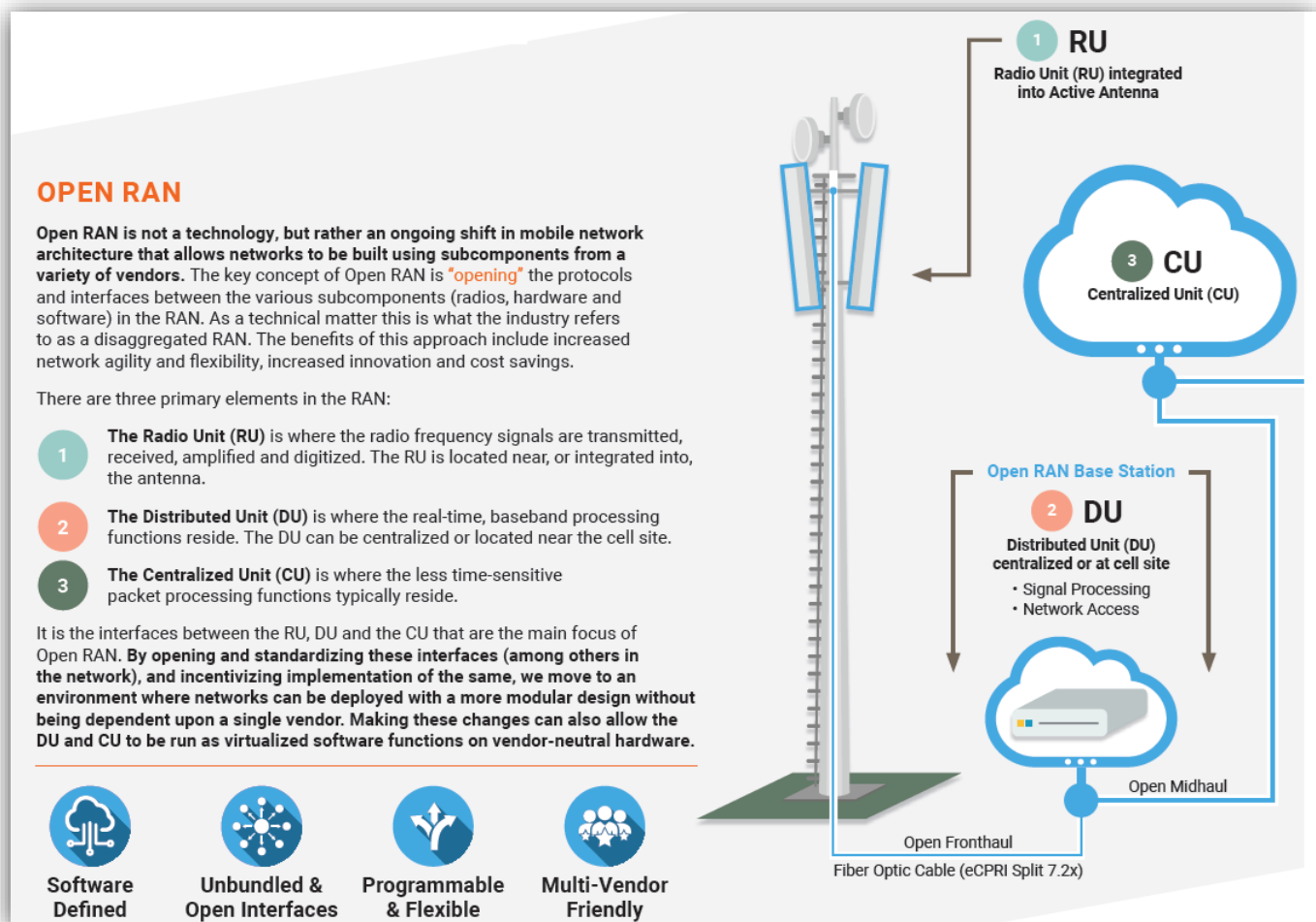


Open RAN

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Open RAN Wireless Communications Network's Use of Artificial Intelligence for Network Management and Service Delivery¹

Ongoing advances in software-based networks provide promising possibilities to further improve network management through Artificial Intelligence (AI) in **Open Radio Access Networks**, or Open RAN—mobile wireless networks that use open and interoperable protocols and interfaces to allow for increased specialization, diversity, and flexibility among network suppliers. This paper provides a high-level overview of these issues. First, the graphic below provides a snapshot explanation of Open RAN; next, we discuss AI and network management; and finally, we provide representative cases of AI in Open RAN.



¹ This briefing paper focuses exclusively on these two aspects of Open RAN and AI.

AI and Network Management

AI refers to engineered or machine-based systems that can analyze data to generate automated predictions, recommendations, decisions, or actions. For decades, communications networks have used “machine learning” and AI for improving network management and performance, and next generation wireless networks will further advance the use of AI as an integral part of network management and performance. As AI in network management continues to mature, it will improve many capabilities in managing coverage and capacity; energy efficiency; network performance and security; and lifecycle maintenance and upgrades. To amplify the benefits of AI, operators can leverage a software-based network or virtualized RAN approach that includes software or virtualized and disaggregated components of the baseband (which is traditionally hardware) on general commercial off the shelf servers.

As distinct from the conventional understanding of “Generative AI” that produces text or video/image content such as in ChatGPT and other well-known AI applications, AI can be integrated into advanced wireless networks to enhance network management, automation, and optimization, to efficiently manage network resources, improve traffic steering and quality of experience prediction, and detect and correct anomalies. Modern communications networks can leverage all forms of AI: while generative AI captures widespread attention, traditional AI’s strengths in pattern recognition, decision-making, and adaptability provide the foundation for reliable and efficient network operations. Looking ahead, advanced AI may be used for automating network-related decision processes and can leverage generative AI, external databases, and pattern recognition. AI will play a crucial role by enabling networks to autonomously manage, optimize, and adapt in real-time, driving greater automation and resilience in complex environments.

Representative Use Cases of AI in Open RAN

Coverage, Performance, and Capacity. AI algorithms may be used to analyze usage patterns and detect when certain frequency bands are becoming degraded and even make predictions on when this will occur in the future. By continuously monitoring traffic volumes and performance of Open RAN networks, AI applications optimize performance, availability, and power consumption. An effective AI system actively monitors radio performance, making real-time adjustments to minimize interference. Additionally, encapsulating Open RAN software and related functions into isolated units called “containers” can facilitate deployment, scalability, and network management. This enables a new level of automation that can deliver more efficient network management.

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In Open RAN applications, these AI functions leverage data from multiple sources throughout the open architecture, including base stations, radios, user devices, and environmental sensors, enabling more accurate prediction and analysis of network performance. This comprehensive data integration supports dynamic adjustment of resources, such as beamforming, resulting in improved signal quality and higher data rates.

Energy Efficiency and Resilience. AI-powered energy optimization reduces the energy demands for telecom networks, for instance through intelligent “sleep mode” activation based on traffic prediction, as well as dynamic adjustment of transmission power levels, optimized antenna configurations for energy efficiency, and coordinated resources allocation across multiple cells. Further, fault prediction and “self-healing” networks leverage AI to augment network resiliency. Systems analyze network telemetry data to detect anomalies and predict equipment failures, reducing network downtime through preemptive maintenance scheduling.

In Open RAN applications, these AI functions optimize energy consumption and resilience in cell sites. AI solutions can intelligently manage cell activation and deactivation, ensuring minimal energy usage without compromising customer experience or network performance. By leveraging advanced predictive algorithms, these solutions can assess the user experience while ensuring energy savings and decide which cells can be turned on and off without affecting service quality. Further, AI-based anomaly detection capabilities increase resilience by automatically detecting any degradation in performance at both cluster and cell levels. This ability helps reduce the resolution time of trouble tickets by detecting abnormal performance in the early stage.

Pre-Deployment Testing and Multi-Vendor Coordination. Real-time testing and optimization of networks can be improved with AI. This testing can help advance collaboration between operators. The networks produced out of these tests are optimized and accurate, have a reduced cost-to-build, and allow for better long-term planning. This pre-deployment testing also allows for innovation and creativity without the high cost of real-world testing. For instance, alongside a live network, a “network digital twin model” can simulate and evaluate changes impacting network performance, enabling incremental improvements to be safely deployed.

In Open RAN applications, these AI functions allow operators to simulate various scenarios and test the interoperability and performance of different vendors’ equipment in a virtual environment, ensuring compatibility and optimizing network configuration before actual deployment. This reduces the margin of error and accelerates the deployment process.