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Why Now is the Right Time to Automate

By: Teresa Monteiro, Walid Wakim

Demand for bandwidth has continued to surge with cloud-based applications and 5G; in tandem, optical services have become more dynamic and stringent in terms of required service levels.

The rise of AI creates a force multiplier, with network operators expecting it to drive significant traffic on their transport networks. But the high-throughput, low-latency, and reliability requirements of AI workloads are taking network scale and complexity to another level. Operators are now facing unprecedented pressure to deliver more, faster, and better.

On the one hand, they are expected to accelerate service turn-up and enhance end-customer experience; on the other, they must maximize returns on infrastructure investments and be ready to support emerging revenue-generating services.

Manual network management processes used for configuring and monitoring largely static optical networks are now insufficient to meet new, more dynamic connectivity challenges required in this AI era. Resulting in AI-ready optical networks requiring rapid and efficient service fulfillment and flexibility to offer different service types based on requirements, such as latency or resilience. In response, webscalers have led the network automation efforts, providing approaches that the broader industry can adopt.

The opportunity is clear — automation has the potential to reduce errors, simplify operations, accelerate response times, and unlock new efficiencies. Paired with mature enabling technologies, the benefits are there for those prepared to seize them.

The pressure to evolve

A 2024 Heavy Reading survey on "Open, Automated, and Programmable Transport Networks" highlights the growing importance of network automation. Increasing network complexity and scale drive the need for advanced automation techniques that abstract the underlying infrastructure details and simplify network operation.

Optical network automation is no longer a future goal but a present necessity. According to the survey, only a minority of operators continue to operate in a fully manual fashion. Instead, most describe their level of network automation as ranging from "assisted management" to "partial automation," with systems that make meaningful recommendations using a wide range of real-time data and advanced analytics.

The organizations that have implemented transport network automation reported significant benefits, including reduced human error thanks to more consistent processes and simplified operations with fewer manual interventions. Additional benefits include faster service activation, accelerating time to revenue, and optimized infrastructure usage, with improved capacity utilization and a higher return on investment.

The industry is focused on advancing network automation, and, according to Heavy Reading, operators are planning to move toward highly autonomous networks over the next three years.

Ready to deliver real results

Technological advancements made over the last decade are enabling automation to fulfill its promise, making the goal of automating more achievable than ever. For years, network automation was held back by fragmented management systems, proprietary interfaces and workflows, as well as limited visibility into network performance. Today, those barriers are being rapidly reduced with the appropriate automation frameworks.

Automation frameworks provided by standardization bodies and industry initiatives, such as OpenConfig's common data models and the Linux Foundation's Transport API (TAPI), have matured after undergoing extensive development and testing.

These frameworks enable uniform communication between network elements and controllers, as well as between different automation domains. Modern optical networking equipment supports vendor-agnostic data models and open APIs,streamlining integration with various other automation tools. At the same time, advanced network controllers feature modular software architectures and have also been designed around standard data models and open APIs, facilitating seamless communication both southbound into the network and northbound into diverse automation environments.

Additionally, the rise of streaming telemetry has transformed how operators access and use network data. Instead of relying on static network snapshots and a limited set of measurements, teams can now tap into real-time performance metrics originating from devices across the network. And if this influx of data becomes overwhelming, artificial intelligence and machine learning techniques can be employed to help analyze massive datasets, detect anomalies, and even predict behaviors before they occur.

The building blocks for automation are available and proven. Operators now have automation tools they can use for both simple and complex tasks. Network automation has moved beyond theory and labs to deliver real results in live environments.

Network automation in action

Operators are deploying automation to tackle use cases that improve efficiency and reliability and enhance service delivery. Here are some popular examples:

Optical automation initiatives often begin with comprehensive, systematic network performance monitoring, network health analysis, and consolidated network inventory and resource lifecycle management. These foundational use cases facilitate compliance with committed service level agreements and allow for better network utilization.

On-demand capacity fulfillment is another automation use case with clear benefits. Traditionally, delivering new capacity in an optical network requires lengthy manual analysis and processes, often leading to over-provisioning ahead of needs or the inability to respond in time. With automation tools, operators can benefit from uncluttered, dynamic visibility of their network, can easily assess resource utilization and traffic patterns to recognize trends and identify, allocate, and provision resources in real time, activating services and ensuring that capacity matches demand without delay or waste.

Fault localization and troubleshooting are areas where automation also helps. In complex networks, identifying the source of a failure can be time-consuming and disruptive. Automation can correlate events, pinpoint issues, and even suggest corrective actions, dramatically reducing mean time to repair (MTTR) and improving overall network availability.

Many networks have under-utilized or stranded spectrum, due to the accumulation of services that were never removed or inefficient spectral allocation, possibly made worse by the co-existence in the same link of several transponder generations with different spectral widths. Spectrum management and optimization are becoming more important as transponders move to higher baud-rates and need larger slices of contiguous spectrum. Automation solutions that help identify unused services and support defragmentation (reallocating existing demands in a way that frees up blocks of contiguous spectrum) unlock gains without new hardware investments.

Next: AI-powered network operations

The use of artificial intelligence expands network automation potential even further, driving smarter, more adaptive network operations.

Generative AI-powered conversational assistants are emerging as valuable tools for operations teams that are also easy to adopt. These virtual operational assistants can respond to natural language queries, guide troubleshooting, search through relevant documentation, and even suggest configuration changes, making previously complex tasks more accessible, resulting in shorter resolution times.

AI-enhanced fiber sensing is another promising area. By interpreting data that would normally be too noisy for humans, including measurements on the optical signals' amplitude, polarization, and phase, AI can help networks detect accidental or malicious physical intrusion threats in time to prevent or mitigate their negative impacts, and alert performance issues earlier, and more accurately, than deterministic algorithms, improving infrastructure awareness, health, and resilience.

Predictive maintenance is another use case with considerable potential. AI models trained with historical and real-time data can forecast equipment and fiber failures before they occur, enabling operators to schedule interventions proactively and avoid costly downtime.

These AI-powered use-cases represent the next phase of automation, a phase where automation not only helps react to events but also anticipates and adapts to them. As these capabilities evolve, they will further empower network operators to deliver faster, more adaptable, and reliable services, leading to a better quality of experience.

Building future-ready networks

The adoption of network automation is a strategic journey, not a one-time task.

A practical way to begin this journey is by launching targeted pilot projects in collaboration with automation solution vendors. Operators can choose to automate specific functions, like capacity fulfillment, and expand over time, integrating new capabilities as their needs and the network evolve. This incremental approach minimizes disruption, allowing teams to test automation in controlled environments, building confidence, and demonstrating value. Starting small also makes it easier to iterate and improve before scaling up. Digital twin and emulation environments are also great means of testing automation before productizing it in a network. Using modular, standards-based approaches ensures that automation efforts are flexible, extensible, and future-proof.

Automation also gives operators an opportunity to rethink how teams work, collaborate, and contribute. One pressing challenge in telecoms today, especially for smaller operators, is the shortage of skilled

professionals. As demand for bandwidth increases, many operators struggle to capture enough talent and develop deep domain expertise. Automation helps bridge this gap by streamlining mundane, repetitive tasks and accelerating diagnostics. This enables experienced professionals to focus on higher-value activities, bringing insight into the design, validation, and governance of the automation frameworks, and ensuring the systems are robust, reliable, and fit the desired modes of operation. Automation can also ease the integration of new professionals. With intuitive tools, automated workflows, and conversational AI, they can take on network operation tasks more quickly and confidently, adding value to the team sooner.

By embracing automation as a journey and allowing trust in the systems to grow, operators can create what will eventually become more agile and resilient organizations, ready to meet the demands of tomorrow's digital infrastructure.

Now is the right time to automate!

AI-era networks are reshaping the telecom landscape, increasing network scale and complexity, and imposing more demanding service requirements. At the same time, operators face growing pressure to improve return on investment and unlock new revenue opportunities. Many are turning to automation as a strategic approach to enable a more agile and efficient network operation.

The good news is that the network automation tools and the enabling standards and frameworks needed to address these challenges are now mature and available to all. Network automation is no longer a future aspiration; it is delivering results today.

By starting incrementally and using standards-based solutions, operators can scale automation over time without disrupting existing operations. This journey enables them to work more efficiently, to respond to customer needs more effectively, and to embark on new growth opportunities more rapidly - all of which strengthen their competitive advantage.