ATEN Scaling Technology Enables Seamless Viewing Experiences

How a Scaler Allows for Near-Zero Latency and Transmission of Video at the Proper Aspect Ratio and Resolution

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1. Introduction

You've just put the finishing touches on a series of video walls set into pillars in a large retail clothing store. All the hardware setup seems to be going according to plan until you test playing various videos on the video walls. As you switch from video to video you're shocked to discover that some of the screens go blank while switching videos. Still others are displaying video at an incorrect resolution or aspect ratio. What was meant to be a seamless watching experience has seemingly broken down instead, but integrating a certain device could have averted this situation. That type of device is known as a scaler.

With a scaler in place, video from the source can be displayed on a video wall at the correct resolution, aspect ratio, and even with bezels taken into account. What's more, switching between video sources results in near-zero latency and avoids blank screens caused by switching errors.

VM1600A 16 x 16 Modular Matrix Switch

2. What is a Scaler?

Simply put, a scaler can capture an incoming image, resize it to the specified resolution, and then output it to a monitor or TV at the desired resolution, frame by frame. Scalers can also crop the specified region of the incoming image, upscale it to the specified size, and output the new image correctly.

Without a scaler, the resolution of the incoming image might not meet the native resolution of the monitor or TV to which the signal is being sent. In this scenario, during switching, the signal is "broken" during the switching sequence. The monitor can't lock on to the incoming signal; it tries to re-lock, but ends up displaying a blank, black screen instead, just like in our scenario above. Finally, the signal is re-locked and the content is displayed, but only after a delay and unwanted blank screen, resulting in a switching sequence that is anything but smooth.
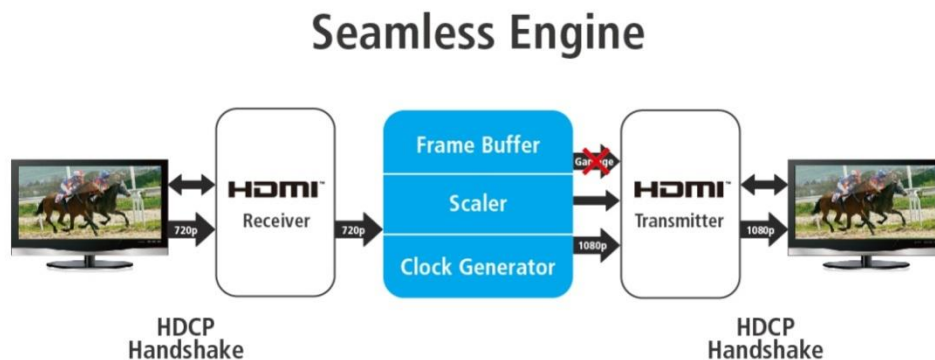
Fig. 1: The above diagram shows the basics of how a scaler works.

3. The Importance of Using a Scaler

3.1 Seamless Switch™

ATEN's Seamless Switch™ technology is an FPGA-based scaler, using a bicubic algorithm, that provides a continuous video signal through the use of HDCP and EDID handshakes. When a device using Seamless Switch™ is employed, the above-mentioned issues are easily sidestepped. In this case, when the signal is sent to the video scaler, the scaler core and frame buffer control take the incoming image and scale it to the correct output. In the end, it outputs the new image with no delay from the previous one, resulting in a seamless, stable switch from one output to another with no blank screens at all.

In a more complex setup, such as with a digital signal matrix, a scaler such still performs admirably. In fact, this type of seamless switching works well even if the aspect ratio of the monitor or TV is different than that of the selected source.

With multiple scalers, each scaler can crop the specified part of the image coming from the same source and scale them up to the corresponding screen to form a video wall. By using a powerful UI, users can save different source selections with the same output resolution setting to different profiles and seamlessly switch their video wall by changing their profile.

3.2 Command Synchronization Mechanism

The aforementioned solution works for a one-box setup but what about seamless switching with a modular matrix setup? In this scenario, the command latency is greater; without a command synchronization mechanism, switching between sources will cause significant delay on a video wall. Each video receiver, such as the 4K HDMI HDBaseT receiver with scaler VE816R, will receive the new signal slowly, and will change one at a time, resulting in an undesirable video experience. However, when a command synchronization mechanism is employed, all scalers can apply the new setting simultaneously, and the video wall content can be switched seamlessly.
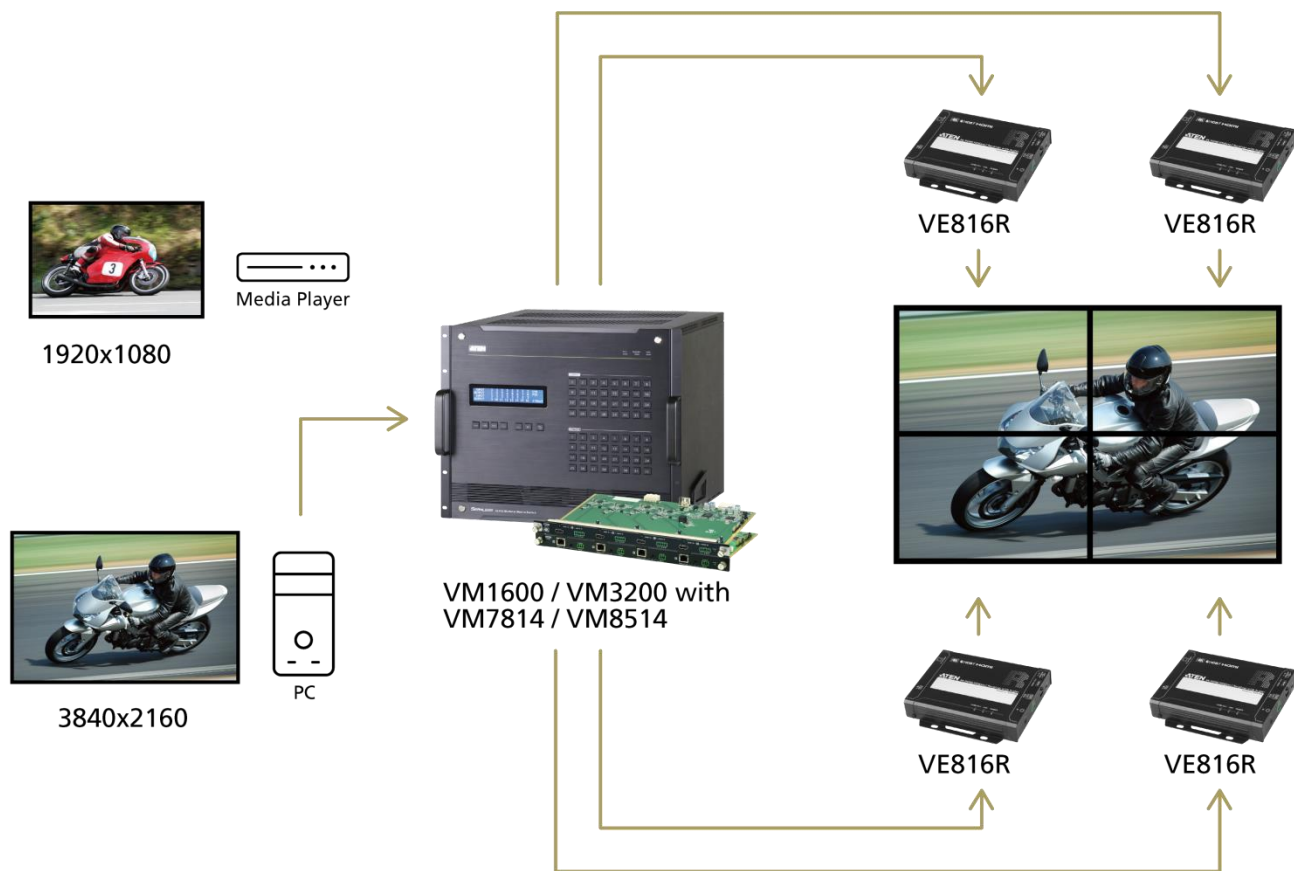
Fig. 2: This diagram shows how a scaler sends signals to video receivers simultaneously.

3.3 Bezel Compensation

Aside from Seamless Switch™, scalers also provide another useful benefit for video wall applications in the form of bezel compensation. When no bezel compensation is employed, a scaler system will crop the image on each screen and upscale the cropped image to the specified output resolution. What this means is, if you're using a four-screen video wall to display one large image, the four screens will not line up as well as they should if no bezel compensation is being used. However, when a scaler utilizing bezel compensation is used, each of the four images will align correctly to output the desired image correctly.

Fig. 3: This illustration shows how bezel compensation helps to display video correctly.

4. Scenarios in Which a Scaler is Useful

4.1 Corporate

Conference Room

Unione Confcommercio Milano, one of the largest business associations in Italy, wanted to upgrade its conference room "Orlando's Hall" (a 562-square-meter hall with 490 seats) from analog to digital. Unione appointed Mr. Edoardo Nogara, CEO of Save Technology, to find a solution that meets the needs of a current-day conference room. With the support of Agenzia Curreri, they discovered ATEN's modular matrix switch as the perfect match. The VM1600's large amount of input and output ports, ability to use multiple interfaces and Seamless Switch technology, makes it not only flexible but also a future-proof solution.
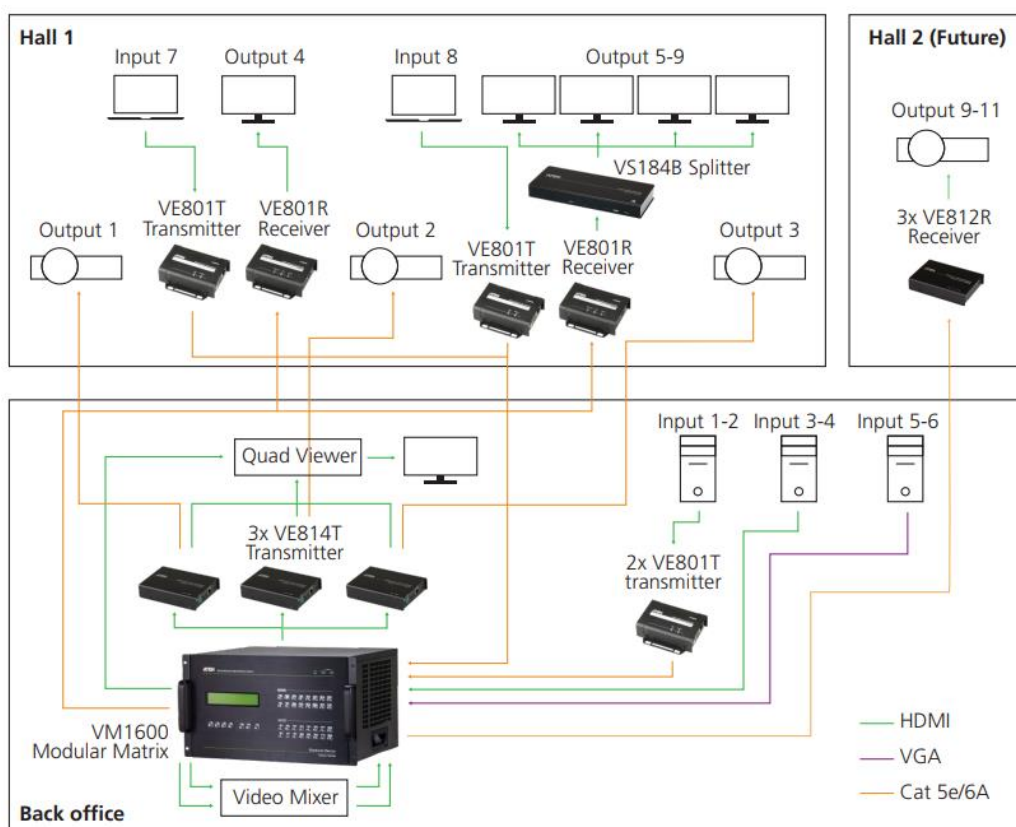

Fig. 4: This diagram shows the scaler solution chosen by Unione Confcommercio Milano.

Showroom

The Yungching Realty Group is one of the leading realty companies in Taiwan. In order to celebrate its 30th anniversary in 2018, they built a state-of-the-art showroom, which they named the iPlus Smart Innovation Center. They required a versatile HD digital signage solution for three video walls, reliable video streams for nonstop immersive visuals, and a flexible and intuitive control system for on-the-go management. The ATEN solution included a VM3200 32 x 32 Modular Matrix Switch; the VM3200's built-in scaler encodes video formats and converts input resolutions to the optimum display resolutions in order to provide seamless, real-time switching, which is what Yungching required for its three video walls in order to provide a seamless experience for prospective customers.
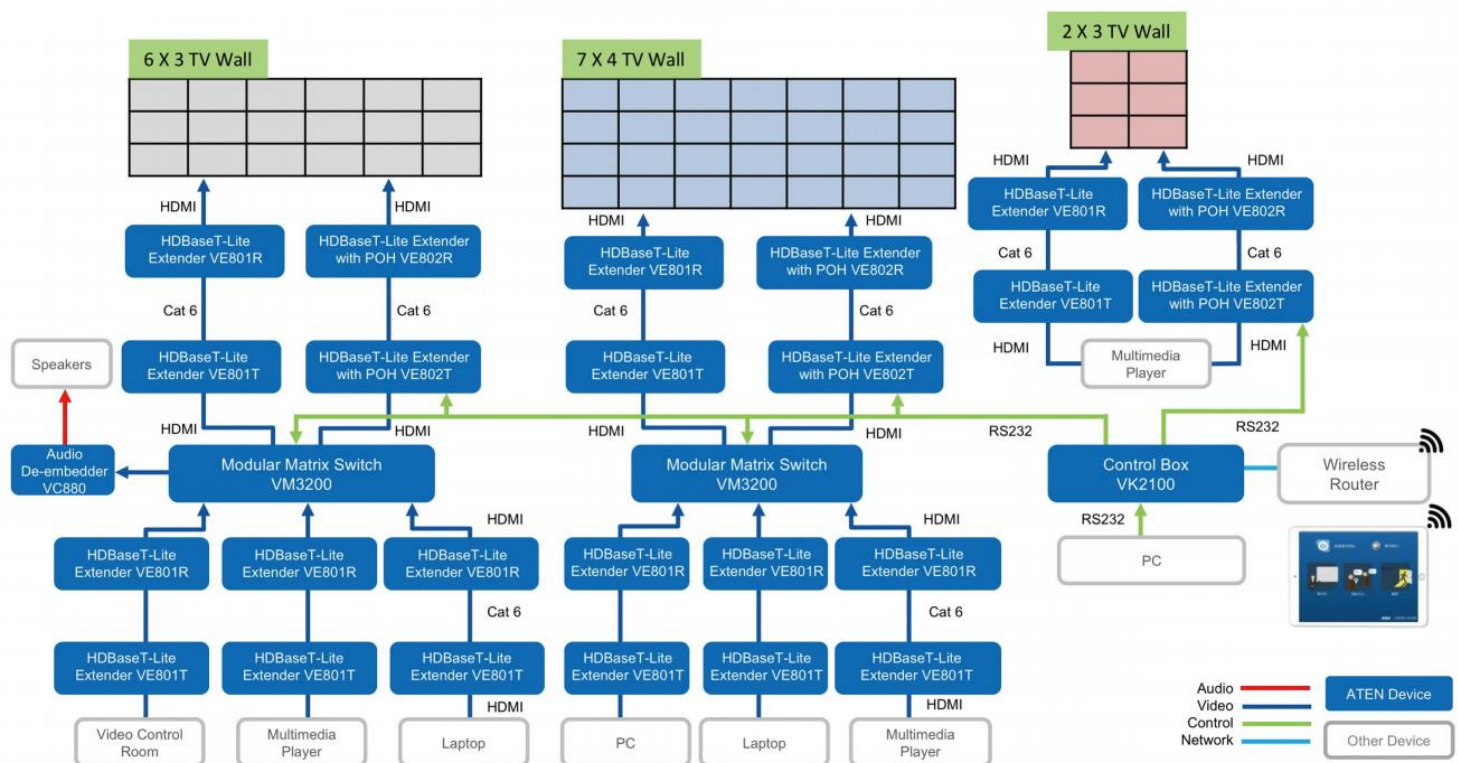

Fig. 5: This connection shows the solution Yungching Realty chose that utilizes an ATEN scaler.

4.2 Digital Signage

Hospitality

Elevens Bar & Grill, a sports bar partnership between Wales and Real Madrid footballer Gareth Bale and the country's biggest hospitality company, S.A Brain & Co. Ltd., opened in Cardiff, Wales in May 2017. Elevens Bar & Grill offers guests 20 flat screens over two floors which broadcast live sporting events in 4K. S.A. Brain & Co. desired a state-of-the-art solution that was unproblematic to use for staff at the venue, yet with the option to expand at a later stage.

ATEN provided a solution with one ATEN VM3200 32 x 32 Modular Matrix Switch with selected modular HDBaseT I/O cards paired with the ATEN Control System. In this scenario it's paramount to be able to switch live broadcasted sports with zero interruptions, otherwise the business could begin to easily lose customers. The VM3200's built-in scaler delivers stable and reliable continuous video streams and quick channel switching.
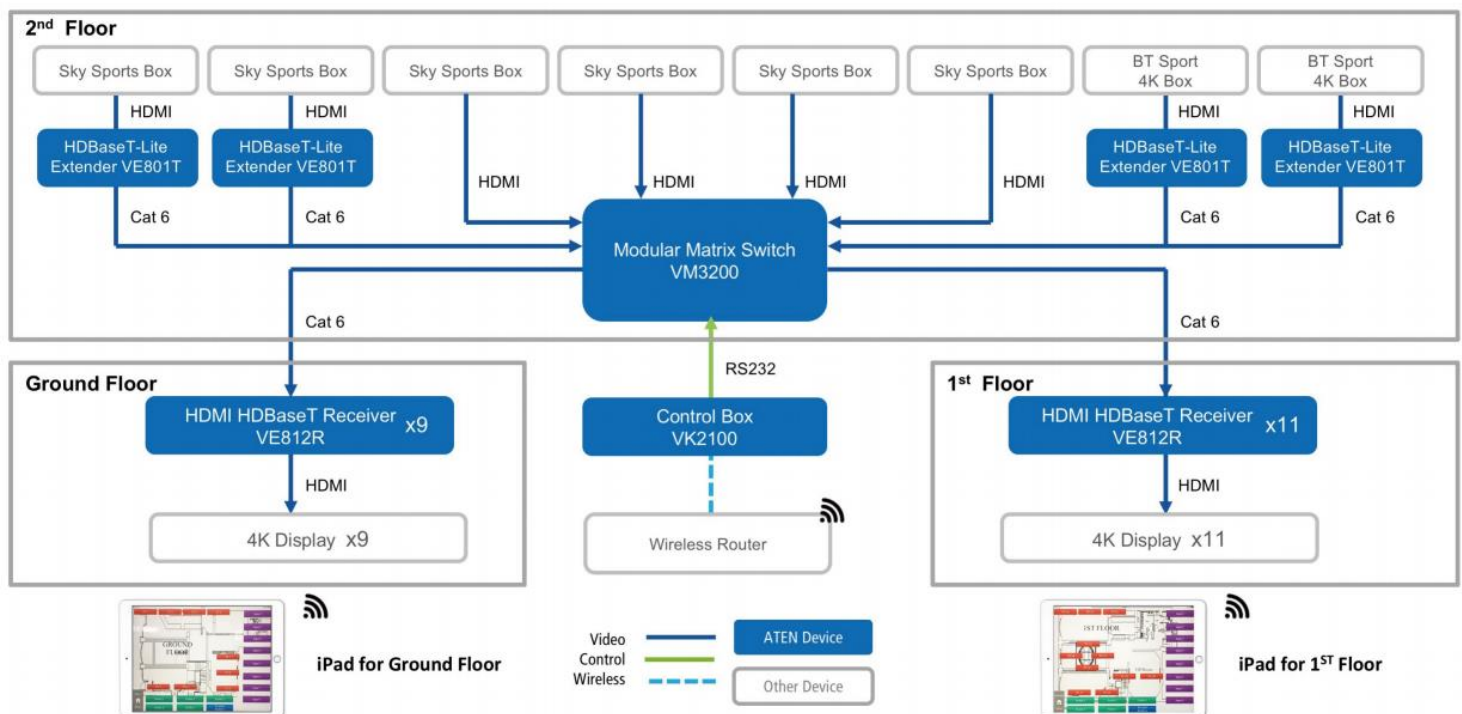

Fig. 6: This diagram shows the scaler solution used in Elevens Bar & Grill.

4.3 Broadcasting

TV Station

Headquartered in Buenos Aires, Artear is one of Argentina's biggest television networks. It recently decided to build a new, state-of-the-art newsroom with two large video walls to display up-to-the-minute content 24-7 for news editors and marketing content creators, and also to display in real-time content streams from live channels, social media platforms, and outside broadcasting vehicles. Artear's previous legacy video wall solution suffered from unacceptable lag when switching between sources. Artear required a video wall solution that was simple to control, catered to a range of display configurations, and featured fast switching between video sources in real-time. There is simply no room for video complications or delays in their industry.

ATEN provided the right solution with six VM1600 16 x 16 Modular Matrix Switches; four VM1600s were used for a 10 x 6 video wall and two for a 5 x 5 video wall. The VM1600's built-in Seamless Switch™ technology delivered stable and reliable continuous video streams and instant real-time source switching without delays, meeting the customer's demand.
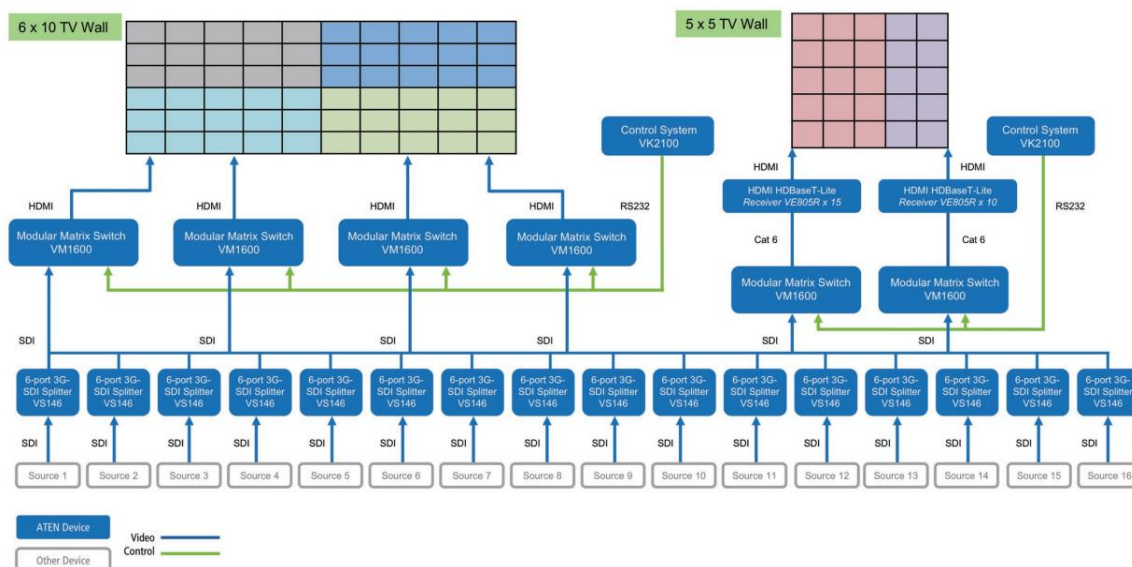

Fig. 7: This diagram demonstrates how six ATEN VM1600 Modular Matrix Switches with built-in scalers helped to create two video walls with near-zero latency switching of video sources.

5. ATEN Scaler Products

ATEN Fixed I/O Video Matrix Switches and Modular Matrix solutions both feature innovative built-in scaler technology to provide switching between video sources with near-zero latency at the correct output resolution and aspect ratio and with the added benefit of bezel compensation to take into account video wall layouts.

ATEN Fixed I/O Video Matrix Switches

VM3404H, VM3909H, VM6404HB, VM6404H, VM6809H, VM51616H, VM5404H, VM5808H

ATEN Modular Matrix Switches

VM3250, VM3200, VM1600A with Output Boards: VM8604, VM8804, VM8814, VM8824, VM8514 + VE805R/VE816R, VM8584 + VE883R

6. Conclusion

Video walls, and other digital signage installations, continue to grow in popularity in corporate settings such as in meeting and conference rooms, and in showrooms, as well as in the hospitality sector and in broadcasting. In an increasingly fast-paced world where users expect fast, lag-free switching in their video display installations, it's vital to not lose them for a moment due to otherwise-avoidable technical issues. However, as video formats are increasingly installed at 4K, and eventually 8K, bandwidth demands will increase, so switching at near-zero speeds will continue to be a challenge.

By implementing scaling-enabled switches, however, you can meet this challenge head-on and offers a solution that provides a near-flawless visual experience for a variety of use cases to give users the near-instant video switching performance they need.

7. Further Resources

- ATEN Fixed I/O Video Matrix Switches
  https://www.aten.com/global/en/products/professional-audiovideo/video-matrix-switches/
- ATEN Modular Matrix Switches
  https://www.aten.com/ext_data/global_en/microsite/Modular_Matrix_Switch_Series/