extension up to 330 feet (100 meters) for digital video, while fiber optic extenders can send signals up to 2 km (6,560 feet) over multimode fiber or up to 30 km (18.75 miles) with singlemode fiber.

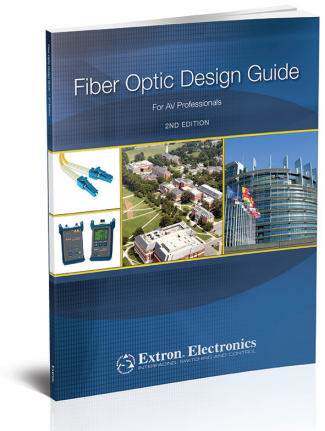
Fiber Interfacing

Fiber optic cabling can be used to transmit video, audio, and data over extreme distances with zero signal degradation and complete immunity from outside electrical interference. Signals sent through fiber are also inherently secure. This is due to the absence of electrical emissions, making fiber the preferred choice for government, military, and medical applications.

Fiber technology has become more and more common; it is the new standard for AV system designers and integrators creating future-proof AV systems. A longstanding perception is that fiber is difficult to work with. However, new, affordable, easy-to-use termination systems make terminating fiber cable assemblies as easy as crimping a BNC.

Extron offers a wide variety of switching, distribution, and signal extension products with direct fiber connections. They are available to designers specifying the most secure, highest quality signal delivery devices in their systems.

For more information on fiber optic technology, consult the Extron Fiber Optic Design Guide, available for free download at www.extron.com/fiberguide.



The Extron Fiber Optic Design Guide provides tutorials on fiber optic technology and cabling, and provides practical examples of fiber system designs.

Audio

While a videowall may support a room's viewing requirements, additional signal management may be required to support audio. A videowall can display many video signals, but program audio typically originates from only one of the displayed sources. The system's control interface should allow for the selection of one or more audio sources. Many matrix switchers that route video can also manage audio distribution, as can standalone audio switchers.

An audio signal processor with DSP and matrix mixing can be used for routing and supplemental audio processing. Functions can include volume, equalization, and mixing program audio with one or more microphones or other audio sources. Once a program audio source is selected and processed, the signal needs to be amplified and sent to speakers. The size of the amplifiers and the type and number of speakers needed depend on the application, the size of the room, and the required sound level.

FIBER INTERFACING

Extron FOX3 T 201 & FOX3 SR 201
Fiber Optic Transmitter and Receiver

AUDIO

Extron XPA U 1004
Audio Amplifier

Additional Videowall System Elements

STREAMING AND RECORDING

Extron SMP 352
Streaming Media Processor

Streaming and Recording

The ability to transport audio, video, and graphics streams across a data network has revolutionized many signal distribution applications. Live and pre-recorded content can now be delivered across greater distances to larger audiences more efficiently than ever before. By utilizing the infrastructure provided by LANs, WANs, and public networks, audio, video, and graphics can be delivered anywhere in the world. These multimedia streams can be decoded by hardware devices, videowall processors, computers, and smartphones or tablets. They can also be captured and stored with recording devices, allowing for future playback of recorded content for training or debriefing purposes.

Streaming decoders can be used as a source for videowall processors. At the outputs of a videowall processor, streaming encoders can send videowall imagery to a recorder or remote locations for collaboration among different functional groups or agencies.

Networks

Once used exclusively for computers, data networks are now used for other functions such as streaming audio, video, and control signals for videowalls or other devices in an AV system. Networks for AV can be standalone entities, isolated from a larger house network, or integrated within an organization's infrastructure. Isolated networks can often be installed and managed entirely by integrators or third-party service providers. Collaboration with IT departments is important when incorporating AV data into a house network. AV network topology vary, depending on the application and complexity of the system. For example, an unmanaged, eight-port switch is sufficient for a simple one-room control system, while building-wide distribution of multicast video streams may require several linked, programmable switches to manage data flow.

Keyboard and Mouse Extension and Switching

When an operator must have control over several remote workstations, or needs keyboard and mouse control of a computer from a great distance, USB switchers and extenders provide the solution. Extron offers an expansive family of USB extension and distribution products. USB switchers allow an operator to use a single keyboard, mouse, or other USB peripheral device to control multiple computers. More complex control can be realized with USB matrix switchers, which allow the operator to assign multiple USB peripheral devices to a selection of computers.

Extron USB extenders enable remote operation of USB peripherals at distances much greater than the 15 feet (4.5 meters) designated by the USB specification. Twisted pair USB extenders enable remote operation of USB peripheral devices at distances of up to 450 feet (135 meters), while fiber optic USB extenders support distances up to 10 km (6.25 miles). ■

NETWORKS

Network Switch

KEYBOARD / MOUSE
EXTENSION AND SWITCHING

Extron SW4 USB Plus
USB Switcher

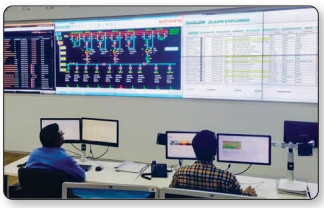
Videowall System Designs

While videowalls are best known for their ability to create “big pictures,” their uses and applications vary widely. Public spaces and workspaces benefit from the flexibility videowall processors provide with their ability to upscale, downscale, and tile images.

Systems incorporating videowall processors include a variety of source devices, including cameras, workstation computers, and even streamed content delivered over an IP network. Display devices may include projection cubes, flat-panel displays, LED arrays, or 4K projectors.

The following videowall designs highlight the diverse applications for videowalls, from a small videowall in a utility operations center, to a medium-sized videowall as the centerpiece of a museum exhibit, to a large videowall supporting a traffic management center. The System Overview and Room Needs Assessment sections establish how these videowalls are used. Detailed application drawings clearly depict signal flow and the types of sources and displays utilized.

Utility Operations Center



Corporate Presentation Auditorium

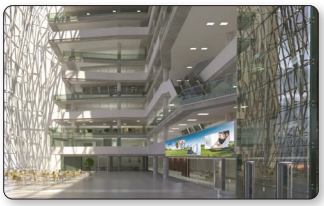
Command Center

Museum Exhibit

Simulation Debriefing Theater

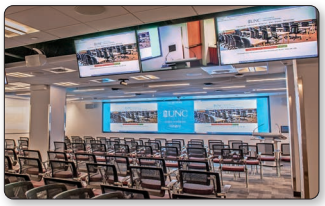
Traffic Management Center

University Student Center Atrium

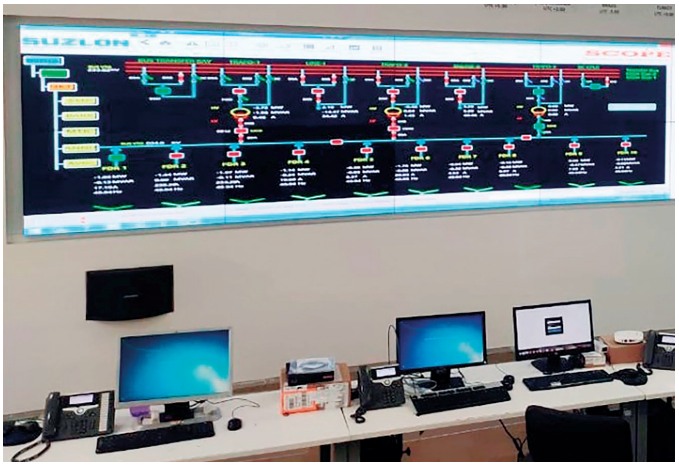


Corporate Lobby and Collaborative Theater

Educational Medical Facility



Utility Operations Center



Overview

This utility control room tracks operations monitored through 16 personal computers. Each of the four workstations with designated areas of responsibility are equipped with four displays, with the control room supervisor able to determine what is monitored at each station. A central 2x4 videowall in the main control room provides the status of all critical processes being tracked. A touchpanel allows the supervisor to choose the content displayed on the videowall and what each operator views.

Room Needs Assessment

Staffing	Four technicians, one for each of the four workstations, analyze data on the four local displays at each workstation. The control room supervisor selects the data sources to be displayed on the videowall, and also designates the processes to be monitored at each workstation.
Display Requirements	A central videowall consists of eight 60" (152 cm) 1920x1080 flat-panel displays arranged in a 2x4 configuration. Additionally, each workstation is equipped with four monitors.
Source Types	Sixteen computers with HDMI outputs track and control the processes monitored in the control room.
System Control	One touchpanel interface for selection of window layout presets, source selection for each preset, and designating data to be tracked at each workstation.
Special Requirements	The system must be expandable to allow additional inputs to accommodate anticipated future growth.

System Design Solution

Videowall Processing

A **Quantum Ultra Connect 128** videowall processor drives the eight screens of the 2x4 videowall. It enables the display of up to eight sources simultaneously, in any configuration.

Source Connectivity

The 16 computers are connected to an **XTP II CrossPoint 320**0 modular HDMI matrix switcher, configured with 16 inputs and 32 outputs.

Display Systems

Eight 60" (152 cm) 1080p LCD flat panels provide an overall display resolution of 7680x2160 for the 2x4 videowall. Each individual workstation has four 1080p LCD displays.

Switching and Signal Management

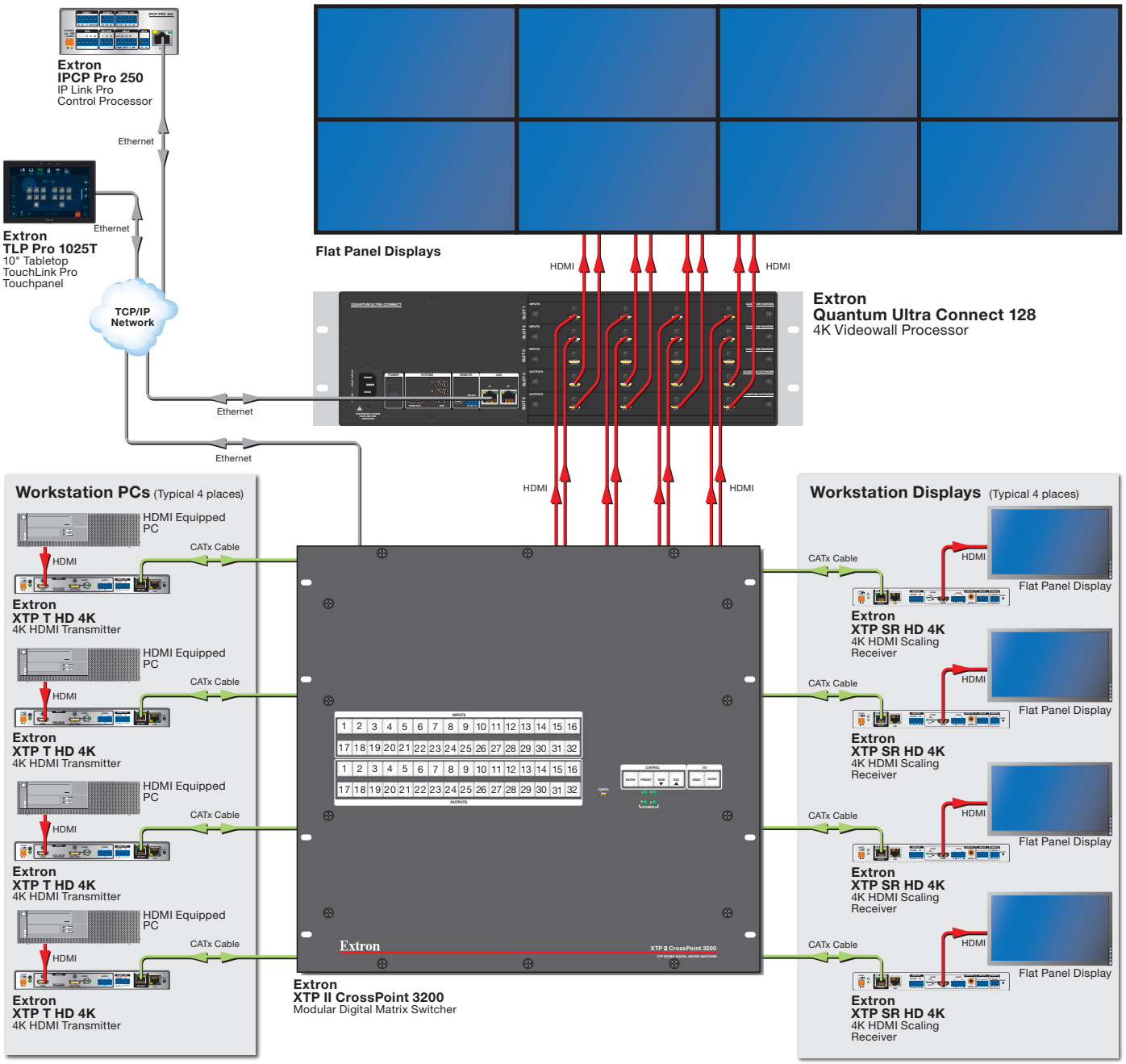
The XTP II CrossPoint 3200 outputs feed the Quantum Ultra Connect 128 inputs and the workstation displays. Full matrix switching capability enables any window on the videowall and any workstation monitor to display any data source. EDID Minder® ensures that sources power up properly and reliably output content for display. The system is expandable to accommodate up to 16 additional data sources.

Network

The network includes a Layer 2 Ethernet switch for the Quantum Ultra Connect 128 videowall processor, XTP II CrossPoint matrix switcher, TouchLink Pro touchpanel, and IP Link Pro control processor.

System Control

An Extron **TLP Pro 1025T** 10" (25-cm) TouchLink Pro touchpanel and an Extron **IPCP Pro 250** IP Link Pro control processor are used to control the Quantum Ultra Connect 128 processor and the XTP II CrossPoint 3200 matrix switcher. The touchpanel provides a selection of preset videowall configurations. It also can be used to designate any data source to be monitored at any workstation display.


Extron
IPCP Pro 250
IP Link Pro
Control Processor
Ethernet
Extron
TLP Pro 1025T
10" Tabletop
TouchLink Pro
Touchpanel
Ethernet
TCP/IP
Network
Ethernet
Ethernet
Flat Panel Displays
HDMI
HDMI
Extron
Quantum Ultra Connect 128
4K Videowall Processor
HDMI
HDMI
Workstation PCs (Typical 4 places)
HDMI Equipped
PC
CATx Cable
HDMI
Extron
XTP T HD 4K
4K HDMI Transmitter
HDMI Equipped
PC
CATx Cable
HDMI
Extron
XTP T HD 4K
4K HDMI Transmitter
HDMI Equipped
PC
CATx Cable
HDMI
Extron
XTP T HD 4K
4K HDMI Transmitter
HDMI Equipped
PC
CATx Cable
HDMI
Extron
XTP T HD 4K
4K HDMI Transmitter
Extron
XTP II CrossPoint 3200
Modular Digital Matrix Switcher
Workstation Displays (Typical 4 places)
CATx Cable
HDMI
Flat Panel Display
Extron
XTP SR HD 4K
4K HDMI Scaling
Receiver
CATx Cable
HDMI
Flat Panel Display
Extron
XTP SR HD 4K
4K HDMI Scaling
Receiver
CATx Cable
HDMI
Flat Panel Display
Extron
XTP SR HD 4K
4K HDMI Scaling
Receiver
CATx Cable
HDMI
Flat Panel Display
Extron
XTP SR HD 4K
4K HDMI Scaling
Receiver

Corporate Presentation Auditorium

Overview

A corporate auditorium provides a venue for large companies to hold employee gatherings or shareholder meetings. With an advanced video display system, media-rich presentations can convey corporate information, product introductions, and data for employee meetings.

Room Needs Assessment

Staffing	A single operator at a podium to deliver presentations. AV staff members to configure and load system content for special events.
Display Requirements	An attractive, seamless display eight feet high by 25 feet wide, with the ability to simultaneously display from one to eight sources.
Source Types	A computer providing high resolution 4K corporate content, a 4K media player providing pre-produced corporate and product information, a Blu-ray player providing high-definition corporate videos, a satellite receiver providing high-definition broadcast programming, a document camera for presenting hard-copy information, a high-definition video camera for presenting live content, and connections for a laptop and a mobile device.
System Control	A simple touchpanel controller for selection of window layout presets and source selection within each preset, as well as control of the media player.
Special Requirements	Ease of use is a primary concern, as the system will often be controlled by non-technical personnel.

System Design Solution

Videowall Processing

A **Quantum Ultra 305** Videowall Processor delivers a 4K HDMI signal to each of the auditorium's projectors. The outputs provide redundant pixels for the overlapped region required by the projectors to facilitate edge-blending. All 4K and high definition sources can be displayed simultaneously, at any size and at any position, across the seamless display.

Source Connectivity

A Quantum Ultra HDMI input card accepts a 4K signal from a desktop computer and a media player. A document camera, Blu-ray player, satellite receiver, and camera provide HD video content, connecting to a second HDMI input card. A third HDMI input card accepts signals from a laptop and a mobile device.

Display Systems

A pair of 4K projectors configured for rear projection provide an overall display resolution of 6912 pixels by 2160 pixels on a 25-foot wide by eight-foot tall screen.

Switching and Signal Management

All source switching is managed internally by the Quantum Ultra videowall processor.

Network

The network includes a simple Layer 2 Ethernet switch for communication between the Quantum Ultra videowall processor, the 4K media player, and the TouchLink Pro touchpanel and IP Link Pro processor.

System Control

An Extron **TLP Pro 1025T** 10-inch (25 cm) TouchLink Pro touchpanel and an Extron **IPCP Pro 250** control processor send Ethernet control messages to the Quantum Ultra videowall processor and the 4K media player. The touchpanel provides a simple, easy-to-navigate interface, allowing operators to easily select any of ten videowall presets, as well as assign sources to windows.

Control VLAN

HDCP-Complaint 4K Projector

HDCP-Complaint 4K Projector

HDMI

HDMI

Ethernet

Ethernet

Extron TLP Pro 1025T
10" Tabletop TouchLink Pro Touchpanel

Extron Quantum Ultra 305
Ultra-high Bandwidth 4K Videowall Processor

HDMI

HDMI

4K Media Player

Extron IPCP Pro 250
IP Link Pro Control Processor

Document Camera

Blu-ray Player

4K Desktop PC

Satellite Receiver

or

iPhone

Laptop

Camera

iPad

HDMI Adapter

Command Center

Overview

Command centers aggregate a wide variety of video and data for monitoring and analysis. In order to efficiently make critical decisions, staff members need to analyze various sources in close proximity to each other and in a variety of layouts. The solution requires that any of the video and data sources be presented on a large display, in a variety of easily selectable window layouts.

Room Needs Assessment

Staffing	Numerous information specialists monitor one or more video or data sources. A shift manager periodically changes information as needed on the large, centralized display.
Display Requirements	A multi-screen videowall, occupying an area roughly 4.5 feet high by 16 feet wide (1.4 m by 4.9 m), presents at least two 4K sources at native resolution plus additional overlayed computer and video sources.
Source Types	Sources include four remote computers displaying low-motion map and data content, eight computers displaying visualizations with moderate to high motion, and two 4K/60 workstations displaying animated map content. Three satellite receivers provide news content, and a media player is used for internally developed media.
System Control	A simple touchpanel interface enables selection of window layout presets and source selection for each preset.
Special Requirements	Ease of use and quick response to layout and source changes is mandatory for this mission-critical environment.

System Design Solution

Videowall Processing

An Extron **Quantum Ultra II 610** Videowall Processor is configured with two Quantum OUT4HDMI 4K PLUS output cards for a total of eight 1080p HDMI outputs. It delivers signals to the eight display devices in the videowall. The processor enables display of any combination or all 18 physical and networked input sources simultaneously on the videowall.

Source Connectivity

The Quantum Ultra II utilizes four Quantum IN4HDMI input cards and one Quantum IN4HDMI 4K PLUS input card to receive 14 physical HDMI inputs. Three satellite receivers and a media player connect to the first Quantum IN4HDMI input card. Eight workstation computers connected to the input cards in slots 2 and 3 display high-motion content. Two workstation computers feed animated map content up to 4K/60 resolutions to the Quantum IN4HDMI 4K PLUS input card in slot 4. Four computers displaying low-motion content utilize VNC servers to stream their desktops onto the network and are decoded by the videowall processor's internal VNC client.

Display Systems

Eight HDCP-compliant 1080p displays provide an overall resolution of 7680x2160, in a space 192" wide by 54" tall (4.9 m by 1.4 m).

Switching and Signal Management

All source switching is managed internally by the Quantum Ultra II videowall processor. Quantum OUT4HDMI 4K PLUS cards provide an upgrade path if 4K display devices are required at a future date.

Network

A dedicated VLAN on a Layer 3 Ethernet switch supports the four remote VNC workstations. A separate VLAN is used for the control network, containing the Quantum Ultra II and control system components.

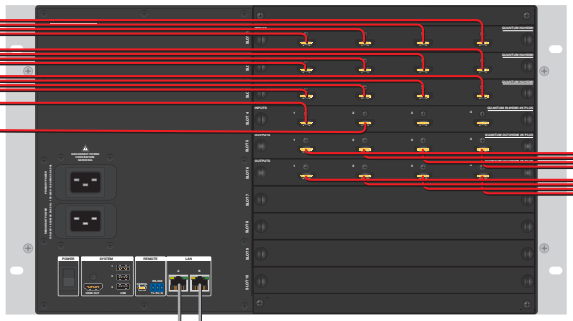
System Control

An Extron **TLP Pro 1025T** 10" (25 cm) TouchLink Pro Touchpanel and an Extron **IPCP Pro 250** control processor send Ethernet control messages to the Quantum Ultra II videowall processor. The user-friendly interface allows the shift manager to easily select the content displayed on the videowall. Presentations vary from a few map sources to more complex layouts containing all available map, workstation, and news content.

Extron
Quantum Ultra II 610
Ultra-high Bandwidth
4K/60 Videowall Processor

1080p HDMI

1080p HDMI



HDMI

HDMI

Ethernet

Control LAN

Ethernet

Ethernet

Extron
TLP Pro 1025T
10" Tabletop
TouchLink Pro
Touchpanel

Extron
IPCP Pro 250
IP Link Pro Control Processor

Ethernet

Media VLAN

Ethernet

Ethernet

Satellite Receiver

Satellite Receiver

Satellite Receiver

Media Player

Remote Workstation PC with VNC

Remote Workstation PC with VNC

Remote Workstation PC with VNC

Remote Workstation PC with VNC

4K/60 Map Server

4K/60 Map Server

Workstation PC

Workstation PC

Workstation PC

Workstation PC

Workstation PC

Workstation PC

Workstation PC

Workstation PC

Museum Exhibit

Overview

Museums provide an environment for exhibiting, preserving, and storing objects of historical, scientific, artistic, or cultural interest to the general public. In addition to static displays, modern museums use dynamic multi-screen installations to bring stories to life and keep guests actively engaged. A well-designed videowall system is ideal for creating an interactive, operator-free exhibit that enhances the overall visitor experience.

Room Needs Assessment

Staffing	Operation of the videowall is performed by the patrons of the museum. Museum creative staff updates content sourced from the 4K media players, computers, and the still images stored on the Quantum Ultra II for special events or exhibit updates.
Display Requirements	A large video display, with a look reminiscent of a painting hung on a wall.
Source Types	A pair of 4K media players provide animated backgrounds for still artwork images with themes such as music, landscapes, and wildlife. Two 4K computers deliver additional graphics and museum information.
System Control	A simple touchpanel controller for selection of the displayed exhibit theme.
Special Requirements	Ease of use is a primary concern, as the system is designed to be operated by museum patrons. The equipment cabinet housing the processing equipment is 200 feet (60 meters) away from the displays, so care must be taken to maintain signal integrity over this distance.

System Design Solution

Videowall Processing

A **Quantum Ultra II 305** Videowall Processor outputs six 4K signals to the displays. Artwork images stored within the processor are framed with internally generated colored borders and drop-shadows. The artwork is displayed on top of abstract, animated backgrounds sourced from a pair of 4K media players.

Source Connectivity

A Quantum IN4HDMI 4K PLUS input card mounted in one of the Quantum Ultra II frame's five slots accepts 4K/60 signals from two media players and a pair of workstation computers.

Display Systems

Six portrait-oriented displays comprise the four-foot high by 13.5 foot wide videowall, with a total resolution of 12,960x3840.

Switching and Signal Management

All source switching is managed internally by the Quantum Ultra II videowall processor.

Audio

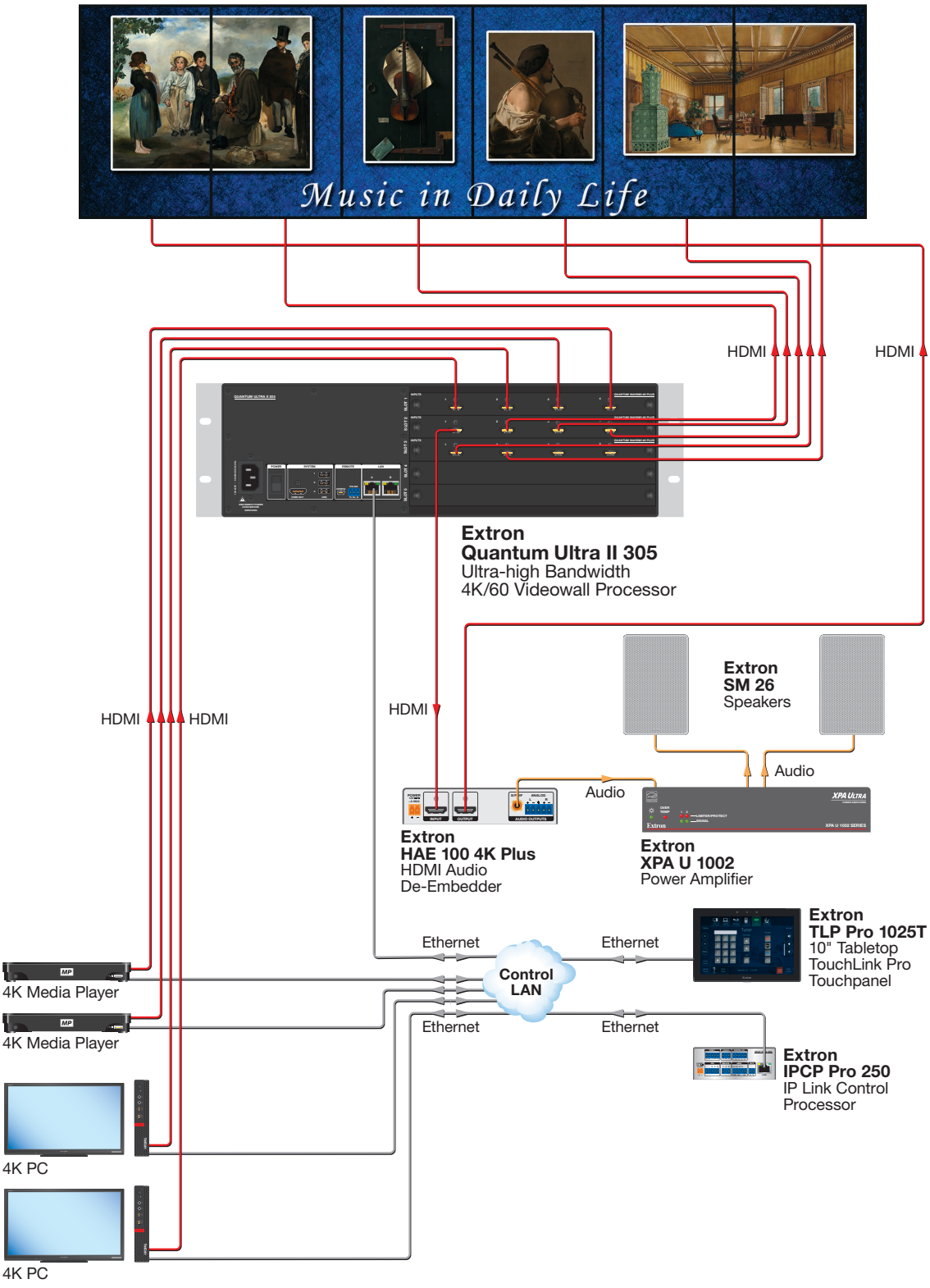
Embedded audio from the media players is switched and routed to the first HDMI output of the Quantum Ultra II. It is then extracted by the HAE 100 4K PLUS and fed into the sound system. The HDMI signal is then routed to the first video display.

Network

The network includes a simple Layer 2 Ethernet switch for communication between the Quantum Ultra II videowall processor, the source equipment, and the control system.

System Control

An Extron **TLP Pro 1025T** 10" (25 cm) TouchLink Pro Touchpanel and an Extron **IPCP Pro 250** Control Processor send Ethernet control messages to the videowall processor, 4K media player, and 4K computers. The touchpanel provides an easy-to-navigate interface, allowing patrons to select from a variety of artwork themes.


Music in Daily Life
HDMI
HDMI
Extron
Quantum Ultra II 305
Ultra-high Bandwidth
4K/60 Videowall Processor
HDMI
HDMI
HDMI
Extron
SM 26
Speakers
Audio
Audio
Extron
HAE 100 4K Plus
HDMI Audio
De-Embedder
Extron
XPA U 1002
Power Amplifier
Ethernet
Ethernet
Control
LAN
Ethernet
Ethernet
Extron
TLP Pro 1025T
10" Tabletop
TouchLink Pro
Touchpanel
4K Media Player
4K Media Player
Extron
IPCP Pro 250
IP Link Control
Processor
4K PC
4K PC

Simulation Debriefing Theater

Overview

Simulation systems provide land, sea, and air environments for virtual training missions of military personnel. Team members interact with one another during these missions run by a Presentation Manager. The presentation manager controls the session, triggering the engagements and challenges team members encounter. Large video display systems present live or prerecorded simulation sessions that enable side-by-side comparisons of each participant's actions. This allows for critical mission analysis, both in real-time by the session manager and by the participants themselves when replayed from an archiving system.

Room Needs Assessment

Staffing	A presentation manager to run simulations and personnel to be trained during simulated missions.
Display Requirements	An edge-butted videowall, occupying an approximate area of six feet high by 25 feet wide (1.8 meters by 7.6 meters). It must be capable of displaying at least 12 sources at various sizes and locations.
Source Types	Three simulation systems with four image generators, each providing one high-resolution out-of-the-window - OTW view and three medium resolution instrument panels.
System Control	A simple touchpanel interface for selecting window layout presets. The touchpanel is also used for starting, stopping, and replaying missions recorded by the archiving system. System control should be over Ethernet.
Special Requirements	Shift managers need to be able to identify the source of each window by applying colored borders.

System Design Solution

Videowall Processing

Three **MGP 641** multi-window processors drive the three displays in the videowall. They provide the capability to display any or all input sources simultaneously.

Source Connectivity

Three simulation systems drive similar signal processing paths for each channel of the three-screen videowall. For each simulator, an OTW view connects via HDMI to an Extron MGP 641. Three image generators producing instrument data also connect to the MGP 641 over HDMI. The output of the MGP 641 connects to an Extron **VNE 250** IP encoder, which feeds one projector of the videowall via the HDMI loop through. An Extron VND 250 IP decoder connects to a secondary input on the projector.

The three VNC 250 encoders, three **VND 250** decoders, Extron **VNM Recorder**, and an Extron **VNM EC 201** connect to the media network. The VNM Recorder is used to archive sessions and can replay content on the videowall. The VNM EC 201 is used to control and manage the VNM Recorder and the VN-Matrix encoders and decoders.

Display Systems

Three WUXGA rear projectors arranged in a 1x3 edge-butted configuration provide an overall display resolution of 5760 pixels by 1200 pixels in a space 29 feet wide by six feet tall (8.8 meters by 1.8 meters).

Switching and Signal Management

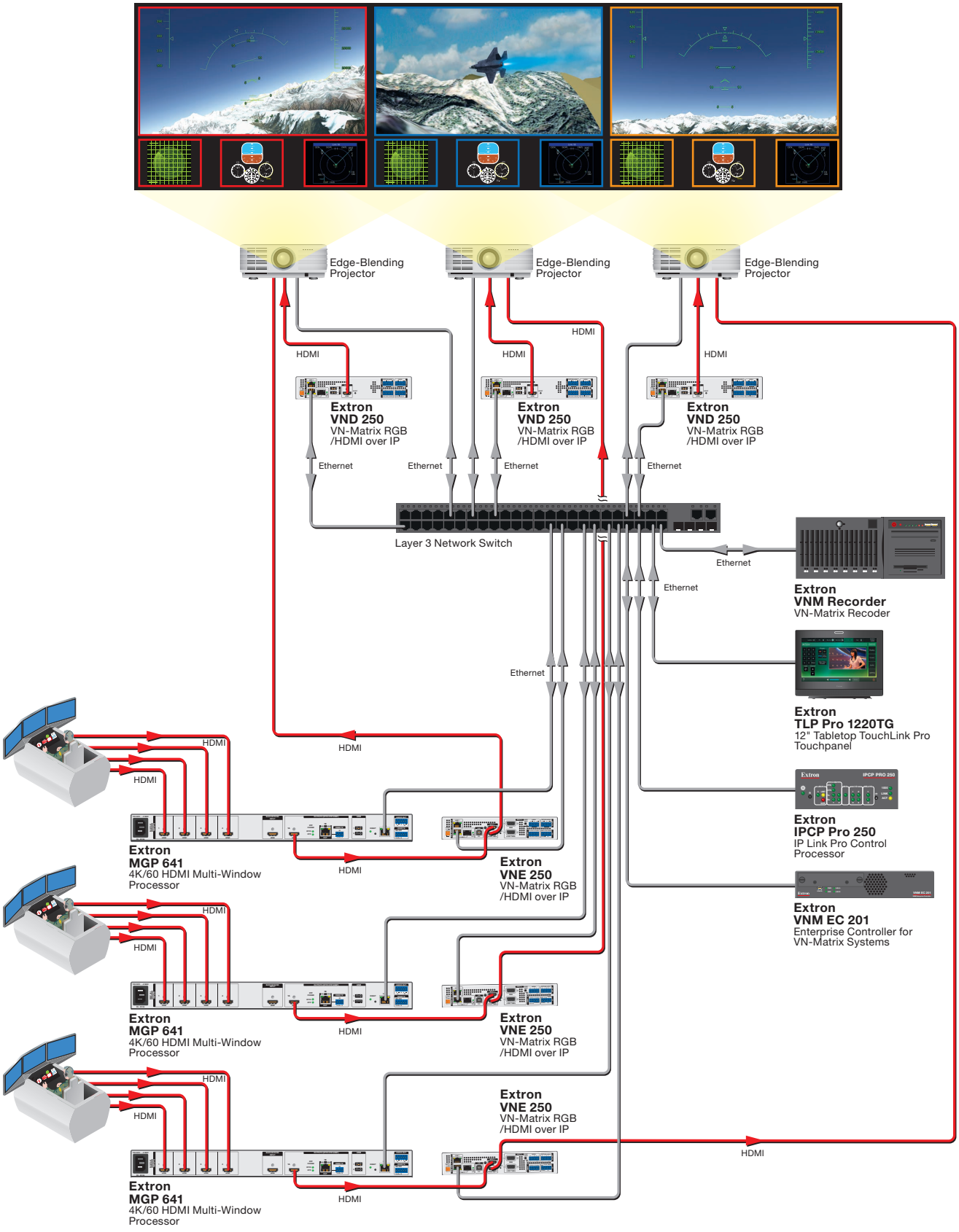
All source switching and windowing is managed internally by the MGP 641 processors.

Network

The network for the VN-Matrix archiving system includes a Layer 3 Ethernet switch. To ensure efficient performance, it is configured to support multicast traffic and IGMP snooping. A VLAN supports the VN Matrix 250 encoders and decoders, VNM Enterprise Controller, and VNM Recorder. The same VLAN facilitates the control data for the MGP 641 processors, projectors, and the streaming and recording system.

System Control

For system control, an Extron **TLP Pro 1220TG** 12" (30 cm) TouchLink Pro touchpanel and an Extron **IPCP Pro 250** IP Link Pro control processor interface via Ethernet with the MGP 641 processors and the VNM EC 201. The touchpanel provides access to multiple window layout presets and source selection within each preset. The touchpanel can also be used to start or stop archiving and replay saved missions on the videowall.


Edge-Blending Projector
Edge-Blending Projector
Edge-Blending Projector
HDMI
HDMI
HDMI
HDMI
Extron VND 250 VN-Matrix RGB /HDMI over IP
Extron VND 250 VN-Matrix RGB /HDMI over IP
Extron VND 250 VN-Matrix RGB /HDMI over IP
Ethernet
Ethernet
Ethernet
Ethernet
Layer 3 Network Switch
Ethernet
Ethernet
Extron VNM Recorder VN-Matrix Recoder
Ethernet
Extron TLP Pro 1220TG 12" Tabletop TouchLink Pro Touchpanel
Extron IPCP Pro 250 IP Link Pro Control Processor
Extron VNM EC 201 Enterprise Controller for VN-Matrix Systems
HDMI
HDMI
HDMI
HDMI
Extron MGP 641 4K/60 HDMI Multi-Window Processor
Extron VNE 250 VN-Matrix RGB /HDMI over IP
HDMI
HDMI
HDMI
HDMI
Extron MGP 641 4K/60 HDMI Multi-Window Processor
Extron VNE 250 VN-Matrix RGB /HDMI over IP
HDMI
HDMI
HDMI
HDMI
Extron MGP 641 4K/60 HDMI Multi-Window Processor
Extron VNE 250 VN-Matrix RGB /HDMI over IP
HDMI

Traffic Management Center

Overview

Traffic Management Centers consolidate information from traffic cameras and graphic applications to monitor and manage traffic flow. Operators use local monitors to view maps and traffic status. A large display presents video from any of the region's traffic cameras to be viewed as either a thumbnail or large image, while simultaneously displaying specialized high-resolution graphic sources.

Room Needs Assessment

Staffing	Numerous operators monitor and manage traffic data on local displays. A shift manager and operators select which maps, traffic data, and camera feeds are highlighted on the large, centralized display.
Display Requirements	A multi-screen videowall, occupying an area 240" (610 cm) wide by 70" (178 cm) high, presents 50 to 60 traffic camera feeds and graphical maps
Source Types	Over 100 video streams from IP traffic cameras, four 4K satellite receivers presenting televised sources, and two computers displaying high-resolution graphical map and traffic data
System Control	Multiple touchpanel controllers allowing simultaneous window layout preset selection and source selection within each preset.
Special Requirements	The ability for the operators to highlight camera feeds by applying colored borders and titles to source windows

System Design Solution

Videowall Processing

A pair of **Quantum Ultra 610** Videowall Processors are linked with Quantum Ultra Expansion IN and OUT cards, creating one cohesive system. Eight HDMI outputs deliver signals to the display devices, presenting 64 camera feeds, two computer sources, and four satellite feeds in source windows on the videowall. Colored borders and text titling can be applied to each displayed window.

Input Source Connectivity

The IP traffic camera feeds and Quantum IN SMD 100 cards connect to a dedicated media LAN. Each input card can decode up to 16 video streams. The 4K satellite receivers connect to a pair of Quantum IN4HDMI cards, and are used to present broadcast content. Two workstation computers connected to a Quantum IN4HDMI input card present map and traffic data.

Display Systems

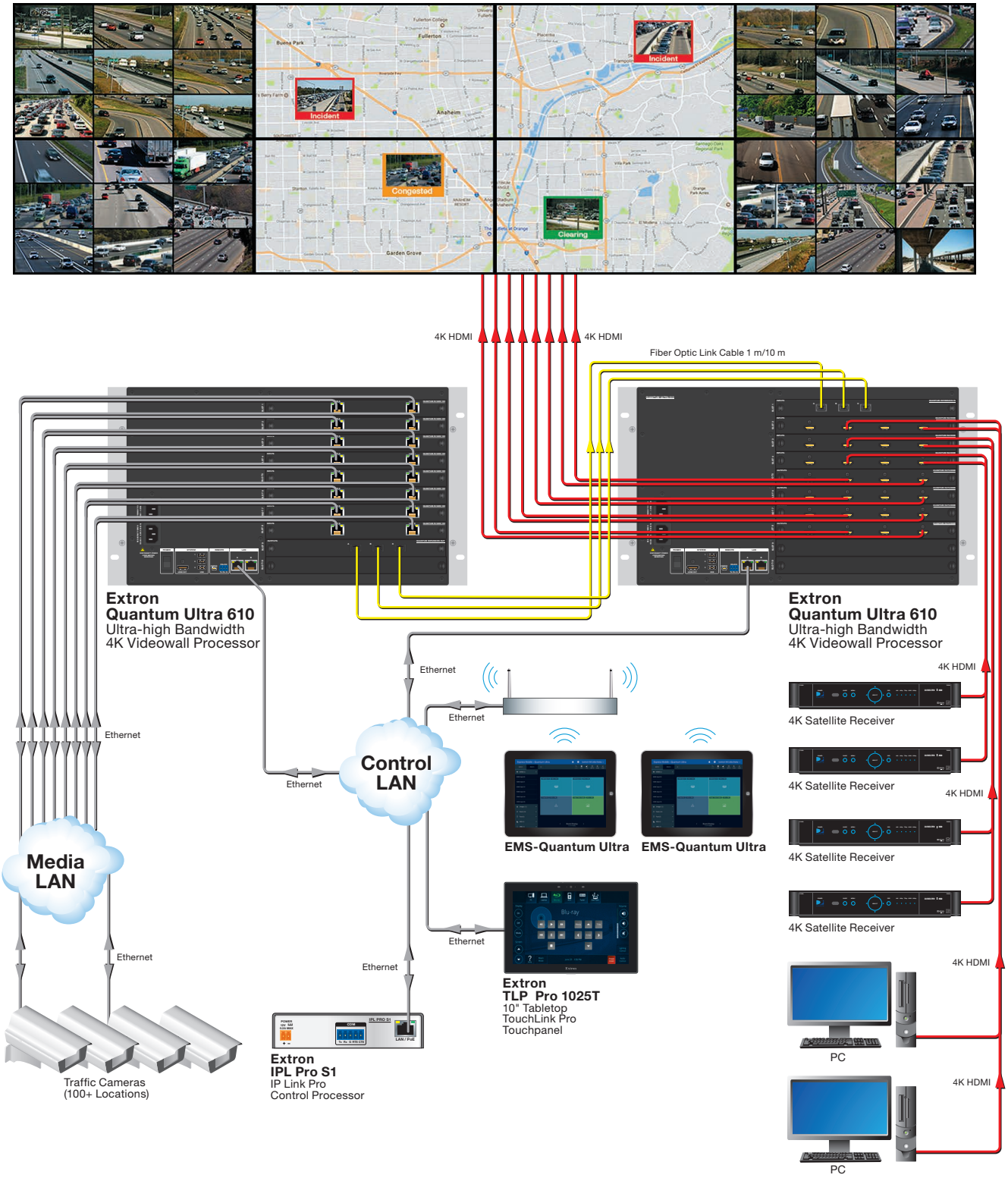
Eight 70" (178 cm) 1920x1080 rear-projection displays provide an overall resolution of 7680x2160 in a space that is 240" (610 cm) wide by 70" (178 cm) tall. Switching and Signal Management All source switching and IP stream management is performed internally by the Quantum Ultra videowall processors.

Control Network

A dedicated VLAN on the house network switch is used for the control network, containing the Quantum Ultra processors and control system components.

System Control

An Extron **TLP Pro 1025T** 10" (25 cm) TouchLink Pro Touchpanel and an Extron **IPL Pro S1** control processor send Ethernet control messages to the Quantum Ultra videowall processors. The shift manager uses the touchpanel to select from several window presets and assigns sources to windows on the videowall. Colored borders and text data can also be applied to windows to call attention to traffic events. Two wireless tablets running the EMS-Quantum Ultra app provide similar functionality from any location within the room.


Incident
Incident
Congested
Clearing
4K HDMI
4K HDMI
Fiber Optic Link Cable 1 m/10 m
Extron
Quantum Ultra 610
Ultra-high Bandwidth
4K Videowall Processor
Extron
Quantum Ultra 610
Ultra-high Bandwidth
4K Videowall Processor
Ethernet
Ethernet
Ethernet
Ethernet
Control
LAN
Media
LAN
Ethernet
Ethernet
Ethernet
4K HDMI
4K Satellite Receiver
4K Satellite Receiver
4K HDMI
4K Satellite Receiver
4K Satellite Receiver
EMS-Quantum Ultra
EMS-Quantum Ultra
Extron
TLP Pro 1025T
10" Tabletop
TouchLink Pro
Touchpanel
4K HDMI
PC
4K HDMI
PC
Extron
IPL Pro S1
IP Link Pro
Control Processor
Traffic Cameras
(100+ Locations)

University Student Center Atrium

Overview

An open atrium in a university student center can provide a relaxed space for private studies, working together on class projects, and socializing among students, professors, and staff. The area offers food and coffee stands that are accessible not only to students but also campus visitors, widening the exposure to potential enrollees and sources of university funding. A large video display is used to promote the diverse campus activities and upcoming events to those enjoying the atrium. The display also provides news, weather, and other information.

Room Needs Assessment

Display Requirements	A large, seamless video display covering an area approximately 23 feet (7 meters) by 7 feet (2.1 meters). The space presents an air of professionalism and quality, so image quality and brightness is crucial to the experience.
Source Types	Content for the video system is contributed by the university schools and departments and prepared and managed by the IT staff. Four 4K media players and two HD media players are available for playback of promotional content. In addition, two 4K satellite receivers facilitate presentation of broadcast weather, business, local and world news, and other information.
System Control	A control system allows simple scheduling of media and videowall control. It supports override of the system schedule for ad hoc presentation of content.
Special Requirements	Area of use is exposed to large amounts of natural light, requiring the display to be of sufficient brightness to accommodate this type of environment.

System Design Solution

Videowall Processing

A **Quantum Ultra II 305** 4K Videowall Processor with eight 1920x1080p DTP outputs delivers signals across twisted pair cabling. Eight DTP HDMI 4K 330 Rx receivers provide HDMI outputs to the LED panels. The videowall processor enables presentation of 4K and windowed sources anywhere on the display, as well as internally generated clocks, logos, and dynamically updated text.

Input Source Connectivity

Two Quantum IN4HDMI 4K PLUS input cards receive signals from four 4K media players and two satellite receivers outputting 4K/60 signals, and two media players outputting HD signals.

Display Systems

Seventy-two direct view 640x360 LED panels, arranged as twelve panels wide by six panels tall, comprise the overall display. Grouped as eight 3x3 arrays, each cluster has a resolution of 1920x1080. The Quantum processor provides a 1080p signal to each group that is looped between panels. The overall display has a resolution of 7680x2160, and is 3.6 feet (7.2 meters) wide by 6.7 feet (2.0 meters) high.

Switching and Signal Management

All source switching is performed internally by the Quantum Ultra II videowall processor.

Control Network

A control LAN on a dedicated network switch accommodates the Quantum Ultra II, control system components, and media players.

System Control

An Extron **TLP Pro 1025T** 10" (25 cm) TouchLink Pro Touchpanel and an Extron **IPCP Pro 250** control processor send Ethernet control messages to the Quantum processor and the media players. The system performs scheduled playback of content and videowall preset selection, which can be overridden by the system administrator for presenting televised broadcasts in the event of breaking news.

1080p HDMI RS-232 1080p HDMI RS-232 1080p HDMI RS-232 1080p HDMI RS-232 1080p HDMI RS-232 1080p HDMI RS-232 1080p HDMI RS-232 1080p HDMI RS-232

Extron
DTP HDMI
4K 330 Rx
Long Distance
DTP Receiver
for HDMI

CATx Cable
up to 330'
(100 m)

CATx Cable
up to 330'
(100 m)

HDMI

4K Media Player

Extron
Quantum Ultra II 305
Ultra-high Bandwidth
4K Videowall Processor

4K Media Player

4K Media Player

4K Media Player

Ethernet

Extron
PS 124
Multiple Output
12 Volt DC Power Supply

Extron
PS 124
Multiple Output
12 Volt DC Power Supply

Ethernet

Media Player

Media Player

Ethernet

Control LAN

Ethernet

Extron
TLP Pro 1025T
10" Tabletop
TouchLink Pro
Touchpanel

Ethernet

Extron
IPCP Pro 250
IP Link Pro
Control Processor

4K Satellite Receiver

HDMI

4K Satellite Receiver

Corporate Lobby and Collaborative Theater

Overview

Videowalls can serve many purposes in a wide variety of environments, including corporate settings. From collaboration between employees to showcasing the latest products and services for guests, a videowall presents information on a grand scale. Internally, it can enhance productivity. On the public-facing side, a videowall in the lobby can reflect both the creativity and innovation that exist beyond the waiting area.

Room Needs Assessment

Staffing	Engineers collaborate and share product designs in a presentation theater, and front-desk staff manage the lobby display system.
Display Requirements	A presentation theater consisting of six 65" (165 cm) displays are arranged in a 2x3 configuration. Also, a lobby videowall consisting of four 55" (140 cm) 1080p displays are arranged in a 2x2 configuration.
Source Types	Sources include workstation PCs, media players, satellite tuners, and BYOD-connected devices.
System Control	A touchpanel interface for display control and selecting window layout presets and active sources.

System Design Solution

Videowall Processing

Both videowalls are driven by XTP scaling receivers. XTP SR HD 4k receivers support the 2x3 system in the presentation theater over shielded CATx cable, and the 2x2 videowall located in the lobby area incorporates XTP SFR HD 4K MM receivers with OM4 multimode fiber optic connectors. Fiber optics are required to span the 900 feet (274 meters) between the lobby and the equipment rack in the control room.

Source Connectivity

All sources connect to an XTP II CrossPoint 3200 modular matrix switcher rack-mounted in the control room at the core of the complex. XTP CP HD 4i 4K PLUS input cards support the satellite receivers and media players rack-mounted with the matrix switcher. They are connected over HDMI. For the remote sources, such as workstation PCs and BYOD devices connected to the system at Cable Cubby® enclosures, XTP transmitters extend AV and control signals to XTP CP 4i 4K input cards mounted in the XTP II CrossPoint matrix switcher frame.

Display Systems

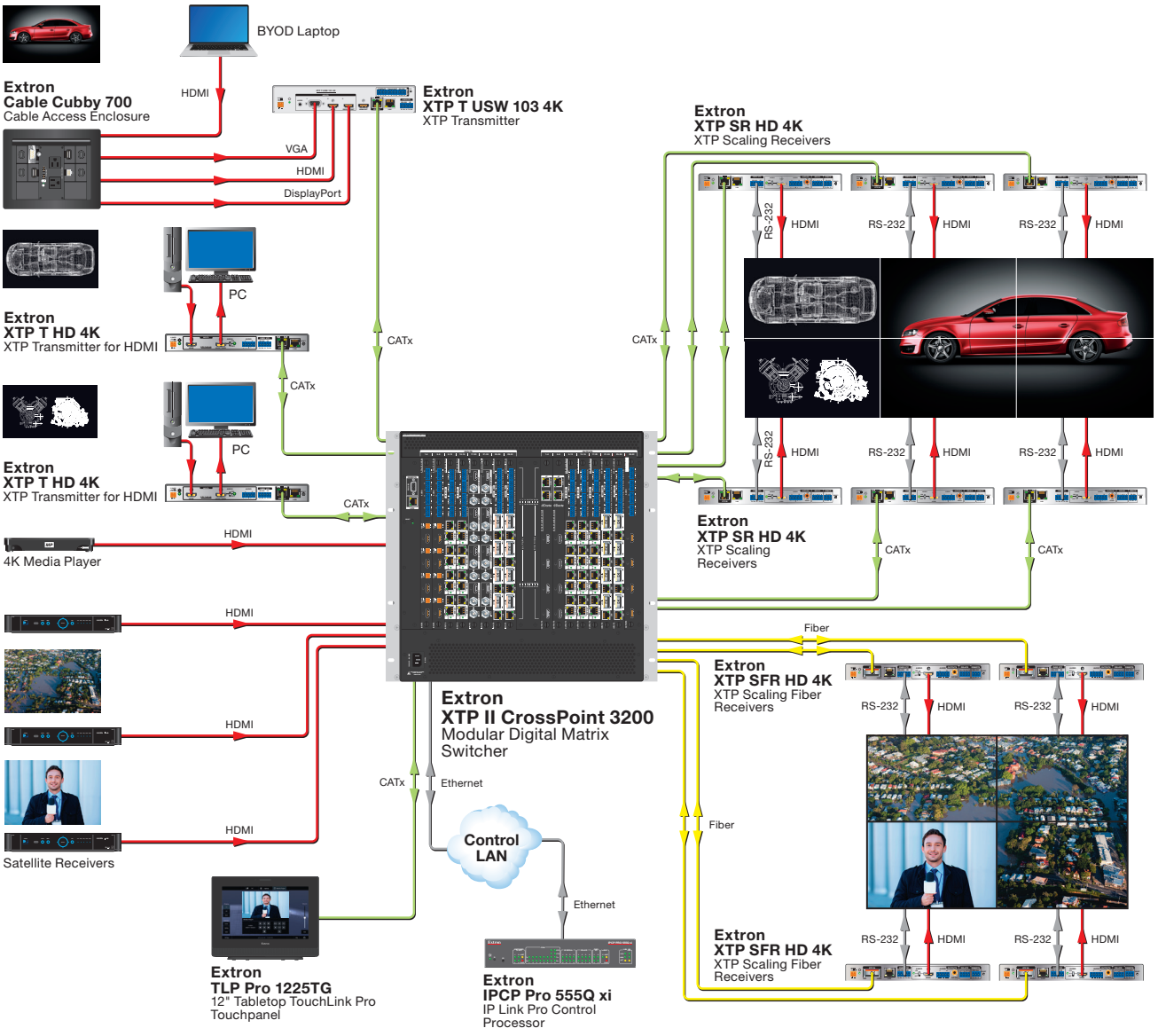
Six 65" 1080p displays comprise the presentation theater system. They are arranged in a 2x3 configuration, providing an overall display resolution of 5760 pixels by 2160 pixels in a space 169" by 63.5" (429.2 cm by 161.29 cm). For the corporate lobby, four 55" 1080p displays arranged in a 2x2 configuration provide an overall display resolution of 3840x2160 in a space 95.4" x 53.7" (242.3 cm x 136.4 cm).

Switching and Signal Management

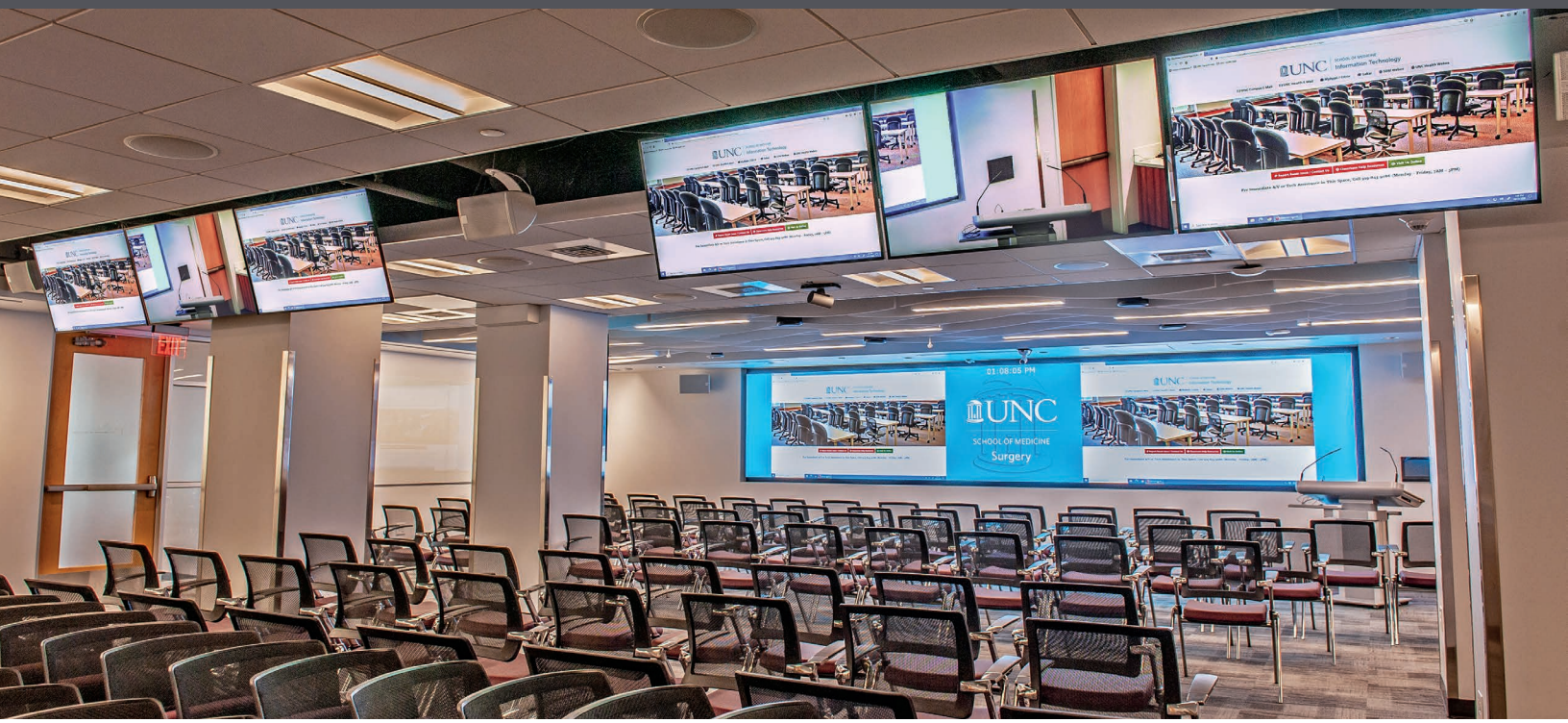
All source switching is managed by the XTP II CrossPoint 3200. The XTP scaling receivers present either a single source or a portion of the source. When content from one receiver is combined with material from the adjacent receivers, the upscaled source image spans multiple displays.

System Control

The control network includes a Layer 2 Ethernet switch for distributing house-wide system control. An Extron TLP Pro 1225TG 12" (30 cm) TouchLink Pro touchpanel and an Extron IPCP Pro 555Q xi control processor interface via Ethernet with the XTP II CrossPoint 3200 matrix switcher, which provides centralized control for each transmitter and receiver. Communication occurs over the same twister pair or fiber AV cable used for video delivery, and also allows receivers to transmit RS-232 control data to the displays.


BYOD Laptop
HDMI
Extron
Cable Cubby 700
Cable Access Enclosure
VGA
HDMI
DisplayPort
Extron
XTP T USW 103 4K
XTP Transmitter
Extron
XTP SR HD 4K
XTP Scaling Receivers
RS-232
HDMI
PC
Extron
XTP T HD 4K
XTP Transmitter for HDMI
CATx
Extron
XTP SR HD 4K
XTP Scaling
Receivers
4K Media Player
Fiber
Extron
XTP SFR HD 4K
XTP Scaling Fiber
Receivers
Extron
XTP II CrossPoint 3200
Modular Digital Matrix
Switcher
Ethernet
Control
LAN
Satellite Receivers
Extron
TLP Pro 1225TG
12" Tabletop TouchLink Pro
Touchpanel
Extron
IPCP Pro 555Q xi
IP Link Pro Control
Processor

Educational Medical Facility



Overview

Videowalls and displays fill multiple roles in this medical environment. In the operating room, stand-alone displays benefit surgeons by providing larger-than life views of camera feeds and the patient's data readout status. A videowall in the observation room facilitates a shared view of the operation. It presents live surgical camera and data feeds in real-time and with high quality to medical professionals in a learning environment.

Room Needs Assessment	
Staffing	A learning coordinator leads surgery observation on the videowall, while surgeons control source selection in the OR.
Display Requirements	A presentation theater consisting of six 65" (165 cm) displays are arranged in a 2x3 configuration, and two stand-alone 65" 1080p displays are in the OR.
Source Types	Sources include cameras, medical equipment, a PC, and a BYOD-connected device.
System Control	A touchpanel interface enables selection of the videowall window layout presets and active sources. A tactile button panel provides source selection for the operating room.

System Design Solution

Videowall Processing

The six-display videowall is driven by six NAV SD 101 AV over IP scaling decoders. These decoders support videowall applications using Extron's WindoWall® processing, enabling a mix of full screen and image magnification across multiple displays. WindoWall presets provide a quick and easy way to manipulate the videowall canvas between different image arrangements. Two additional NAV SD 101 IP decoders deliver content to the displays located in the operating room.

Source Connectivity

All sources connect to the system via HDMI to NAV E 101 encoders. These encoders stream ultra-low latency video over the 1 Gbps Ethernet network. The Extron patented PURE3® codec delivers groundbreaking performance with high-quality video at resolutions up to 4K @ 60 Hz with 4:4:4 chroma sampling and ultra-low latency.

Display Systems

Six 65" 1080p displays comprise the videowall in the observation room. They are arranged in a 2x3 configuration, providing an overall display resolution of 5760 pixels by 2160 pixels in a space 169" by 63.5" (429.2 cm by 161.29 cm). Two 65" 1080p displays located in the operating room deliver live camera content and patient data.

Network

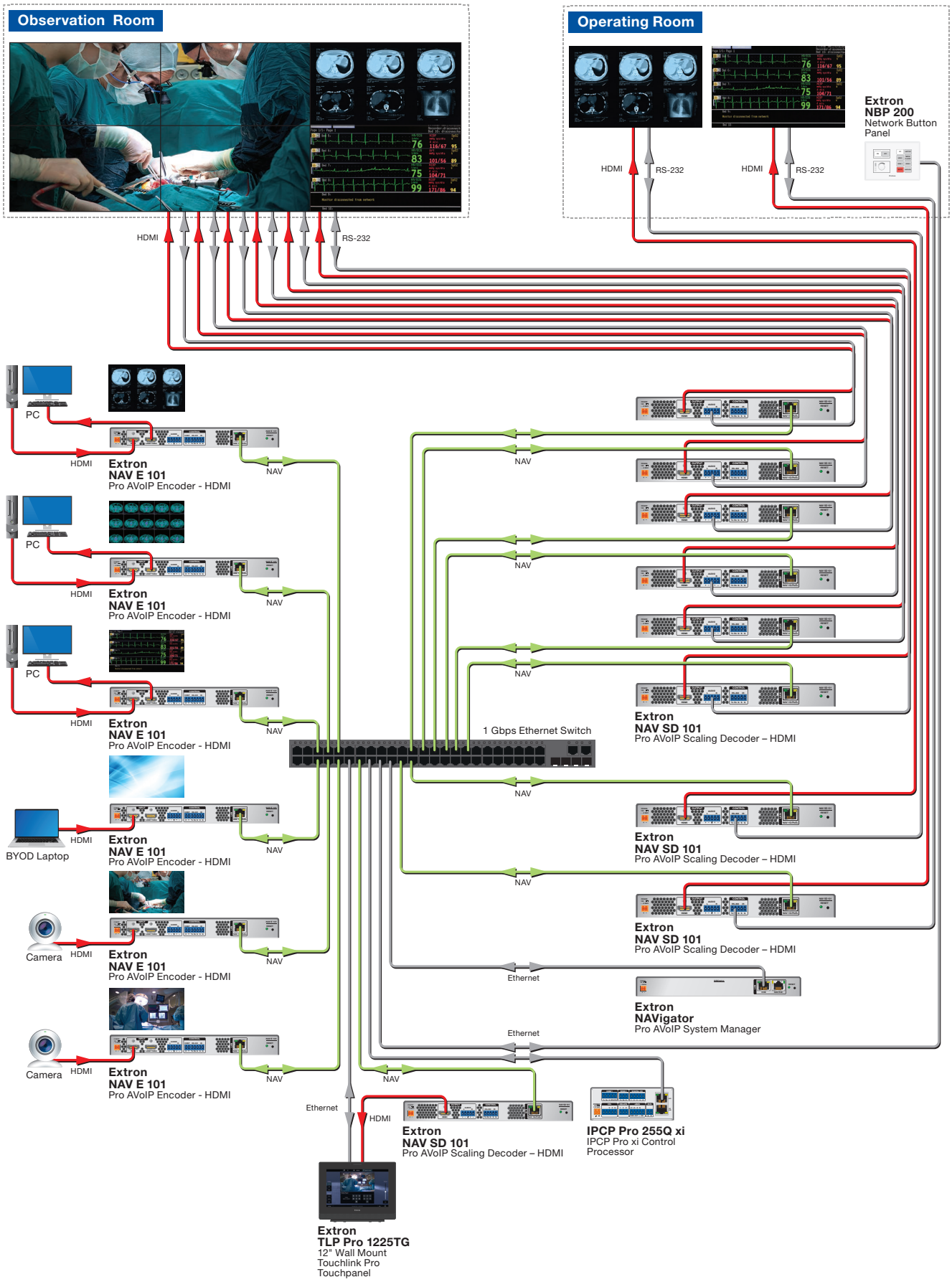
AV over IP and system control is routed through a Layer-3 Network switch.

Switching and Signal Management

Switching and signal management is performed with Extron NAVigator, which turns the collective encoders and decoders into a powerful and flexible IP-based matrix solution. NAVigator also facilitates easy setup, configuration, and quick switching, and includes extensive features for monitoring, diagnostics, and troubleshooting.

System Control

Videowall control is performed with an Extron TLP Pro 1225TG 12" (30 cm) TouchLink Pro touchpanel, and an Extron IPCP Pro 255Q xi control processor. They communicate with NAVigator, which provides intuitive control for layout and source selection. For the displays in the operating room, sources are selected with an NBP 200, providing a simple interface with tactile buttons.


Observation Room
Operating Room
Extron
NBP 200
Network Button
Panel
HDMI
RS-232
HDMI
RS-232
HDMI
RS-232
PC
HDMI
Extron
NAV E 101
Pro AVoIP Encoder - HDMI
NAV
PC
HDMI
Extron
NAV E 101
Pro AVoIP Encoder - HDMI
NAV
PC
HDMI
Extron
NAV E 101
Pro AVoIP Encoder - HDMI
NAV
1 Gbps Ethernet Switch
BYOD Laptop
HDMI
Extron
NAV E 101
Pro AVoIP Encoder - HDMI
NAV
Camera
HDMI
Extron
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Pro AVoIP Encoder - HDMI
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Pro AVoIP Encoder - HDMI
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Extron
NAV SD 101
Pro AVoIP Scaling Decoder – HDMI
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NAV SD 101
Pro AVoIP Scaling Decoder – HDMI
Extron
NAV SD 101
Pro AVoIP Scaling Decoder – HDMI
Ethernet
Extron
NAVigator
Pro AVoIP System Manager
Ethernet
Ethernet
HDMI
Extron
NAV SD 101
Pro AVoIP Scaling Decoder – HDMI
IPCP Pro 255Q xi
IPCP Pro xi Control
Processor
Extron
TLP Pro 1225TG
12" Wall Mount
Touchlink Pro
Touchpanel

Notes

Extron Videowall Product Solutions

Extron offers a variety of videowall products designed to meet the performance and capacity requirements of large or small videowall applications. Extron videowall processors provide source signal optimization and multi-window processing for videowalls, employing multi-input switching and distribution, advanced video signal processing, and multiple outputs to accommodate all of the displays in the videowall system.

Extron videowall processing systems offer comprehensive flexibility in creating and customizing multi-window presentations within an intuitive GUI that streamlines videowall system setup and operation.

Extron videowall processors are used in a variety of large screen or multi-display applications where there are many video and computer-video sources to be presented at the same time. They are commonly employed in large areas where numerous images need to be viewable by everyone, such as in command and control centers or a network operation center. Such images often include high resolution computer graphics that need to be presented with the best possible quality.

Scalable Mid-Sized and Large Videowall Processors

Extron offers processing systems for videowalls with up to 40 displays or more. Extron Quantum Ultra and Quantum Ultra II are HDCP-compliant, scalable 4K videowall processing systems that are ideal for mid- to large-sized systems. They deliver unmatched real-time performance, even for applications requiring large numbers of inputs and outputs.

Small Videowall Processors

Extron Quantum Ultra Connect processors are ideal for small videowalls with six or fewer displays and support up to 12 HDMI inputs. The MGP 641 is a cost-effective solution for applications that require viewing multiple sources on a single screen.

WindoWall

XTP and NAV systems allow integration of videowalls as part of twisted pair, fiber optic, or AVoIP distribution systems. They incorporate WindoWall scaling technology, enabling a mix of full screen and image magnification across multiple displays. Up to eight videowalls can be supported, and multiple presets are available per wall for quick and easy viewing between different image arrangements.

XTP SYSTEMS

NAV PRO AVoIP

Scalable Mid-Sized and Large Videowall Processors

HYPERLANE 500 Gbps

18 Gbps 4K/60 4:4:4

VECTOR 4K SCALING

JITC CERTIFIED

Quantum Ultra II

Next-Generation 4K/60 Videowall Processing with Audio Support

Quantum® Ultra II represents the next generation of Extron videowall processors, providing advanced, future-ready connectivity and throughput capabilities. The expanded HyperLane® video bus delivers unmatched real-time performance with a throughput of up to 500 Gbps. The 18 Gbps HDMI connectors on the 4K input and output cards support resolutions up to 4K/60 at 4:4:4 with full HDCP 2.3 compliance. Embedded HDMI audio from any source can be routed independently to each active canvas. A single processor can support multiple videowalls with mixed resolutions and screen orientations. Features such as portrait and landscape output support, output overlap, bezel compensation, and custom output resolutions ensure compatibility with nearly any display. RS-232, USB, and Ethernet interfaces provide direct connections for control systems.

Quantum IN4HDMI 4K PLUS

Quantum OUT4HDMI 4K PLUS

FEATURES

- Scalable 4K/60 videowall processing for display systems of any size
- Modular architecture accommodates a variety of input and output arrangements
- NEW Future-ready 500 Gbps HyperLane® video bus delivers unparalleled real-time performance for resolutions up to 8K
- NEW HDMI 4K PLUS cards support 4K/60 on each connection
- NEW HDMI embedded audio switching
- NEW 8K-ready design ensures compatibility with existing as well as next generation input and output cards
- NEW HDCP 2.3 compliant
- Compatible with select Quantum Ultra input and output cards
- Manage multiple videowalls with varying resolutions and screen arrangements from a single processor
- Designed for 24/7, mission-critical environments

MODEL	VERSION
Quantum Ultra II 305	3U, 5-slot Frame
Quantum Ultra II 610	6U, 10-slot Frame
Quantum IN4HDMI 4K PLUS	Four-channel 4K/60 HDMI Input Card
Quantum OUT4HDMI 4K PLUS	Four-channel 4K/60 HDMI Output Card

Note: Part numbers and pricing for complete system configurations are available. Please contact your Extron customer support representative for more information.

HyperLane - Unparalleled Real-Time Performance

Quantum Ultra II features a high-speed video bus that incorporates Extron HyperLane technology that delivers real-time performance unattainable by other videowall processors. The future-ready HyperLane video bus has a maximum throughput of 500 Gbps, providing full compatibility with the highest video resolutions currently in use, such as 4K/60 with 4:4:4 chroma sampling. It has the capacity to simultaneously carry more than twenty 4K/60 4:4:4 sources. The processor also possesses the bandwidth required to support evolving signal formats such as 8K, which can include high dynamic range - HDR, greater color depth, and expanded color gamut.

Future-ready, 500 Gbps video bus has the capacity to carry more than twenty 4K/60 sources, with support for 8K and other evolving signal formats

Flexible, Modular Architecture

Quantum Ultra II utilizes a modular architecture consisting of a card frame, input cards, and output cards to meet the needs of any application. The Quantum Ultra II 610 is a 6U, 10-slot card frame that supports any combination of input and output cards for I/O sizes from 36x4 to 4x36. The Quantum Ultra II 305 is a 3U, 5-slot card frame for small to medium-sized videowalls. The Quantum IN4HDMI 4K PLUS card supports HDMI resolutions up to 8K/60. It accepts four 4K/60 HDMI signals or a single quad-path 8K/60 signal. The Quantum OUT4HDMI 4K PLUS output card delivers four HDMI signals up to 4K/60. Quantum Ultra II is compatible with Quantum Ultra input and output cards, including the Quantum IN4HDMI, Quantum IN SMD 100, Quantum OUT4HDMI, and Quantum OUT4DTP.

Vector 4K Scaling

Quantum Ultra II incorporates the Extron-exclusive Vector™ 4K scaling engine, developed in-house and engineered to deliver best-in-class image upscaling and downscaling. Vector 4K embodies several Extron-patented scaling technologies, plus a new set of image processing algorithms that provide uncompromising scaling performance. This enables sharp, accurate 4:4:4 processing and scaling of video and computer video signals up to 4K, as well as downscaling of 4K source signals for display in small windows or on lower resolution displays without losing critical image detail.

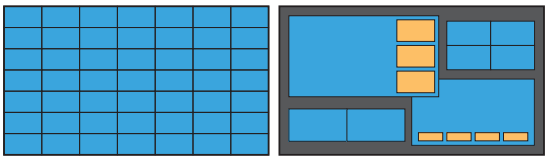
Flexible Configuration

The configurability of Quantum Ultra II makes it compatible with nearly any display type. It accommodates a mixture of display devices with varying resolutions. Output overlap facilitates integration with edge-blended projection applications and simplifies integration with large LED displays. When an image is magnified across multiple displays, adjustable mullion compensation ensures content appears natural. Output rotation accommodates displays with portrait and landscape orientation. Custom output resolutions provide compatibility with current and future display devices, as well as custom LED walls. All of these options are available simultaneously from within a single processor, allowing multiple videowalls to be easily controlled from a single Quantum Ultra II.

Portrait Videowall

Advanced Features

Quantum Ultra II ensures your video display presents the information you need, exactly how you want to see it. Sources can be windowed and positioned anywhere on the canvas. Seamless switching between presets enhances presentation capabilities. Additionally, static image files can be stored locally on the Quantum Ultra II and displayed with full keying and alpha channel support. Internally generated clocks can be presented in a variety of time formats, in multiple time zones. For flexible presentation of unique and repeated live sources, stored images, and clock windows, custom color borders can be applied to any window. This capability includes support for rounded corners, drop shadows, flashing, and transparency. Each output card can display up to 64 windows.



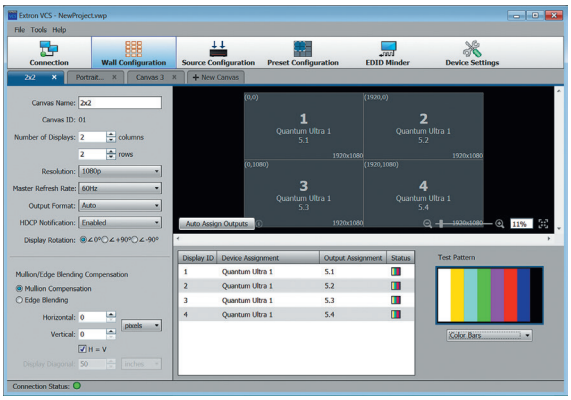
Versatile Windowing Capabilities

Streamed Content

The Quantum Ultra II 305 and Quantum Ultra II 610 card frames support direct decoding of VNC client sessions for presenting desktop information from networked computers in source windows on the videowall. For traffic management, security, or other applications requiring full motion video, the IN SMD 100 input card decodes and displays multiple simultaneous MPEG2, Motion JPEG, and H.264 video streams at up to 60 frames per second. This eliminates the need for external decoders and reduces system cost and complexity.

System Configuration and Control

Quantum Ultra II setup and preset configuration is performed using Extron VCS - Videowall Configuration Software. It is run on a computer connected to the rear panel USB or Ethernet port. This intuitive application simplifies configuration of even the largest and most complex systems. Settings and preset changes within the software are automatically synchronized and stored on the videowall processor, facilitating direct RS-232 or Ethernet connection of control systems.



Quantum VCS software provides intuitive system configuration and control

Scalable Mid-Sized and Large Videowall Processors

Quantum Ultra II 610

6U, 10-slot Frame

The Quantum Ultra II 610 card frame is the next generation of Extron videowall processors, providing advanced, future-ready connectivity and throughput capabilities. It can be populated with any combination of Quantum Ultra II and Quantum Ultra input and output cards to match source and display requirements. The frame holds up to ten input and output cards cards. Multiple card frames can be configured and operated as a single system to accommodate any size videowall.

FEATURES:

- Supports any combination of input and output cards for I/O sizes from 36x4 to 4x36
- Future-ready 500 Gbps HyperLane® video bus delivers unparalleled real-time performance for resolutions up to 8K
- RS-232 and Ethernet interfaces provide direct connections for SIS control
- Dual-redundant, hot swappable Extron-engineered Everlast™ power supplies for 24/7 mission-critical environments
- HDMI 4K PLUS cards support 4K/60 on each connection
- HDMI embedded audio switching
- HDCP 2.3 compliant
- Solid-state, write-protected operating system drive
- Secondary solid-state drive for image storage
- Simultaneous management of multiple output resolutions and screen arrangements from a single processor

MODEL	VERSION
Quantum Ultra II 610	6U, 10-slot Frame

Quantum Ultra II 305

3U, 5-slot Frame

The Quantum Ultra II 305 is the next generation of Extron videowall processors, providing advanced, future-ready connectivity and throughput capabilities. It supports any combination of up to five Quantum Ultra II and Quantum Ultra input and output cards. A single solid-state storage drive with an embedded, write protected operating system ensures fast boot times and reliable performance. The Quantum Ultra II 305 is a powerful yet cost-effective solution for small to medium size videowalls.

FEATURES:

- Supports any combination of input and output cards for I/O sizes from 16x4 to 4x16
- Future-ready 500 Gbps HyperLane® video bus delivers unparalleled real-time performance for resolutions up to 8K
- HDMI 4K PLUS cards support 4K/60 on each connection
- HDMI embedded audio switching
- HDCP 2.3 compliant
- Single solid-state storage drive with write-protected operating system

MODEL	VERSION
Quantum Ultra II 305	3U, 5-slot Frame

Quantum IN4HDMI 4K PLUS

Four-channel 4K/60 HDMI Input Card

The Quantum IN4HDMI 4K PLUS input card features 18 Gbps HDMI connectors and supports source resolutions up to 4K/60 with 4:4:4 color sampling and full HDCP 2.3 compliance. It quickly and precisely acquires standard source formats, as well as unique signal types common in military or medical environments.

FEATURES:

- Supports up to four simultaneous 4K/60 HDMI sources
- Supports sources from 480i to 4K/60
- HDCP 2.3 compliant
- 4:4:4 signal processing
- Source rotation
- Aspect ratio control

MODEL	VERSION
Quantum IN4HDMI 4K PLUS	Four-channel 4K/60 HDMI Input Card

Quantum OUT4HDMI 4K PLUS

Four-channel 4K/60 HDMI Output Card

The Quantum OUT4HDMI 4K PLUS output card features 18 Gbps HDMI connectors and supports output resolutions up to 4K/60 with 4:4:4 color sampling and full HDCP 2.3 compliance. Embedded HDMI audio from any IN4HDMI 4K PLUS source can be routed to each active canvas.

FEATURES:

- Supports up to four 4K/60 HDMI displays simultaneously
- Supports signals from 1024x768 to 4K/60
- 4:4:4 signal processing
- Output rotation
- Custom output resolutions support evolving display technology

MODEL	VERSION
Quantum OUT4HDMI 4K PLUS	Four-channel 4K/60 HDMI Output Card

Scalable Mid-Sized and Large Videowall Processors

Quantum Ultra 610

6U, 10-slot Frame

The Quantum Ultra 610 card frame can be populated with any combination of up to ten Quantum Ultra input and output cards to match source and display requirements. Multiple card frames can be configured and operated as a single system to accommodate any size videowall.

FEATURES:

- Supports any combination of input and output cards for I/O sizes from 36x4 to 4x36
- RS-232 and Ethernet interfaces provide direct connections for SIS control
- Future-ready 400 Gbps HyperLane® video bus delivers unparalleled real-time performance
- Dual-redundant, hot swappable Extron-engineered Everlast power supplies for 24/7 mission-critical environments
- Two AC power inputs
- Solid-state, write-protected operating system drive
- Secondary solid-state drive for image storage
- Simultaneous management of multiple output resolutions and screen arrangements from a single processor

MODEL	VERSION
Quantum Ultra 610	6U, 10-slot Frame

Quantum Ultra 305

3U, 5-slot Frame

The Quantum Ultra 305 supports any combination of up to five Quantum Ultra input and output cards. It features a single solid-state storage drive with an embedded, write protected operating system for fast boot times and reliable performance. The Quantum Ultra 305 is a powerful yet cost-effective solution for small to medium size videowalls.

FEATURES:

- Supports any combination of input and output cards for I/O sizes from 16x4 to 4x16
- Future-ready 400 Gbps HyperLane® dedicated video bus
- Single solid-state storage drive with write-protected operating system
- Internal Extron Everlast power supply
- RS-232 and Ethernet interfaces provide direct connections for SIS control
- Simultaneous management of multiple display resolutions and screen arrangements from a single processor

MODEL	VERSION
Quantum Ultra 305	3U, 5-slot Frame

Quantum IN4HDMI

Quantum Ultra HDMI Input Card

The Quantum IN4HDMI input card supports up to four 2K inputs, two 4K/30 inputs, or a single 4K/60 input. It quickly and precisely acquires standard source formats, as well as unique signal types common in military or medical environments.

FEATURES:

- Compatible with Quantum Ultra and Quantum Ultra II videowall systems
- Up to four simultaneous HDMI inputs
- Supports signals from 480i to 4K/60
- Supports 4K/30 signals on a single connection
- Supports 4K/60 signals on two or four connections
- 4:4:4 signal processing
- Source rotation
- Aspect ratio control

MODEL	VERSION
Quantum IN4HDMI	Four-channel HDMI Input Card

Quantum IN SMD 100

Streaming Decoder Card

The Quantum IN SMD 100 streaming decoder card is compatible with MPEG-2, Motion JPEG, and H.264 streams at bitrates up to 40 Mbps. Each card is capable of decoding up to four 1080p/60, eight 1080p/30, or 16 SD streams. It supports the video sections of ONVIF Profile S, making it compatible with a wide variety of H.264 encoders and IP cameras.

FEATURES:

- Compatible with Quantum Ultra and Quantum Ultra II videowall systems
- Hardware decoding of H.264, MPEG-2, and MJPEG streams at bit rates up to 40 Mbps
- Adherence to ONVIF Profile-S video specification
- Decodes from four 1080p/60 streams up to 16 standard-definition video streams
- Supports a wide range of streaming transport protocols
- Two independently-configurable network connections

MODEL	VERSION
Quantum IN SMD 100	Streaming Decoder Card

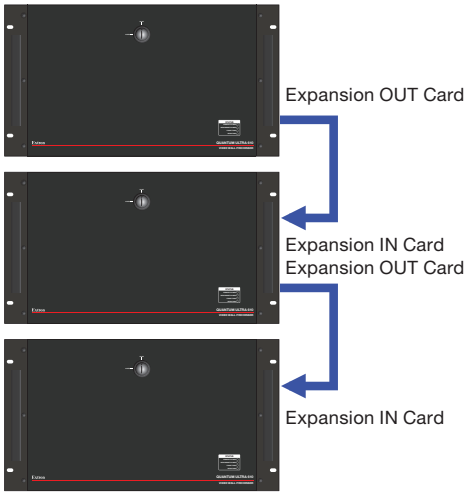
Quantum Ultra Expansion Cards

Link Multiple Processor Frames to Create Large Videowall Systems

Quantum Expansion In and Quantum Expansion Out cards link multiple Quantum Ultra videowall processors together, simplifying the design, integration, and operation of large videowalls. Three fiber optic cables link each pair of expansion cards, which extends the high-speed HyperLane® bus between the processors to create a common, shared bus. This makes all input sources available to all video outputs. Once configured, the processors operate as a single system without the need for front-end switching or distribution amplifiers. Up to five processors can be linked using four pairs of expansion cards. Quantum Ultra outputs are genlocked across all processors, maintaining image synchronization and eliminating video tearing.

Quantum Expansion IN

Quantum Expansion OUT



Up to 5 Processors

FEATURES

- Links multiple Quantum Ultra processors together to create a single large system
- Create videowalls with up to five processors and 168 total inputs/outputs
- Three fiber optic cables extend the high-speed HyperLane bus between each expansion card pair
- Uncompressed data link between expansion cards retains critical image quality
- Eliminates the need for front-end switching / distribution of sources across multiple processors
- Outputs are genlocked across each Quantum Ultra processor
- Multiple processors operate as single, cohesive system

MODEL	VERSION
Quantum Expansion IN	Expansion Input Card
Quantum Expansion OUT	Expansion Output Card
MPO MM 1m	Expansion Link Cable 1m
MPO MM 10m	Expansion Link Cable 10m
MPO MM 100m	Expansion Link Cable 100m

Quantum OUT4HDMI

Quantum Ultra HDMI Output Card

The Quantum OUT4HDMI has four HDMI outputs and supports resolutions from 1024x768 to 4K/60. Output rotation, output overlap, mullion compensation, and custom output resolutions provide compatibility with nearly any display device.

FEATURES:

- Compatible with Quantum Ultra and Quantum Ultra II videowall systems
- Up to four simultaneous HDMI outputs
- Supports signals from 1024x768 to 4K/60
- Delivers 4K/30 signals on a single connection
- Delivers 4K/60 signals on two or four connections
- 4:4:4 signal processing
- Output rotation
- Custom output resolutions support evolving display technology

MODEL	VERSION
Quantum OUT4HDMI	Four-channel HDMI Output Card

Quantum OUT4DTP

Quantum Ultra DTP Output Card

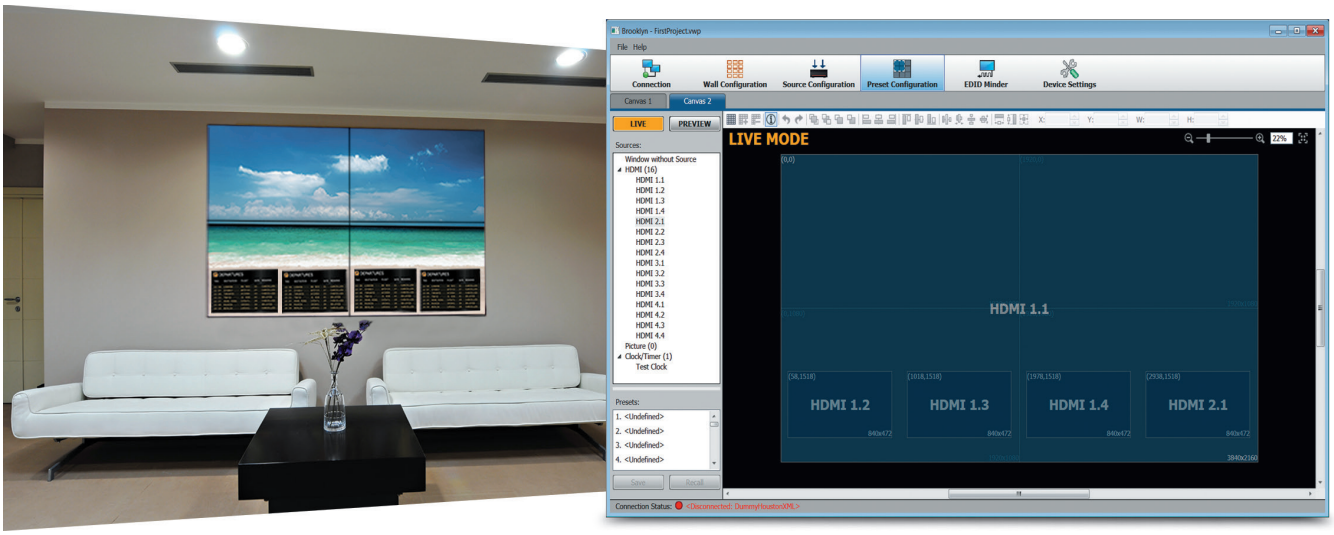
The Quantum OUT4DTP shares the same features as the OUT4HDMI, and offers four DTP outputs that can send signals up to 330 feet (100 meters) over shielded CATx cable.

FEATURES:

- Compatible with Quantum Ultra and Quantum Ultra II videowall systems
- Up to four simultaneous twisted pair outputs
- Supports signals from 1024x768 to 4K/30 on a single connection
- Delivers 4K/60 signals on two or four connections
- Supports transmission distances up to 330' (100 m)
- Selectable DTP, XTP, and HDBaseT twisted pair output modes
- Power insertion enables remote powering of DTP receivers
- Bidirectional RS-232 and IR insertion for AV device control
- RS-232 insertion from the Ethernet control port

MODEL	VERSION
Quantum OUT4DTP	Four-channel DTP Output Card

Scalable Mid-Sized and Large Videowall Processors



VCS

Videowall Configuration Software

Extron VCS – Videowall Configuration Software is a universal application for configuring Extron Quantum Ultra 4K videowall processors. With this intuitive, time-saving software, Extron videowall products are configured using a common interface. System configuration is broken down into logical tasks, such as wall configuration, source setup, preset design, and EDID management for simplified integration. Online and offline editing allows creation and configuration of systems with or without an attached processor. Familiar editing controls streamline layering, aligning, and sizing of source windows. Live and Preview modes provide the option for immediate or controlled wall response to edits. With an intuitive workflow and familiar interface, VCS provides efficient configuration of any Extron 4K videowall processor.

VCS is a computer-based software application supporting Ethernet and USB communication. Settings and preset changes within the software are automatically synchronized and stored on the videowall processor, allowing direct connection and control of the hardware using SIS commands. System maintenance is simplified with integrated connection status indicators and firmware update controls.

Powerful Editing Features

VCS features advanced editing controls that accelerate the configuration process. Window presets are created by dragging and dropping sources onto a virtual representation of the videowall. Multi-level Undo and Redo facilitates fast preset editing by allowing you to quickly revert changes to a previous layout arrangement, and back again. Offline configuration allows commissioning to begin before arriving on site, or when the processor is temporarily unavailable due to limited facility access or other restrictions. Preview mode supports “ad hoc” edits during live events, leaving the videowall unaffected by preset edits until a “Take” action is performed.

The intuitive interface, task-oriented workflow, and advanced configuration features give VCS the power and flexibility you require to get your videowall up and running fast, without sacrificing ease-of-use. Whether managing a few windows on one or two displays, or hundreds of windows across a multitude of displays, VCS provides an efficient solution for your videowall commissioning needs.

- Provides a common user interface for configuring Extron 4K videowall processors
- Task-oriented workflow
- Configure systems while online or offline
- Live and Preview editing modes
- Undo/Redo edits to wall presets
- Familiar tools and icons for window management
- Supports devices with Ethernet or USB connectivity
- Stores all configuration and preset parameters locally on the videowall processor
- Status indicators give users visual confirmation of processor connection
- Update device firmware directly from the Device Settings task
- Efficient configuration for videowalls of any size and complexity

Compatible with:

- Quantum Ultra II
- Quantum Ultra
- Quantum Ultra Connect
- MGP 641

EMS Express Mobile Software - Quantum Ultra

Multi-platform Control Application for Videowall Processors

EMS Express Mobile Software - Quantum Ultra is an application designed to provide intuitive user control of Quantum Ultra videowall processors. It is compatible with Apple® iOS® and Google® Android™ tablets and Microsoft® Surface and Windows 10 PCs. The software combines the freedom of wireless control with an easy to use tablet application operated with familiar finger gestures. These include drag and drop, swipe, and tap. It facilitates preset selection, window size and position, source selection, and other common operational tasks, and can work in tandem with VCS and a control system. Up to 10 users can control one or more videowalls. Separate User, Designer, and Administrator credentials define operational roles. EMS-Quantum Ultra is ideal for use with systems requiring one or more points of control through a user-friendly interface.

EMS-Quantum Ultra can be used in any application that requires mobile, wireless or wired control of a videowall for operational use. This includes corporate conference rooms, command and control centers, network operations hubs, or other applications that would benefit from intuitive control, either single-point or multi-point. A LinkLicense® upgrade for the Quantum Ultra, LinkLicense for EMS-Quantum Ultra, is required to enable communication between EMS and the processor.

Familiar finger gestures facilitate easy and intuitive control of videowalls. Drag and drop enables quick changes between presets and source selection within windows. Effortlessly resize windows using standard two-finger pinch and stretch actions. To access each videowall in the system, swipe to switch between canvases.

Multi-platform Compatibility

EMS-Quantum Ultra is fully compatible with tablets running iOS, Android, and Windows operating systems, easily adapting to the chosen platform of an organization's infrastructure.

The software works with the following operating systems:
- iOS 10 or above
- Android 6.0 or above
- Windows 10 or above, including Surface and PCs

In addition to the functionality you would expect from an easy-to-use videowall control application, EMS-Quantum Ultra provides access to a wide variety of features that enhance operation, content presentation, and management.

Separate User, Designer, and Administrator Credentials

Three permission levels define operational roles. Users can recall and switch between presets and temporarily edit presets. Designers and Administrators have the added ability to create and save edited presets.

EMS-Quantum Ultra can be used in a variety of control scenarios. It can act as a single, exclusive point of control for one or more videowalls. As a multi-point control solution, up to 10 devices can operate the videowalls. It can also be a supplemental point of control used in conjunction with Videowall Configuration Software - VCS and a control system.

Streamlined Setup

Initial Quantum Ultra setup is performed using VCS. This includes:
- Establishing system communication
- Creating the screen layout
- Setting output resolutions and refresh rates
- Assigning overlap or bezel compensation, if required
- Configuring sources and EDID
- Creating window presets

Once initial configuration is complete, EMS-Quantum Ultra can run from one or more locations. This allows easy system control from up to 10 devices. The application can be used by itself or in conjunction with VCS and a control system, such as an Extron Pro Series control processor and a TouchLink Pro touchpanel.

Features

- Compatible with Apple® iOS®, Google® Android™, and Microsoft® Surface tablets
- Simplifies common operational tasks, such as preset selection, window management, and source switching
- Supports familiar operational gestures, including drag and drop, swipe, and tap
- Control videowalls from up to 10 devices simultaneously
- Requires videowall processor with LinkLicense® for EMS-Quantum Ultra

MODEL	VERSION
EMS Express Mobile Software - Quantum Ultra	iOS App for Quantum Ultra Control
EMS Express Mobile Software - Quantum Ultra	Android App for Quantum Ultra Control
EMS Express Mobile Software - Quantum Ultra	Windows App for Quantum Ultra Control

Quantum Ultra Connect

4K Videowall Processing for Small to Mid-Sized Applications

Extron Quantum® Ultra Connect 84 and Quantum Ultra Connect 128 are eight and twelve HDMI input videowall processors for systems with up to four or eight displays. They deliver the same high-quality scaling and real-time performance as Extron's Quantum Ultra processors, featuring the Vector™ 4K scaling engine and HyperLane® high-speed video bus technology. Custom output resolutions, input and output image rotation, and bezel compensation provide compatibility with a wide variety of display technologies. Flexible window placement allows side-by-side, overlap, and picture in picture image positioning. For HDCP-encrypted content, Key Minder® and SpeedSwitch® Technology deliver virtually instantaneous switching. RS-232, USB, and Ethernet interfaces provide control system connection, eliminating the need for a dedicated control computer.

Quantum Ultra Connect 84

Quantum Ultra Connect 128

FEATURES:

- Cost effective 4K/60 HDMI videowall processors for videowalls with up to eight screens
- Supports 4K on one, two, or four connections
- Extron Vector™ 4K scaling engine
- 400 Gbps HyperLane® video bus delivers unparalleled real-time performance
- Direct control via RS-232, USB, and Ethernet
- Designed for 24/7, mission-critical environments
- Integrates easily into a diverse array of 4K environments such as lobbies, auditoriums, and simulation environments
- Seamless transitions
- 3U, 5-slot card frame
- Solid-state storage
- Write-protected operating system

MODEL	VERSION
Quantum Ultra Connect 84	8 Inputs, 4 Outputs
Quantum Ultra Connect 128	12 Inputs, 8 Outputs

18 Gbps 4K/60 4:4:4

VECTOR 4K SCALING

DTP SYSTEMS

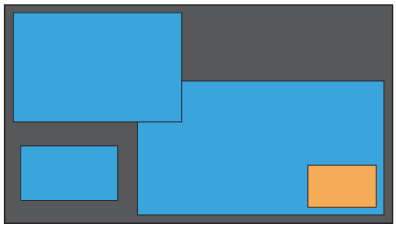
MGP 641

4K/60 HDMI Multi-Window Processor with DTP2 Extension

The Extron MGP 641 is a multi-window processor that scales and presents up to four 4K/60 source signals on a single screen. It features advanced Extron Vector™ 4K scaling technology for unequaled image quality. The HDCP 2.3-compliant processor includes four HDMI 2.0 inputs and an additional HDMI background input. HDMI and DTP2 4K/60 outputs deliver duplicate signals to local and remote displays. Audio de-embedding simplifies integration. These features and capabilities enable the MGP 641 processor to deliver professional presentations that are ideal for high-end environments and live events.

Flexible Source Windowing

The MGP 641 offers extensive windowing options, enabling side-by-side, overlap, and picture in picture positioning of live sources.



Restriction-free window placement

Window Presets and Transitions

128 window presets allow for quick saving and recall of size, positioning and priority for each window. Transitions between presets can be set to Cut or Animated. The Animated effect dynamically resizes and repositions the windows to the selected preset's locations.

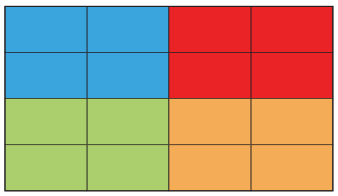
Source and Output Rotation

Content received on Inputs 2 and 4 can be rotated 90 degrees. The duplicate HDMI and DTP2 output signals can also be rotated 90 degrees to accommodate displays arranged in portrait or landscape orientations.

4K/60 HDMI Background Input

The HDMI background input supports animated backgrounds, tickers, or other live content. It can also accommodate additional MGP 641 processors to present up to 16 fully customizable windows.

Live video or scrolling text



Cascade up to four MGP 641 processors

MODEL
MGP 641

VERSION
4 HDMI Inputs

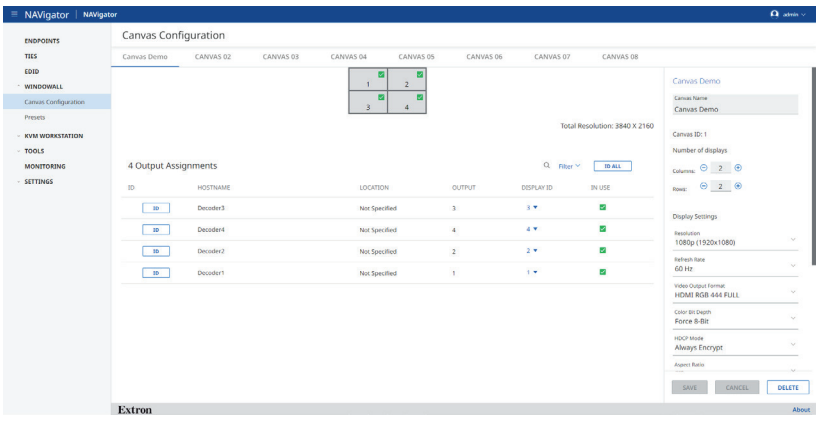
NAV PRO AVoIP

AV over IP Distribution with Flexible Videowall Features

NAV® is the only no-compromise Pro AV over IP solution for distribution and switching of ultra-low latency, high quality video and audio signals over an Ethernet network at low bitrates. NAV WindoWall® mode utilizes NAV scaling decoders with Extron Vector 4K scaling technology to enable videowall support within the NAV system. This further expands capabilities and enables broader use in installations, such as command and control and emergency operations centers. The NAVigator system manager simplifies configuration of powerful WindoWall features.

FEATURES

- Enables a mix of full screen and image magnification across multiple displays
- Browser-based NAVigator setup simplifies the configuration process
- Up to eight videowalls per system
- Supports display arrays up to 8x8
- Up to eight assignable presets are available per wall
- Provides mullion compensation for displays



Canvas setup using NAVigator browser interface

XTP SYSTEMS

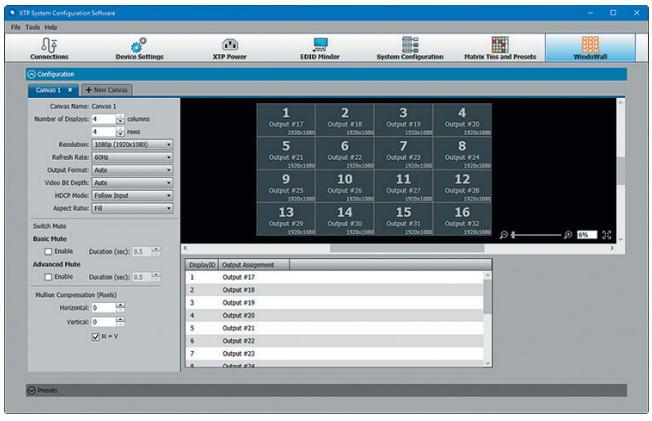
XTP Systems Deliver Powerful Capabilities for Videowall Applications

We are pleased to introduce XTP WindoWall®, an exciting enhancement that brings videowall capabilities to XTP Systems®. Utilizing XTP® scaling receivers, XTP WindoWall enables a mix of full screen and image magnification across multiple displays. Up to eight videowalls can be supported within an XTP system, and up to eight assignable presets are available per wall for quick and easy viewing between different image arrangements. Convenient software features such as drag and size layout configuration, mullion compensation, and the ability to create multiple presets expedite the setup process.

FEATURES

- Expands XTP Systems applications to include videowall environments
- Supports any aspect ratio configuration up to 8x8
- Enables a mix of full screen and image magnification across multiple displays
- XTP System Configuration Software streamlines videowall set up, saving time and money
- Presets offer quick and easy selection between layouts
- Mullion compensation for flat panel displays

MODEL	VERSION
XTP SR HD 4K	HDMI Scaling Receiver
XTP SFR HD 4K MM	HDMI Scaling Receiver - Multimode
XTP SFR HD 4K SM	HDMI Scaling Receiver - Singlemode



XTP System Configuration Software Offers Quick and Easy Setup

Energy Efficient Power Supplies Engineered for Ultimate Reliability

The Power to Perform

Power supply failures in mission-critical AV products can cause significant disruption to signal distribution and facility operations, creating serious challenges for system integrators, end users, and manufacturers alike. Extron has answered this challenge with the Everlast™ Series of high-performance, "no compromise" internal and external power supplies, setting a new standard for reliability and efficiency in the professional AV industry.

Designed from the ground up by our Extron engineering team, Everlast Power Supplies use state-of-the-art technology and the highest-quality components to ensure the reliability of our products. Like all of Extron's products, our design philosophy and manufacturing process for the Everlast Power Supplies are driven by safety, performance, reliability, and efficiency…not merely by cost.

Everlast power supplies are integrated into a wide range of Extron products and are also available as external PS Series power supplies.

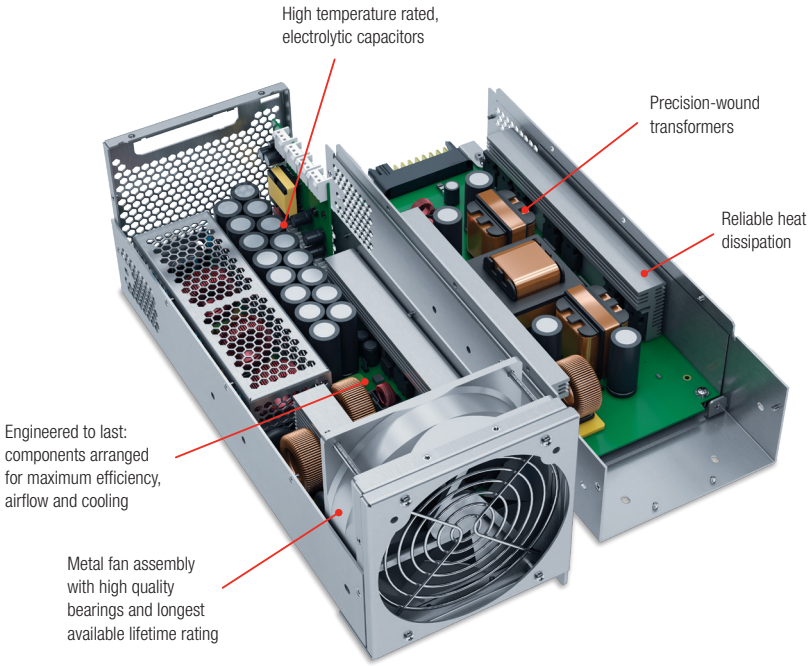
Aren't All Power Supplies the Same?

Definitely not. Our AV industry competitors typically use generic off-the-shelf power supplies from 3rd party vendors. These mass-produced power supplies are frequently designed to meet a low price point, employing the least expensive components meeting the minimum manufacturing spec. Using a cheap diode vs. a efficient transistor, or a 10 cent capacitor instead of a 20 cent version might save some pennies in manufacturing costs, but those savings can turn into expensive liabilities when the product fails to power up.

The Extron Everlast Difference

Our Everlast Power Supplies are designed and manufactured in-house, employing premium-quality components and highly efficient, modern topologies for thermal management, transistor switching, energy dissipation, and virtually every other critical aspect of the power system. Each Everlast Power Supply is built with the same care and meticulous attention to detail as our award-winning high-end video products.

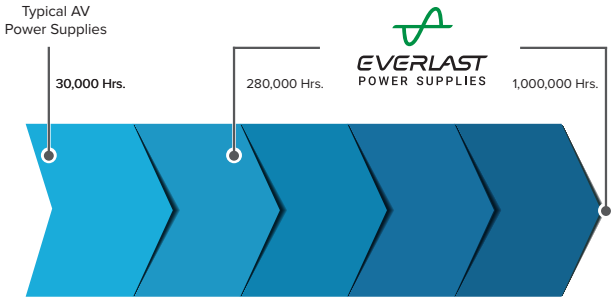
The Anatomy of an Everlast Power Supply



Demonstrated Reliability. Proven Performance.

Typical AV power supplies have an average MTBF, Mean Time Between Failure, rating of around 30,000 hours, calculated by using the stated specifications of the individual components.

To ensure that our Everlast power supplies meet Extron standards of performance and quality, we subjected each model of our PS Desktop Series to actual, not calculated, accelerated operational life testing, using a heat chamber at an ambient temperature of 85° C. Based on this life testing, we achieved MTBF benchmarks of 280,000 hours up to an incredible 1,000,000 hours, or the equivalent of over 114 years, depending on the model. We know of no other company that has gone to such lengths to guarantee power supply reliability.



Lean, Mean, and Green

The energy efficient designs of our Everlast Power Supplies help to meet green building requirements by lowering power consumption and reducing overall operating costs.

- Our Everlast PS Series of Desktop Power Supplies are Level VI rated and consume just 0.075 watts or less at idle when no load is present on the output.
- Our superior heat dissipation and thermal management engineering enables Everlast-powered installations to run cooler, which in turn lightens the demand on the local HVAC system.

7-Year Warranty

Extron is pleased to announce that we are extending the Warranty period to 7 years for all of our Everlast desktop power supplies and Everlast internal and integrated power supplies. Product performance and reliability have always been important guiding principles for Extron. Quality and reliability are two of the most important design criteria for every Extron product. The confidence we have achieved has enabled us to enhance our support program. Providing this World Class Warranty is another example of Extron's commitment to stand behind our products and our customers.

Power Supply Trade-up Program

Extron has a Power Supply Trade-up Program for Extron Customers. For any combination of fifteen qualifying 12 Volt PS Series power supplies returned to us on an authorized RMA, we will ship to the customer a new PS 124 Multiple Output 12 Volt DC Power Supply. The PS 124 features eight 12 volt DC outputs, providing a total of 4 amps across all outputs with no per-port current limitations. This power supply is designed to take the place of several individual PS Series desktop power supplies, which frees up space in the equipment rack. Additionally, the PS 124 is UL 2043 rated when used with the optional Flexible Conduit Adapter Kit for installation into a ceiling space.

Extron provides 12 volt power supplies with many products, but when power supplies are shared, the unused power supplies are tossed aside and could end up in a landfill. Extron customers have asked for a way to trade in these brand new power supplies and our Power Supply Trade-up Program is an excellent way to avoid unnecessary waste.

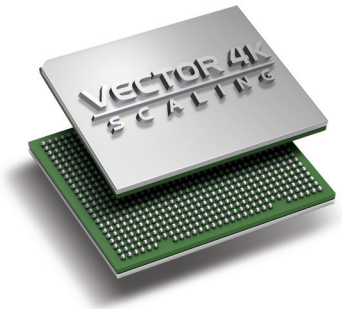
To learn more about Everlast power supplies, visit **www.extron.com/everlast**

Vector 4K

Extron Vector 4K Scaling Technology

For over 20 years, Extron has been engineering scaling and signal processing solutions that deliver uncompromised image quality and performance. As a result, we have become an industry leader in scaling technology, designing best-in-class products renowned for their quality, reliability, and ease of use. We have continually refined our technology to keep pace with evolving video formats – from standard definition to high definition signals, and now, 4K.

Engineered by Extron from the Ground Up



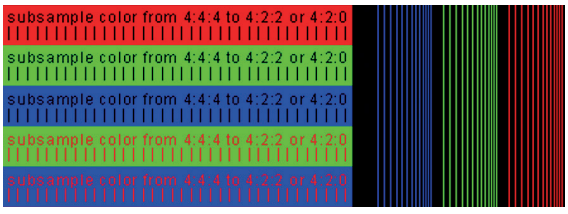
Vector 4K was developed internally by Extron's expert team of signal processing engineers. Extron engineers have crafted patented image processing technologies that set the industry benchmark for visual performance. Features such as 4:4:4 chroma sampling and bicubic scaling ensure very high image quality and preserve detail present in the original source material.

Patented Scaling Technology for the Most Demanding 4K Applications

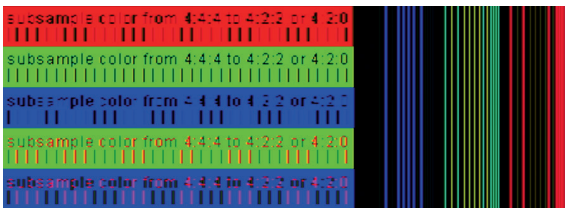
By developing our own scaling technology, we can design to our own exacting specifications and have absolute control over the end product. Our many years of signal processing achievements have resulted in 24 worldwide patents for our scaling engines and video processing algorithms. These patented technologies are part of what makes Extron Vector 4K scaling the new benchmark for 4K video processing.

4:4:4 Chroma Sampling

Vector 4K processing is always performed in the RGB domain with full 4:4:4 color bandwidth, which is critical for processing fine image details. Competing 4K scalers commonly process in the component domain, employing 4:2:2 or 4:2:0 chroma subsampling. This decreases the bandwidth required to process the signal, at the expense of reduced color detail. Chroma subsampling may be acceptable when processing full-motion video content, but with PC-generated content, subsampled color negatively impacts the clarity of the image. Vector 4K 4:4:4 color processing retains the fine color details present in the original source.



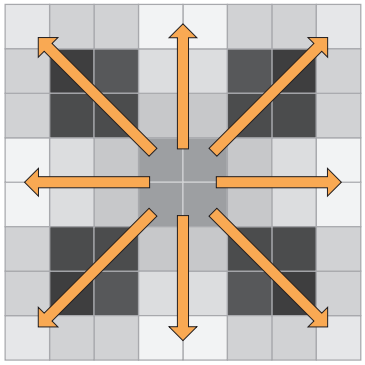
4:4:4 Chroma Sampling



4:2:2 Chroma Subsampling

Bicubic Interpolation

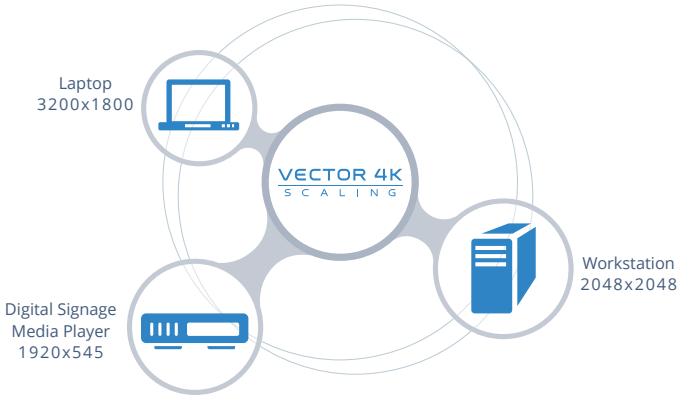
The Vector 4K scaling engine incorporates Extron-patented, multi-tap, bicubic interpolation, which creates a new pixel by averaging adjacent pixels above, below, to the sides, and diagonally of the new pixel. This produces sharp, accurate output, preserving single-pixel detail that other scaling methods lack. Vector 4K algorithms continually and dynamically adapt, ensuring optimal processing for upscaling, downscaling, or 1:1 pass-through applications.

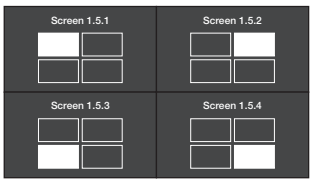


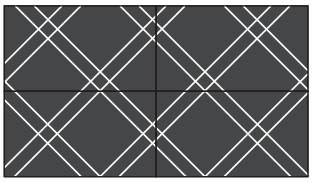
Bicubic Interpolation

Dynamic Digital Input Detection and Auto-Image

Today's computer video standards allow for signal customization to suit the needs of a particular application or display. Such sources can present a challenge for signal processors that rely solely on fixed lookup tables of common resolutions, which are typically incomplete and quickly become obsolete. Vector 4K goes beyond conventional lookup tables, incorporating dynamic input detection which analyzes incoming digital video signals and accurately identifies the signal parameters before processing them for precise conversion and scaling.







Dynamic Internal Test Patterns

Extron Vector 4K scalers and signal processors are equipped with a set of dynamic, mathematically generated, vector-based video test patterns. They aid in configuring displays, and provide test signals to facilitate troubleshooting and expedite system recovery. These patterns are precisely generated based on the scaler's output resolution, and are automatically redrawn if the resolution is changed. This ensures that test patterns exactly match the signal resolution, producing sharp, crisp images, which in turn facilitate precise setup and configuration of display devices. Patterns specific to videowall applications are included, such as Diagonal Crosshatch, Edge Blend Alignment, and Display ID.

EDID MINDER

EDID Management

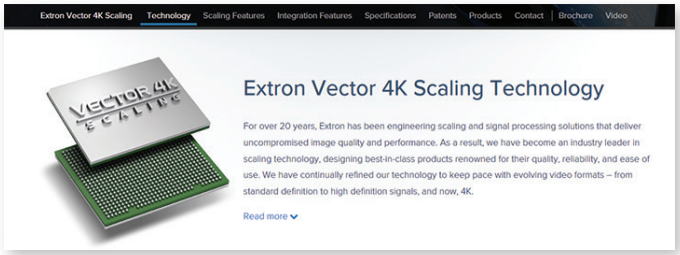
Vector 4K encompasses a range of advanced signal management technologies common across many of Extron's digital video product solutions, simplifying integration of digital video sources and displays, and ensuring optimal system performance and dependability. EDID Minder® manages EDID communication between devices so that preferred video formats are always correctly and reliably output from the source to the receiving device. Custom EDID can also be captured or uploaded to Extron products for special applications.

Integration Features

Vector 4K technology also provides features that aid in system integration, such as aspect ratio control, auto-memory and user presets, advanced HDCP management, and more.

Learn More

To learn more about Vector 4K scaling, visit www.extron.com/vector4k, where you can see interactive demonstrations of Vector 4K technology, view an informational video highlighting key features, and download the Vector 4K brochure.



www.extron.com/vector4k

Videowall System Commissioning

Videowall Commissioning

Product Commissioning Service for Extron Videowall Processors

Extron Videowall Commissioning is a proactive service that ensures your Quantum Ultra, Quantum Ultra II, or Quantum Ultra Connect processing system matches the specified performance requirements. An Extron Systems Design Engineer - SDE provides personalized assistance, from concept to completion, to help you deliver a system that meets your customer's expectations.

FEATURES:

- Extron support services for Quantum® videowall processors
- Ensures videowall system designs meet performance requirements
- Pre-installation design review and assistance
- On-site or remote support with an Extron SDE
- Videowall product performance optimization and configuration
- Videowall system operator training

Extron Videowall Commissioning Includes:

Pre-installation design review services – Extron SDEs are available to assist you throughout the design process. We review your final system design diagram, prior to commissioning, to verify that it provides optimal videowall performance.

Window layout optimization – Using your wiring schematic and window layout drawings, we create a VCS project file that includes all aspects of the system. It includes videowall parameters, I/O routing, and window layout presets. Once on-site, the Extron SDE verifies the presets, configures source parameters, and delivers to you a completed project file.

Processor and source optimization –The Extron SDE optimizes all Quantum processors, including signal timing, clock and phase settings, size and position adjustments, video adjustments such as color, tint, contrast, and brightness settings, as well as other general image parameters.

Validation of processor control – After processor and source optimization is complete, the Extron SDE verifies that window layout presets are being recalled accurately, and that the processor is correctly responding to commands it receives from an external control system, if present.

Basic VCS and EMS software training for the system operator – After correct processor control is verified, the Extron SDE provides training on the VCS software's user interface, as well as how to perform system adjustments and design window layouts. EMS software, if utilized, will also be reviewed.

Pre and Post-Commissioning Checklists

A site preparedness form to guide you through the pre-commissioning requirements is provided to you before commissioning is performed. Upon completion of the commissioning, you are issued a site acceptance form to facilitate signoff of the Extron Videowall Commissioning service.

Developing a Commissioning Plan

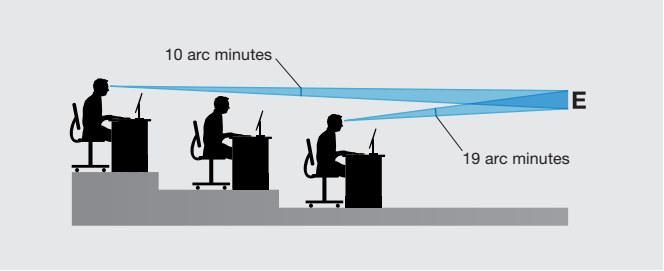
Extron can assist you in developing a commissioning plan for the installation. Please contact your local Extron sales representative or sales office to discuss:

- Job site location
- System application, such as a network operations center, command and control center, corporate lobby, or retail center
- How the system will be use, and if known, the layouts for the video window presets
- Current system design, including switcher size, sources, display type, resolution, and cable distance estimates
- Primary method of user control, be it VCS, EMS, or an external control system and touchpanel interface
- Site considerations, such as general site availability and access restrictions for individuals or equipment
- Contact details for the primary AV system designer
- Anticipated dates for equipment delivery, installation, commissioning, and project completion for commissioning
- Whether on-site or remote commission is preferred

MODEL	VERSION
Remote Commissioning Videowalls	Remote Commissioning for Videowalls
Onsite Commissioning - Videowalls	Onsite Commissioning for Videowalls

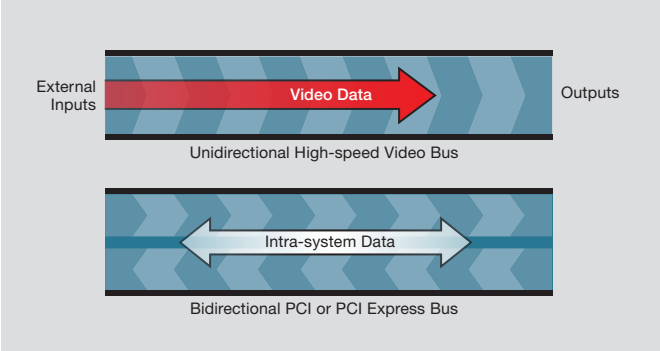
AV Glossary

In use throughout this guide is the language of videowalls. The lexicon of words, phrases, acronyms, and abbreviations appropriate to videowalls, video signals, sources, displays, control, and the products designed for use in videowall systems is defined in the following glossary of terms.



Arc Minutes

A unit of angular measurement used to describe how much of a viewer's vision is occupied by an object. An arc minute is equal to 1/60 of a degree, with 360 degrees comprising a complete circle.



Bus

A path for transporting voltages, signals, or a ground between the different sections of an electronic device, such as a data bus between a CPU and memory or a peripheral device, or a video bus between the inputs and outputs of a video processor. Its width is determined by the number of lines (conductors) that make up the bus, and its speed (data transfer rate) is determined by the circuits that drive the lines.

AV Glossary

1080i
Interlaced HDTV transmission standard. Refers to an active pixel rate of 1920x1080 with a vertical refresh rate of up to 60 fields (30 frames) per second for NTSC countries or 50 fields (25 frames) per second for PAL/SECAM countries.

1080p
Progressive-scan HDTV standard. Refers to an active pixel rate of 1920x1080 with a vertical refresh rate of up to 60 frames per second for NTSC countries or 50 frames per second for PAL/SECAM countries. 1080p is often stated with an associated frames per second rate, such as: 1080p24 (24 fps, progressive), 1080p30 (30 fps, progressive) and 1080p60 (60 fps, progressive). 1080p is extremely rare in broadcasting; for example, the ATSC standard provides bandwidth sufficient only for 1080p24 and 1080p30. Blu-ray and other pre-recorded high definition schemes can support full 1080p60 content playback.

2:2 Film Detection
The ability to determine whether PAL video has been converted from film using 2:2 pulldown. Film material with 2:2 pulldown may result in artifacts and jaggies when the video signal is deinterlaced. By using 2:2 film detection to determine if the material originated from film and was converted to PAL, the video processing algorithm can be used to optimize any video for deinterlacing so that the images are free of artifacts.

2:2 Pulldown
See “2:2 film detection.”

3:2 Pulldown
The process of matching the frame rate of film (24 frames per second) to the frame rate of NTSC video (30 frames per second). In 3:2 pulldown, one frame of film is converted to three fields (1 ½ frames) of video, and the next frame of film is converted to two fields (1 frame) of video. This cadence is repeated (3 fields, 2 fields, 3 fields, 2 fields.) until the film is fully converted to a video of approximately the same duration.

3:2 Pulldown Detection
A sophisticated technology in Extron scalers used to detect the presence of a 3:2 pulldown that helps maximize image detail and sharpness. When film-originated material is detected, this technology applies video processing algorithms that optimize image reproduction and avoids causing jaggies.

3G-SDI
A signal standard for serial digital, high definition video with 1920x1080 resolution and a 50 Hz or 60 Hz progressive frame rate. Up to 32 audio channels can be carried as ancillary data. 3G stands for three gigabits per second, which is twice the bit rate of the 1.485 Gbps HD-SDI signal.

4:1:1 Color Space
Chroma, or color information is sampled at one-fourth the horizontal resolution of the luminance, or black and white information.

4:2:0 Color Space
Chroma, or color information is sampled at half the vertical and half the horizontal resolution of the luminance, or black and white information.

4:2:2 Color Space
Color information is sampled at half the horizontal resolution of the luminance, black and white information. 4:2:2 color sampling is popular in high-quality broadcast video systems.

4:4:4 Color Space
Color information is sampled at the same rate as the luminance, black and white information. Video systems designed for capturing real images typically quantize color information at one-fourth to one-half the detail of luminance information. This is acceptable for real images, where sharp, on-off transitions between colors do not occur. Computer graphic pictures contain sharp, pixel transitions and require maintenance of 4:4:4 color space. Otherwise, information is lost.

4K
Digital cinema resolution at 4096x2160 pixels. Frame rates can range from 24 to 120 fps. 4K is often mentioned along with Ultra HD, which has a video resolution of 3840x2160.

720p
Progressive-scan HDTV transmission standard. Refers to an active pixel rate of 1280x720 with a vertical refresh rate of 60 frames per second for NTSC countries or 50 frames per second for PAL/SECAM countries. The 720p standard also allows refresh rates of 24, 25, and 30 frames per second.

8K
An image or display resolution of 7680x4320. This is the highest resolution defined in the Rec. 2020 standard, which defines various aspects of ultra-high-definition television.

A

Aliasing
(1) Aliasing occurs when smooth curves and lines become rough or jagged because of a lower resolution device, or by an event.
(2) In analog video, aliasing is typically caused by interference between the luma and chroma frequencies or between the chroma and field scanning frequencies. It appears as a moiré or herringbone pattern, straight lines that become wavy, or rainbow colors.
(3) In digital video, insufficient sampling or poor filtering of the signal causes aliasing. Defects typically appear as jagged edges on diagonal lines and twinkling or brightening in picture detail.

Analog
A continuously varying action or movement that takes time to change from one position to another. An analog signal has an infinite number of levels between its highest and lowest value (unlike digital, in which changes are in discrete steps).

ANSI lumen
The common unit of measurement for the light output of a projector, as measured by ANSI, the American National Standards Institute. The higher the ANSI lumen rating, the brighter the projector. In general, there needs to be about a 30% differential in the ANSI lumen rating before the human eye can really notice an appreciable difference in brightness when two projectors are shown side by side. Determining the lumen output for a given application depends on five factors, (1) the level of ambient room light, (2) the size of the audience, (3) the size of the projected image, (4) the quality of the projection screen, and (5) the amount of detail in the presentation material. Also see “Lumen.”

AV Glossary

Antialiasing
A technique in computer graphics for smoothing jagged edges by blending shades of color or gray along the edges. Some video devices, such as character generators, have an antialiasing feature to minimize aliasing through filtering and other techniques. Also see “Aliasing.”

Arc minutes
A unit of angular measurement used to describe how much of a viewer’s vision is occupied by an object. An arc minute is equal to 1/60th of a degree, with 360 degrees comprising a complete circle.

Aspect ratio
The relationship of the horizontal dimension to the vertical dimension of an image. In viewing screens, standard TV is 4:3, or 1.33:1; HDTV is 16:9, or 1.78:1. Sometimes the “:1” is implicit, making TV = 1.33 and HDTV = 1.78.

ATMS
Advanced Traffic Management Systems. Specialized systems that integrate technology to improve the safety and flow of traffic on public roadways. Such systems serve to reduce fuel consumption and environmental cost, while increasing economic efficiency for a transportation infrastructure or geographic region. Real-time traffic data from cameras, speed sensors, etc. are typically integrated into a TMC - Traffic Management Center for the purposes of incident detection. TMC staff will dispatch public safety or maintenance services, manage traffic routing or messaging, or undertake other actions to improve the flow of traffic.

AVoIP (Audio Video over Internet Protocol)
Audio Video over Internet Protocol – AVoIP – AV over IP – is a method of transmitting digital audio and video over standard network switching and routing equipment. The digital audio and video are broken into segments and encapsulated in standard internet protocol packet headers. These Internet Protocol or IP packets can then be carried from a transmitter to a receiver over standard networking equipment across a local network or over the Internet. Modern AVoIP systems typically include the exchange of additional data such as USB, RS-232, IR, and control signals along with the audio and video. These systems commonly incorporate encoders and decoders to compress and decompress the audio, video, and data to improve network efficiency.

B

Bandwidth
Capacity or available bandwidth in bit/s, which typically means the net bit rate, channel capacity, or the maximum throughput of a logical or physical communication path in a digital communication system.

Black level
More commonly referred to as “brightness,” the black level is the level of light produced on a video screen. The level of a picture signal corresponding to the maximum limit of black peaks. The bottom portion of the video wave form, which contains the sync, blanking, and control signals. The black level is set by the brightness control.

Blu-ray Disc
An optical disc storage medium developed by Sony as an alternative to DVDs. Blu-ray is capable of storing high definition video, audio, and data with a capacity up to 50 GB per disc. Blu-ray players are backward-compatible, supporting playback of standard DVDs and audio CDs.

Bus
A path for transporting voltages, signals, or a ground between the different sections of an electronic device, such as a data bus between a CPU and memory or a peripheral device, or a video bus between the inputs and outputs of a video processor. Its width is determined by the number of lines (conductors) that make up the bus, and its speed (data transfer rate) is determined by the circuits that drive the lines.

C

C2
Command and Control. An organization of personnel, equipment, communications, facilities, and procedures managed by a command structure for planning, directing, coordinating, and controlling forces and operations in the accomplishment of a mission. There are variants of the C2 acronym which incorporate subordinate activities, including: C2I - Command, Control and Intelligence; C2ISR - Command, Control, Intelligence, Surveillance and Reconnaissance; C3I - Command, Control, Communications and Intelligence; and C4I - Command, Control, Communications, Computers and Intelligence.

CAT 5
Category 5. Describes the network cabling standard that consists of four unshielded twisted pairs of copper wire terminated by RJ-45 connectors. CAT 5 cabling supports data rates up to 100 Mbps. CAT 5 is based on the EIA/TIA 568 Commercial Building Telecommunications Wiring Standard.

Cathode ray tube
A vacuum tube that produces light when energized by the electron beam generated inside the tube. A CRT has a heated cathode and grids in the neck of the tube, making up the “gun”. Electrons are accelerated from the gun toward the front surface of the tube (screen), producing a beam. The surface on the back of the screen is coated with phosphors that light up when struck by the electron beam. The CRT in a TV is known as the picture tube. CRT projectors had three guns – one for each red, green and blue color.

Chrominance (chroma or C for short)
The signal used in video systems to convey color information separately from the accompanying luma signal (or Y for short). Chrominance may be represented as either a single signal or as two signals. S-video comprises one chrominance signal and one luminance signal, while component video comprises two chrominance signals and one luminance signal.

Client
A computer or network device that uses information supplied by a server.

Color depth
Describes the number of bits used to represent the color of a single pixel in a bitmapped image or video frame buffer. A common bit depth applied to computer graphic signals is 8-bits each for Red, Green, and Blue. An 8 bit depth will produce 256 levels and 256 raised to the 3rd power, results in a resolution of over 16 million colors.

Component digital
Digital video using separate color components, such as Y, Cb, Cr. Digital recording formats such as D1 (Sony, BTS/Philips) and D5 (Panasonic) utilize component digital recording technology. Component digital is the digital representation of the component analog signal set, Y, B-Y, R-Y; it is often represented as 4:2:2. The encoding parameters are specified by ITU-R BT.601-2 (formerly known as CCIR 601).

Component video
Color television systems start with three channels of information: red, green, and blue (RGB). In the process of translating these channels to a single composite video signal, they are often first converted to Y, R-Y, and B-Y. Both three-channel systems, RGB and Y, R-Y, B-Y, are component video signals. They are the components that eventually make up the composite video signal. Higher quality program production is possible if the elements are assembled in the component domain.

Composite video
An all-in-one video signal comprised of the luma (black and white), chroma (color), blanking pulses, sync pulses, and color burst.

Compression
The art and science of reducing the amount of data required to represent a picture or a stream of pictures and sound before sending or storing it. Compression systems are designed to eliminate redundant or visually imperceptible information to the desired data level while allowing the original information to be reproduced at the desired quality.

Contrast
The range of light and dark values in a picture, or the ratio between the maximum and the minimum brightness values. It is also the name of a TV monitor adjustment, which increases or decreases the level of contrast of a displayed picture. Also called “white level.”

Contrast ratio
The ratio of a display’s highest light output level divided by its lowest light output level.

Crosshatch
A test pattern consisting of vertical and horizontal lines used for converging a color display device.

CRT
See “cathode ray tube”.

CVT
Coordinated Video Timings. A VESA standard defining signal timing information for computer-video signals. Signal parameters are determined using a formula based on horizontal and vertical blanking intervals, horizontal frequency, vertical frequency, and horizontal and vertical sync polarity. CVT superseded the GTF standard.

D

Digital
A system of data or image values in the form of discrete, non-continuous codes, such as binary. When data is in a digital format, it can be processed, stored (recorded), and reproduced easily while maintaining its original integrity.

DisplayPort
A digital audio/video interconnect standard designed primarily for use between a computer and display device. DisplayPort supports data rates up to 10.8 Gbps at a distance of two meters over standard copper cable. DisplayPort is not directly compatible with DVI or HDMI, but a DisplayPort connector can pass these signals, and the standard does provide an emulation mode for ease of integration with DVI or HDMI equipped products.

Distribution amplifier
A device that distributes multiple outputs from a single source input. Distribution Amplifiers (DAs) not only split signals, but provide amplification and enhancement features to maintain signal integrity.

DLP®
Digital Light Processing. An imaging technology for video projection developed by Texas Instruments, based on the modulation of light reflected from mirror elements known as Micromirrors™. Each pixel is represented by its own Micromirror, which mechanically tilts in accordance to the extent of light reflected toward or away from the screen. A matrix of Micromirrors comprising the video image is situated on a microchip, or DMD™ (Digital Micromirror Device). DLP is implemented as a three-chip configuration (one DMD for each of the RGB colors), or as a one-chip configuration (R, G, and B are sequentially processed by a single DMD via a color wheel).

DMT
Display Monitor Timing. A VESA standard defining signal timing information for computer-video signals. DMT was superseded by the GTF standard.

Dual-link DVI
Dual-link DVI supports 2 x 165 MHz (2048x1536 at 60 Hz, 1920x1080 at 85 Hz). A dual-link implementation utilizes all 24 of the available pins. A dual-link DVI output has two TMDS links and twice the bandwidth of single-link DVI, and can therefore support much higher resolutions. With two TMDS links, the number of data channels is doubled, although there is still only one clock signal, so both links are clocked identically. Apple’s 30 inch Cinema Display, with a native resolution of 2560x1600, is an example of a display requiring dual-link DVI.

DVD
Digital Versatile Disc. An optical disc similar in physical size to a CD-ROM, but capable of storing an entire movie. The technology uses MPEG-2 compression. Typical capacity for these discs is 4.5 GB, or about 133 minutes of digital video.

DVI
Digital Visual Interface. The digital video connectivity standard that was developed by DDWG (Digital Display Working Group). This connection standard offers two different connectors: one with 24 pins that handles digital video signals only, and one with 29 pins that handles both digital and analog video. This standard uses TDMS (Transition-Minimized Differential Signaling) from Silicon Image and DDC (Display Data Channel) from VESA (Video Electronics Standards Association).

DVI-D
DVI connector that supports digital signals only.

DVI-I
DVI connector that supports both digital and analog signals.

E

EBU
European Broadcast Union. A confederation of radio and television stations from over 50 European, Middle Eastern, African, and Asian countries, headquartered in Geneva, Switzerland. Among the services provided by the EBU are the exchange of audiovisual content for news production and co-production, and transmission services for sports, music, and other live events.

Edge blended projection
An approach to delivering a seamless image from multiple projectors. This is achieved by aligning the images from adjacent projectors so the images overlap each other, typically by 20%. The overlapped region is then adjusted for color and brightness to match the non-overlapped areas, with the goal of creating the appearance of a single, continuous image.

EDID
Extended Display Identification Data. EDID is a data structure used to communicate video display information, including native resolution and vertical interval refresh rate requirements, to a source device. The source device will then output the optimal video format for the display based on the provided EDID data, ensuring proper video image quality. This communication takes place over the DDC – Display Data Channel.

EOC
Emergency Operations Center. A facility run by national or regional governments and public safety organizations. EOCs are used to monitor critical situations.

Ethernet
A Local Area Network (LAN) standard officially known as IEEE 802.3. Ethernet and other LAN technologies are used for interconnecting computers, printers, workstations, terminals, servers, etc. within the same building or campus. Ethernet operates over twisted pair and over coaxial cable at speeds starting at 10 Mbps. For LAN interconnectivity, Ethernet is a physical link and data link protocol reflecting the two lowest layers of the OSI Reference Model.

F

Foot candle
A unit of illumination from one candle at a distance of one foot. Equal to one lumen incident to one square foot.

Frame
In interlaced video, a frame is one complete picture. A video frame is made up of two fields, or two sets of interlaced lines. In film, a frame is one still picture of a series that makes up a motion picture.

Fresnel lens
A thin, flat lens made by cutting concentric circular grooves into its surface. The grooves act like prisms to bend and focus light. The Fresnel lens is often used for the condenser lens in overhead projectors and in studio spotlights.

Front projection screen
A light-reflecting screen used when the image is projected from a source in front of the screen. Also see “Rear projection screen.” Front screen projection - To project an image from the audience’s side of a light-reflecting screen.

G

Gamma
The light output of a CRT is not linear with respect to voltage input. The difference between what you should have and what is actually output is known as gamma.

Gamma correction
Before being displayed, the linear RGB data must be processed (gamma corrected) to compensate for the gamma of the display.

GTF
Generalized Timing Formula. A VESA standard defining signal timing information for computer-video signals. Signal parameters are determined using a formula based on horizontal and vertical blanking intervals, horizontal frequency, vertical frequency, and horizontal and vertical sync polarity. GTF was superseded by the CVT standard.

GUI
Graphical User Interface. The visual element of an operating system or device that serves as the user interface. GUIs are seen in computer applications, web sites, and touchpanel interfaces.

AV Glossary

H

H.264 encoding
A standard for video compression equivalent to MPEG-4 Part 10 or MPEG-4 AVC - Advanced Video Coding. H.264 was created to provide video quality suitable for high definition applications at bit rates lower than that utilized in MPEG-2, the compression standard used in DVD authoring.

HD
High Definition.

HDCP
High-bandwidth Digital Content Protection. A digital rights management scheme developed by Intel to prevent the copying of digital video and audio content. HDCP is mandatory for the HDMI interface, optional for DVI. HDCP defines three basic system components: source, sink, and repeater.

Sources send content to the display. Sources can be set-top boxes, Blu-ray Disc players, computer-graphics cards, and so forth. A source can have only one HDCP transmitter.

Sinks decrypt the content so it can be viewed. Sink is typically used to describe a flat panel display, television, or projector. Sinks can have one or more HDCP receivers.

Repeaters sit between Sources and Sinks. They accept content, decrypt it, then re-encrypt and transmit. Internally, a Repeater may provide signal processing, such as scaling, splitting out audio for use in an analog audio playback system, or splitting the input data stream for simultaneous viewing on multiple displays. Switchers, matrix switchers, and distribution amplifiers are all examples of Repeaters.

HDMI
An interface for the digital transmission of high-resolution video, multi-channel audio, and control signals, over a single cable. HDMI is the de facto standard for consumer level video sources and displays.

HD-SDI
The high-definition version of SDI specified in SMPTE-292M. This signal standard transmits audio and video with 10 bit depth and 4:2:2 color quantization over a single coaxial cable with a data rate of 1.485 Gbps. Multiple video resolutions exist including progressive 1280x720 and interlaced 1920x1080 resolution. Up to 32 audio signals are carried in the ancillary data.

HDTV
High Definition Television. HDTV refers to a complete product/system with the following minimum performance attributes: a receiver that receives ATSC terrestrial digital transmissions and decodes all ATSC Table 3 video formats; a display scanning format with active vertical scanning lines of 720 progressive (720p), 1080 interlaced (1080i), or higher; aspect ratio capabilities for displaying a 16:9 image; receives and reproduces, and/or outputs Dolby Digital audio.

High definition video
Refers to any video system of higher resolution than standard definition (SD) video, and most commonly involves display resolutions of 1280×720 pixels (720p) or 1920×1080 pixels (1080i/1080p).

I

Illuminance
The light density (the luminous flux divided by area) shining onto a surface. This is the specification that measures how bright a screen is lit by a projector or ambient light. The unit is lux. 1 lux = 1 lumen/m^2.

Interlacing
Interlacing is the process of scanning the picture onto a video screen whereby the lines of one scanned field fall evenly between the lines of the preceding field.

IP
Internet Protocol. The protocol or standard used to send information from one computer to another on the Internet.

IP address
A numerical label that is assigned to devices in a network that use Internet Protocol. The IP address for the source and destination are included in an IP datagram.

ISO OSI Model
The ISO open systems interconnection model represents the functions of a communication system as seven layers. Each layer interacts only with the layer directly above or below itself. The seven layers are 1) physical, 2) data link, 3) network, 4) transport, 5) session, 6) presentation, and 7) application.

ISR
Intelligence, Surveillance and Reconnaissance. Activities relevant to information gathering methods applied in the observation of a criminal or enemy area of operations, in support of current and future military or law enforcement operations.

ITS
Intelligent Transportation Systems. Specialized systems that apply technology and intelligence to enable improved services in various modes of transportation and traffic management. Such systems make better information available, resulting in safer, more efficient use of transportation systems.

ITU-R Recommendation BT.2020
Defines parameters of ultra-high-definition television (UHDTV) including picture resolutions, frame rates with progressive scan, bit depths, color primaries, RGB and luma-chroma color representations, chroma subsamplings, and an opto-electronic transfer function. Commonly referred to as Rec. 2020 or BT.2020. The first version of Rec. 2020 was posted on the International Telecommunication Union (ITU) website on August 23, 2012.

L

Landscape
Orientation of a display device so that it is wider than it is tall. This is the common orientation for a display.

Latency
A measure of time delay experienced in a system, the precise definition of which depends on the system and the time being measured. In video processing or encoding products, it is a measure of the amount of time used to process an input signal. In a packet switched network it is measured either one-way (the time from the source sending a packet to the destination receiving it), or round-trip (the one-way latency from source to destination plus the one-way latency from the destination back to the source).

Layer 2 switch
Layer 2 switches support functions of the second layer of the ISO OSI Model. Layer 2 switches provide hardware switching and switch packets between connected devices. A table is built into each switch based on the physical MAC address of connected devices. A Layer 2 switch does not examine IP packets.

Layer 3 switch
Layer 3 network switches support functions of the third layer of the ISO model. They examine network packets and make switching and routing decisions based on information in the Ethernet packets. They are used in networked audio and video network delivery systems and large or complex internetworks, such as the Internet. Layer 3 switches support packet routing, VLANs and IGMP-snooping, and multicast data stream delivery.

LCD
Liquid Crystal Display. A panel that utilizes two transparent sheets of polarizing material with a liquid containing rod-shaped crystals between them. When a current is applied to specific pixel-like areas, those crystals align to create dark images. The dark areas are combined with light areas to create text and images on the panel. LCD panels do not emit light but are often back-lit or side-lit for better viewing.

LCD projector
Utilizing LCD panel technology, these projectors separate the red, green, and blue information to three different LCD panels. Since LCD panels do not produce color, the appropriate colored light is then passed through each panel and combined to exit through the projector lens and onto a viewing screen.

LED
Light Emitting Diode. A semiconductor device that emits incoherent, narrow-spectrum light within the p-n junction.

Lenticular screen
A screen designed to reflect maximum light over wide horizontal and narrow vertical angles. It must be held very flat to avoid hot spots. A large series of parallel lenticulations cut vertically into the screen surface improve horizontal dispersion.

Luma
Also called Luminance. The photometric radiance of a light source. The luma signal represents brightness in a video picture. Luma is any value between black and white and is abbreviated as “Y.” Also see “Chroma.”

Lumen
The unit of measure for luminous flux, or light emitted from a source, such as a projector. Projector light output is commonly specified in ANSI lumens, which is the average of several light level measurements at various locations on the screen.

Luminance
The light density coming out of a surface. This is the specification for measuring the brightness of a projection screen or a display device’s surface. The SI unit is “cd/m^2” (candles per square meter), also called a “nit.” Luminance is notated as “foot-lambert” when using English standard measurements, where One foot-lambert = 3.426 cd/m^2.

Lux
The unit of measure for light incident on a surface area, also known as illuminance. One Lux - lx equals 1 lumen per square meter - lm/m^2.

M

Matrix switcher
A switcher with multiple inputs and multiple outputs. A matrix switcher allows an input source to be connected to one or more outputs.

M-JPEG
Motion JPEG or M-JPEG is a method of video compression that applies the discrete cosine transform to each video frame independently. No temporal compression is applied and no frame interdependence exists as with MPEG compression. Each video frame is encoded as though it is an MPEG I-frame. Editing and random access are easily facilitated in product designs applying M-JPEG.

MPEG-2
The second generation standard for compression of audio and video applying the discrete cosine transform. The standard includes a combination of lossy video and audio compression methods which permit storage and transmission of movies using currently available storage media and transmission bandwidth. Commonly used for digital television transmission, DVD, and other similar equipment.

MPEG-4
Similar to MPEG-2, but with a much greater ability to scale to different compression rates and resolutions. MPEG-4 is suitable for applications ranging from low bit-rate streaming video applications for videoconferencing and cell phone video delivery, to high bit-rate high definition television production systems.

Mullion
The physical bezel surrounding the screen of a display device. Stacking display devices to form a videowall creates a criss-cross pattern of space between the active screen areas, with the appearance of mullions in a window pane.

Multicast
Multicast addressing is a network technology for one-to-many communication over an IP infrastructure in a network. Multicast uses network infrastructure efficiently as the source sends packets only once, regardless of the number of receivers. Network nodes replicate packets to reach multiple receivers, minimizing network traffic.

AV Glossary

N

Native resolution
Refers to the single fixed resolution of an LCD, plasma, or other fixed matrix display. An image said to match the native resolution of a display is one where pixels between the image source and display are perfectly aligned and require no scaling or other signal processing.

Nit
A unit of measurement of luminance, or the amount of light leaving a surface in a specific direction. One nit is equal to one candela per square meter - cd/m^2. Nits are commonly used when specifying the brightness of flat-panel displays and videowall projection cubes.

NOC
Network Operations Center. A facility used to monitor and manage system operations for telecommunications and network providers.

Noise
Any unwanted signal that adversely affects the quality of the picture or sound.

NTSC
National Television System Committee. The analog television system used in most of North America, South America, Japan, South Korea, Taiwan, Burma, and some Pacific island nations and territories.

O

Overscan
The result when active picture area extends past the boundaries of the display screen.

P

PAL
Phase Alternating Line. An analog television encoding system used in broadcast television systems primarily in Europe, Asia, Africa, and Australia.

PC
Personal Computer.

PCB
Printed Circuit Board.

Pixel
Picture Element. The smallest unit or area of a video screen image that can be turned on or off, or varied in intensity.

Pixel density
The number of pixels per unit area on a screen. Pixel density is commonly expressed as pixels per inch - PPI.

Pixel resolution
In computer graphics and video images, the number of pixels in the display. For example, a picture with 1024x768 pixels is much sharper, or has higher resolution, than a picture with 640x480 pixels. The total number of pixels is the product of these two numbers.

Portrait
Orientation of a display device so that it is taller than it is wide.

PPI
Pixels per Inch. PPI is a common unit of measurement for pixel density.

Progressive scan
A method by which all video scan lines within a frame are presented on the screen in one pass instead of two. Typically denoted by the letter “p”, as in “480p,” which indicates a signal with 480 active lines running at 60 frames per second.

Protocol
A set of agreed-upon standards that define the format, order, timing, handshaking, and error checking method for data transfer between two pieces of equipment.

PURE3 Codec
A codec which is capable of encoding and streaming both video and computer graphic inputs and a wide variety of resolutions, preserving equal quality for both signal formats. It preserves a balance between three performance factors low latency, low bandwidth and high image quality. The PURE3 Codec has been optimized for use on IP networks which are acknowledged to be lossy. The codec includes an error concealment system which is highly resistant to network errors without using forward error correction.

R

Real-time
A video system is said to be real-time if it outputs motion content that is synchronized with the input signal, and at the original refresh rate. Systems are generally not considered to be real-time if there is some processing latency, or frames are dropped.

Rear projection screen
A translucent screen with a special coating that allows an image to be projected through the screen from the rear, instead of from the front.

Redundancy
Repeated data or equipment which provides a backup if the primary data or equipment fails.

RGB
Red, Green, and Blue. The chroma information in a video signal. The basic components of the color television system. They are also the primary colors of light in the additive color process.

RGBHV
Red, Green, Blue, Horizontal and Vertical Sync. A five-wire signal where the red, green, and blue video signals, as well as the horizontal and vertical sync signals each travel over its own conductor.

RGBS
The Red, Green, and Blue chroma information in a video signal, with a separate channel for the combined horizontal and vertical sync signals.

RGsB
Red, Green, Blue, and Sync on Green. A three-wire signal with separate red, green, and blue video signals with the sync (horizontal and vertical) travelling on the same wire as the green signal.

S

Scaler
A device that takes a standard video signal, decodes it, and uses advanced digital signal processing technology to scale the image to the optimal or native resolution of a display device. (Usually at a higher rate).

Scaling
Scaling is changing the size of an image to fit the native rate (or pixel size) of a display device, without changing its shape. For example, to fit a 720x480 resolution TV image on a 1024x768 XGA resolution display, the TV image has to be scaled "up;" pixels need to be created in order for the original image to fill the screen. Alternately, to fit a 1280x1024 SXGA resolution image on an XGA resolution screen, the image will need to be scaled "down;" pixels need to be removed from the original image in order for it to fit on the screen. There are many different methods for image scaling, and some produce better results than others.

SCADA
Supervisory Control and Data Acquisition. Generally refers to industrial control systems used to monitor and manage industrial infrastructure, or facility-based processes used in manufacturing, production, power generation, fabrication, and refining processes. Facility-based processes may be applied to public or private organizations, including oil and gas pipelines, electrical power transmission and distribution, water treatment and distribution, wastewater collection and treatment, wind farms, or large communication systems.

Scan
(1) In video, to move an electron beam across the raster in a camera or monitor. (2) To feed visual information into a computer by means of an optical device called a scanner.

SCIF
Sensitive Compartmented Information Facility. An enclosed room or area that is used to process Sensitive Compartmented Information - SCI level classified information. The classified information may be contributed from various intelligence sources or methods, and must be handled in a defined method. All activity and conversation occurring inside an SCIF is restricted from public disclosure.

SD
Standard Definition.

SDI
Serial Digital Interface. Standard definition video is carried on this 270 Mbps data transfer rate. Video pixels are characterized with a 10 bit depth and 4:2:2 color quantization. Ancillary data is included and typically is comprised of audio or other metadata. Up to sixteen audio channels can be transmitted. Audio is organized into blocks of four stereo pairs.

Server
A computer whose primary function is to provide data, images, or applications to a host or client computer.

Single-link DVI
The electrical signaling used to transmit data over DVI is known as Transition Minimized Differential Signaling, or TMDS. A single TMDS link carries three data channels and one clock signal, with a maximum video frequency of 165 MHz, capable of standard resolutions up to 1920x1200 pixels. See also "Dual-link DVI."

SMPTE
Society of Motion Picture and Television Engineers. A global organization, based in the United States, that sets standards for baseband visual communications. This includes film as well as video and television standards.

Software
The programs used to instruct a processor and its peripheral equipment to perform prescribed operations.

SOC
Security Operations Center. A location within a building where staff monitors and manages security-related tasks for an organization. This may include monitoring live camera feeds, reviewing security camera recordings, electronically monitoring building access, and controlling lighting, alarms, and vehicle barriers.

SOG
Sync On Green. The combined horizontal and vertical sync signals integrated with the green video signal.

SVGA
Super VGA. A screen resolution of 800x600 pixels and above.

S-video
A composite video signal separated into the luma ("Y" is for luma, or black and white information; brightness) and the chroma ("C" is an abbreviation for chroma, or color information).

Switch
A device that cross-connects network devices. Today, switches are broadly deployed on modern industrial and consumer networks. Switching is a Layer 2 function. Ethernet frames are delivered between MAC addresses connected to network switches.

Switched fabric
A network topology where network nodes connect with each other via one or more network switches (particularly via crossbar switches, hence the name). The term is in contrast to a broadcast medium, such as early forms of Ethernet.

SXGA
Super Extended Graphics Array. A graphics standard with a resolution of 1280x1024 (1,310,720 pixels), with an aspect ratio of 5:4. This exceeds XGA (1024x768, at 786,432 pixels).

AV Glossary

SXGA+
Super Extended Graphics Array Plus. Commonly used on 14 inch or 15 inch laptop LCD screens with a resolution of 1400×1050 pixels.

T

Thumbnail
A small representation of a larger image.

Time code
A digital or binary code used to label each frame of a video signal, notated by hours, minutes, seconds, and frames. Used extensively for synchronization, and for logging, identifying, and editing recorded media.

TMC
Transportation Management Centers. Facilities where real-time traffic data from cameras, speed sensors, and other data are integrated for the purposes of incident detection and the management of regional traffic. TMC staff is responsible for identifying incidents and dispatching public safety or maintenance services, messaging, or other actions to improve the flow of traffic.

Touchpanel
A control panel with a flat surface (usually with graphic divisions or buttons) that functions as a switch or control. Also called a "touchscreen."

U

UHD
See "Ultra HD."

UHP
Ultra High Performance. A mercury arc lamp technology developed by Philips in 1995 for use in commercial and consumer projectors.

Ultra HD
Video resolution at 3840x2160 pixels, with frame rates from 24 to 60 fps. Ultra HD is often mentioned along with 4K.

Underscan
A decreasing of the raster size (H and V) so that all four edges of the picture are visible on the screen. Underscanning allows viewing of skew and tracking that would not be visible in normal (overscanned) mode. It is also helpful when aligning test charts to be certain they touch all four corners of the raster. Likewise, when checking the alignment of multiplexer images from a film chain, underscan allows proper framing of projected images going into the video camera.

Unicast
The sending of messages to a single network destination host on a packet switching network. Sending a separate copy of the media stream from the server to each recipient.

USB
Universal Serial Bus. Up to 127 external computer devices may be added through a USB hub. USB devices can be attached or detached without removing computer power.

UXGA
Ultra Extended Graphics Array. 1600x1200. A UXGA display has 1600 horizontal pixels and 1200 vertical pixels giving a total display resolution of 1,920,000 individual pixels.

V

VESA
Video Electronics Standards Association. A nonprofit member organization dedicated to facilitating and promoting personal computer graphics through improved standards for the benefit of the end-user.

VGA
Video Graphics Array. A widely used analog interface between a computer and monitor that uses a 15-pin plug and socket. The original VGA resolution was 640x480 pixels.

Video
A format for transmitting and storing moving pictures. Video is transmitted and stored in various analog and digital physical formats.

VLAN
Virtual LAN. A group of devices on a network with a common set of requirements that communicate as if they were attached to the same broadcast domain, regardless of their physical location. A VLAN is a Layer 3 network function. A group of network devices can be grouped together into a functionally separate logical network. VLAN and their network traffic will be segmented from other devices that may be connected to the same physical system.

Videowall
A grouping of display devices to produce a single image across the array, or visually subdivided to show multiple images simultaneously. The display array is typically driven by a video processor that provides a separate output to each display.

W

WXGA
"Wide-XGA" defines a class of XGA displays with a width resolution sufficient to create an aspect ratio of 16:9. Resolution is defined as the number of individual dots that a display uses to create an image. These dots are called pixels. A WXGA display has 1366 to 1280 horizontal pixels and 768 to 720 vertical pixels respectively that are used to compose the image delivered by the projector.

X

XGA
Extended Graphics Array. A screen resolution of 1024x768 pixels.

Y

YUV
Defines color space in terms of Y – luminance or brightness, and two color-difference components, U - red minus luminance and V - blue minus luminance. YUV is interchangeable with "Y Cb Cr" for digital component video and "Y Pb Pr" for analog component video.