NATIVE-MINI

MICROTCA CHASSIS WITH NAT-EMCH

DESIGNED BY N.A.T. GMBH

TECHNICAL REFERENCE MANUAL V1.0

HW REVISION 1.X

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1. PREFACE

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Note:

The release of the Hardware Manual is related to a certain HW board revision given in the document title. For HW revisions earlier than the one given in the document title please contact N.A.T. for the corresponding older Hardware Manual release.

1.2. About This Document

This document is intended to give an overview on the **NATIVE-mini's** functional capabilities.

Preface

General information about this document

Introduction

Abstract on the **NATIVE-mini's** main functionality and application field

Quick Start

Important information and mandatory requirements to be considered before operating the **NATIVE-mini** for the first time

Hardware

Details on the **NATIVE-mini's** most important components and interfaces

Configuration

Adapting the **NATIVE-mini** to personal needs and updating the firmware of the **NAT-eMCH**

Management Interface

Information about the interaction of the **NAT-eMCH** and an external system controller

Specifications and Compliances

Detailed list of specifications, abbreviations, and datasheets of components referred to in this document, as well as standards, the **NATIVE-mini** complies to

Document's History

Revision record

Note:

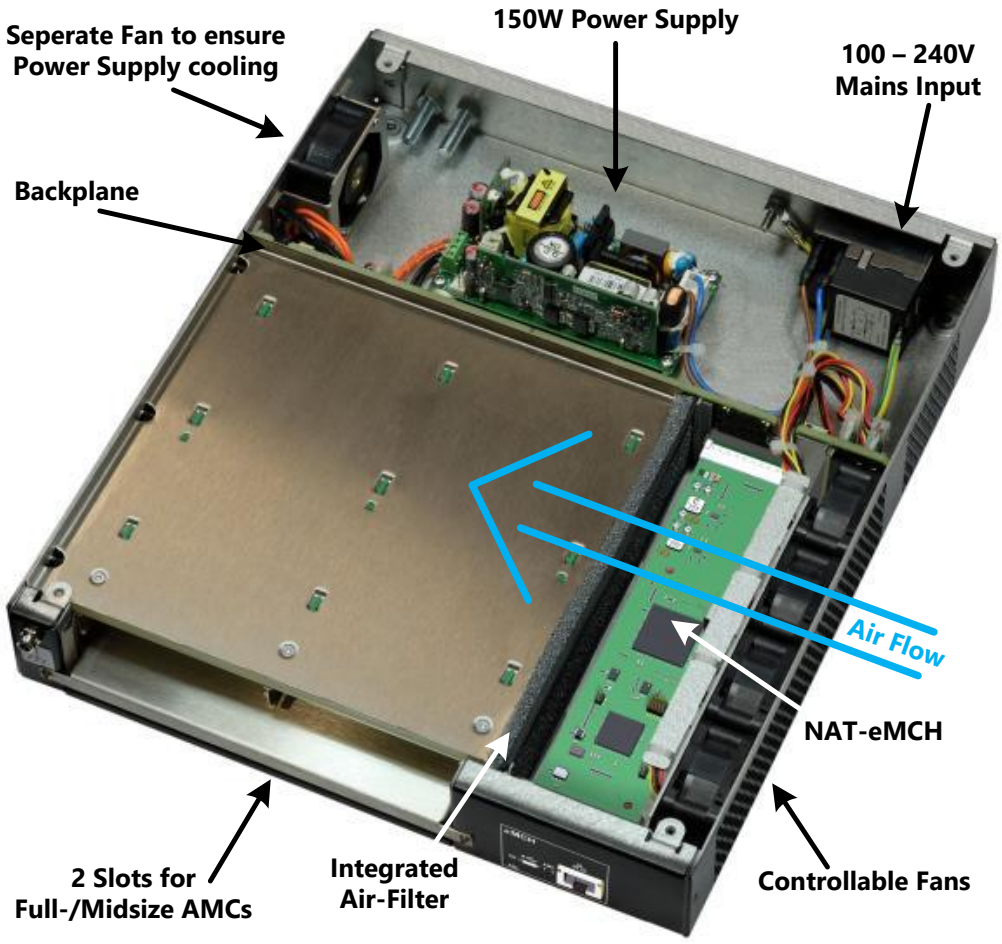
It is assumed, that the **NATIVE-mini** is handled by qualified personnel only!

2. INTRODUCTION

The **NATIVE-mini** is a compact µTCA chassis featuring two payload slots for single-wide, full- or mid-size AMC modules, and an embedded MCH (referred to as **NAT-eMCH** in this document), which enables the communication between the AMC modules and the monitoring of the system, including the power and cooling management.

The following figure shows the chassis design of the **NATIVE-mini**.

Figure 1 – Chassis Design



2.1. Basic Functionality

The **NAT-eMCH** provides via its 1GbE switch direct access to both AMCs and the system management via the 1GbE-Uplink at the chassis front. The 1GbE switch also allows the direct integration of the system components in an existing network infrastructure. Hereby, it is also possible to simply integrate the **NATIVE-mini** in existing management architectures like e.g. SNMP. The **NAT-eMCH** is fully compatible with the **NAT-MCH** and therefore offers a natural migration path to bigger systems while keeping already used AMCs.

Furthermore, it supports the typical hot-swap-management and its transition state machine (M0 to M6) for each AMC module. In addition to that, the **NAT-eMCH** monitors and verifies local sensor data of the chassis and installed FRU devices, and supplies µTCA power and cooling concepts by accessing the chassis integrated power supply and fan coolers. Remote administration can be done locally over the Command Line Interface served by the front USB port.

2.2. Applications

The **NATIVE-mini** aims for applications which are cost-sensitive and get along with only few AMCs, but on the other hand want to profit from the proven technological benefits that are offered by µTCA (e.g. error detection and isolation, open system management and monitoring, etc.).

Due to the fact that the chassis is stackable or mountable in a 19'' rack, the **NATIVE-mini** is multi-purpose and usable, e.g. for digital video and image editing, automation and machine control, electronic signal processing, security, and gateway.

2.3. Main Features

Table 1 – Technical Data

Form Factor	
	• 2-slot 1U chassis – 260mm x 43mm x 302mm (W x H x D) • designed for up to two single-wide, mid- or full-size AMCs • stackable or mountable in 19'' racks
NAT-eMCH	
Processing Resources	• Atmel ATSAM4E16C Cortex-M4 processor @ 120 MHz • Main memory: 128 kByte embedded SRAM • FLASH PROM: 1024 kByte embedded FLASH ROM
Interfaces	• 1GbE switch for Fabric A • 1GbE-Uplink at front panel • local point-to-point connections at AMC ports 2-20 and TCLKA-D
System Management	• management and fault isolation for built-in power supply, fans, and AMCs • Allows system integration into existing management architectures, i.e. SNMP, RMCP
Software	• FreeRTOS 7.3.0 • Fully compatible with **NAT-MCH** • Life-long free firmware update service • NATview-EASY included • Configuration via web interface
Power Supply	
	• Integrated 150W AC Open Frame power supply (auto-range 100-240 VAC) • Power management on backplane • ON/OFF-switch • Simply replaceable
Cooling Units	
	• Integrated cooling units including air filter • Cooling power of 150W @ +55°C operating temperature • Fanspeed-controlled fans, controlled by temperature sensors and managed by **NAT-eMCH** • Supports side-to-side cooling • Simply replaceable
Front Panel	
	• 1x GbE interface via RJ45-connector • 1x console via Micro-USB • 2x green LEDs for status indication of each of the 2 AMC modules • 2x green/red LEDs for status indication of **NAT-eMCH** module
Compliance	
	• PICMG µTCA.0 Rev. 1.0 • PICMG AMC.0 Rev. 2.0
Environmental	
Ambient Temperature	• -5°C to +45°C (long term) • -5°C to +55°C (short term)
Humidity	• 5% to 85%, non-condensing

3. QUICK START

To ensure proper functioning of the **NATIVE-mini** during its usual lifetime, take the following precautions before handling the shelf.

3.1. Unpacking

Electrostatic discharge, incorrect board installation, and uninstallation can damage circuits or shorten their lifetime. Before touching integrated circuits ensure to take all required precautions for handling electrostatic devices.

Avoid touching gold contacts of the AMC-Edge-Connectors to ensure proper contact when inserting the modules into the **NATIVE-mini**.

Make sure that the chassis and its attachments are undamaged and complete according to delivery note.

3.2. Mechanical Requirements

Despite its compact design the **NATIVE-mini** is compliant to the open µTCA standard MTCA.0 and therefore every standard-compliant, single full-size or mid-size AMC module can be integrated.

Before installing or uninstalling an AMC, read the Installation Guide and the User's Manual of the module.

Check all modules for steps that you have to take before turning on or off the power. After taking those steps, turn on or off the power if necessary.

Make sure the part to be installed/removed is hot-swap-capable, if you don't switch off the power.

Ensure that the module is connected to the **NATIVE-mini** with the connector completely inserted.

Install the system in an open rack whenever possible. If installation in an enclosed rack is unavoidable, ensure that the rack has adequate ventilation.

Maintain ambient airflow to ensure normal operation. If the airflow is blocked or restricted, or if the intake air is too warm, an over temperature condition can occur.

Ensure that cables from other equipment do not obstruct the airflow through the shelf.

Use filler panels which include an airflow baffle that extends to the backplane to cover all empty chassis slots. The filler panel prevents fan air from escaping out of the front of an open slot.

The **NATIVE-mini** is intended to be grounded. Ensure that the shelf ground terminals are connected to Protective Earth of the building.

3.3. Voltage Requirements

3.3.1. Power supply

The **NATIVE-mini** consumes 150W (determined by integrated power supply) at a voltage range from 100 to 240 VAC.

3.3.2. Hot-Swap

The **NATIVE-mini** supports hot-swapping, which means that an AMC module, which features hot-swap-capability as well, can be inserted or extracted during normal system operation without affecting other modules.

Make sure to follow the procedure ***exactly*** to prevent the AMC module or the system it is plugged into from damage!

Insertion of a hot-swap-capable module

- Ensure the module supports hot-swapping
- Ensure that the hot-swap-handle is in "unlock"-position (pulled out)
- Push the module carefully into the dedicated slot of the **NATIVE-mini** until it is completely inserted
- The blue HS-LED turns solid on
- With pushing the hot-swap-handle to "lock"-position, the HS-LED starts blinking and the IPMI-Controller of the backplane/carrier detects the board
- If the information provided by the module is valid, the **NATIVE-mini** enables payload power and the blue HS-LED turns off

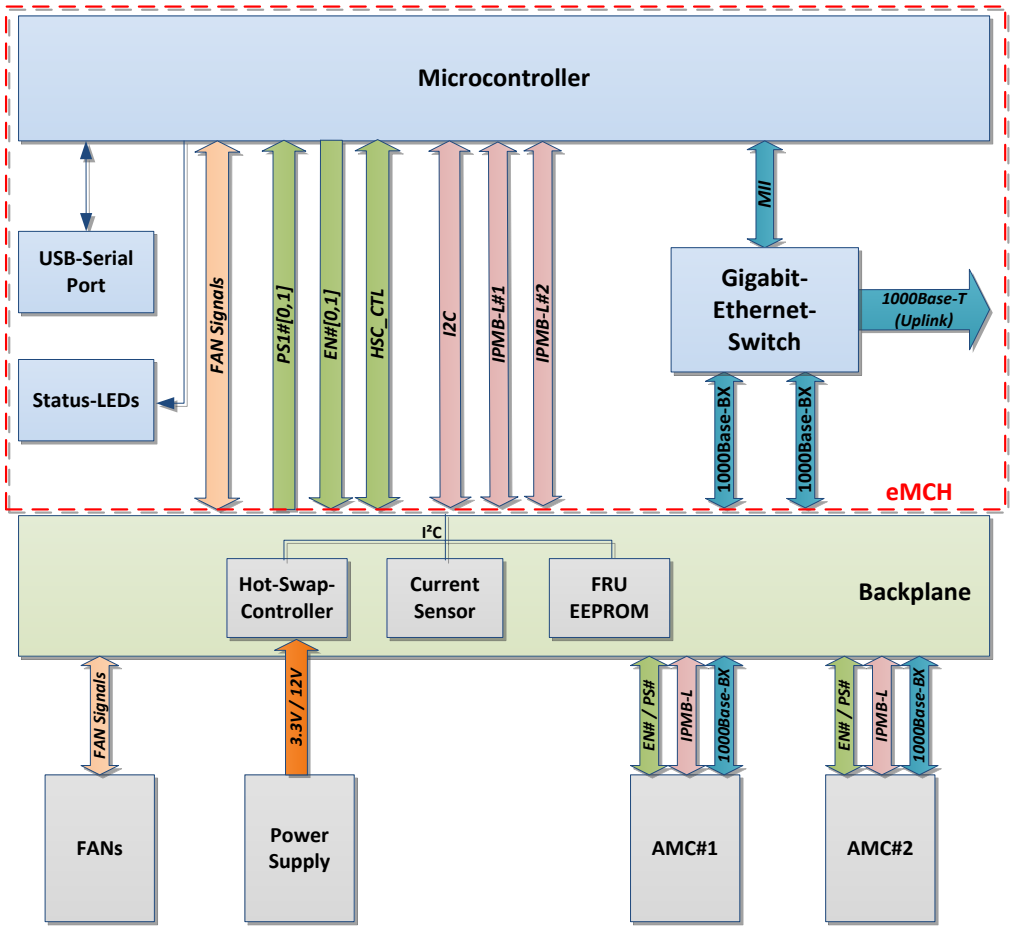
Extraction of a hot-swap-capable module

- Pull the hot-swap-handle in "unlock"-position
- The blue HS-LED starts blinking
- The IPMI-Controller of the **NATIVE-mini** disables payload power
- The HS-LED turns solid on
- Pull the module carefully out of the **NATIVE-mini**

4. HARDWARE

The **NATIVE-mini** is made up of several functional blocks, which are described in the following paragraphs.

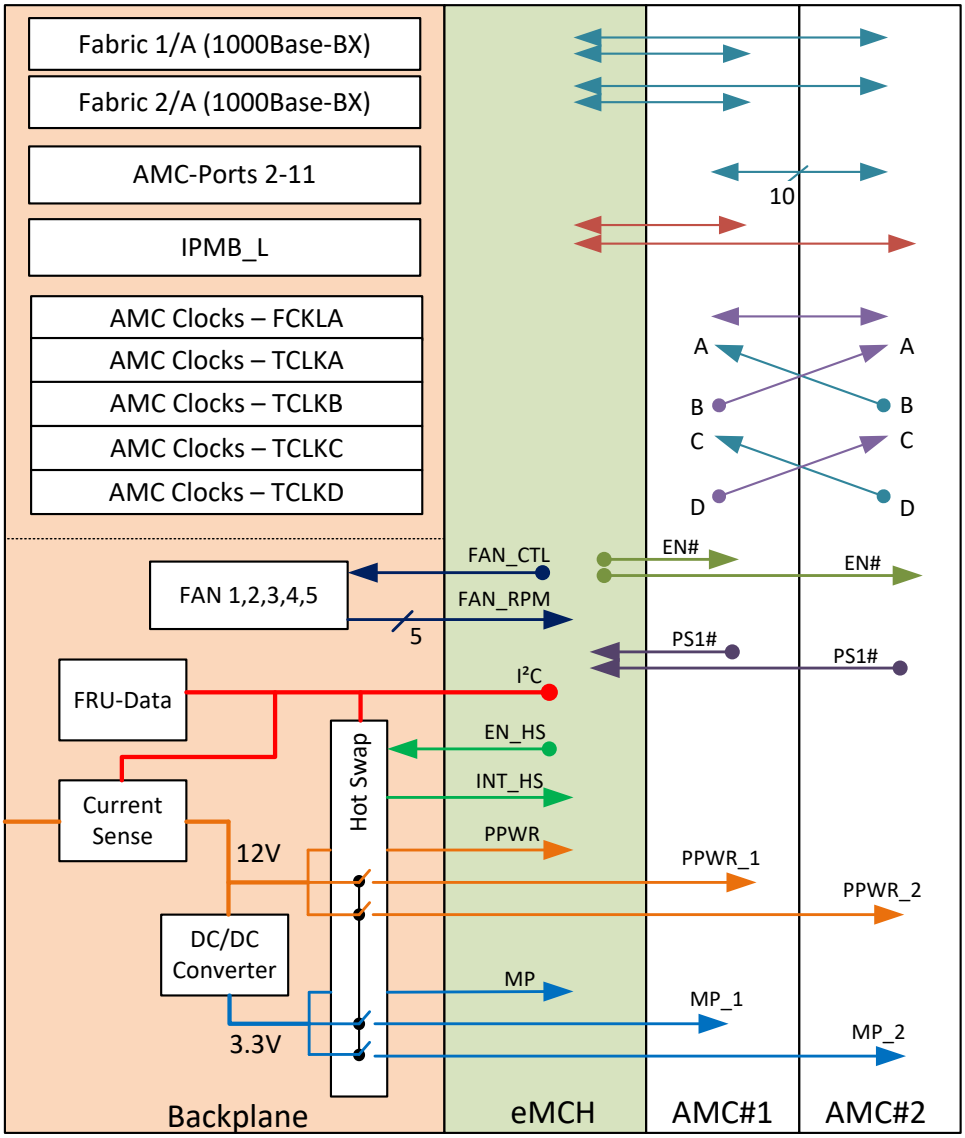
Figure 2 – Block Diagram



4.1. Backplane

The figure below shows the inner port assignment of the backplane and the way how the **NAT-eMCH** is connected to it.

Figure 3 – Backplane Topology



To each of the AMC-Modules, the **NAT-eMCH** has radial connections including 1000Base-BX Ethernet (port 0 and 1), I²C-IPMB for management based on IPMI messages, and enable-/ power switch signals for serving µTCA hot-swap-capabilities.

AMC ports 0/1 are switched by the **NAT-eMCH**. AMC ports 2-11, FCLKA, and TCLKA-D are directly crossover connected between both of the AMC modules, which enables a high operational performance.

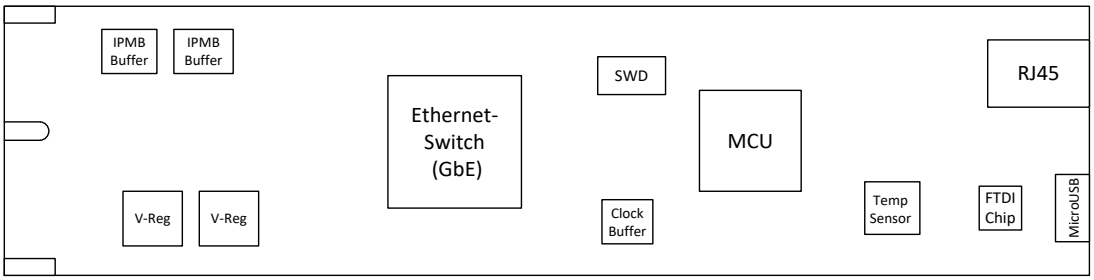
Table 2 – AMC Port Assignment

AMC Port#	Assignment
0	Fabric 1/A – 1000Base-BX
1	Fabric 2/A – 1000Base-BX
2	SATA
3	SATA
4-7	Fat Pipe
8-11	Extended Fat Pipe

Powers for payload (12V) and management (3.3V) for each installed AMC are circuit switched by a hot-swap-controller that remains on the backplane, and which is available via a further I^2C-bus to the **NAT-eMCH**. A current sensor and the backplane FRU-EEPROM are also connected to that bus.

4.2. NAT-eMCH – Component-, Connector-, and Switch-Location

Figure 4 – Location Diagram NAT-eMCH



4.3. Front Panel, LEDs, and Connectors

The **NAT-eMCH** front panel features two status LEDs for the AMCs, and two LEDs (OK, FAIL) for the system's operation status; the behaviour is described in the table below.

Additionally, sockets for a RJ45 plug and a micro USB cable are mounted.

Figure 5 – Front Panel and LEDs

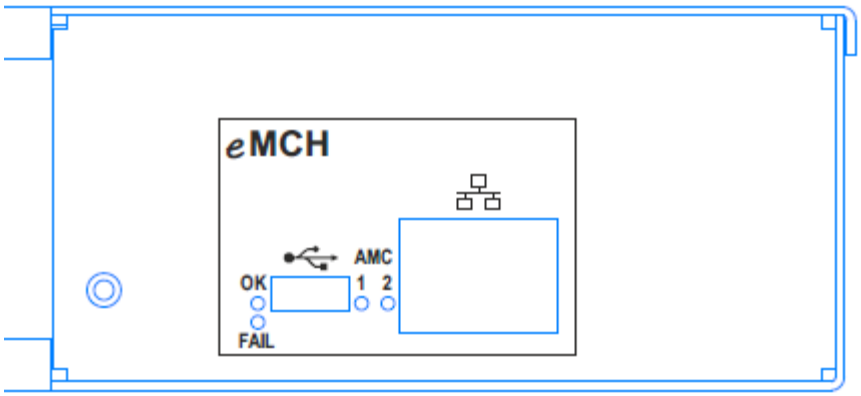


Table 3 – LED Functionality

LED	Color	Behaviour	Function
LED AMC1 / LED AMC2	green	Fast flash	Reading FRU information (M1)
		Slow blink	Waiting for HS-Handle being closed (M1)
		Solid ON	FRU operating state (M4)
		Solid OFF	No module installed
LED OK	green/red	Fast flash	Test mode
		Solid ON	Normal operating status
LED FAIL	green/red	Solid ON	Hard Fault

4.3.1. USB Debug Connector

The **NATIVE-mini** features an USB debug interface towards the **NAT-eMCH**.

Figure 6 – USB Debug Connector

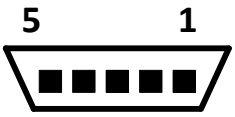


Table 4 – USB Debug Connector – Pin Assignment

Pin #	Signal	Signal	Pin #
1	VCC	D-	2
3	D+	nc	3
5	GND		

4.3.2. RJ45 Connector

A RJ45 connector offers an 1000Base-T interface for remote control.

Figure 7 – Remote Control

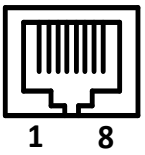


Table 5 – Remote Control – Pin Assignment

Pin #	Signal	Signal	Pin #
1	MX0+	MX0-	2
3	MX1+	MX2+	4
5	MX2-	MX1-	6
7	MX3+	MX3-	8

4.4. Cooling Unit

The **NATIVE-mini** is equipped with integrated air-filters and four fans, which are controlled by a temperature sensor and managed by the **NAT-eMCH**. Cold air is taken from the right side and led through the system. Thus, a cooling power of 150W at an operating temperature of +55°C is ensured.

For scalable applications, the chassis is stackable or mountable in 19" racks and supports side-to-side cooling. Fans and air-filters are simply replaceable.

4.5. Operation

4.5.1. System Start-up and Redundancy Operation

After power-up, the **NAT-eMCH** tries to read the backplane FRU information and locates the available power module and cooling unit before it starts scanning for installed AMC modules.

4.5.2. AMC Module Start-up Sequencing

For all AMC modules found in the system, the **NAT-eMCH** reads the FRU information and sensor data records. If power negotiation is successful, the power module is advised to power up the AMC modules either in the activation sequence defined in the `'Carrier Activation and Current descriptor'` record of the backplane FRU device or - if the record is not found - according to the site number.

Any populated slot of the **NATIVE-mini** is represented by a green LED on the front panel.

4.5.3. Local Shelf Manager

The **NATIVE-mini's** local shelf manager provides management of the following resources within the µTCA system:

- Sensor Event Log
- Temperature management and CU control

4.5.3.1. System Event Log

The **NAT-eMCH** provides a System Event Log that stores all events occurring in the µTCA system. These events are kept in the **NAT-eMCH's** SRAM and are not stored into persistent memory.

Events can be read by an application using the IPMI message `'GET_SEL_ENTRY_REQ'`.

Events are removed from the SEL on read. To remove single events from the SEL in this configuration, the IPMI message `'DELETE_SEL_ENTRY_REQ'` has to be sent to the **NAT-eMCH**, by using `'CLEAR_SEL_REQ'`, the whole SEL is cleared.

Note: some events (e.g. temperature events) are handled by the local shelf manager.

4.5.3.2. Temperature Management

The local shelf manager receives temperature events from the following sources:

- Local temperature sensors on the **NAT-eMCH**
- Temperature sensors on the AMC modules
- Temperature sensors on cooling units and power modules

In case the **NAT-eMCH** receives a temperature event from a FRU, i.e. the temperature of a certain module has reached a critical level, it increases the fan speed of the cooling units to maximum and starts monitoring the temperature sensors of the respective FRU.

As soon as the temperature returns to normal level, the fan speed will be decreased to a level which is 10% higher than the level before the temperature event occurred. If the temperature is stable for a certain time, the fan speed will be reduced step by step.

5. CONFIGURATION

5.1. COM-Settings

The **NAT-eMCH** has a command line interface which allows users to initially set up configuration parameters as well as supplying low level diagnostic information. The CLI is available at the console port and telnet.

To establish a local connection to a host PC over USB, a serial terminal program is needed, e.g. Terra-Term, HTerm, Putty, etc. The configuration of the COM port settings is described in the following table.

Table 6 – COM Port Settings

Parameter	Value
Baud rate	115200
Data	8 bit
Parity	None
Stop	1 bit
Flow Control	None
COM	Device's COM address defined by host

If the terminal is opened, press `Enter` to see if the connection is established successfully. Typing `'help'` lists the available commands, `Enter` calls the previous command again.

Note: Depending on the used operating system, the FTDI-chip driver must be downloaded and installed manually (see chapter 7.2 External Reference Documentation). Installing the driver automatically by the windows update may take up to a few minutes.

The commands supported by the command line interface may vary with the firmware version. For a current list of available commands enter `'?'` at the command line prompt. Please note that some commands are intentionally not listed in the table because they are used for testing purpose only.

Table 7 – Commands supported by CLI

Command	Parameter	Description
bi		**Board Information** Prints the vital product information record (i.e. serial number, hardware revision, and release codes).
ip		**IP configuration** Configures IP addresses, net mask, broadcast address, and gateway.
password		**Password Configuration** Allows changing the password which is verified before starting a telnet session or accessing the webserver. A password length of not less than 8 to maximum 16 characters is required. The default password is set to `'nat'`.
reboot		**Reboot the NAT-eMCH**
cmu_dbg		**Configure CM upper part debug**
csif_dbg		**Configure CM/ShM interface debug**
imsg_dbg		**Configure IPMI message debug**
lshm_dbg		**Configure local ShM debug**
rmcp_dbg		**Configure RMCP interface debug**
sdrrep_dbg		**Configure SDR repository debug**
sel_dbg		**Configure System Event Log debug**
imsg_info		**IPMI message information** Prints the implementation status of the supported IPMI messages on the Host (RMCP) interface and can be used to print a list of IPMI messages that are supported by the **NAT-eMCH**.
lshm_info		**Print local ShM information**
idb_info		**Print IPMI data base information**
sdrrep_info		**SDR repository information** Prints an overview of the Sensor Data Repository of the **NAT-eMCH**.
sel_info		**System Event Log information** Prints the Sensor Event Log status and stored events in raw and decoded format.
session_info		**Session information** Print status of currently active sessions.
show_ekey		**Show all activated connections**
show_fru		**Show all FRUs**
show_fruinfo	fru_id	**FRU contents** Shows the contents of a FRU device selected by `<fru_id>`. For valid FRU numbers please refer to MTCA R1.0 table 3-3.
show_pwrconf		**Power Configuration** Displays the power channel assignment by the backplane FRU device
show_cu		**Show cooling unit**

show_pm		**Power Module Status** Shows the current power allocation status for all AMC modules and cooling units.
show_sensorinfo	fru_id	**Shows the sensor values of the selected FRU**
version		**Print firmware version information**
ni		**Print network configuration**
ti		**Print task runtime information and memory usage**
ping	IP Address	**Issue ICMP echo request** This command supports several command line options. For more information on the command's usage, type `'ping -?'`
diag		**Menu driven diagnostic tool** This menu shall be used on N.A.T.'s explicit advice only
fan_ctl		**FAN control** Command to get fan properties and speed level, and to set the fan speed level.
shutdown	`<fru_id/all>`	**Successful shutdown of FRU or all AMCs**
fru_start	`<fru_id>`	**Successful start for FRU**

5.2. Boot Manager

Note: Use this menu on N.A.T.'s explicit advice only!

The device contains a boot manager which normally executes either the firmware or the bootloader. By pressing `'x'` to CLI at the boot process within half a second, the boot menu of the boot manager will be called, and the boot option (firmware, bootloader) can be chosen manually. Furthermore, the default configuration (e.g. IP settings, web password, etc.) can be restored.

5.3. Updating the Firmware

The **NAT-eMCH** serves a web based front end for easy upgrading the firmware in field. To use this utility, first establish an Ethernet link via the **NAT-eMCH** uplink port. If not changed, the standard interface configuration is as shown in the following table.

Table 8 – Standard Interface Configuration

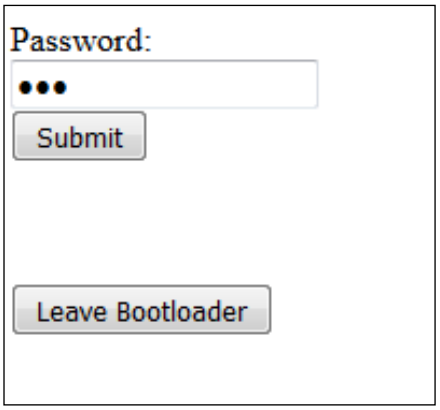
Parameter	Value
IP Address	192.168.1.138
Netmask	255.255.255.0
Gateway	0.0.0.0

First, the bootloader needs to be called by either typing 'bl' to the command line interface or submitting 'http://192.168.1.138/' to the web browser.

The index page is shown with a button 'call bootloader'. By clicking this button, a software reset will be triggered and the system will boot into the bootloader.

Wait a few seconds and call 'http://192.168.1.138/' again. The page should have changed slightly and will ask for a password (default 'nat').

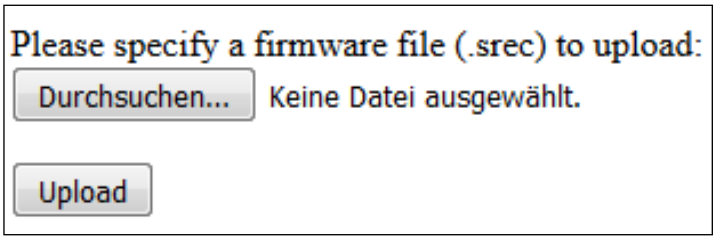
Figure 8 – Firmware Update Login



For leaving without any changes, use 'Leave Bootloader'.

'Submit' opens the following page:

Figure 9 – Firmware Update Upload

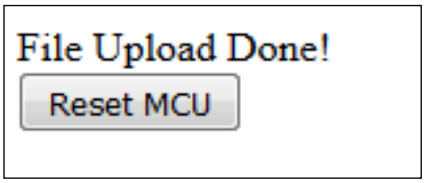


A valid N.A.T. firmware image with the file extension '.srec' has to be chosen. 'Upload' flashes the image into the device memory.

Note: The upload process will take a few seconds, do not interrupt or close the browser while upgrading!

If successful, the following page is shown.

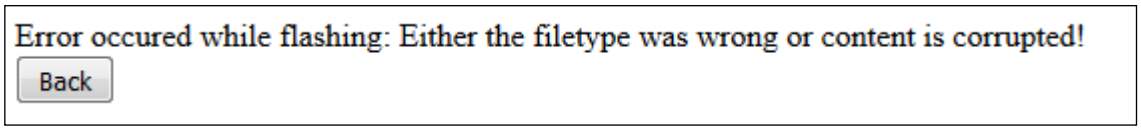
Figure 10 – Firmware Update Successful



Click on 'Reset MCU' to trigger a software reset. The device should now boot into the new firmware.

Note: If an error occurs during the firmware upgrade (e.g. power or communication interrupted while transferring file), the device will boot into the bootloader again instead of loading the firmware. In this case the firmware upgrade can be started again.

Figure 11 – Firmware Update Failure



6. MANAGEMENT INTERFACE

For interfacing to a system controller, the **NAT-eMCH** is equipped with an Ethernet based management port which resides on the front panel 1000 BaseT port. By the exchange of IPMI messages, an external system controller can communicate with the **NAT-eMCH**.

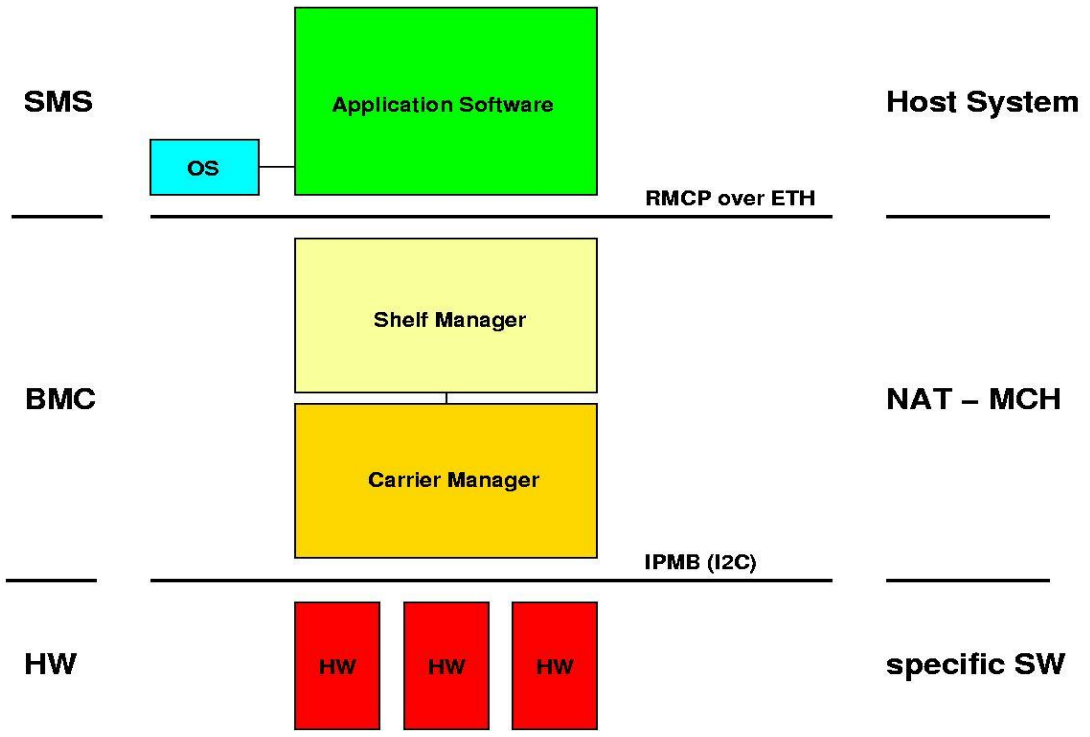
The IPMI messages are encapsulated in RMCP packets for transport via Ethernet. By this standard interface, the user has access to a broad range of open source and commercial tools to access and manage the **NAT-eMCH**.

The N.A.T. graphical system management JAVA application **NATview** utilizes this interface as well.

6.1. Software Structure

The following figure gives a basic overview about software structure on the **NAT-eMCH**.

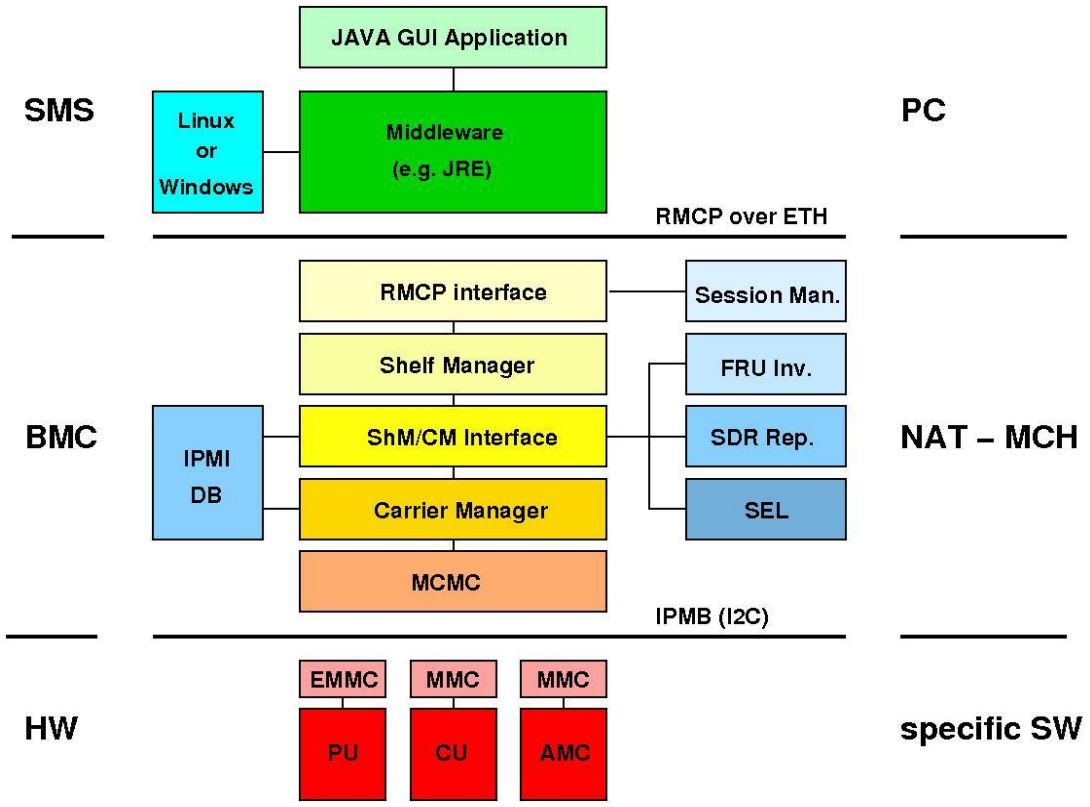
Figure 12 – Software Structure Overview



The System Management Software (SMS) is running on a host system that communicates with the **NAT-eMCH** by RMCP via Ethernet. The **NAT-eMCH** itself implements base management controller (BMC) functionality and communicates over IPMI messages via I^2C with hardware modules (e.g. Cooling Units, Power Modules, AMCs) that run hardware module specific software.

An example for a software implementation that uses a graphical JAVA application running on the host system is given below.

Figure 13 – Software Structure Details



The system management software is described more detailed in the following chapters.

The software on the **NAT-eMCH** can be divided up into two parts:

- A layer structured stack that implements the interfaces to external systems (host and hardware), and message handling
- Supporting modules to save data (IPMI data base, FRU inventory, SDR repository, SEL), and communication information (session management)

  Note: the SEL on the **NAT-eMCH** is kept in memory but not stored into persistent memory.

6.2. Communication between Host System and NAT-eMCH

Communication between a host system and the **NAT-eMCH** is done via IPMI messages. To allow a flexible and common available transport of these IPMI messages, the **NAT-eMCH** offers an Ethernet based management interface.

6.2.1. Remote Management Control Protocol

Transport via Ethernet usually requires some high-level protocols to be used. The **NAT-eMCH** implements a Remote Management Control Protocol (see chapter 7.2 External Reference Documentation for details) interface, whereby the IPMI messages are embedded into the RMCP messages, which are sent using UDP via an Ethernet channel.

The RMCP fulfils all requirements to transfer IPMI messages via Ethernet:

- Presence echo mechanism (RMPC ping/pong messages)
- Message flow control via sequence numbers
- Support for multi-session
- Transfer of session header
- Support for authenticated access
- Per-message authentication disable
- User-level authentication disable

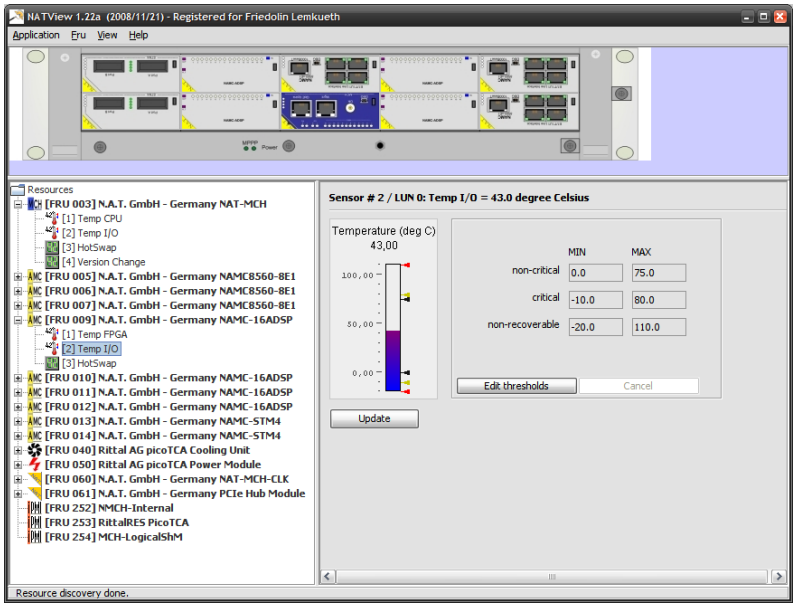
The **NAT-eMCH** supports access to the RMPC interface via its front Ethernet interface.

6.3. Host Software Overview

6.3.1. NATview

NATview is a graphical application that can be used to monitor and control an µTCA system using IPMI messages. The application is written entirely in Java – it should therefore run on every operating system that is able to execute the Sun Java Runtime Environment (JRE).

Figure 14 - NATview



6.3.1.1. Supported Java Releases

NATview requires Sun Java 1.6 or higher to guarantee the largest possible JRE installation basis on Window, Linux, and Mac OS X systems. For information about the Java version on the used system, enter `'java -version'` to a command prompt window.

For an appropriate copy of the Sun JRE, please refer to chapter 7.2 External Reference Documentation.

6.3.1.2. Installing and Running NATview

NATview is usually distributed as a zip archive via the N.A.T. FTP-Server (refer to chapter 7.1 Internal Reference Documentation). The following steps will install **NATview** on the system.

- Extract the content of the zip archives to an empty directory. This empty directory will be the root directory of the application.
- Start the application from within the root directory. Otherwise the application cannot find the board images in the subdirectory images.
- From the command line, type:
  ```
  cd <root-directory>
  java -jar natview.jar
  ```

6.3.1.3. Further Information

More detailed information can be found in the documentation that is accompanying the software.

6.4. Known Bugs and Restrictions

Table 9 – Known Bugs and Restrictions

0001	ARP Request using a Windows PC may take longer than expected
0002	NATview support just in early beta state. It may cause errors with the **NAT-eMCH**. Also not all functions are supported yet (FRU-editor)
0003	Maximum number of sensors per FRU device is limited to 30
0004	Only temperature sensors, device locator and OEM sensors are stored in the sensor data repository and thus visible for NATview.
0005	IPMItool operation is in beta state and not officially supported. Some commands may cause unexpected system behaviour.

7. SPECIFICATIONS AND COMPLIANCES

7.1. Internal Reference Documentation

- **NAT-MCH** User's Manual
  https://www.nateurope.com/manuals/nat_mch_man_usr.pdf
- **NATview**
  ftp.nateurope.com – User: `natmch` – Password: `natmch`

7.2. External Reference Documentation

- Atmel ATSAM4E16C Microcontroller Datasheet, Rev. 11157H, 03/2016
- **IPMItool**
  http://ipmitool.sourceforge.net/
- **FTDI-Driver**
  http://www.ftdichip.com/FTDrivers.htm
- **Java**
  https://www.oracle.com/technetwork/java/index.htmL
- **RMCP**
  http://www.dmtf.org/

7.3. Standards Compliance

- AMC.0 R2.0, µTCA.0 R1.0
- CE, RoHS

7.4. Compliance to RoHS Directive

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS) predicts that all electrical and electronic equipment being put on the European market after June 30th, 2006 must contain lead, mercury, hexavalent chromium, poly-brominated biphenyls (PBB) and poly-brominated diphenyl ethers (PBDE) and cadmium in maximum concentration values of 0.1% respective 0.01% by weight in homogenous materials only.

As these hazardous substances are currently used with semiconductors, plastics (i.e. semi-conductor packages, connectors) and soldering tin any hardware product is affected by the RoHS directive if it does not belong to one of the groups of products exempted from the RoHS directive.

Although many of hardware products of N.A.T. are exempted from the RoHS directive it is a declared policy of N.A.T. to provide all products fully compliant to the RoHS directive as soon as possible. For this purpose since January 31st, 2005 N.A.T. is requesting RoHS compliant deliveries from its suppliers. Special attention and care has been paid to the production cycle, so that wherever and whenever possible RoHS components are used with N.A.T. hardware products already.

7.5. Compliance to WEEE Directive

Directive 2002/95/EC of the European Commission on "Waste Electrical and Electronic Equipment" (WEEE) predicts that every manufacturer of electrical and electronical equipment which is put on the European market has to contribute to the reuse, recycling and other forms of recovery of such waste so as to reduce disposal. Moreover this directive refers to the Directive 2002/95/EC of the European Commission on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

Having its main focus on private persons and households using such electrical and electronic equipment the directive also affects business-to-business relationships. The directive is quite restrictive on how such waste of private persons and households has to be handled by the supplier/manufacturer; however, it allows a greater flexibility in business-to-business relationships. This pays tribute to the fact with industrial use electrical and electronical products are commonly integrated into larger and more complex environments or systems that cannot easily be split up again when it comes to their disposal at the end of their life cycles.

As N.A.T. products are solely sold to industrial customers, by special arrangement at time of purchase the customer agreed to take the responsibility for a WEEE compliant disposal of the used N.A.T. product. Moreover, all N.A.T. products are marked according to the directive with a crossed out bin to indicate that these products within the European Community must not be disposed with regular waste.

If you have any questions on the policy of N.A.T. regarding the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS) or the Directive 2002/95/EC of the European Commission on "Waste Electrical and Electronic Equipment" (WEEE) please contact N.A.T. by phone or e-mail.

7.6. Compliance to CE Directive

Compliance to the CE directive is declared. A 'CE' sign can be found on the PCB.

7.7. Product Safety

The board complies with EN60950 and UL1950.

7.8. Compliance to REACH

The REACH EU regulation (Regulation (EC) No 1907/2006) is known to N.A.T. GmbH. N.A.T. did not receive information from their European suppliers of substances of very high concern of the ECHA candidate list. Article 7(2) of REACH is notable as no substances are intentionally being released by NAT products and as no hazardous substances are contained. Information remains in effect or will be otherwise stated immediately to our customers.

7.9. Abbreviation List

Table 10 – Abbreviation List

Abbreviation	Description
AC	Alternating Current
AMC	Advanced Mezzanine Card
BIOS	Basic Input/Output System
BMC	Base Management Controller
CLI	Commend Line Interface
CPU	Central Processing Unit
COM	Communication Port
EEPROM	Electrically Erasable Programmable Read Only Memory
eMCH	Embedded MCH
FLASH	Non-Volatile Memory
FRU	Field Replaceable Unit
FTP	File Transfer Protocol
GbE	Gigabit Ethernet
GUI	Graphical User Interface
HS	Hot-Swap
I^2C	Inter-Integrated Circuit
IP	Internet Protocol
IPMB	Intelligent Platform Management Bus
IPMI	Intelligent Platform Management Interface
JRE	Java Runtime Environment
LAN	Local Area Network
µC/MCU	Microcontroller (Unit)
MCH	µTCA Carrier Hub
µTCA	Micro Telecommunications Computing Architecture
OS	Operating System
RMCP	Remote Management Control Protocol
SDR	Sensor Data Repository
SEL	System Event Log
SMS	System Management Software
SNMP	Simple Network Management Protocol
SRAM	Static Random Access Memory
UDP	User Datagram Protocol
VAC	Volt Alternating Current
TCKL	Telecom Clock
USB	Universal Serial Bus

8. DOCUMENT'S HISTORY

Table 11 – Document's History

Rev	Date	Description	Author
1.0	2.07.2019	initial release	se
	13.01.2021	Update title photo Minor changes	se