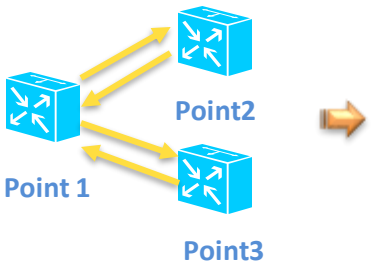
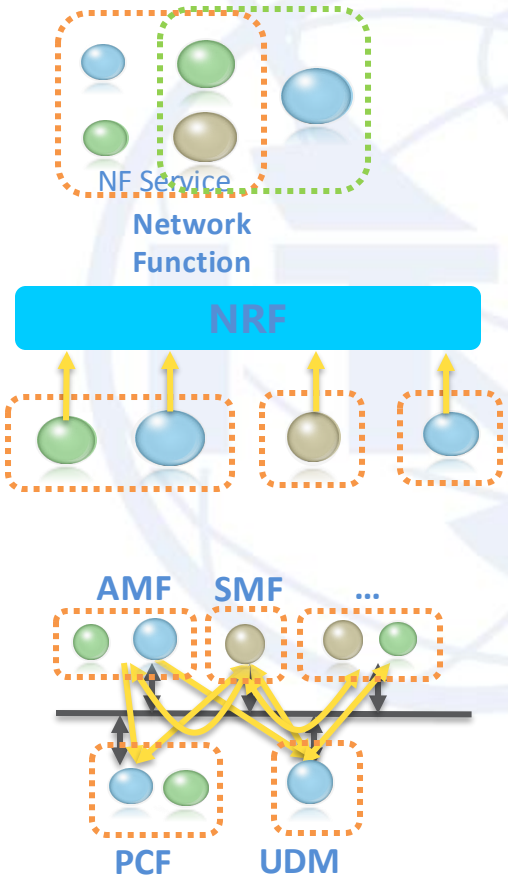

ITU

Smart Grid: Enabled by 5G network slicing and tailored to customers needs

XIA XU
CHINA TELECOM

“Smart DNA”: 5GC Service Based Architecture





Standard & Open

- Comply to 3GPP, ETSI NFV, etc. Based on open source projects (OPNFV, OpenStack, etc.)

Service based

- Service based architecture
- Stateless Design
- C/U decoupled

Network On Demand

- Flexible network slicing
- Component sharing, cross-DC deployment
- Network acceleration

Convergent

- Common NFVI & MANO
- 2/3/4/5G access support
- Non-3gpp support

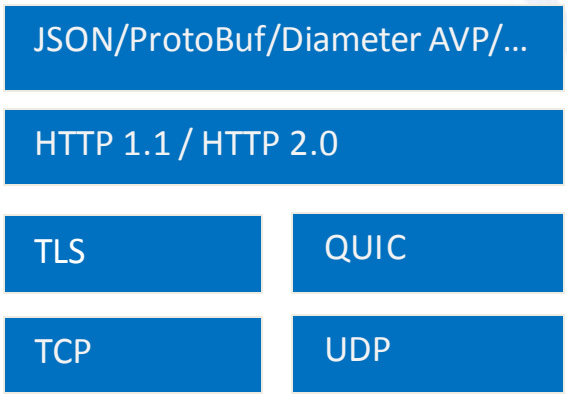
5GC Interfaces and Protocol

Requirements for Service Based Interfaces

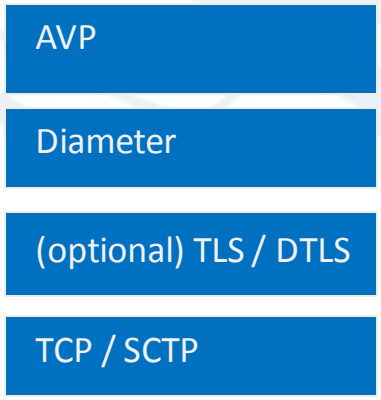
Bidirectional communication, Reliable communication, Scalability, Low response time, Security, Resource efficiency, Stateless enable, Forward compatibility, Easy to upgrade, Ease and speed of deployment and instantiation, …

On going discussion in 3GPP

1) HTTP Oriented



2) Diameter Oriented

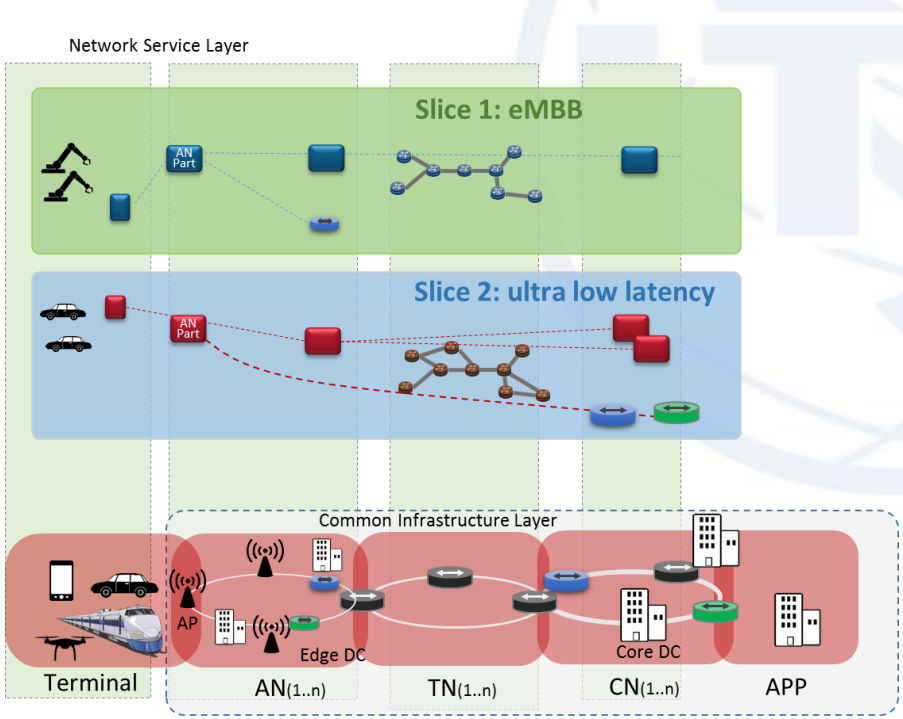


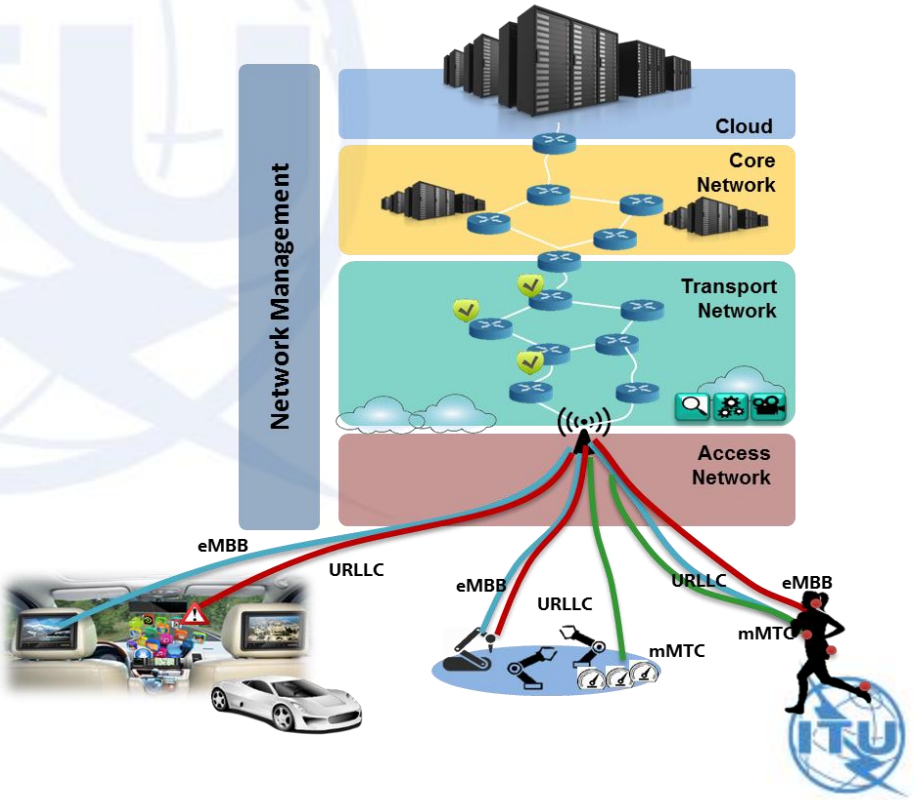
view & preference

- HTTP is light weighted and suitable for service invocation;
- HTTP 2.0 provides advanced features and is more efficient than HTTP 1.1;
- QUIC is well-defined for reliable and high efficient communication, but it depends on the maturity of IETF spec;
- JSON is acceptable, if efficiency is not strictly required;
- Diameter AVP can be considered as HTTP payload, if high efficiency is required;

Key Features of 5G Network Slicing

- Definition: 5G E2E Network Slicing is a concept for running multiple logical networks (which could be customized and with guaranteed SLA) as virtually independent business operations on a common physical infrastructure.





Smart Grid

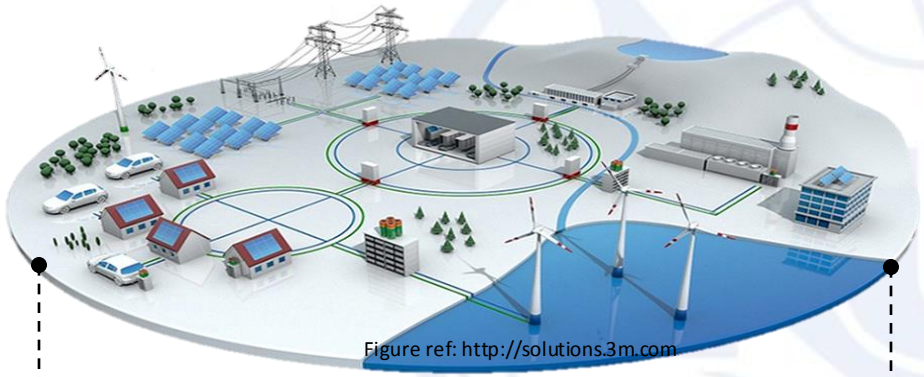


Figure ref: http://solutions.3m.com

Network Requirement

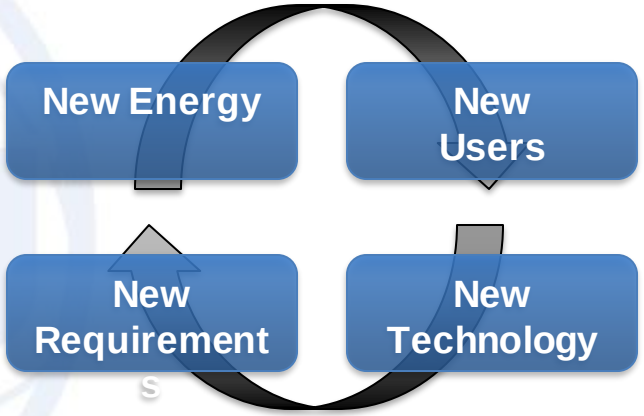
Ultra high security isolation

~ms ultra low latency for intelligent control

Ultra high reliability to guarantee stable operation

Massive IoT

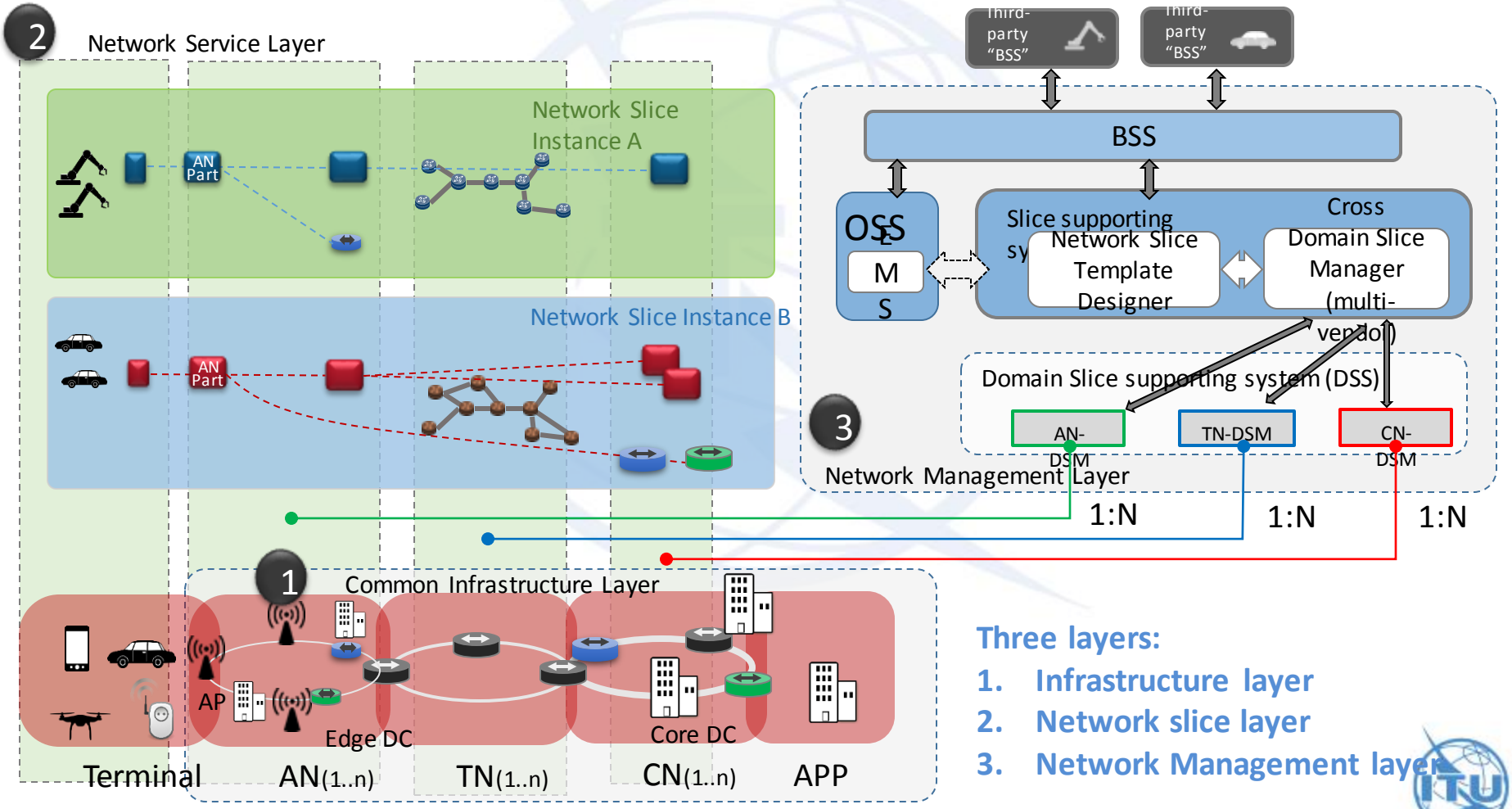
Challenges



Dedicated Network
Security, Isolation &
Ultra low latency

Public Network
Price & Short TTM

5G E2E Network Slice Architecture and Technical Scope



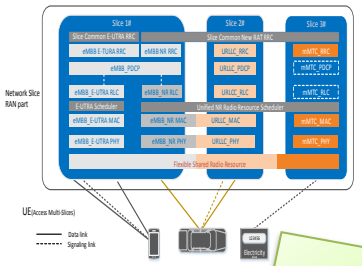
Three layers:

1. **Infrastructure layer**
2. **Network slice layer**
3. **Network Management layer**

Key Technologies

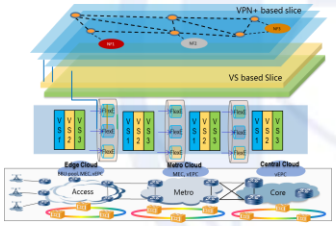
AN

Key technologies: Flexible Air , RCM , New scheduling …



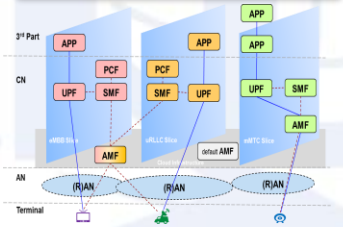
TN

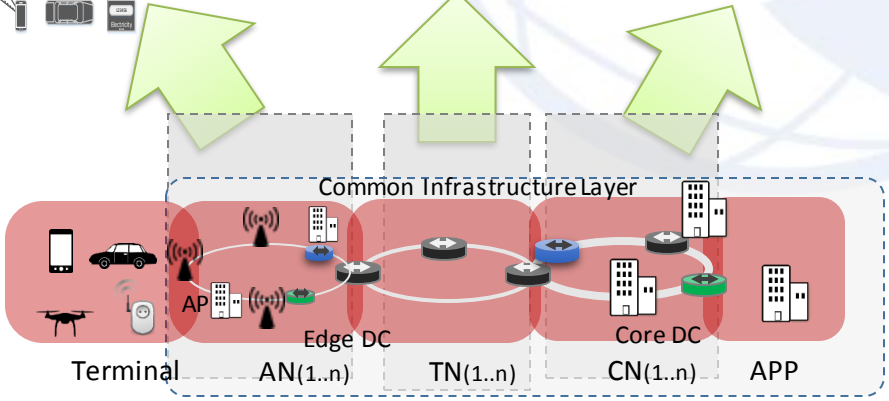
Key technologies: VS , FlexE , VPN+ , Cross-layer (Optical+ IP) …



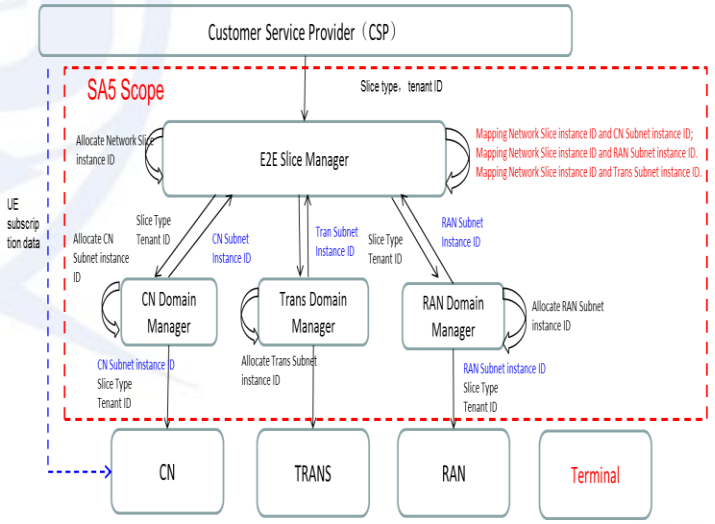
CN

Key technologies: SOA, Modularization, Virtualization …

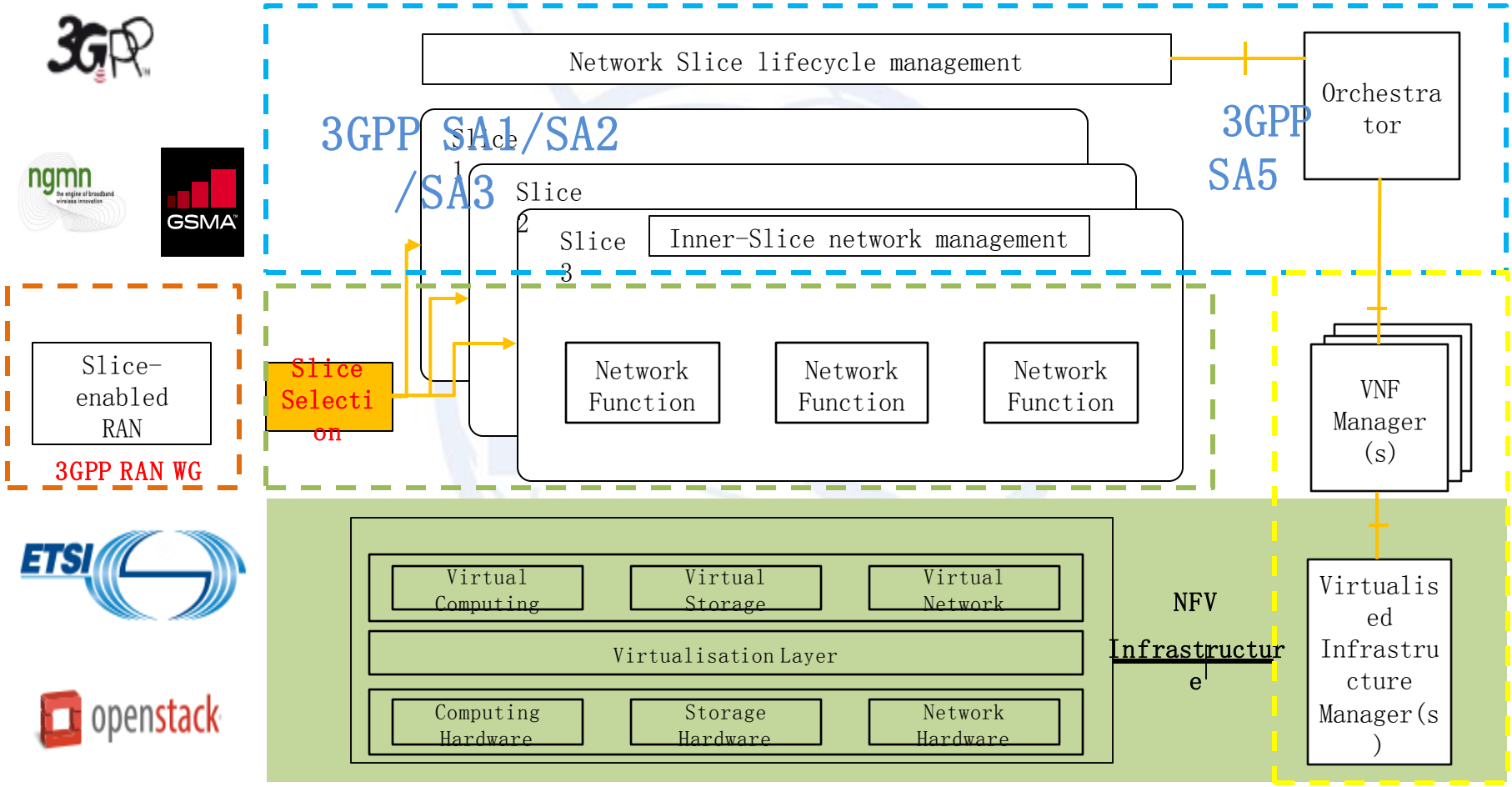




- Main standard-relevant procedures of cross-domain(AN, TN, CN) slicing management



Network Slicing SDO



3GPP&Open Source Communities work together for unique 5G standards

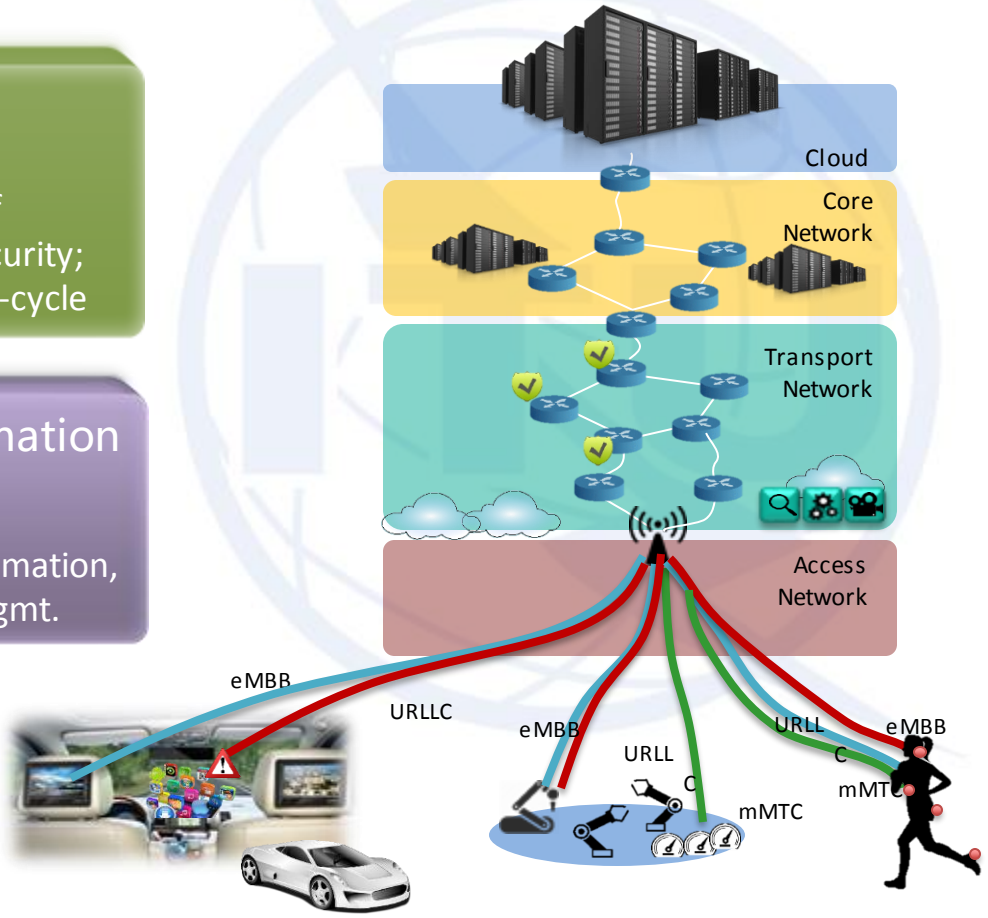
Build a E2E Network Slice

Isolation

Different level of isolation and security; independent life-cycle

System Automation

Network slicing deployment automation, operation and mgmt.



Network Slicing is E2E

It includes Terminal, AN, TN, CN and Cloud.

Terminal Awareness

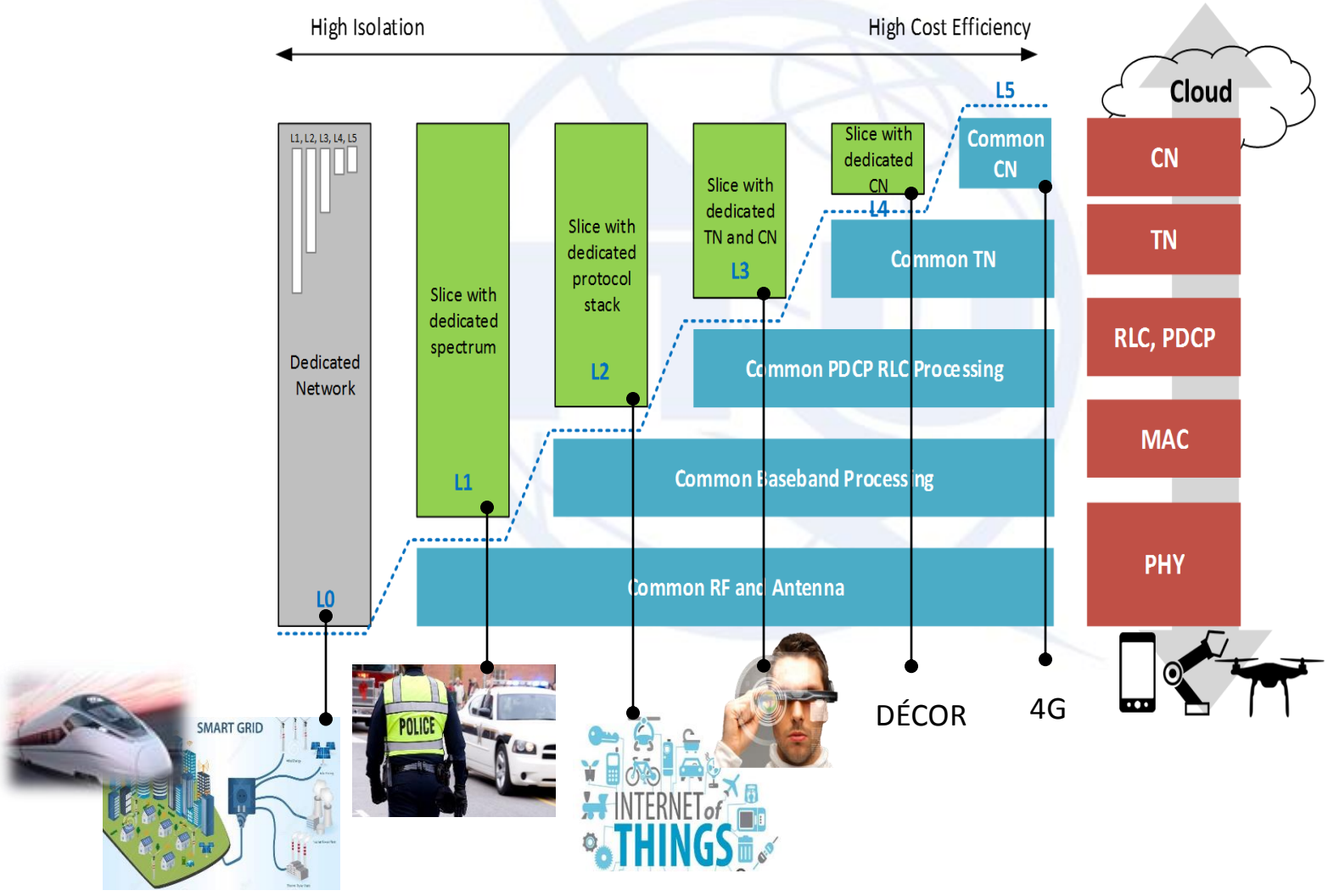
Diverse terminal types, possible to slice the terminal

On demand

Based on service-based arch. (SBA), customized network function

Network Slicing Realization Model

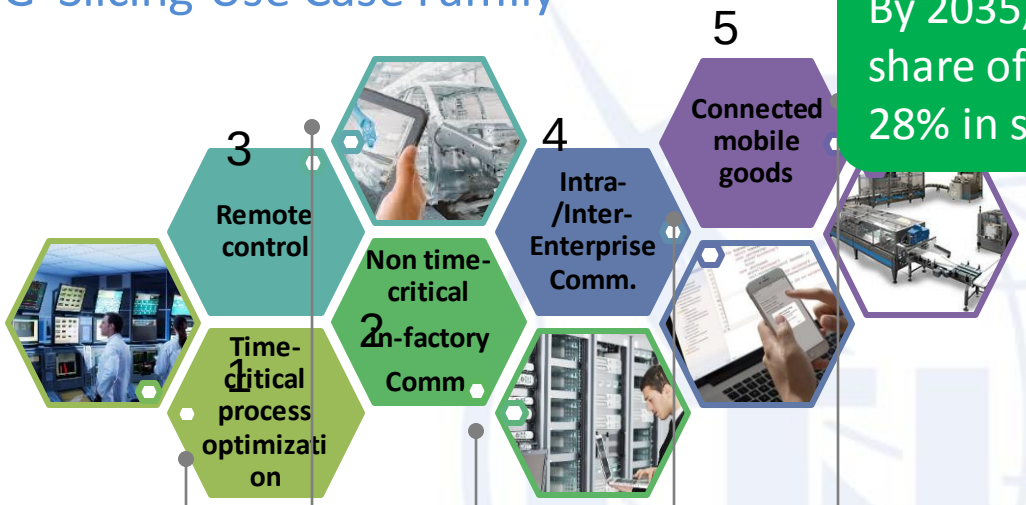
One model to unify the understanding of slicing implementation



Vision: Manufacturing Industry

5G Slicing Use Case Family

By 2035, manufacturing will be the largest share of 5G enabled economic activity – almost 28% in sales enablement [1].

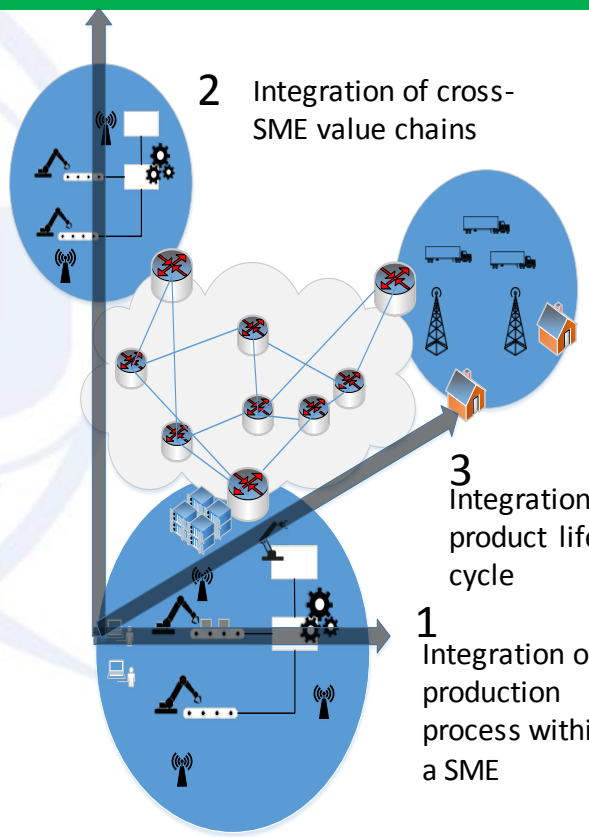


- Low-latency and ultra high availability
- Security
- Real time **monitoring**
- Real time closed loop **communication** between machines
- 3G AR and video driven interaction between colligative robots (**eMBB**)

- Localization
- Support sensor data capturing (mMTC)
- High availability for indoor comm. even in harsh environment conditions
- Provide ubiquitous networking
- Overall E2E solution with flexible convergence of different comm. tech.

- "Servification"
- Exploiting the product lifecycle and personalizing usage data (data analytics)

Use Case 5G Slicing Requirements



[1]. HIS Economics & IHS Technology, "The 5G economy: How 5G technology will contribute to the global economy", Jan 2017

Thank you