GPON Expresse®

ASSIA Software Solutions

Reliably Fast Broadband & Wi-Fi for the Home
ASSIA Overview

Market Leader in Diagnostics and Optimization Software

DSL & Optical Broadband and Residential Wi-Fi

Machine Learning Cloud Technology

Improves Subscriber Internet Performance, Reliability, QoE

Key Customers

Reliably Fast Broadband & Wi-Fi for the Home

- Top Tier Global Customer Base: 35+
- Historical Customer Retention: 99%
- Patent Families: 90+
- Growth in Revenues in 2017: 50%+
- Internet Connections Managed: ~100M
- Typical ROI for Customers: 10X

www.assia-inc.com
SOFTWARE SOLUTIONS
Driving Subscriber Satisfaction Up & Churn Down while Reducing Costs for over 30 Service Providers around the world

Reliably Fast Broadband & Wi-Fi for the Home

Market Leading Cloud Based Management, Diagnostics & Optimization serving over 100 Million Homes

www.assia-inc.com

ASSIA® has patents and pending patents that cover all the products it sells into the marketplace and represented in this presentation
Extends the Expresse® product family by adding support for Gigabit Passive Optical Network (GPON) technology

Providing functionality that simplifies the operation of a fiber-based access network.
GPON Expresse®: Built on the Foundation of DSL Expresse®

- 100% Software Platform
  - Collects & analyzes data from GPON network elements (OLTs)
  - Automatically provides diagnostics and performance for the whole network
  - Includes a powerful GUI for diagnosis and resolution of issues
  - Provides approximate location of the fault, e.g., OLT, feeder, collector, distribution segments or the ONT

- 100% OLT Vendor agnostic

- Scalable to accommodate millions of subscribers/links

- Northbound API for powerful OSS, BSS, and operator service application integration

GPON Expresse®:
a powerful Monitoring, Analysis, and Diagnostics tool
GPON Expresse® Architecture

Expresse®
- Performance monitor
- Optimization
- Fault detection & localization

Northbound API
- Open, XML over SOAP

Southbound interface
- Vendor neutral, per-device plug-in

Web client interface (GUI)

Database (RDBMS)
- Oracle database for raw data, analysis results
GPON Expresse® Analytics

**Link Layer**
- Optical attenuation
- Comparison with link budget calculated from ODN inventory
- Optical operational params (temp., voltage)

**Service Quality**
- Link quality indicator
- Quality thresholds configurable per service product as in DSL
- Link Layer metrics
- PHY-layer error counters
- Raised alarms

**Throughput**
- Average calculated over 15-minute interval
- Depends on usage
- Useful for detecting poor throughput/congestion
- Useful for identifying high bandwidth users

---

**Optical Power Attenuation (dB)**

**Historical Link Quality**

**Average Throughput (Mbps)**
Fiber damage
- Fiber can be crushed, pinched, cracked, broken, or cut
- Typically from mechanical stress
- Typical impact is complete failure

Bad splice, faulty connector
- Can be dirty, contaminated, misaligned, or wet
- Result of improper installation
- Causes excessive attenuation, errors or even failure

Macro/micro-bends
- Fiber cable curvature may exceed specification
- Result of improper installation
- Impact can lead to excessive optical signal attenuation and errors

ONT failure
- Equipment can lose power, be disconnected, or fail
- Typical impact is link degradations, or complete failure
- Rogue ONTs can harm other ONTs in PON, especially in uplink

OLT failure
- Port failure can occur from laser diode aging and malfunction
- Line-card or system hardware can fail
- Typical impact is link failure

Congestion
- PON is a shared medium
- Downlink or uplink congestion can occur at peak usage times
- Impact is degraded quality of service
- Congestion can occur on PON port level, line card level or ONT chassis level (backhaul connection not sufficient)
### GPON Expresse® Fundamental Capabilities

#### Data collection

**Operational data**
- Link status, raised alarms
- Transmitted/received optical power
- Laser health

**Performance data**
- Link errors, error seconds, FEC anomalies
- Ethernet traffic data
- Data available as 15-minute counters

**Collection modes**
- **Automated collection** of operational and historical performance data at scheduled times every day
- **Real-time collection** for both operational and performance data
- **Alarms** traps for a pre-defined set of Service-sensitive links

#### Analysis

**Quality of Service Monitoring**
- Link status
- Link layer metrics
- Service layer QoS
- Traffic monitoring and congestion detection

**Diagnostics, detection and localization**
- Equipment fault flags (Faulty OLT/ONT)
- Fiber fault flags
- Fault location with neighborhood analysis
- ONT Ethernet port issue flags

**Analysis modes**
- **Daily analysis for all network links**
- **Real-time analysis** using operational and performance data