# QDXray

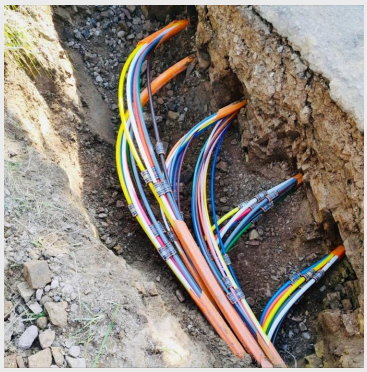
Overcoming Challenges in FTTX Networks with QDXray, a whitepaper

## The many PON standards

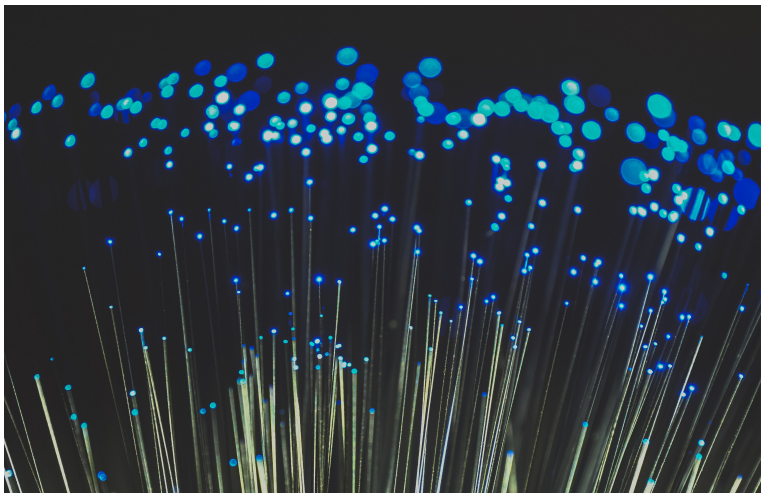
Both IEEE and ITU define multiple standards. We recognise the various EPON standards as well as the GPON standards. Both standards house several individual standards as customer demand grows and higher speeds are required.

Each standard has its own characteristics, like wavelengths, so that the standards can coexist on the same passive network.

## The passive plant



In a Passive Optical Network (PON), the passive plant topology refers to the optical distribution network (ODN) that connects the central office (CO) to multiple customer premises.

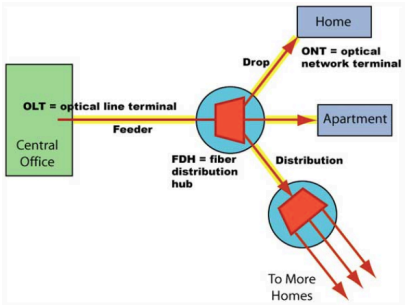


# Fiber to the X

Fiber to the Home (FTTH) is the gold standard for broadband connectivity, offering high-speed internet, voice, and video services to end-users. However, providing reliable and high-quality service over an FTTH network presents several challenges for telecom providers. In this whitepaper, we will discuss some of the common challenges faced by FTTH providers and how QDXray can help overcome these challenges.

### *PON networks*

A passive optical network (PON) is a fiber-optic network that uses optical splitters to divide a single fiber optic strand into multiple fibers, which can serve multiple customers. While PONs offer numerous advantages, they also face some unique challenges. Here are some of the most common challenges of a passive optical network:

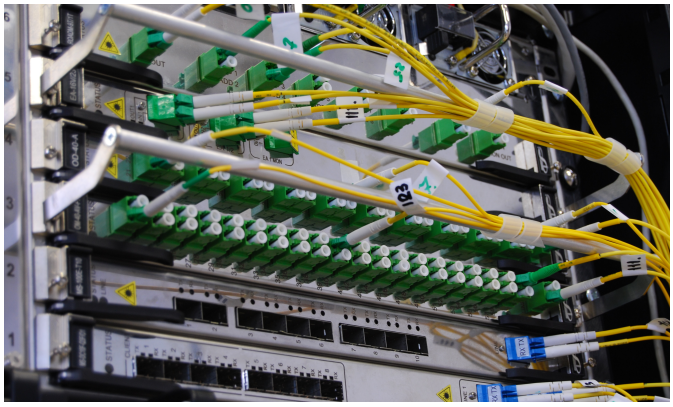



## Passive plant components

The ODN consists of several passive components that distribute the optical signal to each subscriber without the need for active electronics or power. Here are the main components and topology of a PON's passive plant:

- Distribution Section: This section includes the feeder fiber that connects the CO to the optical splitter. The feeder fiber has a higher capacity than the distribution fibers, and it typically uses a single-mode fiber.
- Splitter Section: The splitter section is where the optical signal is split into multiple fibers to serve multiple customers. Splitters can divide the signal in several ratios, such as 1:2, 1:4, 1:8, 1:16, or 1:32, depending on the number of subscribers being served.
- Drop Section: The drop section is the final segment of the ODN that connects the optical network terminal (ONT) at the customer premises to the splitter.

1. **Distance limitations**: PONs have a limited range compared to active optical networks. The distance limitations of PONs are determined by the signal attenuation and the splitting ratio of the optical splitters. This can make it difficult to serve customers in remote or rural areas, where the distance between the central office and the customer premises may be longer.
2. **Bandwidth limitations**: PONs typically have a limited amount of bandwidth that is shared among multiple customers. This means that as more customers are added to the network, the available bandwidth per customer decreases. This can lead to reduced performance and slower internet speeds during peak usage periods.
3. **Reliability issues**: PONs rely on passive components such as splitters, which can degrade over time and impact network performance. Additionally, PONs can be vulnerable to damage from construction or other activities that may disrupt the fiber optic cable.
4. **Upfront costs**: PONs require a significant investment in infrastructure, including fiber optic cables, optical splitters, and other equipment. This can make it challenging for service providers to justify the upfront costs, particularly in areas with low population density.
5. **Compatibility issues**: PONs use specialized equipment that may not be compatible with existing infrastructure, including customer premises equipment (CPE) and network management systems. This can make it difficult for service providers to integrate PONs into their existing networks and can increase the overall cost of deployment.



## Trunks & Handholes

In a Passive Optical Network (PON), the fibers are typically dropped from a trunk cable to individual customers using handholes. A handhole is an underground enclosure that provides access to the fibers and other passive components of the PON network.

## Challenges

The trunk cable is a high-capacity fiber optic cable that connects the central office to the distribution point, which is typically located in a handhole. The trunk cable contains several fibers that are used to serve multiple customers in the distribution area.

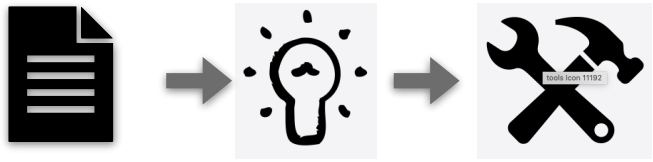
The trunk cable can easily contain hundreds of fibers that connect many different PON interfaces on different OLT's to hundreds of subscribers.

## Fiber trenching

Imagine the havoc when an excavator digs through an existing trench that houses massive trunk cables. Suddenly hundreds of customer calls and red alerts on the OLT's and massive ONT drop. NOC staff clicking on NMS's, topology software and provisioning data..

## Lower your TCO with QDXray

While these challenges can make it challenging to deploy and maintain a PON, service providers can overcome these challenges by working with experienced partners, leveraging advanced network management systems, and focusing on proactive maintenance and upgrades.



Data Insights Actions

Traditional network management software provides active telemetry derived from routers, switches and specific equipment like OLT's, CMTS's, video streaming equipment etcetera.

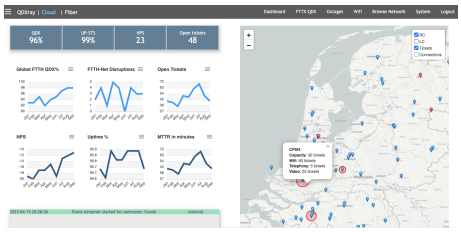
Passive topology in a telecom network is administered by inventory- and passive topology- and/or GIS systems.

Next to these data sources, BSS systems like provisioning, billing and ordering systems provide valuable data on customer insights.

In a data-driven organisation, decision-making is based on enriched data sources creating actionable insights.

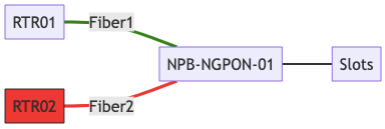
## The QDXray solution

QDXray collects and mediates data from all these systems, uses smart algorithms to enrich this data and bring the outcome to the respective target-audience in a Telco organisation. Rather than overwhelming the user with tons of graphs that require deep subject-knowledge to interpret, we implement subject matter expertise into software routines to do the work. The result is a collection of actionable insights for different target users, from helpdesk to NOC-walls/users, from network planners to Senior management reporting.



## Topology.

Latitude and longitude of your datacenters and PoP's, and even outdoor street-cabinets are tagged on streetmaps with actual status, number of issues, tickets and quality markers.




Topologies are automatically discovered and generated using the active telemetry and topology data sources.

Disruptions and quality tags are visualised to enable lightspeed problem-solving in complex networks.

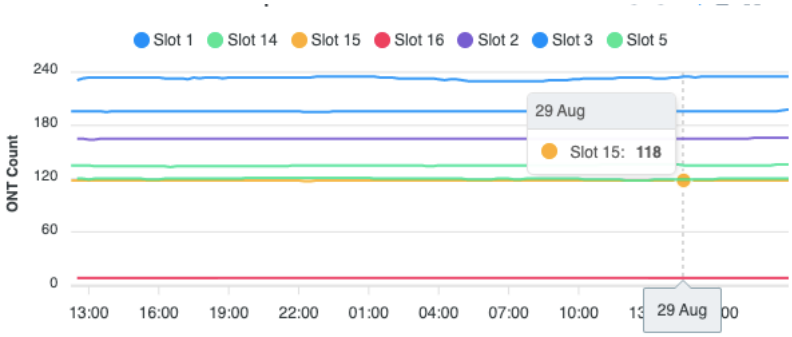
## Cloud or on-prem

As datacenter maintenance and lifecycle can be a burden for companies, we bring QDXray as a cloud offering, and optionally as a on-prem solution, based on your need.

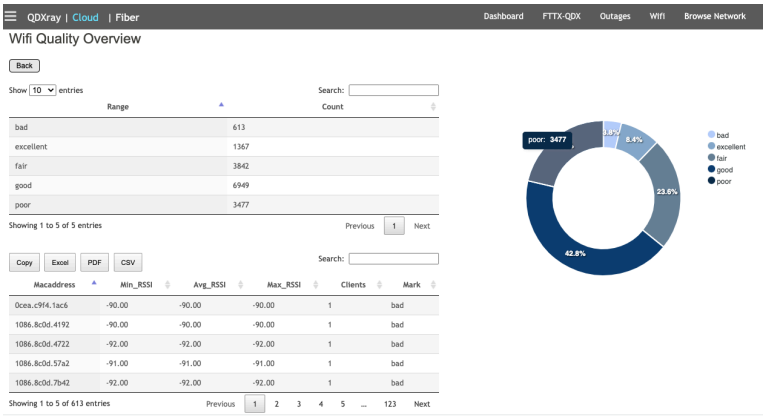
## QDXray: Data to the rescue

In our QDXray product we don't just graph the data, we rather graph the outcome of our thought process, translated into datascience algorithms.


Outages and historical performance are easy to track and solve, depicted even per passive element.




As customer perceived quality includes wifi performance, we include wifi insights in addition to the plant monitoring software. Stitching wifi quality to network quality results in real QoE




## Be Data-driven!

## Let us accompany you on your digital journey

Thank you for reading our whitepaper. If you have any questions about our company or products, please don't hesitate to contact us. You can reach us at:

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We look forward to hearing from you!