



# NGA System Architecture – 6G Wide Area Cloud

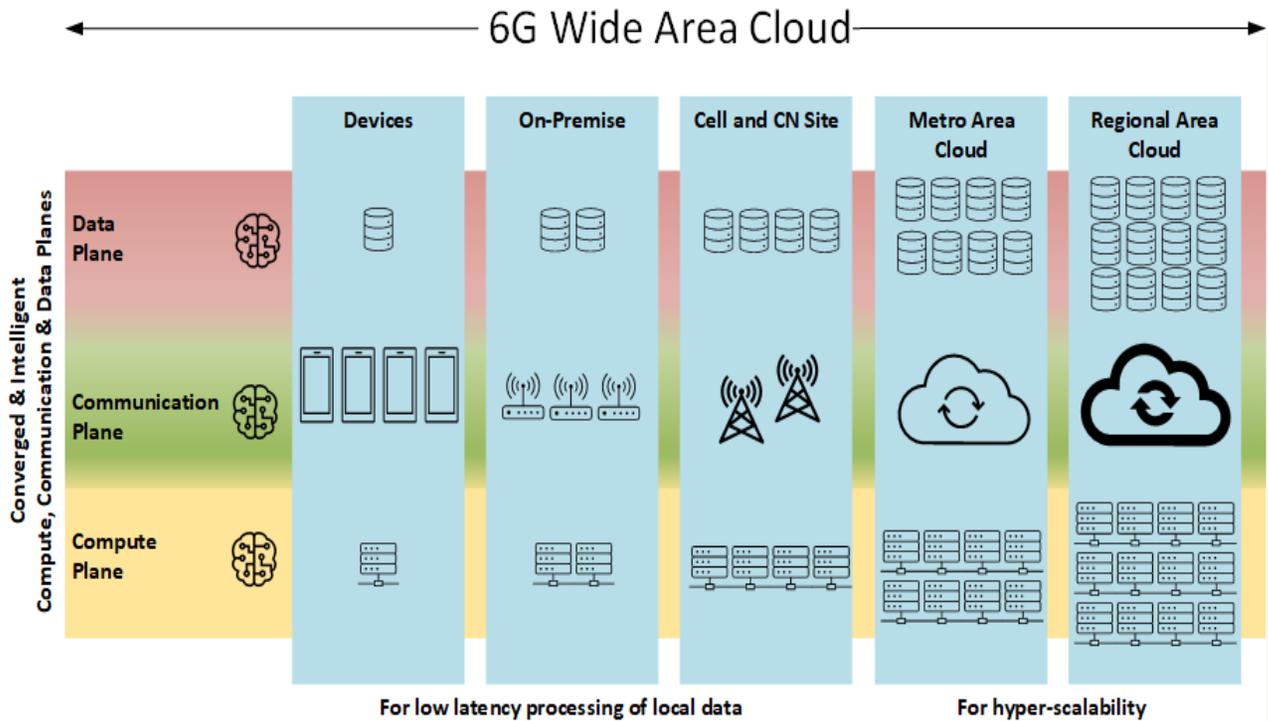
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# NGA 6G Wide Area Cloud



- > Vision is to holistically integrate communications and compute to meet the demands of new applications by merging two distinct objectives:
  - Making integration of Cloud Concepts that started in 5G more efficient, reliable, and cost-effective
  - Leveraging the mobile network to integrate distributed computing resources for richer and more dynamic cloud services to applications.
- > Goal is to Integrate Mobile Network and Cloud Architectures that have so far evolved independently
  - Port primarily centralized cloud models to a heavily distributed 6G system envisioned as a vast array of sensors, users, applications, and services that will both produce and consume vast amounts of data.
  - Offload computation due to the dual demands for compute-intensive applications and lightweight, low-power devices. Efficiently support the dynamic discovery of compute capabilities

# Overall Architecture



Cloudification of 5G mobile networks evolves to 6G WAC, leveraging the cloud computing technologies with maximum reuse

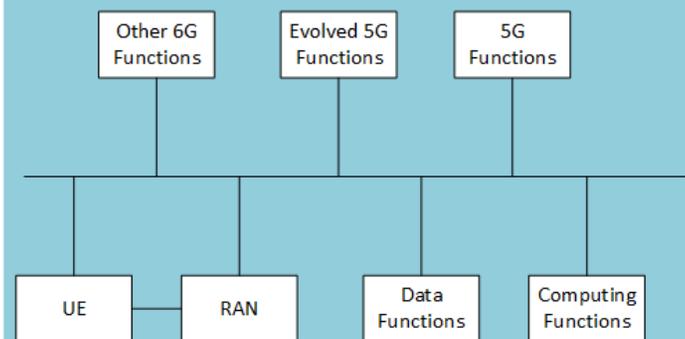
6G WAC is comprised of intelligent and ubiquitous computing, communication, and data services spanning regional and metro area data centers, cell sites, on-premise equipment, and devices.

Supports both 6G system functions and applications as workloads

Computing and data planes with dedicated computing and data management functions may be introduced to cellular networks

# Convergence of Cloud Capabilities with the 6G System

Note: This is an exemplary 6G architecture



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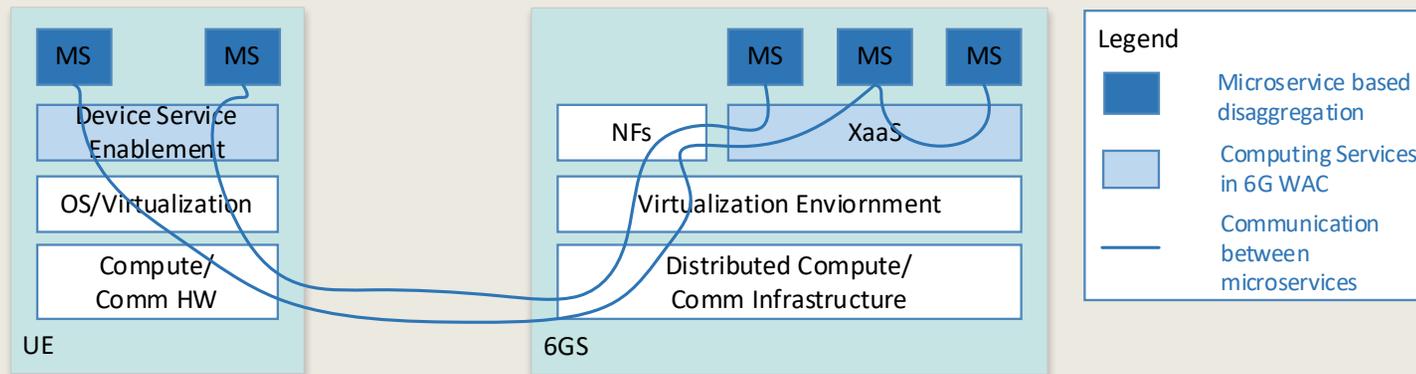
- Orchestration
- Workload disaggregation and distribution
- Service function chaining
- Service mesh
- Data management
- Authentication and security
- ...



Convergence of Cloud Computing Capabilities with 6GS

- Cloud computing enables network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand
- Convergence may include adopting the cloud native infrastructure, enabling computing workload distribution to share heterogenous resource, enhancing system capabilities on orchestration, and integrating joint control of communication, computing, and data services

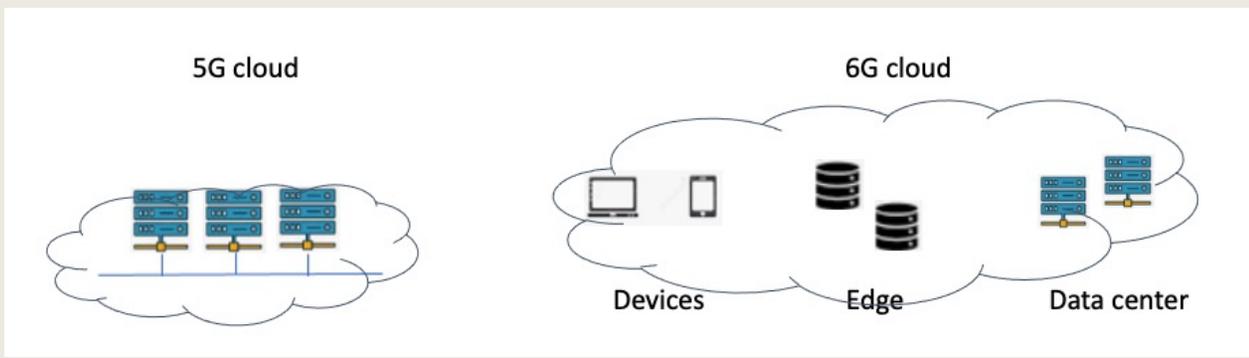
# Cloud Computing Capabilities Not Yet Integrated with 5GS



Workload Disaggregation and Microservice Communication

- Computing and data services (e.g., data management) are outside of the mobile system domain.
- XaaS (IaaS, PaaS, and SaaS) service disaggregation, and resource sharing with workload migration vs 5GS communication services to mobile devices.
- Microservices architecture allows a huge service logic to be broken down to a series of loosely coupled microservices distributed across locations and compute nodes. → requires a microservice communication fabric.
- 6GS likely to incorporate data centric services, separate from computing to support sensing and AI-powered applications.

# Data Management as a Service



Data Distribution in 5G and 6G

- > For the 6G WAC to become more intelligent with personalized and predictive services, massive amounts of data from device sensors, network measurements / status, and applications needs to be securely distributed.
- > Examples include use of tracking data such as device mobility, application usage, and interest level to predict future patterns. JCAS data can enable multiple services including area monitoring and object detection.
- > Data distribution for AI/ML model training and inference enables the 6G WAC to learn, predict, and adapt to achieve customized services and orchestrates communication, compute, and storage resources accordingly.

# 6G Wide Area Cloud Key Take Aways



- The 6G WAC both:
  - Continues the integration of cloud concepts into the network that began in 5G, and
  - Leverages the network to integrate distributed computing resources.
- Network Functionality should be like any other application workload handled by cloud resources.
- The 6G network can be envisioned as a vast array of sensors, users, applications, and services that will both produce and consume vast amounts of data.
- The 6G WAC is envisioned to comprise intelligent and ubiquitous computing, communication, and data services spanning from regional data centers to on-premise equipment and devices.
- The 6GS should leverage the 5GS and cloud computing technologies with maximum reuse.



Building the foundation  
for North American  
leadership in 6G and beyond