

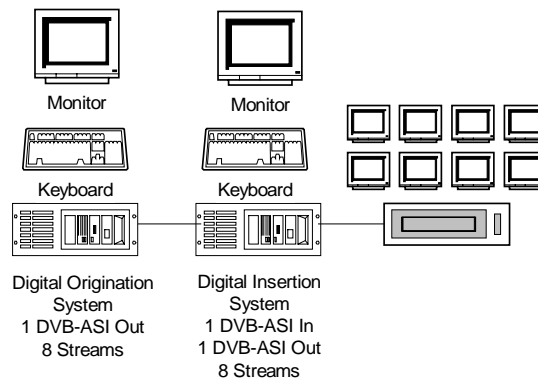


The Case For Digital Commercial Insertion Into CBR Streams

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The Case For Digital Commercial Insertion Into CBR Streams



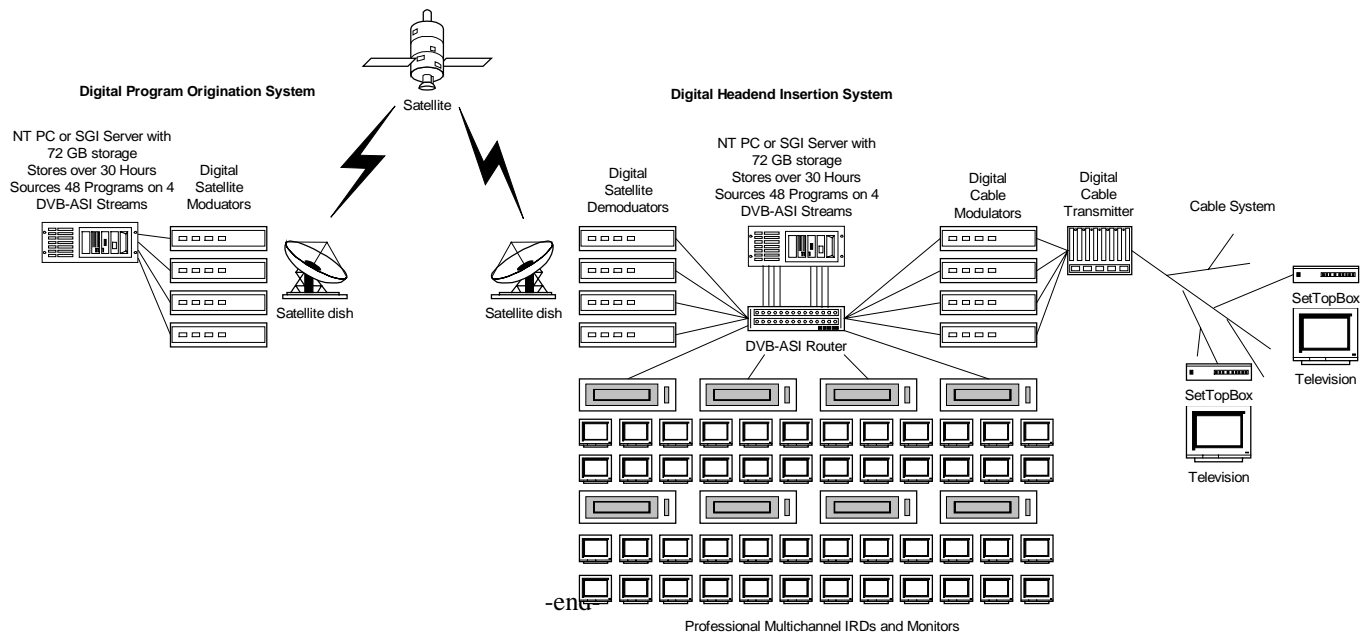
This demonstration clearly illustrates the efficiency of digital domain insertion directly into a CBR MPEG2 transport stream broadband DTV feed.

In this demonstration eight programs are originated from one PC based server system using Viewgraphics MediaPump DVB-ASI mux-adapter. The server feeds a single DVB-ASI link containing the eight multiplexed programs across to the insertion system. The insertion system is likewise a single PC server housing Viewgraphics' MediaPump adapter employing Viewgraphics MediaSplice seamless splicing technology. This system is used to insert commercials into the eight television programs simultaneously.

Operators of the demo can select a channel to insert into by pressing a number key on the origination system's keyboard. Depression of the key will cause the demonstration program to embed an insertion cue in the associated MPEG2 stream. Depressing the space bar will cause the insertion cue to be injected on all program streams. These cues are then transmitted to the insertion system. When the insertion system sees a cue in the incoming stream, it splices in a commercial segment from a list of segments stored within the insertion system. The commercial is then played directly out of the insertion system on the selected channel for the duration of the commercial. At the end of the segment, the play out reverts to the live stream being received by the insertion system.

Alternatively, operators can press any number key on the insertion system. This will cause a preemptive insertion of the next commercial independent of any cue information embedded in the incoming stream.

With this approach, the entire commercial insertion operation of a digital head-end can be performed by a single low cost server, as illustrated in the figure below.



By using multiple boards in a single commercial insertion server, more than one hundred simultaneous programs can be processed. With this highly efficient architecture, the cost per head-end can be contained to under \$100,000, resulting in a cost per channel of less than \$1000.

Alternative approaches, requiring expensive variable bit rate (VBR) and statistical multiplexor stream processing, decoding and recoding equipment, results in a cost per channel of at least ten and perhaps as much as twenty to fifty times as much. The cost per head-end will easily exceed \$1 million.

The United States cable industry has been very interested in VBR statistically multiplexed streams due to a significant increase in stream capacity that this complex technology provides. However, the economic benefit gained from this approach must be analyzed against the increased capital cost of the system wide deployment of the technology.

With over 5,000 cable head-end facilities to equip, and potentially hundreds of channels to insert into per head-end, the cost to the industry of a \$10,000 per stream price tag is at least \$5 billion versus a few hundred million with CBR transmission.

Switching into a VBR stream is fantastically complex, requiring at least partial recoding of the stream. This requires a lot of processing, so it is expensive. The recoding operation also results in visual quality degradation to the commercial. Anytime you decompress and recompress you are further damaging image quality. Advertisers are not going to like the fact that they are not getting the best quality possible.

The inability to guarantee image quality in general is another huge business problem with VBR statistical multiplexing. MPEG2 gains its efficiency by carrying multiple channels in a single digital feed. When you have a VBR statistically multiplexed stream you are constantly varying the image quality based on the complexity of all the streams carried together. If, for instance, there happens to be a lot of movement in the scene on several other programs in the multiplexed data stream the quality of all the streams must be reduced to prevent overload of the multiplex. Accordingly, it is impossible to guarantee program quality.

Commercial insertion provides the clearest example of the disadvantage of VBR statistical multiplexing, but this approach significantly impacts all DTV programs. The typical way these streams are generated is through real time encoding of all the video programs in the multiplex. The encoding parameters are adjusted based on feedback from the statistical multiplexer. In general, server systems that originate pre-compressed MPEG2 streams can't be used since the encoding parameters must be adjusted based on this feedback. This is a huge disadvantage since playout of precompressed streams from servers offers the potential for fantastic cost savings to the industry. Of course you can originate CBR streams from a server with subsequent re-encoding and re-multiplexing to reduce bandwidth into a VBR statistical multiplex. But, again we're talking about complex expensive technology. This may be good for head-end equipment providers, but it keeps DTV systems impractically expensive. The result will certainly be to greatly increase the price and hinder the pace of adoption of DTV.

Viewgraphics' MediaSplice delivers an effective, low cost, straightforward solution to MPEG2 seamless splicing for CBR streams. MediaSplice works with unmodified MPEG2 transport streams currently produced by industry standard MPEG2 encoders. No special clues or codes need to be encoded into the bitstreams. MediaSplice splices streams of different bit rates together, and it can process all programs simultaneously.

MediaSplice joins any valid CBR transport stream to any other valid CBR transport stream seamlessly. No recoding is performed, so the compressed MPEG2 stream suffers no quality degradation. No decoder buffer exceptions are introduced. The decoder buffer will not overflow or underflow. No black frames are inserted at the switch point and no discontinuities are presented downstream to the decoder.

The transition behaves like a normal video vertical interval switch or an insert edit. The first picture of the new stream is displayed immediately following the last picture of the old stream. The new stream continues to be decoded as if the decoder had been reset and begun with the new stream.

MediaSplice splices both video and audio in real time with very modest demands on the host computer system. Streams are processed for splicing as the data is transferred through the MediaSplice interface. Multiple splicing operations occur simultaneously. The spliced streams are then muxed together by the Viewgraphics' MediaPump into one output multi-program transport stream. Everything is done in real time.

In short, the technology is available to cost-effectively provide commercial insertion for digital television, but it is not possible to cost-effectively insert into VBR statistically multiplexed streams. We should be asking questions about overall systems economics and deployment issues and not letting one specific parameter - number of streams per transponder - be the ostensible justification for every major system engineering decision. Does the modest increase in the number of channels really justify the incredible increase in capital cost to the industry? There will certainly be some cases where it does, but in general the answer is most certainly; "no."