GE Intelligent Platforms

High Performance Embedded Computing (HPEC)
- Bringing technology from Supercomputing to rugged MilAero applications
  - Mainstream processors and interconnects
- Open Standards Architectures
  - Hardware
  - Software
- Dense High Performance Embedded Computing platforms
  - Lowest SWaP
Typical Supercomputer

42% of the world’s most powerful computers use InfiniBand and OFED
3 of the top 5 use GPGPU
Embedded Supercomputers

The same architectures, but designed for deployment in harsh environments

Shock, Vibration, Temperature extremes, Long lifecycles
HPEC Center of Excellence (CoE) capabilities

Provide solutions based pre-sales customer engagement via HPEC capture team:

- System architecture definition.
- System performance studies & benchmarking.
- Application orientated system demos.

Develop ‘application-ready’ development systems:

- Develop integrated, pre-configured HPEC lab systems.
- Linux & middleware pre-installed, out-of-the-box examples & demos.
- Feed requirements into Systems team in Huntsville for volume production.

Provide post sales application support and professional services:

- On-site ‘getting started’ support & training.
- Application development support & services (custom algos etc).
GE supports HPEC from desktop to deployment

1. Desk Top PC or Blade Servers
2. HPEC Application Ready Platform MOSA
3. Deployed Production Platforms

HPC
Benign

Deployable HPEC OpenVPX
Extended Temp.
Full rugged boards & systems
Radar processing

**Typical older system:**
- 4 cu ft., 105 lbs., 2000W
- 576 GFLOPS peak
- (18 x quad PPCs, 6U VXS)

**New system:**
- 0.8 cu ft., 10 lbs., 120W
- 770 GFLOPS peak
- SBC325 + GRA112
- (Intel 3rd Gen i7 + Kepler GPGPU, 3U VPX)
The Enabling Technologies
Module Open System Architecture

- Modular OpenVPX platforms
- Latest Intel 2\textsuperscript{nd} & 3\textsuperscript{rd} Gen. Core i7, NVIDIA GPUs & Tilera Multicore
- 10GbE, Infiniband & PCIe Switched Fabrics

- Single Board Computers
- Multiprocessors
- GPGPU
- I/O Carriers
- Switch Modules
MOSA components with technology roadmap
Embedded Compute Clusters

Intel 3rd Gen i7 Quad Core

PCIe x16

PCIe Switch

RDMA NIC

10GbE or DDR IB

10GbE or DDR IB

Kepler GPGPU

DDR3

DDR3

10GbE or DDR IB

3rd Gen i7 ~ 150 GFLOPS

Kepler EXK107 ~ 622 GFLOPS

Cooling:
Air Conduction
Spray Air-flowthrough

High Performance Embedded Computing for Rugged Mobile Applications
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OpenVPX enables fabric connections

Expansion Plane
- PCIe

Data Plane
- 10GbE, InfiniBand

Control Plane
- 1GbE

OpenVPX Chassis: CHAS6-OPN-10-1PA-A-12H-Y-BPN
Backplane: BKP6-CEN10-11.2.6-3 (8 Payload + 2 Switch)
AXIS
Advanced Multi-Processor Integrated Software

AXISLIB
RSPL
VSIPL
VSIPL++

AXISFLOW
Dataflow
RDMA
MPI

AXISVIEW
Runtime
Performance visualization & tuning
Multiple OpenVPX Build Styles

- Convection cooled VITA48.1-1” pitch
- Conduction cooled VITA48.2-0.85” pitch
- Air flow through VITA48.5-1.2” pitch

- NDA required-
Summary

Bringing technology from supercomputing to rugged MilAero applications

- Intel Processors
- NVIDIA GPGPUs
- InfiniBand and 10G Ethernet interconnects

Open Standards Architectures

- OpenVPX
- Linux
- VSIPL / VSIPL++
- OpenMPI / DDS / CORBA

Dense High Performance Embedded Computing platforms

- Lowest SWaP
- Air, conduction, air-flow through, spray, liquid cooling
- Fully rugged, Fully lifecycle supported

For more information visit: http://defense.ge-ip.com/hpec