Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix E, “Special notices” on page 287.
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Preface

This redbook provides suggestions on how to approach problems that may occur in a Domino production environment on the S/390 platform. The first part of the book covers architecture and terminology to familiarize you with the environment. The second part contains step-by-step approaches to enable you to track down the source of a problem and take steps to fix it. The third part contains tools and resources that you can use during problem determination. The appendix contains worksheets and other helpful information.

This book assumes some knowledge of Domino and OS/390 operations. The intended audience is UNIX and OS/390 system programmers, Domino administrators, and other people who support a production Domino system in the OS/390 environment.

The team that wrote this redbook

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This IBM redbook *Domino for S/390 Release 5: Problem Determination Guide* was initiated upon the recommendation of the PD-focused products list by the *Problem Determination Design Council.*
Comments welcome

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We want our Redbooks to be as helpful as possible. Please send us your comments about this or other Redbooks in one of the following ways:

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• Use the online evaluation form found at http://www.redbooks.ibm.com/
• Send your comments in an Internet note to redbook@us.ibm.com
Part 1. The Environment
Chapter 1. How to Use This Redbook

We wrote this redbook to help you solve problems in the Domino for S/390 Release 5 environment. Our intent is to give you the information you need to determine what to do when Domino for S/390 does not work the way it should.

1.1 The Contents of This Redbook

This redbook starts with an overview of Domino R5 architecture in Chapter 2, “Domino Architecture For Problem Determination” on page 7. We then describe the new architectural features that differentiate this release from the previous ones in Chapter 3, “The OS/390 Environment and Terminology” on page 21. Then we give an overview of the S/390 environment in order to explain this platform to newcomers in Chapter 4, “Domino R5 Server Implementation in S/390” on page 45.

Chapter 5, “Handling Problems in a Domino for S/390 Environment” on page 59 offers a summary of the methodologies and approaches to solving a problem.

Chapter 6, “Troubleshooting Techniques and Tips” on page 75 describes some of the most common types of problems. It gives a list of actions that can be taken for each of them.

Chapter 7, “Maintenance Philosophy” on page 93 explains the maintenance philosophy for Domino in the OS/390 environment.


After that, we present some case studies to illustrate some problems and how they were solved in Chapter 11, “Real Case Studies” on page 195.


Chapter 13, “How to Avoid Domino Problems” on page 233 details some general ways to prevent problems from occurring.

Finally, in Chapter 14, “Resources” on page 257 we describe the information available about this environment and give pointers to valuable Web sites.

Note: Before starting to go through this redbook, be sure that you follow the advice in 1.2 to avoid problems that have already been solved.

1.2 Important: Absolute Prerequisites

Our experience is that you will avoid many problems if you refer to the Release Notes and the Installation Guide that are shipped with the product and available on the Lotus Web site:

http://www.lotus.com/home.nsf/welcome/notesua
The redbook *Lotus Domino for S/390 Release 5: Installation, Customization, and Administration*, SG24-2083 (level 02) also provides valuable information to supplement the product documentation.

### 1.2.1 Release Notes

In the Release notes, read the following sections carefully:

- Things you need to know. This describes the platform requirements.
- Fix lists. If you are using customized templates or applications, you should evaluate if there are any potential inter-operability problems with previous Domino versions.

### 1.2.2 Installation Guide

The installation guide will assist you in preparing your OS/390 environment and in applying the installation procedures.

### 1.2.3 Things To Remember

Apply to your OS/390 system *all the maintenance* recommended on the following Web site:


You can validate that your maintenance is complete by running the PTF Checker tool (available from the same site) on a regular basis. You should do this to prevent problems and before placing a call to the IBM software support center.

- Set your system parameters as recommended in the *Lotus Domino for S/390 Installation Guide* for release 5.0 and the redbook *Lotus Domino for S/390 Release 5: Installation, Customization, and Administration*. This includes:
  - Overall system parameters in SYS1.PARMLIB (IEASYSxx)
  - UNIX System Services parameters in SYS1.PARMLIB (BPXPRMxx)
    - The command ‘d omvs,o’ on the OS/390 console will give you the current values for these parameters on your system.
    - **Important**: Use the recommended values for these parameters if possible, since the use of other values has been a major source of problems.
  - Communications Storage Manager (CSM) parameters in SYS1.PARMLIB (IVTPRMxx)
  - Set the initialization parameters of the Lotus Domino for S/390 (NOTES.INI), as recommended for any Domino server. There is no need to explicitly give a value to the USS Notes_SHARED_DPOOLSIZE parameter for Domino R5, unlike in release 4.x; the UNIX default value of 8 MB works fine.
  - Set up the right team. The Domino for S/390 environment is generally a large-scale production environment and many people may be involved, such as the following:
    - Help desk
    - Technical Support
      - OS/390 system programmer
      - Network specialist
• Domino administrator
• Security administrator

These people should understand their roles and collaborate as a team.

1.3 Initial Recommendations

Read the background chapters (2 to 4) before proceeding.

In case of a problem, use Chapters 5 and 6 to understand what to do. The tools described in Chapters 8, 9 and 10 provide more detailed information about the diagnostic aids that are available and how you can use them.

Remember to test any release of Domino (QMR or QMU) before putting it into production to flush out problems related to the installation of new code.

Take advantage of the vast amount of information available on the Web. You can search for documentation on Domino or OS/390 books or even look for known problems. Chapter 14 is a guide to the information you need.
Chapter 2. Domino Architecture For Problem Determination

Lotus Domino is the leading environment for development of groupware and mail applications. In addition, Domino provides several Internet integration functions, such as Web application infrastructure and Internet messaging. In this chapter, we will provide architecture information about the Domino server which will help you in doing problem determination.

Several resources on architecture were used as our reference:

- Lotus Databases (Knowledge Base and others)
- The material of Lotusphere 98 and 99
- Lotus education courses
- Other redbooks

Since architecture continues to change, check for current information using the resources showed in Chapter 14, “Resources” on page 257.

2.1 Common Structure of Domino Server

The current release of Lotus Domino is Release 5. Figure 1 shows the functions that Domino R5 provides.

![Diagram of Domino Release 5](image)

*Figure 1. Function of Domino Release 5*

The main component of Domino is Notes services. It is a client-server system based on its own Remote Procedure Call mechanism, called Notes Remote Procedure Call (NRPC). Lotus Domino servers and Notes clients run on many platforms, from workstations to mainframes, but the basic structure of the Notes services function is the same. Any platform differences are transparent to the user and the application programmer; Notes appears the same across platforms.
In this chapter we describe the general internal structure of Domino, ignoring release-specific details. There are several changes in internal design for Release 5, and we explain those in 2.2, “New Internal Structure of Domino R5 Server” on page 15.

2.1.1 Kernel Design of Domino/Notes

The core modules of the Notes software are shared between client and server code; it is the kernel which is known as the Notes “C” API, called Notes Object Services (NOS). Some NOS services manage Notes databases and files; others are “operating system”-type services (memory management, time and date services, network services) that interface to the equivalent services in the host operating system but which hide the particular differences between operating systems from their callers, making it easier to develop portable client and server applications.

This approach is necessary in any architecture which must span existing and future operating system choices. Insulation of the groupware application developer from platform details is the best way to create a truly open system, where choice of software is not constrained by a particular hardware or operating system vendor. Application developers (at the API level or at the Notes user interface) gain three key isolation layers: from the operating system, from network transport, and from the physical location of the object store (through a transparent form of remote procedure call).

Figure 2. Structure of Notes kernel

All these core modules are available to higher layers of Notes, including API programs, in the client and in the server environments, on all platforms supported by Domino/Notes. Figure 2 shows the Notes kernel, the major constituents of the
Notes workstation and server, and the integration options available to API developers.

Important modules in the Notes kernel are:

**OS**

The operating system isolation layer, which provides platform-independent access to memory, shared resources, semaphores, environment information and so on. Beneath the isolation layer are highly optimized implementations of these services for each individual operating system.

**SEC**

The Security module, which provides access to user information, certificates and encryption keys, based on the BSAFE security package from RSA Security Inc.

**NSF**

The Notes Storage Facility, which is a subsystem that manages the Notes database, allowing its users to create, open and delete databases, create, open and delete documents, and store and retrieve information. Part of this function includes On-Disk Structure (ODS) management, which ensures portability of the .NSF file format across platforms and on the network. All the published NSF interfaces are independent of the database location; a remote procedure call system transparently redirects requests to the local disk or to the appropriate server. This RPC layer is also used by other kernel modules such as NIF (the indexer, which is used to retrieve a pre-built index from the appropriate server).

**NIF**

The Notes Index Facility, which manages indexes of Notes documents into Views. Views define the selection of particular documents and columns containing information from those documents (or calculated values based on the documents); columns can be sorted, or categorized (where similar values appear under one heading), and can use the hierarchy of main and response documents in a database. These collections of documents are indexed in a B-tree structure, for presentation to the user as a Notes view. NIF is responsible for maintaining and using the indexes, adding and removing information incrementally as documents are modified.

**FT**

The Full Text Index facility, which provides content-based retrieval and weighting of documents with Boolean logic searches through the full text of any document.

**NTI**

The Network Transport Layer provides a single interface to drivers for many networking protocols, and has the capability to initiate and receive phone calls or create LAN-protocol sessions for communication over ports defined by “connection” documents in the Name and Address Book.

**COMPUTE**

The module responsible for performing calculations, using the Notes formula language. Notes API programs can ask COMPUTE to create and evaluate formulae, and also implement custom @-functions which are called by the COMPUTE module.

**NAME**

The user directory service, while not strictly a part of the kernel code, has some direct APIs which give access to the Lotus Notes Name and Address Book. This is a special Notes database which contains user names and E-mail addresses. User identification uses a X.500-based
naming model and conforms to X.509 certificate and authentication standards.

The Domino/Notes server consists of one core server program, which manages the server's other processes and threads and users' connections with the server. The server functionality is largely implemented with “add-in” modules. Some are a necessary part of any server system, others are optional or developed by third parties. Important add-ins include the database replicator (which schedules and connects to other servers or workstations to replicate databases), the indexer (which keeps indexes up-to-date for immediate access by workstations), the mail router (which directs mail between mailboxes and between servers), and Chronos, which schedules “agents” to perform background tasks in Notes databases at the application designer's request.

2.1.2 Process the Request

Each request from the Notes client is processed by the thread owned by the server process. A thread is a way of sharing the CPU within an application. A thread is a piece of code that owns a stack, registers, and its priority. It shares everything else (code, variables, and so on) with all the other threads in the process. Figure 3 shows the relation between the user sessions and the threads running on the server processes.

Note: The following figure is only applicable to releases of Domino before Release 5. The new process structure in Domino R5 is shown in Figure 7 on page 16.

![Figure 3. Server Processes and User Sessions (Before Domino R5)](image)

Before Release 5, there was a restriction on the number of threads per process. For example, Release 4 was restricted to one hundred threads per server process. So when the number of concurrent requests exceeded this limit, another server process was executed and created the next session. Starting with Release 5, a new concept of thread pooling extended the limit of sessions per server process, reducing the number of server processes. Thread pooling is discussed in 2.2.1, “Thread Pooling” on page 15.
2.1.3 Control Resource Sharing

On a Domino server, each thread in the server process shares system resources such as database files. For concurrent processing, the Domino server uses semaphores to serialize access to the resources. A general usage of the semaphore is shown in Figure 4.

![Figure 4. Usage of Semaphores](image)

A semaphore is a software switch or flag that is used to synchronize the execution of various tasks to ensure that one process has completed before another begins. A thread which requires the resource locks an appropriate semaphore to prevent other tasks from using that resource until it is finished. If another thread tries to use the same resource, it will have to wait for the owning thread to finish and unlock the semaphore. In Figure 4, this operation may happen in the following way:

1. Thread A locks the semaphore “0” to access the resources.
2. Thread B tries to lock the same semaphore but cannot. Then Thread B waits for that semaphore to become available.
3. Thread A finishes its use of the resource and frees the associated semaphore.
4. Thread B tries again and succeeds this time.

In the previous flow, we mention only one semaphore. But in the actual processing environment, there are many semaphores used for controlling access to shared resources. So if the thread tries to lock multiple semaphores at one time, it may cause a deadlock situation. Looking again at Figure 4, suppose that Thread B had already locked semaphore “1” (pointed to by A) and entered a wait state. If Thread A tries to lock the semaphore “1” before releasing the previous semaphore “0” (pointed to by B), it will also wait and both threads will not run any more. If this happens in Domino server, it will cause a server error.

2.1.4 Database File Structure

Notes databases are also known as “Notes applications” because they contain more than just data documents. They are complete, self-contained applications having code, schema, indexes, security, and data all bundled into one file. They are the foundation of the Notes architecture and can reside either on clients or servers. They have unique structures designed to support simultaneous online access by multiple users. They also support re-synchronization of the contents of two copies (replicas) of the same database. This makes it easy to for an
individual to “take an application offline” for awhile and then merge offline edits
back into a common, shared database.

A Notes database is a container for documents, form designs, view definitions,
and all the other classes of notes. The Notes’ flexible structures and features are
tailored to the need to transport and identify them: unique identifiers,
last-modified timestamp, summary information and so on. The container
database also reflects its function: the need to quickly retrieve appropriate
information, the need for extreme reliability, and the need to support replication.
Figure 5 shows the structure of this database.

---

**Figure 5. Format of Database File**

The Notes database (a file on disk, usually with extension .NSF ) begins with
header information and an allocation map. Important parts of the header include:

- A Database ID, uniquely identifying this file
- A Replica ID, uniquely identifying all replica copies of this file on all servers
- A Creation timestamp
- A Last Modification timestamp (the last time that any of the database’s
  contents were modified)
- A title and a “category” for easy identification
- A Design Class, indicating that the design elements should be inherited from a
central template database and maintained in synchronization with that
  template

The replicator task and others use this information to efficiently decide whether a
database should be replicated, and which database replicas exist on any
particular server. The database contents can be scanned extremely quickly for
the notes which have been added or modified since a certain time. This again is optimized for the replicator.

The rest of the database contains notes and other objects; summary buffers stored for rapid access, and non-summary items in another area of the file. There is another internal abstraction: notes themselves are a specialized class of objects. Other object classes include file attachments, OLE packages, packed lists of documents (unread lists, for example). Every object is identified by a Record Relocation Vector (RRV) which is a file-position pointer; a NOTEID is simply the note's RRV.

Some objects, such as the collections which constitute an index of the database, are never replicated (since they must be built for each local copy of the database).

### 2.1.5 Shared Memory Management

Lotus uses shared memory segments to allocate portions of the segment designated for Notes use to pools and semaphores. This segment is referred to as the memory manager, which manages all shared memory segments allocated to Notes.

After the server starts and the initial segment for the memory manager gets allocated, the server needs some memory space to work with. At this time, Domino will spawn (fork) its first working area memory segment. Space within this segment will start getting taken up by NSF buffering space to contain information for the Name and Address Book, log files, and mail.box. (These are files that are always open when a Notes or Domino server is running.)

Next, the Domino server receives a request to open a database. This requires the use of a semaphore, and takes some space in the segment as well. Now an index has to be read, and Domino needs space in which to put it, so the server allocates space for the NIF pool to store the index information. The semaphores are regarded as “traffic cops” for the shared memory segments. They control the allocated space and the sharing of semaphores. Therefore this scenario occurs over and over. When it needs more space, Domino will fork a new segment of the specified size (whether it be set using the algorithm or the dpool variable). Shared memory segments are taken from the virtual memory, which is the combination of both physical memory and swap space.

### 2.1.6 Network Address Resolution

In a Domino environment, the name resolution service is basically provided by the Notes Name Services (NNS) used with NRPC.

All Domino servers and Notes users have a hierarchical name based on the X.500 naming standard. This naming scheme uses a tree structure that reflects the structure of the company using Notes. For example, the following is the hierarchical name of Joe Smith who works in the accounting department of the XYZ organization:

```
Joe Smith/Accounting/XYZ
```

This name is broken down as follows:

- **Common Name (CN)** = Joe Smith
- **Organizational Unit (OU)** = Accounting
In the case of the server, the server name is placed in the Common Name field. To access the server, the client looks up the NAB to get the server document, which includes several network details about the server.

When using TCP/IP as a network, it is important to manage the relationship between the server common name and the TCP host name or IP address. In the TCP/IP environment, the TCP host name is managed by the Domain Name Server or stored in the local hosts file. The host name is translated to an IP address to make a TCP/IP connection. Using TCP/IP and the Domino native name services, a Domino server or Notes client processes the name-to-address resolving, as shown in Figure 6.

![Figure 6. Domino Server/Host Name Resolve Process using TCP/IP](image)

### 2.1.7 Data Representation

In a Domino environment, there is a special code set used for representing the data in the database. It is Lotus Multi-Byte Character Set (LMBCS). LMBCS is based on the US ASCII code set, with some modifications. Table 1 shows the code assignment of LMBCS.

<table>
<thead>
<tr>
<th>1st byte</th>
<th>2nd byte</th>
<th>3rd byte</th>
<th>Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>none</td>
<td>none</td>
<td>Terminate</td>
</tr>
</tbody>
</table>
2.2 New Internal Structure of Domino R5 Server

Domino R5 is Lotus’ next generation of Internet products. The Domino R5 server builds on its already strong foundation for messaging and Web applications. To improve functionality of availability, reliability and performance, the Domino R5 server introduces several new structures. How they implement these enhancements depends on the server platform. Domino for S/390 runs on OS/390 UNIX System Services environment, so we describe the new design based on the implementation in a UNIX environment.

2.2.1 Thread Pooling

As described in 2.1.2, “Process the Request” on page 10, Domino R4 servers use one thread per connection. When a client came in with a request, the request would be received and a thread of execution would be created. The thread of execution would then handle all requests made against that connection. This works well for 100 to 500 users, but with thousands of users, there are thousands of threads executing on a system, trying to get to the same shared resources at the same time. A lot of time and resources are spent managing contention between these threads.

Domino R5 uses a thread pool model, in which each server thread can support many connections. Figure 7 on page 16 shows the thread pool model and how the server process uses it.
When a user connects to the server, a client session is created with a unique socket descriptor and a virtual thread ID is assigned. When a client performs I/O, a physical thread is associated with the virtual thread and does the associated work on behalf of the client's session. After the work is completed, the physical thread is returned to the pool of threads. It is no longer associated with the virtual thread and is available to service another request. For this reusable thread model, the server can keep fewer threads than the maximum number of concurrent user connections.

By having fewer threads, the contention for resources is reduced significantly. Also, there is a reduction in the amount of memory consumed per connection. The thread pool model is a much faster performer on same system. There is a greater reduction in amount of resources consumed, because you don't have a threads storage issue. There are more CPU cycles available because you aren't managing contention.

### 2.2.2 Asynchronous I/O

In the thread pool model, it is necessary that the operating system supports both asynchronous I/O and a fast event notification method. I/O event notification says "I know when this read or write operation is completed and I can now go do the next thing." The way it works is that all connections have an asynchronous read posted and each of the threads is waiting on an event from the asynchronous notification queue. When a client on the other end of a connection makes a request, the operating system creates an event that is placed on the asynchronous notification queue. The request is then handled by the next available thread. After the request is satisfied, the whole process begins again.

On all UNIX platforms, the POSIX asynchronous I/O is used for all network reads and writes. This allows Domino to post reads and writes, and then come back and
take control with the thread. While this works well on all UNIX platforms, the problem was to find out when these I/Os completed (the notification to the O/S that the pending async I/O had completed).

The normal method of determining that a POSIX I/O has completed is to examine the per I/O status structure. The problem with this is that if you have 10,000 connections or users, it would take a long time to look at each of the 10k or more containers to find out (for every I/O operation) which one had activity.

This didn't make sense. So Domino R5 uses the signal context, passed in from a blocking call, to determine which I/O has completed. The server issues the `sigio` for asynchronous operation and then waits for the signal using a `sigwait`.

### 2.2.3 Unified Buffer Manager (UBM)

Unified Buffer Manager (UBM) is a shared memory cache for most disk resident data in Notes/Domino databases. It is also a memory cache for temporary files like external sorting temporary files or containers. Cached data is shared system-wide. UBM has fair replacement policies and high concurrency in all operations.

In R4 there are many types of caches for each database, but they do not have functionality such as global sharing, global fair replacement, fair competition for memory among database components, uniform “control” over I/O, or asynchronous clearing and prefetching.

UBM combines elements of many buffer managers, for example the clock replacement algorithm similar to DB2. It also has some unique requirements:

- Variable-size buffers
- Content-specific I/O and management methods
- Page “groups”
- Retrofit into a code base that was not designed to use a buffer manager

Buffer Manager is a cache for database and temp file data. It saves doing I/O each time data is modified or accessed. Buffer Manager presumes a paginated structure of data. Pages have embedded metadata that improves integrity, enables recovery, and increases performance. It is important that you distinguish database Buffer Manager from the file system buffer cache.

Buffer Manager manages a pool of memory called the buffer pool (NSF Buffer Pool). Buffer Manager maintains a dynamic mapping of database “pages” onto memory “buffers”. A buffer is the memory area used to cache the page when it is “buffered”. A page is a contiguous section of a database, including the data stored in the page and any persistent page metadata stored in the page.

Buffered pages can be shared by any running process and thread. Multiple modification can be absorbed in a buffered page before it is written to disk. Multiple accesses (reads) can be done against a buffered page once it is read from disk. Reads and writes can be mixed for a single buffered page.

### 2.2.4 Transaction Logging

In Domino R5, there is a new on-disk structure (ODS) for the database. This new format optimizes I/O and increases reliability. It has better utilization of disk I/O by using page-oriented handling of data. Writing to disk takes place less frequently
but more efficiently, which means the I/O is dramatically reduced. The maximum database size limit has been increased to more than 64 GB (this was the maximum tested, not an architectural limit) from 4 GB in R4.

When migrating the database files to the new ODS format, you can select the option of transaction logging. Transaction logging is an industry standard technique for ensuring reliable data storage. In the event of failure, the server restart time is much faster, and no fixup is required. Significantly improved uptime is possible with R5 logging; Domino can be restarted in a matter of minutes even with many very large databases. A simplified view of the logging process is given in Figure 8.

Figure 8. Transaction Logging

Let us say that a user writes a document to a database. When the new document is saved, Domino writes it to a memory buffer (1). When the memory buffer is needed for other data, the contents are posted to the transaction log (2). At some time later, determined by the system, the logged event is written to the actual Domino database (3).

Transaction logging records database operations in a sequential file, TXN, rather than writing operations to various nonsequential locations on disk. It is important to configure the server with the transaction logs on a dedicated physical disk that is not the same device as the Notes database or swap file, temp directory and so on. This allows the code to write sequentially to the log files, without having to move the disk heads around the disk.

Important: Ideally the logs should be on a mirrored disk, since a failure of the device containing the logs can mean losing a lot of transactions which have not been written out to the databases.

When you enable transaction logging, Domino creates a unique database instance ID (DBIID) for every database on that server. This enables Domino to
record information about transactions made to each database. The server then creates the transaction log files and a control file. Now, every time a database is updated, the server logs the transaction to the sequential log file, and a separate task actually updates the database file. The transaction is marked complete when the log operation is completed. The server therefore does not have to wait until the transaction is actually written to the database.

Domino/390 R5 uses HFS in both log file and nsf file writing. It opens the log file in read/write mode AND read/write in non-cached mode and opens the nsf file in read/write mode with fdata_sync on. This ensures that log file is always written to disk earlier than the nsf file under a new environment consisting of UBM (Unified Buffer Manager) and HFS 1.5. The log file can be thus be used as a recovery file for the nsf file.

Transaction logging provides not only improvements in database reliability and integrity, but also in performance testing; it gives about a 10% boost in performance. Also, backups of servers can be more easily managed.
Chapter 3. The OS/390 Environment and Terminology

OS/390 may seem unfamiliar if you are coming from another system environment. In this chapter, we give a brief summary of the S/390 world. We include information which can help you maintain a Domino for S/390 server or talk with an OS/390 system programmer or operator.

OS/390 guarantees data integrity, provides automatic data backup, regulates security, analyzes resource usage, and provides a range of facilities unmatched by even a sophisticated network of workstations.

OS/390 contains an operating system formerly known as MVS. We discuss this in 3.1, “Introduction of the MVS Environment in OS/390” on page 21. It also runs the UNIX instruction set natively as part of the operating system. We discuss this in 3.2, “UNIX Application Environment on OS/390” on page 28.

3.1 Introduction of the MVS Environment in OS/390

The core of OS/390 is MVS, which stands for “multiple virtual storages.” It runs on IBM's S/390 servers. Over 34,000 companies, including many of the world's largest corporations, have used MVS to develop applications and store data for their important business processes. MVS and the processors it runs on have become the repository for valuable and critical information resources, including 70% of the world's data.

On the other hand, the operation and usage of MVS is complex and may be a challenge to understand if you are moving from other platforms. This chapter will help you understand the OS/390 environment.

Figure 9. Overview of OS/390
3.1.1 System Environment

Figure 9 on page 21 shows a functional overview of OS/390.

OS/390 consists of a number of components derived from MVS, which control and manage system activities. The major MVS system tasks are:

**JES**  Job Entry Subsystem. A spooling system that provides job queuing and job output management.

**VTAM**  Virtual Telecommunication Access Method. It controls communications based on a System Network Architecture (SNA) network.

**TSO/E**  Time Sharing Option/Extensions. It provides the user environment on OS/390 via VTAM.

**WLM**  Workload Manager. It enable MVS to cooperate with subsystem work managers to achieve installation-defined goals for work, to distribute work across a sysplex, to manage servers and to provide meaningful feedback on how well workload management has achieved those goals. They also allow programs to create an interface to define a service definition.

**RACF**  Resource Access Control Facility. It controls overall security criteria in MVS.

**DFSMS**  Data Facility Storage Management Subsystem. It manages overall data store in MVS. Refer to 3.1.4, “Data Management” on page 26 for more information.

**SMP/E**  System Modification Program/Extended. It is a tool designed to manage the installation of software products on your OS/390 system and to track the modifications you make to those products. (It is not shown in Figure 9.)

**SMF**  System Maintenance Facility. It allows the system to record activity, which you can then format with a report facility such as Resource Monitoring Facility (RMF). OS/390 now writes SMF Type 108 records for Domino R5 activities.

When the system tasks start, they get their parameter settings from the OS/390 parameter data sets, for example SYS1.PARMLIB. These parameter libraries contain many control members. Some of these are valid for all the tasks and some are effective only for the specific task. Here are some examples of parmlib members:

**IEASYSxx**  This member contains several system parameter settings. It also includes the suffix of the rest of parmlib members which are active.

**IEASYMxx**  This contains system symbols and user-specified values.

**LNKLSTxx**  It contains a list of datasets that OS/390 uses to maintain common modules used by the operating system and various vendor products.

**LPALSTxx**  It contains a list of datasets that OS/390 loads into the Link Pack Area (LPA) at IPL time. LPA is an area in the operating system where common system modules are loaded and remain resident. This area contains Domino modules. This is done for performance reasons and is required for Domino.
PROGxx  It is an optional parameter which overrides other members such as LNKLST or LPALST when it exists.

3.1.2 Address Space and Virtual Storage

The system tasks listed in 3.1.1, “System Environment” on page 22 and the user tasks are executed in address spaces. An address space consists of virtual storage, and Figure 10 shows the layout of the storage areas.

![Virtual Storage Map](image)

Each virtual address space consists of:

- The common area below 16 megabytes
- The private area below 16 megabytes
- The extended common area above 16 megabytes
- The extended private area above 16 megabytes

The common area contains system control programs and control blocks. The following storage areas are located in the common area:

- Prefixed storage area (PSA)
- Common service area (CSA)
- Pageable link pack area (PLPA)
- Fixed link pack area (FLPA)
- Modified link pack area (MLPA)
- System queue area (SQA)
- Nucleus, which is fixed and non-swappable

Each storage area in the common area (below 16 megabytes) has a counterpart in the extended common area (above 16 megabytes) with the exception of the PSA.

Each address space uses the same common area. Portions of the common area are paged in and out as the demands of the system change and as new address spaces start and old ones terminate.
The private area contains:

- A local system queue area (LSQA)
- A scheduler work area (SWA)
- Subpools 229, 230, and 249 (the authorized user key area)
- A 16 K system region area
- Either a V=V (virtual = virtual) or V=R (virtual = real) private user region for running programs and storing data

Except for the 16 K system region area and V=R user regions, each storage area in the private area below 16 megabytes has a counterpart in the extended private area above 16 megabytes.

Each address space has its own unique private area allocation. The private area (except LSQA) is pageable unless a user specifies a V=R region. If assigned as V=R, the actual V=R region area (excluding SWA, the 16 K system region area, and subpools 229, 230, and 249) is fixed and non-swappable.

In addition, there is another type of space called a data space. The data spaces are areas of virtual storage that the program can ask the system to create. The size of this space can range from 4 kilobytes to 2 gigabytes, according to the user's request. Unlike an address space, a data space contains only user data or user programs stored as data. Program code cannot run in a data space. Figure 11 shows the difference between an address space and a data space.

![Figure 11. Address Space and Data Space](image)

The data space is used for a large data buffer as the extension of address space. From the task point of view, it is an area which is available for data store. For the system, it is treated the same as an address space in terms of virtual storage management.

### 3.1.3 User Interface

When you set up or manage a Domino for S/390 server, you may use the traditional MVS user interface. This interface is provided by TSO/E and ISPF.
Figure 12 shows the initial menu panel of ISPF. You select the several system programs listed there and do the appropriate tasks, such as installing Domino for S/390.

While installing Domino for S/390 or related tools, you often have to run jobs written with Job Control Language (JCL). JCL consists of control statements that introduce a computer job to the operating system.

Figure 13 shows sample JCL included in the installation package of Domino for S/390.


3.1.4 Data Management

Figure 14 on page 26 shows how the concept of data handling is different between OS/390 and UNIX.

In OS/390, data management is based on a **data set**. The data set is a collection of a data stored on a Direct Access Storage Device (DASD), which is comparable to a hard drive on workstation or PC. Some types of data sets correspond to files, but others do not. For example, a Partitioned Data Set (PDS) is a library that contains multiple members with the same characteristics. It can be thought of as a UNIX or PC directory structure with executables or source files.

The data management tasks are maintained by Data Facility Storage Management Subsystem (DFSMS). DFSMS is a subsystem that manages DASD volumes and datasets. DFSMS is comprised of the following functional components:

- **DFSMSdfp** This provides several functions for storage management, data management, device management, and program management.
- **DFSMSdss** This copies and moves data to help manage storage, space, and data more efficiently.
- **DFSMShsm** This provides automatic management of low-activity and inactive data, and automatic backup and recovery of active data, in both system-managed and non-system-managed environments.
- **DFSMSrmm** This helps you manage your removable media, such as tape cartridges, reels, and optical volumes. DFSMSrmm provides a central online inventory of the resources in your removable media library and in storage locations outside your removable media library.
The most unique function provided by DFSMS is the Storage Management Subsystem (SMS), which automatically assigns service requirements and attributes to new data when that data is created. SMS automatically controls system storage so that users do not need to worry about the physical characteristics of storage devices.

### 3.1.5 System Monitoring and Diagnosing

One of the benefits of OS/390 is its serviceability. For the operator and system programmer, there are several monitoring facilities on OS/390.

**SDSF** Spool Display and Search Facility. SDSF panels provide current information about jobs, printers, queues, and resources in an OS/390 JES2 system. From these panels, you can enter SDSF commands or MVS and JES2 system commands to control the processing of jobs and the operation of system resources. Figure 15 shows the main menu panel of SDSF.

![SDSF Main Menu](Image)

**SMF** System Maintenance Facility. It corrects and records system and job-related information. There are various record types for each information and Domino for S/390 R5 now creates its SMF record.

**RMF** Resource Monitoring Facility. It is a tool to report system activity and resource usage.

And for problem determination, OS/390 has several capabilities for generating diagnostic data:

**CTRACE** Component Trace. It provides data about events that occur in the component. The trace data is used to diagnose problems in the component or see how the component is running.

**SLIP Traps** Serviceability Level Indication Processing. A method of data collection that can be used when Domino failures occur.

**SVC dump** Supervisor Call Instruction Dump. It provides a representation of the virtual storage for the system when an error occurs. Typically, a system component requests the dump from a recovery routine when an unexpected error occurs. However, an authorized program or the
operator can also request an SVC dump when diagnostic dump data is needed to solve a problem.

For diagnosing dump data, you can use the Interactive Problem Control System (IPCS). IPCS is a tool provided in the MVS system to aid in diagnosing software failures. IPCS provides formatting and analysis support for dumps and traces produced by MVS, other program products, and applications that run on MVS. You can use IPCS from the dialog panels shown in Figure 16 or by entering the IPCS command at the TSO/E READY prompt.

Figure 16. IPCS Dialogue Main Menu

3.2 UNIX Application Environment on OS/390

OS/390 not only provides traditional MVS services, but also a rich set of UNIX services which conform to open system specifications such as POSIX and XPG4. This allows existing UNIX applications to be ported to OS/390 and new ones to be developed. The coexistence of UNIX and MVS applications is shown in Figure 17 on page 29.
The UNIX environment on OS/390 is like running the UNIX operating system on S/390; it is a native part of OS/390. UNIX applications therefore benefit from the S/390 strengths such as performance, DASD capacity, system availability and security, and so on. Apart from the UNIX services which also include a UNIX-like hierarchical file system, OS/390 comes with a UNIX front-end that provides users with the UNIX “look and feel”, a collection of UNIX tools and utilities, and a versatile debugger to debug UNIX applications on OS/390.

### 3.2.1 OS/390 UNIX System Services Overview

The functionality of UNIX on OS/390 is called OS/390 UNIX System Services or OS/390 UNIX. It responds to requests from programs and the OS/390 shell and is made up of system and application services. Figure 18 is a simplified representation of OS/390 UNIX.
OS/390 UNIX is fully integrated into OS/390 core services and other traditional MVS products. OS/390 UNIX consists of two service functions, System Services and Application Services.

System Services provides:
- XPG4 UNIX 1995 conformance
- Assembler-callable services
- TSO/E commands to manage the file system
- ISPF shell environment

Application Services interprets commands from users or from programs, called shell scripts, and requests MVS services in response to the commands. Application Services provides:
- A TSO/E command to enter the shell environment
- A shell environment for developing and running applications
- Utilities to administer and develop in a UNIX environment
- The dbx debugger
- Support for socket applications
- rlogin (remote login) and inetd functions
- Direct telnet based on TCP/IP protocol
- Support for full-screen applications (curses support)
- Communications Server login monitor support

Application Services also contains the code that was provided in the optional Shell and Utilities and the Debugger features prior to OS/390.

Each process of a UNIX application owns and runs in an address space, just like as a traditional MVS task. Any system call operations such as I/O processing are trapped by the kernel address space of OS/390 UNIX. The address spaces relationship between system task and user process is described in Figure 19.

![Figure 19. The Address Spaces Construction of OS/390 UNIX](image_url)

The address spaces needed for OS/390 UNIX are:

**OMVS**  OMVS has the role of the kernel in the typical UNIX system.

**BPXONIT**  BPXONIT runs the initialization process. It has two categories of functions.
1. It behaves like PID(1) of the typical UNIX system. This is the parent of /etc/rc, and it inherits orphaned children so that their processes get cleaned up using normal code in the kernel. This task is also the parent of any MVS address space that is dubbed and not created by fork() or spawn(). Therefore TSO/E commands and batch jobs have a parent PID of 1.

2. Certain functions that the kernel performs need to be able to make normal kernel calls. This address space is used for these activities, for example, mmap() and user ID alias processing

**BPXAS** BPXAS address spaces are created by the OS/390 Workload Manager (WLM) when a program issues a fork() or spawn() non-local.

To hold system parameter, OS/390 UNIX uses the member BPXPRMxx in the parmlib, like SYS1.PARMLIB for MVS. BPXPRMxx contains the following information:

- Control parameters for the OS/390 UNIX environment
- Hierarchical File System definitions
- Socket File System definition

We discuss how to customize BPXPRMxx for Domino for S/390 in 4.1, “Domino for S/390 R5 and Related System Parameters” on page 45.

### 3.2.2 File System - How OS/390 UNIX Stores Data

OS/390 UNIX uses the Hierarchical File System (HFS). A specially formatted data set called HFS is used for the physical data store on OS/390. It is defined to MVS as a data set, and is treated like other MVS data sets for allocation and management. But its contents cannot be accessed without OS/390 UNIX. Figure 20 shows the structure of HFS.

![Figure 20. Hierarchical File System](image)

HFS data sets require that SMS be active when controlling them. Until recently, HFS data sets could not span DASD volumes. Now multi-volume allocation for
HFS data sets is provided by DFSMS V1R5. But DASD storage usage requires research and planning.

From a UNIX application or user point of view, the Hierarchical File System looks like a single structure which is composed of the directory. Figure 21 on page 32 shows the relationship between the directory structure and the HFS datasets.

To make an HFS data set available in the file system, you have to mount it, just like you add new hard disks or partitions to a UNIX file system. You can issue the mount command from a user ID which has superuser authority. The mount command for OS/390 UNIX is not a shell command but a TSO command, so you need to use the traditional MVS user interface. Or you can specify the MOUNT parameter in BPXPRMxx member to mount the HFS data set at initialization time.

![Figure 21. Directory Structure and HFS Data Set](image)

### 3.2.3 User Interface—How You Can Access OS/390 UNIX

In a UNIX environment, you connect from your local workstation or PC to a UNIX server via a TCP/IP application called telnet. OS/390 UNIX provides a telnet application in the OS/390 eNetwork Communication Server IP, which is a TCP/IP product on OS/390. So you can work in the shell environment of OS/390 UNIX with the same “feel” as a UNIX environment.

In addition, there are several user interfaces into OS/390 UNIX. They are based on the traditional MVS 3270 terminal and you can use them through the TSO environment. One is the OMVS shell; Figure 22 on page 33 shows the screen displayed when you start an OMVS shell session.
To start an OMVS shell session, you enter the OMVS command from TSO command prompt. Then this panel is shown and you can enter any shell commands, as you do with telnet.

But there are differences from telnet. For example, you do not type the command next to the command prompt, but instead on the command input area specified by the arrow. At the bottom there are function keys defined, such as scrolling backward and forward.

Another difference is the ISHELL. This is not an actual shell environment but a panel interface like ISPF, which is familiar to general OS/390 users. Figure 23 is the initial panel of ISHELL.

From this panel, you can do any operations, such as editing a file or making a new directory by selecting the item from the menu. This menu is placed on the top of the panel. You move the cursor to the menu and press Enter. Then the operation items are shown, as in Figure 24 on page 34.
3.3 Security Management in OS/390

From a security standpoint, OS/390 Security Server is the security package that IBM supplies with S/390. The OS/390 Security Server is an optional function of OS/390. It provides all the necessary products to provide a high degree of data security for a single OS/390 installation or for a Distributed Computing Environment. The OS/390 Security Server consists of:

- Resource Access Control Facility (RACF)
- OpenEdition DCE Security Server
- LDAP Server

However, not all customers use this package as there are others on the market such as ACF2, a product that is not IBM proprietary. Non-IBM security products may provide similar functions, especially for OS/390 UNIX, but check with their vendors to be certain.

3.3.1 Overview of RACF

The Resource Access Control Facility (RACF) provides data security by controlling the access to information stored within an OS/390 installation. It provides this security through:

- User Authentication – identifying and verifying users
- User Authorization – controlling the access of users protected resources
- Recording and Reporting access attempts

Figure 25 on page 35 shows the operational flow of RACF.
Before accessing a system's resources, a user has to connect to the system by performing a logon. To verify the identity of a user, a RACF-protected system not only requires user identification (a user ID) but also a password. Each user ID has its own, unique password associated with it. Originally the password is set by your security administrator when a user ID is defined to the system. At the time of your first logon, RACF requires you to modify your password. An IS installation usually defines a set of password rules (such as password length, allowed characters and so on) and a time interval after which a password expires. Whenever a user enters a user identification and a password on the logon screen, RACF compares the entered combination of user ID and password with its own recordings. The user is allowed to proceed only if the combination is valid.

To keep track of user IDs and passwords, RACF has its own database. This RACF database uses three kinds of entries, known as RACF profiles:

- User Profiles
- Group Profiles
- Resource Profiles

RACF enables an IS installation to define individuals and groups who use the system RACF protects. A group is a collection of users who share needs and requirements. RACF also enables an organization to control the access of an individual user or a group to the system's resources. This is called user authorization. Different users can have different access rights; for example, while one user can only read a data set, another one can update it. The access rights a user has are based on the needs of his job. Resources in RACF terms can be entire DASDs, sets of data sets, tape volumes, transactions, program and so on. The access to these resources is described in the resource profiles.
For program execution, applications that run on OS/390 have to prepare the several security attributes to access the system functions or resources protected by RACF. For example, APF authorization is a facility that allows non-system related-programs to perform system-related functions.

### 3.3.2 RACF and UNIX-Style Security

The UNIX applications like Domino server also run in the security environment controlled by RACF. But the methodology of security management differs between RACF and the general UNIX environment. For example, each individual is distinguished by the user ID on OS/390 via RACF, but UNIX recognizes the difference by the numerical value of the UID. Also, RACF controls the access rights to data with the profile, but each file on UNIX has permission bits for access control.

To bridge between two different security criteria, RACF has been extended to include UNIX-style security as shown in Figure 26. The user profile in the RACF database has a field which contains UNIX attributes like UID, home directory, and the initial programs. The group profile also has this field, which stores the appropriate numerics called the GID. When processing the file access, the kernel checks the permission bits of the requested file to see if the UID or GID of the requester has a right to do this process.

In terms of control superuser authority, the user who has a UID of 0 is recognized as a superuser in OS/390 UNIX and gets privileged authority. But under RACF control, you can assign a UID value of 0 to multiple user IDs. And the `su` shell command is also provided for temporary superuser authority. But you need to have read access to the BPX.SUPERUSER profile in the Facility class or you cannot issue the `su` command.

For access control, the Hierarchical File System supports file permission bits just like a native UNIX platform. There is a minor difference, which is the “sticky bit.”
occurs when you see “T” in the last position, for example rwxr-x-T. When you set the sticky bit for the program files, they are not loaded from HFS but from an MVS data set. In addition, there are several special bits for program files in HFS.

- APF authorized bit
- Program Controlled bit

You can see these extended attributes by issuing the `ls` shell command with the parameter `-E`.

Table 2 summarizes the difference between UNIX security and RACF.

<table>
<thead>
<tr>
<th>Category</th>
<th>&quot;Traditional&quot; UNIX</th>
<th>OS/390 (MVS)</th>
<th>OS/390 UNIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>User identity</td>
<td>Users are assigned a unique 4-byte integer UID and user name.</td>
<td>Users are assigned a unique 1 to 8 character user ID.</td>
<td>Users are assigned a unique user ID with an associated UID.</td>
</tr>
<tr>
<td>Security identity</td>
<td>UID</td>
<td>User ID</td>
<td>UID for accessing traditional UNIX resources and user ID for accessing traditional OS/390 resources.</td>
</tr>
<tr>
<td>Login ID</td>
<td>Name used to locate a UID</td>
<td>Same as the user ID</td>
<td>Same as the user ID</td>
</tr>
<tr>
<td>Special user</td>
<td>Multiple user IDs can be assigned a UID of 0.</td>
<td>RACF administrator assigns necessary authority to users.</td>
<td>Multiple user IDs can be assigned a UID of 0 or users can be permitted to BPX.SUPERUSER.</td>
</tr>
<tr>
<td>Data set access</td>
<td>Superusers can access all files.</td>
<td>All data sets controlled by RACF profiles.</td>
<td>Superusers can access all HFS files; data sets controlled by RACF profiles.</td>
</tr>
<tr>
<td>Identity change from</td>
<td>Superuser can use system functions to change the UID of</td>
<td>APF-authorized program can invoke SAF service to change identity.</td>
<td>There are two options: - If the BPX.DAEMON FACILITY class profile is not defined, the superuser can use system functions to change the UID of a process to any UID. - Or, the superuser must be permitted to the BPX.DAEMON FACILITY class profile in order to change UIDs.</td>
</tr>
<tr>
<td>superuser to regular user</td>
<td>any process to any UID.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3.4 Network Connectivity for OS/390

<table>
<thead>
<tr>
<th>Category</th>
<th>“Traditional” UNIX</th>
<th>OS/390 (MVS)</th>
<th>OS/390 UNIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity change from regular user to superuser</td>
<td><code>su</code> shell command allows change if user provides root's password.</td>
<td>No provision for unauthorized user to change identity.</td>
<td><code>su</code> shell command allows change if the user is permitted to the BPX.SUPERUSER FACILITY class profile or if the user provides the password of a user with a UID of 0.</td>
</tr>
<tr>
<td>Identity change from regular user to regular user</td>
<td><code>su</code> shell command allows change if user provides password.</td>
<td>No provision for unauthorized user to change identity.</td>
<td><code>su</code> shell command allows change if user provides password.</td>
</tr>
<tr>
<td>Terminate user processes</td>
<td>Superusers can kill any process.</td>
<td>MVS operator can cancel any address space.</td>
<td>Superuser can kill any process.</td>
</tr>
<tr>
<td>Multiple logins</td>
<td>Users can login to a single user ID multiple times.</td>
<td>Users can only log on to TSO/E once per user ID.</td>
<td>Users can login multiple times to a single user ID and logon once to TSO/E at the same time.</td>
</tr>
<tr>
<td>Login daemons inetd</td>
<td>daemon processes user requests for login. A process is created with the user identity (UID).</td>
<td>TCAS and VTAM process user requests for logon. A TSO/E address space (process) is created with the user identity (user ID).</td>
<td>Users can log on to TSO/E or login using the inetd daemon. In all cases, an address space is created with both an MVS identity (user ID) and a UID.</td>
</tr>
</tbody>
</table>

3.4 Network Connectivity for OS/390

For Domino for S/390, TCP/IP is the only protocol available for connections. OS/390 supports various types of network connections with several types of hardware and software. Figure 27 on page 39 shows the network connectivity of OS/390.
From the software point of view, a TCP/IP protocol stack is provided in OS/390 by OS/390 eNetwork Communication Server IP. Figure 28 is an overview of the OS/390 eNetwork Communication Server IP.

Before activating the TCP/IP stack functions, you have to prepare several definition files.
PROFILE.TCPIP  It contains the configuration parameters like operation, port assignment, network and hardware configuration, TELNET 3270 definition, and routing information.

TCPIP.DATA  It is the anchor configuration data set for the TCP/IP stack and all TCP/IP servers and clients running in OS/390. It contains configuration information such as the name of the TCP/IP address space, the TCP/IP host name, and the data set prefix to use when searching for other configuration data sets.

/etc/resolv.conf  It serves the same purpose as TCPIP.DATA but is stored as an HFS file. The OE resolver will look for this file by default.

TCPIP.DATA and /etc/resolv.conf are important for Domino for S/390 in terms of resolver function. UNIX applications that are invoked from the UNIX System Services shell environment would search for their TCPDATA information in this sequence:

1. Any MVS data set or HFS file explicitly defined with a UNIX System Services environment variable called RESOLVER_CONFIG. This variable may be set by an UNIX System Services shell command, by passing it as a JCL PARM with the EXEC statement or with the STDENV DD card.
   - // PARM='ENVAR("RESOLVER_CONFIG=/etc/tdata03a")'...
   - // PARM='ENVAR("RESOLVER_CONFIG=/TCP.TCPPARMS(TDATA03A)"")'
   - //STDENV DD .......

   OE applications that use BPXBATCH to get started, for example ORouteD, can use the special //STDENV DD card to point to a file that contains the environmental variables. BPXBATCH will read this file and set the variables before starting the OE program.
   - RESOLVER_CONFIG=/'TCP.TCPPARMS(TDATA03A)' (ISHELL)
   - RESOLVER_CONFIG=/etc/tdata03a (ISHELL)
   - export RESOLVER_CONFIG=/etc/tdata03a (OMVS shell)
   - export RESOLVER_CONFIG=/'TCP.TCPPARMS(TDATA03A)'' (OMVS shell)

2. /etc/resolv.conf (HFS file) (Implicit Allocation)
3. //SYSTCPD DD DSN=TCP.TCPPARMS(TDAT03A) (Explicit Allocation)
   This may not be a good technique for processes that use the fork() command. This allocation will not be available to the child process that is forked since DD allocations for the parent process are not inherited by the child. The only exception to this rule is a STEPLIB allocation.
4. userid.TCPIP.DATA or jobname.TCPIP.DATA (Implicit Allocation)
5. SYS1.TCPPARMS(TCPDATA) (Implicit Allocation)
6. TCPIP.TCPIP.DATA (Implicit Allocation)

3.5 Application Environment on OS/390

You can develop your applications on OS/390 using any of several languages. For UNIX applications such as Domino, the most common programming languages are C and C++. Recently, Java is becoming popular as the e-business application environment. OS/390 also supports this new Java environment.
3.5.1 Common Language Environment

UNIX applications are usually coded with C/C++ languages. OS/390 UNIX also provides the compiler product and debugger tool of C/C++. But the run-time environment is provided by the Language Environment (LE). LE is a prerequisite for applications generated with the compiler products on OS/390 and provides common services and language-specific routines in a single run-time environment for multiple High Level Languages (HLL) including:

- COBOL
- C/C++
- PL/I
- FORTRAN
- Assembler (not HLL)

LE establishes a common run-time environment for all participating HLLs. It provides essential services, such as routines for run-time message handling, condition handling, and a storage management. Figure 29 on page 41 shows how the UNIX applications (including the shell program) get the system service via LE.

![Figure 29. Language Environment and OS/390 UNIX System Services](image)

LE uses options to control the use of run-time libraries during execution. For UNIX applications, these run-time options are passed to the application via an environment valuable named _CEE_RUNOPTS. The following lists important options for problem determination:

- **ABTERMENC** Specifies enclave termination behavior for an enclave ending with an unhandled condition.
- **ERRCOUNT** Specifies the number of synchronous error conditions tolerated.
- ** HEAP** Controls the allocation of the initial heap, controls allocation of additional heaps, and specifies how that storage is managed. Heaps are storage areas where you allocate memory for user-controlled dynamically allocated variables such as malloc().
STACK  Controls the allocation of the thread's stack storage. Typical items residing in the stack are C automatic variables.

RPTOPTS  Generates, after an application has run, a report of the run-time options in effect while the application was running.

STORAGE  Controls the initial content of storage when allocated and freed. And also controls the amount of storage that is reserved for the out-of-storage condition.

TERMTHDACT  Controls response when an enclave terminates due to an unhandled condition.

TRAP  Specifies how LE programs handle abends and program interrupts. When set to on, LE traps routine interrupts and abends, and optionally prints trace information or invokes a user-written condition handling routine. When set to off, the operating system handles all interrupts and abends.

When a program failure occurs, LE produces a CEEDUMP. This is a dump of the run-time environment for LE and the member language libraries. Sections of the dump are selectively included, depending on options specified on the dump invocation. This is not a dump of the full address space, but a dump of storage and control blocks that LE and its members control.

Under OS/390 UNIX, if the application is running in an address space created as a result of a fork(), spawn(), spawnp(), vfork(), or one of the exec family of functions, then CEEDUMP is placed in the HFS in one of the following directories in the specified order:
1. The directory in the environment variable _CEE_DMPTARG, if present
2. The current working directory, if it is not the root directory (/) and the directory is writable
3. The directory found in the environment variable TMPDIR (a variable that indicates the location of a temporary directory if it is not /tmp)
4. The /tmp directory

For information about how to use CEEDUMP for the problem determination of Domino for S/390, refer to 8.6, “Language Environment - CEEDUMPS” on page 129.

3.5.2 Java Application Environment on OS/390

Java is an object-oriented programming language and execution environment that offers significant new opportunities for software development, interoperability and portable execution. Figure 30 on page 43 shows the Java environment in OS/390.
Java for OS/390 is based on OS/390 UNIX, which means that tools such as a compiler and the core service named Java Virtual Machine (JVM) are running on OS/390 UNIX. To use the Java environment from a UNIX application or shell, you should verify that the directory path of the appropriate Java class library is set to the classpath environment variable.

Figure 30. Java on OS/390
Chapter 4. Domino R5 Server Implementation in S/390

In Chapter 2, “Domino Architecture For Problem Determination” on page 7, we describe the internal design of Domino server in general. We also mention some new functions in Domino R5. We give an overview of OS/390 in Chapter 3, “The OS/390 Environment and Terminology” on page 21. In this chapter, we show how the Domino R5 server is implemented in an OS/390 environment.

4.1 Domino for S/390 R5 and Related System Parameters

Before Domino for S/390 R5 is up and running, you must check the system settings described in the redbook Lotus Domino for S/390 Release 5: Installation, Customization and Administration or Domino 5.0 for S/390 Installation Guide.

4.1.1 OS/390 UNIX System Services Parameters

Domino for S/390 is an application running in the OS/390 UNIX environment. OS/390 UNIX gets environment settings from the parmlib member BPXPRMxx. The recommended values of BPXPRMxx parameters for Domino for S/390 R5 are shown in Table 3.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RECOMMENDED SETTINGS</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORKCOPY</td>
<td>COPY</td>
<td>How user storage is copied between processes.</td>
</tr>
<tr>
<td>IPCSEMNIDS</td>
<td>2000</td>
<td>Max. no. of semaphore sets in the system.</td>
</tr>
<tr>
<td>IPCSEMNOPS</td>
<td>32767</td>
<td>Max. no. of operations for each semaphore operation call.</td>
</tr>
<tr>
<td>IPCSHMMPAGES</td>
<td>25600</td>
<td>Max. no. of pages for a shared memory segment.</td>
</tr>
<tr>
<td>IPCSHMNIDS</td>
<td>500</td>
<td>Max. no. of unique shared memory segments in the system.</td>
</tr>
<tr>
<td>IPCSHMNSEGS</td>
<td>1000</td>
<td>Max. no. of shared memory segments attached for each address space.</td>
</tr>
<tr>
<td>IPCSHMSPAGES</td>
<td>2621440</td>
<td>Max. no. of pages for shared memory segments in the system.</td>
</tr>
<tr>
<td>MAXASSIZE</td>
<td>2147483647</td>
<td>Address space region size.</td>
</tr>
<tr>
<td>MAXCPUTIME</td>
<td>2147483647</td>
<td>Max. CPU time that a process is allowed to use, in seconds.</td>
</tr>
<tr>
<td>MAXFILEPROC</td>
<td>65535</td>
<td>Max. no. of files that a single process is allowed to have concurrently active or open.</td>
</tr>
<tr>
<td>MAXQUEUEDEDSIGS</td>
<td>100000</td>
<td>Max. no. of queued signals for asynchronous I/O.</td>
</tr>
</tbody>
</table>
You should not start Domino for S/390 R5 with the default system parameters. For the description of each parameter, refer to OS/390 UNIX System Services Planning, SC28-1890 or OS/390 MVS Initialization and Tuning Reference, SC28-1752.

Note: The MAXQUEUEDSIGS parameter is the newest one, so there may be no description in the planning manual of OS/390 UNIX. If so, refer to APAR OW37041 for further information. We mention this parameter in 4.2.3, “How Asynchronous I/O is Enabled for Domino for S/390 R5” on page 51.

### 4.1.2 Other Parameters

In Release 5, Domino for S/390 can create SMF Type 108 records. If you want to write these records into the SMF data set, you should include SYS(TYPE108)) in the SMFPRMxx member in parmlib.

For performance reasons, you should modify the IVTPRMxx member in parmlib. This parameter is used for the Communication Storage Manager (CSM), which controls the communication buffer created by VTAM and used by TCP/IP stack. The recommended values are:

- **FIXED MAX(120M)**
- **ECSA MAX(30M)**

For more information about IVTPRMxx, refer to OS/390 MVS Initialization and Tuning Reference, SC28-1752.

### 4.2 How Domino for S/390 R5 Runs on OS/390

Though Domino for S/390 is a UNIX application running on OS/390 UNIX, it is treated the same as other MVS applications in terms of the program execution. Let us explain how the Domino server runs on OS/390.

### 4.2.1 Address Space Configuration of Domino for S/390 R5

On OS/390, a process (the execution unit in UNIX) occupies one address space. So after starting, a Domino for S/390 server consists of several address spaces to execute server tasks, as shown in Figure 31 on page 47.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RECOMMENDED SETTINGS</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXSHAREPAGES</td>
<td>32768000</td>
<td>Max. no. of shared storage pages that be concurrently in use by OS/390</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UNIX functions.</td>
</tr>
<tr>
<td>MAXTHREADS</td>
<td>1000</td>
<td>Max. no. of threads that a single process can have currently active.</td>
</tr>
<tr>
<td>MAXTHREADTASKS</td>
<td>1000</td>
<td>Max. no. of MVS tasks that a single process may have concurrently active.</td>
</tr>
<tr>
<td>MAXSOCKETS DOMAINNAME(AF_UNIX)</td>
<td>10000</td>
<td>Max. no. of UNIX domain sockets.</td>
</tr>
<tr>
<td>MAXSOCKETS DOMAINNAME(AF_INET)</td>
<td>35000</td>
<td>Max. no. of network sockets.</td>
</tr>
</tbody>
</table>
Figure 31. Domino Address Spaces in OS/390

In this picture, the following tasks (which ran in separate address spaces in R4, are now integrated in one address space:

**Server Base** Runs basic server tasks
**Comms Listener** Listens on the communications port for client requests

Other tasks are executed automatically by the specification in the notes.ini file, or are started with a load command. Table 4 lists tasks in this category.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration Process</td>
<td>Automates a variety of administrative tasks.</td>
</tr>
<tr>
<td>Agent Manager</td>
<td>Runs agents on one or more databases.</td>
</tr>
<tr>
<td>Billing</td>
<td>Collects all generated billing information.</td>
</tr>
<tr>
<td>Calendar Connector</td>
<td>Process requests for free-time information from another server</td>
</tr>
<tr>
<td>Cataloger</td>
<td>Updates the database catalog.</td>
</tr>
<tr>
<td>Chronos</td>
<td>Updates full-text indexes that are marked to be updated hourly, daily, or weekly.</td>
</tr>
<tr>
<td>Cluster Administration Process</td>
<td>Oversees the correct operation of all components of a cluster.</td>
</tr>
<tr>
<td>Cluster Database Directory Manager</td>
<td>Updates the cluster database directory and manages databases with cluster-specific attributes.</td>
</tr>
<tr>
<td>Cluster Replicator</td>
<td>Performs database replication in a cluster.</td>
</tr>
<tr>
<td>Database compactor</td>
<td>Compacts all databases on the server to free up disk space.</td>
</tr>
</tbody>
</table>
The user requests are processed in the Notes user address space. Before R5, each connected session from the client was associated with a physical thread in an address space for the duration of their connection to the server. One Notes user address space could have a maximum of one hundred threads, so a new address space was created whenever the one hundred and first session request came to Notes.

In R5, this processing model has changed to use the thread pool model described in 2.2.1, “Thread Pooling” on page 15. Instead of creating many address spaces
for user requests, Domino for S/390 R5 uses a single address space to service all incoming connection requests.

4.2.2 How Domino for S/390 R5 Uses Shared Memory

As described in 2.1.5, “Shared Memory Management” on page 13, Domino for S/390 allocates shared memory for several buffer types. With the previous OS/390 version of shared memory, each page of shared memory used a 32-byte Real Storage Manager (RSM) control block in Extended System Queue Area (ESQA) and each address space had its own page tables. Figure 32 shows the overview of this shared memory structure.

If you tried to share 500 MB storage across 500 address spaces, it would consume 2 GB of ESQA for the control blocks and 1GB of Local System Queue Area (LSQA) for the page tables.

From OS/390 V2R6, the caller of `shmget()` can request megabyte-level sharing. When this is done, the kernel calls RSM to set up shared page tables. Now, for 500 MB storage shared by 500 address spaces, it will only consume 2 MB for a set of page tables. With this new option, the application must agree to have all sharing address spaces maintain the same view of the storage. Figure 33 on page 50 describes this design.

Figure 32. Shared Memory Management on Previous OS/390

If you tried to share 500 MB storage across 500 address spaces, it would consume 2 GB of ESQA for the control blocks and 1GB of Local System Queue Area (LSQA) for the page tables.

From OS/390 V2R6, the caller of `shmget()` can request megabyte-level sharing. When this is done, the kernel calls RSM to set up shared page tables. Now, for 500 MB storage shared by 500 address spaces, it will only consume 2 MB for a set of page tables. With this new option, the application must agree to have all sharing address spaces maintain the same view of the storage. Figure 33 on page 50 describes this design.
The shared memory area is allocated in the data space owned by the kernel of OS/390 UNIX. From the system console, you can find the kernel data space by using the system command D A,OMVS. Figure 34 shows the result.

In this panel, each line that starts with DSPNAME= shows a data space which the OS/390 UNIX kernel address space (named OMVS) owns. Among these data spaces, those which have the name BPXDS001 and BPXDS002 are used for the shared memory buffer.

For the shared memory, there are several system parameters specified in 4.1.1, “OS/390 UNIX System Services Parameters” on page 45. Figure 35 on page 51 shows how these parameters affect each other.
Figure 35. Shared Memory and the Related Parameters

The kernel address space creates the system-wide shared storage area with a size of MAXSHAREPAGES in its data space. This area is used for shared memory functions, as well as other InterProcess Communication (IPC) functions such as memory map or message queue. For shared memory functions such as shmget(), the kernel gets the number of pages defined in IPCSHMSPAGES from this data space. When a process such as the Domino server requests shared memory, the kernel gives a part of this shared storage as a unit of segments. The size of each shared memory segments is specified in IPCSHMMPAGES. Each process can attach the shared memory segments, up to a value equal to IPCSHMNSEGS.

### 4.2.3 How Asynchronous I/O is Enabled for Domino for S/390 R5

Because asynchronous I/O is required to execute Domino R5, OS/390 implements several asynchronous I/O functions. They are:

- **aio_read()** read file/socket data to specified buffer
- **aio_write()** write from specified buffer to file/socket
- **aio_suspend()** wait on list of aiocbs for aio to complete
- **aio_cancel()** cancel outstanding aio request
- **aio_error()** get error status aio operation
- **aio_return()** get return info of completed aio operation

These functions may be used by an application to kick off several I/O requests where each request is represented by an Asynchronous I/O Control Block (aiocb). The aiocb is a user control data area that defines the asynchronous I/O request and contains such information as the File Descriptor, buffer®, notification...
event type and the return code of the request. The notification event type may be one of several "flavors." The application may opt for no notification, notification by running an exit, posting of an ECB, or having a signal generated to the process. Figure 36 shows the usage of these asynchronous I/O functions:

![Figure 36. Asynchronous I/O on OS/390](image)

In this figure, there are two types of flow. One is where a user issues an asynchronous I/O request (with signal notification), gets control back and continues running while the I/O is being handled by the PFS. When the I/O completes, the LFS again gains control, reads the requested information into the buffer pointed to by the aiocb, sets the return code of the read and generates the user-requested signal to the process. The signal interrupts the user and control is given to the user's signal handler. From here, the I/O completion can be acted upon by the application. The trick here is to set up the AIO such that the AIOCB address is passed into the signal catcher using the si_value. This tells the application which I/O event completed.

In the other type, the application issues an asynchronous I/O request, then waits using the aio_suspend() function. In this case, no notification was specified.

Domino R5 uses the asynchronous I/O with the signal notification. For that environment, OS/390 supports a subset of the UNIX 98 real-time signals services. Asynchronous I/O real-time signal extensions allow faster access to sockets. With real-time signal extensions, multiple generated signals are delivered to their target thread. A new callable service, sigtimedwait (BPX1STW), suspends the invoking thread until a specified time out expires, or until a signal specified in the signal set becomes pending, at either the process or the invoking thread. Figure 37 on page 53 shows how this implementation works on OS/390.
In this model, the main thread creates a pool of worker threads. These worker threads will issue the sigtimedwait() function where they will wait for work. The main thread also creates an aiocb for each socket which in turn represents a client connection. The aiocb specifies a signal that will be raised to the process in the event that any activity occurs on the socket. The main thread can then do an aio_read(), have control returned, and handle the next connection. Now it is very important that all threads running in the server process block the specified aiocb signal (sigprocmask()). This forces all async I/O signals to be delivered to a thread in sigtimedwait.

When client activity is detected, the LFS will send the specified signal from the aiocb to the process. It is now up to the kernel signal processing to determine the best thread to send the signal to. Since all threads are blocked, the one in sigtimedwait will receive the I/O. In the event that the kernel finds more than one thread in a sigtimedwait(), the kernel just picks the first one found. In the event that all the worker threads are busy, the signal is just queued up at the process level where it will wait for the first thread that does a sigtimedwait().

Once the thread is interrupted with the signal, sigtimedwait() returns with the signal information, including a 4-byte value specified in the aiocb. This value can be the address of the aiocb, which will tell the worker thread which I/O request to deal with.

### 4.3 Considerations for Running Domino for S/390 R5

Domino for S/390 has the same characteristics as a Domino server on other UNIX platforms. On the other hand, OS/390 UNIX has different flavors, as described in 3.2, “UNIX Application Environment on OS/390” on page 28. So you need to be aware of the difference during the setup of Domino for S/390.
4.3.1 Security Management

The security functions required for the Domino environment are provided by Domino for S/390 itself. But OS/390 Security Server (RACF) has a role as a security manager in OS/390, and Domino for S/390 is under the control of RACF as an application. RACF controls the following security attributes of Domino server:

- OS/390 user ID assigned to Domino server tasks
- Creation of SMF record

For assigning user IDs to Domino-related tasks/users, you should follow this rule:

- For server tasks, assign a user ID without superuser authority (UID not 0).
- For an administration user from the shell, use the same user ID as the server tasks.

As described in 4.1.2, “Other Parameters” on page 46, Domino for S/390 R5 can write to the SMF data set to record its activities. But when enabling this function, you must define the user ID of the server to have at least READ access to the BPX.SMF profile in the FACILITY class. BPX.SMF is used to control write access to the SMF data set.

4.3.2 Character Code

In Domino for S/390, LMBCS is implemented as the base code representation. As we described in 2.1.7, “Data Representation” on page 14, LMBCS is based on ASCII code points. On the other hand, the standard character format of OS/390 is EBCDIC. So there are some considerations when analyzing problem data from the user interface of S/390.

For example, the Language Environment produces a CEEDUMP for the occurrence of any run-time problems. In a CEEDUMP, there are several storage maps of the address space. These maps contain the portion which represents the storage area treated as the character code of EBCDIC. So if the storage area contains character data (file or directory name) based on EBCDIC, you can see it in this portion. But you cannot find any character data in the CEEDUMP for Domino for S/390 processes because their data code is not EBCDIC but LMBCS.

Note

For an application using LotusScript, data is translated to EBCDIC code during read I/O from Release 5. Therefore you can see the character data in a CEEDUMP.

4.3.3 Transaction Logging and HFS Caching

Because of a new ODS structure, you can use the transaction logging function for each Domino R5 file. When you enable this function for your files, each write operation is finished when the data is stored on the memory buffer.

On the other hand, the deferred write function is also implemented in OS/390 V2R7 for better performance of HFS I/O processing. With this function, the write I/O operation is ended when data is written to the system buffer on the kernel data space rather than to disk. Then a sync daemon, which is a part of the OMVS kernel address space, writes that data to disk asynchronously. “HFS Write
Operation by DFSMS 1.5" on page 55 shows the processing of writing data in OS/390 UNIX (V2.7).

Figure 38. HFS Write Operation by DFSMS 1.5

Now every change inside an HFS will be cached in storage first (1). For this cache area, the kernel address space creates several data spaces named HFSDSP01, HFSDSP02, HFSDSP03, and HFSDSP04 (refer to Figure 34 on page 50). The cached buffers will be chained to the sync daemon. The sync daemon will be called (for example, every 60 seconds) to write the cached data to DASD (2). The sync interval timer can be defined in BPXPRMxx FILESYSTYPE for all HFS data sets in an OS/390 UNIX system or at mount time for a specific HFS data set. The amount of virtual storage and the number of fixed pages used for caching could be influenced or limited by BPXPRMxx parmlib settings, too. However, you will lose the cached data that was changed since the previous sync interval. This means you could miss newly created files, and newly removed files will still be present.

In case both transaction logging and HFS deferred write are enabled, when is the integrity of the database file guaranteed? From the server task, it will be assured when the operation is posted to the log file. But at this time, it may not be written to the actual file because of the deferred write operation. If the whole system goes down at that time, is this log file valid for recovering the associated database? Based on this example, you have to be careful to when setting up transaction logging in Domino for S/390.

Domino/390 R5 uses HFS in both log file and nsf file writing. It opens the log file in read/write mode AND read/write in non-cached mode and opens the nsf file in read/write mode with fdata_sync on. This ensures that log file is always written to disk earlier than the nsf file under a new environment consisting of UBM (Unified Buffer Manager) and HFS 1.5. The log file can be thus be used as a recovery file for the nsf file.
Part 2. The Methodology
Chapter 5. Handling Problems in a Domino for S/390 Environment

This chapter discusses how to apply problem determination techniques in the Domino for S/390 environment. Here we review some general steps that you can take to fix problems. The next chapter will go through specific types of problems and offer actions related to those problems.

5.1 Problem Determination Process Flow

The following sections describe the classical phases you go through to solve any problem:

5.1.1 Problem Determination

First, you discover that something is not going the way it should: this is the *problem determination* phase. In this phase, you gather information about the external and internal aspects of the problem. It may be first discovered by the Domino users; for example, no access to server, or mail not delivered. Or it may manifest itself to Notes Administrators and OS/390 system programmers through messages or other technical indications.

5.1.2 Problem Source Identification

In the second phase, you study the information you have collected in order to isolate the system components that are indicated in the failure. This is the *problem source identification* phase. Some problems are easy to limit to a single component. But some situations may be more complex, involving relationships between various components. At that point, you might contact the IBM Support Center to receive assistance. You may try, with their help, to recreate the problem, run commands, collect trace data, do tests, or take whatever steps are suitable in order to pinpoint what is not working.

5.1.3 Problem Fixing

The third phase involves *fixing the problem* if possible, or at least circumventing it. If the root cause of the problem is well defined and understood, the solution to the problem is certainly not far away. Some problems will point to the core code of either the OS/390 operating system or the Domino server. Only the developers maintaining those systems will be able to provide a modification that will solve those. Others problems will point to user-written or third-party applications or operational procedures.

This methodology is system-independent when the problems that need to be fixed are linked to the logic of the Domino server itself. However, some of the tools and techniques used may differ according to the operating system on which you run a Domino server. Therefore it is important to understand who are the main people involved and what tools they use to manage their system and identify problems.

5.2 Support Staff and Their Tools

Lotus Domino runs on the OS/390 platform as a UNIX application using the UNIX System Services APIs provided by the OS/390 system, one or more Hierarchical...
File Systems (HFS), and TCP/IP networking. There is no client code on the
Domino for S/390 server. This is in line with the trend to have fewer client
platforms supported.

As previously mentioned, Domino on OS/390 is very similar to Domino on other
UNIX platforms, such as AIX. This means that the problem determination process
for Domino on OS/390 is the same, since the vast majority of Domino code is the
same.

However, what makes the OS/390 environment different is that it provides more
than the UNIX application environment. Systems programmers and operators are
usually in charge of transactional systems like CICS Transaction Server and IMS,
or databases like DB2, and have the use of tools for their administration.

For the UNIX environment on OS/390, a new set of tools and functions are
available that provide information specific to these new functions. Although these
tools provide valuable information, there is still the need to know some S/390
tools.

Domino administrators face a limited number of differences between platforms,
so most of their tools work on any server.

This section will describe the environment of the main technical persons involved
with Domino for S/390 and the tools they can use. They are described in more
detail in Chapter 8, “Tools in the OS/390 Environment” on page 109, Chapter 9,
Troubleshooting” on page 179.

5.2.1 OS/390 System Programmer Working Environment

OS/390 system programmers generally use workstations. They access the
classic MVS and UNIX Systems Services environments through 3270 emulation.
They also use a telnet screen from their workstation to access the UNIX System
Services Shell. More details are presented in Chapter 3, “The OS/390
Environment and Terminology” on page 21.

System programmers can log on to a full-screen non-graphical application called
Interactive System Productivity Facility (ISPF). A customized menu offers several
choices, of which the most common are:

- The full-screen program editor Program Development Facility (ISPF/PDF) that
  allows them to create partitioned files, browse and edit information. It provides
  access to a command processor called TSO to submit procedures. A TSO
  command named OMVS gives access to the UNIX shell environment. In
  addition to all the UNIX facilities, OMVS offers a full-screen editor for the UNIX
  files called ISHELL.

- The System Display and Search Facility (SDSF) that allows authorized users
  on any terminal or emulator to have all the capabilities provided by the OS/390
  Operating System Console. It allows system programmers to run commands,
  browse and search the system log (SYSLOG), display the active address
  spaces, monitor the main activity indicators of the OS/390 system such as
  CPU utilization rate, and access many other features.

- Optionally, the Interactive Systems Managed Storage (ISMS) panels that
  provide information about file allocation and properties.
Chapter 5. Handling Problems in a Domino for S/390 Environment

- Optionally, the Resource Monitoring Facility (RMF) to track the system activity online or offline.
- Optionally, the Security Server administration panels.

5.2.1.1 The OS/390 UNIX System Services Environment via telnet

Accessing the UNIX System Services Shell is like accessing any UNIX system via telnet. It is simple to use and provides good response time. However, there is a limited scrollback facility and no full text editor other than the classic vi editor.

But using telnet is the only supported way to start a Domino for S/390 server either in background (recommended) or in foreground. The OMVS feature is not supported because the OMVS environment is not suitable for a console display; you may need to hit the refresh PF key from time to time, and there may be other problems in a production environment.

The Domino Console (DOMCON) tool, provided by the Washington Systems Center on an as is basis, provides a way to start, stop and communicate with a Domino for S/390 server using 3270 emulation. You can either communicate from the OS390 console (in fact, often inside the SDSF application) using the DOMINC command of DOMCON, or from the OMVS environment using the DOMOE command.

5.2.1.2 Summary of How to Start a Server

The following tables indicate which interface is used to perform which functions. More information is available in Chapter 8, “Tools in the OS/390 Environment” on page 109. Here is a summary of START functions available from each system interface.

Table 5. Ways to Start a Server

<table>
<thead>
<tr>
<th>Classic OS/390 functions (via 3270 emulation)</th>
<th>OMVS access to UNIX System Services Shell (via 3270 emulation)</th>
<th>UNIX System Services Shell (via telnet session)</th>
<th>Notes Administrator interface (client or browser)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDSF System Log with DOMINS command of DOMCON (not supported)</td>
<td>Not supported and not recommended</td>
<td>The only officially supported way either in -background: via the shell script rc.notes and concom to communicate. Then you communicate with the server using notes.input. -foreground: the telnet session becomes the operator console. If disconnected, you use the remote console function of the Administrator client.</td>
<td>Not available</td>
</tr>
</tbody>
</table>
### 5.2.1.3 Summary of How to Stop a Server

Table 6 describes various ways to stop a server.

**Table 6. Ways to Stop a Server**

<table>
<thead>
<tr>
<th></th>
<th>OMVS access to UNIX System Services Shell (via 3270 emulation)</th>
<th>UNIX System Services Shell (via telnet session)</th>
<th>Notes Administrator interface (client or browser)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic OS/390 functions (via 3270 emulation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDSF System Log with DOMINK command of DOMCON (not supported) if started with DOMCON or not.</td>
<td>Not available</td>
<td></td>
<td>-concom to send quit command if started in background -quit command piped to noteslog/notes.input if started from rc.notes -quit or exit command on console if started in foreground</td>
</tr>
<tr>
<td>-SDSF System Log with DOMINS command of DOMCON (not supported) if started with DOMCON.</td>
<td>-via DOMOE command of DOMCON (not supported) if started with DOMCON.</td>
<td>-concom script if started in background -notes.input if started w/ rc.notes -on console if started in foreground.</td>
<td>-on live console -via menus and tabs.</td>
</tr>
</tbody>
</table>

### 5.2.1.4 Summary of How to Send Commands to a Server

Table 7 describes various ways to send commands to a server.

**Table 7. Ways to Send Commands to a Server**

<table>
<thead>
<tr>
<th></th>
<th>OMVS access to UNIX System Services Shell (via 3270 emulation)</th>
<th>UNIX System Services Shell (via telnet session)</th>
<th>Notes Administrator interface (client or browser)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic OS/390 functions (via 3270 emulation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-ISHELL (OEDIT or OBROWSE</td>
<td>-via OEDITASCII editor. - OEDIT/OBROWSE (EBCDIC)</td>
<td>-via vi or viascii editor.</td>
<td>-some variables can be entered and modified via menus and tabs against server document.</td>
</tr>
</tbody>
</table>

### 5.2.1.5 Summary of How to Browse/Edit Files in an OS/390 HFS

Table 8 describes various ways to browse or edit files in a S/390 HFS. This needed at installation times and for modifying the NOTES.INI file.

**Table 8. How to Browse/Edit files in a OS/390 HFS**

<table>
<thead>
<tr>
<th></th>
<th>OMVS access to UNIX System Services Shell (via 3270 emulation)</th>
<th>UNIX System Services Shell (via telnet session)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Classic OS/390 functions (via 3270 emulation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-ISHELL (OEDIT or OBROWSE</td>
<td>-via OEDITASCII editor. - OEDIT/OBROWSE (EBCDIC)</td>
<td>-via vi or viascii editor.</td>
<td>-some variables can be entered and modified via menus and tabs against server document.</td>
</tr>
</tbody>
</table>
5.2.2 Domino Administrator Working Environment

To manage the Domino for S/390 environment, the Domino administrator uses tools such as the Domino R5 Administration client or Web Administration client and one or more telnet sessions.

A more detailed presentation of Domino tools is given in Chapter 9, “Tools for Domino” on page 141.

5.2.2.1 The Domino R5 Administration Client

The Domino R5 Administration client is intended to provide assistance to manage multiple servers from a single user interface.

It provides a large number of well-documented features, as shown in Figure 39.

![Figure 39. The Domino Administration Client Help Menu](image)

Domino administrators can register users, manage databases, track mail and activate functions. This interface contains much information for troubleshooting Domino problems.

The monitoring feature allows administrators to display the current status of multiple tasks on multiple servers on a single screen, as shown in Figure 40.
The administration client provides a live console to send commands to any server.

The Domino administrator can see more detailed information about a single server by browsing the log.nsf database of that server.

5.2.2.2 Telnet Session

However, you cannot start a Domino for S/390 server from the administration client. For starting a server, most Domino administrators have at least one telnet session. You can have several telnet sessions active at the same time with the same user ID.

This interface will be used to validate access to the server via TCP/IP or to send commands when the server does not seem to be responding.

5.2.2.3 log.nsf and Notes.log

The log.nsf file contains a lot of information about the activity of a server, with preformatted views for ease of access to the right information. As a database, it can be viewed from the Domino administration client when the server is running, or from any Notes client.
Notes.log is the text file to which the live console output has been redirected, such as when starting the server with rc.notes or DOMCON. It can be browsed without a Notes client. Our experience is that it is often the quickest solution to read the latest messages recorded in the log before a crash or a hang. It also contains certain data that does not appear in log.nsf (such as *show performance* data). However, when the problem is limited to a specific function such as routing, the log.nsf views offer a simpler way to access relevant information.

### 5.2.3 Network Specialist Working Environment

In order to identify problems, the network specialist will generally use a 3270 and an OMVS or telnet session. The tools available include TCP/IP commands and traces. They are detailed in Chapter 10, “Tools for Network Troubleshooting” on page 179.

### 5.3 Overview of Domino Problems

Domino is a feature-rich product which supports and delivers your business processes right to the end-user desktop. It provides mail applications, workflow technology, Web technology and many other useful features. It has enhanced its power and extended its boundaries by collaborating with another robust and well-researched technology: the IBM System 390.

With this partnership of state-of-the-art software and hardware technology, along with the synergy of dedicated teams in delivering Domino power to your business, Lotus Domino for S/390 presents one of the leading business solutions to organizations today.

#### 5.3.1 Introduction

The importance of Domino Applications to the business has put a lot of pressure on the technical support teams to ensure continuous Availability, Reliability and Scalability for Domino servers. As the Domino technology is embraced by large-scale organizations, the Reliability and Scalability of the Domino Servers and its applications are key success factors.

Problems are bound to occur in any technology: Domino is not immune to this, no matter how hard the Domino developers have tried to prevent it. While everyone wishes for a problem-free technology, the following questions are often asked:

1. What could go wrong?
2. What pro-active measures can be taken to ensure the stability and reliability of Domino Servers?
3. How should we react to problem scenarios?

Note: For additional discussion on this topic and a checklist for what to do before calling Lotus Support, see this web site:

http://notes.net/today.nsf/lookup/Calling_Support

#### 5.3.2 What Could Go Wrong

While many different problems could exist in a given environment, most serious Domino problems can be broadly categorized into:
1. Server crash
2. Server hang
3. Server performance slowdown
4. Database corruption

5.3.2.1 What Is a Server Crash?
A server crash is when the server fails to respond to any user. In most cases Domino-related tasks are not active or may not even appear in the operating system process views. None of Domino server tasks are functioning and able to serve any of the users.

Situations that qualify as a server crash are those that generate a Domino panic or fatal error. In some cases a segmentation fault could also occur. In the Domino UNIX environment, running nsd diagnostics (with no parameters) immediately after a server becomes non-responsive will provide some information. However, on S/390, part of this information will be available from Language Environment CEE dumps. It is our understanding that the OS/390 termination process flushes out memory so that nsd does not yet provide as much information on OS/390 as on other UNIX platforms.

Panic
A panic error occurs when Domino violates its own internal checks, as a result of operating system or Domino-related coding issues. A common violation area is a handle that is invalid, null or out of range.

Fatal
A fatal error occurs when Domino violates an operating system (OS) construct because of OS- or Domino-related coding errors. Most common fatal errors are Type a and b, which are hexadecimal for UNIX signals 10 (bus error) and 11 (segmentation violation).

Possible Causes of Server Crash
A server crash could be due to various reasons:
1. Memory leak
2. Database corruption
3. Poor application designs
4. Some other system or network environmental hazard

5.3.2.2 What is a Server Hang
A server hang is when the server fails to respond to any user while the Domino tasks are still up and running. Users who are already in the system may still able to use the server, while new users are not able to gain new connections. The DBServer task may still be processing user requests. Unlike a crash, a hang can be temporary. The server is considered hung and dead when no connected users or new users are able to access the server, while the Domino tasks are indicated to be idle and no console commands are accepted.

The server is only considered crashed if you have the panic and fatal errors appearing and some or all Domino server tasks no longer appear in the system.
**Possible causes of server hang**
1. CPU spin
2. Infinite loops of agents or agent hangs
3. Semaphore time-out
4. Resource contention (for example memory, semaphore lock, or HFS)
5. Network or port binding problems

5.3.2.3 What is a Server Performance Slowdown
A performance slowdown is when users begin to experience slow response between their location and the server. The server however, is still able to service its users but with a very long response time. None of the server tasks appears to be hung or crashed on the system.

A performance slowdown may be temporary or permanent. However, it may become a real problem if the slowdown is becoming persistent.

**Possible causes of performance slowdown**
In many circumstances, performance slowdowns are caused by environmental factors:
1. CPU, memory or I/O contention
2. Network I/O
3. Network collision, congestion
4. Poor design of an application that may consume excessive server resources
5. OS/390 GRS latch contention
6. High memory paging to auxiliary storage
7. Slow disk access times
8. Resource contention; for example, memory or a semaphore lock
9. Indexing high-use databases, such as the Name and Address Book
10. Domino database attributes not set properly (for example, make sure "Don't Maintain Unread Marks" is set where possible for high-use databases such as the Name and Address Book)
11. DFSMS real pages set too low

5.3.2.4 Things to Check
To collect the best data on this problem with the least impact on server resources, use the following command (on OS/390 R7 and above). It will shown many resource and semaphore contentions.
```
ps -A -o pid,xasid,xstid,wtime,semnum,semval,lsyscall,atime,state,thdcnt,ruser
-o THREAD -o comm > ps.out
```

Also check SMF and RMF data for paging rate and disk access times. Look at your configuration to check the number of DFSMS real pages allocated. See *Lotus Domino for S/390 Release 5: Performance Tuning and Capacity Planning*, SG24-5149 for more information.
5.3.3 What Should Be Done

One of the biggest challenges is to find a quick and permanent fix to any type of problem and restore full service to the users. However, before any permanent solution can be produced, the following actions have to be performed:

1. Problem determination
2. Data collection

In most cases, the problems need to be simulated. By re-creating and understanding problems, a permanent fix or solution is possible.

The IBM and Lotus support teams need to understand the problem scenarios and collect all the necessary data for further investigation, analysis and diagnosis. Several iterations of data gathering or site investigations may be necessary to determine the cause of the problems.

The chapters contained in Part 3, “Tools and Resources” on page 91 give more details on the approaches, tools and techniques used to identify and resolve problems.

5.4 How to React to a Problem

As the Domino for S/390 environment is complex, it is difficult to provide rules that would suit all situations. However, here is a list of actions that you will want to take to evaluate the problem. More detailed information about specific situations are given in Chapter 6, “Troubleshooting Techniques and Tips” on page 75.

5.4.1 List of Steps

Look for the following information:

5.4.1.1 Server Status
Through the administrator interface or a telnet session, verify that the server is running by issuing `show users` and `show tasks` commands.

5.4.1.2 Network Status
Validate that the TCP/IP connectivity is active by using `ping` commands.

5.4.1.3 OS/390 SYSLOG
Check for messages about the Domino for S/390 server in the OS/390 SYSLOG and record them.

In the SYSLOG, you will see messages if the server has entered a state of panic. In that case, you may have a message starting with prefix CEE from the Language Environment component or OS/390 giving you more details.

5.4.1.4 Notes.log or log.nsf
Check for messages in the Domino server log (Notes.Log or log.nsf).

The Domino Server Log will provide information similar to the SYSLOG. In addition, it may show what Domino was doing just before the incident, which could give an indication of the cause of the failure.
5.4.2 Before Recycling a Server

Recycling (restarting) the server that has a problem should be your last option. Consider these other steps first:

- It may be that only one server task is causing the problem, or a single corrupted database that will not be fixed automatically. You will need to run utilities against it to avoid future problems with the server.

- In case of a hang, automatic recovery routines are embedded within Domino R5. If you suspect that the hang is due to high activity, you should give the server time (up to 10 minutes) to fix the situation by itself.

- Unless you capture the elements that will help solve the problem, the problem may re-occur sooner or later. Recycling the server wipes out all the memory contents. Run nsd.sh in order to have the information needed by the support center.

When you do decide to recycle, you should first check if the memory is clean with the UNIX System Services command `ipcs -bo` from a telnet or an OMVS session. This command will display `ipcs` information about message queues, shared memory and semaphores that may not have been freed automatically. If you have run the `nsd -kill` command (a last resort), then run the `ipcrm` command with options to remove these leftover resources.

5.4.3 Providing Information to the Support Center

If you need the assistance of the IBM/Lotus Customer Support Center to help you fix a problem, you should prepare the following documentation:

5.4.3.1 Software Environment
- Domino version (run nsd.sh -info to provide valuable information about your environment, such as software versions, Notes.ini)
- OS/390 version and output from PTF checker tool
- Security tool used
- TCP/IP vendor and version
- Hardware installed (CPU, memory, disk types)
- Network Interface (374x Communications Controllers, OSA cards, etc.)

5.4.3.2 Domino Usage Questions
- How was the server started?
  - telnet session using NON-SUPERUSER-ID
    - In foreground
    - In background using rc.notes. (This is the recommended way.)
  - Domino Console (DOMCON) V3.0. This level picks up the parameters of UNIX System Services and does not use its own specific parameters for region size.
  - TSO/OMVS shell. This is not supported and not recommended because it may create memory problems, plus you must manually refresh the console screen.
5.4.3.3 Problem Description
The appearance of a problem may vary according to who is reporting it. You should fully understand what has happened.

- Server side:
  - Slowdown
  - Hang
  - Crash
  - High CPU usage
  - Error messages
  - Inaccessibility (server not responding)
  - Function not performed
    - Replication
    - Routing
    - Other
- Scope (number of users or servers affected)
  - Some users/servers only
  - Large group of users/servers
  - All users/servers
- When has the problem occurred:
  - At Domino server startup
  - During operations
    - When a specific action was taken
  - At server shutdown
  - Frequency of the problem
    - Single occurrence
    - Multiple occurrences
  - Can the problem be re-created?
- Recent changes in configuration:
  - Hardware
  - Software
  - Domino customization

5.4.3.4 Data Gathering
The Customer Support Center specialists may also ask you to provide the following:

- OS/390 information:
  - A copy of part of the OS/390 SYSLOG
  - CEEDUMPS taken by the system in case of Abend U=034
  - SVCDUMPs for specific events (usually gathered through a SLIP TRAP to collect more information about the Abend U=034)

- Domino Information
  - A copy of part of the NOTES.LOG or the log.nsf database.
  - The result of the nsd.sh script run from Notesdata directory with the Domino server user ID, generally located in /usr/lpp/lotus/bin/tools/diag. It will provide information about for memory utilization, processes, threads, statistics, NOTES.INI, environment variables, and files. It should be run as close to the problem as possible to be really significant.
5.5 Performance Issues

Performance issues may occur even on a server that has been working well for a long time.

5.5.1 Contention Issues

Contention for a given resource can lead the server to slow down or to hang. These contentions may involve OS/390 resources like HFS files or disk addresses. Console commands of the Global Resource Serialization (GRS) component of OS/390 may help to find those contentions.

The command `d grs,c` will display existing latch contentions and you can take actions to solve them.

5.5.2 High Activity for CPU, Paging or Disk

When the CPU utilization rate is very high (above 95%), or when paging begins to rise, or when some disks give a bad average response, the server may experience slowdowns. Our experience shows that even moderate paging activity can seriously affect Domino server performance.

5.5.2.1 Monitoring Utilization Rates

To determine the CPU utilization rate, the DASD response time, or the paging activity, you can use:

- A monitoring tool such as RMF Monitor II or III
- Or, less accurately, the Display Active panel of the Spool Display and Search Facility (SDSF) tool (you cannot this for DASD response time)

Any of these symptoms may be the consequence of a malfunction (program loop, for example) and you need to look for the cause of this problem.

It may also be an indication that you need to allocate more resources to your Domino server.

To get a better picture of your environment over a significant period time, you can ask the OS/390 system programmer to collect and print a full set of RMF Monitor (batch activity reports).

Some information to look for:

- CPU:
  - On the CPU activity report, is the CPU running at 100% busy? It could highlight a global CPU constraint.
  - On the Partition Data Report, if you are using an LPAR, is the partition where Domino runs close to its weight for the processor or to the cap? If so, you may have a CPU constraint in the LPAR where Domino is running.

- Paging and storage
  - On the summary report, is there any demand paging? If it is more than two pages per second, there is probably a storage shortage. Always favor real (central) storage to expanded storage. If you are running Domino in its own LPAR, limit Expanded Storage to 50 MB until the real storage limit per partition (2 GB) has been reached.
• On the summary report, the indicator Average UIC is an indication of how Central Storage is used. If its value is less than 200, you may have a shortage of processor central storage.

• On the storage report, is Extended SQA (ESQA) overflowing into Extended CSA? If so, the system programmer should increase the size of ESQA to avoid this.

• Do you face excessive SQA usage? You should check that the value of the Server_Session_Timeout parameter in Notes.ini is not the default value of 4 hours. Set it to 15 or 30 minutes. Sessions tend to never close and the memory used is never freed.

• Disks

• On the DASD report, check for any disk with a response time of more than 10 milliseconds (ms). Is any Domino data on these disks? If so, is disk caching, including DASD Fast Write, turned on for these disks?

• Are any of the HFS data sets in multiple extents? If so, reorganize them back to one extent (at an appropriate time).

5.5.2.2 Workload Management

For workload management, we recommend that you do the following:

• Use goal mode for simplicity and fewer problems.

• Check that Domino has a velocity of 60 or more.

Here are some workload management tips when using PARMLIB members:

• If using PARMLIB members IPS and ICS to define your workload management policies, check that Domino is at or near the highest priority level.

• Domino uses multiple address spaces, therefore you should not constrain the multiprocessing level (MPL) for Domino.

5.5.2.3 Modules in Dynamic LPA

Some installation problems may show up after the first Domino tests have run successfully.

You need to be sure that the Domino modules are copied in Dynamic LPA, and not loaded into every Domino address space that is created. Dynamic LPA is used instead of LPA because the size of the modules is larger than the 16 MB limit of the LPA; the Libnotes module alone is approximately 22 MB.

If this install problem occurs, you will not see any messages, only slower performance than expected.

Check the following using Lotus Domino for S/390 Release 5: Installation, Customization and Administration in Chapter 7, "Preparing Dynamic LPA."

Are the sticky bits turned on for the modules listed (libnotes, ftgtr, decestx)? This indicates that the modules will be loaded into LPA. Check for this with the `ls -l` command against the files contained in `/usr/lpp/lotus/notes/latest/os390`.

If the sticky bits are not turned on, then check the following:

• Was the PUTINLPA job run when Domino was last installed or upgraded?
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5.5.2.4 Domino Parameters

Some Domino parameters may strongly influence the performances of a UNIX Domino server when the load is heavy.

- The Notes_SHARED_DPOOLSIZE parameter is automatically set by the system to an 8 MB value. This value works well in most circumstances.
- NSF_BUFFER_POOL_SIZE_MB is a key parameter to support a heavy workload. It is a new way to specify the buffer pool size in MB instead of the NSF_BUFFER_POOL_SIZE which allows you to specify the same information in bytes.

This parameter specifies the maximum size (in MB) of the NSF buffer pool, a section of memory dedicated to buffering I/O transfers between the NIF indexing functions and disk storage. This buffer pool is up to one quarter of the physical memory, limited to 256 MB. You will benefit from having a high value for storing views. When this value is increased, you should experience a decrease in I/O activity (according to Lotus document CC737NA, “Maximizing Application and Server Performance in Domino,” January 1999)

The following statistics will help you tune this parameter:

1. Database.BufferPool.Maximum
2. Database.BufferPool.Peak (this may exceed maximum for a while due to the algorithms used for calculating it)
3. Database.BufferPool.PercentreadsInBuffer

5.5.2.5 Understanding Domino Activities

If Domino uses a lot of CPU time at certain times, it may be because of some Domino agents or server tasks. The Domino administrator should be able to tell what tasks were running at a given time. If you are experiencing performance problems, list the Domino tasks that were running at those times to help with your analysis. If the performance cannot be explained by the number of types of tasks running at the time, proceed with further analysis as suggested in this chapter.

- Adapt and copy the sample MDFYPROG file provided with Domino for S/390 code to a SYS1.PARMLIB(PROGxx) member.
- To activate the dynamic LPA, you must add the following entry to SYS1.PARMLIB(COMMNDxx): COM='SET PROG=xx'. As PDSE files are SMS-managed, the SMS address space must be started before the command is issued.
- SYS1.PARMLIB(IEASYSxx) must point to point to SYS1.PARMLIB(COMMNDxx)
- Note: You cannot activate from the dynamic LPA via a PROG= statement in SYS1.PARMLIB(IEASYSxx).
- If you were running a previous version of Lotus Domino for S/390, have you done a Create LPA (CLPA) IPL to clear the LPA?

Note: To be sure that the modules are being executed from LPA, you can replace the modules in the HFS with dummy modules. The system will not start if it uses these dummy modules. If the server starts, you know that you have not loaded the modules into LPA.
Chapter 6. Troubleshooting Techniques and Tips

This chapter describes some of the symptoms we have experienced with Domino for S/390, as well as what commands we used to help isolate and articulate them to software support. It is usually not the readers of this book, but rather the end users who experience the problem first. They then contact the Help desk to report the problem, who in turn contact the Notes administrator. Often the only information given to the administrator and the OS/390 system programmer is: the server is not responding or there are no paths to server.

We have provided quick reference tables for both the system programmer and the Notes administrator. It is very important that they are in constant communication with one another during problem determination. If they cannot be in the same office, they should do the problem determination over the phone together.

6.1 Troubleshooting Techniques

There is usually no quick way to resolve Domino problems. Depending on the type of error, the problem determination process alone could take hours. Using the right tools and getting accurate information are crucial. Here are a few pointers for achieving the necessary analysis, diagnosis and solution.

During a server crash or hang, there are two important issues you should address immediately. They are:

- Server recovery
- Data recovery

6.1.1 Server Recovery

The way to recover your server immediately is to terminate all Domino processes and flush out the shared memory and semaphores segments of Domino from the operating system (OS).

Server recovery is easy and straightforward: it can be executed automatically using external scripts and Notes parameters, or it can be carried out manually by operator assistance.

Fortunately, on UNIX platforms (including OS/390), a single server crash does not cause other servers to crash too.

On OS/390, when a server gets a Panic or Fatal error, it will terminate itself and generate the necessary CEEDUMP. By this time, all information in memory will be flushed out. This will allow you to restart your server immediately, without a problem. However, it may come up slowly, because it does consistency checks on the databases that were open during the crash.

However, sometimes recovering the server is not enough. Depending on the type of server crash or hang, a series of crashes could occur if the real cause of the problem is not addressed.

Furthermore in some cases (especially on AIX, SOLARIS and HP-UX) you will want to ensure that Domino and the operating system will not flush out the failing
threads from memory. In this case you should disable the Fault Recovery and Kill Process options to ensure that you can capture the failing threads and other related information for further diagnosis.

6.1.2 Data Recovery

It is a common phenomenon in Domino that a server crash could be due to corrupted databases. While the latest code (Releases 4.5x, 4.6x and 5.x) of Domino are now being equipped with better code streams to prevent such crashes, these scenarios could still happen.

Preventing database corruption is the best option. However, to some extent, DB corruptions are inevitable.

When a Domino server crashes or terminates abruptly, the open databases could be corrupted by the crash. If these databases are not identified and proper data recovery procedures are not in place, another series of database crashes could occur. The results could be fatal; each crash could lead to other corruptions.

To avoid such scenarios, the following sections describes briefly some troubleshooting techniques. However, such steps are not fool-proof.

In troubleshooting a server crash or hang (or even performance issues), here are the main areas to focus on:

- System resources
- Network contention or TCP/IP problems
- Domino server system failures
- Notes database corruptions
- Application problems

To analyze where the problems are, it is important that the problem determination cycle and data collection processes are accurate, and are implemented very close to the time of the crash or hang. In some cases, such analysis and investigation requires an iterative process.

1. The problem scenario has to be described in accurate detail. Error messages on server and client machines must be explicit and accurate. Since customers are the only eyes and ears to the problems on site, even the smallest details of problem scenarios must be described when escalating the problems.

2. All data must be collected immediately, such as the following:

   - NSD.LOG
   - Server Console Output Log (if any)
   - Log.nsf
   - Dump files such as CEEDUMP, SYSDUMP
   - Debug Output Files (if any)
   - Customized templates or customized application designs (if applicable)

3. Before sending these files, the data gathered must be verified for its accuracy and its timing of execution. Here are some pointers on how to verify the data:

   - NSD.LOG. Ensure that nsd.sh was run immediately after the crash by opening up the NSD log and viewing the headers of the output log (see example below). Check the following:
- Version of NSD.SH (should be version 3.2.7 or above)
- Date and time of NSD execution
- For other UNIX platforms (other than OS/390), ensure that the ID used to run is the ROOT ID.

- Log.nsf. Do not send all information from the log.nsf. Instead, extract only the miscellaneous events log and the date when the problem occurred. In the miscellaneous view, verify that the time of server termination coincides with the NSD timing.

- Dump Files. Ensure that the dates and the time of these files tally with the crash date and time.

**Important**

Sending wrong files or incomplete information will delay the analysis and prolong the resolution of your problem.

6.1.3 Quick Steps to Server and Data Recovery

While waiting for the information to be analyzed by the support team, here are some quick steps you can do before releasing the server to the users.

1. One of the quickest ways to resolve server problems is through isolation. Trying to identify the cause of the problem can be done onsite, often by looking at the server log.
   - If you suspect that the AMGR is at fault, try stopping the AMGR task. When recycling the server, do not enable the AMGR task. Do the same if you suspect other tasks, such as indexer, replicator, or cluster.
   - If you think mail.box is the culprit, rename the old mail.box and create a new one. If there is pending mail, you may need to copy and paste it to the new mail.box. Should you have reason to suspect corrupted mail documents, try pasting just a few pieces at a time into the new mail.box. Wait until that mail is sent out before pasting another batch. This way, you can observe if the router task crashes or hangs when corrupted mail is about to be sent.

2. If you have any customized templates on the Domino Directory (PNAB), or mail templates that have been introduced recently, replace the design with a standard template. Run the server for a few days with standard templates. Should the server run well, you may want to review your customized template and have it thoroughly tested on your test servers. To a certain extent, you may want your vendor to review your customized templates. Generally, customized templates are not supported by Lotus or IBM.

3. If you have new customized applications and the server is crashing, try isolating the applications from the servers. Review the applications and test thoroughly on your test environment.

4. Before the server is recycled, do the following:
   a. Rename the following files, and allow the server to recreate them:
      - Mail.box (if you have pending mail, you may need to paste to the new mail.box).
      - LOG.NSF
      - BUSYTIME.NSF
Among the databases that are commonly accessed when the server is running are NAMES.NSF, LOG.NSF, BUSYTIME.NSF and MAIL.BOX. So, by creating the new set of the files and running FIXUP on the PNAB, you will eliminate the possibility of corruption on these system databases.

b. Review the miscellaneous event logs of log.nsf to identify all DBs that were opened within one hour of the crash. Review the logs and try to find any peculiar errors that appeared when the databases were accessed. If you can find errors on any of the databases opened, remove the identified databases and try simulating the error in your test environment. You can restore the identified databases from your backup copies or create new databases for the users.

c. If you are unable to find explicit errors on accessed databases one hour prior to the crash, run the DB maintenance tasks such as FIXUP and UPDALL on these databases.

d. Run FIXUP and UPDALL on Domino directory assistance.

### 6.2 Server Hang

The following tables give OS/390 system programmers and Notes administrators some guidance on what to look for if they suspect a server hang. This section also gives an idea of what each is looking for, so they can understand one another. You will find that it is very important for the two to work as a team when managing the Domino server. For instance, with Domino Release 5, if there is an OS/390 dump, the administrator may not need to run nsd.sh. However, sometimes both the dump and nsd.sh are necessary (nsd shows the threads for all the tasks). Again communication is key to gathering the needed input.

#### Table 9. OS/390 System Programmer Checks--Server Hang

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Server Hang</strong></td>
<td>Supervisor call instruction (SVC) dump</td>
<td>Display dump d d t</td>
</tr>
<tr>
<td>Error messages</td>
<td>Search the system log f abend</td>
<td></td>
</tr>
<tr>
<td>Latch contention</td>
<td>Display contention d grs,c</td>
<td></td>
</tr>
<tr>
<td>Central Processing Unit (CPU) utilization is high</td>
<td>SDSF do a display active command. DA</td>
<td></td>
</tr>
</tbody>
</table>

#### 6.2.1 System Programmer Checks

The OS/390 system programmer can do the following diagnostic checks:

##### 6.2.1.1 SVC dumps

Look in the system log to see if an SVC dump was taken. SVC dumps are usually set up through a slip trap, so that when the failure occurs the system will take a dump automatically. You can also take a dump manually with a Dump command which utilizes parameters set up in a PARMLIB member, IEADMCxx. As you read through the systems you will find that most Domino server failures result in the
system taking a SVC dump. For more information on SVC, refer to Chapter 8, “Tools in the OS/390 Environment” on page 109.

To determine if the system took a dump, search the system log using the command `d d,t` from the command line.

### 6.2.1.2 GRS Contention

You should search the system log for latch contention. Latch contention will show up if there is a lock or hold on a system resource and other jobs want the same resource that has the lock on it. This is determined by displaying the global resource serialization (GRS) contention. The command for this is: `d grs,c` from the system console. For more information refer to Chapter 8, “Tools in the OS/390 Environment” on page 109.

### 6.2.1.3 CPU Utilization

There are a couple of ways to check the CPU utilization, as follows:

**SDSF**

One way would be to use spool display and search facility (SDSF). From the main menu enter the display active command, `DA`. This will show you all the tasks that are running on the system and their CPU utilization. At the top of the display is the total CPU usage.

You can also determine if a task is using too much CPU, which might be the reason for the server hang. At this point you can do some displays on the address space of the task that is using high CPU to find out what the task is and what it is doing.

Keep in mind that displays such as grs (above) and OMVS (below) will also give the support specialist data to look at in the logs.

**Resource Measurement Facility (RMF)**

RMF is another way to view system resource utilization such as CPU usage. For more information on using RMF, refer to Chapter 8, “Tools in the OS/390 Environment” on page 109.

### 6.2.2 Commands

The following commands will give a snapshot of the system:

From OMVS (run commands with UID(0)):

- `onetstat>onetstat.output 2>&1` - (shows the TCP/IP point of view)
- `ps -A -o THREAD -o xtid,wtime,semnum,semval,lsyscall -o pid,xasid,atime,state,ruser,comm>ps.out 2>&1` - (gives thread information on processes, semaphore usage, CPU time and so on.)
- `df -kP > df.output 2>&1` - (Shows file system usage)

From the MVS console or system log:

- `D OMVS,A=ALL` (shows what is going on in USS)
- `D OMVS,O` (shows current BPXPRM options)
• D GRS,C (shows current resource contention incidents)

Table 10. Notes Administrator Checks -- Server Hang

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Hang</td>
<td>Server not responding</td>
<td>Telnet to server to check processes: ps -ef</td>
</tr>
<tr>
<td></td>
<td>Errors in notes.log</td>
<td>Check the logs:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cd /domino4/notesdata/noteslog tail -50 notes.log</td>
</tr>
<tr>
<td></td>
<td>CEEDUMP*</td>
<td>cd /&lt;server&gt;/notesdata/</td>
</tr>
<tr>
<td></td>
<td>Tasks are looping</td>
<td>Telnet to server:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cd /usr/lpp/lotus/bin/tools concom sh ta</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Job with increasing CPU time:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ps command</td>
</tr>
</tbody>
</table>

6.2.3 Notes Administrator Checks

The Notes administrator can run the following diagnostic checks:

6.2.3.1 Notes log

To search the server notes.log for errors, telnet to the server and go to the notesdata directory. Then do a tail command to look at a specific number of previous lines in the notes.log, as follows: (You will have to change the path of the noteslog to where your notes.log file is.)

• cd /domino4/notesdata/noteslog
• tail -50 notes.log

6.2.3.2 Server Log (log.nsf)

This is a log that Notes administrators look at using the Notes Administration client. We found that this log doesn’t have as much information as the notes.log file has. If the support center asks you to turn on special debug parameters in the NOTES.INI file, the trace information will show up in this log or the Notes.log.

This is useful data to gather for software support. To access this log, do the following.

1. Log on to the Notes Administration client.
2. Click File.
3. Under your server name, click noteslog.

6.2.3.3 CEEDUMP

If the server crashes or panics, you can check the notesdata directory for a CEEDUMP. This is a dump that you will pass along to software support. For more information on CEEDUMPs refer to Chapter 8, “Tools in the OS/390 Environment” on page 109.

1. First telnet to the server.
2. Next issue the command cd /domino4/notesdata.
3. Issue the command ls CEEDUMP.* (This will list all the CEEDUMPs; remember to use CAPITAL letters for CEEDUMP.)
6.2.3.4 Show Tasks
There are a couple of ways to enter the show task command. When the OS/390 system programmer tells you which task is using a lot of CPU, you should watch the output of this command for a few minutes to show the task and make sure that it is not stuck on one particular file.

6.2.3.5 Show Stat
This displays a list of server statistics for disk space, memory, mail, replication, and network activity.

6.2.3.6 Notes Client
- Logon to the Notes Administration client.
- Click Server.
- Click the Console button.
- Click the Live button.
- Enter the command show task.

6.2.3.7 Telnet
Enter the following commands. Note that your directory path may be different.
- cd /usr/lpp/lotus/bin/tools/
- Enter concom show task

6.2.4 Commands
The following commands will give a snapshot of the system:
- sh port tcpip - (for current sessions on the port, from Domino point of view)
- sh dbs - (shows database stats, #fd,max waiters, current waiters and so on)
- sh stat - (shows full server statistics)
- sh users debug - (shows authenticated users and their associated TCP/IP connection)

6.2.5 Data Collection
Provide the following documentation for the support center.
- detailed problem description
- nsd.sh output
- notes.log
- MVS dumps created
- MVS system log
- onetstat.output
- ps.outpput
- df.output
6.3 Server Crash

This section describes what we have experienced when a Domino server has taken a fatal error, or panics or crashes. The tables show what we found and list the commands used to investigate.

Table 11. OS/390 System Programmer Checks--Server Not Responding

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server not responding</td>
<td>SVC dumps</td>
<td>Display dumps: d d, t</td>
</tr>
<tr>
<td>TCP/IP abends</td>
<td></td>
<td>Search system log: f tcp or f abend</td>
</tr>
<tr>
<td>HFS corruption</td>
<td></td>
<td>Search system log: f HFS f 0F4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Search Domino log: 0F4</td>
</tr>
<tr>
<td>VTAM abends</td>
<td></td>
<td>Search system log: f vtam or f abend</td>
</tr>
</tbody>
</table>

6.3.1 System Programmer Checks

Search system log. Go into SDSF and enter the following commands:

1. log (This will put you in the system log.)
2. f hfs
3. f vtam
4. f tcp
5. f abend
6. f SVC

If you find abends or error messages in VTAM, you should note the message and get the VTAM personnel involved.

If you find abends or error messages in TCP/IP, there is more information you can collect for TCP/IP. At this point you should have your TCP/IP personnel involved. For information on the TCP/IP commands, refer to Chapter 10, “Tools for Network Troubleshooting” on page 179.

- Go into OMVS and run the following commands:
  - onetstat>onetstat.output 2>&1 - (To show the TCP/IP point of view)
  - otracert <server name> >otracert.output 2>&1
  - oping <server name> >oping.output 2>&1

Table 12. Domino Administrator Checks -- Server Not Responding

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server not responding</td>
<td>Can't telnet to server</td>
<td>Telnet &lt;server name&gt;</td>
</tr>
</tbody>
</table>
6.3.2 Notes Administrator Checks

Try to access the Notes server using the Notes client. If this fails, try to telnet to the server. Search the notes log for errors. If you cannot get into the shell with telnet or rlogin, use TSO NETSTAT or try the TSO OMVS shell.

6.3.3 Data Collection

Provide the following documentation for support.

- Detailed problem description.
- nsd.sh output
- notes.log
- MVS dumps
- MVS system log
- onetstat.output
- oping.output
- otracert.output

6.4 Database Corruption

There are many elements of corruption that the server can’t detect that will cause the server to crash. The following tables help you in looking for database corruption. As previously mentioned, you should ensure that you have a Notes administrator and a system programmer always communicating during a failure. Going through these checks will only be successful if you have at least these two disciplines working together on the problem.

6.4.1 What is Database Corruption in Domino

Corruption is when part or all of the database objects are unreadable or, at a minimum, the integrity is questionable. A corrupt state can occur in several places. These relate to bad tables, notes, folders, bitmaps and so on.

Questionable integrity occurs when a database header or index has entries that appear to be invalid. To some extent, an unknown state could occur that prevents any Domino task from performing as it should.

Normally, database corruptions are resolved by performing FIXUP and UPDALL, depending on where the corruptions are.

During server startup, you may observe the following message on the server console or the log.nsf:

Performing Consistency Check on Database XXX.NSF

This message indicates that Domino is performing a consistency check on a database. A consistency check is synonymous with the fixup server task. Consistency checks are done when a database is found to be in an unknown or corrupt state or the integrity is questionable.

6.4.2 Causes of Database Corruption

- Improper operation procedures (for example, improper shutdown)
- Operating system or network problems
- Memory overlay
- Hardware failures
In any event, these environmental hazards cause abrupt termination that prevents a database from writing to disk or being closed properly after it was accessed.

An unknown state occurs when the database is not closed properly, for example, a server crashes or a database file is copied at the operating system level while open.

6.4.3 Read-Only Corruption

Fortunately, with Domino Release 5, when the server identifies that there is a database corruption, it should no longer cause the server to crash. When the Domino server detects a corrupt database, it will mark it as read only. The following tables show what to look for and how to handle this situation.

Table 13. Domino Administrator Checks--Read-Only Corruption

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands/Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can't open database</td>
<td>Error message</td>
<td>Search notes log:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>From notes client:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>File - Database - Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter &lt;servername&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select database, notes log()</td>
</tr>
</tbody>
</table>

6.4.4 Notes Administrator Checks

Search the noteslog for error messages on specific databases from the Notes client:

- Select **file-Database-Open**.
- Enter `<servername>` (example: D01ZX96).
- Select database: `notes log()` file `log.nsf`
- Go to “Misc Events” view
- Search for an error similar to Figure 41.

![Figure 41. Output from the Noteslog](08/30/99 12:51:24 PM Router: Unable to deliver message 005C97A3, 005C97A3 to Eddie.Mcin/KINPK/Itso from mcin@PSK025XCV.vnet.com@IUOUIY
08/30/99 12:51:24 PM Database is corrupt -- Cannot allocate space
NSFDbOpen: File '/domino4/mail7/mcin.nsf' is CORRUPT - Now Read-Only!]

If you are using transaction logging:

- Use transaction logs to apply or undo database transactions not written to disk for databases that were open during the system failure.

If you are not using transaction logging:

- Either restore the database from backup or run the FIXUP utility
- If this doesn’t work: run compact -c utility to recover.

6.4.5 Data Collection

Provide the following documentation for the support center:

- The corrupt database
- The console log
6.4.6 Undetected Corrupted Database

This happens only when any of the server tasks are unable to recognize the integrity of the database table, index, view and so on. The effects however, may cause a server downtime.

Table 14. Domino Administrator Checks--Undetected Corrupt Database

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error Message</td>
<td>Search noteslog</td>
<td></td>
</tr>
</tbody>
</table>

Domino administrator:

Search notes logs for the last couple of crashes and compare similarities of any particular mailfiles(s) that AMgr, Indexer or any other task was working on before the crash.

6.4.7 Data Collection

Provide the following documentation for support:

- Detailed problem description
- nsd.log
- log.nsf
- console log
- Debug output file (if any)
- CEEDUMP (if applicable)
- SVC dump

6.5 Mail.box Compaction Hang

Table 15. Domino Administrator Checks -- Mail.box Corruption

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not receiving mail</td>
<td>Mail backup</td>
<td>Look for pending mail</td>
</tr>
</tbody>
</table>

6.5.1 Notes Administrator Checks

From a Notes client:

- Select **Messaging tab** and then **Routing status** (look for pending mail).
- Run **show tasks** and **show stat**.
- Run **nsd.sh**.
- Release the pending mail manually. If this doesn’t work, do the following:
  - Recycle the server.
  - Create a new mail.box.
  - Open the old mail.box and the new mail.box.
  - Cut and paste the pending mail to the new mail.box.

6.5.2 Data Collection

Provide the following information for the support center:

- Detailed problem description
- nsd output
- log.nsf - (with current date, miscellaneous events and mail routing)
- old mail.box file
6.6 Looping Tasks

When a task is looping, it can cause the server to hang. There are several tasks that can loop, such as:

- Router
- Agent manager
- Statistics collector
- Calendar connector
- Indexer
- Replicator

These are only a few of the tasks that could be running and have the potential to loop. There are several steps that can be taken to find out if you have a task looping and what the task is. Table 16 shows what command and actions the system programmer and the Notes administrator will take. Keep in mind that the administrator will be contacted by the Help desk or the team that monitors the servers.

Table 16. OS/390 System Programmer Checks -- Looping Tasks

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail backlog</td>
<td>High CPU usage</td>
<td>Go into SDSF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter da</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter Prefix &lt;servername*&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Press PF11</td>
</tr>
<tr>
<td>Latch Contention</td>
<td></td>
<td>Go into SDSF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter d grs,c</td>
</tr>
<tr>
<td>TCP/IP problems</td>
<td></td>
<td>Go into OMVS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cd /&lt;servername&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter onetstat</td>
</tr>
</tbody>
</table>

6.6.1 System Programmer Checks

Determine which job is using CPU at a high rate:

- Go into SDSF (see Figure 42 on page 87).
- Enter: da
To look at the server jobs that are running, without seeing all of the other system started tasks, issue the command shown in Figure 43, which has the format of `pre <server name*>`. Be sure you sort on CPU percentage (see `sort=` field in the figure).

```
Display Filter View Print Options Help
HXX1900------------------- SDSF PRIMARY OPTION MENU -------------------
COMMAND INPUT ==> da SCROLL ==> CSR

LOG - Display the system log
DA - Display active users in the sysplex
I - Display jobs in the JES2 input queue
O - Display jobs in the JES2 output queue
H - Display jobs in the JES2 held output queue
ST - Display status of jobs in the JES2 queues
PR - Display JES2 printers on this system
INIT - Display JES2 initiators on this system
MAS - Display JES2 members in the MAS
LINE - Display JES2 lines on this system
NODE - Display JES2 nodes on this system
SO - Display JES2 spool off load for this system
```

**Figure 42. SDSF Primary Menu**

To look at the CPU usage, issue the command shown in Figure 44 on page 88. To see more details for these tasks, you will have to scroll to the right.

```
Display Filter View Print Options Help
HXX1900------------------- SDSF PRIMARY OPTION MENU -------------------
COMMAND INPUT ==> da SCROLL ==> CSR

PREFIX=ML83NP* DEST=(ALL) OWNER=* SORT=CPU%/D
NP JOBNAME STEPTNAME PROCSSTEP JOBS JOBID OWNER C POS DP REAL PAGING SIO

DOMINO4 STEP1 IN F3 2690 0.00 0.00
DOMINO4 STEP1 LO FF 280 0.00 0.00
DOMINO4 STEP1 IN F3 478 0.00 0.00
DOMINO4 STEP1 IN F3 414 0.00 0.00
DOMINO4 STEP1 IN F3 485 0.00 0.00
DOMINO4 STEP1 IN F3 514 0.00 0.00
DOMINO4 *OMVSEX LO FF 46 0.00 0.00
DOMINO4 STEP1 IN F3 388 0.00 0.00
DOMINO4 STEP1 IN F3 489 0.00 0.00
DOMINO4 STEP1 IN F3 703 0.00 0.00
```

**Figure 43. SDSF Display Active Tasks**

To look at the CPU usage, issue the command shown in Figure 44 on page 88. To see more details for these tasks, you will have to scroll to the right.
To help the Notes administrator to find out which Domino task is using high CPU, display the address space.

- issue the dump command as follows using the IEADMCxx member in SYS1.PARMLIB. (This is an example of a IEADMCxx member; 000E is the OMVS (OE) address ID and 007C is the ROUTER address ID.)

\[
\text{DUMP COMM=(comments),PARMLIB=xx}
\]

You will get a response similar to the following:

\[
\begin{align*}
\text{command} & \quad \text{scroll} \\
\text{RESPONSE=SC63} \\
\text{BPX00401 11.19.57 DISPLAY OMVS 611} \\
\text{OMVS} & \quad \text{OMVS=(96)} \\
\text{USER} & \quad \text{PID} \\
\text{DOMINO4} & \quad \text{352321575 HS 01.41.53 33480.185} \\
\text{LATCHWAITPID} & \quad \text{CMD=/usr/lpp/lotus/notes/latest/os390/indexer}
\end{align*}
\]
Note: This information will help the Notes administrator do further analysis to find out what the task is doing and if it is looping.

Table 17. Domino Administrator Checks -- Mail Backlog

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail Backlog</td>
<td>Router not transferring mail</td>
<td>Telnet into server or use Notes Administrator Client. Check the logs: cd /domino4/notesdata/noteslog tail -50 notes.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long-running tasks</td>
<td>Telnet to server: cd /usr/lpp/lotus/bin/tools concom sh ta</td>
</tr>
</tbody>
</table>

6.6.2 Domino Administrator Checks

1. Telnet to the server.
2. cd /usr/lpp/lotus/bin/tools
3. concom sh ta
   Issue this show task command for several minutes to ensure the task is not moving.
4. Take an nsd.sh dump.
5. Recycle the task.
   • cd /usr/lpp/lotus/bin/tools
   • concom tell <task> quit
   • Get confirmation that the task ended.
   • concom load <task>

6.6.3 Data Collection

Provide the following information to the support center:

• Detailed problem description
• nsd output
• notes.log
• Debug output file
• MVS dump

6.7 HFS Problems

When a user is not able to open a database, this could mean many different things to the Domino administrator. The following tables help you to isolate if it is an HFS problem.

6.7.1 System Programmer Checks

Table 18. OS/390 System Programmer Checks--User Access Problem

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands/Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>User access problems</td>
<td>Error messages in the system log.</td>
<td>f0F4 (associated abend code)</td>
</tr>
</tbody>
</table>

From syslog issue these commands:
- f abend
- f d d, t
- Set a slip trap dump to capture the HFSDSP01 dataspace under the OE address space at the next 0F4 abend occurrence.

```
SLIP SET,COMP=0F4,ACTION=(SVCD),ENABLE,ID=HFS1,
DSPNAME=(E.HFSDSP01),ML=100,
SDATA=(ALLPSA,CSA,SQA,RGN,SUM,TRT),END
```
- Set Ctrace on until the slip is hit, then turn it off.

```
TRACEOPTS ON BUFSIZE(2M)
OPTIONS(‘ENTRY,EXIT,EXITA,SPECIAL,CB,COMP=(PFS)’)
```
- Create a new HFS.
- Unmount the old HFS and mount the new HFS.

### 6.7.2 Domino Administrator Checks

Table 19. Domino Administrator Checks -- User Access Problem

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptoms</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>User access problem</td>
<td>Error message in notes log</td>
<td>Search noteslog</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>File - Database - Open</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter server name and database to be opened</td>
</tr>
</tbody>
</table>

From a Notes client:
- Click **File - Database - Open**.
- Select server name and notes log().
- Search for messages like those shown in Figure 45:

```
06/17/99 09:54:41 AM File name: admin4.nsf: Unknown OS error
06/17/99 09:54:45 AM Error updating view in mail01/tree.nsf: Unknown OS error
06/17/99 09:54:59 AM Periodic macro agent - Error opening mail03/cami.nsf: Unknown OS error
06/17/99 09:53:58 AM Error delivering to Domino4/ITSO mail2/cmore; Unknown OS error
06/17/99 09:53:59 AM Error delivering to Domino4/ITSO mail7/dapes; Unknown OS error
```

Figure 45. Error Message

### 6.7.3 Data Collection

Provide the following information to the support center:
- Detailed problem description
- nsd output
- notes.log
- Slip dump and Ctrace output
Part 3. Tools and Resources
Chapter 7. Maintenance Philosophy

IBM's service organization is committed to providing optimum operational availability of your information systems. IBM service offers you the advantages of experience, professional support and provides the highest level of quality in the industry. When you call IBM's convenient toll-free number (1-800-IBM-SERV), you activate a network of support that assumes responsibility for reporting your problem. An automated, real-time dispatch system puts you in touch with highly-qualified technical support specialists, customer engineers (CEs), IBM parts locations, and management support needed to successfully resolve your problem.

7.1 Domino’s Problem Reporting Process

Lotus has revised their service and support structure for Lotus Domino R5 for S/390. This new support strategy is in line with what S/390 customers are familiar with from IBM.

7.1.1 Lotus Domino Support for S/390: What It Is

- Unlimited defect support calls
- Named Caller restriction removed
- 7x24x365 voice support
  - Live Transfer from IBM PSS to Lotus Support in Year 2000
  - 8:00 a.m. to 5:00 p.m. January 2000
  - 8:00 a.m. to 8:00 p.m. July 2000
- Local language support
- Support Line optional feature
- Additional dedicated Lotus S/390 skilled analysts for the front end and back end support team -- January 2000
- Ability to view problem status in RETAIN -- 3Q99
- Fix information will continue to be available through the QMU/QMR information posted on the Web.

7.1.2 Lotus Domino Defect Support for S/390: What It Is Not

There are several distinct differences between traditional IBM S/390 defect support and that provided by Lotus Support for Domino R5 for S/390. Defect support for Domino R5 for S/390 excludes the following activities:

- Separate PTFs are not supported (atomic level fixes are not provided). Fixes are delivered using the standard Lotus QMU/QMR Process.
  - An entire program upgrade is required for a QMU/QMR.
  - All fixes in a QMU/QMR will be applied at the time of the program upgrade.
  - If a required fix is available in a QMU/QMR, customers must upgrade to the most currently available QMU/QMR in which it is provided.
- Fix information is not tracked in the RETAIN/APAR database.
- Information about available fixes is not available in RETAIN.
  - Information about fixes contained in QMUs/QMRs will continue to be provided in the QMU/QMR release notes.
  - Fix information will continue to be available via the QMU/QMR information posted on the Web in Domino Notes Network (DNN).
• Verification that an individual customer problem is included in an existing QMR and/or QMU will not be provided.

• There is no guarantee to fix all defect problems.

• There is no mechanism to install maintenance using SMP/E (so there is no checking for co-req or pre-req fixes).

• This is only server support. Support for Notes Clients, DB design and value-added products continues under current Lotus programs.

• Defect support under the MLC agreement is for the *Lotus Domino R5 for S/390 server* only. Server support for other platforms will continue as before.

### 7.1.3 QMRs and QMUs

Lotus Domino produces Quarterly Maintenance Releases (QMRs). These are scheduled quarterly updates to the major releases. For example, if we receive R4.6.3, this would be a quarterly update for the R4.6x code stream. QMRs are released approximately every 90 days for Domino and Notes. QMRs include all QMUs (see next paragraph) for the quarter. Lotus has two QMRs each quarter, one for each active code stream.

Lotus Domino also produces Quarterly Maintenance Updates (QMUs). This is a method of shipping a small collection of critical fixes on an as-needed basis before the next QMR. They are typically used to fix problems introduced by a QMR.

Distinguishing between a QMR and a QMU is easy. A QMR is represented by a number and a QMU has an additional letter. For instance, the first QMU for QMR 4.6.1 was R4.6.1a. These releases and updates of Domino and Notes supersede the previous QMR. They contain all of the fixes in the previous release, plus the additional fixes for the problems being addressed in the QMU.

### 7.1.4 How a Problem Becomes Fixed in a QMR

All software problem reports (SPRs -- requests for fixes from customers) are ranked based on severity of the problem and the number of customers affected. Then the developers write their code and quality engineers (QE) perform testing. When they have a build that includes a particular fix, a beta is sent out to customers requesting that they verify the fix. When they confirm the problem has been fixed, the code goes into the “Gold” build. Lotus tests their weekly builds on internal Lotus and Iris servers to test stability. Lotus deploys the Gold build on their internal servers, then the product goes to manufacturing for distribution to the customers.

### 7.1.5 Operating System Maintenance Level

One of the first questions you may be asked by the Support Center is the maintenance level of your OS/390 system. This is because many problems in Domino are fixed by having the correct level plus all the PTFs. You can find if your level is current by going to the S/390 Web site and viewing the required PTF list. Or you can download the PTF checker and run it. This utility checks your PTFs against the Domino prerequisites.

**Note:** This task should be performed at least every two to three weeks, either by using the checker or by manually reading the list.
IBM would like to ensure that they can deliver the technical assistance required to meet or exceed customer expectations regarding software support.

Through the software support structure, they provide:
- Information, tools, and fixes to prevent known software problems.
- Timely responses to all of your software inquiries.
- Resolutions to your software problems.
- Answers to your software usage questions.
- Consistent support options for all of your IBM software.

Regardless of what type of system you are running, from the largest mainframe to the smallest laptop, you want your system to be available when you need it to get your work done. The data should also be secure from loss or contamination, ensuring confidence in the accuracy of the results. IBM recommends the installation of Preventive Service Packages (PSPs) to proactively avoid impacting problems caused by software problems already known and corrected.

Preventive Service Packages are updated frequently. If you have a stable environment where you never encounter problems, you do not need to install every package; however we recommend periodic installation. The frequency of these installations will be based on your operating environment. Before making major changes (such as adding new hardware or software or even major applications) you should consider installing the most recent PSP.

The delivery mechanism and media used for the S/390 are ESO Tape and CBPDO. These are available monthly, but it is recommended to apply them quarterly. There is also a list of fixes for High Impact APARs that should be conscientiously installed between Preventive Service Package installations, depending on the applicability to your environment. These APARs are known as “HIPER” which means the problems they describe and fix are in one of the following categories:
- Problems that cause the destruction and/or contamination of customer data.
- Problems that cause the customer to re-IPL, reboot, recycle, or restart one or more systems or subsystems.
- Problems that cause a major loss of function.
- Problems that cause severe impact to system performance or throughput.

The IBM Software Support Center is organized into either a Single Point of Contact (SPOC) or, like the U.S., into a combination of Response Centers (Customer Support Centers) and Resolution Centers (Product or Component Teams). In countries using a response center - resolution center, when you call IBM Software Support, your call is taken by a representative in the Customer Support Center. This representative will ask you some basic questions, such as what operating environment you have. The representatives in Support Centers are responsible for creating a unique problem management record (PMR) in an online database for your request. Make a note of the PMR number and use it in any future calls to the support center in reference to this same problem.

Once the representative in the Support Center has enough information to direct your request, they will then either route your call to a resolution team or queue your call for callback by a resolution team. In either case, the next person you
speak with will be a specialist in the appropriate self-directed resolution team. For problems that span multiple platforms (such as an AIX application talking to an OS/2 application) or multiple products (such as CICS/2 interacting with DB2/2), you may request assistance from the Problem Determination/Problem Source Identification (PD/PSI) group if you are unsure about which platform or product is failing.

For countries with a Single Point of Contact (SPOC), when you call IBM for software support, the SPOC representative will create the PMR and will be your representative on the resolution team. At the team level, your call is recorded, researched, resolved, or escalated as appropriate. Due to the level of specialization required to maintain superior technical expertise at the team level, it is sometimes necessary to involve more than one support team in resolving a particular software problem. This is easily handled as IBM support teams are all networked together and work to resolve whatever problems arise.

The IBM On-line Technical Support Home page is:


### 7.3 Response Objectives

When you call IBM Software Support, the first objective is to connect you to a technical specialist right away. However the number of other calls queued may make this impossible. For Support Line or Passport Advantage requests, when your call cannot be routed live to a technical specialist, IBM’s commitment is to call you back within 2 business hours during prime shift, and, for critical problems within 2 hours offshift (where available, and when you have previously purchased the appropriate offshift option). Prime shift is defined by the prevailing business hours, such as 8:00 am to 5:00 pm in North America or 9:00 am to 6:00 pm in Japan and some parts of Europe, but always in your time zone, Monday through Friday, except national holidays. Offshift is defined as all other hours. Depending upon your request, an additional fee may be applicable for offshift support.

For problems reported against monthly license charge (MLC), for example System/390 software products, IBM and Tivoli's response objectives continue to be based upon the severity of the request. Table 20 describes these objectives:

<table>
<thead>
<tr>
<th>Severity</th>
<th>Impact</th>
<th>Response Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Critical business impact</td>
<td>Response within two business hours.</td>
</tr>
<tr>
<td>2</td>
<td>significant business impact</td>
<td>Response within four business hours.</td>
</tr>
<tr>
<td>3</td>
<td>Some business impact</td>
<td>Response by the end of the next business day.</td>
</tr>
<tr>
<td>4</td>
<td>Minimal business impact</td>
<td>Response by the end of the next business day.</td>
</tr>
</tbody>
</table>

Response criteria may vary from country to country.

Except for severity 1 problems, System/390 problems reported offshift will be queued for response during normal business hours. The goal is to respond to
critical System/390 problems reported offshift within 2 hours for those problems which require product expertise.

7.4 Authorized Program Analysis Reports and Program Temporary Fixes

If it is determined that your request for service is a result of an IBM/Lotus/Tivoli software defect that has not been reported before, you will be asked for needed diagnostic information so that an authorized program analysis report (APAR) can be created to track the resolution of the defect.

For a low-impact problem where you don't need an immediate, permanent fix, it may, with your agreement, be deferred for a future release. Such APARs will have a closing code of FIN (Fixed If there is a Next release) to show they will be fixed in a future release.

For problems with some impact, once an APAR is created, the appropriate development team is engaged and will work to resolve the APAR. Because of the complexities of the environments supported, APARs will often take several weeks, possibly months, to debug and to write, test (in all applicable environments), package and distribute the fix.

For high-impact problems, the resolution teams will make every effort to develop a workaround that you can use until your APAR has been resolved.

Once the APAR is resolved, a program temporary fix (PTF) is created. A PTF is a fix to a reported defect that can consist of documentation and/or code. A PTF is associated with an APAR.

Once you have received a PTF, IBM will follow up with you to confirm resolution of your reported problem. If you have verified the fix, contact the call center so that the PMR can be placed in a resolved status. If for some reason, the problem is not resolved, or you are dissatisfied with the solution, your PMR will remain open while IBM/Lotus/Tivoli support personnel continue to work on the problem. The PMR should not be closed until you are satisfied the problem has been resolved.

The following steps are an illustration of how your call for technical support flows through the software support structure in countries using the response center.

Your call goes to a Response Center

When you call the Single Point of Contact number, a Voice Response Unit directs your call to the Response Center for the appropriate software platform. In the US:

For S/390 Software, press 4
Then to a Resolution Team

Then your call is routed to the appropriate Resolution Team to determine the source of your software problem.

Where the source of your problem is determined

The Resolution Team will invoke the resources needed to resolve your situation, including IBM Availability Centers, IBM/Lotus Software Development Teams, or other non-IBM/Lotus/Tivoli software providers.

7.5 Sending Documentation to Lotus and IBM

In order to minimize the amount of time it takes to resolve problems, you should become familiar with the procedures for sending documentation to the Lotus and IBM technical support centers. The following sections detail both the Lotus and the IBM procedures.

7.5.1 Lotus Procedures for Sending Problem Documentation


7.5.1.1 Overview

Files for and from Lotus Technical Support can be transferred via an FTP site, by users with FTP client software (for example, WS_FTP). In addition to the ability to upload files for review by Technical Support, you can also download files from Technical Support and download updated drivers. Unlike Lotus' World Wide Web page, you will not be allowed to leave messages for a system administrator. This site is intended for the storage and retrieval of files only. Customers should report upload or download problems to their Lotus contact.

7.5.1.2 Connecting to the FTP Site

By using an FTP client or command-line interface, you can connect to the Lotus FTP site at transfer.support.lotus.com.

Connect as:

User ID anonymous
Password (your Internet E-mail address)

After connecting you should select the /lotus directory. Within this directory, you enter either one of the following directories:
Chapter 7. Maintenance Philosophy

7.5.1.3 Uploading Files

If you have been instructed by Technical Support to upload a file, copy it to the appropriate /lotus/inbound/ directory (for example /lotus/inbound/approach). The technical support analyst you spoke to will give you a file name for the upload file(s). Wherever possible, all files should be zipped (using PKZIP) into a single file with the name you were given.

Note: Virtually all files should be uploaded as binary files; see 7.5.1.6, “Common Problems Encountered with this Procedure” on page 100 at the end of this document.

Attention: For security reasons, once a file is uploaded, it can not be overwritten, modified, downloaded, or even viewed in the directory. If you have a problem with a file you have uploaded and need to upload it again, change the last character in the file name to an appropriate digit. For example, if you were instructed to use the name FTP_TEST.ZIP and you need to upload an additional file, name the second file FTP_TES2.ZIP.

Be sure to upload files with the name that you were given by the technical support analyst, and do not upload any files except at the direction of a technical support analyst.

7.5.1.4 Downloading Files from Technical Support

If you have been instructed to download a file from one of the /lotus/outbound/ directories, you will not be able to see the file in the directory structure even though it is there. This is done for security reasons. The support analyst (or a document that you may be reading regarding an update/utility/tool you are interested in) will provide you with the exact name of the file you will need to download.

7.5.1.5 Downloading Public Technotes, Updates and Drivers

The FTP server used for inbound/outbound files no longer holds the public FTP files. Inbound/outbound files are to be accessed on transfer.support.lotus.com, while public files can be found on ftp.support.lotus.com. And the reverse holds true--files can no longer be uploaded to ftp.support.lotus.com.

On the support FTP server for public files, ftp.support.lotus.com, under the /pub directory, directories and files will continue to be added for updates (refer to the next section), technotes, and examples. Unlike the download directories, you can see the files in these directories and may download any of them.

Most directories under /ftp/pub will contain a file called 00_index. This is a text file which contains a directory listing including descriptions of the files stored in that directory.
Most FTP client software packages have a command to view text files while
attached to the server. If your client software does not have this feature,
download the file and open it in any text editor or word processor.

**Note:** Some of the directory listings are very large (over 64 K) and cannot be
opened in some text editors such as NotePad.

### 7.5.1.6 Common Problems Encountered with this Procedure

#### ASCII vs. Binary

When uploading files, it is critical that the proper file type is specified. If you are
uploading or downloading any program, data, graphic, or zipped file, you will
need to use binary. ASCII is for text-only files, such as log files.

#### Checking the Log

If you have problems, check the log. Virtually all FTP applications produce a log.
Depending upon the application, the log can be displayed in a number of ways:

- Displayed on the screen
- Located in a separate window, which can be opened
- Written to a file on your hard drive

In the case of WS_FTP, for example, two lines are displayed in the bottom of the
connect dialog box. Clicking the LogWnd button, located at the bottom of the
dialog box, displays the log file.

#### Case Sensitivity

If you are having a problem with files not found when attempting to download
them, check case-sensitivity. On the server, both file and directory names are
case-sensitive.

### 7.5.1.7 If You Do Not Have an FTP Client

If you do not have an FTP client, but do have a Web Browser, you can download
WS_FTP (in 16-bit or 32-bit versions) from the following Web site:

http://www.ipswitch.com/

You can also access the Lotus Support File library (public files) by using the
following addresses in a Web browser:

http://www2.support.lotus.com/ftp/pub/

Also refer to the related document: Sending Database Files to cc:Mail- Lotus,
SIMS Document number 114782.

### 7.5.1.8

A mail-in database has been created to receive customer files so that small files
like notes.ini and crash information are not sent directly to one person. This is so
that if that person is not in, the files are still accessible for other analysts to get to.
This also helps if the FTP site is down. Here is an excerpt from TN 175488:

If a Notes Support Analyst has requested that you provide sample files to
assist in troubleshooting an incident, use the following instructions to send the
files via the Internet. In addition, note the following file size restrictions:

- The maximum file size is 10 MB.
All files should be restricted to the size that is necessary to illustrate the problem or question. (For example, if you have encountered an issue while designing a database, the sample database you send to Notes Support should contain only the elements needed to illustrate the problem.)

Instructions for Sending Files to Notes Support Over the Internet:
1. Attach your file (or files) to an e-mail note.
2. Address the email to the following Internet address:
   Incident_Files@Lotus.com
3. Enter the seven-digit Incident Number as the first 7 characters in the Subject line.

7.5.2 IBM Procedures for Sending Problem Documentation
The following information can be found on the Web at http://techsupport.services.ibm.com/support/s390

7.5.2.1 Uploading to IBM Level 2
To access the procedures for uploading supporting documentation to IBM, from the navigator of the Web page above, click Problem Management, then Submitting Supporting Information Electronically.

7.5.2.2 Navigating Through the S/390 Support Site
The home page for the United States S/390 Technical Support site is http://techsupport.services.ibm.com/support/s390. IBM Customers can access the free databases and fixes without having to register or login. If you wish to register, you will be able to report problems electronically, download fixes, and order fixes on standard physical media. You will also have access to authorized problem analysis reports (APARS) currently being worked. You can register by selecting your country from this Web page:

http://techsupport.services.ibm.com/support/390.support/country

7.5.2.3 Asking a Question About an S/390 Software Product
Your S/390 software product licensing fees provide for defect problem reporting only. IBMLink, however, offers for an additional fee a service called TalkLink. TalkLink provides the ability for IBM customers to ask questions about IBM S/390 program products. It is one of the MartLink services under the IBMLink umbrella of customer services. If you would like additional information about TalkLink, or to order TalkLink or other IBMLink service, you should contact the IBMLink Marketing Office within your country. (Note that TalkLink may not be available in all countries.) The IBMLink Web page is located at:

http://www2.ibmlink.ibm.com/

Other sources of information are available to customers. Complete IBM Redbooks are available on the Internet at http://www.redbooks.ibm.com. Customer User Groups such as Guide and Share may offer avenues to pursue your questions.

7.5.2.4 Reporting S/390 Software Defects to IBM
Be sure your company is up-to-date on ALC or MLC payments and has a valid IBM Customer Number. Then you register to access additional features on the S/390 Software Technical Support Internet site.
Once registered, users can then select a link under the Communicate section on the S/390 Tech Support home page. This service is currently limited to United States and Canadian customers. IBM will be expanding this service worldwide. In the meantime, contact your local country support center to inquire about this service.

7.5.2.5 Registering to Access Additional Features

Certain features are available only to IBM customers in the United States and Canada. There is no additional fee associated with S/390 Tech Support Internet registration. Features available at the S/390 Tech Support Internet site are provided as a part of your IBM S/390 software program product licensing fee.

Customers must register electronically. You will be asked to provide your IBM Customer Number, an Internet E-mail address, phone, fax, and postal address information. Additionally, you submit your three top choices for a user ID. Every effort is made to assign your top choice. Some restrictions apply. The registration process may take up to one week to complete. Upon completion of your registration profile, IBM will send you an E-mail notification with information concerning your S/390 Technical Support site, your user ID, and your password. If you do not receive E-mail confirmation within one week, you can receive registration status by submitting feedback (see 7.5.2.6) to this site.

7.5.2.6 Differences Between This Site and IBMLink

IBMLink has been providing customers electronic access to the IBM software support technical support centers for over ten years. IBMLink provides more and richer function over a secure network controlled by IBM. In addition, IBMLink offers optional access via the Internet. Because of the insecure and unreliable nature of the Internet, many S/390 customers choose IBMLink as their primary electronic connection to IBM Technical Support. For more information about any of the services within IBMLink, you should telephone the IBMLink Marketing Office within your country. (Note that IBMLink may not be available in all countries.)

The S/390 Software Technical Support Internet site, on the other hand, is an extension of IBM telephone support. Services are offered through this site that mirror the services that IBM Technical Support provides to S/390 Customers over the telephone. Since telephone support is considered a part of your company's software licensing fees, these services are provided at no additional fee.

Table 21 compares the services provided to IBM Customers with various types of S/390 Software Support licenses (US offerings shown).

Table 21. Services Provided to IBM Customers

<table>
<thead>
<tr>
<th>Service</th>
<th>Traditional Phone Support</th>
<th>IBM S/390 Software Support (non-registered)</th>
<th>IBM S/390 Software Support (registered)</th>
<th>IBMLink ServiceLink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search INFO APARs</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>Search Closed APARs</td>
<td>All</td>
<td>3 Years</td>
<td>10 Years</td>
<td>All</td>
</tr>
<tr>
<td>Search Open APARs</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>APAR DB Update Interval</td>
<td>n/a</td>
<td>Twice weekly</td>
<td>Twice weekly</td>
<td>Continuously</td>
</tr>
</tbody>
</table>
7.5.2.7 An FTP Host

A File Transfer Protocol (FTP) host is a “transfer area” that permits two-way file exchange between IBM Customers and IBM Tech Support Reps. Using FTP, files can be exchanged electronically in a matter of minutes, rather than days. IBM Tech Support promotes the use of these two FTP servers:

*ftp.software.ibm.com*

This site is used exclusively for file downloading. The files and fixes at this FTP site are the latest official maintenance and fixes. This site also contains IBM-approved tools, demos, and other helpful material.

*testcase.software.ibm.com*

This site is used for file uploading and downloading when working with IBM to resolve a reported problem. Files placed on this server are automatically deleted after a few days. If you do place a file onto this FTP site, be certain to verify that the IBM Tech Support Engineers working your problem are aware of your action so that the file is not deleted before it reaches them.

7.5.2.8 Logging On

FTP hosts support a type of logon called anonymous ftp logins.

1. First connect to the FTP host by issuing the command

   `ftp <remotename>`

   where `<remotename>` is the name of the FTP server. The FTP server will prompt for user name and password.

2. For user name, enter the word `anonymous`.

3. For password, enter your complete Internet E-mail address; for example:

   `kelsey_bowen@it.megacorp.com`

The FTP will acknowledge a successful login, display a welcome message, and provide you with an `ftp> ` prompt.

A simpler method is to let your Web browser log for you. Many browsers let you simply specify an FTP URL and when invoked, will log you on as `anonymous`. Navigating through the remote directory structure is also easier through the browser interface.

Footnotes: (1) Indicates a Supportline contract is required.
### 7.5.2.9 Commands Needed
Once logged into the FTP server (with the ftp> prompt interface), there are several FTP commands that can be entered. Here are a few:

- **ls**
  
  This command lists the contents of the current directory

- **cd <directoryname>**
  
  This command will position you into the subdirectory named `<directoryname>`

- **cd ..**
  
  This command will place you into the current directory's parent directory

- **ascii**
  
  This command sets a flag indicating to the FTP host that ascii text will be transferred.

- **binary**
  
  This command sets a flag indicating to the FTP host that binary data will be transferred.

- **locsite <options>**
  
  This command is used when transferring files from a UNIX machine to an S/390 machine. It tells the receiving S/390 machine the format, record length, and blocksize of the incoming file; for example: locsite recfm=fb lrecl=4160 blksize=4160

- **get <filename>**
  
  This command will download the file `<filename>` to your local computer in either ASCII or binary format depending on which flag is currently set.

- **put <localfilename> <remotefilename>**
  
  This command will upload the local file `<localfilename>` to the remote FTP server in either ascii or binary format depending on which flag is currently set.

- **bye**
  
  This command disconnects your local computer from the remote FTP host.

### 7.5.2.10 Finding S/390 Information
Directory structure and file naming conventions have been established to help guide both you and your IBM representative to the data files being exchanged.

**ftp.software.ibm.com**

- The first level subdirectory defines the platform/family of the IBM product being investigated, for example: s390.
- The next level subdirectory defines the IBM support team by product name, for example: MVS.
- The next level subdirectory defines the type of data that will be downloaded, for example: info, fixes, demos.
• Additional subdirectories are possible depending on the product and the number of files available for downloading.

**testcase.software.ibm.com**

• The first level subdirectory defines the platform/family of the IBM product being investigated, for example: s390.

• The next level subdirectory defines the direction in which the data is travelling: “toibm” or “fromibm”.

• The next level subdirectory defines the IBM support team by product name, for example: ims, db2, or cobol. Note that /s390/toibm/db2/ is very different from /aix/toibm/db2/.

7.5.2.11 Naming a File

Customers should adhere to the following rules when dropping off data.

• All files are to be named in this manner: pmrxxxxxyyy.zzz, where xxxxx is your existing problem record number and yyy.zzz represents information provided to describe the file type (for example: pmr3X543megacorp.imslog).

• Notify the IBM representative working on your problem that you are sending or have sent information related to your PMR, and provide the filename to help identify your file.

7.5.2.12 Transfer Type

It is very important to specify the correct transfer type, ASCII or binary when sending files to IBM.

• Binary transfer is suitable for unformatted data such as SVC dumps.

• ASCII transfer is suitable for formatted data such as console logs, job logs, or program listings.

**Notice:** Some corporations and government sites do not allow their systems to send data using FTP.

7.5.2.13 Setting Up a Batch Run

If you have a lot of information to transfer or a slow TCP/IP connection, you can set up a batch run to connect to the FTP site for you. The following JCL is an example of such a batch job. In this example, a customer is uploading a file to the testcase.software.ibm.com machine in the /s390/toibm/ims/ subdirectory. The JCL specifies the FTP machine by its specific IP address (198.17.57.67).

```plaintext
//USERFTP JOB ,....................
//FTPSTEP EXEC PGM=FTP,REGION=4096K,
//      PARM='198.17.57.67 (EXIT'
//STEPLIB DD DISP=SHR,DSN=SYS1.TCPIP.LINKLIB
//SYSMDUMP DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//OUTPUT DD SYSOUT=*
**********************************************************************
* The following 'put' subcommand will take dsn='userid.ftpfile.dat' *
* and will PUT it on the testcase server as *
* and will PUT it on the testcase server as 'ftpfile.dat' .          *
**********************************************************************
//INPUT DD *
anonymous your-email-id
cd s390/toibm/ims
```
7.5.2.14 Specifying LRECL and RECFM
UNIX systems store files as byte streams. That is, to any UNIX system (IBM FTP servers are UNIX systems) a file is simply a long succession of bytes. There is no concept of blocks or records. When data is transmitted from an MVS system to a UNIX file system, all concept of record length is lost.

Needless to say, when transferring a file that has a variable-length record format, it would be impossible to determine where any record began or ended. This is why it is common to place only fixed record length files onto a UNIX server. During upload (PUT) all record length information is lost. However, if we specify a record length when we retrieve (GET) the file, an MVS system is able to reconstruct the file. Therefore, you should do the following:

- Always convert variable-length record files into fixed-length record files before uploading to the UNIX machine.
- Always communicate the fixed-record length value to the person who will be retrieving the file so that he or she can reconstruct it correctly.

The following JCL uses the TRSMAIN program to convert a RECFM=VB file into a RECFM=FB file. TRSMAIN can also reduce the size of your datasets up to seventy percent. Customers may download TRSMAIN from the IBM FTP Internet site: ftp.software.ibm.com.

```
//GNZTERSE JOB , ....
//*******************************************************************
//*FOLLOWING PARM= CAN BE PACK, SPACK, UNPACK
//*******************************************************************
//TERSE EXEC PGM=TRSMAIN,PARM='SPACK'
//SYSPRINT DD SYSOUT=*,DCB=(LRECL=133,BLKSIZE=12901,RECFM=FBA)
//INFILE DD DISP=SHR,DSNAME=GONZO.IMS.OLDS
//OUTFILE DD DISP=(,CATLG,DELETE),
//      DSN=GONZO.OLDS.TERSED,
//      SPACE=(CYL,(20,10),RLSE),
//      UNIT=SYSDA
/*
```

7.5.2.15 Can Others Download My Files
Access control has been set up on the testcase.software.ibm.com FTP server so that users who log in anonymously can:

1. PUT files only into /toibm subdirectories
2. GET files only from /fromibm subdirectories

Once a file is uploaded by an anonymous user, it is downloadable only by IBM Technical Support. It is possible, however, to view all the names of the files within a subdirectory. Also, these access control protections let you be sure that any file you download from a /fromibm directory is really from IBM.

7.5.2.16 Common Error Messages
Why do I get message EZA1761W?
Why do I get JCL return code 656?

Why do I get a “Foreign Host Aborted Connection” message?

Occasionally, the receiving FTP machine fills up all available storage space. When this occurs, your file is only partially transferred, and one or more error messages will be issued. If this occurs, contact your IBM Level 2 support engineer to report the problem. He or she can work with the IBM FTP administrators to remove unneeded files.

7.5.2.17 Procedures for Uploading to IBM Level 2

1. Open a problem record. Documentation can only be exchanged after an official IBM problem management record (PMR) is opened. Your 5-character PMR number will be used when naming files which are exchanged with IBM.

2. Compress your file. MVS customers should use the TRSMAIN program to compress your file [SPACK parameter]. By compressing your data, you improve data transfer time and convert your file into a familiar record length and record format.

3. Rename your file. Use the form pmrxxxxxyyy.zzz where xxxxx is your PMR number and yyy.zzz is descriptive information which you provide (for example: pmr3X543megacorp.imslog).


5. Contact Level 2. Notify them that you have successfully transferred your file to the testcase server. Inform them that you compressed the file with TRSMAIN with the PACK option, and that you used the binary transfer protocol. This will speed up the process of downloading your file at the IBM Level 2 site.

7.5.2.18 Procedures for Downloading from IBM Level 2

1. Verify the file location. Check the testcase.software.ibm.com site under the proper /s390/fromibm/productname subdirectory to verify that the file from IBM Level 2 is available for you to download.

2. Verify the file format. Verify that IBM Level 2 has compressed the file with the TRSMAIN program for MVS and that the binary protocol was used when uploading the file.

3. Download your file with binary protocol. IBM Level 2 should use the same procedure above (TRSMAIN with binary transfer) when placing the file onto the testcase.software.ibm.com server. Download your file from testcase.software.ibm.com using binary transfer protocol.

4. Uncompress your file. Using the TRSMAIN program, uncompress your file [UNPACK parameter].
This chapter describes the following useful sources of information for diagnosing Domino problems in the OS/390 operating environment.

**SYSLOG:** The traditional OS/390 system log

**DOMCON:** The tool from IBM Advanced Technical Support for bridging between the Domino console function and the OS/390 system console

**Operator Commands:** Simple display commands from the OS/390 console

**USS Commands:** UNIX System Services commands

**SVCDUMPS:** Data captured as the result of a component failure or a SLIP trap

**CEEDUMPS:** Data captured by the Language Environment from failing programs

**RMF Monitors II and III:** Provide information on delays in the system

**SMF:** New SMF record type 108 contains Domino server data

**Domino PTF Checker:** Serviceability aid to verify PTFs

Operators of Domino for S/390 have to become familiar with several ways of interacting with it. Because Domino runs as an application under UNIX System Services and has its own administrative commands, operating Domino requires access from:

- The OS/390 Console, to monitor, troubleshoot, and sometimes stop the Domino server. If DOMCON is installed, the OS/390 console can start, stop, and issue Domino administrative commands to the server. A TSO session with SDSF and appropriate authority is capable of performing the same functions.
- A Telnet or rlogin USS session, to start Domino via a shell script, view server text logs in the HFS, and issue commands to the server by using concom (the Domino console communications utility), cconsole (the Domino Character Console interface), or the domoe command (if DOMCON is installed).
- The Domino Administrative Client, which can issue commands to the server, view log data bases, and shut down the server.

Do not use an OMVS session to start the Domino server; this is not supported. You can use OMVS to view UNIX files and to issue commands through the concom interface or the domoe command if DOMCON is installed.

### 8.1 The OS/390 System Log

Domino runs under UNIX System Services as several distinct tasks. OS/390 writes messages to SYSLOG during the Domino server startup and termination as well as when an error or exceptional condition occurs.

Because MVS messages scroll off the Multiple Console Support (MCS) console quickly, normal operations require access to a TSO terminal and SDSF for viewing and searching through the system log. In a Parallel Sysplex environment, operators can view a merged log of all systems in the sysplex.

The SYSLOG data set will show basic information about the Domino server.

- Domino startup and shutdown
• RACF messages
• Communications errors from TCP/IP, including those related to Domino users
• Abnormal termination of the Domino server or related tasks

OS/390’s view and control of the Domino server is limited. Commands to the Domino server are issued by a Domino system administrator in a default configuration. OS/390 has no view of what is happening inside Domino.

8.2 DOMCON - Domino Console for OS/390 Operators

DOMCON is a free tool developed by the IBM Washington Systems Center Advanced Technical Support group. It is IBM’s intention to incorporate DOMCON function in a future release of Domino for S/390. DOMCON gives visibility to the OS/390 console operator of what is going on inside of the Domino server. DOMCON also supports issuing Domino commands to the server from the OS/390 console, as well as from authorized USS users accessing the system via Telnet, rlogin, or TSO.

Figure 46 is a high-level view of a single Domino partition showing how commands can be issued and various logs viewed on an S/390 server.

When DOMCON is added to the configuration, several additional options are available for controlling or troubleshooting the Domino server.

• The OS/390 console operator can issue commands directly to the Domino server.
• The OS/390 system log will also contain all the messages written by the Domino server to the log.nsf file.
• A TSO user can issue commands to the Domino server from SDSF, as well as view Domino messages in the OS/390 system log.
A UNIX System Services user who is accessing the system via Telnet, rlogin, or OMVS can view Domino logs in the hierarchical file system and issue commands to the Domino server.

The Domino Administrator client has all the same capabilities as without DOMCON to issue commands and view logs.

There are four commands that the OS/390 operator can use from DOMCON. These commands may change as new versions of DOMCON become available.

- DOMINS - Start a Domino server
- DOMINK - Terminate a Domino server
- DOMINC - Issue a command to the Domino server
- Domoe - Allows a Telnet or OMVS user to issue commands to the Domino server

An operational benefit of DOMCON is that it enables an OS/390 operator to start the Domino server without involving a Notes administrator. For example, at the end of a weekend outage window, the OS/390 operator is able to get the entire system, including the Domino servers, up and running. A startup option of DOMCON allows it to start the Domino server and terminate without enabling the message monitoring function.

If the configuration contains multiple Domino partitions, DOMCON commands can be directed by name to the appropriate partition. Also, the SYSLOG contains messages consolidated from all the Domino partitions. A benefit of recording all these messages to the OS/390 system log is that most installations already have procedures for archiving the information so it can be easily retrieved if needed at a later time.

A downside is that the OS/390 console and SYSLOG is flooded with messages. The latest release of DOMCON is 3.0, and it allows message filtering to eliminate messages that are not relevant to the OS/390 operations and support groups. Automation techniques also allow many messages to be suppressed. This is discussed in Chapter 12, “Automation of Domino Operations” on page 225.

DOMCON is currently provided by IBM free of charge on an as-is basis. The code and discussions about DOMCON are available from a Web-enabled Domino discussion database. This database can be accessed by following the DOMCON links at [http://www.s390.ibm.com/products/domino/domdown.html](http://www.s390.ibm.com/products/domino/domdown.html)
If DOMCON is available to the OS/390 operator or system programmer, they can use the command procedure to display information and statistics. Figure 47 is an example of a command, S DOMINC,CMD='SH TASKS',SRVID='MANNE' issued from a TSO session. The name MANNE is an alias name we defined for the test server, DOMINO4.

Figure 48 is an example of a command, domoe show server being issued from an OMVS session. It could also be entered from a Telnet session. The OMVS session permits scrolling back so more information is viewable.

8.3 OS/390 Operator Commands

Some simple commands are useful in monitoring the overall health of the system. If the Domino server does not terminate in response to the administrative command quit, the OS/390 operator has the option of cancelling the server.
8.3.1 OS/390 Display Active and OMVS

Display Active - By issuing a `D A, servername` command, you can display the related set of address spaces from an OS/390 point of view; see Figure 49. Besides listing the user ID the server was started under and the address space IDs (which are useful to know if a DUMP command is to be issued), this display can help identify address spaces consuming a large amount of CPU: CT = large value for example. Along with the output from a `D OMVS, A=ALL` command, this information gives a good picture of the server address spaces.

Domino creates several address spaces depending on which services are selected. For example, POP3, HTTP, and SMTP are separate address spaces. If a particular service is suspected of having a problem, the OS/390 console command `D OMVS, A=ALL` will display the relationship between the address space names and the programs they are running.

Figure 49. MVS Console Command to Display Domino Address Spaces

Figure 50 on page 114 shows an SDSF log display containing some output from the `D OMVS, A=ALL` command. The address space MANNE1 is executing the server program. Address space MANNE3 is executing the AGENT Manager program, and so on. If Domino creates more than 10 address spaces, the address space names will be re-used; however the actual ASID of each one is unique.
A useful variation of the D OMVS command in a configuration with multiple Domino partitions is D OMVS,U=userid, shown in Figure 51. Each Domino partition requires a unique user ID, so by specifying the U= option, you can display all of the related address spaces of a specific partition. This saves time from being spent scrolling through irrelevant lines of output. CPU consumption can also be quickly examined if a looping task is suspected.

More detail can be obtained about a specific UNIX System Services address space by issuing a D OMVS,A=asid command; see Figure 52 on page 115. The start time and CPU seconds consumed may be useful. Also, by using the process ID (PID), you can enter a D OMVS,P=processid command to see even more information about the numerous threads running under the select process. This display can be several screens long.
The D OMVS command by address space displays the process ID and parent process ID. We now use the process ID to obtain more detailed information about the threads including CPU time consumed; see Figure 53.

**Display OMVS Options**

Domino for S/390 requires the OMVS environment to be configured according to the recommendations. To verify which BPXPARMS are in effect, you can issue a D OMVS,OPTIONS command. This information should be included in any SYSLOGS sent to the Support Center; see Figure 54 on page 116.
The Hierarchical File System needs to be monitored so that enough space is available. The D OMVS,F command (Figure 55) is useful to the storage administrator in verifying HFS file names and mount status. See 8.4.1, “Displaying HFS Storage Use” on page 118 which shows how to get more detail about files within these HFS data sets using the USS command df.

8.3.2 Display Titles of System Dump Data Sets

Dump Data Sets - If an OS/390 system function abends, the recovery and termination function will automatically capture a dump of the failing component in one of the SYS1.DUMP data sets. By displaying the dump titles with a D D,T command, enough information is presented to search the IBM problem database for matching problems.
Any system-initiated dump should be investigated to determine whether a serious problem occurred. Dumps taken by operators or taken because of a SLIP trap were done for a reason and should be investigated and the data set cleared.

### 8.3.3 Display GRS - Contention

Issuing the D GRS,C command via automation allows the operations group to monitor the system for contention conditions proactively; see Figure 56. One large Domino customer uses automation to issue this command every 15 minutes.

![Figure 56. MVS Console Command - Display GRS,C](image)

If a contention situation persists for an unreasonable amount of time, then a dump of the relevant address spaces should be taken as described in the DUMP command paragraph.

### 8.3.4 OS/390 Cancel Commands for Emergencies

The CANCEL command is used to terminate a job or address space abruptly. Because several Domino address spaces may have the same job name, the specific address space ID is specified on the cancel command. The DUMP option is not normally used because when dealing with a Domino server, a DUMP command from the OS/390 console would be needed to collect all the required data.

```shell
CANCEL jobname,A=asid
```

The FORCE command will terminate a task immediately with no recovery processes. The force command is more dangerous and is only used as a last resort. The syntax of force is the same as cancel.

```shell
FORCE jobname,A=asid
```

Normally the Domino administrator will shut down the server with a quit command. If this does not work, it may be necessary to use the cancel command to end the server. Refer to 8.4.3, “Problems Shutting Down: ps, kill, and CANCEL” on page 120.

### 8.4 UNIX System Services Commands

UNIX System Services (USS) provides a UNIX 95-branded programming and interactive environment on OS/390. Users can access these services via Telnet, rlogin, or TSO OMVS. A batch interface is also provided. Authorized system programmers or administrators have access to some very powerful USS debugging facilities and commands. This section discusses some specific commands that have proven to be useful in actual situations encountered by customers.
Online help information about USS shell commands is available online from Telnet or OMVS sessions, if you have installed the manual pages command, `man` command name. This information can also be accessed from a TSO/E session by using the OHELP command.

### 8.4.1 Displaying HFS Storage Use

When one customer encountered a server hang situation, Lotus Support requested the following command be entered to obtain detailed information about the state of Domino and the processes running within it.

```
ps -A -o THREAD -o xstid,wtime,semnum,semval,lsyscall -o pid,xasid,atime,state,ruser,comm >ps.out 2>&1
```

The output of the command is redirected to an output file so it can be sent to Lotus Support for review. The output can also be viewed from OMVS using `OBROWSE` as seen in Figure 58.

### 8.4.2 Displaying Process and Thread Information

The `ps` command returns the status of processes running under USS. It provides detailed data about processes and their threads. OS/390 V2R7.0 has added a number of options to the `ps` command at the request of Domino for S/390 development to aid in debugging Domino problems. These fields are described in *OS/390 V2R7.0 UNIX System Services Command Reference*, SC28-1892.

When one customer encountered a server hang situation, Lotus Support requested the following command be entered to obtain detailed information about the state of Domino and the processes running within it.

```
ps -A -o THREAD -o xstid,wtime,semnum,semval,lsyscall -o pid,xasid,atime,state,ruser,comm >ps.out 2>&1
```

The output of the command is redirected to an output file so it can be sent to Lotus Support for review. The output can also be viewed from OMVS using `OBROWSE` as seen in Figure 58.

---

*Figure 57. USS Display Amount of Free Space in File System*

Space is displayed by using the `df` command. The `-Pk` options lists the amount of free space and used space in kilobytes. Figure 57 shows how much space is used by the mail directory on our test server.

*Figure 58. Output of USS Command: ps*
The specific fields that were selected by the `ps` command in Figure 58 are described in Table 22 using information from SC280-1892, which lists many more fields that can also be selected. The third column titled “Process or Thread Info” indicates whether the information is meaningful for only processes, only threads or both. The default column heading is shown in column two inside the square brackets.

### Table 22. Description of Specific Fields on Example `ps` Command

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description of Field from OS/390 USS Command Reference</th>
<th>Process or Thread Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>xstid</td>
<td>Displays the short thread ID as a hexadecimal value. This is the low-order word (the sequential value) of the thread ID. A non-hex short thread ID is not supported. [STID]</td>
<td>Thread Only</td>
</tr>
<tr>
<td>wtime</td>
<td>Displays waiting time in the form <code>hh:mm:ss[xx]</code> where <code>dd</code> is the number of days, <code>hh</code> is the number of hours, <code>mm</code> is the number of minutes, and <code>ss</code> is the number of seconds. [WTIME]</td>
<td>Thread Only</td>
</tr>
<tr>
<td>semnum</td>
<td>Displays the semaphore number of the semaphore the thread is in a wait state for. (Note: a semaphore number is only available when the thread is in a semaphore wait state (state field value equals d), otherwise, a dash will be displayed). [SNUM]</td>
<td>Thread Only</td>
</tr>
<tr>
<td>semval</td>
<td>Displays the semaphore value of the semaphore the thread is in a wait state for. (Note: a semaphore value is only available when the thread is in a semaphore wait state (state field value equals D), otherwise, a dash will be displayed). [SVAL]</td>
<td>Thread Only</td>
</tr>
<tr>
<td>syscall</td>
<td>Displays the last five syscalls. This is a 20-character string consisting of five four-character syscalls with no delimiting characters between them. From left to right the syscalls are ordered from most recent to oldest. In the following example of syscall output, 1WAT is the most recent syscall: 1WAT1SPM1SPM1SPM1TSP. [LASTSYSC]</td>
<td>Thread Only</td>
</tr>
<tr>
<td>pid</td>
<td>Displays the process ID as a decimal value. Decimal PIDs are reported with default actions. [XPID]</td>
<td>Process Only</td>
</tr>
<tr>
<td>xasid</td>
<td>Displays the address space ID as a hexadecimal value (Note: a non-hex asid is not supported). [ASID]</td>
<td>Process Only</td>
</tr>
<tr>
<td>atime</td>
<td>Displays the amount of processor time that the process has used since it began running. Time is displayed in the format <code>ss:nn</code> where <code>ss</code> is the number of seconds and <code>nn</code> is the hundredths of seconds. [TIME]</td>
<td>Process Only</td>
</tr>
<tr>
<td>state</td>
<td>Displays the process state. [STATE] Various values can be printed in this field. Refer to SC28-1892.</td>
<td>Process and Threads</td>
</tr>
<tr>
<td>ruser</td>
<td>Displays the real user ID of the process, as a user name if possible and as a decimal user ID otherwise. [RUSER]</td>
<td>Process Only</td>
</tr>
<tr>
<td>comm</td>
<td>Displays the name of the command that is running without its arguments. This string is padded on the right if necessary. [COMMAND]</td>
<td>Process Only</td>
</tr>
</tbody>
</table>
8.4.3 Problems Shutting Down: ps, kill, and CANCEL

A more common use of the ps command is to identify tasks that have not ended after attempting to terminate the server and that are preventing a clean shutdown. The Domino QUIT command is issued to request a normal shutdown of the server. If the message Server Shutdown Complete is not issued in a couple of minutes, there is a problem with the shutdown process.

If this happens, issue the following two commands to see if any Domino-related tasks are still executing. First, if you are connected from a Telnet session, issue the ps -ef | grep notes command shown in Figure 59.

Second, even if the ps command shows no tasks active, check to see if any shared resources are left in the system by issuing the ipcs command, as shown in 8.4.4, “Interprocess Communications Resources” on page 121.

If there are any tasks left or residual shared resources, issue nsd -kill at the command line. Issue the ps and ipcs commands again to identify any remaining processes or resources. The next step is to issue a kill -9 command on each process still listed. This issues a SIGKILL to the process and should always work. Also use the ipcrm command to remove shared resources.

If the kill command doesn’t terminate work, go to the OS/390 console and issue a CANCEL command for any remaining address spaces. Because Domino creates several address spaces with the same name, OS/390 requires the hexadecimal address space identifier of the work unit you want to cancel. The ASIDs can be obtained from the DISPLAY A,jobname or DOMVS,ALL commands discussed in 8.3, “OS/390 Operator Commands” on page 112.

CANCEL serverjobname,ASID=hex ASID

The last step before IPLing the operating system is to attempt the CANCEL command with the FORCE option for any remaining Domino address spaces.

Any situation where the kill -9 command does not work should be referred to the IBM Support Center as a possible UNIX System Services kernel problem.

If you are using DOMCON, use the DOMINK command from OS/390 to terminate the server.
8.4.4 Interprocess Communications Resources

Domino for S/390 uses several Interprocess Communications facilities as described in Chapter 2, “Domino Architecture For Problem Determination” on page 7. Shared resources that must be serialized include:

- Message queues
- Semaphores
- Shared memory

In some cases, such as a partial server failure or after improperly bringing down the Domino server, residual message queues, semaphore sets, or shared memory IDs remain in the operating system environment and prevent the successful restart of the server. A system administrator has the ability to display these resources with the ipcs command and then remove them via the ipcrm command. Obviously, such a drastic option should only be taken by qualified and authorized staff members.

The following shows the results of an ipcs command listing several semaphores and shared memory resources. The ipcs should be issued with the -bo option to display important debugging information needed by the Support Center. The -b option shows:

- The maximum number of bytes in messages on the queue for message queues
- The size of segments for shared memory in 4K units
- The number of semaphores in each semaphore set.

The -o options on the ipcs command displays this additional information:

- The number of messages on queue,
- The total number of bytes in messages in queue for messages queues
- The number of processes attached to shared memory segments.

In the case where the server had crashed and these resources needed to be removed manually, the system administrator would issue the ipcrm command once for each resource. The syntax of the command to remove a shared memory segment with a SharedMemoryID of 40004 is:

```
ipcrm -m 40004
```

To verify the successful removal, issue the ipcs command again, as shown in Figure 60 on page 122.
Another ipcs command variation is ipcs -x. This will display shared memory resources and the actual process IDs that are attached to them, as well as extended status about semaphores. This information is useful when diagnosing a deadlock situation. An example of the command output is shown in Figure 136 on page 235.

8.5 SVCDUMP\text{s} and SLIP Traps

In the normal course of problem determination, the IBM Support Center may request documentation obtained via a Serviceability Level Indicator Processing trap, or SLIP trap. A SLIP trap allows OS/390 to capture requested information when certain specified conditions are met. The Support Center provides instructions on setting the SLIP trap based on what they want to know about a given problem.

Early Domino testing on System 390 showed that data sets needed to be enlarged from 500 megabytes to 2000 megabytes. This can be done via the command CHNGDUMP SET,SDUMP,MAXSPACE=2000M.

One particular SLIP trap has been used several times to collect information about problems with the Domino for S/390 environment. Because Domino is written in the C language, it runs under the OS/390 Language Environment. When Domino encounters a serious error, it may choose to abend with a User 0034 abend code rather than continue.

The SLIP shown in Figure 61 on page 123 forces an SVCDUMP to be written to an OS/390 dump data set. This dump can then be viewed locally by the
Interactive Problem Control System (IPCS) or transmitted via the FTP utility to the IBM Support Center.

**Figure 61. Definition of an OS/390 SLIP for a User 0034 Abend**

Another way to ensure that both the server address space encountering the abend and the OMVS address space are captured in the dump is to change the JL= parameter to ASID=(CU,000E) or ASID(CU,000F) depending on which ASID the OMVS address space has been assigned to in your system.

Dumps generated by a complex USS application such as the Domino server tend to be more complex than the average MVS dump because of the large number of address spaces and processes involved along with the many semaphores used. For this reason, most customers will choose to send the dump to the IBM Support Center where experts in internals can investigate it. The Support Center provides instructions for sending it dumps at the following Web location:

http://support.software.ibm.com/390.ww/go?/mktdocs/support/HELP.HTM

### 8.5.1 OS/390 Console DUMP Command

**DUMP Command:** In case of a Domino server hang, the operator may be directed to take a snapshot of the server address space and the OMVS address space by issuing a DUMP command. The IBM Domino Support organization recommends the following options when collecting documentation via the DUMP command. It is important to include all of the parameters listed in order to capture useful diagnostic data for the IBM Support Center.

The command will prompt the operator to provide parameters using a Write to Operator with Reply (WTOR). The operator then enters multiple lines, terminating the last line with the word **END**.

```
DUMP COMM=(Description of Problem)
  r nn,SDATA=(ALLNUC,PSA,CSA,LPA,SQA,RGN,SUM,TRT,GRSQ),CONT
  r nn,JOBLIST=(OMVS,serveras),CONT
  r nn,DSPNAME=('OMVS'.SYSZBPX1,'OMVS'.SYSZBPX2),END
```

To reduce the chance of error, the installation can define a member in SYS1.PARMLIB named IEADMCDMxx to contain much of the repetitive information. For example, define a PARMLIB member named IEADMCDM containing:

```
SDATA=(ALLNUC,PSA,CSA,LPA,SQA,RGN,SUM,TRT,GRSQ),
DSPNAME=('OMVS'.SYSZBPX1,'OMVS'.SYSZBPX2)
```

The operator could then issue the command on one line:

```
DUMP COMM=(Description of Problem),JOBNAME=(OMVS,serveras),PARMLIB=DM
```
In case of a server hang or a performance problem, IBM recommends taking a system dump. Before issuing the DUMP command, we recommend turning on the Component Trace for OMVS and recording that information to an external file. Remember to turn the Component Trace off after taking the dump to reduce overhead.

The following describes how to set up/start/stop/view the OpenEdition Component Trace, CTRACE. Because the data is voluminous, the CTRACE data should be recording on a disk or tape data set using an external writer.

First, space must be located in an appropriate storage group or on disk volumes. Then the JCL for the external writer is added to the system procedure library, as shown in the following example:

```
//WTRD12 PROC
//IEFPROC EXEC PGM=ITTTRCWR,REGION=4096K
//TRCOUT01 DD DSN=SYS1.LOTUS12.CTRACE88,UNIT=3390,VOL=SER=SYSC01,
//   SPACE=(CYL,500),DISP=(NEW,CATLG,DELETE),DSORG=PS
//TRCOUT02 DD DSN=SYS1.LOTUS12.CTRACE89,UNIT=3390,VOL=SER=SYSC02,
//   SPACE=(CYL,500),DISP=(NEW,CATLG,DELETE),DSORG=PS
```

Multiple output data sets are allocated to avoid losing records during periods of high system activity. Use the IPCS utility to merge trace files.

Create a member in SYS1.PARMLIB for the CTRACE option that runs the external writer procedure you created. The member name should be in the format CTIBPXnn. This example has commented out all the trace options except for system calls, SYSCALLS, which is our recommended starting point for data gathering. The member name of this example in PARMLIB is CTIBPXLC. Note how it is linked to the external writer procedure name.

```
TRACEOPTS
   WTRSTART(WTRD12)
   ON
   WTR (WTRD12)
   BUFSIZE(4M)
   OPTIONS(
      /* 'ALL' */
      /* 'COMMON' */
      /* 'FILE' */
      /* 'PIPE' */
      /* 'IPC' */
      /* 'LOCK' */
      /* 'MISC' */
      /* 'PROCESS' */
      /* 'SIGNAL' */
      /* 'STORAGE' */
      'SYSCALL'
   )
```

To ensure that a trace is not already running, issue the following command.

```
TRACE CT,OFF,COMP=SYSOMVS
```

Start the Component Trace from the OS/390 operator console, specifying the parmlib member just created.
TRACE CT,ON,COMP=SYSOMVS,PARM=CTIBPXLC

To stop the Component Trace after taking a dump or after tracing the information of interest, issue these two commands to stop CTRACE and the external writer.

TRACE CT,OFF,COMP=SYSOMVS
TRACE CT,WRSTOP=WTRD12

Select a large enough BUFSIZE for the problem (note that 4 MB is the largest value allowed). The larger the value, the more data you will capture, but keep in mind that you will also be increasing the amount of paging on your system. A change to BUFFERSIZE will require an IPL unless you have APAR OW26406 installed.

To display the current trace settings, issue the following command:

D TRACE,COMP=SYSOMVS

Figure 62. Displaying Component Trace Status

Once the CTRACE external writer creates the data set with the CTRACE records, IPCS is used to format and display those CTRACE records. For example, the following IPCS command displays the frequency of UNIX System Services kernel system calls. This is extremely useful in solving UNIX System Services performance problems.

IP CTRACE COMP(SYSOMVS) OPTIONS((SCCOUNTS))

Figure 63. Displaying OMVS CTRACE Records with IPCS
This IPCS command will produce output similar to Figure 63 on page 125 showing the count and rate by Syscall name and number.

8.5.3 IPCS - OS/390 Dump Reading

We obtained an SVCDUMP created from a SLIP trap for a User 034 abend on a production system. Although it is important to work with the IBM Support Center to get to the root cause, in some cases customers may choose to perform some preliminary dump analysis so they can search the existing IBM problem records for matching symptoms.

We used similar Interactive Problem Control System (IPCS) commands to review the resulting dump as discussed in the redbook, *Debugging UNIX Applications on OS/390*, SG24-5613. The first command issued was a SUMMARY ALL. Scrolling to the bottom shows the failing TCB with a non-zero completion code in the CMP column; see Figure 64.

```
* * * * T C B S U M M A R Y * * * *

JOB ML98NP2   ASID 0053   ASCB 00F57780   FWDP 00F57600   BWDP 00F57900   PAGE 00000005

           TCB AT  CMP  NTC  OTC  LTC  TCB  BACK  PAGE
        007FE1D8  00000000  00000000  00000000  007FDE48  007FF1D8  00000000  00000025
        007FF1D8  00000000  00000000  007FE1D8  00000000  007FDE48  007FE1D8  00000030
        007FD4E4  00000000  007FF1D8  007FE1D8  007FBA70  007FBA70  007FF1D8  00000034
        007FBA70  00000000  00000000  007FDE48  007DE2C0  007DE2C0  007FDE48  00000039
        007DE2C0  00000000  00000000  007FBA70  007AB5C8  007B5EB8  007DE970  00000044
        007B5EB8  00000000  00000000  00000000  007FBA70  007FBA70  00000051
        007B5CB8  00000000  007B5EB8  007DE2C0  00000000  007B5EB8  00000056
        007B5A60  00000000  007B5CB8  007DE2C0  00000000  007B5EB8  00000061
        007B5EB8  00000000  007B5A60  007DE2C0  00000000  007B5EB8  00000065
        007B5638  00000000  007B5EB8  007DE2C0  00000000  007B5EB8  007B5EB8  00000070
        007B5EB8  007B53A8  00000000  007B5638  007DE2C0  00000000  007B5EB8  007B5EB8  00000075
        007B5EB8  007B5118  00000000  007B53A8  007DE2C0  00000000  007B5EB8  007B5EB8  00000080
        007B5EB8  007B5EB8  00000000  007B5118  007DE2C0  00000000  007B5EB8  007B5EB8  00000085
        007B5EB8  007B5EB8  00000000  007B5EB8  007DE2C0  00000000  007B5EB8  007B5EB8  00000090
        007B5EB8  007D9B00  00000000  007D9B00  007DE2C0  00000000  007B5EB8  007B5EB8  00000095
        007B5EB8  007D9B00  00000000  007D9B00  007DE2C0  00000000  007B5EB8  007B5EB8  00000099
        007D9B00  00000000  007D9B00  007DE2C0  00000000  007D9B00  00000102
```

Figure 64. IPCS Results of Summary All

The next command is OMVSDATA. Searching the result with the processid results in the following list of processes running under UNIX System Service; see Figure 65 on page 127. By searching for matching lines for ASID x’0053’, two related threads are found. By the process of elimination, the failing thread can be identified.
The next IPCS command issued is OMVSDATA PROCESS DETAIL. Use the repeat find command using the process ID, 1200001A, until you find the process detail report for that process; see Figure 66. Details on the individual threads follow this section. Note that this process is running the Domino server program. Also the ASID is 0053 and the Parent PID, 0E00000D, matches the previous display of the processes.

**Figure 65. IPCS Results of OMVSDATA**

**Figure 66. IPCS - Results of DISPLAY PROCESS DETAIL**

From this screen, enter a search for the original TCB address, 007B53A8. This will locate information about the failing thread whose ID appears on the line above the located TCB address: see Figure 67 on page 128. The program name shows that the Language Environment is doing something such as taking a CEEDUMP for the address space.
To view the call stack for the failing thread, issue the following LEDATA command in IPCS:

```
verbx ledata 'TCB(007B53A8) ASID(53) CEEDUMP'.
```

The result will show the calling sequence, bottom to top, of the failing thread; see Figure 68.

The failing thread number also matches the previous display. This information can be used to search the IBMLINK problem database for matching symptoms and possible fixes.
In order to see what module called the OSLockedObject routing, issue the command: where 325B4068. Your output will be similar to Figure 69.

Figure 69. IPCS - Identifying Module Associated with an Address

At this point, a customer can search IBMLINK using the search words of LIBNOTES and OSLockObject. In this case the only matching record was for an AS/400 server. Another location to search for matching symptoms is the Lotus Notes Knowledge Base, which is accessible from the Internet.

This example dump was transmitted to the IBM Support Center along with two CEEDUMPs and the notes.log messages from before the time of the failure. The latest status we have was that it was still under investigation with a new SLIP trap having been developed to trap a possible storage overlay.

Another piece of information that may be useful is what files the failing task had open. This is especially useful when the issue is database corruption. Starting at the detailed process information in Figure 66 on page 127 and scrolling down to the “Memory Map Files”, we can see what files were open to the failing process (refer to Figure 70).

Figure 70. IPCS - Files Open to the Failing Process

8.6 Language Environment - CEEDUMPS

The Domino for S/390 server may encounter errors in server code that result in Language Environment (LE) dumps. Normally these dumps are placed in the /notesdata subdirectory. The file names contain a time and date stamp as well as a process ID that can be correlated to the Notes logs or OS/390 console log. The precise format of the file name is CEEDUMP.date.time.pid; for example, CEEDUMP.19990531.153001.9267211.

In most cases LE condition handling will trap original program checks, such as an ABEND S0C4, and turn them into a corresponding LE condition, such as CEE3204S. After storing information about the original program check, LE will terminate with an ABEND U4039.

Under OS/390 UNIX System Services if the application is running in an address-space created as a result of a fork(), spawn(), spawnp(), vfork(), or one
of the exec family of functions, then the CEEDUMP is placed in the HFS in one of
the following directories in the specified order:

1. The directory defined in environment variable _CEE_DMPTARG, if found
2. The current working directory, if this is not the root directory (/), and the
directory is writable
3. The directory found in environment variable TMPDIR (an environment variable
that tells C the location of a temporary directory if it is not /tmp)
4. The /tmp directory

The CEEDUMP shown in Figure 71 was viewed from ISHELL in a TSO session. For
classical OS/390 system programmers, this is a more familiar interface for
browsing the contents of a file or dump. Browsing this information may provide
enough information to call the IBM Support Center or search the existing IBM
problem database. The IBM and Lotus Support organizations have access to
source code which may be required to fully interpret the dump.

Some Lotus Administrators choose to examine the CEEDUMP for possible
culprits. By looking at the Program Unit column, it may be able to recognize a
failing task such as a mail router or a specific agent. In that case, the
administrator has the option of restarting the Domino server without that service
in order to restore overall service.

Figure 71. Displaying a CEEDUMP using OBROWSE
We recommend reviewing the specific Language Environment options that are discussed in information APAR II11603. The options are displayed in Figure 72 on page 132.

Another option is to force an SVCDUMP to an MVS data set by following the instructions in information APAR II10573 so the dump can be examined with IPCS. The IBM Support Center has requested this additional information via the TERMTHDACT(UADUMP) in some circumstances.

IPCS was enhanced by a PTF for APAR PN89873 to easily format Language environment control blocks including Message Handler control blocks, Condition Management control blocks, and more. Information APAR II11016 provides tips on using this new function to find the PSW and registers at the time of error in Language Environment dumps.

To capture an Language Environment dump on an OS/390 data set from a UNIX System Services task so you can use IPCS, follow these instructions. At OS/390 2.7 or later, specify where to write the system dump by issuing the following shell command:

```bash
export _BPXK_MDUMP=filename
```

The filename is a fully qualified data set name with LRECL=4160 and RECFM=FB. Add the Language Environment run-time option via the command:

```bash
export _CEE_RUNOPTS="termthdact(suboption)"
```

The suboptions are UAONLY, UADUMP, UATRACE, or UAIMM. If UAIMM is set, TRAP(ON,NOSPIE) must also be set.

For the option UAONLY, Language Environment generates a U4039 system dump of the user address space.

For the option UADUMP, Language Environment generates a message indicating the cause of the termination, a trace of the active routines on the activation stack, a Language Environment dump, and a U4039 system dump of the user address space.

For the option UATRACE, Language Environment generates a message indicating the cause of the termination, a trace of the active routines on the activation stack, and a U4039 system dump of the user address space.

For the option UAIMM, Language Environment will immediately request the operating system to generate a system dump of the original abend/program interrupt of the user address space. After the dump is taken by the operating system, the Language Environment condition manager can continue processing. If the thread terminates due to an unhandled condition of Severity 2 or higher, then Language Environment will terminate as if TERMTHDACT(QUIET) was specified and Language Environment will issue no message. This type of dump may be the cleanest from a troubleshooting point of view because it is taken immediately upon task abend, before the recovery routines run and possibly mask a problem condition.
Place in /usr/lpp/lotus/bin/server/tools/startup.
Find the section for os390 and edit the LE runoption specification
to the following:

```
CEE_RUNOPTS="RPTSTG(OFF) \ 
ALL31(CN) \ 
STACK(140000,140000,ANY,KEEP) \ 
LIBS(9K,9K,FREE) \ 
STORAGE(NONE,NONE,NONE,1K) \ 
HEAP(19843484,32K,ANYWHERE,KEEP,8K,4K) \ 
BELOWHEAP(490000,4096,FREE) \ 
ANYHEAP(200000,8K,ANYWHERE,FREE) \ 
NONONIPTSTACK(4K,4K,BELOW,KEEP) \ 
THREADHEAP(4K,4K,BELOW,KEEP) \ 
TRAP(CN)"

export _CEE_RUNOPTS
```

Figure 72. Recommended _CEE_RUNOPTS

### 8.7 USS Messages and Reason Codes - Panic Symptoms

Some of the information contained in UNIX System Services messages is
-described in this section. While Domino messages do not have message
-numbers (only words), UNIX System Services have numbers and reason codes
(or return codes), which further explain the message. A complete description can
-be found in a message manual such as *OS/390 V2R7.0 UNIX System Services
-Messages and Codes*, SC28-1908. It has a list of return codes that contains the
decimal value, the hexadecimal value, the return code name and the description.

#### 8.7.1 Explanation of UNIX System Services "errno"

Some of the Lotus Domino messages, as well as the UNIX System Services
-messages, are difficult to interpret. Figure 73 shows a Domino server message in
-the notes log (log.nsf). Frequently an error such as this will also result in a
CEEDUMP as well.

![Figure 73. Error message](image)

We can take a look at the two codes in the message, as follows:

#### 8.7.1.1 errno=116

This errno is a decimal USS reason code. So look for 116 (decimal) or 0074 (hex)
in the manual and you will find:

<table>
<thead>
<tr>
<th>Decimal value</th>
<th>Hex value</th>
<th>Return Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>116</td>
<td>0074</td>
<td>EDEADLK</td>
<td>A resource deadlock is avoided</td>
</tr>
</tbody>
</table>

#### 8.7.1.2 errno2() =57C006C

The errno2 is divided into two parts, where:
- cccc is a half word (two byte) reason code qualifier.
**rrrr** is the half word reason code described in USS Messages and codes.

Table 24. **USS errno2**

<table>
<thead>
<tr>
<th>cccc</th>
<th>rrrr</th>
</tr>
</thead>
<tbody>
<tr>
<td>057C</td>
<td>006C</td>
</tr>
</tbody>
</table>

The two high-order bytes of the reason codes returned by OS/390 UNIX contain a value that is used to qualify the contents of the two low-order “bytes”. If the contents of the two high-order bytes are within the range of X’0000’ to X’20FF’, the error represented by the reason code is defined by OS/390 UNIX. If the contents of the two high-order bytes are outside the range, the error represented by the reason code is not an OS/390 UNIX reason code.

Since the hexadecimal value ‘057C’ (*half word reason code qualifier*) is within the range of X’0000’ to X’20FF’ in the preceding example, code ‘006C’ is an OS/390 UNIX reason code. As shown in Table 25, if you look up 006C in the USS messages and codes manual, you will find:

Table 25. **Reason Code Example 006C**

<table>
<thead>
<tr>
<th>006C</th>
<th>JRFilenotThere</th>
</tr>
</thead>
<tbody>
<tr>
<td>The requested file does not exist.</td>
<td></td>
</tr>
<tr>
<td>Action: The service cannot be performed unless the named file exists.</td>
<td></td>
</tr>
</tbody>
</table>

There is a complete list of USS Return Codes in the messages and codes manual. Table 26 lists a few examples.

Table 26. **Partial List of Reason Codes**

<table>
<thead>
<tr>
<th>Reason Code</th>
<th>Decimal</th>
<th>Hex</th>
</tr>
</thead>
<tbody>
<tr>
<td>JRAccept</td>
<td>531</td>
<td>0213</td>
</tr>
<tr>
<td>JRAccess</td>
<td>331</td>
<td>014B</td>
</tr>
<tr>
<td>JRWriteUserStorageFailed</td>
<td>448</td>
<td>01C0</td>
</tr>
<tr>
<td>JRZeroOrNegative</td>
<td>846</td>
<td>034E</td>
</tr>
</tbody>
</table>

### 8.7.2 How to Interpret Abend EC6 Reason Codes

Information APAR II11607 discusses the fact that system EC6 abends have reason codes that are not well documented in the OS/390 Messages and Codes, GC28-1780, for Release 2.6 and below. The following is update information which is being added to the OS/390 V2R7 system codes manual.

Explanation: An error occurred during processing of a callable service to OS/390 OpenMVS. The callable service may have been originally issued as a function in a program or as a shell command.

A hexadecimal reason code in register 15 describes the error. The reason codes are in the form xxxx yyyy, where xxx represents internal information (not described here) and yyyy represents external information shown in this manual.

Only external reason codes are documented. There are many other possible reason codes for internal errors. The internal errors should be reported to IBM.
APAR II11607 and the release 7.0 manual describe several of the external reason codes. Refer to OS/390 V2R7.0 OpenEdition Programming: Assembler Callable Services Reference, SC28-1899 for reason codes FD01 through FD7F. The last two digits of these reason codes are Signal Constants and are described in the appendix of that book. For example, a reason code of FD09 indicates a terminating signal with a dump from a #SIGKILL termination signal.

We encountered some of these abends during our tests; however, they were usually a secondary effect of an earlier failure.

** BPXYSIGH: Component signal definition  
** Used By: KIL SIA SPM  
*********************************************************************  
* Signals with default action ABNORMAL TERMINATION  
SIGNUP# EQU 1 Hangup detected on controlling terminal  
SIGINT# EQU 2 Interactive attention  
SIGABRT# EQU 3 Abnormal termination  
SIGILL# EQU 4 Detection of an incorrect hardware instruction  
SIGPOLL# EQU 5 Pollable event  
SIGURG# EQU 6 High bandwidth data is available at a socket  
SIGFPE# EQU 8 Erroneous arithmetic operation, such as division  
* by zero of an operation resulting in overflow  
SIGKILL# EQU 9 Termination (cannot be caught or ignored)  
SIGBUS# EQU 10 Bus error  
*********************************************************************

Figure 74. BPXYSIGH Signal Constants Excerpt for Interpreting EC6 Abends

### 8.8 RMF Monitors II and III

The RMF Work Delay Monitor, or Monitor III, can display resources that are slowing down the Domino server. For example, Monitor III could show if the Domino server was waiting for CPU resources because the priority is set too low and other CPU-intensive work is consuming everything. Specific delays that RMF Monitor III show are:

- CPU delays  
- DASD I/O delays  
- ENQ delays  
- Operator delays

The sample display in Figure 75 on page 135 shows a job delay view from Monitor III. Note that our Domino server is comprised of several address spaces, MANNE1 through MANNE8. To determine what function each address space is performing, use the DOMVS,A=ALL command and look at the program being executed by each address space.

If a program is looping, RMF Monitor III will help identify it quickly.

Monitor III is cursor-sensitive; if the display shows a resource delay, place the cursor on the field of interest and press Enter. The example below is from our test system without any measurable load; there was no problem at the time.
RMF Monitor II provides real time displays of resource consumption, disk activity, ENQ activities and more. One useful option is to display the Address Space Resource Data report in DELTA mode. This means that every time the Enter key is hit, the statistics on the display are updated to show how much resource was used since the last time the enter key was hit. A looping job will stand out.

Another feature is the ability to sort the display on JOBNAMEs by positioning the cursor on that column and hitting PF6. Then all the related jobnames are grouped together, as shown in Figure 76 on page 136.
Lotus Notes Domino servers can now record internal statistics via an SMF record type 108. Currently the record format is described in an Adobe Acrobat file on the Web at:


Eventually this documentation will be added to MVS System Management Facilities Publication, GC28-1783.

Capacity planners and performance analysts are accustomed to working with SMF data which they collect in databases and process with a suite of reporting tools. Having Domino SMF records is valuable because different views of performance data can be consolidated and correlated. The Performance Management group at the IBM Advanced Technical Support organization in Gaithersburg is planning to incorporate this data into their PMMVS offerings.

Domino creates these records periodically, which allows the creation of trend charts and the analysis of specific time intervals when performance problems exist. Some typical data in the record includes the number of currently active users, the total number of transaction processed in the interval, and many more.

The IBM Support Center has the ability to turn on another subtype of the SMF 108 record to collect detailed diagnostic data. The description of this subtype is proprietary and only used to diagnose problems with the guidance of the Support Center. To avoid having unnecessary diagnostic subtypes written to the SMF data sets, we recommend explicitly requesting only subtype I records in the SMFPRMxx member of SYS1.PARMLIB.
A few of the fields in the SMF Type 108 record include:

- Current number of users
- Number of currently connected users that are active
- Number of currently connected users that have been active in the last 1, 3, 5, 15, and 30 minutes
- Average size of Domino mail and SMTP messages delivered to local users and other servers
- Total number of transactions in an interval
- Number of replications initiated by this client
- Total number of physical thread pool threads, server_pool_tasks
- Number of virtual thread pool threads currently in use
- Transaction sections for each transaction type requested of the server showing the number of transactions processed in the interval and the accumulated milliseconds of response time

The sample job in Figure 77 runs ICETOOL and can be modified to display any of the SMF record fields in the server section of the record that you are interested in. It takes advantage of the fact that, even though the record is variable length, the offsets to the server section are fixed length. This approach is useful for a quick inspection of the data.
* 2 - time in hundredths of a second
* 3 - server name
* 4 - current number of users
* 5 - currently active users
* 6 - average size of mail message delivered to local users
* 7 - total trans in interval

OUTREC FIELDS=(1,4,7,4,53,8,117,4,121,4,149,4,177,4)

//TOOLMSG DD SYSOUT=I,OUTPUT=*.OUT1
//REPORT DD SYSOUT=I,OUTPUT=*.OUT1
//TOOLIN DD *

SORT FROM(SRT1IN) TO(SRT1INT) USING(SRT1)
COPY FROM(SRT1INT) TO(SRT1OUT) USING(SRT2)
DISPLAY FROM(SRT1OUT) LIST(REPORT)

TITLE('Domino Server SMF Data')
PAGE DATE TIME BLANK
HEADER('Time in 10 Sec.') HEADER('Server')
HEADER('Total Users') HEADER('Active Users')
HEADER('Avg Message size') HEADER('Total Transactions')
ON(5,4,FI,/K,A1) ON(9,8,CH)
ON(17,4,FI) ON(21,4,FI)
ON(25,4,FI) ON(29,4,FI)

/*
Figure 77. JCL to Print SMF Type 108 Record with ICETOOL

SMF Record Type 92 - OpenMVS File System Activity is also important and is
used to troubleshoot I/O performance issues.

Seven SMF Type 92 subtypes are written.

- Subtype 1 - When the file system is mounted
- Subtype 2 - After the file system is quiesced or suspended
- Subtype 4 - When the file system is unquiesced or resumed
- Subtype 5 - When the file system is unmounted
- Subtype 6 - When the file system is remounted
- Subtype 10 - When the file is opened
- Subtype 11 - When the file is closed

These records refer to the file by INODE number rather file name. To be able to
correlate the data back to an actual file name for the time period under study,
issue the following recursive list file command and redirect the results to a file.

cat - R > lsnodes.out

8.10 Domino PTF Checker

The PTF Checker is a serviceability aid from the IBM/Lotus Support Center that
verifies all the required and recommended OS/390 software maintenance has
been applied to a customer's system.

Our experience has been that many Domino-related problems are resolved by
applying OS/390 maintenance. The PTF Checker is updated frequently as new
fixes become available.
The tool is an MVS batch job downloadable in text format from the Domino for S/390 web site at:


A customer downloads the file to a workstation, uploads the program to his system, customizes the job card, updates the SMP/E information needed (installation name of SMPCSI and installation name of target zone). Then the job is run against the target SMP/E zones to generate a report of which PTFs are applied and which are missing.

PTF ERROR reports show the list of PTFs that are missing for each of the FMIDs, or function modification identifiers, being checked. If there are any required PTFs that are listed as missing, then a message will be displayed:

DOMPTFCK: ERROR - MISSING PTFS <fmid>

Figure 78 shows the result of a run against the SMP/E file of our test system. It shows that three FMIDs need to receive maintenance.

![Figure 78. PTF Checker Output on JES Spool](image)

Figure 79 details the content of the PTFs missing on FMID JBB6607.

![Figure 79. PTF Checker - Report of Missing PTFs](image)
Chapter 9. Tools for Domino

Domino provides several tools to help you troubleshoot problems. Although it is true that there are many different components that can affect the Domino server, we will focus only on the Domino server side in this chapter. There are many tools that are available through the Domino Administrator. We will cover a few server tools and a couple of client tools. For more information on these tools, see Administering the Domino System.

9.1 Troubleshooting Tools from the Server

The nsd.sh script that we discuss is based on accessing the system through telnet. We also discuss some helpful Domino server commands.

9.1.1 Domino Server Console Commands

This section lists some of the server commands. They must be typed at the server console.

BROADCAST "msg" ["user"] Broadcast a message to user(s) of this server

DBCACHE Database Cache management commands
  DISABLE Disable use of database cache
  FLUSH Clear out database cache
  SHOW Show contents of database cache

DROP ["username"] [ALL] Drop one or more sessions
EXIT [password] Exit server
HELP Help (Displays this help information)
LOAD pgnname Load program
PULL servername Replicate one-way (pull)
PUSH servername Replicate one-way (push)
QUIT [password] Quit (exit server)
REPLICATE servername Replicate two-way request
RESTART Restart information:
  SERVER [password] Restart Server
  PORT portname Disable/Enable transactions on port
ROUTE servername Route mail to server
SET Set server option:
  CONFIGURATION "variable=value" Configuration variable
  SECURE [current-password] [new-password] Secure Console Password
  STAT [Facility] [Statname] Reset statistics
SHOW Show server information:
  ALLPORTS Show configuration for all ports
  CLUSTER Cluster information
  CONFIGURATION variable Configuration variable
  DATABASE filename Show Database Information
  DBS Show Open Database Information
  DIRECTORY Directory Information
  DISKSPACE filesystem Available disk space
  MEMORY Memory information
  PORT portname Port specific information
  SCHEDULE Next Schedule [Server/Program/Location] [Appl]
  SERVER Server information
  STATISTIC variable Statistic variable
  TASKS Server tasks
  USERS Users with open sessions
START Starts the specified service
Important

The following pages show syntax, description and examples of most of the Domino server commands when typed on the server console.

Be aware that all these issues can also be handled via the Domino Administration function on a Workstation Client.

Detailed information about these commands is also described in the online Domino 5 Administration Help guide (help5_admin.nsf) in the chapter titled “Domino server commands”.

Broadcast

Syntax: Broadcast message usernames

Description: This command sends a message to specified users or to all users of this server. Use this command to warn users when a server is brought down for maintenance. The message you enter appears in the user's status bar.

Example:

> broadcast “this is a test note” Wilhelm Michel

Drop

Syntax: Drop username

Description: This command loses one or more server sessions. To visually confirm which sessions are dropped, you must enter the Log_Sessions=1 setting in the server's NOTES.INI file.

Examples:

> Drop “Sandy” Closes the current session running under the user name Sandy
> Drop “Lee” “Fran” Closes the sessions running under the user names Lee and Fran
> Drop All Closes all server sessions

Load

Syntax: Load programname

Description: This command loads and starts a specified server task or program on the server. You can start a server add-in program or one that takes a command line for additional data, such as a backup program. The program you run must be on the server's search path. Use the Load command to run a program until it completes or, if the program runs continually, until you stop the server. Where applicable, you can include arguments that determine how the program runs.
Example:
  > load Fixup  Loads and runs the Fixup server task

**Quit**

*Syntax:* Quit

*Description:* This command stops the server. This command is identical to the Exit server command. However, the Quit server command differs from the Tell server command, which you use to stop a particular server task without stopping the server.

If you stop a server while it's replicating databases or routing mail, these tasks resume at the next scheduled interval after you restart the server. Replication or mail routing continues until the databases are fully replicated and until the complete mail message is transferred or returned to the sender.

Before you use the Quit server command to stop the server, use the Broadcast server command to warn users to finish their current tasks before you stop the server.

**Replicate**

*Syntax:* Replicate servername [databasename]

*Description:* This command forces replication between two servers (the server where you enter this command and the server you specify). Use the server's full hierarchical name. If the server name is more than one word, enclose the entire name in quotes.

To force replication of a particular database that the servers have in common, specify the database name after the server name. The initiating server (where you're currently working) first pulls changes from the other server, and then gives the other server the opportunity to pull changes from it. You can use this command to distribute changes quickly or to troubleshoot a replication or communication problem.

If the server is already replicating when you issue the command, Domino queues the command until the current replication ends. To check the status of the Replicator, enter this command at the console:

**Show Tasks**

The server displays one of the following messages:

- If the server isn't replicating, the word *Idle* appears next to the Replicator program.

- If the server is replicating, a status line such as *Replicating CONTRACT.NSF from MARKETING\CONTRACT.NSF* appears.

To optimize resources, Domino replicates only what is necessary. For example, if the servers recently replicated and no changes have since been made to any databases on either server, the servers will not replicate when you enter a Replicate command. Also, the replication is two-way only if databases on both servers have changed since the last replication. If databases on only one of the servers changed, the replication is one-way.

To force replication in only one direction, use the Pull or Push server commands.
Examples:

> replicate domino5\ITSO2 Initiates replication between your server and the domino5\ITSO2 server.
> replicate domino5\ITSO2 NAMES.NSF Initiates replication of NAMES.NSF between your server and the domino5\ITSO2

**Set configuration**

**Syntax:** Set Configuration setting

**Description:** This command adds or changes a setting in the NOTES.INI file.

Example:

> set config
  SERVERTASKS=Router,Replica,Update,Amgr,AdminP,CalConn,Sched,Event,Stats,HTTP,DECS

**Show port**

**Syntax:** show port portname

**Description:** This command displays traffic and error statistics.

Example:

> show port tcpip
  TCP/IP Port Driver
  Transport Provider: TCP

<table>
<thead>
<tr>
<th>Notes Session</th>
<th>Local Address</th>
<th>Foreign Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>175A0004</td>
<td>9.12.2.35:1352</td>
<td>9.12.2.167:1049</td>
</tr>
<tr>
<td>175A0007</td>
<td>9.12.2.35:1352</td>
<td>9.12.2.163:1336</td>
</tr>
<tr>
<td>175C0003</td>
<td>9.12.2.35:1352</td>
<td>9.12.2.163:1150</td>
</tr>
<tr>
<td>17600002</td>
<td>9.12.2.35:1352</td>
<td><em>:</em></td>
</tr>
</tbody>
</table>

**Show stat**

**Syntax:** show stat statisticname

**Description:** Used without the optional statisticname argument, this command displays a list of server statistics for disk space, memory, mail, replication, and network activity. To display a single statistic, enter the name of the statistic as the optional argument. To display only a subset of statistics, add a group of statistics as an optional argument by using an asterisk (*) as a wildcard.
Example:

```plaintext
> show stat server.version.notes
Server.Version.Notes = Release 5.0a (Intl)
> show stat server.version.os
Server.Version.OS = OS/390
> show stat server.users.peak.time
Server.Users.Peak.Time = 07/01/1999 11:29:05 EDT
> show stat database.n*
Database.NAMELookupCache.Peak = 1,048,576
Database.NAMELookupCache.Used = 468,224
Database.NIFPool.Peak = 1,048,576
Database.NIFPool.Used = 249,248
Database.NSFPool.Peak = 1,048,576
Database.NSFPool.Used = 221,824
```

### 9.1.2 Reading Server Statistics Output

If we cannot analyze and understand our servers, then generating statistics has no value. It is with statistics that we are able to understand the behavior of our servers and applications. Then we are able to decide how well we can optimize them. The following list describes some of these statistics.

**Database.BufferPool.Maximum**: The maximum allowed NSF Buffer Pool for this PC. It defaults to 1/4 of available physical RAM. If the Notes.INI parameter NSF_BUFFER_POOL_SIZE=<bytes> is set, this parameter overrides the default.

**Note**: Do not be alarmed if your statistics show that the values of the Peak and Used exceeded the Maximum value by a small percentage. This is due to the way the server reads some data structures into the pool.

**Database.BufferPool.Peak**: This value provides an accumulative figure that the pool has grown since the server startup.

**Database.BufferPool.PerCentReadsInBuffer**: The cumulative percentage of time that the buffer pool was used to service requests. The higher this number, the better.

**Database.BufferPool.Reads**: The cumulative number of times the buffer has been read.

**Database.BufferPool.Used**: The amount of memory allocated within the buffer pool. This value may be misleading, because it does not reflect the amount of the buffer pool that is currently being utilized, but rather the amount that has been used. Prior to Domino 5, this value gets recycled only if it reaches its maximum, or when the server gets recycled. In Domino 5, the server task will manage it efficiently.

**Database.BufferPool.Writes**: The cumulative number of times that data has been written to the buffer.

**Server.Users**: specifies the number of active Notes Sessions. This includes all users and all server tasks connecting to the server (for example, the Replicator).
Server.Users.1MinPeak: This specifies the number of users who have, in the past minute, performed a Notes transaction (some network activity caused, for example, when opening a database or document on the server). This value does not specify the number of users or transactions in the past minute. The Domino server checks this data regularly and updates the value only if the number is greater than the previous value.

Server.Users.1MinPeakTime: This value shows the date/time at which the maximum number of users have done a network operation in the past minute. Note that “Server.Users.1MinPeak” specifies the number of users during this past minute. Users who have not done any transaction so far, but are waiting for a transaction, are also counted in this list.

Server.Users.5MinPeak and Server.Users.5MinPeakTime: These show the number of users and the time, respectively, at which the server had the most users performing a transaction during the past five minutes.

Server.Users.Peak and Server.Users.PeakTime: These show the maximum number of users and the time for users who had an active connection to the server.

Show tasks: This command displays the name of the server, the path of the Domino program directory, and the status of the active server tasks; for example:

```
Lotus Domino (r) Server (Release 5.0a (Intl) for UNIX) 07/01/99 04:37:07 PM
Server name: Domino4/Itso2
Server directory: /domino4/notesdata
Partition: .domino4.notesdata
Elapsed time: 06:29:04
Transactions/minute: Last minute: 2; Last hour: 2; Peak: 126
Peak # of sessions: 6 at 07/01/99 11:29:05 AM
Transactions: 678
Availability Index: 100 (state: AVAILABLE)
Message Tracking: Not Enabled
Shared mail: Not Enabled
Number of Mailboxes: 1
Pending mail: 0 Dead mail: 0
Waiting Tasks: 0
Transactional Logging: Not Enabled
Task Description
Database Server Perform console commands
Database Server Listen for connect requests on TCPIP
Database Server Load Monitor is idle
Database Server Perform Database Cache maintenance
Database Server Idle task
Database Server Server for Manfred Hauff/Itso2 on TCPIP
Database Server Server for Wilhelm Michel/Itso2 on TCPIP
Database Server Server for Wilhelm Michel/Itso2 on TCPIP
HTTP Web Server Listening on port(s) 80
Stats Idle
Event Monitor Idle
Schedule Manager Idle
Calendar Connector Idle
Admin Process Idle
Agent Manager 'Executive '1': Idle
Agent Manager Idle
Indexer Idle
Replicator Idle
Router Idle
```
**Tell**: This issues a command to a server program or task. The command is especially useful for stopping a server task without stopping the server. This is the most powerful server command, with a lot of possibilities.

Example:

```bash
> tell http quit  Stops only the http task. All other tasks on the server continue to run.
```

**Specialized Tell commands**

Some Tell commands are common to all server tasks, for example, Tell task Quit. Other Tell commands are unique to a particular task. These tasks have unique Tell commands and are available for the following services:

- Administration Process
- Agent Manager
- Cluster Replicator
- NNTP
- LDAP
- Router
- Schedule Manager
- Statistic Collector
- Web Navigator
- Web Server

**Note**: For detailed information about the different tell commands, look at the online *Domino5 Administration Help* guide (help5_admin.nsf) in the chapter titled “Domino server commands”.

### 9.2 NSD.SH Command

NSD stands for Notes System Diagnostic. The nsd.sh shell script helps you diagnose and report problems you may encounter when running Notes (Domino) servers. It provides configuration and activity data for Notes servers and reports on several system-related areas for Notes on the UNIX platform.

It provides configuration and activity data so a customer does not need to execute a long series of system commands to obtain current system configuration information and activity.

Generally speaking, nsd.sh can be used for problem determination purposes or simply for documenting your Domino Server and other System configuration information on OS/390.

The nsd.sh script collects various system information that can be used to diagnose problems. This information includes:

- The notes.ini file
- Current user environment variables
- Resource limits
- Physical and virtual memory
- Processor(s) information
Table 27 lists the options that can be used with the nsd.sh command.

Table 27. nsd.sh options

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-batch</td>
<td>Run in batch mode - don’t write to tty</td>
</tr>
<tr>
<td>-info</td>
<td>Only report system information</td>
</tr>
<tr>
<td>-noinfo</td>
<td>Don’t report system information</td>
</tr>
<tr>
<td>-nolog</td>
<td>Don’t log output to log file</td>
</tr>
<tr>
<td>-version</td>
<td>Only show version header</td>
</tr>
<tr>
<td>-ps</td>
<td>Show process tree</td>
</tr>
<tr>
<td>-kill</td>
<td>Kill all user, notes process, and cleanup IPCs</td>
</tr>
<tr>
<td>-user&lt;user_id&gt;</td>
<td>Operate only on notes process run by ‘user_id’</td>
</tr>
<tr>
<td>-exec_path&lt;dir[:dir]*&gt;</td>
<td>Add additional directories to the search path</td>
</tr>
<tr>
<td>-filter &lt;log_file&gt;</td>
<td>Filter stack output of log_file</td>
</tr>
<tr>
<td>-help</td>
<td>Show help list</td>
</tr>
<tr>
<td>-help &lt;option&gt;</td>
<td>Show help for a specific option</td>
</tr>
<tr>
<td>-help general</td>
<td>General information about the script an how it works.</td>
</tr>
<tr>
<td>-help limitations</td>
<td>General information on script limitations</td>
</tr>
<tr>
<td>-help update</td>
<td>List script version update information</td>
</tr>
</tbody>
</table>

9.2.1 Where is nsd.sh Located

The nsd.sh script is installed in the following directory:

/usr/lpp/lotus/bin/tools/diag

To save time and effort in specifying the absolute path of the nsd.sh location, you can do either of the following:

1. Put the path /usr/lpp/lotus/bin/tools/diag in the PATH statement in the user .profile.
2. Move the nsd.sh file to the notesdata directory.

Verify that the nsd.sh script is given authorization to be executed by the appropriate user account -- especially if the nsd.sh is copied manually into the system.

9.2.2 When to Run nsd.sh

Since the purpose of nsd.sh script is for Notes System Diagnostics, it is crucial that the script is executed *immediately* at the point of server failure, be it a crash, hang or performance slowdown.

In most cases, running it even five minutes after the problem occurs will not provide critical or vital information that relates to the problem. In other words, when you experience a crash, hang or slowdown, the information in memory contains the processes and activities that are causing the problems. By running
nsd.sh immediately, you are able to get this information in a timely and accurate way. The challenge is to run nsd.sh before the system flushes the information from memory.

In a nutshell, the basic rules to running nsd.sh are:

- Run nsd immediately when the problem occurs—via automation or manually.
- Run it before the server gets recycled.
- Run it before nsd.sh -kill is executed.
- Run before any other manual MVS or UNIX commands that will kill the Domino server processes.

Notes:

1. If you have an auto-recovery procedure with the clean-up scripts option enabled, ensure that nsd.sh script is triggered first, before your clean-up scripts clear the Domino-related tasks from the memory.
2. If you have Domino partitioned servers with the KillProcess=1 parameter in notes.ini, change the value to KillProcess=0. KillProcess=1 will flush out vital information from the memory at the time of Server Failure automatically and immediately, thus running nsd.sh will not be useful.

9.2.3 How to Use nsd.sh

The nsd.sh shell script can be run on all supported or certified UNIX operating systems. The nsd.sh file permissions must be given the executable right, so it can be used immediately. It is desirable to copy the file to a location that is generally accessible and in a user's path. Otherwise you have to specify the complete path and file name where nsd.sh resides. Ensure that you have nsd.sh version 3.2.7 or above.

In most cases, it is recommended to run nsd.sh without any option, especially during server crash, hang or performance slowdown. This will provide a complete view of what is happening to the server and the system.

Syntax of running nsd.sh:

```
/usr/lpp/lotus/bin/tools/diag/nsd.sh [options]
```

1. If you don’t specify any options or arguments, the script finds all running Notes processes and attaches the debugger to each process to dump the stacks of that process and its threads.

2. Unless the -nolog flag is specified, the script will automatically log its output to one of these files:
   - `nsd_all<platform>_<hostname>_<date>@<time>.log` - (default)
   - `ps_<platform>_<hostname>_<date>@<time>.log` - (using the -ps parameter)
   - `kill_<platform>_<hostname>_<date>@<time>.log` - (using the -kill parameter)
   - `sysinfo_<platform>_<hostname>_<date>@<time>.log` - (using the -info parameter)

9.2.3.1 Using nsd.sh -kill

Domino R5 no longer contains the killnotes script to terminate the server. It has been replaced by the -kill option of the nsd.sh command. You should log on with the server ID (to have the proper authorization), then go to the notesdata directory and issue the command:
nsd.sh -kill -user <unix id that starts the domino server>

If you have partitioned servers, use caution when running nsd with the -kill option. Include the option -user to ensure that only the intended server is cancelled.

Notes:
1. Nsd.sh -kill should only be used when you are unable to stop a Domino server gracefully.
2. Remember to use the -user option in a Domino partitioned server environment.
3. Nsd.sh -kill option will terminate the Domino server abruptly. Use only when it is absolutely necessary.

9.2.3.2 Using nsd.sh -info
To get system configuration information, issue the nsd.sh -info command and the output will go into the notesdata directory with the file name of:

sysinfo_<platform>_ <hostname>_ <date>@<time>.log

Figure 80 on page 151 shows an example of the output for nsd.sh -info.
INFO: Generating binary list file /tmp/nsd.DOMINO4/nsd__cache.ins.lst
INFO: Generating cache file /tmp/nsd.DOMINO4/nsd__cache.ins
Script Version : nsd.sh 3.3.6_1
Notes Version : Release 5.0a (Intl) 14 June 1999
Notes Base : 5.0
Data Dir : /domino4/notesdata
Notes Exec Dir : /usr/lpp/lotus/notes/latest/os390
Search Path : /usr/lpp/lotus/notes/latest/os390 /usr/lpp/lotus/notesapi
Debugger : /bin/dbx
Debugger Version: Compiled: Feb 23 1999 11:09:56 GMT as BFP
Script Dir : .
Host Info : OS/390 SC63 07.00 02 9672
User : DOMINO4 (DOMINO4)
Date : Fri Aug 27 13:22:03 EDT 1999
Clearcase View : ins
Input arguments :

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ IPC STATS ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Message Queues:
Shared Memory:
T ID KEY MODE OWNER GROUP CREATOR CGROUP NATTCH
m 40004 0xf83a8000 --rw--rw----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16
m 40005 0xf83a8001 --rw--rw----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16
m 40007 0xf83a8002 --rw--rw----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16
m 40008 0xf83a8003 --rw--rw----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16
Semaphores:
T ID KEY MODE OWNER GROUP CREATOR CGROUP NSEMS
s 85540 0xf83a8000 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 13
s 20005 0xf83a8270 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 13
s 20009 0xf83a8001 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 13
s 20010 0xf83a8002 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 9
s 20011 0xf83a8003 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 9
s 20012 0xf83a8004 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 12
s 20013 0xf83a8005 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 13
s 20014 0xf83a8006 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 12
s 20015 0xf83a8007 --ra--ra----- DOMINO4 OEDOMINO DOMINO4 OEDOMINO 16 9

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ notes.ini ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

."Notes"
."Directory=/domino4/notesdata"
."KitType=2"
."SetupDB=setupweb.nsf"
."UserName=
."CompanyName=
."SERVER_POOL_TASKS=100"
."SERVER_CONSOLE_CODEPAGE=1047"
."SERVER_ENABLE_THREADPOOL=1"
."PhoneLog=2"
."Log=log.nsf, 1, 0, 7, 40000"
."Passthru_LogLevel=0"
."Console_LogLevel=2"

Figure 80. nsd.sh -info (1 of 5)
Figure 81. nsd.sh -info (2 of 5)

<table>
<thead>
<tr>
<th>Key</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log</td>
<td>log.nsf, 1, 0, 7, 40000</td>
</tr>
<tr>
<td>Passthru_LogLevel</td>
<td>0</td>
</tr>
<tr>
<td>Console_LogLevel</td>
<td>2</td>
</tr>
<tr>
<td>DETimeout</td>
<td>10</td>
</tr>
<tr>
<td>NAMEDSTYLE0</td>
<td>03004261736963000000000000000000000000000000000000000000000000000000</td>
</tr>
<tr>
<td>NAMEDSTYLE0_FACE</td>
<td>Default Sans Serif</td>
</tr>
<tr>
<td>NAMEDSTYLE1</td>
<td>030042756C6574000000000000000000000000000000000000000000000000000000</td>
</tr>
<tr>
<td>NAMEDSTYLE1_FACE</td>
<td>Default Sans Serif</td>
</tr>
<tr>
<td>NAMEDSTYLE2</td>
<td>0300486561646C696665000000000000000000000000000000000000000000000000</td>
</tr>
<tr>
<td>NAMEDSTYLE2_FACE</td>
<td>Default Sans Serif</td>
</tr>
<tr>
<td>$$OpenSpecial</td>
<td>NotesNIC</td>
</tr>
<tr>
<td>$$NotesNIC</td>
<td>CN=Home/OU=Notes/O=NET, welcome.nsf, Notes NIC Welcome, Notes Netwo</td>
</tr>
<tr>
<td>DefaultMailTemplate</td>
<td>mail50.ntf</td>
</tr>
<tr>
<td>Preferences</td>
<td>32</td>
</tr>
<tr>
<td>ServerTasks</td>
<td>Router, Replica, Update, Amgr, AdminP, CalConn, Sched, Event, Stats,</td>
</tr>
<tr>
<td></td>
<td>HTTP, DE</td>
</tr>
<tr>
<td>ServerTasksAt1</td>
<td>Catalog, Design</td>
</tr>
<tr>
<td>ServerTasksAt2</td>
<td>UpdAll, Object Collect mailobj.nsf</td>
</tr>
<tr>
<td>ServerTasksAt3</td>
<td>Object Info -Full</td>
</tr>
<tr>
<td>ServerTasksAt5</td>
<td>Statlog</td>
</tr>
<tr>
<td>TCPIP</td>
<td>TCP, 0, 15, 0</td>
</tr>
<tr>
<td>TCPIP_TcpIpAddress</td>
<td>0.9.12.2.35:1352</td>
</tr>
<tr>
<td>SPX</td>
<td>SPX, 0, 15, 0</td>
</tr>
<tr>
<td>Serial1</td>
<td>XPC, 1, 15, 0</td>
</tr>
<tr>
<td>Serial2</td>
<td>XPC, 2, 15, 0</td>
</tr>
<tr>
<td>$$HasLANPort</td>
<td>1</td>
</tr>
<tr>
<td>Ports</td>
<td>TCPIP</td>
</tr>
<tr>
<td>DisabledPorts</td>
<td>SPX, Serial1, Serial2</td>
</tr>
<tr>
<td>LOG_REPLICATION</td>
<td>0</td>
</tr>
<tr>
<td>LOG_SESSIONS</td>
<td>1</td>
</tr>
<tr>
<td>ExistingServerName</td>
<td>CN=tot105/O=ITSO2</td>
</tr>
<tr>
<td>SETUP_ERRORPATH</td>
<td>File already exists: /u/domino4/domino4.id</td>
</tr>
<tr>
<td>KeyFilename</td>
<td>/u/domino4/domino4.id</td>
</tr>
<tr>
<td>SETUP_PERCENTDONE</td>
<td>100</td>
</tr>
<tr>
<td>SETUP_STATUS</td>
<td>Updating network settings</td>
</tr>
<tr>
<td>ServerKeyFileName</td>
<td>/u/domino4/domino4.id</td>
</tr>
<tr>
<td>MailServer</td>
<td>CN=Domino4/O=ITSO2</td>
</tr>
<tr>
<td>Domain</td>
<td>ITSO2</td>
</tr>
<tr>
<td>Admin</td>
<td>CN=Marco Foellmer/O=ITSO2</td>
</tr>
<tr>
<td>EXTMR_ADDINS</td>
<td>decsext</td>
</tr>
<tr>
<td>TemplateSetup</td>
<td>54</td>
</tr>
<tr>
<td>Setup</td>
<td>58</td>
</tr>
<tr>
<td>ServerSetup</td>
<td>50</td>
</tr>
<tr>
<td>Timezone</td>
<td>5</td>
</tr>
<tr>
<td>DST</td>
<td>1</td>
</tr>
<tr>
<td>CleanSetup</td>
<td>1</td>
</tr>
<tr>
<td>MTEnabled</td>
<td>1</td>
</tr>
<tr>
<td>SCHEDULE_VERSION</td>
<td>3</td>
</tr>
<tr>
<td>WebAdminSetup</td>
<td>5</td>
</tr>
<tr>
<td>DominoConfigLevel</td>
<td>3</td>
</tr>
<tr>
<td>DEBUG_REP</td>
<td>1</td>
</tr>
<tr>
<td>Log_AgentManager</td>
<td>1</td>
</tr>
<tr>
<td>Debug_AMgr</td>
<td>*</td>
</tr>
<tr>
<td>#pop3debug</td>
<td>1</td>
</tr>
<tr>
<td>#debug_threadid</td>
<td>0</td>
</tr>
<tr>
<td>pop3domain</td>
<td>itso2</td>
</tr>
<tr>
<td>#smtpdebug</td>
<td>2</td>
</tr>
<tr>
<td>#smtpclientdebug</td>
<td>1</td>
</tr>
<tr>
<td>#pop3clientdebug</td>
<td>1</td>
</tr>
<tr>
<td>SMF_RECORDING</td>
<td>0</td>
</tr>
</tbody>
</table>
.debug_outfile=/domino4/notesdata/debug98.txt
.SERVER_SHOW_PERFORMANCE=0
.TRANSLOG_AutoFixup=1
.TRANSLOG_UseAll=0
.TRANSLOG_Style=0
.TRANSLOG_Performance=2
.TRANSLOG_Status=0
.SHOW_TASK_DETAIL=1
.DEBUG_ADMR=*.
.NSF_BUFFER_POOL_SIZE=10000000

-----------------------------------------------------------------------------------------------------------------

User (DOMINO4) Environment

MAIL=/usr/mail/DOMINO4
HOSTNAME=SC63
_LIBDIRS=/lib /usr/lib
_PATH=/usr/bin:/bin:/usr/bin:/bin:/usr/lpp/java16/J1.1/lib/mvs/native_threads
_SHELL=/bin/sh
_WORK_UNIT=SYSDA
__INCDIRS=/usr/include /usr/lpp/ioclib/include
Notes_Directory=/domino4/notesdata
__PLIB_PREFIX=CCE
_PS1=$LOGNAME @ $HOSTNAME:$PWD>
__CEE_RUNOPTS=AL(ON) ENVAR(_BPXK_SETIBMOPT_TRANSPORT=TCPIPMVS) POS(ON) TE
_:~/bin/env
CLASSPATH=/usr/lpp/java16/J1.1/lib/classes.zip
LOGNAME=DOMINO4
STEPLIB=none
LANG=C
_LIBPATH=/lib:/usr/lib:.:/usr/lpp/java16/J1.1/lib/mvs/native_threads
__SLIB_PREFIX=SYS1
TERM=vt100
__LIB_PREFIX=CBC
__BPX_SHAREAS=YES
HOME=/u/domino4
TZ=EST5EDT
MANPATH=/usr/man/%
NLSPATH=/usr/lib/nls/msg/%L/%N
Notes_SHARED_DPOOLSIZE=8388608

-----------------------------------------------------------------------------------------------------------------

Executable & Library Files

-rwcr-xr-x 1 STC OEDOMINO 2084864 Dec 3 1998 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 STC OEDOMINO 188416 Jun 10 02:09 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 STC OEDOMINO 630784 Jun 10 01:22 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 STC OEDOMINO 184320 Jun 10 02:10 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 STC OEDOMINO 303104 Jun 10 01:23 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 STC OEDOMINO 86016 Jun 10 01:23 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 STC OEDOMINO 69632 Jun 10 01:59 /usr/lpp/lotus/notes/5001/
-rwcr-xr-x 1 DOMINO4 OEDOMINO 73728 Jun 10 02:04 /usr/lpp/lotus/notes/5001/

Figure 82. nsd.sh -info (3 of 5)
Figure 83. nsd.sh -info (4 of 5)
Datasetprefix TCPIPOE

Messagecase mixed

HostName wtsc63oe

DomainOrigin itso.ibm.com

NSInterAddr 9.12.2.7

NSportAddr 53

ResolveVia UDP

ResolverTimeout 10

ResolverUdpRetries 1

@@@ Current Procs: @@@

<table>
<thead>
<tr>
<th>UID</th>
<th>PID</th>
<th>PPID</th>
<th>C</th>
<th>STIME</th>
<th>TTY</th>
<th>TIME</th>
<th>CMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOMINO4</td>
<td>83886099</td>
<td>3355441</td>
<td>-</td>
<td>09:28:39</td>
<td>?</td>
<td>0:02</td>
<td>o telnetd -Y 9.12.2</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>16777236</td>
<td>83886099</td>
<td>-</td>
<td>09:28:48</td>
<td>ttyp0002</td>
<td>0:02</td>
<td>sh -L</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>234881046</td>
<td>38587592</td>
<td>-</td>
<td>09:31:30</td>
<td>ttyp0002</td>
<td>0:06</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>167772183</td>
<td>1</td>
<td>-</td>
<td>09:30:53</td>
<td>ttyp0002</td>
<td>0:00</td>
<td>sh -L</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>38587592</td>
<td>167772183</td>
<td>-</td>
<td>09:30:55</td>
<td>ttyp0002</td>
<td>3:26</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>25</td>
<td>234881046</td>
<td>-</td>
<td>09:31:34</td>
<td>ttyp0002</td>
<td>0:09</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>26</td>
<td>38587592</td>
<td>-</td>
<td>09:31:36</td>
<td>ttyp0002</td>
<td>0:01</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>27</td>
<td>38587592</td>
<td>-</td>
<td>09:31:41</td>
<td>ttyp0002</td>
<td>0:04</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>28</td>
<td>38587592</td>
<td>-</td>
<td>09:31:46</td>
<td>ttyp0002</td>
<td>0:07</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>29</td>
<td>28</td>
<td>-</td>
<td>09:31:50</td>
<td>ttyp0002</td>
<td>0:08</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>30</td>
<td>38587592</td>
<td>-</td>
<td>09:31:52</td>
<td>ttyp0002</td>
<td>0:20</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>31</td>
<td>38587592</td>
<td>-</td>
<td>09:31:57</td>
<td>ttyp0002</td>
<td>0:07</td>
<td>/usr/lpp/lotus/not</td>
</tr>
<tr>
<td>DOMINO4</td>
<td>32</td>
<td>38587592</td>
<td>-</td>
<td>09:32:03</td>
<td>ttyp0002</td>
<td>0:07</td>
<td>/usr/lpp/lotus/not</td>
</tr>
</tbody>
</table>

Data Directory Full Listing:

- rwxr-x--- 1 DOMINO4 OEDOMINO 905 Aug 20 1996 ./binary.gif
- rwxr-x--- 1 DOMINO4 OEDOMINO 8293 Feb 24 1999 ./browser.cnf.1047
- rwxr-x--- 1 DOMINO4 OEDOMINO 8293 Feb 24 1999 ./browser.cnf
- rw------- 1 DOMINO4 OEDOMINO 5609 Jul 15 12:16 ./debug1.txt
- rw------- 1 DOMINO4 OEDOMINO 9722 Jul 15 14:15 ./debug2.txt
- rw------- 1 DOMINO4 OEDOMINO 5134 Jul 15 15:40 ./debug3.txt
- rw-r--r-- 1 DOMINO4 OEDOMINO 0 Jul 15 16:20 ./cgi-error07151999.log
- rw-r--r-- 1 DOMINO4 OEDOMINO 0 Jul 16 00:00 ./cgi-error07161999.log
- rw-r--r-- 1 DOMINO4 OEDOMINO 1003 Jul 16 00:00 ./agent07151999.log
- rw-r--r-- 1 DOMINO4 OEDOMINO 177 Jul 16 10:56 ./agent07161999.log
- rw-r--r-- 1 DOMINO4 OEDOMINO 456 Jul 16 10:56 ./access07161999.log
- rw------- 1 DOMINO4 OEDOMINO 25807 Jul 16 10:56 ./debug4.txt
- rw------- 1 DOMINO4 OEDOMINO 15299 Jul 16 11:56 ./debug.txt

Note:
.You can set the environment variable NSD_LOGDIR to point
.to the directory where you want your logs/cores to be
.automatically saved

Run nsd.sh -help for more info on new options/features

Script started at: Fri Aug 27 13:21:49 EDT 1999

Generated Info/Warnings/Errors:

1. INFO: Generating binary list file /tmp/nsd.DOMINO4/nsd_cache.ins.lst
2. INFO: Generating cache file /tmp/nsd.DOMINO4/nsd_cache.ins
3. INFO: The Maximum core file size is 8192b blocks.
4. INFO: The maximum number of open descriptors allowed for the process is 65
### 9.2.3.3 Using nsd.sh -ps

This provides a hierarchical listing of Notes processes. If you enter the nsd.sh -ps command, the output will go to the file name:

```
ps_<platform>_.<hostname>_<date>@<time>.log
```

Figure 85 shows an example of the output of the command nsd.sh -ps.

```
INFO: Using cache file /tmp/nsd.DOMINO4/nsd__cache.ins
Script Version : nsd.sh 3.3.6_1
Notes Version  : Release 5.0a (Intl) 14 June 1999
Notes Base     : 5.0
Data Dir       : /domino4/notesdata
Notes Exec Dir : /usr/lpp/lotus/notes/latest/os390
Search Path    : /usr/lpp/lotus/notes/latest/os390 /usr/lpp/lotus/notesapi
Debugger       : /bin/dbx
Debugger Version: Compiled: Feb 23 1999 11:09:56 GMT as BFP
Script Dir      : .
Host Info       : QS/390 SOS3 07.00 02 9672
User            : DOMINO4 (DOMINO4)
Date            : Fri Aug 27 14:37:23 EDT 1999
Clearcase View  : ins
Input arguments : 

------------------- PROCESS TREE ---------------------
Status is:
  .R  -- process is running
  .D  -- process is dead
  .T/status -- process terminated with exit status
  .S/signal -- process killed with signal
  .?   -- Unknown status

username status pid program
DOMINO4 R 167772183 /bin/sh
DOMINO4 R 385875992 /usr/lpp/lotus/notes/5001/os390/server
DOMINO4 R 234881046 /usr/lpp/lotus/notes/5001/os390/router
DOMINO4 R 25 /usr/lpp/lotus/notes/5001/os390/mc
DOMINO4 R 26 /usr/lpp/lotus/notes/5001/os390/replica
DOMINO4 R 27 /usr/lpp/lotus/notes/5001/os390/update
DOMINO4 R 28 /usr/lpp/lotus/notes/5001/os390/amgr
DOMINO4 R 29 /usr/lpp/lotus/notes/5001/os390/amgr
DOMINO4 R 30 /usr/lpp/lotus/notes/5001/os390/adminp
DOMINO4 R 31 /usr/lpp/lotus/notes/5001/os390/calconn
DOMINO4 R 16777248 /usr/lpp/lotus/notes/5001/os390/sched
DOMINO4 R 16777249 /usr/lpp/lotus/notes/5001/os390/event
DOMINO4 R 34 /usr/lpp/lotus/notes/5001/os390/stats
DOMINO4 R 35 /usr/lpp/lotus/notes/5001/os390/http
DOMINO4 R 36 /usr/lpp/lotus/notes/5001/os390/decs
DOMINO4 R 37 /usr/lpp/lotus/notes/5001/os390/smtp
DOMINO4 R 40 /usr/lpp/lotus/notes/5001/os390/dircat
```

Figure 85. nsd.sh -ps (1 of 2)
9.2.3.4 Using nsd.sh

Running nsd.sh script with no options will give stack information for Domino server panics or crashes. When you enter this command, it will default to the file name nsd_all<platform>_<hostname>_<date>@<time>.log.

Figure 87 is a partial example of an nsd.sh dump for S/390 running the command nsd.sh with no options.

```
ls: FSUM6785 File or directory "UNKNOWN" is not found
[: /usr/lpp/lotus/bin/tools/diag/nsd.sh 3504: FSUM6807 expression syntax error
INFO: Using cache file /tmp/nsd.DOMINO4/nsd_3.2.7_cache.ins
Script Version : /usr/lpp/lotus/bin/tools/diag/nsd.sh 3.2.7
Notes Version : Release 5.0a.0a (Intl) 16 June 1999
Notes Base : 5.0
Data Dir : /domino4
Notes Exec Dir : /usr/lpp/lotus/notes/latest/os390
Search Path : /usr/lpp/lotus/notes/latest/os390 /usr/lpp/lotus/notesapi
Debugger : /bin/dbx
Debugger Version: Compiled: Feb 23 1999 11:09:56 GMT as BFP
Script Dir : /usr/lpp/lotus/bin/tools/diag
Host Info : OS/390 SC^#A 07.00 02 9672
User : Domino4P (DOMINO4)
Date : Tue Aug 10 08:10:42 EDT 1999
Clearcase View : ins
Input arguments :
```
prog: /usr/lpp/lotus/notes/5001/os390/router pid(s) : 452984854
----------- Attaching to /usr/lpp/lotus/notes/5001/os390/router 452984854
FEB00278: Waiting to attach to process 452984854 ...
FEB00289: dbx for MVS.
FEB003199: Compiled: Feb 23 1999 11:09:56 GMT as BFP
FEB00400: OS level: 07.00 02, LE level: 2.7
FEB00100: Type 'help' for help.
FEB00600: ptrace(request=60,pid=0x1B000016,addr=0x16843E50,data=0x400,buff=0x14E74F)
FEB00601: ptrace(): addr=0x16843E50, buff=0x14E74F, r_val=0xFFFFFFFF, errno=0x79,
errno_jr=0xD3D006B
FEB00999: reading symbolic information ...
warning: FEB0160: dbx does not have write capability to program ROUTER.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
error: FEB00936: Cannot convert 0x41C046C to an image address.
CEE3204S The system detected a protection exception.
From entry point take dump at compile unit offset +00000076 at address 1663EC96.
ERROR: Debugger may have failed attaching to /usr/lpp/lotus/notes/5001/os390/router
(452984854).

prog: /usr/lpp/lotus/notes/5001/os390/stats pid(s) : 318767127
-------- Attaching to /usr/lpp/lotus/notes/5001/os390/stats 318767127
FEB00278: Waiting to attach to process 318767127 ...
FEB00289: dbx for MVS.
FEB003199: Compiled: Feb 23 1999 11:09:56 GMT as BFP
FEB00400: OS level: 07.00 02, LE level: 2.7
FEB00100: Type 'help' for help.
FEB00999: reading symbolic information ...
warning: FEB0160: dbx does not have write capability to program STATURS.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
warning: FEB0160: dbx does not have write capability to program EDUX11EY.
error: FEB00936: Cannot convert 0x41C046C to an image address.
CEE3204S The system detected a protection exception.
From entry point take dump at compile unit offset +00000076 at address 1663EC96.
ERROR: Debugger may have failed attaching to /usr/lpp/lotus/notes/5001/os390/stats
(318767127).

Figure 88. nsd.sh (2 of 3)
9.3 Programs (compact, update, updall and fixup)

This section describes the three major utilities (compact, updall and fixup) as well as how to use them. It also describes some of the parameters. It is a summary of the Domino 5 Administration Help.

9.3.1 Compact

There are three styles of compacting used in Release 5:

- In-place compacting with space recovery
- In-place compacting with space recovery and reduction in file size
- Copy-style compacting

9.3.1.1 In-place Compacting, Space Recovery Only

This style of compacting recovers unused space in a database but doesn't reduce the size of the database on disk. Databases retain the same database instance IDs (DBIIDs), so the relationship between the compacted databases and the transaction log remains intact. Users and servers can continue to access and edit...
databases during compacting. This style of compacting is useful for Release 5 databases that you expect to either stay the same size or grow in size.

When you run Compact without specifying options, Domino uses this style of compacting on all Release 5 format databases enabled for transaction logging. Domino also uses this style of compacting when you use the -b option (case sensitive) when compacting any Release 5 format database.

Use this compacting method the most frequently—it is the fastest method and causes the least system impact.

9.3.1.2 In-place Compacting, Space Recovery and Reduced File Size
This style of compacting reduces the file size of Release 5 databases as well as recovering unused space in databases. This style of compacting is somewhat slower than in-place compacting with space recovery only. This style of compacting assigns new DBIIDs to databases, so if you use it on logged databases and you use a Release 5-certified backup utility, do full backups of the databases shortly after compacting is complete. This style of compacting allows users and servers to continue to access and edit databases during compacting.

When you run Compact without specifying options, Domino uses this style of compacting on Release 5 databases that aren't enabled for transaction logging. Domino also uses this style of compacting when you use the -B option (case sensitive) when compacting Release 5 format databases. To optimize disk space, it's recommended that you run Compact using the -B option on all Release 5 format databases once a week or once a month.

9.3.1.3 Copy-style Compacting
Copy-style compacting creates copies of databases and then deletes the original databases after compacting completes, so extra disk space is required to make the database copies. This style of compacting essentially creates a new database with a new database ID. If you use copy-style compacting on Release 5 logged databases (using the -C option), compacting assigns new DBIIDs, so if you use a Release 5-certified backup utility, you should do full backups of databases shortly after compacting completes. When you use copy-style compacting, users and servers can't edit databases during compacting and they can only read databases if the -L option is used.

Domino uses copy-style compacting by default, either when you use an option with Compact to enable a database property that requires a structural change to a database, or when you run Compact on a database that has a structural change pending that was initiated from the Database Properties box. Enabling or disabling the database properties “Document table bitmap optimization” and “Do not support specialized response hierarchy” requires structural database changes. Compacting a Release 4 format database also uses copy-style
compacting. Note that if you compact a Release 4 format database without using the -R option, compacting converts the database to the Release 5 format.

**Table 28. Comparison of the Three Styles of Compaction**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>In place, space recovery</th>
<th>In place, space recovery with file size reduction</th>
<th>Copy-style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Databases that use it when Compact runs without options</td>
<td>R5 logged databases with no pending structural changes</td>
<td>R5 unlogged databases with no pending structural changes</td>
<td>R4 databases; R5 databases with pending structural changes</td>
</tr>
<tr>
<td>Databases you can use it on</td>
<td>R5</td>
<td>R5</td>
<td>All (Need -C for R5 databases)</td>
</tr>
<tr>
<td>Relative speed</td>
<td>Fastest</td>
<td>Medium</td>
<td>Slowest</td>
</tr>
<tr>
<td>Users can read databases during compacting</td>
<td>Yes</td>
<td>Yes</td>
<td>No (unless -L option used)</td>
</tr>
<tr>
<td>Users can edit databases during compacting</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Reduction in file size</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Extra disk space required</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

There are four ways to compact databases:

1. Run Compact using the Compact tool in the Files tab of the Domino Administrator. Use this method to compact a few databases; you can easily select the databases to compact, but you can't use the Domino Administrator until compacting finishes.

2. Run Compact using the Task-Start tool in the Domino Administrator. Use this method to easily compact all databases on a server. You can continue to use the Domino Administrator during compacting and you do not have to remember specific command-line options.

3. Run Compact using the Domino console. Use this method if you are comfortable using command-line options, or to compact databases directly at the server when there is no Domino Administrator client running on the server. The syntax is as follows:

   Load compact databasepath options

4. Run Compact using a Program document. Use this method to schedule Compact to run at particular times:

   - From the Domino Administrator, click the **Configuration** tab.
   - Next to “Use Directory on,” select the server with the replica of the Domino Directory that you want to modify.
   - Expand **Server - Programs** and then click **Add Program**.
   - Complete the **Basics** tab.
   - Complete the **Schedule** tab.
- Click save and close.

Table 29 describes the options you can use with the Compact server task. The first column lists the options as they appear when you run Compact using the Task - Start tool or the Files tab in the Domino Administrator. The second column lists the equivalent command-line options that you use when you run Compact using a console command or using a Program document.

Table 29. Options for the Compact Utility

<table>
<thead>
<tr>
<th>Option</th>
<th>Command-line equivalent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact only this database or folder</td>
<td>database path</td>
<td>To compact a database in the Domino data folder, enter the file name, for example SALES.NSF. To compact databases in a folder within the data folder, specify the database path relative to the data folder.</td>
</tr>
<tr>
<td></td>
<td>Specify any additional options after the database path.</td>
<td></td>
</tr>
<tr>
<td>Keep or revert database back to R4 format</td>
<td>-R</td>
<td>Compacts databases without converting to the current release file format of the server that stores the databases or reverts databases in the current release file format to the previous release file format.</td>
</tr>
<tr>
<td>Compact database only if unused space is greater than x percent</td>
<td>-S percent</td>
<td>Compacts all databases with a specified percent of unused space.</td>
</tr>
<tr>
<td>Discard any built view indexes</td>
<td>-D</td>
<td>Use this option to compact databases just before you store them on tape, for example. Does copy-style compacting.</td>
</tr>
<tr>
<td>Compaction style: In-place (recommended)</td>
<td>-b</td>
<td>Uses in-place compaction and recovers unused space without reducing the file size, unless there's a pending structural change to a database, in which case copy-style compaction occurs. <em>This is the recommended method of compacting.</em></td>
</tr>
<tr>
<td>Compaction style: In-place with file size reduction</td>
<td>-B</td>
<td>Uses in-place compaction, recovers unused space and reduces file size, unless there's a pending structural change, in which case copy-style compacting occurs.</td>
</tr>
<tr>
<td>Compaction style: Copy-style</td>
<td>-C</td>
<td>Uses copy-style compaction. Use this option, for example, to solve database corruption problems with Release 5 format databases.</td>
</tr>
<tr>
<td>Compaction style: Copy-style: Allow access while compacting</td>
<td>-L</td>
<td>Enables users to continue to access databases during compacting. If a user edits a database during compacting, compacting is cancelled. This is useful only when copy-style compacting is done.</td>
</tr>
</tbody>
</table>
As mentioned before, there are two other options available. For a complete list of them, refer to the *Domino 5 Administration Help* guide.

### 9.3.2 UPDATE and UPDALL

The Update and Updall tasks keep view indexes and full-text indexes up-to-date.

**UPDATE** is loaded at server startup by default and runs continually, checking its work queue for views and folders that require updating. When a view or folder change is recorded in the queue, Update waits approximately 15 minutes before updating all view indexes in the database so that the update can include any other database changes made during the 15-minute period. After updating view indexes in a database, it then updates all databases that have full-text search indexes set for immediate or hourly updates.

When Update encounters a corrupted view index or full-text index, it rebuilds the view index or full-text index in an attempt to correct the problem. This means it deletes the view index or full-text index and rebuilds it.

**UPDALL** is similar to Update, but it doesn't run continually or work from a queue; instead you run Updall as needed. You can specify options when you run Updall, but without them Updall updates any view indexes or full-text search indexes on the server that need updating. To save disk space, Updall also purges deletion stubs from databases and discards view indexes for views that have been unused for 45 days, unless the database designer has specified different criteria for discarding view indexes.

Use the NOTES.INI setting Default_Index_Lifetime_Days to change when Updall discards unused view indexes.

Like Update, Updall rebuilds all corrupted view indexes and full-text search indexes that it encounters.

By default Updall is included in the NOTES.INI setting ServerTasksAt2, so it runs daily at 2 am. Running Updall daily helps save disk space by purging deletion stubs and discarding unused view indexes. It also ensures that all full-text search indexes that are set for daily updates are updated.

Table 30 compares the characteristics of Update and Updall. For Updall, the table describes default characteristics, some of which you can use options to modify.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Update</th>
<th>Updall</th>
</tr>
</thead>
<tbody>
<tr>
<td>When it runs</td>
<td>Continually after server startup</td>
<td>2 am and when you run it</td>
</tr>
<tr>
<td>Runs on all databases?</td>
<td>No. Runs only on databases that have changed.</td>
<td>Yes</td>
</tr>
<tr>
<td>Refreshes views indexes?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Updates full-text indexes?</td>
<td>Yes. Updates full-text indexes set for immediate and hourly updates.</td>
<td>Yes. Updates all full-text indexes.</td>
</tr>
<tr>
<td>Detects and attempts to rebuild corrupted view indexes?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
There are three different methods to run Updall:

1. You can use the **Task - Start** tool in the Domino Administrator. Use this method if you don't want to remember command-line options.

2. You can use the `load updall` console command. Use this method if you're comfortable using command-line options or if you want to run Updall directly at the server console when there is no Domino Administrator running on the server machine.

   ```
   Load updall databasepath options
   ```

3. You can use the program document that runs Updall. Use this method to schedule Updall to run at particular times.
   - From the Domino Administrator, click the **Configuration** tab.
   - Next to “Use Directory on,” select the server with the replica of the Domino Directory that you want to modify.
   - Expand **Server - Programs** and then click **Add Program**.
   - Complete the **Basics** tab.
   - Complete the **Schedule** tab.
   - Click **save** and close.

Table 31 lists the options you can use with Updall.

<table>
<thead>
<tr>
<th>Option in Task - Start tool</th>
<th>Command-line option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Index all databases</td>
<td>database path</td>
<td>&quot;Only this database&quot; updates only the specified database. &quot;Index all databases&quot; (or no database path) updates all databases on the server.</td>
</tr>
<tr>
<td>- Index only this database or folder</td>
<td>database -T title</td>
<td>Updates a specific view in a database. Use, for example, with -R to solve corruption problems.</td>
</tr>
<tr>
<td>Update this view only</td>
<td>-V</td>
<td>Updates built views and does not update full-text indexes.</td>
</tr>
<tr>
<td>Update: All built views</td>
<td>-F</td>
<td>Updates full-text indexes and does not update views.</td>
</tr>
</tbody>
</table>

Refer to the *Domino 5 Administration Help* guide for more information.
9.3.3 FIXUP

When you restart a server, the server quickly searches for any Release 4 format databases and any unlogged Release 5 databases that were modified but improperly closed because of a server failure, power failure, hardware failure, and so on. A few minutes after server startup is complete, the Fixup task then runs on these databases to attempt to fix any inconsistencies that resulted from partially written operations caused by a failure. When users attempt to access one of these databases and Fixup hasn't yet run on the database, the users see the message This database cannot be opened because a consistency check of it is in progress. A similar Fixup process occurs when you restart a Notes client.

Multiple Fixup tasks run simultaneously at server startup to reduce the time required to fix databases. The number of Fixup tasks that Domino runs by default at startup is equal to two times the number of processors available on the server. Although this default behavior should be adequate in most circumstances, you can edit the NOTES.INI file to include the Fixup_Tasks setting. The actual number of tasks run is the smaller of the configured number of tasks that can run and the number of databases that require fixing. For example, if you set Fixup_Tasks to 4 but only one database requires fixing, then only one Fixup task runs.

**Note:** Keep in mind that after you convert Release 4 databases to Release 5 and set up transaction logging, Fixup is not needed or used to bring databases back to a consistent state.

**9.3.3.1 Four Ways to run Fixup Manually**

1. Run Fixup using Fixup tool in the Files tab. Use this method to run Fixup on one or a few databases; you can easily select the databases and you do not have to remember command-line options, but you cannot use the Domino Administrator until Fixup finishes.

2. From the Domino Administrator, select the server that stores the databases you want to run Fixup on. If the Domino Administrator does not run on a server, you can select local to run Fixup on databases stored on the client.
   - Click the **Files** tab.
   - Select the databases on which to run Fixup.
   - On the Tools panel at the right, select **Database - Fixup**.
   - (Optional) Select options to control how Fixup runs.
   - Click **OK**.

3. Run Fixup using the Task - Start tool. Use this method to run Fixup on all databases; you can continue to use the Domino Administrator while Fixup runs and you don't have to remember command-line options.

4. Run Fixup using a console command. Use this method if you are comfortable using command-line options or to run Fixup directly at the server console when there isn't a Domino Administrator client available.

   **Load fixup options**

5. Run Fixup using a program document. Use this method to schedule Fixup to run at particular times.
   - From the Domino Administrator, click the **Configuration** tab.
Next to “Use Directory on” select the server with the replica of the Domino Directory that you want to modify.

Expand Server - Programs.

Select Server - Programs and then click Add Program.

On the Basics tab, complete the fields.

On the Schedule tab, complete the fields.

Click save and close.

Table 32 lists the options you can use with Fixup.

<table>
<thead>
<tr>
<th>Fixup options in Fixup tool and Task - Start tool</th>
<th>Command-line equivalent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Fixup all databases</td>
<td>database path</td>
<td>“Fixup only this database or folder” runs Fixup only on a specified database or all databases in a specified folder. “Fixup all databases” or no command line database path runs Fixup on all databases on the server.</td>
</tr>
<tr>
<td>- Fixup only this database or folder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report all processed databases to log file</td>
<td>-L</td>
<td>Reports to the log file every database Fixup opens and checks for corruption. Without this argument, Fixup logs only actual problems encountered.</td>
</tr>
<tr>
<td>Scan only since last fixup</td>
<td>-i</td>
<td>When you run Fixup on a specific database, causes Fixup to check only documents modified since Fixup last ran. Without this option, Fixup checks all documents.</td>
</tr>
<tr>
<td>Scan all documents</td>
<td>-F</td>
<td>When you run Fixup on all databases, causes Fixup to check all documents in the databases. Without this option, Fixup checks only documents modified since it last ran.</td>
</tr>
<tr>
<td>Perform quick fixup</td>
<td>-Q</td>
<td>Causes Fixup to check documents more quickly but less thoroughly. Without this option, Fixup checks documents thoroughly.</td>
</tr>
<tr>
<td>Exclude views (faster)</td>
<td>-V</td>
<td>Prevents Fixup from running on views. This option reduces the time it takes Fixup to run. Use if view corruption isn't a problem.</td>
</tr>
<tr>
<td>Fixup transaction-logged databases</td>
<td>-J</td>
<td>Causes Fixup to check databases that are enabled for transaction logging. Without this option, Fixup runs on logged databases. If you are using a backup utility certified for Domino Release 5, it's important that you schedule a full back of the database as soon after Fixup finishes as possible.</td>
</tr>
</tbody>
</table>

Refer to the Domino 5 Administration Help guide for more details.
9.4 Troubleshooting Tools for the Domino Client

Domino provides several tools to help you troubleshoot problems. Most of the tools are available through the Domino Administrator. Table 33 summarizes the available tools.

Table 33. Administrator Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Problems that the tool resolves</th>
<th>How to access the tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server log file (LOG.NSF)</td>
<td>All problems</td>
<td>From the Server - Analysis tab in the Domino administrator</td>
</tr>
<tr>
<td>Server's MAIL.BOX</td>
<td>Mail routing problems</td>
<td>From the Messaging - Mail tab in the Domino Administrator</td>
</tr>
<tr>
<td>Mail trace</td>
<td>Mail routing problems</td>
<td>From the Messaging - Mail tab in the Domino Administrator</td>
</tr>
<tr>
<td>ISpy</td>
<td>Slow mail</td>
<td>Configured in the Statistics and Events database on the Configuration tab in the Domino Administrator</td>
</tr>
<tr>
<td>Mail tracking</td>
<td>Lost mail</td>
<td>From the Messaging - Tracking Center tab in the Domino Administrator</td>
</tr>
<tr>
<td>Network trace</td>
<td>Connection problems</td>
<td>In User Preferences. Choose File - Preferences - Notes Preferences</td>
</tr>
<tr>
<td>Replication schedule</td>
<td>Replication problems</td>
<td>From the Replication tab in the Domino Administrator</td>
</tr>
<tr>
<td>Database analysis</td>
<td>Database problems</td>
<td>From the Files tab in the Domino Administrator</td>
</tr>
</tbody>
</table>

9.5 Notes.ini and its Parameters

Customers have often asked for some quick tools in understanding Domino related problems, but there are few available. In a specific situation, however, customers are frequently advised to activate certain debug parameters in the server Notes.ini file to collect more information for further analysis or diagnosis of problems.

While some customers may be reluctant to activate the debug parameters, others may request that such parameters be activated by default into the system.

In fact, you should rarely, if ever, need to modify notes.ini. The Notes.ini file contains many settings that Domino and Notes rely on to work properly. An accidental or incorrect change may cause Domino or Notes to run unpredictably. Before you make changes to the notes.ini, ensure that you fully understand what you are doing and why the changes are necessary.

9.5.1 Debug Parameter versus Activity Log Parameter

For the purpose of our discussion, let us divide the parameters into two different categories:

1. Debug parameters
2. Activity log parameters
Though the usage of these parameter categories are similar, the approaches and intentions are quite different.

**Debug parameters** are often not published publicly, and are used only for specific needs and circumstances. They are activated with close supervision and only upon direct advice between the customer and the IBM/Lotus support team. It is activated only to resolve specific problems that are happening in your environment.

### 9.5.1.1 Example 1

If you want to debug an agent, you would have to enable the debug parameter \texttt{Debug\_AMGR=*} in the Notes.ini file.

This is an undocumented Notes.ini parameter that allows the Domino server to report agent manager activities to the \texttt{log.nsf} or to an outfile, enabling further analysis and diagnosis.

**Activity log parameters** are published in Appendix E of *Administering the Domino System*. The primary focus is to allow Notes Administrators to understand the behavior of the Domino server and its applications.

Most of the time, there is no real problem; using these parameters is simply a proactive step in collecting more data and making appropriate analysis in order to fine-tune the Domino server and its applications.

Notes Administrators don’t have to engage IBM/Lotus Support team to decide on which activity log parameters to enable. The administrator’s manual is comprehensive on the options of these parameters. However, we do encourage you to consult IBM/Lotus Support Team for further clarification on how to use these parameters for your own analysis.

### 9.5.1.2 Example 2

If you want to understand the behavior of your Agent activities, then you would enable the parameter \texttt{Log\_AgentManager=<value 0-2>} in the notes.ini file.

More details on such activities logging parameters are found in Appendix E of the Administrator Manual.

**Note:** In these two examples of Agent Manager, we are able to see the distinction between the two in the approach and intention of activating these parameters. There are cases, however, where the activity log parameter can be use to determine the cause of the problem.

### 9.5.2 Understanding Debug Parameters in the notes.ini file

Let us understand the issues revolving around the Notes debug parameters in the notes.ini file and examine them in a broader perspective.

Applying debugging parameters is always a reactive approach and it must be treated with caution. It is not something nice to have, but rather something necessary only in certain circumstances. Often it requires close supervision by Notes administrators with advice from the IBM/Lotus Support Team.

Such close monitoring is necessary to avoid any potential adverse effects when applying the debug parameters. There are always some trade-offs in applying
debug parameters. If applied indiscriminately, they may have implications on your server performance.

Bear in mind, however, that applying debug parameters would not generally cause server failures, but may contribute to the increment of your server workloads, so server performance may degrade.

The use of debug parameters often occurs only after a specific problem appears in a customer environment. These parameters should be used on a short-term basis during the troubleshooting period to find the cause of the problem.

9.5.3 Activity Log Parameters in the notes.ini file

Many of the published notes.ini parameters documented in the Appendix E of the administration manual are generally for administrative and server performance tuning purposes. In contract, the parameters introduced by IBM/Lotus Support are specifically meant for debugging purposes.

If you intend to monitor your server and application behaviors, you can customize your notes.ini file to collect additional information. The output of these activities will be captured in the log.nsf file.

When you record additional information in the log file, you choose a logging level that specifies the amount of detail that is recorded. If you set a high logging level, the log file may become quite large. Therefore, after you troubleshoot the problem, remember to reset the logging level. Table 34 lists some debug information you may want to record in the log file.

<table>
<thead>
<tr>
<th>To record information about</th>
<th>Use this setting, field or command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent Manager</td>
<td>Log_AgentManager in NOTES.INI</td>
</tr>
<tr>
<td>Indexer activity</td>
<td>Log_update in NOTES.INI</td>
</tr>
<tr>
<td>Mail routing</td>
<td>Mail_log_to_MiscEvents in NOTES.INI</td>
</tr>
<tr>
<td>Replication</td>
<td>Log_Replication in NOTES.INI</td>
</tr>
<tr>
<td></td>
<td>“Log all replication events” setting specified during server setup</td>
</tr>
<tr>
<td>Server tasks</td>
<td>Log_Tasks in NOTES.INI</td>
</tr>
<tr>
<td>User sessions</td>
<td>Log_Sessions in NOTES.INI</td>
</tr>
</tbody>
</table>

9.5.3.1 Log_AgentManager

Specifies whether or not the start of an agent execution is recorded in the log file and shown on the server console.

The syntax for this parameter is: Log_AgentManager=value

where value can be one of the following:

0 - Do not log agent execution events
1 - Log agent execution events (partially and completely successful)
2 - Log agent execution events (completely successful only)
9.5.3.2 Log_Update
This parameter specifies the level of detail of Indexer events displayed at the server console and in the log file.

The syntax for this parameter is: Log_Update=value

where value can be one the following:

0 - Records when the Indexer starts and shuts down.

1 - Records when the Indexer starts and shuts down and when the Indexer updates views and full text indexes for specific databases.

2 - Records when the Indexer starts and shuts down and when the Indexer updates views and full text indexes for specific databases. Also records the names of views the Indexer is updating.

9.5.3.3 Mail_Log_to_MiscEvents
This parameter in notes.ini determines whether all mail event messages are displayed in the Miscellaneous Events view of the log file.

The syntax for this parameter is: Mail_Log_To_MiscEvents=value

where value can be one of the following:

0 - Does not display mail events in the Miscellaneous Events view

1 - Displays mail events in the Miscellaneous Events view

Default: None, although if this setting is omitted, mail events are not displayed in the Miscellaneous Events view.

9.5.3.4 Log_Replication
Specifies whether the start and end of replication sessions are recorded in the log file and displayed on the console.

The syntax is: Log_Replication=value

where value can be one of the following:

0 - Do not log replication events

1 - Log server replication events

2 - Log replication activity at the database level

3 - Log replication activity at the level of database elements (views, document, etc.)

4 - Log replication activity at the field level

5 - Log summary information

9.5.3.5 Log_Tasks
Specifies whether the current status of server tasks is recorded in the log file and displayed on the console.
Chapter 9. Tools for Domino

The syntax is: Log_Tasks=value

where value is one of the following:

0 - Do not send status information

1 - Send the status of server tasks to the log file and to the console

9.5.3.6 Log_Sessions

 Specifies whether individual sessions are recorded in the log file and displayed on the console.

The syntax is: Log_Sessions=value

where value is one of the following:

0 - Do not log individual sessions

1 - Log individual sessions

9.6 Editing the notes.ini file

Here are different ways to edit the notes.ini file:

• By using the Set Configuration command at the console.
• By editing the Server Configuration document.
• By using oeditascii editor.
• By using the viascii editor.
• By using the Administrator client.

Notes:

1. Before updating the notes.ini file, make a backup copy of the file. To enable the new parameters take effect, you will need to recycle the Domino server.

2. Examine the characteristics of your editor. If you use a different editor than those mentioned, choose one that does not add carriage returns (CR) to the file. Most workstation editors add CRs.

9.6.1 Using the Set Configuration Command

To edit the notes.ini file with the Set Configuration command, you need to enter this command at the Domino server console.

Usage: Set Configuration setting

Example:

> set config
SERVERTASKS=Router,Replica,Update,Amgr,AdminP,CalConn,Sched,Event,Stats,HTTP,DECS

9.6.2 Using the Configuration Document

1. From the Domino Administrator, open the Domino Directory and click the Configuration tab.
2. To edit an existing Configuration Settings document, highlight it and then click **Edit Configuration**. To create a new configuration document, highlight the server for which the Configuration Settings document will apply, then click **Add Configuration**.

3. To modify notes.ini settings on the server, click the **NOTES.INI Settings** tab. This tab lists a number of current settings in the server's notes.ini file.

4. To add or change a setting, click **Set/Modify Parameters** to display all settings that you can set in the Configuration Settings document. Select the setting(s) you want to add/modify.

5. Save and close the document.

### 9.6.3 Using oeditascii

To edit the notes.ini file from an OMVS session using the oeditascii editor:

1. Logon to TSO using a user_id with OMVS access.
2. Enter `tso omvs`.
3. Enter `cd /notesdata`.
4. Make a backup copy of the notes.ini file: `cp notes.ini notesini.bkp`
5. Edit the notes.ini file: `/usr/lpp/lotus/bin/tools/oeditascii notes.ini`

### 9.6.4 Using viascii

To edit the notes.ini file using viascii you need a Telnet session.

1. Logon to the S/390 server using Telnet from a workstation.
2. Change to the notesdata directory: `cd /notesdata`
3. Make a backup copy of the notes.ini file: `cp notes.ini notesini.bkp`
4. Edit the notes.ini file: `/usr/lpp/lotus/bin/tools/viascii notes.ini`

### 9.6.5 Edit notes.ini Using Domino Administrator Client

To edit the notes.ini file, from your Domino Client screen select the **Domino Administrator** icon or click **File -> Tools -> Server Administration**; you will see Figure 90. Press Escape to move the Administration menu.
On the following screen (Figure 91), select the **configuration** tab and click **Server - Configurations**.

The box in the center shows a list of servers. See Figure 92, which shows one server. Highlight the server you wish to administer and click it twice.
Figure 92. Server Configurations

Figure 93 shows the Configuration Settings panel. When you first enter this panel, click the NOTES.INI Settings tab. This will show the Current parameters and Last parameter set.

Figure 93. Configuration Settings

Click Edit Server Configuration. This will enable you to edit certain notes.ini parameters. Figure 94 on page 175 shows the current and last parameter set. It also shows the value that the last parameter was set to and the person who updated that parameter. Click Set/Modify Parameters.
Figure 94. Modifying the notes.ini Variables

Figure 95 shows the pop-up screen that appears when you set/modify the parameters.

If you click the drop-down arrow, it will give a list of parameters that can be edited. Highlight Log_AgentManager and click OK. To set a value, enter the value you wish to set for this parameter and click Next. Then click OK. This will add it to the list of current parameters if this parameter has never been set before; see Figure 96 on page 176.
9.7 Tools for Monitoring the Domino System

The Domino server provides services and tasks that create and report information about the Domino system. This information comes in two forms: statistics and events. Statistics show the status of processes running on the system. For example, the statistic “Free space on drive C” indicates the amount of free space available on drive C. Events are generated when something takes place on the system. For example, the event “Replicating files with servername” occurs when a file replicates with a specified server.

The Domino server continuously updates statistics. To view system statistics at any time, you use the Show Stats command at the server console. To obtain statistics to monitor the Domino system, use the Collect task, which collects statistics and puts the information into the statistics database (STATREP.NSF). Then to view statistic reports, you click the Server -> Analysis tab -> Statistics Reports view in the Domino Administrator.

The Domino server also provides monitor documents that you use to configure statistic thresholds. When the Collect task collects a statistic and places it into the Statistics database (STATREP.NSF), it compares the statistic to the threshold configured in the monitor document. The first time the statistic reaches the specified threshold in the monitor document or in the Statistic Names document, an Alarm report is generated. An alarm report is nothing more than a document informing you that a statistic has reached its threshold. To set up an alarm, you must specify a collection alarm interval in the Server Statistic Collection document. Alarms documents are automatically created in the Server -> Analysis Tab -> Statistics Reports -> Alarms view in the Domino Administrator.

Events happen continuously on the Domino system. To notify you about important system information, the Domino server has a notification facility called the Event task. The Event task sends notification about the event to a destination configured in the Event Notification document.
You can create statistics and events monitoring documents for your particular server and network needs by creating Statistic Monitors and Event Notification documents from the Statistics & Events view on the Configuration tab in the Domino Administrator. If you do not set up an Event Notification document, you will not be notified that an event has occurred.

9.7.1 Starting the Event and Collect Tasks

The Event task and the Collect task are two of the server monitoring tasks that gather information about the Domino system.

Note: You must run the Event task on each server that you want to monitor.

9.7.1.1 To Start the Event Task

The Event task monitors system activities when you start the Domino server. The Event task also creates the Statistics & Events database (EVENTS4.NSF) on the server, if it doesn’t exist.

Note: The Event task is automatically loaded at server startup. If the Event task is not loaded, you must load it manually from the Domino Administrator or the server console.

1. From the Domino Administrator, click the Server - Status tab.
2. Click Task - Load
3. In the Load task box, click Event.
4. Click OK.

You may also start the task from the server console by typing load event.

9.7.1.2 To Start the Collect Task

The Collect task collects and monitors statistics from the servers configured in the Server Statistic Collection document. To start the Collect task, load it on the server designated to collect statistics.

1. From the Domino Administrator, click the Server - Status tab.
2. Click Task -> Load.
3. In the Load task box, click Collect.
4. Click OK.

You may also start the task from the server console by typing load collect. For more information on these monitoring tools, refer to the online Domino 5 Administrator Help guide from the Domino Client.
Chapter 10. Tools for Network Troubleshooting

When connectivity is lost but all other components are working properly, you need to investigate the network. These problems are usually routed to a separate network organization to isolate the problem to a router, common carrier service, or other failing component. Some useful tools include:

**NETSTAT**
A TSO command for local host TCP/IP information

**onetstat**
USS equivalent of NETSTAT

**PING and OPING**
Used in checking connectivity

**NSLOOKUP and onlookup**
Perform DNS name validation

**Tracert and otracert**
For tracing routes over TCP/IP networks

**Domino Administrator Display**
The graphical console

**Network Trace**
From Notes Client Desktop

**NotesCONNECT or NPING**
An extension to PING that tests for the presence of the Domino server

**Mail Probes**
ISpy administrator tool to examine server to server links

**Component Trace for TCP/IP**

### 10.1 NETSTAT - TSO Command for Displays Local Host Information

One of the strengths of the OS/390 platform is the ability to run several TCP/IP stacks. Most of the Communications Server display commands must be directed to a specific TCP/IP stack name. The Display TCPIP command provides a list of the stack names, as shown in Figure 97.

```
D TCPIP
EZAO50I TCPIP STATUS REPORT 236
COUNT  TCPIP NAME  VERSION  STATUS
-------  ------------  --------  -------------------
  1  TCPIPOE         CS V2R7  ACTIVE     
  2  TCPIPMVS        CS V2R7  ACTIVE     
*** END TCPIP STATUS REPORT ***
```

*Figure 97. Display TCPIP - List the TCPIP Stacks*

The NETSTAT command offers numerous options; refer to *OS/390 V2.R7.0 eNetwork CS IP Users Guide*, GC31-8514. Figure 98 on page 180 shows that our expected Domino server (IDs MANNE1, MANNE2 and MANNE5) ports are assigned properly and listening for traffic. A follow-on command with the byteinfo parameter gives the output shown in Figure 100 on page 181.

When connections have been made with the Domino server, the Domino server command, SHOW USERS, should show the same number as the number of connections shown in a NETSTAT or ONETSTAT command. If the numbers do not match, then more investigation is required. Check the BPXPARMS setting as a starting point.
Performance problems and slowdowns can mislead people into believing they have a network problem. One specific problem where a “Close-Wait” state has been encountered is referred to as the “hex session” or “ghost session” problem. That name comes from the fact that a Domino show users debug command will lists many lines of hexadecimal session IDs without any user identification. If the Domino server cannot authenticate the users quickly enough as they try to connect, the user may try again several times and create many more pending connections. Thus the Domino server does more processing because these sessions are tying up resources and create longer task queues that the server must search through.

During a hex session problem the onetstat display shows a large number of connections but the number of users is not nearly as large.

```
netstat tc tcpipoe
MVS TCP/IP NETSTAT CS V2R7  TCP/IP NAME: TCPIPOE  13:27:56
---------- ---- ------------ -------------- -----
User Id Conn Local Socket Foreign Socket State
------- ---- ------------ -------------- ----- --------
DB2XDIST 00023 9.12.2.35..33341 0.0.0.0..0 Listen
DB2XDIST 00022 0.0.0.0..33340 0.0.0.0..0 Listen
FTPDE1 0001C 0.0.0.0..21 0.0.0.0..0 Listen
INETD 00014 0.0.0.0..19 0.0.0.0..0 Listen
INETD 00016 0.0.0.0..37 0.0.0.0..0 Listen
INETD 0000F 0.0.0.0..514 0.0.0.0..0 Listen
INETD 00010 0.0.0.0..513 0.0.0.0..0 Listen
INETD 00015 0.0.0.0..13 0.0.0.0..0 Listen
INETD 00011 0.0.0.0..512 0.0.0.0..0 Listen
INETD 0000E 0.0.0.0..23 0.0.0.0..0 Listen
INETD 00013 0.0.0.0..9 0.0.0.0..0 Listen
INETD 00012 0.0.0.0..7 0.0.0.0..0 Listen
MANNE1 0926E 9.12.2.35..1352 0.0.0.0..0 Listen
MANNE2 09279 0.0.0.0..8080 0.0.0.0..0 Listen
MANNE5 0927B 9.12.2.35..25 0.0.0.0..0 Listen
TCPIPOE 00009 127.0.0.1..1026 127.0.0.1..1025 Establish
TCPIPOE 00003 0.0.0.0..1025 0.0.0.0..0 Listen
TCPIPOE 0000A 127.0.0.1..1025 127.0.0.1..1026 Establish
INETD 00019 0.0.0.0..19 *.* UDP
INETD 0001B 0.0.0.0..37 *.* UDP
```

Figure 98. Output of the netstat Command

The TCP/IP state diagram is useful when trying to understand the different status field values; this is shown in Figure 99 on page 181. For a detailed discussion of this diagram and other information, refer to page 38, figure 2.4 in UNIX Network Programming, Volume 1: Networking APIs--Sockets and XTI by W. Richard Stevens, copyright 1990. (Figure reproduced by permission of Prentice-Hall, Inc., Upper Saddle River, NJ.)
A status of “Close_Wait” should be followed by a server driven event to move to the next state of “Last_Ack”.

Figure 99. TCP/IP States

Figure 100. Output of the Netstat Command Showing Bytes Transferred
Another way to issue a NETSTAT command is as a variation of the D TCPIP command with NETSTAT subcommands. This is easier for operators because it avoids the requirement for a TSO or Telnet session. Figure 101 shows issuing a NETSTAT HOME command from the console or from SDSF.

**Figure 101. Issuing NETSTAT Commands with D TCPIP**

10.2 The onetstat Command from the USS Environment

The onestat command offers the same options for users accessing the system from Telnet or from the USS environment via OMVS; see Figure 102. Refer to OS/390 V2 R7.0 eNetwork CS IP Users Guide, GC31-8514, for more information.

**Figure 102. Output of the USS onestat Command**

10.3 Checking Network Connectivity

When users describe problems with symptoms such as “can’t get connected,” “server not responding,” or “request timed out,” there may be a network problem. If the difficulty is isolated to only one user, then the problem is in the client’s machine or in their local network environment. If many users report problems, the investigation should begin from the server and go out to the network. Mail routing problems may be an indication of network problems between servers.

10.3.1 Using PING

When a user reports no connectivity or a loss of connectivity to the Domino server, the first test is for the end user to issue a ping command pointing to the host in question by numeric IP address from an MS-DOS or PC session.
The specific options used in this example are to send a 1024-byte test frame 100 times; see Figure 103. If the number of bytes returned is seen to decrease during this test, it is an indication of a network congestion problem. This approach cannot be used from the server because the bytes returned by the target are not shown, as can be seen in Figure 105.

Figure 103. Ping from the Client

If this test succeeds, try to ping the remote client from the server. First obtain the TCP/IP address of the client machine by having the user issue the appropriate command for their system. For example, from Windows NT issue `ipconfig`, as shown in Figure 104.

Figure 104. Results of ipconfig Command from Windows NT Client

From the server, the network help desk can issue an `oping` command from a Telnet or OMVS session. Oping is the USS version of the ping command. Figure 105 on page 183 shows options to perform the command eight times with 256-byte packets.

Figure 105. Results of oping Command from Server
Success with the oping command verifies that a path to the client is clear and that you can communicate with IP through network routers. At this point we suggest having the workstation ping its own numeric IP address. If this test fails, TCP/IP is not properly configured on the client's machine and needs to be fixed.

If the response times displayed in the oping command are not consistent, the network may be congested.

Next the server should oping itself using its own Fully Qualified Domain Name (FQDN) to verify it has been added to the network correctly. Next the client workstation should ping the server using the FQDN. If either test fails, the network support group needs to correct the setup.

The final two verifications of the TCP/IP and DNS setup are first, to ping the server from itself using the DNS alias name, such as DOMINO4, and second, to ping the server from the workstation the same way. Failures here should be referred to the network support group. We recommend that the server host alias names should be the same as the Domino Notes server names.

### 10.3.2 Resolving ping and oping Command Problems

The following information is taken from *IBM OS/390 V2R7.0 eNetwork CS IP User's Guide*, GC31-8514.

A host may fail to respond even after several ping/oping commands for any of the following reasons:

- The host is not listening to the network.
- The host is inoperative, or some network or gateway leading from the user to the host is inoperative.
- The host is slow because of activity.
- The packet is too large for the host.

The echo request sent by the ping/oping command does not guarantee delivery. More than one ping/oping command should be sent before you assume that a communication failure has occurred.

Use additional ping/oping commands to communicate with other hosts in the network to determine the condition that is causing the communication failure. However, you should know the network topology to determine the location of the failure.

Issue the ping/oping commands in the following order until the failure is located.

1. Send a ping/oping command to your local host. A successful ping/oping command sent to a different host on the same network as the original host suggests that the original host is down, or is not listening to the network.

2. Send a ping/oping command to a host other than your local host on your local network.

3. Send a ping/oping command to each intermediate node that leads from your local host to the remote host, starting with the node closest to your local host.
If you cannot get echoes from any host on that network, the trouble is usually somewhere along the path to the remote hosts.

Direct a ping/oping command to the gateway leading to the network in question. If the ping/oping command fails, continue to test along the network from the target until you find the point of the communication breakdown.

### 10.4 Network Name Resolution Problems

TCP/IP name resolution problems are commonly reported by messages such as Notes server is not a known host or Server not responding.

Refer to Figure 6 on page 14 for an overview of how Domino resolves names.

If you are using a hosts file, check for illegal characters. Make sure there are no illegal characters such as a space or a letter in the numeric IP address. Each section of the dotted decimal numeric IP address is no longer than three numbers and there are four sections to an address such as 8.33.2.229.

Make sure there are no illegal characters in the Names Fields. Only alphabetic characters, numbers and dashes should appear. Spaces and underscores are not allowed according to DNS standards.

In most UNIX systems, you must make sure there is only one correctly named hosts file in use. Rename any other hosts files. In an OS/390 environment, the search order is more complex. For OS/390 servers, the TCPIP.DAT search order is as follows:

1. The MVS data set or HFS file that is identified in an environment variable called RESOLVER_CONFIG
2. /etc/resolv.conf
3. //SYSTCPD DD DSN=ddd.eee.fff(anyname). The //SYSTCPD DD card can be specified in TCPIPROC JCL
4. jobname.TCPIP.DAT
5. SYS1.TCPPARMS(TCPDATA)
6. hlq.TCPIP.DAT

You should verify that you are using only one of the above sources for the configuration data to avoid confusion. To determine if the correct file is being used by TCP/IP, run a TSO HOMETEST command.

Check for any changes made to the hosts file recently and confirm that the information in the hosts file is correct. All the target machines that a computer may contact must be defined in the local hosts file.

Once you’ve verified everything and you want to see whether DNS is working, you can use the TSO NSLOOKUP command or the USS onslookup command to establish accessibility of name servers. In some cases the IBM Support Center may request a customer to uncomment the TRACE RESOLVER statement in the TCPIP.DAT in order to collect messages generated by queries to and from the name server.
Figure 106 below shows an onsllookup command issued by a UNIX Systems Services user.

```
JDANDER @ SO63:/>onsllookup domino4.itso.ibm.com
Server: itsodns.itso.ibm.com
Address: 9.12.2.7
Name: wtsc63oe.itso.ibm.com
Address: 9.12.2.35
Aliases: domino4.itso.ibm.com
```

Figure 106. Name Server Lookup - onsllookup

The NSLOOKUP command has the equivalent function for a TSO user and is shown in Figure 107.

```
nslookup domino4
Server: itsodns.itso.ibm.com
Address: 9.12.14.7
Name: wtsc63oe.itso.ibm.com
Address: 9.12.2.35
Aliases: domino4.ITSO.IBM.COM
```

Figure 107. TSO NSLOOKUP Command

On our test system, the DNS did not have an entry for WTSC63.ITSO.IBM.COM so the HOMETEST command issued the error message seen in Figure 108. The first error message regarding the SYSFTPD file was erroneous and a PTF was installed fix the problem.

```
hometest
Running IBM MVS TCP/IP CS V2R7 TCP/IP Configuration Tester

The TCP/IP system parameter file used will be SYSTCPD DD.
Syntax or other errors found in SYSFTPD DD file, continuing.
See Line 1 on or before column 8
The FTP configuration parameter file used will be SYSFTPD DD.

TCP Host Name is: WTSC63.ITSO.IBM.COM

Using Name Server to Resolve WTSC63.ITSO.IBM.COM
Error: Found no IP addresses corresponding to TCP Host Name: WTSC63.ITSO.IBM.COM

* * * Hometest failed - configuration error * * *
Please correct your TCP/IP configuration and run this program again.
```

Figure 108. Confirming TCP/IP Source of Names Information with hometest

From the Domino point of view, to verify that the Domino server has the correct names configured, check the server document in the public Notes Name and Address Book (now called the Domino directory). Make sure the Domino server’s common name in the TCP port’s Net Address Field is the same as the TCP host name. If this is not the case, a name resolution alias is required in either the HOSTS file or in the DNS table.
If changes are required to the NAB server document, restart the Domino server and verify that the changes have taken effect.

In Figure 109, we had defined an alias in the DNS because the Domino server’s common name was not the same as the TCP host name. Our host name as defined in TCPDATA was DOMINO1 while the Domino common name was WTSC67OE.ITSO.IBM.COM.

Some Notes client name resolution errors occur because a server has been moved and the client is resolving the name using out-of-date information cached in hidden fields within their local location document. The error is reported with message Not a known TCP/IP Host.

The hidden fields are in the location document referred to as the Notes Name Server Cache (NNSC) and they provide fast execution using the Notes Named Network (NNN) that the client and server share.

To force the client to resolve the name to a new address, you can do one of the following:

- Change the client NOTES.INI and restart the client. The setting to change is `Dont_Use_Remembered_Addresses=1`. Reverse the setting after successfully resolving to the correct address.
- Create a new location document. This will not have the incorrect address in the hidden fields.

Figure 109. Domino Server Document and DNS Names
10.5 Tracing Routes with TRACERT and OTRACERT

Tracing a route through the network can be done by using the otracert command from an OS/390 USS session as shown in Figure 110 on page 188. The path taken from this server went through five hops, starting with the gateway at 9.12.2.75. Performance problems can be introduced by network configuration changes made without the awareness of the Domino administrator.

```
JDANDER @ SG03:/> otracert pdemier.pok.ibm.com
Traceroute to pdemier.pok.ibm.com (9.117.130.57).
Use escape C sequence to interrupt
1 9.12.2.75 (9.12.2.75) 5 ms 5 ms 5 ms
2 9.32.41.41 (9.32.41.41) 8 ms 8 ms 8 ms
3 cmpnpok2.mpn.ibm.com (9.32.44.3) 10 ms 7 ms 16 ms
4 9.32.236.138 (9.32.236.138) 13 ms 7 ms 7 ms
5 pok707-2.pok.ibm.com (9.117.1.12) 9 ms 23 ms 16 ms
```

Figure 110. Tracing Route through TCP/IP Network with OTRACERT Command

From the client end, network routing is traced with the tracert command, as shown in Figure 111, a sample from a Windows NT workstation. This helped us understand the slow response time we were experiencing.

```
C:\> tracert d03nm013
Tracing route to d03nm013h.boulder.ibm.com [9.99.140.27] over a maximum of 30 hops:
  1 <10 ms <10 ms <10 ms 9.12.2.75
  2 <10 ms <10 ms <10 ms 9.32.41.41
  3 <10 ms <10 ms <10 ms cmpnpok2.mpn.ibm.com [9.32.44.3]
  4 40 ms 40 ms 50 ms 9.32.1.82
  5 40 ms 40 ms 50 ms 9.97.62.4
  6 40 ms 40 ms 50 ms d03ca017f.boulder.ibm.com [9.99.87.116]
  7 40 ms 40 ms 50 ms d03nm013h.boulder.ibm.com [9.99.140.27]
Trace complete.
```

Figure 111. Tracing the Network Route from a Windows NT Workstation

10.6 Domino Administrative Client Displays

The Administrative Client provides the Domino server’s point of view of who is connected and what resources are used. Figure 112 on page 189 shows the results of the following commands:

- show port tcpip - shows current sessions on the port
- show users debug - displays authenticated users and their associated TCP/IP connection
- show dbs - shows database stats, number of file descriptors, maximum waiters, current waiters, and more
These commands are all standard Domino operator commands and could have been entered from a Telnet user with the DOMCON domoe command or from a TSO session with DOMINC.

This information helps the administrator validate network data. TCP/IP configurations can be compared to other display commands such as onetstat. A user’s logon status can be verified when troubleshooting a connectivity issue.

![Figure 112. Administrative Client - “sh port tcpip”, “sh user debug”, and “sh dbs”](image)

10.7 Notes Trace Connection from Client

A Notes user can trace the connection to the Domino server from the Notes desktop. This verifies that a complete TCP/IP connection can be made using the symbolic names of the Domino server. This is a good test for the Help Desk to request when a user cannot access a server.

As shown in Figure 113 on page 190, to perform this connection trace, the user clicks **File -> Preferences -> User Preferences -> Ports -> Trace**. The user can select from a pull-down list of servers that the client has accessed.
### 10.8 NotesConnect Diagnostic Aid

NotesCONNECT or NPing - Ping only uses IP/ICMP protocol to test the connection; there is no application-specific protocol or data exchanged during the connection. An extension to ping called NotesCONNECT is available to IBMers and Lotus employees from the Lotus Support Information Management (SIMS) database. Refer to document number 2755. NPING is supported on both Windows NT and Windows 95/98. Both a graphical interface and a command line version of the tool is available.

Nping is a TCP/IP diagnostic tool designed to verify that an end-to-end TCP/IP connection can be established without using the Domino Notes Address Book (NAB) or Notes address resolution logic. Nping establishes the connection with TCP/IP rather than IP/ICMP, which ping uses. There is no application-specific protocol or data exchanged during the nping test; it simply connects and disconnects. This permits the tool to go into the Notes TCP/IP Interface (NTI) layer.

For the example shown in Figure 114 on page 191, nping was started without any parameters, so the GUI interface prompted the user for the information. The address or DNS name of the target server is specified, the number of times to perform the test is selected with a slider bar, and the specific service is selected from a drop-down menu. The results of the test appear in the message box.
10.9 Mail Probes and the ISpy Administrative Tool

ISpy is a tool for creating a mail probe as well as testing and gathering statistics on mail routes. To test a mail route, ISpy sends a mail-trace message to the mail server of an individual you specify. The probe generates a statistic that indicates the time it took to deliver the message. If the probe fails, the statistic has the value of -1.

Mail probes provide a proactive problem determination tool which allows the Notes administrator to become aware of a problem before receiving phone calls from unhappy users.

If the Collect task is running, the Statistics database (STATREP.NSF) stores the mail probe statistics. In addition, ISpy generates events for probes that fail. You can set up an Event Notification document to notify you when an event has occurred. By default, ISpy monitors the local mail server. To monitor other Domino mail servers, you must create probe documents.

These instructions for creating a mail probe are taken from the online help reference for the systems administrator and can be found by searching on ISPY.

1. Make sure that you started the ISpy task on the server.
2. From the Domino Administrator, click the Configuration tab.
3. Click Statistics & Events -> Probes -> Mail.
4. Click New Mail Probe.
5. Click the Basics tab and complete these fields.
Note: Do not select "All Domino servers in the domain will probe themselves."

<table>
<thead>
<tr>
<th>Field</th>
<th>Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probing servers (source)</td>
<td>Enter the server you want the probe to start from, or select the server from the drop-down box.</td>
</tr>
<tr>
<td>Target mail address (destination)</td>
<td>Enter the mail recipient for which you want to check the mail route, or use the drop-down box to select a recipient from a Domino Directory or Address Book. Do not enter more than one individual and do not enter a group name.</td>
</tr>
</tbody>
</table>

6. Click the **Probe** tab and complete these fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send interval</td>
<td>Enter the probe interval. This is the frequency at which probes will be sent.</td>
</tr>
<tr>
<td>Time out threshold</td>
<td>Enter the time out threshold. This is the period the probing server (source) will wait for a response before logging a failure.</td>
</tr>
</tbody>
</table>

7. Click the **Other** tab, complete these fields, and then click **OK**.

<table>
<thead>
<tr>
<th>Field</th>
<th>Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event</td>
<td>Select the severity of the event you want to be generated if the probe fails.</td>
</tr>
<tr>
<td>Create a new notification profile for this event.</td>
<td>You can set up notification for a custom event. If you click this button, you will be guided through the process by the Event Notification Wizard. (Note - This option did not appear to be available on our test system.)</td>
</tr>
<tr>
<td>Enablement</td>
<td>Select the &quot;Disable the probe&quot; field if you want to disable this probe. You can re-enable it at any time.</td>
</tr>
</tbody>
</table>

You must start the ISpy task before you can create server and mail probes. From the administrative interface, clicking the **TASK** twistie and then **Start Task** will bring up this list of startable tasks. This is shown in Figure 115 on page 193. The ISpy tasks will use Java, so be sure that the server is pointing to the correct libraries.
The administrative interface is easy to use and uses pull-down menus throughout so you do not have to remember cryptic names or definitions; see Figure 116. The instructions from the Administrative help documentation matches the screens accurately.
10.10 Component Trace for TCP/IP

For difficult communications problems, the Support Center may request a Component Trace for TCP/IP. The following example comes from an actual problem management record where Domino mail routing was not occurring between servers in a configuration involving Virtual IP Addressing (VIPA). The external writer records the CTRACE data to a data set.

Here are instructions for gathering the Ctrace:

1) TRACE CT,WRSTRT=Cttcp (starts the writer for ctrace)
2) Start CTRACE
   
   TRACE CT,ON,COMP=SYSTCPIP,SUB=(tcpipproc)
   R xx,JOBNAME=(tcpipproc, JOB1, Lotusjobname)
   ,OPTIONS=(INTERNET, PFS, SOCKET, TCP)
   ,WTR=Cttcp, END

   where tcpipproc is the jobname of the TCPIP stack
   where Lotusjobname is each Lotus jobname that needs to be traced
   where JOB1 is the name of the job which is pulling information from
   server (such as an SMTP job).

** Recreate Failure *****

3) TRACE CT,OFF,COMP=SYSTCPIP,SUB=(tcpipproc) (Turn off Ctrace)
4) TRACE CT,WRSTOP=Cttcp

Here is a sample JCL for the External Writer:

```
//CTTCP PROC
//*
//CTTCP EXEC PGM=ITTTRCWR
//SYSPRINT DD SYSOUT=A
//TRCOUT01 DD DSN=TCPIP.TRACEBUF.DATA,UNIT=3390,
// VOL=SER=D83SP2,
// SPACE=(CYL,(400),,CONTIG),DISP=(,CATLG)
```

**Figure 117. CTRACE for TCP/IP**

When requesting an OS/390 system dump for a TCP/IP problem, be sure to request the TCP/IP data space in the operator responses to dump processing or in the IEADMCxx member of PARMLIB.

DSPNAME='TCPIP'.TCPIPDS1
Chapter 11. Real Case Studies

This chapter provides some examples of problem determination from real-world production situations, including customers and IBMers who are running Domino servers on OS/390.

11.1 Case: Improper Java Environment Setup

In this situation, the server went into a state of panic because it did not find the libjava.a module.

11.1.1 Summary

Environment: OS390 2.7; Domino for S/390 5.0a.

We could correlate the need for this module with a command sent to run a Java agent named ISpy.

The Notes.Log at the startup confirmed that the Java environment was not set up properly and that the Java Virtual machine could not run. We corrected the Java environment to clear the message about Java at startup time. We were then able to run ISpy successfully.

11.1.2 Details

Problem symptom: The server crashed with a panic error.

- Figure 118 shows the Notes.Log at startup time.

```
Lotus Domino (r) Server, Release 5.0a (Intl), 14 June 1999
Copyright (c) 1985-1999, Lotus Development Corporation, All Rights Reserved

Performing consistency check on log.nsf...
Releasing unused storage in database log.nsf...
08/10/99 08:32:50 AM Begin scan of databases to be consistency checked
08/10/99 08:32:57 AM End scan of databases: 13 found
08/10/99 08:32:57 AM Region size is 2015342592 (< 2G)
08/10/99 08:32:57 AM Performing consistency check on admin4.nsf...

08/10/99 08:32:59 AM An Adminp request has been submitted to update port information in the server document
08/10/99 08:33:04 AM Mail Router started for domain ITSO2
08/10/99 08:33:04 AM Router: Internet SMTP host wtsc63oe in domain itso.ibm.com
08/10/99 08:33:08 AM Database Replicator started
08/10/99 08:33:13 AM Index update process started
08/10/99 08:33:19 AM Agent Manager started
08/10/99 08:33:25 AM JVM: The JVM runtime library could not be found.
08/10/99 08:33:25 AM JVM: Java Virtual Machine failed to start
08/10/99 08:33:25 AM AMgr: Executive '1' started
08/10/99 08:33:25 AM tot105/Itso2 is the Administration Server of the Domino
```

* Figure 118. Log at Startup Time

- Figure 119 on page 196 shows the Notes.Log at the time of panic.
11.2 Case: Relating a Performance Problem to a Domino Task

In this case, the performance problem was caused by a Domino task and an architecture problem. This case illustrates how using RMF can help you to understand a performance issue.

11.2.1 Summary

Environment: OS390 2.6; Domino for S/390 4.61, 5 partitioned servers.

Performance of Domino on S/390 was perceived as a problem. The customer was concerned that Domino was using 60% of an IBM Multiprise 2003 model 224 (47 MIPS), even though there were only one or two users on the system.

The customer was running 5 Domino partitions to serve various EMEA countries with different languages.

The performance study proved that the SMTPMTA was using more CPU than any other task. In addition, there was a design problem. The customer had defined one SMTPMTA task per partitioned server. But Lotus advises using a single SMTPMTA per Notes Named Domain.

11.2.2 Details

A meeting was held with the customer to discuss the problem.

11.2.2.1 RMF measurements

RMF measurements were taken and produced the results shown in Table 35 on page 197. During our tests, we turned off various Domino server tasks and were able to see the effect on the CPU use. These are the results that we recorded during the visit. The values shown are in thousands of CPU service units, reported for each server for each time interval (start time shown). Except where noted, all the servers ran identical server tasks including POP3, SMTP, and HTTP.
11.2.2.2 Summary of Conclusions

The analysis led to the conclusion that the excessive CPU usage was caused by the SMTPMTA task. Closing down that task reduced the CPU use by 80%. It may have been a bug corrected by software maintenance. The following recommendations were issued:

1. Install all of the PTFs pointed to by the Domino for S/390 Web site. Several new PTFs have been added since March 1999 when this system was built.

2. If that does not address the problem, upgrade Domino to the latest level (Release 4.6.4). Some problems have been reported with their current release (4.6.1) in the HTTP server area, which suggests there may also be problems with SMTP.

3. If the preceding actions do not address the problem, raise a formal incident with IBM.

4. There should be only one SMTPMTA per Notes Named Network. The architecture should be revised to adapt to this requirement. In the meantime, avoid running the SMTPMTA in more than one server at a time to reduce impact on any other workloads on the system.

Note: This recommendation is for this customer only and does not necessarily apply to others. There is no architectural limitation, and each server is capable of running its own SMTPMTA task.

11.2.2.3 Other Recommendations

1. Continue to monitor the Domino for S/390 Web site on a monthly basis and install new PTFs that are identified.
2. During the visit, RMF settings were modified to allow the monitoring of each Domino server individually. Use that capability to identify when the current problem is resolved, and in future monitoring.

3. We checked the UNIX environment variable Notes_SHARED_DPOOLSIZE on their system. It is defined in the member /u/domcon/domino_global_env that DOMCON reads when starting the Domino servers. It was set to 1000000. We changed it to 32000000 as recommended in the redbook SG24-2083 level 01, *Lotus Domino for S/390 Release 4.6: Installation, Customization and Administration*. This will improve performance. (This is valid for Domino 4.6x releases. For Domino R5, we advise using the default value of 8 MB).

4. It is possible for modules to be loaded from the hierarchical file system (HFS) instead of from LPA if either the sticky bits get set off in the HFS or the modules are not correctly loaded into LPA at IPL time. The result would be that modules would be loaded into the many Domino address spaces, significantly increasing storage use on the system and causing performance degradation. It would be difficult to identify that as no error messages would be produced.

To avoid this situation, we recommended that they review the modules loaded into LPA by the PUTINLPA installation job, and replace those modules in the HFS with dummy modules with the sticky bit on. Normally the modules will be loaded from LPA, but if that should not occur, the dummy modules would be loaded instead and a load failure would occur that would identify the problem. The real modules should be copied before replacing them.

5. OS/390 is beginning to show signs of storage constraint. We saw average high UIC numbers of 214 and average expanded storage migration age of 374. These numbers should be monitored as more users are added to the system, as the current storage allocations of 200 MB central storage and 40 MB of expanded storage may not be sufficient.

6. Once they have a significant number of users on the system (more than 100) we can review their use of Domino against the sizing guidelines that were used initially. Be aware that those guidelines are based on Notes client users doing simple E-mail. Other types of workstation client and workload can result in significantly higher processor usage.

### 11.3 Case: Understanding Domino CPU Usage

This case presents a list of steps that were taken to track how much CPU was used by the Domino for S/390 environment. It highlights how RMF reports were used.

#### 11.3.1 Summary

Environment: OS/390 2.5; Domino for S/390 R4.61.

Performance of Domino on S/390 was perceived as a problem. The customer was concerned that Domino was using a lot of CPU on his 9672-R65.

This case presents a way to establish performance figures using OS/390 tools and Domino statistics. As these figures are often used for capacity planning, they should be as relevant and as correct as possible.
11.3.2 Conclusions

The initial analysis shows that Domino’s capacity use on their system is in line with IBM expectations. We recommend that they continue to track this, as described in 11.3.3.5, “Further Validation” on page 200.

Performance of Domino on S/390 was good during the day of the meeting. No performance problems could be identified. As these occur only at certain times, we recommend that they ask the users to tell them when performance is poor and then investigate those time periods.

A demonstration package for group calendaring and scheduling is being run on the S/390 server. It adds a significant load to the server each hour. Since this package does not run on any of their other Domino servers, realistic comparisons can only be made when the package is not running on the S/390 server.

11.3.3 Details

A meeting was held to discuss the performance of Domino on S/390. There were two apparent issues:

1. Domino appeared to be taking more CPU resource than was expected.
2. The performance of Domino on S/390 was not as good as the performance of Domino on other platforms.

11.3.3.1 Domino Resource Use

The numbers provided at the start of the meeting suggested that Domino was using up to 50 MIPS on the 9672-R65 server. With 35 users on the server, this is much greater than IBM capacity sizing would suggest.

11.3.3.2 Capacity Used

When we investigated the numbers we found that what was being measured was the capacity used by the whole Logical Partition (LPAR) in which Domino runs. While Domino is the main workload in that LPAR, other work runs also, including a SAP system. Therefore our first step was to verify the resource use of Domino.

The current system parameters did not differentiate between the different UNIX workloads (they all ran and were reported under performance group 25). We therefore introduced an additional definition into IEAICSA0 to report the Domino workload (identified by the user id UIDJN39) in performance group 225.

We were then able to identify specifically the Domino workload on the processor. For the two-hour period immediately after this change, the utilization of Domino averaged 6.0% of the processor or 18.1 MIPS (assuming the processor has a MIP value of 301). The detailed data is shown in Table 36 on page 202.

However, the utilization data also shows three peak periods where the utilization goes above 10%. This coincides with the running of a group calendar and scheduling package, which builds a summary of calendar data every hour. This uses a lot of processor resource, and the use of such applications is not included in IBM’s standard sizing methodology. The package also does not run on other Domino platforms at the customer. To get a valid comparison the utilization should exclude this package. While we cannot do an exact analysis of this from the data, if we remove the three peak intervals we get an average utilization of 4.5% or 13.5 MIPS.
11.3.3.3 Number of Domino Users
We found 33 user mailboxes in the directory /notesdata/mail/customer on the Domino server on S/390. However Domino statistics, obtained with the show statistics command, showed 54 users connected at 15:36, and a peak of 57 users connected at 11:59. These additional users are using the Domino server on S/390 for databases other than mail.

11.3.3.4 Sizing Estimate
A sizing estimate for 54 active Notes clients, doing mail, calendaring and database access with OS/390 Version 2 Release 5 and Domino Release 4.6.1 suggests that approximately 3% of the 9672-R65 would be used. This is close to the measured value of 4.5%. From the data we analyzed, we believe that the capacity usage experienced by customer is close to what we would expect. However, further validation is recommended.

11.3.3.5 Further Validation
The previous calculation is based on a very limited amount of data during one day. We recommend that they now measure Domino resource use and Domino users on a daily basis (perhaps 8:00 to 18:00 each day) to get a more accurate picture.

In addition they should stop running the Group Calendaring and Scheduling Package, at least for a few days, to get an accurate view of the S/390 server's capabilities. The decision to run the package is one that should be made as a separate exercise based on its functionality and resource use.

We also recommend that they look at the profile of Domino across the day and night, and investigate any peaks that may occur. They should at least understand them. If they are caused by other heavy-use applications or agents, then they should consider when and if they need to run them.

11.3.3.6 Domino Performance
The second issue that we were asked to look at was poor performance of Domino compared to Domino on other platforms. Certain tasks were understood to take longer on S/390.

The first observation was that during the day of the meeting, the performance of Domino for S/390 was excellent. This was confirmed by staff from the customer. As we questioned them it appeared that poor performance only occurs at certain times; one time quoted was after 18:00.

We went through the parameters on their system and did not detect any that would cause poor performance. We also looked at RMF performance reports, both for daytime periods, and for 18:00 to 18:30 one evening. There were no major issues.

Indeed, because performance is often good, it is likely that poor performance is caused by some other factor, such as:

- Running a very large Domino task (such as a Compact or a long-running agent) when users are accessing the system.
- Running other work that uses a lot of system resources and thus slows Domino down. Such contention could occur in the network, in the processor, or in the disk subsystem.
To identify the cause of the poor performance, we recommend that their users record and notify them of any times when performance is poor. They can then investigate those specific times using RMF and Domino statistics.

11.3.3.7 Other Recommendations
The parameters on their system were generally set correctly. However, we did identify some items that could have a negative impact on performance. While there was no evidence of problems in the reports we looked at, we recommend that they address these areas to optimize the performance.

11.3.3.8 PTFs
After checking the status of their system, the system programmer found that a few PTFs were not installed. These should be applied as soon as possible.

11.3.3.9 Multiple Extents in HFS Datasets
At the time of our visit, the HFS data set OMVS.OSA0.NOTES.DATA (which holds the /notesdata directory) was 91% full with 41 extents. The root HFS data set was also in many extents (more than 80, we believe). With multiple extents, every access to these directories can take multiple I/Os, thus degrading performance. These data sets should therefore be reorganized as soon as possible to bring them back to one extent, with room for growth allowed.

They should monitor all HFS datasets regularly and reorganize any that go into multiple extents.

11.3.3.10 ESQA Overflow Into ECSA
The RMF virtual storage activity report showed that ESQA exceeds its maximum size at times, and it then overflows into ECSA. This brings a small performance penalty. Domino uses UNIX shared memory which uses ESQA for control blocks. They should therefore increase the ESQA value, and monitor it as they add Domino users.

11.3.3.11 Performance Settings
The preferred way to run Domino is with Workload Manager goal mode active. This is the easiest way to ensure that Domino gets the resources it needs. They currently run OS/390 in compatibility mode, so we recommend that they migrate to goal mode.

We reviewed the current performance settings in IEAIICSA0 and IEAIIPSA0. These members set the relative priorities for workloads on the OS/390 system. The current settings could allow some other workloads to preempt Domino for processor resources. While there was no evidence of resource shortages in the reports that we analyzed, it may be that occasional workloads could impact Domino. We recommend that you review the following points to check that they fit with your desired system performance:

Started tasks in the ‘HOT SHOT’ performance group 90 run at a higher priority than Domino. If these are CPU-intensive jobs, they could impact Domino.

Batch jobs with jobnames SMFHAAA, R907021N, R907022N, R904189N, and jobs with class J, run in performance group 25 at the same level as Domino. Heavy long-running jobs could impact Domino. Consider whether it is appropriate to reduce the priority of some of these jobs.
All UNIX workloads run under performance group 25. To protect Domino performance, consider whether Domino should run at a higher priority than the other UNIX work.

Particularly consider whether some large workloads, such as a database loads, backups or reorganizations, could run in one of these groups and thus impact Domino. It may be, for example, that occasional large SAP jobs, such as database loads, could impact Domino based on the current priorities defined.

11.3.3.12 Replace Domino Modules in HFS
If the sticky bit on Domino modules in the HFS is turned off for any reason, the modules will be loaded from the HFS rather than from LPA. This will cause a performance degradation, but no error messages will be produced. To make sure that this does not happen, we recommend that they replace modules with sticky bits on in the HFS with dummy modules. Then if the sticky bit gets turned off the dummy will be loaded, which will fail and you will get an error message. Make sure you take a backup copy of the modules first.

11.3.3.13 Calculating Domino’s Capacity Use
Table 36 shows how Domino’s capacity use was calculated based on data of the day of the meeting. The values are expressed in thousands of service units for CPU and SRB.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>LPAR Busy CPU (K)</th>
<th>SRB (K)</th>
<th>PGN=225 CPU (K)</th>
<th>SRB (K)</th>
<th>PGN=225 % of proc</th>
<th>MIPS'</th>
<th>Users</th>
<th>Users/MIPS'</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/25/99</td>
<td>01:30 PM</td>
<td>4.23</td>
<td>861.6</td>
<td>20.6</td>
<td>1586</td>
<td>768.4</td>
<td>1.6</td>
<td>4.8</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>01:40 PM</td>
<td>9.41</td>
<td>5569</td>
<td>31.2</td>
<td>6185</td>
<td>783.8</td>
<td>7.6</td>
<td>22.8</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>01:50 PM</td>
<td>5.52</td>
<td>2168</td>
<td>21.8</td>
<td>2742</td>
<td>753.2</td>
<td>3.5</td>
<td>10.4</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>02:00 PM</td>
<td>13.26</td>
<td>7723</td>
<td>119</td>
<td>8492</td>
<td>1315</td>
<td>10.6</td>
<td>31.9</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>02:10 PM</td>
<td>7.8</td>
<td>3526</td>
<td>28.2</td>
<td>3942</td>
<td>807.2</td>
<td>4.9</td>
<td>14.7</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>02:20 PM</td>
<td>6.98</td>
<td>3286</td>
<td>28.2</td>
<td>3942</td>
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<td>4.9</td>
<td>14.7</td>
<td>50</td>
</tr>
<tr>
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<td>02:30 PM</td>
<td>9.63</td>
<td>4638</td>
<td>36.4</td>
<td>5750</td>
<td>1007</td>
<td>6.7</td>
<td>20.1</td>
<td>50</td>
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<tr>
<td>03/25/99</td>
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<td>7.79</td>
<td>2266</td>
<td>24.4</td>
<td>4240</td>
<td>980.5</td>
<td>3.4</td>
<td>10.3</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>02:50 PM</td>
<td>8</td>
<td>4084</td>
<td>32.7</td>
<td>4684</td>
<td>920.2</td>
<td>5.9</td>
<td>17.7</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>03:00 PM</td>
<td>12.8</td>
<td>7877</td>
<td>82</td>
<td>8510</td>
<td>1072</td>
<td>10.6</td>
<td>32.0</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>03:10 PM</td>
<td>12.38</td>
<td>8118</td>
<td>37.4</td>
<td>8704</td>
<td>830.2</td>
<td>10.6</td>
<td>31.9</td>
<td>50</td>
</tr>
<tr>
<td>03/25/99</td>
<td>03:20 PM</td>
<td>3.94</td>
<td>798.2</td>
<td>14.5</td>
<td>1386</td>
<td>747</td>
<td>1.5</td>
<td>4.5</td>
<td>50</td>
</tr>
</tbody>
</table>

| Excluding 3 peaks | 4.5 | 13.5 | 50 | 3.7 |

These values were collected over a limited time period. We recommend that you monitor Domino’s capacity use on a regular basis. The information comes from the following places:

- LPAR Busy% comes from the RMF CPU Activity Report - LPAR BUSY TIME PERC - TOTAL for the partition. This number is also reported in the RMF
Partition Data Report - PHYSICAL PROCESSORS - TOTAL (last column) for the partition.
- PGN=225 CPU (K) and SRB (K) come from the RMF Workload Activity Report. PGN 225 is the performance group that Domino runs in (see the ICS/IPS members). These fields report CPU usage by Domino.
- PGN=ALL is similar to the PGN=225 fields and is reported at the end of the RMF Workload Activity Report. This records the captured CPU time for all workloads in the LPAR.
- The Domino utilization of the whole processor (Domino% of processor) is: LPAR Busy% * (CPU+SRB for PGN=225)/(CPU+SRB for PGN=ALL)

11.3.3.14 Number of Domino Users
They also need to track the number of connected users on the Domino server. The number of users and transactions is printed to notes.log (not log.nsf) every minute, if show_server_performance=1. This information can also be displayed by the Domino command show statistics. It is recorded in the statistics and reporting database (statrep.nsf). Look at these fields:

Server.Users: This is the number of users with connections to the server at the end of the interval when statistics were collected.

Server.Users.1MinPeak: This is the peak number of users during a one-minute interval since the server started. It is not the peak during this interval. The peak number of users in a five-minute interval is also reported. You are given the date and time these occurred.

11.4 Server Cannot Process New Connections
In this case, leftover threads were causing a server to become overloaded. The case description includes helpful notes.ini values and steps to document performance problems.

11.4.1 Summary
When the server cannot process a new connection from a client or another server, it creates what is called a “hex session.” The connection is started, but the client times out before the connection has completed. This leaves behind the thread that was used to start the connection. The server will eventually clean up the thread, but this may take some time.

11.4.2 Details
There are three main reasons why a connection initialization gets hung up:
1. An abend occurred, causing a process to terminate. This process (or one of its threads) may have held an important resource lock that is now lost. The threads doing the session initializations may be waiting for that resource.
2. The server is not getting enough CPU time. This occurs if the CPU has reached 100%, or there are not enough CPUs assigned to this server. You may also see a lot of paging going on. In this situation, the problem increases because new connections will cause new server processes to be created which will in turn use more CPU and cause more paging.
3. There is a lot of contention on the Domino Directory (nicknamed NAB). For example, one of the important views in the NAB may be getting rebuilt. You
should avoid NAB indexing during the day. There is also some overhead in processing the UNREAD marks in the NAB. You should turn off the recording of unread marks to avoid this problem.

In order to tell if you have hex sessions, issue a SHOW TASKS DEBUG command. If you see a lot of sessions with a hex number instead of a user name, then you have hit the situation called hex sessions.

R4.6.3 included a function to limit the number of hex sessions that can be created. Set the SERVER_MAXSESSIONS notes.ini variable to a number which will be used as the largest number of connected users possible. Note that hex sessions can be a normal occurrence for a busy server, so use a value larger than the number of possible users (we used 1.5 times the number of users of on each server but we did not have any servers with more than 1000 users).

Once the server hits the limit, the user connections will get rejected. The number of users will stay at the peak for a while but as the server recovers, the hex sessions will be freed quickly, allowing more users to come in. This mainly stops new address spaces from being created, which can really slow down the system.

11.4.3 notes.ini Values Which Affect Performance

The following notes.ini values have been found to be very useful in diagnosing most types of server performance problems without degrading performance. A large production mail system runs with these settings. They give a good idea of what is going on with the server.

- \LOG_SESSIONS=1
- \LOG_REPLICATION=1
- \LOG_AGENTMANAGER=1
- AgentManagerVerboseMode=1 (you may want to turn this on only if you are experiencing agent manager problems)
- \LOG_VIEW_EVENTS=1
- \LOG_UPDATE=1
- \LOG_MAILROUTING=20
- SERVER_SHOW_PERFORMANCE=1
- Console_LogLevel=2
- \DEBUG_OUTFILE=DEBUG.TXT (only if you are not already piping the console to the notes.log file)

11.4.4 How to Investigate Performance Problems

Solving these types of problems consists of investigating both Domino and the S/390 operating system.

1. Check the MVS operator console for any abends that may have occurred. Check SYS1.LOGREC for any abends that may not show up on the MVS Operator's console.
2. Check the notesdata directory for CEEDUMPs that may have been taken due to a panic.
3. Run commands which give a good picture of the state of the system. From the USS command prompt, logged on as the root user, issue:

   onetstat >onetstat.output 2>&1 (this will show the network connection status from the TCP/IP point of view.)
   df -kP > df.output 2>&1 (this shows the file system usage.)
From the Domino server console, issue:

- `sh stat` (this shows full server statistics.)
- `sh users debug` (this shows authenticated users and their associated TCP/IP connection.)

From the MVS operator console, issue:

- `D GRS,C` (this shows any latch contention.)
- `D OMVS,A=ALL` (this shows what is going on with USS in general.)
- `D OMVS,O` (this shows current BPXPRM options.)

4. Determine the ASID of the main server task. You can use the `ps` shell command or issue `D OMVS,U=server_userid` from the MVS operator console. Look for the entry that has the following program: `/usr/lpp/lotus/notes/latest/os390/server`. You will find many, but the one to dump is the main server task, which will show up as the parent of all the other server tasks.

5. Start up USS CTRACE in preparation for a dump. If there is any kind of loop or recurring error, then the USS trace might show it.

   - `TRACE CT,2M,COMP=SYSOMVS`  
   - `R XX,OPTIONS=(ALL),END`  

6. Take a dump of the system. This can be a SADUMP but to save time you may gather a SVC dump of the server address space and the USS address space. Use the following command and replies:

   - `DUMP COMM=(description)`  
   - `R xx,SDATA=(ALLNUC,PSA,CSA,LPA,SQA,RGN,SUM,TRT,GRSQ),CONT`  
   - `R xx,JOBNAME=(OMVS),ASID(server_asid),CONT`  
   - `R xx,DSPNAME=('OMVS'.SYSZBPX1,'OMVS'.SYSZBPX2),END`  

7. If you took a SVC dump, then stop the USS trace and gather output from a `nsd.sh` command. To stop the trace issue:

   - `TRACE CT,OFF,COMP=SYSOMVS`

8. To gather `nsd.sh` output, telnet in with the server user ID and cd to the server's notesdata directory. Issue:

   - `/usr/lpp/lotus/bin/tools/diag/nsd.sh`

9. If you see that the Agent Manager (or any other task is hung up or possibly looping), you can try to QUIT that task to see if the server recovers.

10. Terminate the server and clean up as best as possible.

11. Collect the following documentation for transfer to the Support structure:

   - Type and name of dump created
   - nsd.sh log
   - MVS Operator's log
   - SYS1.LOGREC
   - notes.log
   - onetstat and df command output
   - notes.ini

You should also do performance analysis using SMF and any other S/390 tools normally used for analyzing performance.
11.5 Case: Domino Activities Impact on Performance

This case presents the consequences of lack of communication between OS/390 system programmers and Domino administrators.

11.5.1 Summary

Environment: OS390 2.4; Domino for S/390 R4.61

The customer has three Domino partitions.

Performance of Domino on S/390 was perceived as a problem. The customer was concerned that Domino was using a lot of CPU on his 9672-R25 and had only 80 users on the system on a specific day.

11.5.2 Details

The performance issue was raised by the S/390 system programmer. However, he was describing what the usage of the system was supposed to be, not the actual one.

He had a meeting with the Domino administrators and discovered some new facts. The cause of the high CPU use is now understood.

This customer was migrating from a Domino for NT environment to Domino for S/390. The Domino administrator had decided to replicate the Name and Address Book (NAB) of an existing Domino for NT server to one of the Domino servers on S/390, and then to replicate it from there to another server. However, he accidentally replicated it to all three Domino servers on the S/390 at the same time. The result was 100% CPU utilization for 5 hours. The replication of the NAB induces a indexation that is very heavy.

Recommendation: Some of the Domino administrative activities may consume a lot of resources. Interacting with the Directory (Names and Address Book in R4) should be planned carefully.

11.6 Case: Server Cannot Start Because /tmp is Full

Domino Release 5 uses /tmp more extensively than before. You need to take this into account when designing your data structure.

11.6.1 Summary

Environment: OS390 2.7; Domino for S/390 5.0a.

The customer has one Domino partition and uses Notes clients 4.63.

Two days after server startup, users were unable to gain access. New UNIX connections were also unsuccessful. All UNIX users already in the system were unable to execute UNIX System Services commands.

11.6.2 Details

Support tried to connect with telnet sessions. One telnet session was able to reach the server, but unable to execute UNIX commands.
On the OS/390 console, there was an error message pointing out that the root directory was full.

Further investigation indicated that /tmp directory was the directory that was filling the root directory. The customer had followed the default setup that creates HFS /tmp into the root directory.

The solution was to create an independent HFS for /tmp with automount capability of an appropriate value on a separate file system.

11.6.3 More Information About the /tmp Directory

When you have a large number of interactive users, the /tmp directory can sustain large amounts of I/O activity. To counter this situation, there are a couple of approaches you can take:

1. Mount a temporary file system (TFS) over /tmp in the HFS, so that you have a high-speed file system for temporary files. The temporary file system is an in-memory file system that is not written to DASD. As many caches exist in the Domino for S/390 environment, this option has not been considered yet as a potential performance improvement.

2. Place the /tmp directory in its own mountable file system and put the file system on its own pack. This is the option that we have used on our test system.

11.7 Threads Waiting and Sample ps Command

Appendix D, “Example of threads waiting and a ps command” on page 283 shows a real world example where threads have been waiting for three days, and gives some suggestions on how to track down the problem. It also gives an example of some very helpful ps command parameters.

11.8 Case: Message Routing Problem

This customer was able to route messages successfully, except from server to server within their complex. The case includes a process for isolating transmission problems.

11.8.1 Summary

Although the customer could not route messages between servers in a complex, they could route to everywhere outside the complex, and all messages from outside could to routed to anywhere inside the complex.

Upon investigation, a parameter called LINET was discovered in the BPX parameters. This is an older parameter which does not support multiple TCP/IP stacks, which the customer was using in conjunction with the new virtual IP addressing (VIPA) capabilities of TCP/IP. They removed the LINET parameter and the problem was solved.

11.8.2 How to Use the debugroute Parameter

If you have questions about how a routing path is being built, you can set a variable in the notes.ini file:
debugrouter=3

This will display (in the log.nsf file and on the console) how the router is building the tables. From this you can determine the actual path taken.

If you use the ‘set config debugrouter=3’ statement at the Notes console, this variable will take effect immediately. To get information on how the table is being built, quit and reload the router.

11.8.3 How to Trace OS390setup

Here is some information on tracing OS390SETUP, which might be applicable in other situations, not just setup problems.

The job /usr/lpp/lotus/bin/tools/os390setup has two parts. The first part "populates" the directories for notes. The second part does the actual server setup. So, during the pause between the two parts, in another telnet session also using superuser, edit the notes.ini file which has been just created. Add debug statements. Switch back to the session with the second part of os390setup and complete your attempts. Files will be created with a good amount of transport tracing.

Here is a list of the steps for the process just described:

1. Register the second server on an existing server.
2. Run the first part of os390setup using superuser.
3. In another session using superuser, edit the notes.ini and add the following:
   - DEBUG_NTI_ALL=1
   - DEBUG_TCP_SESSION=1
   - DEBUG_NTI_HANDOFF=1
   - DEBUG_TCP_ALL=1
   - DEBUG_OUTFILE=/notesdata/lotus5/debug.txt
4. Complete your process.
5. Collect the debugX.txt.
6. Screen captures or telnet logfiles of the exact responses to the setup questions would also be helpful.

Figure 120 on page 209 is the first of several screens captured during the install/setup of an additional Domino server named ABCLotus5.
Now we use another session to edit the notes.ini using viascii, while logged on as uid=0. At the end of the notes.ini, add the following variables:

```
DEBUG_NTI_ALL=1
DEBUG_TCP_SESSION=1
DEBUG_NTI_HANDOFF=1
DEBUG_TCP_ALL=1
DEBUG_OUTFILE=/notesdata/lotus5/debug.txt
```

Then we continue with the second part, setting up an additional server, where we see the next three screens. Figure 121 on page 210 shows the initial setup questions.
Review of options for setting up the Notes server.

Is this the first Notes server in the organization?: NO
Server name: ABCLotus5
Server to get Domain Address Book from: ABCLotus4
Is the new server's ID supplied in a file?: NO
Time zone: EST
Observe Daylight Savings Time April-October?: YES
Log all replication events?: YES
Log all client session events?: YES
Enter y to accept options or n to change. (y/n, default is y):

Begin setup of the Notes server
Setting default information in preferences file...
Setting Up Additional Notes Server

Figure 121. Setting Up an Additional Domino Server

Figure 122 and Figure 123 show the messages during the setup.

01/09/99 13:25:32.34 [536870947:587268097] cmd_SendDriverMsg:DRIVER_INIT> NTI TCP transport driver version 400h
01/09/99 13:25:32.34 [536870947:587268097] cmd_SendDriverMsg> exit wMsg: 0201h, iError = 0000h
01/09/99 13:25:32.34 [536870947:587268097] cmd_SendDriverMsg> enter hDrvr = 1096 0h, wMsg = 204
01/09/99 13:25:32.34 [536870947:587268097] cmd_SendDriverMsg> exit wMsg: 0204h, iError = 0000h
01/09/99 13:25:32.34 [536870947:587268097] cmd_SendDriverMsg> enter hDrvr = 1096 0h, wMsg = 203
01/09/99 13:25:32.34 [536870947:587268097] cmd_SendDriverMsg> exit wMsg: 0203h, iError = 0000h
01/09/99 13:25:32.34 [536870947:587268097] cmd_open> hEndp: 00010B24h iError = 0000h
01/09/99 13:25:32.34 [536870947:587268097] Tcp_GetCallAddress> TcpTrimNameForDNS = FALSE, Looking up: ABCLotus4
01/09/99 13:25:32.56 [536870947:587268097] TCPEndp_GetHostByNames> exit dwNtvErr = 0000h
01/09/99 13:25:32.56 [536870947:587268097] cmd_SendPvdrMsg> MAPADDR ABCLotu

Figure 122. Setup Messages
11.8.4 TCP/IP CTRACE

Here are instructions for gathering a CTRACE for TCP/IP.

1. Start the writer for ctrace by issuing `TRACE CT, WTRSTART=Cttcp`

2. Start CTRACE and enter the parameters in the reply:

   TRACE CT, ON, COMP=SYSTCPIP, SUB=(tcpipproc)
   R xx, JOBNAME=(tcpipproc, ROB1, Lotusjobname)
   , OPTIONS=(INTERNET, PFS, SOCKET, TCP)
   , WTR=Cttcp, END

   where tcpipproc is the jobname of the TCP/IP stack
   where Lotusjobname is each Lotus jobname that needs to be traced
   where ROB1 is the name of the job which is pulling information from server

3. Recreate the problem.

4. To turn off Ctrace, issue:

   TRACE CT, OFF, COMP=SYSTCPIP, SUB=(tcpipproc)

5. To turn off the write, issue: `TRACE CT, WTRSTOP=Cttcp`

---

**Figure 123. Setup Messages (continued)**
Following is sample JCL for the external writer; alter this as appropriate for your environment.

```bash
//CTTCP PROC
/*
//CTTCP EXEC PGM=ITTTTRCWR
//SYSPRINT DD SYSOUT=A
//TRCOUT01 DD DSN=TCPIP.TRACEBUF.DATA,UNIT=3390,
// VOL=SER=D83SP2,
// SPACE=(CYL,(400),,CONTIG),DISP=(,CATLG)
```

The key is the storage allocation for the data set, which will wrap. Depending on how long it takes to recreate the error, increase the data set size accordingly.

You could consider creating a dump of TCP/IP after the error. Use these sdata parameters when taking the dump:

```
SDATA=(ALLNUC, CSA, LPA, LSQA, RGN, SWA, SQA, TRT)
```

To dump the TCP/IP dataspace, issue:

```
DSPNAME='TCPIP'.TCPIPDS1
```

### 11.8.5 Tracing SMTP/MTA

Here are two trace scenarios for capturing SMTP message transfer agent (MTA) data. To avoid affecting the production traffic, create a new foreign SMTP document named "abcnet" with abc.ca instead of ".*" and a connection doc from SMTP server to abcnet. Only the sends to abc.ca should be routed to the 390 MTA.

#### 11.8.5.1 Test One

1. Make sure “host name mapping” in the MTA subform server document, is set to “dynamic then local”.
2. Stop the SMTP server.
3. Set trace in SMTPMTA trace level to 0X000000AA and set log to verbose in the SMTP server document - MTA subform.
5. Start the server and MTA. Let it start all the way until it becomes idle.
6. Sent one note to an Internet user.
7. Stop the SMTP MTA.
8. Stop the server.

#### 11.8.5.2 Test Two

Do the following:

1. Create an entry in the host file (etc) for ican.ca with the address of the main mail MTA for the domain (smtp.accglobal.net = 204.92.55.106).
2. Set “host name mapping” in the MTA subform of the server document to local. Replicate to the SMTP server’s names.nsf.
3. Stop the server and rename log.nsf, then start the server again.
4. Send to a user in ican.ca.
5. Stop the server.
6. Then ftp and zip log.nsf into log2.zip.
7. Create a new copy of names.nsf from the SMTP server with documents and design. Delete all user docs except the sender. Compact and zip into names.zip.

Send the following to the support center: log1.zip, log2.zip and names.zip.

11.9 Case: Migration Problem

This case deals with a migration problem. It shows that the error messages that come with CEE messages can point to useful information.

11.9.1 Summary

Environment: OS390 2.7; Domino for S/390 5.0a.

The customer is migrating from Domino Release 4.63 servers. He is at the same time consolidating three Domino servers into a single one. This creates the need to move some HFS files containing mail files. When launching the Domino R5 server, the mail databases cannot be accessed.

By looking at the OS/390 console and reading the CEEDUMP messages, the Domino administrator understands that the problem is related to file authorization. He changes the permission bits of the mail files and solves the problem.

11.9.2 Details

Figure 124 shows a copy of the log with the error messages.


It showed the following explanation for the errno and errno2 values:

- **Return Code**: 128 0080 ENODEV No such device exists.
- **Reason Code**: the first 4 digits are an indication of the source of the error. The last 4 digits are a more detailed explanation.

0119 JRNotSupportedForFileType
The requested service is not supported for this file type.
Action: Reissue the request, specifying a file of the correct type for the request.

---

Figure 124. OS/390 Log Messages
The customer modified the authorization settings of the mail databases and could then start the server with no problems.

11.10 Case: Compact Problem

This case deals with a Domino code problem during a compact operation. It shows that the process of problem isolation and reporting can be of immediate benefit. Anyone experiencing this problem should check with the Support Center and receive the current workaround.

11.10.1 Summary

Environment: OS390 2.7; Domino for S/390 4.6; Notes R5 Admin client

The customer is running a Domino Release 4.6 server with an R5 Administration client. While running a compact job using the server administration panel, the compact job will issue the command using a backslash. This produces the error File does not exist in the Notes log. Even though the file does exist, it cannot be located since the backslash issued by the R5 Admin client on Windows NT did not convert the slash to function on a UNIX server.

11.10.2 Solution

This has been fixed in Domino server 5.0.1. Currently, the workaround is to enter the Compact command using the correct slash at the remote or server console.

11.11 Case: Test Platform as Debug Tool

It is always desirable to have a test machine to aid in problem determination. In this case, the customer had an AIX test machine on which they could recreate the same bad database they found on their OS/390 platform.

11.11.1 Summary

The customer ran a trace comparison between a bad database on S/390 and the same bad database on AIX (both under load to provide a fair comparison). It would also be helpful to do this comparison for a good database, too.

The server notes.ini variables required to produce the level of detail required are the "Set 1" list as documented in 11.11.2.1, "Variables to set" on page 215. This provided a NETIO timing comparison between platforms to see if there is something platform-specific about this problem.

11.11.2 Preparation

To recreate the problem on the test machine, we list the notes.ini variables to set to gather more information. Make a few runs, turning on different notes.ini variables for each one, to ensure that all the information is collected without overloading the server. Otherwise it would have too many things to collect at once and possibly you would not get anything.

Start the server from the background in a telnet session:

```
cd /notesdata
/usr/lpp/lotus/bin/tools/rc.notes
```
This will create a notes.log file plus a notes.input file. The notes.input file will be used to pipe commands to the server.

cd /noteslog

To issue a command:

echo command >> notes.input

where command is the command you are issuing.

Make the test run with both a bad and a good database. The variable settings are listed in the following section:

11.11.2.1 Variables to set

Ini Variables -- Set 1:

LOG_UPDATE=2
LOG_VIEW_EVENTS=1
SERVER_SHOW_PERFORMANCE=1
DEBUG_THREADID=1
SERVER_CLOCK=1

Ini Variables -- Set 2:

DEBUG_GROUP_CACHE=1
DEBUG_NIF=1
DEBUG_NIFCALLS=1
DEBUG_NIF_INDEX=1
DEBUG_NIF_POOL=1
DEBUG_NIF_READ=1
DEBUG_NIF_STATS=1
DEBUG_NIF_TEST=1

These will show up in the log.

11.11.3 Instructions for the Test Run

1. Start the server in the background (see the instructions in 11.11.2).
2. Start the server.load.
3. Turn on Ini variables in Set 1 using the set config command.
4. Verify that ini variables have taken effect. Issue the tail notes.log command from the /notesdata/noteslog directory. You should see messages prefixed with thread IDs in brackets.
5. Ini variables Set 1: $Calendar view of bad database.
6. Issue the show stat command (ex. echo show stat >> notes.input).
7. Ini variables Set 1: $Calendar view of good database.
8. Issue the show stat command.
9. Turn on additional Ini variables from Set 2 using set config command.
10. Ini variables Set 1 & 2: $Calendar view of bad database.
11. Issue the show stat command.
12. Ini variables Set 1 & 2: $Calendar view of good database.
13. Issue the show stat command.
14. Turn Server.load off.
15. Issue the show stat command.
17. Issue the show stat command.
18. Ini variables Set 1 & 2: $Calendar view of good database.
19. Issue the show stat command.
11.12 What to Do When Your Server Hangs

To document a server hang situation, do the following:

1. Check the MVS Operator's console for any abends that may have occurred.
2. Check the notesdata directory for CEEDUMPs that may have been taken due to a panic.
3. Run commands which give a good picture of the state of the system. From the USS command prompt, logged on as the root user, issue:

   onetstat >onetstat.output 2>&1 (this shows the network connection status from the TCP/IP point of view)
   ps -A -o THREAD -o xstid,wtime,semnum,semval,lsyscall -o pid,xasid,atime,state,ruser,comm >ps.out 2>&1
   (this tells the state of each thread in all processes, plus semaphore usage, CPU time) Note: some of these options work only on OS/390 2.7 and later.
   df -kP > df.output 2>&1 (this shows the file system usage)

   From the Domino server console, issue:
   sh port tcpip (this shows current sessions on the port from Domino point of view)
   sh dbs (this shows db stats, # fd, max waiters, current waiters)
   sh stat (this shows full server statistics)
   sh users debug (this shows authenticated users and their associated tcpip connection)

   From the MVS Operator's console, issue:
   D GRS,C (this shows any latch contention)
   D OMVS,A=ALL (this shows what is going on with USS in general)
   D OMVS,O (this shows current BPXPRM options)

4. Determine the ASID of the main server task; you can use the ps output from above. Look for the entry that has the following at the end of the line:

   XXXXXX /usr/lpp/lotus/notes/latest/os390/server

   where XXXXXX is the user ID of the server. This line should also have the ASID value (note that it is in hex, which is what the DUMP command uses).

5. Start up USS CTRACE in preparation for a dump. If there is a loop or recurring error, then the USS trace might show it.

   TRACE CT,2M,COMP=SYSOMVS
   R XX,OPTIONS=(ALL),OMVS

6. Take a dump of the system. This can be an SADUMP, but to save time you may gather an SVC dump of the server address space and the USS address space. Use the following command and replies:

   DUMP COMM=(description)
   R xx,SDATA=(ALLNUC,PSA,CSA,LPA,SQA,RGN,SUM,TRT,GRSQ),CONT
   R xx,JOBNAME=(OMVS),ASID(server_asid),CONT
   R xx,DSPNAME=('OMVS'.SYSZBPX1,'OMVS'.SYSZBPX2,HFSDSP01),END

Send the notes.log and log.nsf to the Support Center.
7. If you took a SVC dump, then stop the USS trace and gather output from a nsd.sh command. To stop the trace, issue:

```
TRACE CT,OFF,COMP=SYSOMVS
```

To gather nsd.sh output, telnet in with the server user ID and cd to the server's notesdata directory. Issue:

```
/usr/lpp/lotus/bin/tools/diag/nsd.sh
```

8. Terminate the server and clean up. If all resources cannot be cleaned up, then an IPL may be necessary.

9. Collect the following documentation for transfer to the Support Center:

   - Type and name of dump created.
   - MVS operator's log
   - notes.log (see note below about DEBUG_OUTFILE)
   - onetstat.output
   - ps.output
   - df.output
   - notes.ini

The following notes.ini values are useful in diagnosing most types of server problems without a significant impact on performance. We recommend that you run with these settings on.

```
LOG_SESSIONS=1
LOG_REPLICATION=1
LOG_AGENTMANAGER=1
AgentManagerVerboseMode=1 (you may want to turn this on only if you are experiencing agent manager problems)
LOG_VIEW_EVENTS=1
LOG_UPDATE=1
LOG_MAILROUTING=20
SERVER_SHOW_PERFORMANCE=1
Console_LogLevel=2
DEBUG_OUTFILE=DEBUG.TXT (only if you are not already piping the console to the notes.log file)
```

11.13 Domino for S/390 5.0a Install and Setup Problems

Following are more problems and messages that have been encountered when running the install and setup of a Domino for S/390 Server.

11.13.1 CEE3250C: The System or User Abend U034 R=07170458

Message: CEE3250C The system or user abend U034 R=07170458 was issued

More Details: Occurs during httpsetup

Resolution: Disable IEFUSI exit, which limits region size.

11.13.2 Lotus Notes: error 0x107

Message: Lotus Notes: error 0x107

More Details: Occurs during httpsetup.
Resolution: Adjust parameter values in BPXPRMxx (especially those associated with shared memory) to values recommended in the Install Guide.

11.13.3 There is not enough disk space
Message: There is not enough disk space for the program directory at xxxx/yyyy/zzzz.

Or, There is not enough disk space for the data directory at /xxxx/yyyy/zzzz.

More Details: Occurs when running the install script.

Resolution: The install script requires a certain amount of pre-allocated space for the binary and/or data directories. Secondary extents will not work. The job ALOCPROD documents the minimum space allocations required by the installation script.

11.13.4 Lotus Notes: error 0x19e
Message: Lotus Notes: error 0x19e.

More Details: Occurs when running httpsetup.

Resolution: This message indicates that multiple servers with different versions of Domino are running. Verify that there are no other processes active for the server or http. Also, verify that IPCS doesn’t show any shared memory or semaphores from a previous server startup or httpsetup.

This error can also be related to running with Domino binaries (code) from previous releases (in LPA or DLPA). In one case, the error was resolved by changing BPX parameter values to those specified in the Domino Installation Guide.

11.13.5 Document Contained no Data
Message: Document contained no data.

More Details: Appears in browser window during httpsetup.

Resolution: Press the reload button. If this action doesn’t work, press the back arrow button and then the Finished button.

11.14 Domino 5.0a Startup and Execution Problems
This section presents some of the problems and messages that occurred during the startup and run of Domino 5.0a servers.

11.14.1 EDC5129I No such file or directory
Message: EDC5129I No such file or directory.

Server exiting: File cannot be created

More Details: Occurs during server startup.

Resolution: Corrupted notes.ini file; replace it with a good backup.
11.14.2 DNS Resolver Initialization Failed

Message: DNS Resolver Initialization Failed.

More Details: Occurs during server startup.

Resolution: When the server/server document indicates the SMTP listener task is enabled, the router will automatically try to initialize an Internet domain name (DNS) resolver and then load SMTP. If the resolver fails to initialize, this message is generated.

The most likely errors are that there is no /etc/resolv.conf file or it is improperly formatted. Create an /etc/resolv.conf file in the appropriate format (see the Release Notes for Lotus Domino on S/390).

Attention: Editing notes.ini with a PC editor can cause insertion of carriage return characters, which corrupt the file. If corruption occurs using a PC editor, edit the notes.ini file with Domino on S/390 provided utilities, OEDITASCII or VIASCII. The invalid characters may be viewed using OEDITASCII with hex turned on for the edit session; the carriage returns appear as X’0D’ in the last non-blank(X’40’) character on a line.

11.14.3 Java Agent: could not find class java/lang/Threads

Messages: Java Agent: could not find class java/lang/Threads.

More Details: Occurs during server startup.

Resolution: Ensure that all PATH, LIBPATH and CLASSPATH environment variables have been set as described in the Domino Install Guide.

11.14.4 Error Writing SMF records ERRNO=8B ERRNOjr=9210405

Messages: Error Writing SMF records ERRNO=8B ERRNOjr=9210405.

More Details: Occurs periodically while server is running.

Resolution: Give Domino user ID read access to the BPX.SMF facility class.

11.14.5 Hex errno=70, errnojr=b510292 / EDC5112I

Messages: hex errno=70, errnojr=b510292.

OSpthread_create: EDC5112I Resource temporarily unavailable.

Unable to create Server task: Cannot create thread.
More Details: Occurs during startup of a server migrated from R4 to R5 (R4 notes.ini used during server installation).

Resolution: Do not use the R4 notes.ini file for the install. Rename the R4 notes.ini file. Rerun the install script to create a new R5 notes.ini file. Then merge installation-specific parms from the R4 file into the R5 file.

**Note:** SERVER_MAXINITIALTHREADS and SERVER_SECONDARY_THREADS should not be retrofitted into the R5 notes.ini.

### 11.14.6 HTTP Web Server: Too many concurrent formula evaluations

**Messages:** HTTP Web Server: Lotus Notes Exception -- Too many concurrent formula evaluations: please retry.

Freezing all server threads....

PANIC: decimal errno=132/hexadecimal errno2=0

Session closed.

More Details: Occurs during user registration.

Resolution: Remove IEFUSI exit, thus increasing the region size.

### 11.14.7 Error: Unable to generate Notes binary list

**Messages:** INFO: Generating binary list file
/tmpp/nsd.OMVSKERN/nsd_3.2.7_cache.ins.l

ERROR: Unable to generate Notes Binary list.

More Details: Occurs when executing nsd.sh -kill.

Resolution: Copy /samples/magic file to /etc/magic.

### 11.14.8 HTTP Socket bind error

**Messages:** HTTP Socket bind error, hostname/ip aa.bbb.ccc.ddd.

HTTP server: Could not bind port 80. Port may be in use.

HTTP Web Server shutdown.

More Details: Occurs during HTTP startup.

Resolution: If port 80 is not in use by another application, this could be a case where “Bind to host name” is specified as an IP address in the server document. There is a code problem in this area, which will be fixed in R5.01. The workaround is to specify a fully qualified hostname in this field.

### 11.14.9 Socket bind error

**Messages:** Socket bind error (or similar message text).

More Details: Occurs during load of HTTP, IMAP, POP3 or SMTP protocols.
Resolution: The ports statement in the TCP configuration reserves the port for some other job, user ID or started task. Also, low ports may be restricted.

Comment out the port statement or make corrections to its assignment. If low ports are restricted, it is desirable to remove this restriction temporarily for the purposes of testing the server. When the server is known to work, rework the port statement and re-enable the low port restriction.

11.14.10 Server: Listener failure: Restart Server


Suspending listen task for 20 seconds due to network errors.

More Details: Occurs during load of POP3, IMAP, NNTP or LDAP.

Resolution: Change the owner of the bindsock executable to root and turn the setuid bit on.

11.15 Other Domino Problems and Solutions

Here are some other Domino problems and their solutions.

1. Prevent DOMCON (pre-V3) and Domino abends caused by the IEFUSI exit.

   When disabling IEFUSI, you must disable both SYS.IEFUSI and SYSSTC.IEFUSI.

   Note: If you disable OMVS in your SMFPRMxx, you will not go through IEFUSI processing.

   Note: DOMCON V3.0 circumvents the IEFUSI exit problem.

2. Problem caused by having two SMTP servers running.

   A customer has installed Domino R5.0a under OS/390 V2.7. When they start the server, all of the tasks start except for SMTP. It writes these errors to the console:

   Unexpected TCP/IP error func 0004h error Notes: 1C5B NTI 1000h, Stack: 0000006Fh
   Suspending listen task for 20 seconds due to network errors
   SMTP Server: Waiting for all tasks to complete
   SMTP Server: Listener failure: Suspending listen task for 20 seconds due to network error

   This problem occurred when the customer was running SMTP in native TCP/IP and started the SMTP task in Domino. Having both SMTP tasks active was causing port contention. When they disabled the SMTP task in Domino, the problem was fixed.

   SMTP CIServ CreateListenerTask> Listen on Port 25
   SMTP CIServ ListenerTask> Listener task Single-Endpoint) started >Unexpected TCP/IP error func: 0004h error Notes: 1C5B,NTI: 1000h, Stack: 0000006Fh
   SMTP Server: Listener failure: Unexpected TCP error

   Check your TCP/IP.PROFILE data set. In your PORT section you may have reserved port 25 for something other than “OMVS,” which is necessary to allow Domino to bind to port 25.
3. Domino DNS resolver errors symptom.

The following messages were received.

06/08/99 04:13:58 PM Lotus Domino (r) Server started, running Build 166.1.03
06/08/99 04:13:58 PM Performing consistency check on admin4.nsf...
06/08/99 04:14:03 PM An Adminnp request has been submitted to update port information in the server document
06/08/99 04:14:07 PM Router: Message Tracking is enabled
06/08/99 04:14:07 PM Router: Message Tracking using directory
   /notes/notesdata_mprlex1t/mtdata
06/08/99 04:14:07 PM DNS Resolver failed to initialize. DNS resolver error

**Fix:** The Domino resolver is different from the OE resolver or the TCP/IP native resolver. The Domino resolver requires an /etc/resolv.conf file. It does not use the TCPIP RESOLVER_CONFIG value or SYSTCPD. If there is no /etc/resolv.conf, it fails.

**Hint:** /usr/lpp/ezm/tcpip/samples contains /etc/resolv.conf sample on OS/390 2.6.

4. HTTP setup error (Domino V5) Symptom.

When installing Domino R5 for OS/390, the install program ran successfully. However, during server configuration after entering /usr/lpp/lotus/bin/http httpsetup, the following message was displayed:

lotus Notes: error 0x107

We checked our BPXPRM00 settings, which match the installation guide.

**Fix:** The 0x107 error indicates insufficient memory. If you are running httpsetup from TSO OMVS, your TSO region size may be limiting you. Try running the script from a Telnet session (where MAXASSIZE controls the size). Also make sure that an IEFUSI exit is not resetting your size/limit.

**Tip:** /usr/include/errno.h contains meanings of many error codes beginning with “0x.” Also, the error codes which are documented in the Web Connector Install Guide are useful for debugging Domino R5 httpsetup errors.

5. JVM errors at startup.

    JVM: The Java Virtual Machine creation returned an invalid JVM pointer.
    JVM: JVM failed to start.

**Fix:** Check the Domino Release Notes, and the location of Java class and thread libraries on your system. Add them to the DOMCON domino_global_env, and Domino’s .profile or /etc/profile PATH, CLASSPATH, and LIBPATH.

**Example:**

    PATH=$LotusDir:/usr/lpp/lotus/bin/tools:/usr/lpp/java16p/J1.1/bin:/usr/lpp/java16p/J1.1/lib/mvs/native_threads:$PATH
    LIBPATH=/usr/lpp/java16p/J1.1/lib/mvs/native_threads:
    CLASSPATH=/usr/lpp/java16p/J1.1/lib/mvs/native_threads:
    export PATH LIBPATH CLASSPATH

This error can be caused by starting the server from TSO OMVS instead of Telnet (not getting MAXASSIZE storage), or by an IEFUSI exit. We also found that on a system with only 128 MB of storage, we were unable to start a second Notes partition.

7. Domino R5 error running setupweb.

You may receive a series of messages like this:

HTTP Web Server Lotus Notes Exception - too may concurrent formula evaluations; please retry
[setupweb.nsf/WebSetup?OpenForm&Seq=1]
Fatal error signal = 0x0000000b
PID/Server-TID/Kernel-TID-1d000006/e0100006/0b8bfb68
Freezing all server threads
Thread=[486539278:00007-234946566]
PANIC: fatal error signal handler
PANIC:decimal errorno=132/ hexadecimal errno2=0
Session closed

Tip: See APAR II11603, ETR 43552,010,618

Make sure that _CEE_RUNOPTS is set correctly. Also note that HEAPPOOLS and RUNOPTS can be permanently set with usermod CEEDOPT.

8. Domino time not reflecting CPU time.

This problem was caused by not setting the TZ variable correctly in /etc/init.options. You can set this in CEEDOPT. This is a CSECT that contains the default settings for LE run-time options. In addition, you can also place any C environmental variable here using the ENVAR run-time option. LE provides a USERMOD called CEEWDOPT that you can use to change any of the default settings.

By setting this in CEEDOPT (and not in other places), any C application will pick up this environment variable.


The first time we brought our Domino server up, we saw the “unable to connect” problem and everything ran very slowly. We had made several changes to the system:

a. We were using a 100 MB Fast Ethernet connection (new in the environment) and it was connected to a half-duplex router port. It needed to be plugged into a full-duplex router port. This was causing all access on that port to be slow; pings timed out and Telnet sessions were very slow.

There have been cases where the NT servers’ NIC cards could not handle the MTU size for TCP/IP traffic coming from the 390 system. The fix is to lower MTU size in the TCP/IP profile or reconfigure the client to handle a larger MTU. Maintenance must be very current when using OSA cards.

There are also cases of mail routing failures due to packet fragmentation and a router’s inability to handle the fragmentation properly.

b. Our server was falling into a default batch performance group which had an MPL of 6. This caused thrashing and logical swap outs. To fix this problem, we added an OMVS performance group and increased the MPL to 75 for our projected three servers.
Make sure TNF, VMCF, TCP/IP and VTAM are in a high enough group.

10. Problems caused by not cleaning up after server crash.

When launching the HTTPSETUP process we received these errors:

```
CEE3204S The system detected a protection exception
From entry point OSLockReadSem at compile unit offset +00080c22 at address
31C0FA7A
(1) + Done(139) /usr/lpp/lotus/bin/http httpsetup
1543503894 Segmentation violation /usr/lpp/lotus/bin/http
```

**Fix:** The solution to this problem was to clean up the semaphores (ipcrm -s) and the memory (ipcrm -m).

This is the Domino abend we encountered when we shut down the Domino server with the HTTP Server running, and tried to restart the Domino:

```
DOMINO:/notesdatal: >server
CEE3204S The system detected a protection exception.
    From entry point OSLockReadSem at compile unit offset +00000064 at address
78544DC.
/ospanic.c at entry
```

The shell command `ipcs -a` displayed this output:

```
Shared Memory:
 T ID KEY MODE OWNER GROUP CPID LPID
m 171076 0xf8138801 --rw-rw---- DOMINO LOTUSGRP 67108895 67108895
m 171078 0xf8138800 --rw-rw---- DOMINO LOTUSGRP 67108895 419430430
```

**Fix:** Use the ipcrm command to clean up shared memory segments.

11. RACF permission problems.

```
ICH408I USER(DOMINO ) GROUP(WRONG) NAME(DOMINO USER 1
/notesdatal/notes.ini
CL(FSOBJ ) FID(01D67F1C8C6E2001032000000A0000)
INSUFFICIENT AUTHORITY TO OPEN
ACCESS INTENT(R--) ACCESS ALLOWED(GROUP ---)
```

This can be caused by a wrong owner for /notesdata. Use the chown:chgrp command to make Domino the owner and your LOTUSGRP. This is recommended in *Managing Domino from the OS/390 Console*, the DOMCON 3.0. user’s document.
Chapter 12. Automation of Domino Operations

This chapter describes the methods for automating operator tasks. This includes both normal operational tasks and tasks performed in conjunction with problem determination. The benefits of automation include speed of execution, higher application availability levels, and thoroughness in terms of data collection.

Some of the material on message-driven automation was taken from Lotus Domino for S/390 Release 5: Installation, Customization and Administration, SG24-2083 level 02.

12.1 OS/390 Automation Experiences

One large Domino installation used multiple automation tools to integrate the Domino for S/390 into their normal operation. The goal was to automate starting the servers at system initialization, monitor the status of the servers, notify support of a specific abend, and shut the servers down in an orderly manner.

This location runs up to 10 Domino partitions per server and used DOMCON to send Domino messages to the OS/390 system log and consoles. This resulted in a very large number of Domino messages that would fill up the Write to Operator (WTO) console buffers and slow the OS/390 system. Therefore, the installation decided to suppress a large number of messages.

The facilities that were used to implement automation included:

- Message Processing Facility (MPF) of OS/390
- System Automation for OS/390, product 5645-005, which contains the Automated Operator Console (AOC/MVS) component
- Domino Console (DOMCON)

The MPF facility inspects messages and prevents them from being routed to a console, but they are still written to the system log. This MPF entry is placed in SYS1.PARMLIB:

```
WSC/*, AUTO(YES)
```

It suppresses DOMCON messages that begin with “WSC/” and reduce the number of WTO buffer shortages. Note that the default value for suppression is SUP(YES).

The System Automation for OS/390 Message Table searched for errors such as “panics” and invoked a predefined procedure. For performance reasons, the WSC messages were processed first. This is because their message was placed at the top of all the message tables, so that any WSC messages that did not hit this table would exit immediately rather than continue processing through the message table.

By marking the Domino server as started in this procedure, the AOC/MVS console will update the status to green so the operators can verify the servers are up and operational.

```
IF TOKEN(1) = 'WSC/SR'.
    THEN BEGIN;
    *
```
* To mark SRxxNP up per 'Database Server started'

\[
\text{IF TEXT} = \text{.'Database Server started'}. \&
\text{TOKEN}(1) = \text{.'WSC/'SRJOB}
\text{THEN EXEC(CMD('ACTIVMSG UP=YES,MSGTYPE=UP,JOBNAME='SRJOB)}
\text{ROUTE(ONE AUTGSS))};
\]

* To mark SRxxNP down per 'Domino shutdown now complete..

\[
\text{IF TEXT} = \text{.'Domino shutdown now complete..'.} \&
\text{TOKEN}(1) = \text{.'WSC/'SRJOB}
\text{THEN EXEC(CMD('TERMMSG FINAL=YES,JOBNAME='SRJOB)}
\text{ROUTE(ONE AUTGSS))};
\]

***********************************************************************

* To issue NPDA alert if receive any PANIC error messages

* PANIC: LookupHandle: handle out of range
* PANIC ENTRY VALUES: decimal errno=129 / hexadecimal errno2=5620062
* PANIC: fatal error signal handler
* PANIC ENTRY VALUES: decimal errno=0 / hexadecimal errno2=56

\[
\text{IF TEXT} = \text{.'WSC/SR'.} \& \text{TOKEN}(1) = \text{.'WSC/'SRJOB} \& \text{TEXT} = \text{.'MESSAGE}
\& \text{TEXT} = \text{.'PANIC:'}.
\text{THEN EXEC(CMD('DOMPANIC SRJOB' 'MESSAGE) ROUTE(ONE AUTFTP))}
\text{DISPLAY(N) NETLOG(Y) SYSLOG(Y);}
\]

* Exit immediately for all other WSC messages.
\[
\text{IF TOKEN}(1) = \text{.'WSC/SR'}.
\text{THEN DISPLAY(N) NETLOG(N);}
\]

END;

*********************************************************************** Bottom of Data ****************************

Figure 125. System Automation for OS/390 - Message Table Entry

**AOC Policy** - The policy shown in Figure 126 and Figure 127 on page 227 was
defined to automatically start the server using the DOMINS command after IPL.
Testing showed that OMVS was the correct parent to define, because Domino
must have USS services available to initialize. This customer had to define
Domino as a non-MVS job type because there could be multiple address spaces
with the same name, including systems administrators who had user IDs with the
same beginning characters. An administrator logging off could erroneously trigger
a server restart if Domino were handled as a typical MVS address space.
12.2 Message-Driven Automation with NetView

In 8.2, “DOMCON - Domino Console for OS/390 Operators” on page 110, we discussed the DOMCON package that allows the Domino server to be managed from the OS/390 operator console. With the Domino server commands and messages on the OS/390 operator console, we can automate operation of the Domino server using NetView (or an equivalent automation package). We use the NetView message automation facilities. They monitor the console for specified messages and then take action by running an MVS CLIST or REXX file.
We wrote automation for two situations that may occur. You can use these as ideas for your environment. For more information, refer to *NetView Customizing: Using Assembler Version 3*, SC31-8053.

In this example we respond to a task that shuts down, and we use NetView to restart the task.

For our testing we closed down the adminp task using the Domino `tell` command. This command, and the resulting message, are shown in Figure 128.

```
S DOMINC,CMD='tell adminp quit'
WSC/DOMINO-B TELL ADMINP QUIT
WSC/DOMINO-B > 07/18/97 02:15:57 PM Administration Process shutdown
```

*Figure 128. Console Message When Task Ends*

We want to use NetView automation to trap this event and issue the Domino server command `load adminp` to restart the administration process. To do this we create a new member, DOMPROC, in the NetView procedure library. This procedure looks for the message `Administration Process shutdown` and responds to it by issuing the OS/390 operator console command `S DOMINC,CMD='load adminp'`. DOMPROC is shown in Figure 129.

One consideration, if you are trying to automate a restart of the Domino Server, is that you must ensure that the server and all related tasks are completely down. The `Domino shutdown now complete` message used in the System Automation Table entry above would guarantee a complete shutdown.

```
ARG DOMDATA /* get input argument */
DOMTMP = ''||substr(DOMDATA,39,31) /* */
If DOMTMP = 'Administration Process shutdown' /* Adminp terminated? */
   Then "S DOMINC,CMD='load adminp'" /* Start Administration process */
Exit /* */
```

*Figure 129. NetView Procedure DOMPROC*

We now dynamically activate DOMPROC by issuing the NetView AUTOTBL command. This enables the IF-THEN statement in Figure 130 to run DOMPROC whenever a Domino message is detected. A better technique for performance reasons would be to add this logic to the AOC/MVS message table.

```
IF MSGID='WSC/DOMINO-B' & TEXT=DOMTXT THEN
   EXEC(CMD('DOMPROC' DOMTXT) ROUTE(ONE OPER1))
```

*Figure 130. NetView IF-THEN Statement to Run DOMPROC*

The required automation process is now active.

### 12.3 Highlight Resource Constraint

In this example we respond to a resource constraint and highlight the problem to the OS/390 operator.
We assume that a Notes user tried to connect to the Domino server, but the connection was rejected because there was no memory available to open a new session. The messages in Figure 131 would appear on the OS/390 operator console.

```
WSC/DOMINO-B > Error attempting to load or run /usr/lpp/lotus/notes/latest/os390/server:
WSC/DOMINO-B Unable to invoke program
```

**Figure 131. Console Message When Not Enough Resources**

We want to use NetView automation to trap this event and notify the OS/390 operator by issuing a Write To Operator (WTO). The OS/390 support staff can then be asked to review the system parameters and take appropriate action. In this case the DOMPROC procedure is shown in Figure 132. It looks for the message: Error attempting to load or run and uses the WTO macro to write the message Domino server failure on the OS/390 operator console.

```
ARGS DOMDATA /* get input argument */
DOMTMP = ' ' || substr(DOMDATA,17,28) /* */
If DOMTMP = 'Error attempting to load or run' /* system error? */
   Then 'WTO Domino server failure' /* Let MVS operator know! */
Exit /* */
```

**Figure 132. NetView Procedure to Issue WTO Macro**

To dynamically enable DOMPROC to run, we again use a NetView AUTOTBL command to activate the IF-THEN statement in Figure 130 on page 228.

**Note:** There is no published list of the error messages and their meanings for the Domino S/390 server. You should monitor your environment and test solutions to problems in order to feel comfortable with implementing any automated responses to error messages.

### 12.4 Cleaning Up UNIX Files Automatically

Actively managing space in the HFS can prevent problems due to shortages. Some of these tasks should be automated. The most important files to maintain are the Notes data files. If Domino runs out of space, it will not be able to deliver the mail or mail routing between servers will fail.

Appendix B.3, “Sample Shell Script to Clean Up UNIX Files” on page 272 contains a sample UNIX shell script from a large customer that periodically cleans up the various UNIX files and logs created by Domino. The sample demonstrates how to implement file retention policies within a shell script and what type of file names to look for.

Running this shell script is automated by using the chron daemon.

By studying the script, you can get a feeling for the depth of UNIX skills that are needed to efficiently run a large Domino operation. This shell uses many of the standard list file commands and shell programming constructs, plus some powerful UNIX tools.
• awk - A programming language that lets you work with information stored in files
• grep - Search a file for a specified pattern
• sed - Noninteractive stream editor


12.5 Backing Up Files Automatically

Refer to 13.6, “Backup” on page 251 for a discussion of the various backup tools including ADSM, DFSMShsm, DFSMSdss, UNIX file commands and more.

12.6 Automating Domino Administrative Tasks

The Domino Administrator can set up routine maintenance tasks such as Notes database compaction to run automatically at specific times. To do this, use the Administrative Interface to define a Program Document that executes commands on a specific schedule. A typical example is to compact mail databases weekly during a quiet, off-peak time. This will prevent a number of space-related problems so users do not see error messages saying that their mail box is full.

To define a program document, start the Administration client and go to the Configuration tab. Under the Server twistie, click Programs, and then click Add Program; see Figure 133.

![Figure 133. Automating Mail Data Base Compaction - Program Document](image)
There are three tabs on the Add a Program function:

- **Basics** - Specify the command with options such as `Compact all.nsf files in the Mail subdirectory if the unused space is greater than 10 percent`. The option `-L` enables users to continue to access databases during compacting. If a user edits a database during compacting, the compacting is cancelled.

  The `-L` option is useful only when copy style compacting is done. Copy style compacting solves database corruption problems with Release 5 format databases. The syntax is as follows:
  
  `Compact /wtsc67oe/notesdata/mail/*.*nsf -s 10 -L -C`

- **Schedule** - When to run

- **Administration** - Who can modify or delete this Program Document

Figure 134 shows the Basics screen, and Figure 135 on page 232 shows the Schedule screen, filled in with these specifications.

![Figure 134. Program Document Basics - What Program to Run](image-url)
12.7 Tivoli Manager for Domino Not Available for S/390

The Tivoli Manager for Domino, IT Director Edition, is a snap-in product for Tivoli IT Director which facilitates managing Lotus Notes and Domino applications in conjunction with systems and network management from one integrated console.

Some of the product’s capabilities include:

- **Server Availability** - Provides real-time status of the Domino Server.
- **Mail Status** - Monitors the mail environment, such as undelivered mail, and the total number of messages send and received.
- **Disk Space** - Monitors used disk space, in bytes and percentage, as well as available space. You can establish corrective actions for backing up files to prevent problems when disk space reaches critical levels.

Currently this product is not available for S/390 servers.

12.8 Domino SNMP Agent

The Domino for S/390 CD-ROM comes with an SNMP agent. This agent allows Domino Notes servers to send alerts to any SNMP management application such as IBM NetView for AIX, HP OpenView for Windows Workgroup Node Manager, or any management station that supports the DPI2.0 level of SNMP.

We did not implement this feature while writing this redbook because we found the Administration client and OS/390 itself provided the functions that we needed.
Chapter 13. How to Avoid Domino Problems

In preceding chapters we talked about steps and procedures for reacting to Domino problems. However, taking a proactive approach can be very helpful in preventing server crashes to begin with and in this chapter we describe how to implement this approach. We focus on these areas:

a. Operating systems
b. Network (TCP/IP) protocol and services
c. Database preventive maintenance
d. Restarting the server
e. Performance Issues
f. Backup
g. Other considerations

13.1 Operating System

In addition to applying PTF maintenance, administrators should ensure that all system resources are running well.

Areas to look at in the operating system are:

• Maintenance level (PTFs or patches)
• Installation issues
• CPU resource utilization
• HFS utilization and maintenance level

13.1.1 Maintenance Level

Ensure your system has the proper maintenance levels, as noted here.

13.1.1.1 Lotus Domino for S/390--Required Service

As we have pointed out elsewhere in the book, most problems can be fixed by installing PTFs for the OS/390 operating environment. They are kept up-to-date on a Web site; see 14.1.2, “Lotus Domino for S/390 Required PTF List” on page 259.

Note: This list is updated without notice, so we recommend that you check it frequently, even if your server is up and running.

Many problems involving CPU, memory and I/O can be resolved by applying all the OS/390 PTFs. To avoid unnecessary problems in OS/390, stay with the current maintenance level, especially for these Domino for S/390-related components.

• OS/390 base functions
• OS/390 UNIX System Services
• OS/390 eNetwork Communication Server IP (TCP/IP)
• OS/390 Security Server (RACF)
• DFSMS
• Language Environment

13.1.1.2 Domino Code Level

The normal way to fix a problem in Lotus Domino code is by applying a Quarterly Maintenance Release (QMR) or a Quarterly Maintenance Update (QMU). No
single fix or code patch is provided for a Lotus Domino problem, including Domino for S/390. This means a QMR/QMU code replacement is required if your Domino for S/390 system gets a code problem that has no workaround. We recommend that you:

- Create a test system, environment or procedure for updates.
- Review the QMR/QMU when information becomes available.
- Start testing the code when available.
- Migrate to the QMR/QMU.

Applying scheduled maintenance will prevent unexpected problems related to a QMR/QMU update. The situation could become worse if a problem is discovered during emergency maintenance.


13.1.2 Installation Issues

Most installation problems can be fixed by verifying that the recommended values in the Domino for S/390 Install Guide are being used. These values must be set before setting up the Domino server. Some changes may not become effective until an IPL is done. Read the appropriate OS/390 publication to verify which parameters require an IPL.

13.1.2.1 Domino Release Notes Documentation

The Domino Release Notes product manual is the most important document to review. See especially the sections titled “Things You Need to Know” and “Fix-Lists.” This information provides crucial insights into Domino prerequisites as well as the patches in the Domino code stream or scripts and formulas that you may be using in your Domino applications.

In any installation or upgrade, ensure that you have made all the necessary reviews and changes to your application, as needed.

See 14.2.1, “Databases Shipped with Domino R5” on page 262 for more information.

13.1.2.2 Common Install Problem Areas

Here is a list of the most common install problem areas.

IEASYSxx Values

IEASYSxx values must be set according to the Domino for S/390 Install Guide. With R5 of Domino for S/390, the libnotes executable is loaded into dynamic LPA. This means that you must take into consideration an additional 16 MB of storage when planning for extended CSA.

BPXPRMxx Values

BPXPRMxx values must be set exactly as specified in the Domino for S/390 Install Guide unless a formula is given. The SETOMVS command can be used to pick up most of the BPXPRMxx changes without an IPL.

Starting the Server

The server must be started from a telnet or rlogin session. (Do not start the server from the TSO OMVS shell.) Many customers have been using the DOMCON
program available through the Web, but the Domino server has not been tested using this product. Therefore, IBM recommends that you diagnose any problems using a server started from a telnet session. This is especially true if you are experiencing any kind of storage problems. In previous versions of DOMCON, the region size used by the server was inherited from the TSO environment instead of the MAXASSIZE parameter in BPXPRMxx. DOMCOM V3 has fixed this situation.

13.1.2.3 IEFUSI
Currently, there is a recommendation in UNIX System Services Planning that the IEFUSI exit should not change the region size for OMVS work; refer to chapter “Customizing OS/390 UNIX” under section “Customizing the BPXPRMxx PARMLIB Member,” MAXASSIZE.

The IEFUSI user exit can modify the region size of an address space. Users are strongly discouraged from altering the region size of address spaces in the OMVS subsystem category.

For more information, refer to OS/390 V2R7.0 MVS Installation Exits, SC28-1753, and APARs OW38477 and OW32459.

Follow the S/390 Install Guide for migration considerations.

13.1.2.4 Java
Java will crash the server if it is not run from a specific directory. Sometimes if you start a Java application from the Administration client, the server does not realize it is actually using Java; see Figure 136.

![Start New Task](image)

*Figure 136. Example. ISpy Started from the Administration Client*

The description of ISpy in Domino R5 Administration Help (server tasks topic) is that it sends server and mail probes and stores the statistics. For more detail on this problem, see 11.1, “Case: Improper Java Environment Setup” on page 195.
13.1.3 Resource Utilization

Resource utilization should be carefully monitored to avoid problems with Domino, as described in the following section.

13.1.3.1 S/390 Resource Utilization

If you monitor CPU utilization, memory (physical and virtual) usage, and disk I/O utilization, you can detect and prevent such problems as program loops, memory leaks or I/O bottlenecks. Use RMF reports, SMF records, SDSF or other tools.

Also see 5.5.2, “High Activity for CPU, Paging or Disk” on page 71, 8.8, “RMF Monitors II and III” on page 134 and 8.9, “System Management Facilities - Domino SMF Record” on page 136.

13.1.3.2 Domino Server Statistics

Generate statistics regularly and make the necessary assessment to ensure that the Domino database does not heavily consume memory and CPU. These statistics provide a realistic usage view of your server and application. For more details, see 9.7, “Tools for Monitoring the Domino System” on page 176.

13.1.4 HFS Space Management

If you run out of space, for example on notesdata or the system HFS dataset, you will experience various problems. These include hangs, crashes, corrupted databases, and unpredictable output results. For examples, see 11.6, “Case: Server Cannot Start Because /tmp is Full” on page 206, and B.3, “Sample Shell Script to Clean Up UNIX Files” on page 272.

13.1.4.1 HFS Utilization Maintenance Level

For the file system, we recommend that the utilization of disk space should not exceed 65% of the entire file system. This is to ensure that even during the maximum storage in user mail files over weekends and holidays, the files system will not grow out of disk space. Otherwise the entire file system may crash or prevent users from accessing the servers. We recommend a file system size as follows:

\[
\text{HFS File size} = (\text{Database's quota size} \times \text{Number of Database}) \times 1.4
\]

**Note:** This formula will create a 40% margin. Please include mail and application database in the number of databases in the formula.

13.1.4.2 Monitoring HFS Space

You should monitor HFS space utilization using several methods. For example, HFS file system usage, HFS data set extents, and SMS-managed volume usage.

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>1024-blocks</th>
<th>Used</th>
<th>Available</th>
<th>Capacity</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/tmp</td>
<td>500000</td>
<td>105</td>
<td>499895</td>
<td>1%</td>
<td>/tmp</td>
</tr>
<tr>
<td>OMVS.DOMINO5.PROD.HFS</td>
<td>392400</td>
<td>347992</td>
<td>44408</td>
<td>8%</td>
<td>/usr/lpp/lotus</td>
</tr>
<tr>
<td>HFS.SC63.DOMINO4</td>
<td>2355264</td>
<td>1153552</td>
<td>1201712</td>
<td>49%</td>
<td>/domino4/notedata/shbug</td>
</tr>
<tr>
<td>OMVS.DOMINO5.DOMINO4.MAIL.HFS</td>
<td>301680</td>
<td>61732</td>
<td>239948</td>
<td>21%</td>
<td>/domino4/notedata/mail</td>
</tr>
<tr>
<td>OMVS.DOMINO5.DOMINO4.DAT.A2A.HFS</td>
<td>389520</td>
<td>251564</td>
<td>137956</td>
<td>65%</td>
<td>/domino4/notedata/mail</td>
</tr>
<tr>
<td>HFS.SC63.DOMINO4.O37RA17.HFS</td>
<td>168480</td>
<td>162076</td>
<td>7404</td>
<td>46%</td>
<td>/domino4/notesdata/debug</td>
</tr>
<tr>
<td>OMVS.SC63.WEB.APPE</td>
<td>6480</td>
<td>1160</td>
<td>5320</td>
<td>18%</td>
<td>/web/apple</td>
</tr>
<tr>
<td>OMVS.SC63.VAR</td>
<td>6480</td>
<td>76</td>
<td>6404</td>
<td>2%</td>
<td>/var</td>
</tr>
<tr>
<td>OMVS.SC63.IMPERS</td>
<td>37440</td>
<td>16264</td>
<td>18176</td>
<td>52%</td>
<td>/u</td>
</tr>
<tr>
<td>OMVS.SC63.ETC</td>
<td>38160</td>
<td>1524</td>
<td>36636</td>
<td>4%</td>
<td>/etc</td>
</tr>
<tr>
<td>HFS.OF390R7.SC63.03RA1.NETWARE</td>
<td>324720</td>
<td>273804</td>
<td>50916</td>
<td>85%</td>
<td>/usr/lpp/netware</td>
</tr>
<tr>
<td>HFS.OF390R7.SC63.03RA1.SCOT</td>
<td>747360</td>
<td>538508</td>
<td>208852</td>
<td>73%</td>
<td>/</td>
</tr>
</tbody>
</table>

*Figure 137. Sample *df -kP* UNIX Command Output*
Chapter 13. How to Avoid Domino Problems

Figure 137 on page 236 shows the results of a df command with helpful HFS usage information. (We have adjusted the columns for better readability.)

13.1.4.3 Set Corresponding Path for Log

In addition to Notes databases, also take care with files such as Debug_Outfile, Logfiles (http.logs, notes.logs), CEE dump outputs, nsd.sh outputs. Those files are placed in the notesdata directory by default. They will become very large, so we recommend creating a separate HFS for those files. Set a corresponding path.

The Notes.log Output Path

The rc.notes and DOMCON utilities provide a notes.log and archives in the noteslog directory under the NOTESDATA directory. It might be good idea to create a unique HFS file for this directory, or to create a shell script to move those files outside of the notesdata HFS.

HTTP logs

You can find the HTTP log file location under the HTTP; Internet protocol tag in Server Document. By default, it goes to notesdata directory. In the example shown in Figure 138, HTTP logs go to the notesdata/debug directory.

![Figure 138. Server Document (Log file location)](image)

Debug_outfile path

Remember to specify Debug_outfile if you need to set debug notes.ini parameters and the output size is unpredictable. We recommend the output file be separate from the notesdata and system HFS files.

**Example**

Customer is using the DEBUG_OUTFILE=debug.out parameter in NOTES.INI to capture debugging information. The LotusScript agent is running information (in conjunction with LOG_AGENTMANAGER=1 and DEBUG_AMGR=*), but the 'debug.out' file size is growing at more than 200 MB per day, causing strain on the disk free space level.
**NSD Output Path**
You can set the environment variable NSD_LOGDIR to point to the directory where you want your NSDs to be automatically saved. Run /usr/lpp/lotus/bin/tools/diag/nsd.sh -help for more information regarding NSD.

**CEEDUMPs Output Path**
The environment variable _CEE_DMPTARG was introduced by APAR PQ22684. This environment variable specifies the directory in which Language Environment dumps (CEEDUMPs) are written. This environment variable is ignored if the application is not run as a result of a fork, exec, or spawn. When _CEE_DMPTARG is set in one of these environments, its value is used as the directory name in which to place CEEDUMPs.

For example, if in the OS/390 UNIX shell, you set the environment variable as follows:

```
export _CEE_DMPTARG=/domino4/notesdata/debug
```

then the Language Environment dumps will be written to directory /domino4/notesdata/debug. This is a separate HFS dataset.

---

13.2 Network (TCP/IP) Protocol and Services

Ensure that some historical samples of the network traffic are being taken, analyze and tuned. Such efforts must be continuous and progressive so that analyses can be made and reasonable conclusions are possible.

In the past, we have seen server crashes and performance degradation that were due to faulty Network Interface Cards. These are the ports where users were communicating with the Domino Server.

For further details on network-related analysis, review Chapter 10, “Tools for Network Troubleshooting” on page 179.

13.2.1 SMTP Configuration File

When configuring SMTP, it is important to have a resolver configuration file that reflects your domain and name servers. The HFS file /etc/resolv.conf file contains resolver configuration directives. Domino S/390 SMTP requires a minimum of two directives in this file.

**Domain:** The default domain of the resolver. Example: pok.ibm.com

**Nameserver:** The IP addresses of a particular nameserver to query. The addresses are queried in order. Domino S/390 SMTP will use up to three nameserver addresses; for example:

```
nameserver 1.2.3.4
nameserver 5.6.7.8
```


13.2.2 TCP/IP Setup

To run Notes successfully, verify that you have a working /etc/resolv.conf file. The following statements will need to be included in the /etc/resolv.conf file.

```
TCPIPJOBNAME
DATASETPREFIX
```
In addition, the permission bits for the resolv.conf file need to be set to 755.

**TCP/IP ports conflicts:**

Many applications running in UNIX System Services try to use well-known ports, leading to port conflicts.

For example, the Domino HTTP task and other Web servers all use port 80, TN3270 and Telnet use port 23, and so on. They try to use the same well-known port by default. The same is also true in Domino partitioning. For more information, see Appendix F, “Related publications” on page 291.

### 13.2.3 Syslog Daemon

Sometimes you can find an error message related to Domino for S/390 in the syslog daemon’s log.

#### 13.2.3.1 Syslog Daemon Description

Syslog daemon (syslogd) is a server process that has to be started as one of the first processes in your OS/390 UNIX environment. Other servers and stack components use syslogd for logging purposes and can also send trace information to syslogd. The syslogd reads and logs system messages to the console, log files, other machines, or users as specified by the configuration file. The configuration file is read at startup and whenever the hang-up signal (SIGHUP) is received.

#### 13.2.3.2 Related files

The following files are used by the syslog daemon:

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/console</td>
<td>Operator console.</td>
</tr>
<tr>
<td>/etc/syslog.pid</td>
<td>Process ID is written here.</td>
</tr>
<tr>
<td>/etc/syslog.conf</td>
<td>Default configuration file name.</td>
</tr>
<tr>
<td>/dev/log</td>
<td>Default log path for UNIX datagram socket.</td>
</tr>
<tr>
<td>/usr/sbin/syslogd</td>
<td>This is the server.</td>
</tr>
</tbody>
</table>

And the following line is required in file /etc/services.

```
syslog 514/udp
```

For a sample syslog.conf, see B.5, “Syslog Daemon Sample Config File” on page 278.

**Note:** A syslog daemon’s log file can also become large; you should monitor it. See 13.1.4, “HFS Space Management” on page 236 for more information.
13.2.3.3 Starting Syslogd

A shell script that starts the syslogd daemon would look like the following example:

```
/etc/rc
_BPX_JOBNAME='SYSLOGD' /usr/lpp/tcpip/sbin/syslogd -f /etc/syslog.conf &
```

13.2.3.4 Usage Notes

- syslogd can only be started by a superuser.
- syslogd can be terminated using the SIGTERM signal.
- If you want syslogd in an MVS image to receive log data from remote syslogd servers, then UDP port 514 must be reserved for OMVS in your CS for OS/390 PROFILE data set.

```
PORT
  514 UDP OMVS ; OE SyslogD Server
```

- If there is no TCP/IP (AF_INET) transport connected to OS/390 UNIX when syslogd starts, syslogd cannot bind to port 514, so it cannot receive log data from remote syslogd servers. If you want data from remote syslogd servers, you must stop and restart syslogd after TCP/IP has been initialized.

**Note:** If trace messages were being written at the time syslogd was stopped and restarted, all subsequent trace messages will be lost.

- If the configuration file cannot be opened, the following configuration lines are used as a default:
  
  *
  .err /dev/console
  .panic *

- Configuration file errors are written to the operator console because initialization is not complete until the entire configuration file has been read.
- Facility mark is not affected by the *.priority usage.
- Minimum mark interval is 30 seconds.

For more information, refer to Appendix F, “Related publications” on page 291.

13.3 Database Preventive Maintenance

Carry out regular backups and FIXUP or UPDALL where appropriate, at least every three months.

FIXUP and UPDALL must be treated with caution. Running them blindly will only cause longer server downtime, or even performance degradation on a server that is running.

Preventive maintenance on the databases can prevent database corruption if executed in a reasonable fashion.

13.3.1 Server Commands for Database Recovery

FIXUP, UPDALL -R, and COMPACT are tools that are often used unnecessarily. In the course of troubleshooting an issue, if you determine there is a problem within a database (for example, corruption or a faulty index), then you can use the appropriate tool to try to correct the problem. These utilities are not universal fixes for all ailments.
The use of these tools can be time-consuming, cause downtime of a Notes server, be resource intensive, and have a significant negative impact on a production environment. Using these tools unnecessarily or incorrectly could leave a production server unavailable for a lengthy period, and hence they should be used only when you are certain they offer value.

To determine the appropriate time to use FIXUP, UPDALL -R, or COMPACT, you should first determine why the issue has occurred, or why it is re-occurring. Running one or more of these tools may fix the immediate problem without addressing the root cause. Problems with Notes databases could be the result of the following:

- Hard-drive subsystem problems
- Inappropriate server shutdown
- Power surges or power outages
- Memory or CPU subsystem problems
- Operating system or application memory leaks
- Protocol transmission failures
- Problem in the product

13.3.2 FIXUP, UPDALL and COMPACT

In this section we explain what each of these tasks does.

**FIXUP** repairs corruption in databases and documents.

FIXUP reads every item in a database (data notes, design notes, view indexes, etc.) and verifies that it is consistent with what is expected for that type of item. If the item is found to be inconsistent, it is either repaired (this does not happen very often) or purged from the database.

Views are also verified; if they are found to be inconsistent, they are marked for rebuild. Note that FIXUP does not rebuild the view, it only marks it for rebuild. Only UPDALL -R rebuilds the view. So if you have a view problem, you should use UPDALL -R, not FIXUP.

---

**Note**

Keep in mind that after you convert Release 4 databases to Release 5 and set up transaction logging, Fixup is not needed (or used) to bring databases back to a consistent state. For more detail refer to 9.3, “Programs (compact, update, updall and fixup)” on page 159 and to the Administration help database.

**UPDALL -R** rebuilds view indexes.

UPDALL has various switches, depending on what action is required. The most overused switch is -R, which rebuilds the already-indexed views in the databases. UPDALL -R fixes view index problems only. It should be used only when a view index is believed to be one of the following:

- Out of date
- Inconsistent with what is expected to be in the view index
• Corrupt

Table 38. Updall - Rebuild Options

<table>
<thead>
<tr>
<th>Option in Task - Start tool</th>
<th>Command line option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebuild: Full-text indexes only</td>
<td>-X</td>
<td>Rebuilds full-text indexes and does not rebuild views. Use to rebuild full-text indexes that are corrupted.</td>
</tr>
<tr>
<td>Rebuild: Full-text indexes and additionally: All used views</td>
<td>-R</td>
<td>Rebuilds full-text indexes and all used views. Using this option is resource-intensive, so use it as a last resort to solve corruption problems with a specific database.</td>
</tr>
<tr>
<td>Rebuild: Full-text indexes and additionally: All unused views</td>
<td>database -C</td>
<td>Rebuilds unused views and a full-text index in a database. Requires you to specify a database.</td>
</tr>
</tbody>
</table>

**NOTE:** For information about what the hidden views of the Public Name & Address Book (NAB) are used for, refer to the Internal Use Only document titled "What Is Each Hidden View in the Notes 4.5x Name & Address Book Used For?" (# 154230).

**COMPACT** - When documents and attachments are deleted from a database, Domino tries to reuse the unused space, rather than immediately reducing the file size. Sometimes Domino won't be able to reuse the space or, due to fragmentation, can't reuse the space effectively, until you compact the database. Note that Release 5 is much better at reusing space (in Release 5 format databases), so compacting is needed less often than in past releases.

There are three styles of compacting used in Release 5:

1. In-place compacting with space recovery
2. In-place compacting with space recovery and reduction in file size
3. Copy-style compacting

This utility rarely fixes a problem inside a database because, in order for COMPACT to work, it must be able to read these items. If it cannot read the item, it will fail to compact the database and will generate an error message.

For more detail, see 9.3, “Programs (compact, update, updall and fixup)” on page 159.

### 13.4 Restarting the Server

This section discusses how to restart the server. This includes:

- Using the fault recovery system
- Performing a manual restart of the server

#### 13.4.1 Fault Recovery System

The fault recovery system automates the job of gathering information from, cleaning up, and restarting the faulted server. Fault recovery allows a server to "clean itself up" from a number of different failures and then restart itself.
The general idea is that, by recovering the faulted server quickly, the end users should not notice that the server has been down. This minimizes server downtime and reduces Notes administration. Each fault is logged to a file. At the time of a fault, user-defined actions can be invoked through a user-defined external script. This external script is also known as the cleanup script. With both fault recovery and cleanup scripting implemented, customers can minimize downtime and maximize data collection in a painless fashion.

13.4.1.1 Invoking Fault Recovery

Bourne or Korn Shell settings in your .profile or .kshrc file should be as follows:

FaultRecovery=1
export FaultRecovery

13.4.1.2 Faulted Conditions Currently Handled

With the environment variable enabled, the Notes Domino Server will recover from the following conditions:

1. Fatal Error signals: 4, 6, 7, 8, A, B. Table 39 shows these descriptions.

2. Notes-initiated panics or halts. (Common errors: Panic-Lookuphandle out of range, object handle is invalid.)

3. Any Notes internal call to OSStaticHang().

13.4.1.3 Faulted Conditions Not Handled at This Time

1. Hangs that do not call OSStaticHang().
2. Semaphore deadlocks.

13.4.1.4 User-defined External Script Execution

The user can define an external script to be executed at the time the server faults. The script is defined in the notes.ini file as the CleanupScriptPath variable:

CleanupScriptPath=/local/notesserver/notes/rc.notes.fatal

where rc.notes.fatal might be a script that combines the nsd.sh diagnostic script with some other activities. These might be making a copy of a Notes console log to a new name and archiving it.

For sample scripts, see B.1.1, “rc.notes.fatal” on page 269.
13.4.1.5 Caveats for the Fault Recovery System

1. External scripts (such as the CleanupScript) can increase the downtime of a faulted server.
2. The CleanupScriptPath, if included, must be error-free.
3. The fault recovery option should be enabled only after the Domino Server has a history of running smoothly.
4. The Message Queue is assumed to contain the correct information.
5. KillProcess=1 must not exist in the notes.ini files.

Note: This information was initially presented at a Lotusphere presentation. As of April 1997 it is not otherwise documented and is not supported. It is provided on an FYI basis only. This should be considered a value-added option a customer can try if they have a need. It is not necessarily a standard to be encouraged at all customer sites. For more detail, see technote 147201.

13.4.2 Restarting the Server Manually

Sometimes server shutdown (for example, by using the quit command) does not work properly, especially while a problem is present, so you need to restart the server manually. In this case, you should check the following:

- How much server process is remaining
- Which resources (such as semaphores, shared memory or message queues) did not clean up correctly

Remember, if you have learned in advance how to manually restart your server, you will decrease downtime when recovering from a problem.

Note

Sometimes you need to recover a corrupted database or mail.box from the notesdata directory before restarting the server, otherwise it will crash the server again if accessed.

For more detail, see 6.1, “Troubleshooting Techniques” on page 75. Also see B.4, “Sample Program for CEEDUMP” on page 276.

13.4.2.1 Server Cleanup by "nsd -kill"

The nsd.sh shell script shipped by Lotus provides you with a resource cleanup function. To shut down the server and clean up its resources, run nsd -kill.

Sometimes running nsd -kill twice will help. For more detail on nsd, see 9.2, “NSD.SH Command” on page 147.

No killnotes in R5

The killnotes is the script used to shut down the server or clean up UNIX System Services tasks in previous releases of Domino for S/390 (4.5x and 4.6x), but it is not used in R5.

Therefore, if you try to execute the killnotes script on your Domino R5 for S/390 server, you will receive the following message:

Use NSD -kill
13.4.2.2 Check and Kill the Server Process

You can check the running process for the server by issuing an MVS DISPLAY OMVS command or `ps` UNIX command. Figure 139 shows an OMVS command example.

```
DMVS, U=DOMINO4
BPX040I 13.35.33 DISPLAY OMVS 503
OMVS 000F ACTIVE OMVS=(7C)
USER JOBNAME ASID PID PPID STATE START CT SECS
DOMINO4 DOMINO42 0035 50331664 436207635 HS 11.36.53 634.751
LATCHWAITPID= 0 CMD=/usr/lpp/lotus/notes/latest/os390/router
DOMINO4 DOMINO43 0036 16777233 50331664 1S 11.36.57 58.611
LATCHWAITPID= 0 CMD=/usr/lpp/lotus/notes/latest/os390/mtc
DOMINO4 DOMINO43 0042 16777234 436207635 1SI 11.36.58 58.611
LATCHWAITPID= 0 CMD=/usr/lpp/lotus/notes/latest/os390/replic
DOMINO4 DOMINO41 0045 436207635 50331668 HS 11.36.21 6652.323
LATCHWAITPID= 0 CMD=/usr/lpp/lotus/notes/latest/os390/server
```

Figure 139. D OMVS,U=UserId_for_Server Example

Figure 140 shows a `ps` command example. In this example, no heading line is displayed because the output is filtered by a `grep` command. The heading line is as follows:

```
UID PID PPID C STIME TTY TIME CMD
```

```
MASA2 @ SC63:/u/masa2>ps -ef | grep DOMINO4
DOMINO4 50331664 436207635 - Aug 18 ? 10:36 /usr/lpp/lotus/notes/latest/os390/router
DOMINO4 16777234 436207635 - Aug 18 ? 0:58 /usr/lpp/lotus/notes/latest/os390/replic
DOMINO4 436207635 50331668 - Aug 18 ? 1h51 /usr/lpp/lotus/notes/latest/os390/server
DOMINO4 83886101 436207635 - Aug 18 ? 1:35 /usr/lpp/lotus/notes/latest/os390/update
```

Figure 140. ps -ef | grep UserId_for_Server Example

To terminate this process, use the following commands. We recommend using kill or cancel commands first, because force commands do not take care of resources. The commands are listed in their recommended sequence:

1. `ps -9 PID` or `ps -s SIGKILL PID`
2. `F BPXOINIT,TERM=PID`
3. `F BPXOINIT,FORCE=PID`
4. `CANCEL Jobname`
5. `FORCE Jobname,ARM`

**Note**

Either the A= or ASID= keyword is required to cancel a job, if multiple address spaces have the same job name.

As an example, in Figure 139, ASID 0036 and 0042 have the same job name (DOMINO43).

In this case, use `CANCEL DOMINO43,A=0036` to terminate the process.
13.4.2.3 Check and Remove Semaphore and Shared memory

Semaphore and shared memory can be checked by the UNIX command `ipcs -bo` and removed by the `ipcrm -s` or `ipcrm -m` commands. Figure 141 shows an example.

```
MASA2 @ SC63:/u/masa2>ipcs -bo
Message Queues:
Shared Memory:
  T  ID  KEY  MODE  OWNER  GROUP  NMATCH  SEGSZ  PG
  m  40004 0xf83a8000  --rw-rw----  DOMINO4  OEDOMINO  15   1682
  m  40005 0xf83a8001  --rw-rw----  DOMINO4  OEDOMINO  15   2048
Semaphores:
  T  ID  KEY  MODE  OWNER  GROUP  NSEMS
    s 85540 0xf83a8000  --ra-ra----  DOMINO4  OEDOMINO  16
    s 20005 0xf83a8270  --ra-ra----  DOMINO4  OEDOMINO  16
    s 20009 0xf83a8001  --ra-ra----  DOMINO4  OEDOMINO  16
```

Figure 141. `ipcs -bo` sample output

You can remove a resource by using these commands:

- `ipcrm -s Semaphore_ID`
- `ipcrm -m Shared_Memory_ID`

The `ipcs -x` command is also useful to track the relationship between process and resources; see Figure 142.

```
MASA2 @ SC63:/u/masa2>ipcs -x | pg
Message Queues:
Shared Memory:
  T  KEY  OWNER  GROUP  SEGSZ  PG  ATPID  ATADDR
    m 0xf83a8000  DOMINO4  OEDOMINO  1682  42 0x0a109000 40 0x0a107000
    m 0xf83a8000  DOMINO4  OEDOMINO  1682  38 0x0a576000 37 0x0a002000
      35 0x0a0ca000 34 0x0a0cb000
    m 0xf83a8000  DOMINO4  OEDOMINO  2048  42 0x0a0a80000 40 0x0a800000
    m 0xf83a8000  DOMINO4  OEDOMINO  2048  38 0x0a800000 37 0x0a800000
```

Figure 142. `ipcs -x` sample output

For more detail, see 8.4.4, “Interprocess Communications Resources” on page 121. Also see 8.4.3, “Problems Shutting Down: ps, kill, and CANCEL” on page 120.

13.5 Common Performance Issues

This section discusses common performance issues. It includes:

- Advanced database properties
- Having multiple mail.box files on a mail server

Also see 5.5, “Performance Issues” on page 71.
13.5.1 Advanced Database Properties

Setting advanced database properties can improve the performance of an active database. Setting these properties on many databases or on one large active database can also improve server performance. In addition, some of these property settings help reduce the size of databases. Although in many cases large databases perform significantly better in this release of Domino, reducing database size can still improve performance as well as save disk space. Many of these properties require knowledge of application design. Database designers often set these properties when they create databases. And do not forget that these options in template files, where applicable, will prevent further problems.

To open the database advanced properties dialog:

1. Start Domino Administrator.
2. Open the server (Click File -> Open server).
3. Select Files tab.
4. Click Tools -> Database.
5. From the center list of databases, highlight the one you wish to process.
6. Click Advanced properties.

Let us explain each entry in Figure 143.
13.5.1.1 Don't Maintain Unread Marks
Maintaining unread marks in a database slows performance. For some databases, such as the Domino Directory or the Domino log file, unread marks are not useful. If a database does not require the tracking of read and unread documents, consider disabling unread marks to improve performance.

13.5.1.2 Document Table Bitmap Optimization
Lotus Notes refers to tables of document information to determine which documents appear in an updated view. Selecting the "Document table bitmap optimization" property associates tables with the forms used by documents in each table. During a view update, Notes searches only tables whose views contain forms used by documents in that view. While there is a slight performance cost to maintaining this association, this setting speeds updates of small views in large databases significantly.

To enable optimization using the table-form association, you should select "Document table bitmap optimization." When you change this setting, compact the database to enable it. (In R4 or with R4-compatible files, make sure your system has sufficient disk space, as this compact makes a temporary copy of the database. Native R5-format files are compacted in-place.) You can also use the load compact command with the -F or -f switch to enable or disable bitmap optimization.

13.5.1.3 Don't Overwrite Free Space
To prevent unauthorized users from accessing data, Notes overwrites deleted data in databases, which can reduce database performance. In some situations, this security feature is not necessary, such as when:

- The database is physically secure--for example, on a password-protected server in a locked room
- Space in the database is quickly reallocated--for example, in system databases such as mail.box
- Security is not an issue--for example, in an employee discussion database

13.5.1.4 Maintain Last Accessed Property
Domino databases store the date when a document was last modified or read. By default, the database records only changes to documents--not reads. If you select the database option "Maintain Last Accessed property," the database records reads of a document as well as changes to it. If you set the database to delete documents based on intervals without activity, such as 10 days without being read or modified, you should select "Maintain Last Accessed property", but be aware that this may negatively impact database performance. Otherwise, leave the option deselected for best performance.

13.5.1.5 Disable Transaction Logging
When disabled, this option turns off logging of all transactions for all Domino API functions. It also turns off full database integrity and a replacement of Database Fixup on system restart with high-speed transaction roll forward/rollback from transaction logs, along with support for backup and recovery APIs.

13.5.1.6 Allow Soft Deletions
This option provides the ability to restore deleted notes for a specified amount of time by accessing them in a special view type. By setting the "soft delete"
database option and creating this view, mistakenly deleted documents can be retrieved simply and quickly.

### 13.5.1.7 Don't Support Specialized Response Hierarchy
Documents store information about their parent or response document, which is used only by the @functions @AllChildren and @AllDescendants. In databases that don't use these @functions in views, you should select the database property "Don't support specialized response hierarchy" to improve database performance.

### 13.5.1.8 Don't Allow Headline Monitoring
Users can set up their headlines to search databases automatically for items of interest. If many users do this, database performance can slow. To prevent a database from being monitored, select the "Don't allow headline monitoring" option.

### 13.5.1.9 Limit the Number of Entries in the $UpdatedBy Fields
A document stores the name of the user or server that made each change to it in the $UpdatedBy field. This edit history requires disk space and slows both view updates and replication. If you do not need to maintain a complete edit history, specify the number of changes that the $UpdatedBy field tracks with the database setting "Limit entries in $Updated fields." Once the $UpdatedBy field reaches this limit, the next edit causes the oldest entry to be removed from the $UpdatedBy list. Limiting the number of entries in the $UpdatedBy field in documents improves database performance.

### 13.5.1.10 Limit the Number of Entries in the $Revisions Fields
A document stores the date and time of each change saved to it in the $Revisions field. Domino servers use this field to resolve replication or save conflicts. The $Revisions field stores up to 500 entries by default. If you do not need to track changes this closely, specify the number of changes that $Revisions field tracks with the database setting "Limit entries in $Revisions field." Once the $Revisions field reaches this limit, the next edit causes the oldest entry to be removed from the $Revisions list. Limiting the number of entries in the $Revisions field in documents improves database performance.

Consider limiting the entries in $Revisions fields in databases that:
- Contain many documents
- Replicate often or have no replicas
- Contain documents that are rarely edited
- Undelete Expire Time (in hours)

This provides the ability to limit the time that users can restore deleted notes by accessing them in a special view type. By setting the "soft delete" database option and creating this view, mistakenly deleted documents can be retrieved simply and quickly.

For more detail, see the Advanced database properties topic in the Lotus Notes Help database.
13.5.1.11 Advanced Database Properties for Public NAB

By default, the options of "Don't maintain unread marks", "Document table bitmap optimization" and "Don't support specialized response hierarchy" are set to off for the Domino Directory (Public Name and Address Book).

Maintaining unread marks in a database requires system resources and can significantly slow database performance. For some databases, unread marks aren't useful; for example, reference databases such as the Help databases provided with Domino, administration databases such as the Domino Directory, or databases such as the log file (LOG.NSF) that are continually updated. In these types of databases, consider disabling unread marks. To disable unread marks, you should select the Advanced database property "Don't maintain unread marks."

If you select or deselect the "Don't maintain unread marks" property, you must compact the database so that the setting takes effect. Compacting in this case makes a temporary copy of the database, so your system must have the disk space to make the copy.

13.5.2 Multiple MAIL.BOX Databases on a Mail Server

Domino Release 5 can route mail using multiple mail.box databases. Under heavy load, several server threads may try to deposit mail into mail.box, along with the router attempting to read and update mail. Any process trying to write to mail.box, including the server threads and the router, needs exclusive access to mail.box.

In addition, when the router reads new messages from mail.box, other processes trying to write to the database must wait. This can lead to long wait times if there is a large amount of new mail, for example, on a busy system with heavy mail traffic.

With multiple mail.box databases, Domino can use multiple concurrent processes, since one process can write to each mail.box database. When the router is reading one mail.box, it marks the database "in use" so other server threads trying to deposit mail move to the next mail.box. This improves performance.

Disk contention is rarely an issue for mail.box, so there is usually no need to put the multiple mail.box databases on different disks. However, it is useful to spread user mail files across multiple disks to ensure that all mail files and mail.box databases are not on the same disk.

You see large performance improvements even by adding only one additional mail.box database. Marginal benefit decreases with increasing number of mail.box databases, though you will continue to see performance gains.

To set multiple mail.box databases for a server, open the Server Configuration document that applies to that server, click the Router/SMTP-Basics tab, and enter the number of mail.box databases you want in the Number of mailboxes field.

Additionally, mail.box and its template are also nominees of Advanced database properties.
13.6 Backup

This section briefly describes how to backup both files and the Domino system. A backup system is very important for recovery, and sometimes it can also help with problem determination.

When running Lotus Domino, like any other application on OS/390, it is critical to have a well-defined backup strategy in place to ensure fast and effective data recovery. Performing regular backups of your Notes data is critical. Back up your Domino servers often to insure against data loss.

13.6.1 Backup Databases and Files

The data for the Domino server on S/390 can be backed up in a number of different ways, including the following:

- Using ADSTAR Distributed Storage Manager (ADSM, now enhanced and renamed to Tivoli Data Protection for Domino) to back up the UNIX files
- Using Hierarchical Storage Manager (DFSMShsm) to back up HFS data sets
- Using Data Facility Data Set Services (DFSMSdss) to back up HFS data sets or whole DASD volumes
- Using Notes facilities to replicate databases to another HFS data set or another server.

We strongly recommend that you back up, in case of a crash, any files that will change. We also recommend that you try to restore the backup to make sure it works. Sometime files and databases will corrupt physically or logically (from a crash or by mistake).

13.6.1.1 Backup Using ADSM

The IBM ADSTAR Distributed Storage Manager (ADSM) is now renamed to Tivoli Data Protection for Domino (TDP). It is a tool that allows the backup of data sets from many client platforms to many server platforms. It provides functions similar to DFSMShsm on OS/390, but across a network.

The ADSM (TDP) server and UNIX backup-archive client are both available on OS/390. The ADSM (TDP) server executes as a native MVS application; the UNIX backup-archive client executes under OS/390 UNIX Services. TCP/IP is required as the communication protocol between the ADSM (TDP) server and UNIX client even when the client and server execute on the same machine.

ADSM (TDP) backs up data at the UNIX file level. Each Notes database is a UNIX file.

ADSM (TDP) has an incremental backup capability so that only changed files are backed up. However, if one document in a Notes database is changed, then the whole database will be backed up.

ADSM (TDP) can back up files while they are open, so there is no need to close the Domino server down before taking the backups. However, the backup version of a file may not accurately reflect what is currently in the file, because ADSM (TDP) backed up the file while it was being modified.

To help avoid this problem, ADSM (TDP) will detect if a file was updated during the time it was being backed up and, if so, will retry the backup four times. Some
installations will decide to take backups with the server shut down, to ensure a
current, synchronized backup of all files at a given point in time.

There are four options are available for backing up files:

**Static:** If being modified, ADSM (TDP) will not back up the file or directory.

**Shared Static:** If being modified, ADSM (TDP) will not back up the file or
directory, but will retry the backup a predetermined number of times.

**Shared Dynamic:** If being modified, ADSM (TDP) will not initially back up the file
or directory. It will retry the operation a predetermined number of
times; it will back up the file on its last attempt, even if the file is being
modified.

**Dynamic:** ADSM (TDP) will always back up the file or directory, regardless of
whether or not it is being modified.

### 13.6.1.2 Backup Using DFSMShsm

DFSM Hierarchical Storage Manager (DFSMShsm) is an OS/390 product that
backs up OS/390 data sets, including HFS data sets. It can take incremental
backups. DFSMShsm works at the HFS data set level so the whole HFS data set
will be backed up if any of the files within it have changed.

Ideally, when a data set is created in the SMS environment, a data management
class is assigned to it. Note that the data management class determines the kind
of handling the data set will be subject to for the duration of its life. This includes
backup frequency, backup retention and number of versions to be kept.

DFSMShsm is the agent responsible for executing the actions dictated by the
data management class, such as taking backups and deleting old backups when
obsolete.

Since DFSMShsm uses DFSMSdss as the data mover, its use has issues similar
to the use of DFSMSdss. In addition, there is the consideration of the timing of
the backup in relation to the status of the Domino server. This is particularly
critical if the backup is to be taken with the server down.

### 13.6.1.3 Backup using DFSMSdss

DFSMS Data Set Services (DFSMSdss) is another standard OS/390 product that
can back up OS/390 data sets, including HFS data sets. DFSMSdss works at the
data set or DASD volume level. DFSMSdss is a very fast way to back up a lot of
data, and is therefore useful for DASD volume, HFS data set and disaster
recovery backups.

Unmounting the HFS files is required during backup and restore.

### 13.6.1.4 Replicate the Databases

Notes provides standard facilities to replicate databases. The replicas can exist
on the same server with a different file name, or on a different server. This
provides a very easy way to make backup copies of databases. However, as we
explain, it does not meet all of your backup requirements:

- It is possible that *an error could be propagated to the replicas* before you spot
  it. In that case the replicas also have the error, and you would not have a valid
  copy to recover from.
- The replicas take up additional disk space.
• If the replicas are on the same server, you will need to copy those backups to
tape to take them off site.
• If the replicas are on another server, you must transfer the data across a
  network connection, which is slow and may require additional network
capacity.

As you can see, while replication is useful, you should not rely on it as your only
backup method.

13.6.1.5 Clustering and Replicating
Clustering servers increases the availability of information. But if a server in a
cluster crashes or stops, other servers in that cluster may also fail because of
replication.

13.6.1.6 Clustering
Clustering servers offers the following advantages:
• High availability.
• Scalability - you can grow the cluster to accommodate more users.

However, while clustering affords these benefits, it is important to remember that
it adds extra complexity to the domain and additional administrative
responsibilities that are not apparent in non-clustered environments.

Also, while replication in a cluster provides almost real-time synchronization of
databases, some caveats apply. Clustered servers should be interconnected
through a sufficiently high data transfer bandwidth network to allow for near
real-time synchronization between the databases in the cluster.

There are some installations, with a combination of critical and less critical data,
that choose to use a combination of tools, like ADSM (TDP) and DFSMSdss.
Keep in mind that backups created with DFSMSdss cannot be used in
conjunction with the Domino transaction log to provide forward recovery.

For more detail on backup, see
• Chapter 13, "Data Backup" in Lotus Domino for S/390 Release 5: Installation,
  Customization and Administration, SG24-2083 level 02
• ADSM V3R1 MVS Admin Guide, GC35-027
• ADSM V3R1 Using the UNIX Backup-Archive Clients, SH26-4075
• DFSMS/MVS V1R5 DFSMSdss Storage Administration Reference,
  SC26-4929
• DFSMS/MVS V1R5 DFSMShsm Storage Administration Guide, SH21-1076

13.7 Other Considerations
In this section, we discuss some other considerations, including:
• File handling changes in Domino R5
• Troubleshooting tools

13.7.1 ASCII and EBCDIC File Handling
Sometimes file handling causes a problem, because EBCDIC and ASCII files are
mixed in the Domino for S/390 environment. In Domino for S/390 Release 5,
notes.ini is still in ASCII format, but some of the other files become EBCDIC.
Domino for S/390 provides two editors for editing ASCII text files:

**viascii**: A vi ascii editor used to update the notes.ini file.

**oeditascii**: An OS/390 UNIX ASCII editor that can be used in the OMVS shell to update the notes.ini file.

**Note**: As previously mentioned, you should not download the notes.ini file to a workstation to edit it. Most workstation editors will insert carriage returns, which are not present in a notes.ini file. This could corrupt the file and crash your server.

### 13.7.1.1 Migrating Directory/Database Links to Domino R5

In past releases of Domino for OS/390, database and directory links were stored in ASCII in an HFS. For Domino R5, directory and database links are now in native EBCDIC.

To migrate all existing directory and database links in the notesdata directory, do either of the following:

1. A shell script named migratelinks.sh is provided in the /usr/lpp/lotus/bin/tools directory. Run this script from the notesdata directory. This script searches the notesdata directory and converts all directory and database link files to EBCDIC. This allows the links to function properly.

2. This step can also be done manually. Using the iconv shell command, you can convert all known directory and database link files to EBCDIC from the previous ASCII codepage.
   - Example:
     ```bash
     iconv -f ISO8859-1 -t IBM-1047 dirlink.lnk > dirlink.lnk.tmp
     mv dirlink.lnk.tmp dirlink.lnk
     ```

### 13.7.1.2 ASCII-to-EBCDIC File Conversion

This TSO command example shows how to convert an ASCII file to EBCDIC. Use the OCOPY command to do the copy from the HFS to a PDS, while simultaneously converting formats.

```bash
allocate file(ascii) path('/notesdata/lotus3/notes.ini')
allocate file(ebcdic) dataset(notes.ini(notescpy))
ocopy indd(ascii) outdd(ebcdic) text convert((bpxfx311)) to1047
```

### 13.7.1.3 LotusScript Interoperability

LotusScript now uses native EBCDIC for all file I/O. In Release 4.6.x, file I/O was in ASCII. Refer to the Domino R5 Release Notes for all interoperability notes.

### 13.7.2 Troubleshooting Tools

Refer to chapters 8 through 10 for in-depth information about the troubleshooting tools available for Lotus Domino R5 problem determination.

However, the nsd utility must be checked to be sure it runs correctly after each installation or upgrade before you use it to analyze problems. (We once experienced an nsd failure after a QMR upgrade.)

#### 13.7.2.1 Make Sure nsd.sh Works

The nsd.sh utility is a very useful tool to gather information from a Domino server, but sometimes you might face a problem with running this utility. If you do, it may be caused by your OS/390 UNIX System Services setup; see the following example.
So we recommend that you run nsd.sh to make sure it works after an install or upgrade (but not during production). Note that the nsd.sh utility uses the DBX file utility and other UNIX commands, and DBX uses the ptrace API. The ptrace API needs shared memory; if there is not enough, it could fail. You should ensure that you are always at the current maintenance level of UNIX System Services.

In addition, there are DBX ptrace-related APARs that are not listed on the Domino required service Web page today (for example, APARs OW39152 and OW38670). While these may not be required service for Domino for S/390, we recommend that you apply them since they may prevent extra problems during problem determination.

There are also circumstances where the nsd script may fail and not be able to detect and report errors. The following is a list of known limitations:

- On all platforms, the debugger may fail trying to attach to a process that has the set user ID bit on execution bit set. In this case, just re-run the script as root.
- On AIX, the script may hang when the debugger tries to attach to a process that is in wait state in kernel mode. You will need to kill the process that the debugger is trying to attach to. If you try to killing the debugger process, it will also kill the process it is trying to attach to. Therefore, it is better to let the script continue checking other processes, then kill it when it hangs.

For more detail, see the output from nsd -help limitations. Also see 9.2, “NSD.SH Command” on page 147.

### 13.7.2.2 Telnet Terminal

Sometimes you will encounter a problem with your telnet terminal, especially when using a vi or viascii file editor. The file becomes corrupted if you save it after these problems. (In fact, we hit this problem with our test server, which then would not start after the notes.ini became corrupted.) Therefore, we recommend these actions to make sure the telnet software works properly.

- Obtain good telnet software. There are many freeware products that have nice features, such as screen scrolling, several VT emulation settings, logging, language and so on.
- Make sure your telnet software works.
- Use "vi -R" (read only mode), if possible.

---

**nsd Failure Example**

We received the following message in the nsd output:

```plaintext
file: magic file "/etc/magic": EDC5129I No such file or directory.
```

It was solved by copying the magic file from the /sample directory.

Also see 11.14.7, “Error: Unable to generate Notes binary list” on page 220.
Chapter 14. Resources

This chapter describes where to find important information about troubleshooting Domino for S/390. These resources were available at the time this book was written, but note that resource addresses (URLs, Notes DBs) can change locations. In any case, the tips in this chapter should help you to find the information that you need.

14.1 Web Sites

This section describes:
- Where you can find known problems
- Where you can find required service information
- Other useful Web pages

14.1.1 Lotus Notes/Domino Knowledge Base Search

This site is very useful for finding technical documents using keywords.

<table>
<thead>
<tr>
<th>You will find</th>
<th>Keywords</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known problems</td>
<td>Problem Symptom</td>
<td>The document named &quot;Technote&quot; contains symptoms as well as solutions and workarounds.</td>
</tr>
<tr>
<td>QMR/QMU information</td>
<td>Fixlist and QMR</td>
<td>Fixlists are also found at the download site.</td>
</tr>
<tr>
<td></td>
<td>Version_info</td>
<td></td>
</tr>
<tr>
<td>Troubleshooting scripts</td>
<td>Troubleshooting and</td>
<td>These are useful when you cannot find any hits with your symptom keywords. You may find relevant questions and checkpoints here.</td>
</tr>
<tr>
<td></td>
<td>script and Simple_Symptom</td>
<td></td>
</tr>
<tr>
<td>Other technical information.</td>
<td>Any_Technical_Keywords</td>
<td></td>
</tr>
</tbody>
</table>

In general, Domino for S/390 uses the same core code as other platforms, especially UNIX. There is also a small amount of S/390-unique code. So many problems are common to other platforms, especially UNIX. So try a search with general symptom keywords first, then try UNIX or S/390 keywords.

14.1.1.1 Search Using Lotus Support Search

This site uses the "natural language query". It differs from traditional Boolean querying, which uses absolute AND/OR logical operators among query terms. Consider the following example, which compares a natural language and a Boolean query.

- Natural Language Query: Some messages in the SMTP MTAs inbound work queue process very slowly
- Boolean Query: message AND smtp AND mta AND inbound AND slow

Note: To search for technical information using a Boolean Query, search the Notes/Domino Knowledge Base.
Try the "390" keyword if you want to search for Domino on S/390 articles. The keywords "OS390" or "S390" hit only three items. In contrast, "OS/390" or "S/390" keywords hit too many items, because "S" or "OS" and "390" are searched for.

**How to get there**

Follow the link from Lotus Support Home -> Technical Resources -> Lotus Support Search and Lotus Knowledge Bases -> Lotus Support Search. You can also go to the following URL:

http://search2.lotus.com/cgi-bin/web_evaluate.exe?dataset=support2&shs_action=adv_query

Then select Notes/Domino Technote to begin your search.

**14.1.1.2 Search Using Notes/Domino Knowledge Base->Search**

This site use Boolean Query and Domino full text search.

**How to type entries**

- Separate multiple words by AND, OR, NOT; for example, dog AND cat.
- Enclose phrases in double quotes ("); for example, "domain server 5.0".
- Use wildcard characters; for example, search* (finds searches, searching)

In this site's case, try 390 or S390 or OS390 or S/390 or OS/390 to search Domino for S/390 items.

**How to get there**

Follow the link from Lotus Support Home -> Technical Resources -> Lotus Support Search and Lotus Knowledge Bases Library -> Notes/Domino Knowledge Base -> Search. You can also go to the following site:

http://support.lotus.com/sims2.nsf/notesdocscat/$searchForm?SearchView

---

**Lotus Customer Support Technical Paper**

**Title:** Troubleshooting Script: How to Diagnose Notes and Domino TCP/IP issues

**Product Area:** Domino Server, Networks, Notes

**Product:** Domino Server 5.0, Domino Server 4.6x, Domino Server 4.5x, TCP/IP, Notes Client 5.0, Notes 4.x

**Topic:** Protocols \ TCP/IP \ General TCP/IP Info

**Number:** 144502

**Date:** 04/07/99

This script provides instructions for examining basic TCP/IP problems and errors. It is written for Notes deployments on Windows NT 4.0, Windows NT 3.5x, Windows 95, Windows 3.1x, OS2 Warp 3.x, Novell NLM, Macintosh MacOS, and UNIX.

- **Table of Contents:**
  - I. - Check Connectivity
  - II. - Check Name Resolution
  - III. - Check Network Layout (Large LAN or WAN issues)
  - IV. - Information Needed to Escalate to Lotus TCP/IP Team
  - V. - Additional TCP/IP Resources

*Figure 144. Sample Technical Paper with a TCP/IP Troubleshooting Script*

Figures 144 and 145 show examples of information to be found at this site.
14.1.2 Lotus Domino for S/390 Required PTF List

This site shows the current releases of Lotus Domino for S/390 and points to the service required for the supporting OS/390 releases. The URL is:


14.1.3 Lotus Domino for S/390 Page

14.1.3.1 IBM’s Lotus Domino for S/390 Page

Use this Web page to access valuable information about Lotus Domino for S/390. Its navigator (on the left side of the page) provides valuable links to other sites. The technical information page includes:

- Required service for OS/390 (PTFs)
- Domino SMF support
- IBM redbooks (which provide how-to information)

URL: http://www.s390.ibm.com/products/domino/

14.1.3.2 Lotus’s Domino for S/390 Page

This site points to the IBM site. To get there, go to this URL:

http://www.lotus.com/home.nsf/welcome/dominos390

---

**Figure 145. Sample Technote Showing a Problem and Solution**

**Lotus Customer Support Technote**

| Title: Output to Remote Console and Log Truncated When Longer Than 77 Characters |
| Product Area: Domino Server |
| Product: Domino Server 5.0, Domino Server 4.6x |
| Topic: Server Administration Remote Console |
| Number: 173052 |
| Date: 07/14/99 |

**Problem:**

You are running a Domino 4.6x or 5.0 server and notice that any output sent to the Remote Console or Notes log is truncated if longer than 77 characters.

To reproduce this issue:

1. Access the Remote Console and select "Live Console."
2. Issue any Notes command with a string longer than 77 characters.
3. The output displayed stops at the end of the first line. Any output written to the Notes log is the same.

**Solution:**

This issue has been reported to Lotus Quality Engineering. To work around this issue, limit the number of characters entered at the Remote Console if all output must be seen exactly as entered.

This was tested and reproduced on Windows NT, AIX and S/390, using Domino 4.6.3 and 5.0.
14.1.4 Domino and Notes Documentation Library

This Documentation Library was created by the Domino and Notes User Assistance (UA) Group. In this library, you can download documentation in Domino database (.NSF) and Adobe Acrobat (.PDF) formats, browse databases online, and learn how to order printed books. This site is linked from several sites as “Documentation”. It includes the Lotus Domino for S/390 5.0 Install Guide and Release Notes.

You can also find the *Lotus C API 5.0 Reference* database at this site. Refer to Figure 146. A C API name can appear in a CEE dump or nsd output, so it is very useful to find the Notes function involved at time of a crash or hang. For example, OSUnlockObject, which is sometimes found in a module trace back (see Figure 68 on page 128) is found in this database.

![Lotus C API 5.0 Reference](image)

**How to get there**

URL: [http://notes.net/notesua.nsf](http://notes.net/notesua.nsf)

Choose **Product name** under **View the Document By**: menu or click the **R5 Documentation** is here icon, then find the title you need.

14.1.5 Lotus Support Home Page

This site is a very good place to research information about Domino problem determination.

<table>
<thead>
<tr>
<th>Portfolio of offering</th>
<th>Spotlight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support program</td>
<td>Product News</td>
</tr>
<tr>
<td>Technical resources</td>
<td>HOT! Tech Note</td>
</tr>
<tr>
<td>Support Downloads</td>
<td>Lotus Support Site Update</td>
</tr>
<tr>
<td>The Support Zone <em>entitled area</em></td>
<td>Product Update</td>
</tr>
<tr>
<td></td>
<td>Product Patch/Fix</td>
</tr>
</tbody>
</table>

URL: [http://www.support.lotus.com/lshome.nsf](http://www.support.lotus.com/lshome.nsf)

14.1.6 Other Useful Web Sites

Here is a list of other helpful Web sites.
14.1.6.1 Lotus Domino Tool Sites
Here are two sites that have tools.

The Domino Tools Zone
This site includes other platform tools. To get there, go to URL:
http://www.lotus.com/home.nsf/welcome/dominotools

Lotus Domino for S/390 Tools for Developers
This page links as a download from IBM’s Lotus Domino for S/390 page. Refer to Figure 14.1.3 on page 259. It contains CAPI, LS:DO, LSX Toolkit, DOMCON, libascii and others. To get there, go to URL:

14.1.6.2 Domino R5 Web Site
This page provides R5-related information. It includes Domino IT Central, the technical resource center for Domino IT professionals, which is designed to help you get the most out of your Domino infrastructure. To get there, go to URL:
http://www.lotus.com/home.nsf/welcome/r5home

14.1.6.3 Lotusphere Web Site
This site contains technical information about Domino R5. You can find some Domino internals information. To get there, go to URL:

14.1.6.4 Notes.net
This site provides a technical complement to the Lotus Web site. This site is owned by the developers of Notes and Domino. You can find lots of advanced information in this site. To get there, go to URL:
http://www.notes.net

The home page for Iris Associates is:
http://www.iris.com/

14.1.6.5 OS/390 UNIX System Services Page
This site provides UNIX System Services (USS) information. This is very useful for understanding OS/390 USS. It includes:

- information on porting the Lotus Domino Server to S/390. It describes how S/390 version of Domino differs in implementation of UNIX.
- Presentations about OS/390 UNIX that you can download.
- Useful tools and aids
- UNIX System Services documentation (library)
- Other technical information about OS/390 USS

To get there, go to URL:

14.1.6.6 S/390 Technical Support in the United States
This site contains technical information and links for OS/390. You can also search for hints and tips and the APAR database from this site. To get there, go to URL:
http://service.software.ibm.com/390.us/support?lang=english
14.2 Databases and Books

This section describes useful online documents and books for problem determination.

14.2.1 Databases Shipped with Domino R5

*Release notes for Domino for S/390* contains information specific to Domino for S/390. You should review it before starting your installation or migration. It includes:

- What is new?
- Things you need to know
- Troubleshooting
- Documentation updates
- Inter-operability

You can download it from a Web site, as described in 14.1.4, “Domino and Notes Documentation Library” on page 260.

*Domino R5 Administration Help* has a troubleshooting section, where you can find very helpful information about Domino and Notes. This database can be found under the "help" directory in your installed server. See Figure 147 for a Domino R5 Administration Help example.

![Figure 147. Domino R5 Administration Help](image)

**Troubleshooting the Domino system**

Even with careful server maintenance, you may occasionally encounter unexpected system problems.

Domino provides a collection of tools that you can use for general troubleshooting. Lotus provides a Web site and a Customer Support team, both of which can provide you with additional troubleshooting assistance.

- [Table of troubleshooting tools](#)
- [Searching the Lotus Customer Support Web site](#)
- [Contacting Lotus Customer Support](#)

There is detailed troubleshooting information for these areas of Domino:

"Notes R5 Help" also contains troubleshooting information, which can be found by selecting **Index** instead of **Contents**; see Figure 148.
These databases are also found in the Notes Documentation Library; see 14.1.4, “Domino and Notes Documentation Library” on page 260.

14.2.2 Domino for S/390 Redbooks

Redbooks that can help you in troubleshooting are found at this URL:
http://www.redbooks.ibm.com

- Lotus Domino for S/390 Release 5: Installation, Customization and Administration, SG24-2083 version 02. Troubleshooting tips are located in Appendix A.
- Debugging UNIX Application on OS/390, SG24-5613. This book has Lotus Domino for S/390 troubleshooting hints and tips.

14.2.3 UNIX System Services Books

Following is a list of publications that you may want to refer to for help in problem determination. For other related publications, see Appendix F, “Related publications” on page 291.

- OS/390 UNIX System Services Messages and Codes, SC28-1908
- OS/390 UNIX System Services Command Reference, SC28-1892
- OS/390 UNIX System Services Users Guide, SC28-1891

14.2.4 Lotus Documentation

The following Lotus documentation is very useful. You can purchase it from the Lotus education store online. The URL is:
http://www.lotus.com/home.nsf/welcome/educationstore

14.2.4.1 R5 Domino Administration Doc Pack
The Lotus part number of this documentation pack is AE7NTNA.
Administering the Domino System: Volumes 1 & 2
These manuals describe how to set up and manage servers, users, server connections, mail, replication, security, calendar and scheduling, Web servers, NNTP servers, billing, and system monitoring. They also describe how to troubleshoot system problems.

Moving to Notes and Domino Release 5
This document describes how to upgrade existing Domino servers and Notes clients to Release 5. It also describes how to move users to Domino from other messaging systems.

Setting up a Domino Server
This document describes how to set up the first Domino server, once you have completed the installation.

Configuring the Domino Network
This document explains how to configure a specific network to work with Domino. Also illustrates how to run Notes using multiple network protocols and individual protocols, such as AppleTalk, Banyan VINES, NetBIOS, Novell SPX (NetWare), and TCP/IP.

Administering Domino Clusters
This document describes how to set up, manage and troubleshoot Domino clusters.

Managing Domino Databases
This document provides information on managing databases, including putting databases into production, setting up access control lists and replication, and maintaining databases.
Appendix A. Our Test Environment at the ITSO

We used several Domino Servers on a S/390 LPAR and ran tests with several tools, as documented in this redbook. We also re-created several problems and studied each case.

A.1 Our Test Environment

We created a test environment in an ITSO system. We used the following hardware and software:

- Processor: 9672-R76 (partitioned)
- OS/390 V2R7
- DFSMS 1.5
- OS/390 eNetwork Communication Server V2R7
  - It has 2 TCPIP stacks:
    - TCPIPMVS
    - TCPIPOE
- Java 1.1.6
- Lotus Domino for S/390 Release 5.0a
- DomCon V2.2, migrated to V3.0a

A.2 What We Tested

We set up the Domino environment as follows:

- We registered a number of users and groups.
- We updated the server administrator's field in the Public Name and Address Book (Domino Directory) to include our team members.
- We created connection and domain documents to enable mail routing and replication between the various domains. This includes SMTP domains.
- We installed a Notes Client, Domino Designer and Domino Administrator for Domino R5.
- We created location documents in the local address books of the administrators to facilitate easy switching between domains and ID files.
- We created administration preferences in the Domino administrator client to facilitate easy switching between servers.
- We cross certified domains, servers and administrators.

We tested HTTP using Netscape Communicator and MS Internet Explorer.

We tested mail transfer between users in the various domains, including SMTP and POP3 mail.

We tested Domino Administrator functions.

We tested several troubleshooting tools, including Domino, UNIX System Services and network.

We tested several DOMCON functions, including migration to Version 3.0a.
We installed and tested a new version of NSD.SH.

A.3 Re-created Problems

We re-created some problems including:

- Server crash with USS kill command
- Server crash with Java setup
- The HTTP server crash with Web browser
- Problem with Domino Administrator

These scenarios included real-life problems. For example:

Compact command does not work from Domino Administrator.

Compacting a database using the Server Administration Panel (Files, Tools, Server Administration, Database Tools, Compact) will issue the command using a backslash and produce an error “File does not exist” in the Notes Log. Even though the file does exist, it cannot be located since the backslash issued by the Windows NT R5 Administration client did not convert the slash to function on the UNIX server.

For more detail, see Technote 173088.

We studied problem determination approaches, server restart procedures and test tools with these problems.

We also studied cases involving real customer problems.
Appendix B. Sample Scripts and Programs

The following script and programs are presented for instructional purposes only. There are no warranties of any kind, and there is no service or technical support available for these from IBM.

B.1 Sample Fault Recovery Cleanup Shell Scripts

The following is a sample fault recovery script. The rc.notes.fatal is called from Domino built-in fault recovery capability, if you set CleanupScriptPath notes.ini variable and export FaultRecovery=1. For more details, see 13.4.1, “Fault Recovery System” on page 242.

B.1.1 rc.notes.fatal

This shell script is called automatically by Notes in the event of a fatal crash.

Note: The script shown must complete before the server can finish cleaning up. The faulted process will wait for the externally-defined script to complete before it cleans up the server processes and ipcs and then restarts. If your script has syntax errors, the Fault Recovery process will terminate. Test the actions of the script prior to implementing it in a production environment.

```bash
#!/bin/ksh
# Shellsript Name: rc.Notes.fatal
# Date Modified: 05-20-97
# Description: This shell script is called automatically by Notes in the event of a fatal crash. It must start a new script in the background so that it can return to Notes immediately and the crash can continue processing.

get_notes_version() {
    case $1 in
        /vobs*) _resfile=$1/strings.res;;
        /usr/lpp* ) _resfile=$1/res/C/strings.res;;
        /opt*) _resfile=$1/res/C/strings.res;;
    esac
    $cat_cmd $_resfile | tr -d "\[000\]
    tr -c "[ -~]" "\[\n*
    sed -n '/^No error/p;
    /^.*Build[ \]*[0-9.]*,*/p;
    /^.*Release[ \]*[0-9.]*,*/p' |
    sed 's;No error.;;g;
    s;^.*Build;Build;g;
    s;^.*Release;Release;g;
    s;|; ;g;' | sort -u
}

get_notes_base() {
    ver=$(
        echo $1 | sed 's;[^0-9.]*[0-9.]*$;1;g' |
        awk '{
            if (NF == 3)
                printf("%s,%s", $1, $2, $3);
            else if (NF == 2)
                printf("%s,%s", $1, $2);
        }'
    )

    case $ver in
        *147*) echo 4.6; return 0;;
        *145*) echo 4.5; return 0;;
        *138*) echo 4.1; return 0;;
        [0-9]*.[0-9]* echo $ver; return 0;;
    esac
}
```

© Copyright IBM Corp. 1999 269
echo 4.1;
*) echo "UNKNOWN"; return 1;
esac
return 0
}

vernum="1.2"
system=`uname`
if [ $# != 0 ]
then
  # See if version number was requested
  if [ $1 = "-v" ] || [ $1 = "-V" ]
  then
    echo
    echo "This is version $vernum of $0."
    echo
    exit 101
  fi
  # See if help was requested
  if [ $1 = "-h" ] || [ $1 = "-H" ]
  then
    echo "Syntax: $0"
    exit 102
  fi
fi

if [ ! -x $cat_cmd ]
then
  echo "Could not execute $cat_cmd!"
  exit
fi
log_file="notes.log"

if [ ! -x $cat_cmd ]
then
  echo "Could not execute $cat_cmd!"
  exit
fi

inipath=`find $search_dirs -name notes.ini -print $find_parm 2>/dev/null | sort -u`
inini=`echo $inipath | wc -w | sed "s/ //g"`

if [ $inini = 0 ]
then
  echo "No notes.ini file found in search path!"
  exit
fi

if [ $inini != 1 ]
then
  echo "More than one notes.ini file found in search path!"
  echo "PATH: $PATH"
  echo "Found: $inipath"
  exit
fi

if [ ! -s $inipath ]
then
  echo "notes.ini could not be found at $inipath!"
  exit
fi

data_dir=$($cat_cmd $inipath | grep -i "^Directory=" | cut -d"=" -f2 | sed "s/\///g")
notes_log=`find $data_dir -name notes.log -print $find_parm 2>/dev/null | sort -u`

nlog=`echo $notes_log | wc -w | sed "s/ //g"`

if [ $nlog = 0 ]
then
  echo "Could not extract data directory from $inipath!"
  exit
fi

export oflag=`ls -l $inipath | awk '{print $3}'`
export gflag=`ls -l $inipath | awk '{print $4}'`
sname=`cat $inipath | grep -i "MailServer=" | cut -d"=" -f2 | cut -d"\"" -f1`
export DataDirectory=$data_dir
export notes_log=`find $data_dir -name notes.log -print $find_parm 2>/dev/null | sort -u`

if [ $notes_log = 0 ]
then
  echo
  echo "Could not find notes.log in $data_dir!"
  exit
fi
B.1.2 rc.notes.dump

This shell script is called to gather dump information for Lotus Notes servers. This script uses nsd.sh. After this script completes, restart the server using rc.notes.

```bash
#!/bin/ksh
# Shellscript Name: rc.notes.dump
# Date Modified: 05-20-97
# Description: This shell script is called to bring gather dump information
# for lotus notes servers.
# This script will do the following:
# - get the shared memory dump
# - collect nsd info
#
# Running rc.notes.dump
# system=`uname`
# dfdir=$DataDirectory
cd $dfdir
/usr/lpp/lotus/bin/tools/diag/nsd.sh
# Check to see if Notes will try to recover itself on its own.
dir="/usr/lpp"
if [ ! -d $dir"/lotus/notes/latest" ]
then
    echo $dir"/lotus/notes/latest directory could not be located!"
    exit
fi
if [ "$FaultRecovery" != "1" ]
then
    sleep 120
    /usr/lpp/lotus/bin/tools/nsd -kill $oflag now
    sleep 60
    cd $dfdir
    /usr/lpp/lotus/bin/tools/rc.notes &
fi
echo "Exiting rc.notes.dump"
```

B.2 Display ASCII Text File

This is a simple but useful utility for displaying an ASCII file. It is also used by the rc.notes.fatal shell script.

```bash
usage catascii filename

export LANG=C
iconv -f ISO8859-1 -t IBM-1047 $1
```
B.3 Sample Shell Script to Clean Up UNIX Files

This sample demonstrates how to implement file retention policies within a shell script and provides file names to look for in the real world. This script is presented as is, as a model to aid customers in developing their own local tools. It is not operational and must be adapted to a specific installation's Domino Notes storage policies and practices. Over time, each installation develops many local procedures that result in additional file names and directories that must be maintained.

It is important to maintain enough free space for Domino to function. The most important files to maintain are the Notes data files. If Domino runs out of space, either it will not be able to deliver the mail or mail routing between servers will fail.

This shell uses many of the standard list file commands and shell programming constructs, plus these powerful UNIX tools:

- **awk**: A programming language that lets you work with information stored in files
- **grep**: Allows you to search a file for a specified pattern
- **sed**: A non-interactive stream editor

The main logic of the script builds a file of erase file commands based on the current date and how long you want to keep any specific type of file. After the cleanup script completes successfully, the file that was built is actually executed and the selected files are removed.

This type of space management script should be run daily using the cron daemon at a period of low activity.


```sh
#!/bin/sh
#-------------------------------------------------------------------#
# cleanup script
#
# This script is run on the S/390 Lotus NOTES nodes via cron.
# It erases files and also maintains file(s) for a number
# of days, and therefore various copies of files for a period
# of time. It is needed to help save DASD space.
#
##-------------------------------------------------------------------#

clean_log="/tmp/cleanup.$(date +%m%d).$(date +%H%M%S)"
echo "# Today is " $(date) > $clean_log
echo "# All entries in this file starting with ## " >> $clean_log
echo "# indicates that that file has been erased." >> $clean_log
echo " " >> $clean_log

#-------------------------------------------------------------------#
# Function keep_file
#
# argument 1 = fully qualified filenames , used with
```
ls -l command to find files to keep.
Should be a ‘*’ somewhere in the actual filename, since multiple copies should be around.
argument 2 = integer, number of days to keep these files on the system. Those older than this number will be erased

```
# call function 'keep_file'
```

keep_file "/it?so???/log.nsf.*" 60
keep_file "/it?so???/log.nsf.*Z" 60

#-------------------------------------
keep_file "/it?so???/*TMP" 7
...
keep_file "/it?so???/noteslog/rc.notes*" 3
keep_file "/it?so???/noteslog/DEBUG/nsd*" 14
keep_file "/it?so???/noteslog/log*" 7

keep_file "/it?so???/*_dir/*/*/.*.old" 14
keep_file "/it?so???/*_dir/*/*/.*.bak" 3
keep_file "/it?so???/*_dir/*/*/.*.bad*" 3

keep_file "/misc_err*" 7
keep_file "/usr/lpp/adsm/bin/dsmerror.log*" 14
keep_file "/usr/lpp/adsm/bin/dsmsched.log*" 14

keep_file "/u/it??np*/*.*nsf" 7
keep_file "/u/it??np*/*.*ntf" 7

# list of directories with 'mail' in their name -> put in tmp.out
ls -dl /it?so???/mai* 2>/dev/null | grep dr | awk '{print $9}' > tmp.out

while read mail_dir
do
  # loop -- this next loop is from a request from NOTES administrators.
  # If /it?so???/mail*/*.*.ft directory exists, this means that
  # a 'full text index' of the *.nsf file is being kept. If *.ft
  # exists but there is no corresponding *.nsf file, this means
  # that the *.nsf file has been migrated to another node and
  # the *.ft is not needed (or any of the files in it).
  ls -d $mail_dir/*.*.ft 2>/dev/null > temp.out
  while read fn
do
    dotnsf=${fn%.*}.nsf
    if [ ! -f $dotnsf ]
      then
        rm -r $fn
        print " " >> $clean_log
        print "## ft = full text index " >> $clean_log
  done
done

while read mail_dir
do
  # loop -- this next loop is from a request from NOTES administrators.
  # If /it?so???/mail*/*.*.ft directory exists, this means that
  # a 'full text index' of the *.nsf file is being kept. If *.ft
  # exists but there is no corresponding *.nsf file, this means
  # that the *.nsf file has been migrated to another node and
  # the *.ft is not needed (or any of the files in it).
  ls -d $mail_dir/*.*.ft 2>/dev/null > temp.out
  while read fn
do
    dotnsf=${fn%.*}.nsf
    if [ ! -f $dotnsf ]
      then
        rm -r $fn
        print " " >> $clean_log
        print "## ft = full text index " >> $clean_log
  done
done
print "## Directory $fn and all its files erased!" >> $clean_log
print "## ft = full text index " >> $clean_log
print " " >> $clean_log
fi
done < temp.out
rm temp.out

#---------------------------------------------#
# loop -- this next loop will run keep_file 14 against all files
# in /it?so???/mail* directories that are NOT *.nsf or *.ft
# files.
# Fixed bug - added $ in 2 places in line below. Before this, it
# was filtering out even *.nsf.bak or *.nsf.moved files, whereas
# we really WANT to cleanup these files (but not the .nsf files!)
#---------------------------------------------#
ls -d $mail_dir/* | grep -v "n$" |grep -v "NSF$" |grep -v "ft"
2>/dev/null > temp.out
while read fn
do
    keep_file $fn* 14
done < temp.out
rm temp.out
done < tmp.out
rm tmp.out

#---------------------------------------------#
# The next line will get all the files in the *_dir directories off of
# /it?so??? and check for any files other than .nsf, .NSF, .ft or
# .gif. If any other files exist we will give them 14 days to exist
# and then erase them.
#---------------------------------------------#
ls -d /it?so??/*_dir/* 2>/dev/null | grep -v "n$" |grep -v "NSF$" |grep -v "ft" | grep - v "gif" | awk '{ print "$keep_file", "$0","14" }' > temp.out
while read fn
do
    keep_file $fn* 14
done < temp.out
rm temp.out

#---------------------------------------------#
# now to clean up the cleanup files! We'll keep 30 days worth
# call function 'keep_file'
#---------------------------------------------#
keep_file "/tmp/cleanup.*" 30

#---------------------------------------------#
# Keep the ADSM error file(dsmerror.log) from growing. dsmsched.log
# is already being trimmed by ADSM
#---------------------------------------------#
/usr/bin/tail -500 /dsmerror.log > /tmp/dsmerror.log
cat /tmp/dsmerror.log > /dsmerror.log
rmi /tmp/dsmerror.log
B.4 Sample Program for CEEDUMP

We created a sample as is program during this project. We learned that an RIP file, created by QNC (debugger in a Windows environment), sometimes contains the failing file name or other useful information. Domino for S/390 uses ASCII and EBCDIC, but CEEDUMP only translates hex to EBCDIC characters in the dump portion. So we wrote this translation program and tested it under OS/390 V2R6 and V2R7.

This sample program makes ASCII-translated characters print for the hex dump part of CEEDUMP. It is coded in REXX and can run under OS/390 UNIX System Services. You can give any name to this program, for example CDX2A.

Syntax: CDX2A CEEDUMP_File_Name > Output_File_Name

----Part of sample output---------------------------------------------
Storage around GPR2 (0937B702)
-0020 0937B6E2 20726573 74617274 2070726F 63657373 696E672C 20657272 203D2025 652E0A00
+0000 0937B702 556E6162 6C652074 6F20636F 6D706C65 74652072 65737461 72742070 726F6365
+0020 0937B722 7373696E 672E002E 2F726D2F 726D7265 73742E63 70703A31 39363700 2E2F726D

Storage around GPR3 (0937B6D0)
-0020 0937B6E0 6573742E 6370703A 31373635 00444542 55475F43 484B5054 5F544852 45414400
+0000 0937B6D0 556E6162 6C652074 6F20636F 6D706C65 74652072 65737461 72742070 726F6365
+0020 0937B6F0 7373696E 672C2065 7272203D 2025652E 0A00556E 61626C65 20746F20 636F6D70

Storage around GPR4 (0937BB8)
-0020 0937BB98 05404140 401E07F4 90EB00C5 8EB0D4C 4100E198 550C314 4140F040 4720F014
+0000 0937BB88 58F0C280 90F0BE08 9210E000 50D0BE00 18DEE150 00005860 1C1F5870 48A4E180
+0020 0937BBDB 0F885897 61284107 60785820 90005050 0041B111 431829CC 1B318830 0071233

|...../.....?.....>..............| restart processing, err = %e...
|./.%...?..?_.%......../.....?..|Unable to complete restart proce
|>....-._---------------| ssing.../rm/rmrest.cpp:1967.../rm
The right-hand side of the translation is added by following the program.

Now you can read ASCII characters in a dump more easily. Therefore, sometimes you can find the file name or user ID that caused the problem. We recommend you do one of the following:

- Transfer the output file to your PC and open it with a text editor.
- Or OBrowse the file with a screen size of 27x132, if you use TSO, to increase the width for easier readability.

```rexx
/* This program read a CEEDUMP file and translate Hexdump portion of CEEdump to ASCII.*/
/* setup read parms */
address syscall
say "This is sample program translate Hexdump portion of CEEdump to ascii"
/* Read the input file */
"readfile " in_file "read_data."
if read_data.0 = 0 then do
  say "Line count = 0, May be input file " in_file " not found"
  exit 999
end
/* check line by line */
Do i = 1 to read_data.0
  l= length(read_data.i)
  if l > 130 then do
    work = ""
    do j =3 to 10
      Tran_text=word(read_data.i,j)
      call Do_Trans_words
    end
    say read_data.i || work
  end
```
else say read_data.i
end
return 0
/* End of Main Routine */
/* sub routines */
Do_Trans_words:
   Do k = 1 to 8 by 2
      xx= substr(Tran_text,k,2)
      x1 = x2d(xx) - 31
      work1 = "."
      if x1 > 0 then do
         if x1 < 98 then workl= substr(after,x1,1)
      end
      work = work || work1
   end
return

B.5 Syslog Daemon Sample Config File

For information about the Syslog daemon, see 13.2.3, “Syslog Daemon” on page 239.

Here is an example of a syslog.conf file:

# Examples:
# log all daemon messages to the operator console.
# Note: this may generate a lot of master console
# output if traces are currently active in several
# TCP/IP components
daemon.* /dev/console
#
# All debug messages (and above priority
# messages) from telnet go to telnet.debug
local1.debug /tmp/syslogd/telnet.debug
#
# All debug messages
# (and above priority messages) go to
# server.debug
daemon.debug /tmp/syslogd/server.debug
#
# log mail messages at info and above to /tmp/user.info
mail.info /tmp/user.info
#
# user1 and user2 should get all emergency messages
*.alert user1,user2
#
# log all messages (except mail) to /tmp/all.except.mail
*.*,mail.none /tmp/all.except.mail
#
# log clock and printer err(+) messages to yourhost
#
cron,lpr.err @yourhost
Appendix C. Summary of Tools by Problem Type

This table correlates the tools and commands discussed in various sections of this redbook to the major categories of problems that are encountered. The meaning of each cell is:

- **Y** - Definitely required for the problem type
- **M** - May be requested by the IBM Support Structure
- **Blank** - Not used normally for this type of problem

Use this table as a reminder of the numerous sources of data that can be used in the problem determination process. The parameters listed in the section "Optional Debug Data via Notes.ini" are only to be used as directed by the Support Center and with the agreement of the customer, due to the potential increase in overhead.

**Note:** During some problems, the Domino Server console may not be responding, so commands may not be processed.

<table>
<thead>
<tr>
<th>Problem category ====&gt;</th>
<th>Server Hang</th>
<th>Server Crash</th>
<th>Looping Tasks</th>
<th>Performance Slowdown</th>
<th>Corrupted Database or HFS</th>
<th>Network Connection Problems</th>
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</thead>
<tbody>
<tr>
<td>MVS: PTF Checker</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>MVS/USS: CEEDUMP</td>
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<td>M</td>
<td>M</td>
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</tbody>
</table>

**Commands for State of System**

<p>| USS: onetstat          | Y           | M            | M             | M                    |                          |                           |
| Section 10.2           |             |              |               |                      |                          |                           |
| USS: ps -A -o ...      | Y           | Y            | Y             | Y                    |                          |                           |
| Section 8.4.2          |             |              |               |                      |                          |                           |
| USS: df -kp            | Y           | Y            | Y             | Y                    | Y                       |                           |
| Section 8.4.1          |             |              |               |                      |                          |                           |
| USS: ipcs -bo          | Y           | Y            | Y             | Y                    |                          |                           |
| Section 8.4.4          |             |              |               |                      |                          |                           |
| DOM: sh port tcpip     | Y/M         | Y            | Y             | Y                    |                          |                           |
| Sections 9.1.1 and 10.6|             |              |               |                      |                          |                           |
| DOM: sh dbs            | Y           | Y            | Y             |                      |                          |                           |
| Section 9.1.1 and 10.6 |             |              |               |                      |                          |                           |
| DOM: sh stat           | Y           | Y            | Y             |                      | M                       | M                         |
| Section 9.1            |             |              |               |                      |                          |                           |
| DOM: sh user debug     | Y           | Y            | Y             |                      | M                       | M                         |
| Section 9.1 and 10.6   |             |              |               |                      |                          |                           |</p>
<table>
<thead>
<tr>
<th>Problem category ====&gt;</th>
<th>Tool or Command</th>
<th>Server Hang</th>
<th>Server Crash</th>
<th>Looping Tasks</th>
<th>Performance Slowdown</th>
<th>Corrupted Database or HFS</th>
<th>Network Connection Problems</th>
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<tr>
<td></td>
<td>MVS: D GRS,C</td>
<td>Y</td>
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<td>MVS: DISPLAY OMVS,A=ALL</td>
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<td>DOM: notes.log/log.nsf</td>
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<td>USS: onetstat output</td>
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<td>Tool or Command</td>
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<td>Server Crash</td>
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Appendix D. Example of threads waiting and a ps command

This appendix contains an example of threads waiting, which need investigation. Although this server seems to be running fine, the support staff should obtain problem determination data on these long-waiting threads.

D.1 shows output from a ps command for Domino server processes ML96NP and ML83NP. Note the difference in threads between ML96NP and ML83NP. ML96NP shows a number of threads waiting for semaphore number SNUM 2 for over three days in the WTIME (wait time) column. ML83NP is an example of what Domino server threads should look like under good conditions.

Other threads, such as short thread ID 0000007, seem to be in an infinite loop performing sleep(1) calls. The traceback call stack for this thread may be interesting to look at as well.

You can collect data to (during second or third shift) to figure out why the threads are waiting by taking one of the actions shown in section D.1.

D.1 Collecting data

Here are some of the methods available to collect good problem determination data to diagnose why threads are waiting:

1. Issue nsd.sh 33555047.
   This will obtain the call stack for every thread in server process ID 33555047 using DBX. The server should remain running after completing nsd.sh.

2. Issue kill -s SEGV 33555047.
   This freezes all server processes threads and takes a CEE dump of the server process, as well as an SVC dump if a slip grasp for an ABEND U34 is set. This causes the server to Panic and may cause additional delays to restart the server due to the consistency checking required. This method produces a very good traceback stack for every frozen thread in the server process, which will be captured in the CEE dump.

3. Issue an MVS system console command to take an SVC dump of the server process (in this case ASID 95) and OpenEdition address space. Traceback stacks for all threads in a server process are sometimes hard to obtain. The server should remain running after completing the dump.

4. Issue the following ps command. Note that it works only on OS/390 V2.7 or above.
   
   `ps -A -o pid,xasid,xstid,wtime,semnum,semval,lsyscall,atime,state,thdcnt,ruser -o THREAD -o comm`

D.2 Output from ps command

```
 PID ASID STID WTIME SEMM SEMVAL LASTSYSFC TIME S THCNT RUSER COMMAND
33555047 95 - - - 15h41 HS 160 ML96NP
 /usr/lpp/lotus/notes/latest/os390/server
 - - 00000000 0:03 - 1SLP1SLP1SLP1SLP 7:37 SU -
 - - 00000001 3d11 2 6553 1SLP1SLP1SLP1SLP 0:08 DJV -
 - - 00000002 0:00 - 1SEL1AI01IOCON1M1FCT 25:25 FJU -
```
Appendix D. Example of threads waiting and a ps command
Appendix E. Special notices

This publication is intended to help people who support Domino production systems on the OS/390 operating system to handle problems which might occur. The information in this publication is not intended as the specification of any programming interfaces that are provided by Lotus Domino for S/390. See the PUBLICATIONS section of the IBM Programming Announcement for Lotus Domino for S/390 for more information about what publications are considered to be product documentation.

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- DFSMSShsm
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Appendix F. Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

F.1 IBM Redbooks publications

For information on ordering these publications see “How to get IBM Redbooks” on page 295.

- *Lotus Domino for S/390 Release 5: Installation, Customization and Administration*, SG24-2083 version 02
- *Debugging UNIX System Services, Lotus Domino, Novell Network Services, and other Applications on OS/390*, SG24-5613
- *Lotus Domino R5 for IBM RS/6000*, SG24-5138
- *Netfinity and Domino R5.0 Integration Guide*, SG24-5313
- *OS/390 Version 2 Release 6 UNIX System Services Implementation and Customization*, SG24-5178
- *IBM TCP/IP V3R2 for MVS Implementation Guide*, SG24-3687
- *OS/390 eNetwork Communications Server V2R7 TCP/IP Implementation Guide Volume 1: Configuration and Routing*, SG24-5227 version 01
- *Hierarchical File System Usage Guide*, SG24-5482
- *Integrating Java with Existing Data and Applications on OS/390*, SG24-5142

F.2 IBM Redbooks collections

Redbooks are also available on the following CD-ROMs. Click the CD-ROMs button at [http://www.redbooks.ibm.com/](http://www.redbooks.ibm.com/) for information about all the CD-ROMs offered, updates and formats.

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<td>IBM Enterprise Storage and Systems Management Solutions</td>
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F.3 Other resources

These publications are also relevant as further information sources:
• OS/390 V2R7.0 UNIX System Services Messages and Codes, SC28-1908 version 06
• OS/390 V2R7.0 UNIX System Services Users Guide, SC28-1891
• OS/390 V2R7.0 UNIX System Services Command Reference, SC28-1892
• OS/390 V2R7 UNIX System Services Planning, SC28-1890
• OS/390 V2R7.0 UNIX System Services File, SC28-1909 version 06
• OS/390 V2R7.0 Using REXX and OS/390 UNIX System Services, SC28-1905
• OS/390 V2R7.0 UNIX System Services Assembler Callable Services, SC28-1899
• OS/390 V2R7.0 MVS Initialization and Tuning Guide, SC28-1751 version 06
• OS/390 V2R7.0 MVS Initialization and Tuning Reference, SC28-1752 version 08
• MVS System Management Facilities Publication, GC28-1783
• OS/390 V2R7.0 MVS System Messages, Vol 1 (ABA-ASA), GC28-1784
• OS/390 V2R7.0 MVS System Messages, Vol 2 (ASB-EZM), GC28-1785
• OS/390 V2R7.0 MVS System Messages, Vol 3 (GDE-IEB), GC28-1786
• OS/390 V2R7.0 MVS System Messages, Vol 4 (IEC-IFD), GC28-1787
• OS/390 V2R7.0 MVS System Messages, Vol 5 (IGD-IZP), GC28-1788
• OS/390 V2R7.0 MVS Dump Output Messages, GC28-1749
• OS/390 V2R7.0 MVS System Codes, GC28-1780
• OS/390 V2R6.0 Security Server (RACF) Messages and Codes, SC28-1918
• OS/390 V2R7.0 JES2 Messages, GC28-1796 version 04
• OS/390 V2R7.0 SMP/E Messages and Codes, SC28-1738
• OS/390 MVS System Commands, GC28-1781
• OS/390 V2R7.0 MVS Installation Exits, SC28-1753
• The OS/390 V2.R7.0 SecureWay CS IP Users Guide, GC31-8514
• OS/390 SecureWay Communication Server IP Configuration, SC31-8513
• OS/390 SecureWay Communication Server IP Planning and Migration, SC31-8512
• OS/390 SecureWay CS IP Diagnosis, SC31-8521
• OS/390 V2R7.0 SecureWay CS IP Messages: Volume 1, SC31-8517
• OS/390 V2R7.0 SecureWay CS IP Messages: Volume 2, SC31-8570
• OS/390 V2R7.0 SecureWay CS IP Messages: Volume 3, SC31-8674
• OS/390 V2R7.0 SecureWay CS IP and SNA Codes, SC31-8571
• TCP/IP Performance Tuning Guide, SC31-7188
• OS/390 V2R7.0 Lang Env for OS/390 & VM Debug & Msqs, SC28-1942
• OS/390 V2R7.0 Lang Env for OS/390 & VM Prog Guide, SC28-1939
• OS/390 V2R7.0 Lang Env for OS/390 Customization, SC28-1944
Appendix F. Related publications

- DFSMS/MVS V1R5 DFSMSdss Storage Administration Reference, SC26-4929
- DFSMS/MVS V1R5 DFSMSHsm Storage Administration Reference, SH21-1075
- DFSMS/MVS V1R5 DFSMSHsm Storage Administration Guide, SH21-1076
- ADSM V3R1 MVS Admin Guide, GC35-0277
- ADSM V3R1 Using the UNIX Backup-Archive Clients, SH26-4075
- OS/390 V2R6.0 RMF Diagnosis Guide, SC33-6592
- OS/390 V2R7.0 RMF Messages and Codes, GC28-1948
- OS/390 V2R7.0 RMF Programmers Guide, SC28-1952
- OS/390 V2R7.0 RMF Performance Management Guide, SC28-1951
- OS/390 V2R7.0 RMF Report Analysis, SC28-1950
- OS/390 V2R7.0 RMF Reference Summary, SX22-0044
- OS/390 V2R7.0 RMF Users Guide, SC28-1949 version 04
- OS/390 V2R7.0 TSO/E REXX Reference, SC28-1975
- OS/390 V2R7.0 TSO/E CLISTs, SC28-1973
- OS/390 V2R7.0 TSO/E Command Reference, SC28-1969
- OS/390 V2R7.0 TSO/E Messages, GC28-1978

F.4 Referenced Web sites

These Web sites are also relevant as further information sources:

- http://search2.lotus.com/cgi-bin/web_evaluate.exe?dataset=support2&shs_action=adv_query
- http://notes.net/notesau.nsf
- http://www.support.lotus.com/lishome.nsf
- http://www.lotus.com/home.nsf/welcome/r5home
- http://www.notes.net
F.5 Lotus Documentation

These books are shipped with the Lotus Domino for S/390 Release 5.0 server code CD-ROM:

- Lotus Domino for S/390 Install Guide for Servers (part number AB0999)
- Lotus Domino for S/390 Release 5.0 Release Notes (part number AA0814)
- The following Lotus Notes Release 5.0 books:
  - R5 Domino Administration Doc Pack
    - Administering the Domino System: Volume 1 & 2
    - Moving to Notes and Domino Release 5
    - Setting up a Domino Server
    - Configuring the Domino Network
    - Administering Domino Clusters
    - Managing Domino Databases
  - Domino R5 Administration Help (online guide)
  - Application Development with Domino Designer
    - Domino Designer Programming Guide - Volume 1: Formula Language
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First name  Last name

Company

Address

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Telephone number  Telefax number  VAT number

☐ Invoice to customer number

☐ Credit card number

Credit card expiration date  Card issued to  Signature

We accept American Express, Diners, Eurocard, Master Card, and Visa. Payment by credit card not available in all countries. Signature mandatory for credit card payment.
Glossary

ACL. Access control list. A list of database users (individual users, Lotus Domino servers, and groups of users and/or servers) created and updated by the database manager. The ACL specifies which users can access the database and what tasks they can perform.

Address space. An OS/390 construct used to represent a batch job, TSO/E user, started task, UNIX Systems Services user, or forked USS process. An address space control block (ASCB) points to many other control blocks used to manage the virtual storage, I/O resources and programs used by the work unit. A USS process creates an address space.

ADSM. ADSTAR Distributed Storage Manager. IBM product for distributed file backup, restore, archive and more. The products have been rebranded to Tivoli Data Manager (TDM).


Canonical Format. Format for storing hierarchical names that displays the hierarchical attribute of each component of the name. For example, the canonical format for the name Reuben D. Smith/Ottawa/Acme/CA is: CN=Reuben D. Smith/OU=Ottawa/O=Acme/C=CA where: CN is the common name, OU is the organizational unit, O is the organization, and C is the country code.

DECS. Domino Enterprise Connection Services. A forms-based interface that allows integration to external data from Domino applications.

DNS. Domain Name System. A function to associate names and addresses on Internet domain servers.

Domain. A Domino domain is a collection of Domino servers and users that share a common Domino Directory. The primary function is mail routing. Users' domains are determined by the location of their server-based mail files.

GRS. Global Resource Serialization. An OS/390 base component that manages serialization.

HTTP. Hypertext Transmission Protocol. An Internet protocol used to transfer files from one computer to another.

ICM. Internet Cluster Manager. Domino component for failover and load balancing of HTTP clustering.

IOP. Internet Inter-ORB Protocol. An Internet protocol that implements CORBA solutions over the Web. IIOP lets browsers and servers exchange complex objects, unlike HTTP, which only supports transmission of text.

IIS. Internet Information Server. Microsoft Internet Information Server is a Web server that lets you browse HTML and Active Server pages. Domino includes an IIS product extension that lets you browse Domino databases using IIS.

IMAP. Internet Message Access Protocol. A mail protocol that allows clients running it to retrieve mail from a host mail server also running the protocol. IMAP is similar to POP3 but has additional features. For example, it supports three modes of mailbox access. You can enable IMAP on a Domino server.

I/O. Input/output.

IPCS. Interactive Problem Control System. An OS/390 tool for examining operating system and subsystem dumps. The OS/390 flavor of IPCS is written in all caps.

ipcs. Inter-Process Communication System. A UNIX programming model to coordinate and serialize separate threads. The UNIX ipcs is usually written in lower case characters.

IPL. Initial program load. The initialization procedure that causes an operating system to start operation.

IRIS. A wholly owned division of Lotus. They developed the Domino/Notes product.

ITSO. International Technical Support Organization.

JES2. Job Entry Subsystem/2. A component of OS/390 that manages the initiation and termination of batch jobs, TSO users and started tasks as well as printed output.

JES3. Job Entry Subsystem/3. An optional component of OS/390 that manages the scheduling, device allocation, initiation and termination of batch jobs, TSO users and started tasks as well as printed output. JES3 evolved in parallel with JES2 to satisfy unique requirements of some MVS customers.

LDAP. Lightweight Directory Access Protocol. A set of protocols for accessing information directories. LDAP is based on the X.500 protocol, but supports TCP/IP, which is necessary for Internet access. Because it’s a simpler version of X.500, LDAP is sometimes called X.500-lite.

You can enable LDAP on a Domino server to allow LDAP clients to access information in Domino Directory, for example, e-mail addresses.

LMBCS. Lotus Multibyte Character Set. The format in which Notes stores all internal text, except file attachments and objects. As a result, any user can edit, forward, and mail documents and work with databases in any language. All text leaving the system (displayed, printed, and exported) is translated from LMBCS to the appropriate character set. LMBCS supports Western and Eastern European, North American, and Asian languages.
Logical partition. In LPAR mode, a subset of the processor unit resources that is defined to support the operation of a system control program (SCP).

Logically partitioned mode (LPAR). A mode that allows the operator to allocate hardware resources of the processor unit among several logical partitions.

Lotus. A wholly-owned subsidiary of IBM, and the owner of the Domino/Notes product.

LotusScript. A version of BASIC that offers not only standard capabilities of structured programming languages, but a powerful set of language extensions that enable object-oriented development within and across products. Its interface to Notes is through predefined object classes.

LPAR. Logical Partition. System/390 capability to divide up the processors, memory and channels so that several operating system images can run independently on the same machine.

LS:DO. The ODBCConnection, ODBCQuery, and ODBCResultSet classes, collectively called the LotusScript Data Object (LS:DO), provide properties and methods for accessing and updating tables in external databases through the ODBC (Open Database Connectivity) Version 2.0 standard.

MIB. Management Information Base. Defines the scope of what can be managed by SNMP.

MIME. Multipurpose Internet Mail Extensions. Software that allows you to attach non-text files to Internet mail messages. Non-text files include graphics, spreadsheets, formatted word-processor documents, and sound files.

MTA. Mail transfer agent. A message transfer agent, also called a gateway, is a program that translates messages between mail formats.

NAB. Notes Name and Address Book. Now called the Domino Directory or Personal Address Book.

NNN. Notes Named Network. Now DNN or Domino Named Network.

NNS. Notes Name Service. Domino service for converting Fully Qualified Domain Names or Host names to a TCP/IP address.

NNSC. Notes Name Service Cache. Hidden fields in the user's personal NAB Location document that is used when accessing the Domino server in question or in the server document of the server that initiated the connection to the other Domino server.

NNTP. Network News Transfer Protocol. Protocol that supports reading newsgroups, posting new articles, and transferring articles between news servers. When enabled on a Domino server, allows NNTP clients to access newsgroups on the server and allows the Domino server to exchange news with other NNTP servers.

Notes RPC. Notes remote procedure call. This is the architectural layer of Notes used for all Notes-to-Notes communication. You can set up either the HTTP or the SOCKS proxy to work with RPC.

NSF. The file extension for a Notes database file (.NSF). A database file contains the data for an application. Its structure is composed of forms, folders, views, and other presentation features, such as a navigator and a database icon.

NTF. The file extension for a Notes template file (.NTF). A template file contains the structure for the database--that is, forms, folders, and views--but does not contain documents. Domino Designer comes with a collection of templates that you can use to create system and application databases.

NTI. Notes Transport Interface. The component of Domino Server that manages communications.

ODBC. Open Database Connectivity. A standard developed by Microsoft for accessing external data. ODBC has four components: the ODBC-enabled application, the ODBC Driver Manager, ODBC drivers, and data sources. Lotus Notes is an ODBC-enabled application.

ODS. On Disk Structure. The format in which a Notes database is physically stored on disk. Also called a database format. In Release 5, the ODS version of a database is listed on the Info tab of the Database Properties box.

POP3. Post Office Protocol (level 3). A mail protocol that allows clients running it to retrieve mail from a host mail server also running the protocol. You can enable POP3 on a Domino server.

PTF. Program Temporary Fix. A temporary solution or by-pass for a problem diagnosed by IBM as resulting from an error in a current unaltered release of the program.

QMR. Quarterly Maintenance Release. Lotus software upgrade package, distributed quarterly, to give customers the latest release level of Domino/Notes code. The entire package must be installed, as it is a complete code replacement.

QMU. Quarterly Maintenance Upgrade. Lotus software upgrade package distributed between QMRs and designated by a letter, for example 4.5.4a. It is for critical or widespread fixes to Domino code.

SCIP. Session Control Inbound Processing facility

SIMS. Support Information Management System. Lotus internal databases for tracking problems

SMF. System Management Facilities. OS/390 facility for recording performance and capacity data.

S/MIME. Secure/MIME. A secure version of the MIME protocol that allows users to send encrypted and electronically signed mail messages, even if users have different mail programs.

SDSF. Spool Display Search Facility. OS/390 tool for JES2 systems that allows a TSO user to view and
route output from the JES2 spool and to view the SYSLOG and issue commands to OS/390 if authorized.

SMTP. Simple Mail Transfer Protocol. The Internet standard host-to-host mail transport protocol. It traditionally operates over TCP/IP using port 25. SMTP does not provide a mailbox facility, or any special features beyond basic mail transport.


SPR. Software Problem Record. Lotus software problem record tracking record.

SSL. Secure Sockets Layer. Security protocol for the Internet and intranets that provides communications privacy and authentication for Domino server tasks that operate over TCP.

TCB. Task Control Block. An OS/390 construct that represents a dispatchable unit of work. One address space can create multiple tasks. A USS thread creates a TCB in OS/390.

TCP/IP. Transmission Control Protocol/Internet Protocol. Network protocols that define the Internet. Originally designed for UNIX, TCP/IP software is now available for every major computer operating system.

TSO/E. Time Sharing Option/Extended. The principal interactive interface to OS/390.

UNIX. An operating system developed at Bell Laboratories (trademark of UNIX System Laboratories, licensed exclusively by X/Open Company, Ltd.).

URL. Uniform Resource Locator
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