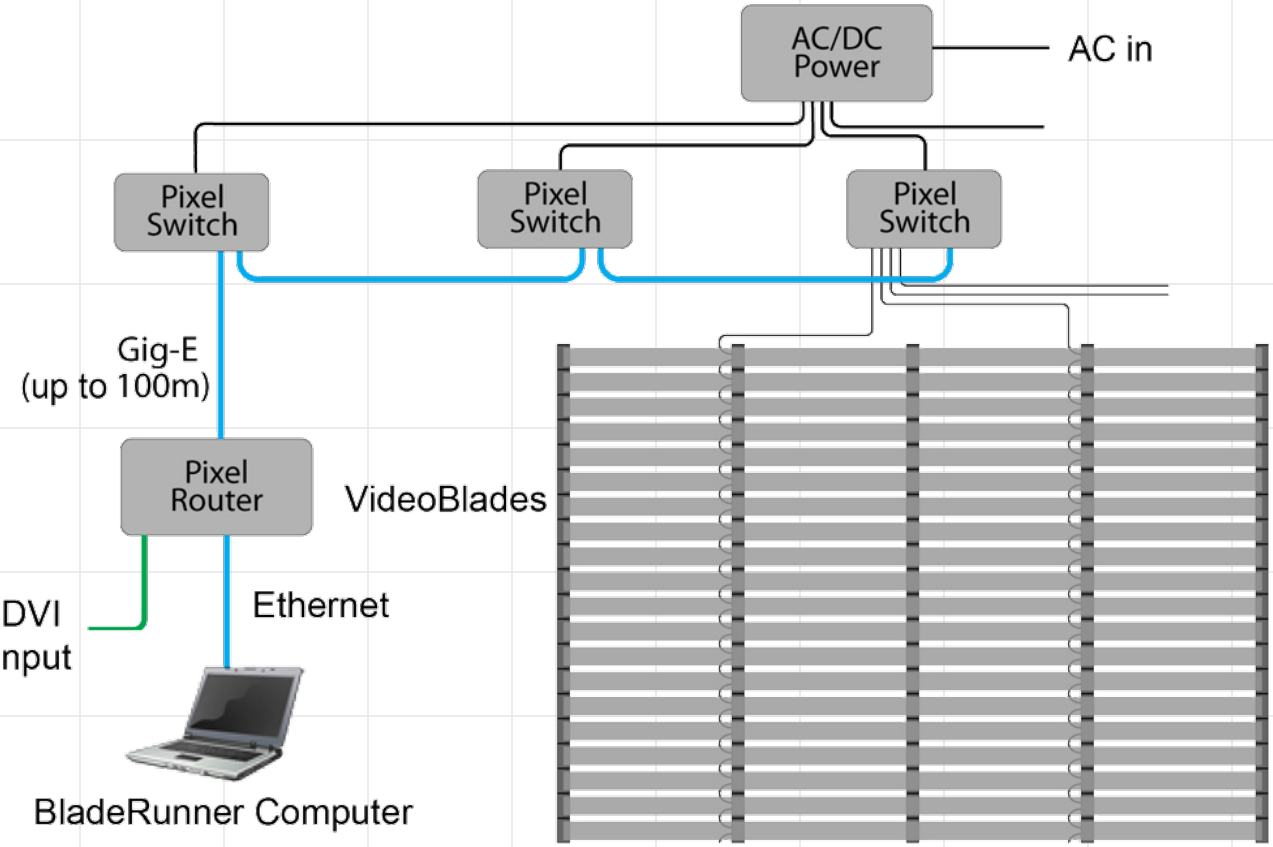
System Architecture

Introduction

In addition to rethinking the mechanical structure of a video display, Pix$_2$o has redefined how video information traverses an LED video wall system. The Pix$_2$o team has extensive experience architecting and implementing world-class communications networks. We applied several core principles to develop this video distribution architecture. This architecture is a fully distributed processing and is based on multi-tiered Ethernet protocols and interfaces. The net of this are some significant advantages to our users.

System Block Diagram



System Components

Pixel Router

The Pixel Router scans the incoming data from the DVI stream and routes specific locations within that stream to defined pixels in the video display. The Pixel Router then packetizes the data into appropriately sized UDP packets, applies a multi-tiered header enabling routing through the system and then transmits that packet using advanced traffic shaping protocols. Because the Pixel Router is not processing the DVI data, all of this routing can be done cost effectively and very quickly. Traffic delays through the router are measured in µsec. Our current Pixel Router can manage 300,000 pixels. As the DVI signal is fully regenerated and output form the Router, they can simply be daisy chained for larger screens. System delay due to cascading is negligible.

Physically, the Pixel Router is a 2RU tall, 19" rack mount, AC powered assembly.

Pixel Switch

The Pixel Switch, switches data between the Gigabit Ethernet backbone from the Pixel Router and up to 6 subnets which contain up to 25 VideoBlades™ each. It also converts the physical layer of the ethernet from 1000bT to the Pix$_2$o created 75bT$_2$m™ physical layer. This point to multi-point physical layer was invented by Pix$_2$o to address cascade failure modes which exist in standard "base-T" systems.

Physically, the Pixel Switch is 4" x 6" x 8".
Mounts via a Cheeseborough clamp
SykRoll: Inside the drum
GroundRoll: In the header bar
Touring Frame: In the header bar or onto the frame.
Set & Scenic: Application dependent

VideoBlade

The VideoBlade is more fully described in it's own data sheet.

BladeRunner™

BladeRunner is a PC and Mac application which allows the user to:

- Create and provision a routing table in the Pixel Router to match the physical implementation of a display
- Provision the mapping table which maps video frame locations to specific pixels in the display.
- Manipulate all of the Image Controls detailed in an associated data sheet.
- Monitor status of the display and other system components.
- Troubleshoot and isolate issues.

Features and Benefits

Distributed Processing

Feature

All processing of the video information including calibration, color conversion and image adjustments is allocated to the VideoBlade™. The Pixel Router simply packetizes data from the DVI input and routes it to the assigned pixel. The Pixel Switches simply translate the packets received from the Pixel Router to the appropriate subnet and it converts the physical layer.

Benefits

- Lowest overall total system cost for a feature rich display system because processing many smaller groups of pixels can be done for minimal incremental cost in an intelligent system.
- Low cost common equipment (Pixel Router and Switch) which allows production to tour with spares.
- Significantly reduced latency through the system because those many smaller processors are operating in parallel.
- Higher reliability both software and hardware because there is much simpler common hardware operating on a minimal, real time operating system.

Ethernet Backbone

Feature

All communications within our system employs Ethernet protocols. External to the display itself, we utilize the industry standard physical layer of 1000bT (or GigE). A completely standard implementation here allows the use of standard ethernet switches, cables, advanced protocols and connectors between the Pixel Router and the Pixel Switch. These connections are fully WAN capable and will utilize the rich catalog of standard Ethernet features.

Between the Pixel Switch and the VideoBlades, we have chosen to develop a point to multi-point Ethernet physical layer to eliminate the primary defect of all standard Ethernet networks. Ehternet is a point to point network topology which requires that each node regenerate the signal and transmit it to the next node. This issue is that if a node fails, all nodes downstream stop receiving traffic, essentially failing as well. In our common equipment, we can protect against those types of failures. However that type of protection is not feasible in the display itself. This led us to develop our own physical implementation in which a single failed element will not cascade to a larger system failure with a minimal cost and no complexity burden.

Benefits

- Hot Swap. By utilizing the Ethernet infrastructure and our networking foundations, all components in the system are hot swappable, automatically detected and can be autonomously reconfigured for use.
- Resilience and Protection. Properly equipped, the Pix_2o video system is fully protected and redundant all the way up to the blade. Any piece of common equipment could fail or most any cable could be cut yet system performance will not be impacted. In the unlikely event of a blade failure, the failure is limited to that Blade. Coupled with our simplified Blade removal process, a Blade could literally be swapped in the middle of a show. Failed common equipment would simply be swapped out at the next venue during load-in.
- Because data and management traffic is carried on a unified network, a laptop equipped with BladeRunner can literally be jacked in anywhere in our system to gain full provisioning, management and diagnostic access.