

O-RAN Class Week 1

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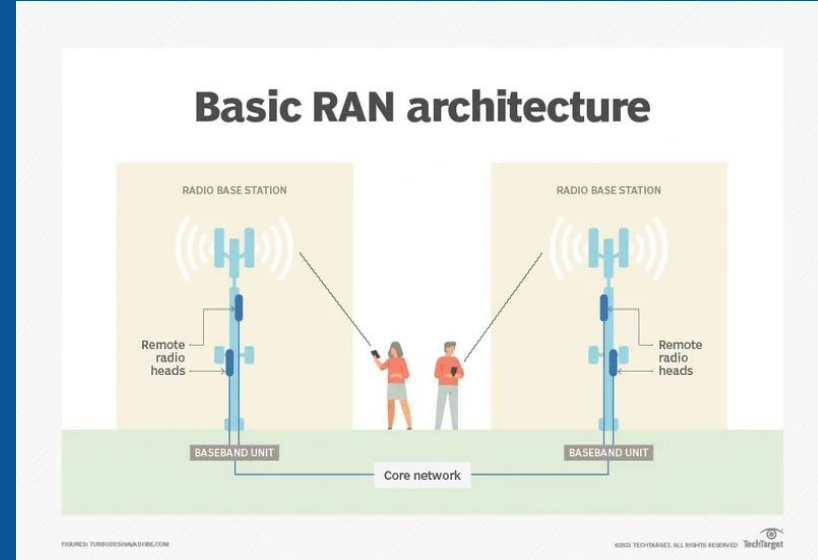
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Wrap-up and Questions

Fundamentals of Radio Access Networks (RAN)

Functions of the RAN:

- **Radio Resource Management:** Allocating and managing radio resources (frequency, power, time slots) to ensure efficient and reliable communication.
- **Handover Management:** Ensuring a seamless handover of calls or data between different base stations as the user moves.
- **Interference Management:** Reducing interference between different cells and users.
- **Network Optimization:** Adjusting network parameters to optimize performance and capacity.



Evolution of RAN

2G

- Primarily voice and basic text messaging.
- Used GSM (Global System for Mobile communications).

3G

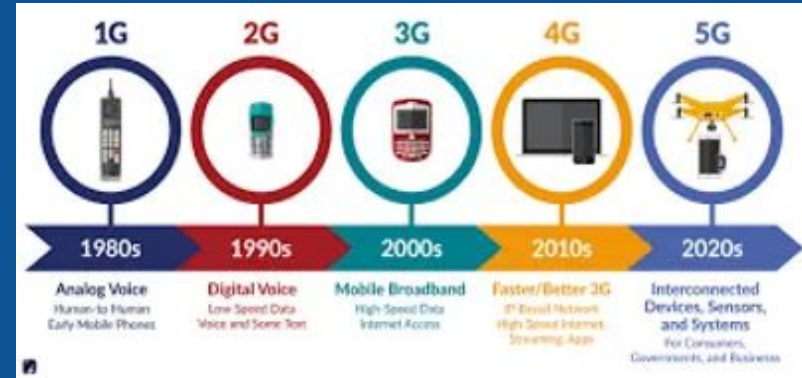
- Added data services like internet browsing and email.
- Introduced packet switching for data

4G

- High-speed data, multimedia, and mobile internet.
- Uses LTE (**Long-Term Evolution**) technology.

5G

- Ultra-reliable, low-latency communication, and support for a wider range of services, including IoT and AI.
- Enables: Self-driving cars, remote surgery, AR/VR, smart cities.



Limitations of traditional RAN

1. Vendor Lock-in

- Proprietary hardware/software bundles.
- Limited interoperability between different vendors.
- Difficult and costly to switch vendors or integrate multi-vendor environments.

2. Inflexibility

- Hardware and software are tightly integrated.
- Difficult to upgrade or scale specific components independently.
- Cannot easily introduce new services or technologies.

3. High Costs

- Expensive proprietary hardware.
- High capital (CAPEX) and operational (OPEX) expenditures.
- Long procurement and deployment cycles.

The Emergence of Open RAN

Goals of Open RAN

- Open, Standardized Interfaces
- Disaggregation of RAN Functions
- Vendor Diversity and Ecosystem Growth
- Network Agility and Flexibility
- Support for Software Defined Networks & Network Function Virtualization

Potential Benefits of Open RAN

- Reduced Costs
- Increased Innovation
- Faster Time-to-Market
- Improved Automation
- Greater Scalability and Flexibility
- Resilience and Future-Proofing

Key industry players and organizations

- O-RAN Alliance (Open Radio Access Network Alliance)
- TIP (Telecom Infra Project)
- Mobile Network Operators (MNOs)-(Vodafone, Telefonica, etc)
- Technology Vendors and Startups(Parallel Wireless, Mavenir, etc)
- Cloud and Infrastructure Providers(Intel, Red Hat, etc)
- Hyperscalers(AWS, Google Cloud, etc)

O-RAN ALLIANCE Foundation in 2018

O-RAN ALLIANCE has been established as a German entity in August 2018

Merging C-RAN Alliance and X-RAN Foundation



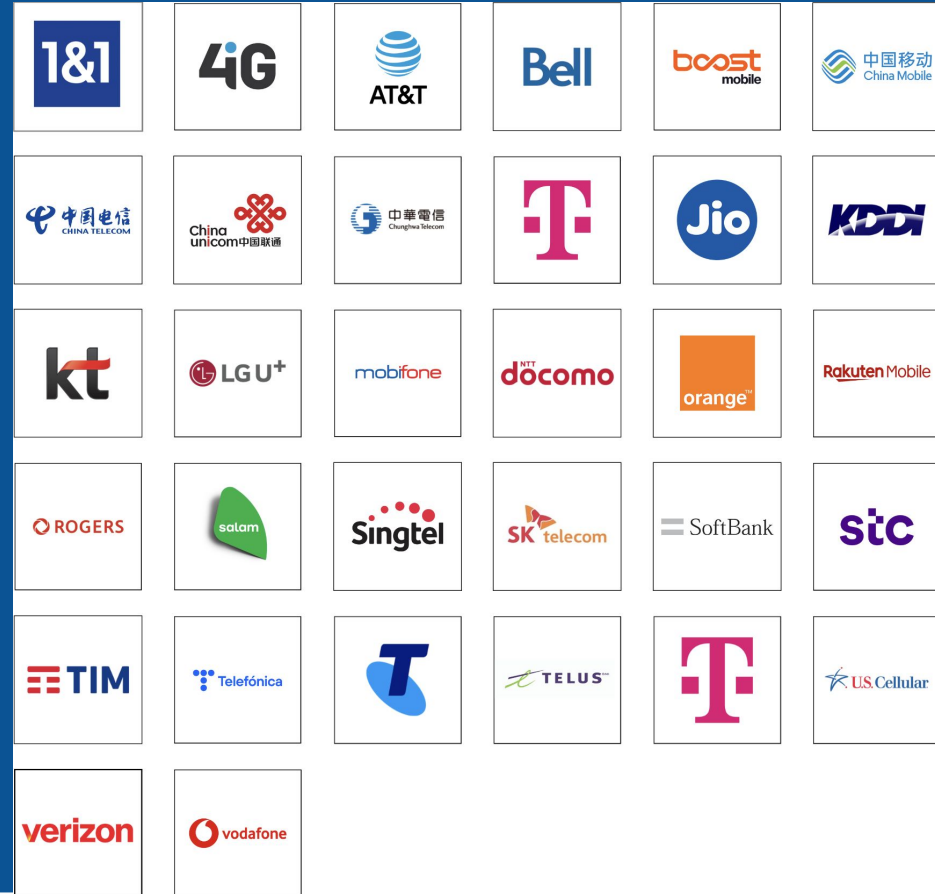
5 founding Members



O-RAN Members

Comprised of mobile operators, vendors, research, academic, and government institutions.

- Define open interfaces and architectures.
- Enable intelligent, virtualized RAN components.
- Promote vendor interoperability and multi-vendor deployments.



O-RAN Contributions

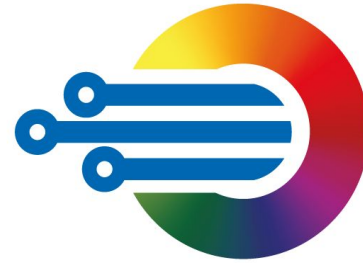
- Open Fronthaul Interface
 - RIC (RAN Intelligent Controller) for AI/ML network automation
 - Open source software through collaboration with Linux Foundation (O-RAN Software Community)
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O-RAN Software Community

COSMOS(WINLAB)

- WINLAB hosts the COSMOS OTIC for the O-RAN Alliance
 - Open Testing and Integration Center
 - OTICs issue certificates or badges in the O-RAN Certification and Badging program
 - Ensures products and systems adhere to O-RAN specifications
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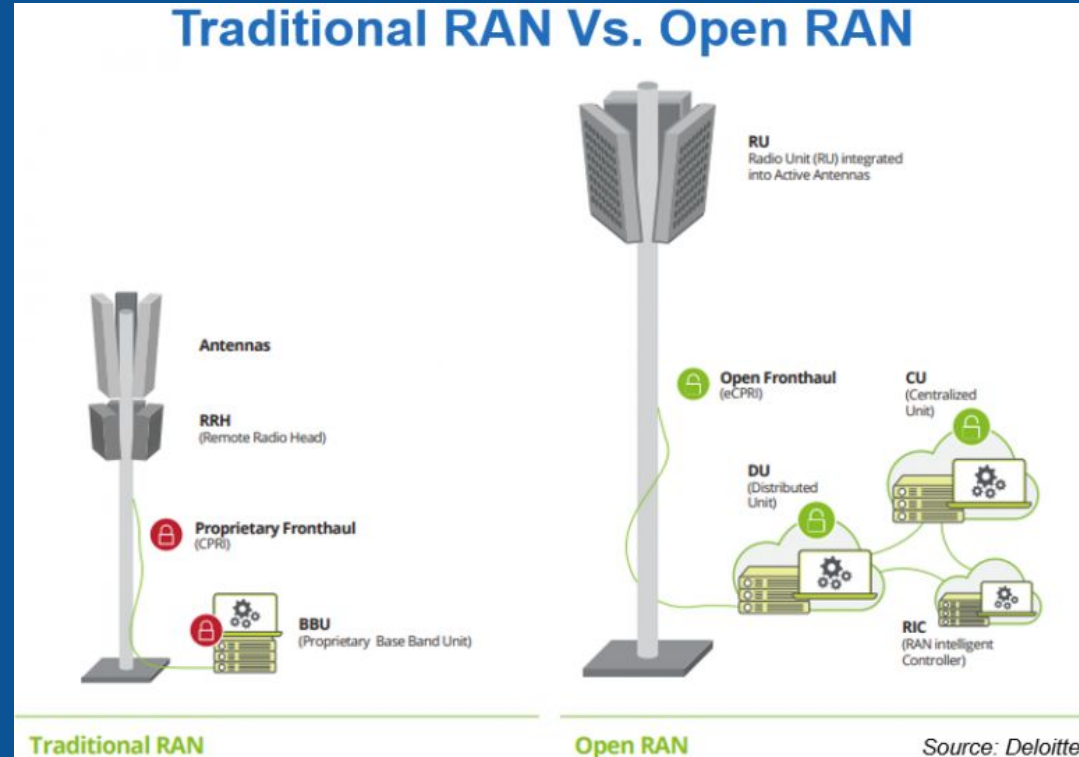


**OPEN
TESTING AND
INTEGRATION
CENTRE**

O-RAN Architecture

Coming in Week 2...

- Disaggregated architecture: O-RU, O-CU, O-DU.
- Functional split concepts: (e.g., Fronthaul).
- Control Plane (C-Plane) and User Plane (U-Plane) separation in Open RAN.
- Logical interfaces within the Open RAN architecture.



Thank you!

Questions?
