IBM *Power Personal Systems* Architecture

PowerPC Reference Platform NVRAM Specification

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NVRAM

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Document Change List

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1. Several clarifying wording changes made.
2. “PowerPC Examples” corrected.
3. nvram.h (appendix) updated.

1.0 NVRAM

1.1 Introduction

This document describes the NVRAM layout for PowerPC Reference Platform systems. Its purpose is to establish the nomenclature to be used in the global structures and enumerate current usages of these areas. The document should be viewed as the current and extendible definition of NVRAM for Version 1.1 of the PowerPC Reference Platform Specification. The structure is provided as **`nvram.h`** in the appendix of this document. Feedback on this document in the form of corrections or suggestions for improvement should be sent via the Internet to the document owner named on the cover sheet.

There are a number of TBDs in the document. These are place holders for certain products that are still in development and will be filled in, changed or removed as these designs get finalized.

NVRAM consists of a **header** and three major areas:

1. **Global Environment Area (GEArea)** - This area is used to store information that is common to all elements of the system, including firmware and the operating systems.
2. **Operating System Area (OSArea)** - This area is private to the operating system and will not be discussed in any detail in this document. Note that the contents of this area cannot really be guaranteed across boots of the system since it is unpredictable whether the same OS will be booted. NVRAM_MAP.HEADER.LastOS is provided to indicate whether the contents of the OSArea can be considered to be valid.
3. **Configuration Area (ConfigArea)** - This area is used to store configuration data that is required to be maintained across boots of the system.

1.2 Nomenclature

The nomenclature used in this document is based on the P1275 Open Firmware Specification with reasonable assumptions made where P1275 was lacking definition at the time this needed to be resolved. There is no guarantee that this will match the final Open Firmware specifications.

1.2.1 Open Firmware Device Naming Conventions

A device is uniquely identified by its location within the system device tree. This is specified by writing

down the path from the root node of the tree out to the device as follows:

```
/node-name0/node-name1/ ... /node-nameN
```

A node-name is specified by

```
driver-name@unit-address:device-arguments
```

For purposes of this document:

- `driver-name` is an ASCII string giving the name of the node. Allowable names will be listed in this document.
- `unit-address` is the text representation of the physical address of the node with the address space of its parent. The exact form of this is device dependent.
- `device-arguments` is a field of printable characters of arbitrary length giving additional device information. These are also device dependent.

The leading "/" represents the root node which is not explicitly named. The root node is generally the processor.

1.2.2 PowerPC Device Naming

Conventions that will be used throughout the following discussion:

- All strings are lower case ASCII with the exception of the "PNP" in Plug and Play device ids (example: PNP0700).
- All numbers (hexadecimal or otherwise) are lower case ASCII representations of those numbers with leading zeros removed.

A PowerPC device tree is comprised of a set of nodes that may represent either a bus or a device**.** A bus is most completely described by its generating logic, usually referred to as a *bus bridge.* In this document, *devices* are further described as *device controllers* and actual end *devices*.

1.2.2.1 Bus Bridges

Bus bridges take on a form relative to their parent node. The current allowable forms are:

- **pci**@*aaaaaaaa* designates a PCI bus bridge based at root node address *aaaaaaaa*; *aaaaaaaa* is the hexidecimal base address decoded by the bridge controller with leading zeros removed.
- **pci***vvvv,dddd*@dd,f is used to designate a PCI device that is a bus bridge. See "Device Controllers" on page 2. for details.

1.2.2.2 Device Controllers

Device controllers take on a nomenclature that is peculiar to the bus on which it resides.

1.2.2.2.1 PCI Device Controllers
PCI device controllers take the form **pci***vvvv,dddd*@*dd,f*:`device-arguments,` where

- *vvvv* is the PCI configuration space *vendor identifier* for the device.
- *dddd* is the PCI configuration space *device identifier* for the device.
- *dd* is the PCI configuration space *device number* for the device.
- *f* is the PCI configuration space *function number* for the device.
- `device-arguments` are device dependent and are listed in Table 2 on page 3.

1.2.2.2.2 ISA Device Controllers
ISA device controllers take the form *xxxxxxx*@*gggg*:`device-arguments`, where

- *xxxxxxx* is the uncompressed Plug and Play device id.
- *gggg* is the controller's base I/O or memory address.
- `device-arguments` are device dependent and are listed in Table 2 on page 3.

1.2.2.3 Devices

Devices are generally represented by *ssssssss*@`unit-address:device-arguments`, where

- *ssssssss* is a string representing the type of device. The valid choices are **harddisk**, **cdrom**, **floppy**, and **tape**.
- `unit-address` is device dependent and are listed in Table 1 on page 3.
- `device-arguments` are device dependent and are listed in Table 2 on page 3.

Where there is an identity relationship between a controller and its device, the device may not need to be specified directly.

Table 1. unit-address assignments for devices

Device	Type	unit-address
(any)	SCSI	*gg,hh* is a hex number for the SCSI id, SCSI logical unit number.
(any)	IDE	*h* is 0 for the master IDE device, 1 for the slave IDE device.
floppy		a is the number of the floppy device (0-3)
tape		

1.2.2.4 device-arguments

The following `device-arguments` have been defined:

Table 2. device-arguments assignments for devices

Device	Type	device-arguments
controller	SCSI	*ii* is the hex number for the SCSI id of the SCSI

1.2.3 PowerPC Examples (IBM6070)

1. A PCI device on a root PCI bus:
   - /pci@80000000/pci1000,1@10,0 is the scsi controller (*vvvv* = 1000 = NCR).
   - /pci@80000000/pci1000,1@10,0:0 specifies the initiiator scsi id to be 0.
   - /pci@80000000/pci1000,1@10,0/harddisk@6,0 is the scsi harddisk with id=6.
2. An ISA device on a root PCI bus:
   - /pci@80000000/pci1014,a@b,0/PNP0700@3f0/floppy@0 is the floppy drive (1014 = IBM).
3. A PCI network device:
   - /pci@80000000/pci1022,2000@c,0:0,0 is the ethernet controller. Note that there is no need to specify a separate device.

1.3 Global Environment Area

The Global Environment Area (GEArea) provides an important interface between the firmware and the operating system. It is used for storage of system parameters that must be preserved between boots of the system.

1.3.1 Boot Device

The boot device is set up by the firmware each time the system is booted. This device specification must