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whitepaper

Barco LVC 400

HDCP Compliant Scalable Video Wall Controller

Introduction:

To be globally competitive, organizations today lay great emphasis on deriving the highest **R**eturn **o**n **I**nvestment **(RoI**). Organizations operate from small or upgraded, energy efficient buildings that house infrastructure that can be quickly deployed and redeployed to cater to the changing business needs. This trend is especially applicable for control room applications.

Modern Control rooms are also transforming into nimble and agile spaces that employ cutting edge technology to bring the crucial cost advantage achieved via efficient decision making. Control rooms today serve as the nerve center for the entire organization.

Information is acquired and captured from multiple sources simultaneously, that could be running in very large numbers ranging into millions of devices that could be dispersed geographically. Information acquired from these resources is then processed and presented to the users in real time to facilitate efficient decision making.

In order to do this effectively, a video wall controller is used that is used for accepting inputs (Analog & Digital) from multiple sources and rendered onto the display wall, in a user defined or configurable format.

Typically, sources are broadly classified into two major categories, viz. Baseband Resources and Networked Resources.

- Baseband Resources are typically sources that are physically connected to the video wall controller through physical cables via VGA, DVI-D, HDMI, and Display Port etc.
  Typical examples include:
  1. Media storage devices: DVD/Blue Ray Players,
  2. Computing devices: PC's, Laptops, Servers etc.
  3. Monitoring devices: Analog Cameras
  4. Conferencing devices: Video Camera Codecs

- Network Resources are those resources that are available on the network and transfer information using the Internet Protocol (IP) or other relevant network protocols over physical media like CAT-X cables or

wirelessly (802.XX). These network resources can be available either on the company's own communication network (LAN, MAN or WAN) or can be available in the public domain like the Internet.

Typical examples include:

1. IP Enabled Storage devices: Apple media players
2. Computing devices: PC's, Laptops, Servers etc. available on the network
3. Monitoring devices: IP Cameras
4. Unicast Feed devices: UAV, Remote Sensing Equipment, Signage
5. Broadcast Feeds: Devices like Satellite TV
6. Conferencing devices: Video Camera Devices

Available Architecture Options

Various architectures have been developed over time to cater to the evolving needs of organizations. In the following section, we evaluate some of the major architectures that have evolved over a period and analyses their merits and demerits.

Backplane Architecture:

This architecture makes use of a Backplane. A backplane (or "backplane system") is a group of electrical connectors in parallel with each other, so that each pin of each connector is linked to the same relative pin of all the other connectors, forming a computer bus. It is used as a backbone to connect several printed circuit boards together to make up a complete computer system.

In this architecture, baseband inputs were captured and fed into the video wall controller using the available input ports. A system bus was used to carry the input data from the input ports to the image processing module and the "manipulated" data was in turn transferred to the output ports from where it was fed to the display wall using appropriate cables (VGA, DVI, HDMI, Display Port, etc.)

This architecture works well if the no. of sources is less and has a lower resolution, as there is a direct co-relation to the data handling capacity (Bandwidth) of the system bus, which should be more than the total bandwidth required for processing of the captured data sources and their transmission from input port to the output port.

However, an inherent drawback in this architecture is that the quality of the data rendering is limited by the following factors:

a. Data Capacity of Input & Output Ports
b. Data Handling Capacity of the System Bus

Additionally, this architecture could not accept network feeds and data had to be neccessarily and mandatorily be converted for feeding to one of the available analog or digital AV ports like VGA , DVI, HDMI, DP etc.

Although advancements in electronics allowed for increased data carrying capacity, the ever increasing need to add sources with high resolution data has constantly ensured that this architecture is limited in terms of scalability.

PC Based Architrecture:

With the development of a distributed network and subsequent develoipments of newer and powerful enabling protocols , the demand for having data on a " network" continues to grow. Equipments today make use of various algorithms and protocols that enable seamless sharing of data between multiple user groups across the globe, utilising the capabilities of the underlying networks. Users could now access resources from a PC that was available on a network and pull data from any other node on the network.

A category of videowall controllers called Networkable Controllers allowed users to pull data from sources primarily PC's, Servers and Laptops and basically operated on the client server architecture used in IT networks.

This approach was a significant improvement over the traditional "Backplane Architecture", and allowed users to access resources anywhere on the network. This approach works well as users are able to add sources on the fly.

However this approach suffers from some disadvantages that stem out of usage of Internet Networks,viz,.

a. Not all sources have a network port that allows for data to be streamed onto a network. Additional equipment like streaming media encoders are required to get the equipment onto the network, this also adds to additional cost.
b. As the network is the main transmission medium, the reliability of networked controllers is always less than or equivalent to the availability of the network. Implying that if the network goes down, the entire system is “dead”.
c. The quality of the final rendering is totally dependent on the available bandwidth at the time of streaming and processing. The quality of algorithms also has a great role to play when it comes to display of content.
d. The availability of sources is subject to various threats like Virus Attacks, Denial of Service etc.

With advancements in computing technology, power and more efficient compression codecs being available, this technology still has challenges in terms of integration of baseband sources with the networked sources.

The following table shows a comparative between Baseband and Networked Controllers

PARAMETER	**BACKPLANE ARCHITECTURE (Baseband I/O)**	**NETWORKED ARCHITECTURE**
Inputs Supported	**Analog :** • S-Video • Component • Composite • VGA **Digital :** • DVI-I/D • Display Port • HDMI	**IP Based Inputs**
Outputs Supported	**Analog :** • S-Video • Component • Composite • VGA **Digital :** • DVI-I/D • Display Port • HDMI	**Analog using decoders:** • VGA **Digital :** • DVI-I/D • Display Port • HDMI

No. Of Inputs	Limited	Unlimited
No. Of Outputs	Limited	Limited
Dependency on Hardware	Very High	No
Dependency on Network	No	Very High
Scalability	Limited	Limited
Storage	Limited or low capacity	Configurable Storage Available
Image Qulaity	Dependent on Bandwidth Capacity of • Connectors • Cables • Backplane • Processing Hardware	Dependent on • Network Speed • Cable Data Rate • Network Congestion • Priorities • Compression & Decompression Codecs
Security	Generally Secure	Subject to Virus Attacks , Denial of Service Attacks etc.
Upgrade path	Involves change of hardware but simple	Involves upgardation of Policies but relatively more complex.

From the above table it can be seen that both technologies have their merits and demerits that have to be weighed carefully , and ofetn a compromise had to be reached while selecting one technology over another.

Barco LVC-400 :

Barco, a pioneer in visualisation solutions was one of the first companies that offered a comprehensive offering of videowall controllers to meet practically all customer requirements. Barco's controllers are not only efficent and robust but are also scalable to cater to meet current, forseeable and future customer requirements. Utilising its vast expirience in developing videowall controllers, Barco developed the LVC-400.

The LVC-400 is a high performance Out of box video wall controller, that utilises the Best-In-Class Features available from the Backplane architecture and the Network based architecture.

It is capable of accepting baseband(Analog, Digital) and network based inputs and can render them onto a display screen as per the requirements of the user.

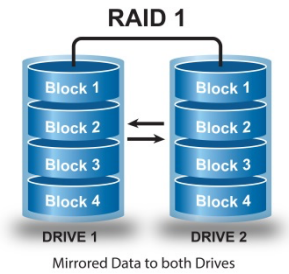
Based on a high performance Intel Xeon based architecture, the LVC-400 uses the networking capabilities of the latest Windows 10 Operating System to offer flexibility in terms of accepting data sources from baseband sources, network sources using encoders of various makes as well as accepting direct network streams onto its RJ-45 ports and renders a truly customisable collage of sources meeting customer requirements. Some of the salient features of LVC-400 are defined as follows:

Modular Architecture : The LVC-400 has a highly modular and scalable architecture that allows users to perform customization to the underlying hardware(RAM, HDD, Input Ports, Output Ports) as well as gives the user flexibility to maintain backward compatibility by offering support for Windows 10 and previous stable versions like Windows7.

Redundancy : The LVC -400 comprises of twin redundant power supplies that run in parallel ensuring complete peace of mind by offering immunity against remote possibilities of unexpected failures through *audio* and *visua*l alarms.

On Demand Storage : The LVC -400 comes in a superiorly configurable form factor that allows users to customize the LVC Video Controller to perform seamless switching and manipulation of most memory intensive applications. Available options include:

- Primary Storage: **R**andom **A**ccess **M**emory **(RAM)DDR4**
  - 16 GB (Base Config.)
  - 32 GB
  - 64 GB
- Secondary Storage: Hard Disks Drives (HDD)
  - Redundant Array of 1 TB HDD (S.A.T.A.) in RAID 1 Config.
  - 1TB for DATA
  - 1 TB for Redundancy



Intutive GUI : In addition the class leading Content Management System allows users to use a highly intuitive GUI to get a consolidated dashboard of information, complete with metadata.

Security: The LVC-400 addresses various security related issues like:

a. Open Case Alarm
b. User Notifications on repeated booting.
c. Role Based Access
d. Audio & Visual Alarms & Notification arising out of hardware failure.

Additionally , the LVC-400 is fully compliant with HDCP ensuring data protection and security at all levels.

Processing : The LVC-400 enables the following .

a. Up to 16K x 16K texture and render processing
b. Transparent multisampling and super sampling
c. 16x angle independent anisotropic filtering
d. 16K Texture and Render Processing
e. 128-bit floating point performance
f. 32-bit per component floating point texture filtering and blending
g. 64X full scene antialiasing
h. Compact and secure DisplayPort 1.2 connectors support multi-stream technology, stream cloning and ultra-high-resolution panels (up to 3840 x 2160 at 60Hz). This enables maximum range, resolution, refresh rate, and color depth designed to support the latest display technologies.
i. Dedicated H.264 encoding
j. Under scan/over scan compensation and hardware scaling.
k. Decode acceleration for MPEG-2, MPEG-4 Part 2 Advanced Simple Profile, H.264, MVC, VC1, DivX (version 3.11 and later), and Flash (10.1 and later)
l. Equalization Support for long length DVI Cables.
m. Provides the ability to texture from and render to 16K x 16K surfaces. Beneficial for applications that demand the highest resolution and quality image processing.

SUMMARY :

The use of LVC-400 not only helps organisations leverage on available cutting edge technology, and can be deployed at a moments notice to reneder highly informative and engaging content for a wide variety of displays like LCD Video Walls, Cubes , Projectors etc from various manufactuers, making LVC-400 the preferred choice when deploying efficient control rooms.

Glossary:

DVI	Digital Visual Interface is a video display interface developed by the Digital Display Working Group. The digital interface is used to connect a video source, such as a video display controller, to a display device, such as a computer monitor
HDMI	High-Definition Multimedia Interface (HDMI) is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device.[4] HDMI is a digital replacement for analog video standards.
HDCP	High-bandwidth Digital Content Protection is a form of digital copy protection developed by Intel Corporation to prevent copying of digital audio and video content as it travels across connections.
MPEG	The Moving Picture Experts Group is an alliance of working groups of ISO and IEC that sets standards for media coding, including compression coding of audio, video, graphics and genomic data, and transmission and file formats for various applications.
RAM	Random-access memory is a form of computer memory that can be read and changed in any order, typically used to store working data and machine code.A random-access memory device allows data items to be read or written in almost the same amount of time irrespective of the physical location of data inside the memory, in contrast with other direct-access data storage media (such as hard disks, CD-RWs, DVD-RWs and the older magnetic tapes and drum memory), where the time required to read and write data items varies significantly depending on their physical locations on the recording medium, due to mechanical limitations such as media rotation speeds and arm movement.
S.A.T.A	Serial ATA is a computer bus interface that connects host bus adapters to mass storage devices such as hard disk drives, optical drives, and solid-state drives.
TB or Terra Byte	A terabyte is 1012 or 1, 000, 000, 000, 000 bytes and is abbreviated as “TB”. 1 TB is technically 1 trillion bytes, therefore, terabytes and tebibytes are used synonymously, which contains exactly 1, 099, 511, 627, 776 bytes (1, 024 GB) (240).