Open Programmable (OPI) Project’s DPU/IPU Demos

Presentation Subtitle

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OPI – Quick Review

Standardizing DPU/IPU
- Easier to Deploy with OPI Provisioning
- Easier to Run & Maintain with OPI APIs

Well Defined Use Cases
- Use Case Today @ SDC:

Virtual Block Storage
Virtual Block Storage

Initiator – Target Design

Initiator:
Virtual Device Operations (Read/Write/Flush/etc.)
Packetized Over Network

Target:
Contains Disks
Applies Resiliency

Initiators - Current
OPI Storage Focus

Targets - Future
OPI Storage Focus

Physical Initiator Server

CPU

Container(s)
FIO or DB app running

PCle PF/ VF

PCle PF/ VF

D/ IPU

NVMeoF / NULL
iSCSI / Ceph / Debug

VLAN
IPSec
TLS

Switch

Emulated Nvme/PCle
or Virio (blk,scsi,fs)

Network Attached Storage
/ JBOF / eBOF
NVMeoF or iSCSI target

Initiators - Current
OPI Storage Focus

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Block Storage Initiator - Overview

Virtual Storage Devices Inside a Server

- No Server Footprint (Drivers Only)
  - Significant Core Savings
  - Simplifies Deployment

- Resilient, Migrate-able, Virtual Disks
  - Disks & Data follows the application
  - Built-in Redundancy & Data Integrity

- No Loss in Performance
  - SSD-level Performance
  - Hardware QoS

- Standard Drivers (NVMe, Virtio-blk/scsi)
OPI APIs Standardization

- Marvell Bridge
- Nvidia Bridge
- Intel Bridge
- Others Coming Soon

- Marvell DPUs
- Nvidia DPUs
- Intel IPUs
- Other DPU/IPUs
Let’s Try It!
OPI Storage APIs

**Front End** – Host Facing APIs
NVMe, Virtio-blk/scsi create, delete, limit, ...
Properties of controllers & disks
*Future*: Object & Filesystem Front End

**Middle End** – Storage Services APIs
Encryption, QoS, Compression, Resiliency,...
Logical Services for Virtual Devices

**Back End** – Network Facing APIs
Local Disks & Remote Targets
Transports (PCI, TCP, RDMA, ...)
Protocols (NVMe-o-TCP/TLS/Fabric, iSCSI, ...)

![Diagram](image-url)
OPI Storage APIs Demo

1. Device Creation
2. Remote Target Connect w/ Multipath
3. Device Level QoS Hardware Rate Limit
4. Hardware Disk Encryption
Coming Soon - OPI Lab

Access to DPU/IPUs donated by vendors
Provisioned and Programmed Using OPI Standards
Set up more complex use cases
  e.g.,
  DPU/IPU Infrastructure for AI Clusters

DPU/IPUs Enabling Cloud Native Wireless Core

Virtualized, Secure, High-Speed Networking & Storage
Summary

OPI Storage APIs running on Multiple DPU/IPU-based Systems
1. Block Device Management
2. Multipath Network Connectivity
3. Hardware QoS Limits
4. Hardware Crypto

More features exposed over time
OPI Lab to Build & Test Systems
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