Digital Signage
Application Note

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1 Introduction

Digital signage is a method of electronically displaying advertising or other information. Digital signage is also sometimes called dynamic signage or digital out of home, abbreviated as DOOH. Often times the content is displayed in places located remotely from the source of the information, such as in public or private places for informational or advertising purposes. The messages delivered can be displayed at specific times. Digital signage is used in retail stores, fast food restaurants, schools, libraries, office buildings, medical facilities, airports, train and bus stations, banks, auto dealerships and other venues.

There are several advantages for using digital signs instead of printed signs. Digital signs can be quickly updated anytime from a remote location, while printed signs require physical replacement and require someone to travel to each sign location. Digital signs are environmentally friendly because they do not create any material waste such as paint or paper. Digital signs can be animated and can deliver multimedia content such as sound and visual content. The data on the screen can be updated in real time by means of an Internet or VPN intranet network connection. The information is often times compressed to minimize the amount of data required to send over a network. If an extra-large display is desired, the decode and display system may include multiple tiled screens. In this case intelligent decoder hardware is required for stitching together the large image across multiple displays.

Digital signage is a fast growing video application. Analysts project the overall market size to be in excess of $7.5B by 2013 with 2.2M displays sold.

- IPVideoMarket.ino “Update on Statistics: Digital Signage Market Size / Growth Examined”

2 System Architecture

The foundation of any digital signage system is its hardware. Selecting the right architecture and components for a system is a crucial step towards creating the most effective signage possible. The display for a digital sign is often a large bright LCD, LED, plasma display, or projected image. Two popular decoder architectures for digital signage are: 1) integrated decoder and display or 2) external decoder with separate display. The integrated decoder and display architecture is more commonly found in large scale displays, where as the external decoder architecture allows for the use of a standard LCD/LED display alongside a decoder box or standard PC with embedded decoder hardware. Although the overall system architecture for digital signage is relatively straightforward, there are many hardware component options available to support the features required by digital signage systems.
3 Decoder System Design

3.1 External decoder with separate display for high-end video

This architecture allows for the use of any standard LCD/LED display alongside high-performance decoder hardware. The system is easily scalable; data can be sent to multiple displays from a single decoder box by use of a simple HDMI switch. The video may also be transmitted wirelessly to displays using Wireless HD. The box can be connected to the network via Ethernet, Wi-Fi or Cellular technology, which enables the content to be easily updated.

This architecture is commonly seen in gas station displays, retail signage, corporate information systems, waiting rooms (doctor’s office, automotive service centers, banks) and cinema lobbies.

3.1.1 System Features

- Flexible connectivity
- Flexible inputs - decodes HD programs in most formats, including MPEG2, MPEG4, H.263/4
- High performance up-scaling up to 1080p60
- Wireless HD video output
- 3D graphics support

3.1.2 Featured Products

**Video Decoder – Trident**
- 2x1080p60 or 16xD1 decode
- Integrated MAC + PHY

**Video Scalar – Silicon Image**
- High-performance scaling
- De-interlacing

**Power over Ethernet – Silvertel**
- 6W to 200W complete module solution
- Only 5 external components required (max)

**HDMI Rx/Tx – Silicon Image**
- HDMI 1.4 with HEC support
- 48-bit color depth at up to 1080p@30Hz

**Wireless HD – Silicon Image**
- Multi-gigabit wireless data rates @ 60GHz
- Advanced micro array antenna technology

**Wi-Fi serial module - Redpine, Roving, Lantronix**
- 802.11a/b/g/n data rates up to 35Mbps
- Chip or module solutions for easy integration
3.2 Integrated decoder and display with motion compensation for video

This architecture is most commonly used for larger displays. This allows for flexible content in each display, which can be easily controlled by Wi-Fi, Ethernet or USB. The 200W Power over Ethernet solution minimizes the number of connections to the system, making the display system portable and easy to install.

This architecture is commonly seen in outdoor displays, hotel lobbies, retail signage, corporate information systems, hospitals and cinema lobbies.

3.2.1 System Features

- Flexible content
- Decodes HD programs in most formats, including MPEG2, MPEG4, H.263/4
- High quality picture with de-judder and 120Hz output
- Simple design, compact board size

3.2.2 Featured Products

**Video SoC – Trident SXL**
- Integrated 4-port HDMI receiver
- 2D to 3D conversion
- Superior noise reduction
- Advanced overlay engine

**Frame Rate Converter – Trident FRC-S**
- AnyRate Frame rate conversion
- Motion blur elimination for up to 240Hz
- Real Motion®FHD film de-judder

**Video Decoder – Trident/Averlogic**
- Supports Composite, S-video, component, etc.
- Industrial temp range for outdoor applications

**Power over Ethernet – Silvertel Ag5700**
- 200W complete module solution
- Only 3 external components required
- Class programming capability

**Antenna Solution – Taoglas/EAD/Antenova**
- Internal, external, weatherproof options
3.3 Mid-range signage for graphic/text displays

The mid-range signage is targeted toward applications that require only static text or graphics. These are simpler systems to design and the data can easily be modified using a Wi-Fi or cellular network connection. Some of the advantages of this architecture are ease of design, smaller board space, and faster time-to-market.

These systems are common in fast food/drive-through restaurant order signs & displays, retail signage (such as mall and department stores), corporate information systems, airports and cinema lobbies.

3.3.1 System Features

- Simple, low-cost design leads to faster time-to-market
- Supports up scaling and down scaling of image
- ARM processor is integrated in some graphic display controllers
- Graphic display controller supports:
  - Dual capture (YUV)
  - Dual digital outputs (RGB)
  - Content may be same or unique to each panel

3.3.2 Featured Products

**Graphic Display Controller – Fujitsu**
- 6 layers of overlay display
- Rendering engine for 2D/3D graphic acceleration functions

**ARM Processor – Fujitsu**
- Multiple peripheral options
- High amounts of embedded FLASH & RAM
- Low power products available

**Cellular module - Telit**
- 2G or 3G cellular connectivity
- 14.4 Mbps DL / 5.8 Mbps UL speeds

**Wi-Fi module – Redpine/Roving Networks**
- UART, SPI, or SDIO interface
- Up to 35Mbps data rates
- Fully embedded network protocol

**Embedded Device Server – Lantronix**
- Enterprise-grade security and authentication
- Wired or wireless Ethernet option
- Built-in web server for device communication and configuration via a standard browser

**Long Range Wireless Ethernet – AvalAN Wireless**
- 40 line of site mile Ethernet bridge
- 128 bit AES Encryption
3.4 Variable-Message Signs

The variable message sign is often times found on roadways and is used to provide travelers with information. These systems usually display text or simple 2D pictures. The display portion is typically a large pixel-based display with a limited color palette. Although the electronics to drive the displays is less complex, the display cost may be high due to the required ability to sustain a wide array of weather conditions.

3.4.1 System Features

- Wireless or wired network connectivity
- Power over Ethernet driven
- Enterprise-grade security support
- 2D image support
- Wireless 802.11i support
- Simple design, faster time-to-market

3.4.2 Featured Products

**Embedded Device Server – Lantronix PremierWave**
- Enterprise-grade security and authentication
- Wired or wireless 802.11i Ethernet option
- Built-in web server for device communication and configuration via a standard browser

**HD FIFO Memory – Averlogic AL460**
- High speed synchronous sequential access with maximum speed up to 150MHz
- Reduces design/development effort & cost

**Advanced LCD controller – Averlogic**
- Digital progressive RGB 48-bit output
- Supports resolutions up to SXGA, high quality scaling, OSD and motion adaptive deinterlacing

**Wi-Fi serial module – Redpine**
- SPI, SDIO, or UART interface
- Up to 35Mbps data rates
- Fully embedded network protocol

**Long Range Serial RF – AvaLAN Wireless**
- RS232, RS485, SPI, UART
- 1.54Mbps DSSS Radio

**Cellular module - Telit**
- 2G or 3G cellular connectivity
- 14.4 Mbps DL/ 5.8 Mbps UL speeds

**Antenna – Taoglas/EAD/Antenova**
- Internal, external or custom antennas
- Cellular, Wi-Fi, or multi-band
4 Common Applications

- Gas station displays
- Outdoor displays
- Waiting rooms/lobbies (banks, doctor’s offices, etc.)
- Retail signage (mall, department stores, etc.)
- Corporate information systems
- Cinema lobbies
- Stadiums & arenas
- Subways
- Elevators
- Hospitality – hotel lobbies, etc.
- Order signs/displays in fast food/drive-thru restaurants
- Food courts
- Freeway signs and traffic control