ERICSSON

Goodbye SON...

Hello rApps!

A revolutionary transition for the new era of RAN automation.

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Introduction

Laying the foundation of tomorrow's networks

Self-organizing networks (SON) have provided foundational automation for radio access networks (RAN) over the past decade, but their effectiveness has been limited by vendor lock-in, proprietary architectures, and a narrow focus on RAN-specific data. These constraints have led to fragmented networks and missed opportunities for holistic, subscriber-centric optimization, especially as the industry transitions to 5G and cloud-native platforms.

Our vision for the future centers on service management and orchestration (SMO), non-real-time RAN Intelligent Controllers (non-RT RIC), and modular rApps. This new paradigm enables centralized policy control, multi-domain data fusion, and rapid innovation through cloud-native architectures. Migrating SON functions to rApps allows communications service providers to preserve proven capabilities while unlocking new efficiencies and AI-driven automation.

The transition from SON to SMO and rApps is not just evolutionary—it is revolutionary

Market signals confirm a shift in investment toward open, scalable platforms, and modular solutions, with industry collaboration accelerating adoption. Centralized policies, multi-domain insights, and AI-powered orchestration are redefining RAN automation, offering service providers unmatched agility and vendor flexibility.

How we got here

The SON paradigm and its legacy

SON emerged more than 15 years ago at the peak of 3G rollout, as a bold promise to revolutionize RAN operations. In those days, it was a much-needed addition to operators' toolboxes.

Fueled by the desire to automate repetitive manual tasks, 3GPP Rel8, back in 2009, was the first version of the standard to include 4G and the concept of Self-Organizing Networks (SON). SON aimed to reduce operational expenses (OPEX) and elevate customer experience by enabling networks to self-configure, optimize, and heal.

Across large operator networks, SON delivered significant value by automating baseline operational functions such as automatic cell configuration, coverage optimization, capacity load balancing, and interference management—traditionally labor-intensive processes that slowed innovation cycles.

SON's architecture from 3GPP perspectives has largely been vendor-specific and proprietary. Industry leaders approached SON differently. At Ericsson, we embraced a hybrid SON model, combining centralized and distributed intelligence to apply automation where it truly matters. This approach delivered measurable OPEX reductions and enhanced service quality.

Competing approaches

In contrast, other RAN vendors and independent software vendors (ISVs) pursued a more centralized SON strategy and positioned themselves as key players offering multi-vendor virtualization platforms that address heterogeneous network complexities through shared application platforms. SON provided a level of foundational automation, however, with limited success—its siloed, proprietary nature and inadequate interoperability capped its potential.

SON set the foundation of automation, but couldn't fully unlock the network's potential—this requires a hybrid, adaptable approach.

The story of SON, in short

- SON laid the automation foundation, yet it never fully unlocked the network's true intelligent potential.
- From manual chaos to basic automation —SON got us started, but couldn't take us all the way.
- The industry learned that a one-size-fits-all approach doesn't work.

Why we need to evolve

Understanding SON's limitations and market realities

The promise of SON hit an undeniable wall in real-world deployments. Vendor lock-in and proprietary interfaces impacted SON implementation across operators and created a fragmented environment.

This fragmentation created silos, severely hindering multi-vendor interoperability —a critical drawback as networks evolved into increasingly heterogeneous and complex RAN environments. Operators struggled to harmonize operations between 2G/3G/4G/5G layers, different vendors' equipment, and varying deployment architectures such as Cloud RAN and Open RAN.

SON's key limitations

Moreover, SON's optimization focus remained stubbornly narrow, centered predominantly on RAN-specific data streams. It failed to bridge insights from the core network, subscriber experience metrics, or external contextual data such as crowd-sourced inputs or live-event analytics. This limited its ability to deliver holistic, subscriber-centric automation and optimization, leaving key opportunities on the table.

It can be said that some RAN vendors opted for a hybrid model (with centralized and distributed RAN automation in collaboration), which partially mitigated these challenges, offering more flexible application of SON use cases with open interfaces designed to reduce vendor lock-in. On the other hand, those with a more centralized setup faced integration and ecosystem challenges and still grappled with orchestrating across diverse vendor environments. Despite these efforts, closing the gap between isolated RAN automation and unified end-to-end intelligent operations remained elusive.

Multi-vendor realities exposed SON's cracks —modern networks need a new approach with interoperable, ecosystem-wide intelligence.

Complexity grows beyond SON's capabilities

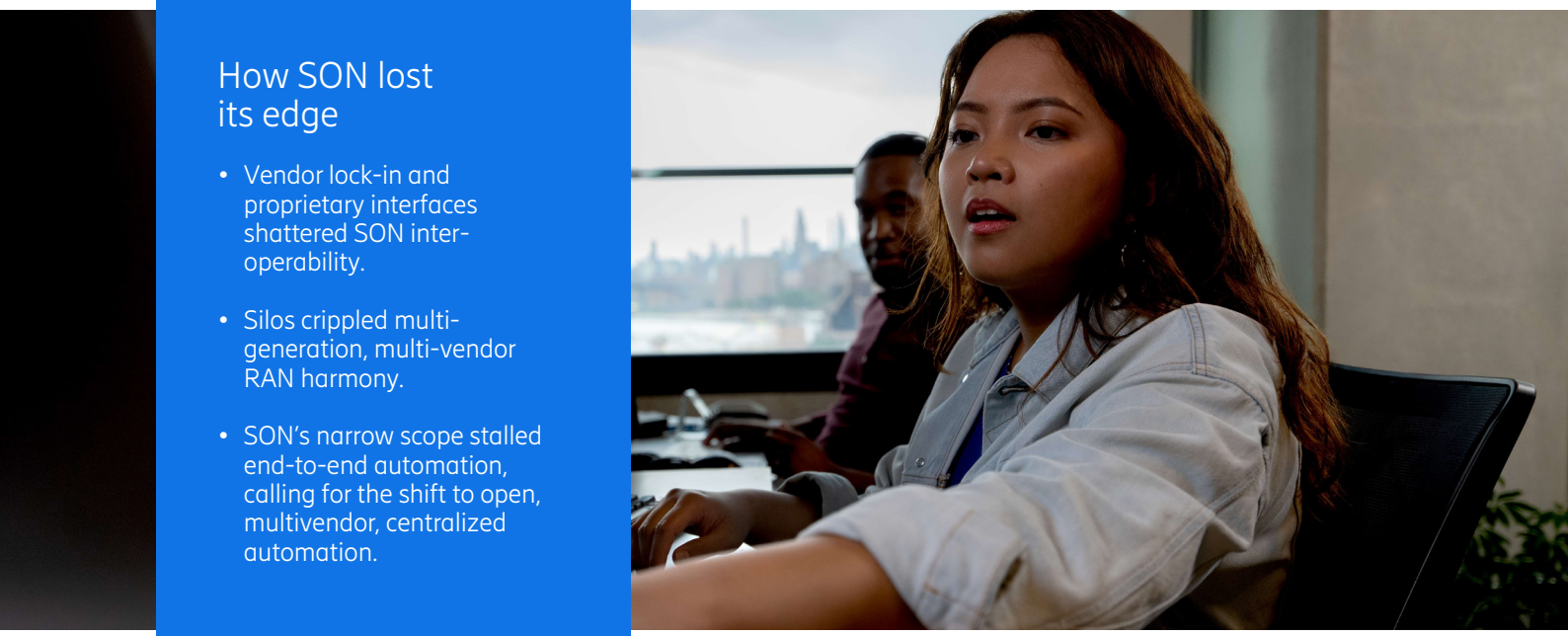
Back then, SON lived in a world of hard-wired rules, silos, and hand-tuned scripts —AI was a distant dream, data was sparse, and multi-vendor chaos made learning curves steep. Needs were simpler: basic self-optimization with limited conflict between energy and performance, with little incentive to train models that could predict future states.

The straightforward SON use cases sold by vendors offered quick wins and a readable entry point into automation, creating hopeful demos and early efficiency gains. Yet many service providers soon outgrew them, building sprawling in-house automations to address unique networks, data silos, and bespoke interfaces.

The result was a patchwork of siloed platforms, customizations, and vendor lock-in that inflated cost and complexity while soaking up scarce engineering bandwidth. As the glory of quick wins gave way to fragmentation, the path forward now hinges on open, multivendor, centralized automation that scales across the entire network.

How SON lost its edge

- Vendor lock-in and proprietary interfaces shattered SON interoperability.
- Silos crippled multi-generation, multi-vendor RAN harmony.
- SON's narrow scope stalled end-to-end automation, calling for the shift to open, multivendor, centralized automation.



Moving towards intelligent automation

SON is not the answer anymore

The fast-evolving network landscape decisively outpaced SON's capabilities. Technological, operational and strategic gaps, unbridgeable by incremental SON upgrades, signal the end of the road for legacy frameworks.

The introduction of 5G, with its multi-vendor, multi-technology, and cloud-native architectures, massively escalates network complexity and demands automation that is agile, intelligent, and inherently open.

Current SON implementations struggle in the face of pervasive software-defined networking, edge computing, and artificial intelligence/machine learning (AI/ML) driven orchestration. Service providers want control but also crave scalable, interoperable automation platforms that transcend vendor barriers and geographic boundaries. SON's closed and proprietary systems simply can't keep up with the dynamic orchestration requirements of modern networks.

The pivotal role of AI

AI is the engine that turns static SON rules into living, predictive network intelligence. It learns from historical traffic patterns, geographic peculiarities, and multi-site, multi-band realities to adapt in real time and forecast future states. Traditional SON use cases struggle with such complexity, multi-objective trade-offs, and the sheer data deluge from 5G.

By leveraging AI models trained on vast data from live networks, explainable in-RAN intelligence, and rApp-based orchestration, networks can preempt congestion, optimize energy and performance, and evolve SON use cases beyond legacy capabilities.

The dawn of a new era

Leading the new era, Ericsson Intelligent Automation Platform introduces an open, cloud-native, and scalable common automation platform aligned with the 3GPP SMO framework and non-RT RIC. This fosters a rich ecosystem of AI/ML-powered rApps, enabling operators to coordinate multi-vendor optimizations seamlessly. Other RAN vendors and ISVs are also transitioning, though challenges persist in achieving the same level of ecosystem openness and scalability. In essence, evolving SON is no longer enough. Replacing SON with an intelligent, service-oriented SMO and rApps architecture is imperative to unlock the full potential of 5G, Cloud RAN, and beyond.

Figure 1.
AI and intent—pivotal for a paradigm shift towards autonomy

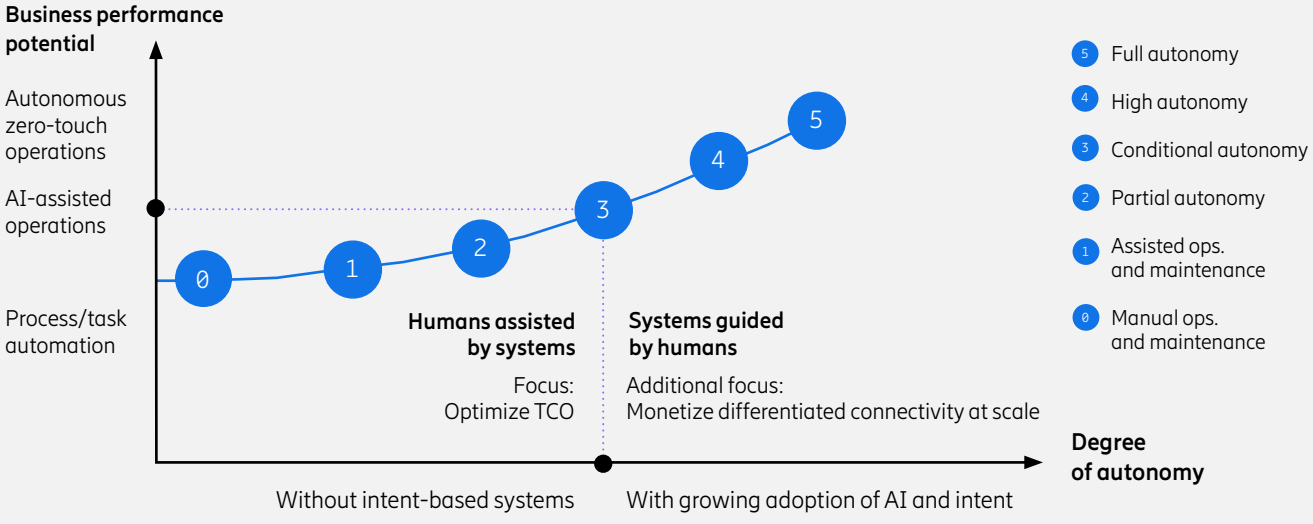
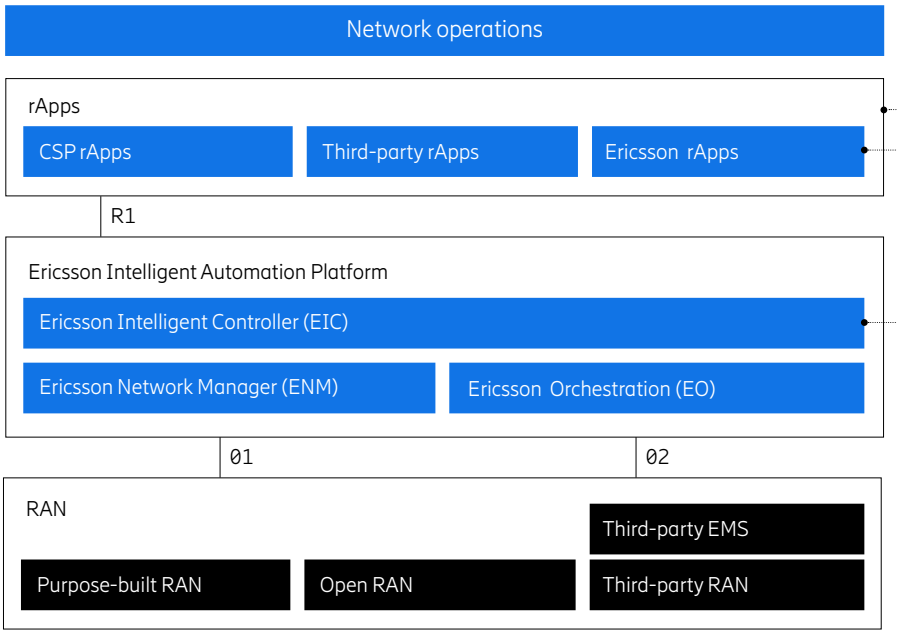


Figure 2.
Horizontal architecture benefits

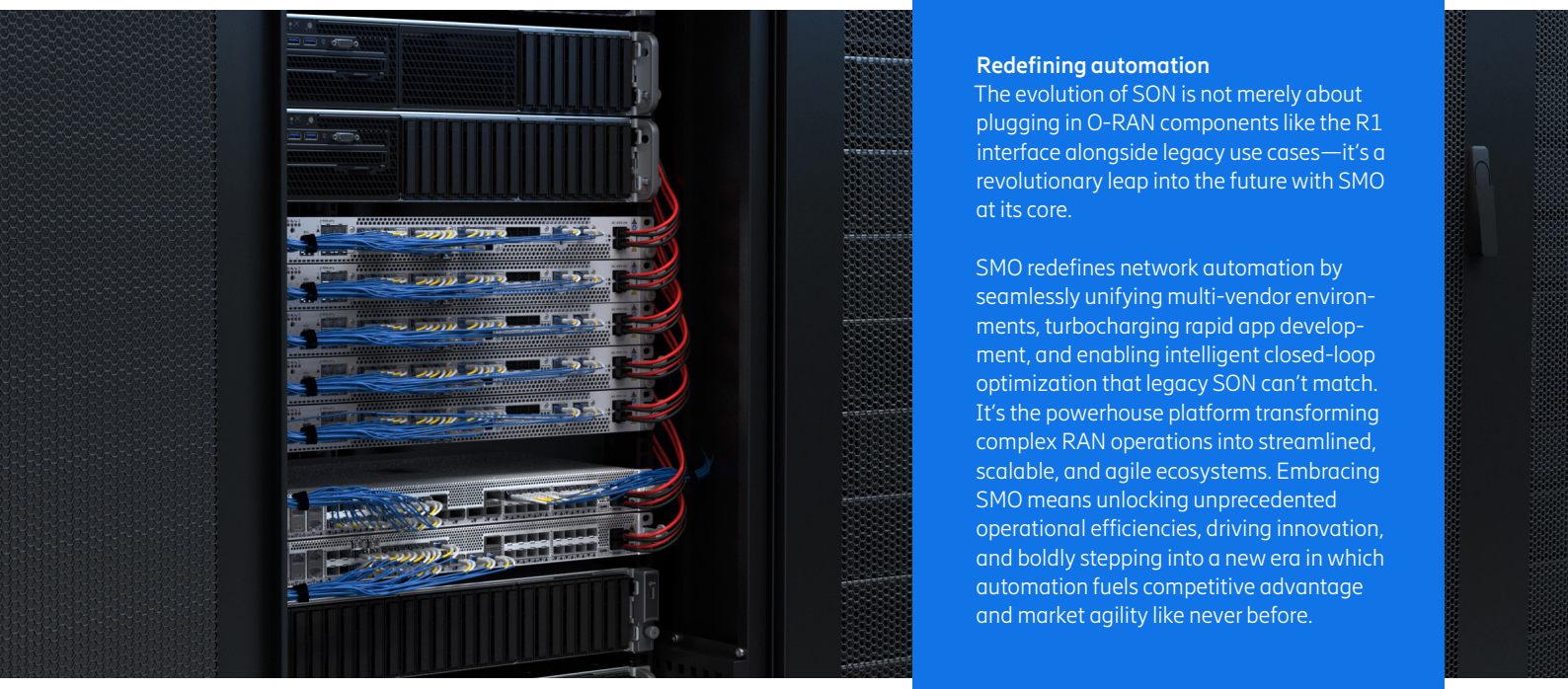


Open ecosystem
Provides agility and flexibility to liberate innovation.

Ericsson rApps
Assures advanced network efficiency utilizing AI and Ericsson's RAN experience.

Ericsson Intelligent Controller
Leverages vendor-agnostic RAN automation excellence at scale—where anyone can build rApps.

Beyond the silos—tomorrow's networks need open, intelligent orchestration through SMO and rApps to navigate 5G's complexity and drive true automation.



Redefining automation
The evolution of SON is not merely about plugging in O-RAN components like the R1 interface alongside legacy use cases—it's a revolutionary leap into the future with SMO at its core.

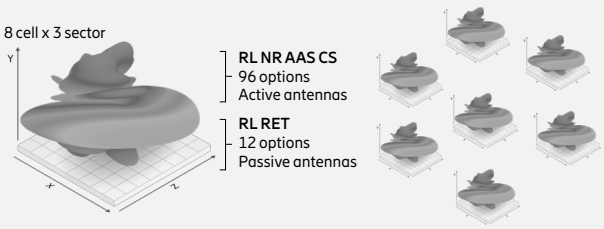
SMO redefines network automation by seamlessly unifying multi-vendor environments, turbocharging rapid app development, and enabling intelligent closed-loop optimization that legacy SON can't match. It's the powerhouse platform transforming complex RAN operations into streamlined, scalable, and agile ecosystems. Embracing SMO means unlocking unprecedented operational efficiencies, driving innovation, and boldly stepping into a new era in which automation fuels competitive advantage and market agility like never before.

Industry evolution

The foundations for the new automation era

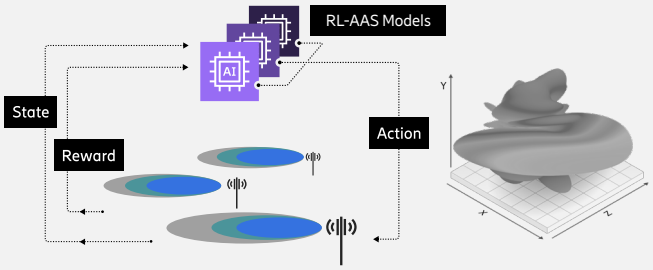
The world of global connectivity is changing fast. Networks that were once monolithic and proprietary are breaking apart into disaggregated, modular building blocks.

Figure 3.
Only AI can handle accelerating complexity



In a 500-site cluster containing 12 000 individual cells, there are 96^{6000} possible configurations. In this scenario, rule-based automation is not enough—only AI can handle the complexity.

Figure 4.
Expanding capabilities with AI



Multi-objective reinforcement learning

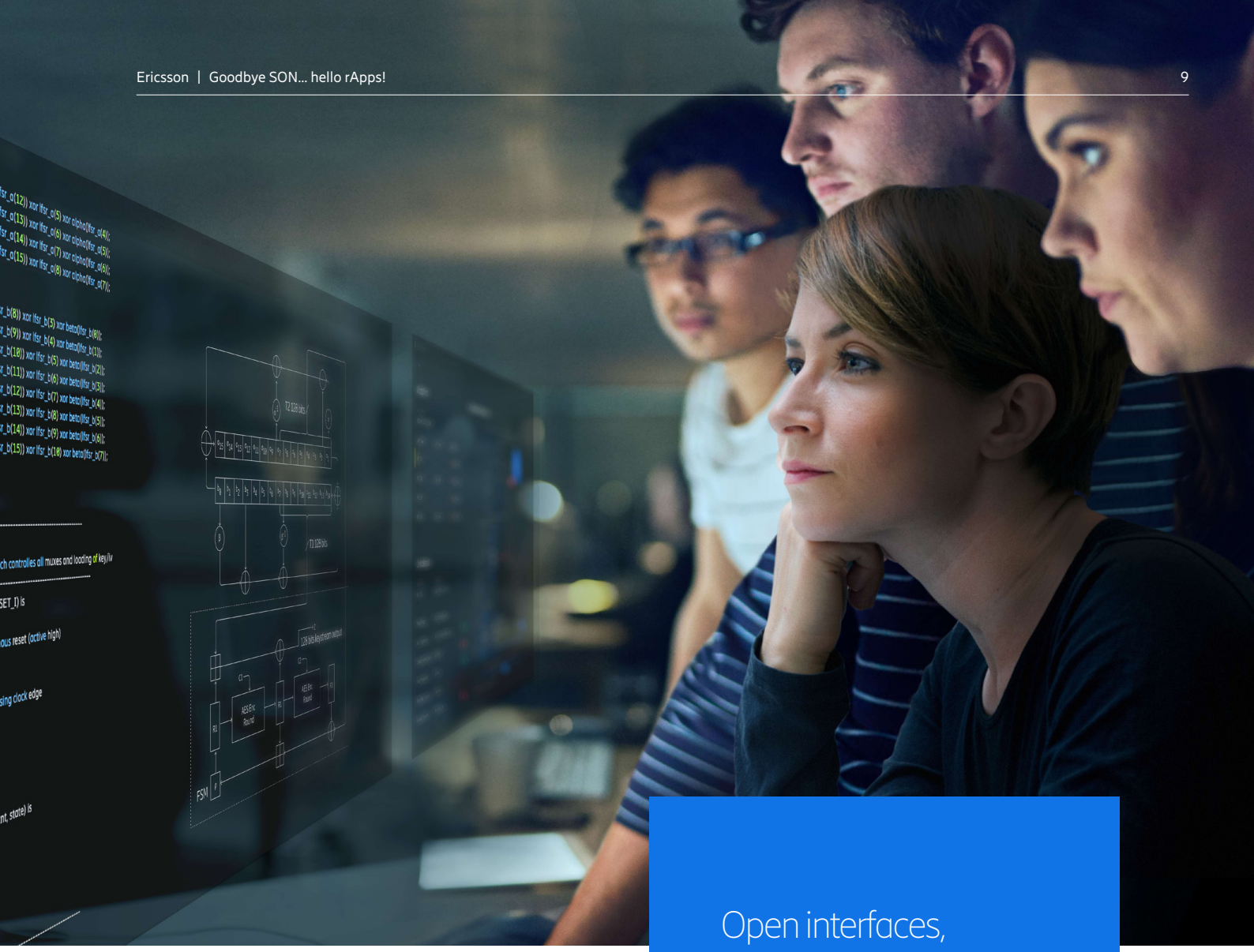
Develop reinforcement learning algorithms on parameter configuration changes and performance behaviors, trained on millions of samples and reward models.

Open RAN, with its open interfaces and vendor-neutral components, has shifted from a vision to a practical pathway for service providers who want choice, innovation, and faster time-to-market. By allowing best-of-breed elements to be mixed and matched, Open RAN fosters vendor diversity and creates a fertile ground for new entrants and specialized capabilities.

Parallel to this architectural shift, the industry has converged on a new orchestration paradigm: the SMO framework. SMO has become the standardized management layer that tames RAN complexity across multi-vendor deployments, providing the unified control plane service providers need to automate at scale. It is the glue that connects disaggregated RAN elements into a coherent, manageable whole.

The role of AI

AI/ML integration rises to core transformative status, not as a curiosity but as a decision-making engine. Smarter analytics translate mountains of subscriber, RAN, core, and external data into actionable insights, enabling proactive, context-aware optimization and automated remediation. The industry is no longer asking for better data—it's asking for intelligent decisions on top of that data with closure in seconds rather than hours, and with reproducible results.



Open interfaces, AI-driven SMO and Open RAN unlock vendor diversity and truly intelligent automation beyond SON.

From static to proactive
Today, AI/ML has arrived as a core capability: vast data from live networks, unified platforms (SMO, non-RT RIC), software development kits (SDKs), and open ecosystems enable explainable, multi-vendor automation (rApps) that can truly navigate complexity, balance trade-offs, and forecast outcomes, turning SON from a static assistant into a proactive, intelligent network operations partner.

Market forces are aligning
Service providers face growing operational costs and diverse, latency-sensitive services that demand smarter automation. The ecosystem, from standards bodies to cloud platforms and developer communities, is now ready to move beyond legacy SON. The ingredients are in place: open architectures, orchestration standards, and AI-driven capabilities that collectively rewrite the automation playbook.

The path ahead

SMO, non-RT RIC, and rApps in the context of the journey to autonomous networks

Our vision for SMO and rApps is a bold, unifying engine for autonomous networks, overcoming the limitations of SON and creating a new paradigm for the networks of tomorrow.

By delivering a single pane of glass that orchestrates RAN automation across multi-vendor and multi-technology environments, SMO unlocks rApp innovation, accelerates AI-driven decisions, and sets the foundation for resource-level assurance, working tightly with service-level and business-level assurance. Thus, it enables network slicing, assurance, and complex service orchestration.

The path forward targets high OPEX areas with proven use cases: network deployment, optimization, and healing, while migrating legacy SON into a modern, open, O-RAN-aligned architecture. Together, SMO and rApps propel the industry from 5G toward 5G Advanced and 6G, delivering agility, efficiency, and transformative revenue opportunities.

EIC's pivotal role

Within this architecture, non-RT RIC Ericsson implementation, known as Ericsson Intelligent Controller (EIC), plays a pivotal role. As the non-real time execution environment, EIC hosts analytics and control functions that operate on timescales from seconds to hours. It ingests diverse datasets, runs AI/ML models, and delivers refined policies and insights to the network. This separation of concerns—non-real-time analytics and policy generation vs. real-time enforcement—enables richer, safer, and more sophisticated automation than legacy SON approaches.

Agility through rApps

rApps are the innovation engine of this vision. As modular automation applications built on standardized SDKs, rApps leverage AI/ML to deliver specialized capabilities—from network deployment automation to advanced optimization and proactive assurance. They are vendor-neutral, composable, and capable of running across multi-vendor deployments, giving operators the freedom to adopt proven use cases quickly and expand their automation portfolio over time.

In the move toward autonomous networks, EIC, the non-RT RIC, and rApps together address the core limitations of traditional SON. They deliver openness and interoperability through standardized interfaces, extensibility through an SDK-driven ecosystem of modular apps, and enriched observability by fusing multi-domain data into actionable intelligence. For service providers, this is not just an upgrade—but represents a fundamentally new operating model that reduces complexity while accelerating innovation.

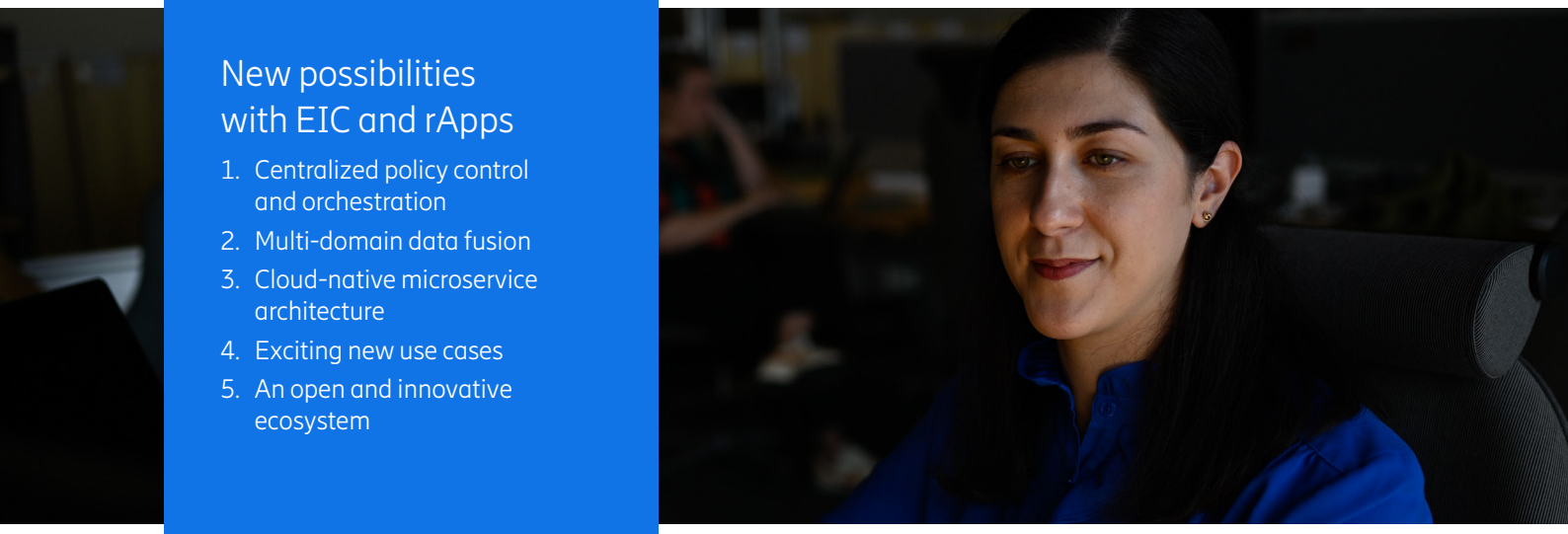
Unlocking new opportunities

What EIC and rApps bring that SON could not

As a foundation, there is a future-proof, industry-aligned open architecture that supports multi-technology, multi-domain, and multi-vendor automation. It enables innovation and autonomous operation, providing a set of unique capabilities.

New possibilities with EIC and rApps

1. Centralized policy control and orchestration
2. Multi-domain data fusion
3. Cloud-native microservice architecture
4. Exciting new use cases
5. An open and innovative ecosystem



First, centralized policy control and orchestration prevent harmful conflicts between concurrent optimization functions. No more competing "tweaks" from siloed algorithms: SMO provides coordinated decision-making, so optimizations are consistent, safe, and aligned with operator intent.

Second, multi-domain data fusion becomes a reality. SMO can ingest and correlate RAN telemetry, network data, subscriber context, and even external datasets (such as location-aware information). This holistic view enables optimizations that are far more effective because they understand the full-service context —a capability SON was never designed to deliver.

Third, a cloud-native, microservice architecture brings rapid innovation, elastic scaling, and resilient operations. Communications service providers can deploy new rApps quickly, scale them on demand, and isolate failures without impacting the underlying platform and network. This agility transforms how automation is developed, validated, and rolled out—from months or years to weeks.

Fourth, this opens the door to entirely new use cases: cognitive automation driven by continuous learning loops, proactive network management that anticipates issues before customers notice, and differentiated service experiences such as dynamic slicing and tailored QoS. Where SON reacted, rApps predict and prescribe.

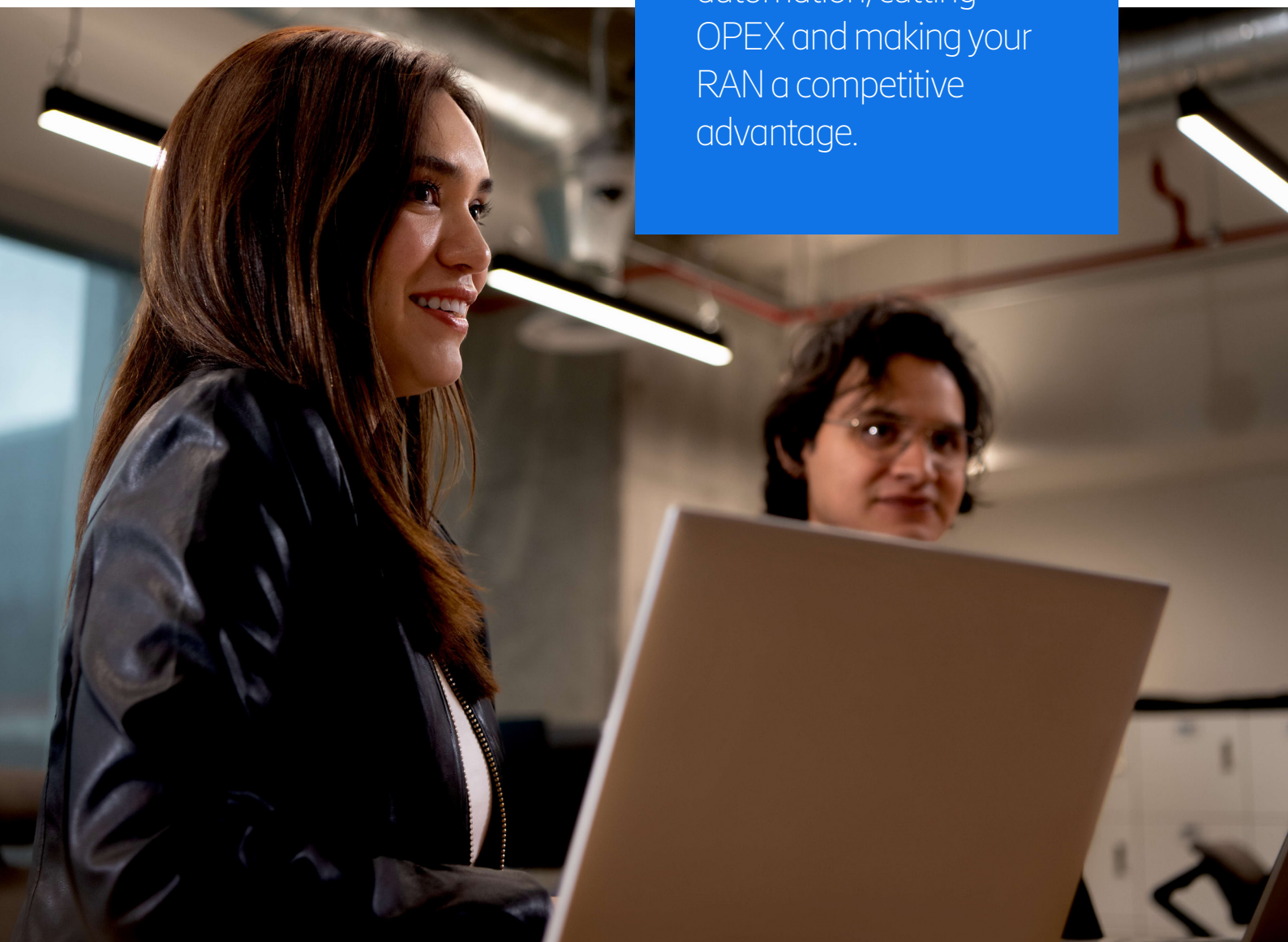
Finally, the open ecosystem enabled by R1, SDK, and the developer community broadens innovation beyond traditional RAN vendors, making rApp development easier and faster. Operators and third-party developers can contribute specialized rApps, accelerating the rate of capability expansion and fostering competition that drives both efficiency and creativity. The openness and capabilities of the platform support a suite of use cases that span the entire life cycle of a radio access network, across network evolution, deployment, optimization, and healing.

How to go forward
This is a call to action: service providers should prioritize SMO deployment in the most complex, cost-intensive RAN areas where multi-vendor interoperability and operational savings matter most. Take proven SON and design automation apps for the SMO platform, target high OPEX domains, like deployment, RAN optimization, and healing, and harness the developer ecosystem to scale success across the network.

The path forward is clear. Legacy SON served a purpose, but the future belongs to an open, AI-powered, cloud-native automation stack. Deploy SMO, embrace the non-RT RIC, and catalyze innovation with rApps—and turn complexity into agility, cost into capability, and data into decisive action.

The new automation era is here —lead it.

SMO, cloud native rApps and centralized multi domain policies unlock AI driven, proactive automation, cutting OPEX and making your RAN a competitive advantage.



Where we need to go

The revolutionary approach is the way forward

The network evolution ahead of us is not a gentle step—it's a revolution. Operators need to embrace this major shift to ensure their networks continue to meet user needs.

Operators today live in hybrid realities: decades of robust, battle-tested SON functions running on legacy RAN coexist with cloud-native ambitions and the emergent SMO, plus non-RT RIC architecture. That coexistence is not a glitch to be erased—it's the launchpad for practical, low-risk transformation.

Reality check
Many operators have large investments in proven automations—cell planning, cell shaping, load balancing, energy-saving modes—that have shaped operational know-how. Some key automations are not simply disposable. Their logic, data models, and operational outcomes hold the secrets to fast and safe automation in the SMO era.

Migrating intelligently
Other automations, on the other hand, have already served their purpose and might not bring value in more complex scenarios compared to the needs that existed when they were developed. The transition strategy that wins is therefore not "rip and replace" but selective, intelligent migration.

Figure 5.
Journey from legacy SON to SMO/rApps

Migration strategies should follow a clear playbook:

Inventory and triage:
Identify SON automations for reimplementation as rApps based on ROI, business value and portability.

Rebuild for openness:
Rearchitect selected relevant functions as AI-powered rApps, taking advantage of learnings from SON.

Phased coexistence:
Run legacy SON functions alongside rApps in a controlled, orchestrated environment with a clear timeline.

Continuous validation:
Use hybrid testing, shadow mode, and staged rollouts to ensure rApp performance before full cutover.

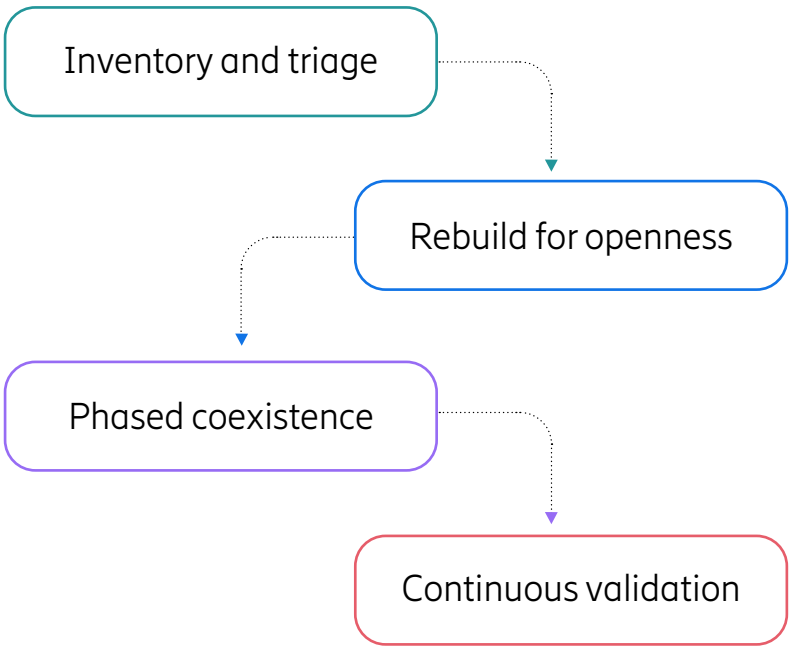
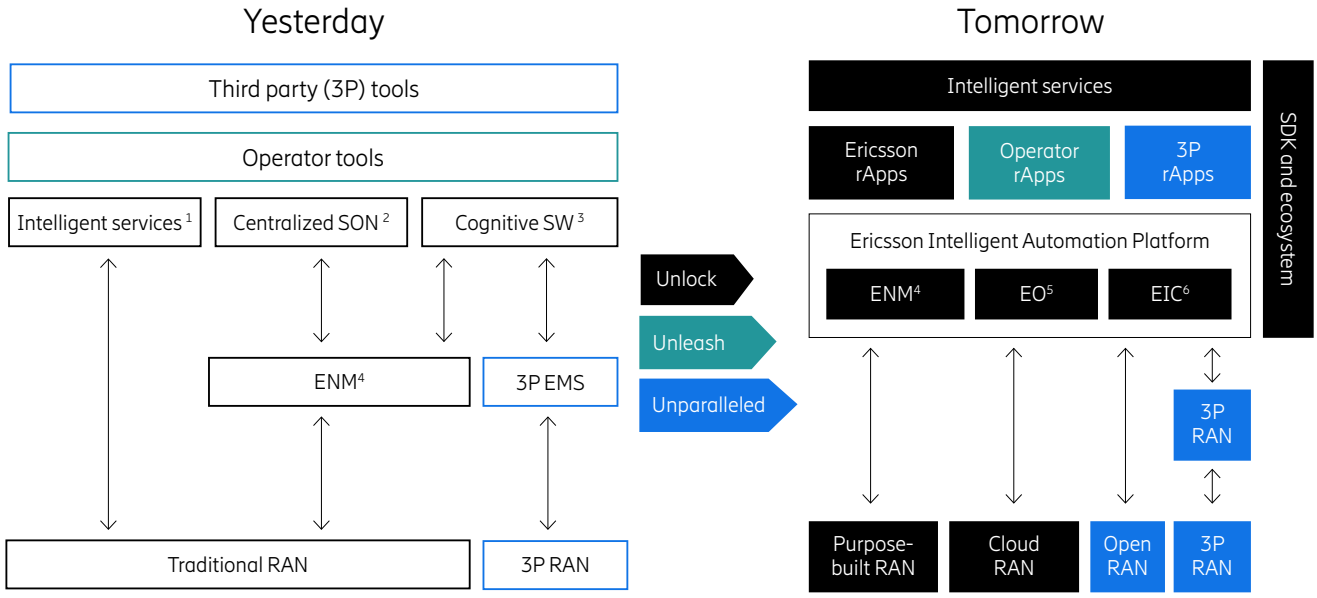


Figure 6.

EIAP is the horizontal platform that allows integration with existing platforms



[1] Intelligent services: Centralized automation services
[2] Centralized SON: Traditional SON solutions
[3] Cognitive SW: AI-based network design and optimization
[4] ENM: Ericsson Network Manager (O&M)
[5] EO: Ericsson Orchestrator (cloud infra)
[6] EIC: Ericsson Intelligent Control (non-RT RIC)

Evolving selectively
rApps deliver richer, more proactive optimization than SON ever could. But that enrichment only happens if operators carefully select which use cases to migrate—not every legacy function survives the revolution unchanged. It is also important to consider which new use cases will be added as part of this revolution, primarily leveraging AI-powered rApps to take network optimization, healing, and deployment outcomes to the next level.

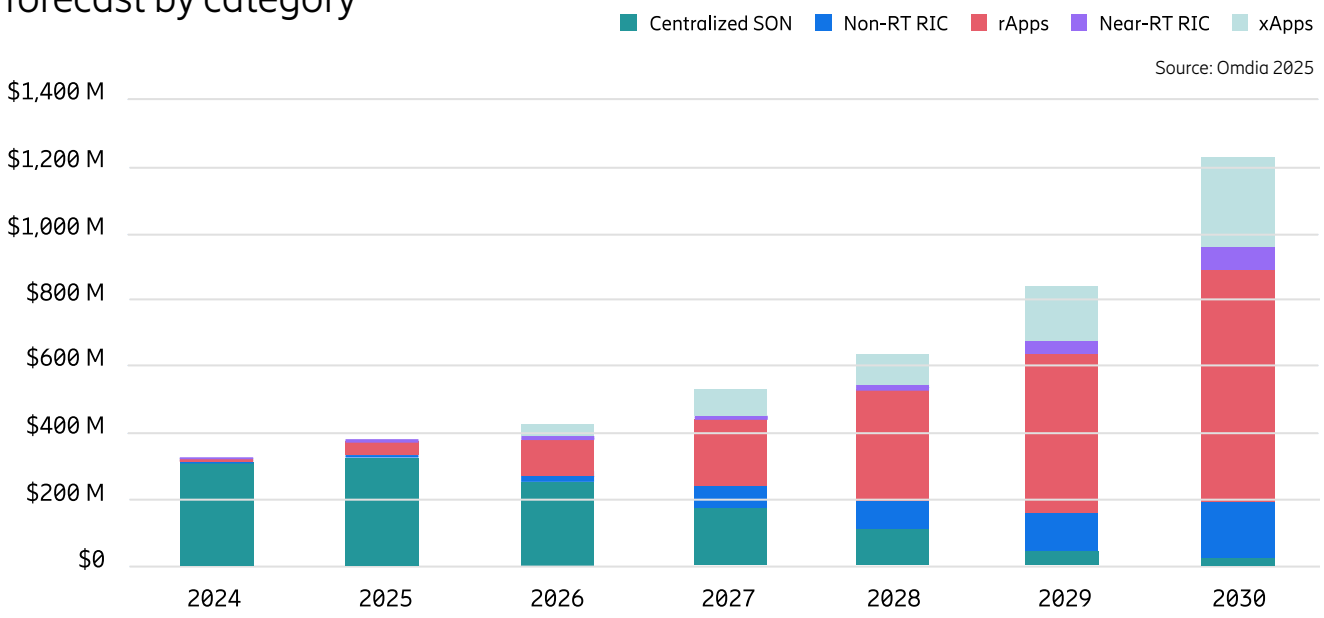
Keep what works, modernize what matters. Phased rApp adoption turns legacy strengths into future agility, with the SMO harmonizing the old and new.

An urgent shift

The time is now

Service providers and their optimization teams sit on a mountain of domain knowledge—years of tuning, countless drive tests, operator playbooks, and the nuanced heuristics that make networks hum. This institutional memory is gold in an SMO world.

Figure 7.
Centralized RAN automation forecast by category



Translating that expertise into rApps and SDK-ready components gives incumbents a head start: they already understand edge cases, vendor quirks, KPI trade-offs, and the operational thresholds service providers care about.

In short, they know what to automate and how to prove it.

Market signals confirm the shift
Traditional SON spending is forecast to remain flat in the near term, while investments pivot to SMO, non-RT RIC, and rApps. This is an opening for innovation: operators will prioritize platforms that offer SDKs, multi-vendor support, cloud-native resilience, and AI/ML toolchains. Incumbents who evolve and expand their logic as modular rApps, while exposing APIs and embracing open standards, can convert legacy contracts into recurring, platform-aligned revenue streams.

For operators, the strategic playbook is threefold:

1. Partner with a domain expert who provides a future-proof open platform. Benefit from the wealth of network optimization experience while keeping your freedom of choice in later stages for selecting the best rApp provider for each use case.

2. Adopt an incremental migration strategy that proves ROI quickly (pilots that reduce OPEX or improve key KPIs).

3. Insist on openness—in SDKs, interoperable interfaces, and shared data models—to avoid new lock-in and accelerate multi-vendor innovation.

Operators that balance caution with structured experimentation will extract maximum business value: lower cost per bit, better customer experience, and faster feature velocity.

How to lead the shift
Open standards and industry collaboration are the turbocharger. When rApps adhere to common APIs, when SMO vendors implement established data models, and when testbeds provide real-world validation, the ecosystem scales faster. Incumbents who combine their operational playbooks with a commitment to openness become the natural integrators: they can deliver quick wins while enabling third-party innovators to extend capabilities.

The transition from SON to SMO and rApps is not about discarding the past—it's about monetizing it. Incumbent vendors who translate their deep operator knowledge into modular, AI-powered, and cloud-native solutions will not just survive the shift—they will lead it.

Conclusion

The revolution in RAN automation is here

SON served us well, but its era is fading. SMO, together with AI-driven rApps on the non-RT RIC, unlocks a scalable, open, cloud-native automation stack that breaks vendor lock-in and accelerates intelligent decisions across multi-vendor, multi-technology networks.

This is the pragmatic shift operators have awaited: a future where automation isn't rules-based alone, but data-driven, AI-powered, adaptable, and self-improving at scale.

Service providers gain unmatched efficiency, scale, and agility as centralized policies and analytics within SMO orchestrate diverse functions and domains. The result is faster fault resolution, optimized deployments, and energy-aware operations.

Vendor flexibility blossoms through open interfaces and a thriving rApps ecosystem, while users experience smoother, more reliable services through AI-enabled optimization, resource assurance, and service orchestration. Open RAN becomes a catalyst, turning complexity into capability and costs into customer value.

Embrace this new architecture as a strategic imperative: move beyond legacy SON to a cloud-native, AI-powered automation foundation. Lead with SMO, leverage non-RT RIC and rApps, and catalyze interoperability, innovation, and resilience. Today and tomorrow.

About Ericsson

Ericsson's high-performing networks provide connectivity for billions of people every day. For nearly 150 years, we've been pioneers in creating technology for communication. We offer mobile communication and connectivity solutions for service providers and enterprises.

Together with our customers and partners, we make the digital world of tomorrow a reality.

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