SPD-meeting
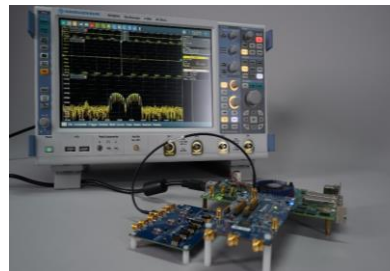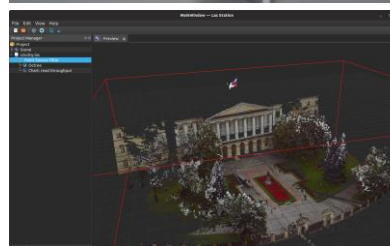
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# Current status of TSS development. TSS control protocol

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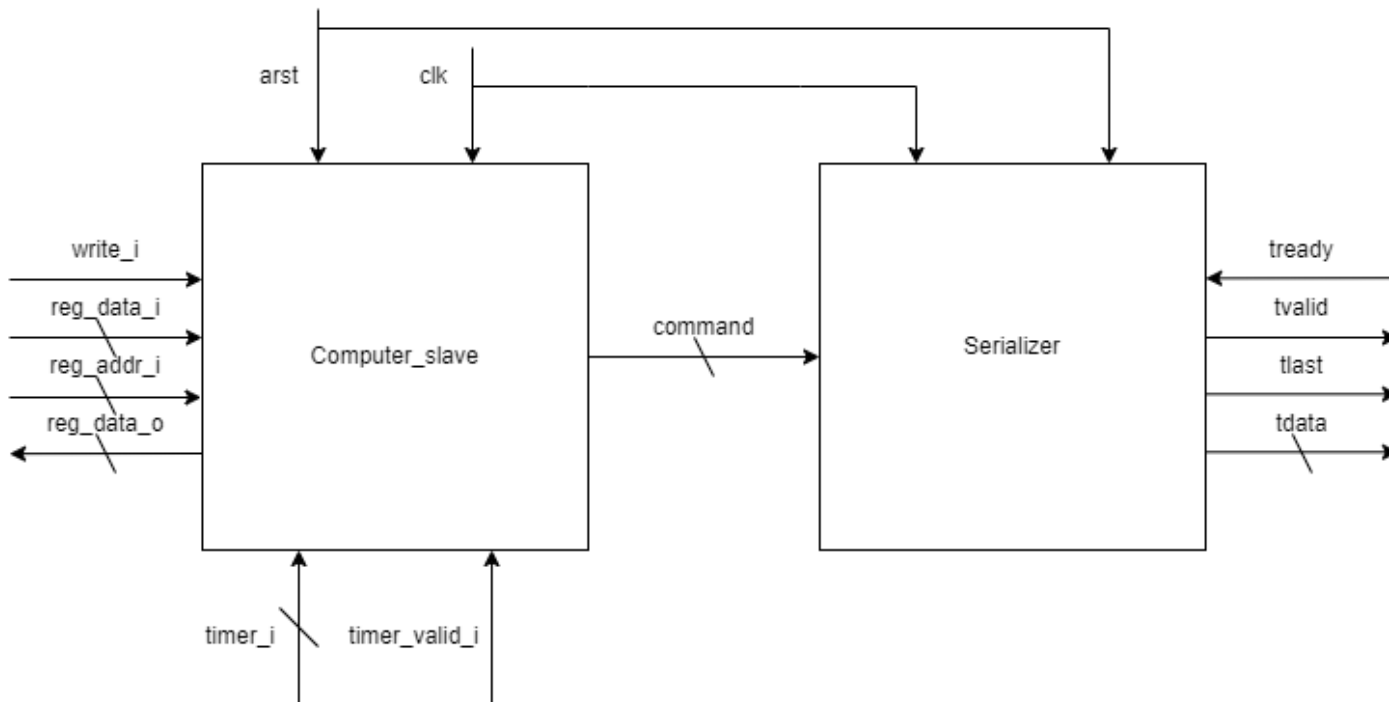
Time Synchronization System

- The main purposes of the Time Synchronization System (TSS) are:

  - Distribution of the global clock signal throughout the installation

  - Generation and distribution of synchronous commands throughout the installation

- The central part of the TSS is the so-called TSS controller. The TSS controller generates synchronous commands, which are then distributed throughout the installation.

- The TSS controller will implement the following commands:

  - Start of Sequence — upon receiving this command, the TSS controller must start the generation of a sequence of frame batches using parameter values loaded into its registers.

  - Stop of Sequence — upon receiving this command, the TSS controller must complete the generation of a sequence of frame batches.
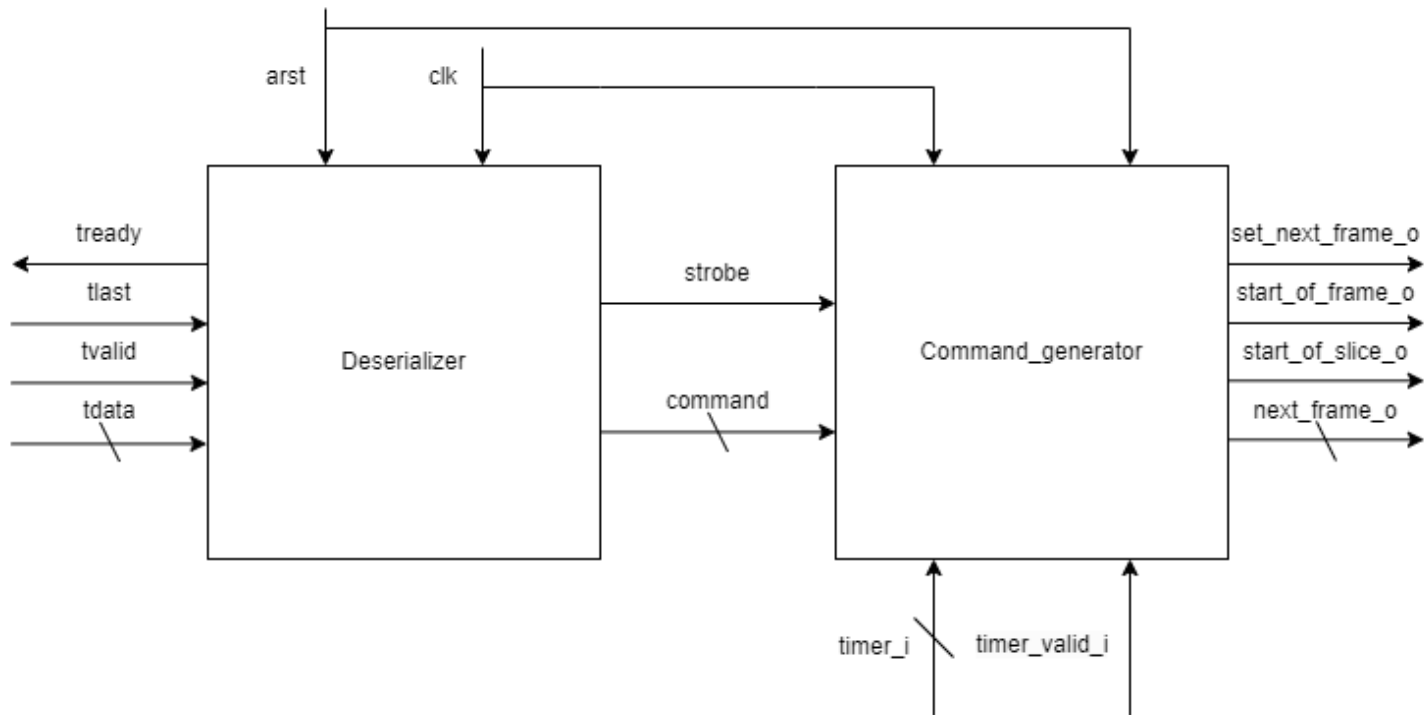
TSS Architecture
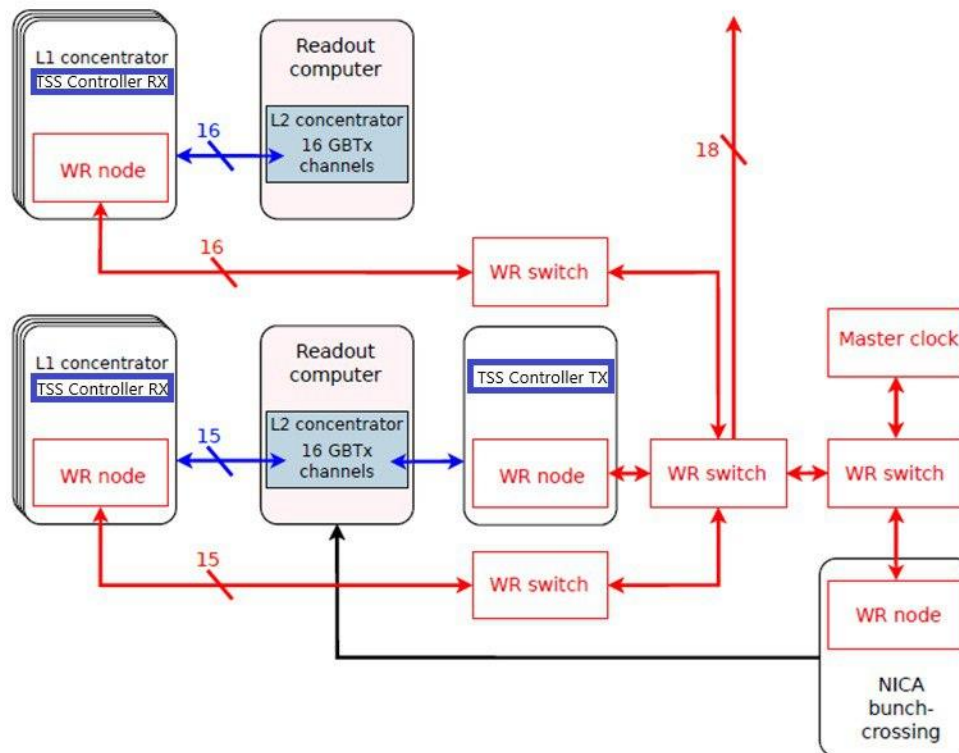
TSS Controller IP core

TSS Controller IP core

TSS Controller RX

TSS Controller Command Format

| HEADER	TIMESTAMP	PAYLOAD
8 bits	40 + 28 = 68 bits	32 * 6 = 192 bits
Start of Sequence	Delta Time + Timer	Slice Length + Frame Length + Batch Length + Sequence Length + Batch Interval + Last Frame
Stop of Sequence	Delta Time + Timer	0
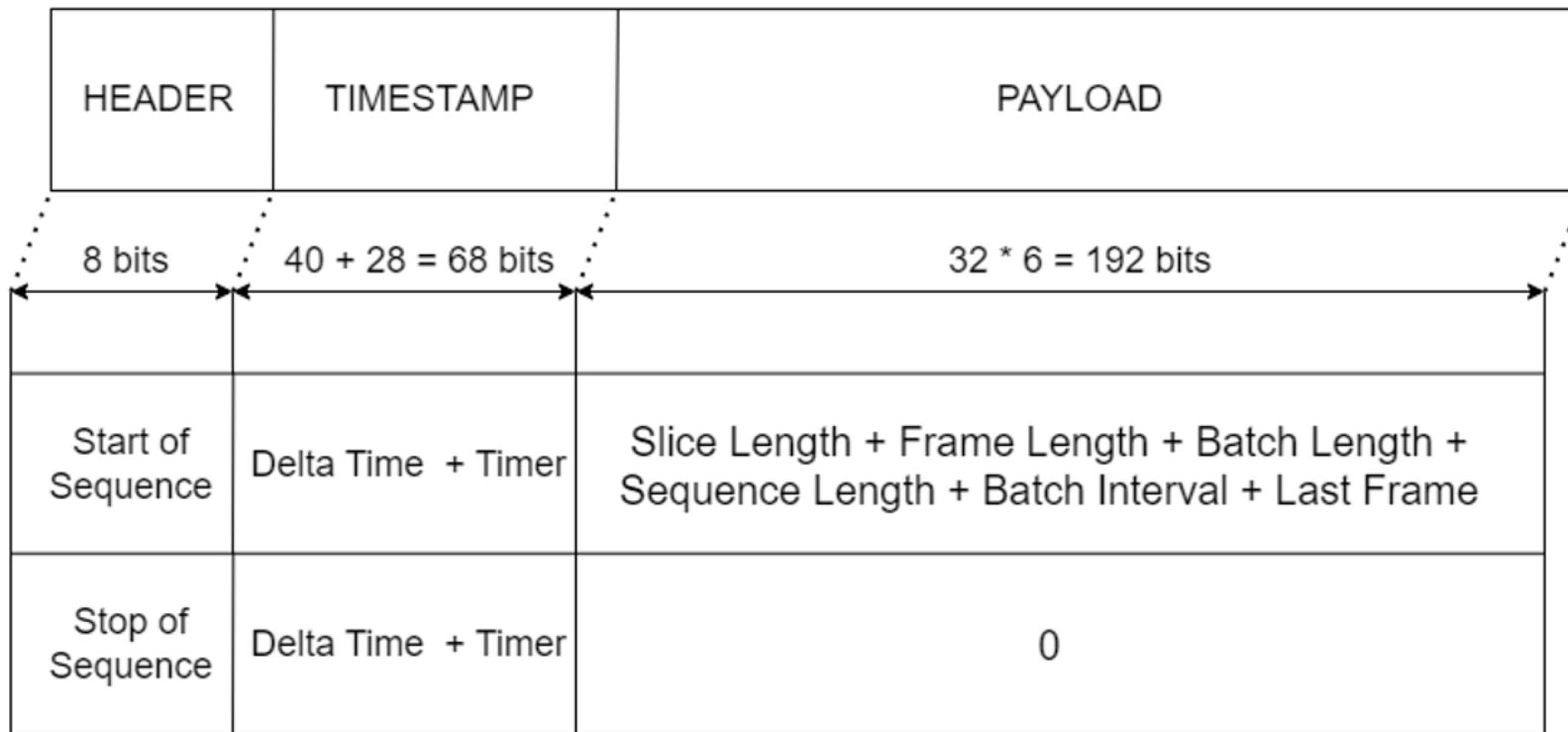
Verification Scheme
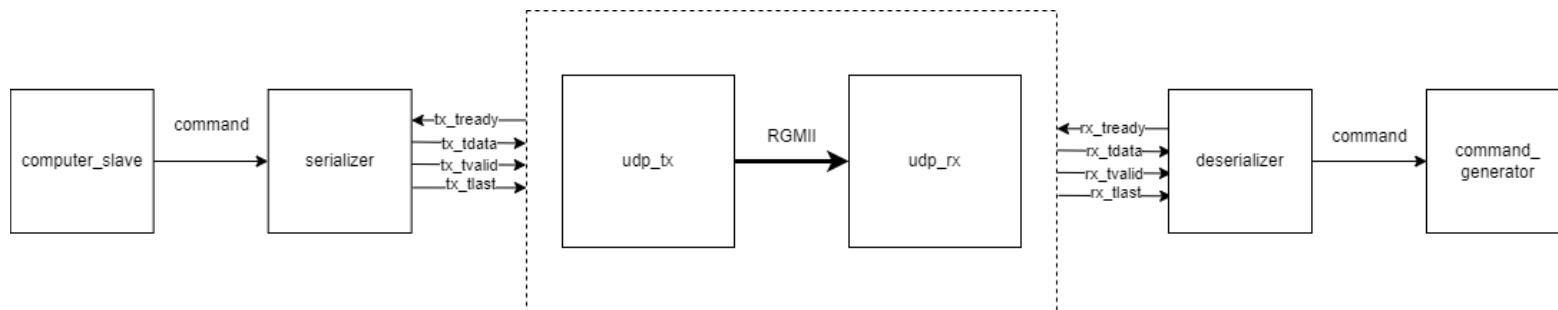
Verification

Main features of tests:

- Written with cocotb framework.
- Check generation of SNF, SOF and SOS signals.
  - Control time intervals between synchronous signals.
  - Count and check number of generated signals in relation to received command.
- Send different types of commands to computer_slave with different parameters, including edge cases.
- Check all conditions of stopping sequence generation.

```
*******************************************************************
** TEST                          STATUS  SIM TIME (ns)  REAL TIME (s)  RATIO (ns/s) **
*******************************************************************
** tss_top_tb.default_values_test      PASS       4661.00         0.02      210236.17 **
** tss_top_tb.stop_com_test            PASS       3881.00         0.04       93739.74 **
** tss_top_tb.last_frame_0_test        PASS       4821.00         0.04      128687.96 **
** tss_top_tb.last_frame_long_test     PASS      93541.00         0.64      145826.41 **
** tss_top_tb.batch_length_0_test      PASS       4341.00         0.03      129743.85 **
** tss_top_tb.sequence_length_0_test   PASS       4581.00         0.02      271075.56 **
** tss_top_tb.long_batch_test          PASS     165061.00         1.00      164839.34 **
** tss_top_tb.long_sequence_stop_test  PASS     185301.00         1.12      165806.93 **
** tss_top_tb.slice_length_min_test    PASS       4661.00         0.03      134319.40 **
** tss_top_tb.slice_length_long_test   PASS      63001.00         0.21      296254.12 **
** tss_top_tb.batch_interval_min_test  PASS       3821.00         0.02      240944.68 **
** tss_top_tb.batch_interval_long_test PASS       8161.00         0.03      249155.39 **
** tss_top_tb.min_frame_length_test    PASS       2261.00         0.02      142229.91 **
** tss_top_tb.long_frame_length_test   PASS      83461.00         0.40      207985.87 **
*******************************************************************
** TESTS=14 PASS=14 FAIL=0 SKIP=0            631554.00         3.93      160594.13 **
*******************************************************************
```

Verification Results
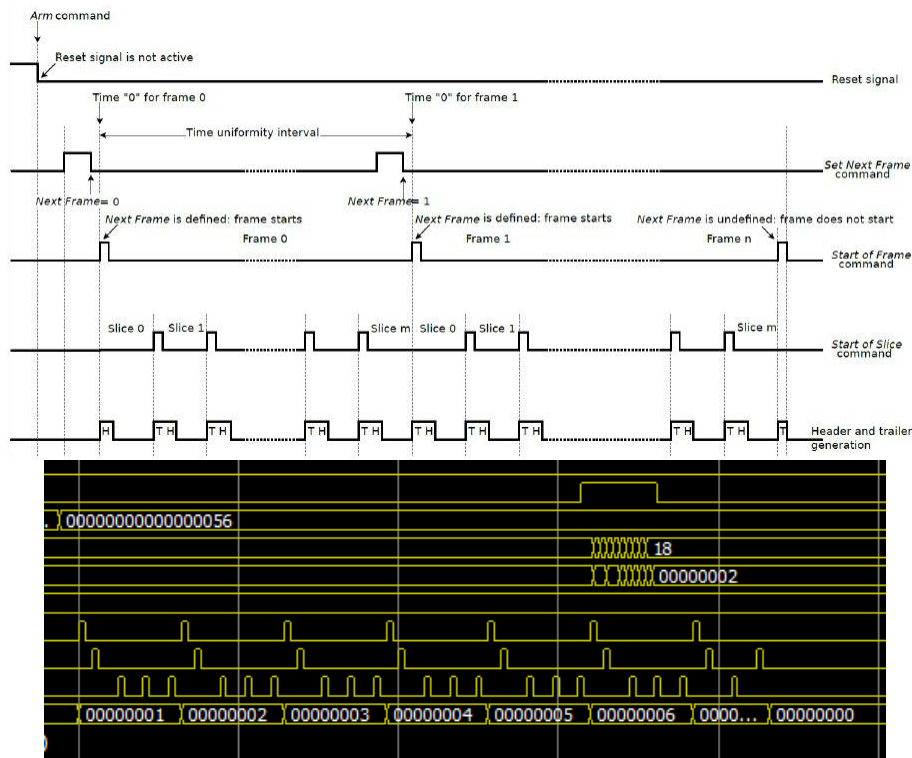
Next Version of TSS Controller

The first version implements functions for adjusting parameters such as:
- Frame length
- Batch length
- Batch interval
- Sequence length
- Number of frames in the sequence
- Delay in network
- Start and Stop of Sequence

In next version of TSS controller we plan to add new functions:
- Monitoring
- Diagnostic
- Recovery

And two new commands: Abort Run and Continue of Sequence