

# White Paper

## IPTV Content Aggregation With S75 and S75CA DVB-S Receivers

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## Introduction

The purpose of this document is to describe the use of Novra Technologies Inc. S75-PRO satellite receiver (MPEG video forwarder) and/or S75CA (MPEG video forwarder) satellite receiver with DVB conditional access common interface for multicast distribution of satellite TV streams onto corporate LANs, cable TV head-ends or IPTV head-ends. The S75-PRO/S75CA provides a compact, economical solution that enables bridging of multi-channel DVB-S to Ethernet. It has the ability to forward up to 60 Mbps of aggregated transport stream data for re-distribution onto a LAN that makes it an ideal, low cost solution for content aggregation and distribution into IPTV or cable TV head-ends, or multi-dwelling environments such as hotels or apartments.

This white paper discusses the application of the S75-PRO and S75CA DVB-S receivers as a content aggregation source and distribution means into an IPTV downlink and the factors to be considered in the design.



## Network Description

The Network diagram (shown below in Figure 2) illustrates a typical IPTV downlink. The intent of this white paper is to discuss the application of the S75-PRO and S75CA DVB-S receivers as a Content Aggregation Point (CAP) within an IPTV down link head-end. The use of the S75-PRO or S75CA allows the operator to receive the MPEG content via satellite and aggregate it onto a single LAN for further processing or distribution to the IPTV clients. To give the reader an overall view of the IPTV network, a very brief description is provided of some of the other elements of the IPTV distribution network, such as transcoding the MPEG data rates, IP encryption and video storage. These elements are also shown below in Figure 2.

## Satellite Signal Reception

Referring to Figure 2, initial reception of the MPEG signals occurs at the satellite dish. The number of satellite dishes used depends on the number of satellite signals that the system needs to receive. Generally one dish per satellite is needed.

Dual LNB's provide both polarizations to the receivers. The L-Band signal may be split using RF splitters and connected to the S75-PRO and/or S75CA receivers. Network Engineering should be applied to ensure redundancy and load balancing are achieved within the S75 pool.

## Content Aggregation

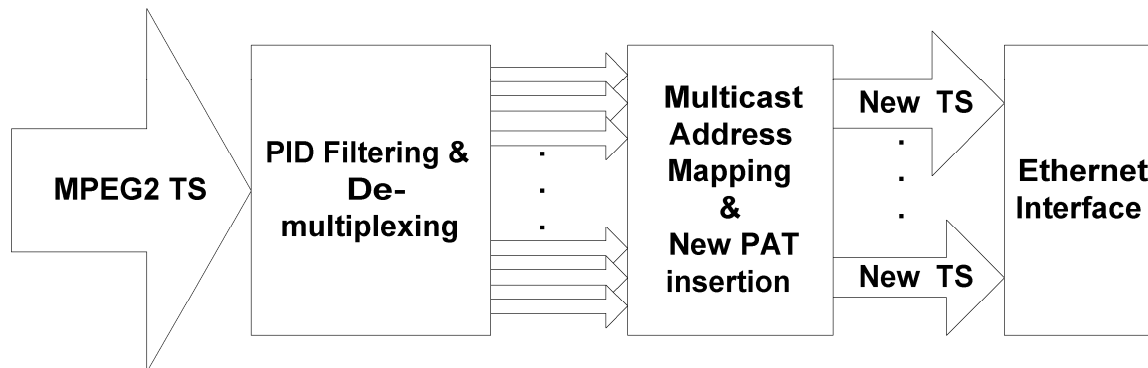
Content aggregation is performed using the Novra S75-PRO and S75CA receivers. The received RF signal is down converted to a standard Intermediate Frequency (IF) and fed to the S75 receivers. In the S75-PRO/S75CA, this signal is demodulated and the MPEG transport stream packets are extracted and placed onto the Ethernet LAN. The S75-PRO is able to receive un-encrypted or free-to-air signals. Reception of DVB encrypted signals is performed by the S75CA. The S75CA supports a standard Conditional Access Module (CAM) Common Interface (CI), enabling it to interface with many of the well-known DVB conditional access systems.

In this example, multicast is used by the S75s to forward the MPEG traffic on the LAN. Using the S75 configuration management tool, received Program Identifiers (PID's) are mapped to multicast addresses. In this way, related PIDs may be grouped together (such as audio and video) and forwarded to a common multicast address. IGMP is deployed in downstream devices to enable the reception of only the desired content.

The S75-PRO and S75CA also provide the operator enhanced MPEG routing capabilities<sup>1</sup>. Often it is desirable to send a single video stream with several different audio channels, each as a separate transport stream. This optional feature of the S75-PRO/S75CA will enable the operator to group multiple PIDs together in a single program stream. This stream is sent out the Ethernet interface along with a re-generated Program Association Table (PAT). The S75-PRO (or S75CA) is therefore able to support Single Program Transports Streams (SPTS) or Multi Program



Transports Streams (MPTS). The firmware also enables a single PID, such as the video PID, to be sent repeatedly in several different multi program transport streams. In this way, a single video stream may be combined with several different audio channels (each a different language, for example), and each audio/video combination sent out of the S75-PRO/S75CA as a separate transport stream. This enhanced functionality is illustrated in the Figure 1 below.



**Figure 1 - S75-PRO and S75CA Enhanced Capability**

The S75-PRO and S75CA provide the IPTV service provider with a very low cost/high-density content aggregation solution. By employing a custom-designed hardware package, the S75 family of receivers provides the operator with a superior performing receiver that has the following attributes:

- High reliability (no moving parts)
- Low cost
- Low power consumption and cooling requirements
- High rack density - Both receivers are available in a 1 Rack Unit (RU) chassis that will support up to 3 S75-PROs or 3 S75CAs per rack unit

Each S75-Pro can support up to a full transponder of channel reception and the S75CA will support the reception of 1 or more encrypted channels, depending on the type of CAM employed. Given the S75's cost, performance, size and power consumption attributes, it is a MPEG content aggregation solution that appeals to both large and small service providers alike. The photo in Figure 3 below illustrates this point – here a bank of 18 S75CAs and 6 S75-PROs are housed in an 8 RU rack space.

An S75-PRO/S75CA management station may be utilized to configure the individual receivers, or to monitor the status of the receivers. It is also possible to extend the functionality of the management station to provide custom applications such as enabling S75 hot swapping, load sharing, redundancy, and/or parsing of service information table for a complete list of programs in XML or custom formats. Novra will work with customers to customize the management station to suit their needs.

## Content Distribution – Other Elements in the IPTV Head End

The traffic output from the S75-PRO/S75CA receivers is aggregated at the first layer on a gigabit Ethernet link to the main distribution switch. Conversion to Ethernet provides a convenient means to provide additional traffic shaping and/or distribution elements needed to get the TV signal to the end customer. The implementation and/or detailed discussion of these elements is outside the scope of this paper, but is included to give the reader an understanding of what further elements may be needed.

In the Figure 2 example below, a transcoder has been included to enable the higher bit rate channels to be transcoded down to match bandwidth available to each customer. In cases where the received signal bitrate is less than the existing customer channel size, this step can be omitted.

In deployed networks, it is often necessary to re-encrypt the decrypted MPEG signals coming from the S75CA. In this case, an IP Encryption appliance has been included to enable re-encryption of the TV signal prior to distribution to the end customer. For channels that don't require re-encryption (such as free-to-air services), this step may be omitted.

Once the data is received by the S75s, it may be temporarily (or permanently) stored in Video server(s). This opens up the possibility of providing enhanced customer features, such as Video-on-Demand where stored movies may be available for viewing or television shows may be offered on a time-limited basis.

Distribution to the end customers is done via IP and Ethernet. Low cost MPEG-2 Set Top Boxes (STBs) are deployed to request and receive the digital video/audio signals. In our example multicast is utilized throughout the network. This enables the customer STB to receive streamed content directly from the S75(s), or from the transcoder, or from the IP encryption appliance. Stored content may be requested by the STB from the video server.

## Content Distribution - Traffic Management and IGMP

When IGMP is employed throughout the network, every receiver (or appliance) will send the channels for which it receives an IGMP request. The switches will forward traffic on the links from which it has received IGMP replies. This implementation will ensure overloading the end user links with unnecessary traffic does not occur.

If necessary, IGMP can be turned off via the S75-PRO/S75CA management console. In this case the multicast management capabilities of the Ethernet switches may be employed to control the traffic flow through the network.

For budgetary link analysis, it is common to use 6 to 4 Mbps for a video channel with associated audio. The channel can utilize up to 8 Mbps or as low as 2 Mbps depending on the encoding employed.

<sup>1</sup>Optional Firmware Feature



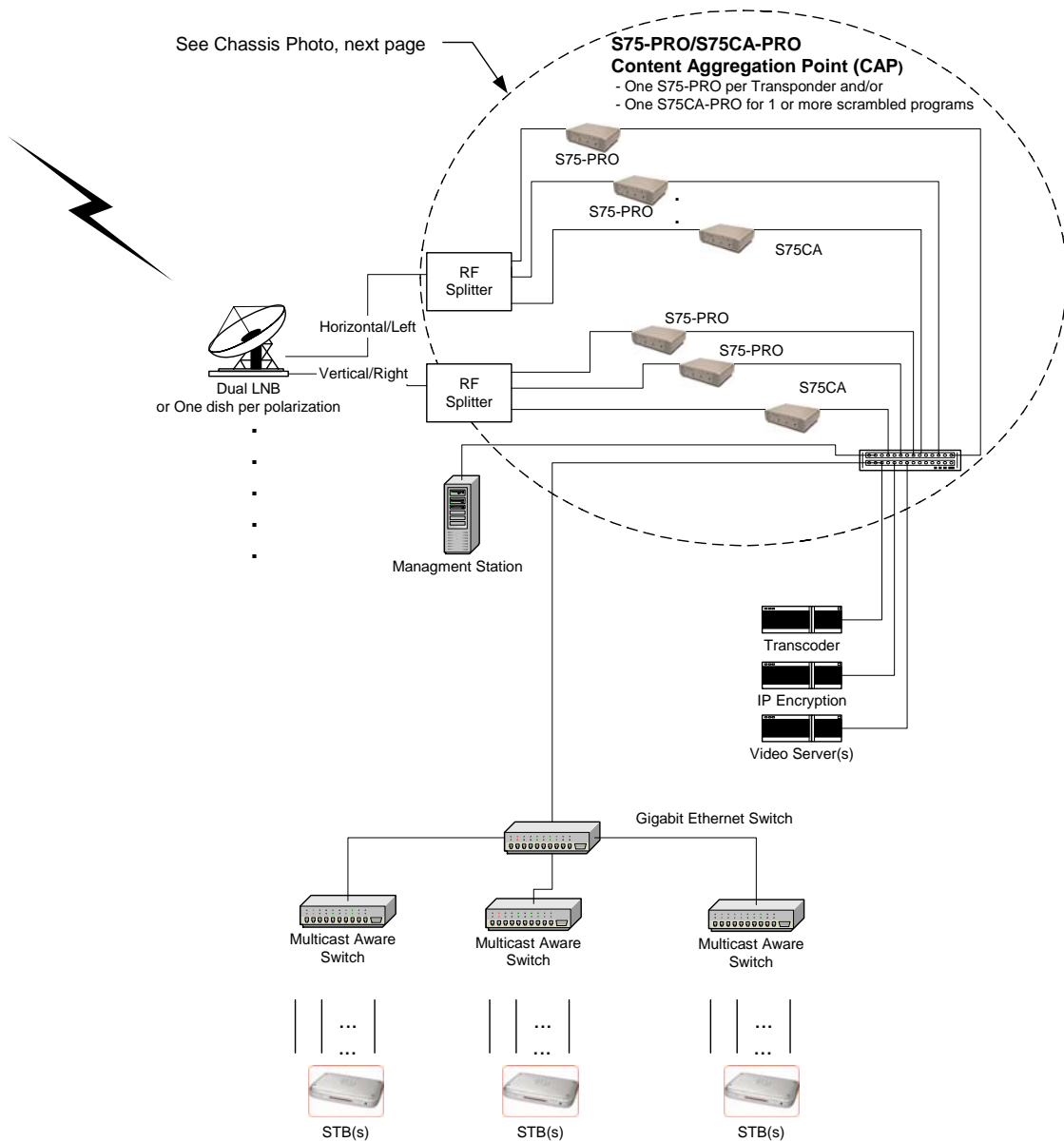
## System Considerations

In general, the installation of an S75 Content Aggregation Point for the multicast distribution of satellite transport streams will require detailed consideration in a number of areas. These include:

- Dish installation and link budget considerations
- RF signal levels
- Receiver power supply options and receiver rack mounting options
- Receiver Redundancy and availability
- Network Monitoring and Management

Novra Technologies can provide system integration and engineering services to assist in the deployment of the S75-PRO and S75CA subsystem into applications such as the IPTV service described above.





**Figure 2 - IPTV Network Diagram Example**

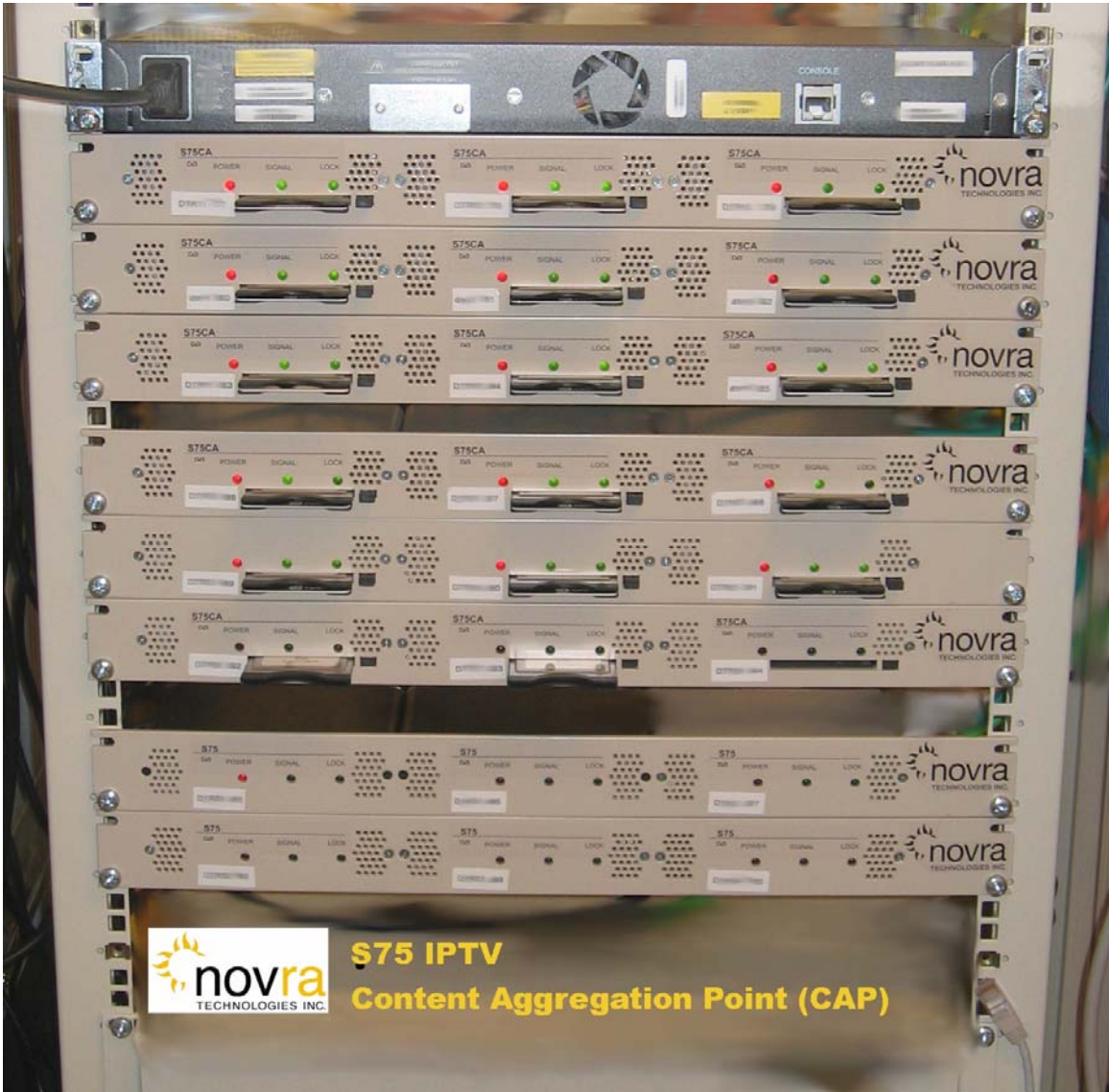


Figure 3 - IPTV Downlink CAP Rack



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## Terms and Acronyms

S75-PRO	Specific version of the S75 DVB-S receiver that forwards MPEG traffic to the LAN
S75CA	Specific version of the S75 DVB-S receiver that forwards de-encrypted MPEG traffic to the LAN
PVR	Personal Video Recorder
VOD	Video on Demand
IPTV	Internet Protocol Television
LNB	Low Noise Block, down converts satellite signal to L-Band
DVB-S	Digital Video Broadcasting standard satellite signal (ETSI standard13818-1)
RU	Rack Units (1RU = 1.75" in a 19" rack)
PAT	Program Association Table
IF	Intermediate Frequency
RF	Radio Frequency
PID	Program ID

