Self-Healing Networks and Intelligence Architecture

The foundation for a self-healing network is built on an Intelligence Architecture.

SELF-HEALING NETWORKS

According to the TM Forum, "Autonomous Networks aim to revolutionize telecommunications by providing a seamless, zero-wait, zero-touch, and zero-trouble experience for CSPs' customers and their internal operations." In the TM Forum's Network Autonomy, level 4 signifies highly autonomous networks with systems making decisions largely independently and level 5 represents fully autonomous networks with complete self-management and no human intervention.

TOP DEPLOYMENT TRENDS IN SELF-HEALING

Troubleshooting, leveraging AI and Machine Learning is often the first area tackled. Much has been accomplished in data gathering but data federation and building intelligence using federated data is an ongoing activity. Using AI/ML techniques to automate root cause analysis has been the most prominent activity, providing observations across one or multiple domains to more accurately determine root cause and improve overall operational efficiency.

CRITICAL STEPS IN THE JOURNEY TO SELF-HEALING

There are five progressive moves towards a level 4 self-healing network.

1. Observability: Federated data is foundational. The ability to see not only within but across domains, stacks and customers.
2. Automation Steps: Automating steps in the assurance process including root cause analysis, dynamically setting thresholds, and initiating remediation activities like trouble tickets.
3. Service Orchestration: End-to-end orchestration in fulfilling customer requirements for a new service.
4. Leveraging captured data: Getting the right information to the right people at the right time.
5. Closed Loop: Closed loop resolution of issues with and without humans in the loop.

INTELLIGENCE ARCHITECTURES AS A REQUIREMENT FOR SELF-HEALING

A self-healing network requires the creation of many nested closed loops which poll in near-real-time; fixing issues discovered or requesting that orchestrators redesign the next-best configuration or otherwise fix issues. This requires the full range of intelligence and automation capabilities, with AI/ML providing the brain with various analytics models that are acting like the human nervous system to bring information to the brain. Closed-loop functionality is required to provide information back to the brain to improve the model. Doing this requires different ML models, knowledge bases, time-series databases, and monitoring across the network to bring in data from multiple domains. These capabilities are defined here as an "intelligence architecture".

KEY COMPONENTS OF AN INTELLIGENCE ARCHITECTURE

- **Data:** Gathering, federation, transportation and use of data for training models and their use.
- **Intelligence:** Development of models to improve RCA performance and KPIs. For complex self-healing problems for a service, this will likely need to be centralized.
- **Knowledge:** Federation and organization of knowledge that is about the network, services, devices and other elements, their descriptions and the relationships between them.

- **Agents:** Agents offer orchestration capabilities initially but will interact to solve problems or achieve specific goals as intelligence becomes more distributed. They will then inform downstream actuators to alert humans and update the right people and processes.

BUSINESS VALUE OF INTELLIGENCE ARCHITECTURE

The business value of an intelligence architecture is the move from individual assurance solutions focused on a particular piece of network equipment or a specific domain towards a single end-to-end, cross-domain view of a service or the experience of your customers.
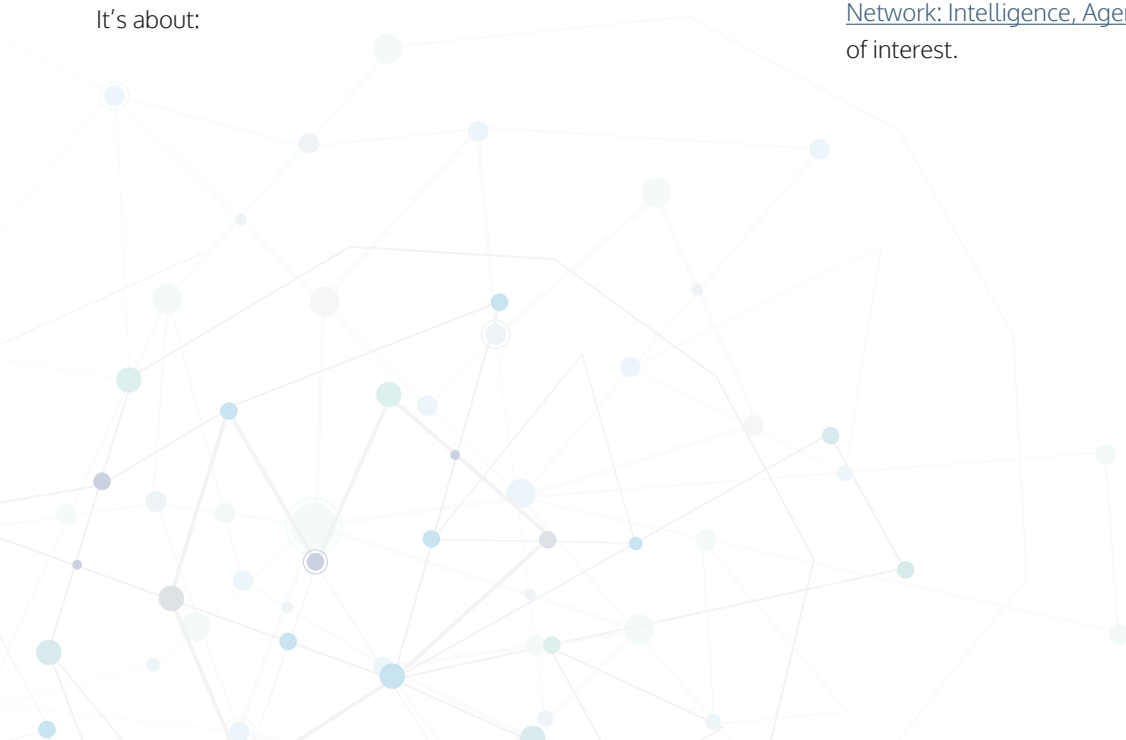
The value of the Intelligence architecture is not about saving headcount it's about doing things that couldn't be done before. It's about:

- Automating repetitive tasks such as low-hanging remediations (a Vitria customer found that these simple automations removed 20% of the workload from their skilled staff)
- Moving towards fully closed loop processes, with humans-in-the-loop when needed to build confidence, reliability and ensure adequate governance with each automation

Ultimately, it is about bringing the customer into the center of service assurance and delivering significant improvements to overall service delivery and service quality.

For more information on Intelligence Architecture and Self-Healing Networks, check out the white paper, "Journey to the Next-Generation of AI-based Service Operations".

Recent research summarized in "The Journey to a Self-Healing Network: Intelligence, Agents and Complexity" may also be of interest.