
AMAZING
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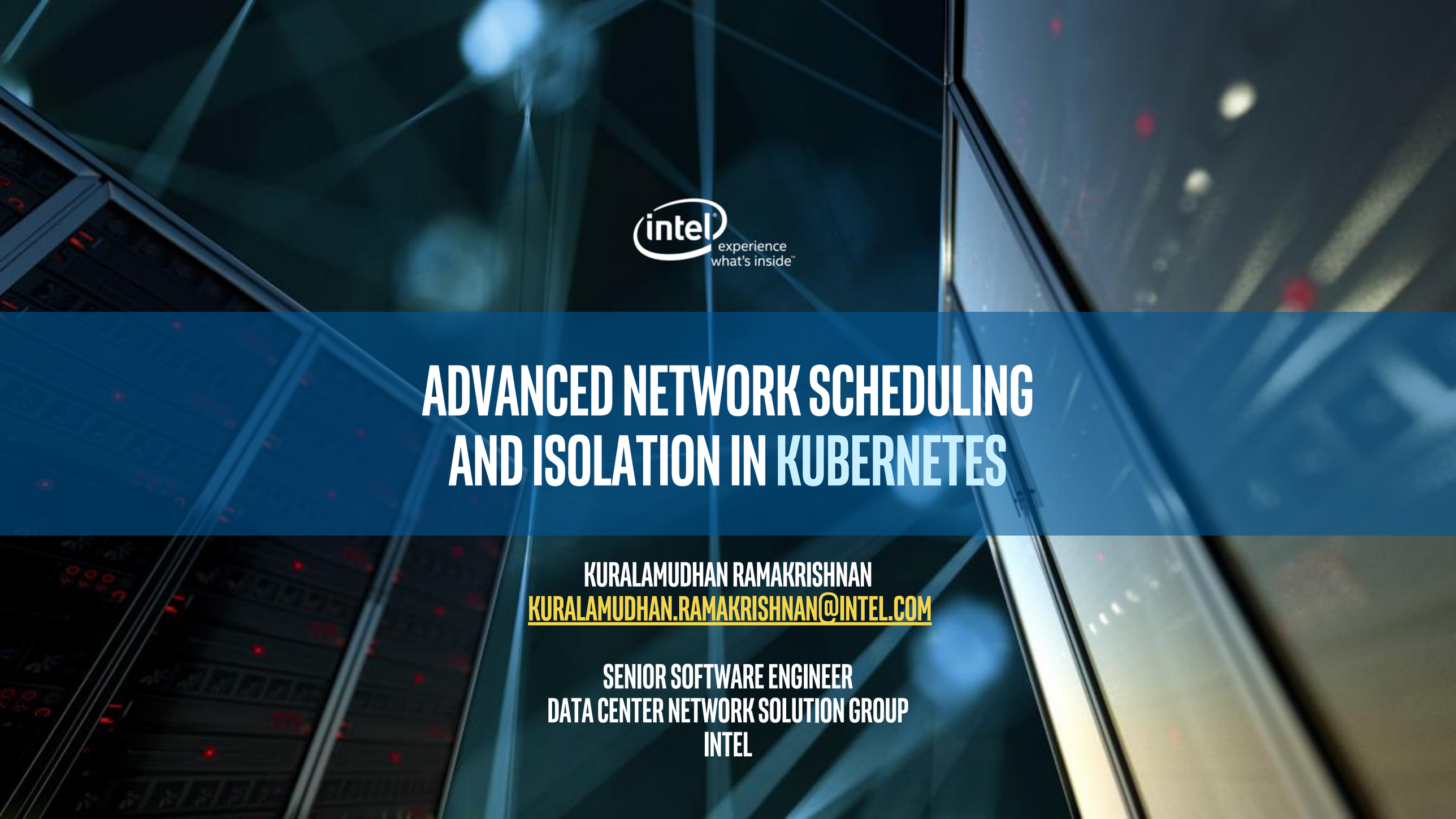

ADVANCED NETWORK SCHEDULING AND ISOLATION IN KUBERNETES

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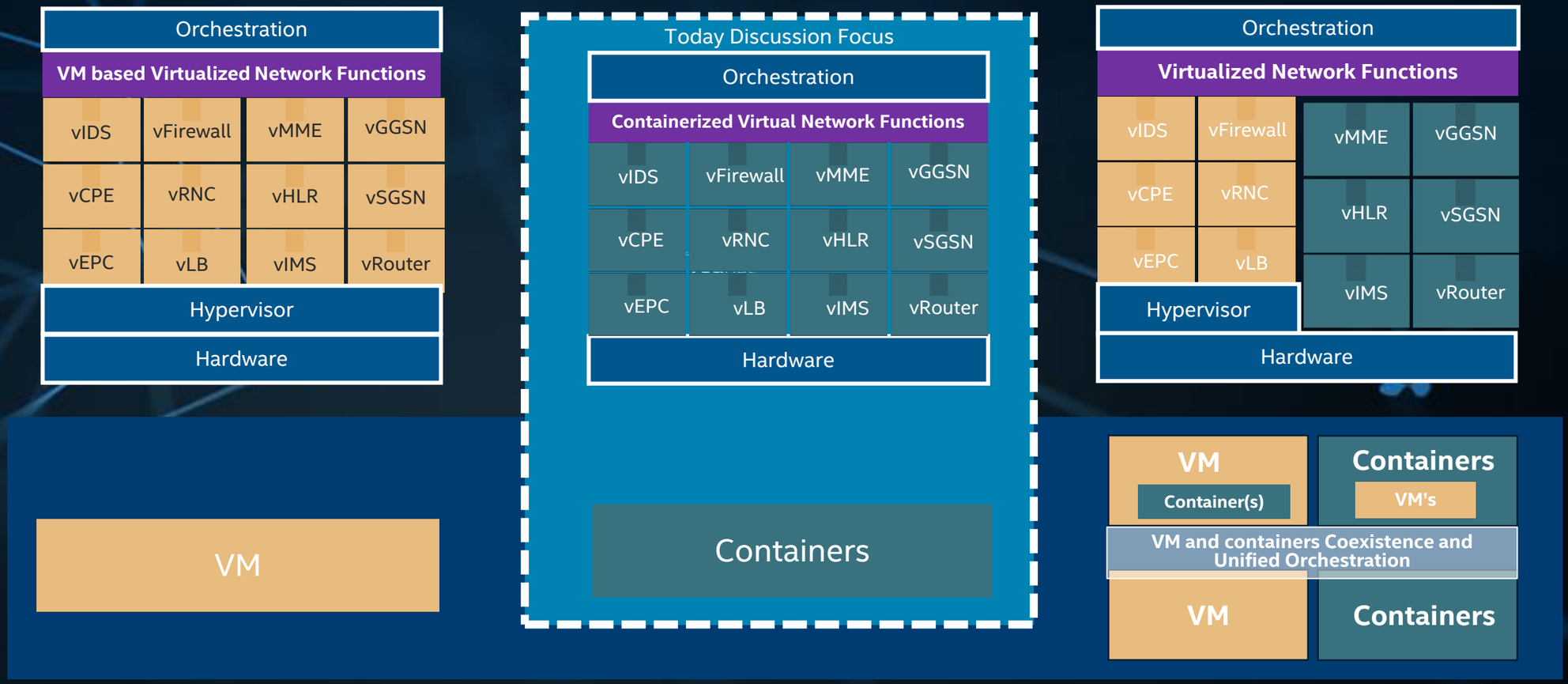
WHAT WILL YOU LEARN TODAY?

- Containers in the NFV ecosystem
- Introduction to Kubernetes and CNI
- Kubernetes Networking and Scheduling Challenges
- Advanced Networking Solution for Kubernetes
- Summary and Next Steps
- High Performance Networking Demo

VIRTUALIZATION OF NETWORK FOR SDN/NFV – MULTIPLE DEPLOYMENT MODELS



CONTAINERS IN NFV ECOSYSTEM

VNF Deployment model

VM

Containers

VM
Container(s)

Coexistence and Unified Orchestration

VM | Containers

VNFs

vEPC	vNAT	vIMS	vRouter	vGGSN	vFirewall
vCPE	vRNC	vHLR	vSGSN	vMME	vIDS

NFVi- Network

OvS Open vSwitch | .io | DPDK | SR-IOV

NFV Orchestration

ONAP OPEN NETWORK AUTOMATION PLATFORM | Open Source MANO

kubernetes by Google | openstack™

OPEN DAYLIGHT | OVN (Open Virtual Network)

KUBERNETES INTRODUCTION

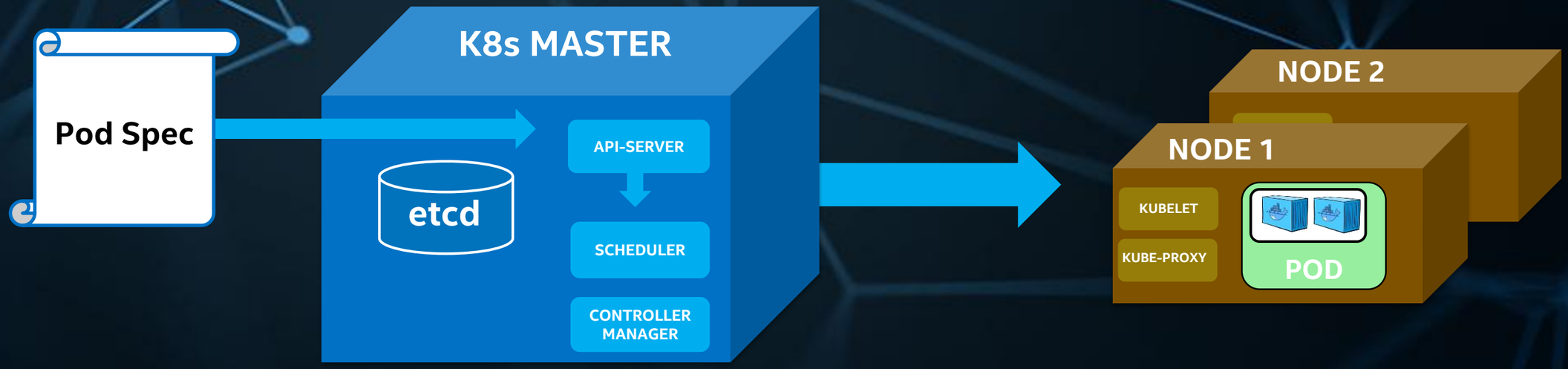
Open-source Platform for containerised applications

Automates Deployments

Manages application lifecycle and Scaling

Originated from Google and contributed to Cloud Native Computing Foundation (CNCF)

BUILDING BLOCKS OF KUBERNETES



KUBERNETES NETWORKING VIA CNI

Management

Containers Node - Environment

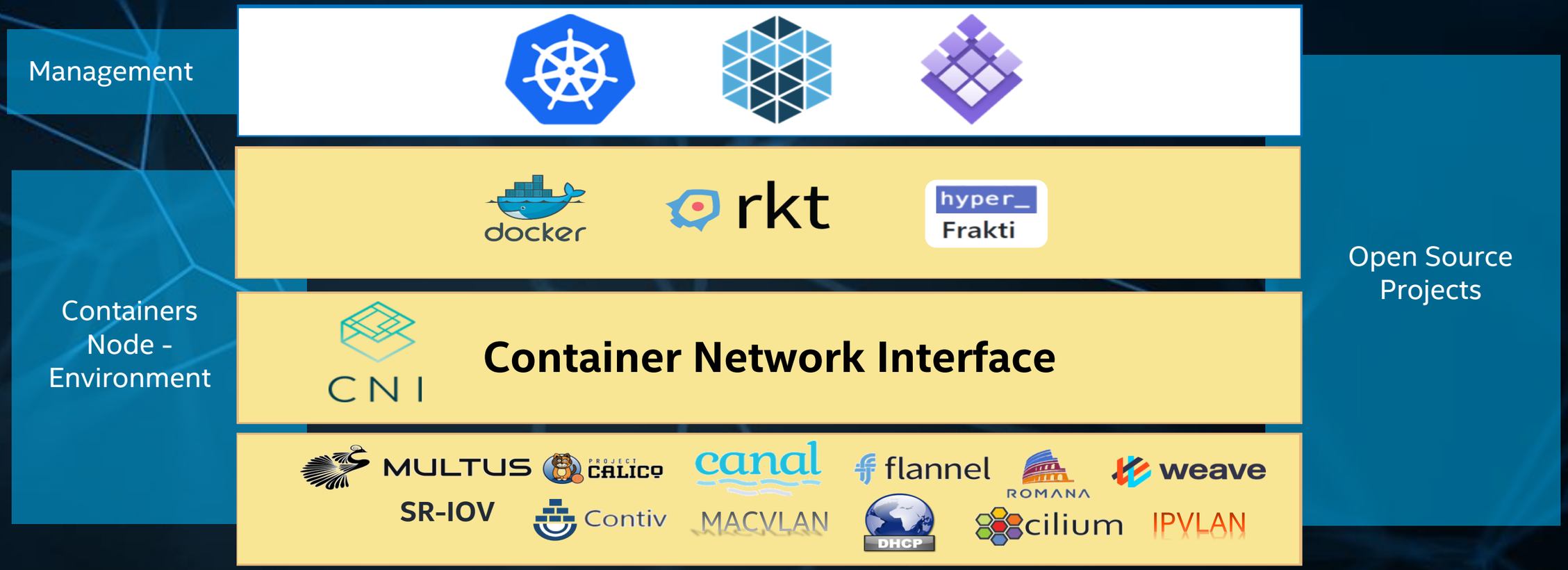
Container Orchestration Engines

Container Runtime

Container Network Interface

Container Network Interface Plugins

KUBERNETES NETWORKING VIA CNI



INDUSTRY CHALLENGES

- Multiple network interfaces for VNFs
- Support for resource isolation
- Support for Data Plane Networking
- Ability to request/allocate platform capabilities
- Support for CPU Core pinning for Kuryr-K8s pods

MULTIPLE NETWORK INTERFACES

PROBLEM

Lack of multi-network support in k8s

No network traffic separation for management, control and data planes.

No ability to Implement different network SLAs

SOLUTION

Introducing MULTUS as a CNI plugin to support multi-homed pods in k8s

Working on Multiple Network proposal in Kubernetes Network SIG

REFERENCE

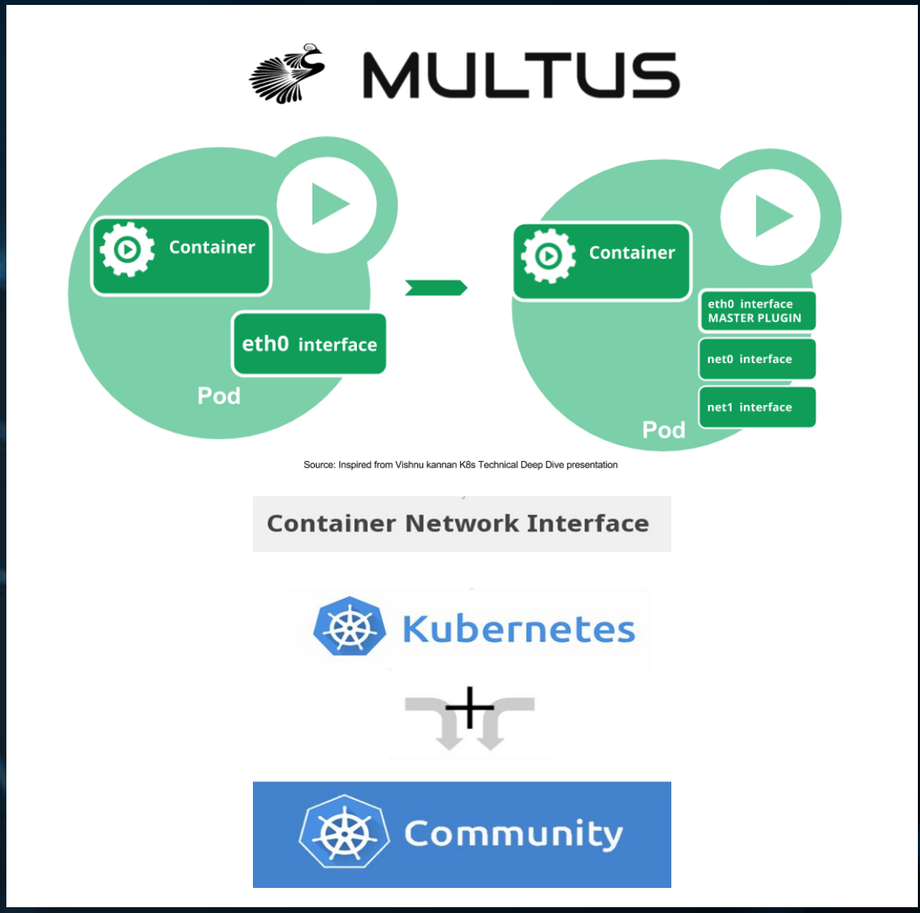
https://github.com/Intel-Corp/multus-cni

Multus CNI referenced in the following:

Containers in NFV, March 2017 Peter Willis, BT

Enter Multus CNI, Feb. 2017 Doug Smith, RedHat

A Hacker's Guide to Kubernetes Networking, Feb 2017, Yaron Haviv, Iguazio



SRIOV CNI PLUGIN

PROBLEM

Lack of support for physical platform resource isolation

No guaranteed network IO performance

No support for Data Plane Networking

SOLUTION

Allows SRIOV support in Kubernetes via a CNI plugin

Intel contributor and maintainer of SR-IOV CNI plugin

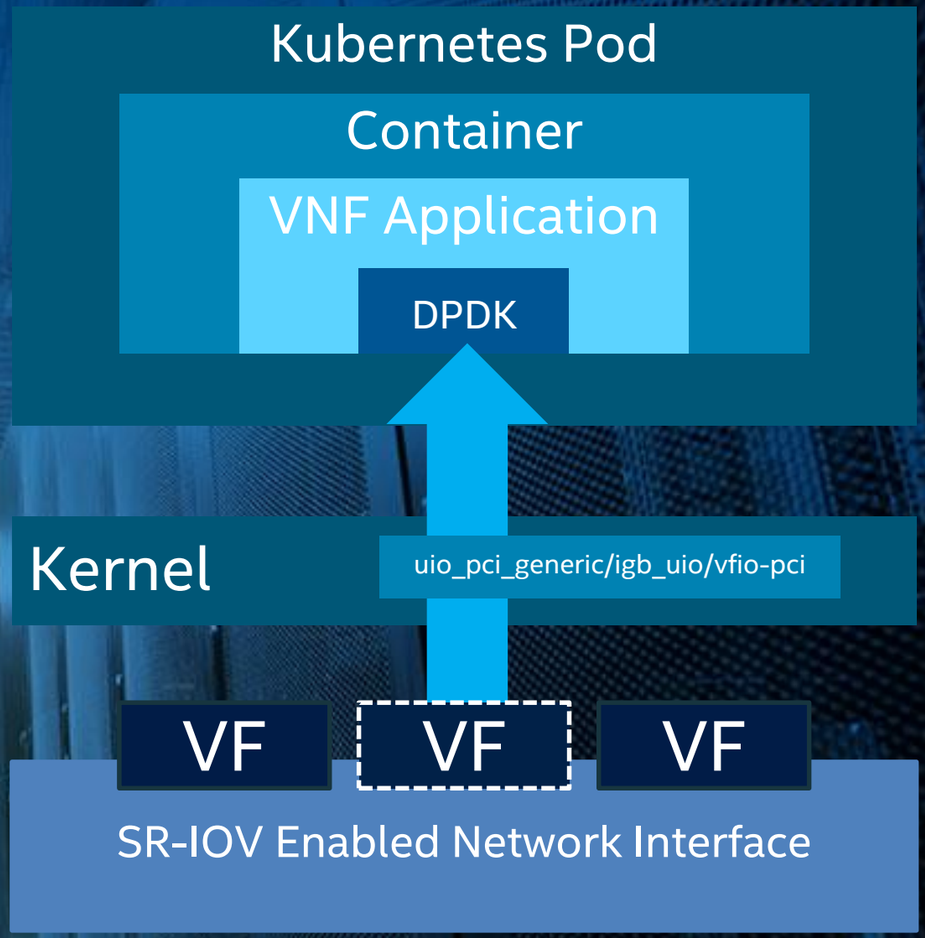
Supports two modes of operation:

SR-IOV : SR-IOV VFs are allocated to pod network namespace

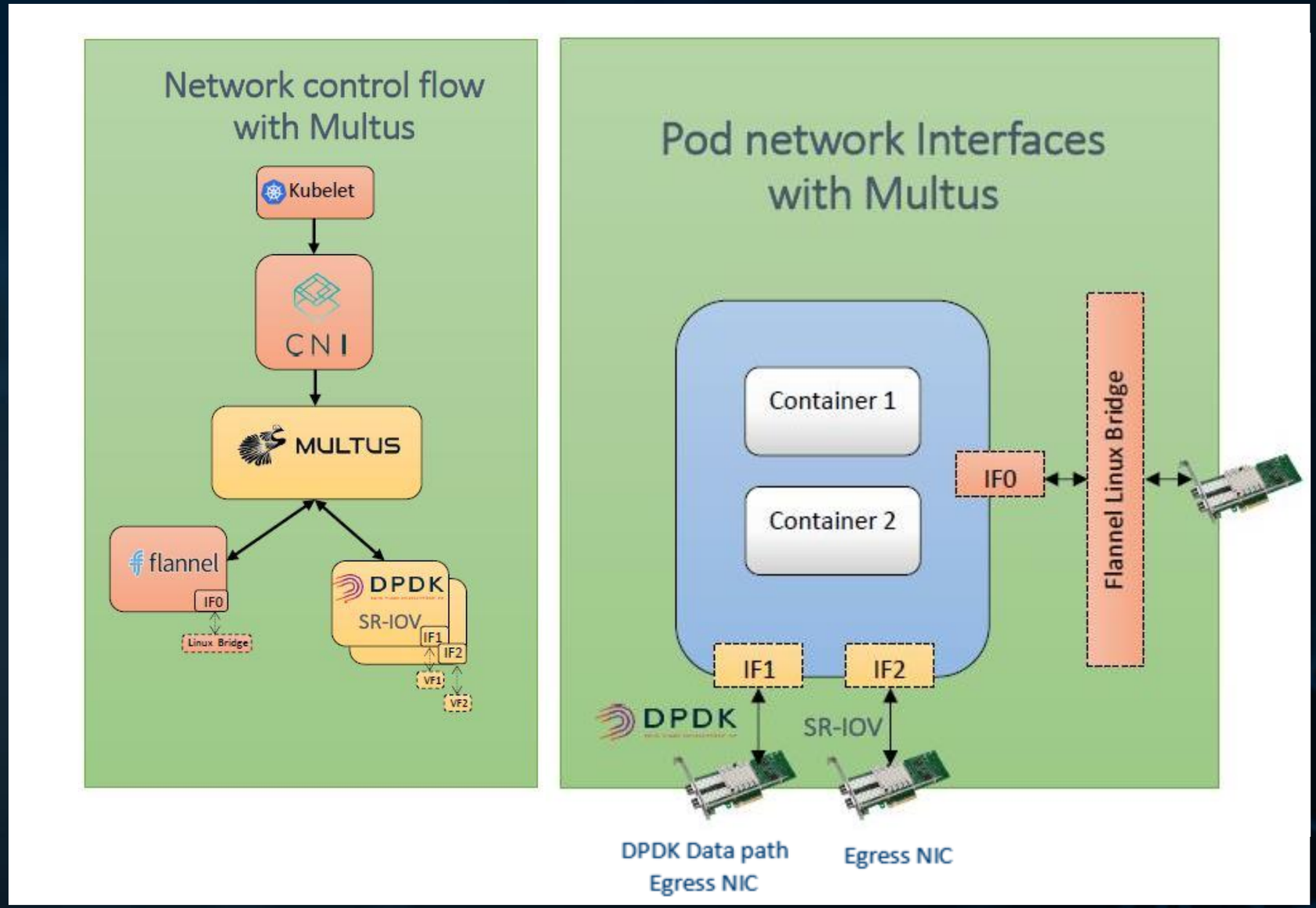
DPDK : SR-IOV VFs are bounded to DPDK drivers in the userspace

REFERENCE

https://github.com/Intel-Corp/sriov-cni



MULTI HOMED POD WITH MULTUS AND DPDK-SRIOV CNI PLUGIN

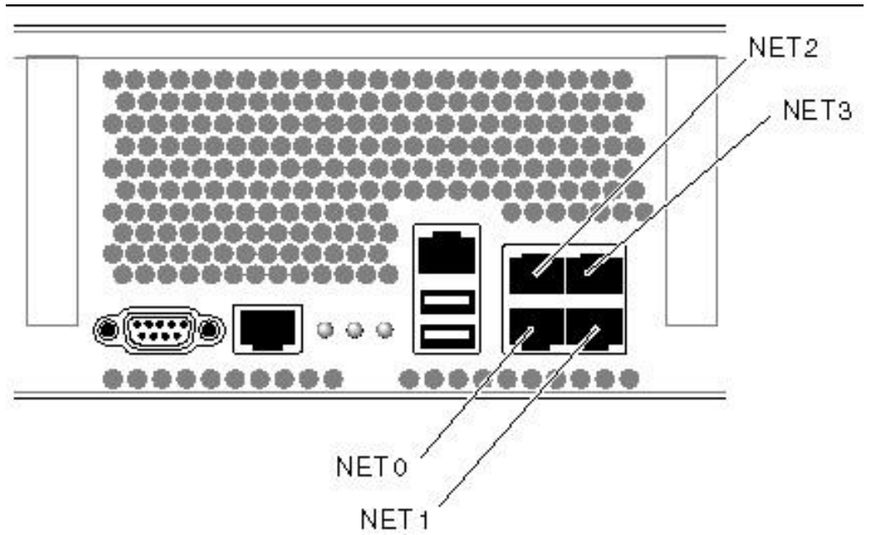


MULTUS & DPDK CNI PLUGIN CONFIGURATION FILE DETAILS

Multus CNI with DPDK-SRIOV CNI

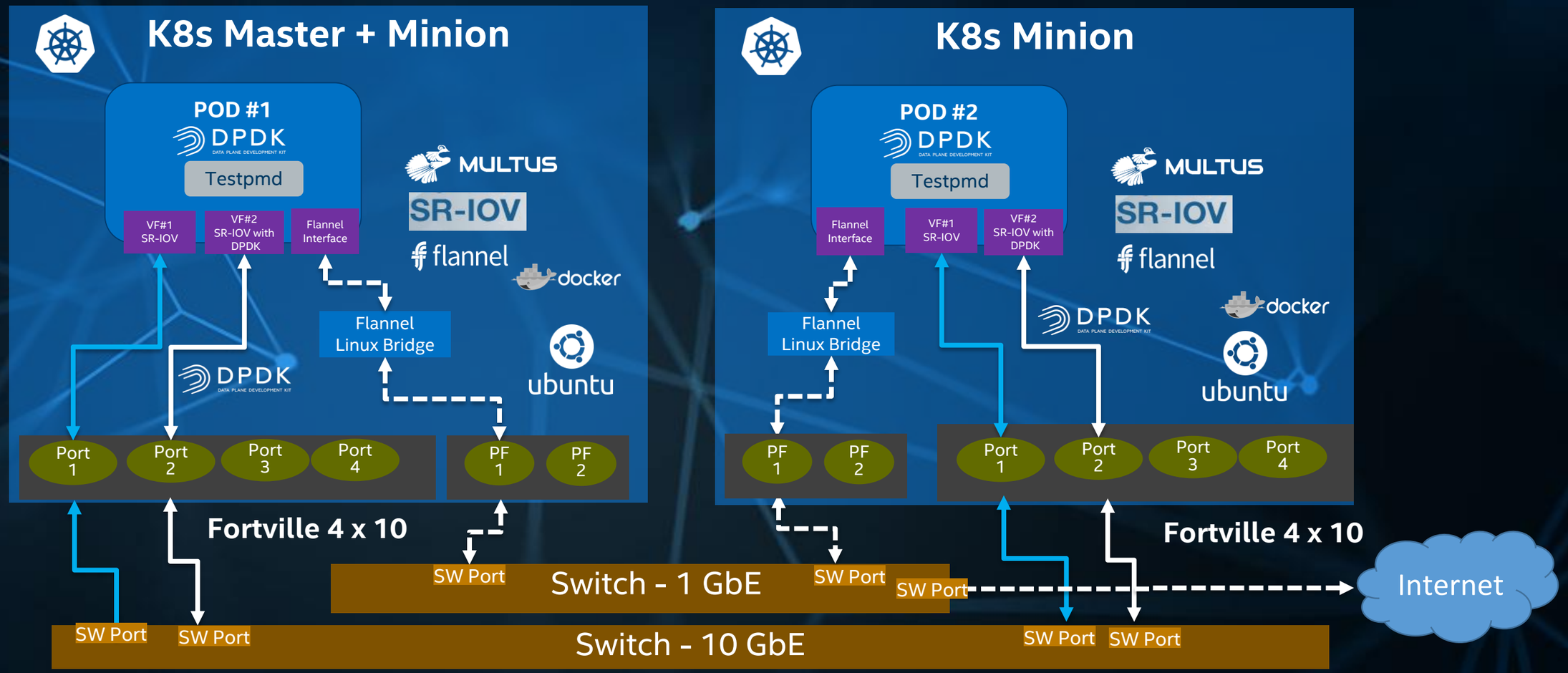
```
{
  "name": “dpdk-demo-network",
  "type": "multus",
  "delegates": [
    {
        "type": "sriov",
        "if0": “net2",
        "if0name": "south0",
        "ipam": {
            "type": "host-local",
            "subnet": "10.56.217.0/24",
        }
    },
    {
        "type": "sriov",
        "if0": “net3",
        "if0name": "north0",
        "dpdk": {
            "kernel_driver":"ixgbevf",
            "dpdk_driver":"igb_uio",
            "dpdk_tool":“.../dpdk/tools/dpdk-devbind.py"
        }
    },
    {
        "type": "flannel",
        "masterplugin": true,
        "delegate": {
            "isDefaultGateway": true
        }
    }
  ]
}
```

In the server backend

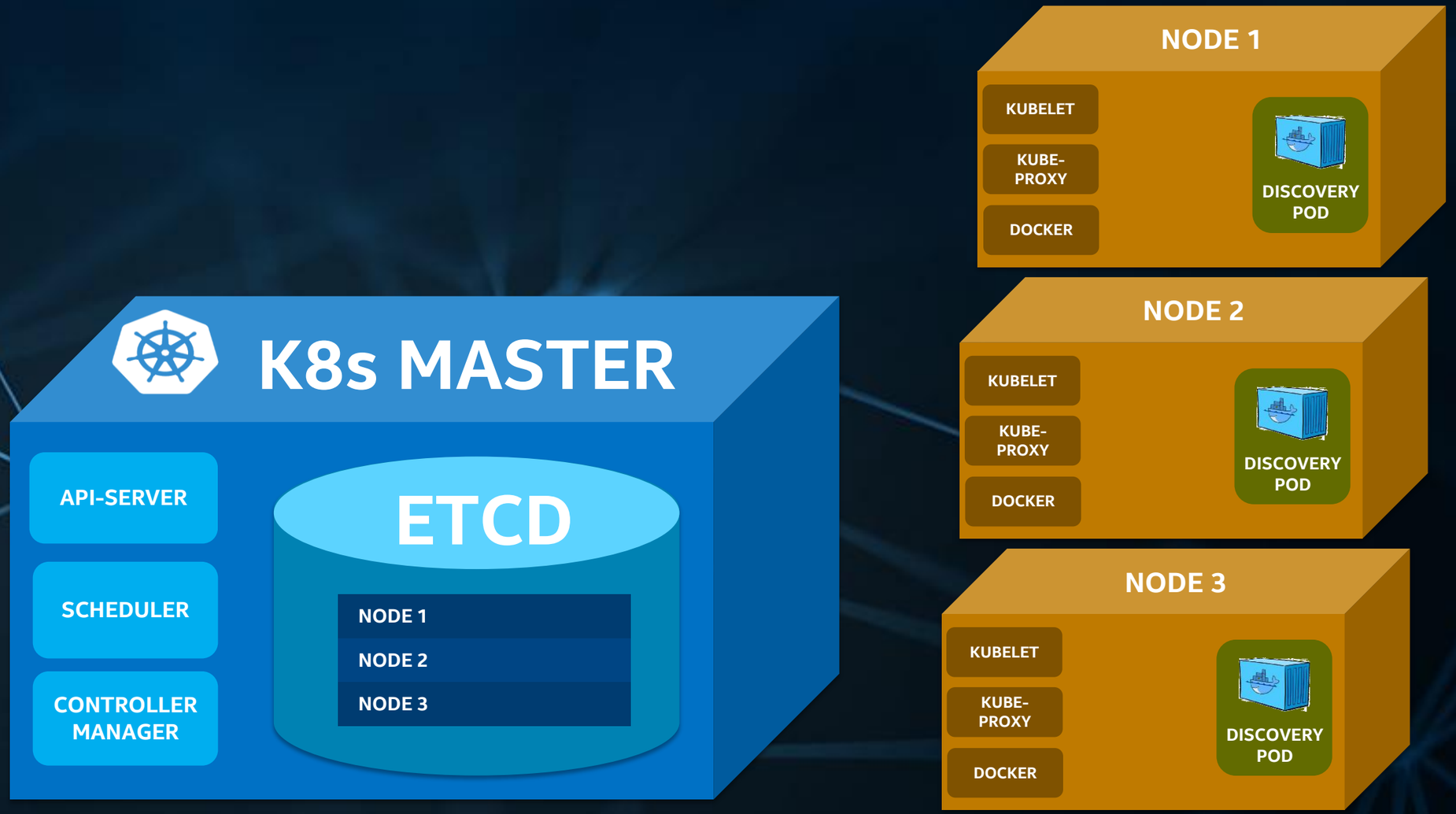


*Source : https://docs.oracle.com/cd/E19076-01/sparc.t2k/819-7988-10/rack_install.html

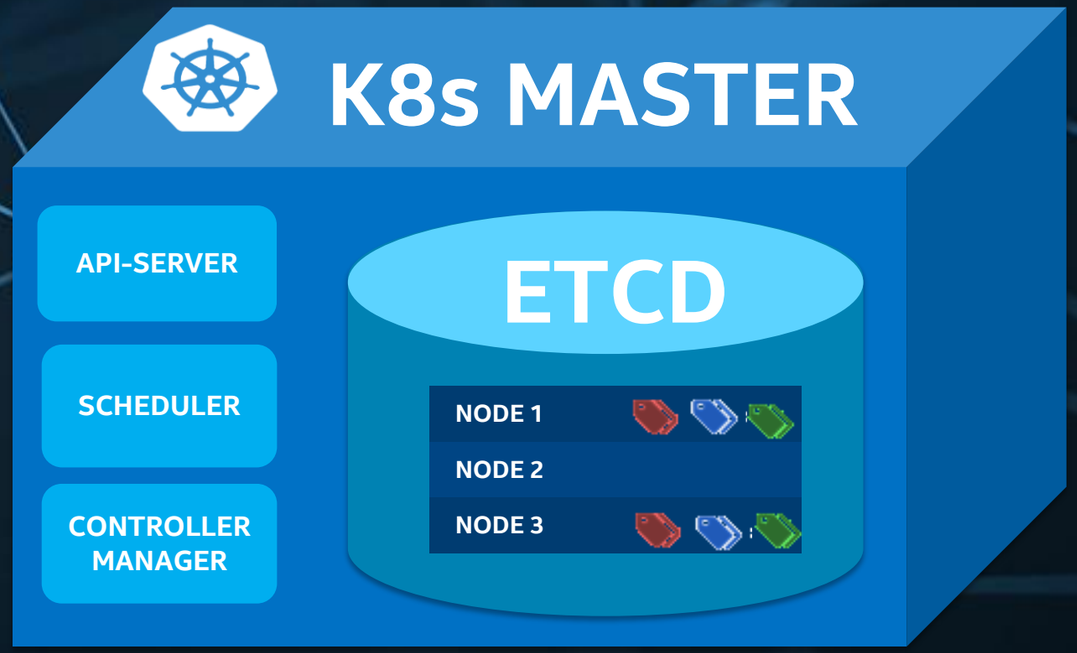
PHYSICAL TOPOLOGY FROM MULTUS CNI CONF

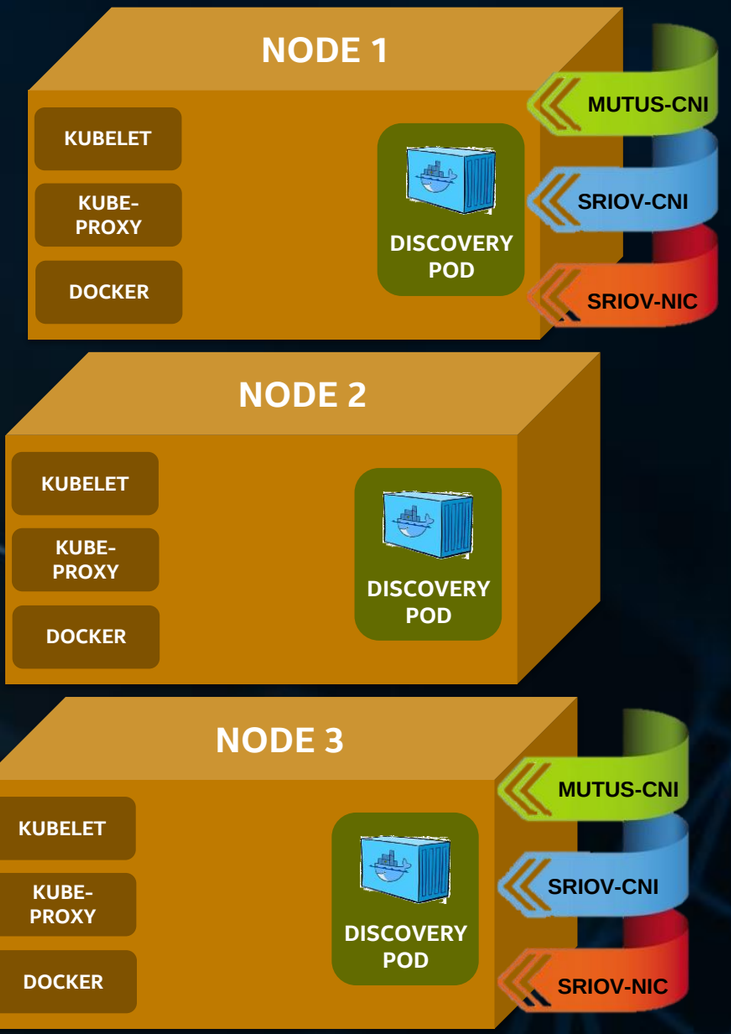


NODE FEATURE DISCOVERY



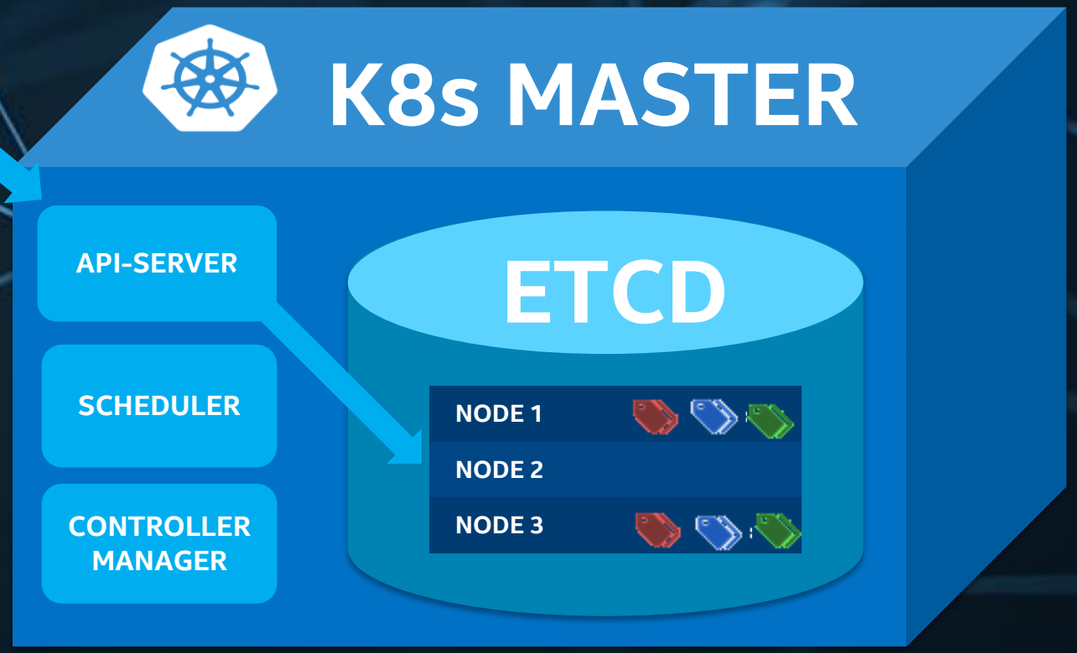
FEATURE LABELS

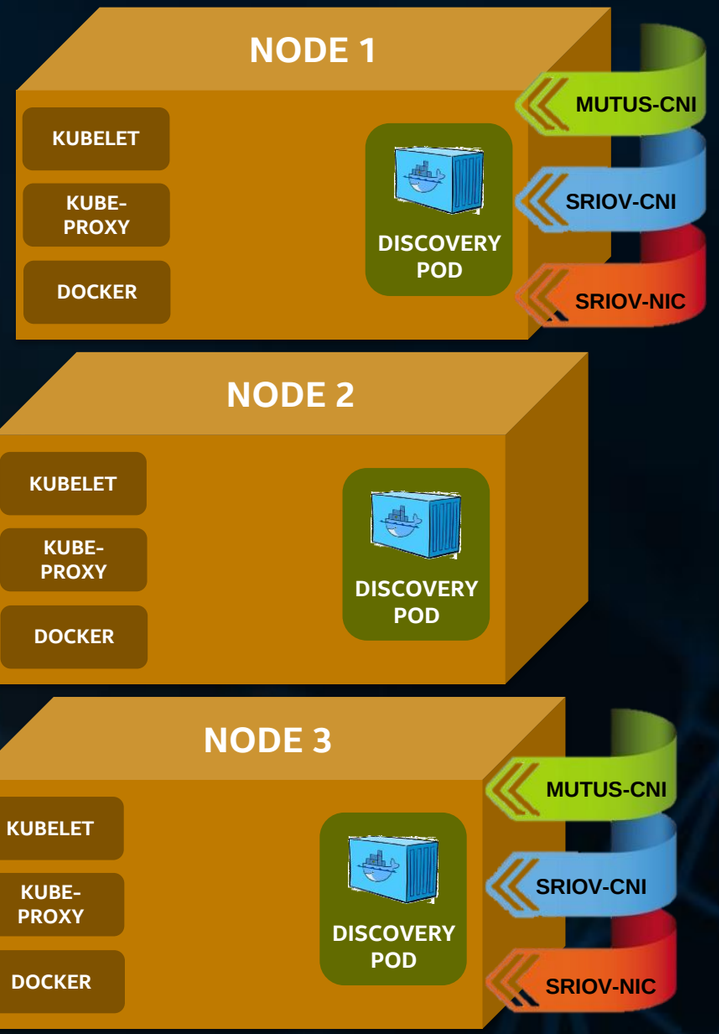




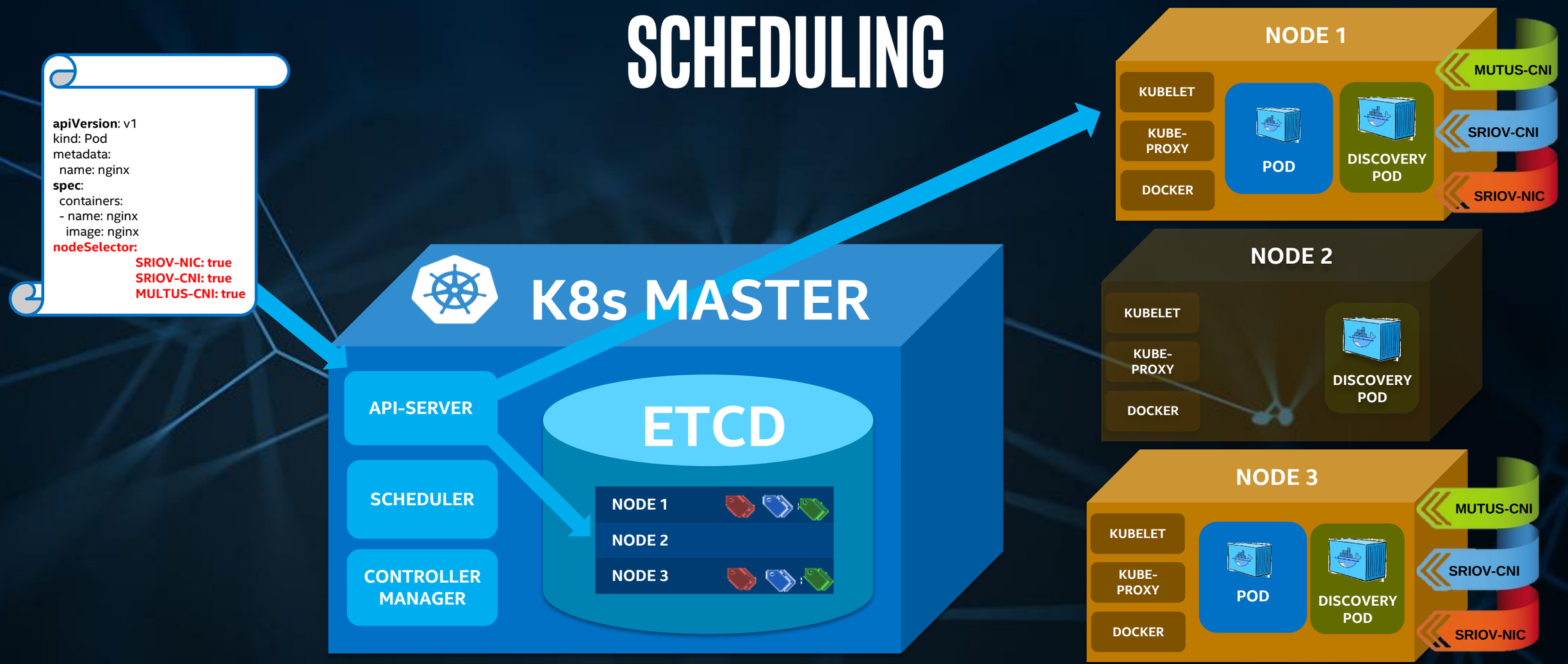
NODE SELECTION

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx
spec:
  containers:
  - name: nginx
    image: nginx
nodeSelector:
                SRIOV-NIC: true
                SRIOV-CNI: true
                MULTUS-CNI: true
```





ADVANCED NETWORKING SCHEDULING



INTEL NFV EXPERIENCE KITS
ADDRESSING NFV USES IN KUBERNETES

Kubernetes Networking

Kubernetes Compute

Identified Gaps

EXISTING SOLUTIONS

MULTUS
Multi-network Support

SR-IOV CNI PLUGIN
Resource Isolation

DPDK CNI PLUGIN
Data Plane Support

Node Feature Discovery
Data Center Heterogeneity

NEW SOLUTIONS: WIP

Resource Management
Core pinning
Hugepages
RDT

Integrate

SW Contributions Demo Integration

Open Source Projects

VNF

Kubernetes v1.5.0
Docker v1.12

flannel SRIOV CNI MULTUS
Flannel v0.5.0
Multus V1.0
SRIOV v0.2-alpha

DPDK DATA PLANE DEVELOPMENT KIT
DPDK v16.11

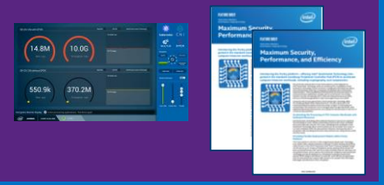
CentOS
CentOS Linux 7 (Core)
Linux 3.10.0-327.36.3.el7.x86_64

intel
82599ES 10-Gigabit SFI/SFP+ Network Connection
X710 for 10GbE SFP+

Build

Best Practice Guidelines Intel Experience kits

Experience Topic



Experience Topic

SW

CALL TO ACTION

- Talk to us about your NFV use cases in K8s
- Join K8s Network SIG and collaborate with us on Multi-network proposal
- Join K8s Resource Management SIG for performance sensitive NFV use cases
- Contribute and provide feedback for Intel Multus & SR-IOV CNI plugin

CNI

kubernetes by Google

TALK TO US FOR YOUR CONTAINERS USE CASE?

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Github: rkamudhan
Twitter: @kuralamudhan


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