Server System Infrastructure(SM) (SSI) Blade Specification Technical Overview

May 2010

About SSI

- Established in 1998, the Server System Infrastructure(SM) (SSI) Forum is a leading server industry group that drives the server infrastructure standards
- For ten years SSI created standards for redundant server power systems, rack-mount server chassis, power control and management, and other components and services that simplify the build of server solutions
- In recent years SSI has extended it's standardization to add blade-based server standards to address customer and ecosystem challenges.
- SSI's goal is to enable future server market growth by standardizing interfaces between components, including boards, chassis, and power supplies, and by developing common server hardware elements.

The SSI Ecosystem

Since 1999, SSI[SM] has delivered over 45 Industry specifications to enable more than 125 companies to deliver standards-based systems.

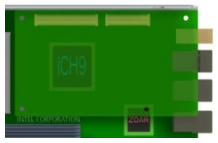
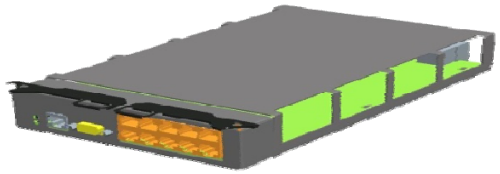
The SSI organization was extended in preparation for the next wave of server growth into HPC, Blades, Data centers, virtualized environments, and Cloud Computing.

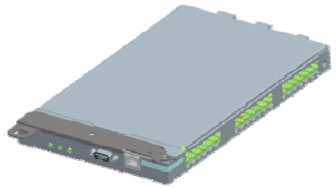
Organization enables massive opportunity for enterprise compute platform development - potential $1B or greater industry savings for the Server Market over next decade

Industry responding to SSI's market opportunity with more than 40 members engaged and more joining weekly

Modular Server Specification Philosophy of SSI(SM)

- Focus on needs of midsize market segments and channel ecosystem
- Optimize bladed platform for existing data center power/cooling infrastructures
- Strong focus on cost structure and rack motherboard design re-use
- Headroom for at least 3 generations of processor and fabric technology
- Deliver improved and simplified management & diagnostics
- Allow member innovation and differentiation

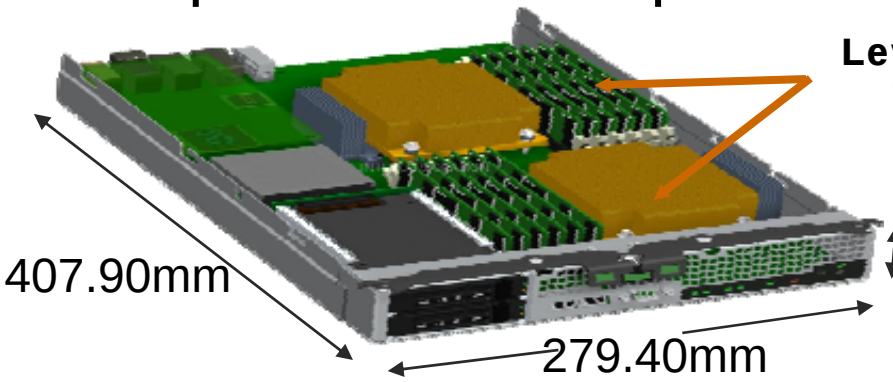





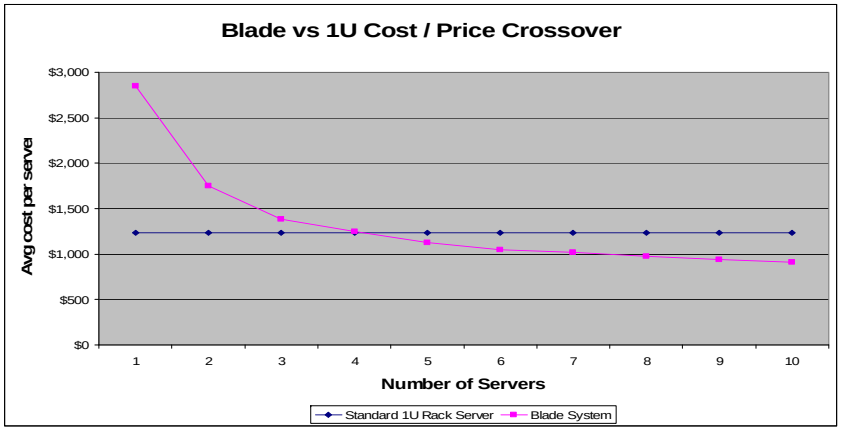
Server Specification Philosophy of SSI(SM)

Strong focus on cost structure and rack motherboard design re-use

- Compute Module Specification:



Leverage standard 1U Designs:
Thermal solutions & standard DIMMs

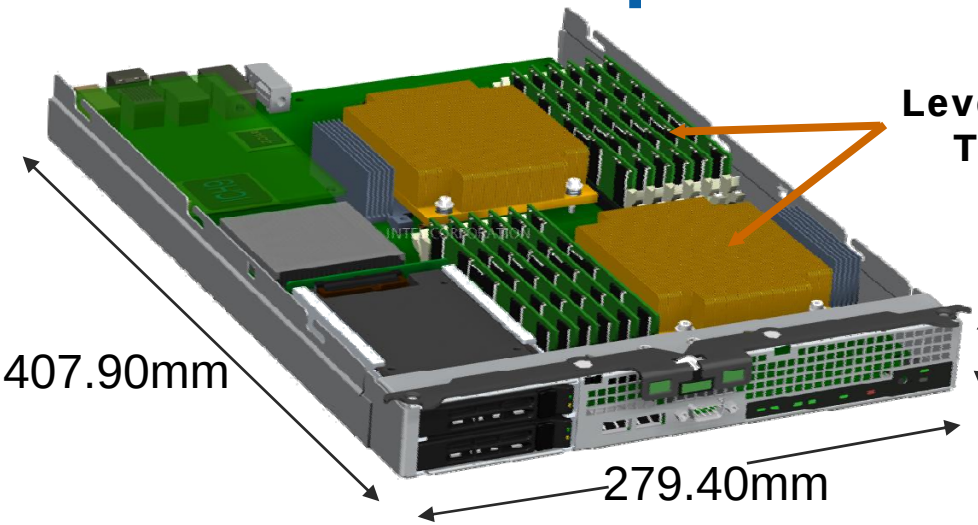


Source: Intel EPSD Finance

Volume Economics = Lower Costs

SSI SERVER SYSTEM INFRASTRUCTURE FORUM
Managing Component Interfaces

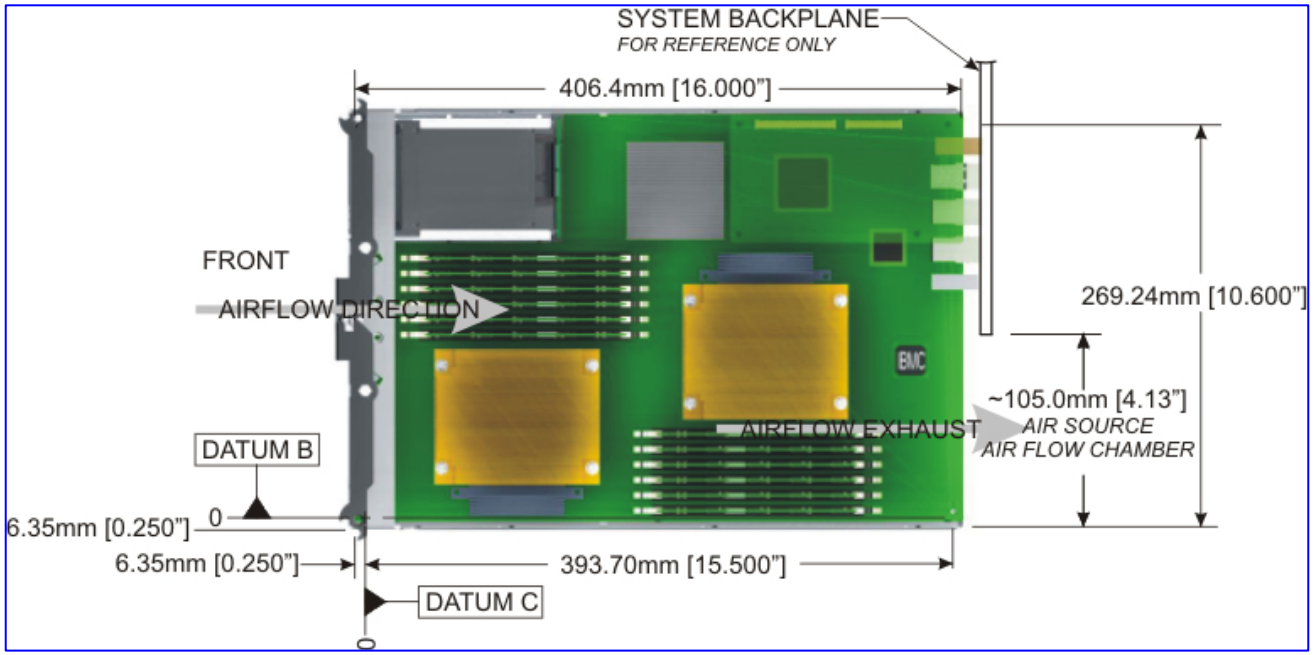
SSI(SM) Compute Module Specification

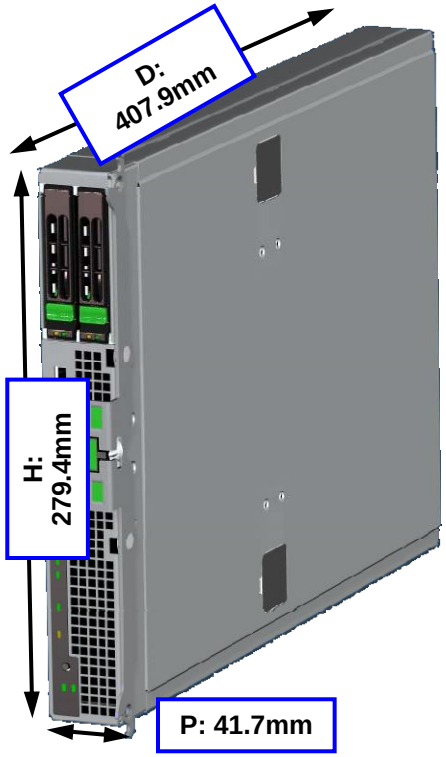


Leverage standard 1U Designs:
Thermal solutions & standard DIMMs

Maximum Power

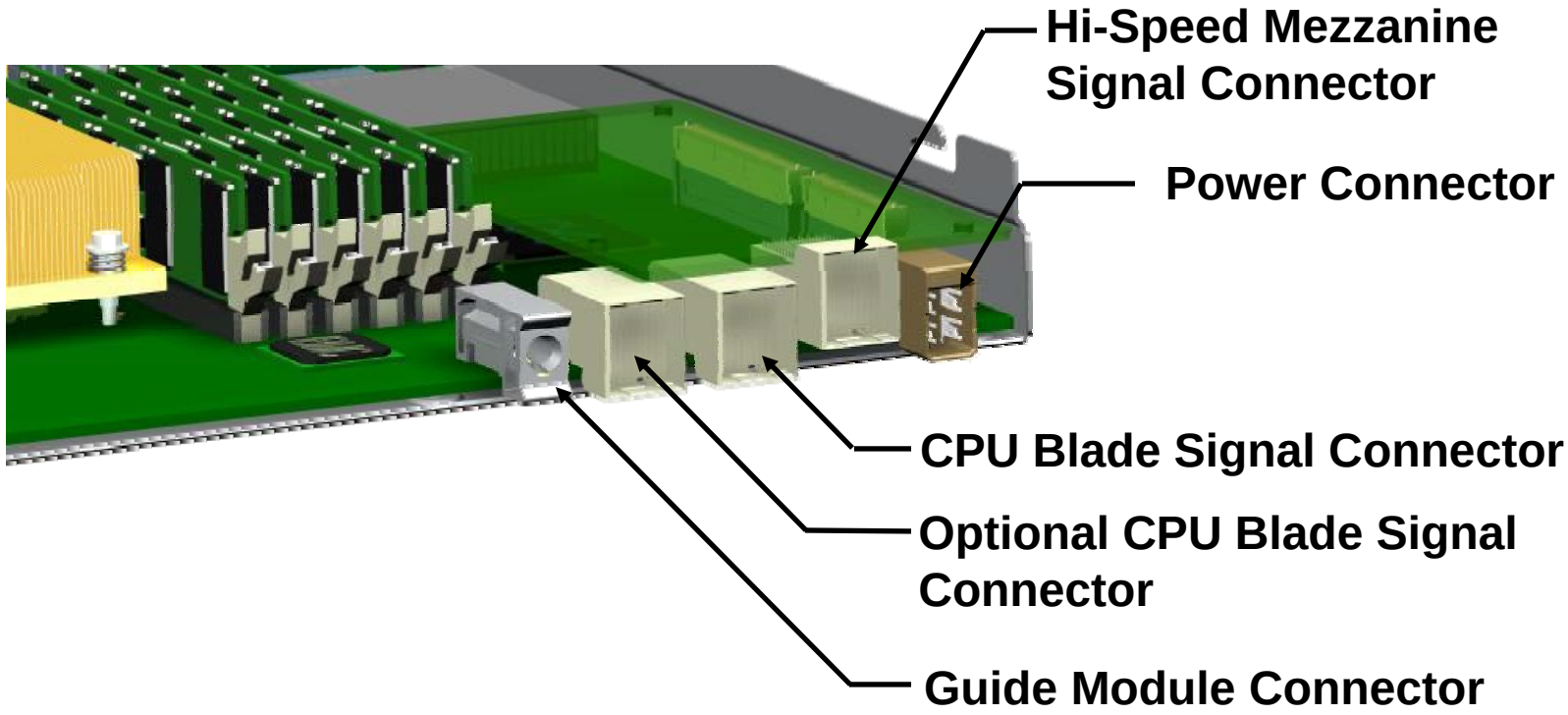
450 Watts



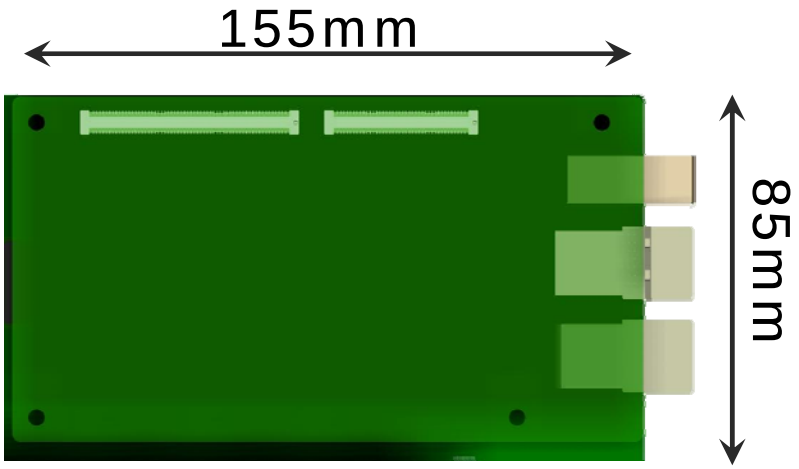


SSI
SERVER SYSTEM INFRASTRUCTURE FORUM
Managing Component Interfaces

Compute Module Connectors

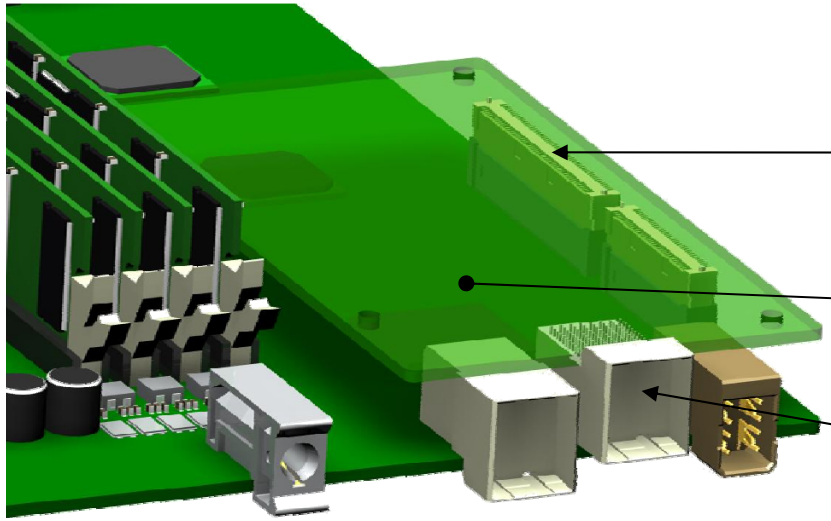


Mezzanine Card Overview



Mezzanine Board Highlights

- Total PCB Area 20.4 square inches
- Power: 25 Watts
  - 3W Standby power
- 2 x8 PCI-e links from the CPU board
- 2 x4 High Speed links to the Midplane
- 2 x1 High Speed links to the Midplane
- IPMI (SMB) based management I/F to the CPU Blade

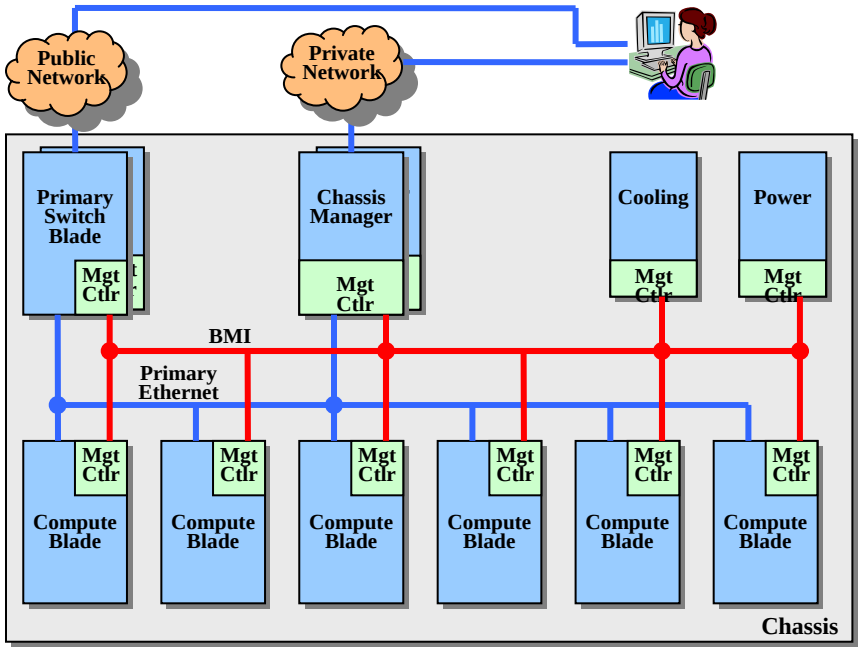


Blade to Mezzanine Board Connector

Mezzanine Board *(Transparent)*

Mezzanine Board to Midplane Connector

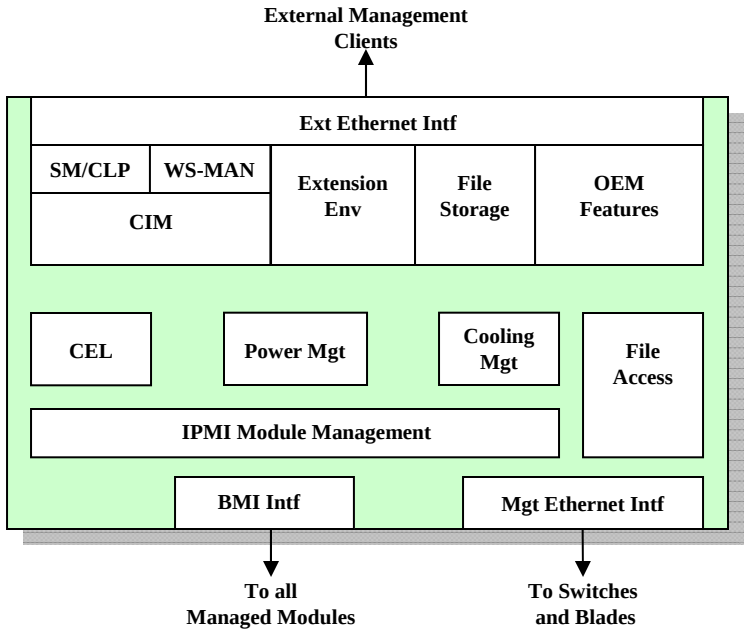
SSI(SM) Chassis Manager Architecture Overview



Inside the Box

Industry Standard Protocols:

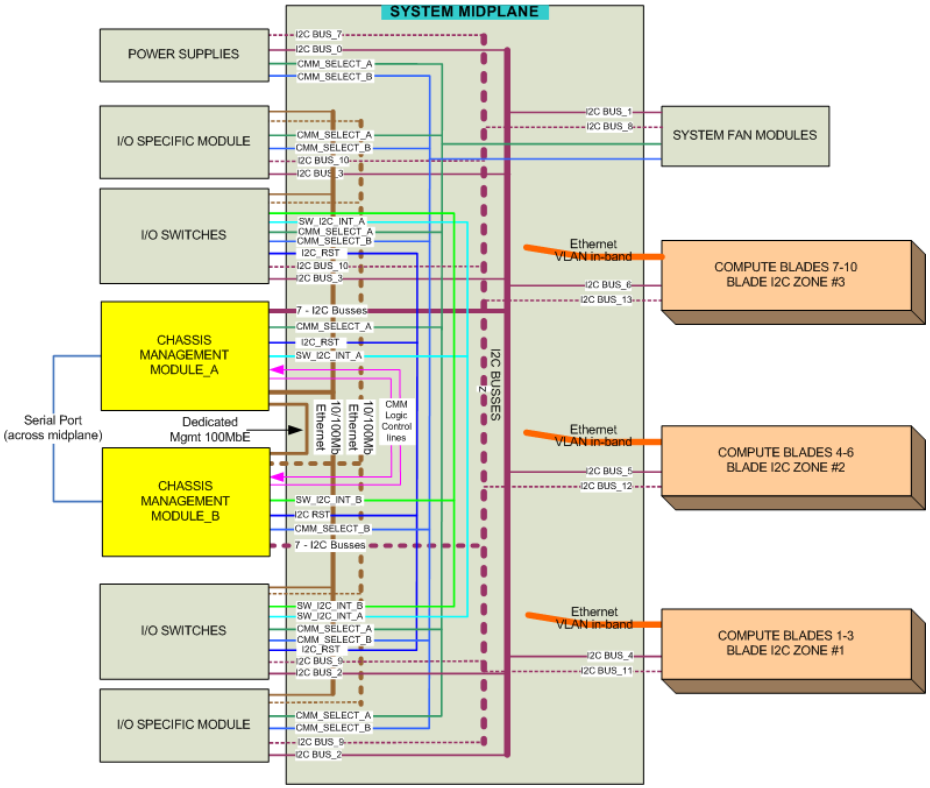
- **IPMI 2.0 for Power up, Discovery, Configuration and HW Monitoring**
- **Ethernet for "rich" functions like SOL, KVM redirection**



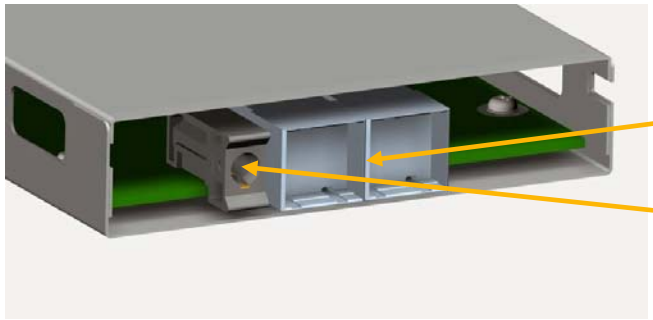
Outside the Box

- **Industry Standard Protocols**
- **Management Dashboard (SNMP2.0 MIBs), WS-MAN/CIM, SMASH Profiles**
- **OEM Extensions**

CMM Overview



- **Total PCB Area ~54 square inches**
- **Power: 50W Max**
- **Management provision for 10 Blades, 4 Switches, and 2 custom I/O Modules**
- **IPMI (SMB) based management I/F to all modules, with 10/100 Ethernet to Blades, Switches, I/O**
- **Redundant CMM Failover comprehended**



2 x 120 Pin Airmax* connectors for Signal and Power connections to the Midplane

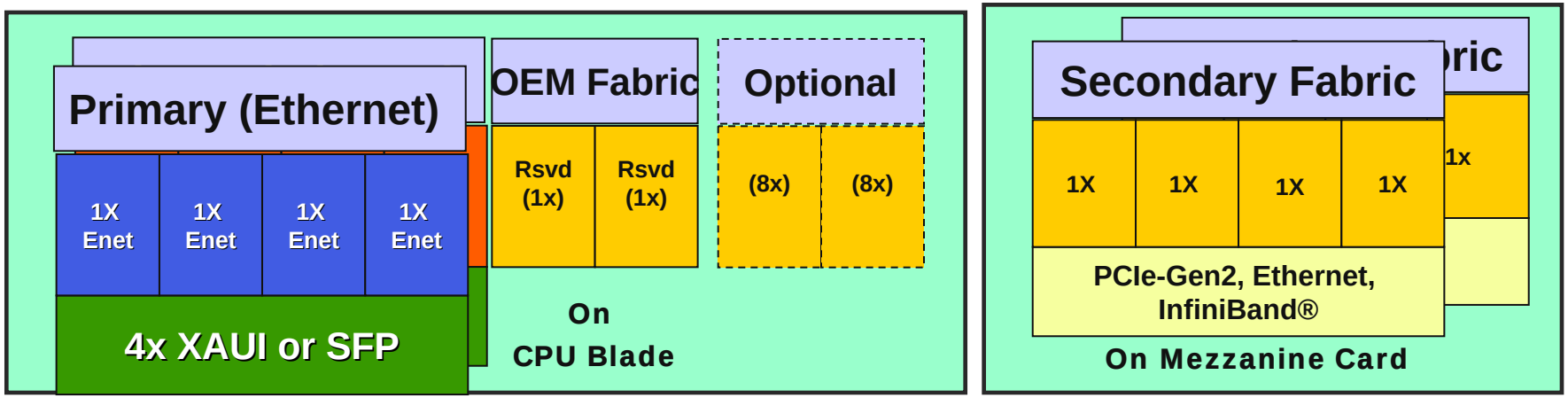
Guide Pin for CMM Module alignment with Midplane

Backplane Interconnect in Blades

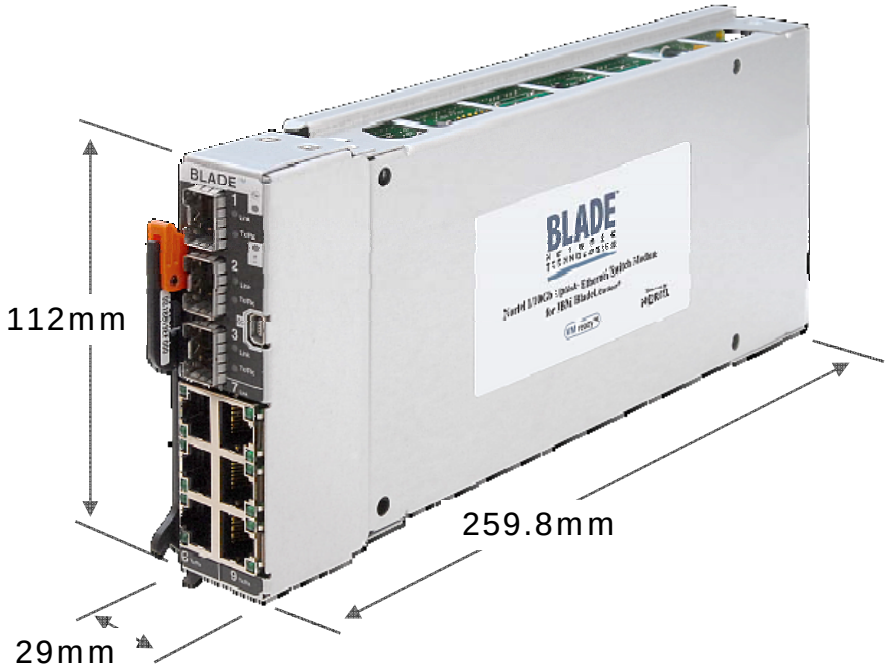
Provide Flexibility, Scalability, and Headroom for future through use of standard interfaces

Flexible Fabric Solution:

- **Primary Ethernet: Dual 4x differential Link Pairs**
  - **Support IEEE802.3ap data rates (max. 10Gbps)**
  - **Payload Bandwidths: max 80Gbps**
- **Optional Flexi Channels through Mezzanine Interconnect: Dual 4x differential Link pairs**
  - **Ethernet, PCIe*, InfiniBand***
- **Reserved and Expansion Interconnects for OEM differentiation**

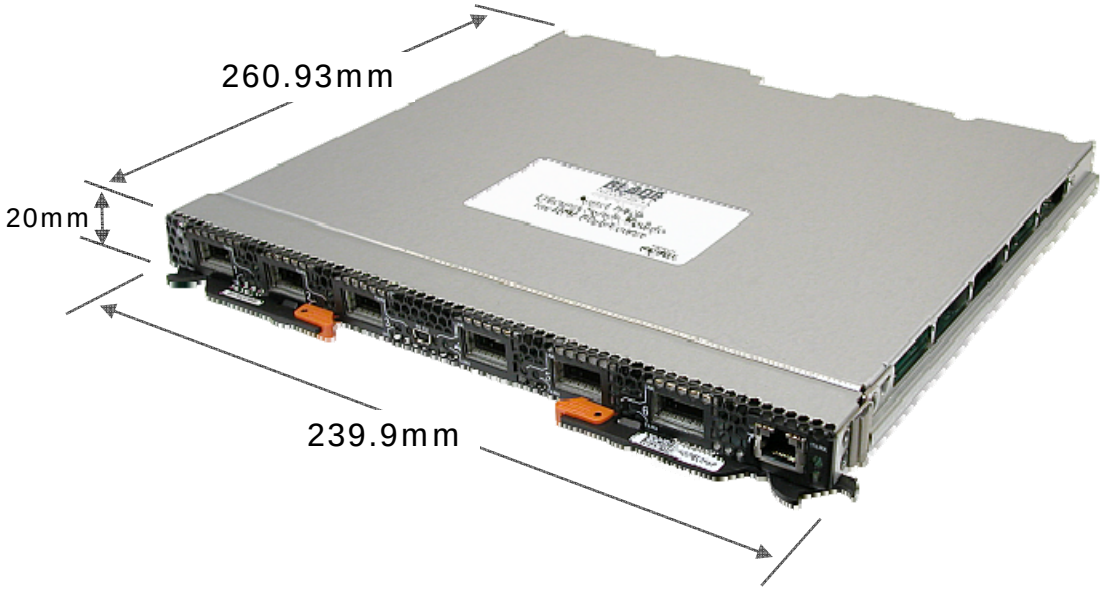


1x Switch Module Overview



4x Switch Module Overview

- High Speed (x4)
- Single Height (20mm)
- Double Height (41mm)
- GBX Connector
  - 14 x4 internal ports
  - Dual I2C Busses (to each Management Module)
- 60 Watts
- 10GbE, IB, PCIe Available
- SNMP/Web management
- Standard OK/Fault LEDs



SSI(SM) Midplane Electrical Specification

- SSI Midplane Ethernet Electrical Specification
  - Ensures 802.3ap compliance
  - Simulation complete for KX and KX-4
  - Hardware verification of KX and KX-4 on-going
  - Simulation for KR on-going
- Provides Standards Based requirements for a complete end to end SERDES channel for SSI-based chassis designs
- Defines test criteria for ensuring compliance
  - Verification of this criteria will be validated by the SSI Compliance and Interoperability Lab

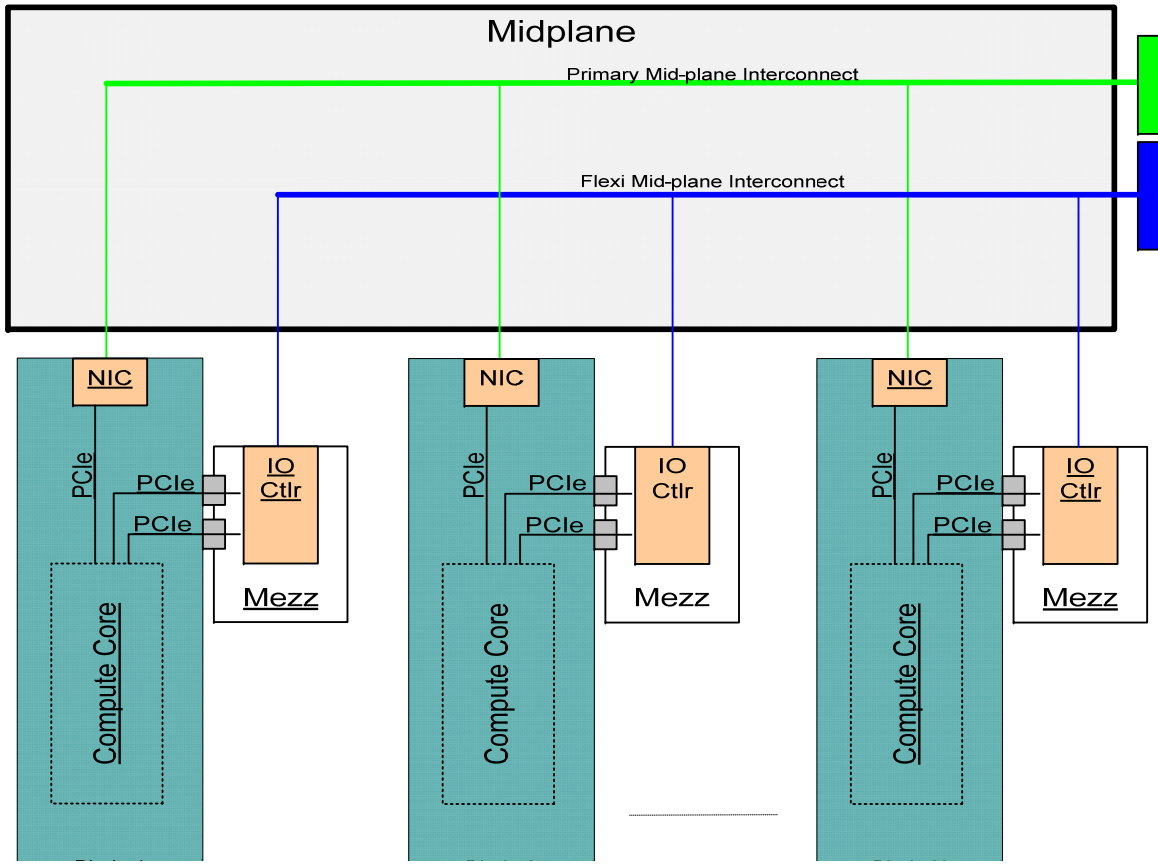
SSI(SM) Midplane Design Guide

- Mechanical Guidance
  - Specifies the connectors needed on the Midplane
    - Compute Blades utilize Airmax* series connectors
    - Switch Modules utilize VHDM (1x) and GbX (4x) connectors
  - Provides connector placement locations
- Electrical Guidance
  - Sample board stackup
  - Power distribution
  - High-speed routing
  - PCB technology choices based upon system requirements
- Channel Guidance
  - End-to-end channel lengths
  - Routing techniques
  - Via stub reduction
  - Length matching/spacing
- System Guidance
  - I2C topology
  - Thermal consideration

SSI(SM) Midplane Design Guide

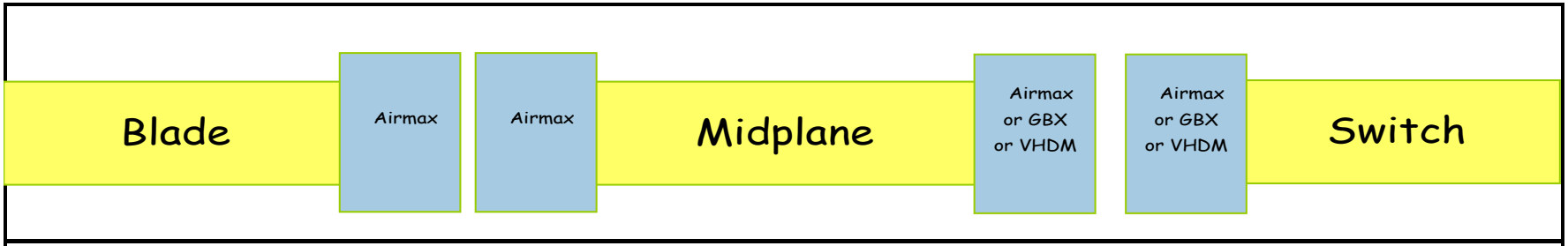
2. Midplane

1. Blade



Midplane Connectivity Guide

SSI(SM) Midplane Design Guide – Midplane Route Length



Channel										
Blade			Midplane					Switch		
Channel Technology	Impedance Target	Connector Type		Design Point LC	Design Point MC	Design Point HC	Impedance Target	Connector Type	Impedance Target	Channel Technology
KX	85	Airmax	Max Len	16.5	19.5	22.5	85	VHDM	100	KX
			Rev	*0.8*	*0.0*	*0.0*				
KX4	85	Airmax	Max Len	10	14	16	85	Airmax	85	KX4
			Rev	*1.0*	*1.0*	*0.0*				
KX4	85	Airmax	Max Len	9	10.5	12	85	GBX	100	KX4
			Rev	*0.5*	*0.5*	*0.5*				
KR	85	Airmax	Max Len	6	10	16	85	Airmax	85	KR
			Rev	*0.0*	*0.0*	*0.0*				
KR	85	Airmax	Max Len	4	8	12	85	GBX	100	KR
			Rev	*0.0*	*0.0*	*0.0*				

Rev Definitions

- 0.0 Engineering targets to meet timings and noise margins
- 0.5 Simulations complete pending Blade, Switch or Midplane Specification changes
- 0.8 Simulations complete without outstanding specification changes
- 1.0 Simulations correlated with hardware
- 2.0 Demonstrated in Compatibility and Interoperability Lab

Blade Specifications Scope

Industry Std's

OEM differentiated

Management

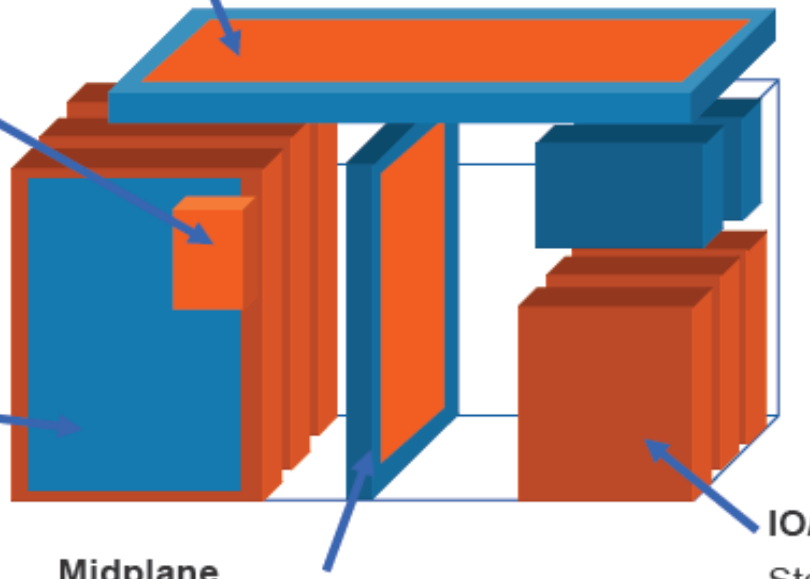
Standardize: Inside the chassis (IPMI, E-net), Outside the chassis (SMASH, WS-MAN, CLI, SNMP)

Differentiable: MM (virtual or dedicated), chassis mgmt value-add (power control, failover, keying, etc.)

Mezzanine Card

Standardize: FF, connector, electrical & mgmt, power & cooling profile

Differentiable: Nothing



Chassis

Standardize: Blade & switch FF, power & cooling profile

Differentiable: Configuration, # blades-switches, orientation, power supply, fans

Compute Blade

Standardize: FF, connector, electrical & mgmt, power & cooling profile, latching

Differentiable: Green/perf power profile, Platform (1S, 2S, 2+2S, 4S), DIMM count, storage (HDD, NAND, none), I/O (LOM, mezz), BIOS/FW, Look & Feel

Midplane

Standardize: Blade-switch connectors, fabric topologies, channel model

Differentiable: Number and type of fabrics, orientation, redundancy

IO/Switch

Standardize: FF, connector, electrical & mgmt, power & cooling profile, latching

Differentiable: Teaming, failover, bandwidth aggregation

Opportunity for Innovation w/Open Specs: Ability to add unique value within SSI(SM)

- Match system size to application, 3 blades and up
- Compute blade spec supports an optional fabric
  - 10G Ethernet, Fiber channel, InfiniBand*, etc.
- Compute blade mezzanine can support multiple technologies
- Add value to the backplane or chassis
  - e.g. virtualized storage
- Flexible Chassis Management Module specification supports user feature differentiation

Cost Effective Standards, Unique OEM Value

For More Info

- **Visit *www.ssiforum.org* to learn more about**
  - SSI(SM) organization
  - Current status or download of all specifications
  - Benefits of joining SSI at different membership levels
  - Demos and trade show activities
  - Companies participating in SSI
- ***Compute, Mezzanine, Chassis Management Module, and Switch Specifications available for Design starts***
- ***Participate in Server, Architecture, C&I, Marketing Work Groups***
- **Contact Information:**
  - chairman@ssiforum.org (jim.ryan@intel.com)

Thank You!