Addressing RADAR Processing needs with 3U OpenVPX COTS Solutions

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Platform trends – Back end processing

1. Multi-core and many-core (GPP, GPU) processing
2. High bandwidth, low latency IPC & storage
3. Open System Architectures (OSA), standard APIs, middlewares and performance libraries

Sensors → A to D → Process → Exploit → Transmit

Signal acquisition, digitize & format → Extract, identify, track, analyse, format → Transmit

= HPC clusters
SAR and GMTI applications present significant processing challenges
Legacy high-performance air-cooled system

>3 cu ft., 105 lbs., 2000W

576 GFLOPS peak
Intel® Xeon® Processor D-1500 Platform Overview

**CPU**
- Up to 16C BDW Xeon® SMT (14nm) *
- Targeted TDP ~20W - 65W
- Intel® Xeon® Features

**Memory**
- 2 Memory Channels, 2 DIMMS/channel
- DDR3L/DDR4
- 128GB Max Capacity

**Integrated IOs**
- x24 PCIE 3.0, x8 PCIE2.0
- x6 SATA3
- x4 USB 3.0, x4 USB 2.0
- x2 10 GbE Intel® Ethernet

**Storage/Network Features**
- Storage/Network Environment (Reliability, Temp, Availability)
- Validated with external Crypto accelerator (Coleto Creek)
- Non-Transparent Bridging (NTB), Asynchronous DRAM self-refresh (ADR), Intel® QuickData Technology

* Recent changes in red
* 8/12 core Extended Temperature Versions
NVIDIA GM107 Maxwell GPU

- Maxwell architecture targets performance/Watt
- 640 cores
- 1.1 TFLOPS (theoretical)
- 128-bit dual-bank memory
- PCI Express Gen 3 (subject to system compatibility)
- 28 nm process technology
- CUDA Compute 5.0
- Shader Model 5.0, OpenGL 4.4, PhysX, DirectX 11.2
- Commercial equivalent is the *GeForce GTX 850M*
CUDA model

1 Multiprocessor = 8 Processors
Putting it all together in 3U OpenVPX

Slot 1
SBC347D
Intel Xeon D
GRA113
Nvidia GPGPU
J0 J1 J2

Slot 2
SBC347D
Intel Xeon D
GRA113
Nvidia GPGPU
J0 J1 J2

Slot 3
SBC347D
Intel Xeon D
GRA113
Nvidia GPGPU
J0 J1 J2

Slot 4
SBC347D
Intel SBC
GRA113
Nvidia GPGPU
J0 J1 J2

Slot 5
SBC347D
Intel Xeon D
GRA113
Nvidia GPGPU
J0 J1 J2

Slot 6
SBC347D
Intel SBC
GRA113
Nvidia GPGPU
J0 J1 J2

Slot 7
PEX431 PCIe switch
J0 J1 J2

<1 cu ft., <45 lbs., <500W

>4.5 TFLOPS peak
Considerations

- Radar applications such as SAR and GMTI suit CPU/GPGPU combinations
- Throughput on the backplane is trending from PCIe Gen 3 to Gen 4 and 10 to 40GE
  - 10GBASE-KX4 and 10GBASE-KR with a view towards 40GBASE-KR4
  - Optical Interconnects have to be considered at or above Gen 4 and 40GE
- CPU cores will continue to trend upwards
- Nvidia’s next generation Pascal GPGPU will be over 1,000 cores
- 3U OpenVPX is a great way to address SWaP in space/weight constrained environments