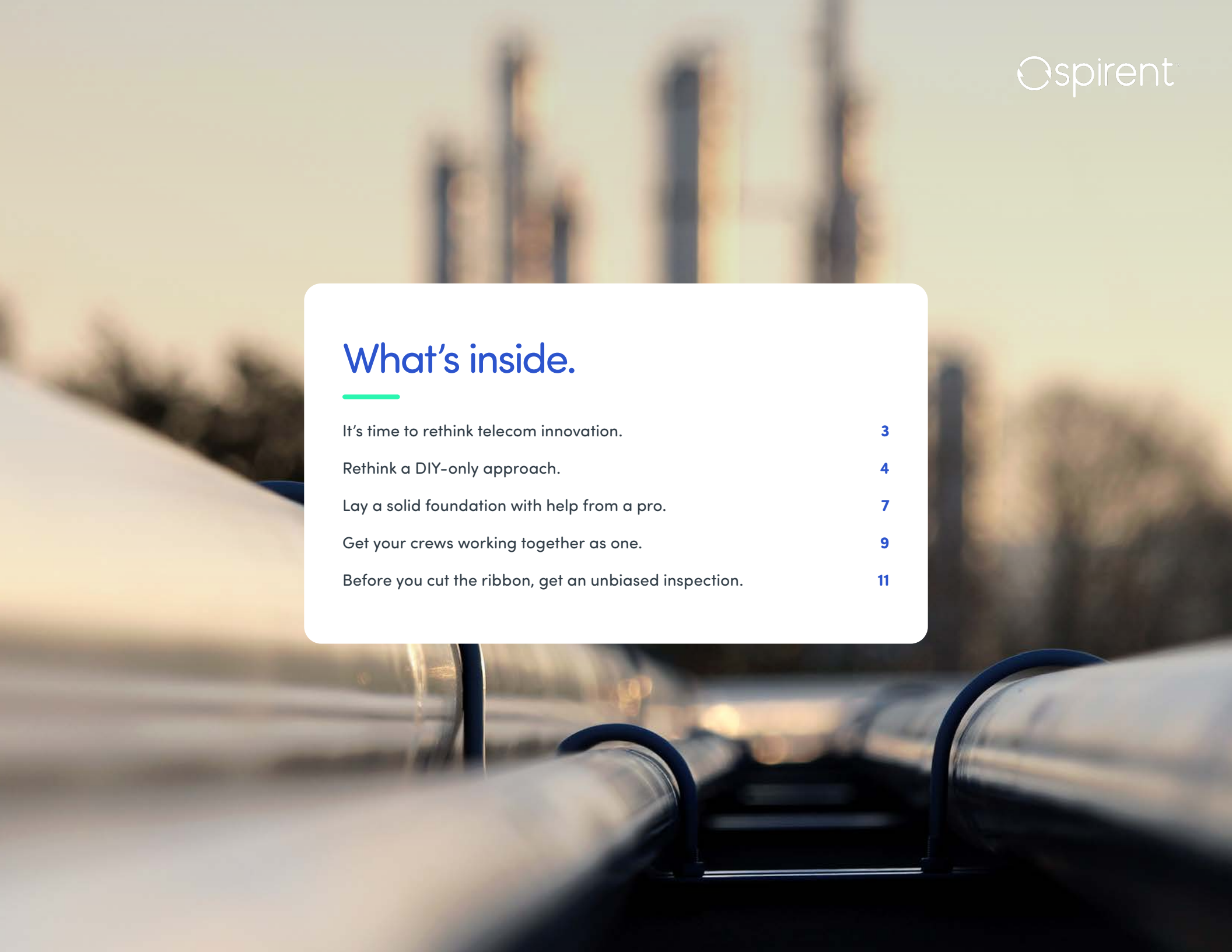
A SPIRENT E-BOOK

Building the New Telecom Innovation Pipeline



What's inside.

It's time to rethink telecom innovation.

New technologies such as 5G, SD-WAN and Cloud require a new approach to both innovation and testing.

We're just beginning to see the fruits of a multi-year transformation of telecom networks. Virtual networks have become cloud native networks. The tantalizing vision of rapid telecom innovation appears closer now. But just as networks have undergone a major architectural shift, we must now transform our Telecom Innovation Pipelines – the way we design, develop, and deploy new network-based products and services. A new coat of paint won't cut it. We need to build a new approach that takes full advantage of the cloud from the ground up.

With legacy silos embedded throughout internal teams and supplier ecosystems, service provider efforts to transform their telecom innovation pipelines are hampered by unwieldy manual and repetitive testing within each silo. New technologies such as 5G and SD-WAN require new test infrastructure, new labs, new experts, new processes and new training. At the same time, budget and time constraints are greater than ever.

The goal is for organizations to move from a handful of waterfall-style network releases each year, to a steady stream of continuous network development and integration. Getting there requires a fundamental rethinking of the traditional approach to network labs, validation and deployment. As part of this, service providers and network vendors must take a hard look at what they can do themselves, and when expert help is required.

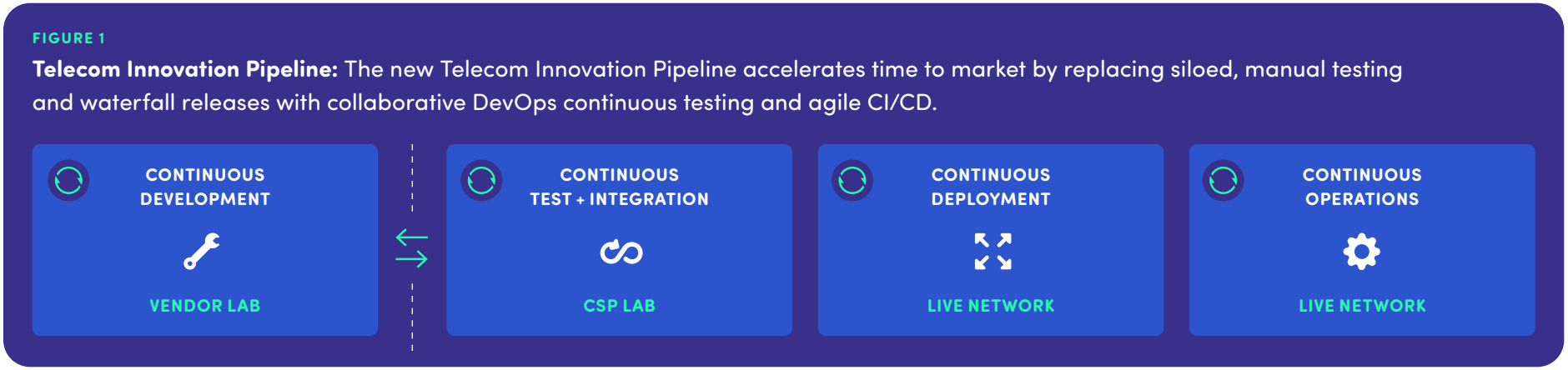


FIGURE 1

Telecom Innovation Pipeline: The new Telecom Innovation Pipeline accelerates time to market by replacing siloed, manual testing and waterfall releases with collaborative DevOps continuous testing and agile CI/CD.

Rethink a DIY-only approach.

Are automation and DevOps continuous testing core competencies? If not, consider bringing in specialists to accelerate transformations.

A do-everything-yourself approach to transforming telecom innovation becomes even more challenging as we consider all the new use cases that must be supported. These include autonomous vehicle communications, industrial IoT, telehealth, agricultural monitoring, battlefield communications, augmented reality, and beyond. Each use case brings intensive performance requirements against a backdrop of multi-layered domains of hybrid network complexity.

Delivering on the promise of these new use cases with limited investment and expertise requires new levels of automation and a shift to continuous integration / continuous development (CI/CD). But development and testing silos, both within service providers and their vendor ecosystems, were formed over many years and have strong inertia. To overcome the systemic testing challenges that block meaningful change to telecom innovation pipelines, service providers and network vendors must ask:

- Do we have all the expertise required to rebuild our innovation pipeline with an agile, CI/CD approach?
- Can we develop test cases to validate new network functions and services as quickly as we need to?
- Can we ensure all our network software and infrastructure will work together across vendors?
- Do we have the Capex/Opex budget and time it will take to get all these elements in place?

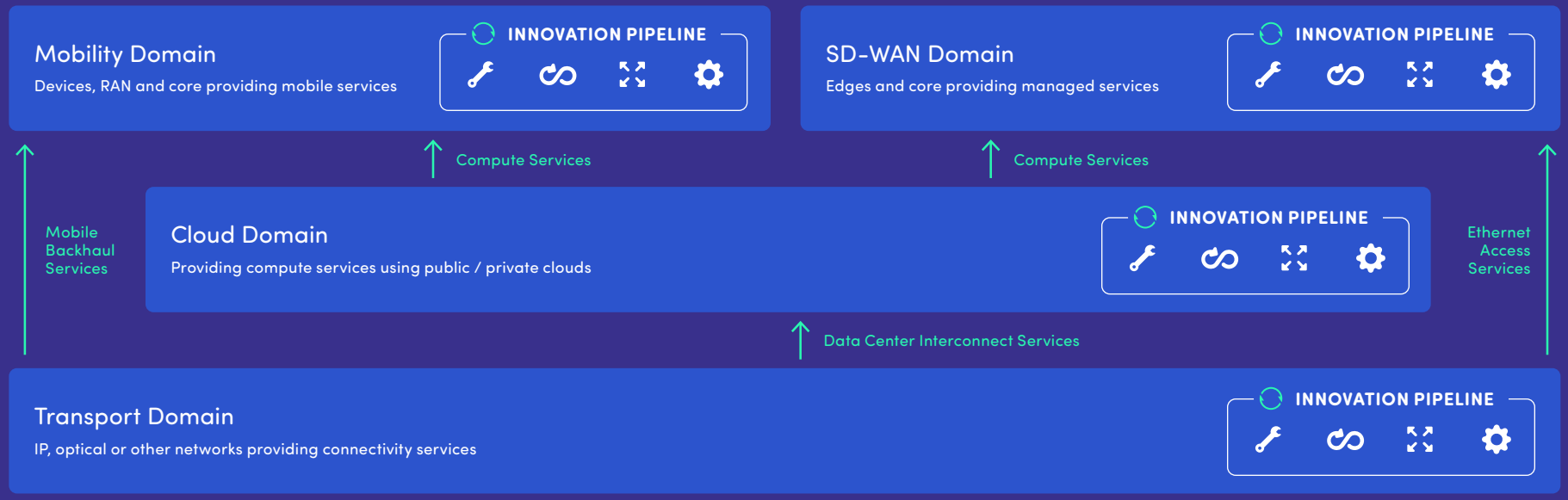
KEY TAKEAWAY

Development and testing silos in service provider and vendor ecosystems have widespread workflow inertia, institutionalized over years. Many organizations lack the internal expertise and resources required to successfully transform to a CI/CD model within their time and budget constraints.

For many companies, the answer to one or more of these questions is “No.”

FIGURE 2

Overcoming Complexity with Domain-Based Innovation Pipelines: Applications and underlying infrastructure have become phenomenally complex, making it difficult for providers and vendors to collaborate on new innovations. To address this complexity, the network should be segmented into domains with well-defined interfaces. Innovation pipelines may then be established for each domain, allowing domains to evolve independently. To accelerate innovation in each domain, pipelines should follow CI/CD best practices with continuous testing as a key enabler. Continuous testing should be highly automated, enabling rapid validation and problem isolation as new functions and infrastructure are developed and then deployed into production environments.



BUILDING THE NEW TELECOM INNOVATION PIPELINE

Based on our experience helping Tier 1 providers around the world transform their Telecom Innovation Pipelines, partnering with a DevOps and automation expert can successfully overcome the most entrenched inhibitors of change. We recommend working with a DevOps continuous testing specialist to rethink network validation and automation across the Innovation Pipeline, exploring the benefits of an 'as a Service' model in the following areas:

RETHINK THE LAB

Identify partners with advanced lab automation and technology test expertise and explore options to consolidate legacy physical and virtual labs into shared, web-accessible resources. Assess the benefits of optimizing and automating global lab resources with an 'as a Service' approach.

RETHINK VALIDATION

Reconsider ownership of validation testing for new technologies by working with partners who specialize in designing, building and deploying collaborative development environments (aka CI/CD). Explore how a services-based approach can lower costs, accelerate high-quality releases and improve agility.

RETHINK DEPLOYMENT

Evaluate use of a neutral, vendor-agnostic partner to validate and deploy new network functions across vendors. Examine how a combined approach to deployment and validation, delivered as a service, can maximize efficiency while ensuring a seamless, high-quality experience for end users.

Lay a solid foundation with help from a pro.

Take the first step to more efficient telecom innovation by consolidating and automating physical labs with **Lab as a Service (LaaS)**.

The past ten years have seen a proliferation of geographically dispersed lab environments that require manual configuration and execution of tests. A growing number of organizations recognize this trend runs counter to their need to become more agile and efficient. In response, organizations are taking bold steps to address the inefficiencies of legacy labs by consolidating and automating lab infrastructure and test equipment. However, full automation of complex lab environments may require management of tens of thousands of test configurations. Many organizations don't have the in-house systems or expertise to fully automate such complex environments, or to deliver critical enabling features including automated sharing of lab resources, and remote access and control.

A LaaS approach pools physical and virtual resources across worldwide labs so they function as one lab. LaaS manages and tracks utilization of all lab resources, so resources can be rapidly reconfigured, testbeds can be spun up and down on-demand, and complex validation test suites can be fully automated. LaaS solutions enable zero-touch provisioning by connecting all physical, virtual and hybrid infrastructure and test equipment with programmable Layer-1 switches. Web interfaces deliver a "single pane of glass" where resources located in different global regions are discovered and made accessible to users worldwide and testbeds can be designed and provisioned.

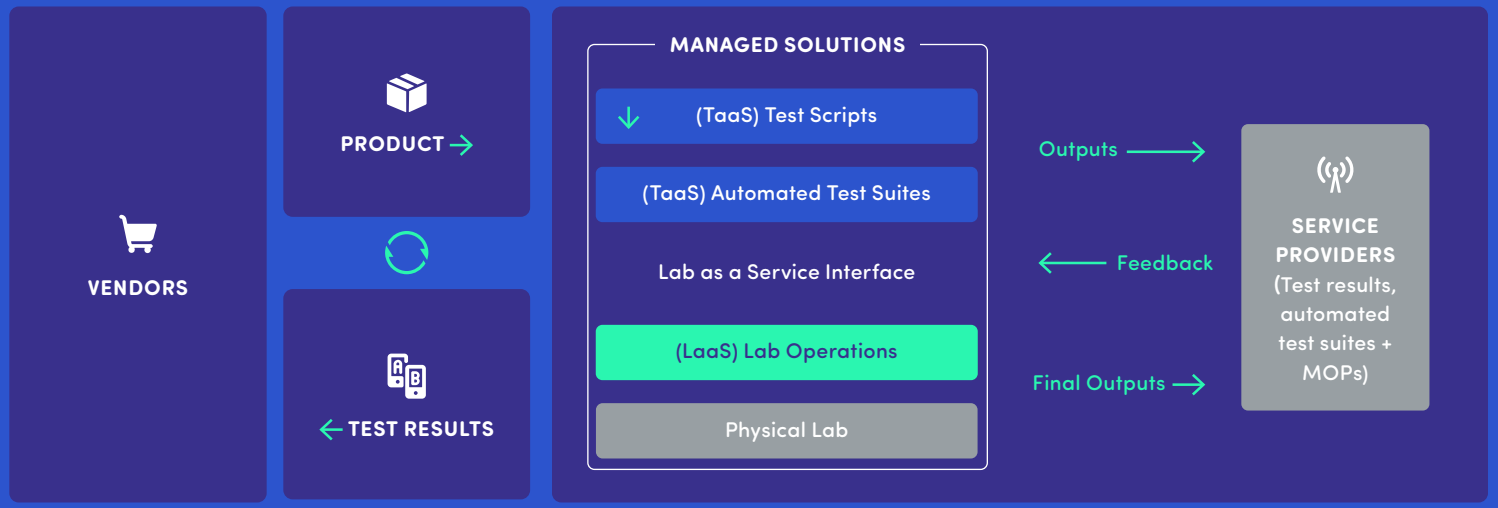
Because the continuous delivery process typically involves multiple suppliers and multiple internal teams, the lab environment must enable state-of-the-art collaboration across all of these groups. LaaS should give each group access to the same automated test environment so they can perform consistent validation as part of a larger innovation pipeline. LaaS must also integrate seamlessly with in-house or third-party automation tools to maximize reuse of all resources across the existing innovation pipeline.

KEY TAKEAWAY

LaaS pools physical and virtual resources across worldwide labs. It manages and tracks utilization of all resources so they can be rapidly reconfigured, enabling testbeds to be spun up and down on-demand, and delivering full automation of complex validation test suites.

FIGURE 3

LaaS/TaaS Solutions: Lab as a Service enables consolidation and automation of physical labs to create a foundation for automated test suites and supporting test scripts (Test as a Service).



Get your crews working together as one.

Streamline collaboration between Service Provider and Network Vendor teams and adopt agile CI/CD practices with **Test as a Service (TaaS)**.

Transforming Telecom Innovation may start with the lab, but it extends far beyond to network validation test cases, workflows and cross-team collaboration. Testing of previous generations of network equipment used to be much simpler because it focused on validation of well-defined physical network elements. With the 5G Core and its cloud native architecture, these monolithic network elements are superseded by individual CNFs (cloud native network functions) that may be deployed in traditional centralized locations or closer to the network edge to enhance performance. Likewise, SD-WAN introduces multiple layers to the network with CNFs distributed across the end-to-end network, from the core to customer premises.

This new reality requires that individual CNFs are validated both in isolation and as part of an end-to-end cloud network. To enable rapid collaboration and development, CNF validation must be automated and seamlessly integrated into systems for tracking feature requests, creating new builds, and managing the status of testing and bug fixes. This automated and integrated approach to validation, often referred to as Continuous Testing (CT), is a critical element of CI/CD, a best practice for accelerating cloud software releases

KEY TAKEAWAY

To maximize development agility, test suites must be automated and integrated with CI/CD test environments. As new CNFs become available, they must be rapidly validated both in isolation and as part of an end-to-end cloud network, requiring emulation of all surrounding network functions and realistic user traffic.

Adopting CI/CD requires new capabilities:

- Implementing a CI/CD environment for multiple vendors with a constant stream of releases
- Integrating automated CNF isolation and end-to-end validation tests into the CI/CD environment
- Emulating the network to perform realistic validation including interoperability testing of vendor CNFs
- Validating both performance and security for network functions and cloud infrastructure

Organizations often struggle to build their own CI/CD environments. Why? Because they don't have the internal expertise or toolsets to do this on their own and they have limited time and budget to acquire them. On top of this, 5G and SD-WAN bring a range of new testing demands that span cloud environments, network functions and security. Established testing practices such as competitive benchmarking of services must evolve to support a much faster pace of network change. Building automated test suites that cover these diverse needs, especially security, is a challenge for many providers.

Test suites must also be automated and integrated with CI/CD test environments, so that as new CNFs become available, they are rapidly validated. New CNFs must be validated both in isolation and as part of an end-to-end cloud network, requiring emulation of all surrounding network functions and realistic user traffic. Adding yet another layer of complexity, cloud infrastructure is also continuously updated and must be tested and benchmarked. Widespread use of software expands the attack surface of the network, requiring proactive assessment of security vulnerabilities. A mature Test as a Service solution should address this complex range of technology challenges and needs.

A specialized class of TaaS validation, Certification as a Service (CaaS) provides vendor-neutral validation and industry-recognized certification based on open standards (e.g., 3GPP, MEF and OPNFV) and service provider ecosystem requirements. Spirent collaborates with standards bodies and service providers to support both TaaS and CaaS needs, and is the exclusive administrator of MEF's industry-first certification program for SD-WAN.

FIGURE 4

CaaS Solution: Certification as a Service ensures user experience, performance and interoperability based on industry standards and service provider ecosystem test plans.

Before you cut the ribbon, get an unbiased inspection.

Launch high-quality services with confidence by taking a neutral, vendor-agnostic approach to turn-up testing with **Deployment as a Service (DaaS)**.

As hyperscale companies set the standard for continuous deployment – with new release rates as fast as one every 16 seconds – technology organizations around the world are seeking to deploy faster with higher quality. Compounding the challenge is the need to not only get to market quickly, but to ensure releases address rising subscriber demand for increased bandwidth. Organizations often struggle to perform realistic assessments of new technologies under load, in many cases only discovering performance issues after deployment. On top of these challenges, service providers must consider the inherent bias of vendors conducting integration testing of their own solutions.

Because of constrained budgets and limited internal expertise, organizations often lack the resources they need to make continuous deployment faster, more efficient, and more reliable. A mature Deployment as a Service model overcomes these challenges by integrating turn-up of virtual and cloud native network functions with highly realistic, vendor-agnostic validation testing. By adopting deployment and validation as a service, service providers can ensure seamless high-quality user experiences, while remaining focused on their core mission to offer innovative products and services.

KEY TAKEAWAY

Employing holistic network emulation, a DaaS solution integrates turn-up of virtual and cloud native network functions with highly realistic, vendor-agnostic validation testing. With DaaS, organizations can ensure a seamless high-quality user experience for their customers.

FIGURE 5

DaaS Solution: Deployment as a Service delivers realistic, unbiased validation as new functions are deployed in the live network, ensuring high-quality deployments and maximizing efficiency by reusing lab tests.

The pros of using a pro.

Spirent customers that adopt managed 'as a service' solutions achieve new levels of efficiency, agility and quality. Following are examples of real-world benefits.

LaaS Benefits

Accelerate testbed setup by 300x. Successful lab optimization and automation has a dramatic and measurable impact on productivity and efficiency, while lowering costs and accelerating time to market. Operators, service providers and solution vendors who have deployed a Lab as a Service model have been able to accelerate testbed setup by as much as 300x, while extending lab availability from 40 hours per week to 24/7. One Spirent customer, a cloud service provider, found it could spin up complex network testbeds in less than 15 minutes after deploying LaaS. Prior to deploying LaaS, the same activity required 50 hours of lab technician work.

TaaS Benefits

New releases every 6 weeks instead of 4-6 months. Another Spirent customer, a tier 1 mobile operator, needed to deploy a 5G core in a multi-vendor cloud environment to enable faster innovation. In support of that objective, the customer adopted TaaS and was able to transition from releasing 4G core network features every 4-6 months to releasing new 5G core features every 6 weeks. The managed solution also reduced Capex by delivering 5G test infrastructure as a service, avoiding significant upfront investment. In addition, the TaaS approach improved quality and reduced costs by helping to rapidly pinpoint and resolve complex issues spanning cloud infrastructure, security and network testing domains – before launch.

CaaS Benefits

Deliver flawless user experiences at launch. CaaS provides many of the same benefits of TaaS, across service provider ecosystems and the broader industry. As an increasing number of SD-WAN managed service providers and network vendors participate in MEF's SD-WAN certification program (exclusively administered by Spirent), improved interworking of products and services is helping the industry to accelerate its time to market. Other CaaS programs, such as Spirent Fit4Launch, enable service providers and their ecosystems of device vendors to ensure new products deliver flawless user experiences at launch.

DaaS Benefits

Identify performance bottlenecks before deployment. For Beijing's massive new international Daxing Airport, spanning over 7.5 million square feet, DaaS played a critical role in the validation of network connectivity and data centers, traveler Wi-Fi, and network security. DaaS provided the ability to identify potential integration and performance bottlenecks within the airport's multi-vendor cloud-based solution stack, allowing issues to be resolved during deployment which ensured a smooth launch. The DaaS deployment included a centralized test and assurance orchestrator emulating the entire network from end-to-end to enhance operational efficiency and user experience.

The Value of Managed Solutions

TEST AS A SERVICE

- Faster time to market and improved agility: **accelerating major network releases 3x**, from 4-6 months per release to 1 every 6 weeks
- **Higher quality** due to broader test coverage: cloud infrastructure, network functions and security
- **Reduced cost** due to optimized testing with automation, consistency and repeatability
- Increased agility and scalability

LAB AS A SERVICE

- Faster time to market: **300x faster** testbed setup
- Optimized tool and human resource management, increased productivity: **320% increase** in test capacity due to automation and extended test hours
- **Reduced upfront Capex and Opex**, catering to next-generation technology trials and roll outs
- Potential to monetize lab usage

DEPLOYMENT AS A SERVICE

- **Prevention of time-consuming and costly outages** from upgrades by validating new deployments under realistic conditions
- Provides **flexibility for continuous changes** and upgrades in network-wide live environments
- **Budget reduction** through automation
- Vendor neutral deployment partner

CERTIFICATION AS A SERVICE

- Assure new devices, network functions and services work together to deliver a **flawless user experience**
- Ensure network **vendor solutions are interoperable**
- Make sure inter-carrier services work and deliver seamless user experiences
- **Confidence to launch** based on a neutral, unbiased test expert

Spirent: Your telecom innovation pro.

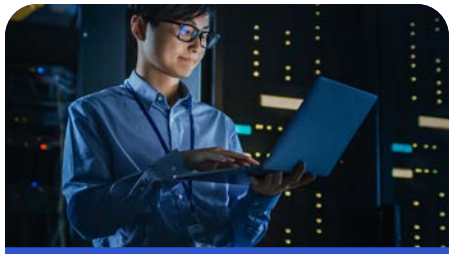
As neutral, vendor-agnostic experts in automation and DevOps continuous testing, we're proud to partner with service providers around the world in building a new telecom innovation pipeline.

We're known as pioneers of automated test and assurance for networks, security and positioning, and as technology experts for 5G, SD-WAN, cloud, PNT, and high-speed Ethernet. We've been involved with lab and test automation since its inception and are specialists at transforming labs, development and deployment workflows using cloud automation. Our solutions cover the full product lifecycle, from the lab to the real world, assuring networks and services for the largest, most complex networks on the planet. Our test and assurance expertise is unparalleled – spanning the network, cloud and security domains – so you can get to market faster, with greater confidence.

For customers rethinking whether testing and assurance should be a core focus, we offer a comprehensive suite of Managed Solutions built on our technology expertise and industry-leading test and assurance products. We have a track record of delivering our as a Service offerings to address the needs of leading technology companies around the world, from lab development to real-world deployment and beyond. We're proud to have helped leading service providers and their vendor ecosystems to build new telecom innovation pipelines that are delivering the enhanced agility and efficiency promised by next-gen networks.

LAB AS A SERVICE

Cloud-based, automated lab environments to accelerate innovation and lower costs.



TEST AS A SERVICE

Automated testing for faster time to market, improved agility and reduced Capex.

CERTIFICATION AS A SERVICE

Validation of service providers and vendors to ensure new networks and devices platform.

DEPLOYMENT AS A SERVICE

Software deployment with integrated validation testing for successful turn-ups.

About Spirent Communications
Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks. We help bring clarity to increasingly complex technological and business challenges. Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled. For more information visit: www.spirent.com

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