Seeing the World with the Latest Display Technology: Advantech Video Wall Controllers Certified By Matrox

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The advancements in video wall technology are opening up more windows on the world, conveying new thoughts and messages of the latest developments in many areas. From digital signage in sports, entertainment, shopping and other public venues, to mission-critical control rooms for military operations, power and energy, factory automation, transportation management, security and surveillance, video wall controller technologies are bringing us to a whole new world of immediate visualization, extensive collaboration and more responsive and effective decision making based on access to accurate and timely information.

Take the MRT (Mass Rapid Transit) control room as example. Benefiting from a new generation of video wall controllers loaded with multiple Matrox Mura™ MPX output/input graphic cards, display systems used in the control room can create large-scale and highly functional video walls to display any incoming video or data, such as VGA or DVI feeds from any of a range of sources: operator workstations running maps, Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO) programs or Passenger Information System (PIS), platform live video CCTV feeds, set-top BOX HDMI feeds, etc. Broad video walls composed of multiple monitors provide the viewers with a large virtual desktop that can be easily manipulated in response to rapidly changing conditions. This helps to enhance situational awareness, which can be a crucial factor in executing safe and efficient transportation management.

At the core of a video wall application is one or more output/input graphic cards plugged into a computer system–the video wall controller. The function of the video wall controller is to capture all the

video sources to be viewed, convert them to a common format, then scale and spread them across the video wall matrix.

As mentioned, many video walls are in mission-critical environments, such as military command centers, or nuclear power plant control rooms; computer systems used for video wall controller platforms are not ordinary commercial computers, but highly ruggedized, stable, reliable industrial computers designed with special considerations for video wall applications.

That is to say, successful and outstanding video wall performance relies on the marriage of powerful video card(s) and reliable industrial computer(s). This is the nexus of the partnership between the world's leading innovator in display solutions, Matrox Graphics, and global IPC manufacturer, Advantech.

Matrox Mura™ MPX Driven by Advantech Server-grade IPC

To continue to expand market share, Advantech and Matrox are partnering to launch a series of video wall controllers designed for and validated with Matrox's Mura™ MPX graphics cards. These will be called Advantech Video Server (AVS) series products, and will aim to enable OEMs and system integrators to create video wall solutions for various markets such as digital signage, process and system control rooms, and security and surveillance monitoring, just to name a few.

Under this cooperative scheme, video wall system integrators who buy AVS products need not worry about issues of compatibility with Mura™ MPX; the AVS products have been certified compatible by the Matrox laboratory. In addition to the product itself, Advantech also offers premium system integration, technical support and logistics services through its worldwide service centers. With these benefits, system integrators can reduce costs and focus on activities that maximize their add-on value.

The Mura™ MPX series, featuring the Gen 2.0 PCI Express x16 connection interface, provides up to a maximum of four inputs and four outputs on a single card that can capture a variety of input sources then scale, rotate, position and display them across the video wall matrix in real-time. Video source feeds may include both digital and analog signals from surveillance cameras, satellite and cable TV set-top boxes, computers, Blu-ray players, and so on. Users can configure the video display wall with great flexibility, opening one or multiple

sessions on each display or spanning a single spreadsheet across several monitors—depending on the focus requirements of any given situation.

Matrox PowerDesk software is powerful enough to allow for flexible configuration of video wall layouts that can respond to situational awareness. With friendly graphics user interface, the operator can easily display just a few sources of more situational significance and enlarge any of the images to be shown across a number of monitors, and minimize it in the next moment, or move images from here to there across the entire visual canvas. Moreover, when using projectors as display devices, the PowerDesk edge-overlap feature allows the user to easily and intuitively adjust the number of overlapping pixels between edge-blending projectors to create a seamless, unified image.

Advantech has developed a series of AVS products with a variety of PCIe expansions ranging from two slots to more than ten slots. For example, the AVS-290 with two PCIe x16 slots can support two Mura^{TM} MPX cards, allowing for a maximum of eight video source inputs and display outputs corresponding to eight monitors. To further illustrate this with a practical factory control room scenario, two of the inputs could be connected to a surveillance system NVR machine, two connected to operator workstations running production management software, and the other four connected to those running SCADA software. All information can be immediately displayed on the video wall.

Design Highlights

As mentioned, computers supporting video wall applications are no ordinary computers. A reliable, powerful dedicated video wall controller has to deal with the following problems from the design level:

(1) PCIe Bandwidth and Data Switch Rate Provision

When images on a video wall are enlarged, reduced or moved across multiple monitors, it requires huge transient video data transfers between and among multiple Mura^{TM} MPX cards. Especially for a dense system in a large scale video wall application, there can be many data inputs and outputs in combination, and data exchanges among these inputs and outputs are extraordinary. For example, a 1080p full HD video stream generates 0.5 GB/sec data throughput; when four such video streams are captured by a Mura^{TM} MPX card and displayed through four output ports on a different card, a 2.0 GB/sec card to card (slot to slot) data

transfer occurs. A video wall controller's PCIe slot design must have not only enough bandwidth but also a data switch rate that ensures quick, smooth, no-latency display.

Because in most application scenarios a video wall controller needs to carry more than two Mura[TM] MPX cards, all Advantech AVS products are designed with server grade chipsets to have enough PCIe lanes from the CPU and high data switch rates between PCIe slots. Every PCIe x16 slot supports at least Gen 2.0 PCIe x8 bandwidth; BIOS is also tweaked to support multiple GPUs (a Mura[TM] MPX card can have up to two GPUs) and to maximize card-to-card transfer rate.

Advantech sends all video wall controller prototypes to Matrox headquarters in Montreal, Canada for validation; this ensures rock solid compatibility. Advantech video wall controllers driving Matrox cards can power video walls up to full 1080p inputs and outputs with zero latency.

(2)   Thermal Design

When multiple graphic cards are employed in a computer system to drive a multiple monitor video wall, the power consumption is huge and there rise system heat problems that need to be carefully dealt with in both board and system design levels. System cooling performance relies on the selection and installation of fans and efficient air flow design in the chassis.

Ordinary computer motherboards have their memory sets be positioned horizontally, perpendicular to CPU, PCIe expansion slots and other components on the board. This is to facilitate more economic PCB wiring, as PCIe traces can be more conveniently routed to the CPU.

However, when it comes to a dense system supporting video wall, ventilation becomes the priority. Advantech has employed a component placement call Rack Optimized Placement which places the memory slots parallel to PCIe slots on the motherboard in order to maximize the efficiency of the chassis airflow and cooling performance, effectively lowering CPU, memory, motherboard major ICs, Mura[TM] MPX GPUs' temperatures to keep system very stable when operating with multiple Mura[TM] MPX cards. This poses challenges for PCB wiring and forces us to employ more PCB layers to complete needed wiring.

This is one of the reasons why a video wall controller is usually more pricy than other IPCs or ordinary computers. However, the price tag is worth it as system shutdown or failure due to overheat could be catastrophic in mission-critical applications.

(3) Remote Management Capability

Remote control and monitoring is also an important part for maintaining system health and operational reliability. When a computer system is going awry, abnormal signals will surface first in temperature, voltage or fan rotation speeds. Remote management allows operators to get their hands on all these figures related to system health via network connection. This feature is especially important for a video wall administrator because the video wall controller is usually put in the computer room where the operator usually does not seat in.

In addition to using a remote computer to access the video wall controller, operators can also use smartphone, iPad or laptop to monitor system status. When operators find the voltage in the system becomes unstable, temperature is rising or the fan rotation is slowing, they can immediately take actions to repair, and if in time, they can avoid a catastrophic system failure.

The remote management capability has almost become heritage for server-grade IPCs, especially for those used in critical missions. Many of these systems can automatically issue local alarms, send alerts or notifications to operators through e-mail or cell phone message when any abnormal situation is happening in the system.

There are technological or business options for remote monitoring and control: either software-based in-band solutions which operate utilities or application software under operating system like Windows, or hardware-based out-of-band solutions such as IPMI or iAMT that are enabled by a separate BMC circuits on motherboard or embedded controller inside Intel PCH chipset to allow remote administrators to have access to it regardless of whether the system power is on or off, in a dormancy or is failed. With out-of-band solution, administrators or operators can start, shut down or restart the system remotely; even when the system is powered off or the OS is dead, as long as that small unit is still "alive", the operators can get access to that unit via the Internet to understand the status of the system.

Obviously, the software-based solutions are more economically appealing. The SUSI-Access remote diagnosis software developed by Advantech is even free and available for all its

customers. However, for video walls used for mission-critical applications, hardware-based IPMI or iAMT solutions are strongly recommended.

Matrox Graphics Validation

For a highly functional system, good electronic designs are important. However, all excellences will never count till they are thoroughly validated.

Under the cooperation plan between Matrox and Advantech, Advantech has sent all the prototypes of its video wall controllers to Matrox's lab at their Montreal headquarter for validation and certification of compatibility and reliability.

Matrox validation means assurance that Advantech video wall controllers are electronically, mechanically and thermally compatible with Matrox's graphic cards, can install these cards without mechanical interference, run them reliably and stably without getting overheated, and can support all the functionalities and merits to perfection. These guarantees are nowhere available if one purchases any ordinary PC from the market or any IPC without Matrox validation to run a video wall graphic card.

Advantech Technical Support

Advantech is the world's top IPC manufacturer and supplier, and operates a global business and technical support network with sales and service available in every corner of the world.

Advantech has established branches in many countries which can provide system assembly services to video wall system integrators to save their assembly and testing efforts, helping them speed up deliveries. And all customers using Advantech systems are entitled to Advantech's 3-5-7 Services, which means: 3 Levels of Service, up to 5 Years of Extended

Warranty, and 7 Years' guaranteed Product Supply. Video wall system integrators and users of Matrox graphic cards running on Advantech platforms do not have to worry about maintenance and repair issues.

Alliance of Winners

This partnership between Matrox and Advantech is a win-win strategy: on one hand, Matrox can leverage Advantech's worldwide business and technical network to further expand its market share; on the other hand, with validation from Matrox, Advantech expects to plant flags in the burgeoning video wall market.

Conclusion

The advancement of video wall technology is changing the industrial landscape and the way we see and react to the world. In some critical application cases, such as electric utilities monitoring and military battlefields, system reliability and stability can be a matter of life and death, demanding the most powerful Matrox Mura^{TM} MPX cards running on the most reliable Advantech Video Server (AVS) systems.

Advantech, with decades of experience in developing computing platforms for applications in various industrial sectors, sees the importance of the video wall mission and is proud to offer its best support.