Capgemini × TELUS

From automation to autonomy

How telcos turn network complexity into competitive advantage

Contents

Executive summary

Communication networks are entering a phase where traditional operating models can no longer keep pace with rising complexity, cost pressure, and customer expectations. While automation has delivered incremental efficiency, it is no longer sufficient to address the scale, speed, and variability of modern networks. Autonomous networks represent the next structural shift moving from rule-based execution to intent-driven, AI-enabled decision making.

For service providers, autonomy is more of a business imperative rather than a technology aspiration. Autonomous networks enable sustainable cost reduction, faster innovation cycles, improved resilience, and differentiated customer experiences. They provide the operational foundation required to support 5G evolution, cloudification, network slicing, edge services, and future connectivity models.

Competitive advantage in telecom will increasingly be determined by how effectively operators can translate network capabilities into business outcomes. Autonomous networks allow CSPs to operate with greater predictability, agility, and confidence transforming the network from a cost center into a strategic asset. Those who scale autonomy will outperform peers on efficiency, time-to-market, and experience; those who do not risk structural disadvantage.

Autonomous networks represent the next structural shift moving from rule-based execution to intent-driven decision making.

Redefining network operations for business impact

Automation focuses on executing predefined tasks more efficiently. Autonomy goes further: it enables the network to understand intent, evaluate options, act independently within defined guardrails, and continuously learn from outcomes. This shift fundamentally changes how networks are operated, governed, and monetized.

Autonomy reduces dependency on manual intervention and fragmented tooling, replacing them with closed-loop intelligence that spans planning, build, operate, and optimize. For business leaders, this means lower operational risk, improved service consistency, and a scalable operating model that can absorb growth without linear cost increases.

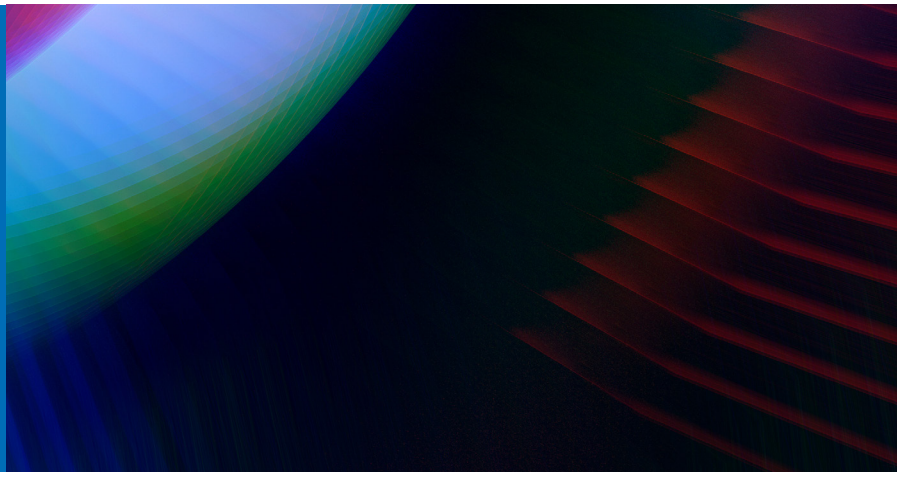
Traditional operations are largely reactive responding to alarms, incidents, and performance degradation after customer impact occurs. Autonomous networks enable a proactive model, where intent is translated into policy, and AI systems continuously anticipate issues, optimize performance, and self-heal before problems manifest.

This transition unlocks measurable business value: fewer outages, reduced mean time to resolution, improved SLA adherence, and stronger trust with enterprise and ecosystem partners.

Some of the key areas to focus while redefining automation are:

- Digital twins to optimize performance, energy and resource planning through real-time simulation
- GenAI for resilience, predicting issues and automated remediation for critical services
- Closed-loop optimization to dynamically adjust capacity, energy consumption and resources on demand
- AI-enabled lifecycle automation, reducing unintentional errors while configuring networks. Self-optimizing networks, continuously tuning network parameters based on live KPIs
- Telco-specific AI models to automate design, operations, customer experience and planning
- Interoperability of AI agents with significant guardrails keeping security and resilience as a core element for designing networks

Autonomy reduces dependency on manual intervention and fragmented tooling, replacing them with closed-loop intelligence.



Enablers of the autonomous network journey for a telecom service provider

Autonomy requires intelligence embedded across domains RAN, transport, core, cloud, and service layers. Closed-loop control systems, informed by real-time data and contextual knowledge, allow decisions to be executed and validated continuously. AI becomes an operational co-pilot, augmenting human expertise rather than replacing it.

In the TM Forum Autonomous Networks maturity model, progressing from domain-specific automation (Levels 1–2) to cross-domain intent-based orchestration (Levels 3–4) requires the integration of AIOps functions such as real-time monitoring, event correlation, incident and problem management, and automated change execution. By embedding the AIOps lifecycle across OSS/BSS and network layers, closed-loop controls can evolve into predictive, business-driven optimization systems aligned with enterprise policy and customer experience objectives.

Digital twins provide a virtual representation of the live network including its hidden correlations, enabling simulation, prediction, and risk-free optimization. When combined with agentic systems, they allow autonomous actions to be tested, refined, and scaled with confidence. This capability is essential for managing complex, multi-vendor environments and for accelerating innovation without compromising stability.

These twins become exponentially more valuable when fed by robust AIOps DataOps pipelines that ingest, cleanse, and enrich multi-domain telemetry. Coupled with a causal knowledge graph, they enable determining the impact radius of network events on services, which is critical for creating proactive operational guardrails to automatically prevent issues. This integrated context supports what-if scenario analysis, anomaly simulations, and policy-driven optimizations before live implementation, accelerating AN maturity while minimizing operational risk.

Autonomy must be explainable, auditable, and aligned with regulatory and operational constraints. Governance frameworks, human-in-the-loop controls (when necessary), and standardized interfaces are critical to building trust in autonomous decisions. Industry collaboration across CSPs, vendors, and partners is essential to establish shared standards and interoperability.

Governance frameworks should incorporate TM Forum Autonomous Network Effectiveness Indicators to continuously measure resilience, agility, and trustworthiness. Policy-based intent translation must be linked to AIOps-managed automation workflows, with built-in human-in-the-loop/automated checkpoints and full audit trails. Establishing interoperability through TMF Open APIs ensures consistent policy enforcement across multi-vendor ecosystems while enabling collaborative innovation between CSPs, technology partners, and standards bodies.

Business outcomes for service providers

Autonomous networks significantly reduce manual effort, tool sprawl, and process fragmentation. By optimizing resources dynamically and resolving issues autonomously, operators can achieve material OPEX reductions while improving network reliability.

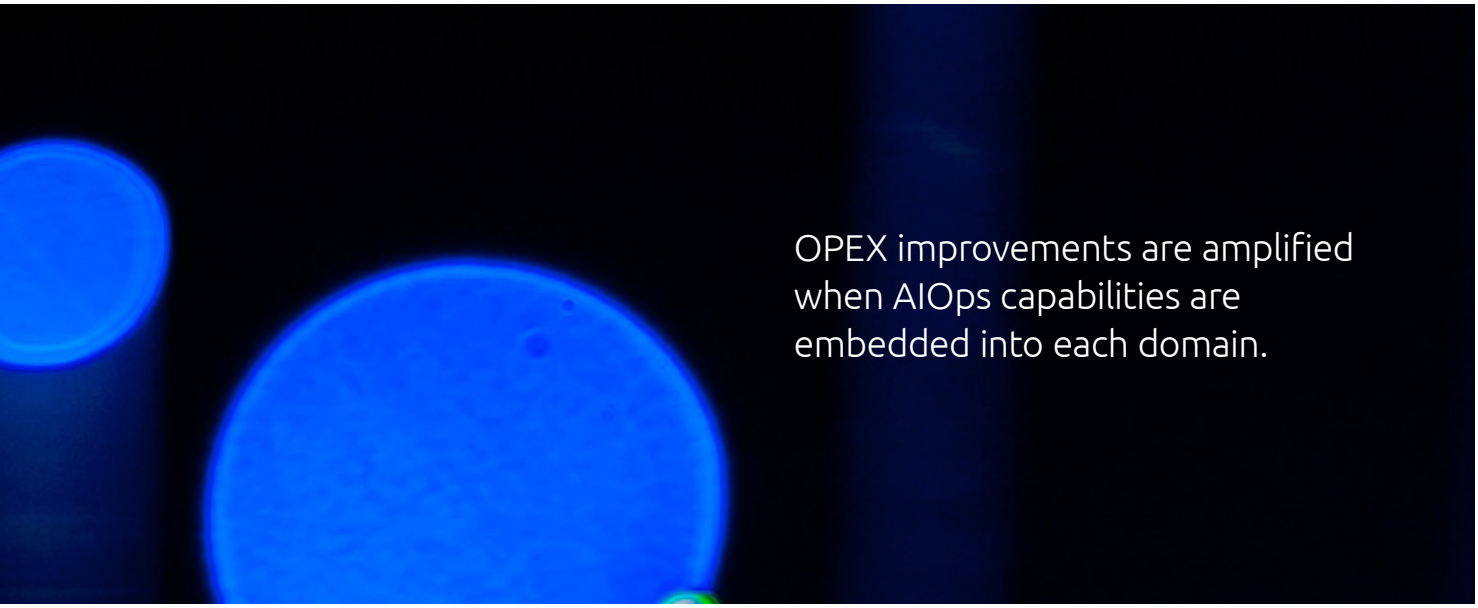
OPEX improvements are amplified when AIOps capabilities are embedded into each domain. Multi-domain AI correlation ensures that faults are not only fixed faster but prevented through proactive anomaly mitigation, increasing Mean Time Between Failures (MTBF) and reducing Mean Time to Repair (MTTR).

With autonomy, new services can be launched faster and scaled with confidence. Intent-driven operations shorten design-to-deploy cycles, enabling CSPs to respond rapidly to market opportunities and partner demands.

In TMF AN Levels 3–4, this acceleration comes from translating commercial intent into resource orchestration through policy-based automation and zero-touch provisioning. The AIOps-driven continuous integration and automated testing workflows reduce deployment risk, while AI-assisted change governance ensures compliance with service-level objectives and regulatory requirements.

Consistent performance, proactive assurance, and personalized service experiences become achievable at scale. Autonomous networks strengthen customer trust and enable deeper ecosystem integration, particularly for enterprise and industry use cases.

Through integration with AIOps Knowledge Management and Effective Indicators (per TMF IG1256), CSPs can deliver measurable improvements in customer experience KPIs—such as latency, service availability, and satisfaction scores—and share these transparently with partners. Digital twins, enriched by AIOps DataOps pipelines, enable ecosystem co-innovation workflows and joint service assurance models across verticals like healthcare, manufacturing, and smart cities.



Foundations and enablers in TELUS: The role of TINAA

At TELUS, the journey toward autonomy is grounded in a strong automation foundation. The TELUS Intelligent Network Analytics & Automation ecosystem (TINAA) serves as the strategic backbone for network automation, orchestration, and assurance across domains. TINAA provides a unified, scalable platform that standardizes processes, integrates data, and enables closed-loop operations.

In the TMF Autonomous Networks journey, TINAA enables TELUS to take deliberate steps from Level 3 (Conditional Autonomous Operations) toward Level 4 (High Autonomy) by serving as a unified orchestration and assurance plane. Its integration of AIOps functions—monitoring, event correlation, incident resolution, and performance optimization—ensures that automation is not limited to single domains but spans RAN, transport, core, and service layers, delivering true cross-domain intelligence.

TINAA operationalizes the MAPE-K model—Monitor, Analyze, Plan, Execute, with Knowledge—enabling continuous negative control feedback loops across the network stack. This architecture allows TELUS to progressively introduce AI-driven decision making while maintaining operational control and transparency.

The MAPE-K cycle within TINAA is augmented by AIOps data pipelines that feed high-quality telemetry into AI/ML models for real-time anomaly detection, root-cause analysis, and predictive planning. This gives TELUS the operational maturity to translate commercial intent directly into automated, closed-loop network actions, ensuring compliance with SLAs and regulatory policies.

By incorporating digital twins and agentic AI capabilities into TINAA, TELUS can simulate network behavior, optimize configurations in real time, and safely expand the scope of autonomous actions. This approach balances innovation speed with operational assurance.

By embedding AIOps Knowledge Management and TMF AN Effective Indicators into digital twins, TELUS can measure and track improvements in efficiency, reliability, and customer experience. Agentic AI modules operate with policy-based intent translation aligning autonomous decisions with business strategy while maintaining human-in-the-loop governance for high-impact changes.

Architecture overview: TINAA platform + mediation layer + applications

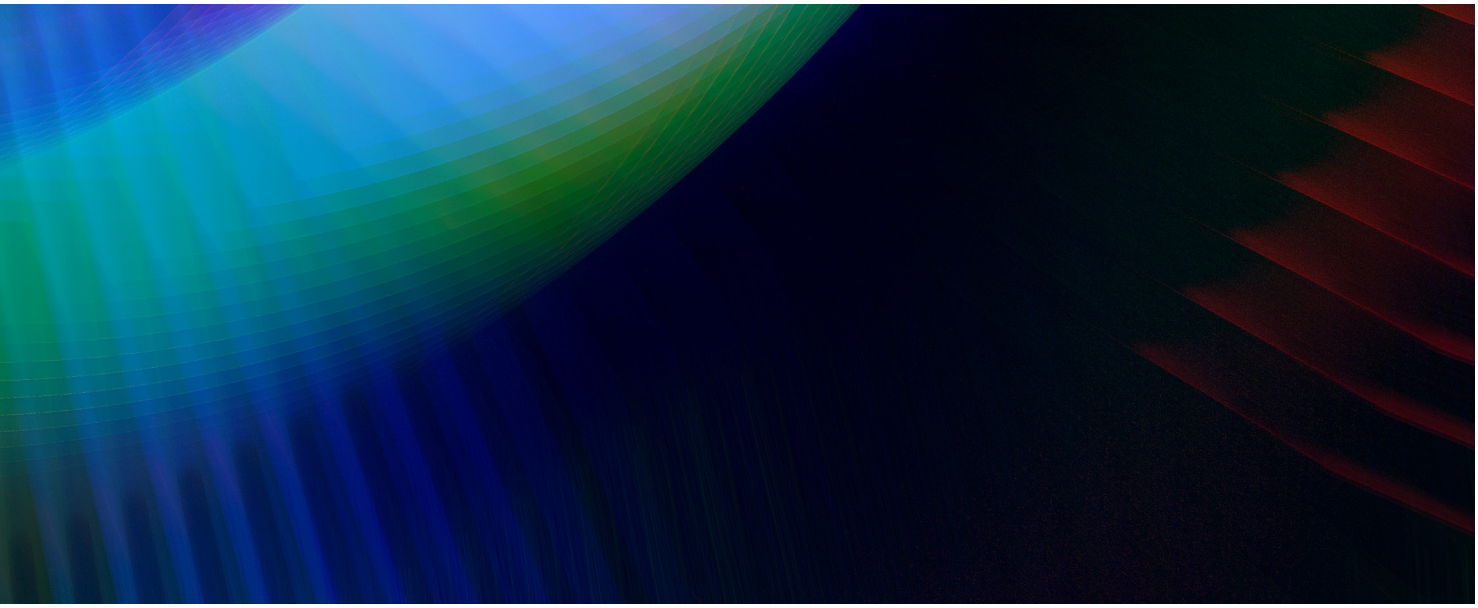
This section describes the end-to-end architecture for the Proof of Value (PoV) built on TELUS' TINAA (TELUS Intelligent Network Analytics & Automation ecosystem) platform, and a set of application-level automation use cases. The architecture aligns with TM Forum Autonomous Networks Level 4 principles intent-driven operations, closed-loop assurance, and explainable AI while leveraging cloud-native services (GCP/OCP) for scale, resilience, and velocity.

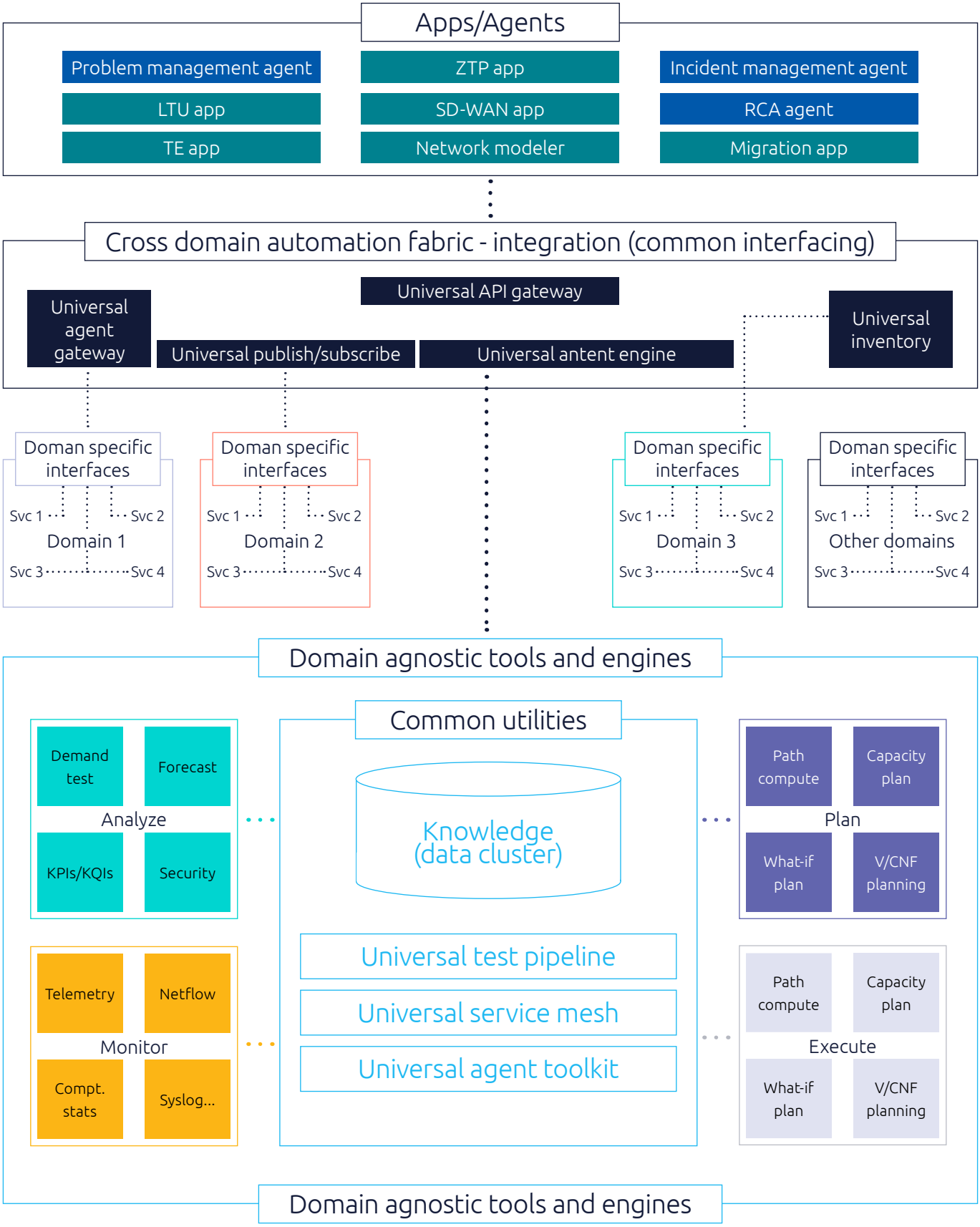
TINAA ecosystem: core capabilities (vision)

- Unified automation backbone across Wireline, Wireless (RAN/Core), Transport, and Service layers
- MAPE-K (Monitor–Analyze–Plan–Execute with Knowledge) closed-loop model operationalized
- Cloud-native target architecture on Hybrid cloud primarily including Google Cloud Platform (public cloud) and OpenShift (On-Premise) with Standardized interfaces

Resource mediation and abstraction layer that presents a Common information model for managing multi-vendor network elements. Resource demarcation point and interfaces can be considered as I type Intent interfaces from Resource layer of TMF AN model to Service layer.

- Inventory federation to enable a Single Source of Truth and centralized knowledge graph Intent translation and execution





Cloudified network

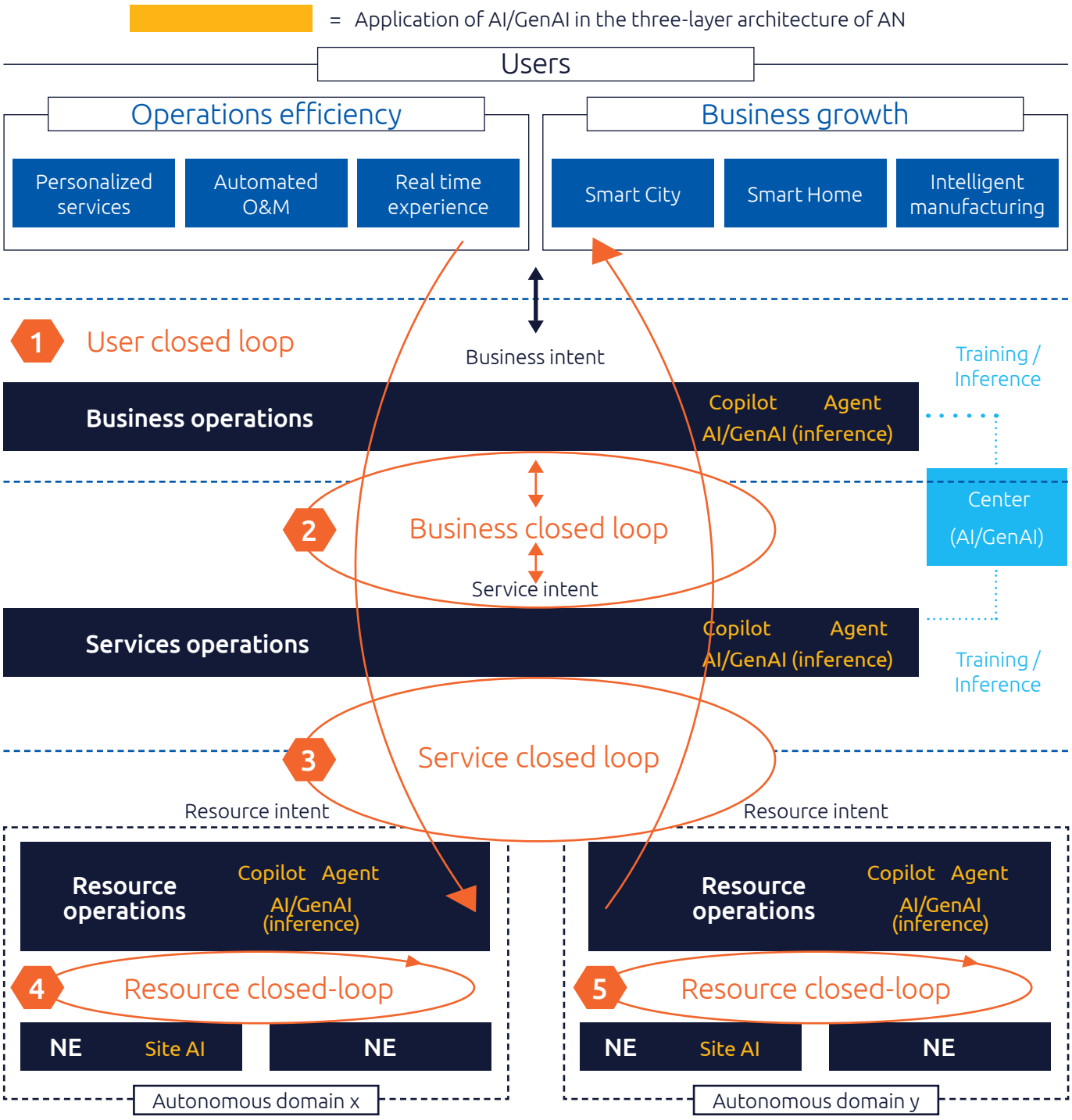
Figure: TELUS TINAA architecture

TELUS mediation and abstraction layer (resource layer)

The resource mediation layer introduces a Resource YANG-based abstraction (OpenConfig-focused 'MicroTemplates') that decouples Service intents from device-specific configurations. This enables service-to-resource decomposition, reusable automation components, and consistent policy enforcement across multi-vendor environments. The layer can be implemented inside an orchestrator such as Cisco NSO (two-step mapping) or externalized at the Service/ Application tier, depending on deployment preferences.

- Service YANG (e.g., IETF L3VPN) Resource YANG (OpenConfig) decomposition
- Reusable 'MicroTemplates' for IF, MPLS, BGP, VLAN, QoS
- TMF Open API alignment for intent ingestion and exposure
- Option to map inside NSO or at the application/service layer for portability

The solutioning architecture and platform services overview follows the full stack AI/Gen AI recommendation of TMF AN Stack



Full-stack AIIGenAI in AN
At AN Level 4, AI/GenAI willl be Widely used in the three-layer architecture of AN. Two types of agent applications, including **copilot** oriented to operations roles and **agents** oriented to operations scenarios, are used to enhance the autonomous capabilities of each layer.

Business/Service operations: Agents are developed for users, businesses, and service operations to achieve an E2E autonomous closed loop. AI/GenAI on which the agents depend can be implemented in either of the following modes:

- Model inference integrated to the agents
- Model training/inference centrally provided by the cloud Al center

Resource operations: Agents integrating AI/GenAI model inference collaborate with intelligent NEs to implement a closed loop of single-domain network autonomy.
NE: Built-in Al models offer local inference, highprecision awareness, and control capabilities.

Figure: Full-stack AI/GenAI in three-layer architecture of AN

Application layer and use cases

- Planning: Digital Twin for network planning, capacity estimation, and forecasting
- Provisioning: Workflow automation for L2/L3VPN, EVPN, zero-touch detection and service activation
- Assurance: Health monitoring, alarm correlation, SLA analytics, predictive failure detection
- Maintenance: Software upgrades, configuration a udit/validation, regression test automation
- Support: Field operations assist, guided remediation, inventory reconciliation

Agentic AI & closed-loop operations

The PoV will demonstrate agentic workflows that dynamically orchestrate programmatic automation microservices, with human-in-the-loop initially and progressive autonomy. Intent parsing, plan-and-execute loops, memory/knowledge integration, and guardrailed execution will be showcased, culminating in explainable, auditable closed loops aligned to TMF L4.

PoV scope, success criteria, and KPIs

- Deploy baseline automation services on TINAA and integrate mediation layer
- Demonstrate at least one end-to-end service (e.g., L3VPN) from intent to device with validation
- Show closed-loop detection of intent drift and automated correction in a controlled scenario
- Produce measurable KPIs: provisioning time reduction, error rate reduction, MTTR improvements
- Illustrative KPIs for the PoV include: (a) 40–50% reduction in manual steps for provisioning, (b) measurable reduction in configuration defects via template reuse, (c) improvements in MTTR through proactive detection and guided remediation, and (d) OPEX optimization through cloud cost-aware design.

Environment and tools

- Cloud: GCP as primary; OpenShift for container orchestration where applicable
- Automation: Cisco NSO (or equivalent), workflow orchestrator, API Gateway
- Data & Observability: Telemetry pipelines, MELT (Monitoring, Events, Logs, Traces)
- Security/IAM: SSO, RBAC / ABAC, ZTNA-aligned (Zero Trust Networking Access) controls

The PoV will demonstrate agentic workflows that dynamically orchestrate programmatic automation microservices

TELUS and Capgemini's role in accelerating autonomy

TELUS and Capgemini bring complementary strengths: operational leadership and domain depth from a Tier-1 CSP, combined with Capgemini's global engineering, AI, and systems integration expertise. Together, they define a pragmatic, outcome-driven framework for progressing from automation to autonomy.

Autonomy cannot be achieved in silos. Capgemini's experience integrating complex, heterogeneous network environment enables TELUS to scale TINAA across vendors, technologies, and operational domains while preserving interoperability and resilience.

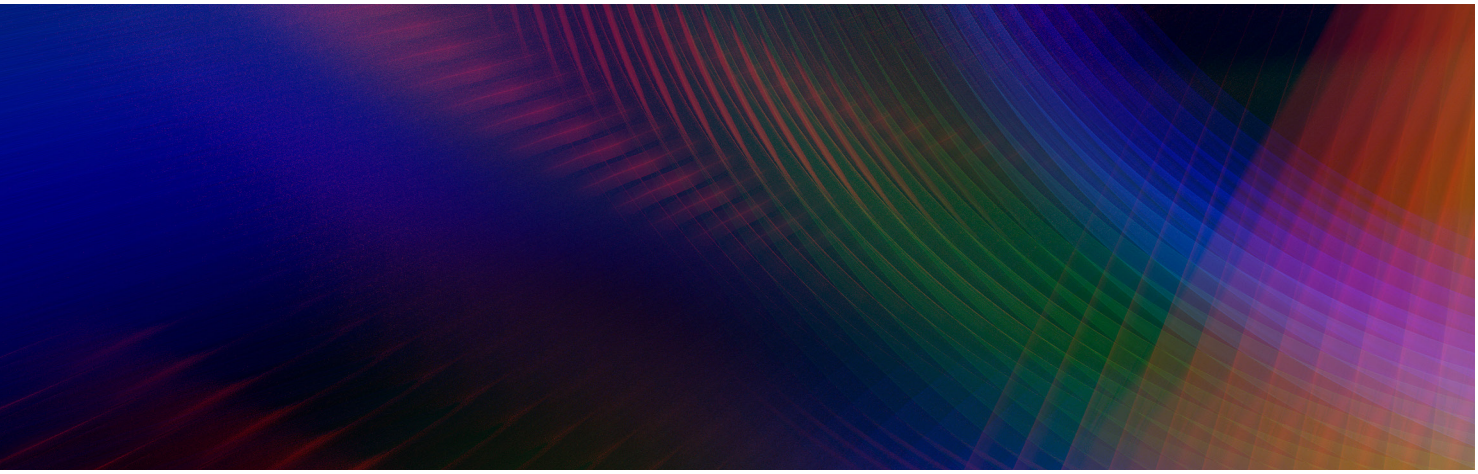
The partnership leverages reusable accelerators, reference architectures, and a strong ecosystem spanning network vendors, hyperscalers, and AI platforms. This reduces time-to-value and de-risks large-scale transformation.

The path forward

The journey to autonomy is incremental and deliberate. CSPs should start by strengthening data foundations, standardizing automation platforms, and introducing AI in clearly bounded use cases. Trust, governance, and organizational readiness must evolve in parallel with technology.

Scaling autonomy requires a clear roadmap moving from isolated pilots to domain-level autonomy, and ultimately to cross-domain, intent-driven operations. TELUS and Capgemini's joint experience demonstrates that sustained business value comes from aligning technology, operations, and strategy around a shared vision of autonomous networks.

TM Forum: Autonomous Networks



For more details, contact:

Ali Tizghadam
Fellow & Chief Automation Architect TELUS

Kalimani Govindarajan
Technology Director
Capgemini

Shamik Mishra
Vice President & CTO
Connectivity Capgemini

Ammar Al Betar
Senior Director - Telecom Industry Leader, Capgemini

Asheesh Rangnekar
Vice President, Sector Leader
Telecom, Retail and Services,
Capgemini Canada

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About TELUS

TELUS is a world-leading communications technology company operating in more than 45 countries and generating over $20 billion in annual revenue with more than 21 million customer connections through its advanced suite of broadband services for consumers, businesses and the public sector. Leveraging technology to enable remarkable human outcomes, TELUS is passionate about putting its customers and communities first, leading the way globally in client service excellence and social capitalism.

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