Michigan User Groups
HMC Intro and Advanced Topics on HMC and server firmware for the iSeries eServer i5

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Agenda

- **IBM eServer i5 LPAR Changes**
- **Hardware Management Console**
  - Hardware overview
  - Connection options
  - Features and functions
- **Additional Console options on i5 Servers**

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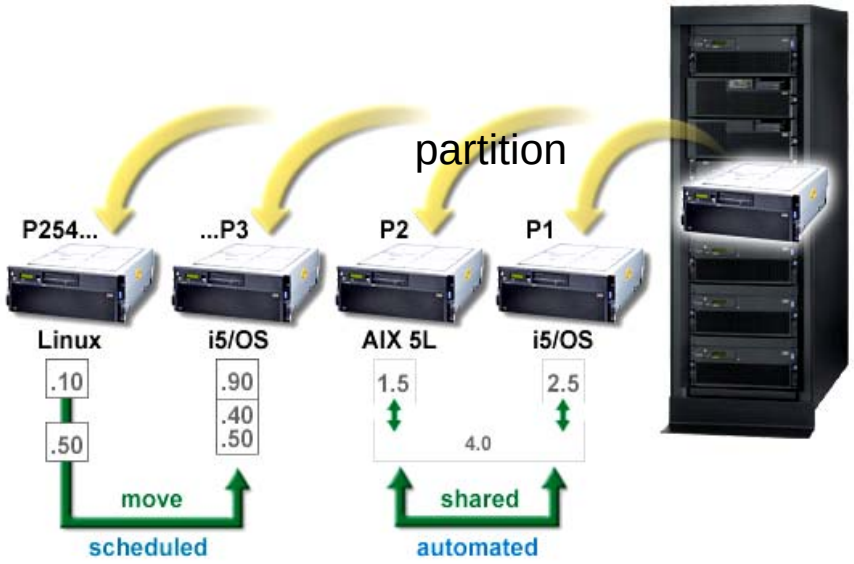
i5/OS V5R3 Logical Partitioning

- **Interface on pre-POWER5 systems remains the same via (Service Tools and iSeries Navigator)**
- **Interface on POWER5 systems moved to the HMC**
- **POWER5 Systems (520,550,570,595)**
  - Include the POWER Hypervisor™
  - Improve fault tolerance and lower management costs
  - No longer uses a primary partition
  - Supports i5/OS, AIX 5L and Linux
  - Supports up to 254 partitions
  - Provide automatic processor balancing with shared uncapped partitions



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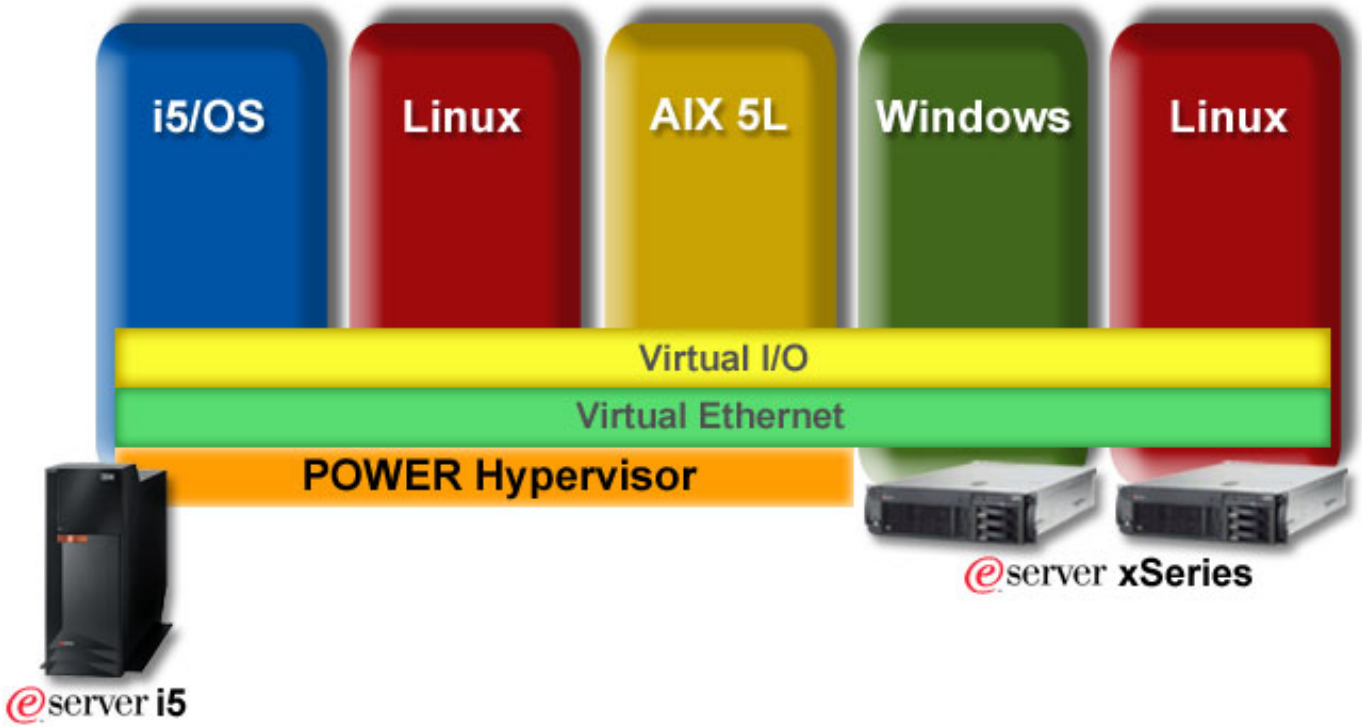
IBM eServer i5 POWER5 LPAR Changes

No requirement for primary partition or load source in CEC

All LPAR'ed servers must have HMC

All OS/400 partitions must be at V5R3 or greater

Simple migration process



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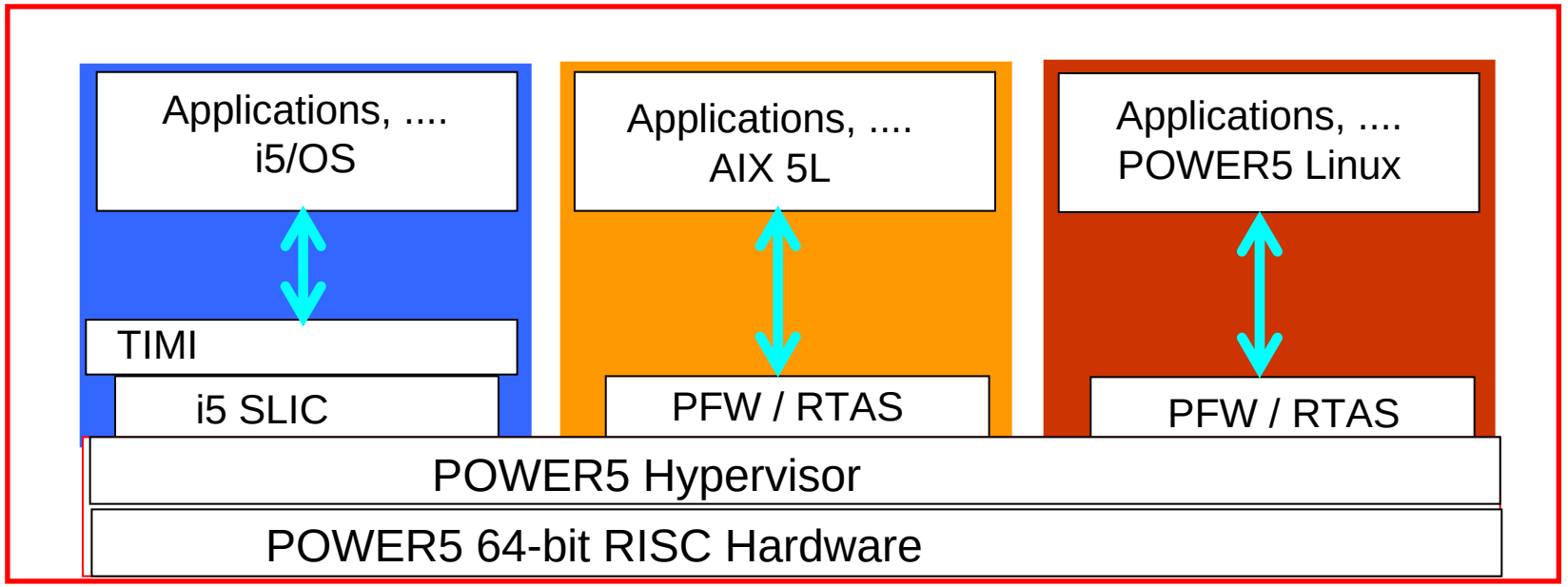
Multiple Operating Systems – more details

Underneath the operating systems ...



TIMI = Technology Independent Machine Interface
SLIC = System Licensed Internal Code
PFW = Partition Firmware
RTAS = Run-Time Abstraction Services

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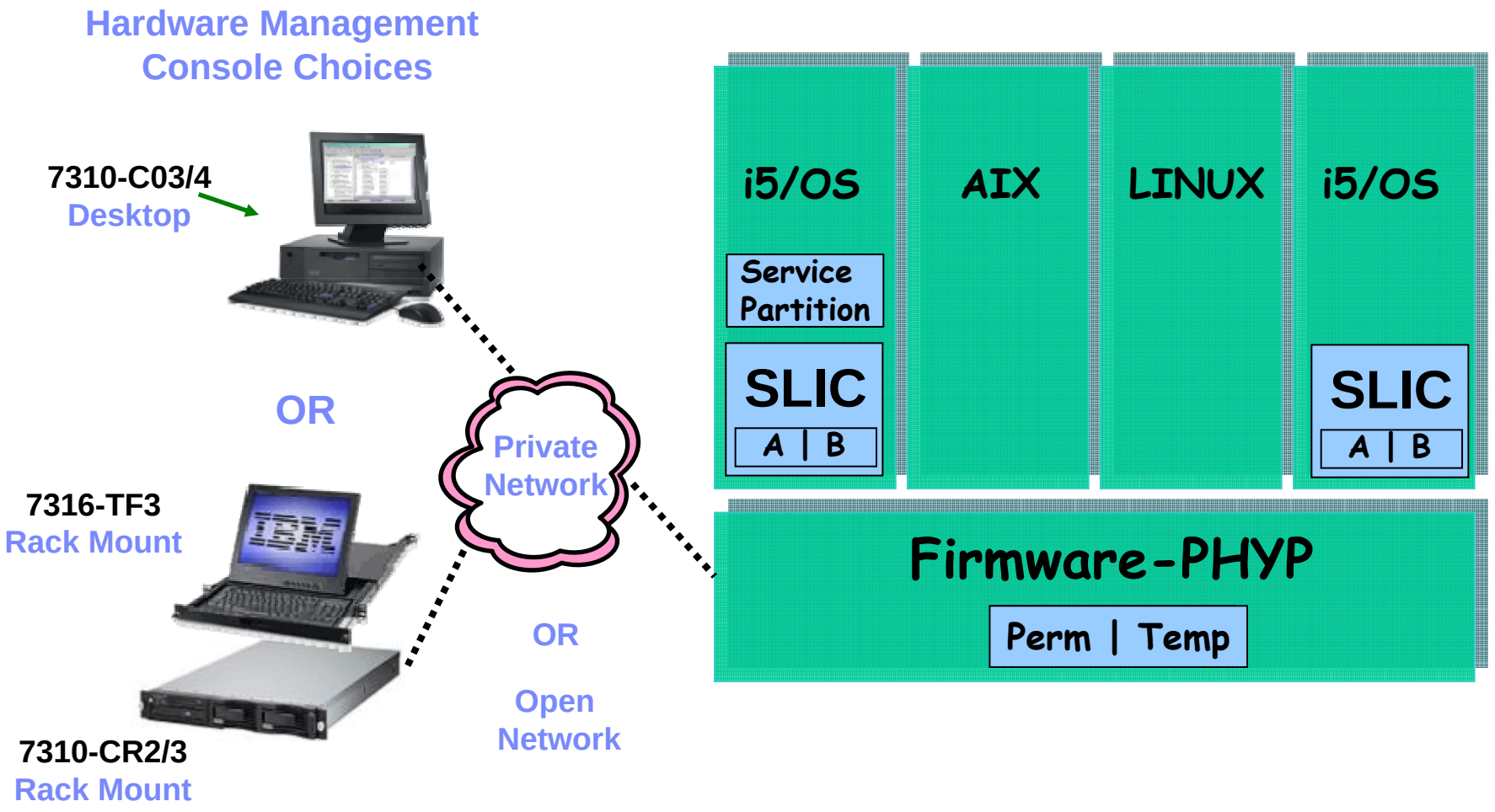
i5 LPAR System Layout



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Private vs. Open service network

The connection between the HMC and its managed systems can be implemented either as a private or open network. The other network connections on the HMC are considered open, which means that they are configured in a way that you would expect when attaching any standard network device to an open network.

In a private service network, however, the only elements on the physical network are the HMC and the service processors of the managed systems. In addition, the HMC provides Dynamic Host Configuration Protocol (DHCP) services on that network, which allow it to automatically discover and assign IP configuration parameters to those service processors. You can configure the HMC to select one of several different address ranges to use for this DHCP service, so that the addresses provided to the service processors do not conflict with addresses used on the other networks to which the HMC is connected. The DHCP services allow the elements on the private service network to be automatically configured and detected by the HMC, while at the same time preventing address conflicts on the network.

On a private network, therefore, all of the elements are controlled and managed by the HMC. The HMC also acts as a functional firewall, isolating that private network from any of the open networks to which the HMC is also attached. The HMC does not allow any IP forwarding; clients on one network interface of the HMC cannot directly access elements on any other network interface.

It is recommended that you implement service network communications through a private network, because of the additional security and ease of setup that it provides. However, in some environments, this is not feasible because of physical wiring, floor planning, or control center considerations. In this case, the service network communications can optionally be implemented through an open network. The term open refers to any general, public network that contains elements other than HMCs and service processors, and that is not isolated behind an HMC. The same functionality is available on both types of networks, although the initial setup and configuration on an open network requires more manual steps.

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When is an HMC Required on i5 Systems?

- Systems with LPARs - Logical Partitions
- Systems with Capacity on Demand (ASMI has subset)
- Systems with Bulk Power Assemblies (High-end 595)
- Systems with redundant service processors (570 & 595 only) recommend 2 on 595 – A & B Side
- CFM - Concurrent Firmware Maintenance (GA5 – May2005)
- Boot from SAN to tag the location of the load source (GA6 – Oct2005)

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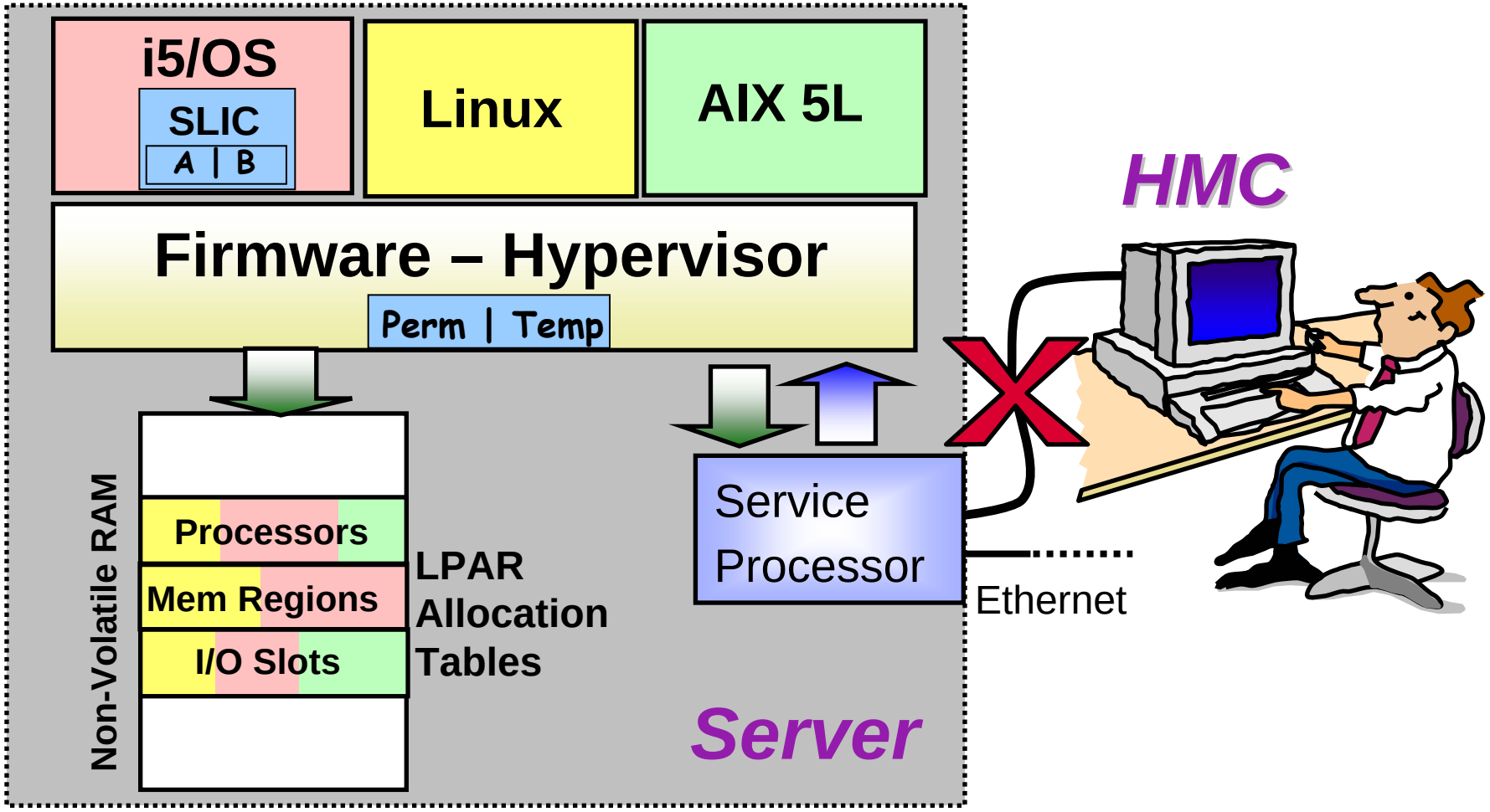
LPAR on an i5 System



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Why a Hardware Management Console (HMC)?

- **Servers are becoming more virtualized**
  - Operating systems will continue to have less direct visibility and control over “real” server hardware
  - A place for hosting advanced platform management applications, outside of the operating systems, to do:
    - Server configuration prior to operating system deployment
    - Service when operating systems are unavailable
    - Coordination of platform-related operations across multiple operating system images, in an independent security model
    - Presentation of virtual operating system consoles
  - These functions should have common user and programming interfaces, independent of any one operating system
    - Supporting both local and remote operation
    - A common delivery vehicle, which enables IBM to deliver more function, more quickly

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What is the HMC

- **Runs an IBM-provided GUI console application**
  - Not to be used with customer applications
  - Helps ensure a more stable console environment
- **Local console sessions for i5/OS (5250), AIX 5L and Linux**
- **Remote console sessions by other workstations through HMC**
  - WebSM client – remote GUI to HMC
  - i5/OS 5250/Linux/AIX interface
    - i5/OS 5250 interface via Telnet5250 client
- **POWER5 HMC is different from a POWER4 HMC**
- **Apr 2005 GA5 HMC Support - 2 HMCs per server, 48 Servers, up to 254 partitions**
- **HMC cannot be used on pre-POWER5 iSeries servers**

7310-C03/4 (desktop) with monitor & keyboard

7310-CR2/3 with 1U keyboard & flat panel (rack)

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HMC – More Details

- **Based on xSeries server technology**
  - Minimum HMC configuration includes: 1 GB memory, 40 GB disk, DVD-RAM, 10/100/1000 Mbps Ethernet port, diskette drive, etc
  - Select options for HMC's display, keyboard, etc
  - HMC connects to the POWER5 service processor via one of the two dedicated HMC Ethernet ports.
    (Different from the two embedded 10/100/1000Mbps Ethernet LANs.)
- **Standard HMC maintenance support is CRU. Suggest upgrading support to IBM On-Site Repair to be more consistent with POWER5 server's support agreement.**
- **Can have additional non-HMC i5/OS consoles connected to your i5 server**
- **High availability suggestion: "buy a spare HMC"**

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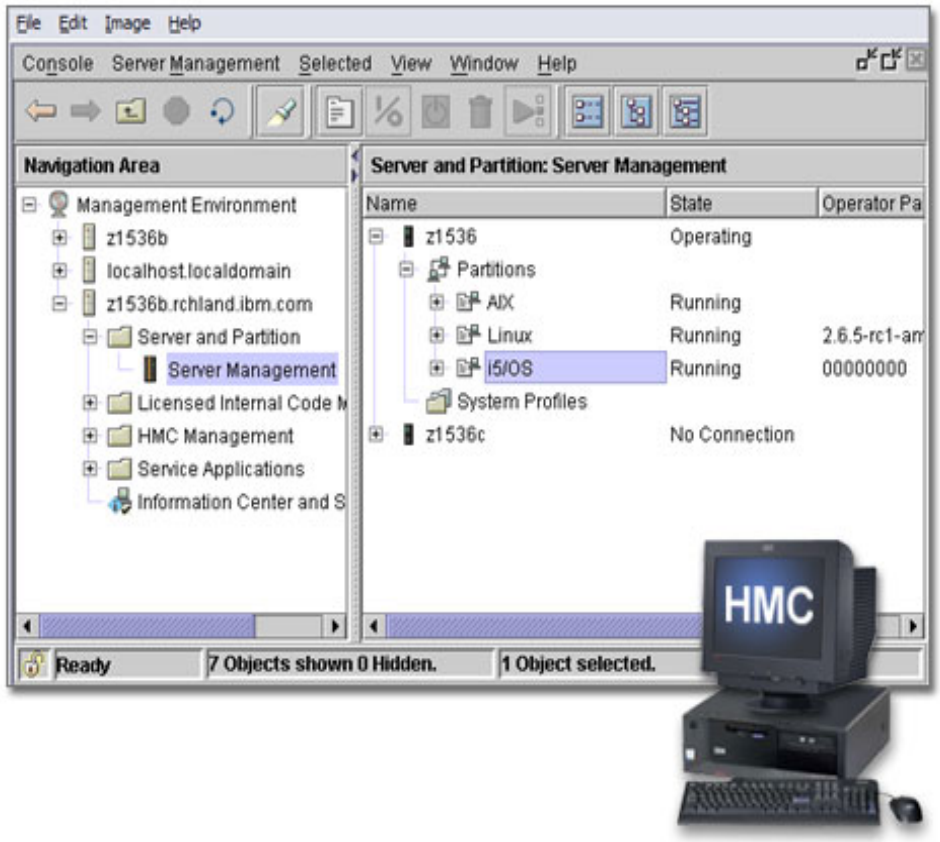
HMC – More Details

- **Required on POWER5 servers to create/change partitions (LPAR) or to use Capacity on Demand**
- **HMC is dedicated to console functions**
- **Not required to operate the partition**
- **Saves the cost of typical primary partition**



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Refreshed Hardware Management Console (HMC)

7316 display

(rack)

7310-CR2

7310-CR3

(desktop)

7310-C03

7310-C04

January 2005 announcement – February General Availability

- New CR3/C04 models replace current models
- Same server HMC function
- Change due solely to updated xSeries base

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Detailed HMC Comparison

The Model 7310-CR2:
- Intel XEON-based rack-mounted workstation
  - 1U tall
  - Mounts in a 19-inch system rack
- 1 GB of system memory
- **40 GB minimum hard disk**
- DVD-RAM for backup
- One integrated serial port
- One graphics port
- 2 integrated 10/100/1000 Mbps Ethernet ports
- Three USB ports
- Two PCI slots
- **Integrated diskette drive**

The Model 7310-CR3:
- Intel XEON-based, rack-mounted workstation
  - 1U tall
  - Mounts in a 19-inch system rack
- 1 GB of system memory
- **80 GB Serial ATA HDD**
- DVD-RAM for backup
- One integrated serial port
- One graphics port
- 2 integrated 10/100/1000 Mbps Ethernet ports
- Three USB ports
- Two PCI slots
- Orderable external diskette drive if needed

The Model 7310-C03:
- Intel Pentium desktop workstation
- 1 GB of system memory
- 40 GB minimum hard disk
- DVD-RAM for backup
- Two integrated serial ports
- One graphics port
- 1 integrated 10/100/1000 Mbps Ethernet port
- Six USB ports
- Two PCI slots
- Integrated diskette drive

The Model 7310-C04:
- Intel Pentium desktop workstation
- 1GB of system memory
- 40 GB minimum HDD
- DVD-RAM for backup
- Two integrated serial ports
- One graphics port
- 1 integrated 10/100/1000 Mbps Ethernet port
- Six USB ports
- Two PCI slots
- **Two PCI-Express slots (for future use)**
- Integrated diskette drive

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Connection options

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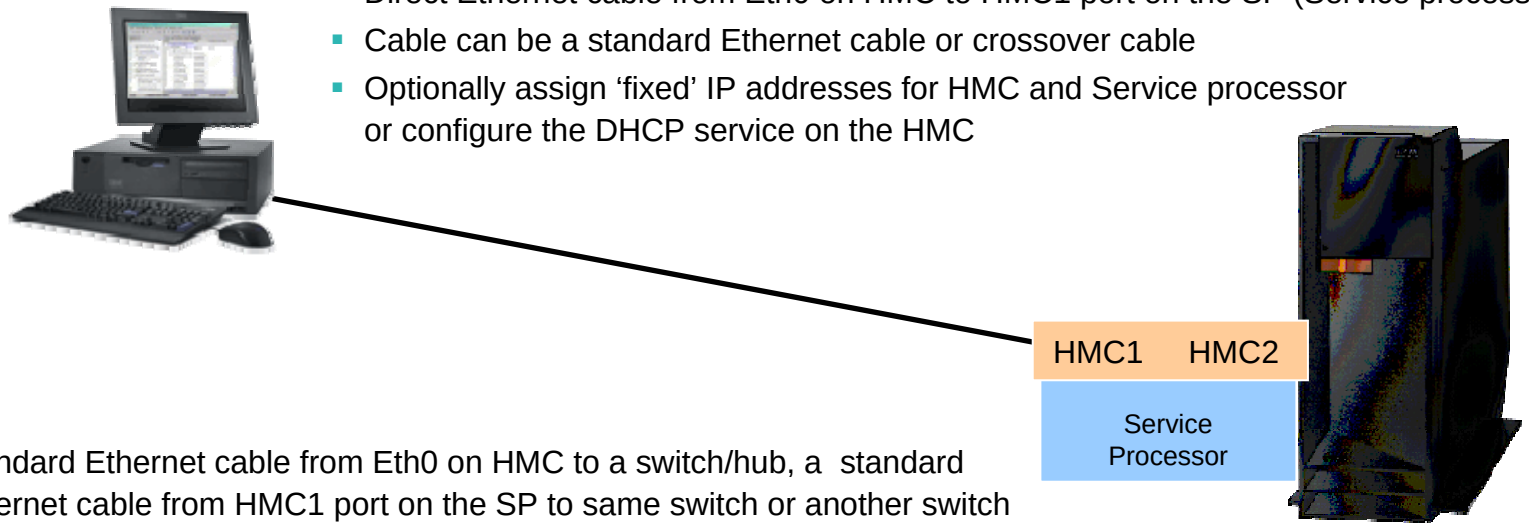
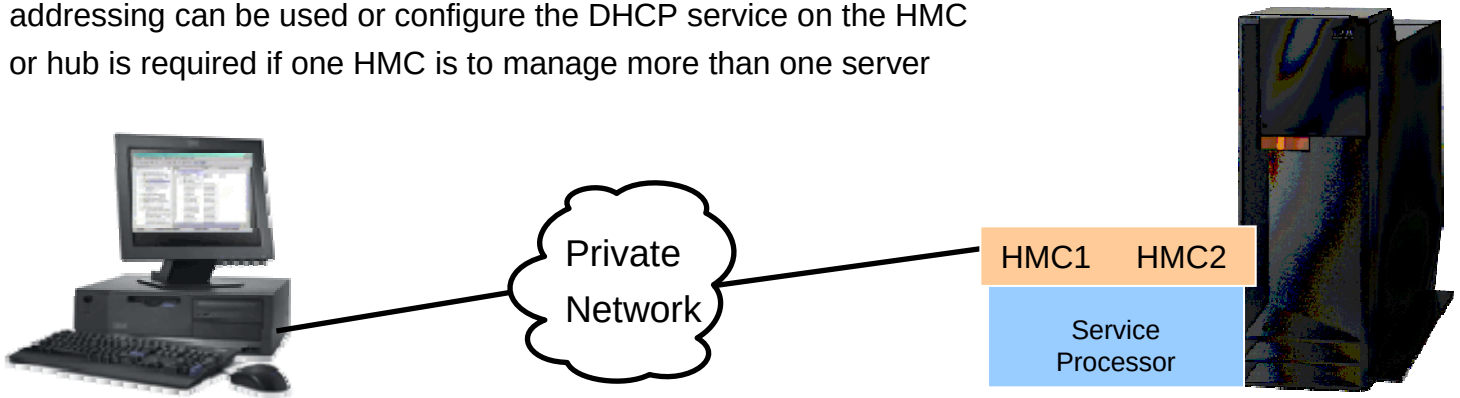
Single HMC with one i5 System, models 520, 550 or 570



- Direct Ethernet cable from Eth0 on HMC to HMC1 port on the SP (Service processor)
- Cable can be a standard Ethernet cable or crossover cable
- Optionally assign 'fixed' IP addresses for HMC and Service processor or configure the DHCP service on the HMC



- Standard Ethernet cable from Eth0 on HMC to a switch/hub, a standard Ethernet cable from HMC1 port on the SP to same switch or another switch on same LAN segment.
- Static IP addressing can be used or configure the DHCP service on the HMC
- A switch or hub is required if one HMC is to manage more than one server

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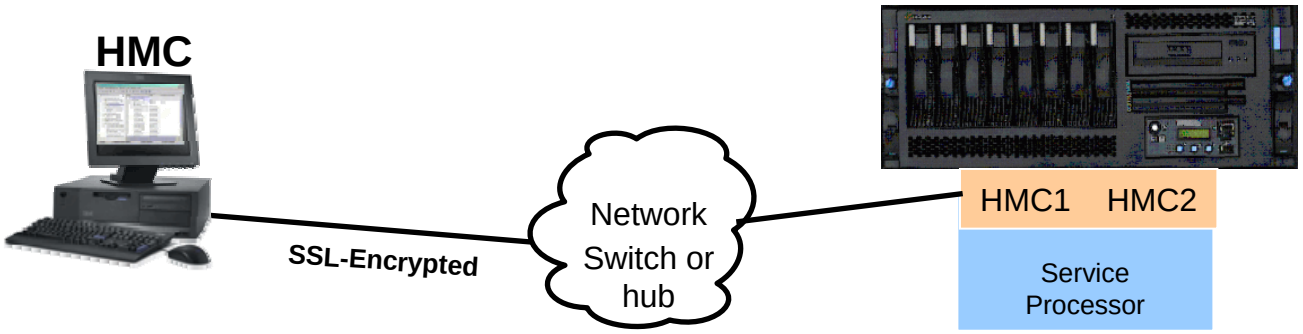
HMC connection options

At boot up, the Service Processor, first checks to see if a static IP address has been configured for each port, if not, it starts a DHCP client. If no response from a DHCP server, each port has a predefined default IP address assigned

192.168.2.147 for HMC1 port

192.168.3.147 for HMC2 port

For security considerations and potential DHCP server conflicts. It is best to ensure the 'managed server' network is a private network and that the HMC is the only DHCP server on this network.



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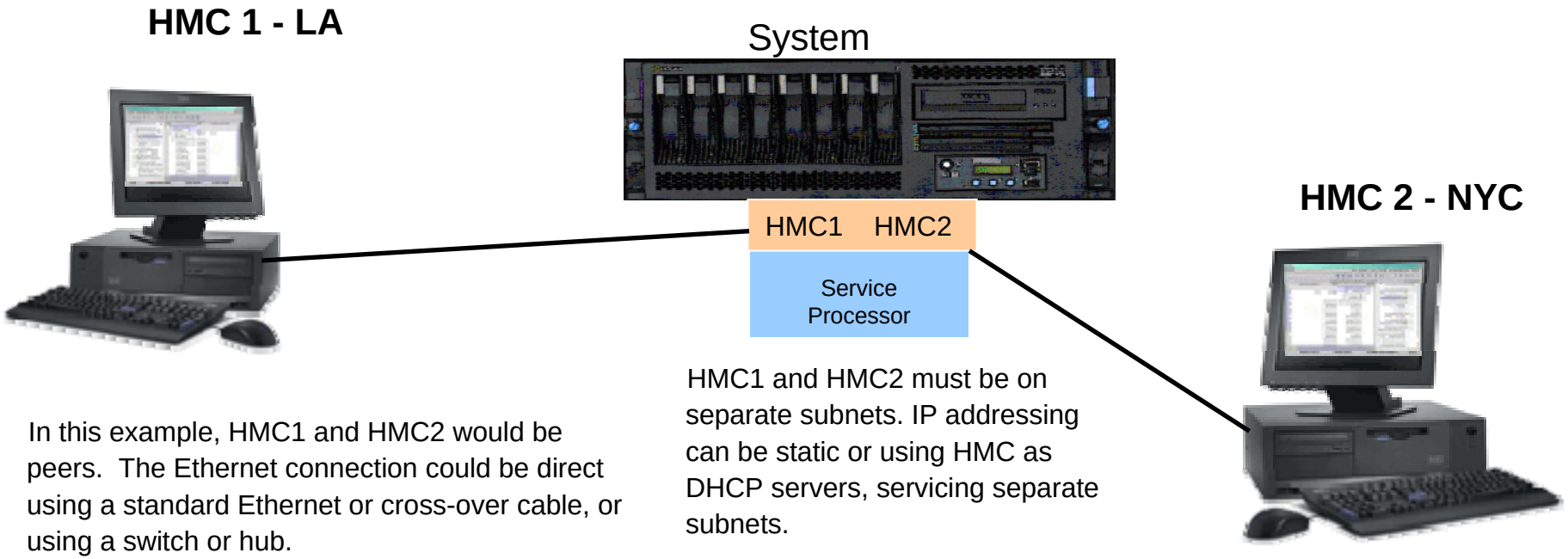
Redundant HMC connection for models 520, 550 & 570

To enhance server management availability, consider a redundant HMC.

For a single server, these could be direct cables. For more that one server, a switch or hub is required.



In this example, HMC1 and HMC2 would be peers. The Ethernet connection could be direct using a standard Ethernet or cross-over cable, or using a switch or hub.

HMC1 and HMC2 must be on separate subnets. IP addressing can be static or using HMC as DHCP servers, servicing separate subnets.

In this example, the second HMC could also be remote connecting over a WAN

Note: HMC configurations, such as security, user profiles, etc. are NOT replicated between HMCs

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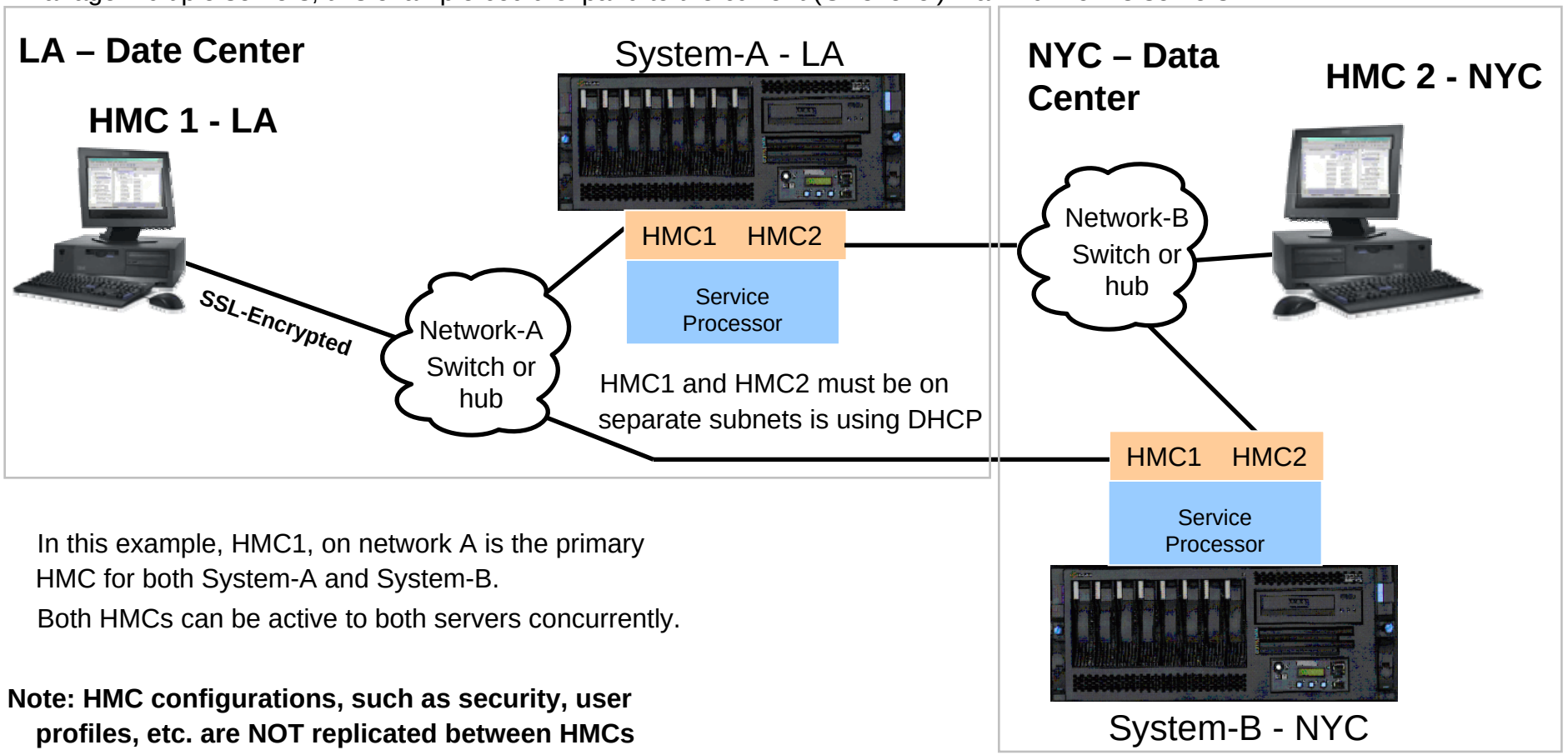
Redundant remote HMC, multiple servers for models 520, 550 & 570

To maximize server management availability, a second HMC can be connected. For a single server, these could be direct cables. For more that one server a switch or hub is required. Since each HMC can manage multiple servers, this example could expand to the current (GA5 level) maximum of 48 servers



In this example, HMC1, on network A is the primary HMC for both System-A and System-B.

Both HMCs can be active to both servers concurrently.

Note: HMC configurations, such as security, user profiles, etc. are NOT replicated between HMCs

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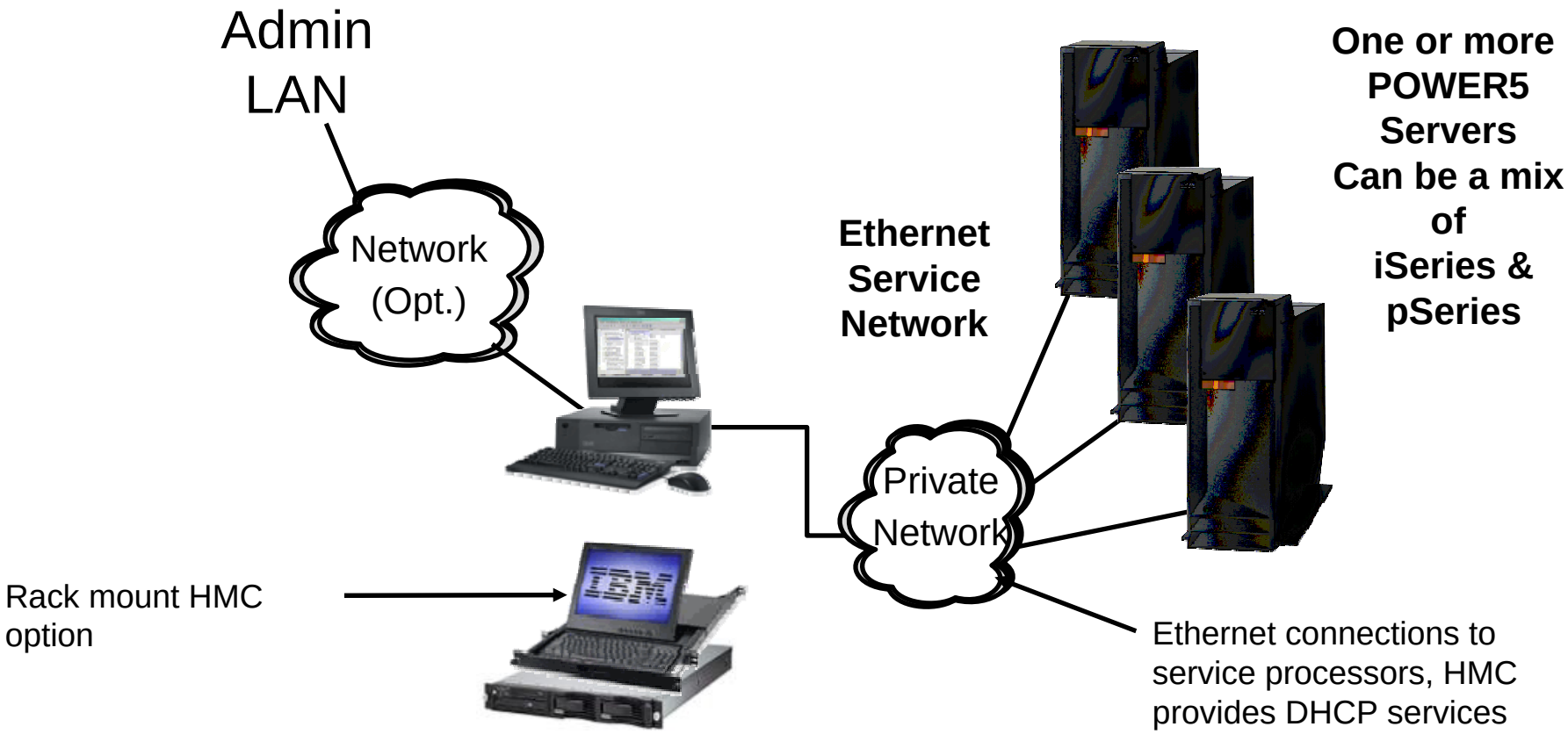
HMC Network Topology for one or more POWER5 Systems



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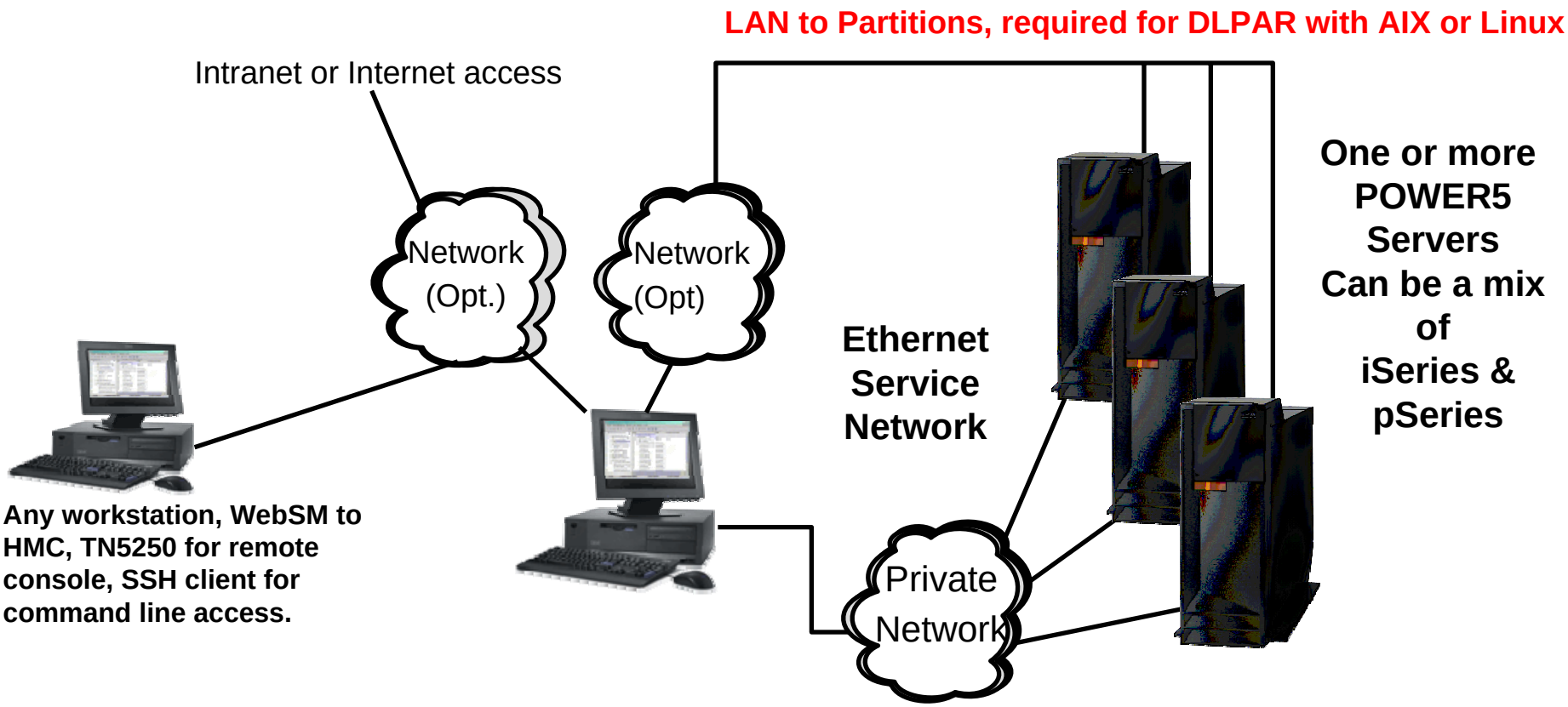
HMC Network Topology for one or more POWER5 Systems with AIX or Linux



This third interface from the partitions to the HMC is also required for i5 if you want partition problems logged to the HMC. CE's like to have a copy of the error log on the HMC when they do the repair.

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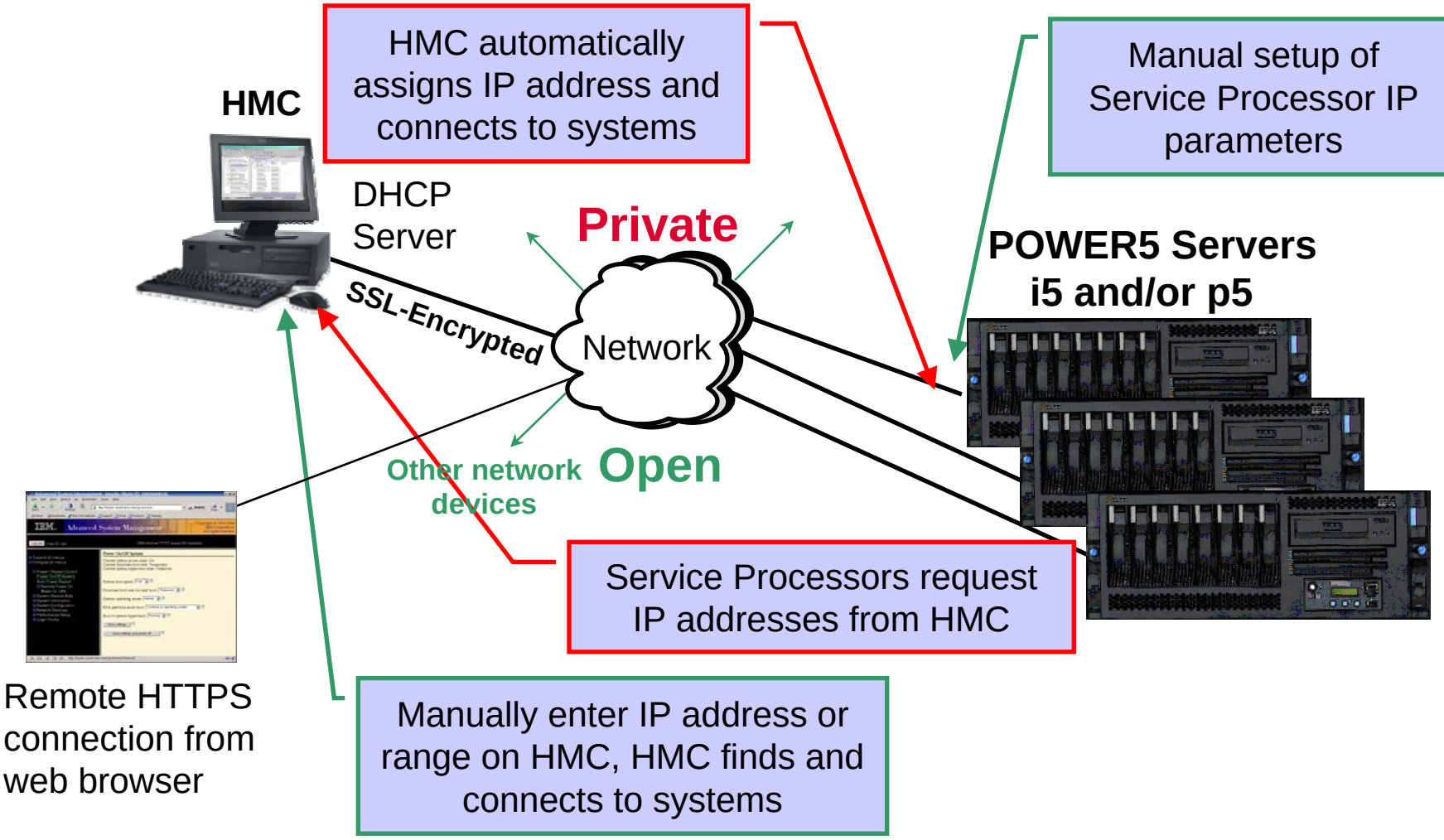
"Private" and "Open" Network Options



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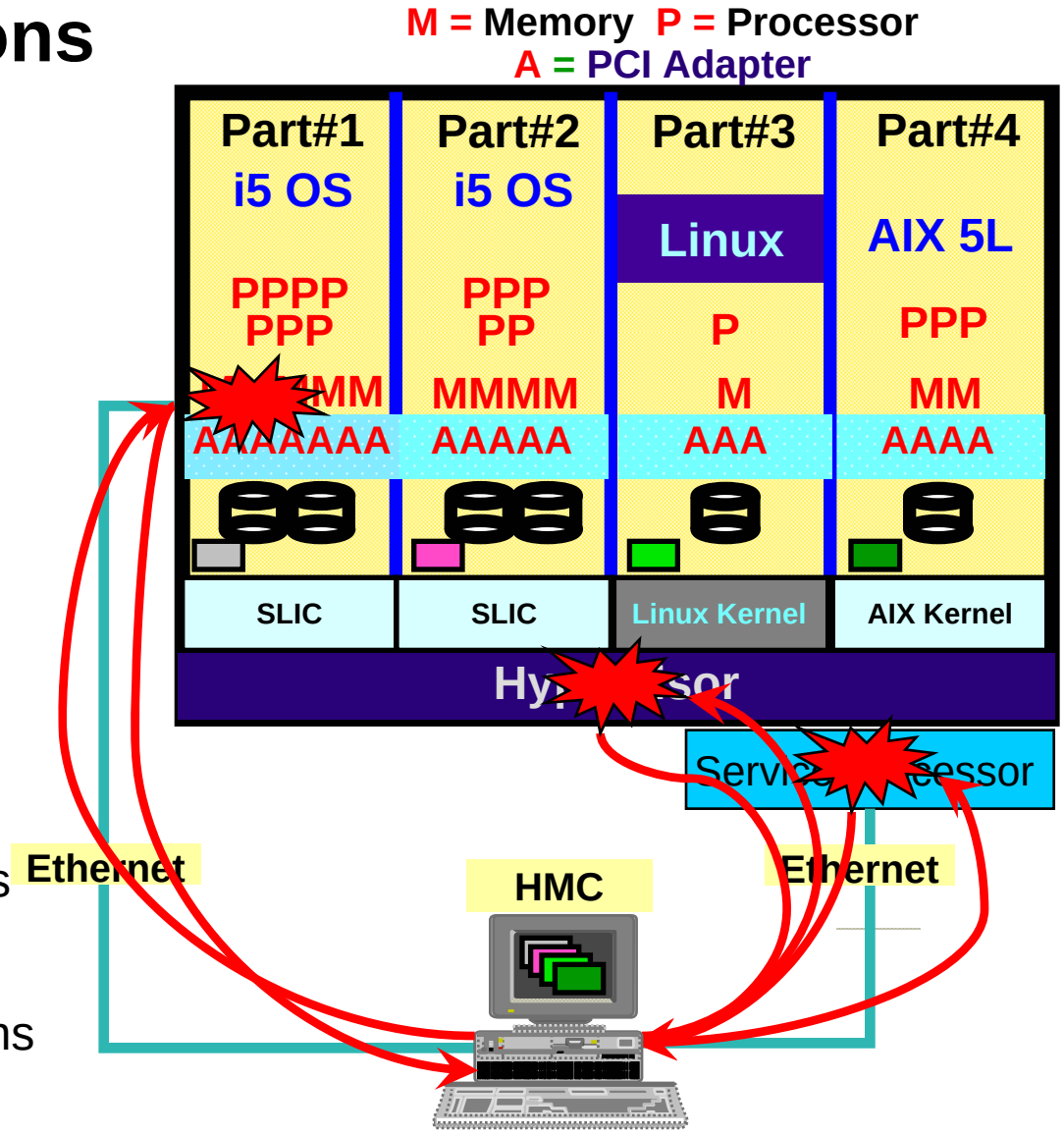
HMC Communications

Service processor
- HMC SSL communication
- Power control
- Error event handling
- Hypervisor Code updates

Hypervisor (pass-through)
- System configuration data
- Partitioning control
- Virtual I/O definition
- Capacity on Demand
- Concurrent Service
- Console Sessions

Operating Systems
- Gather hardware error events
- Gather hardware inventory
- Dynamic LPAR (AIX/Linux)
- Use of i5/OS VPN connections



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High-end server i595 & p590/p595 have unique requirements

- The High-end servers (i595 & p590) require at least one Hardware Management Console
  - **An i595 can not be powered off/on without an HMC**
  - **The Base expansion tower no longer has an operator panel. SRC codes are only observable from an HMC**
- The network connection between the HMC and the managed server must be a private network; the HMC must be configured as a DHCP server
- There is no longer the ability to directly access ASMI (Advanced System Management Interface) on the SP from a browser. ASMI access must be launched from a managing HMC. Starting with GA5, ASMI can be accessed from a WebSM client.
- The HMC allows the selection of various address ranges when configured as a DHCP server. A Class C address is recommended
  - Because 2 HMCs are recommended, they must each serve a unique Class C address range

i595 - engage ATS to review configuration options for redundant HMCs

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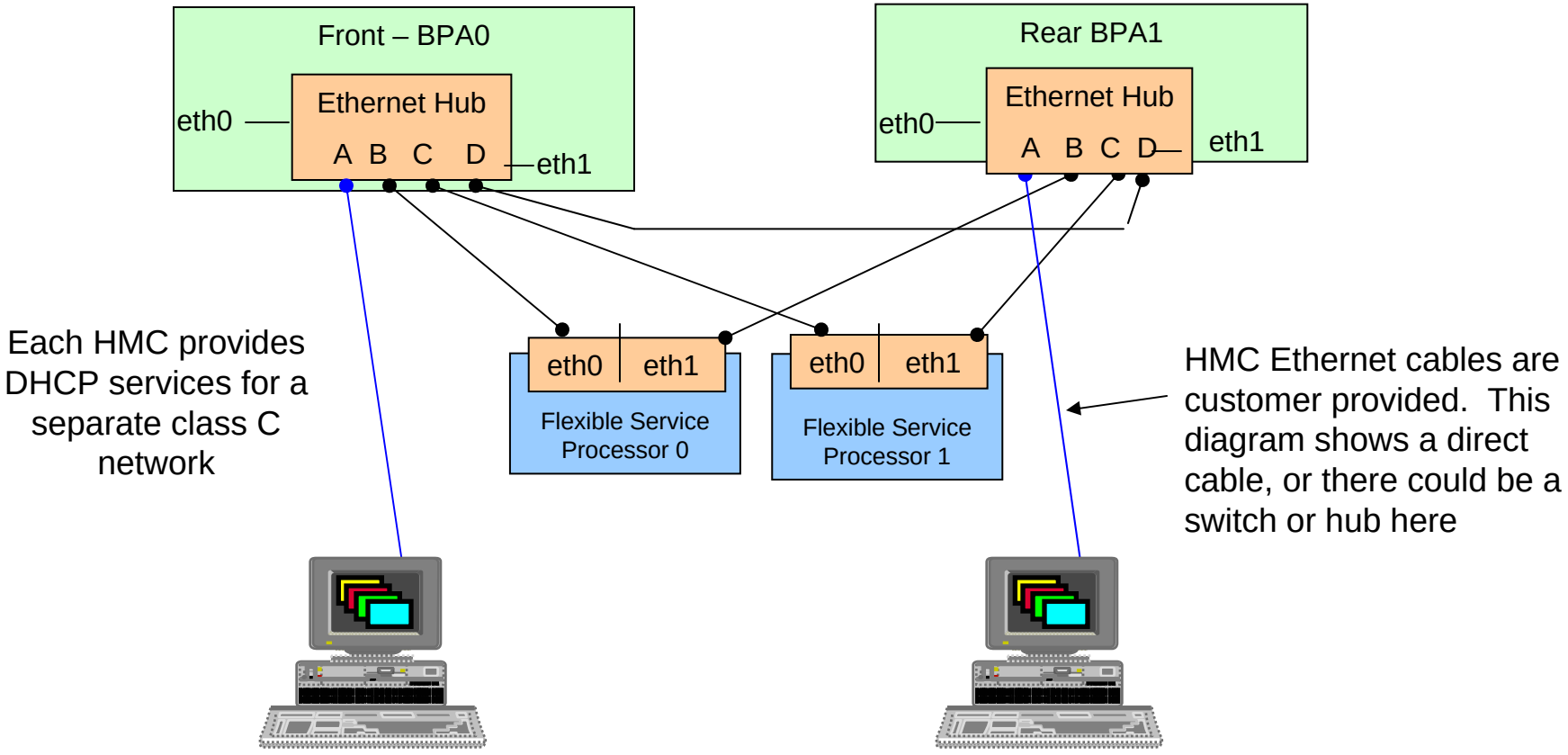
i595 Management Network Cabling Logical Layout



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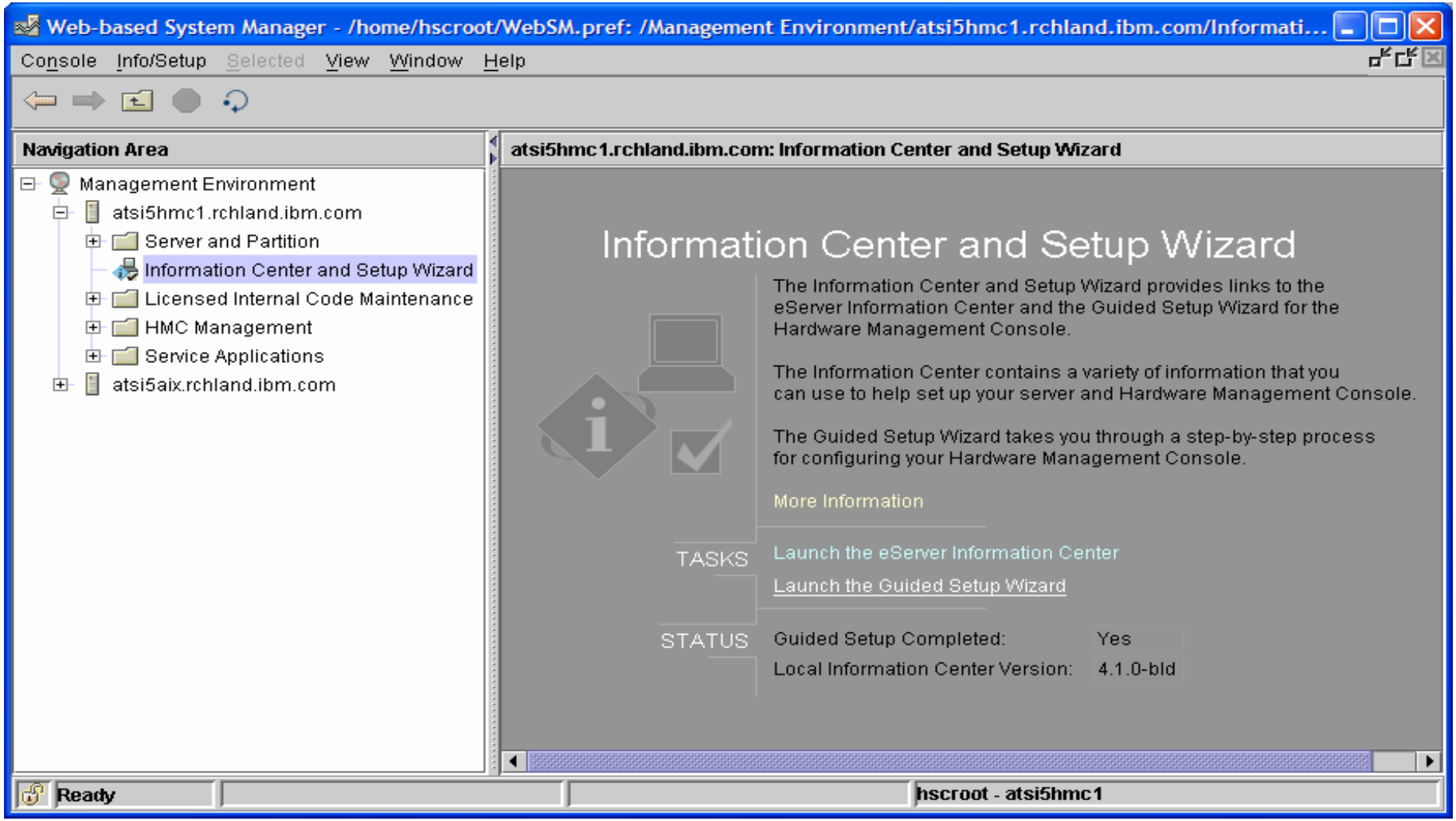
HMC Guided Setup Wizard



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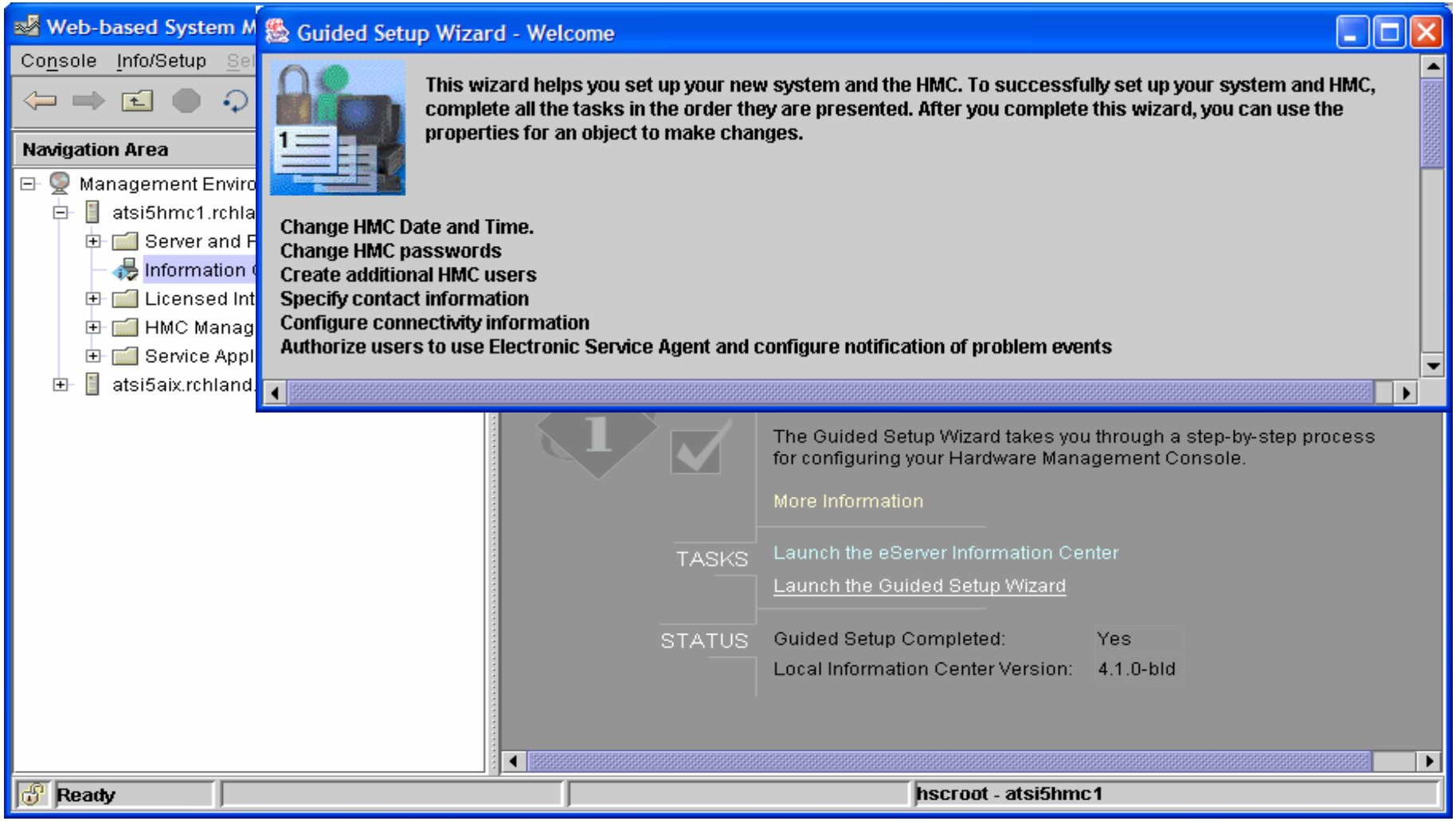
HMC Guided Setup Wizard



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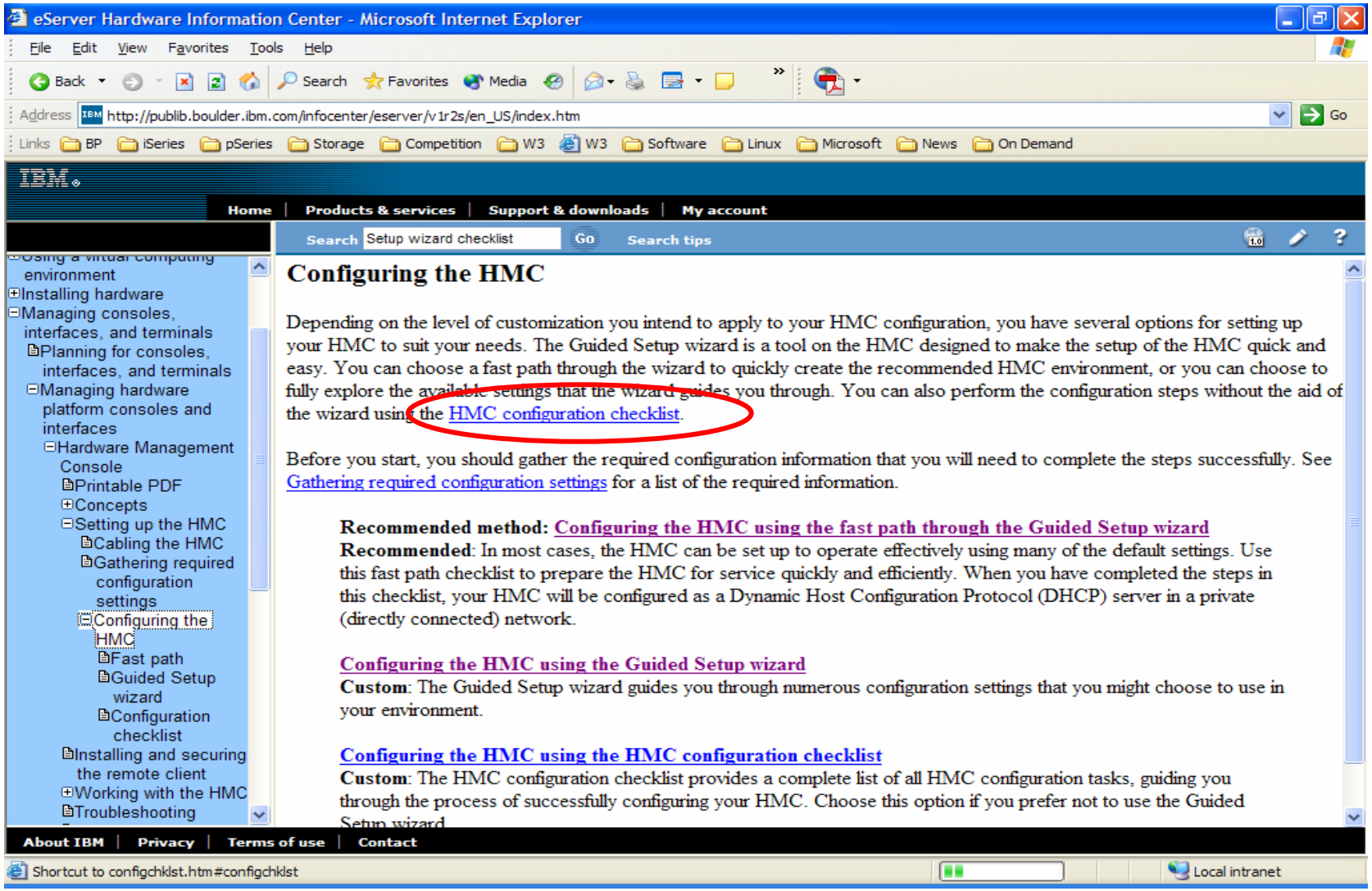
IBM eServer eServer info Center – Configuring the HMC

http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/info/iphai/configure.htm



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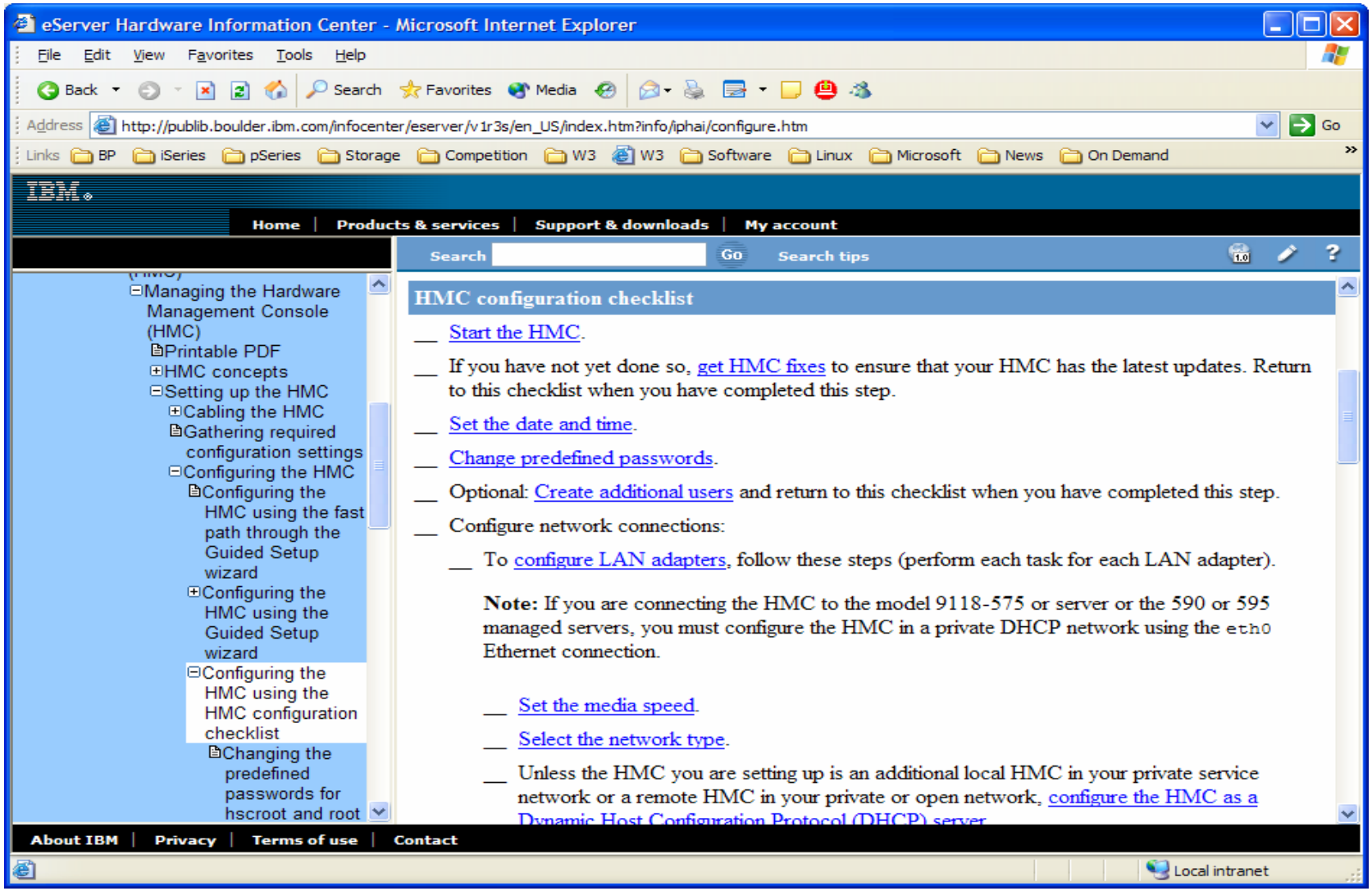
IBM eServer eServer info Center – HMC configuration checklist

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/en_US/info/iphai/configchklst.htm#configchklst



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HMC User Interfaces and Access

- Local GUI (on HMC)
  - Starts automatically whenever the HMC is started
  - Requires user login prior to access
- Remote GUI (on network PC)
  - Uses an installable standalone remote client application (WebSM Client)
    - Windows (NT,XP) or Linux
    - Downloadable as an installable application directly from the HMC, via web browser
  - Also supported from one HMC to another, or from AIX 5L
  - Can be SSL secured through public/private key files
    - Generate on the HMC, and transfer to client systems
- Local Command Line (on HMC)
  - Launched from a right-click menu option on the HMC desktop
  - Restricted to a set of supported HMC commands
- Remote Command Line (on network PC)
  - Accessed through encryption-protected Secure Shell (SSH)
  - Key files can be set up and exchanged to avoid password prompts
    - Very useful for automation and scripting without human intervention

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HMC GUI top-level navigation

Manage HMC configuration, users, services, ...

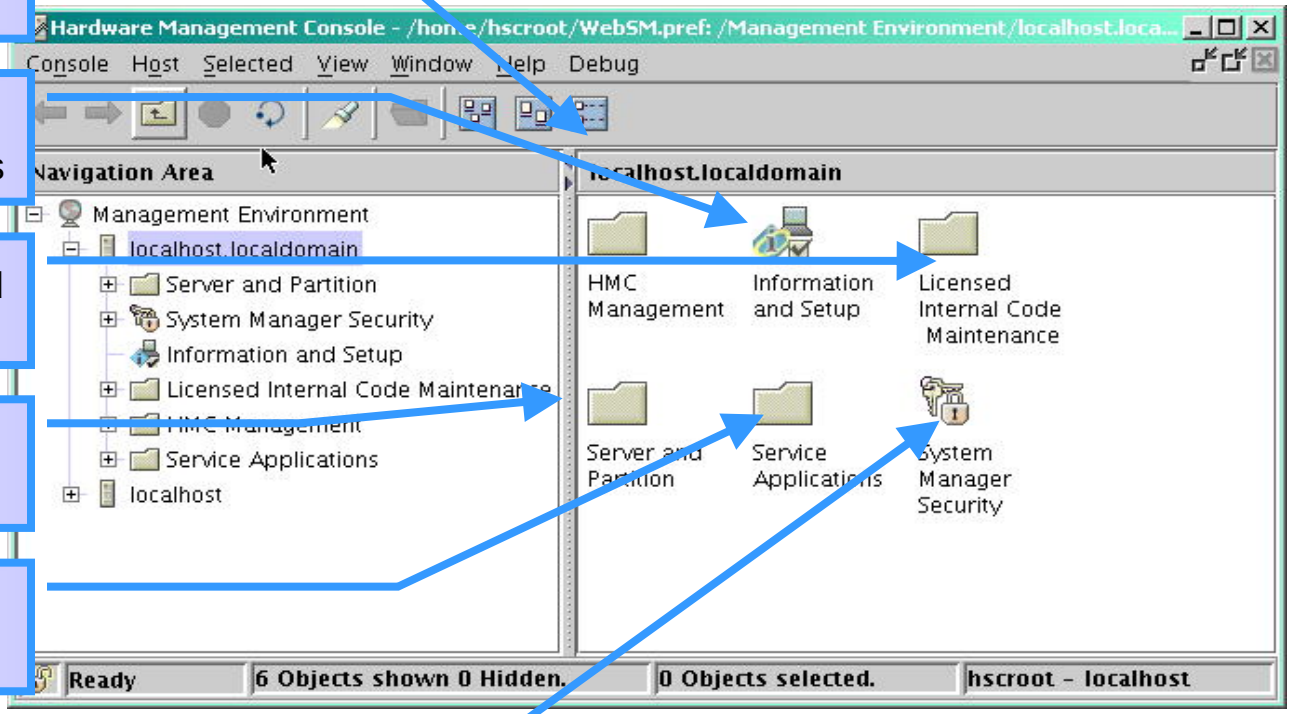
Guide setup wizard and online documents

Update your Licensed Internal Code

Manage your servers and partitions

Service tools to analyze and repair

Set up security for remote GUI access



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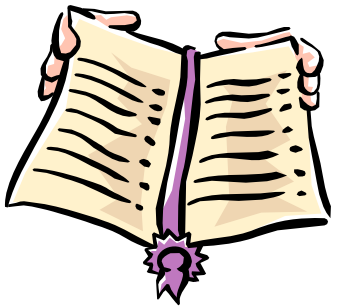
HMC Functions

- **Configuration Management**
  - Server and partition configuration
  - Virtual I/O configuration
  - Capacity on Demand management
  - HMC setup and configuration
- **Operations Management**
  - GUI or command line, local or remote
  - Virtual operating system consoles
  - Server and partition controls
  - Dynamic LPAR resource movement
  - Scheduled operations
- **Change Management**
  - Add/remove server hardware
  - Check and update Licensed Internal Code on servers, and on HMC itself
- **Problem Management**
  - Hardware error event collection, analysis, and correlation
  - Gathering of extended debug data
  - Transmission of problems to IBM
- **Service Management**
  - Guided concurrent repair procedures
  - Hardware inventory collection
  - Service utilities



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Remote GUI - Web-based System Manager WebSM

- **Two remote clients available:**
  - Web-based System Manager Remote Client
  - Web-based System Manager Remote Client for Java Web Start
  - Either client works the same after installation
- **You can access your HMC remotely by installing this remote client on your PC workstation**
- **The remote client provides flexibility by allowing you to manage your system from virtually anywhere you have a PC. Up to 5 remote clients can be logged in simultaneously**
- **Can use SSL security**
- **Some tasks not performed using the remote client**
  - These tasks include restarting the HMC interface and configuring System Manager Security for certificate authority or viewing overview and status information.

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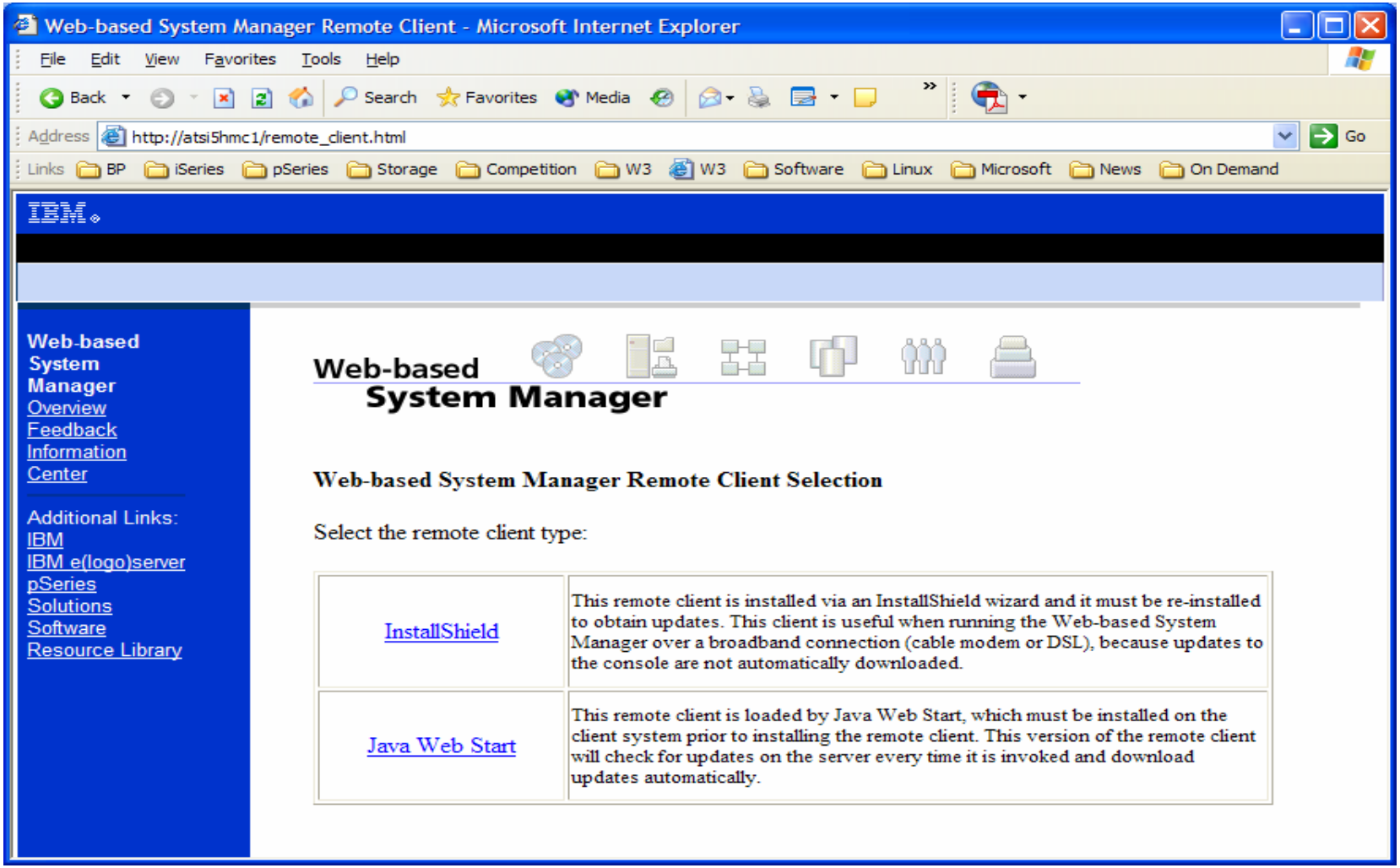
WebSM client - http://HMC Name/remote_client.html



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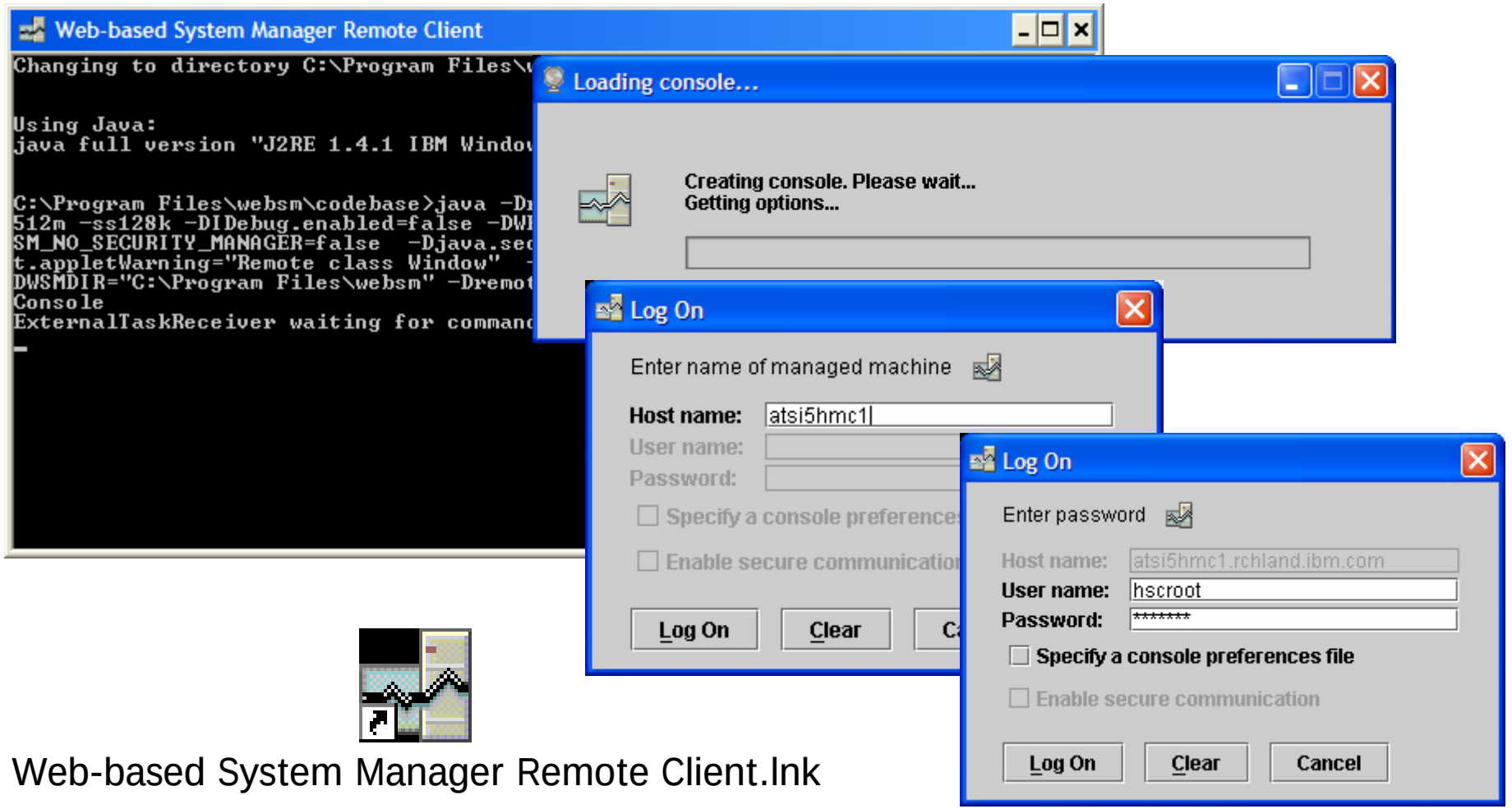
WebSM Remote Client



Web-based System Manager Remote Client.lnk

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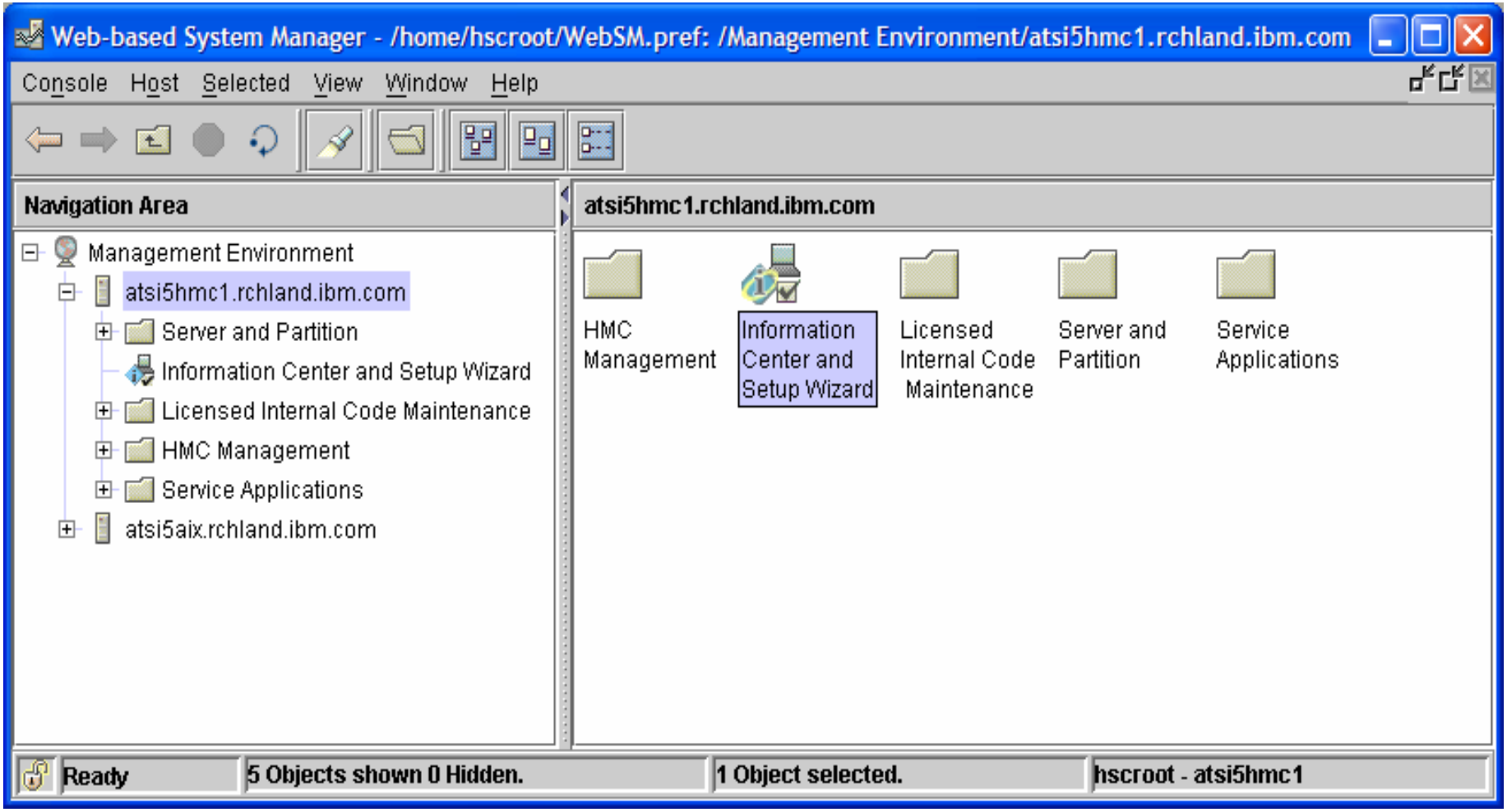
HMC via WebSM Remote Client



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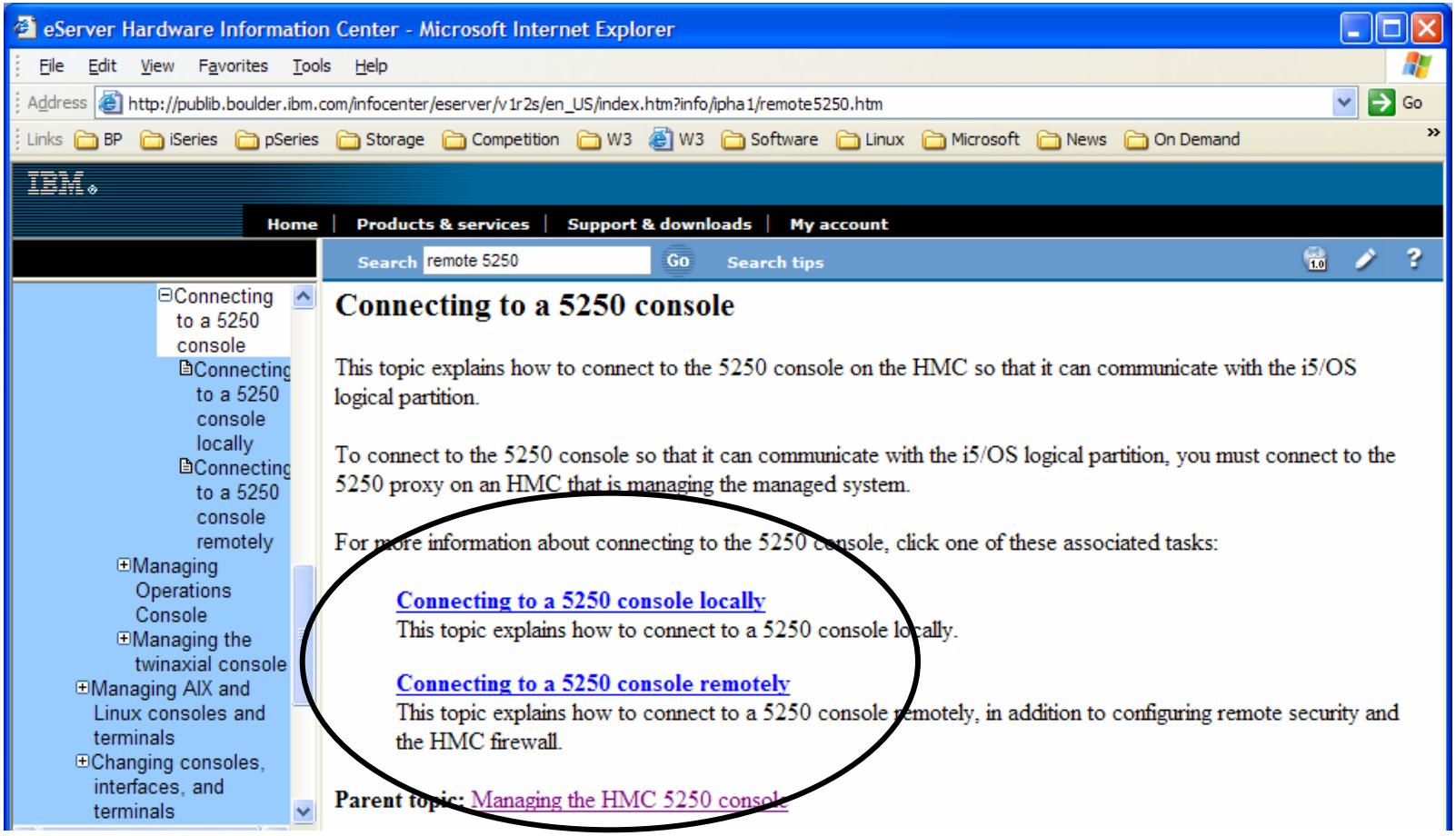
Connecting a 5250 Console to i5/OS LPAR via HMC



http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/info/iphb8/connecting5250.htm

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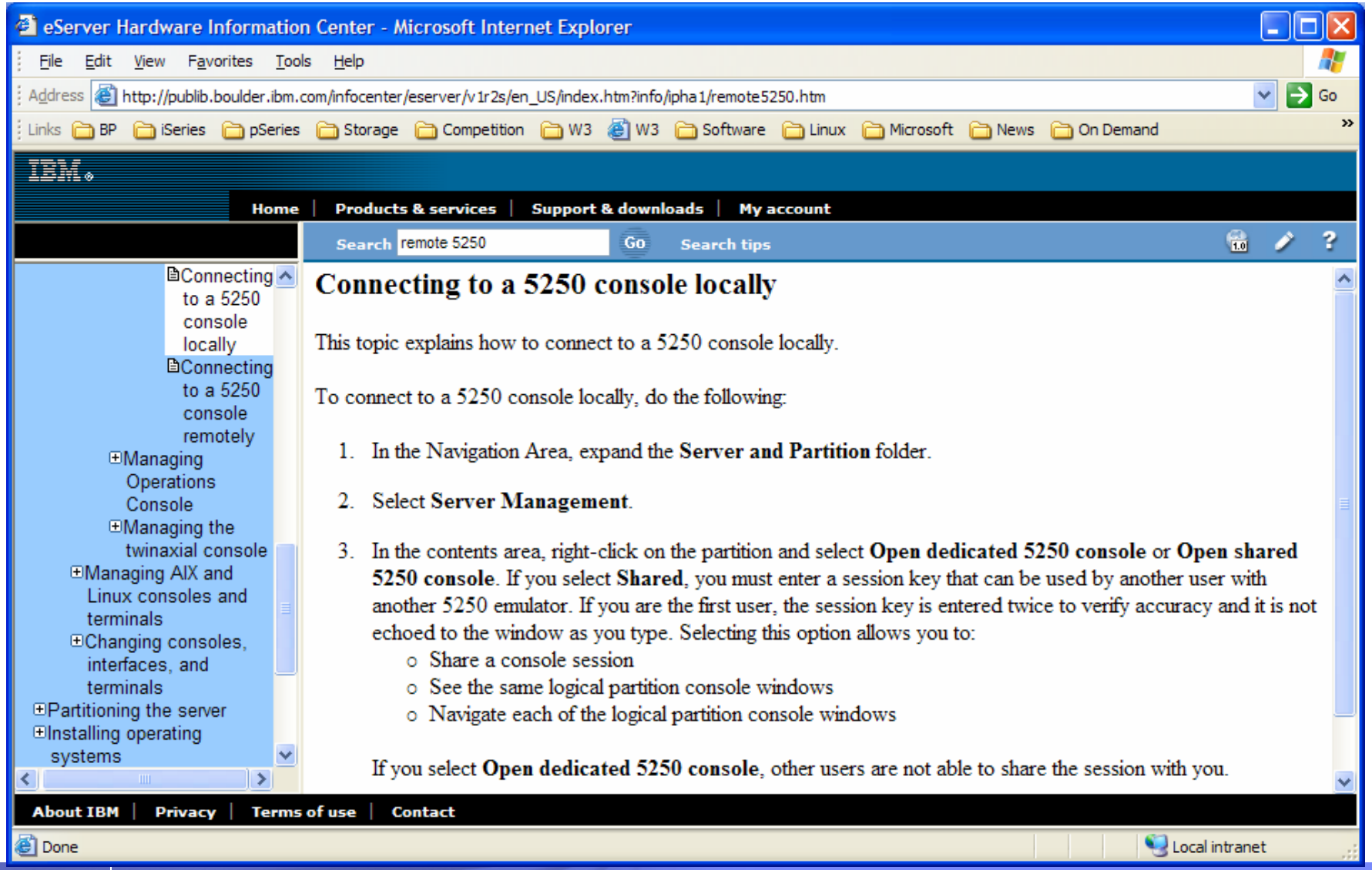
Local 5250 Console thru the HMC



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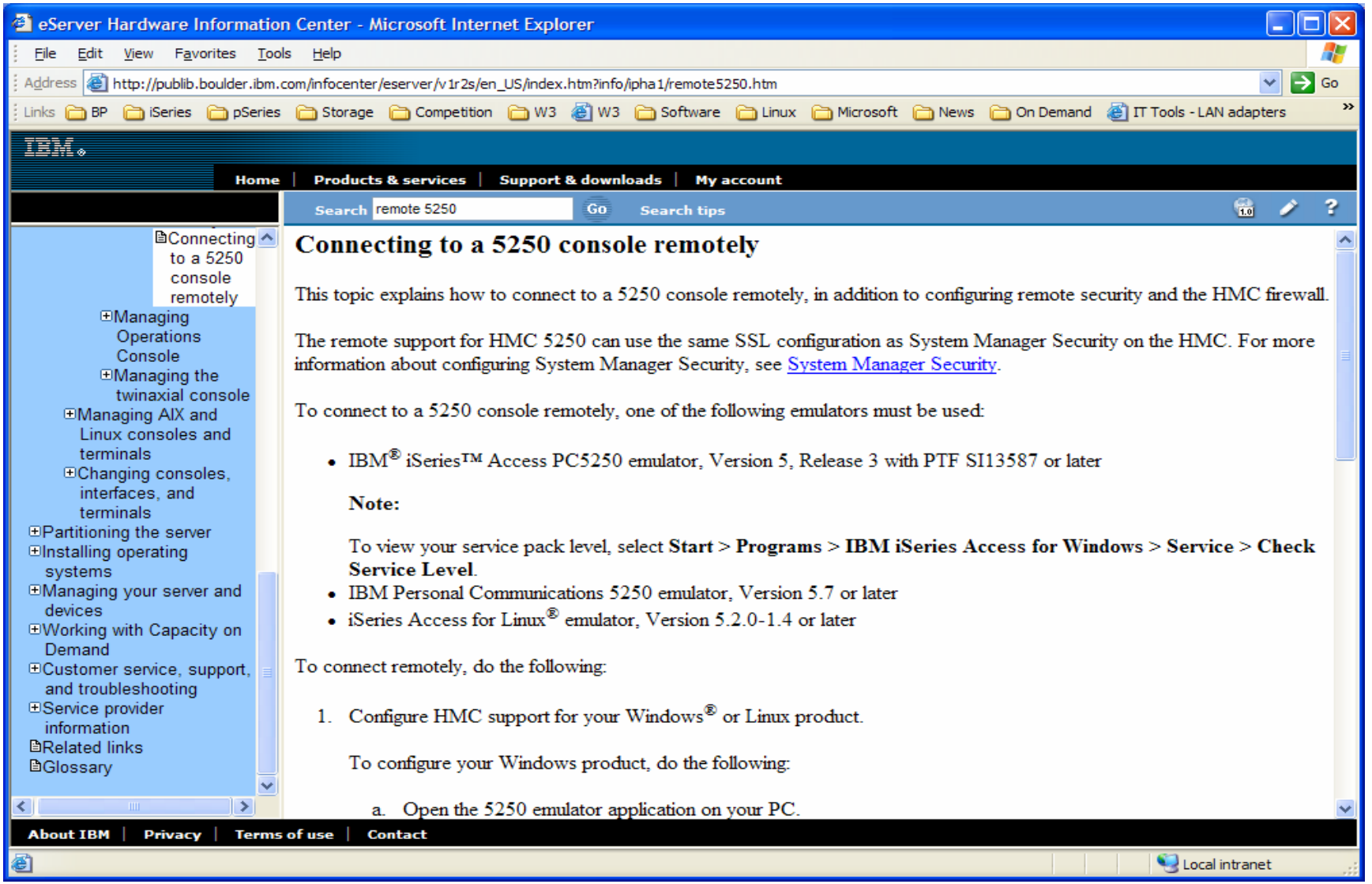
Remote 5250 Console thru the HMC



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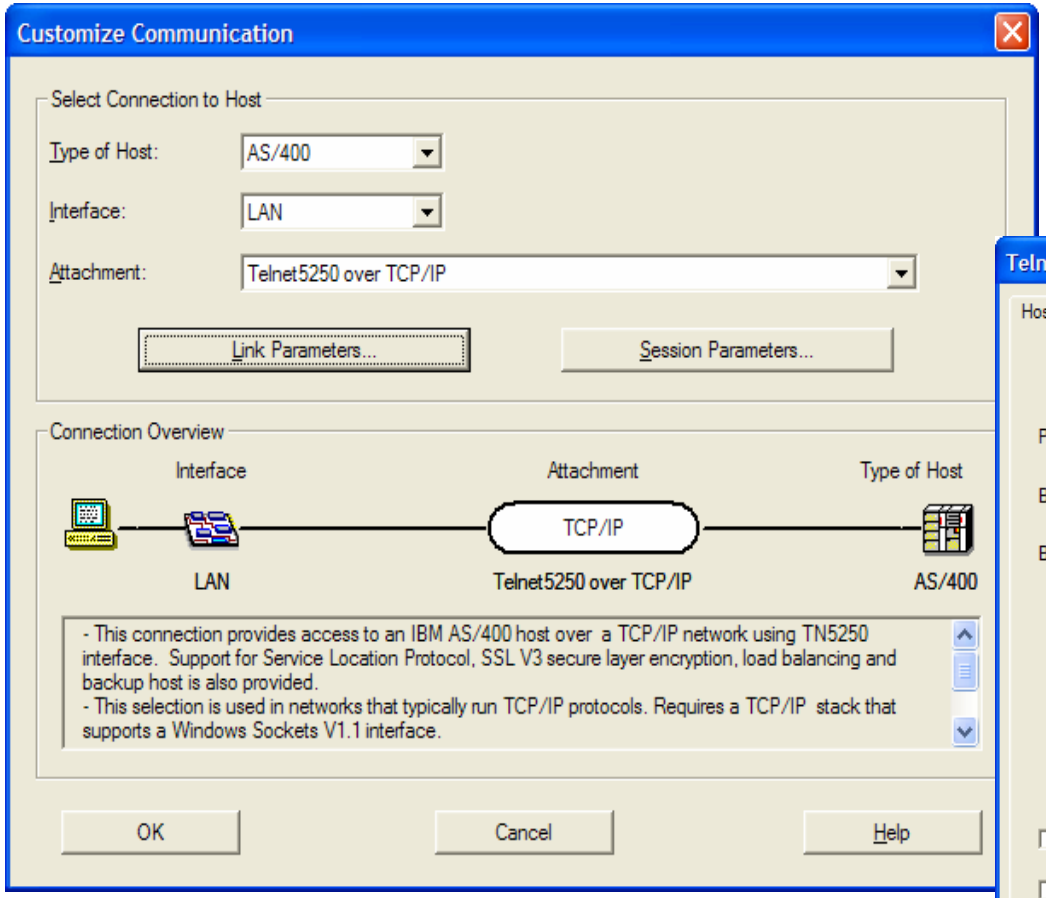
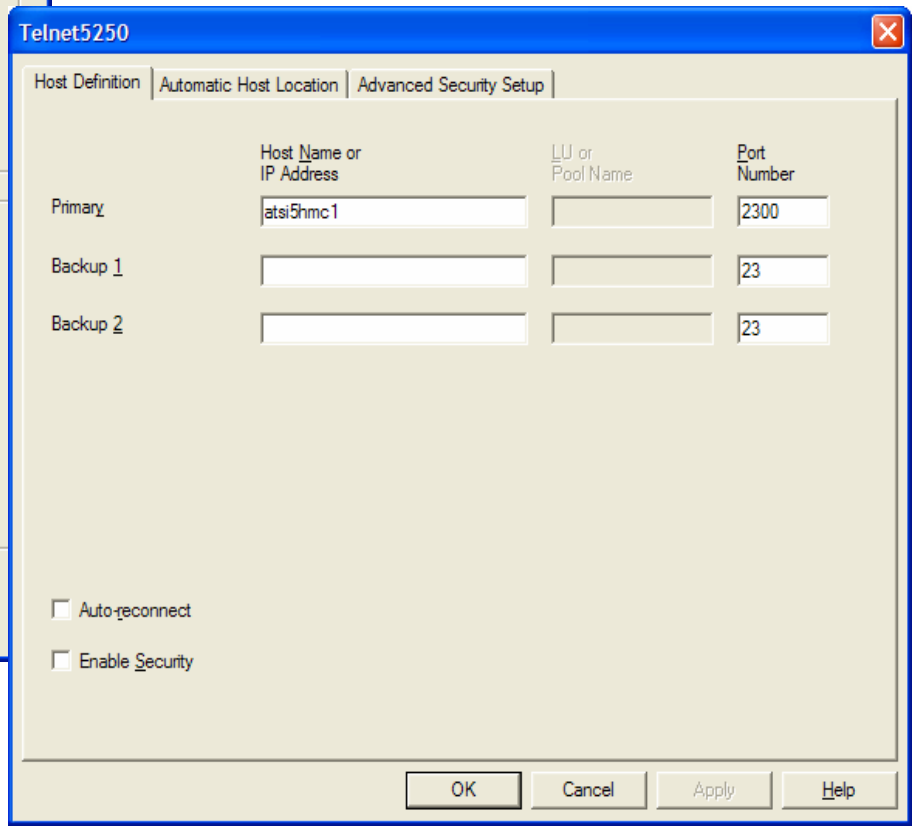
Example of PCOMM Configuration





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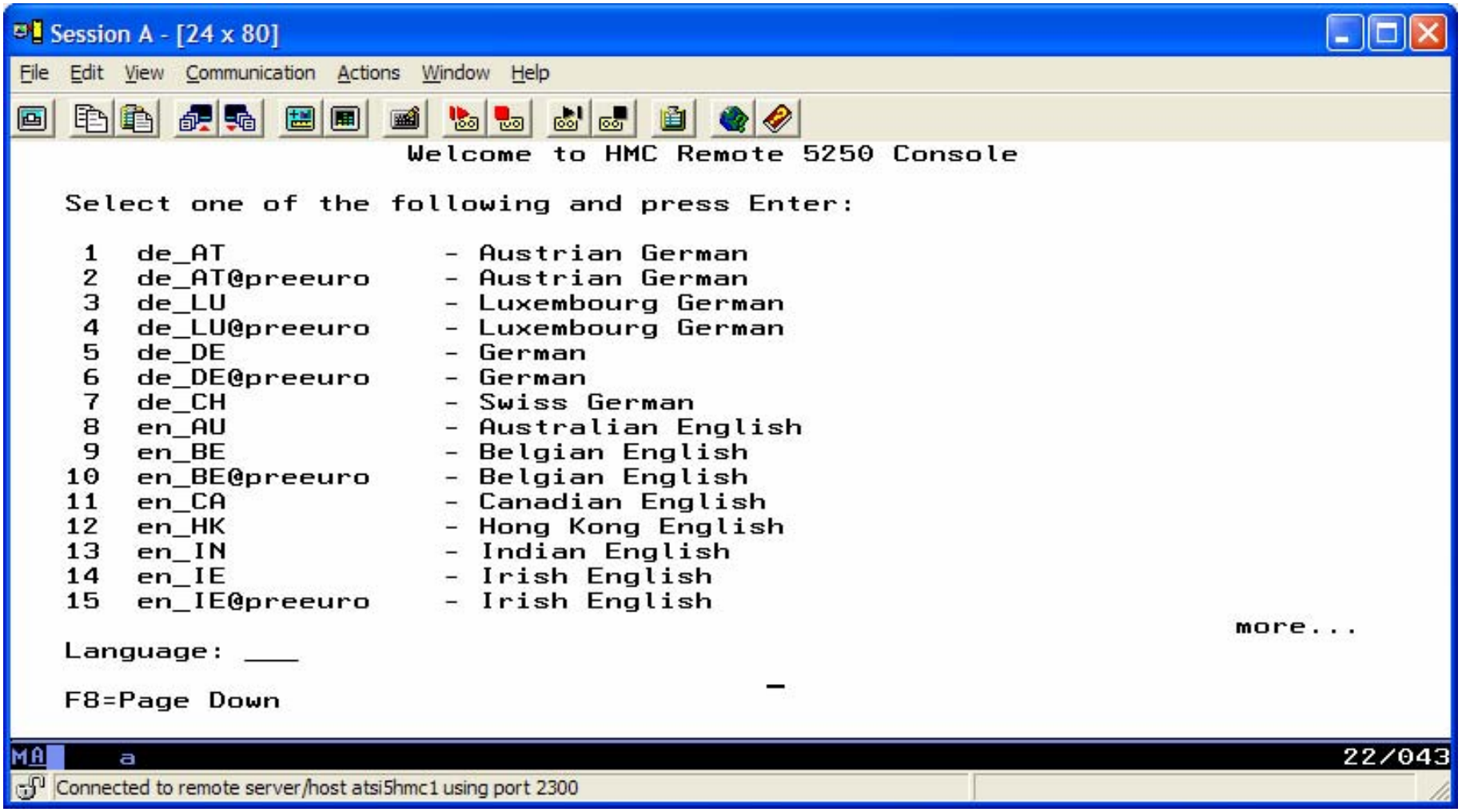
Remote 5250 Console thru the HMC via PCOMM



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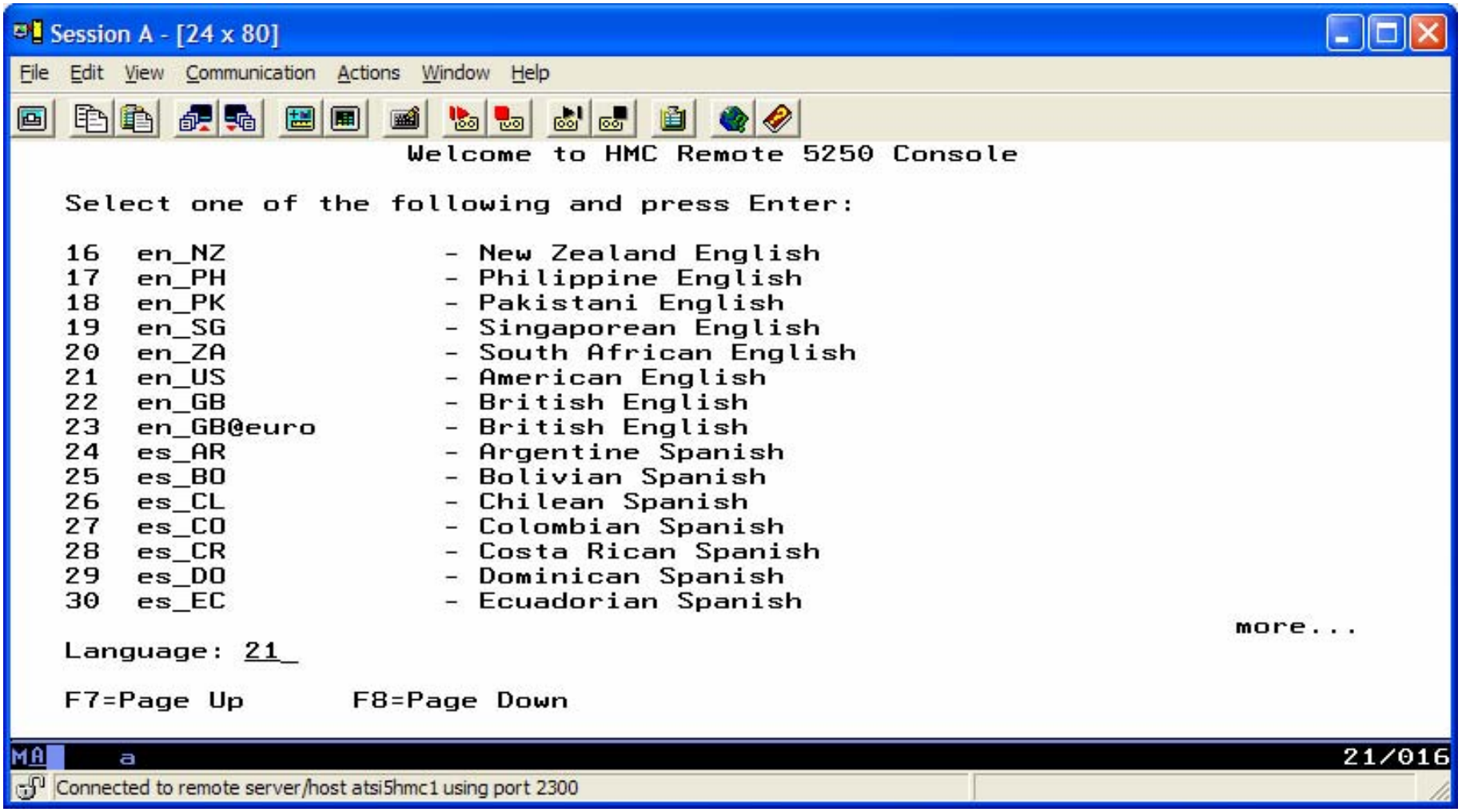
Remote 5250 Console thru the HMC via PCOMM



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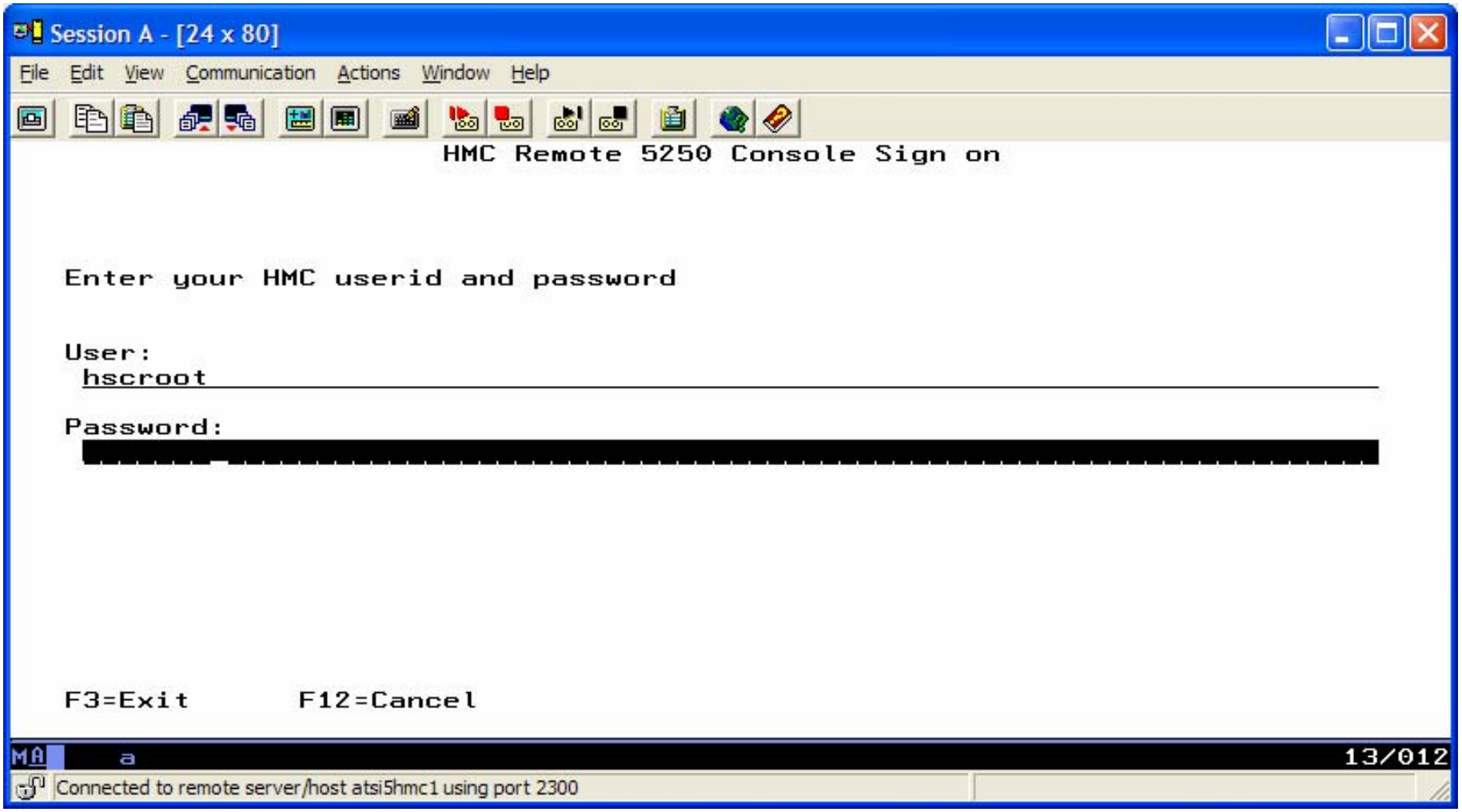
Remote 5250 Console thru the HMC via PCOMM



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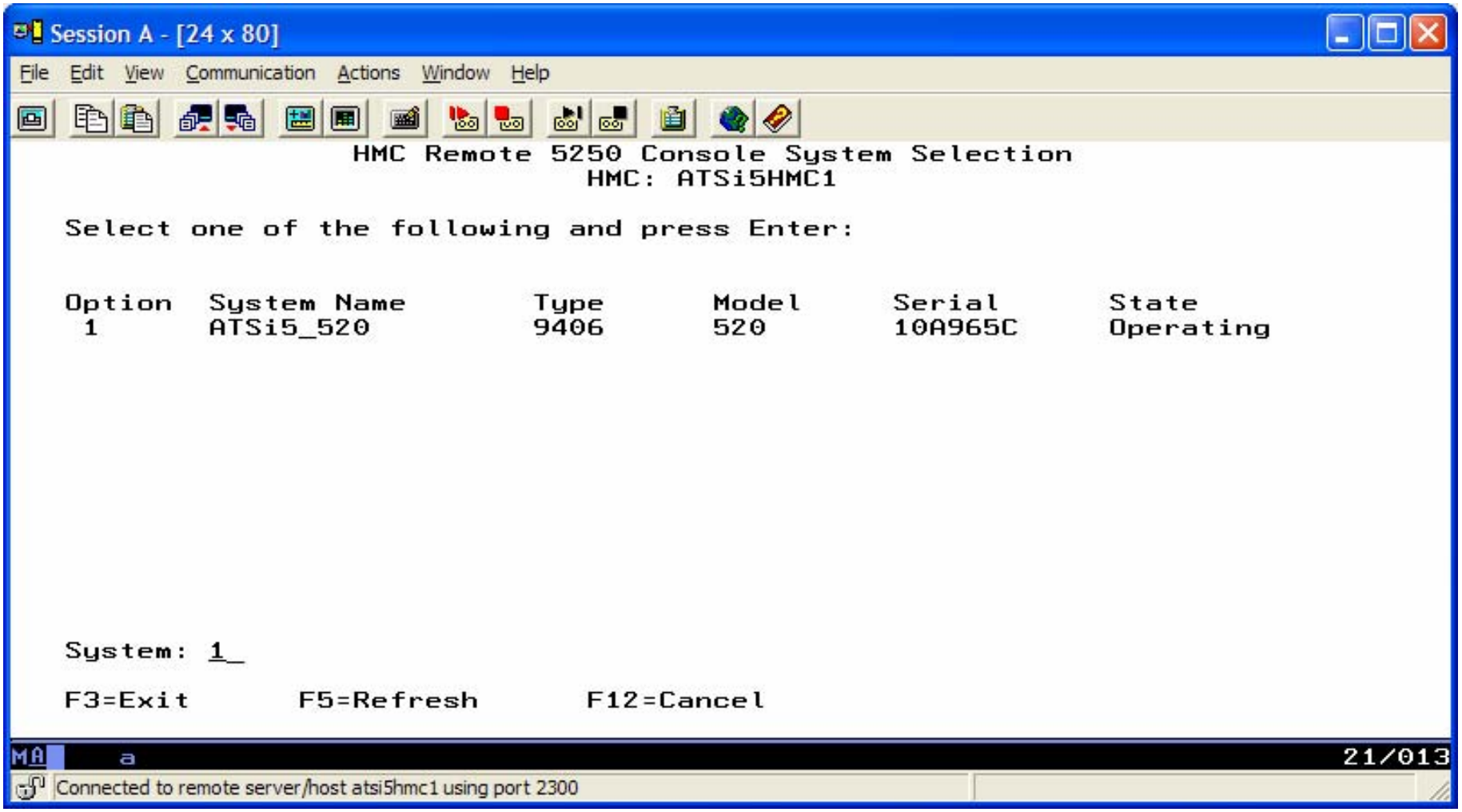
Remote 5250 Console thru the HMC via PCOMM



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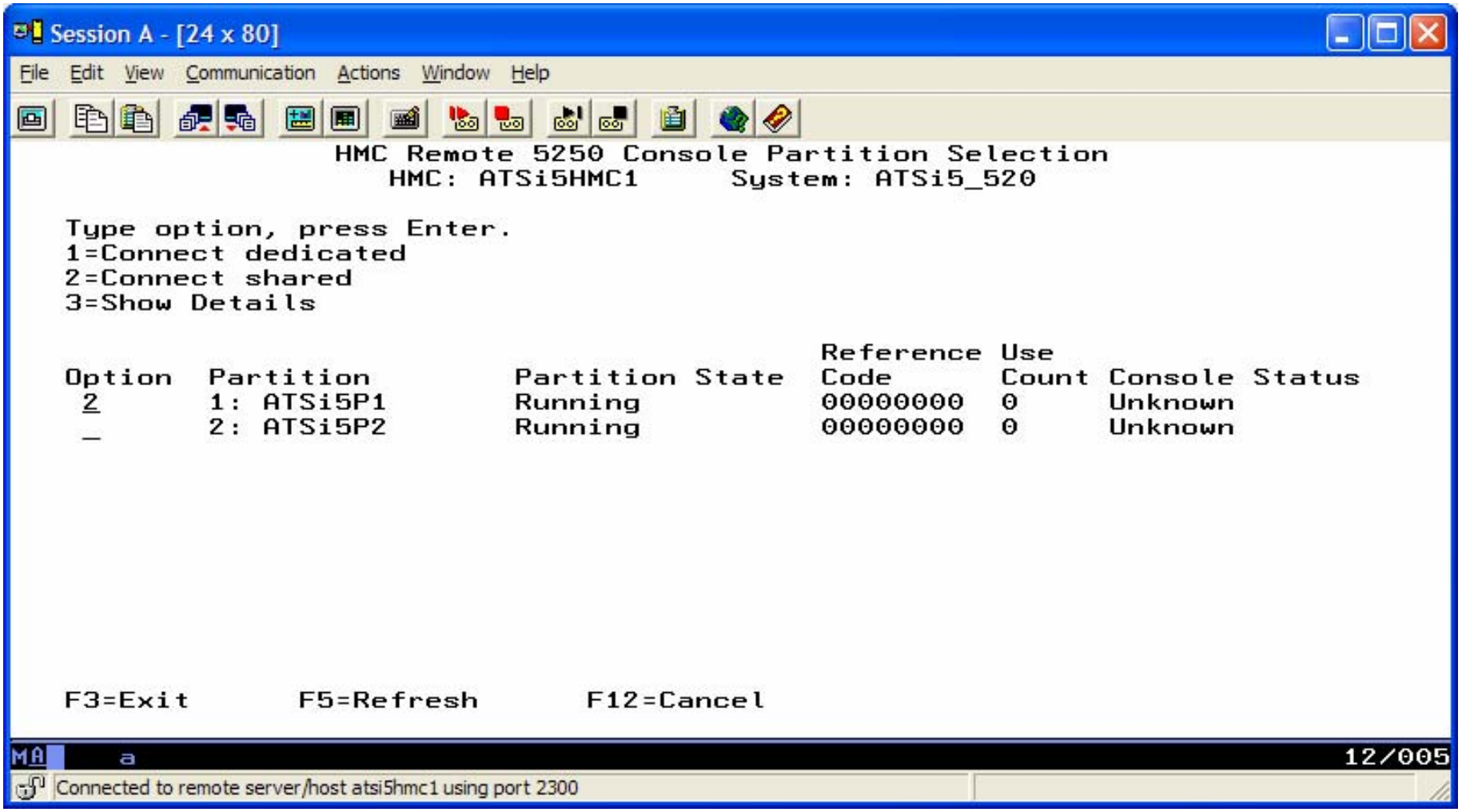
Remote 5250 Console thru the HMC via PCOMM



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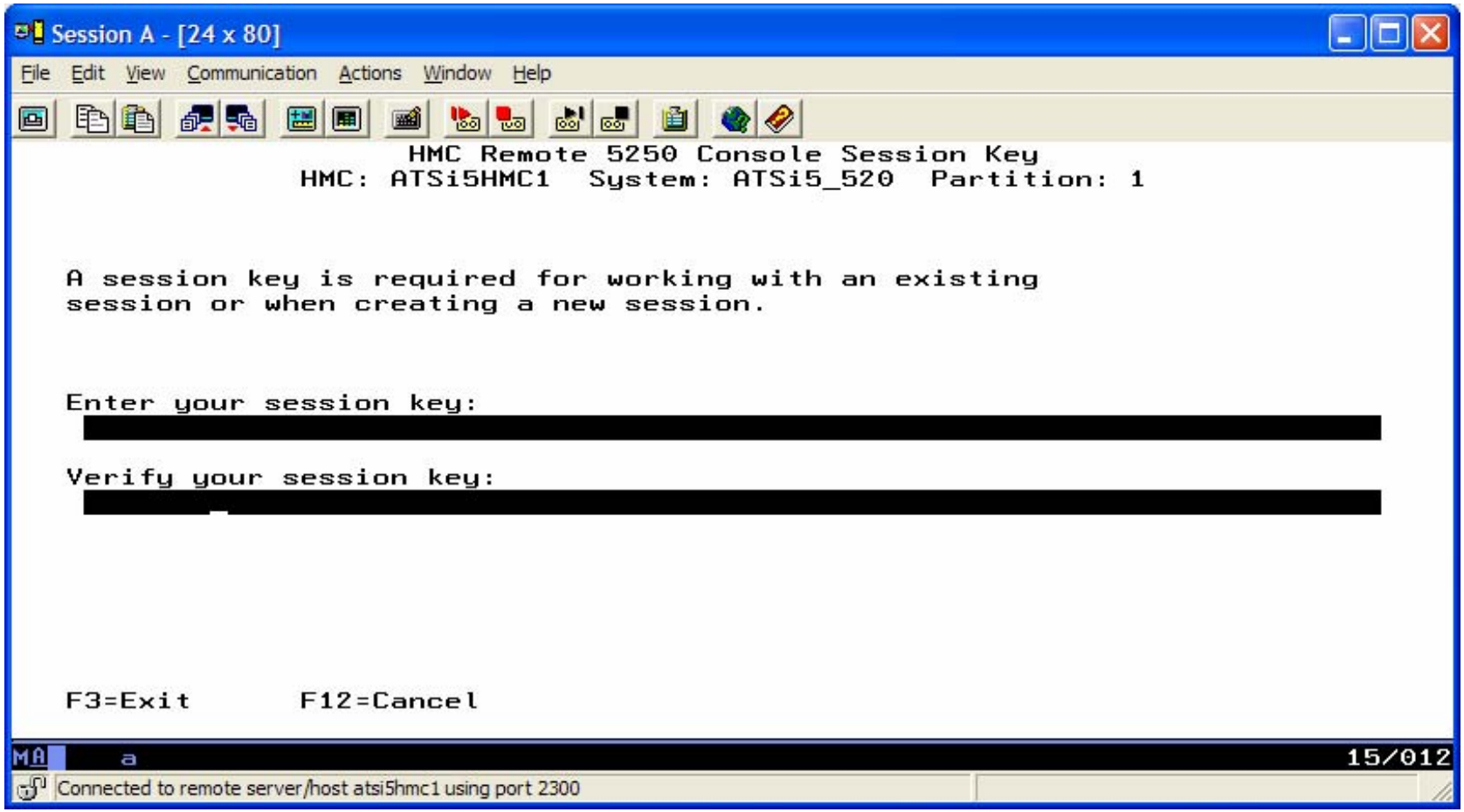
Remote 5250 Console thru the HMC via PCOMM

Another security layer:Remote user must know the ‘arbitrary session’ for this HMC console session



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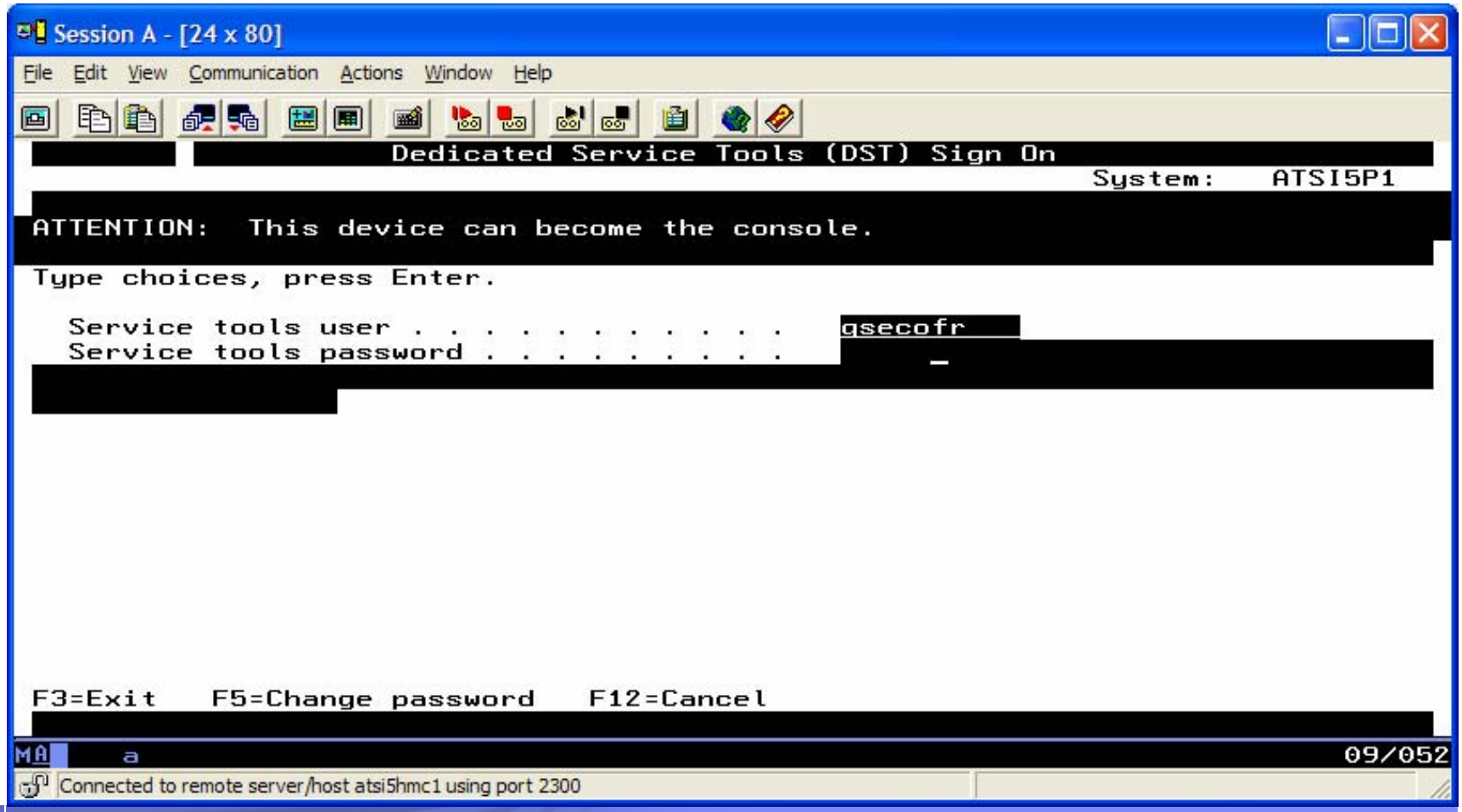
Remote 5250 Console thru the HMC via PCOMM

This screen, and the next 2 will appear if the i5/OS option is set to 'Allow Console Take-over'. This is set in SST under the 8. Work with service tools user IDs and Devices, then 3. Select console



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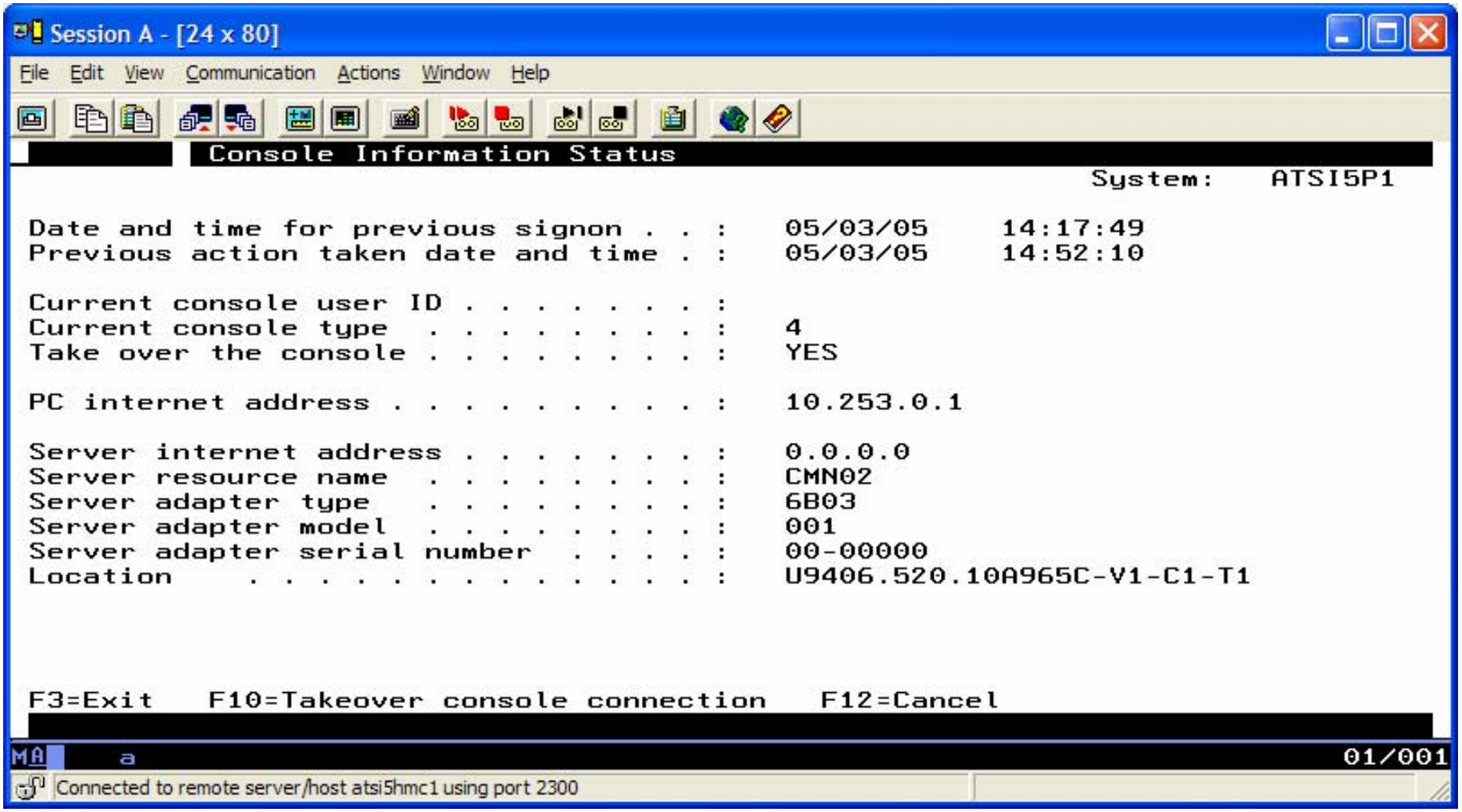
Remote 5250 Console thru the HMC via PCOMM



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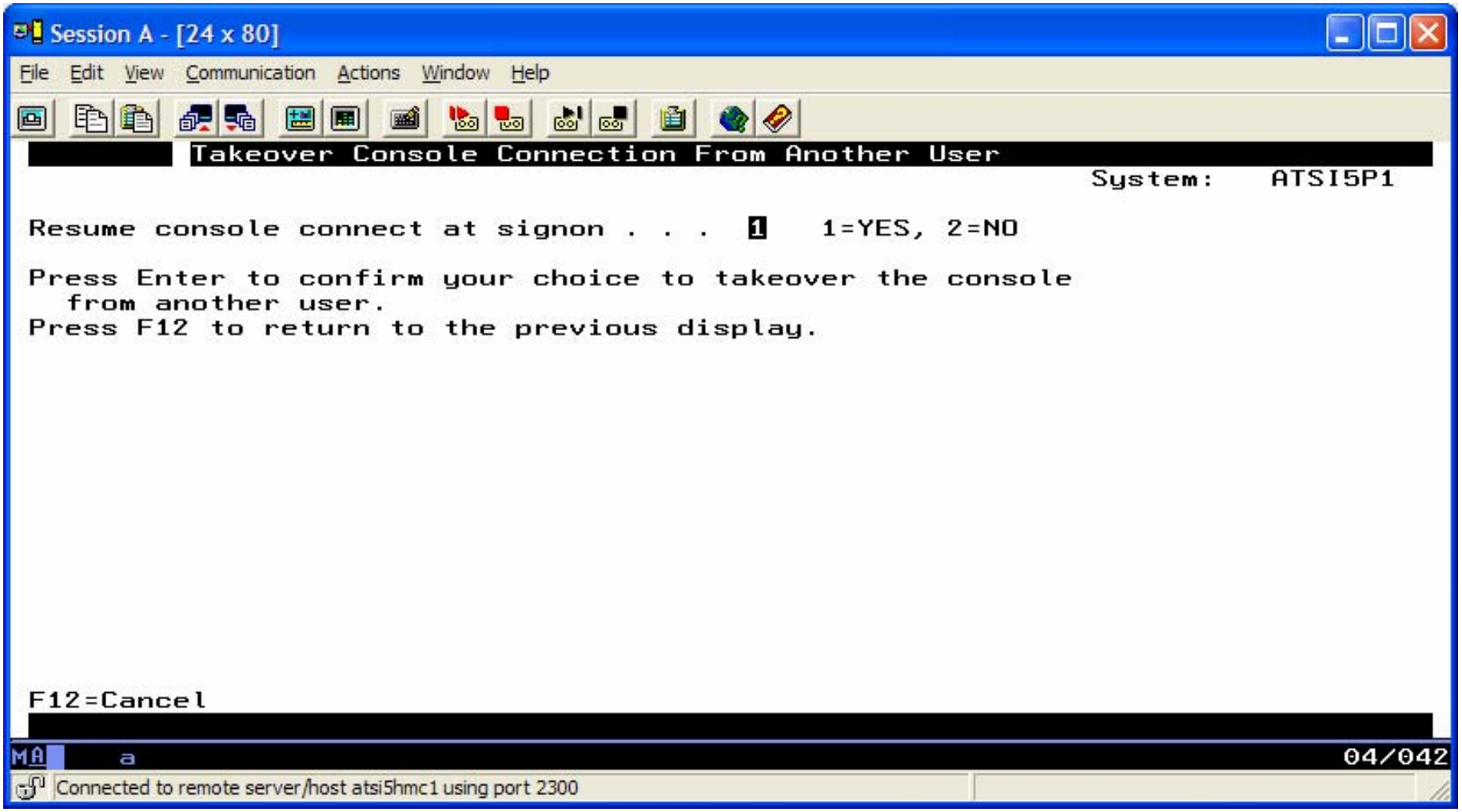
Remote 5250 Console thru the HMC via PCOMM



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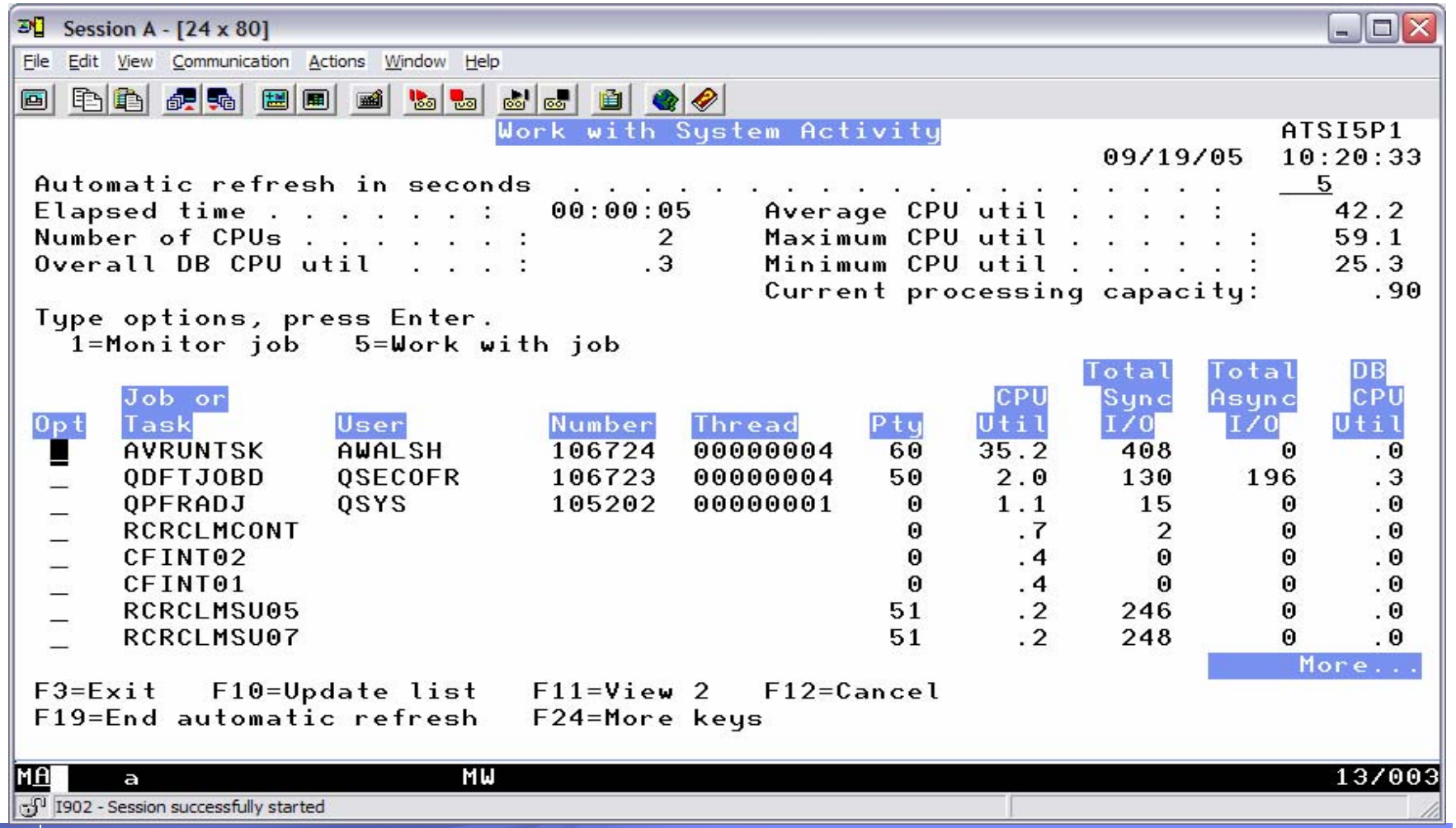
Connection to the HMC i5/OS console session completed.

This screen will reflect the state of the ‘console’ session at this point in time.



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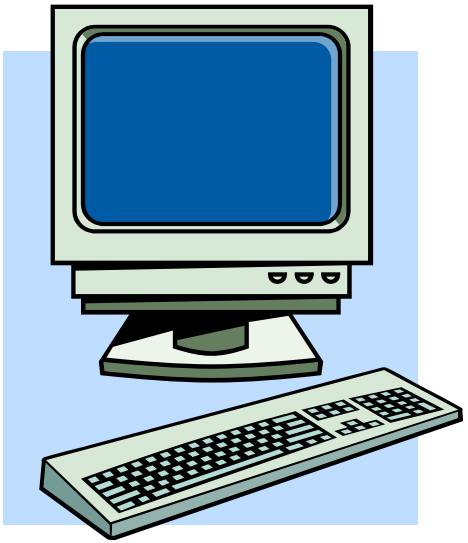
i5/OS Console Choices

Types of consoles that can be used to control i5/OS on i5:

1. Twinax terminal
2. Operations Console direct-connect
3. Operations Console LAN-connect
4. Hardware Management Console (HMC)



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i5 Console Choices

Function	**Twinax**	**Op Console** (functions apply to pre-i5 and i5 unless specified	**HMC** (all functions are for i5 only)
Local 5250 access	Yes	Yes	Yes
Remote 5250 access	No	Yes	Yes (via passthru)
One console PC can manage many partitions/systems	No	Yes (LAN-only)	Yes
LPAR and CUoD managed with	No	Yes (pre-i5 only)	Yes
Graphical disk management available on	No	Via iSeries Navigator	No
Remote Control panel functions available	No	Yes (but no remote power on capability on i5)	Yes
Requires IOP and dedicated IOA	Yes	Yes	No
Supported via LAN	No	Yes	Yes
Customer has to install software on console	No	Yes	No

http://www-1.ibm.com/servers/eserver/iseries/literature/iSeriesi5consolepositioningpaperJune3004.pdf

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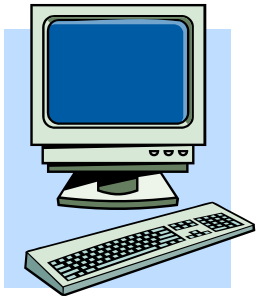
i5/OS Consoles

Ops Console LAN

- Cannot use the embedded Ethernet port
- Can not use dual Ethernet adapter (IOPless)



Model	Operations Console (on a network [LAN])		Operations Console (directly attached)		
	Supported LAN adapters	LAN adapter locations	Supported asynchronous adapters	Asynchronous adapter locations	Cable (part number)
520	**2744, 2838, 2849**	**C5 or C2**	**2742, 2793, 4745, 9771**	**C3**	**97H7557**
550	**2744, 2838, 2849**	**C4 (2)**	**2742, 2793, 4745, 9771**	**C2 (1)**	**97H7557**
570	**2744, 2838, 2849**	**C4 or C6**	**2742, 2793, 4745, 9771**	**C2**	**97H7557**
595	**2744, 2838, 2849**	**C4**	**2742, 2793, 4745, 9771**	**C2**	**97H7557**
(1) For Model 550, use C5 if an IXS is installed. **(2) For Model 550, there is no LAN or workstation support if an IXS is installed.**					

http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/info/iphbx/hardwarereq.htm

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i5/OS Consoles for the CEC

For LAN connectivity:

520

- Look for console in slot 5. If not there, look in slot 2 (which requires 2nd IOP)
- If customer wants an IXS, must put console on 2nd IOP

550

- Console must be in slot 4 (which requires a 2nd IOP)
- Only IXS or LAN console can be used, not both.
- If GX Adapter (for HSL) is needed, it must go in slot 5

570

- Look for console in slot 4 (which requires a 2nd IOP). If not there look in slot 6
- IXS can be put on the 2nd IOP in addition to console.
- If GX Adapter (for HSL) is needed, it must go in slot 6

595

- Console must be in slot C04
- Since HMC required, HMC can be used to set slot to whatever customer wants.

For twinax, same slots at LAN. Therefore no ability to have twinax be a backup for LAN. Async will have to be the backup.

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Information Centers

- **The eServer Hardware Info Center contains information on the POWER5 models...everything from planning for the hardware, installing the hardware (and the consoles), setting up partitioning and CoD, to servicing the hardware**
  - http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm
- **iSeries pre-POWER5 and OS/400 & i5/OS main web site for V4R5–V5R3**
  - http://www.ibm.com/eserver/iseries/infocenter
- **iSeries pre POWER5 and OS/400 V5R3 (i5/OS) direct link**
  - http://publib.boulder.ibm.com/infocenter/iseries/v5r3/ic2924/index.htm

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