Solution Products for
PayTV & Internet Service Providers

NEXTLab

CONTENTS

1. No.1 brand in Korea delivering solution products of
(1) IPTV Service Assurance
(2) Broadband Service Quality Measurement Device

2. An Engineering Powerhouse, fully covers AI & Vision tech. to Hardware production

STB Multimeter

"The All-in-One PayTV Service Tester"

netMeter

"Handheld Device for Broadband, PayTV Installation & Maintenance"

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1 **Designed to Minimize Labour-related Risks**
- Automating the repeated tasks for saving unnecessary labour costs
- Supporting the novice engineers to handle the issues

2 **Price Competitiveness**
- Maintaining price competence through AI and Hardware convergence
- Can save 50% or more than the market's other major brands

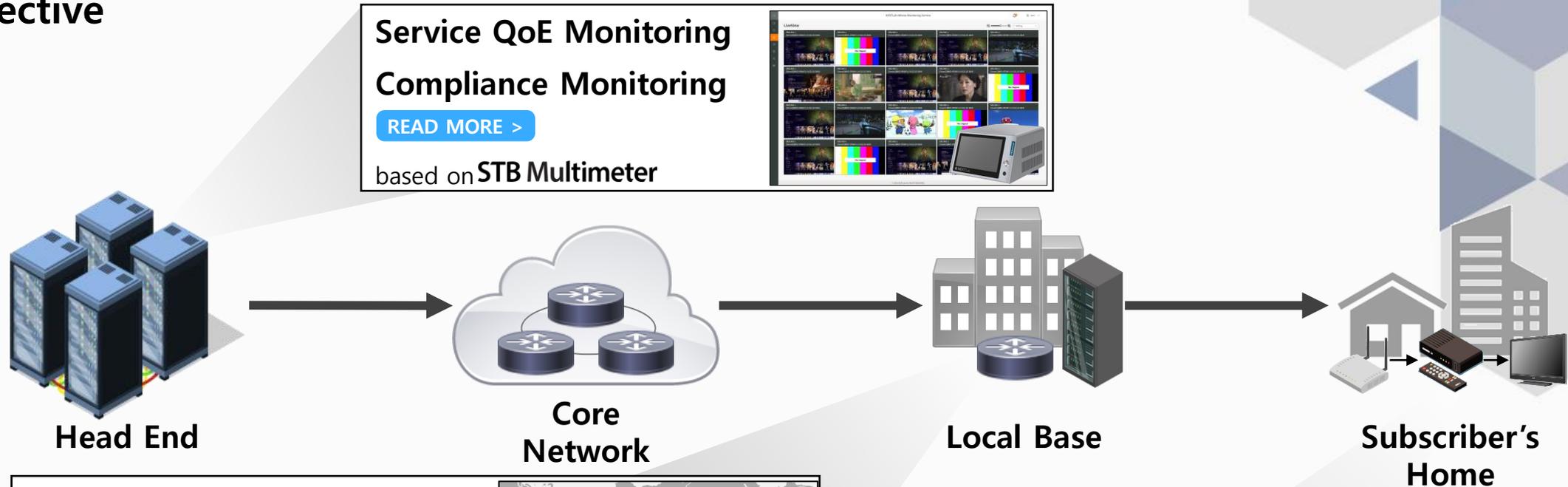**3** **Specialized for ISPs and PayTV Service Providers**
- A decade history of deliveries to ISPs and PayTV service providers

Customers are Saving Costs with NEXTLab's solution products

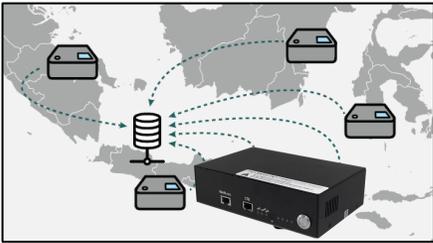| Product	Representative Delivered Solution
STB Multimeter *Not for Public - internal use only*　YouTube	**Automation Solution for IPTV Software Quality Evaluation Center** (SK Broadband, 2017~) (1) Aging Test Automation (2) QoE Measurement Automation (3) Reproducibility Test Automation **1 Saved Labour Costs** STB Multimeters reduced required QA testers **2 Faster QA Lead-Time** STB Multimeters keep testing 24/7 **3 Increased Bug Fixing Rate** Can pinpoint the right dev. team to solve SK broadband **Web-based Test Assigning & Results Querying**　**Share with Dev. Teams** **Voice UI**　**Set-Top Box**　**Remote Control Unit**
netMeter *Not for Public - internal use only*　YouTube	**Broadband SLA Measurement Device for Field-Engineers** (LGU+, 2020~) (1) Internet Speed Measurement (2) IPTV Streaming Quality Measurement (3) STB's VOD Streaming Quality Measurement **1 Saved Revisiting Costs** All onsite works must be confirmed by netMeter → Decreased defective works **2 Saved Extra Expense** No need to carry laptops anymore LG LGU+

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(1) Network Transport Perspective

Service QoE Monitoring

Compliance Monitoring

READ MORE >

based on **STB Multimeter**

Head End

Core Network

Local Base

Subscriber's Home

Nationwide Service Monitoring

READ MORE >

based on **netMeter**

Contents Streaming/STB Testing by Field Engineers

READ MORE >

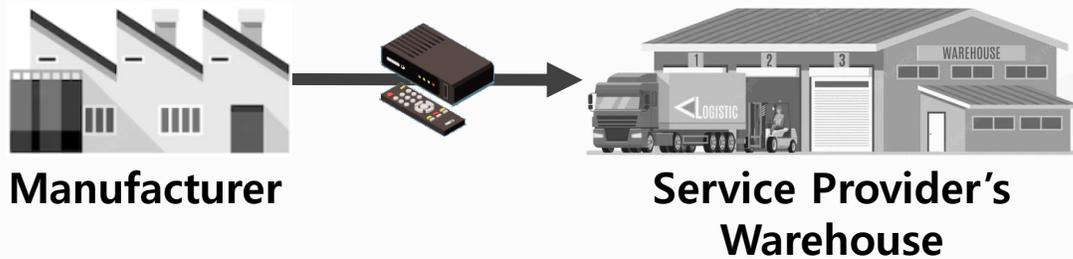**Embedded Service Monitoring Agent**

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based on **netMeter**

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(2) Service Lifecycle Perspective

S/W Dev. Teams → **NEW!** → **S/W QA in Progress** → **OK APPROVED** → **Mass Updates**

Software QA Automation

READ MORE >

based on **STB Multimeter**
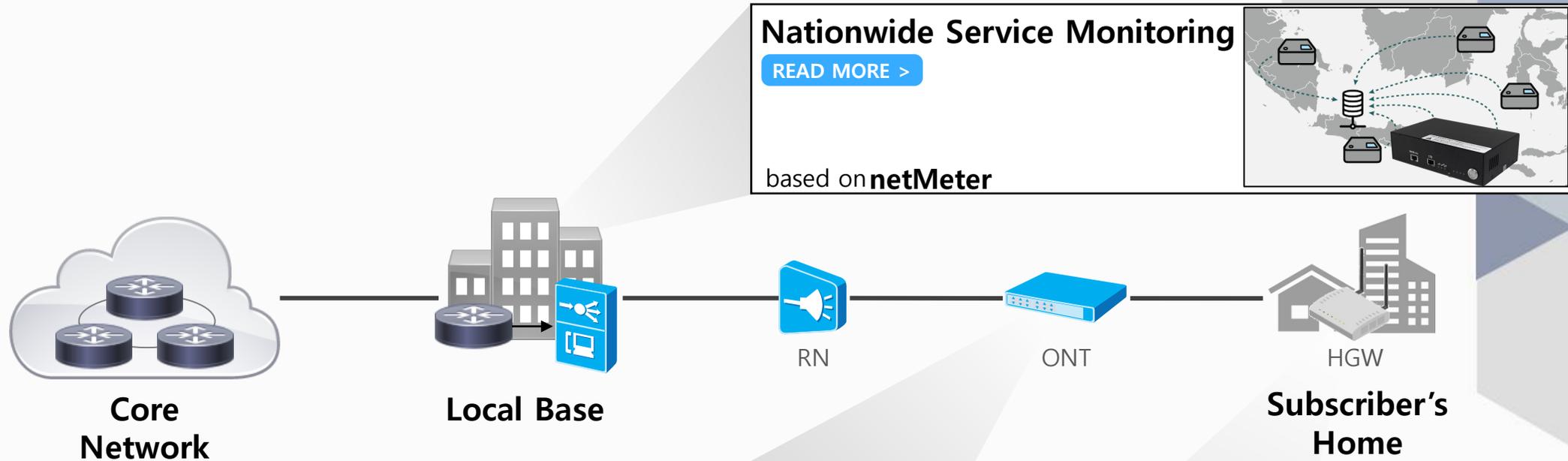
Manufacturer → **Service Provider's Warehouse**

Acceptance Test Automation

READ MORE >

based on **STB Multimeter**

Nationwide Service Monitoring

READ MORE >

based on **netMeter**

Core Network

Local Base

RN

ONT

HGW

Subscriber's Home

Portable Probe for Root Cause Analysis

READ MORE >

based on **netMeter**

Service SLA Measurement for Field Engineers

READ MORE >

based on **netMeter**

(1) Service QoE, Compliance Monitoring

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Benefits

1 **Monetization Features Monitoring** (i.e., Contents Purchasing)
Automated STB user interface control

2 **Realistic Service QoE Monitoring**
Measurement based on the Set-Top Box (STB) output

Features

QoE Monitoring	**Audiovisual Quality** (AI and non-reference based) (1) Macro Block Detection (2) Freeze, Black Screen Detection (3) Loudness **Service Quality** (1) Channel Change Time (2) Reset, RCU Reaction Delay
Features Monitoring	(1) Scenario-based User Interface Control (2) Automated Result Evaluation
Alert	(1) Flexible Rule-based Alert Criteria (2) Real time Alerts via SNMP, Email, Slack and even the customer's dedicated NMS

Operators

NMS

Desktop Model
(Supports 1 STB)

Rackmount Model
(Supports 2 STBs)

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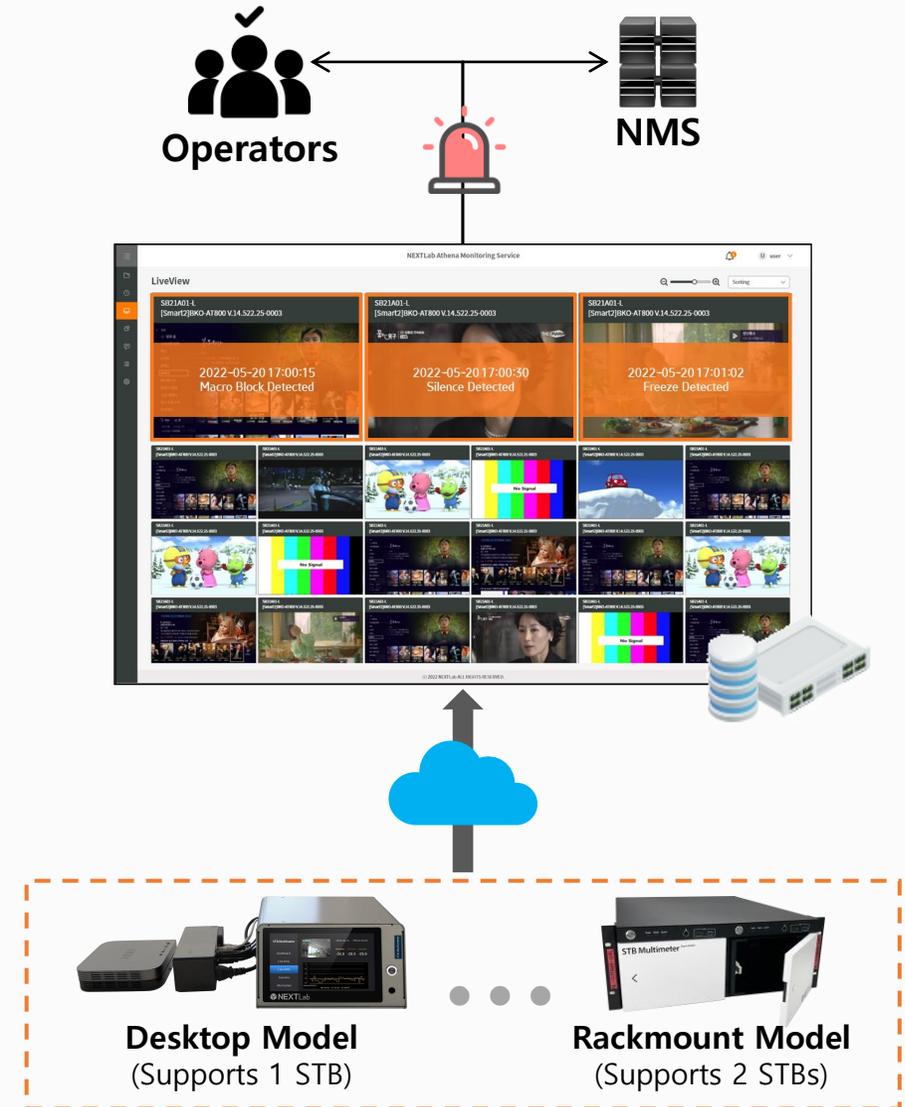
(2) Acceptance Test Automation
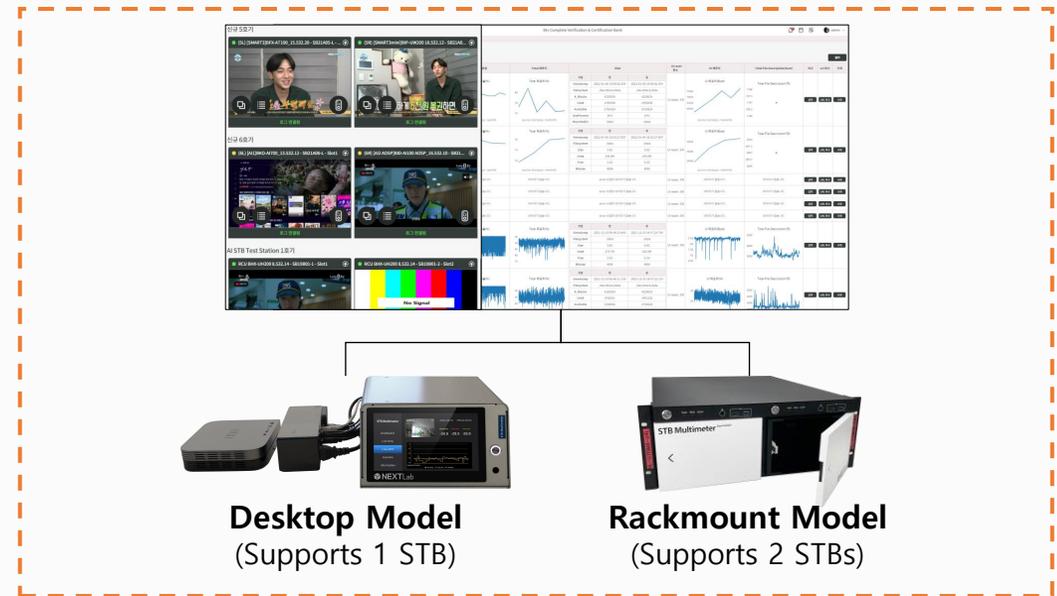
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Benefits

1 **Boost Inspection Throughput & Accuracy**
via Inspection scenario automation

2 **Prevent Disputes with STB Manufacturers**
Failed cases can be proven by the inspection data

Features

Inspection Automation	(1) Scenario-based Function Test
	(2) Random-based Aging Test
	(3) Performance Measurement
Back Data Acquisition	(1) Video Recording
	(2) STB Logs Collection (incl. Top, dumpsys, Logcat, Tombstone)
	(3) URL-based Back Data Share (Visualized Web Viewer)

Incoming STBs from Manufacturer

Desktop Model
(Supports 1 STB)

Rackmount Model
(Supports 2 STBs)

Automated Acceptance Test

APPROVED

REJECTED

(3) Software QA Automation
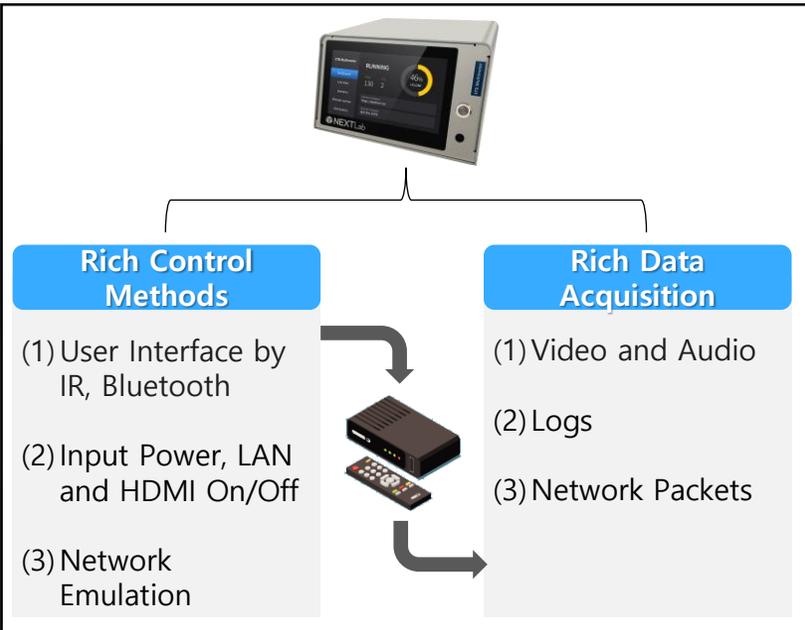
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Benefits

1 **Save Labour Cost**
By automating the repetitive, complicated and accuracy-sensitive tasks

2 **Reduce Bug Fixing Time**
- Back-Data Visualization enables pinpointing the exact dev. team to fix the bug
- Dev. teams do not need to do reproducibility test since every back-data has been acquired

Features

Rich Control Methods

(1) User Interface by IR, Bluetooth

(2) Input Power, LAN and HDMI On/Off

(3) Network Emulation

Rich Data Acquisition

(1) Video and Audio

(2) Logs

(3) Network Packets

Designed for All-in-One Testing

Scenario-based Test	(1) Suitable for Regression Test
	(2) Script-based Test Automation with OCR, Image Matching and Powerful Python Libraries
Random-based Test	(1) Suitable for Long-Time Aging, Stability and Stress Testing
	(2) Advanced Regression Test : Can verify functionalities at various situations
	(3) Intelligent Monkey Test : Aim to cover the 'Grey Area' of QA, the first phase version will enable random test in certain specified menus

Test Case based | Grey Area | Random based

**Rich Testing Methods**
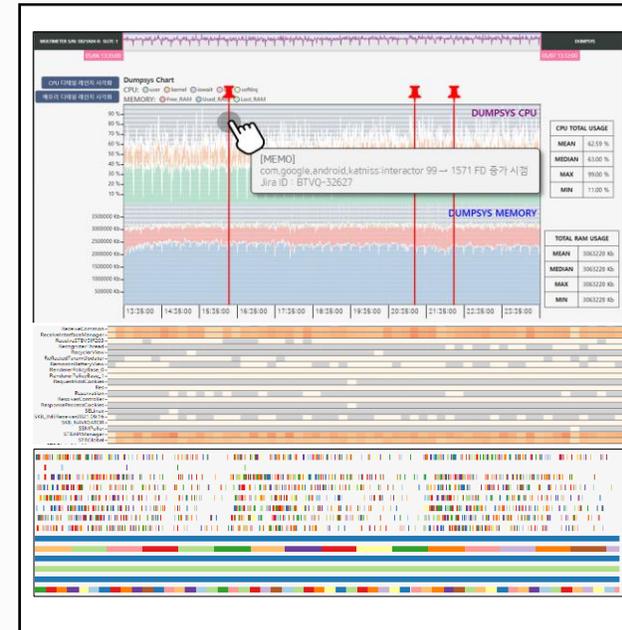
Back-Data Visualization

(4) Nationwide Service Monitoring

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Benefits

1 Variety KPIs Monitoring in One Device
Not only on TS analysis, other KPIs reflecting subscribers' service experience quality can be monitored in one device

2 Local Network Optimization
Network optimization can be carried out according to regional characteristics

Features

MPEG2-TS Monitoring	(1) Up to 30 Channels Concurrent Monitoring (2) RFC 4445 Media Delivery Index (MDI) (3) ETSI TR 101 290 (4) IGMP Leave/Join Delay
OTT QoE Monitoring	(1) Playback Delay (2) Buffering Delay & No. of Occurred (3) No. of Resolution Changes & Average Resolution
Internet QoE Monitoring	(1) Internet Speed Measurement (2) TWAMP, Ping, Traceroute (3) Web surfing QoE KPIs

Core Network
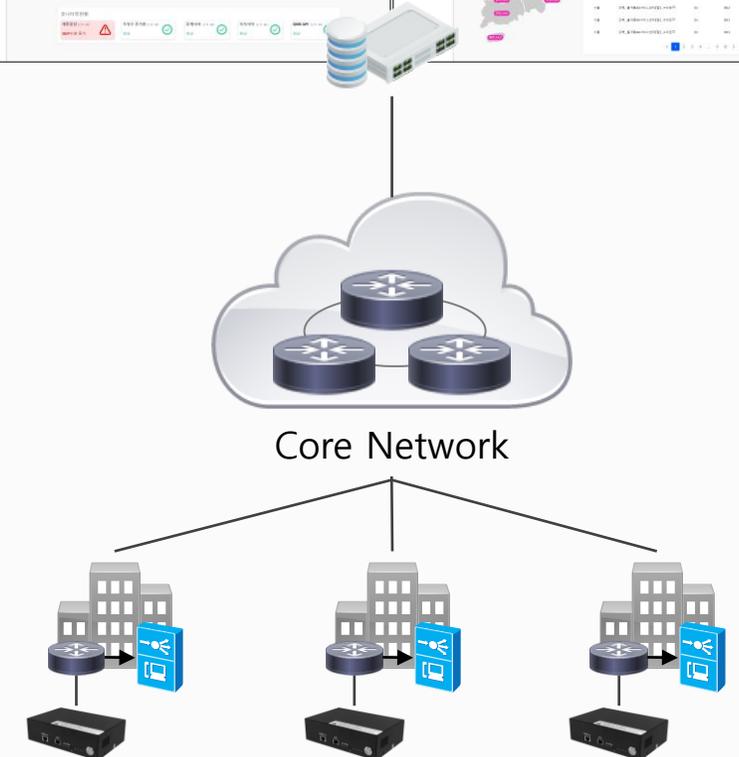
**Probes are installed at each Local Base**

(5) Contents Streaming and STB Testing by Field Engineers

Benefits

1 **Save Unnecessary STB Replacement Cost**
Field engineers can identify the service failure is an STB issue or a network issue

2 **Save Revisiting Cost**
Field engineers can do work based on the measurement results

Features

Passive Testing	(1) Outputs IR Signals
	(2) Scenario-based Test (i.e., One-Click Major Functions Availability Test)
	(3) RFC 4445 Media Delivery Index (MDI)
	(4) ETSI TR 101 290
	(5) Channel Change Delay, Streaming Bandwidth
Active Testing	(1) Up to 5 Channels Concurrent Monitoring (MPEG2-TS)
	(2) RFC 4445 Media Delivery Index (MDI)
	(3) ETSI TR 101 290
	(4) IGMP Leave/Join Delay, Each Channels Bandwidth
	(5) OOB^Out of Band^ Channels Connection Test
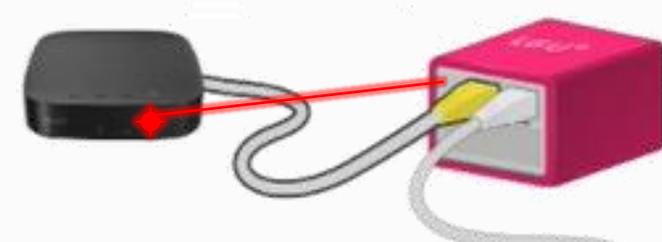
Passive Testing – For Verifying STB Failure
(Emulating STB via IR & Monitors flowing packets)
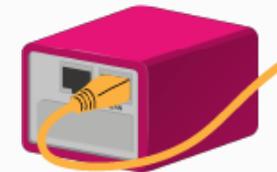
Active Testing – For Verifying Network Failure
(The device directly joins the multicast channels)

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## (6) Portable Probe for Root Cause Analysis

Benefits

1 Get to Know the Reason for Service Degradation
Rich and dense data can boost your Root Cause Analysis

2 Save Cost for Cause Analysis
No need to wait and see on site until the measurement is complete.
The probe automatically collects data 24/7 and is remotely controlled.

Features

Measurement	(1) Scenario-based Measurement at each Probes
	(2) MPEG2-TS : MDI, ETSI TR 101 290, Bandwidth
	(3) Internet Speed Measurement : UP/DN, Ping/Loss
	(4) TWAMP, Ping, Traceroute to Appointed Targets
	(5) Network Discovery, CDP/LLDP for ONT Info.
Remote Operation	(1) Configuring Various Scenarios and Probe Assignment
	(2) Real Time Measurement Visualization
	(3) Collects All Probes' Data
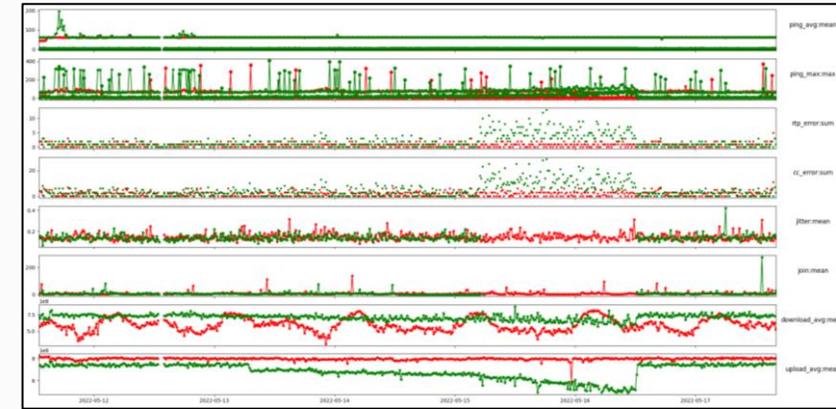
Collecting & Visualizing Measurement Data Continuously

or
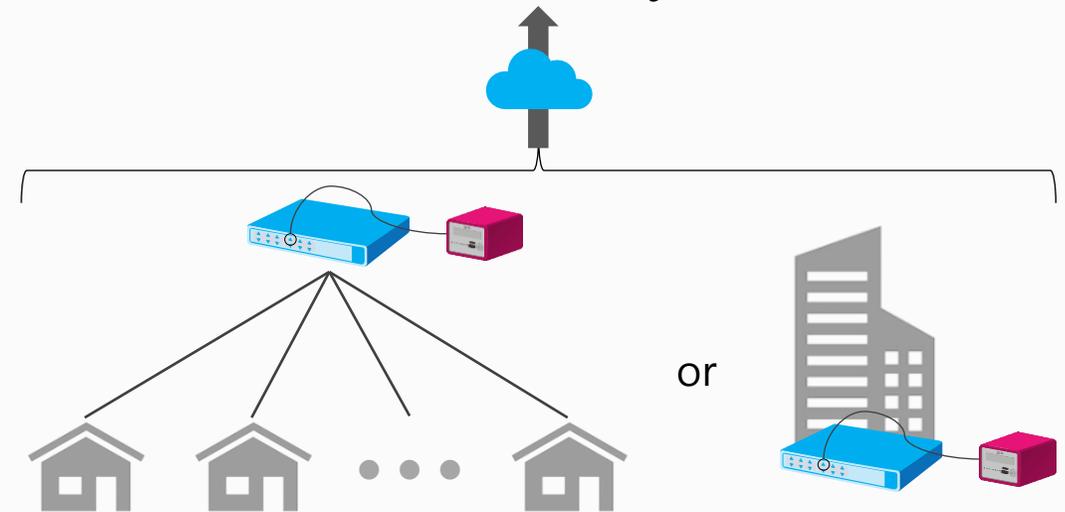
Probes are Temporarily Plugged-in to the Service Degraded ONTs

(7) Service SLA Measurement for Field Engineers

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Benefits

1 **Save Re-Visiting Cost**
Reduced Defective Work Rate Reduces Re-Visiting Cost

2 **Prevent Compliance Issue**
Servicing below the SLAs will lead to Compensation to the Subscriber and the Government Penalty

Features

SLA Measurement	(1) Internet Speed Measurement : UP/DN, Ping/Loss
	(2) MPEG2-TS : MDI, ETSI TR 101 290, Bandwidth
	(3) STB's VoD Streaming Bandwidth
Network Tools	(1) Ping, Traceroute to Appointed Targets
	(2) Querying DHCP Information
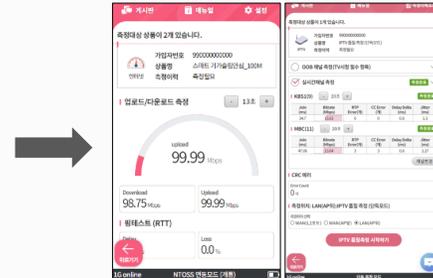
Cable Plug-in → **1-Click Measurement** → Verify SLA Satisfaction → **Service Opening/Fixing Complete**

(8) Embedded Service Monitoring Agent

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Software-based 24/7 Endpoint Monitoring is Possible with NEXTLab's Embedded Software Agents

Use Cases

(1) **Service Status Monitoring by Regions or Sites**

(2) **Service Failure Cause Analysis**
(e.g., Whether the ethernet cable is causing the failure)

(3) **Analyzing Service Impact caused by OTT streaming**

(4) **STB S/W Improvement**
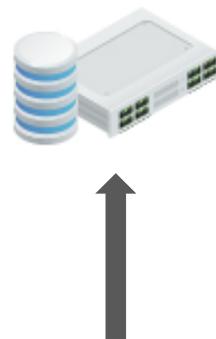
(1) **Compatible with Linux**

(2) **Monitoring Criteria**
- Internet Speed, Ping, TWAMP
- CRC
- <u>**OTT Streaming Traffic Detection**</u>

[Access Point, Router]
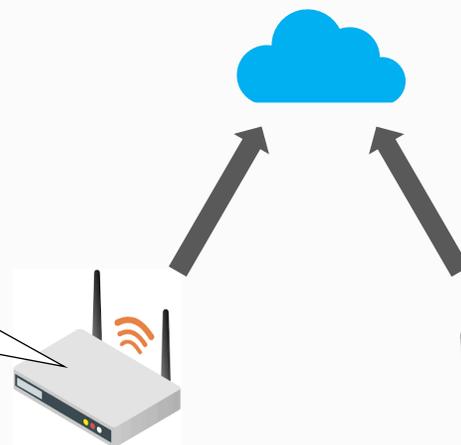
(1) **Compatible with Linux, Android STBs**

(2) **Monitoring Criteria**
- RTP Error, MDI
- Internet Speed, Ping, TWAMP
- CRC

(3) <u>**Collects & Sends STB Logs**</u>

[Set-Top Box]

NEXTLab

Innovation with NEXTLab

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"The All-in-One PayTV Service Tester"

1 **Target Customers**
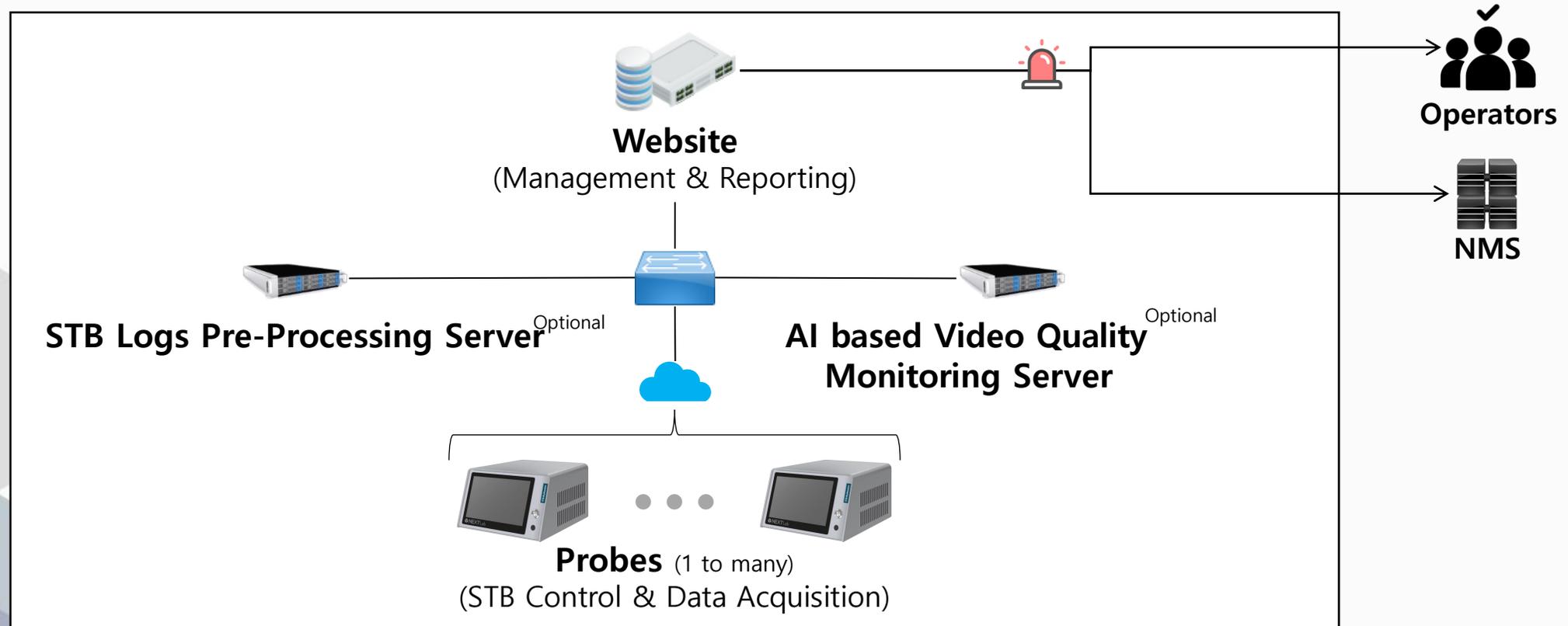PayTV service providers (i.e., IPTV, SatTV, CATV)

2 **Benefits**
- Automating the repeatability or precision required tasks
- Provides various STB control functions
- Supports Root Cause Analysis
  - ✓ Collects STB's output video and logs altogether
  - ✓ Simultaneous network packet analysis

3 **Key Features**
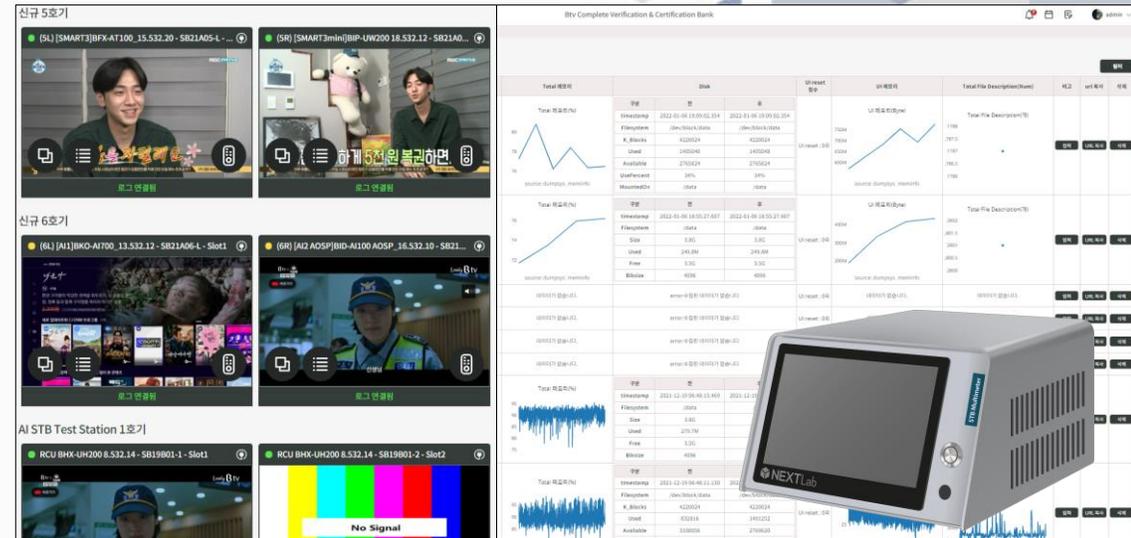
Test Automation	Video-based Service QoE Measure	Audio-Video Monitoring
• Scenario Test • Monkey, Aging Test	• Channel Change Time • Booting Time (Cold, Warm) • UI Reaction Time • UI Object Movement Jerkness	• AI-based Macro Block Detection • Freeze, Black Screen • Loudness • Mute

Scenario Test — **Aging Test** — **Monkey Test**

← Stereotype   Randomness →

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Website
(Management & Reporting)

STB Logs Pre-Processing Server^{Optional}

AI based Video Quality Monitoring Server^{Optional}

Probes (1 to many)
(STB Control & Data Acquisition)

Operators

NMS

Variety of Ways to Control STB

UI Control

- IR, Bluetooth
- Shell/Adb Command

I/O Control

- LAN/WAN Physical Connection
- Supply Power

Network Control

- Bandwidth, Delay Modulation
- Specific Port/IP Blocking

Rich Back-Data Acquisition

Video & Audio

- Via HDMI Capturing
- Up to 60FPS @ 1080p

STB Log

- Via Shell/Adb
- Top, dumpsys, Logcat, Tombstone

Network Packet

- Via PCAP
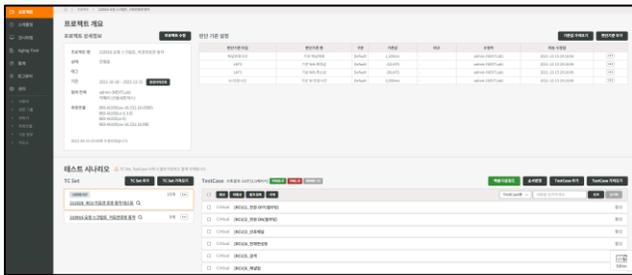
Project Unit-based Management
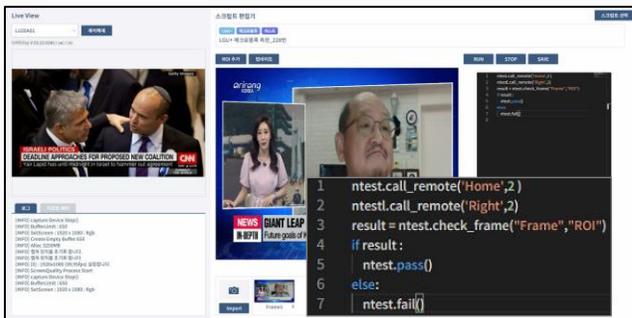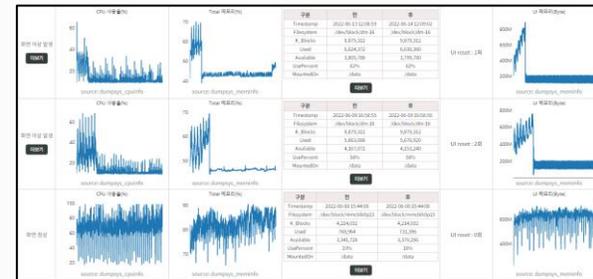
Script-based Scenario Making Tool

Drag & Drop based Probe Scheduling

Execution Status Querying & Manual Control

Trending Summary

Business Intelligence Reporting

In-depth Results Visualization

Preparation

Execution

Results Querying

Website – Demo Video

"Handheld Device for Broadband, PayTV Installation & Maintenance"

1 Target Customers
Internet service providers (ISPs / CSPs)

2 Key Features
- Helps ISPs to save cost
- Help field engineers to clear onsite issues
- Probes are adaptable to various solutions
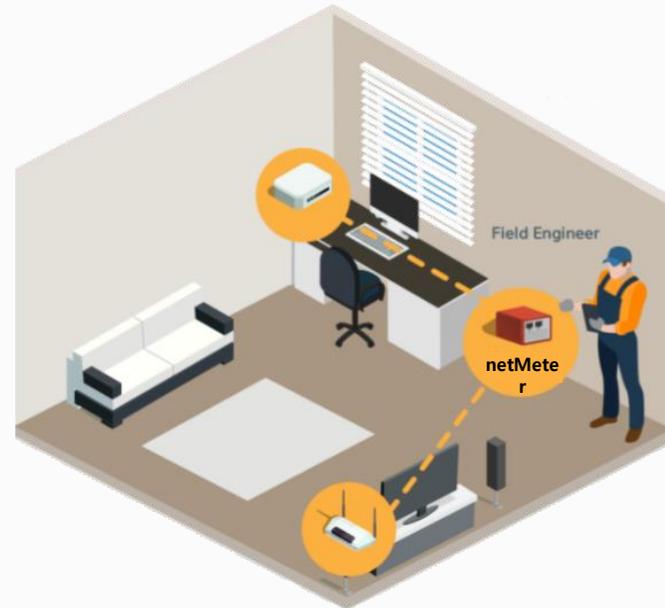
3 Benefits
Proven by LGU+

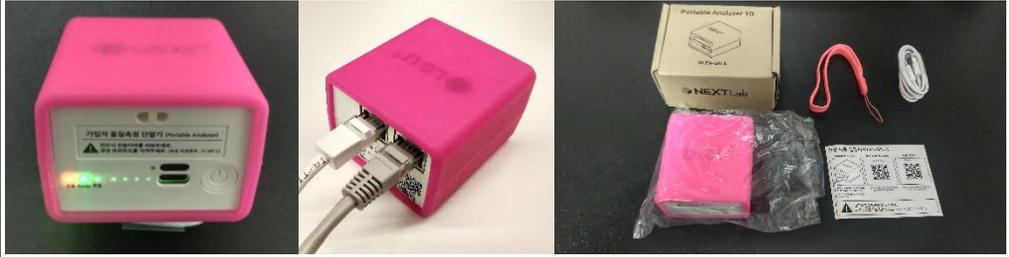**(1) Save Re-visiting Cost**   **(2) Save Unnecessary Replacing Cost**   **(3) Great Integrability**

USD 1.2M / year

50% ↓ of revisiting
due to defective work

netMeter provides "Data-Driven Decision Making" for replacing

netMeter solution is open to integrate with Customer's Business Lifecycle

	Essential 1G	Essential 10G
Hardware Specs.	(1) Size : W61mm X H42mm X D66mm (2) Interface : 2 X 1Gbps RJ-45 (3) Battery : 3.7V 2,500mAh Li-Po (4) Charging Spec. : 5Vdc Fast Charging (Type-C) (5) Incl. IR Transmitter	(1) Size : W191mm X H53mm X D124mm (2) Interface : 1 X 10Gbps RJ-45 + 1 X 1Gbps RJ-45 (3) Battery : 11.1V 3,300mAh Li-Ion (4) Charging Spec. : USB-PD 3.0 (Type-C) **(5) Incl. IR Transmitter**

(1) Measurement Functions

(1) MPEG2TS Stream Monitoring	(2) Internet Quality Monitoring	(3) OTT & Other QoE Monitoring (10G Only)
- Upto 30 channels concurrent monitoring - RTP Error, ETSI TR 101 290, MDI	- Internet Speed Testing - TWAMP, Ping, Traceroute - CDP/LLDP - Link Speed, Network Discovery	- OTT : Playback Delay, Buffering Times, Resolution Changes - Websurfing : Initial Loading Delay, Loading Complete Delay

Software Specs.

(2) Others - OTA F/W Updating
- Disabling Stolen, Lost Device
- Restriction on use outside the designated IP band

Certifications & Others

(1) Certifications
- KC, EMC
- Environmental Test (1.5m Drop, -20~60℃, Low Frequency Vibration)
(2) Subscribed Product Liability Insurance

(1) Certifications
- KC, EMC
- Environmental Test (0.35J Impact, -20~60℃, Low Frequency Vibration)
(2) Subscribed Product Liability Insurance