
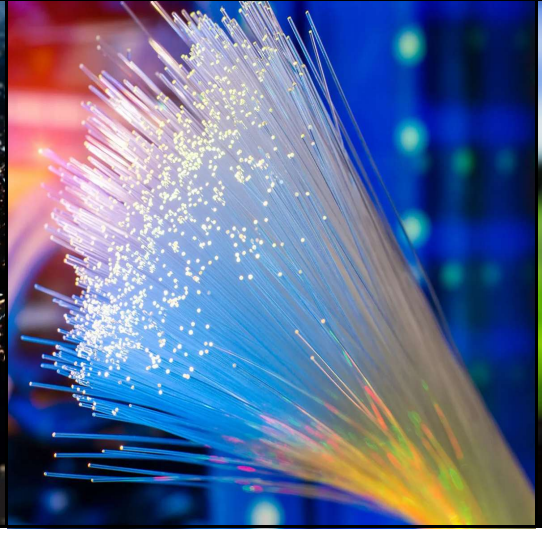
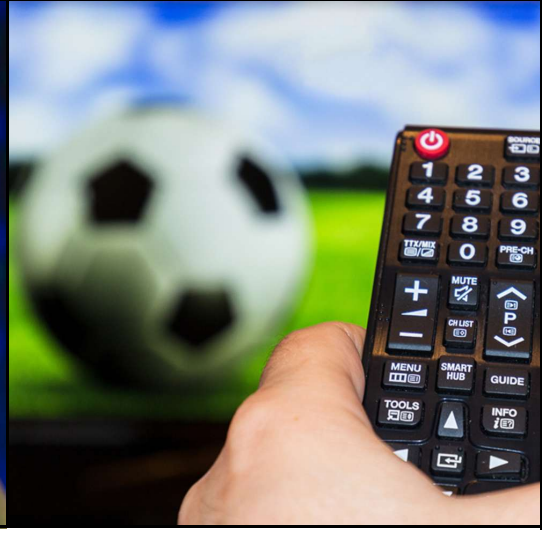

GPD CUBE

GPD Cube system

Autonomous validation platform with 5G connectivity and ONT control

GPD Cube is a remote and autonomous GPON and XGS-PON protocol system designed for continuous validation, monitoring, and troubleshooting of FTTH networks without requiring on-site intervention. It combines protocol-level visibility, ONT control, and cloud connectivity in a compact and self-contained unit.

The system enables engineers to deploy distributed test nodes across the network, capturing operational behavior in real conditions. It performs continuous or scheduled measurements, remotely accessible via 5G or Ethernet connectivity. By integrating ONT emulation and control, GPD Cube validates registration procedures, service provisioning, and end-to-end connectivity, providing full visibility of network behavior from the subscriber perspective.

Unlike traditional portable testers, GPD Cube operates as a persistent measurement point, enabling long-duration captures, event correlation, and real-time analysis of network performance. It supports large-scale validation campaigns and significantly reduces operational costs by eliminating the need for field intervention.

Remote Operation

GPD Cube provides full remote control through integrated 5G and Ethernet connectivity, enabling engineers to configure tests, access measurements, and manage devices from any location. It supports distributed deployments and centralized operation, allowing simultaneous control of multiple units across the network.

Autonomous testing, remote operation and continuous monitoring of FTTH networks

ONT Emulation & Cloud Integration

The system integrates ONT control capabilities to simulate subscriber behavior and validate OLT provisioning mechanisms. It enables verification of authentication, configuration, and service activation procedures under real conditions. Test results, logs, and protocol events can be automatically uploaded to cloud platforms, enabling centralized analysis, long-term monitoring, and data correlation across multiple locations.

ALBEDO

Key Features

With a single deployment, GPD Cube enables continuous validation of FTTH networks without repeated field visits, transforming testing into a persistent and remotely managed process.

Autonomous Operation

GPD Cube operates as an autonomous measurement node capable of executing continuous, scheduled, or event-triggered test campaigns. Once deployed, it performs long-duration measurements without human intervention, enabling persistent monitoring.

Distributed Validation Concept

Traditional FTTH testing relies on portable instruments and on-site intervention while GPD Cube introduces a distributed approach where autonomous units are deployed across the network to continuously validate under real conditions.

Zero-Touch Deployment

No specialized personnel is required on-site. A local operator simply connects the optical fibers, and the system becomes immediately accessible remotely via integrated 5G connectivity. No VPNs, firewalls, or corporate network configuration are required.

Distributed Testing Architecture

Multiple GPD Cube units can be deployed across the network to create a distributed measurement infrastructure. Engineers can centrally manage all devices, correlate measurements across locations, and detect configuration inconsistencies, provisioning errors, and performance degradation.

Remote Control & Connectivity

Integrated 5G and Ethernet connectivity provide secure remote access for configuration, monitoring, and data retrieval. It supports centralized operation and simultaneous control of multiple units, enabling large-scale validation campaigns without field presence.

From portable to distributed network testing

ONT Emulation + Control

GPD Cube simulates subscriber behaviour and validates OLT provisioning procedures under real operating conditions:

- Registration validation
- Authentication validation
- Service activation verification
- Configuration consistency verification
- End-to-end connectivity validation

It also integrates remote power control of connected ONTs for reset and recovery.

Service Validation

GPD Cube verifies real services over the network, ensuring correct delivery of:

- IP connectivity
- Data services
- Multicast and broadcast traffic

It enables verification of QoS and service integrity under real network conditions.

Protocol Awareness

It provides visibility of GPON and XGS-PON operation at protocol level:

- Registration procedures
- Service provisioning flows
- Subscriber-side behavior
- Optical Switching & Test Control

Integrated optical switching enables control of multiple test paths and advanced test scenarios, including synchronization validation, event-triggered measurements, and controlled test conditions.

Cloud Integration

Test results, logs, and events are automatically transmitted via integrated 5G connectivity to centralized platforms:

- Centralized data analysis
- Long-term monitoring
- Correlation across multiple nodes
- Remote reporting and diagnostics

Event Correlation

GPD Cube enables long-duration measurements and correlation of events over time, allowing detection of:

- Sporadic failures
- Provisioning inconsistencies
- Performance degradation

Compact Design

Ready to deploy in real environments:

- Integrated form factor
- Low power consumption
- Easy installation
- Distributed locations

Multiple GPD Cube units can be deployed across the network to create a distributed measurement infrastructure.

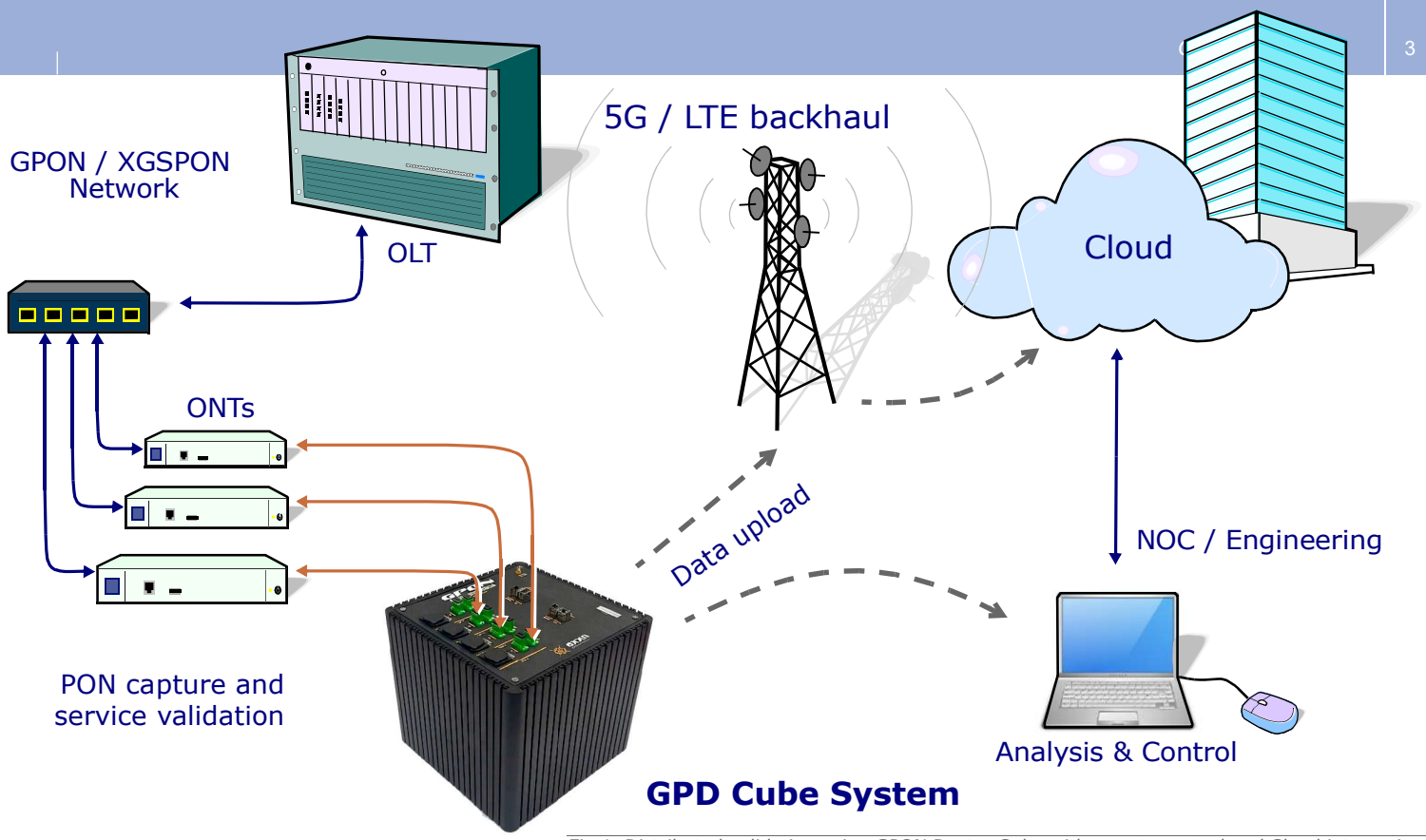

Fig 1. Distributed validation using GPON Doctor Cube with remote control and Cloud integration.

GPD Cube applications

FTTH deployment validation

GPD Cube enables validation of GPON and XGS-PON deployments without requiring on-site engineers. Distributed units verify service activation, configuration consistency, and end-to-end connectivity simultaneously across multiple locations simultaneously, without requiring on-site engineers.

Remote troubleshooting

Installed units provide permanent remote access to the network, enabling diagnosis of intermittent faults, provisioning issues, and service degradation without requiring field intervention.

Continuous network monitoring

GPD Cube operates as a persistent measurement point, enabling long-term monitoring of network, early fault detection, and verification of SLA compliance over time.

Mass validation campaigns

Operators can deploy multiple units to perform large-scale validation campaigns, ensuring consistency across regions, vendors, and network segments.

Interoperability verification

Validation of OLT–ONT interaction in multi-vendor environments, ensuring correct implementation of standards and detecting provisioning or compatibility issues.

Distributed validation concept

Traditional FTTH testing relies on portable instruments and on-site intervention. GPD Cube introduces a distributed approach where autonomous units are deployed across the network to continuously validate operation under real conditions.

This enables scalable and persistent network validation:

- Network-wide visibility
- Reduced operational costs
- Faster fault detection
- Scalable validation strategies.

Service validation

GPD Cube verifies real service delivery over the PON network, enabling validation of IP connectivity, multicast services, and end-to-end service performance under real operating conditions.

USERS

- FTTH operators
- ONT & OLT manufacturers
- Network operations (NOC)
- Quality assurance teams
- Engineering / validation

APPLICATIONS

- Installation
- Troubleshooting
- Interoperability
- Commissioning
- Protocol compliance
- Validation campaigns

KEY FEATURES

- Autonomous distributed testing
- Event-driven measurements
- Integrated 5G connectivity
- Zero-touch deployment
- ONT emulation
- Remote ONT power management
- Optical switching and control
- Service validation
- Protocol-aware analysis
- Cloud-based data collection and correlation

Functional Specification

GPD Cube – Autonomous PON Validation System	
Autonomous Operation	Autonomous operation. Distributed validation. Real network visibility • Continuous, scheduled and event-triggered measurements • Long-duration autonomous operation without human intervention • Persistent measurement point in the network • Full remote access via 5G or Ethernet • Centralized control of multiple distributed units • Remote configuration, execution and monitoring
ONT Emulation & Subscriber Validation	• ONT registration and authentication validation • Service provisioning and activation verification • Subscriber behavior emulation • Configuration consistency validation • End-to-end connectivity validation • Remote ONT power control (reset / recovery)
Service & Protocol Validation	• Ethernet connectivity and data service verification • Multicast and broadcast traffic validation • QoS and service integrity validation • GPON (ITU-T G.984) and XGS-PON (G.9807.1) support • Analysis of registration procedures and provisioning flows • Subscriber-side visibility under real conditions
Optical Control & Test Scenarios	• Integrated optical switching (up to 4 paths) • Selection of test paths and scenarios • Event-triggered measurements • Controlled test conditions and error injection • Support for synchronization validation
Cloud & Data Intelligence	• Automatic upload of measurements, logs and events • No VPN or firewall configuration required • Centralized data storage and analysis • Correlation across multiple distributed nodes • Remote reporting and diagnostics
Distributed Monitoring & Analytics	• Long-duration measurements and trend analysis • Detection of intermittent and sporadic faults • Correlation of events over time • Real-condition network behavior analysis • API / CLI integration for automation (optional) • Centralized orchestration of validation campaigns
Interfaces & Deployment	Interfaces • GPON / XGS-PON • Ethernet (local connectivity) • Integrated 5G / LTE modem (SIM-based) Deployment Model • Zero-touch deployment (plug & operate) • No specialized personnel required on-site • Remote provisioning and activation • Scalable distributed architecture
Platform Characteristics	• Compact standalone unit (no laptop required) • Integrated CPU • Low power consumption • Field-deployable design • No local user interface required
Deployment Model	• Zero-touch deployment (plug & operate) • No specialized personnel required on-site • Remote provisioning and activation • Scalable distributed deployment