5G Mobile Core and Network Slicing

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Agenda

- 5G Drivers
- 5G Architecture Synthesis View
- 5G Technologies Enablers
- Implementing Network Slicing
- Use Case Demonstration - Internet offload
- Summary
5G Driver

Changing market dynamics
1. Smartphone data/month growth ~10 GB to 100 GB
2. Devices (smartphones << mMTC, sensors, Artificial intelligence)
3. Network to drive digital economy ($ 4.5T by 2025)

What needs to change
1. Smart and Secured Network
2. Flexible Architecture
3. Unwind Complexity

Virtualize + Automate + Simplify = Opportunity
An emerging industry consensus ... 

Service Focused Programming the network

Micro Services "Personal" Networks

Intelligent Slicing Sub-Slicing

NG RAN
- NRs
- LTE-AP
- Wi-Fi
- NB-IoT
- Other

HetNet RAN & cRAN

Network Slice Selection Function

Slice Selection

Logical Network Slicing Functions

NG C-Plane Function

NG U-Plane Function(s)

NG Lawful Intercept

NG-X

NG-Ch

NG-Gx

NG-6a/p

Service Capability Exposure

E2E Orchestration

NG Policy Control

Charging/Billing

IP Services

VAS

VAS

SDN

Virtualization

... around a functional specification for the 5G Architecture
5G Technologies Enabler (1/4)

Control/User Plane Separation

Offload user traffic at edge, cost saving for internet offload

Charging & Policy
Authentication & Security
Legal Intercept
5G Technologies Enabler (2/4)

Mobile Edge Computing  →  Video caching, multicast traffic optimization
5G Technologies Enabler (3/4)

Cloud-RAN ➔ Dis-aggregate and Commoditize and scale radio
5G Technologies Enabler (4/4)

Network slicing → Automate resources creations and Service launch

Network Slice Service Function

Control → Sub DB

IoT Core Network

MBB Core Network

Streaming Camera Core Network

THE LINUX FOUNDATION
Implementing Network Slicing

- Meta-orchestration System
  - Dynamic instantiation of slices; provide class/load balancer with slice information

- Master slice
  - Ultra Slice Controller
  - SPR

- mm-wave core slice
  - MSM Controller
  - PCRF
  - Fastpath-U

- ICN core slice
  - MME
  - PCRF
  - ICN Router

- MBB slice
  - MME
  - Controller
  - PCRF
  - SAE-GW-U
  - Gi-LAN

- Ultra Slice Controller: Subscriber and KPI aware classification and load balancing as well as MME functions

- Initial subscriber attach and redirection

- Redirected subscribers

- IP Connectivity

- Subscriber records and policies; provide class/load balancer with subscriber and policies

- Internet
- Managed Video
- ICN Services
- IMS
- Internet
- Other APNs
NFVI and Network Slice Orchestration

- Modular architecture that maps to ETSI NFV framework
- Model driven design for declarative NFV orchestration
- Supports Cisco and 3rd party VNF Managers
- Supports Cisco and 3rd party SDN Controllers
- Supports Cisco and 3rd party VNFs
Use Case: Internet offload using Network Slicing

- **Architecture for Internet offload based on 5G Control and User Plane (CUPS)**
  - 5g-internet APN is routed to User Plane Forwarder (UPF) at edge
  - 5g-ims APN carrying premium traffic is routed to centralized User Plane Forwarder

- **Benefits**
  - ~90% internet traffic offloaded/directed to regional and metro caches for OTT video
  - Saving in Opex and improved customer experience
Internet offload Use Case Demonstration

https://youtu.be/OKglqUXUCAE
Summary

- 5G will enable new business opportunities
- Use Cases relies heavily on open source tools
- Let us collaborate and co-invent
Abstract

5G mobile technology will transform business models for service providers and contents providers. 5G core is built using open-source tools and end-to-end virtualization. One of unique feature is “networking slicing” which manages life cycle of 5G services ensuring end-to-end QoS and SLA. This session discusses about overall architecture for 5G architecture, open sources tools network slicing. The presentation will also cover use cases being deployed by service providers.