

SPIRENT

ON SITE TESTING SOLUTIONS

OnDEMAND

3G/4G WIRELESS EDITION

OnDEMAND Wireless Packaged Test Services

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OnDEMAND On Site Performance Testing

3G/4G WIRELESS EDITION

Performance problems in 3G/4G Wireless network systems and software applications are costly both in terms of business disruption and remedial work. These issues often go undetected prior to launch due to the difficulty of conducting realistic performance testing. Quantifiable consequences of undetected performance problems include: revenue loss, customer base erosion, and brand damage. All of these issues call into question any business's long-term viability.



Spirent OnDEMAND Performance Testing is a suite of test services designed to detect and mitigate these problems before you launch wireless products, services or applications. Through the use of proven, advanced techniques, a structured testing approach, and full benefit of Spirent's broad array of test equipment, we eliminate risks of poor performance for new or enhanced wireless products, services and applications.

Spirent's OnDEMAND Performance Test Services include:

- Scalability and volume testing
- Endurance and soak testing
- Product performance evaluation
- Performance tuning
- Vendor selection: load and stress testing



Independent research confirms testing strategic IT initiatives is critical

*"...Without proper testing, such strategic initiatives can fail, with serious unforeseen consequences, including significant hard-dollar and opportunity costs.... **Gains may be minimized or erased if a lack of testing results in problems when the initiative goes live.**"*

—Source: Nemertes Research

The Cost of Failure???

The average cost of a single hour of network downtime is about \$42,000.

—Source: Gartner Group

*Mission Critical application downtime can **cost millions of dollars each minute.***

—Source: Standish Group

3G/4G Wireless OnDEMAND Testing Solutions

Test Results On Time, On Budget

Testing is instrumental in planning, deploying and maintaining a reliable and scalable wireless services network. Schedule test practices and ineffective test methodologies fail to deliver within the project window. When projects are behind schedule, a test window may be minimized or eliminated to ensure on-time delivery. Protect your projects with OnDEMAND.

Since the advent of network testing, Spirent test engineers have helped hundreds of clients save thousands of hours testing by bringing products to market faster and with higher quality. Leverage industry-certified test experts, packaged test plans, and a world-class service delivery process designed to deliver reliable test results on time, on budget.

3G/4G Wireless OnDEMAND Test Packages

In response to evolving technologies and growing demand for new solutions in the wireless space, Spirent Professional Services has developed a suite of packaged test services specifically addressing the challenges. The solutions include utilizing the power of the award-winning Landslide wireless test platform.

Spirent's OnDEMAND Test Package for 3G/4G Wireless:

- LTE
- WiMAX
- UMTS
- GPRS
- UMTS



LTE – OnDEMAND Performance Testing

PROBLEM

Next-generation cellular technology is converging on a single global standard: LTE (Long-Term Evolution). While LTE offers higher data rates, better service quality and lower operational costs, it also represents the most drastic evolutionary step in several years, and requires much more care than other recent wireless technology upgrades. LTE relies on new, complex, evolving standards. Some network operators who plan early LTE deployments are transitioning from older technologies that must interoperate seamlessly with the new standards. Implementing this generational advancement successfully involves managing multiple complex risks. Failure in this initiative leaves your competitive edge in doubt.

SOLUTION

Spirent test solutions have been a fundamental component behind most of the world’s successful wireless technology rollouts. Spirent’s Landslide won the LTE Visionary Award for 2009 and is a leading test tool in the LTE technology. Spirent’s OnDEMAND packaged test service, which tests the core requirements of any LTE launch, ensures the deployment delivers on its promise. Spirent Landslide supports inter-technology mobility to assure seamless migration from existing networks.

BENEFITS & VALUE

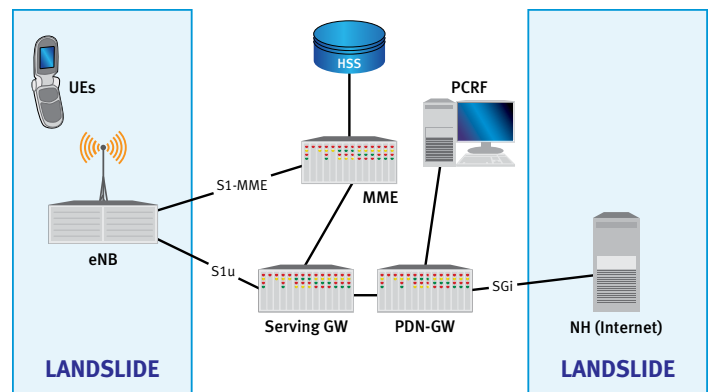
- Ensure network services and infrastructure meet current standards requirements
- Establish network/device performance under load identifying break points, allowing issues to be resolved prior to the subscriber experience
- Verify network equipment manufacturer product claims, acquiring consistent, comparable statistics, to provide objective comparison of each tested vendor
- Fortify customer satisfaction by delivering the highest service quality possible
- Gain budget savings with successful first time seamless system integration

Spirent’s OnDEMAND LTE Performance Test Package includes:

- **Assessment:** Stability, capabilities and performance
- **Vendor Selection:** MME, Serving GW – Configuration, user rates, data throughput, protocol compatibility
- **Standard On Site Engagement:** 5 days

SOLUTION COMPONENTS – LTE PERFORMANCE TESTS

- **4G Wireless Tests:** MME Node, SGW Node, PGW Node or End-to-End
- **Typical LTE Tests:** Maximum Users; Maximum User Activation Rate; Maximum Session Loading (Simultaneous Activations and Deactivation for a long period of time); Maximum Handoff Rates (Inter-MME, Inter-SGW or Intra-SGW); Maximum Data Throughput (Stateless and Stateful Data Flows)
- **Test Network Data Collection:** Max Number of Users; Max Activation/Deactivation Rate; Maximum Activations/Deactivations per second; Maximum Handoffs per second; Maximum BPS and Maximum PPS



LTE End-to-End Test Topology



WiMAX – OnDEMAND Performance Testing

PROBLEM

With its mature and rich ecosystem, numerous experts state that WiMAX is expected to undergo a surge in popularity in the near future. Currently with 502 networks in 142 countries, a recent WiMAX.com survey reports that by 2013 there will be over 120 million subscribers. As WiMAX reaches its potential in a growing market share – offering innovative services such as open Internet anywhere at true broadband speeds – it is critical that past deployment challenges not impair future adoptions. The full benefits of WiMAX's broad and innovative services cannot be delivered until performance and quality of service are assured.

SOLUTION

Spirent test solutions have been employed since the introduction of WiMAX technology. In addition, Spirent has provided solutions for virtually all the major wireless services. Spirent's OnDEMAND packaged test service, which tests the core requirements of any WiMAX launch, ensures that WiMAX delivers on its promise. Testing with Spirent helps avoid any delays due to unanticipated deployment irregularities. Spirent Landslide has been integrated with many vendors and has variants to support vendor-specific WiMAX implementations.

BENEFITS & VALUE

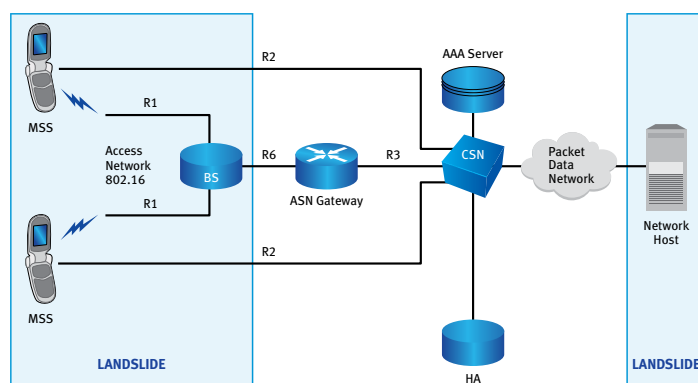
- Ensure network services and infrastructure meet current standards requirements
- Establish network/device performance under load identifying break points, allowing issues to be resolved prior to the subscriber experience
- Verify network equipment manufacturer product claims, acquiring consistent, comparable statistics to provide objective comparison of each tested vendor
- Fortify customer satisfaction by delivering the highest service quality possible
- Gain budget savings with successful first time seamless system integration

Spirent's OnDEMAND WiMAX On Site Performance Test Package includes:

- **Assessment:** Stability, capabilities and performance
- **Vendor Selection:** ASN Gateway, CSN – configuration, user rates, data throughput, protocol compatibility
- **Standard On Site Engagement:** 5 days

SOLUTION COMPONENTS – WIMAX PERFORMANCE TESTS

- **4G Wireless Tests:** ASN Node, CSN Node or End-to-End
- **Typical WiMAX Tests:** Maximum Users; Maximum User Activation Rate; Maximum Session Loading (Simultaneous Activations and Deactivation for a long period of time); Maximum Handoff Rates (Inter-ASN GW, Mobile Node Mobility, or Inter-Technology Mobility); Maximum Data Throughput (Stateless and Stateful Data Flows)
- **Test Network Data Collection:** Max Number of Users; Max Activation/Deactivation Rate; Maximum Activations/Deactivations per second; Maximum Handoffs per second; Maximum BPS and Maximum PPS



WiMAX Forum End-to-End Test Topology



UMTS – OnDEMAND Performance Testing

PROBLEM

As air interface technology continues to evolve, the demand for data services has grown exponentially. UMTS (Universal Mobile Telecommunication System) technology is constantly changing as it progresses towards LTE (Long-Term Evolution). Future revenue growth from emerging services and next generation devices are highly dependent on the performance and the quality of user experience (QoE). Failure to keep pace with these fast-evolving market demands and service requirements can result in loss of customers and consequentially business failure.

SOLUTION

Spirent’s OnDEMAND on site packaged test services provide accurate and efficient test solutions that are geared for future technology changes. By leveraging Spirent’s OnDEMAND testing, service providers can deliver the reliable performance and quality of service that customers demand in this ever-evolving market space.

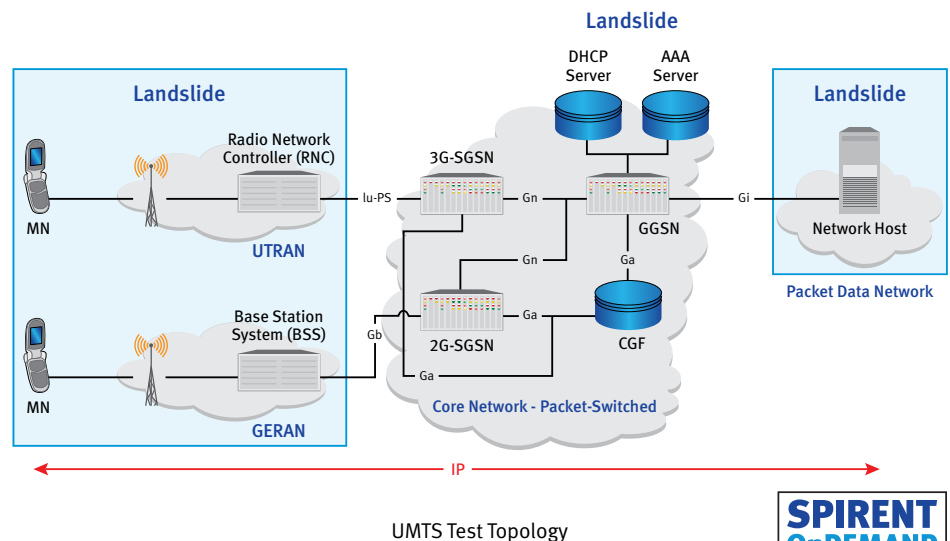
BENEFITS & VALUE

- Ensure network services and infrastructure meet current standards requirements
- Establish network/device performance under load identifying break points, allowing issues to be resolved prior to the subscriber experience
- Verify network equipment manufacturer product claims, acquiring consistent, comparable statistics to provide objective comparison of each tested vendor
- Fortify customer satisfaction by delivering the highest service quality possible
- Gain budget savings with successful first time seamless system integration

Spirent’s OnDEMAND UMTS On Site Performance Test Package includes:	<ul style="list-style-type: none"> • Assessment: Stability, capabilities and performance • Vendor Selection: 3G/2G-SGSN, GGSN – configuration, user rates, data throughput, protocol compatibility • Standard On Site Engagement: 5 days
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SOLUTION COMPONENTS – UMTS PERFORMANCE TESTS

- **3G/2G Wireless Tests:** SGSN Node or End-to-End
- **Typical UMTS Tests:** Maximum Users; Maximum User Activation Rate; Maximum Session Loading (Simultaneous Activations and Deactivation for a long period of time); Maximum Handoff Rates (Inter-SGSN, Inter-Technology Mobility); Maximum Data Throughput (Stateless and Stateful Data Flows)
- **Test Network Data Collection:** Max Number of Users; Max Activation/Deactivation Rate; Maximum Activations/Deactivations per second; Maximum Handoffs per second; Maximum BPS and Maximum PPS



GPRS – OnDEMAND Performance Testing

PROBLEM

Operators and service providers, who fail to properly measure GPRS performance ceilings to enable accurate capacity planning, make expensive vendor selections with insufficient data, which can result in budget overruns and costly time delays. Failing to characterize GPRS device/network performance before delivery, NEMs may discover too late their system scalability and capacity limits are inadequate, and suffer damage with customers and their position in the market. In both cases the consequences represent a severe impact on business livelihood.

SOLUTION

Spirent's OnDEMAND GPRS Performance packaged test service provides comprehensive isolated device or network end-to-end testing that emulates millions of mobile data subscribers, all accessing the wireless network simultaneously via various connectivity profiles. The test service provides wireless equipment vendors with accurate performance characteristics of their equipment under real-world conditions. OnDEMAND testing allows wireless service providers to accurately characterize the performance of their network under load to establish capacity limits, stability and robustness.

BENEFITS & VALUE

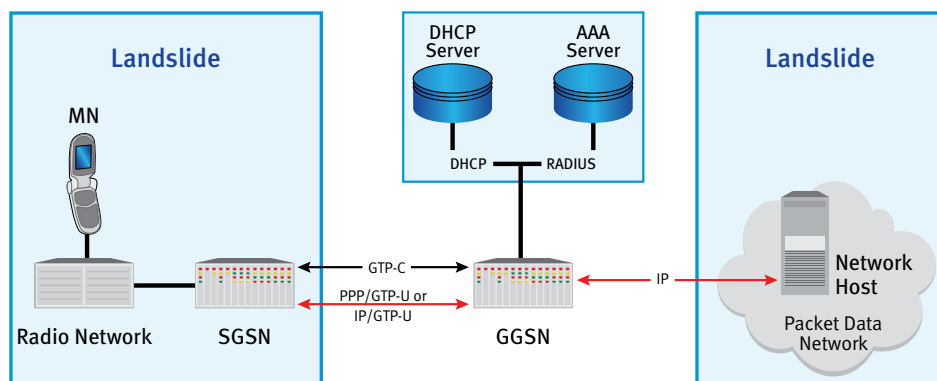
- Ensure network services and infrastructure meet current standards requirements
- Establish network/device performance under load identifying break points, allowing issues to be resolved prior to the subscriber experience
- Verify network equipment manufacturer product claims, acquiring consistent, comparable statistics to provide objective comparison of each tested vendor
- Fortify customer satisfaction by delivering the highest service quality possible
- Gain budget savings with successful first time seamless system integration

Spirent's OnDEMAND GPRS On Site Performance Test Package includes:

- **Assessment:** Stability, capabilities and performance
- **Vendor selection:** GGSN – configuration, user rates, data throughput, protocol compatibility
- **Standard On Site Engagement:** 4 days

SOLUTION COMPONENTS – GPRS PERFORMANCE TESTS

- **3G Wireless Tests:** GGSN Node
- **Typical GPRS Tests:** Maximum Users; Maximum User Activation Rate; Maximum Session Loading (Simultaneous Activations and Deactivation for a long period of time); Maximum Handoff Rates (Inter-SGSN), Maximum Data Throughput (Stateless and Stateful Data Flows)
- **Test Network Data Collection:** Max Number of Users; Max Activation/Deactivation Rate; Maximum Activations/Deactivations per second; Maximum Handoffs per second; Maximum BPS and Maximum PPS



WiMAX Forum End-to-End Test Topology



CDMA – OnDEMAND Performance Testing

PROBLEM

CDMA (Code Division Multiple Access) wireless technology serves more than half a billion subscribers in over one hundred countries around the world. A massive established user base, as well as double-digit deployment growth in key segments, creates a need for robustness and reliability in one of the world’s most competitive wireless markets. Falling out of step with evolving demand, and allowing any degradation or disruption of delivering the highest quality of service, will directly affect your viability as a business.

SOLUTION

Spirent wireless solutions are the first choice of the world’s leading CDMA service providers and mobile device makers. These solutions have become the de facto industry standard for passing CDMA conformance testing. Spirent OnDEMAND testing provides the ideal solution for performance and scalability testing of 3GPP/2 networks and equipment. The test solution emulates millions of mobile data subscribers, all accessing the wireless network simultaneously via various access models. Spirent’s OnDEMAND testing helps you make certain your next CDMA service rollout is profitable and performs exactly as you planned.

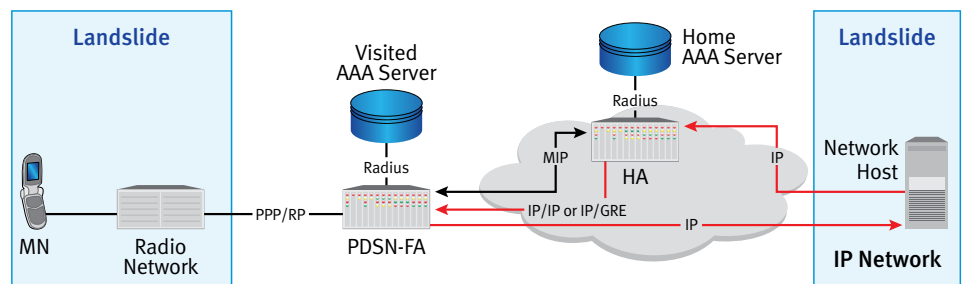
BENEFITS & VALUE

- Ensure network services and infrastructure meet current standards requirements
- Establish network/device performance under load identifying break points, allowing issues to be resolved prior to the subscriber experience
- Verify network equipment manufacturer product claims, acquiring consistent, comparable statistics to provide objective comparison of each tested vendor
- Fortify customer satisfaction by delivering the highest service quality possible
- Gain budget savings with successful first time seamless system integration

Spirent’s OnDEMAND CDMA On Site Performance Test Package includes:	<ul style="list-style-type: none"> • Assessment: Stability, capabilities and performance • Vendor Selection: HA, PDSN-FA – configuration, user rates, data throughput, protocol compatibility • Standard On Site Engagement: 4 days
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SOLUTION COMPONENTS – CDMA PERFORMANCE TESTS

- **3G Wireless Tests:** Simple IP, FA Node, HA Node or End-to-End
- **Typical CDMA Tests:** Maximum Users; Maximum User Activation Rate; Maximum Session Loading (Simultaneous Activations and Deactivation for a long period of time); Maximum Handoff Rates (Inter-PDSN or Intra-PDSN); Maximum Data Throughput (Stateless and Stateful Data Flows)
- **Test Network Data Collection:** Max Number of Users; Max Activation/Deactivation Rate; Minimum Activation/Deactivation times; Maximum Activations/Deactivations per second; Maximum Handoffs per second; Maximum BPS and Maximum PPS



CDMA End-to-End Test Topology



3G/4G Wireless Custom Test Solutions

PROBLEM

A diverse range of technologies and unique customer environments can mandate customized testing requirements. In addition, some applications are scaled to significantly larger and more complex network setups. As a result, an OnDEMAND test package may not completely address all the testing requirements of a customer's service or product requirements to assure successful implementation of a wireless initiative. In such cases, a more extensive, complex and specialized solution can be developed to assure that you meet the due diligence expected to demonstrate that the initiative you are about to launch meets quality service delivery targets.

SOLUTION

In scenarios such as these, a custom testing engagement with Spirent Professional Services is traditionally the best solution. Developing a detailed assessment of your test environment and requirements is part of the pre-engagement process. A precise scope of your testing needs for the new wireless initiative you are planning to deploy is defined. Building a custom test methodology, and delivering it with detailed report analysis, including a comprehensive transfer of information, are critical elements of a successful engagement.

Having Spirent Communications Professional Services on hand as your qualified test partner provides you with the expertise you need to assure the initiative is deployed exactly as you planned. Testing with Spirent's team of experts helps you avert budget overruns due to unexpected performance problems in a newly-deployed service or product.

BENEFITS & VALUE

- Deliver the performance and scalability demanded by the next generation of mobile subscribers
- Have the tailored solution required, scaled to your exact requirements and specifications
- Reduce the number of network elements required to test a specific network device by emulating required network nodes with Landslide
- Perform the lab-based network traffic emulation required for pre-deployment test of new equipment or new software roll outs
- Ensure networks have the capacity and performance to meet the customer's demands today and in the future
- Streamline seamless implementation of the system
- Gain budget savings with successful first-time integration

Wireless Custom Test Solutions include:

- AAA (Radius and Diameter)
- CDMA Femtocell
- CDMA WiFi Convergence
- CDMA WiMAX Convergence
- Charging GW
- DCCA
- DHCP
- HSGW
- IP Applications
- Mobile IP (IPv4 and IPv6)
- L2TP
- PCRF
- PCF
- PDIF
- PDG Micro Mobility
- SBC
- Dynamic IPSec (IPv4 and IPv6)
- EAP



Spirent Professional Services Overview

Spirent Professional Services – Comprehensive Guidance

Spirent's Professional Services team represents the best in the network testing business. They deliver unparalleled expertise and draw from extensive real-world testing experience in a wide range of customer engagements.

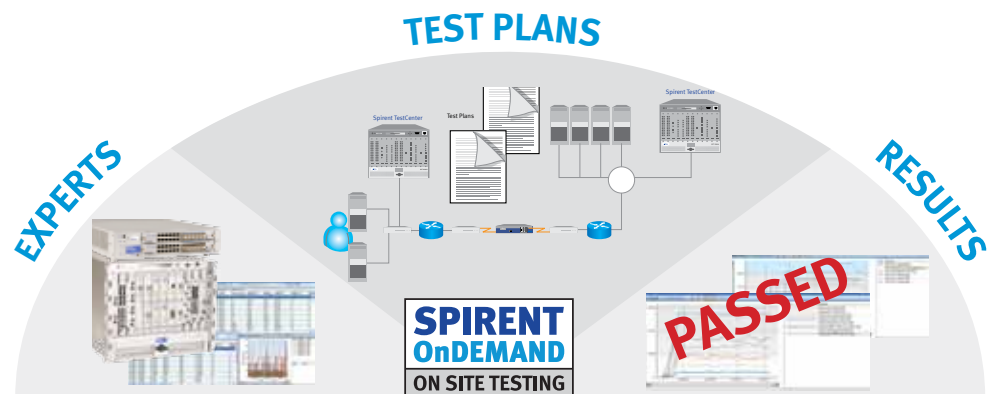
HOW WE MITIGATE RISK

Our experts quickly identify issues before they become problems. This enables you to plan and respond so you are confident that the product or service you are launching does exactly what it is designed to do.

- **Vendor selection:** We test network equipment against your requirements and specifications for configurations, features delivered, capacity and performance. Our test data empowers your vendor negotiations.
- **Network Design:** Our testing challenges existing designs. Our specialists offer expert input for new designs. We confirm the selected components to fit your customized needs.
- **Network Implementation:** Our team targets all critical issues before you go live, such as incompatible devices or protocols, configuration, number of users supported, data throughput. We help you work through all your roadblocks prior to launch.
- **Network Security:** Our solutions recognize that 100% effectiveness in security is 100% useless if it uses all your CPU preventing intrusion, slowing throughput in the process.

Spirent Testing Services Include:

- Comprehensive outsourced testing
- Test methodology creation
- Test equipment rental option for short test cycles and tight budgets
- Highly-skilled test engineers for test execution
- Design validation
- Scalability projections
- Security assessment
- Implementation validation
- Data analysis and report creation



“Spirent’s intensive testing identified performance issues with our network and enabled us to make the corrections needed for a successful deployment. The level of expertise, experience and customer dedication from Spirent’s Professional Services team enabled our successful network deployment.”

—Douwe Visser
Project Manager
Optiver Derivatives Trading

Spirent's World Class Service Delivery Process:



- **Discover:** Gather requirements; perform Gap Analysis
- **Define:** Create Statement of Work; present roadmap and resources, illustrate ROI
- **Develop:** Develop test cases; write scripts; develop code
- **Deliver:** Deploy test engineers; manage project; measure and report
- **Debrief:** Ensure customer requirements and expectations have been met

Spirent Expertise

Spirent provides services expertise for all major communications vendors. Our test methodology and automation experts include IETF engineers and RFC authors who have developed many of the industry's acclaimed benchmarks. They help define standards and performance tests for dozens of industry forums and standards bodies. Such industry expertise optimizes your solution capabilities and ensures you deliver your product or service to market on time.

Our Customers

Spirent has been a pioneer since the advent of network testing and has provided services to customers across a broad range of global industries. These varied business sectors include 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 the US government which includes military and space agency projects.



“Spirent Professional Services delivered everything we asked from them, and more. Based on their testing we were able to determine the optimal network design and save significant amounts of money. Most important, we knew that when we rolled out the new network, it would perform exactly as we had planned.”

—Delfine Goujon
Network Manager
Easynet



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