M480 uIP TCP Client

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	An example of TCP client using uIP TCP/IP stack
BSP Version	M480 Series BSP CMSIS v3.03.001
Hardware	NuMaker-PFM-M487 Ver 3.0

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1 Function Description

1.1 Introduction

NuMicro® M480 series support 10/100M Ethernet controller. M480 BSP includes EMAC sample programs based on TCP/IP open-source projects. Sample program bsp\SampleCode\StdDriver\EMAC_lwiperf shows the example TCP/IP framework using lwIP, a lightweight TCP/IP stack. Sample program bsp\SampleCode\StdDriver\EMAC_uIP_httpd and EMAC_uIP_telnetd are Http daemon and Telnet daemon using uIP, a micro TCP/IP stack.

Using uIP TCP/IP stack, the example code EC_M480_uIP_TCP_Client_V1.00 shows how to create a TCP connection and send data.

1.2 Principle

This example code shows how to use uIP TCP/IP stack to create a TCP connection on M480 platform. This example uses fixed IP setting. According to the physical network environment, users may have to modify the IP address of local host and default router.

1.3 Demo Result

The following text is the UART message log of M480 NuMaker board running this example code.

```
M480 uIP_TCP_Client example code start
tcp client connected !
tcp client closed !
```

2 Code Description

In main.c, the following code initialize EMAC multiple function pins and hardware.

```
/* Enable EMAC engine clock */
CLK_EnableModuleClock(EMAC_MODULE);

// Configure MDC clock rate to HCLK/(127 + 1)=1.5 MHz if system is running at 192 MHz
CLK_SetModuleClock(EMAC_MODULE, 0, CLK_CLKDIV3_EMAC(127));

// Configure RMII pins
SYS->GPA_MFPL |= SYS_GPA_MFPL_PA6MFP_EMAC_RMII_RXERR |
                 SYS_GPA_MFPL_PA7MFP_EMAC_RMII_CRSDV;
SYS->GPC_MFPL |= SYS_GPC_MFPL_PC6MFP_EMAC_RMII_RXD1 |
                 SYS_GPC_MFPL_PC7MFP_EMAC_RMII_RXD0;
SYS->GPC_MFPH |= SYS_GPC_MFPH_PC8MFP_EMAC_RMII_REFCLK;
SYS->GPE_MFPH |= SYS_GPE_MFPH_PE8MFP_EMAC_RMII_MDC |
                 SYS_GPE_MFPH_PE9MFP_EMAC_RMII_MDIO |
                 SYS_GPE_MFPH_PE10MFP_EMAC_RMII_TXD0 |
                 SYS_GPE_MFPH_PE11MFP_EMAC_RMII_TXD1 |
                 SYS_GPE_MFPH_PE12MFP_EMAC_RMII_TXEN;

// Enable high slew rate on all RMII TX output pins
PE->SLEWCTL = (GPIO_SLEWCTL_HIGH << GPIO_SLEWCTL_HSREN10_Pos) |
              (GPIO_SLEWCTL_HIGH << GPIO_SLEWCTL_HSREN11_Pos) |
              (GPIO_SLEWCTL_HIGH << GPIO_SLEWCTL_HSREN12_Pos);


// Select RMII interface by default
EMAC_Open(ethaddr.addr);         // Initialize EMAC controller and auto-negotiate PHY
NVIC_EnableIRQ(EMAC_TX_IRQn);
NVIC_EnableIRQ(EMAC_RX_IRQn);
EMAC_ENABLE_RX();
EMAC_ENABLE_TX();
```

In main.c, the following code configures network environment and initialize uIP TCP/IP stack.

```
/* set IP address local host */
uip_ipaddr(ipaddr, 192, 168, 0, 2);
uip_sethostaddr(ipaddr);
```

```
    /* set IP address of default router */
    uip_ipaddr(ipaddr, 192, 168, 0, 1);
    uip_setdraddr(ipaddr);

    /* set net mask */
    uip_ipaddr(ipaddr, 255, 255, 255, 0);
    uip_setnetmask(ipaddr);

    /* set MAC address */
    uip_setethaddr(ethaddr);

    /* initalize TCP client and LEDs */
    tcp_client_init();
```

In tcp_client.c, the following code creates a TCP connection to 192.168.0.2 port 80.

```
    void tcp_client_init(void)
    {
        uip_ipaddr_t ipaddr;

        /* Connect to IP address 192.168.0.2 port 80 */
        uip_ipaddr(ipaddr, 192, 168, 0, 2);
        uip_connect(ipaddr, HTONS(80));
    }

    void tcp_client_appcall(void)
    {
        if (uip_connected())   /* TCP connection created */
        {
            printf("tcp client connected !\n");
            /* Send data to TCP server side */
            uip_send("hello server !", strlen("hello server !"));
        }
        else if (uip_newdata())
        {
            uip_send(uip_appdata, uip_len);
        }
        else if (uip_closed())/* TCP connection closed */
        {
            printf("tcp client closed !\n");
```

```
        }
    }
```

3 Software and Hardware Environment

Software Environment

- BSP version
  - M480 Series BSP CMSIS v3.03.001
- IDE version
  - Keil uVersion 5.26

Hardware Environment

- Circuit components
  - NuMaker-FPM-M487
  - Ethernet jack (CN1)
- Diagram

M480		Ethernet jack (CN1)
PA.6	←	RMII_RXERR
PA.7	←	RMII_CRSDV
PC.6	←	RMII_RXD1
PC.7	←	RMII_RXD0
PC.8	←	RMII_REFCLK
PE.8	→	RMII_MDC
PE.9	↔	RMII_MDIO
PE.10	→	RMII_TXD0
PE.11	→	RMII_TXD1
PE.12	→	RMII_TXEN

4 Directory Information

- EC_M480_uIP_TCP_Client_V1.00
  - Library — Sample code header and source files
    - CMSIS — Cortex® Microcontroller Software Interface Standard (CMSIS) by Arm® Corp.
    - Device — CMSIS compliant device header file
    - StdDriver — All peripheral driver header and source files
  - SampleCode
    - ExampleCode — Source file of example code
  - ThirdParty
    - uip-0.9 — uIP is a very small implementation of the TCP/IP stack that is written by Adam Dunkels <adam@sics.se>. More information can be obtained from the uIP homepage at http://www.sics.se/~adam/uip/

5 How to Execute Example Code

1. Browsing into sample code folder by 4.Directory Information and double click uIP_TCP_Client.uvproj.
2. Enter Keil compile mode
   a. Build
   b. Download
   c. Start/Stop debug session
3. Enter debug mode
   a. Run

6 Revision History

Date	Revision	Description
June 18, 2019	1.00	1. Initially issued.

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