



# Disruptive Technology in the Video Wall Sector

*Tackling the big challenges: cost, complexity and flexibility*

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## Introduction

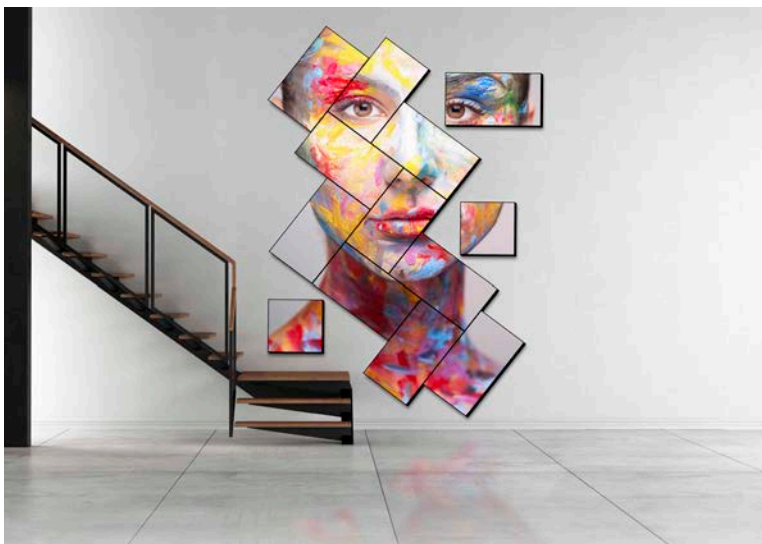
Video wall sales and installations are experiencing record growth. Many factors have contributed to the increasing demand for video walls including a robust expansion of the digital signage market and increasing demand for high-impact solutions to capture audience attention. However, the video wall market is still hampered by solutions that are both costly and complicated, and all too often turn out to be functionally limited as well.

This white paper will examine new network-based approaches to video wall delivery that simplify and reduce infrastructure costs while offering much greater flexibility in terms of both how video walls are deployed, supported and managed, as well as how different Content Management Systems (CMS) can integrate with them.

## Challenges in the video wall market

Traditionally digital signage companies looking to deploy video walls have turned to costly proprietary servers, complex relay systems, high-end, multi-headed video-cards, or limited and expensive signal splitters. In fact, there have been so many approaches to delivering video walls that it is hard to talk about a single, standard traditional approach. Many companies have been forced to juggle a variety of solutions within the video wall category to meet all their deployment needs. A single company might end up deploying one video wall technology for a 2x2 install, another when 4k content is required, a third solution when called upon for a 25 screen array, and a fourth approach when an artistic style video wall with unique screen rotation and placement is needed.

This lack of standardization has been a key challenge and a source of frustration for both experienced professionals and newcomers to video wall deployments. It has also been part of the reason for the high cost and maintenance complexity of video walls.



## Network delivery dramatically simplifies video wall deployments

Use of a Local Area Network (LAN) as a delivery mechanism is an obvious choice for a standardized and cost-effective approach to video walls. Delivering a video wall over a standard LAN reduces the amount of specialized knowledge, equipment installers and support teams need. Network equipment is standardized and easily available, and its use significantly reduces deployment costs. It also provides customers with unique flexibility benefits. However, until now, approaches to deploying video

walls over the network have had performance and scalability limitations. The innovations behind Useful Network Video Wall change that.

<sup>1</sup> "The video wall market maintained its strong growth trajectory in 2013, posting nearly 60% CAGR from 2009 to 2013 to reach sales of 449,000 units" Future Source Consulting, "Global Video Wall Market Posts 25% YoY Growth," May 2014. <http://www.futuresource-consulting.com/2014-05-Videowall-press-release-8908.html>

“Userful has created a unique innovation with its Network Video Wall that allows real-time splitting of the video stream. This enables a Userful video wall to utilize the network to deliver 4k and higher content across twenty five displays.”

Userful's significant innovations allow companies to offer the same solution for a 2x2 video wall, or a 5x5 video wall, or even an artistic style video wall with rotated displays using just one Core i7 PC or server. Because of Userful's approach to network delivery, it can do this in a cost-effective way while supporting content at 4k/UHD resolution.

## Deliver 4k and larger content onto a network video wall

There are three approaches to delivering video walls over the network:

The most common approach is to deliver the entire image to every display on the video wall and then have each display output only the appropriate cropped portion of the content. Hence in a traditional twenty-five screen video wall, each of the 25 displays receive the entire image, but the player device on each display crops and displays just 1/25th of the total image. This system can sometimes work for lower resolution content (e.g., 1080p and lower), however, when deploying 4k content (particularly real-time content) or when video walls require interactivity, it's not realistic to try to send that much data over a standard network and retain synchronization.

A second approach to network video wall delivery is to enable customers to pre-split and separately upload the cropped portions of the video. The players on each display then talk to each other or to a server during playback to maintain synchronization. Unfortunately, this approach is extremely limiting and time consuming in terms of content creation. The customer has to pre-split the content and upload separate files, which is a laborious process. Additionally, perfect synchronization remains a challenge for many of the pre-split video wall solutions. Furthermore, the pre-split approach rules out interactive content or real-time feeds such as social media posts, weather, live TV/video, thus limiting end-user engagement and interaction

A third, more scalable and higher-performance approach to network video delivery splits, crops, rotates, and scales the content as appropriate at the server. The server also sends only the appropriate portion of the image to each corresponding display. This approach is dramatically more efficient with network bandwidth and enables high performance and flexibility.

Userful has created a unique innovation with its Network Video Wall that allows real-time splitting of the video stream. This enables a Userful video wall to utilize the network to deliver 4k and higher content across twenty five displays. This

<sup>2</sup> With all network-based video walls, including Userful's, it's important to have a LAN that operates at Gigabit capacity to ensure optimum performance. This requires a gigabit switch and Cat5e or Cat6 cabling.



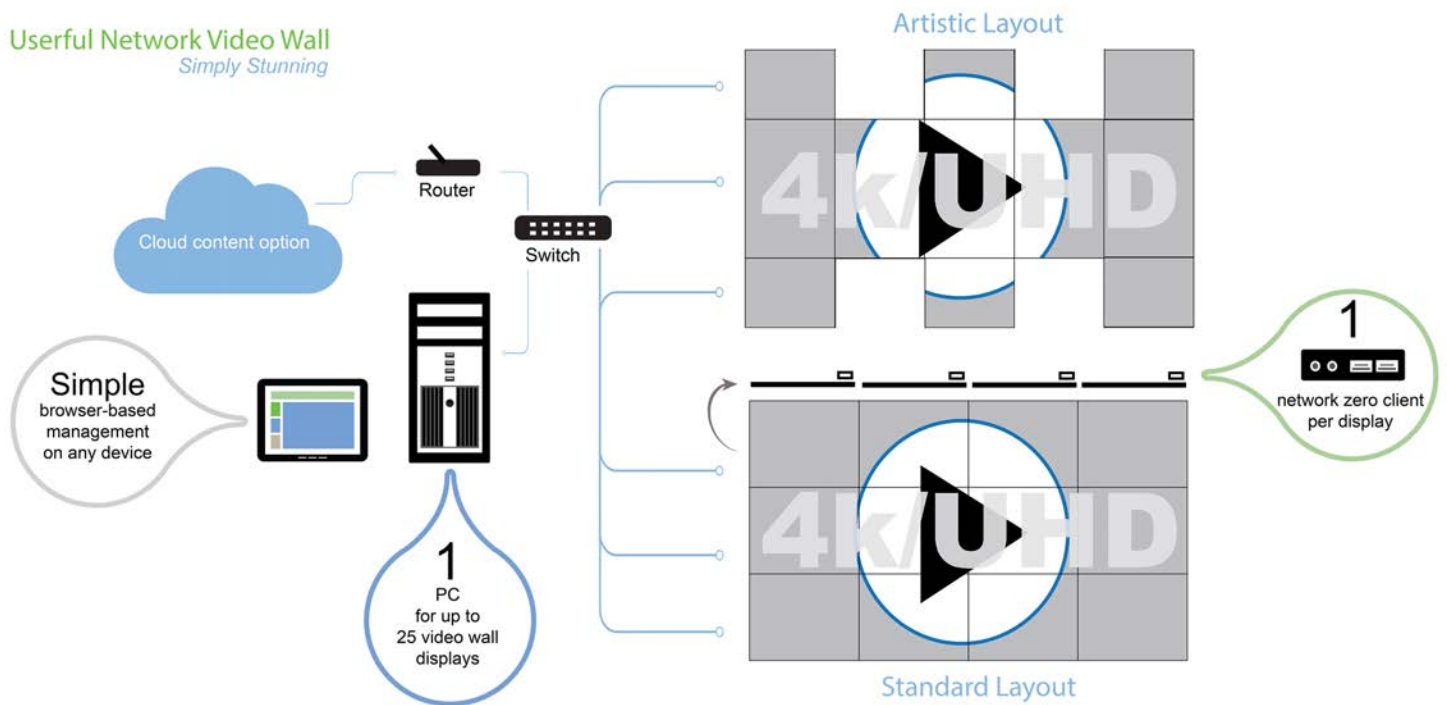


Diagram: One PC/Server supporting two video walls, one in a 4x3 grid matrix, the other in an artistic layout with a mix of displays in different sizes and orientations.

is accomplished by sending each display only 1/25th of the 4k stream as the video stream splitting is completed in real time. This means the solution works well for real-time applications, and customers don't need to spend time preparing content. They can change the video wall layout at will and benefit from all the flexibility and creativity that a real-time network video wall allows.

## Centralized vs distributed CPU and GPU processing

There are two different broad approaches to how video walls use CPU and GPU power to synchronize displays and ensure a flawless image. Previous approaches to network delivery of video walls maximize the computing power at each display in order to ensure that there is enough processing power to support a customer's content demands while achieving synchronization.

This imposes both high, upfront costs as well as a heavy setup and maintenance burden. The complexity of this kind of solution quickly adds up, even when deploying 1080p content.

A more efficient approach to video wall delivery is to centralizing the video processing onto one server or PC. This allows solutions to fully utilize both CPU and GPU of just one PC or server and results in cost savings as well as maintenance and performance benefits over an approach that requires a CPU at each display. It also allows video walls to display larger content. However, until Userful, all solutions that used just one CPU required either a high-end, multi-headed video card, or an expensive splitter. No previous solution centralized onto one CPU could support network delivery. Customers using multi-headed video cards and splitters were saving money by not having to put a CPU at each display, but

<sup>3</sup> Today on an 4th generation Intel Core i7 (Haswell), Userful supports suggested maximum canvases for video playback at up to 4096x4096, dynamic HTML5 content of up to 6000x6000, and static images at up to 16,000x16,000. These suggested maximums will increase in parallel with performance increases in Intel CPU/GPUs.

all those savings were then spent on splitters or video cards and none had the benefit of standardized network-based hardware.

With Userful, all CPU and GPU power is centralized to the server. Customers have only one PC or server to support and manage. As seen in the diagram below, each display has an industry standard network zero client device, which are all connected through the LAN to the PC or server which does all processing and video rendering.

The network zero client devices are little more than a video card with no encoding or decoding done at the device level. In the simplest possible terms, the server sends pixels out across the LAN using standard HTTP protocols. This keeps all processing and rendering on the server itself, keeping costs low and allowing for standardized hardware and network delivery of 4k/UHD video.

## Optimizing CPU and GPU usage to maximize video throughput

To ensure high performance, Userful's software makes use of the PC or Server's CPU and GPU. Customers using a certified GPU (ie Intel 4th Gen GPU) will get a significant boost in performance because the video wall will take advantage of both the GPU and CPU and the latest processor optimizations when rendering content.



*Network zero clients are available from a broad range of companies including ViewSonic, Acer, ThinGlobal, Centerm, Atrust, and others.*

This approach ensures it is easy for customers to upgrade in the future. As Intel's GPU's continue to increase their performance and output, the Userful architecture will also scale to video wall resolutions well beyond 4k. Customers who buy into this architecture can rest assured that when 8k is supported by Intel GPU's, even video walls deployed today will be able to support the higher resolution simply by replacing the PC. The rest of the infrastructure--screens and all--can remain exactly as it is.

## Flexibility benefits to network delivery

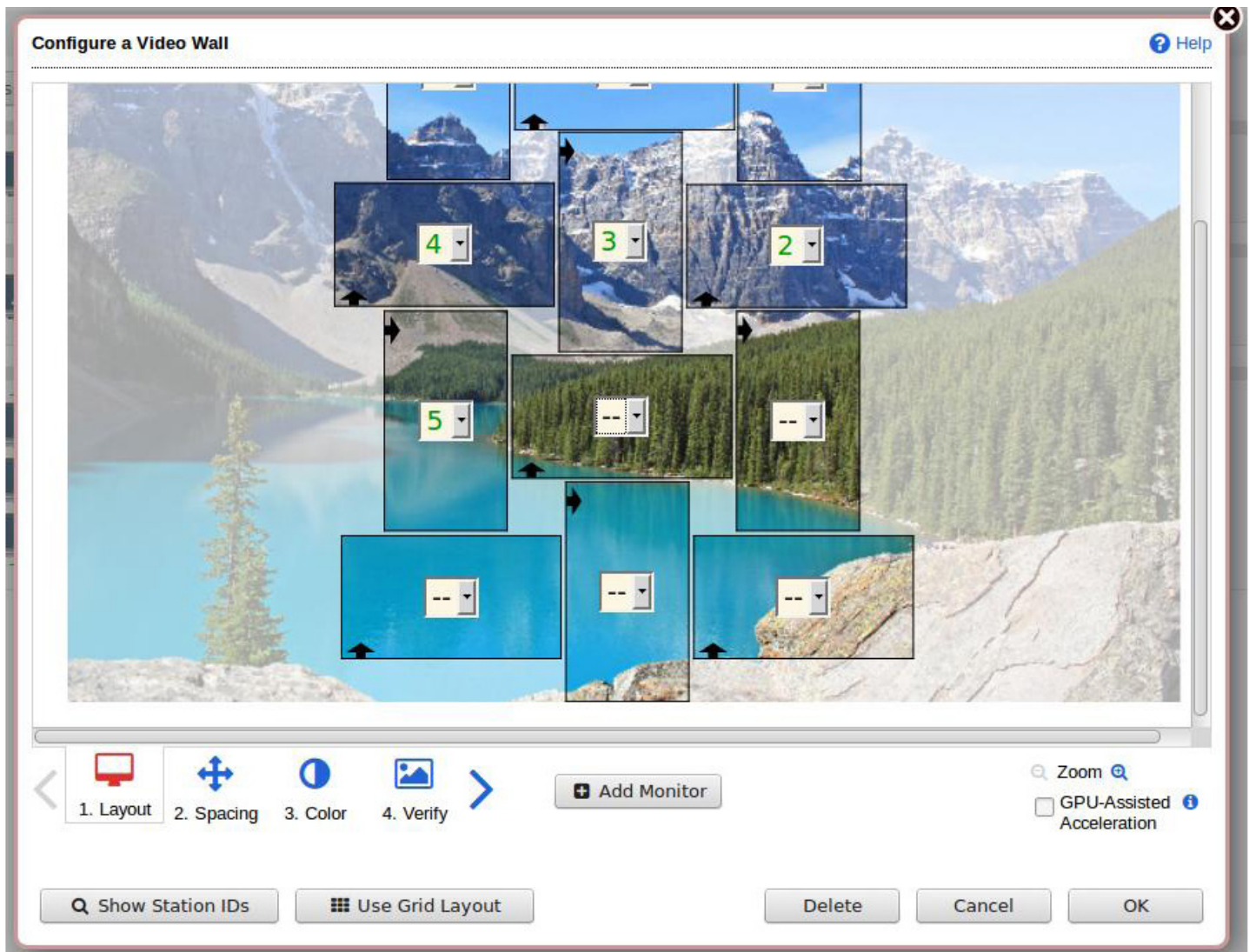
Network delivery of video walls offers more than just cost savings and simplification, it also offers significant flexibility and functionality benefits. Network delivery means the video wall server (or PC) can now be placed anywhere in the building. Many traditional video wall solutions required the video wall player, controller, or server to sit in close proximity to the actual screens (or required the use of expensive cable extender solutions). This often makes deployment, service and support a headache, particularly in high traffic areas, or hard to get to places. In high-heat, greasy, or other hostile environments, putting the server or PC in close proximity to the displays can shorten its life and can increase downtime.

Userful's approach means the only thing that needs to be near the displays are stateless network zero client devices, with no moving parts, an expected 10 year life span, and a significantly reduced risk of downtime.

An additional benefit of network delivery is that one PC or server can actually support two or more video walls simultaneously. This can be very attractive for customers looking to deploy multiple video walls. In addition, it offers customers the option to eliminate the risk of downtime by having two servers each supporting one video wall but capable of supporting two in the unlikely event of a hardware failure. Should a component in one server fail, both video walls can temporarily run off a single PC or server.

## Artistic and non-standard layout options

Video walls are powerful tools to command customer attention and organizations who want to make a unique statement or architectural impact with their video wall may want to angle or place screens in an artistic fashion.



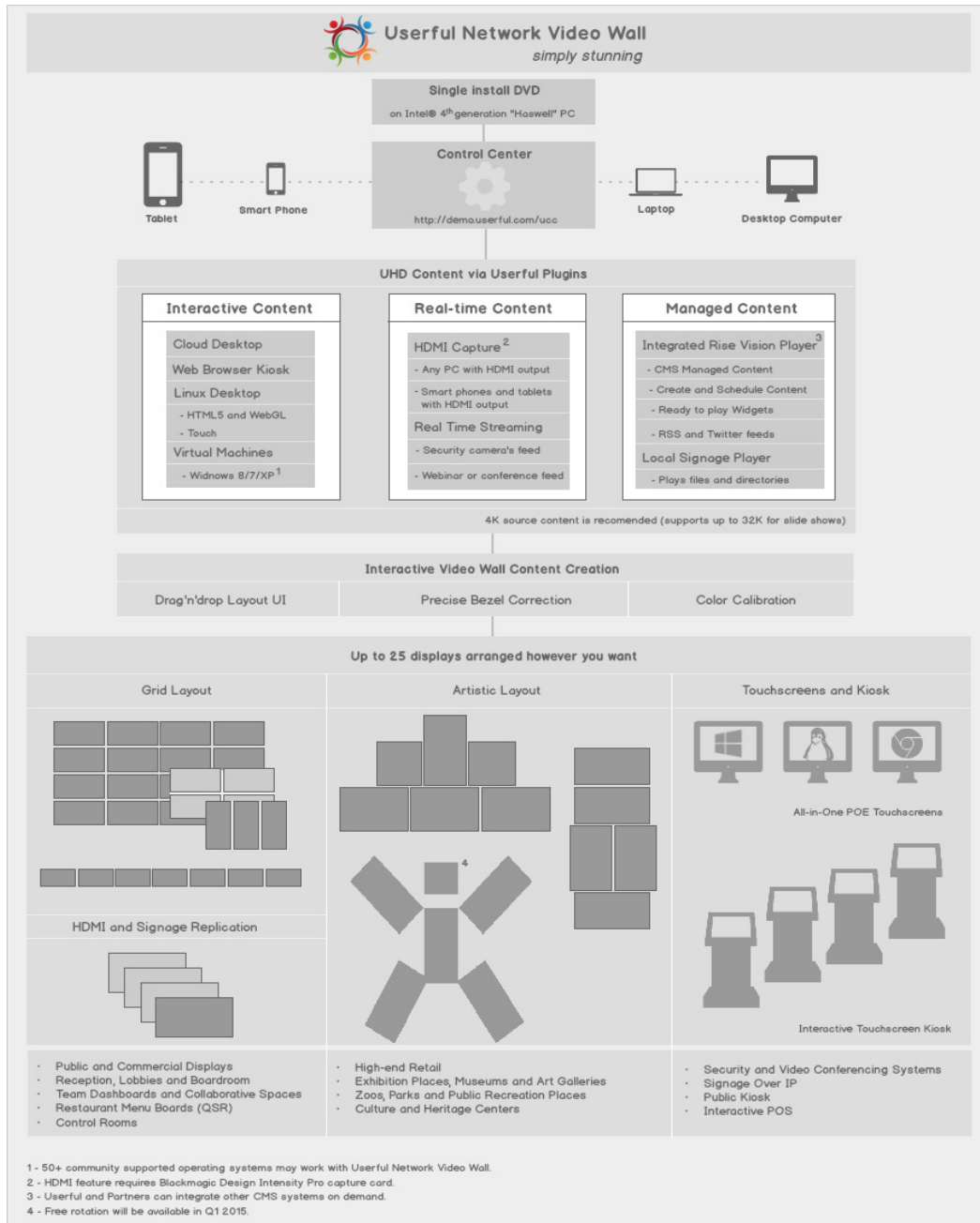
Screen shot of GUI to configure video walls, either grid or artistic, with screen rotation, multiple display sizes and ad-hoc display placement.

<sup>4</sup>The native player option lets customers upload content and play in a loop but does not include scheduling or advanced CMS features.

Userful's integrated layout tool allows any screen to be rotated at any angle, as well as ad-hoc placement of displays anywhere on the canvas. The unique browser-based Graphical User Interface (seen below) allows drag and drop visual configuration of just about any screen layout with bezel compensation and more.

## Support for desktops, touch screens, stand alone signs, and more

Video walls are not always deployed in isolation. Sometimes customer requirements include touch screen, self serve kiosks, digital signs, replication displays or even desktops. Userful's architecture allows the same PC or server that is



*This architectural diagram illustrates the broad set of use cases from video walls and signage replication to touch screen kiosks, desktops and support for real-time content or managed-content through a CMS.*



powering the video wall to support not just the video walls, but also touch screens, desktops, self-serve kiosks, and individual digital signs simultaneously.

## Flexibility on content management solution

Many video wall solutions today are both a Content Management System (CMS) and a video wall management software combined. This creates some difficult decisions for companies looking for a video wall solution, but who are already tied to a particular CMS. In addition, it can often result in a higher price for those customers that aren't seeking all of the bells and whistles of a high-end content management solution and would prefer the flexibility to choose a CMS appropriate to their needs.

Userful's approach is flexible. In addition to supporting HTML5, Flash, and basic playlists, it also integrates with popular third party CMSs. Userful's professional services team can work in conjunction with your CMS provider to ensure their player and content can be delivered seamlessly onto Userful Network Video Wall. Contact Userful for the list of currently supported CMS's and to find out how a particular CMS can be integrated.

Userful's architecture also supports select HDMI capture cards at either 1080p or 4k resolutions allowing for input of just about any real-time content stream using an existing player device.

## Sophisticated synchronization across displays for menu boards

Coming in 2015, Userful is also offering a specialized feature to support for QSR menu board synchronization, which allows, for example, a 1x5 menu board to briefly turn into a bezel corrected video wall to display a featured promotion. The menu board can switch back and forth between being a 1x5 video wall (with all screens synchronized) and a 1x5 menu board showing pricing and menu options tied into the CMS.

## Conclusion

The high visual impact of video walls has resulted in strong and growing demand for video walls around the world. In order to satisfy their customers, digital signage and AV companies need to be able to deploy video walls into a variety of configurations and with increasingly high resolution content at a competitive price. Companies looking to standardize on a single solution capable of serving all markets should choose a network delivered video wall which supports real-time, 4k content in both grid and artistic formations such as the Userful Network Video Wall.

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