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Alan Robinson, CEO, and Robert Winters, CMO, of Shenick Network Systems put the case for essential test and measurement

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Quality is the key

The promise of IPTV is fraught with dangers – from outages to poor quality pictures - but effective systems test and measurement could save the day. Co-founders Alan Robinson, CEO, and Robert Winters, Chief Marketing Officer of Shenick Network Systems, discuss the options with Priscilla Awde

Imagine this: virtually the whole nation settling in to watch the rugby world cup or European soccer final and the television picture goes down for thirty minutes or freezes just as the home side is about to score a goal. It may flicker at critical times, the sound be unsynchronised or users unable to change channels quickly/efficiently. Perhaps the latest film released on Video on Demand (VOD), can be paid for but not downloaded or hackers may launch a denial of service attack. A power outage may cause major disruption to television signals.

One person, at least, needs no imagining. Robert Winters, Chief Marketing Officer at Shenick Network Systems, instead predicts a riot should any one of these

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all too feasible scenarios actually happen in a live IPTV network.

Couch potatoes everywhere are increasingly intolerant of any outages and expect picture perfect television. Guaranteeing quality of service and of individual subscriber's experiences are, however, major and often underestimated challenges for all service providers, but especially in the IPTV environment where lost packets, jitter and latency, combined with poor network architecture and inability to scale, will all affect the viewing experience.

Driven by the twin imperatives of falling revenues from the cash cow of voice, and customer churn to competitors, operators are now moving into higher margin services. The possibilities of increasing ARPU in their growing base of broadband subscribers and reducing churn by creating sticky applications make the triple play package of voice, video and data compelling, if challenging. In fact, operators have little option but to add new revenue streams if they are to compete effectively in the next generation world of integrated and convergent multimedia services.

However, in doing so, telcos are moving into a highly competitive market already populated by established cable and satellite providers. Having gone through trial and error, these networks are optimised for video, can carry voice and data applications and are scaleable. The cable and satellite operators have also negotiated long standing agreements with major studios and other content owners.

Alan Robinson CEO at Shenick suggests it is difficult for telcos to get interesting content, given competition from existing players and because they are not used to the video/television business. "However, telcos must produce compelling content services at the right price point," says Robinson. "The audio/visual sector is very competitive but can provide excellent revenue streams for operators and a way of increasing ARPU and keeping customers."

The best effort approach to service levels is no longer good enough in the IPTV world where packet losses have become more serious then ever. User expectations have risen with exposure to digital video consumer electronic equipment and DVDs, which provide high quality video and audio, making people less tolerant of degradation or poor service.

These are just some of the challenges facing operators and, which have also delayed roll out of some early commercial IPTV launches. Others involve more technical issues including network capacity and scalability. Yet most can be solved by careful network planning and a serious commitment to early and continual end-to-end test and measurement routines.

"It will take operators a while to roll out television," Robinson suggests. "IPTV is harder to get working than people realised, mainly because legacy systems were best effort - which may be alright for broadband and Internet access but is not for mission critical television services. People will tolerate service outages in certain situations, like the mobile phone sector where dropped calls still happen because there is no alternative technology, but that is not the case in the competitive television market."

Unlike the first deployment of DSL broadband applications in which the quality could be patchy and losing data packets was rarely critical, operators cannot afford any loss or interference with IPTV signals but must ensure high service levels and minimise transmission and technical problems. "Quality is a key differentiator for IPTV, so implementing the best and right equipment, carrying out pre and post deployment and real-time network monitoring and testing are essential," explains Winters. "Operators must continually test the quality of subscriber's experience and monitor service assurance to deliver the best possible results."

Among the old but significant factors affecting service levels are the huge number and variety of equipment installed in multi-vendor communications networks. Operators are used to handling interoperability and integration issues and ensuring equipment conforms consistently to open standards, but these become critical in IPTV deployments.

Although it may sound obvious, operators must match

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triple-play services to network capabilities – a consideration which has delayed at least one major European IPTV launch. Targeting the entire subscriber base with IPTV means that telcos will at some point, hit the scalability wall. Pre-deployment testing will help determine the exact number of subscribers any given architecture will be able to support and demonstrate how the existing network will react to application loads both at launch and going forward.

The constant challenge of transmitting next generation services over legacy architecture is the ability to scale, and, ultimately, performance – all problems that must be addressed at the earliest stages of IPTV launches.

"Prior to deployment operators must decide which vendor to use for IPTV; which set top boxes; DSLAM equipment; network components; routers; switches; core transport and encoders, among others, they will use," believes Robinson. "Which vendors can do the job and, when everything is put together, does it work? What are the integration issues; the performance limitations? Will the network need to be re-architected to provide more bandwidth or more boxes added to reduce contention and handle demand? Assuring on-going quality of service is an end-to-end problem."

Fortunately, there are solutions but they require an early and on-going commitment to testing and measuring how equipment performs, what is happening in the network, and how the whole reacts to peaks and troughs in demand. Emulating the behaviour of hundreds or thousands of subscribers in the laboratory prior to deployment identifies and solves problems before any customers are connected.

Able to test both standard and high-definition IPTV and VoD down to the level of individual viewers, Shenick's high performance converged IP communications test system diversifEye 4.0 gives both equipment vendors and service providers the ability to test real world VoD functionality. They can determine how networks perform under high load conditions such as network surges. So operators can guarantee service level quality before televisions are turned on.

Quality of experience testing in IPTV networks must include service and transmission layers and an understanding of the interaction between them. Ideally, testing the actual received decoded video stream against a known good source on an end-to-end basis provides the most accurate results.

It is important to conduct converged IP tests which include layers two to seven and carry out functional, load, QOS/QOE limitation testing for IPTV, VoD, VoIP, data applications and overall security. Passive and active probes throughout the network are part of on-going monitoring and service assurance programmes.

"We can set up and test the type of traffic generated behind a typical household, which may include several televisions, perhaps high definition TVs; one or two PCs and several telephones," explains Robinson. "Engineers can emulate traffic in a multiple home system and create a real world environment to give operators and equipment manufacturers an opportunity to test performance limitations and quality of service. They can monitor VoIP or high-speed Internet traffic and see what happens if there is a surge to join channels as users all switch programmes simultaneously – will this clog the DSLAMs or other aggregation devices or even the video servers? Powerful laboratory equipment and test routines find bottlenecks in high load systems.

"Pre-deployment performance testing allows operators to upgrade systems where necessary but it must not stop there. There is a constant need to monitor live networks and do regression tests whenever new equipment is added into the system. Service assurance monitoring guarantees high performance, discovers problems fast and highlights where to go to fix them."

Testing early and often is a mantra operators ignore at their peril since it is difficult to debug problems in live IPTV deployments. Consistent low performance increases customers' dissatisfaction and the likelihood they will move to competitors.

Effective network and application monitoring is best controlled from a dedicated centre where each channel can be checked in real time from the satellite feed into

Operators are already concerned with content security but there will be an increasing number of malicious or denial of service attacks on television

the head end and through to individual subscribers. Sophisticated statistical models produce scores to evaluate the video quality. The optimum standard of service may vary between operators and with what subscribers are watching or doing.

Changing camera angles, choosing what to watch, when, or having on-screen 'chats' with friends are big drivers for IPTV but most are bandwidth intensive. Equally the system must be able to handle people browsing through channels without either slowing down or adversely affecting the video/audio quality.

"The bandwidth required for Digital Video Recording (DVR), VoIP, Video on Demand (VOD), or peer-to-peer downloads is up to 30Mbps for successful deployments," explains Winters. "Television must take priority but it also takes up bandwidth which may have an adverse effect on other services. It is therefore important to split application flows over virtual LANs, otherwise channel hopping, for instance, will affect QOS. Operators must monitor each application stream and be able to control, test and measure flow quality. Fully integrated triple-play packages strain networks, making it important to test for full use of all equipment simultaneously."

As telcos scale up and deliver IPTV to the mass market they may hit bandwidth problems. Current DSL technologies may handle today's requirements and deployments of up to 200,000 subscribers but operators are likely to see performance issues when they scale up to millions of customers. It is then they may have to extend fibre deeper into the network but fibre to the home/curb/node (FTTH/C/N), architectures are becoming cheaper and increasingly feasible especially in new housing or commercial developments. Telcos may also have to add more boxes in exchanges to reduce the number of subscribers per unit. Alternatively operators may turn to WiMax as a means of adding more bandwidth in the last mile.

Countries in the Far East are driving broadband deployment: in Japan and South Korea for instance access speeds of 100Mbps are commonly available and not expensive. With this available capacity there are no problems with scalability, contention or quality of service.

Keeping ahead of developments and being able to test for future technologies, network architectures or applications are part of daily life for Shenick. Winters and Robinson agree the next big shift is that IPTV will move from the current multicast model to more of a unicast system better able to cater for personal usage patterns. Single users will be allocated an amount of dedicated bandwidth for applications like VOD, which may raise more contention/capacity problems especially if one person in the house is downloading a video whilst another is watching broadcast television.

However, convergence is a reality now, they believe, and people are starting to look at interactive and integrated voice and video applications.

"This is still very early days for IPTV, with only around two million deployments worldwide. Lots of operators are talking about it but it is still in the early growth stage," says Winters.

Security is yet another factor which must be considered. "Operators are already concerned with content security but there will be an increasing number of malicious or denial of service attacks on television. Hackers may jam the system to prevent people changing channels or generate viruses making it important to test firewalls and simulate the effects of such attacks, in the laboratory," adds Winters.

Operators are expanding the amount of bandwidth in the access network either by rolling out fibre or using new technologies to squeeze more capacity from the copper plant. Several different core network protocols are appearing with the move to NGNs, all of which must be supported and tested. "Each vendor has their own way of testing and implementing standards. Equipment manufacturers may work with specific operators who have certain performance expectations which must be tested. Test and measurement is all about flexibility and we must be two years ahead of deployed services," concludes Robinson.

Priscilla Awde is a freelance communications journalist