

The background of the slide is a night-time photograph of a city skyline, likely New York City, with the Empire State Building prominently visible. The lights of the buildings are reflected in the water in the foreground. The CableLabs logo is overlaid in white text.

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## FCC OPEN RAN SOLUTIONS SHOWCASE: OPEN RAN OVERVIEW

**CableLabs**

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# Outline

- CableLabs Overview
- Open RAN Overview & Benefits
- Key Deployment Considerations & Vendor Questions
- Convergence & Open RAN
- Closing

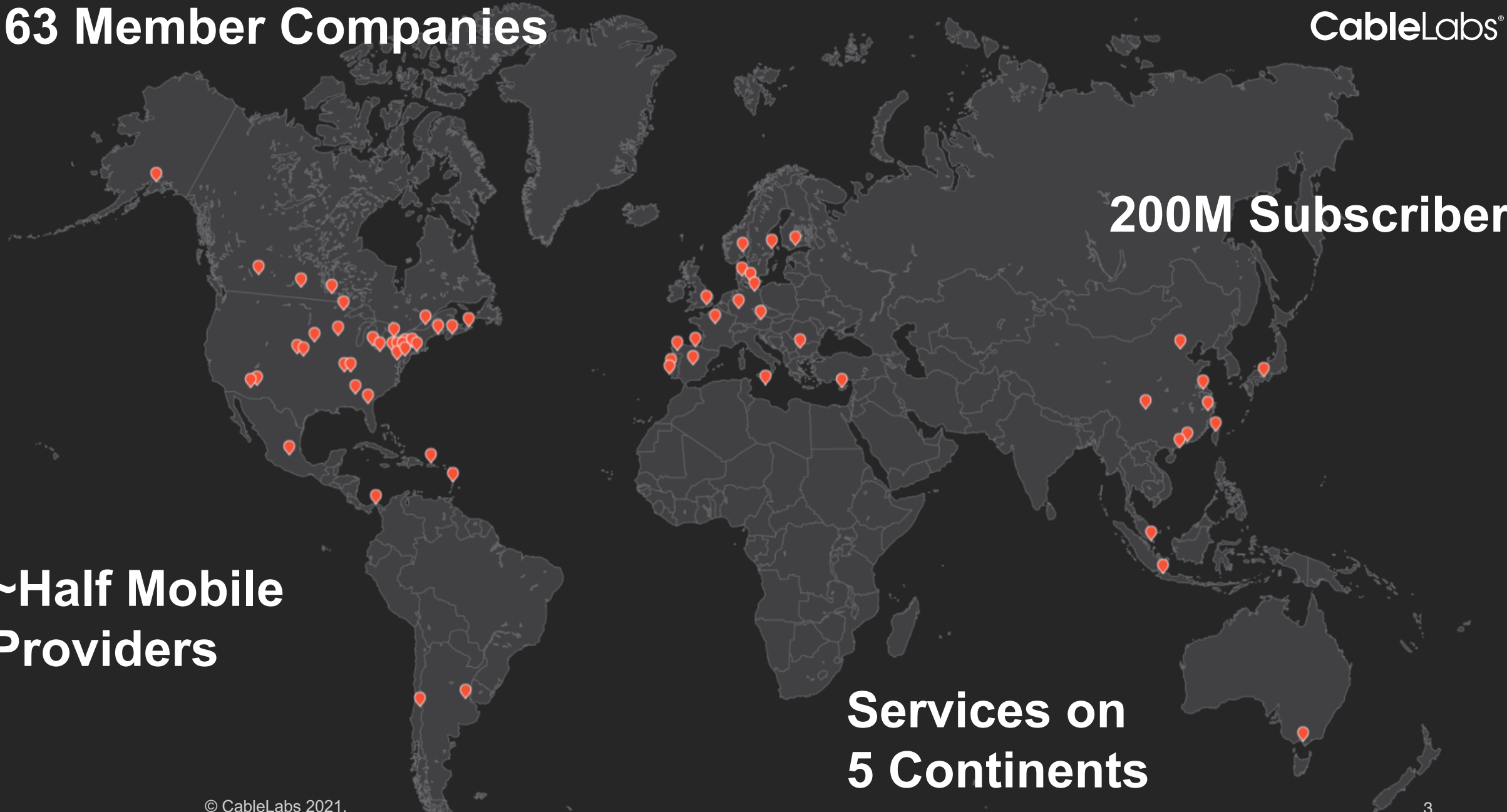
**63 Member Companies**

**CableLabs®**

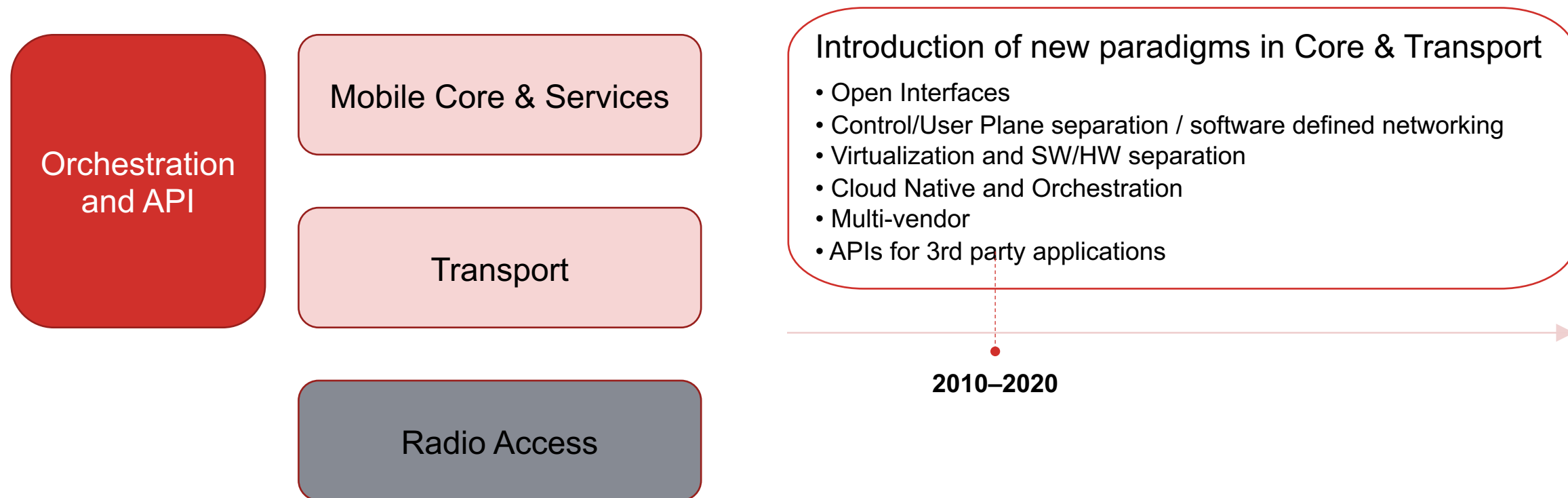
**200M Subscribers**

**~Half Mobile  
Providers**

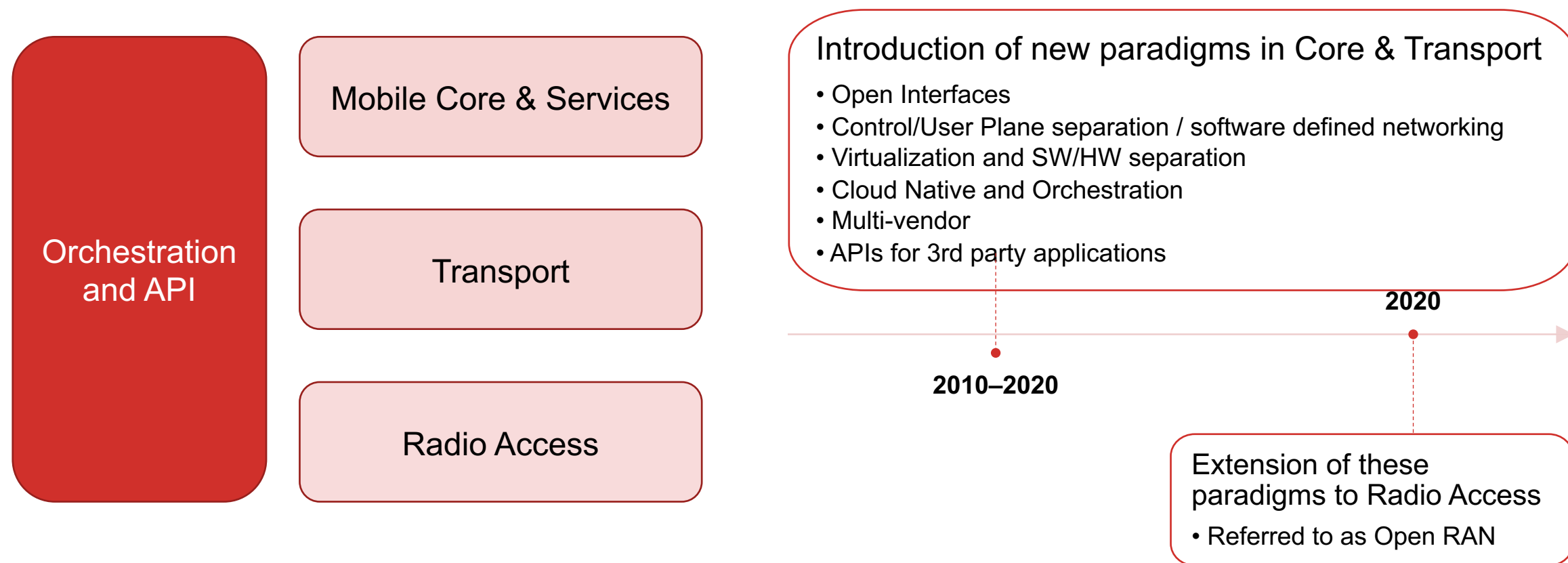
**Services on  
5 Continents**



# Three Key Components of a Mobile Network



# Evolution to an Open RAN Network



Open RAN – interoperability of radio access functions with standardized open interfaces, leveraging cloud platforms to enable separation of software and hardware with open APIs to facilitate introduction of new RAN features and innovations

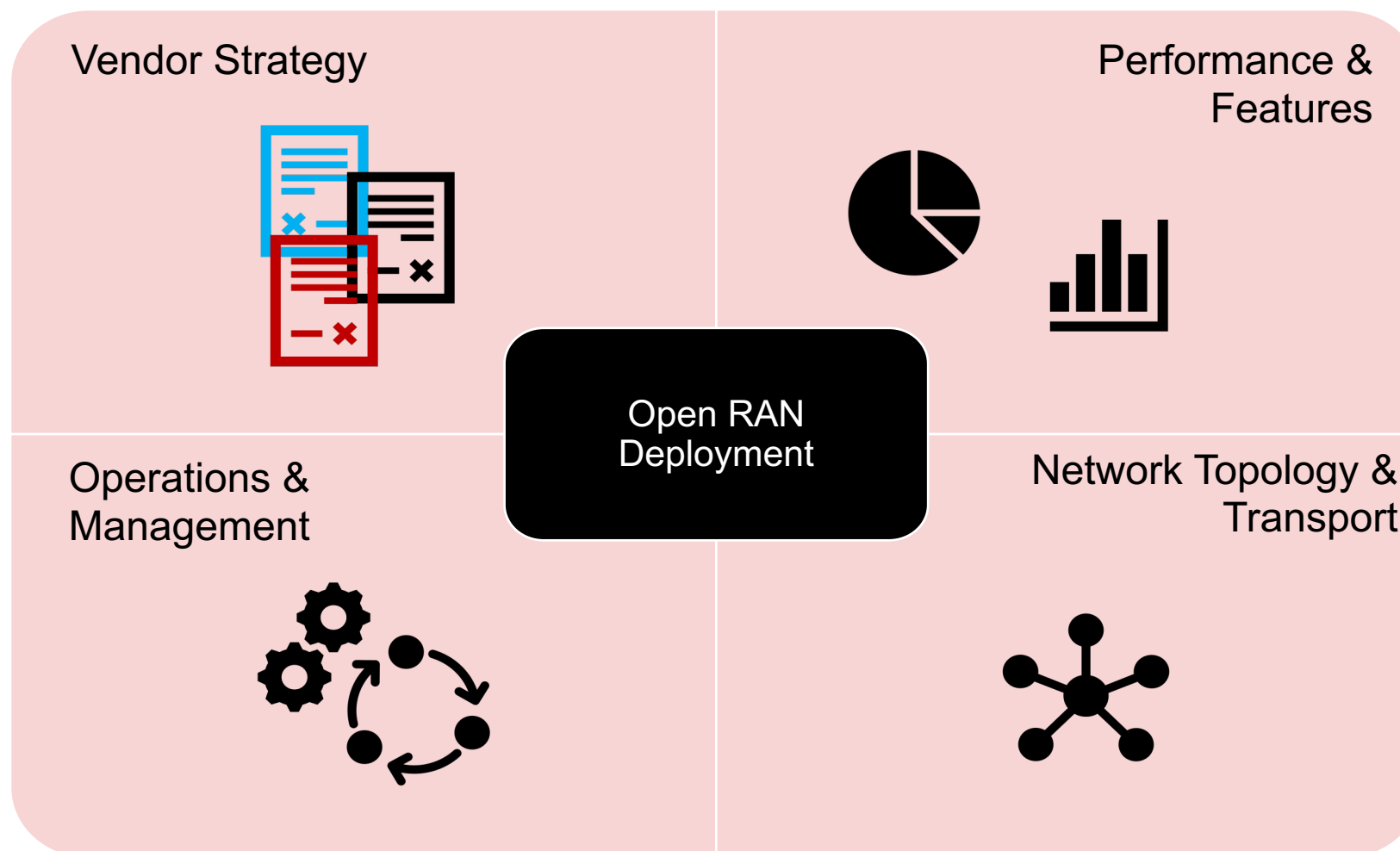
## Open RAN in Summary

- ❖ Open interfaces between RU and DU
- ❖ Decoupling of Hardware and Software
- ❖ Decoupling of control and user plane
- ❖ Open interfaces / APIs for integration of 3<sup>rd</sup> party AI/ML software

## Open RAN Benefits

- ❖ Versatility and deployment flexibility
- ❖ Orchestration and automation
- ❖ New programmable services and features
- ❖ Leveraging multiple access technologies
- ❖ New opportunities for security and supply chain management
- ❖ Increased modularity and visibility into network behavior and security management
- ❖ Vendor diversity and competition
- ❖ Potential cost reductions (competition, performance improvements, increased utilization of hardware)

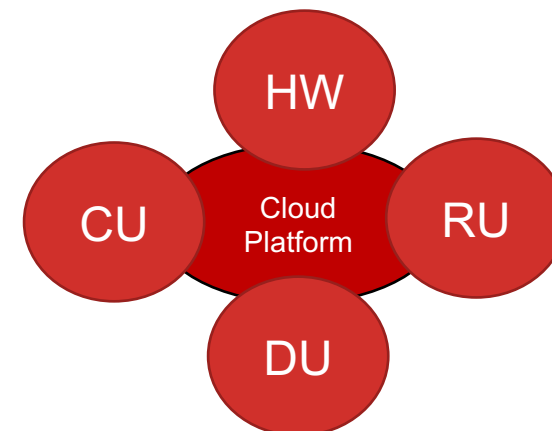
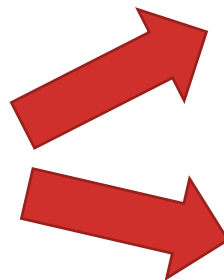
# Key Deployment Considerations



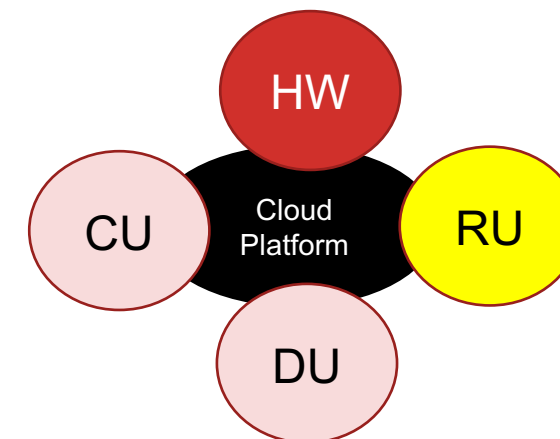
# Vendor Strategy

## Key considerations

- Total cost of ownership (TCO)
- Interoperability and System Integration
- Organizational skill sets
- Operations and Management
- Cloud Platform



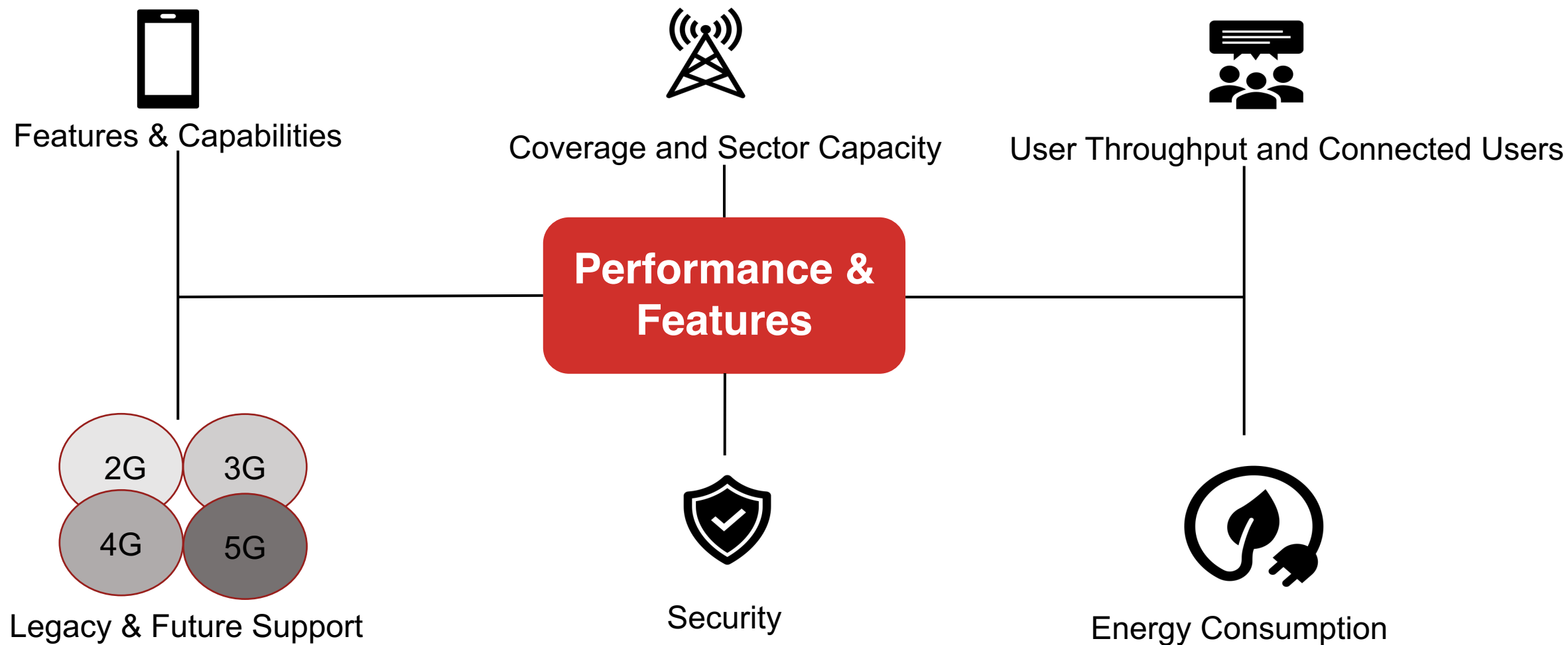
Single vendor solution but based on open interfaces



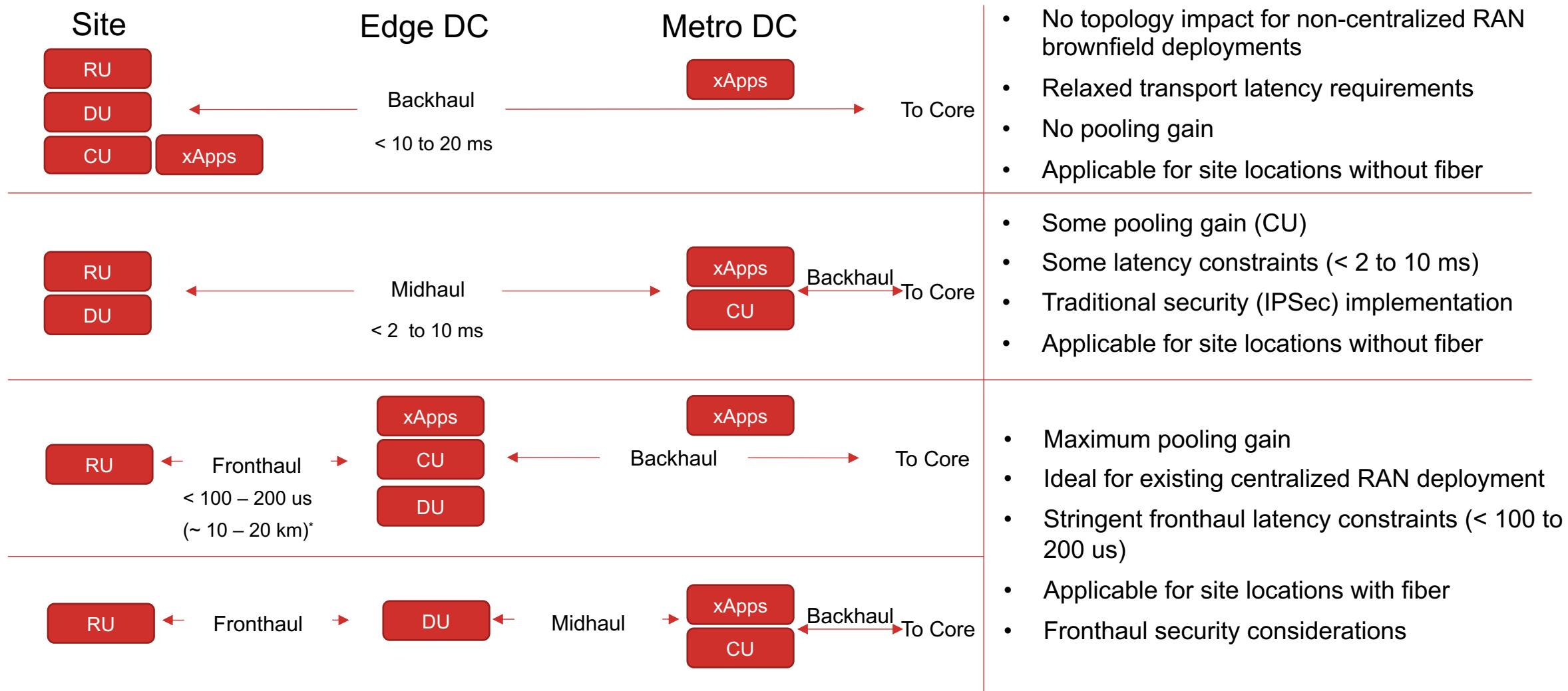
Multi-vendor solution using open interfaces 8



# Performance & Features

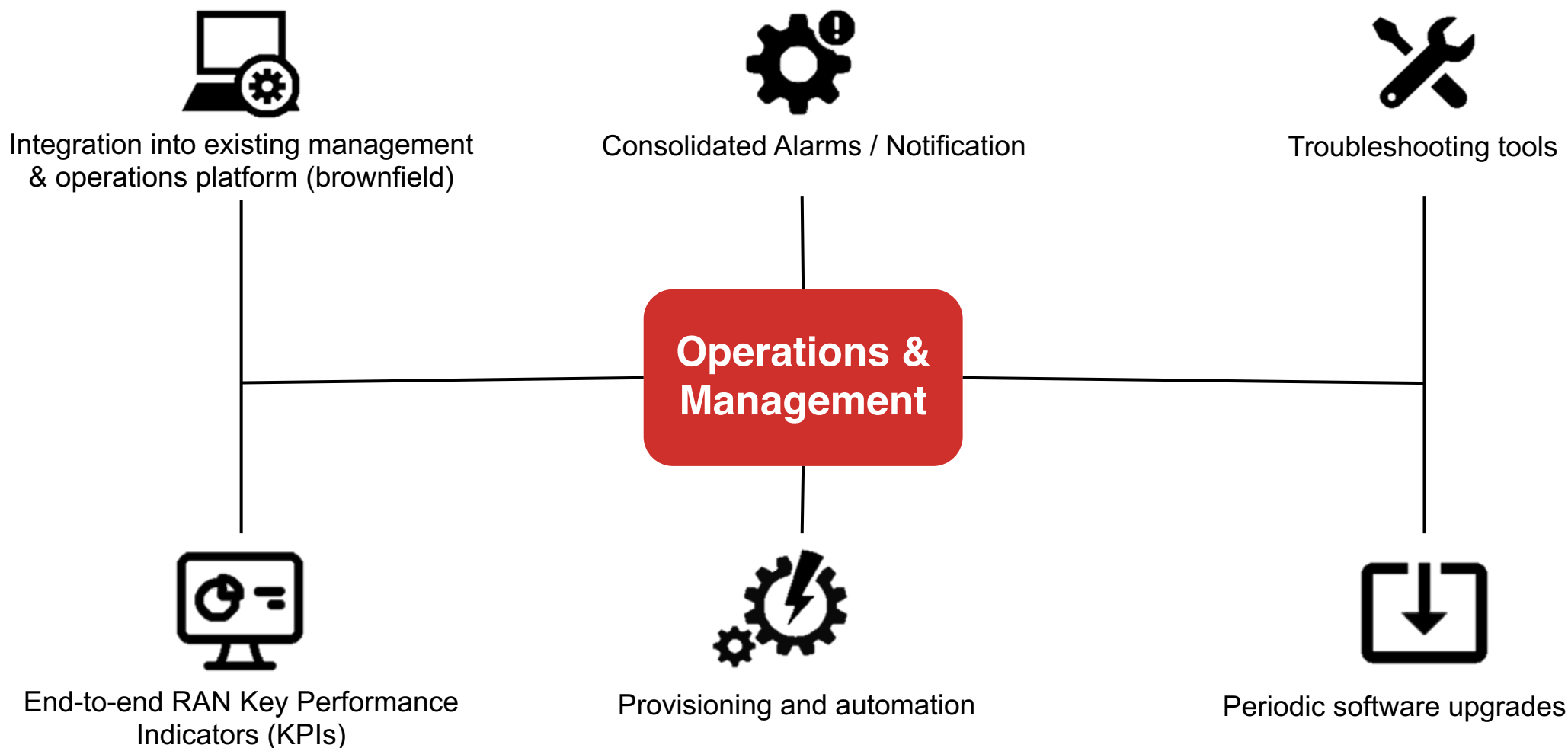


# Network Topology & Transport



- No topology impact for non-centralized RAN brownfield deployments
- Relaxed transport latency requirements
- No pooling gain
- Applicable for site locations without fiber
- Some pooling gain (CU)
- Some latency constraints (< 2 to 10 ms)
- Traditional security (IPSec) implementation
- Applicable for site locations without fiber
- Maximum pooling gain
- Ideal for existing centralized RAN deployment
- Stringent fronthaul latency constraints (< 100 to 200 us)
- Applicable for site locations with fiber
- Fronthaul security considerations

# Operations & Management



# Key Vendor Question Categories

## Product Specific

*Specific questions about products' specifications, latency requirements, performance and features will inform the operators about the impact on coverage and capacity, location of data centers, feature parity with the existing deployment and total cost of ownership*

## Interoperability/Integration

*Specific questions about their ability to interoperate with other vendors' equipment will inform operators about the maturity of each vendor's solution and validate feature parity with existing deployment.*





*Specific questions about system integration will inform operators on whether to perform system integration in-house or not and identify potential candidates for the system integrator role*

## Management/Operations

*Specific questions about management and operations will inform operators on capabilities needed for automating provisioning / configuration, consolidating alarms, developing system level KPIs, planning as well as single pane of glass capabilities for system level visibility / configurability / troubleshooting*

# Key Product Questions

*\*This is not meant to be an exhaustive list of questions*

- Frequency bands supported?
  - Size/weight of RUs?
- 
- Number of radios required and evaluating impact to tower lease / structure
- 
- Minimum specifications for DU/CU hardware?
- 
- Evaluating impact to cost (CapEx and OpEx) and hardware reuse across the network (Core & RAN)
- 
- Number of antenna ports supported?
  - Reference sensitivity related (dependent on both RU Noise Figure and signal processing in DU)?
- 
- Evaluating impact to RF coverage and whether existing site grid will be sufficient or not
- 
- Supported Transmit power?
  - Scheduler Implementation?
  - Supported Carrier Aggregation / Load balancing algorithms?
  - MIMO capabilities?
- 
- Evaluating impact to user throughput and cell capacity performance

# Key Product Questions – Contd.

*\*This is not meant to be an exhaustive list of questions*

- Comply with security requirements specified by the standard organizations (e.g., O-RAN Alliance)?
- Integrate the best security development lifecycle practices into your product and services development process?



- Evaluating Security

- Support for 2G/3G/4G/5G?
- Supported RAN features?



- Evaluating RAN feature and service (e.g. CSFB, WEA, etc.) parity\* and future support

*\*Applicability for brownfield deployment*

- Minimal latency requirements (fronthaul, midhaul)?



- Evaluating impact to supported network topologies by determining the maximum distance between the cell site and the existing CO/data center locations



- Proprietary extensions for RU/DU interface and DU/CU APIs for xApps, supported cloud platforms?



- Evaluating dependencies and impact to introduction of new vendors in the future



# Key Interoperability/Integration Questions

*\*This is not meant to be an exhaustive list of questions*

- Interoperability
    - Does RAN equipment interoperate with products from other vendors?
    - What is the interoperability testing process and cadence?
    - What core equipment do the RAN products interoperate with?
  - System Integration
    - If an operator decides to outsource the system integration, is the DU/CU vendor willing to be the lead system integrator and integrate 3<sup>rd</sup> party RUs and into the existing core and operations infrastructure?
    - Which 3<sup>rd</sup> party system integrators and certification entities/labs does the vendor work with?
    - Process for aligning feature roadmap and introduction into the production network?
- 
- 
- Comprehensive interoperability test report and testing cadence responses from vendors will inform the operator of
    - Maturity of their Open RAN solution
    - Feasibility and success of a multi-vendor Open RAN deployment
    - Validation of feature parity with existing deployment
  - Evaluating potential system integrator partners if the operator lacks the organizational / operational capability to perform system integration in-house
    - Larger operators are more likely to have in-house capabilities compared to the smaller ones

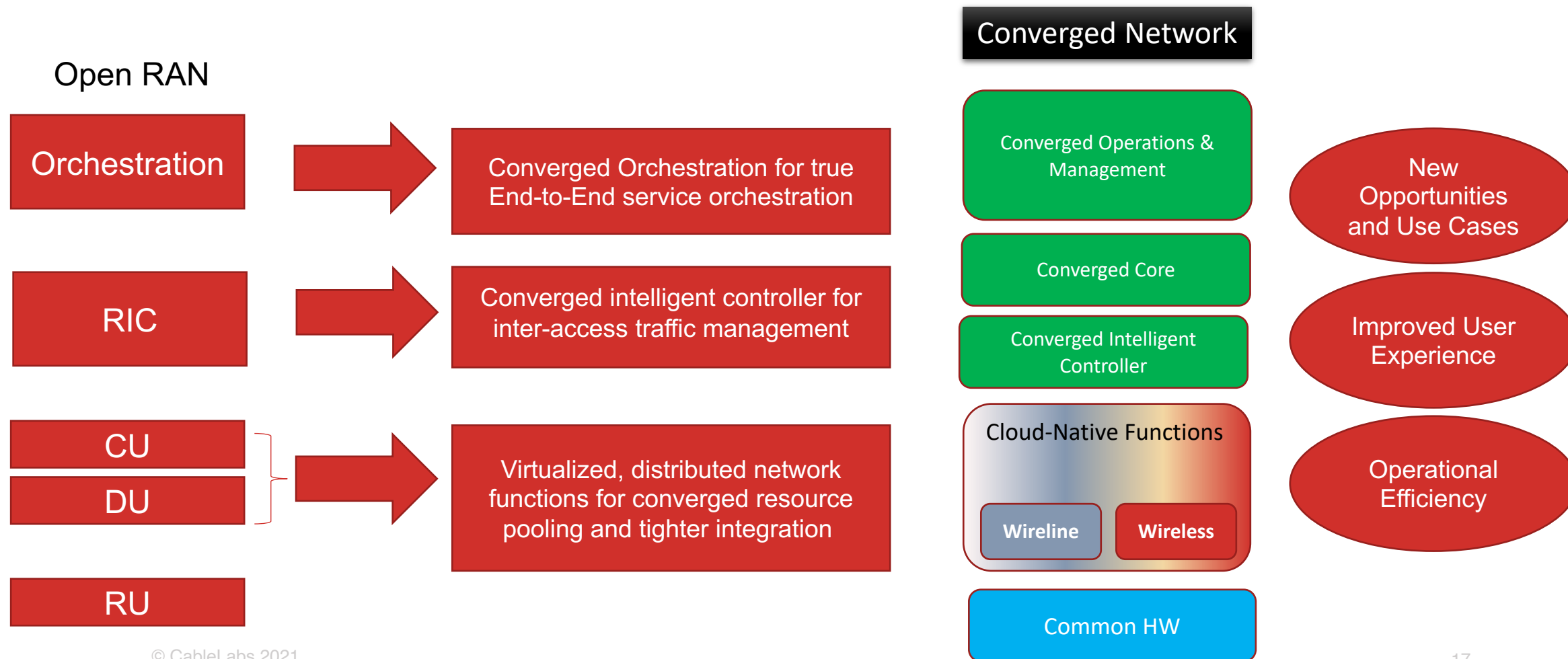
# Key Management/Operations Questions

*\*This is not meant to be an exhaustive list of questions*

- Management
    - How do you manage (provision, configure, update) the various components of Open RAN?
    - How is provisioning/configuration sequenced?
    - What new tools and capabilities are required to enable zero touch provisioning?
  - Operations
    - Which alarms/notifications are correlated across components of Open RAN (RU, DU, CU, HW)?
    - What KPIs are specified for individual system?
    - What metrics are used for capacity planning and hardware upgrades?
    - How do you recover from an outage and/or unplanned restarts?
    - How are configuration changes verified, e.g., signed software updates? Verified? Secure Boot?
- 
- Evaluating requirements that vendors have on operational support systems (OSS) for
    - Configuration of multi-vendor deployment
    - Deployment of individual Open RAN sub-systems
    - Integration of individual Element Management Systems (if available) of Open RAN sub-systems into existing operations systems
- 
- Evaluating updates required to the OSS for unified view of Open RAN subsystems (single pane of glass) for
    - Monitoring
    - Troubleshooting and resolving outages
    - Network planning



# Open RAN as Convergence Enabler



# Closing

- Open RAN – applying paradigm shifts within core and transport network to RAN
- Flexibility of Open RAN - Facilitates a variety of deployments models and vendor strategies
- Trust but Verify – Operators need to fully evaluate product capabilities and maturity, interoperability and operational impacts
- Open RAN is one of the enablers of convergence for fixed and mobile access across wired and wireless networks

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