Fiber to the Home GPON networks Analyzer

**Description**

GPON Doctor™ 4000 is a passive, chipset-less GPON FTTH protocol sniffer and analyzer. Connected to any location within your PON distribution network (ODN), it will capture downstream and upstream bit-level information. Provides comprehensive analysis of the GTC layer: OAM, PLOAM, and OMCI. GPON Doctor™ is mainly oriented for conformance and interoperability tests. It is a perfect tool for labs and field application engineers engaged in GPON deployment or for GPON active elements developers/integrators.

Capture+Analyze+Evaluate

GPON Doctor™ is a complete and autonomous solution. Composed by a GPON capture card, an “state of art” chassis and a processing software capable of analysing and evaluating the captured data.

Based on our own implementation, the capture hardware includes last generation optical modules and powerful computing engine. Capable of synchronizing with the Downstream and Upstream data flow of the GPON fibre and performing automatic calibration. Its storage capacity allows to perform long time captures.

The Analysis Engine interprets the captured data and provide all the tools for engineers to inspect the control flow while adding useful information for debugging and troubleshooting. From the content of the control information, it infers the topology and state of a GPON network: ONTs detected, data channels established, configuration exchanged, bandwidth analysis and graphics for every ONT and by TCONT.

The GPON Protocol Evaluation System applies a set of contextualized, dynamic rules to test if the captured traffic complies with the ITU-T G.984.x protocol. Generating a final report listing all protocol violations of possible sources of malfunction.

GPON Doctor™ 4000 can export the captured data in XML as well as the E/R diagram in HTML and the Final report in Text. It also includes “SW desktop” licenses for “off-line” debugging of captured information.

Windows XP Embedded

Based in Windows XP Embedded, GPON Doctor can include (according to customer needs) other office and analyse tools for other service protocols used over GPON. Very intuitive and usable, with a very low learning curve that lets you start using it right from the start.

**Features**

Capture+Analyze+Evaluate in 1 click

GPON Doctor™ 4000 gathers all control and management information from the PON and by using an smart analysis engine it is capable of inferring the network topology and verifying the ITU-T G. 984.x recommendation level of compliance. Its automatic adaptive synchronization, automatic calibration and easy interface makes it ready to be used from the first day.

Troubleshooting a GPON network

Evaluates and detects problems in a GPON, identifying the origin of the malfunction and its source.

Real time user traffic extraction

GPON Doctor™ 4000 extracts, decrypts and reassembles user traffic at Ethernet layer, in real time. This traffic is made available at the 10/100/1000BaseT interface. Possible applications are: QoS/QoE monitoring, network performance and upper layer analysis. Its hardware decoder fully supports AES automatic decryption combined with FEC encoding.

Service regeneration and QoS/QoE Evaluation

GPON Doctor™ 4000 can regenerate services established over a PON network. Multicast video can be sniffed & reassembled in real time and played as in Customers’ premises. This feature is perfect to identify services optimum performance deviation over a PON.

Real time GPON Capture

GPON Doctor™ 4000 captures GTC and OMCI messages within the PON in Real Time. Highlight negotiation processes and configurations, while showing the current status of ONTs, GEM and TCONT.

Detailed diagrams of OMCI entities and BW allocation

Easy to understand and complete entity-relation OMCI diagram, including alarms and errors. Bandwidth allocation per ONT and TCONT and its evolution in time. Real time Upstream bandwidth consumption per GEM port.
Troubleshooting in PON and GPON networks

With the aim of widening ONTs offer, it is important that any OLT interoperates with all available ONUs in the market. However, GPON has a number of intrinsic characteristics that is currently making difficult to achieve the desired level of the interoperability:

- Coexistence of products with different standard versions.
- Problems during the activation process.
- Different ways of implementing the standards
- OMCI, a very broad and with “vendor specific” options.
- Heterogeneity among operators.

Furthermore, the structure of a PON network is a fibre that is further divided using optical power splitters. The “degree of splitting”, is defined as the number of divisions that suffers the fibre to reach an ONT, which determine the percentage of optical power arriving to an ONT. Attenuation in a GPON circuit can be very high due to the sum of fibre splitting, connectorization (insertion loss), fusion splice, and distance in the fibre, and thus, some of the network active elements operate under stress conditions.

In order to reach the optimum performance state of a GPON network, during the deployment and maintenance, all causes of interference need to be debugged by tools like GPONDoctor 4000.

Non-invasive Capture

Once a Network is deployed, it is required that the usage of a test tool does not impact in its behaviour. Therefore, GPON-Doctor™ 4000 transparently sniffs traffic within a FTTH network. Moreover, its automatic calibration and stand alone configuration enables full capture of GPON network traffic without disturbing the communication between the OLT and ONTs.

The capture can be very long (e.g. 30 minutes) and allows captured data export to XML format for later analysis in desktop computers.

Smart Network analysis and evaluation

The smart analysis software interprets the captured data and translates it into a graphical and categorized format that can be easily used for in-depth analysis of GPON protocol conformance, interoperability evaluation, bandwidth assignments and field deployment troubleshooting.

The results from the GPON Doctor™ analysis show:

- GPON network topology: ONTs detected, ONTs and OLT operational status, data channels established,
- Entities created and the relationship among them,
- Bandwidth assignment graphics per ONT and TCONT,
- Degree of standard conformance, by applying an evaluation smart engine, based on contextualized dynamic rules, against the ITU-T G.984.x protocol.

Real time upper layer Ethernet traffic extraction

GPON-Doctor™ 4000 allows clear-text user traffic extraction in real-time for both upstream and downstream. The traffic is extracted at Ethernet layer. This traffic can be further analysed by upper layer protocol analyzers, either external or by a software network protocol analyzer installed within the GPON Doctor™ 4000.

The combination of the GPON Doctor™ 4000 with a traffic generator and GPON OLT emulator, like GPON-Doctor™ OLT-e, is a powerful setup to verify the correct ONTs behaviour over a GPON network.

This feature can be also used to regenerate services inside GPON Doctor™ 4000: Play Multicast Video flows, hear sound of voice services in realtime, analyze QoS & QoE.
GPON-Doctor™ 4000

Highlights

Start screen

Control traffic analysis GPON G.984.3 and G.988

ONTs GPON state (GTC and OMCI)

Entity-relation diagram of OMCI entities

Real Time Extraction using Industry standard application

Analysis of bandwidth distribution per ONT and TCONT
### Technical Specifications

**Application examples**
- Fundamental tool for GPON new network deployment and conformance testing.
- Diagnosis and Analysis of events and deviations for already deployed GPON networks.
- Interoperability troubleshooting among different vendors equipment coexisting in a Telco access network.
- Triple play services assurance by user traffic Quality of Experience monitoring.
- Broadband Forum ONUs conformance testing.
- GPON Auditing and Optimization.
- Real time supervision of the Network state and all its active elements (ONTs).

**Technical features**
- Capture OAM + PLOAM control data and OMCI messages (full support).
- Real Time PLOAM + OMCI + Negotiation messages capture
- Long duration captures (~30 minutes)
- Low attenuation (<1.5 dB) external fibre tap module, perfect for field environment. Can be installed as fixed testing point
- Ruggedized (MIL-810F) portable form factor. Very Low Weight: <3.5 kg
- Battery Powered: ~1 hour of full power operational time
- Infers the GTC machines in ONTs state and the ONTs OMCI entities state/value.
- Infers network topology: ONU/ONTs, OLT.
- Evaluation of the compliance degree with the ITU-G.984.x standard, generating a list of standard inconsistencies and violations.
- Bandwidth distribution analysis per T-CONTs for every ONT.
- Real Time Service regeneration and monitoring: Multicast Video, Voice
- Automatic calibration.
- Real time upper layer Ethernet traffic extraction.
- Windows XP Embedded Operating System.
- Automatic behaviour: capture, analyse and evaluate in one click.
- Captures storage for further analysis by the GPON-Doctor™.
- Hardware/software customization upon request.

**Interfaces**
- Touch screen (High definition colour TFT, 12”, 1024x768).
- Gigabit Ethernet Capture/Management Port: QinQ Transparent/Stripping configurable
- Wi-Fi B/G interface, both for sniffing and IP management purposes
- Gigabit Ethernet over GPON Real Time Extraction port: External network protocol analyser plug in.
- 2x USB 2.0 to easy transfer data, traces and reports export.
- GPON capture interfaces:
  - Downstream: SFP Single Mode 1490nm (2.5Gbps) module, SM 1310nm optional
  - Upstream: Single Mode 1310nm (1.25Gbps)

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