



Affordable Digital Broadcasting with NV5128-MC

Introduction

This paper presents a comprehensive, integrated implementation of an affordable DTV and HDTV broadcast facility.

On February 17, 2009, analog television transmission must “fade to black” in the United States. For the past four years, Miranda’s NVISION business unit has been working with network executives, station owners, managers, and chief engineers to design affordable master control, routing, and modular products that can be configured in a variety of system topologies. This flexibility is key as stations develop diverse business models that increase revenue opportunities from DTV implementation.

In some circumstances, these business models can be successfully applied to other facilities and locations with minor modifications that compensate for the unique demographic composition of each television station broadcast audience. In nearly every case, additional equipment is required to implement a DTV/HDTV facility. Approval of capital equipment expenditures is based upon opportunities to increase revenue, and the expected return for a given investment.

Equipment tailored to these new business models now provides the opportunity to increase return on investment significantly in three ways:

- By increasing the effective capacity of the infrastructure.
- By decreasing the cost of the infrastructure.
- By decreasing the operational costs of the infrastructure.

Recent technical advances provide very affordable routing and master control equipment that enables the new business models for medium- and small-market stations.

A Simple Economic Overview

The costs for a transmitter, tower, antenna and their installation can constitute 70–90% of the total budget associated with a DTV buildout. The actual dollar costs for the total buildout can range from \$3.8M to \$5.4M with transmitter power being the key determinant of total cost in most cases. This is a significant expense for a middle or small market station whose annual revenues may only total \$10M.

Using the low end of both ranges, and assuming 5-year amortization, the annualized capital expenditure is over \$500,000 just to get a signal on air. This is a substantial sum of money to provide digital television broadcast services to a small, albeit growing, percentage of the viewing audience. For many stations, a 5% capital expenditure just to get DTV on air does not generate additional revenue.

Using the same ranges above, the min-to-max cost spread for routing and master control is \$380,000 to \$1.6M, a large range indeed. In fact, some top market stations spent 4 to 5 times this amount on routing and master control. Clearly, even \$380,000 is a reach for many stations. However, it is very likely that the correct investment in this equipment will offer the greatest potential to adopt new business models and offer higher levels of customer service, thereby increasing revenues. To capitalize on the transmitter package, it is important that the router/master package be very affordable, permitting the soonest possible deployment in the facility.

Taking this simple model into account, it seems that if the initial router/master package had a non-amortized purchase price of less than \$200,000, or 2% of the annual operating revenue, then this equipment could be purchased earlier in the cycle, therefore decreasing the time to increased revenues and accelerating the return on investment for the entire DTV upgrade.

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A Simple Economic Overview

Two Percent Capital Expenditure

The NV5128-MC Master Control System offers the combined capabilities of routing, master control, and signal format conversion in a single product. And, for initial installations, or small market stations, the costs can be well under 2% of annual revenues. The following diagrams demonstrate how the NV5128-MC can be used to reduce the costs associated with a DTV broadcast installation.

As background, the NV5128-MC is an 8 RU 128×128 router chassis. It can be populated with analog video inputs and outputs, analog video decoder inputs, analog video encoder outputs, SDI (HD and SD) inputs and outputs, AES3 inputs and output, analog audio (A/D) inputs and analog audio (D/A) outputs. The NV5128-MC allows simultaneous routing and switching in a single package.

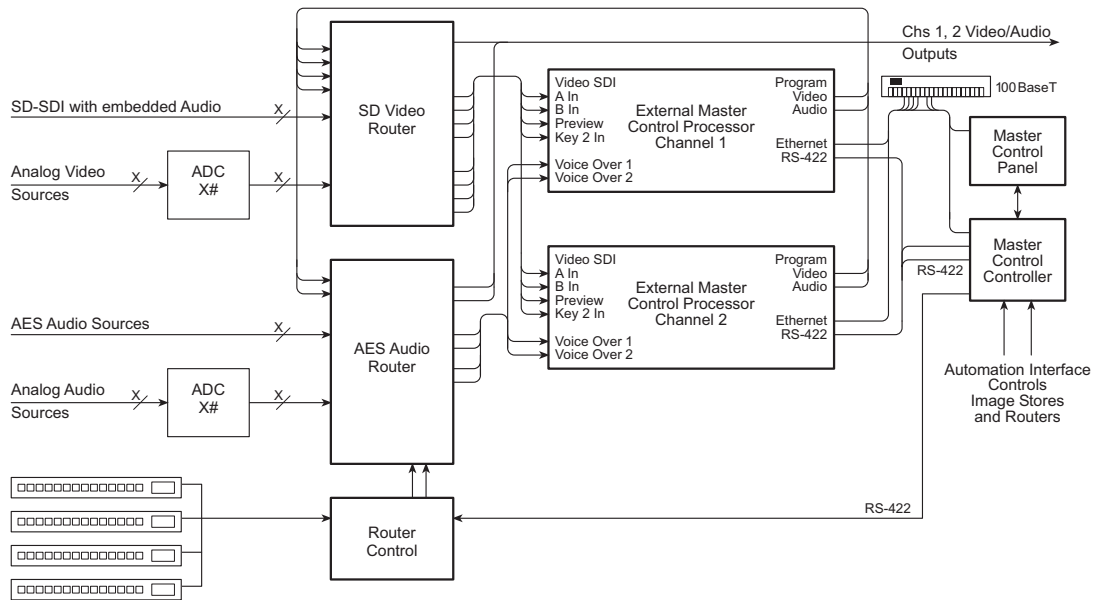


Figure 1. Classic Master Control and Routing

To show how the NV5128-MC reduces costs, compare figures 1 and 2. Figure 1 shows a classic router, master control, and conversion equipment system. (Patch bays and distribution amplifiers are not shown for reasons of clarity.) There are separate layers of pre-select routing for audio and video, as well as external A/D

converters that support legacy analog equipment. In Figure 1, two channels of master control are in operation as might be the case in a duopoly, a concept discussed later in this paper.

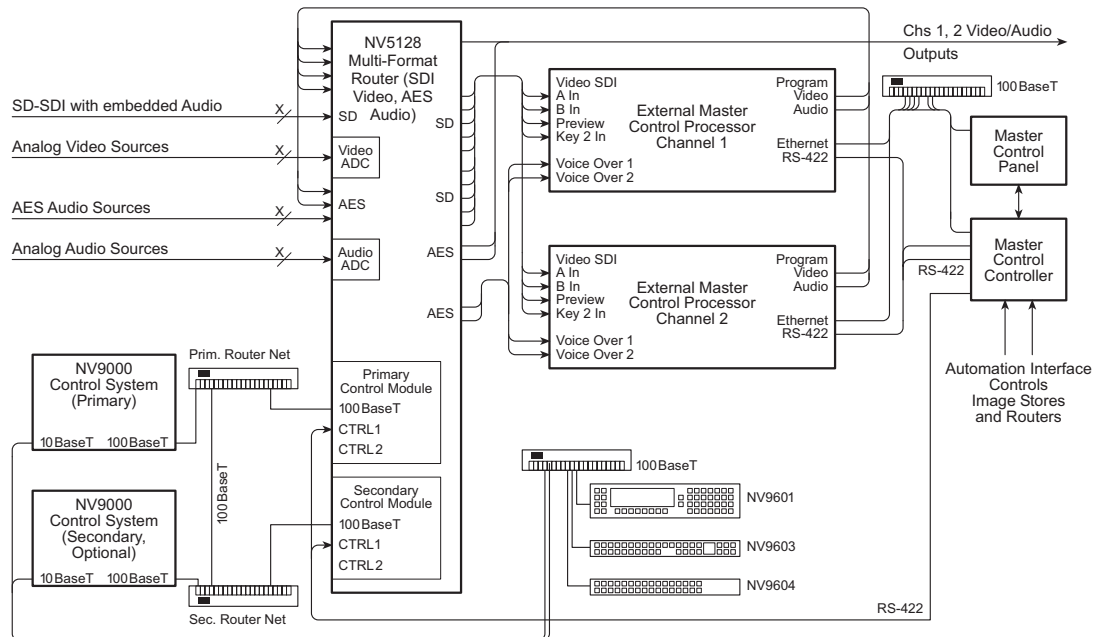


Figure 2. NV5128-MC Integrates Conversion and Routing

The NV5128-MC router simplifies the system dramatically. The router can have any combination of HD, SD, and AES signals up to 128 inputs. (The SDI video inputs can carry up to 8 embedded audio channels.) Video decoder input modules are available that convert analog video inputs into SDI signals before feeding them to the internal router bus. Analog audio input cards are available that convert analog audio to AES3 signals before feeding them to the internal router bus.

The entire routing system now has a single point of external control for all four signal layers: analog video, digital video, analog audio and digital audio. This dramatically simplifies automation selection of router buses for master control. Integration of analog-to-digital conversion into the router protects the investment in analog machines already in place in the facility.

In addition, Miranda's NV9000 router control system and NVISION series routers are uniquely designed so that the automation system can bypass the control system, controlling the router directly. This improves switching determinism and offers a more resilient on-air topology than feeding automation system commands to the router control system, and then to the router. Of course, the automation system can interface directly to the NV9000, and redundant NV9000 systems will provide full, on-air backup.

The next step in the progression is to integrate the master control engine with the router. By combining the master control engine with the router in a single chassis, significant cost advantages are possible. Direct cost savings result because there are fewer frames, fewer interface chips and fewer PCB assemblies. Indirect cost savings stem from (1) reduced rack space requirements, (2) fewer interconnect cables, and (3) eliminating the labor associated with installing and terminating the cables.

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Two Percent Capital Expenditure

The NV5128-MC provides this exact functionality, as shown in Figure 3.

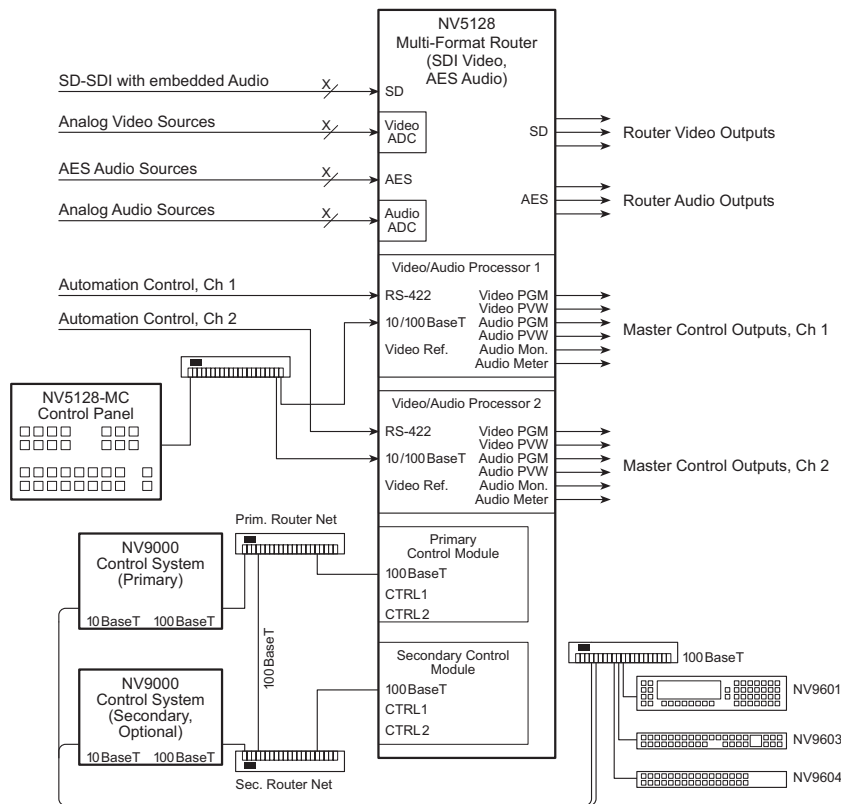


Figure 3. The NV5128 MC Provides Routing and Master Control

A single 8RU NV5128-MC frame can accommodate up to 8 channels of SD branding, 4 channels of HD branding, 4 full-featured SD channels, or 2 full-featured HD channels. Master control processors can also be mixed in various combinations.

Each master control channel also provides full video processing and transition processing capabilities, including channel branding. It provides 3 video key and fill processors and a 4th key/fill for channel branding (a.k.a. logo insertion). There is also a DVE processor for squeeze effects.

Each channel provides automatic timing for the program, preview, and keyer inputs. Audio inputs can either be embedded in the SDI signal or discrete AES3 inputs. Each channel provides audio processing for 8 channels as a standard configuration — enough for a 6-channel Dolby E source and an LtRt mix.

The NV5128-MC is the first master control switching system designed with Dolby E in mind. Dolby E signals are supported as either embedded inputs or discrete AES3 inputs. The output of a master control channel includes 8 channels of audio plus Dolby E metadata. Each channel provides significant monitoring and metering capabilities as well.

Each channel has access to all 128 router inputs, including inputs for keys or fills. Each channel has an automatic fail-over switch, providing immediate on-air backup either from a redundant master control engine or an emergency standby video feed. The ability to upgrade and expand the system is nearly limitless. This means extremely low costs for future maintenance and growth.

This topology provides a very highly integrated, cost-effective approach to routing, master control, and conversion for DTV upgrades and new installations. The dramatic reduction in interconnect between functional blocks in the system provides excellent savings in physical space, cable, installation, equipment chassis, electronic components, and therefore cost. A system configured as shown in Figure 3 can cost one quarter to one half the amount of a traditional installation.

Operational Enhancements Provided by Master Control

By reducing the costs for master control, routing, and conversion to less than 2% of annual revenue, stations should be able to invest earlier in this type of equipment. Having this level of functionality should allow more stations to provide a higher level of service, attracting more viewers, and therefore more revenues.

Inserting local news, weather, public service announcements, and other demographically pertinent information is now possible. Adding a second channel for multicasting is another possibility. This might be a community access television channel or alternative programming channel. Any number of new options for adding value to local television programming are now possible for more stations, not just the top market properties.

The sooner these capabilities are installed and on-air, the sooner the opportunities to increase viewership and advertising value can occur, and the sooner the cost of the transmitter, tower and antenna can be recouped. The advantage with the NV5128-MC is that any station can start with a single channel, and experiment with what works and what adds value.

As the investment pays for itself, expansion is easy. Another card set could be used for a second unique channel to be multicast, or “data-cast” to the viewer. It could be used to re-brand the existing channel content for either data-casting or video streaming to the internet user community. The cost of adding an additional channel of master control is very low indeed. Adding an additional channel is as easy as inserting the cards. And, when you ready, you can even install an HD-SDI card set.

Duopoly and Cooperative Business Models

Duopolies and cooperatives increase operating margins by reducing expenses. Sharing towers, buildings, main equipment rooms, live stages, and other expensive capital investments provide opportunities for middle and small market stations to save money.

The NV5128-MC system provides independent control of each master control engine, allowing each programming output to be independently configured, monitored, branded, or otherwise formatted and enhanced based on the needs of the operation. Control for each engine is carried out over TCP/IP, with automation operating via an RS-422 port. This means that master control operations need not be co-located with the engine. Using a virtual private network (VPN) and a secure WAN, a duopoly or central cast operation can enable geographically remote operation of the master control engines.

The NV5128-MC system allows centralized operations with geographically diverse control, or centralized control of diverse operational locations, or highly centralized control and operations. In fact, the NV5128-MC package enables facility designs and operational models that can, in some cases, save enough money to recoup cost of the NV5128-MC equipment package in 12 to 18 months.

An Optimistic Outlook

The NV5128-MC system provides an extremely affordable package for routing, master control, and signal format conversion. It allows very low cost expansion and can be easily upgraded for multi-channel operations and HDTV. It is certainly true that the Internet is competing for television viewer time. However, it is interesting to note that more and more home computer rooms are now adding TVs. It is also interesting to note that advertisers and advertising budgets are leaving the “dot com” medium and returning to television broadcast.

Currently, IPTV is being offered as a new option by both AT&T and Verizon. It is not yet clear how much bandwidth will be available for this product offering, but most industry analysts agree that there is not enough bandwidth available at a low enough cost. Substantial capital investments must be made to deploy this technology fully.

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An Optimistic Outlook

It is interesting that in almost every recent survey, the majority response has indicated that television is the entertainment viewing mechanism of choice. It is interesting to note the diverse and nearly universal demographic appeal of HDTV. All of these trends make a strong case that broadcast television should continue to be a strong, viable business. The challenge is to capitalize quickly on new technologies and new business models that will actually extend the longevity and viability of television broadcast.

The NV5128-MC master control system—by significantly reducing the costs of capital investment—enables an aggressive technical investment even in the current difficult economic environment. The NV5128-MC is a key building block in any such plan. It truly enables affordable digital broadcasting at a time when broadcasters need it the most.