Application Note

Integration of Routers and Multi-Image Displays

Introduction

Over the past decade, there have been major developments in monitor wall display technology. Systems based on CRTs are being replaced with flat-screen monitors that can support single or multiple images per display. This paper shows how Miranda provides the most effective router integration for systems ranging from traditional designs that can be used with any multi-image display to a tightly integrated “best of breed” solution that combines the Miranda’s NV8576 router with the Miranda Kaleido-X multi-image display processor.

Contemporary system designs are increasingly using routers to function as “dynamic DAs” as well as for their basic routing functions. A very popular router application is to be able to feed sources dynamically to a monitor wall which may include multi-image processors. Multi-image systems display multiple video images with audio metering for each on a single display. This results in cost savings and flexibility not found with conventional single-monitor-per-source installations.

Such designs have created a need for routers that simultaneously feed monitor wall displays while retaining a maximum utilization of valuable router real estate.

Miranda fills this need by offering a 576×1152 matrix in virtually the same rack space as other offerings that are limited to a maximum of 576 outputs.

With the NV8576, the customer can simply add the number of scalable output modules (18 per card) required for their routing and display needs without additional rack space. Signals from one or more output modules can be fed to any multi-image processor using conventional coaxial cable. Although coaxial connectivity has some distinct advantages, in other applications, a high-density cable interface between the router and the multi-image processor can lead to reduced system and labor costs. The NV8576 supports this type of connectivity without impacting the basic router matrix size when interfaced with the Kaleido-X multi-image processor.

Figure 1 shows a typical early design of a monitoring system. Because of router size and cost limitations, most monitor inputs came from DAs attached to discrete source devices such as cameras and VTRs. Very few valuable router destinations were assigned to monitors.

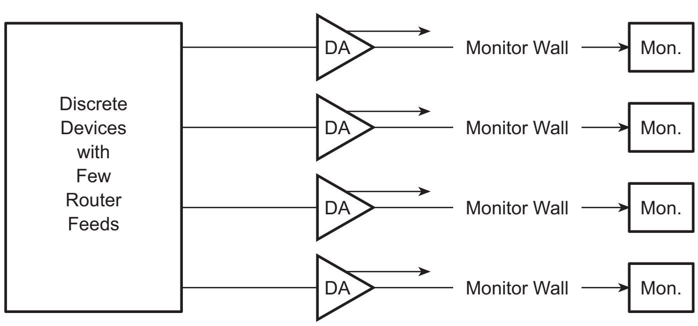

Figure 1. Early Designs

Compared to earlier systems, current router hardware provides much more capability and flexibility when it comes to matrix size and lower cost. As a result, many, if not all, sources can be made available as inputs to a large number of displays in the control area. Displays can include single monitors, multi-image displays, large flat screens, or projectors. Typically, most systems will use a combination of both as shown in Figure 2.

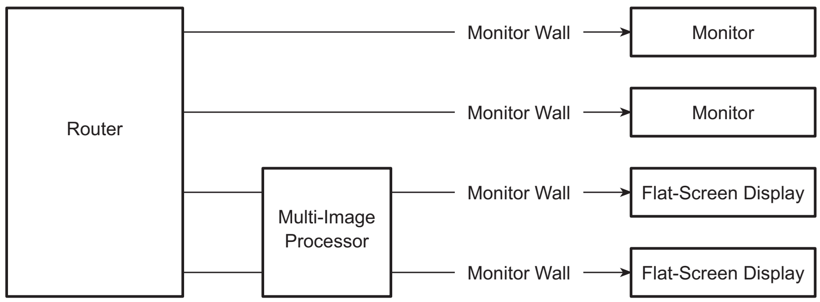

Figure 2. Current Designs

Square and Rectangular Matrix Designs

Most routers available today have ***square*** matrices — those that are framed for equal numbers of inputs and outputs (e.g., 288×288). Square routers might work well for routine routing applications but they are limited when it comes to adding large numbers of monitor wall destinations. Monitor outputs burn up valuable router output space as shown in the top diagram in Figure 3. One way to solve the problem is to add non-redundant crosspoints and high-density output modules to the square matrix. This provides additional dedicated feeds to a multi-image processor using high-density multi-conductor cables. However, this does not eliminate the need for discrete router outputs to feed single display monitors in a hybrid monitor wall.

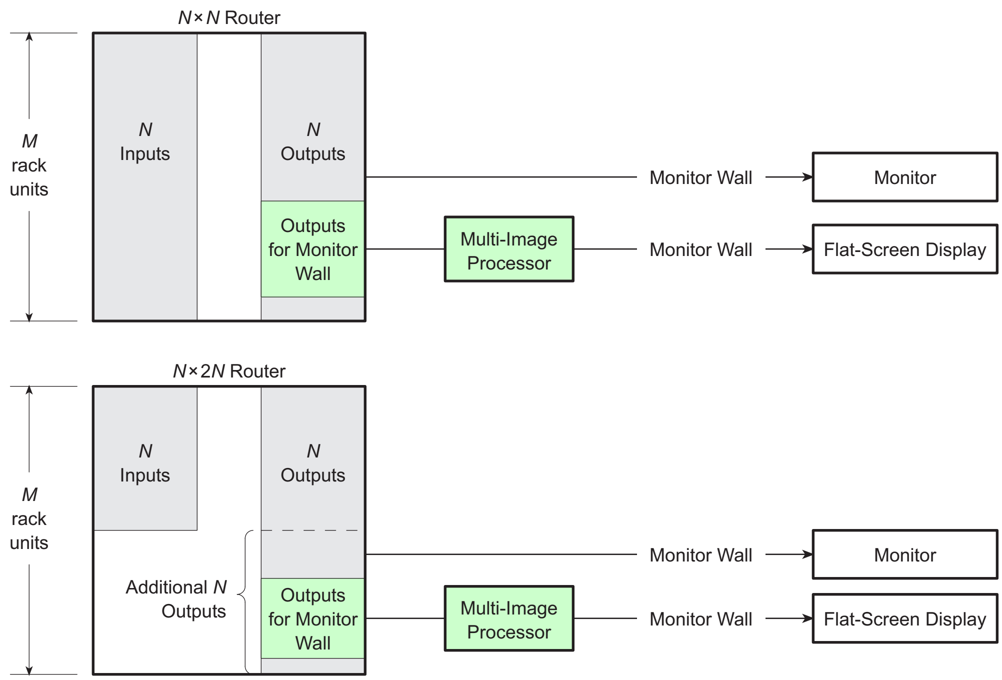

Figure 3. Square and Rectangular Matrices

An alternative to square matrix router design uses routers with larger output capacity than input capacity—rectangular matrices. The diagram at the bottom of Figure 3 shows a rectangular router that has twice as many outputs as inputs. This design addresses the limitations of the square matrix approach to supporting a monitor wall by providing expandable output space that does not burn the core router real estate. Miranda pioneered rectangular matrices in the NV8288 Truck Router providing twice the number of outputs as the input capacity. Building on this legacy, the NV8576 router offers up to 576 inputs and 1152 outputs in a single 32RU frame.

NV8576 outputs are scalable in small steps (groups of 18 coaxial connections or high-density connectors carrying 16 feeds depending on which cable interface is desired). With the NV8576, you don't have to add a lot of crosspoints just to start adding high-density outputs. Users can start small and grow in the most affordable manner available in the market.

Redundancy

Full crosspoint redundancy—another Miranda first, introduced in 2001 with the NV8256—is also available in the NV8576. Because all NV8576 outputs are fed from the same crosspoints, the addition of the redundant crosspoint option automatically protects all monitor wall feeds as well. This is unlike the square matrix solution that uses isolated, non-redundant crosspoints to feed a single block of high-density-only outputs to a single-source multi-image processor without the option of coaxial connectivity.

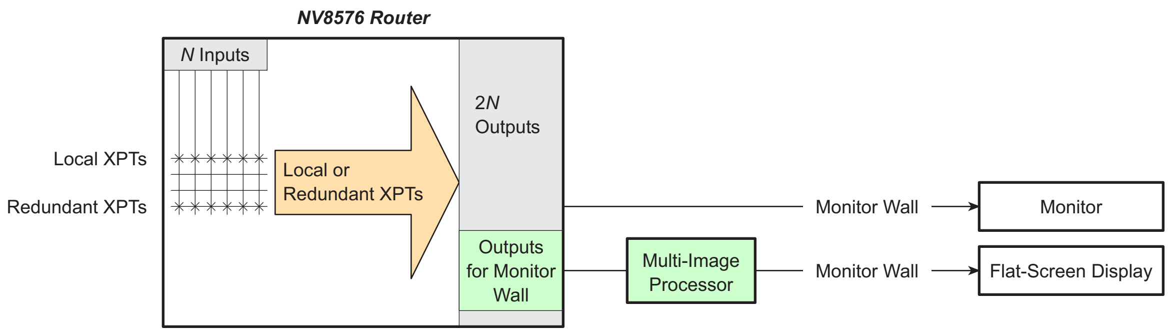

Figure 4. NV8576

Control Integration

Early control room monitoring was very straightforward. Monitors had fixed signs (UMDs) under them to identify fixed sources. On-air tally lamps could be lit under each monitor whenever the source went to air. The lamps were typically driven by relay closures from production and master control switchers. The following examples describe recent developments in monitor status and control technology.

For several years, third-party vendors have provided devices that have essential display features for monitor walls including dynamic source name and tally status on under monitor displays (UMDs) as shown in Figure 5. In this example, the NV9000 control system provides source names and tally status to the tally system.

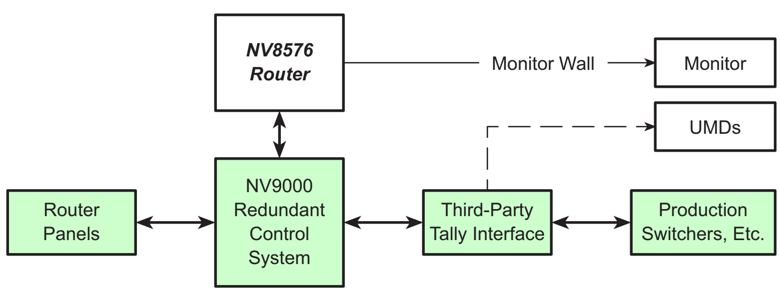

Figure 5. NV9000 provides source name and tally status

Systems that added multi-image displays were also integrated with tally interface devices. Typically, basic UMD data were sent from the tally interface to the UMDs in the multi-image display. Router sources are selected using router control panels. These systems require that separate databases are maintained in the router controller, tally interface, and multi-image processor.

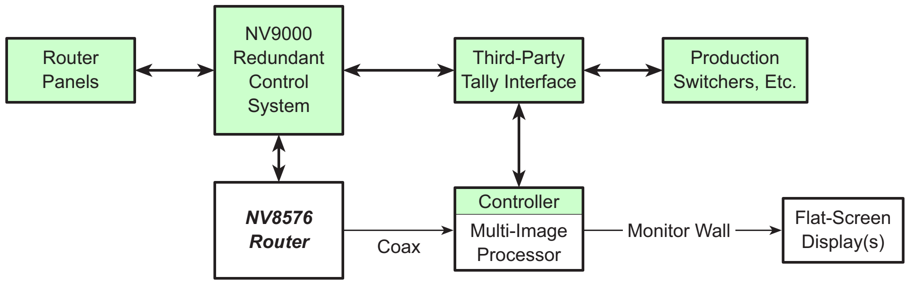

Figure 6. Added Multi-Image Processor

Multi-image processor vendors such as Miranda have developed direct interfaces with router control systems such as the Miranda's NV9000 Router Control System. In this example, the multi-image processor connects to the NV9000 over Ethernet and retrieves metadata such as source names from the NV9000 database. Systems like this work well where tally logic is less complicated (such as in Master Control) eliminating the need for a third-party tally logic processor.

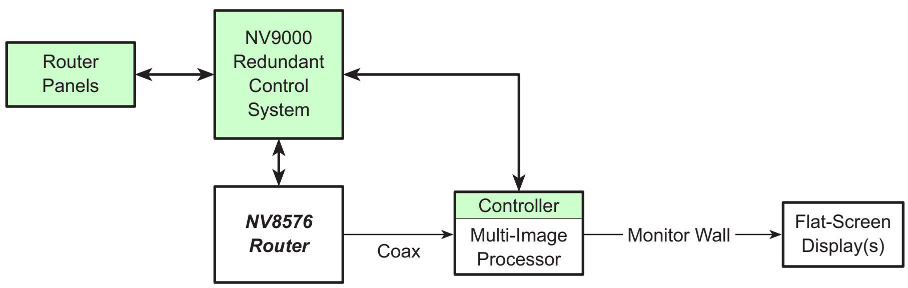

Figure 7. Without Tally Interface

Recent efforts by Miranda have taken the router/multi image processor interface a step further. Current production workflows require even tighter integration between the monitor wall display system and router control making operation of either device transparent to the user. In these cases, the Kaleido-X not only retrieves data from the NV9000 but also performs router control panel functions.

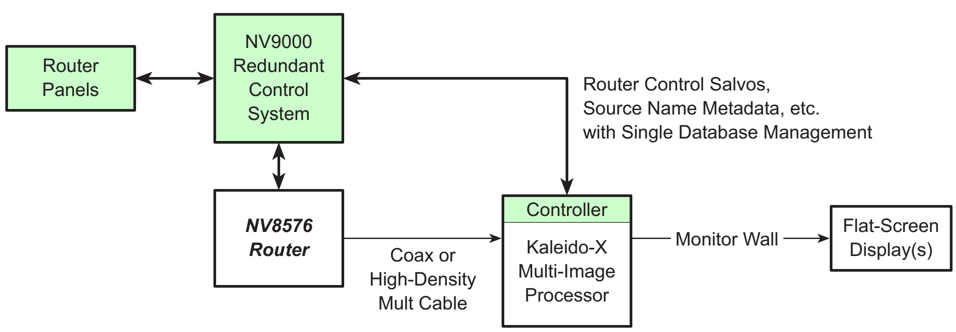

Figure 8. Enhanced NV9000/Miranda Interface

For example, router sources and their corresponding metadata can be updated for any Kaleido-X monitor display with a simple mouse click using the Kaleido interface. Also, Kaleido's RCP (router control panel) can instantly reconfigure a monitor wall display at the touch of a button while simultaneously reassigning monitor sources by issuing a salvo command to the NV9000 router control system. These features can be very useful in operational environments (such as sports production trucks) where monitor wall changes are made on a routine basis.

Powerful in systems of any size, the NV8576 and Kaleido-X provide a unique solution for very large systems. The NV8576 is very efficient in both space and performance while the NV9000/Kaleido-X combination is extremely well suited for large control facility applications that require signal management and display in multi-room environments of various sizes.

Systemization

"Have It Your Way..."

There are two basic system design options when it comes to router/multi-image processor integration. One uses high density cables connected between the router and the multi-image processor while the other uses a traditional coaxial interface. Figure 9 shows the two approaches:

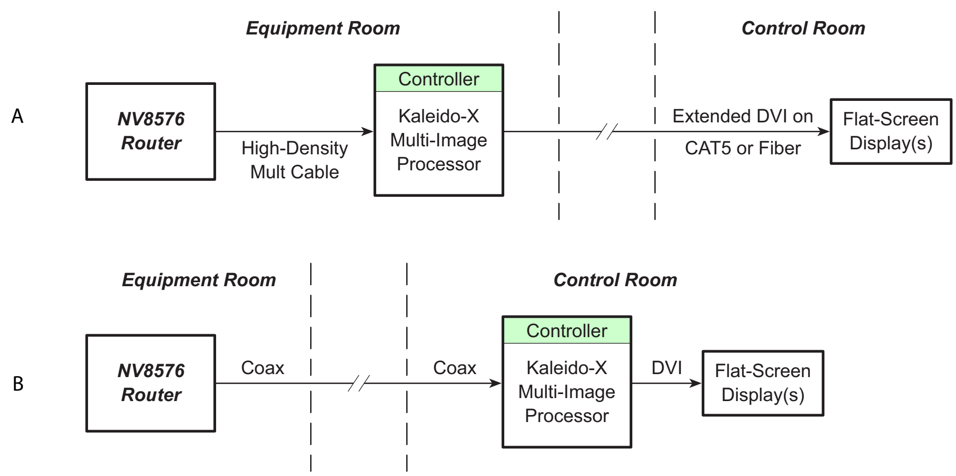

Figure 9. Two Designs

The high-density interface shown in diagram labeled "A" is useful when runs of multiple coaxial cables between the equipment and control rooms are ***not*** desired.

Notice that the multi-image processor is located in the equipment room close to the router. The reason for this is that high-density cables have length limits when it comes to carrying 1.5 Gbps or 3 Gbps signals. Miranda's NVISION business unit has been a pioneer in high-density cable interface technology for high-speed signals starting with the NV8256 linear expansion cables. Experience shows that the maximum length for these high-density cables falls in the 6–7 meter range. Given this limitation, the longer cable run between the equipment room and control room is implemented using extended DVI on either CAT5 or Fiber. (Miranda offers a DVI extender built into the Kaleido-X matrix.)

The diagram labeled "B" illustrates how multi-viewer systems have been integrated before the recent introduction of the high-density interface shown in diagram A. Such a coaxial interface is appropriate for applications where cable runs and router real estate (i.e. rectangular matrices) are not critical. Long coaxial runs from the router allow the image processor to be located close to the monitor wall in the control room allowing standard DVI (non-extended) cables to be used. The coaxial cable interface also allows the distribution of critical feeds over different output modules in the router for further security.

Of course, coaxial connectivity can be used with any multi-image processor including those that offer a high-density interface. For example, the Kaleido-X multi-image processor from Miranda can interface with either coaxial or high-density cables.

The NV8576 and Kaleido-X offer the best possible system performance: no blocking, 2-D adaptive filtering for the best picture sharpness and resolution, independence of aspect ratio and pixel count, field-proven

3 Gb/s routing operation, fully redundant crosspoint backup for every router output, including multi-viewers, cost-effective configuration for multi-viewer integration, the best audio support in a multi-viewer, and the best embedded audio support in a multi-viewer.

Miranda can support either approach depending on the final system design.

Summary

Control room display requirements have undergone dramatic change. Simple static monitor walls have been replaced with highly flexible and sometimes very large systems.

Miranda's router technology is adaptable to any design approach offering a true *best of breed* solution for any monitoring application.