



Deploying a High-End Digital Signage Solution

Digital Signage has moved beyond a nice to have for businesses to a critical communication vehicle that is driving investments in infrastructure across multiple industries and sizes of businesses. The growth in signage can be viewed indirectly through the growth in advertising dollars across multiple channels. Today, according to Deloitte & Touche, in-store advertising is growing at 21% vs 15% for online advertising. This makes in-store advertising, enabled by digital signage, the fastest growth sector for advertising spend. More than the dollars being spent on this new technology, we now see businesses understanding and accepting the ROI for these investments. Digital signage is not the 'experiment' it once was. Of course, once the decision to implement digital signage is made the next question is how.

Before we discuss the technical nuances of Digital Signage it's important to ask the question, what business problem are you trying to solve with your signage solution? Is the signage part of employee communications or is it for a large retail store? Is it intended to be interactive? How often will the signage content need to change? Understanding the business usage model will drive the technical implementation of the solution as the costs and effort for digital signage implementations can vary dramatically.

The first key question is how often the rich content is going to change? Signage solutions take dramatically different approaches to this. The first approach is what we'll call 'video based signage', this type of signage solution is characterized by video content that is produced ahead of time and then scheduled and distributed via the signage solution. Applications for this type of signage tend to be more permanent looped display sequences as the resulting video is hard to change quickly (see Figure 1). The complexities in video based signage are in the video production process rather than the content distribution arena. Furthermore, video based signage tends not to fulfill the original requirement for which *digital* signage was really envisioned, dynamically changing content. Instead it provides a static looped video that is only marginally better than a static sign.



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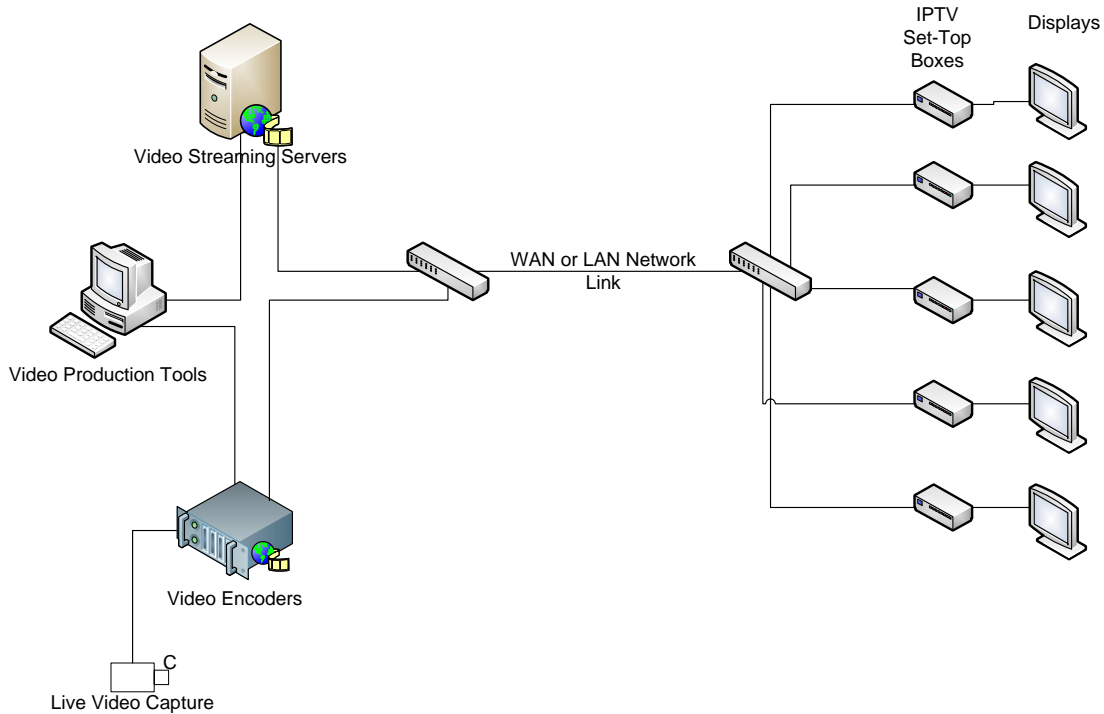


Figure 1: Video Based Signage Solution

In contrast high-end signage solutions are template based with rich graphics, text, and multiple video sources. This type of signage solution involves content that can be changed on the fly; the templates and content are rendered in real-time by each signage player (high end PCs). Within this signage approach you have large and small scale implementations, small scale maybe an enterprise that is creating a single signage channel that is to be distributed within their facility, with content maybe updated regularly by internal staff. A large scale implementation maybe a store chain with multiple locations, where each location has multiple signage channels and multiple displays. Content in this scenario is created by a central organization but certain content maybe overridden by individual store managers. Additionally, what channel is played on what display maybe completely controlled by store managers. This breadth of implementations means that high end signage solutions can vary greatly in cost and time to implementation.



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We'll focus primarily on high-end signage as video based signage tends to have simpler requirements due to its static nature. Figure 3 shows the baseline topology of this type of signage solution.

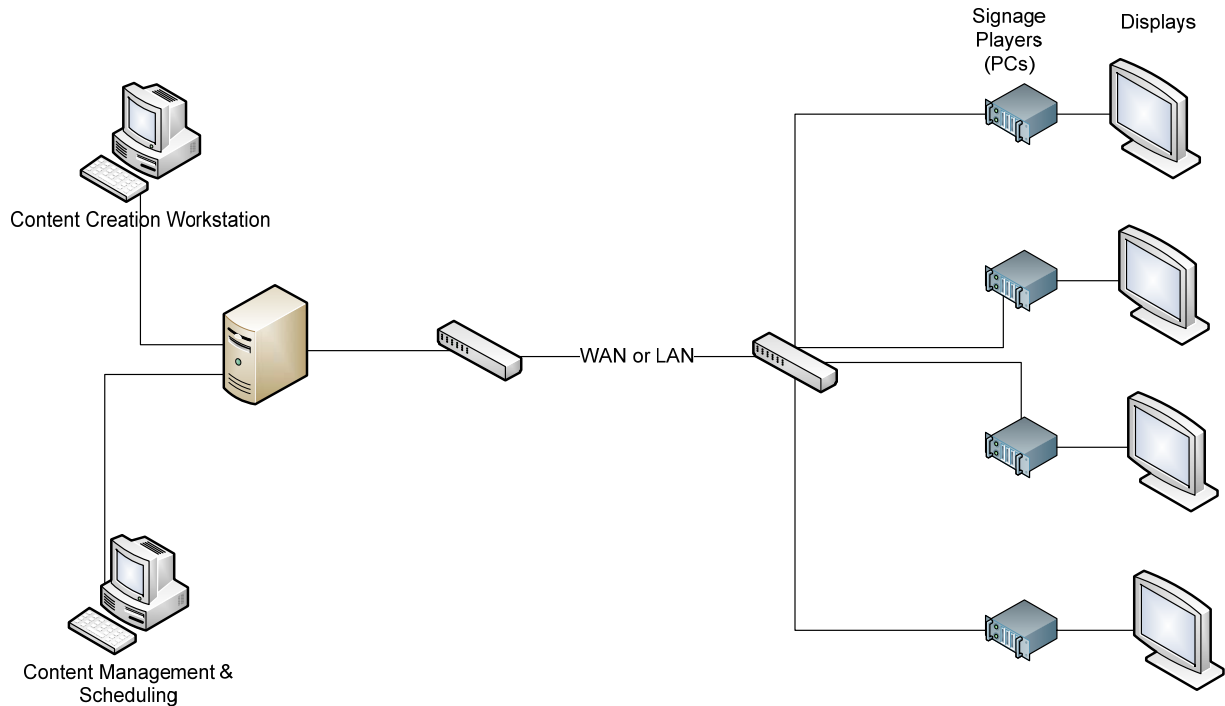


Figure 2: High-End Digital Signage

The solution consists of the server, where the centrally managed aspects of the signage are dealt with, e.g. content templates, the content itself, scheduling etc., the content creation tools, and the players. The ideal content creation tools for high-end signage are tools that your end users are familiar with. In the corporate environment Microsoft PowerPoint is a great example of a tool that could be used to create content. In fact, a *NetStreams* partner, X20 Media, uses PowerPoint as the underlying product to build content. This approach reduces training time and makes a signage solution that is much more effective on day one. The server and player are often separated physically, with the server located in a data center location and the players on site closer to the displays. However, in small scale signage solutions (e.g. the corporate example discussed earlier in this paper) the server and player are included in one physical box. This allows for a low cost solution where signage may not be the primary focus of the project.



Within the high-end signage solution you have 3 major elements, video content (often shown within a window on the screen), graphics and text, and control of the signage. Each of these elements requires careful consideration. We focus on the video content and control of the signage going forward as the graphics and text are primarily a creative function not typically addressed by the integrator.

In all cases, each player has 1 to 4 video inputs so that any video elements that are to be part of the signage solution can be input into the player. You will recall that the player does the rendering in this type of solution so each player must get each type of video source that you want to include. Of course, as the scale of this deployment increases it is quickly evident that in addition to the players you need to implement a video switching and distribution solution. This allows you to locate the video sources somewhere within the facility, but avoids having to duplicate video sources at each player. Of course, once you have located the video sources you have need to control those sources, whether they be set-top-boxes, DVD players, PCs with stored content you need to control them so that the content can be switched based on the signage channel that is being played. Additionally, the content is likely to be formatted at different resolutions and connected to the video distribution system in different ways. For example you may connect the DVD players via component and the PCs via VGA cable. This adds the additional complexity of transcoding the content so it is input into the signage players appropriately. We call this series of challenges the *video source selection* challenge. The video source selection challenge is addressed by *NetStreams* IP Video solution as show in Figure 3 below. The *NetStreams* solution handles the challenge of switching sources, controlling the sources and displays, and transcoding content that may come in VGA and go out component.



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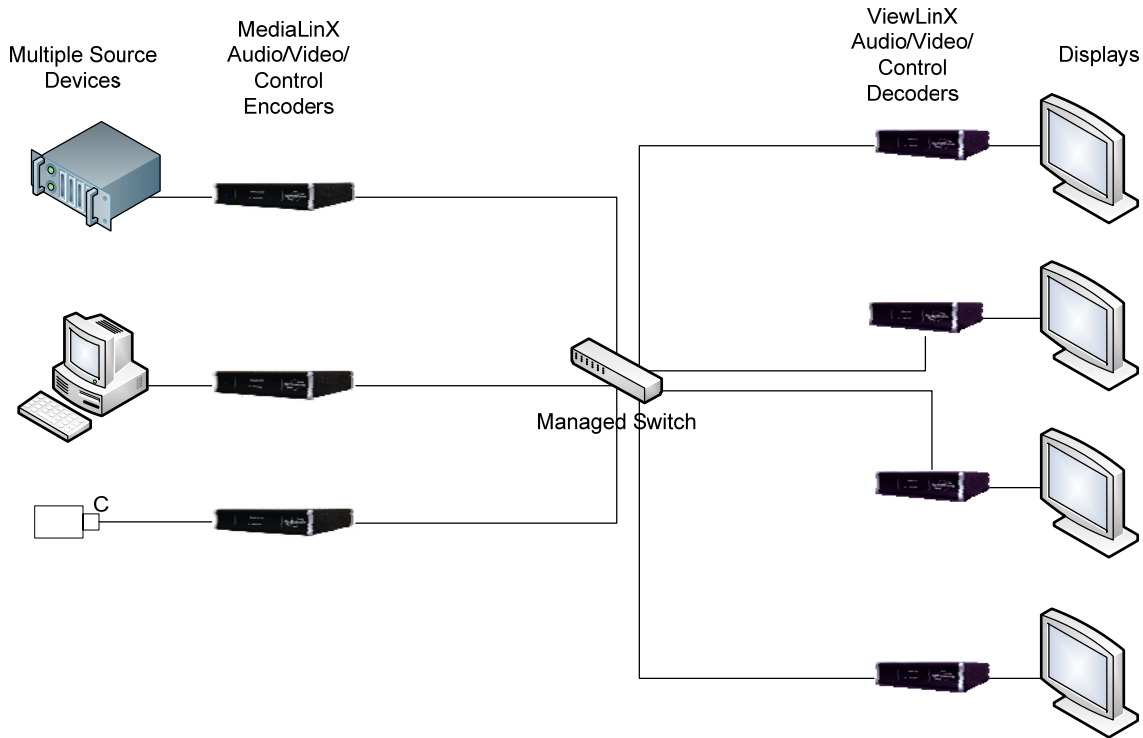


Figure 3: *NetStreams* IP Video – Solving the Source Selection Challenge

Once you've addressed the video source selection challenge, the next consideration is how to distribute the final rendered video content. There are two typical models here and the scope and scale of the signage solution will drive which model is used. The first model is where each player is placed next to, or mounted behind the displays. This model is used when each display has its own unique content, for example interactive signage displays. The second model is where a limited number of signage channels are distributed to multiple displays. For example you may have five digital signage channels distributed to 50 displays. Putting signage players, which tend to be high end PCs with moving parts behind each of the 50 displays is not practical from a maintenance perspective. Additionally, if the players are the primary video source for the display you lose the ability to use the displays for other purposes. As an example, we recently had a corporate customer who implemented a signage solution for employee communication, but was also using the same displays for satellite TV distribution throughout their facility. If they had only used players as sources they would have had to have a completely separate video



distribution, and satellite TV control solution for each display. Either that or they would have to have multiple boxes behind each display, a messy and trouble prone solution. Instead they opted for a *single* solution that could distribute and control the satellite TV while at the same time distributing the signage when needed. This was the *NetStreams* IP Video distribution solution shown in Figure 3. Additionally, the *NetStreams* solution ensures that audio and video in a single display and across displays is synchronized to below 1 ms. This means that in a large scale implementation you don't have content that's playing out of sync as you often see today.

With the video distribution challenge behind us, the next step is to address the quality of video that you want in your solution. There are many ways to distribute video around a facility, but all are not created equal. Many buyers today want an IP-based solution as this is the technology that they understand. The benefits of IP are many, you can scale the solution as large as you want, you can control the solution from any point on the network, you get to leverage your existing network infrastructure investment, and you can combine control with the video signal distribution. However, most IP based solutions tend to compress the video fairly significantly. As an example, a high-definition video signal (1080i) uncompressed is just about 1 gigabit per second of network traffic. This is often compressed using MPEG2, 4 or H.264 video codecs to approximately 8 megabits per second. That is a 125 to 1 compression ratio – a lot of detail gets lost in this sort of compression. Only one solution delivers lossless high-definition video, the *NetStreams* IP Video solution. Is 1 gigabit per second practical? The short answer is yes. Network switching technology allows us to take full advantage of the CAT-5 or CAT-5e cable that you've run to the display and deliver the highest quality video to that display. This can be done over a managed switch so that no other network traffic is impacted! In some cases, quality may not matter, but in almost all scenarios that we have seen, given price/performance tradeoff between various IP-based solutions, end users will almost always select the high performance/quality solution with a price point similar to that of the compressed video solutions. For many, there is the question of whether a compromise is possible on bandwidth, this is of particular concern where there maybe a shared fiber link between buildings. For this purpose, *NetStreams* is introducing a 50Mbps stream, this stream will be capable of running



over share fiber links and also running within a premise on lower cost 10/100 switches.

Finally, you now have an eighty percent solution; the missing piece to the puzzle is control of the signage solution and distribution network. Ideally you want a solution where you can control not only what content is rendered on what players and when, but also which displays that content is finally sent to. Here is where the IP-based solution, such as *NetStreams* IP-Video, really shines. A traditional matrix switch at each facility would require a control element to direct it to distribute content to each display. This would involve programming for each location's switch. In cases where there are facilities of varying size you may have different size matrix switches, each of these would require their own separate programming efforts. With the IP based solution it's possible to have the players send network based commands to the video distribution network when it starts to play a piece of scheduled content. For example, when a store opens in the morning the players maybe scheduled to play the welcome message, as they start to process this content they can send a single message that selects all displays, powers on each display, and tells the displays to play content from signage player 1 (the player with the welcome message). An hour after opening the other players in the store can start their content and take over a pre-selected set of displays. In the IP-based model this is simple, in a matrix switch model – this is a significant programming effort. Next generation integration between *NetStreams* IP Video solution and our partners will allow this type of selection from the same interface where content is scheduled making this process that much simpler. Figure 4 shows the solution once the pieces of video source selection, distribution, quality, and control are addressed. This creates a solution that is easily maintainable, flexible for use with multiple source types, and cost effective.



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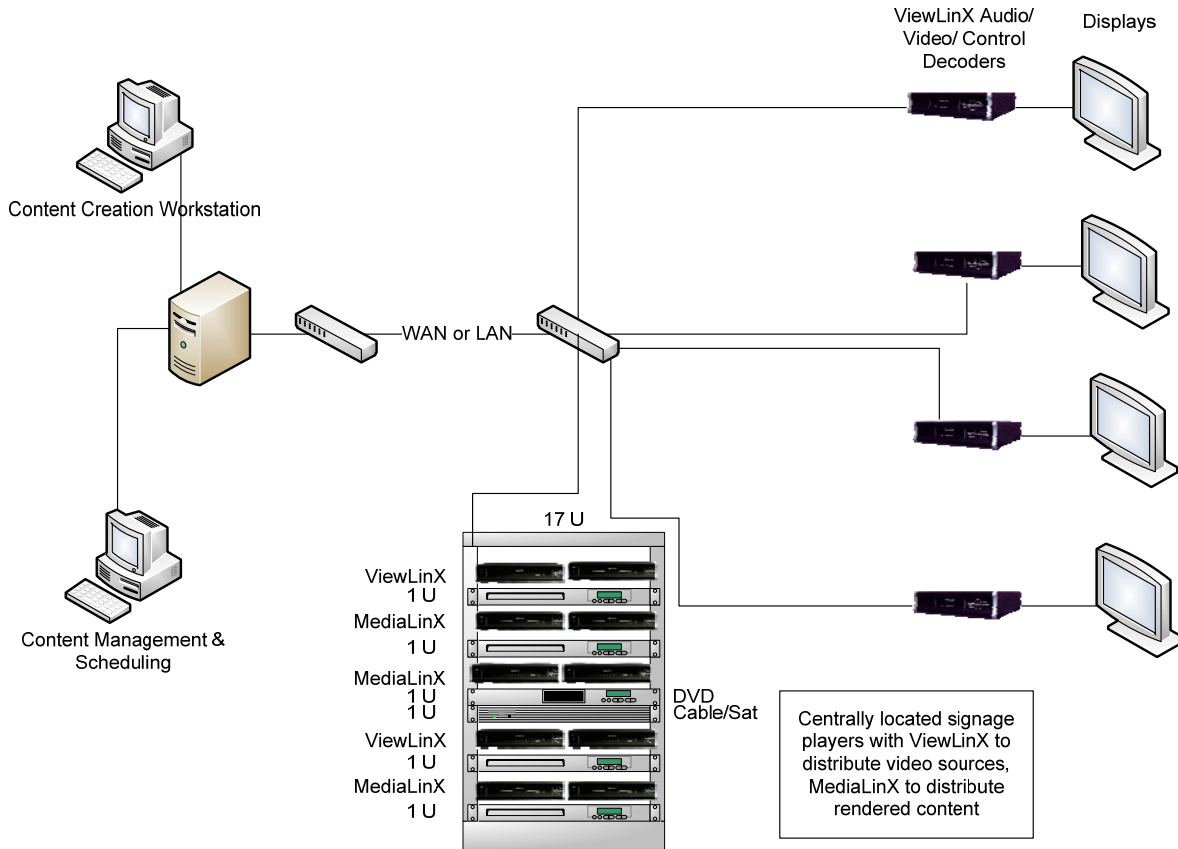


Figure 4: Complete Implementation of High-End Digital Signage

The professional digital signage solution has moved far beyond slides on a display, now that businesses understand the benefits of signage, the demands on the system have gone up commensurately. The *NetStreams* IP-Video solution is unique in its ability to meet the demands of high-end signage solutions. The system is fully networked based, will scale as large as the network capacity allows, provides source and display control, enables source selection and rendered content distribution, transcodes content from source to display or player, and allows itself to be controlled by any player or application on the network. The resulting integrated digital signage solution is illustrated in Figure 4. Our partners in completing this solution include X20 Media on the signage side as well as Cisco and Dell on the network infrastructure side. While there are many other solutions on the market, if you're building a high end signage offering to meet the needs of the most demanding

environments, this integrated solution is unique in its ability to deliver what the market needs.

For more information on specifying or designing a Digital Signage Solution contact your *NetStreams* sales representative.

A Primer on Network Multicasting

Video is new to networks, YouTube was the first experience that most IT professionals had with video on an IP network. As you can imagine, this experience was not a positive one for those involved in managing the network. In order to better explain why a *NetStreams* IP Video solution does not flood the network its important to differentiate between unmanaged video, like YouTube, and managed video. Let's begin with unmanaged video.

The Figure 5 below shows video content from one source being sent to 3 displays and 1 other source to a single display.

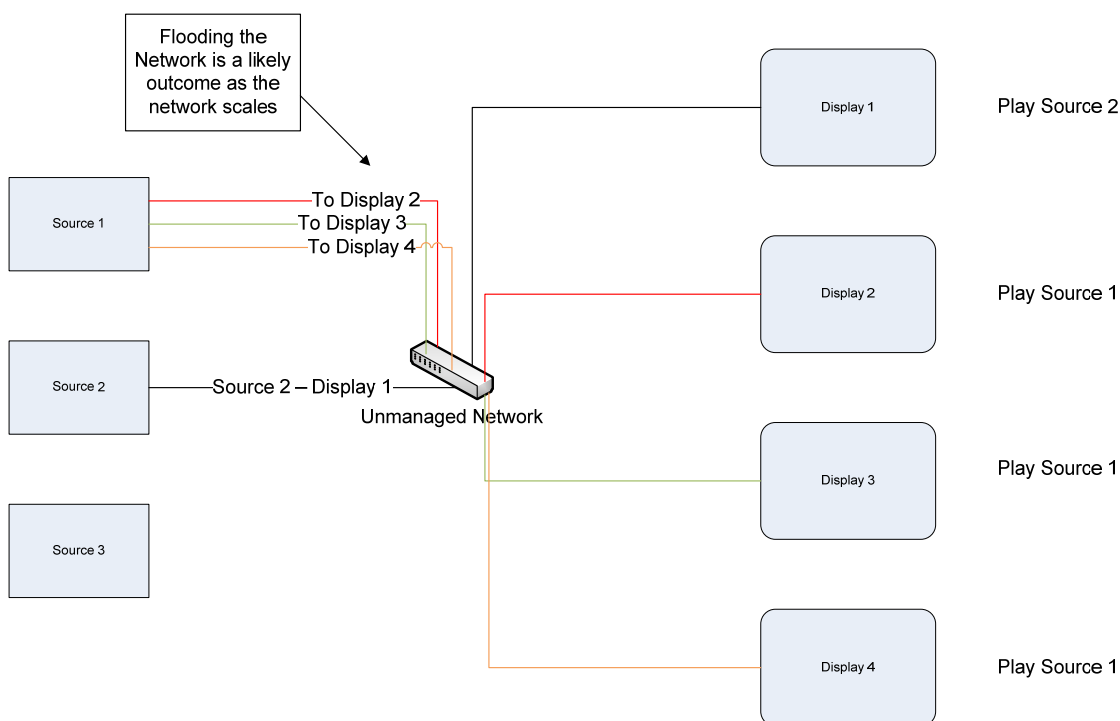


Figure 5: Unmanaged IP Video Networks (e.g. YouTube)



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Each line in the diagram represents a stream of traffic to or from the switch. Source 2 goes to display 1 at 1 Gbps and its link is able to handle this traffic fine. However, when source 1 is asked to play on displays 2,3, and 4 you see that each request from the displays results in a separate stream from source 1. As source 1's connection to the network is a single CAT-5(e) it cannot support 3Gbps of traffic and the result is poor or no picture on any of the displays 2,3, and 4. But why should source 1 have to send the exact same packets to each display 2,3, and 4 separately? The answer is that there isn't a good reason, and this is where managed video comes into play.

Figure 6 shows the same scenario on a managed network. As you can see, there is only 1 stream from source 1 now. This stream is then copied by the managed switch and sent to each of the displays that is requesting the stream.

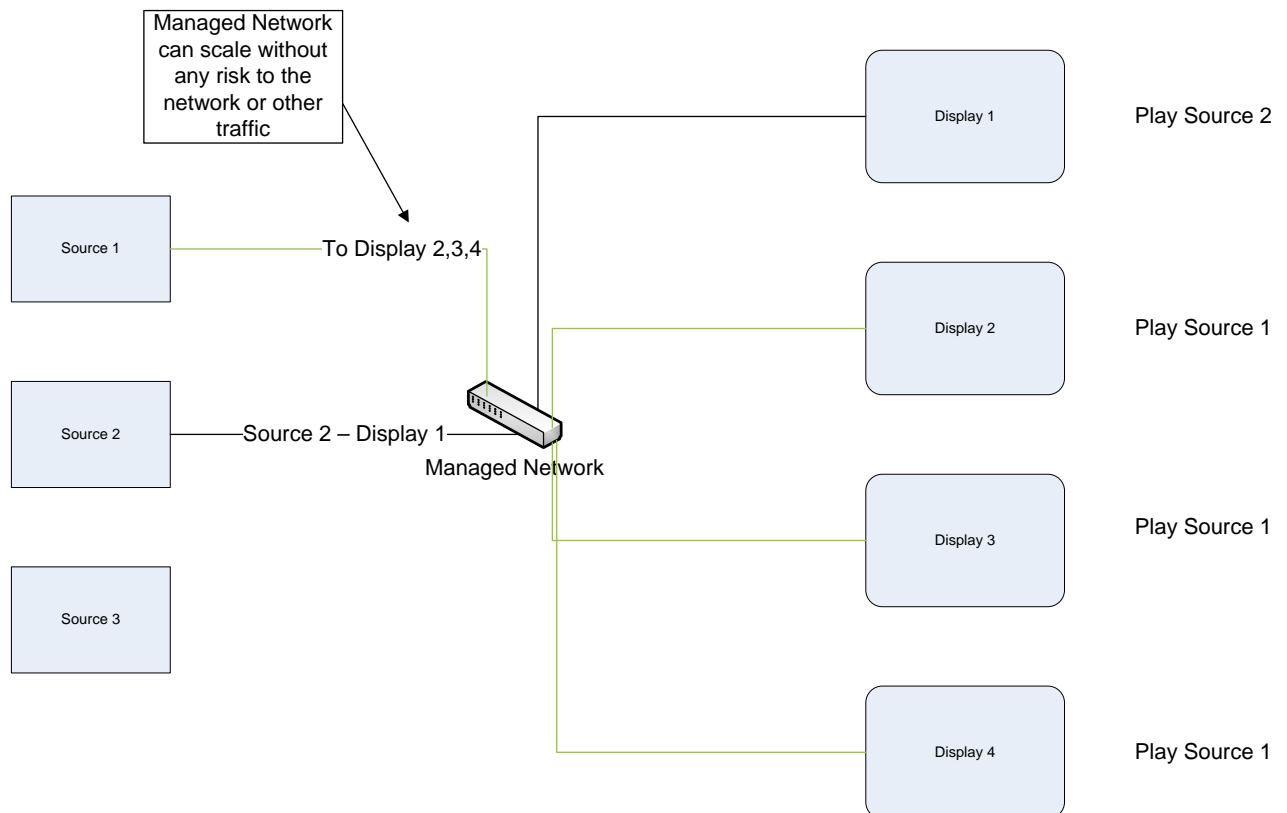


Figure 6: Managed Video Network (e.g. *NetStreams* IP Vide)



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This model can now scale as large as necessary with the appropriate switches. These switches are what is known as Layer 3 Managed switches. There are several requirements for *NetStreams* IP Video solution, but any professional quality video distribution system will have similar requirements. The switches must support Internet Group Management Protocol (IGMP) fully, additionally there must be enough bandwidth on the switch backplane to support all the ports being used simultaneously. Finally, most implementations will need more than one switch, most often to support the distances that may need to be covered. If you have a trained network engineer or designer on staff then you will be ready to start designing the network, if not, *NetStreams* Field Systems Engineers can help you design a network infrastructure that will support your installation. *NetStreams* works with Dell and Cisco to source network equipment for IP Video, we highly recommend that one of these switches be used in the deployment of your solution as many vendors implement IGMP inconsistently or incompletely.

Finally, many people ask whether other traffic (data, voice) can be run on the same network as video. The short answer is yes, because the traffic for video is only sent where it needs to go. This means that as long as the switch has the capacity and is configured appropriately other traffic should be able to co-exist. As a clear example of this, you will recall that *NetStreams* sends audio, video, and control over the same network. There is nothing special about the audio we send, this could be a high-fidelity voice call, and the control data could be a data stream from any file. The networks handle this traffic just fine and deliver all the data synchronously to the requesting end point.