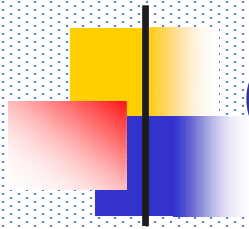# Wireless Mobile & Ad Hoc Networking (7COM1031)
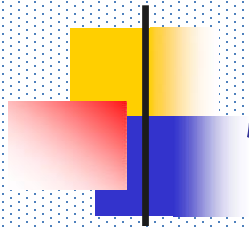
Cellular Wireless Networks (2)

Overview

- Principles of Cellular Networks

- AMPS (1G)

- GSM (2G TDMA) and IS-95 (2G CDMA)

- WiMax and LTE (both 4G OFDM)

- *5G Technology*

5G :- 5'th Generation

- It is the next major phase of mobile telecommunication & wireless system.
- It is 10 times faster than 4G.
- It has an expected speed of 1gbps.
- Lower cost than the previous version.

Comparison of 5G with other

| Technology	1G	2G	3G	4G	5G
Start/ Deployment	1970/1984	1980/1999	1990/2002	2000/2010	2014/2020
Data Bandwidth	2Kbps	14-64Kbps	2Mbps	200Mbps	1Gbps and higher
Technology	Analog cellular	Digital cellular	Broadbandwidth/ CDMA/ IP technology	Unified IP & seamless combo of LAN/WAN/WLAN/ PAN	4G+WWWW
Multiplexing	FDMA	TDMA/CDMA	CDMA	CDMA	CDMA
Core network	PSTN	PSTN	Packet network	Internet	Internet
Service	Mobile telephony	Digital voice, short messaging	Integrated high quality audio, video & data	Dynamic information access, variable devices	Dynamic information access, variable devices with AI capabilities
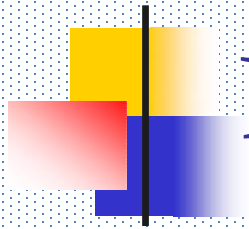
Networking Architecture of 5G

➢ OSI Layers   5G mobile

| OSI Layers	5G mobile
Application Layer	Application(Service)
Presentation layer	
Session Layer	Open Transport Protocol
Transport Layer	
Network Layer	Upper network layer
	Lower network layer
Datalink Layer	Open Wireless Architecture
Physical Layer	
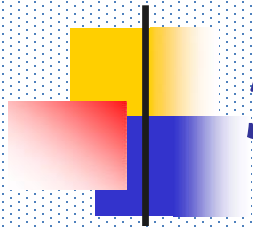
5G Network Layers

- OWA stands for Open Wireless Architecture this layer is used to be used as Physical Layer + Data link Layer = OWA.

- Network Layer is divided into two sub layers
  - ✓ 1) Lower Network Layer
  - ✓ 2) Upper Network Layer
  - ▪ Network Layer is used to route the data from source to destination.

- Open transport layer perform the operation of both Transport Layer and Session Layer.
  - ▪ Transport Layer + Session Layer=OTL.

- Application Layer marks the data into proper format i.e., it decrypts the data which is in encrypted form and selects the best wireless connection for a given service.

5G Data Transfer Architecture
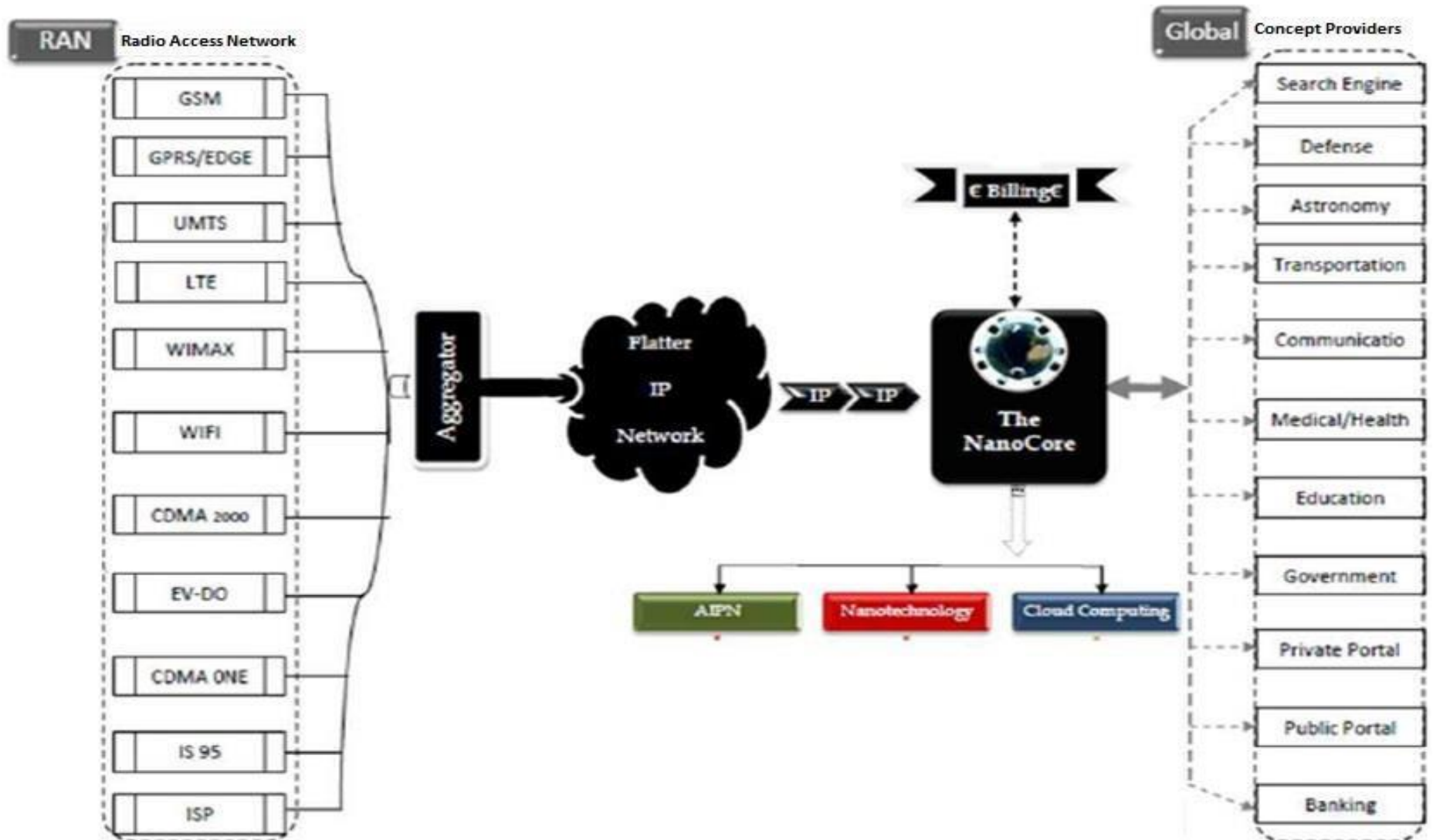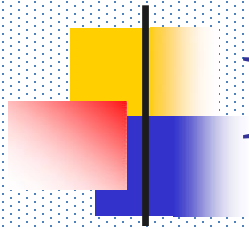
RAN and Flat IP Network

- ## Radio Access Network (RAN)
  - A RAN is part of a mobile telecommunication system. It implements a Radio Access Technology. Conceptually, it resides between a device such as a mobile phone, a computer, or any remotely controlled machine and provides connection with its core network.

- ## Flat IP Network
  - Certainly Flat IP network is the key concept to make 5G acceptable for all kind of technologies. To meet customer demand for real-time data applications delivered over mobile broadband networks, wireless operators are turning to flat IP network architectures.
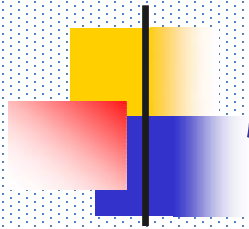
5G Nanocore

- The 5G Nanocore is a convergence of below mention technologies.
    - Nanotechnology
    - Cloud Computing
    - All IP Platform
- Nanotechnology is the application of nano science to control process on nanometer scale. i.e. between 0.1 and100nm. The field is also known as molecular nanotechnology(MNT). It deals with control of the structure of matter based on atom-by-atom and molecule by molecule engineering.
- The term nanotechnology was introduced by Nori Taniguchi in 1974 at the Tokyo international conference on production engineering.
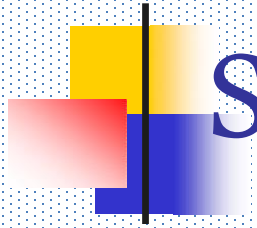
Service-Driven 5G Architecture

- Aims to flexibly and efficiently meet diversified mobile service requirements.

- Use Software-Defined Networking (SDN) and Network Functions Virtualization (NFV) to support the underlying physical infrastructure.

- Comprehensively cloudifies access, transport, and core networks

- Cloud adoption enables network slicing, on-demand deployment of service anchors, and component based network functions.
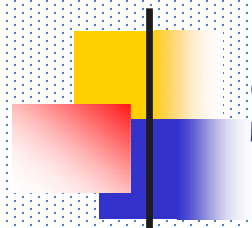
Service-Driven 5G Architecture
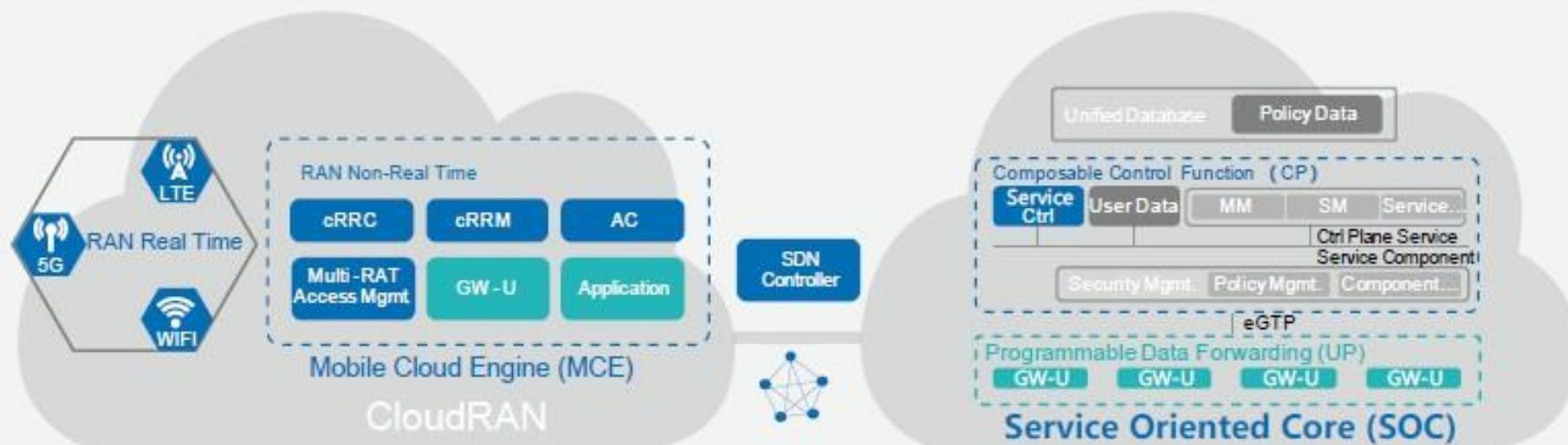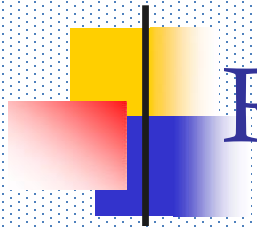
Reconstruct the RAN with Cloud

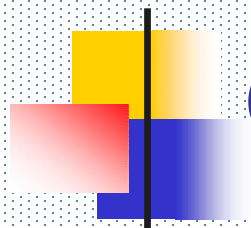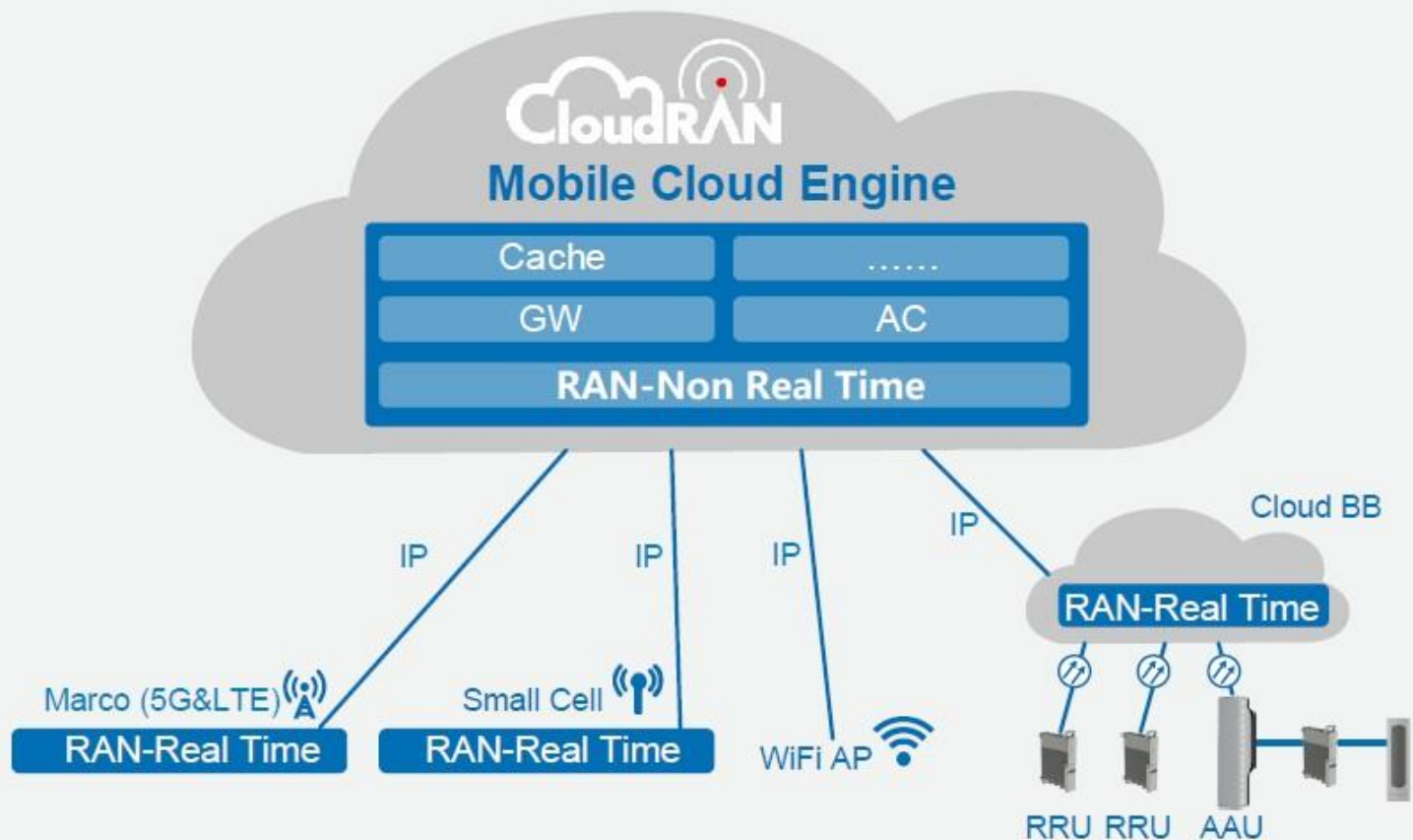- CloudRAN architecture is used on the RAN side
- Implement RAN Real Time functions, on-demand deployment of non-real time resources.
- Implement RAN slicing.
- Use Mobile Cloud Engine (MCE)

CloudRAN

Common Network Architecture across Different Technologies & Layers
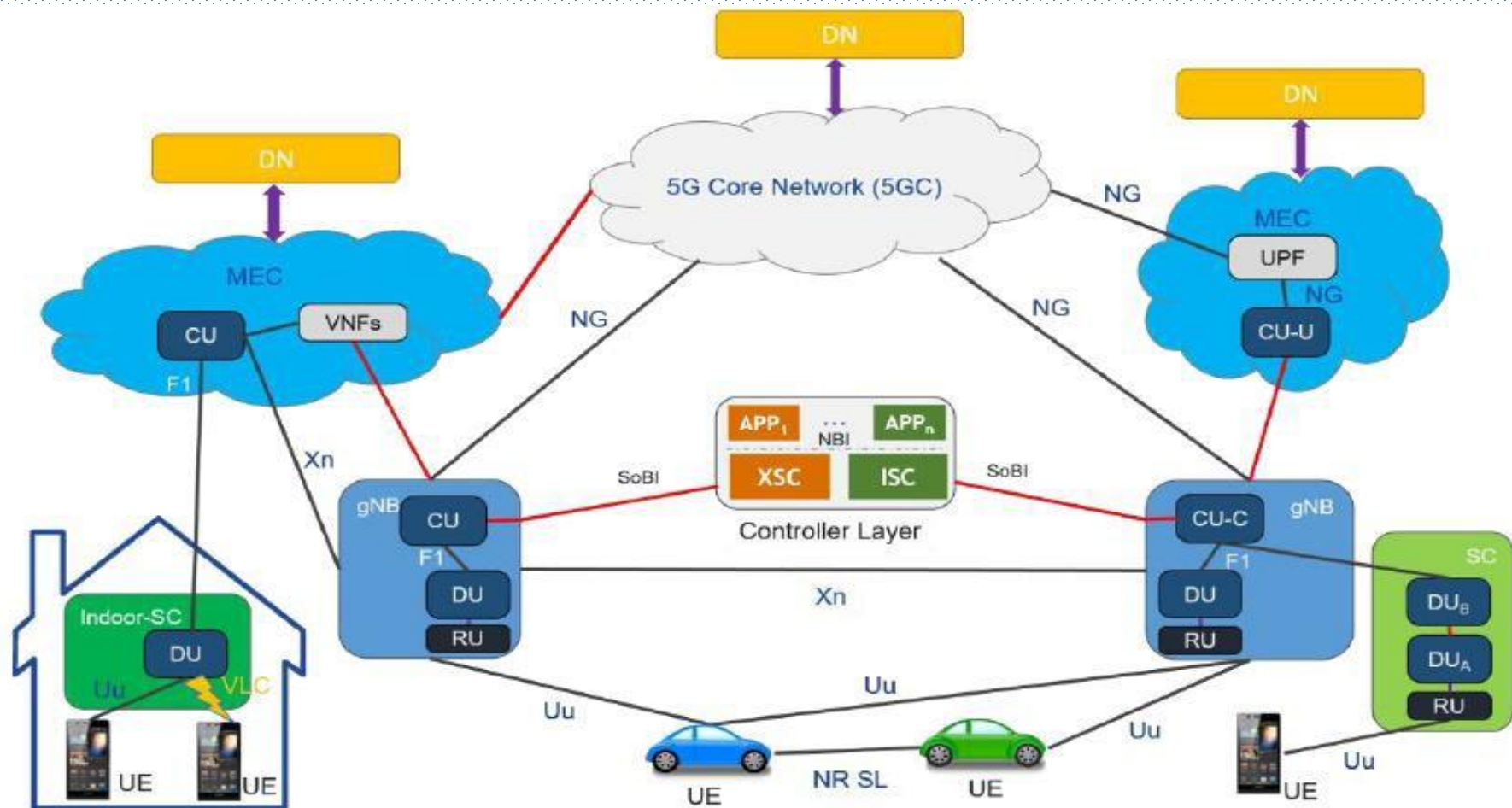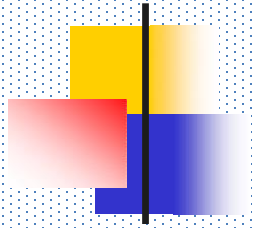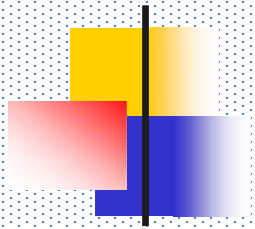
RAN Architecture

Figure 3-1: Overall RAN Architecture

5G Advantages

- Data Bandwidth of 1Gbps or higher.
- Dynamic information access.
- Available at low cost.
- Finest Quality Of Service(QOS).
- Pages will upload almost instantly.
- Support interactive multimedia, voice, streaming video, Internet, and other broadband services.

5G Outlook

- 5G technology is going to be a new revolution in wireless systems market.

- 5G will be User Centric.

- 5G is the next frontier of innovation for entire mobile industry.

- 5G - a promising generation of wireless communication that will change people's lives.