

NUVOTON USB Protocol in Linux

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	The sample code implements the ISP protocol with USB interface on Linux platform, and provides the setup step and using process.	
ISP FW Version	Nano100B_Series_BSP_CMSIS_v3.02.002	
Hardware	NT-Nano100K	

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1 Function Description

1.1 Introduction

The ISP (In System Programing) is a technology that enables target chip to be directly updated by the system. The target chip runs the boot/loader code of LDROM through the peripheral interface such as USB/UART/SPI/I²C/RS-485/CAN... to update the internal APROM, Data Flash and User Configuration Word.

This sample code implements the ISP sample program with USB as the interface on the Linux platform, and provides the usage process and steps.

1.2 ISP Protocol

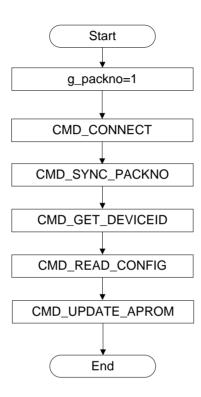
ISP packet is 64 byte fixed regardless of packet type. The ISP supported commands are listed as below.

Command	Command Code	ACK	Command Description
CMD_UPDATE_APROM	0x000000A0	Yes	Within the range 0~MAX_APROM_SIZE, program APROM from address user specified.
CMD_READ_CONFIG	0x000000A2	Yes	Get Config0 and Config1
CMD_SYNC_PACKNO	0x000000A4	Yes	Synchronize packet number with NuMicro™ MCU microcontrollers before a valid command send.
CMD_GET_FWVER	0x000000A6	Yes	Get version information of ISP firmware.
CMD_GET_DEVICEID	0x000000B1	Yes	Get chip product ID.
CMD_RUN_APROM	0x000000AB	No	Instruct ISP to boot from APROM.
CMD_RUN_LDROM	0x000000AC	No	Instruct ISP to boot from LDROM.
CMD_RESET	0x000000AD	No	Instruct ISP to reboot.
CMD_WRITE_CHECKSUM	0x000000C9	Yes	Instruct ISP to write application length and checksum in APROM to the last 8 bytes of APROM.
CMD_GET_FLASHMODE	0x000000CA	Yes	Get boot selection.



2 Commands flow

This flow is for command only. If user needs to update APROM, the following commands need to issue





3 Code Description

```
//the ISP flow, show to update the APROM in target chip
BOOL CmdUpdateAprom(int flag)
    BOOL Result;
    unsigned int devid, config[2], i, mode, j;
    unsigned long cmdData, startaddr;
    unsigned short get_cksum;
    unsigned char Buff[256];
    unsigned int s1;
                    //taget bin file pointer
    FILE *fp;
    g_packno = 1;
    //synchronize packet number with ISP.
    Result = CmdSyncPackno(flag);
    if (Result == FALSE)
    {
        dbg_printf("send Sync Packno cmd fail\n");
        goto out1;
    }
    //This command is used to get boot selection (BS) bit.
    //If boot selection is APROM, the mode of returned is equal to 1,
    //Otherwise, if boot selection is LDROM, the mode of returned is equal to 2.
    Result = CmdRunCmd(CMD_GET_FLASHMODE, &mode);
    if (mode != LDROM_MODE)
        dbg_printf("fail\n");
        goto out1;
    }
    else
    {
        dbg_printf("ok\n");
    }
    //get product ID
    CmdGetDeviceID(flag, &devid);
    printf("DeviceID: 0x%x\n", devid);
```



```
//get config bit
CmdGetConfig(flag, config);
dbg_printf("config0: 0x%x\n", config[0]);
dbg_printf("config1: 0x%x\n", config[1]);
//open bin file for APROM
if ((fp = fopen("//home//tester//rtemp//t1.bin", "rb")) == NULL)
    printf("APROM FILE OPEN FALSE\n\r");
    Result = FALSE;
    goto out1;
}
//get BIN file size
fseek(fp, 0, SEEK_END);
file_totallen = ftell(fp);
fseek(fp, 0, SEEK_SET);
//first isp package
memset(sendbuf, 0, PACKET SIZE);
cmdData = CMD_UPDATE_APROM;
                                       //CMD_UPDATE_APROM Command
WordsCpy(sendbuf + 0, &cmdData, 4);
WordsCpy(sendbuf + 4, &g_packno, 4);
g_packno++;
startaddr = 0;
WordsCpy(sendbuf + 8, &startaddr, 4);  //APROM start address
WordsCpy(sendbuf + 12, &file totallen, 4); //APROM file size
fread(&sendbuf[16], sizeof(char), 48, fp);
//send CMD_UPDATE_APROM
Result = SendData();
if (Result == FALSE)
    goto out1;
//for erase time delay using, other bus need it.
sleep(2);
Result = RcvData(20);
if (Result == FALSE)
```



```
goto out1;
//Send other BIN file data in ISP package
for (i = 48; i < file_totallen; i = i + 56)</pre>
{
    dbg_printf("i=%d \n\r", i);
    //clear send buffer
    for (j = 0; j < 64; j++)
         sendbuf[j] = 0;
    }
    WordsCpy(sendbuf + 4, &g_packno, 4);
    g_packno++;
    if ((file_totallen - i) > 56)
         fread(&sendbuf[8], sizeof(char), 56, fp);
         Result = SendData();
         if (Result == FALSE)
             goto out1;
         Result = RcvData(2);
         if (Result == FALSE)
             goto out1;
    }
    else
    {
         fread(&sendbuf[8], sizeof(char), file totallen - i, fp);
         Result = SendData();
         if (Result == FALSE)
             goto out1;
         Result = RcvData(2);
         if (Result == FALSE)
             goto out1;
         #if 0
         WordsCpy(&get_cksum, rcvbuf + 8, 2);
         if ((file_checksum & 0xffff) != get_cksum)
         {
             Result = FALSE;
             goto out1;
```



```
}
    #endif
}
out1:
    return Result;
}
```



4 Software and Hardware Environment

Software Environment

- BSP version
 - ◆ Nano100B_Series_BSP_CMSIS_v3.02.002
 - ♦ ISP source code path:
 - Nano100B_Series_BSP_CMSIS_v3.02.002\SampleCode\ISP\ISP_HID
- IDE version
 - ◆ Keil uVersion 5.26
- Config bit must setting boot in LDROM

Hardware Environment

- Circuit components
 - ♦ NT-Nano100K
 - The Detect Pin (PB15) must keep low state for ISP upgrade.



5 Directory Information

Source file of example code



6 How to Execute Example Code

Please install libusb according to the following instructions in the Linux environment. sudo apt-get install libusb-dev

```
jc@jc-VirtualBox:~/sharefolder/Debug$ sudo apt-get install libusb-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
libusb-dev is already the newest version (2:0.1.12-28).
0 upgraded, 0 newly installed, 0 to remove and 198 not upgraded.
```

sudo apt-get install libudev-dev

```
jc@jc-VirtualBox:~/sharefolder/Debug$ sudo apt-get install libudev-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
libudev-dev is already the newest version (229-4ubuntu21.2).
0 upgraded, 0 newly installed, 0 to remove and 198 not upgraded.
```

Next, execute "make" command under \Linux_USB_ISP, and generate a debug folder after compiling.

```
jc@jc-VirtualBox:~/sharefolder$ make
mkdir Debug
g++ -ggdb -ffunction-sections -00 -I/usr/local/include/libusb-1.0 -DDEBUG=1 -I/u
c LinuxProject1.cpp -o Debug/LinuxProject1.o -MD -MF Debug/LinuxProject1.dep
g++ -o Debug/LinuxProject1 -Wl,-gc-sections -L/usr/local/lib -Wl,--start-group [
usb -Wl,--rpath='$ORIGIN' -lusb-1.0 -Wl,--end-group
Please execute under \Linux_USB_ISP\debug
Sudo ./LinuxProject1 user_binfile.bin
User_binfile.bin is the user's bin file.
After the _execution, the USB ISP is burn the _bin file to APROM in target chip.
jc@jc-VirtualBox:~/sharefolder/Debug$ ./LinuxProject1 ./user_file.bin
Vendor/Product ID: 80ee:0021
Vendor/Product ID: 1d6b:0001
```



7 Revision History

Date	Revision	Description
Oct. 1, 2019	1.00	1. Initially issued.



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