MTCA Tutorial:
Use of Management Functions

Follow on of “How to setting up Tutorial” of 1st Workshop

Follow on of “Configuring and Maintaining” of 2nd Workshop

ONE TECHNOLOGY MULTIPLE SOLUTIONS

Dipl. Ing. Vollrath Dirksen
vollrath@nateurope.com

Tutorial about MicroTCA.4
Agenda

- About N.A.T.
- MicroTCA.4 standard and Webpage mtca.eu
- System start of MicroTCA.4 system
- Analysis remotely: inventory, current, revision
  - Command Line Interface
  - NATView
  - Web interface
- Configuration
- Firmware update
- PCIexpress
  - Clustering
  - Hot Plug (hand over to next presentation)

About N.A.T.

Network and Automation Technology

- Founded in 1990, privately owned
- Hard- and Software design and manufacturing
- Focus on innovation in communication
- international and worldwide operations
- Headquarters

  Konrad-Zuse-Platz 9

  53227 Bonn

  Germany

- Instructors:
  - Dipl. Ing. Vollrath Dirksen, vollrath@nateurope.com
  - Dipl. Phys. Heiko Körte, heiko@nateurope.com

Innovation in Communication

N.A.T.

The brain of your MTCA.4 system

Higher bandwidth for Physics: the new NAT-MCH-PHYS80

Key features

- x16 PCIe Gen3 uplink at front panel
- 128Gbps link to local CPU/root complex
- special low latency and low jitter CLK module
- fully user accessible quad core Intel (R) Core i7
- new RTM for LLRF backplane
- complete product line

Let Your **Application** benefit

The brain of your MTCA system read more ...

The power of your MTCA system
read more ...

The brain of your MTCA system
read more ...

The QorIQ-Family
read more ...

Board Level Products

System Solutions

Upcoming Events

- **MTCA Workshop at DESY**
  Dec. 10th - 11th, 2014, Hamburg
- **Embedded Software Engineering Congress**
  Dec. 1st - 5th, 2014
- **IEEE RTC 2014**
  May 25th - 30th, Nara, Japan

Latest News

- **HARTING Plug for AMC/MCH stays available**
  ITB takes over product line from HARTING
- **NAT-MCH firmware v2.15 and NATview v2.13**
  New versions of firmware and GUI available
- **NAT-MCH-PHYS80**
  New MCH for Physics with special CLK and new PCIe Gen3 switch
- **N.A.T. acquired assets of former MicroBlade**
  New home for MicroBlade technology

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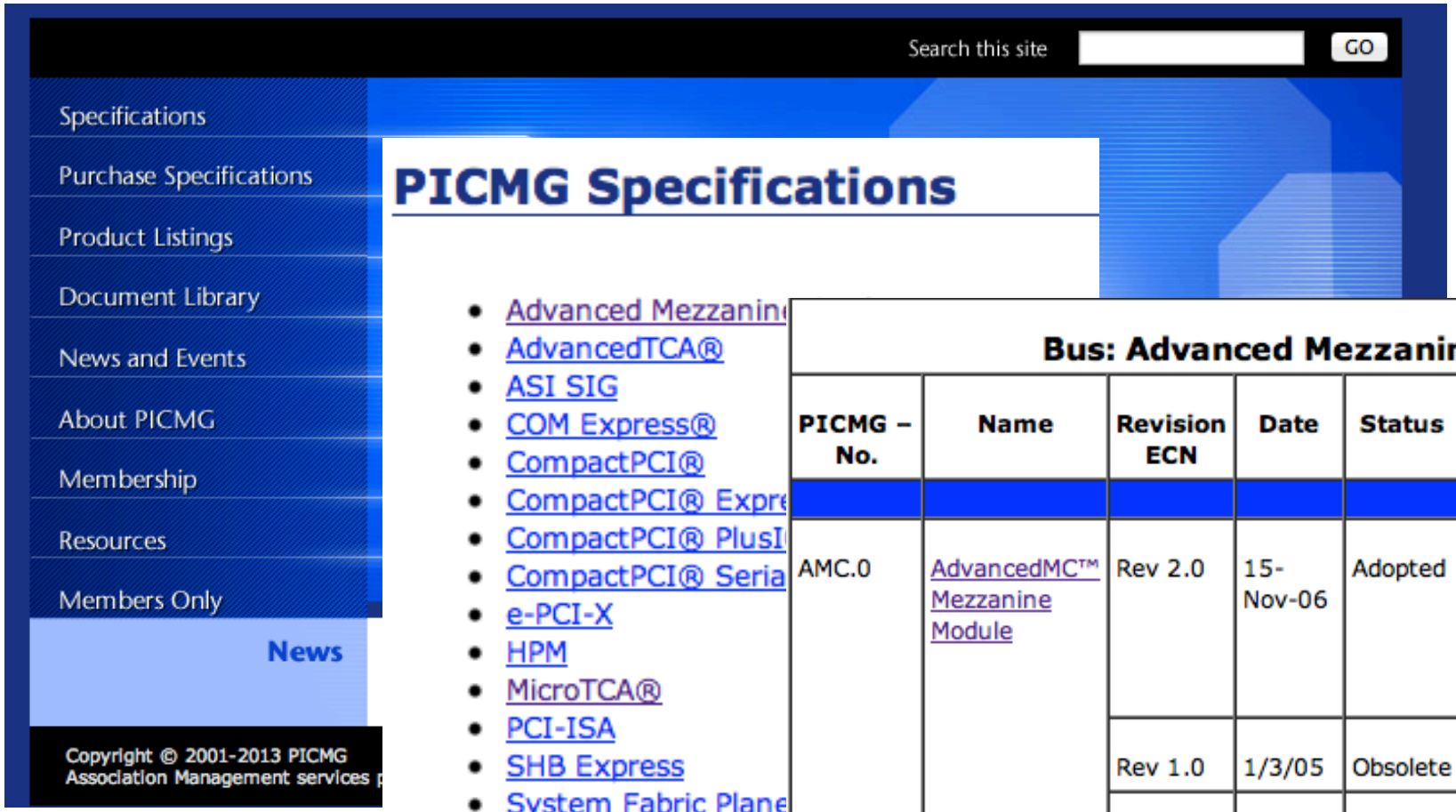
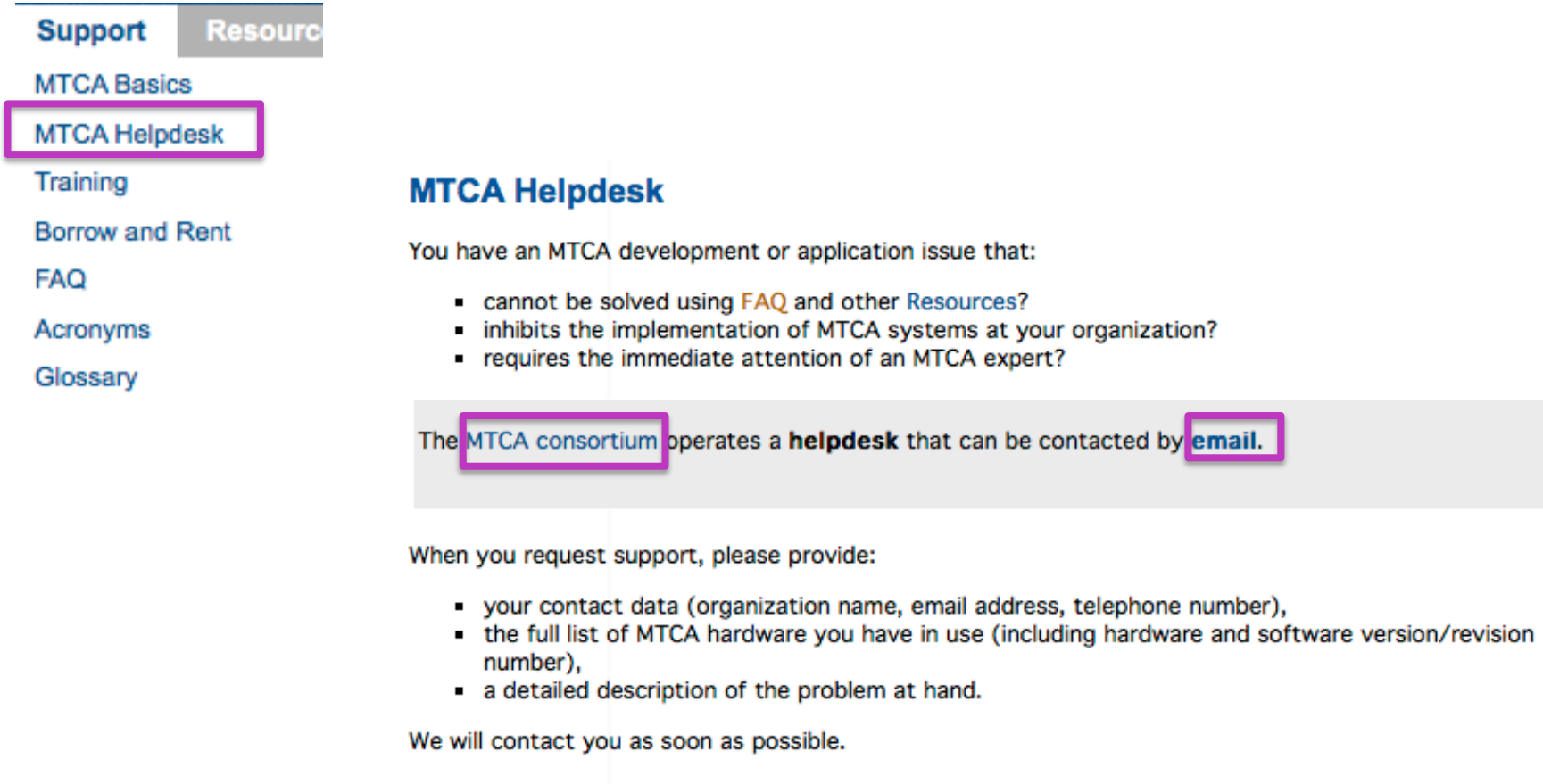
Open Standard MTCA
www.picmg.org




Medical
Test and Measurement
Communication
Control
Automation
Aerospace
Accelerator
Transportation
N.A.T.
Let Your Application benefit
www.nateurope.com

mtca.eu
mtca.desy.de

mtca.eu
Support: mtca-helpdesk@desy.de



Support | Resourc

- MTCA Basics
- MTCA Helpdesk
- Training
- Borrow and Rent
- FAQ
- Acronyms
- Glossary

MTCA Helpdesk

You have an MTCA development or application issue that:

- cannot be solved using FAQ and other Resources?
- inhibits the implementation of MTCA systems at your organization?
- requires the immediate attention of an MTCA expert?

The MTCA consortium operates a **helpdesk** that can be contacted by **email**.

When you request support, please provide:

- your contact data (organization name, email address, telephone number),
- the full list of MTCA hardware you have in use (including hardware and software version/revision number),
- a detailed description of the problem at hand.

We will contact you as soon as possible.

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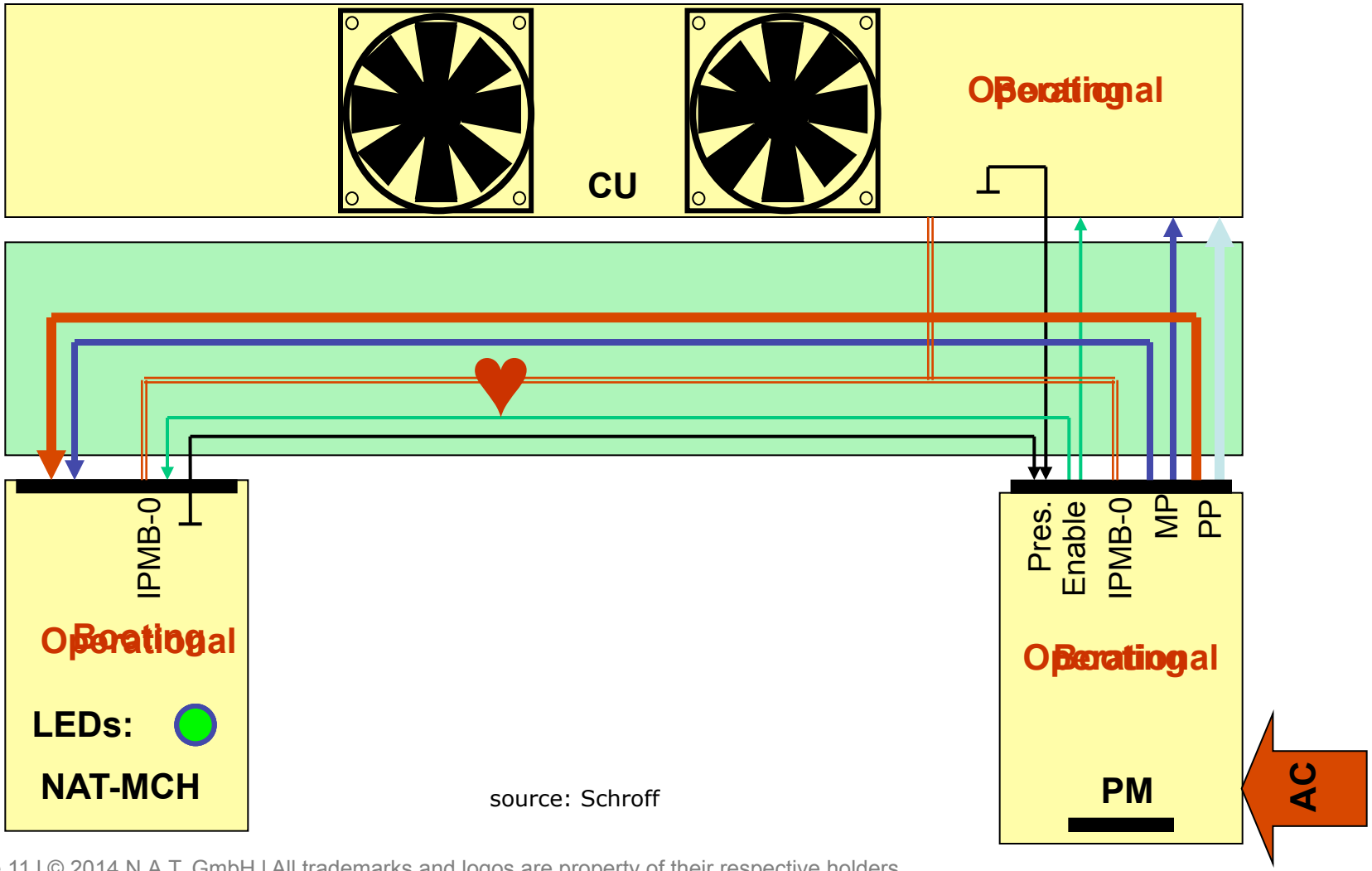
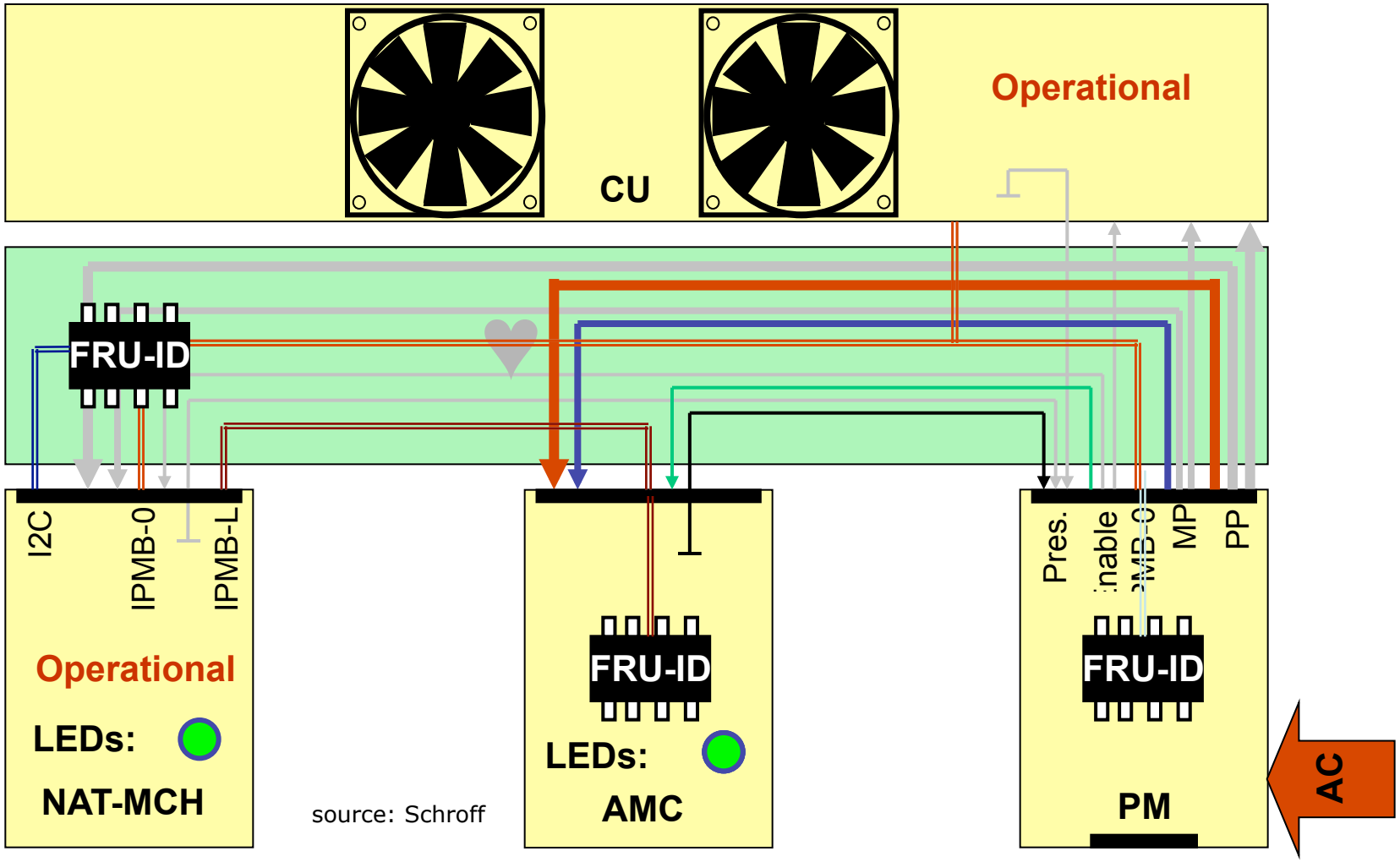
MTCA Tutorial: Configuring and Maintaining
Enabling the Management Plane



source: Schroff

MTCA Tutorial: Configuring and Maintaining
Enabling the Management Plane

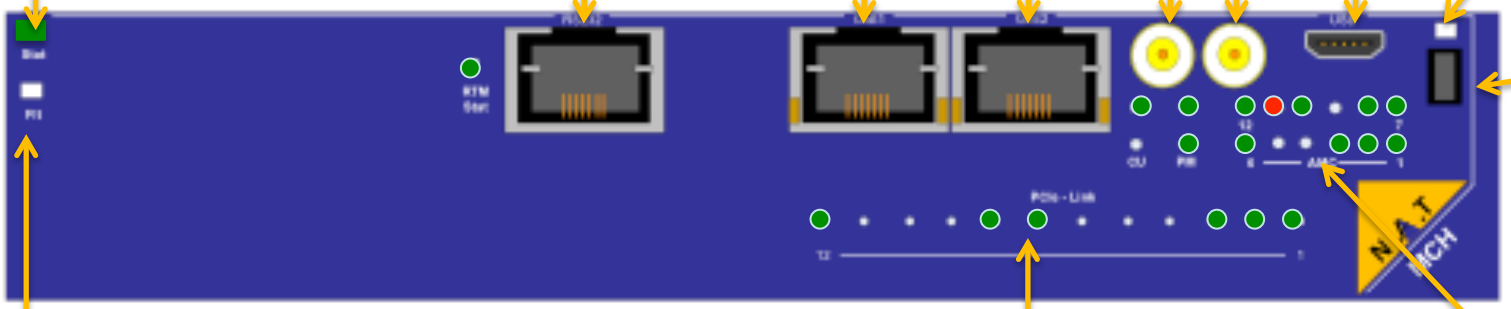


MCH MicroTCA Carrier Hub
NAT-MCH-PHYS

STAT
Primary/Secondary LED

RS232 GbE1 GbE2 CLK1&2 USB Blue LED

Hot-Swap Hdl

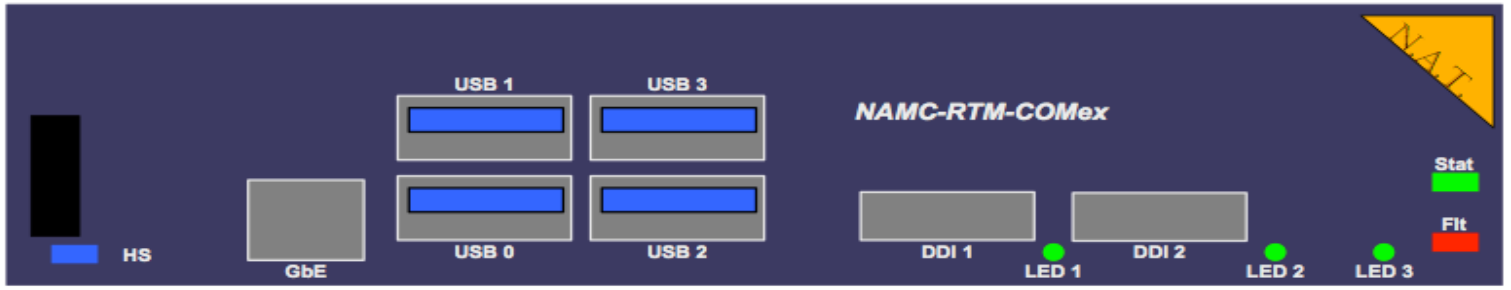


FLT
Red LED =Fault

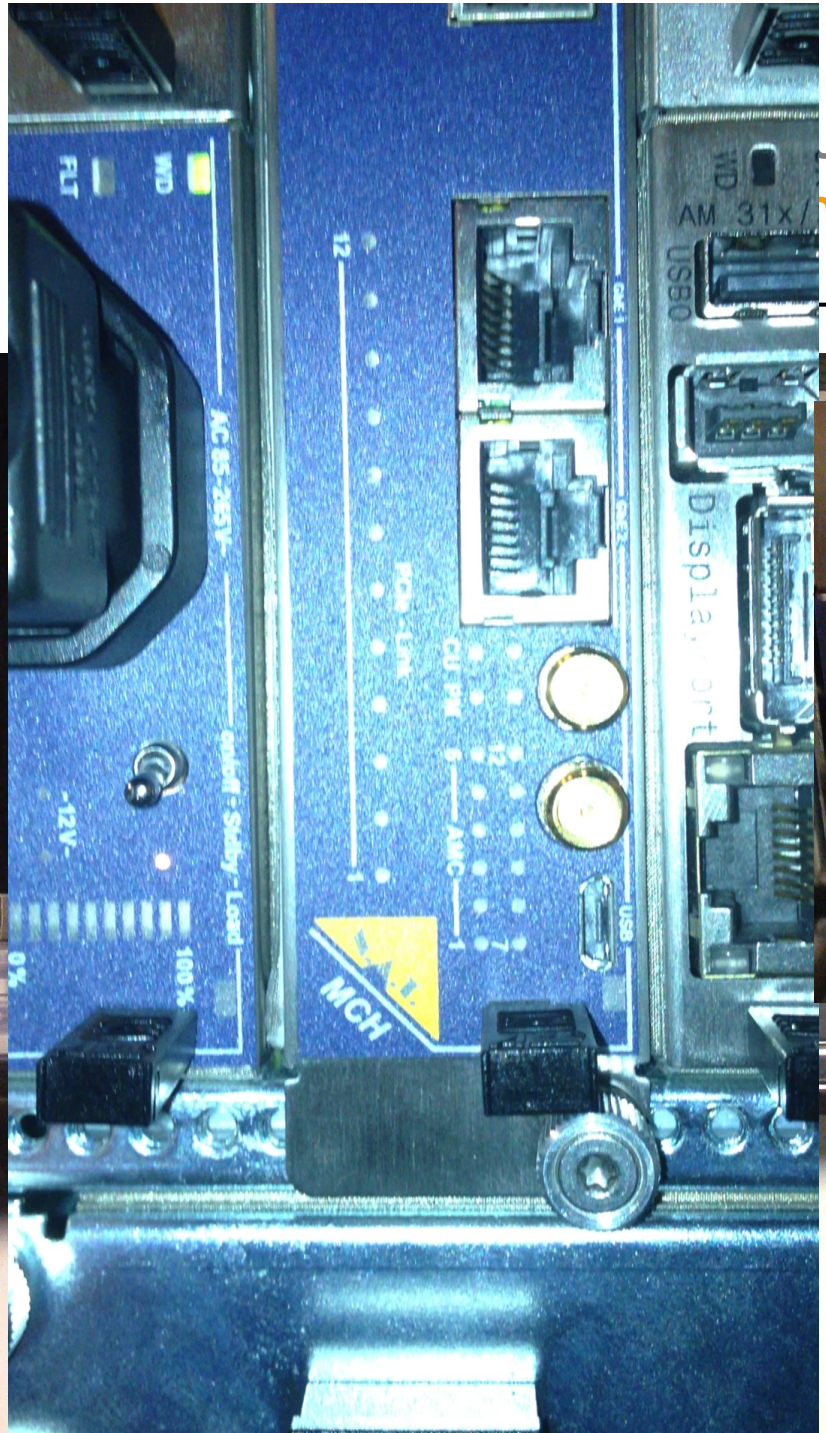
<u>PCIexpress Status and Speed LEDs:</u>

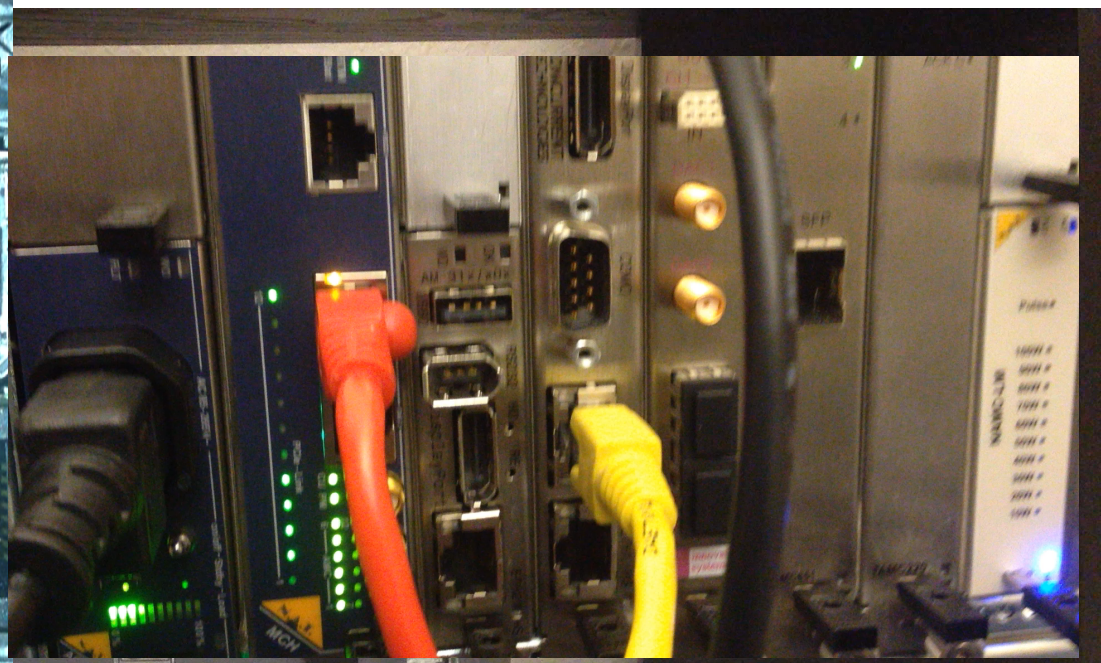
off	no PCIe link active
on	PCIe-Gen3 link active
fast flashing	PCIe-Gen2 link active
slow flashing	PCIe-Gen1 link active

<u>FRU Status LEDs:</u>
AMC 1-12
CU 1, 2
PM 1, 2



uring and Maintaining
nent Plane





IPMI-Bus (IPMB) in MTCA:
Technical Concept - Management

IPMB-L

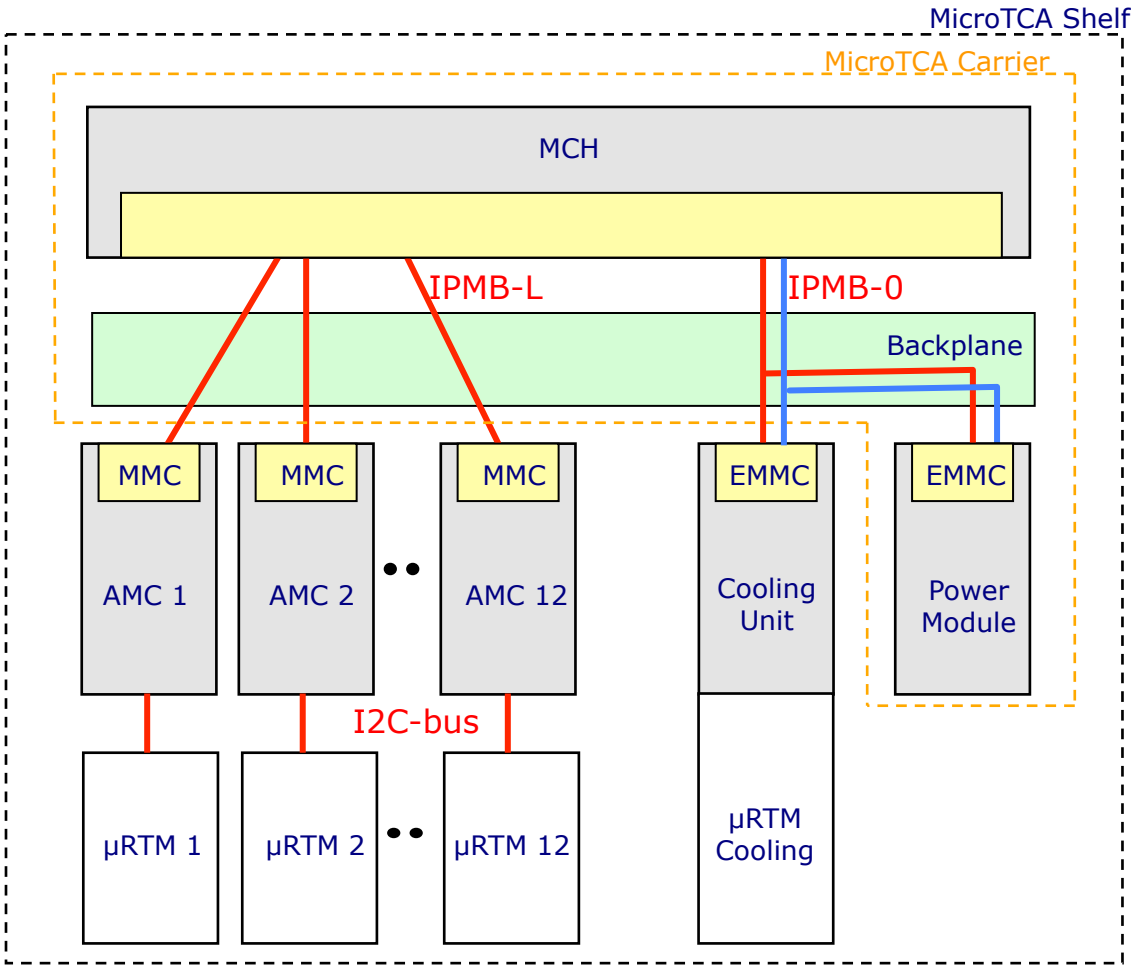
- **I**ntelligent **P**latform **M**anagement **B**us **L**ocal
- Connects the MCMC on the MCH to the MMC on the AMC Modules
- Radial architecture

IPMB-0

- IPMB**-0**, divided into redundant IPMB-A and IPMB-B
- Connects the MCMC on the MCH to the EMMC on the PM and CU
- Bused architecture

I2C-bus

- Connects the AMC to the µRTM
- The µRTM is treated as managed FRU of the AMC



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Your Maintenance Tools
NAT-MCH-CLI, Web-Interface, NATView, ipmitool

- **Examples of command line interface (CLI) commands:**

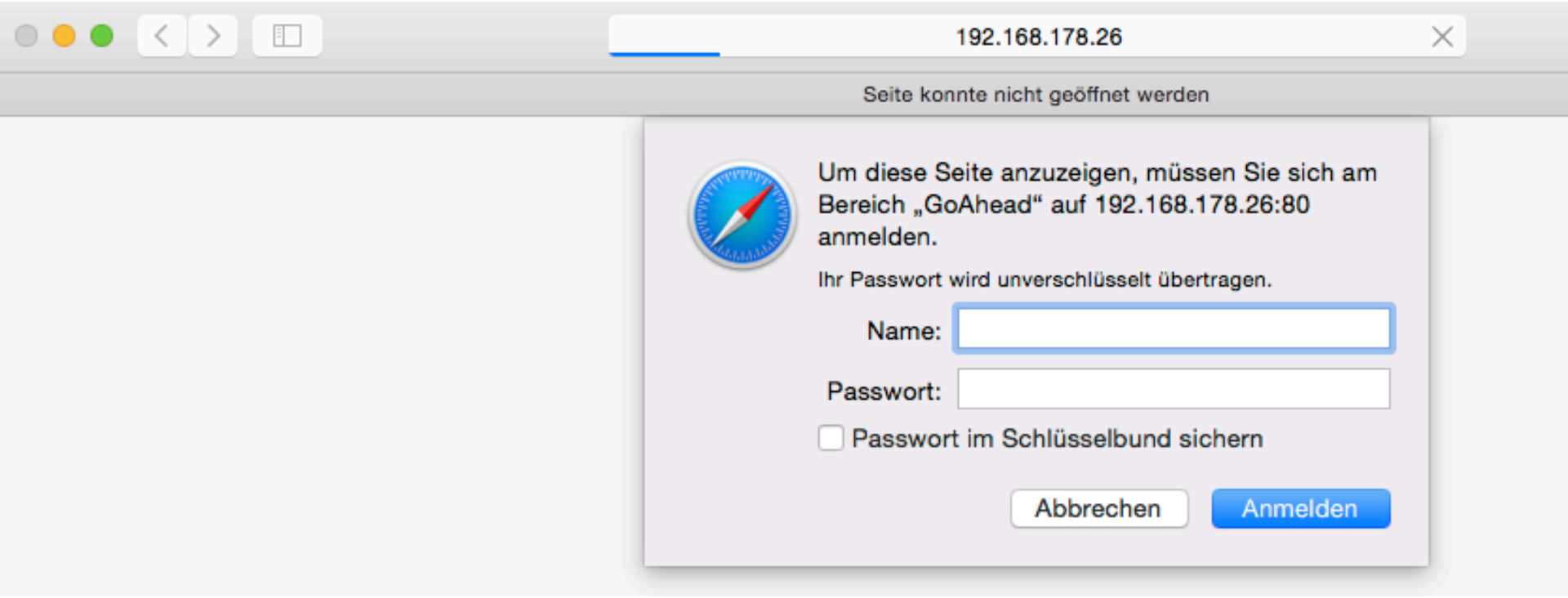
- `idb_info` - Print IPMI data base information
- `imsg_info` - IPMI message information
- `lshm_info` - Print local ShM information
- `sdrrep_info` - SDR repository information
- `sel_info` - System Event Log information
- `session_info` – Status of currently active Sessions
- **`show_ekey` - Show all activated connections**
- **`show_fru` - Show all FRUs**
- **`show_fruinfo` - fru_id FRU contents**
- **`show_cu` - Show cooling unit**
- **`show_pm` - Power Module Status**
- `show_sensorinfo` - Show sensors for FRU
- `version` - Print firmware version information
- `ni` - Print network configuration
- **`history`**

Login into Remote System

- Ethernet
  - ssh to CPU
  - telnet to MCH
  - Webbrowser
    - to MCH

```
VollrathsAir10:~ vd$ ssh nat@192.168.178.47
nat@NAT-MCH-RTM-I7:~$ telnet 192.168.178.26

or

VollrathsAir10:~ vd$ ssh nat@NAT-MCH-RTM-I7
nat@NAT-MCH-RTM-I7:~$ telnet MTCA4TRAINING
nat> show_fru

Or

VollrathsAir10:~ vd$ telnet MTCA4TRAINING
nat> show_fru


VollrathsAir10:~ vd$ safari MTCA4TRAINING
```


Login into Remote System



- Webbrowser
  - to MCH

NAT-MCH by N.A.T.

Setup

Base Configuration
Switch BASE 1GbE
- Age Time
- Port on/off
- Port VLAN
- 802.1Q VLAN
- 802.1X
- 802.1p
- Port Mirroring
- Jumbo Frame
- Link Aggregation
- Rapid Spanning Tree
- Link Status
- BCM5396 counters
- Configure PCIe Virtual Switches

Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

Welcome to the HTML based NAT-MCH configuration tool.

Setup Functions:

Base Configuration:	- Changes Base Configuration.
Age Time:	- MAC Table setup: set the aging of the MAC Table Entries.
Port VLAN:	- Port based VLAN setup and port enable/disable.
802.1Q VLAN:	- 802.1Q VLAN setup.
802.1X:	- 802.1X security setup.
802.1p:	- 802.1p Quality of Service setup.
Port Mirroring:	- Mirroring of the inbound and outbound traffic on a port
Jumbo frames:	- Support of the Jumbo frames on a port
Link Aggregation:	- Support of up to four the Link Aggregation groups
Rapid Spanning	- Support of the Rapid Spanning Tree by 1GbE-Switch
IGMP Snooping	- Support of the IGMP Snooping by 10GbE-Switch (FM4000 only)
Link Status:	- Show the current status of the Ethernet links
Counter Statistic:	- Show the counter statistic of the Ethernet switch

Maintenance Functions:

Script Management:	- Backup/Restore settings to/from flash memory or file.
Board Information:	- Provides hardware information of this NAT-MCH.
System Information:	- Collect hardware information of this system.
Reboot NAT-MCH:	- Allows rebooting over the Web-Interface.
Update MCH:	- Allows updating several components over the Web-Interface.
Change/Reset Password:	- Allows changing or reseting of the MCH Password over the Web-Interface.
N.A.T. Webpage:	- Opens the N.A.T. webpage in a new browser window.
Home:	- Shows this page.

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NAT-MCH:
Command Line Interface

- **show_ekey - Show all activated connections**
- **show_fru - Show all FRUs**
- **show_fruinfo -** fru_id **FRU contents**
- **show_cu - Show cooling unit**
- **show_pm - Power Module Status**
- **show_sensorinfo** fru_id - **Show sensors for FRU**

MTCA.4 Debugging
Inventory

- show_fru

```
 FRU   Device   State   Name
=======================================
  0    MCH       M4     NMCH-CM
  3    mcmc1     M4     NAT-MCH-MCMC
  5    AMC1      M4     SIS8300
  6    AMC2      M4     SIS8300
  7    AMC3      M4     SIS8300
  8    AMC4      M4     TAMC900-10
 40    CU1       M4     Cooling  Unit
 50    PM1       M4     PDM
 60    Clk1      M4     MCH-Clock
 61    Hub1      M4     MCH-PCIe
 64    RTM1      M4     MCH-RTM-ComEx
```


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NATview 2.17

Version 2.17
(built Thu Nov 13 09:44:54 CET 2014)

Licensed options:

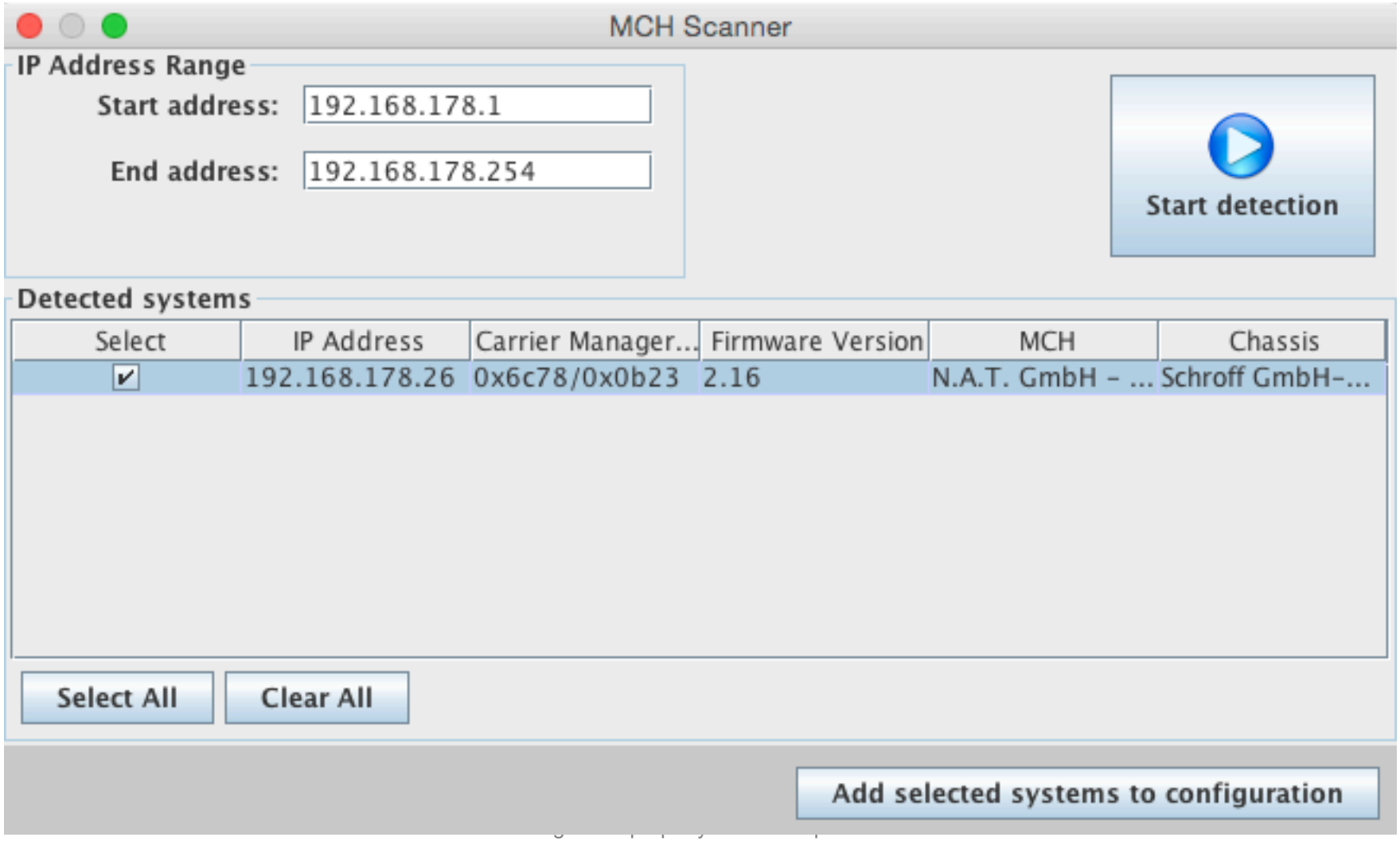
- FRU Editor
- Backplane Viewer
- HPM Update
- MCH Scanner
- System Dump
- Event Log

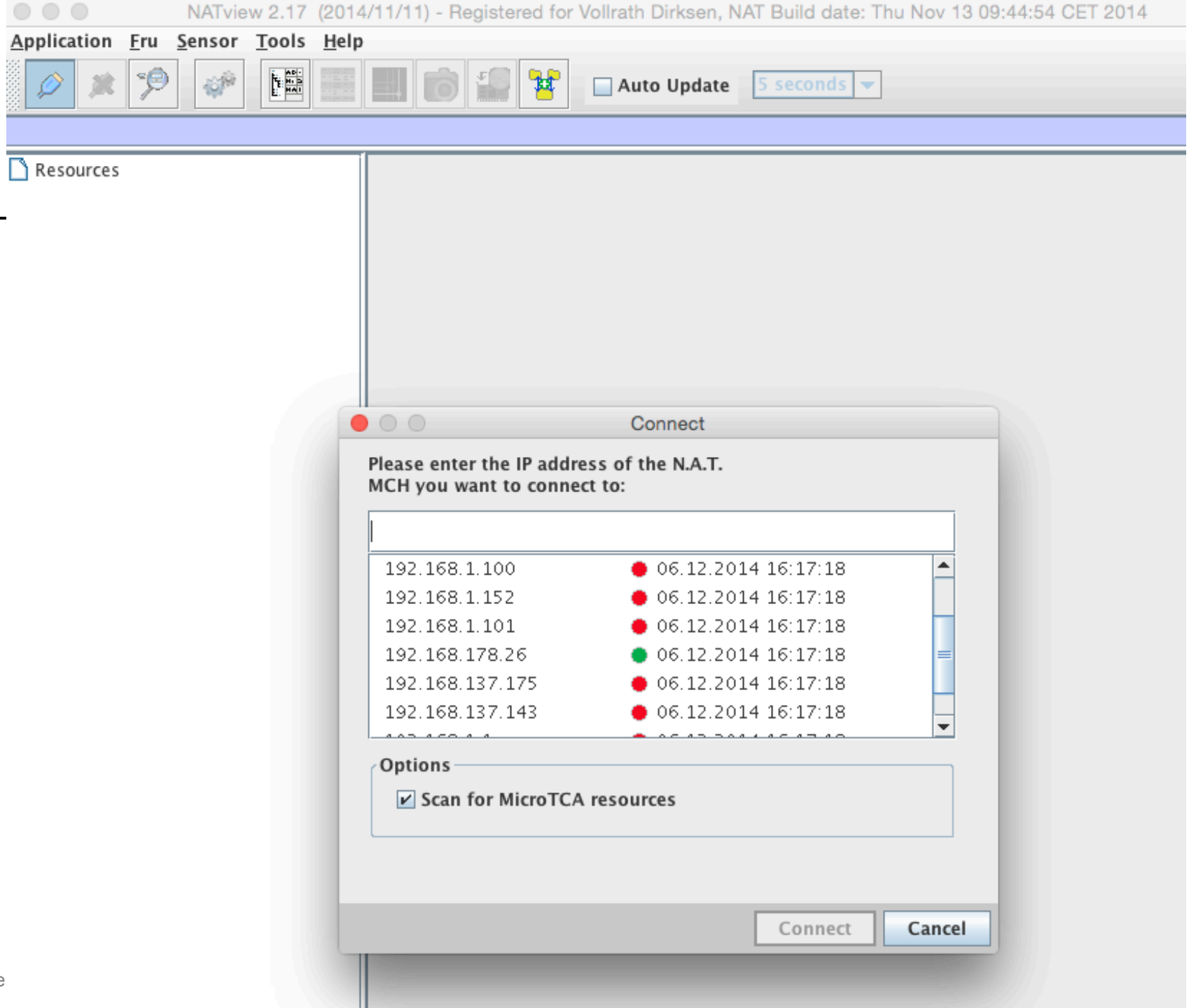
License holder: Vollrath Dirksen, NAT

Check our FTP server ftp.nateurope.com
for updates (User: natmch, Password: natmch)!

Close window

NATView
Find MTCA Systems in the Network

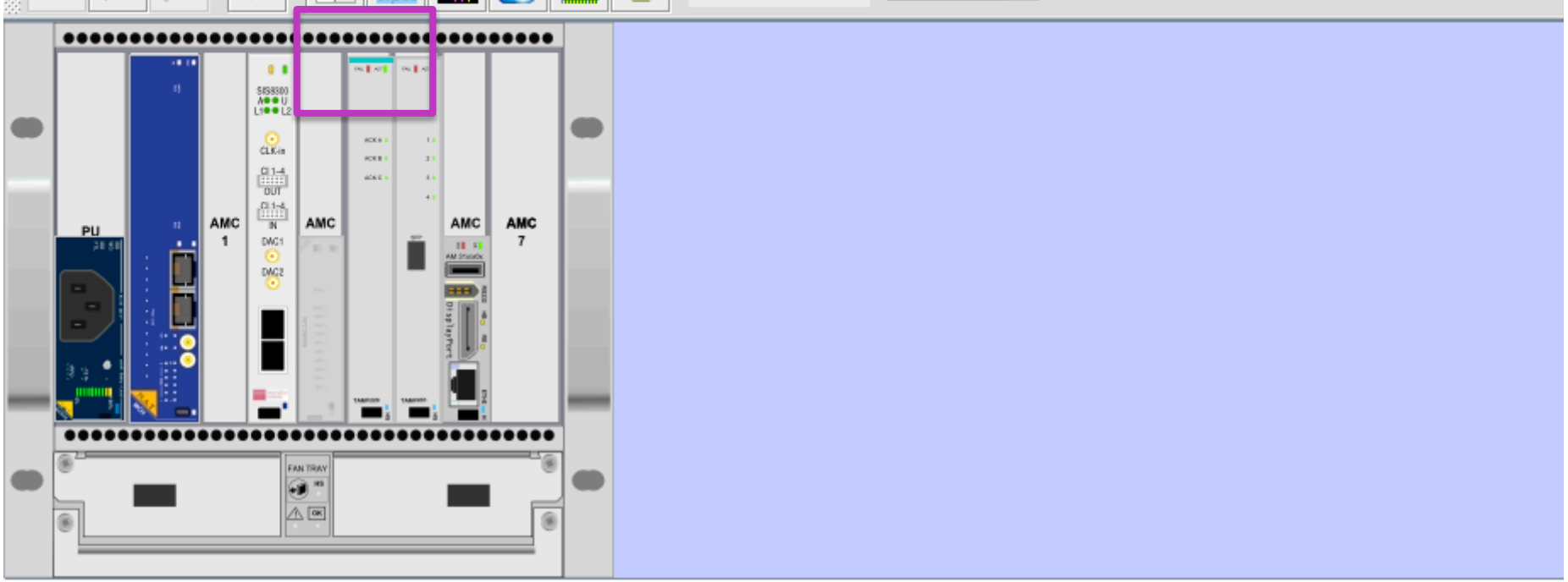



NATview 2.17 (2014/11/11) - Registered for Vollrath Dirksen, NAT Build date: Thu Nov 13 09:44:54 CET 2014
Application
Fru
Sensor
Tools
Help
Auto Update
5 seconds
Resources
Connect
Please enter the IP address of the N.A.T.
MCH you want to connect to:
192.168.1.100 06.12.2014 16:17:18
192.168.1.152 06.12.2014 16:17:18
192.168.1.101 06.12.2014 16:17:18
192.168.178.26 06.12.2014 16:17:18
192.168.137.175 06.12.2014 16:17:18
192.168.137.143 06.12.2014 16:17:18
Options
Scan for MicroTCA resources
Connect
Cancel

NATview 2.17 (2014/11/11) - Registered for Vollrath Dirksen, NAT Build date: Thu Nov 13 09:44:54 CET 2014

Application Fru Sensor Tools Help

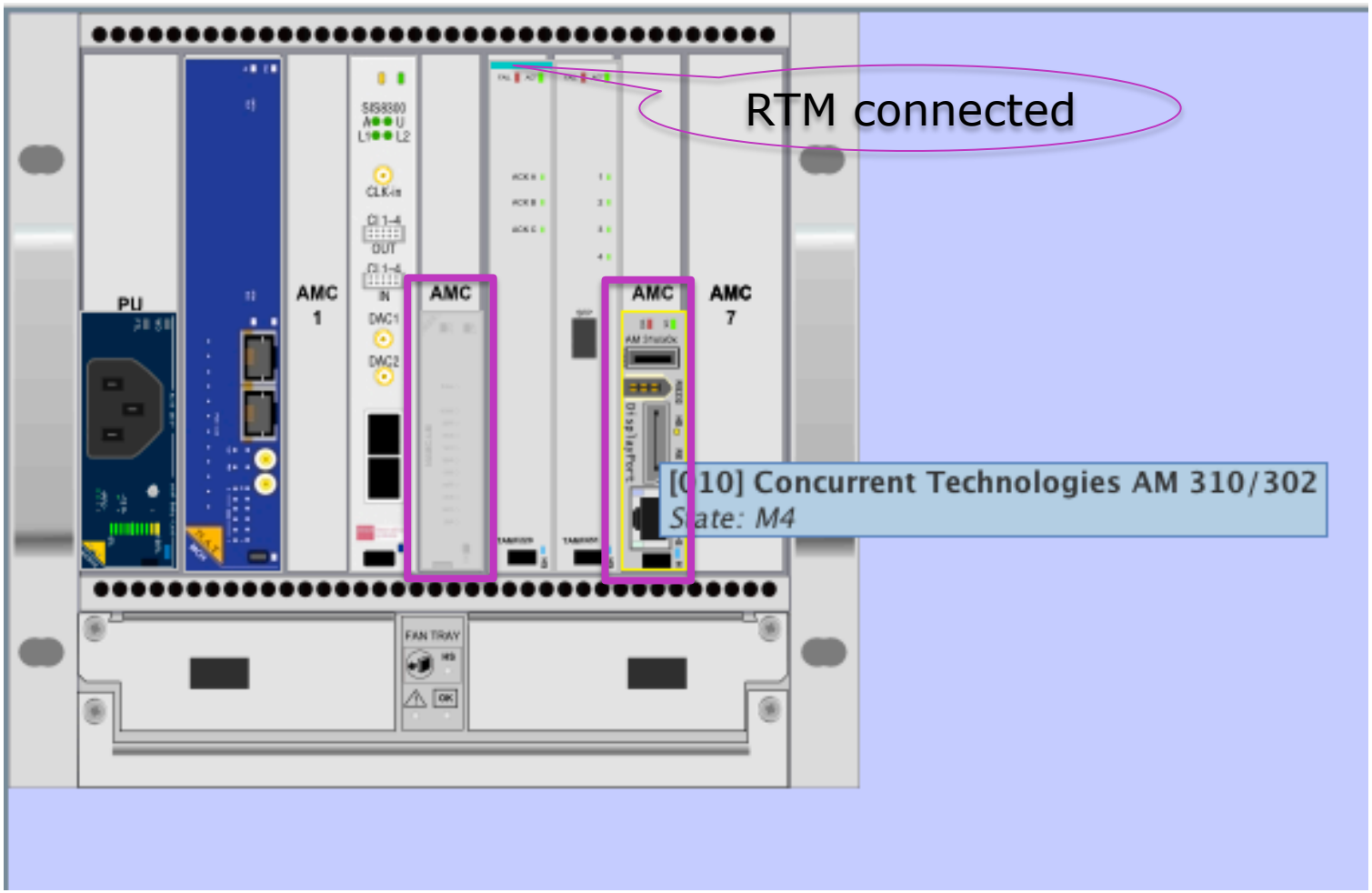
Auto Update 5 seconds



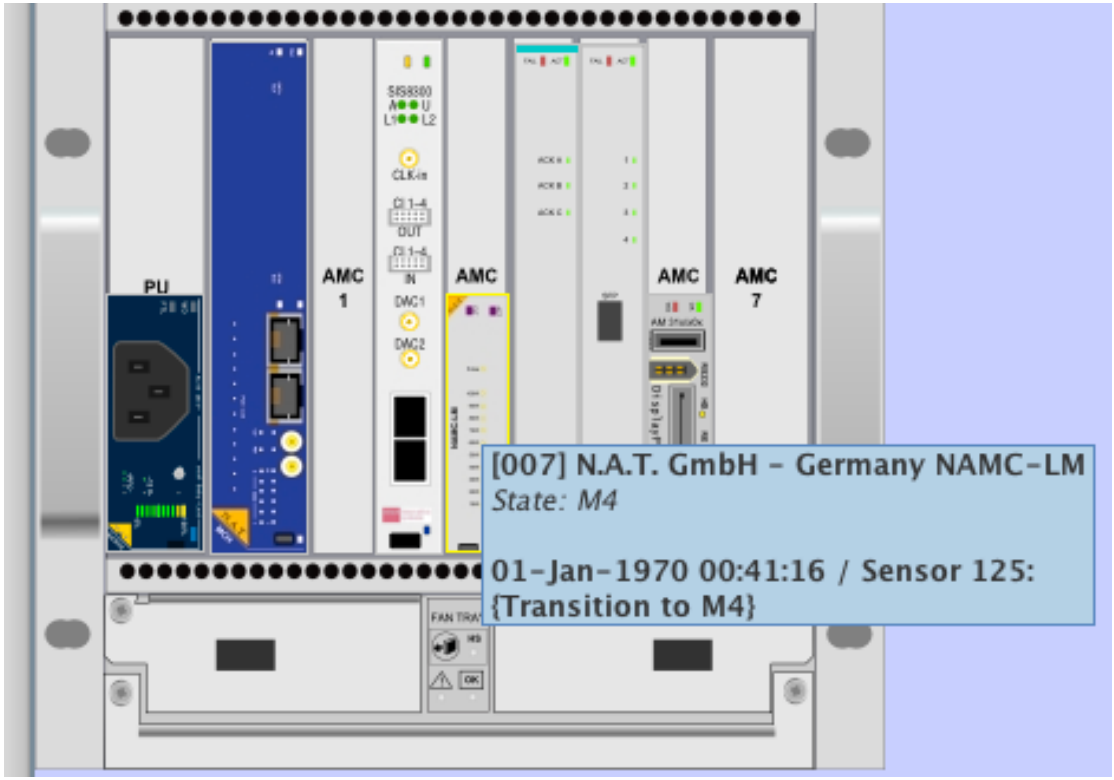
Resources
- [003] N.A.T. GmbH - Germany NAT-MCH
- [006] Struck Innovative Systeme GmbH SIS8300
- [007] N.A.T. GmbH - Germany NAMC-LM
- [008] TEWS TECHNOLOGIES GmbH TAMC220
- [009] TEWS TECHNOLOGIES GmbH TAMC651
- [010] Concurrent Technologies AM 310/302
- [040] Schroff GmbH uTCA Cooling
- [050] N.A.T. GmbH NAT-PM-AC600
- [060] MCH-Clock
- [061] MCH-PCIe
- [064] N.A.T. GmbH - Germany NAT-MCH-RTM-ComExpress
- [093->008] TAMC220-RTM
- [253] Schroff GmbH Schroff MicroTCA Backplane
- [254] Schroff GmbH Schroff MicroTCA Backplane

Newly successfully connected host 192.168.178.26 added to the systems list.

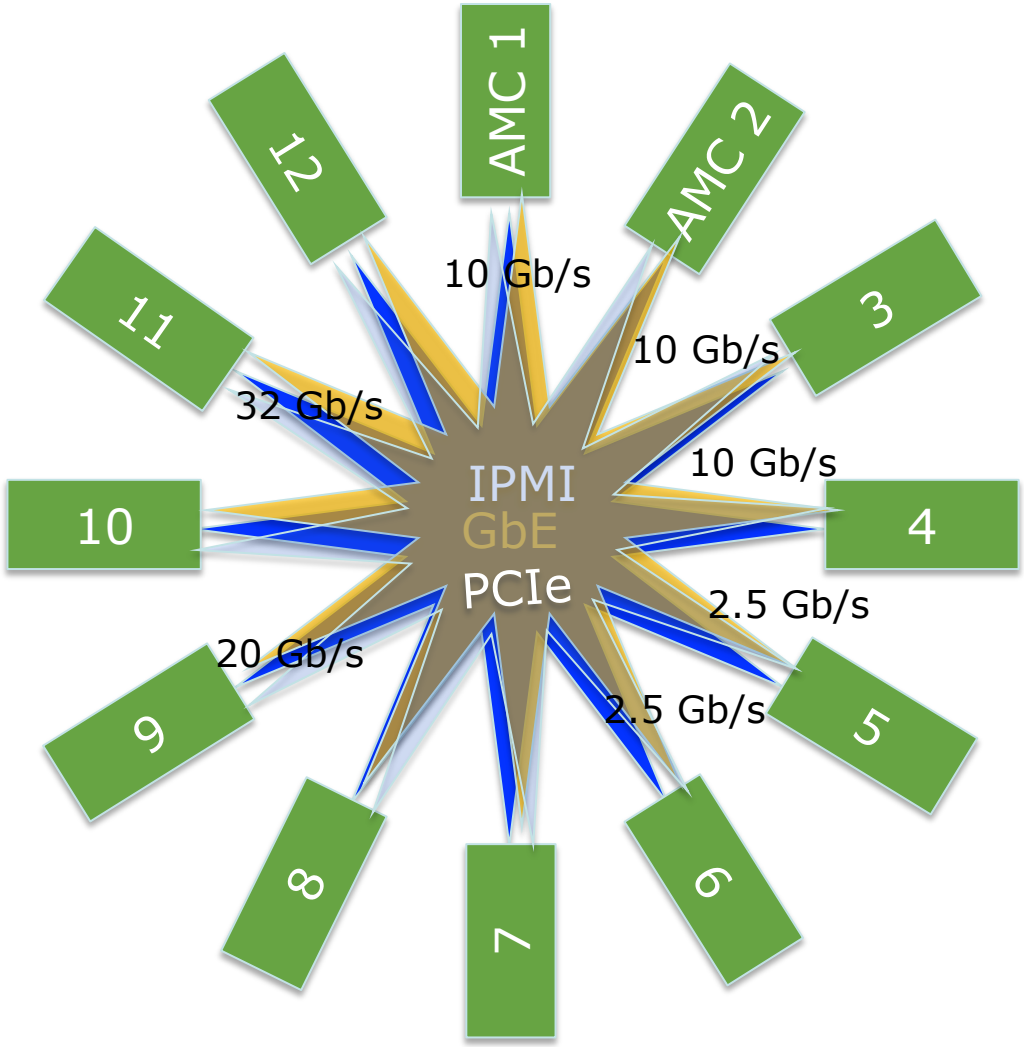
NATView
M-State, Inventory, Sensors, Events

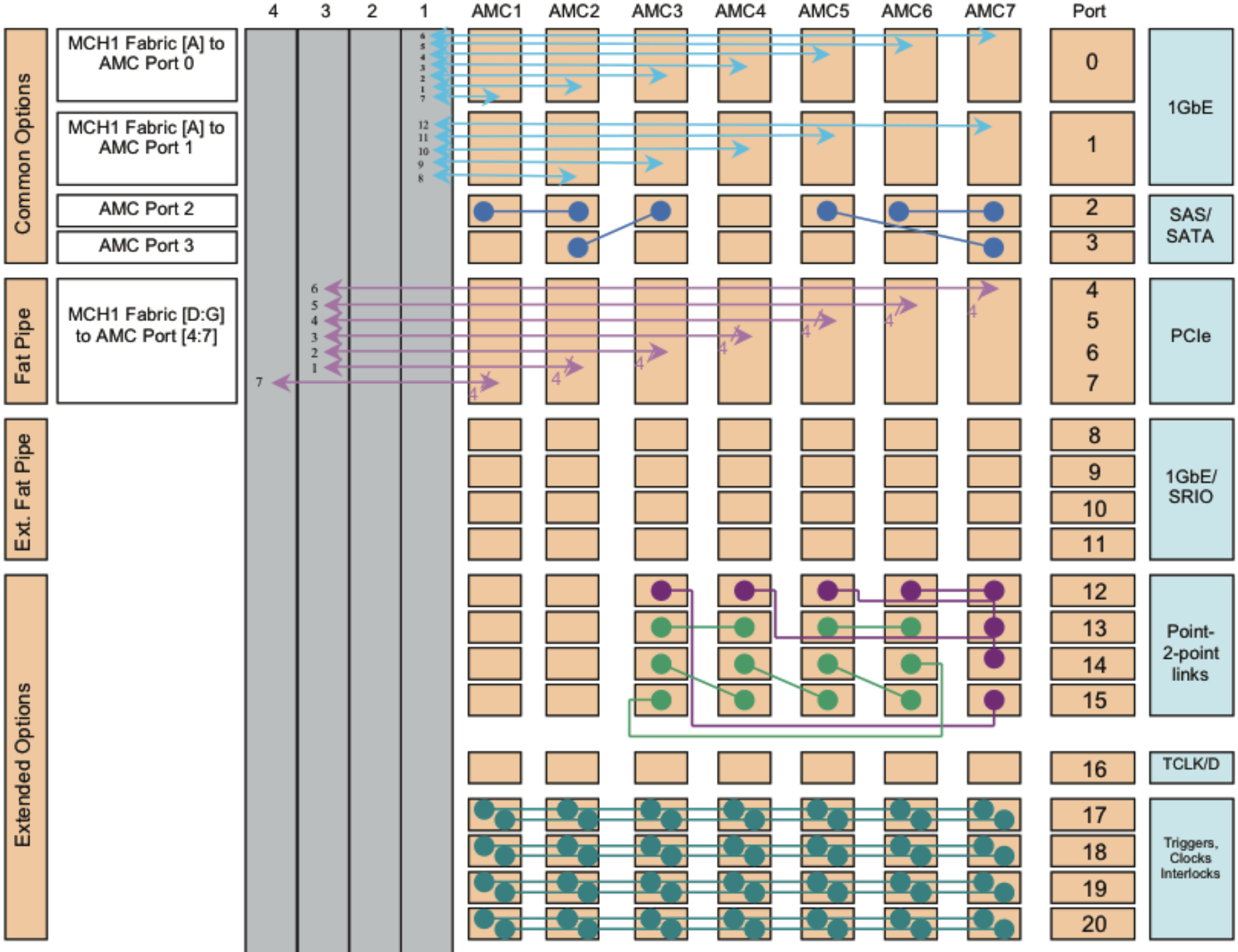


NATView
M-State Change

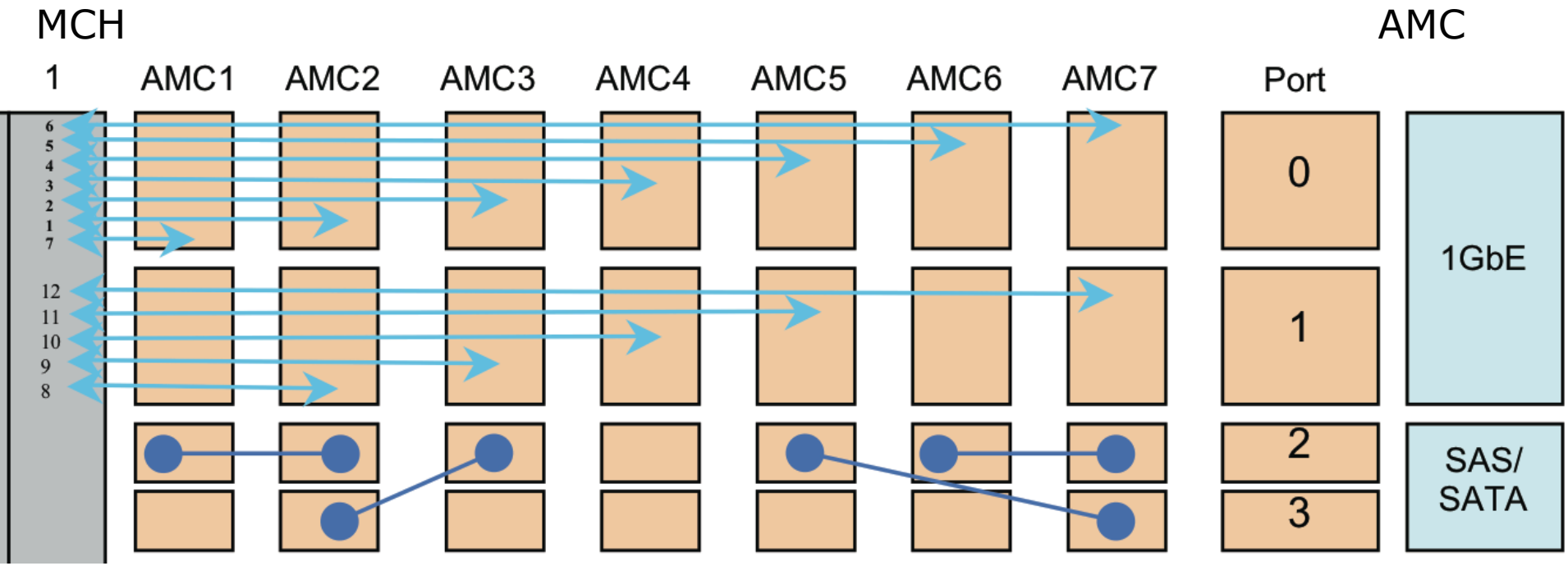


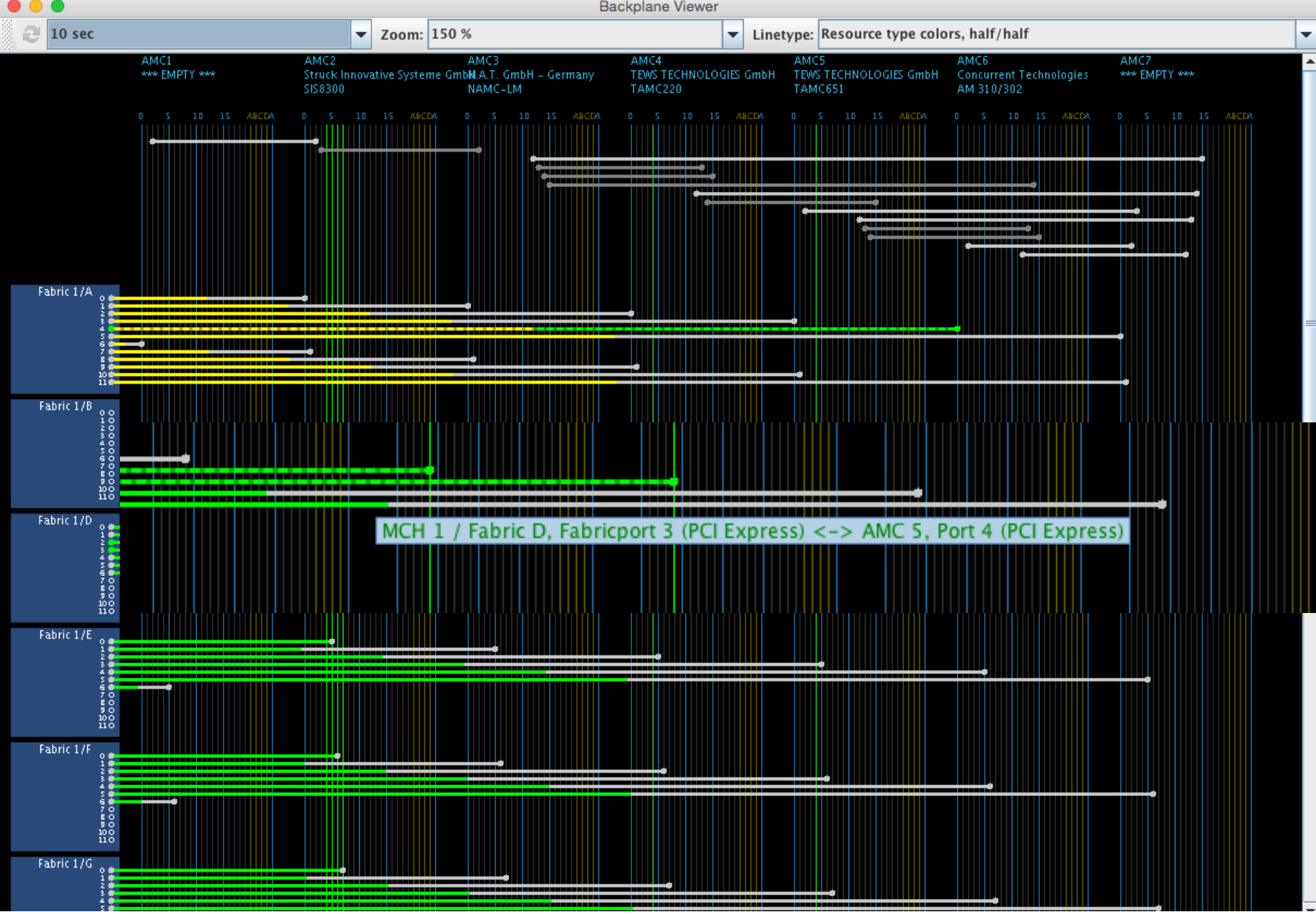
MTCA.4 Tutorial
Star Topology: IPMI, PCIe (SRIO, XAUI), GbE




4
3
2
1
AMC1
AMC2
AMC3
AMC4
AMC5
AMC6
AMC7
Port
Common Options
MCH1 Fabric [A] to AMC Port 0
MCH1 Fabric [A] to AMC Port 1
AMC Port 2
AMC Port 3
Fat Pipe
MCH1 Fabric [D:G] to AMC Port [4:7]
Ext. Fat Pipe
Extended Options
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
1GbE
SAS/ SATA
PCIe
1GbE/ SRIO
Point-2-point links
TCLK/D
Triggers, Clocks Interlocks

Backplane Topology MTCA.4
Multiple differential Connections & Transfers





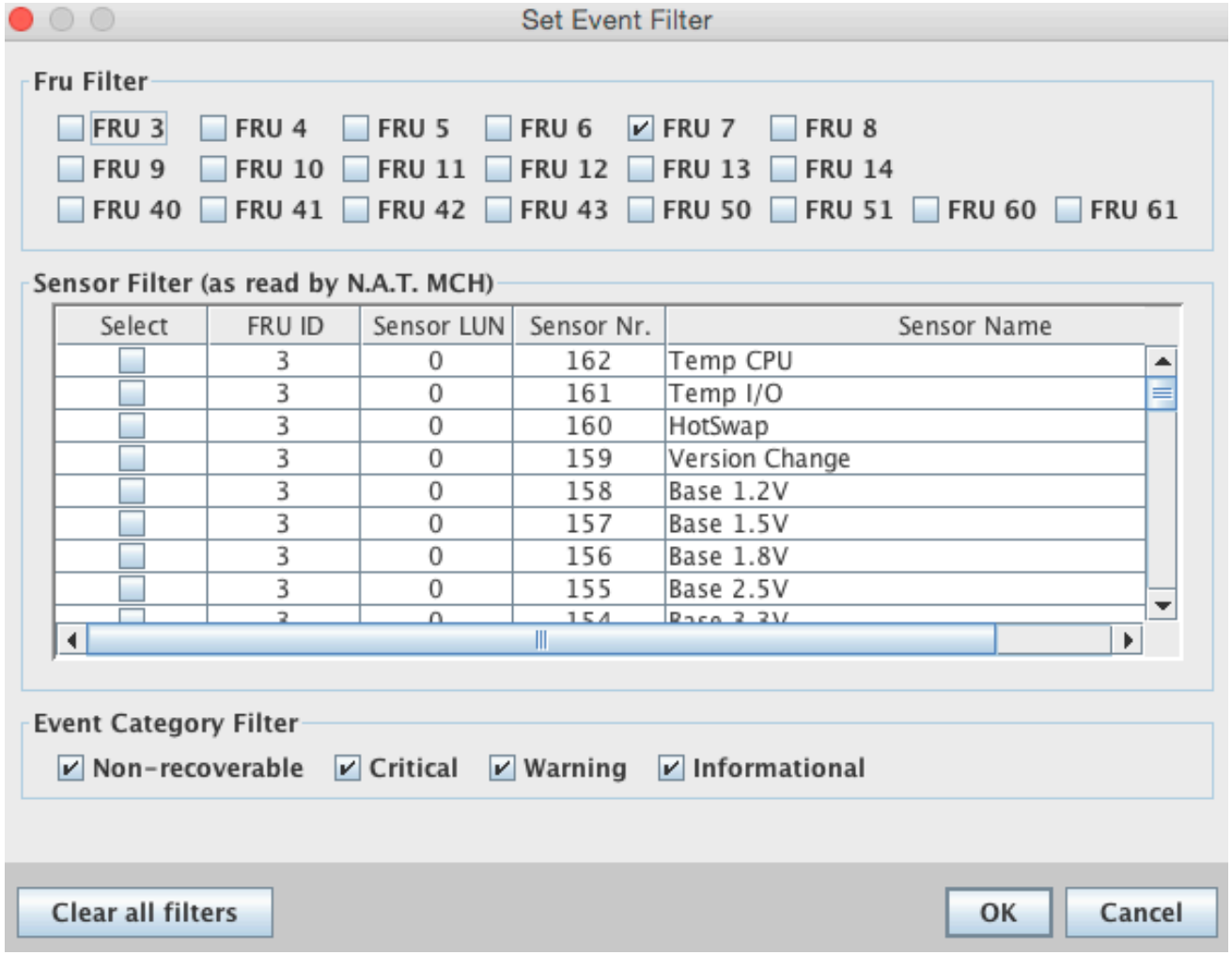
NATView
All Events

EventViewer

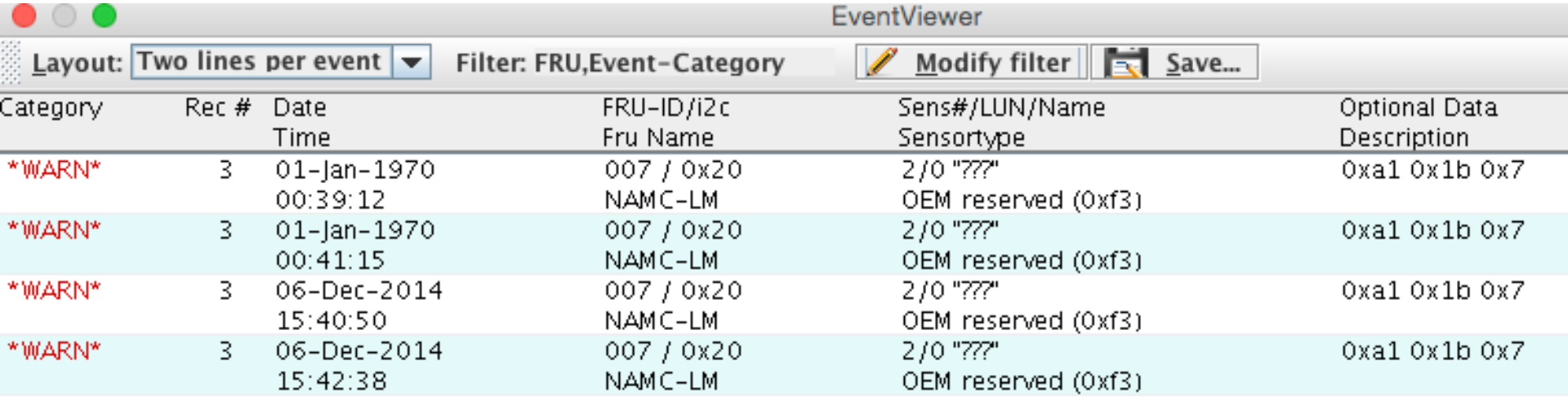
Layout: Two lines per event | Filter: -- none -- | Modify filter | Save...

Category	Rec #	Date Time	FRU-ID/i2c Fru Name	Sens#/LUN/Name Sensortype	Optional Data Description
INFO	1	01-Jan-1970 00:39:12	007 / 0x20 NAMC-LM	125/0 "HotSwap" OEM reserved (0xf0)	0xa2 0x1 0x0 {Transition to M2}
INFO	2	01-Jan-1970 00:39:12	007 / 0x20 NAMC-LM	125/0 "HotSwap" OEM reserved (0xf0)	0xa3 0x2 0x0 {Transition to M3}
WARN	3	01-Jan-1970 00:39:12	007 / 0x20 NAMC-LM	2/0 "???" OEM reserved (0xf3)	0xa1 0x1b 0x7
INFO	4	01-Jan-1970 00:39:13	007 / 0x20 NAMC-LM	125/0 "HotSwap" OEM reserved (0xf0)	0xa4 0x3 0x0 {Transition to M4}
INFO	1	01-Jan-1970 00:39:23	007 / 0x20 NAMC-LM	125/0 "HotSwap" OEM reserved (0xf0)	0xa5 0x4 0x0 {Transition to M5}
INFO	2	01-Jan-1970 00:39:23	007 / 0x20 NAMC-LM	125/0 "HotSwap" OEM reserved (0xf0)	0xa6 0x5 0x0 {Transition to M6}
INFO	3	01-Jan-1970 00:39:23	007 / 0x20 NAMC-LM	2/0 "???" OEM reserved (0xf3)	0xa1 0xb 0x7
INFO	4	01-Jan-1970 00:39:23	007 / 0x20 NAMC-LM	125/0 "???" OEM reserved (0xf0)	0xa1 0x6 0x0 {Transition to M1}
INFO	1	01-Jan-1970 00:41:15	007 / 0x20 NAMC-LM	125/0 "???" OEM reserved (0xf0)	0xa2 0x1 0x0 {Transition to M2}
INFO	2	01-Jan-1970 00:41:15	007 / 0x20 NAMC-LM	125/0 "???" OEM reserved (0xf0)	0xa3 0x2 0x0 {Transition to M3}
WARN	3	01-Jan-1970 00:41:15	007 / 0x20 NAMC-LM	2/0 "???" OEM reserved (0xf3)	0xa1 0x1b 0x7
INFO	4	01-Jan-1970 00:41:16	007 / 0x20 NAMC-LM	125/0 "???" OEM reserved (0xf0)	0xa4 0x3 0x0 {Transition to M4}

NATView
Set Event Filter



NATView
Filtered Events



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NAT-MCH by N.A.T.

Setup

- Base Configuration
- Switch BASE 1GbE
  - Age Time
  - Port on/off
  - Port VLAN
  - 802.1Q VLAN
  - 802.1X
  - 802.1p
  - Port Mirroring
  - Jumbo Frame
  - Link Aggregation
  - Rapid Spanning Tree
  - Link Status
  - BCM5396 counters
  - Configure PCIe Virtual Switches

Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

Board Information

MCH Information

Type of Information	Value
Firmware Version	V2.16 RC (18:40:09 Nov 26 2014)
FPGA Version	V1.9
Microcontroller Version	V1.2
Assembly Option	0x3d - SMA CLK, SRAM, HS Ctrl, 2nd FRT ETH, LED MOD
Board Serial Number	113513-0109
Board Revision	130927
PCB Version	V1.3
Attached SATA	
Management IEEE Address	00:40:42:22:00:6d
Management IP Address	192.168.200.140
Management Subnet Mask	255.255.255.0
Management Broadcast Address	192.168.200.255

Clock Module Information

Type of Information	Value
Clock Module Version	V1.0
Microcontroller Version	V1.3
FPGA Version	V1.15
Assembly Option	HCSL buffer PCIe Clock Gen
Board Serial Number	0145
Board Revision	130829

Setup

- Base Configuration
- Switch BASE 1GbE
  - Age Time
  - Port on/off
  - Port VLAN
  - 802.1Q VLAN
  - 802.1X
  - 802.1p
  - Port Mirroring
  - Jumbo Frame
  - Link Aggregation
  - Rapid Spanning Tree
  - Link Status
  - BCM5396 counters
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Maintenance

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- Home

NAT-MCH System Information

---

collecting information about your system
please wait . . .

Please download file(s) below and attach them to your support request!

nat_mch_sysinfo.txt

Web Interface Release: V1.30 Final (11:35:34 Nov 26 2014)

System Information

Setup

- Base Configuration
- Switch BASE 1GbE
  - Age Time
  - Port on/off
  - Port VLAN
  - 802.1Q VLAN
  - 802.1X
  - 802.1p
  - Port Mirroring
  - Jumbo Frame
  - Link Aggregation
  - Rapid Spanning Tree
  - Link Status
  - BCM5396 counters
  - Configure PCIe Virtual Switches

Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

```
****************** Begin of History Buffer ******************
ory Buffer ******************
formation ********************

************************************************************
*** MCH CM/ShM Firmware V2.16 RC (18:40:09 Nov 26 2014) ***
************************************************************

NAT-MCH-PHYS HW: M4 PCB V1.3 Rev 130927  FPGA V1.9  AVR 1.2 - sn: 113513-0109 - Rel:130927
        AOPT: 0x3d - SMA CLK, SRAM, HS Ctrl, 2nd FRT ETH, LED MOD
CLK MOD: for Physics PCB V1.0  MC V1.3  FPGA V1.15 (assembly option:  HCSL buffer  PCIe Clock Gen) - sn: 0145 - Rel:130829
HUB MOD: PCB PCIe-x48 V2.3  MC V1.9  FPGA V1.5 (assembly option -X48 LOSC) - sn: 1066 - Rel:121112 - ChipRev: ba
RTM MOD: ComExpress PCB V1.1  MC V1.0  FPGA V1.1 - sn: 0015 - Rel:121102 - ComEx Name: BC6L14C7Z22PAW03

BSP V1.17 Final (11:35:19 Nov 26 2014)
CM/ShM interface
Diagnose software
TCP/IP V1.1 Final (11:34:59 Nov 26 2014)
Telnet daemon support
compiled with GCC 2.95
instruction cache enabled
data cache enabled

CPU: Coldfire MCF 54450
DRAM size: 32 MB



************* Board Information **********************

Board Configuration Information:
--------------------------------
Board Identifier: 113513-0109
Serial Number   : 109
Manufacturer ID : 01
Board Code      : 1135
Layout Version  : 1.3
Revison Code    : 130927
CPU             : Coldfire / 200 MHz
DRAM            : 32 MB
SRAM            : 32 KB
EEPROM          : 32 MB
SIO             : 19200 baud (0 default)
IEEE Address    : 00-40-42-22-00-6d
--------------------------------
TCP/IP Configuration:
nat0 interface configuration:
   IP Address   : 192.168.200.140
   IP Net Mask  : 255.255.255.0
   IP Broadcast : 192.168.200.255
   IP Gateway   : 192.168.178.1
```

Ethernet Link Status

Setup

- Base Configuration
- Switch BASE 1GbE
  - Age Time
  - Port on/off
  - Port VLAN
  - 802.1Q VLAN
  - 802.1X
  - 802.1p
  - Port Mirroring
  - Jumbo Frame
  - Link Aggregation
  - Rapid Spanning Tree
  - Link Status
  - BCM5396 counters
  - Configure PCIe Virtual Switches

Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

Link States of Ethernet Connections

Slot	AMC1	AMC2	AMC2	AMC3	AMC3	AMC4	AMC4	AMC5	AMC5	AMC6	AMC7	AMC7	FRT1	FRT2	UPDB	RTMB	CPU1
Port	0	0	1	0	1	0	1	0	1	0	0	1	-	-	-	-	-
Links	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	DIS	EN	EN	EN

	- Link is up
	- Link is down
"EN"	- Interface is enabled
"DIS"	- Interface is disabled

Web Interface Release: V1.30 Final (11:35:34 Nov 26 2014)

Tutorial about MicroTCA.4
Agenda

- About N.A.T.
- MicroTCA.4 standard and Webpage mtca.eu
- System start of MicroTCA.4 system
- Analysis remotely: inventory, current, revision
  - Command Line Interface
  - NATView
  - Web interface
- Configuration
- Firmware update
- PCIexpress
  - Clustering
  - Hot Plug (hand over to next presentation)

NAT-MCH by N.A.T.

Setup

Base Configuration
Switch BASE 1GbE
- Age Time
- Port on/off
- Port VLAN
- 802.1Q VLAN
- 802.1X
- 802.1p
- Port Mirroring
- Jumbo Frame
- Link Aggregation
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- Link Status
- BCM5396 counters
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Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

Welcome to the HTML based NAT-MCH configuration tool.

Setup Functions:

Base Configuration:	- Changes Base Configuration.
Age Time:	- MAC Table setup: set the aging of the MAC Table Entries.
Port VLAN:	- Port based VLAN setup and port enable/disable.
802.1Q VLAN:	- 802.1Q VLAN setup.
802.1X:	- 802.1X security setup.
802.1p:	- 802.1p Quality of Service setup.
Port Mirroring:	- Mirroring of the inbound and outbound traffic on a port
Jumbo frames:	- Support of the Jumbo frames on a port
Link Aggregation:	- Support of up to four the Link Aggregation groups
Rapid Spanning	- Support of the Rapid Spanning Tree by 1GbE-Switch
IGMP Snooping	- Support of the IGMP Snooping by 10GbE-Switch (FM4000 only)
Link Status:	- Show the current status of the Ethernet links
Counter Statistic:	- Show the counter statistic of the Ethernet switch

Maintenance Functions:

Script Management:	- Backup/Restore settings to/from flash memory or file.
Board Information:	- Provides hardware information of this NAT-MCH.
System Information:	- Collect hardware information of this system.
Reboot NAT-MCH:	- Allows rebooting over the Web-Interface.
Update MCH:	- Allows updating several components over the Web-Interface.
Change/Reset Password:	- Allows changing or reseting of the MCH Password over the Web-Interface.
N.A.T. Webpage:	- Opens the N.A.T. webpage in a new browser window.
Home:	- Shows this page.

NAT-MCH by N.A.T.

Setup

- Base Configuration
- Switch BASE 1GbE
  - Age Time
  - Port on/off
  - Port VLAN
  - 802.1Q VLAN
  - 802.1X
  - 802.1p
  - Port Mirroring
  - Jumbo Frame
  - Link Aggregation
  - Rapid Spanning Tree
  - Link Status
  - BCM5396 counters
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Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

Set generic MCH Password

The Changing of the MCH password has effect on the login of the telnet session.

Current Password Reset Reset MCH Password to default (user: root password: nat)

New Password

Confirm New Password

Save Discard Changes

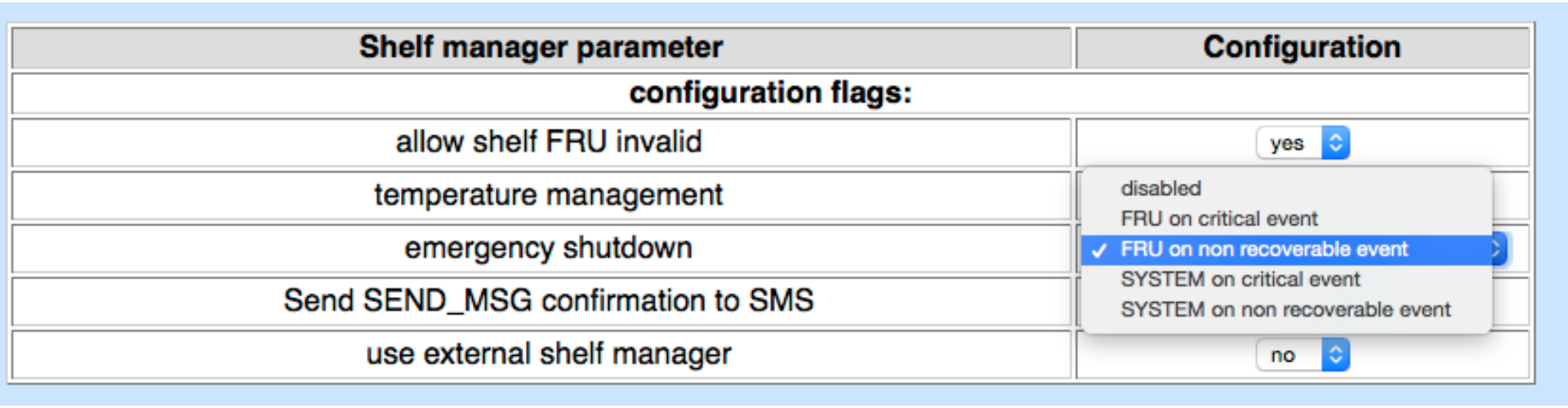
Web Interface Release: V1.30 Final (11:35:34 Nov 26 2014)

Web Interface
Source of IP address

Change MCH Configuration

MCH global parameter	Configuration
remote interfaces:	
Management interface at GbE port	disabled
RMCP access	enabled
telnet access	enabled
WEB access	
IP address source for management port	
IP address source for GbE port	
RMCP session activity timeout minutes	0 min
RMCP session activity timeout seconds	60 sec
default fan level	30 percent
MCH configuration flags:	
enable backward compatibility V2.4	no
Enable alternative cooling scheme	no
Control rear transition module fans	yes
PM Assignment strategy	strict

Emergency Shutdown
Only switch of the faulty FRU



Shelf manager parameter	Configuration
configuration flags:	
allow shelf FRU invalid	yes
temperature management	
emergency shutdown	
Send SEND_MSG confirmation to SMS	
use external shelf manager	no

Set E-keying Debug Flag
AMC in Slot 2 (FRU-ID 6)

Carrier manager parameter	Configuration
carrier number default	0
quiesced event timeout	10 sec
configuration flags:	
allow carrier FRU invalid	yes
overrule carrier FRU	no
shutdown system if MCH goes down	no
enable Clock E-keying	no
debug flags:	
IPMI	disabled
FRU	disabled
E-keying	✓ disabled enabled
sensor	
event	disabled
power module	disabled
cooling unit	disabled
CM/ShM interface	disabled
FRU communication to debug (0=all)	6

Ethernet switch parameter	Configuration
configuration source	✓ no configuration load from FLASH
Ignore Backplane FRU Info	

Clock module parameter	Configuration
configuration source	no configuration

PCIe parameter	Current Configuration
configuration flags:	
upstream slot power up delay	15 sec
PCIe hot plug delay for AMCs	0 sec
hot plug support	enabled
PCIe early ekey (before payload)	disabled
Use PCIe on MCH-RTM(disable AMC12)	yes

Time Protocol/SNTP parameter	Current Configuration
Time server IP	195 . 145 . 119 . 188
'Check for Time' delay minutes	0 min
'Check for Time' delay hours	0 h
local time offset	1 h
configuration flags:	
SNTP or Time Protocol	Time Protocol
Time client	enabled

DHCP parameter	Current Configuration
Host name	MTCA4TRAINING

NAT-MCH by N.A.T.

Setup

Base Configuration
Switch BASE 1GbE
- Age Time
- Port on/off
- Port VLAN
- 802.1Q VLAN
- 802.1X
- 802.1p
- Port Mirroring
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Port on/off (enable/disable)

Slot	AMC1	AMC2	AMC2	AMC3	AMC3	AMC4	AMC4	AMC5	AMC5	AMC6	AMC7	AMC7	FRT1	FRT2	UPDB	RTMB	CPU1
Port	0	0	1	0	1	0	1	0	1	0	0	1	-	-	-	-	-
Enable	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑

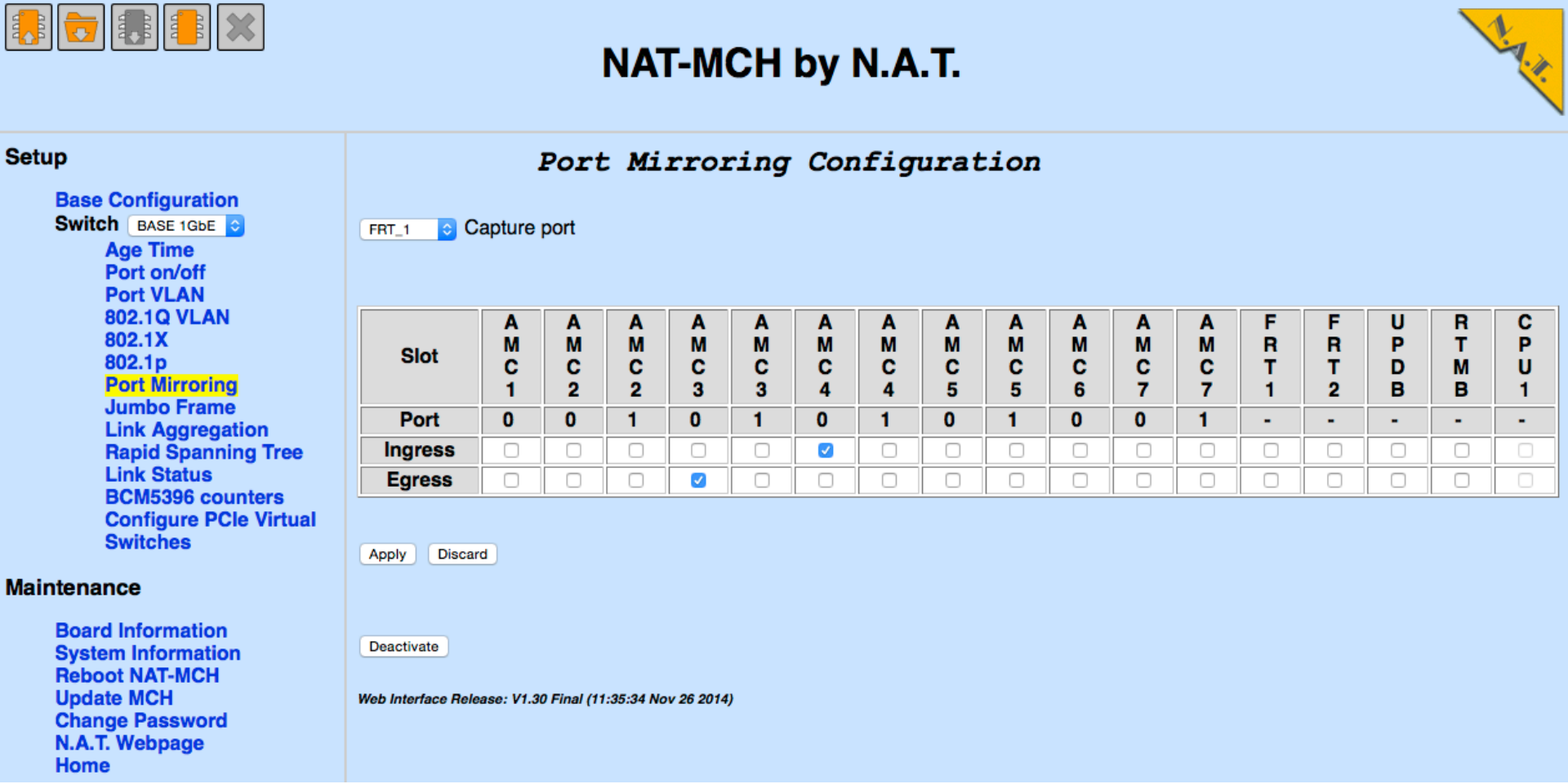
Apply Discard

You need to click apply to save your changes.
The following table will be reloaded by clicking apply.

Port based VLAN Configuration

Slot	AMC1	AMC2	AMC2	AMC3	AMC3	AMC4	AMC4	AMC5	AMC5	AMC6	AMC7	AMC7	FRT1	FRT2	UPDB	RTMB	CPU1
Port	0	0	1	0	1	0	1	0	1	0	0	1	-	-	-	-	-
AMC1/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC2/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC2/1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC3/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC3/1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC4/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC4/1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC5/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC5/1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC6/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC7/0	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
AMC7/1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
FRT_1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

Ethernet Analysis with Wireshark
Mirroring inside GbE Port to Front GbE



NAT-MCH by N.A.T.

Setup

Base Configuration
Switch BASE 1GbE
- Age Time
- Port on/off
- Port VLAN
- 802.1Q VLAN
- 802.1X
- 802.1p
- Port Mirroring
- Jumbo Frame
- Link Aggregation
- Rapid Spanning Tree
- Link Status
- BCM5396 counters
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Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
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- Home

Change MCH Configuration

MCH global parameter	Configuration
remote interfaces:	
Management interface at GbE port	disabled
RMCP access	enabled
telnet access	enabled
WEB access	enabled
IP address source for management port	DHCP
IP address source for GbE port	no IP address
RMCP session activity timeout minutes	0 min
RMCP session activity timeout seconds	60 sec
default fan level	30 percent
MCH configuration flags:	
enable backward compatibility V2.4	no
Enable alternative cooling scheme	no
Control rear transition module fans	yes
PM Assignment strategy	strict

Shelf manager parameter	Configuration
configuration flags:	
allow shelf FRU invalid	yes
temperature management	enabled
emergency shutdown	FRU on non recoverable event
Send SEND_MSG confirmation to SMS	disabled
use external shelf manager	no

Carrier manager parameter	Configuration

NAT-MCH by N.A.T.

Setup

Base Configuration
Switch BASE 1GbE
- Age Time
- Port on/off
- Port VLAN
- 802.1Q VLAN
- 802.1X
- 802.1p
- Port Mirroring
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- Configure PCIe Virtual Switches

Maintenance

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- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

Ethernet switch parameter	Configuration
configuration source	no configuration
Ignore Backplane FRU Info	no

Clock module parameter	Configuration
configuration source	no configuration

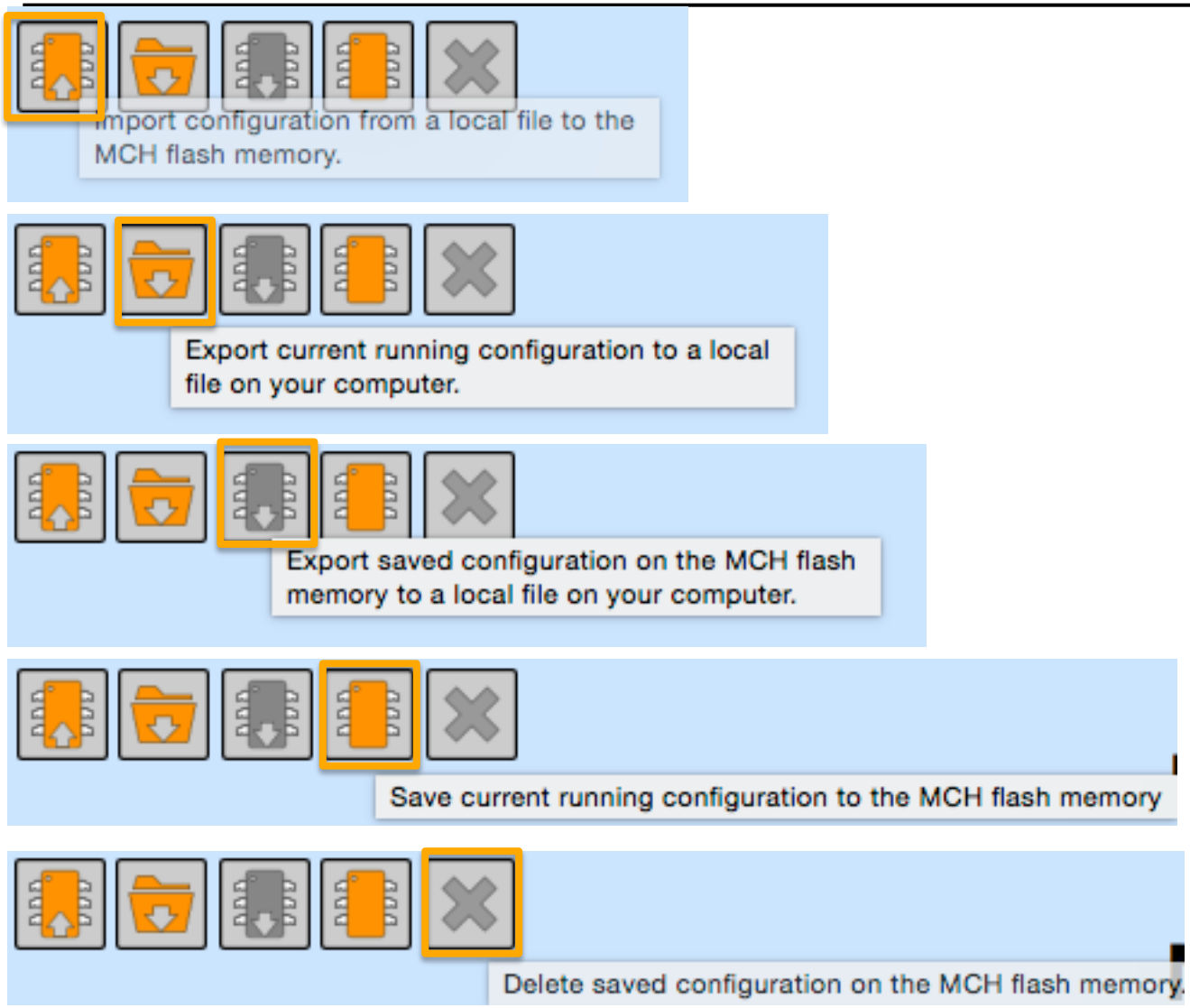
PCIe parameter	Current Configuration
configuration flags:	
upstream slot power up delay	15 sec
PCIe hot plug delay for AMCs	0 sec
hot plug support	enabled
PCIe early ekey (before payload)	disabled
Use PCIe on MCH-RTM(disable AMC12)	yes

Time Protocol/SNTP parameter	Current Configuration
Time server IP	195 . 145 . 119 . 188
'Check for Time' delay minutes	0 min
'Check for Time' delay hours	0 h
local time offset	248 h
configuration flags:	
SNTP or Time Protocol	Time Protocol
Time client	enabled

DHCP parameter	Current Configuration
Host name	MTCA4TRAINING

Save Discard Changes

MCH Configuration
Save, Restore, Extend

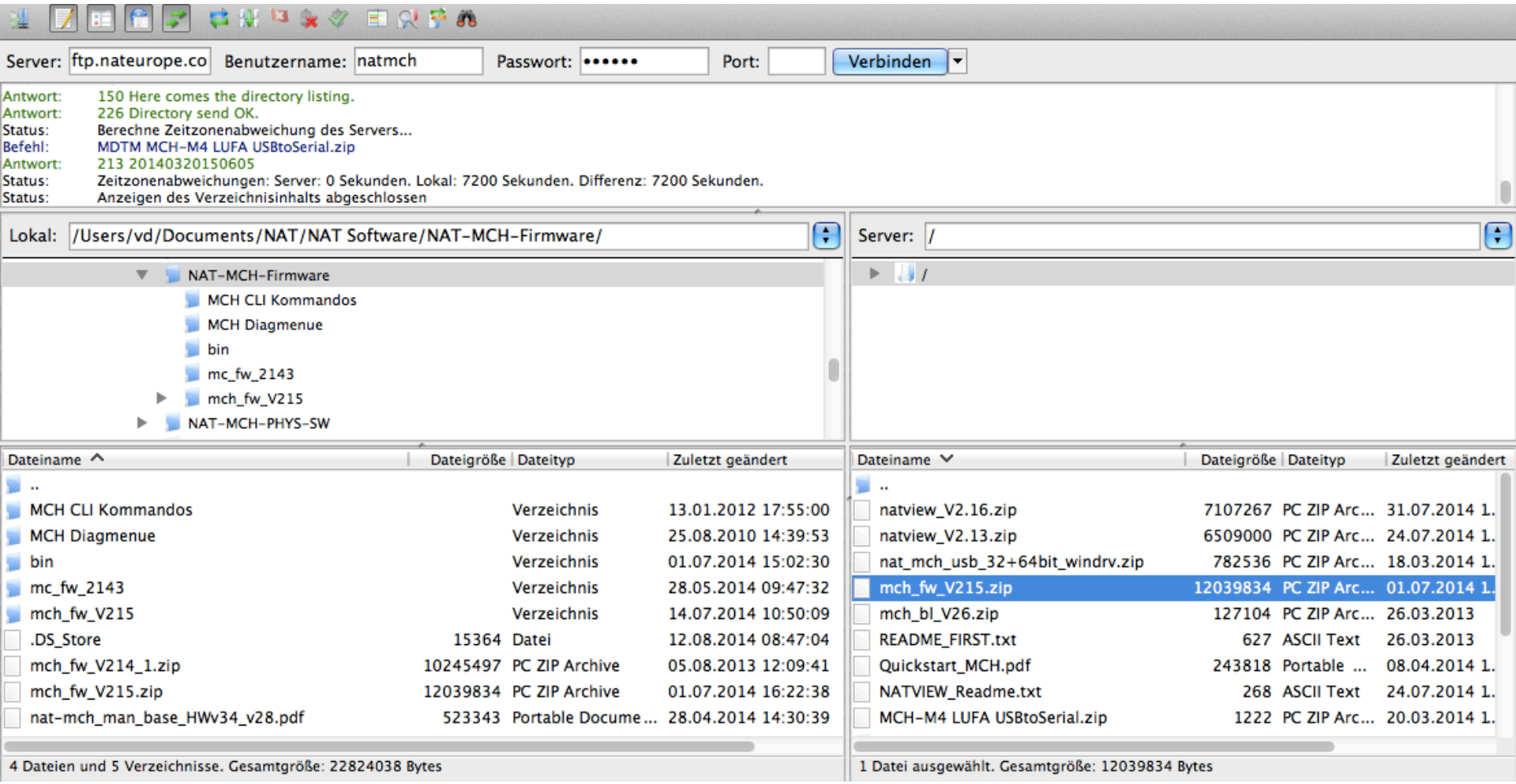


Tutorial about MicroTCA.4
Agenda

- About N.A.T.
- MicroTCA.4 standard and Webpage mtca.eu
- System start of MicroTCA.4 system
- Analysis remotely: inventory, current, revision
  - Command Line Interface
  - NATView
  - Web interface
- Configuration
- Firmware update
- PCIexpress
  - Clustering
  - Hot Plug (hand over to next presentation)

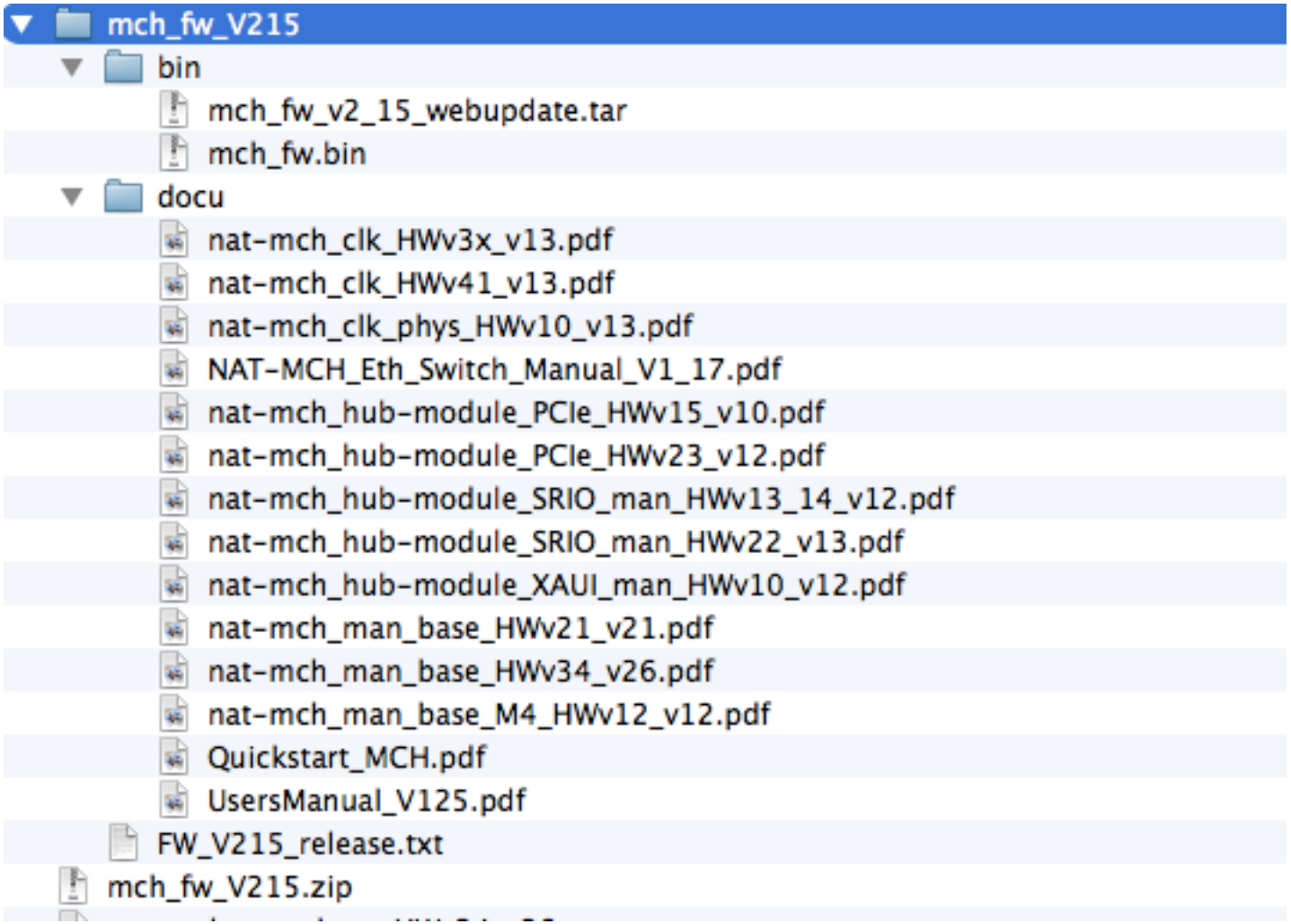
Firmware Update

NAT-MCH: Download latest firmware



Firmware Update

NAT-MCH: Unzip firmware (Password!)



Firmware Update
NAT-MCH via Command Line Interface

- bs
  - boot string
  - loads .bin file from a tftp server
  - recommended for compatibility check or quick tests
  - *example see during training*

- update_firmware
  - update firmware in flash
  - loads .bin file, which can be downloaded from NAT FTP-Server

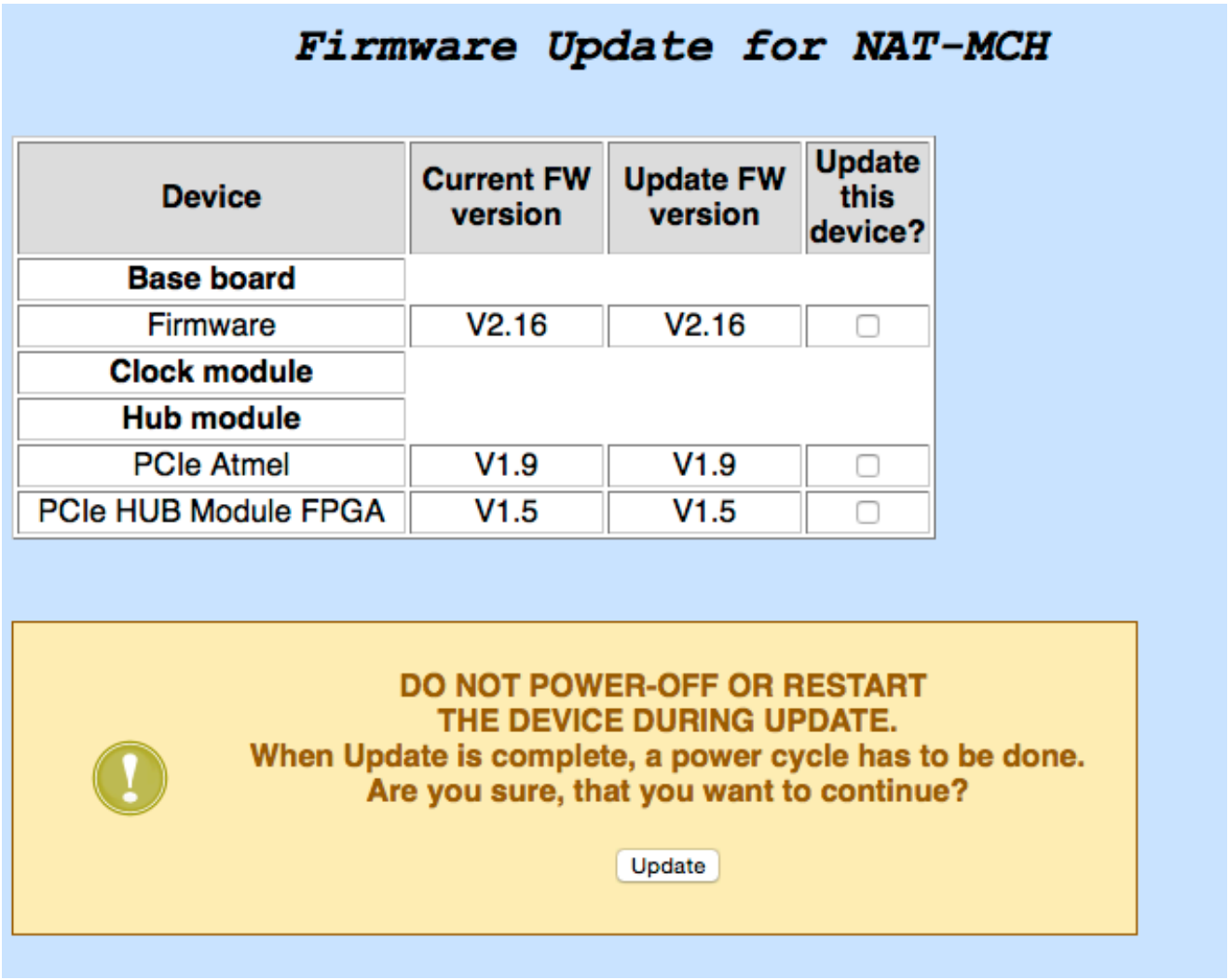
```
nat> update_firmware

Update firmware into FLASH at offset 0x00100000:

------------------------------------------------
Enter host and file name [IP:FILENAME]:
firmware> 192.168.1.225:ftp_folder/mch_fw_215.bin
```

- update_fpga
  - update FPGA firmware (only on request of NAT engineering, NAT engineering provides files)

HINT: Ensure file protections on the TFTP server are set correctly and firewalls do not prevent the MCH from downloading the image.

MCH Firmware Update
Web Interface

MCH Firmware Update
Web Interface



MCH Firmware Update
Web Interface

Device	Current FW version	Update FW version	Update this device?
Base board			
Firmware	V2.15	V2.16	☑
Clock module			
Hub module			
PCIe Atmel	V1.9	V1.9	☐
PCIe HUB Module FPGA	V1.5	V1.5	☐

DO NOT POWER-OFF OR RESTART THE DEVICE DURING UPDATE.

When Update is complete, a power cycle has to be done.

MCH Firmware Update

Web Interface & Command Line Interface

Firmware Update for NAT-MCH

DO NOT POWER-OFF OR RESTART THE MCH
UNTIL AN UPDATE STATUS IS DIPLAYED FOR EACH DEVICE
THIS MAY TAKE UP TO 5 MINUTES

Device	Update Status
MCH Firmware	Updated MCH Firmware successfully

All components updated successfully. You should power cycle the system now to restart all components.

HPM
Overview

- What is HPM?
  - HPM = Hardware Platform Management
  - PICMG (PCI Industrial Computer Manufacturers Group)
  - HPM.1: basic update protocol
  - HPM.2: extended update
- Purpose
  - Remote Firmware Update
  - Automated
  - Reliable
  - Safe

HPM
Implementations

- **IpmiTool**
  - Swiss Army Knife
  - Complicated to use
  - Requires a lot of background knowledge

- Example: Firmware update of NAMC-LM in AMC slot 3:
  I2C 0x76 = FRU7 = AMC3

- ipmitool 1.6

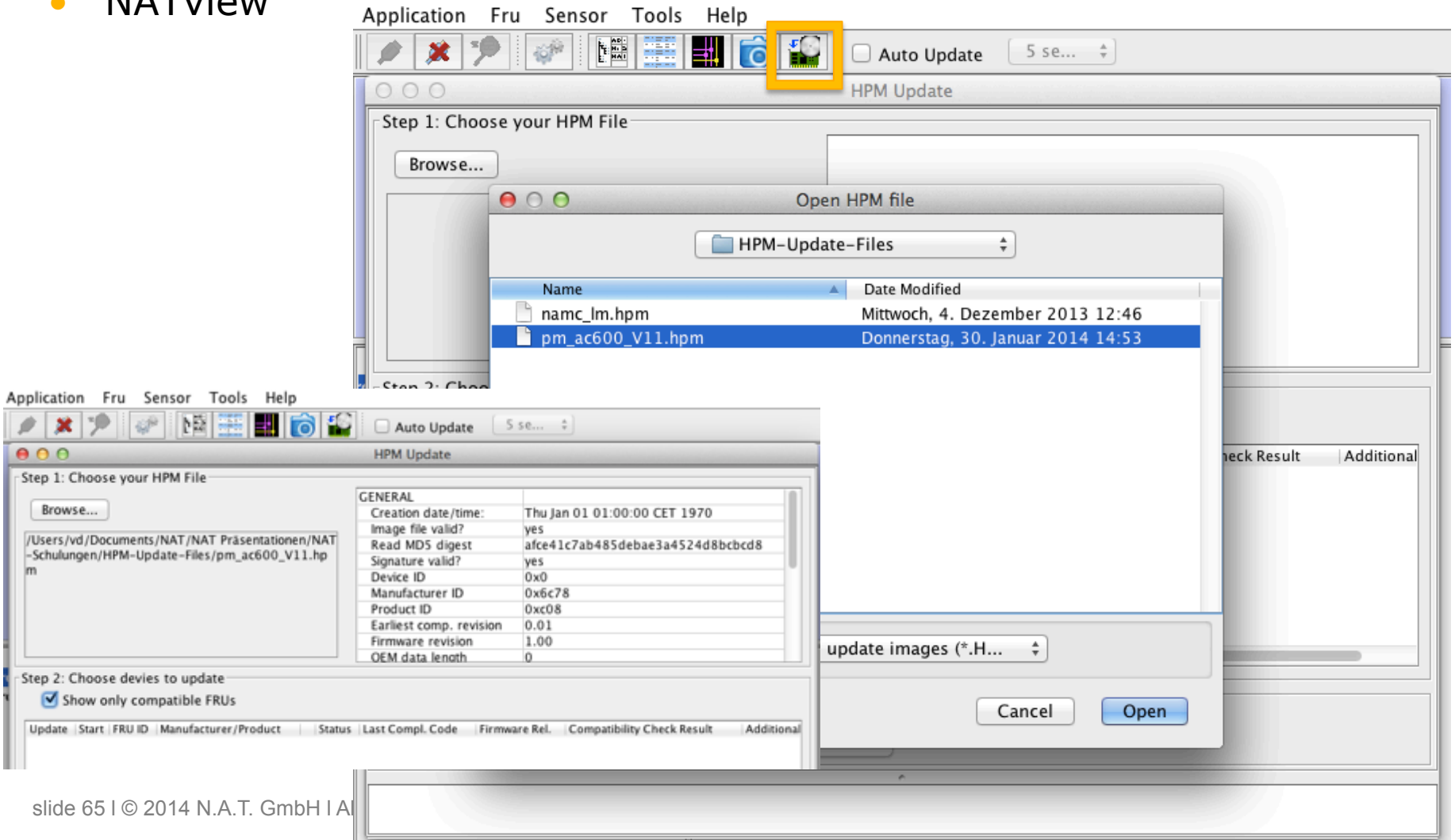
```
➢ ipmitool.exe -H 192.168.1.254 -A none -B 0 -b 7 -T 0x82 -t
  0x76 hpm upgrade .\namc_lm.hpm
```

- ipmitool 1.8

```
➢ ipmitool -H 192.168.1.41 -A none 7 hpm upgrade .\namc_lm.hpm
```

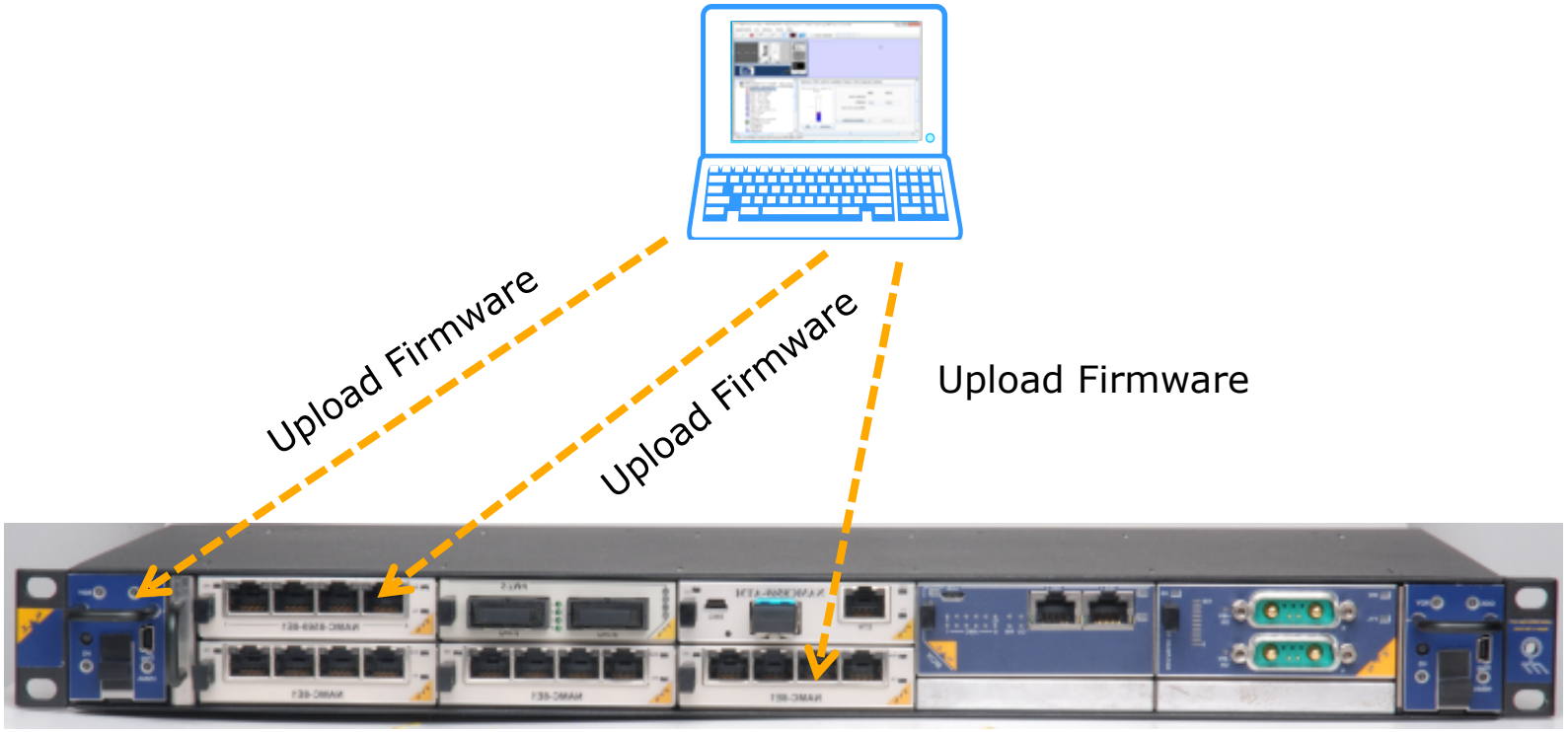

Powermodule Update
FRU update

- NATview



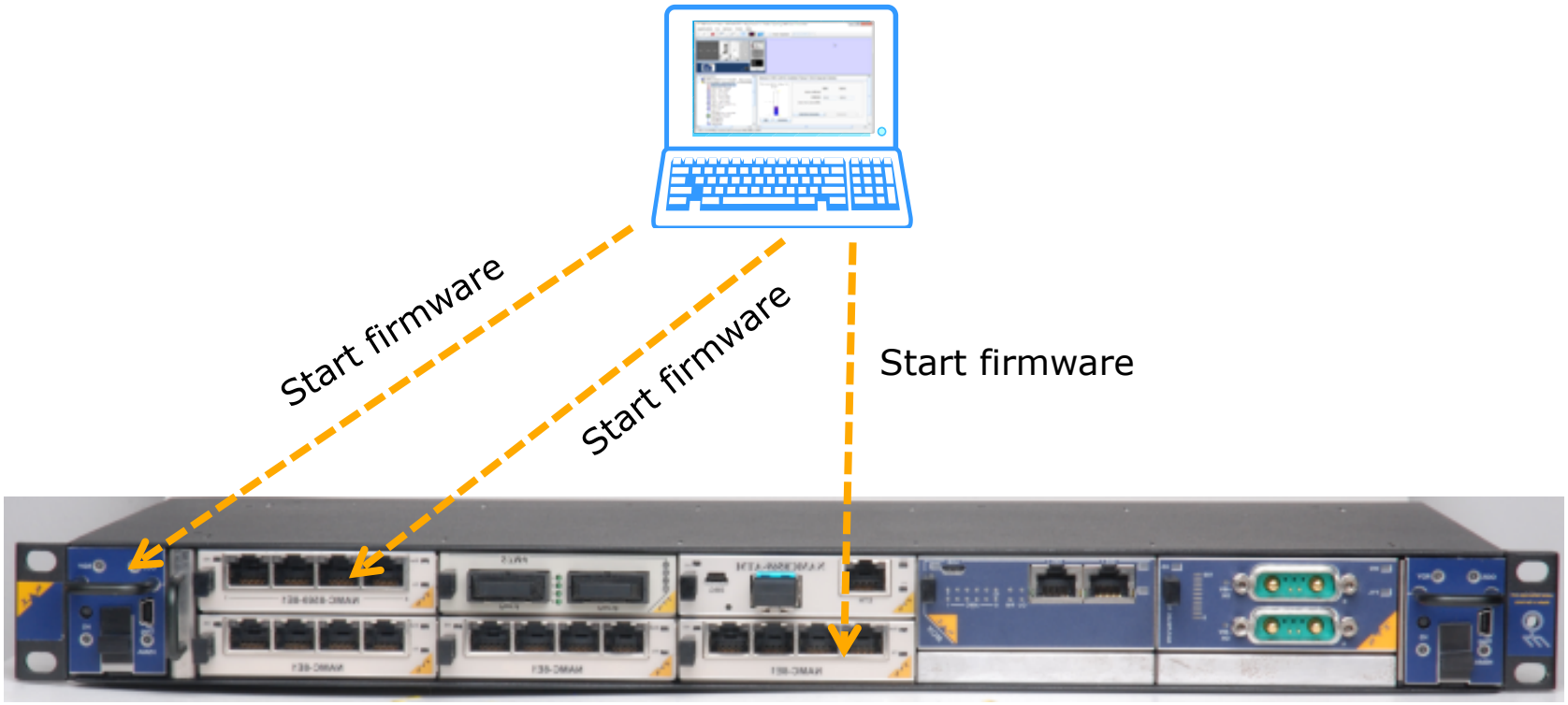
HPM with NATview
Multiple Card Update (1/2)

- 1. Transfer firmware to all selected targets,
  - one by one.



HPM with NATview
Multiple Card Update (2/2)

- 2. Start firmware together



=> Minimizes overall system downtime

Backplane Update
FRU update

- Command Line Interface: diag

```
nat> diag
FPGA already initialized
  [ 0] : no action (unsupported)
  [ 1] : (submenu) INFO menu
  [ 2] : (submenu) UPDATE menu
  [ 3] : (submenu) I2C menu
DIAG (RET=0/0x0): 2
  [ 0] : no action (unsupported)
  [ 1] : FPGA update menu
  [ 2] : show backplane EEPROM content
  [ 3] : update backplane EEPROM
  [ 4] : update FRU DATA
  [ q] : q: quit submenu
```

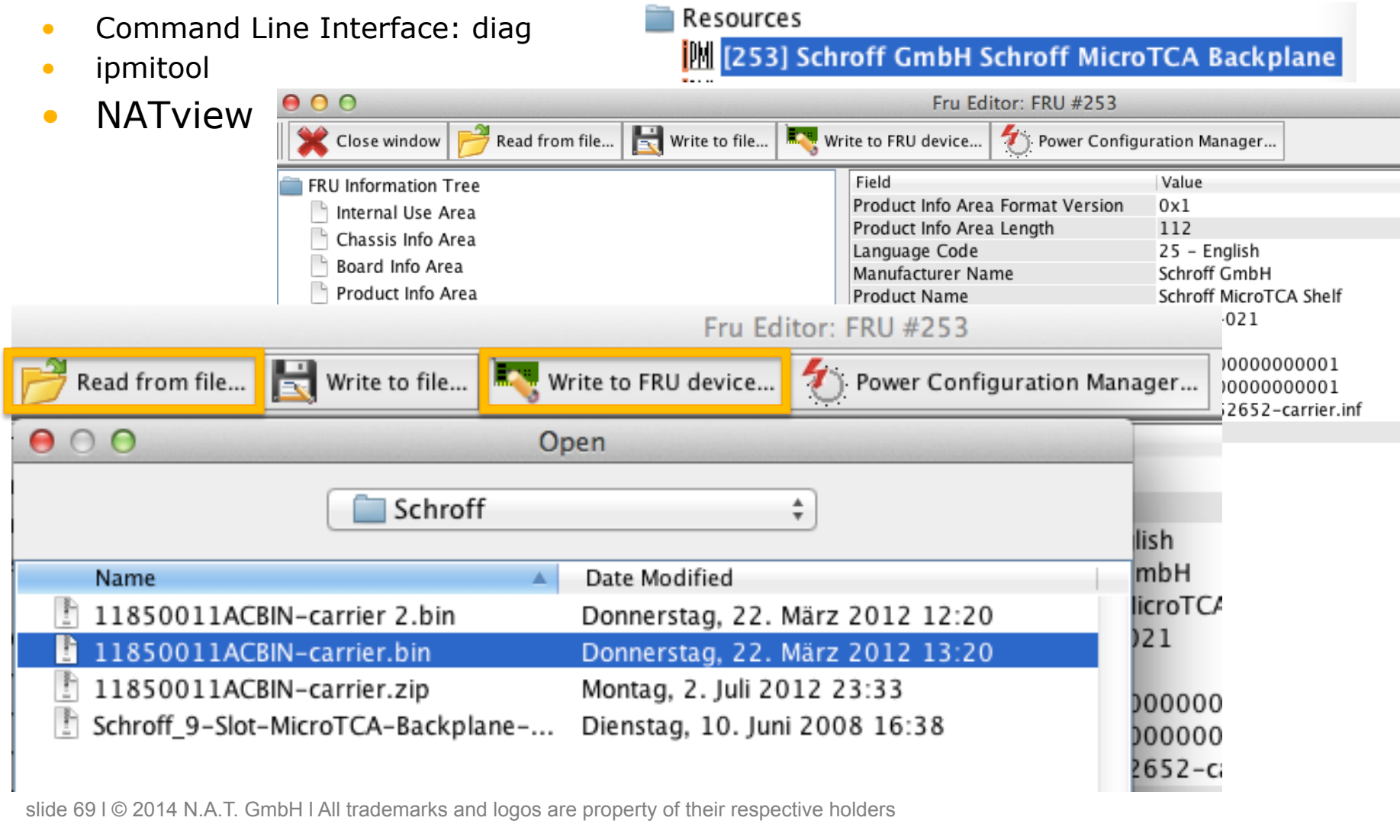
- ipmitool for FRU 253

```
ipmitool -H 192.168.1.41 -P "" fru write 253 11850011ACBIN-carrier_8A.img
```

- NATview
  - see next slide

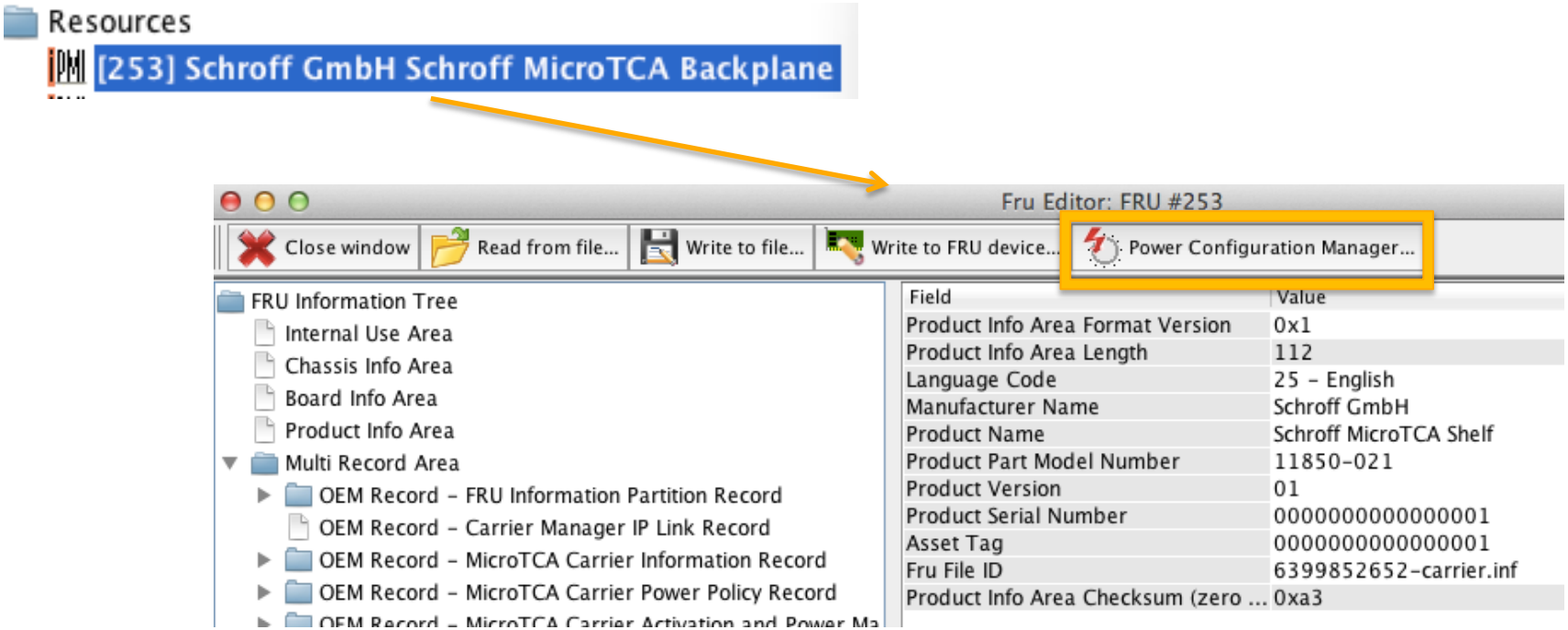
Backplane Update
FRU update

- Command Line Interface: diag
- ipmitool
- NATview



Maintenance: Backplane
Power Configuration Management

- Start for FRU 253 (Backplane) the NATview FRU-Editor
- Klick on Power Configuration Manager



Tutorial about MicroTCA.4
Agenda

- About N.A.T.
- MicroTCA.4 standard and Webpage mtca.eu
- System start of MicroTCA.4 system
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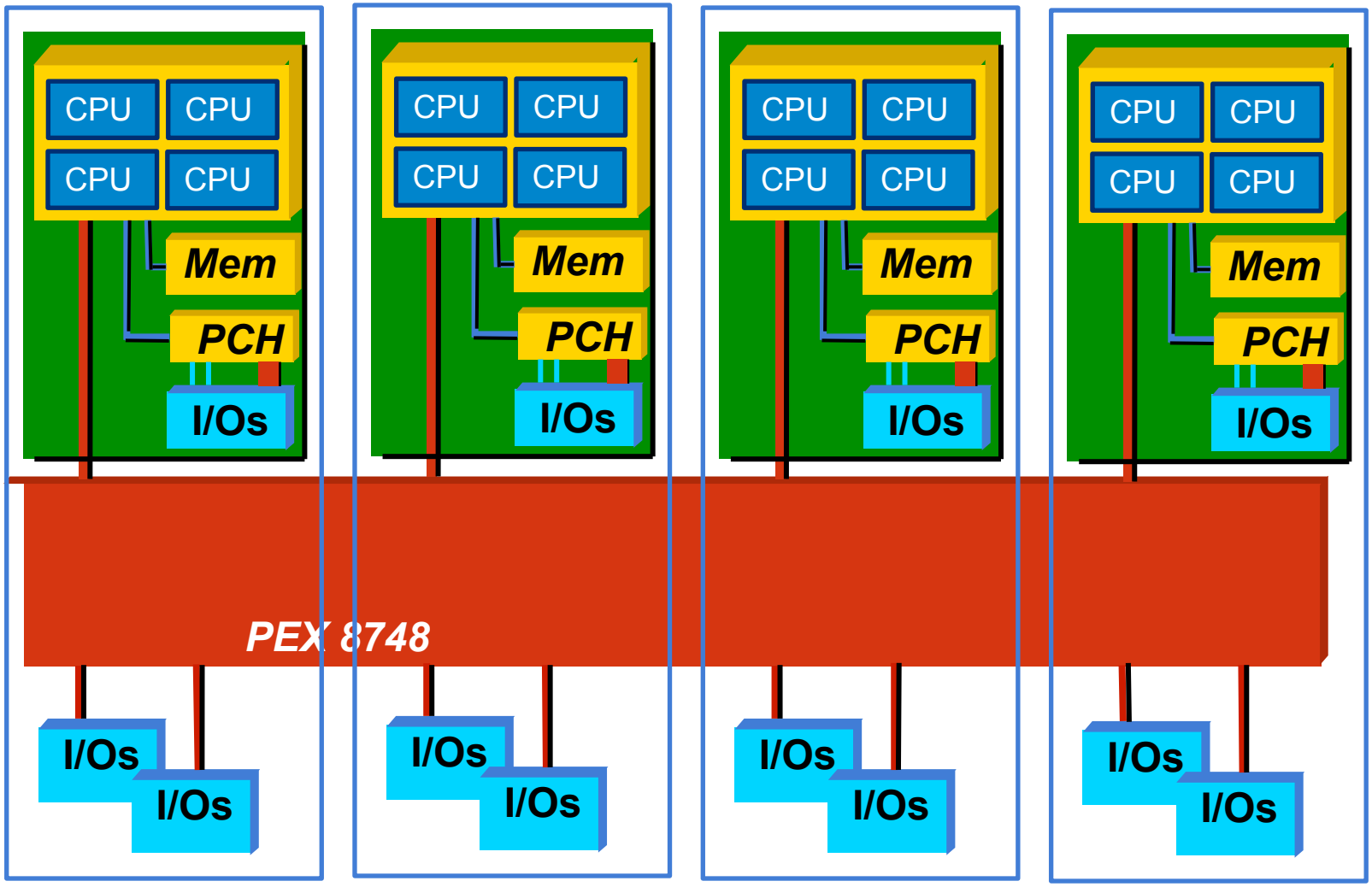
  - Clustering
  - Hot Plug (hand over to next presentation)

PEX8748

Multi-Host Configuration: up to 6 Cluster



NAT-MCH by N.A.T.

Setup

- Base Configuration
- Switch BASE 1GbE
  - Age Time
  - Port on/off
  - Port VLAN
  - 802.1Q VLAN
  - 802.1X
  - 802.1p
  - Port Mirroring
  - Jumbo Frame
  - Link Aggregation
  - Rapid Spanning Tree
  - Link Status
  - BCM5396 counters
  - Configure PCIe Virtual Switches

Maintenance

- Board Information
- System Information
- Reboot NAT-MCH
- Update MCH
- Change Password
- N.A.T. Webpage
- Home

PCIe Virtual Switch configuration

Select Host AMCs (Upstream) for each virtual switch that shall be enabled first.
Select Host AMCs (Non-Transparent Upstream) for each virtual switch that shall be enabled afterwards.
Select which AMCs shall be connected to each virtual switch as downstream in the end.

Virtual Switch	Upstream AMC	NT-Upstream AMC	AMC 1 4..7	AMC 2 4..7	AMC 3 4..7	AMC 4 4..7	AMC 5 4..7	AMC 6 4..7	AMC 7 4..7
none			○	○	○	○	○	○	○
Virtual Switch 0	RTM	- none -	●	●	●	●	●	○	●
Virtual Switch 1	AMC 6_4		○	○	○	○	○	◉	○
Virtual Switch 2	- none -		○	○	○	○	○	○	○
Virtual Switch 3	- none -		○	○	○	○	○	○	○
Virtual Switch 4	- none -		○	○	○	○	○	○	○
Virtual Switch 5	- none -		○	○	○	○	○	○	○
Max. Link Speed			8.0 GT/s	8.0 GT/s	8.0 GT/s	8.0 GT/s	8.0 GT/s	8.0 GT/s	8.0 GT/s

Apply

Note: You need to click apply before you can save your changes to EEPROM.

PCIexpress Configuration
Command Line Interface

```
nat> mchcfg
MCH CFG: configuration modes
  [ 2] reset to defaults
  [ 9] modify PCIe configuration
Enter configuration mode (RET=0/0x0): 9
PCIe parameter:
---------------
PCIe Virtual Switch configuration
change via web-interface
 VS # | Host    | NT-Host | Members
  0     RTM       none      AMC01_4 AMC02_4 AMC03_4 AMC04_4 AMC05_4 AMC
  1     AMC06_4             AMC06_4
Upstream slot power up delay:          15 sec
PCIe hot plug delay for AMCs:          0 sec
PCIe configuration flags:
  hot plug support:                    enabled
  PCIe early ekey (before payload):    disabled
  'no ekey' for PCIe:                  disabled
  PCIe clustering:                     enabled
  Use PCIe on MCH-RTM(disable AMC12):  yes
```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PCIexpress
Hot Plug not Hotswap Solution

- Provide three important capabilities:
  - a method of replacing failed expansions cards without turning the system off
  - keeping the OS and other services running during the repair
  - shutting down and restarting software associated with the failed device
- The base sequence of the HotPlug procedures are:
  - monitoring of the PCIe slot events (e.g. card removal or Attention Button/Module Latch Handel pressing) and reports these events to software via interrupts
  - selectively turns on or off the Power and Attention Indicators associated with a specific card connector to draw the user's attention to the connector and advertise whether power is applied to the slot
  - system software then prepares the card, slot and processes associated with the current device for the card's removal or insertion
  - remove or apply power to the card connector

MTCA.4 Debugging
E-Keying

- show_ekey

```
EKeying information - activated Links:
---------------------------------------
 AMC FRU State Channel Type Port
================================================
AMC1   5   M4    0     PCIe   4 <-> MCH1 Fabric D downstream Gen 1, no SSC
                              5 <-> MCH1 Fabric E downstream Gen 1, no SSC
                              6 <-> MCH1 Fabric F downstream Gen 1, no SSC
                              7 <-> MCH1 Fabric G downstream Gen 1, no SSC

AMC2   6   M4    0     PCIe   4 <-> MCH1 Fabric D downstream Gen 1, no SSC
                              5 <-> MCH1 Fabric E downstream Gen 1, no SSC
                              6 <-> MCH1 Fabric F downstream Gen 1, no SSC
                              7 <-> MCH1 Fabric G downstream Gen 1, no SSC

AMC3   7   M4    0     PCIe   4 <-> MCH1 Fabric D downstream Gen 1, no SSC
                              5 <-> MCH1 Fabric E downstream Gen 1, no SSC
                              6 <-> MCH1 Fabric F downstream Gen 1, no SSC
                              7 <-> MCH1 Fabric G downstream Gen 1, no SSC

...........
```

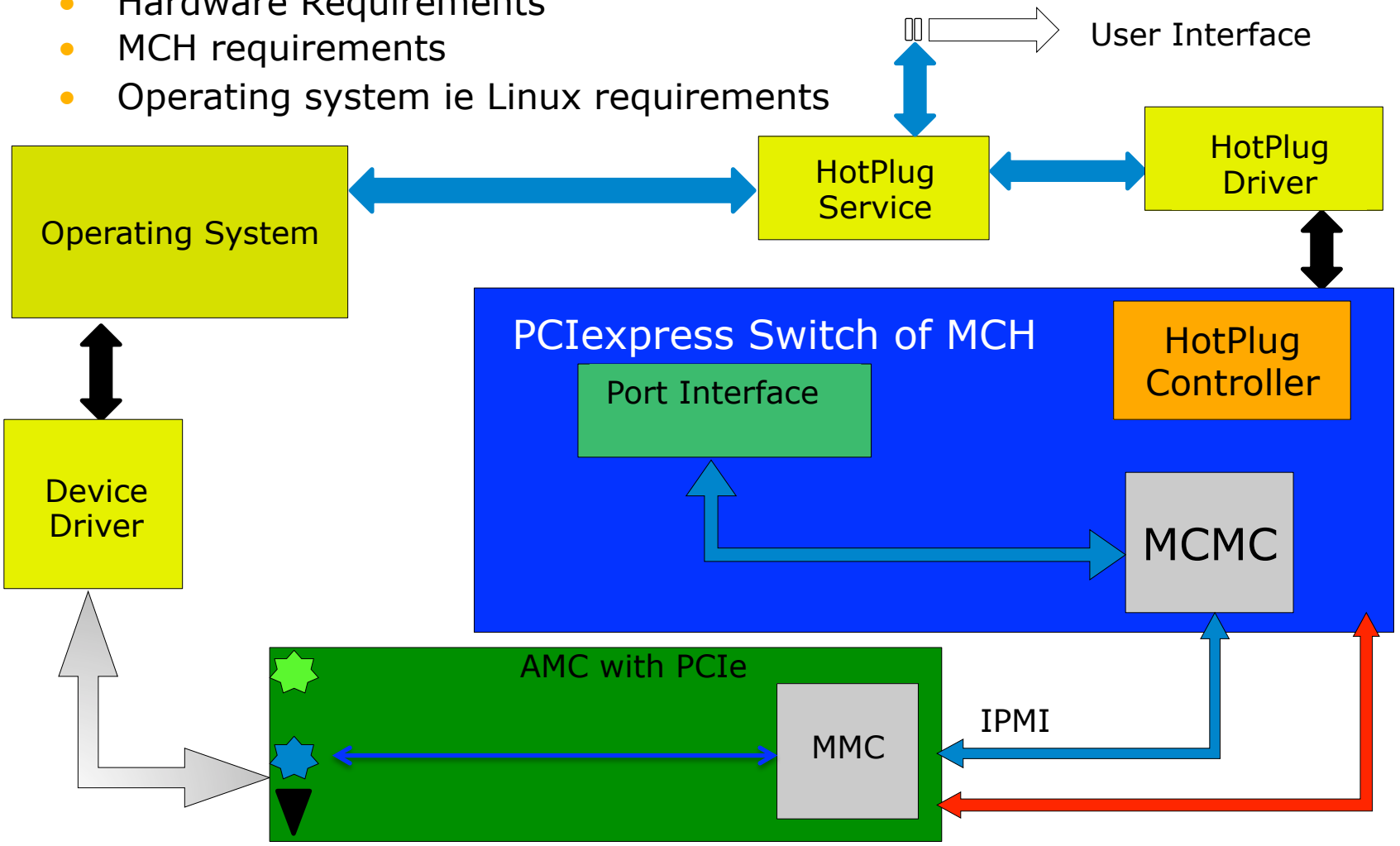

MTCA.4 Debugging
Result of PCIexpress Training

- show_link_state

```
AMC   1 Port   4 is PCIe - x4 - 2,5 GT/s
AMC   1 Port   5 is PCIe - x4 - 2,5 GT/s
AMC   1 Port   6 is PCIe - x4 - 2,5 GT/s
AMC   1 Port   7 is PCIe - x4 - 2,5 GT/s
AMC   2 Port   4 is PCIe - x4 - 2,5 GT/s
AMC   2 Port   5 is PCIe - x4 - 2,5 GT/s
AMC   2 Port   6 is PCIe - x4 - 2,5 GT/s
AMC   2 Port   7 is PCIe - x4 - 2,5 GT/s
AMC   3 Port   4 is PCIe - x4 - 2,5 GT/s
AMC   3 Port   5 is PCIe - x4 - 2,5 GT/s
AMC   3 Port   6 is PCIe - x4 - 2,5 GT/s
AMC   3 Port   7 is PCIe - x4 - 2,5 GT/s
AMC   4 Port   4 is PCIe - x4 - 2,5 GT/s
AMC   4 Port   5 is PCIe - x4 - 2,5 GT/s
AMC   4 Port   6 is PCIe - x4 - 2,5 GT/s
AMC   4 Port   7 is PCIe - x4 - 2,5 GT/s
local RTM link status:
   Ethernet - 1000Base-BX
   PCIe - x4 – 8 GT/s
```

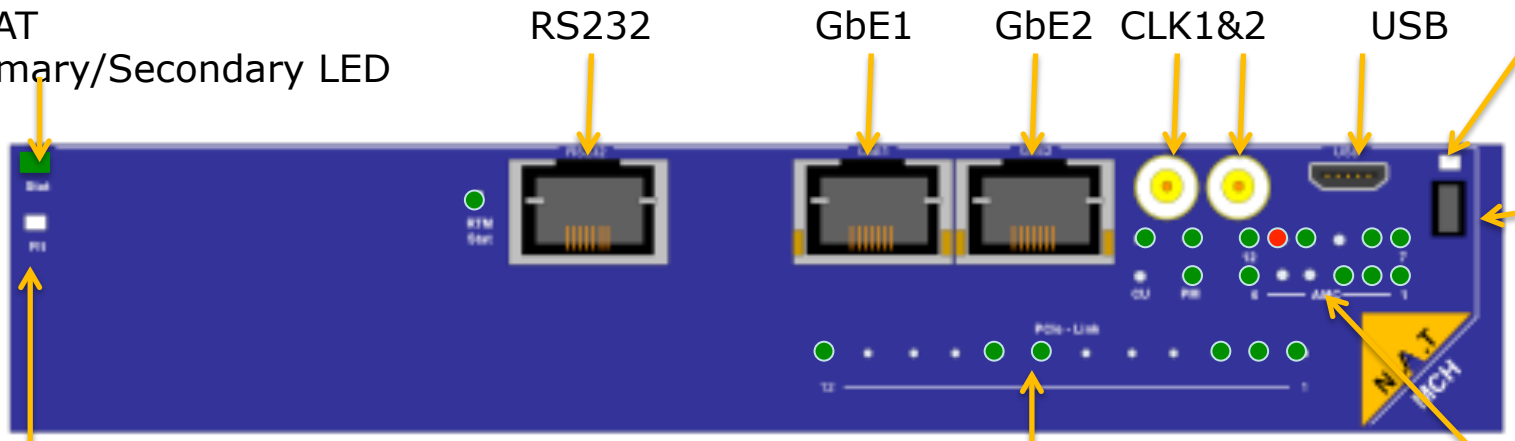

PCIexpress Requirements
Hot Plug and not Hotswap Solution

- Hardware Requirements
- MCH requirements
- Operating system ie Linux requirements



MCH demanded by SLAC and Desy

NAT-MCH-PHYS, NAT-MCH-PHYS80

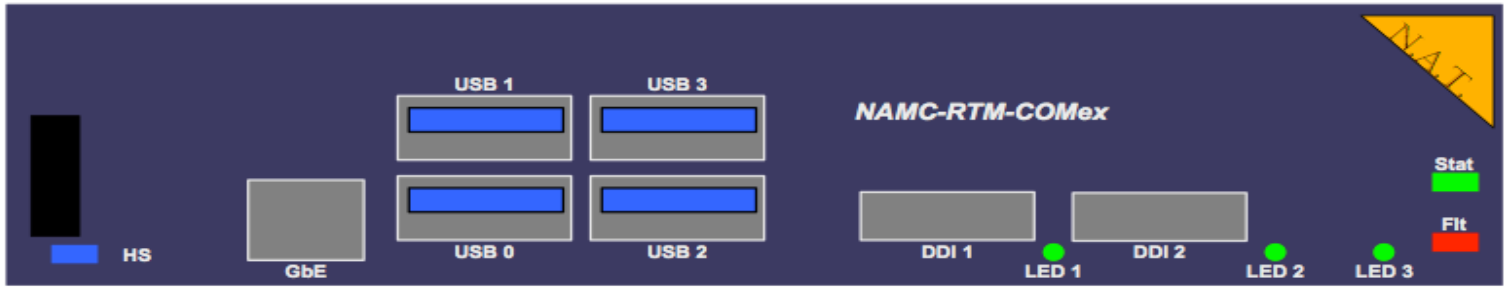


<u>PCIexpress Status and Speed LEDs:</u>

off	no PCIe link active
on	PCIe-Gen3 link active
fast flashing	PCIe-Gen2 link active
slow flashing	PCIe-Gen1 link active

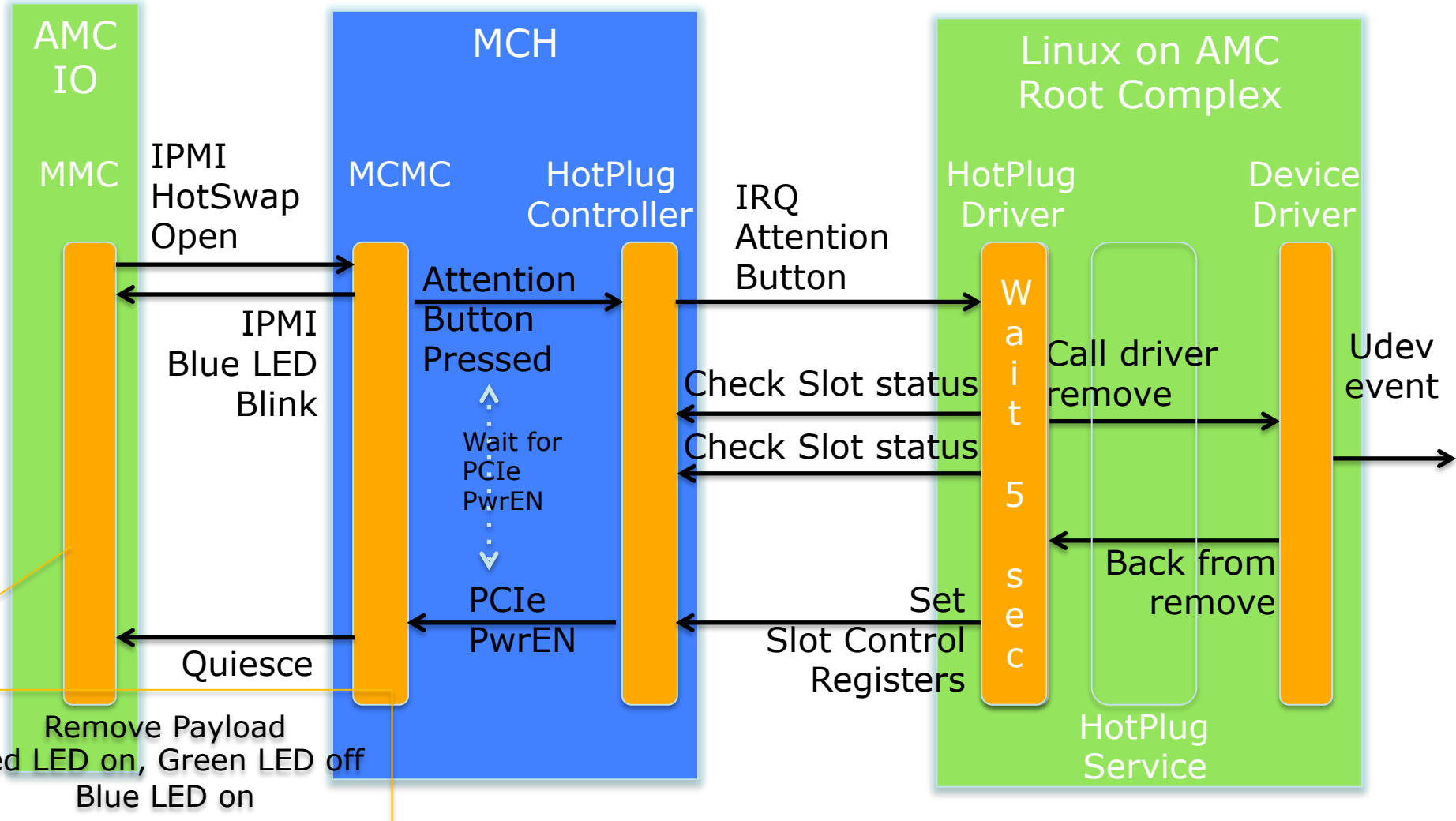
<u>FRU Status LEDs:</u>

AMC 1-12
CU 1, 2
PM 1, 2



Hot Removal of AMC with PCIe

Hotswap handle pulled out: standard procedure



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  - Clustering
  - Hot Plug -> See next, how this is seen on Linux side

Thank you very much!
Questions?

Vollrath Dirksen
Strategic Business Development

vollrath@nateurope.com

N.A.T. GmbH
Konrad-Zuse-Platz 9
53227 Bonn, Germany

www.nateurope.com

MTCA.4 Training:

mtca.desy.de/support/training

2015: PowerBridge N.A.T.

