ASCLIN_Shell_UART_1 for KIT_AURIX_TC375_LK

Shell via UART communication

AURIX™ TC3xx Microcontroller Training
V1.0.0

Scope of work

A Shell is used to parse a command line and call the corresponding command execution. The ASCLIN module is used to interface with the Shell through the USB port via UART.

The ASCLIN module is configured for UART communication.
The Shell from iLLDs exploits the ASCLIN module to interpret and manage commands from the user like “info”, “toggle [x]” or “help”.

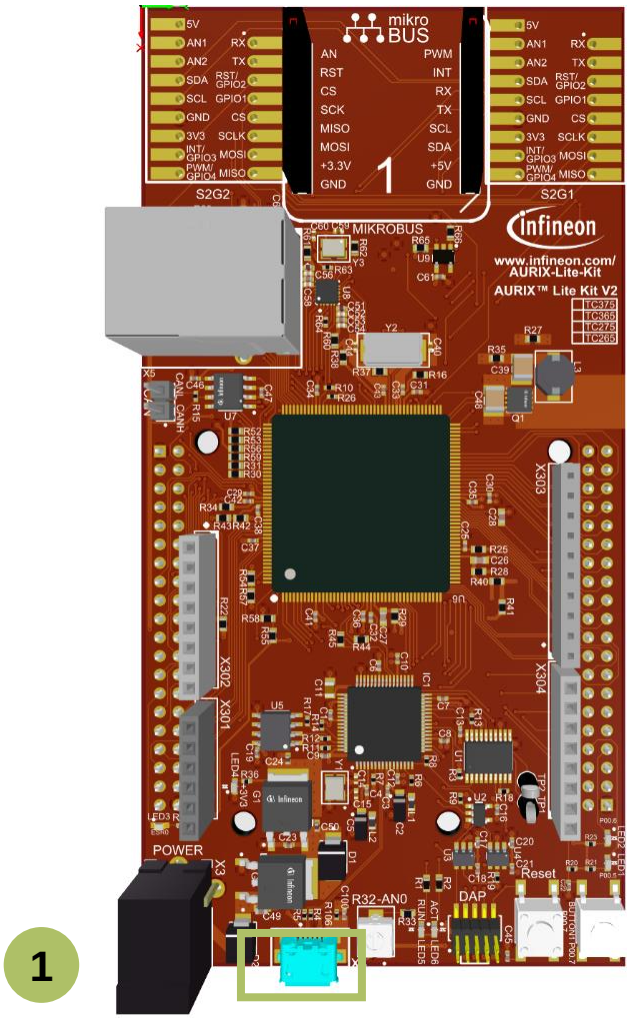
Introduction

- The **Asynchronous/Synchronous Interface** (ASCLIN) module provides serial communication with external devices. In this example, it is used to interface with the PC through the USB port via UART communication.
- A **Shell** is a user interface for parsing commands and accessing services.

Hardware setup

This code example has been developed for the board KIT_A2G_TC375_LITE.

The board should be connected to the PC through the USB port (1).



Implementation

Configure the ASCLIN module

The configuration of the ASCLIN module is done by initializing an instance of the ***IfxAsclin_Asc_Config*** structure, which contains the following fields:

- ***baudrate*** – a structure that allows to set
  - ***baudrate*** – the communication speed in bit/s
  - ***oversampling*** – the division ratio of the baud rate for reaching higher frequencies to ensure oversampling
- ***bitTiming*** – a structure that allows to set the sampling mode with
  - ***medianFilter*** – the number of samples per bit
  - ***samplePointPosition*** – the first sample point position
- ***interrupt*** – a structure that allows to set
  - ***txPriority***, ***rxPriority*** and ***erPriority*** – the interrupt priorities for transmission, reception and error events
  - ***typeOfService*** – the service provider responsible for handling the interrupt, which can be any of the available CPUs, or the DMA
- ***pins*** – a structure that allows to set which port pins are used for the communication
- ***rxBuffer***, ***rxBufferSize***, ***txBuffer***, ***txBufferSize*** – parameters that allow to configure the buffers that will hold the incoming/outgoing data

The function ***IfxAsclin_Asc_initModuleConfig()*** fills the configuration structure with default values and ***IfxAsclin_Asc_initModule()*** function initializes the module with the user configuration.
Both the functions can be found in the iLLD header ***IfxAsclin_Asc.h***.

Implementation

Configure the Shell

To configure the Shell, it is needed to firstly initialize a Standard Interface and a Standard IO from the iLLDs. This is done by the functions ***IfxAsclin_Asc_stdIfDPipeInit()***, ***Ifx_Console_init()*** and ***Ifx_Assert_setStandardIo()***, that can be found respectively in the iLLDs headers ***IfxAsclin_Asc.h***, ***Ifx_Console.h*** and ***Assert.h***.
Furthermore, it is needed to define the macros ***IFX_CFG_ASSERT_STDIO***, ***IFX_CFG_ASSERT_VERBOSE_LEVEL_DEFAULT*** and ***IFX_CFG_ASSERT_INCLUDE*** to configure the ***Ifx_Assert.h*** header.
This is done in the configuration header ***Ifx_Cfg.h***.

The Shell is configured inside the function ***initShellInterface()*** by initializing an instance of the ***Ifx_Shell_Config*** structure with default values through the function ***Ifx_Shell_initConfig()***. Then, the following parameters are modified:

- ***standardIo*** – that allows to set the module used for serial communication
- ***commandList*** – that allows to set the list of commands supported by the shell
  The command list is an array of structures of the type ***Ifx_Shell_Command***, that contains:
  - ***commandLine*** – the actual command which will be sent to the shell by the user
  - ***help*** – a small description of the command that is shown when help command is given
  - ***data*** – a link to the shell
  - ***call*** – the function called when the command is given

The ***Ifx_Shell_init()*** function initializes the shell with the user configuration.
The functions ***Ifx_Shell_initConfig()*** and ***Ifx_Shell_init()*** can be found in the iLLD header ***Ifx_Shell.h***, while the function ***initShellInterface()*** is defined in the header ***UART_ASCLIN_Shell.h***.

Implementation

Run the Shell

The Shell is continuously run through the function ***runShellInterface()*** called inside the infinite while loop in the ***Cpu0_Main.c*** file.

It continuously reads the incoming data and evaluates it when the carriage return character is entered.

Configure and control the LEDs

The LEDs are toggled by **controlling the port pins** to which they are connected using methods from the iLLD headers ***IfxPort.h***.

The LED port pins have to be **configured to output push-pull mode** using the function ***IfxPort_setPinMode()***.

During program execution, the LEDs are **switched on and off** using the function ***IfxPort_setPinState()***.

Implementation

Configure the Interrupt Service Routine (ISR)

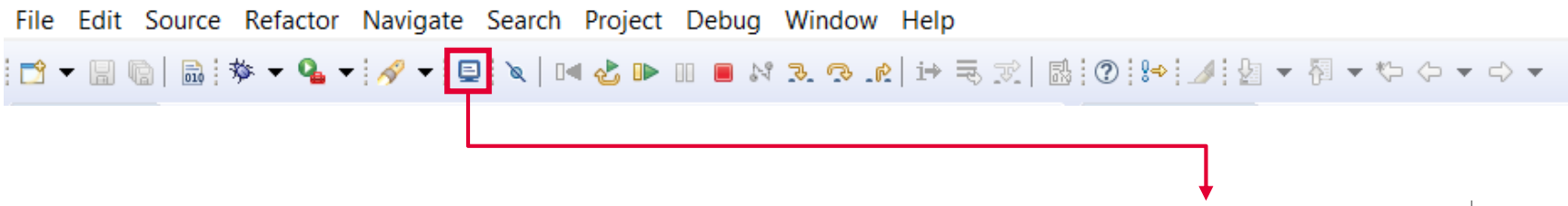
The function implementing the ISR needs to be assigned a **priority** and a **core** responsible for its execution. This is done with the macro ***IFX_INTERRUPT(isr, vectabNum, priority)***.

Since the Shell uses the ASCLIN module to interface with the user, three ISRs are needed to be configured for transmission, reception and error events.

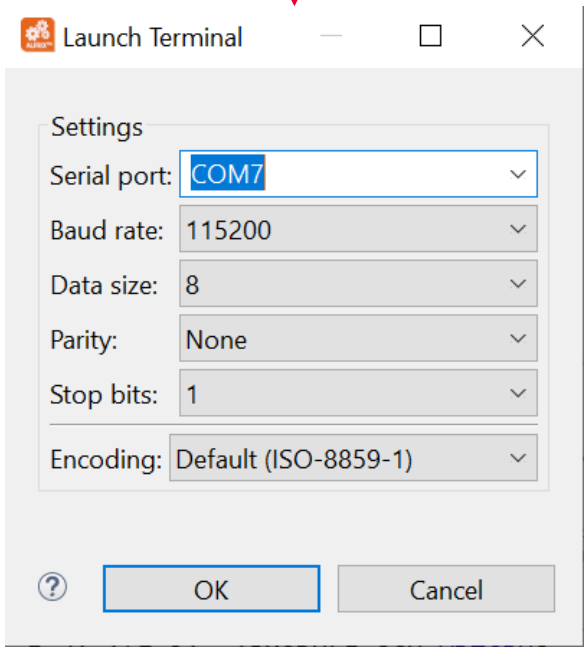
Each ISR should call the handler for the respective operation (transmit, receive or error) by passing the ASC handle.

Run and Test

- For this training, a serial monitor is required for visualizing the values. The monitor can be opened inside the AURIX™ Development Studio using the following icon:



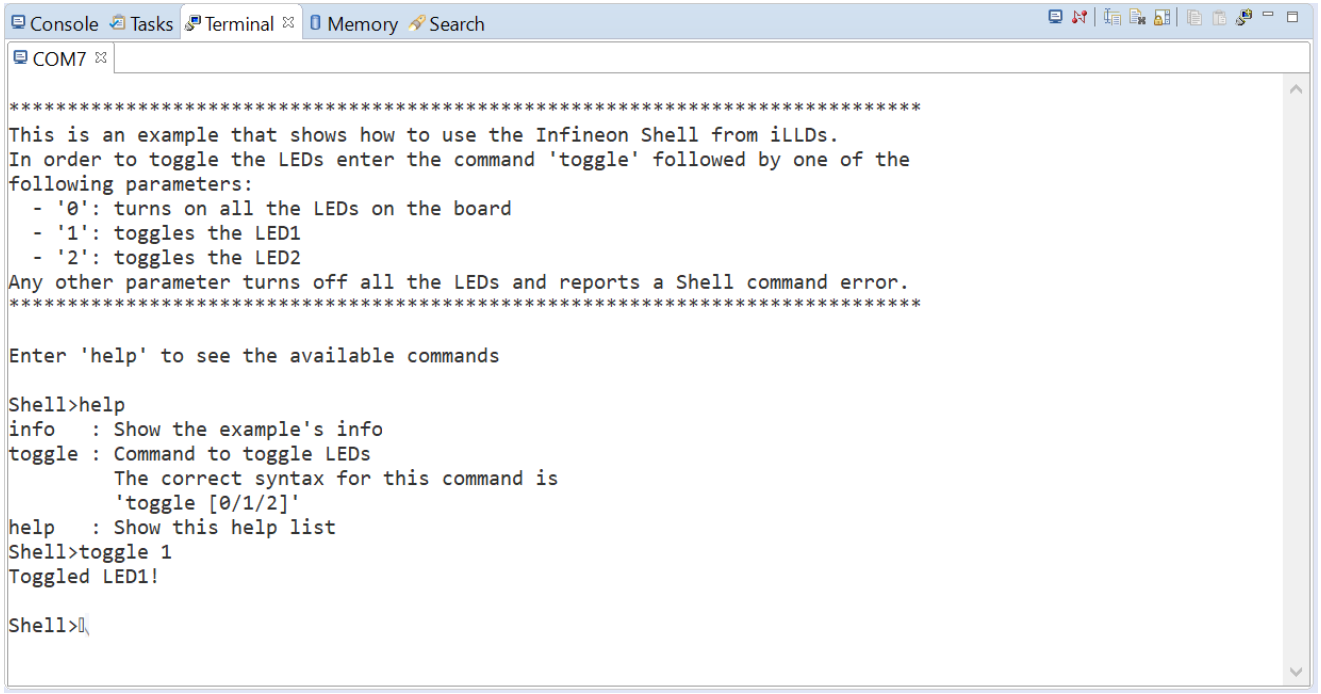
- The serial monitor must be configured with the following parameters to enable the communication between the board and the PC:
  - Speed (baud): 115200
  - Data bits: 8
  - Stop bit: 1



Run and Test

Firstly, the serial monitor should be opened. After code compilation and flashing the device, perform the following steps:

- Type “help” to see the list of available commands
- Type “toggle [0/1/2]” to respectively: turn on all LEDs, toggle LED1, toggle LED2
- Check command execution.



References

- AURIX™ Development Studio is available online:
- https://www.infineon.com/aurixdevelopmentstudio
- Use the *„Import...“* function to get access to more code examples.

- More code examples can be found on the GIT repository:
- https://github.com/Infineon/AURIX_code_examples

- For additional trainings, visit our webpage:
- https://www.infineon.com/aurix-expert-training

- For questions and support, use the AURIX™ Forum:
- https://www.infineonforums.com/forums/13-Aurix-Forum

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