Telco Cloud Requirements: What VNFs Are Asking For

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Agenda

1. What is the Telco Cloud?
2. Telco Cloud Requirements to Date
3. Solving for VNF Unique Requirements
4. Evolving Telco Cloud Requirements
What is the Telco Cloud?

The Existential Threat: Why should Telco’s want it? Introducing ’The Value Stack’

The Real Value: Value Moving Up The Value Stack and away from Telco’s

<table>
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<th>Services / Content SaaS</th>
<th>Centralized Platforms PaaS, IaaS, etc.</th>
<th>Distributed Telco Cloud</th>
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<td>Voice</td>
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Value

To today

Services / Content SaaS

Centralized Platforms PaaS, IaaS, etc.

Distributed Telco Cloud
What is the Telco Cloud?
High Level Target Architecture

**Key Properties**

1. Physical distribution providing fungible cloud resources close to Telco consumer and business eyeballs.

2. Enables applications to have:
   1. Low Latency
   2. High Availability (through distribution)
   3. High volume of last mile throughput; minimizing network wide capacity growth (choke points)

3. Seamless Integration of DC and WAN technologies leveraging existing network and operational procedures.

**Connectivity Building Blocks**

- **WAN/METRO**
  - BGP (Control Plane)
  - MPLS (Service)
  - MPLS (Transport)
- **DC Fabric**
  - BGP / OSPF (Control Plane)
  - IP (Transport)
- **DC Overlays**
  - MPLS, VXLAN, IP, GRE, etc.

**Openstack**

- Neutron & Neutron Extensions, etc.
What is the Telco Cloud?

Example VNF Use Cases

<table>
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<tr>
<th>Use-Case</th>
<th>Functional Properties (i.e. VM, Container and Bare Metal)</th>
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<tr>
<td>Networking (L2-L7)</td>
<td>Edge Routing/Switching, CPE, etc.</td>
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<td>Security</td>
<td>Firewall, NAT, IDS/IPS, IPsec/SSLVPN, etc.</td>
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<td>3GPP (MPC/EPC)</td>
<td>SGW, PGW, MME, Probes, ePDG, GiLan, MMSC, etc</td>
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<tr>
<td>Voice</td>
<td>VoLTE, SBC, etc.</td>
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<tr>
<td>CDN/Caching</td>
<td>Databases, Storage, HaaS (BM), etc.</td>
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<tr>
<td>Access</td>
<td>OLT, BNG, RGW’s, etc.</td>
</tr>
<tr>
<td>Video Content Management</td>
<td>Transcoding, Network DVR, etc.</td>
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Telco Cloud Requirements to Date
What we know about Telco Cloud VNF(s) Applications

1. Akin to web apps
   - MME, HSS, Backend Databases, Application/Business Tiers, PCRF, etc.

2. Packet Forwarding and Manipulation
   - Network & Security, EPC/MPC, etc.

3. Combination of traditional Networking elements
   - SBC + Firewall + Load Balancing + SIP server/management

4. CDN/Proxies

5. Transformation Elements
   - Transcoding/Encoding/Decoding/Encryption

Common Cloud and VNF Requirements

- Multi-tenancy (Reservation and Separation)
- Self Service
- Low Latency / Low Jitter (i.e. Voice / Gaming / M2M / Small Packets)
- Application High Availability
- General QoS (IOPS, CPU, Resources)
- Orchestration
  - Inventory, Event/Log Management, Config Management, CI/CD/Testing, Monitoring, ITSM/ITIL/FCAPS/OSS, Probing/CALEA
- Brownfield App/VNF Support (Cattle Transition)
- Network QoS (Marking and Treatment)
- Migration of HA pet to midget cow VNFs (i.e. BGP, HA, VRRP, etc.)
- Geo-Dependency of Workloads to Connections (i.e. Service mobility and network availability)
- KPI Measurements of VNF Requirements (i.e. Rich Network Analytics)
- Operational Transitions/Events (Workload and DC Dry Out)

Unique Telco Cloud VNF Requirements

- High Packet Per Second Throughput (i.e. DNS, Network I/O)
- Low Latency / Low Jitter (i.e. Voice / Gaming / M2M / Small Packets)
- Migration of HA pet to midget cow VNFs (i.e. BGP, HA, VRRP, etc.)
- Geo-Dependency of Workloads to Connections (i.e. Service mobility and network availability)
- KPI Measurements of VNF Requirements (i.e. Rich Network Analytics)
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Operational Transitions/Events (Workload and DC Dry Out)
Solving for Unique Requirements

1. To SRIOV or not SRIOV
2. Creating truly scale out routing
3. Brownfield Enablement
4. Communicating and Aligning on Telco's Uniqueness
Solving for Unique Requirements
To SRIOV or not SR-IOV (Performance Classification)

1. **Desired vR Packet Performance per Server**
   ~75% of VNFs may be satisfied at 7M PPS

2. **Desired vR Flows per Server**
   ~70% of VNFs may be satisfied at 1.5M flows per server

3. **Desired vR Peak Flow Rate**
   ~25% of VNFs may be satisfied at 25K flows per second per server

**Four dimensions of vRouter Forward performance**

1. **Packet Processing**
2. **Aggregate Flows**
3. **Peak Flow Rate**
4. **Features**

All fours are dimensions are important for VNF to make use of overlay networking
Solving for Unique Requirements
To SRIOV or not SR-IOV

Proposed Solutions

1. Build Cloud Native VNFs
   - .. and if you can’t the real question you need to answer is:
   - Should I be virtualizing vs. should I be automating this xNF?

2. Judicious use of SR-IOV and traditional Cloud workloads
   - Governance: A stern reminder to tenants still using SR-IOV:
     - The barrier to entry is now removed.
     - Technical Co-existence

3. Moore's Law (Hardware) to the Rescue
   - SR-IOV workflow integration into TORs (silicon)
   - Smart NIC offload of SR-IOV workload properties into silicon

4. Software to the Rescue (optimized linux kernel, drivers, vR/vS, memory management, etc.)
Solving for Unique Requirements
Truly Scaled Out Routing

• Leverage the network, protocols and tools you already have.
• Example of a scale-out platform/solution:

More details: [http://www.opencontrail.org/opencontrail-architecture-documentation](http://www.opencontrail.org/opencontrail-architecture-documentation)
Solving for Unique Requirements
Brownfield Enablement

• Physical Network Functions (PNFs) by nature are legacy and expect certain behaviors around it
  • Traditional PNF vendors not incentivized to re-write/port
  • PNF owners (internal or external) have moved on

• Typical technology solutions needed for PNF to VNF migration:
  • Liveliness detection and High Availability
    • PING, HTTP URI (TCP) level checks, BGP, BFD, etc.
  • Dynamic Insertion of Network Reachability
    • Think SSL/IPSec Tunnel Termination of remote endpoints (UE’s, Small Cell Site, etc.)
    • i.e. BGPaaS [https://blueprints.launchpad.net/juniperopenstack/+spec/bgp-as-a-service](https://blueprints.launchpad.net/juniperopenstack/+spec/bgp-as-a-service)
  • Live Migration of VNFs supporting legacy behaviors as a crutch
  • Geo Distributing VNFs where possible
Solving for Unique Requirements
Communicating and Aligning on Telco's Uniqueness

1. Documented Telco Cloud use-cases for operational alignment
   • OPNFV

2. Documented APIs and Data Models
   • Openstack
   • OpenConfig
   • IETF
   • OPNFV
   • Others..
Evolving Telco Cloud Requirements
Looking Forward..

1. Operational focus of in-service upgrades of Telco Cloud platform to avoid legacy/semi-cloud VNF disruptions
   • Better defined and industry accepted dry out procedures (OPNFV)

2. More options without compromise to performance and scale
   • OpenPower, RISCv, ARM

3. Hardware acceleration in compute of common application and network patterns
   • Network I/O, Database lookups, Encryption, Security, to name a few.

4. Distributed Persistence and State
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