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Consolidation Planning Workbook
Practical Migration from x86 to IBM LinuxONE

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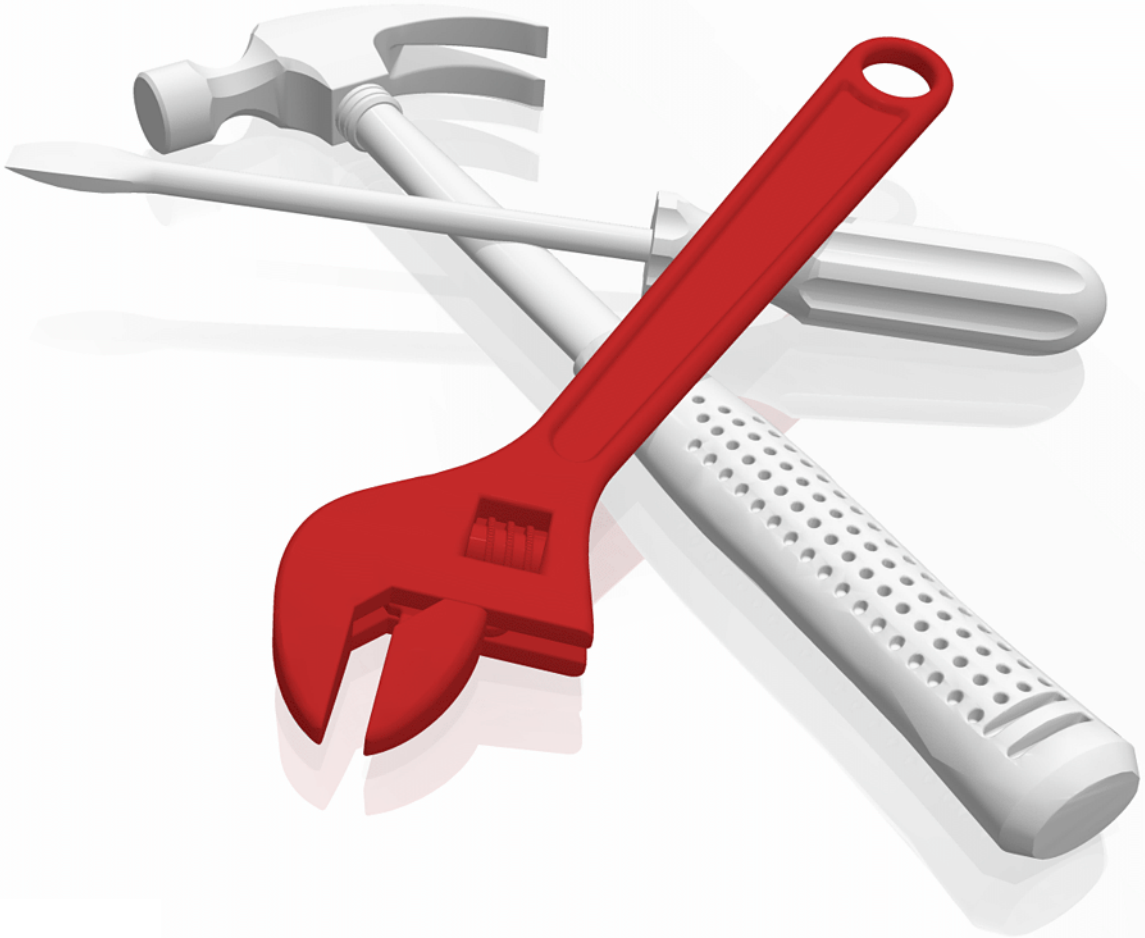

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Consolidation Planning Workbook: Practical Migration from x86 to IBM LinuxONE

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Note: Before using this information and the product it supports, read the information in “Notices” on page v.

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Contents

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Preface

IBM® LinuxONE is a portfolio of hardware, software, and solutions for an enterprise-grade Linux environment. It is designed to run more transactions faster and with more security and reliability specifically for the open community. It fully embraces open source-based technology.

This IBM Redbooks® publication provides a technical sample workbook for IT organizations that are considering a migration from their x86 distributed servers to IBM LinuxONE. This publication provides you with checklists for each facet of your migration to IBM LinuxONE.

This IBM Redbooks workbook assists you by providing the following information:

- Choosing workloads to migrate
- Analysis of how to size workloads for migration
- Financial benefits of a migration
- Project definition
- Planning checklists and worksheets
- Sample project plan

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Planning

This chapter describes the selection of suitable workloads for migration to IBM LinuxONE. It then provides several planning worksheets and the following topics:

1.1 Selecting workloads for migration to IBM LinuxONE

Use the following checklist to select the workloads that are most suitable for migrating:

- ☐ Application components (such as databases, middlewares, and web servers) that are supported by a software vendor on multiple platforms, including IBM LinuxONE.
- ☐ Applications that require close data proximity, or that are components of IBM LinuxONE applications. The overall performance and speed of your applications can be greatly enhanced by placing them on the same physical server as their data sources.
- ☐ Applications with high I/O or transactional I/O. Because of its design, IBM LinuxONE excels at handling sustained high I/O rates.
- ☐ Applications with lower sustained CPU peaks and average memory needs. These workloads are ideal for IBM LinuxONE. The platform is designed to run multiple workloads at a consistently high CPU and memory utilization.
- ☐ Linux-specific tooling and applications development toolchains. Because of its specialized processors, the IBM LinuxONE platform provides an ideal environment to develop and test applications before their deployment to Linux for native and cross-platform workloads.
- ☐ Applications that are written in interpreted languages (such as Java, Python, and Ruby) that do not require recompiling. Applications that are written in compiled languages (such as C and C++) that do not rely on architecture specific instructions and where its source code is available.

Complete the worksheet in 1.2, “Software products and tooling worksheet” on page 3 by using Table 1-1 on page 3.

After you assess your overall application’s portfolio and establish the ones that are most suitable for migrating, see 1.3, “Application features worksheet” on page 4.

1.2 Software products and tooling worksheet

All of the products and tools that are required for the application to function that are used in the source operating environment should be listed in the software product and tooling worksheet that is shown in Table 1-1.

The worksheet provides a column in which you can record whether the same or similar products and tools are available on the target IBM LinuxONE operating environment.

Table 1-1 Software products and tooling worksheet

Application name: **Supporting business area:** **Technical application owner:**				
Name	**Version**	**Vendor/Source web site**	**License type**	**IBM LinuxONE**

1.3 Application features worksheet

The application features worksheet (see Table 1-2) lists the level of details that are present in an application and its interconnected components. Any configurable requirements, such as specific accounts, groups, programs, or jobs that are required for an application to function should be recorded in this checklist. Use one sheet for each application.

Table 1-2 Application features worksheet

Application name: **Supporting business area:** **Technical application owner:**		
	Source (x86)	**Target (IBM LinuxONE)**
OS Name and Version		
Required Users		
Required Groups		
Required privileges (SUDO)		
Observations		
	Backup Solutions	
Operating System		
Database		
Hypervisor		
Other		
	Application-specific Dependencies	
Operating System Packages		
External Programs / Libraries		
Cron jobs		

1.4 Application flows worksheet

In this worksheet (see Table 1-3), you prepare a planning document that describes the network flows that the application provides and all of the external services to which is must connect. Make the descriptions are as detailed as possible by providing the physical location, server host name, IP address, network zone, firewalls involved, and any other information that is important about the services. The target IBM LinuxONE system must access the same resources as are available in the source environment.

Table 1-3 Application flows worksheet

Source hostname	Source IP	Target hostname	Target IP	Protocol	Port

1.5 Hardware planning worksheet

The hardware planning worksheet lists the hardware resources that you must consider during a migration project. The source system resources are examined and mapped to a similar or more advanced technology present on IBM LinuxONE. An example of how to complete this process is shown in Table 1-4. A blank worksheet is provided in Table 1-5 on page 7.

Table 1-4 Example of completed hardware planning worksheet

Hardware planning worksheet			
SERVER NAME:			
RESOURCE	**SOURCE**	**DESTINATION**	**OBSERVATION**
Number of CPU	4	2	Real to Virtual
System memory(in GB)	8	8	
OS SWAP Memory(in GB)	4	4x512M	Disk to VDISK
Network connection[a]			
Connection Description	Gigabit Ethernet	Gigabit Ethernet	
Connection Type	Gigabit Ethernet	Vswitch/GbE	
IP Address/Netmask	129.40.19.88/24	129.40.23.153/24	
VLAN number: Vswitch	2	2 : Vswitch1	
Disk Resource[b]			
OS Filesystem	/ : 30 : Ext3	/ : 10 :Ext4	Root
Mount Point : Size (in GB) : Type		/home : 3 :Ext4 VG OS	Logical Volume
Mount Point : Size (in GB) : Type		/opt : 5 :Ext4 VG OS	Logical Volume
Mount Point : Size (in GB) : Type		/tmp : 5 :Ext4 VG OS	Logical Volume
Mount Point : Size (in GB) : Type		/var : 1 :Ext4 VG OS	Logical Volume
DATA Filesystem			
Mount Point : Size (in GB) : Type	/DB : 100 : Ext3	/DB:100:XFS VG DB	Logical Volume
Mount Point : Size (in GB) : Type	/WAS : 50 : Ext3	/WAS:50:XFS VG DATA	Logical Volume
CUSTOM Filesystem			
Mount Point : Size (in GB) : Type		/MGM:10:BTRFS VG DATA	Logical Volume
Volume Groups: Volume Group OS : 20GB Volume Group DB : 150GB Volume Group DATA: 80GB			

a. The following network connections are available for IBM LinuxONE:
- Ethernet/QETH
- Open vswitch
- IBM HiperSockets
- Direct OSA-Express connection

b. Logical Volume Manager (LVM) provides storage management flexibility and reduced downtime with online resizing of logical volumes.

Table 1-5 Hardware planning worksheet

Hardware planning worksheet			
SERVER NAME:			
RESOURCE	**SOURCE**	**DESTINATION**	**OBSERVATION**
Number of CPU			
System memory(in GB)			
OS SWAP Memory(in GB)			
Network connection[a]			
Connection Description			
Connection Type			
IP Address/Netmask			
VLAN number: Vswitch			
Disk Resource[b]			
OS Filesystem			
Mount Point : Size (in GB) : Type			
Mount Point : Size (in GB) : Type			
Mount Point : Size (in GB) : Type			
Mount Point : Size (in GB) : Type			
DATA Filesystem			
Mount Point : Size (in GB) : Type			
Mount Point : Size (in GB) : Type			
CUSTOM Filesystem			
Mount Point : Size (in GB) : Type			
Logical Volumes:			

a. The following network connections are available for IBM LinuxONE:
- Ethernet/QETH
- Open VSWITCH
- HiperSockets
- Direct OSA-Express connection

b. Logical Volume Manager (LVM) provides storage management flexibility and reduced downtime with online resizing of logical volumes.

1.6 Network planning worksheets

Determine the connectivity options that you want to use. Use Table 1-6 to determine your connectivity options and select network devices.

Table 1-6 Connectivity options to assist in determining network devices

Check	Connectivity	Guidance
	Communication outside the IBM LinuxONE platform	For general purpose external traffic, use one of the following OSA configurations: ► Dedicated OSA: For dedicated connection requirements (that is, data traffic separation for security purposes). ► Shared OSA: Multiple LPARs use the same device for higher utilization. ► Link Aggregation (using multiple OSA ports): Configured in the VSWITCH to satisfy high throughput requirements. A minimum of two OSA ports should be considered for redundancy. For specialized workloads, such as big data, high performance computing, and machine learning, consider the use of Shared Memory Communications over RDMA (SMC-R).
	Communication within the same IBM LinuxONE platform	Use HiperSockets for Linux guests spread across different LPARs within the same IBM LinuxONE. If data traffic processing must be off-loaded from the CPU, OSA LPAR-to-LPAR connectivity can be used instead of HiperSockets. HiperSockets and OSA connections can use the VSWITCH to simplify virtual machine network configurations. If data traffic must be restricted to certain virtual machines, VLANs can be used at the OSA port or in the VSWITCH to create virtual networks.
	Communication within the same IBM z/VM LPAR	Cross Linux image communications can be achieved by using the VSWITCH within the z/VM LPAR. If data traffic must be restricted to certain virtual machines, VLANs can be used to create virtual networks in the VSWITCH, or multiple VSWITCHes can be implemented.

Use the worksheet that is shown in Table 1-7 to record your z/VM networking resources.

Table 1-7 z/VM networking resources worksheet

Name	Value	Comment
TCP/IP user ID		`TCPIP` is recommended
SSI Cluster name		
z/VM host name, member 1		
z/VM host name, member 2		
z/VM host name, member 3		
z/VM host name, member 4		
TCP/IP domain name		System domain name usually set in DNS
TCP/IP gateway		The router to and from the local subnet

Name	Value	Comment
DNS server 1		Assigned by the network administrator
DNS server 2/3		Optional
Interface name		
OSA starting device number		Start of OSA *triplet* for z/VM TCP/IP stack
Subnet mask		Assigned by network administrator
OSA device type		
MTU size		Check with network administrator
Primary OSA device for virtual switch		Specify the first real device number and the next two device numbers will also be used
Secondary OSA device for virtual switch		Ideally, it should be on a different CHPID/OSA card

Use the worksheet that is shown in Table 1-8 to document your Linux guests network resources. Use one worksheet for each Linux guest.

Table 1-8 Linux networking resources blank worksheet

	Value	Comment
Linux Distribution		
Purpose		
Hostname		
Domain Name		
IP Address		
Default Gateway		
Subnet Mask		
Primary DNS		
Other DNS (optional)		
Default DNS Search		
VLAN		

1.7 Memory (storage) planning

Memory planning must consider the following aspects:

- Determine real memory needs
- Virtual machine memory requirements
- Memory management features (such as z/VM saved segments and disk paging)

1.7.1 Determining real memory needs

Carefully size your LPARs real memory needs by considering the number of virtual machines that you require. Also, consider the amount of virtual memory that is simultaneously used by your Linux guests. z/VM can support up to 2 TB of real memory and up to 1 TB of virtual memory for a single guest.

Determining LPAR real storage (set in the IBM hardware management console)

INITIAL _____ (When you IPL z/VM, Control Program [CP] assumes that all of the INITIAL storage is available to it)

RESERVED _____ (Amount of real storage in reserved state that can become available; for example, if another logical partition is deactivated)

If you want to limit the amount of storage to be used by CP, set STORE=nnnnu as an IPL parameter passed to CP by the Stand-Alone Program Loader (SAPL)

_____*nnnnu (where n is a 1 to 4 digit decimal number and u is the storage unt suffix)*

If you do not set this IPL parameter, CP assumes that all of the INITIAL storage is available to it.

z/VM and Linux memory

Use Table 1-9 to document the memory needs for your z/VM and Linux systems.

Table 1-9 Memory requirements worksheet

Virtual Machine Name (Linux included)	Required memory	Comment
z/VM 1st level		Required minimum amount of 576 MB of real memory.
z/VM (other than 1st level)		The minimum amount of virtual memory that is required is 64 MB.
KVM (LPAR installation)		Real memory.
Linux guest		Virtual memory.

Use the worksheet that is shown in Table 1-10 to document the Direct Access Storage Device (DASD) that you use for system paging.

Table 1-10 DASD paging blank worksheet

Device number	Label	Type	Notes

1.7.2 Memory management features

IBM LinuxONE provides several memory management features that can improve the overall virtual memory usage footprint. In that sense, it is important to remember that the amount of virtual memory that is used by the Linux guests can exceed the amount of real memory that is dedicated to z/VM or KVM. To keep your systems running at optimal performance and avoid memory shortage conditions, it is highly recommended to make use of such functions.

Select the memory management features for Linux and z/VM that are shown Table 1-11 that you use to optimize virtual memory management that is used by virtual guests.

Table 1-11 Memory management features

	Memory management feature	Comments
☐	CMM	Cooperative Memory Management: Reduces double paging. Plan to load the cmm kernel extension by using the modprobe command.
☐	CMMA	Collaborative Memory Management Assist: Share page status of all 4 KB pages of guest memory.
☐	NSS	Named Saved Systems: Allows virtual guests to share a read only copy of a single operating system.
☐	DCSS	Discontiguous Saved Segments: Allows virtual machines to share reentrant code for applications.

Considerations for Linux Swapping

IBM recommends the usage of Virtual disks (VDISKs) when allocating swap storage for your Linux guests. A VDISK is a high-speed I/O device that has great potential of achieving performance improvements, which reduces the latency during Linux swapping I/O operations.

Linux can use a VDISK as a high-speed swap device. By using VDISKs instead of real disk volumes, the demand on the I/O subsystem is reduced. As a result, the performance penalty that is normally associated with swapping operations also is reduced and the efficiency of your overall virtual machine performance improves.

Select the type of swap device that you will be using:

- ☐ VDISK: Provide a VDISK device for swapping during installation of each Linux guest and ensure it is formatted as a swap device.

  Note: A VDISK must be formatted each time that the Linux guest is started. It is backed by a memory address space instead of by real DASD.

- ☐ T-disk: Because it is temporary, it must be configured whenever the Linux virtual machine logs on. Storage and performance benefits of traditional minidisk I/O apply. If you use a t-disk, you should disable minidisk cache for that minidisk. If you choose to use a t-disk, select the following method by which it will be configured:
  - ☐ Configured via: PROFILE EXEC
  - ☐ Configured via: _____

1.8 Database planning

This section provides the worksheets that are used to configure and migrate database workloads to IBM LinuxONE.

1.8.1 Recommended kernel parameters

The recommendations that are shown in Table 1-12 should be followed to avoid issues when running database workloads, such as memory starvation and performance penalties.

Table 1-12 Recommended kernel parameters

Parameter	Description	Recommended value
kernel.shmax	Defines the maximum size of one shared memory segment in bytes.	90% of the total memory, but if you have a large amount of storage, you can leave 512 MB to 1 GB for the operating system instead.
kernel.shmall	Define the available memory for shared memory in 4 K pages.	2 * <size of RAM in the default system page size>
kernel.shmmni	Define the maximum number of shared memory segments.	4096. This amount enables large segments to be created, which avoids the need for thousands of small shared memory segments. This parameter can vary, depending on you application.
kernel.sem	Four values must be set in this parameter: ► First - Number of semaphores ► Second - Indicates the maximum number of semaphores. ► Third - Maximum number of semaphores operations within one semop call. ► Fourth - Number of allocatable semaphores.	250 256000 32 1024
kernel.msgmni	Maximum number of queues on the system.	1 024 * <size of RAM in GB>
kernel.msgmax	Maximum size of a message in bytes.	65536
kernel.msgmnb	Default size of a queue in bytes.	65536

Note: Consult your database product documentation for specific kernel parameters that might require more tuning.

1.8.2 Planning to migrate a single database instance

Complete Table 1-13 to plan for the migration of a single database instance.

Table 1-13 Single instance

Database	Source server	Destination server	File location and name

Complete Table 1-14 to map your single instance servers performance measurements.

Table 1-14 Database server workload mapping

Server information			Peak load measure		Peak load time		
Name	Total of CPU	Total of memory	%CPU used	% mem. used	Week day	Start time	Stop time

1.8.3 Planning to migrate multiple database instances

Consider the following questions when you migrate from a server that is running multiple database instances to IBM LinuxONE:

- Is the source server running at maximal CPU capacity?
- Is the use of the CPU balanced across all instances?
- Is a unique instance using all of the CPU?
- What is the average CPU cycles that is used by each instance?
- During which periods does the instance use more CPU cycles?
- Does the instance write or read more data onto the disk?
- How much memory does each instance require?

Complete Table 1-15 to map the performance of every single instance used.

Table 1-15 Instance workload map

Instance information			Peak load measure		Peak load time		
Name	Total of CPU	Total of memory	%CPU used	% mem. used	Week day	Start time	Stop time

1.9 Security planning

This section provides the following planning checklists to complete the following tasks:

- “General security strategy” on page 15
- “Manage the z/VM directory” on page 15
- “Secure console access to the z/VM virtual machines” on page 16
- “Linux Security” on page 17
- “Other security planning considerations” on page 17

1.9.1 General security strategy

The following goals are a part of a general security strategy:

- ☐ Meet and maintain compliance to industry security standards
- ☐ Establish policies for encryption of files and disks

1.9.2 Manage the z/VM directory

Select how you will manage the z/VM directory by selecting one of the following options and proceed to the section that you selected:

- ☐ “Manual directory management” on page 15
- ☐ “IBM Directory Maintenance (DirMaint) facility” on page 16
- ☐ Are you using an external security and directory management system for z/VM?

  Enter name of external product here: _____

Manual directory management

The following high-level overview tasks must be performed if you will be manually managing the z/VM directory:

- ☐ Set up password conventions.
- ☐ Are you backing up z/VM data onto the Linux administration system?
  - ☐ Yes: Linux administrator will have access to all z/VM passwords.
  - ☐ No: z/VM and Linux system administrator roles must be kept separate.
- ☐ Update USER DIRECT with new virtual machine directory entry.
- ☐ Run the DIRECTXA utility to compile the source file and place the new user directory online.

Complete Table 1-16 to plan for user management by way of manual directory management. You change these passwords in USER DIRECT.

Table 1-16 Administration roles, classes, and users

Role	Name	Privilege class	Password	
z/VM system administrator				Main system admin
	MAINT			
	MAINT630			
	PMAINT			

Role	Name	Privilege class	Password	
z/VM network administrator	TCPMAINT			
z/VM Linux administrator	LNXMAINT			LNXMAINT, Linux administration system, Linux virtual server virtual machines
Linux virtual server end users				As many as you need with or without access to 3270 sessions, with or without the root passwords

IBM Directory Maintenance (DirMaint) facility

Use the following checklist of steps to enable the IBM DirMaint facility:

- ☐ Ensure you have a license.
- ☐ Ensure DirMaint was installed when z/VM was installed.
- ☐ Enable DirMaint.
- ☐ Change service machine passwords and the default password for DirMaint.
- ☐ Configure the following DirMaint configuration files:
  - ☐ CONFIGxx DATADVH
  - ☐ AUTHFOR CONTROL
  - ☐ EXTENT CONTROL
- ☐ Import the current user directory.
- ☐ Put DirMaint into production (Run PUT2PROD on every member of your SSI cluster).
- ☐ Start DirMaint.

1.9.3 Secure console access to the z/VM virtual machines

Use the following checklist to maintain physical and logical security controls to protect the Hardware Management Console (HMC):

- ☐ Physically secure the HMC.
- ☐ Do not enable general-use console terminals until after you install and initialize an external security manager (ESM), such as RACF/VM. Enable only the system console and keep it under strict physical security. Consider the use of an ESM that helps you manage the console log of the operator daily.
- ☐ Adhere to Controlled Access Protection Profile (CAPP) and Labeled Security Protection Profile (LSPP) criteria before assigning objects over to new owners.
- ☐ Set up an automation environment so that the operator closes console files daily, in such a way that operator logs are ready for archiving processes. By using system user IDs, set the observer as “TCPIP, IBM DirMaint” on the operator user ID.
- ☐ Set up auditing as required.

1.9.4 Linux Security

Use the following checklist to keep track of Linux security:

- ☐ Ensure the Linux distribution is under a vendor supported level
- ☐ Apply security fixes in a timely frequency
- ☐ Ensure SELinux or AppArmor is enabled
- ☐ Use Pluggable Authentication Modules (PAM) policies
- ☐ Use two-factor authentication solutions
- ☐ Use pervasive encryption; that is, encrypt all data that is in-flight and at-rest
- ☐ Use Sudo to maintain individual accountability
- ☐ Disable direct access to the root account

1.9.5 Other security planning considerations

The following checklist provides other resources that should be secured and serve as a reminder as you head into your migration project:

- ☐ Secure network access to z/VM:
  - ☐ Use digital certificates to establish secure connections to your z/VM system.
- ☐ Secure Linux running on IBM LinuxONE servers
- ☐ Secure users
- ☐ Use an external security manager (ESM)

1.10 Backups

Backing up and restoring data are essential components of data storage management. Regularly backing up your data helps protect your system against the loss of data in the event of a major disaster, or when data is accidentally deleted or becomes corrupted.

Depending on the configuration of the IBM LinuxONE environment, you can select to use a z/VM specific strategy, a Linux specific strategy, or a combination of the two for your backup plan.

Select the following external backup and restore software (you can select more than one):

- ☐ IBM Backup and Restore Manager for z/VM
- ☐ IBM Spectrum® Protect
- ☐ Other: _____

Select the strategy that you will use:

- ☐ z/VM specific
- ☐ Linux specific
- ☐ Combination z/VM and Linux

In this section, we provide an overview of some aspects to consider when backing up your z/VM and Linux systems.

1.10.1 General

Select the type and frequency for your backups:

Backup type:

- ☐ Incremental backup
- ☐ Differential backup
- ☐ Full Backup

Backup frequency:

- ☐ Daily
- ☐ Weekly
- ☐ Monthly

Will you be retaining data for long periods?

- ☐ Yes
- ☐ No

Use Table 1-17 to document the backup solution that is used, the type of data archived (filesystem, database, and so on), and the source and target locations for easier reference.

Table 1-17 Data archiving

Backup Type	Backup Solution	Source Location	Target Location

Select the type of backup:

- ☐ Online backup
- ☐ Offline backup

Include each of the following components in your backup strategy:

- ☐ File-level back up of the z/VM hypervisor:
  - ☐ CMS user data
  - ☐ Directory information
  - ☐ Configuration files
  - ☐ Log files
  - ☐ Tools: For example, REXX EXECs, and automation scripts.
- ☐ Image level back up for recovery of z/VM systems:
  - ☐ Operating system (do not forget SSI members)
- ☐ Image level back up for recovery of Linux guests:
  - ☐ Operating system
  - ☐ Applications
  - ☐ Application data
- ☐ File level backup of Linux virtual guests:
  - ☐ Back up of any golden images (that were never booted)
  - ☐ Configuration files
  - ☐ Log files
  - ☐ Tools

1.11 Skills and training worksheets

A sample of required skills to perform a migration from x86 distributed servers to LinuxONE are listed in Table 1-18.

Table 1-18 Required skills worksheet

Skill Required	Assigned	Comments
z/VM		
Linux		
Networks		
Storage		
Database management		
Security		
Application management specific		

A sample table is provided in Table 1-19 to help you organize an employee training schedule.

Table 1-19 Employee training schedule

Name of person in need of training	Type of training required	Required date for completion

2

Sample project plan

In this chapter, we provide a sample project plan that provides an at-a-glance view of the tasks that are involved in planning for migration. The duration is dependent on how many resources you might apply to this project. For this sample plan, it is assumed that one resource is allocated with the defined skill.

This sample plan that is shown in Table 2-1 is a baseline project plan that can assist you in starting your own plan. You can download this sample plan in MS Project or Excel and adjust it to fit your needs.

Table 2-1 Sample project plan

WBS	Task name	Duration
1	**Consolidation: Planning Migration from x86 to IBM LinuxONE**	**74 days**
1.1	**Workload selection**	**10 days**
1.2	**Software product and tools**	**10 days**
1.3	**Application features**	**10 days**
1.4	**Application flow**	**10 days**
1.5	**Hardware planning**	**25 days**
1.6	**Network planning**	**14 days**
1.6.1	Determine connectivity options and select network devices	10 days
1.6.2	Record z/VM network resources	2 days
1.6.3	Document Linux guests network resources	2 days
1.7	**Memory (Storage) planning**	**10 days**
1.7.1	Size LPAR real memory needs	2 days
1.7.2	Determine the memory needs for your z/VM and Linux systems	2 days
1.7.3	Determine DASD requirement	2 days
1.7.4	Determine memory management features	2 days

WBS	Task name	Duration
1.7.5	Determine the type of swap devices that you will be using	2 days
1.8	**Database planning**	**9 days**
1.8.1	Determine which kernel parameters to update	2 days
1.8.2	Determine whether you will migrate a single DB instance or multiple DB instances	2 days
1.8.3	Map DB server workloads	5 days
1.9	**Security planning**	**23 days**
1.9.1	Determine security strategy	10 days
1.9.2	Manage z/VM directory	2 days
1.9.3	Plan for user management by way of manual directory management	2 days
1.9.4	Secure console access to the z/VM virtual machines	2 days
1.9.5	Complete Linux security checklist	2 days
1.9.6	Other security considerations	5 days
1.10	**Backups**	**15 day**
1.10.1	Determine backup and restore software	5 days
1.10.2	Determine a backup strategy	5 days
1.10.3	Document the backup solution employed, the type of data archived, and the source and target locations	5 days
1.11	**Skills and training**	**8.5 days**
1.11.1	Document required resources and skills	3.5 days
1.11.2	Complete employee training schedule	5 days

3

Summary

Want to migrate to IBM LinuxONE? Complete the following steps:

1. Survey your current environment (machines, licenses, staff, and space/power).

   Use this workbook, along with *Practical Migration from x86 to IBM LinuxONE*, SG24-8377.
2. Calculate potential savings in cash, time and effort by using the IBM LinuxONE TCO calculator.
3. Plan to reallocate resources to higher value projects.
4. Build a migration plan with a partner that you trust.

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