Service Chaining for NFV and Delivery of other Applications in a Global Multi-Cloud Environment

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ADCOM 2015, Chennai, India, September 19, 2015

These slides and video recording of this presentation are at:
http://www.cse.wustl.edu/~jain/talks/adn_in15p.htm

Overview

1. Network Function Virtualization and Service Chaining

2. Function Virtualization and Service Chaining

3. OpenADN – How to do it with no content visibility

Network Function Virtualization (NFV)

1. Fast standard hardware ⇒ **Software based Devices** Routers, Firewalls, Broadband Remote Access Server (BRAS) ⇒ A.k.a. *white box* implementation

2. **Virtual Machine implementation**
   ⇒ Virtual appliances
   ⇒ All advantages of virtualization (quick provisioning, scalability, mobility, Reduced CapEx, Reduced OpEx, …)
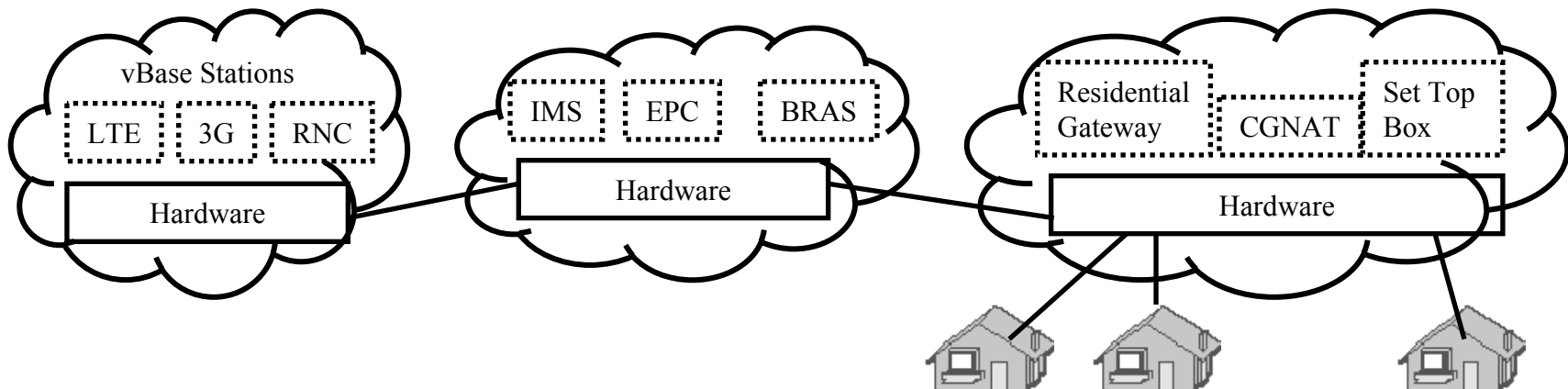
Ref: ETSI, "NFV – Update White Paper," Oct 2013, http://www.tid.es/es/Documents/NFV_White_PaperV2.pdf (Must read)
Washington University in St. Louis   http://www.cse.wustl.edu/~jain/talks/adn_in15p.htm   ©2015 Raj Jain

Why We need NFV?

1. **Virtualization**: Use network resource without worrying about where it is physically located, how much it is, how it is organized, etc.

2. **Orchestration**: Manage thousands of devices

3. **Programmable**: Should be able to change behavior on the fly.

4. **Dynamic Scaling**: Should be able to change size, quantity

5. **Automation**

6. **Visibility**: Monitor resources, connectivity

7. **Performance**: Optimize network device utilization

8. **Multi-tenancy**

9. **Service Integration**

10. **Openness**: Full choice of Modular plug-ins

Note: These are exactly the same reasons why we need SDN.

Service Chaining in a Multi-Cloud Multi-Tenant Environment

- ❑ VNFs (Virtual network fns) belong to tenants. Multiple tenants.
- ❑ Each Cloud belongs to a different Cloud Service Provider (CSP)
- ❑ Internet infrastructure belongs to an NFVI service provider (NSP)
- ❑ Service chain = Workflow
- ❑ IETF SFC workgroup

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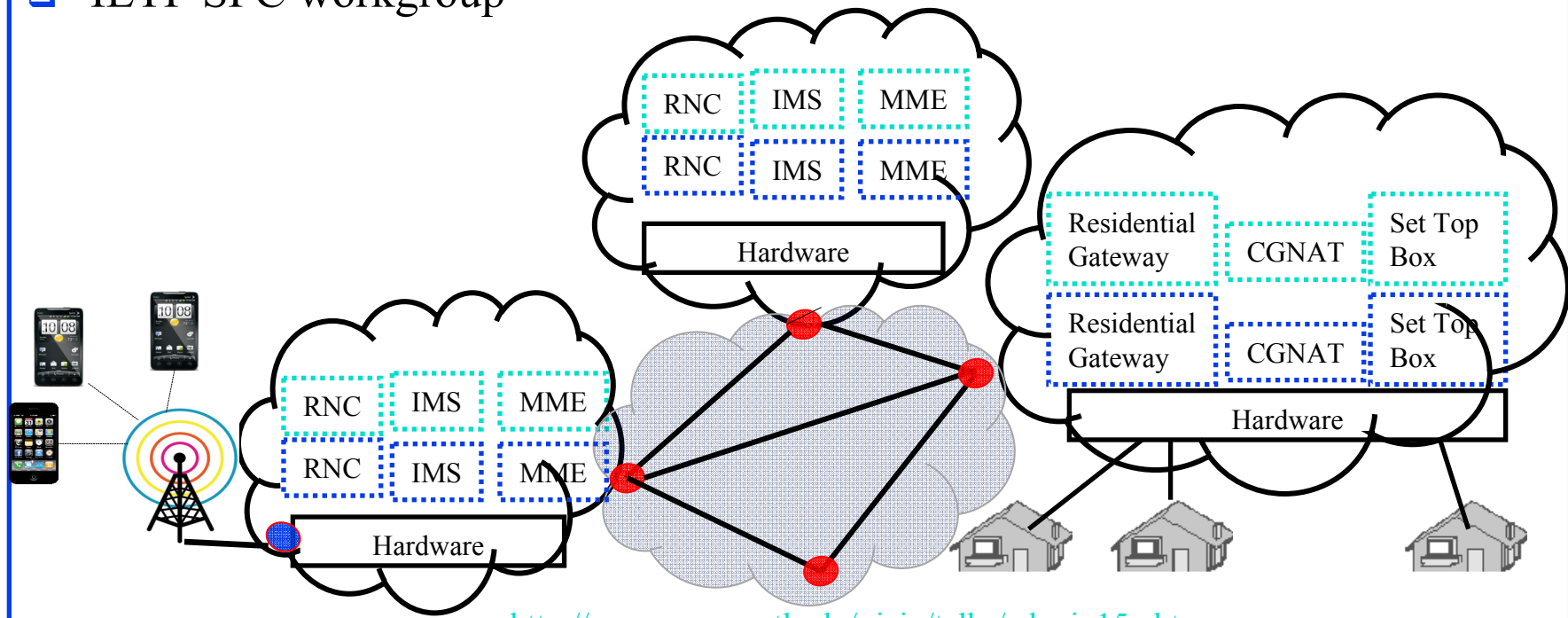
Challenges in Service Chaining

- **Dynamic**:
  - Forwarding changes with state of the servers, links, …
- **Content sensitive**:
  - Different for different types of videos, read-writes, …
- **Distributed Control**:
  - Equipment belongs to infrastructure provider
  - Data belongs to Tentants
- **Massive Scale**:
  - Billions of Users with different user context
- **Stateful Services**:
  - All packets of a flow should be sent to the same replica

Any Function Virtualization (FV)

❑ Network function virtualization of interest to Network service providers

❑ But the same concept can be used by any other industry, e.g., financial industry, banks, stock brokers, retailers, mobile games, …

❑ Everyone can benefit from:

➢ Functional decomposition of there industry

➢ Virtualization of those functions

➢ Service chaining those virtual functions (VFs)
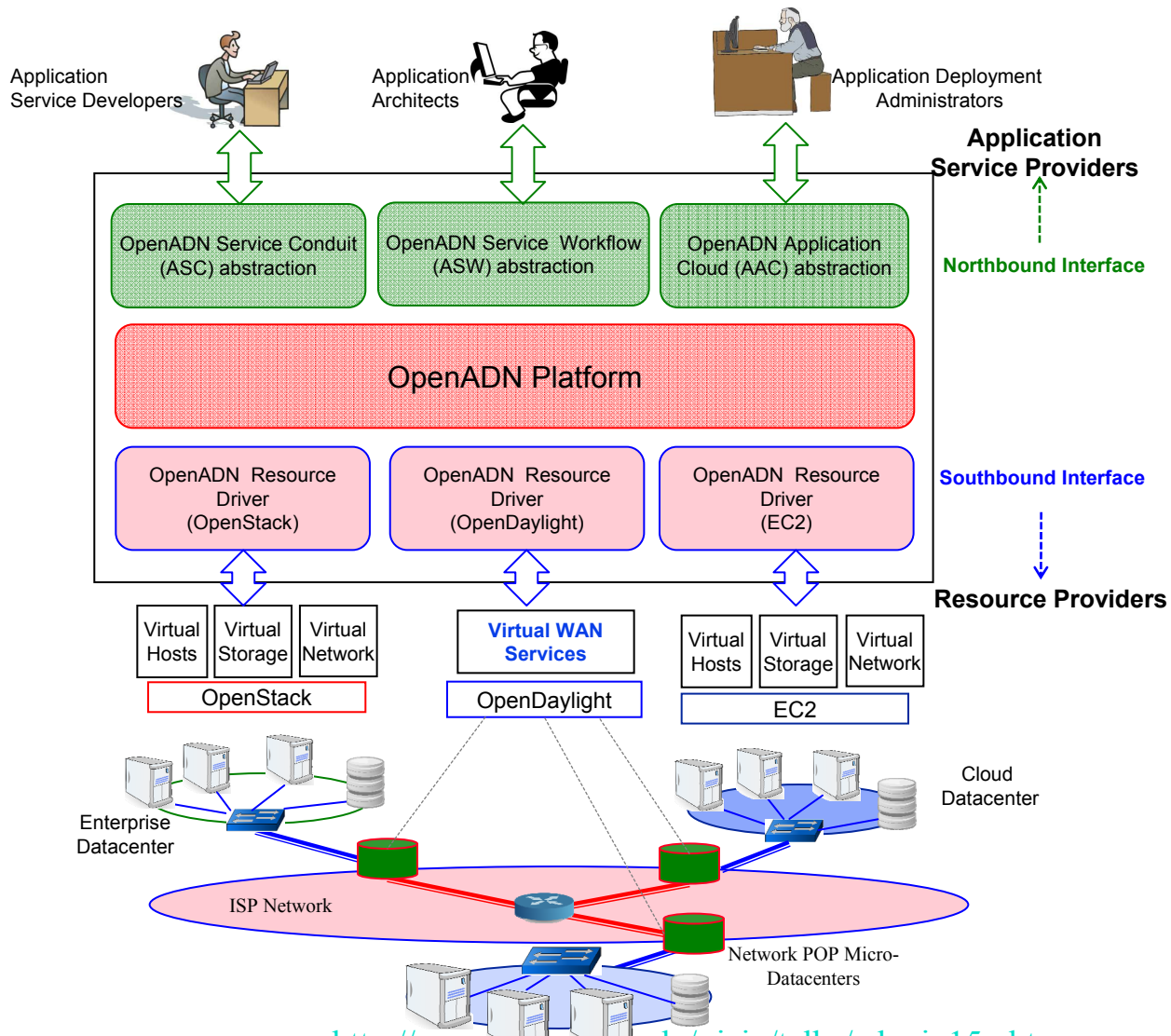 $\Rightarrow$ A service provided by the next gen ISPs

Enterprise App Market: Lower CapEx

Virtual IP Multimedia System

Available on the App Store

amazon.com® and you're done.™ App Store

ANDROID

200,000 AVAILABLE APPS

Our Solution: OpenADN Platform

- Application Service Developers
- Application Architects
- Application Deployment Administrators

Application Service Providers

OpenADN Service Conduit (ASC) abstraction

OpenADN Service Workflow (ASW) abstraction

OpenADN Application Cloud (AAC) abstraction

Northbound Interface

OpenADN Platform

OpenADN Resource Driver (OpenStack)

OpenADN Resource Driver (OpenDaylight)

OpenADN Resource Driver (EC2)

Southbound Interface

Resource Providers

| Virtual Hosts | Virtual Storage | Virtual Network |

OpenStack

Virtual WAN Services

OpenDaylight

| Virtual Hosts | Virtual Storage | Virtual Network |

EC2

Enterprise Datacenter

Cloud Datacenter

ISP Network

Network POP Micro-Datacenters

Resource Control

❑ Tenants keep complete control of their data.
NSP does not have to look at the **application data** to enforce application level policies

❑ NSPs keep complete control of their equipment.
tenants communicate their policies to NSP's control plane

❑ **VFs and Middle boxes** can be located anywhere on the global Internet
(Of course, performance is best when they are close by)

❑ Tenants or NSPs can **own** OpenADN modules.
NSPs can offer "Service Chaining" **service**.

❑ **No changes** to the core Internet

Data Control Management Planes

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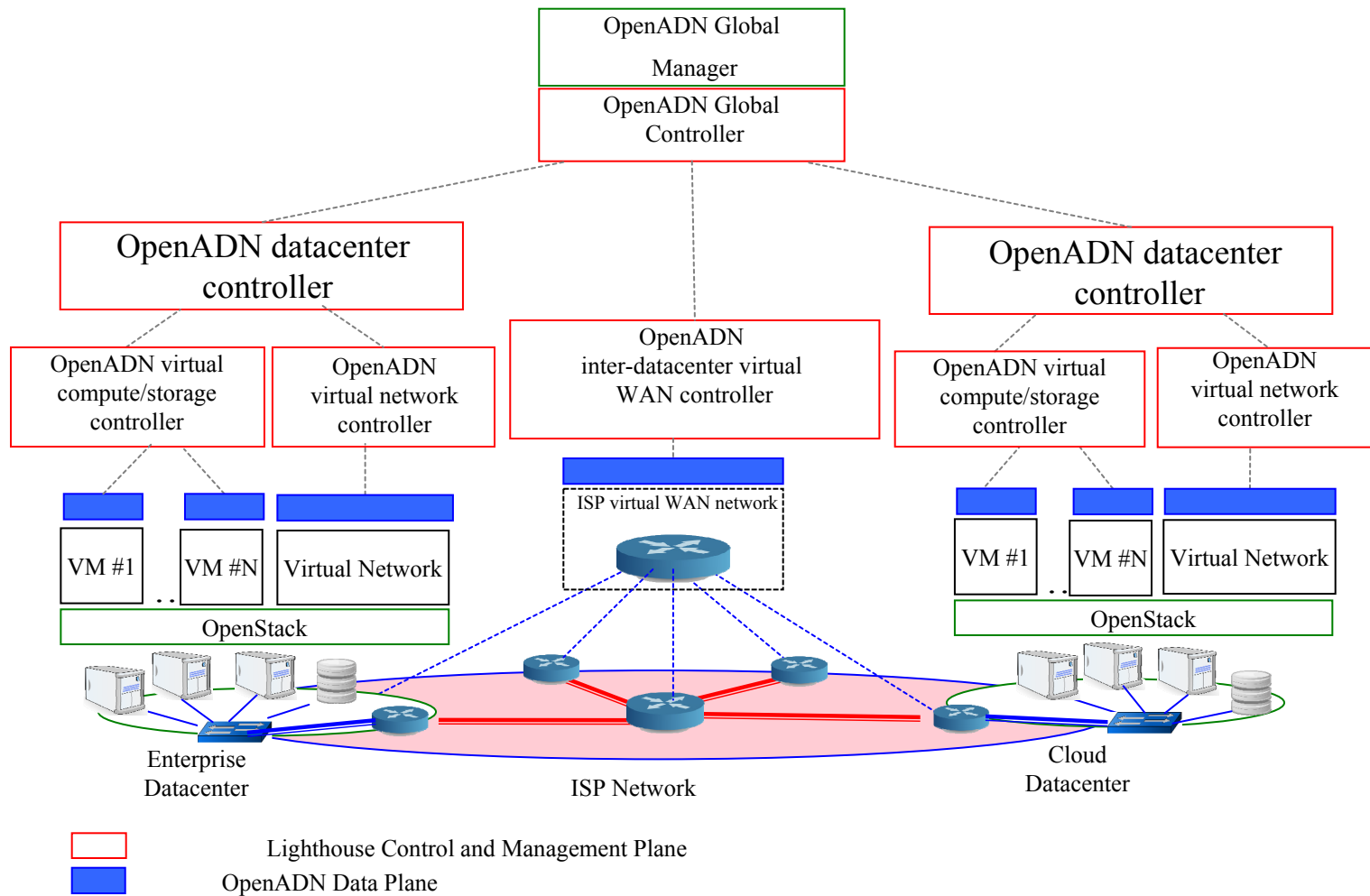
Summary

1. Virtual Networking Functions (VNFs) will be replicated and deployed globally
   $\Rightarrow$ Need **dynamic** service chaining based on user, network, and application context

2. Virtual functions useful not only for networking but also for **all other global enterprises** and games
   $\Rightarrow$ New business opportunity for NFV Infrastructure service

3. **Tenants can share** wide area network infrastructure and specify their policies

4. NSPs keep complete **control** over their resources.
   Tenants keep complete control over their traffic.

5. Can be implemented incrementally **now**.