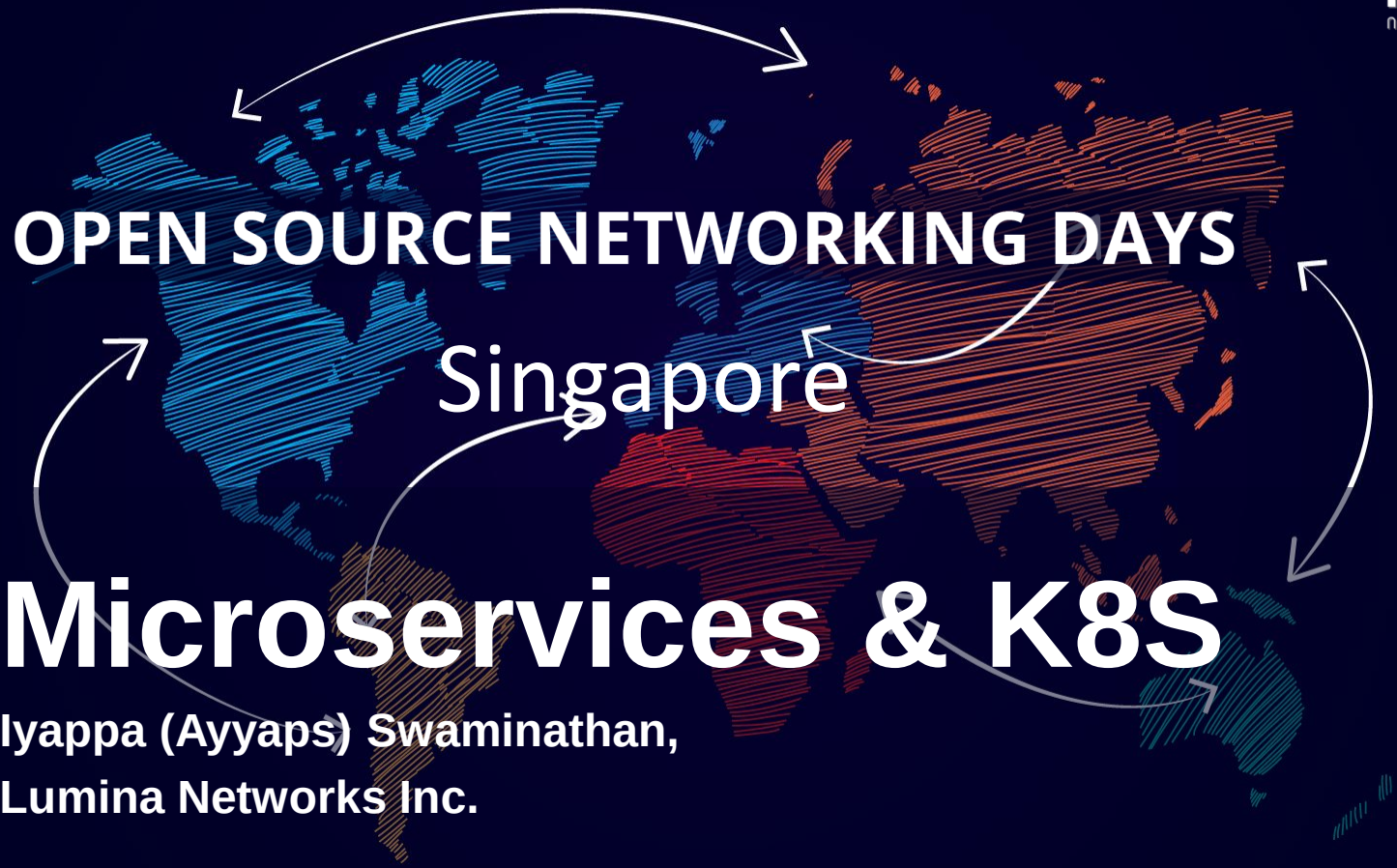

Microservices & K8S

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Lumina Networks Inc.

Agenda

- Microservices introduction
- Containers
- Container Management
- Kubernetes architecture
- Adoption challenges for microservices
- Container Networking
- Service Mesh
- Key Takeaways
- Experiences in integrating ODL with microservices
- Experiences with ODL CNI plugins and COE
- Q&A

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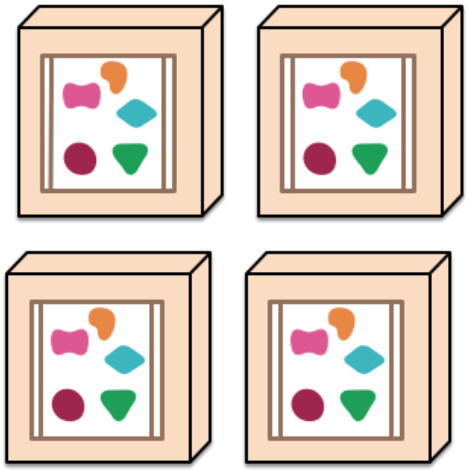
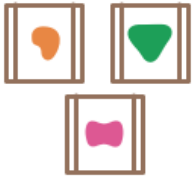
Microservices

A monolithic application puts all its functionality into a single process...

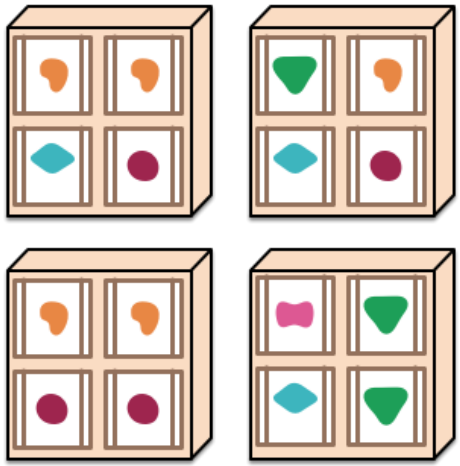
... and scales by replicating the monolith on multiple servers



A microservices architecture puts each element of functionality into a separate service...



... and scales by distributing these services across servers, replicating as needed.



Reference / Image credit : https://martinfowler.com/articles/microservices.html

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Containers

- Microservices is an architectural guidance for building apps
- Apps can be built as
  - Services on a single OS on a bare-metal [Issues: Services can have conflicting library versions. Dependency management is an issue]
  - Each service in a VM [Issues: Compute utilization unoptimized]
  - Each service in a container
    - Lightweight and isolated execution environment
    - Consistent environment across development, test, staging and production
    - Granular control on workload placement
    - Better options for horizontal scaling
    - Improved resource utilization
- Microservices does not dictate use of containers (Eg. Netflix)
  - But containers are a great way to decompose large applications

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The need for container management

- Services will always have failures. Create a resilient system to deal with issues, rather than targeting to develop perfect microservice components
- “Pet” vs “Cattle” approach
- Typical management functions
  - Configure / Deploy
  - Upgrade
  - Scale
  - Discover
  - Load Balance
  - Network
  - Decide Placement
  - Federate
  - Authenticate
  - Predict resource needs
  - Manage life-cycle
  - Manage quota
  - Monitor
  - Query
  - Health-check

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Kubernetes Architecture

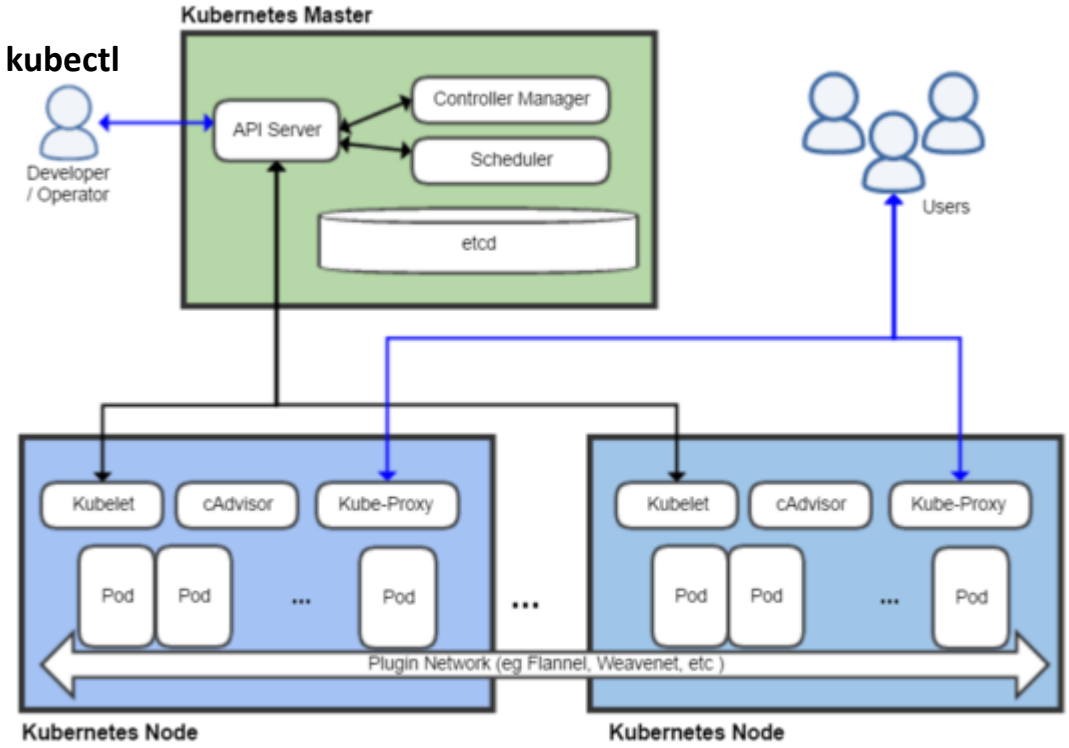
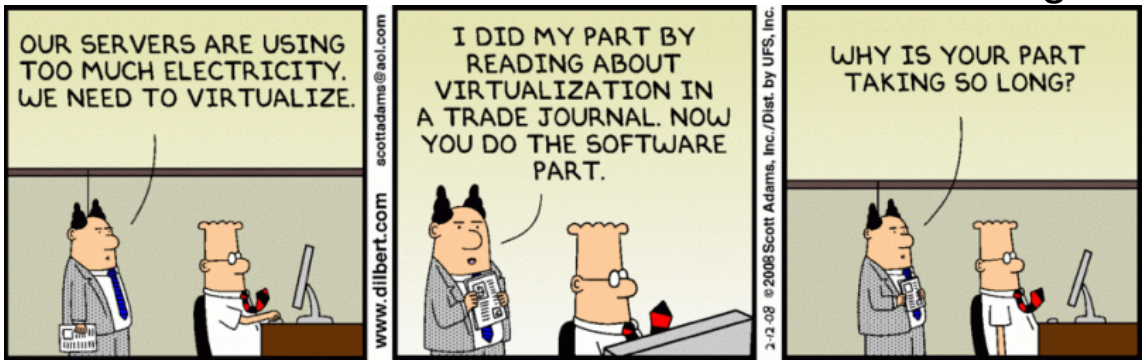


Image credit : https://en.wikipedia.org/wiki/Kubernetes

Challenges with microservices adoption

- Existing applications and VNFs almost need a rewrite/reorganize to migrate to the microservices architecture model. Needs huge investments



- Increased East-West network traffic between components because of the distributed model
- Difficulty in enforcing security/policy, because of the large attack surface

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Container Networking - Introduction

- Single Host
  - Docker models (Bridge, Host, Container)
  - Linux MACVLAN / IPVLAN
  - Direct attachment to SRIOV
- Multi Host
  - L2 - Flannel
  - L3 - Calico
- External world interaction
- IP address management
- Port allocation

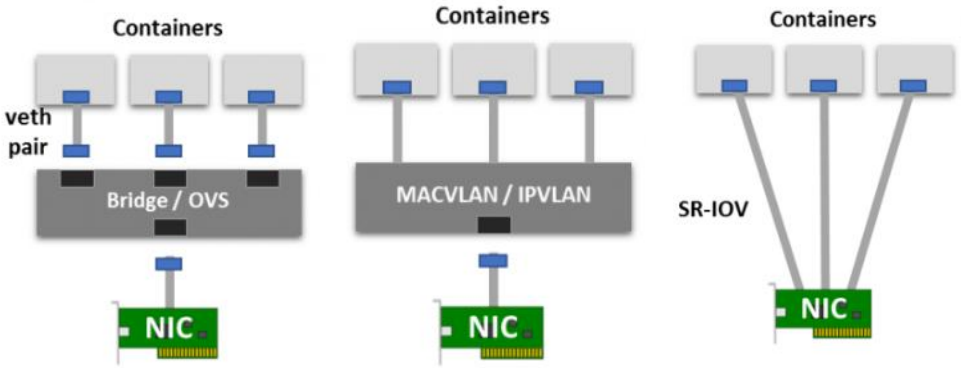

Image credit : https://thenewstack.io/hackers-guide-kubernetes-networking/

Application Networking requirements

- Application networking needs (L7)
  - Discover services
  - Handle timeouts / retries
  - Load balance / rate-limit
  - Implement circuit-breakers
  - Distributed tracing
- Service Mesh
  - Separate network functions from business logic
  - Push network-functions into infra
  - Facilitates fault & latency injection

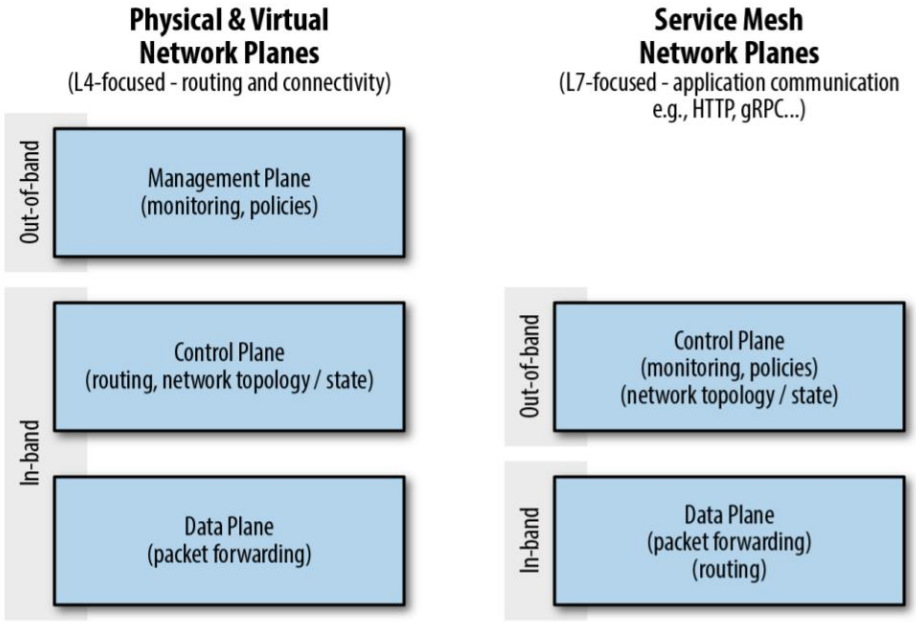

Image credit : Oreily/Nginx

Istio Architecture

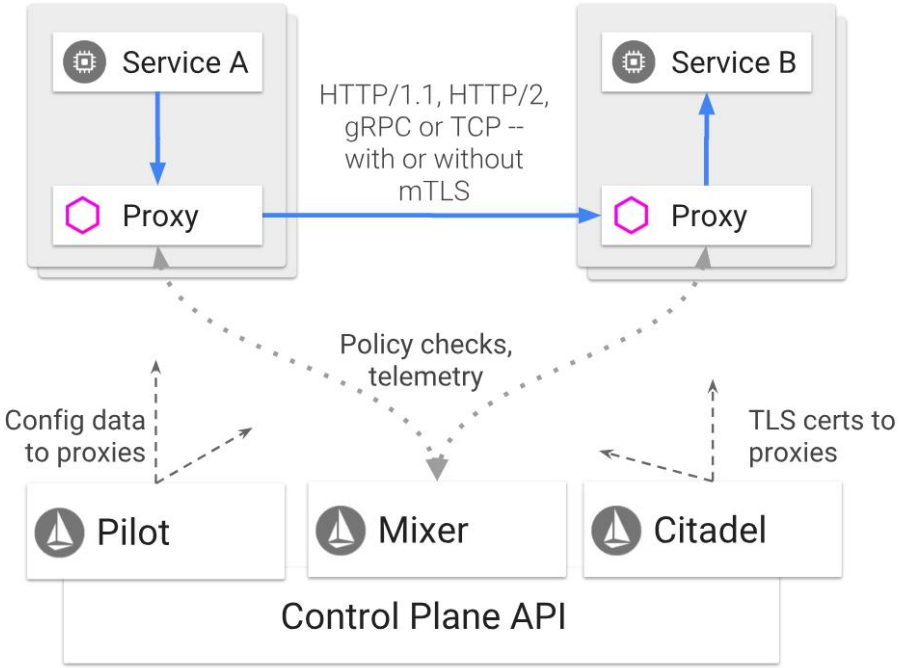

Image credit : https://istio.io/docs/concepts/what-is-istio/arch.svg

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Key Takeaways

- Containers are a great way to decompose large applications
- Container orchestration/management needed to operate container based applications at scale
- Service Mesh is an essential component of microservices development
  - Policy/Security
  - Observability
  - Uniformity

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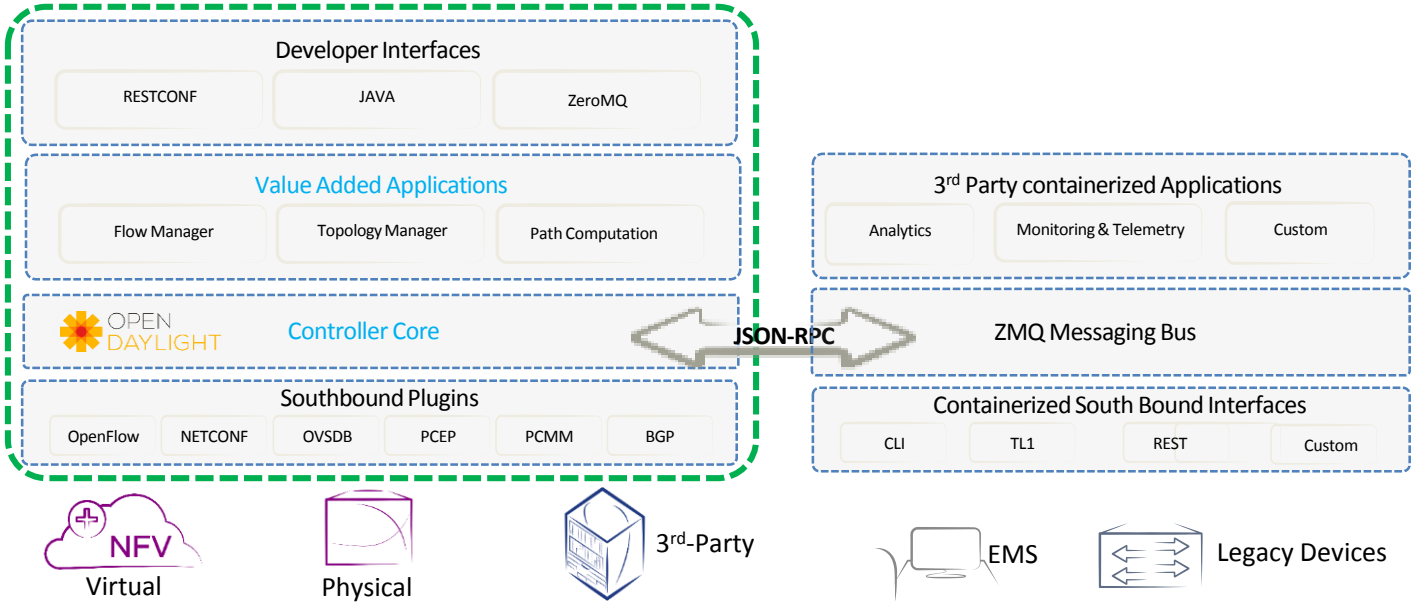
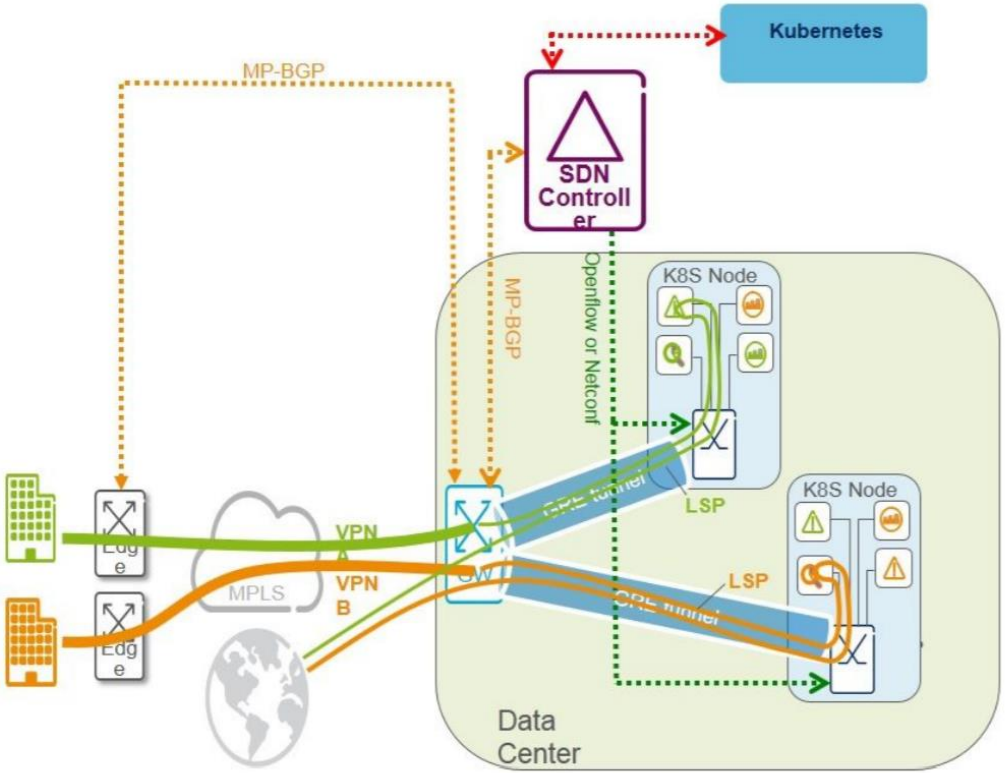
ODL integration with microservices bus



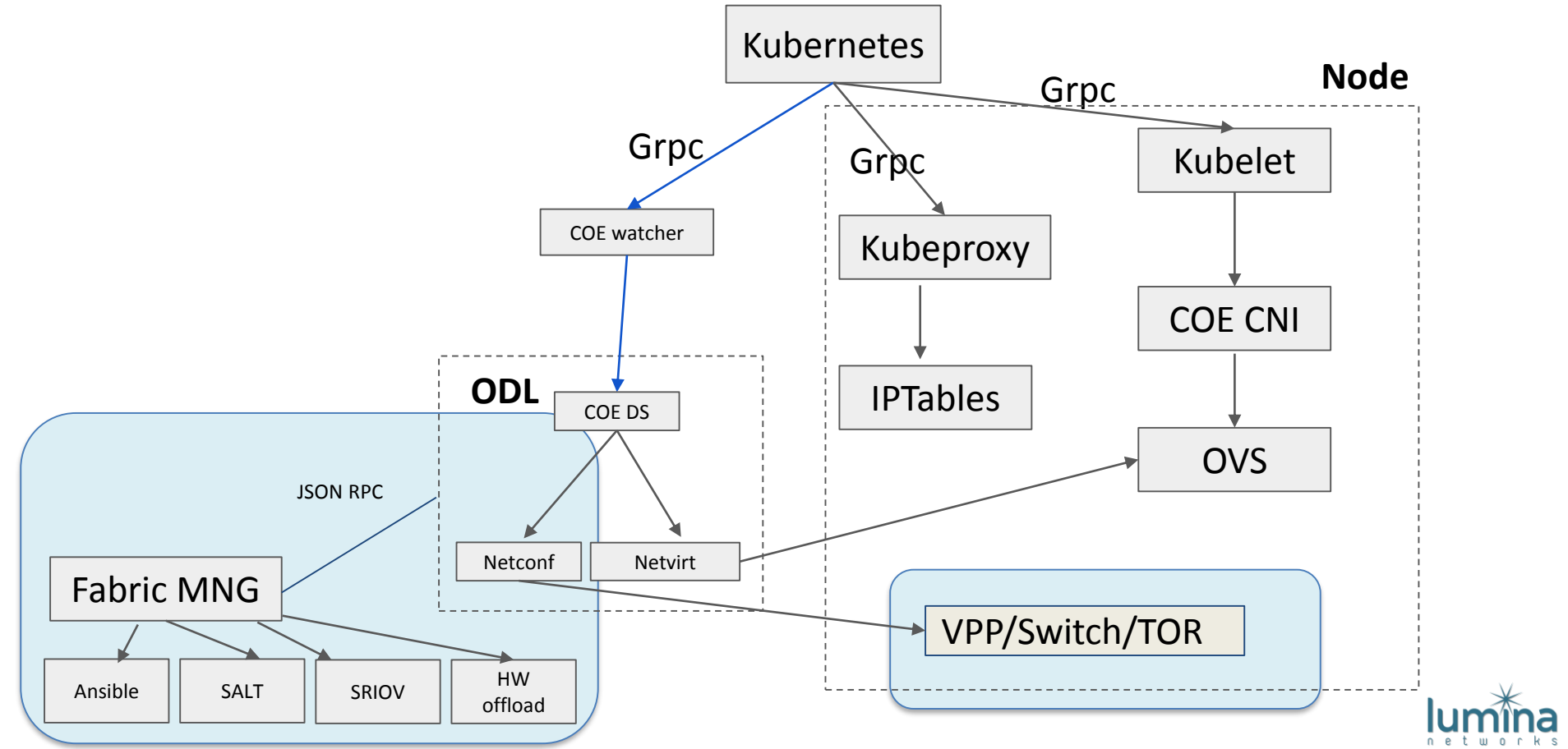
Container Networking Challenges

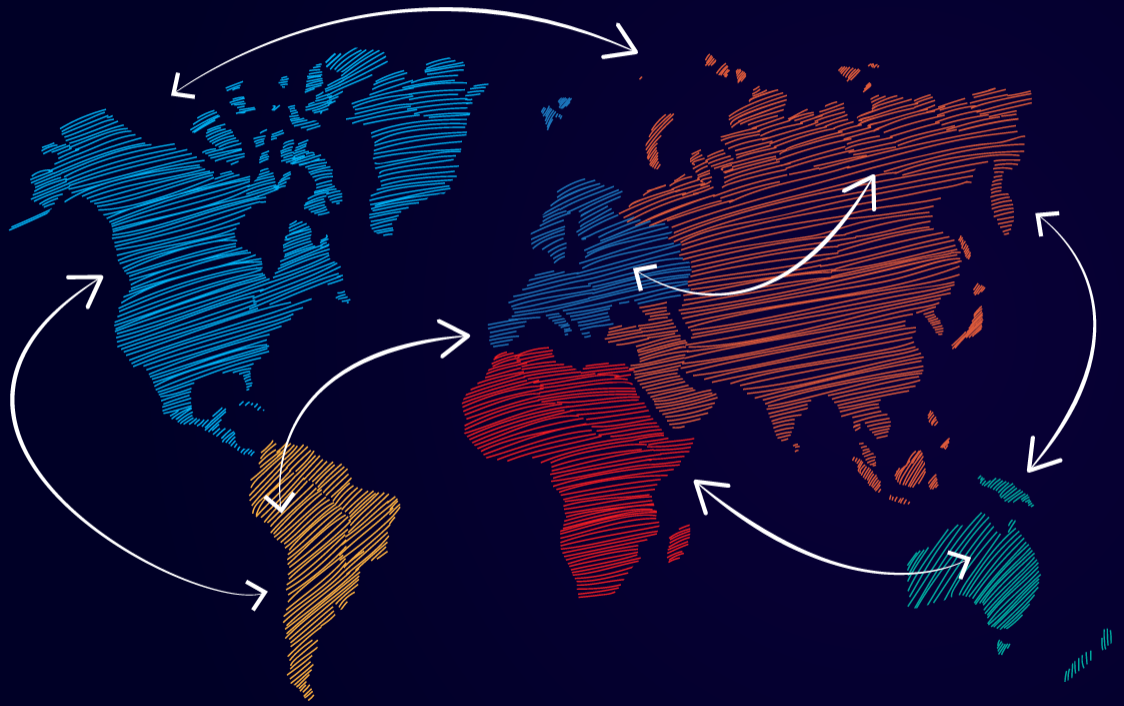
- Currently built for homogenous, high throughput, enterprise-centric application clusters
- Needs more tweaking for L2/L3 use-cases of Telcos
- Enabling container orchestration frameworks to access and leverage the advanced networking capabilities of commercial switch vendors is desirable
- Operators don't want to give up key capabilities in one area of the system (networking) for gains in another (compute)



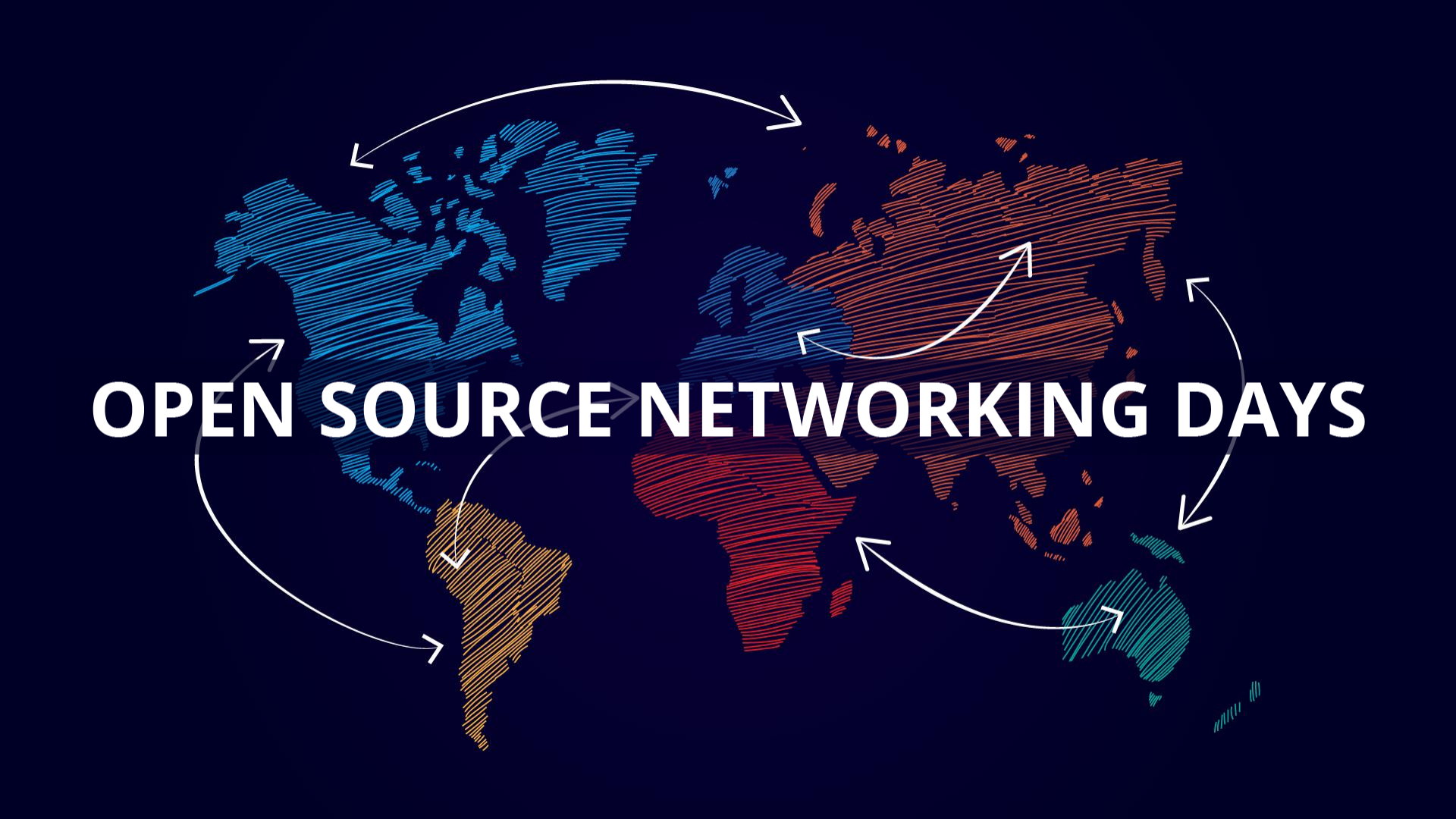
Reference / Image credit : https://github.com/ligato/networkservicemesh

Extensions to Opendaylight COE for physical underlay





Q&A


OPEN SOURCE NETWORKING DAYS