

Remote Administration via Service Modules

HEPiX Spring 2008 – Stefan Haller

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HEP **iX**

Remote Administration via Service Modules

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- IPMI
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The well-known problem:
Administrator and server at different locations



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one possible solution: remote administration

available for different OS, e.g.

- ssh (telnet, rsh) for UNIX/Linux
- Remote Desktop for Windows

not bad, but still has some disadvantages:

- requires running operating system
- requires specific tools
- not suitable for changing BIOS settings, installing, or resetting

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another possible solution: IPMI service modules

requires additional hardware, but:

- independent from the operating system
- management possible even if the system is powered off
- needs only java-enabled browser
- allows changing BIOS settings, installing, or resetting

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IPMI = Intelligent Platform Management Interface

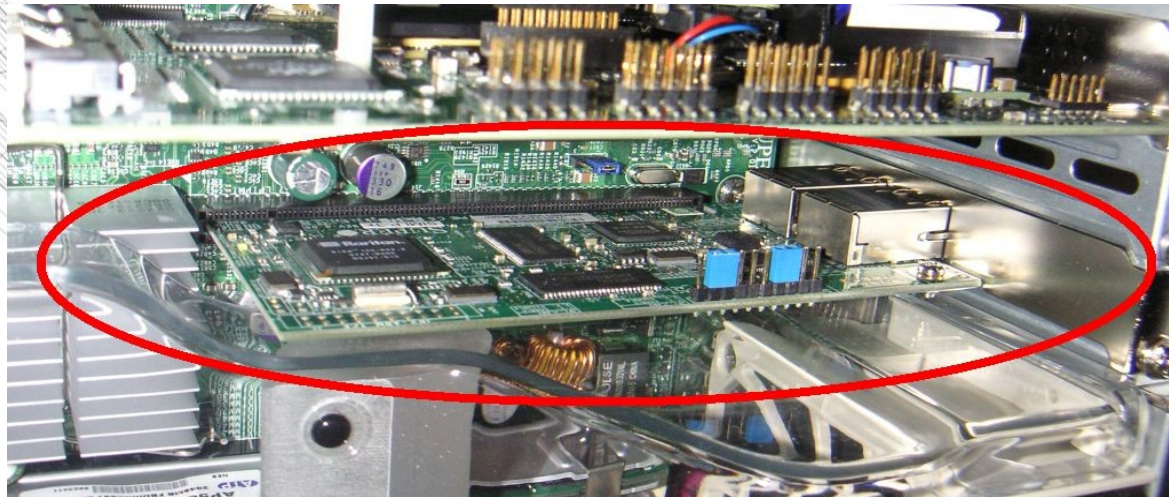
- specification of interfaces to computer hardware and firmware
- designed for managing and monitoring remote systems
- supports serial connection, LAN, and SOL
- alerting via SMTP possible
- created by Dell, HP, Intel, NEC 1998;
actual version 2.0 from Feb. 2004

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Baseboard Management Controller (BMC)

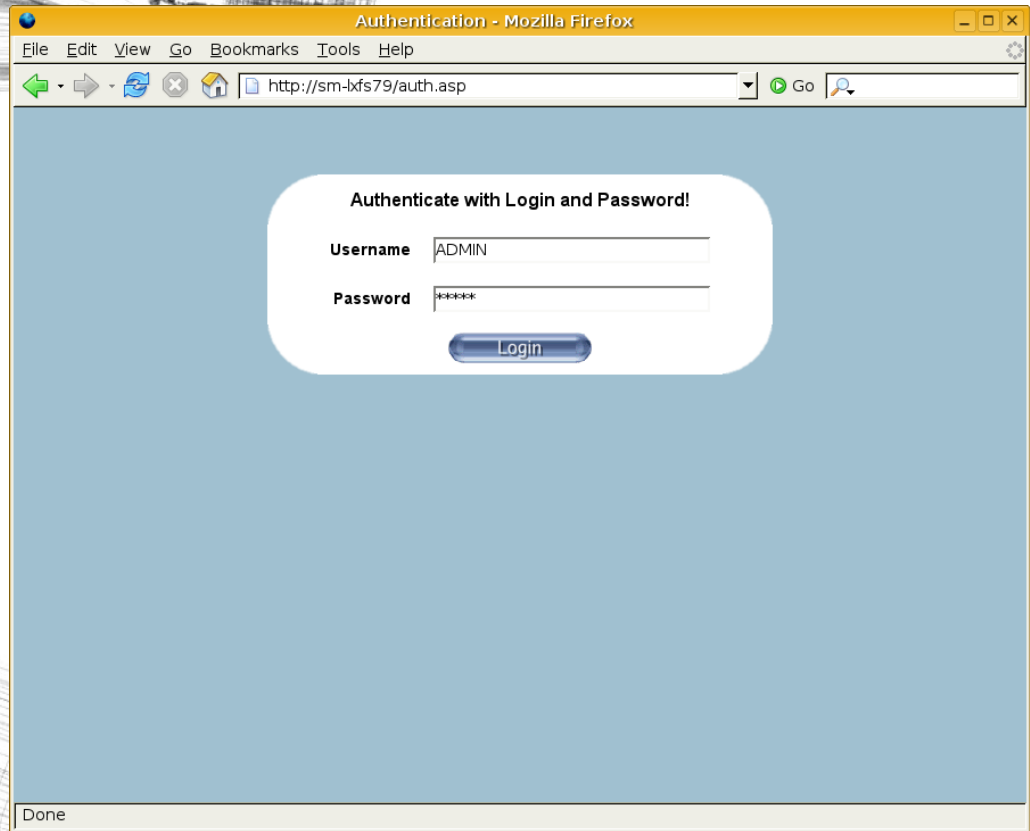
- Raritan KIRA 100 ARM-RISC-CPU 100 MHz
- embedded Linux OS
- dedicated 100 Mbit-LAN-Port
- connected to Intelligent Platform Management Bus (IPMB)



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- easy access via web frontend
- supports HTTP and HTTPS
- requires any Java-enabled browser



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Main Window

- some icons for quick access
- Menu list
- Remote Control for Console and Remote Power

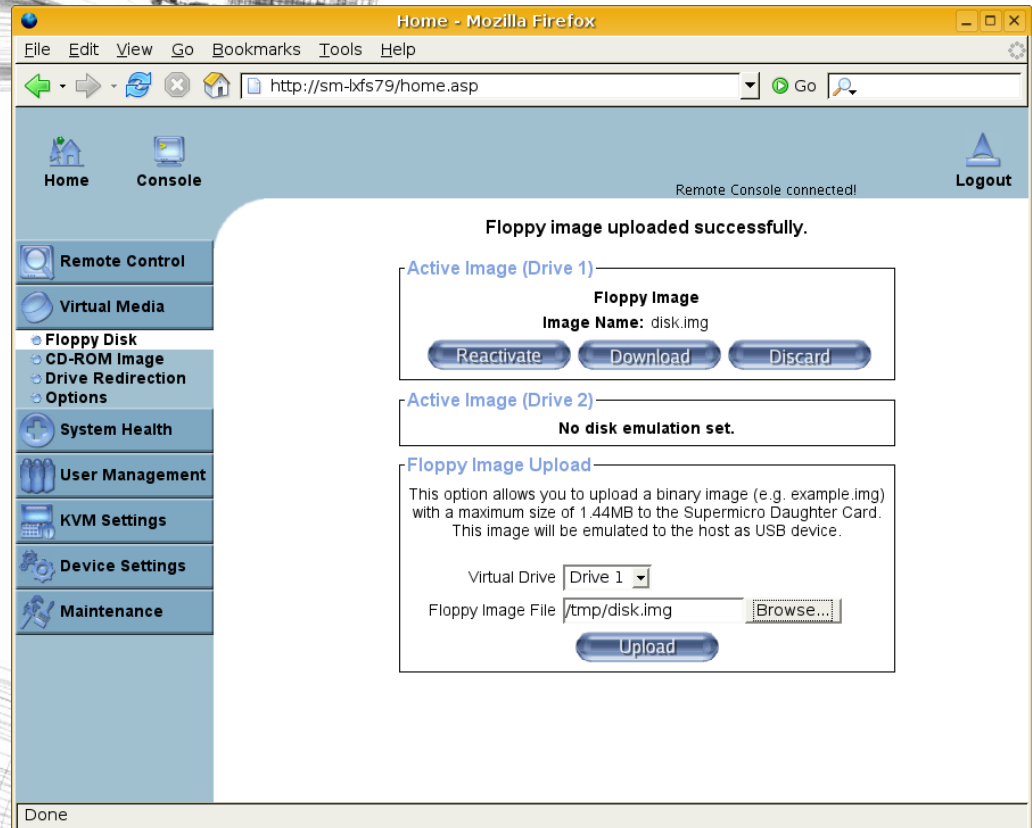
The screenshot shows a Mozilla Firefox browser window displaying a web-based remote administration interface. The browser's address bar shows the URL `http://sm-lxfs79/home.asp`. The interface has a blue header with navigation icons for Home and Console, and a status indicator that says "Remote Console connected!". On the left side, there is a vertical menu with the following items: Remote Control (with sub-items: KVM Console, SOL Console, Remote Power), Virtual Media, System Health, User Management, KVM Settings, Device Settings, and Maintenance. The main content area features a "Remote Console Preview" window with a "Click to open" button. The preview shows a terminal window with the Debian logo and system information: "Debian GNU/Linux 4.0 (lucid) tty2", "Lefz28 login: _", "Desktop size: 1024 x 768", and a "Refresh" button. Below the preview, there is a "Power Control via IPMI" section with three buttons: "Power On", "Power Down", and "Reset". The browser's status bar at the bottom shows the URL `http://sm-lxfs79/title_app.asp`.

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Virtual Media

- allows 2 floppy disks (image uploaded to service module)
- allows 2 CD-ROMs (image access via SMB share)
- available to the system as USB drives



The screenshot shows a Mozilla Firefox browser window displaying a web interface for remote administration. The address bar shows the URL `http://sm-lxfs79/home.asp`. The interface includes a navigation menu on the left with options: Home, Console, Remote Control, Virtual Media, Floppy Disk, CD-ROM Image, Drive Redirection, Options, System Health, User Management, KVM Settings, Device Settings, and Maintenance. The main content area displays a message: "Floppy image uploaded successfully." Below this, there are three sections: "Active Image (Drive 1)" showing a "Floppy Image" with "Image Name: disk.img" and buttons for "Reactivate", "Download", and "Discard"; "Active Image (Drive 2)" showing "No disk emulation set."; and "Floppy Image Upload" with a description: "This option allows you to upload a binary image (e.g. example.img) with a maximum size of 1.44MB to the Supermicro Daughter Card. This image will be emulated to the host as USB device." Below the description, there is a "Virtual Drive" dropdown menu set to "Drive 1", a "Floppy Image File" input field containing `/tmp/disk.img` and a "Browse..." button, and an "Upload" button.

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System Health

- Chassis Control for power status and power control buttons
- Monitor Sensors for temp, voltage, ...
- System Event Log for health events
- Alert Settings for SNMP

The screenshot shows a web browser window displaying a remote administration interface. The browser address bar shows the URL `http://sm-lxs79/home.asp`. The interface has a navigation menu on the left with options: Home, Console, Remote Control, Virtual Media, System Health, Chassis Control, Monitor Sensors, System Event Log, Alert Settings, User Management, KVM Settings, Device Settings, and Maintenance. The 'Monitor Sensors' section is active, displaying a table of sensor data. A 'Refresh' button is located at the bottom of the table.

Sensor Type	Sensor Name	Sensor Status	Sensor Reading
Temperature	CPU Temp 1	OK	32 degrees C
Temperature	CPU Temp 2	OK	36 degrees C
Temperature	CPU Temp 3	No reading	
Temperature	CPU Temp 4	No reading	
Temperature	Sys Temp	OK	37 degrees C
Voltage	CPU1 Vcore	OK	1.224 (+/- 0.004) Volts
Voltage	CPU2 Vcore	OK	1.176 (+/- 0.004) Volts
Voltage	3.3V	OK	3.296 Volts
Voltage	5V	OK	4.968 (+/- 0.012) Volts
Voltage	12V	OK	11.616 (+/- 0.048) Volts
Voltage	-12V	OK	-12.100 (+/- -0.050) Volts
Voltage	1.5V	OK	1.488 (+/- 0.008) Volts
Voltage	5VSB	OK	4.944 (+/- 0.012) Volts
Voltage	VBAT	OK	3.264 (+/- 0.008) Volts
Fan	Fan1	OK	6300 RPM
Fan	Fan2	OK	6400 RPM
Fan	Fan3	OK	6400 RPM
Fan	Fan4	Below lower non-recoverable...	0 RPM
Fan	Fan5	OK	5100 RPM
Fan	Fan6	OK	5000 RPM
Fan	Fan7/CPU1	Below lower non-recoverable ...	0 RPM
Fan	Fan8/CPU2	Below lower non-recoverable ...	0 RPM
Physical Security	Intrusion	General Chassis intrusion	
Power Supply	Power Supply	OK	
Module / Board	CPU0 Internal E	OK	
Module / Board	CPU1 Internal E	OK	
Module / Board	CPU Overheat	OK	
Module / Board	Thermal Trip0	OK	
Module / Board	Thermal Trip1	OK	

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User Management

- change user password
- manage users and groups
- set permissions for users (by default taken from group membership)

The screenshot displays a web browser window titled "Home - Mozilla Firefox" with the address bar showing "http://sm-lxs79/home.asp". The page features a navigation menu on the left with options: Home, Console, Remote Control, Virtual Media, System Health, User Management (selected), Change Password, Users & Groups, Permissions, KVM Settings, Device Settings, and Maintenance. The main content area is titled "User Management" and includes a "Logout" button in the top right. The "User Management" section contains a "Lookup" button and a "New user name" field with the value "ADMIN". Below this are fields for "Full user name" (Administrator), "Password", "Confirm Password", "Email address", and "Mobile number". The "Group membership" section has a "Member of" list (empty) and a "Not Member of" list containing "ipmi_administrator", "supergroup", and "ipmi_user". The "IPMI Privilege Level" is set to "Administrator". At the bottom of this section are buttons for "Create", "Modify", "Copy", and "Delete". The "Group Management" section below it has an "Existing groups" dropdown (set to "--- select ---") and a "New group name" field, with "Create", "Modify", "Copy", and "Delete" buttons at the bottom. The status bar at the very bottom shows "Done".

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KVM Settings

individual tuning for each user, e.g.

- data compression for slow networks
- key combinations as Hotkeys
- keyboard and mouse settings

The screenshot shows a web browser window titled "Home - Mozilla Firefox" with the address bar displaying "http://sm-lfs79/home.asp". The page content is organized into several sections:

- Remote Console Settings for User:** A red warning message states, "The settings on this page are user specific. Changes you make here will affect the selected user only." Below this is a dropdown menu set to "ADMIN" and an "Update" button.
- Transmission Encoding:** A section with radio buttons for "Automatic Detection" (selected) and "Manually". A dropdown menu for "Network speed" is open, showing options: "LAN (high color)", "Video Optimized", "Video Optimized (high color)", "LAN (high color)" (highlighted), "LAN", "DSL", "UMTS", and "ISDN 128k".
- Remote Console Type:** Radio buttons for "Default Java" (selected) and "Sun Microsystems". A dropdown menu for "Default Java" is open, showing options: "ISDN/Modem V.90", "GPRS/HSCSD", and "GSM Modem". A red warning message below states, "If you do not have the Java Browser Plugin already installed on your system, this option will cause downloading of around 11 MByte Plugin code. The Plugin will enable extended Remote Console functionality."
- Miscellaneous Remote Console Settings:** Two checkboxes: "Start in Monitor Mode" and "Start in Exclusive Access Mode", both of which are unchecked.

The left sidebar contains navigation links: Home, Console, Remote Control, Virtual Media, System Health, User Management, KVM Settings, User Console, Keyboard/Mouse, Device Settings, and Maintenance. The status bar at the bottom of the browser window shows "Done".

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Device Settings (1)

- network settings like static or dynamic IP address
- ports for HTTP and HTTPS
- LAN interface parameters
- Dynamic DNS via dyndns.org

The screenshot shows a web browser window titled "Home - Mozilla Firefox" with the address bar displaying "http://sm-lfs79/home.asp". The page content is organized into several sections:

- Navigation:** Home, Console, Remote Console connected!, Logout.
- Left Sidebar (Device Settings):**
 - Remote Control
 - Virtual Media
 - System Health
 - User Management
 - KVM Settings
 - Device Settings
 - Network
 - Dynamic DNS
 - Security
 - Date/Time
 - Event Log
 - Maintenance
- Network Basic Settings:**
 - IP auto configuration: DHCP (selected)
 - Preferred host name (DHCP only): None
 - IP address: [text input]
 - Subnet mask: 255.255.0.0
 - Gateway IP address: 10.6.0.1
 - Primary DNS server IP address: 10.6.0.2
 - Secondary DNS server IP address: [text input]
- Network Miscellaneous Settings:**
 - Remote Console & HTTPS port: 443
 - HTTP port: 80
 - Bandwidth Limit: [text input] kbit/s
 - Disable Setup Protocol
- LAN Interface Settings:**
 - Current LAN interface parameters: autonegotiation on, 100 Mbps, full duplex, link ok
 - LAN interface speed: Autodetect
 - LAN interface duplex mode: Autodetect
- Buttons:** Apply, Reset to defaults
- Footnote:** * Stored value is equal to the default.

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Network Settings (2)

- many security features like data encryption, IP access control, or user blocking
- Date/Time
- Event Log targets (local, NFS, SMTP, SNMP) and event selection

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- Encryption Settings:** Includes a checkbox for "Force HTTPS for Web access" and a "KVM Encryption" dropdown menu with options: Off, Try, Force.
- IP Access Control:** Includes a warning message: "Please note: 'Apply' is required, or changes will be lost." and a checkbox for "Enable IP Access Control". Below this is a "Default policy" dropdown menu set to "ACCEPT". A table lists a single rule:

Rule #	IP/Mask	Policy
1	10.6.10.6/32	ACCEPT

Buttons for "Append", "Insert", "Replace", and "Delete" are located below the table. Below the table is a "User Blocking" section with input fields for "Max. number of failed logins" and "Block time (minutes)", both with "(empty for infinite)" as a hint. "Apply" and "Reset to defaults" buttons are at the bottom of this section. A note states: "* Stored value is equal to the default."

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Maintenance

- get device information like IP, MAC, firmware, ...
- view event log (default 20 entries per page)
- update firmware
- reset unit

Home - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://sm-lfs79/home.asp

Home Console Remote Console connected! Logout

Remote Control

Virtual Media

System Health

User Management

KVM Settings

Device Settings

Maintenance

Device Information

Event Log

Update Firmware

Unit Reset

Event Log

[Prev] [Next]

Date	Event	Description
04/30/2008 15:19:29	Remote Console	Connection to client 140.181.85.59 closed.
04/30/2008 15:19:27	Remote Console	Connection to client 140.181.85.59 established.
04/30/2008 15:19:14	Remote Console	Connection to client 140.181.85.59 closed.
04/30/2008 15:19:12	Remote Console	Connection to client 140.181.85.59 established.
04/30/2008 15:19:06	Remote Console	Connection to client 140.181.85.59 closed.
04/30/2008 15:18:19	Remote Console	Connection to client 140.181.85.59 established.
04/30/2008 15:18:02	Authentication	User 'ADMIN' logged in from IP address 140.181.85.59
04/29/2008 17:15:28	Remote Console	Connection to client 140.181.85.59 closed.
04/29/2008 17:01:20	Remote Console	Connection to client 140.181.94.210 closed.
04/29/2008 16:35:40	Remote Console	Connection to client 140.181.85.59 established.
04/29/2008 16:35:34	Remote Console	Connection to client 140.181.85.59 closed.
04/29/2008 16:23:49	Remote Console	Connection to client 140.181.94.210 established.
04/29/2008 16:23:06	Authentication	User 'ADMIN' logged in from IP address 140.181.94.210
04/29/2008 16:22:50	Authentication	User 'ADMIN' failed to log in from IP address 140.181.94.210
04/29/2008 16:14:42	Remote Console	Connection to client 140.181.85.59 established.
04/29/2008 14:53:38	Authentication	User 'ADMIN' logged in from IP address 140.181.85.59
04/29/2008 14:53:30	Remote Console	Connection to client 140.181.85.59 closed.
04/29/2008 14:50:33	Remote Console	Connection to client 140.181.85.59 established.
04/29/2008 14:50:20	Authentication	User 'hurga' logged in from IP address 140.181.85.59
04/29/2008 14:49:48	Remote Console	Connection to client 140.181.85.59 closed.

[Prev] [Next]

Done

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Remote Console

- access via icon or link “click to open”
- starts Java applet
- allows connection to the system before booting, e.g. to manipulate BIOS

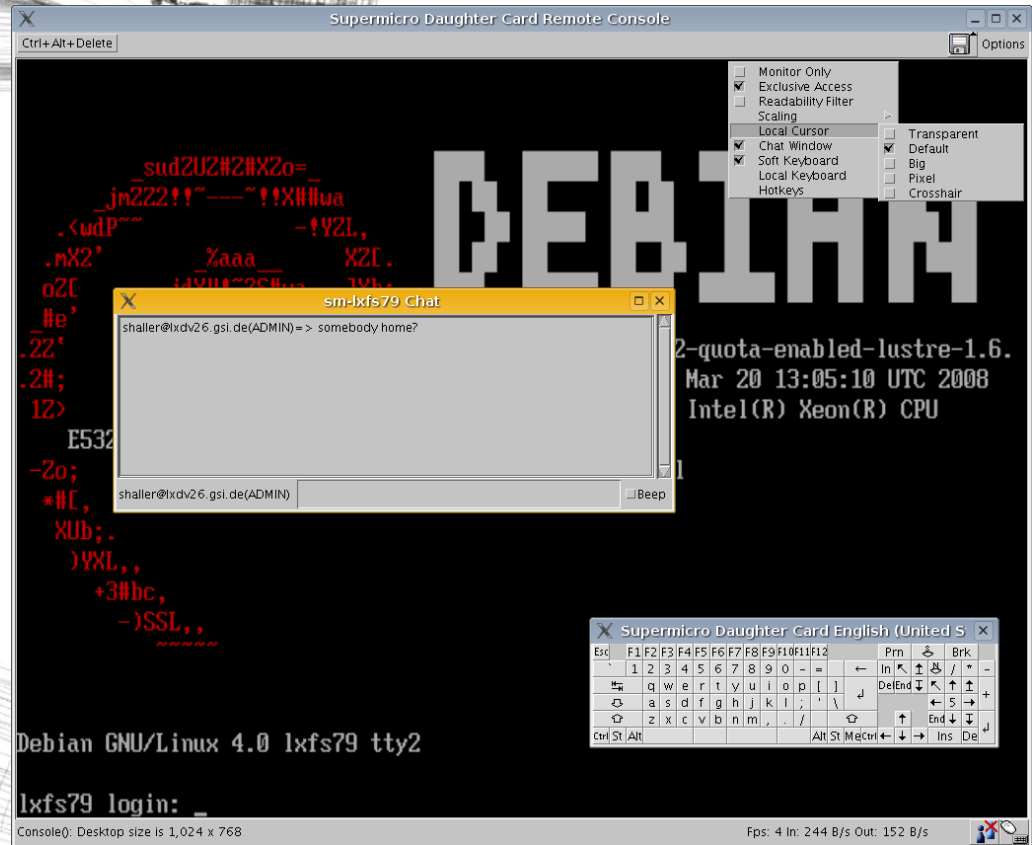


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Console Options

- Monitor Only
- Exclusive Access
- Readability Filter/Scaling
- Local Cursor
- Chat Window
- Soft Keyboard
- Local Keyboard
- Hotkeys



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Command line tools for IPMI

actual implementations:

- OpenIPMI (kernel drivers etc.)
- IPMItool (command line frontend)

useful for:

- non-interactive access (scripting)
- low network bandwidth (modem, ISDN)

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IPMItool

- open source command-line interface to IPMI-enabled devices (IPMIv1.5/v2.0 LAN interface or Linux/Solaris kernel driver)
- homepage <http://ipmitool.sourceforge.net>
- latest version 1.8.9 dated 2007-03-06
- pre-compiled packages available for many Linux distributions

Example 1: local power off

```
ipmitool -I open chassis power off
```


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Example 2: sensor readings as CSV list

```
ipmitool -I lan -H 10.6.101.1 -U ADMIN -c sdr list
```

Password:

...

```
CPU Temp 1,32,degrees C,ok
```

```
CPU Temp 2,36,degrees C,ok
```

```
CPU Temp 3,, ,ok
```

```
CPU Temp 4,, ,ok
```

```
Sys Temp,37,degrees C,ok
```

```
CPU1 Vcore,1.232,Volts,ok
```

```
CPU2 Vcore,1.176,Volts,ok
```

...

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Example 3: view LAN settings

```
ipmitool -I lan -H 10.6.101.1 -U ADMIN lan print 0x1
```

Password:

...

```
IP Address Source      : DHCP Address
IP Address             : 10.6.101.1
Subnet Mask            : 255.255.0.0
MAC Address            : 00:30:48:91:ae:6a
```

...

for more details try `man ipmitool`

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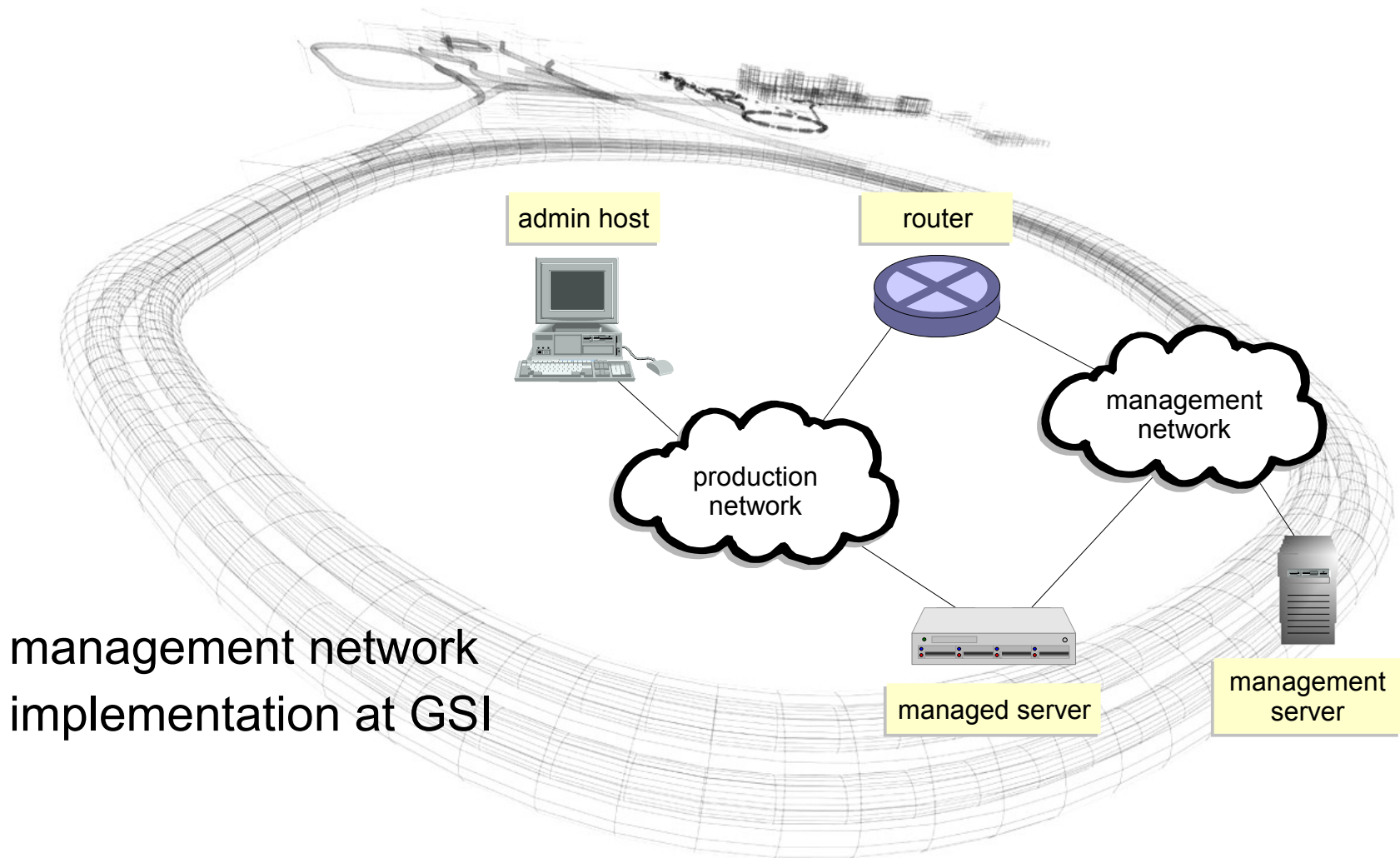
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Implementation at GSI Darmstadt

- separated VLAN 10.6.0.0/16;
internal access via router
- own DNS/DHCP-Server for subdomain;
only static IP addresses
- configuration files for DNS and DHCP generated on demand by
shell script from data list
- MAC addresses of service modules supplied by hardware
vendor

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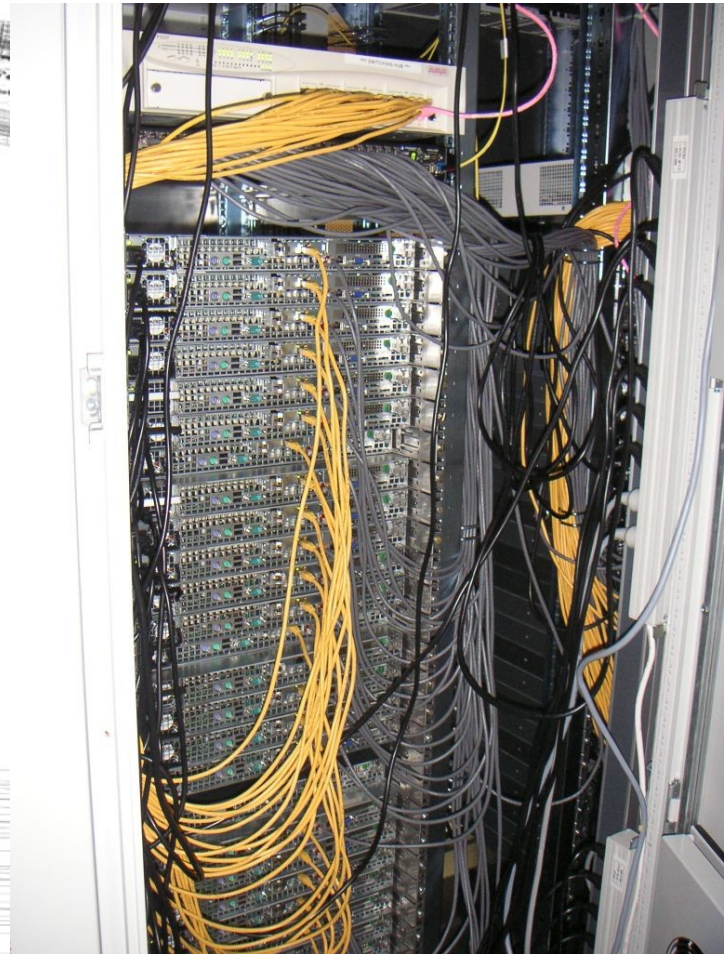
management network
implementation at GSI

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Example with compute servers

- since bandwidth is 100 Mbit/s no high-end network components are necessary
- yellow ethernet cables for easy differentiation from productive network



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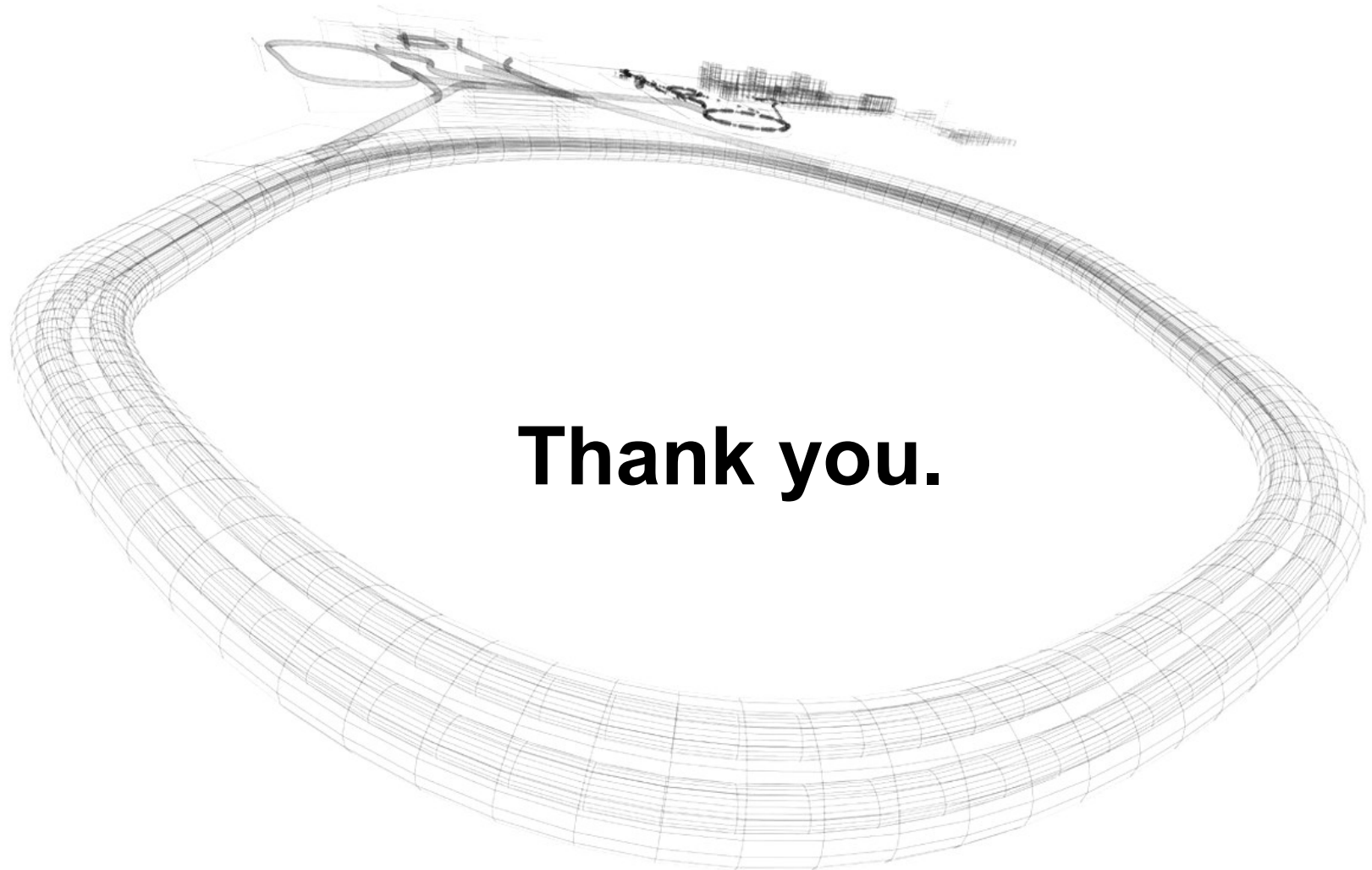
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Conclusion

- cheap and easy solution for remote management
- access independent of OS or power state
- comfortable web frontend with many features
- command line tools for scripting
- saves administrator's soles

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Thank you.