

# IPMI Support for FMC modules in MicroTCA.4 Systems

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# Agenda

- ▶ FPGA Mezzanine Card Standard
- ▶ Support for FMC in MTCA.4 Systems
- ▶ Current Issues with FMC modules in MTCA.4 Systems
- ▶ Possible IPMI Support for FMC modules on MTCA.4 Systems
- ▶ First Implementation in Hardware
- ▶ Proposal of Standards Extensions

# FPGA Mezzanine Card Standard

- ▶ Modular expansion of FPGA
- ▶ High speed communication interfaces
- ▶ High pin count connector for I/O flexibility
- ▶ Ability to change FPGA functionality without need of costly redesign of board with FPGA
- ▶ Mechanical dimensions allow for up to two FMC modules on single MTCA.4 AMC board



Example of FMC module

# FPGA Mezzanine Card Standard

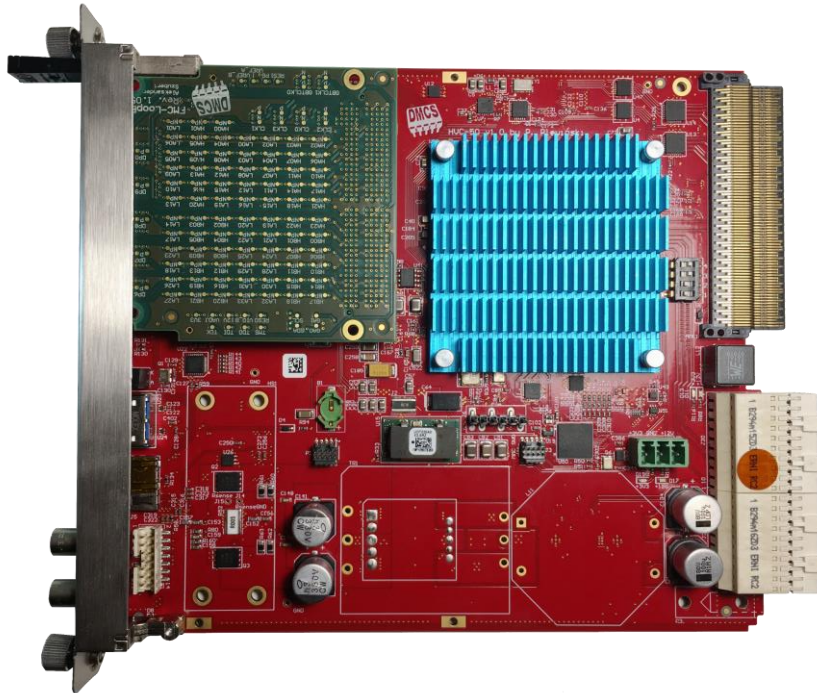
- ▶ Developed and maintained by VITA
- ▶ Defined by the ANSI/VITA 57.x standard
- ▶ Many FMC solutions available on the market
- ▶ Adjustable operating voltage up to 3.3 V
- ▶ Information about FMC module stored in EPROM on the module as an FRU



# Support for FMC Module in MTCA.4 Systems

- ▶ Many existing MicroTCA.4 designs utilizes FMC modules
- ▶ FMC I/O available on front panel of carrier
- ▶ Identification of connected FMC module by reading FRU inside fixed-address I2C EEPROM
- ▶ FMC module managed and controlled by MMC on AMC carrier board

# Support for FMC Module in MTCA.4 Systems



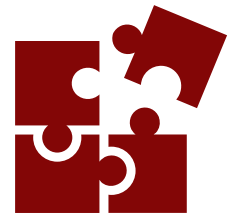
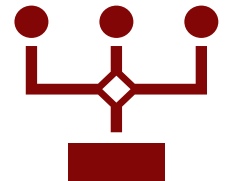
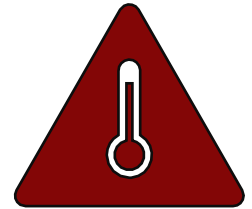
The HVC-50 board with  
single FMC module  
(Xilinx Zynq US+ XCZU4CG)



The MFMC carrier board  
with two FMC modules  
(Xilinx Artix XC7A200T)

# Current Issues with FMC modules in MTCA.4 Systems

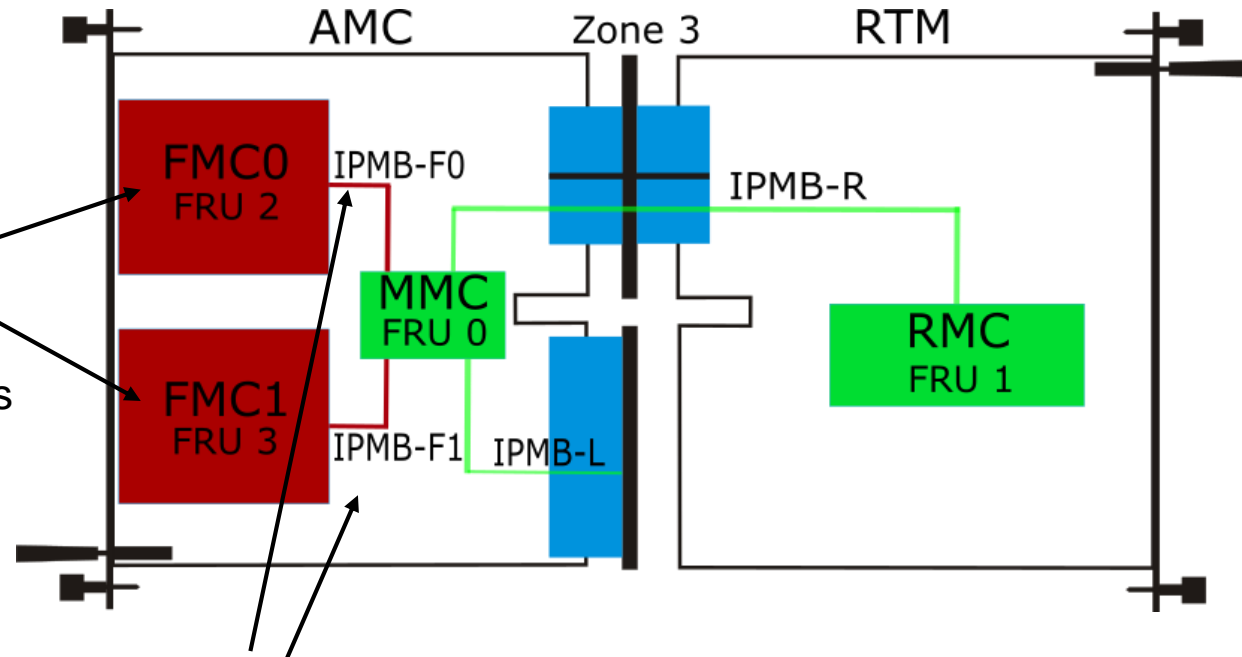
- **Lack of management compatibility of MicroTCA and FMC standards**
- **No thermal management – Risk of overheating FMC module**
  - FMC modules may generate significant amount of heat (more than 10 Watts)
  - Often FMC modules lack thermometer, as it is not required by VITA57.x standard
  - Temperature of the FMC module should be feedback to ShMC in order to ramp up the fans in the chassis and cool down FMC for non-interrupted operation
- **No centralized management of FMC – Full IPMI support needed**
  - FMC managed only locally by AMC carrier board - MCH should have access to FMC FRU as well as sensors and initiate power on/off of the FMC module.
  - **FMC should be managed by MCH in similar manner as it is done currently with RTM**
  - Powering up FMC must be done after checking if FMC is compatible with the carrier – DC load records need to be read from the FMC's FRU to chose right supply voltage



# Possible IPMI Support for FMC modules on MTCA.4 systems

FMC modules with:

- ▶ EEPROM for FRU storage
- ▶ At least one temperature sensor at fixed I2C address is obligatory



Dedicated MMC  $\leftrightarrow$  FMC I2C bus or buses



# Possible IPMI Support for FMC modules on MTCA.4 systems

## FMC FRU content

### Board info and Product info:

➤ Information about board name, manufacturer, serial number, part number FRU\_ID,.

```

-----
Board Info Area          : at offs=264, len=21
Manufacturer(04)         : DMCS
Board Name(06)           : FMC_LB
Serial Number(04)        : 0000
Part Number(04)          : 0000
FRU file ID(03)          : LB_F
-----
Product Info Area       : at offs=285, len=90
Manufacturer(04)         : DMCS
Product Name(06)         : FMC_LB
Product Number(02)       : 00
Part Version(25)         : 00000000000000000000000000000000
Product Serial Number(25): 00000000000000000000000000000000
Asset Tag(25)            : _____
FRU file ID(03)          : LB_F
Customer Info-0 (0)      :
-----

```

# Possible IPMI Support for FMC modules on MTCA.4 systems

## FMC FRU content:

### MultiRecord Area (single-width module)

#### ◆ DC Load/Output Records (Min, Nominal, Max voltage):

VADJ (Most important), 3P3V, 12P0V, VIO\_B\_M2C,  
VREF\_A\_M2C, VREF\_B\_M2C

#### ◆ FMC unique info:

Module width, Connector type,  
number of used I/Os per bank,  
number of GBT Transceivers, Max  
clock for TCK

```

Multirecord Area:
Record Checksum OK
Record Checksum OK
FMC unique record
---subtype 7
---version 3
---modulesize single-width
---P1ConnSize LPC
---P2ConnSize None
---P1Bank_A_Numbersignals 21
---P1Bank_B_Numbersignals 0
---P2Bank_A_Numbersignals 0
---P2Bank_B_Numbersignals 0
---P1_GBT_Number 0x0
---P2_GBT_Number 0x0
---MaxClockForTCK 10 MHz
    
```

```

Multirecord Area:
Record Checksum OK
Record Checksum OK
DC LOAD record:
---Output P1_VADJ
---Nominal Voltage 2.5V
---Max Neg Voltage 2.4V
---Min Neg Voltage 2.6V
---Minimal Current 10mA
---Maximal Current 100mA
    
```

```

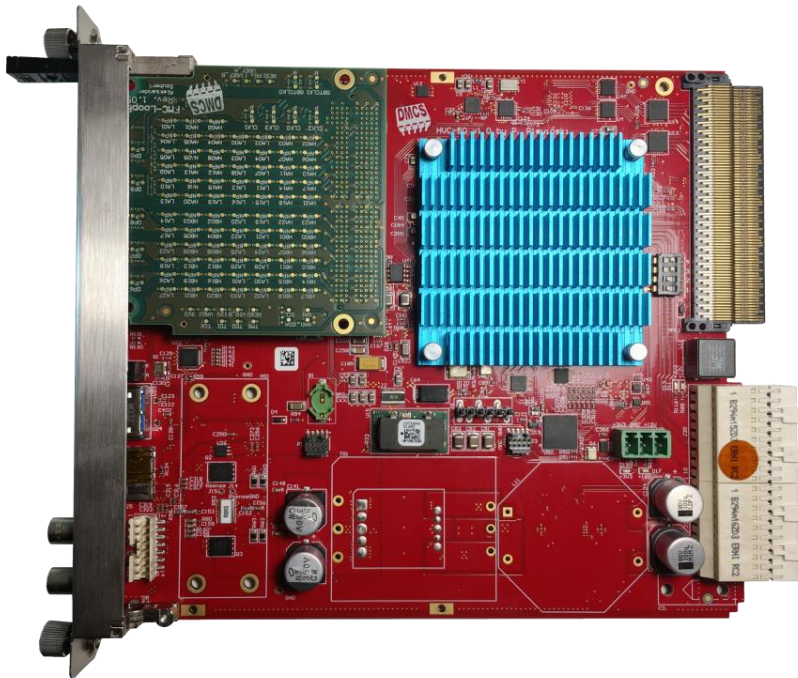
Multirecord Area:
Record Checksum OK
Record Checksum OK
DC LOAD record:
---Output P1_3P3V
---Nominal Voltage 0.0V
---Max Neg Voltage 0.0V
---Min Neg Voltage 0.0V
---Minimal Current 0mA
---Maximal Current 0mA
    
```

```

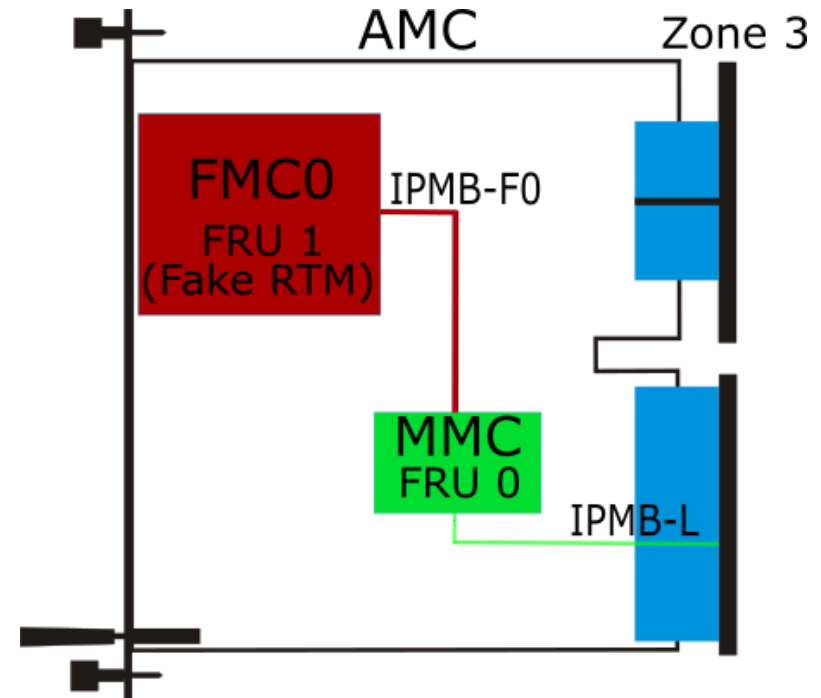
Multirecord Area:
Record Checksum OK
Record Checksum OK
DC LOAD record:
---Output P1_12P0V
---Nominal Voltage 12.0V
---Max Neg Voltage 11.0V
---Min Neg Voltage 13.0V
---Minimal Current 10mA
---Maximal Current 500mA
    
```

# First Implementation in Hardware

- Simple test implementation of IPMI support for FMC module on HVC-50 AMC board
- Special MMC firmware tricks MCH into thinking that connected FMC module is RTM



HVC-50 - FMC carrier used during tests



Scheme of connections

# First Implementation in Hardware

- MMC provides FRU and sensors from FMC to MCH
- MCH reads FMC FRU and displays created sensors
- System can read temperature of FMC module and enable fans if it will be required

FMC sensors visible as one entity

FMC Temperature sensor

Voltage sensor

```

nat>show_sensorinfo 92
Sensor Information for FRU 92 / RTM3
=====
#   SDRType  Sensor Entity Inst  Value  State  Name
-----
-   FDevLoc   0xc0  0x63                BASIC FMC
32  Full      0xf2  0xc0  0x63  0xa0    IPMI FMC TEST
33  Compact  0x0b  0xc0  0x63  0x00    0x00 UID:080000000000
34  Full      Temp   0xc0  0x63  26.0 C  ok      FMC TEMP
35  Full      Voltage 0xc0  0x63  0.3648 V  ok      FMC_VIOB
36  Full      Voltage 0xc0  0x63  3.2528 V  ok      FMC_3V3
37  Full      Voltage 0xc0  0x63  1.7632 V  ok      FMC_VADJ
38  Compact  0xf0  0xc0  0x63  0x02    HS 092 RTM3
=====
                    
```

FMC Sensor Information in MCH

# Summary

- ◆ Need further investigation
- ◆ Extension of both standards is required
  - ◆ ANSI-Vita: Vita57.x
    - ◆ Add requirement for at least one temperature sensor at fixed I2C address
    - ◆ Maybe we need more sensors (multiple temp. sensors, voltage sensors)
  - ◆ PICMG: MicroTCA / AMC
    - ◆ Add IPMI management of the FMC in MCH
    - ◆ Add FMC temperature sensor management to AMC MMC firmware
    - ◆ Need a simple but efficient solution
- ◆ Future plans:
  - ◆ Continue work and propose solution for PICMG discussion

# Thank you for your attention