

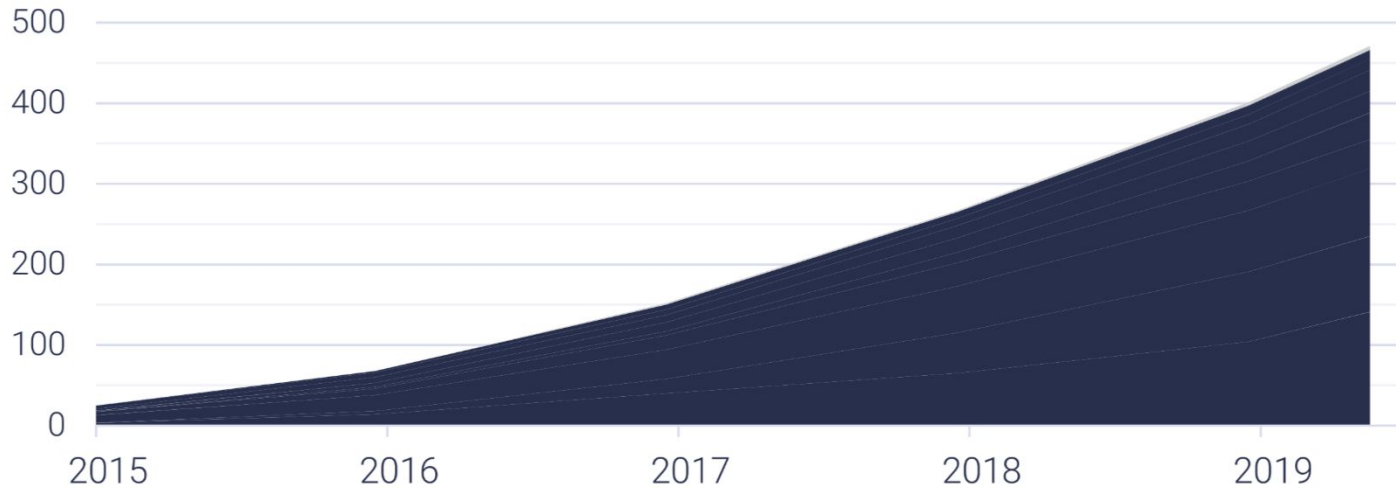
Industrialization of Network Softwarization

José Castillo Lema

Network softwarization

Figure 4: Total live deployments of telco cloud technology, 2015-2019

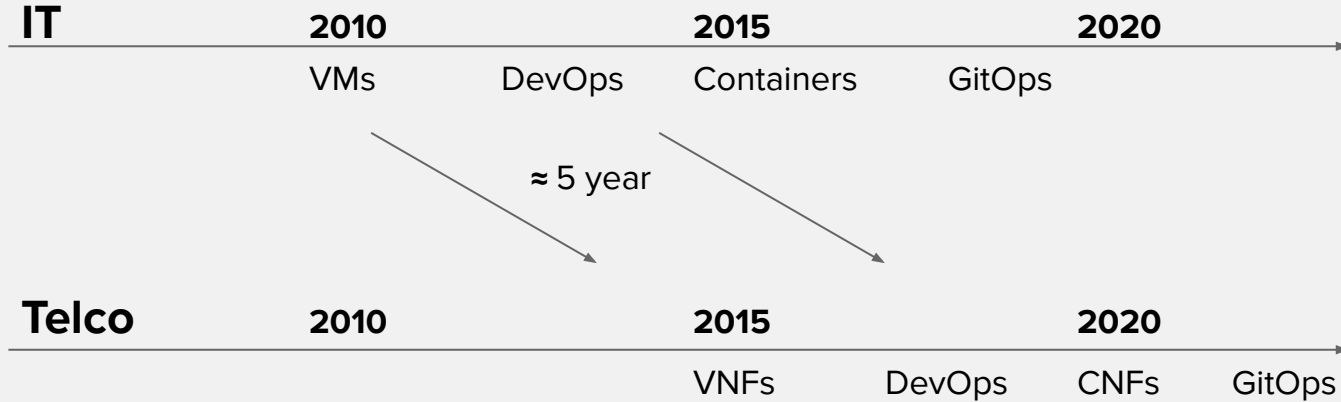
Includes NFVi, VNF, SDN deployments running in live production networks, globally³



Source: STL Partners NFV Deployment Tracker



Telco late technology adoption



Enhanced Platform Awareness (EPA) working group

Feature Name	First OpenStack Release	Release date
Host CPU feature request	Icehouse	2014
PCI passthrough	Havana	2013
HugePages* support	Kilo	2015
NUMA awareness	Juno	2014
IO based NUMA scheduling	Kilo	2015
CPU pinning	Kilo	2015
CPU threading policies	Mitaka	2016
OVS-DPDK, neutron	Liberty	2015



EPA implementation on K8s

Kubernetes 1.22 (2021)

- NUMA aware memory management
- CPU Manager: reject Hyperthread core-unaligned containers
- Load Balancer for bare-metal (metalLB): L2
 - IPv4 and IPv6
- DPDK Workload over SR-IOV (GA)
- More SR-IOV NIC support (start to align with [Fast DataPath](#))
- VRF CNI (GA)

Kubernetes 1.23 (2021)

- Load Balancer for bare-metal (metalLB): L3/BGP
 - Dual Stack IPv4/IPv6
 - BFD
- NUMA aware scheduler (Technology Preview)
 - based on Pod Resource API (beta)
 - based on Resource Topology Exporter
- bond CNI (on top of SR-IOV kernel VFs only)
- Must Gather automated analysis (insights rules)

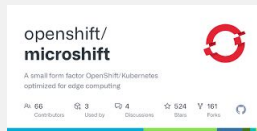
Kubernetes 1.24 (2022)

- NUMA aware scheduler (GA)
- Load Balancer for bare-metal (metalLB)
 - Per node address pool
 - Services on multiple node (!pod) interfaces
 - Linux VRF
- SR-IOV kernel (not DPDK): Network Policies

Kubernetes 1.25 (2022)

- NUMA aware scheduler - FYI
 - no user API change (Pod Resource API)
 - based on NFD
- Load Balancer for bare-metal (metalLB)
 - Egress IP as service IP (!node IP)
 - Gateway API
- CPU Manager: mix of exclusive and shared CPU for a container
- Gatekeeper: labels and annotations update
- SmartNIC enablement: Bluefield2





Single node edge servers

Low bandwidth or disconnected sites.



Site 1

Remote worker nodes

Environments that are space constrained



Site 2



Site 3

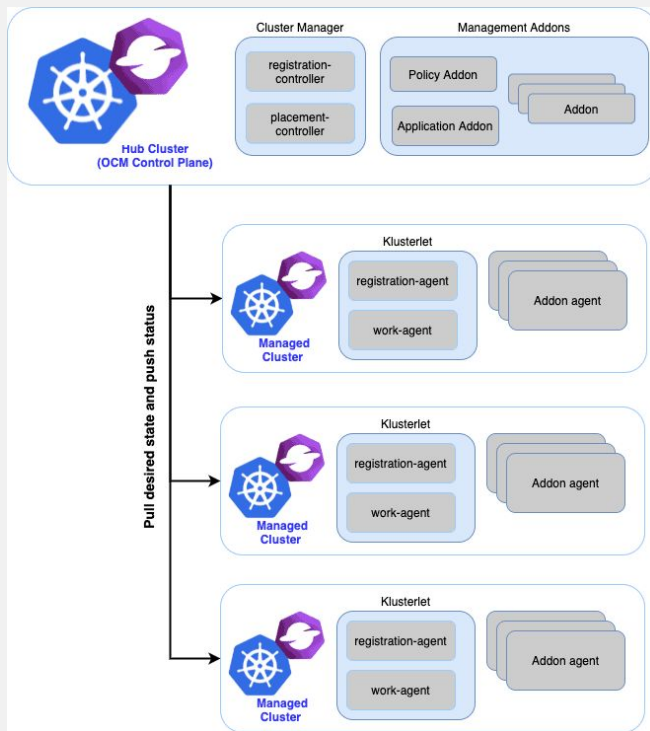
Edge

Regional data center

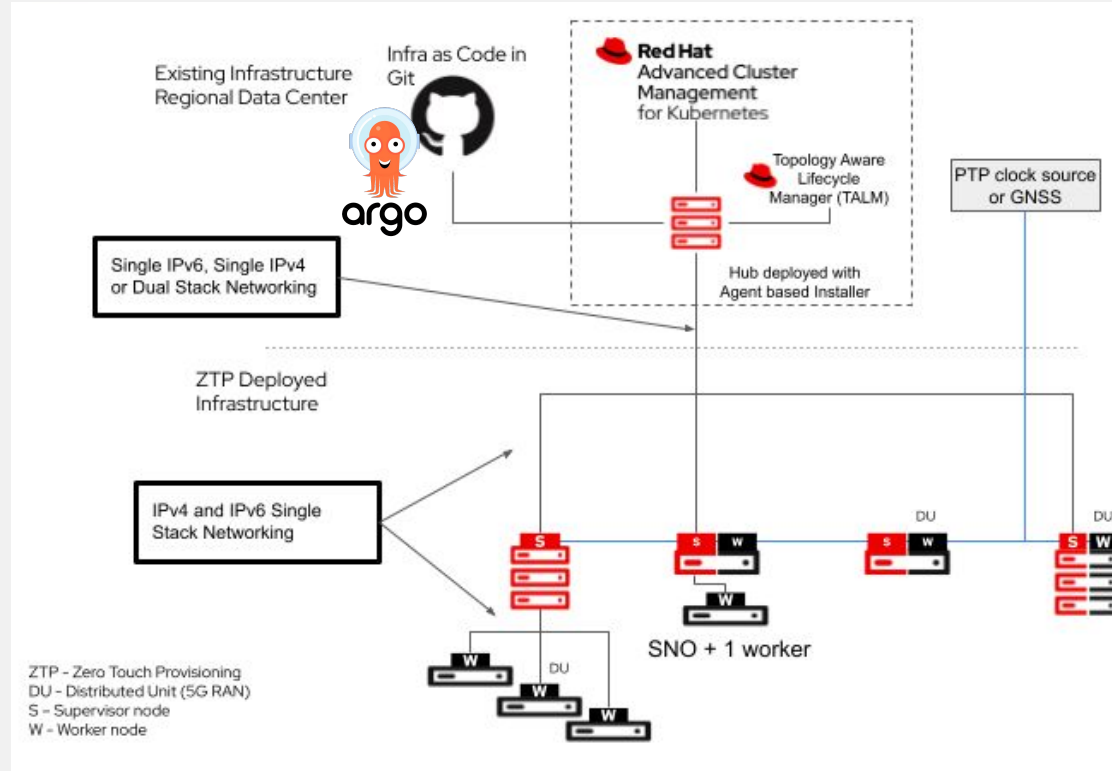
Central data center



Open Cluster Management (OCM)



Zero Touch Provisioning (ZTP) → GitOps approach

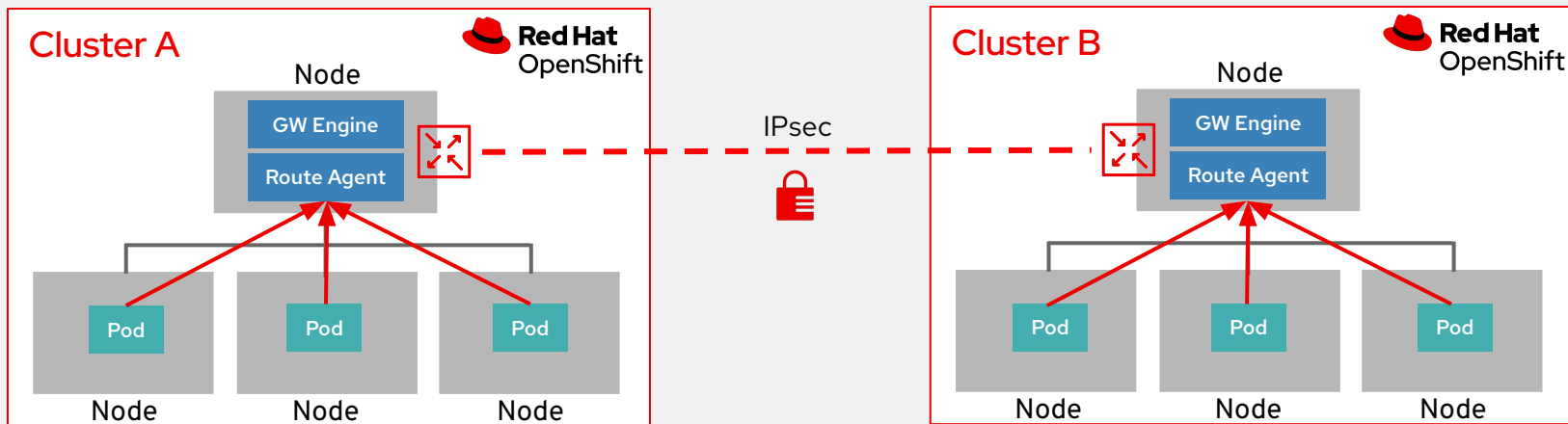


Submariner: Multiclusternet networking

Globalnet

Cluster CIDR: 10.128.0.0/14
Service CIDR: 172.30.0.0/16
Global CIDR: 242.0.0.0/16

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Service CIDR: 172.30.0.0/16
Global CIDR: 242.1.0.0/16



Future directions

- Data path
 - Cloud Native Data Plane (CNDP), eBPF and AF_XDP
 - [The Hybrid Networking Stack](#)
 - Virtio Data Path Acceleration (vDPA)
 - [Hyperscale virtio/vDPA introduction: One control plane to rule them all](#)
 - NIC offloading, DPUs
 - [Orchestrate offloaded network functions on DPUs with Red Hat OpenShift](#)
- Environment Sustainability
 - Project [Kepler](#)
- Web Assembly applications for edge

Thank you

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