

5G Network Softwarization: Key issues and Gap Analysis

Yachen Wang

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Agenda



Requirement, View and Key Issues



Consideration of Key Issues



Gap Analysis and Potential Work

5G Scenarios & Requirements



- 5G scenarios and requirements are widely investigated and extended like massive IOT, low latency and high reliability, and so on.
- It is hard for one traditional architecture to meet diverse scenarios in cost-efficient and flexible way



8 scenarios

- Broadband access in dense areas
- Broadband access everywhere
- Higher user mobility
- Massive internet of things
- Extreme real-time communications
- Lifeline communications
- Ultra-reliable communications
- Broadcast-like services



3 scenarios

- Enhanced mobile broadband
- Ultra-reliable and low latency communications
- Massive machine type communications



4 scenarios

- Seamless wide-area coverage
- High-capacity hot-spot
- Low-power massive-connections
- Low-latency high-reliability



scenarios

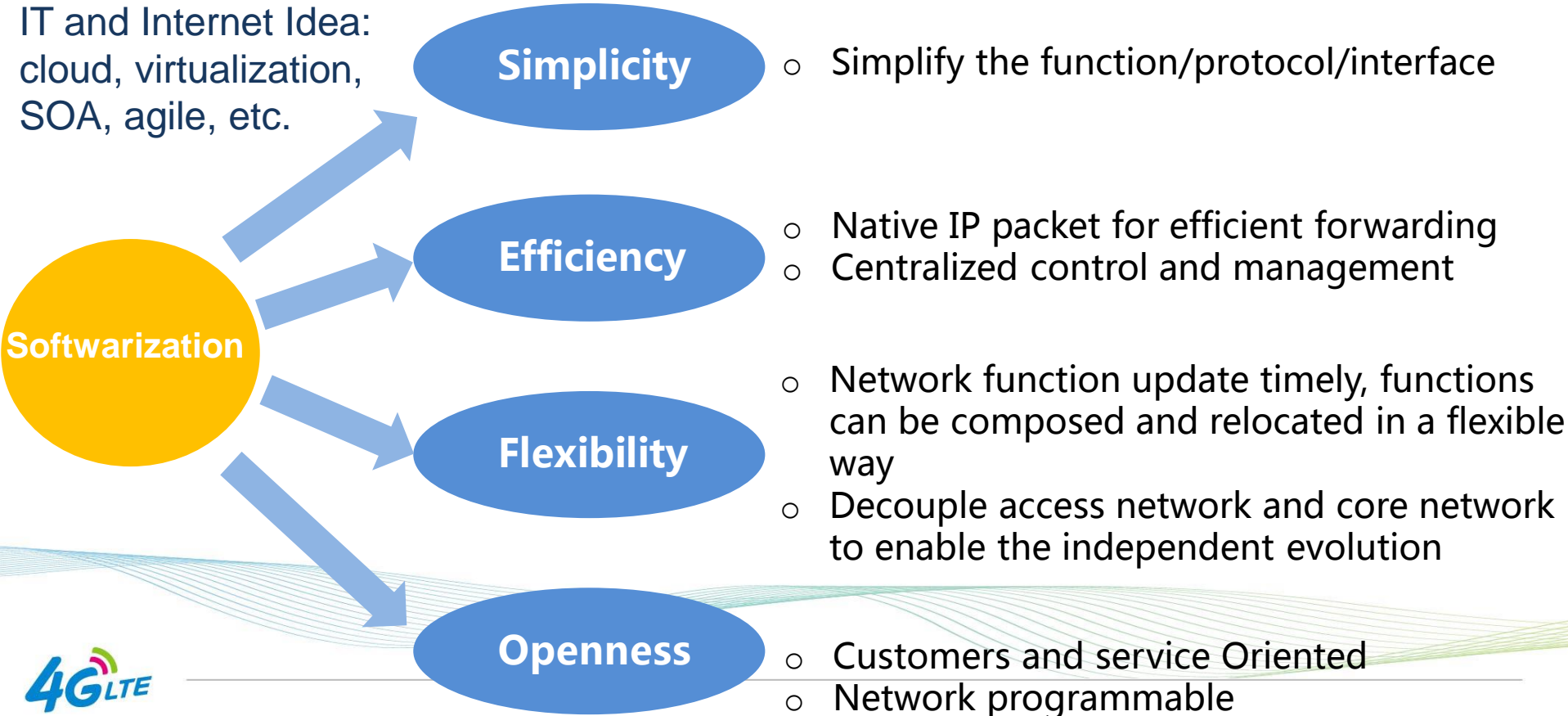
- Ultra-reliable
- Mobile broadband
- Flexible and scalable
- Wide-area
- Virtual presence
- Real-time
- ...

5G Requirement: the Network Perspective



- IT technologies and Internet idea can be introduced to transform our network to meet diverse scenarios
- Softwarization is a key concept to bring the simplicity, efficiency, flexibility and openness to the network

IT and Internet Idea:
cloud, virtualization,
SOA, agile, etc.



Design principle: based on IT technology based and new mobile service oriented future network architecture

- **Customized Service**
 - Network programmable , openness, network agility
- **Modularized Function**
 - function atomization, modularization and composition per demand
- **Virtualized Infrastructure**
 - Logical cell dynamic configuration.
 - NFV for network functions
 - Make the network more friendly for the cloud
- **Centralized Management**
 - Manage and orchestrate the network service and functions centralized

CMCC 5G Network Architecture



Network Capability Openness

Customized C-Plane Function



NFV Platform

C/U Split

Service chain

Data Forwarding

Charging

Video Optimizer

Firewall

...

Internet

NFV Platform

On-demand Service Function provision

Simplified U-Plane Function

Access

5G/2G/3G/4G/
WIFI

D2D



Control function

Data function

Data flow

Control flow

Enabling technologies



- New capability provided by slice, service chain...
- Open API
- ...

- Network slicing
- C/U Split
- Control plane optimization
- U plane simplification & Service chain
- ...

Service Customized

Function Modularized

Infrastructure

MANO

Centralized,
Collaborative

- Slice MANO
- E2E Coordination
- Automatic config

- E2E network programmable
- NFV/SDN
- ...

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 Requirement, View and Key Issues

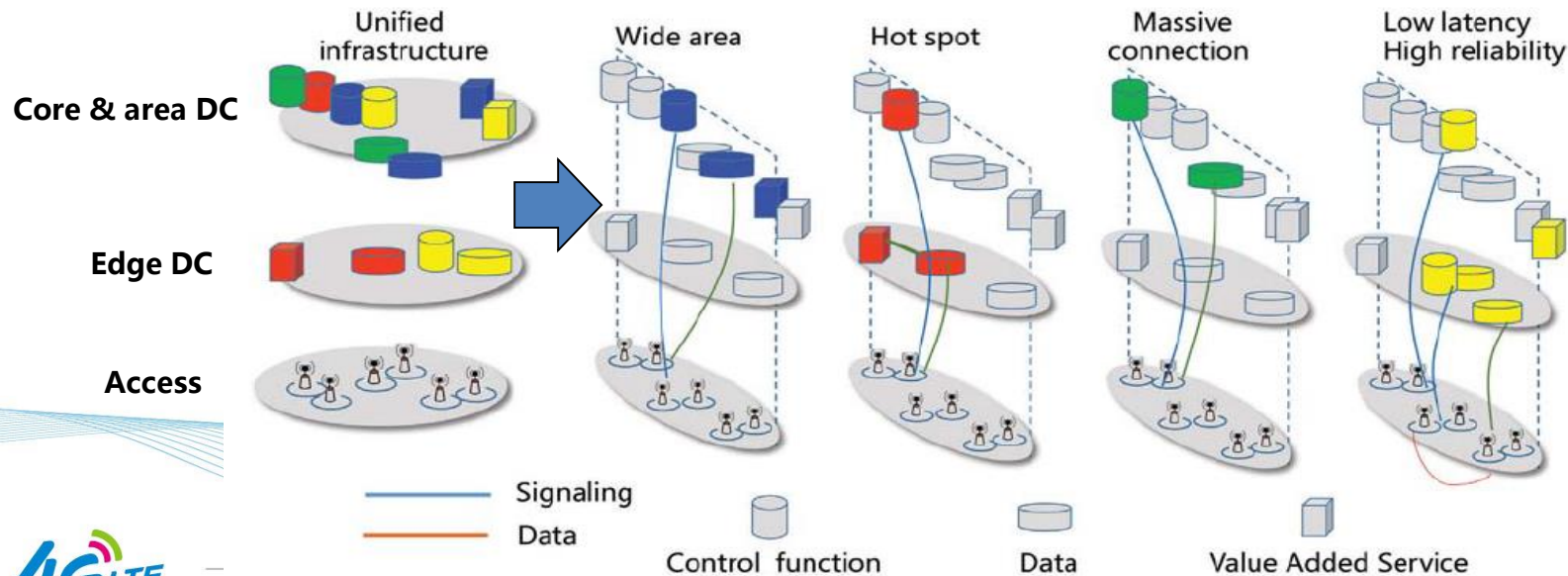
 **Consideration of Key Issues**

 Gap Analysis and Potential Work

Network slicing

Network slicing proposes the scalability and flexibility of network architecture to support diverse scenarios

- Network slice is a End-to-end logically isolated network including 5G device, access, transport and core network function. And these system functions can be also shared in different slices
- Key issues:
 - How to identify and select the slice in device, access and core part
 - How to guarantee the end-to-end QoS of a slice
 - How to design the slices to different scenarios



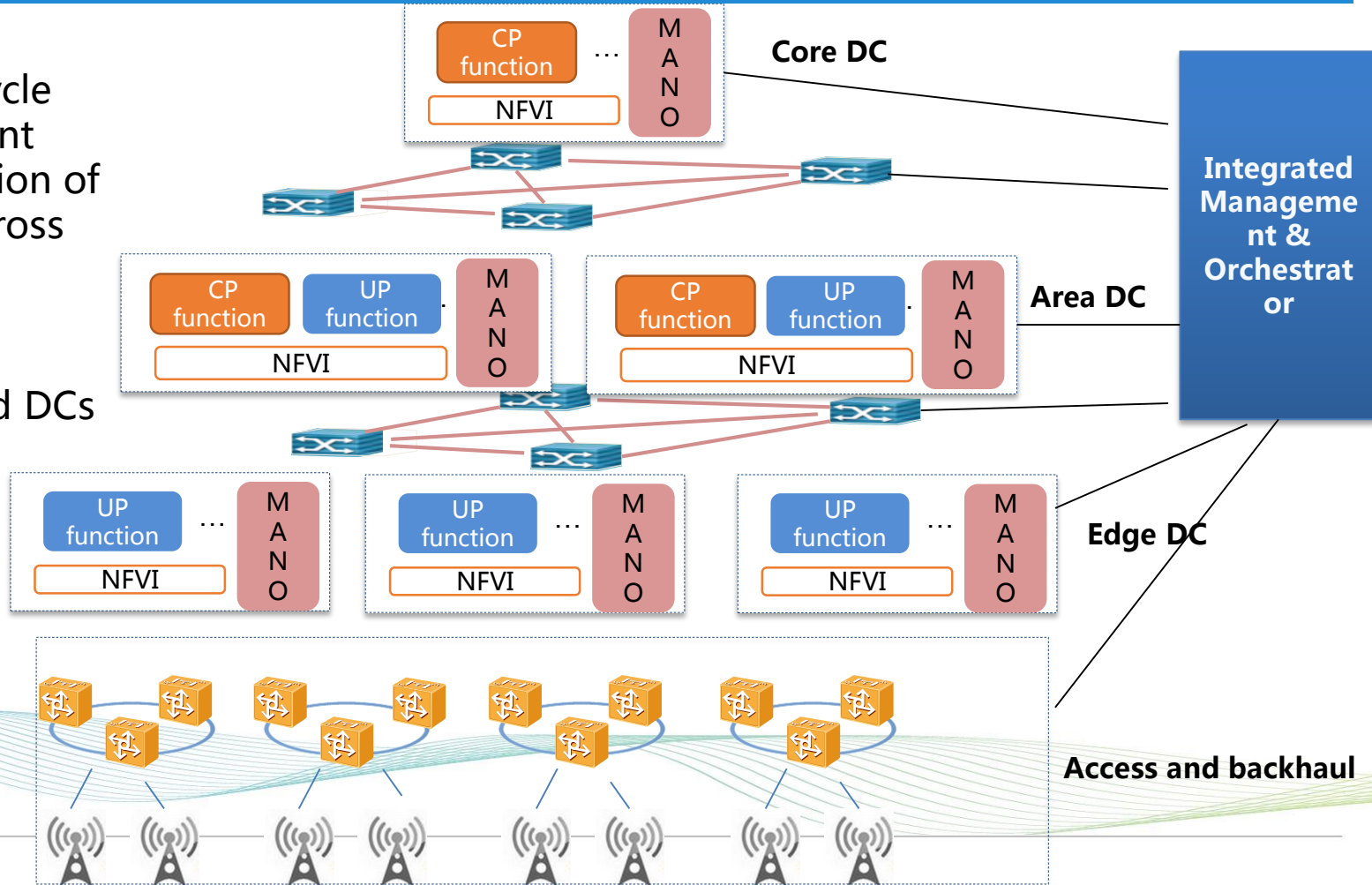
Infrastructure revolution and integrated MANO



- NFV/SDN transforms infrastructure into a manageable common platform
- MANOs should be enhanced to support distributed DCs, and the management and orchestration across transport, DC, and IP network.
- Slices or its functions can be flexibly deployed anywhere and on demand.

Key issues

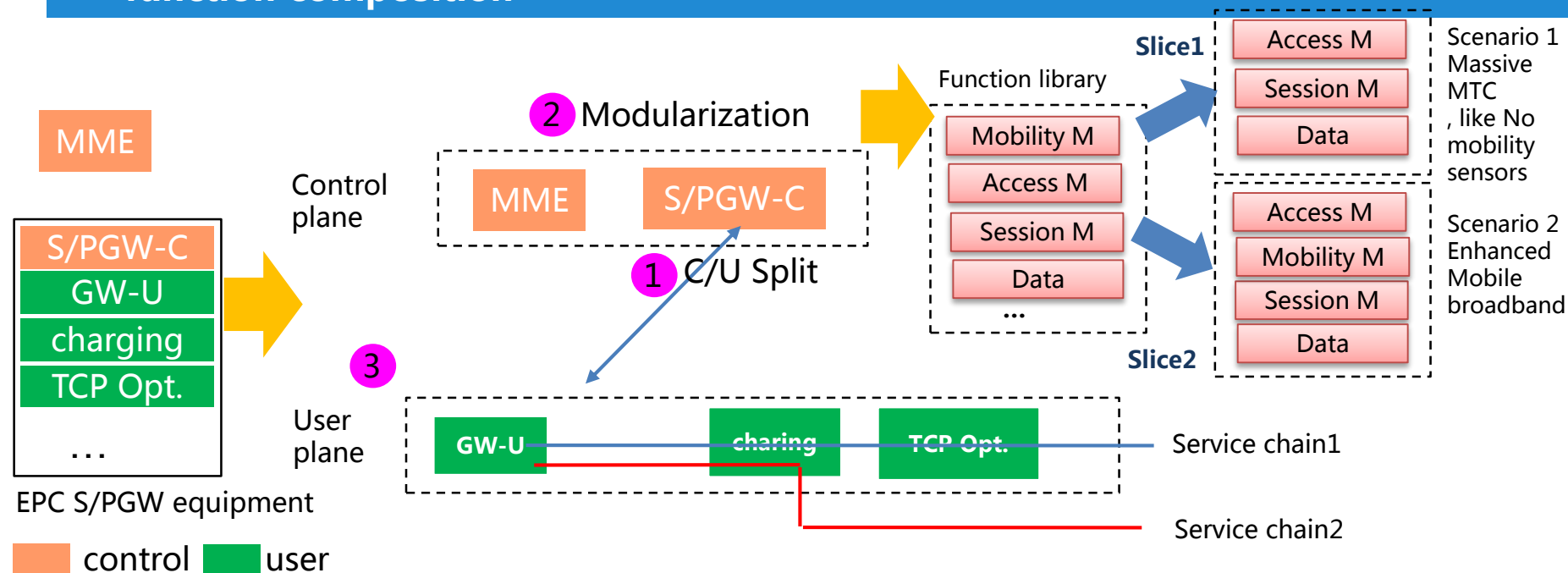
- Slice lifecycle management
- Coordination of MANO across network
- MANO of distributed DCs



C/U split, Control Plane Optimization and User plane Simplification



1. Control and user plane separation allows flexible deployment and scale
2. Control plane functions: Modularization and customization on demand
3. Data plane functions: function split and simplification, service chain based function composition



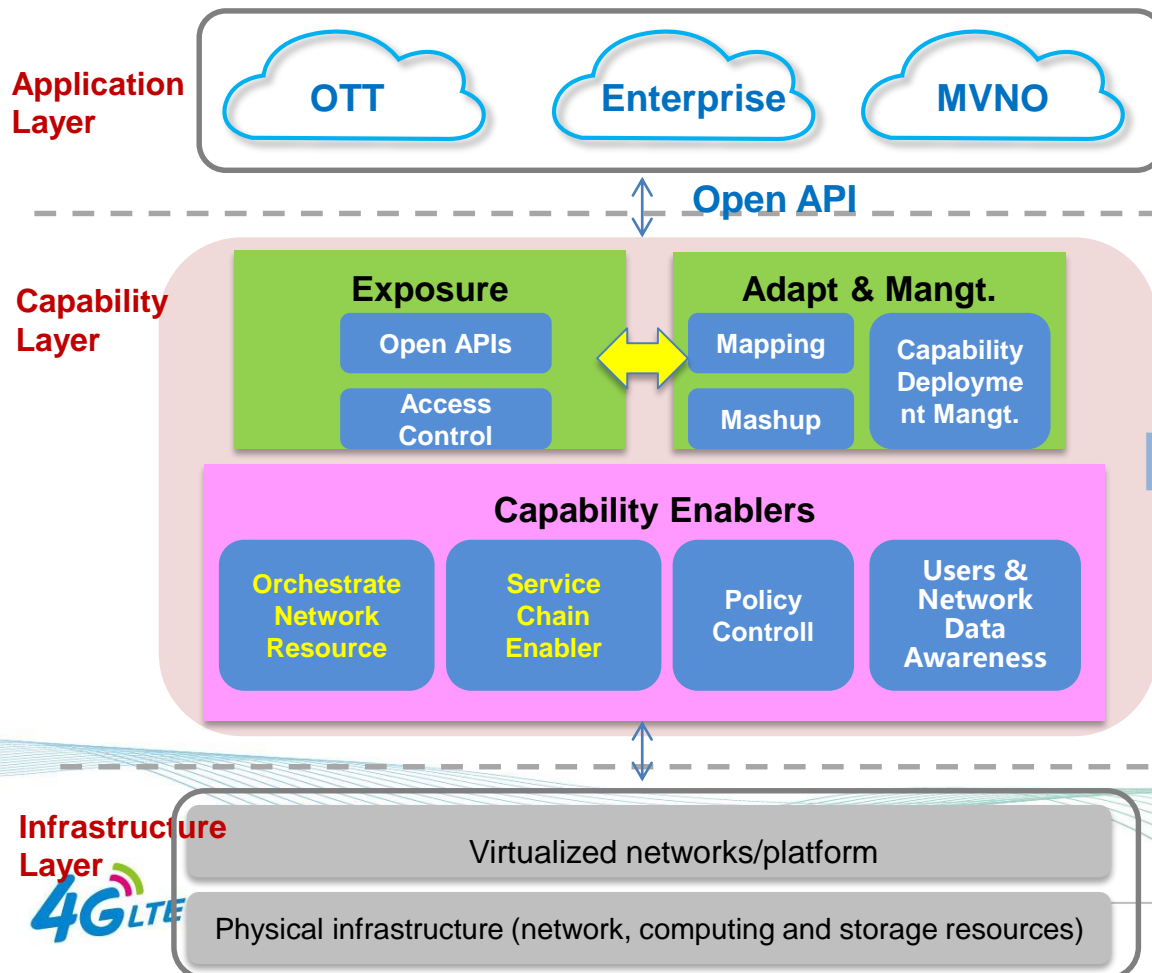
- Key issues

- Which protocol is better, GTP-C or openflow?
- How to design the atomic function for control function and simplify the function, protocol and interface

Network Capability Exposure

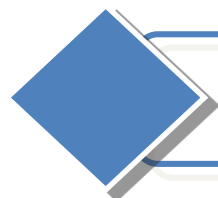


- A new Network Capability Layer: with resource orchestration, capability enabler to achieve a highly efficient coordination between service and network
- Network capability exposure function will incorporate with new 5G architecture from access to core network side



- Key issues
 - Achieve an unified network capability exposure architecture based on IT technology and new mobile service requirement, also compatible with 4G network
 - Coordination of MANO to build the network slices according to the 3rd party demand
 - Custom network functions based on service chain technology

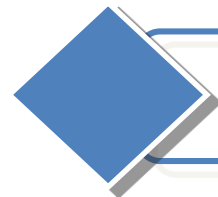
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Requirement, View and Key Issues



Consideration of Key Issues



Gap Analysis and Potential Work

Gap Analysis



- 5G architecture
 - Some high level architectures had been proposed by NGMN, China IMT 2020, Part of Vendors and etc.
 - Absence of the detailed study on architecture functions design, interfaces and protocols
- Infrastructure revolution and integrated MANO
 - ETSI NFV focus on NFV common architecture, function, and interfaces
 - Absence of end-to-end coordination study
- Network slicing
 - 3GPP SA2 Décor can not isolate the slices better
 - Absence of RAN slice selection mechanism, slice MANO, Qos guarantee mechanism
- Function design
 - Absence of overall design for each kind of network slice supporting a specific scenario
- Capability openness
 - Absence of overall requirement, architecture, function study

Proposed work suggestions to ITU-T

- **Network slicing:** Study on design principles of architecture and functions in a network slice serving the specific scenario
- **QoS of network slice:** Study on QoS mechanism of network slice considering that it could be customized and opened to third party
- **5G network exposure:** Study on the new requirements, architecture, functions and open API of capability exposure, and potential solution for each capability

Some Work in CMCC



From 2013, Proposed SAME(Softnet Architecture for Mobile) with the features of C/U split, Gi service chain, control plane optimization and NFV-based infrastructure

Prototype and Demo

1. Develop prototypes with C/U split and service chain features (with Huawei, ZTE)
2. Demo the prototypes in 2015 MWC (Barcelona & Shanghai)

Standardization

1. CCSA: finish SAME study item, 2014
2. ONF: propose C/U split requirement , 2014
3. NGMN: involved in architecture design and principles of 5G white paper, 2014——
4. China IMT-2020 Group: lead the network technology subgroups, 2014——
5. 3GPP: initiated C/U split of gateway study item,2015
6. ITU: launch and lead SAME requirement and co-lead IMT 2020 Focus Group work , 2015

Thanks