Open Source Cloud Native Operations Management & Security: ONAP Perspective

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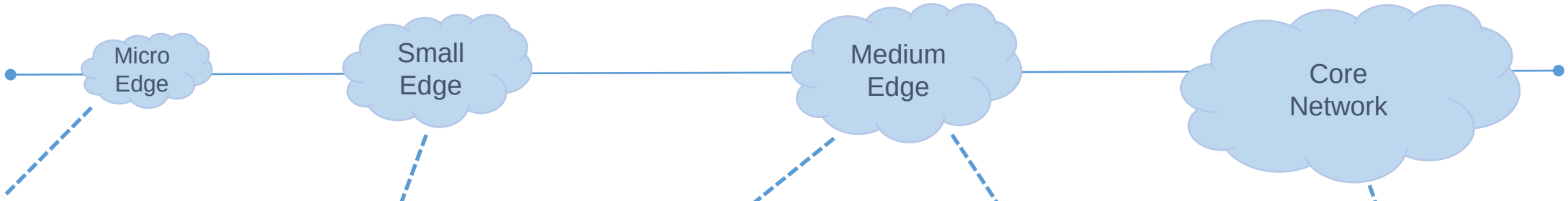
Agenda

- Use Cases – Edge → Core Deployment Profiles
- Cloud Native NFV/Edge Deployment Options
- NFV/Edge Deployment Options and Trade-Offs -- General/Management/Security
- ONAP Perspective
  - Introduction to ONAP Operations Manager (OOM)
  - OOM Deployment Architectural Vision
  - Multi-vendor Demo (Unconference session)
- Summary & Discussion

Use Cases – Edge → Core Deployment Profiles

Key Industries:
Telco (e.g. NFV, 5G, and IoT),
Retail (e.g. IoT, Supply Chain)

Key Application Domains:
Surveillance (e.g. CCTV),
Telematics, Enterprise Security



Micro Edge Device
- Remote Radio Head
- Remote Radio Unit
- CPE / set top box

Runs a single instance, instance changes infrequently

Small Edge Device
- Retail Wi-Fi
- POS for a store
- Cell tower site

Multiple instances, instances change occasionally

Medium Edge Backhaul, **Critical Deployment**
- Cloud-RAN
- Big cell site
- National Broadband Network Point of Interconnect (NBN-POI)

Multiple instances, instances change daily

Medium Edge Backhaul, **Non-Critical Deployment**
- Big box retail
- Cloudlet

Multiple instances, instances change daily

Core Network
- Region DC
- IMS
- EPC Control Plane

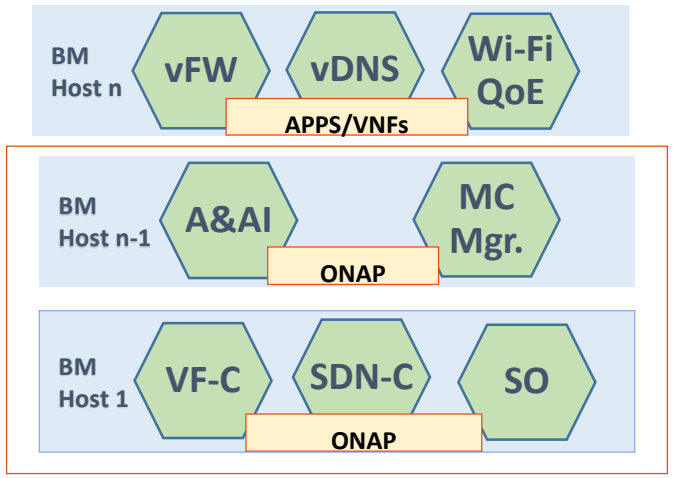
Thousands of instances, instances changing constantly

* Use cases were identified in OpenDev 2017

Cloud Native NFV/Edge Deployment Options

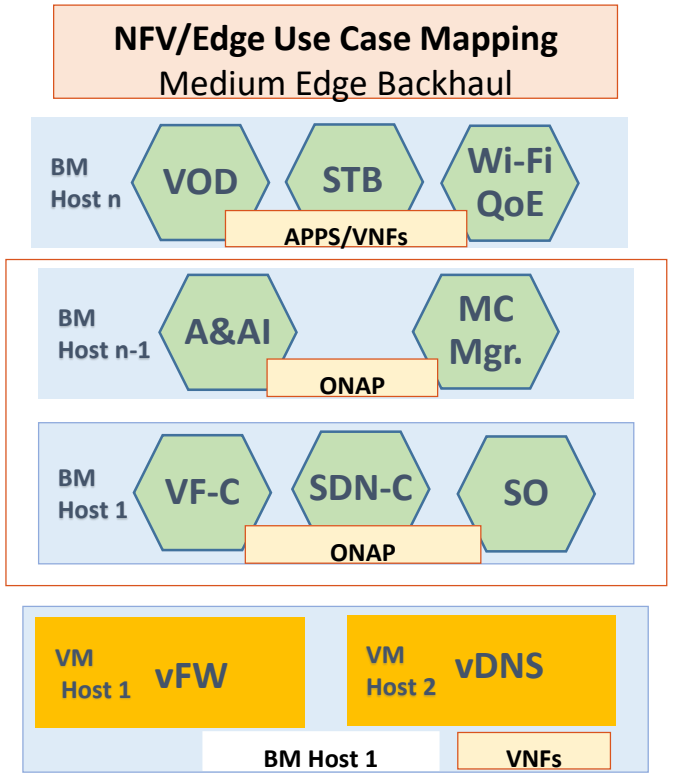
Bare Metal (Small Scale)

NFV/Edge Use Case Mapping
Micro Edge/Small Edge



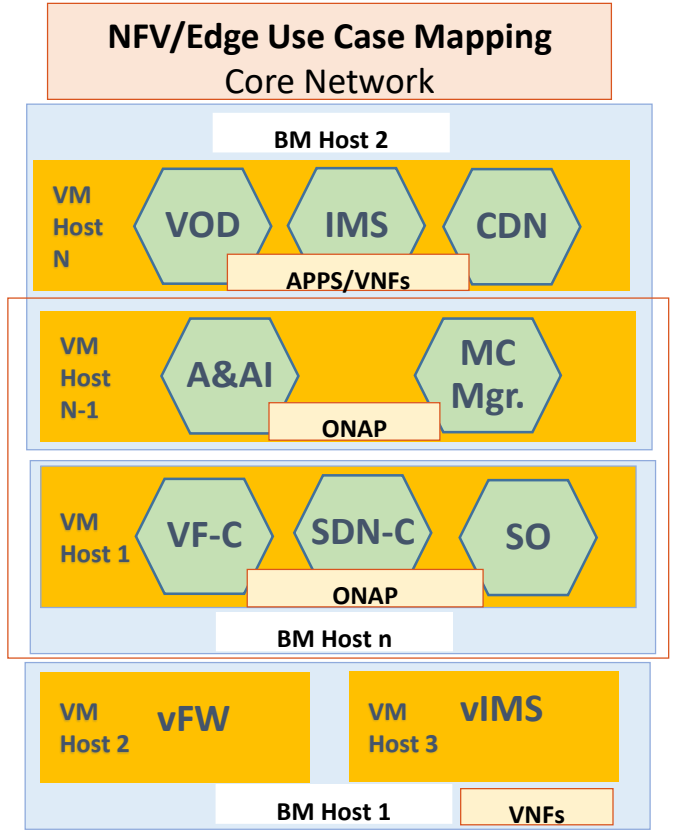
Hybrid (Medium Scale)

NFV/Edge Use Case Mapping
Medium Edge Backhaul



CaaS (Hyper Scale)

NFV/Edge Use Case Mapping
Core Network



Legend:
STB – Set Top BOX; EPG – Electronic Programming Guide; VOD – Video On Demand; IMS – IP Multi Media Subsystem
BM - Bare Metal; VM – Virtual Machine; Hybrid – Mix and Match VM and BM hosts;
CaaS – Container Orchestration on VM Hosts;
Containerized ONAP components – A&AI, SDN-C etc.

NFV/Edge Deployment Options and Trade-Offs (General)

	Bare Metal (BM)	Hybrid (VM + BM)	CaaS (VM)
Base Architecture	Everything over K8s over bare metal hosts	Containerized applications on K8s cluster over bare metal hosts; Rest on VMs	Everything over VMs, including K8s clusters
Application/VNF Architecture	All applications and VNFs have to be containerized	Support containerized and VM-based Applications and VNFs	Support containerized and VM-based Applications and VNFs
Mixed Workloads	No Support for VM-based VNF/Application workloads	Supports containerized and non-containerized workloads	Supports containerized and non-containerized workloads

Note: VNFs can be potentially developed as native OS processes [NetBricks], but entails redevelopment of the entire stack and applications

NFV/Edge Deployment Options and Trade-Offs (Management)

	Bare Metal (BM)	Hybrid (VM + BM)	CaaS (VM)
Operational Simplicity	Single panel of glass deployment for containers	Independent management of Bare Metal and VM hosts	Single pane of glass deployment for containerized and VM-based Applications/VNFs
Mixed Hardware Portability	No hardware-independent abstraction for normalized capability and capacity metrics	Partial support (limited to VM-based Hosts)	VM-based Hosts provide normalized capability and capacity metrics across mixed hardware
Scalability	Dynamic scalabilty for containers	Scaling across bare metal & VMs requires major reconfiguration	Dynamic scalability of VM/Container workload capacity

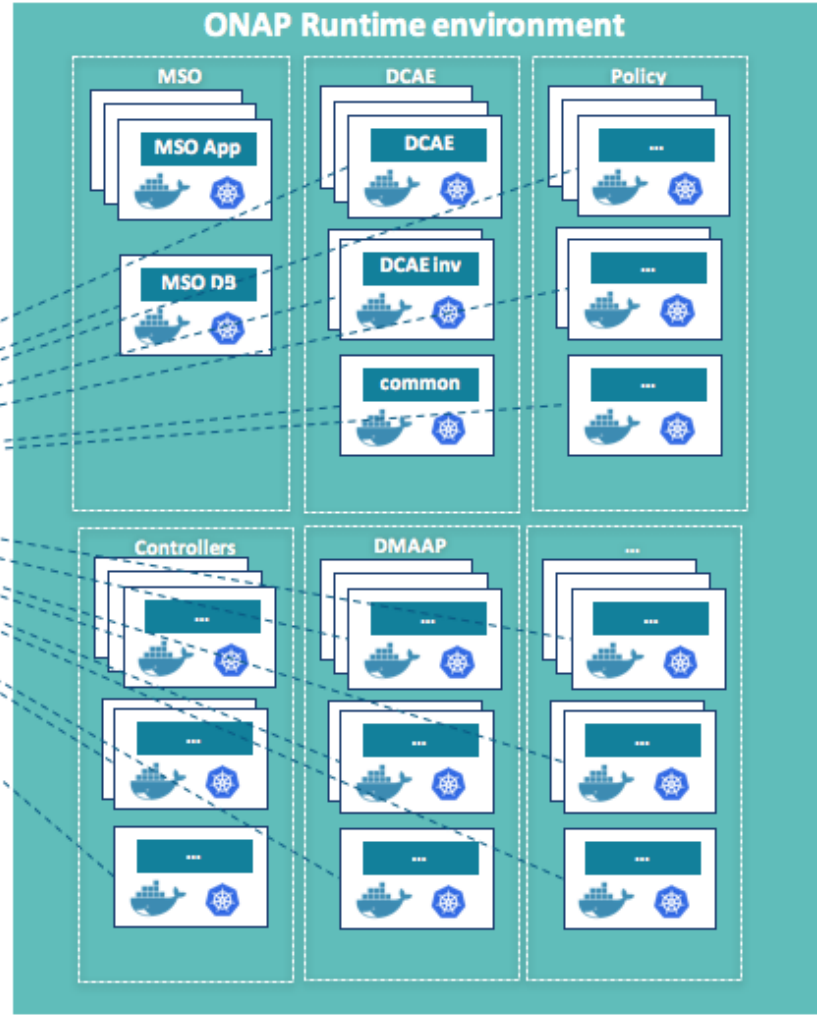
NFV/Edge Deployment Options and Trade-Offs (Security)

	Bare Metal (BM)	Hybrid (VM + BM)	CaaS (VM)
Component/VNF Isolation	Security only via physical HW topology isolation	Additional security for specific VMs possible	Native HW security for all components and VNFs
Security Attestation (e.g. TPM, image integrity, etc.)	Cannot provide extra security for specific components/VNFs	Can provide extra security for VM based components/VNFs	Can provide extra security for any user-specified components/VNFs
Open Source Security	Relies purely on software security (base K8s security)	VM layer provides additional hardware security for VM based components/VNFs	VM layer provides additional hardware security for all components/VNFs

ONAP Operations Manager (OOM)

- ONAP on Containers (K8s)
- Supports Bare Metal or VM hosts
- Efficiently deploy, manage, operate the ONAP platform, its components, and infrastructure
  - Life-cycle Management
  - Hardware Efficiency
  - Deployment Speed
  - Cloud Provider Flexibility
- Deployment Speed & Hardware Efficiency (vs OpenStack deployment):
  - Memory: 200 GB vs 60 GB
  - Disk Space: ~ 1.3 TB vs 120 GB
  - Deployment time (US): 2 hours vs 1 hour
  - Deployment time (international): very high without mirrors

- Deploy
- Monitor
- Heal
- Scale
- Upgrade
- Configure
- Migrate



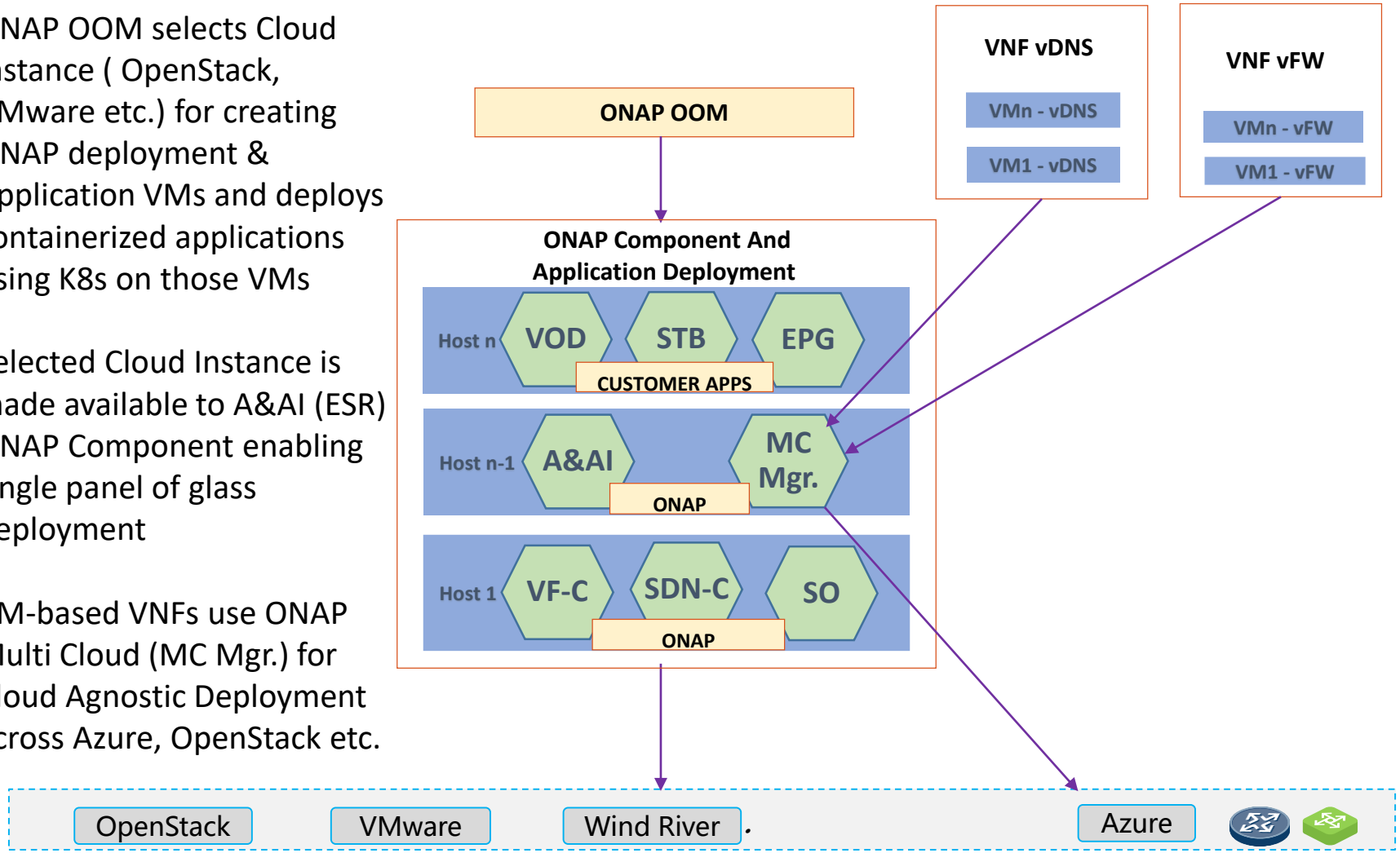
All Containers Deployment

OOM Deployment Architectural Vision

ONAP OOM selects Cloud Instance (OpenStack, VMware etc.) for creating ONAP deployment & Application VMs and deploys containerized applications using K8s on those VMs

Selected Cloud Instance is made available to A&AI (ESR) ONAP Component enabling single panel of glass deployment

VM-based VNFs use ONAP Multi Cloud (MC Mgr.) for Cloud Agnostic Deployment across Azure, OpenStack etc.

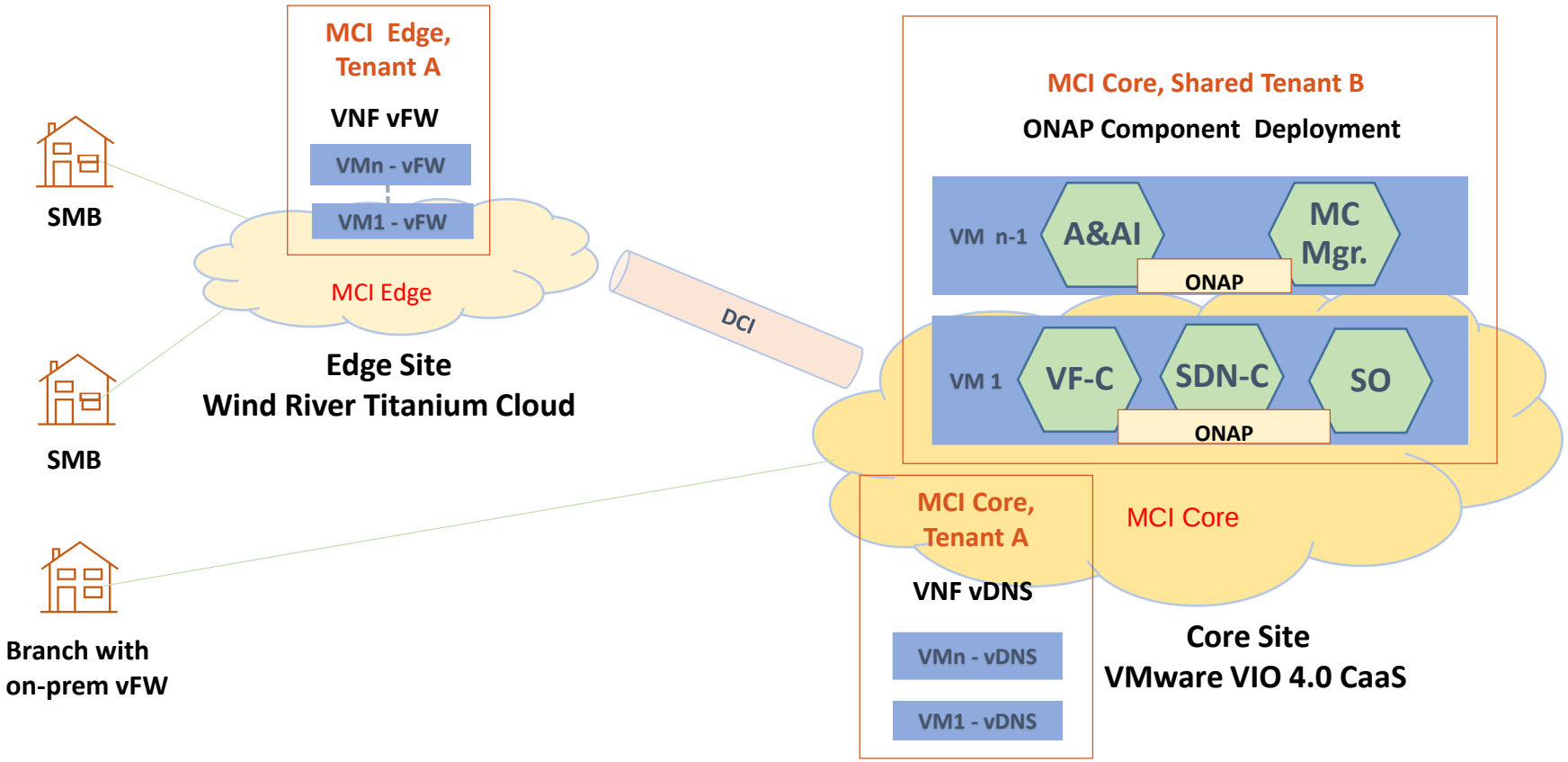


Flexible Architecture

Support Bare Metal, Hybrid and CaaS deployment options

Legend:
STB – Set Top BOX; EPG – Electronic Programming Guide; VOD – Video On Demand
Host – VM or Bare Metal

Multi-vendor Demo (Unconference session)



CaaS - Simplifying Workload Management & Delivering Native Security

Single pane of glass deployment for Containerized Microservices and VM-based Applications/VNFs
Native HW security/isolation for all Components and VNFs

Pivotal Container Service

ONAP Multi Cloud

Cloud Agnostic VNF deployment across Wind River Titanium Cloud and VMware VIO

Multi Cloud Instance (MCI) Core (VMware VIO 4.0) - Core site with containerized ONAP component microservices deployed on VMs and vDNS VNF VMs
MCI Edge (Wind River Titanium Cloud) - Edge site with vFW VNF VMs

Admin deploys ONAP component microservices using ONAP OOM which leverages VMware VIO K8s running on VMware VIO VMs

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Summary & Discussion

- CaaS → Hybrid → Bare Metal
  - CaaS - Everything over VMs, including K8s clusters
  - Hybrid - Containerized applications on K8s over Bare Metal hosts; Rest on VMs
  - Bare Metal - Everything over K8s over Bare Metal hosts
- Balancing Tradeoffs
  - Single Pane of Glass Management
  - Native HW Security/Isolation
  - Need for Higher Performance
- Critical thinking needed before jumping in!
- More on Cloud Native VNFs and Security in the upcoming sessions!
  - Toward Container Support As VNF-based Cloud Infrastructure
  - Overview & Discussion: Security In The Modern Virtualized Data Center