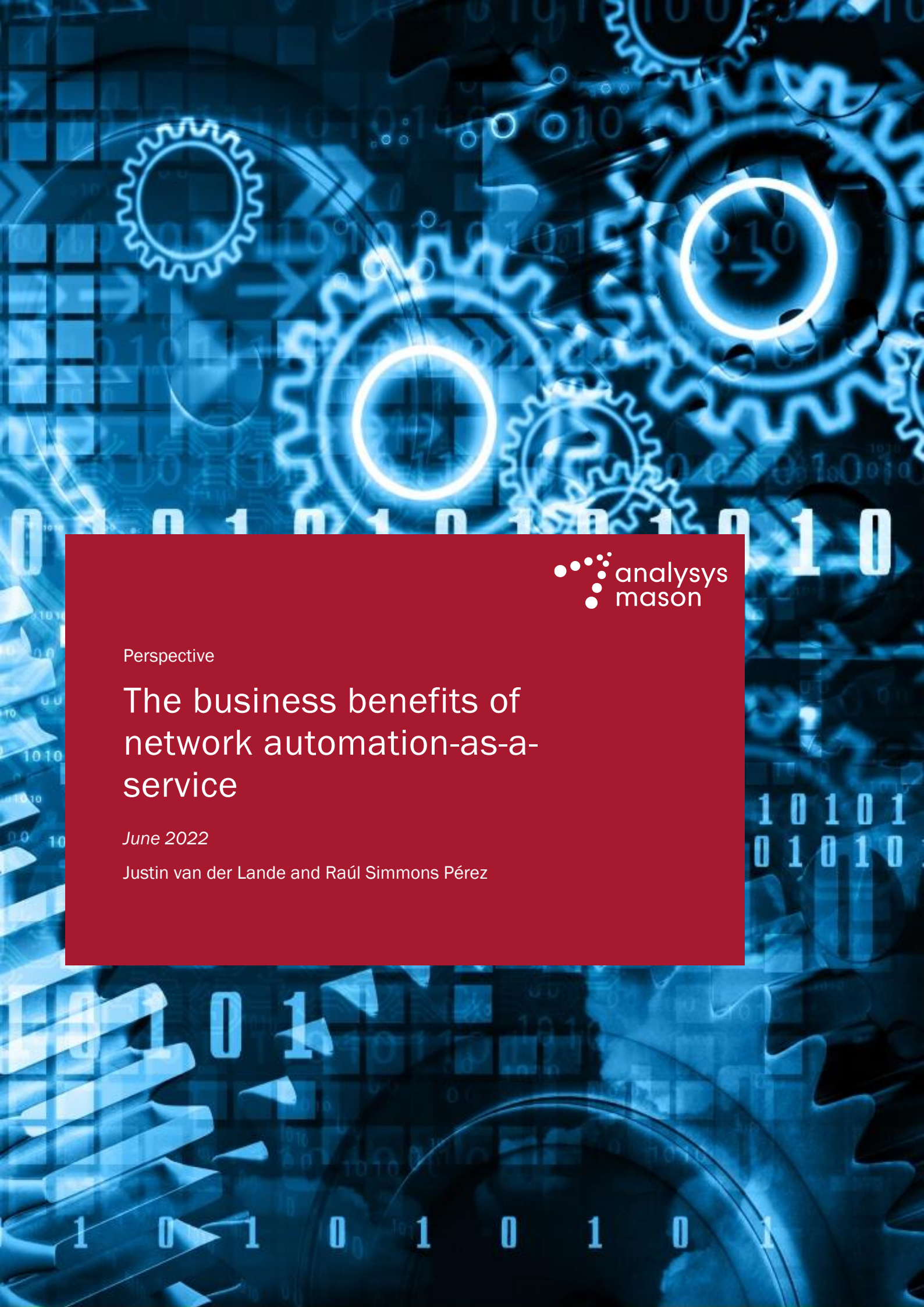

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Perspective

The business benefits of network automation-as-a-service

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1 Executive summary

Communications service providers' (CSPs') attitudes to SaaS solutions are rapidly changing. This change has been driven by innovative commercial models from vendors, an increased enthusiasm for cloud-based delivery models and an acute imperative to deliver complex new services more quickly without increasing operational costs. SaaS adoption is beginning to increase among CSPs because it reduces the time to value and better aligns costs with business benefits.

Automation has always been a key strategic priority for CSPs, and advanced vendors are now beginning to release SaaS-based automation solutions in order to accelerate automation adoption and increase the success rate of automation projects. The traditional 'do-it-yourself'(DIY) automation projects have proven to be challenging because they requires CSPs to invest upfront in hardware, software licences and skilled staff (for application maintenance), and to build 'software factories' that are able to develop automation solutions based on the integration of off-the-shelf applications and open-source software. DIY automation deployments also tend to focus on wide-ranging 'big bang' projects that automate many processes to justify their cost, but the complexity and requirement for a more general automation framework means that many CSPs have struggled to gain a return on their investments. As such, a lower-risk approach that reduces the time to value for smaller projects is desirable. SaaS-based approaches enable a single or focused automation to be realised much more quickly than with DIY approaches (typically reduced from months to weeks and lower), and to be paid for swiftly without needing to implement a complete DIY solution with the delays and increased cost that this entails.

The faster time to value that is possible with SaaS-based automation also enables more innovations and new market opportunities to be addressed more quickly or cost reductions to be accelerated. Innovations built on an already-deployed SaaS solutions typically take 70% less time to deploy than DIY-based approaches. Furthermore, SaaS solutions mitigate many of the risks associated with DIY projects because the solutions are proven and in production with multiple CSPs.

2 Recommendations

- **CSPs should focus their automation efforts.** General, large-scale automation projects are risky and more prone to failure than those that focus on one use case at a time. Overly complex automations often fail; indeed, according to a survey in 2021, fewer than 30% of complex automation projects are implemented successfully by in-house development teams.[1]

- **CSPs should consider using SaaS for automation.** SaaS reduces the time taken to reach outcomes and associated benefits. It enables a targeted use case approach that results in lower costs and better and more predicable ROI. SaaS ensures the faster adoption of innovation driven by cross-operator/global learning, knowledge and expertise curated by the vendor.

- **CSPs should use automation solutions from vendors with a deep understanding of the telecoms industry.** Vendors that already understand telecoms data sets, networks and key processes are likely to

[1] Survey in 2021 run by Pacetera Technologies. Similar results are available from McKinsey (2021), *A blueprint for telecom's critical reinvention* at: www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/a-blueprint-for-telecoms-critical-reinvention.

have the required expertise to build successful automation solutions for telecoms use cases. In a survey of CSPs conducted by Analysys Mason, specialist telecoms vendors were cited as the organisations most expected to provide automation support, ahead of both internal teams and external system integrators.[2]

- **CSPs that require network-based automation solutions should focus on vendors with network equipment experience.** These vendors are typically network equipment providers who have the deep domain knowledge and experience needed to create specific automation solutions.

3 Primary network automation business drivers

3.1 Reduce the time to deploy services

Reducing the time taken to onboard new customers is critical to improving the customer experience and providing a differentiated service. Automating the key steps to service delivery (such as the on-boarding of new devices) can help CSPs to achieve this. Automation should address the need to reduce the number of misconfiguration errors due to manual configurations. Such errors create additional time-consuming steps and typically need to be rectified. Significant numbers of services still take weeks to deploy with days spent troubleshooting.

3.2 Lower network TCO

Operational complexity is driving up network costs, largely due to 5G and network virtualisation. Network automation is needed to reduce this complexity and lower costs for CSPs. More than 50% of CSPs in a 2020 survey conducted by Analysys Mason said that network automation is a top-three strategic initiative; a reduction in opex is the main driver of this initiative for 73% of CSPs. [3]

3.3 Increase network uptime/reliability

Any manual process inevitably results in human errors, and CSPs still have many manual processes. These processes include performing manual configurations, which often lead to some human errors, whether from using an incorrect template and introducing typos or copy and paste errors, or from unanticipated maintenance. For example, Telefónica's 2018 outage was caused by human error: a software certificate expired, resulting in 32 million subscribers losing connectivity. Automations make processes more predictable and reliable.

The results of Uptime Institute's annual survey shows that manual processes are the cause of 75% of outages[4].Most brownouts and network issues are first discovered by customers, so CSPs need automated processes to quickly instigate changes to manage SLA breaches, ideally before SLAs are affected. Outages and poor service performance can also reduce customer satisfaction, thereby resulting in increased churn.

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2 Analysys Mason survey of 165 service providers in May 2022.

3 For more information, see Analysys Mason's *Network automation survey: CSPs' automation initiatives*.

4 Uptime Institute (2021), *Uptime Institute Releases 3rd Annual Outage Analysis.* Available at: https://uptimeinstitute.com/about-ui/press-releases/uptime-institute-releases-3rd-annual-outage-analysis.

3.4 Improve customer experience

Enterprise and consumer requirements are becoming more diverse, thereby requiring increasingly complex networks to support differentiated service offerings and requiring CSPs to compete with and differentiate from public cloud providers and others. Customers who experience poor service and churn are estimated to inform the CSP in very few cases. For example, these so-called 'silent churners' accounted for 99.6% of Hong Kong Telecom's churners.[5]

Assurance systems with AI/ML capabilities must be able to predict service issues before they affect end users. As the underlying service delivery chain becomes more complex, service experience will become more difficult to measure and manage. CSPs would therefore benefit from adopting automated active assurance, where service quality is measured through active testing of the service. Active assurance ensures quality even before customer services are launched and guarantees that service characteristics are delivered to customers throughout the life of the service.

The mean time to repair (MTTR) is typically set to several hours for business services; this allows for only a few outages each year. As a result, automations are required to improve each stage of the repair process, including detection, diagnosis (root-cause analysis), fixing and verifying the fix. Each of these stages can be automated thereby enabling staff to react more quickly or can be completely automated to provide a zero-touch repair capability.

3.5 Improve staff productivity

Staffing costs are a significant investment for CSPs, so it is important that staff are as productive as possible. Improving staff productivity and their operational efficiency through of the use of automation tools enables CSPs to execute more processes with the same number of staff. This increased productivity enables staff to concentrate on more-complex issues, thereby making them better able to support customers, improve service quality and reduce the deployment time for new services.

4 Challenges of today's DIY automation solutions

4.1 Generic automation frameworks are ineffective

Previous automation efforts have achieved limited success. Such efforts have focused on too broad a scope to automate effectively, thereby resulting in a limited alignment of costs and expenditure to the business value received. This has been demonstrated in the results of a recent survey in which 40% of CSPs said that using a generic automation framework is the first barrier to adopting automation in transport networks.[6] Automation efforts are now beginning to focus on a domain-by-domain approach; this is less risky and has a higher alignment with the business benefits.

5 Twitter (2018). Available at: https://twitter.com/LynxAnalytics/status/1067497136441430017/photo/1.

6 Juniper Networks (2022), *Heavy Reading sample of 76 CSPs*. Available at: https://www.juniper.net/content/dam/www/assets/white-papers/us/en/2022/heavy-reading-cloud-metro-service-providers-survey-analysis.pdf

4.2 Hidden internal costs are much greater than just the software application licence fees

When building autonomous networks, various applications are required for each stage of the service lifecycle, such as for configuring devices, activating and updating services, testing quality, implementing traffic engineering/control and configuring network protocols and service paths in the network. CSPs typically purchase software licences from multiple vendors and open-source repositories to create their automation solutions. Each application requires integration, staging, deployment and monitoring to ensure that the solution works as a whole and that any future application upgrades are compatible with the overall solution. CSPs are required to pay for application licences regardless of what services or functions they are running within them, which means that the upfront cost can be large because often only part of each software application is used. This cost may not always be well-aligned to the business benefits.

The cost associated with on-premises deployments comes from the compute and storage hardware that is required to run a solution. In-house expertise is required for hardware maintenance and operational support. Alternatively, CSPs can use a public cloud provider, but expertise will still be needed to manage the services.

On-premises deployments can be slow to respond to new services. New software and hardware are often required to support deployments, which requires time-consuming procurement and implementation. Adding automations to on-premises deployments tend to take weeks, if not months, thereby delaying the time to value that the automations deliver. DIY automations are not as robust and reliable as pre-built product-based solutions that have been implemented elsewhere and are therefore more likely to fail or be unable to support a rich set of functionalities.

DIY solutions tend to slow CSPs' automations and hence the frequency with which they can launch or implement service offerings. The lower cadence affects a CSP's ability to innovate, which increasingly becomes an issue as service lifespans decrease.

4.3 The disruptive nature of upgrades limits innovation

Software application updates are paid for via maintenance and support contracts, and major software updates are often charged for within a DIY solution. Support and maintenance costs are typically equivalent to 18–22% of the initial licence fee (according to Forrester[7]); upgrades are often also equivalent to a significant percentage of the initial software cost. Both updates and upgrades are significant projects for CSPs.

These costs mean that CSPs often delay updating and upgrading their applications and the automation solutions that are built on them, thereby resulting in outdated software that is unreliable, insecure and/or lacking in functionality. Over time, systems that have been highly customised, such as DIY solutions, become more cumbersome to maintain, which means that they are upgraded even less frequently, thereby reducing their functionality and reducing the innovation possible by the CSP.

4.4 It is difficult to manage CSP scale in real time

On-premises deployments are inherently slow to scale. New hardware must be provisioned, purchased and integrated with existing deployments. This becomes more complicated to execute with proprietary or highly customised, multi-vendor deployments and can be a major issue in networks that have transient services that are only deployed for a short period of time and require rapid scalability. Furthermore, a network with many

7 Forrester (2010), *Software Maintenance Fees May Not Be Invulnerable To Change After All*. Available at: https://www.forrester.com/blogs/10-06-29-software_maintenance_fees_may_not_be_invulnerable_to_change_after_all/.

transient services or with lower-than-anticipated demand runs the risk of underutilising hardware. This a further cost for CSPs because they must plan for peak requirements, even if these peaks are rarely reached.

5 Automation-as-a-service and its benefits

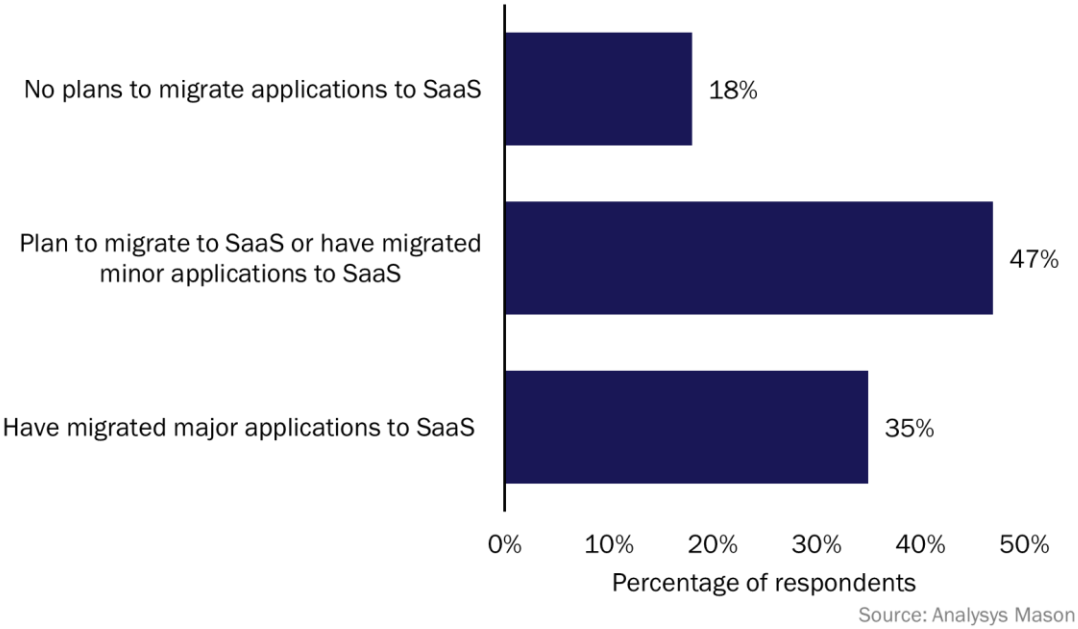
5.1 What is SaaS?

Vendors of SaaS-based deployments take responsibility for the software and cloud-based infrastructure, and the CSP pays a regular fee for access. A SaaS-based deployment is far less expensive upfront than an on-premises deployment because the CSP only has to pay for the initial subscription fee and not the infrastructure, its associated operations and application deployment and ongoing maintenance. As such, SaaS-based deployments can be much more flexible. CSPs can also deploy services far more quickly using SaaS because the set-up complexity is greatly reduced.

5.2 Current as-a-service adoption rates within CSPs

There is a growing demand for SaaS-based deployment models among CSPs. 35% of respondents to Analysys Mason's survey of 50 major CSPs worldwide reported that they have migrated major applications to SaaS; a further 47% stated that they have plans to migrate to a SaaS-based model, or have already migrated minor applications. A far lower proportion (18%) reported having no intention to migrate applications to SaaS (Figure 5.1).

Figure 5.1: CSPs' plans to migrate applications to SaaS-based models, worldwide, 2022

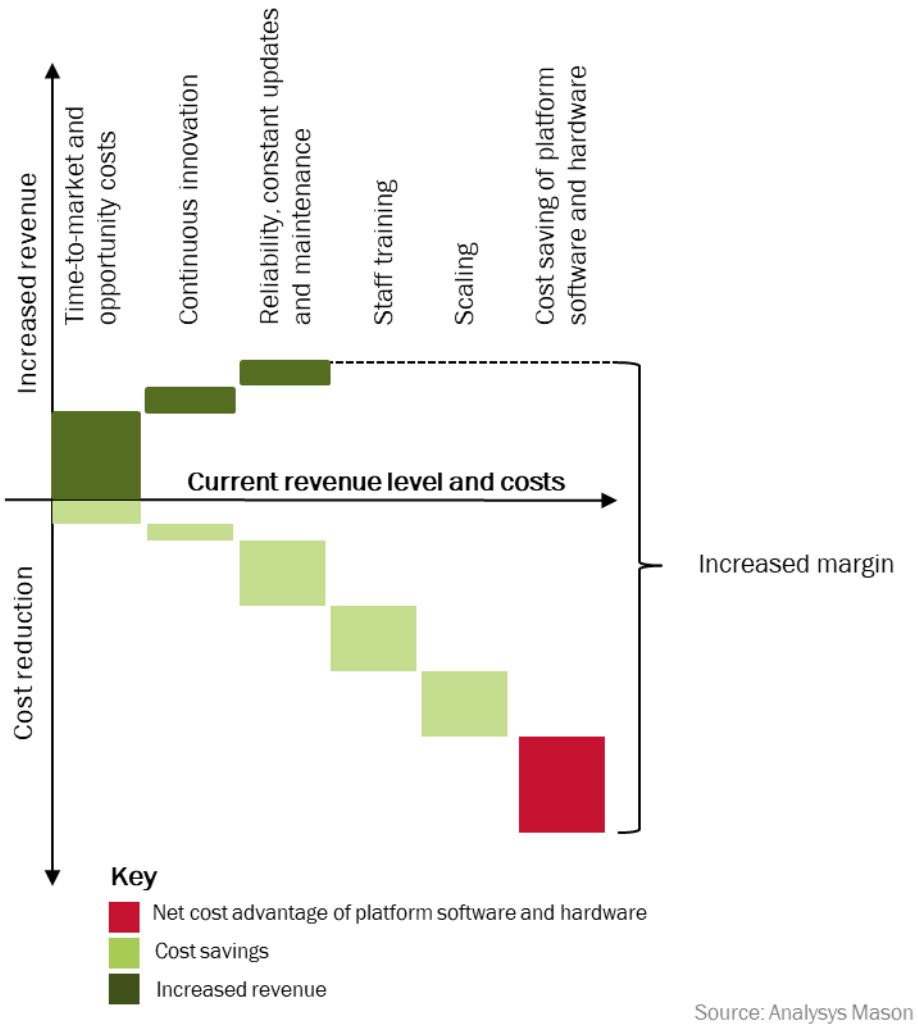


5.3 The benefits of SaaS-based solutions

Implementing SaaS-based software is often expected to provide short-term gains over DIY applications, but is believed to cost more in the long term. However, when every aspect of designing, implementing, deploying and maintaining a solution are considered, SaaS solutions can also deliver a long-term cost advantage. It is therefore important to take into consideration the relative costs and benefits of all aspects of the project over multiple years when comparing various strategies for building autonomous networks.

Figure 5.2 shows the relative cost benefits of SaaS-based deployments over on-premises DIY solutions in terms of costs. Some tangential benefits that a SaaS-based deployment model benefits from are not shown in Figure 5.2. These include an ability to create a much more robust and complete solution by more easily sharing anonymised data sets on which AI/ML models can build a stronger set of insights. Furthermore, SaaS deployments force more standardisation of data, processes and interfaces, thereby leading to a higher degree of automation.

Figure 5.2: Estimated relative costs and benefits of SaaS deployments compared to on-premises DIY alternatives



Time-to-market and opportunity costs

SaaS enables CSPs to deploy new automation solutions much more quickly than is possible in a typical DIY automation project that takes months or years to design, implement and deploy. The greater accessibility of a SaaS platform, coupled with the in-built access to compute and storage, reduces the time to automation to weeks or days. Indeed, SaaS deployments typically reduce the time to automation by 50% compared to DIY projects. This enables services to be launched more quickly and allows CSPs to realise the associated opportunity costs of that additional service sooner.

Constant innovation

Once the initial installation is accomplished, further services and functionality can then be added, thereby enabling CSPs to respond to new demands more rapidly than with an on-premises deployment. The delay in providing new functionality with on-premises DIY approaches affects CSPs' ability to build new offerings for their customers. Every project is unique, but the implementation of follow-on features can be as much as 70% faster for SaaS deployments than comparable DIY approaches.

Reliability of the automation process

SaaS-based services are generally more reliable than DIY-based approaches because they are built and tested by multiple CSPs and are implemented, managed, maintained and hosted by the vendors that have developed them. SaaS-based deployments provide ongoing access to the most up-to-date software available from the vendor. This can provide a saving in terms of maintenance costs and software upgrades as well.

A single integrated software solution that is kept up-to-date tends to be more reliable than a one-off DIY approach created by a CSP. Experts carry out the upgrades and updates in a SaaS solution, which helps to reduce outages and therefore improve reliability. When outages do occur, they can be restored more quickly. No SaaS providers can commit to 100% uptime, but many commit to 99.5% (such as Azure), which compares favourably with on-premises solutions. Critically, a productised automation solution is less likely to fail than a DIY approach, which outweighs any potential underlying perceived differences in hardware reliability. However, machine learning is associated with high failure rates in creating automations (historically as high as 85% according to Gartner[8]), thereby adding time and costs to a DIY-based approach.

Staff training costs

Training and retraining staff has become a significant issue for CSPs. Fewer skilled staff are required to operate a SaaS-based system because the vendor provides support for the hardware and generic IT software. In addition, the simplification of the software in a SaaS deployment reduces the amount of training required by staff. This enables a wider range of staff to be able to support critical business processes and ensures that new staff can become fully productive in a shorter time. Skilled staff are able to concentrate on complex technical issues.

Scaling – operational software and hardware

A SaaS-based deployment can respond quickly to changes in demand and can scale up or down rapidly. This allows a CSP to follow a pay-as-you-grow model more closely and align costs to its actual business requirements. This is especially relevant when a network has many transient services that are only run for short periods of time and when software is required for a short period.

Significant differences in costs can be realised early on in projects because SaaS-based services often allow for focused automations to be deployed, which means that prices (based on volume) are likely to be low at the time

8 Gartner (2018), *Gartner Says Nearly Half of CIOs Are Planning to Deploy Artificial Intelligence*. Available at: https://www.gartner.com/en/newsroom/press-releases/2018-02-13-gartner-says-nearly-half-of-cios-are-planning-to-deploy-artificial-intelligence.

of launch. This may provide a 70–80% reduction in software licensing costs in the first year compared to a DIY approach, in some cases, and allows CSPs to buy what they need.

87% of respondents to a survey of over 150 CSPs by Analysys Mason in May 2022 stated that they would like to have the same vendor for each application element of a closed-loop automation solution. Many reported that having a single interface and integrated approach means that a complete process can be developed, managed and scaled using cloud delivery far more easily than when having to use multiple separate vendor systems.

Software and hardware costs

Software and hardware infrastructure is included as part of the cost in a SaaS-based deployment. The vendor configures, manages and optimises the hardware and associated software platform used to support each of the automation solutions on the infrastructure. These hardware and software costs typically account for 15–20% of the cost of a DIY automation project, but are included in a SaaS-based solution. CSPs can also save money by using a SaaS-based solution because they do not incur operational staff costs or facilities costs and avoid hardware replacement every 6 years.

Figure 5.3 provides a summary of the above-mentioned benefits.

Figure 5.3: Comparison of DIY approaches and SaaS solutions

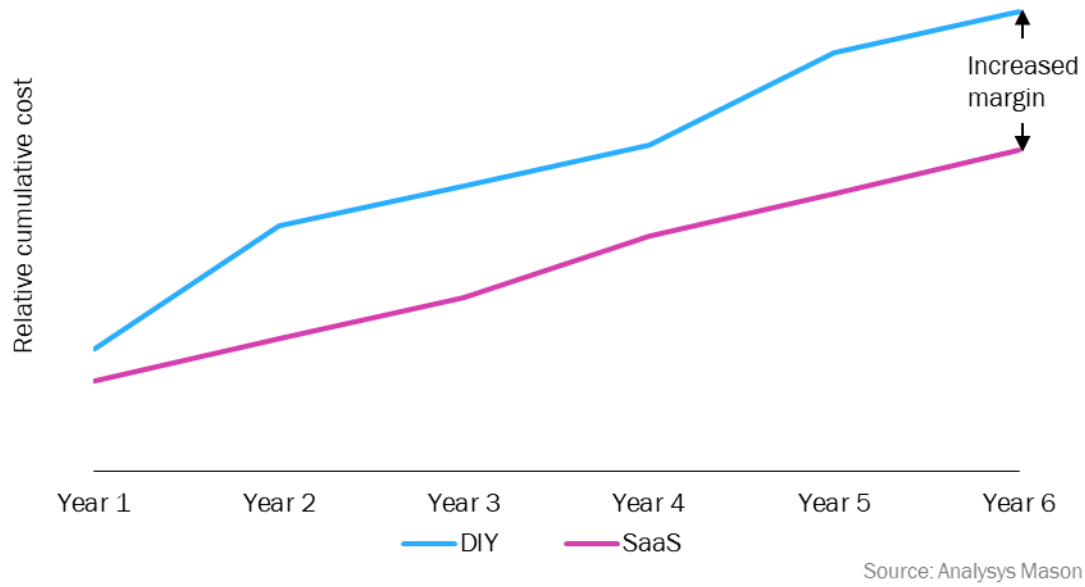
Benefit	DIY approach	SaaS solution
Time-to-market and opportunity costs	May take months or years to build, test and deploy and there is a higher risk of failure before seeing business benefits.	Deployed in weeks, which means that it takes less time to launch new services and realise the benefits of reduced operational time and costs. SaaS solutions typically have a 50% faster time to value than DIY alternatives.
Continuous innovation	New features and functions take longer to implement because the burden to maintain the solution increases and the IT budget is limited. Innovation is restricted to in-house teams.	New features can be added near-instantly (typically 70% faster). Market-wide innovation is available on the platform.
Reliability, continuous maintenance and updates	Maintenance costs (18–22% of the total annual cost) must be added to each software component. The reliability is lower because applications are not updated or tested as often as those deployed via the SaaS model.	SaaS solutions are constantly updated, tested and monitored to reduce risks and outages. They are more predictable and reliable than DIY alternatives and the maintenance and update costs are included in the solution price.
Staff training	The complexity of the system requires significant staff training,	The amount of staff training is reduced through system simplification and more industrial processes for support.
Scaling	Hardware and software scaling requires over specification to account for growth and future uncertainty.	The cloud-based approach enables usage to be easily changed to match demand.
Hardware and licensing costs	The full cost of the automation software platform and associated hardware comes at the initial stage of deployment.	Platform software costs are spread across all platform customers and hardware is right-sized for each customer.

Source: Analysys Mason

5.4 Benefits summary over a 6-year period

SaaS-based services are often perceived to initially provide a cost advantage over DIY solutions but to be more expensive over time. However, this is often based on an incorrectly comparing only software licence costs. SaaS solutions provide benefits in both the short term and the longer term, and DIY approaches cost significantly more than expected when you take all aspects of the project (training, updates, maintenance, operations and IT) into account. Where there is a need to support constant innovation, we estimate that a SaaS-led automation approach can be 40% less expensive than an internal DIY development over a 6-year period (Figure 5.4). There are, of course, variations depending on the project, the skills of the CSP development team and the complexity of the processes that are in place.

Figure 5.4: Relative cumulative costs of SaaS-based and DIY solutions



6 Summary

CSPs that are aiming to increase their degree of automation should consider SaaS-based deployments, but need to be prepared to transform their current processes to adopt automations that are instantiated within vendors' software. Vendors must have deep telecoms knowledge to develop efficient and optimised automations to support CSPs' requirements, built from engagements with multiple parties.

A SaaS-based automation deployment can yield fast time-to-revenue with a low upfront cost. In addition, staff productivity can be improved and CSPs can become better able to support more-complex services. Customer experience can be enhanced through increased reliability due to the standardised nature of a SaaS approach.

SaaS solutions also contribute to cost savings. CSPs that use SaaS solutions can benefit from a vendor's experience in maintaining deployments and from best-in-breed data methodologies.

7 A network automation-as-a-service example: Device Onboarding-as-a-Service

This network automation-as-a-service example was provided by our sponsor, Juniper Networks. Analysys Mason does not endorse any of the vendor's products or services.

Juniper Networks is leveraging cloud-delivered automation to accelerate CSPs' time to revenue while validating quality and device integrity automatically.

Deploying new equipment is time-consuming and error-prone due to the required number of manual interventions and the limited ways that CSPs and service providers validate quality and device integrity as they are onboarding new devices. Moreover, it requires field technicians to have networking expertise and knowledge of command-line interface (CLI), which increases costs.

In the age of AI and autonomous networks, it does not have to be this way.

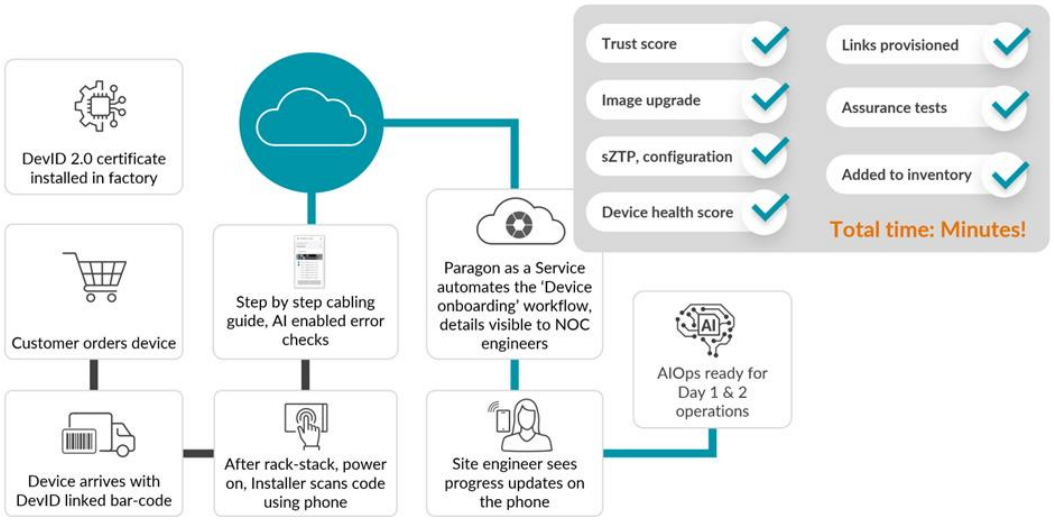
- The onboarding process should not stop at zero-touch configuration and provisioning. Onboarding should be automated from the moment the device is unboxed to when it is ready for service.
- Field technicians should not need to be network experts or be slowed down by document manuals or insufficient CLI knowledge. They should have visual guides and easy step-by-step instructions at their fingertips. They should be guided where to insert cables and warned if a cable is inserted in the wrong port.
- Device health checks and hardware and software integrity should not be afterthoughts or forgotten. They should be embedded into the onboarding process.
- Operations should not waste cycles reviewing a sea of basic alarms. Critical issues should be highlighted, and their root cause established automatically, as they happen.
- End-to-end connectivity tests should be performed automatically on the data plane before a device is marked "ready for service."

With Juniper Paragon Automation-as-a-Service, Juniper Networks re-imagined the device onboarding process to an fast, consistent, simple, secure, and fully automated experience that spans from unboxing to service-ready.

The Paragon Automation-as-a-Service onboarding solution is easily initiated by a field technician (Figure 7.1). Using a mobile phone, the technician scans a unique bar code on a network device, which triggers Paragon Automation-as-a-Service specifically for that device. Once the application determines authentic Juniper hardware, it provides a step-by-step visual installation guide to make sure each cable is connected correctly by the technician. It applies the correct software and device configurations automatically and runs additional device health and network performance checks. Meanwhile at the backend, network operation centre (NOC) engineers

have full oversight on every onboarding activity happening across the network. Thanks to Paragon Automation-as-a-Service, engineering and operation teams are in sync with the network state in real time.

Figure 7.1: Overview of Juniper Paragon Automation-as-a-Service



Source: Juniper Networks

Traditional zero-touch provisioning (ZTP) implementations are limited to configuring devices. With Paragon Automation-as-a-Service, you can not only do configuration and provisioning but extend the workflow to include secure ZTP, device trust validation, device health checks, connectivity, and performance checks, as well as do AI- enabled resolution of issues in case of errors. The completeness and ease-of-use of the Paragon Automation-as-a-Service device onboarding solution makes it unique and sets the benchmark for the right way of onboarding devices at speed, scale and quality.

Automation should drive CSP business outcomes that accelerate innovation, increase operational efficiency and deliver amazing customer experiences. This saves you time, money and resources, while allowing you to introduce new service enhancements at your own pace and protect network performance and quality.

Device onboarding through Paragon Automation-as-a-Service you can empower your engineering and operation teams and accelerate time to revenue while guaranteeing network quality and security in large-scale networks.

8 About the authors

Justin van der Lande (Research Director) leads the Applications practice, which is part of Analysys Mason's Telecoms Software and Networks research stream. He specialises in business intelligence and analytics tools, which are used in all telecoms business processes and systems. In addition, Justin provides technical expertise for Analysys Mason in consultancy and bespoke large-scale custom research projects. He has more than 20 years' experience in the communications industry in software development, marketing and research. He has held senior positions at NCR/AT&T, Micromuse (IBM), Granite Systems (Telcordia) and at the TM Forum. Justin holds a BSc in Management Science and Computer Studies from the University of Wales.

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