Manuals+ — User Manuals Simplified.

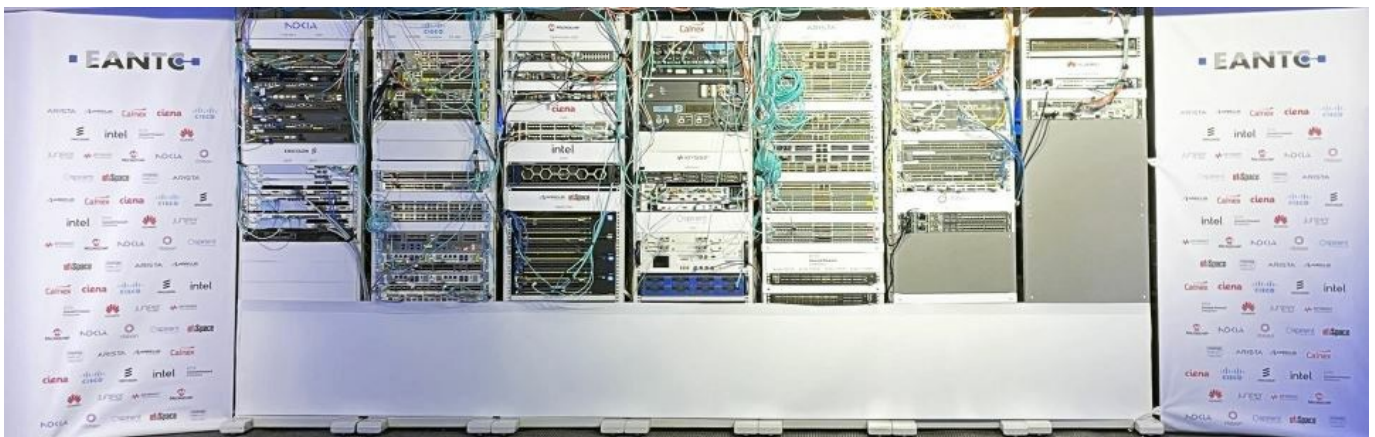# Spirent Advanced Validation for Private 5G Networks User Guide

Spirent Advanced Validation for Private 5G Networks

Product Information

The Spirent Managed Solutions is an advanced validation solution for private 5G networks. It ensures quality and

performance in the design, deployment, and management of private 5G networks. The solution offers conformance, performance, and security testing across various network components including NG RAN, transport and TSN, core, apps/services, cloud and MEC, and network slices.

Highlights

- Assessment Stages of Private 5G Networks
- Comprehensive validation of private 5G network design
- Identification of issues before deployment
- Avoidance of costly and time-consuming remediation

Sample Private 5G Network Topology

The solution includes enterprise User Equipment (UEs) with app emulation, e/gNodeB, NiB, on-premises outpost/private cloud, public MEC or local availability zones, and cloud. It assesses various aspects of the network including coverage, capacity, performance and QoE, devices, applications, and app endpoints.

Product Usage Instructions

Phase 1: Network Design and Validation Testing

In this phase, the Spirent Managed Solutions validates the viability of the private 5G network design. Follow the steps below:

1. Assess coverage: Use heatmaps to evaluate the coverage of the network from building to campus.
2. Evaluate capacity: Determine the loading limits and performance thresholds of the network.
3. Analyze performance and QoE: Measure the data, video, voice handovers to ensure optimal performance.
4. Assess devices: Evaluate the compatibility and performance of relevant devices such as phones, tablets, and IoT devices.
5. Emulate critical applications: Create a data footprint of critical apps to test their performance on the network.
6. Evaluate app endpoints: Test the performance of cloud, on-prem edge, and public edge app endpoints.

Phase 2: Network Acceptance Testing

In this phase, the Spirent Managed Solutions characterizes the performance of the private 5G network for customer confidence and SLA management. Follow the steps below:

1. Measure latency: Determine if the network meets low latency targets to enable new 5G services.
2. Analyze performance by location: Identify cities, sectors, and markets that are underperforming and investigate the reasons.
3. Evaluate infrastructure providers: Assess if infrastructure providers are delivering as expected.
4. Assess partner performance: Determine if the (hyperscaler) partner is delivering the expected low latency.
5. Compare edge latency: Compare the latency of the network's edge with that of the cloud and MEC competitors.

Specifications

- Supported Networks: Private 5G Networks
- Testing Components: NG RAN, transport and TSN, core, apps/services, cloud and MEC, network slices
- Validation Capabilities: Conformance, Performance, Security

Frequently Asked Questions

What is the purpose of Spirent Managed Solutions?

Spirent Managed Solutions ensures quality and performance in the design, deployment, and management of private 5G networks.

What are the assessment stages of private 5G networks?

The assessment stages include network design and validation testing, as well as network acceptance testing.

What is the benefit of using Spirent Managed Solutions?

The solution identifies issues before deployment, avoiding costly and time-consuming remediation.

What aspects of the network does Spirent Managed Solutions assess?

The solution assesses coverage, capacity, performance and QoE, devices, applications, and app endpoints.

What is the purpose of network acceptance testing?

Network acceptance testing characterizes the performance of the private 5G network for customer confidence and SLA management.

Advanced Validation for Private 5G Networks

The Need to Ensure Quality in New Private 5G Networks

- Private networks are taking on greater importance in vertical-specific enterprise use cases such as manufacturing, mining, transport logistics, and finance, which currently represent over 80 percent of the private networking market. These diverse enterprises represent diverse ecosystems, technologies, and environments.
- Major network equipment manufacturers, cloud providers, system integrators, and operators are intent on servicing the needs of these verticals with collaborative offerings aimed at making private 5G networks easy to order, deploy, manage, and scale.
- These stakeholders face a host of questions: Does the private 5G/4G/Wi-Fi network have the capacity for the required performance and quality of experience (QoE) customers expect? Is coverage of the campus, building, or factory comprehensive? Where must optimization take place to meet customer requirements? Does the network deliver the high-speed voice, video, data, and application performance customers require?
- The need to assure nothing is 'broken' – while managing the challenge of disaggregation in the 5G network – is essential. The service planned must be the one delivered. Each component of a private 5G network has its own unique requirements for validation.
- To address this comprehensively, automated validation, acceptance, and lifecycle testing, along with

automated assurance solutions, are essentials for success.

What assessment strategy is required to ensure enduring quality in the launch of a Private 5G Network?

Highlights
Private 5G Network Solutions:

- Network design and validation testing – Accelerate network design, validation and 5GtoB application development: Conformance; Performance; Security
- Network acceptance testing –Simplify site acceptance testing: Field Testing as a Service; network performance; QoS/QoE; Security; RAN Optimization
- Lifecycle management and assurance – Proactively assure service performance, SLAs and ongoing change management: continuous integration, deployment, and testing (CI/CD/CT); continuous monitoring (CM/Active Test)

## The Solution: Advanced Validation for Private 5G Networks

Spirent's Advanced Validation for Private 5G Networks solution is a phased, sophisticated, and proven program delivering independent network performance analysis. Spirent has provided the world's leading operators and OEMs with customized measurement and reporting to help meet research objectives, minimize network impact, improve products, optimize the subscriber experience, and build brands. Spirent's ability to quickly deploy teams of engineers helps carriers make decisions on key strategies that can impact customers in the long term. Our team of specialists will build a test plan tailored to your needs that can answer specific questions regarding your network's interaction. Spirent will examine the challenges of your service, identify the key criteria for success, define the test plan, then execute the validation to make sure you are ready for launch.

Phase 1: Network Design and Validation – Lab Testing Areas

Spirent's approach: Assessment of voice, video, data, and application QoE and underlying access network, and its design, using Spirent tools and methodologies in lab-based testing prior to deployment. This phase includes survey coverage of campus, buildings or factories with industry leading tools. Spirent assesses capacity and impact
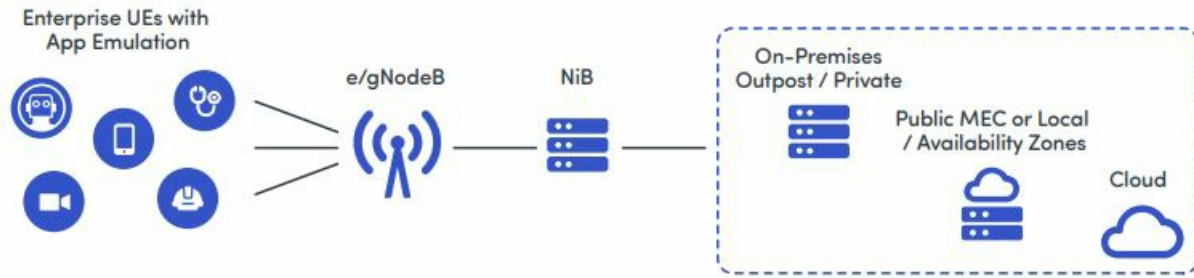on performance and tests critical enterprise applications to cloud or edge. In essence, Spirent supports the planning, building, optimization and evolution of an enterprise private network.
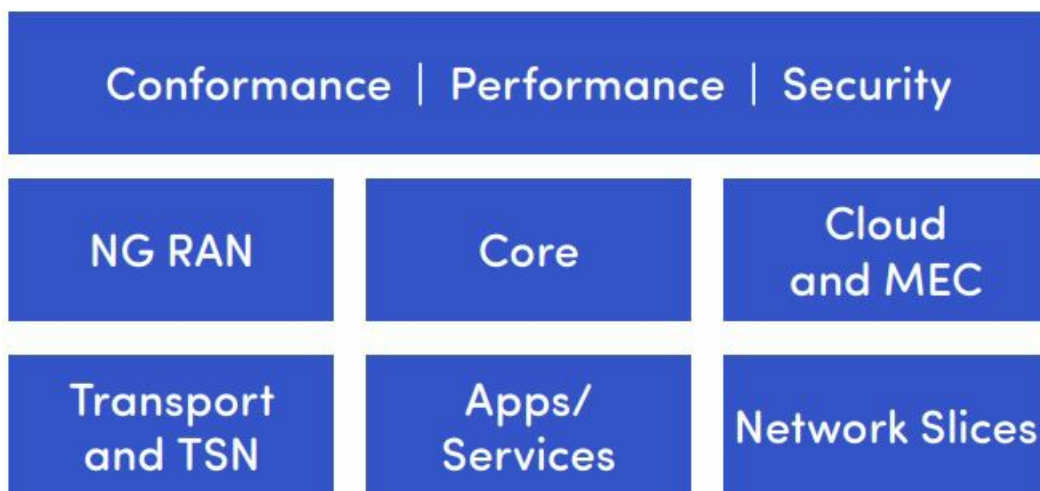
Solution benefits. Spirent validates the viability of the private 5G network design and ensures comprehensive QoE performance in the lab before new private 5G network service launches. In doing so, the solution identifies issues before deployment, avoiding costly and time-consuming remediation.

Sample Private 5G Network Topology

Sample Private 5G Network Topology

Assessment Areas included in Phases 1 & 2

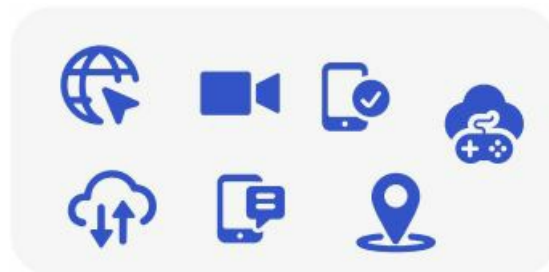| **Coverage**	**Capacity**	**Performance and QoE**	**Devices**	**Applications**	**App Endpoints**
Building to campus heatmaps	Loading limits, performance thresholds	Data, video, voice handovers	Assess relevant devices; phones and tablets; IoT	Emulate data footprint of critical apps	Cloud; on-prem edge, public edge

Phase 2: Network Acceptance Testing

Characterizing performance for customer confidence and SLA management, key questions include: Is the 5G network hitting low latency targets? What cities, sectors, and/or markets are underperforming and why? Are infrastructure providers delivering? Is the (hyperscaler) partner delivering the low latency expected? How does my edge latency compare to the cloud and my MEC competitors? Knowing the latency is the key to enabling new 5G services and getting expected return from a 5G investment.
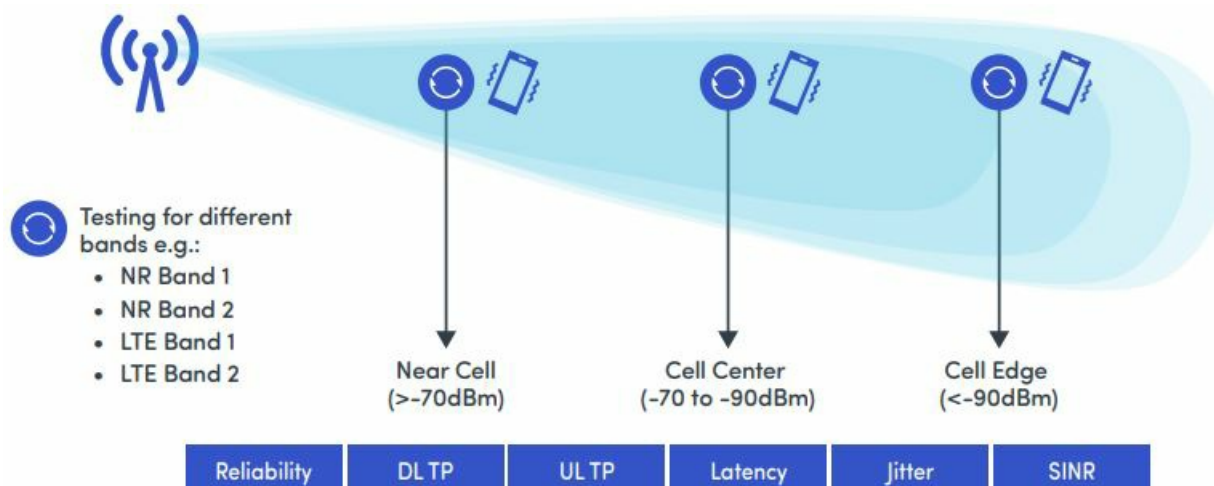
Spirent's approach: Live network active field tests from commercial UEs to Spirent data servers are placed at the edge and in the cloud are employed. Testing also covers multiple protocols that are applicable to the specific use case the private 5G network addresses, which can include: TCP – throughput; UDP – one-way latency, jitter, packet failure rate; ICMP – RTT/latency. Tests are supported in multiple markets/cities and include coverage of different infrastructure combinations. This assures the promise of a quality user experience across mobile devices, networks, communication services and content.
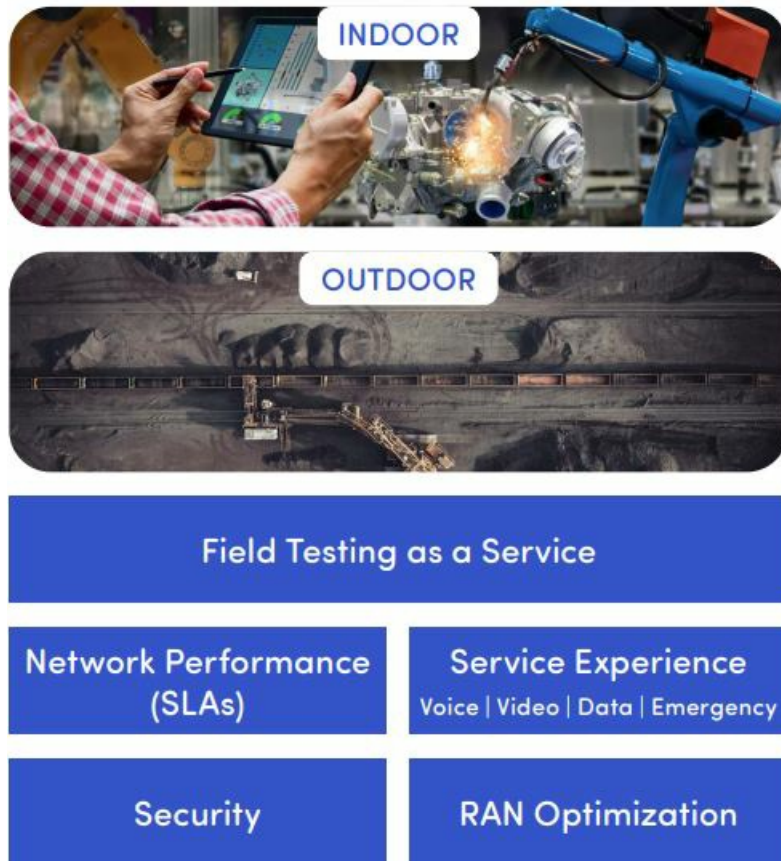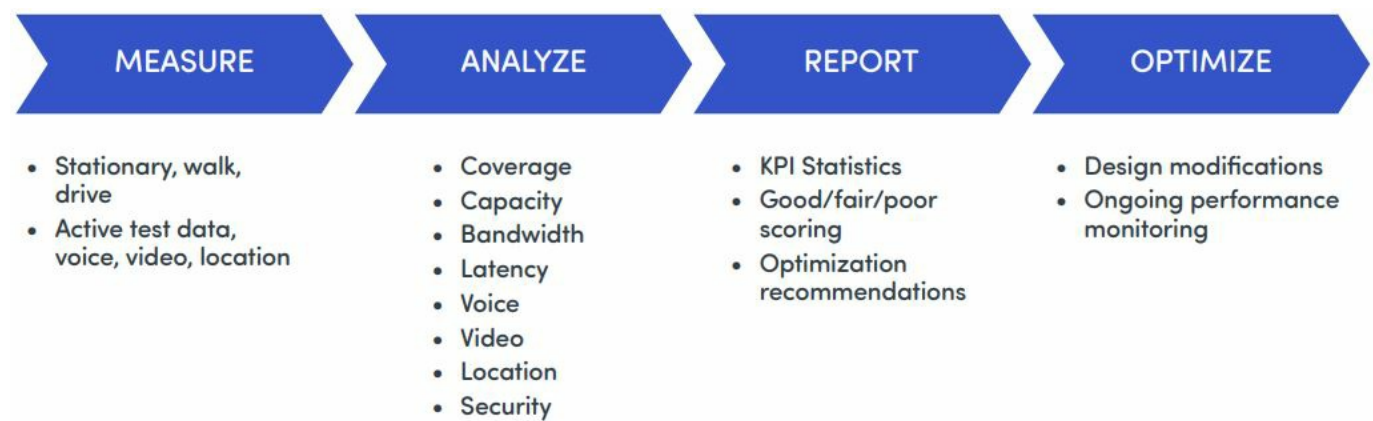
Solution benefits. Spirent measures success against the standard that matters to end users – a positive experience – and ensures QoE during the deployment of new private 5G network service launches.

Private 5G Network Site Acceptance Testing Example

Testing for different bands e.g.:
- NR Band 1
- NR Band 2
- LTE Band 1
- LTE Band 2

Near Cell (>-70dBm)

Cell Center (-70 to -90dBm)

Cell Edge (<-90dBm)

| Reliability | DL TP | UL TP | Latency | Jitter | SINR |

Typical Private 5G Network Site Acceptance Field Testing

MEASURE	ANALYZE	REPORT	OPTIMIZE
• Stationary, walk, drive • Active test data, voice, video, location	• Coverage • Capacity • Bandwidth • Latency • Voice • Video • Location • Security	• KPI Statistics • Good/fair/poor scoring • Optimization recommendations	• Design modifications • Ongoing performance monitoring

Phase 3: Lifecycle Management and Assurance – Continuous Monitoring

The requirement. Guarantee business outcomes through reduced downtime, increased operational efficiency, increased survivability, and optimized security. The solution must support proactive and automated activation of change management to accelerate deployment using a combination of over-the-air (OTA) and virtual test agents (VTA), including load testing. Service-level agreement (SLA) validation must support compliance. End-to-end assurance must provide rapid fault isolation/resolution between Radio, Mobile core, and application servers, to rapidly identify if it was private 5G gear or an enterprise issue. Self-test functions for enterprise customers should be available. Spirent's approach: Empower operation and management (O&M), by validating private 5G network performance prior to and following activation. Utilize VisionWorks VTAs and OCTOBOX OTA chambers – powered by iTest and Velocity Core automation (or third-party solutions) – for active service performance by testing and validating that all the infrastructure and functions of largely software-based architecture can work together as intended with compliance to 3GPP standards. Support SLAs and ongoing change management by emulating L2-7 traffic from demarcation points inside and outside the network. Actively inject traffic 24/7 or on demand.


Continuous Monitoring (Active Test)

Network and Service SLAs	Fault Isolation

Solution benefits. The solution provides end-to-end visibility with proactive analytics and automated troubleshooting – from lab to live. These solution features deliver:

- Accelerated Time-to-Market. Achieve up to 10x faster turn-up of new network functions and services
- Optimized User Experience. Proactively discover and resolve issues before users are impacted
- Reduced Costs. Avoid hours of manual troubleshooting and SLA violation penalties

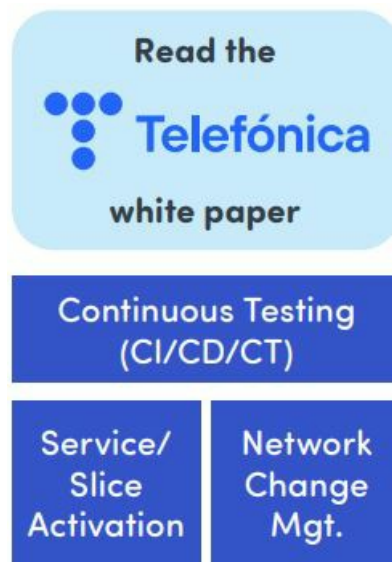**Use Case: Active Assurance and SLA Management**
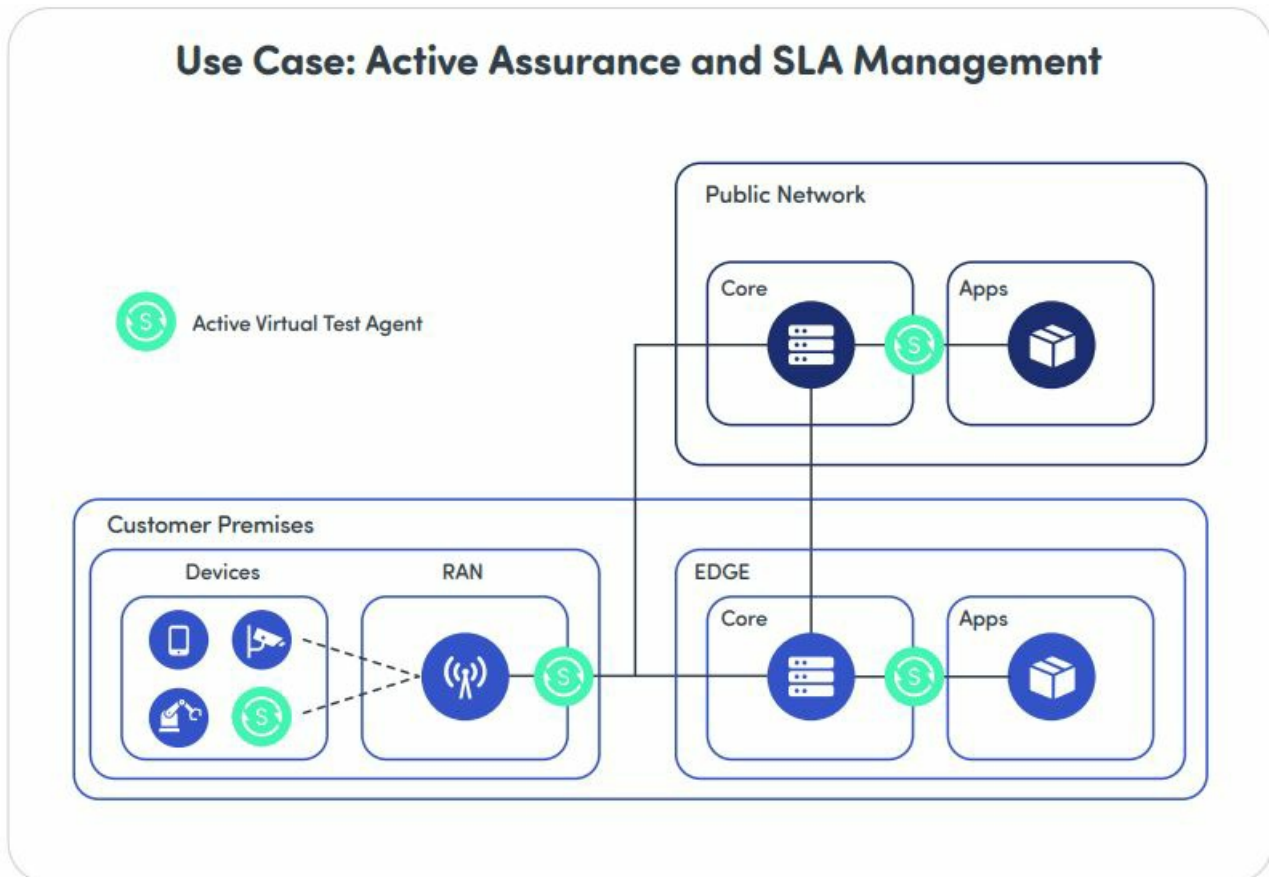
The Value of Spirent VisionWorks
VisionWorks supports private 5G network testing in economical phases which can be scaled robustly in a range private network use cases and deployment stages.

Phase 3: Lifecycle Management and Assurance – Continuous Testing

The requirement. Reduce total cost of ownership (TCO), while delivering agile, high-performance private 5G networks. Any service provider offering private 5G network services must meet the needs of a wide range of emerging enterprise, public, and IoT use cases. The private 5G network (PN) must provide clients with dedicated 5G connectivity, edge compute, and a portfolio of vertical-specific value-added services. These PNs are complex due to multiple components and a fast release lifecycle of software. Traditional ways of testing connectivity are not suitable to manage this framework of services. Spirent's approach: Utilize continuous integration, deployment, and testing (CI/CD/CT) with the Landslide test platform – powered by iTest and Velocity Core automation (or third-party solutions) – to support O&M, and proactively assure service performance. Leveraging low-touch automated lifecycle management, continuously test and validate that all the infrastructure and functions of largely software-based architecture so that they can work as intended with compliance to 3GPP standards. Support service-level managed (SLAs) and ongoing change management.

Read the **Telefónica** white paper

Continuous Testing (CI/CD/CT)

Service/ Slice Activation

Network Change Mgt.

Solution benefits. Spirent's low-touch automated CI/CD/CT solution improves the time (often 3x) it takes to test and validate functionality, performance, and security throughout the lifecycle of a private 5G network stack. In doing so, it reduces the total cost of ownership (TCO).

Note: The Continuous Monitoring and Continuous Testing components of Phase 3 can be implanted separately, or in concert with each other.

Use Case: Telefonica's Lifecycle Management Test Framework
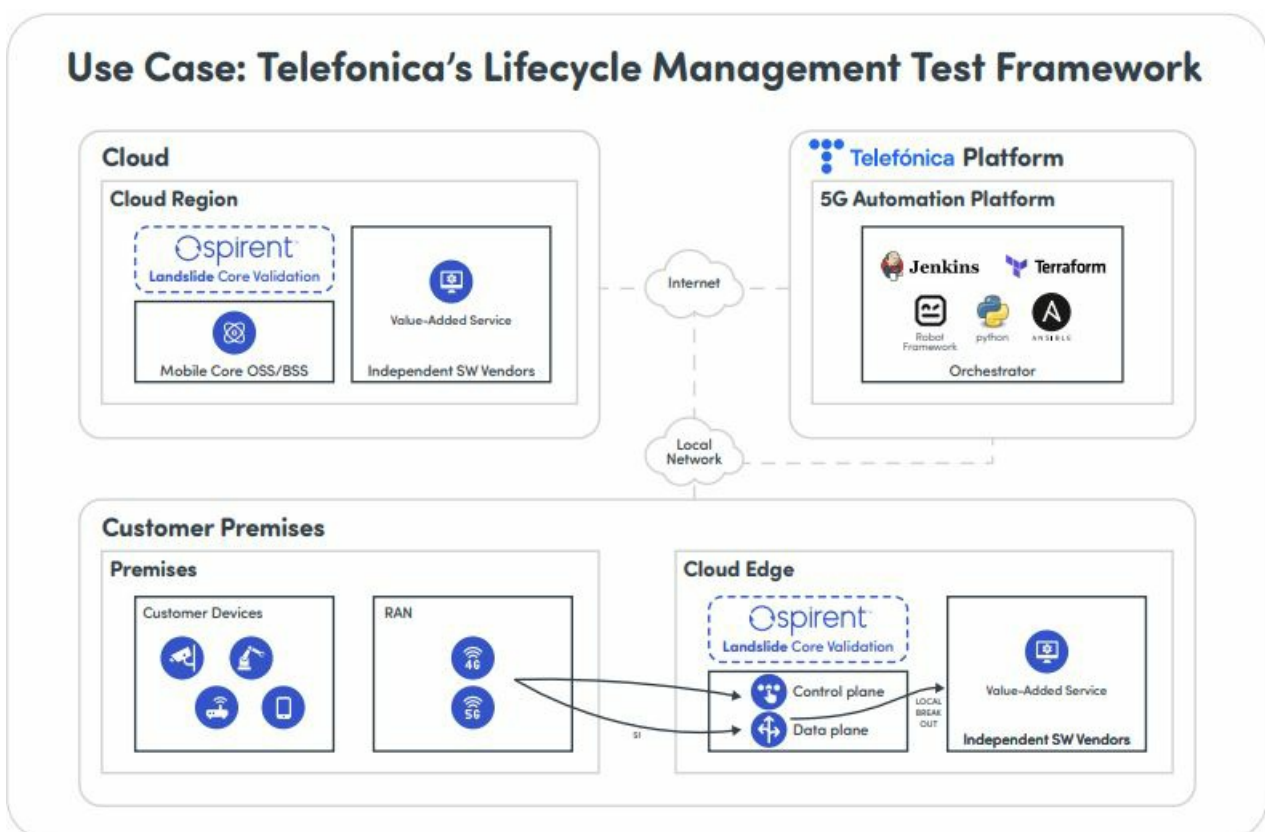
Why Spirent?

Our customizable Advanced Validation for 5G Private Networks solution employs test and validation efficiencies and strategies drawn from an authoritative portfolio of capabilities and established leadership in broad technology and domain expertise. This stems from offering a comprehensive suite of solutions for cutting-edge technologies in networking, cybersecurity, and positioning including 5G, 5G Core, Cloud, SD-WAN, SDN, NFV, Wi-Fi 6, and more. A pioneer in lab and test automation, our expertise includes DevOps and CI/CD, which employs industry-recognized best practices for test and assurance to achieve comprehensive continuous testing and monitoring.

Solution Suite Business Value

- Work with the pioneers in testing mobile QoE under real-world conditions and global leaders in 5G validation
- Employ extensive experience with new and existing mobile technologies from leading industry players
- Utilize industry-leading test and automation platforms
- Maximize capital expense budgets and reduce TCO
- Utilize proven methodologies and test plans, based on global cloud-based measurement systems
- Attain comprehensive test coverage with methodology covering voice, data, video, 5GmmWave, cloud gaming, and location accuracy

Our Customers

Spirent has been a pioneer since the advent of network, wireless and GNSS testing, validation, and assurance, and has provided services to customers across a broad range of global industries. These varied business sectors include global navigation satellite systems, aircraft and automotive manufacturers, as well as telecommunications and wireless service providers, network equipment manufacturers, petroleum, education, the media, financial institutions and stock exchanges, technology enterprises and publishing giants. Spirent also services governments worldwide, which includes military and space agency projects.

Spirent Expertise
Spirent provides services expertise for all major communications vendors — from Lab to Live. This end-to-end proficiency draws from a deep bench of seasoned professionals who are qualified experts in our technology portfolio. Our services cover devices, infrastructure, cloud infrastructure, networks, network applications, security and assurance, all powered by state-of-the-art lab and test automation. Such industry expertise maximizes your solution capabilities and ensures you deliver your product or service to market on time and with optimal quality.

The Global Services Delivery Process

The Global Services Delivery Process

DISCOVER > DEFINE > DEVELOP > DELIVER > DEBRIEF

Spirent Global Business Services Portfolio
Spirent's Advanced Validation for Private 5G Networks solution is part of a comprehensive suite of services and solutions. Spirent's portfolio of services for an initiative's entire lifecycle – from Lab to Live – helps organizations achieve their short-term testing and validation goals, while building a strong framework for future and enduring business success.

Managed Solutions

Performing strategic operational functions for customers:

- Lab as a Service
- Test as a Service
- Certification as a Service
- Deployment as a Service
- SecurityLabs

Professional Services

Providing a broad range of test and validation services enabling Spirent products and solutions that involves:

- Implementation and Integration
- Customer Training
- Resident Engineers

Consulting Services

Supporting custom projects, helping customers with specific strategies and objectives:

- Assessments and strategy
- Planning and design
- Network architecture and engineering
- Test methodologies

For more information on Spirent's Managed Solutions, please visit: **www.spirent.com/products/services-managed-solutions**

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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Documents / Resources

Spirent Advanced Validation for Private 5G Networks [pdf] User Guide
Advanced Validation for Private 5G Networks, Validation for Private 5G Networks, Private 5G Networks, Networks

References

- ↻ **[Automated Testing and Assurance Solutions - Spirent](#)**
- ↻ **[Managed Solutions for Test and Assurance - Spirent](#)**
- ↻ **[Telefónica Leverages Spirent Continuous Testing for Agile Delivery of 5G Private Networks - Spirent](#)**
- **[User Manual](#)**