## Service Health Manager

Proxilliant Service Health Manager (SHM) is the dashboard required to monitor the quality of any network including health and customer experience of the services provided in the network. The system integrates perfectly with the Proxilliant CAMS and consists of only three system components: The **PollingEngine**, the **Datawarehouse** and the **HealthManager** a Web based front-end application.
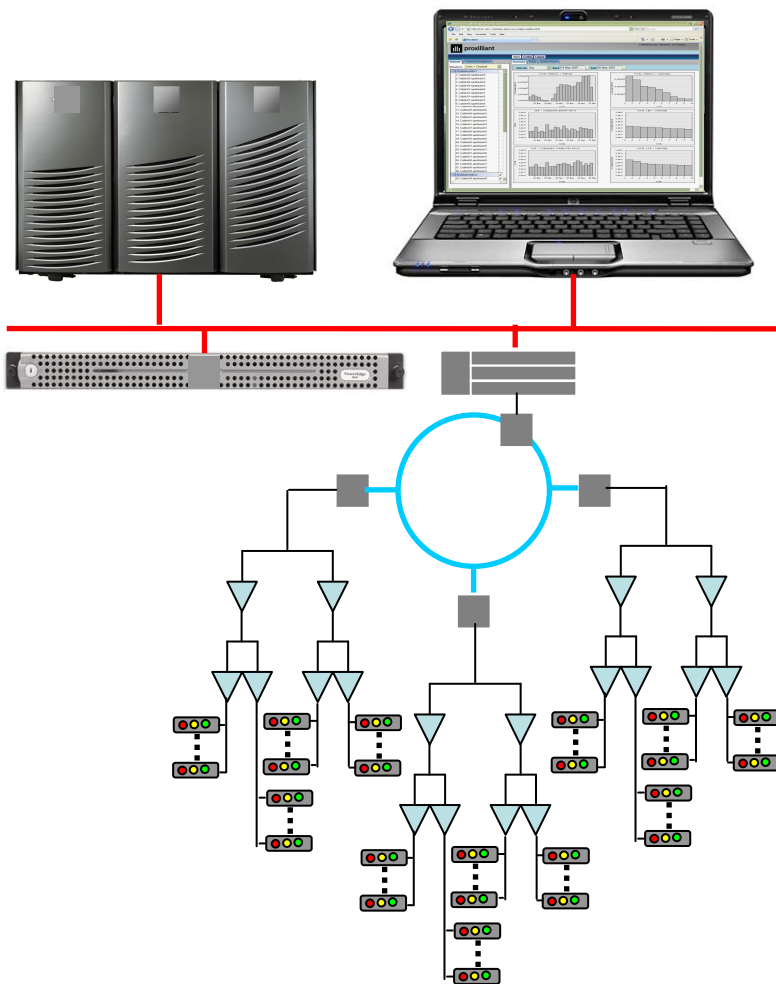
The system performs advanced polling of network devices in order to supervise and monitor the health of the network and the network services. The data is collected by the **PollingEngine** and stored in the **Datawarehouse**. The collected data is then analyzed by the advanced features of the **HealthManager** application.

The PollingEngine

The polling engine is a software package running on a standard off the shelf hardware. The software package can be configured to poll any device in the network. The polling engine software store all data in the data warehouse

The Data Warehouse

The data warehouse is a software package with an integrated WEB server that interacts with the Front-end software and a database. The system does support the most common database systems.
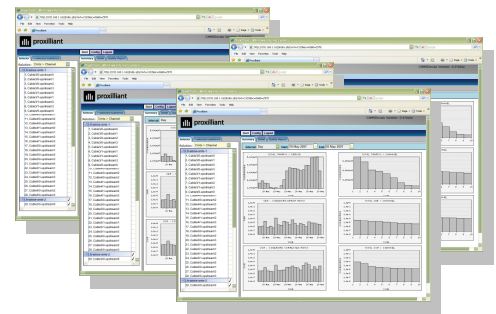
The Health Manager

This Front-end software is a Web based application that provides the operator with the dashboard and tools required to in detail analyze network health and customer experience of the services provided in the network

Features
- Network Quality indication per node, modem group e.t.c deep in the network
- Modular approach, possible to integrate and poll any type of network device
- Detail fault analysis per network node
- Automated ranking of metrics on all network levels
- Pinpointing problematic net work areas on all network levels node level, modem group level down to individual modem
- Trend analysis
- Modem transmit level supervision,
- Scalable from small to nation wide networks
- CMTS "flaplist" supervision
- Automated alarm notification based on thresholds settings per network node
- User defined network views
- Simple and automated configuration
- Root cause analysis

Optional features
- Integrated upstream spectrum analyzer
- Integration with third party trouble ticketing system
- Integration with third party NIS

Network quality

The criteria for a high quality network do not depend on one parameter only, the criteria for quality is based on a number of key-parameters. In the Health Manager the operator has the freedom to choose which parameters that should serve as the key-parameters and also to define the relative importance between one key-parameters and another. This information is then used by the application quality algorithm to provide the operator with a graphical view of the quality status of the networks. Quality can be viewed for any random period and for any node level in the network. The system will also provide the operator with ranking information to show network nodes with quality problems. The information can be used to schedule and prioritize service work in the network.

The basis for the network quality indicators is a user defined number of metrics, for instance the network quality may be a function of SNR, Ingress, CER and customer complaints e.t.c. The relative importance of each chosen quality metrics may be defined by the operator. Also the metrics to be used as measures for the network quality may be arbitrarily defined by the operator. Optionally the system provides default metrics for network quality.

## Modular approach, simple integration of any type of network device

The HealthManager is generic in the sense that it is easy to include any type of device. In the case the new device is a SNMP enabled device the HealthManager will provide built-in support for integrating the device in to the system. In case of proprietary devices there is a number of ready made plug-ins available that supports the most common proprietary devices. In case no plug-in is available such support can optionally and up on requests be provided. This modular approach makes it also simple to integrate data from other systems for instance trouble ticketing systems, customer support system in order to achieve trend data from for instance customer complaints, service calls e.t.c.

Detail fault analysis per network node

The system provides detail analysis of each polled key- parameter on every network node. This is helpful when quality indicators signals bad node quality. The detailed analysis is a way to dig deeper and further explore the root cause of the problem in order to provide an accurate diagnose to help service personnel to solve network problems.

Automated ranking of key parameters on all network levels

For each polled parameter the system will automatically present a ranking diagram showing the 10 worse network nodes based on the specific parameter. The presentation gives an immediate overview and correlation between key parameters in order to quickly find problematic nodes and areas of the network.
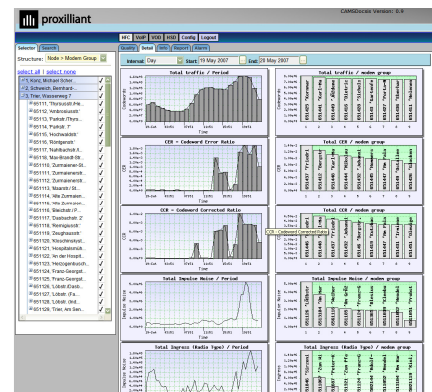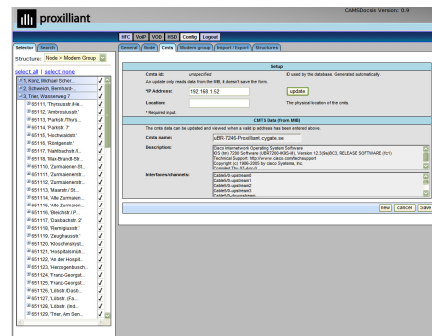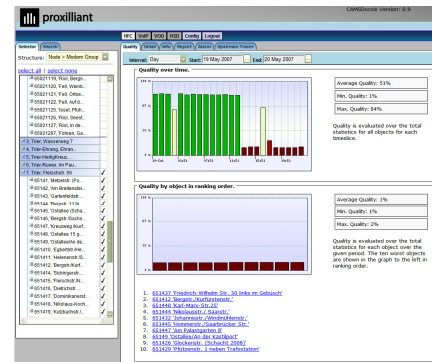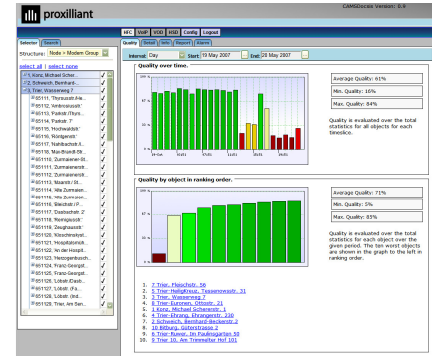
Pinpointing problematic net work areas on all network levels from fiber nodes, modem groups, down to individual modem

The concept of network grouping where polled data and key-parameters are aggregated over the different node levels is an efficient tool to rapidly dig deeper and deeper into the network structure in order to find the cause of a network problem. This view also gives the necessary tools to, at a granular level, schedule and prioritizes service and maintenance work in the network.

Trend analysis

Data collected over time can be used to identify the nominal values for a set of key-parameters and then used as the norm for the network. Once the norm is established the system can automatically monitor the parameter and send notifications when changes from the established norm are detected. Of course the acceptable deviation from the norm can be taken into account as well. A proactive trend analysis can be issued to prevent an upcoming problem to affect customer services in the network.

Modem transmit level supervision, modem metrics monitoring

The HealthManager can be used to, manually or in some cases automatically define groups of network devices. The groups may be created based on the structure if the network. For instance a modem group is created based on that they are all connected to the same end amplifier or dlb. Thus the whole group of modems depends on the same network path. Using this approach the cable modem key-parameters can be analyzed for the whole group, such that any changes on the parameter will identify where in the network the change has occurred. For instance a change in transmit level by 3 dB for the whole modem group will clearly indicate that there has been some modifications in the upstream path for this modem group path. While an increase in transmit level for only one modem within the group will indicate that this is caused by changes further out in the network e.g. in the customer premises.

Scalable from small to nation wide networks

Depending on the number of devices to poll and the underlying network structure the network is divided into polling regions where each region is managed by a polling engine. The size of the polling regions is chosen based on the capacity of the polling engine and the amount of data that has to be collected in the regions. In order to balance the load evenly and in order to be able to handle the amount of data that has to be polled and registered, the number of polling engines can be adjusted so the balance is correct. This also applies for the data ware house that could be configured as centralize function or a distributed over the network. By adding polling engines and distributed data warehouse the system can scale from a very small system, consisting of one polling engine with an integrated data storage to very large nationwide networks supported by several polling engines and distributed data storage.
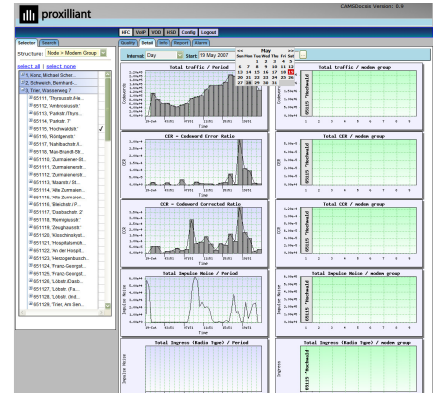
Automated alarm notification based on thresholds settings per network node

The system supports alarm settings per node level down to individual device. This means that for each node within a defined view a different set of alarm notification criteria can be set.

User defined network views

The system allows the operator, based on the devices installed in the network, to in flexible way define different views of the network structure. The different views are a way to focus performance monitoring and supervision to a specific devices type and network levels.

Simple and automated configuration

A new network device is simple to add to the system. For SNMP enabled devices the system provides build-in support to define the device itself and to define the poll parameters associated with it. For non SNMP enabled devices e.g. devices using proprietary protocols the system support a number of plug-ins for the most common device types.

Root cause analysis

When the full network structure is available the alarm/notification/poll data analysis may be used to pinpoint the device that is the root cause of the reported errors. For instance if poll data reveals that a group of modems have increased their transmit levels. This may at the first glance indicate that the common distribution amplifier is the root cause of the problem. Further analysis may reveal that also other modem groups was at the same time increasing their transmit power and then the root cause may be find higher up in the network. This basic analysis is done automatically and continuously based on received alarms and changes in poll data.

Integrated upstream spectrum analyzer

As an option the system provides an integrated spectrum analyzer where each upstream node may be measured and the return spectrum is displayed for the selected node. The spectrum data may either be generated from the upstream spectrum data that is provided by DOCSIS 2.0 CMTS's or by additional upstream tracer hardware provided by Proxilliant