IPTV Quality Monitoring and Testing Products

IPTV Qos/QoE

Content
Head-End
Transcoding
Server Content Analysis

Transport
Multicast
Unicast / VoD
OTT
Key Reasons to Invest in IPTV Monitoring

- IP transmission is a subject of traffic congestions, packet losses, variable delay which cause in turn real distortions to digital video signal. Error propagation in a video is worse than in audio and much worse than in data.

- IPTV is a complex technology combining many layers of information, protocols and equipment. Interaction of these components can cause problems during installation but also during normal operation.

- Encoding issues on live and prerecorded video may cause problems at the head-end affecting all subscribers. Checking programming video quality before encryption at the head-end detects problems at the source.

- Customer equipment issues are frequently a major cause of poor service or total failure. Detecting these problems before the customer does is a hallmark of service quality. Therefore the EOC Diagnostics are highly recommended for each EOC device.

- Customer churn is what we want to prevent. We can do it if the IPTV audio/video issue is detected before the customer does and the problem isolated and removed before it gets out of hand.

- Finally, efficiency of locating and troubleshooting IPTV problems saves time and money. When combined with churning prevention the system will save enough to pay for itself in 1-2 years.

Enterprise Key Performance Indicators

Based on long term history of Key Performance Indicators collected from the head-end, core and access network and customer sites, the NET-xTVMS can provide historic QoE/QoS trends per region or per programming.
## IPTV Quality Monitoring and Testing Products

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Operator Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cable TV</td>
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<tr>
<td>NET-XTVMS System</td>
<td>✓</td>
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<tr>
<td>NET-EVSR Enterprise Server</td>
<td>✓</td>
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<tr>
<td>NET-NMSC Client R/W</td>
<td>✓</td>
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<tr>
<td>NET-NMSC Client R</td>
<td>✓</td>
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<tr>
<td>NET-200 Probe</td>
<td>✓</td>
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<tr>
<td>NET-200B Probe</td>
<td>✓</td>
</tr>
<tr>
<td>NET-EXP Probe</td>
<td>✓</td>
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<tr>
<td>NET-OTT-X Probe*</td>
<td>✓</td>
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<tr>
<td>DVB-C Option (QAM A/B/C)</td>
<td>✓</td>
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<tr>
<td>DVB-S/S2 Option</td>
<td>✓</td>
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<tr>
<td>DVB-T/T2 Option</td>
<td>✓</td>
</tr>
<tr>
<td>NET-mini Probe</td>
<td>✓</td>
</tr>
<tr>
<td>NET-EVSR-EXP-X Server/Probe</td>
<td>✓</td>
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<tr>
<td>NET-MOZAIC-X Probe*</td>
<td>✓</td>
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<tr>
<td>NetProbe 2000 IPTV-X*</td>
<td>✓</td>
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</tbody>
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### Stand Alone Systems

<table>
<thead>
<tr>
<th>Product</th>
<th>Operator Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q Probe</td>
<td>✓</td>
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<tr>
<td>H Probe</td>
<td>✓</td>
</tr>
<tr>
<td>M Probe</td>
<td>✓</td>
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<tr>
<td>NET-OTT Probe</td>
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<tr>
<td>NET-MOZAIC Probe</td>
<td>✓</td>
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<tr>
<td>NET-EVSR-EXP Server/Probe</td>
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<tr>
<td>NET-MetriXs Software Only Solution</td>
<td>✓</td>
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<tr>
<td>NetProbe 2000 IPTV</td>
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*More Info on each out products below and on out website www.netrsr.com*

*All Products with an X appended to the end of the name come as a stand alone product as well. With the X they are integrated into the Net-xTVMS System as a whole.*
NET-ESVR Enterprise Server

The Enterprise Server NET-ESVR is a hub of the system. Its central role is to receive every 5 seconds the alarm status of each probe NET-XXX and to store the status and update system alarm matrix. It also provides communication with the multiple Clients NET-NMSC.

NET-NMSC

The NET-NMSC Client is a MS Windows application that communicates with the NET-ESVR remotely and in any place with Internet access. Multiple users can access the NET-xTVMS system at the same time. The Client is the main and only interface to the system. It provides real-time status information from the server such as:

- Alarm matrix view of all channels at all locations
- Geographical view of Map with aggregate alarm status
- Alarm log, current and historical with view filters.
- Details of the chosen NET-XXX probe metrics, both current and historical
- QAM metrics for the selected frequency of DVB-C carrier (cable TV only)
NET-200 Probe

- Monitors 24/7 simultaneously up to 1.5 Gbps of bandwidth for SD and/or HD channels in MPEG-2 TS format in real time.
- Actively connects to all these channels at the edge router and/or edge QAM locations
- Supports MPEG2-TS from IPTV. Has optional DVB-C and PAL sources
- Supports UDP or UDP/RTP encapsulation
- Monitors quality of service of IPTV transport and optionally DVB-C QAM transport
- Captures and stores over 30 transport metrics including TR101290 priority 1 & 2, packet loss rate and PCR jitter, and more...
- Provides real time and historical data on the metrics and alarms via Net-ESVR and NET-NMSC Clients
- All metrics have user defined alarm thresholds
- Sends alarms with 5 second resolution to the NET-ESVR alarm matrix and alarm MAP
- Fail safe auto restart in case of power outage
- Uses 1 or 2 Gigabit Ethernet ports

NET-200B Probe

The Net-200B Probe is a scaled down more economical version with less features to be able to fit your budget. The Net-200B is a 1U Chassis only unit and does not support DVB-C or PAL Sources. The available metrics for this product have been slimmed down to just the basics.

NET-EXP (Expandable) Probe

The NET-EXP Probe is an expandable probe that can be purchased with an initial amount of bandwidth of as little as 0.5 Gbps and expanded up to 5 Gbps by merely additional software license. The customer can purchase his own server class computer on Net Research’s recommendation and upgrade the computer class once the hardware bandwidth is exceeded.

48VDC power NET-200 and NET-EXP available
Key alarms reported
Stream Presence
Packet loss:
- Number of Packets Lost
- Number of Packets Discarded
- Number of Packets Out Of Sequence
- Number of Packets Duplicated
- Packet Loss Ratio in %
TR 101290 PARAMETERS
Priority 1:
- TS Sync Loss
- Sync Byte Error Count
- PAT Error Count
- PAT2 Error Count
- Continuity Error Count
- PMT Error Count
- PMT2 Error Count
- PID Error Count
Priority 2:
- Transport Error Count
- CRC Error Count
- PCR Error Count
- PCR Repetition Error Count
- PCR Discontinuity Error Count
- PCR Accuracy Error Count
- PTS Error Count
- CAT Error Count
- Video Stream Resolution Changed
Metrics and Alarms Resolution:
5 seconds
Optional DVB-C Interface:
- Dual demodulators
- QAM 256 constellation diagram

Net-OTT Probe X
Monitors HLS streams for:
- Saving manifest files
- Analyze of manifest files
- Available profiles
- Chunks list
- HTTP status errors
- Manifests errors
- Chunk download bitrate
- 24 hours chart with 10min resolution for each stream profile, that presents number of chunks errors
- Saving errors for chunks downloads that return code is differed than 200
- Connect to the HLS streams actively or passively
- Reports to the Net-EVSR server

RF Signal Level dBmV
- MER 0-40 dB
- BER counter
- Frequency of the carrier in Mhz

Metrics calculated:
- Video Bit Rate in kbps
- Audio Bit Rate in kbps
- TR 101290 Priority 1 Errors (8)
- TR 101290 Priority 2 Errors (8)
- Packet Lost ratio in %
- Packets Discarded
- Packets Out of Sequence
- Packets Received
- Packets Duplicated
- Video PIDs
- Audio PIDs
- Jitter
- Video Codec
- Audio Codec
- Encapsulation Protocol
- Video Stream Resolution
- Total Bandwidth Usage
- MOS Score
- Type of Service
- Time to Live

Computer Equipment Requirements:
- Linux OS
- RAM - 8 Gbytes
- Hard Drive - 512 Gbyte
- USB ports - 4
- RGB Graphics Interface - 1
- Enclosure - server class 19”
- Operating Temperature - 0 to+40 ° C (relative Humidity 90%)

NET-Mini Probe
- Intended for low bandwidth 100-200 mbps application where cost is the main factor.
- Small size and low power consumption
- Applies the same transport metrics and connects to the Net-EVSR as the Net-200 probe

NET-200 and EXP – Technical Specification
The Net-Mozaic-X Probe can be used as a stand alone product or an integral part of our NET-xTVMS system. The Net-Mozaic-X is normally located at the Head End with access to unencrypted TV channels. Customers define groups of 16 channels at the time. They are then decoded and analyzed for picture quality. Hundreds of channels can be analyzed this way on the round robbin.

### Features
- Simultaneous full motion preview and image analysis of up to 16 SD and/or HD channels
- Round-robbin for hundreds of channels
- Integrated with Net-xTVMS system for centralized control/access
- Supports MPEG-2 and H.264/AVC
- Supports audio codecs AC-3, MPEG-1 Level 2, MPEG-2 AAC, MPEG-4 AAC
- Supports UDP or UDP/RTP encapsulation
- All metrics have user defined alarm thresholds

### Video quality metrics

**How Non-reference objective metrics really works?**

Objective metrics are results of subjective experiments conducting with people, who answer questions how they like presented video. Original and degraded(video with artificial introduced artifacts) video is presented to people. Researchers can collect answers to create statistical model It can be first step to implement metric calculations algorithm. What is most important added value of Non-reference objective metric Objective metrics allow to evaluate video quality without people assessment, nor reference video.

### Content quality monitoring

Continuous monitoring of content providers image and audio quality, like video degradation & artifacts. With this knowledge, operator can faster identified and address problem for savings resources and decrease customers churn

### Service availability monitoring

Operator can handle lack of video audio streams : black screen or mute in received streams. High availability of services can encourage new customers to come
Primary Video Quality Metrics Pack

Black Screen
It shows as disappearing of picture – black screen. Appears, when all packets of data are lost or as a result of incorrect video recording.

Static Image / Freezing
Stilted and jerky motion — often found on occasions of high motion within IPTV streams— is seen as time-discrete ‘snapshots’ of the original continuous scene strung together as a disjointed sequence.

No Video (No Valid PID Number)
Missing valid Video PID will cause loss of stream and will trigger an alarm.

No Audio (No Valid PID Number)
Missing valid Audio PID will cause loss of stream and will trigger an alarm.

Audio Clipping
The original audio signal may be clipped in some special situation during the recording due to the impact of environmental noise or recording equipment. The maximum amplitude of the clipped signal is often limited to a constant. This clipping distortion will lead to a harsh noise. It will affect the subjective listening quality seriously if the clipping intensity is strong or the clipping density is large.

Audio Silence
Signal losses are one of the most common degradations in audio streaming at low bit rate. The end-user perceives a silence followed by abrupt clipping. Cell loss in the packet networks, restitution strategy or audio recording error could be the origin of this perceived temporal audio discontinuity.

Extended Video Quality Metrics Pack

Flickering (Jerkiness)
Flickering is one of the most annoying temporal artifacts in predictive video coding. As it is widely known, modern algorithms encode video as a sequence of images. The first frame from this sequence is a key frame (I), others are additional (previous[P] and subsequent [B]) frames. All sequences are encoded by motion-compensated algorithms. When an observer watches the decoded video, the flickering effect is noticeable due to the difference between key frames (I) and other frames (P, B).

Blockiness (Pixelization)
This effect is caused by all blockbased coding techniques. It is a well-known fact that all compression techniques divide image into small blocks and then compress them separately.

Block loss
Block loss occurs when some of the data packets that form the video signal are lost during some stage of the transmission. The result of that loss is that one or more false black blocks are included in the frame instead of the original (lost) ones.

Blurring (Poor Contrast)
Blurring shows as reduced sharpness of edges and spatial detail. It’s the result of the loss of high frequency information during the coding.

Brightness
Exposure time distortions are visible as imbalance in the brightness (too dark or bright frames).

Noise
Noisiness is known as unnatural smoothness or irregular pixel colors values in distinct parts of video frame.
Net-MetriXs analyzer probe is a software-based application an integral part of the NET-xTVMS system, the real-time monitoring system of IPTV services. Intended for installation on customer appliance (CPU, PC, server, etc.) at the customer selected site (example: headend), Net-MetriXs can be optioned with monitoring of DVB-C/S/T/H, analog PALsed IPTV probe is highly expandable to monitor actively from very few to several hundred multicast streams.

Features

- Monitors 24/7 simultaneously up to 3 Gbps of bandwidth filled with SD and/or HD streams in MPEG-2 TS format in real time.
- Actively connects to all these channels at the selected location with up to 12 Ethernet ports
- Supports MPEG2-TS from IPTV and UDP or UDP/RTP encapsulation
- Monitors quality of service of MPEG-TS IPTV transport
- Monitors quality of the physical and transport layers of optional DVB-C/DVB-T/DVB-S/DVB-H/Analog PAL interfaces if equipped with the corresponding PCI-E cards
- Monitors quality of delivery of OTT streams
- Captures and stores over 30 transport metrics including TR101290 priority 1 & 2, packet loss rate and PCR jitter, and more...
- Provides real time and historical data on the transport metrics and alarms via Net-ESVR and NET-NMSC Clients
- All metrics have user-defined alarm thresholds and presentation filters
- Sends alarms with 5 second resolution to the NET-ESVR alarm matrix and alarm MAP
Features

> Install the server in your existing rack or as a stand alone desktop system.

> 24/7 monitoring of up to 3.5 Gbps of combined bandwidth of SD and/or HD channels in MPEG-2 TS format in real time.

> Actively connects to all selected channels at the designated locations to performs MPEG2-TS deep packet inspection with TR 101290, jitter, packet loss and QoS performance analysis.

> Supports MPEG2-TS, UDP, UDP/RTP and OTT-HLS encapsulation.

> Decodes a group of up to 16 unencrypted MPEG-TS or OTT streams and checks for issues such as frozen screen, no video, no audio, audio clipping, black screen, blockiness, video blur, flickering, jerkiness. Further, channels are displayed in the Mozaic featuring a user selected group of 16 channels using round robin.

> Monitor and logs alarms from transport and image quality metrics analysis. Automatically notifies key personal via emails or text messages.

> Analysis of DVB-C with dual tuners and MPTS stream monitoring for transport quality.

> Monitoring of PAL, NTSC, DVB-T and ATSC of physical layer.

> OTT streaming analysis for transport quality.

> IPTV stream generator for multi stream simulation.

> Offered as a complete hardware/software appliance in 19” rack 1U or desktop enclosure.

> Available as software only for installations on customer server class PC.
The NetProbe 2000 IPTV is a hand held IPTV tester that can emulate set top box or passively monitor video channels in pass-thru mode. It can be used to turn up new service by auto scanning all channels and checking their quality or to troubleshoot the service. It is battery powered and easy to operate by tier one technician.

**NetProbe 2000 IPTV Technical Specs**

- **Interface:** 10/100-Base T
- **Encapsulation supported:** MPEG2-TS/UDP, MPEG2-TS/RTP/UDP
- **Modes of Connection:** Termination and monitor
- **Max # of streams tested:** up to 40 mbps total bandwidth (average 3 terminate or 3 monitor)
- **Test Results:** Save/export to USB
- **Channel List:** import/export from/to USB Autolog to NET-XTVMS when connected
- **STB Emulation:** IGMP Multicast join&leave, IGMPv.2, IGMPv.3, Quick Channel Scan (autotest)

**Stream Information:**
- Stream Presence
- Video Bit Rate kbps
- Audio Bit Rate kbps
- Video Codec
- Audio codec
- Encapsulation protocol
- Total Bandwidth usage
- SPTS tree with all PIDs

**Transport Metrics:**
- **TR101290 Priority 1**
  - TSYNC Loss
  - Sync Byte Error Count
  - PAT Error Count
  - PAT2 Error Count
  - Continuity Error Count
  - PMT Error Count
  - PNT2 Error Count
  - PID Error Count

- **TR101290 Priority 2**
  - Transport Error Count
  - CRC Error Count
  - PCR Error Count
  - PCR Repetition Error Count
  - PCR Discontinuity Error Count
  - PCR Accuracy Error Count
  - PTS Error Count

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