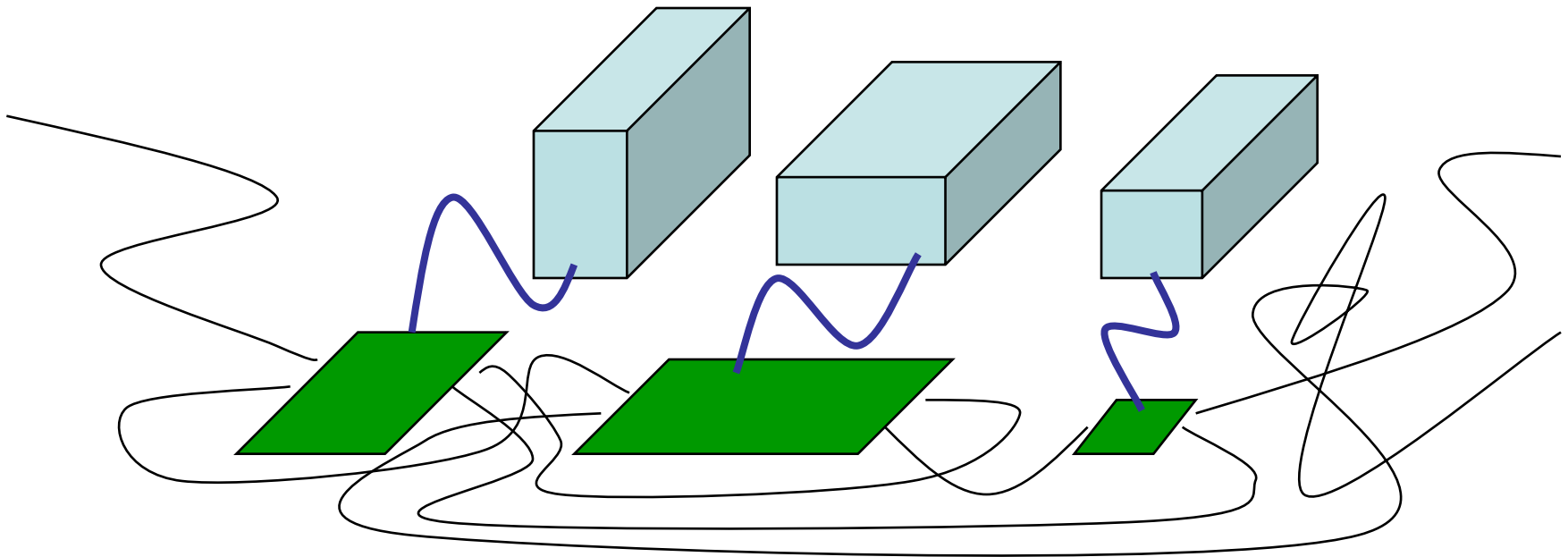# Serial backplane for SpaceWire

Osaka University

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Introduction

- SpaceWire brings flexibility to systems.
  - Physical configuration is free from logical configuration.
- "Elastic" system
  - Develop and test

Standardisation

- Lose
  - Flexibility = "hard system"
- Get
  - re-usability
  - Mixed products
  - Compact integration for ground systems.
- Standard
  - Mechanical   VME, cPCI, ,,,,
  - Power supply
  - Backplane communication   Serial backplane

We propose to use AMC/microTCA standard

Mezzanine cards

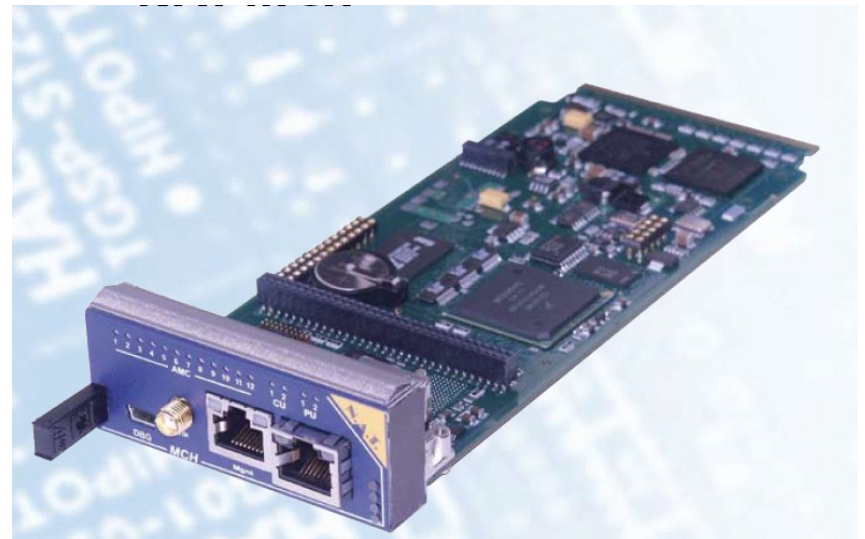CMC = common mezzanine card
PMC = PCI mezzanine card
AMC = Advanced mezzanine card for Serial data link

- AMC (Advanced Mezzanine Card) is developed by PICMG
- AMC is designed for telecom applications..

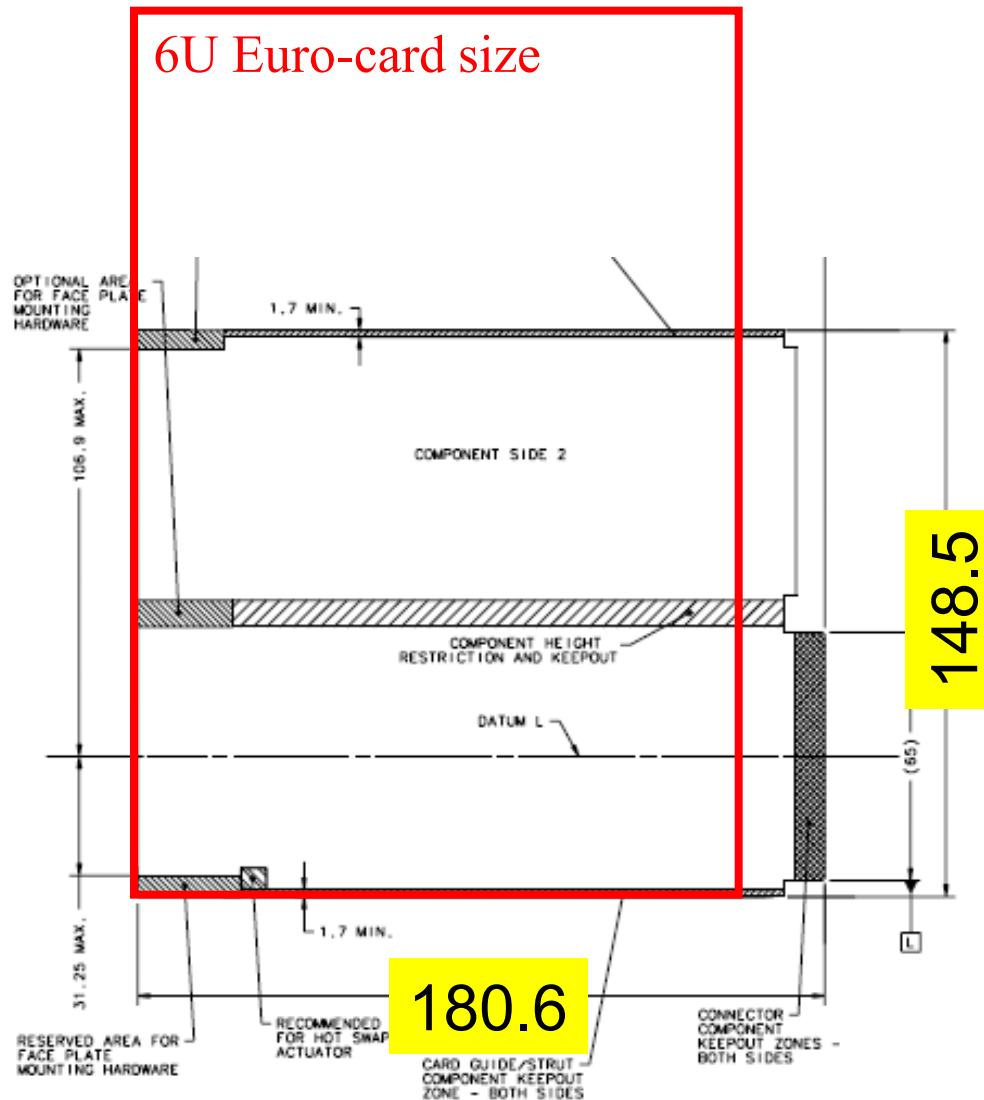PICMG=PCI Industrial Computer Manufacturers Group
www.picmg.org

AdvancedMC™

AMC board size (single size)

3U Euro-card size

COMPONENT SIDE 2

DATUM L

(65)

73.5

1.7 MIN.

18 180.6

L

AMC board size (double size)

6U Euro-card size

148.5

180.6

Power on AMC

Table 5-1 AMC.0 Module power and ·

AMC.0 Module Power		
Width	Height	Watts/each
Single	Half	20
Single	Full	40
Double	Half	40
Double	Full	80

Power 12V
A point of load (POL) regulated power distribution is applied.

AMC interconnection

AMC has 174(170) pin **card edge** contacts
with Hot-swap capability

- 40 signal pairs allocated to the Fabric Interface
    > Gb serial data link
- 5 signal pairs allocated to the AMC Clock Interface
- 5 contacts allocated to the JTAG Test Interface
- 9 contacts allocated to the System Management Interface
- 8 contacts allocated to Payload Power
- 56 contacts to allocated to Logic Ground
- 2 contacts reserved

Backplane serial link
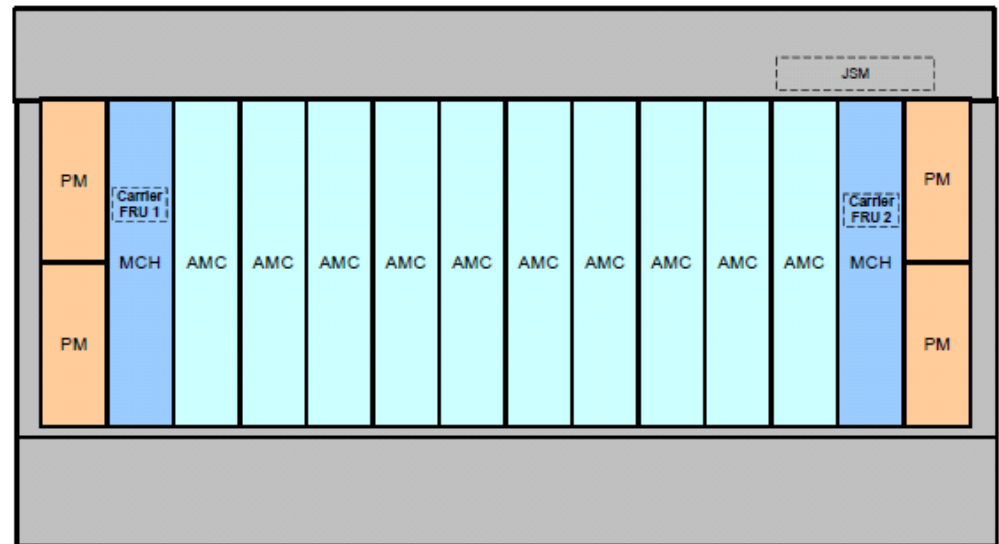

Figure 6-3 AMC Port mapping regions

Component Side 1

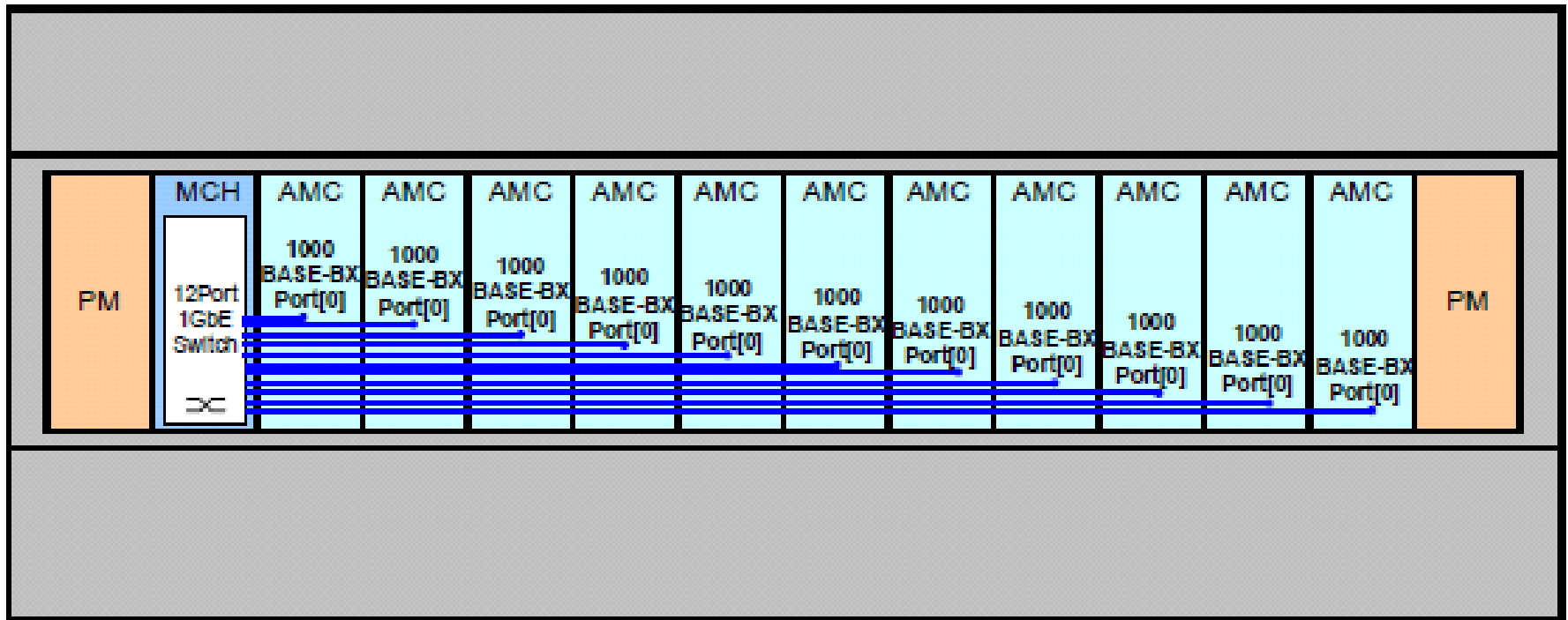Component Side 2
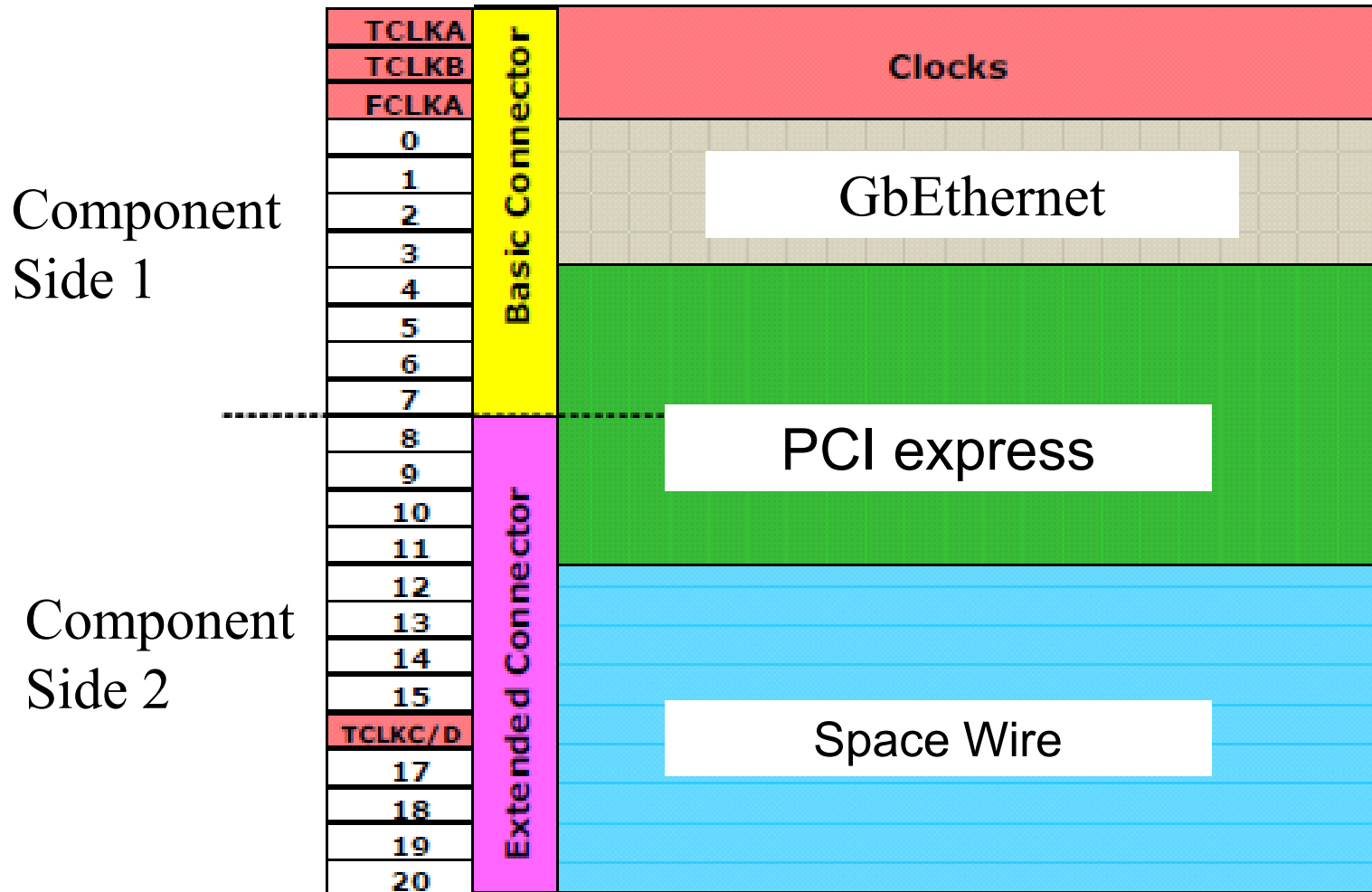
One port has Tx and Rx.

9

Mechanical

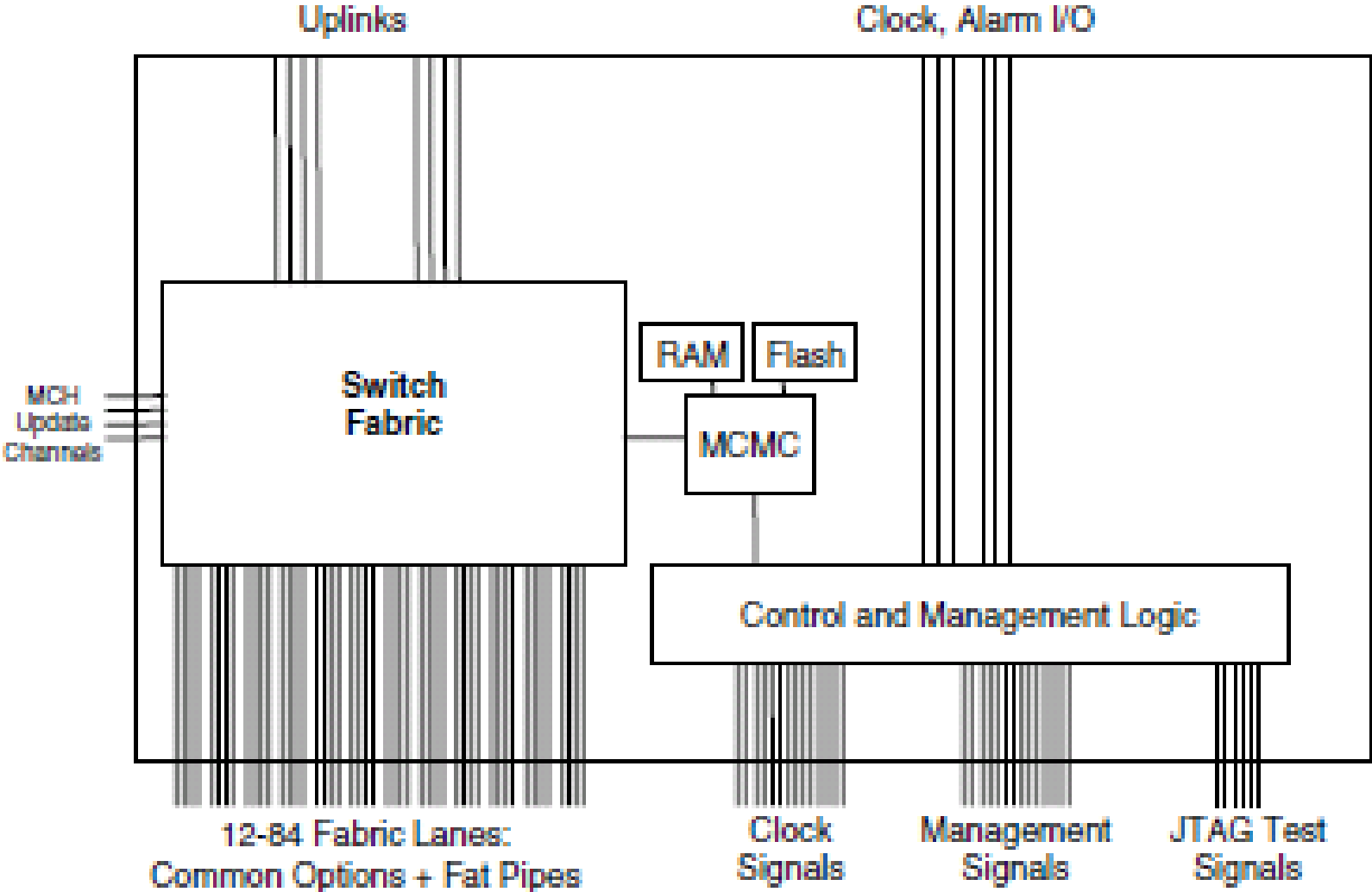Figure 6-15 Redundant MicroTCA Shelf example

μTCA™

Star connection to a MCH

Figure 6-11 Example Centralized MCH switch model
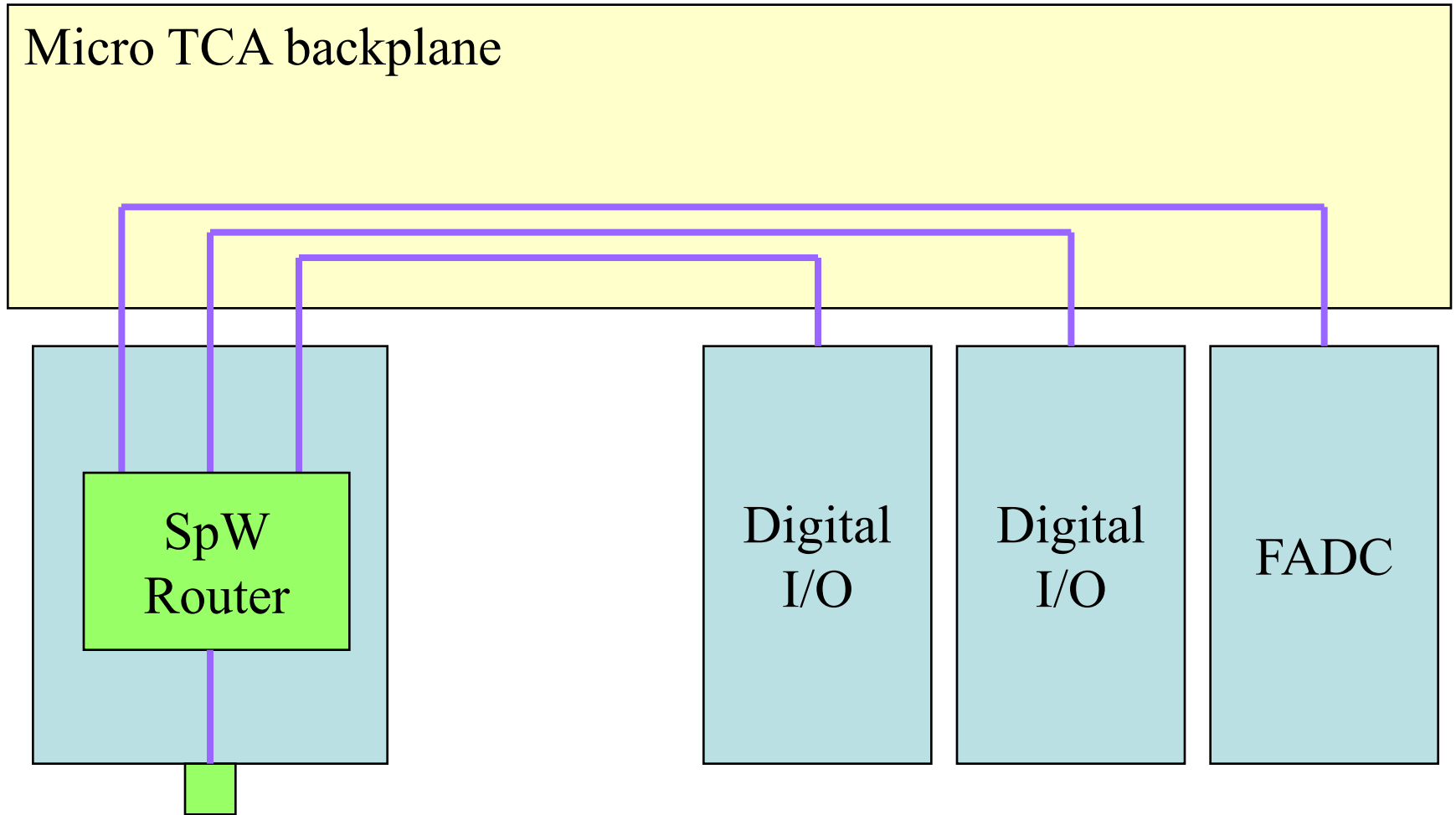
MCH = Micro TCA carrier Hub

Figure 1-4 MicroTCA Carrier Hub block diagram (12 AdvancedMCs/48 Lanes)

Uplinks

Clock, Alarm I/O

MCH
Update
Channels

Switch
Fabric

RAM Flash

MCMC

Control and Management Logic

12-84 Fabric Lanes:
Common Options + Fat Pipes

Clock
Signals

Management
Signals

JTAG Test
Signals

12

example

Micro TCA backplane

SpW Router

Digital I/O

Digital I/O

FADC

MCH
Router module

13

Possible application

Micro TCA backplane

SpW
Router

SpW
PCIe
interface

Digital
I/O

Digital
I/O

PCIe
Router
To PC

MCH
Router module

MCH
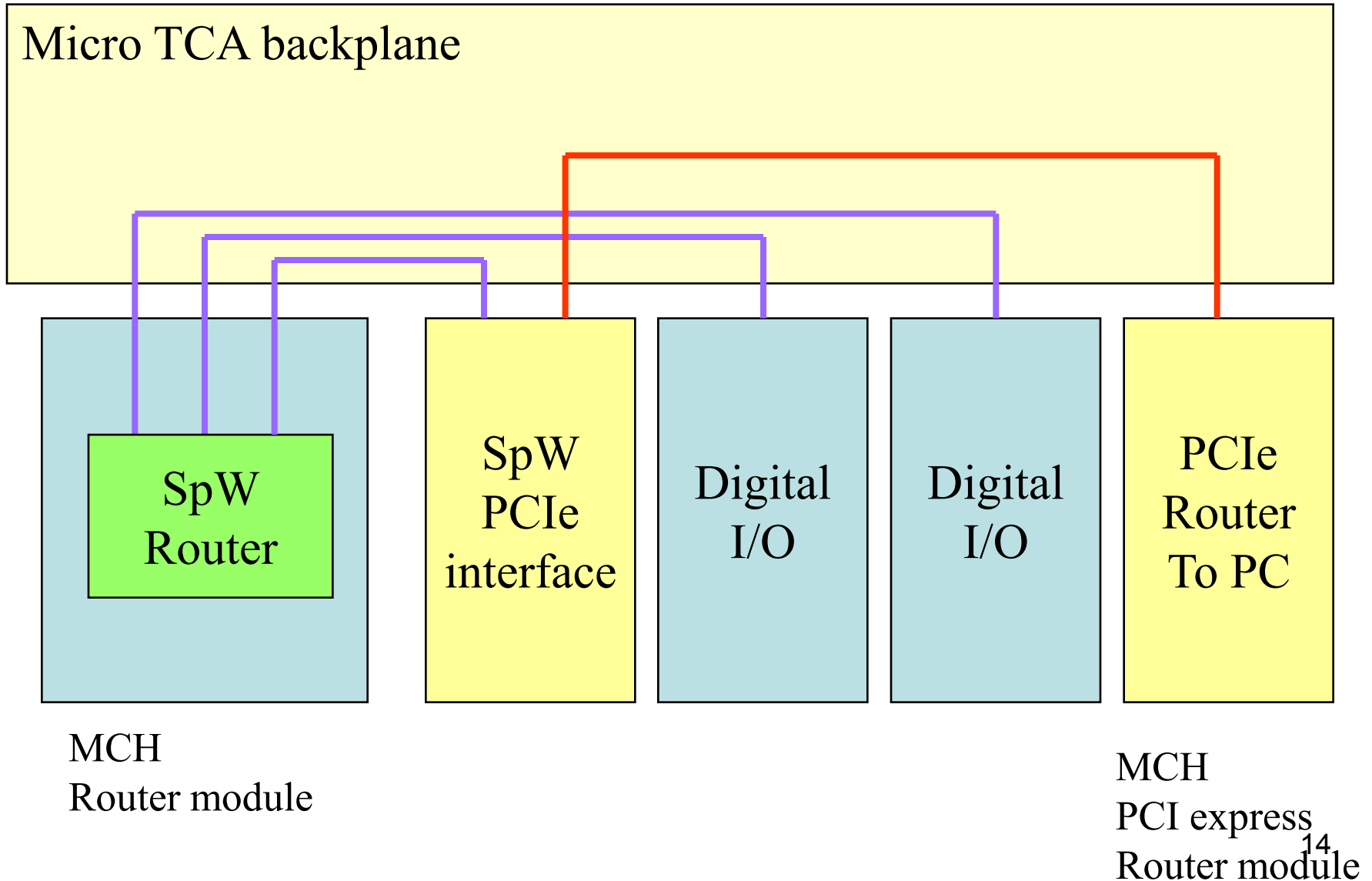PCI express
Router module

Advanced TCA (ATCA)

- 500 MHz FADC system has been developed on ATCA

- ATCA is defined by PICMG for telecom applications before micro TCA.

- ATCA is 8U Euro card size with "differential connectors"
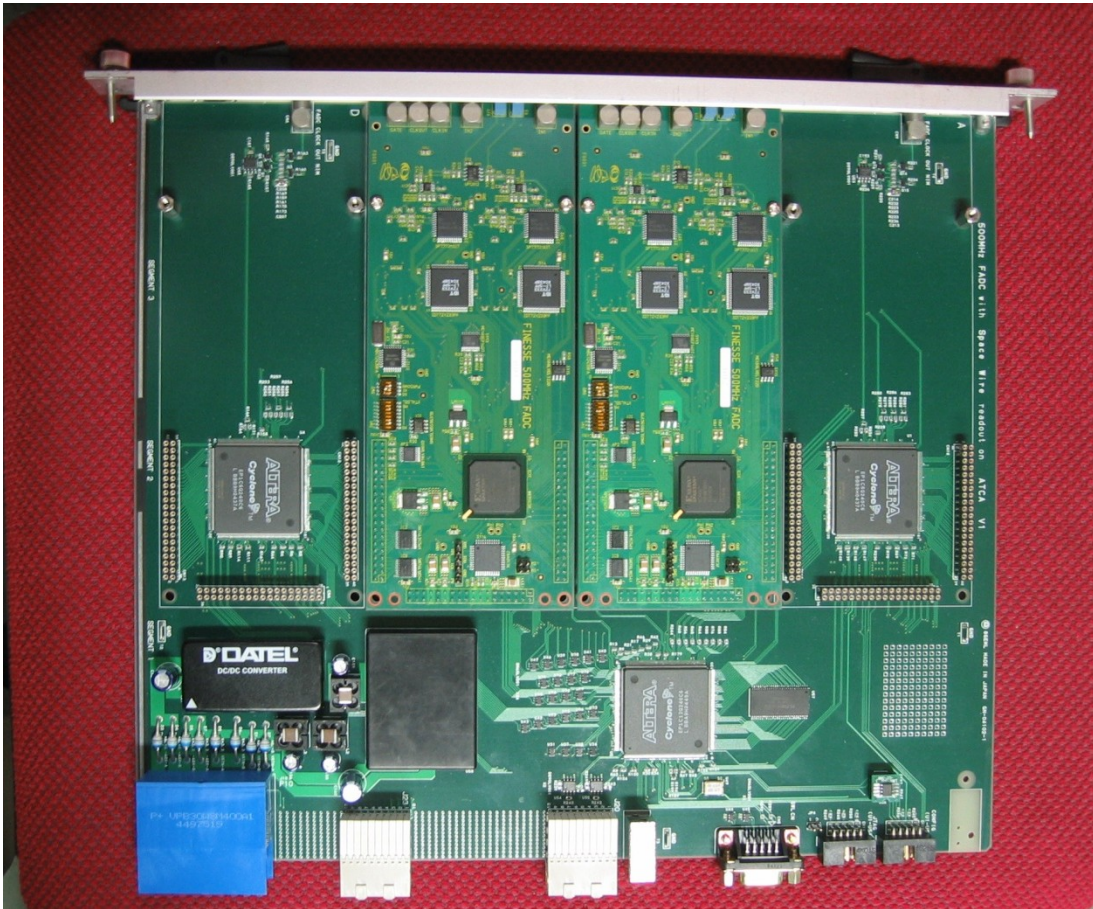
Serial Data Link on Advanced TCA Back Plane
Nomachi, M.; Ajimura, S.;
Nuclear Science, IEEE Transactions on
Volume 53, Issue 5, Part 2, Oct. 2006 Page(s):2849 - 2852

500 MHz FADC

8 ch analog input
FADC mezzanine card

Power consumption is
About 20W

Cyclone EP1C6
Cyclone EP1C12 for router
100Mbps SpW (8~9 MB/s from the module)
Readout buffer with 128Mb SDRAM waiting second level trigger

Shelf management

- Micro TCA / Advanced TCA has powerful shelf management capability.

- It will be useful for applications on the ground.

summary

- AMC/microTCA will be a good candidate for develop and test system on the ground.

- Backplane SpaceWire interconnection makes system compact.

- Co-existence with GbE and/or PCI express opens new and wide field of SpaceWire application.