

Service Quality Assurance for Digital Media Services

iTVSense Probe Technologies

NETvisor





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SERVICE QUALITY ASSURANCE FOR DIGITAL TV AND MULTI-PLAY SERVICE PROVIDERS

iTVSense MiniProbes and RackProbes are compact and feature-full devices for monitoring and diagnosing IP and digital media transmission networks, including IP transport over L3 or MPLS networks, Internet / Intranet traffic and services, IPTV/ DVB/OTT streams or SIP/VoIP communication.

The various models of the iTVSense Probe product line share a unified and proven architecture, with distinct advantages: the MiniProbes (right) combine this versatility with small size, portability, ruggedness and low power requirements, while the powerful RackProbes (below) offer 1 or 5 Gbps analysis for network hubs and datacenters – depending on the model.

Benefits

With a wide variety of measurement capacity of RackProbes and MiniProbes are versatile measurement devices for multiple application scenarios, e.g.

- In network hubs and aggregation points, i.e. on switch/router ports for active testing or passive monitoring of backbone and aggregation routing, switching and auxiliary services like DNS, DHCP, etc.
- In data centers, monitoring the availability, performance and resource status of servers (Web, Mail, DB etc.) and services.
- On network access devices (xDSL, GPON, Cable), analyzing access concentration operation and performance.
- iTVSense Probes support all testing and monitoring functions in a single device, offering exceptional versatility and favorable price/performance.

- RackProbes are capable to provide a combination of most tests with SFP+ interface
- The MiniProbes, with their small size, robust construction and friendly price tag are also an excellent portable tools for field technicians or for temporary, on-demand deployments at customer premises, like for 72-hour service qualification or diagnosis sessions.



Figure 1: MiniProbe



Figure 2: Rackprobe

Architecture

iTVSense probes are based on an innovative architecture, where measurements of different types are processed through a unified workflow of data acquisition, analysis, storage, presentation and export. This not only results in high performance and resource efficient processing for the standard measurement technologies, but also supports custom extensions on specific customer needs.

- Probing modules are responsible for executing active measurements and collecting measurement data. Technologies supported through probing modules are described later
- The Measurement analysis module is responsible for the initial analysis and basic conversion of results from various technologies. Active measurements – like IPTV/OTT/HTTP transactions, other digital media-related monitoring are also scheduled through this module.
- The Measurement Data Store provides high performance, compressing storage for measurements and alarms. Data is saved in the probe's persistent memory and can be accessed over the SNMP or a HTTP/XML data access interface by NETvisor's iTVSense/PVSR or by 3rd party collection systems.
- Profiles and Alarms Processor validates incoming metrics against user-defined alarm criteria and records alarms if those are violated.
- The Web UI is the primary interface to control measurements and access to results on the probes operating in standalone mode (see section Operation modes / Standalone mode)
- iTVSense Connectivity makes it possible to operate multiple probes from an iTVSense Server (see section Operation modes / 'Centralized Operation')

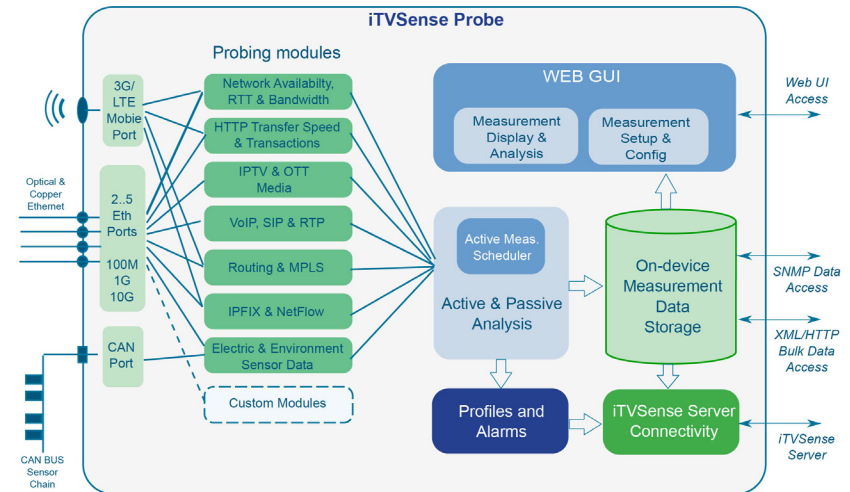


Figure 3: Architecture and functional blocks of iTVSense RackProbes and MiniProbes

SERVICE QUALITY ASSURANCE FOR DIGITAL MEDIA SERVICES

Operation modes

ITVSense probes may be operated in stand-alone mode (controlled from the Web GUI), or under the central control of an ITVSense server.

STANDALONE MODE AND WEB GUI

Probes in stand-alone mode are operated using the MiniProbe Web GUI, a sophisticated, dynamic and bandwidth-economic web application with the following main functions:

- Probe status overview: identification, system and network status, probe alarms, and measurements overview.
- Detailed measurement charts with
 - Selectable measurements and metrics
 - Selectable time resolution (1 secs - 4 hours)
 - Interactive zoom functions
 - Related alarms indicated on measurement charts.

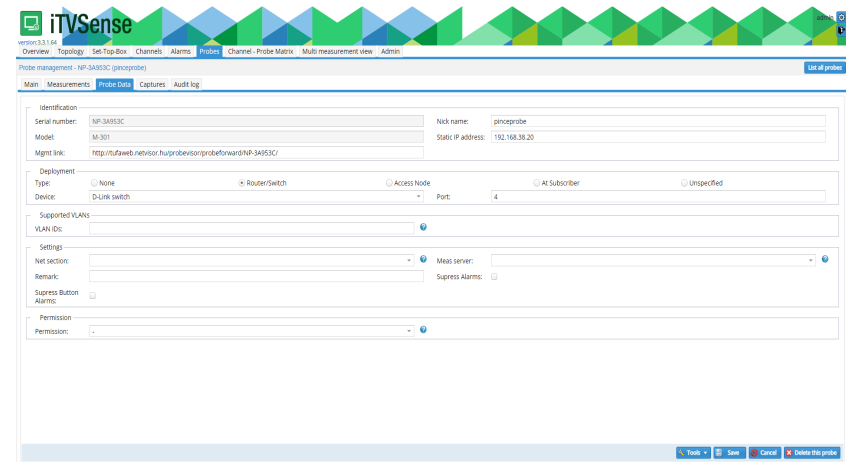
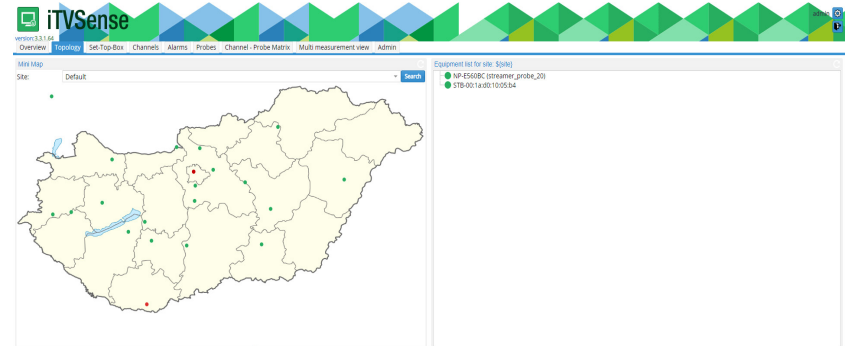


Figure 5: Probes managed by the ITVSense server

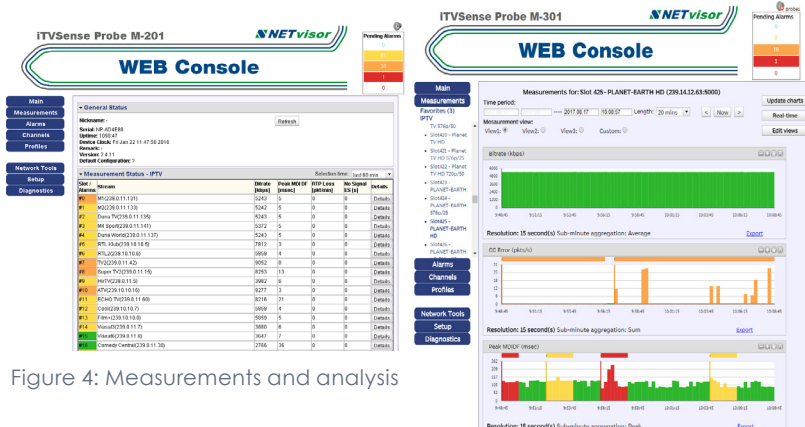


Figure 4: Measurements and analysis

Operation modes

- Setup screens for
 - Boot and network settings, including tunneling interfaces to make probe accessible from external networks.
 - Measurement settings
 - Alarm thresholds defined through profiles.
- Additional Network and Diagnostic tools like
 - Selective or generic mode packet capture: captured data can be uploaded to a different host in tcpdump format for further analysis. Selective captures only include single channels or directions, while generic mode includes all network data, with custom filter definitions supported.
 - DNS, NTP, Ping, HTTP, FTP availability tests

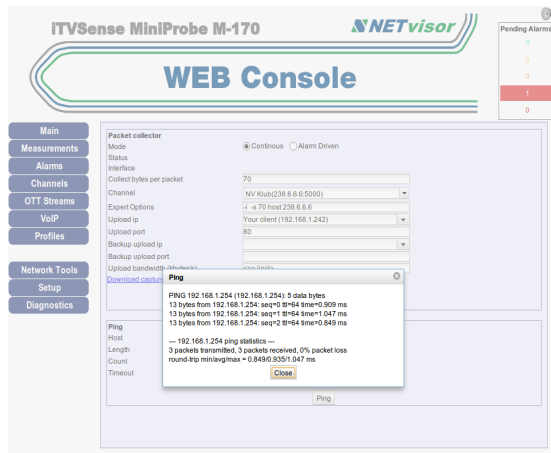


Figure 6: Diagnostic tools

CENTRALIZED OPERATION

Operated under central control, the probe communicates with the iTVSense/PVSR server environment for:

- Downloading measurement configuration from a central repository.
- Serving the iTVSense performance monitoring server with periodic minute-resolution measurement readings.
- Propagating locally evaluated alarms to higher-level services for further processing
- Serving the iTVSense GUI charts with sub-minute resolution measurement results for on-demand queries.
- Uploading network data, captured by the probe to the iTVSense server.
- In addition to configuration data, centralized operation also allows probe firmware to be downloaded from the central iTVSense system, offering fully automated upgrade management for all probes from a single central location.

In order to enable centralized operation and control in different deployments, probes support several options to provide firewall-transparent access from the management server.

Technology Specific Features and Usage

iTVSENSE PROBES USED FOR IPTV AND OTT MONITORING

In IPTV and OTT service environments, iTV Sense Probes provide the following main monitoring features:

- Measurement of up to 50 IPTV channels or VoD streams (SD, HD or mixed SD/HD channels) simultaneously
- Seconds-resolution metrics and minute-based aggregates of standard and custom metrics:
 - average and maximum bitrate,
 - packet loss, burst packet loss
 - RFC 4445 MDI DF (delay factor), and MLR (media loss rate, a.k.a. „CC error“),
 - PCR jitters and errors
 - RTP errors (loss, duplicates and out-of-order packets),
 - no signal conditions
 - IGMP / RTSP response time to first packet and to first iFrame, including monitoring of fast channel change (FCC) transactions
 - Elementary Streams presence and bandwidth
 - Monitoring of FEC and BEC effectiveness
- Measurements on external/unrelated multicast and unicast bandwidth
- Past measurement results stored in non-volatile memory; 60 seconds resolution data stored for up to 168 hours and seconds-level data stored for up to 24 hours.
- Alarm definitions based on measured values. In addition to being displayed on the probe Web GUI, alarms may trigger
- syslog/SNMP alerts sent to external devices

- automatic data capture enabled for the alarm period

Miniprobes also support the measurement of access to **live or pre-recorded OTT content**, like HLS adaptive streaming formats.

iTVSENSE MINIPROBES USED FOR VOIP AND RTP TRANSMISSIONS

VoIP measurement functions include

- SIP-based VoIP call initiation and termination over different transport protocols.
- Generated, or user-defined content transmitted
- Measurement of success rate, and call quality
- Measurements provide objective, QoS metrics (RTT, loss, jitter, data and encoding errors, etc.) and subjective, QoE or Mean Opinion based scores (MOS)

iTVSENSE PROBES USED FOR INTERNET SERVICES

- Internet access measurements: availability, utilization, average/maximum RTT
- Basic internet service availability tests for DHCP, DNS, NTP, etc.
- Scheduled, periodic download/upload rate tests for selected servers
- Website and online service availability tests, including replays of simulated or recorded multi-step HTTP/HTTPs transactions (like online shopping sessions including catalog, registration/login/logout shopping cart, ordering, payment, etc.) – with PVSR module

Specifications

SUPPORTED STANDARDS AND RFC

- Network UDP stream packet rate, byte rate, packet loss rate and several jitter metrics
- MPEG Transport Stream packet rates, jitter, packet loss, counter and encapsulation errors. Metrics are provided both as an aggregate and also by individual Mpeg streams (video, audio, control).
- RFC 4445 Media Delivery Index (MDI).
- Multicast join times and zapping time.
- Encoder alarm events
- IPTV server operation, network traffic and stream processing (via SNMP)
- VCAS Server network traffic and stream processing (via SNMP)
- Middleware and VoD service operation, resources and response time, server/OS/Database health.
- DHCP and Boot Image server availability and events
- STB CPU load, memory used and available, network traffic, process count, reboot events and uptimes, process monitoring, STB agent footprint

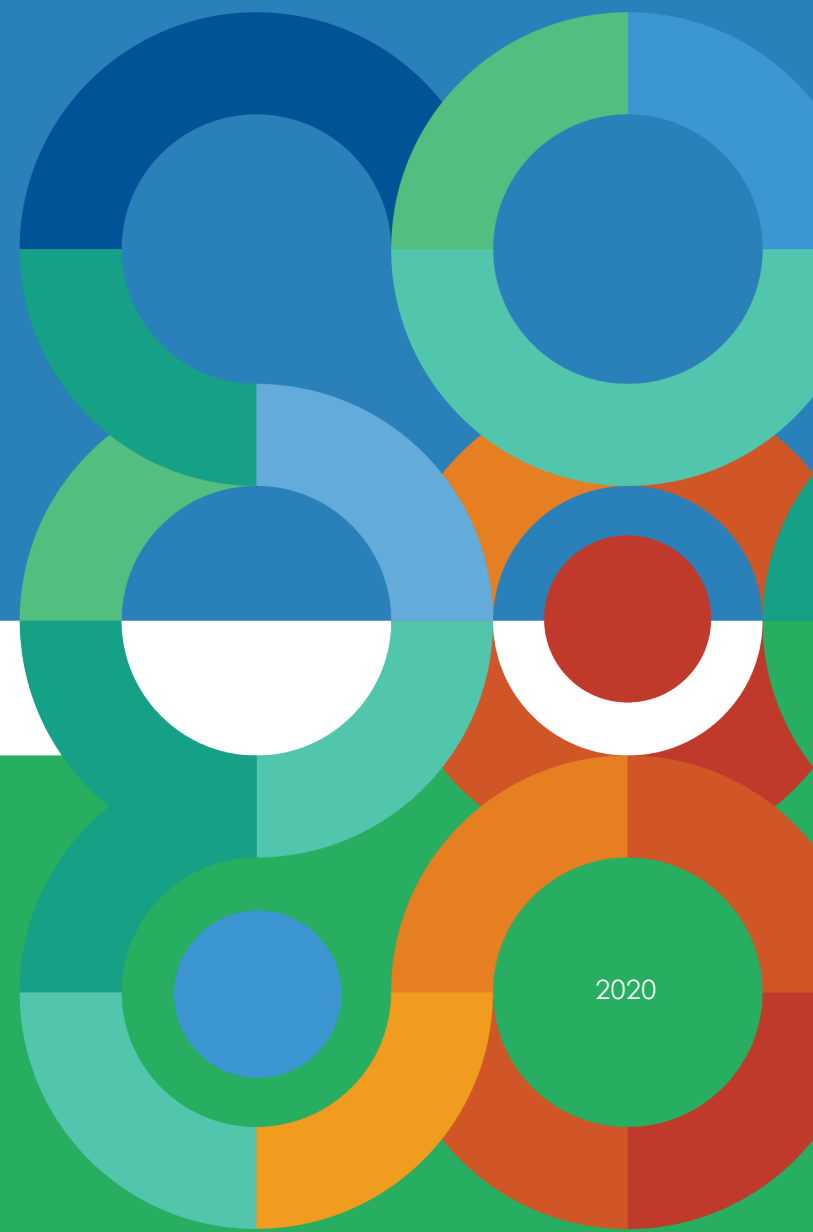
PROBE MODELS AND OPTIONS

Type	No. of channels supported [#]	Appr. stream bandwidth [Mbps]
M-196	100	900
M-201	200	900
M-301	1000	5000

Table 1 - IPTV measurement capabilities grouped by probe types



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