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CASE STUDY

Internet Protocol Television (IPTV)

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Case Statement

Acronyms used

AON	ATM Passive Optical Network
CMTS	Cable Modem Termination System
DRM	Digital Rights Management
DVB	Digital Video Broadcasting
EPON	Ethernet Passive Optical Network
FTTC	Fiber -To-The-Curb
FTTH	Fiber-To-The-Home
GPON	Gigabit Passive Optical Network
HDTV	High-Definition Television
HFC	Hybrid Fiber Coax
IPTV	Internet Protocol Television
Mbps	Megabits per second
POTS	Plain Old Telephone System
QoS	Quality of Service
RAST	Raptor Adaptive Switch Technology
ROI	Return on Investment
VMAN	Virtual Metropolitan Area Network

Internet Protocol Television (IPTV) delivery is accelerating and becoming a mainstream method of delivering video content to subscribers. The addition of the “Triple Play” of video, voice, and Internet has replaced the original IPTV concept such that IPTV is synonymous with triple play. A simple Yahoo or Google search shows the high level of interest in IPTV.

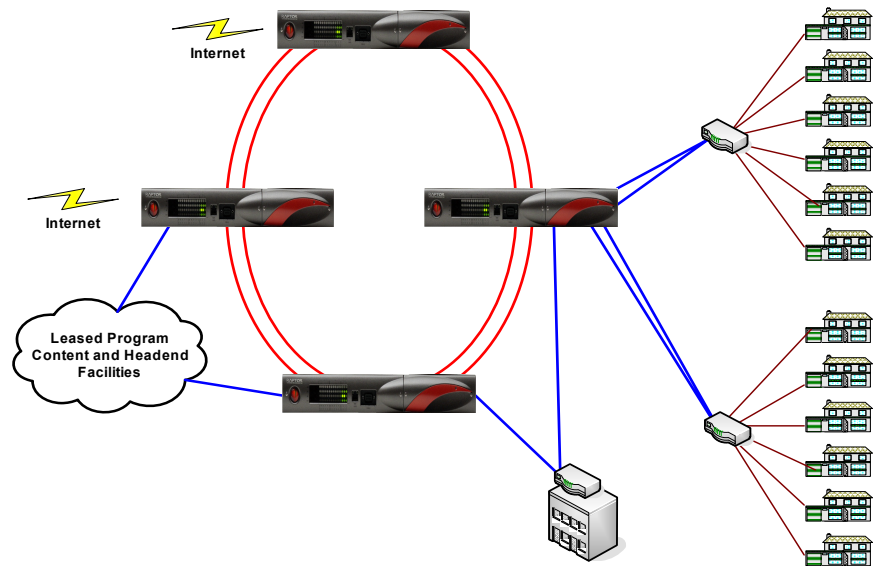
So what is so exciting about the triple play? For an answer we need to see how this has been done to date. Video in the form of TV programs, films, and other formats has been delivered in its raw form over coaxial cable for decades and, in more recent times over a cable delivery system known as Hybrid Fiber Coax (HFC). A form of digital delivery over HFC has been in place for several years giving rise to the term “digital cable.” HFC is roughly analogous to satellite delivery as both use Digital Video Broadcasting (DVB) formats to deliver content to subscribers, only the transport media is different.

Offering anything other than program content has been problematic at best. When Internet over digital cable began, Cable Modem Termination System (CMTS) delivery was used to create a pathway over the HFC system to deliver Internet data. Voice traffic over digital cable has been avoided in favor of using a more traditional Plain Old Telephone System (POTS) for many installations because HFC back-channel speeds and quality are not really up to the task. Some cable companies have implemented the triple play in a somewhat “cobbled together” form, where phone services are delivered in POTS style with phone switches in cable headends and allied equipment delivering a phone signal to the subscriber (dual network), which is not as successful as it could have been.

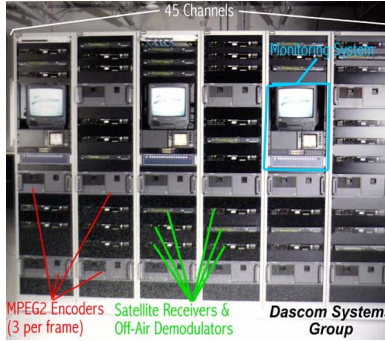
The arrival of IPTV has allowed the triple play to be delivered over a single cable into the premises, with all video, voice, and data being delivered in the exact same fashion, using base industry-standard protocols and media. This delivery method creates a better quality video delivery package at a much lower cost than the traditional HFC system and delivers high-definition television (HDTV) with no modifications to the core delivery network.



Standard Cable Headend



Raptor Solution



45-Channel HFC System



Ether-Raptor IPTV 200-Channel Solution

CASE STUDY 1

A traditional HFC system does not scale well and has a maximum number of subscribers per lobe that increases the cost per subscriber installed. IPTV can scale very well and does not have a maximum number of subscribers that can be serviced on a single lobe.

One of the most expensive parts of any cable system is the headend where video is collected and converted for delivery over a HFC system. The cost of a system to support a 200-plus traditional cable system could be as high as \$8,000,000, which for a 10,000-user system raises the per-subscriber price to levels out of reach of almost anyone. With IPTV the headend function can largely be leased including the content, reducing the most expensive part of the capital expenditure to \$100,000–\$200,000.

The transport part of a cable network is also very expensive when a resilient network is required, and the delivery of content to the subscriber over HFC systems limits the number of subscribers that can be serviced, and much of the cost and limitation is because of the need to amplify and re-amplify the signal again and again. IPTV does not have this limitation because Ethernet switches actually regenerate the signal every time it is switched through the system. Even the final step to the subscriber will copy the signal more correctly and efficiently than any HFC system.

In an IPTV network, the building blocks are much more simple to implement because these building blocks contain devices that have been in place in enterprise businesses for several years and are well understood by all enterprise network engineers, which allows a much larger population of technical people to be employed in this area. The need for specialist HFC video engineers is reducing, along with the costs of employing these individuals.

Raptor Solution

A small town in Oregon with 10,000 subscribers is looking to implement a new cable system, with triple play very much in the forefront of their thinking. Resiliency is also a requirement because this network will carry the town's phone system including the 911 system. Assuming that each dwelling is unlikely to need more than three HDTV channels simultaneously, four phone lines, and 10 Mbps Internet access, a bandwidth utilization of 38 Mbps is adequate to service each customer's needs, making a 10/100 Mbps Ethernet connection more than adequate.

Therefore, we need to supply 10,000 ports of 10/100 Ethernet direct to dwellings, with resilient connections to the core delivery network. The 10,000 ports of 10/100 Ethernet must be resiliently connected to a backbone network that can be relied upon to resist failures and continue to pass traffic.

Ether-Raptor ER-1010 switches are precisely the devices to provide this resilience. Raptor Networks' Raptor Adaptive Switch Technology (RAST™) creates a distributed switched Ethernet fabric, producing a "Virtual Metropolitan Area Network" (VMAN) at very low cost, but with resiliency features never seen before.

Our customer (IPTV MSO) needs coverage for 10,000 subscribers. Using 48-port 10/100 edge switches with 4 x 1 Gigabit Ethernet uplinks requires 209 of these switches (under \$500.00 each) using resilient connections to Ether-Raptor ER-1010 switches, which are connected in a resilient 20-Gigabit ring (25 switches total for under \$28,000 each) creating a transport system for less than \$1,000,000.

Raptor Solution

Triple-play services from broadband providers will significantly enrich the landscape for home entertainment and communications services. The home network is a key part of the triple-play infrastructure. New technologies eliminate barriers at the last hundred-feet by enabling whole-home distribution of multimedia content over low-cost, standard Wi-Fi. The digital home will never be the same.

Source: IPTVnews

Given the leased headend system results in a capital expenditure for the entire system of less than \$4,000,000, including 10,000 HDTV capable set-top boxes.

Subscriber capital expenditure cost = (\$4,000,000/10,000)	\$400.00 per subscriber
Amortized over 24 months (400/24)	\$17.00 per subscriber/month

Note



Most cable companies amortize their equipment over 10-15 years. Return on investment (ROI) on a 24-month plan would require only \$17.00 of profit over costs per month to achieve total ROI.

Leased headend services prices are complex to put ball park figure on, but a good rule of thumb is a 120-channel non-premium line up with POTS voice and Internet should be profitable at a 2-year ROI level. Operating expenditures are also reduced with a simpler transport platform, leased content, digital rights management, (DRM), and program guide are also leased as part of the content lease. Therefore a minimal support staff is all that is required to handle customer questions, billing, and technical support.

CASE STUDY 2

In the 1st quarter 2005 there were: 2.1 million IPTV users worldwide 150 million broadband users worldwide, More than 240 carriers providing IPTV services, more than 25 manufacturers producing IP set-top boxes.

Source: IPTVnews

A neighboring town to the one in Case Study 1 now decides to follow suit, can justify the capital expenditure, but cannot justify the operational expenditure of running such a system. In any other cable TV solution, this will almost guarantee that this new town cannot implement a new cable solution.

IPTV allows Town 1 to connect the subscriber delivery system in Town 2 (Town 2 must still install the transport and subscriber systems), and sublease content, DRM, and program guide from Town 1. In fact Town 1 can completely run Town 2's system remotely, with perhaps a revenue-sharing agreement in place.

CASE STUDY 3

A company offers IPTV and the triple play in a large city. HFC-based cable systems normally support up to 320,000 subscribers, To support a figure of 1,000,000 subscribers, 3 or 4 headends and attendant HFC delivery systems will be built and I need to be operated, which is why a city such as New York has multiple cable companies and multiple headends.

IPTV (and rest of the triple play) allows very large delivery networks to be created, far in excess of a normal cable headend system. The reason this works is because Ethernet (predominate physical protocol) regenerates the TV signal each time it passes through a switch or router, which means that although practical limit (number of Ethernet addresses the switches can work with, and number of routes a router can work with), the theoretical maximum is as high as 3.4×10^{38} subscribers.

This theoretical limit is very unlikely to be reached. However, this regeneration of the signal at each switch port allows the video program to be delivered with the best possible quality (depending in the source quality), to many more subscribers, at much lower cost than traditional means.

Many other methods are being explored to deliver the Triple Play to subscribers. Ethernet Passive Optical Network (EPON), is being tested and implemented in areas where existing AON (ATM Passive Optical Network) systems exist. However EPON and GPON (Gigabit PON) are using a shared system with a fixed speed up to 1 Gigabit. For TV delivery this is a good system as most TV programming is broadcast, and PONs will simply copy each channel as needed, but, this shared system is different for Point to Point operations such as video on demand, voice, or Internet.

Innovation is smaller in U.S.

In the U.S., telephone companies have led the way in IPTV but mostly small regional companies such as Dalton Utilities in Georgia, the Matanuska Telephone Association (MTA) in Alaska and Pioneer Telephone Cooperative in Oklahoma. There are 1,200 to 1,400 of these independent phone companies in the U.S. According to one estimate, 50 to 75 are already offering IPTV services, and 70 percent of the rest intend to offer service within 12 to 24 months.

Source: ISP-Planet.com

PON technology can have congestion issues, and because it is a shared media (using tag addressed packet streams) congestion will cause problems. The various optical splitter points do not support any form of QoS they cannot, they are passive, so congestion on one PON tree, affects the entire tree.

FastDSL (or other connotations of the same system) does allow high bandwidth (20–36 Mbps) to each subscriber, which will be fine for standard digital TV delivery and the Triple Play, but if the user wants to start using 4 HDTV signals (9.1 Mbps MPG4) would need 36.4 Mbps and Voice/Internet far exceeds what the technology can handle. FastDSL is a good interim solution, but to truly support modern TV, the system with either need to be upgraded or replaced soon after it is implemented, simply to support multiple HDTV streams.

Fiber-to-the-Home (FTTH) has been seen as the holy grail for high bandwidth to the home. It is a very expensive solution, but does carry the highest levels of bandwidth possible to the subscriber.

Fiber -to-the-Curb (FTTC) is an alternative to FTTH and is less expensive. It also passes as much data as FTTH, making it a good high bandwidth system for delivery to subscribers.

All of these technologies are very different, but all can carry IPTV traffic. Only FTTH and FTTC or (FTTP Fiber-to-the-Premises) can actually support the triple play with full bandwidth available to all services and subscribers.

Summary

IPTV and triple play are here and working now and will be everywhere in a few years. Who can implement an IPTV solution? Anyone! Consider an apartment complex owner with 1000 possible subscribers. This owner can use the features of the triple play either as a method to attract certain type of renters, or as an incremental revenue stream, or both.

The strength of an IPTV triple-play solution is the resiliency of the transport network. Raptor Networks provides the most cost-effective high resiliency transport system on the market. Whatever technology is used to connect to the subscriber, Raptor Network's *Distributed Switch Fabric* makes that technology more resiliently connected to the headend. Raptor Networks also excels in its ability to create a resilient backbone for headend systems to work with. The resilient connections to a Raptor transport network completes the IPTV package.

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