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Telstra International Automation: A Case Study

A custom Heavy Reading report produced for Cisco Systems

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1. INTRODUCTION

Network automation is more than an industry buzzword. Leading communications service providers (CSPs) are deploying automation in production networks today and achieving a wide range of business goals.

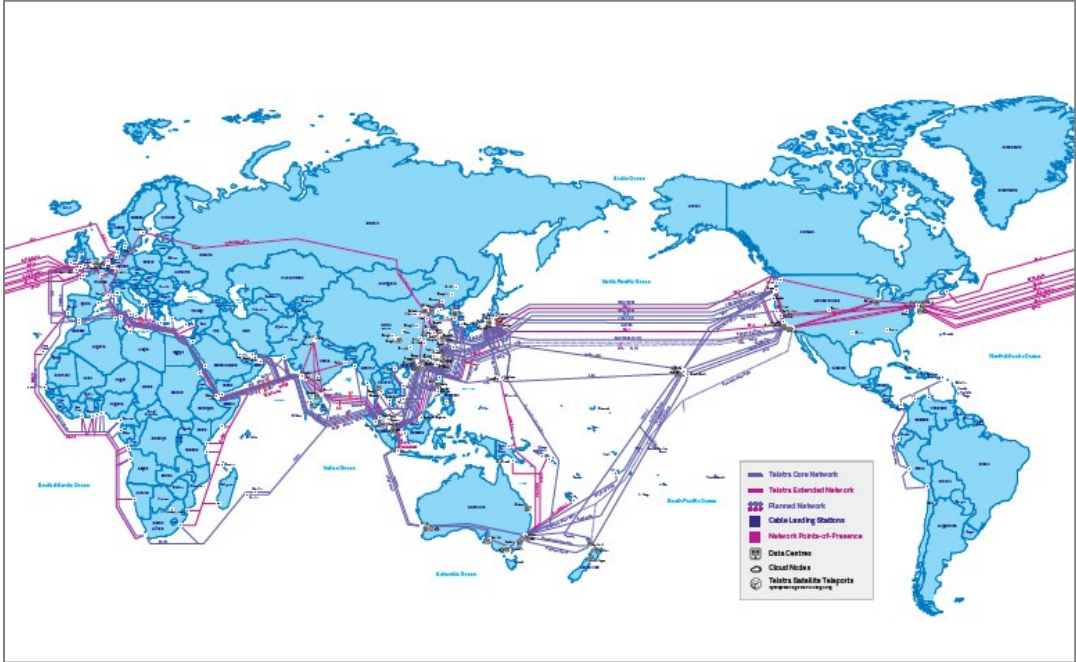
Australian incumbent operator Telstra is one such operator. After applying network automation on its domestic network and seeing success, Telstra has now built an automation strategy for its international operations. This case study focuses on Telstra International’s transport network automation strategy and the role of Cisco Systems as Telstra’s partner for multi-domain services orchestration. The report details Telstra International’s network automation goals, its early use cases, expected benefits, and next steps.

2. TELSTRA INTERNATIONAL SNAPSHOT

Headquartered in Melbourne, Australia, Telstra is one of the largest telecommunications providers globally and the largest communications provider within its domestic market, including in fixed, mobile, and enterprise services. Telstra generated \$18bn (AUD\$26.2bn) in fiscal year 2020 (FY20). As the international arm of the company, Telstra International is responsible for all services outside of Australia, including wholesale, subsea capacity, IP and Ethernet services, voice, unified communications, and others.

Its focus on the Asia Pacific region gives Telstra International a global footprint spanning 20 countries outside Australia and employing 3,500 people. Network access extends to more than 400,000km with three fully owned cable systems (TEC, EAC, and C2C). **Figure 1** shows Telstra International’s global footprint.

Figure 1: Telstra network and infrastructure map, 2021



Source: Telstra, 2021

Network automation background

Some operators view automation as a means to cut costs, but for Telstra, cost is not a primary motivation. Rather, it was a requirement to improve resilience and reliability that prompted Telstra to adopt network automation in its domestic market beginning in 2016.

After experiencing several significant and high profile network outages, the Telstra team turned to automation to reduce manual touchpoints in the network and reduce the number of manual errors occurring through day-to-day operations. Manual errors (as simple as mislabeled inventory) were compounding over time to have a ripple effect throughout the national network when problems occurred, leading to large and prolonged outages. The effort to introduce automation in the Telstra network was led by David Robertson.

Following success in the domestic network, Telstra embarked on automating its international network operations. Formed in mid-2019, the international automation team is led by Robertson, who is now an executive in Telstra International Networks, along with Andy Lumsden, who is head of network services for the Telstra International Group. Lumsden came to Telstra through the acquisition of Asia Pacific software-defined networking (SDN) pioneer Pacnet, so he also has a strong background in network automation.

Significantly, given Robertson's leadership role in both programs, the experience and learnings from the domestic rollout can carry over to the international network.

3. AUTOMATION PROGRAM GOALS

Telstra International lists its top three goals in moving to an automated IP network as follows.

Greater network resilience

Just as in the domestic network, resilience and reliability are crucial to international operations and the first priority in network automation. The team's goal is to remove as much human element in the configuration and the management of the international network as possible. Compared to domestic operations, the international engineering and operations personnel have greater networking expertise, but there are far fewer employees. Activating, provisioning, and managing networks in the face of greater complexity with limited personnel is a key challenge.

Improved customer experience

Automation leads to improved customer experience in several ways. Improving network resilience provides an obvious benefit for wholesale and enterprise customers as they experience fewer interruptions to services delivered over the Telstra International Network. Automation also reduces time to troubleshoot network faults, resulting in shorter downtime during outages, which also benefits end customers. Service activation and provisioning is another area of improved customer experience, whereby provisioning of an IP VPN or an Ethernet private line can be done in minutes, compared to days prior to automation.

Taking provisioning a step further is the introduction of user portals in which customers can access network performance and other data specific to their own services in real time. Real-time network visibility in the hands of customers requires an automated backend to communicate with the internal systems, perform the calculations, and send the data back to the customers.

A common framework

A third goal is the creation of a common automation framework across the organization from which the engineering and operations teams can work. The framework includes a detailed roadmap for projects and deliverables, giving teams a common understanding of the technology and product direction. Additionally, as new technologies come along, they are fitted into the framework.

Network simplification

Although its network spans the globe, Telstra International operates with a lean network team. Leadership concluded that the traditional operations model was not sustainable for meeting customer demands for capacity, performance, and agility, which are driven largely by the enterprise migration to cloud applications. At a time when revenue growth does not match network capacity growth (a reality shared by nearly every Tier 1 operator globally), adding more employees to address increasing demand and complexity is not an option. Simplifying operations through process standardization and automation is the only solution.

As Lumsden notes, the traditional “swivel chair” approach to service delivery is incompatible with on-demand connectivity.

Finally, similar to the domestic program, cost reduction is not a primary goal of Telstra International’s automation strategy. Robertson notes that there are clear cost benefits in reducing time for service activation or in avoiding a network outage, but the strategy was not designed around cost savings. At this stage, cost reduction is not part of the network automation business case.

4. CISCO’S ROLE IN NETWORK AUTOMATION

Cisco Network Services Orchestrator (NSO)

NSO is an intent-based, model-driven platform for automating the provisioning, monitoring, and managing of applications and services across multi-vendor networks. It accomplishes this goal by abstracting device configurations and service definitions from the underlying physical and virtual infrastructure, separating intent from implementation. NSO loosely couples the team’s building apps and services with the team’s operating infrastructure, bridging the two communities so they can work together without getting in each other’s way.

NSO northbound APIs are exposed through programmatic interfaces that include bindings to common languages, such as C, Python, and Java, remote procedure call (RPC)-based protocols, such as NETCONF and RESTCONF, and human-machine interfaces (HMIs), including a web user interface (UI) and network command-line interfaces (CLIs), which are important for traditional network operations teams. Southbound, NSO communicates with

Cisco equipment and more than 170 third-party platforms and operating systems (OSs) through network element drivers (NEDs), which are software components that convert intent into device-specific commands and configurations or directly via NETCONF.

To date, more than 250 service provider and large enterprise customers worldwide are using Cisco NSO.

Itential IAP

Also essential to the automation rollout is the Itential Automation Platform (IAP), which is the workflow engine for Telstra's network automation and part of Cisco's SolutionsPlus program. IAP connects different systems, such as IT service management, inventory, analytics, and orchestration tools, to enable end-to-end and closed-loop network automation capabilities. As a third-party software product, it is designed to work across multiple domains and across multiple vendors. For Telstra International, this multi-domain aspect of IAP is crucial. Through open northbound APIs, IAP communicates with the NSO layer.

Telstra International intends to use the combination of NSO and IAP for the orchestration of all platforms for IP voice and transport.

Why Cisco?

Telstra's relationship with NSO predates Cisco, as the Telstra domestic team began working with the services orchestration pioneer when it was still independently owned as Tail-f. NSO's role as an independent orchestrator for multi-vendor IP networks was essential. That relationship continued after the Cisco acquisition, and the operator has been pleased that multi-vendor interoperability remains fundamental to the product. With years of experience working with NSO and feeding specific features into the roadmap, using NSO for multi-vendor orchestration in international operations was a natural fit.

Additionally, integration of the IAP with NSO is important, as workflow engine software is required to work with a services orchestrator. There are different options for workflow engine functions, but Telstra selected Itential. Cisco's professional services are important, as the lean Telstra International network team needs additional expertise and developers to build out and deploy use cases.

5. USE CASES AND BENEFITS

Telstra International has created a detailed roadmap of automation use cases out to its FY23 (ending June 2023) and encompassing transport, IP, multilayer IP, optical, voice services, IT, and other areas. The detailed roadmap contains dozens of use cases.

Of the dozens of use cases on the roadmap, five have been released in the first production phase, known as a minimal viable product (MVP). These leading use cases are OS upgrades, IP network link, Type B NNI, day one configuration management, and voice session border controller (SBC) activation for Microsoft Teams. **Figure 2** provides a snapshot of the eight leading use cases. OS system upgrades and IP networks link are the two most advanced, having both been launched in 2021.

Figure 2: Telstra International automation use cases in production

Use case	Status	Description	Automation benefits
IP network link	Production	<ul style="list-style-type: none"> Automation and service lifecycle management of IP network infrastructure links. Pre-check and post-check on the target nodes are built in to ensure the integrity of network links during provisioning. Supports create, modify, and delete operations. 	<ul style="list-style-type: none"> Standard set of configurations across all the network links, reducing the chance of human errors. Improvement in process time to load configuration into multiple network nodes.
Type B NNI	Production	<ul style="list-style-type: none"> Automated provisioning of Type B NNI services using NSO. Supports create, modify, and delete operations, including optional NNI parameters. 	<ul style="list-style-type: none"> Standardized way to configure the Type B NNI services across multiple NNI partner links. Overall reduction of inputs and technical skills required to provision, leading to the ability to do so during business hours with increased throughput.
Day 1 configuration management	Production	<ul style="list-style-type: none"> Automated application of vendor-agnostic base configuration templates on network devices using NSO. Can be applied to network devices on demand (bulk updates) or as part of new device onboarding into NSO. 	<ul style="list-style-type: none"> Reduce the resources and process time by applying boilerplate code for devices that share the common configuration across multiple devices in different network domains. Base templates can be expanded and customized for future needs.
OS upgrade	Production	<ul style="list-style-type: none"> Automated software upgrades for Cisco and Juniper devices in Telstra International MPLS IP network. 	<ul style="list-style-type: none"> Shorter process and lead times for completing the OS upgrade activity, as most of the activities will be performed by the NSO in the backend. Reduced network operations center (NOC) and Tier 3 support labor, as they only need to monitor the activity and perform the verification.

Use case	Status	Description	Automation benefits
Voice SBC activation for Microsoft Teams (TCMT)	Production	<ul style="list-style-type: none"> TCMT service provisioning on voice platforms by the NSO as part of the order-to-activate automation solution. Service data originating from the IT backend is pushed into IAP via API calls, which is translated into orchestration by NSO. This is a seamless process covering northbound and southbound systems. Supports create, modify, and delete operations. 	<ul style="list-style-type: none"> Shorter process and lead times for completing complex customer service configuration via Ribbon PSX. Provisioning attributes can be expanded and customized for future needs.
Global Internet Direct (GID) service	Planned FY21	<ul style="list-style-type: none"> Automated provisioning of Telstra internet connectivity between provider edge and customer edge. Supports create, modify, and delete operations. 	<ul style="list-style-type: none"> Automation improves process time to load configuration on network nodes and reduce swivel chair interface between IT systems (DNS and route management)
Ciena Ethernet Private Line (EPL) activation	Planned FY21	<ul style="list-style-type: none"> Automated provisioning of EPL service that delivers Ethernet across a Multiprotocol Label Switching – Transport Protocol (MPLS-TP) network. Supports create, modify, and delete operations. 	<ul style="list-style-type: none"> Standardized and simplified way of provisioning EPL services on Ciena equipment via Ciena Network Management System. Automation of the RFC 2544 testing for the on-net EPL segment.
IP VPN service	Planned FY21	<ul style="list-style-type: none"> Automated provisioning of IP VPN services in the Telstra International MPLS IP network. Supports create, modify, and delete operations. 	<ul style="list-style-type: none"> Replacing the current offline IPVPN provisioning tool with the NSO to provide a one-stop solution keeping track of IPVPN services with the ability to filter on customer topology and access links.

Source: Heavy Reading, Telstra International and Heavy Reading, 2021

6. CONCLUSION AND FUTURE DIRECTIONS

Telstra International's network automation strategy is off to a strong start, with five use cases already in production and three additional use cases planned for near-term launch. Dozens of use cases are in the pipeline over the next two years across IP and transport networks, IT, voice and unified communications, and other product areas. On the transport side, one of the near-term goals is to unify the multi-vendor IP and optical domains under a common control and orchestration layer using Cisco NSO.

One lesson learned is that the transition to automation is challenging for personnel in the field, who often have spent years performing operations one way and need to be re-trained on the new ways of operations for each new use case. Learning takes time. But the automation team is starting to receive some positive news from the field as people realize they can skip an old set of tedious tasks or can perform an operation without having to contact and coordinate with multiple teams. They are starting to save time and feel less frustration.

In addition to launching new use cases, the next steps will include quantifying the business benefits with hard data, including measuring increases in uptime, speed of activation and provisioning, and hours saved, among others.

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