Inside FireCast™

A Look at the Technology Behind a Linux-based Kiosk Operating System

Takeaway

Until recently, systems integrators and project managers involved in kiosk projects had few options when selecting kiosk management software. Although a number of vendors sell tools for locking down and managing interactive kiosks, their products are largely undifferentiated and are typically hampered by a common set of shortcomings. These drawbacks are due in part to their dependence on a standard desktop operating system, like Microsoft Windows. In addition, the handful of consulting firms willing to build a customized operating system tailored for the rigors of public use often charge a hefty fee for their services, and are simply not an option for ROI-minded operations. With the recent introduction of the FireCast software suite from WireSpring Technologies, another option is now available. For the first time, there is an affordable, easy-to-use, Linux-based option built exclusively for powering and managing interactive kiosks.

Why Linux?

FireCast OS is a highly customized distribution of Linux, designed and built for the sole purpose of driving interactive kiosk networks. WireSpring's choice of Linux as the base platform for FireCast has made the system extremely robust, scalable, and extensible. Among the many features that make FireCast unique in this marketplace are:

Power and Stability

The legendary power and stability of the Linux operating system are well known in the Information Technology arena, even among Windows specialists. And while there have been many arguments over which is “better”, Windows or Linux, few can question the growing popularity of Linux for powering web servers, databases and other high-availability systems. However, as Linux was originally an operating system designed for scientists, programmers and system administrators, it can be somewhat difficult to configure and use. Recognizing this, WireSpring removed the traditional command-line interface from its FireCast OS Linux distribution, replacing it with an easy-to-use and intuitive graphical interface. By eliminating extraneous options and presenting important features and functions in a logical fashion, FireCast is easier to configure and use than any Windows-based kiosk environment.

The Open Source Advantage

Many professionals today are engaged in the open source software debate: while some claim that the ability to view software's source code makes it inherently inferior and less secure, others argue that these same traits make the programs more stable and bug-free. The rationale is simple: open source software is subject to massive and intensive peer-review by thousands of programmers who can find bugs and make changes to the underlying code when the need arises. Although the debate will likely continue for some time, one point is undeniable: it is much easier for a third party to access and modify the source code for open source software programs. This has a tremendous impact on the way individuals and companies write software. For example, when a customer discovers a bug in Microsoft Windows, only Microsoft's own engineers may fix it, since only they possess the code it was built from. If Microsoft chooses not to fix the problem immediately, third

parties are essentially out of luck. On the other hand, if a bug is found in some critical portion of a Linux system, the source code is readily available and anyone may modify it. Thus, while Microsoft has the sole authority to determine the order in which Windows bugs will be fixed, any software engineer needing to alter Linux code may do so at will.

Product Availability and Life-Cycle

Another major advantage of Linux-based products like FireCast is often overlooked: the ability to guarantee product availability and support. Microsoft, in an effort to drive upgrade sales, discontinues sales and support for its older operating systems every few years. Thus, a user who bought 100 licenses of Windows NT in 1999 and wishes to purchase another 100 licenses today may not be able to do so. Plus, the Microsoft license policy now dictates that users must purchase an ongoing "subscription" for Windows XP and other products or else forfeit technical support. The Yankee Group's recent survey of IT managers found that 37 percent were so annoyed with Microsoft's new licensing plan that they were seeking alternative software solutions. In contrast, because FireCast was designed with the needs of the interactive kiosk industry in mind, older versions of the software will always be available and supported. Plus, all of FireCast OS can be remotely upgraded for those users who want to keep their kiosks as up-to-date as possible.

The FireCast Platform

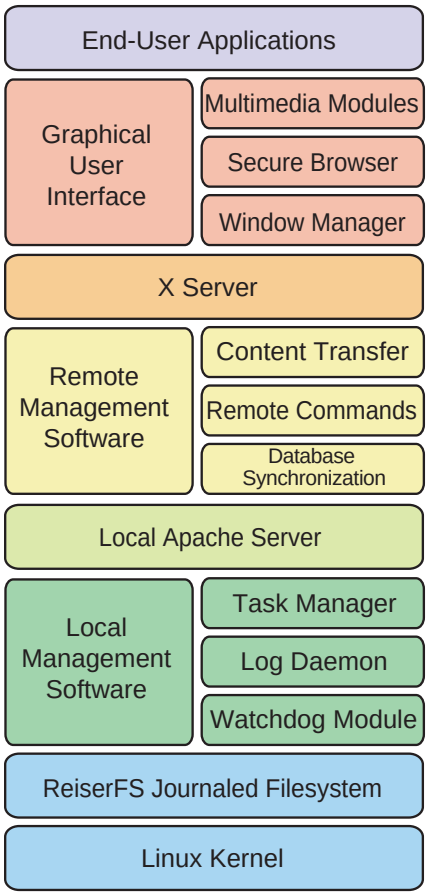
FireCast OS is a complete 32-bit operating system built on top of the Linux kernel. The entire system has been optimized to withstand the rigors of public use, and many kiosk-specific features have been added to make the software powerful, scalable and easy to use.

Low-Level Subsystems

The Linux kernel featured in FireCast OS provides low-level hardware support, memory management functions, and a unified interface for programs to access resources and execute commands. FireCast uses the ReiserFS filesystem for hard disk management. ReiserFS is a journaling filesystem that never needs to be defragmented and provides excellent data security and integrity, even in situations where the hard disks are powered up and down repeatedly. (This is especially important in locations subject to regular blackouts and/or brownouts.)

Graphical Interface

The FireCast OS Graphical User Interface (GUI) is driven by the XFree86 windowing environment, using a custom window manager and auto-configuration utilities. Both the end user interface and the administrative control panel are web applications served locally from an Apache web server directly to the OS's custom browser. The interface is infinitely customizable and can be built using static or dynamic HTML, along with Java, Flash, and a variety of other web technologies. The user interface and all web pages are presented through a customized browser built atop the Mozilla Gecko rendering engine. Gecko provides FireCast with fast, reliable rendering for HTML, XML, CSS, SVG and



FireCast OS is built on top of the rock-solid Linux kernel, and features a modular architecture that allows engineers to add in new kiosk-specific features and enhancements without changing any underlying code.

MathML documents. Numerous plugins allow users to view MacroMedia Flash, Java, MP3 audio, and full-motion video files, as well as Microsoft Word, Excel and PowerPoint documents.

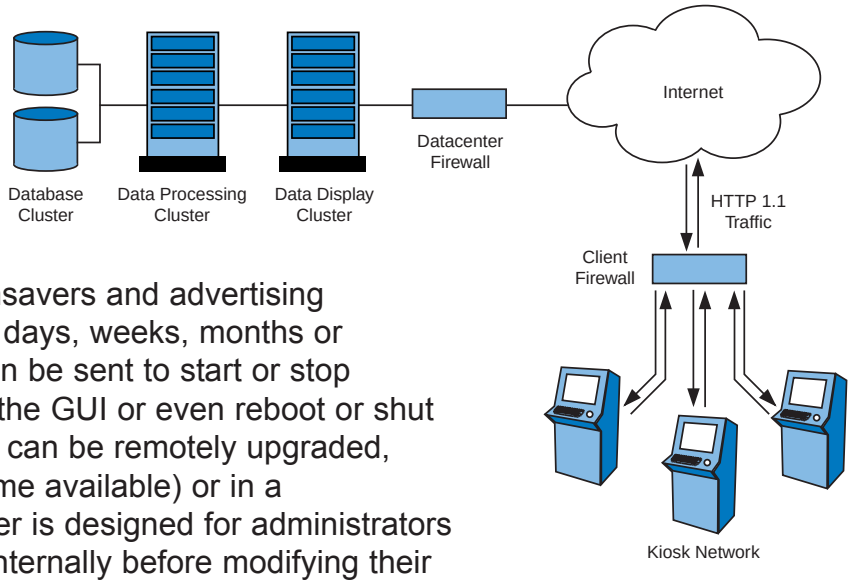
Administrative Access

Access to administrative functions is provided through the Local Control Panel (LCP), a secure command center that can only be accessed by pressing a unique key combination and entering a secure password. The LCP gives on-site administrators access to a powerful set of configuration and management tools, including a graphical file explorer, system preferences and network configuration panels, and a process manager. In addition, because the LCP serves as a front end to many standard Linux/UNIX system utilities, kiosk administrators can take advantage of powerful command line programs and low-level system tools without having to learn any Linux commands.

Process Management

All vital processes (including X-Windows, the window manager, browser interface, remote monitoring applications, and system maintenance tools) are monitored by a pair of fully-redundant "watchdog" daemons which ensure the highest possible uptime. In the rare event that a process should freeze or crash, multiple low-level systems will attempt to recover the application and log the problem for future examination. In the event that an application cannot be saved, the entire graphical subsystem is automatically restarted (usually within 2-3 seconds on modest hardware), flushing all caches, buffers, file handles and other system resources. In addition, because networking tasks are implemented directly in the Linux kernel, WireSpring's remote management tools will continue to diagnose and correct problems even in the event of a more serious malfunction. Thus, virtually any system problem can be addressed quickly and easily without physically accessing the kiosk itself.

Remote Management



Remote management for FireCast is provided via the ClientCenter web-based administration system. Through ClientCenter, kiosk administrators have access to a wide variety of system, network and multimedia configuration options. Graphical interfaces, multimedia screensavers and advertising campaigns can be scheduled to run for days, weeks, months or years at a time. Remote commands can be sent to start or stop particular software applications, restart the GUI or even reboot or shut down the kiosk. And all of the software can be remotely upgraded, either automatically (as upgrades become available) or in a customized, modular fashion. (The latter is designed for administrators who want to test all software changes internally before modifying their kiosks in the field.) WireSpring administrators can upgrade everything from the Gecko-based web browser to the Linux kernel itself, while customers are allowed to install and manage their own applications as well as other add-on software packages that provide functionality like database support or peripheral device integration. Because all transfers appear as standard HTTP 1.1 traffic over port 80, the entire remote management process is virtually invisible to firewalls.

System Security

As a purpose-built kiosk operating system, FireCast OS eliminates many extraneous Linux features that add complexity and compromise security. For example, while most Linux distributions feature a virtual terminal and "shell" that gives users access to a command prompt, this feature has been removed in all versions of FireCast OS. The availability of virtual terminals is a security liability and introduces the risk that others may gain unauthorized access to the kiosks. In instances where the core functionality of the LCP is insufficient to meet a certain need, additional features can be added remotely and accessed through the secure, web-based LCP interface. To eliminate the threat of users breaking into the system during a reboot, a keyboard attached to the kiosk will not become active until FireCast OS has finished booting into the GUI. Once the system is running, all harmful key combinations are also blocked.

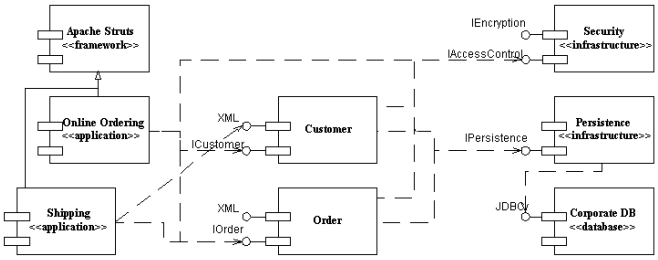
End-user privacy is protected with several methods, including a 'logout' mechanism that clears cookies, browser cache and other personal information once a kiosk usage session is completed. The logout mechanism may be activated manually or automatically, depending on the application. Moreover, all network traffic between FireCast-powered kiosks and the ClientCenter remote management system is encrypted with a 128-bit cipher utilizing a 448-bit symmetric key, and authenticated using a shared-secret, challenge-response system, virtually eliminating the chance that sensitive data could be intercepted by a malicious third party.

Developing for FireCast

Using FireCast OS as your kiosk platform opens up a wide range of development possibilities. A kiosk application can be as simple as a few web pages downloaded to the device, or as sophisticated as a multi-user application taking advantage of advanced multimedia and external peripheral support.

Design Tools

One common misconception is that building a kiosk application for Linux is more difficult than creating one for Windows. While it is true that some Windows-based kiosk software manufacturers have chosen to create proprietary tools for making simple kiosk applications, WireSpring has instead chosen to leverage existing tools and technologies. This not only frees WireSpring to concentrate on its primary goal of building a robust kiosk operating system, but also guarantees that developers have a choice of tools for building their applications— from such renowned vendors as Oracle, Macromedia, and Borland. Rather than having to learn new tools for building kiosk applications, designing GUIs, making virtual keyboard layouts, and creating screensavers, programmers and designers can leverage their existing expertise with industry-standard applications like Kylix, Dreamweaver and Photoshop. To complement these tools, WireSpring's ClientCenter provides access to a valuable set of kiosk-centric functions (such as applying user interfaces or scheduling screensavers) through an intuitive browser interface.



Developers building applications for FireCast OS will find that their current design strategies— from planning with UML to following Extreme Programming practices— will seamlessly transfer onto the FireCast platform.

By making kiosk-specific features available via any web browser, and allowing the use of standard development tools for content creation, customers are free to work on whatever platform they are most comfortable with. In many cases, these development tools can be used to generate cross-

platform end products, helping to make kiosk applications and media extensible to other business areas as well. For example, Borland's Delphi and Kylix rapid application development (RAD) environments allow designers to build cross-platform applications that will work in both Linux and Windows. Design programs like Macromedia Dreamweaver and Flash MX can be used to build world-class web-based applications that run on any operating system, or they may be coupled with FireCast's unique web-based user interface to build powerful, kiosk-specific applications. Even novice programmers who prefer to write Perl CGIs in a simple text editor will find that their applications run smoothly on FireCast's local Apache web server.

System Integration

Because FireCast uses a web-based GUI, developers building web applications can take advantage of powerful features unique to the OS's browser to build secure, reliable and exciting software. These browser-based applications can combine everything from multimedia and full-motion video to databases and kiosk peripherals, such as credit card scanners. Large graphics and multimedia files can be cached on the kiosk itself (to speed page loading and lighten network overhead) while "live" content can be pulled dynamically from remote web pages and databases. Using CGI or Java, developers can link web applications to scanners, bar code readers, proximity sensors, thermal printers and other devices, and even incorporate real-time chat and videoconferencing capabilities.

Additionally, system builders can integrate their applications with FireCast ClientCenter to add remote management functionality. From simple integration such as transferring logs and reporting errors, to customizations that provide remote application control, the ClientCenter framework provides developers with a standarized platform, secure HTTP-based communication, and access to kiosk-centric functions and data.

Industry Standards and Portability

Strict adherence to standards makes FireCast a logical choice for extending legacy applications, integrating with 3rd party solutions, and deploying software across multiple channels. From low-level features like POSIX threads, UNIX sockets and System V IPC, to new, state-of-the-art standards including XML and Cascading Style Sheets, FireCast is designed to work with software from yesterday, today, and tomorrow. And because FireCast is standards-based, the kiosk applications you create may easily be extended to alternate channels, such as the web, handheld devices, and other emerging content platforms. By integrating smoothly with your existing infrastructure and helping leverage your kiosk investment across multiple channels, FireCast helps generate higher ROI throughout the enterprise.

For More Information

With industry-leading reliability, security, and flexibility, FireCast is the premier solution for companies who are serious about deploying a high-availability kiosk application. If you need help planning your next kiosk project, or if you would like more information about how FireCast can work for you, contact WireSpring at:

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