M451 Driver DM9051 with FreeRTOS

Example Code Introduction for 32-bit NuMicro®Family

Information

Application	This sample code uses M451 to drive DM9051 with FreeRTOS
BSP Version	M451BSP_v3.01.003
Hardware	NuTiny-SDK-M451V

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1 Function Description

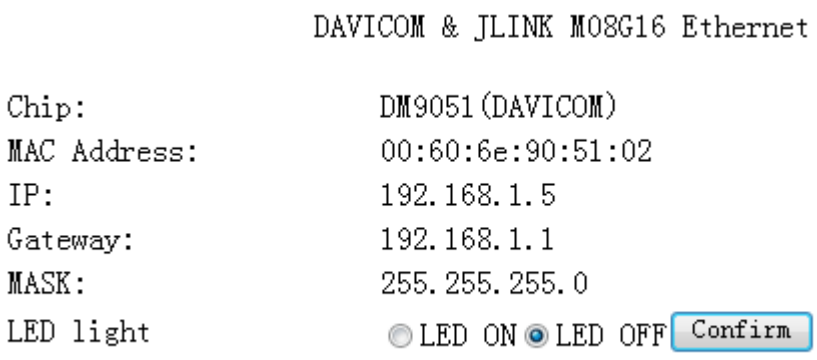
1.1 Introduction

This sample code uses M451 to drive DM9051 though SPI interface to achieve uIP/httpd function and flash led via PC9 in FreeRTOS.

1.2 Principle

The DM9051 is a fully integrated and cost-effective low pin count single chip Fast Ethernet controller with a Serial Peripheral Interface (SPI), a 10/100M PHY and MAC, and 16K-byte SRAM. It is designed with low power and high performance process interface that supports 3.3V with 5V IO tolerance.
The PHY of the DM9051 can interface to the UTP3, 4, 5 in 10Base-T and UTP5 in 100Base-TX with HP Auto-MDIX. It is fully compliant with the IEEE 802.3u Spec. Its Auto-Negotiation function will automatically configure the DM9051 to take the maximum advantage of its 10M or 100M abilities.
The DM9051 supports IEEE 802.3az in PHY and MAC to save power consumption when Ethernet is idle. The IEEE 802.3x Full-Duplex flow control and Half-Duplex back-pressure functions are also supported to avoid Ethernet packet loss with link partner.
The slave SPI interface is designed to support SPI clock mode 0 and 3 that are compatible with the master SPI interface of CPU. The clock speed can be up to 50Mhz to co-operate with highest throughput master SPI. The SPI burst command format is code-effective to minimize the command overhead in access to DM9051 internal registers and packet data in memory.

1.3 Demo Result



2 Code Description

Initialize DM9051：

```
int32_t DM9051_INIT()
{
    int i, oft, lnk;
    uint32_t value=0;
    DM9051_Configuration();
  /* identfy DM9051   */
  value |= DM9051_Read_Reg(DM9000_VIDH) << 8;
  value |= DM9051_Read_Reg(DM9000_PIDL) << 16;
  value |= DM9051_Read_Reg(DM9000_PIDH) << 24;
  value |= DM9051_Read_Reg(DM9000_VIDL);
  . . . . . .
}
```

uIP initialize and IP address setup：

```
void vuIP_Task(void *pvParameters)
{
    . . . . . .
    uip_init();
    uip_arp_init(); // Clear arp table.
#ifndef __DHCPC_H__
    // setup the dhcp renew timer the make the first request
    timer_set(&dhcp_timer, CLOCK_SECOND * 600);
    dhcpc_init(&uip_ethaddr, 6);
#else //Fixed IP set
    uip_ipaddr(ipaddr, 192, 168, 1, 5);   //Host IP address
    uip_sethostaddr(ipaddr);
    uip_ipaddr(ipaddr, 192, 168, 1, 1);   //Default Gateway
    uip_setdraddr(ipaddr);
    uip_ipaddr(ipaddr, 255, 255, 255, 0); //Network Mask
    uip_setnetmask(ipaddr);
        . . . . . .
#endif
    httpd_init();
}
```

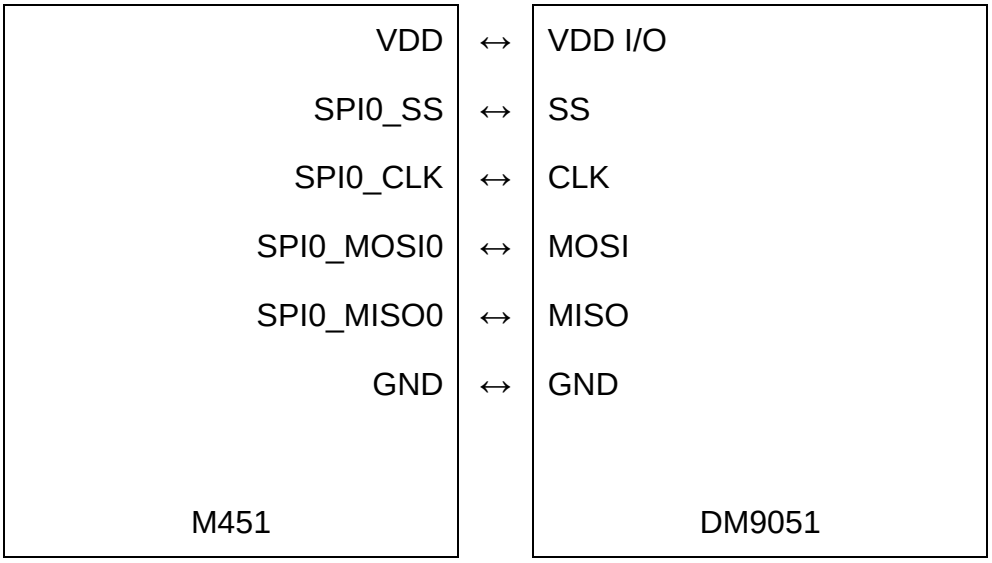
Build two tasks in FreeRTOS：

```
int main( void )
{
  /* Init System */
  prvSetupHardware();
 /* create task */
 xTaskCreate( vuIP_Task,  "uIP", configMINIMAL_STACK_SIZE * 3, NULL, tskIDLE_PRIORITY + 4, NULL );
 xTaskCreate( vLEDTask,  "LED", configMINIMAL_STACK_SIZE, NULL, tskIDLE_PRIORITY + 1, NULL );
 printf("FreeRTOS is starting ...\n");
  /* start OS */
  vTaskStartScheduler();
  for(;;);
}
```

3 Software and Hardware Environment

- **Software Environment**
  - BSP Version
    - M451BSP_v3.01.003
  - IDE Version
    - Keil uVersion4.74
- **Hardware Environment**
  - Circuit Components
    - NuTiny-SDK-M451V
    - DM9051
  - Diagram

M451driver DM9051 though SPI interface.



4 Directory Information

EC_M451_SPI_DM9051_uIP_FreeRTOS_V1.00	
Library	Sample code header and source files
CMSIS	Cortex®Microcontroller Software Interface Standard (CMSIS) V4.5.0 definitions by ARM® Corp.
Device	CMSIS compliant device header file
StdDriver	All peripheral driver header and source files
SampleCode	
ExampleCode	Source file of example code

5 How to Execute Example Code

1. According to Directory Information, enter the KEIL folder in path ExampleCode and double click “M451_SPI_DM9051_uIP_FreeRTOS.uvproj”
2. Enter the compilation mode interface
   a. Compilation
   b. Download code to Flash
   c. Enter/leave debugging mode
3. Enter the debugging mode interface
   a. Execution code

6 Revision History

Date	Revision	Description
Apr. 24, 2019	1.00	1. Initially issued.

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