Abaco SYSTEMS

AMETEK

Enabling Cutting Edge Capabilities in Open Architecture Systems

Embedded Tech Trends 2024

Simon Collins, Director of Product Management

abaco.com

Trends

VITA-aligned products typically operating deployed in vehicles with a power-constrained environment

- Power available
- Power that can be dissipated

Significant strides in performance capabilities

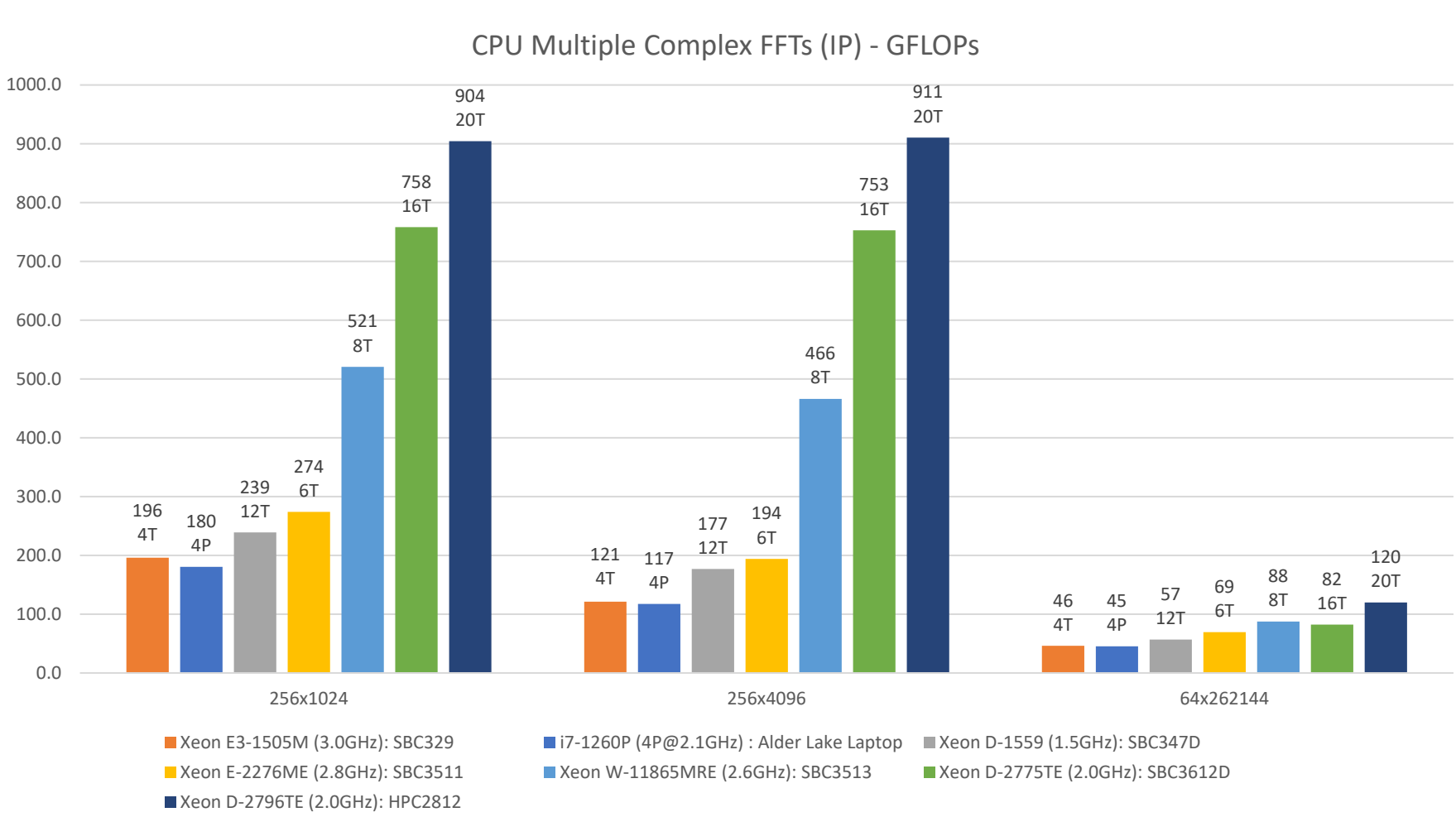
- Technology partners are providing ever greater performance per Watt
- Machine Learning & Artificial Intelligence
- Increasing RF A/D capabilities
- Greater interconnect bandwidth

Ability to generate and consume data at the Edge has never been greater, driven by Open Standards technology

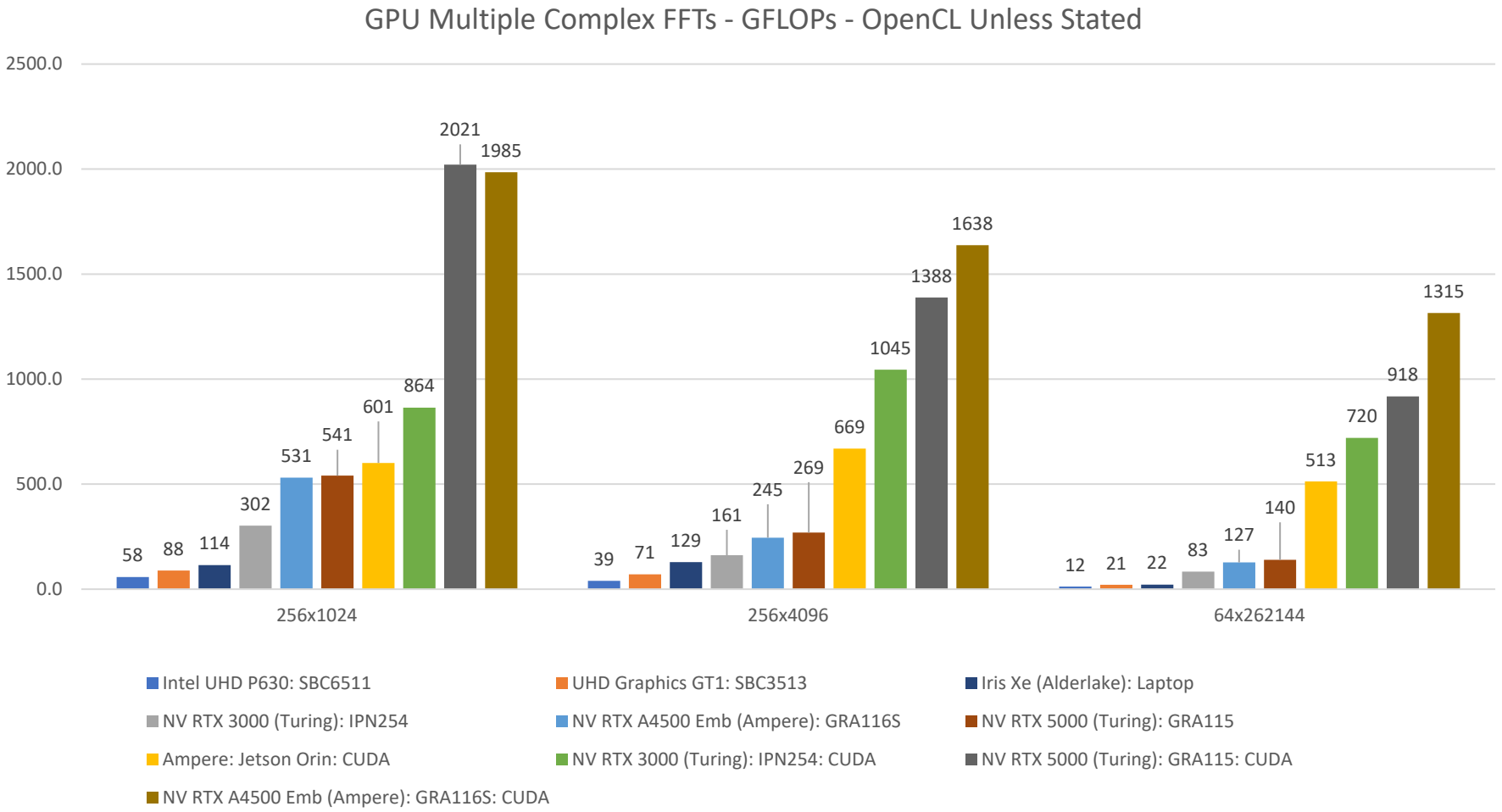
Broader, system-level Open Standards are enabling practical use of these cutting-edge technologies to accelerate deployment through interoperability

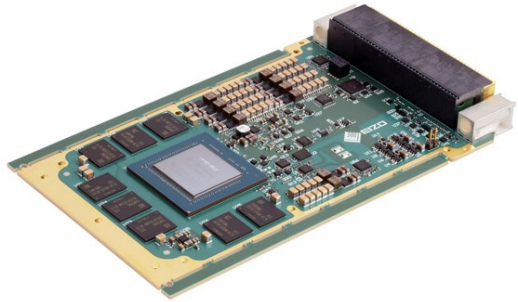
CPU performance gains

2017 - 2023



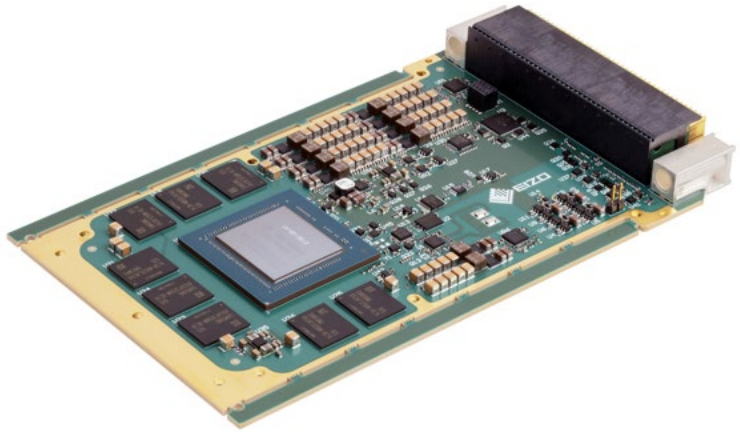
GPU performance gains





Supercomputing brought to a VPX chassis near you!

Sandia National Labs **ASCI Red** supercomputer was the first to break the 2 TFLOPS performance threshold, in 1999



Artificial Intelligence in Defense

Many use-cases across a broad set of application spaces, and a large part of moving towards greater level of autonomy

High-performance identification and tracking from large data streams, e.g.:

- EO and IR domains, RF, Radar

NVIDIA leading the industry & setting the performance standards, but other technologies available at lower power dissipation

Very effective technology for enabling rapid response to new threats

- Needs significant data for training, either synthetically generated or gathered from real-world sensors
- Need robust methods for safely using the results

RF performance increases

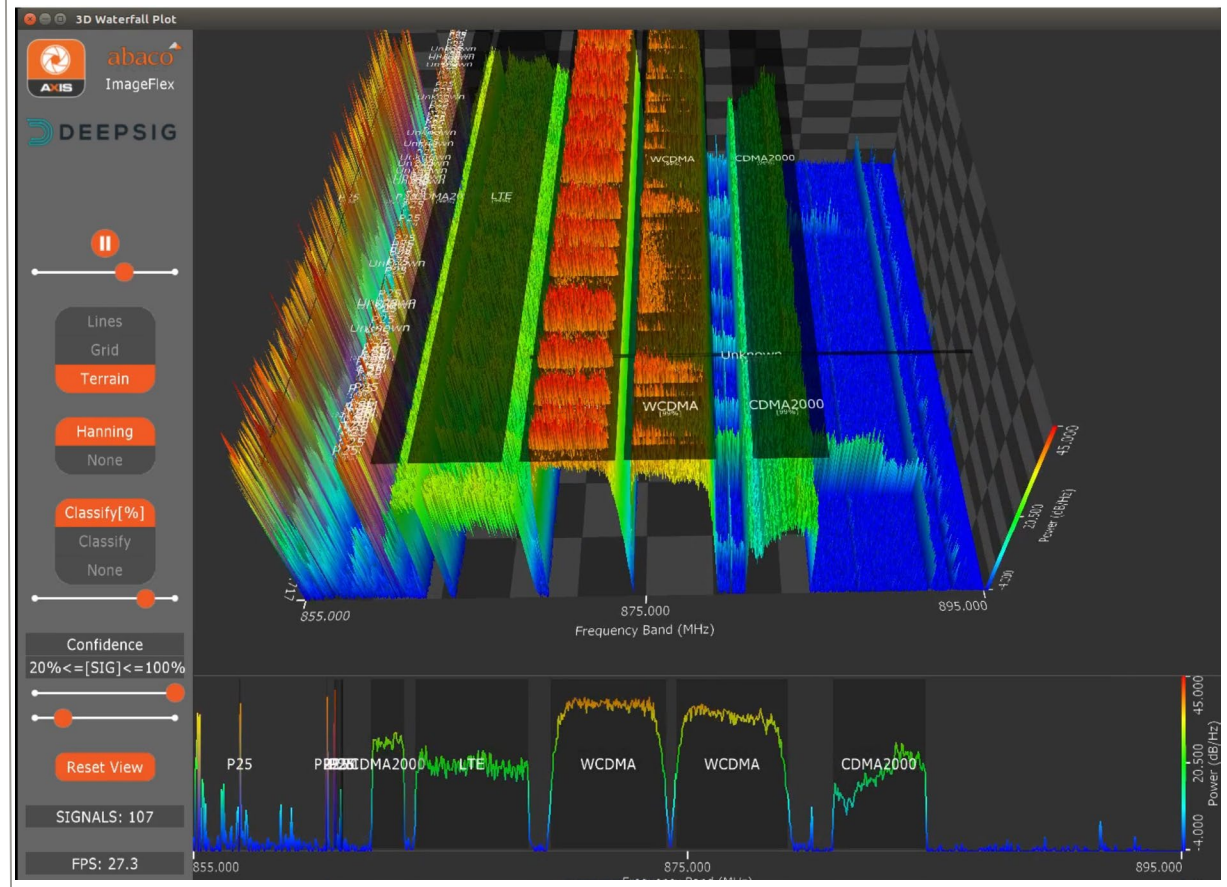
Ingest of analog radio frequency signals creating huge volume of raw data

Analog to digital conversion:

- Increasing sample frequency, > 6 giga samples/sec
- Increasing channel count

FPGA processor integration increasing performance and reducing latency

Multi-chip sync imperative to ensure data remain coherent



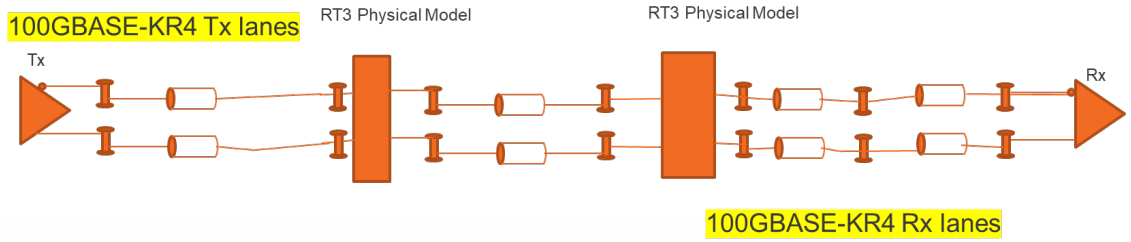
High performance connectivity

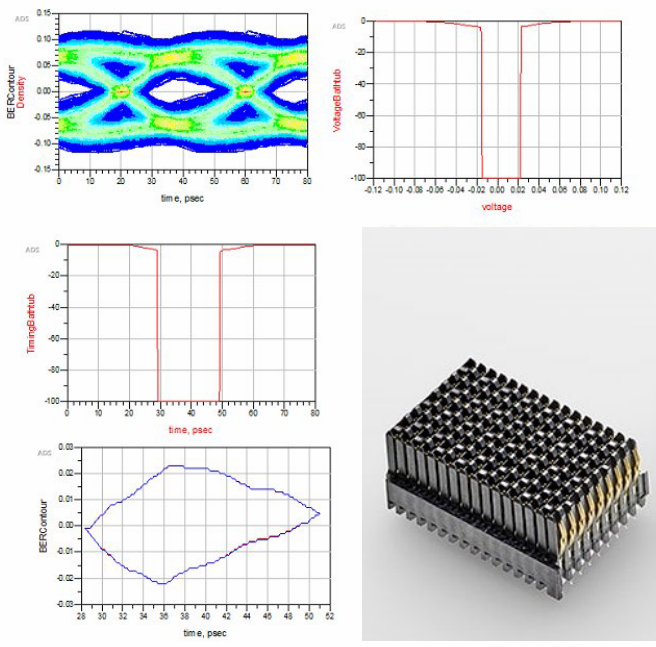
Now able to generate a huge amount of data, and process a huge amount of data, but:

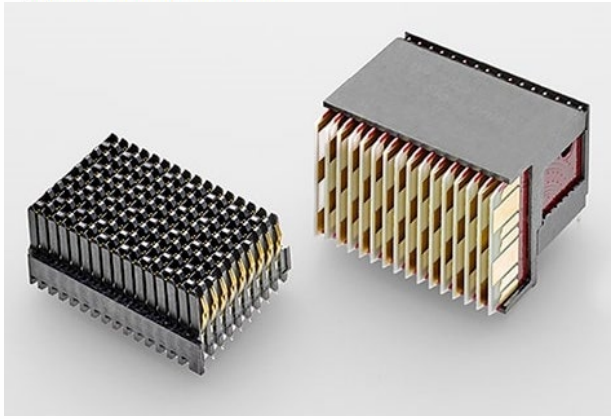
Moving the data within a system, and between systems presents new challenges

Connectivity partners pushing the envelope to facilitate the improvements in *rugged deployable* systems

Signal integrity improvements from TE's MULTIGIG RT3 connector, plus stringent design guidelines and SI analysis, allowing 100GBASE-KR4 at full line rate across the backplane



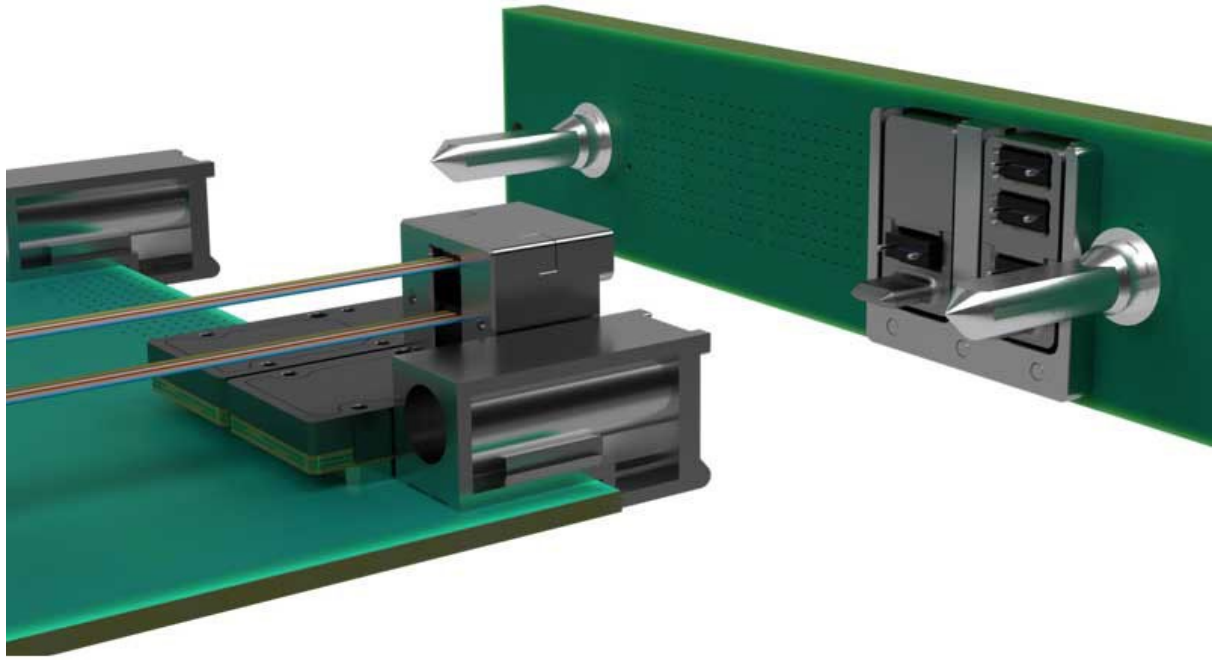




VPX backplane connectors

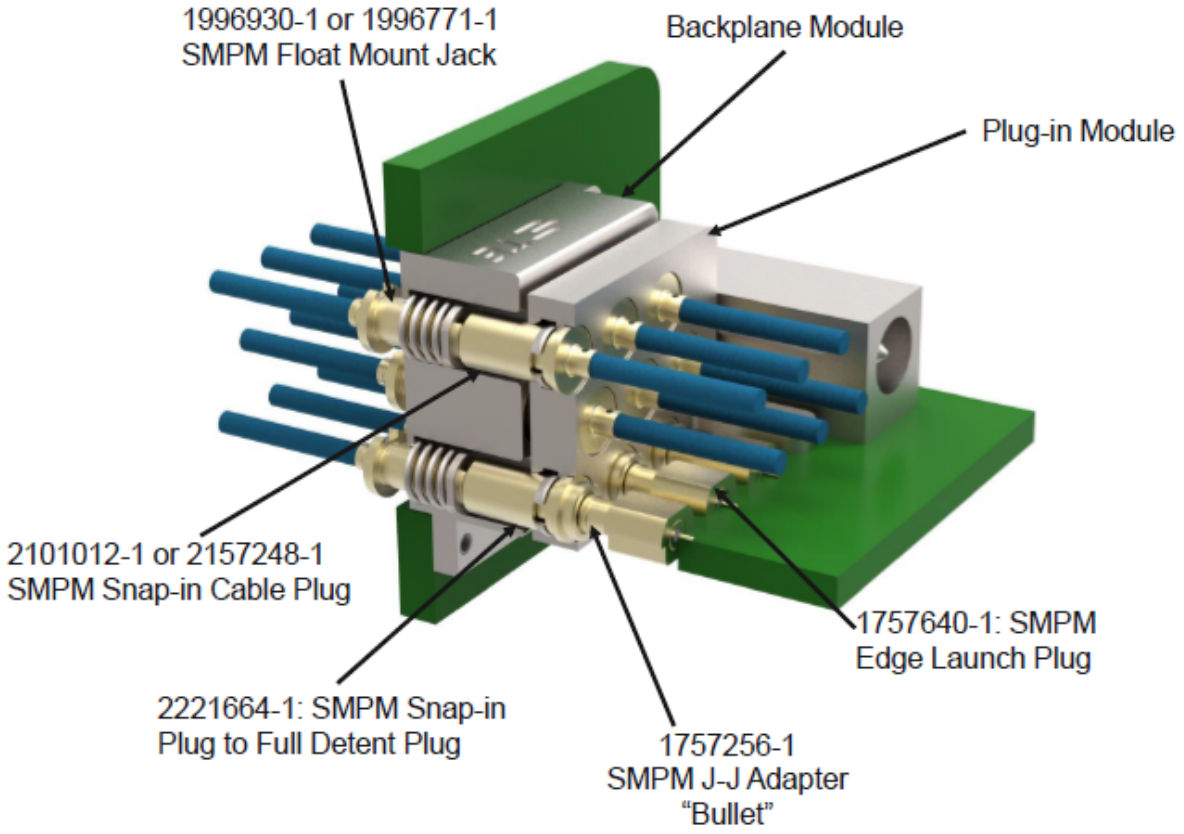
Image courtesy of TE Connectivity

High-performance backplane connectivity



Optical backplane connectors

Image courtesy of Smiths Interconnect



Coaxial backplane connectors

Image courtesy of TE Connectivity

Ethernet Switching

100 Gigabit Ethernet copper or optical

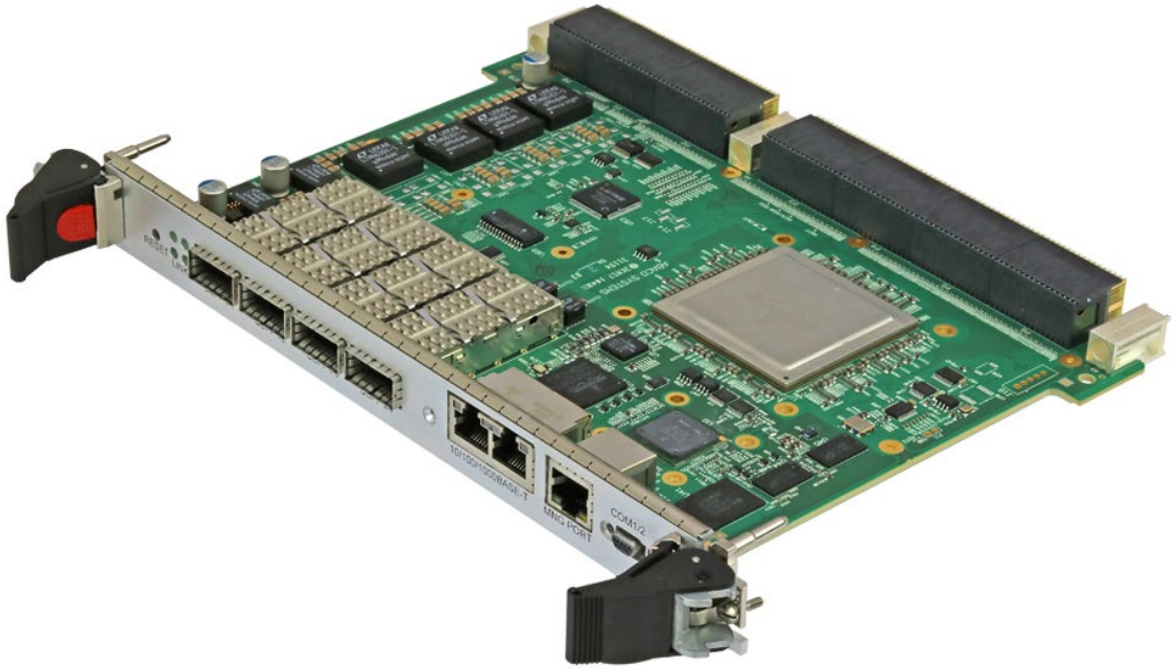
1GbE and 10GbE still prevalent across deployed systems

Time Sensitive Networking - TSN

- Evolving set of standards under 802.1xx providing deterministic, low-latency communication over Ethernet networks
- Aerospace profile 802.1dp specifies protocols for security, high-availability, and bounded latency
- Useful for giving protected bandwidth or protected scheduling

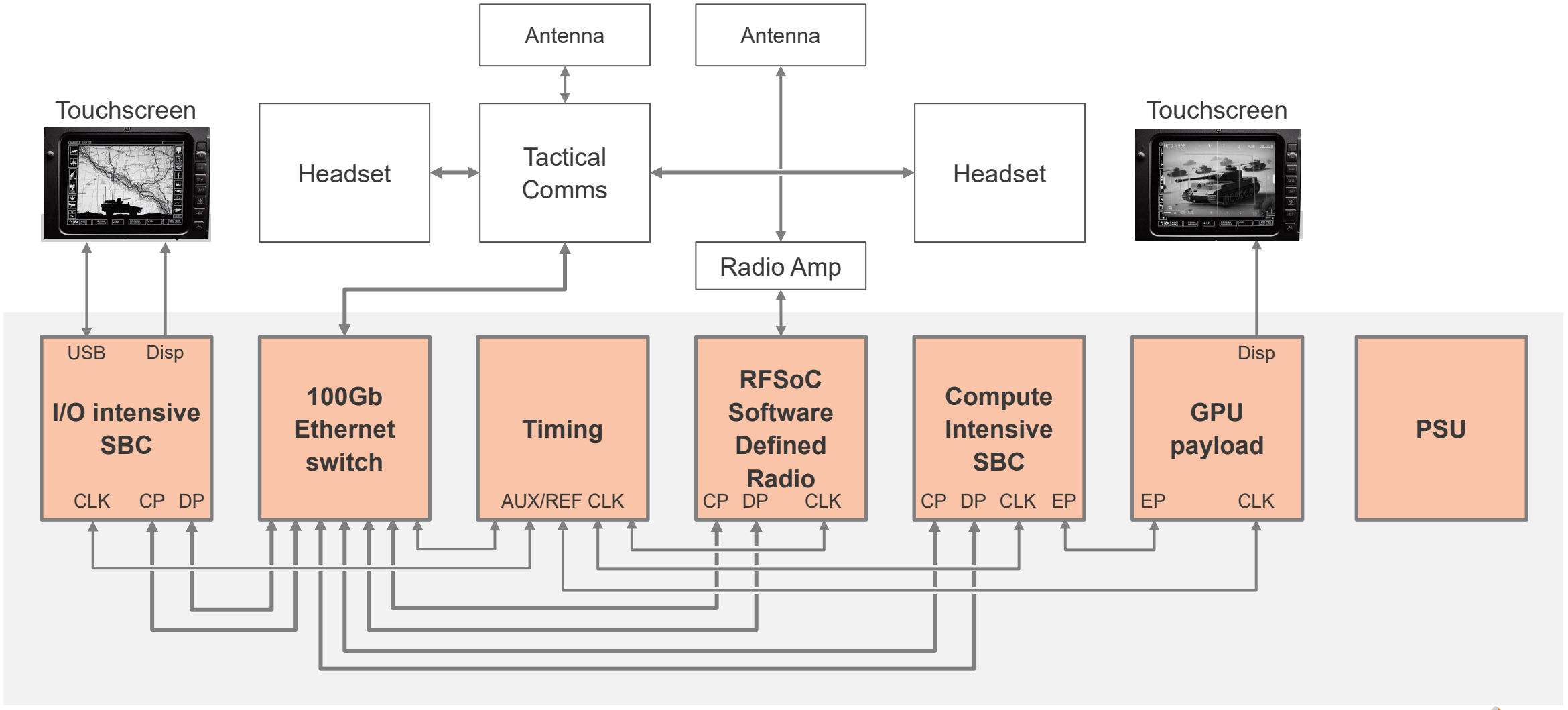
Multi-domain networks

- Physical separation between networks to provide enhanced security
- Red/Black enclaves



CMFF / MOSA architecture

Integration of C5ISR



Summary

Commercial applications continue to drive need for increasing performance

Standardization of core technologies drives interoperability

Hierarchy of industry standards builds a robust ecosystem

Relentless increase of performance and data availability in a SWAP-C constrained environment enabling new capabilities each year