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Service Provider Edge Computing Use Cases & Ecosystem Challenge Areas

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Use Case - Wireless

- Mobile Infrastructure is becoming more disaggregated and virtualized with both distributed and centralized (pooled) elements
- Edge Computing (EC) will be used to host RAN and Packet Core virtual network functions
- Distributed Services can be co-located at EC for low latency or local break out

Open Network Automation Platform (Common Cross-Platform Orchestration)















- Adaptive Transport L1/L2/L3
- Ability to insert new Edge Clouds almost anywhere

- RAN Data Plane (DU)
- RAN Radio Elements
- Co-lo or local/metro (distance driven)
- RAN Data Plane (CU)
- Packet Core Data Plane*
- Distributed Services (e.g., AR/VR)
- RAN Control Plane
- Packet Core Data Plane*
- RAN Management
- Packet Core Data Plane*
- Packet Core Control Plane







- High density locations package together modular components
- Co-location of infrastructure and services for QoE and network efficiency
- * Packet Core Data Plane at multiple tiers associated with service locality requirements – Tier selection via APN or Network Slicing



Use Case – Wireline Consumer

- Converged consumer service (broadband Internet, OTT/IPTV, VoIP) on L3 access
- Virtualized infrastructure located both at the premises (CPE) and network
- Total volume is dominated by video

Open Network Automation Platform (Common Cross-Platform Orchestration)

Network Peripheral

Home

Edge (Metro)

Adaptive Transport L1/L2/L3

Ability to insert new Edge Clouds almost anywhere

- Typical Home CPE provides L3 gateway
- Optional POTS to VoIP
- Add-on services

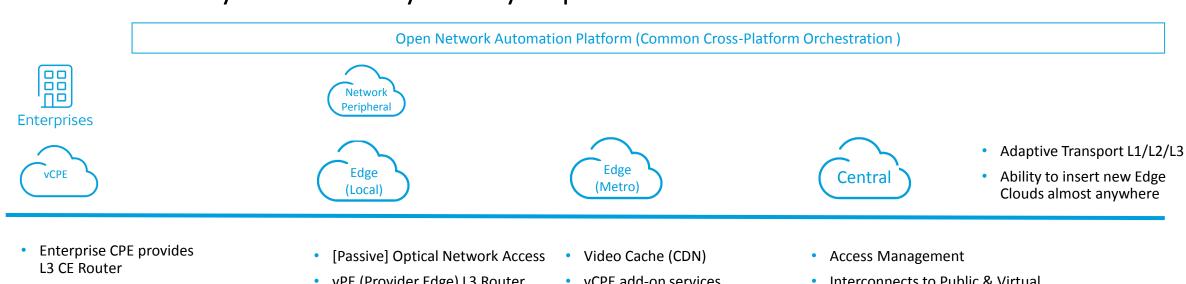
- Passive Optical Network Access
- Broadband Network Gateway
- Distributed Services (e.g., AR/VR)
- Video Cache (CDN)
- vCPE add-on services

- Access Management
- Video Content Store (Region)



Use Case – Enterprise

- Converged enterprise service split between vCPE and Network
- Enterprise access agnostic connectivity across broadband internet, Ethernet & wireless
- Service flexibility and reliability is a key requirement



- Placement for add-on
- VNF (e.g., Firewall, WAN Optimizer, etc.)
- Add-on services

- vPE (Provider Edge) L3 Router shard
- Distributed Services (e.g., AR/VR)
- vCPE add-on services

 Interconnects to Public & Virtual **Private Clouds**



Use Cases - Themes

- Video dominates volume Optimized infrastructure critical
- Growth of IoT (5G mMTC) creates new infrastructure challenges Quantity of devices, networking signaling, new network traffic characteristics
- Network infrastructure separation mechanisms evolving Network slicing to associate resources with specific use cases
- Automation critical across design, build, and operate Entire lifecycle (birth to death)
 must be fully automated and work across functions & layers
- Emergent use cases must be easy to trial and scale Dynamic allocation of resources including the ability to pull back workloads from local to metro to regional if latency tolerance permits



Ecosystem Challenge Areas for Openstack

Efficient Configurations

- Support for small scale deployments (1/2 rack, vCPE single box) with low overhead
- Ability to use VM or Container based VNF

Hardware Abstractions

- Ability to effectively change hardware without re-building binaries (VOLTHA)
- Ability to automatically and effectively use specialty hardware (GPU, FPGA)

Network Stack

- Support for direct (SR-IOV/Pass-Through) and mediated "overlay" networking
- Efficient for VNF, de-coupled from hardware, and with support for L2 & L3 SP semantics
 Operational
- Effective split between local and remote components
- Ability to operate when disconnected from rest of network with graceful re-connect
- Effective inter-operation of platform components with ONAP

Distributed Services Support

A common sand-boxed execution environment that allows for running services at the edge

