Lessons Learned from Using ONAP to Build a Multi-vendor SD-WAN Solution

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IF YOU HAVE DIGITAL TV OR BROADBAND SERVICES, YOU ARE MOST LIKELY USING REDEFINING CONNECTIVITY ARRIS TECHNOLOGY
ARRIS

End-to-end technology innovation and the experience to bring it all together

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PROFESSIONAL SERVICES
“ARRIS provides software-defined solutions for Multi-Domain Service Orchestration that streamline service activation, enhance service agility and help Service Providers free themselves from the constraints of their legacy networks.”
ARRIS Managed Networks

As ARRIS’s Managed Network business scales, automation and orchestration are essential!

• ARRIS provides Managed Network Solutions for Service Providers serving SMB and Enterprise customers
  – Managed Wireless and Wired
  – Managed Router/Firewall

• Includes Operator-defined VNFs with service chaining
  – Firewall, Router, NAT, DHCP, Content Filtering, Intrusion detection

• Enables multi-vendor VNF ecosystem

• Leverages open source technologies
Support a Multi-Vendor Ecosystem
- Create unique services agnostic of vendor-specific components
- Support various types of VNFs

Multi-Deployment Scenarios
- Universal CPE
- Virtual CPE
- Hybrid

Open Source Software Approach
- ONAP, OSM
- Continue to avoid vendor lock

Standards Development Organizations
- MEF, ETSI, IETF
- OASIS-TOSCA
- TMForum Alignment

Mission: Digital Transformation
Different Deployment Scenarios

1. "Thin" CPE (vCPE) tunnels traffic to Edge-Cloud VNFs

2. "Thick" CPE (uCPE) runs local VNFs

3. Hybrid Scenario managed by same Orchestration layer
Why ONAP for Automation & Orchestration

- Model Driven
- Standards-Based Interfaces
- Centralized Design Studio
- Modular & Microservices Architecture
- Policy Driven Run Time
- Multi-Tenancy
- L1-L7 Controllers
- Pluggable Architecture
- Edge Automation*
Approach

- Use Case Analysis
- VNF Evaluation
- VNF Onboarding
- Basic Functional Testing
- Service Function Chaining

- VNF LCM Validation
- VNF CI & CD
- VNF Monitoring
- Network Service Chaining

- Lifecycle Management
- Closed Loop Integration
- Performance

ITERATE
VNF Terminology

Design Time View: **SERVICE A**

Run Time View: **SERVICE A**

<table>
<thead>
<tr>
<th>VF</th>
<th>VNF</th>
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</thead>
<tbody>
<tr>
<td>VENDOR A VFC N/W Functions</td>
<td>VENDOR A VF-MODULE</td>
</tr>
<tr>
<td>AAA</td>
<td>FW</td>
</tr>
<tr>
<td>VENDOR B VFC N/W Functions</td>
<td>VENDOR B VF-MODULE</td>
</tr>
<tr>
<td>FW</td>
<td>NAT</td>
</tr>
</tbody>
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VNF Onboarding Steps

**Design Time**
- **VNF Onboarding**
  - Design Resource Template
  - Define VLM Using SDC
  - Define VSP Using SDC
  - Define VF Using SDC

**Run Time**
- **Design Service Using SDC**
- **SO, AAI, Policy, Controllers**

**Vendors**
- **Vendor A VFC**
  - N/W Functions: AAA, FW, NAT
- **Vendor B VFC**
  - N/W Functions: FW, NAT, CF

**Service A**
- Distribute

**Service A**
- New Version
- Enables VNF BB
- Enables VF Module BB
## Lessons Learned

<table>
<thead>
<tr>
<th>Observations</th>
<th>What We Did</th>
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| Limitations in validation and verification of onboarded VNF in ONAP | • Manual verification at different steps of onboarding and orchestration of VNF  
• Manual verification for compatibility checks, translation of design time entities to run time entities |
| Vendor VNF can provide multiple functions packaged in a single VM | • Developed integration wrapper on VNF to orchestrate deployment & key LCM operations  
• Used different BPMN flows in ONAP to support different LCM operations |
| Existing Network Services limit optimized use of VNFs. | • As a first step modeled VNF’s to match current service scenarios and operations  
• Iterated analysis of use cases to generalize the build and deployment of VNFs |
| Many ONAP workflows – hard to choose best | • Study ONAP use cases to understand BPMNs, controllers and internal integrations.  
• Testing of ONAP components to pick between existing SO flows, customization or new flows |
| SDC framework limitations for complete onboarding | • Automated the pre-onboarding activities using the REST API of appropriate ONAP components |
Summary

Iterate VNF design approach over several use cases

Allow for standard and propriety VNF onboarding

Iterate over service chaining scenarios

Design tools to simplify onboarding
What's Next?

- Reusable building blocks to ensure service agility
- CNF over Kubernetes VIM
- Open API for cross provider automation
- Performance commitment
THANK YOU