



IBM® Technical Support Appliance Configuration Assistant Guide

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Introduction

The IBM Technical Support Appliance (TSA) is an easy-to-use tool that enables you to get more value from your IBM Support contracts. TSA discovers key information technology elements and their relationships within your IT Infrastructure, and securely transmits the data to IBM Support for analysis. This data provides IBM Support with insight into the complex relationships between the servers and network components in your data center.

The intent of this document is to provide information and guidance to assist with installation, planning, and the configuration of TSA.

 Throughout the document, TSA refers to the Technical Support Appliance.

Pre-Discovery Network Considerations

Before configuring TSA for the initial discovery and transmission, ensure that the following items have been addressed. It is assumed that TSA has already been installed, the web interface is accessible, and TSA has been updated to the most current level, if not, see the Technical Support Appliance Setup Guide (referred to as setup guide in the remainder of this document).

TSA Pre-Discovery Network Considerations	
Networking	
	Open firewall access from TSA to IBM. See section, Configuration requirements for connections to IBM Support in the setup guide.
	If an SSL proxy is used to connect back to IBM, ensure that it is configured in TSA. See section, Setting up IBM connectivity in the setup guide. <div data-bbox="402 1339 1458 1438" style="border: 1px solid black; padding: 5px;"> SSL inspection is not supported. If utilizing SSL inspection on the proxy, disable it for these flows.</div>
	If any firewalls exist between TSA and the target devices that will be scanned. See section, “Firewall Considerations” .

Useful Documentation

A complete set of TSA documentation can be obtained via the TSA user interface.

Overview

TSA collects information about your IT infrastructure, which includes deployed software components, firmware components, physical servers, network devices, virtual LAN, etc. To optimize the breadth and depth of information that is collected, configuration tasks are required within the appliance to identify the discovery devices.

TSA attempts to minimize impacts to the customer's network environment. Thus, the discovery process uses an iterative and measured approach which may cause a full discovery to take up to 72 hours. The status of the discovery job can be monitored by viewing the **Job Summary** section of the **Summary** panel.

As part of the discovery process, TSA initially attempts to detect devices within the defined scope without using credentials. This involves the use of Nmap to discover and classify devices via low intrusive IP scanning, stack fingerprinting and port mapping. Generally, this activity should not be significant enough to set off an intrusion detection system (IDS) but may if there are stringent local settings.

For TSA to collect information about your IT infrastructure, provide it with the following:

- Scopes
- Access Credentials

Defining scope sets

A scope set is a logical grouping of individual scopes. Scopes use IP addresses to tell TSA where to begin discovering the environment. A scope set is composed of one or more scopes. There are three types of scope entries:

- Subnet - Defined by an IP address and a subnet mask. Subnets are limited to class C subnets.
- IP Range - Includes all IP addresses between the start and end.
- IP Address / Host - An individual IP address or Host name.

 Host name is resolved at entry time, not discovery time. See section "[Factors to Consider When Creating Scopes](#)," for details.

If desired, scope exclusions can be defined for a scope by specifying a host, range, or subnet definition. The resulting IP addresses will not be considered part of the scope and will not be scanned.

For detailed instructions regarding how to define discovery scopes on the appliance, see section, **Setting up discovery scopes** in the setup guide.

Factors to Consider When Creating Scopes

There are not any defined standards for setting up scopes; however, there are some practical considerations that can save time and effort:

- Use IP Range or Subnet scopes to discover multiple devices as opposed to individual IP addresses or host names. This will limit the number of scope definitions and make administration easier.
- If using subnet scope definitions, only include one per scope set. Ensure the subnet scope definition resolves to a Class C network (256 IP addresses) or less.
- Use the Import scope set feature to create a new scope set based on the specified name and the list of the IP addresses from an input text file. For more information, see section **Discovery Scopes → Importing a scope set** in the setup guide for instructions.
- TSA currently stores only IP addresses. This means that host names are resolved at entry time and not at discovery time. Best practices suggest that you either use IP Address or IP Range for the scope definition, not the host name.
- The more IP addresses that are in the scope set, the longer the discovery will take. To minimize the time a discovery takes, set up scopes to target only the elements that you want to discover.

 Limit the cumulative number of IP addresses that a scope set resolves to (after expanding any range or subnet scope definitions) to 400 or less. Performance, server, or network issues may be encountered during the discovery process if more than 400 IP addresses are scanned for a single scope set.

- To determine the number of IP addresses that a scope set resolves to, sum the following items:
 - The count of individual IP address or host name scope entries in the scope set.
 - The sum of all IP addresses included in any IP range scope entries in the scope set. This is a count of all the possible IP addresses in the ranges, regardless if they are in use or not.
 - The sum of all possible IP addresses defined by any subnet scope entries, regardless if they are in use or not.
- TSA does not prevent IP addresses from being defined in multiple scope sets. In general, this practice should be avoided since it increases the discovery time without collecting any additional information.

- Group scopes into scope sets that make up a logical grouping of devices:
 - Group the same device type within a scope set. For example, create a scope set for all VMware vCenter servers.
 - Group devices that are in the same geography.
 - Group devices based on business applications or services.

Discovery Credentials

With a few exceptions, discoveries require some level of access to acquire the detailed information that is needed for a complete understanding of the environment.

Normally service accounts should be created on the discovery devices for use by TSA. See the sections below for the specific access rights required by each platform type. To simplify administration of these service accounts, use the same user name for all devices of a given product family.

The task of maintaining the service accounts that TSA uses to connect to the devices can be simplified by using one of the following strategies:

- Create service accounts with non-expiring passwords
- Use SSH keys for device product families that support their use

For detailed instructions regarding how to define access credentials on the appliance, see section **Setting up discovery credentials** in the setup guide.

Factors to Consider to Setup Discovery Credentials

The appliance attempts to use credentials in the order that they appear in the access list. To speed up discovery, make sure you have the credentials in the order that best suits your environment. Some considerations are as follows:

- Restrict credentials to specific scope sets where appropriate. This will limit unnecessary login attempts and improve discovery performance.
- SSH keys can be used for these device discoveries:
 - AIX
 - Linux
 - HMC
 - IVM
 - Sun SPARC (Solaris)
 - SVC / V7000
 - VIOS

- Fortinet
- HP-UX
- IBM Flash System
- F5 Big IP
- Check Point

 Only one SSH key credential can be linked to a scope set.

- It is a best practice to create separate service accounts that are used exclusively by TSA with the lowest level of authority required.

Getting Started

This section covers some best practices and recommendations for configuring TSA.

Initial Setup and Configuration of TSA

Go through the instructions specified in the following sections of the setup guide:

- Connecting and powering on the hardware Technical Support Appliance
- Logging in to the Technical Support Appliance
- Accepting the License Agreement
- Registering the Technical Support Appliance
- Configuring network settings
- Setting the clock
- Setting up IBM connectivity
- Updating the Technical Support Appliance
- Setting up user accounts and groups

Preparing for Discoveries

An iterative process is recommended whereby a small portion of the network is initially configured for discovery and more sections of the network are added with each iteration until all of the desired network is covered.

 It is a best practice to save your TSA configuration after significant additions/modifications made to scopes and/or credentials. For more information, see section “Discovery Scopes” / “Discovery Credentials” in the TSA Setup Guide.

Management Systems

For platforms that have a management entity like IBM Power Systems (HMC or IVM), VMware® (vCenter Server), IBM Flex Systems (FSM), or HP OnBoard Administrator (HP OBA), it is a best practice to initially discover the management entities and then add lower level entities as necessary. A lot of information about the entities being managed can be obtained by discovering the management entity.

For IBM Power Systems, where the configuration of LPARs is generally static, it is best to iterate by adding scopes and credentials for entities in the following order:

1. **The HMC or IVM instances:** The HMC returns high level information about all the Power Systems it manages, and the logical partitions contained therein. The IVM returns similar information for the single system that it manages.

2. **The VIOS partitions:** This returns information about the physical adapters and resources that are owned by these partitions.
3. **Individual partitions:** In some cases, a non-VIOS partition owns physical adapters.

For VMware environments it is best to iterate by adding scopes and credentials for entities in the following order:

1. **The vCenter Server instances:** This returns high level information about the ESXi hosts they manage, and the Virtual Machine guests contained therein.
2. **ESXi hosts:** Add ESXi hosts that are not managed by a vCenter server or have external storage attached (even if they are managed by a vCenter Server). Another reason to add ESXi hosts is that the ESXi CIM interface allows access to hardware adapter information that is not available via vCenter.
3. **Individual Virtual Machine guests:** This allows collection of more detailed information regarding the operating system.

For IBM Power systems, where the configuration of LPARs is constantly changing and for which you desire detailed information about the LPARs and their resources, it might make sense to use HMC Dynamic Scope Sets. With HMC Dynamic Scope Sets you create a scope definition for an HMC and provide the associated HMC and LPAR credentials, but do not need to create scopes for each managed LPAR. When the HMC is discovered, the TSA determines which LPARs are in existence at that point of time and automatically scans each LPAR.

For IBM Flex Systems it is best to iterate by adding scopes and credentials for entities in the following order:

1. **The Flex System Manager (FSM):** This returns high level information about the Flex System Managers and the Chassis they manage along with their associated compute nodes.

 If FSMs are not present, it is recommended to scan the CMMs and any HMCs managing POWER compute nodes on Flex systems.

2. **The Chassis Management Module (CMM):** For chassis that are not managed by an FSM, point to each CMM to retrieve high level information about each chassis and its associated nodes.
3. **The Compute nodes:** This returns detailed information about the Operating System.

For Hewlett Packard (HP) ProLiant Servers it is best to add scopes and credentials for entities of HP OnBoard Administrator (HP OBA). The HP OBA will return high level information about the HP OnBoard Administrator, the enclosure it manages and the compute nodes contained within the enclosure.

Discovery Steps

For each discovery iteration perform the following steps:

1. Prepare the devices for discovery. For any necessary device and credential configuration requirements, see section “[Device Discovery Configuration](#)”.
 - a. Add the desired IP addresses into the appropriate scope sets / scopes. If firewalls exist between the TSA instance and the discovery devices, ensure that the appropriate ports are opened in the firewall to allow the discovery to succeed. For information on which ports must be accessible for each platform type, see section “[Firewall Considerations](#)”.
 - b. Create the necessary credentials. Use the Test function on the **Create Credentials** panel to verify that the credential is defined properly and can be used to establish a connection with a target device.
2. Run a full discovery to scan the IP addresses added for this iteration.
3. Run a transmission to upload the data to IBM.

Device Discovery Configuration

In addition to providing credentials, there may be specific discovery device configuration prerequisites required in order for the appliance to effectively discover and collect useful component information. This section allows you to identify discovery devices in your environment that will require specific configurations. It is recommended that you create service accounts with the minimum authorities required, also refer to section [“Firewall Considerations”](#) for port and protocol information.

✚ For devices for which both the SSH & Telnet ports are open, TSA will first attempt a connection using SSH (for security reasons). If this SSH connection fails, TSA will then attempt the connection through Telnet.

Operating Systems and Hosts

Platform
<u>IBM Power Systems</u> <ul style="list-style-type: none">• <u>Hardware Management Console (HMC)</u>• <u>Integrated Virtualization Manager (IVM)</u>• <u>Virtual I/O Server (VIOS) Partitions</u>• <u>AIX</u>• <u>Linux on Power</u>
<u>UNIX Systems</u> <ul style="list-style-type: none">• <u>Solaris</u>• <u>Solaris via iLOM</u>• <u>Linux</u>• <u>HP-UX</u>
<u>VMware</u>
<u>Windows</u>
<u>ATM devices</u>
<u>IBM iSeries</u>

Management Module

- [Flex System Manager \(FSM\)](#)
- [Chassis Management Module \(CMM\)](#)
- [Advanced Management Module \(AMM\)](#)
- [HP ProLiant Blade Server via HP OnBoard Administrator](#)
- [Integrated Management Module \(IMM & IMM2\)](#)
- [HP Integrity & HP9000 Servers via iLO](#)



Click each of the above links for detailed information.

IBM Power Systems

Hardware Management Console (HMC)

Preparing the environment:

- For TSA to gather information about managing LPARs through the HMC, the HMC must be able to communicate with the LPARs using RMC tools. Ensure that the HMC and the LPARs are configured to allow this communication. For more information on RMC tools for Linux, see <https://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/yum.html>
- To enable secure data collection, remote command execution must be enabled on the HMC. For information, see “Enabling and disabling HMC remote commands” at the following address: <https://www.ibm.com/support/knowledgecenter/POWER7/p7ha1/enablinganddisablinghmcremotecommands.htm>

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the HMC service account.
- The HMC user must have the following roles:
 - Resource role: AllSystemResources
 - Task role (based on hmcooperator with command line tasks):
 - ManagedSystem (lshwres, lssyscfg)
 - Logical Partition (lshwres, lssyscfg, viosvrcmd)
 - HMC Configuration (lshmc)

- A user (service account) with **hmcviewer** authority can be used if necessary, however, this will result in partial data collection.

✚ When running with **hmcviewer** authority, information about adapters owned by VIOS partitions cannot be obtained. To get this information, ensure the service account has a minimum of **hmcoperator** authority. If that is not possible, then add scopes and credentials to discover the VIOS partitions directly in addition to the HMC.

Integrated Virtualization Manager (IVM)

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the IVM service account.
- The IVM user must have view only permission.

Virtual I/O Server (VIOS) Partitions

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the VIOS partition service account.
- The service account must be an administrator account (such as padmin).
- The service account must have a user attribute of "rlogin=true". You can set this attribute using SMIT or by editing the /etc/security/user file.
- The parameter **PermitUserEnvironment** in the /etc/ssh/sshd_config file must be set to "yes".

AIX

Preparing the environment:

- Ensure that the packages bos.perf.tools and openSSH/openSSL are installed.
- Disable invalid login attempt fail for the service account.

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the AIX partition service account.
- The service account can be root or an account with sudo authority.
- The service account must have a user attribute of "rlogin=true". You can set this attribute using SMIT or by editing the /etc/security/user file.
- To enable a non-root service account for sudo authority for AIX:

- Install the sudo RPM (sudo-1.6.9p15-2noldap) and ssh filesets (openssh.base.server, openssh.base.client on the AIX LPAR.
- Create a non-root user ID on the target AIX system / LPAR that can be used by TSA to access the system. This ID needs to have permission to run certain commands on each target AIX device.
- Following are the commands that a non-root service account needs sudo authority for TSA to discover AIX. ‘/etc/sudoers’ must be modified on each AIX device that TSA discovers with a non-root service account.

- TSA /etc/sudoers commands

Cmnd alias specification

```
Cmnd_Alias TSA_CMDS = /usr/bin/lparstat, /usr/sbin/no,
/usr/sbin/nfso, /usr/bin/lslicense, /usr/sbin/vmo,
/usr/sbin/ooo, /usr/sbin/lvmo, /usr/sbin/schedo,
/usr/bin/sysdumpdev, /usr/sbin/smtctl, /usr/sbin/emgr,
/usr/bin/sissasraidmgr, /usr/sbin/lswpar,
/usr/sbin/cpuextintr_ctl, /usr/sbin/lsnim, /usr/sbin/raso,
/usr/sbin/bosdebug, /usr/sbin/chedition,
/usr/esa/bin/esacli, /usr/sbin/bootinfo,
/usr/bin/mpio_get_config, /usr/bin/cat /etc/objrepos/CuData,
/usr/bin/cat /etc/objrepos/CuData.vc, /usr/bin/cat
/var/adm/ras/bootlog, /usr/bin/cat
/etc/lpp/diagnostics/data/diagrpt*.dat, /usr/bin/tapeutil,
/usr/lpp/OV/bin/opcagt, /usr/DynamicLinkManager/bin/dlnkmgr
view, /usr/sbin/powermt version, /usr/sbin/powermt display,
/usr/bin/pcmpath query, /usr/sbin/datapath query
```

User privilege specification

```
<User Name> ALL = NOPASSWD: TSA_CMDS
```

 <User Name> is the non-root service account that TSA uses to collect AIX information. This <User Name> is a user on each AIX LPAR. The /etc/sudoers file on each LPAR must be updated with the above specification.

Or

An alternative to the above modifications to /etc/sudoers is to use the following user privilege specification:

```
<User Name> ALL = NOPASSWD: ALL
```

 <User Name> is the non-root service account that TSA uses to collect AIX information. This user specification allows the service account to use sudo authority on any AIX command.

Linux on Power

Preparing the environment:

- Disable invalid login attempt fail for the service account

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the Linux partition service account.
- The service account can be root or an account with sudo authority.
 - Create a non-root user ID on the actual target Linux LPAR that can be used by TSA to access the system. This ID needs to have permission to run certain commands on each target Linux LPAR.
 - Following are the commands that a non-root service account needs sudo authority for TSA to discover Linux. ‘/etc/sudoers’ must be modified on each Linux device that TSA discovers with a non-root service account

- TSA /etc/sudoers commands

Cmnd alias specification

```
Cmnd_Alias TSA_CMDS = /usr/sbin/lsvpd, /sbin/lsvpd,  
/usr/sbin/lscfg, /sbin/lscfg, /usr/sbin/lsmcode,  
/sbin/lsmcode, /usr/sbin/lvmdiskscan, /sbin/lvmdiskscan,  
/usr/sbin/dmidecode, /usr/bin/mtlib, /usr/bin/tapeutil,  
/usr/bin/crontab, /sbin/fdisk, /bin/ls -aR /boot/*,  
/bin/cat /proc/irq/*, /bin/cat /proc/net/vlan/config,  
/bin/cat /proc/ppc64/rtas/*, /bin/cat /proc/sys/kernel/cap-  
bound, /bin/cat /proc/sys/kernel/random/entropy_avail
```

User privilege specification

```
<User Name> ALL = NOPASSWD: TSA_CMDS
```

 <User Name> is the non-root service account that TSA uses to collect Linux information. This <User Name> is a user on each Linux LPAR. The /etc/sudoers file on each LPAR must be updated with the above specification.

Or

An alternative to the above modifications to /etc/sudoers is to use the following user privilege specification:

```
<User Name> ALL = NOPASSWD: ALL
```

 <User Name> is the non-root service account that TSA uses to collect Linux information. This user specification allows the service account to use sudo authority on any Linux command.

- If you use Proweb, it is recommended that you configure TSA to discover the Power Systems HMCs and the logical partitions (including VIOS) on the power systems.
- Level of data collected for the report by scanning various Power Systems entities:
 - By scanning only HMCs, you will get all essential information on Identified tab, HMC Topology, Power Systems Firmware, IBMi Recommendations, Linux Recommendations, HMC/VIOS/AIX and Contract tabs and some Adapter information.
 - In addition, by scanning VIOS partitions directly you will get additional information on adapter firmware and connected storage.
 - In addition, by scanning LPARs directly you will get more information on the LPAR (such as HACMP, GPFS, PowerSC S/W).

UNIX Systems

Solaris

To discover Solaris devices, complete the following steps:

Preparing the environment:

- On Solaris systems, ensure that the SUNWscpu (Source Compatibility) package is installed.
- On some Solaris systems, SNEEP needs to be installed and configured to obtain serial numbers.

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the service account.
- The service account can be non-root.

Solaris via Oracle iLOM

To discover Solaris devices via Oracle iLOM, you must have the following credentials:

Credentials for access list:

- Computer System: Use username / password for the service account.
- The service account can have either Operator or Administrator privileges.

Linux

If the Linux instance is running on an IBM Power System, refer to the [Linux on Power](#) section under IBM Power Systems for instructions.

To discover Linux devices, complete the following steps:

Preparing the environment:

- Ensure the `pciutils` package is installed. The `lspci` command contained therein is used to collect information about adapters and connections to external storage devices.

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the service account.
- Set `/bin/sh` as the shell for this account.
- For Linux (Intel), the service account can be root or an account with `sudo` authority.
- To discover using a non-root service account add the following to the `/etc/sudoers` file on the Linux system.

- TSA /etc/sudoers commands

Cmnd alias specification

```
Cmnd_Alias TSA_CMDS = /usr/sbin/dmidecode
```

User privilege specification

```
<User Name> ALL = NOPASSWD: TSA_CMDS
```

 <User Name> is the non-root service account that TSA uses to collect Linux information. This user specification allows the service account to use `sudo` authority on any Linux command.

HP-UX

To discover HP-UX devices, complete the following steps:

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the service account.
- The service account can be root or an account with `sudo` authority.
 - Following are the commands that a non-root service account needs `sudo` authority for TSA to discover Hp-UX. ‘`/usr/local/etc/sudoers`’ must be modified on each HP-UX device that TSA discovers with a non-root service account.

- TSA /etc/sudoers commands

```
# Cmnd alias specification

Cmnd_Alias TSA_CMDS
=/usr/sbin/diskinfo,/opt/hpvm/bin/hpvmstatus

# User privilege specification

<User Name> ALL=(ALL) NOPASSWD:TSA_CMDS
```

 <User Name> is the non-root service account that TSA uses to collect HP-UX information.

VMware ESXi / vCenter

To discover vCenter server instances as well as basic information about the ESXi servers they manage, complete the following steps:

Preparing the environment

- Create service accounts for the vCenter instances.
- Ensure there is HTTPS access (port 443) to the vCenter instances.
- For more complete hardware information, ensure that the CIM provider is active on the hosts that the vCenter is managing.

Credentials for access list

- Computer System: Enter the username and password for the service account for the vCenter instances.
- The service account must have Administrator role permissions.

To discover ESXi devices directly, complete the following steps:

Preparing the environment

- Create service accounts for the ESXi servers.
- Ensure there is HTTPS access (port 443) to the ESXi instances.
- Install the VMware Tools on the Virtual Machines that are hosted on the ESXi instances. If these are not installed, then some inventory data for the Virtual Machines will not be accessible to TSA.
- If standard data collection (via port 443) is successful, TSA attempts to collect additional adapter data via the CIM provider on port 5989 if it is available. For more information about the CIM provider, see “[Appendix C](#)”.

 To ensure complete data collection, it is recommended that the CIM provider be enabled on the device.

Credentials for access list

- Computer System: enter the username and password for the service account for the ESXi servers.
- The service account must have Administrator role permissions

Windows

TSA supports discovery of Windows instances with the following methods:

- WINRM
- SMB1

 Windows via WINRM is preferred as it is the more secure interface.

Windows via *WINRM*

To discover Windows devices via WINRM, complete the following steps:

Preparing the environment:

The most common way to prepare the environment is to use a server certificate generated by a certificate authority that is installed on the target Windows server. The certificate must meet the following conditions:

- The root and intermediate certificates from the certificate authority are in the Trusted Root Certification Authorities certificates.
- The server certificate is installed in the Personal certificates.
- The server certificate must show that it is issued to the fully-qualified hostname of the server.
- The server certificate must include the private key for this server.

The following command configures WINRM for remote HTTPS connections:

```
winrm quickconfig -transport:https
```

This command does the following:

- Enables WINRM if not currently active
- Modifies the WINRM service so that WINRM starts automatically on restarts
- Configures the WINRM HTTPS listener
- Modifies the Windows Firewall rules to allow remote HTTPS connections

The command produces the following output. Respond with "y" when asked to make the changes.

```
WinRM service is already running on this machine.  
WinRM is not set up to allow remote access to this machine for  
management.  
The following changes must be made:
```

Create a WinRM listener on HTTPS://* to accept WS-Man requests to any IP on this machine.
Configure CertificateThumbprint setting for the service, to be used for CredSSP authentication.
Configure LocalAccountTokenFilterPolicy to grant administrative rights remotely to local users.

Make these changes [y/n]? y

WinRM has been updated for remote management.

Created a WinRM listener on HTTPS://* to accept WS-Man requests to any IP on this machine.
Configured required settings for the service.
Configured LocalAccountTokenFilterPolicy to grant administrative rights remotely to local users.

Finally, to allow user id / password authentication over HTTPS, run the following command:

```
winrm set winrm/config/service/auth @{Basic="true"}
```

An alternative is to use a self-signed certificate. The instructions for this configuration are in [Appendix D: Windows using WINRM](#).

Credentials for access list:

- Enter user name and password for the service account.
- The service account must be a member of one of the following groups:
 - Administrators
 - WinRMRemoteWMIUsers__

To add a user to the WinRMRemoteWMIUsers__ group, use the following command:

```
net localgroup WinRMRemoteWMIUsers__ [user_id] /add
```

Windows via SMB1

To discover Windows devices, complete the following steps:

Preparing the environment:

- Ensure that Windows Scripting Host (WSH) or the Windows Management Instrumentation (WMI) service and VBScript are enabled on the target device.
- Ensure that port 445 is not blocked by firewall or IP security policies as TSA requires Server Message Block (SMBv1) protocol over TCP/IP.
- To apply security policies, go to **Start** → **Control Panel** → **Administrative Tools**, then choose the following navigation based on whether your policies are stored locally or in an Active Directory:
 - Locally stored policy - Administrative Tools → Local Security Policy → IP Security Policies on Local Computer

- Policies Stored in Active Directory - Administrative Tools → Default Domain Security Settings → IP Security Policies on Active Directory or Administrative Tools → Default Domain Controller Security Settings → IP Security Policies on Active Directory
- TSA requires access to the hidden remote administration disk share for access to the system %TEMP% and other directories. Access to the Interprocess Communications share (IPC\$) is also required for TSA to access remote registries. Ensure the Interprocess Communication share Server service is started. To start the Server service, go to → **Control Panel** → **Administrative Tools** → **Services** → **Server**.
- Ensure that the Remote Registry Service is active. This is required for the appliance to be able to establish a session with the Windows device.

Credentials for access list:

Windows releases prior to 2008 R2:

- Computer system (Windows): enter the username and password for the service account.
- The service account can be either a local account in the local administrators' group or a domain account in the domain administrators' group.

Windows release 2008 R2 and newer:

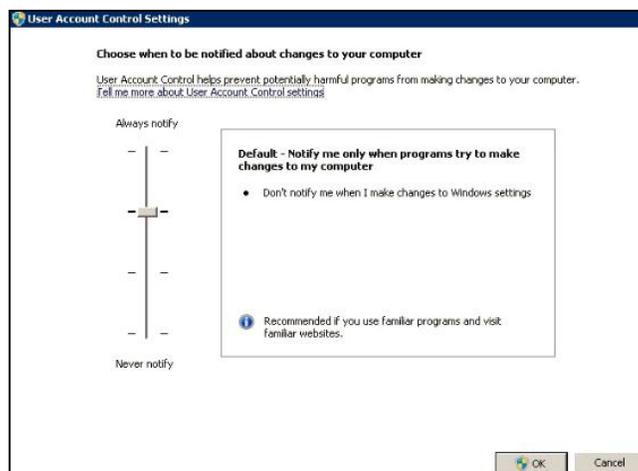
- Computer system (Windows): enter the base Administrator account and password. This account will work regardless of the User Account Control (UAC) settings.

 It is possible to use an account other than the base Administrator account if certain conditions are met. The account must be a local or domain administrator account and the User Account Control (UAC) settings must meet certain requirements. Reference the table below for the combinations of account type and UAC setting that are supported. Reference Microsoft Windows documentation for additional details regarding UAC.

	User Account Control Settings			
	Always Notify	Notify me only when programs try to make changes to my computer (default setting)	Notify me only when programs try to make changes to my computer (do not dim my desktop)	Never Notify
Base Administrator	Yes	Yes	Yes	Yes
User in Domain Administrators Group	No	Yes	Yes	Yes
User in Local Administrators Group	No	Yes	Yes	Yes
Non-Administrator Account (Domain or Local)	No	No	No	No

To access UAC Settings, click the **Start** button, then click **Control Panel**. Type **uac** in the search box and then click **Change User Account Control settings**.

Following is the default setting:



ATM Devices

Certain models of ATM devices can be discovered. To discover ATM devices, including basic information about their components, complete the following steps:

Preparing the environment:

- Wincor Nixdorf models - Follow instructions for [Windows via SMB](#).

IBM iSeries Servers

IBM iSeries are discovered using an SSH connection. If the IBM i Series does not have SSH installed and configured, complete the following steps to discover IBM iSeries target devices:

Preparing the environment:

Ensure that the following products/options are installed and configured for IBM i 7.1:

- IBM Portable Utilities for i, 5733-SC1, *BASE
- Qshell, 5770-SS1, option 30
- Portable App Solutions Environment, 5770-SS1, option 33
- J2SE 6 32 bit, 5761-JV1, option 11

Ensure that the following products/options are installed and configured for IBM i 7.2:

- IBM Portable Utilities for i, 5733-SC1
- Qshell, 5770-SS1, option 30
- Portable App Solutions Environment, 5770-SS1, option 33
- IBM Developer Kit for Java, 5770-JV1

Ensure that the following products/options are installed and configured for IBM i 7.3:

- IBM Portable Utilities for i, 5733-SC1
- Qshell, 5770-SS1, option 30
- Portable App Solutions Environment, 5770-SS1, option 33
- IBM Developer Kit for Java, 5770-JV1 option 16
- Java SE 8 32 bit

To start the SSH daemon execute the following command:

```
SBMJOB CMD (CALL PGM (QP2SHELL) PARM('/QOpenSys/usr/sbin/sshd'))
```

 For additional information on how to configure SSH on IBM iSeries servers, see chapters 21-23 in this Redbook - <http://www.redbooks.ibm.com/redpapers/pdfs/redp4163.pdf>

Credentials for access list:

- Computer System: Enter the username and password for the service account that will be used to access the iSeries servers.
- The service account can have any user class including ***USER**, though additional object authority requirements are needed to collect PTF information (which is done using the **DSPPTF** command).
- DSPPTF is shipped with the following object authority restrictions:
 - The command is shipped with ***EXCLUDE** public authority

- **QPGMR, QSYSOPR, QSRV, and QSRVBAS** user profiles are shipped with private authorities to use this command
- As always, the **QSECOFR** user profile or any user profile with a user class of ***SECOFR** can run this command
- The **QSYS/DSPPTF** object of object type ***CMD** can have its authorities edited to allow any other user to run this command.
- If a new service account is created for TSA, the following recommendations apply:
 - Create the user profile with user class ***USER**
 - Use the **GRTOBJAUT** command to allow this user profile to run the **DSPPTF** command; object is **QSYS/DSPPTF** of object type ***CMD**.

Management Module

Flex System Manager (FSM) Devices

To discover FSM devices, you must have the following credentials:

Credentials for access list:

- Computer System: Enter user name and password.
- The credential must have SMAdmin authority.

Chassis Management Module (CMM) Devices

To discover CMM devices, you must have the following credentials:

Credentials for access list:

- Computer System: Enter user name and password.
- Ensure the service account has a minimum of “operator” authority.

Advanced Management Module (AMM) Devices

To discover AMM devices, you must have the following credentials:

Credentials for access list:

- Computer System: Enter user name and password.
- Ensure the service account has a minimum of “operator” authority.

HP Proliant Blade Server via HP OnBoard Administrator

To discover a HP Proliant Blade server via HP OnBoard Administrator (OBA), complete the following steps:

Preparing the environment:

- HP OBA must be in Active mode.

Credentials for access list:

- Computer system: Enter username and password
- The credential must have either OA administrator, OA operator, or OA user authority on the HP Onboard Administrator. The recommended user authority is OA user which grants the least authority possible.

 TSA collects information from HP OnBoard Administrators that are in active state only. No information is collected from HP OnBoard Administrators that are in standby state.

Integrated Management Module (IMM) & Integrated Management Module II (IMM2) Devices

To discover IMM & IMM2 devices, you must have the following credentials:

Credentials for access list:

- Computer System: Enter user name and password for the service account.
- The service account can have the minimum authority required.

HP Integrity & HP9000 Servers via iLO

The iLO is a separate processor card within an HP Integrity & HP9000 Server that provides basic hardware information about the server. The iLO is active as soon as the server is plugged in, even if the server itself is not powered on yet.

To discover the Summary-level inventory information via iLO for HP Integrity & HP9000 servers, you must have the following credentials:

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The credential needs only "User" authority which is the lowest level of authority.

Network Devices

This section provides a detailed information on the following types of network devices:

Platform
<u>BNT Switches</u>
<u>Cisco Switches</u>
<u>Juniper Switches</u>
<u>Brocade Switches</u>
<u>IBM b-type Storage Area Network (SAN) switches</u>
<u>QLogic Switches</u>

Fortinet (FortiOS)
F5 Big-IP (TMOS)
Check Point
 Click each of the above links for detailed information.

BNT Switches

To discover BNT switches, the following credentials are required:

Credentials for access list:

- Computer System: Enter username and password.
- The credential must have administrator authority.

Cisco

To discover Cisco devices, you can use the following computer system credentials or the SNMP credentials:

Credentials for access list:

- Computer System or Other (Cisco Device) or Other (Cisco Works): Use username / password or username / SSH key for authentication.
- The service account requires network-admin role privileges.
- SNMP: Enter community string (for SNMPv1 and SNMPv2).
- SNMP (SNMPv3):
 - Enter
 - user name
 - password
 - private password (optional)
 - Select authentication protocol: none, MD5, SHA

 It is important that a single community string is made available to TSA that has read-only access to ALL in scope network devices.

Juniper

To discover Juniper devices, the following credentials are required:

Credentials for access list:

- Computer System: Enter username and password.
- The credential must have administrator authority.

 **Note:** Discovery of memory size information requires Junos® version 12.1 or later to be installed on the device.

Brocade

To discover Brocade devices, the following credentials are required:

Credentials for access list:

- Computer System: Enter username and password.
- Virtual Fabric mode disabled: The credential needs only "User" authority which is the lowest level of authority on Fabric OS.
- Virtual Fabric mode enabled: The credential needs "Admin" authority on Fabric OS.

IBM b-type Storage Area Network (SAN) switches

To discover IBM b-type SAN devices, the following credentials are required:

Credentials for access list:

- Computer System: Enter username and password.
- Virtual Fabric mode disabled: The credential needs only "User" authority which is the lowest level of authority on Fabric OS.
- Virtual Fabric mode enabled: The credential needs "Admin" authority on Fabric OS.

QLogic Switches

To discover QLogic switches, the following credentials are required:

Credentials for access list:

- Computer System: Enter username and password.
- The credential must have administrator authority.

Fortinet (FortiOS)

To discover Fortinet devices that are running FortiOS, complete the following steps:

Preparing the environment

- Ensure that the system console is configured to display entire command output:

```
config system console
set output standard
end
```

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the Fortinet device.
- The credential must have at least Read-Only permissions.

F5 Big-IP (TMOS)

To discover F5 Big-IP systems that are running TMOS, the following credentials are required:

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the Big-IP systems.
- The credential must have F5 administrator authority.
- The credential must have SSH access to run TMSH CLI commands.

Check Point

To discover Check Point systems, the following credentials are required:

Credentials for access list:

- Computer System: Use username / password or username / SSH key authentication for the Check Point system.
- The credential must have administrator authority (adminRole).
- The credential must have SSH access to run CLI commands.

Storage Devices

This section provides detailed information on the following types of Storage and Tape devices:

Platform
<u>EMC Corporation Storage</u>
<u>IBM FlashSystem, v9000</u>
<u>HP StorageWorks P2000 Modular Smart Array</u>
<u>IBM DS3xxx, DS4xxx or DS5xxx</u>
<u>IBM DS6xxx or DS8xxx</u>
<u>IBM SVC or V7000/V3700</u>
<u>IBM V7000 Unified</u>
<u>IBM XIV</u>
<u>nSeries or NetApp</u>
<u>IBM ProtecTier</u>
<u>TS3100 Tape Library</u>

Platform
<u>TS3200 Tape Library</u>
<u>IBM TS3310 Tape Library</u>
<u>IBM TS3494, TS3953 Tape Libraries</u>
<u>IBM TS3500, TS3584 Tape Libraries</u>
<u>IBM TS4500 Tape Library</u>
<u>IBM TS7700 Tape Library</u>
 Click each of the above links for detailed information.

EMC Corporation Storage

EMC CLARiON / VNX / VMAX

To discover EMC CLARiON / VNX / VMAX devices, complete the following steps:

Preparing the environment:

- Ensure that an instance of the EMC SMI-S Provider product is installed on a Windows or Linux system. By default, TSA follows the EMC SMI-S recommendation to discover the location of the provider using SLP. If your network security policy blocks SLP network traffic, TSA can be configured to directly access the EMC SMI-S Provider without the use of SLP.
- If your network security does not allow SLP network traffic, use the Discovery Settings → Connection Settings page to provide information about which ports the EMC SMI-S Providers listen for query requests.
- Ensure that at least one of the IP addresses that the SMI-S Provider is utilizing is defined in a scope set. TSA will connect to the SMI-S Provider to retrieve information about the EMC devices that it manages. The IP addresses of the individual EMC devices do not need to be placed in a scope set. TSA attempts to connect to the SMI-S provider using HTTPS if available, otherwise HTTP is used.

Credentials for access list:

- Computer System: Enter username and password.
- The credentials can use any role that the EMC SMI-S provider supports. The recommended role is “monitor” which has the least authority.

 Only the credentials for the SMI-S provider need to be entered in TSA. No credentials for the EMC devices need to be entered.

EMC Data Domain

To discover EMC Data Domain devices, you must have the following credentials:

Credentials for access list:

- Computer system: Enter username and password.
- The service account can have the minimum authority required.

IBM FlashSystem, v9000

To discover IBM FlashSystems, complete the following steps:

Preparing the environment:

- For old models, the MCP (Management Control Port) must be in an active state to discover the system successfully.
 - To check if a system is in active state, run the command - `system status`.
 - Of the two IP addresses, if one IP goes down, the system goes into passive state. To make the other Ethernet port active, run the command - `sync activate`.

Credentials for access list:

- Computer system: Use username / password or username / SSH key authentication for the service account.
- The service account can have the minimum authority required. The Monitor role is recommended since it has the least authority.

HP StorageWorks P2000 Modular Smart Array

To discover HP Storage systems, you must have the following credentials:

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The service account can have the minimum authority required.

IBM DS3xxx, DS4xxx or DS5xxx Storage

To discover IBM DS3xxx, DS4xxx or DS5xxx devices, complete the following steps:

Preparing the environment:

- Ensure that the storage manager allows the use of remote smcli commands.

Credentials for access list:

- For non-secured storage devices, no credentials are required.
- For secured storage devices, the following credentials are required:

- User role: User role must be either “admin” or “monitor”. The “monitor” user role is preferred since it gives TSA less authority.
- Password: Password associated with user role

IBM DS6xxx / DS8xxx Storage

To discover IBM DS6xxx / DS8xxx devices, complete the following steps:

Preparing the environment:

- Ensure that the storage manager allows the use of remote dscli commands.

Credentials for access list:

- Computer System: Enter username and password.
- Must have the “monitor” user role.

IBM SVC, V7000/V3700 storage

To discover SVC and V7000/V3700 devices, you must have the following credentials:

Credentials for access list:

- Computer system: Use username / password or username / SSH key for authentication.
- The credential needs the “monitor” user role which is the lowest access level for SVC and Storwize systems.

IBM V7000 Unified Storage

To discover V7000 Unified devices, you must have the following credentials:

Credentials for access list:

- Computer system: Enter username and password.
- The credential needs the “monitor” user role which is the lowest access level for V7000 Unified Storage systems.

IBM XIV Storage

To discover XIV devices, complete the following steps:

Preparing the environment:

- Ensure that the storage manager allows the use of remote xcli commands.

Credentials for access list:

- Computer System: Enter username and password.
- The service account must have the “read-only” user role.
- Be aware that XIV systems may have a low threshold for invalid sign-on attempts before generating alerts. If you are using a large credential set, you may exceed this

limit and cause unnecessary problems to be reported. Try to group the XIV devices in a single scope set and restrict their service account credentials to that scope set.

nSeries or NetApp Storage

To discover nSeries or NetApp devices, complete the following steps:

Preparing the environment:

- Data collection is supported for systems configured with the Data ONTAP CLI, RLM CLI and SP CLI. However, the BMC CLI is not supported.
- The **telnet.distinct.enable** option must be turned on.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The service account can have the minimum authority required.

IBM ProtecTIER

To discover ProtecTIER devices, you must have the following credentials:

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The credentials must have administrator privileges.

TS3100 Tape Library

To discover TS3100 Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is HTTP access to the device.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The credentials must have administrator authority.

TS3200 Tape Library

To discover TS3200 Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is HTTP access to the device.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The credentials must have administrator authority.

IBM TS3310 Tape Library

To discover TS3310 Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is HTTP access to the device.
- The web service is configured in secured mode always.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The credentials must have administrator authority.

IBM TS3494, TS3953 Tape Libraries

- To discover TS3494, TS3953 Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is Telnet access to the device.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The service account can have the minimum authority required.

IBM TS3500, TS3584 Tape Libraries

The following prerequisites are required:

- The TS3500 Tape Library must be at firmware level 8xxx (or higher).
- The Advanced Library Management System (ALMS) must be installed and enabled.

To discover TS35xx Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is HTTP / HTTPS access to the device. Both SSL and non-SSL connections are supported.
- The TS3500 web interface can be configured for “No password protection” or “Password protection”
 - If “Password Protection” is activated, create a ‘Computer system’ credential with the user ID and password for the service account used to access the web interface.
 - If “Password protection” is disabled, no credentials are required.

Credentials for access list:

- Computer system: Enter username and password for the service account.

- The credentials must have administrator authority.

IBM TS4500 Tape Library

The following prerequisites are required:

- The TS4500 Tape Library must be at firmware level 8xxx (or higher).
- The TS4500 Tape Library must be at 130b (or higher)
- The Advanced Library Management System (ALMS) must be installed and enabled.

To discover TS4500 Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is HTTP / HTTPS access to the device. Both SSL and non-SSL connections are supported.
- The TS4500 web interface can be configured only for “Password protection”.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The service account must be mapped to the 'Service' role.

IBM TS7700 Tape Library

To discover TS7700 Tape Library devices, complete the following steps:

Preparing the environment:

- Ensure that there is HTTP / HTTPS access to the device.

Credentials for access list:

- Computer system: Enter username and password for the service account.
- The credential needs only "Read-Only" authority.

Firewall Considerations

Firewall(s) between the appliance and the discovery devices could prevent a complete and successful discovery from occurring.

In cases where it is necessary to traverse a firewall, ports may have to be opened in the firewall, depending on the type of device the user would like to discover. Typically ports 22 (SSH) and 161 (SNMP) should be opened, followed by the appropriate ones in the following table based on the supported devices.

Discovery Endpoint	Ports	Interface / Protocol
Numerous	22	SSH
Numerous	161	SNMP
Storage Devices		
DS6000 / DS8000	1750 (HTTP) or 1751 (HTTPS)	DSCLI
DS3000 / DS4000 / DS5000	2463	SMCLI
XIV	7778	XCLI
nSeries or NetApp	22 / 23	SSH or Telnet
SVC or V7000/V3700	22	SSH
V7000 Unified	22	SSH
IBM TS3500	443 / 80	HTTPS or HTTP
IBM TS4500	443 / 80	HTTPS or HTTP
IBM TS7700	443 / 80	HTTPS or HTTP
IBM TS3100 / TS3200 / TS3310	80	HTTP
IBM TS3494, TS3953	23	Telnet
IBM ProtecTier	22	SSH
HP Storage	22 / 23	SSH or Telnet
IBM Flash System, v9000	22	SSH

Discovery Endpoint	Ports	Interface / Protocol
EMC Corporation Storage - CLARiiion/VNX/VMAX	427 - (default) when SLP discovery is allowed, else if SLP discovery is disabled, this port is not used. HTTPS / HTTP ports configured by EMC SMI-S provider; default values are 5989 / 5988	SLP, HTTPS / HTTP
	 You can enable or disable the SLP discovery option to discover EMC storage devices through EMC SMI-S Providers.	
EMC Corporation Storage – EMC Data Domain	22	SSH*
Operating Systems and Hosts		
FSM	22 / 23	SSH or Telnet
CMM	22 / 23	SSH or Telnet
AMM	22 / 23	SSH or Telnet
HP Proliant Blade Server via HP OnBoard Administrator	22 / 23	SSH or Telnet
IMM & IMM2	22 / 23	SSH or Telnet
HP iLO for the HP Integrity / HP 9000 servers	22 / 23	SSH* or Telnet
Network Devices		
Brocade	161 / 22 / 23	SNMP, SSH, Telnet
IBM b-type Storage Area Network (SAN) switches	22 / 23	SSH, Telnet
Cisco	161 / 22 / 23	SNMP, SSH, Telnet
BNT	22 / 23	SSH or Telnet
Juniper	22 / 23	SSH or Telnet
QLogic	22 / 23	SSH* or Telnet
Fortinet (FortiOS)	22 / 23	SSH or Telnet

Discovery Endpoint	Ports	Interface / Protocol
F5 Big-IP (TMOS)	22 / 23	SSH or Telnet
Check Point	22 / 23	SSH or Telnet
Operating Systems / Server Platforms		
HMC	22	SSH
VIOS	22	SSH
AIX	22	SSH
Linux	22	SSH
Windows	445	SMBv1
VMware vCenter	443	HTTPS
VMware ESXi	443, 5989	HTTPS
IVM	22 / 23	SSH or Telnet
IBM iSeries	22	SSH
SUN	22	SSH
 TSA supports only SSH v1 for the devices that are marked by SSH*.		

Discovery Issues

Most discovery problems are due to access or authorization issues.

The most common access issues are due to firewalls blocking access to the necessary ports on the device. The ports that need to be open and reachable vary by device type. See section “[Firewall Considerations](#)” to determine which ports are applicable.

The most common authorization issues include the following:

- **No credentials defined.** Ensure that credentials for the devices are defined in the TSA and the appropriate service accounts are created on the devices.
- **Credential user name or password incorrect.** Use the Test function of the **Create Credential** panel to verify that the credential being created is valid.
- **Credential password expired.**
- **Credential lacking the necessary authorities on the device.** To determine the credential requirements for a target device, see section [Device Discovery Configuration](#).
- **Use valid credential type.** For Windows devices, create a 'Computer System (Windows)' credential and not a 'Computer System' credential.

 Check the **Authentication Status** panel (**Tools** → **Authentication Status**) to see if any service account credentials have expired passwords or have stopped working.

Ongoing Considerations

After the desired portions of the network have been defined in TSA and scanned successfully, TSA can be left to run periodic discoveries and transmissions on the desired schedules.

The following are some expected ongoing activities:

- Review the reports generated by TSA with your IBM representative on a periodic basis.
- Perform a backup via the TSA user interface periodically to save a copy of the TSA configuration.

 This operation does not save data collected by TSA. It only saves configuration information.

- Periodically check the **Authentication Status panel (Tools → Authentication Status)** to see if any service account credentials have expired passwords or have stopped working.
- When the passwords are updated for the service accounts on the devices, be sure to update the passwords in TSA as well to keep the credential definition in TSA in sync with the credential on the target device.
- If your security policy allows for it, consider setting up service accounts with non-expiring passwords or use SSH keys. This eliminates the need to update the passwords in the TSA user interface, and on the devices periodically.

Troubleshooting

Active Session for AMM Discovery

AMM devices have a setting that limits the number of simultaneous active sessions (maximum 20). If this setting is not high enough to allow TSA to create a session, the AMM device cannot be discovered.

To change the limit of the active sessions of an AMM device, follow these steps:

1. Log in to AMM web interface by typing the AMM device's IP address in the browser.
2. Go to **MM Control** → **Login Profiles**.
3. Click login ID that TSA is using to discover the device.
4. Increase the **Maximum simultaneous active sessions** setting value.
5. Click **Save** at the lower right of the page.

Appendix A: Terms and Definitions

It is assumed that the reader has an in-depth understanding of Internet Protocol (IP) networks and protocols.

Term	Definition
Discovery device	Refers to deployed IT infrastructure components that can be discovered by TSA. Typical devices include: Servers, Computer Systems (e.g. IBM, Dell, and HP), Storage elements, and Network elements (e.g. switches, bridges, routers).
Open network	Network that has internet connectivity.
Private network	Network that has no internet connectivity. (also, known as a Service network)

Appendix B: Miscellaneous Items

User Interface Download Functions

In some cases, when using a web browser, the Download All Logs (from the **Activity Log** page), the file downloads (from the **Discovery History** page), or documentation downloads (from the **Documentation** page) does not complete successfully. To resolve this issue, try switching to another supported web browser as documented in the TSA Setup Guide. If that is not an option, try resetting your browser's properties to their default settings.

Appendix C: CIM Provider for VMware ESXi

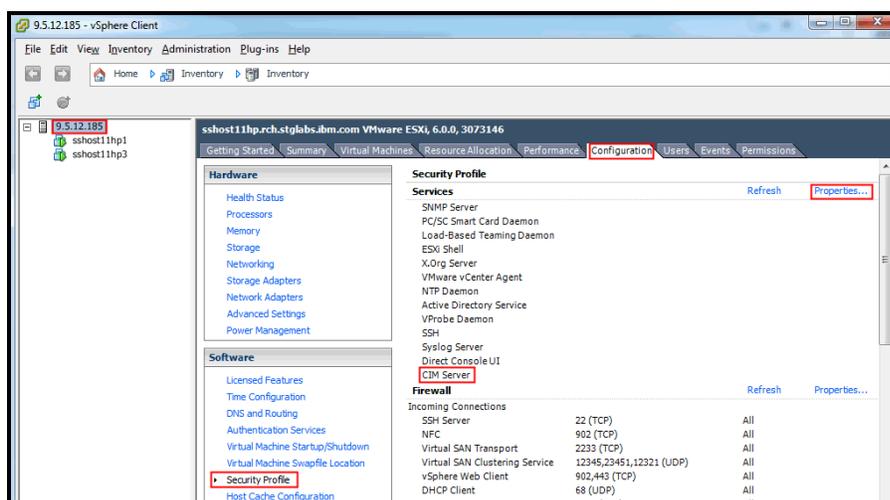
A CIM provider is a set of VMware ESXi plug-ins that can collect additional hardware and firmware information about the server that VMware ESXi is running on. Both TSA and the VMware vCenter can benefit from this additional information.

CIM provider plug-ins are developed by the server and component manufacturers. To ensure that CIM provider plug-ins are included in ESXi, use a customized installation image where the CIM provider plug-ins are included. For existing VMware ESXi instances that do not have the CIM provider installed, obtain the necessary plug-ins from the server and component manufacturers and install into ESXi. VMware provides a list of the various plug-ins that are provided by manufacturers. For more information, see https://www.vmware.com/resources/compatibility/pdf/vi_cim_guide.pdf.

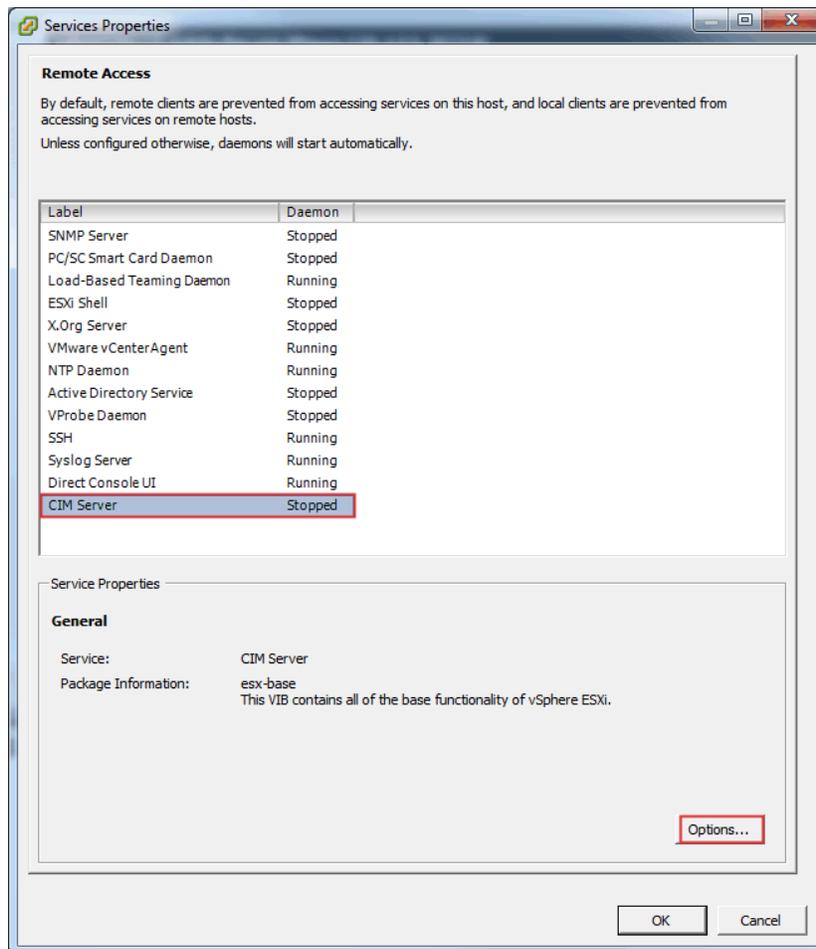
To determine if the CIM provider is active, and to turn on the CIM provider if it is not active, go through the following steps.

On VMware vSphere Client

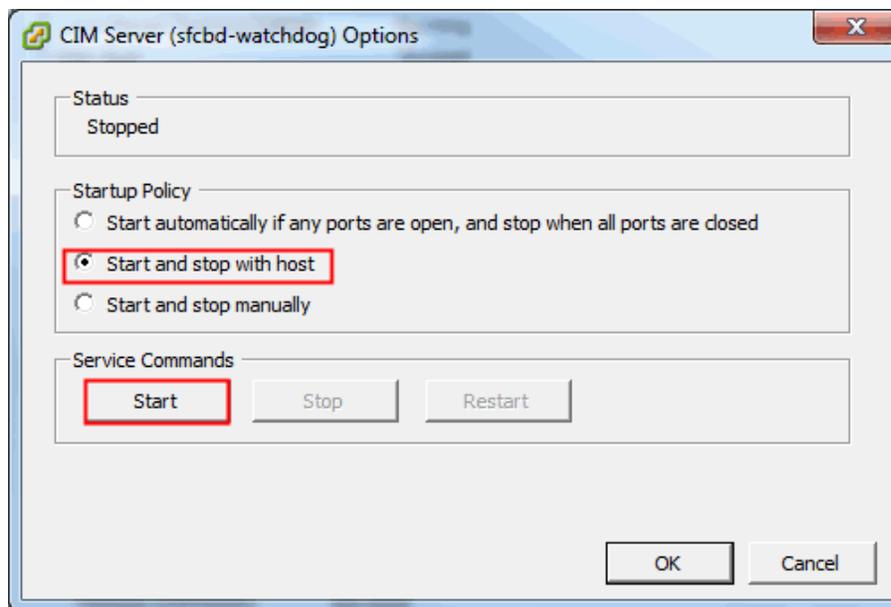
- Start the VMware vSphere Client
- Click on the ESXi server IP in the left navigation window and select the **Configuration** tab in the right pane.
- Select **Security Profile** from the **Software** selection menu in the right pane. A set of services including **CIM Server** in the **Services** section are displayed.



- Select the **Properties...** item in the **Services** section.



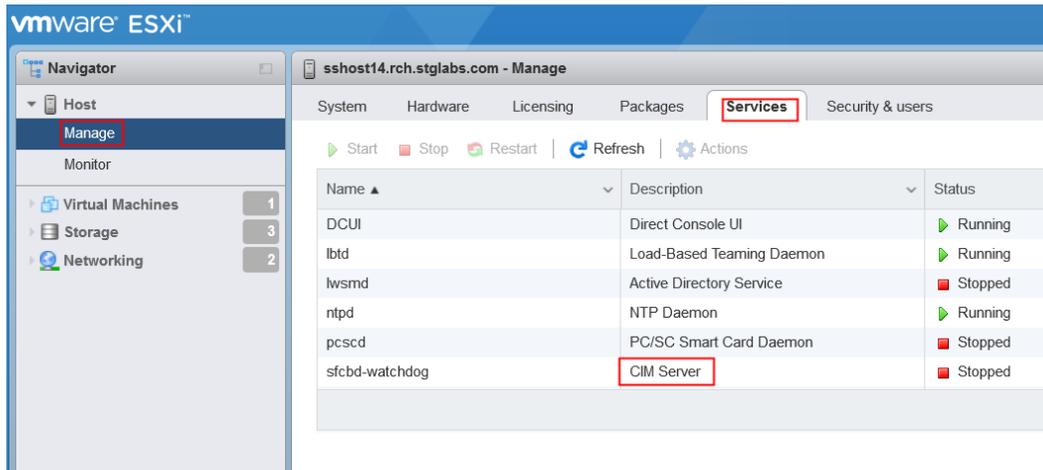
- If **CIM Server** is in **Stopped** state, then select it and press the **Options...** button. The following dialog window is displayed.



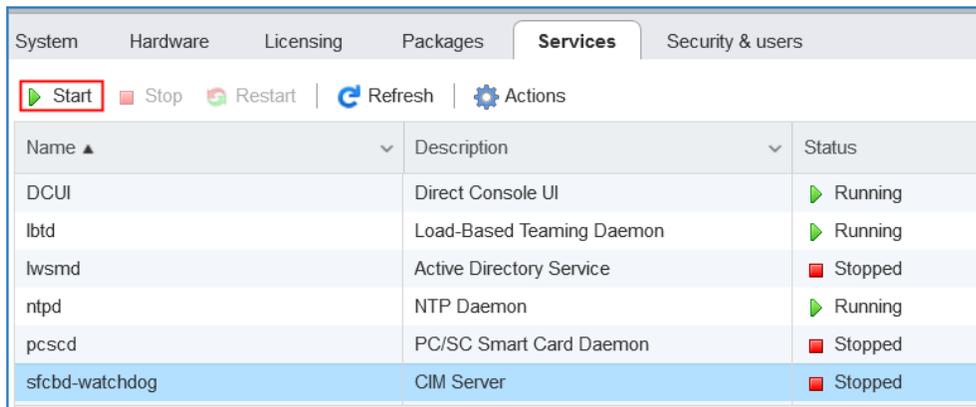
- Select the **Startup Policy (Start and stop with host option)** and click the **Start** button to activate the CIM Server.

On VMware vSphere Web Client

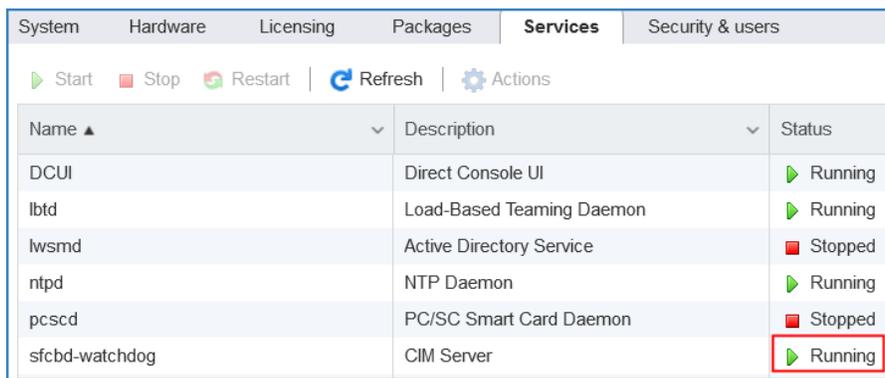
- Login to the VMware vSphere Web Client
- Click on **Host** → **Manage** in the left navigation window and select the **Services** tab in the right pane.
- A set of services including the **CIM Server** are displayed.



- If **CIM Server** is in **Stopped** state, then select it and click **Start** button.



- The CIM Server service starts and the status will be in “Running” state.



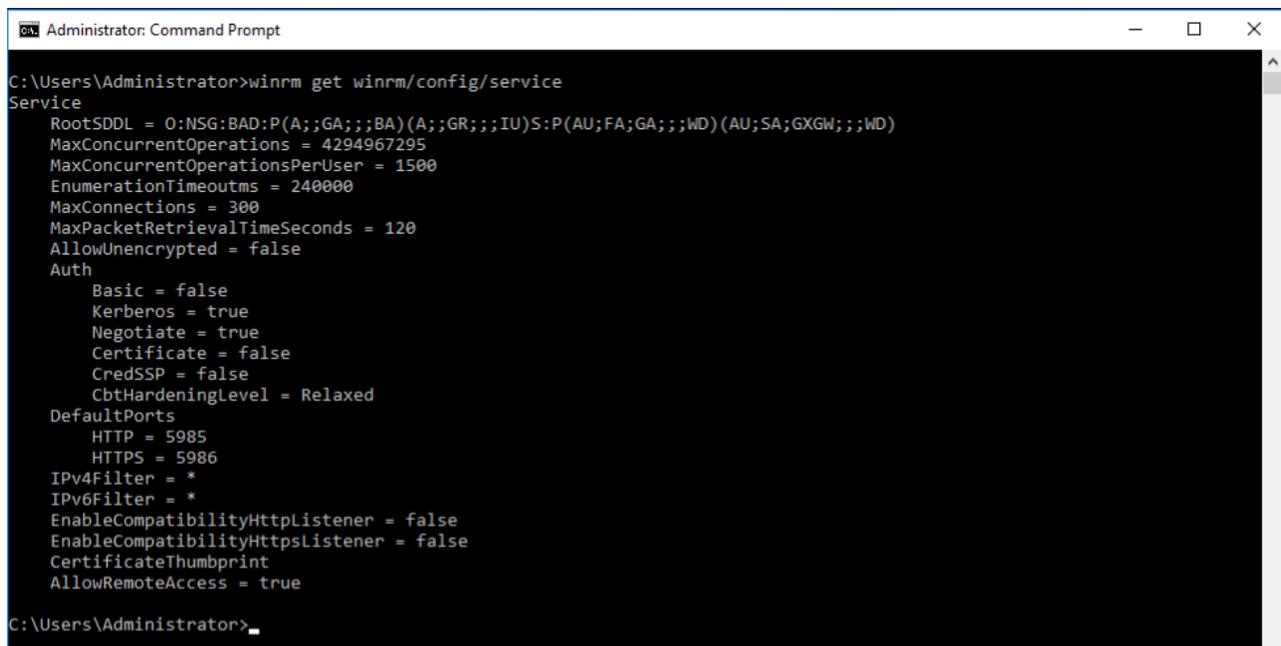
Appendix D: Windows using WINRM

For Windows 2008, 2012, and 2016 Server, the WINRM service is started automatically. However, remote management is not enabled by default. Here is a brief outline on what is required to enable WINRM to allow remote connections using a self-signed certificate:

- Enable WINRM to accept HTTPS connections that authenticate with user ID / password
- Associate a self-signed certificate with the HTTPS listener for WINRM that was enabled
- Modify the Windows firewall to allow inbound connections via port 5986 (the default WINRM HTTPS port)

The following commands prepare WINRM to allow remote connections over HTTPS:

- Determine the current state of the WINRM service using this command:
winrm get winrm/config/service



```
Administrator: Command Prompt
C:\Users\Administrator>winrm get winrm/config/service
Service
  RootSDDL = O:NSG:BAD:P(A;;GA;;;BA)(A;;GR;;;IU)S:P(AU;FA;GA;;;WD)(AU;SA;GXGW;;;WD)
  MaxConcurrentOperations = 4294967295
  MaxConcurrentOperationsPerUser = 1500
  EnumerationTimeoutms = 240000
  MaxConnections = 300
  MaxPacketRetrievalTimeSeconds = 120
  AllowUnencrypted = false
  Auth
    Basic = false
    Kerberos = true
    Negotiate = true
    Certificate = false
    CredSSP = false
    CbtHardeningLevel = Relaxed
  DefaultPorts
    HTTP = 5985
    HTTPS = 5986
  IPv4Filter = *
  IPv6Filter = *
  EnableCompatibilityHttpListener = false
  EnableCompatibilityHttpsListener = false
  CertificateThumbprint
  AllowRemoteAccess = true
C:\Users\Administrator>
```

- The value for **AllowUnencrypted** must be *false*. If *true*, use the following command to change to *false*:

```
winrm set winrm/config/service @{AllowUnencrypted="false"}
```

- The value for **Basic** must be *true*. If *false*, use the following command to change to *true*:

```
winrm set winrm/config/service/auth @{Basic="true"}
```

- Determine if WINRM has an HTTPS listener using this command:

winrm enumerate winrm/config/listener

```

Administrator: Command Prompt
C:\Users\Administrator>winrm enumerate winrm/config/listener
Listener
  Address = *
  Transport = HTTP
  Port = 5985
  Hostname
  Enabled = true
  URLPrefix = wsman
  CertificateThumbprint
  ListeningOn = 9.5.80.125, 127.0.0.1, ::1, 2001:0:5ef5:79fb:34be:1cf4:f6fa:af82, 2002:905:150e:251:d7f:a049:285a:ae33
, fd55:faaf:e1ab:2251:d7f:a049:285a:ae33, fe80::200:5efe:9.5.80.125%6, fe80::d7f:a049:285a:ae33%7, fe80::34be:1cf4:f6fa:
af82%3
C:\Users\Administrator>

```

- In the command example above, only an HTTP listener exists, so an HTTPS listener needs to be configured. To enable HTTPS listener if not configured:
 - Using PowerShell, create a self-signed certificate:


```
New-SelfSignedCertificate -DnsName "myHost@myBusiness.com" -CertStoreLocation Cert:\LocalMachine\My
```
 - Replace the DnsName in the example with the Windows fully-qualified domain name for the Windows server.
 - Save the certificate thumbprint for the next step

```

Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> New-SelfSignedCertificate -DnsName "testServer.testCo.com" -CertStoreLocation Cert:\LocalMachine\My

PSParentPath: Microsoft.PowerShell.Security\Certificate::LocalMachine\My

Thumbprint                               Subject
-----
90973CF1FBC575A3E570113718E158AD8A6AFF80  CN=testServer.testCo.com

PS C:\Users\Administrator>

```

- Create the HTTPS listener:


```
winrm create winrm/config/Listener?Address=*+Transport=HTTPS @{{Hostname="myHost@myBusiness.com"; CertificateThumbprint="[COPIED_CERTIFICATE_THUMBPRINT]"}}
```
- Check to ensure HTTPS is now configured:


```
winrm enumerate winrm/config/listener
```
- Modify the Windows firewall to allow inbound remote connections to WINRM:
 - Use Control Panel → System and Security → Windows Firewall

- Click **Advanced settings**. The **Windows Firewall with Advanced Security** window displays.
- Click **Inbound Rules**.
- Select **Actions** menu and, click on **New Rule**. The **New Inbound Rule Wizard** displays.
- Select **Port** and click **Next**.
- Select **TCP → Specific local ports** and specify 5986. Click **Next**.
- Select **Allow the connection** option and click **Next**.
- Ensure to select **Domain, Private,** and **Public** checkboxes if not already checked and click **Next**.
- Give the new rule a name (such as Windows Remote Management (HTTPS-In)) and click **Finish**.

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