



DSL Expresse

Highlights

- Extend the reach and rate of DSL systems
- Provide next-generation services, including IPTV
- Maximize service quality
- Reduce maintenance costs
- Optimize DSL network performance during your maintenance window or in real time

Take Your DSL Further, Faster and into the Future

With the massive growth in demand for IPTV and wireless Internet, service providers must be able to do more with less to compete and avoid churn. Many are discovering that fiber-to-the-home is neither cost effective nor practical in a large number of cases, and cable still lacks substantial customer adoption worldwide.

DSL continues to serve more people than fiber, fixed wireless, and cable combined, challenging service providers to leverage existing copper investments while offering next generation capabilities. The ASSIA® DSL Expresse® solution is helping achieve that goal and extend the rate and reach of DSL systems while maximizing service quality and minimizing maintenance costs.

ASSIA DSL Expresse optimizes the operating parameters (“profile”) of each DSL and produces detailed line-level and network-level diagnostics for both the copper plant and DSL service. ASSIA DSL Expresse is a software-only solution and compatible with all standards-based DSLAMs. Currently, it supports ADSL1, ADSL2/2+, DSL Bonding, and VDSL2, and is successfully deployed

on networks throughout the world. Designed for the most challenging DSL deployments, ASSIA's DSL Expresse is scalable to networks of more than 20 million lines.

ASSIA DSL Expresse also is the industry's first DSL management platform to incorporate industry-leading technologies for optimizing DSL networks, commonly referred to as Dynamic Spectrum Management (DSM) Level 2. Central to these features is a power management module that can significantly reduce DSLAM energy costs without compromising speed and reliability.

The ASSIA DSL Expresse southbound interface supports SNMP, TL1, and other standard management languages for easy integration with all vendors' DSLAMs and element management systems (EMSs). An XML-based Web-services northbound interface is provided for integration with other operations support systems. ASSIA DSL Expresse also supports access to diagnostic and management interfaces via standard Web browsers, so operators can enjoy immediate benefits with minimal integration effort (see Figure 1).

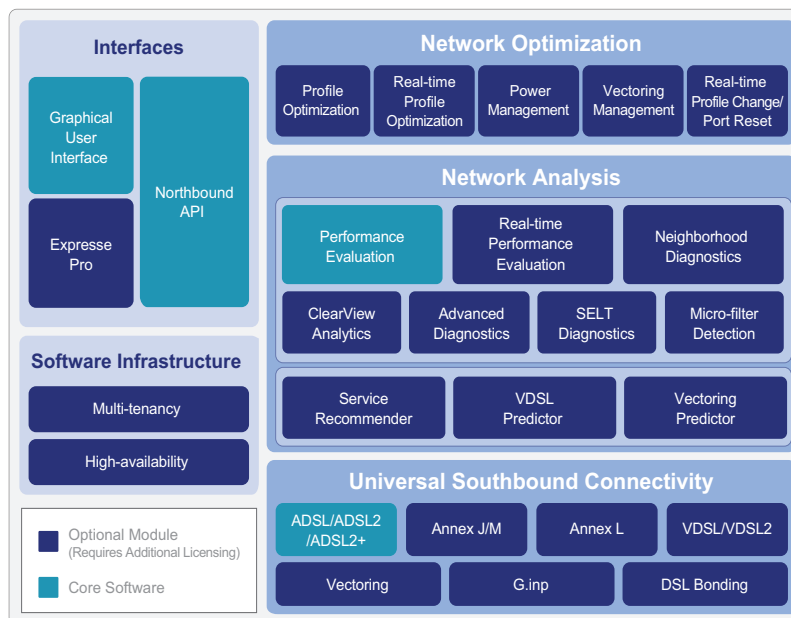


FIGURE 1. DSL Expresse Architecture

ASSIA DSL
 Expresse
 automatically
 configures
 all lines in
 the network
 to the highest
 possible
 stable speed.

ASSIA DSL Expresse Functions

AUTOMATIC RE-PROFILING AND REPAIR

DSL profiles are complex and include many factors that constantly interact, such as power levels and margins, bit rates, interleaving, and forward error correction schemes. Operators have traditionally defined a limited number of profiles for their network and applied them to their DSLs manually using simple heuristics such as loop length. Each loop in the network is different, however, and often the result of the traditional process is that lines are either under-provisioned by being programmed to a speed lower than what they can support, or over-provisioned by being programmed to a speed that is too high to maintain stability. Under-provisioned lines lead to lost revenue opportunities for higher-speed services or for applications such as IPTV. Over-provisioned lines lead to higher maintenance costs from customer complaints and high churn rates.

Based on the DSL operator's service tiers and quality-of-service targets, ASSIA DSL Expresse automatically configures all lines in the network to the highest possible stable speed. ASSIA DSL Expresse is run proactively on all lines in an operator's network on a daily basis. It can also be run reactively in the case of newly provisioned lines, or at the request of technical or customer support personnel.

Figure 2 shows the results of automatic re-profiling in a commercial network with ADSL1 and ADSL2/2+ equipment. Downstream rates are shown on the left. Stability appears on the right, characterized by a combination of code violations in a 15-minute period, and modem retrains in a 12-hour period. The light and dark blue stability categories are suitable for IPTV.

In these real-life results, ASSIA DSL Expresse increased the fraction of users that could receive speeds in excess of 10 Mbps from roughly 5

percent of the network to nearly 60 percent of the network. At the same time, the fraction of users with poor quality IPTV services was reduced by nearly 75 percent, from 37 percent of the network to 9 percent of the network.

DIAGNOSTICS

ASSIA DSL Expresse analyzes data collected from DSLAMs and EMSs to produce powerful and unique DSL and physical layer performance diagnostics (see Table 1 on last page).

These diagnostics help improve customer care and increase technical staff efficiency, significantly reducing the number of steps required to restore service, and eliminating or reducing expensive technician visits through improved problem localization.

ASSIA DSL Expresse's powerful neighborhood analysis feature quickly separates customer premises problems from outside plant problems, enabling DSL operators to dispatch the correct repair personnel and to proactively plan plant upgrade or repair services. Unlike legacy diagnostic approaches, ASSIA DSL Expresse advanced DSL-centric diagnostics do not interrupt the customer's DSL service. The diagnostics are easily accessible by all authorized operator personnel using standard Web browsers, such as Firefox, Safari or IE via the Web client interface. In addition, the ASSIA DSL Expresse northbound interface provides a standard XML-based mechanism for distributing diagnostic data to other OSS systems.

DSL Expresse also takes advantage of SELT capabilities available in certain DSLAMs to locate the fault identified by its diagnostics engine. The combination of DSL Expresse advanced diagnostics and SELT greatly improves the accuracy of issue detection and location (see Table 1)

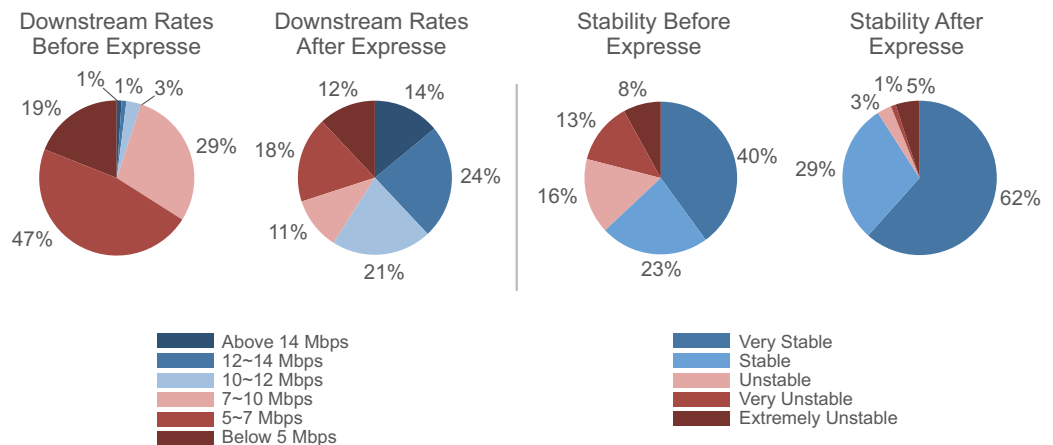


FIGURE 2. DSL Expresse Automatic Re-Profiling Results

Diagnostics are easily accessible by all authorized personnel using standard Web browsers.

REAL-TIME DIAGNOSTICS AND OPTIMIZATION

This state-of-the-art capability can easily be triggered by the field technician while on dispatch, and confirms in real time that the problem has actually been fixed and that DSL performance is restored or enhanced. The result is an improvement in technician performance in the field and a reduction in the number of repeat calls and dispatches.

The Real Time Performance Evaluation module requires supplementary licensing and may be integrated through ASSIA professional services into the service provider's Interactive Voice Response (IVR) systems. This enables intelligent triage to level-2 DSL technicians when an actual physical layer fault is detected by ASSIA DSL Expresse. This powerful, real-time capability helps reduce the unnecessary level-1 manual investigation and increases customer satisfaction.

Like diagnostics, real-time optimization is an optional license which allows the service provider to reconcile the real-time needs of a call center agent or a technician with the longer span of data required for a full optimization. This feature allows partial realization of the profile optimization value proposition, helping to reduce dispatch costs and quickly improve line performance.

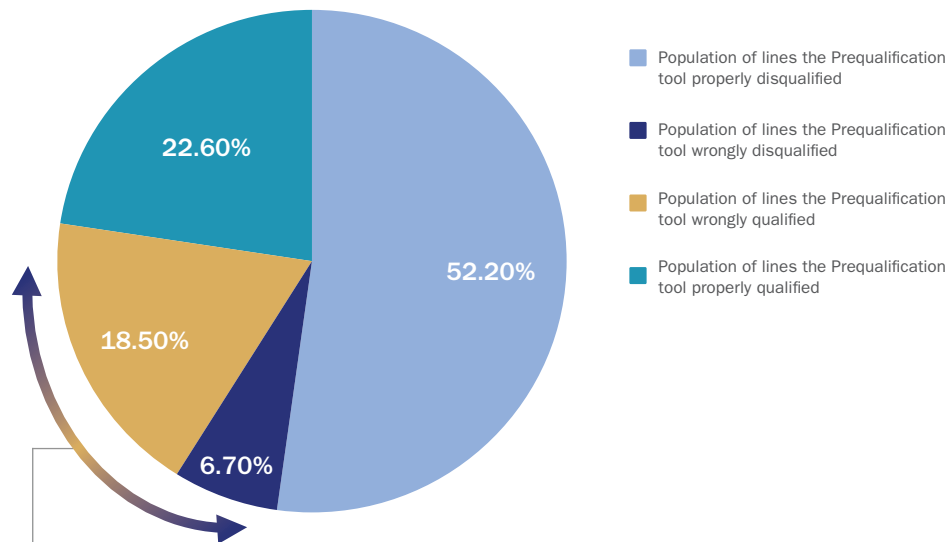
SERVICE RECOMMENDER

Using the DSL operator's service tiers, the Service Recommender analyzes the characteristics of all DSLs in the network to identify lines that can support a higher level of service than that for which they are currently provisioned (and hence produce higher Average Revenue per User).

The Service Recommender software module lets the operator target new service offerings to specific subscriber groups, whose lines can sustain the higher grade of service. This helps improve marketing returns and sales costs and can lead to higher customer satisfaction with reduced churn.

Figure 3 illustrates the performance differences between a traditional loop qualification system and the DSL Expresse Service Recommender software module. The section in gold indicates the portion that the loop qualification tool erroneously identified as capable of carrying the 7 Mbps DSL service, causing customer frustration and high opex for the service provider to manage. The section in dark blue identifies the portion of lines which have been marked as not qualifying for the same 7 Mbps service and could actually generate supplementary revenue for the service provider.

Service Recommender requires additional licensing, and results can be viewed with a Web browser or accessed through operations support systems via the ASSIA DSL Expresse northbound interface.



ASSIA DSL Expresse identified more than 25% of lines that had been improperly prequalified by traditional methods

FIGURE 3. Performance comparison between traditional loop qualification systems and DSL Expresse Service Recommender for ASSIA customer

Makes Economic Sense Today and Tomorrow

ASSIA DSL Express greatly improves the economics of DSL operations. Revenues are improved through reductions in churn and increased sales opportunities for higher-tier services and bandwidth-intensive applications like IPTV. Operating costs are reduced due to fewer customer calls and reduced technician dispatches.

ASSIA DSL Express can deliver these benefits by extending DSLAM reach, automating the repair/re-profiling of DSLs, improving the efficiency of customer care operations, and improving the service provider's ability to manage vendor relationships through network-level analysis. Furthermore, capital costs can be reduced through extensions in the DSLAM rate/reach curve that extend the usefulness of existing DSLAMs in the network.

One of the key hurdles to rolling out faster DSL technologies is economics. Deploying more DSLAMs across the network and closer to the subscriber is usually a costly proposal and something which rarely can be distributed between service providers without giving the incumbent

an unfair advantage, and thereby eliminating a competitive environment. ASSIA offers the option of virtually slicing the overall DSL network down to the port level via multi-tenancy management. This not only allows ISPs to share the hardware infrastructure and outside plant investments but also enables them to introduce the latest DSL technologies, such as vectoring to deliver 100Mbps reliably to the house, through managing a mixed-binder environment. In addition, a regulatory body can be established as a "super user" to verify the quality of the networks within its jurisdiction and potentially enforce performance/coexistence rules through the active use of this platform.

Realizable improvements depend on the details of the operator's business and network. For that reason, ASSIA routinely works with operators to develop in-depth economic analyses of ASSIA DSL Express tailored to a particular network or business model. Contact ASSIA today to arrange a trial of ASSIA DSL Express in your network, and start taking your existing DSL infrastructure to a whole new level.

LOOP DIAGNOSTICS	NOISE ANALYSIS	CONNECTION STATISTICS	NETWORK PERFORMANCE
✓ Loop Length	✓ DSL Crosstalk	✓ Maximum Data Rate	✓ Rate, QoS Analyses
✓ Short/Open Circuit	✓ AM Noise	✓ Code Violation Rates	✓ Vendor Comparisons
✓ Bridged Taps with Length	✓ T1/E1 Crosstalk	✓ Retrain Rates	✓ Neighborhood Analysis
✓ Bad Splice	✓ ISDN Crosstalk	✓ Power and Margins	✓ CPE performances
✓ Crossed Pair	✓ Impulse noise	✓ Line Stability level	✓ DSLAM performances
✓ MDF mis-wiring	✓ HDSL Crosstalk	✓ MABR after Removal of Impairment	✓ Highest/Lowest MABR percentile
✓ Water in cable	✓ High Power noise	✓ DS/US variation	
✓ Loop unbalance/ untwisted wiring	✓ High Power noise at high frequency		
✓ Missing Micro filter detection			
✓ Fault location (SELT required)			

TABLE 1. DSL Express Diagnostics (partial list)

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