

IBM zSystems and LinuxONE

*Hardware Management Appliance*



**Note:**

\Before you use this information and the product it supports, read the information in “[Safety](#)” on page [vii](#), “[Notices](#)” on page [19](#) , and IBM Systems Environmental Notices and User Guide, Z125–5823.

This edition, GC28-7045-00, applies to IBM zSystems and IBM Linux One servers.

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# Safety

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## Safety notices

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## Laser safety information

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All IBM zSystems and IBM LinuxONE (LinuxONE) models can use I/O cards such as FICON®, Open Systems Adapter (OSA), RoCE Express, Integrated Coupling Adapter (ICA SR, ICA SR1.1), zHyperLink Express, or other I/O features which are fiber optic based and utilize lasers (short wavelength or long wavelength lasers).

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**CAUTION: This product might contain one or more of the following devices: CD-ROM drive, DVDROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:**

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- **Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure. (C026)**

**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)**





## About this publication

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Use this worksheet to gather configuration information needed to install and configure the Hardware Management Console (HMC) and Support Element network for the IBM zSystems.

- Worksheet start pages
- HMC and SE worksheet tables.

Remote access must be enabled for each user ID. This is done with the **User Management** task using the **ACSADMIN** user ID.

If the customer will allow Outbound Connectivity via the internet, you may have to provide SSL Proxy information. Obtain this information from the customer.

## Accessibility features

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Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

## Consult assistive technologies

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We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information.

For additional information use the following link that corresponds to your configuration:

Configuration	Link
IBM z16 Model A02	<a href="#">How to send feedback to IBM</a>
IBM z16 Rack Mount Bundle	<a href="#">How to send feedback to IBM</a>
IBM LinuxONE Rockhopper 4 Model LA2	<a href="#">How to send feedback to IBM</a>
IBM LinuxONE Rockhopper 4 Rack Mount Bundle	<a href="#">How to send feedback to IBM</a>



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# Chapter 1. Introduction and Benefits

The z16 supports the new Hardware Management Appliance (HMA) optional feature which provides redundant Hardware Management Consoles (HMCs) and Support Elements (SEs) that run on redundant physical servers inside the Central Processor Complex (CPC) frame. Each of the redundant Hardware Management Appliance servers run a peer HMC and a SE (Primary SE on one Hardware Management Appliance and Alternate SE on the other Hardware Management Appliance). Prior to z15, the HMC was only available through separate physical hardware servers either as a mini tower or as a rack mounted server. The HMC inside a Hardware Management Appliance provides the exact same functionality as a standalone HMC (mini tower or rack mounted). The only difference is that the client does not have physical keyboard or display access. The HMC in a Hardware Management Appliance has the same physical network redundancy as the standalone HMC to allow the clients to follow the recommended two LAN security approach (dedicated LAN between the HMC and SEs and outbound LAN for remote browsing, SNMP/Web Service APIs, support system, secure FTP servers, etc.).

The main client advantage of the Hardware Management Appliance is not having additional hardware to manage/inventory outside of the CPC frame. However, some clients have noted that there is a secondary advantage that they no longer have to locate a physical HMC for the Systems Services Representative (SSR) to have access to in order to perform firmware updates to the SE and HMC.

If the Hardware Management Appliance hardware is installed on one CPC, it doesn't need to be installed on other CPCs. It meets the criteria of IBM recommendation of redundant HMCs and the Hardware Management Appliance HMC can functionally manage all other CPCs. [Figure 1 on page 2](#) shows the HMC standalone hardware being eliminated, but the standalone HMC hardware can also still exist with Hardware Management Appliances if a client wants to keep their existing HMC hardware until that physical hardware is no longer supported by new HMC code releases. There is some consideration to have the Hardware Management Appliance feature on another CPC if there are scenarios where wall power is removed from a CPC (for example, moving a CPC to another physical location). If the CPC is simply Deactivated or Powered Off through HMC or SE controls, standby power remains on for the Hardware Management Appliances and the HMC functionality is still provided. Having the Hardware Management Appliance on a second CPC in the same data center is something that a client can decide based on their CPC use cases. If a standalone HMC exists, it can be used to address the CPC physical move scenario.

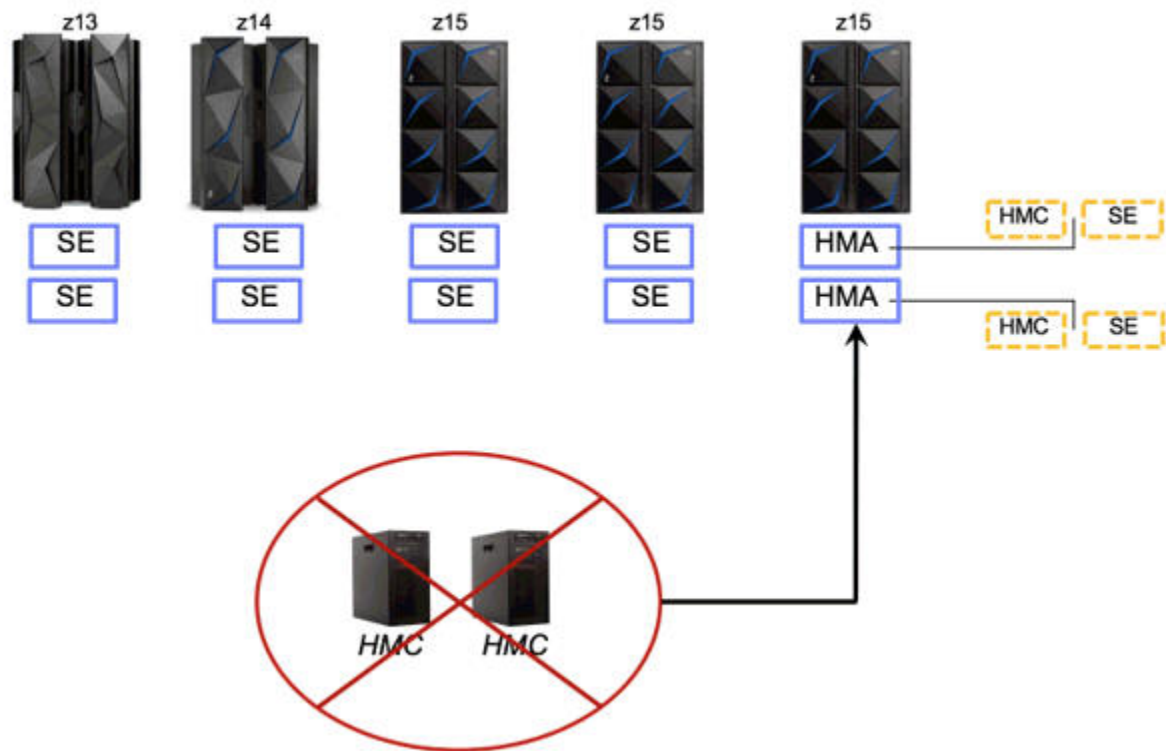


Figure 1. Hardware Management Appliance

The Hardware Management Appliance is an optional feature and the standalone HMC hardware features for rack mounted and mini tower are still available. The Hardware Management Appliance feature is a viable option for clients that only use remote browsing or the HMC Mobile app for HMC user interface management. If clients don't support remote browsing the Hardware Management Appliance is still a possibility as the client could establish a physical workstation within their data center which could be limited to remote browsing into the HMC within the Hardware Management Appliance or other limited operations. The Hardware Management Appliance HMCs can manage z16, z15, z14, and z13 CPCs. Finally, the Hardware Management Appliance feature must be specified with the initial CPC order and cannot be added subsequently with a separate Miscellaneous Equipment Specifications (MES).

The redundant Hardware Management Appliances provide two peer HMCs and Primary and Alternate SEs in the CPC frame. The HMC within the Hardware Management Appliance provides the host environment and grants direct access to physical hardware devices for best performance and simplicity. Both the HMC host and the SE guest have been designed to incorporate and take advantage of Firmware Integrity Monitoring. Hardware Management Appliance resilience was a base design construct ensuring that periodic Alternate SE reboots do not affect the HMC. In addition, controls were established to block the HMC user interface from affecting the Primary SE, and HMC and SE recovery restarts were interlocked for shutdowns. Finally, Hardware Management Appliance hardware problems are logged on the SE, either directly or through forwarded errors from the HMC. This enables the SE to provide guided repair from the Primary SE for the actual physical repair on the Alternate SE. This Hardware Management Appliance repair approach is a more efficient repair environment than the hardcopy instructions that are utilized for standalone HMC hardware repair actions.

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## Chapter 2. Accessing the Hardware Management Console and Support Element

For normal operation, the Hardware Management Console portion of the Hardware Management Appliance is accessible through the remote browser or the HMC mobile app. Access to the Support Element is through the **Single Object Operations** task.

For service, there is a monitor and keyboard available for logging into the Hardware Management Console which is switchable between IU servers. The Support Element console can be opened from the **Virtual Support Element Management** task by clicking **SHOW SE CONSOLE** or you can right-click on the HMC desktop and select Show SE Console to quickly access the running SE Guest desktop.

### USB Section

The Hardware Management Appliance 1U server also features two front-facing USB ports. One of these USB ports is passed directly to the Virtual SE guest using the USB pass through feature of QEMU-KVM. When any device is plugged into this USB port, the SE guest has direct access to it. The HMC does not have any access to the device. The USB Smart Card reader is passed directly to the SE guest in a similar manner.

- Port 1 (left port) is Hardware Management Console
- Port 2 (right port) is Support Element.



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## Chapter 3. Shutdown or restart consideration

The Hardware Management Appliance feature design uses the HMC as the host to minimize the potential loss of HMC and SE application use due to host shutdown/restart. The Alternate SE can be expected to reboot one or more times daily due to application mirroring, the HMC normally does not require restarting except for service. The HMC also has a capability to only restart its application without rebooting the operating system whereas the SE must restart the entire console including a reboot of the operating system. The HMC application restart (Shutdown or Restart, Restart application) allows the SE guest to continue running because the host operating system can still provide QEMU-KVM guest emulation and shared file system use during the restart.

The HMC actively monitors and maintains information about its virtual SE guest. This information is available on the **Virtual Support Element Management** task and includes whether or not the SE guest is running, the SE name, and whether it is a Primary or Alternate SE. The HMC host application's shutdown/restart logic automatically shuts down a running SE guest before proceeding with a host console shutdown/restart. This is to avoid data loss or corruption on the guest. Shutdown blockers on the SE guest are honored as on a standalone SE, thus allowing code within the SE application to delay the shutdown during sensitive periods. The HMC host automatically starts its SE guest during HMC startup.

Shutting down or restarting the HMC console hosting the Alternate SE will cause a graceful shutdown of the Alternate SE before the HMC continues with its own shutdown or restart. The Alternate SE will be restarted automatically when the HMC starts.

Shutting down or restarting the HMC console hosting the Primary SE will be blocked. Any task that requires a reboot to apply changes will also be blocked. Here's the list of tasks that will be blocked:

- **Change Console Internal Code**
  - Install and activate changes that were retrieved
  - Remove and activate changes.
- **Single Step Console Internal Code**
- **Customize Console Date/Time**
  - Change of time zone.
- **Shutdown or Restart**
  - Restart console
  - Power-off console.
- **Customize Scheduled Operations**
  - Install and Activate internal code changes
  - Remove and Activate internal code changes
  - Single Step retrieve and activate internal code changes.
- **Customize Console Services** - The following are blocked unless Change Licensed Internal Code security mode is also changed:
  - SSLv3 and RC4 compatibility
  - TLSv1.2 only
  - SSL anonymous cipher suites.





# Chapter 4. Networking considerations

Both the Support Element and the Hardware Management Console components of the Hardware Management Appliance have dedicated network interfaces which can be connected directly to a customer network switch. See [Figure 2 on page 7](#) for network connection requirements.

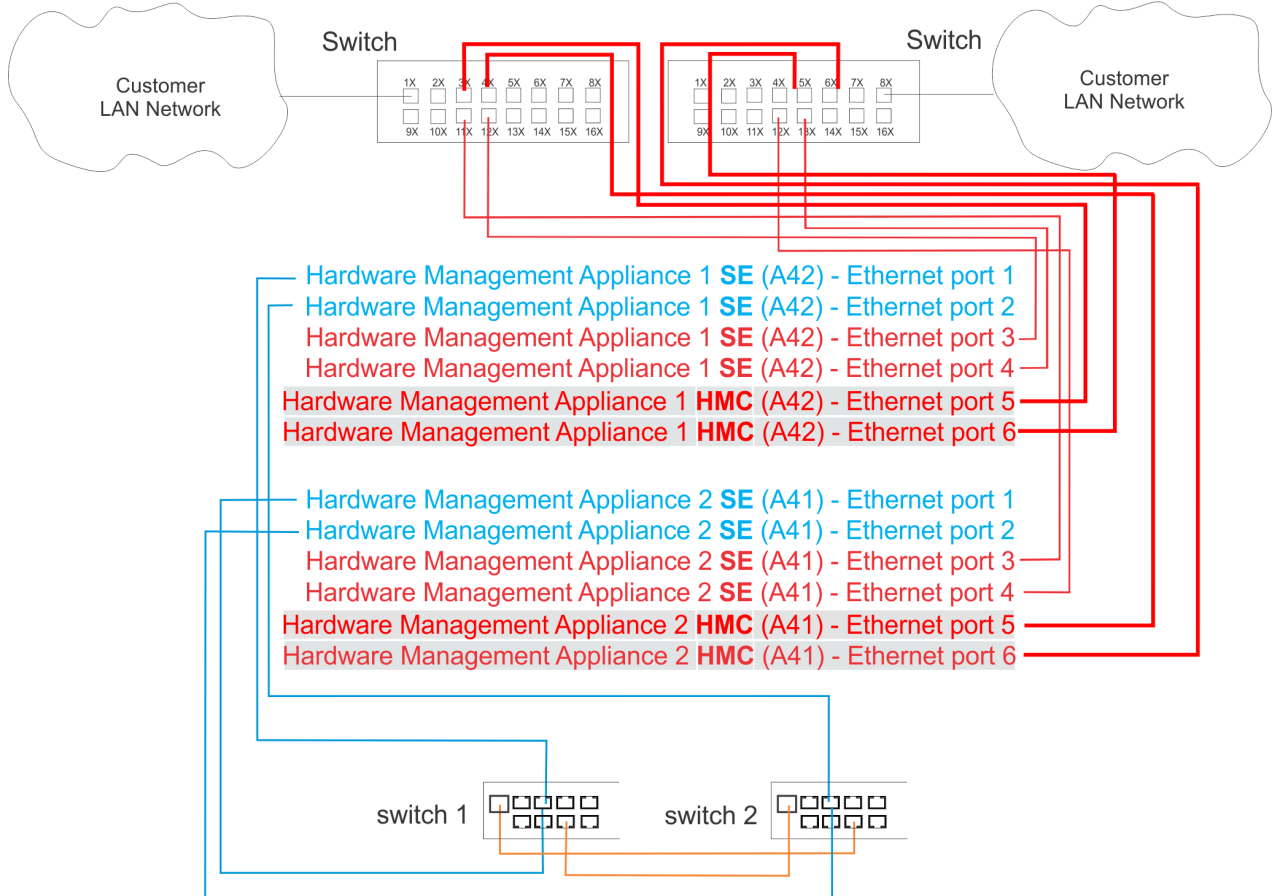


Figure 2. Customer network two-switch configuration with Hardware Management Appliance (FC 0100)

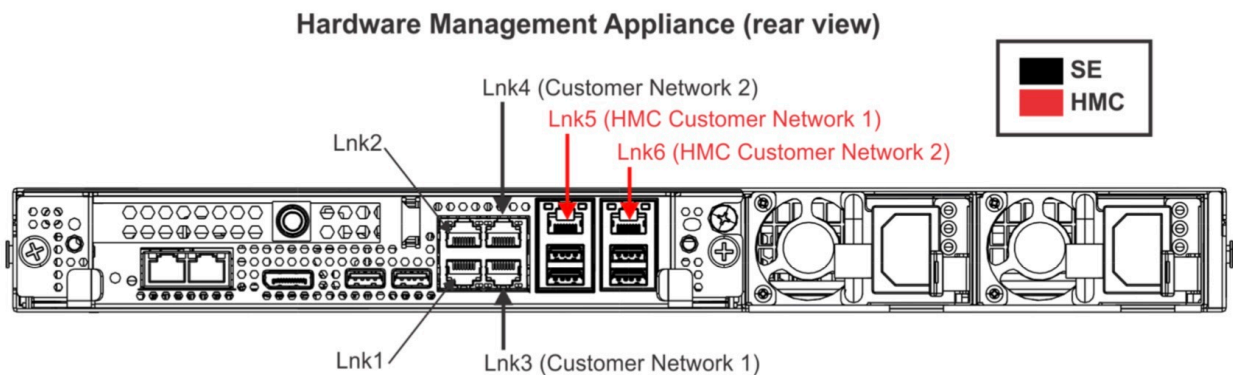


Figure 3. PSCN Link 1 and 2



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## Chapter 5. Configuration Requirements

- The CPC must always be defined to both host HMCs
- Domain Security settings must be the same for both HMCs and the SEs.
- Both HMCs of the Hardware Management Appliance must have at least one network interface that share a common subnet for discovery purposes (for example, HMC1: 192.168.10.42/255.255.255.0, HMC2: 192.168.10.43/255.255.255.0)



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## Chapter 6. Security considerations

The Firmware Integrity Monitoring support within an HMC or SE can operate in either a Monitor mode or a Monitor and Protect mode. When Monitor mode is in effect, the client is alerted if a potential threat is detected on either the SE or the HMC. When Monitor and Protect mode is in effect and a potential threat is detected, the customer is alerted and the SE or HMC is stopped. Similarly, the Hardware Management Appliance can operate in either mode.

The mode is changed in the **Customize Console Services** task of the HMC and affects both the HMC and the SE when running within the Hardware Management Appliance and will automatically update on peer and hosted SE's. Thus, Licensed Internal Code security mode is disabled on the hosted primary SE. If a problem with the integrity of the firmware is found for either the HMC or the SE, both the HMC and SE within the Hardware Management Appliance are suspended.

The Domain Security settings must be the same for both HMCs and the SEs. Additionally, the hosted primary SE must be a defined object on both HMCs.

The same Firmware Integrity Monitoring support is used to protect the embedded SEs and attached z16 HMCs. In addition, the Firmware Integrity Monitoring support is enhanced to support the Hardware Management Appliance.



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## Chapter 7. Problem Analysis

Problem Analysis is responsible for monitoring both the Operating System kernel errors, as well as Baseboard Management Controller (BMC) hardware errors on the server. In a traditional environment (separate hardware for the HMC and the SE), the HMC and SE separately monitor their respective hardware for errors. However, in an Hardware Management Appliance environment, even though Problem Analysis is running on both the HMC and the SE, all hardware errors are called home from the SE and not the HMC.





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## Chapter 8. Service support

Internal code changes, online guided repairs, and hard disk restore can be performed on the Hardware Management Appliance with the following sections:

- [“Procedures for changing console internal code” on page 15](#)
- [“Guided repair” on page 15](#)
- [“Hard disk restore” on page 16](#)

### Procedures for changing console internal code

Installation of console internal code changes on a Hardware Management Appliance HMC must be performed on the HMC hosting the alternate SE. Code updates will be blocked if the HMC is hosting the Primary Support Element. Determine which HMC is hosting the primary SE from the **Virtual Support Element Management** task by clicking **SHOW SE CONSOLE** or right click on the Desktop and select Show SE Console from the drop-down menu. Then perform the following steps:

1. Log on to the Primary SE and enable Service Status.
2. Install internal code changes on the HMC that is hosting the Alternate Support Element using the **Change Console Internal Code** task. The CPC enters Service Required Status once the Primary Support Element detects that it has lost communication to the Alternate Support Element.  
**Note:** This is normal and not a cause for concern.
3. **Perform Support Element Mirror** using the **Alternate Support Element** CPC task.
4. Switch the Support Elements using the **Alternate Support Element** CPC task.
5. Install internal code changes on the peer HMC that is now hosting the new Alternate Support Element using the **Change Console Internal Code** HMC task.
6. Disable Service Status.

### Guided repair

Since the Hardware Management Appliance design has two physical servers, each running the HMC and either the Primary or Alternate SE, it was desirable to extend the online guided repair strategy of the SE to the Hardware Management Appliance instead of using the standalone HMC hardcopy strategy. Even though each HMC on the physical server is an individual HMC, not configured as a primary/alternate pair, it was technically possible to achieve this goal by routing HMC hardware issues to the virtual SE guest. With the HMC hardware errors visible to the SE, the physical hardware can be repaired as if it is an SE hardware FRU instead of an HMC hardware FRU. [Figure 4 on page 16](#) shows the Primary SE operating on an Hardware Management Appliance, running the **Perform a Repair Action** task to correct a hardware problem on the Hardware Management Appliance which is hosting the virtual Alternate SE. If the Hardware Management Appliance was originally hosting the virtual Primary SE, the first step is to swap which Hardware Management Appliance the Primary and Alternate SEs are running on. Special precautions are in place to ensure that swapping and shutting down of one server is nondisruptive as well as preventing an HMC user from interrupting a repair procedure by restarting the HMC and destroying the repair session.

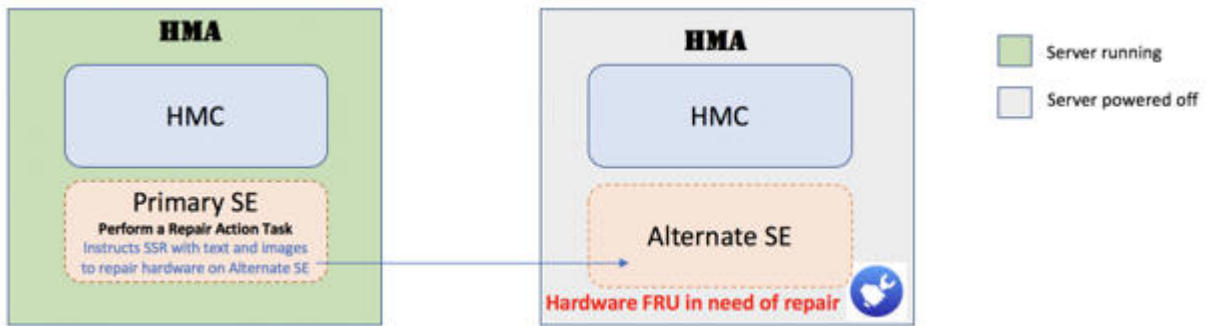


Figure 4. Online guided repair of hardware in Hardware Management Appliance with virtual SE

## Hard disk restore

The Virtual SE must be stopped before performing the Install operation (Hard Disk Restore). To perform a Hard Disk Restore of the Virtual SE, use the **Virtual Support Element Management** task to stop the Virtual SE. Then, with the appropriate media in front USB port 2 or through Network - LAN Interface 1 or 2 click **INSTALL SE**.

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## Chapter 9. Hardware Management Appliance FAQ

- Q: How do I restart the SE?
- A: Use the **Shutdown or Restart** task on the SE. It will reboot the Virtual SE VM and leave the HMC running.
- Q: What if the SE is not responding or is locked up?
- A: From the HMC, use the Stop function of the **Virtual Support Element Management** task. Then restart the SE.
- Q: I now have two HMCs. Which is Primary and which is Alternate?
- A: There is no primary or alternate HMC configuration on the HMCs. You just now have two separate HMCs; One that happens to be hosting the Primary SE, and one that is hosting the Alternate. In the case of an SE Switchover, the hosting HMCs remains the same, but their SE "Guests" will swap. Please do NOT use Upgrade Data from the first HMC and restore it on the second HMC. You will create a **duplicate IP** situation.
- Q: Can I define other CPCs to my HMC?
- A: Yes. Your HMCs are just like regular HMCs in that you can define whatever CPC you want to them. In fact, you do not even have to define the guest SE that the HMC is hosting.
- Q: Which USB port is for accessing from the SE?
- A: The Front port 2.
- Q: What is the quickest way to access the SE?
- A: Right click on the Desktop, select Show SE Console.
- Q: Can I cancel and restart for the HMC without impacting the SE?
- A: Yes, the Restart application will restart the HMC without impacting the operations on the SE.



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V C C I - A

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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.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden.



IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:

"Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

**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**

**ВНИМАНИЕ! Настоящее изделие относится к классу А.  
В жилых помещениях оно может создавать радиопомехи, для  
снижения которых необходимы дополнительные меры**







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