POC Requirements and use cases

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POC Requirements and use cases

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Why do a Proof-of-Concept

- Learn
- Reduce Risk
- Convince Skeptics
POC Unique Challenges

• Problem has to be hard enough that you expose the issues
• Solution has to be easy enough that you can do it fast
Multiple dimensions of POC

• Architectural
  − Validate interfaces protocols
  − Evaluate performance issues
  − Develop software programming models

• Physical
  − Explore chiplet integration and packaging
  − Validate power distribution
  − Develop high-speed I/O solutions

• Business
  − Force information sharing at a bare die-level
  − Exposing issues of sharing sensitive business metrics
  − Validate risk and value sharing models
Ambitious POC

- Smart Network Interface Card
  - A NIC that offloads work from the host CPU
  - Virtualization, SDN and NFV moved more networking tasks from hardware to software on the host...
    ... now we need to hardware accelerate those software tasks
  - Good candidate for POC because everyone wants a domain-specific accelerator, but lots of custom requirements and configurations

- To make it fun lets also cover Computational Storage Solutions
  - Another important category of domain specific accelerators
  - Leverage some of the same connectivity building blocks of Smart NICs
Smart NIC

- Programmable Engine Task
  - Match based on Src/Dst/transaction (go back to host software if no match)
  - Security checks
  - Optional TCP/IP and HTTP processing
  - Potentially simple substitutions in header
  - Potentially encrypt/decrypt

- Programmable Engine Requirements
  - Highly flexible because protocols and tasks change over time
  - Want low-latency and high-throughput

- Programmable Engine Implementation
  - Some combination of Configurable ASICs, CPU cores, and FPGAs
  - Configured as (a) part of NIC, (b) sidecar to NIC, or (c) bump in wire before NIC
POC

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
Major Units

- Network Processor
  - For networking support
- CPU module
  - For control plane
  - Storage connectivity
- FPGA
  - For data plane
Connectivity

• PCIe Gen3 x8 (64 Gbps)
  - To host
  - To represent chiplet link
• 40G Ethernet
  - Performance match to PCIe Gen3 x8
• DDR3 memory
POC

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC - NIC

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC – Bump-in-the-wire SmartNIC

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC – SmartNIC w/ data accelerator

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC – Computational Storage

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC – Computational Storage

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC - Alternative

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)
POC – SW Dev System

40G Ethernet copper
40G Ethernet optical
X8 PCIe G3 (64Gbps)

HOST

NETWORK

STORAGE

CPU

NFP

FPGA

DRAM

DRAM
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THANK YOU