The Alcatel-Lucent
5530 Network Analyzer

Alcatel·Lucent

Implementing Best-Practices
Access Loop Operations

The Alcatel-Lucent 5530 Network Analyzer (NA) is a comprehensive line testing and quality management solution that helps you ensure that DSL lines meet quality and stability requirements for the successful deployment of high-speed Internet and triple-play services. The Alcatel-Lucent 5530 NA supports operational best practices throughout the access line lifecycle, including provisioning, maintenance, troubleshooting and customer support. It helps you achieve appropriate service rollout decisions, streamlined service delivery, improved service quality, reduced service downtime and faster problem resolution — all contributing to OPEX reduction of up to 50 percent. In addition to allowing advanced integration into your customer care processes, the Alcatel-Lucent 5530 NA supports a POTS testing capability in order to provide a cost-effective testing solution as your broadband access network integrates POTS and evolves towards FTTN architectures.

Service Provider Challenges and Needs

With higher bit rates and triple-play services, the performance required from DSL lines is rising dramatically. Lines are being operated closer to their bit rate limit while real-time voice and video services are requiring greater line stability. As a result, you will need to put the right tools and processes in place to prevent escalating OPEX, while keeping customers happy.

Support more quality sensitive services

DSL technology has enabled you to deliver triple-play services more cost effectively. Video and voice as well as new multimedia services tend to become more demanding in terms of bandwidth, latency and error rate, making them more sensitive to the line quality. Despite advances in DSL technology, DSL technology does have its limits. A DSL line capable of supporting High Speed Internet may be unable to support more quality-sensitive services such as IPTV or VoIP. Problems may arise from the poor condition of the loop itself (e.g., contact problems, crosstalk, interference, etc.) or from service demands that exceed the loop's capability.

Figure 1. More real-time and quality-sensitive services
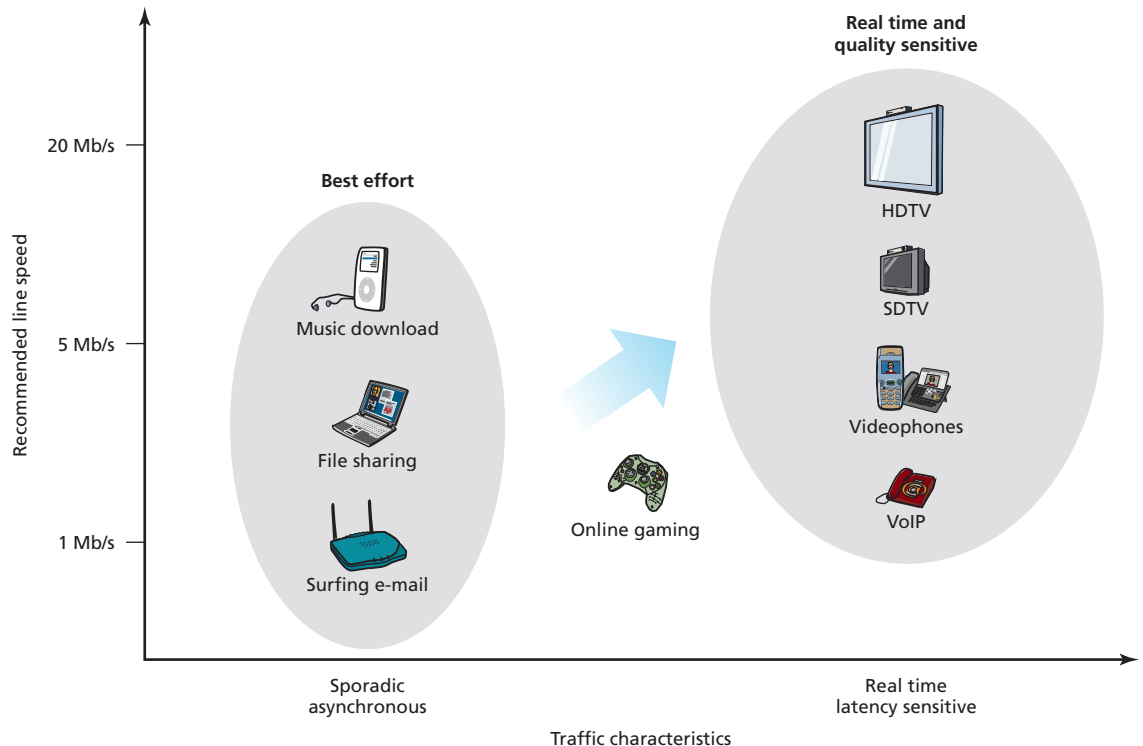
Streamline operations and control OPEX

The access network, with its many ramifications and connections, is a natural place for problems to arise. With DSL, you will need to master a new set of challenges in order to avoid escalating costs. The problem, however, is that traditional testing systems can't provide you with the visibility required for DSL line quality. To streamline operations, while maintaining control of your operational costs, you need to implement operational best practices. This must encompass the whole service life-cycle, including: service planning and network readiness, service provisioning, maintenance, troubleshooting and customer support.

Provide better customer support

Providing better customer support is paramount for customer satisfaction and retention. The quality perceived by your customers is linked to the service quality and degree of support they get from your organization. That's why, ever since the early stages of DSL, you have tried to bring greater visibility of the DSL line quality to your customer support team. You want to take the right decisions and actions from the very start, enabling faster and more appropriate problem resolution.

Line testing strategies in the evolving access network

The obsolescence of telephone switches and the on-going demand for higher bandwidth is also driving the transformation of your access network. This often entails the deployment of smaller remote access nodes, which allow you to reach customers with shorter loops. Broadband access infrastructures are also evolving to support telephony services by means of various POTS or VoIP deployment options. As the telephony switches gradually disappear, and you begin to deploy smaller FTTN nodes, you will need to put in place a new line testing strategy that adapts to your evolving network architecture.
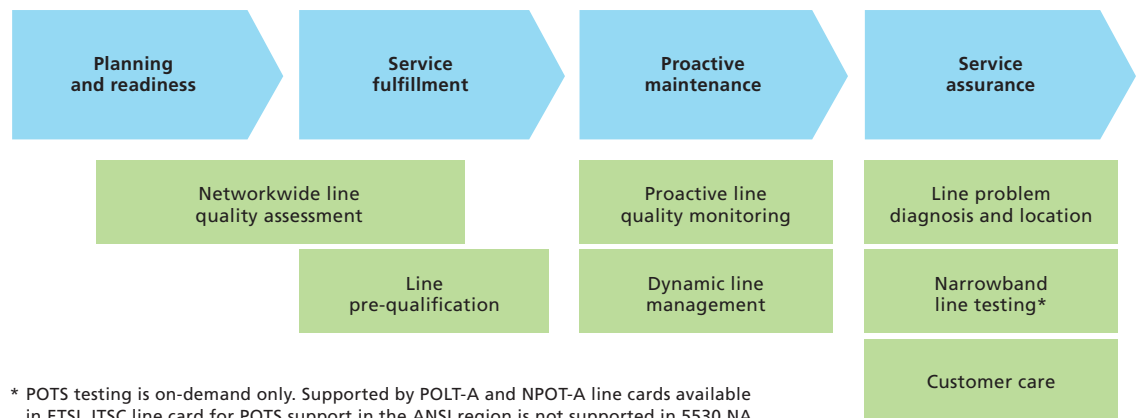
Supporting access operational best practices

The Alcatel-Lucent 5530 NA is a comprehensive line testing solution helping ensure that DSL loops meet quality and stability requirements for the successful deployment of high speed Internet and triple play services. With the Alcatel-Lucent 5530 NA, you can streamline service delivery, improve service quality, reduce service downtime and resolve problems faster.

Streamlining operations end-to-end

The Alcatel-Lucent 5530 NA supports the full life-cycle of your DSL line. This includes network-wide line quality assessment, accurate line pre-qualification, in-service line validation, pro-active problem detection and advanced troubleshooting. Whatever your service mix and organization, the Alcatel-Lucent 5530 NA will provide you with the right support to implement DSL operational best practices.

Figure 2. End-to-end operational best practices

Planning and readiness	Service fulfillment	Proactive maintenance	Service assurance
Networkwide line quality assessment	Line pre-qualification	Proactive line quality monitoring	Line problem diagnosis and location
		Dynamic line management	Narrowband line testing*
			Customer care

* POTS testing is on-demand only. Supported by POLT-A and NPOT-A line cards available in ETSI. ITSC line card for POTS support in the ANSI region is not supported in 5530 NA.

Pro-active line management

Pro-active management will enable you to detect problems before they impact your customers, or correct problems automatically through dynamic line reconfiguration. The Alcatel-Lucent 5530 NA monitors your DSL lines and detects degradation trends in line transmission quality. Dynamic Line Management is a further capability that automatically rearranges line configuration parameters to stabilize lines and assure they are working at the best performance possible. This capability can stabilize up to 70 percent of your problem lines, eliminating customer frustration and operational costs.

Customer care integration

The Alcatel-Lucent 5530 NA has also been extended to support customer care processes. This gives you visibility of simplified line quality information, letting you design the workflows you need to guide call center agents — quickly and efficiently — through problem resolution steps. By enabling agents to take an active role in problem resolution, operational costs and service downtime will be significantly reduced. What's more, better support means happier customers.

Figure 3. Putting the call center at the core of your troubleshooting process

Call center
(first level support)

Customer service representative

Network operations center
(second level support)

DSL experts

Escalation

- Simplified customer line information
- Guidance for resolution or escalation
- Based on fully customizable workflow

Advanced and comprehensive troubleshooting capability

The Alcatel-Lucent 5530 NA provides a wide array of testing capabilities allowing you to detect, diagnose and troubleshoot any and all problems affecting customer lines. It will allow you to check line state information, perform line quality diagnosis (in-depth line diagnosis, including in-service and over-the-time diagnosis results), and provide you with tools for problem location and specialized field technician tools. Among the list of available tests, some are non-intrusive and can be executed while the service is running, enabling the detection of problems that would otherwise go unnoticed. The Alcatel-Lucent 5530 NA also supports the newly released Alcatel-Lucent Smart DSL designed to protect lines from external noise. Alcatel-Lucent Smart DSL will not only stabilize lines, resulting in a dramatic improvement to customer quality of service, but will also stabilize lines at a greater bit rate.

In sum, the Alcatel-Lucent 5530 NA lets you successfully resolve line problems, quickly, simply and cost-effectively.

Rationalizing your testing architecture

Network evolution scenarios for Class 5 switch replacement include the implementation of POTS line cards in the access node. This transformation option can apply to access nodes deployed in Central Offices (COs), or to nodes deployed in outside plants (FTTN architecture). The Alcatel-Lucent 5530 NA will help you to cope with network evolution thanks to the support of extended Narrowband Line Testing capabilities. These include inward POTS self-testing, as well as loop and POTS terminal testing (voltage, current, capacitance, ring tone, loop back, etc.). By handling both DSL and POTS testing from the Alcatel-Lucent 5530 NA, you will be able to rationalize your testing architecture.
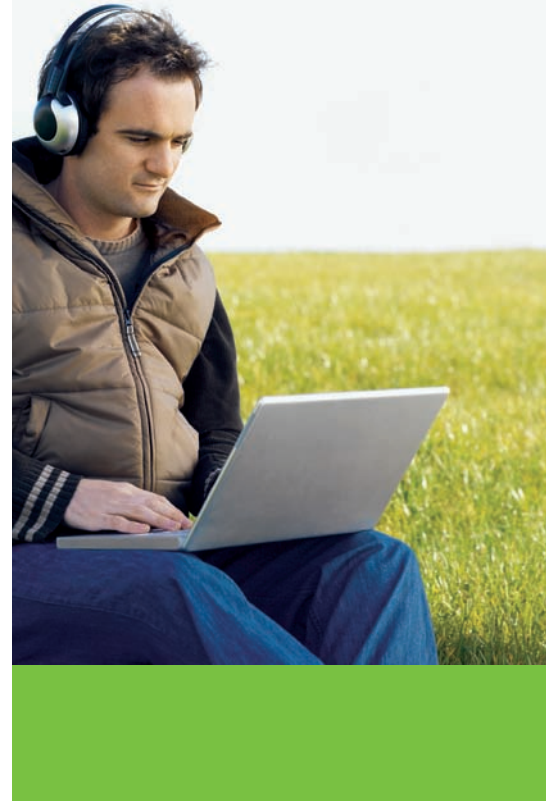
Figure 4. Advanced troubleshooting with Line Quality Diagnosis (LQD)

Table 1. Features and benefits of the Alcatel-Lucent 5530 Network Analyzer

FEATURES	BENEFITS
• Network-wide line quality assessment	• Confidently launch new services by identifying major problems sources from the very start
• Advanced line pre-qualification and validation	• Identify and solve customer line problems upfront
• Pro-active line quality monitoring and automated line test execution	• Assure fast reaction and minimized customer service disruptions
• Dynamic line management – automatic line profile changes for optimized line quality	• Increase customer satisfaction due to increased quality and optimized line performance • Significantly reduce operational expenses through automatic resolution of line problems
• Comprehensive troubleshooting means covering customer care, expert troubleshooting, field technicians.	• Streamline operations end-to-end • Implement operational best practices and reduce operational expenses
• One-click access to consolidated line-state information	• Assure faster and more appropriate reaction
• Non-intrusive in-service line monitoring	• Facilitate detection and diagnosis of critical non-stationary problems (crosstalk, interference, etc.)
• Embedded DSL expertise for advanced root cause analysis	• Enable to-the-point diagnosis. • Provide faster and more appropriate reaction.
• Customer care integration - simplified information and customizable customer support workflow	• Significantly reduce service downtime by appropriate handling of customer complaints • Reduce operational costs by avoiding systematic escalation to experts
• Full POTS testing capability	• Take advantage of single integrated testing for your new generation access networks • Eliminate costly test head systems
• Easy OSS integration with full testing scope accessed from the OSS application	• Flexibly adapt to your processes and organization

How the Alcatel-Lucent 5530 NA works

Embedded line testing technologies

The Alcatel-Lucent 5530 NA relies on several embedded testing technologies.

The Single Ended Line Test (SELT) is a reflectometric test mainly aimed at measuring line length and locating line problems. Consequently, it is used for the estimation of potential line capacity or for the location of possible line impairments.

The Dual Ended Line Testing (DELT) is based on the exploitation of DSL physical layer parameters. DELT testing identifies issues on the higher line frequencies, and enables the detection of problems such as bad contacts, interference, unbalanced loops, etc.

The Narrow-Band Line Testing (NBLT) includes an array of electrical tests such as POTS LT self-test tests and telephone terminal tests. These are supported by the POTS ports implemented in the ISAM products family, which integrates voice capability.

**Figure 5. Comprehensive line testing technologies**
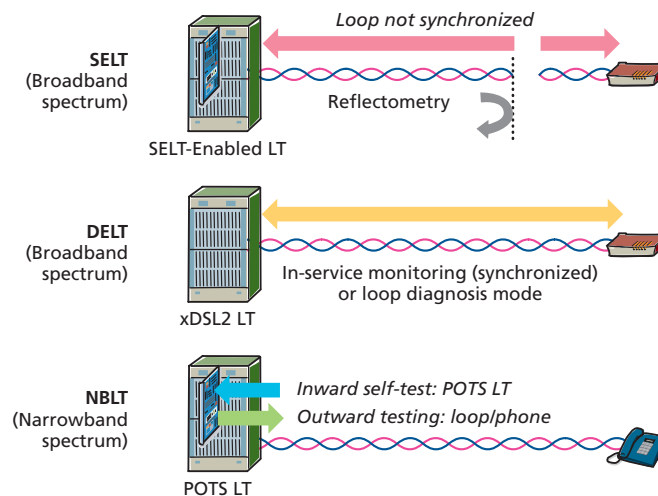
Coping with your evolving access network

The Alcatel-Lucent access testing approach delivers testing capabilities in the Access nodes themselves, thus removing the need for test access matrices and costly external test-head solutions. Furthermore, as your access network evolves with the integration of POTS line cards (Class 5 replacement), you will be able to rely on the Alcatel-Lucent 5530 NA to serve as a single integrated testing solution for DSL and POTS.

Over-the-time monitoring

Broadband services transported in high frequencies are more likely to be affected by line impairments such as bad contact, crosstalk, or interference. Because these problems are intermittent by nature, traditional line testing systems find them difficult to detect. But this can all change with the continuous line monitoring capability of the Alcatel-Lucent 5530 NA. Now such problems can be easily detected, along with their probable cause. The net result is faster reaction and problem resolution, especially for those troublesome and persistent line problems that you may currently leave unresolved.

Figure 6. Single testing solution for DSL and POTS

Voice support: voice overlay or VoDSL
Topology: access node deployment in CO or remote node
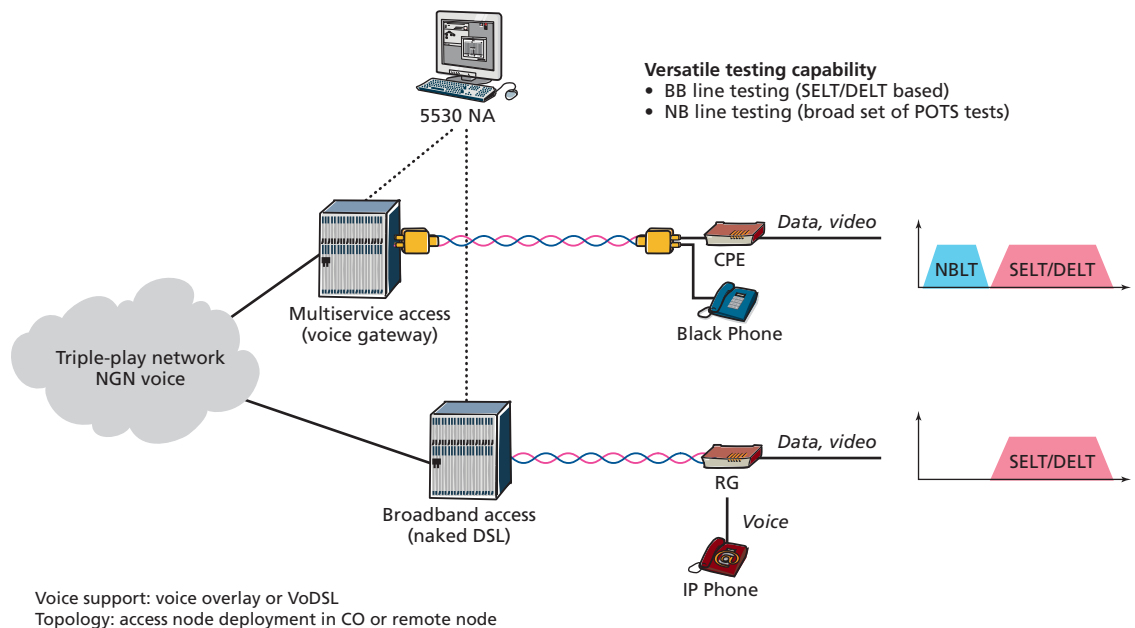
Expert diagnostic system

For more efficient troubleshooting, the Alcatel-Lucent 5530 NA integrates an expert system that analyses tests results and line operational parameters. The system in-cludes a knowledge base derived from Alcatel-Lucent's DSL expertise and from the know-how acquired by consulting teams working with real-life networks. This knowledge and expertise is made available in the Alcatel-Lucent 5530 NA expert system. This will analyse the various symptoms detected and point your operators to the likely problem and root cause affecting a customer DSL line. Again, the net result is faster and more accurate problem resolution.
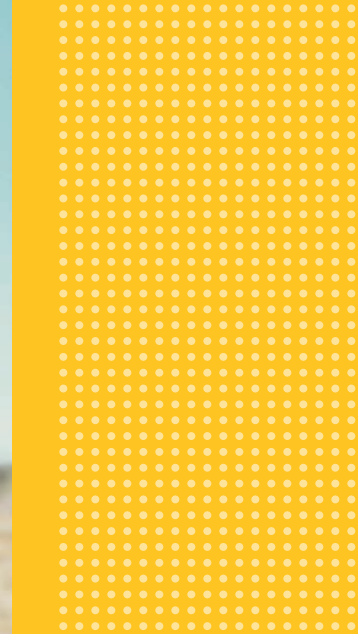
Adaptable customer care workflows

Thanks to the Alcatel-Lucent 5530 NA, your customer support team can now be put back into action and take a key role in the customer trouble resolution process. The product provides means for integrating DSL and POTS line troubleshooting in your customer support applications. The product provides an API, allowing simplified line information and testing capability, along with customizable workflows. This will help you to quickly build the customer support application that fits your unique requirements. Based on this capability, your customer care agents can take advantage of meaningful line state information and follow through well specified troubleshooting steps. As a result, you strengthen both the role and competence of customer support, while reducing problem escalation to your expert teams.

**Figure 7. Customizable customer care workflows**
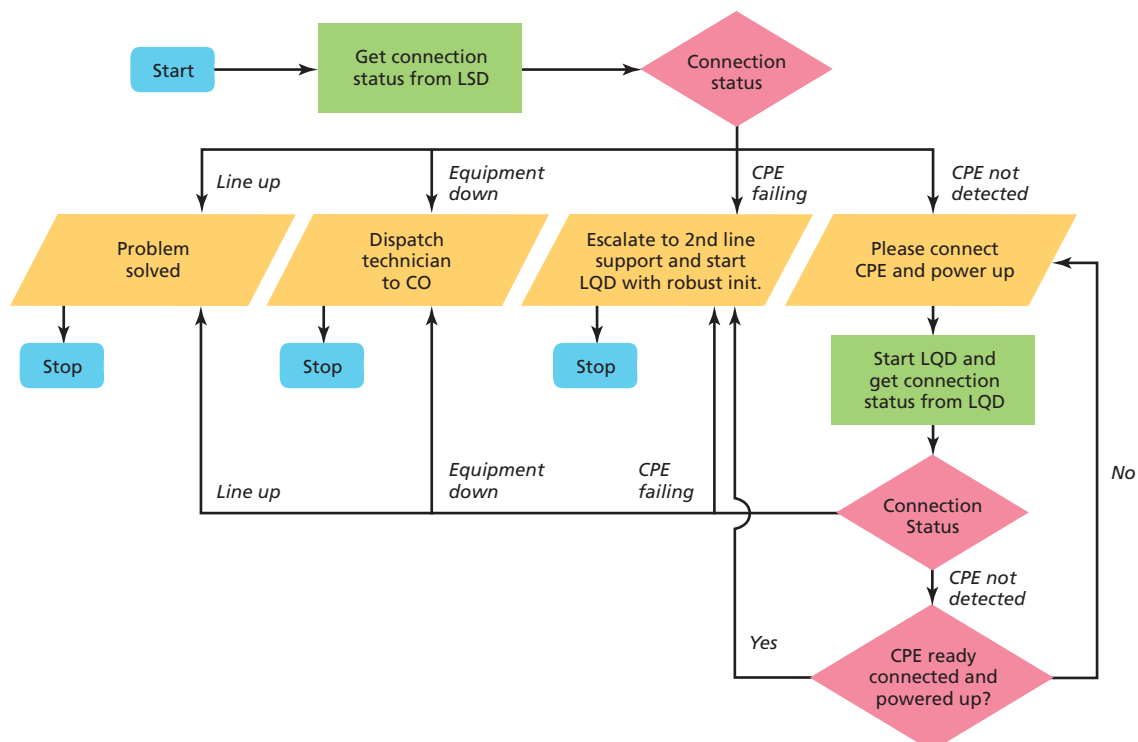
Dynamic line management

Dynamic line management is a capability provided by the Alcatel-Lucent 5530 NA, which greatly improves DSL line stability. With real-time services such as voice and video, line stability has become paramount. To enforce line stability, the Alcatel-Lucent 5530 NA monitors key DSL line parameters and triggers line profile re-configuration, according to pre-defined line profile transitions. This process enables you to fine-tune parameters such as line speed, interleave mode and power spectral density until the line reaches the set quality and stability objectives. The effective reconfiguration of the line is normally executed by your service provisioning OSS upon recommendation of the Alcatel-Lucent 5530 NA, but other implementation options may let the Alcatel-Lucent 5530 NA perform the line reconfiguration by itself.

Figure 8. Dynamic line profile management

Line profile transition definition

Dynamic line profile transition

Line stabilization   Line rate optimization
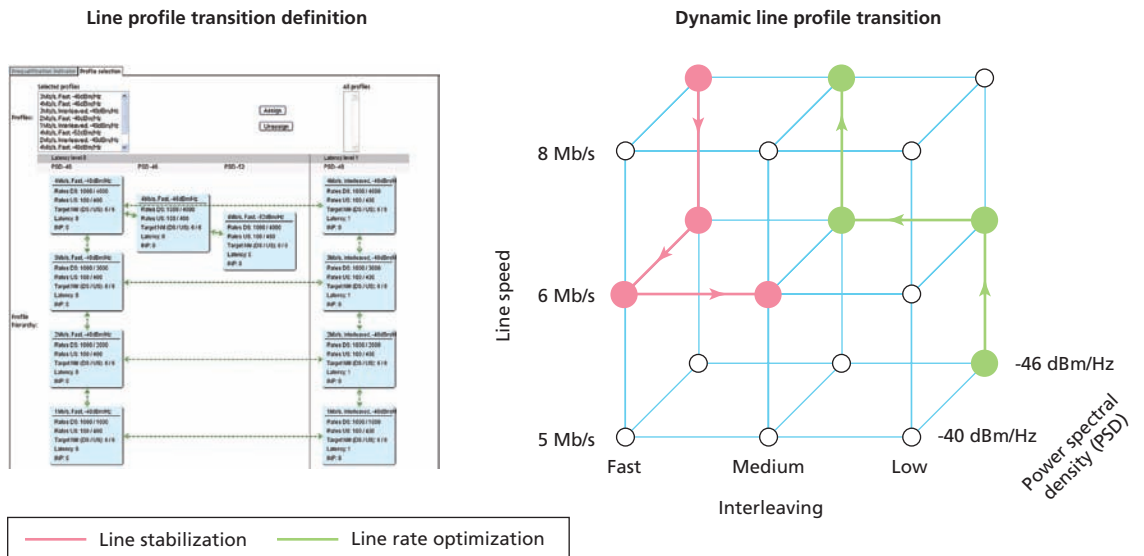
Architecture

The Alcatel-Lucent 5530 NA runs in a clustered SUN server configuration, which provides the greatest scalability as your network evolves. The database provides high availability due to the redundant master slave configuration.

The Alcatel-Lucent 5530 NA interfaces with the access network Element Management system to align with the list of network elements that it needs to manage. The Alcatel-Lucent 5530 NA implements a web-based GUI, letting it run in a PC browser.

OSS and customer care integration

The interface to the OSS is based on XML/SOAP. All testing and diagnosis capabilities are accessible from this interface so you can easily integrate testing capabilities on your other OSSs. A high-level API has also been specially developed for integration into customer care systems. This enables you to expose simplified information to customer care agents, while supporting flexible workflows for customer support operations.

Multi-vendor support

The Alcatel-Lucent 5530 NA supports most Alcatel-Lucent access nodes. The product has also been expanded with a multivendor interface to facilitate support of third-party vendors' access nodes. Support of third-party access networks is handled on a project-by-project basis.

Figure 9. Alcatel-Lucent 5530 NA architecture overview
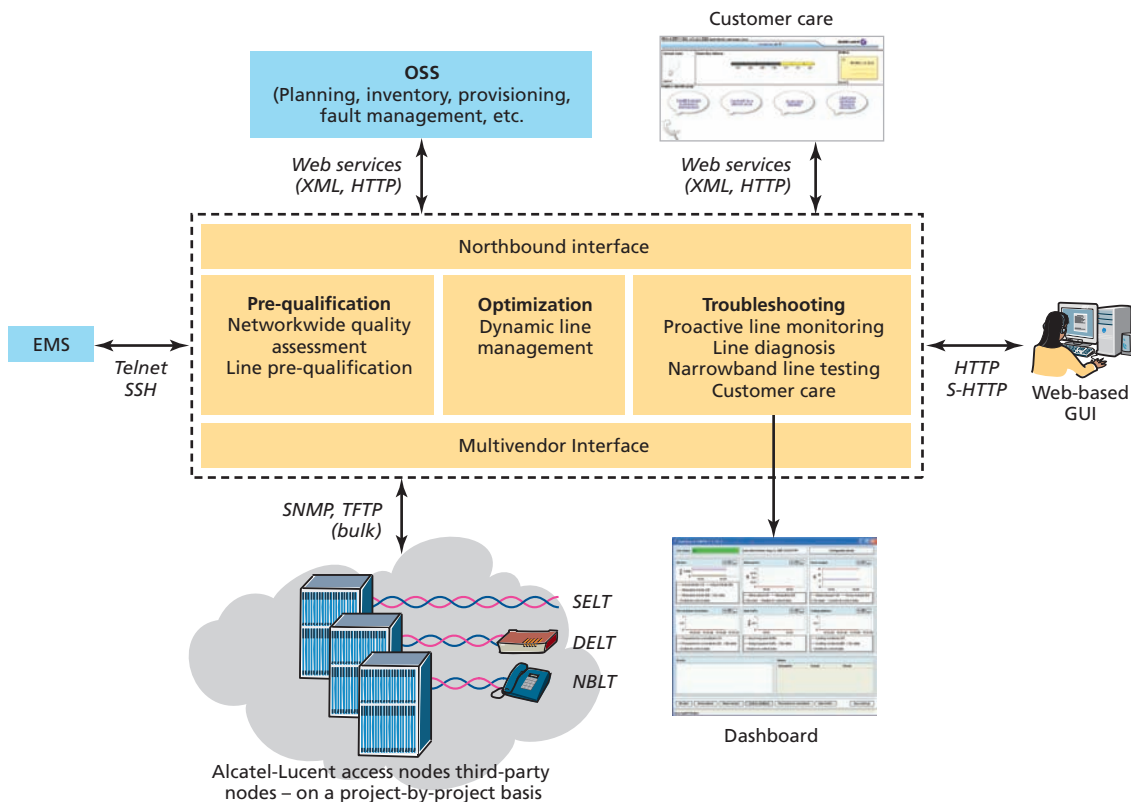
Leveraging unprecedented access management experience

Proven solution, adopted by more than 50 service providers

To date, the Alcatel-Lucent 5530 NA has been deployed by more than 50 service providers worldwide and manages more than 25 million DSL lines. It has quickly become the essential DSL testing and quality assurance tool, cutting operational expenses by as much as 50 percent.

Operational best practices

The Alcatel-Lucent 5530 NA benefits from on-going improvements — the result of hands-on collaboration and feedback from world-leading service providers. That's why it incorporates the right blend of technology expertise and operational best practices.

Technology and innovation leadership

The Alcatel-Lucent 5530 NA is the result of unmatched DSL expertise, backed by intense research and innovation. Alcatel-Lucent's research and innovation teams have filed a significant number of patents in the field of DSL.

Knowledge transfer – consulting projects

Our consulting experts help you get the full benefit of the capabilities offered by the Alcatel-Lucent 5530 NA. We partner with you to investigate and fix your copper access network issues so that you can reliably launch new services and reduce operational expenses.