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mercury systems™



Compose Your Solution

RES High Density (HD) Product Guide

Themis RES-HD and HDslim Configurations

20″ (50-53cm) depth

EnterpriseSeries™

2X Compute Density

6 Module Types

½ the Rack Space

100% Scalable & Flexible

RES HD servers double the compute density by taking half the rack space and reducing total system weight by 50% when compared to standard density systems.

Reduced Total Cost of Ownership

compared to standard commercial hardware

Themis RES

2X the capability within Gross Vehicle Weight Limit

Themis RES-HD

4X the capability within Gross Vehicle Weight Limit

In a 250 unit fielding plan:

DoD saves

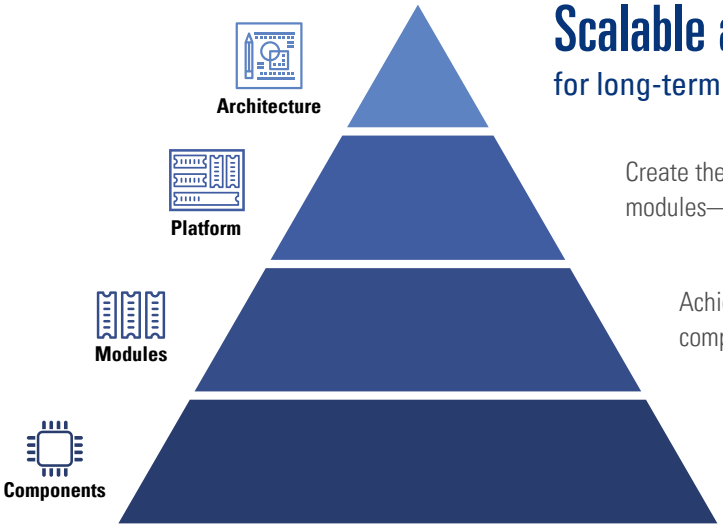
1000

2000

more cost avoidance than the cost of all the hardware

Scalable and Extensible

for long-term sustainability



Create the perfect platform with precise functionality by mixing and matching modules—achieving new types of functionality with each configured combination.

Achieve optimum performance with over six configurable "plug and pull" compute, storage, networking, PCIe expansion, and management modules.

Integrate the latest commercial technology including Intel® Xeon® Scalable processors and NVIDIA® TESLA™ and GRID™ cards.



RES HD Servers

A part of Mercury's EnterpriseSeries™ suite of powerful processing solutions, RES HD servers are designed for mission critical applications that require high-compute density and low latency access to large-data storage.

Dedicated to providing reliable computing platforms that maximize performance for military, aerospace, energy, and rugged commercial use; RES HD server modules integrate the latest key components while providing superior resilience to shock, vibration, and temperature extremes.

COTS Technology
Quick and affordable adoption of leading commercial technologies to deliver cutting-edge performance.

Enhanced Reliability
Proven performance, uptime, and availability in the most stringent environments.

Size, Weight and Power (SWaP)
Modular packaging designed to meet systems engineering constraints.

Composability
Built in composability to give you what you want in a more cost effective purchase.

Security
Security that can be integrated as the threat dictates with "built in" not "bolted on" secure solutions.

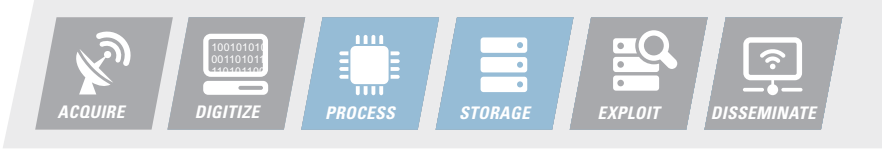
Lifecycle Obsolescence Management
After sale support for obsolescence management at product EOL for current and future deployments.

Interoperability
Seamless integration of popular applications and software across multiple platforms.

Simplified Logistics and Upgrades
Modules and backward compatible chassis that cut costs associated with logistics and upgrades.

Extensive Customer Market Experience
Over three decades of experience delivering reliable solutions best suited to customer needs.

Quick Turnaround
Dedicated technical support and faster or equal lead times comparable to other well-known competitors.



Configuration Versatility

in five composable form factors

Choose between five chassis to create the perfect solution for your application. Each RES HD chassis has a typical 15-year lifespan and accommodates current, previous, and future generation RES HD modules—eliminating the need to rip and replace during technology upgrades and streamlining deployment. With per module weights as low as 5lbs (2.27kg), RES HD simplifies logistics, cuts costs associated with spares, and enables modules to be repurposed across different applications.

Themis RES-HD Chassis

width: 17 inches (432mm), depth: 20.0 inches (508mm), weight:* 16lbs (7.26kg) for 2RU, 24.5lbs (11.1kg) for 3RU



6 BAYS — RES-HD 3U
height: 3RU or 5.25 inches (133.35mm)

4 BAYS — RES-HD 2U
height: 2RU or 3.5 inches (88.9mm)

Fits in 19" wide server racks
Both rear and front i/o chassis options

HDslim Chassis

height: 4RU or 7 inches (177.8mm), depth: 20.7 inches (526mm), weight:*18.1lbs (8.21lbs)



4 BAYS — HDSlim 4U
width: 9.9 inches (25.1cm)

Fits in commercial airline bins
Currently available in rear I/O
Accomodates HDN100 (100GbE switch) module

4 SLOT

Optimized High Density Storage

4 Intel Xeon Scalable Processors and 720TB of storage with 24 direct attached HDD/SSD drives.

Technical Specifications

Environmental*

Operating
- Temperature: 0°C to 50°C
- Extended Temperature: -15°C to 65°C
- Humidity: 8% to 95%
- Shock: 3 axis, 35g, 25ms
- Vibration (10-2000Hz): 4.76Grms, 5Hz to 2000 HZ (SSD)

Non-Operating (if different)
- Temperature: -40°C to 70°C
- Humidity: 5% to 95%

Power Supply Options

Single or Redundant 100/240V VAC (1200W, 50/60Hz, 400Hz)
Single or Redundant 10-36 VDC, 32 Amps
Single or Redundant 36-72 VDC, 18 Amps

Reliability

Safety: EN60950
RFI/EMI: EN 55032, EN 55024, EN 61000
MIL-STD 810G

Additional Options

Shock Pins
Front Door Filter
Slide Rails

*Weight includes chassis and power supplies

Modular Scalability

with over six "plug and pull" modules

The newest generation XR6 RES HD modules integrate the latest Intel Xeon Scalable processors to deliver superior workload-optimized performance and hardware-enhanced security in a smaller footprint. Each module is designed for a special purpose—compute, storage, networking, expansion, or management—and can be plugged into the chassis in any combination. Current modules include:

- Compute (HDC): dual-socket processor module
- Storage (HDS): dual-socket processor module with 4 (HDS4) or 8 (HDS8) storage drives
- Storage Expansion (HDSE): storage expansion module (currently available in rear I/O chassis configurations)
- PCIe Expansion (HDP): dual-socket processor module with multiple PCIe options
- Networking (HDN) switches: 1Gbps (HDN1), 40Gbps, 56Gbps IB (HDN40, HDN56) and 100Gbps (HDN100) managed switches
- Resource Manager (HDRM): resource management module
- Fabric Extender (HDFE): HD Global Fabric Extender

Designed for mission critical applications outside the data center, all modules meet or exceed military specifications—incorporating advanced thermal and mechanical design features to provide enhanced reliability with superior resiliency to shock, vibration, and temperature extremes.

MaxDX

Taking distance out of data

Achieve predictable, distance-independent performance with the HDFE module and MaxDX™ software. Access or transfer large amounts of data up to 75x faster than TCP/IP at 10G/30,000km.

NVIDIA PREFERRED PARTNER

Supercomputing and virtualization

Accelerate virtual desktops and achieve higher throughput for compute intensive workloads with the latest NVIDIA Quadro or Tesla graphics card. Each configured HDP module can integrate one GPGPU.

XR6 Module Specifications

Common Specifications for HDC, HDP, HDS4, and HDS8

HDC COMPUTE | **HDP** EXPANSION | **HDS4** STORAGE | **HDS8** STORAGE

Management and Operating System

Windows®, Linux®, VMWARE® and other hypervisors

IPMI v2.0, Redfish option available

Parameter	Qty	Description
processor	2	Intel® Xeon® Scalable with 22 cores, 44 threads**
memory		up to 1TB DDR4 ECC 2666MHz, 16 DIMM
disk on module	2	up to 128GB per DOM

Input/Output	Qty	Access
USB 3.0 ports	2	front
VGA port	1	front
ethernet ports (RJ45)	4	front (multiple ethernet options)
serial port	1	front (optional)

Multiple Ethernet Options

1 Port: 100Gbps (QSFP28)

2 Ports: (2)1GBaseT
(2) 25Gbps SFP28
(2) 10GBaseT
(1) 1GBaseT + (1) 100Gbps (QSFP28)

3 Ports: (2) 1GBaseT + (1) 56Gbps (QSFP)

4 Ports: (4) 1GBaseT
(4) 10GBaseT
(4) 10G Eth / SFP+
(2) 1GBaseT + (2) SFP28 (25/10Gbps)
(2) 1GBaseT + (2) 56Gbps (QSFP)

All XR6 Module Specifications

Height: 1.6" (41mm, 1 slot) or height: 3.35" (85mm, 2 slot)

Width: 7 inches (177mm)

Depth: 20.3 inches (515mm)

Weight: see individual module specifications

**Typical customer specifications. Specifications are configuration dependent. up to 20 cores per processor for 0-50C thermal profiles.

XR6 Module Specifications

High Density Compute (HDC)



Weight***: 10.5lbs (4.76kg)
Expansion: up to 2 PCiE 3.0x16
low profile, half length cards

High Density Storage (HDS4)



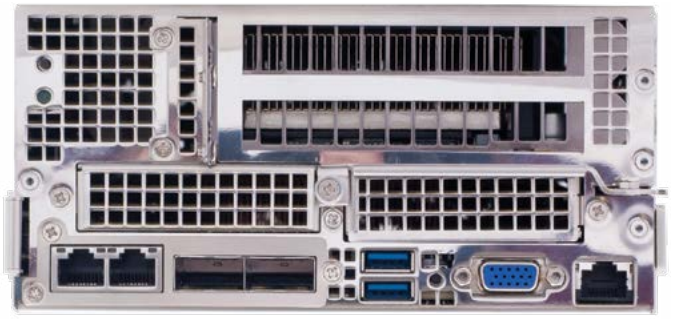
Weight***: 15lbs (6.80kg) with drives
Storage: 4 front-access SATA, SAS3 or U.2 storage drives
for up to 120TB of storage
Expansion: low/high profile, half length cards
Front I/O Expansion: up to 2 PCiE 3.0x16 + 1 PCie 3.0x8
Rear I/O Expansion: 2 PCiE 3.0x16 + 1 PCie 3.0x8 or
1 PCiE 3.0x16 + 3 PCie 3.0x8

High Density Storage (HDS8)



Weight***: 18lbs (8.16kg) with drives
Storage: 8 SATA or SAS3 drives
for up to 240TB of storage
Expansion: low profile, half length cards
Front I/O Expansion: up to 2 PCiE 3.0x16
Rear I/O Expansion: up to 1 PCiE 3.0x16 + 2 PCie 3.0x8

High Density PCiE Expansion (HDP)



Weight***: 12.5lbs (5.67kg), 15lbs (6.80kg) with TESLA card
Expansion: up to 5 PCiE Cards

1. 1 double wide PCiE 3.0x16 (eg. TESLA GPGPU)
   2 PCIe 3.0x16, low profile, half length cards
2. 1 PCIe 3.0 x 8, 1 PCIe 3.0
   low profile, half length cards
3. 2 PCIe 3.0x16 low profile, half length cards and
   2 PCIe 3.0x8 full height, full length cards

High Density Global Fabric Extender (HDFE)

Weight***: 5lbs (2.27kg)
Software: Bay Microsystem's MaxDX™
Processor: 2 Intel Xeon E5-2600 v3/v4 series with 20 cores
Switching: 120Gbps non-blocking switch capacity
Interface: Two 4X FDR InfiniBand QSFP+ ports;
Two 40GE QSFP+ ports; Six 1/10GE SFP+ ports
Fabric Reach: Round Trip Time (RTT) of 2500ms @10Gbps,
625ms @ 40G

High Density Storage Expansion (HDSE)



Weight*: 8lbs (3.63kg) with drives
Requirements: special rear I/O configurations
Storage: 8 SATA or SAS3 drives
for up to 240TB of storage

***Typical customer specifications. Actual weights are configuration dependent.

High Density Management (HDRM)



Weight:	5lbs (2.27kg)
Processor:	Intel i5-5300U vPro Processor
Management:	IPMI 21.0, Zabbix, Web Based Interface
Managed IPMI ports:	16 1GbE (RJ45)
Management ports:	1 (management console)
Other Ports:	1 (serial)
Compliancy:	IEEE 802.3, 802.3u, 802.3ab
	IEEE 802.3x flow control support

High Density Networking Switch (HDN)



Weight: 5lbs (2.27kg)

1GBe Ethernet Switch (HDN1)

Ethernet Ports (RJ45):	16 1GbE
Other Ports (RJ45):	2 (serial, ethernet management)
Network:	Layer 2/3
Routing:	IPv4/IPv6 - IP multicast, VLANs, IETF, IEEE, DSL Forum
Quality of Service:	QoS IEEE 802.1 priority tagging, DSCP, traffic queues
Management:	Ethernet (http, telnet, SNMP, and RS232 (CLI)

Functionality:

48Gbps performance switching capacity
35.71 Mpps maximum forwarding rate
8K entries MAC address table size, 3.5Mbits Packet Buffer
Forwarding mode: store and forward
Supports half/full duplex operation at 10/100Mbps
Supports port auto-negotiation

10GbE, 40GbE, 56GbE IB (HDN40, HDN56)

Switch:	Integrated Mellanox SX1012 or SX6012
Ethernet Ports:	12 56Gb IB, 40GbE, 10GbE VPI switched ports
	Support for up to 24 10GbE switched ports
Other Ports (RJ45):	2 (serial, ethernet management)
Throughput:	Non-blocking bidirectional, 1.344 Tb/s
Latency:	200ns (56Gb IB), 220ns (40GbE), 270ns (10GbE)
Network:	Layer 2/3 (10GbE, 40GbE) feature set

56Gb IB Features

CLI or SNMP Management, IBTA 1.21 and 1.3 Compliancy
9 Virtual Lanes (8 data + 1 management)
256 to 4Kbyte MTU, 4x48K entry linear forwarding data base
On-board SM for fabrics up to 648 nodes
Management ports: 100/1000 Ethernet, RS232 port over DB9, miniUSB

Mellanox FEDERAL SYSTEMS
OPEN ETHERNET

100GbE Switch (HDN100)

Switch:	Integrated Mellanox SN2010
Ethernet Ports):	18 SFP+/SFP28 10/25GbE +
	4 splittable QSFP+/QSFP28 40/100GbE ports
Other Ports (RJ45):	2 (serial, ethernet management)
Throughput:	Non-blocking bidirectional, 1.7 Tb/s
Latency:	300ns for 100GbE, consistent latency
Layer 2/3 Features:	
	10/25/40/50/56/100GbE, Multi chassis LAG (MLAG)
	802.1W rapid spanning tree, 802.1Q, multiple STP
	802.3 ad Link Aggregation (LAG) & LACP
	Jumbo frames (9216 Bytes)
	IPv4 & IPv6 route maps including BGP4, OSPFv2
	BFD (BGP, OSPF, static routes), DHCPv4/v6 Relay
	Router port, int VLAN, NULL interface for routing

Network Virtualization

VXLAN Hardware VTEP-L2 GW
Integration with VMware NSX, Openstack and more

Software Defined Storage (SDN):

Openflow 1.3 (hybrid, supported controllers)

Security:

US APL Department of Defense Certification
System secure mode: FIPS 140-2 Compliance
Access Control Lists (ACLs L2-L4 & user defined)
802.1X Port based access control
SSH server restrict mode - NIST 800-181A
CoPP (IP filter), port isolation, storm control

Mellanox FEDERAL SYSTEMS
OPEN ETHERNET

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Learn more at: **mrcy.com/HD**

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