Digital Signage: A Sign of the Times

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Introduction

Digital signs are remotely-managed displays used to show advertising, employee communications, device-specific data and other messages. They can be found at retail stores, airports, hotels, restaurants, call centers, factories, corporate campuses and elsewhere, and are used to deliver targeted information to a specific audience at a specific place and time.

While the benefits of deploying digital screens instead of traditional signage can be significant, cost and implementation challenges have hindered the deployment of these devices. Further, many OEMs are currently looking for ways to add digital signage technologies to existing products, but have few options for extensible, embeddable hardware and software client platforms.

To combat these challenges, Freescale, with partners WireSpring and S3, offers a cost-effective, high-performance hardware and software solution. This solution is ideal for both new product designs as well as many existing products currently using Freescale chips based on Power Architecture® technology that could benefit from the addition of digital signage, graphical visualization and remote management features.

How Does Digital Signage Work?

Digital signs can take many forms, ranging from stand-alone screens hung from walls and ceilings, to LCD panels that are embedded into store fixtures, food service devices and other

Figure 1: Implementation Model for Digital Signage
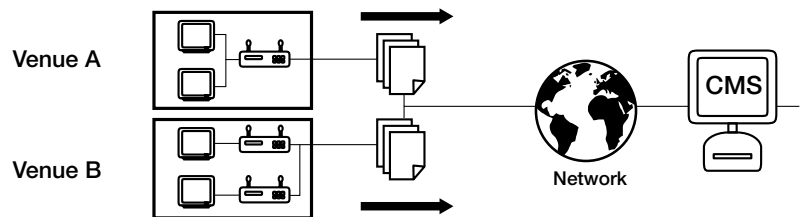
products. In each case, the common trait is that a substantial number of people will interact with the display, or see the content presented on it. Digital signage networks let the network owner or manager remotely control where, when and how content will appear on each of these screens. Most digital signage deployments follow a five-step process:

1. **Deploy network**
   The screens—whether conventional LCD panels connected to media players or other devices containing embedded screens—must be connected to the Internet or a local computer network. Devices can be connected using Ethernet, Wi-Fi®, or even cellular (3G/4G) technology (as illustrated in Figure 1).

2. **Gather content**
   Content assets—video files from an advertising agency or syndicated news feeds, for example—are then loaded into a special digital signage content management system. This software might be out on the Internet where it can be accessed by multiple parties using a Web browser, on your local LAN or even embedded into the media player itself.

3. **Schedule content**
   Once the content assets are loaded into the CMS software, they can be scheduled into play lists—instructions that tell each device to show the content at a particular date and time, or based on some external stimulus such as a fire alarm or smoke detector, a signal from a microcontroller, etc. Other commands for interacting with peripherals or third-party hardware can be scheduled in a similar way.

   Because each device regularly "checks in" with the CMS server to provide status updates, they will automatically begin to download the content assets and instructions that they need.

4. **Play the content on the screens**
   Downloaded assets will be saved to a local storage area (typically a hard disk or SSD), and played according to the play list instructions.

5. **Get feedback from the players**
   As each device plays its content, it generates a compliance log that is then sent back to the CMS system to confirm that everything is working properly. This log may contain other information as well, such as events that triggered content playback, or data from attached peripherals.

Figure 2: How Digital Signage Impacts Everyday Lives

- **Remote management:** Change settings and query local sensors and controls on a machine-by-machine basis or in groups selected by the user

- **Remote diagnostics:** Run automated scripts of commands to test equipment and generate reports on preset schedules

- **Software revision control:** Deploy remote software and firmware updates to devices over the network, and receive confirmation of their application

- **Graphical display:** Show information about devices in real time; target end-users or potential customers with high-definition imagery, video and data visualizations

- **Centralized data collection:** Accumulate data from all devices—everywhere—and analyze it anytime, either on the user's own server or in the cloud

- **Data analytics and reporting:** Use built-in reporting tools to generate graphical tables and charts for all critical data, or use our Web-based APIs to export the data to a location and format chosen by the user

Applications of Digital Signage

Digital signs are used in numerous vertical markets for a variety of purposes (refer to Figure 2). A few include:

- Retail
- Hospitality/entertainment
- Travel/transit
- Government
- Health care
- Corporate communications
- Restaurants/QSR/foodservice
- Education

What Can Digital Signage Technology do?

While the most obvious uses of digital signage technology focus on driving content to one or more screens, increasingly the same hardware and software systems are being used in machine-to-machine (M2M) applications. M2M applications allow computers, industrial machines, home appliances and other devices to communicate with each other and with other systems over a wired or wireless network. Common uses of M2M technology include:

- **Remote monitoring:** Equipment can check in with a "heartbeat" as frequently as every few minutes to provide a snapshot of its current status

[1] "Digital Signage Revenue to Approach $4.5 Billion in 2016 | Press Release | ABI Research." ABI Research–Technology Market Research in Wireless Cellular Automotive RFID Security IP Telephony Semiconductor Energy. ABI Research, 31 May 2011. Web. 09 Nov. 2011. **abiresearch.com/press/3687**

[2] Pulga, Allan. "Daily Dose of IQ: Digital Signage Is Everywhere | IQmetrix." IQmetrix | Intelligent Retail. IQmetrix, 29 June 2011. Web. 09 Nov. 2011. **iqmetrix.com/article/2011/06/daily-dose-iq-digital-signage-everywhere**

Key Advantages of Digital Signage

Like other kinds of out-of-home signage, digital signage lets you deliver time- and place-specific messages, with a few extra benefits:

- **"Venue Parting":** Individual displays throughout the venue are provided with content specific to the location within the venue (for example, merchandise near the display in a retail store); this is often referred to as "moving the call to action" as close to the product as possible

- **Time schedules ("day parting"):** Screens can be instructed to show different content at different times of the day, different days of the week (e.g. weekdays versus weekends), and different times of the year (e.g. for holiday or seasonal promotions)

- **Instant updates:** Content can be triggered by an RSS feed, SMS text message or sensor event (e.g. a fire alarm or signal from a microcontroller)

- **Multimedia playback:** Digital signage systems can show a combination of still and moving images, video and "live" data (e.g. traffic or weather information or data from your inventory system)

- **Remote control:** Digital assets can be changed instantaneously, as often as desired, and from a single, remote location over the network

- **Compliance tracking:** Digital signs provide nearly 100 percent accurate and automatic compliance logging and reporting (important for advertising and safety/security information in particular)

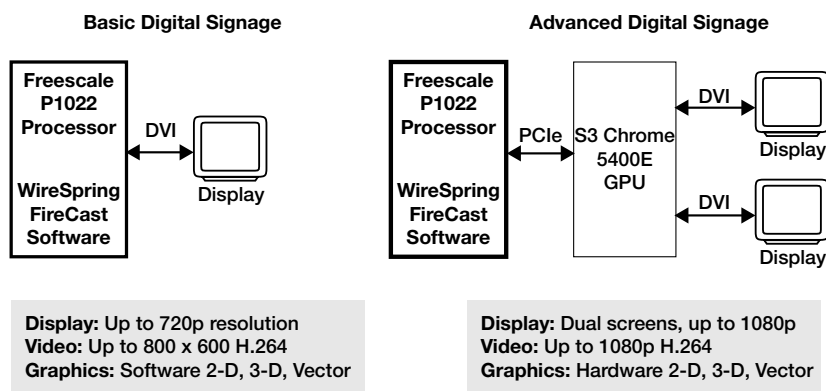### Figure 3: Freescale/Wirespring/S3 Digital Signage Platform

Basic Digital Signage

Freescale P1022 Processor — WireSpring FireCast Software — DVI — Display

Display: Up to 720p resolution
Video: Up to 800 x 600 H.264
Graphics: Software 2-D, 3-D, Vector

Advanced Digital Signage

Freescale P1022 Processor — WireSpring FireCast Software — PCIe — S3 Chrome 5400E GPU — DVI — Display / DVI — Display

Display: Dual screens, up to 1080p
Video: Up to 1080p H.264
Graphics: Hardware 2-D, 3-D, Vector

Figure 4: Freescale/Wirespring/S3 Digital Signage Reference Design

Hardware Stack		Software Stack
P1022RDK	**S3 5400E**	
• Freescale P1022 1067 MHz dual-core processor • 512 MB 64-bit DDR3 memory • 8 MB serial boot flash memory • SD card slot • Two 10/100/1000 Ethernet ports • Two USB 2.0 ports • DVI interface • 4-lane PCI Express® connector • Battery-backed RTC • SATA 2 connector • Headpone out/mic in	• S3 Chrome 5400E GPU • OpenGL 3.1 • OpenVG 1.1 • Hardware accelerated H.264, MPEG4/2, VC-1 video • Two DVI connectors • DisplayPort capable (5400E GPU) • Fanless (5300E) version available	• Freescale Linux® BSP • FireCast digital signage, content management and playback software • S3 graphics video/graphics drivers

- **Interactivity:** Interactive content boosts engagement and puts viewers in control, touch-screen controls let viewers explore rich information resources, integration with mobile communication tools allow for even more personalized messaging

Freescale's Digital Signage Solution

Freescale has developed a digital signage reference platform based on the P1022 processor and an optional S3 GPU. The platform runs WireSpring's FireCast digital signage software and handles playback of video, flash, HTML and image content. Devices already based on the P1022 may be able to support digital signage with no additional hardware. Others may require a faster or multicore P1022 variant upgrade, or the addition of an external GPU to create an upgrade path for an advanced digital signage client. Figure 3 demonstrates digital signage platform options, while Figure 4 showcases the key components of the digital signage reference design from Freescale, WireSpring and S3.

Most of the digital signage systems in use today rely on off-the-shelf PC hardware running a Windows® operating system and client software. However, while x86 systems offer numerous advantages in desktop computing environments, most of these don't carry over to digital signage and converged device applications. Table 1 illustrates this comparison.

Future of Digital Signage

To date, most digital signs have been intentionally installed using new screens, players, etc. However, future growth will largely be derived from adding digital signage functionality to other devices—things that are often found in shared and public spaces. For example, consider the following converged devices already using digital signage:

"Embedded" Digital Signage (Converged Device) Examples

1. **Automated external defibrillators (AEDs):** Frequently use digital signs to show advertisements or employee messages, and then switch to video instructions if the device needs to be used.

2. **Point-of-sale (POS) terminals:** Customer-facing screens can show promotions and messaging in high dwell-time zones like checkout lines.

3. **Food service appliances:** Digital signs show ads or employee messages, and then switch to video instructions or interactive features when the device is used.

Table 1: Comparing x86 and Freescale Systems for Digital Signage

x86 assumed Advantage	Freescale's Counter
Runs Windows® operating system	WireSpring's FireCast digital signage software is based on Linux, which is better suited to OEM and embedded applications requiring the highest levels of reliability, customization and source code control.
x86 Motherboards	Commodity PC parts are a poor choice for industrial applications due to short longevity and lack of extended temperature support. Hardened and long-term availability x86 parts are available in some cases, but are usually not cost competitive.
x86 Ecosystem	Power Architecture technology shares many of the same hard and soft components with x86 (GPU, PCIe boards, chassis, Linux, GNU, DIMMs, etc.) and can leverage the economies of scale found in the x86 ecosystem.
x86 CPU	The x86 CPU manufacturer business model is driven by PC product cycles. Products are in production for a limited time vs. Freescale's QorIQ infrastructure product cycles. As part of our Product Longevity Program, Freescale is committed to making the P1022 processor available for a minimum of 10 years. For Terms and Conditions and to obtain a list of available products please see **freescale.com/productlongevity**.

Figure 5: "Embedded" Digital Signage Examples

Uncovering Digital Signage Opportunities

Opportunities to provide digital signage technology tend to fall into one of three categories:

1. **Converged systems:** Existing devices (workgroup printers, security displays, etc.) that are already being manufactured but could benefit from the addition of digital signage functionality.

2. **OEM media players:** OEMs with experience in the digital video and imaging markets may be looking to expand into the digital signage space.

3. **Machine-to-machine (M2M) applications:** Everything from office coffee machines and water coolers to "smart" parking meters and shipping drop boxes can benefit from remote management and monitoring, visual messaging, or both.

Conclusion

Freescale's QorIQ processors combine long product lifecycles and extended temperature support with a superior price/performance ratio, making them one of the best possible solutions for digital signage applications. With partners WireSpring and S3, Freescale now offers one of the most comprehensive solutions on the market for low-power, high-performance embedded digital signage and M2M projects.

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