Networks in the Software Age

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June 06, 2016
Generational changes via Software Defined Infrastructures:

- **Long Term Topology**
  - COs vs. DCs
  - Copper vs. Fiber
  - Telephony vs. Video
  - Narrowband vs. Broadband
  - TDM leased lines vs. Ethernet and IP

- **Shift to Software and Virtualization**
  - Hardware vs. Software
  - Addresses vs. Identity
  - Appliances vs. VNFs
  - Pipes vs Apps
Emerging Digital Network Architecture requirements

Higher Speeds, Lower Latency, Secure Connection

4K video will require 25-30Mbit/s (FTTH/GPON)

Data Center is becoming part of the Wide Area Network (PODs, NiaB)

Licenced vs Un-licenced Spectrum (Small Cells, WiFi)

Virtual Reality will require 1Gbit/s (5G)

Data and Analytics are becoming the currency of the 21st century…
Open Programmable Networks

Networks are Complex, Closed, Rigid and Proprietary.

SDN is designed to make them Open and Intelligent with Centralised Control for Automation.

We need to Re-Imagine the Network with Gigabit Access Speeds, Ultra Low Services Latency and Clean/Secure Pipes.
In the “Sharing economy” the concept of ownership is becoming obsolete…

Emerging Applications and customer expectations will dictate network resources on demand…

If the network fails, so do M2M, IOT, ICE, Smart City and the Health Applications.
SDN: Pre-requisite for Emerging Technologies

- SDN & Virtualization pre-requisites for 5G
- Massive Connectivity & Capacity
- Assured & Orchestrated Services
Future Broadband

Orchestration Layer - MANO
- Customer Plane
- Service Plane
- Network Plane

Control Layer - SDI
- OTT Domain Controllers
- DCs and PODs Domain Controllers
- Transport SDN Controllers – Access, Backhaul, Optical, IP etc.

Resource Layer – NFVI, NFVO and VNFM
- vNFs and on-boarding strategy
- Cloud OS
- x86
The Next-Gen City – Gigabit City

Key Thrusts

- Tectonic shift to Mobile
  - Up to 10x Densification required
  - Cloud based RAN
  - Virtualized EPC
  - Deeper Integration with Wireline Networks

- Programmable & Virtualized Networks
  - Policy Driven & Software Defined (Open APIs)
  - Multi-Layer Topology Integration
  - Virtualization of Functions
  - Self Organizing & Healing
  - IPv6 based numbering
  - Flows based Visibility

- Services
  - Access Independent Services
  - Metro based Content Caching (CDNs)
  - Control Planes consolidation in IDCs
  - Cloud based Services (IDCs)
  - Self Serve Portals
Enabling the Gigabit City

Distributed Cloud/NFV
Cyber Security
Infrastructure/SDN
Orchestration Systems
User Experience

Home
SMB
Transport
Venue
Office
Mobile
Industry
Global
Supports the emerging needs of 5G and ICE and Health
Our Challenge: Transforming Telco to Softco

- Addresses ➔ Customers
- Corporate ➔ Community
- Narrowband ➔ Broadband
- Telephony ➔ Video Services
- TDM leased lines ➔ Ethernet/IP
- Shelves ➔ Stock = Pipes ➔ Apps...

SOLUTIONS:
- Software Driven Infrastructure – Open & Programmable
- Process Automation – Harnessing the power of Productivity
- IP orientated Infrastructure - Internet vs. VPNs
- Re-alignment of the Communication Value Chain…
Vessels for Change – NFV & SDN

Role of NFV and SDN in Transformation:

- **Intelligent** (mismatched → optimized)
- **Programmable** (rigid → agile)
- **Virtualized** (dedicated → shared)
- **Orchestrated** (manual to automated)
- **Fewer Control Planes** (IP & Optical → IP-Optical)
- **Visibility** (network based view → flow based view)
- **Reduce Costs** (elastic scale up/down etc)
- **Increase Revenues** (rapid service creation)
- **Improve Customer Experience** (improved visibility)
Next-Gen City - Key Themes:

- Cloud RAN (BBU Banks in Core COs)
- Front Haul (Leveraging GPON Fiber)
- GPON (Footprint for Densification – x10)
- CO Consolidation (bypass non-essential buildings)
- Centralized Control planes in Data Centers
- Content close to the edge (CDN, Caches)
- EPC functions Virtualization
Universal Fiber Access

- Residential Rural
- Residential Urban low value voice only
- Residential med/high Value urban
- Business Customer

Fiber Distribution Hub (FDH)

- Tightly Integrated with Wireless Backhaul/Front-haul
- Existing Small Equipment Building
- Location Consolidation (bypass of smaller building built solely for copper)

Fiber footprint is as much about Wireless, as it is about Wireline…

“SDN” Access
- OLT
- Wireless
- Gen++

Large Equipment Building

Flexible Termination equipment, including multiple generations
Connectivity required Anywhere, Anytime, and on Everything

- Outdoors/Municipalities
- Retail venues
- Commercial real estate
- Large venues (ie. Stadiums, Arenas, Attractions)
- Homes
- Vehicles
- Everywhere
What’s needed for the Smart City

Connected & ‘Smart’ City
- Connectivity access
- Mobile access to services
- Two way communication
- Transparency w Citizens
- Consumerization ready
- Operational cost savings
- Infrastructure availability
- In Depth Business Intelligence

TELUS Value provided
- Provide cost savings
  - Free public Wi-Fi, Mobile Apps as a Service, Cloud storage
- Expertise in Connectivity
  - M2M, Devices, Applications, Security
- Sustain best grade Infrastructure
  - Network, Data Centres,
- Technology Strategy and Innovation
  - Fibre, Small Cells, Identity, Health, Payments
Key Message: The synergies between key programs!

- Universal Fiber Access
- Densification (Small Cells, Wi-Fi etc)
- Cloud, NFV & SDN
- Cloud RAN (Economies of Scale)
- LTE (Cloud RAN)
- Swift (Small Cells & Wi-Fi)
- COR (Next-Gen City)
- Falcon Investment (GPON)