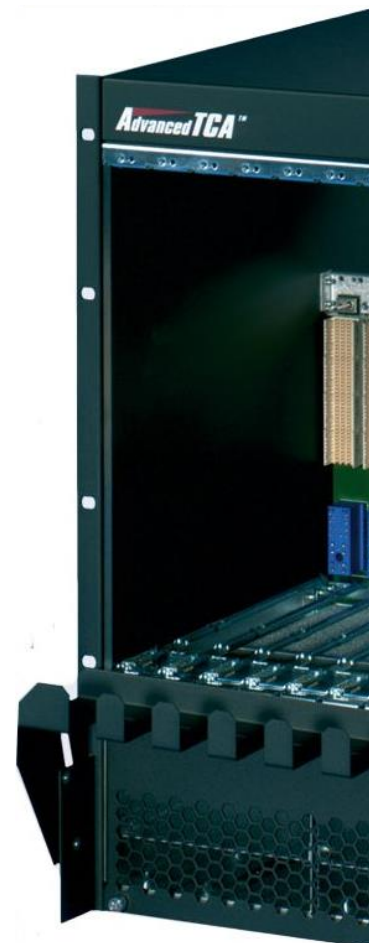


Status of the xTCA Common Project

Procurement Framework for ATCA Shelves, Power Supplies and IPMCs

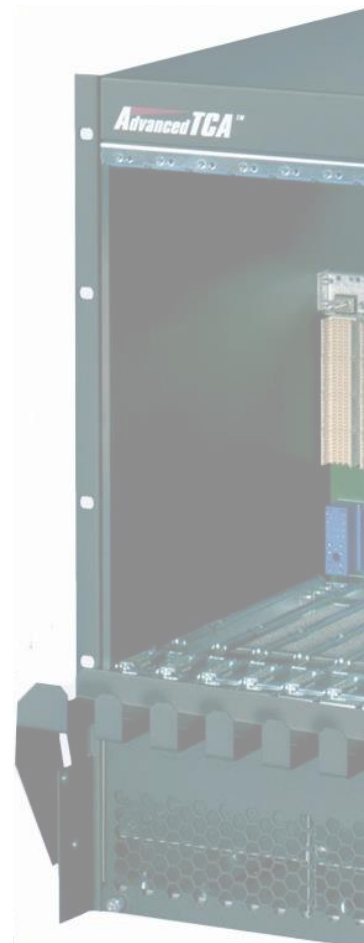
CERN EP-ESE-BE

Vincent Bobillier, Stefan Haas, Markus Joos,
Julian Mendez, Sylvain Mico and Francois Vasey



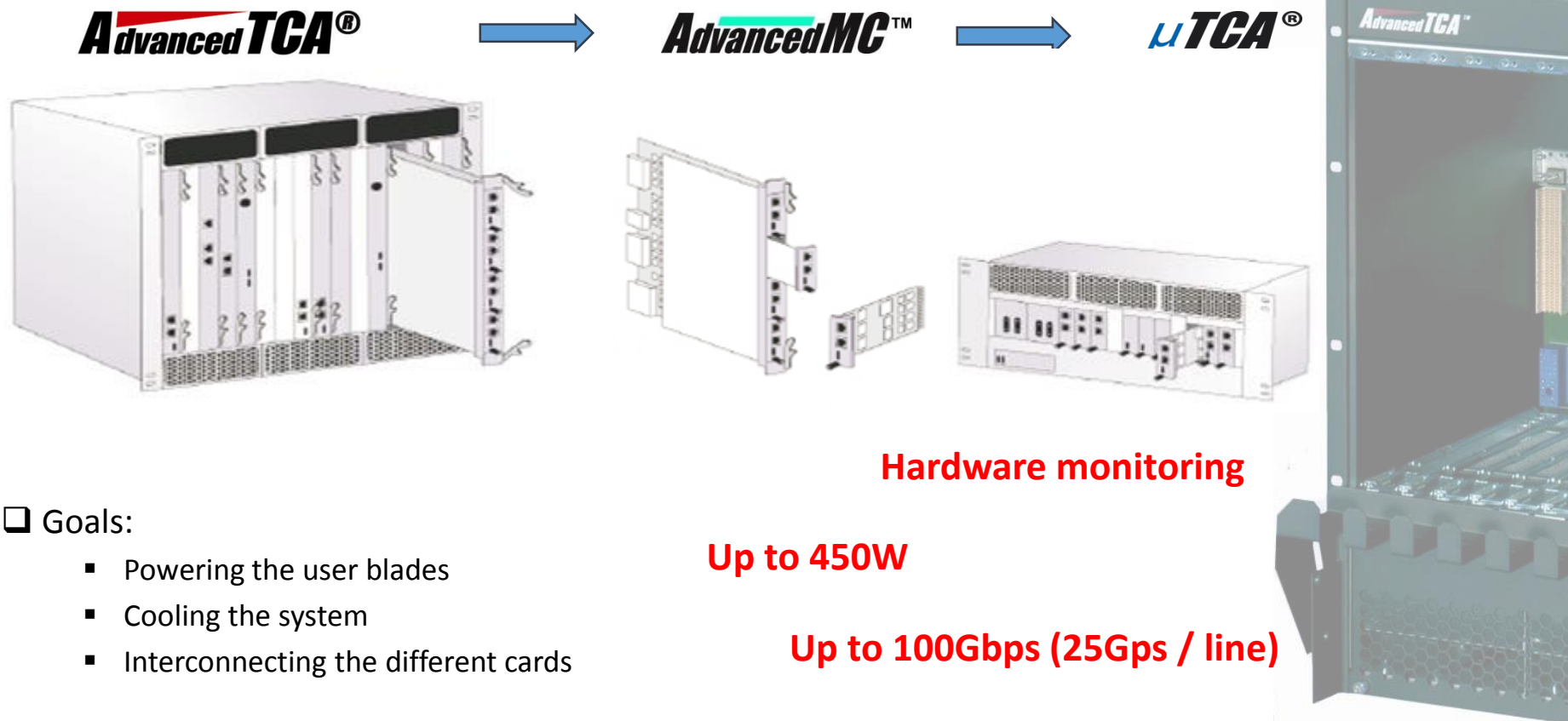
Outline

- Overview
- MicroTCA Status
- AdvancedTCA Status
- CERN-IPMC
- Power supplies



Overview

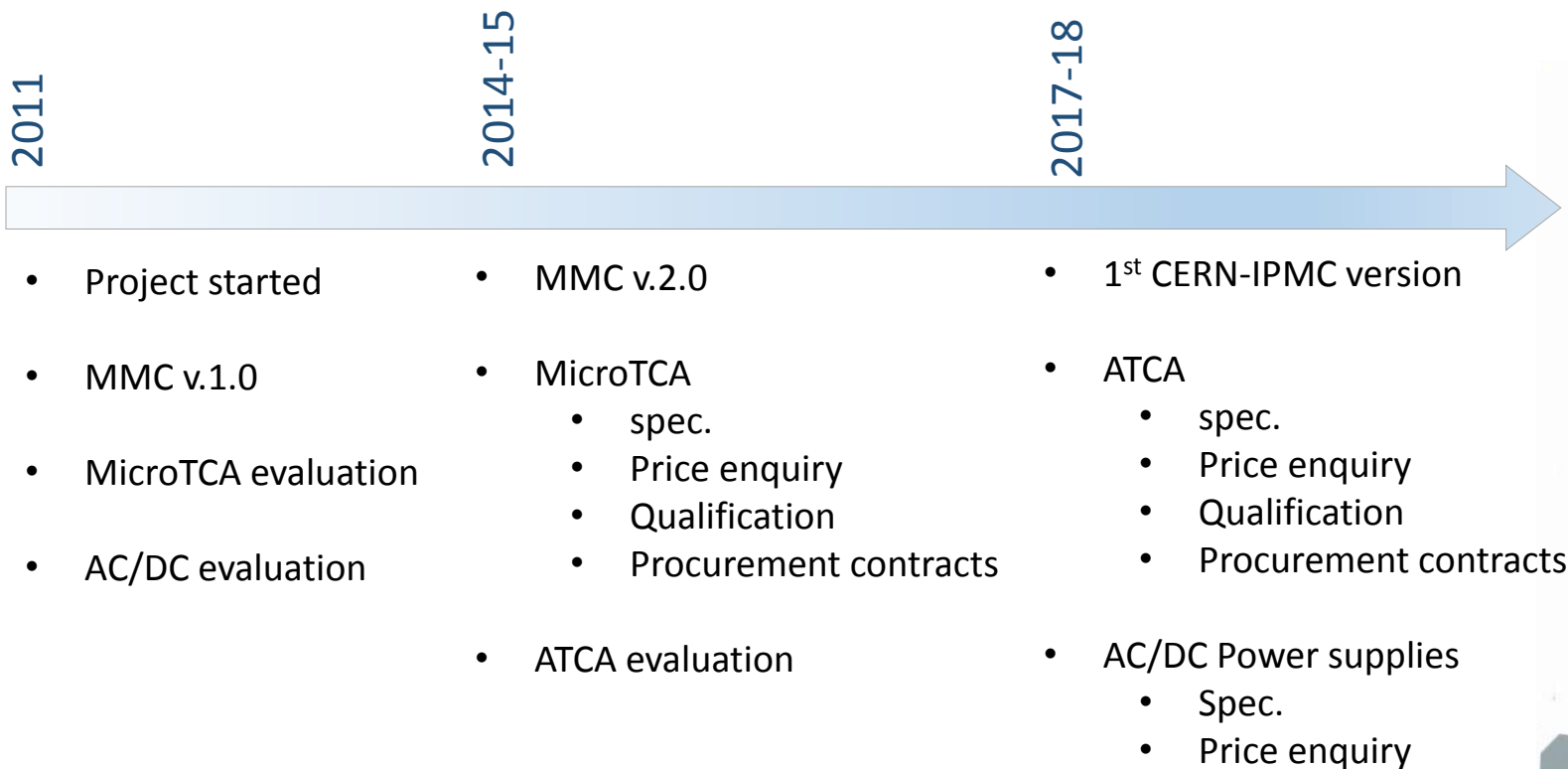
- ❑ **xTCA Standards:** Micro and Advanced TCA



- ❑ **Goals:**

- Powering the user blades
- Cooling the system
- Interconnecting the different cards

Overview



☐ Since 2011:

- User support (Controllers, use of the commercial modules)
- Contact with the manufacturers

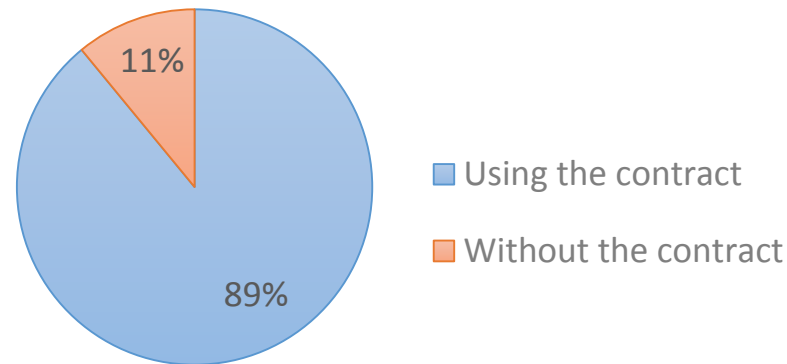


MicroTCA status

- ❑ Usage of the purchase contract
 - 65 microTCA crates over 103 (Schroff)
 - Mainly used by CMS
 - Contracts for shelves and DC Power modules

- ❑ Rented at ePool: 3 systems
 - 3 additional systems are coming soon
 - 3 systems are currently rented

Schroff crate - Purchase order from EDH



MCH:

- Base module: uTCA standard control
- XAUI fat pipe: 12Gbe switch
- Clock switch

- SFP+: Optical module



PM:

- 600W AC/DC Power modules



Shelves:

- 12 slots full height / double width
- CMS backplane topology
- JTAG Switch interface

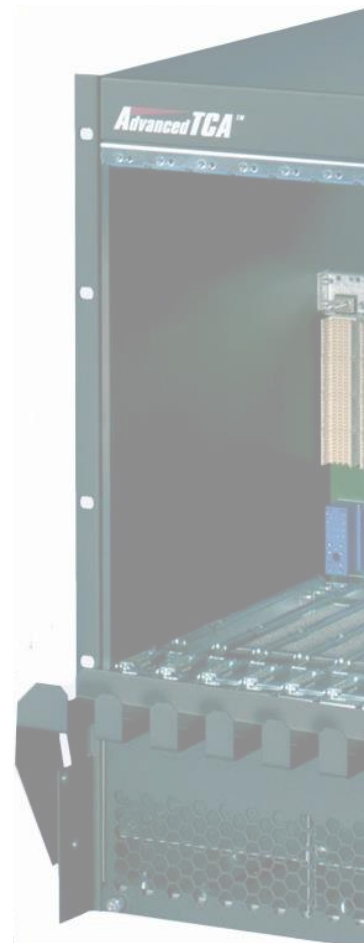
AdvancedTCA status

☐ Specifications

- 14 ATCA slots (400W) with RTM (50W)
- Vertical or Horizontal cooling
- Dual Star or Full Mesh topology
- 40Gbps or 100Gbps backplane
- Bussed IPMB
- 1 Shelf man. included

☐ Timescale

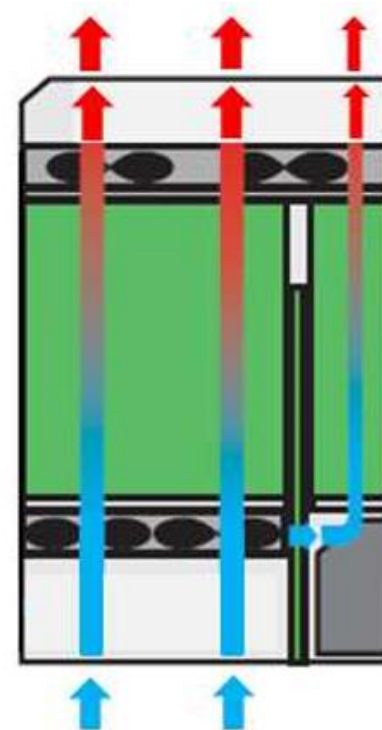
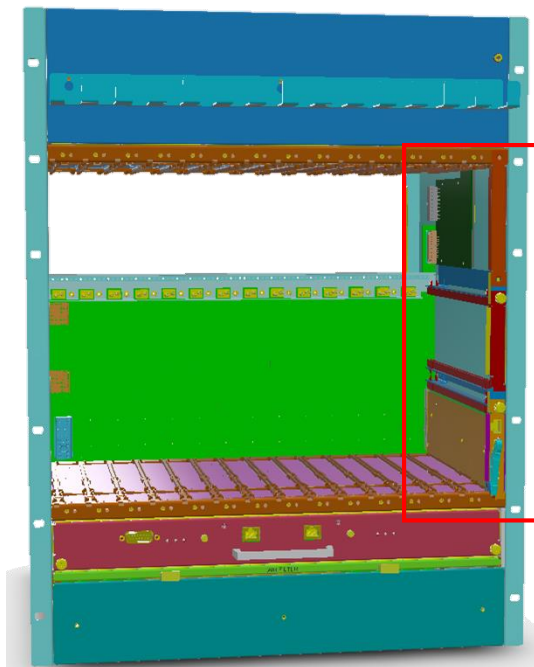
	Horizontal shelf	Vertical shelf
▪ Technical specification	Q4 2016	Q4 2016
▪ Technical evaluation	Q1-Q2 2017	NA
▪ CERN price enquiry	Q2 2017	Q2 2017
▪ Select contractor (pre-series)	NA	Q3 2017
▪ Final qualification	NA	Q2 2018
<p>▪ ATCA Shelf Procurement contract ready for purchase orders by Q2/Q3 2018</p>		



AdvancedTCA Status: Selected crate

❑ Vertical airflow

- Backplane modification: shelf manager slots
- Perforated area in top and bottom covers



Shelf manager slots

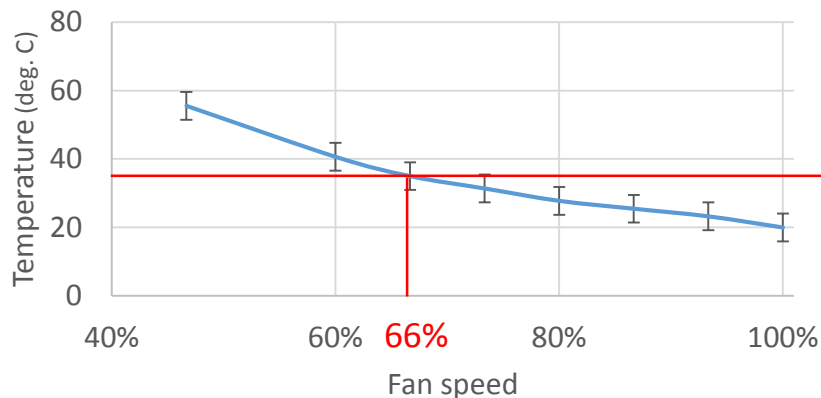
AdvancedTCA Status: Selected crate

❑ Cooling qualification tests

- Carried out using load blades (Up to 450W)
- Measurement at the crate level (out of the racks)



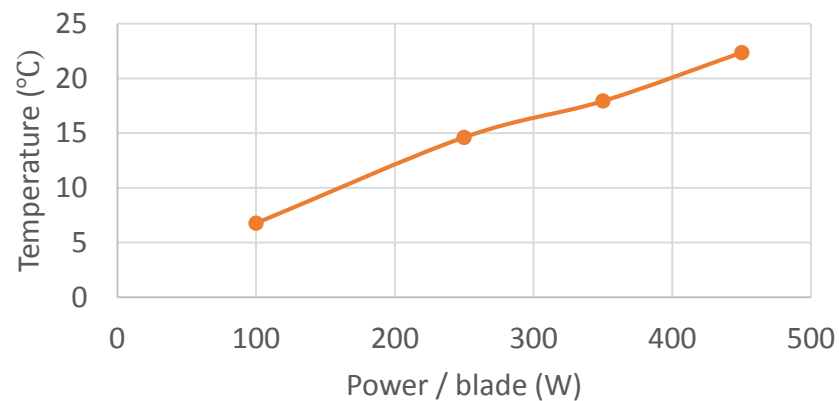
Average delta T. (450W / slots)



Delta T. = 35 deg. C (specs)

Within the specification

Delta T VS Power/blade (max. Fan speed)



AdvancedTCA Status: Selected crate

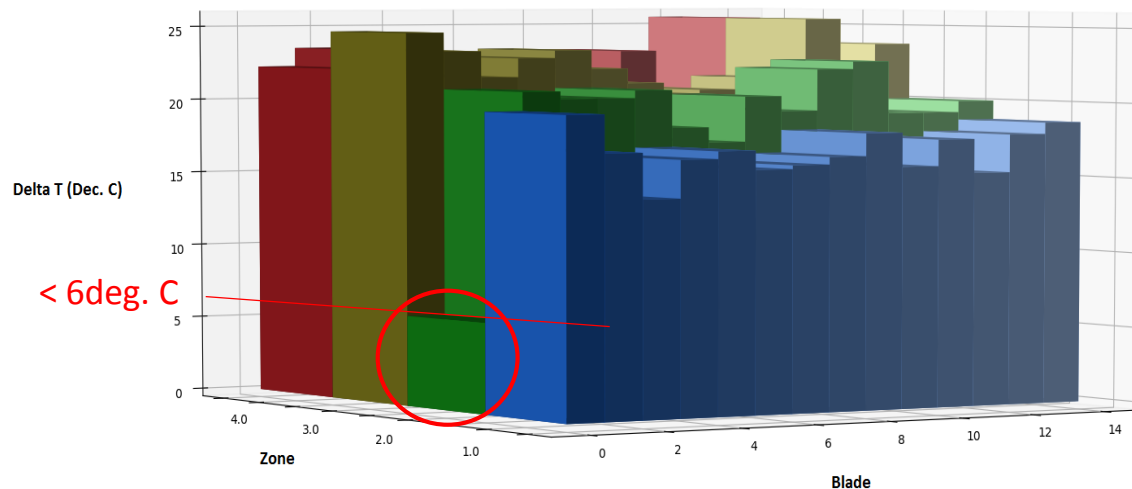
❑ Blade level evaluation



0W zone

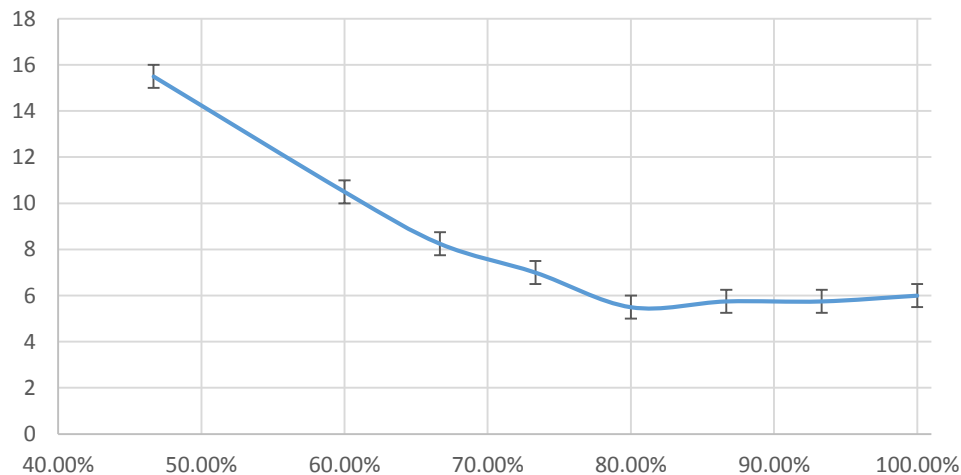
150W / zone

Fan at max. speed



< 6deg. C

0W zone - delta T.



AdvancedTCA Status: Selected crate

❑ Power distribution

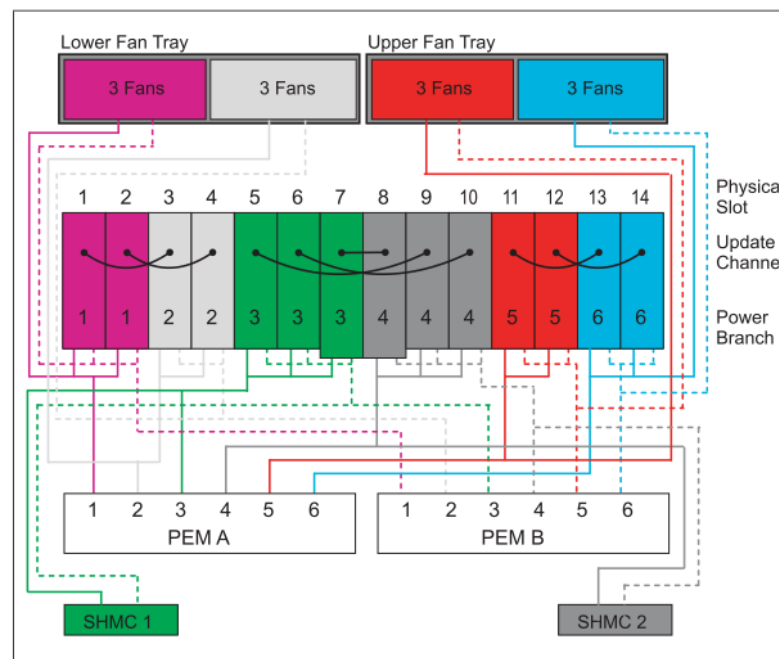
- 6 inputs: max. current per branch of 35Amps
- Fans are supplied by different branches



Bottom fans

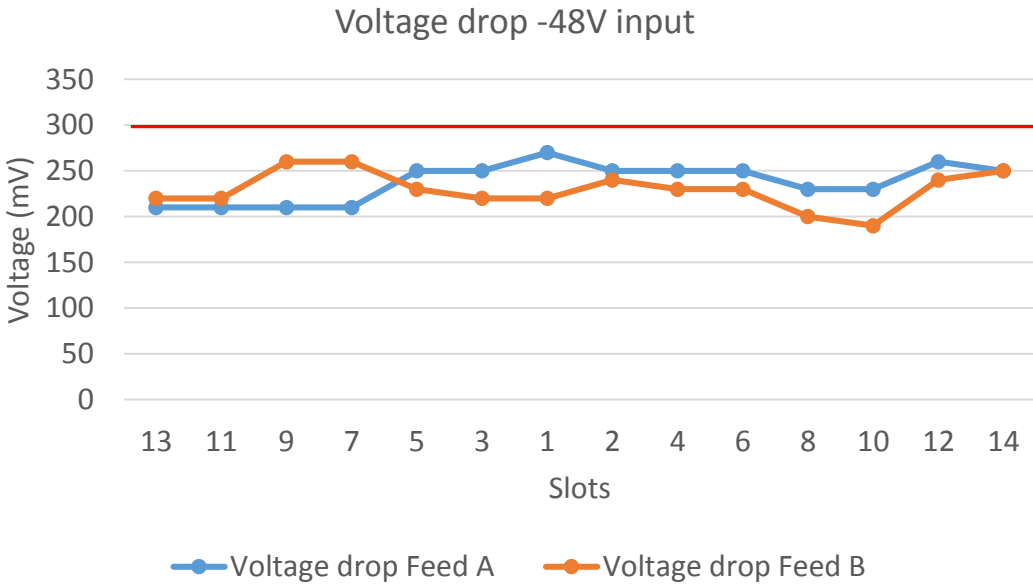


Top fans



AdvancedTCA Status: Selected crate

- ❑ Redundancy and voltage drop
 - Voltage drop measured at 450W



< 300mv (at 48V)



- Redundancy and distribution successfully checked

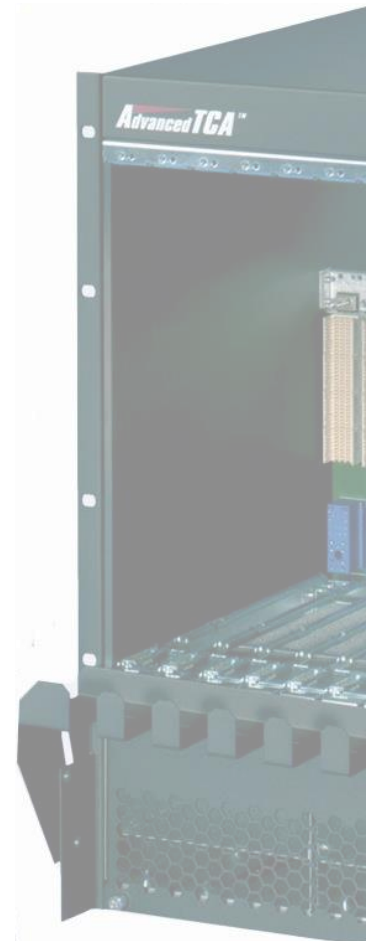
AdvancedTCA status

Crate qualification measurements will be presented in details during the xTCA interest group meeting

- ❑ **Crate selection:**
 - Qualification is on going
 - First crate was successfully validated (out of 3)
 - Purchase contract should be ready in late Q2 2018

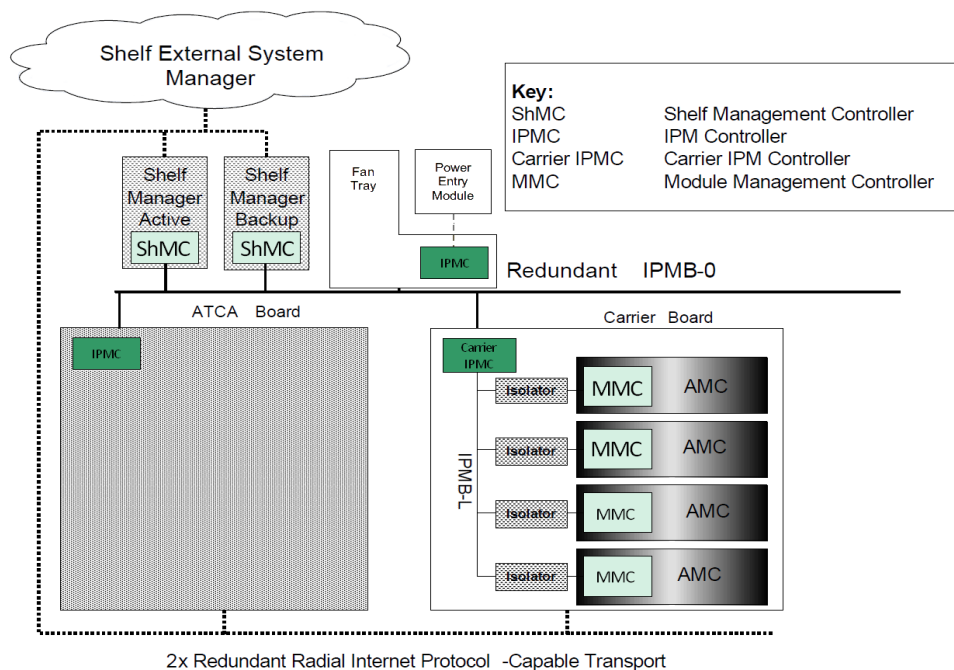
- ❑ **Rack evaluation is on going and was presented by Claudio Bortolin**
 - Performed by the ATLAS technical coordination team
 - Presentation: <https://indico.cern.ch/event/681247/contributions/2929083/>

- ❑ **AdvancedTCA at the Electronics pool**
 - A set of 2 slots ATCA shelves are available for rental via the ePool.
 - Pentair reference: 11990-707



CERN-IPMC

- ❑ Role of the Intelligent Controller for AdvancedTCA blades:
 - Monitoring sensors, Controlling the system and Ensuring proper operations



- ❑ Adaptation from the Pigeon Point solution
 - DIMM-DDR3 VLP form factor
 - Pinout compatible with the existing LAPP IPMC card

CERN-IPMC

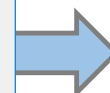
- ❑ User customizable features (mainly header files):
 - FRU Information (Device ID, Manufacturer info., Product info.)
 - LAN (MAC address, Default IP, slot specific IP, Gateway, Netmask)
 - Modules (AMCs, iRTM/Non-intelligent RTM)
 - Sensors
 - E-Keying
 - Power sequencing

- ❑ Python tools to generate configuration files

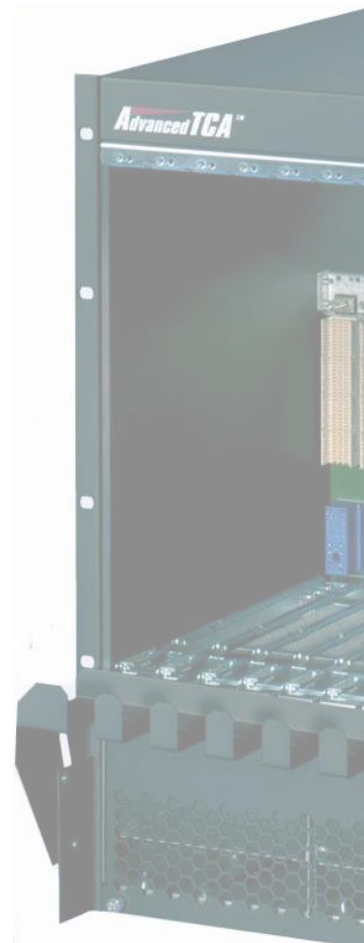


```
cygdrive/c/HardwarePlatformManagement/gitlab/ipmc-dev
FRU information:
DONE: FRU file initialized
DONE: Board information [FRU]
DONE: Product information [FRU]
DONE: LEDs description [FRU]
DONE: Carrier information [FRU]
DONE: General carrier power [FRU]
DONE: New power description entry [0xea = 6.0] [FRU]
DONE: New power description entry [0x72 = 6.0] [FRU]
DONE: New power description entry [0x74 = 6.0] [FRU]
DONE: New power description entry [0x76 = 6.0] [FRU]
DONE: New power description entry [0x78 = 6.0] [FRU]
DONE: New power description entry [0x7a = 6.0] [FRU]
DONE: New power description entry [0x7c = 6.0] [FRU]
DONE: New power description entry [0x7e = 6.0] [FRU]
DONE: New power description entry [0x80 = 6.0] [FRU]
DONE: fru-info binary file generated

LAN configuration:
DONE: MAC address [0A:0A:0A:0A:0A:86]
DONE: IP address [192.168.1.34]
DONE: Netmask address [255.255.255.0]
DONE: Gateway address [192.138.1.3]
```

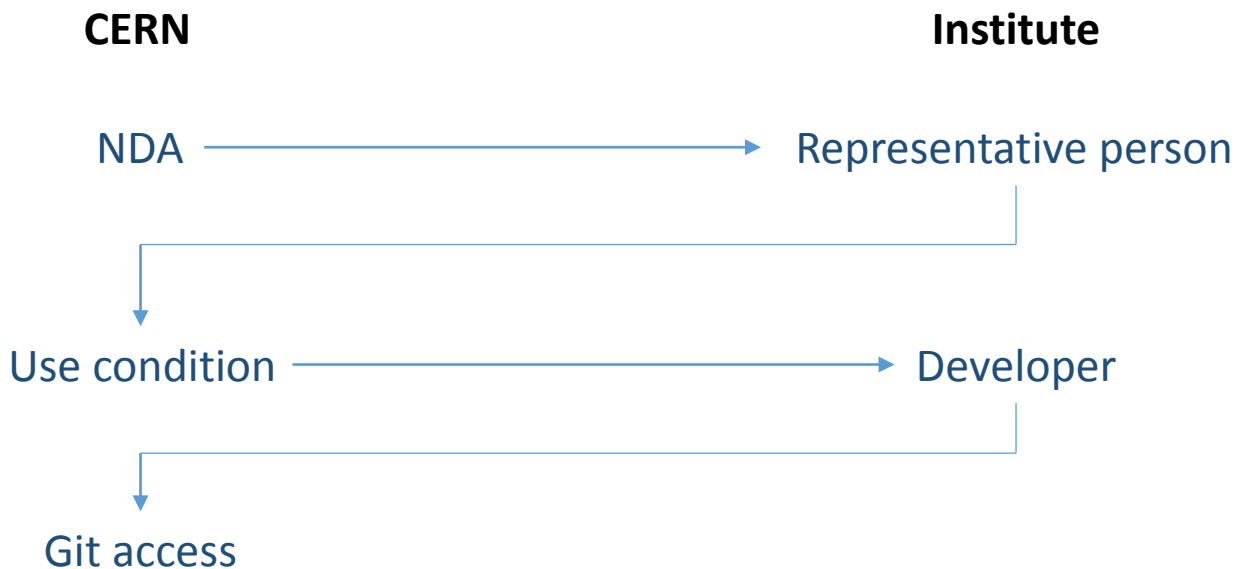


Header Files

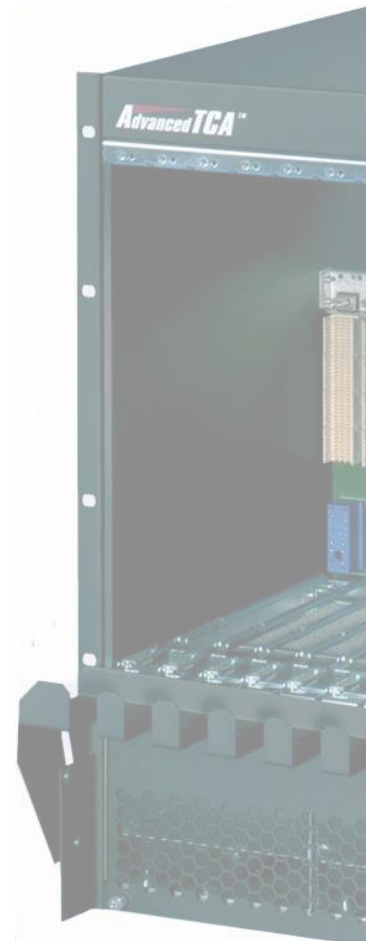


CERN-IPMC

- ❑ NDA Document
 - Protect Pigeon point against extensive distribution
 - **Required only for source code access**

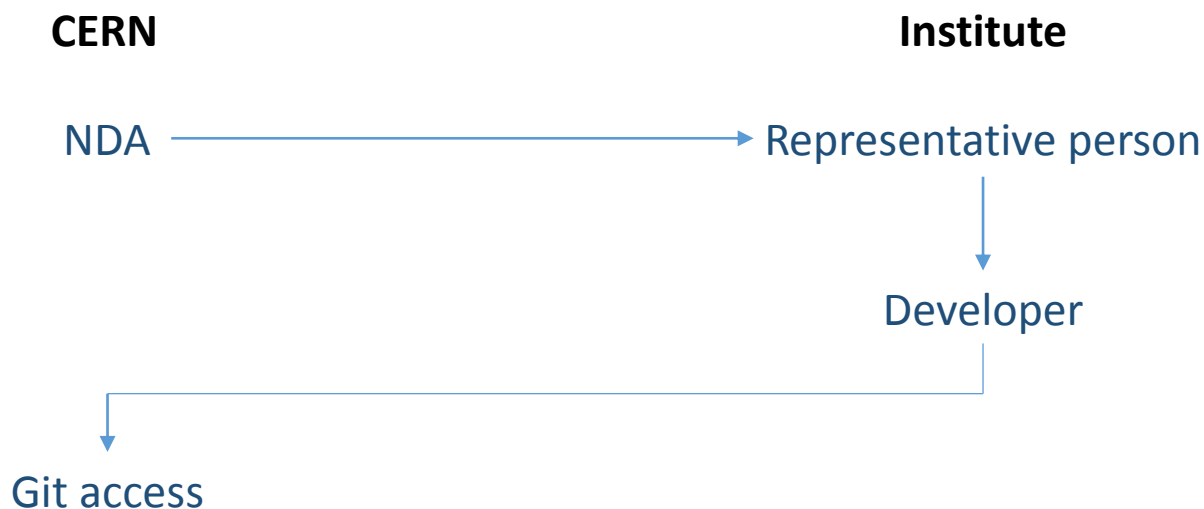


Original signature scheme



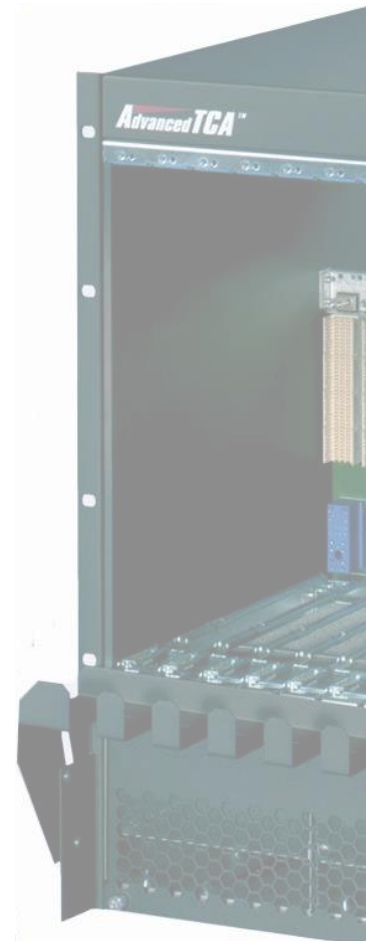
CERN-IPMC

- ❑ NDA Document
 - Protect Pigeon point against extensive distribution
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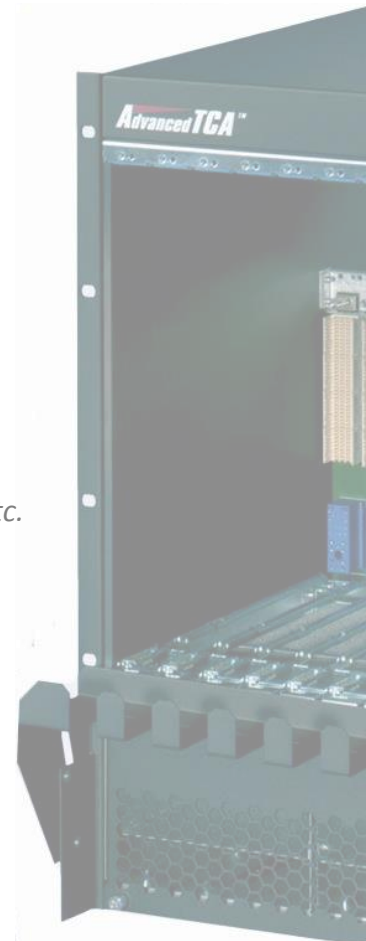
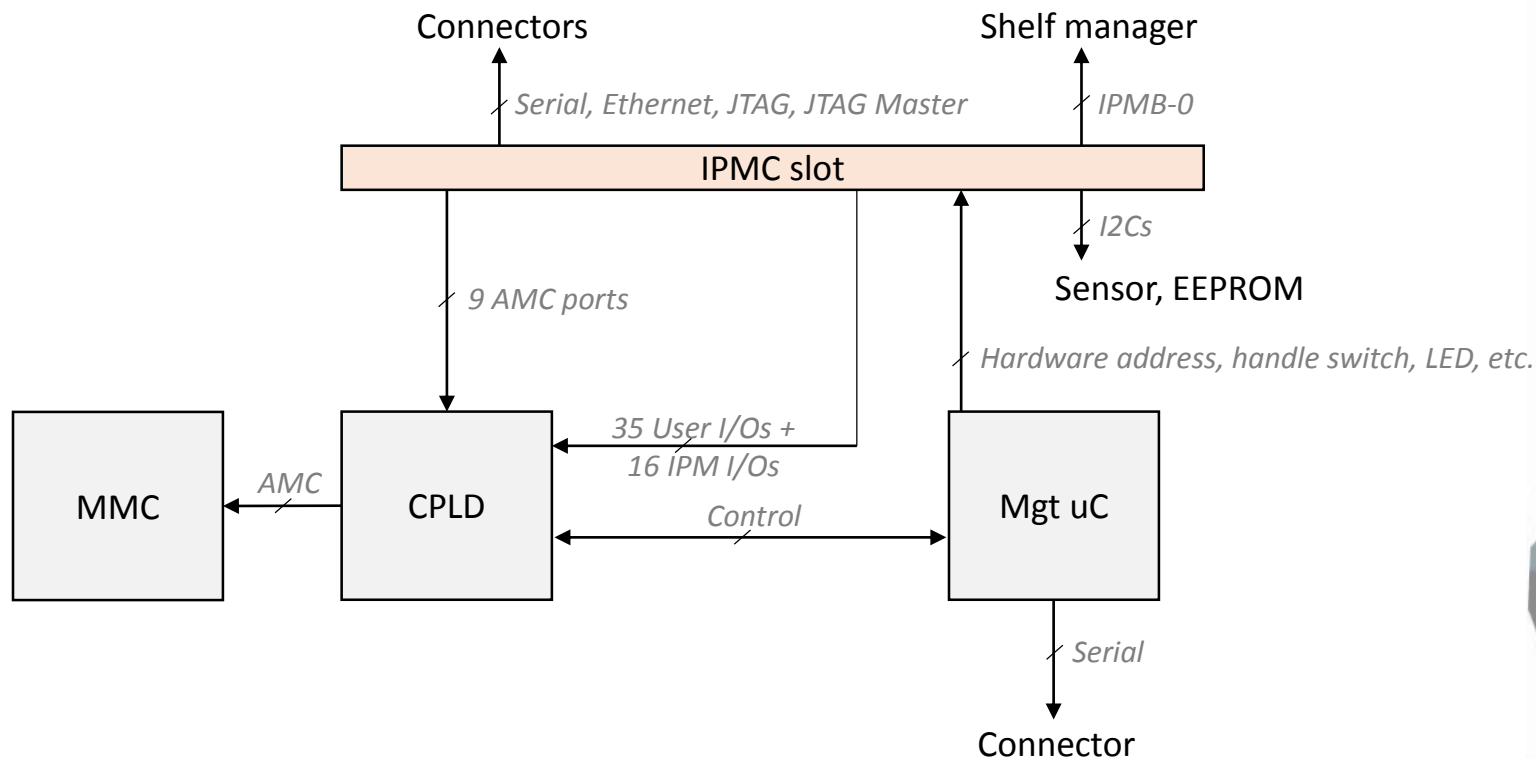
New signature scheme
Coming soon

- ❑ NDA and Use condition merged: simplify the signature process



CERN-IPMC

- ❑ Automatic tester and development kit
 - Python script to control the tester available on Gitlab



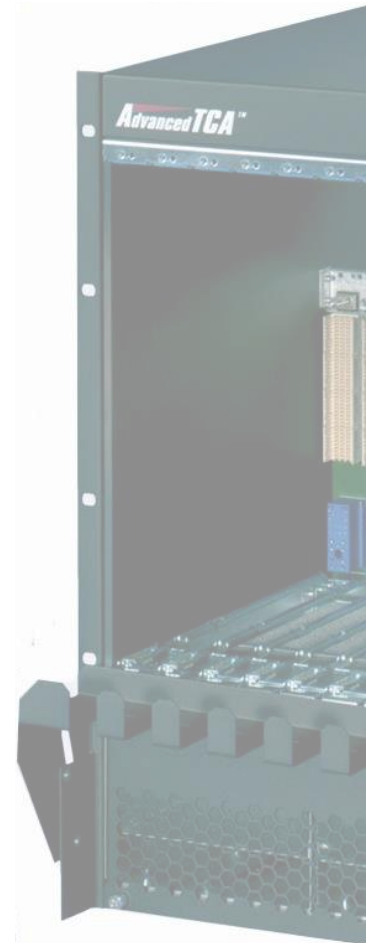
CERN-IPMC

- Ready to be used
 - About 40 mezzanine cards available
 - Can be purchased and used without NDA signature
 - Not customized but operational

- Already used by a few developers (10 mezzanines sold)

- Fully documented: Hardware and Software guide, Pigeon Point documentations and NDA
 - https://espace.cern.ch/ph-dep-ESE-BE-ATCAEvaluationProject/PP_IPMC
 - Software user guide documented on Gitlab (access under NDA)

- 10 additional Tester/Evaluation kits in production



Power supplies

☐ Specifications

- Min output power 11kW
- Max. height: 3RU
- Control module (Ethernet connection)
- N+1 redundancy capable
- 95% efficiency above 30% of the max. load
- Minimum 12 circuit breakers



☐ Timescale

-48Vdc PS

- | | |
|----------------------------------|----------------|
| ▪ Technical specification | Q4 2016 |
| ▪ Technical evaluation | NA |
| ▪ CERN price enquiry | Q3 2017 |
| ▪ Select contractor (pre-series) | Q3 2017 |
| ▪ Final qualification | Q1 2018 |
-
- **Modules for qualification have not been delivered yet ...**
 - **Pre-series expected by the end of 2017**

Power supplies

Alternative - Temporary/Lab solutions

❑ Alternative

- Eltek 2U rectifier system, Flatpacks, 7.2 kW (lead time: 12 weeks -> not evaluated yet)



❑ Power supplies from the Electronics pool

- Delta El. power supply SM52-30, 1.5kW (23.-CHF/month)
- Delta El. power supply SM60-100, 5kW (84.-CHF/month)

❑ Single output module

- GE CP3500 1U rectifier system, 12kW (available via several distributors, not evaluated yet)

Summary

MicroTCA

- Equipments were selected and qualified
- Purchase contracts are ready and used
- CERN-MMC is released and used in several systems

AdvancedTCA

- Shelf manufacturer was selected and qualification is on-going
- CERN-IPMC is released and start to be used by AdvancedTCA blade designers.

Power supplies

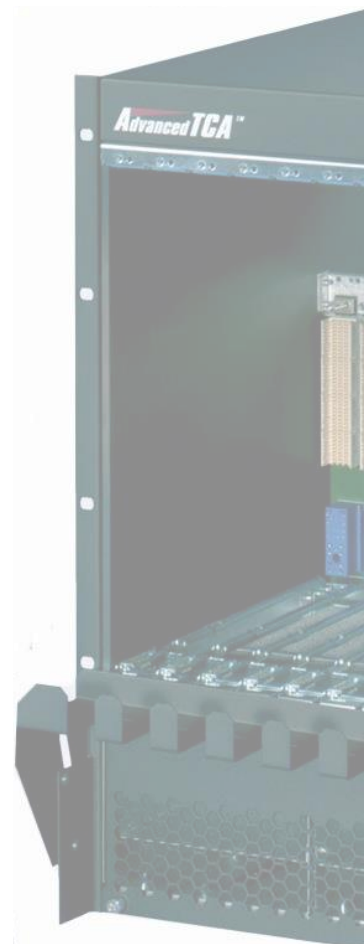
- The modules have not been delivered yet and alternative solutions are evaluated

Next steps

- Finalizing the AdvancedTCA qualification process
- Qualify the 100G backplane for the selceted ATCA chassis
- Finalizing the Power supply selection process
- Continue to provide user support on xTCA infrastructure and management equipment

Thank you

julian.mendez@cern.ch



AdvancedTCA blade cooling

☐ Talk from Francois:

- **A word of caution to backend board designers:**

- Do not preselect your favorite on-board optics module
- VL+ is presently considering freezing module type and giving you advance notice
- Run your optics cool or make it replaceable
- Running at elevated temperature is possible, but will affect life-time
 - Data from one supplier (T is heatsink temperature)
 - T<50degC will result in <1% wearout failures in 15 years (to which random failures will add ~3.7%)
 - T<57degC will result in <10%

ACES 2018

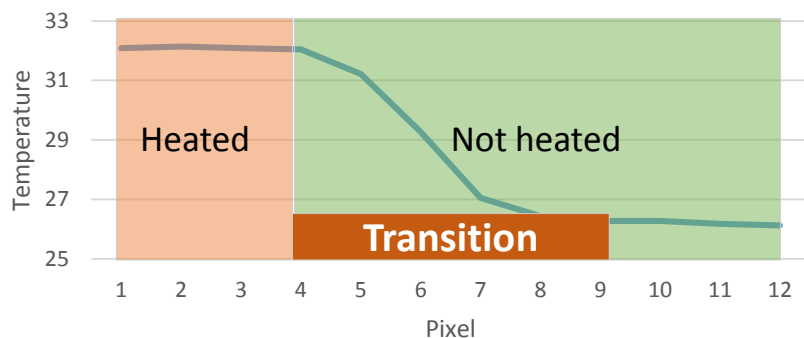
francois.vasey@cern.ch

17

☐ Goal of the evaluation:

- Evaluate whether we can get a “cold” zone or not on an ATCA blade?

Impact of a heated zone on a not heated zone

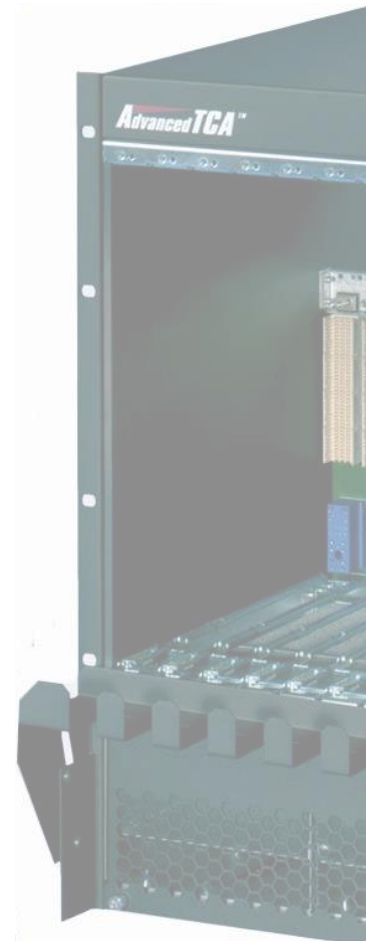
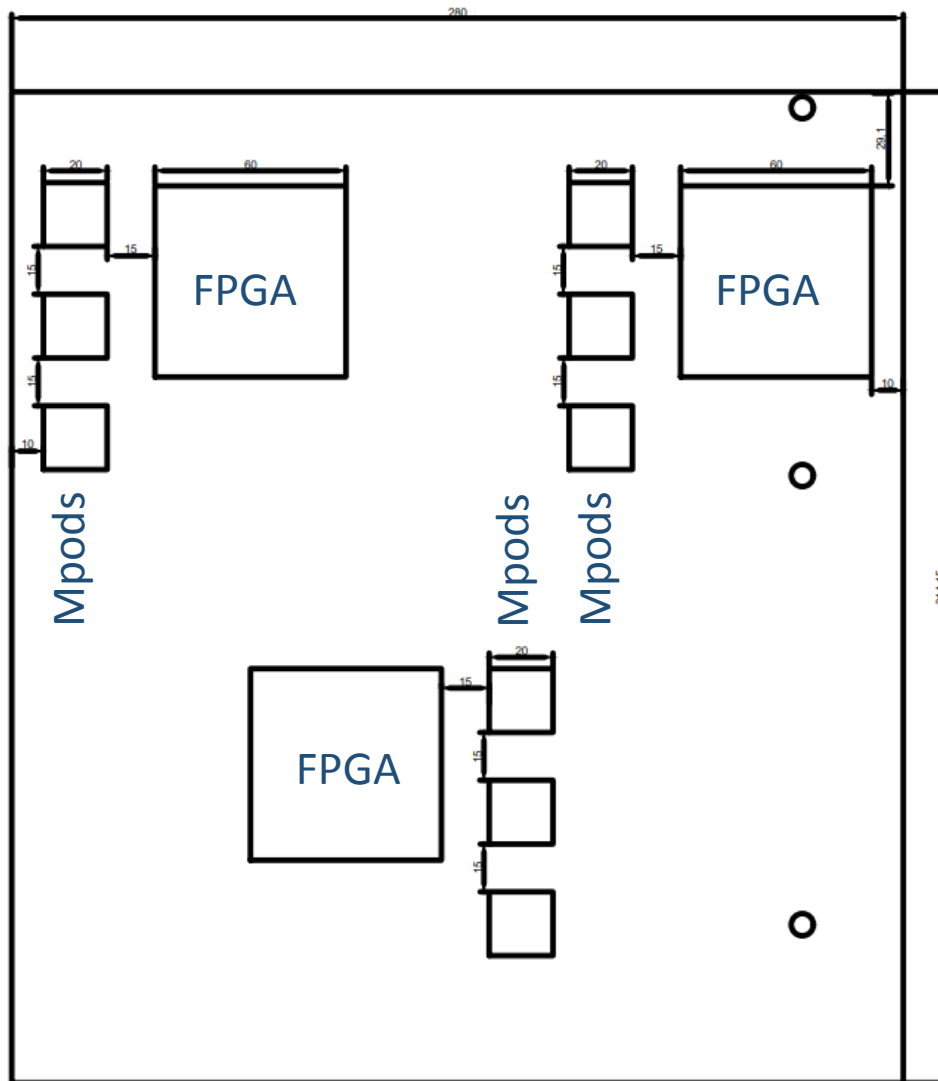


Optics component shall be placed 2cm away from the FPGAs



AdvancedTCA blade cooling

□ Placement proposal:



Power supply

❑ Guardian (UniPower)

- 14 kW max output pwr
- 11 kW with N+1 redund.
- Based on 5 pwr bricks
- Up to 12 CB output
- Ctrl module (SNMP over eth.)

❑ Delta Electronics

- 3 Versions can be used:
 - 100Amps @48V (4.8kW) [ePool ref: SM60-100]
 - 30Amps @48V (1.4kW) [ePool ref: SM52-30]
 - 20Amps @48V (0.96kW) [ePool ref: SM60-20]

