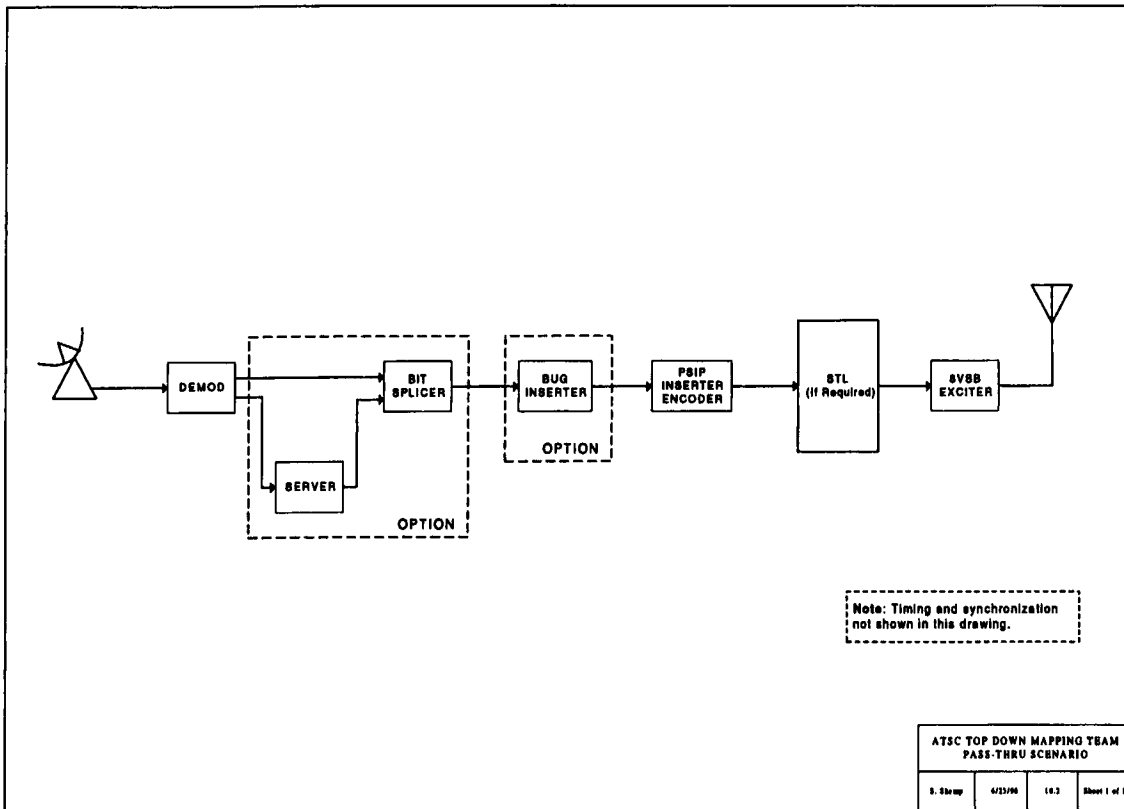


A station could store pre-encoded program or interstitial material on a transport stream server. Bit stream splicers can provide seamless switching between the network and local material, but this functionality is dependent on characteristics of the compressed bit stream.

Figure 2. Pass Through Scenario



Encoding and Multiplexing

Introduction

At the heart of the transition to digital broadcasting is the utilization of compression systems to optimize the program quality through limited bandwidth networks. Additionally, the transition to digital allows multiple streams (audio, video, data and control) to be multiplexed to share a common communication link. In addition to the encoding and multiplexing that must occur to provide an ATSC compliant transmission, an examination of the various paths that program information flows within a station clearly indicates that compression and multiplexing will have extensive use within the plant.

Video compression schemes have been under development for a significant period, and standards activities have resulted in the MPEG-2 standard being well documented and adopted by various manufacturers. The flexibility of this compression standard allows each manufacturer to exercise a number of options to provide the best tradeoff of cost and performance that they feel appropriate for their target applications. While this flexibility is key to ongoing improvements in video quality and programming choice, it can also lead to a multiplicity of design choices that potentially wreak havoc on interface standards. This confusion is multiplied by the application of compression encoders in various

points of the station operations, the multiplicity of video formats in the ATSC standard and the variety of channel bandwidths that could potentially be addressed. An additional complicating factor in this area is the level of integration found in various product offerings. Often manufacturers may deliver solutions that integrate video compression, audio compression, control and multiplexing in a single rack with the interconnection of these functions implemented through a proprietary interface.

Scope of Effort

In an effort to identify the choices broadcasters face, interfaces have been documented for a variety of implementation scenarios. An inventory of both current and expected future practice has been created. For defined scenarios, preferred standards/mechanisms are identified, with particular focus on scenarios that can be implemented in a practical fashion in the DTV Station in the mid-1999 time frame.²

Methodology

In order to provide as complete an inventory as possible, each interface on the reference Top/Down Map within the area of effort was reviewed. Current practices known to be in use by the industry current and expected future practice have been documented, without opinion on its future applicability. Where it is known that proprietary implementations may exist they are noted.

Near-term (before mid to end 1999) station scenarios are defined as a subset of the reference map. Examples include simple migration from analog to digital routing, basic DTV on-air functions, etc.

Using a particular scenario, a preferred standard/implementation is defined for each interface. If a single implementation can not be determined by consensus, a minimum subset of the inventory will be attempted.

Once near-term scenarios have been completed, longer term systems will be addressed.

Findings

In order to accommodate a variety of implementation scenarios that have been identified, numerous signal paths were added to the reference map. Interfaces were identified and added to address legacy NTSC transmitter links, compressed video connections from the router to the multiplexer and scrambling capabilities for connections to the transmitter and cable feeds.

As noted in the Multiple Video Format section, routing of signals within the station can utilize a variety of different formats. Interfaces for routers were documented for analog implementations as well as SMPTE 259 routers for standard definition signals. It should be noted that the data carried within the SMPTE 259 signal could be uncompressed or packetized as defined by SMPTE 305M or DVB-ASI. Routers capable of carrying 1.5 Gbps could carry uncompressed or packetized data of all rates. The encapsulation method for these various rates is currently undergoing SMPTE standardization.

A full inventory of the interfaces is attached in Appendix 2.

² The group identified that additional work should be done to document the potential use of Transport Streams (TS) and Elementary Streams (ES) in the studio.

Issues Pending

- Keyer and Splicer functions were not separated in the “existing” router plant (upper part of top/down map). Only splicing was considered at this point. A splicer does program switching, while a keyer overlays “bugs” onto a picture. Keyers should be added in a similar manner as done in the “HD” plant (lower part of top/down map).
- While format converters were added at the boundary point of the routers, these functional blocks were not yet considered. Interface types should be the same, however.
- Additional work is necessary to identify the preferred implementation for DS-3. Under consideration are use C-Bit, No C-Bit, and T1A1.5 MPEG over DS Hierarchy proposal.
- Currently, the signals for carrying the video in and out of the keyer have been documented, but no path for carrying information on location of the bug to be inserted in a logo application has yet been identified.

Issues for Further Consideration by IS

- It is noted that there will certainly be latency issues that could require additional functional blocks for synchronization. This need would be enhanced in the presence of format conversions that may need to take place. Based on the findings of the timing plane group, future effort should be spent to determine the precise functionality required as well as the preferred signal interfaces.
- Unless otherwise identified, AES-3 audio has been considered PCM Audio. However, the AES-3 stream may also be used as a data carrier. Any impact on the functional block diagram and required interfaces should be documented in future efforts.
- The group has also not accounted for all cases of associated data encapsulated in SMPTE 305M.
- To insure availability of service, redundancy of many functions will certainly be recommended. While in most cases, the interfaces will be likewise be redundant, the functional block diagram does not address this matter.
- As this effort has been focused on the signal paths, additional paths that may be required for synchronization of data services to other related program elements remain to be identified and documented.
- The carriage of Audio metadata has not been determined, so additional signal paths that connect the source of the data with AC-3 encoders may need to be identified and documented.
- In the event that some output connections from the ATSC multiplex may not directly connect to the transmitter or cable facility, there may be the potential that these interfaces could operate at rates other than 19.4 Mbps or multiples thereof.

Station In/Out

Introduction

There are a variety of means by which the station receives the content it ultimately packages and delivers to its audience. This subgroup focused on the implementation of network feeds and other contribution links to and from the station. The group also dealt with how stations will implement communications links between the studio and the transmitters for both the NTSC and digital simulcast services.