Reliable, Innovative, Experienced….

Your Trusted Teammate for Rugged High Performance Computing

By Philippe Weber
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THEMIS

Themis Computer
Building a Mission-Critical Reputation

- **A Leading Provider of Computer Solutions for Mission-Critical applications**
- **Headquartered in Fremont, CA**
- **Established 1979 as Thomson-CSF Microsystems**
- **One of the 4 Companies Who Created VMEbus**
- **Technology, Packaging and Integration Expertise**
  - Advanced thermal and mechanical design
  - Systems that continue to function reliably under extreme conditions
  - Industry leading SWaP-C
  - Integration of 3rd party products and services
- **ISO-9001:2008**
- **EMEA & India Sales & Support Office in Grenoble, France**

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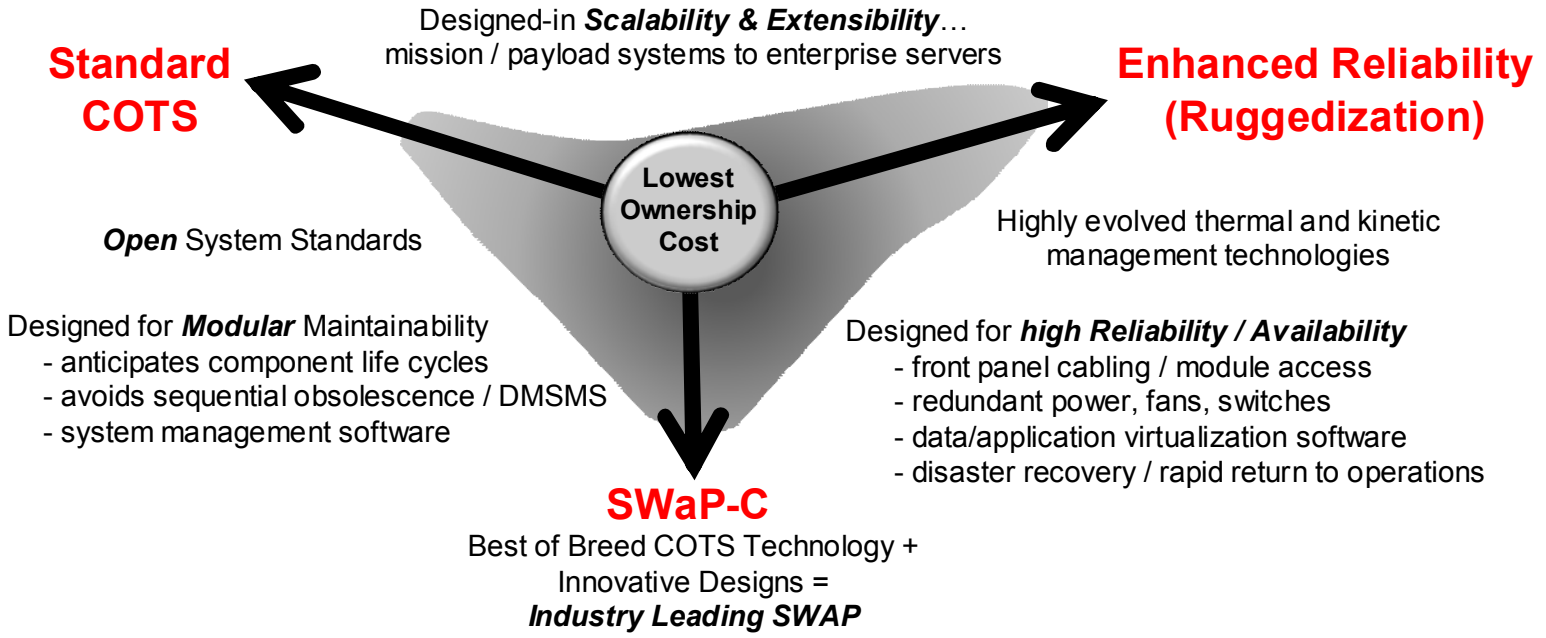
Capability and Background Summary

- Over 33 years of success providing board and system level products and services to the Defense Marketplace, the US Navy being our largest end customer
- Active IPT participation with LSI's and end customers in many programs including Q70, NATO AWACS, DCGS-A, and CDS
- Strategic and teaming relationships with domain experienced LSI's such as LM, NG, GD-AIS, EADS, Raytheon, Boeing and DRS to meet program requirements
- Strategic relationships with key technology providers such as Intel, AMD, Oracle, IBM, NetApp, FusionIO, and Nvidia
- Internal electronic and mechanical design expertise for standard product offerings and program specific requirements

Themis' Value Proposition

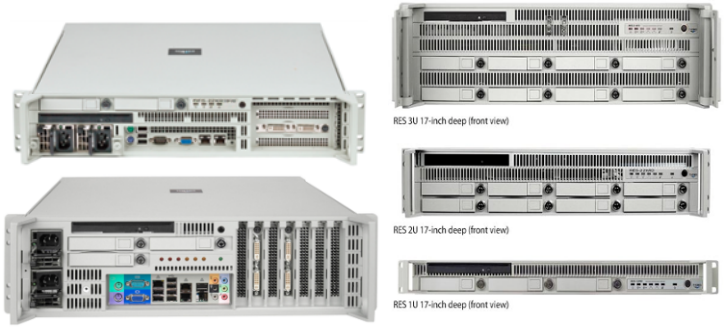
MISSION CRITICAL means you must have it to accomplish the mission.
Themis' computing products are designed to provide the enhanced reliability and availability demanded by mission critical applications in harsh environmental conditions.



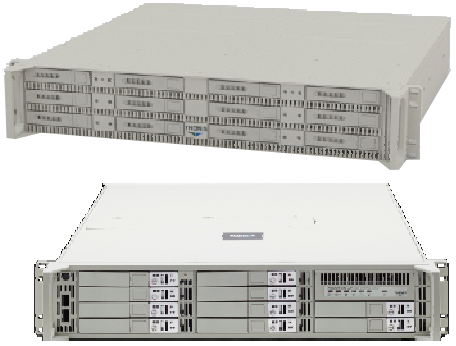
We pride ourselves in working closely with customers to **strike the right balance between the competing imperatives for COTS, ruggedization, and SWaP-C**

Portfolio of Hardware Products

VME Single Board Computers



Rack Mounted
Rugged Enterprise Servers (RES)



Rack Mounted
Rugged Storage

3U VPX

VITA-74
“Nano ATR”

NanoPAK

NanoSWITCH

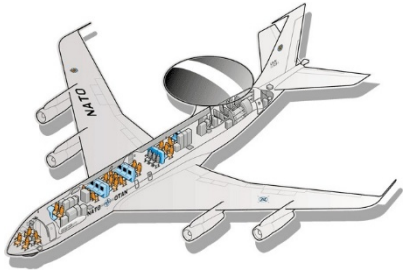
MIL Worldwide Customers

Sea

- CDS CEM
- F125 and F124 frigates
- DDG-1000 Digital Application Processor
- 76/62 Air Defense Gun
- Fridtjof Nansen-class multirole frigates
- F-100 Frigates
- Type 209 Submarines

Air

- NATO AWACS
- Aurora long-range Patrol Aircraft
- ASARS Imaging Radar
- U-2 Reconnaissance Aircraft
- P-3 Orion Patrol Aircraft
- Multi-Sensor Command&Control Aircraft (MC2A)
- MIT-LL Radiant Falcon



Land

- Forza NEC
- MEADS
- Shadow TUAV
- Firescout VTUAV
- AN/TYQ-23Tactical Air Operations Modules
- ERMP Extended-Range Multi-Purpose UAV
- DCGS-A Distributed Common Ground System

Non military markets

- Aviation
- Oil detection
- Security
- Smart Energy
- Video Broadcasting
- Science

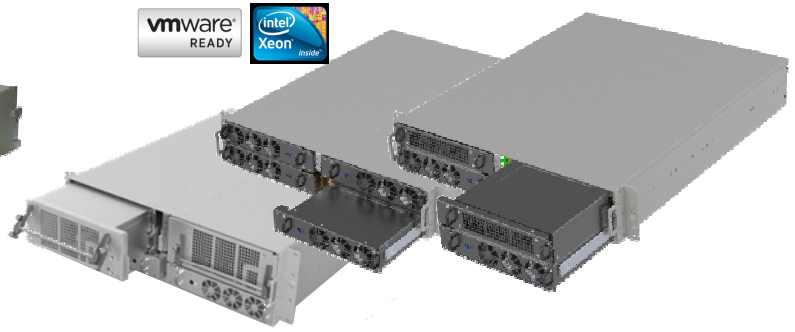
Themis Offers a Highly Evolved and Complete Suite of Rugged Rack-Mounted Computer Hardware

THEMIS

Sub-Rack RES

Standard Density 1, 2, and 3U RES (>160 Variants)

High Density RES Variants



Smallest Virtualized Server/Storage Appliance

50% Lighter, 75% Cube, Unlimited Configurability

Highest Density Rugged Computing on the Market

Enhanced Reliability COTS - Themis RES Value Discriminators

Only NVIDIA Preferred Partner for M- and K-series Tesla GPGPUs

Smaller, Lighter, Shallower Depth, Dual Purpose Server/NAS

Only Rugged Mgmt Appliance

High Performance GPGPU Computing

Mission Critical Data Storage

Systems Management

Standard Density RES Servers

Designed for High Reliability in Harsh Operating Environments

1 or 2 sockets; up to 512 GB DDR3 ECC
20”(24 lbs) or 17”(22 lbs) depth; 3 or 4 hot pluggable drives; 2 x PCIe 3.0 slots; CD

1 or 2 sockets; up to 512 GB DDR3 ECC
Front IO or Rear IO; 20”(26 lbs) or 16.5”(23 lbs) or 13.5” (21 lbs) depth; up to 8 hot pluggable drives; up to 7 x PCIe 3.0 slots; CD

1 or 2 sockets; up to 512 GB DDR3 ECC; Front IO or Rear IO; 20”(29 lbs) or 17”(27 lbs) depth; up to 8 hot pluggable drives;
up to 7 x PCIe 3.0 slots; CD

- **Compact Size**
  - ❖1U, 2U, 3U Rack Mount Form-Factor
  - ❖Shallow Depth: 20, 17 & 14 inch versions
  - ❖Front I/O variants

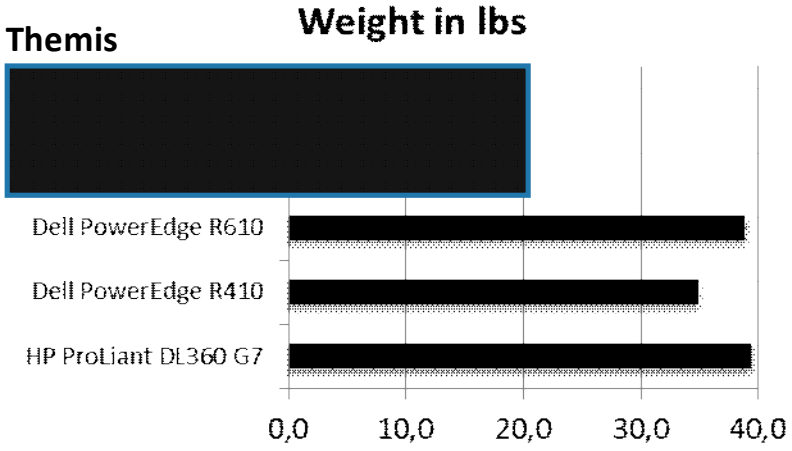
Over 160 different configurations to meet every project’s needs.

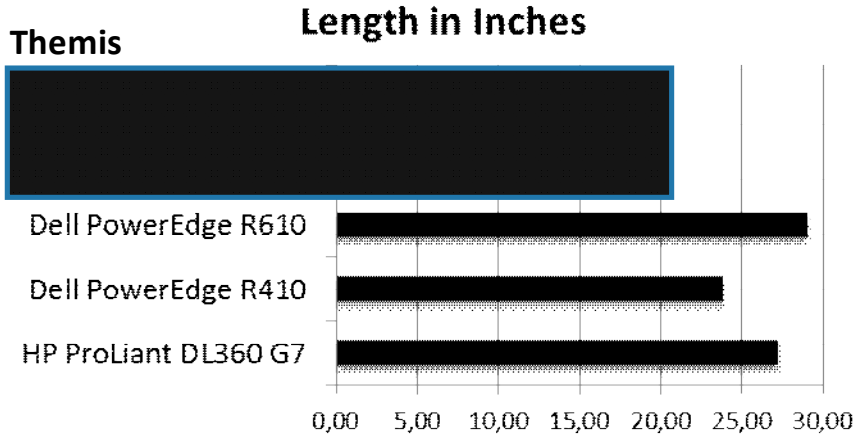
- **Light Rugged Construction**
  - ❖Specially coated Aluminum chassis reduces weight and corrosion
  - ❖35G Shock; up to -10°C/+65°C (Configuration dependent)
  - ❖MIL-STD 810G, 740, 461
- **Commercial Components**
  - ❖State of the Art Motherboards & Expansion Cards
  - ❖4- to 12- Core Intel Xeon Processors (Sandy Bridge)
  - ❖Windows® and Linux® OS, IPMI v2.0 support
- **High Reliability**
  - ❖Hot Swappable Fans, Disk Drives and AC/DC Power Supplies
  - ❖Air Filters / Dust Covers
  - ❖Up to 8 Removable SAS/SATA drives, RAID controlled

Modular Design for Easy Upgrade and Service; Highly Configurable / Expandable using COTS Components

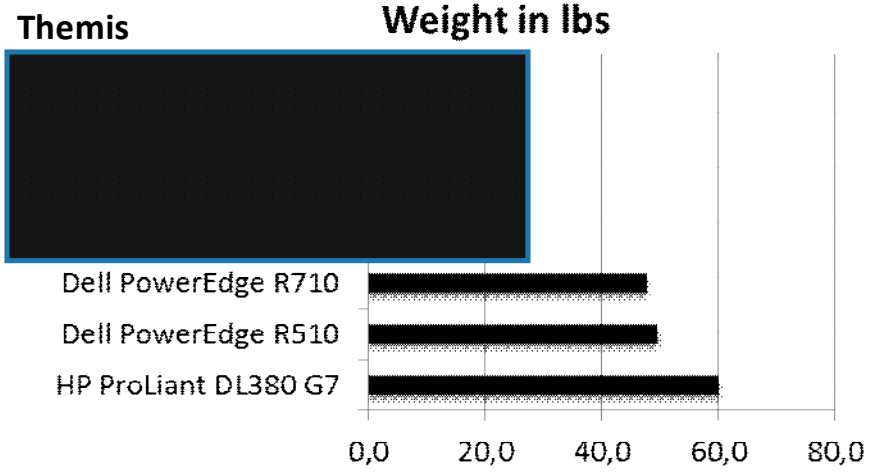
1U Size and Weight Comparison

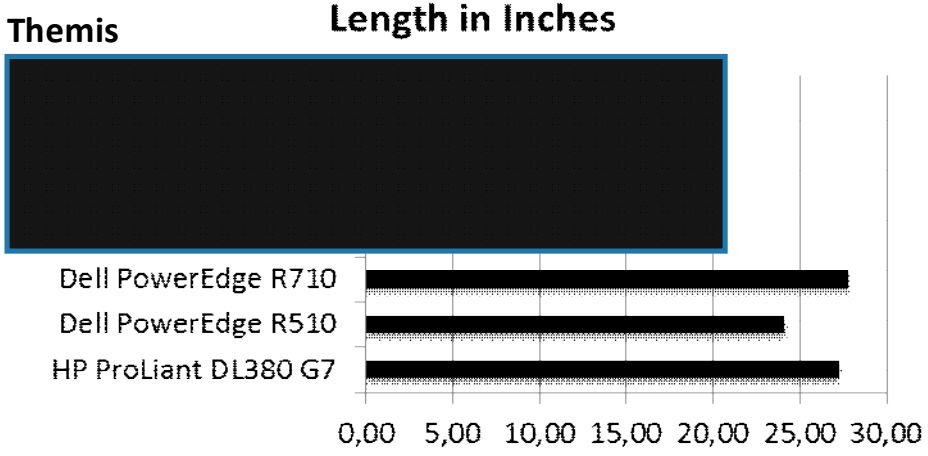
Themis' "Enhanced Reliability" Hardware is also Smaller and Lighter





2U Size and Weight Comparison





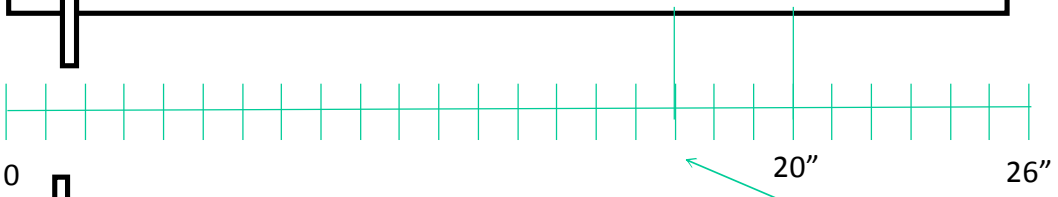
Illustrative Comparison

What's important to you?

Dell Power Edge R420

Intel E5-2400 series processors
384 GB Memory
Expansion Slots: 2
Storage: up to 8 x 2.5" HDD
Max Operating Temp: 35°C
Max Humidity: 80%
Max Vibe: 0.26 Grms at 5Hz to 350Hz
Max Shock: Half sine shock in all operational orientations of 31G +/– 5% with a pulse duration of 2.6ms +/– 10%

20 kg
18 kg with 4 HDD



Themis also offers a 17" deep variant

RES-XR4-1U

Intel E5-2600 series processors
512 GB Memory
Expansion Slots: 2
Storage: up to 3 x 2.5" HDD
Max Operating Temp: 55°C
Max Humidity: 90%
Max Vibe: 3.0 Grms, 10 Hz to 2000 Hz
Max Shock: 3 axis, 35G at 25 ms

11 kg

Reduced SWaP/C
Enhanced Reliability

Customized RES I/O panel

RES-Mini

- Non-rackmounted server for use in demanding environments with limited Size, Weight, and Power (SWAP)
- 102 x 343 x 278 mm (HxWxD), 8.2 kg
- Single 8-core Xeon
- Eight 2.5” drives
- Internal RAID controller
- One PCIe Expansion Slot

RES-Mini Servers

Themis RES-STOR

Storage Protection and Efficiency at the Edge

Dual Purpose Sub-Rack System: Virtualized Server / NAS Appliance
Themis' RES-Mini Server + VMware + NetApp's Data ONTAP Edge-T

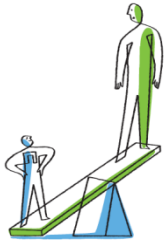
NetApp Data ONTAP Edge-T is a low-cost edge storage solution that runs in a virtual machine on the VMware® vSphere® platform. Data ONTAP Edge-T delivers enterprise-class data management and protection to environments that don't warrant a dedicated NetApp storage system.

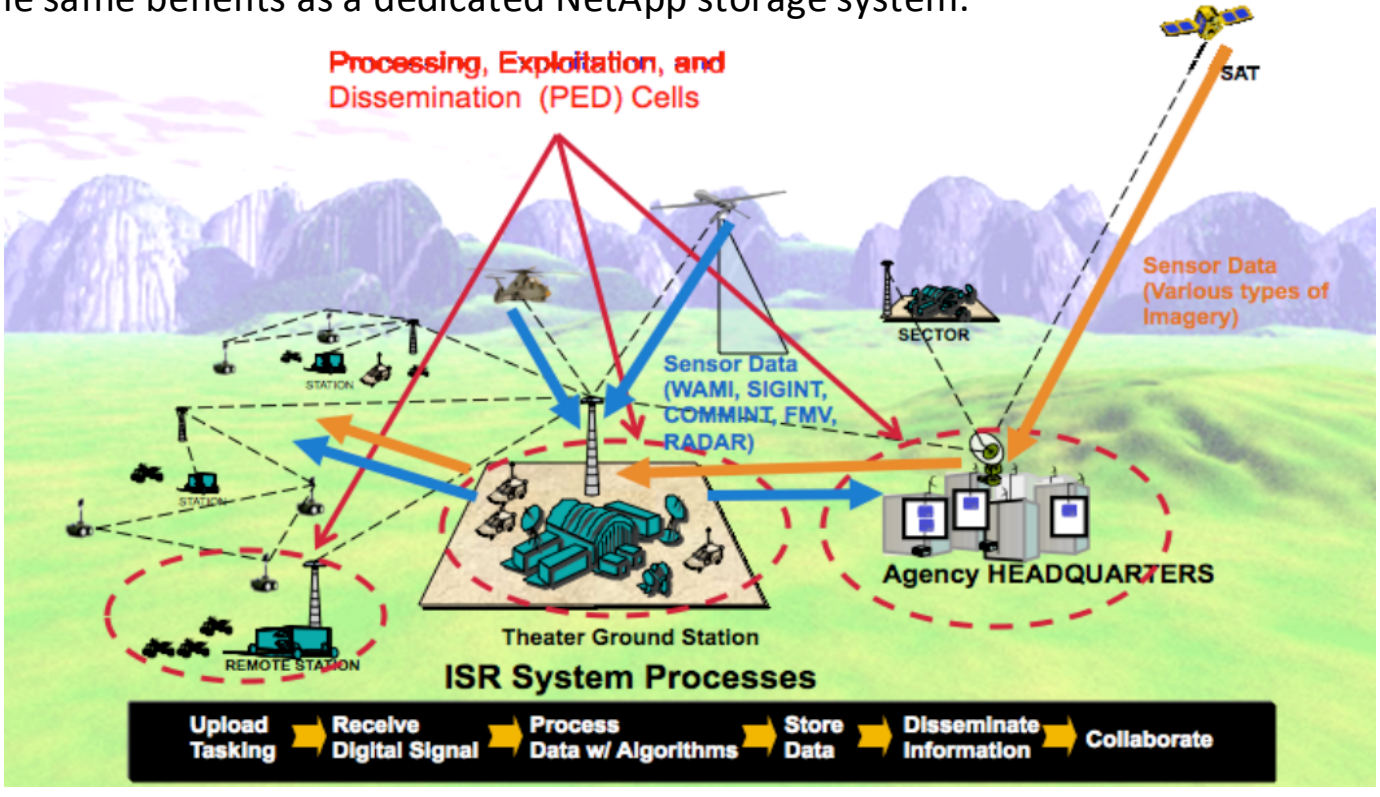
Data ONTAP Edge converts the RES-mini server's internal disk drives into a flexible storage platform that enables many of the same benefits as a dedicated NetApp storage system.

NetApp

Data ONTAP Edge

Build a "data center on a server" with NetApp fundamentals





RES-NT High Performance Computers

THEMIS

Themis is NVIDIA's only rugged computer manufacturer "Preferred Partner"

- **Support for NVIDIA Tesla K10, K20, K20X, GRID K1, or GRID K2 GPGPUs**
- **Target applications: graphics virtualization, high-performance signal and image processing**

NVIDIA.

- **RES-NT2 1U HPC**
  - ✓ OneTesla Kepler Card (3,072 GPU Cores)
  - ✓ Two 8-core processors

- **RES-NT2 3U HPC**
  - ✓ Three K10 Tesla Kepler Cards (9,216 GPU Cores)
  - ✓ Two 8-core processors

RES Ruggedized High Density Systems – One Chassis, Three Configurations

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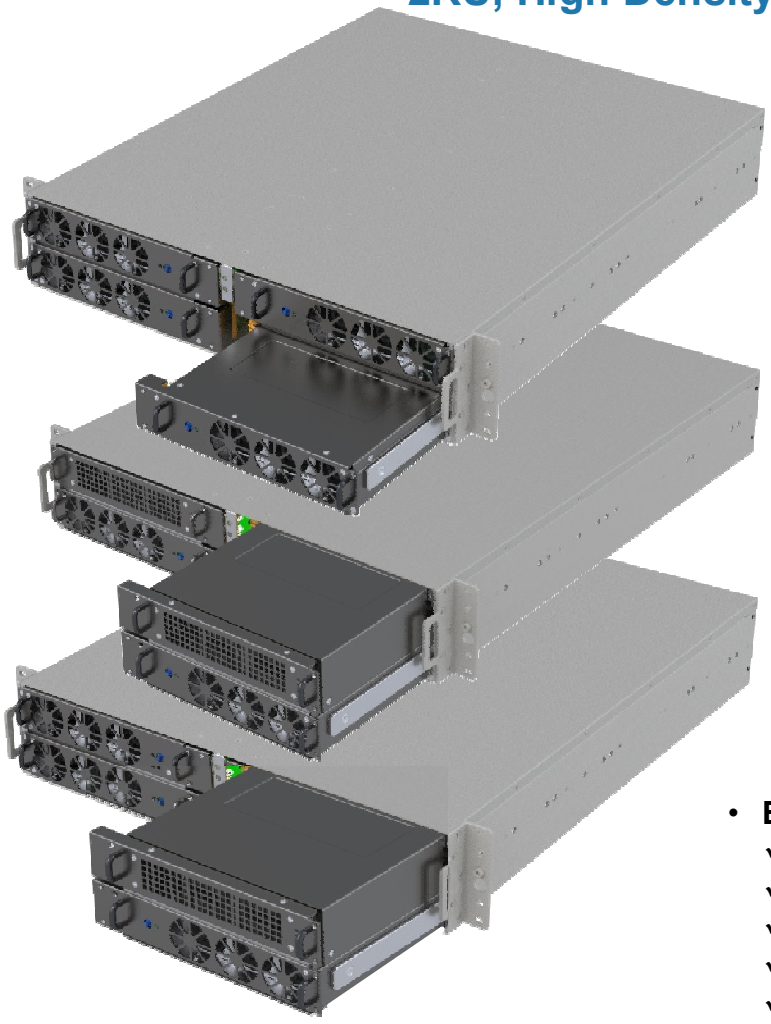
2RU, High Density, Extended Temp, Shock and Vibration



Four Independent Compute Modules:
up to 64 cores, 1024 GB DDR3 SDRAM

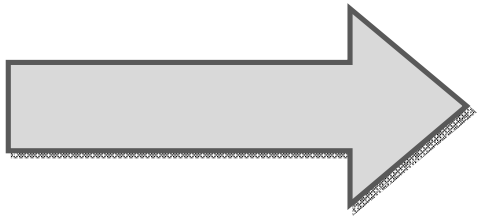
Two Independent Compute Modules and Two Removable Storage Canisters:
up to 32 cores, 512 GB DDR3 SDRAM, 32 TB (SSD or HDD)

Three Independent Compute Modules and One Removable Storage Canister:
up to 48 cores, 768 GB DDR3 SDRAM, 16 TB (SSD or HDD)

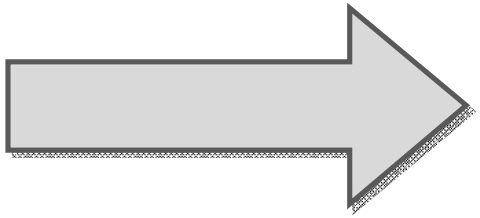
- **Each compute module contains:**
  - ✓Dual socket Intel® Xeon® processor
  - ✓Up to 256 GB DDR3 1600MHz ECC
  - ✓Expansion slots: 1 PCI-E 3.0 x16
  - ✓InfiniBand Port Options
  - ✓Dual GigE LAN
  - ✓Integrated IPMI 2.0 and KVM with Dedicated LAN
  - ✓3x USB 2.0 ports

SD vs. HD/HDS RES XR4 Servers

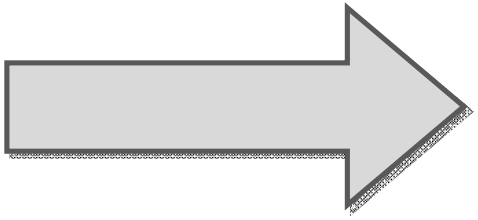
Same # sockets/cores, HD/HDS less PCIe slots



No Removable Storage



Removable Storage



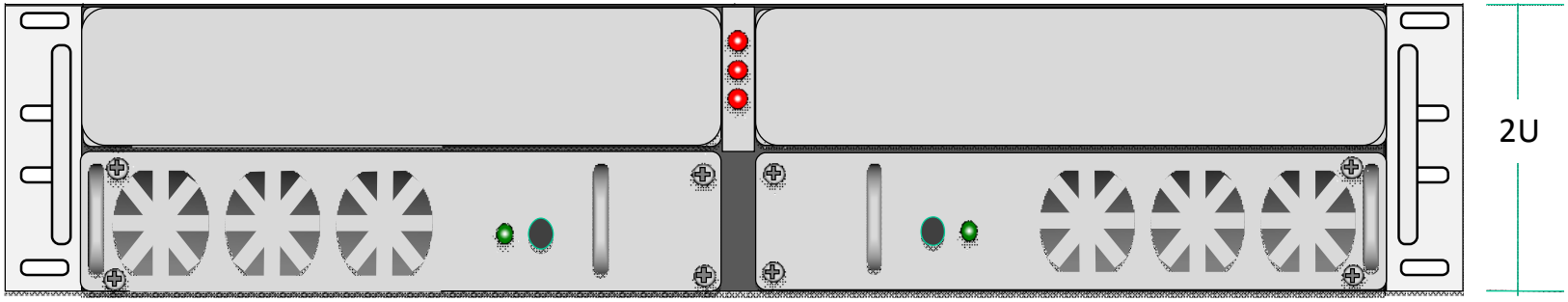
Removable Storage

4 Rack Units / 20” Deep or Less

2 Rack Units / 20” Deep
Less Weight per Server

Modular Flexibility

The Themis RES HD and HDS XR4 systems can be deployed partially populated with compute modules and / or storage canisters to tailor to specific application / deployment requirements



Field repair / upgrade is quick and easy with front loadable compute modules, storage canisters, and power supplies

Illustrative Comparison

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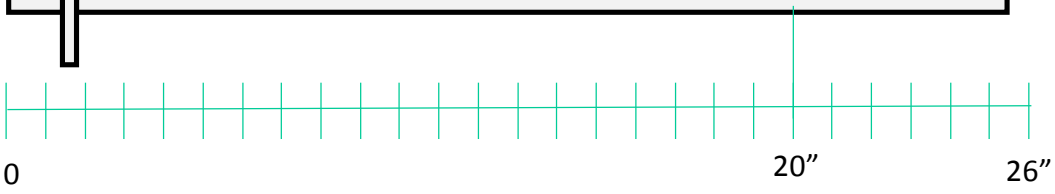
Max Humidity: 80%
Max Vibe: 0.26 Grms at 5Hz to 350Hz
Max Shock: Half sine shock in all operational orientations of 31G +/– 5% with a pulse duration of 2.6ms +/– 10%

20 kg



High Density Compute Module

Intel E5-2600 series processors
256 GB Memory
Expansion Slots: 1
Max Operating Temp: 50°C
Max Humidity: 90%
Max Vibe: 3.0 Grms, 8 Hz to 2000 Hz
Max Shock: 3 axis, 35G at 25 ms

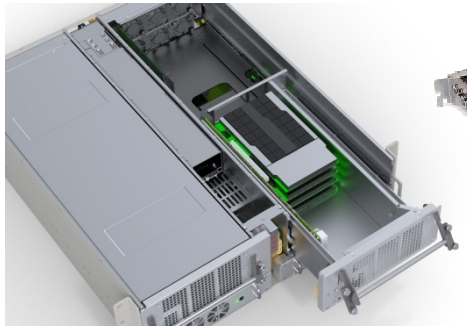
5 kg (including ¼ RES HD XR4 Chassis / Pwr Supply Weight)

Minimum SWaP/C
Enhanced Reliability

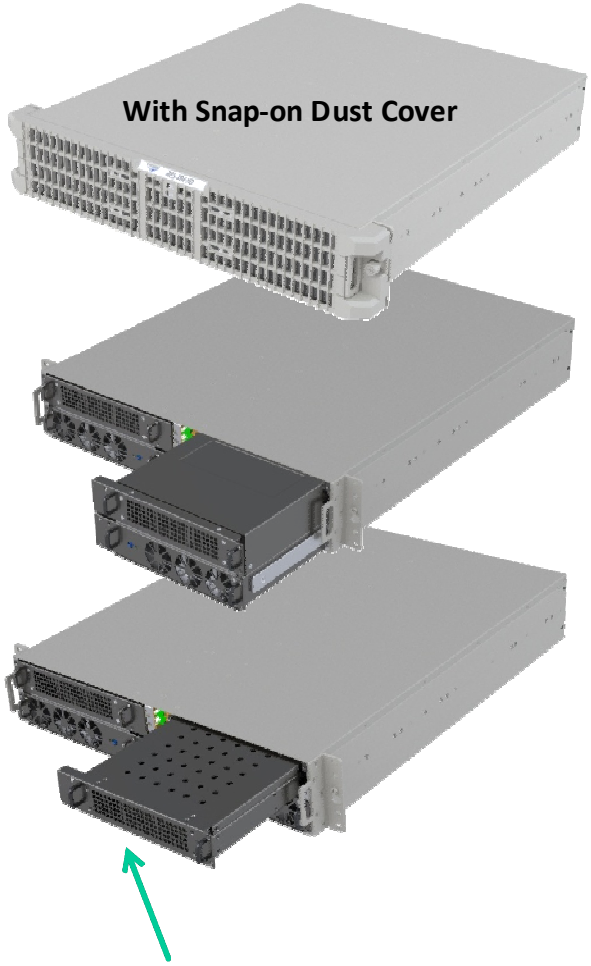
2U Themis HDS (PCIe) variant

2RU, High Density, Extended Temp, Server / PCIe Expansion System:
Up to 32 cores, up to 512 GB DDR3 SDRAM, 12.8 TB PCIe Flash Storage

- **Two 2RU compute / Storage modules, each containing**
  - **1U compute module and 1U PCIe external canister**
    - ✓ Each Canister can accommodate 4 full height, full length PCIe cards
      - ✓ 4 x 3.2 TB MLC PCIe Flash Drives (up to 12.8 TB) or
      - ✓ 2 x NVIDIA Tesla GPGPU cards or
      - ✓ 4 X NVIDIA VGX K2 Virtual Desktop Infrastructure (VDI) Cards
      - ✓ Others combination of PCIe cards



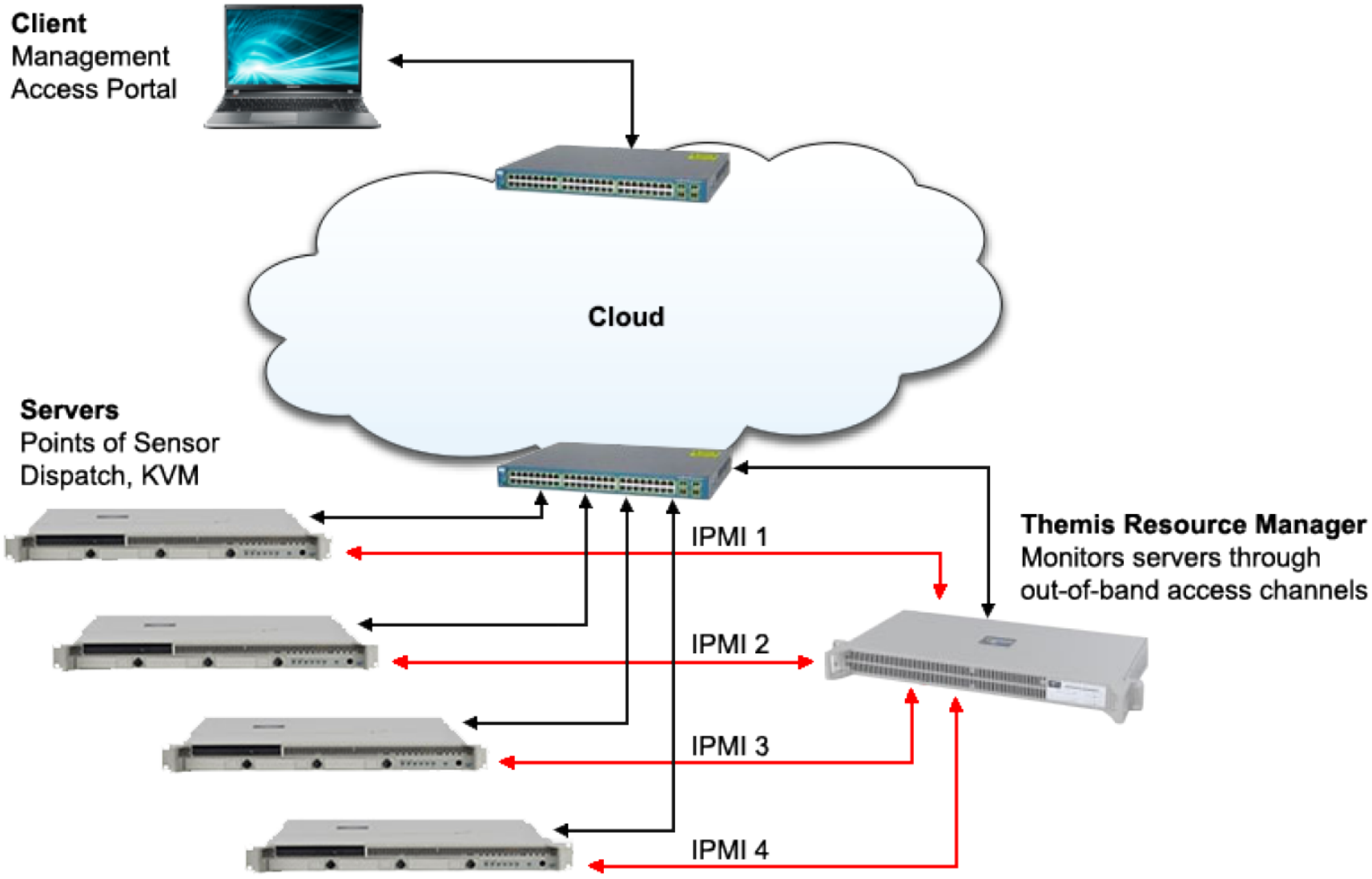
1100 Watts,
2RU High x 20" Deep
18 kg



Advantages / Disadvantages:

- PCIe Flash Storage Performance
- Consumes more power than HDD and SSD
- Removable PCIe Canister for classified data storage
- Higher cost for PCIe storage than HDD and SSD
- **1 x Cloud Node per 1 Rack Unit**

Resource Manager Appliance



A220 and RES-XR4 Network Storage Appliances

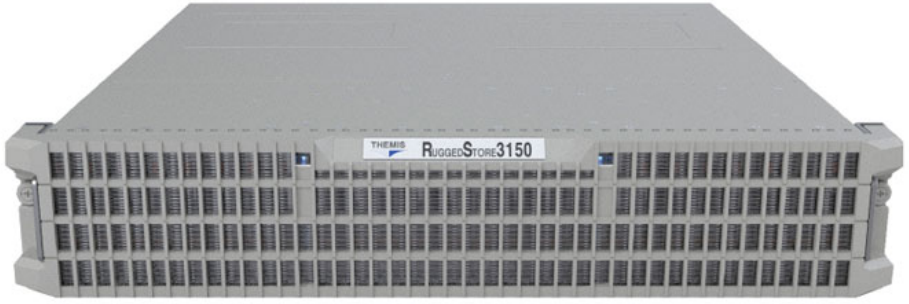
- **NAS+SAN support all in one integrated 2U solution**
- **Up to 20 removable 2.5” 1TB drives or Up to 5 removable 3.5” 4TB drives**
- **Flexible network options (10 gigE, Fibre, IB, etc)**
- **Based on Themis RES mechanics**

RuggedStore 3150 Network Storage Appliance

THEMIS

EMC²
where information lives®

- Dual redundant architecture, based on the EMC VNX-3150
- Support of CIFS, NFS, iSCSI protocols
- Bundled with EMC Unisphere for VNXe
- 2U, up to (25) 900-GB SAS drives or 200-GB SSD
- Optional 10 gigE links
- Up to (7) 2U extensions with 12 drives each

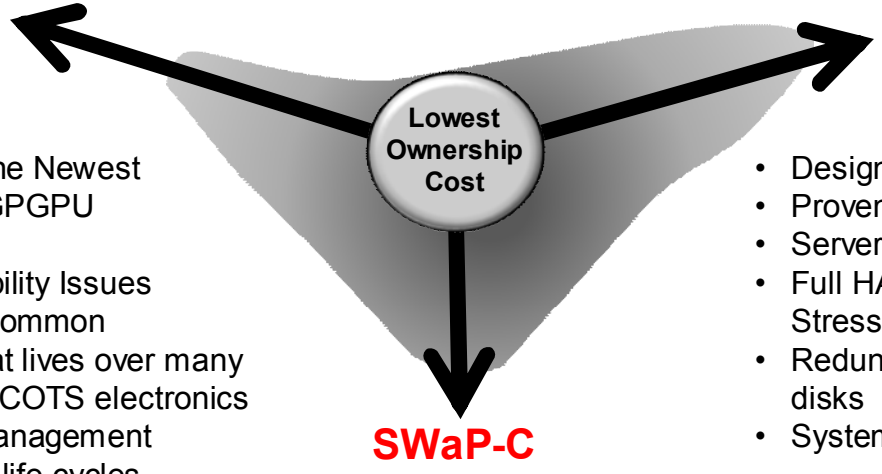


Themis Rack-Mounted Products

Benefits

Standard COTS

- Immediate Access to the Newest Generation CPU and GPGPU Technology
- No driver/OS Compatibility Issues
- Common form factor, common environmental spec that lives over many generations of internal COTS electronics
- Improved Life Cycle Management anticipates component life cycles



Enhanced Reliability (Ruggedization)

- Designed for demanding environments
- Proven in demanding environments
- Server Technology vs. Desktop
- Full HASS (Highly Accelerated Stress Screen)
- Redundant/hot-swappable power, fans, disks
- System management software

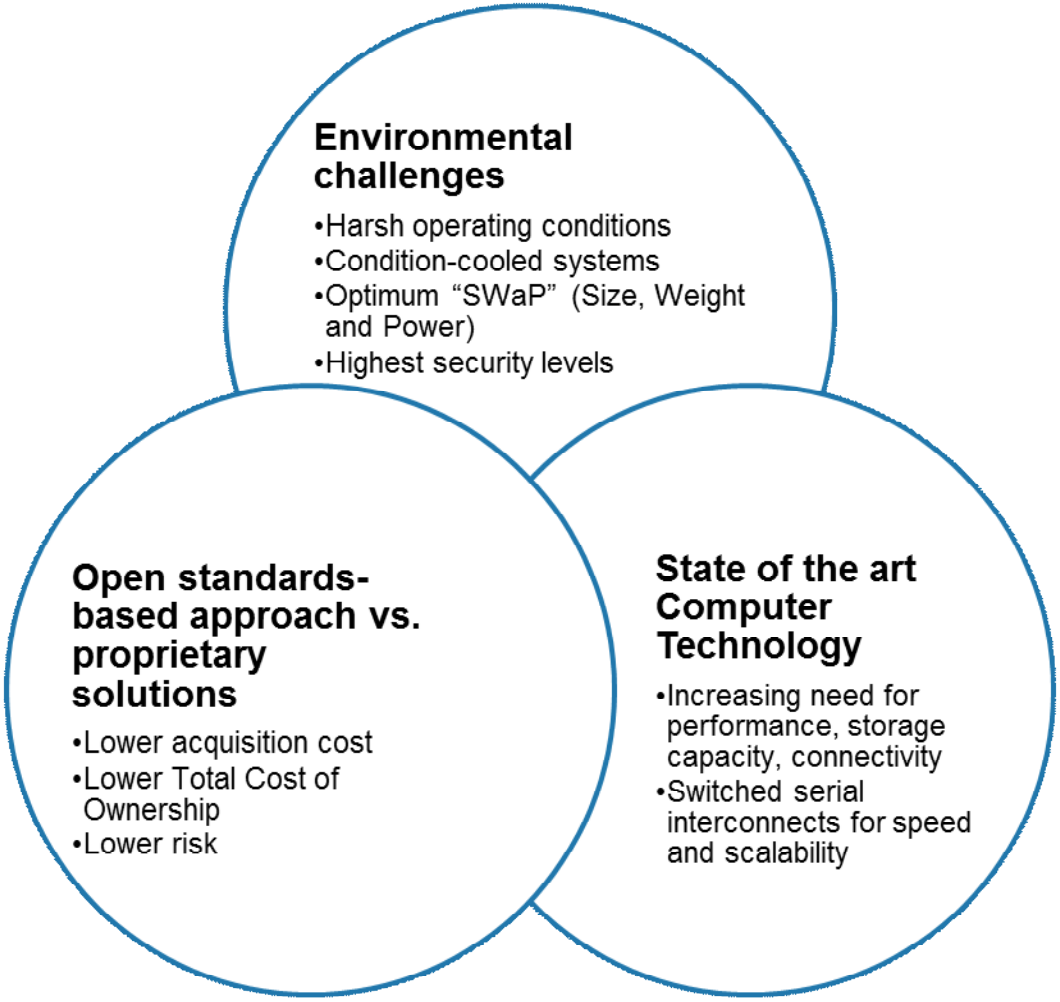
SWaP-C

- Light, Compact systems (typical: 25%-30% Shallower and Half the Weight)
- Industry-leading computing density
- MIL technology at Affordable Price
- Reduced Risk of Failure and Cost of Failure

Tactical Systems and VITA-74

a Standard for Small Form Factor, Conduction-Cooled Systems

The Story Behind VITA-74



VITA-74 Traditional Markets

- **Traditional Military Markets**
  - Manned Ground Vehicles
  - Unmanned Vehicles
  - Robotics
  - Man-wearable Systems

- **Industrial Applications**
  - Oil and Gas Exploration
  - Industrial Training
  - Video Surveillance
  - Security Systems

The VITA Organization

- VITA is a non-profit organization of manufacturers and users of embedded, real-time computer systems
- VSO (VITA Standards Organization) defines open standard that will be submitted to ANSI and IEC
- Main VITA Standards:

- Themis is in charge of the VITA-74 workgroup

The VITA-74 standard

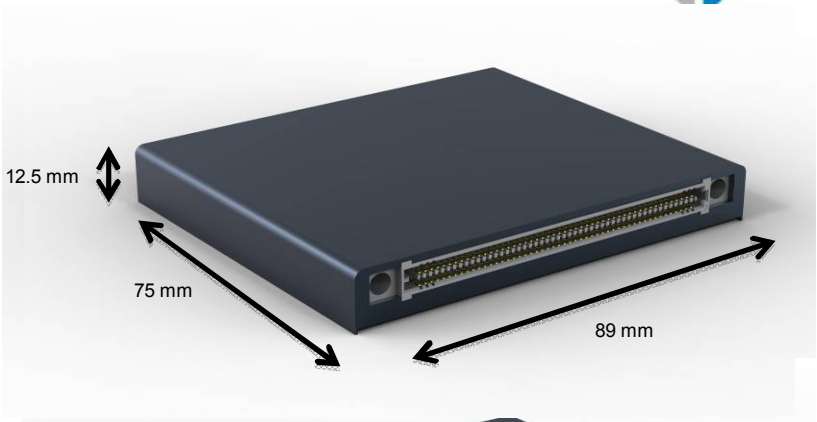
- **A Standard which draws upon existing standards**
  - PCI Express
  - Existing VITA Standards for VPX, OpenVPX and FMC
  - Reduced risk and schedule

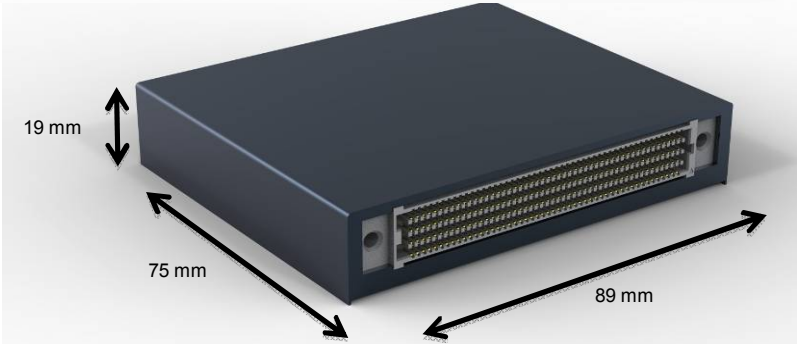
- **Prices less than ½ that of traditional rugged, conduction cooled, systems**

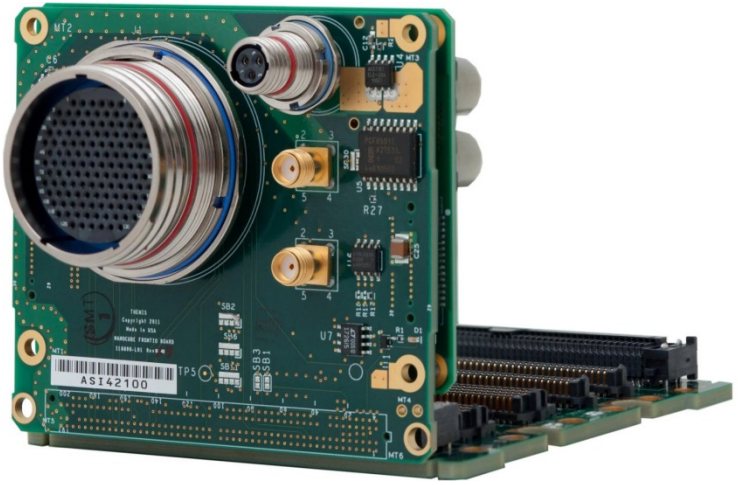
- **“Nano Computer” reference systems**
  - NanoATR – System of Multiple Computers and a wide variety of I/O
  - NanoPAK – Stand Alone Computer
  - NanoSWITCH – Small Form Factor Switch, Firewall, and Timing

VITA-74 Definitions

- **12.5 mm Module**
  - Basecard only
  - 4 Row Connector (200 pins)
- **19 mm Module**
  - Basecard plus Mezzanine Card
  - 8 Row Connector (400 pins)
- **Reference Backplane**
  - Backplane has exact same signaling as 3U VPX
  - Mix of 12.5 mm and 19 mm slots depends on application
  - Locating pins
- **Reference I/O Transition Panel**
  - Plugs perpendicularly into backplane







NanoATR-4 and NanoATR-5 Reference Systems

- **4 or 5 VITA-74 slots:**
  - 2x 19mm Modules
  - 2x or 3x 12.5mm Modules
- **1x Rear Flash Storage Module, fixed or removable**
- **Typical Slot Utilization**
  - SBC#1
  - SBC#2 or Video Frame Grabber
  - IMU / SAASM / GPS
  - MIL-STD-1553
  - Discrete I/O
- **Circular MIL & SMA RF Connectors**

Specifications - NanoATR systems

- **System Power**
  - Power Input:18-36 VDC
  - Typical Power:25 Watts
  - Max Power:50 Watts/70 Watts
- **Environmental Specifications**
  - Electrical PowerMIL-STD-704, MIL-STD-1275 (NanoATR-5)
  - EnvironmentalMIL-STD-810G
  - EMIMIL-STD-461F (NanoATR-5)
  - Operating Temp:up to -40 to +71°C
  - Storage Temp:-55 to +85°C
- **Physical**
  - NanoATR-4: 124mm (W) X 104mm (H) X 111mm (D)
  - NanoATR-5: 124mm (W) X 129mm (H) X 136mm (D)
  - 2.0 Kg (Typical System)

VITA-74 Modules

- **SBC options:**
  - Intel Atom N455 (low power, single core)
  - AMD Fusion G-Series (dual core, 80-core GPU)
  - Intel i7 gen 3 (high performance, dual core)
- **GPS Module**
- **2-Channel MIL-STD-1553 Module (2x Pri + 2x Sec)**
- **Quad SATA Flash Storage Module (up to 2TB)**
- **Inertial Measurement Unit + GPS and Optional SAASM**
- **4-Channel Frame Grabber, 2x CAN Bus, 1x Ethernet, 16x GPIO**
- **Dual Mini-PCIe Carrier**

  ADC/DAC, ARINC 429, MIL-STD-1553, Serial, GigE, FPGA, etc

NanoPAK Standalone Rugged Computer
"Laptop in a Box"

- **Processor Options**
  - Intel Atom N455 (low power, single core)
  - AMD Fusion G-Series (dual core, 80-core GPU)
  - Intel i7 gen 3 (high performance, dual core)
- **Up to 8 GB RAM, 256 GB Flash drive**
- **Standard devices**

GigE VGA SATA HDMI
Serial USB 2.0, 3.0
Audio I2C

- **Cooling Options**
  - Baseplate Cooled with Optional Fin Kit
  - Forced Air Conduction Cooled (i7 Only)
- **Micro-DSUB 69- or 100- Pin Connector**
- **9-30V DC power, Operates up to -40/71°C**

Atom or AMD-based NanoPAK
21 x 89 x 96 mm (HxWxD)

I7-based NanoPAK
38 x 94 x 162 mm (HxWxD)

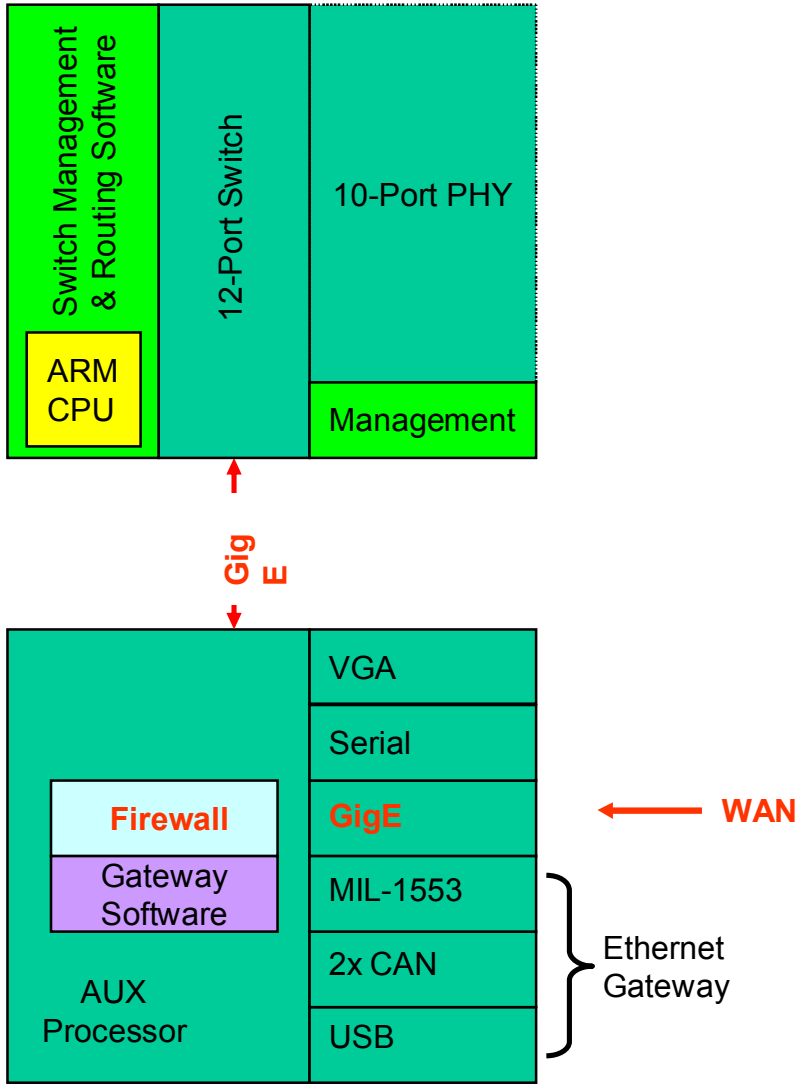
NanoSWITCH - Smart Rugged Switch

- **Ten 10/100/1000 BaseT Ports**
- **L2 Managed Switching, L3 Routing, In & Out of Band Management**
- **Auxiliary Processor (Intel Atom or AMD Fusion)**
- **Ethernet Gateway to CAN Bus, MIL-STD-1553 and other busses**
- **Software Firewall Ready**
- **10-36V DC Power Input**
- **Optional GPS and Inertial Measurement Unit**
- **Same Pin Assignments as DEF STAN 23-09**
- **Conduction Cooled, Water resistant**
- **MIL-STD-1275, MIL-STD-704, MIL-STD-461, VICTORY compliant**

Base NanoSWITCH
36 x 160 x 250 mm (HxWxD)

NanoSWITCH Block Diagram

- 10 Port Managed Layer 2 Switch
- Aux Processor
- Gateway to CANbus or MIL-1553
- Software Firewall
- GigE to WAN

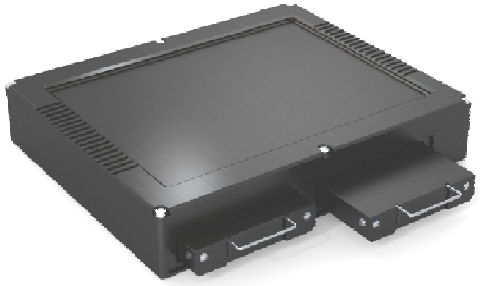


NanoSWITCH standard configurations

- **NanoSWITCH Vehicle Ethernet Switch**
  - Base 10-port multi-layer switch
- **Tactical NanoSWITCH**
  - Aux Processor
  - Global Positioning System
  - SAASM, Zeroize, Fill
  - 3x Time Of Day Distribution Serial Ports
    - 1x/10x PPS, HAVEQUICK, SINCGARS
  - Restricted export
- **NanoSWITCH Gateway**
  - Aux Processor
  - CAN Bus, MIL-1553 and other busses
  - Software firewall

Typical Nano Applications

- **VITA-74 SBC as CPU for Smart Displays**
  - CPU + Dumb Display = Smart Display
  - Easy technology refresh



- **NanoPAK as Man-Wearable Computer for Soldier**
  - Wrist or Kneeboard display and keyboard
  - Monocle display

- **NanoPAK or NanoATR as Industrial Computer**
  - Replace shoebox sized ETX applications
  - Oil & Gas, Mining and other rugged applications
  - Trucks and Fleet Vehicles

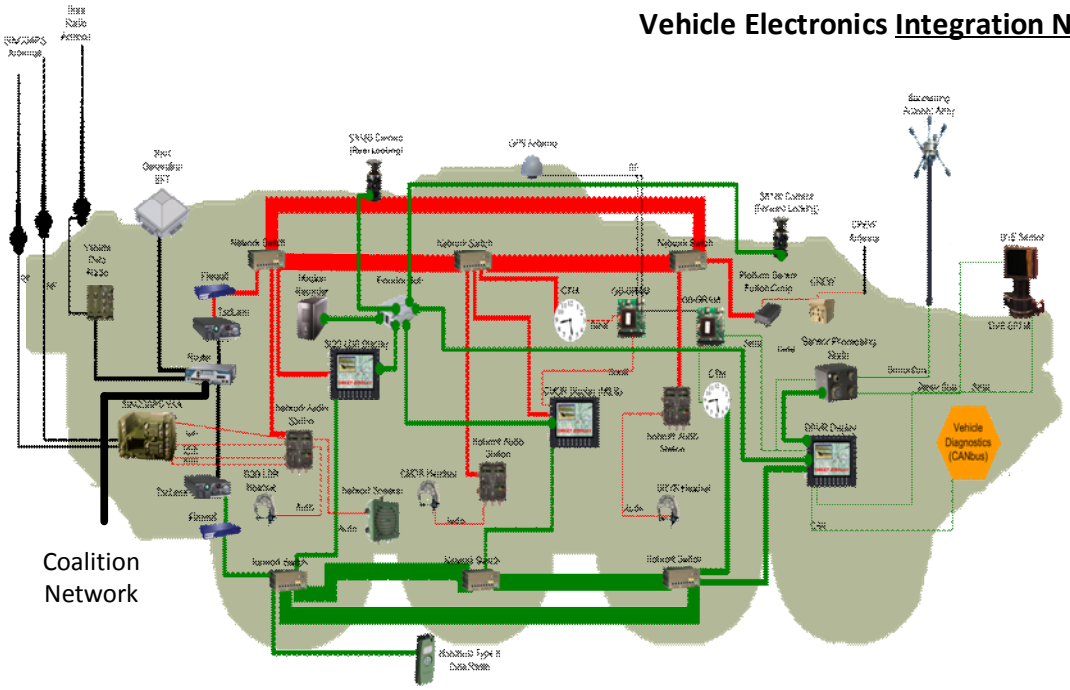
- **NanoPAK or NanoATR as UV Vehicle or Payload Control**

The Army's VICTORY Architecture

Vehicular Integration for C4ISR/EW Interoperability

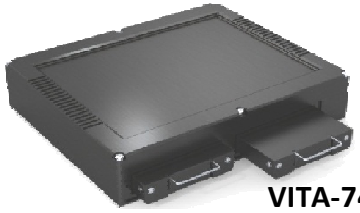
OIF/OEF JUONS Systems Bolted On to Vehicle Platforms

Vehicle Electronics Integration Nightmare

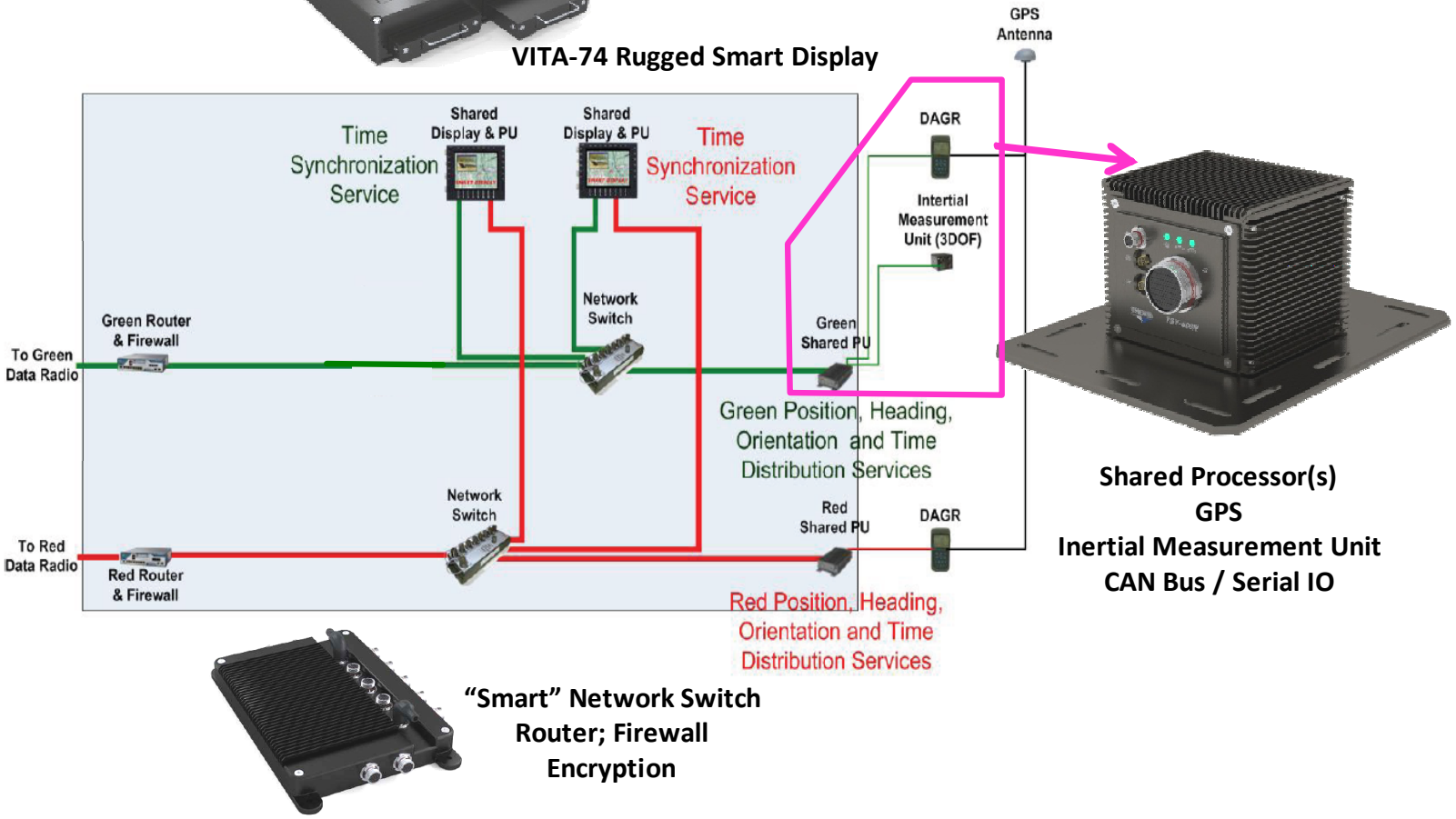


- The VICTORY Architecture Specification Document was published July 2011
- JLTV is the first vehicle program directed to comply; Ground Combat Vehicle will be next
- Eventually all US tactical vehicles, new and existing, will be required to comply, i.e., HMMWV, MRAP, FMTV, Abrams, Stryker, Bradley, etc.
- NATO is pursuing a similar initiative to establish a STANAG Standard, Themis is involved

Typical Tactical Vehicle Digital Backbone



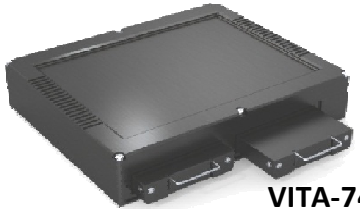
VITA-74 Rugged Smart Display



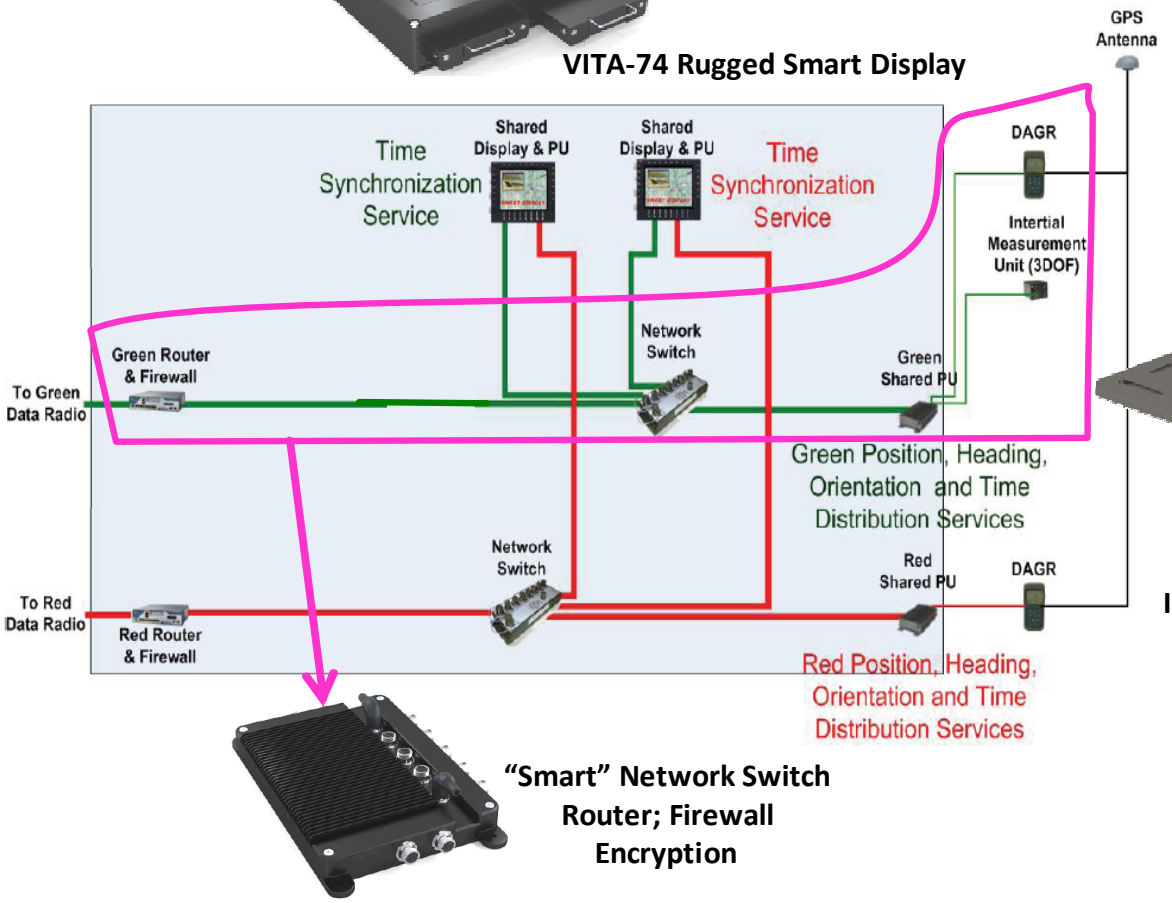
Shared Processor(s)
GPS
Inertial Measurement Unit
CAN Bus / Serial IO

"Smart" Network Switch
Router; Firewall
Encryption

Typical Tactical Vehicle Digital Backbone



VITA-74 Rugged Smart Display



Shared Processor(s)
GPS
Inertial Measurement Unit
CAN Bus / Serial IO

"Smart" Network Switch
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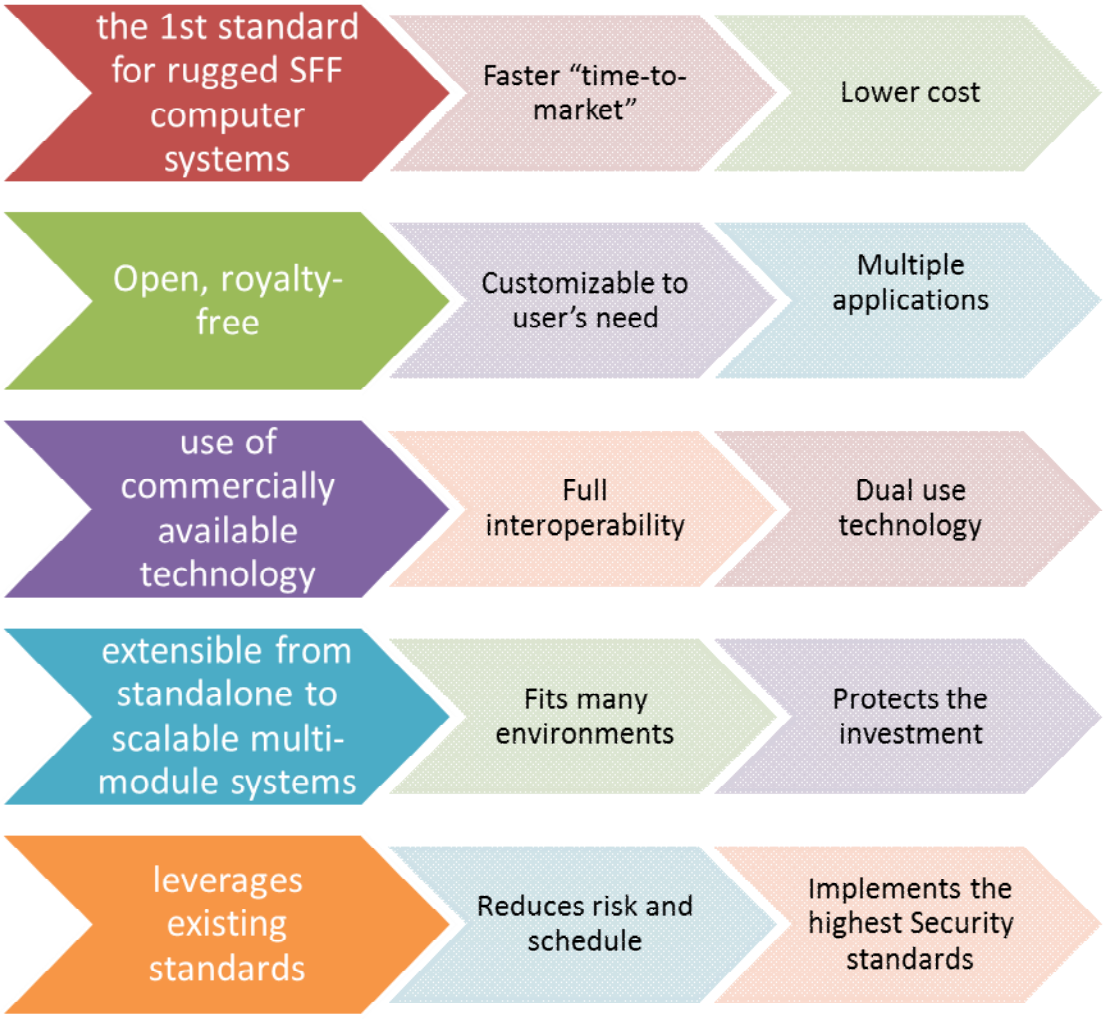
VITA-74 Summary and benefits



Thank You!

For more information:

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