

BUILDING AUTONOMOUS RAN ON TODAY'S FOUNDATIONS

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EXECUTIVE SUMMARY

Operators are pursuing autonomous Radio Access Networks (RANs) because current operations cannot keep up with greater network complexity, multi-vendor environments, growing Artificial Intelligence (AI) workloads and pressure to improve operational efficiency. Most already have assets such as working automation, software, and engineering experience; reaching autonomous RAN will depend on how well they build on it.

ABI Research's view is that the operator path to autonomous RAN must be treated as an evolutionary process: automation of individual tasks ⇨ coordinated closed loops ⇨ intent-driven automation ⇨ autonomous RAN. Operators can protect existing investments, lower adoption barriers, and progress toward autonomous RAN through AI and Service Management and Orchestration (SMO) without replacing the automation they already run.

The following list summarizes the insights discussed in this executive brief:

- SMO can provide the foundation for autonomous RAN by connecting network management, optimization, applications, data, and automation capabilities, allowing operators to increase network autonomy without having to rip and replace existing systems.
- Existing automation, such as a Self-Organizing Network (SON), is a valuable asset for autonomous RAN because it provides proven optimization capabilities and operational knowledge from live network environments that operators can build on as they introduce more automation and AI.
- Openness and interoperability become more important because operators need to combine capabilities from different vendors and generations of technology to operate together within a common environment.
- AI is mandatory for autonomous RAN. An evolutionary approach can provide operators with a lower-risk path toward autonomous RAN by allowing them to modernize existing investments, introduce new automation capabilities, and generate measurable improvements.

Operators can keep what works, modernize how it is governed and orchestrated, and make AI the foundation of how the RAN is automated.

MARKET OUTLOOK: WHY THE MARKET IS MOVING TOWARD AUTONOMOUS RAN

RAN operations are becoming harder to manage as operators introduce cloudified RAN, multi-vendor deployments, network slicing, and growing AI workloads. Manual and siloed optimization cannot keep pace with this complexity, and the scale of the challenge is also increasing as operators manage more network functions across multiple technology generations and vendors.

Fragmentation is a key challenge to autonomous RAN. Over time, operators have accumulated automation, optimization, management, and analytics tools, often from different vendors and to solve different problems. Each performs its function, but the tools do not share data or context.

Table 1 illustrates these challenges and how SMO addresses each.

Table 1: Challenges Operators Face and How SMO Can Address Them

(Source: ABI Research)

CHALLENGE	WHAT OPERATORS EXPERIENCE	HOW SMO HELPS
Fragmentation	Tools from different vendors may not share data or context	Provides a common data and context layer across tools
Operational complexity	Multiple tools with separate interfaces, workflows, and data models increase the effort and skills needed to run the network	One operating environment with common interfaces, workflows, and data
Integration	New capabilities must be connected to existing systems, increasing complexity and cost	A common framework that allows new capabilities to connect once
Conflicting automation	Automation optimizing different objectives, such as capacity, coverage, or energy use, can work against each other	A coordination layer that applies shared intent and policy across loops

These challenges affect how operators evaluate automation platforms. The market is shifting from individual automation tasks toward platforms that can coordinate multiple automation loops and applications. For operators, the strategic value of the platform comes from how well it integrates what they already have with what they add next.

SMO gives operators a common operating model for introducing new applications without creating a separate operating model for each use case. This creates a more practical route toward autonomous RAN because new capabilities can build on existing data and automation, and share common mechanisms for orchestration and governance.

SMO AS THE FOUNDATION FOR AUTONOMOUS RAN

SMO provides a framework for managing and orchestrating multi-vendor, and multi-technology RAN environments. Its value comes from its ability to connect network management, optimization, applications, data, and AI-driven capabilities within a unified operating environment. This gives SMO a central role in the evolution toward autonomous RAN because operators can use it to coordinate existing automation and introduce new capabilities.

AI-driven, intent-based intelligence is what separates automation from autonomy. A closed loop can execute a task, but an autonomous system must examine competing objectives, apply policy, and act safely as conditions change. The TM Forum autonomous networks framework describes Level 4 autonomy as requiring intent-based operations, policy control, conflict detection and resolution, and contextual decision-making.

SON and other automation systems can already execute defined optimization tasks through closed loops. Autonomous RAN adds the need for broader context, policy, and the ability to evaluate competing objectives and decide on actions as conditions change. SON provides established optimization logic and operational knowledge from live networks and rApps provide a mechanism for introducing new applications and automation capabilities. AI can extend both by identifying patterns, predicting network conditions, and supporting more complex decisions. SMO provides the environment in which these capabilities can be managed, coordinated, and governed.

EVOLUTIONARY PATH: BUILDING ON EXISTING INVESTMENTS

Existing automation can continue handling optimization tasks and gives operators a foundation for autonomous RAN. The operational knowledge accumulated in live networks remains valuable as operators introduce AI-driven capabilities. RAN engineers understand network behavior, optimization constraints, service requirements, and the conditions that automated systems need to account for. That expertise becomes important for governing AI-driven automation, particularly where operators need to validate decisions, define constraints, and manage exceptions.

SMO can connect these existing assets with new applications and AI capabilities. Open interfaces can support interoperability across vendors and technology generations, and common application and lifecycle management can reduce the operational burden created by a diverse automation environment.

Table 2 (following) shows what remains valuable and what SMO adds.

Table 2: The Value Added by SMO to Existing Assets

(Source: ABI Research)

EXISTING ASSETS	WHAT REMAINS VALUABLE	WHAT SMO ADDS
Automation and SON	Proven optimization and closed-loop functions	Coordination across domains and objectives
Installed software	Existing apps that continue to support operations	Integration and lifecycle management
People and expertise	RAN knowledge and operational experience	New governance and decision-making processes
Operational processes	Established optimization and assurance practices	Intent, policy, and conflict management
Data and context	Historical performance and operational information	Mechanisms for sharing data and context

An evolutionary approach still requires investment in integration, interoperability, governance, and lifecycle management. These needs grow as operators add applications and AI into the network. The goal is an operating environment where new capabilities are built on existing investments.

Operators should evaluate existing systems based on the role they can play in a future autonomous RAN environment. Some systems may need replacement because their interfaces, lifecycle costs, or integration requirements limit modernization. Others, such as SON, can continue providing valuable automation, data, and operational knowledge.

OPERATOR SCENARIOS

NTT DOCOMO provides an example of how existing automation can support the transition toward autonomous RAN. The operator introduced its OREX SMO in 2023, an SMO designed for multi-vendor environments, which already automates use cases such as energy efficiency, parameter tuning, and network optimization. Nokia's MantaRay SON has been deployed in DOCOMO's multi-vendor 5G network, and SON is one of the key products enabling the evolution toward a full SMO. NTT DOCOMO has described its longer-term direction as building on C-SON toward SMO, with open rApps and AI capabilities becoming part of this evolution. DOCOMO's in-house SMO and Nokia's SMO can coexist in the same operational framework, coordinated through open interfaces.

The example illustrates how operators can retain proven automation and implement AI-driven capabilities needed for autonomous RAN operations.

CONCLUSION AND TAKEAWAYS FOR NETWORK EXECUTIVES

The evolution toward autonomous RAN will take place within networks that already contain automation, software, data, and operational expertise. For network executives, the key decision is how to increase autonomy and continue to capture value from these existing investments.

- Operators should connect existing and new automation through a common orchestration environment, reducing duplication and allowing new capabilities to build on existing data and automation.
- Open interfaces, multi-vendor integration, and shared governance will become critical as operators introduce new capabilities across different vendors and technology generations.
- SMO can provide this foundation by coordinating proven automation in the short term while building AI-driven, intent-based policy, data, and orchestration capabilities needed for autonomous RAN in the long term.

Autonomous RAN will emerge through the evolution of networks that already exist and SMO can supply the operating foundation that connects these capabilities, giving operators a path toward autonomous RAN.





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