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Volume 21, Issue 7

Embracing Autonomous Networks *The Road to Level 4 Autonomy*

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The global telco industry stands at the cusp of transformative change driven by autonomous networks; networks capable of operating, healing, and optimizing themselves with minimal human intervention. For Communications Service Providers (CSPs) looking to both streamline their operations and unlock growth through new services, achieving ‘zero-touch, zero-wait, zero-trouble’ operations is no longer aspirational, it's essential.



Autonomous networking represents a fundamental shift from manual and reactive processes towards predictive, real-time, and self-managing networks. It's not merely a technological upgrade, it's a strategic imperative to address rising network complexity, relentless customer expectations, and the need to rapidly launch innovative services.

Level 4 autonomy: crossing the threshold

While network automation itself isn't new, genuine autonomy demands new commitments to both technology adoption and network architecture. In collaboration with our members, [TM Forum has developed an autonomy model](#) that benchmarks networks into levels 0 to 5, with Level 4 marking a significant milestone. At Level 4, networks transition from human-dependent automation towards true AI-driven independence. Here, networks autonomously manage, optimize, and self-heal in complex scenarios, continuously learning from their environment.

And global momentum is building. TM Forum members are collaborating on best practices, guidance and implementation aspects toward L4. To date, more than 70 CSPs have committed to achieving Level 4 autonomy by 2027, underscoring industry-wide confidence in the strategic value of autonomous network. Yet, today, most CSPs operate between Levels 2 and 3, indicating significant progress is still required. This gap highlights both the immense potential and the practical challenges CSPs face.

AI and GenAI: Powering Autonomous Intelligence

Artificial Intelligence (AI), particularly Generative AI (GenAI), is the essential enabler of Level 4 autonomy. Unlike traditional automation relying on fixed scripts, AI enables adaptive, real-time decision-making. Machine learning algorithms can analyze vast datasets, predict emerging issues, and proactively manage network resources, drastically reducing manual interventions.

GenAI further extends these capabilities. By interpreting unstructured data, GenAI assists operators through tasks such as real-time troubleshooting, customer interaction, and network optimization. For example, Orange is leveraging GenAI for summarizing trouble tickets, technical documentation retrieval, and natural language querying of network issues, significantly enhancing operational responsiveness.

To fully harness AI and GenAI, networks must embed intelligence into their architecture by design, rather than retroactively integrating it. True autonomy requires intelligent systems capable of making complex, instantaneous decisions across multiple network domains, radio, transport, and cloud without human oversight.

Intent-based, Closed-loop Management

Intent-based management is another key technology that is central to autonomous operations, transforming high-level business goals into real-time network actions. Rather than detailed technical instructions, operators specify desired outcomes or ' intents,' and the autonomous network dynamically adjusts itself to meet these objectives.

Coupled with closed-loop automation, intent-based networks continuously monitor performance, analyze data, adapt configurations, and verify outcomes. This proactive loop enables networks to swiftly address issues, often before customers detect them. In practice, this might mean rerouting traffic to avoid congestion or pre-emptively resolving faults, dramatically enhancing customer experience and operational efficiency.

High-value Use Cases Demonstrate Real-world Impact

[Real-world examples](#) already illustrate the tangible benefits of autonomous networks. One critical area is autonomous fault management. AI-driven detection and closed-loop resolution significantly lower repair times, improve availability, and minimize customer impact. For instance, Telekom Malaysia boldly guarantees 24-hour broadband fault restoration—a service commitment achievable only through autonomous capabilities.

Digital twins represent another powerful application, creating virtual network replicas that operators use to simulate configurations and predict outcomes without risking live operations. This capability boosts planning accuracy, reduces downtime, and ensures reliable performance. Operators leveraging digital twins report significant OPEX savings and improved service reliability.

Proactive customer experience management is also seeing transformative effects. AI-driven networks can detect problems instantly, matching customer experience metrics with network performance data, enabling rapid, autonomous issue resolution. This proactive approach drastically reduces complaint resolution times, enhances satisfaction, and fosters customer loyalty.

Navigating the challenges

Despite clear advantages, achieving Level 4 autonomy is not without hurdles. Integrating autonomous capabilities into legacy, multi-vendor, and siloed environments is challenging. TM Forum research has identified cross-domain integration complexity as a significant barrier, requiring standardized, open APIs and unified data models to enable seamless interactions across network domains.

Another key challenge is data readiness. Autonomous networks depend on high-quality, accessible data to feed AI models. Many CSPs still grapple with fragmented data architectures and silos. Forward-thinking businesses can address this by modernizing data architectures, consolidating data lakes, adopting real-time analytics, and ensuring robust governance. For example, Orange takes a 'data democracy' approach which facilitates cross-functional data sharing, significantly enhancing AI efficacy.

Equally, organizational readiness cannot be overlooked. Adopting autonomous networks requires shifts in workforce skills, moving towards data science, policy management, and AI oversight rather than routine operational tasks. Operators must foster an 'AI-first culture,' ensuring that teams trust AI-driven insights and decisions. Aligning automation initiatives directly with customer outcomes, such as Telekom Malaysia's customer-centric automation strategy, helps motivate teams and overcome internal resistance.

Seizing the Autonomous Advantage

Autonomous networks are reshaping telecom operations, promising enhancements in service quality, efficiency, and agility. The shift towards Level 4 autonomy is essential to meet future demands, delivering near-perfect availability, real-time service delivery, substantial OPEX reductions, and new revenue streams through innovative, customized services.

For CTIOs, CTOs, and Chief Network Architects, the mandate is clear: invest now in AI capabilities, modernize data architectures, and proactively engage in collaborative industry standards. Begin targeted domain-specific autonomous projects, build internal expertise, and cultivate organizational acceptance of AI-driven decision-making.

TM Forum is taking a leading role in bringing the industry together to deliver on the promise of Autonomous Networks Level 4. In collaboration with our members, we have developed three industry missions: composable IT & ecosystems, autonomous networks, and AI & data innovation, that will unlock growth for the industry. No mission can be undertaken on its own, and greater autonomy is key to delivering on that growth promise.

Telco's future is heavily dependent on embracing and mastering autonomous network operations today. The CSPs who successfully navigate the path to Level 4 autonomy will not only meet tomorrow's challenges but actively shape the digital world ahead.

Join TM Forum in Copenhagen June 17-19th for DTW Ignite where you learn more about, and co-create, groundbreaking solutions to network challenges powered by end-to-end autonomous operations, AI-driven automation, and intent-based networking. You'll also see real-world solutions from CSPs that are already unlocking value from autonomous networks. Find out more and register here: <https://dtw.tmforum.org>.