White Paper

Perfecting the Last Mile: Advanced DSL Management

Introduction

In 2010, two-thirds of the 485 million broadband connections worldwide were provided over DSL, and DSL's share of the broadband market has remained constant over the last five years. Indeed, DSL appears poised to remain the dominant broadband access technology into the foreseeable future. However, DSL's continued success is contingent on telecommunication companies' successfully dealing with ever stronger competition from broadband providers such as cable TV, satellite, and wireless. Telecommunication service providers need to enhance their services with higher bandwidth, greater reliability, and new offerings such as IPTV and VoIP over DSL. It is becoming evident that the capabilities of the DSL "last-mile" determine to a very large degree the service provider's ability to remain competitive and to be profitable.

A DSL access network capable of offering the best value-added services to the most customers is essential for the success of a telecommunications company (telco). The DSL access network must achieve the following goals:

- Reach a maximum number of customers
- Achieve the highest possible speeds for its customers
- Maintain the highest levels of service quality
- Minimize capital and operational costs

This paper describes how Advanced DSL Management can achieve these objectives. Figure 1 illustrates the key ingredients for profitability when offering DSL services. Enabling the highest DSL rates allows the offering of services with high value-add that increase revenue and prevent customer loss to the competition. At the same time, the reach of these DSL services must be extensive to maximize the number of subscribers that can be served while minimizing capital expenditures. Operational costs must be reduced, while service quality needs to increase to avoid the churn caused by dissatisfied subscribers. DSL provisioning must be as streamlined and trouble-free as possible, and DSL monitoring must be in place to provide fast detection line problems and to enable automatic remedial actions with as little human intervention as possible.

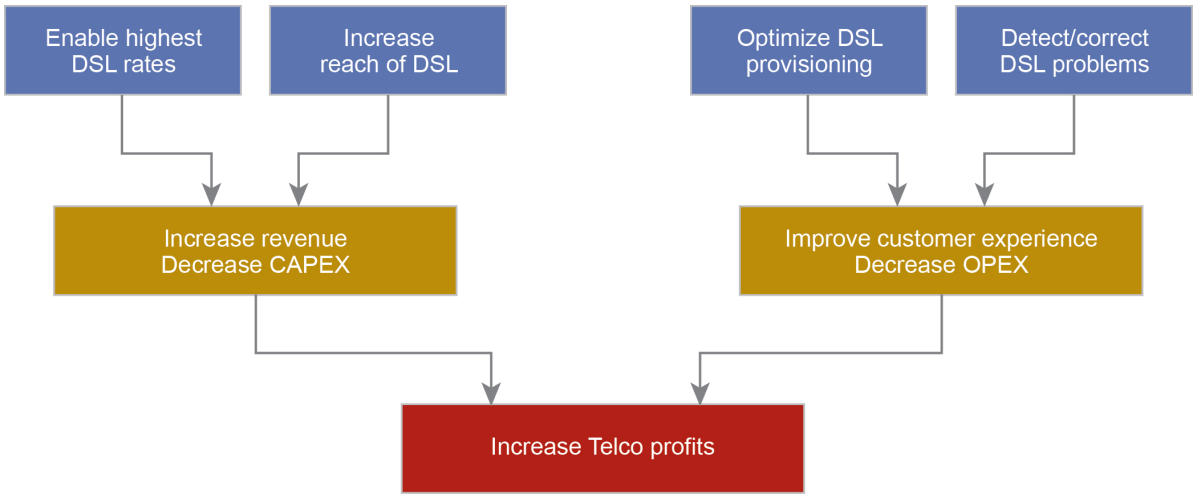

Figure 1. Key ingredients for telco profitability.

Advanced DSL Management provides the telco with tools to "tune" the DSL links for optimum operation. Using reported information about the performance of the subscribers' DSL links, Advanced DSL Management enables the telco to configure each DSL line to address the causes of DSL impairment. This translates into higher rate services and more reliable broadband access for all subscribers. The same tools also extract information from the DSL links to rapidly diagnose field problems and to either automatically take corrective actions or to identify the exact cause and location of the degradation.

Requirements for Advanced DSL Management

The main features of an Advanced DSL Management system include the following:

- Collection of operations and maintenance data from all DSL lines (both periodically and on-demand)
- Automatic DSL service optimization on a per-line basis
- Automatic detection and correction of DSL problems
- Easy access to line and network analysis data for users of the system (e.g. call center, field technicians)
- Seamless integration with existing Operations Support Systems (OSSs)

Collection of operations and maintenance data with regard to Physical Layer performance from DSL lines is vital for proper network management. Such data provide current and historical information about each individual line that is essential for determining the "health" of the service, for diagnosing faults, and for reliably predicting the capability for service upgrades.

DSL service optimization is critical for ensuring that the customer has the best service experience. The DSL service must be optimally configured for each line to provide the highest levels of reliability and performance. This optimization must be performed in an automated way and must be based on close monitoring of the DSL line. Such optimization is especially important shortly after the line is provisioned for the first time, so that customer complaints about the service and consequent truck-rolls are minimized.

Detection and correction of DSL problems must be automated to avoid the costly steps of customer calls and manual interventions for fixing issues. Periodic data collection provides the needed input for line supervision that enables early discovery of issues. Proactively solving an emerging problem before the customer notices any degradation is necessary to prevent customer dissatisfaction and churn. Problematic lines must be reconfigured to address the fault, or a detailed line analysis must be provided to the field team to take corrective actions in the most efficient way. This process is particularly valuable for services offered on long loops at the "edge" of the network, where stability issues arise most frequently.

The collected data about the DSL lines represents a wealth of information that must be available to all telco divisions related to the operation of the DSL network. The raw data about the DSL link is processed and analyzed to provide meaningful information that is readily understood by users with different views of the network. Potential users of such information include call centers, field operations, network operations, and network planning.

Finally, an advanced management system needs to easily integrate with existing systems used for network management and provisioning. Any new management system must “sit” on top of established management models and interact with other provisioning, accounting, and diagnostic tools.

Architecture for Advanced DSL Management

A generic architecture for advanced DSL management that meets the previously stated requirements is shown in Figure 2. The core of the management system consists of two modules -- data collection/configuration and analysis/estimation.

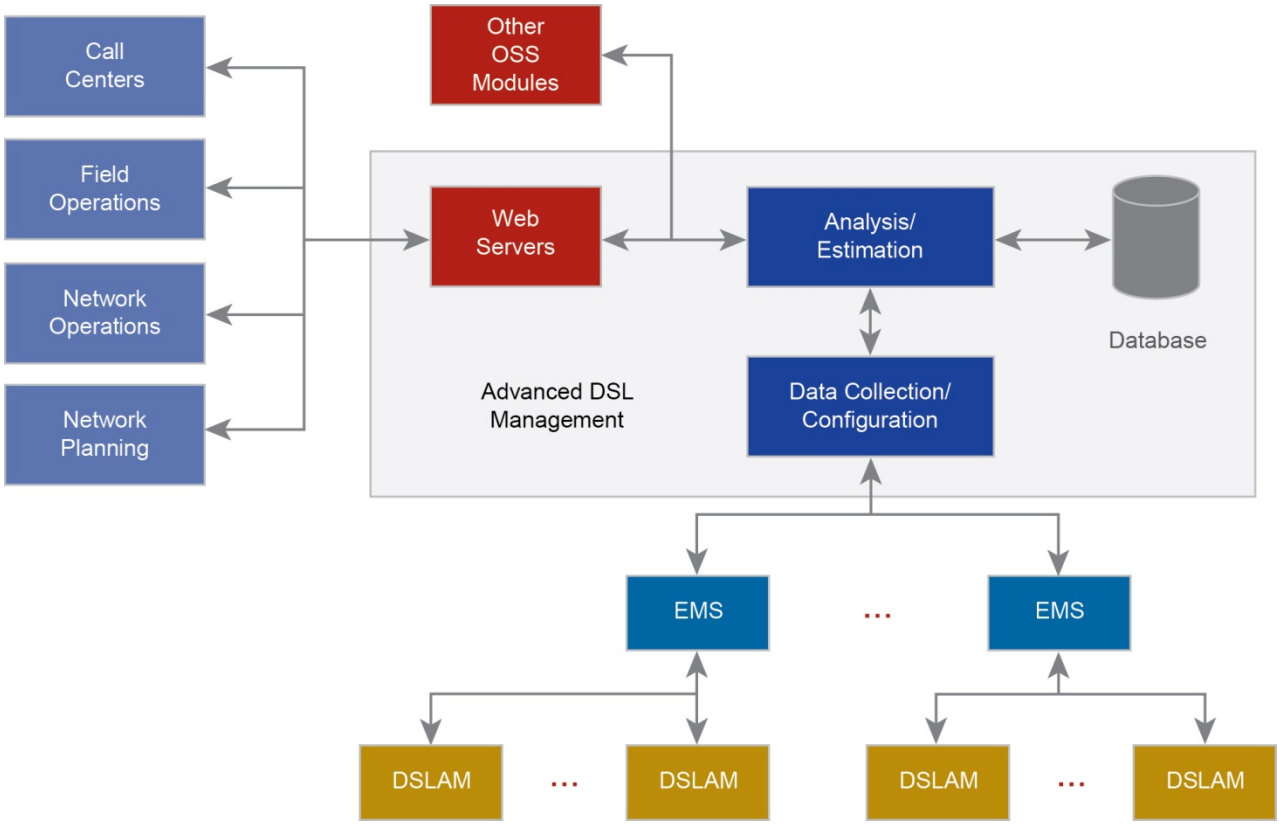

Figure 2. Architecture for Advanced DSL Management.

The data collection/configuration module interacts with existing element management systems (EMSs) that are used for DSLAM management. An additional option for further enhancement of the data collection capabilities allows for this module to be connected with the systems used for remote management of the customer premises equipment (auto-configuration servers).

The data collection/configuration module sends data to the analysis/estimation module, which in turn executes algorithms to derive useful information about the DSL lines. Based on this information, the analysis/estimation module can send configuration commands back to the data collection/configuration module. The analysis/estimation module makes use of a database that stores current and historical information about the line’s behavior and performance.

The analysis/estimation module is connected to other OSS systems (sometimes referred to as Network Management Systems, or Service Management Systems). Information may be provided by other OSS systems to allow the analysis/estimation module to make more informed decisions, e.g. accounting and diagnostics, and information needs to be provided to other OSS systems to keep them up-to-date, e.g. provisioning database. These connections to other OSS systems provide the “context” for optimizing the configurations of the DSL links.

Finally, information from the analysis/estimation module becomes available to various users through Web servers. Call centers can use this information to identify the causes of customer complaints, field technicians can use data to pinpoint line issues, network operations can have a high-level view of the DSL performance, and network planning can make use of information about capacity utilization, observed trends, and usage statistics.

Conclusion

Advanced DSL management is essential for telcos to provide profitable broadband access services. Offering high-end services to the most customers and minimizing the associated operational costs requires management capabilities that include active DSL line monitoring, automatic service optimization, automatic problem detection and correction, and easy access to information about the DSL network. Implementing an architecture that meets these requirements is the key for successful DSL operation.

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