White Paper

IPTV Solutions With Novra DVB Receiver Gateways

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Notice

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Introduction

The purpose of this document is to describe the use of Novra receiver for multicast distribution of satellite TV streams onto organizational LANs, cable TV head-ends or MDU IPTV head-ends. The S300V/CA provides a compact, economical solution that enables bridging of multi-channel DVB trasnsport streams to Ethernet. It has the ability to forward up to 80 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 Novra receiver gateways 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 Novra receivers as a Content Aggregation Point (CAP) within an IPTV down link head-end. The use of the receivers 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 Novra receivers. Network Engineering should be applied to ensure redundancy and load balancing are achieved within the receiver pool.

Content Aggregation

Content aggregation is performed using the Novra receiver gateways. The received RF signal is down converted to a standard Intermediate Frequency (IF) and fed to the receivers. In the receiver, this signal is demodulated and the MPEG transport stream packets are extracted and placed onto the Ethernet LAN. The receiver is able to receive un-encrypted or free-to-air signals. Reception of DVB encrypted signals is performed by the CA version of the Novra receiver. The CA version 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 receivers to forward the MPEG traffic on the LAN. Using the Novra 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 Novra receivers also provide the operator enhanced MPEG routing capabilities[1]. 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 Novra receiver 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 Novra receiver) 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 receiver as a separate transport stream. This enhanced functionality is illustrated in the Figure 1 below.

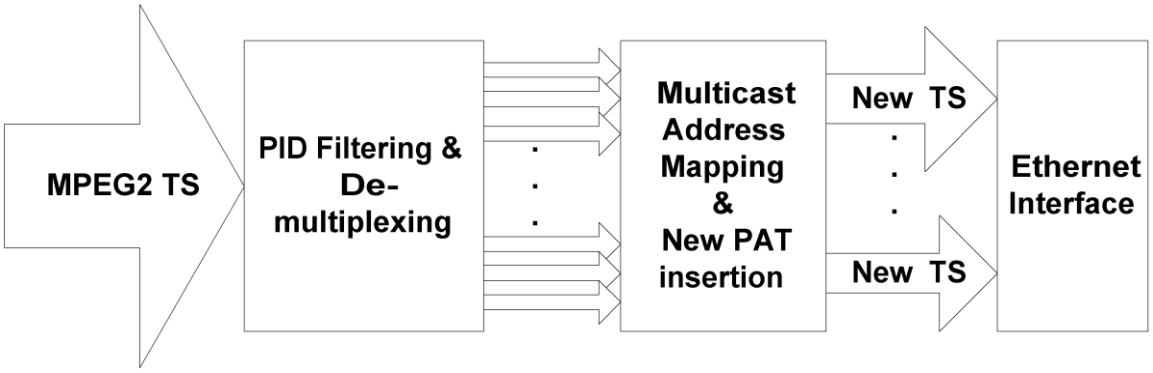

Figure 1 – Novra Receiver Enhanced Capability

The S300V/CA provide the IPTV service provider with a very low cost/high-density content aggregation solution. By employing a custom-designed hardware package, the Novra family of receivers provides the operator with a superior performing receiver that has the following attributes:

- High reliability (no moving parts)
- High Value
- 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 receivers per rack unit (MSR)

Each receiver gateway can support up to a full transponder of channel reception and the CA version will support the reception of 1 or more encrypted channels, depending on the type of CAM employed. Given the Novra receiver 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. In Figure 4 is an example of a 1 rack unit multiple receiver unit that includes three Novra IPTV receiver gateways.

An receiver 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 receiver 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 Novra receiver gateways 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 decrypted CA streams. 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 Novra IPTV gateways, 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 IPTV 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 Novra receiver(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 Novra receiver 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.

[1]Optional Firmware Feature

System Considerations

In general, the installation of an Novra IPTV 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 Novra receiver gateway subsystem into applications such as the IPTV service described above.

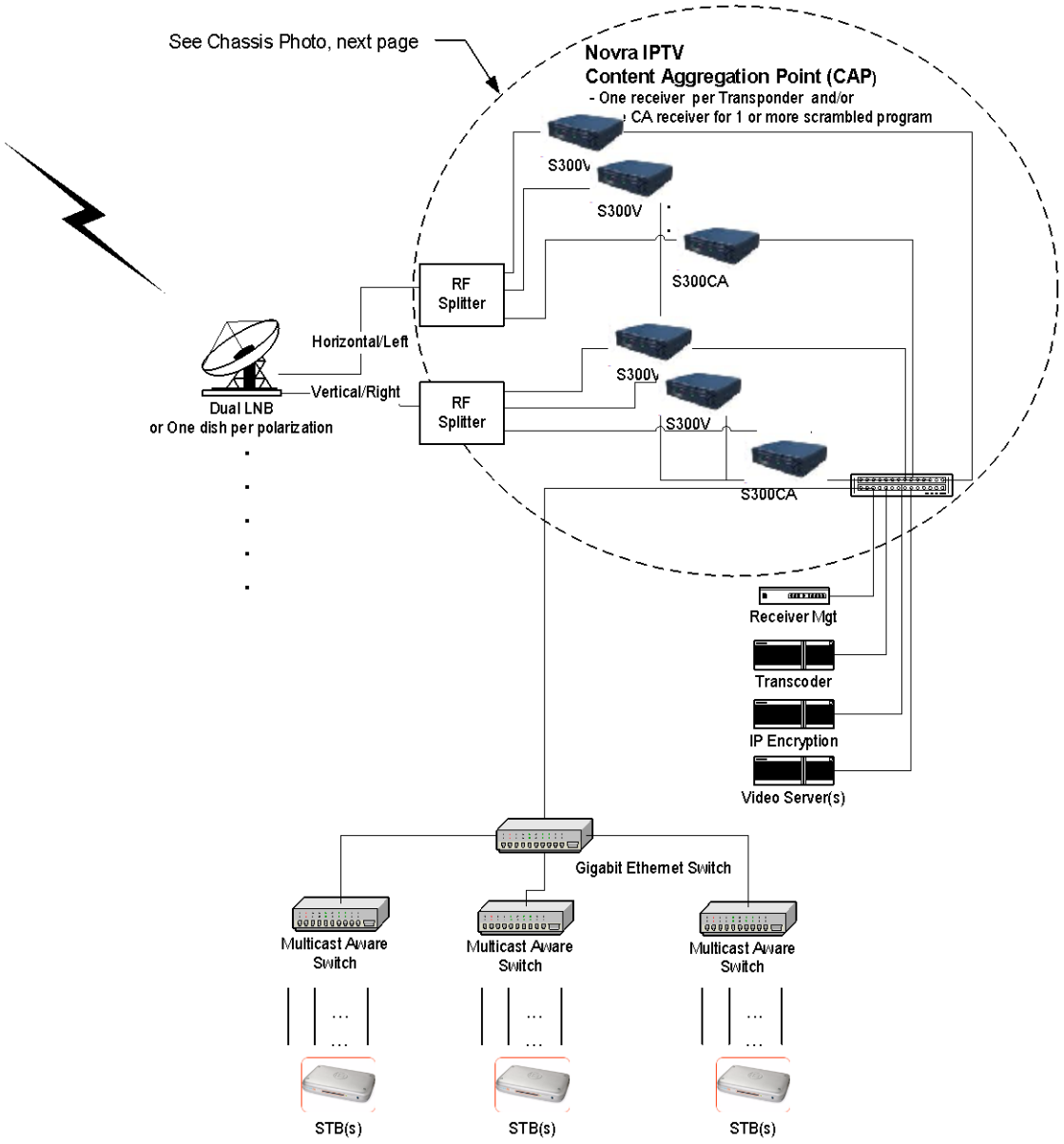

Figure 2 - IPTV Network Diagram Example

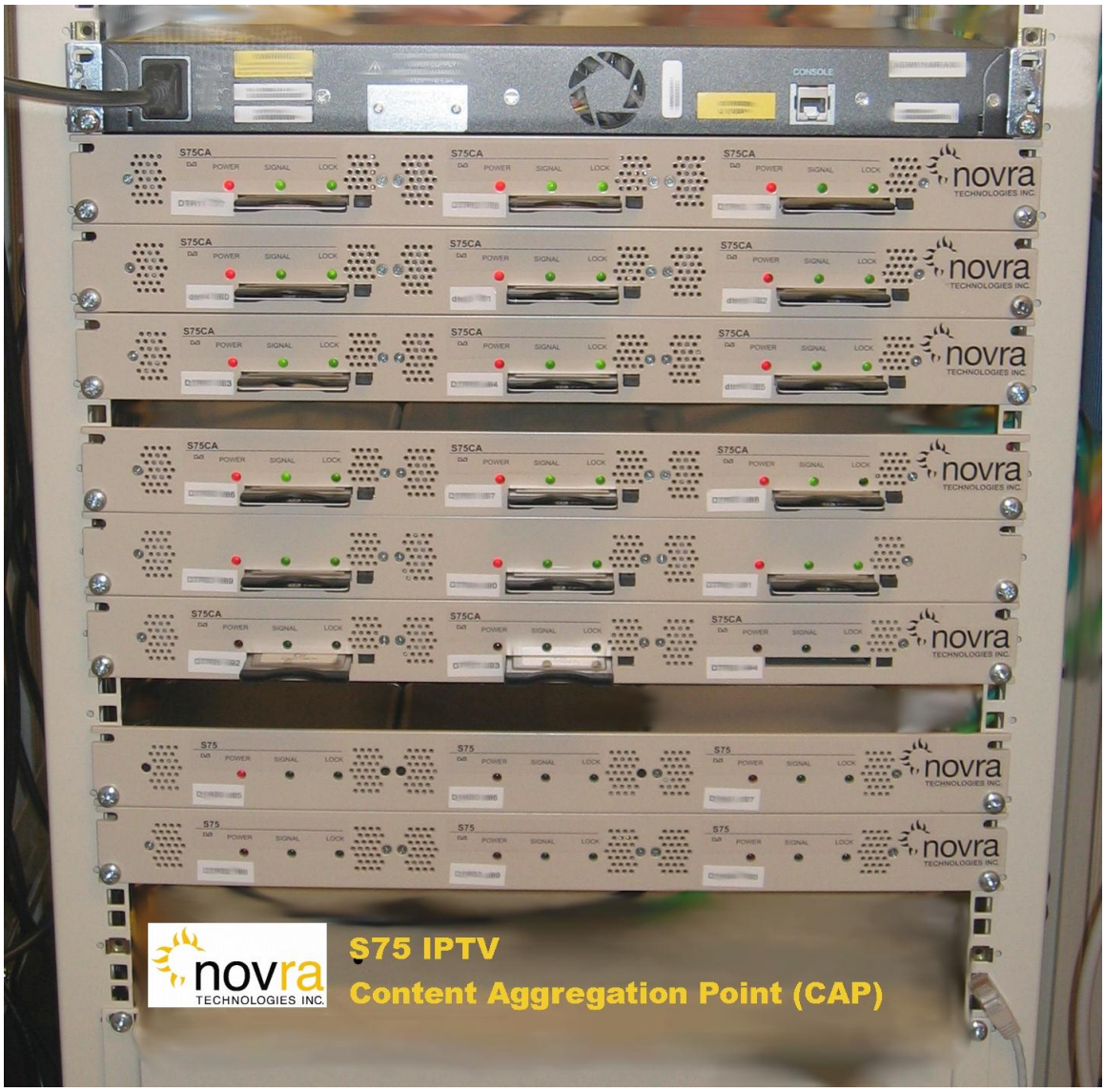

Figure 3 - IPTV Downlink CAP Rack

Figure 4 – Novra IPTV MSR Rack

Terms and Acronyms

S300V	Specific version of the S300 DVB-S2 receiver that forwards transport stream traffic to the LAN
S300CA	Specific version of the S300 DVB-S2 receiver that forwards de-encrypted transport stream 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