

# RetroVue®

## System Overview

*This system overview is provided for informational purposes only and may be subject to change. Specifications contained within this document are for reference only.*

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### Introduction

*It's 9:17pm. You've been zapping through the channels, and finally found a television program you'd like to watch. But, you've missed the first seventeen minutes of the show. What if, with the click of a button, you could jump back to the start of that program, or any airing program in the digital TV lineup?*

GoBackTV's RetroVue System gives cable operators the ability to offer services like this, as well as conventional Video on Demand (VoD), switched digital broadcast, network-based personal video recording (nPVR), and time-shifting windows. RetroVue even gives cable operators the option of affordable IPTV-over-cable, using CMTS-bypass technology. RetroVue is all about freedom of choice, not only for subscribers, but also for operators.

Cable operators have a unique asset, when compared to satellite and telco competitors: physical plant with the flexibility and potential to deliver an affordable high-capacity channel to and from every home and every pair of eyes.

The cable industry has already made a massive investment in CATV plant upgrades over the last decade, so it is imperative that new services incur minimal incremental cost, while remaining flexible enough to support the evolving advanced services enabled by an all-digital, two-way plant. The RetroVue System encompasses a suite of versatile components, comprising a high-density broadcast/switched-broadcast/narrowcast edgeQAM, a high ingestion-rate video server, an ASI-to-Gigabit Ethernet IP streamer, a service controller/resource manager, and a CMTS-bypass solution for IPTV-over-cable.

RetroVue scales from a few hundred users to virtually unlimited numbers, and supports the operator through multiple transitions, from analog to digital, from broadcast to unicast, from QAM to IPTV, and from today to the future.

## How does RetroVue work?

GoBackTV's RetroVue suite of products enables cable operators to dynamically and affordably provide subscribers with their own personal television channels, which means that subscribers get to watch what they want, when they want. Besides jumping back to the start of the program, the viewer can jump forward, jump backward, pause, and return to the normal video broadcast. Also, by using the HTML-based MyRetroVue interface on his set top, computer, or PDA, the subscriber can create playlists, manage channel bundles, and access other time-shifted, on-demand applications such as network PVR (nPVR), Video on Demand (VoD), and Television on Demand (ToD). In addition, the MSO can use the two-way interaction to collect aggregated usage statistics

## Enabling technology

GoBackTV's vision reflects the new digital headend, in which video, voice, and data services coalesce into a single digital system. RetroVue delivers the video portion of this all-digital triple play. Individual components interconnect through standardized Gigabit Ethernet (GbE), and can be deployed to fit any cable operator's network topology—centralized, distributed, redundant, or mixed. RetroVue system elements can interoperate with legacy and third-party equipment. They can also perform as standalone products.

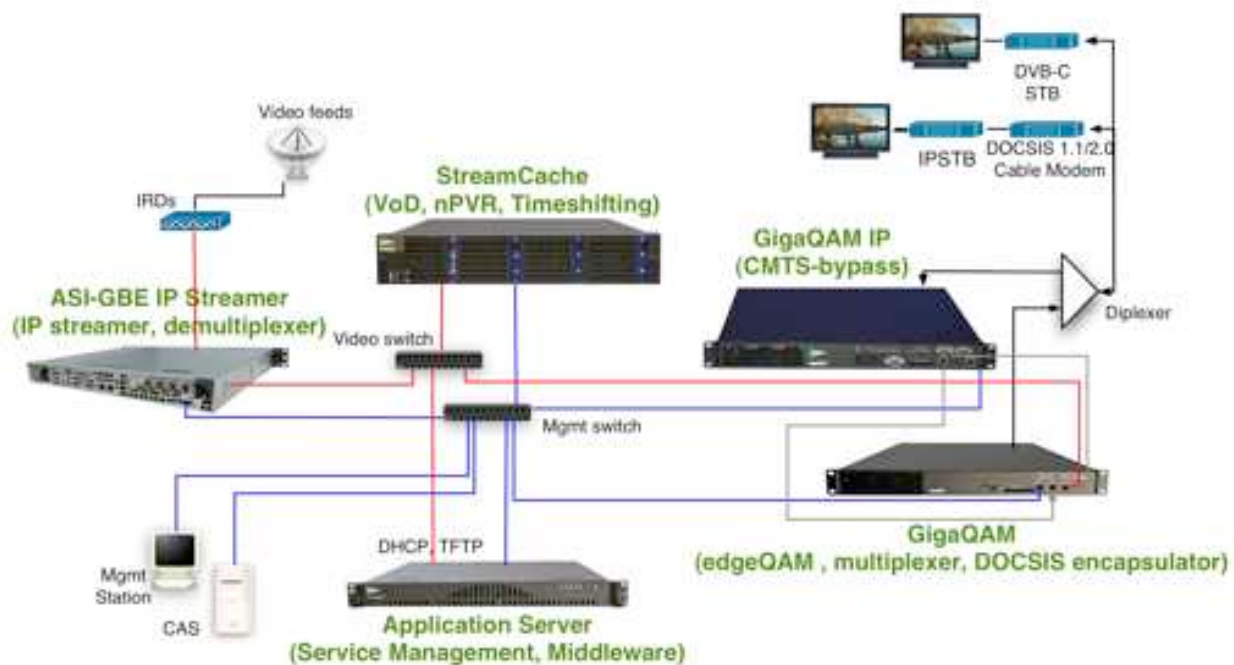


Figure 1 RetroVue System Diagram (Distributed Architecture)

Figure 1 illustrates the RetroVue system. GoBackTV-supplied elements include:

- GigaQAM® 3000 edgeQAM with DOCSIS® encapsulator and CBR/VBR multiplexer
- GigaQAM IP for IPTV-over-cable timing and control information
- StreamCache™ high-ingestion-rate digital video server
- RetroVue Application Server for service and subscriber management, lightweight middleware, and element management
- ASI-to-GbE IP streamer and MPTS demultiplexer for integration with legacy equipment.

Other components not shown include:

- GigaQAM 1000/2000 narrowcast/broadcast edgeQAM
- DVB-Sifter (DVB-SI parser), as needed for extracting program information from DVB-SI tables

**GigaQAM edgeQAM.** GigaQAM enables narrowcast, broadcast, and switched digital broadcast transmission in a single compact package. It provides 24 QAM-RF outputs, integrated with an extremely versatile software-based multiplexer and optional conditional access scrambling in a 1RU chassis. The GigaQAM 3000 also performs DOCSIS encapsulation for IPTV-over-cable via CMTS-bypass, using DOCSIS timing and control information from a GigaQAM IP bypass controller. Channels are dual-bonded but otherwise completely frequency agile. Inputs are Gigabit Ethernet RJ45 ports, which are used for video input, dual-homing or DOCSIS upstream traffic, and management.

**GigaQAM IP CMTS-bypass controller.** The GigaQAM IP enables affordable delivery of IPTV over cable, using existing standards-based DOCSIS® 1.1 and 2.0 cable modems and low-cost IP set-top boxes. The GigaQAM IP provides DOCSIS timing and control information for up to eight attached GigaQAM 3000 edgeQAMs (192 QAM channels), allowing the edgeQAMs to deliver any mix of DOCSIS and traditional MPEG2 video, even within a single channel. It also provides up to six upstream channels to be shared among the downstreams.

In combination with GoBackTV's field-proven GigaQAM edgeQAM technology, the GigaQAM IP provides a versatile, extremely cost-effective way to deliver broadcast, multicast, and unicast services over both traditional MPEG2 and IP. It also allows MSOs to leverage the development boom in IPTV technologies, including a wide variety of readily available IP set-top boxes, MPEG-4 encoding, advanced encryption systems, soft-client conditional access, and interactive middleware.

**StreamCache high-ingestion-rate video server.** StreamCache is a 2RU server that currently provides up to 1700 hours of real-time storage at 3.8Mbps, and sufficient disk throughput to simultaneously ingest 100 digital channels and serve 480 independent, non-blocking 3.8Mbps video streams. StreamCache supports VOD, network PVR, and revolving-buffer timeshifting applications like Startover. I/O and management ports are Gigabit Ethernet.

**RetroVue Application Server.** The RetroVue Application Server is the heart of the RetroVue System, and coordinates RetroVue System components to deliver a complete spectrum of stream-based video services, including switched broadcast, Video on Demand (VoD), network PVR (nPVR), time-shifted television, Start Over and Look Back, historical EPG, user-based profiles, and personalTV services. It manages and controls the entire RetroVue system, including service creation, subscriber management, dynamic scheduling of video streams and edgeQAM resources, system monitoring and data collection, and GUI-based element management and configuration. The platform also provides host support for MyRV Portal

HTML-based middleware, which enables television service providers to deliver customized navigation and information services to subscribers' set-top boxes using a standard HTML browser interface. By leveraging industry standards, client GUI layout and appearance are simple to customize or update, and can even be done in-house using standard design tools.

**ASI-to-Gigabit Ethernet IP Streamer.** The AG4404 converts up to 4 ASI's worth of MPEG-2 transport streams into a Gigabit Ethernet stream in order to bridge the gap between legacy interfaces and RetroVue components. The output stream can be unicast or multicast IP or native Ethernet. Input Multi-Program Transport Streams (MPTSs) may be transmitted in "pass-through" mode or may be demultiplexed into individual Single Program Transport Streams (SPTSs) for simpler remultiplexing or for transmission to separate destinations. In addition, the ASI-GbE IP Streamer can perform the same function as the Sifter, and provide DVB-SI-based EPG information to the RetroVue Application Server.

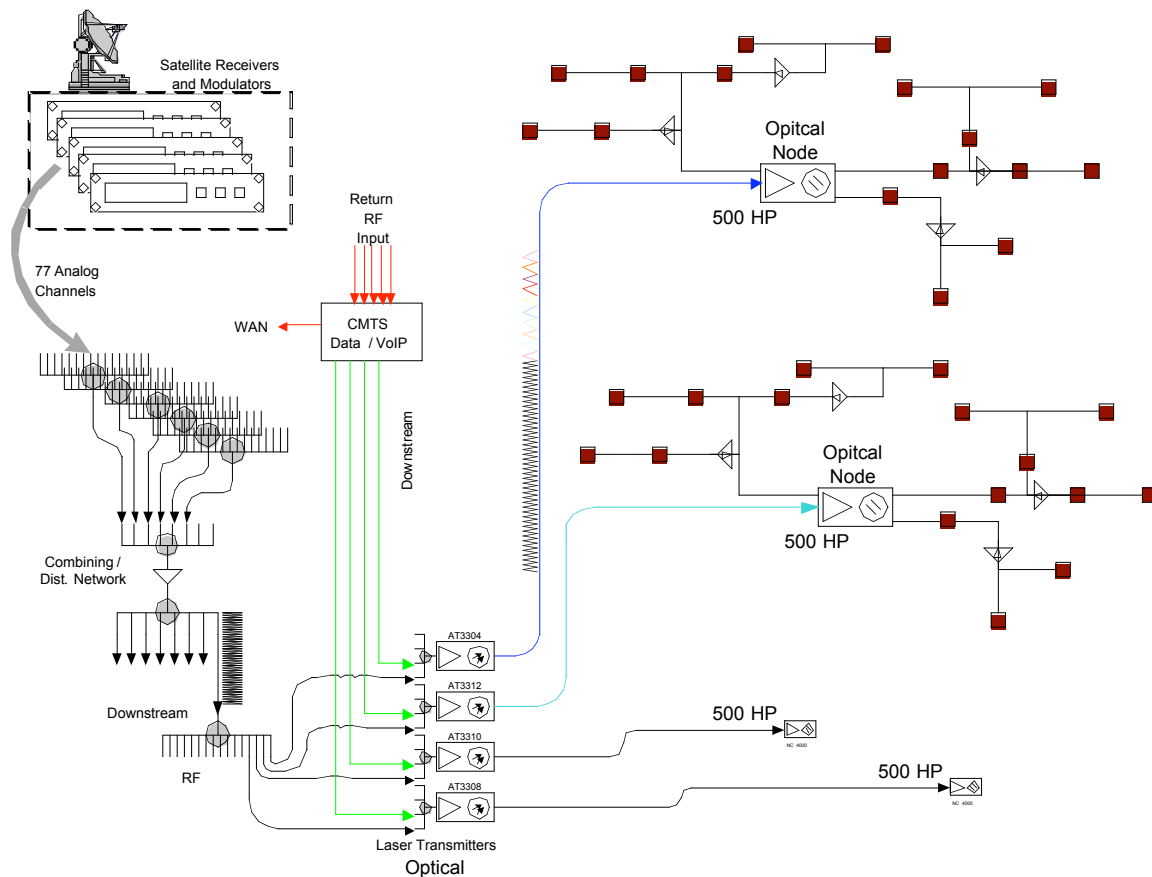
**DVB-Sifter.** The Sifter is used to probe the DVB System Information (SI) tables embedded within DVB-C transmissions and extract Electronic Program Guide (EPG) information for the RetroVue Application Server databases. With this information, the RetroVue Application Server creates a historical EPG to help viewers locate and navigate time-shifted content. The input port for the Sifter is Gigabit Ethernet.

## How to get started with RetroVue

RetroVue System components can be deployed as standalone elements to deliver just the functionality you need, when you need it. For example, GigaQAM can be deployed alone as a broadcast QAM gateway during a cable operator's analog-to-digital transition, to carry a simulcast digitized version of the analog channel lineup. Once the migration is accomplished, analog channels can be recovered, and the newly-freed bandwidth repurposed for stream-based services such as switched broadcast, time-shifting, VoD, and nPVR by adding GigaQAMs, StreamCaches, and RetroVue Application Servers. In addition, the QAM channels can deliver IPTV through DOCSIS 1.1/2.0 cable modems with the addition of a GigaQAM IP CMTS-bypass controller.

As the demand for personal streams increases, the RetroVue System can be incrementally expanded. Half a rack (20RU) of RetroVue head end components can service 2000 independent MPEG-2 video streams, including real-time ingestion of 100 channels of digital video, play-out of 2000 independent streams, remultiplexing, timing correction, conditional access encryption, stream processing, and 64/256 QAM-RF modulation, all at a fraction of today's VoD per-stream costs.

## How does RetroVue fit in the cable plant?



**Figure 2 Traditional cable headend**

RetroVue System elements can be inserted gracefully into a working headend, in parallel with existing equipment and services. Digital video sources with traditional ASI interfaces, such as IRD/IRTs, encoders, remultiplexers, and video groomers can feed into an ASI-to-GbE converter for protocol conversion to Gigabit Ethernet, and demultiplexing if necessary. StreamCache video servers can intercept video streams carried on Gigabit Ethernet to provide storage and play-out for on-demand services, or can be bypassed by legacy VoD and non-stored video. GigaQAM edgeQAMs accept video input on Gigabit Ethernet, and output QAM-RF into the plant's combining network. The GigaQAM IP CMTS-bypass controller enables the GigaQAM to use any or all of its channels to carry IP traffic as well.

GoBackTV equipment can accept native Gigabit Ethernet input, or IP/UDP-encapsulated Gigabit Ethernet, with either multicast or unicast addressing. Content may be pre-encrypted by Conditional Access systems, or it may be encrypted by GigaQAM on the fly using DVB Simulcrypt, 3DES, or AES.

Although diagrams in this document show all components, each RetroVue product may be used independently from the others.

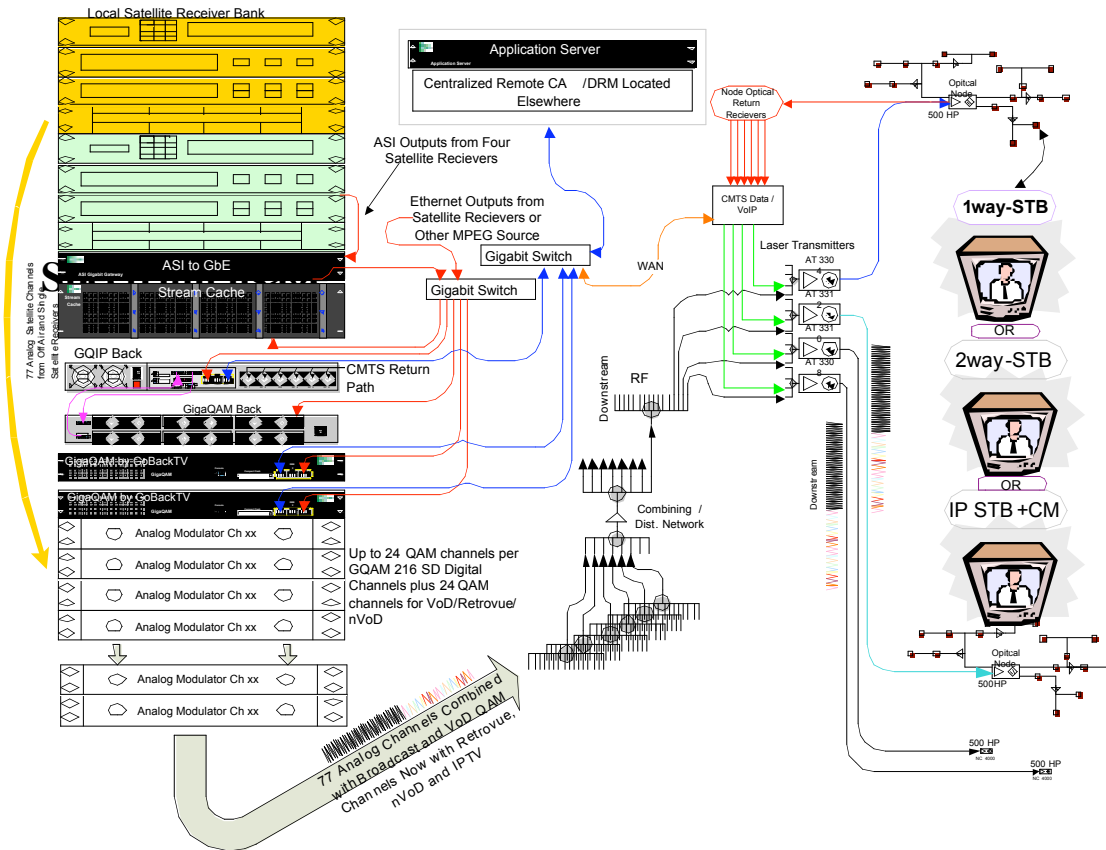


Figure 3 Cable headend with RetroVue System elements

During initial rollout, GigaQAM can be used to modulate as few as one or two 6Mhz or 8MHZ channels on any given trunk. This allows GigaQAM-supported services to be installed in parallel with legacy services. Figure 4 illustrates this situation.

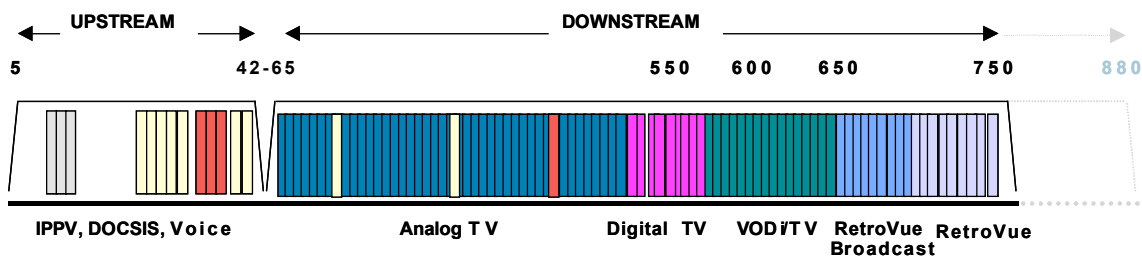


Figure 4 Spectrum usage during the transition

In an all-digital, all-switched broadcast future, RetroVue can be used to provide every television set in a node with its own unicast channel, enabling unlimited services. Cable operators could offer their subscribers many more channels and services than today’s 550MHz and 750MHz

plants can carry, since each television can only watch one channel at a time. A node size of 500 households passed could be served at 100% penetration, 100% peak usage, and more than two televisions per house. Figure 5 illustrates this case.

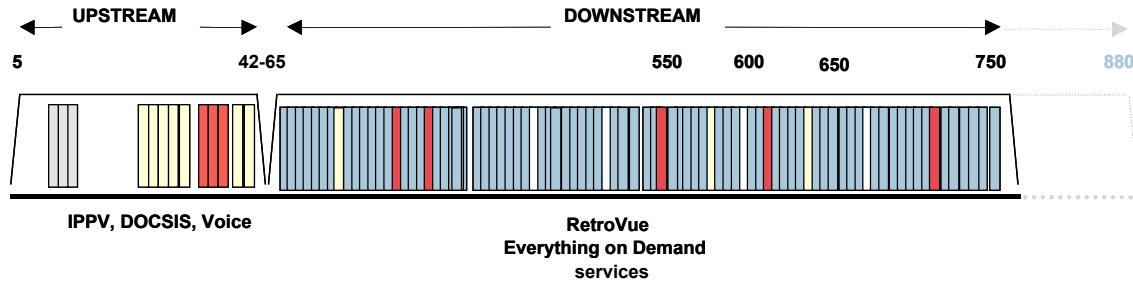


Figure 5 Spectrum usage in a switched broadcast/unicast mode

## Conclusion

RetroVue takes television viewing into the future. It co-exists with existing digital services; it enables added-value services that generate new cash flows; and it gives a competitive advantage in the battle to gain new digital subscribers, regain lost subscribers, and retain existing subscribers.

The RetroVue System streamlines the transition from analog to digital broadcast, from digital to switched broadcast, from standard-definition to high-definition, and from broadcast to narrowcast/unicast services like VoD, IPTV, time-shifting, network PVR, and advanced advertising. GoBackTV strives to help MSOs implement their visions for the services of today and tomorrow by providing affordable, compact, and interoperable components.



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