N9H20 NVT Loader Reference Guide

Document Information

Abstract	N9H20 NVT Loader Reference Guide
Apply to	N9H20 series

For additional information or questions, please contact: Nuvoton Technology Corporation.

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1 General Description

1.1 General Description

Generally, there are 3 stages to launch the user's application code as power on N9H20 system. These booting stages are IBR, NAND/SD Loader and NVT Loader. NVT loader acts as the 3rd stage to load kernel. NVT Loader is used to load Linux kernel to memory address 0 and make it running well. It can load kernel binary file from SD drive or NAND drive. As power on, IBR is the first execution code that detects the DRAM memory type and size and configures DRAM controller. After that, IBR will parse SD Loader or NAND Loader on SD card or NAND flash system area. If they exist, IBR will load the SD Loader or NAND Loader to SDRAM memory address depends on different chip type. After that, it passes the CPU control to SD Loader or NAND Loader. SD/NAND Loader sets the desired system clock, memory clock, the SDRAM timing and clock skew respectively. After setting the correct memory access timing, SD/NAND Loader will parse the system area of SD card or NAND device. Basically, the system area is used to store SD/NAND Loader image, logo image and NVT Loader. SD/NAND Loader will load the logo image and NVT Loader to the addresses that recorded in system area. After NVT Loader is loaded to the executed address, SD/NAND Loader passes the CPU control to NVT Loader. There is no code size constraint on NVT Loader. It provides more powerful functions, such as file system access, playback motion animation and USB mass-storage. NVT Loader loads next image from the user area of SD card or NAND flash. After NVT Loader loading the execution image, it passes the CPU control to the execution image.

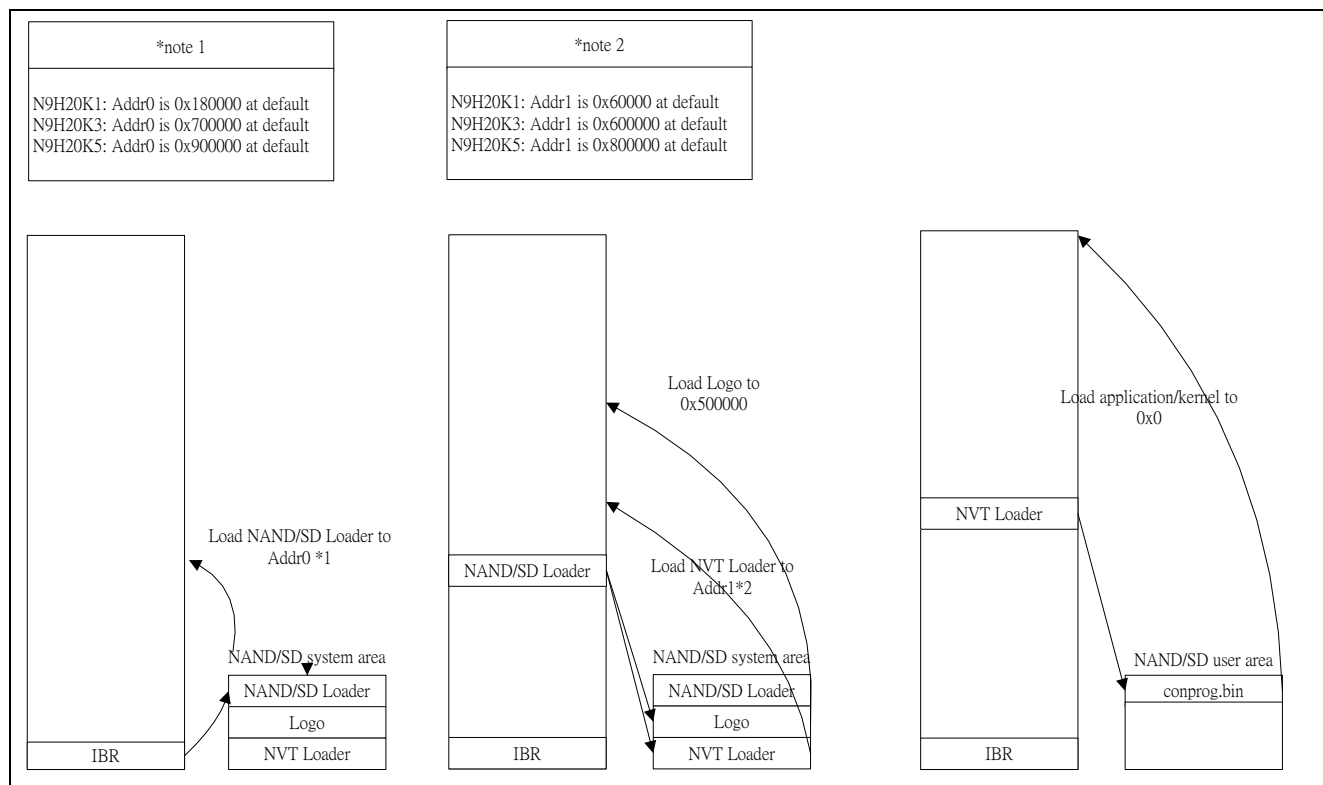The sequence for loading the kernel from power on was showed as following figure.

*note 1

N9H20K1: Addr0 is 0x180000 at default
N9H20K3: Addr0 is 0x700000 at default
N9H20K5: Addr0 is 0x900000 at default

*note 2

N9H20K1: Addr1 is 0x60000 at default
N9H20K3: Addr1 is 0x600000 at default
N9H20K5: Addr1 is 0x800000 at default

Load Logo to 0x500000

Load application/kernel to 0x0

Load NAND/SD Loader to Addr0 *1

NVT Loader

Load NVT Loader to Addr1*2

NAND/SD Loader

NAND/SD system area

NAND/SD Loader

Logo

NVT Loader

IBR

NAND/SD user area

conprog.bin

Figure 1-1: Sequence for loading kernel

2 Introduction

NVT Loader acts as the 3rd stage to load kernel or sample program. Due to it does not have code size limitation, NVT Loader could provide more features than SD/NAND Loader.

2.1 Features

- Supports FAT file system on NAND flash or external SD card.

- Supports USBD mass storage connected with PC.

- Supports AVI playback

2.2 Execution Flow

There are two mainly branches to load kernel from on board NAND flash or external SD card. The following figure shows the control flow of NVT Loader.
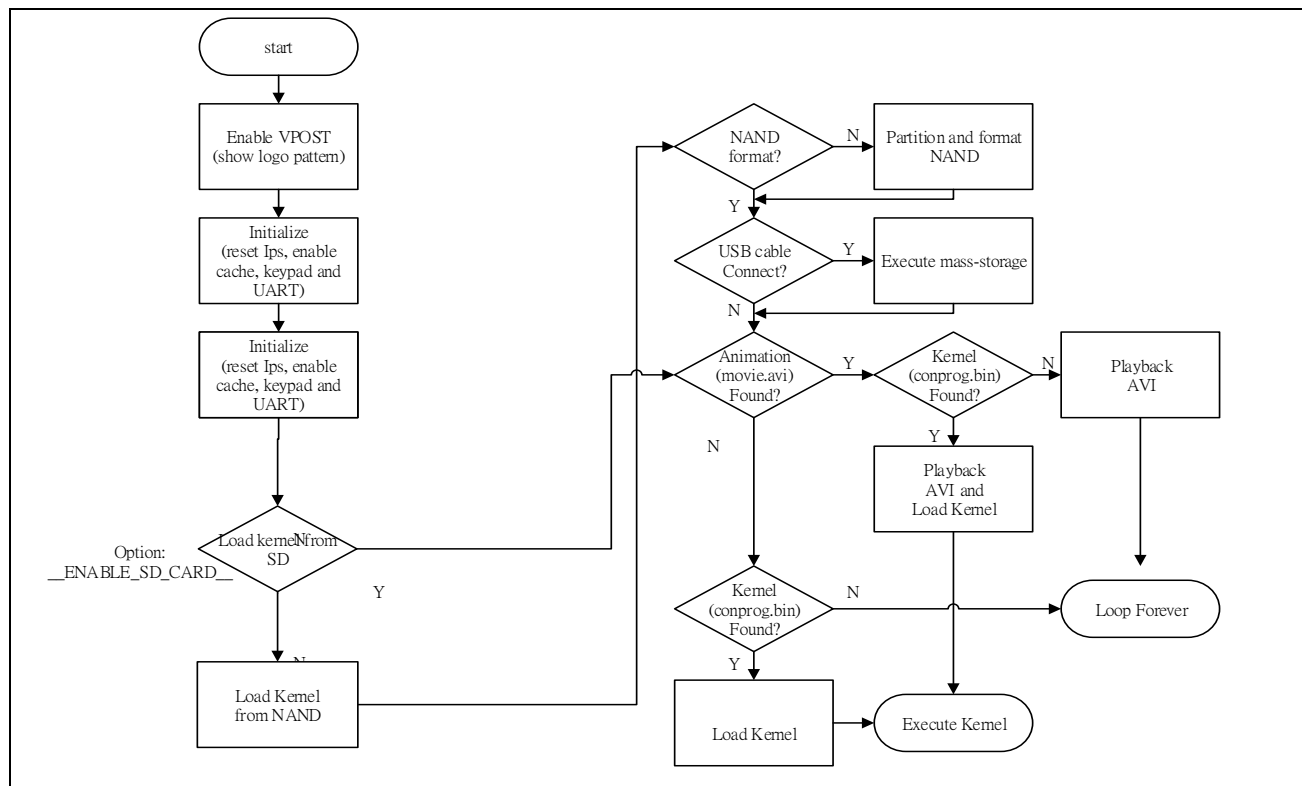

Figure 2-1: Execution Flow

NVT Loader follows following steps to update files or launch next image.

1. Initialize system and detect battery level. If the detected battery voltage is lower than the specified level, shut down the system immediately.
2. Initialize panel if necessary. The frame buffer address always fixed at address 0x500000. The address follows Linux driver's setting to avoid flash or un-continuous symptom as starting up Linux kernel.\
3. Mount SD or NAND device. If it is unknown device, partition and format the device.
4. Detect USB cable plug in or not. If USB cable plug in, run mass-storage function. Then user can update image or AVI file to the root directory of disk label "SD1-1" or "NAND1-1" through PC. After update image done, user can plug out the USB cable. NVT Loader will disable mass-storage function and enter step 6.
5. Play AVI file with file name "movie.avi" if the file exists.
6. Load next image with file name "conprog.bin" if the file exists. After this action done, pass the CPU control to next image.

2.3 Memory Map

Scatter description loading file describes the memory map in load and execution view. NVT Loader should be loaded to address 0x600000 or 0x800000 dependent on N9H20 series by using different Scatter file. The following table and figure show the execution view of Loader and NVT Loader.

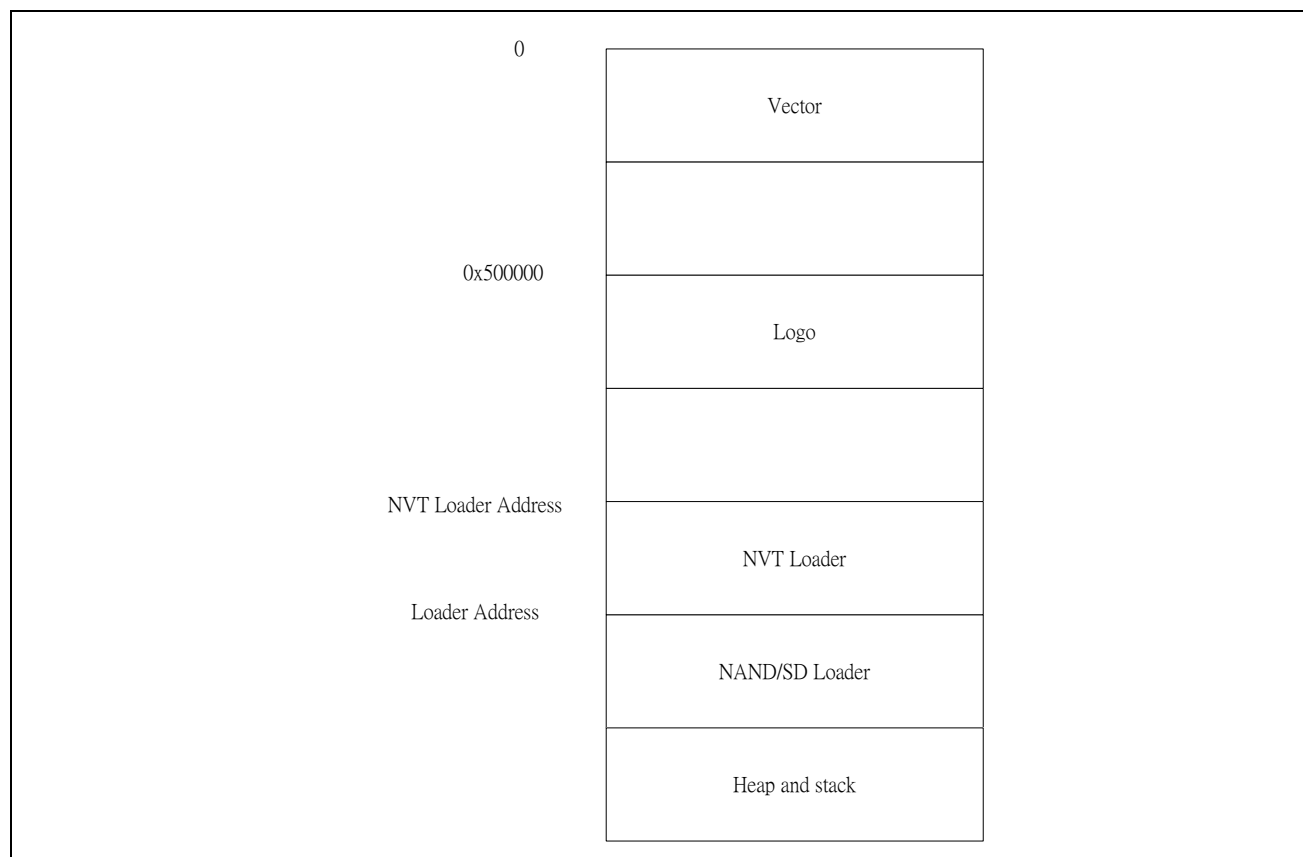|	SD/NAND Loader Address	NVT Loader Address	Logo
N9H20K1	0x180000	Undefined	Undefined
N9H20K3	0x700000	0x600000	0x500000
N9H20K5	0x900000	0x800000	0x500000

Table 2-1: Execution address for vary chip type

Figure 2-2: NVT-Loader Execution View

Revision History

Date	Revision	Description
2021.06.21	1.10	Revision
2018.05.02	1.00	Initially issued.

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