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STANDARDS FOR SUSTAINABLE DEVELOPMENT



Date: 7-10 November 2022

**Session S2 - 6G Vision, Air Interfaces and Network Architectures
8 November 2022**

**6G Network Architecture – a cloud-native system with
ubiquitous computing**

by

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Intel

Goals, challenges and expectations

Goals

- Growth
- Sustainability
- Scalability
- Resilience and security

Challenges

- Flattening MBB innovations and growth
- Exponential growth of data
- Shannon limit
- Rigid platform and protocol

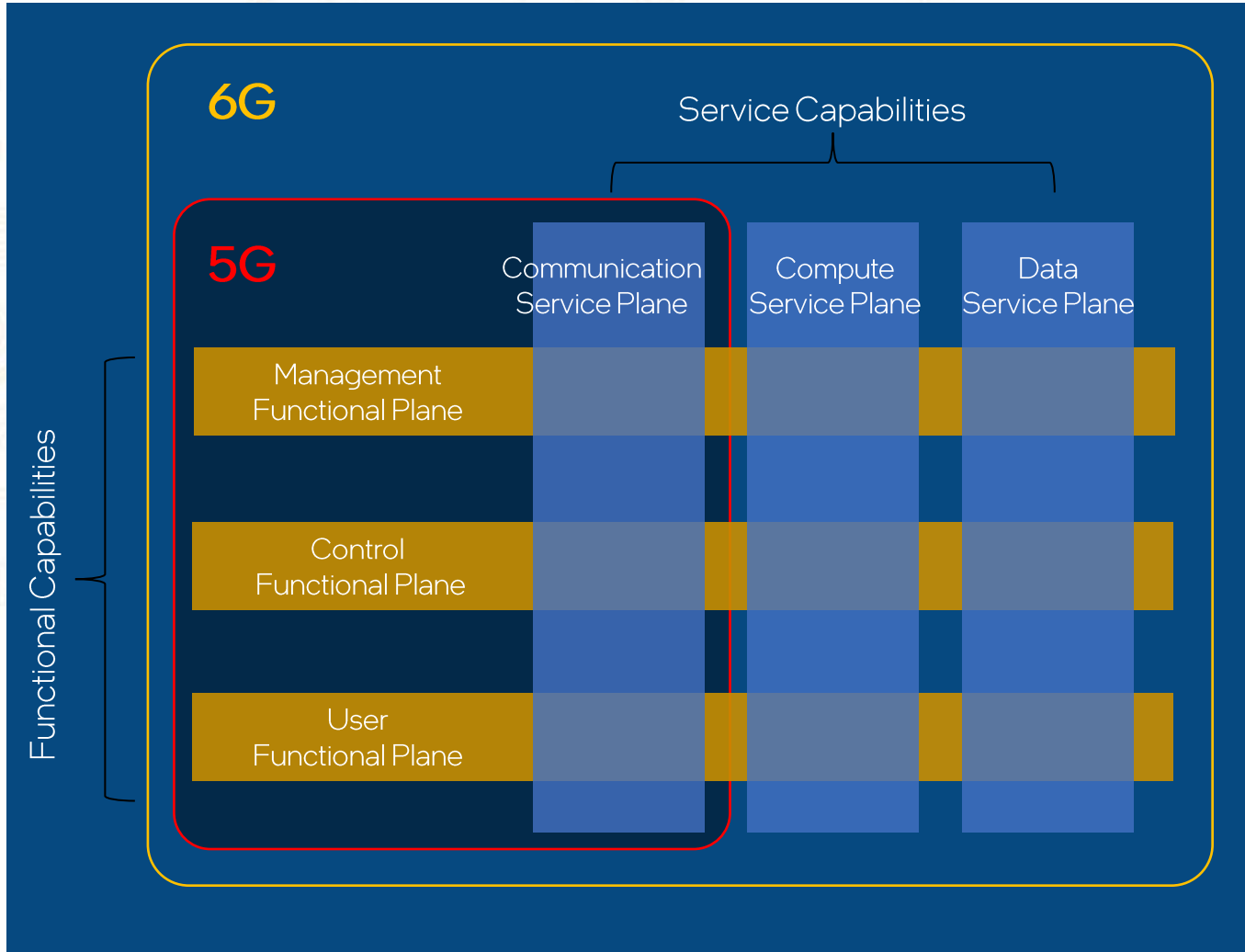
Trends

- Cloud scaling out to far edge
- Disaggregation in SW and HW
- Advancement in AI/ML
- Network cloudification

Expectations on 6G

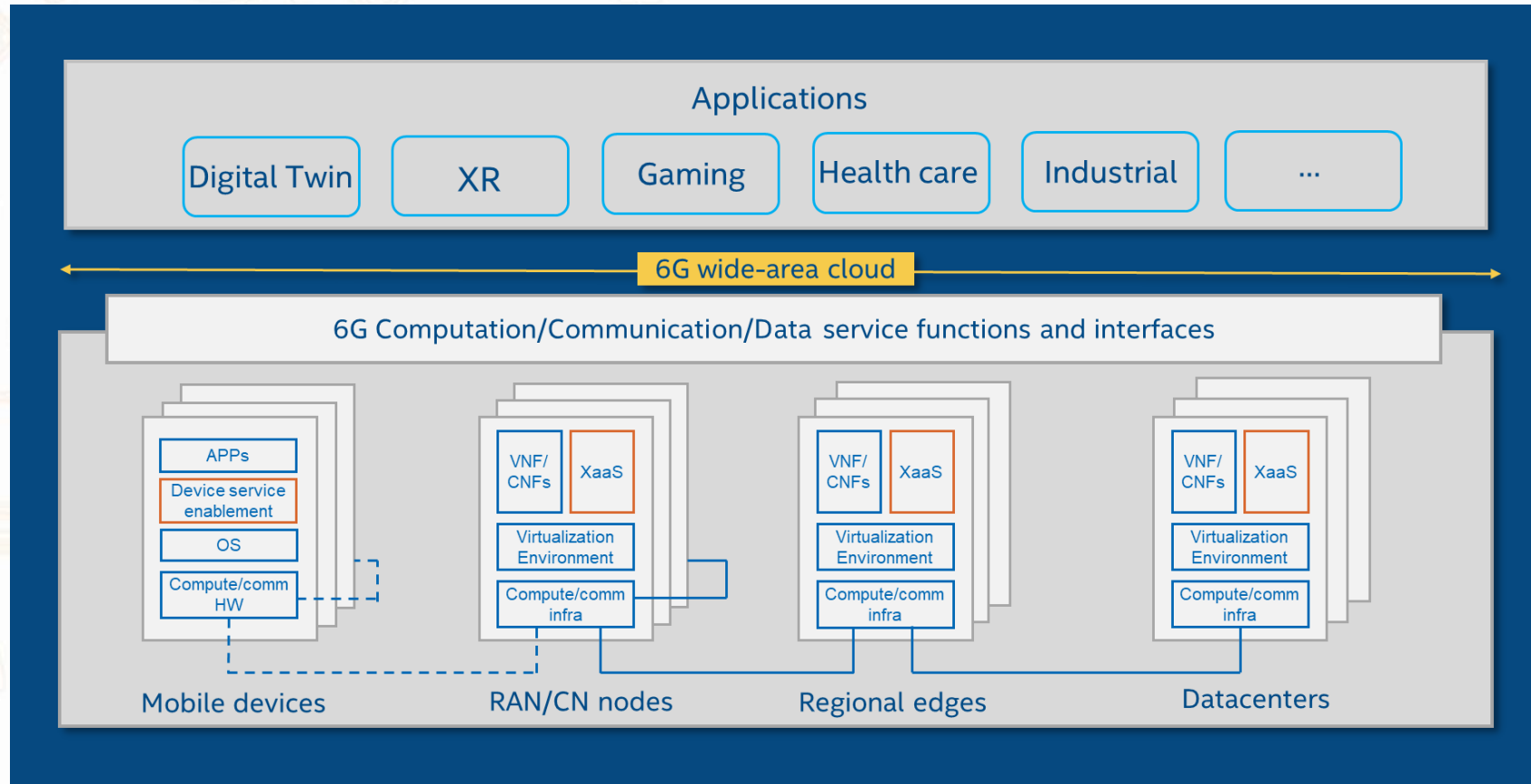
- Shift from communication-centric to communication-computing-data centric
- Shift from radio KPI focused to system and services focused
- Natively build for/by cloud and AI

System transformation towards 6G



- Add new end-to-end “Compute service plane” and “Data service plane”
- Increased level of coupling between computing and communication
- Enable a wide-area cloud with ubiquitous computing

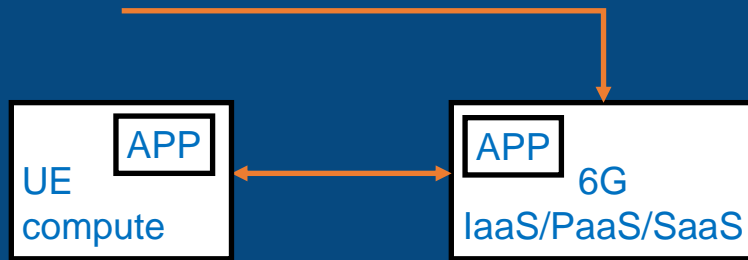
6G wide-area cloud with ubiquitous computing



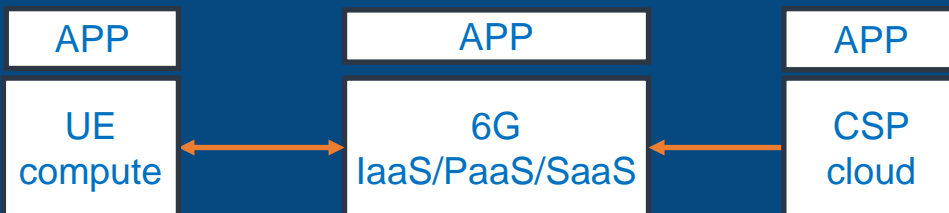
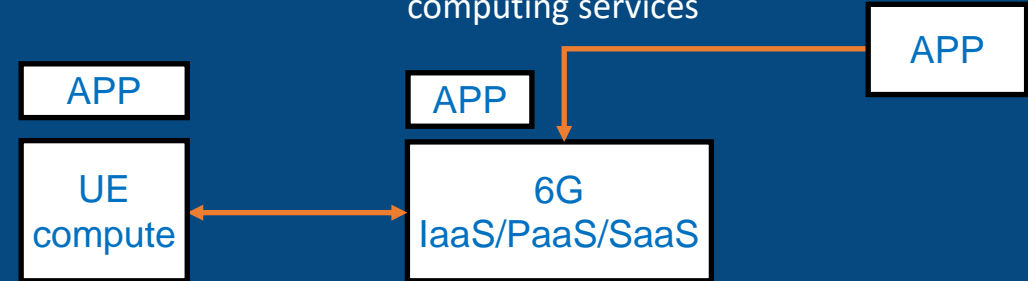
- 6G system builds on cloud, optimized for ubiquitous computing, and natively provides computing services
- Enable a wide-area cloud with ubiquitous computing across devices, network nodes and data centers
- Provides infrastructure service (IaaS), platform service (PaaS), software services (SaaS)

Example service scenarios

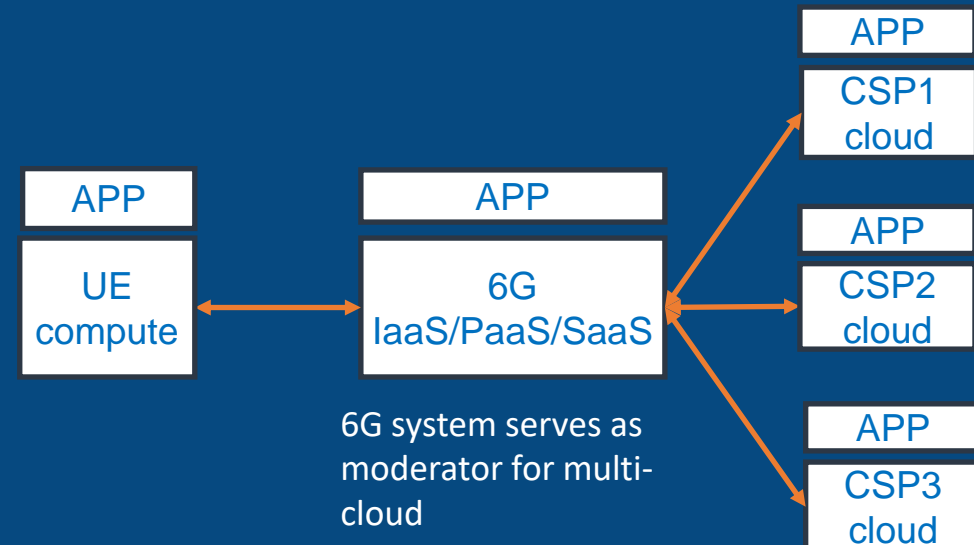
Mobile user or mobile device vendor subscribe to 6G computing services



APP provider subscribe to 6G computing services



CSP subscribe to 6G computing services

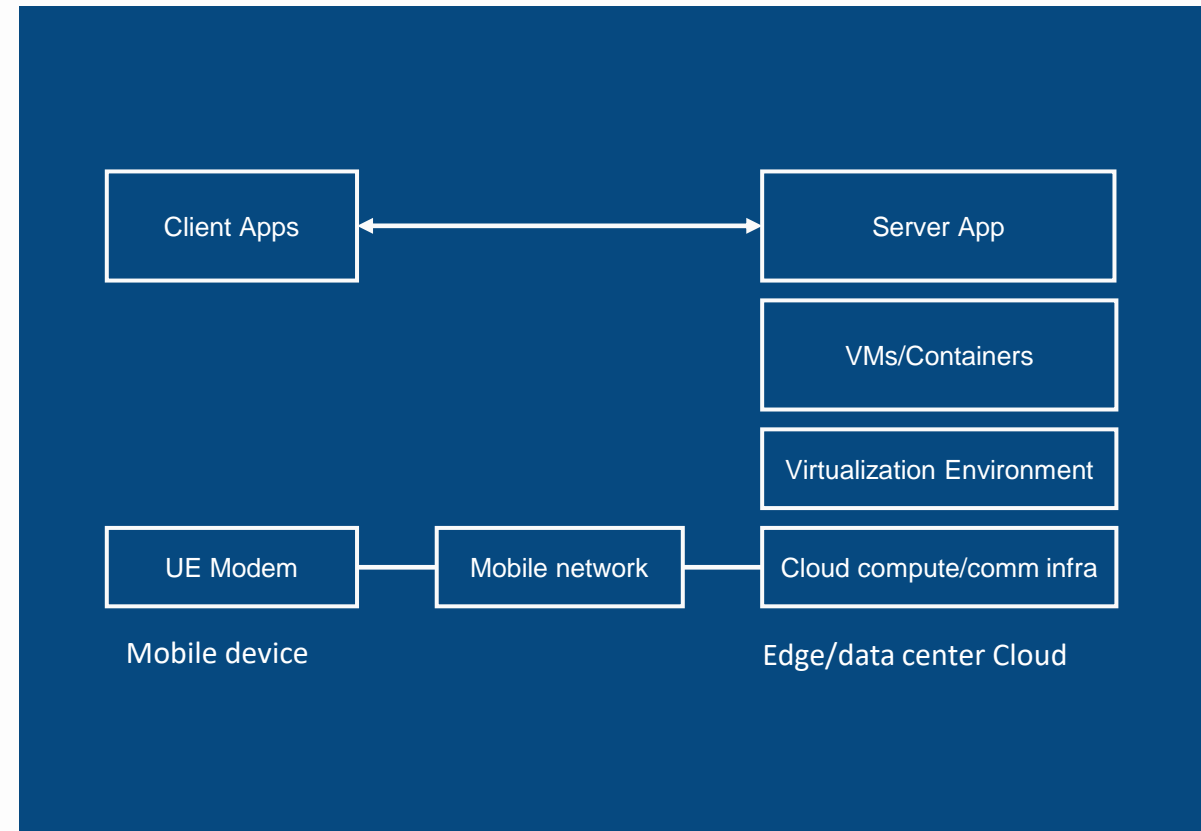
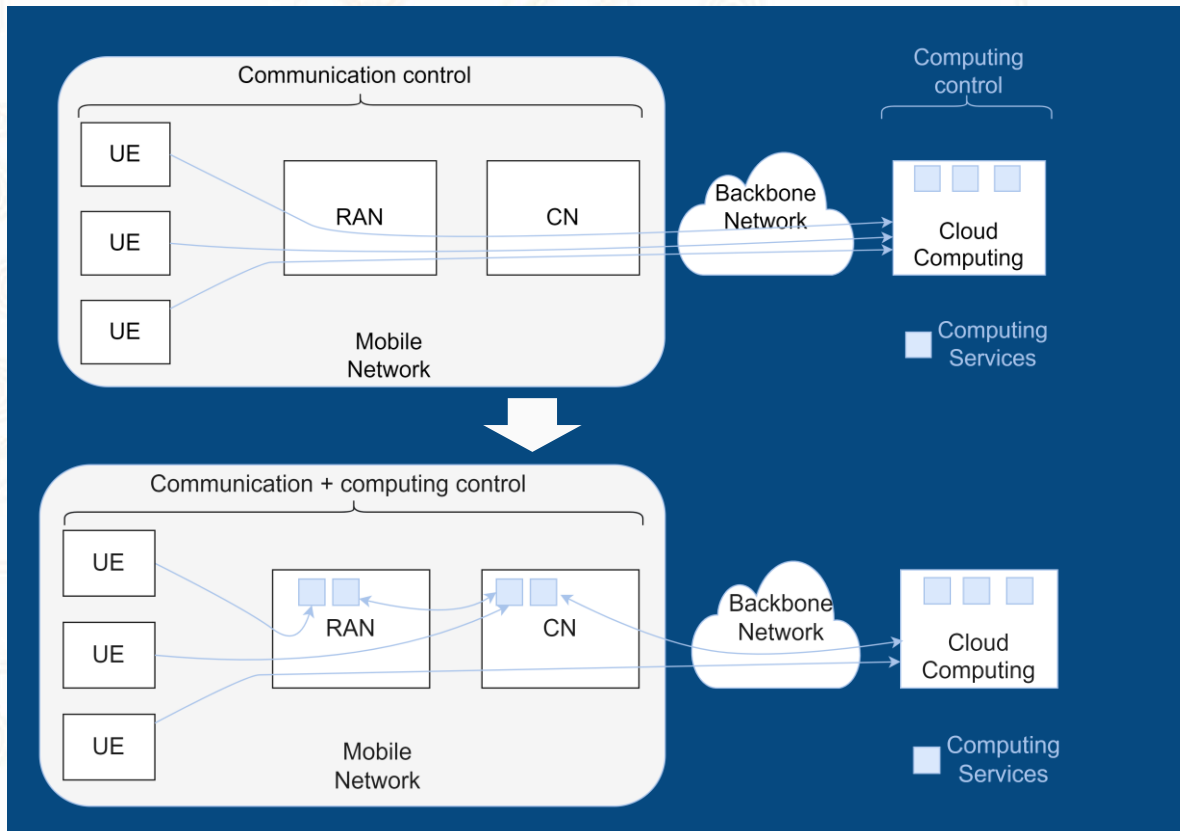


6G system serves as moderator for multi-cloud

5G Edge computing vs. 6G Ubiquitous computing

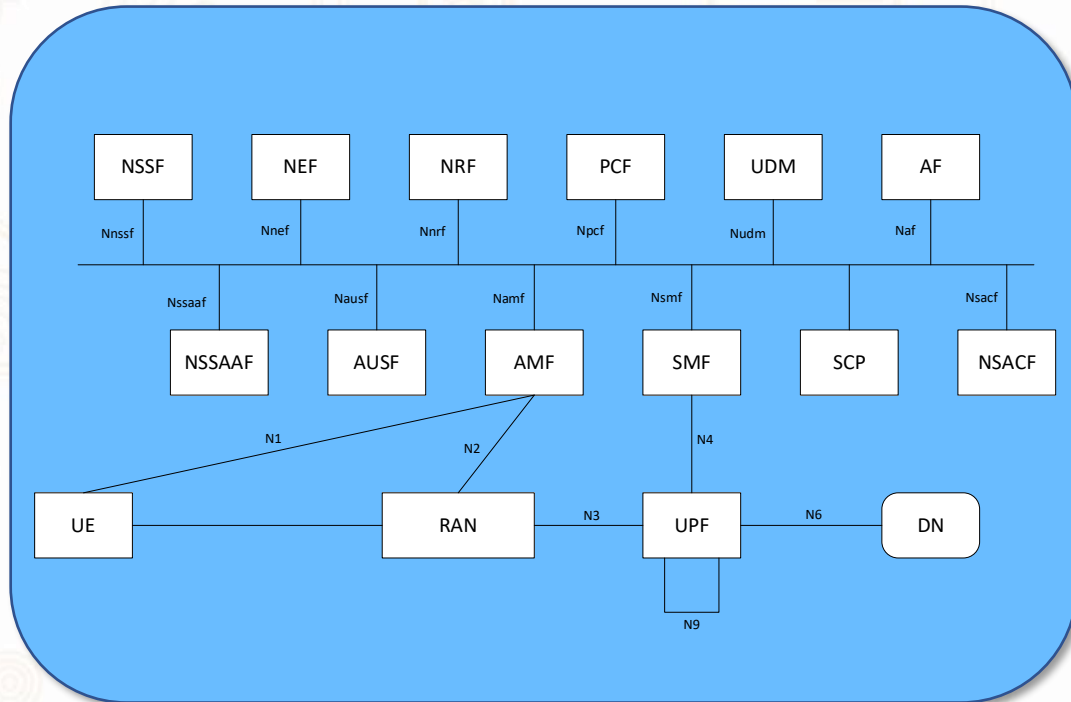
Edge computing characteristics	Ubiquitous computing characteristics
Regional edge or private network on-premise edge	Widely distributed across device compute, network compute, regional edges and data centers
Focus on computing functionality	Focus on scalability as well as computing functionality
Single ownership and security domain	Multiple ownership and security domains
Abundant computing resources in each location	Limited computing resources in each location
Over the top of mobile network	Coupled with mobile system
Fixed client-server workload partition	Dynamic workload partition
Scale down from data center cloud	Need a new form of cloud
Trade computing resources for performance and efficiency	Trade computing resources for performance and efficiency

Challenges



- Mobile systems were conventionally designed for centralized computing.
- 5G treats edge computing as an extension of center cloud to the edge and follows the design approach for centralized cloud
- Mobile network user plane transport serves as pure data pipes
- Devices conventionally interact with cloud via client-server applications
- Device compute is not part of the cloud

Joint force cloud technologies/tools and mobile system technologies in 6G system



+

Orchestration

Workload disaggregation and distribution

Service function chaining

Service mesh

Data management

Authentication and security

...



kubernetes



SRv6



envoy



Istio



kafka



etcd



spiffe



SPIRE

[1] <https://www.cncf.io/>

[2] <https://kafka.apache.org/>

[3] 3GPP TR 23.501

Critical questions

1. Focus on (broader) key capabilities instead of traditional (narrow) KPIs?
2. What is the right level of coupling between communication and computing?
3. How to enable ubiquitous computing at scale and across multiple security and ownership domains?
4. How to incorporate mobile device compute and network compute as part of the 6G wide-area cloud?
5. How to provide seamless distributed computing experiences with minimal application impacts?
6. How does the standardization community (3GPP) and open implementation community(e.g., O-RAN, ONF, CNCF, DMTF, etc.) organically work together for commercial success?
7. Effective collaboration model between telecom industry and cloud computing industry?

Thank You

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