Automation: From software-defined to self-driving

verizon

“

Increased IT automation, centrally and remotely managed, is essential for businesses to keep pace in the digital world.

Cisco[1]

Automation: From software-defined to self-driving

Tony Judd

Managing Director
UK & Ireland
Verizon Business Group

Tony has over 30 years of experience in the IT and telecoms field. He leads the architecting and delivery of transformative business IT solutions to global enterprises based in the UK and Ireland. These solutions help companies create the IT infrastructure to enable the transformation of business communications, application delivery and customer experience. He has deep industry understanding, from healthcare to energy and utilities, manufacturing to the public sector.

For most organisations, digital transformation isn't about disruption, it's about survival. Companies that aren't actively driving the automation of business processes, reduction of costs and customer experience improvements risk obsolescence. Realising the real-time enterprise is utterly dependent on being able to connect people, things and applications; securely and reliably. To be offline is to be dead in the water. Come rain or shine, pandemic or Black Friday, companies need to be able to create, gather, store and process data. And when things change, they need their infrastructure to adapt. Fast.

There's very little good that can be said about the COVID-19 pandemic, but it has acted as a catalyst for change. What the World Economic Forum (WEF) calls the fourth industrial revolution has moved forward in leaps and bounds. Companies are addressing weaknesses in their business models and rethinking risk models. There will be losers, but many more organisations will be stronger for the changes made to cope with the restrictions forced upon them. The reimagination and automation of business processes is key.

Network management is never going to sound as exciting as using 5G to enable automated guided vehicles or the myriad of other exciting digital transformation projects companies are working on. But being able to execute changes to network configurations quickly is crucial to delivering these projects and the agility that businesses need to survive and prosper. But, and I know it's not popular to say this, networks are complex. We expect them to enable thousands of applications, transfer enormous amounts of data across vast distances in milliseconds, prioritise the most time-sensitive data and reroute automatically if there's a problem. When you really think about it, how could they not be complicated?

Things have changed a lot over the years I've been working in this industry. One of the biggest changes has been how much of the complexity of the underlying network is exposed to those managing the company's IT infrastructure. Verizon has been working hard to make it easier for our customers to control and configure their networks. The old command-line interfaces are being replaced by GUIs, making performing common tasks easier. But that's not enough to deliver the agility that businesses need. The future is the self-driving network. I believe that over the next five years automation will totally transform network management.

Why does this matter? According to Cisco, "...95% of network changes are performed manually, resulting in operational costs two to three times higher than the cost of the network."[2] When everybody is hunting for ways to eke out a bit more performance and trying to focus on innovation, that's a lot of time and money that could be being put to better use.

What makes this possible?

Virtualisation. That might be a term that you associate more with data centres, but it's been one of the big trends in networking for nearly 10 years.

Software-defined networking (SDN) separates the physical layer, the cables in the ground and mobile base stations, from the logical network. Functions like load balancers, firewalls and wide-area network (WAN) accelerators can now be deployed as software. We've been virtualising and building SDN into our core networks for close to 10 years. And now, with our SD WAN services, we are bringing the same technology to customer networks.

It's like your phone. You expect to be able to add new features without having to wait for a new device to arrive in the post. Likewise, your network can now be updated "over the air". You can reconfigure it, even redesign it, virtually.

And because it's now possible to do all this virtually, it means it can be automated. You can add, remove and configure services like firewalls and load-balancers from your desk. No waiting for deliveries or finding space to store stuff. No need to worry about site access and plan for hours of downtime so things can be unplugged. The network is built by dragging and dropping the components you need into place at the time you want them.

Our 3-step automation maturity model

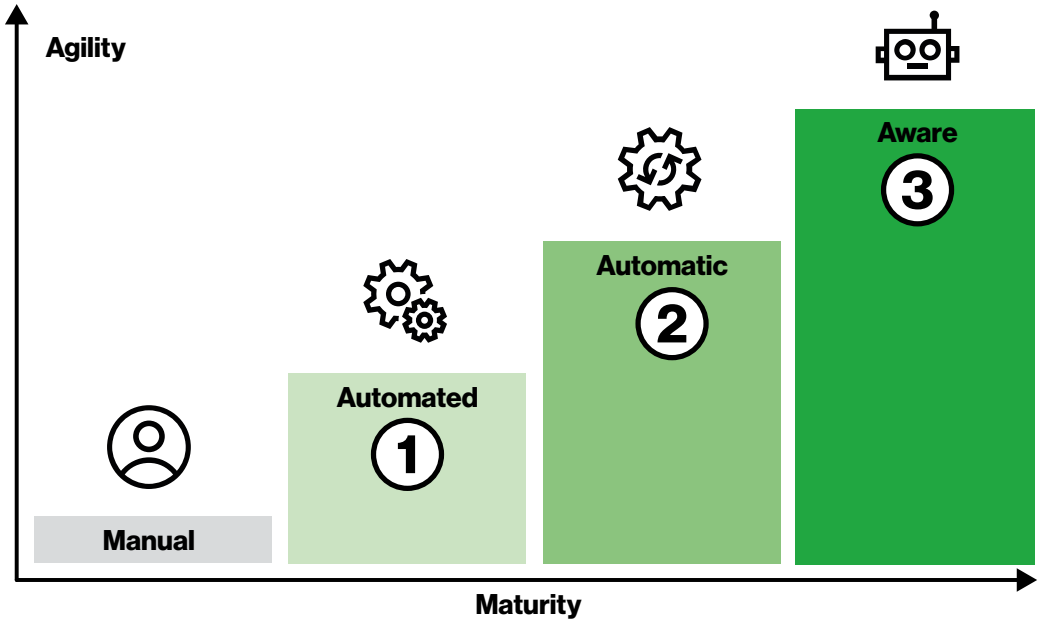

Figure 1. The Verizon 3-step automation maturity model. More detail on page 5.

Understanding the maturity model

	Process initiation	Process execution	Responsiveness and scalability
Manual	The process is initiated manually, perhaps through completing a web form or contacting a service desk.	Processes are documented to try and make this as consistent as possible, but variation and even errors are likely.	Delivery is labour-intensive and dependent on resource scheduling.
Example: Fault recovery	The problem is reported by a user.	Fault tracing is a manual process. It requires skilled workers, but is laborious and time-consuming.	Resolution times are hard to predict and depend upon time of day and other factors.
Automated	Execution is initiated through a self-service portal.	A library of scripts is used to help improve the speed and consistency of service delivery. But these must be updated and tested, which is costly and time-consuming.	The burden on IT should be reduced through the use of scripts, but delivery is dependent on manual coordination and oversight.
Example: Fault recovery	System monitoring identifies performance anomalies.	Scripts are used to perform repetitive actions, but the process is still driven by people. Inconsistency remains an issue.	Problems are identified more quickly, but resolution often still involves people and so is dependent on availability of skills.
Automatic	Execution can be automatically triggered by business processes and management systems.	Scripts are integrated with AI/ML engines enabling higher consistency and speed of service delivery.	The requirement for manual involvement is further reduced.
Example: Fault recovery	Automated monitoring of synthetic transactions shows “real world” degradation in user experience.	The network management system prioritises traffic based on pre-set rules to maintain key systems. Routes can be changed and devices rebuilt automatically.	Many problems can be identified and resolved automatically. Things that took hours can be done in minutes.
Aware	Need is anticipated by intelligent systems and execution triggered.	Processes can be highly – or even entirely – automated, delivering a high degree of reliability and freedom from errors.	Execution should be fast and efficient, with little reliance on manual intervention.
Example: Fault recovery	Intelligent systems predict potential problems and automatically initiate resolution.	Fault finding is automated. ML models enable identification and resolution of problems that haven’t been seen before.	Resolution is fast. Most problems can be resolved before they impact the user experience.

Figure 2. An explanation of the Verizon 3-step automation maturity model.

Automation is about connecting business rules to network configuration changes.

Where things stand

Most companies have moved on from the "Manual" stage and are using scripts and other tools to cut the time to perform common tasks and increase consistency. We call this the "Automated" stage. Compared to what's possible, it's a relatively low level of automation maturity.

The introduction of software-defined wide area networks (SD WANs) is helping companies to increase their automation maturity. These enable a greater degree of self-service – so companies can make changes themselves without having to go through service desks and ticketing systems.

This enables faster activation of new services, reduced management overheads and faster resolution of issues. SD WANs can also improve monitoring as you're able to see further into the network. This can help you to understand the dependencies between applications and users that the network needs to support. Knowing how the network is being used can not only help you spot problems more quickly, it can also improve planning for the future too.

One of the main areas of development of SD WAN controllers is adding APIs that enable integration with the service management platforms that IT already uses. Instead of having to learn and log into a proprietary SD WAN portal, DevOps will be able to manage network features through the same "single pane of glass" they use for other IT services.

When companies reach the "Automatic" stage of maturity, they will be able to think about their networks in terms of business logic not configurations. Sophisticated network orchestration tools will handle the detail.

What this means for business

Over the last few years I've seen businesses change how they measure the performance of IT, moving away from simplistic service-level agreements (SLAs) to "real world" measures like application performance and employee satisfaction. The ultimate goal of network automation is to integrate network management with core business systems and use artificial intelligence and machine learning (AI/ML) to make it proactive and invisible. This will enable companies to focus on things like transaction processing times, instead of latency and packet-loss statistics.

I think of it like cars. We've gone from the sort of car I learnt to drive in. The extent of its intelligence was a speedometer that could tell you roughly how fast you were going. If you were lucky it had power-steering and servo-assisted brakes.

Then came features to augment the driver, like cruise control. This meant you were saved the monotony of adjusting the accelerator to stick to 70 mph on long journeys. So long as nothing actually happened, like encountering another car, that is.

Fast forward a couple of decades and we're very close to having fully autonomous vehicles. Soon we'll be able to jump in the car and it'll know where to go from our diary or emails. We'll be able to sit back and think about what we're going to do when we get to our destination. The car will take care of the route, avoiding roadworks and congestion, and even taking evasive action if something unexpected happens.

This is the "Aware" stage in our maturity model. Gartner calls it "AIOps". This promises network engineer robots that operate tirelessly 24/7, never have an "off" day or make mistakes. They will devour the enormous amounts of data networks generate – not the data they carry, but the metadata about the traffic flows – to build and constantly improve cognitive models. This will enable them to adapt the network configuration so fast that it seems like magic. When companies reach the Aware stage, their networks will:

- Proactively monitor application performance and carry out optimisation tasks automatically, making better use of resources and improving the user experience
- Dynamically identify and configure new devices and services as they are added, cutting the time to bring new users, applications and even sites online
- Monitoring capacity and performance of each component in the data path and compare them with a global knowledge base, enabling proactive reconfiguration
- Automatically reroute traffic and repurpose devices, resolving issues before you even realise that they existed or the end-user experience is affected

What comes next?

The ultimate goal is being able to consume connectivity “as a service”. Network as a Service (NaaS) isn’t a technology, it’s a model for the future of networking.

The reliable, programmable and massively scalable network needed to make NaaS possible didn’t exist, so we had to invent it. Since 2000, we’ve invested US$145 billion to build a world-leading global infrastructure that is the foundation of our NaaS platform. We’ve been able to do this due to our track record of technology firsts and proven experience building high-performance global networks, integrating systems, delivering mission-critical services and optimising application performance.

Automation is key to achieving NaaS, but it’s just one component. Successful NaaS also depends upon a fundamental shift in the approach to security. The leading candidate for this new security architecture is secure access service edge (SASE, pronounced “sassy”). It will also require fundamental changes to contracts, commercial models and business processes.

I look forward to the next five years. I think that we’re going to see a dramatic transformation in how networks are bought and managed. That will enable companies to do things we can’t even imagine yet. And I believe that Verizon is incredibly well positioned to lead the way.

1 Cisco, What is Network Automation?

2 Cisco, What is Network Automation?