IPTV Migration Strategies

Part 2: The Household Infrastructure

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Contents

Executive Summary

Part 2 of this series on IPTV will cover the challenges that Cable Operators face in and out of the household. As a brief refresher from Part 1 (Security for IPTV), MSOs see a number of advantages in delivering video over IP, including opening their markets, providing TV Everywhere, competing with OTT services, and more. IPTV could potentially capture new viewers, provide new services and bring new revenue to Cable. Changing the media delivery method means examining every part of the business model to ensure success; in this paper we focus on understanding the household infrastructure.

It is important to take a good look at the effect of the household infrastructure when making the transition from a QAM based video infrastructure to an IPTV delivery model.

Cable operators have set a high standard for video service quality. Customers expect crisp video without interruption from their cable providers. In contrast, as IPTV OTT services have grown, users have needed to accept interruptions of the video stream transmission, and buffering events when the streaming fails. OTT's use of adaptive bit rate (ABR) streaming has helped to alleviate buffering, but at a cost: The algorithm keeps the stream flowing by dropping the resolution of the picture dynamically when bandwidth availability varies, causing the quality of the video to be degraded.

As more and more IP bandwidth is soaked up by the demands of multiple devices and services, the challenges of delivering high quality streaming video are exacerbated. While customers can ratchet up their broadband accounts – increasing revenue for cable operators – at some point operators may face key questions: Are they willing to downgrade video quality to deliver IPTV? Or are there solutions for ensuring they can deliver the video quality that meets their current standards?

It is important to take a thorough look at the effect of the household infrastructure when making the transition from a QAM based video infrastructure to an IPTV delivery model. According to Digitalsmiths Q4 2015 Video Trends Report, nearly 55% of US households pay for OTT services like Netflix, and 33% use pay-per-view services like Amazon. Many of those households can already be considered 'hybrids' that subscribe to both cable and OTT services, and some operators already are providing some content over IP. As the adoption of OTT content catalogs continues to grow, operators need to determine the best path forward to retain and attract subscribers.

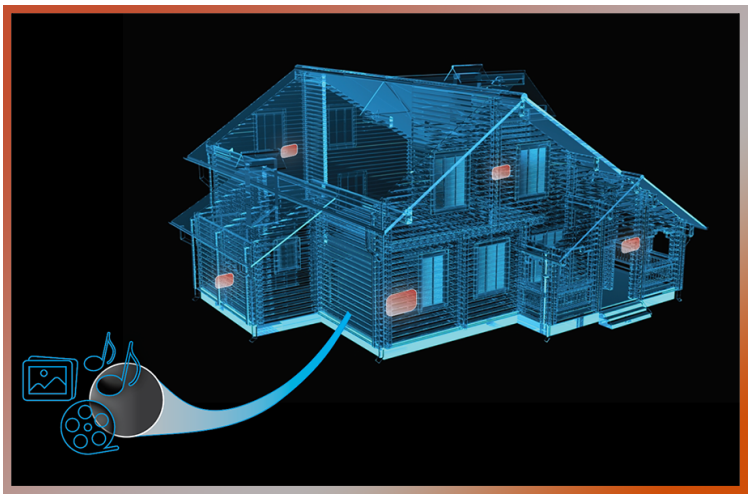
1. Setting the Stage

To move into this new realm of content delivery, a variety of topics need to be addressed. In Part 1 we reviewed the elements that need to be addressed for security; here we look at the household infrastructure.

1.1. Content Rights

Some of the considerations for IPTV systems are business related, and may include renegotiation of existing content rights and negotiating to add existing OTT services into the cable offering. Content rights are most important in moving to the TV Everywhere model. Many existing contracts do not allow operators to deliver programmers' content outside the operator's geographic footprint. With new contracts, operators are starting to provide mobile access to their services outside their market areas.

Like architectural concerns, these items need to be included early in planning schedules, as business negotiations sometimes can take longer than putting in place delivery infrastructures.



1.2. Household Infrastructures

In an ideal situation the operator will be providing the broadband service to the household. In addition to strengthening brand awareness, this can provide the strong marketing message of a single point of contact for service issues. As many users of services like Netflix have experienced, the source of a service outage could be Netflix, the internet service, the Wi-Fi router, or the device(s) being used for streaming and watching Netflix. This can result in long investigations, multiple phone calls and

significant consumer frustration to resolve the issue. If the consumer has purchased their own Wi-Fi router, problems that involve the ISP or home network could mean one more call to correct the problem. It's amazing that the typical consumer is willing to navigate through this maze of services to solve streaming issues. Of course, over the last five years there has been a gradual improvement of technology, particularly in streaming algorithms. That has eased some of the problems, but they still exist, particularly for consumers who are not technically proficient or those in outlying areas who may not have large sets of choices for each part of the system.

What does this mean to the operator? Many are already set up to do fairly complex support of both video and broadband services, but let's consider the complexity of problems that might arise.

1.1.1 Wi-Fi Continuity in the Home

A perfect Wi-Fi set-up in a house would not have any dead spots and the Wi-Fi would operate equally well in any room of the house. Factors that might impede Wi-Fi operations include:

- Home size, shape and construction materials.
- Variety of homes includes single family and multi-dwelling buildings

  Operators have asked about how they ensure uninterrupted services in a narrow, three-story unit.

  Ranch houses are notorious for having problems if there is a single router placed at one end of the house.
- Wi-Fi setup, including a single router and possibly amplifiers

  Consumers often are tackling Wi-Fi problems themselves with self-help instructions from various sources. Often the instructions found in the products they buy are less than helpful in making sure that Wi-Fi equipment performs as expected.

  In dense cities operators have provided boosters in homes. While this helps solve Wi-Fi problems, some boosters transmit hotspot signals to the public. While these functions are secure and separate, this has still caused consumer backlash.
- Number of simultaneous services connected to the Wi-Fi system

  An oft-heard question in many homes is: "Johnny, are you online in your room?" The easy solution to buffering and ABR problems

is limiting the number of services straining the network simultaneously, but this is not an ideal solution.

Depending on the type of network in the neighborhood, usage by neighbors can bring down bandwidth within a community.

Broadband streaming quality may be further exacerbated when there is greater availability of 4K content. As users get more savvy they will expect 4K not to use ABR streaming, as the whole purpose of 4K is the improved picture.

There is a lot of development going on to improve Wi-Fi networks and to develop other networks using technologies such as Li-Fi, or Light Fidelity. Low-band networks in particular are on the the rise to support the surge in IoT data handling. Mesh networks have been around a while, but are not used much in the home. As research continues, there will likely be new ways to take advantage of various discoveries which will be applied to improve the in-home network.

1.1.2 Wired vs Wi-Fi

Wired service delivery is easier to monitor and troubleshoot for the operator. It avoids problems like construction materials, consumer-purchased network devices and household design. Unfortunately, many of the devices consumers use for streaming video are mobile, so expecting a fully wired delivery system is no longer practical.

At a minimum, though, the operator can test the points of those wired spots to ensure that the bandwidth ordered is the bandwidth delivered. There are also common tools for consumers to test bandwidth to their mobile devices.

1.1.3 Device Support

More and more consumers are expecting operators to deliver services to myriad consumer owned devices. This can prove to be challenging for a number of reasons.

- Variety of manufacturers, devices, and operating systems to support
- Device Software Release Management is out of operator control
- Browser/Player compatibility

  As the sun sets on Flash, there is still a plethora of browsers and media players in the market. The operator can do their best to

control the playback scenario, but this often means complex solutions and native implementations across multiple platforms.

- Continuity of User Experience (UX) across devices

The SW tools for troubleshooting have improved immensely over the last few years. As noted, the operator can test the signal to the device. This does not provide assurance on the equipment side for user interface operations.

Operators have been deciding between two options for UX design: HTML5 with the hope to minimize code development support, or native implementations supporting Android and iOS environments. Sometimes other devices like Roku, Smart TVs and Gaming consoles bring their own, proprietary development ecosystems. There is some benefit to HTML5 as the operator can recommend specific browser choices for each operating system, providing some known quantities for Quality of Service (QoS). HTML5 also has the potential to reduce the test environment and accelerate turnarounds for UX updates. However, native implementations can allow operators to take advantage of what each OS might have to offer, providing specific control and sometimes improved results on performance. Native implementation benefits come at a cost in upfront development, and on-going service and support.

1.1.4 Hardware Environment

Imagine what the future of the household will be with services beyond media consumption. Home automation and other new services will be putting additional pressure on the in-home network. Operators may consider a central data gateway that also ties in services with media delivery. In a white paper Alticast penned on IoT, the idea was presented that IoT services should not all have separate gateways as is often seen now, but they should all access a central gateway that communicates with cloud services. This reduces security threats to the home, allowing a single, strong, secure and all-encompassing system. This data gateway can be the same HW that provides media services, whether audio, image or video. This headless gateway would be a juncture for: managing all of the services; collecting statistical data for both customer behaviors and services; and monitoring tools for ensuring QoS.

This hardware platform is the hub. Instead of a number of large STBs in the house, the consumption model could be spread over consumer IP-enabled devices like tablets, phones and Smart TVs along with smarter, smaller and more powerful STBs in the form of pucks and sticks. This could be further enhanced with cloud services, including Cloud DVR and

Cloud UI; IoT networks to various sensors for household management; and traffic over broadband that is already ubiquitous (i.e. online shopping).

1.3. Network Support

The network within the household will play a critical role in IPTV, and likely already does in most households that have additional OTT services like Netflix.

With the extensive amount of change in architecture for IPTV, it is likely there will be a staged approach to providing IPTV services. Operators will want to keep the QAM system in place and preserve legacy hardware as they build up the QoS to the home for IPTV. That means both networks will continue to operate in parallel, at least for a time.

As operators complete their rollout of IPTV delivery, cable-based networks like MoCA appear to be headed towards obsolescence. In a headless gateway configuration for the house, the incoming content -- whether received over fiber, cable or DSL -- will enter the gateway and exit over Ethernet or Wi-Fi. The headless gateway won't 'touch' the video (i.e, perform transcoding), but will act as a pass through to the destination device. Passing through the gateway will allow the operator to monitor service and collect data. The accepting device could be a smart TV, tablet, mobile phone, STB or any other device with the ability to connect to the network and play back media.

Another consideration for operators may be the ability to take advantage of multicast video delivery. From the gateway, multicast could provide performance and bandwidth optimization, particularly for mass-consumed events like the Super Bowl and the Olympics. Use of multicast may be helpful when multiple screens in the household are watching the same content. If this could be intelligently detected, multicast may improve the play-out experience.

1.4. QoS

QoS will be the lynchpin in determining when any operator is ready to flip the switch to IPTV. Of course, most are transitioning by starting to provide services on mobile devices, but at some point video over QAM delivery may be end-of–lifed to reduce system support at the headend.

This will require that operators set out a plan with quality benchmarks that they expect to meet before they feel comfortable with a complete IPTV delivery model.

It is easy to identify a parallel from telephony's shift from analog to digital. It's been more than 10 years since the transition began from analog copper services to cell phones and VoIP services. Today, garbled and dropped connections indicate that call quality is still not up to par to what we had in 'twisted pair' home phones. Over time, however, the flexibility of cellphones became 'good enough' that a large percentage of the general public determined they could eliminate their wired home phone service.

Younger audiences, many of whom have not adopted pay-TV services, are more accustomed to video break-up, buffering, and ABR quality degradation. Will this mean this generation will accept a lesser quality in video services than what QAM delivers?

This technology shortcoming will continue to be addressed. The easy answer is faster and more bandwidth to the home; the better answer is finding better algorithms to improve video streaming, which is even more imperative as equipment manufacturers drive up resolution and look for new innovations like virtual reality (VR) that need more and more bandwidth. Finding those technology breakthroughs may be the key to getting to an equivalent to QAM quality service.

1.5. IPTV Benefits

1.1.5 Big Data

Among the most interesting possibilities as a result of this new infrastructure are data aggregation and home automation.

With a centralized server interconnecting all these services, collecting and analyzing data will provide a plethora of information to introduce better advertising models and reduce media clutter. With the explosion of new content production, big data can help each individual find the needle in the haystack they are looking for at any one moment, whether it be video or music -- or even narrowing down a purchasing decision for hard goods.

If all user actions are recorded (opting-in may be required), the operator can begin to think more like Google, and the established internet models for personalized advertising increasingly will converge with the television viewing experience. Understanding each household member on a personal level will not only help drive the right videos to that person, but also enable filtering to provide other products and services. If larger data sets are involved in those recommendations from social networks and internet search, there are even more opportunities to bring forth new

content. Having all these services and data sources tied together while providing smart algorithmic data analysis will allow operators to expand their offerings while providing a friendly and efficient solution.

1.1.6 Improved Service Tools

IPTV may present an impetus for operators to provide interactive dashboards for consumers to manage their Wi-Fi networks visually. Tools like this have become available commercially to consumers already, but if the operator provides those tools, customer service teams together with the consumer will have control over and visibility into how the bandwidth is being used throughout a home. This would provide opportunities to improve service and phone support, since both parties could visualize the network.

1.1.7 Future Challenges

Even as IPTV infrastructures are being put into place, the consumption of bandwidth continues to grow. The report from the Cisco® Visual Networking Index (VNI) provides a number of interesting forecasts, among them:

- Global bandwidth consumption will pass the zettabyte mark (1000 exabytes) by the end of the year and will double again by the end of 2019.
- Peak consumption during the busiest 60 minutes of the day is expected to increase by a factor of 3.9 between 2014 and 2019.
- The number of devices connected to IP networks will exceed 3 times the world population by 2019, with traffic exceeding 22 GB per capita.

Even more astounding, Cisco VNI reports that an individual would need 5 million years to watch one month of video crossing global IP networks in 2019! Video has been and will continue to be the driver of most data usage.

As 4K grows, 8K arrives and (VR) pushes the envelope for content delivery, video will gobble even more bandwidth. VR requires huge, stitched-together files to provide near-360 degree viewing environments and VR goggles requiring two copies of the video will challenge networks in the years ahead.

Conclusion

Along with ensuring the security of content discussed in Part 1, quality of the video experience is another key factor in moving ahead with IPTV. The various topics that need to be addressed all lead to ensuring the consumer can enjoy video and other media without frustration. For operators, having a reliable system in place means a deep understanding of the in-home network so they can respond and quickly resolve any problems. The tools will continue to improve as systems are put into place. Fortunately since many operators provide the broadband service to the home, they are in a great position to gradually grow their IPTV service, extending new products and services for the customer.

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