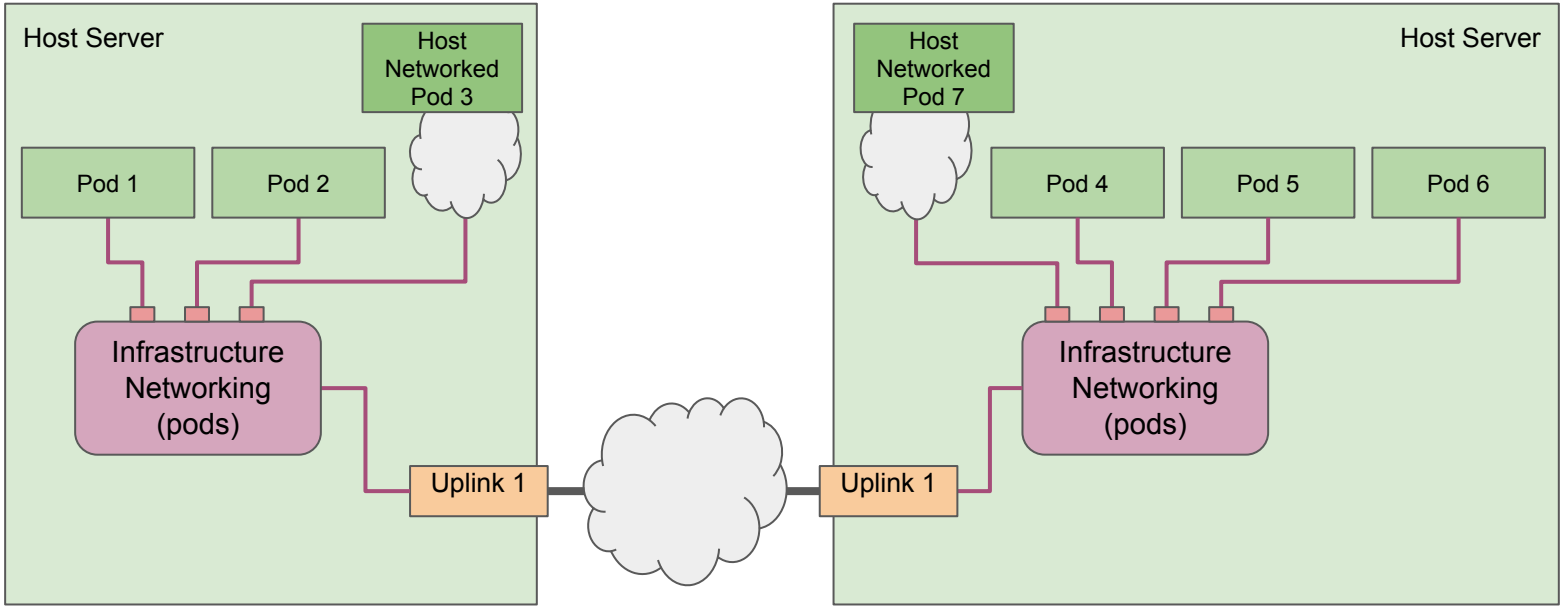
Kubernetes Scenarios
Network OPI API

Feb, 2023

K8s Scenario Overview



Goal: show at a high level the actors, use cases and scenarios to consider when referencing offloading Kubernetes Networking Infrastructure (as shown above) and accelerating services via xPU.

These slides:

- Do not represent a specific deployment scenario.
- Do not specify where the Networking Infrastructure Control Plane resides unless noted.
- Do not specify the number of clusters or their configuration.
- Do not specify the details of the APIs.

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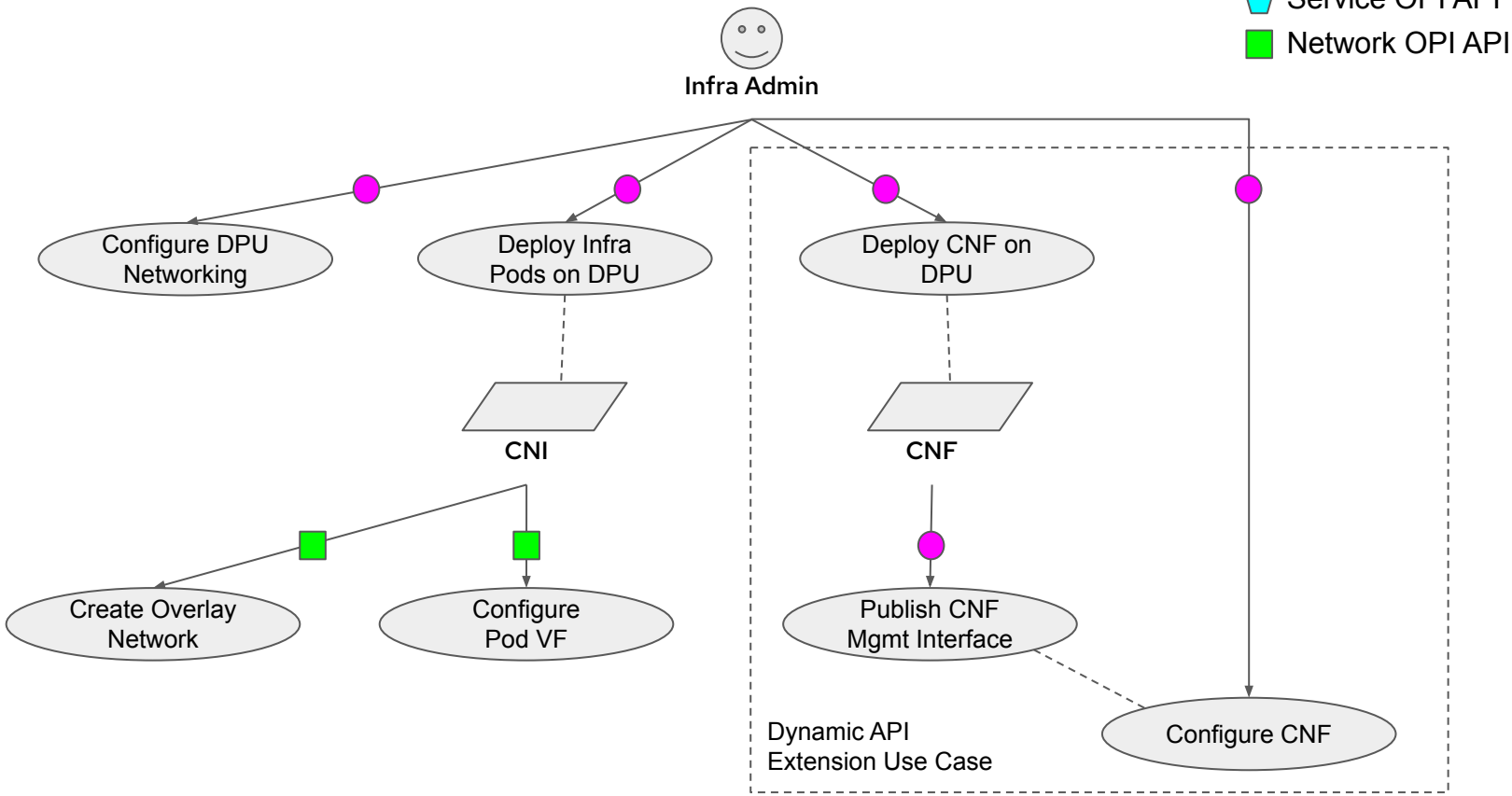
Actors and Use Cases – Infrastructure



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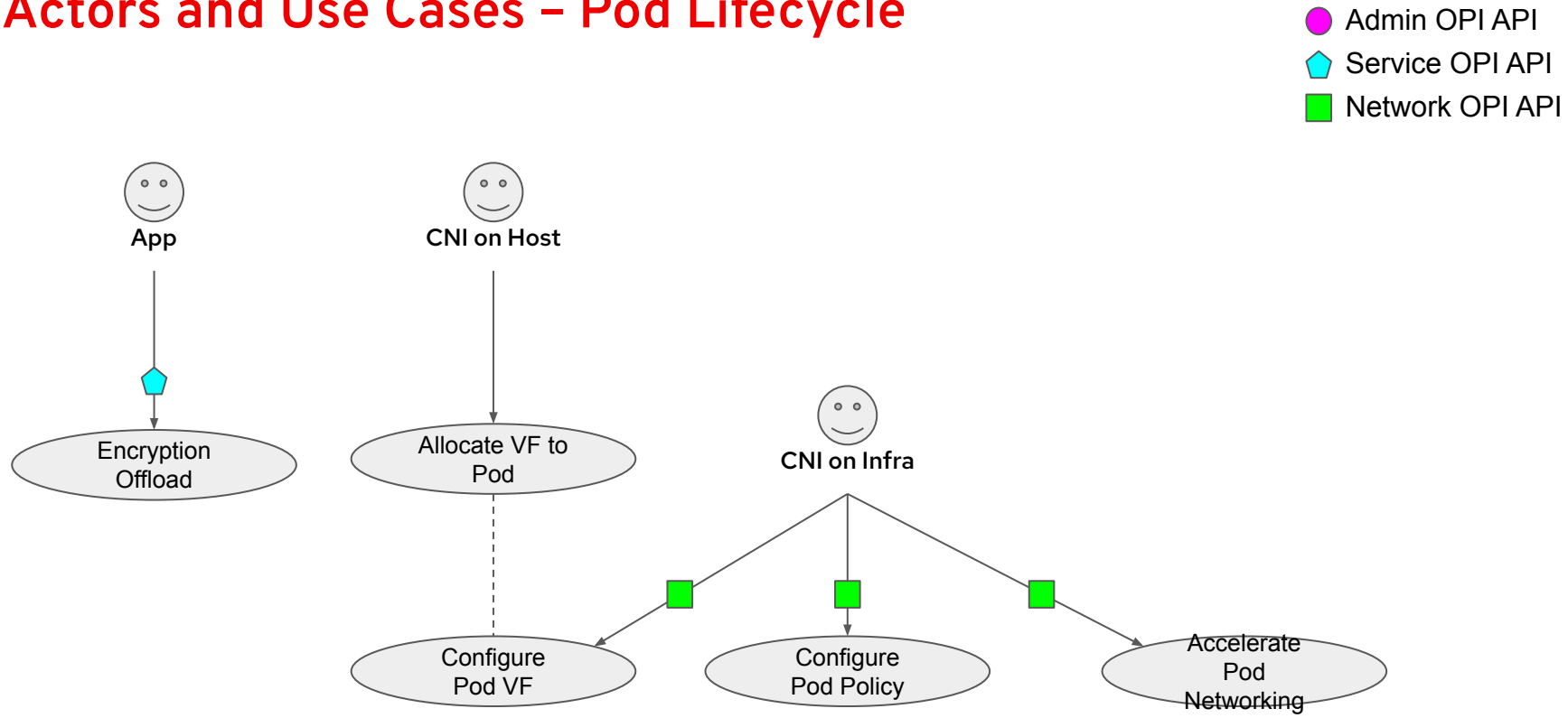
Actors and Use Cases – Pod Lifecycle



Scenario 1: Offload K8s Infrastructure Networking

Example: Brownfield*, i.e. Existing CNIs.

Initially they may not use any Hardware acceleration.

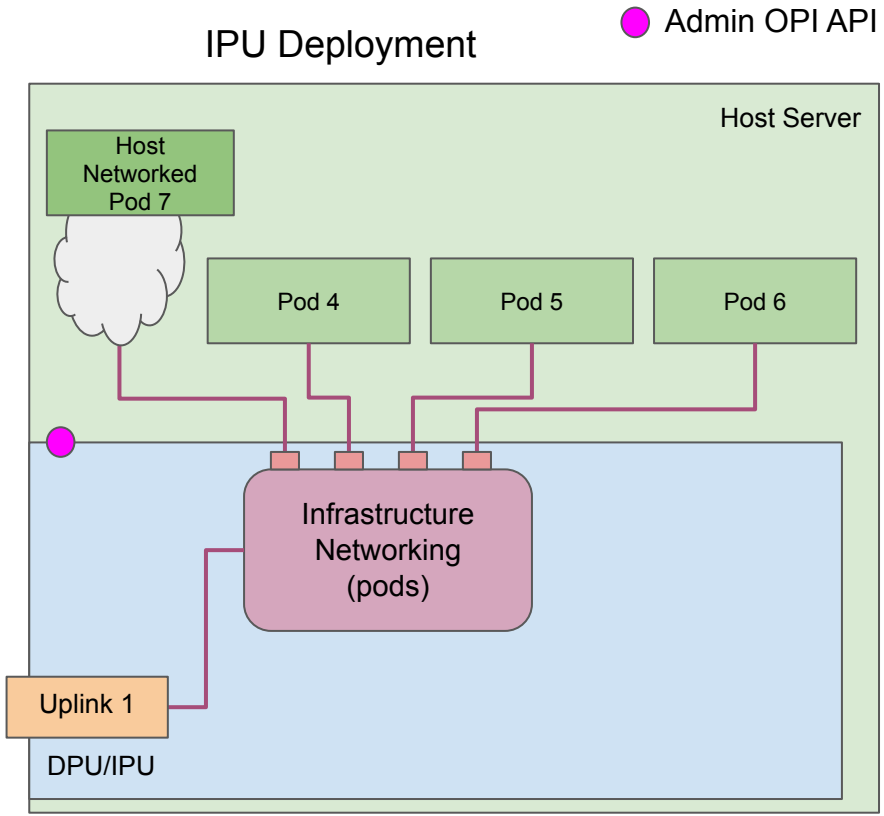
Note: The full CNI is offloaded to the DPU/IPU.

Admin OPI API:

- DPU network configuration
- Probably minimal OPI-API.

Opens:

- How do Interfaces get exposed to the Host and how are they selected and mapped to pods?
- Are the interfaces VFs/Sub-Functions/Scalable Functions/Other?
- OPI-API or OPI-Lifecycle Management or other?
- CNIs likely to require changes for this to work.



Note: Diagrams are logical views.

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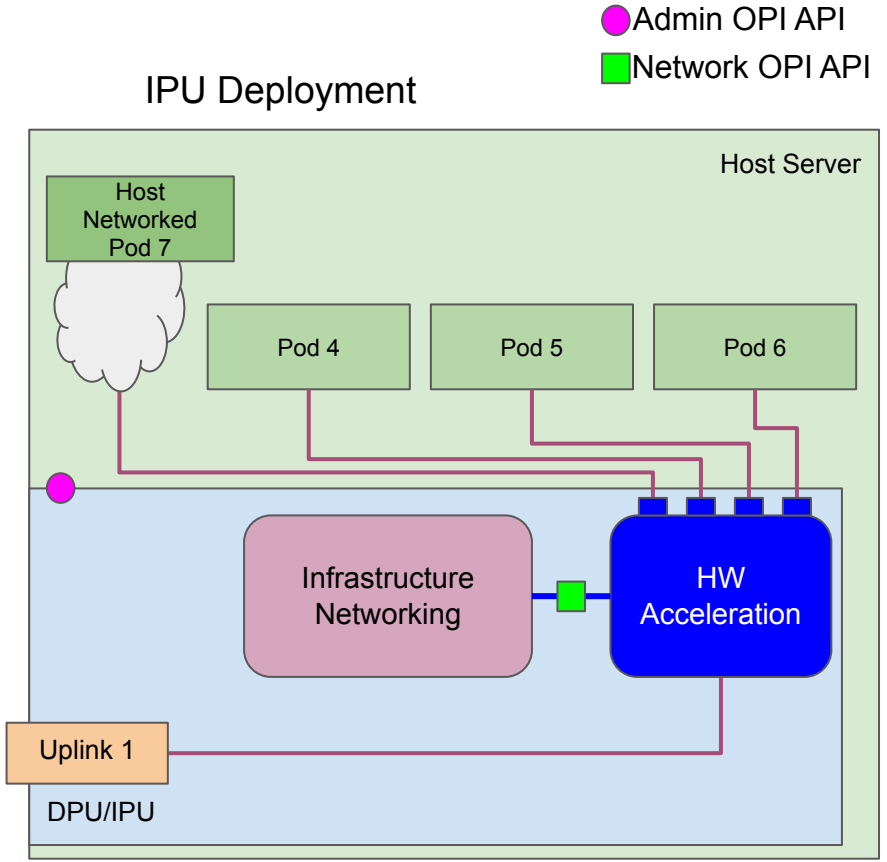
Scenario 2: Offload + Accelerate K8s Infrastructure Networking

Example: Infra Network packet processing fully offloaded to hardware acceleration calling Network Intent API.

Note: Infrastructure networking control plane could run either on the Host or on the DPU.

Network OPI API:

- High level, program full data model using this OPI-API.
- Network API should align closely with netlink.
- Could be a set of layered APIs.



Note: Diagrams are logical views.

Scenario 3: Accelerate K8s Application/Service

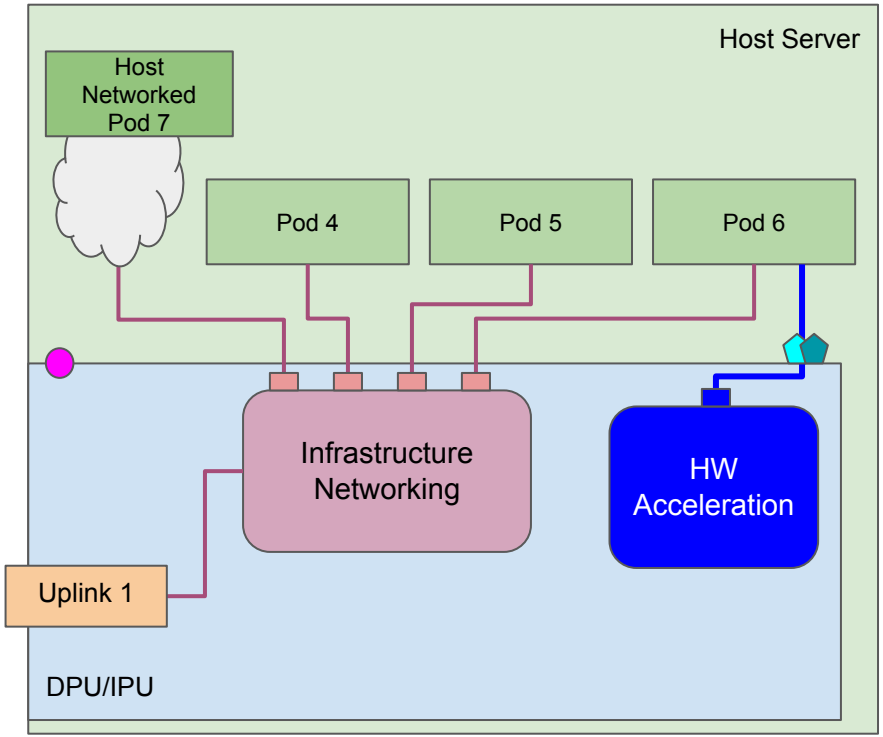
Admin OPI API
Service OPI API
Service CP OPI API

Example: Application workload leveraging acceleration directly (encryption/compression/etc).

Service OPI API: Lower Level API exposing specific acceleration functions (SDK?).

Opens:
- Is the service API actually 2 APIs, 1 control and 1 more data processing based API?
- Is this more like the existing storage API

IPU Deployment



Note: Diagrams are logical views.

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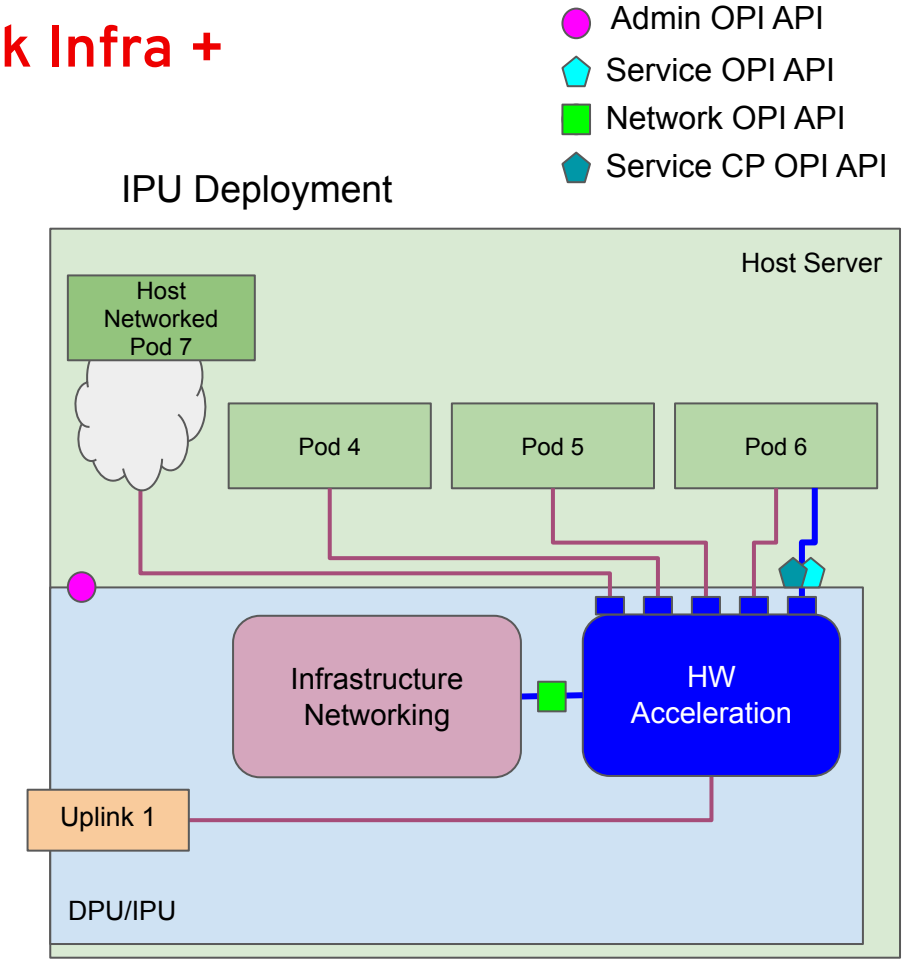
Scenario 4: Accelerate K8s Network Infra + Application/Service

Example: Combination of Use Case 2 & 3.

Programing full data model using OPI-API, with low level acceleration exposed to pods as needed.

Note: Infrastructure networking control plane could run either on the x86 Host or on the DPU.

OPI APIs: Same as Scenario 2 & Scenario 3.



Note: Diagrams are logical views.

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Scenario 5: Infra Application

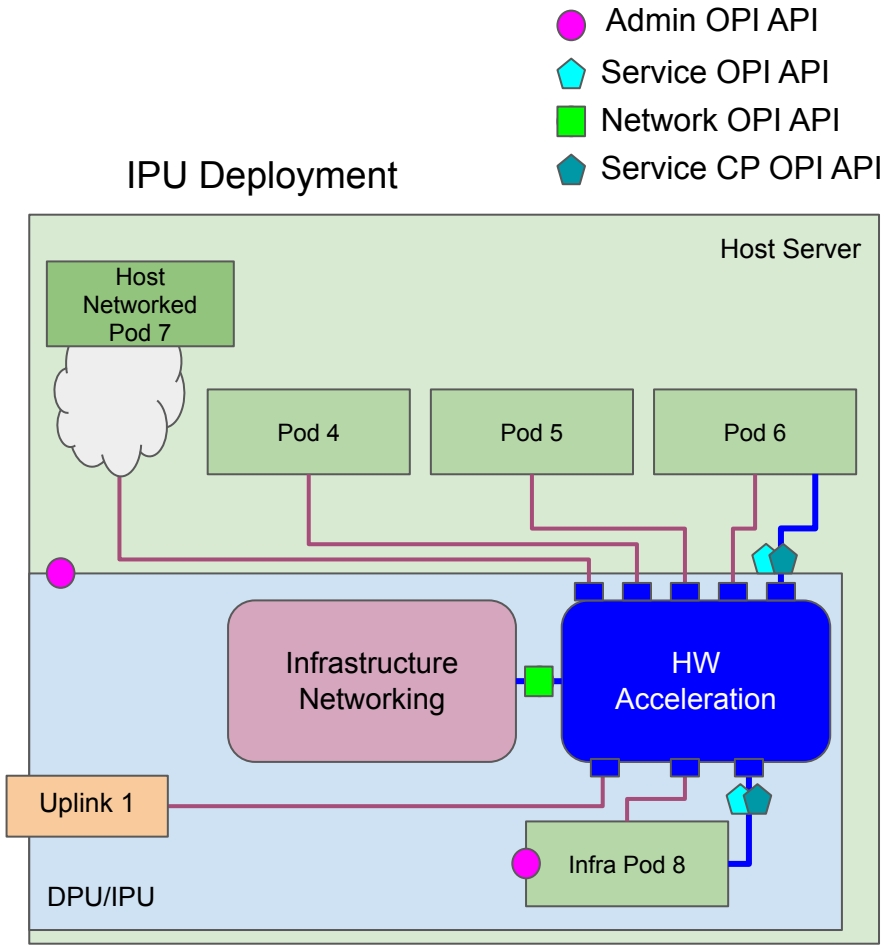
Example: Run Infrastructure Pods on the DPU/IPU (Firewall/Load Balancer/SubFunction Chaining). May or may not take advantage of acceleration.

Note: Infrastructure networking control plane could run either on the x86 Host or on the DPU.

OPI-API: Same as Scenario 2 & Scenario 3.

Opens:

- Need to be able to plumb interfaces into pod. Are these interfaces different than the interfaces exposed to the host?



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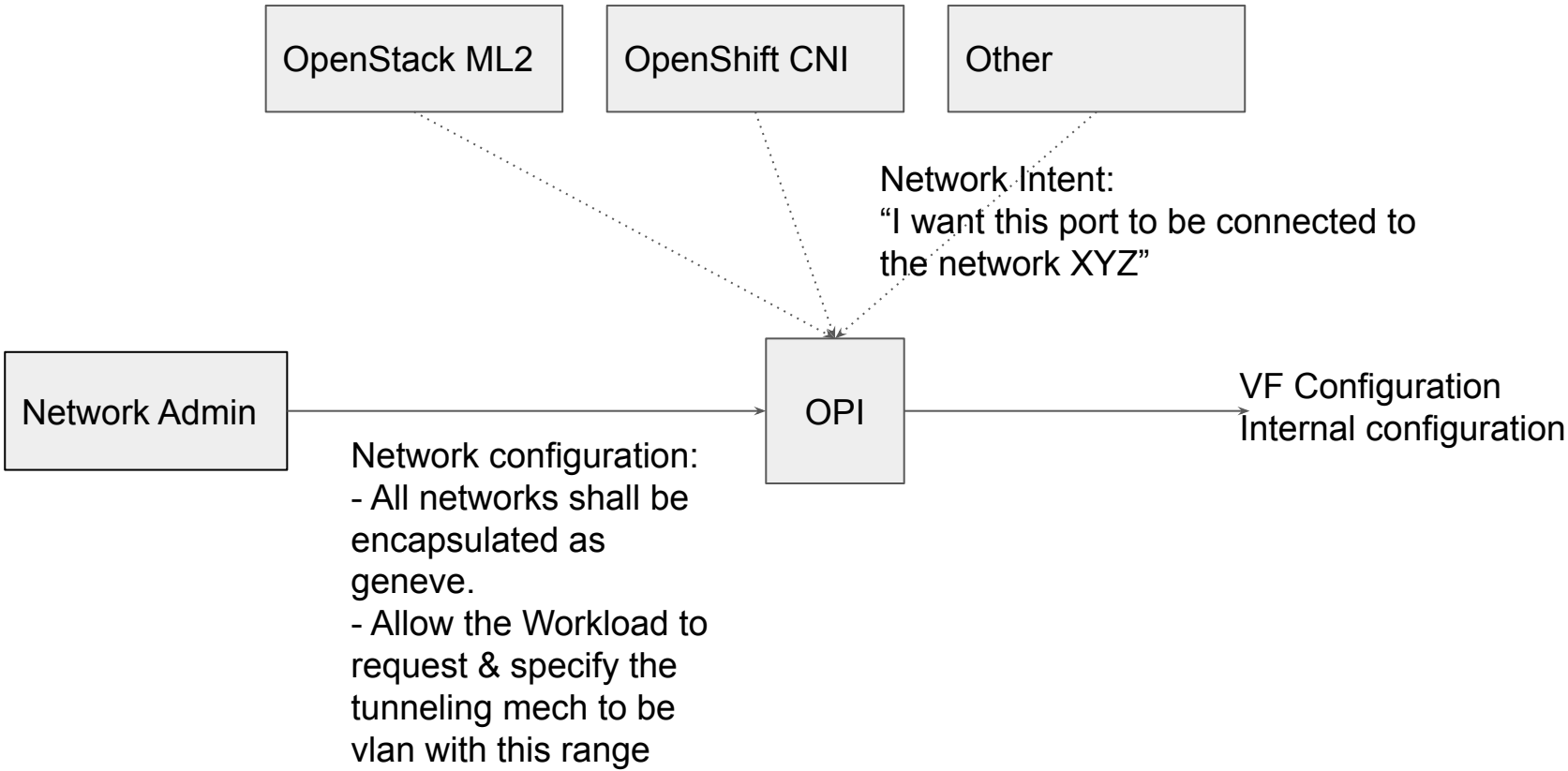
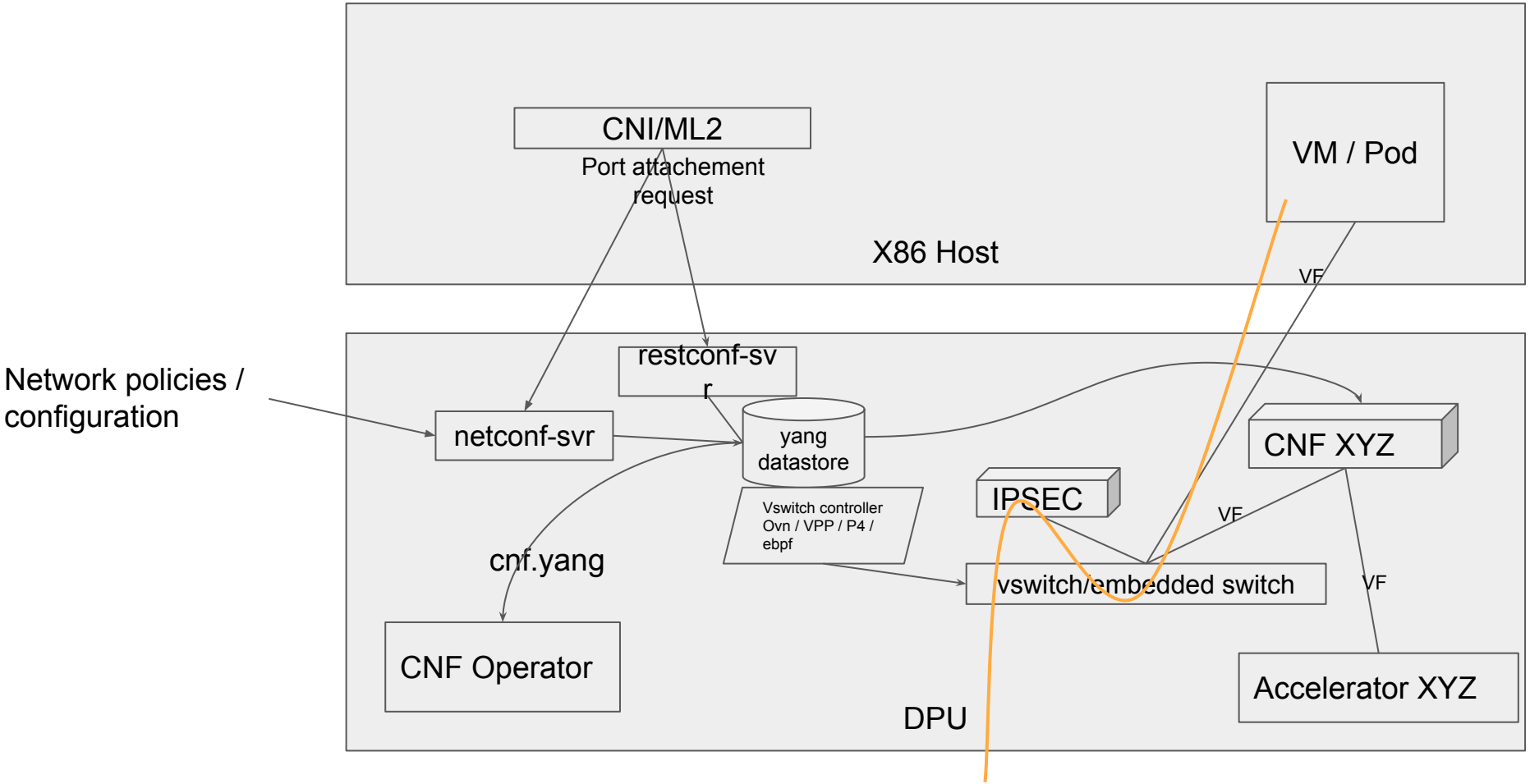

OpenStack ML2
OpenShift CNI
Other
Network Intent:
“I want this port to be connected to the network XYZ”
Network Admin
OPI
VF Configuration
Internal configuration
Network configuration:
- All networks shall be encapsulated as geneve.
- Allow the Workload to request & specify the tunneling mech to be vlan with this range


CNI/ML2
Port attachement request
VM / Pod
X86 Host
VF
Network policies / configuration
restconf-svr
netconf-svr
yang datastore
CNF XYZ
Vswitch controller
Ovn / VPP / P4 / ebpf
IPSEC
VF
cnf.yang
vswitch/embedded switch
VF
CNF Operator
Accelerator XYZ
DPU