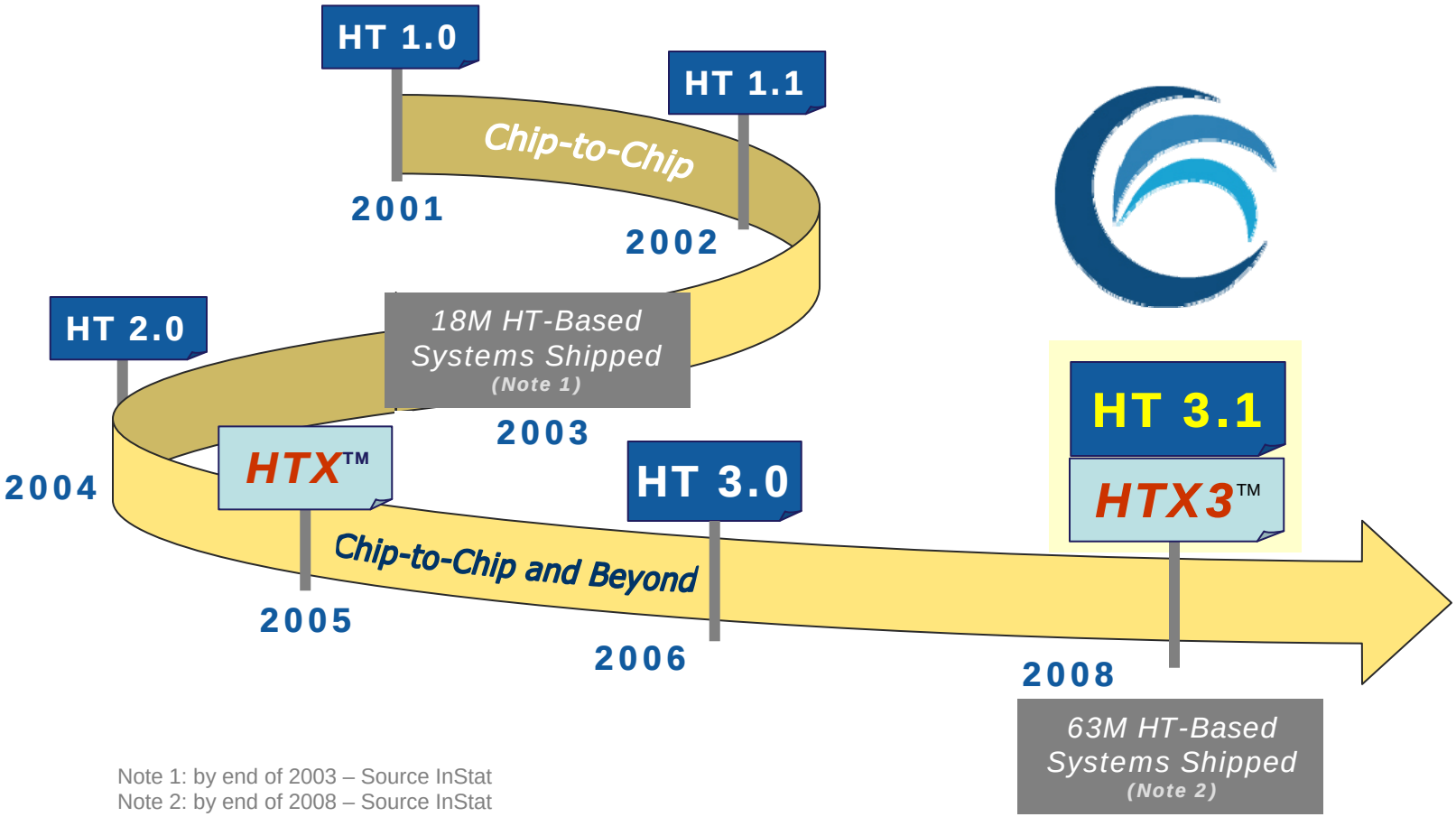
HyperTransport™ *HTX*™ Snapshot

HyperTransport™ CONSORTIUM

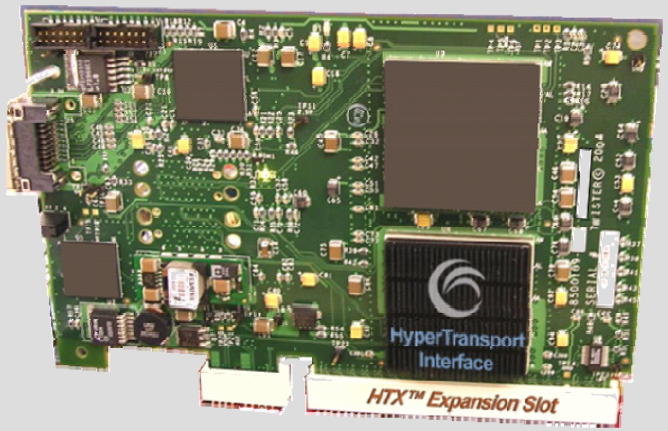
HTX™ Leaps Forward to *HTX3*™



Note 1: by end of 2003 – Source InStat
Note 2: by end of 2008 – Source InStat

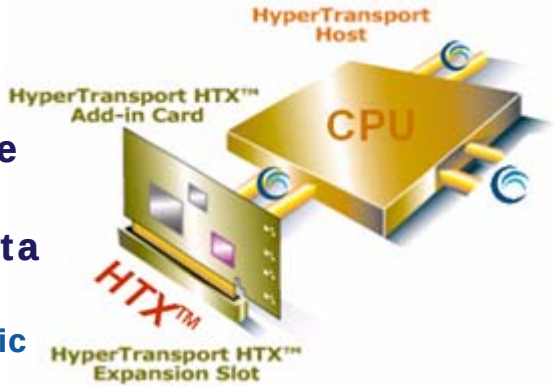
HyperTransport™ CONSORTIUM

Technology Overview



HTX™ Interface = Performance Edge

That PCI-Class Interconnects Cannot Deliver



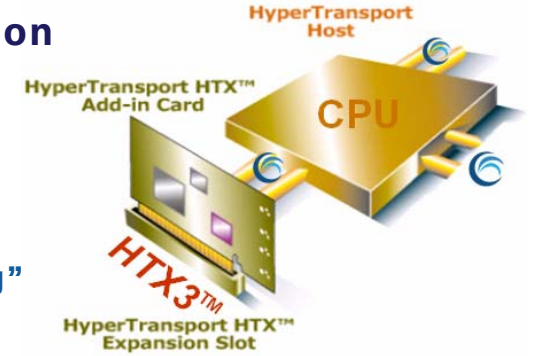
- **Lowest Latency, Highest Bandwidth Direct Connect Between CPU and Compute-Intensive Subsystems**
- **Removes Performance Bottlenecks in HPC Data Processing and Coprocessing Functions**
  - **No Intermediate CPU-to-Subsystem Control Logic**
- **Reduces Overall Power Consumption**
- **Complements PCI-Class Interconnects**
  - **Typically Co-Exist with PCI-X and PCI Express Connectors in Same MB Design**

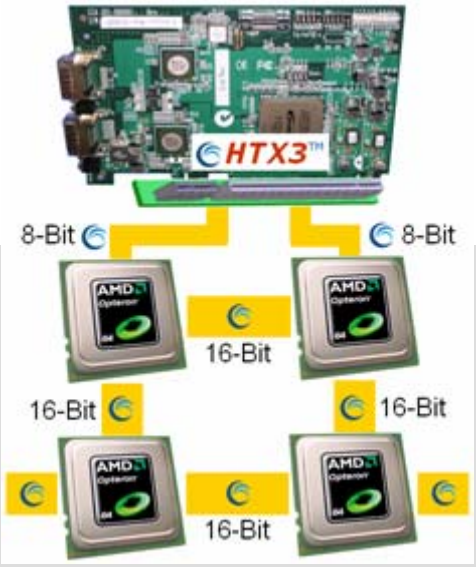
Features

8-Bit and 16-Bit HyperTransport Link Support
800 MHz Max Clock Rate
6.4 GB/s Bandwidth (16-bit, Aggregate)

Introducing HyperTransport™ *HTX3™*

- >3x Bandwidth of Standard HTX Specification
- Brings HT 3.0 Performance and Architectural Latitude to HTX Connector
- Triples HT Clock Rate While Preserving Signal Integrity
  - Leverages HT 3.0 Clock Recovery “Scrambling” and “Training” Features
- Adds Power Management Features
- Adds Link-Splitting Capability
  - Allows Subsystem Connection to 2 CPUs





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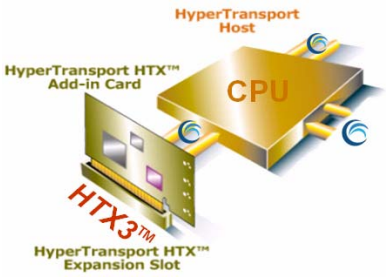
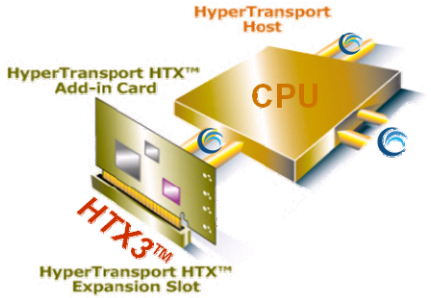
HTX3™ Features Summary

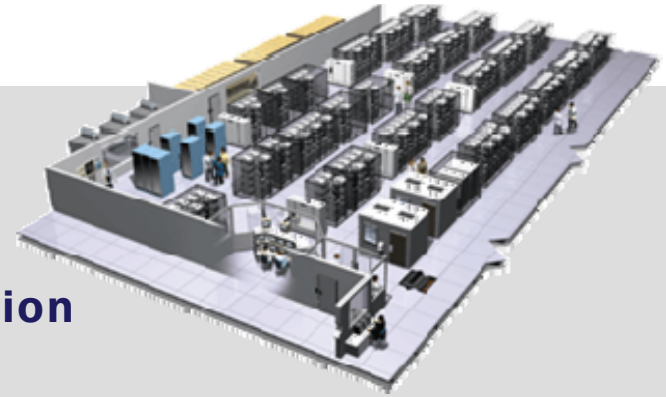


Feature	*HTX*	*HTX3*	Notes
Max Clock Rate	800 MHz	**2.6 GHz**	**12" Trace length**
Max Bandwidth x Lane	1.6 GT/s	**5.2 GT/s**	**Bi-directional**
Max Bandwidth Aggregate	6.4 GB/s	**20.8 GB/s**	**Bi-directional 16-Bit HT link**
HT3 Link Splitting Support	NO	**YES**	**HT link can be 1x 16-Bit or 2x 8-Bit for mutli-CPU support**
HT3 Extended Power Management	NO	**YES**	**LDTREQ# Signal Added to participate in x86 power states**
Extended FPGA Guidelines	NO	**YES**	**Incorporated field-proven recommendations**
Full Backward Compatibility	--	**YES**	**Level shifters and signal allocation**

Why HyperTransport™ *HTX3™*?

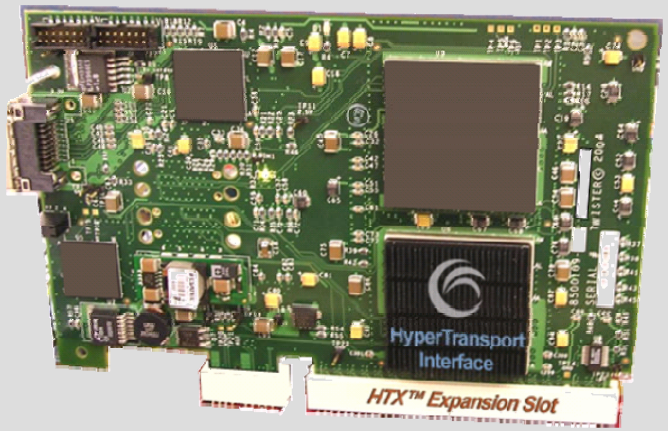
- FPGAs Play Key Role in Compute-Intensive Designs
- HTX3 Well Aligns with Expected FPGA Technology Progress
- FPGA Cores Expected to Support HT3.0-Class Clock Rates
  - From Bandwidth Bottlenecks to Drivers
- Power Optimization Ranks High in HPC Agenda
- HT 3.0 Has Reached Maturity and Stability
  - Design Learning Curve
  - Product Implementations
  - Market Feedback
- HT 3.0 Capability Now Safely and Stably "Connectorized"





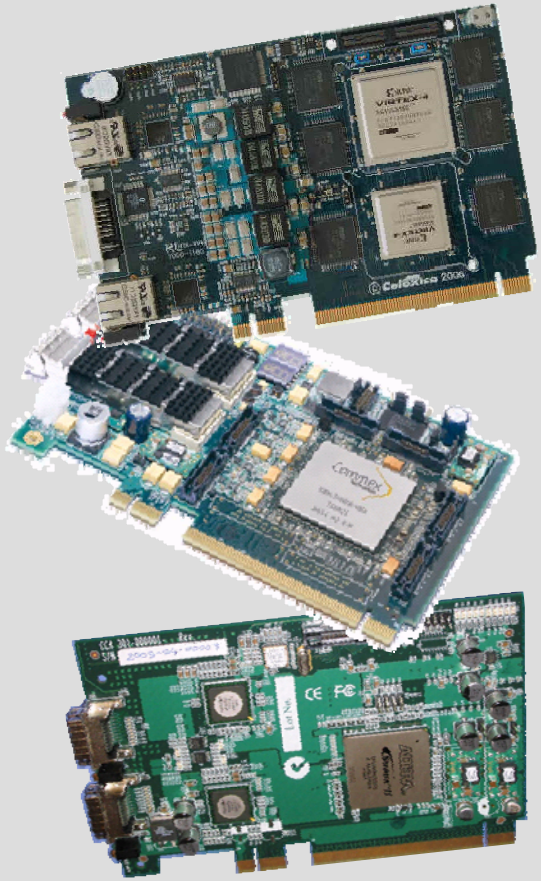
With its State-of the-Art Features Set *HTX3™* Empowers Future HPC Innovation

Main Applications



HyperTransport™ CONSORTIUM

HTX™ Applications



Compute-Intensive Board Level Subsystems Requiring:

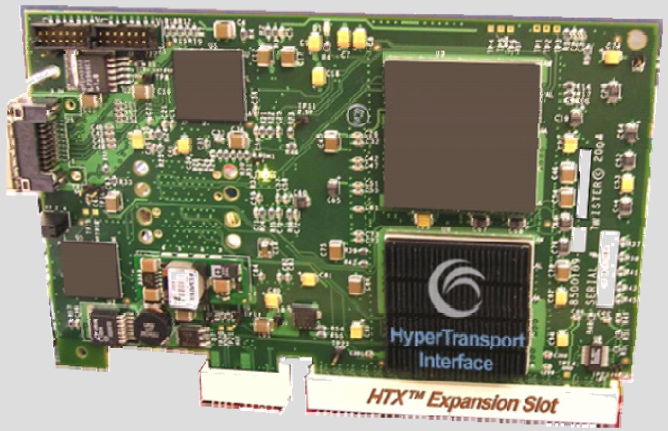
- **High Bandwidth + Low Latency**
- **Multi-CPU Connections** (HTX3)
- **Advanced Power Management** (HTX3)

Targeting:

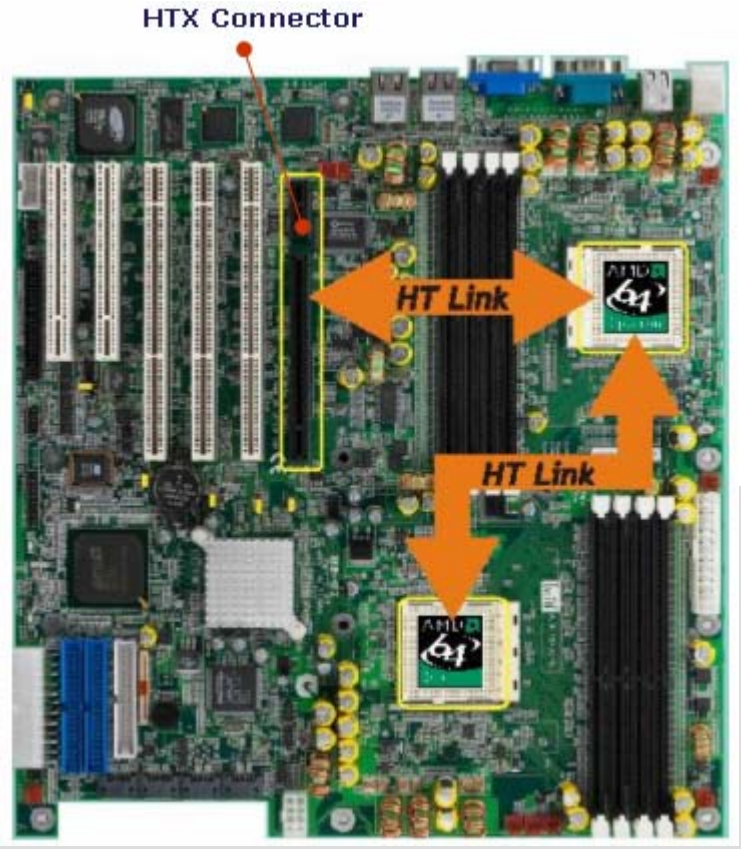
- **Database Analytics**
- **Stock Trading Acceleration**
- **High-Traffic Web-Based Applications**
- **Transaction Servers**
- **Streaming Media Servers**
- **Storage Servers**
- **Server Clustering and SMP**
- **Financial Modeling**
- **Communications**
- **Content Processing**
- **Security Processing**
- **High-Perf Real World Rendering**

HyperTransport™ CONSORTIUM

Core Values

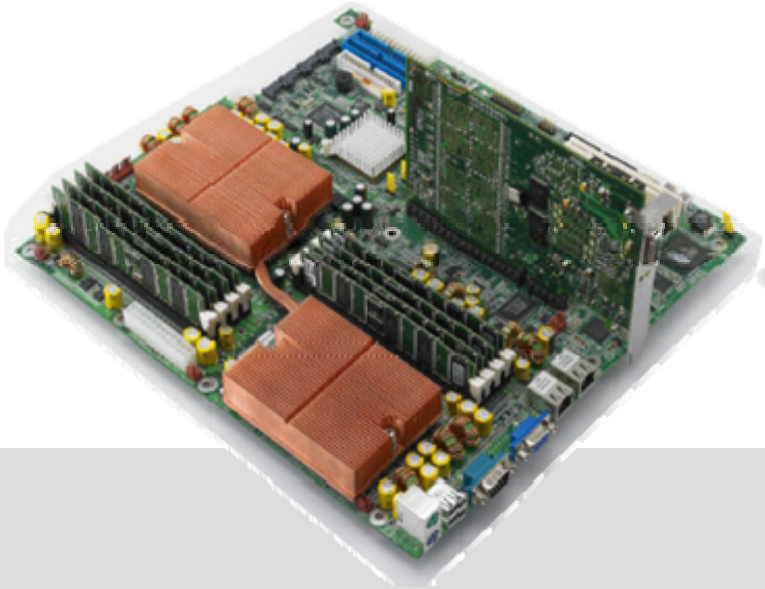


HTX™ and *HTX3*™ Connector



- **Uses popular PCIe Connector**
  - **High-volume part, Low cost**
- **HT-defined signals**
- **Reverse-Installed vs. PCIe Slots**
  - **Prevents Wrong Card Insertion**

HTX™ and *HTX3*™ Connector Mounting



- **Vertical Mount**
- **Horizontal Mount via HTX Riser**

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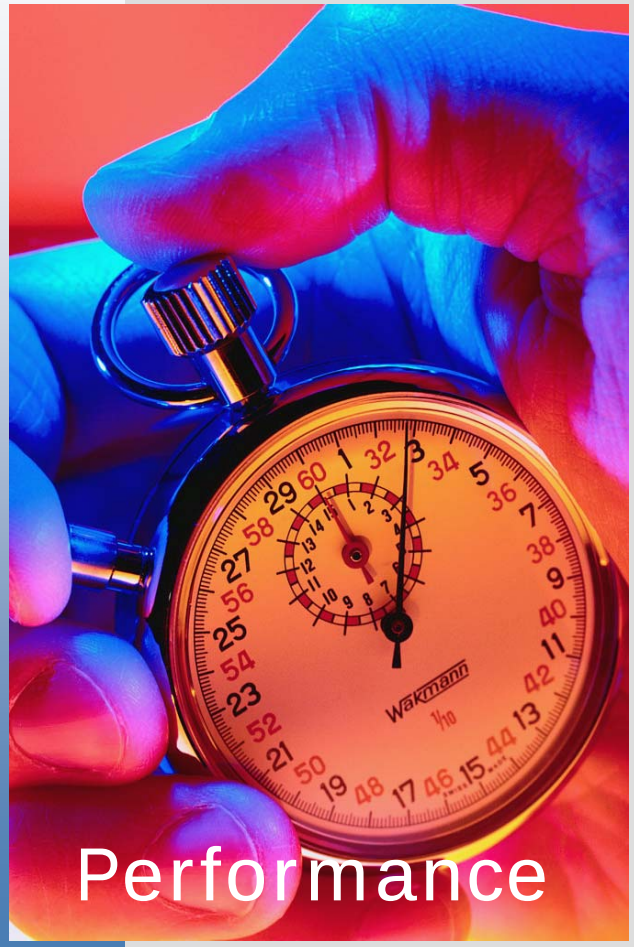
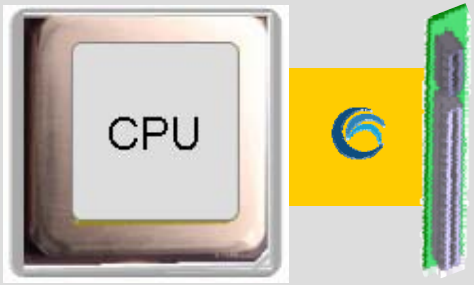
Lowest Achievable Latency

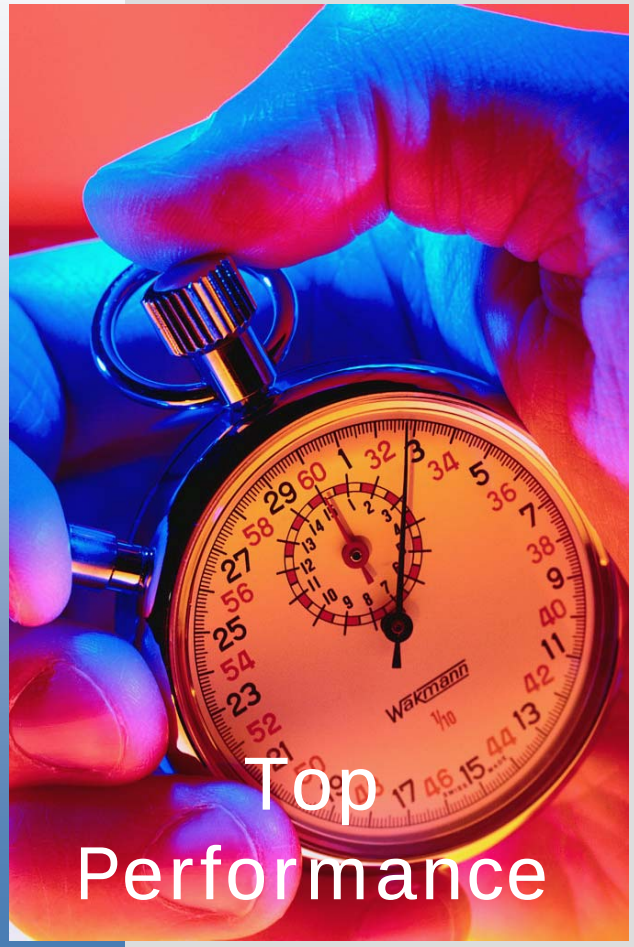


No Control Logic Penalty



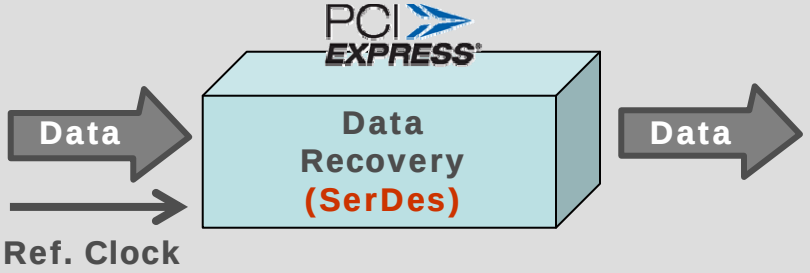
Control Logic Penalty

Lowest Achievable Latency (cont.)

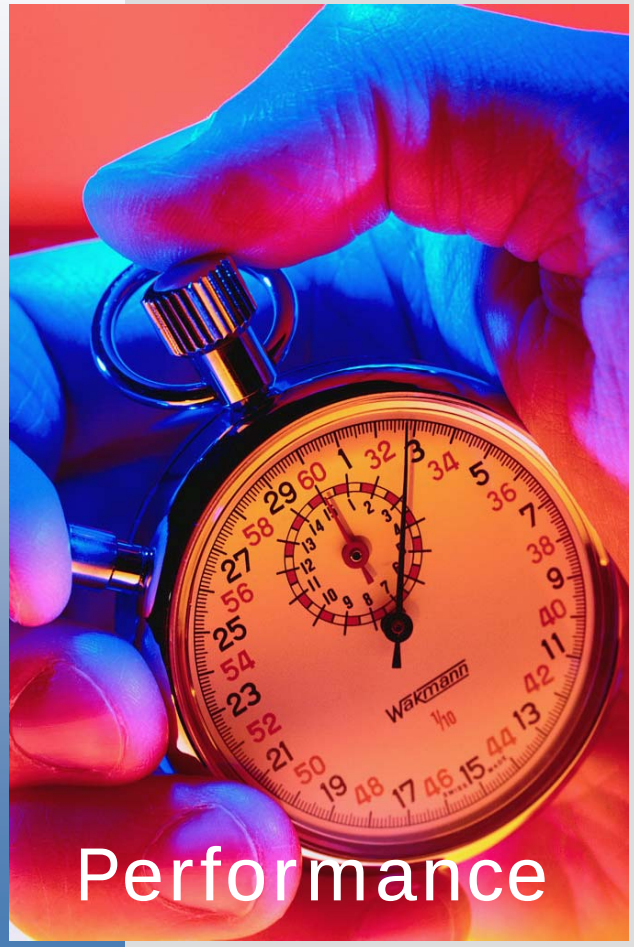


No 8B/10B Overhead Penalty

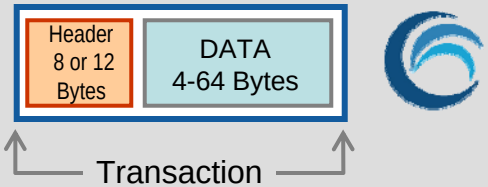
20% 8B/10B Fixed Overhead Penalty



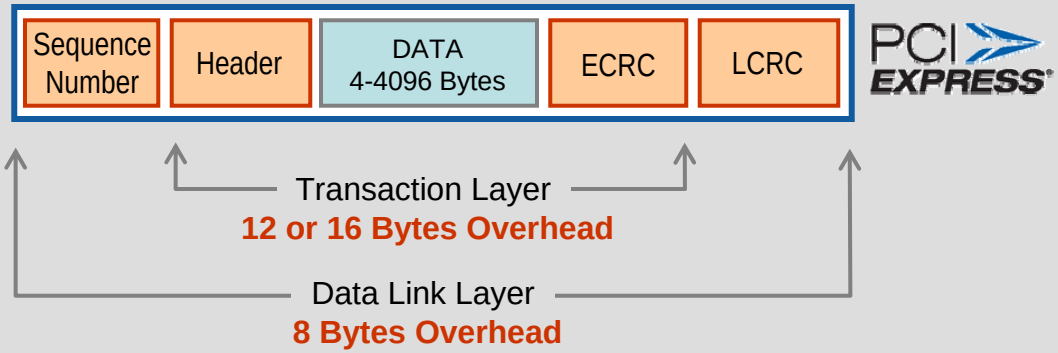
Lowest Achievable Latency (cont.)



Minimized Packet Overhead



12 Byte Overhead Penalty vs. HT



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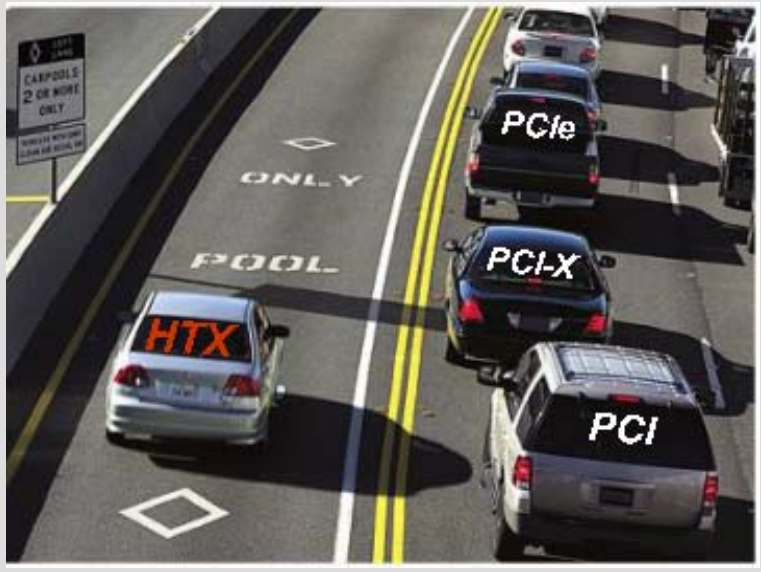
HTX™ Delivers the Extra Performance that PCI-Class Interfaces Cannot Deliver

Complements PCIe and PCI-X



Cohexists within Same System

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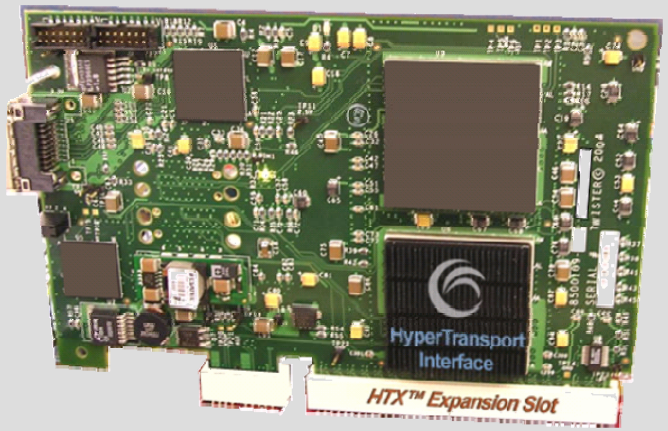
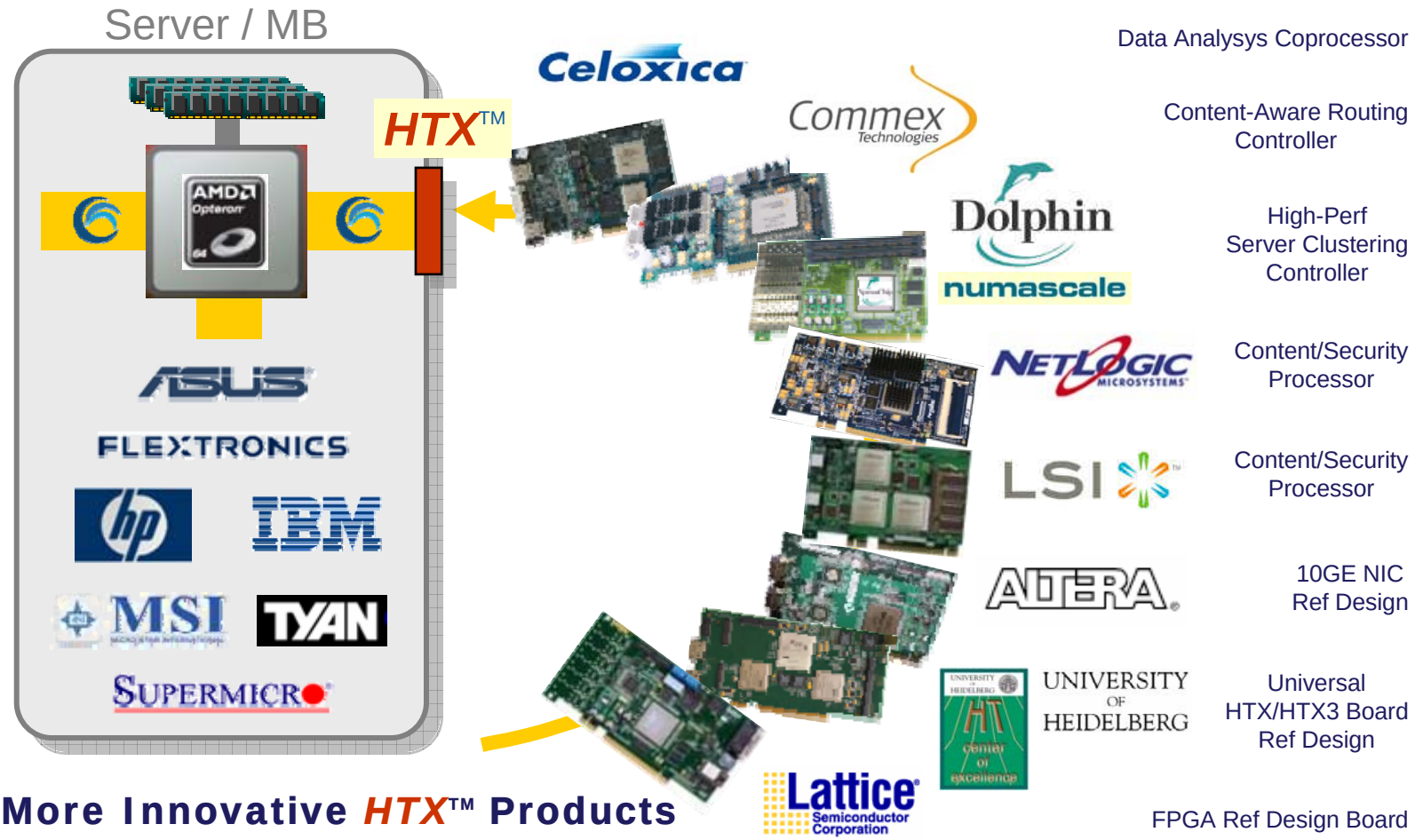
Product Ecosystem



HyperTransport™ CONSORTIUM

Expanding *HTX*™ Products Ecosystem



More Innovative *HTX*™ Products in the Pipeline

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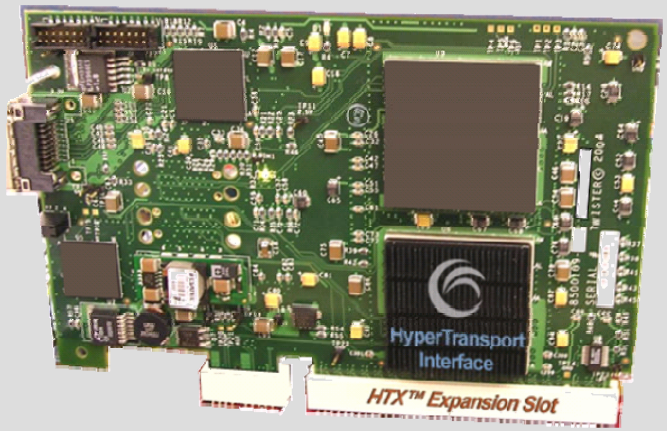
Development Support



HTX™ Development Support

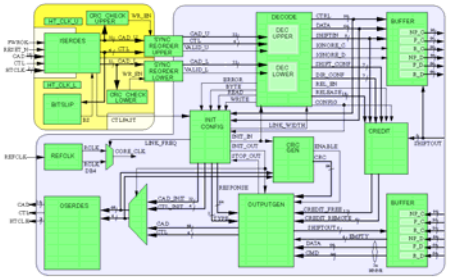
HyperTransport Center of Excellence Design Support and Services

Universal Board Reference Designs

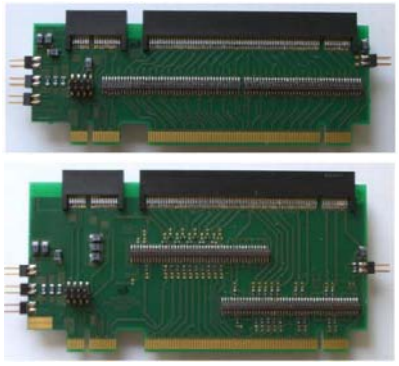
HTX™

HTX3™

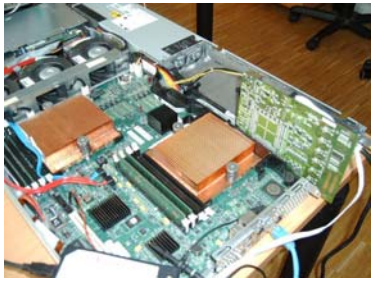
HT and cHT Cores



Test Tools



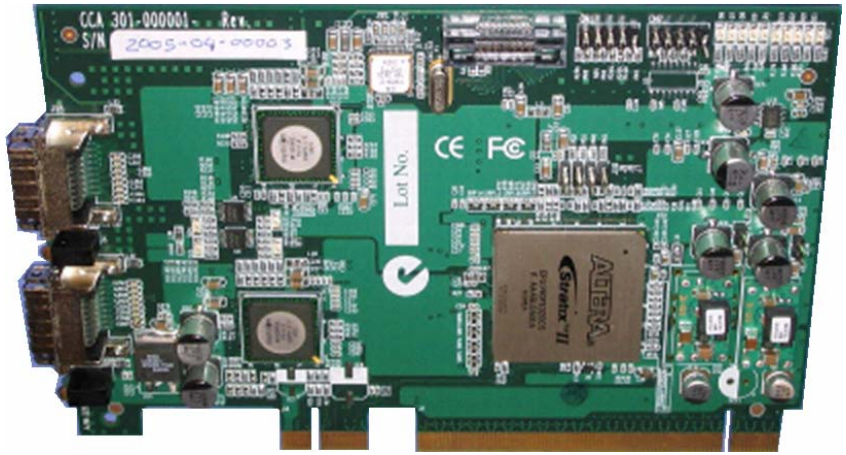
Design Support Product Validation



HTX™ Development Support (cont.)

HTX ™ 10GE NIC Design Kit

- Validated and Tested 10 Gigabit Ethernet Solution
- Dowloadable Free-of-Charge from HTC Web Site



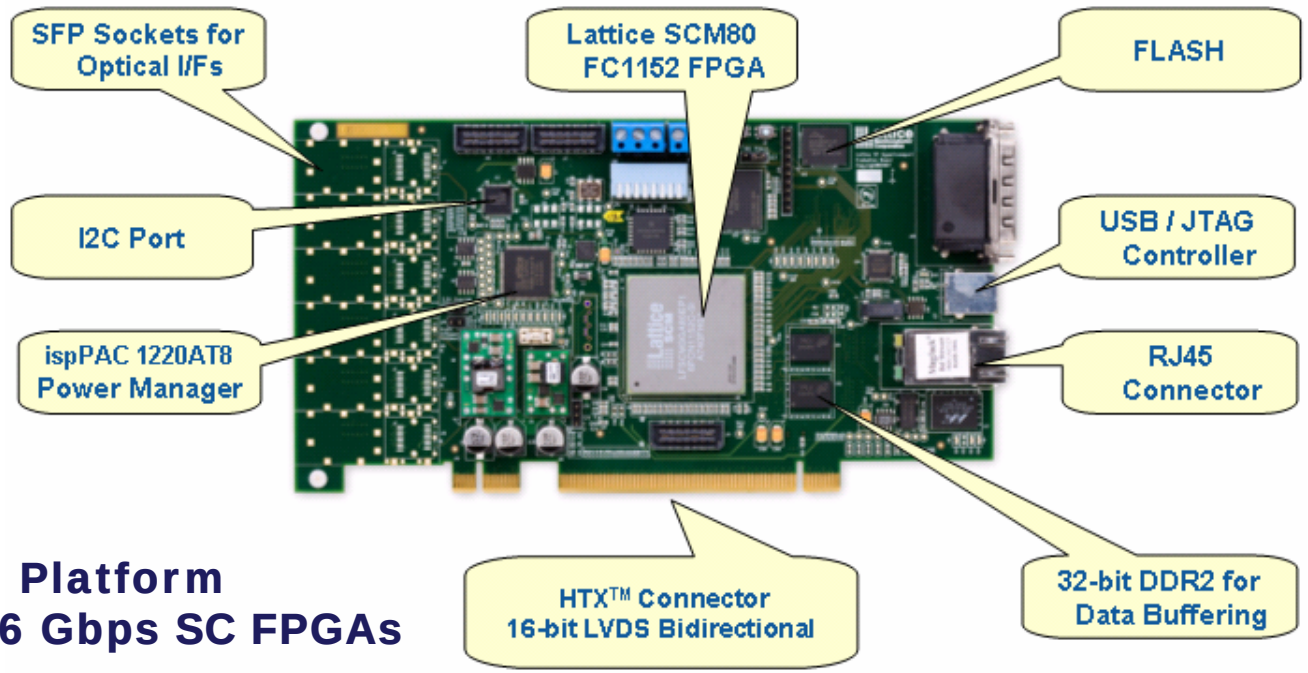
HTX™ Connector

- 2x 10GE Ports
- Stratix II FPGA

Fast Time-to-Market

HTX™ Development Support (cont.)

HTX ™ FPGA Development Board



Rapid Design Platform for Lattice 1.6 Gbps SC FPGAs

HTX™ Connector

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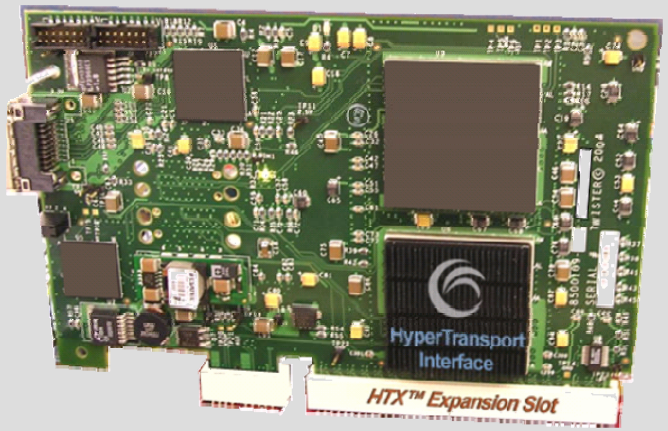
BIOS Support



HTX™ BIOS Support

Consortium-Defined and Standardized *HTX*™ BIOS Specifications

Cross-Compatibility

Fast Time-to-Market

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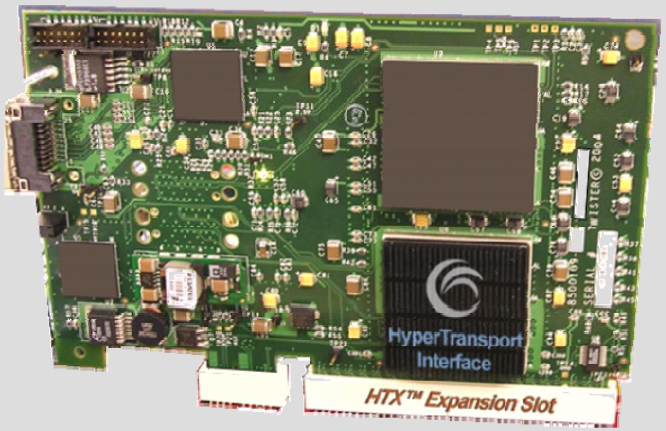
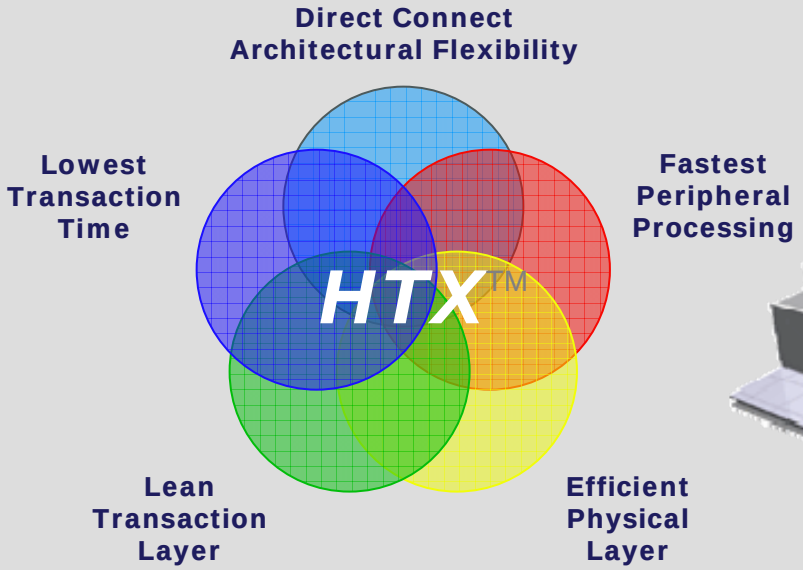
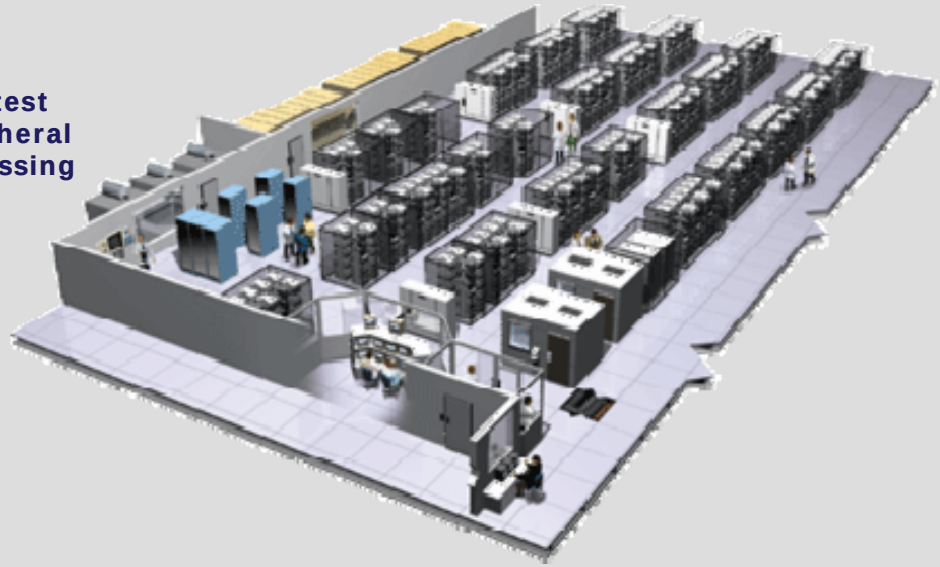
Why HTX?



Unique Technical Values

HTX™ Provides Superior Performance and Architectural Capabilities In Line with HPC Market Expectations





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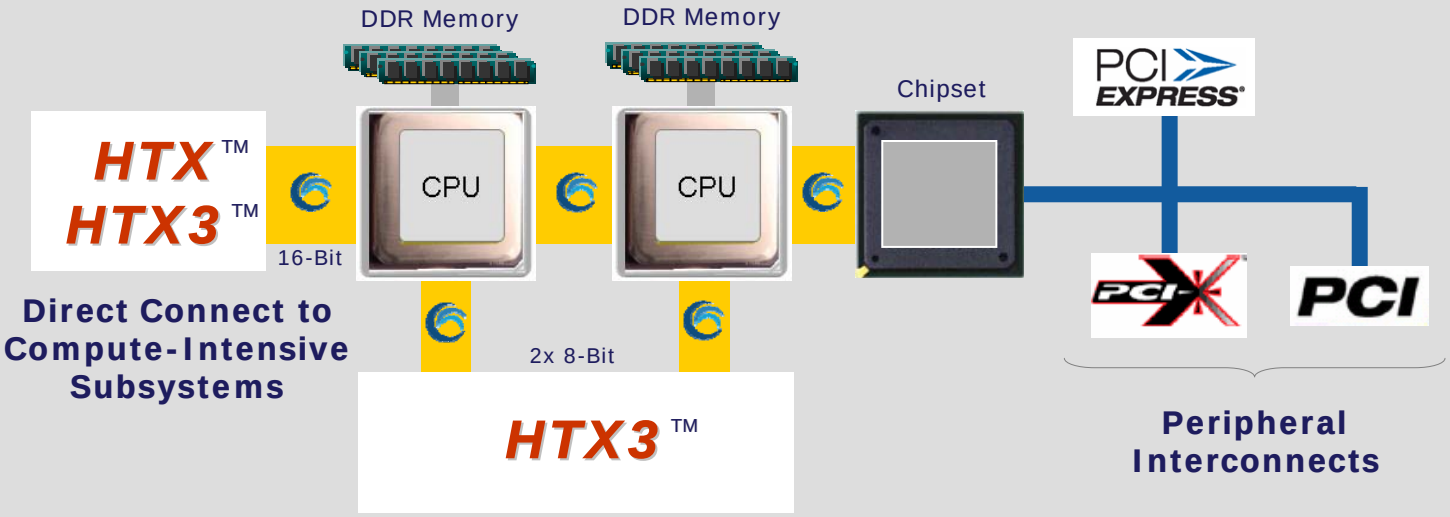
HTX™ Complements PCI Express

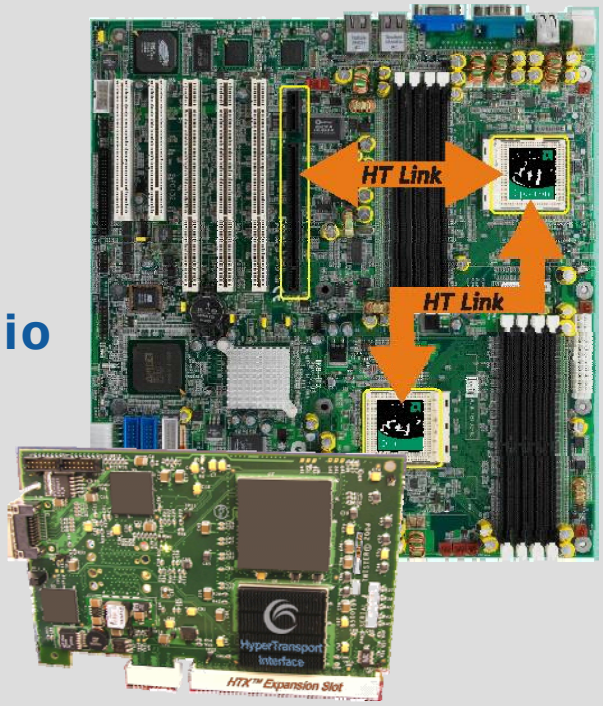


With its Unique Architectural and Performance Edge over General Purpose Interconnects, HTX is an Ideal Complement to PCI-Class Slot Connector Interfaces

HTX™ Business Values

HTX™ is a Competitive Differentiator for High-Performance Total Solution Vendors

- **Negligible BOM Cost**
  - Leverages PCIe Economy of Scale
- **System Flexibility**
  - Single MB Serves Multiple Markets
- **Growing HTX Subsystem Portfolio**
  - Coprocessors, Accelerated 10GE, ccNUMA Cluster Controllers, Content Processors, Others Released Soon
- **Up-Selling Enabler**
  - Delivers Greater End-User Value



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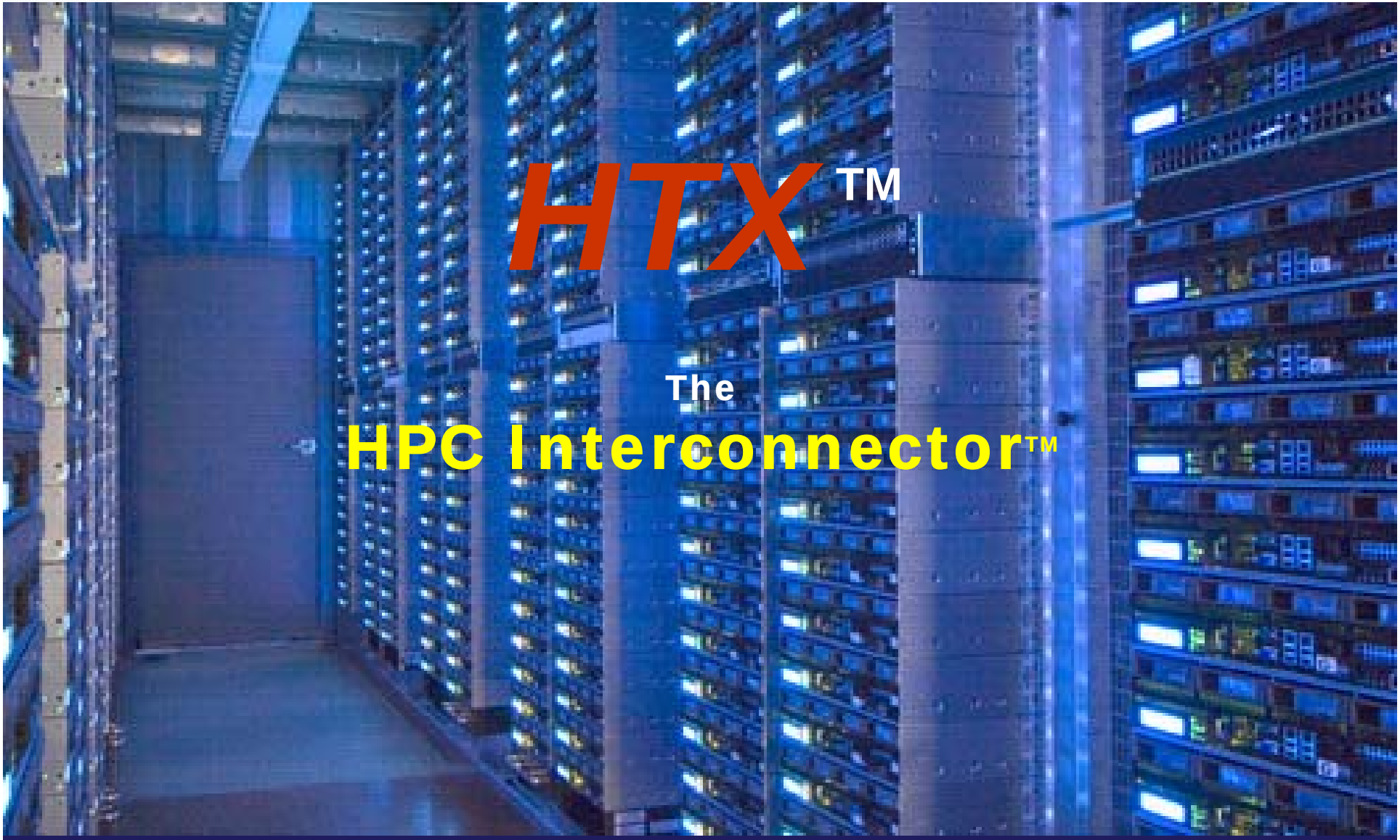

HTX™

The HPC Interconnector™

HyperTransport™ CONSORTIUM

With HyperTransport™ The Technology Industry Wins