PCIe Non-Transparent Bridging for RDMA

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Modern storage pushes interconnects

- Resilience and scale require multiple controllers
- Flash raises performance demands
RDMA is the answer

- Highest throughput, lowest latency
- Offloaded data movement frees CPU for storage services
- Kernel bypass avoids context switch overhead
InfiniBand checks all the boxes

- IB is *the* standard for RDMA in HPC
- However: features and complexity required to scale to 1000s of nodes are a disadvantage in storage systems
PCIe NTB as an alternative

- Today's CPUs integrate PCIe
- Non-transparent bridging allows direct links between independent CPUs
PCIe NTB as an alternative

- Today's CPUs integrate DMA engines
- Offload data movement to PCI
PCle NTB as an alternative

- Today's CPUs integrate IO virtualization (IOMMU)
- Linux vfio and similar allow kernel bypass
PCIe NTB as an alternative

- High throughput, low latency
- Offloaded data movement
- Kernel bypass
Experiences with PCIe NTB

- Performance can match and exceed IB
- Not widely used yet, may need to work around HW errata
- No RDMA stack available yet, need to write register-level code
Thanks!

Questions?