Building Autonomous Networks journey with Cisco Crosswork Network Automation

CISCO Live !

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BRKSPG-2870

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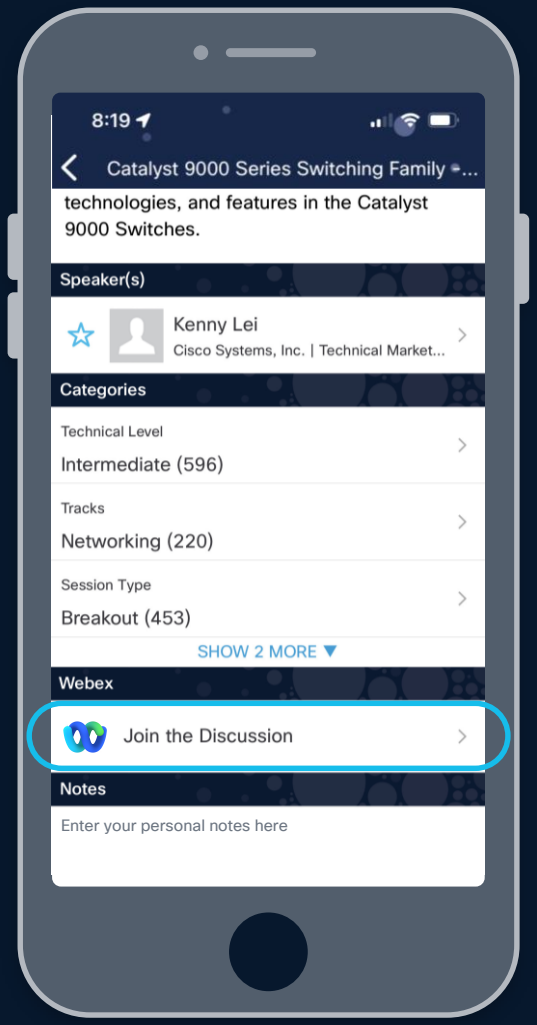
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Evolving Expectations

Cloud era market entrants have redefined the **user experience standards**

Mounting Operational Costs

OPEX continues to strain business continuity, making efficiency and cost optimization critical

Rising Complexity

Decades of **accumulated technologies and processes** have created an intricate environment

Resource Contention

Workforce reduction and top **talent attrition** to other market verticals challenge pace of innovation

Network Providers in the Eye of a **Perfect Storm**

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Agenda

01 Drivers for autonomous networking

02 Blueprint for Autonomous Networks

03 Crosswork Introduction

04 Use-Cases: Level 2, 3 and 4

05 Use of Agents and Multi-Agents

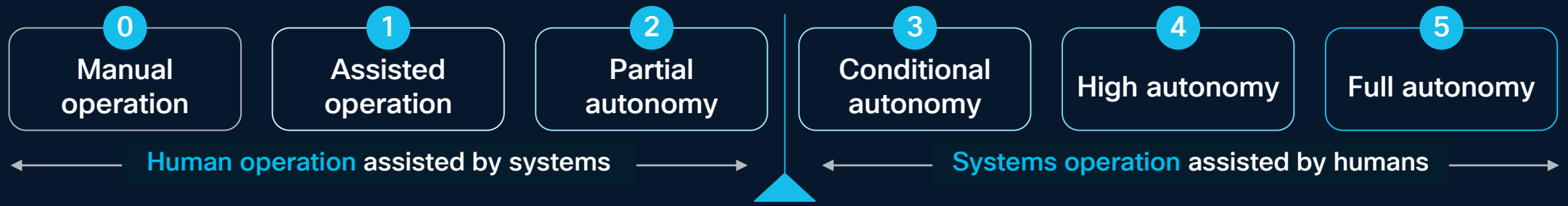
06 Use-Case Demonstrations

07 Summary

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Journey and drivers for Autonomous Networking

Autonomous network levels



84%

of companies are currently at initial levels of autonomy

The big disruption

61%

aiming to achieve Level 3 or above by 2028

Source: Capgemini Research Institute, Autonomous Telco Network Survey

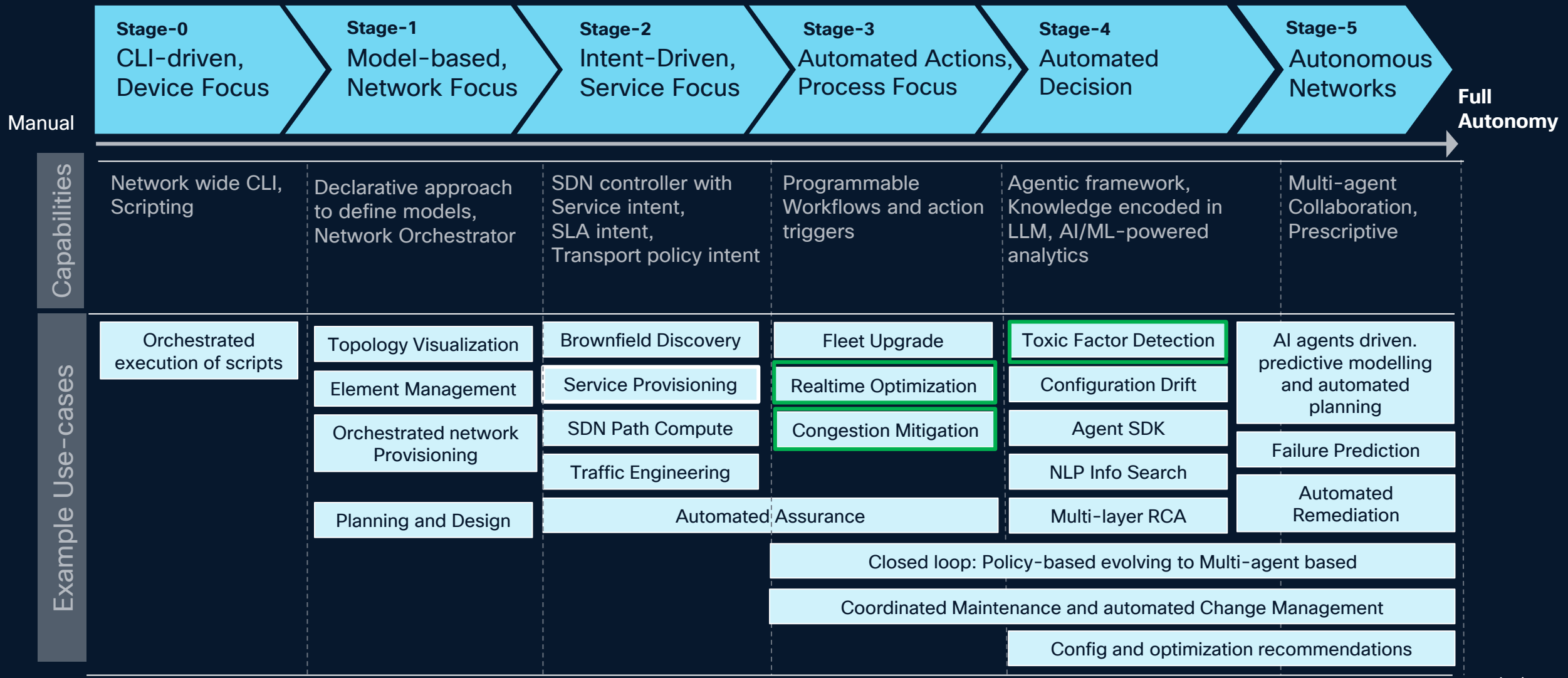
- Network Monetization
- Operational efficiency
- Resource efficiency and energy savings
- Experience excellence

Source: Cap Gemini "Capgemini Research Institute, Autonomous Telco Networks Survey, December 2023-January 2024

Source: https://inform.tmforum.org/research-and-analysis/reports/autonomous-networks-exploring-the-evolution-from-level-0-to-level-5

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Building a blueprint for Autonomous Networks



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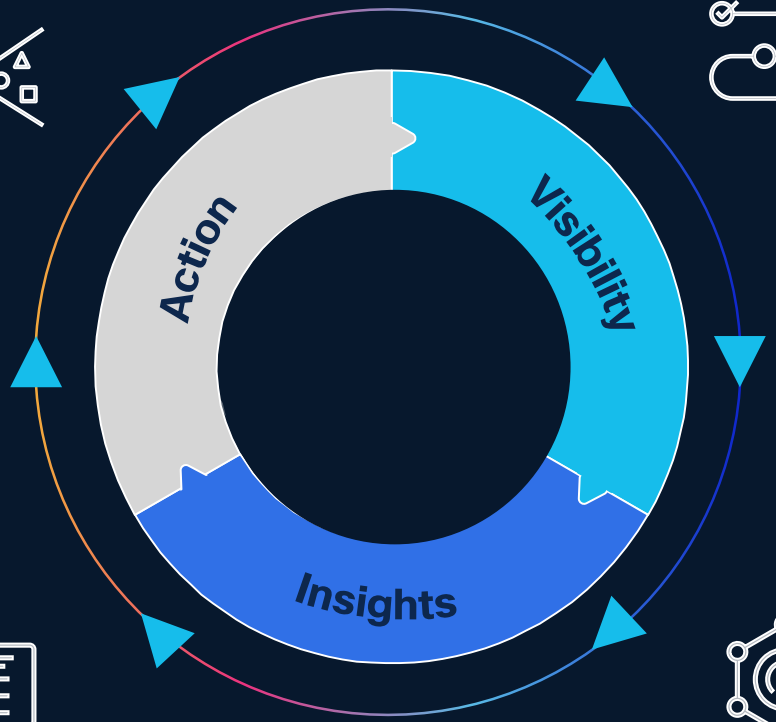
Demonstrated in the session

Simplifying the modern multivendor, multidomain network

Visualization
Single pane of glass, unified visibility across IP and Optical domains

Automated assurance
SLA adherence and digital experience assurance

Planning
Network planning and resource allocation



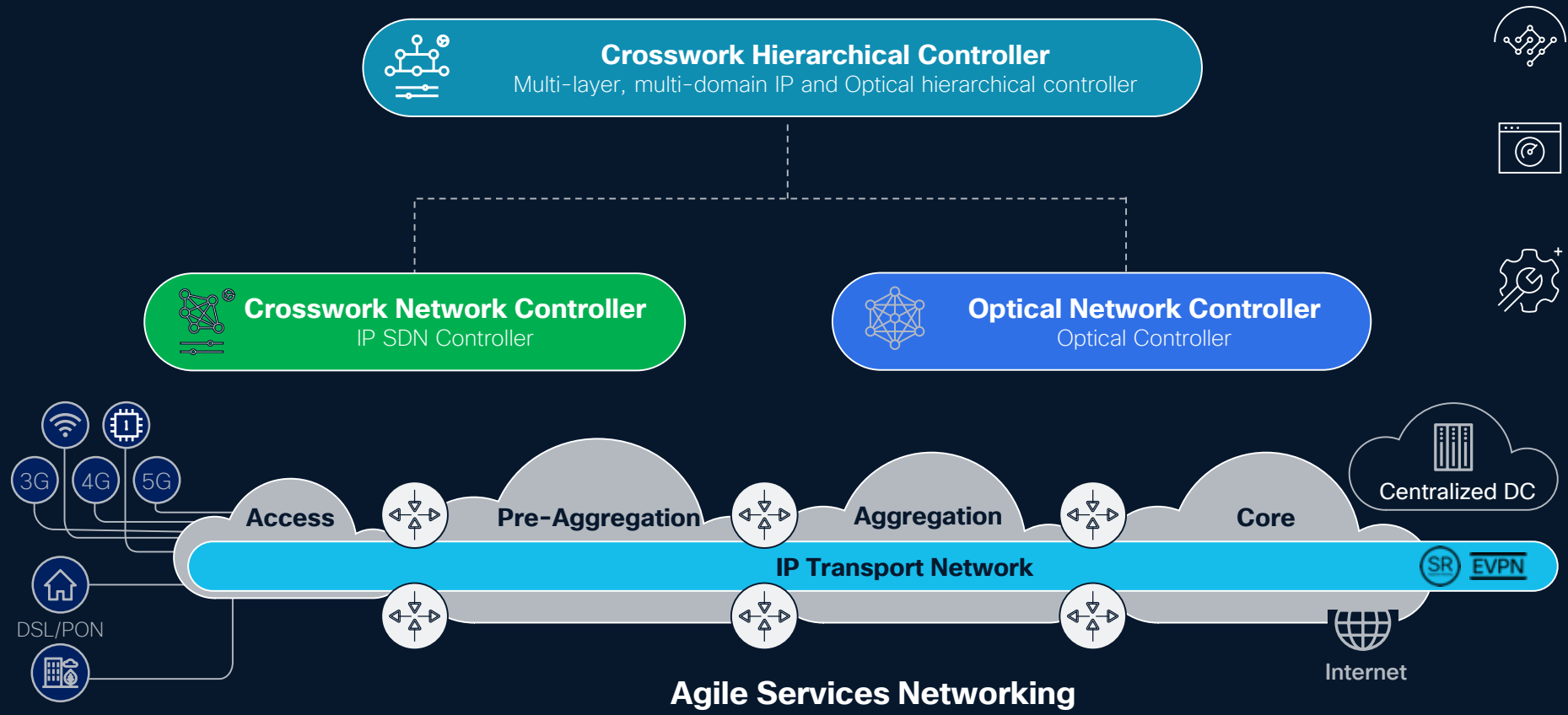
Workflow
Low-code process automation

Service Orchestration
Device configuration and service provisioning

Optimization
Segment Routing path optimization leadership
Top-rated IP SDN Controller per leading operators

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Crosswork Automation Portfolio



Crosswork NSO
Service orchestration

Crosswork Planning
Capacity planning tool

Crosswork Workflow Manager
Process automation

Follows principles of RFC 8453/ACTN Framework
Endorsed by major Service Provider

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Introducing Crosswork Network Controller Premier

Reinforcing the journey to realize closed loop and autonomous networks

Open, Programmable, Customizable and Extensible

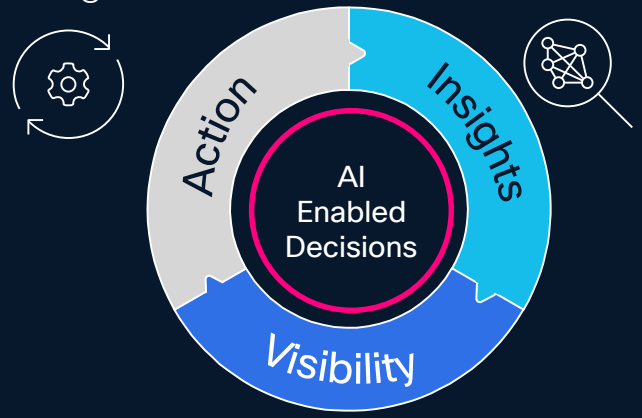
Workflow based Actions (CNC 7.1)

Powered by embedded Workflow Engine

- DIY Workflow Development
- Pre-packaged workflow

Target use-case examples:

- Remediation
- Maintenance
- Config push
- Ticket creation



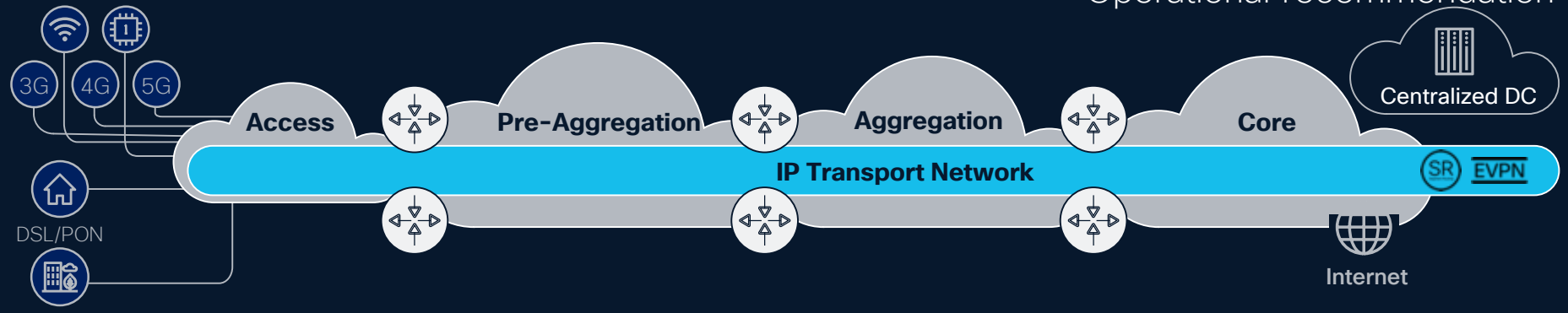
AI-enabled Insights (Roadmap)

Powered by embedded Foresight capabilities

- Multi-agentic framework for AIOps and decision making
- SDK for 3rd-party agent development

Target use-case examples:

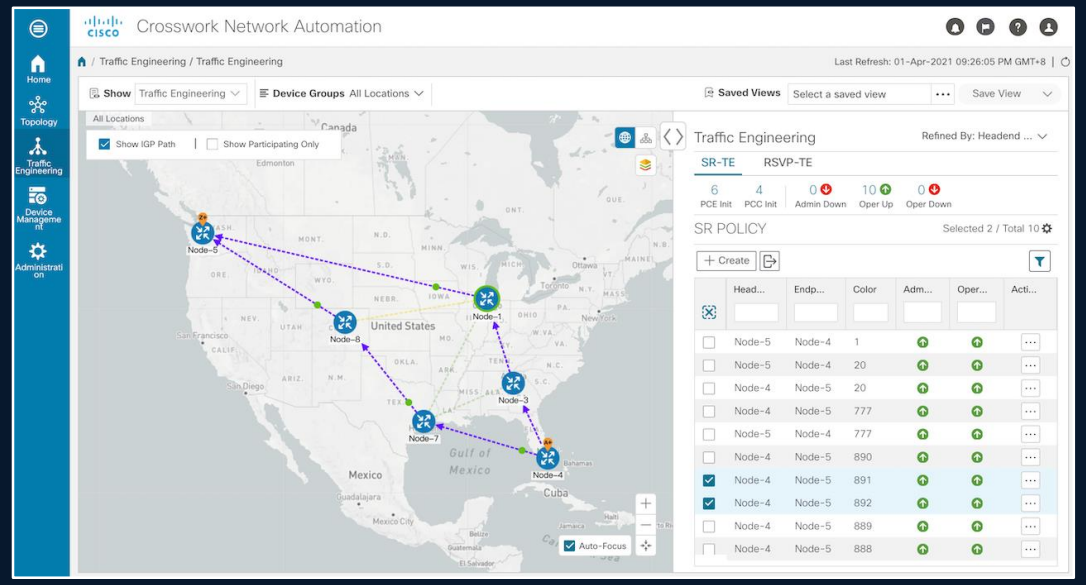
- Anomaly detection
- Configuration drift
- Toxic factor Identification
- Operational recommendation



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Automated Service and transport provisioning

Intent-based automation



SR policy SLA objectives and constraints	
Objective	Latency/IGP/TE metric minimization
Constraints	Affinities, disjoint paths, bandwidth

Rapid time to value

Challenges:

- Cumbersome and time-consuming service provisioning
- Missing transport and service context linkage and visibility, need to satisfy service-specific performance objectives, such as low latency

Solution:

- Intent-based automated provisioning
- Customizable service intent with explicit SLA definitions
- Service topology visualization with actionable operational context (health, path changes, etc.)

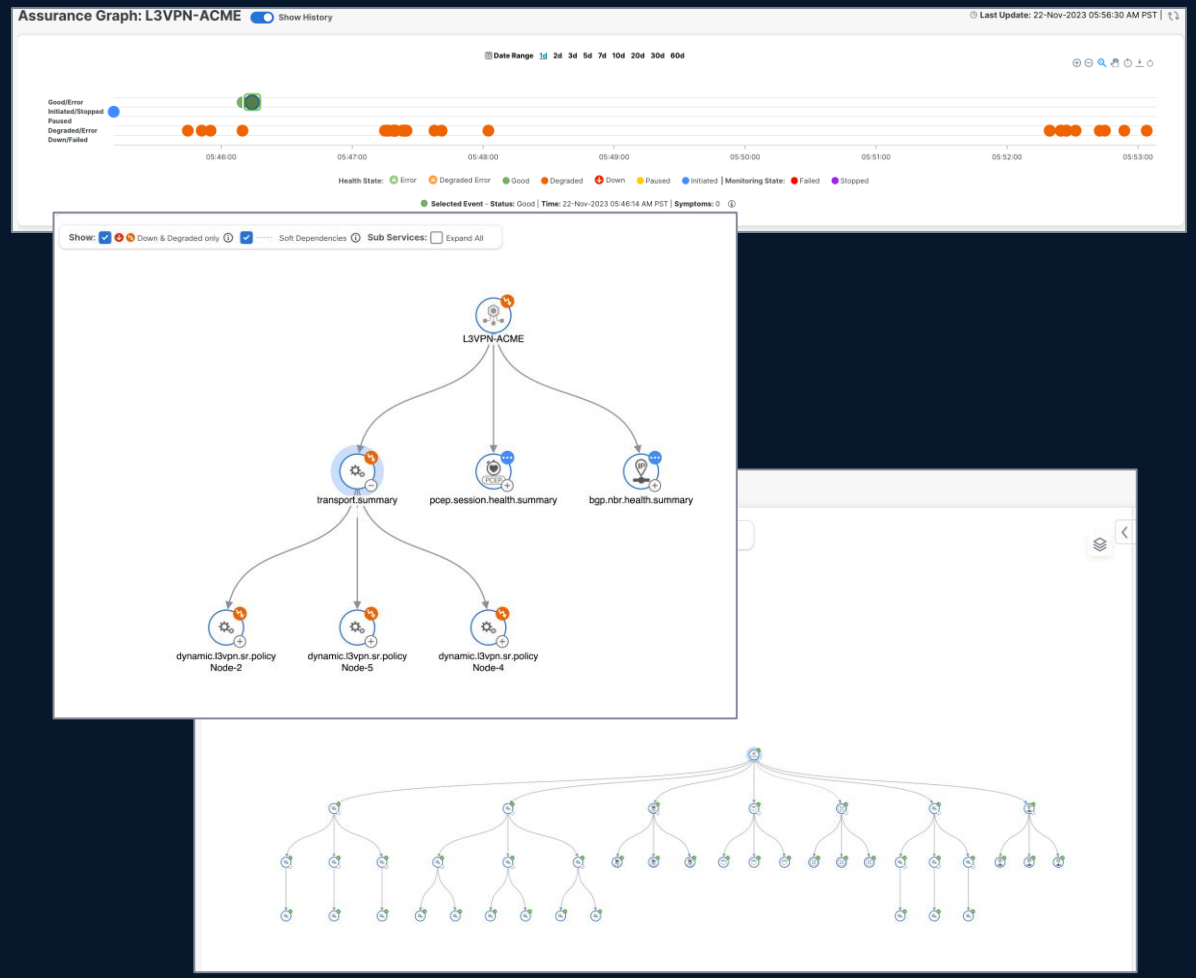
Outcomes:

- Rapid time to value with provisioning reduced from weeks to minutes

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Automated Assurance: Service Health Monitoring

Enhanced end-user experience with expedited troubleshooting



Challenges:

- Decoupled Service Provisioning and monitoring
- Disconnect between customer service experience and network health

Solution:

- End-to-end service health monitoring
- Proactive causality models
- Linkage between service and underlying components

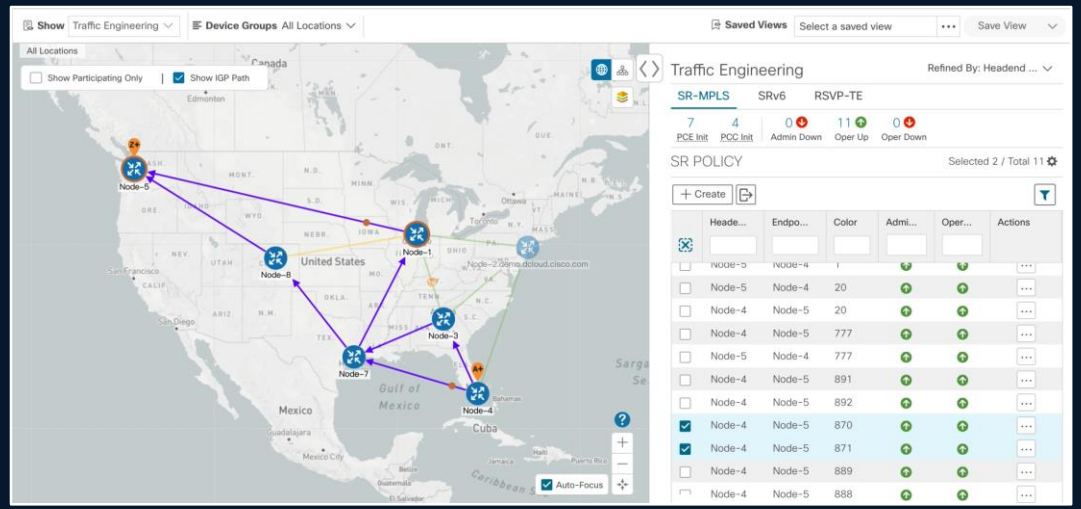
Outcome:

- Reduction in Time to Detect service issues and remediation
- Improved user experience and operator productivity

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Real-time network optimization

Closed Loop Operation



SR policy SLA objectives and constraints	
Objective	Latency/IGP/TE metric minimization
Constraints	Affinities, disjoint paths, bandwidth

Preserved service intent

Challenge:

- Manual re-optimization based on network changes is not scalable and poses risk to target SLAs

Solution:

- Define policy intent once
- Automatically detect topology changes
- Real-time recomputation of paths in violation of “optimization metric” aka intent
- Optimized path is automatically provisioned

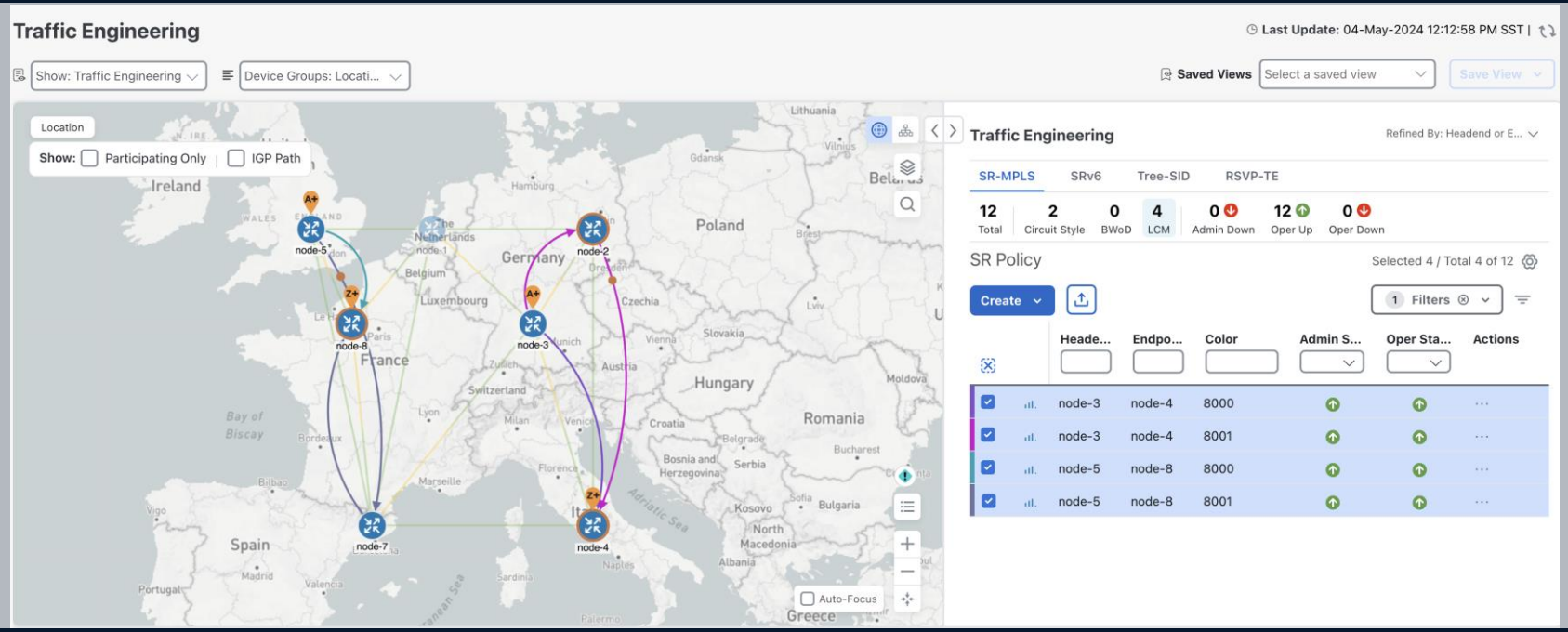
Outcomes:

- Preserved service policy intent and associated SLAs
- Enhanced operational agility with real-time action
- Achieved optimal utilization of network capacity

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Congestion Mitigation

Quickly mitigate impact on end-user experience



Challenge

- Dynamic network state with risk of congestion leading to degraded service levels and user experience

Solution

- Congestion handling in a localized manner using tactical traffic engineering policies
- Automated path recommendation to divert best-effort traffic
- User approval for path acceptance and automated provisioning
- Traffic steered on shortest path around congestion points

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Demo: Level 3 Use-cases
(Conditional Autonomous Networks)

Adoption of Autonomous Networks is no longer optional

Autonomy represents a paradigm shift for network operations

- Adaptive Learning
- Context-Aware reasoning
- Ability to address of long-tail operational situations

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What is the state of Autonomous Network adoption?

TM Forum's autonomous network levels – current and future (2028)						
Percent of telcos in the category	L0: Manual operation and maintenance	L1: Assisted operation and maintenance	L2: Partial autonomous networks	L3: Conditional autonomous networks	L4: Highly autonomous networks	L5: Fully autonomous networks
End-2023	9%	42%	42%	6%	1%	0%
End-2028 (projected)	0%	8%	31%	44%	16%	1%

Source: Capgemini Research Institute, Autonomous Telco Networks Survey, December 2023–January 2024, N = 113 large CSPs.

Significant shift in expectations

Examples: Zero-Wait Service Delivery, Self-Configuration, Self-Healing

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Level 4 Represents Significant Shift in Expectations

Perspective	Dimensions	L3 Characteristic	L4 Characteristics
Customer	Zero-wait	Automated service provisioning	Automated service delivery (E2E automation)
	Zero-trouble	Experience awareness and visualization, automatic complain diagnosis	Experience evaluation and assurance
	Zero-touch	Service progress and SLA visualization	Proactive recommendation and intelligent response
Network	Self-configuration	Configuration reviewed and automatically delivered	Pre-event simulation, Post-event verification
	Self-healing	Accurate fault identification and localization	Potential risk prediction and prevention
	Self-optimizing	Single objective optimization	Multi-objective collaborative optimization

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Why agents?

Autonomous AI agents represent a step change in adaptability, task complexity, scalability, and resiliency over current robotic process automation.

	Process Automation	Autonomous Agents
Use Cases	Automate **static, rule-based approach for repetitive** tasks, simple decision-making with criteria, predicable inputs/outputs	Operate in **complex, dynamic** scenarios that require understanding, planning and creative problem solving. AI to make decisions and adapt to **novel situations** and capable of learning from data and experiences (memory) to **improve** performance.
Learning and decision-making	**None**—all actions are pre-scripted. Any change requires manual re-coding by humans.	Have **learning** capabilities based on AI techniques like neural networks and reinforcement learning. Capable of **handling novel situations** without human involvement
Intelligence	Like a machine, very good at what it does, but **not intelligent**—no understanding or reasoning	Can **apply logic and reasoning** to data, can demonstrate **contextual awareness** some a degree of "**understanding**" (how much is both a matter of debate and rapidly evolving)
Lifecycle management	Changes to capability or scale must be **planned and implemented by humans**	**Intrinsic ability to adapt** makes agents more **resilient**. Scaling may necessitate more resources and new data strategy.

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Why multi-agents?

Parallelism	• Distribute tasks across multiple agents to speed execution • Share/aggregate learning from each agent—accelerate improvements
Specialization	• Develop agents with specific skills • Develop responses for specific environments
Scale	• Horizontal scaling • Targeting scaling
Modularity	• Update specific functionality in granular and minimally disruptive way • Leverage existing components to build new use cases
Better decision-making	• Make decisions based on multiple, diverse agent insights • Consensus-based decision-making to combat hallucinations
Resilience	• Redundancy, constrained blast radius for failures, self-healing, traceability

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Toxic Factor Detection

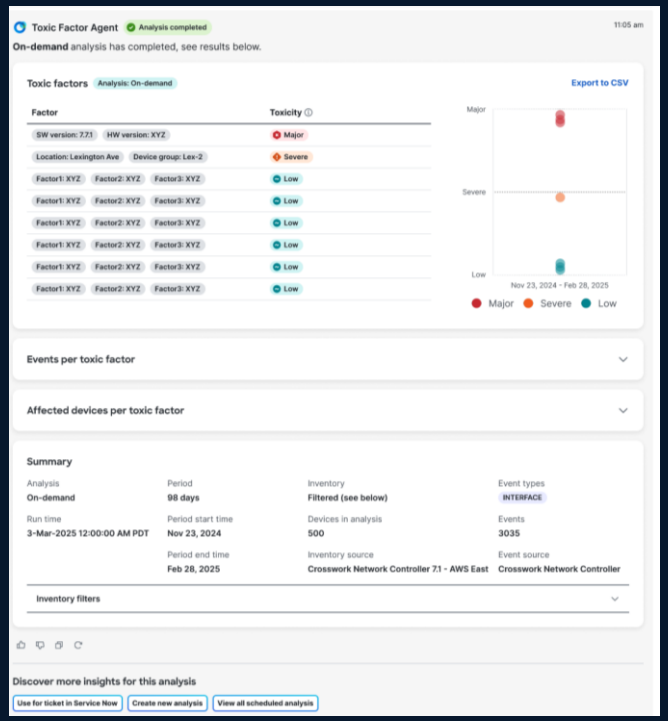
Toxic factor detection **is a generic functionality that may be leveraged to identify toxic patterns of factors that drive multiple failure types.**

Toxic Factor Detection Use Case

Description: Identify toxic patterns of factors that drive multiple failure types. May be periodically scheduled, and corresponding alerts may be provided to users.

Failure Types: Release 1.0: Interface flaps and BGP flaps.
Future releases: software failures, configuration failures, optical transceiver failures, fiber failures, connectivity failures, user authentication failures, etc.

Outcome: Enables informed decisions for SW/HW roll out and proactive updates of network.



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Demo: Level 4 Use-cases
(Highly Autonomous Networks)

Summary

Adoption of Autonomous Networks is no longer optional



Monetization of the network & new revenue streams



Operational Efficiency



Resource Efficiency & Energy Conservation



Experience Excellence

Telco sector is hovering around Level 2. CSPs that have successfully accelerated their automation journey have already reported a...

20%
Increase in operational efficiency

18%
Savings in network operational expenses

32%
projected decrease in emissions of the next 5 yrs

Level 3 and above will be key to unlocking the many competitive advantages autonomous networks promise.

30%
Reduction in OPEX compared to Level 2

Improvements up to
40%
In network responsiveness

10%
Potential increase in network capacity utilization

Source: Cap Gemini "Capgemini Research Institute, Autonomous Telco Networks Survey, December 2023–January 2024

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