Ultra Services Platform and 5G Strategy

Cisco Knowledge Network Webinar

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Mobile Core Business Unit (MCBU)

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Topics

• Business Drivers (5 minutes)
• Technology Evolution (5 minutes)
• Cisco Ultra Services Platform (30 minutes)
  • Ultra Overview (Gateways and Functions (including CPS))
  • Network Slicing
  • Ultra Automation
  • CUPS, Distributed Core, MEC
  • Cloud Native Core
  • 5G Evolution View
• MWC and Announcements– Great things to come (3 minutes)
Business Drivers
## Average Mobile User and Connection

### Cellular Traffic per Month

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2021</th>
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<tbody>
<tr>
<td><strong>Average Traffic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>per <strong>User</strong></td>
<td>1,456 MB per month</td>
<td>8,423 MB per month</td>
</tr>
<tr>
<td><strong>Average Traffic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>per <strong>Connection</strong></td>
<td>902 B per month</td>
<td>4,226 MB per month</td>
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</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2016–2021
By 2021, a 5G connection will generate 30 GB/mo, nearly 5X higher than the 6.3 GB/mo for 4G connections.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2016–2021
Technology Evolution
The Market’s Evolution Paths

4G
Transition to Virtual Performance

5G
Cloud Native

- Scale | Distributed Architecture | Slicing
- Low Latency | Gig-Speed

Automation | Containers | Micro-Services

2020
Cisco’s Evolution Paths

ASR 5500 to Ultra
Performance parity
Migrate functionality

Ultra Platform with CUPS
MANO
MEC, MAF, NB IoT

1 Gbps at edge
1 ms latency
1 billion connections

Dynamic Distributed Slices
Containers
Microservices Architecture

Cloud Native

5G

2020
1 Business Challenge
Compete with Hyper-cloud and other MNO

Cloud Providers have different business model:
More Agile – Lower costs

You need:
Increase flexibility and agility (services and schedules)
Automate and simplify • Service creation, testing, and activation
Telco-reliability with cloud efficiencies • New architecture that is also 5G ready

…and need to support multiple use cases without overbuilding the network
Cisco Ultra Services Platform
Industry Leading Virtualized Mobile Core

35+ Deployed
150M Deployed Subs within 6-12 Months
Cisco Ultra Services Platform

VNF Element Manager, VNFM Proxy, Service Manager, Monitoring

Ultra Policy Platform
• Carrier-grade policy, charging, and subscriber data management solution
• Rapid service creation environment
• Monetization opportunities for 3G, 4G, 5G and IMS service architectures

Ultra Gateway Platform
• Cloud ready VNF, fully featured packet core functionality
• Multiple EPC/PC elements
• CUPS - Separated control and user-planes
• Remotely deployable user plane for ultimate elasticity & scalability

Ultra Services Function
• Pluggable framework for in-line, subscriber-aware, enhanced services
• Integrated as separately upgradeable software packages
• Native life-cycle management and automated configuration
Ultra Services Platform – ETSI NFV Compliance

• Composite ETSI MANO Virtual Network Function (VNF) software bundle with multiple mobility use cases:
  • Gateway Functions (vEPC)
  • Policy Functions (CPS)
  • Service Functions (USF)
• Common Management and Orchestration Framework
• Integrated Configuration Management
• VNFM Lifecycle
• SDN Integration
• NFVI/VIM Support
• WebScale–IT Automation
Ultra M
Safe & Simple Stepping Stone to Virtualized Architecture

Pre-integrated, tested & validated by Cisco

Full stack Mobility Solution

Single support point of contact

Feature parity with physical packet core

Ready to deploy today

= ASR5K

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What’s Inside the Ultra M Stack

- **VNF**
  - VPC (MME, SGSN, SGW, PGW)
  - Elements Manager

- **VNFM**
  - Cisco ESC

- **VIM**
  - OpenStack

- **Compute, Network & Storage Hardware**
  - Cisco UCS C

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Delivering Instant Mobile Networks

With Ultra
Each enterprise or category gets its own Core

The Outcome
- Focus existing core on mass market traffic
- Add Virtualized slice(s) for verticals & introduction of new mass market services
- Immediate set up – Enterprises on-boarded in minutes
- Highly customizable
- Self-service reduces OpEx
Capture Vertical Markets—Quickly Meet Diverse Business Requirements
Ultra Automation Services

- **End to End** deployment option
- **Automate** NFVI & OpenStack installation
- **Accelerate** software qualification & deployment

*Ultra Automation Services* enables operators to deploy and run Ultra Packet Core Services, Orchestrating hardware, software and Openstack with Day 0 Configuration and Day N Services

(Enables *full Life Cycle Management*, onboarding of 3rd party VNFs and, IoT use cases)
Day-0/Day-N Provisioning & Deployment

- Site & VNF Inventory
  - AutoDeploy
- NFVI Installation
  - AutoIT-NFVI
- Cloud Installation
  - AutoIT-VNF
- Full VNF Deployment
  - AutoVNF
- VNFM & VNF-EM Installation
  - AutoVNF
- Deployment Validation
  - AutoSLA
- Monitoring
  - AutoVNF
Day-N Operations

- Software Qualification
  - AutoIV & AutoQA
- Service Level Monitoring
  - AutoSLA
- Software Validation
  - AutoIV
- Software Upgrade
  - AutoIT-VNF & AutoVNF
## Ultra Automation Services – Main Functionalities

### AutoVNF
- Automated Deployed of VNF
- Support for Multiple NFV-O/VNFM Stacks
- ESC/ECM/HP-NFVD

### AutoIT-NFVI
- Automated upgrade & install of NFVI
- Installs in customer environment
- Integration with underlying hardware

### AutoIT-VNF
- Automated upgrade & install of VNF
- Installs in customer environment
- Import 3rd Party Functions

### AutoQA
- Validate VNF via fully automated QA Cycle
- Runs on target whether virtual application or cloud

### AutoSLA
- Automate measurement of key SLA metrics
- Correlation with AutoIT triggered KPIs

### VNF & VNFM orchestration
- Bootstrapping
- Software management
- VIM provisioning for VNFs
- AutoVNF HA
- Upgrades (ICSR & Non-ICSR)
- Graceful stop of VNF

### Site-level orchestration

### NFVI & VIM installation automation
- Bootstrapping
- Configuration management
- Software management
- Hardware and VIM sanity
- L2/L3 hardware elements in Ultra-M

### Operational tasks automation (Future)
- AutoQA
- AutoIT
- AutoSLA
Ultra Packet Core CUPS Options

**Hybrid-CUPS**
- Hybrid CUPS Ultra Packet Core solution.
- ASR5500 as U-Plane.
- C-Plane on COTS.
- 3GPP Compliant CUPS architecture.
- DPC2 card based solution.
- New Ultra Packet Core Architecture to cater to NextGen requirements.

**CUPS**
- CUPS Ultra Packet Core solution.
- C & U-Plane on COTS.
- 3GPP Compliant CUPS architecture.
- New Ultra Packet Core Architecture to cater to NextGen requirements.
Mobile Edge Computing with CUPS

- A very flat mobile core architecture based on CUPS
- Internet access is via “Edge UP”
- IMS and special APNs are accessed via “centralized UP”
- Edge UP+ CP is functionally equivalent to StarOS and includes services (ADC, NAT, etc.)

Benefits
- Offloaded traffic can be directed to regional and metro caches for OTT video
- Offloaded traffic does not impinge on MSOs and is much simpler to network as it can be express directed to an Internet POC
Cisco’s Cloud-Native Architecture provides:

- API-driven NFV model
- Combine applications from different sources
- Support new functionality
- Quickly install patches

Extend SP’s innovation capabilities at scale
Combine Ultra and CPS platform services to support Docker lifecycle automation and common operational functions. Package VNFs as Docker containers for orchestration and automation.

Refactor and rebuild functions of StarOS as containerized microservices extending current UP/CP separation effort. Address next gen forwarder, state and protocol separation.

Leverage analytics to combine artificial intelligence & deep learning and dynamic network to create knowledge network.

Ability to deploy an E2E mobile core solution in a public cloud with user plane on premise. Fully automated lifecycle integration of local UP and hosted CP in separate domains.

Building Mobile Core as a Service Solutions for E2E IOT, Enterprise, MVNO, PMB, and Consumer verticals.

Automated instantiation and lifecycle management across a complete mobile core solution. Along with EPC and PCRF, include additional 3GPP functions for an E2E Mobile Core: AUSF/HSS, UDM, etc.
Cisco’s Evolution in Cloud Nativity

VPC instantiation in cloud
Bring up virtual instance in a cloud environment
PoC on VMware and public cloud - Nordic Operator

CUPS and separation of UP in geo locations
Functional demo available with TME support, successfully demoed at MWC earlier this year

PCRF (CPS) + VPC instantiation in cloud
Onboarding of CPS on Ultra Platform → Composite VNF

Dockersed PCRF + VPC
Targeted for early next year, planning in process to define roadmap requirements

February 2017
MWC 2017
2H17
1H18
Mobile Core is the key to driving 5G services through CUPS, Network Slicing, Identity & Policy

Cloud Native enables the transition to automation and simplicity to maximize OPEX savings

Deliver 5G enabled services and new business adjacencies focused on fixed/mobile, Enterprise, IOT, Security & Video

Integrate multi-access solutions across Cisco technologies such as WiFi, Fixed & Cable
What is Driving 5G - Next Generation Application Needs

Sources include:
- Cisco Analysis
5G Migration Options

Option 3, NR NSA, LTE Assisted, EPC Connected

Option 3a, NR NSA, LTE Assisted, EPC Connected

Option 3x, NR NSA, LTE Assisted, EPC Connected

Option 4, NR NSA, NR Assisted, NGCN Connected

Option 4a, NR NSA, NR Assisted, NGCN Connected

Option 5, NR SA, LTE, NGCN Connected

Option 2, NR SA, NGCN Connected

Option 7, NR NSA, LTE Assisted, NGCN Connected

Option 7a, NR NSA, LTE Assisted, NGCN Connected

Option 7x, NR NSA, LTE Assisted, NGCN Connected

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Deploy 5G Radio alongside 4G Core

Option 3 - 5G radio is deployed and high BW traffic is passed through optimized user plane

Limited network changes
- Focus on the Radio and Transport changes
- New MME, HSS and policy features
- High Speed connection use case deployments

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3GPP 5G Standalone Packet Core (Service Based Architecture)

- NSSF (Network Slice Selection Function)
- AUSF (Authentication Server Function)
- AMF (Access and Mobility Management Function)
- UDM (User Data Management Function)
- NEF (Network Exposure Function)
- NRF (Network Repository Function)
- PCF (Policy Control Function)
- SMF (Session Management Function)
- UPF (User Plane Function)
- AF (Application Function)
- (R)AN (Radio Access Network)
- DN (Data Networks)

APIs (HTTP/JSON)
Easy Steps to Option 3 and 5G Core

Virtualize

- Understand how to deploy VNF on NFVI
- Automation and integration tools
- Create new slices

CUPS

- Re-architect the GW
- High speed UP
- Scale the UP and CP independently
- New LCM

Option 3

- Augment RAN capacity
- Optimize the deployment
- Define new services

StandAlone

- Introduce SMF, AMF etc nodes
- Create slice per service
- New 5G core services

Distribute

- Introduce low latency services
- Address new verticals
- Cloud native implementation
Feature Continuity from PGW to SPGW-C/U to SMF/UPF

- Platform evolves to virtual and distributed
- SGW and PGW features and operation need to continue with little to no interruption

DPI, Charging, IP Pools, KPIs, Resiliency...
90% of features

Per APN UP Flexible scaling
SA Arch, SBA 5G Features
Cloud Native
CI/CD

ASR5500 VNF/Ultra

4G CUPS

5G SMF+UPF VNF’s

5G SMF+UPF Cloud Native
Cisco @ MWC—Barcelona

Cisco 5G Now!
Coming Soon

• Mobile World Congress
  • Announcements of new products, solutions and capabilities
  • Live demonstrations of new solutions
  • Come see us in Barcelona:
    • Cisco Booth in Hall 3, location #3E30