

**PXI** *Express*<sup>TM</sup>

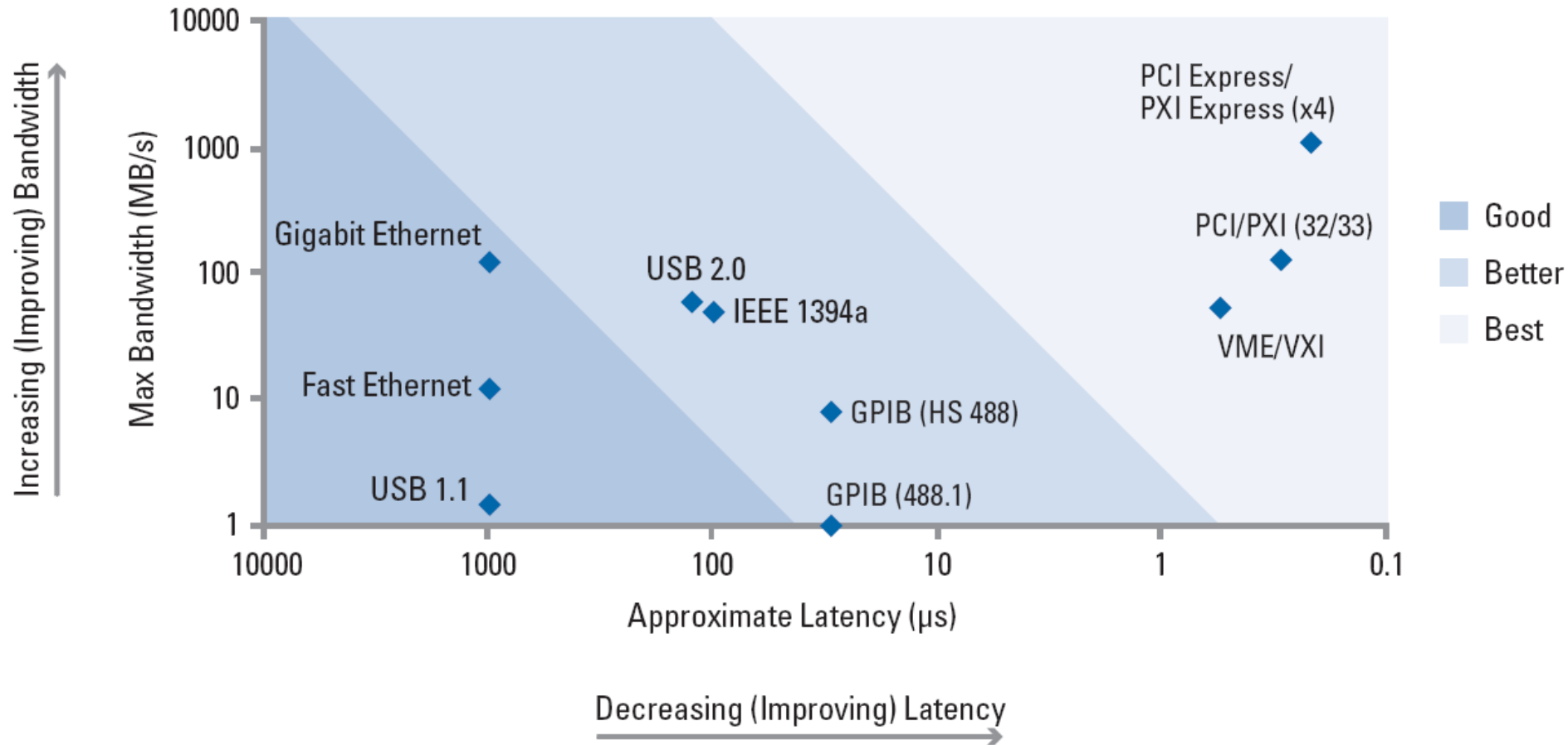
# Integrating PCI Express into the PXI Backplane

# PCI Express Overview

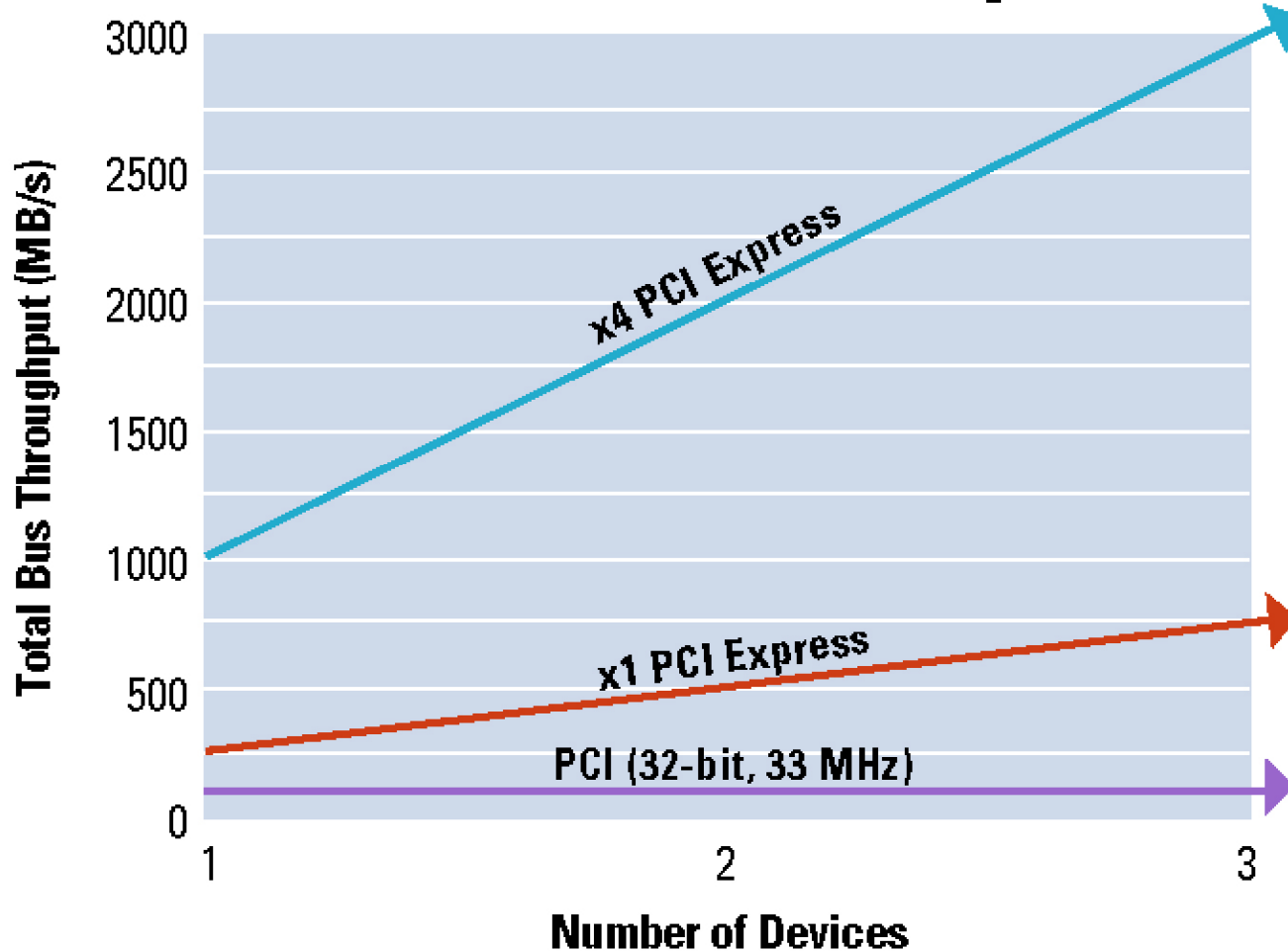


- Serial interconnect at **2.5 Gbits/s**
  - Low-voltage differential signaling, point-to-point, 8B/10B encoded
  - **Multiple lanes can be grouped together to form links**
  - x1 (by 1) has bandwidth of **250 MBytes/s/direction**
  - x16 (by 16) has bandwidth of **4 GBytes/s/direction**
- Uses same software model as PCI
  - Ensures software compatibility
- Roadmap for longevity with Gen-2 (2x Gen 1) and Gen-3 (2x Gen-2)
- Nearly all other I/O is built upon PCI Express

# Latency versus Bandwidth



# Dedicated Bandwidth per Device



# PCI Express Industry Adoption

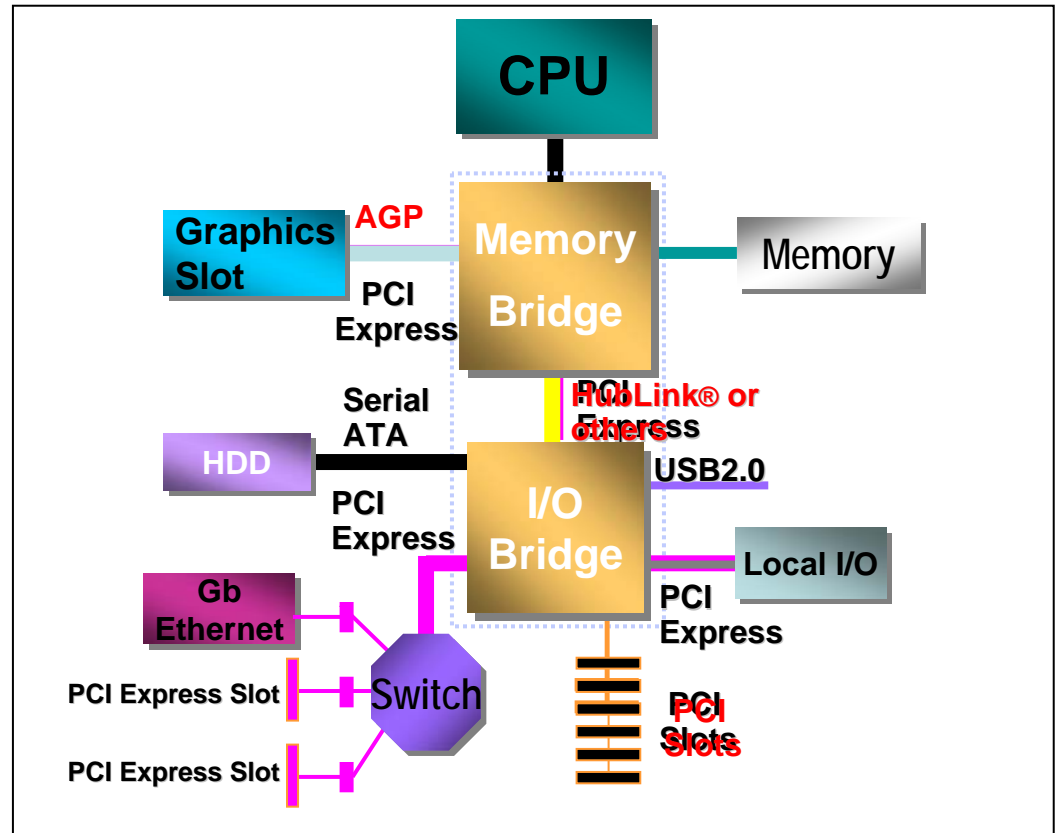
- First PCI Express desktops shipped mid 2004
- First ExpressCard laptops shipped early 2005
- PCI and PCI Express are side-by-side in all Intel/Dell roadmaps
- Primary consumer drive is graphics processing (gamers, video editing)
  - PCI Express x16 replacing AGP

# PCI Express Advantages

- Software compatibility
- High throughput (up to > 4 GBytes/sec/direction)
- Low latency
- Most pervasive interconnect to processor / chipset
- Scalable bandwidth
- Dedicated bandwidth per slot
- Peer-to-peer communication
- Long life (20+ years in mainstream market)

# PCI Express Provides the Foundation for I/O

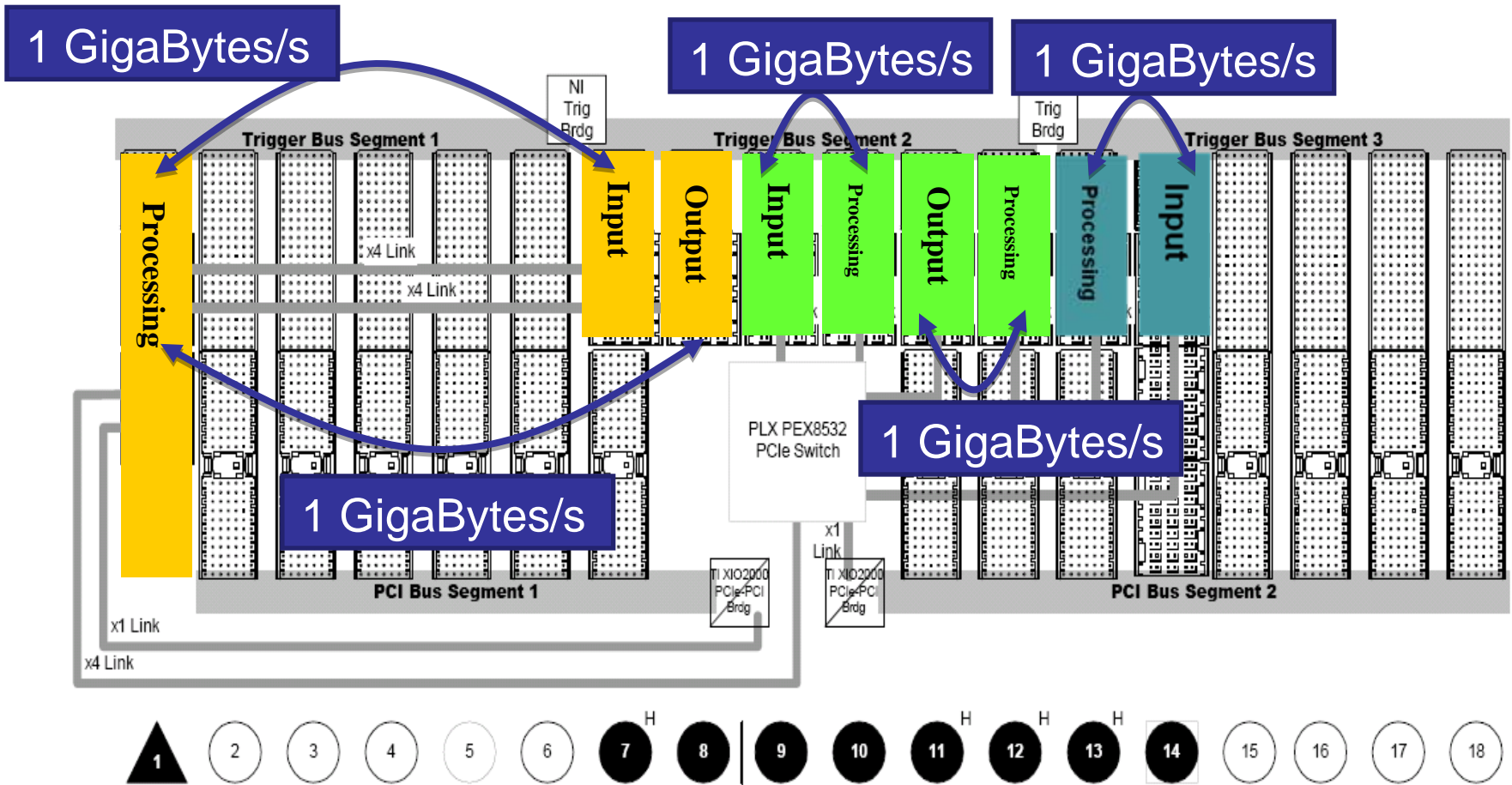
- Nearly all architectures build upon PCI Express to get to other I/O
- Other I/O built upon PCI Express can not be lower latency or higher bandwidth than PCI Express
- Systems built on PCI Express give you the greatest flexibility to attach to other I/O



# Integrating PCIe into the PXI Backplane

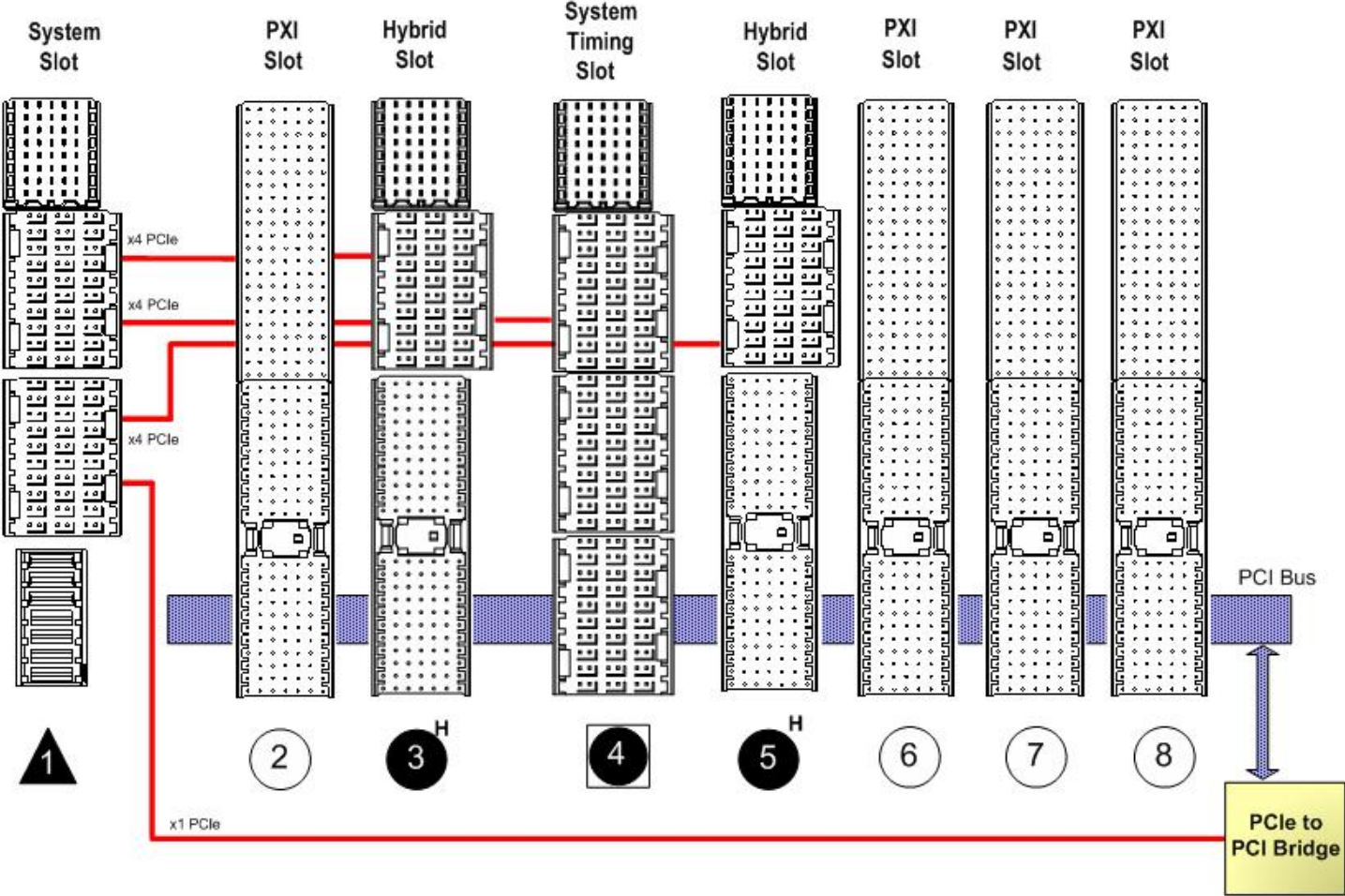
- Up to 2 GBytes/sec/direction dedicated bandwidth per slot
- Up to 6 GBytes/sec/direction to the host
- Up to 18 GBytes/sec/direction system bandwidth
  - Bandwidth not limited to System Controller
- Enhanced synchronization capabilities
  - 100 MHz differential clock, differential triggering
- Backwards compatibility
  - Complete software compatibility
  - Hybrid slot definition - install modules with either PCI or PCI Express signaling in a single slot

# Peer to Peer Extends System Bandwidth: Example

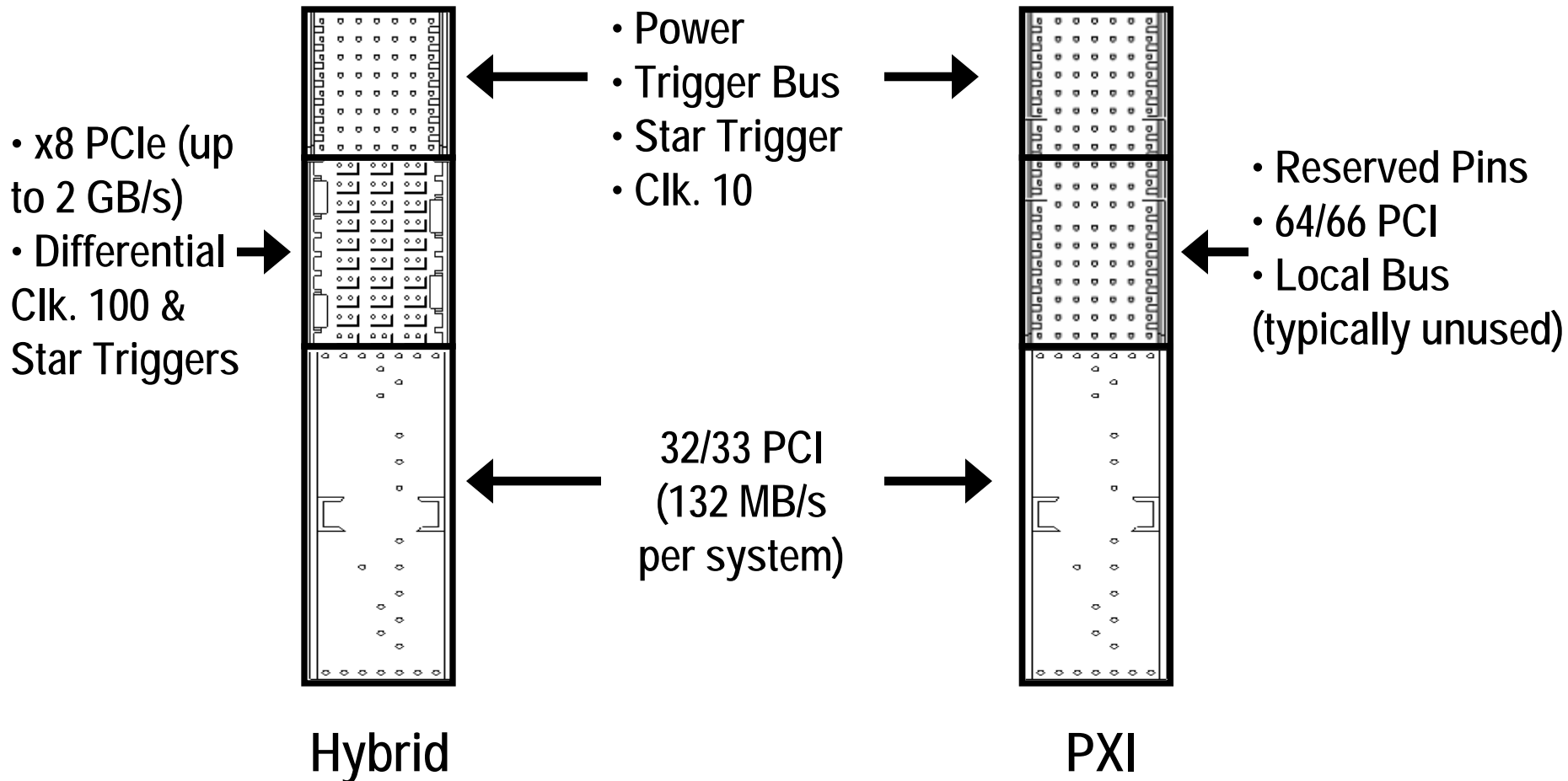


**Bandwidth not limited to System Controller**

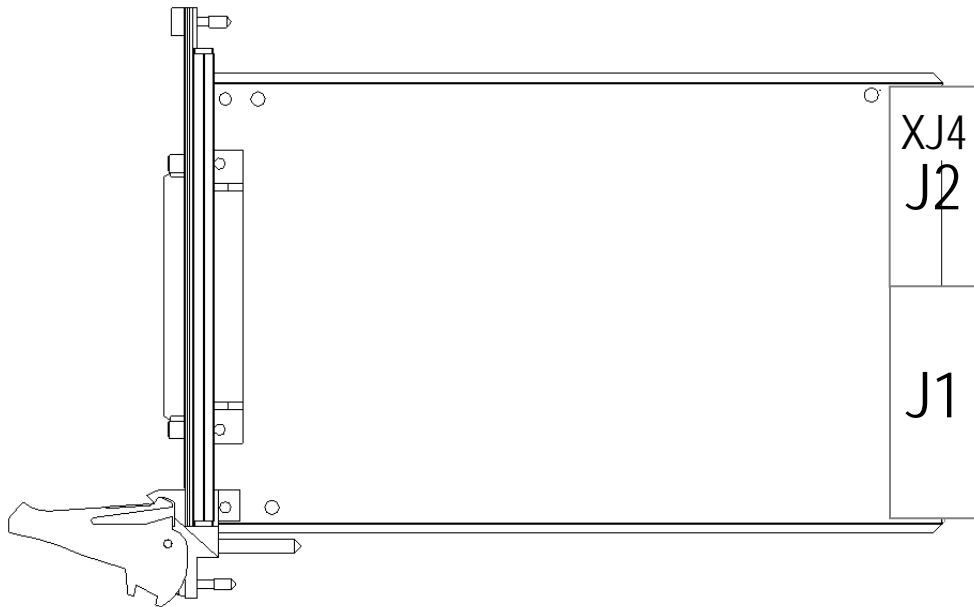
# PXI and Hybrid Slots Ensure Compatibility



# Compatibility of PXI and Hybrid Slots



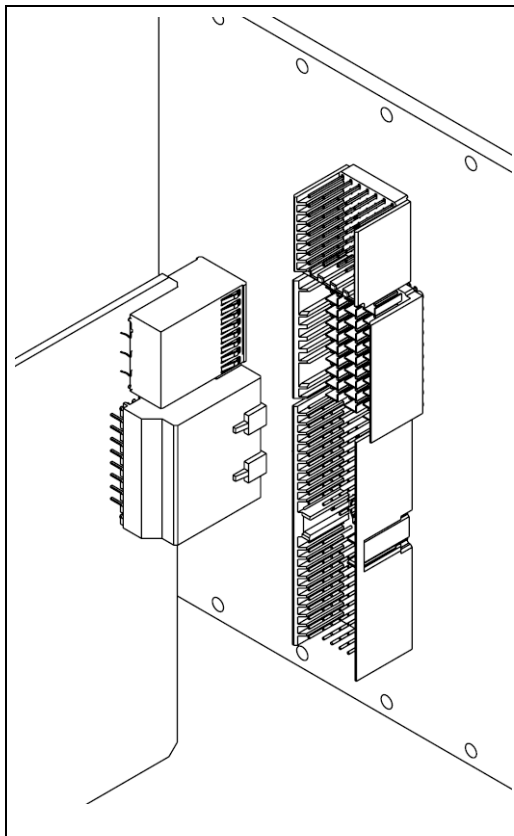
# Creating a Hybrid Slot Compatible PXI Module



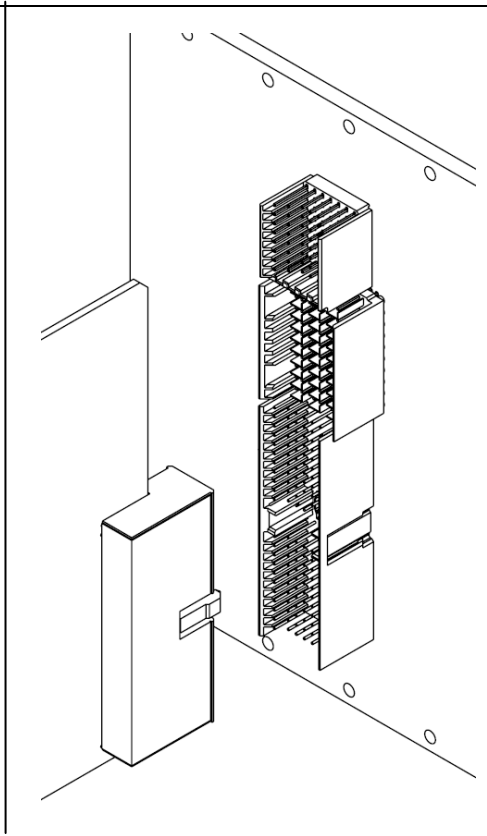
1. Start with a PXI peripheral module
2. Depopulate J2
3. Populate XJ4

# Hybrid Slot Flexibility

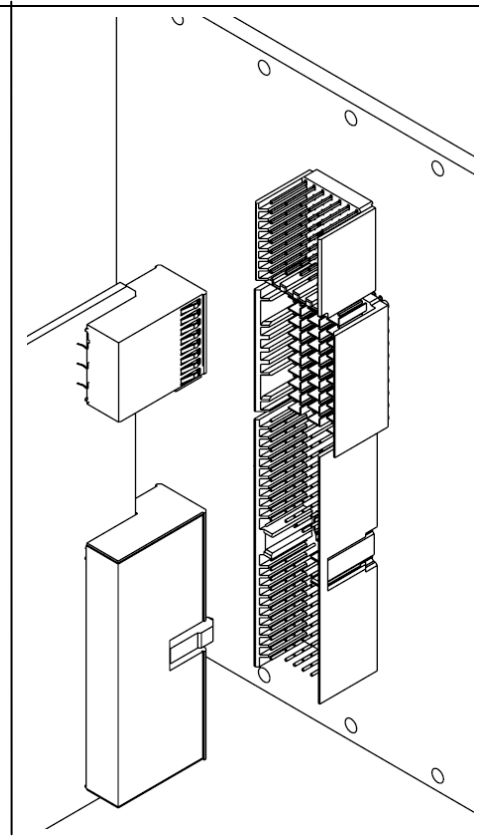
**PXI Express  
Peripheral Module**



**32-bit CompactPCI  
Module**

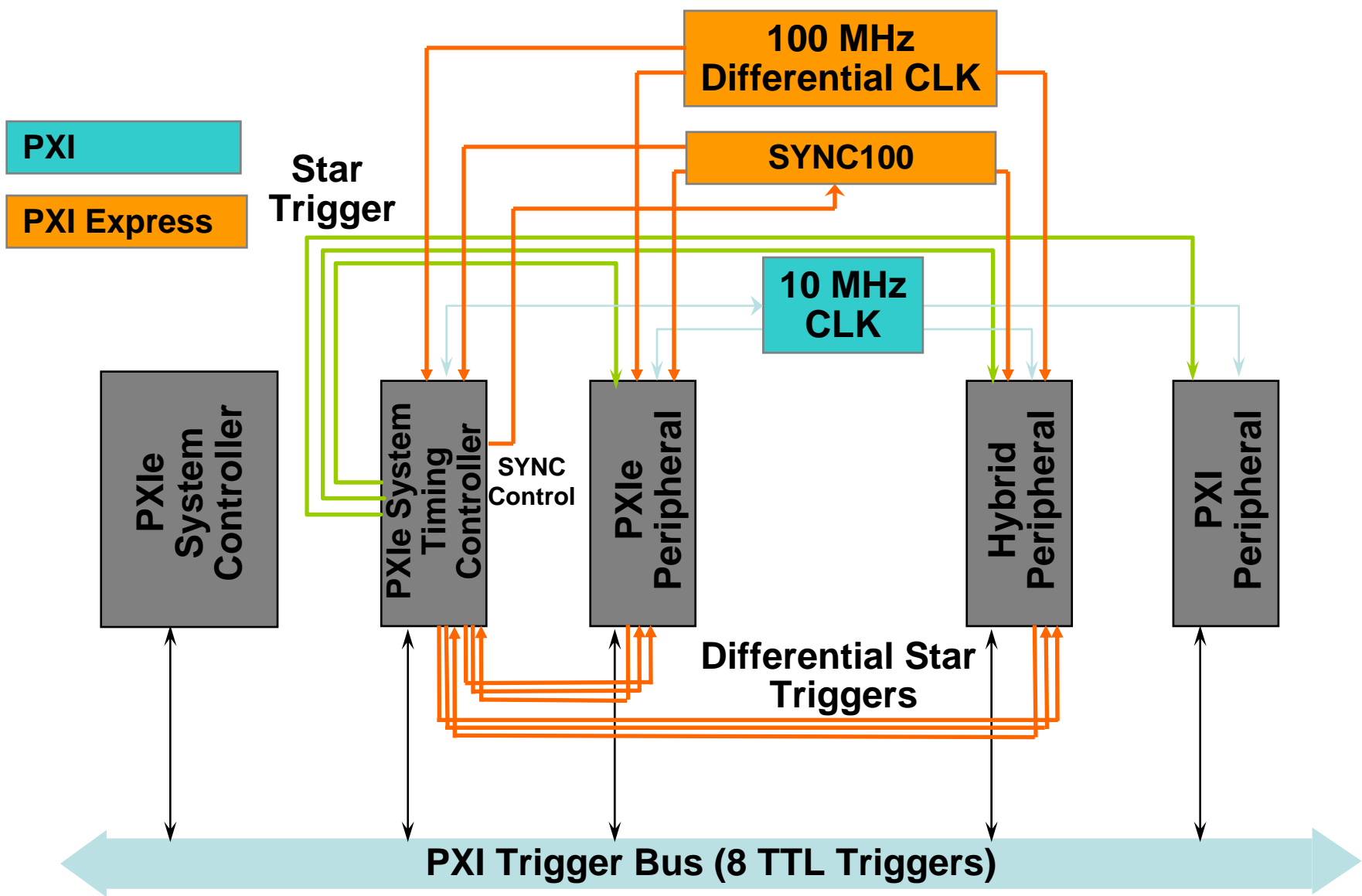


**Hybrid Slot Compatible  
PXI Module**



# Increased BW Enables New Applications

- **PXI applications requiring PCI bandwidth**
  - General purpose automated test (DMMs, switching, baseband instruments, etc)
  - General purpose data acquisition (AI, AO, DIO, etc)
  - Bus interfaces (CAN, 1553, ARINC, etc)
  - Motion control
- **PXI applications requiring PCI Express bandwidth**
  - High frequency, resolution IF / RF systems
  - High speed digital interfaces
  - High channel count data acquisition
  - High speed imaging



# PXI Express Timing & Synchronization Backplane



# PXI Express Software Specification

- Adds system-level management software extensions:
  - System-level geographical addressing
  - Slot type / capability identification
  - Chassis monitoring (temperature, fan speed, etc)
- Retains software compatibility with PXI, CompactPCI, and other PCI-based devices

# PXISA Specification List

- [www.pxisa.org/Specifications.html](http://www.pxisa.org/Specifications.html)
  - [PXI-1 Hardware Specification Rev 2.2](#)  
[PXI - 1 Hardware Specification Rev 2.2 ECN-1](#)
  - [PXI-2 Software Specification Rev 2.3](#)
  - [PXI-4 Module Description Rev 1.0](#)
  - [PXI-5 PXI Express Hardware Specification](#)  
[PXI-5 PXI Express Hardware Specification Rev 1.0 ECN-1 Rev 2.0](#)
  - [PXI-6 PXI Express Software Specification Rev 1.1](#)

# PXI Express Summary

- PXI Express integrates PCI Express into PXI
  - Up to 18GBytes/s system bandwidth
  - Up to 6 GBytes/s backplane to host bandwidth
  - Up to 2 GBytes/s slot bandwidth
- PXI Express maintains backwards compatibility with PXI
  - Software compatibility
  - Hardware compatibility with hybrid slots and hybrid systems
- PXI Express opens new applications to the PXI platform

**Please E-Mail Questions to**  
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