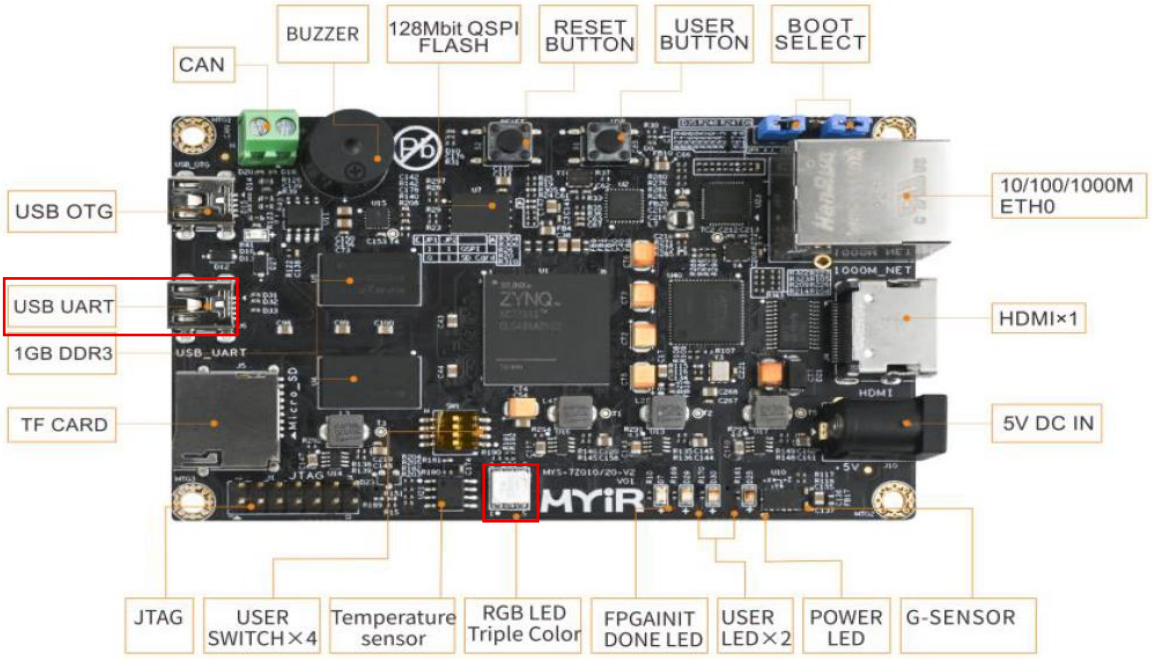
Getting started with OCB UT1 / ZTURN-V2



1- Connect USB-UART to USB port on a PC. This will power on the board and you don't need to connect the external 5V PS.
2- Configure the USB port to be UART COM port with the following settings:
    - 115200 bit/s, 8-bits, no parity, 1 start, 1 stop
3- Connect a terminal on the configured COM port and reboot the board, the system will print the following and is listening for command interpreter client (CI) to connect on TCP port #50000 and DAQ client on TCP port #50001 :

```
-----------------------------------
FreeRTOS Unit Test 1 (Single SIM FEB, ping memory DMA transfer)

COM TelnetServer CTOR:Creating 2 Clients Task
COM CTOR:Creating Main Task ...
COM MainTask CTOR:Creating Network Task ...
COM NetworkTask CTOR:Creating Emac Input Task ...
MAIN:DAQ Sim mode
MAIN:Add commands to CI List with access
MAIN:Starting tasks scheduler...
MT:Main Task started
MT:Phy Reset...
MT:Lwip init...
MT:Starting Network Task...
NT:Network Task started
NT: MAC address : 8C-1F-64-D8-80-0A
WARNING: Not a Marvell or TI or Realtek or Xilinx PCS PMA Ethernet PHY or ADI Ethernet PHY. Please verify the initializat
Start PHY autonegotiation
Waiting for PHY to complete autonegotiation.
autonegotiation complete
Using default Speed from design
link speed for phy address 7: 1000
NT:Starting Emac Input Task...
EI:Emac Input Task started
NT:Starting DHCP client...
NT:Starting DHCP client loop...
MT:DHCP request success
 Board IP : 10.195.49.227
 Netmask  : 255.255.248.0
 Gateway  : 10.195.48.1
TLS:Resume Clients Task
TLC0:'DAQ' Telnet Client Task started
TLC0:Starting listening loop on port #50001
TLC1:'CI' Telnet Client Task started
TLC1:Starting listening loop on port #50000
```

MAC and IP addresses can be seen on the screen.

4- Connect the 2 clients, this will show:

```
TLC0:'DAQ' Telnet Client Task started
TLC0:Starting listening loop on port #50001
TLC1:'CI' Telnet Client Task started
TLC1:Starting listening loop on port #50000
TLC0:'DAQ' Client connected on port #50001: Board IP=10.194.51.80
TLC1:'CI' Client connected on port #50000: Board IP=10.194.51.80
```

5- Disconnect the 2 clients, this will show:

```
TLC0:'DAQ' Telnet Client Task started
TLC0:Starting listening loop on port #50001
TLC1:'CI' Telnet Client Task started
TLC1:Starting listening loop on port #50000
TLC0:'DAQ' Client connected on port #50001: Board IP=10.194.51.80
TLC1:'CI' Client connected on port #50000: Board IP=10.194.51.80
TLC0:'DAQ' Client disconnected on port #50001
TLC1:'CI' Client disconnected on port #50000
```

Warning: CI client disconnection is detected automatically by the OCB but DAQ client disconnection is detected only during a DAQ transmission, meaning an abnormal situation since disconnection should be done when the readout is disabled.
To disconnect properly for DAQ and CI, one must:

a- Send the CI command `COM_DaqDisconnect` to force a disconnection
b- Disconnect the CI client

If not done, the DAQ client will remain connected and a new one couldn't be connected.

6- CI Commands with 'help':

```
UT1>help
help            : Display this help
hint            : Display command list
quit            : Quit and disconnect command interpreter
HW_FWversion    : Get Firware Version
UT1_EnTHGLG     : <T> <HG> <LG>: Enable Sim FEB with Time, HG, LG (0,1)
UT1_SetParam    : <CH/GTS> <GTS/EVT> <#Gate> <#EmptyGts> <ChValSpan>: Set Sim FEB with #CH/GTS(1,64) #GTS/EVENT(1,4), Gate Number(0,65535), #empty GTS(0,10) and CH
value span GTS(1,16)
UT1_ResetCnt    : Reset Sim FEB GTS & OCB Event counters
UT1_EnReadout   : <En>: Enable Readout En=(0,1)
UT1_SetDaqDelay : <Delay>: Set Daq delay per event in ms (1,1000)
COM_DaqDisconnect : Disconnect DAQ
[OK]
UT1>
```

7- Readout quick start commands:

a. `UT1_EnTHGLG 1 1 1` to **configure SIM FEB data type sent** by enabling Timing, HG and LG on FEB simulator
b. `UT1_SetParam 64 4 258 1 16` to **configure SIM FEB** with an event having 64 channels enabled per GTS on 4 GTS (i.e. 256-ch a total sent over 4 GTS), Gate #=258 (fixed), 1 empty GTS at end of 4 GTS with data cycle and a span of 16 for timing and analog values
c. `UT1_SetDaqDelay 10` to **set a delay** of 10ms between each DAQ event sent over TCP
d. `UT1_EnReadout 1` to **start the readout** (DAQ client must be connected and listening to the data), OCB green led will be ON
e. `UT1_EnReadout 0` to **stop the readout** (DAQ client must be connected and listening to the data), OCB green led will be OFF

NB: span is made with a value added to the RT/FT/HG/LG with the GTS counter modulo span value set (see algorithm below). For instance:

- GTS/EVT=4, EmptyGTS=1 means 5 GTS sent per event, if SPAN=16 then the value added to RT/FT/HG/LG will be (#GTS+5) modulo 16 at each event sent
- GTS/EVT=1, EmptyGTS=0 means 1 GTS sent per, if SPAN=16 then the value added to RT/FT/HG/LG will be (#GTS+1) modulo 16 at each event sent

Appendix: Algorithm used by SIM FEB to simulate data sent

```
if(_enReadout)
   {
      S_Uint32* l_ptr = _febBuffer[0][0];

      // latch the parameters for 1 event
      S_Byte   l_chPerGts    = _chPerGts;
      S_Byte   l_gtsPerEvent = _gtsPerEvent;
      S_Byte   l_gtsEmpty    = _gtsEmpty;
      S_Uint16 l_gateNb      = _gateNb;
      S_Byte   l_spanGts     = _spanGts-1;
      S_Bool   l_timeHgLg[3];
      l_timeHgLg[0] = _TimeHgLg[0];
      l_timeHgLg[1] = _TimeHgLg[1];
      l_timeHgLg[2] = _TimeHgLg[2];

      // OCB data packet header ----------------------------------
      _ocbDataPacketHeader(&l_ptr,_GATE_TYPE, (S_Byte)l_gateNb, m_event); // Event header written by OCB PS
      _febGateHeader0(&l_ptr, _BOARD_ID, _GATE_TYPE, l_gateNb); // event always start with gate header written by OCB PL

      // FEB data per event starts here --------------------------
      S_Uint16 l_wordSentQty = 0;

      // #N GTS per Event
      for(S_Byte l_i=0; l_i<l_gtsPerEvent; l_i++)
      {
         _febGtsHeader(&l_ptr, &l_wordSentQty, m_gtsCnt);

         // compute value added to T/HG/LG wrt to GTS = T/HG/LG span
         S_Byte l_span = m_gtsCnt & l_spanGts;

         // #N channels sent per GTS
         for(S_Byte l_j=0; l_j<l_chPerGts; l_j++)
         {
            S_Byte l_ch = ((l_i&0x3)<<6) | (l_j&0x3f);

            if(l_timeHgLg[_THGLG_TIME])
            {
               _febTime(&l_ptr, &l_wordSentQty, l_ch, 0, (S_Byte)(m_gtsCnt&0x3), _TIME_RISING, l_ch*3 + 16 + l_span);
               // l_span*2 to see span on Tdiff=TF-TR
               _febTime(&l_ptr, &l_wordSentQty, l_ch, 0, (S_Byte)(m_gtsCnt&0x3), _TIME_FALLING, (S_Uint16)l_ch*2 + 2000 + l_span*2);
            }

            if(l_timeHgLg[_THGLG_HG])
               _febAmplitude(&l_ptr, &l_wordSentQty, l_ch, 0, (S_Byte)(m_gtsCnt&0x3), _AMPL_ID_HG, 0xFFF-l_ch*3 + l_span);

            if(l_timeHgLg[_THGLG_LG])
               _febAmplitude(&l_ptr, &l_wordSentQty, l_ch, 0, (S_Byte)(m_gtsCnt&0x3), _AMPL_ID_LG, 0x0FF-l_ch + l_span);
         }

         _febGtsTrailers(&l_ptr, &l_wordSentQty, m_gtsCnt, true);
         m_gtsCnt++;
      }

      // add empty GTS
      for(S_Byte l_i=0; l_i<l_gtsEmpty; l_i++)
      {
         _febGtsHeader(&l_ptr, &l_wordSentQty, m_gtsCnt);
         _febGtsTrailers(&l_ptr, &l_wordSentQty, m_gtsCnt, false);
         m_gtsCnt++;
      }

      _febEventDone(&l_ptr, _BOARD_ID, (S_Byte)l_gateNb, l_wordSentQty); // last word sent by FEB
      _febDataPacketTrailer(&l_ptr, _BOARD_ID, 0, 0); // Word added by OCB for FEB : no OCB errors during FEB data packet
      // FEB data per event ends here --------------------------

      _ocbDataPackeTrailer(&l_ptr, _GATE_TYPE, (S_Byte)l_gateNb, 0, 0);   // Event trailer built by OCB PS : no OCB errors during event
      // OCB data packet ends ----------------------------------

      S_Int l_nwrote = m_com.halWrite((char*)_febBuffer[0][0], (l_wordSentQty+_OCB_PACKET_W32_NB)*4);
      if (l_nwrote < 0)
         return false;

      m_event++;
   }

   if(_resetGts)
   {
      m_gtsCnt = 0;
      m_event = 0;
      _resetGts = false;
   }

   S_taskDelay(_daqDelay);
```