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IBM Assist On-site for Storage Overview

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Storage

IBM

Redpaper

International Technical Support Organization

IBM Assist On-site for Storage Overview

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

Third Edition (December 2015)

This edition applies to Version 3.3 and Version 4.0 of IBM Assist On-site.

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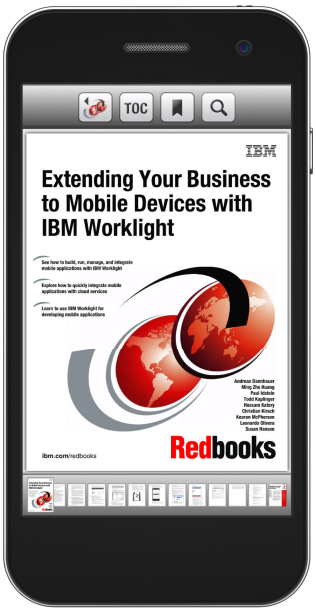

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Preface

This IBM® Redpaper™ publication provides a description and reference information for the IBM Assist On-site (AOS) software.

It is intended for clients who want the benefit of the AOS advanced features, such as port forwarding, which allows an authorized IBM Support Service Representative (IBM SSR) to access a client's enabled storage device to diagnose and troubleshoot efficiently the device.

Authors

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Thanks to the following people for their contributions to this project:

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Summary of changes

This section describes the technical changes that are made in this edition of the paper and in previous editions. This edition might also include minor corrections and editorial changes that are not identified.

Summary of Changes
for IBM Assist On-site for Storage Overview
as created or updated on December 23, 2015.

December 2015, Third Edition

This revision includes an updated description of the IBM Assist On-site software, with a focus on Storage and the DS8000 series in particular.

1

Introduction to remote support for IBM storage systems by using IBM Assist On-site

The chapter contains a brief overview of the IBM Assist On-site (AOS) software, with a focus on the new port-forwarding feature that is available in AOS Version 3.3 and 4.0. The main benefit of AOS is to provide an alternative way for IBM Support to connect to an IBM system at a client site without needing an analog phone line.

The second part of this chapter describes the use of port forwarding within a system that is used as a remote support gateway for IBM Support. Port forwarding provides more flexibility when enhanced security regulations must be enforced.

This chapter covers the following topics:

- Remote support connections for IBM storage systems
- IBM Assist On-site software
- IBM Assist On-site support service client communication flow
- Using the IBM Assist On-site support service as a support gateway
- Security aspects for IBM Assist On-site usage

1.1 Remote support connections for IBM storage systems

IBM storage systems typically offer various support connections. The different support connections can be grouped into the following categories:

- Call Home

  Call Home is either realized by sending an email to IBM or an Agent that is called an IBM *Electronic Service Agent™*. The Electronic Service Agent can establish an SSL or IPSec secured connection to dedicated IBM servers and report issues by opening a support ticket in the IBM Support Ticketing System.

- Data offload

  Data offload is used to download diagnostic data by using FTP over an SSL or IPSec secured session.

- Remote access connection

  This connection can be realized with a modem through provided or preinstalled software, for example, an IPSec client or some customized solution.

Note: Call Home and data offload might not be implemented in all IBM Storage products.

Call Home and data offload require that the client use the corresponding feature as implemented in the product. You cannot use a custom solution.

For remote access, an alternative solution to the analog modem line can be set up. With the AOS software, you can establish an IP-based remote access connection to IBM. In addition, if you enable the port-forwarding mode, IBM Support can use its IP-based maintenance tools to access your device.

Some IBM Storage products come with a preinstalled AOS client to allow remote access through AOS. For products that do not have an AOS client that is installed, AOS configured with port-forwarding can still be used as a remote access gateway to enable IBM Support access. In this case, an analog modem line is not required for remote access.

Most of the IBM Storage products support an SSH, Telnet, or http or https connection for remote access. These different connection types can be used by the product-specific maintenance tools.

Chapter 3, “IBM Assist On-site device connectivity” on page 23 gives an overview of the natively installed AOS clients and the possible use of the AOS Gateway solution.

For a product that does not include AOS preinstalled, AOS must be installed and configured on a customer provided server. With port forwarding enabled, the IBM Support Service Representative (IBM SSR) can use IP-enabled maintenance tools that have specific and enhanced functions for the product or service being supported.

1.2 IBM Assist On-site software

AOS is a no-charge software for remote assistance that is provided by IBM Support. AOS can be started and used in multiple ways. The best known use of AOS is window sharing through 3270 or 5250 terminal sessions. Available with AOS Version 3.3 and 4.0, port forwarding enables IBM Support to use IP-based maintenance tools with your system.

For IBM Storage products that have implemented AOS as remote access solution, the function is tailored to the product.

This section briefly describes the AOS overall functions, and the new port-forwarding capability in 1.2.1, “IBM Assist On-site support session modes” on page 3. For an overview of the available software packages, see 1.2.2, “IBM Assist On-site software packages” on page 4.

The focus of this book is mostly for AOS V4.0.

1.2.1 IBM Assist On-site support session modes

During an active AOS session, you or the IBM SSR can switch between different session modes.

Port forwarding

The port-forwarding function was introduced in AOS Version 3.3. The port-forwarding session is primarily intended to allow IBM Support to use product-specific IP-based maintenance tools. This session mode is accessible only by specific IBM Support groups.

Authorized IBM SSRs use port forwarding to establish an IP connection to a previously defined IP address and port. The IP address and port configuration is exclusively controlled and maintained by the client.

Chat-only mode

Chat-only mode is the default AOS session mode between you and IBM Support when the session is initiated. A chat window is available so that you can chat in real time with the support person. The support person can only chat with you and cannot view your desktop or access your system. You can return to the chat-only mode at any time.

View mode

In View mode, you can share the window contents with the support technician, but the technician does not have any control over the keyboard or the mouse.

Panel sharing

With a panel sharing session, the technician can see the window and take control of the mouse and keyboard and thus directly interact with your system.

Host sessions

A 3270 or 5250 session can be shared between you and IBM Support to provide controlled access to IBM z/OS® or IBM i instances. You and the IBM SSR see the same terminal window display in a web browser. In addition, multiple consoles may be run at once.

1.2.2 IBM Assist On-site software packages

There are multiple software packages of AOS that are available, all of which you can use to establish an AOS connection between your system and IBM Support.

The available packages support all AOS session modes. The differences between the packages are the configuration, the type of installation, and the authentication to establish the session.

IBM Assist On-site support service

Tip: The support service software package is the preferred software package that you use for a remote access solution. The support service software provides the same function as a modem that automatically answers incoming calls.

The AOS support service client is software that can be installed as a service in Microsoft Windows, Linux, or Mac OS. With this software, IBM Support can connect to your system without the need of a connection code exchange. The AOS support service contains three software components:

- AOS Config GUI

  This program is used to configure the allowed session mode (as described in 1.2.1, “IBM Assist On-site support session modes” on page 3) and access control list (ACL). For additional security, after you start the AOS Config GUI, the AOS support service is stopped and the established AOS connection is terminated. This action ensures that the configuration can be changed only on the local computer.

- AOS support service

  The support service program is a program that is installed as a Windows service or as daemon on a Linux system. This program sends a heartbeat every 2 minutes to IBM and checks whether a connection request is present. If so, the AOS program is started.

- AOS program

  The AOS program is started to establish the support connection and can run in the different connection modes. This program is known as the *AOS console*.

The support service client can be configured to run in an attended or unattended mode:

- Attended mode

  In the attended mode, the client must accept a connection request from a support technician within 180 seconds. If the connection request is not accepted within that time, it is refused.

- Unattended mode

  The unattended mode allows IBM Support to connect to the system without additional approval from the client.

Note: Some documentation refers to the term “Lights On mode” for the attended mode and the “Lights Out mode” for the unattended mode.

Web Start

For single use, an AOS session can be requested after completing a request on the AOS website, found at:

http://www.ibm.com/support/assistonsite/

To complete the request, you must be in contact with IBM Support. If an AOS session is required, the IBM SSR provides a connection code to you. Without this connection code, you cannot establish an AOS connection.

IBM Assist On-site Launcher

The AOS Launcher is an AOS client that can be permanently installed on a system. This option might be ideal for you if you cannot or if you are not allowed to download software from the Internet. To establish an AOS connection, you also require a connection code.

1.2.3 Hardware requirements for the IBM Assist On-site software

Because IBM provides only the software, it the customer's responsibility to provide the computer hardware or virtual machine (VM) to host the AOS client.

The advantage of this concept is that the computer hardware and the operating system running on this computer can be adjusted to suit your specific IT security needs and follow your IT maintenance and software upgrade policies. The computer must be an Intel Pentium class PC at a minimum. There are no special requirements for memory or other hardware if the hardware is supported by one of these operating systems:

- Microsoft Windows: Windows 2008 server and later
- Linux: RHEL 4, RHEL 5, SUSE 9, or SUSE 10
- Mac OS: Maverick and later

Alternatively, AOS also can be installed on a Linux on IBM z Systems™ partition for RHEL5, SUSE 9, or SUSE 10.

Tip: Some Linux systems might require a window manager to be installed. A GNOME or KDE environment is not required. The Linux system must start to run level 5. A graphical login is required even if only port forwarding is configured. There is no support for Debian based OS systems.

Note: Java 1.6 or above must be installed in the OS for AOS to run.

1.3 IBM Assist On-site support service client communication flow

Figure 1-1 describes the communication flow between the AOS client software and IBM Support. The chart shows the communication flow when using AOS as a support gateway.

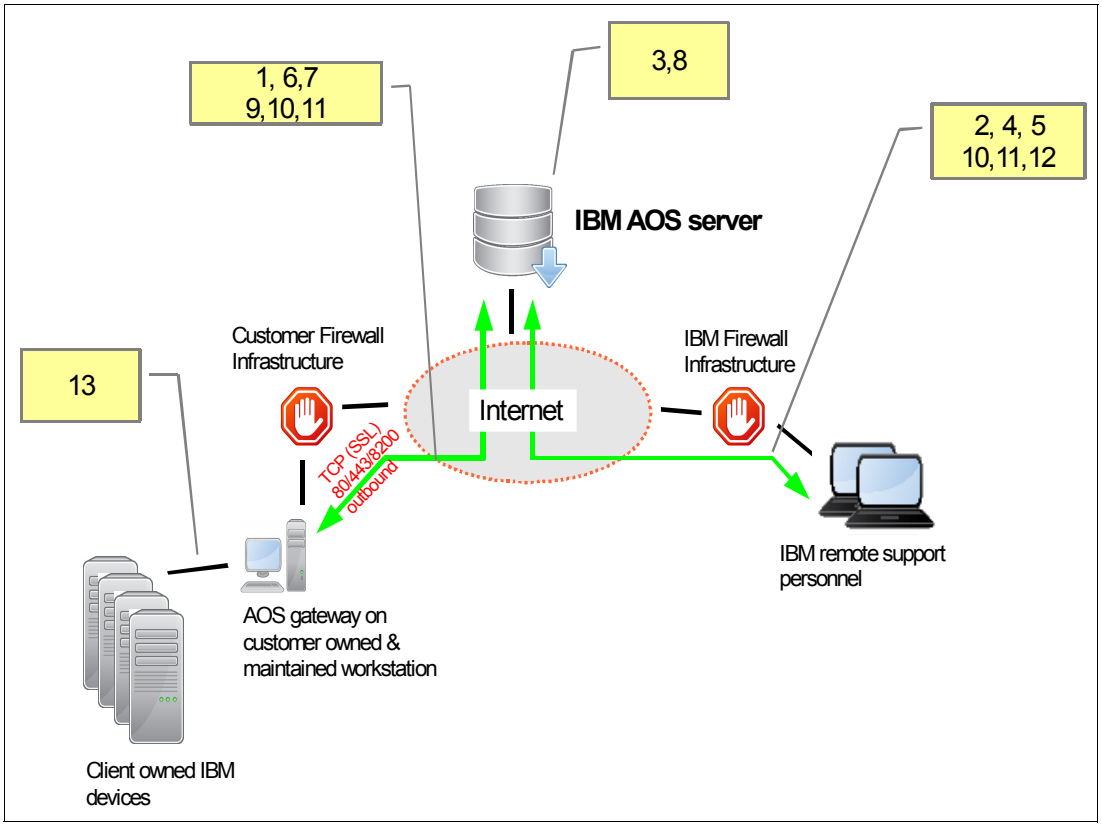

Figure 1-1 IBM Assist On-site communication flow

The green lines are not an indication of bidirectional Call Home, but reflect the flow of traffic after a session is established. AOS is outbound only with regards to the server.

Here is the general AOS communication flow:

1. The AOS support service client sends a heartbeat every 2 minutes to check for a potential connection request, which, from a firewall perspective, is an OUTBOUND connection. The heartbeat contains information such as Customer Name, Customer Number, Systems MTMS, host name, and the ACL.
2. The AOS console application that is installed on the IBM SSR's workstation connects to the AOS server through EDGE, which is a simplified Call Home function that is used for a single domain.
3. The AOS server authenticates the technician and determines the ACL and Team assignment.
4. The AOS console requests a list of allowed AOS support service clients. This list is based on the ACL or Team assignment for this technician. The name of the AOS console program in Version 4.0 is called "controller" and the installation file is named "IBM End Point Manager."

5. The technician creates a connection request and sends it to the AOS relay server through the console.
6. With the next heartbeat, the AOS support service client is notified of the connection request.
7. The support service console starts the AOS client and establishes a remote support connection to the AOS server. (The remote support connection might be established to either `aos.us.ihost.com` or `aos.uk.ihost.com`, depending on the AOS version.)
8. The AOS server is logging the established session and can record a panel sharing session at the technician's request.
9. Optimally, you must accept or refuse the session. The default answer is a configurable item on the support service client.
10. The AOS client and AOS console start the preconfigured session mode. The session mode can be one of the following items:
    - Shared Panel
    - Chat Mode
    - View Mode
    - Port Forwarding
11. The technician or you change the session mode to port forwarding.
12. The technician starts IP-based maintenance software.
13. When using the port forwarding mode, the AOS support service client sends the IP packets of maintenance software to a predefined IP address and predefined port.

1.3.1 IBM Assist On-site Launcher or Web Start client communication

When you use the AOS Launcher or Web Start client, the software requests a connection code that is given to you by the IBM SSR. After you enter the connection code, the AOS client connects to the AOS server. With the connection code, the AOS server establishes the connection to the technician who initially requested the connection.

The connection code is generated by the AOS server and is presented to the technician. This ensures that a connection code is not reused. The standard lifetime of the connection code is 30 minutes, which can be extended twice in 30-minute extents. If the lifetime is not extended, the connection code becomes invalid.

1.3.2 IBM Assist On-site server environment

The AOS server environment is a setup of multiple servers. The main servers are set up for high availability and load balancing.

For load balancing, AOS servers are located worldwide to reduce the network latency and improve availability. For the Web Start and the Launcher versions, the AOS server is manually selected.

For the support service client, the AOS server is determined each time an AOS connection is established. This action ensures that the connection made is not relying on a single AOS server. The selection on the AOS server is based on the network speed to the available AOS servers to ensure the fastest connection possible.

1.4 Using the IBM Assist On-site support service as a support gateway

Note: The gateway solution is an alternative to the standard dial-in solution that is implemented in the product. It should be considered only if the built-in solution cannot be used.

For Call Home and data offload, the standard implementation of the device must be enabled.

When you use AOS in port-forwarding mode, you can use a PC that is running the AOS support service as an entry point for IBM Support into your entire IT infrastructure. The gateway usage is the ideal solution for remote maintenance connections, where you do not need to interact with the support.

The gateway solution can use the benefits of a modem dial-in support connection by using an IP connection instead.

For the gateway, plan to have a second PC to create a redundant setup. Having two AOS gateways with an identical configuration eliminates a possible single point of failure in the remote access infrastructure.

Next, see steps 11 on page 7 - 13 on page 7, which are also shown in Figure 1-1 on page 6. On the AOS gateway in this example, we installed the AOS support service client and configured the AOS port forwarding for each IBM device.

Finally, a technician who wants to connect to an IBM device establishes an AOS connection, as described in steps 1 on page 6 - 10 on page 7. After the session is established successfully, you or the technician can change to the port-forwarding mode to allow the technician to establish a direct IP connection and use advanced maintenance tools.

Important: To ensure that the gateway solution is usable as a modem replacement, work with IBM SSRs. When you work with the IBM Support center, technicians ensure that the IBM internal system reflects the correct remote connectivity information for your system.

1.5 Security aspects for IBM Assist On-site usage

The focus of this section is on using the native AOS software, and see how it can improve security for a remote support connection.

1.5.1 IBM Assist On-site Client windows for user approval and connection monitoring

When the AOS session is in progress, the program window that is shown in Figure 1-2 on page 9 opens. It is always at the upper left menu of the AOS console, and the application name is IBM Endpoint Manager for Remote Control. The session mode can be identified for the purpose of activation, such as port forwarding.

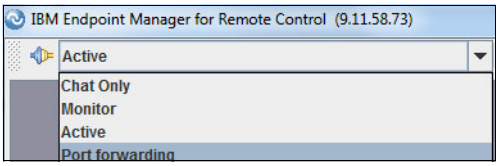

Figure 1-2 IBM Assist On-site V4.0 console application

When the AOS connection is initially established, AOS first opens a window, which is shown in Figure 1-3, to request approval before establishing a session.

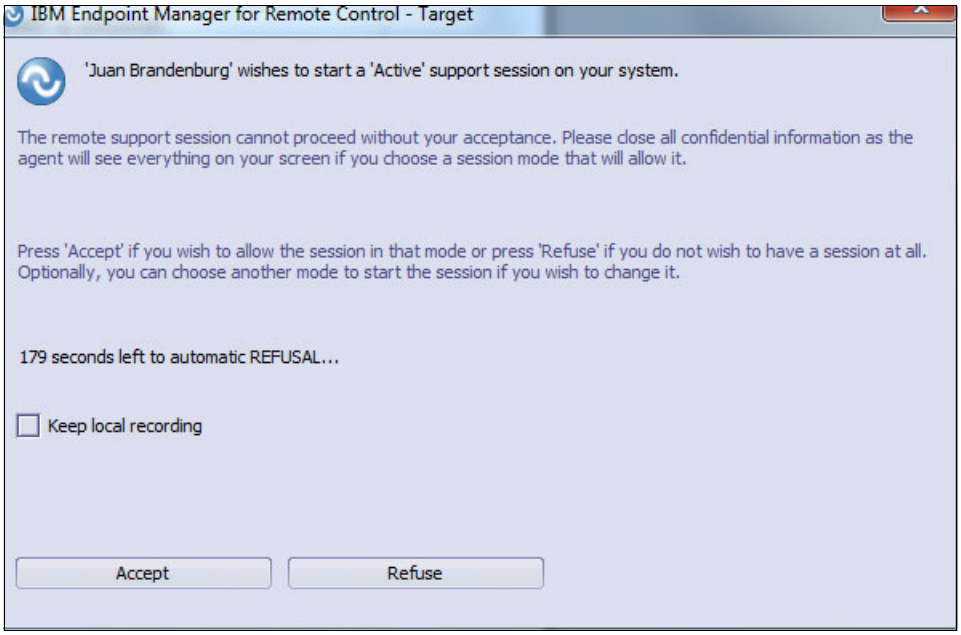

Figure 1-3 IBM Assist On-site client - approval for IBM Assist On-site session establishment

A communication and the exchange of a 7-digit connection code is required to establish the AOS connection. Figure 1-4 shows the AOS connection window that opens for requesting the session code. The connection code is given to you by the IBM SSR who needs to connect to your system.

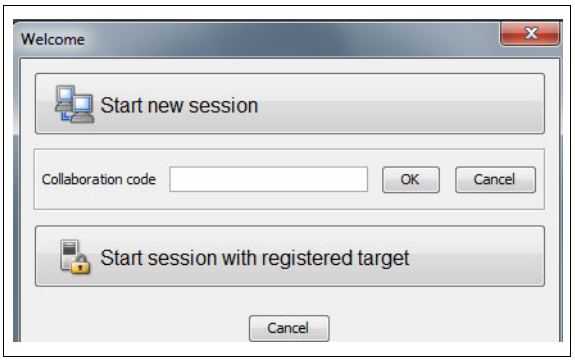

Figure 1-4 Connection code for the remote session

If the technician provides a weblink, clicking the link directs you to the AOS remote website for Web Start, which is described in 1.5.2, “IBM Assist On-site Web Start and IBM Assist On-site Launcher” on page 10.

The technician who is connected can be identified in the approval session window, as shown in Figure 1-3 on page 9**,** or, during an AOS session by clicking the **Connected Users** icon by the taskbar, as shown in Figure 1-5.

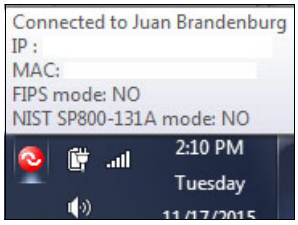

Figure 1-5 IBM Assist On-site client - connected user

If you are not in the shared control mode, the technician cannot change the session type. If the technician requests a change of the session mode, the message box that is shown in Figure 1-6 opens and requests your approval. If **Accept** is not clicked within the specified remaining time, the request is automatically refused.

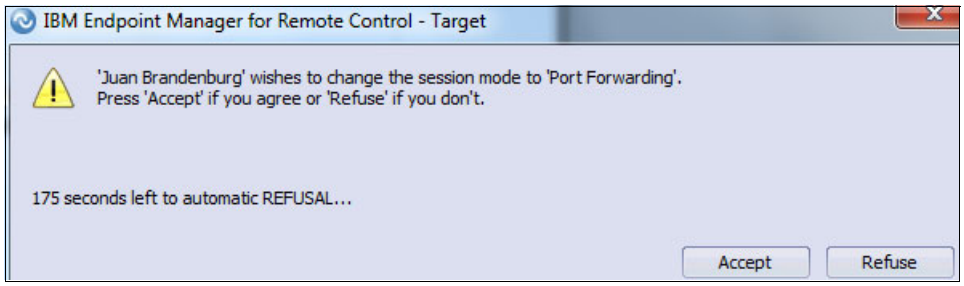

Figure 1-6 IBM Assist On-site client - approval window for changing a session

1.5.2 IBM Assist On-site Web Start and IBM Assist On-site Launcher

When you use the AOS Web Start and AOS Launcher software, IBM SSRs can connect to your system only if you manually start a session. No unattended connection to your IT infrastructure is possible.

Only you and the technician know the connection link. When you click this link, you must read and accept the IBM AOS remote support compliance agreements.

At the bottom of the usage agreement, the AOS initiator session information is available for confirmation. You must verify the session information and accept the agreement to continue.

Upon accepting, a new window opens, where the Web Start tool can be downloaded. This tool file is called `onDemandRCLauncher`. It is a Java application that the technician can use to support the product.

Depending on the user operating system, some additional usage permissions might be displayed and must be accepted before the application can run.

Here are some points to consider if you plan to share support by using Web Start on a continuous basis:

- Operator instructions must be documented so that the operator in your command center knows all the steps that are required to establish an AOS session through either the Launcher or Web Start option.
- The Web Start option might violate your IT regulations regarding downloading an executable file from the Internet.
- Port forwarding must be configured every time that a connection is established.

1.5.3 IBM Assist On-site support service

Tip: If you want to use AOS as a gateway for IBM remote support, consider running in unattended mode. Unattended mode allows IBM Support to connect to the system after a Call Home event.

The installation default of the AOS support service software is to approve the connection and all mode changes, as described in 1.2.1, “IBM Assist On-site support session modes” on page 3. If you do want to grant an unattended connection, disable Attended Mode by using the configuration program for the AOS support service.

Running the configuration program while an AOS session is in progress causes the session to terminate.

With AOS V4.0, there is more logging information in the logs. The trace files contain detailed information, including the name of the IBM SSR and the actions that are performed.

The support service client also has a configurable availability schedule. This schedule can be limited to the hours of the day (0:00 – 24:00), weekdays (Monday through Sunday), or day of the month (1 – 31).

Tip: Do not modify the availability schedule for the support service client if you want to allow IBM Support to access your environment at any time. This setting can be compared to the “allow unattended service” modem setting.

To limit access to the support service client, the ACL must be maintained. There are IBM maintained support group lists that are available. These lists define the support region and the product. You can choose which support teams can access the AOS client. Those group names are given to you when you contact IBM Support to implement an AOS support gateway.

1.5.4 Security considerations for port forwarding

Port forwarding allows IBM Support to connect directly to the predefined devices only. The technician cannot change these settings when in port-forwarding mode. The only way to change the settings is during an attended AOS Web Start or AOS Launcher session.

If you want extra security mechanisms, the port forwarding can be used to redirect the technician to an additional, intermediate server. For example, you can use this option to perform an additional login by using specific credentials that you provide.

Usually, maintenance tools that are used by the technician rely on an end-to-end ASCII connection between the technician's PC and the device. This might be a Telnet or SSH-based ASCII terminal session.

1.5.5 IBM Assist On-site software security aspects

Here are some security highlights of the AOS software:

- The AOS connection is encrypted between the AOS client, the AOS server, and the AOS console.
- The AOS servers are known and the dedicated list of IP addresses is available. You can use this list to configure your firewall in such a way that the AOS PC can talk only to those IP addresses.

For more information about AOS tools and IP addresses, see Chapter 4, "Frequently asked questions" on page 37.

1.5.6 IBM device security aspects

The IBM devices have a built-in authentication method. The authentication is used when IBM Support establishes remote access through the network or the modem.

When you use AOS as the remote access gateway, additional authentication provides additional security. Indeed, only the authorized and trained support member can log in to the device.

2

IBM Assist On-site implementation

This chapter provides a guide about how to set up a remote support gateway by using the IBM Assist On-site (AOS) support service client.

This chapter covers the following topics:

- Getting started
- Setting up the network connectivity
- IBM Assist On-site support service installation
- IBM Assist On-site support configuration GUI

2.1 Getting started

To get started with AOS, the following items are required:

- Be sure that you have the correct environment that is required to install AOS. For a complete list of supported storage products for AOS, see 3.1, “General device information” on page 24.
- Discuss with your IBM Support Service Representative (IBM SSR) your intention to use AOS. A member of the IBM Support team sends you the necessary software to install AOS.
- Prepare the hardware to match the requirements. The minimum requirements for the computer and Internet connection are described in 1.2.3, “Hardware requirements for the IBM Assist On-site software” on page 5.

2.2 Setting up the network connectivity

Before using the AOS application, test the environment connectivity to the AOS network by using the AOS tester. The executable file for the AOS tester can be downloaded from the following website:

https://aos.us.ihost.com/AssistOnSite/

Note: This tool is available only for Windows users.

Figure 2-1 shows an example of an AOS tester output. Results can vary depending on your firewall and proxy settings. The list that is displayed is ordered by connection response speed (fastest to slowest). The preferred IP addresses to use are the ones with port 443.

Region	Server	Port	SSL	Proxy	Result	Comments
EMEA	195.171.173.165	8200	No	Yes		Success. It is a relay
EMEA	195.171.173.165	80	No	Yes		Success. It is a relay
AMERICA	72.15.208.234	8200	No	Yes		Success. It is a relay
AMERICA	72.15.208.234	80	No	Yes		Success. It is a relay
Relay1	72.15.223.60	8200	No	Yes		Success. It is a relay
Relay1	72.15.223.60	80	No	Yes		Success. It is a relay
Backup	72.15.223.61	8200	No	Yes		Success. It is a relay
Backup	72.15.223.61	80	No	Yes		Success. It is a relay
EMEA	195.171.173.165	443	Yes	Yes		Success. It is a relay
Relay1	72.15.223.60	443	Yes	Yes		Success. It is a relay

Figure 2-1 Assist On-site tester results

IBM Assist On-site connectivity requirements

When you download and run the AOS tester utility, the program goes through a series of steps to attempt to ascertain the proxy settings (if applicable) for your environment and then establish a connection to the AOS servers to start the support session.

Firewalls

Firewalls might block the AOS connection, especially when the system is in a management LAN segment. Software firewalls such as Microsoft Windows Firewall, Checkpoint's Zone Alarm, and IBM Internet Security Systems BlackICE can also deny the AOS connection directly on the PC. If the firewall logs indicate that traffic is blocked, configure the firewall according to the vendor's instructions and according to the server and port information in this document. If the software firewall of the PC is not blocking the traffic, there might be an additional firewall in the network infrastructure. Consult your network administrator to change that firewall. All AOS IP traffic to IBM is exclusively outbound through the firewall.

Ports, relay hosts, and IP information

The relay server is an application server that handles the data transmission for support sessions between the Remote Support Console and the Remote Support utility.

If additional configuration is required with your firewall or proxy, see Table 2-1, which describes the required IP and port configuration.

Table 2-1 IP and port information

GEO	Host name	IP address	Ports
Americas	aos.us.ihost.com	72.15.208.234	8200 or 80
Americas	aosback.us.ihost.com	72.15.223.61	8200 or 80 or 443
Americas	aosrelay1.us.ihost.com	72.15.223.60	8200 or 80 or 443
Americas	aoshats.us.ihost.com	72.15.223.62	443
EMEA	aos.uk.ihost.com	195.171.173.165	443

To improve performance and increase redundancy allow encrypted SSL traffic to all the servers that are listed in Table 2-1.

To use geographically specific relay servers and realize improved throughput, you should also allow encrypted outbound traffic to one of the geographically specific relay servers on ports 8200, 80, or 443. The encryption method depends on the port of connectivity. Sessions that use port 80 or 8200 use MARs encryption, and sessions on 443 use TLS. There are no MARs that are used for IBM Endpoint Manager for Remote Control (AOS V4.0).

If the connection cannot be established, an error is displayed on the window, and a diagnostic log is written to disk and automatically opened in `notepad.exe` so that you can review the diagnostic information being gathered and send it to support for analysis.

The diagnostic file is stored in the temp directory for the user, which in systems such as Windows 2008 and XP is `\Documents and Settings\<USERNAME> \Local Settings\%Temp%`, where `USERNAME` is the name of the user logged in to the client machine. The name of the file is `connrpt.html`.

2.3 IBM Assist On-site support service installation

This section describes the AOS support service installation on Windows and Linux.

2.3.1 Installation procedure for Windows

Your local IBM SSR can work with you to get the installation files.

The latest version for AOS is Version 4.0, and the file name for the customer program is called `IBM_AOS_lightsout_setup4.0.0.0.0`*xxx*, where x indicates the patch level.

To install AOS Lights Out target V4.0, complete the following steps:

1. Double-click the installation file to open a command prompt window, as shown in Figure 2-2. The package is installed in the background, as shown in the command prompt window.

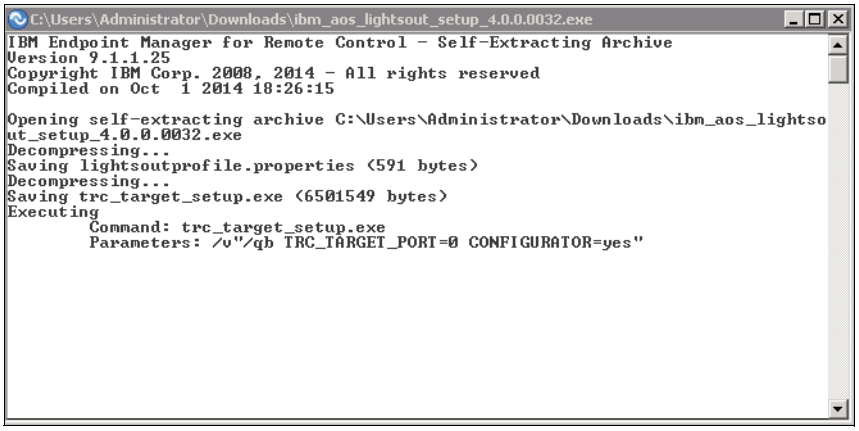

Figure 2-2 Command prompt for IBM Assist On-site V4.0 Lights Out installation

You can check the installation progress from the AOS target controller window, as shown in Figure 2-3.

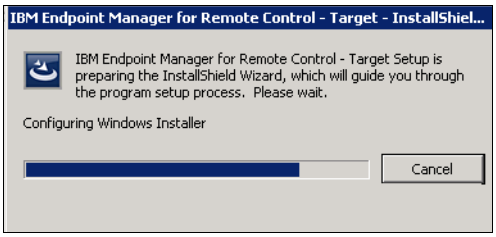

Figure 2-3 IBM Endpoint Manager for Remote Control target installation

2. After the installation completes you can start the configuration utility from the configuration window through the Start menu, as shown in Figure 2-4.

Figure 2-4 Target Configuration Utility for a Lights Out session

2.3.2 Installation procedure for Linux

IBM also provides an RPM package for Linux systems. An illustration of the AOS installation on a Linux system is shown in Example 2-1 and Example 2-2.

Example 2-1 IBM Assist On-site installation on Linux for Version 3.3

```
# rpm -ivh ibm-aos-support-service-3.3.0-0048.i386.rpm

Preparing...                ########################################### [100%]
   1:ibm-aos-support-service########################################### [100%]
```

Example 2-2 IBM Assist On-site installation on Linux for Version 4.0

```
# chmod u+x ibm_aos_lightsout_setup_4.0.0.0212.bin
# ./ibm_aos_lightsout_setup_4.0.0.0212.bin
IBM Endpoint Manager for Remote Control - Self-Extracting Archive
Version 9.1.1.49
Copyright IBM Corp. 2008, 2014 - All rights reserved
Compiled on Jul 28 2015 13:37:44

Opening self-extracting archive ./ibm_aos_lightsout_setup_4.0.0.0212.bin
Decompressing...
Saving lightsoutprofile.properties (3155 bytes)
Decompressing...
Saving ibm-trc-target-configurator-9.1.1.i386.rpm (237360 bytes)
Decompressing...
Saving ibm-trc-target-9.1.1.i386.rpm (2843816 bytes)
Decompressing...
Saving ibm_aos_lightsout.sh (580 bytes)
Executing
        Command: ./ibm_aos_lightsout.sh
        Parameters: install
Preparing...                ########################################### [100%]
   1:ibm-trc-target         ########################################### [ 50%]
   2:ibm-trc-target-configur########################################### [100%]
`lightsoutprofile.properties' ->
`/var/opt/ibm/trc/target/profiles/lightsoutprofile.properties'
Stopping IBM Endpoint Manager for Remote Control - Target: [FAILED]
Starting IBM Endpoint Manager for Remote Control - Target: [  OK  ]
Command executed with return code 0
```

Note: There are some Linux dependencies for installing AOS V4.0. If you receive a bad ELF interpreter error, you can get a list of dependencies by running the following command:

`yum -y install glibc.i686` (on RPM based distributions)

There is no Debian support.

2.4 IBM Assist On-site support configuration GUI

To use the AOS support configuration GUI, complete the following steps:

1. Start the AOS configuration GUI (in Version 3.3) or Target configuration utility (in Version 4.0)

   Note: If the AOS support service tool was installed previously on a Linux system, to start the AOS configuration GUI, run the following commands:

   - **# /opt/ibm/aos/support_service/aos_cfg** (for Version 3.3)
   - **# /opt/ibm/trc/target/ibm-trc-target-configurator** (for Version 4.0)

2. For Version 3.3, provide the information that is shown in Figure 2-5:

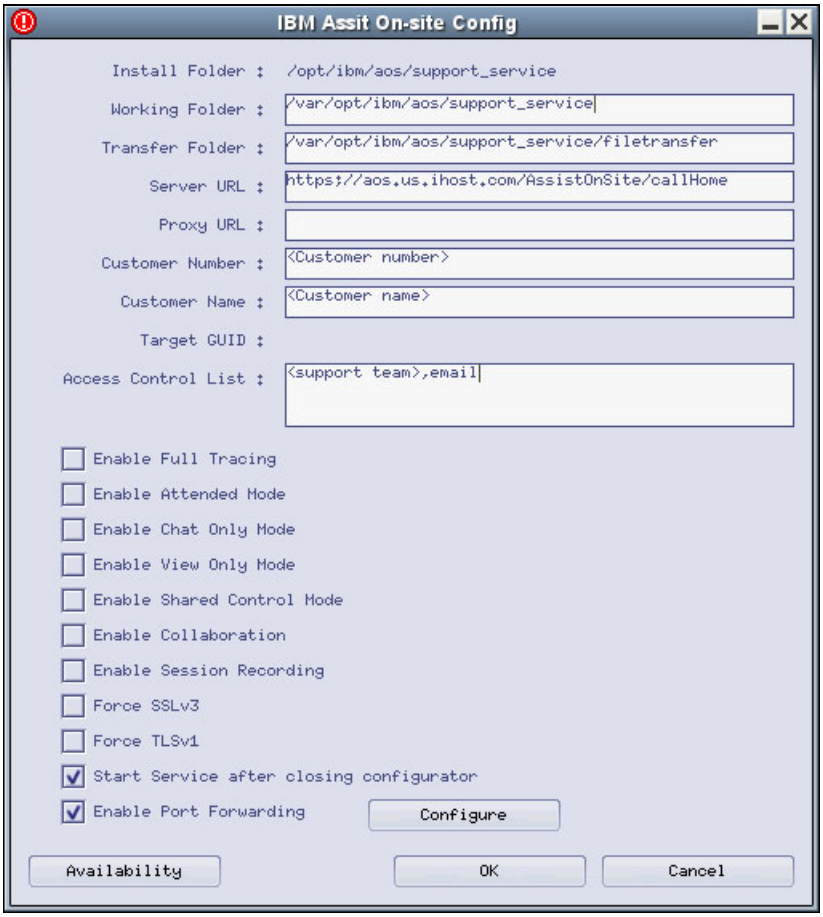

Figure 2-5 IBM Assist On-site Version 3.3 configuration

For Version 4.0, provide the information that is shown in Figure 2-6 on page 19.

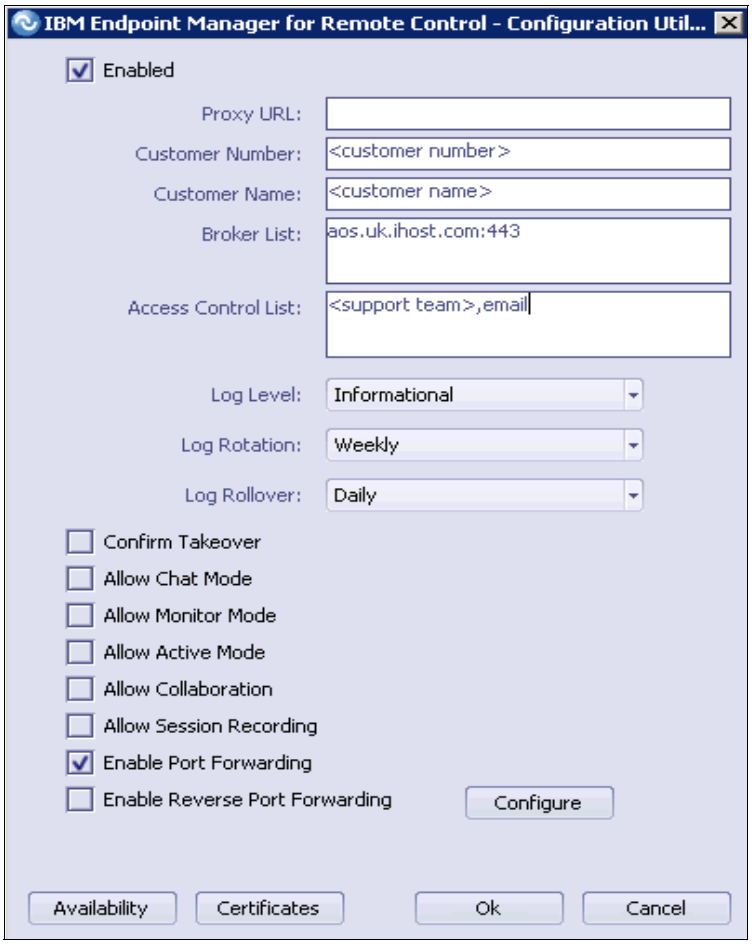

Figure 2-6 IBM Assist On-site 4.0 Target configuration utility

– In the Server URL text box, specify the following paths:
  - `https://aos.us.ihost.com/AssistOnSite/callHome` (for Version 3.3)
  - `http://aos.uk.ihost.com:443` (for version v4.0. This is called a brokerlist.)
– If a proxy authorization is required, use the following scheme:

  `http://username:password@xxx.xxx.xxx.xxx:[port]`
– Enter your customer number and name in the corresponding text boxes.
– In the Access Control List (ACL), specify the authorized Support Teams and AOS User ID or email address of individual support members. If more than one group or AOS user is specified, use the comma (,) character as separator. This is case-sensitive.

> **Note:** Always include the product engineering group in this section. For the ACL of the product, see Chapter 3, “IBM Assist On-site device connectivity” on page 23. Most IBM storage products can be use with the ACL `IBM/BLUE/STG/Storage`.

– Select the session modes. For product-specific settings, see Chapter 3, “IBM Assist On-site device connectivity” on page 23.
– The AOS support service automatically starts if you select **Start Service after closing configurator**. For Version 4.0, the IBM Endpoint Manager for Remote Control configuration utility has the “Enabled” check mark at the top.

Availability settings

For the Availability settings, leave all the boxes selected, as shown in Figure 2-7. This action ensures 24x7 access for the remote support team.

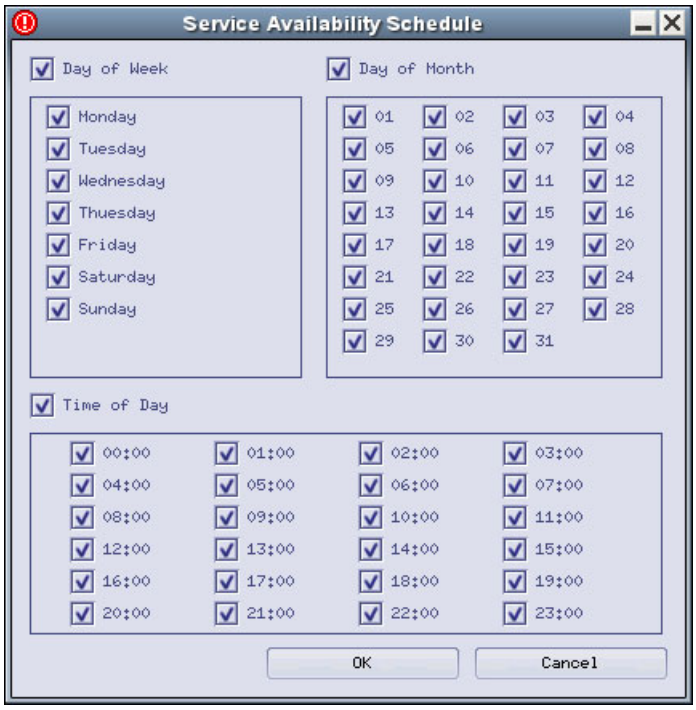

Figure 2-7 Service availability schedule

Port-forwarding configuration

You can configure port forwarding and reverse port forwarding by using the Configure Port Forwarding window. After you explicitly configure permission for port forwarding, the support engineer can begin unattended port forwarding sessions to the authorized ports.

To configure port forwarding, complete the following steps:

1. In the support service Config window, select **Enable Port Forwarding** if required.
2. Click **Configure.** The Configure Port Forwarding window opens, as shown in Figure 2-8 on page 21.

Figure 2-8 Configure port forwarding

3. In the text box, type in a comma-separated list of host machine aliases, host machines, ports, and protocols that the IBM SSRs can connect to during an AOS session, as shown in Table 2-2. Here is the syntax for each allowed connection in the list:

   `<host_alias>=udp|tcp@<host_name>|<IP_addr>:<port_num>`

Table 2-2 Variables for the port forwarding syntax

Variable	Description
<host_alias>=	The optional alias name for the host machine. For example, MTMS (Machine Type, Machine Serial) with management interface and a possible type of protocol: SSH, HTTP, or WUI.
udp|tcp	The protocol for the connection, whether UDP or IBM Tivoli® Storage Productivity Center. For example, tcp.
<host_name>|<IP_addr>	The fully qualified name of the host machine or its IP address. For example: `198.162.1.2`. If you want to configure a reverse port forwarding option, use `0.0.0.0` as the IP address.
<port_num>	The listening port for the connection. For example, 3456 or 22.

If the IBM Endpoint Manager for Remote Control - Configuration Utility does not show the graphical version of the Linux OS after installation, you can configure through command-line interface by using the procedure that is shown in Example 2-3.

Example 2-3 Configure AOS V4.0 in CentOS 7 postinstallation by using a DS8000 storage device

```
> vi /var/opt/ibm/trc/target/profiles/lightsoutprofile.properties

#change the following values as listed below

ProfileEnabled = true

BrokerList = aos.uk.ihost.com\:443;aoshats.us.ihost.com\:443
ProxyURL =

Custom.CustNumber =
Custom.CustName =
ACL = IBM/BLUE/STG/DS8k,IBM/BLUE/STG/Storage

ConfirmTakeOver = false
AllowChatMode = false
```

```
TunnelList=2107-961*75xxxxx_hmc1_https=tcp@x.xx.xx.xxx:443,2107-961*75xxxxx_hmc1_s
sh=tcp@x.xx.xx.xxx:22
AllowMonitor = false
AllowActive = false
AllowCollaboration = true
AllowRecording = false
AllowTunnel = true

#save changes and restart the aos service
> service ibmtrct restart
Stopping IBM Endpoint Manager for Remote Control - Target: [  OK  ]
Starting IBM Endpoint Manager for Remote Control - Target: [  OK  ]
```

After a successful restart, the IBM SSR should see the target through the AOS V4 console. Make sure that the fields Customer Number, Customer Name, and ACL are complete. Contact your local technical representative for list of ACLs for the storage devices.

3

IBM Assist On-site device connectivity

This chapter provides information about the IBM products that can connect through IBM Assist On-site (AOS) remote support service software. It references information about AOS and supported storage devices.

This chapter covers the following topics:

- General device information
- DS8000 with IBM Assist On-site
- IBM XIV Storage System
- IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems
- Tape systems

3.1 General device information

AOS can be used with several IBM storage devices. In fact, on some of those devices, AOS already is installed natively. This is the case for IBM Scale Out Network Attached Storage, IBM Storwize® V7000 Unified, and the IBM System Storage® TS3000 System Console (TSSC). As for other storage devices, such as the IBM DS8000, where AOS is not natively supported, IBM Support Service Representatives (IBM SSRs) can connect to a client-deployed AOS gateway from which the device can be remotely serviced.

Table 3-1 lists the IBM devices in which AOS is embedded.

Table 3-1 IBM Assist On-site native integration

Device	Embedded AOS client
Scale Out Network Attached Storage and the Storwize V7000 Unified family	Yes
Tape Systems with TSSC	Yes
DS8000 family	Yes[a]; otherwise No
IBM XIV® Storage System family	No

a. Starting with DS8870 Licensed Machine Code (LMC) 7.7.10.287, an AOS client is embedded in the Hardware Management Console.

3.2 DS8000 with IBM Assist On-site

The DS8000 devices can be supported by using port forwarding through an AOS gateway or by using an embedded AOS client.

In combination with the Call Home and data offload through an https connection (Internet SSL) options, the AOS embedded server in the HMC enables support to operate your DS8000 system without needing a modem or a customer-provided server.

For more information about the AOS workflow and configuration, see the following website:

http://www.ibm.com/support/docview.wss?uid=ssg1S7005172

3.2.1 IBM Assist On-site server work flow on a DS8000 system

Figure 3-1 on page 25 shows the AOS connection by using the embedded client. When you want to use the embedded AOS client as the replacement for the analog modem, IBM Support can enable the embedded client.

Tip: The embedded AOS client also must be enabled on the external Hardware Management Console (HMC) to provide redundancy.

When enabling the embedded AOS client, no AOS gateway is required.

If the connection must be routed through a proxy server, provide the proxy details to the IBM SSR before the client is activated.

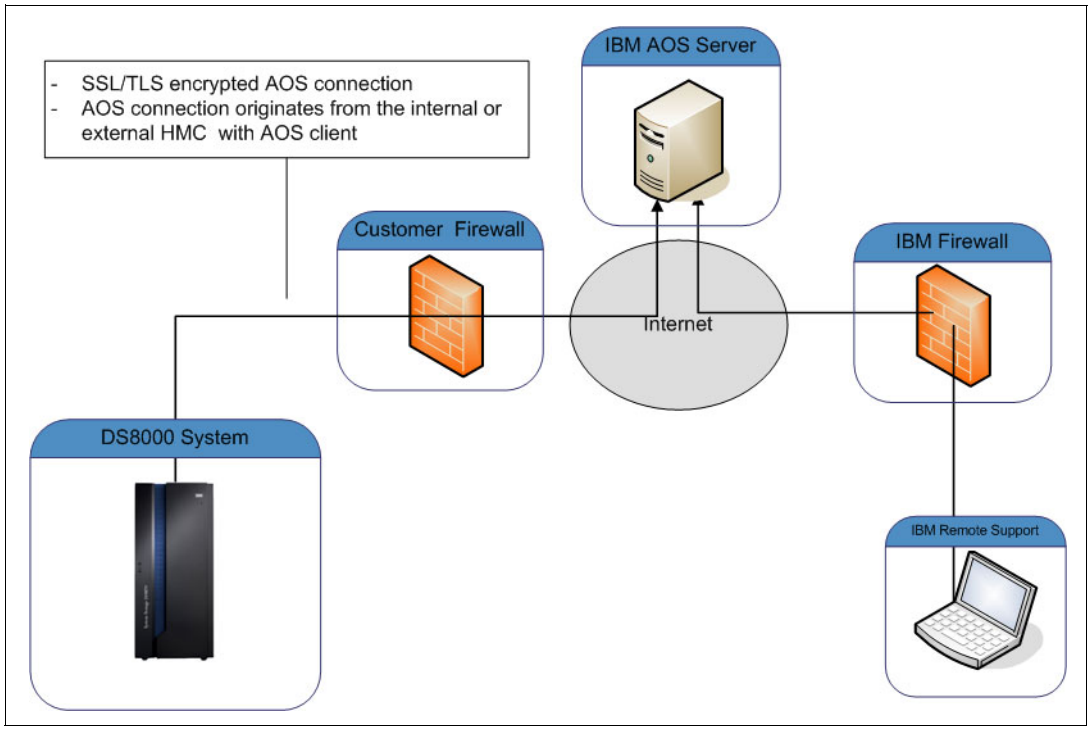

Figure 3-1 DS8000 system with embedded IBM Assist On-site workflow

All models of the DS8000 family can be accessed through an AOS gateway if they are at LMC level 64.x.xx.xxx or higher.

When using a AOS gateway, you must provide a gateway computer where AOS can be installed (Figure 3-2). IBM Support can then use the AOS gateway to connect to the DS8000 storage device and perform remote service actions.

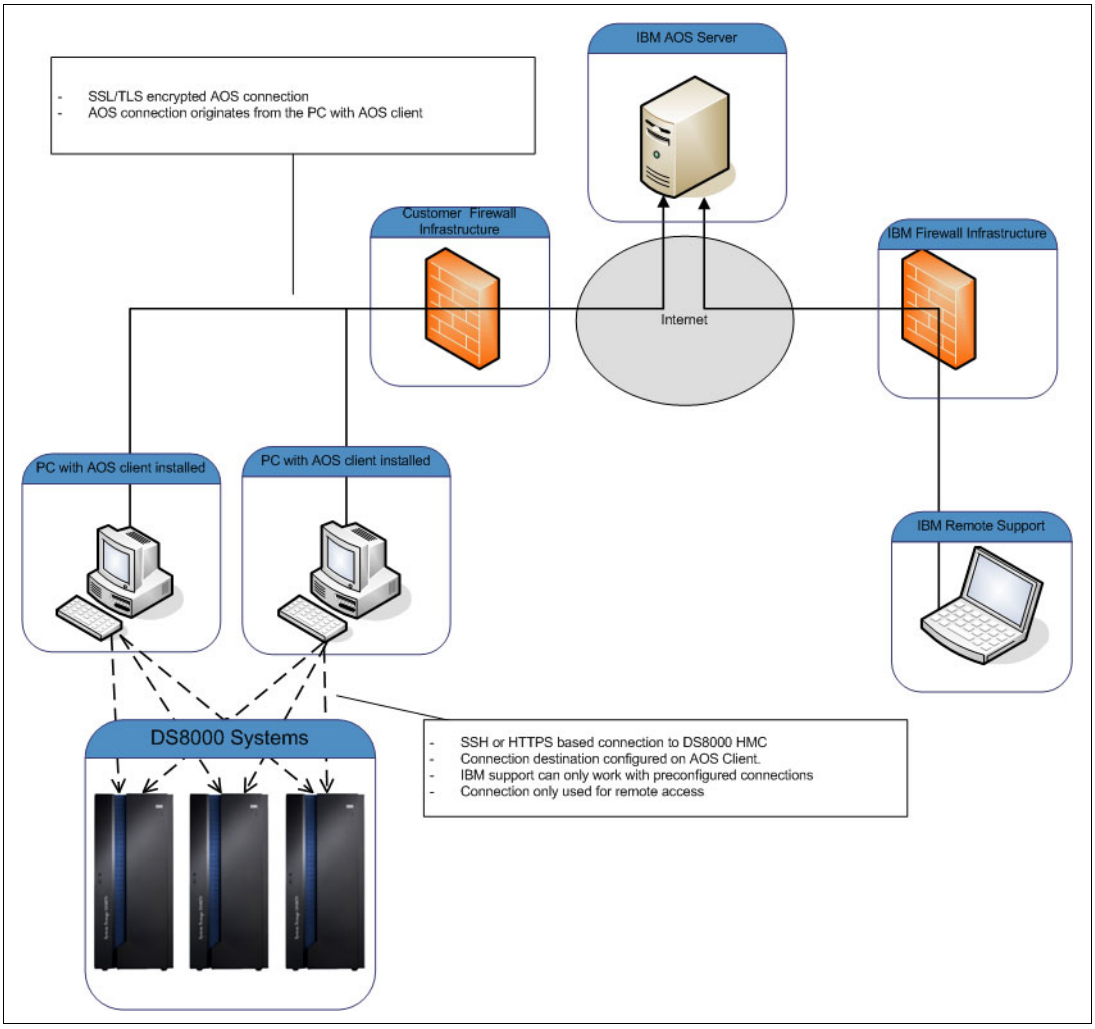

Figure 3-2 Simple IBM Assist On-site connectivity to DS8000 and customer provided gateway

After an AOS session is established, IBM Support can connect to the DS8000 system and use the IBM maintenance tools to perform maintenance on the DS8000 system. These tools use a Secure Shell-secured (SSH) ASCII terminal connection, and they do not support any offloading capabilities through AOS. However, you can offload data by using the existing DS8000 Call Home function.

With AOS, you can enable or disable remote maintenance access for IBM Support through attended or unattended sessions. The session types are defined in 1.1, “Remote support connections for IBM storage systems” on page 2.

There is also another option for enabling IBM Support for the DS8000, where you can open or close IBM Support sessions by running a DS command-line interface (CLI) command, either **chaccess** or **lsaccess**, as shown in Example 3-1.

Example 3-1 Example of how to disable and enable SSH inbound from DSCLi

```
dscli> chaccess -cmdline disable -hmc 1
Date/Time: September 23, 2015 8:57:04 AM CST IBM DSCLI Version: 7.7.21.78 DS: -
```

```
CMUC00441I chaccess: hmc1: The access settings were successfully modified.
dscli>
# All SSH 22 inbound access disable
# to enable again
dscli> chaccess -cmdline enable -hmc 1
Date/Time: September 23, 2015 9:04:08 AM CST IBM DSCLI Version: 7.7.21.78 DS: -
CMUC00441I chaccess: hmc1: The access settings were successfully modified.
dscli>
```

Note: Disabling SSH through DSCLI does not affect Call Home because this is an outbound feature.

In addition, starting with code bundle 88.0.77.0 and later, there is a straight DSCLI AOS option that is implemented, as shown in Example 3-2.

Example 3-2 Enable and disable IBM Assist On-site support through DSCLI starting in bundle 88.0.77.0

```
dscli> chaccess -aos enable
CMUC00441I chaccess: hmc1: The access settings were successfully modified.

dscli> lsaccess
hmc  cmdline wui     modem cim     aos
=========================================
hmc1 enabled enabled -     enabled enabled

dscli> chaccess -aos disable
CMUC00441I chaccess: hmc1: The access settings were successfully modified.

dscli> lsaccess
hmc  cmdline wui     modem cim     aos
=========================================
hmc1 enabled enabled -     enabled disabled
```

3.2.2 Implementing IBM Assist On-site for a DS8000 system

Both the external and embedded AOS can be configured. This section focuses on how to configure a DS8000 system for AOS. For a generic external AOS configuration, see Chapter 2, “IBM Assist On-site implementation” on page 13.

Configuring IBM Assist On-site as embedded in a DS8000 system

Any DS8000 device can be configured for port forwarding in the AOS configuration GUI by allowing port 22 to connect from the client server to the DS8000 HMC. The same steps that are described in “Port-forwarding configuration” on page 20 can be used to configure port forwarding for the DS8000 AOS gateway. Your local IBM SSR can configure the DS8000 AOS system as documented in the *DS8000 Introduction and Planing Guide (IPG)*, found at:

http://www.ibm.com/support/docview.wss?uid=ssg1S7005228

AOS is integrated with the DS8000 HMC with the following models and code bundles:

- 76.31.121.0 for model 941 with AOS Version 3.3
- 86.31.142.0 for model 951 with AOS Version 3.3
- 87.10.0.0 for model 961 with AOS Version 3.3

- 87.51.14.0 for model 961 with AOS Version 4.0
- 88.0.143.0 for models 980 and 981 with AOS Version 4.0

Note: Starting with Release 8.0 (DS8880), the modem and VPN are no longer supported as remote support connectivity options for Call Home and remote access functions. AOS V4.0 is the available remote support feature.

ACL groups are also an additional security feature because only members of such groups can gain access to the system.

When configuring AOS, the following information is required:

- Proxy information:

  Make sure that a backslash is entered before any wild character on a proxy password or you will have connectivity issues. For example, change `passW*rd` to `passW\*rd`.

- Port forward:

  You must enable port forwarding in order for support to access the system. For more information, see “Port-forwarding configuration” on page 20.

In addition, when configuring the AOS gateway (external) port-forwarding option, use the naming convention under the modem number section, as shown in Table 3-2.

Table 3-2 Port-forwarding naming conventions for the DS8000 system

Device type	Alias
HMC1 SSH connection	DS8000 Model-SN_HMC#_ssh. Example: `2107-75xxxx_HMC1_ssh`
HMC1 HTTPS	DS8000 Model-SN_HMC#_https. Example: `2107-75xxxx_HMC1_https`
HMC2 SSH connection	DS8000 Model-SN_HMC#_ssh. Example: `2107-75xxxx_HMC2_ssh`
HMC2 HTTPS	DS8000 Model-SN_HMC#_https. Example: `2107-75xxxx_HMC2_https`

A host alias is needed to enable Call Home correctly for those systems that do not have AOS already embedded. This task must be done on DS8000 models 951 and earlier on which AOS is not embedded. To check whether AOS is embedded on your system, based on the bundle level, see “Configuring IBM Assist On-site as embedded in a DS8000 system” on page 27.

3.3 IBM XIV Storage System

Important: The preferred support method for the IBM XIV Storage System is through the XIV Remote Support Center (XRSC). In some countries, the AOS gateway method that is described in this section is supported. For more information, contact your IBM SSR.

IBM XIV Storage System devices can be supported through AOS, but not natively. For the DS8000 system, a client-supplied AOS gateway is required. As Figure 3-3 shows, you can control access to all systems that are installed at your site by using a single AOS client (gateway).

You can allow permanent or temporary sessions for your IBM SSR, but you also can interrupt and block the connection at the AOS gateway at any time.

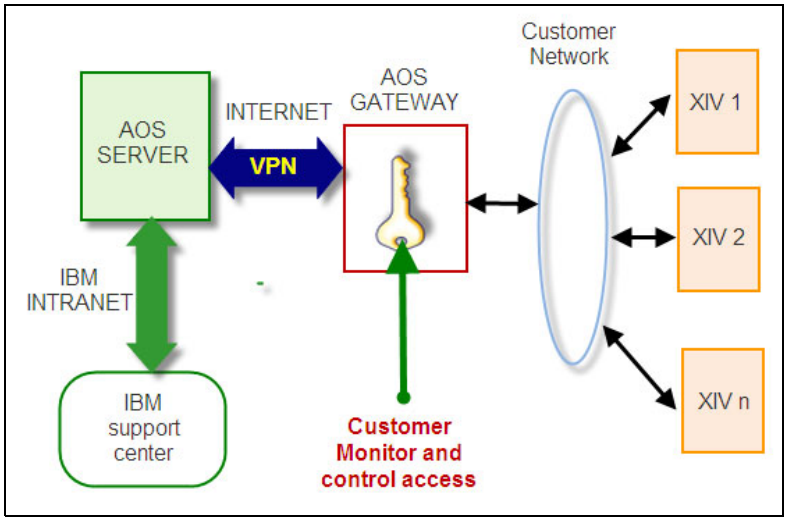

Figure 3-3 Simple IBM Assist On-site connectivity - IBM remote support to client XIV systems

3.3.1 Configuring IBM Assist On-site port forwarding to XIV systems

To configure port forwarding for an XIV Storage System, see Chapter 2, “IBM Assist On-site implementation” on page 13. You can contact IBM Support for further assistance if necessary.

Any XIV Storage System can be configured for port forwarding in the AOS configuration GUI by allowing port 22 to connect from the AOS gateway to all three control modules, if possible. Allowing all three modules ensures that a problem on a single module does not block the remote connection. During configuration, allow the steps in “Port-forwarding configuration” on page 20 to configure AOS to allow port forwarding to the XIV modules. Use the modules 4, 5, and 6 IP addresses.

Also, enable port 7778 to allow the support personnel to use the GUI and the Technical Assistant (TA) tool from a remote location.

Table 3-3 shows the host alias naming convention for XIV systems.

Table 3-3 XIV host alias naming conventions

Device type	Alias
Module 4 SSH	XIV- <serial number> - <module number>#_SSH. Example: `XIV- 6000123 - 4_SSH`
Module 5 SSH	XIV- <serial number> - <module number>#_SSH. Example: `XIV- 6000123 - 5_SSH`
Module 6 SSH	XIV- <serial number> - <module number>#_SSH. Example: `XIV- 6000123 - 6_SSH`
Module 4 GUI	XIV- <serial number> - <module number>#_GUI. Example: `XIV- 6000123 - 4_GUI`
Module 5 GUI	XIV- <serial number> - <module number>#_GUI. Example: `XIV- 6000123 - 5_GUI`
Module 6 GUI	XIV- <serial number> - <module number>#_GUI. Example: `XIV- 6000123 - 6_GUI`

3.4 IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems

The AOS client software is built into both IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems. No additional hardware or software is required at the client site to enable IBM Support for remote connection to the system.

The included AOS client provides both attended and unattended connections.

3.4.1 Setup of IBM Assist On-site for IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems

By default, AOS is disabled for IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems. To enable it, complete the following steps:

1. Open the IBM Scale Out Network Attached Storage or Storwize V7000 Unified GUI. From the Setting icon, select **Support**.
2. From the Support menu, click the **AOS** tab. The window that is shown in Figure 3-4 on page 31 opens.

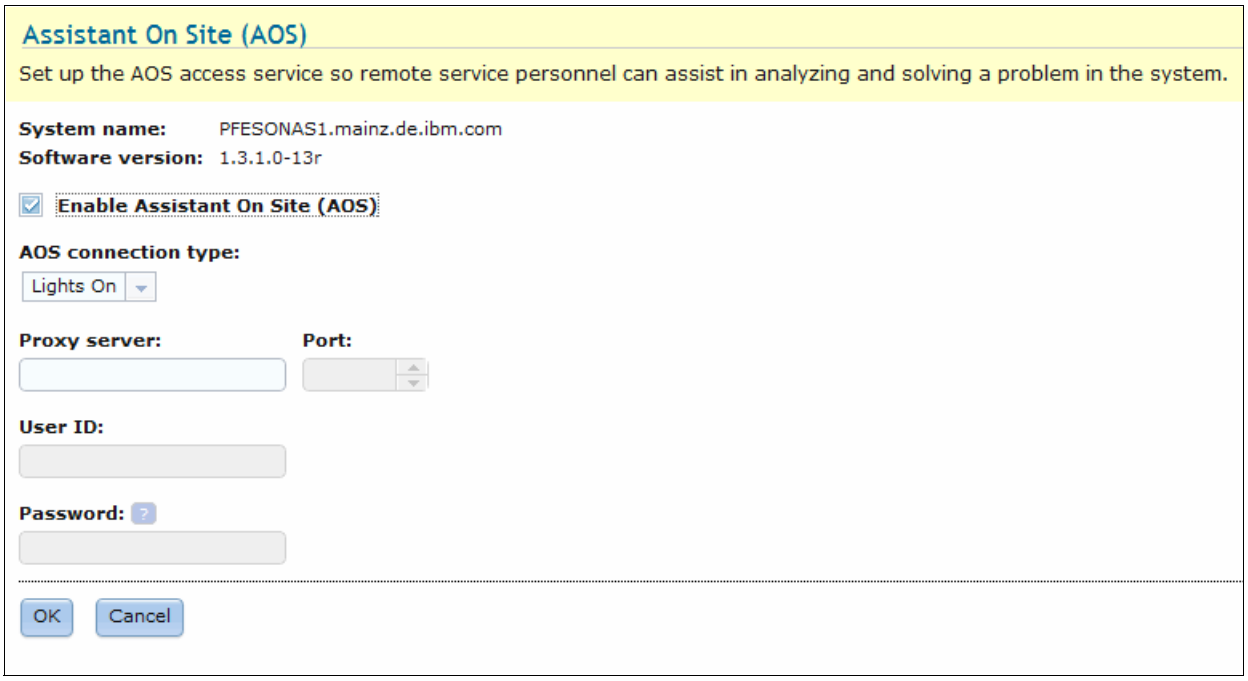

Figure 3-4 Enable IBM Assist On-site in IBM Scale Out Network Attached Storage or Storwize V7000 Unified GUI

3. Click **Edit**.
4. Click **Enable Assist On-site (AOS)**.
5. Choose the AOS connection mode, either **Lights On** or **Lights Out**.
   - Lights On is also referred to as the *attended* mode, which means somebody at the client site must authorize the session manually.
   - Lights Out is also referred to as the *unattended* mode, which means that connections can be established without client intervention.

   For more information about the connection modes, see 1.2.2, “IBM Assist On-site software packages” on page 4.

   Important: Lights On requires the specific file module to be equipped with mouse, keyboard, and video to allow the connection.
6. If required, enter the proxy settings.
7. Click **OK**.

3.4.2 Establishing an IBM Assist On-site connection

This section describes the steps that are required at a client site to authorize a remote IBM SSR to connect to the system through AOS.

Attended mode

If AOS is configured for Lights On connections, you and the remote IBM SSR must work together to establish a connection.

The remote IBM SSR takes the following actions:

1. Creates an HTTP link connection.
2. Provides the connection code to the client.

> **Note:** The connection code is valid for only 30 minutes. It can be extended twice.

At the client site, complete the following steps:

1. Log in to the file module as root.
2. Run **`cnrslaunchaos`**.
3. Enter the connection code that is provided by the remote IBM SSR, which starts your web browser to download the AOS executable file.
4. Confirm the download. The file is stored in `/home/root/desktop/`.
5. After the download is finished, close the browser and run the executable file.
6. Grant the required access level to the remote IBM SSR.
7. When all required actions are finished, close the connection.

Unattended mode

If AOS is configured in Lights Out mode, no additional steps are required at the client site. An IBM SSR can establish a remote connection to your system at any time without intervention by you or your staff.

3.4.3 Using an IBM Assist On-site gateway

You might want to use an AOS gateway to have only one central entry point for all remote connections (for example, if you have other storage devices, such as DS8000 or XIV systems, that do not support AOS natively).

If an AOS gateway is used, port forwarding must be set up to allow remote IBM SSRs to connect to the devices. IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems both use SSH for remote connections, so port forwarding must be configured for port 22.

To identify clearly the device on an AOS gateway, use the naming convention that is shown in Table 3-4.

Table 3-4 Naming convention for IBM Scale Out Network Attached Storage and Storwize V7000 Unified systems

Device type	Alias
IBM Scale Out Network Attached Storage or Storwize V7000 Unified management node	<device type>-<serial number>-<management node number>-SSH Example: `SONAS-7812345-1-SSH`

3.4.4 References

For more information, see the following resources:

- IBM Scale Out Network Attached Storage IBM Knowledge Center:

  http://www-01.ibm.com/support/knowledgecenter/api/redirect/sonasic/sonas1ic/index.jsp

- Storwize V7000 Unified IBM Knowledge Center:

  http://www-01.ibm.com/support/knowledgecenter/api/redirect/storwize/unified_ic/index.jsp

3.5 Tape systems

IBM offers tape backup, recovery, and archiving solutions for data protection and retention. Remote support for these many devices often involves access through the Tape Storage System Console (TSSC), also known as the TS3000. Since Version 5.10, the AOS software is built into the TSSC. It simply must be enabled. Starting with TSSC Version 5.11.5, many clients have adopted the AOS service successfully. To get the newest features and security enhancements, always upgrade to the latest TSSC version.

Because almost all data centers have no ability to monitor modem-based connections, the AOS solution is appropriate for clients who want to control who connects when and where for remote support. Figure 3-5 demonstrates a typical tape setup.

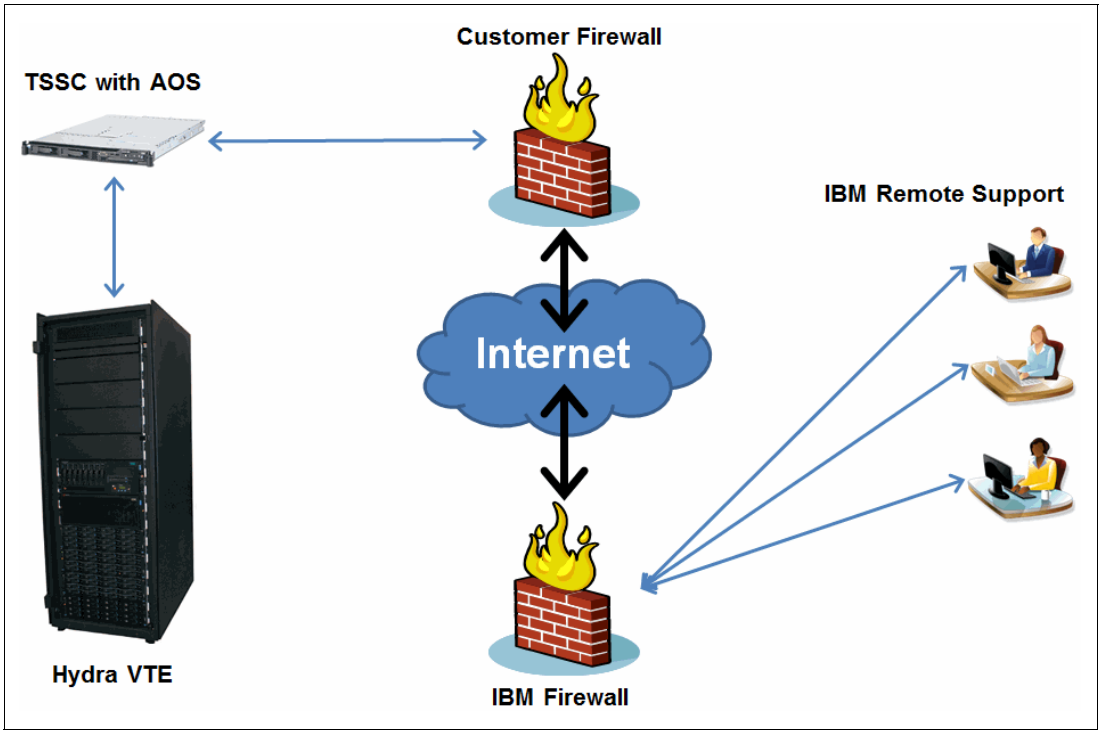

Figure 3-5 Tape products and the TSSC

Lights Out

The Lights Out operation describes setting up the TSSC so that the gateway is always active and can receive a connection without client intervention. This setup is the equivalent of high-speed modem support, where the IBM SSR can establish a session to the TSSC without anyone present in the data center. This setting must be explicitly enabled by the client; it is not the default.

Lights On

The Lights On operation describes setting up the TSSC so that it behaves similarly to the original AOS application for window sharing. When IBM Support must connect, someone must be available at the client site to acknowledge and allow the session. Nothing must be downloaded because the AOS codes are already present. But the client, or an IBM SSR onsite, must enter a key that is provided by IBM Support to complete the connection. This setting is the default for the TSSC.

3.5.1 TSSC implementation

Many entry-level tape products do not have a formal strategy for remote support. The original AOS application, which is used for window sharing, is sometimes used to speed up the analysis of log files or to render occasional assistance. For midrange and enterprise-level products, remote support is most often handled through the TSSC (or TS3000).

The TSSC is the device that generates Call Home messages to IBM on behalf of the tape products, and it is the gateway for remote support. TSSC is also used by the IBM ProtecTIER® products, which are technically not tape devices, but are often implemented in the same data centers. The following devices employ the TSSC, so they can be remotely accessed by using the AOS solution:

- IBM Virtualization Engine TS7700
  - IBM TS7740 Virtualization Engine connected to a TS3584 Tape Library
  - IBM TS7720 Virtualization Engine in a grid with TS7740
- IBM Tape Control Units (TCUs) 3592-C07, 3592-C06, and 3592-J70
- IBM 3584 Tape Library (when connected to VTE or TCU)
- IBM 3494 Tape Library and Library Manager
- IBM 3494 Virtual Tape System (VTS)

3.5.2 Enabling IBM Assist On-site for Lights Out

After logging in to the TSSC, the main window, which is shown in Figure 3-6 on page 35, opens.

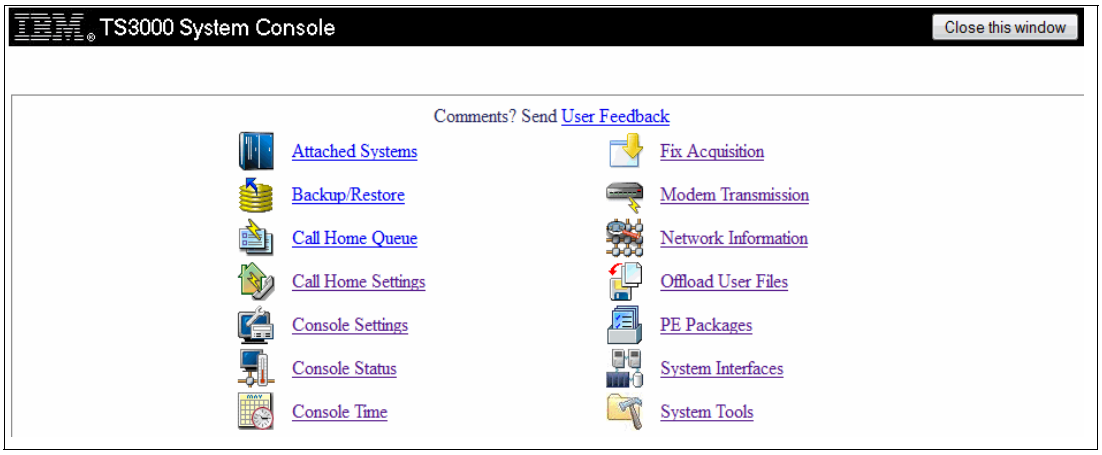

Figure 3-6 TSSC main window

From the TSSC main window, complete the following steps:

1. Click **Call Home Settings** to see several setting categories at the top of the window.
2. Click **AOS Settings**. The window that is shown in Figure 3-7 opens.

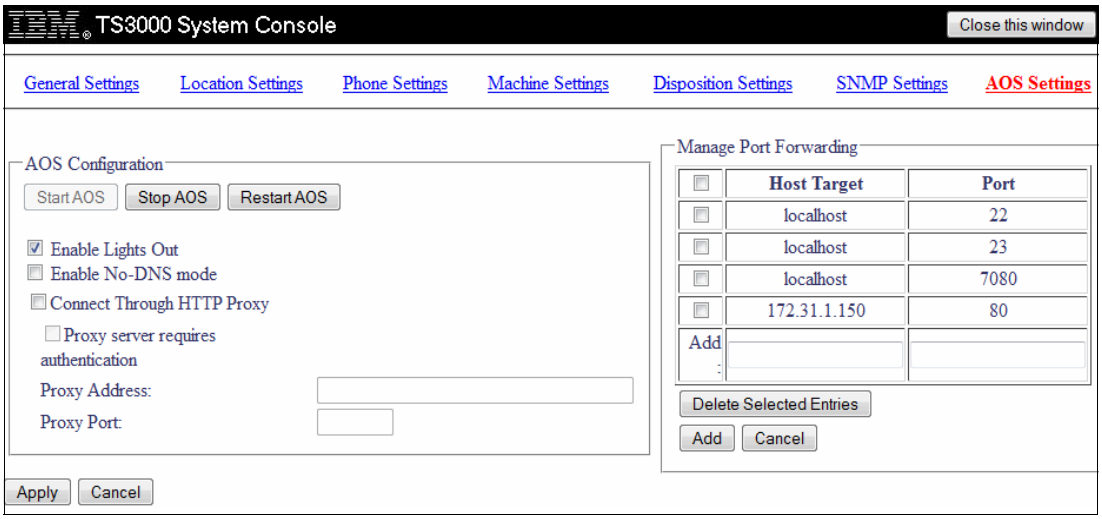

Figure 3-7 IBM Assist On-site Settings window

3. Select the **Enable Lights Out** check box.
4. Click **Apply** (assuming that there is no proxy to be configured on your network).

3.5.3 Port forwarding

If you have enabled the AOS port-forwarding feature, another level of remote support becomes possible. With this feature, IBM Support can tunnel through the TSSC to access the command line or GUI of the tape systems that are attached to the TSSC for those products that support it. If you have enabled the Lights Out mode of operation, IBM Support can make these connections, first to the TSSC and then through it to the tape system, without your intervention.

This level of support is often preferred for data centers with the highest level of enterprise tape products, such as the VTE (Hydra). The window that is shown in Figure 3-7 is where port forwarding can be configured for individual tape devices.

3.5.4 Resources

For more information, see the following resources:

- IBM Tape storage products overview

  http://www.ibm.com/systems/storage/tape/?lnk=mprST-tsys

- Information about TSSC is available in the IBM System Storage TS7700 Combined Service IBM Knowledge Center:

  http://www-01.ibm.com/support/knowledgecenter/api/redirect/ts7700/serv/index.jsp

4

Frequently asked questions

This chapter provides answers to some of the most frequently asked questions about IBM Assist On-site (AOS) and the supported storage devices.

Here are some of the most frequently asked questions concerning AOS:

- What is AOS used for?

  AOS is IBM Tivoli software that allows an SSL secure session for a remote IBM Support Service Representative (IBM SSR) to connect, with port forwarding, to a client's IBM storage devices. AOS is based on IBM Tivoli Remote Takeover.

- How many versions of AOS are there?

  There are two versions: Version 3.3 and Version 4.0.

- What are the main differences between Version 3.3 and Version 4.0?

  Here are some of the differences between Version 3.3 and Version 4.0

  - They have different installation and product names. For example, the AOS V3.3 console in Version 3.3 is called AOS V4.0 controller in Version 4.
  - The log files have different names. For example, `aos_service.txt` is now `trc_base.txt`
  - The installation files are in different paths.
  - The schedule and rotation debug logs are in the control panel configuration for Version 4.0.
  - There is no port compatibility. Version 3.3 cannot see Version 4.0 targets, and Version 4.0 cannot access Version 3.3.
  - Version 4 has a new appearance, but the basic product works and is configured just like Version 3.3.

- What are the benefits of using AOS?

  AOS benefits include an increased layer of security through SSL and real client control of attended sessions. It enables clients to build a remote access infrastructure that is in compliance with their company's IT security regulations.

- Can AOS be deployed in a concurrent client environment?

  Yes. The client needs to provide only a server on which to install the AOS package.

- How does AOS interact with a storage device?

  AOS provides a port-forwarding tunnel or panel-sharing capability for IBM Support. The client can choose among different communication options, from a simple session chat up to allowing an IBM SSR to access and inspect the system on demand.

- Does AOS have special requirements? What are the minimum OS requirements?

  AOS has no special requirements. It runs on several versions of Microsoft Windows and various Linux distributions. For more information, see 1.2.3, “Hardware requirements for the IBM Assist On-site software” on page 5.

- How can IBM support the storage device after establishing an AOS connection?

  Upon establishing an AOS connection, the IBM SSR uses authorized tools to connect securely to the storage device and run diagnostic tests.

- Is the client allowed to work with AOS as well?

  The client is allowed to open and close AOS sessions. The client must ensure that the port-forwarding configuration is up to date.

- Will an AOS session grant access to IBM Support to any other IBM and non-IBM equipment?

  No. Only one AOS session per AOS client server PC can be established. Furthermore, the client can end a session at any point.

- How does AOS receive updates? Where can I find more information and the latest updates?

  AOS packages and updates are available only by contacting IBM Support.

- Will updating AOS affect the existing configuration and other equipment?

  No. Updating the support service AOS client to a new version keeps the saved client configuration. With AOS clients integrated into the device Licensed Internal Code, the AOS client is updated during the overall storage product update process.

- Can AOS 3.3 and AOS 4 coexist on a server?

  Yes. Both installations can be run at the same time. The two versions are independent of each other, for example, the Version 3.3 installation is named `aos_support_service_setup_version.exe` and Version 4 is named `ibm_aos_lightsout_setup_version.setup`. In addition, when you install or upgrade from Version 3.3 to Version 4.0, you can use the configuration utility to import the prior information.

- Can Version 3.3 and Version 4 consoles run at the same time?

  Yes, because they are separate installations. The Version 3.3 console file name is called `aos_console_setup_version.exe`, and the Version 4 is called the controller, and is in a file named `ibm_aos_controller_setup_version.exe`.

- Do clients need to be advised of version changes in firmware? Is there any interoperability information that is provided?

  The AOS package is only a simple installer, so there are no firmware updates that can affect the client’s storage device software or performance.

5

Usage guidance

This chapter provides guidance and additional usage instructions about the IBM Assist On-site (AOS) gateway and AOS support service client.

This chapter covers the following topics:

- Verifying the IBM Assist On-site support service installation
- Understanding the IBM Assist On-site trace files
- Planning for redundancy
- Accessing the IBM Assist On-site gateway from a remote session

5.1 Verifying the IBM Assist On-site support service installation

Verifying the installation of the AOS support service as part of an AOS gateway can be carried out in two steps. The first step is to verify the local network connectivity, and the second step is to verify the connection to the AOS server.

Verifying the local connectivity

First, verify that you can reach the configured IBM devices in the network. This is a basic connection test. The test can be performed with either the service software, such as the TA tool for the XIV Storage System, or simply an SSH client for all connections with port forwarding configured on port 22.

Port forwarding that is configured for port 80 (http) or 443 (https) can be checked with a web browser.

The login to the service interface is not required for the test. It is meant only to verify that the connection on the specific port is possible. If it is not possible, the network administrator must check why a communication on that specific port is not possible.

Note: The **`ping`** command cannot be used because **`.ping`** is an Internet Control Message Protocol (ICMP) Type 8 echo request. This ping is sending the request to the IP address without specifying a port.

Verifying the IBM Assist On-site support service connectivity

To verify the connectivity to the AOS V3.3 server, you must select the **Enable Full Tracing** check box, as shown in Figure 5-1

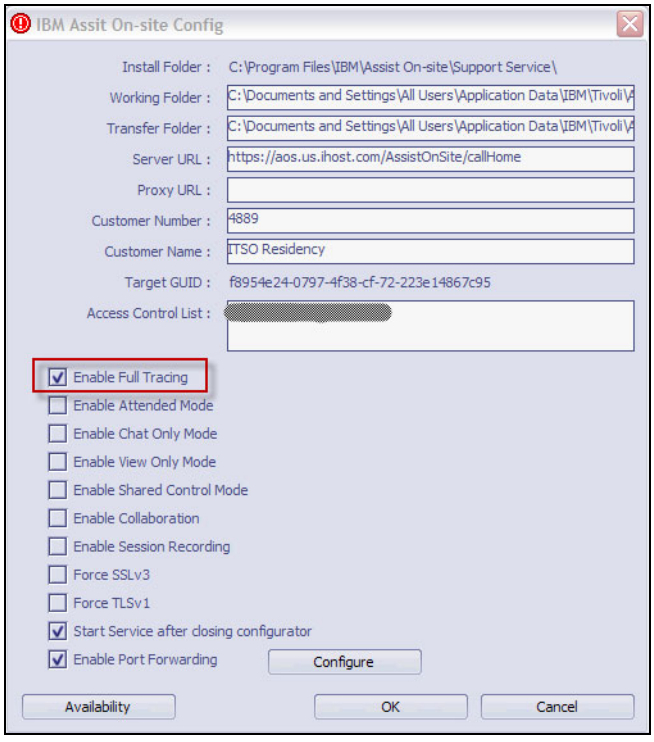

Figure 5-1 IBM Assist On-site configuration window with "Enable full tracing" enabled on Version 3.3

Debugging is enabled by default in AOS V4.0. However, you might need to configure the logging, as shown in Figure 5-2.

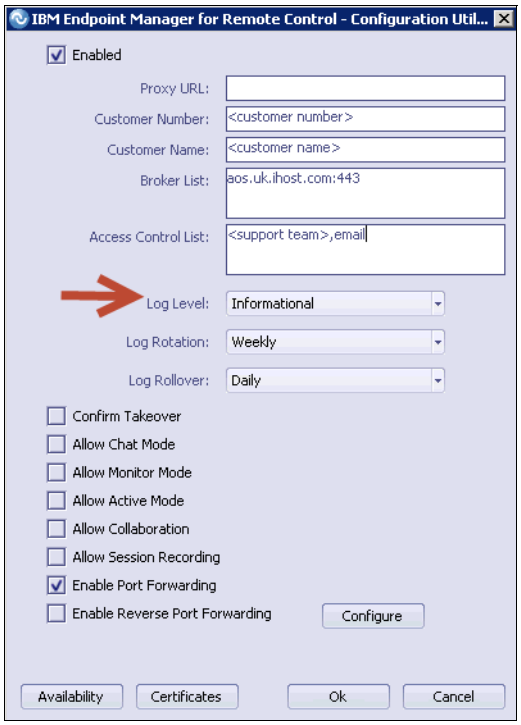

Figure 5-2 Log Level configuration for IBM Assist On-site V4.0

After the full tracing and Start Service after Closing configurator are enabled in AOS V3.3, close the AOS configuration window. The AOS support service program then connects to the AOS server and starts sending a heartbeat.

Wait for a couple of minutes, and open the `aos_service.txt` file. This file is written to the working directory that is specified in the AOS configuration window.

Important: The AOS V3.3 trace files grow quickly and can consume a large amount of disk space if you enable trace for a long period. Therefore, you are advised to turn the full tracing off for normal operation. AOS V4 integrates a log-rotation into the program.

The default location for the working directory for AOS V3.3 is `/var/opt/ibm/aos/support_service` in Linux, and `C:\Documents and Settings\All Users\Application Data\IBM\Tivoli\Assist On-site` in Windows environments.

For more information about how to read the `aos_service.txt` file, see 5.2, “Understanding the IBM Assist On-site trace files” on page 42.

When you can see in the trace file `aos_service.txt` that the AOS support service client has registered with the AOS server, contact your IBM Support Service Representative (IBM SSR) to test whether an AOS session can be established with your system.

Similar to the AOS debug log, AOS V4.0 has a log that is called `trc_base.txt`, which is in `C:\ProgramData\IBM\Tivoli\Remote Control` under Windows or `/var/opt/ibm/trc/target` in Linux. The application records traces are kept for up to two weeks. The more recent logs are named `trc_base_day` and `trc_dsp_day`. The base is the most current trace for that week, and the dsp is the one that is about to expire.

5.2 Understanding the IBM Assist On-site trace files

There are two AOS trace files to consider: the AOS support service trace file and the AOS session log. The debug files `aos_service.txt` and `trc_base.txt` are both AOS support service trace files for their respective version.

5.2.1 IBM Assist On-site support service trace file

The `aos_service.txt` file contains information about the heartbeat and the initiation of an AOS session. The file is written by the `aos_svc` program.

Every time that you start the AOS service, the program dumps the configuration into the trace file.

The trace file shows that every 2 minutes the system is contacting the AOS server and validating the SSL certificate of the server. Example 5-1 shows a successful direct connection that is established with the AOS server. For the sake of clarity for reading the output of the trace file, time stamps and the SSL Certificate check were removed. An example for a connection that is established through a proxy is shown in Example 5-1.

Example 5-1 Example of a successful connection attempt in IBM Assist On-site V3.3

```
[...]-->AoS Polling Server {3664}
[...]-->Transaction is SSL {3664}
[...]-->Using regular SSL compatibility mode {3664}
[...]-->Connecting to Server: 'aos.us.ihost.com' on port 443 {3664}
[...]-->Connection to Server: 'aos.us.ihost.com' (72.15.208.234) on port 443
{3664}
[...]-->Switching to SSL Starting {3664}
[...]-->ssl_load_functions(OpenSSL) {3664}
[...]-->ssl_load_functions() - Done {3664}
[...]-->ssl_setup_client() ... {3664}
[...]-->SSL connected with cypher AES256-SHA (256 bits) {3664}
[...]-->openssl_setup_client() - returning OK {3664}
[...]-->ssl_setup_client() = 0 {3664}
[...]-->*** SSL Certificate START *** {3664}
.....
[...]-->*** SSL Certificate END *** {3664}
[...]-->Switching to SSL Completed {3664}
[...]-->Connected! {3664}
```

After the connection to the AOS server is established, the AOS client starts sending heartbeat data to the server, as shown in Example 5-2.

Example 5-2 IBM Assist On-site support service heartbeat in IBM Assist On-site V3.3

```
Action=AOSPolling&TargetGUID=**********&ComputerName=IBM-*********&CustNumber=4889&CustName=ITSO
%20Residency&Model=*****&Vendor=*****&Serial=*****&Uuid=******&OS=MS%20Windows%20XP%2C%20Version
%205.1.2600%20%28SP%203%29&Platform=windows_i86&LocalTZ=-2&Language=en&TargetVersion=3.3.0.45&St
atus=1&ACL=**********&ChatOnly=no&ViewOnly=no&SharedControl=no&AllowCollaboration=no&AllowRecord
ing=no&AllowTunnelling=yes&Schedule=7F-00FFFFFF-7FFFFFFF&
```

The AOS V3.3 server then replies with an XML structure that includes the interval for the next heartbeat. Example 5-3 shows a response with no connection request pending.

Example 5-3 Response with no connection request pending in IBM Assist On-site V3.3

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<response>
<remotecontrol>
<agent id="aos_agent">
<timeout>
2
</timeout>
</agent>
</remotecontrol>
</response>
```

Example 5-4 shows the server's response, which includes an encrypted session ID and a list of available AOS relays that are available for a connection.

Example 5-4 Response with connection request pending in IBM Assist On-site V3.3

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<response>
<remotecontrol>
<agent id="aos_agent">
<timeout>
2
</timeout>
<session_id>************************************</session_id>
<addr_list>72.15.208.234;72.15.223.60</addr_list>
<port_list>8200,80;443</port_list>
</agent>
</remotecontrol>
</response>
```

When the response to the heartbeat contains a valid session ID, AOS tries to establish a connection to the submitted IP addresses on the submitted ports. If this combination fails, the next combination is used. Example 5-5 shows a successful connection to a relay server.

Example 5-5 Connection to one of the IBM Assist On-site relays in IBM Assist On-site V3.3

```
[...]-->Connecting to RELAY 72.15.208.234:8200 (00000000) {1112}
[...]-->Using hostname aos.us.ihost.com to connect to the relay 72.15.208.234  {1112}
[...]-->Trying to connect DIRECTLY to 'aos.us.ihost.com':8200 {1112}
[...]-->SUCESS: Connected DIRECTLY to aos.us.ihost.com {1112}
```

When an AOS session is created, the name, the IP address, and the MAC address of the IBM SSR is written into `aos_service.txt` and `aos_trc.txt`, as shown in Example 5-6.

Example 5-6 Successfully created IBM Assist On-site V3.3 session

```
[...]-->PROCESS STARTED in session 0x0 pid=9060628 {1112}
[...]-->AOS process running (2164), waiting 4 secs on port 1176 {1112}
[...]-->AOS PROCESS CONNECTED AND RUNNING {1112}
[...]-->EVERTHING READY {1112}
[...]-->ME: 'SYSTEM@192.168.122.89[XX:XX:XX:XX:XX:XX]' running 'MS Windows XP' {1112}
[...]-->HE: 'Bjoern Wesselbaum@192.168.168.25[XX:XX:XX:XX:XX:XX]' running 'Linux' {1112}
```

When you use a proxy server, the trace files show additional entries that are showing the connection initiation to the proxy followed by the connection that is established to the AOS server, as shown in Example 5-7.

Example 5-7 Connection to an IBM Assist On-site V3.3 server through a proxy server

```
[...]-->Connecting to Server: 'aos.us.ihost.com' on port 443 {832}
[...]-->Trying to connect to PROXY server '192.168.122.213':3128 {832}
[...]-->SUCESS: Connected to PROXY 192.168.122.213 {832}
[...]-->Lets ask the proxy to connect to aos.us.ihost.com:443 {832}
[...]-->Lets ask the proxy to connect to aos.us.ihost.com:443 {832}
[...]-->HTTP_SEND: CONNECT aos.us.ihost.com:443 HTTP/1.0{832}
[...]-->HTTP_SEND: Host: aos.us.ihost.com{832}
[...]-->HTTP_SEND: Proxy-Connection: keep-alive{832}
[...]-->HTTP_SEND: User-Agent: Assist On-site Support Service {832}
[...]-->HTTP_SEND: Connection: keep-alive {832}
[...]-->HTTP_SEND: {832}
[...]-->HTTP_RECV: HTTP/1.0 200 Connection established {832}
[...]-->HTTP_RECV:  {832}
[...]-->PROXY ACCEPTED!! we are connected to aos.us.ihost.com {832}
[...]-->Switching to SSL Starting {832}
[...]-->ssl_load_functions(OpenSSL) {832}
[...]-->ssl_load_functions() - Done {832}
[...]-->ssl_setup_client() ... {832}
[...]-->SSL connected with cypher AES256-SHA (256 bits) {832}
[...]-->openssl_setup_client() - returning OK {832}
[...]-->ssl_setup_client() = 0 {832}
[...]-->*** SSL Certificate START *** {832}
...
[...]-->*** SSL Certificate END *** {832}
[...]-->Switching to SSL Completed {832}
[...]-->Connected! {832}
```

If the proxy server is blocking the connection, you can see entries in the trace files that correspond to the proxy error window, as shown in Example 5-8. When the proxy presents an error page, consult the proxy administrator to enable the AOS IP addresses and ports, as shown in Table 2-1 on page 15.

Example 5-8 Example of a blocking proxy server in IBM Assist On-site V3.3

```
[...]-->Connecting to Server: 'aos.us.ihost.com' on port 443 {3084}
[...]-->Trying to connect to PROXY server '192.168.122.213':3128 {3084}
[...]-->SUCESS: Connected to PROXY 192.168.122.213 {3084}
[...]-->Lets ask the proxy to connect to aos.us.ihost.com:443 {3084}
[...]-->HTTP_SEND: CONNECT aos.us.ihost.com:443 HTTP/1.0 {3084}
```

```
[...]-->HTTP_SEND: Host: aos.us.ihost.com {3084}
[...]-->HTTP_SEND: Proxy-Connection: keep-alive{3084}
[...]-->HTTP_SEND: User-Agent: Assist On-site Support Service{3084}
[...]-->HTTP_SEND: Connection: keep-alive{3084}
[...]-->HTTP_SEND:{3084}
[...]-->HTTP_RECV: HTTP/1.0 403 Forbidden {3084}
.....
[...]-->HTTP_RECV:  {3084}
[...]-->http_recv_response(): Ready to read HTTP content {3084}
[...]-->Connection to proxy failed with 403. Proxy response was:0  Forbidden
{3084}
[...]-->Proxy response body was <!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01//EN"
"http://www.w3.org/TR/html4/strict.dtd">
<html><head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8">
<title>ERROR: The requested URL could not be retrieved</title>
....
<body id=ERR_ACCESS_DENIED>
<div id="titles">
<h1>ERROR</h1>
<h2>The requested URL could not be retrieved</h2>
</div>
<hr>
<div id="content">
<p>The following error was encountered while trying to retrieve the URL: <a
href="https://aos.us.ihost.com/*">https://aos.us.ihost.com/*</a></p>
<blockquote id="error">
<p><b>Access Denied.</b></p>
</blockquote>
<p>Access control configuration prevents your request from being allowed at this
time. Please contact your service provider if you feel this is incorrect.</p>
<p>Your administrator is <a href="mailto:webmaster .....</a>.</p>
.....
</body></html> {3084}
[...]-->FAILED to connect to 'aos.us.ihost.com' on port 443: -8 {3084}
[...]-->AoS Polling returned -8 {3084}
```

The sequence trace for connecting to IBM AOS changed in AOS V4.0. It begins by calling home, as shown in Example 5-9.

Example 5-9 Example of a successful connection attempt in IBM Assist On-site V4.0

```
[...]--> TargetGUID = xxxxxx
[...]--> LightsOutOO: Connecting to broker...
[...]--> openssl_setup_context: using trust store 'C:\ProgramData\IBM\Tivoli\Remote
Control\Profiles\lightsoutprofile.properties
[...]--> Starting 1 broker connections (direct: 1, proxy: 0)
[...]--> Starting connection 0 thread for aoshats.us.ihost.com:443
[...]--> Connect thread started, host aoshats.us.ihost.com:443
...
[...]-->  *** TLS Certificate Start ***
...
[...]-->  *** TLS Certificate End ***
[...]--> forth_con: tls handshake complete
[...]--> forth_con: tls connection established
[...]--> forth_con: sending challenge
```

```
[...]--> forth_con: waiting for response
[...]--> forth_con: connected to a broker version 9.1.1.49
```

After the AOS gateway is connected to the relay server, a session with the user is created, as shown in Example 5-10. The session includes the gateway and user IP address, and the user connecting.

Example 5-10 IBM Assist On-site V4.0 session is created

```
[...]--> forth_handle_session_authentication: waiting for initial packet
...
[...]--> LightsOutOO: setting session policies
[...]-->  AllowTools = (null) (0) (default)
...
[...]--> status: forth_set_status_connected
[...]--> ME: '@x.xx.xx.xx[OO:OO:OO:OO:OO:OO]' running 'Microsoft Windows Server 2008 R2, Version
6.1.7601 (SP 1)'
[...]--> HE: 'Juan C Brandenburg@xx.x.xx.xx[8c:7O:5a:6O:1b:98]' running 'Windows7'
```

Following a successful connection, users can change the session mode to port forward and tunnel into the storage device, as shown in Example 5-11.

Example 5-11 Change the session mode to port forward in IBM Assist On-site V4.0

```
[...]--> Processing Session Mode
[...]--> Console Requested Session Mode 0x0100
[...]--> Requested session change to mode 100
...
[...]--> TunnelList =
87XBZ34_CustomerName=tcp@x.xx.xx.xx:22,87XBZ34_CustomerName=tcp@x.xx.xx.xx:443,
...<--if more storage devices are listed, they will be here --> ...
...
[...]--> Start Processing tunnel connect 0x22DF2591-0
...
[...]--> 87XBZ34_CusotmerName (0x22DF2591-0) connecting to x.xx.xx.xxx:22...
[...]--> 87XBZ34 (0x22DF2591-0) created for x.xx.xx.xxx:22...
```

Finally, when the AOS user terminates a session, the logs close the tunnel and a cleanup takes place, as shown in Example 5-12.

Example 5-12 Terminating an IBM Assist On-site 4.0 session

```
[...]--> Tunnel 0x22DF2591-0 closed
[...]--> forth_tunnel_thread(0x22DF2591-0) closing socket 508
[...]--> forth_tunnel_delete(0x22DF2591,0) START (0)
[...]--> forth_tunnel_delete(0x22DF2591,0) END (0)
[...]--> forth_tunnel_thread(0x22DF2591-0) STOPPED
[...]--> openssl: cleaning up on thread exit
[...]--> forth_comm_complete_transaction_via_broker(00000000)
[...]--> RECV Thread: DISCONNECTING got pktNP_SESSION_END
[...]--> LightsOutOO: heartbeat timer expired
```

If there is a proxy involved, AOS V4.0 traces it like AOS V3.3 traces it, as shown in Example 5-13 on page 47.

Example 5-13 Connecting with a proxy on IBM Assist On-site 4.0

```
[...]--> Starting 1 broker connections (direct: 0, proxy: 1)
[...]--> Starting connection 0 thread for aos.uk.ihost.com:443 using proxy
[...]--> forth_con_connect_thread(0x8333d98)
[...]--> Connect thread started, host aos.uk.ihost.com:443
[...]--> Trying to connect to PROXY server 'xx.xxx.xxx.xxx':8080
[...]--> SUCCESS: Connected to PROXY 10.215.130.120
[...]--> Lets ask the proxy to connect to aos.uk.ihost.com:443
[...]--> HTTP_SEND: CONNECT aos.uk.ihost.com:443 HTTP/1.0
[...]--> HTTP_SEND: Proxy-Authorization: Basic xxxxx===
```

However, if the proxy is not configured correctly, for example, the password is wrong, you might see an error, as shown in Example 5-14.

Example 5-14 Wrong proxy password

```
[...]--> HTTP_RECV: HTTP/1.1 400 Bad Request
...
[...]--> HTTP_RECV: Proxy-Connection: close
[...]--> HTTP_RECV: Connection: close
...
[...]--> PROXY returned '400'
[...]--> Proxy response body was <HTML><HEAD>
...
<FONT face="Helvetica">
<p>Your username or password were sent using an invalid/unrecognized format.</p>
<p><i>Please close your browser window.</i></p>
<p>Then, either contact technical support,
or try again using a different username/password combination.</p>
<p><small>
There are two possible causes:
<ul>
<li>Your username or password contains non-ASCII characters, and the ProxySG is
not configured to use the same authentication character encoding as is being used
by your web browser.

<li>Your username or password is too long. (The limits for the username and
password are 64 bytes each, after being translated to UTF-8.)
</ul>
...
[...]--> tls: Proxy connection failed with error code -8
[...]--> Result from proxy_tls_connect... -8
[...]--> forth_con: failed to connect
[...]--> forth_con: failed to connect, error -8
[...]--> Closing connection
```

Therefore, it is important to test firewall and proxy connectivity and the AOS broker address before implementation. Also, make sure to use the appropriate length and standard security passwords. The length of a password should not be longer than (3*7) +1. If wild characters are used, make sure to add a backslash character before them or the AOS password algorithm might break and not work with the proxy, as shown in Example 5-15.

Example 5-15 Use a backslash before wild characters for proxy passwords

```
bad password example: this1sar*nPa33,1
AOS sees it as *nPa33,1

good password example: this1sar\*nPa33\,1
AOS sees it as this1sar*nPa33,1
```

5.2.2 IBM Assist On-site session log

Example 5-16 shows the log entries resulting from a successful port-forwarding session.

Example 5-16 IBM Assist On-site session trace entries for port forwarding in IBM Assist On-site V3.3

```
[...]-->SESSION CHANGED TO MODE 'Port Forwarding' (0x0100) {2228}
[...]-->AFTER process_gui_events()=0 {2228}
[...]-->Start Processing CREATE TUNNEL 0x511ABC17-0 {456}
[...]-->TUNNEL 1_ssh (0x511ABC17-0) CONNECTING TO XXX.XXX.XXX.XXX:22... {456}
[...]-->TUNNEL 1_ssh (0x511ABC17-0) CREATED FOR XXX.XXX.XXX.XXX:22... {456}
....
[...]-->TUNNEL 0x511ABC17-0 CLOSED {456}
```

There is no session log in AOS V4.0; instead, all log traces are included in the `trc_base` and `trc_base_day` logs. For more information, see 5.2.1, “IBM Assist On-site support service trace file” on page 42.

5.3 Planning for redundancy

To ensure that IBM Support can access the IBM devices to perform remote service tasks at any time, two independent AOS gateways should be installed at your site.

When you plan for a dual AOS gateway setup, as shown in Figure 5-3 on page 49, it is not relevant that both systems are running the same operating system. The only requirement is to keep the port-forwarding configurations in sync.

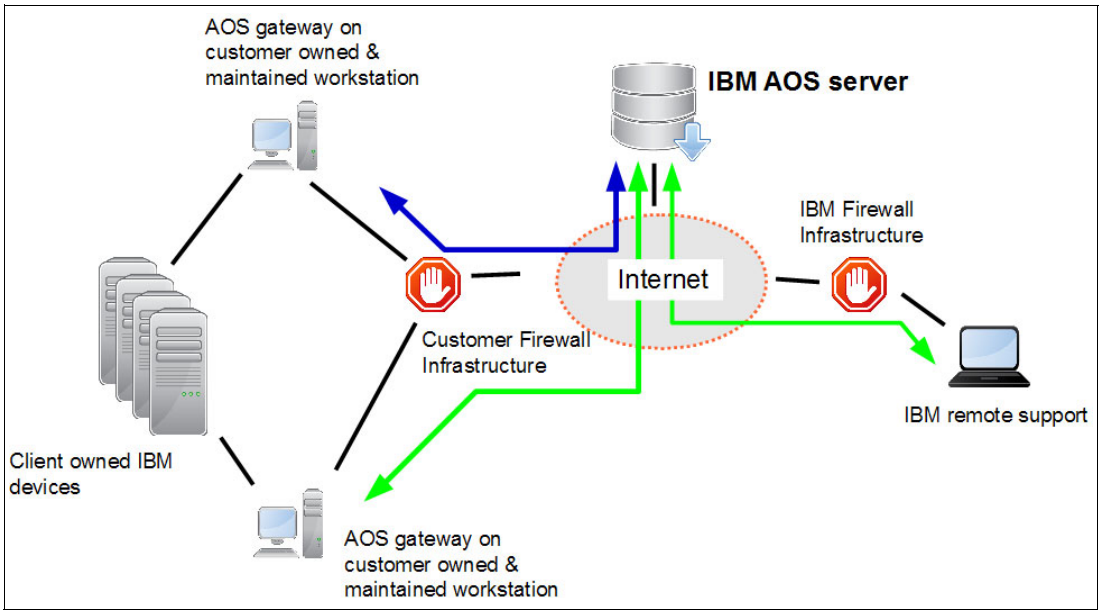

Figure 5-3 Example of a redundant IBM Assist On-site gateway setup

When copying the configuration, you copy only the port-forwarding configuration and paste it into the other system. Use the AOS configuration GUI to clone the port-forwarding configuration.

Note: Do not clone the port-forwarding configuration from the Windows registry or configuration file. Those entries do hold the AOS clients configuration ID that is used on the AOS server to identify the client.

5.4 Accessing the IBM Assist On-site gateway from a remote session

In some configurations, the AOS gateway must be accessed from administrators that cannot use the physical monitor or keyboard.

In this case, a panel-sharing solution must be used where the remote access uses a panel sharing of the session that also sends the output to the physical monitor. These solutions can, for example, be realized by using software such as Tivoli Remote Takeover, VNC-like applications, or a virtual console application of the virtual machine (VM) host.

It is necessary to view remotely the same content that is on the panel because the AOS support service dialogs are sent to the panel device.

Using a Windows Terminal Server that creates a session for each connected RDP client does not work for this usage.

Related publications

The publications that are listed in this section are considered suitable for a more detailed description of the topics that are covered in this paper.

IBM Redbooks

The following IBM Redbooks publications provide additional information about the topic in this document. Some publications in this list might be available in softcopy only.

- *IBM DS8870 Architecture and Implementation (Release 7.5)*, SG24-8085
- *IBM XIV Storage System Architecture and Implementation*, SG24-7659

You can search for, view, download, or order these documents and other Redbooks, Redpapers, web docs, draft and additional materials, at the following website:

http://www.redbooks.ibm.com/

Online resources

- IBM Assist On-site website:

  http://www.ibm.com/support/assistonsite/
- IBM Scale Out Network Attached Storage IBM Knowledge Center:

  http://www-01.ibm.com/support/knowledgecenter/api/redirect/sonasic/sonas1ic/index.jsp
- IBM Storwize V7000 Unified IBM Knowledge Center:

  http://www-01.ibm.com/support/knowledgecenter/api/redirect/storwize/unified_ic/index.jsp
- IBM Tape Products overview:

  http://www.ibm.com/systems/storage/tape/?lnk=mprST-tsys
- IBM TS7700 IBM Knowledge Center:

  http://www-01.ibm.com/support/knowledgecenter/api/redirect/ts7700/serv/index.jsp?topic=%2Fcom.ibm.storage.ts7740.service20.doc%2Fts7740_maintain_login_tssc.htm

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