SRS ATCA Systems and Boards update

RD51 Collaboration and Academy event
19th March 2015

erstellt: Friedrich Fix, 16.3.2015

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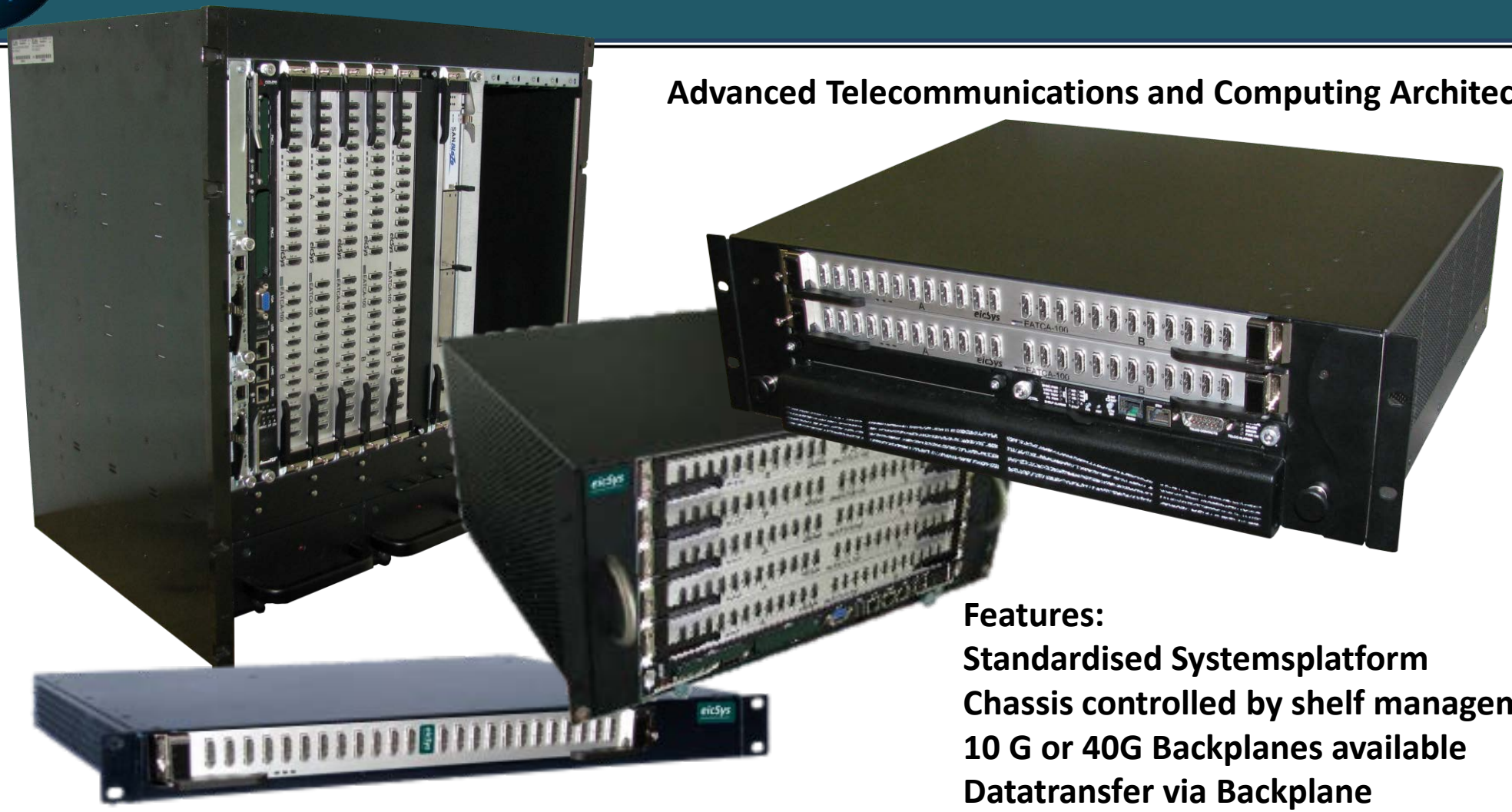
Scalable Readout Systems based on ATCA



Advanced Telecommunications and Computing Architecture

Features:
Standardised Systemsplatform
Chassis controlled by shelf management
10 G or 40G Backplanes available
Datatransfer via Backplane
Flexible configurations
Remote controlable Systems

Development Group

The RD51 Collaboration, the European Organization for Nuclear Research (CERN) in cooperation with Universidad Politécnica de Valencia (“UPV Valencia”) and Institutul Naţional de Fizică şi Inginerie Nucleară Horia Hulubei (“IFIN-HH“) developed the Scalable Readout System,

Development Group

AdvancedTCA®*

ATCA®

eicSys designed together with the SRS Development group under license the SRS ATCA Platforms

eicSys

IP License for SRS

*All ATCA names, brands and Logos are registred trademarks of PICMG G

SRS ATCA Platforms

SRS ATCA System Platforms

- 1 U crate 1 Slot 2 Mezzanines
- 3 U crate 2 Slots 4 Mezzanines
- 5 U crate 5 Slots 10 Mezzanines
- 6 U crate 6 Slots 12 Mezzanines
- 14 U crate 14 Slots max 28 Mezzanines

Configuration

- **ACTCA Blade >> EATCA-100**
- **Mezzanines**
  - Analog Board 12 physical duplexed channels copper

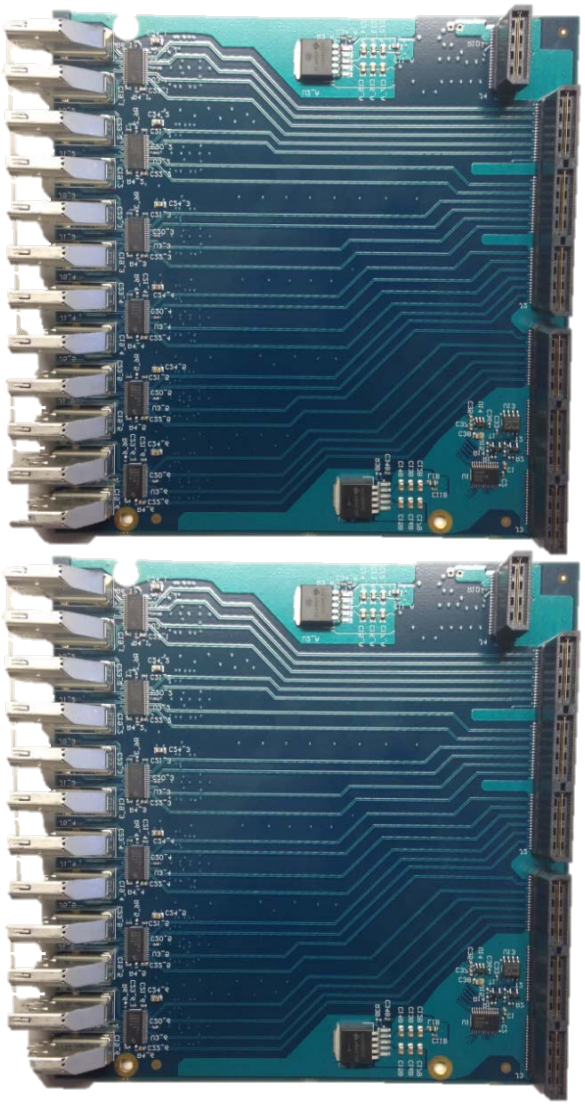
    EAD-M1
  - Digital Board 12 physical duplexed channels copper

    EAD-M3
  - Firefly Light Board 36 physical fiber channels

    EAD-M4
  - Firefly max Board 72 physical fiber channels
  - Analog Board 40 Channels with SMC or min Coax Connectors

    EAD-M2
- **RTM >> ERTM-101**

SRS ATCA Blade

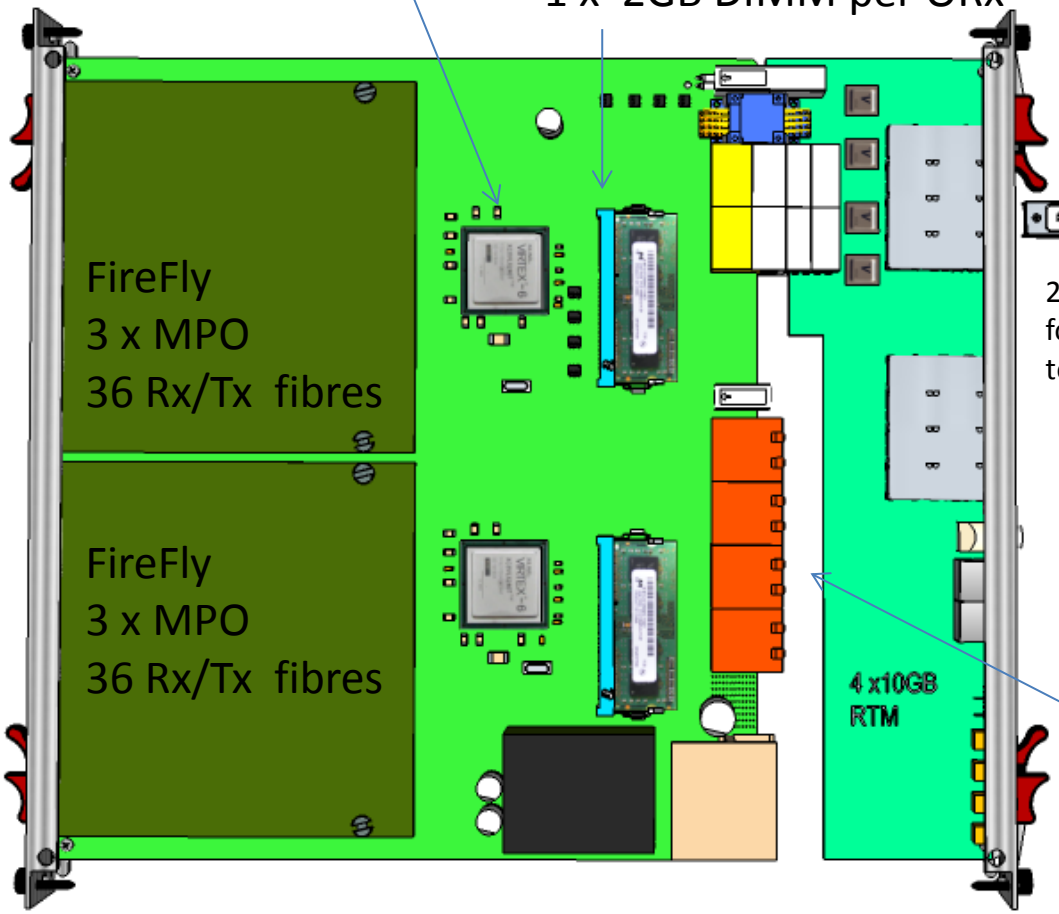


ATCA Blade
with
analog
or
digital
copper
mezzanines
and
RTM
with 2x 10Gbps
SFP+ with XAUI"
and
8x SFP+ up to
10Gbps
(depending on
the front board)

SRS ATCA Blade

One Virtex 6 FPGA per mezzanine

1 x 2GB DIMM per ORx



3 MPO connectors per mezzanine

SFP+ 10 Gbit

2 x 10 GB Ethernet / mezzanine for direct readout via 10 GBE /UDP to DATE Online

ATCA full mesh backplane for data concentration by ATCA SRU

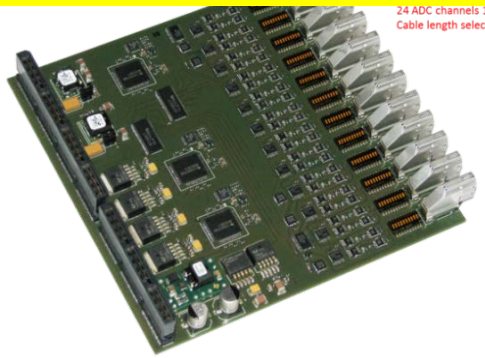
SRS ATCA Configuration

2 Slot ATCA Crate, functionally equivalent SRS-classic with triple channel density

SRS-ATCA minicrate EicSys

1 Blade with 2 x ADC mezzanines for 6 k APV readout channels

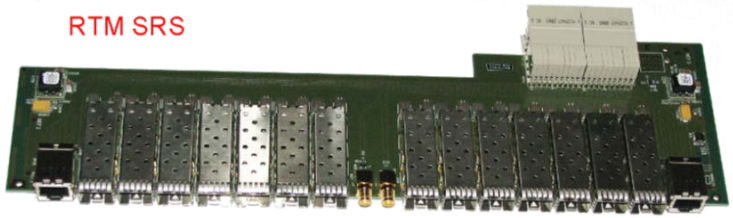
For optical readout, replace these adapter mezzanines by ORx optical receivers for fibres connecting to powered OCx box with the same adapter mezzanines



2 x Mezzanines (ADC):

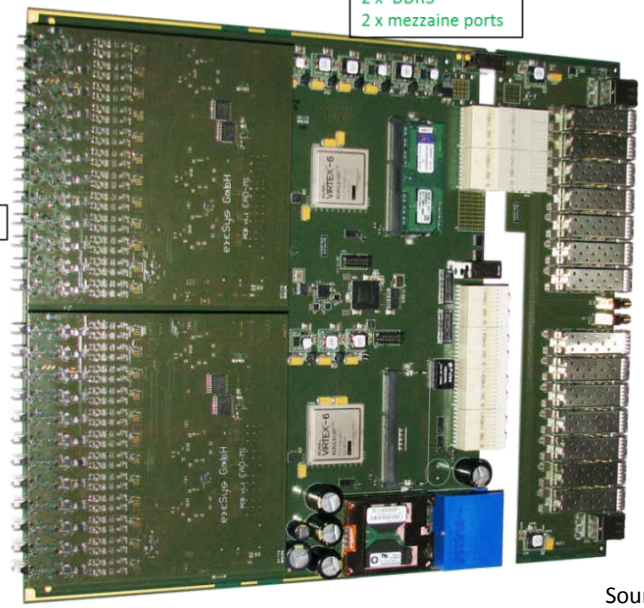
2 mezzanines:
max 6144 channels
APV/Beetle/VFAT

RTM SRS



Blade main board:
2 x Virtex 6 FPGA
2 x DDR3
2 x mezzaine ports

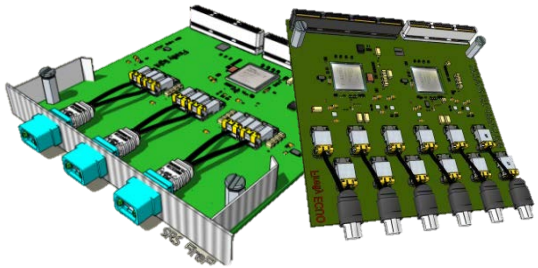
RTM I/O card:
2 x 8 SFP+ ports
2 x Rj45 (DTCC)
2 x NIM (SMA)



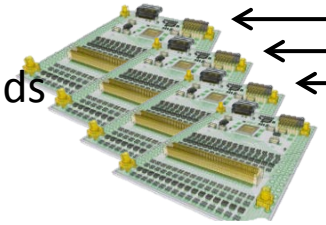
Sources: Hans Muller, CERN

SRS ATCA Configuration

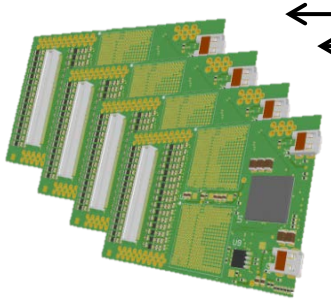
Optical Boards connected via
Fiber Cable direct to
OCX Boxes.
12 Fibers connect 12 Boxes

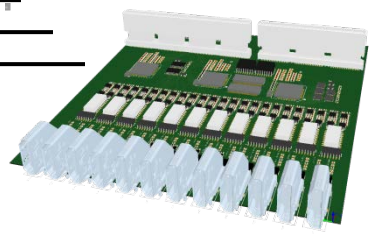


Analog Boards connected via
HDMI Cable direct to APV Hybrids



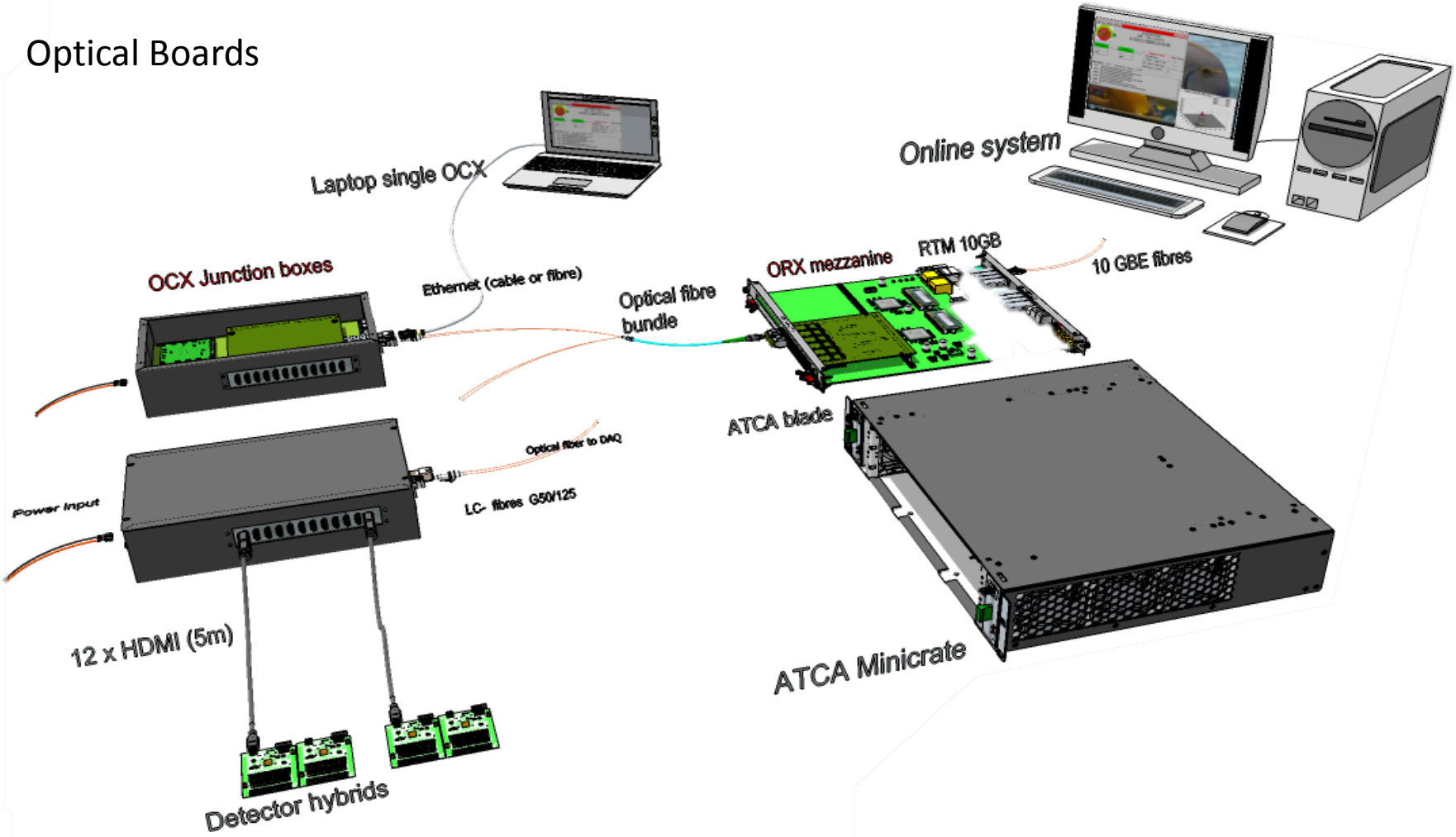
Digital Boards connected via
HDMI Cable direct to VMM
Hybrids





SRS ATCA Configuration

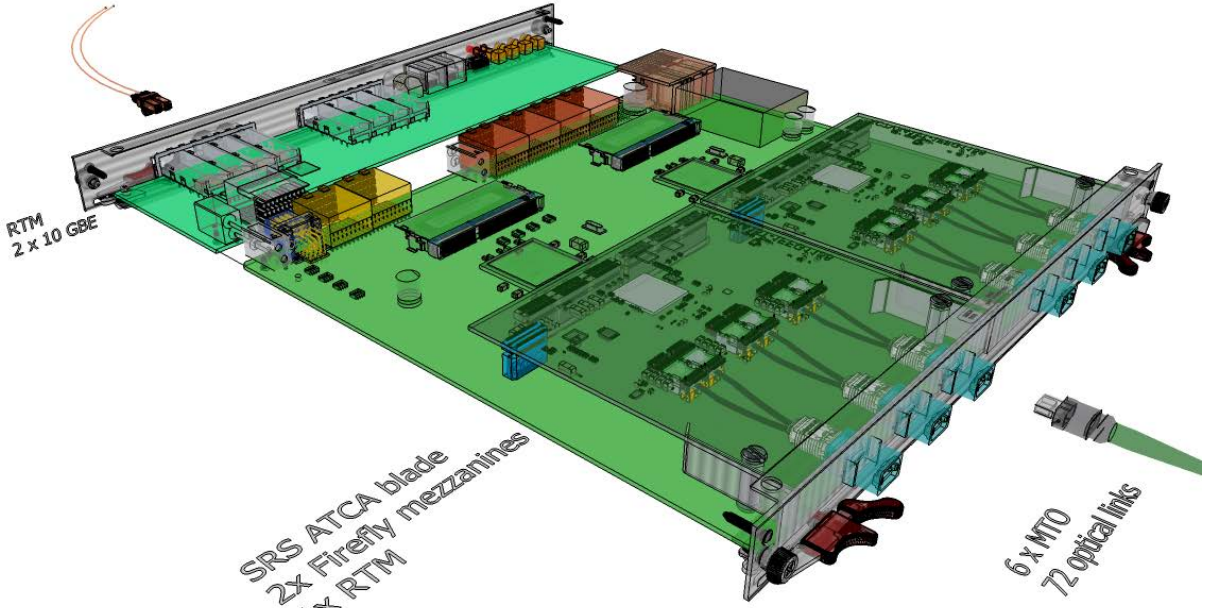
Optical Boards



Sources: Hans Muller, CERN

SRS ATCA Configuration

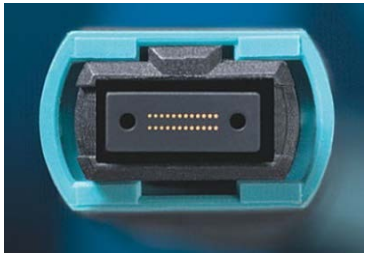
SRS ATCA blade via MTP/MPO parallel optical connectors



72 MM fibres per ATCA blade

ORX (FireFly) mezzanines on ATCA blade:
36 optical channels per mezzanine

24F MPO connector



up to 12 bidirectional optical fibres

MTP is like MPO but more reliable

Sources: Hans Muller, CERN

SRS ATCA Configuration

Example: 2 Slot ATCA System

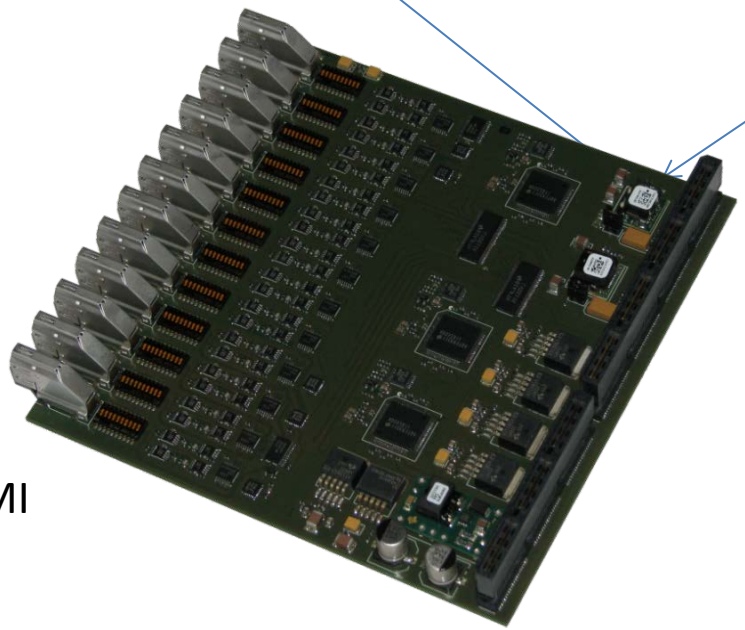
- 2 Blades, 4 analog Mezzanines, 2 RTM´s
  - 24 duplex Channels on board connect 24 APV Hybrids with 128 channels each
  - Means 12.288 Detectors in one 2 Slot ATCA System
- 2 Blades, 4 digital Mezzanines, 2 RTM´s
  - 24 Channels on board connect 24 VMM Hybrids with 128 detectors each
  - Means 6.144 channels in one 2 Slot ATCA System
- 2 Blades, 4 optical light boards with max 3 firefly connectors (12 fibers each)
  - 72 channels for OCX Boxes, each OC Box connect 6.144 Hybrids, means 442.368 detectors are connected in one 2 Slot System with APV hybrids. (VMM 221.184 channels)
- 2 Blades, 4 optical Boards with 6 firefly connectors
  - 144 Channels for OCX Boxes, means max. 884.736 detectors are connected in one 2 Slot System

Mezzanines

EAD-M1

Data connectors for ATCA SRS blade or OCx

Power connector for ATCA SRS blade Ocx



12 x HDMI

HDMI on ATCA frontpanel
Frequence: 65MHz, 12bits, Bandwith 550 MHz
3 booth FPGAs and MMC
Micro USB
3 Mbps
24 analog Channels input

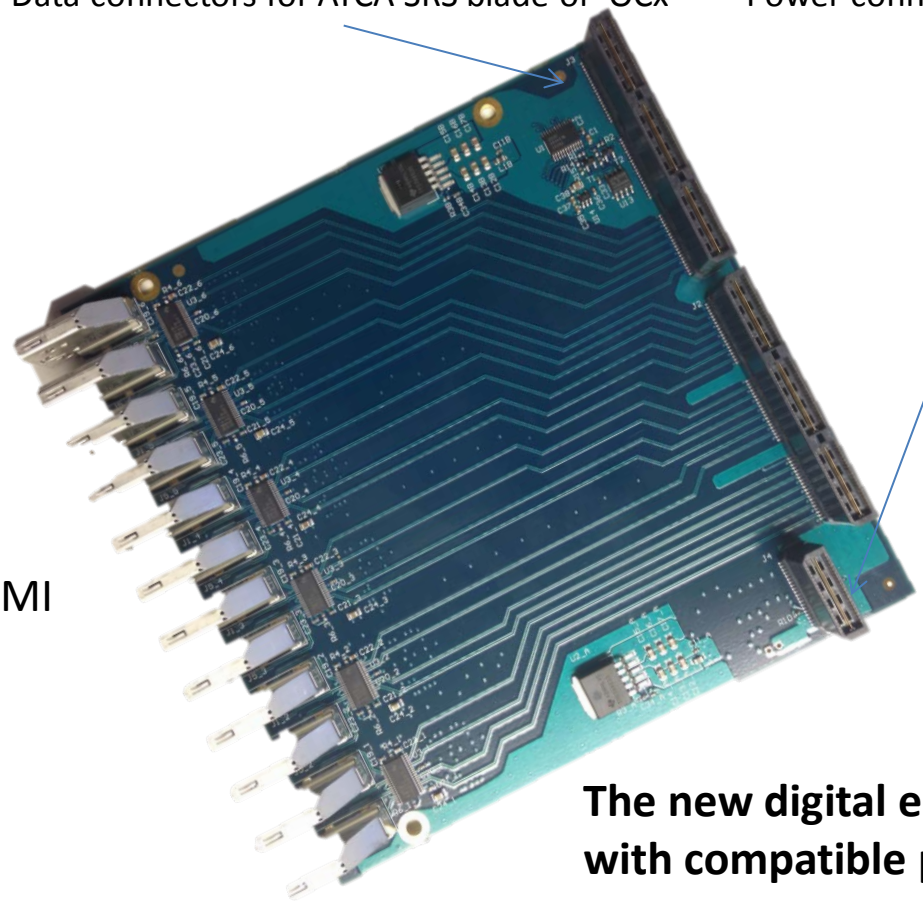
Data connectors and Power Connector are redesigned in Rev. 2

Mezzanines

EAD-M4

Data connectors for ATCA SRS blade or OCx

Power connector for ATCA SRS blade OCx



12x HDMI

Digital Mezzanine Board
12 DTC LVDS Lines
managed over Blade FPGA´s

The new digital eicSys Bord looks similar to the LVDS Board with compatible pin outs.

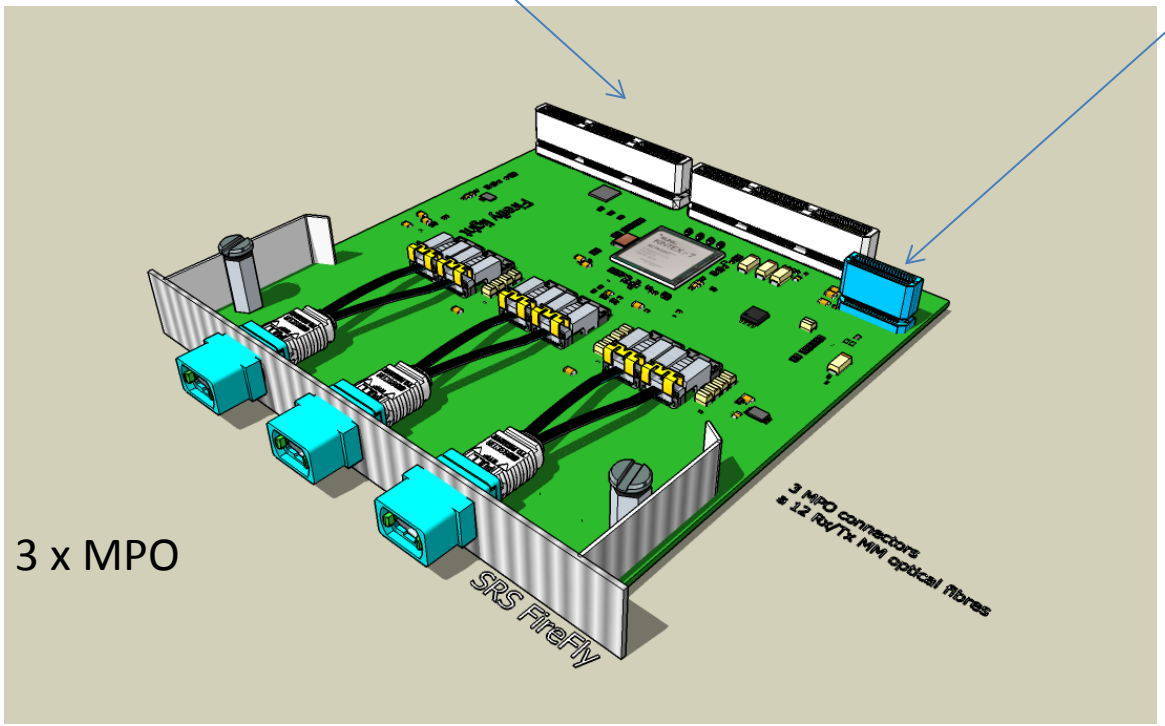
Sources: J. Toledo, Uni Valencia

Mezzanines

EAD-M3

Data connectors for ATCA SRS blade or OCx

Power connector for ATCA SRS blade OCx



3 x MPO

12 or 24 bidir. optical links

MPO / MTP on ATCA frontpanel
MM OM3 fibre
1 x FPGA

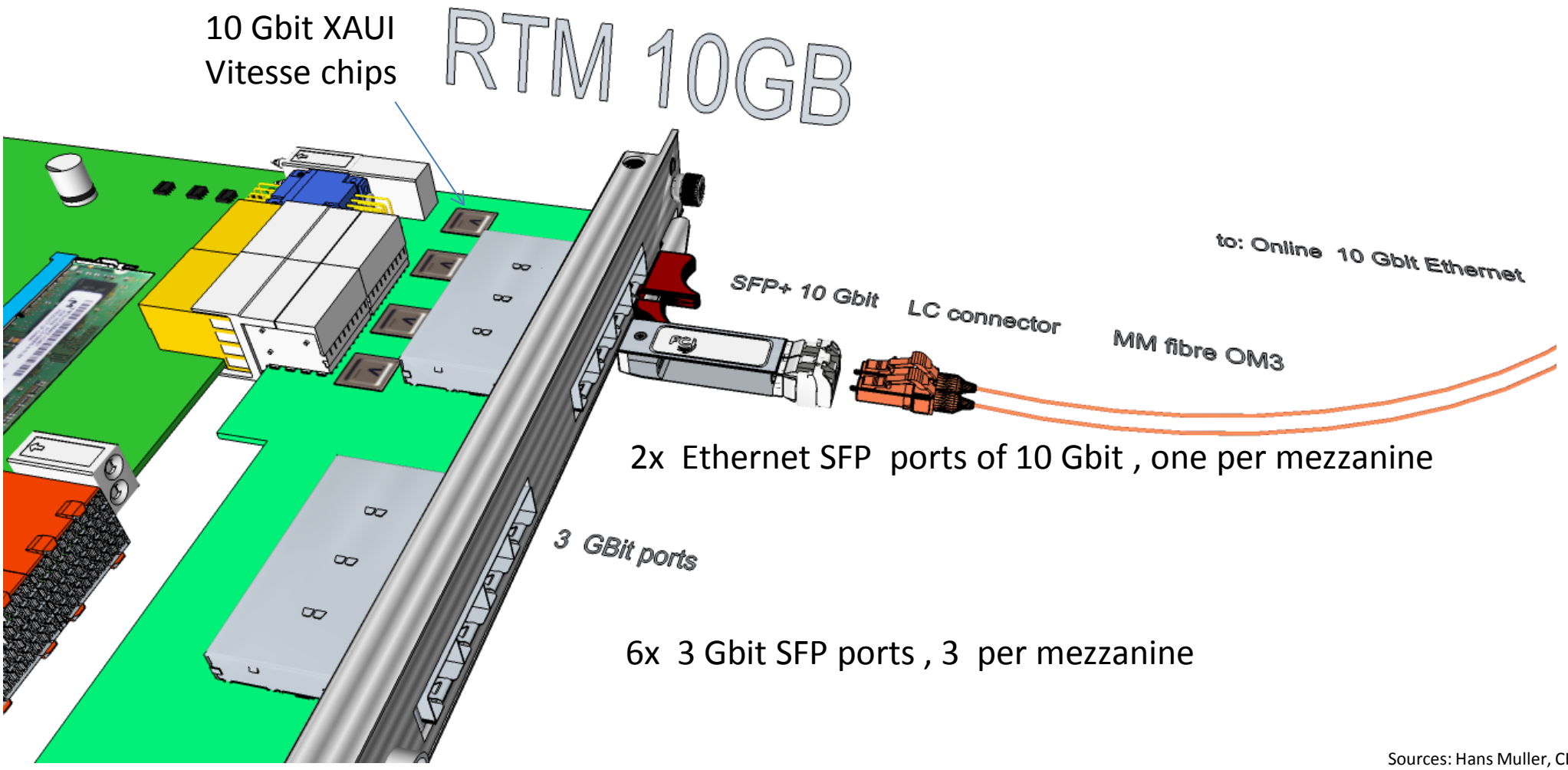
Sources: Hans Muller, CERN

Mezzanines

- EAD-M1
  - 12 physical HDMI interfaces , 12 bits ,65 MHz, Bandwidth 550 MHz
- EAD-M2
  - 40 Channel coax Interfaces,
- EAD-M3
  - 12 physical HDMI interfaces , digital input…
- EAD- M4
  - 3 firefly connectors with 36 fiber channels , Kintex 7 FPGA

- RTM
  - ERTM-101 with 2x XAUI 10Gbps channels (SFP+) and 8x SFP+ up to 10Gbps

Rear Transition Module

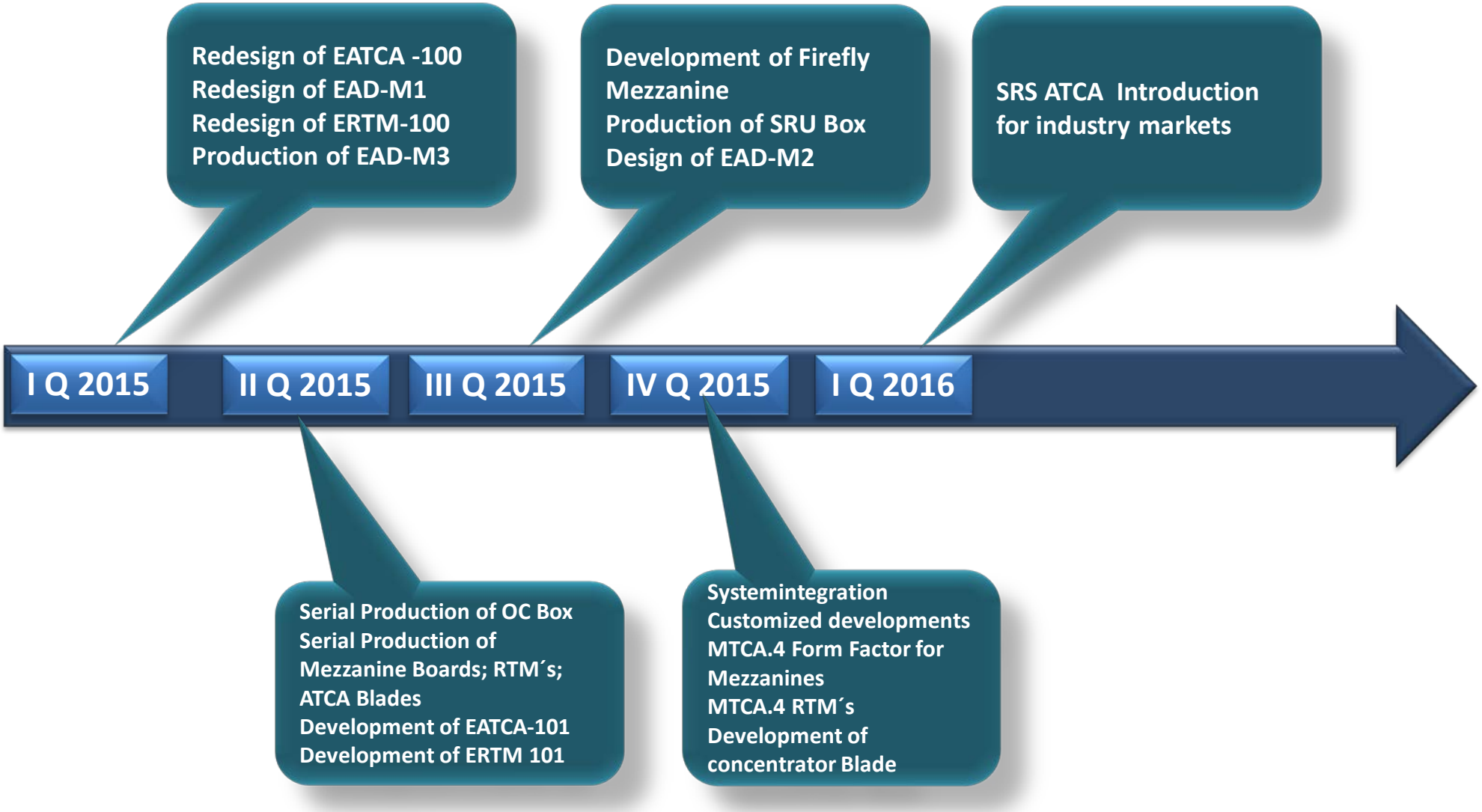


2x Ethernet SFP ports of 10 Gbit , one per mezzanine

6x 3 Gbit SFP ports , 3 per mezzanine

Sources: Hans Muller, CERN

Roadmap for further developments



Actual Situation

Actual Available Systems, ready to use:

- **ATCA Blade EATCA 100 Rev. 2**
- **EAD-M1**
- **EAD-M4**
- **ERTM-101**

together with

Horizontal Systems in

- **2 Slot**
- **5 Slot**
- **6 Slot Versions**

Vertical System in

- **14 Slot with separate Powerrack or PEM**

Thank You for your attention