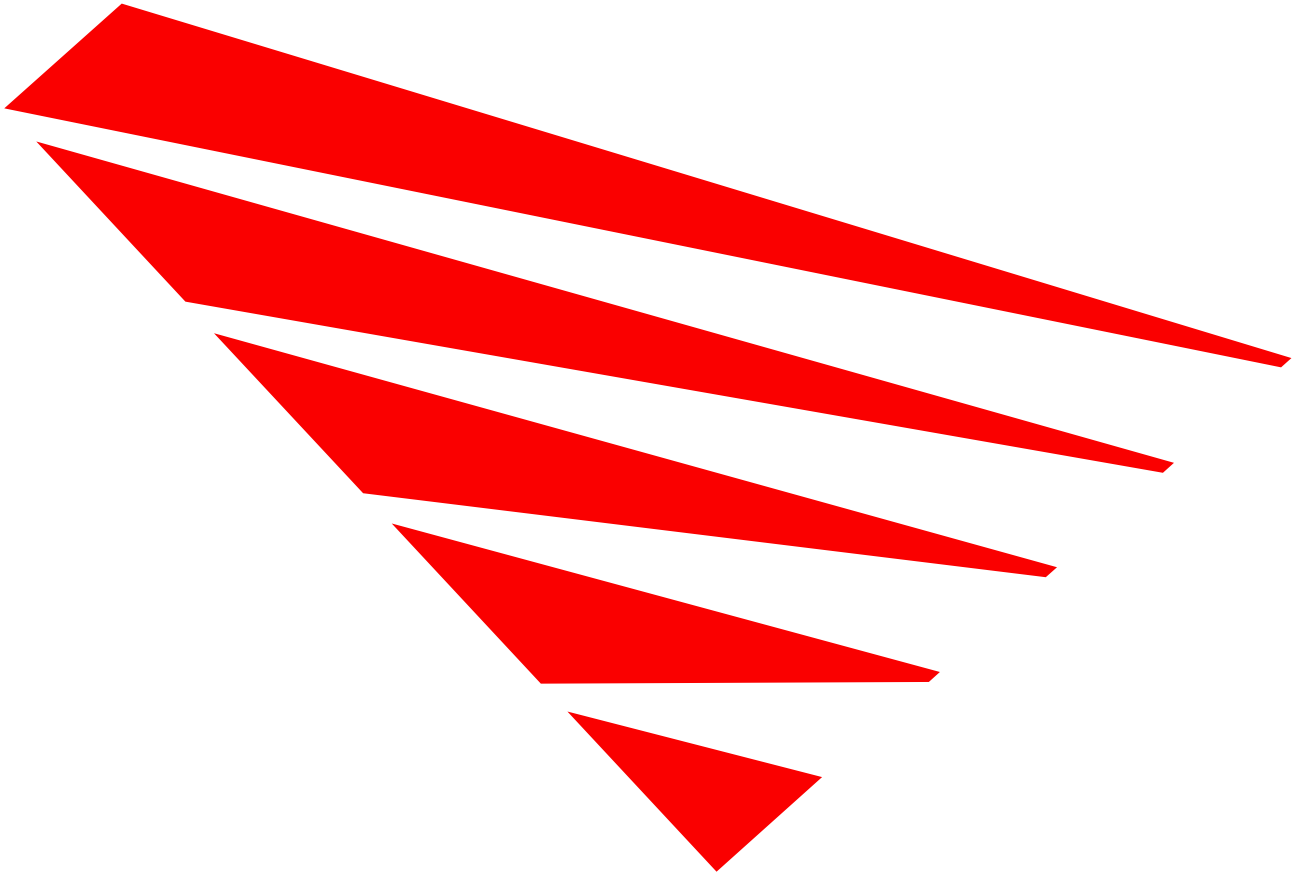

NetWare® Peripheral Architecture (NWPA) Functional Specification and Developer's Guide

Version 2.1D
September 1995

NetWare®

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Preface

This document describes the technical requirements and procedures for building device drivers under a driver architecture known as the NetWare Peripheral Architecture, or NWPA. This document provides a description of the NWPA and the Application Programmers Interface (API) set that it provides; along with a detailed description of requirements that the driver developers must meet to be certified by Novell Labs to work within the NWPA environment.

This document is intended for developers of device drivers that will interface with file servers using NetWare 3.12 and above.

Revision History

Version Number	Description of Revision
Version 1.x	Initial Release
Version 2.0	LONG HACBPutHandle replaces struct HACBStruct* as a stack parameter passed to the following APIs (see Chapter 8): CDI_Abort_HACB() CDI_Blocking_Execute_HACB() CDI_Execute_HACB() CDI_Return_HACB() LONG *NPAHandle is an additional stack parameter required in CDI_Bind_CDM_To_Object() (see chapter 8) LONG NPAHandle is an additional stack parameter required in the following APIs (see chapter 8): CDI_Chain_Message() CDI_Object_Update() CDI_Unbind_CDM_From_Object() CDMTypeStruct has been eliminated from the specification. This was replaced by the Types parameter in the CDI_Register_CDM() API. See chapter 8. Extended HACB completion codes, see table 3-1. Queue state indicator moved from ControlFlags field of HACB to most significant bit of **hacbCompletion** field. See **hacbCompletion** field in section 3.3.2. The ControlFlags field name in the HACB was changed to Control_Info, and its purpose was redefined. See Control_Info field in section 3.3.2. Optional HAM software hot replacement. See section 4.3.4 and *HAM_Software_Hot_Replace()* in chapter 8. NWDIAG support required in HAM. See section 4..3.5. Scatter_Gather and Hardware_Verify bits defined for Function field of CDM message structure. See Function field in section 5.2.2. Entry points that allow applications to get and set device attributes added to the CDM. See sections 6.1.2, 6.2.5, AttributeInfoStruct in chapter 7 and CDI_Register_Object_Attribute in chapter 8. Asynchronous Event Notification. For HAM, see section 4.3.2 and *HAM_Queue_AEN_HACB()* in chapter 9. For CDM see section 6.3.5. Buffer mismatches. See section 6.3.6. Addition of Appendix B for greater clarity in HAM and CDM error handling. QueueLink field defined in CDM Message structure. See QueueLink field in section 5.2.2.

Version Number	Description of Revision
Version 2.1	Added auto error sense support in the HAM and CDM. This required a change to the HACB structure. Refer to the HACB's ErrorSenseBufferLength, VErrorSenseBufferPtr, and PErrorSenseBufferPtr fields in sections 3.3.1 and 3.3.2. Support of auto error sense introduced a new data struccture See ErrorSenseInfoStruct in chapter 7. For HAM specific support of auto error sense, see section 4.3.6 and the AttributeFlags field of the DeviceInfoStruct in chapter 7. For CDM specific support of auto error sense, see section 6.3.7 and the AttributeFlags field of the DeviceInfoStruct in chapter 7. Added specific target ID and LUN scan, also known as multiple LUN scan, support to the HAM and CDM. This also includes the concept of private and public devices. For the HAM, see seciton 4.3.7 and HAM_Scan_For_Devices in chapter 9. For the CDM, see section 6.2.3. For both HAMs and CDMs, also refer to the AttributeFlags field of the DeviceInfoStruct in chapter 7. Added CDI_Rescan_Bus() API in conjunction with multiple LUN scan. See chapter 8. The SCSI command block of the HACB was modified to accomodate 16 byte SCSI commands. The HACommandArea field was extended to be a 16 BYTE array, and the positions of the Reserved3 and HACommandLength fields were swapped. Refer to the SCSI Adapter Command structure in sections 3.3.1 and 3.3.2. Made corrections to NPA_Unload_Module_Check(). The 2.0 specification stated that the *HAM_Unload_Check()* and *CDM_Unload_Check()* routines should make iterative calls to this API. For the correction to the HAM see *HAM_Unload_Check()* in section 4.1.1 and in chapter 8. For the correction to the CDM see *CDM_Unload_Check()* in section 6.1.1 and in chapter 8. Also, see NPA_Unload_Module_Check() in chapter 8. Added two new HAM functions, *HAM_Recovery_Reset* and *HAM_Deactivation_Notification*. See section 4.1. and chapter 9. Introduced the concept of auto detection and auto configuration. See section 4.3.8. Correction to NPA_Exchange_Message(). The DataDirection parameter has been removed. See chapter 8. Clarifications made to field descriptions of the UpdateInfoStruct and DeviceInfoStruct. See chapter 7. Added successful completion code with queue frozen to HACB completion codes in section 3.3.2 and table 3-1. Clarification made to HAM's abort paradigm in section 4.2.3 and to the *HAM_Abort_HACB()* return values in chapter 8. Clarification made to HAM's queue behavior. See section 4.3.1.3 and table 4-1. Correction made to HAM_Return_Device_Info. The 2.0 specification stated that the HAM should place the HAM-generated device handle in the Parameter0 field of the HACB host command block. This is incorrect. The HAM already places the device handle in the return buffer. See chapter 9. Addition of AttributeID stack parameter to *CDM_Set_Attribute()* and *CDM_Get_Attribute()* routines. See section 6.1.2, 6.2.5, AttributeInfoStruct in chapter 7, and CDI Register_Object_Attribute() in chapter 8.

Version Number	Description of Revision
Version 2.1a	Generally, most of the changes were clarifications of existing concepts, not additions of new concepts. Throughout the document, NPABindHandle ws changed to CDIBindHandle. Figure 2-1 was changed. Figure 2-2 was removed. Section 3.3.1, CDMPassThrough command block: the structure of the block was changed. The BufferLength, Buffer, and ReturnParameter fields were replaced with the following: BYTE Reserved5[12]. The reason is that the data that was originally assigned to these fields is now part of the main HACB, DataBufferLenght, VDataBufferPtr, Control_Info, respectively. Chapter 5 and Chapter 7, the CDM MessageStruct: The definition of the CDMMessageStruct ws changed. The QueueLink field was redefined, and a new 1-LONG field was appended to the structure. The former QueueLink field and the new field were combined to make the following: LONG CDMReserved[2]. A new bit was defined in the upper WORD of the CDMMessageStruct's Function field, the CACHE_OKAY_BIT. Section 6.2.1: Clarified CDM use of the NPA's command line parser. Section 6.2.2: Reference to CDMTypeStruct was removed. The change regarding this structure was documented in version 1.x to 2.0 history. Reorganization of Chapter 6. Some of the seciton numbers were changed. The Error Handling section was moved from Special Topics to the Operational Overview. Special Topics: Added pertinent infomation regarding Removable-media device and magazine support.

Version Number	Description of Revision
Version 2.1b	Chapter 3 and Appendix B, Malformed Error Added new HACB error code regarding auto error sense buffers. Chapters 4, 6, and 9 Asynchronous Event Notification (AEN) Hacbs. Fixed typo -- The AEN mask is a bitmap, Adapter Reset was changed from 0x00 to 0x08. Chapter 6, section: CDM Entry Points, secition: Inquiring and Binding to a Device, Chapter 8, CDM_Inquiry - Clarified some of the issues regarding logical binding to a device. CDMHandle parameter is now passed on the stack. Chapter 7, DeviceInfoStruct Defined hardware verify and max units per transfer to attributes field. Chapter 7, UpdateInfoStruct Clarified meaning of some of the field definitions, and fixed the blocksize information as it relates to the changes made to the DeviceInfoStruct. Chapter 8, NPA_System_Alert Added this new API for issuing alert messages to the console screen. Chapter 10, Insert Functions Fixed typo. The NPA function code for insert functions should be 0x1B. Fixed typo. Reset End of Tape should have been Restart Queue. Chapter 11, AllocateResourceTag and RegisterForEventNotification Added technical information for these two OS routines.

Version Number	Description of Revision
Version 2.1c	Administrative Revision - Reformatted entire document to reflect Novell Technical Publications standards. Added Revision History section to document. Changed text citations of NPA to NWPA (NetWare Peripheral Architecture) to avoid confusion with the Network Professional Association (NPA). However, all API and parameter references using NPA were not changed at this time. Added new Control Flag to Table 3-1 (No_Freeze_Queue_Flag). Deleted Chapter 5 since material was also described elsewhere. Changed all subsequent chapter numbers and references to these chapter numbers to reflect deletion. Added NetWare Bus Interface (NBI) material and APIs. See Figure 2-1, Paragraph 4.2.1, and Chapter 7 for NBI related changes. Provided detailed description for the design of Software-Hot Replaceable HAMs in section 4.3.4. Added a description of the Elevator Queueing capabilities of NWPA. See section 4.3.9. Added two new Vendor-Pass Through APIs: NPA_HACB_Passthru() and NPA_CDM_Passthru() See Sections 4.3.10, 5.3.8, and Chapter 7 for details. Corrected descriptions of existing event flags and added 2 new event flags to *CDM_Inquiry()* to support End of Bus cases. See section 5.2.2 and Chapter 7 *CDM_Inquiry()* for details. Updated CDM requirements for Unload-time Deregistration. See section 5.2.6 for details. Updated DeviceInfoStruct and HamInfoStruct parameter lists. Added Product ID Option to Type parameter in NPAOptionStruct. Updated Case 0 and Case 1 scan requirements. Updated Chapter 10 OS Support Routines to describe currently implemented OS routines, including correcting the SetFlags() routine to a VOID from a LONG. Corrected references from .dsk output file to .ham output file in Appendix A. Changed IDE to IDE\ATA where applicable. Reformatted Appendix B into one table. Deleted Table 3-1 and replaced references to this table with a reference to Appendix B. Changed Table 3-2 , Table 3-3 and Table 3-4 (along with all text references to these tables) to Table 3-1, Table 3-2 and Table 3-3 respectively. Added Appendix C LDI/DDI Specification Supplement and Related Material. Deleted the Index from this revision.

Version Number	Description of Revision
Version 2.1d	Corrected typos, format errors, etc. in preparation for Novell Labs release of document. Added NPA_Get_Version_Number () API. Added Blocking flag option for NPA_Allocate_Memory() to Version 4.x NWPA. Replaced Figure 4-1 with update notice. Figure 4-1 will be updated for the next document release, as noted in paragraph 4.2.1 Updated HAM Device Queue State column in Appendix B to reflect addition of the No_Freeze_Queue_Flag option for CDMs. Updated DeviceInfoStruct parameter definitions to add SCSI Synchronous Information. Updated NPAOptionStruct parameter definititions. Deleted HAI_Get_Slot() and HAI_Get_Slot_Name() APIs to reflect changes in the NBI specification. Updated the description for NPA_Interrupt_Control(). Added 10 microsecond resolution note to NPA_Micro_Delay(). Added Thread Context information to In*x*, InBuff*x*, Out*x* and OutBuff*x* APIs. Changed the identifying prefix for NBI APIs from HAI_ to NPAB_ to separate them from the existing Host Adapter specific APIs. Updated the references to these APIs throughout the document to reflect this change. Re-sorted Chapter 7 to place the NPAB_ APIs in alphabetical order. Deleted the NPABusHandle parameter from all of the NPAB_ APIs. Corrected the return value types for CCmpB() and CCmpD() in Chapter 10 from BYTE to LONG. Added InvertLong() function definition to Chapter 10. Updated Draft portion of Appendix C to reflect changes in the LDI/DDI specification. Updated Appendix A to include a new link.def file example and to list the include files needed for HAMs and CDMs.