土龙 / Tulong: A Processor for Research into Secure Enclaves

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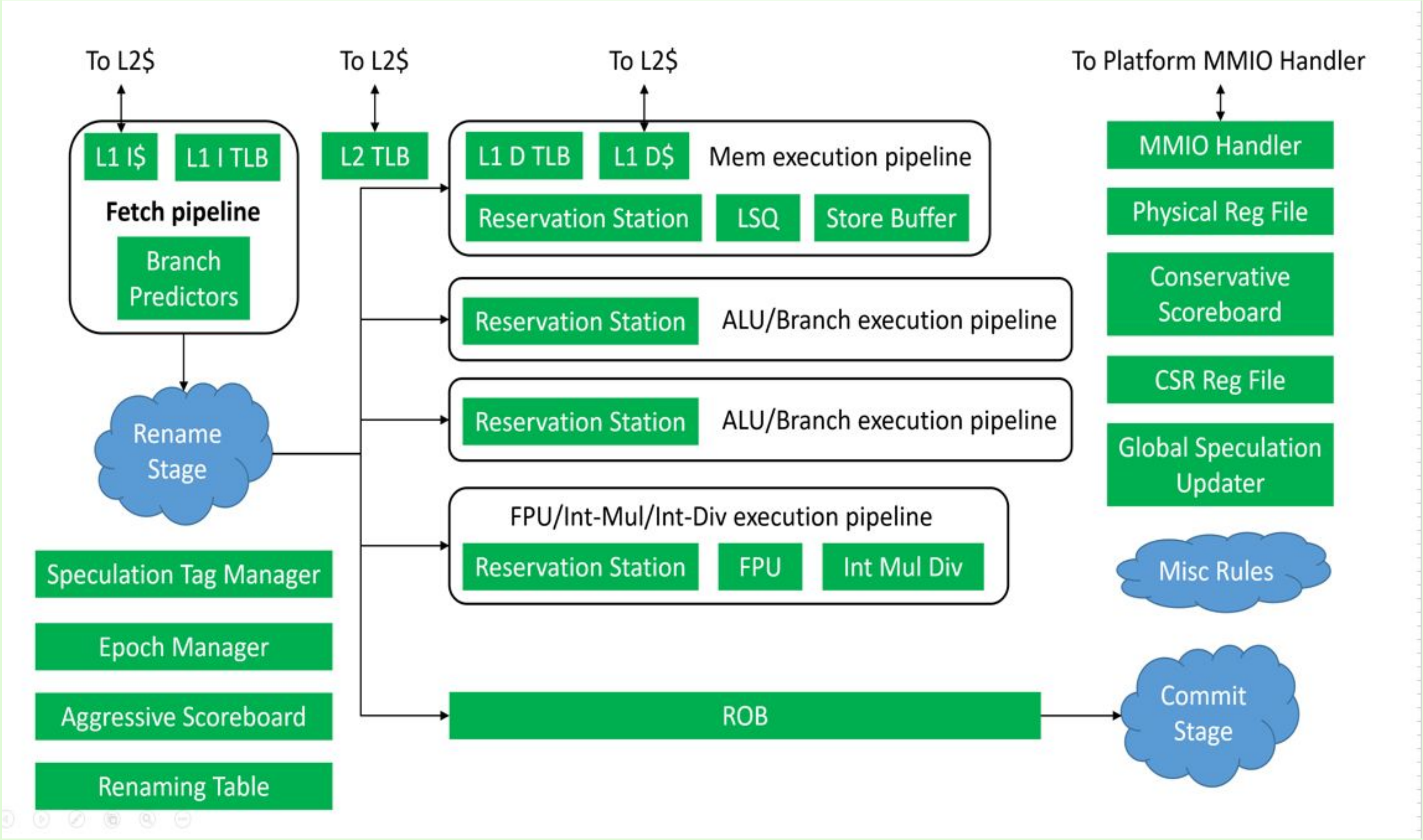
Goals

-Our user story is to build a processor with DAWG security, adding mitigations against other known security vulnerabilities of secure enclaves, provides an platform for testing mitigations.

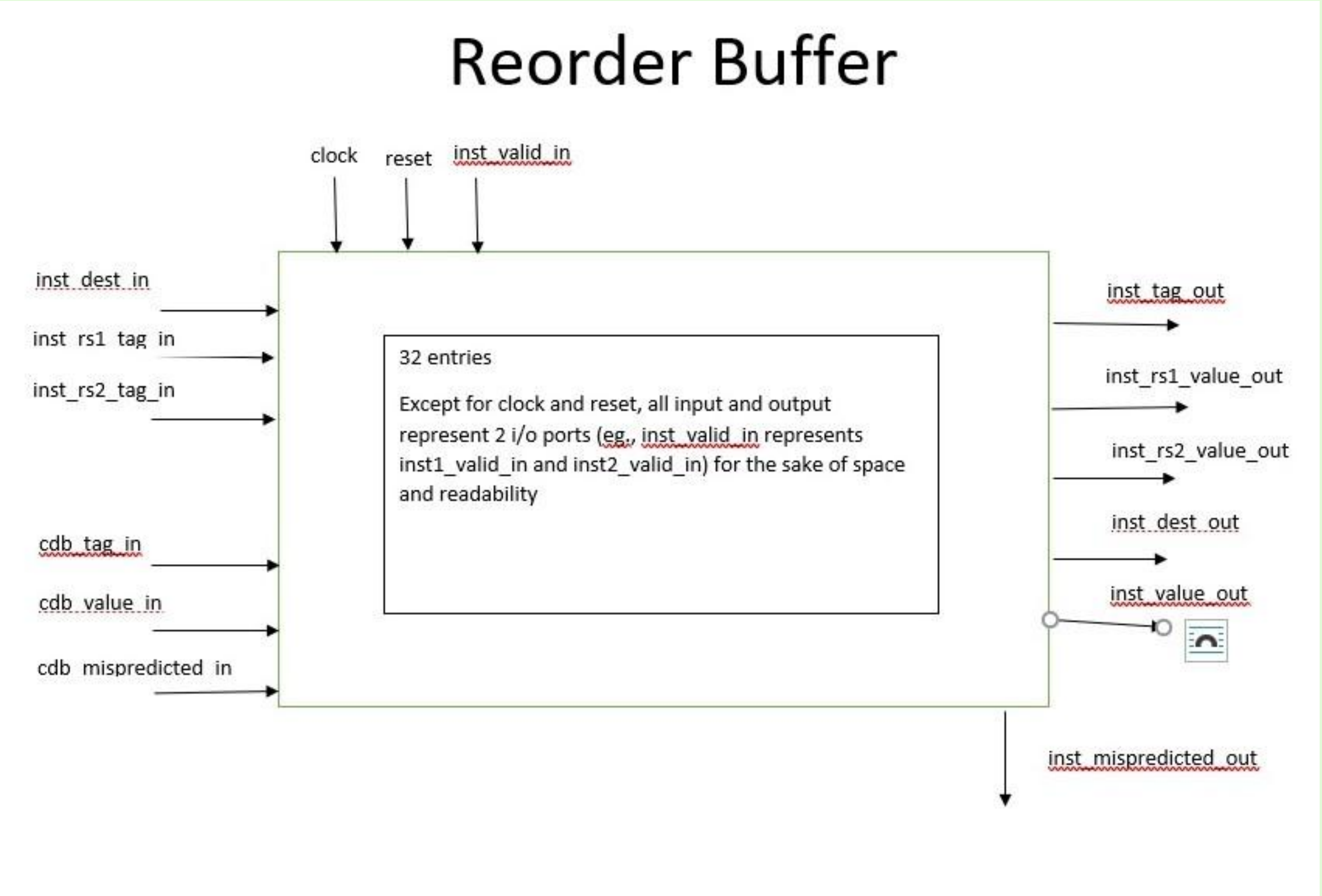
-Our MVP is MI6 processor with DAWG and other vulnerability mitigations.



https://github.com/sizhuo-zhang/RiscyOO_design_doc/blob/master/fig/core.pdf

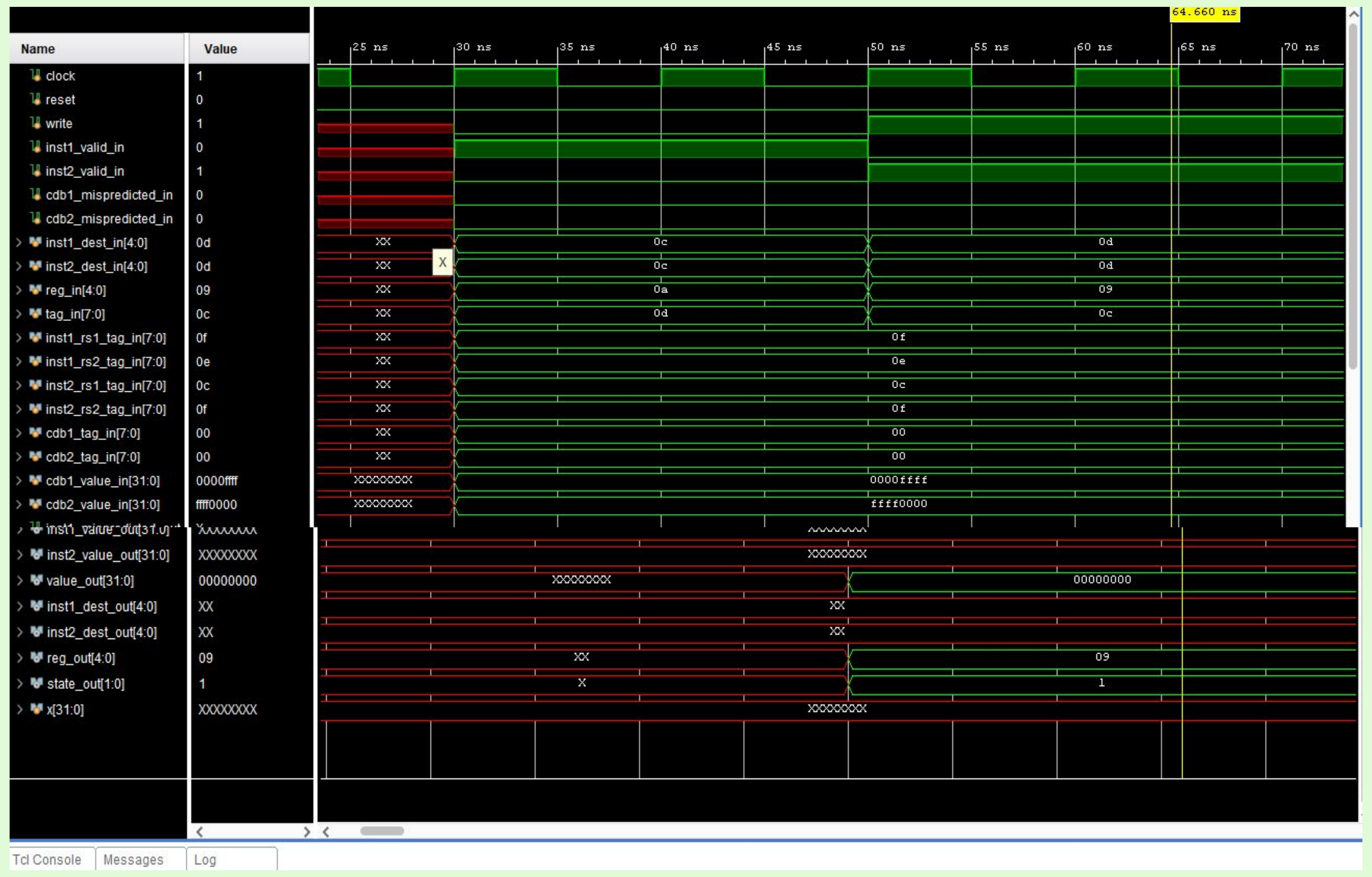
Methods

- Chose to use regular Verilog, instead of Bluespec
- Meant building OoO processor ourselves
- Got pipelined (in order) code from ASCS Lab
- Built Reorder Buffer
- Need to build Rename Buffer, Reservation Station, and other pieces as future work



32 entries

Except for clock and reset, all input and output represent 2 i/o ports (eg., inst_valid_in represents inst1_valid_in and inst2_valid_in) for the sake of space and readability



```
Name                     Value
clock                    1
reset                    0
write                    1
inst1_valid_in           0
inst2_valid_in           1
cdb1_mispredicted_in     0
cdb2_mispredicted_in     0
inst1_dest_in[4:0]       0d
inst2_dest_in[4:0]       0d
reg_in[4:0]              09
tag_in[7:0]              0c
inst1_rs1_tag_in[7:0]    0f
inst1_rs2_tag_in[7:0]    0e
inst2_rs1_tag_in[7:0]    0c
inst2_rs2_tag_in[7:0]    0f
cdb1_tag_in[7:0]         00
cdb2_tag_in[7:0]         00
cdb1_value_in[31:0]      0000ffff
cdb2_value_in[31:0]      ffff0000
inst1_value_out[31:0]    XXXXXXXX
inst2_value_out[31:0]    XXXXXXXX
value_out[31:0]          00000000
inst1_dest_out[4:0]      XX
inst2_dest_out[4:0]      XX
reg_out[4:0]             09
state_out[1:0]           1
x[31:0]                  XXXXXXXX
```

Conclusions & Lessons Learned

- Project has merit, but we made our lives very difficult
- When using open source code as a starting point, make sure all aspects of the source are open source
- Ambition is good, but realism is wise
- Ask for help, early and often

Acknowledgements

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References can be found at:
https://github.com/MargotBauman/601-Main-Project-Secure-Enclaves/blob/master/References

Project code and notes can be found at:
https://github.com/MargotBauman/601-Main-Project-Secure-Enclaves/tree/master