PICMG next generation MTCA

2nd MTCA/ATCA Workshop for Research and Industry

IHEP, Beijing

August 24th – 25th, 2021

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Agenda

- MOSA at the example of MicroTCA
  - Why and Where
  - How application demands create increasing challenges
  - How actual limitations can be overcome
  - What is coming next

MOSA: *M*odular *O*pen *S*ystem *A*rchitecture

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Open Standards – the habitat of the talk

- Benefits:
  - ***Open*** means access to specification for everyone => standard
  - ***Standard*** means industrial supporters => growing ecosystem
  - ***Growing ecosystem*** means growing user base => increasing install base
  - ***Increasing install base*** means longevity support => safe to use for many years
  - ***Safe to use for many years*** means means long term users => new features
  - ***New features*** means keeping the standard state-of-the-art => future versions
  - **Future versions** means growing ecosystems and growing user base

PICMG® µTCA® AdvancedMC™

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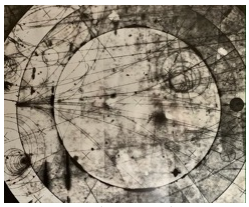
Where MicroTCA is being used today

- Automation
- Communication
- Defense & Aerospace
- Energy
- Industrial Control
- Medical
- Test & Measurement
- Transportation



source: own picture © Heiko Koerte

… and **BIG** Physics

… and **small** Physics

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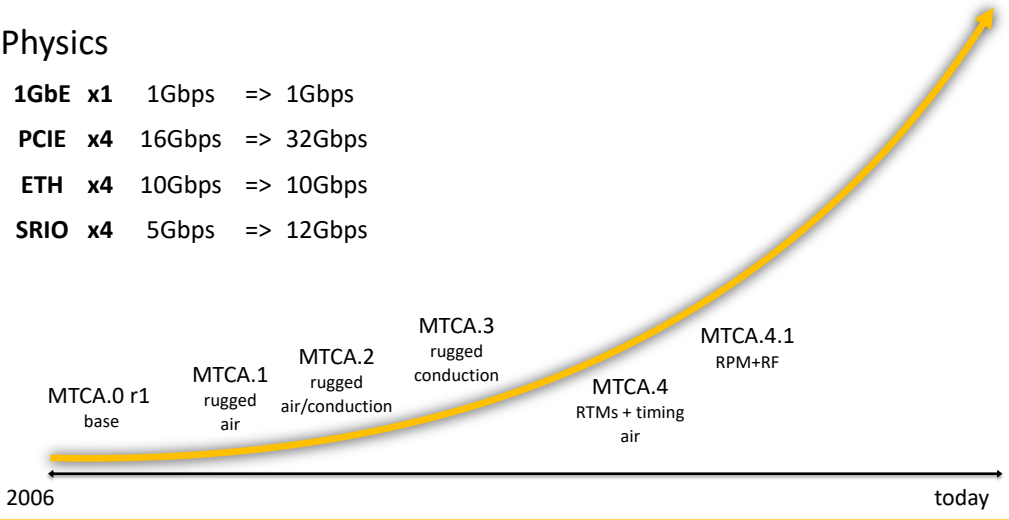
How MicroTCA was used before

- Physics

1GbE	**x1**	1Gbps	=>	1Gbps
PCIE	**x4**	16Gbps	=>	32Gbps
ETH	**x4**	10Gbps	=>	10Gbps
SRIO	**x4**	5Gbps	=>	12Gbps

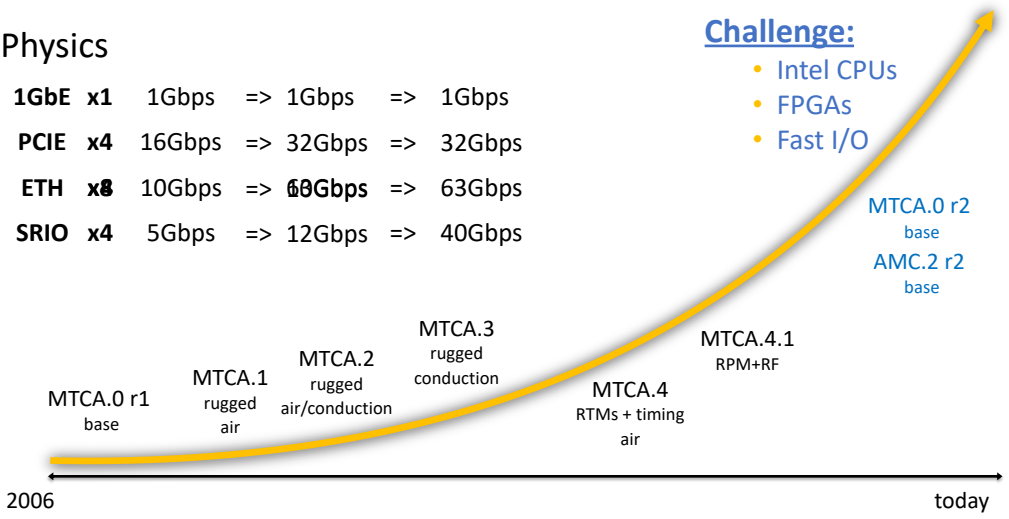


How MicroTCA is used today

- Physics

1GbE	**x1**	1Gbps	=>	1Gbps	=>	1Gbps
PCIE	**x4**	16Gbps	=>	32Gbps	=>	32Gbps
ETH	**x8**	10Gbps	=>	40Gbps	=>	63Gbps
SRIO	**x4**	5Gbps	=>	12Gbps	=>	40Gbps

Challenge:
- Intel CPUs
- FPGAs
- Fast I/O

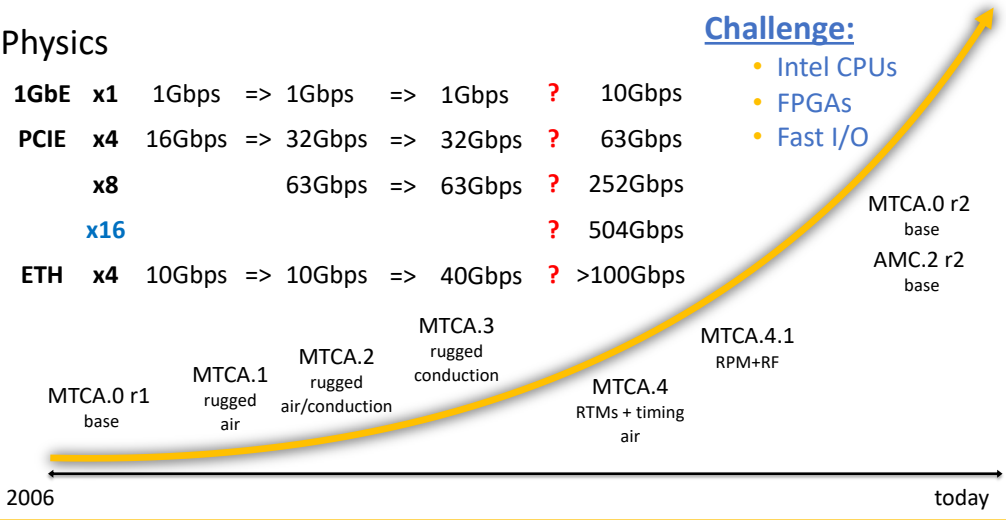


What MicroTCA needs to deliver tomorrow

- Physics

1GbE	**x1**	1Gbps	=>	1Gbps	=>	1Gbps	?	10Gbps
PCIE	**x4**	16Gbps	=>	32Gbps	=>	32Gbps	?	63Gbps
	x8			63Gbps	=>	63Gbps	?	252Gbps
	x16						?	504Gbps
ETH	**x4**	10Gbps	=>	10Gbps	=>	40Gbps	?	>100Gbps

Challenge:
- Intel CPUs
- FPGAs
- Fast I/O



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Impacts on current specification

- Areas to look at
  - AMC:
    - higher bandwidth demanded by new generation of devices, i.e. CPUs, FPGAs, etc.
    - higher power budget for both AMCs and RTMs
    - backplane connector needs to cover higher current and more fabric signals
  - MCH:
    - higher bandwidth to be supplied by new generation of switches
    - higher power budget to support high end switching
    - backplane connector needs to cover higher current and more fabric signals
  - PMs
    - Need to provide more power in same foot print
  - Chassis:
    - backplane needs to cover higher frequencies, higher current and more signals
    - cooling units need to cover higher power budgets for PMs, MCHs, AMCs, and RTMs

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The new approach

- new PICMG work group “Next Generation MicroTCA”
  - Active since end of 2019
  - Work group members represent
    - Manufacturers
      - Chassis (incl. cooling and backplane)
      - Power Modules
      - MCHs
      - AMCs
      - Mechanical components such as connectors
      - Silicons
    - Users
  - Goal
    - Improve MicroTCA so that it can meet the requirements for the **next 10-15 years**
    - Keep next generation of MicroTCA backward compatible

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MTCA – the next generation

- AMC:
  - optional 2nd AMC connector
    - more signals
    - higher power budget

Backward compatibility:

- Foot print: optional 2nd AMC connector allows for mid and full size
- Mechanics: same AMC connectors can be used
- Power: higher budget by optional 2nd AMC connector only

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MTCA – the next generation

- MCH:
  - optional separation of fat pipe switch hub from stacked arrangement
    - more signals by new connector (for separated hub only)
    - higher power budget by new connector (for separated hub only)

Backward compatibility:

- Foot print:
  - optional hub separation still allows for mid size of base + CLK stack and mid or full size for separated hub
  - stacked arrangement still allows for mid or full size but at current switches only
- Mechanics: change with hub separation only, else the same
- Power: higher budget by optional hub separation only

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MTCA – the next generation

- PM:
  - optional 2nd power connector
    - more pins for payload power allow higher current
    - common power rail for all payload power pins for same FRU

Backward compatibility:

- Foot print: optional 2nd power connector allows for 2kW full size
- Mechanics: same power connectors can be used
- Power: higher budget by optional 2nd power connector only

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MTCA – the next generation

- Chassis:
  - optional 2nd power and AMC connectors
  - optional connector for separated hub
    - more pins for payload power allow higher current
    - common power rail for all payload power pins for same FRU
    - more fat pipe signal pins allow for higher bandwidth
  - More efficient fans require higher power and might need different connectors as well

Backward compatibility:

- New functions require new backplane
- MCHs (base + CLK), PMs and AMCs can still be used in new chassis type

PICMG next generation MTCA

- Current status
  - Power Module analysis for 2nd power connector done
  - Pin assignment for 2nd AMC connector under review
  - MCH concept drafted and connector candidate for separated fat pipe hub selected
  - Necessary updates to FRU and system management identified and drafted
  - Channel simulation based on 3D models and real PCB stack-up in progress
- Next steps
  - Analyze results from channel simulation and check findings
  - Adapt changes and repeat channel simulation if needed
  - Build working prototype
  - Draft specification and submit for member review

Conclusion

- new demands and requirements from high and low ends
- current design needs to be maintained for reasons of costs and compatibility
- a new concept for high end demands

There is no doubt… it is time! 😃

Thank you for your attention !

Questions ?

Further questions by e-mail to chairman of PICMG workgroup

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