Agilent N2X

IPTV & IPTVv6 Quality of Experience (QoE) Test Solution

N5570A, N5572A, N5574A & E7877A

Technical Data Sheet

The Agilent N2X IPTV QoE solution is the most comprehensive and integrated solution to validate IPTV Quality of Experience under realistic and scalable Multiplay network conditions.

Agilent Technologies

Key Features

- **Dynamic subscriber simulation creating a real-world test environment**
- **Realistic Multiplay traffic generation such as time-sensitive voice and bursty data traffic**
- **Highly scalable per-subscriber MDI video quality metrics**
- **Emulation of thousands of subscribers and hundreds of channels per system to quickly identify performance thresholds**
- **Real line-rate video generation, capture and replay, at speeds up to 10Gb/s**
- **IPv4 and IPv6 support**
- **Supports 10/100M, 1G and 10G Ethernet at high port densities**

Product Overview

Agilent N2X is the industry's most comprehensive solution for testing the development and deployment of network services for converging network infrastructures. Service Providers, Network Equipment Manufacturers (NEMs), and component manufacturers can verify service attributes of entire networks end-to-end, while also isolating problems down to individual networking devices and subsystems.

Verifying that network equipment can meet Quality of Experience (QoE) expectations for thousands of subscribers is a significant challenge for Service Provider Labs and Network Equipment Manufacturers who are developing, verifying, evaluating, or deploying IPTV services.

The Agilent N2X IPTV Quality of Experience Test Solution is the industry's most comprehensive and integrated test solution for validating Internet Protocol Television (IPTV) service quality for thousands of dynamic subscribers, across hundreds of IPTV channels, under Multiplay video, voice, and data traffic conditions.

N2X uses the industry standard Media Delivery Index (MDI) to make scalable video quality measurements for thousands of subscribers, while simultaneously monitoring service quality for VoIP and data.

N2X realistically emulates the scale and complexity of real-world Multiplay networks within a single powerful test system, eliminating the need to test with a lab full of devices, and providing engineers with significant time and cost savings, and greater flexibility and control over subscriber and traffic parameters. All three Multiplay services (voice, video and data) can be simulated on a single N2X test port.

N2X can be used to completely surround a system under test with video sources and simulated Multiplay subscribers. It can also be used for one-sided tests where the instrument simulates subscribers connecting to a third-party video source. Finally, it can be used simply as a cost-efficient and highly scalable video source.

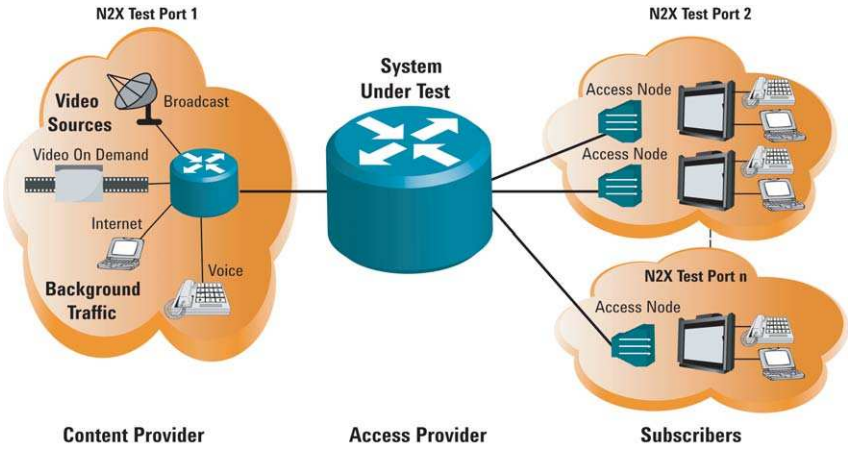

Figure 1: IPTV Network Infrastructure

Product Features

The N2X IPTV Quality of Experience Test Solution includes the N5570A IPTV Quality of Experience Productivity Application, the N5574A IPTV Quality of Experience Productivity Application for IPv6 and the complementary E7877A IPTV Video Traffic Generation and Analysis License that enables real video generation and MDI analysis. Additionally, the N5572A Microsoft TV Protocol Decodes provide diagnostic capabilities to debug MS IPTV/MediaRoom networks. The combined solution enables the following functionality.

Dynamic Subscriber/Protocol Emulation

- Emulate and scale multiple access protocols (PPPoX, DHCP, DHCPv6, IGMP, MLD, multiple VLAN configurations) over each test port to simulate thousands of real IPTV subscribers per system
- Define a unique channel zapping profile for each subscriber
- Emulate IGMPv2/v3 over Ethernet (with or without VLAN) and ATM (1483 Bridged/Routed, SNAP, VC-mux)
- Emulate IGMPv2/v3 over Ethernet (including support for VLANs and stacked VLANs) and ATM (1483 Bridged/Routed, SNAP, VC-mux)
- Emulate MLDv1/v2 over Ethernet (including support for VLANs and stacked VLANs)
- Validate IGMP Snooping and IGMP Proxy Reporting functionality

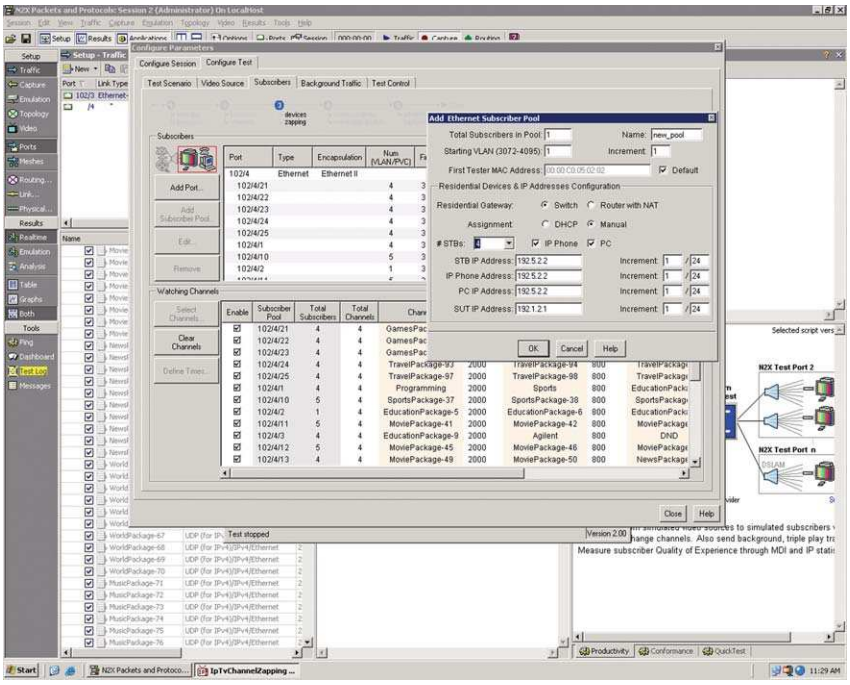

Figure 2: Dynamic Subscriber/Protocol Emulation

Multiplay Traffic Generation

- Generate video traffic (up 4 unique video clips) on up to 512 channels per GbE port
- Define traffic with different formats and encoding schemes: MPEG-2 SD/VOD, MPEG-4 AVC/H.264 SD/HD/VOD
- Generate and measure data and voice traffic to reflect Multiplay services. Stress the DUT and assess the impact of the services on each other
- Use software solution on many existing N2X GbE and 10 GbE cards (XR-2 and XS-2 models) at full line-rate
- Combine unicast (VoD) and multicast (IPTV) traffic in the same test

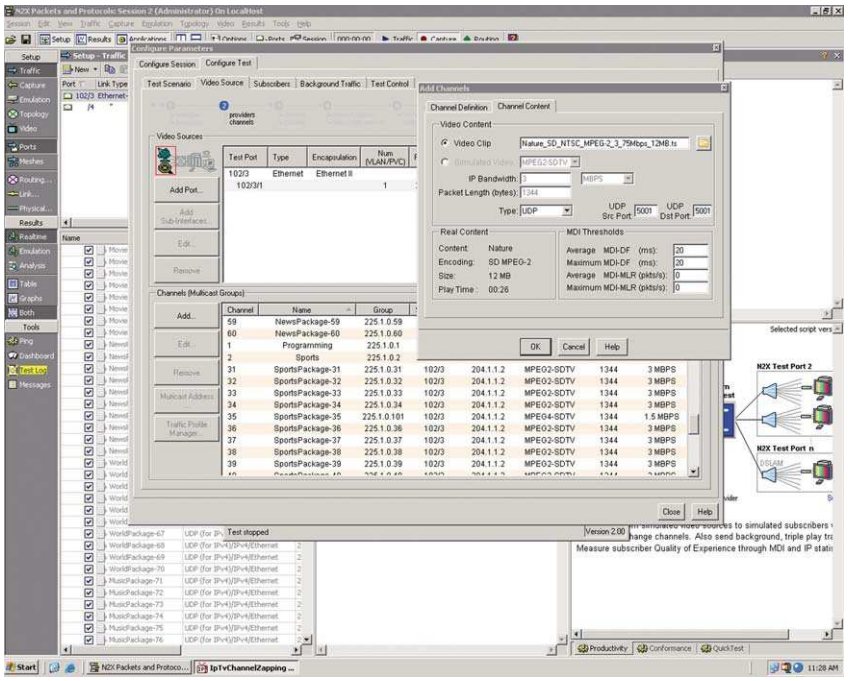

Figure 3: Multiplay Traffic Generation

Channel Zapping Measurements

- Simulate thousands of IPTV subscribers changing to the same channel or cycling through multiple channels in sequence
- Scale channel zapping activity to determine impact on video quality
- Measure channel zapping time on a per-subscriber or per-channel basis

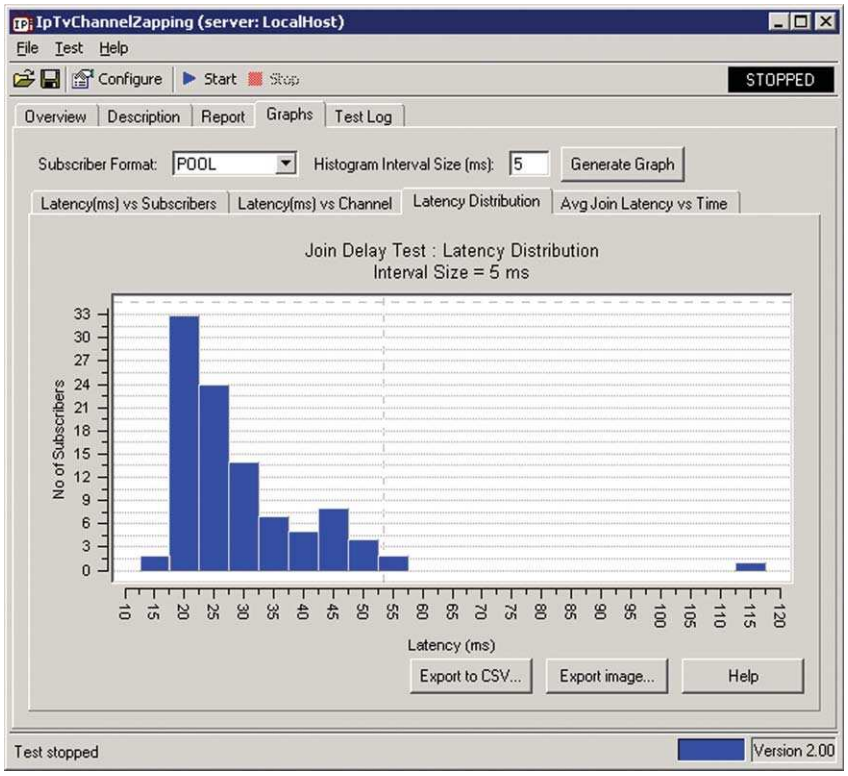

Figure 4: Channel Zapping Measurements

Scalable MDI Video Quality Metrics

- Real-time MDI (Media Delivery Index) delay factor (jitter) and media loss measurements
- Measure MDI on N2X-generated streams or on RTP streams from other sources, including live networks
- Measure MDI on Microsoft IPTV Edition 1.1 (RFC2250) traffic
- Measure MDI on various encapsulations including IPv4, IPv6, UDP/IP and RTP/UDP/IP
- Capture IPTV channels and playback on tester to visually examine quality
- Capture and analyze protocol decodes of Microsoft IPTV Edition 1.1 (RFC2250) traffic (requires additional N5572A license)
- Set MDI performance thresholds to detect channels with poor MDI values and replay video to visually examine quality
- Simultaneously monitor VoIP and high speed internet data quality

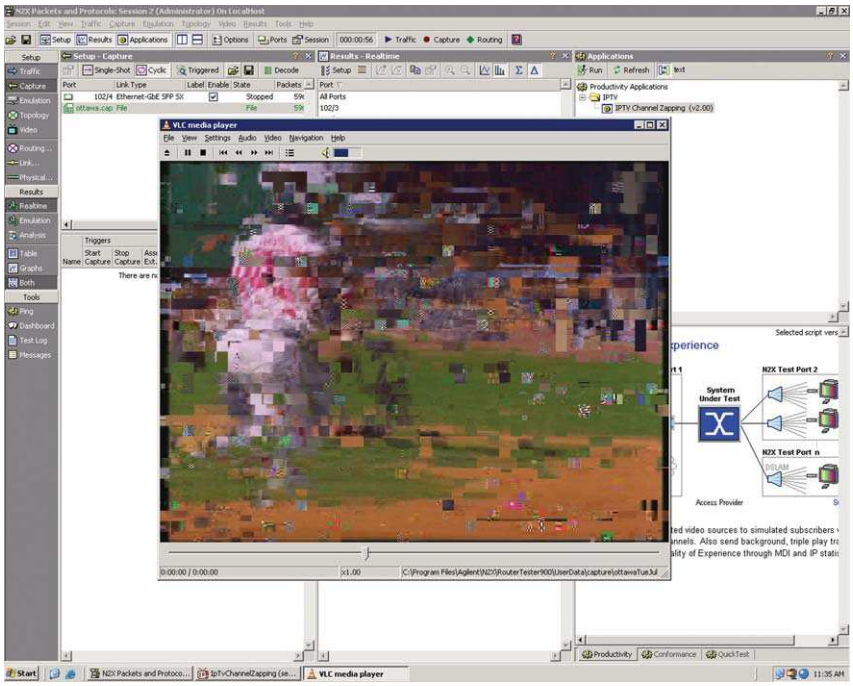

Figure 5: Capture and replay video with poor MDI metrics to visually examine quality

IPTV QoE Technical Specifications

Measurements

- Sampled MDI delay factor
- Minimum MDI delay factor
- Maximum MDI delay factor
- Average MDI delay factor
- Lost media packets
- Ordered media packets
- Received media packets
- Sampled MDI media loss rate
- Minimum MDI media loss rate
- Maximum MDI media loss rate
- Average MDI media loss rate
- Channel zapping latency vs. subscribers
- Channel zapping latency vs. channels
- Distribution of the number of subscribers vs. channel zapping latency

Encapsulations

- MPEG-2 TS/RTP/UDP/IPv4
- MPEG-2 TS/UDP/IPv4
- MPEG-2 TS/RTP/UDP/IPv6
- MPEG-2 TS/UDP/IPv6
- VLAN tagging (0, 1, or 2 tags)

Video clips

Video formats	MPEG-2 SD/VOD, MPEG-4 AVC/H.264 SD/HD/VOD
Standards	NTSC, PAL, 1080i60, 1080i50, 720p60, 720p50
Resolutions	720 x 480, 720 x 576, 1920 x 1080, 1080 x 720
Audio formats	MPEG layer 2 stereo, AC3

Voice Traffic

Audio codec's	G.711, G.726, G.728, G.729, G.723.1 (both 6.3 kbps and 5.3 kbps variants)
Encapsulations	RTP over UDP/IP

Data Traffic

Configurable parameters	• Datagram length (default: 40 octets) • Bandwidth per subscriber (default: 50 kbps) • Protocol (IP or TCP or UDP; default: TCP) • TCP/UDP destination port • IPv4 or IPv6 ToS or DiffServ (default: DiffServ with DSCP=0) • Ethernet 802.1p priority (default: 0)

Channel Zapping

It is important to measure the DUT's contribution to the zap time for each subscriber and each channel, not just the aggregate performance of the device. N2X provides IGMP/MLD join, IGMP/MLD leave, and IGMP/MLD leave to join delay (channel zapping) measurements for each simulated subscriber (IGMP/MLD host) and for each channel (multicast group) and presents those results in tabular and graphical formats.

Channel zapping scenarios	• IGMP/MLD Group Join Latency • IGMP/MLD Group Leave Latency • IGMP/MLD Channel Zapping (Leave-Join Latency) • Peak Load Channel Zapping Latency • Sustained Performance Channel Zapping Latency

Supported protocols

IGMPv2	RFC2236
IGMPv3	RFC3376
IGMP Snooping	RFC4541
MLDv1	RFC2710
MLDv2	RFC3810

As access networks migrate from ATM to Ethernet, it is critical to be able to test multicast network implementation using both technologies. The IPv4 channel zapping measurements using IGMP (but not video generation and analysis) support subscribers on both ATM (OC-3c/12c) and Ethernet (10/100 Gigabit and 10-Gibabit) interfaces. VLANs and stacked VLANs can also be used to separate subscriber traffic on the Ethernet access interfaces. Multicast traffic for IPv4 channel zapping can be sourced on any N2X interfaces, including Ethernet, POS and ATM, at rates up to 40Gb/s.

Channel zapping profiles

- Time between channel zaps (in msec)
- Set-top box latency (leave to join delay) (in msec)
- Channel viewing time (join to leave delay) (in msec)
- Channels to view
- Order to view (linear or random)

Scalability

Max # of channels per port	512
Max # of subscribers per port	2048 or 1024, depending on VLAN configuration
Max # of channels per subscriber	4

Configuration and Ordering Details

E7877A IPTV Traffic Generation and Analysis License

- Enables generation of real IPTV video traffic and MDI analysis on N2X (in Packets & Protocols Application)
- Supports both IPv4 and IPv6
- One license required per N2X controller, allows use on an unlimited number of chassis and ports

N5570A IPTV Quality of Experience Productivity Application

- Provides a wizard-like tool to configure IPTV subscribers and sources (servers), and measure Quality of Experience (QoE) parameters such as channel zapping time (via IGMPv2/v3) and MDI over IPv4 networks
- One license required per N2X controller, allows use on an unlimited number of chassis and ports

Note: Requires E7877A for MDI and real video generation

N5572A Microsoft ® TV Protocol Decodes

- Provides ability to analyze captured MSTV traffic according to Microsoft ® IPTV Edition 1.1 specifications
- One license required per N2X controller, allows use on an unlimited number of chassis and ports

Note: Only available to registered licensees of Microsoft ® TV from Microsoft ® Corporation.

N5574A IPTV Quality of Experience Productivity Application for IPv6

- Equivalent application to N5570A for IPv6 networks
- Provides a wizard-like tool to configure IPTV subscribers and sources (servers), and measure Quality of Experience parameters such as channel zapping time via MLDv1/v2 and MDI* over IPv6 networks
- One license required per N2X controller, allows use on an unlimited number of chassis and ports

Note: Requires E7877A for MDI and real video generation#

Please ensure that you have a current SSA in order to automatically receive future releases and technical product support.

*Please contact your Agilent Technologies representative for timing and availability
Features identified with an asterisk will be available in Q1 2008

Hardware

A N2X system is required with:
- System controller
- Chassis
- Interface cards

The IPTV QoE solution with full video generation and analysis is supported on N2X Ethernet XR-2 (N555xA/B) and XS-2 (N5630A) cards, including N2X EPON card (N5604A), and N2X 10 GbE cards (N5602A, N5603A, N5632A)*

The channel zapping measurements (without real video generation and QoE analysis) are supported on a wider range of cards. For these measurements, any N2X interface can be used as the simulated video source and the following interfaces can be used to simulate subscribers (for the purpose of measuring channel zapping time via IGMP only) on the access side of the network:
- 10/100M Ethernet (N5550A)
- Gigabit Ethernet (E7919A/B, N5605A)
- 10/100/1000M Ethernet (E7918A/B, N5551A/B, N5552A/B, N5606A)
- OC-3c/12c (STM-1/4c) ATM (E7907A/B)
- 10 GbE (N5602A, N5603A, N5632A)*

The N5574A IPTV QoE Productivity Application for IPv6 is supported on the following cards only:
- 10/100/1000M Ethernet (N5551A/B, N5552A/B)
- 10 GbE (N5602A, N5603A, N5632A)#

Software

Each software license has a Software and Support Agreement (SSA) contract options associated with it
- PS-S12-001 - 1 year contract included with initial purchase
- PS-S12-102 - 1 year contract extended to 2 years
- PS-S12-103 - 1 year contract extended to 3 years

The following N2X software licenses are a pre-requisite to supporting the N5570A IPTV QoE Productivity Application:
- E7881B - Packets and Protocols Application Software
- E7828A – IGMP Protocol Emulation Software License

The following optional licenses are recommended:
- E7887A – DHCP Protocol Emulation Software License
- E7888A – Access Protocol Emulation Software License (includes PPPoX and L2TP)

or
- E7829A – DHCP, IGMP, PPPoX and L2TP Emulation Bundle

The following N2X software licenses are a pre-requisite to supporting the N5574A IPTV QoE Productivity Application for IPv6:
- E7881B - Packets and Protocols Application Software
- E7897A – MLD Protocol Emulation Software License

The following additional licenses are recommended:
- E7896A – DHCPv6 Protocol Emulation Software License

or
- E7898A – IPv6 Access Protocol Bundle (includes both DHCPv6 and MLD)

*Please contact your Agilent Technologies representative for timing and availability
#Features identified with an asterisk will be available in Q1 2008

www.agilent.com/find/n2x

Agilent N2X

Agilent's N2X multi-service tester combines leading-edge services with carrier grade infrastructure testing and emulation. The N2X solution set allows network equipment manufacturers and service providers to more comprehensively test new services end-to-end, resulting in higher quality of service and lower network operating costs.

Software and Support Agreement

To protect your investment in the Agilent N2X, every new system includes an initial 12-month comprehensive system-based warranty and Software and Support Agreement (SSA).

Renewing Agilent support services ensures uninterrupted technical support and software upgrades, giving you confidence in N2X throughout the life of your system.

The N2X technical support portion of your SSA includes assistance with product operation and measurements, and verification that the N2X equipment is in correct working order.

Warranty and Support

Hardware Warranty

All N2X hardware is warranted against defects in materials and workmanship for a period of 1 year from the date of shipment.

Software Warranty

All N2X software is warranted for a period of 90 days. The applications are warranted to execute and install properly from the media provided.

This warranty only covers physical defects in the media, whereby the media is replaced at no charge during the warranty period.

Ordering Information

To order and configure the test system, consult your local Agilent field engineer.

Sales, Service and Support

N2X must be serviced by an approved Agilent Technologies service centre, please contact us for more information.

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