UART CRC32 APPLICATION

On TMS570LS12x

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UART CRC32 Application

🔧 Overview

This embedded application runs on the **TMS570LS1227CZW (TMS570LS12x)** microcontroller and calculates the Ethernet CRC32 checksum over a UART byte stream. It uses the **SCI2 (USB UART)** interface with a fixed **baud rate of 937500 bps**. The system is connected and debugged using an **XDS100v2** interface.

1. Functional Description

- The MCU continuously receives bytes over UART.
- When UART becomes idle for **500 milliseconds**, the CRC is calculated over all received bytes.
- The CRC result is transmitted back via UART in **uppercase hexadecimal format**, with a textual prefix.
- If no new bytes are received in the next cycle, the same CRC is re-sent with a message indicating no data was received.
- The application supports a maximum data buffer size of 4096 bytes. If more than 4096 bytes are sent, only the first 4096 bytes will be used for CRC calculation. Any additional bytes are ignored.

2. UART Configuration

Parameter	Value
UART Interface	SCI2 (USB UART)
Baud Rate	937500
Data Bits	8
Stop Bits	2
Parity	None
Flow Control	None
TX Pin	Configured via HALCoGen
RX Pin	Configured via HALCoGen
Max Payload Length	4096 bytes

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3. CRC32 Calculation Details

Property	Value
Algorithm	Ethernet CRC (CRC-32/ISO-HDLC)
Polynomial	0x04C11DB7
Initial Value	0xFFFFFFFF
Input Reflected	Yes (per-byte)
Output Reflected	Yes
Final XOR Value	0xFFFFFFFF
Example Input	123456789
Expected CRC	0xCBF43926

4. Idle Detection Logic

- Data collection continues until no new byte is received for **500 ms**.
- At this point, the CRC is calculated and sent.
- On the next loop:
    - If **new data is received**, the buffer is extended and CRC is updated.
    - If **no new data**, the last CRC is resent with a different message.

5. UART Output Messages

- On startup:

```
Sequential CRC Calculator Started
UART Ready. Send data...
```

- After CRC calculation:

```
Updated CRC in Hex is : 0xXXXXXXXX
```

- On repeated idle:

```
No Data Received, Last Calculated CRC in Hex is : 0xXXXXXXXX
```

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6. ⚙ Hardware and Tools

Component	Details
MCU	TMS570LS1227CZW (TMS570LS12x)
Debug Interface	XDS100v2
SCI Interface	SCI2
Baudrate	937500
UART Tool (PC-side)	TeraTerm or RealTerm
TeraTerm Delay Settings	1–2 ms per byte (required)

7. Test Result

Testing Video : https://www.mediafire.com/file/z1h0yl5snlytbqa/tms570ls12hdk-uart-crc32-Testing.mp4/file

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