ENENSYS Technologies

Application Note

Distributing DVB-H content over IP networks

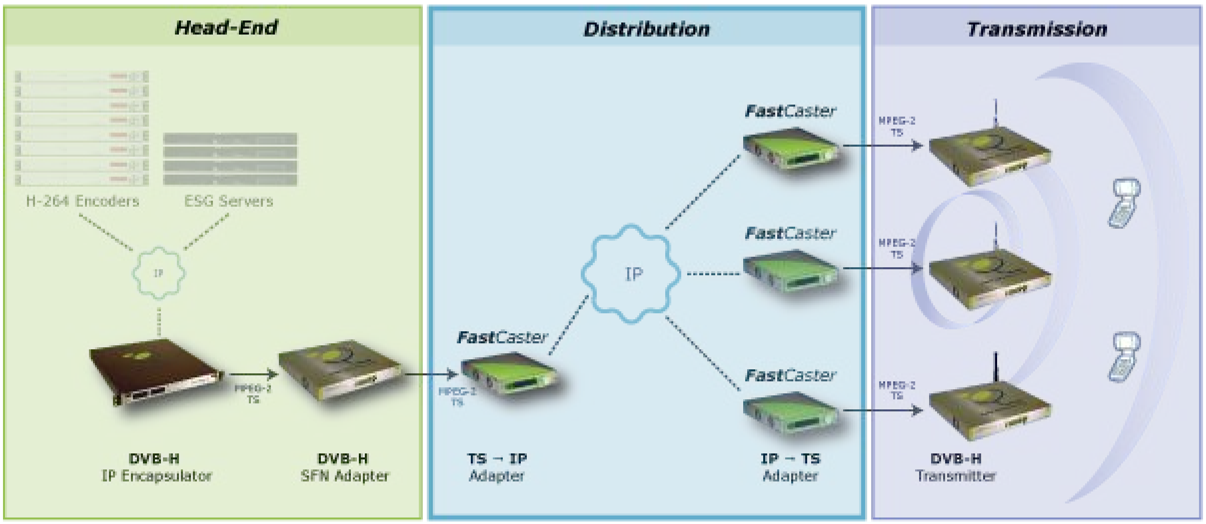
IP networks are becoming increasingly important and are now replacing standard distribution solutions such as ATM and satellite. In addition, leased lines prices are decreasing while bandwidth capability keeps on increasing. For those reasons, professional broadcasters logically moved to IP distribution which offers the same quality of service while dramatically ***reducing both CAPEX and OPEX expenses****.*

DVB-H MPEG2-TS over IP

The Pro-MPEG Forum WAN Group published a code of practice (Pro-MPEG Code of Practice #3 release 2, "CoP3") which provides guidelines for the transmission of professional MPEG2 Transport Streams over IP Networks.

DVB-H content is provided by IP Encapsulators also known as IPE. IPE encapsulate video/audio contents into "bursted" DVB-H MPEG2-TS compliant streams along with signaling (PSI/SI tables). Those MPEG2-TS streams must then be sent to the modulators/transmitters (distribution).

In order to perform distribution over IP, the MPEG2-TS stream must be encapsulated into IP packets (RTP packets), following CoP3 recommendations. DVB-H is aimed at mobile TV so the required throughput is limited (around 400 Kbps per service). All together, a complete DVB-H stream will require between 4 and 20 Mbps which remains quite small compared to DVB-T or even higher bitrate streams (DVB-C, DVB-S, etc.). IP distribution is a very cost effective solution as the leased lines price directly depends on the required throughput.



Broadcast and multicast addressing

Multicast addressing, when using IP distribution, is particularly well suited to broadcast needs: The video content is sent from the head-end to all the transmission sites. There is no need to sent the video content independently to each transmitter thus saving a large amount of bandwidth.

Error correction vs Throughput

Transmission errors can still occur during the distribution, depending on the network link quality. However, CoP3 provides an error correction mechanism that is able to correct several problems such as out of order packets, duplicated packets and even lost packets.

The error correction mechanism, called Forward Error Correction (FEC) inserts extra data that is sent over the network link in order to correct the transmission errors at the receiving side.

Thus, depending on the network link quality, it is possible to decide on the amount of extra data that will be used for error correction.

Single Frequency Networks (SFN) and IP distribution

In order to save frequencies and deliver more services, broadcasters are moving from Multiple Frequency Networks (MFN) to Single Frequency Networks (SFN). SFN networks use the same frequency among the network cells whereas MFN networks use different frequencies. Thus, transmitters must be synchronized to build a SFN network.

A SFN adapter (or MIP inserter) is used at the head-end site to synchronize the modulators/transmitters. The SFN adapter inserts MIP packets (MegaFrame Initialization Packet) into the MPEG2-TS stream coming out of the IPE. Those packets are then used by the modulators/transmitters for synchronization purposes. Read our application note on "Addressing transmitters in a Single Frequency Network (SFN)" for more information on SFN networks.

SFN networks carry more constrainsts than MFN networks: The modulator/transmitters use MIP packets to configure themselves (MIP packets contain the modulation parameters that must be used by the modulators/transmitters) and as the bitrate must be very stable, they are not tolerant to any bitrate variation: There is no bitrate adapting done on the modulators/transmitters side (stuffing removal or adding) so the devices that provide the MPEG2-TS stream to the modulator must have a very stable output even if some problems occurred during the transmission. This can be a real problem when dealing with IP networks in which network jitter, data re-ordering or data loss can occur.

In order to work perfectly with any modulators/transmitters, IP to MPEG2-TS network adapters must embed complex algorithms that will compensate the network problems (delay, jitter, etc.), correct the transmission problems (packets re-ordering or packet loss) and provide an extremely stable output, synchronized with the transmitter.

When dealing with SFN networks, all the modulators/transmitters use a 10 MHz reference clock in order to synchronize with each other. This external 10 MHz clock reference is provided by a GPS, either internal or external to the device. In addition, most of the modulators/transmitters have a 10 MHz output that can be used to feed other devices that would require a clock reference. Thus, the synchronization between the IP to MPEG2-TS adapter and the modulator/transmitter can be achieve very easily by using the modulator's 10 MHz output.

If no clock reference is available for the IP to MPEG2-TS adapter, the internal clock can then be used. However, this clock is not as precise as a 10 MHz reference clock coming from a GPS so it is mandatory to correct the clock drift during the MPEG2-TS dis-encapsulation. Very few devices provide both mechanisms (external and internal 10 MHz) and this is one of the reason why Enensys MPEG2-TS over IP network adapters can be used without any problem when dealing with SFN networks!