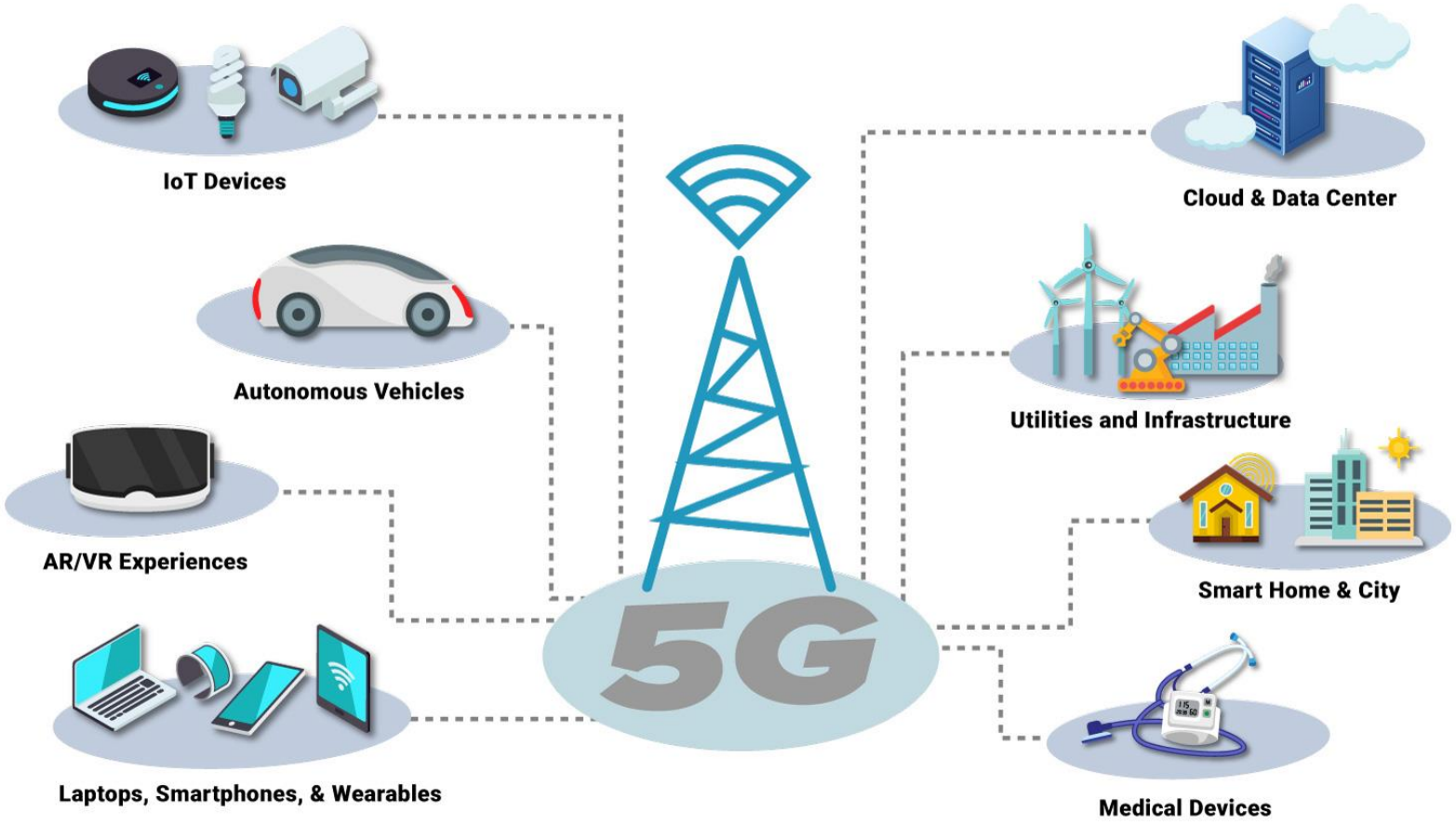
5G Overview

5G intro

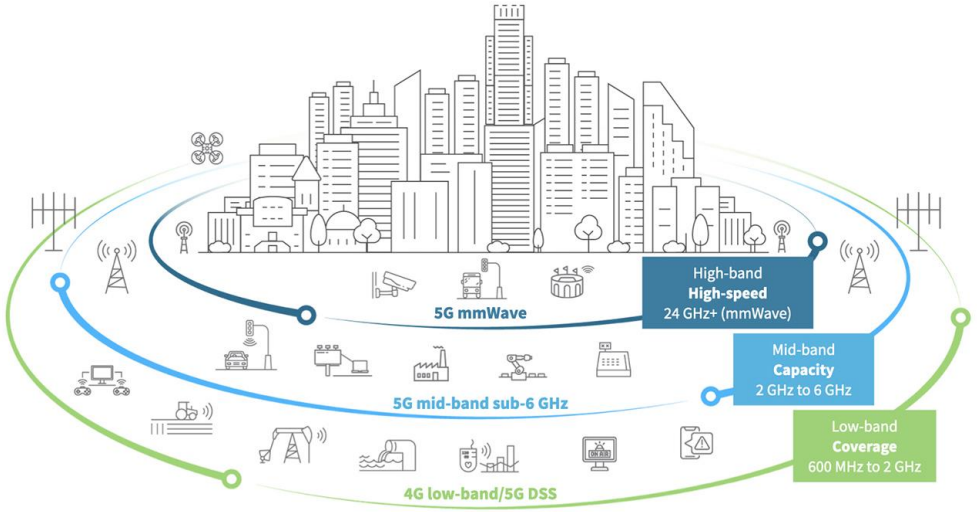
- What is 5G ?
  - 5th Generation Wireless Network
  - Designed to connect User Devices, Machines, Objects
  - Enables Multi-Gigabit data rates over Radio Network
  - Expanded capacity
  - Ultra-Low latency
  - Increased reliability
  - More efficient Power usage

5G Connections & Devices

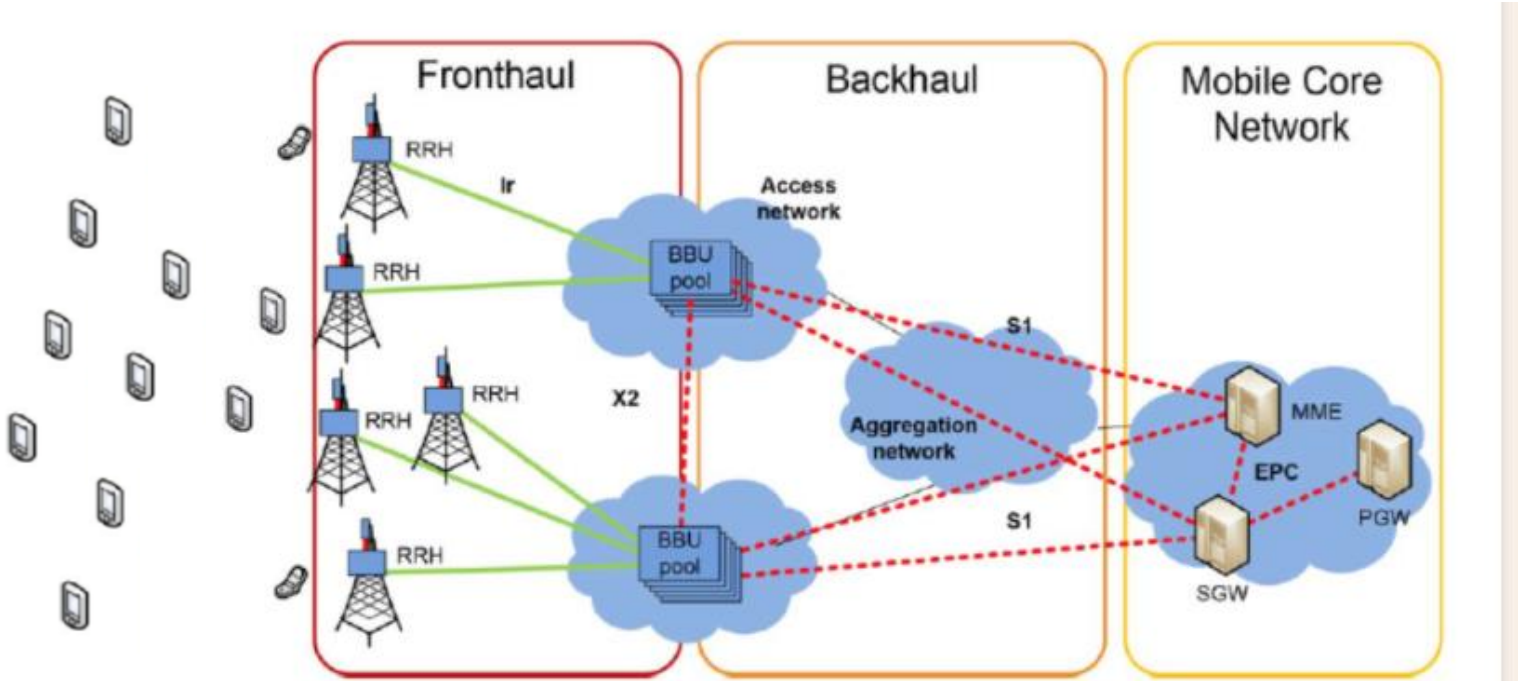


5G Wireless Network

- 5G mmWave band
  - 24Ghz+
  - High capacity (~10Gbps)
  - Wireless fiber replacement
- 5G Sub6Ghz band
  - 2Ghz → 6Ghz band
  - Next gen primary wireless network (~1Gbps+)
  - Mobile HD streaming
- 5G low-band / LTE
  - < 2Ghz band
  - < 100Mbps
  - IOT sensors
  - Industrial equipment connectivity / monitoring
  - Medical devices



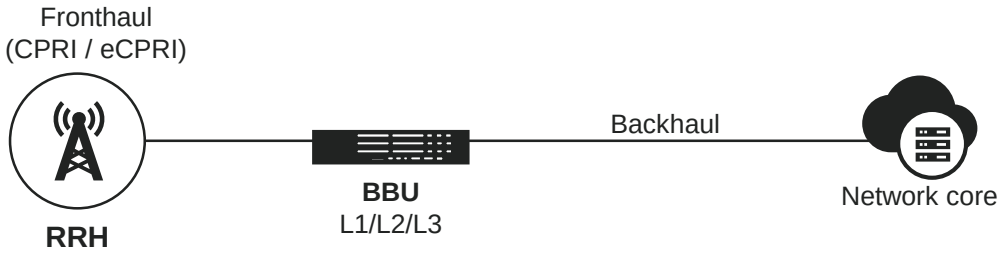
RAN: Radio Access Network



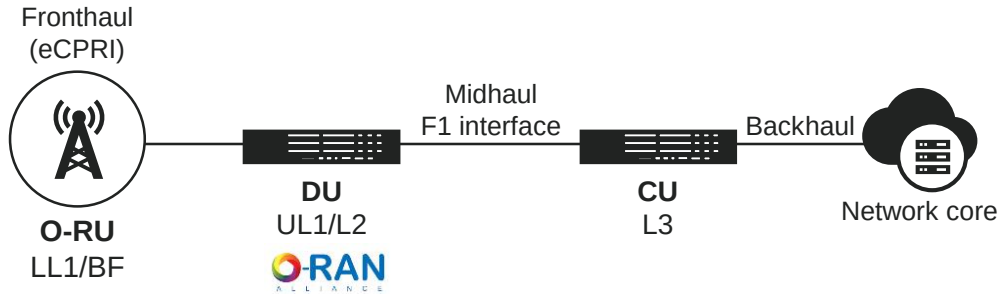
UE: User Equipment Remote Radio Heads Base Station Wired IP Network

5G Network Equipment

Radio Access Network

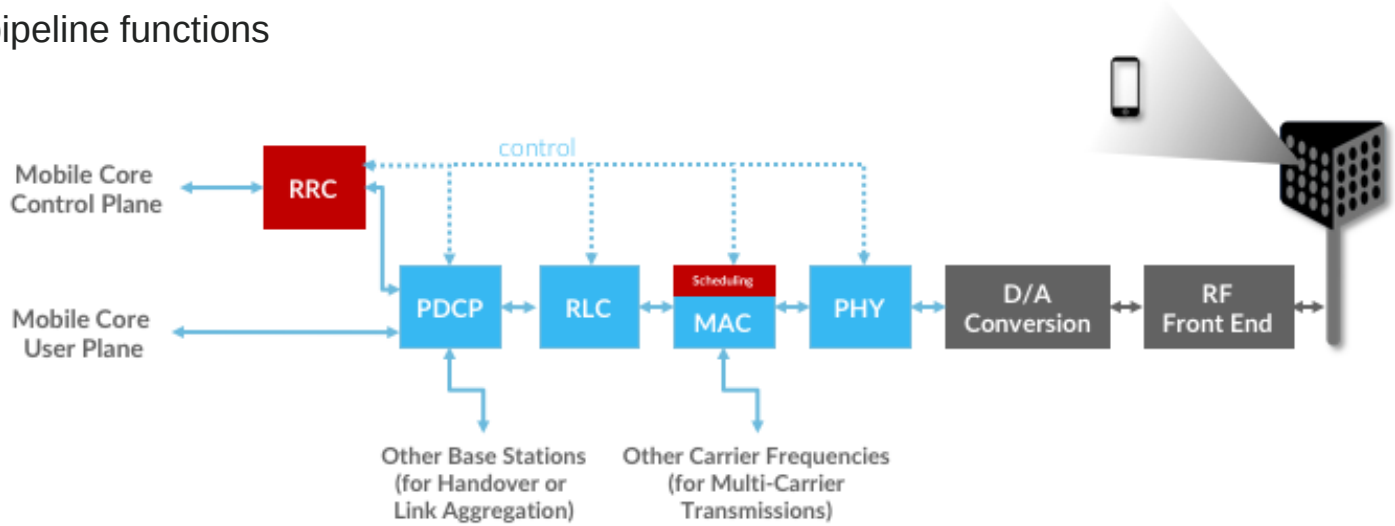


5G Open RAN



5G Base Station

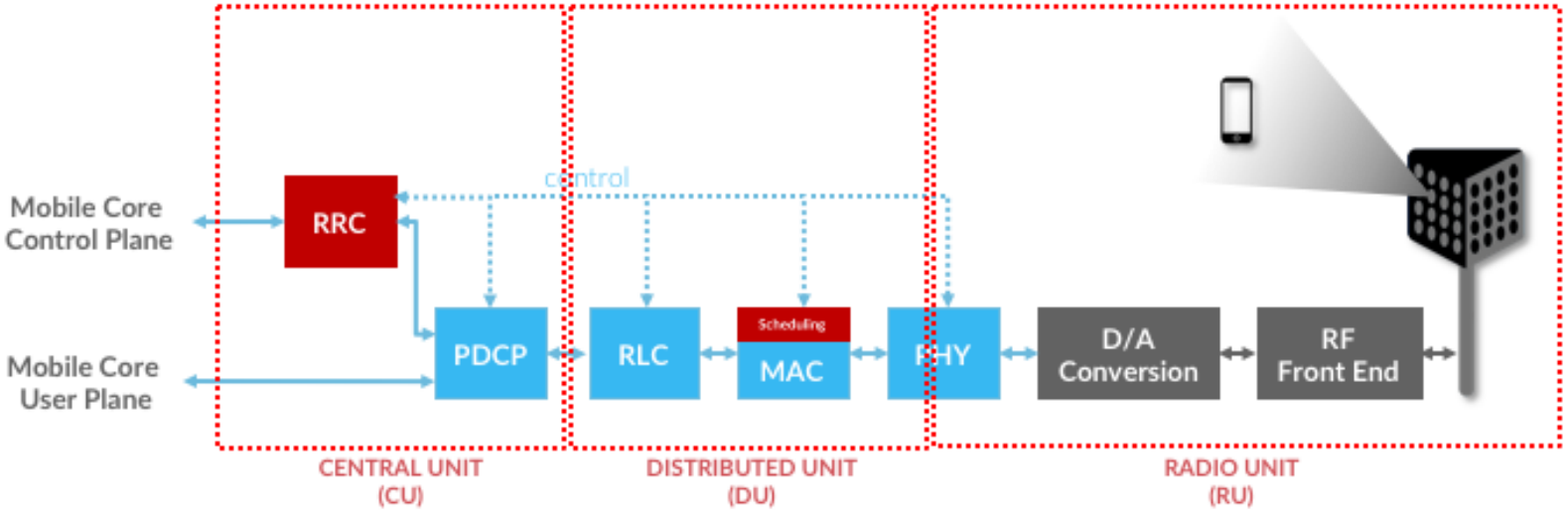
Radio pipeline functions



- **PHY** (Physical Layer)
  → coding and modulation FEC.
- **MAC** (Media Access Control)
  → packet buffering, real-time scheduling
- **RLC** (Radio Link Control)
  → segmentation and reassembly, ARQ, link aggregation
- **PDCP** (Packet Data Convergence Protocol)
  → packet compression / decompression, crypto functions, IP forwarding
- **RRC** (Radio Resource Control)
  → configuring and policy-related aspects of the pipeline.

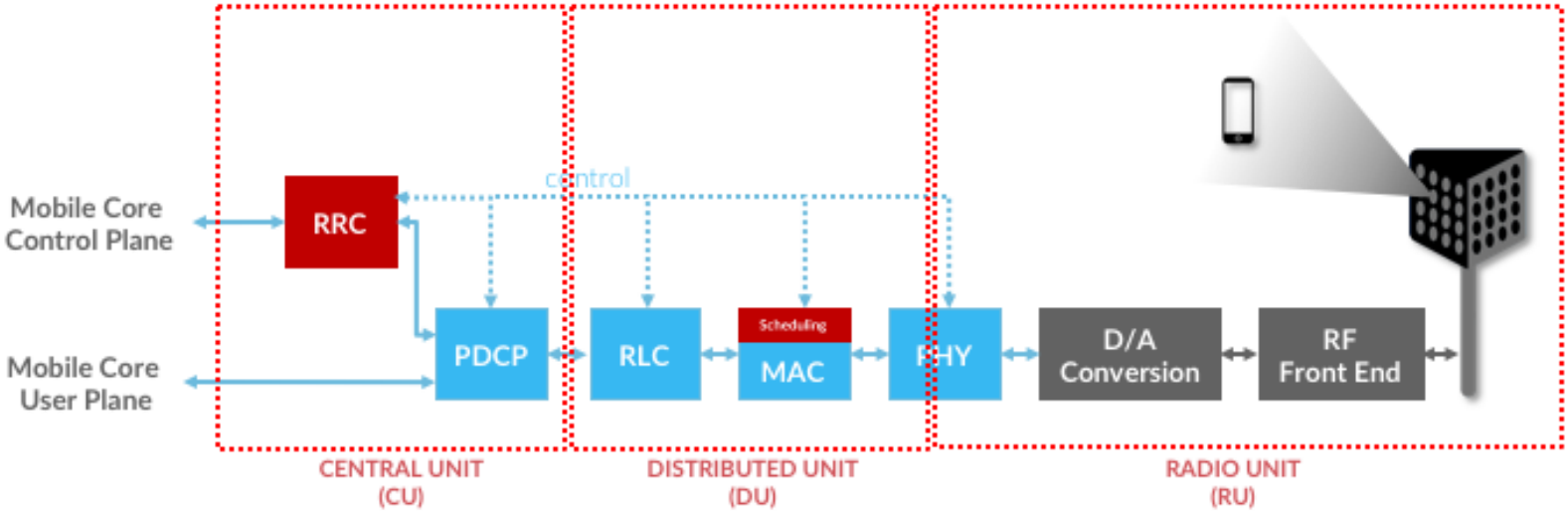
5G Base Station

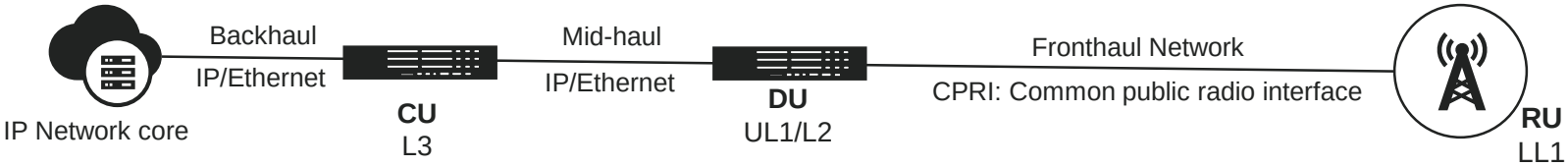
Radio Signal → IP Network pipeline



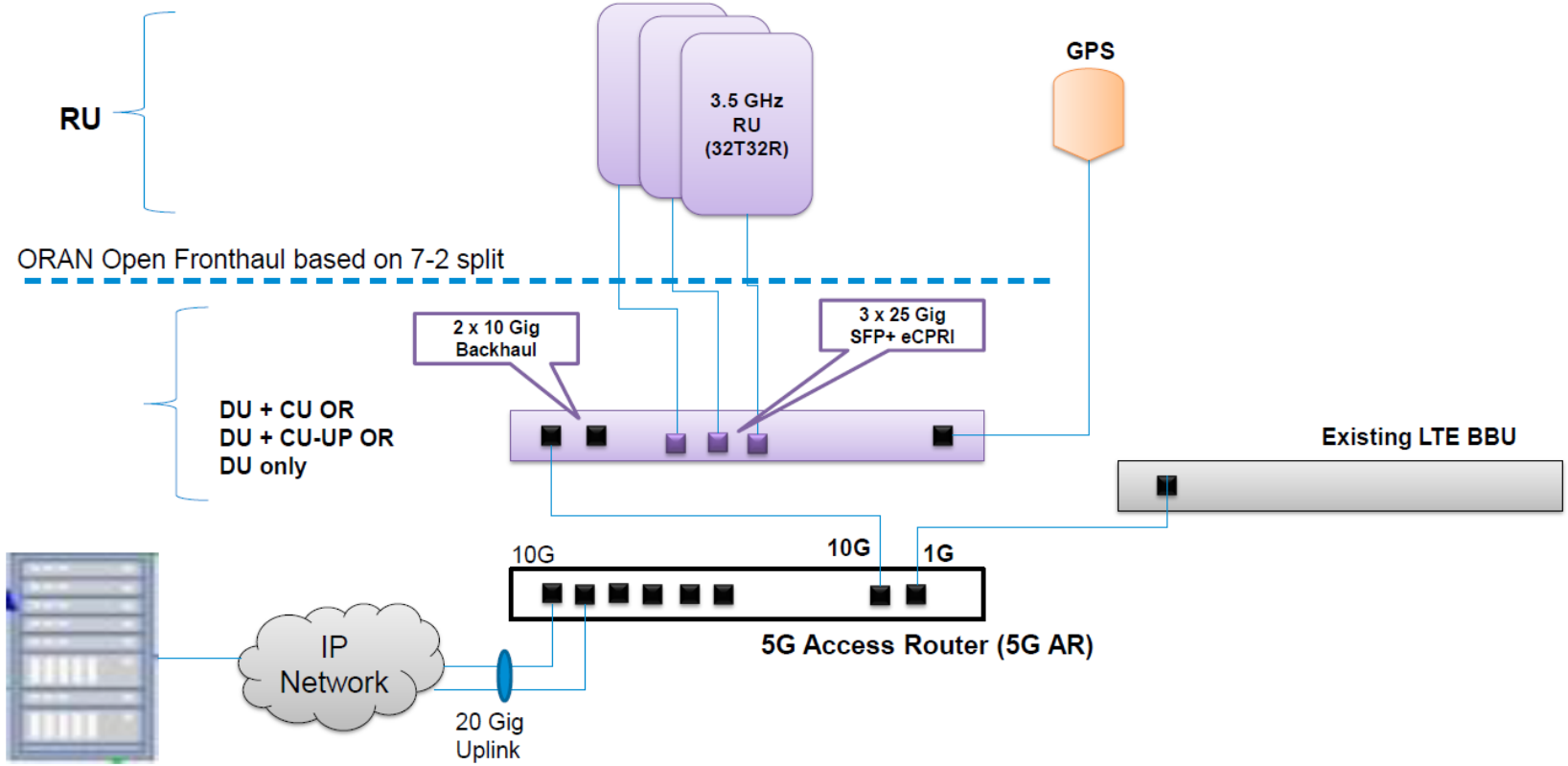
5G Base Station

Radio Signal → IP Network pipeline





Example 5G Network: Reliance Jio



Building 5G network Elements

Equipment	Components	BOM Cost
Centralized Unit (CU) 	X86 Servers Ethernet NIC cards Ethernet Switches	$2000-$5000
Baseband Digital Unit (DU) 	Network Processors Baseband processors Digital Signal Processors Custom SOC silicon FPGA	$5000-$10000
Radio Unit 	FPGA’s AD/DA converters Power Electronics Antenna’s	$5000-$10000

Pakistan Wireless Network Coverage map 2019