National Telecommunications and Information Administration

Office of International Affairs

Open RAN: Setting the Scene

USTTI 5G, Open RAN and
Emerging Technologies Training
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What is NTIA?

NTIA is part of the U.S. Department of Commerce and serves as the President's principal advisor on telecoms and information policy issues.

▶ Specific NTIA activities include:
- Driving global engagement and partnership on 5G supplier diversity, including Open RAN;
- Managing Federal use of spectrum and identifying additional spectrum for commercial use;
- Administering over $48 billion in grant programs that further Americans' access to broadband;
- Addressing 5G supply chain and competition issues through the administration of the $1.5B Public Wireless Supply Chain Innovation Fund
- Leading Internet policy, including online privacy, copyright protection, cybersecurity, and the global free flow of information online; and
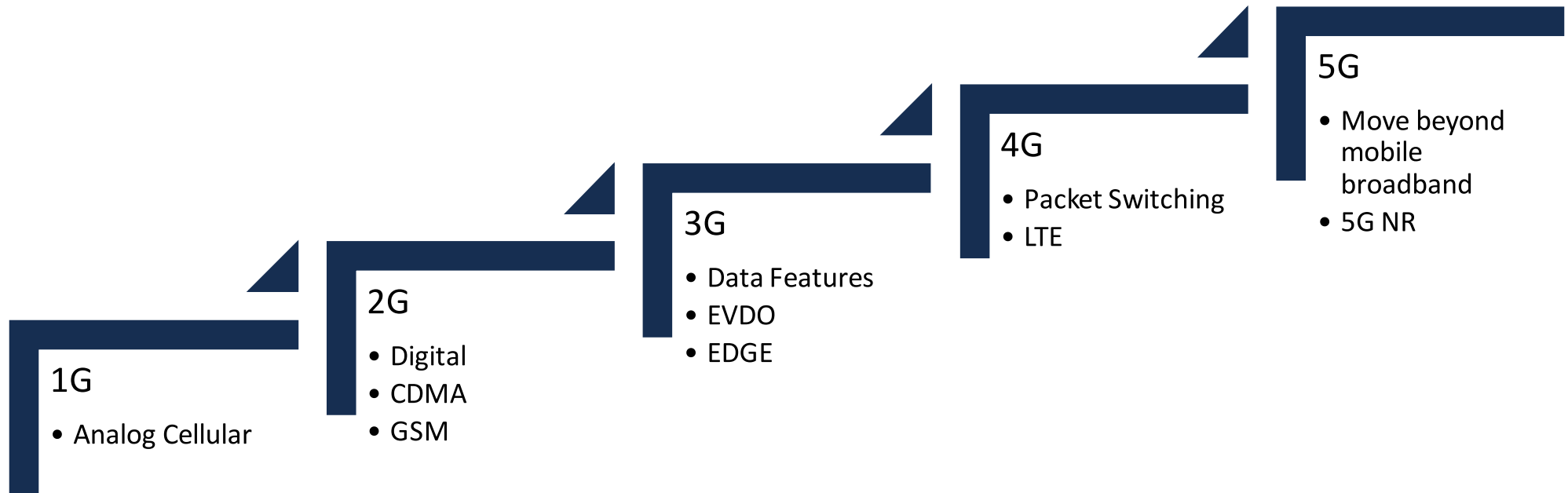- Performing cutting-edge research and engineering.

Evolution to 5G

1G
- Analog Cellular

2G
- Digital
- CDMA
- GSM

3G
- Data Features
- EVDO
- EDGE

4G
- Packet Switching
- LTE

5G
- Move beyond mobile broadband
- 5G NR

5G Today

▶ 5G development focused more on revolution than evolution
- Enhanced Mobile Broadband (eMBB)
- Ultra-reliable low-latency communication (URLLC)
- Massive Machine-Type Communication (mMTC)

▶ In reality:
- eMBB is the primary use case
- URLLC and mMTC are not yet as widespread

▶ 5G Varieties
- Non-standalone 5G
- Standalone 5G
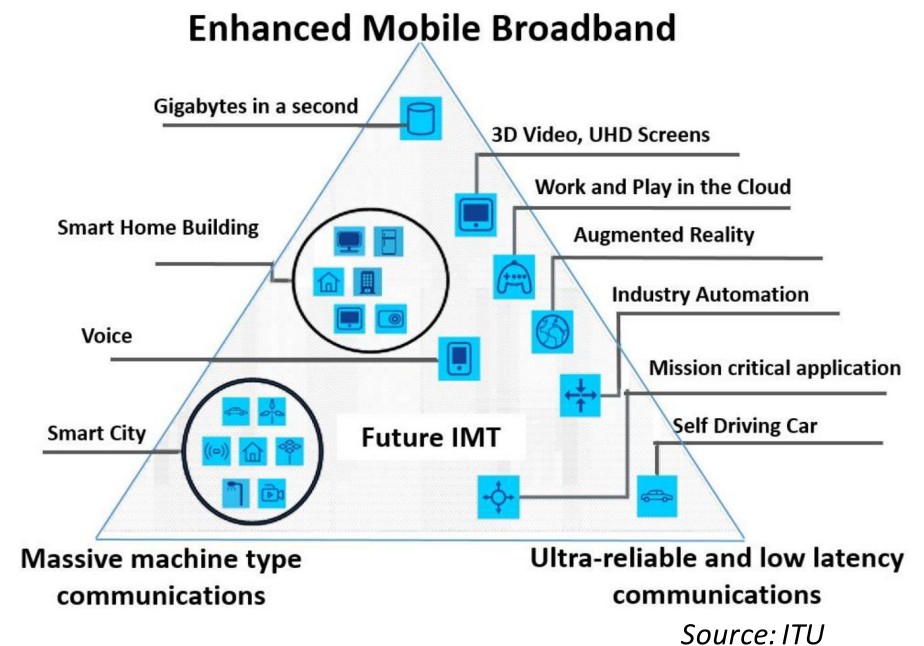
Enhanced Mobile Broadband

Gigabytes in a second
3D Video, UHD Screens
Work and Play in the Cloud
Augmented Reality
Smart Home Building
Industry Automation
Voice
Mission critical application
Smart City
Self Driving Car
Future IMT
Massive machine type communications
Ultra-reliable and low latency communications

Source: ITU

5G Non-standalone (NSA)

▶ 3GPP Release 14

▶ New 5G Radio Access Network (RAN) features

▶ Leverages existing 4G core network

▶ Stop-gap effort:
- 5G core network features were not yet ready
- Allows MNOs to leverage 5G features while waiting for 5G device availability and adoption

5G Standalone

▶ 3GPP Release 15+

▶ "True 5G"

▶ Uses new 5G Core Network (5GCN), separated from existing 4G network

▶ New features:
- Service-Based Architecture – interoperability between interfaces
- Network Slicing – traffic Flow Management through APIs
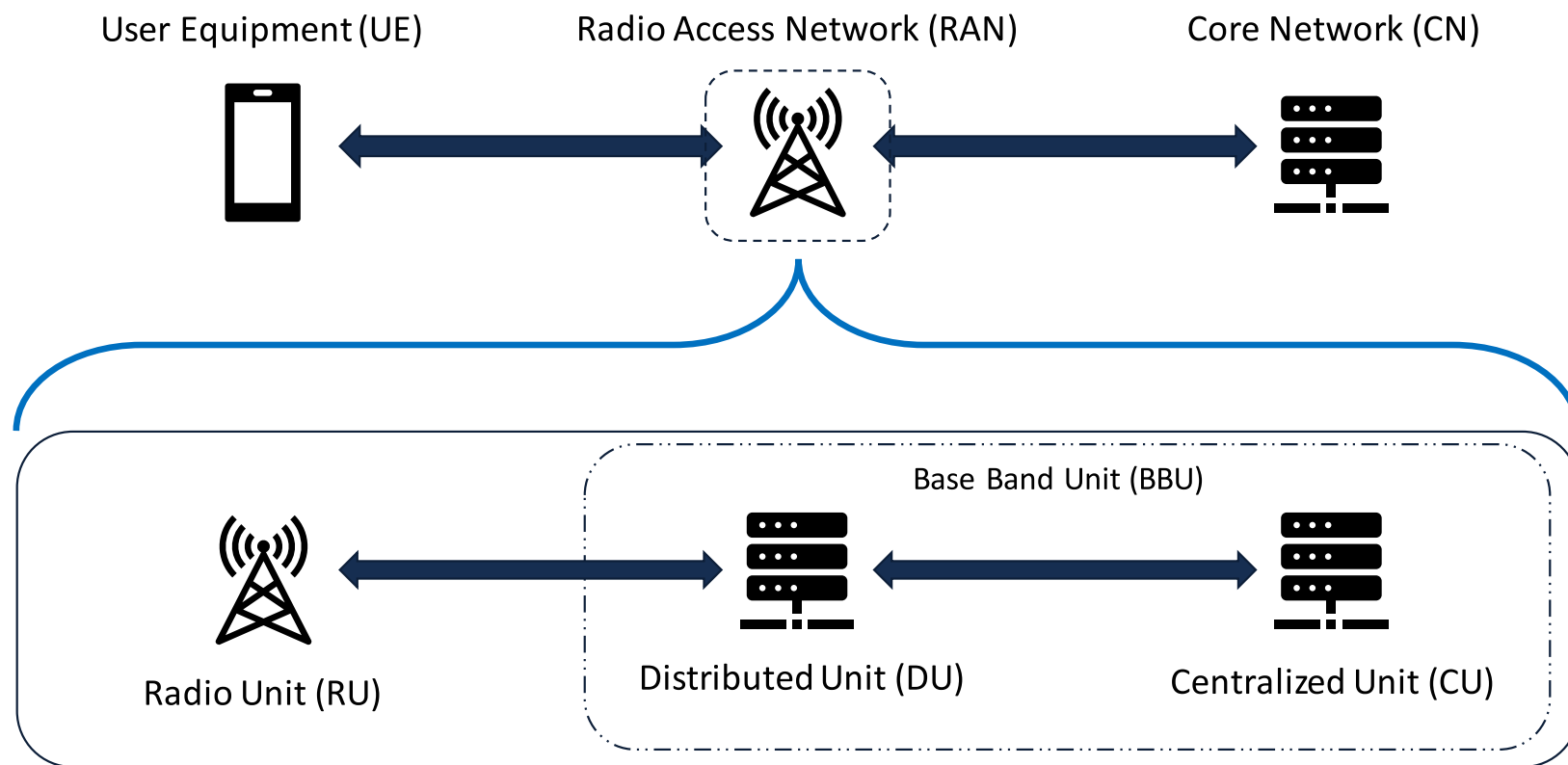- Multi-access Edge Compute (MEC) - cloud computing at the edge

Breakdown of the 5G Stack

User Equipment (UE)   Radio Access Network (RAN)   Core Network (CN)

Base Band Unit (BBU)

Radio Unit (RU)   Distributed Unit (DU)   Centralized Unit (CU)

Market Consolidation & Competition
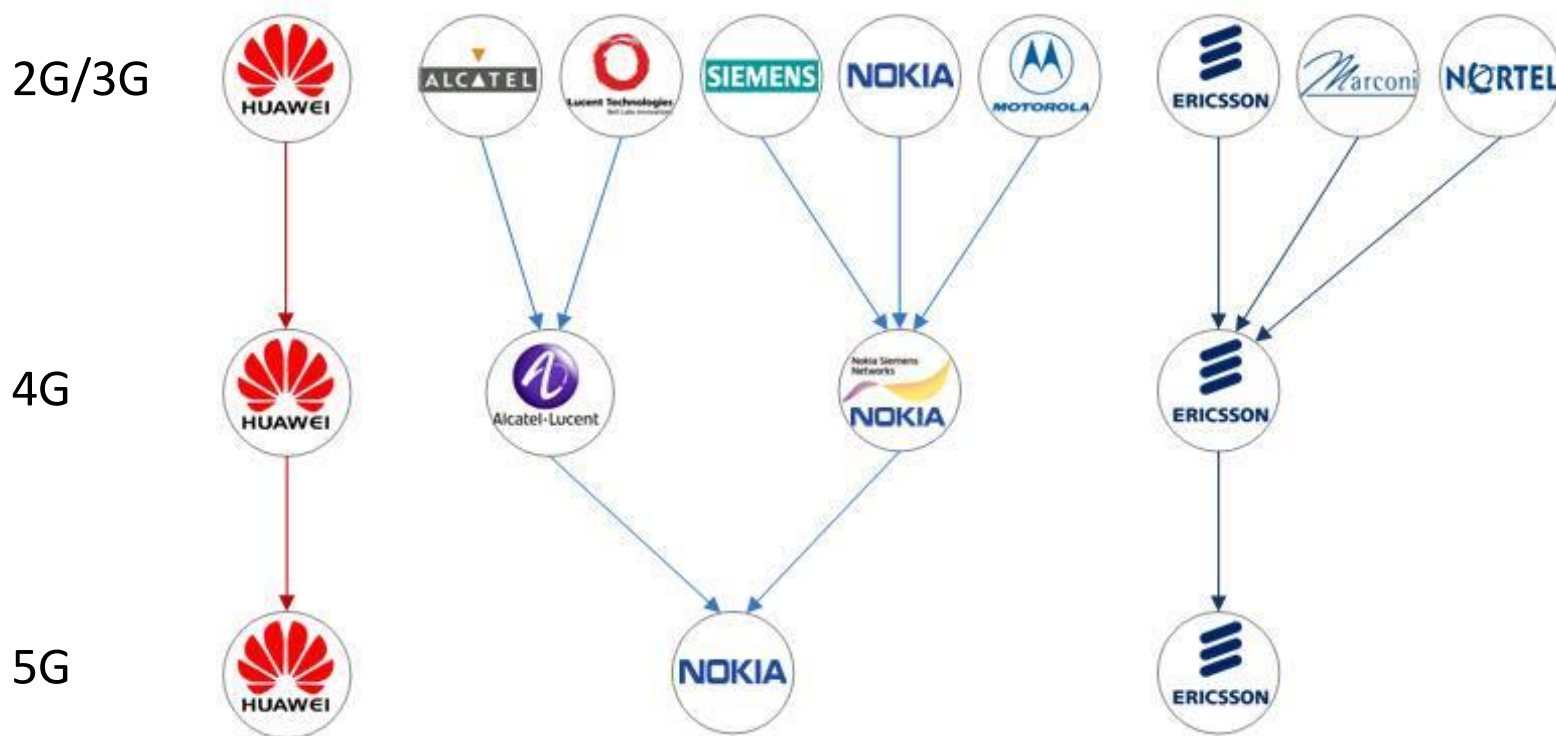
Source: NetManias

Market Barriers to Competition

▶ Business Practices
- Regional Exclusivity Agreements
- Intellectual Property Restrictions
- Price Dumping

Preventing Competition

▶ Technical Practices
- Closed, proprietary interfaces
- Proprietary "Enhancements" to standardized interfaces
- Proprietary interfaces used in lieu of "optional" standardized interfaces
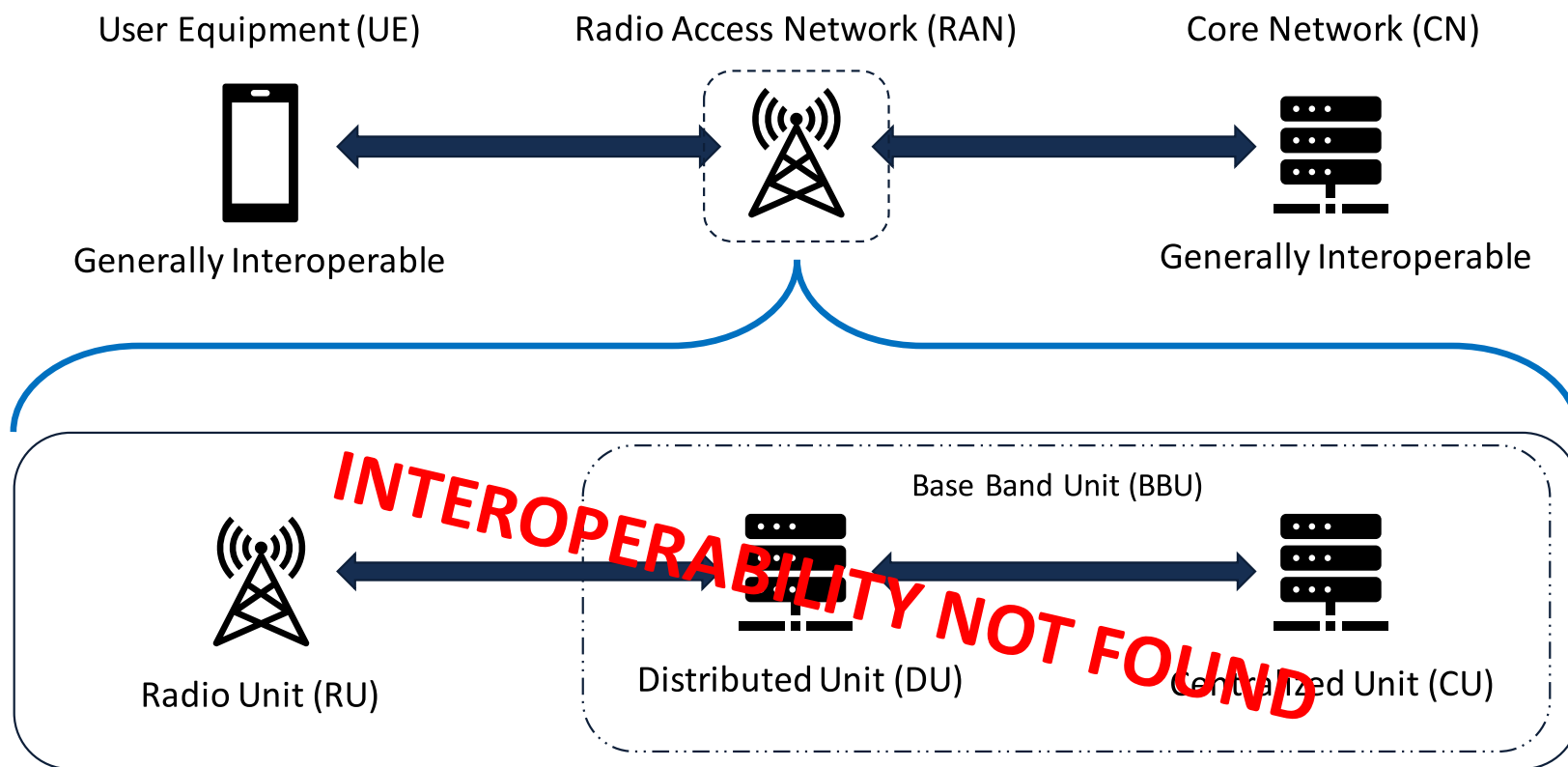
No Interoperability

The focus of today's training

5G Stack, Part Two

User Equipment (UE)   Radio Access Network (RAN)   Core Network (CN)

Generally Interoperable   Generally Interoperable

Radio Unit (RU)

Base Band Unit (BBU)

Distributed Unit (DU)   Centralized Unit (CU)

INTEROPERABILITY NOT FOUND

Example of Technical Interoperability Issues
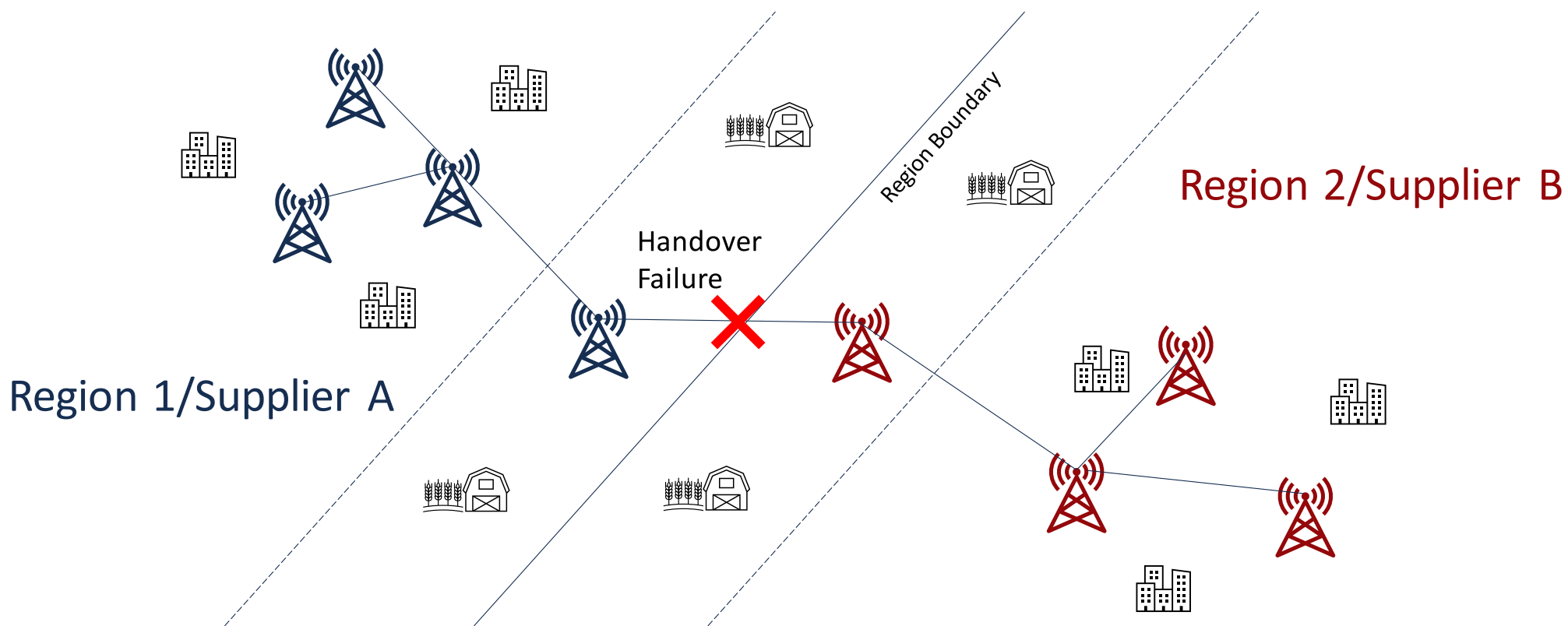
Region Boundary

Handover Failure

Region 1/Supplier A

Region 2/Supplier B

Solving the Competition Issue

▶ Better designed specifications to allow more "mix & match" of different suppliers

▶ Cultivating an innovation ecosystem

▶ Leverage advances in the IT world by moving toward virtualization and cloudification

Moving to an Open RAN