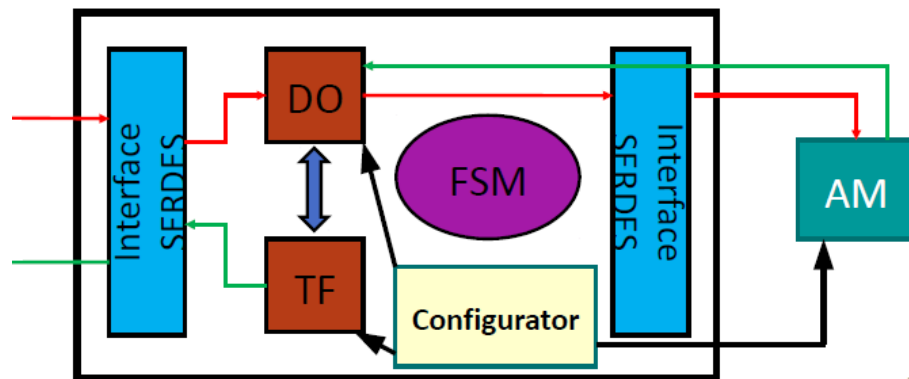


Logic Block of the Mezzanine Firmware

FPGA: Device XC7K355T

The logic block that have to be implemented are

1. Logic to control the SERDES to/from the Pulsar IIb (Aurora Protocol) and to/from AM chips (custom protocol)
2. Track Fitter
3. Data Organizer
4. Finite State Machine to control the dataflow inside the mezzanine
5. Configurator (logic to program the Associative Memory and to load the constant inside the FPGA)



1. Interface to SERDES

- Implementing the communication and the control of the serial link in input/output to the Pulsar and in input/output to the AM chip.
- Define the logic to configure the IP Xilinx logic core to interface the serial link to the GTX transceiver. Define the interface for the custom protocol to AM. Define the interface for the protocol to the Pulsar (Aurora protocol?)
 - Example: Insert the FIFO dual core to adapt the internal clock domain to the recovery clock of the serial link
- Adapt the input serial link (3) from the Pulsar to the (16) in the output to the AM.

- Example: Inserting a logic for demux and define the logic to separate the information of each input layer to the correct output bus
- Adapt the out link (16) from the AM to the (3) in the output to the Pulsar

2. TRACK FITTING

- **IMPORTANT:** Evaluate the logic resources (DSP, RAM) needed to store the constant for the tracker and to implement the algorithm (for fast fitting, multiplier and accumulator, we need to use the DSP slice)
- Manage the communication with the Data Organizer to obtain the full resolution hit after the selection of the AM
- Send out the fit results to the Data Organizer.

3. DATA ORGANIZER

- **IMPORTANT:** Evaluate the logic resources (RAM) needed to store the pattern banks of the AM chip to generate the super strip to send to AM and to keep association between the matched road and the full resolution hits.
- Generation of super strips to send to the AM and the storage the full resolution hits.
- Implementation of a database that contains that association of the incoming hit information to the super strip, to be sent to AM.
- Manage the output from AM. Send the full resolution hits to the track fitting according to the matched road.

4. Finite State Machine

- Implement the logic to control the event processing. Manage the hits transmission to AM and the matched roads from the AM.
- Controls the transmission of information between the Data Organizer and the Track Fitter.
- Controls the dataflow between Pulsar II and Mezzanine.

5. Configurator

- Define an interface to control the mezzanine card.
- At the start up we need to do some operation
 - Load the constant parameters into TF;
 - Load the initial parameters into DO;
 - Load the pattern bank into AM;
- Define a protocol to Get feedback from TF, DO, AM on the quality of the loaded configurations.