



An Introduction to the OPI (The Open Programmable Infrastructure) Project

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Today's Presenters



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SNIA - By the Numbers

Industry Leading
Organizations



180

Active Contributing
Members



2,500

IT End Users &
Storage Pros
Worldwide



50,000

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Today's Agenda

- Introduction to OPI
- Lifecycle Provisioning
- API
- Use Cases
- Proof of Concept, Developer Platform





Introduction to OPI

Paul Pindell, F5



*The objective of the Open Programmable Infrastructure Project is to foster a community-driven standards-based **open ecosystem** for next generation architectures and frameworks based on **DPU/IPU-like technologies**.*

<https://opiproject.org>

<https://github.com/opiproject>

<https://lists.opiproject.org/g/opi>

Premier



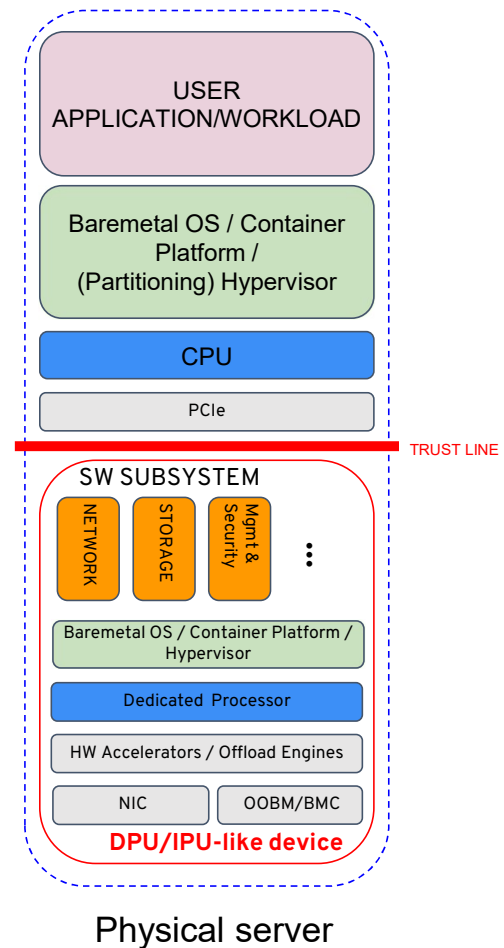
General





Project Goals

- Create community-driven standards-based open ecosystem for DPU/IPU-like technologies
- Create vendor agnostic framework and architecture for DPU/IPU-based software stacks
- Reuse existing or define a set of new common APIs for DPU/IPU-like technologies when required
- Provide implementation examples to validate the architectures/APIs





Lifecycle Provisioning

Boris Glimcher, Dell

Lifecycle Provisioning Focus Areas



PROVISIONING INVENTORY



BOOT
SEQUENCING



LIFECYCLE
MANAGEMENT



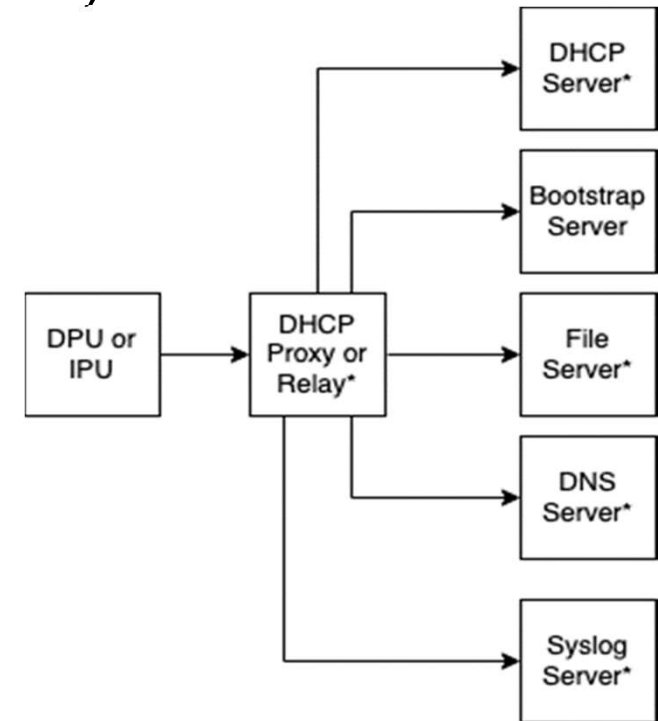
MONITORING &
TELEMETRY

Main repo : <https://github.com/opiproject/opi-prov-life>

Slack: <https://opi-project.slack.com/archives/C0342L6T7EC>

Provisioning

- Secure Zero-touch provisioning (sztp [RFC8572](#) standard)
 - Adding new “**Bootstrap**” server
- Security considerations
 - DPU Validation by the network
 - Network Validation by the DPU
 - Artifacts Validation (signed)
- Auxiliary RFCs
 - [IEEE 802.1AR - Secure Device Identity](#)
 - [RFC8366 - A Voucher Artifact for Bootstrapping Protocols](#)
- Implementing SZTP client/agent:
 - <https://github.com/opiproject/sztp>



Inventory

- Local inventory
 - DMI/SMBIOS standard
 - <https://www.dmtf.org/standards/smbios>
 - Compliance
 - <https://github.com/opiproject/smbios-validation-tool>
- Remote network inventory
 - Redfish standard
 - <https://www.dmtf.org/standards/redfish>
 - gRPC protocol buffers
 - <https://github.com/opiproject/opi-smbios-bridge>
- Remote host (OS and BMC)
 - NCSI, PLDM, VPD, ...
 - WIP



```
$ dmidecode -t system
```

```
Handle 0x0001, DMI type 1, 27 bytes
```

```
System Information
```

```
Manufacturer: https://www.mellanox.com
```

```
Product Name: BlueField SoC
```

```
Version: 1.0.0
```

```
Serial Number: Unspecified System Serial Number
```

```
UUID: 2e3bc1d1-e205-4830-a817-968ed1978bac
```

```
Wake-up Type: Power Switch
```

```
SKU Number: Unspecified System SKU
```

```
Family: BlueField
```

Boot Sequencing

- Boot Sequencing

- Host waits for DPU to complete booting
 - Host halted
 - DPU sends “boot complete” notification
 - Timeout in case no notification
- DPU reboots
 - PCIe DPC hostplug and surprise removal issues
 - Host needs notification from DPU
- Host reboots
 - DPU needs notification from Host (i.e., free resources)
- Crashes
 - both DPU and Host can panic



Lifecycle Management

- Required actions:
 - Reboot a DPU
 - Update:
 - DPU FW
 - DPU OS and Bootloaders
 - DPU SW/Apps
 - Recover DPU to a known state
 - i.e. factory reset
 - Via network & via Host
 - Debugging of the DPU



Monitoring & Telemetry

- Open Telemetry (OTEL) standard
 - <https://opentelemetry.io/>
- Supported data sources
 - Traces
 - Metrics
 - Logs
- Example OTEL collector with SPDK and System monitoring
 - <https://github.com/opiproject/opi-prov-life/tree/main/examples>
- Recommended OTEL collector deploy option:
 - On every DPU close to data generation
 - Increased redundancy, Enrichment, Filtering, Batching, Sanitization, ...



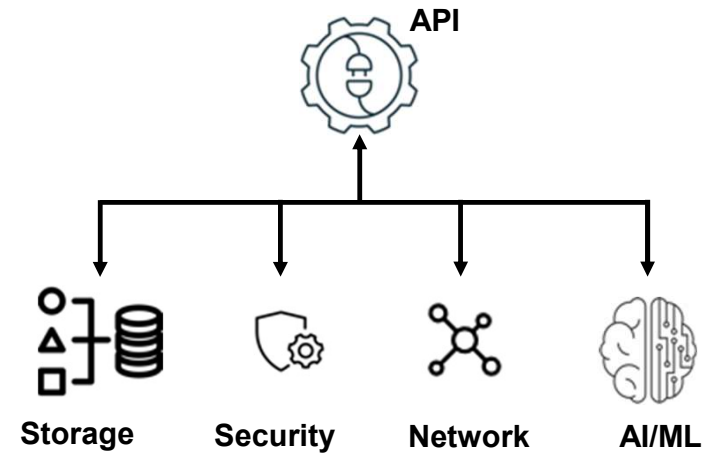


API

Mark Sanders, Dell

API Focus

- Create a Multi-Vendor Open API definition and adoption for:
 - Storage Services
 - Network Services
 - Security Services
 - AI/ML
 - Telemetry
 - System and Lifecycle Management
- Define control/management facing APIs
 - Inventory Discovery Service and Capabilities Advertisement API
 - Configuration API
 - Consumption API

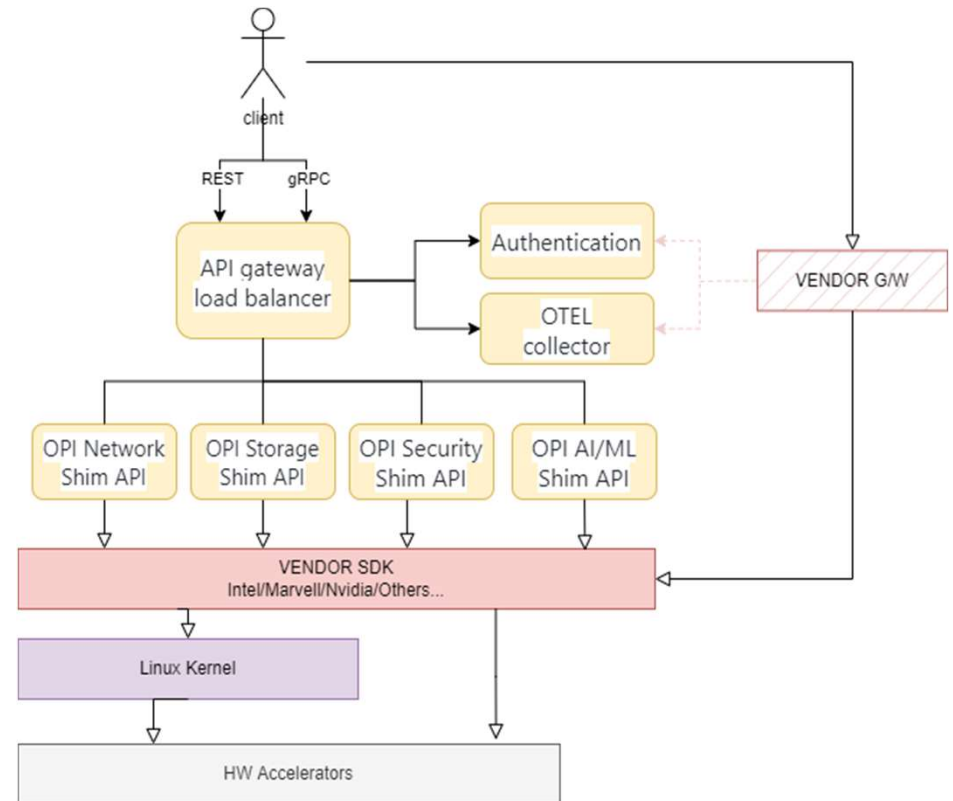


Main repo : <https://github.com/opiproject/opi-api>

Slack: <https://opi-project.slack.com/archives/C0344KMEAKB>

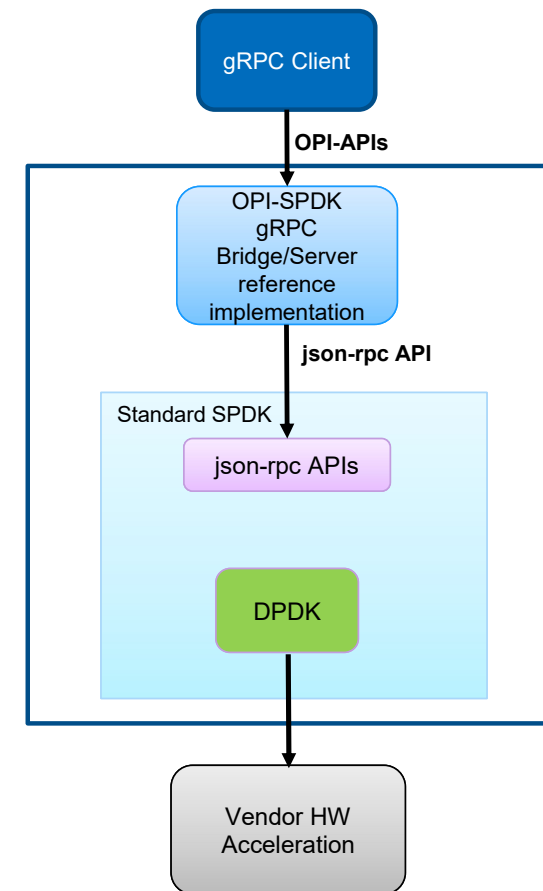
API Mechanism

- Utilize gRPC for the config/control interface
- Use API Gateway
 - Direct delivery of gRPC messages to appropriate shim layer
 - gRPC to REST translation
 - Support gNMI and gNOI
- Expose VF/PF for the data consumption interface



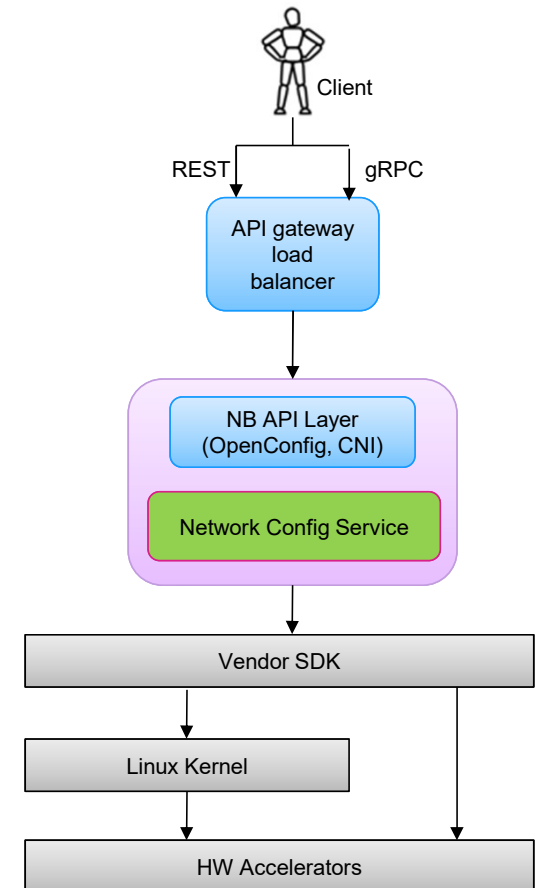
Storage

- Identified 3 sets of APIs for Storage
 - Front End
 - Host Facing APIs (emulated NVMe devices, Virtio-blk, Virtio-scsi, ...)
 - Middle End
 - Storage Services APIs (RAID protection, Compression Encryption, ...)
 - Back End
 - Network Facing APIs
 - Connects to devices locally (pcie) or remotely (iSCSI, RDMA, TCP, IPv4/v6, ...)
- Reference Implementation: OPI SPDK Bridge
 - <https://github.com/opiproject/opi-spdk-bridge>
- Vendor Reference Implementations
 - [opi-marvell-bridge](#)
 - [opi-nvidia-bridge](#)



Networking

- Create a common API framework and extensions for specific areas
 - Cloud
 - Telco
 - K8s
- Support network service capabilities
 - OVS, SONiC, VPP, ...
- Leverage existing API models
 - OpenConfig, OVS DB, CNI, ...
- <https://github.com/opiproject/opi-api/tree/main/network>



Security

- Address the security capabilities
 - Security Offloads (TLS, IPSec)
 - Crypto Offloads
 - Secure Storage and Key Functions
 - Policy and Filters
- Current focus is on IPSec API on top of strongSwan
 - <https://github.com/opiproject/opi-api/tree/main/security>
 - <https://github.com/opiproject/opi-strongswan-bridge>



Use Cases

Elad Blatt, NVIDIA

Use Case Focus:

- Create an open channel with the end users and potential deployment partners.
- Share the work being done by the subgroups and get feedback from the end users and deployment partners.
- Encourage more end users and deployment partners to contribute, take part, and join.
- Alignment to project goal(s)
 - By engaging with and seeking input from end users and deployment partners, the Use Case subgroup will help by validating the implementation examples, architectures, and APIs being worked on in the other subgroups.
 - This will also help build the open community to include additional contributors and members.

Use Case discussions:

We have identified 3 main groups of features that have generated the most interest :

- 1) Routing/Switching – OVS , BGP's , SR , Encap/decap etc
- 2) Security – WAF, NGFW, IPSEC , DDOS etc
- 3) Storage – NVMe oF , oTCP , RDMA , SPDK support etc

Initial Use cases defined :

Security – Basic FW , rule-based filtering .

Storage - Nvme/Pcie to Nvme/Tcp bridge.

Routing – OVS and looking into K8 networking .



Proof of Concept, Developer Platform

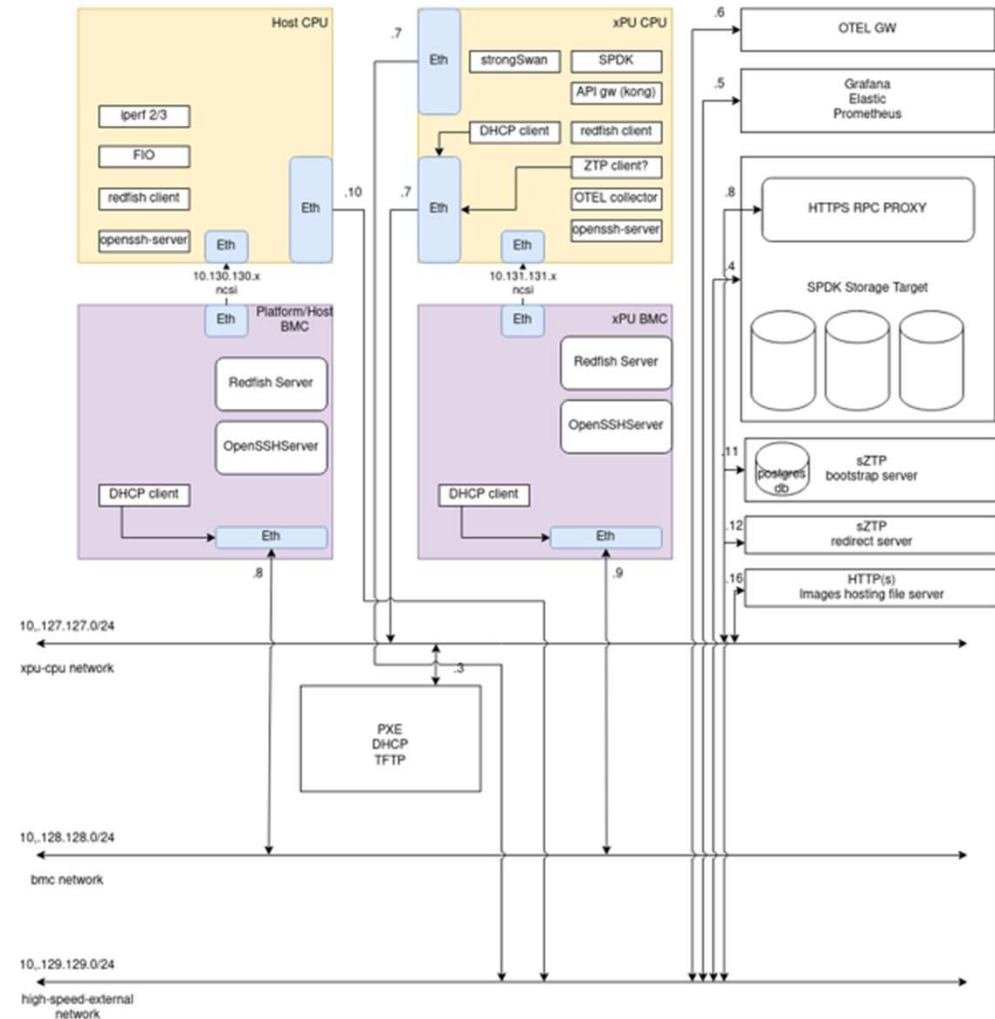
Steven Royer, Red Hat

PoC Focus

- Simulation environment and CI
 - <https://github.com/opiproject/opi-poc/blob/main/integration/README.md>
- Lab definition
 - Building a lab to be used for real hardware environments
- <https://github.com/opiproject/opi-poc>

Simulation

Real services run in containers via docker-compose





Join the Project

Anyone can participate and contribute to the OPI Project

1. **To Participate**, check out the [OPI Mailing List](#), and the [OPI Slack channels](#).
 - a. Join the subgroup lists and channels in which you would like to participate.
 - b. Join the project meetings via the invites found [here](#).
2. **Contribute** by following the steps [here](#) on GitHub.
3. **Become a Member** and support the OPI Project at the Linux Foundation [link](#).
 - a. Open Programmable Infrastructure would not exist without the support of the member organizations.

Q&A

After this Webcast

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- A Q&A from this webcast, including answers to questions we couldn't get to today, will be posted on our blog at <https://sniansfblog.org/>
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Thank You