SDN, NFV and 5G Networks

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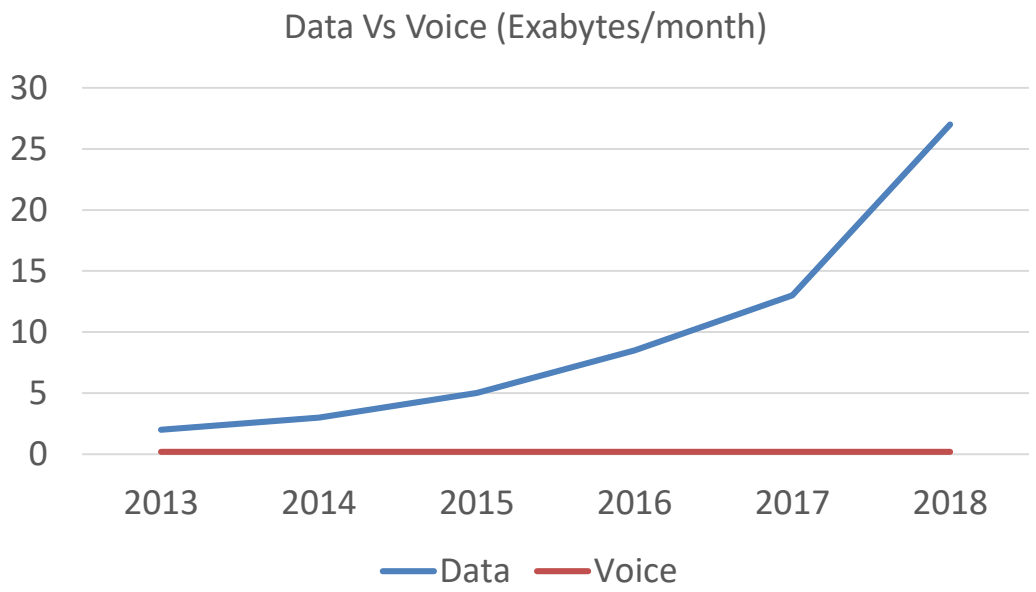
Agenda

- Moving towards 5G
- 5G Drivers
- SDN and NFV - What do they bring to the table?
- How SDN & NFV enables 5G?
- SDN, NFV and 5G Standardization

Moving towards 5G

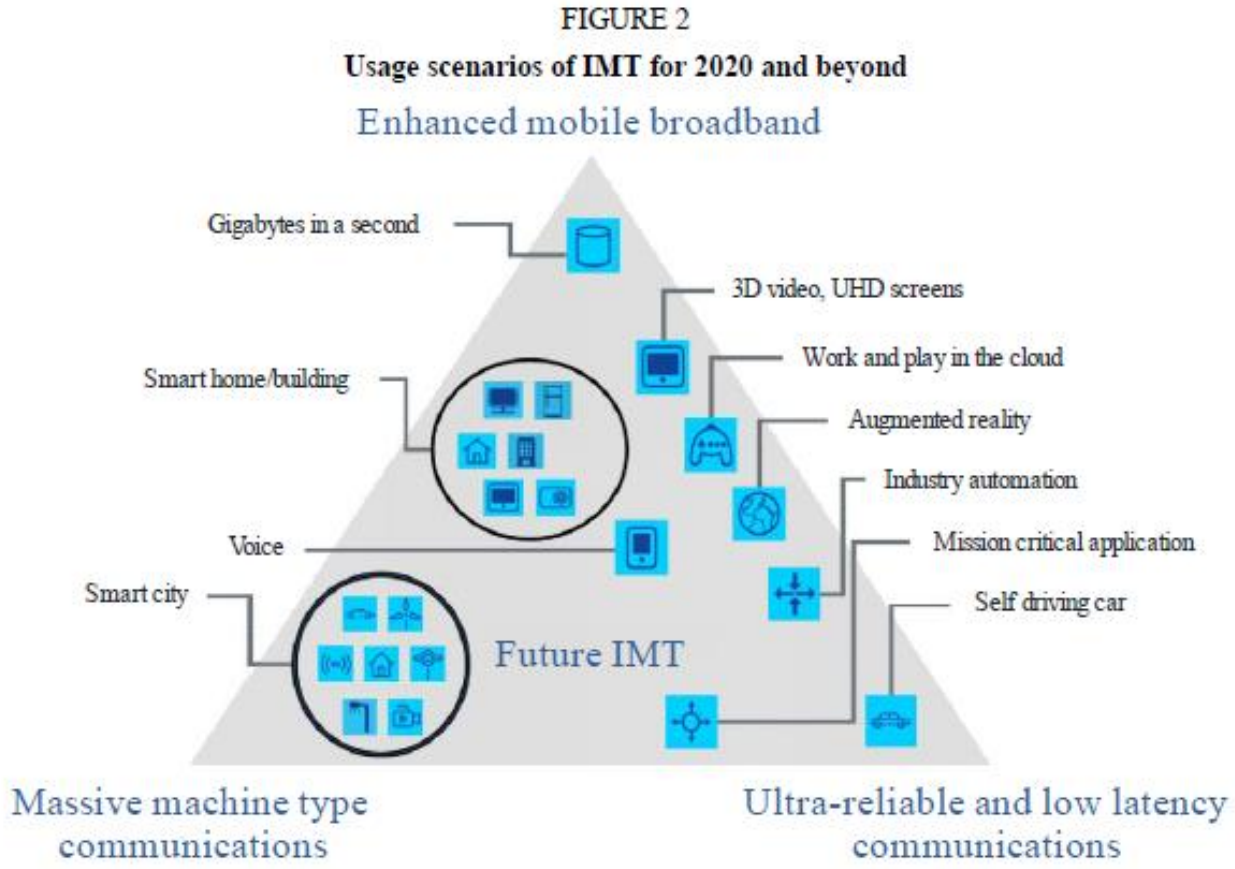
- Huge Growth in Mobile Usage
- 7.9 billion mobile subscriptions world-wide
- 6 billion mobile broadband subscriptions
- Growth primarily in data traffic



Mobile Network Evolution – From Voice to Data

Courtesy : Ericsson Mobility Report June 2019

Moving towards 5G - What does growth in data traffic mean?



Application/Usage Diversity – A key need for 5G

Courtesy – International Telecommunication Union

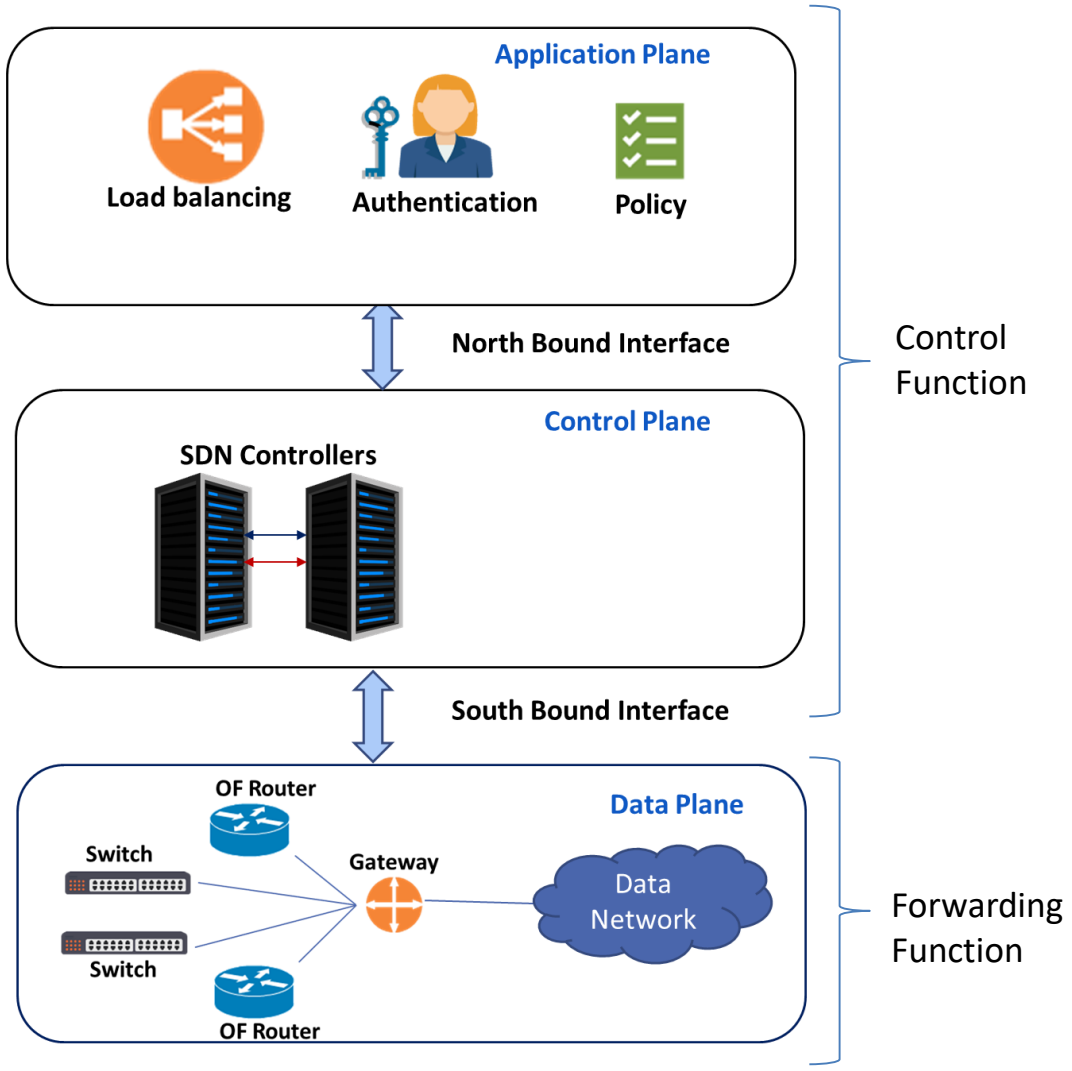
5G Drivers

- Enhanced Network Capability
  - High Throughput
  - Low Latency
  - High Connection Density
- Application/Usage Diversity
  - Variety of Business Customers - Automotive, Manufacturing, Public Safety, e-Commerce, Healthcare…
- Efficiency and Cost Reduction
  - Efficient Control and Management
  - Enhanced Performance
- Heterogeneous Network
  - Ultra-dense Networks - Coexistence of Small and Large cells
  - Multiple Radio Access Technologies - 5G NR, LTE, WiFi

Drivers ⟶ Usage of SDN & NFV

SDN – What does it bring to the table?

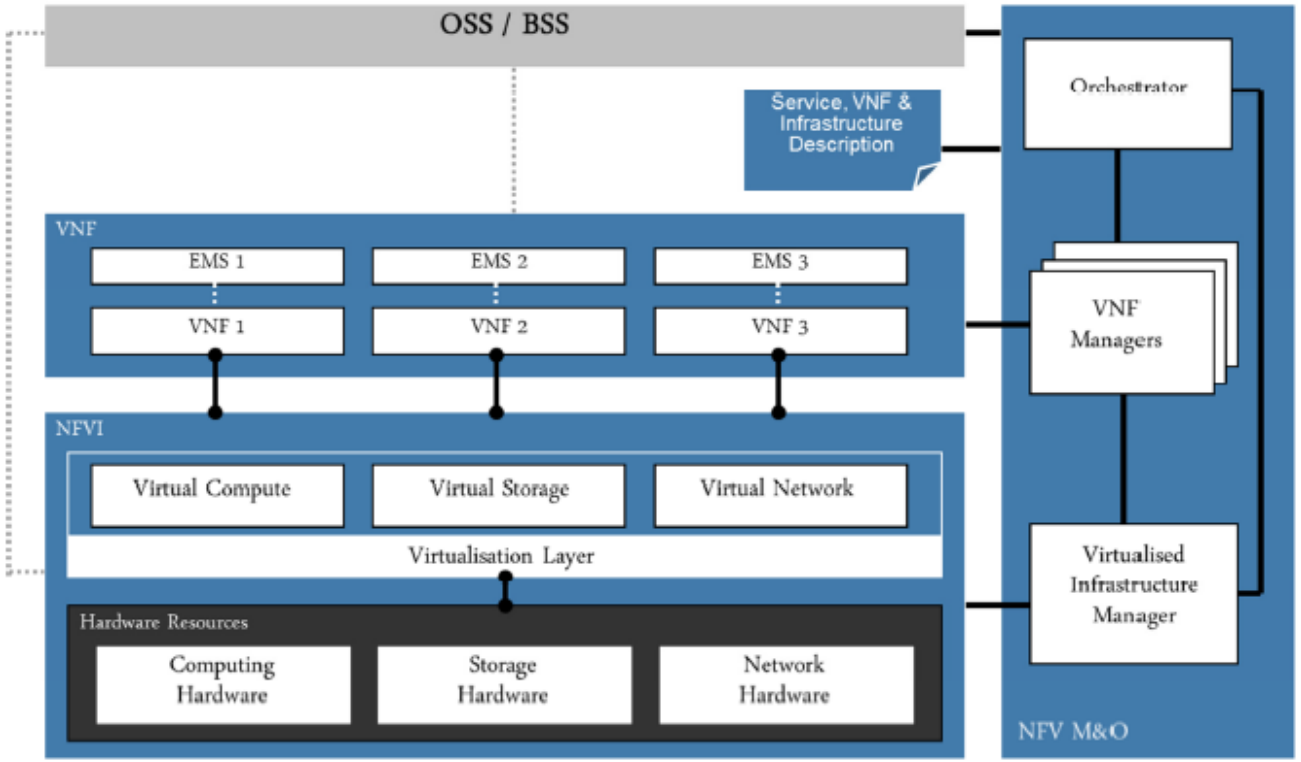
- Programmable Network
- Network divided into two set of functions
  - Control Function
    - Programs forwarding elements
  - Forwarding Function
    - Responsible for Data Forwarding
  - Functions separated through an open programmable Interface
- Unified Control
- Improved NW Performance



SDN Architecture

NFV – What does it bring to the table?

- Decouples Network Functions from the underlying Hardware
  - Flexibility in Deployment - How many? What for?
  - Cost Effective
- Network Function
  - A functional block within network infrastructure with well-defined external interfaces & functional behaviour: eNB, MME

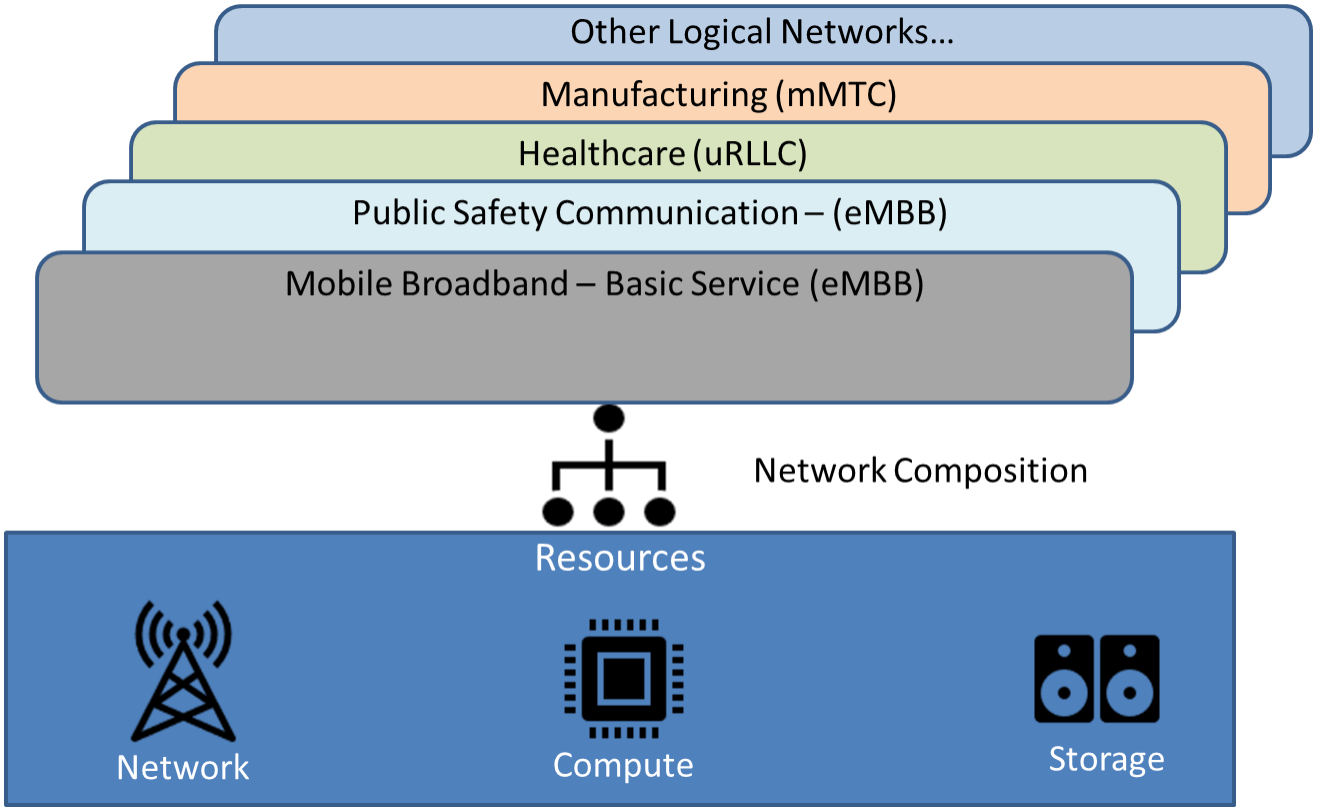


NFV Architectural Framework

Courtesy - ETSI

Application Diversity in 5G - Enabled by SDN & NFV

- Network as a Service
  - Support for diverse set of requirements through Network Slicing
- Network Slices
  - Multiple Logical Networks over shared physical infrastructure

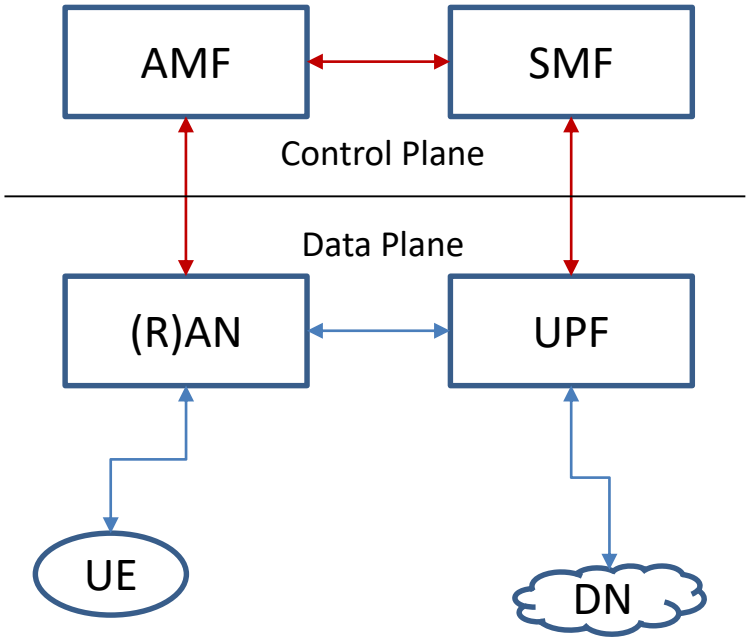


Efficiency, Cost Reduction & HetNet in 5G – Enabled by SDN & NFV (contd.)

- Efficiency and Cost Reduction
  - Network and Service Automation through SDN
  - Improved Performance through Unified Control
  - Usage of COTS Platforms
  - Support for Virtualization & Cloud
- Heterogeneous Network
  - Integrated control of Multiple RATs

SDN, NFV and 5G Standardization

- SDN & NFV - Cornerstone of 3GPP 5G System Architecture
- Separate Data (User) and Control Plane functions
  - Both Core Network (CN) and Access Network (AN)
  - Allowing for independent evolution and scalability
- Support for Network Slicing
- Resources decoupled from each other
  - Supports "stateless" Network Functions
- Converged Core Network with a common AN - CN interface
  - Integration of different Access Types, e.g., 3GPP and non-3GPP access
  - Centralized Core Network Control Plane - RAT independent Control



3GPP 5G Architecture

What are we doing at IIT Bombay?

- SDN based Multi-RAT Radio Access Network Architecture
  - IEEE P 1930.1 – A 5G initiative of IEEE
- Using SDN & NFV to facilitate Rural Broadband Communication
  - Frugal 5G

THANK YOU

IEEE 5G P1930.1 – SDN based RAN Architecture