Power Firmware™ SuperDriver™

Summary

The PowerPC Platform ("PPCP" or "CHRP") Specification and the PowerPC Reference Platform ("PR*P") Specification both require the use of boot firmware conforming to IEEE Standard 1275-1994, *Standard for Boot (Initialization Configuration) Firmware, Core Requirements and Practices* ("Open Firmware"). While Open Firmware provides a limited capability of working with peripheral cards that don't contain Open Firmware boot drivers ("FCode drivers"), the full benefits of Open Firmware booting are obtained when an FCode driver is available.

To quickly enable fully-functional Open Firmware booting, FirmWorks has developed an enhancement to its Power Firmware™ boot firmware, the FirmWorks SuperDriver™ FCode driver. The SuperDriver package is a system-ROM-based set of drivers and components that provides full Open Firmware support for a wide range of plug-in cards whose manufacturers have not yet added FCode drivers to their products.

The SuperDriver package is seen as a transitional device which fills a short-term market gap that will exist during the early introduction phase of CHRP and PR*P systems.

Description

Industry leaders such as Adaptec and ATI already have products containing FCode drivers on the retail shelves. Many other PCI peripheral card manufacturers are in the process of adding FCode support to their products, and FirmWorks expects that the next peripheral card development cycle will see a substantial increase in the number of products that contain integrated FCode drivers. With Apple's Power Macintosh™ and the Motorola Inc. Computer Group's PowerStack™ lines of computers providing demand pull, more and more peripheral card manufacturers will be bringing product to market to support these and the upcoming CHRP machines.

However, the current state of the market is transitional - the industry is moving from PCI peripheral cards without FCode drivers to FCode drivers on most or all such cards.

To help the industry ease this transition, FirmWorks has enhanced its Power Firmware boot firmware so that systems using Power Firmware will automatically provide FCode drivers for many peripheral cards that do not currently contain such FCode drivers in their PCI Expansion ROMs.

This support takes two forms:

1. Availability of the FCode drivers required by a broad range of graphics adapters. This is accomplished by obtaining information from the plug-in graphics adapter about its identity and the controller and RAMDAC chips it uses, and then generating the appropriate FCode driver.

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2. Availability of the FCode drivers required by many market-leading SCSI and Ethernet adapters. The SuperDriver package includes a collection of drivers which specifically target a particular device or family of devices. The correct driver is matched to a particular PCI plug-in card on the basis of the "Vendor ID" and "Device ID" fields of the card's "configuration space header".

This combined technology is capable of supplying FCode drivers for a growing number of the most popular PCI peripheral cards that do not currently have integrated FCode drivers, thus enabling systems using Power Firmware to use the supported cards at boot time as though they contained native FCode drivers.

A simplified description of the Power Firmware/SuperDriver booting process is as follows:

- At system power-on or reset, Power Firmware performs its normal initialization of all of a system's built-in devices and probes all of the devices on the system's expansion buses.
- If an FCode image is found on a given card, Power Firmware loads that FCode driver into the Open Firmware device tree.
- If no FCode image is found on a given card, Power Firmware identifies the controller and RAMDAC chips on the board and the "vendor ID" and the "device ID" fields in the card's configuration space header and the SuperDriver uses this information either (i) to generate the required FCode driver (graphics adapters) or (ii) as an index into the SuperDriver code to identify an entry for the card (SCSI and Ethernet adapters). If the SuperDriver can generate or contains an FCode driver for the card, that FCode image is loaded into the Open Firmware device tree just as if the FCode driver had been found on the card.
- If no FCode image is found on a given card, and if the SuperDriver cannot supply an FCode driver for the card, Power Firmware uses the information contained within the configuration space header to create a series of descriptive "properties" for the card in the Open Firmware device tree. (The mechanism for creating these properties is described in *PCI Bus Binding to IEEE Standard 1275-1994*. A copy of the current draft of this document may be found on the Open Firmware Working Group's web site at *http://playground.sun.com/pub/p1275/*.) Without an FCode driver, either native or supplied by the Power Firmware, the card will not be usable during the boot process, but the operating system will be able to inspect the Open Firmware device tree to obtain the property information for the card.
- Power Firmware then completes the booting process using the FCode drivers in the device tree regardless of whether they were obtained from the cards themselves or from the SuperDriver package.

Note that if a board that is supported by the SuperDriver also has an FCode driver in its PCI Expansion ROM, the above sequence will result in the native FCode driver being used by Power Firmware rather than the one supplied by the SuperDriver.

The SuperDriver has been successfully tested with the following graphics adapter cards:

Manufacturer	Model	Controller	RAMDAC
ATI	Graphics Pro Turbo	MACH-64	ATI Custom
Cirrus	Alpine 5434	Cirrus 5434	integrated
Diamond	Speedstar	Cirrus 5434	integrated
Diamond	Speedstar Pro SE	Cirrus 5430	integrated
Diamond	Stealth 64 Video 3240	S3-968	IBM
Diamond	Stealth 64 Video 3240	S3-968	tvp3026

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Manufacturer	Model	Controller	RAMDAC

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Manufacturer	Model	Controller	RAMDAC
Diamond	Stealth 64 Video 2121	S3-Trio64V+	integrated
Diamond	Stealth 64 Graphics 2120	S3-Trio64(X)	integrated
Diamond	Stealth 64 Graphics 2120	S3-Trio64(Y)	integrated
Diamond	Stealth 64 Graphics 2120	S3-Trio64(Z)	integrated
Diamond	Stealth Viper	Weitek 9100	IBM
Diamond	Stealth Viper Pro	Weitek 9100	IBM
Elsa	Winner 2000PRO/X	S3-968	tvp3026
Matrox	Millennium	Storm	tvp3026
Number9	GXE 64 PCI	S3-864	21c498
Number9	GXE 64 Pro PCI	S3-964	tvp3025
Number9	GXE PCI	S3-928	20c505
Number9	FX Motion 771	S3-968	IBM
Number9	FX Motion 531	S3-868	21c498
Number9	FX Vision 330	S3-Trio64	integrated
Omnicomp	3Demon	GLINT 300 SX	IBM
Orchid	Fahrenheit 64	S3-864	S3-DAC
Orchid	Fahrenheit Pro 64	S3-964	BT485
Orchid	Fahrenheit ProVideo 64	S3-968	BT485
Orchid	Kelvin 64	Cirrus 5434	integrated
Spea	V7-Mercury P-64V	S3-968	tvp3026
STB	Powergraph 64 Video	S3-Trio64V+	integrated
Western Digital	Bahamas 64	S3-864	S3-DAC
Western Digital	Barbados 64	S3-964	485

Since the SuperDriver works by identifying the components of the graphics adapters in addition to the specific manufacturer's model name/number, and the SuperDriver contains support for the most popular graphics controllers and RAMDACs, the fact that a card does not appear on the preceding list does not mean that the SuperDriver will not support it. On several occasions in the FirmWorks lab the SuperDriver has successfully supported a graphics adapter the first time an attempt was made to use the SuperDriver to boot the card.

The SuperDriver currently provides support for the following SCSI and Ethernet cards:

Manufacturer	Product Name	Model
SCSI Boards		
Acculogic	PCIport!	
Interphase	5520	
Western Digital		WD33C296
Ethernet Boards		
3COM	Etherlink III	3C590-COMBO
Z'Nyx		ZX312
Z'Nyx	Net Blaster 200	ZX342

As FirmWorks and our Power Firmware licensees identify other cards that they would like to support, FirmWorks expects to enhance the SuperDriver to support those cards. The current list of supported cards can be found on FirmWorks's web site at *http://www.firmworks.com*.

FirmWorks also offers the FCode drivers that form the basis of this technology to the manufacturers of the supported cards for inclusion in their existing and/or future products as another way of helping the industry through this transition period.

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