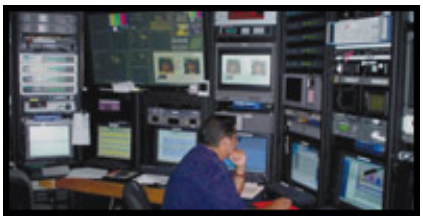
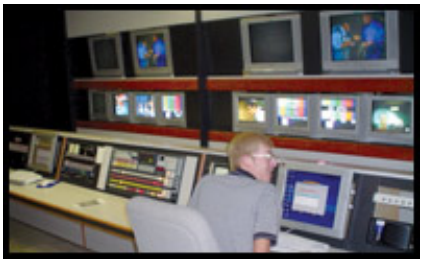
Broadcast Engineering
THE JOURNAL OF DIGITAL TELEVISION
JANUARY 2004

Multichannel broadcasting

BY JIM BOSTON AND MARK BROWN





For some broadcasters, multichannel is the next step in their digital evolution. KCSM−DT in San Mateo, CA (bottom left), broadcasts one HD and two SD channels; KTXT−DT in Lubbock, TX (center), broadcasts four SD channels along with its HD channel; and KLVX−DT (top right) delivers a mix of one HD and three SD channels, along with 12 channels of instructional television services, to its Las Vegas, NV, viewers. Photos courtesy SignaSys.

Local stations' migration from providers of a single NTSC over-the-air service to that of multiple ATSC services is slowly gaining speed. To the broadcast community, this migration has moved beyond a mandate to a matter of downright survival. Most broadcasters, especially commercial broadcasters, began with the minimal required DTV services. By contrast, PBS stations have received additional funding to deploy leading-edge projects, and some have gone beyond the base FCC requirements and experimented with ATSC's potential — offering multiple services from the beginning. These stations understand the business potential additional services can offer. Conversely, commercial broadcasters, as a rule, have looked upon DTV as an added burden that brought much to the expenses column and thus simply subtracted from the bottom line.

However, commercial broadcasters are now starting to realize that in just a few more years, DTV and supporting services may be all that they have to offer. The time is approaching when broadcasters will have to start thinking about how to craft their DTV infrastructure in order to garner a return on their massive digital investment. The revenue pie continues to shrink, and the competition for eyeballs increases. Many are now realizing that there might be far fewer stations in 10 years than the nearly 1600 stations in the United States currently. Even in the large markets, general managers are wondering if more than three competing newscasts can remain viable. Local and national advertisers are finding new and creative ways of getting exposure via alternative program and cable operators. According to a recent study by Marian Azzaro, professor of marketing at Roosevelt University in Chicago, advertisers would need to buy 42 percent more commercial inventory on the three major networks than they did 10 years ago just to reach the same size audience today. It's not just competition with cable programmers; other media, including the Internet and the video game industry, are also siphoning off viewers. In fact, the video gaming industry is a $28 billion dollar force that now rakes in more revenue than all commercial television in this country.

Revenue generation

Within the last year, HD has emerged as one of television's potential "killer apps." A number of elements have aligned to make this technology finally gel for content providers, distributors and consumers. On the content side, cameras were introduced that were native in both 720p and in 1080i. This allows remote trucks — programming and production vendors to the networks — to invest in HD equipment, as they no longer have to invest in two types of cameras or expensive conversion equipment to serve the separate ABC/ESPN/FOX and CBS/NBC/PBS HD camps. Secondly, HD equipment has dropped enough in price that there is a chance of making the investment pay off sooner, rather than later. On the distribution side, ABC, CBS and NBC are now offering all prime time programming in HD. In addition, ESPN is investing $200 million in a large HD production facility in Bristol, CT, and has plans to produce 3700 hours of HD content annually starting in 2004.

Getting back to the option presented by multichannel, many of the major networks are considering or implementing plans to provide multiple program streams to the affiliates. Here again, PBS is leading the way — with PBS-HD, PBS-Kids and PBS-You.

Implementing multichannel

Many local broadcasters are waking up to the fact that the first station in a market to put up a local repurposed news wheel, or extended news coverage on a secondary channel, stands a much better chance of survival than the third or fourth to follow suit. The cost of adding multiple program services to a DTV transport stream is low compared to initial DTV start-up costs, typically 10 percent per additional channel. If a multichannel operation is implemented correctly, the recurring operational cost impact

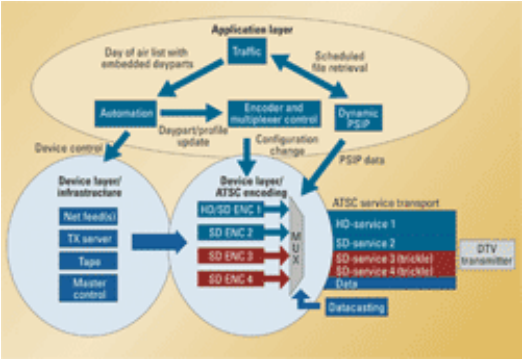


Figure 4. In multichannel broadcasting, a large part of the master control operator's job is reacting to system faults, and keeping program logs up−to−date across channels. Click here to see an enlarged diagram.

is also low — it typically requires the same level of human resources as a single-channel operation.

A benefit of multichannel operation is that it allows for cross-market penetration. If your newscast is to be cannibalized by someone, you might as well do it — thus conserving your views and advertising revenue.

Let's define the term "multicasting" as multichannel ATSC broadcasting that effectively and efficiently manages and integrates several services.

Figure 1 illustrates an ATSC multichannel environment. There are a number of considerations involved in the deployment of a multichannel facility. Additional services do not necessarily require more staff, but often do require changes in operational duties. Therefore, workflow and other operational impacts will have to be considered. Changes to infrastructure also need to be considered carefully — including the topology, redundancy, failover capabilities and fault isolation required to successfully apply the technology to meet your station's business goals.

An important aspect of multichannel operation is that the application processes involved need to be more collaborative and cohesive. Automation, typically driven from traffic, now must control ATSC encoder/muxing elements to change their service profiles (i.e. encoder status and limits, bandwidth to service allocation, etc.). Multiple traffic logs and dynamic PSIP tables must also be kept in coordination so that programming reflects information contained in appropriate PSIP text tables. This coordination can become cumbersome with certain types of live programming, such as sporting events that don't run their scheduled length.

Making the switch

As Figure 2 depicts, television stations commonly follow a three-phase migration path when converting from single-channel NTSC to full-service ATSC. Most stations have undergone the first phase of the evolution — the air phase. This entails nothing more than updating the necessary transmission food chain and encoder/mux, some simple ATSC monitoring at master control, and some acquisition equipment to pass through their network's digital feed. Some large-market stations have also undergone the second phase — the plant phase. Here the migration to "digital" is extended through the rest of the plant's infrastructure, including extended switching and enhanced branding. The third phase — the enhancement phase — is the final leap into the full possibilities of ATSC. Here additional channels, along with HD production and datacasting, might be thrown into the mix.

A number of new issues arise with the implementation of additional channels, including how to handle EAS and closed captioning (see Figure 3 for a typical multichannel conceptual). First, the FCC requires that all major ATSC program services carry required emergency alerts. So the infrastructure to insert the alert needs to be in place for each program, even if additional program streams are simply a "pass-through," or a series of clips from a server. Usually the same device that handles that chore also inserts logos and, potentially, enhanced branding. Seldom do these additional channels have their own master control infrastructure. Some multichannel facilities drop only a single instance of a master control switcher into a specific program path that requires transitions more complex than a simple cut; otherwise a router crosspoint is used to select sources. Other approaches include integrating switching and possibly branding in each program path to embellish the content's look and feel.

Closed captioning is another implementation issue facing local multichannel providers. This is typically not a problem with most SD streams, because closed captioning information is still carried along in the vertical interval or ancillary data space. But there is no standard for doing the same thing in HD. Although there is a standard for embedding serial data into the ancillary data space of a SMPTE 292 stream (SMPTE 334), it is not closed captioning-specific, and not all encoders support extracting the data. Plus, the standards for baseband captioning are different: EIA-608 for SD (SMPTE-59) at 960 baud, and EIA-708 for HD at 9600 baud. There are devices that extract closed captioning from an SD signal and embed the resulting EIA-608 data into an EIA-708 data field, this is commonly done in new encoders. The resulting data can also be interfaced to the ATSC encoder.

Soon additional issues will face the broadcaster, including the Broadcast Flag, and audio metadata issues such as dial norm and Dynamic Range Control (DRC). Newly deployed multichannel systems should take these issues into consideration.

Multichannel broadcasting presents a considerable change in master control operators' primary duties. A master control operator's job migrates from switching feeds to air to keeping a system on air. Under these new requirements, operators will primarily react to systemic faults, rather than actively switch between sources. They react to changes that have occurred in one program log that will need to ripple across other logs. (See Figure 4.) Monitoring multiple programs' health can consume a fair amount of the operator's time.

In support of fault isolation, multi-image displays with integrated alarming and status elements will be needed to aid the operator in isolating subsystem faults and returning programming to air. In addition, more sophisticated methods of automatically trapping system faults are now available. These include integrated stream probes that monitor signal status and, as necessary, provide alarming information along the entire signal path via a visual display. These probes allow an operator to see streaming thumbnails of actual video and audio information, which

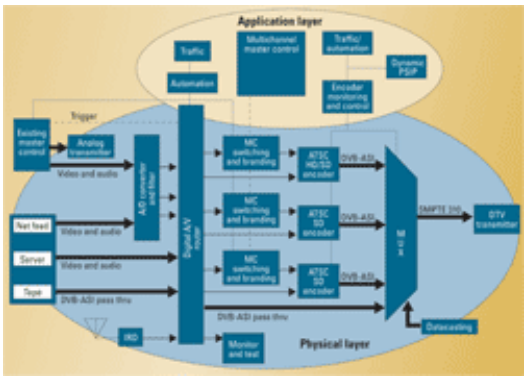


Figure 3. In this conceptual drawing of a multichannel operation, the left side of the physical layer shows legacy infrastructure, while the right side shows the ATSC food chain necessary to support multiple feeds. The dotted lines show interaction between master control and switching and branding, and routing functions. Click here to see an enlarged diagram.

can be displayed on an HTML Web page as a simple system concept, or even on a multi-image display wall. Because this approach uses Web-based technologies, remote personnel can also gain access and monitor system status. In addition, broadcasters are employing a slew of generic and more television-specific SNMP applications, long used by the telcos to spot problems across far-flung networks. SNMP applications allow for simple checks such as for video continuity; active video presence; EDH errors; audio discrepancies, including volume, phase and balance; and metadata problems such as with closed captioning and PSIP.

In multichannel infrastructures, the human and software processes that comprise the application layer need to work much more collaboratively. This collaboration, rather than the signal flow, defines workflow in today's station. Implementing a workflow-based multichannel operation will enable broadcasters to benefit by delivering a broader range of services more effectively.

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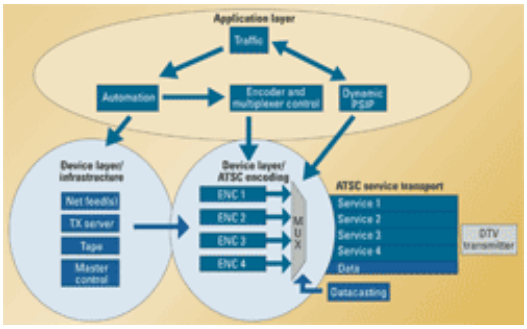

Figure 1. In multichannel operations, the application layer gets larger and more processes must collaborate to effectively manage the additional services. Click here to see an enlarged diagram.