Some of the largest service providers in the world use DSL Expresse software to optimize the performance of their broadband access networks. Many of these organizations operate and maintain this powerful software within their data centers; however, many providers take advantage of ASSIA Expresse Services to deploy this technology using a Software-as-a-Service (SaaS) model.

Increasingly, companies are turning to a SaaS model because of the distinct advantages:

- SaaS allows companies to avoid the significant up-front capital costs associated with purchasing hardware systems and software licenses. Rather, SaaS customers typically pay a monthly or yearly subscription fee to access the software.
- The SaaS provider assumes all ongoing costs of maintaining and upgrading the servers.
- SaaS includes software upgrades that are planned and managed by the SaaS provider, so users have the benefit of the latest software without the corresponding IT overhead for planning, implementation, and testing.
- SaaS providers also offer convenient access to the software functionality, typically through a browser-based GUI and also a web services API. Users and systems can easily access software functions from any browser-enabled device such as a desktop, laptop, tablet, or smartphone. Likewise, SaaS systems can integrate with existing software applications using standard web interfaces.
- SaaS systems provide a high degree of customization and scalability. Most SaaS offerings support providing enhanced functionality based on the end-users’ requirements. SaaS architecture allows the system to grow (or shrink) easily to accommodate the usage and data requirements of the customer.

Furthermore, recent developments in Network Functions Virtualization (NFV) complement the growth in SaaS, as companies replace dedicated network hardware with the equivalent software functionality running on a virtualized, scalable infrastructure.

Secure, Scalable Architecture

Expresse Services bring all the benefits of Dynamic Spectrum Management (DSM) for optimizing the speed and stability of DSL networks, without additional capital investment in hardware and software. The Expresse Software runs on remote servers, either in a third-party private cloud or in ASSIA's hosted environment. ASSIA manages the entire DSM system including the Expresse Software and underlying services.

Expresse Services provide a highly secure environment using best practices for authentication and data security, and with access restricted to authorized individuals. With each Expresse Services deployment, ASSIA establishes a separate, standalone environment for managing the DSL network. In other words, each customer has a dedicated, secure system that collects, stores, and analyzes all of the network performance data. Using a scalable architecture, Expresse Services can readily accommodate the DSM needs of even the largest networks and support tens of millions of DSLs.
As shown in Figure 1, Expresse Services provide customers with a comprehensive set of analytics, diagnostics and optimization for managing the access network.

The Performance Evaluation algorithms of Expresse Services conduct detailed diagnostics on every broadband connection. These algorithms can identify “unhealthy” DSLs and provide the technical details to isolate and resolve performance-related issues.

In addition, Profile Optimization algorithms determine and apply the appropriate profile for each DSL. ASSIA experts work with the service provider to configure the system to support a range of DSL profiles, enabling an acceptable balance of speed and stability depending on the characteristics of each individual line.

Comprehensive Features

On top of these core capabilities for performance evaluation and optimization, customers have the option to implement features such as:
- Advanced Diagnostics (for fault location using SELT),
- Service Recommender (commonly used in network planning and conditioning),
- Real-Time PE/PO (providing service agents with up-to-the-minute diagnostics and validation of any repairs),
- ClearView (providing customer care agents with actionable guidance to resolve DSL performance issues), and other capabilities.

Figure 2 shows how ASSIA collects network data used by the Expresse algorithms. ASSIA installs a standalone DcPc (Data collection and Profile change) server inside the provider’s network. The server is a commercial-off-the-shelf (COTS) system running Linux and dedicated to Expresse functions. Expresse Services connect to the server remotely through a secure VPN connection. ASSIA can deploy multiple DcPc servers for very large networks (exceeding 5 million lines) or for extensive geographies.

The DcPc server collects DSL performance data from the management information base (MIB) of each DSLAM in the service provider network. The data collection typically runs once per day, based on a schedule that ASSIA coordinates with the service provider.

The DcPc software uses standard interfaces to collect detailed performance statistics without requiring any changes to the DSLAM. Customers frequently choose Expresse Services because ASSIA’s open architecture supports heterogeneous networks with DSLAMs from a wide range of vendors including Alcatel-Lucent, Huawei, ADTRAN, Calix, UTStarcom, Marconi, and more.

The DcPc software not only collects performance data from the DSLAMs but also applies new profiles to optimize the performance of each DSL as needed, based on the determination of the Profile Optimization algorithms. As with data
collection, Expresse Services uses standard interfaces supported by each of the DSLAM vendors, with no customization required.

As part of Expresse Services, ASSIA provides customers with secure access to the diagnostic and optimization data through a browser-based GUI as well as through the Expresse Northbound API. Expresse Services customers use the Northbound API to integrate diagnostic and optimization data with other OSS, BSS, customer relationship management (CRM), and field service management systems. For instance, Expresse Services can provide customer care representatives with the most recent performance statistics on a DSL in order to troubleshoot and resolve a customer’s performance issue.

Professional Services

As part of each deployment, broadband providers have the option to engage ASSIA’s professional services organization to facilitate a successful implementation. The professional services organization applies a full lifecycle approach to each deployment, starting with a discovery phase to identify the customer’s business objectives. ASSIA engineers then assist in developing a customized implementation plan tailored to the requirements of the service provider.

Each implementation includes a comprehensive checklist to collect important network statistics such as DSLAM types/models (and restrictions), customer premise equipment (CPE) models, DSL service products, existing DSL profiles, and specifications for interfacing to ASSIA’s DcPc server.

ASSIA engineers then develop a project plan covering installation, configuration, and test of the DcPc server. The plan includes:

- configuration of the Expresse Services back end systems,
- DSL profile design (including stability definitions for service products),
- customer training for the Expresse Services graphic user interface,
- limited testing on a preliminary set of DSLs,
- followed by ramp-up across the entire network.

ASSIA engineers bring considerable expertise to assist in optimizing the performance of the DSL network for the highest degree of performance and reliability. The engineers conduct detailed data collection and analysis to recommend an optimum set of DSL profiles, based on the DSL provider’s current service products and based on the technical characteristics of the access network. For any new DSL service products, ASSIA

FIGURE 2. Example integration of Expresse Services with access network and operational systems.
**Expresse Services Benefits**

- Improve average DSL speed across the network.
- Reduce incidence of unstable/unreliable connections.
- Enhance contact center operations with better visibility to performance issues.
- Reduce unnecessary field technician dispatches.
- Improve workforce productivity with better diagnostics.

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Engineers will also assist with implementing the requisite DSM parameters and associated DSL profiles. And, of course the ASSIA engineers also manage the implementation of new DSL Expresse features, including software updates and optional software modules such as Service Recommender, Real-Time PE/PO, and ClearView.

As part of every Expresse Services engagement, ASSIA professional services can develop customizable reports to support the technical and business objectives of the service provider. Report types can include:

- **Network-level Reports:** Profile changes, speed upgrades/downgrades, exit status for Profile Optimization operations, DSL network stability, performance assessment of DSLAM/CPE combinations, newly provisioned and operational accounts.

- **Business-level Reports:** Impact of Profile Optimization operations, correlation of performance characteristics with business metrics such as call rates or dispatch rates, evaluation of new initiatives against control groups, system utilization, audit/compliance with established processes (such as valid DSL profiles and valid provisioning).

- **Management-level Reports:** Summary dashboard tracking key business metrics over time.

These customized reports give the provider a more detailed and precise view of the network to help achieve optimum service levels. The reports not only provide insight from trend and performance analysis but also help providers to correlate network performance with business metrics such as call and dispatch rates. With this data, ASSIA can help providers identify opportunities to optimize performance, or to reduce trouble tickets and dispatches associated with slow or unreliable DSL connections.