“Virtualization of the Mobile Network; Time to Put the Pedal to the Metal”

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Tuesday, October 27, 2015
Virtualizing the mobile network

Chris Nicoll, Head of Network and Enterprise Research
Virtualizing the mobile network

Key SCN (cloud, NFV, SDN) market drivers and inhibitors

**SHORT TERM**

**NEW DIGITAL SERVICES REVENUE**

SCN provides a long-term flexible, scalable vNGN platform for existing and new digital economy services. This requires long-term transformation (process, people & systems).

vNGN-OSS automation and operational flexibility reduces opex, time to market and captures revenue faster.

Hardware, data centre and disaster recovery cost savings will occur in the short term, but also support tactical cost-reduction business cases to secure SCN budgets for long-term gain.

**LONG TERM**

**COST OPTIMISATION**

NFV and SDN COTS software immaturity is driving in-house development and inhibiting scalable operationalisation of these technologies.

CSPs need to get a return on their investments in existing network infrastructure, and everything will not be immediately virtualised.

SCN spend will continuously compete with sales and marketing for budget and will need business case support for increasing spend (for example, for large deployments, replacements and upgrades).

Source: Analysys Mason
Virtualising the mobile network

Virtualisation can improve network flexibility, responsiveness and automate control functions

Simplified vNGN-OSS functional architecture

- **BSS**: Customer care
  - Customer experience management
- **vNGN-OSS**: Service fulfilment
  - Service orchestration layer
    - Dynamic inventory
    - Network management systems (NMS)
    - Network orchestration layer (VNFM, NFVO)
- **Network and IT**: VIM, VNFs, SDN controllers, PNFs, VNI
  - SDN-enabled

Note: VNF = virtual network function; NFVO = NFV orchestrator; PNF = physical network function; VIM = virtual infrastructure manager; VNFM = VNF manager; VNI = virtual network infrastructure.

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NFV/SDN will provide cost savings, and new revenue from enterprises will be a lucrative target, initially.

- **Cost benefits**
  - Capex reduction
  - Opex reduction
  - Reduced service delivery costs

- **Revenue benefits**
  - SME on the go
  - Enterprise on demand (network, colocation, security, XaaS)
  - Cloud-based smart homes
  - Service cloud
    - Video
    - Apps/voice
    - Gaming
    - M2M/IoT
    - Cloud
    - MVNO

- **Customer empowerment**
  - simple, instant, visibility, AAA
  - (anytime, anywhere, any device)

- **Auto-configure automation**
  - Discover, validate, and inventory
  - OSS automation
  - Auto-configure network policies
  - Validate configuration and add to management

- **vNGN automations**
  - Network augmentation
  - Addition of new NFVI, VNFs or technologies
  - Create services from existing resources
Virtualizing the mobile network

A scalable, flexible, operationalized vNGN is needed by DSPs for future customer-driven digital services

Customer insight:
proactive, learning, responsive, secure

Customer empowerment: simple, instant, visibility, AAA (anytime, anywhere, any device)

Customer QoS:
personalised, adaptive, differentiating, promotes loyalty

CSP revenue: USD1.7 trillion worldwide

Physical and virtual network management, orchestration and control

Dynamic inventory

Service fulfilment

Service assurance

Service orchestration

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The Impact of Cloud-Centric Networking

- Capex reduction
- Service velocity
- Elasticity
- Network intelligence
- New apps enabled
- Differentiation

Bottom line:
- Opex optimization

Top line:
It is about the Software

- Subscriber session and policy
- Value added services (Cisco or 3rd party services)
- Mobile packet core services
- Application Control & Management (VNFM)
- Service Orchestration (NfVO)

Capex vs. Capacity
- Cost (not to scale)
- Opex (not to scale)
Adding Flexibility to EPC – VPC Network Slicing

StarOS supports many functions (MME, SGW, ePDG) and many customer types (VoLTE, MPN, Internet)

Single system – conflicting features; different scaling dimensions; different SLAs; all one SW version

Literally, slice and dice your EPC
VPC Architectures
Virtualization Environment

OSS/BSS

Network Services Orchestrator (NFVO, Tail-f)

EMS/NMS for VNFs
Ctrl Class DPI L7 AF NAT/FW
Virtualized Network Functions
Switch/SDN Service Chaining including forwarder(s)

Application manager
Telco Cloud Foundation Services
Foundation services
Application & VM Auto-build
Cisco Telco Cloud Manager (NVFM)
Abstraction API

Ve-Vnfm
Or-Vnfm
Or-Vi
Vi-Vnfm
NF-Vi
Ve-Vnfm

Virtual Infrastructure Manager (VIM)

Service templates

Virtual Infrastructure Manager (VIM)

Network Function Virtualization Infrastructure (NFVI)

Virtual compute
SDN Infra
Virtual storage

Hardware (compute, storage, switching)

Virtualization Environment

Cisco Telco Cloud Manager (NVFM)
CF and SF VM Description

Control Function Platform management tasks

Session Function Demux Tasks IP address Management

Session Function x2 Session Tasks State replication

Session Function Redundant tasks

HW Blade Server

Blade

Blade

Blade

Blade

Blade

Blade

HyperVisor

HyperVisor

HyperVisor

HyperVisor

HyperVisor

HyperVisor

VM

VM

VM

VM

VM

VM

StarOS

StarOS

StarOS

StarOS

StarOS

StarOS

CF

CF

SF

SF

SF

SF
Single Instance (SI)

Control Function
Platform management tasks

Session Function
Demux Tasks
IP address Management

Session Function
Session Tasks
State replication

SI GW
Redundant tasks

HW Blade Server

Control Function
Platform management tasks

Session Function
Demux Tasks
IP address Management

Session Function
Session Tasks
State replication

SI GW
Redundant tasks

HW Blade Server

Control Function
Platform management tasks

Session Function
Demux Tasks
IP address Management

Session Function
Session Tasks
State replication

SI GW
Redundant tasks

HW Blade Server
VPC (DI) and 3GPP External Elements

- eNB
- MME
- Gx
- AAA
- Ga
- S2b
- S6b
- S4
- LI
- (S)Gi

OSS

CF

StarOS VM

SF

StarOS VM

Context

CF

StarOS VM
Use Cases and Benefits
Cisco VPC Customer Outcome Examples

Increase Revenue
- AT&T Connected Car
- Telefonica “LTE In A Box”
- Increase revenue in IOT
- Increase revenue in PMB

Reduce Cost
- XL Axiata
- STC
- Goal reduce TCO by 30-40%
- Operational efficiencies
- Offload corporate traffic

Increase Agility
- NAKA
- Aspider-NGI
- Needed Faster TTM
- Service Agility
- Scalable Infrastructure
**AT&T Connect Car**

**Increase Revenue**

**Business Challenge / Opportunity**
- Offer same experience across multiple connected devices, whether in homes or in cars, and to connect easily with one user’s profile across both
- Stay relevant and grow revenue from innovate mobile value-added services

**Network Solution**
- The Drive is AT&T’s connected car platform, a modular solution that automakers can use to choose solutions ranging from connectivity to billing solutions to data analytics. By making a connected car a device compatible with its mobile share plans, the option of connecting cars becomes feasible and appealing to a wider audience
- Cisco solution components included the Cisco Virtualized Packet Core, Policy Suite, and PRIME Network Management.

**Business Results**
- AT&T gains directly through adding cars to its mobile share plans, as well as indirectly with automakers adding data connectivity to their car models.

“The connected car space is truly a global business opportunity for us.”
— Joe Mosele, Vice President of Business Development, AT&T
XL Axiata
Reduce Cost

Business Challenge / Opportunity
• XL Axiata needed to support the rapid growth and ever-changing demands of today’s market. XL Axiata had reported 136 percent year-on-year data traffic growth. With a goal of reducing TCO by 30-40%.

Network Solution
• The Cisco® Virtualized Packet Core delivered the network elasticity and service agility needed to support the rapid growth and ever-changing demands of today’s market. Coupled with Cisco Evolved Services Platform (ESP), enabled XL Axiata to turn up new services in minutes and easily scale operations.

Business Results
• XL Axiata network now has the ability to scale resources up and down to support a full range of mobile networks in a fraction of the time of their old network.

“The Cisco Virtualized Packet Core Solution gives us the flexibility we need to turn on new services quickly for our valued customers”
— Dian Siswarini, CEO of XL Axiata

Aspider-NGI
Service Agility

Business Challenge / Opportunity
• With more than 70 clients around the world, ASPIDER needed to deliver solutions designed to minimize both investment and time to market—from traditional M2M and MVNO projects, to Over-The-Top (OTT), Internet of Things (IoT) and Original Equipment Manufacturer (OEM) solutions for consumer connectivity.

Network Solution
• With this deployment of the Cisco’s Virtualized Packet Core, ASPIDER is enhancing Access Point Name (APN) gateway functions and policy integration to provide customers with more configuration flexibility to support Quality of Service management.

Business Results
• With new service agility delivered by the Cisco Virtualized Packet Core enabled ASPIDER and its customers to expand availability and capture new opportunities worldwide, including new markets such as M2M, MVNO, and Premium Mobile Broadband Networks

“The Cisco virtualized Packet Core solution gives us the flexibility that we need to turn on new services for our clients who rely on ASPIDER for their branded cloud-based mobile services.”
— Jan Mooijman, Chief Executive Officer, ASPIDER

ASR5700 Introduction

Adi Raja Murugan Cisco Mobile Solutions Product Manager

23-Oct-2015
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The NEW ASR 5700

Introduction

• New Mobile Packet Core solution: ‘ASR5000’ for a Cisco COTS environment
• ‘Out-of-the-box solution’ that is simple and cost effective to deploy
• Scalability by way of Moore’s Law and UCS flexibility: +50% every 2Y
• Viable ASR 5000 evolution if ASR 5500 is not an option
• Can scale to very small to very large in a single unit (single IP)
  • Opens up market segments on the very small side (2-4 Gbit/s)
  • Ideal for customers starting small and expecting major growth
• Low-risk, first step to COTS environment with ease of migration to full virtualization (or not)
• Truly unique solution and an industry-first

De-risking the present while delivering the future
What problem does it solve, and how?

- Provides an “entry-point” for Customers who want to test out VNF based solutions, with an out-of-box appliance like solution
- Delivers advanced capabilities that lower OPEX today
- Provides the foundation for smooth migration to end-to-end NFV architectures
- Eliminates risk to investment protection, by using COTS HW

De-risking The Present While Delivering The Future

...So that you walk before you run without compromise
What is the ASR 5700, and how is it positioned?

Key Package System Components

- Red Hat OS R 7.1 (w/o Openstack)
- KVM
- VPC-DI R18.2

ASR 5700 Introduction
The current packaged UCS Blade Configuration:
- M4 Blades with 2x 2.50 GHz E5-2680v3 (12 cores)
- 256 GB RAM (16x 16DDR4-2133-MHz)
- 2x 300GB 6Gb SAS 10K RPM
- VIC 1240

ASR5700 Details

ASR5700 Initial System Software (Base):
- 1 UCS Chassis
  - Base:
    - 4 SF Active
    - 1 SF Demux
    - 1 SF Standby
    - 1 CF Active
    - 1 CF Standby

ASR5700 Initial System Software (Base+ Expansion):
- 2 UCS Chassis
  - Base+Expansion:
    - 12 SF Active
    - 1 SF Demux
    - 1 SF Standby
    - 1 CF Active
    - 1 CF Standby

ASR5700 performance:
- 300K sessions/blade
- 3+ Gbps per blade
ASR 5700 Key Technical Information

- Cisco delivers the E2E product
  - HW/SW, Functional Testing, Performance testing, field implementation, support, documentation
  - ‘ASR5000’

- ASR5700 Scales from very small to very large
  - 4Gbit/s to greater than 250Gbit/s (Future)

- Simplifies implementation efforts/costs
  - ASR5700 comes as a “Box”
  - Same/similar implementation effort as per ASR5000/5500

- Fits in the existing SGSN/MME and GW sites
  - This is not a datacenter solution
  - ‘ASR5000’

- Protects the customer investment
  - Puts customers on a path to leverage Moore’s law
  - Can stay where they are or can easily evolve to a full blown, orchestrated, virtualized solution

- ASR 5000 / 5500 Software functional equivalence
  - Same binary

- ASR5700 is a perfect fit for SGSN/MME
  - Feature rich StarOS on server HW
  - Ideal for ASR5000 evolution of SGSN/MME
Control Function (CF) and Service Function (SF)

VM Description

**Control Function (CF) and Service Function (SF)**

**VM Description**

- **HW Blade Server**
  - Blade
  - Blade
  - Blade
  - Blade
  - Blade
  - Blade
- **HyperVisor**
  - HyperVisor
  - HyperVisor
  - HyperVisor
  - HyperVisor
  - HyperVisor
  - HyperVisor
- **VM**
  - VM
  - VM
  - VM
  - VM
  - VM
  - VM
- **StarOS**
  - StarOS
  - StarOS
  - StarOS
  - StarOS
  - StarOS
  - StarOS
- **CF**
  - CF
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- **SF**
  - SF
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  - SF
  - SF
- **Session Function Demux Tasks**
  - IP address Management
- **Session Function x2**
  - Session Tasks State replication
- **Session Function Redundant tasks**

**Control Function Platform management tasks**

**Cisco Telco Cloud Manager VNFM**

**Standby tasks**
Local and Geo SW Redundancy Models

How it works today

Inter System Redundancy

ICSR
Inter “Chassis” System Redundancy
Cisco Packet Core: Software Ubiquity With StarOS

- **ASR 5500**
  - Purpose-built, conventional HW
  - High-capacity, high-density MPC solution

- **ASR 5700**
  - StarOS on Cisco COTS Environment
  - Pre-packaged, pre-tested, & SLA compatible
  - Scale – Very Small to Medium

- **VPC today**
  - Full-scale virtualization
  - Software-only solution
  - Agnostic to HW, hypervisor

- **VPC Evolution**
  - Under Development and NDA
  - Consult your Cisco Account team for more info

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Scaling Mobile Packet Core

- VPC-SI R17.1: 4 Gbps
- ASR 5700 R17.1: 25 Gbps
- ASR 5000 PSC2: 30 Gbps
- ASR 5000 PSC3: 50 Gbps
- ASR 5500 DPC: 80 Gbps
- ASR 5500 DPC2: 160 Gbps
- ASR 5700 / VPC FUTURE: 250 Gbps

Virtualized
Non-virtualized
Virtualized
Solution Migration & Product Evolution

- ASR 5000
  - Migrate to VPC
  - Migrate to COTS
  - Purpose Built

- ASR 5700
  - Evolve to VPC
  - Migrate to COTS

- ASR 5500
  - Evolve to VPC
  - Migrate to COTS
  - Next Gen Purpose Built
ASR5700 Opens Up New Market Segments
Break in new customers/create new revenues streams

- Move control plane functions to standard compute hardware
  - Move signaling functions to standard computing platform
- Dedicated gateway for VoLTE
  - Benefit from high availability and session recovery functions and focus on delivery of high-quality voice services
- Dedicated gateway for corporate APNs
- Dedicated gateway or full EPC for M2M
  - Implement specific functionality for use cases with low traffic
- Dedicated platform for MVNO services
- Safe step towards virtualization
  - Once on COTS hardware, the path towards virtualization is open
- Premium Mobile Broadband
  - provides LTE broadband networks to industrial enterprises, Public Safety & Security, Mining, Oil & Gas, Transportation, and Defense which require high-value private broadband networks that are dedicated to their business operations
Key Takeaways
The Key Takeaways of this presentation are:

• ASR 5700 provides a viable alternative to provide a COTS HW based VNF product solution with a range of Performance capacity

• Eliminates the complexity of Virtualization, by including Install Scripts to automate the setup process, to quickly get to the StarOS CLI prompt

• Provides VNF for all standard well-proven, feature-rich, StarOS Network Service Functions

• ASR 5700 Dimensioning tools are the same as the widely available VPC-DI tools with ASR 5700 platform options
Cisco’s Mobile Packet Core Leadership
Updated – August 2015 - Q2 2015 Data

- Over 350 Operators In More Than 75 Countries
- 1B+ Subscribers Across Mobile Packet Cores
- Cisco Mobile Packet Core Powers More Than 50% Of Worldwide LTE Connections*
- 76 LTE Wins In Over 41 Countries
- #1 EPC Market Share
- ~70% Of World’s ePDG Deployments Powered By Cisco

* Calculation reflects WW market excludes China
ASR 5700 Useful Links

Cisco LTE: http://www.cisco.com/go/LTE


Blogs:

Cisco Ranked #1 in Packet Core – Infonetics Research


Cisco Ranked #1 in Packet Core – ACG Research:


• More Information: Rick Galatioto (Rick Galatioto (ragalati@cisco.com) Adi Raja Murugan ( amurugan@cisco.com) or Jim O’Leary (joleary@cisco.com)
TOMORROW starts here.