Intent-Driven Networks: Energy Efficiency & Performance

RAN programmability delivers high performing, energy efficient autonomous network operation.

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Energy costs, impending sustainability targets, and new service demands challenge classic RAN configuration and management methods. Thus, intelligent automation is imperative. Programmability can boost network and service operation, enabling higher performance and efficiency.

Intent-driven operation—a key element of programmable networks—focuses on high level business outcomes. Such operation enables networks to continuously adapt to meet specific energy efficiency, optimization, or performance goals. The following characterize intent-driven networks:

- **Open, horizontal platforms for energy innovation:** New environments and service management and orchestration (SMO) platforms allow broader partner development for non-real-time software creation (e.g., rApps).
- **RAN software:** Rising demand for differentiated connectivity requires higher service awareness. Distributed (RAN) control loops fulfill critical (real-time) requirements, with non-real-time operations centralizing automation to meet service and energy targets.
- **AI-driven RAN:** Powered by artificial intelligence (AI), the RAN can manage complex trade-offs such as energy consumption and network performance without compromising user experience. For example, a business intent to "secure 50mbps throughput with minimal power consumption" may action energy-saving functionality to activate or deactivate radio resources.

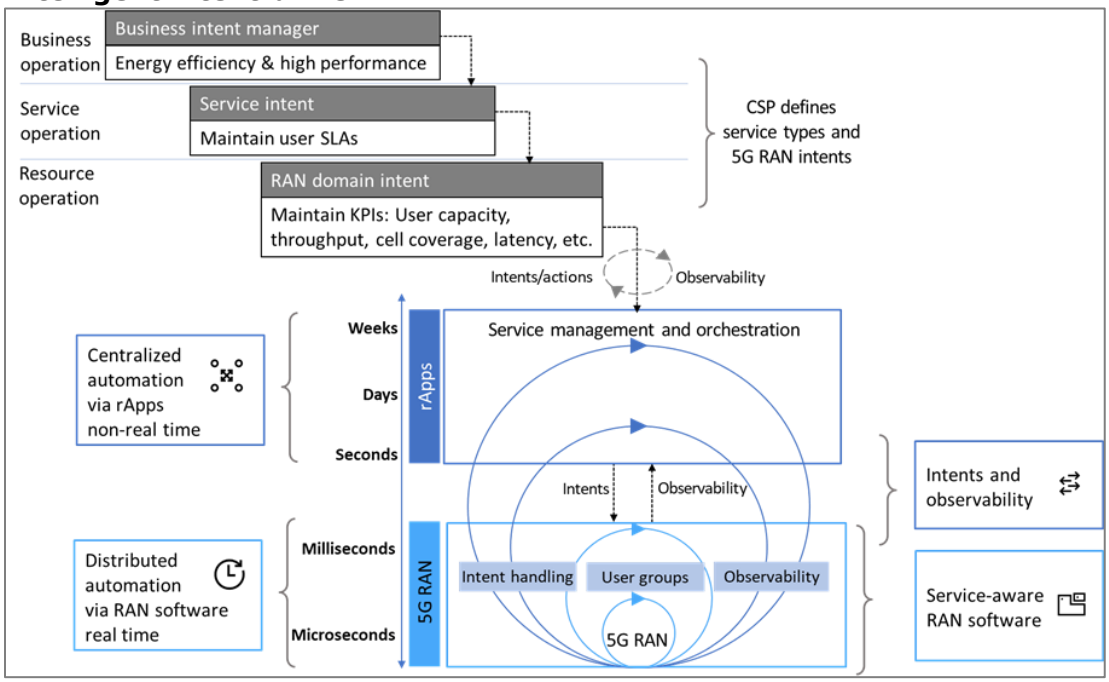
AI in the RAN drives efficiency through intent

Service-aware RAN—an intent-aware assurance loop—is conscious of service-level agreements (SLAs). Intent-driven networks can only optimize to the highest ability of the underlying hardware; operators must dimension their RAN accordingly. Upgrades to RAN compute and new silicon architectures can offer greater AI workload intensity. Higher service objectives may also demand higher performing radios that include elements such as

enhanced spectral efficiency, lower latency, and resource management to secure the service intent with optimal energy efficiency.

The following figure shows automated intent cascading through domains. Each layer communicates its intent, priorities, and actions. At the RAN layer, centralized or distributed automation implements intent actions and adjusts resources through automated software. Examples include cell shaping (reducing interference/increasing link speeds), traffic steering (maximizing radio resources for handover, link aggregation, etc.), energy efficiency (RAN sleep mode orchestration), etc. The system will continually monitor and report on compliance with targets, maintaining the desired KPIs using machine learning algorithms (trained with global network data and reinforcement learning) and automating adjustments if needed.

Intelligent intent-driven RAN



Source: Heavy Reading, Ericsson

High performing, open, programmable networks

Pushing the technology and hardware boundaries cultivates conscious energy use, sustainability, and user experience goals. Open architectures support innovation and the development of new power-saving features, business models, and SLA-based differentiated connectivity. Programmable, intent-driven RAN can allow operators to achieve both energy efficiency and performance.