March 15, 2016

AT&T’s SDN and Virtualization Big Bets

Margaret Chiosi
AT&T Labs Distinguished Network Architect
Open Platform for NFV – OPNFV President (Linux Foundation)
AT&T’s Deployment

**New Services:**

- AT&T Network on Demand – NFV & SDN Control – vCE, vPE, uCPE (vFW)
- AT&T NetBond – SDN Control
- AT&T Connected Car – NFV
- AT&T MVNO – NFV
- URL Redirect (blocking, scrubbing) – NFV and SDN control
- Mobile Call Recording – NFV

**Internal Services:**

- Control Services (DNS, NAT, NTP, DHCP, Radius, FW, LB) – NFV and (SDN Control)
- Probes – NFV
### Virtual Network Functions (VNFs)

<table>
<thead>
<tr>
<th>VNFs</th>
<th>Premise</th>
<th>Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Virtual Router</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• Wireless LAN Controller</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• WAN Acceleration</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• App Reporting</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• Remote Access Gateway</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Firewall</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• Intrusion Detection</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• Web Proxy/Filtering</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• DDOS</td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>• E-mail Security</td>
<td></td>
<td>•</td>
</tr>
<tr>
<td><strong>Voice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Session Border Controller</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

**Deployment Models**

- Virtualized network functions
- Premises
- Network
- AT&T Cloud

---

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, the AT&T logo and all other AT&T marks contained herein are trademarks of AT&T Intellectual Property and/or AT&T affiliated companies. The information contained herein is not an offer, commitment, representation or warranty by AT&T and is subject to change.
AT&T NetBond®

Cloud networking solution that enables customers to “bond” their AT&T Virtual Private Network (VPN) to multiple clouds for the delivery of business applications through fast and highly secure connectivity.

*Equinix: 3rd party meet-me-point for CSPs only.

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, the AT&T logo and all other AT&T marks contained herein are trademarks of AT&T Intellectual Property and/or AT&T affiliated companies. The information contained herein is not an offer, commitment, representation or warranty by AT&T and is subject to change.
International IOT/Connected Car
AT&T's SDN and Virtualization Big Bets

MVNO

Virtualized Policy and Messaging
- PCRF
- SCP
- MMSC

Virtualized Packet Core
- PGW
- GGSN
- PCEF

AT&T Mobile Network
- Gp / S8
- Gi / SGi

Internet Proxy
- NAPT
- Firewall
- Mobile DNS

Internet
- IPv4 / IPv6 port 80
- IPv4 not port 80
- IPv6 not port 80
- DNS

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, the AT&T logo and all other AT&T marks contained herein are trademarks of AT&T Intellectual Property and/or AT&T affiliated companies. The information contained herein is not an offer, commitment, representation or warranty by AT&T and is subject to change.
URL Redirect

AM User IF → Security Services Controller (SSC) → SDN-C → vRR → URL Scrubbing (country specific) → vPE

GMIS PE → vRR

URF (queries DNS to get IP address) → SDN-C

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, the AT&T logo and all other AT&T marks contained herein are trademarks of AT&T Intellectual Property and/or AT&T affiliated companies. The information contained herein is not an offer, commitment, representation or warranty by AT&T and is subject to change.
Mobile Call Recording – Overview and Service Flow

- **Device Agnostic**
  - Mobility redirects calls to MCR VNFs
  - No apps to install
  - No user opt-out
  - Just dial like usual
  - International roaming supported

- **APIs to provision mobile users’ numbers** into AT&T’s Mobility Network and the MCR VNFs

- **Service Control Function (SCF) Virtual Network Function (VNF)** redirects the mobility call to MCR.

- **Recording VNF** records the call under the direction of the **Cloud Foundry (CF)** customer app.
  - The **CF VNF** runs the customer apps (written in node.js) which integrate with the **Recording Processor (RP) VNF**.
  - **RP VNF** delivers the metadata (calling/called numbers, etc) and recording to customer storage **immediately after the call**.

- Some per customer app customizations include: Recording disclaimer; Reminder tone; Reminder interval & URLs and credentials for the storage provider
AT&T’s SDN and Virtualization Big Bets

AT&T’s Deployment

New Services:

- AT&T Network on Demand – NFV & SDN Control – vCE, vPE, uCPE (vFW)
- AT&T NetBond – SDN Control
- AT&T Connected Car – NFV
- AT&T MVNO – NFV
- URL Redirect (blocking, scrubbing) – NFV and SDN control
- Mobile Call Recording – NFV

Internal Services:

- Control Services (DNS, NAT, NTP, DHCP, Radius, FW, LB) – NFV and (SDN Control)
- Probes – NFV
DNS Virtualization Benefits

- **SDN control of anycast traffic distribution**
- **Platform / Application Control**
  - Enforce DNS configuration consistency
  - COTs HW
  - vDNS elasticity with traffic volume drives compute and DNS efficiency
- **Compute Node**
  - vDNS
  - vNTP
  - vFW
  - vNAT
  - vLB
- **DNS Anycast Network**
- **Flexibility in scale and geographic diversity**
- **Efficient operations**
- **Optimal application stacking**

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, the AT&T logo and all other AT&T marks contained herein are trademarks of AT&T Intellectual Property and/or AT&T affiliated companies. The information contained herein is not an offer, commitment, representation or warranty by AT&T and is subject to change.
vProbe

**P-TO-P OR MULTI-POINT ETHERNET (w/CHAINED OAM VM):**
Rep. OAM Stream
(e.g., TWAMP)

**P-TO-P OR MULTI-POINT ETHERNET (w/NO CHAINING OF OAM VM):**
Rep. OAM Stream
(e.g., TWAMP)
MEASUREMENT DEFINITION AND RESULTS COLLECTION

(1) SA function configuration (e.g., TWAMP)
(2) LMAP Measurement Agent (MA)
   Configuration function: https://datatracker.ietf.org/doc/draft-ietf-lmap-yang/
(3) LMAP Measurement Agent (MA)
   Collection function: https://datatracker.ietf.org/doc/draft-ietf-lmap-yang/
(4) AT&T-Specific (or standards-specified)
    Measurement Model Abstraction:
    – Defines configuration to instantiate and report measurements
    – Coordinated with Performance Metrics Registry where feasible
Summary
AT&T has already transformed 5% of our targeted network with a goal of 30% in 2016 onto our SDN enabled cloud.

Domain 2.0 is a transformative initiative to enable AT&T network services and infrastructure to be used, provisioned, and orchestrated as is typical of cloud services in data centers by leveraging SDN, NFV and Orchestration.
MOBILIZING YOUR WORLD™