Shenick diversifEye™

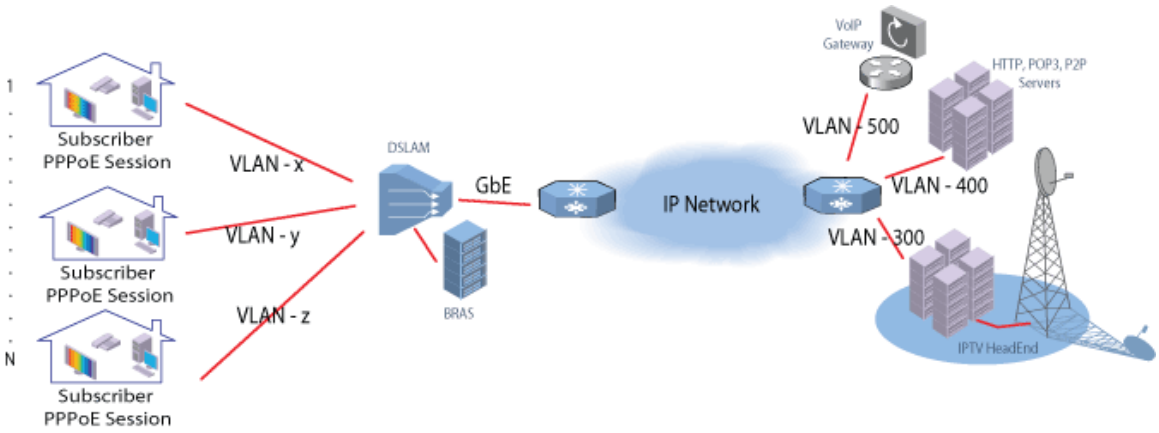
Effective IPTV Triple Play Testing

Shenick Network Systems

Triple play IPTV proof of concept

Delivering real world proof of concept, demonstration & testing of triple play environments requires getting as close as possible to actual deployments with a mix of many individual clients and a mix of several application types, using DHCP / PPPoE per residential gateway (per household) as necessary.

The DHCP / PPPoE session is the critical enabler for services. With the current access network, each DSLAM serves up to 2000 subscribers. Network configurations enable multicast routing while the video servers are connected strategically on Metro Nodes where high concentrations of users are aggregated. These servers utilize VLAN tags for each type of service (Voice, Video or Data) which translates at the user port as raw Ethernet packets.



Effective IPTV Triple Play Testing

An effective method of testing IPTV Triple Play is to build, test & measure on a per client / per flow basis with several unique individual voice, video & application data clients behind each residential gateway.

As per real world scenarios each device will be assigned a unique MAC & IP address per client (critical to validate security in many environments). Part of the overall security will include authentication such as establishing DHCP & PPPoE sessions on a per household basis with external DCHP & PPPoE servers with necessary options enabled and then run & measure individual application & client flows within each PPPoE session.

In supporting customers with multiple VLANs Service Providers encapsulate 802.1Q VLAN tags within 802.1Q this is known as Q-in-Q or VLAN stacking. An effective test for Service Providers for triple play will have multiple individual clients inside multiple individual VLANs (with priority bits enabled) plus the ability of double VLAN tagging as required.

After basic interconnectivity tests are complete the next steps are to complete application performance testing. This may include running individual voice, video & application data clients against **internal** voice, video & application data servers. But more importantly there is the need to run the individual voice, video & application data clients against **external** voice, video &

application data servers. This demonstrates real world performance & QoS as the clients are interacting with the actual deployed servers through the network. Measure individual client performance & quality of experience, including video (MPEG & RTP) and voice quality metrics on a per client basis.

The ability to determine quality on a per flow individual basis is extremely important when scaling tests, as a further step in understanding individual client QoE emulate surges in usage by adding individual clients into the environment in real time, without stopping the test. Ultimately measure the effect of one client on another client on the same Residential Gateway / across multiple Residential Gateways.

Some specific reasoning behind the need to test such tests include :

- What happens when two IPTV STB are on the same channel and one IPTV STB changes channel? Is there any effect on the IPTV STB that does not change channel?
- What happens when you have both IGMP V2 and IGMP V3 STB in the same household? What is the performance difference between these IPTV STB?

It's important to measure IPTV STB's; leave, join latency, zap rate & other performance metrics on a per client basis for each set top box (STB), then to scale to a realistic home scenarios with multiple IPTV STB per residential gateway / household.

Important test scenarios for Service Providers is to determine the max loads of the IPTV STB and IP network, this test scenario maybe completed by emulating IPTV STBs leaving a the IPTV channel immediately after the join. Other interesting scenarios may include configuring IGMP time to live parameter appropriate number (IGMP spec has a TTL of 1. But most live environments have a TTL greater than 1).

After establishing the effective IPTV performance QoE results on a per flow basis the next step is to create client variability to match real world use of voice, video & application data services and apply gain on a per flow per client basis.

Further advance IPTV performance by mitigating against security attacks, this includes running both regular (HTTP, IGMP, POP3, SMTP etc) application flows and disruptive flows (P2P, DDOS, spam, viruses). All the traffic types Good, Bad, Illegal are run from within the same test GUI for synchronization of cause & effect & other metrics. Therefore run real, stateful TCP based application flows along with video & voice flows. Have real documents for email, URLs, attachments for realistic, per client web traffic flows, spam, viruses etc. Replay specific scenarios with original or altered timing using 'capture & replay' capabilities.

To future proof the network and technology advance testing by mixing IPv4 and IPv6 application flows.

Shenick diversifEye measures functionality, performance & QoS of multiple individual voice, video & data application clients & stateful sessions behind each residential gateway / VLAN AFTER setting up viable DHCP / PPPoE sessions.

- This reflects real world deployments.
- A key requirement is to test & measure on a per flow basis.
- This is not possible with testers which establish DHCP/PPPOE sessions and then send stateless traffic / blast packets.

A single diversifEye platform & GUI supports:

- DHCP V4 & DHCP V6 client
- PPPoE client
- VLAN & Double Tagging (Q-in-Q) with priority
- Concurrent IPV4 and IPV6 application flows
- IGMP V1, V2, V3
- MLD V1, V2
- Real time video quality metrics (passive)
- VoIP (SIP & RTP)
- HTTP
- SMTP
- POP3
- P2P
- Streaming application
- Spam / Viruses / DDOS
- PCAP file replay (port based & with TCP timing)

Scenarios

- A. 800 DHCP sessions, with 3 independent IPTV set top boxes, 1 HTTP client & 1 VoIP client per DHCP session. Performance / QoS can be measured for all individual flows inside all DHCP sessions.
- B. 15,000 DHCP sessions, with 1 independent HTTP client per DHCP session. Performance and QoS can be measured for all individual flows inside all DHCP sessions.
- C. 400 DHCP sessions, with 3 independent IPTV set top boxes, 1 HTTP client & 1 VoIP client per DHCP session. Q in Q (double tagging) is implemented, with different inner and outer tag priorities. Performance / QoS can be measured for all individual flows inside all DHCP sessions.
- D. A single "service" vlan per port (3/0 and 4/0) in which all IGMP joins/leaves are over that VLAN (VLAN10) and all data flows on each subscriber vlan.

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