# Network communication protocol for SNOWLeoSDR platform

| 版本 | 日期 | 备注 |
|---|---|---|
| V1.0 | 2013/12 | Initial version |
| V1.1 | 2014/5 | Add SNOWLeoSDR support |
| V1.2 | 2014/7 | Change freq configure mode |

## 1、Control Word Definitions

```
#define  PACKAGE_HEAD                    0xF0
#define  DMA_FILE_TX                     0x10
#define  DMA_FILE_RX                     0x11
#define  DMA_START_ADC                   0x12
#define  DMA_START_DAC                   0x13
~~#define  DMA_STOP_ADC                    0x14~~
~~#define  DMA_STOP_DAC                    0x15~~
#define  DMA_CONNECT_DISABLE             0x16
#define  SDR_RF_CTRL_TX_FREQ             0x17
#define  SDR_RF_CTRL_RX_FREQ             0x18
#define  SDR_RF_CTRL_TX_VGA              0x19
#define  SDR_RF_CTRL_RX_VGA              0x20
~~#define  SDR_RF_CTRL_TEST_SEQ            0x21~~

#define  SDR_CUSTOM_CMD                  0x22
~~#define  SDR_RF_CTRL_TEST_SEQ            0x21~~
#define SDR_RF_CTRL_TX_DC                0x21
```

## 2、Network Command Format

Network command length is 8 bytes,command format as follows

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| packet head | Control Word | Data | Data | Data | Data | Data | Data |

## 3、Network Command Details

DMA_FILE_TX ---- PC will send a file to snowleosdr, the file size is SIZE Kbytes

MSB LSB

| | | | | |
|---|---|---|---|---|
| F0 | 10 | 0 | MODE | SIZE(in Kbyte) |

MODE: Receive File Mode: "1" Single, "0"Loop default:1

DMA_FILE_RX ----PC will recv a file from snowleosdr, the file size is SIZE Kbytes

MSB LSB

| | | | | |
|---|---|---|---|---|
| F0 | 11 | 0 | 0 | SIZE(in Kbyte) |

DMA_START_ADC ---- Start ADC channel

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 |

DMA_START_DAC ---- Start DAC channel

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 |

~~DMA_STOP_ADC ----Close ADC channel~~

~~MSB LSB~~

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ~~F0~~ | ~~14~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ |

~~DMA_STOP_DAC ----Close DAC channel~~

~~MSB LSB~~

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ~~F0~~ | ~~15~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ |

DMA_CONNECT_DISABLE ---- Disconnect pc and snowleosdr's network connection

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 |

SDR_RF_CTRL_TX_FREQ ----Snowleosdr's TX RF configuration

MSB LSB

| | | | | |
|---|---|---|---|---|
| F0 | 17 | 0 | 0 | Frequency (Hz) |

SDR_RF_CTRL_RX_FREQ ---- Snowleosdr's RX RF configuration

MSB LSB

| | | | | |
|---|---|---|---|---|
| F0 | 18 | 0 | 0 | Frequency (Hz) |

SDR_RF_CTRL_TX_VGA ---- Snowleosdr's TX Gain configuration

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 19 | VGA2 | VGA1 | PA | GPIOSEL | 0 | 0 |

~~VGA: 8'd0~8'd63,对应 0~31.5dB~~

SDR_RF_CTRL_RX_VGA ---- Snowleosdr's RX Gain configuration

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 20 | LNA | VGA | GPIOSEL | 0 | 0 | 0 |

SDR_RF_CTRL_SET_SAMPLE ----Configure I2C clock

MSB LSB

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 21 | 0 | MODE | 0 | 0 | 0 | 0 |

**MODE：0:3.25MHz 1:1.2288*4MHz 2:3.2MHz 2:3.84*4=15.36MHz 4:40MHz**

**range:0~4**

SDR_CUSTOM_CMD ----Custom command(for read or write LMS6002's register)

MSB LSB

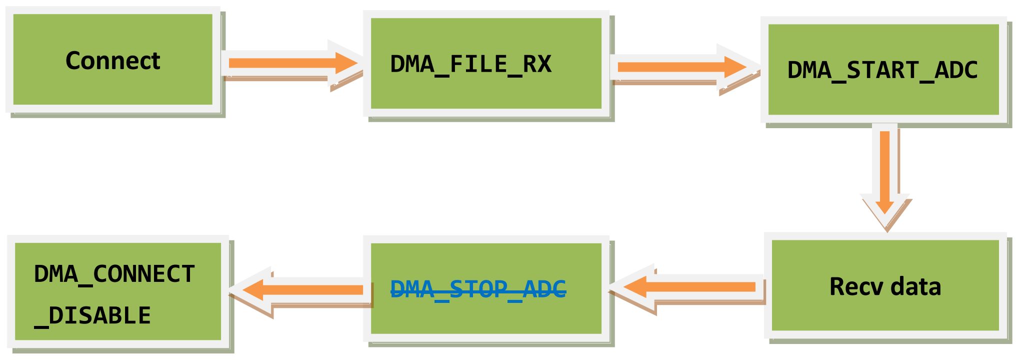
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F0 | 22 | RDWR | SIZE | 0 | 0 | 0 | 0 |

**RDWR: 0:write reg 1: read reg**

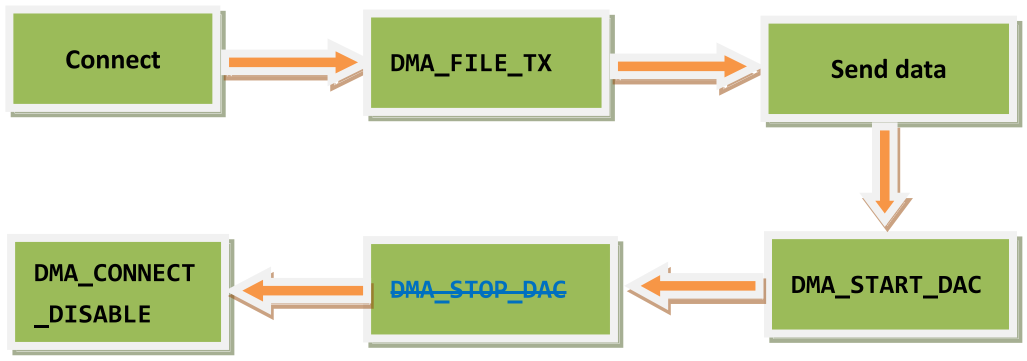
**SIZE:number of reg *2（reg+data）for write; 读 number of reg for read In Byte**

## 5、Operation Flow

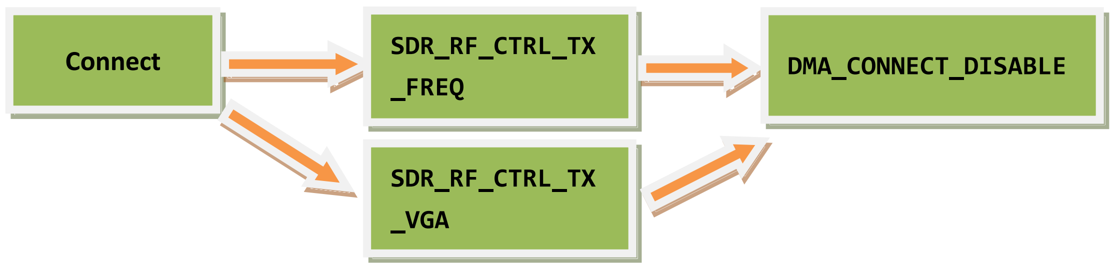
### ADC



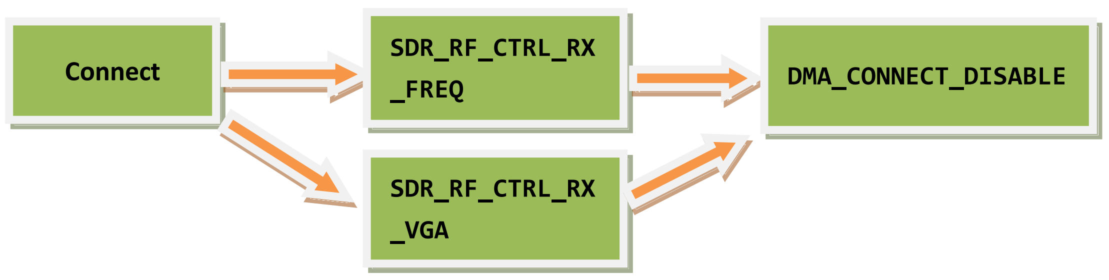
### DAC



### TX RF Configure



## RX RF Configure



## Sample Code

### Configure TX RF

### C code

```
int set_freq(unsigned int d_tx_freq)
{
        unsigned int cmd_buf[2]={0,0};
        d_tx_freq = d_tx_freq & 0x000000FF;
        cmd_buf[0] = 0xF0170000|(d_tx_freq<<8); /*set tx freq*/
        if(send(sockfd, cmd_buf, sizeof(cmd_buf), 0) > 0)
                return 1;
        else
                return -1;
}
```

### Matlab code

```
t = tcpip('192.168.1.10', 8000);
set(t,'InputBufferSize',64*1024);
set(t,'OutputBufferSize',16*1024);
fopen(t);
```

```
%% send rx freq
test_seq=[0 2 hex2dec('17') hex2dec('f0') 0 0 0 0];
fwrite(t,test_seq,'uint8');
```

## Recv data from network

### C code

```
#define RX_SAMPLES_NUM    8*1024
void *recv_sample(void *)
{
        unsigned int cmd_buf[2]={0,0};
        int len = 0, i = 0;
        cmd_buf[0] = 0xF0110000; /*set rx size*/
        cmd_buf[1] = 0x00000008; /*recv 8KBytes */
        send(sockfd, cmd_buf, sizeof(cmd_buf), 0);

        cmd_buf[0] = 0xF0120000;    //start adc
        send(sockfd, cmd_buf, sizeof(cmd_buf), 0);
        do {
                len += recv(sockfd, data+len, RX_SAMPLES_NUM-len, 0);
        }while(len != RX_SAMPLES_NUM);

        cmd_buf[0] = 0xF0140000; /*stop adc*/
        send(sockfd, cmd_buf, sizeof(cmd_buf), 0);
        return NULL;
}
```

### Matlab code

```
%%create tcpip connection
link = tcpip('192.168.1.10', 8000);
set(link,'InputBufferSize',256*1024);
set(link,'OutputBufferSize',16*1024);
fopen(link);
%% send rx size cmd, recv 8KBytes
rx_size=[0 0 hex2dec('11') hex2dec('f0') 8 0 0 0];
```

```
fwrite(link,rx_size,'uint8');
%% send adc start cmd
adc_start=[0 0 hex2dec('12') hex2dec('f0') 0 0 0 0];
fwrite(link,adc_start,'uint8');
%%recv data
data = fread(link,8*1024,'uint8');
```

## Send data to network

### C code

```
int send_sample(unsigned int d_tx_mode)
{
        unsigned int cmd_buf[2]={0,0};
        int len = 0, i = 0, nbyte = 0;

        cmd_buf[0] = 0xF0100000|(d_tx_mode&0x000000FF); //set tx size
        cmd_buf[1] = TX_SAMPLES_NUM/1024;
        send(sockfd, cmd_buf, sizeof(cmd_buf), 0);
                                usleep(10000);
        send(sockfd, read_buffer, TX_SAMPLES_NUM, 0);

        return NULL;
}
```

### Matlab code

```
fid1=fopen('F:\matlab_work\tone_16bit.dat','r');
txdata=fread(fid1,'int16');
%% Data Rearrangement
txd1=(txdata<0)*65536+txdata;
txd2=dec2hex(txd1,4);
txd3=txd2(:,1:2);
txd4=txd2(:,3:4);
txd5=hex2dec(txd3);
txd6=hex2dec(txd4);
```

```
txd7=zeros(length(txd6)*2,1);
txd7(1:2:end)=txd6;
txd7(2:2:end)=txd5;
fclose('all');
t = tcpip('192.168.1.10', 8000);
set(t,'InputBufferSize',16*1024);
set(t,'OutputBufferSize',64*1024);
fopen(t);
%% send file tx cmd， send 16Kbytes data
dac_stop=[0 0 hex2dec('10') hex2dec('f0') 16 0 0 0];
fwrite(t,dac_stop,'uint8');
%% send data.
fwrite(t,txd7,'uint8');
%% send dac start cmd
dac_start=[0 0 hex2dec('13') hex2dec('f0') 0 0 0 0];
fwrite(t,dac_start,'uint8');
```

Note: The above codes are the reference code, part of the C code is Pseudo-code