SDN and NFV: How they Will Change Your Network Operations

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Eric Lampland – Lookout Point Communications
Are you going to be the next legacy network?

Will your services cost too much?

Will you provide the new services that customers want?

Will they complain that it is too hard to work with you?

Will you fall back on trite sayings?

“we give customers everything they need!”

“we can’t afford ______!”
Time is passing and it requires change

IP is assumed … for everything … yesterday

Hardware and Proprietary Software
    … costs too much
    … is too inflexible
    … is hard to introduce new services
    … takes to much time

Operation and Network Management Systems
    … require unique skills that are expensive
    … hard to use
    … inflexible

And the story goes on and on ….
Important Disruptions

Software Defined Networks (SDN)

Network Function Virtualization (NFV)

Management and Network Orchestration (MANO)

SDN and NFV are disruptive from a management perspective because they require change at every level: in employee skillsets, process reengineering and automation, and new OSS capabilities...

Light Reading April 2014
Cover – not necessarily in a linear order

What Software Architectures Promise

A little history SDN and NFV – the issues are not new

How it works … briefly … for understanding only terms, components or parts, how things fit together
Basic Structure

Standard Servers

SDN Controllers

Less expensive switches
SDN — the first important thing
-- separate control from data flow
An old problem(s):

- Speed change issues: Optical – Electrical – Optical (OEO)
  - Latency problems and other delays
  - Relative volume problems
  - Prioritization issues

- ATM, GMPLS, 3GPP (LTE EPC architecture, etc.), others

- Protocol and Traffic Carriage Efficiencies
  - Packet encapsulation – overhead, processing time, etc.
  - IPv4 to IPv6 issues
  - MPLS route establishment

And a lot more ....
How

Controller

OpenFlow Protocols

Flow Table Data Forwarding

Flow Table Data Forwarding

Flow Table Data Forwarding

Flow Table Data Forwarding

Flow Table Data Forwarding

Flow Table Data Forwarding

Flow Table Data Forwarding
Flow Table

Matching and Actions

<table>
<thead>
<tr>
<th>Flow Entry 0</th>
<th>Flow Entry 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match Field [ some value]</td>
<td>Flow Entry 1</td>
</tr>
<tr>
<td>Counters</td>
<td>Flow Entry 2</td>
</tr>
<tr>
<td>Actions</td>
<td>Flow Entry 3</td>
</tr>
</tbody>
</table>

| Flow Entry N | Flow Entry N |
Results in ....

- less expensive equipment (white label, bare metal, with open source code)
- total network view
- simplicity -- change to all OSS/BSS functional interfaces;
- Ability to automate policies and provisioning
- Ability to reconfigure, add services/routes on the fly,
If we move toward ….

**Software Abstractions**

- **Security Functions**
  - Firewalls
  - Intrusion Detection
  - Encryption

- **Analytics**
  - DPI
  - Traffic Analysis

- **Operational Devices**
  - Carrier Grade NATs

- **Optimization Functions**
  - CDN
  - ADC
  - Policy Controls

- **Authentication**
  - AAA servers, HLRs
  - SBC

- **In the Home/Office**
  - Gateways, STBs
Network Function Virtualization

Figure 2: Three Pillars of the ETSI NFV Architecture

Virtual Network Functions (VNFs)
- VNF
- VNF
- VNF
- VNF
- VNF

NFV Infrastructure (NFVI)
- Virtual Compute
- Virtual Storage
- Virtual Network

Virtualization Layer
- Compute
- Storage
- Network

Hardware Resources

Source: ETSI NFV ISG
Service Chaining

Datapath Overview

- Andromeda Network Datapath with integrated programmable NFV
- Datapath pipelined, replicated multiple times as VM resources scale out
- Critical optimizations applied e2e
- Goal: near native performance, CPU efficiency

Google announces Andromeda March, 2014
Mix with other problems along the way .... today’s networks are/have:

- Management and Configuration – whole set of issues
- Effectively static networks; no dynamism
- Costly operationally: difficult to automate
- Vendor proprietary lock ins – “oh, that’s a really nice feature!”
- Ever greater complexity in devices (read: expensive)

And a lot more ....
One Construct – Device Management

NETCONF and Yang replace SNMP/MIBs

Just Applications

Security too
Scalable and Distributed Architectures
Multi-layer Multi Vendor Networks

Programmability: easy-to-deploy

Physical Layers, address/routing layers can be formed along policy needs and changed rapidly

O/BSS view is as multiple separate networks – and a total network view

Isolation: providing security and manageability

Software initiated configuration and provisioning allows per customer service chaining, self-provisioning and/or policy reconfigurations for QoS, bandwidth or short-term products.
Simplicity, Visibility and Control for New Services

“Customers really crave control and visibility into their own services. If you can deliver that at speed, you will be surprised at how the market will change. … “

"There's a ton of complexity in the network, but the thing that is the most urgent is focusing on service evolution and velocity,”

Basil Alwan Alcatel 2-19-15
SDN/NFV/MANO = New Services

- Sell Instantaneous Bandwidth for Variable Duration
- Request and pay for flows by tailored service chains
- Establish Bandwidth Exchanges
- Address continually variable demands – IoT
- Provide instantaneous network reconfigurations addressing emergency services
- Create small group networks – by customers desire

Change the service by re-ordering the abstractions, and change infrastructure by changing the mappings ...
A new way of looking at OPs

Horizontal integration of the functional elements means a single management interface is provided to define, manage, provision and troubleshoot... results in...

✓ reduced operational costs
✓ facilitates scalability
✓ accelerates problem resolution
✓ manage by abstraction

keys to simplifying operations.
WITH THE COMPANY’S MOVE TO VIRTUALIZATION, THE NETWORK HARDWARE BECAME OBSOLETE. THEY LET US KEEP IT FOR THE BREAK ROOM AND THEY SOLD THE FURNITURE ON CRAIGSLIST.