IBM Z

# *Integrating the Hardware Management Console's Broadband Remote Support Facility into your Enterprise*

SC28-6986-04

**Note:**

Before using this information and the product it supports, read the information in "Safety" on page v, Appendix A, "Notices," on page 17, and *IBM Systems Environmental Notices and User Guide*, Z125–5823.

This edition, SC28-6986-04, applies to IBM Z servers, beginning with the IBM z13, and IBM LinuxONE servers, beginning with the IBM LinuxONE Emperor (2964) and the IBM LinuxONE Rockhopper (2965). This edition replaces SC28-6986-03.

There might be a newer version of this document in a PDF file available on Resource Link. Go to http://www.ibm.com/servers/resourcelink and click Library on the navigation bar.

# Contents

# Safety

## Safety notices

Safety notices may be printed throughout this guide. **DANGER** notices warn you of conditions or procedures that can result in death or severe personal injury. **CAUTION** notices warn you of conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous. **Attention** notices warn you of conditions or procedures that can cause damage to machines, equipment, or programs.

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## Laser safety information

All IBM Z® (Z) and IBM® LinuxONE (LinuxONE) models can use I/O cards such as FICON®, Open Systems Adapter (OSA), InterSystem Channel-3 (ISC-3), RoCE Express, Integrated Coupling Adapter (ICA SR), zHyperLink Express, or other I/O features which are fiber optic based and utilize lasers (short wavelength or long wavelength lasers).

### Laser compliance

All lasers are certified in the US to conform to the requirements of DHHS 21 CFR Subchapter J for Class 1 or Class 1M laser products. Outside the US, they are certified to be in compliance with IEC 60825 as a Class 1 or Class 1M laser product. Consult the label on each part for laser certification numbers and approval information.

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**CAUTION: Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)**

**CAUTION: This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)**

# About this publication

This publication provides information that can be used to set up a broadband Hardware Management Console (HMC) connection.

**Note:** Screen captures that appear in this publication may not be at the latest level. They are provided to represent the task for reference and navigation purposes only.

## Related HMC and SE console information

Hardware Management Console (HMC) and Support Element (SE) information can be found on the console help system.

## Accessibility

Accessible publications for this product are offered in EPUB format and can be downloaded from Resource Link® at http://www.ibm.com/servers/resourcelink.

If you experience any difficulty with the accessibility of any IBM Z and IBM LinuxONE information, go to Resource Link at http://www.ibm.com/servers/resourcelink and click **Feedback** from the navigation bar on the left. In the **Comments** input area, state your question or comment, the publication title and number, choose **General comment** as the category and click **Submit**. You can also send an email to reslink@us.ibm.com providing the same information.

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### Accessibility features

The following list includes the major accessibility features in IBM Z and IBM LinuxONE documentation, and on the Hardware Management Console and Support Element console:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Customizable display attributes such as color, contrast, and font size
- Communication of information independent of color
- Interfaces commonly used by screen magnifiers
- Interfaces that are free of flashing lights that could induce seizures due to photo-sensitivity.

### Keyboard navigation

This product uses standard Microsoft Windows navigation keys.

### Consult assistive technologies

Assistive technology products such as screen readers function with our publications, the Hardware Management Console, and the Support Element console. Consult the product information for the specific assistive technology product that is used to access the EPUB format publication or console.

### IBM and accessibility

See http://www.ibm.com/able for more information about the commitment that IBM has to accessibility.

## Revisions

A technical change from the previous edition of this document is indicated by a thick vertical line to the left of the change.

## Summary of changes

Minor updates were made to this publication to incorporate the latest IBM z15™ and IBM LinuxONE III servers.

## How to send your comments

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# Chapter 1. Integrating the HMC's Broadband Remote Support Facility into your Enterprise

## Overview

There are number of options available to set up a broadband Hardware Management Console (HMC) connection.

This document describes the security features built into the Hardware Management Console to support broadband RSF, configuration options, and explains how to integrate security features in your Enterprise to work with broadband Remote Support Facility (RSF). There are also instructions for setting up broadband RSF from the Hardware Management Console.

The traditional Service Support System is no longer supported on HMC Version 2.15.0. Any references to the IBM Service Support System refer to the enhanced IBM Service Support System.

## Security features on the HMC

Broadband support on the Hardware Management Console (HMC) was designed with the understanding that maintaining security of the system is a shared responsibility between IBM and the customer.

Following are built-in facilities on the Hardware Management Console:

- Data encryption using TLS
- Audit logs of outbound connections
- Isolation of Ethernet connections
- Hardware Management Console firewall.

### Data encryption using Transport Layer Security

All data between the customer machine and IBM is encrypted using Transport Layer Security (TLS) sockets. TLS technology ensures data confidentiality and integrity.

### Audit logs of outbound connections

Audit logs are created for each outbound connection including the destination, common name of the certificate of the destination, and the cipher suite used for encryption.

### Isolation of Ethernet connections

There are multiple network interface cards available on the Hardware Management Console. This allows you to isolate your Support Elements from any possible access on the enterprise LAN. IBM recommends you use one of the Ethernet connections on each Hardware Management Console to connect to a private Ethernet LAN that communicates with your CPCs and Support Elements. Another Ethernet connection on the Hardware Management Console should connect to the enterprise LAN or corporate firewall that will in turn connect to the Internet. Figure 1 on page 2 shows this type of configuration.

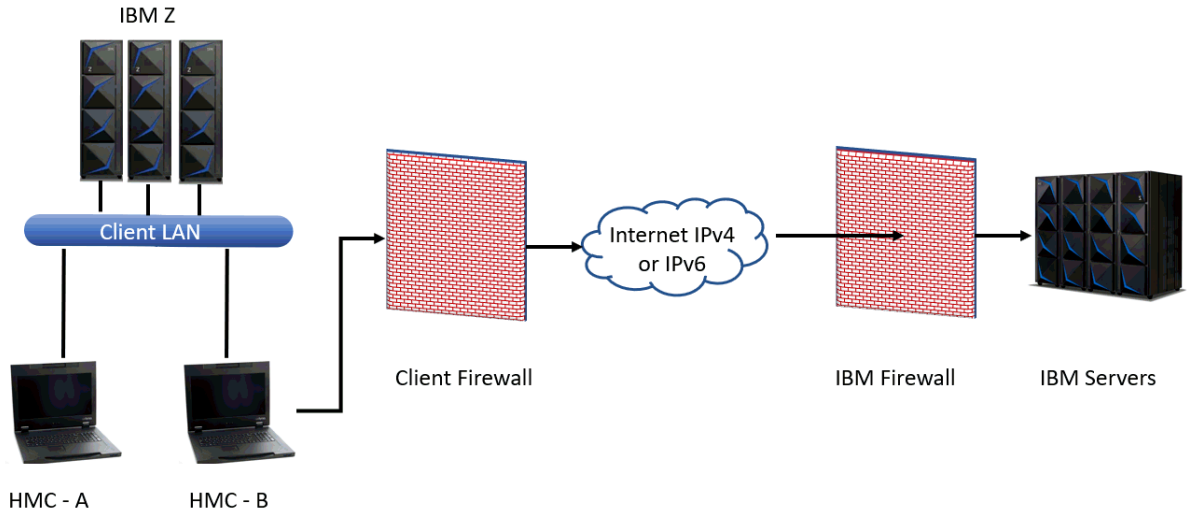



*Figure 1. Separating Ethernet adapters*

In Figure 1 on page 2, the Hardware Management Console uses a second network card to physically separate the local system network from the Internet-enabled network.

### Hardware Management Console firewall

The Hardware Management Console is always protected by an internal firewall that allows outbound traffic to the IBM Service Support System. The default is to block all inbound ports, which ensures that all service communication is initiated by the HMC. The IBM Service Support System will never initiate an Internet connection.

Specific ports are only enabled as needed based on the IP addresses of the defined CPCs and enabled services (such as web browser access).

## Integrating HMC broadband into your Enterprise

### Outbound connections for service

A customer firewall that is connected to the Hardware Management Console must be configured to allow outbound connections to the IBM Service Support System. All connections to the IBM Service Support System are outbound connections to **esupport.ibm.com** port **443**.

The set of specific IP addresses to which your system requires outbound connectivity depends upon Internet protocol (IPv4 and IPv6).

For a list of these addresses, see “IP Addresses for the IBM Service Support System” on page 4. A list of these IP addresses is also available in the **online help** information on the Hardware Management Console. To view the help, click **Help** on the Outbound Connectivity Settings window in the **Customize Outbound Connectivity** task.

### Integrating the customer's firewall

The customer's firewall may also take advantage of Source Network Address Translation (SNAT) and masquerading rules to conceal the Hardware Management Console's Internet address from the packets

in the Internet. The firewall may also limit the specific IP addresses to which the Hardware Management Console can connect.

## Support for an HTTP proxy server

A customer may additionally require all traffic to go through a proxy server. In this case, the Hardware Management Console connects directly to the proxy server, which initiates all communications to the Internet (Figure 2 on page 3).

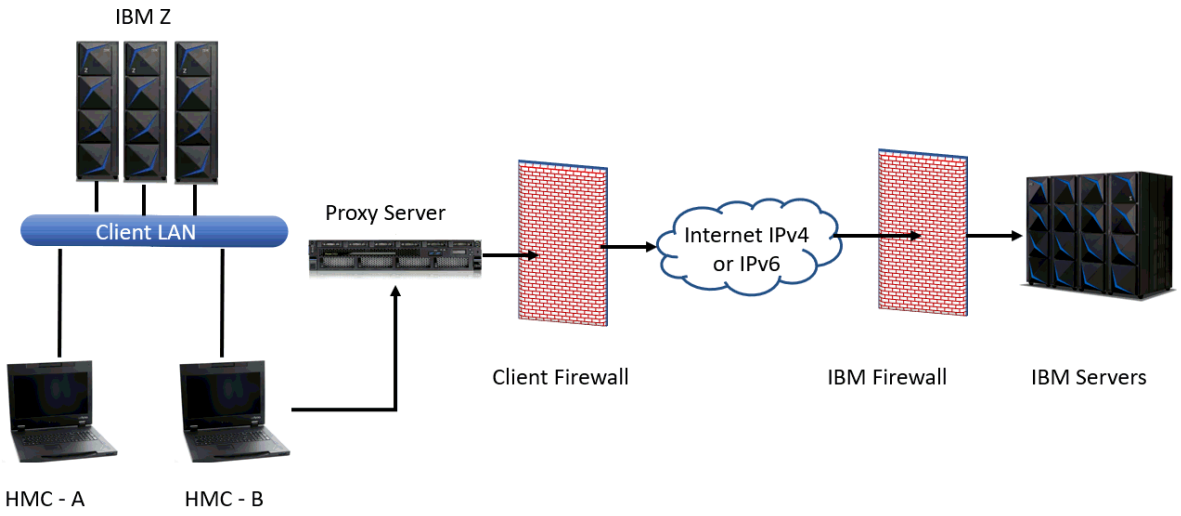



*Figure 2. HMC broadband using a proxy server*

To forward TLS sockets, the proxy server must support the basic proxy header functions (**RFC 2616**) and the CONNECT method.

Optionally, basic proxy authentication (**RFC 2617**) or Microsoft NT LAN Manager (NTLM) may be configured so that the Hardware Management Console authenticates before attempting to forward sockets through the proxy server.

For the Hardware Management Console to communicate successfully, the HTTP proxy server or firewall must allow outbound connections to port 443. The proxy server may limit the specific IP addresses to which the Hardware Management Console can connect. For a list of these required IP addresses, see "IP Addresses for the IBM Service Support System" on page 4.

## Resolving IP addresses of IBM Service Support System

If you select the **Resolve IBM IP addresses on console** option, the HTTP connect request will direct your proxy to connect directly to the set IP address in the "IP Addresses for the IBM Service Support System" on page 4. In this case, your HMC must be configured to have a DNS. Note that the value selected in **Protocol to Internet** from the **Customize Outbound Connectivity** task must reflect the Internet Protocol used by the proxy to connect to the internet.

**Note:** For example, the Hardware Management Console may connect to your proxy using an IPv6 address, but the proxy may be configured to connect to the internet using IPv4. In this case, you would enter the IPv6 address of your proxy server, but select IPv4 for **Protocol to Internet** from the **Customize Outbound Connectivity** task.

If you do not select the **Resolve IBM IP addresses on console** option, the connect request will direct your proxy to connect to the hostname, **esupport.ibm.com** as required. The actual outbound internet protocol will be determined by the proxy server and its DNS services.

## IP Addresses for the IBM Service Support System

A customer firewall between the Hardware Management Console and the Internet must be configured to allow outbound connections to the IBM Service Support System. All connections to the IBM Service Support System are outbound connections to **esupport.ibm.com** on port **443**.

- Using IPv4 requires outbound connectivity to the following IP addresses:
  - 129.42.54.189
  - 129.42.56.189
  - 129.42.60.189
- Using IPv6 requires outbound connectivity to the following IP addresses:
  - 2620:0:6c0:200:129:42:54:189
  - 2620:0:6c0:200:129:42:56:189
  - 2620:0:6c2:200:129:42:60:189

## Checklist for setting up broadband RSF connectivity

The following set of checklists shows how the Hardware Management Console and Site Security Administrator teams might collaborate while configuring the HMC for broadband RSF.

Table 1 on page 4 is a planning checklist that the customer should complete before the site Security Administrator arrives.

*Table 1. Planning Checklist for setting up broadband RSF connectivity*

| Step | Description | Data | Status |
|---|---|---|---|
| 1 | Ensure that one of the HMC Ethernet adapters is configured to the enterprise LAN (see "Isolation of Ethernet connections" on page 1). Unless DHCP is used, record the IP address to configure. | Use DHCP? Yes or No. If not:<br>*IP address:*<br>*Network mask:* | |
| 2 | Record default gateway to corporate network. Also, determine if you want to use RIP protocol for the dynamic routing path. Please note that if you use RIP protocol, you may not need to specify a gateway address device in the User Interface. | *Gateway Address:*<br>Use RIP protocol? Yes or No | |
| 3 | Record version of Internet used (IPv4 or IPv6). | *Protocol to Internet:* | |
| 4 | Record the IBM Service Support System IP addresses that will be used. (See "IP Addresses for the IBM Service Support System" on page 4.) | Port: 443 *IP addresses:* | |
| 5 | Contact your *site's security administrator* to configure firewall permission to establish outbound connections to port 443 using the IP addresses from step 4. | | |

| Table 1. Planning Checklist for setting up broadband RSF connectivity (continued) | | | |
|---|---|---|---|
| **Step** | **Description** | **Data** | **Status** |
| 6 | Contact your *site's security administrator* to determine whether the HMC is required to connect to an HTTP proxy, and that the proxy conforms to the requirements described in "Support for an HTTP proxy server" on page 3.<br>Are you using an HTTP proxy? If yes, continue with steps 7-10. If not, go to directly to step 11. | Use HTTP proxy? Yes or No | |
| 7 | Record the Internet address and port number that will be used by the HMC to connect to the HTTP proxy. | *IP address:*<br>*Port:* | |
| 8 | Determine whether authentication is required to connect to the HTTP. If so, record the user ID and password to be used by the HMC to connect to the proxy. | Use authentication? Yes or No<br>*Connect User ID:*<br>*Password:* | |
| 9 | Determine whether the rules of the HTTP proxy configuration at the customer installation permit IP addresses to be used as the target of the mod_proxy. | | |
| 10 | If IP addresses are not permitted, then the setting for **Resolve IBM IP addresses on console** must be set to False, and you should contact your network administrator to ensure that the proxy is configured to a valid Domain Name Server (DNS). | *Resolve IBM IP addresses on console: True or False* | |
| 11 | If an HTTP proxy is not required (see step 6) ***or*** if the setting for **Resolve IBM IP addresses on console** is True (see step 10), see your network administrator to obtain the IP addresses of one or more DNS servers to resolve internet addresses. Record these addresses. | *Primary DNS Server IP address:*<br>*Secondary DNS Server IP address:* | |

The steps in Table 2 on page 5 should be completed during the HMC installation process.

| Table 2. Configuration Checklist for setting up broadband RSF connectivity | | | |
|---|---|---|---|
| **Step** | **Description** | **Data** | **Status** |
| 1 | In the **Customize Network Settings** task on the HMC, click the **LAN Adapters** tab, and then click Details. Configure the LAN Adapter using the data from Step 1 of Table 1 on page 4. | | |
| 2 | Under the **Name Servers** tab, enter the DNS Server IP addresses from Step 11 of Table 1 on page 4. | | |
| 3 | Under the **Routing** tab, add the data from Step 2 in Table 1 on page 4 | | |
| 4 | Configure outbound connectivity on the HMC, using the data gathered from Steps 3, 6, 7, 8, and 10 from Table 1 on page 4 | | |

| Table 2. Configuration Checklist for setting up broadband RSF connectivity (continued) | | | |
|---|---|---|---|
| **Step** | **Description** | **Data** | **Status** |
| 5 | Test connectivity to the IBM Service Support System. | | |

## Configuration example for broadband RSF

This section contains one example of how to modify a Hardware Management Console (already set up as a call home server using dial support) to use broadband.

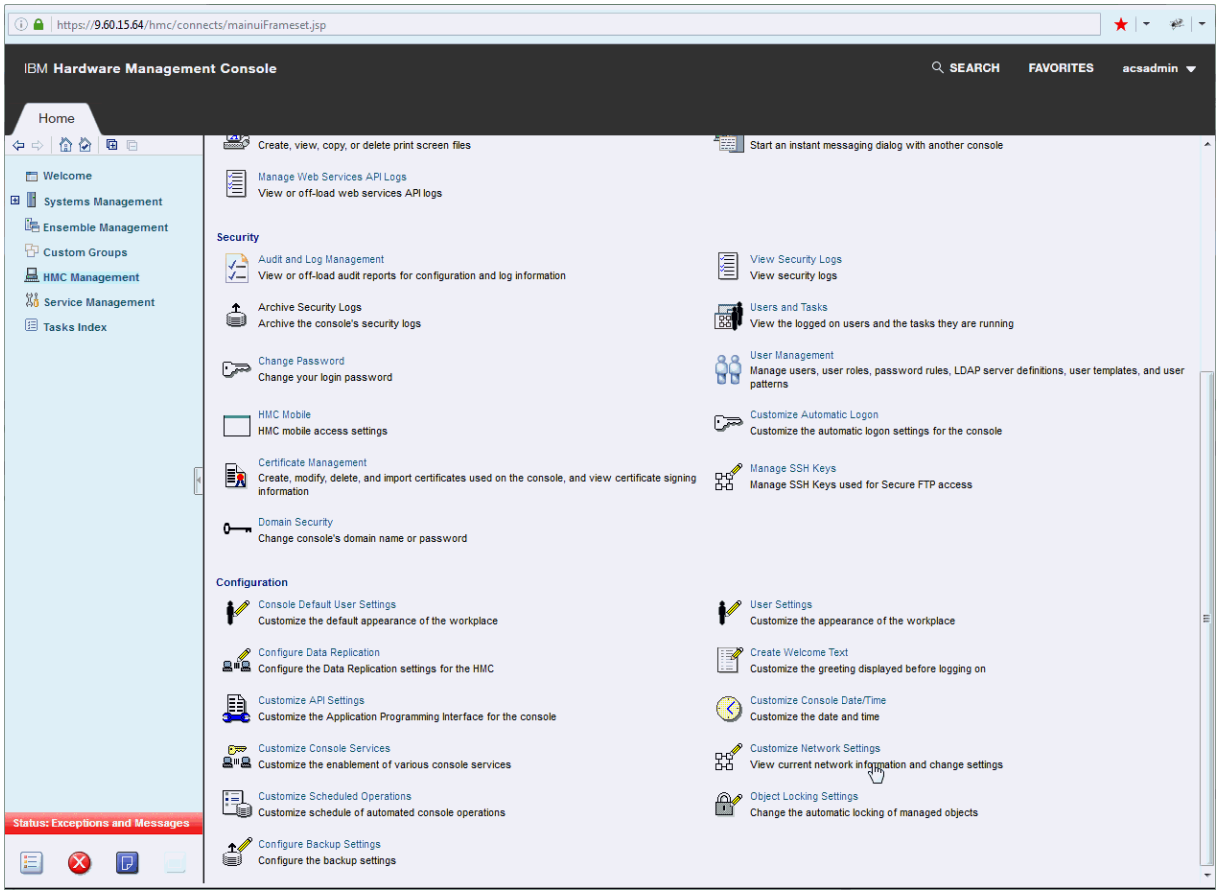
The step numbers in Table 3 on page 6 correspond to the step numbers in the checklist in Table 1 on page 4.

| Table 3. Configuration example for broadband RSF | | |
|---|---|---|
| **Step** | **Configuration Question** | **Configuration Answer** |
| 1 | What is the IP address and network mask assigned for the HMC on the corporate network? | Not DHCP *IP address:* 9.60.15.64 *Network Mask:* 255.255.255.0 |
| 2 | What is the IP address of the default gateway in the corporate network? Also, determine if you want to use RIP protocol for the dynamic routing path. | *Gateway address: 9.60.15.254 Gateway device: eth0*<br>Use RIP Protocol? No |
| 3 | Is the connection to the Internet IPV4 or IPv6? | *Protocol to internet:* IPv4 |
| 6 | Is the connection through an HTTP proxy server? | Proxy? Yes |
| 7 | If so, what is its port and IP address? | *IP address:* 9.60.12.45 *Port:* 8080 |
| 8 | Does the HTTP proxy require authentication? If so, what is the userid and password? | No authentication required |
| 10 | Should the proxy Connect be issued using IP addresses? | Resolve IP addresses on console - True |
| 11 | What are the DNS addresses available at your installation? | *Primary address: 9.0.3.1*<br>*Secondary address: 9.0.2.11* |

**Note:** Use the configuration answers from this configuration example table in the following procedures.

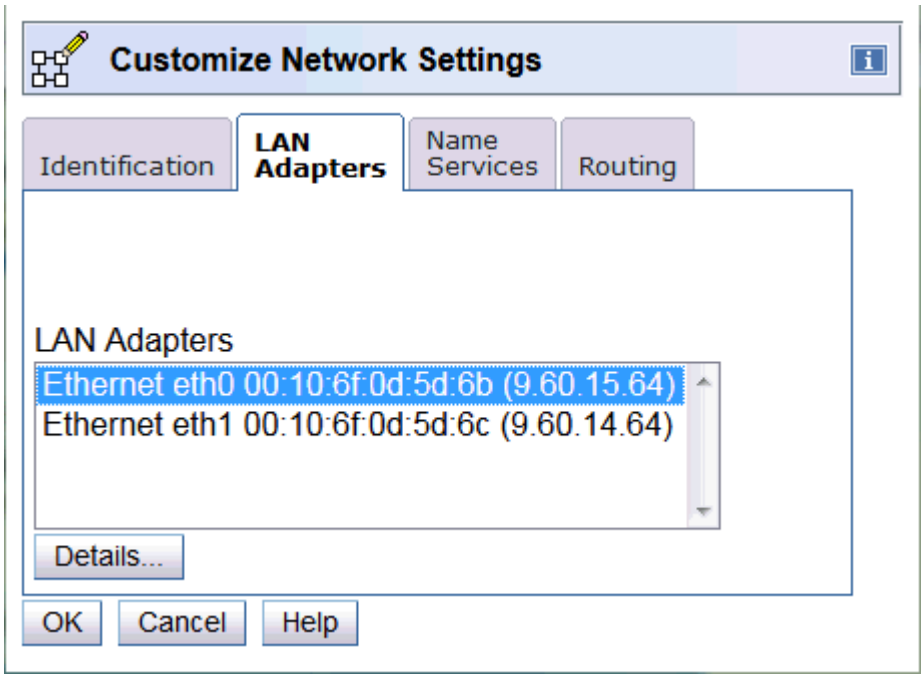
### Configuring network settings on the HMC

1. Log on to the Hardware Management Console in **ACSADMIN** or **SERVICE** mode.
2. Open the **Customize Network Settings** task:
   a. In the navigation pane in the left portion of the window, click **HMC Management**.
   b. In the tasks pad in the bottom portion of the work pane, under Configuration, click **Customize Network Settings**.

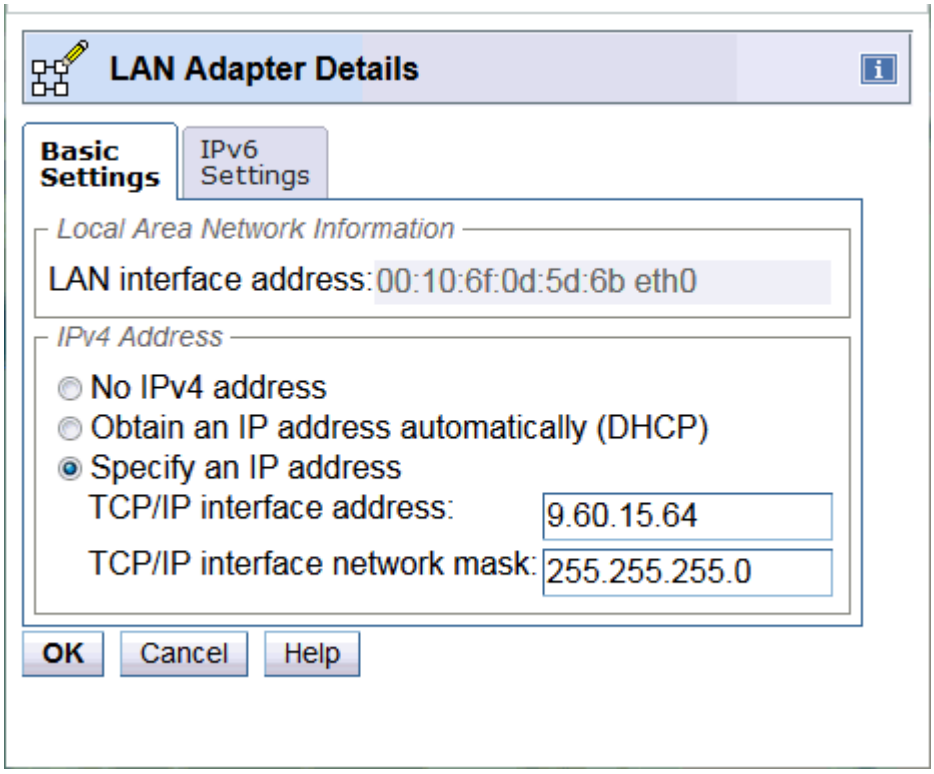



The **Customize Network Settings** window is displayed.

3. Click the **LAN Adapters** tab. If there are more than one LAN adapters listed, click on the Ethernet LAN adapter that is connected to your corporate network (in this example, **Ethernet eth0 00:10:6f:0d:5d:6b (9.60.15.64)**).




4. Click **Details**. The LAN Adapter Details window is displayed.
5. On the **Basic Settings** tab, select **Specify an IP address**. Enter the static IP address **9.60.15.64** and the network mask **255.255.255.0** (from step 1 in Table 3 on page 6).

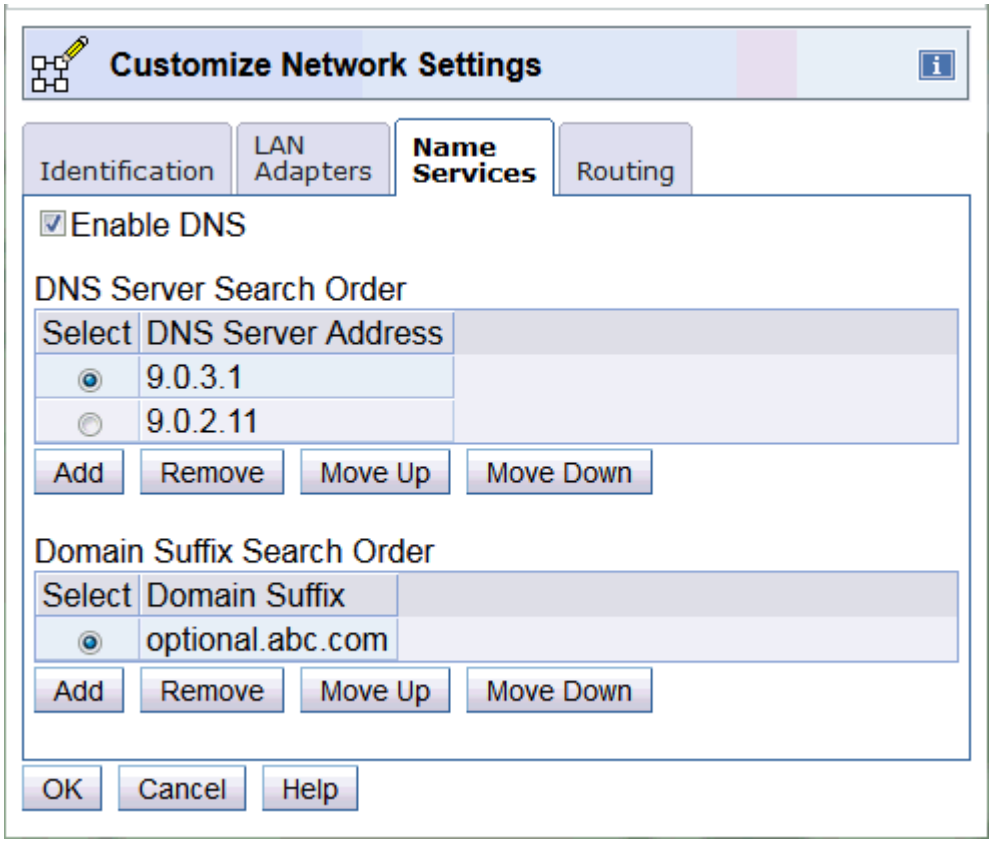



6. Click **OK** to save the information.
7. A Domain Name Service (DNS) must be configured on the HMC if:
   - The outbound connection is direct from the HMC to IBM, or
   - A proxy is defined, but IP address resolution is desired on the HMC.

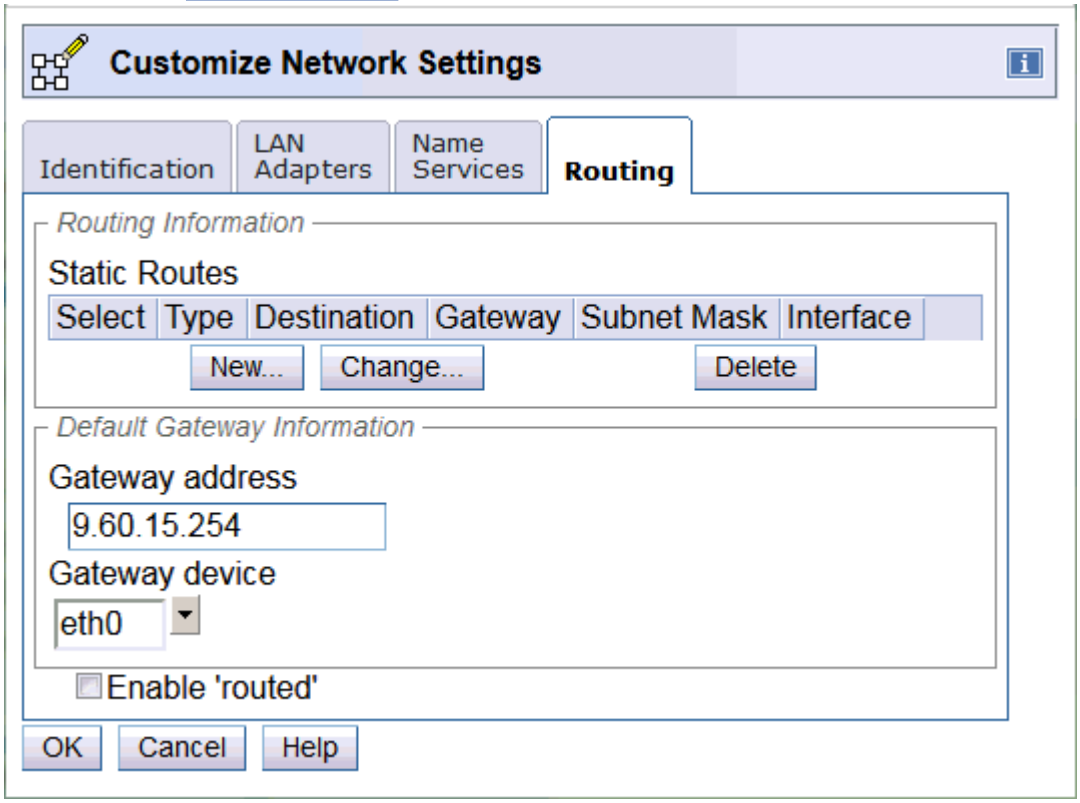
   Determine the appropriate Name Server(s) to use, and obtain them from your network administrator (from step 11 in Table 3 on page 6). A minimum of 1 address is valid, but 2 DNS server addresses are recommended, for reliability purposes.
8. If you need to configure a Domain Name Server (see previous step), click the **Name Services** tab. Select **Enable DNS**. Add the IP addresses for the DNS servers to the search order.

   **Note:** The first IP address entered will be the first one used in the search order. Subsequent IP addresses will be used as secondary addresses.

   The **Domain Suffix Search Order** may be specified, but no value is required for RSF name resolution.




9. Click the **Routing** tab. Enter the default gateway address **9.60.15.254** and the gateway device **eth0** (from step 2 in Table 3 on page 6). In the example below, route daemon is not enabled.




**Note:** Use the value in Step 2 of Table 3 on page 6 to determine whether or not to select **Enable 'routed'**.

10. Click **OK** to save the information.

11. The Network Settings Update window is displayed.
12. Click **OK**. A Question pop-up window may display.

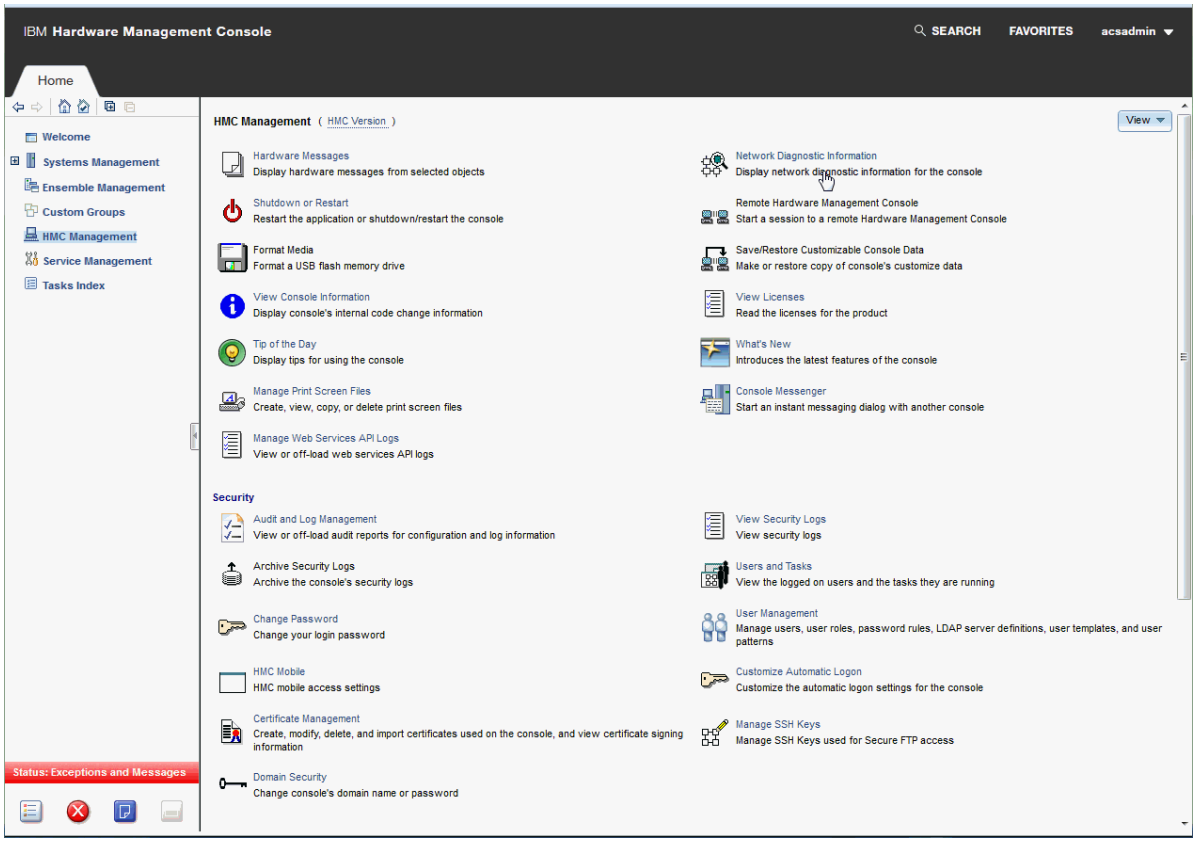
### Verifying your network setup

At this point, the Hardware Management Console network configuration is complete. One way to verify that this is successful is to ping the default gateway.

**Note:** This may not be permitted in your installation.

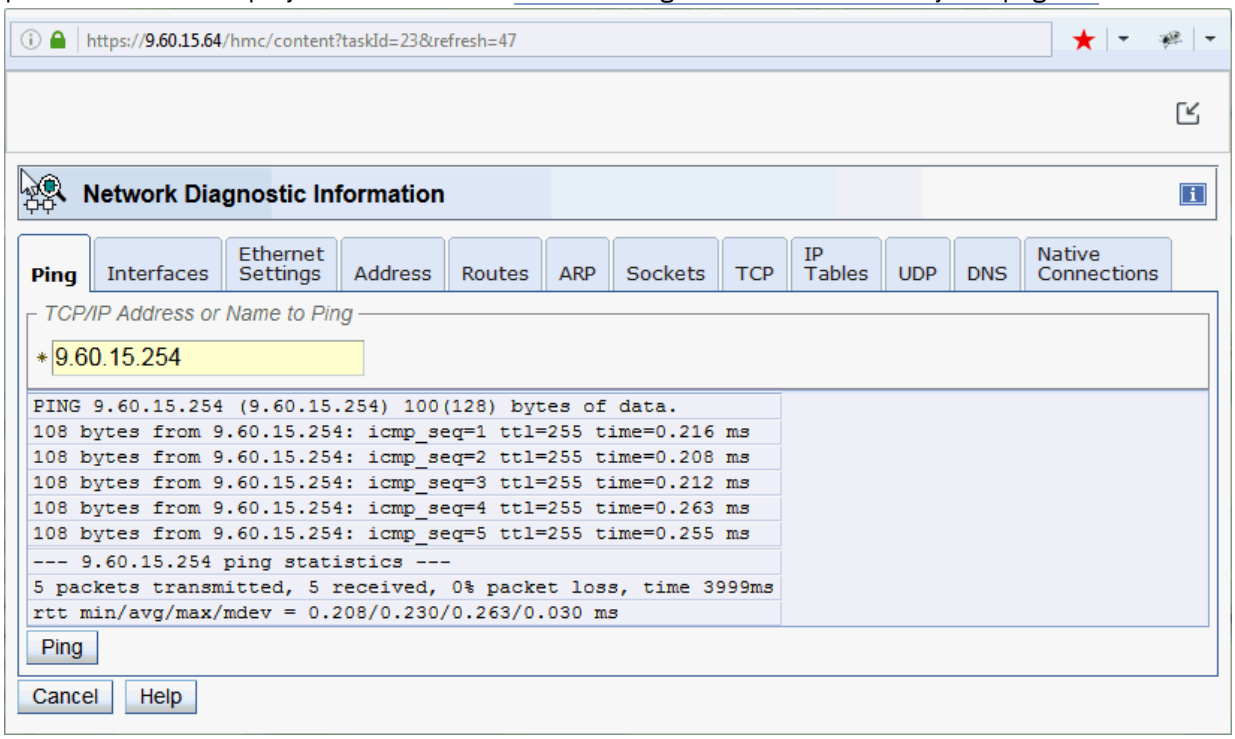
If it is allowed:

1. Open the **Network Diagnostic Information** task:
   a. In the navigation pane in the left portion of the window, click **HMC Management**.
   b. In the tasks pad in the top portion of the work pane, click **Network Diagnostic Information**.




   The Network Diagnostic Information window is displayed.
2. On the **Ping** tab window, enter **9.60.15.254** (the default gateway address from step 2 in Table 3 on page 6) and click **Ping**.

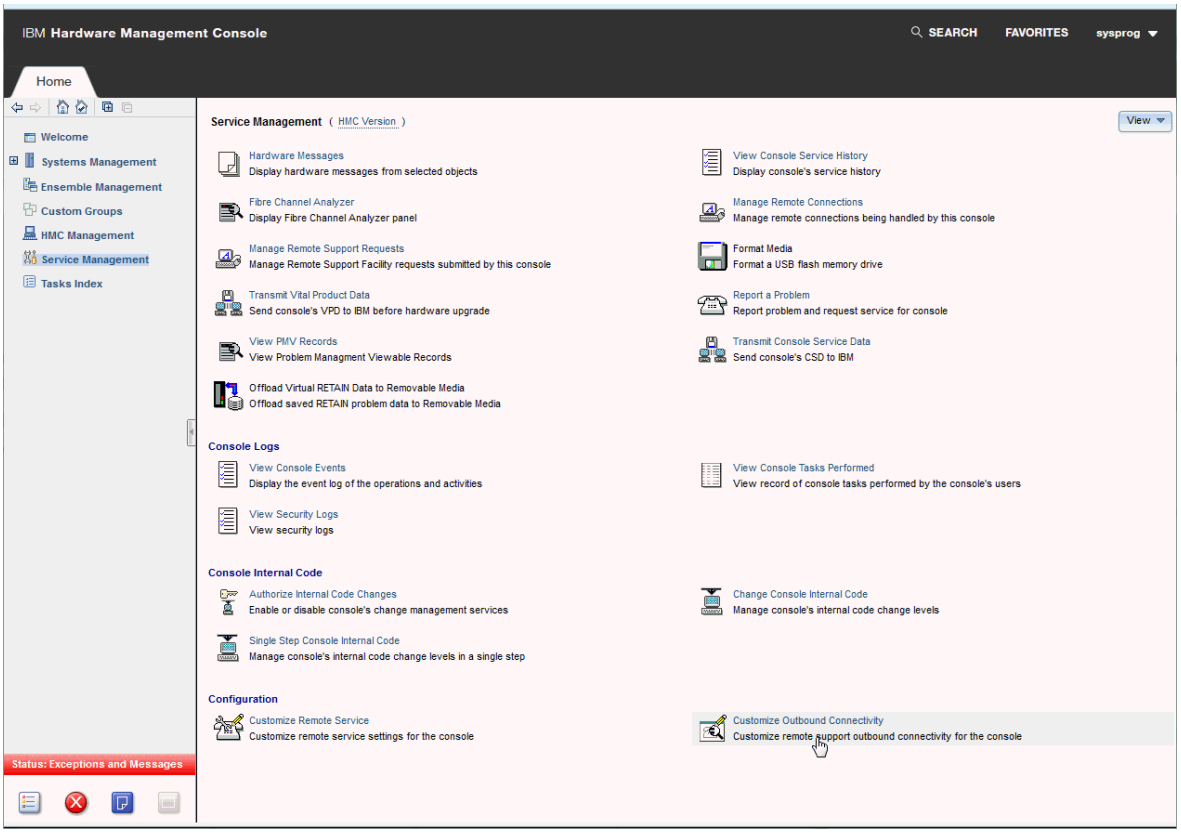
3. If the ping completes successfully, the message `5 packets transmitted, 5 received, 0% packet loss` is displayed. Continue with "Customizing outbound connectivity" on page 11.



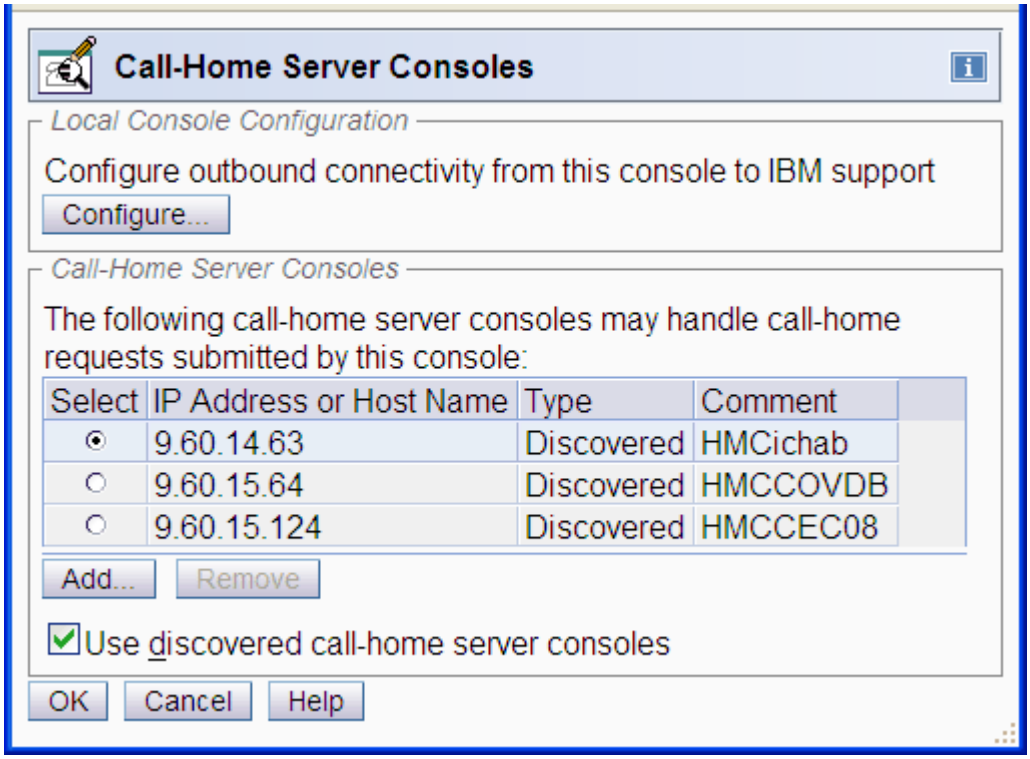

4. If the ping does not complete successfully, here are some common things to check for:
   - Ping not permitted to the gateway
   - Wrong IP address or netmask setting in the Hardware Management Console
   - Wrong default gateway IP address
   - Properly seated Ethernet cable on the Hardware Management Console side or hub.
   - Wrong Ethernet media speed. Try **Auto-detection**.
   - Ethernet adapter card not recognized by the Hardware Management Console. Check resource name of Ethernet card (in this example **eth0**) by clicking the **Interfaces** tab.
5. To validate the DNS set up, ping any external host name that supports the ping operation.

## Customizing outbound connectivity

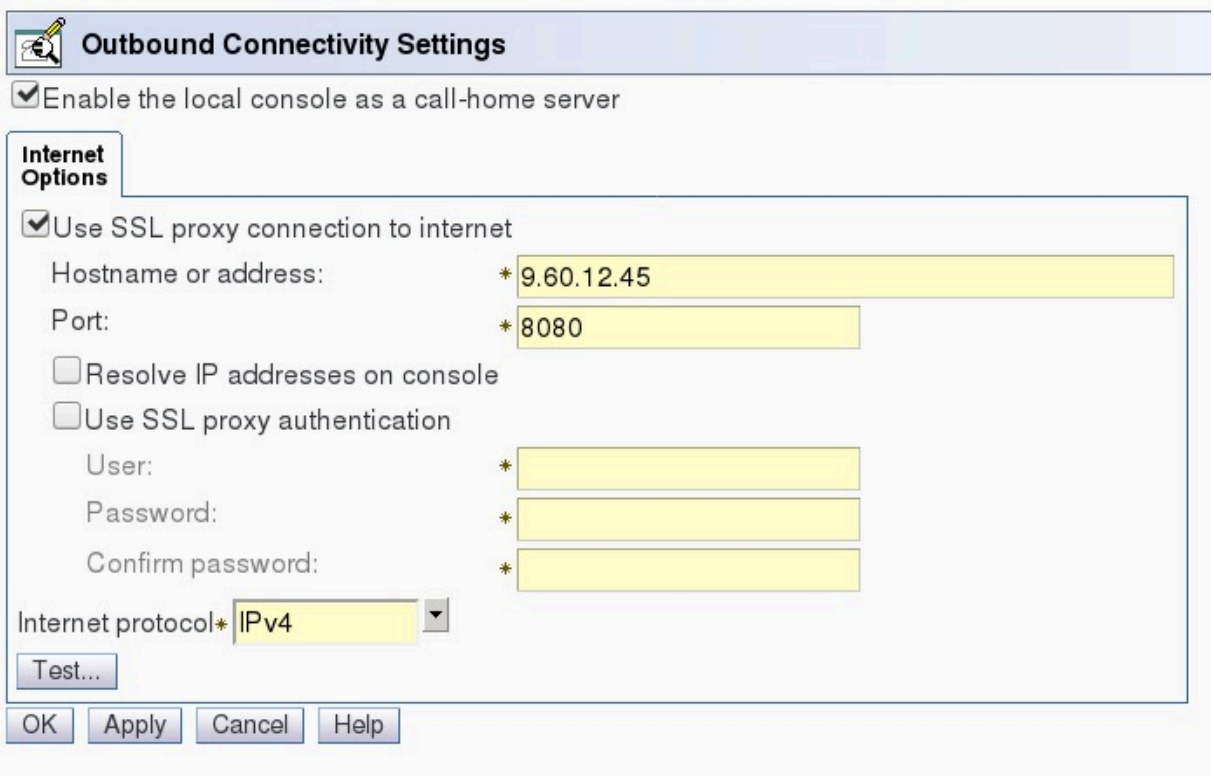
1. Log on to the Hardware Management Console in **ENSADMIN**, **SYSPROG**, or **SERVICE** mode.
2. Open the **Customize Outbound Connectivity** task:
   a. In the navigation pane in the left portion of the window, click **Service Management**.
   b. In the tasks pad in the bottom portion of the work pane, under Configuration, click **Customize Outbound Connectivity**.



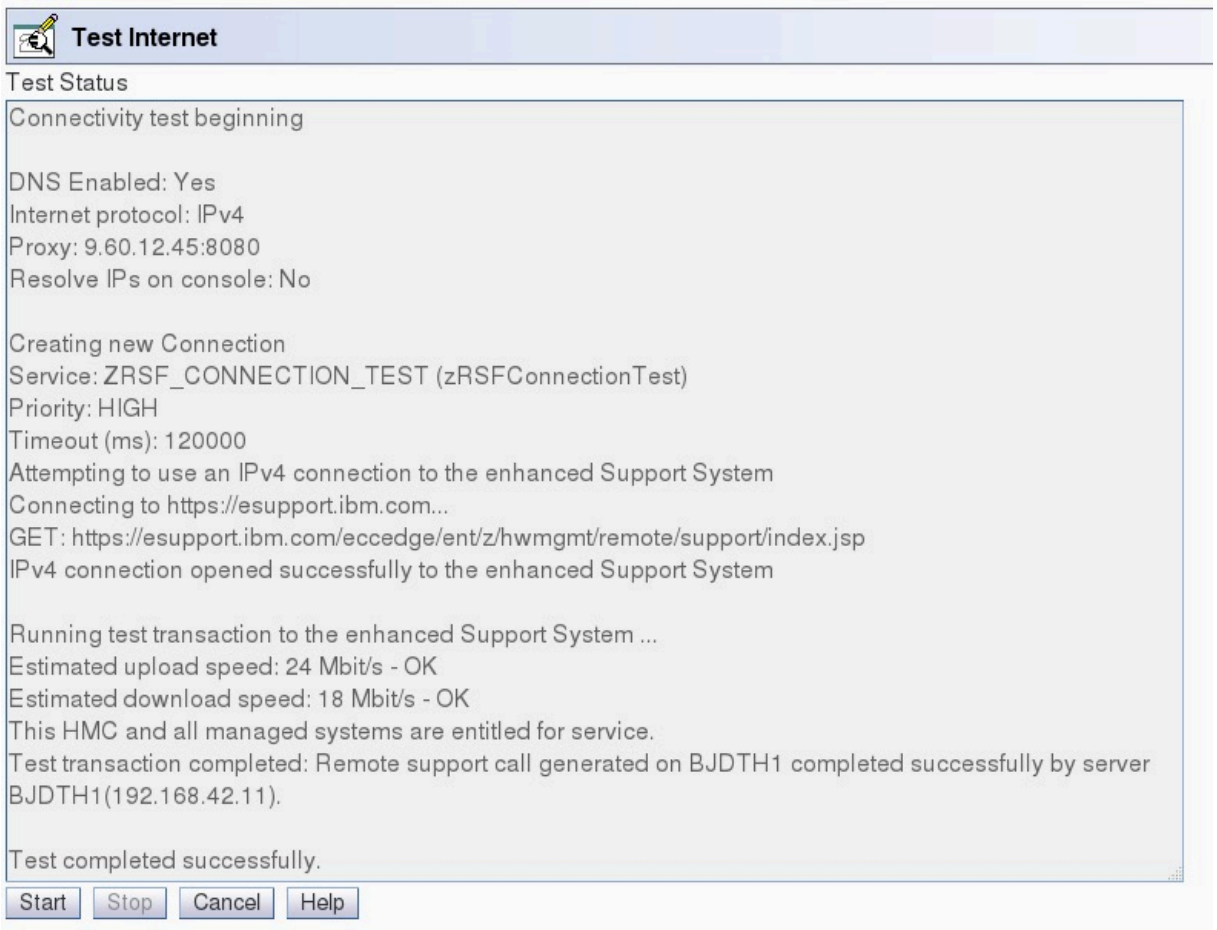

The Call-Home Server Consoles window is displayed.




3. Click **Configure**. The Outbound Connectivity Settings window is displayed.
4. Ensure that **Enable the local console as a call-home server** is selected.




5. Verify if connection is through a proxy server.
   - If ***yes*** (from step 6 in Table 3 on page 6), continue with step 6.
   - If ***no***, go to step 11.
6. In the **Address** field, enter the IP address **9.60.12.45**. In the **Port** field, enter the port address **8080** (use values from step 7 in Table 3 on page 6).
7. Determine whether the rules of the HTTP proxy configuration at the customer installation permit IP addresses to be used as the target of the mod_proxy (from step 10 in Table 3 on page 6). If they are permitted, then select **Resolve IBM IP addresses on console**.
8. Check if proxy authentication is required.
   - If ***no***, (from step 8 in Table 3 on page 6), go to step 11.
   - If ***yes***, continue with step 9.
9. Select **Use SSL Proxy Authentication** . Enter the *user* name and *password*.
10. In the **Internet Protocol** list, select **IPv4** (from step 3 in Table 3 on page 6). Most customers will connect to the IPv4 Internet only.
11. Click **Test**. The Test Internet window is displayed.
12. Click **Start** to verify that a broadband RSF connection can be made.
13. A series of information messages display in the **Test Status** message box :




14. If the connection is successful, `Test completed successfully` is displayed.

    **Note:** If there are as-yet-applied changes to the settings, the HMC will not run the test transaction. If the connection test was successful, it will still end with a "partial" successful overall. You can then return to the previous panel, Apply the changes, then re-run the Test, which will then perform the test transaction.

15. If the connection was not successful, record the error message and click **Help**. The Test Internet help window is displayed. Select **Test Status**. A list of common error messages are displayed. Follow the instructions on the window.

## Frequently asked questions (FAQ)

Following is a set of questions and answers regarding Remote Support Facility (RSF) security on Hardware Management Console version 2.15.0.

**Note:** These FAQs are intended to address most security questions. For additional information, have your IBM service representative document your question into a PMH record for Product Engineering to answer.

**Does IBM initiate a connection into a customer system with Hardware Management Console?**

***No.*** Remote support connections for service are always initiated by the customer's Hardware Management Console to IBM. An inbound connection is never initiated from the IBM Service Support System.

**How are RSF connections made?**

Through Internet connection. All communications are handled through TCP sockets initiated by the Hardware Management Console and use a high-grade TLS to encrypt the data that is transmitted. The

destination TCP/IP addresses are published to enable you to set up firewalls to allow connection. The IBM Service Support System uses standard HTTPS protocols.

**How does the IBM Service Support System validate the incoming connection?**

The IBM Service Support System validates that the incoming requesting system is known and authorized, or the connection is terminated. There are two different validations for each incoming connection:

- The Hardware Management Console validates the trusted host by a digital signature issued for the IBM Service Support System when initializing the TLS encrypted connection.
- The IBM Service Support System also validates decrypted data from the Hardware Management Console and performs an entitlement check.

**What data is transferred through the RSF connection?**

All data transferred is for service use only. No customer data is transferred.

**Is data transferred from IBM to the customer system encrypted?**

***Yes.*** All data transferred from IBM to the customer system is encrypted and checked prior to use.

**What level of TLS encryption is used by the Hardware Management Console?**

All HMC communications with the IBM Service Support System are via TLS 1.2 socket connections. The cipher specification for each connection is available in the HMC Audit Log.

**Are the RSF data exchange protocols published?**

***No.*** All the data exchange protocols are proprietary to IBM service and not published.

**Does the Hardware Management Console have an internal firewall?**

The Hardware Management Console enhancements included an always active internal firewall that has default policy of blocking all inbound ports. Specific ports are only enabled as needed based on the IP addresses of the defined CPCs and enabled services (such as web browser access).

**What are the bandwidth requirements for the HMC?**

It is recommended that the HMC have at least a 10 Mbps internet connection available, for which a 5 GB file download would take approximately 1 hour. Hardware Management Console (HMC) version 2.15.0 provides you with the option to download full system firmware images (AROMs) over the internet. The image files can be as large as 10 GB in size. Depending on the bandwidth available to the HMC or proxy servers that are used for RSF, downloads may take several hours to complete.

**Is there customer access to the underlying system of the Hardware Management Console?**

***No.*** The Hardware Management Console is a closed platform and only IBM can put code on the system.

**What servers are supported on the new Hardware Management Console?**

Version 2.15.0 supports:

| Server | Machine Type |
|---|---|
| z13®, z13s® | 2964, 2965 |
| IBM LinuxONE Emperor, IBM LinuxONE Rockhopper | 2964, 2965 |
| z14, z14 ZR1 | 3906, 3907 |
| IBM LinuxONE Emperor II, IBM LinuxONE Rockhopper II | 3906, 3907 |
| z15™ | 8561, 8562 |
| IBM LinuxONE III | 8561, 8562 |

**Can the Hardware Management Console connect using a NAT router to the Internet?**

***Yes.*** No Hardware Management Console configuration is required.

**Does the Hardware Management Console support HTTP proxy or proxy in general?**

It requires the HTTP Proxy which must support the basic proxy header functions (**RFC 2616**) and the CONNECT method.

**What operating system is used for the Hardware Management Console?**

An IBM proprietary imbedded operating system is used.

**If I require additional information not covered in this section, how can I get more information?**

Request your IBM service representative to open a PMH record with your question. Product Engineering will review your question and answer it.

# Appendix A. Notices

This information was developed for products and services offered in the US.

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## Class A Notices

The following Class A statements apply to this IBM product. The statement for other IBM products intended for use with this product will appear in their accompanying manuals.

### Federal Communications Commission (FCC) Statement

**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

### Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

### European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55032. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

European Community contact:
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Technical Regulations, Department M372
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Tele: +49 (0) 800 225 5423 or +49 (0) 180 331 3233
email: halloibm@de.ibm.com

**Warning:** This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

**VCCI Statement - Japan**

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The following is a summary of the Japanese VCCI statement above:

This is a Class A product based on the standard of the VCCI Council. If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

**Japan JIS C 61000-3-2 Compliance**

（一社）電子情報技術産業協会 高調波電流抑制対策実施
要領に基づく定格入力電力値： Knowledge Centerの各製品の
仕様ページ参照

For products less than or equal to 20 A per phase, the following statement applies:

高調波電流規格 JIS C 61000-3-2 適合品

For products greater than 20 A, single-phase, the following statements apply:

高調波電流規格 JIS C 61000-3-2 準用品

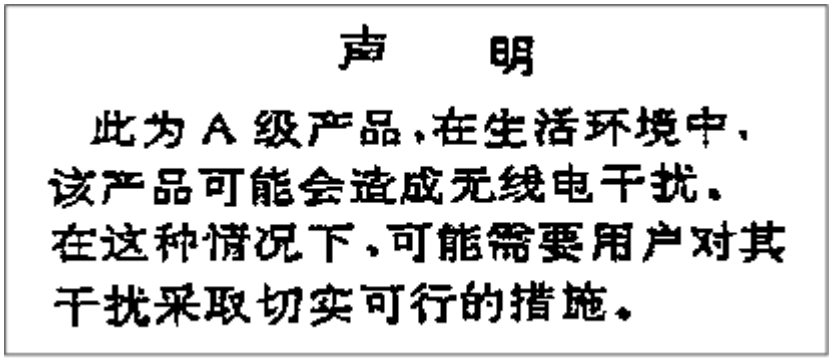
本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。
回路分類：6（単相、ＰＦＣ回路付）
換算係数：0

For products greater than 20 A per phase, three-phase, the following statements apply:

高調波電流規格 JIS C 61000-3-2 準用品

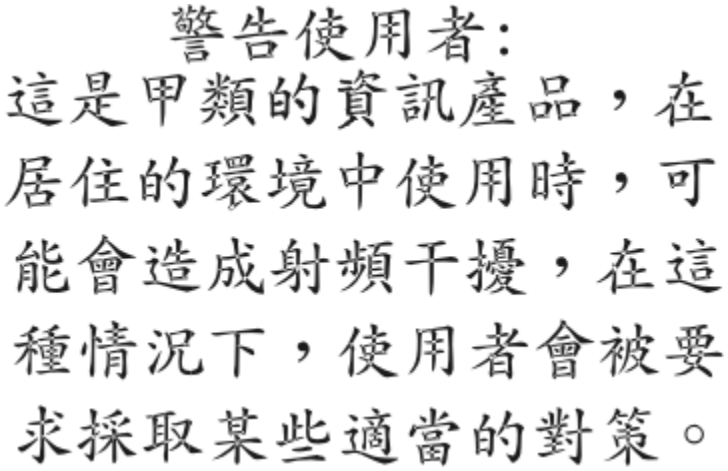
本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。
回路分類 ：5（3相、ＰＦＣ回路付）
換算係数 ：0

**Electromagnetic Interference (EMI) Statement - People's Republic of China**




**Declaration:** This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may need to perform practical action.

**Electromagnetic Interference (EMI) Statement - Taiwan**




The following is a summary of the Taiwan EMI statement above:

**Warning:** This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.

**IBM Taiwan Contact Information:**


**Electromagnetic Interference (EMI) Statement - Korea**

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**Germany Compliance Statement**

**Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit**

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55032 Klasse A ein.

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**Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten**

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

**Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2014/30/EU) für Geräte der Klasse A**

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
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Generelle Informationen:

**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55032 Klasse A**.

**Electromagnetic Interference (EMI) Statement - Russia**

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В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

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