



The Precision Frontier: Maximizing RAN ROI through AI-Driven Diagnostics

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By FusionLayer Group, July 2026.

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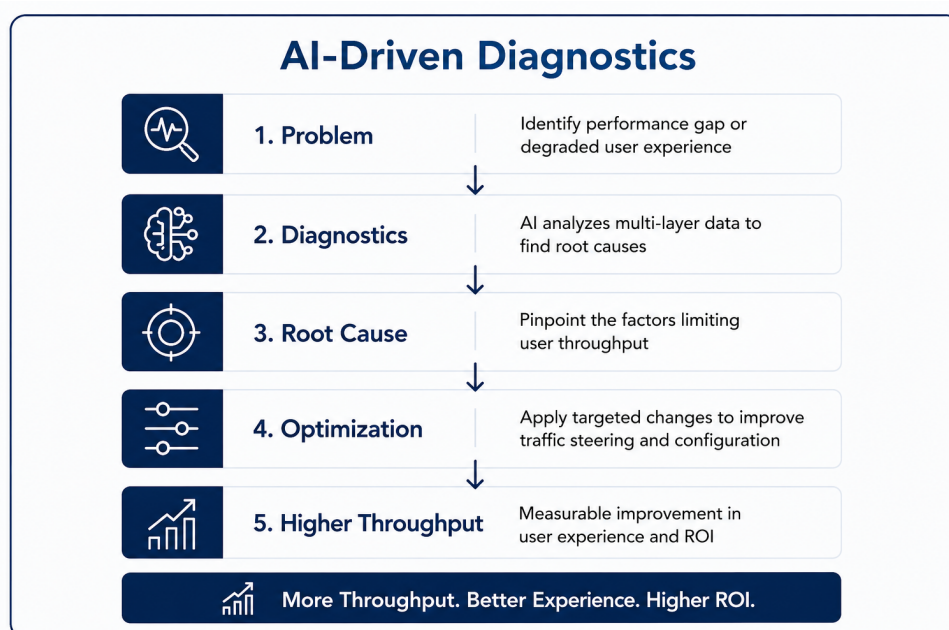


Executive Summary

For much of the past decade, the standard response to degraded mobile network performance has been to build more capacity. When user speeds dropped or connectivity deteriorated, the industry's default response was to add more spectrum or commission additional sites. In the era of 5G-Advanced and tighter capital constraints, however, this approach is no longer financially sustainable or strategically sound.

Modern Radio Access Networks have reached a level of multi-layer, multi-band complexity that traditional monitoring tools can no longer effectively manage in operational environments. As a result, operators often find themselves investing heavily in additional capacity while actual user throughput remains stagnant or even declines.

This paper examines the shift from reactive monitoring to precision diagnostics. By using artificial intelligence to decompose the user experience into its underlying technical drivers, operators can identify significant performance improvements without additional capital expenditure. We demonstrate that moving from broad network averages to site-specific root-cause analysis can unlock substantial gains in user throughput while maximizing the value of existing network investments.





The Performance Paradox: Why Investment Does Not Equal Experience

The primary challenge for modern mobile network operators is the growing disconnect between network investment and the perceived quality of the user experience. A recent European case study illustrates this issue: despite a significant expansion of 5G and LTE capacity, a Tier-1 operator saw a year-over-year decline in downlink user throughput. This suggests that the underlying challenge is not a lack of network capacity but the increasing complexity of operating modern Radio Access Networks efficiently.

In networks where multiple 4G and 5G layers coexist across several frequency bands, how traffic is steered between these layers directly affects the quality of service experienced by end users. Without granular diagnostics, seasonal traffic variations and normal operational volatility can obscure configuration issues that limit network performance, making them difficult to identify and resolve.

Decoding the DNA of User Throughput

To address this challenge, RAN planning must move beyond simple pass-or-fail metrics and adopt a diagnostic framework that decomposes user throughput into its underlying technical drivers. The process begins with an assessment of available network capacity and deployed technologies to determine whether physical assets, such as site density and 5G coverage, are suitable for the service area.

The analysis then shifts to the network configuration layer, which is often a hidden source of performance limitations. This stage evaluates spectral efficiency, MIMO utilization, and traffic distribution across frequency layers to determine whether available radio resources are being used effectively.

Finally, the framework accounts for customer behavior and migration patterns, providing a comprehensive view of how device capabilities, subscriber distribution, and traffic demand affect the airtime available to each user. By quantifying each factor's contribution, operators can replace trial-and-error optimization with targeted interventions grounded in measurable technical evidence.



The Hidden Value in Layer Balance

One of the most immediate opportunities to improve network performance lies in optimizing layer balance. Our analysis of international peer groups shows that even high-performing operators often underutilize specific frequency bands. A recent customer engagement illustrates this opportunity: diagnostics revealed that one operator was experiencing capacity constraints in its lower-frequency layers while newly deployed higher-frequency layers were operating at less than sixty percent of their potential utilization.

This was not a capacity problem requiring additional sites, but a traffic-steering challenge that required more effective optimization. By addressing this imbalance through a focused 30-day traffic-steering project, the operator achieved a double-digit percentage increase in user throughput without investing in new network equipment.

This case demonstrates that disciplined, data-driven diagnostics can unlock significant latent capacity in an existing network, often offering one of the most cost-effective ways to improve the user experience.

Integrating Diagnostics into the Operational Lifecycle

Precision diagnostics should be viewed not as a one-time audit but as an integral part of the network operational lifecycle. This approach complements existing customer experience management (CEM) and self-organizing network (SON) solutions by providing deeper technical insight into the factors shaping network performance.

During the planning phase, diagnostics help identify the underlying causes of coverage and capacity limitations before investment decisions are finalized. Once the network is operational, they enable realistic, site-specific performance targets to be established based on local traffic characteristics. Diagnostics also provide a valuable link to customer support by identifying the technical root causes behind customer complaints and service degradations.

By providing a comprehensive technical context for automated systems, precision diagnostics help ensure that self-optimizing networks focus on the issues that have the greatest impact on user experience, rather than on secondary or misleading performance indicators.



From Reactive to Proactive: The AI Edge

The ultimate objective of modern RAN diagnostics is to shift network operations from reactive troubleshooting to proactive optimization. AI-driven diagnostics enable this shift by quantifying technical factors that have traditionally been difficult to measure directly, such as the impact of spectral efficiency and interference on user throughput.

This capability enables engineering teams to prioritize optimization activities based on their measurable impact on user experience, rather than relying on generic optimization checklists. By comparing local network performance with international best-in-class benchmarks, operators can identify the achievable performance potential of their networks and take targeted actions to realize that potential.

In an environment where every euro of capital expenditure must be justified, maximizing the value of existing network assets through data-driven optimization is a powerful and cost-effective source of competitive advantage.



Realize Your Goals with FL Omnitele

The transition from a capacity-driven strategy to a diagnostic-driven approach requires a fundamental shift in mindset—from expanding network resources to maximizing the value of existing investments. FL Omnitele's consultancy practice, powered by the PRIMEA AI engine, delivers the analytical insight needed to support this transition.

Our services include network performance audits, multi-layer traffic steering optimization, and international benchmarking to pinpoint the most effective opportunities to improve network performance. Whether the objective is to optimize 5G parameters, improve user experience, or increase effective network capacity without additional CAPEX, our experts translate complex network data into clear, actionable recommendations.

In the AI era, operators that achieve the greatest long-term success will be those that combine advanced diagnostics with disciplined, data-driven optimization. FL Omnitele helps operators realize that potential by transforming network data into measurable performance improvements.