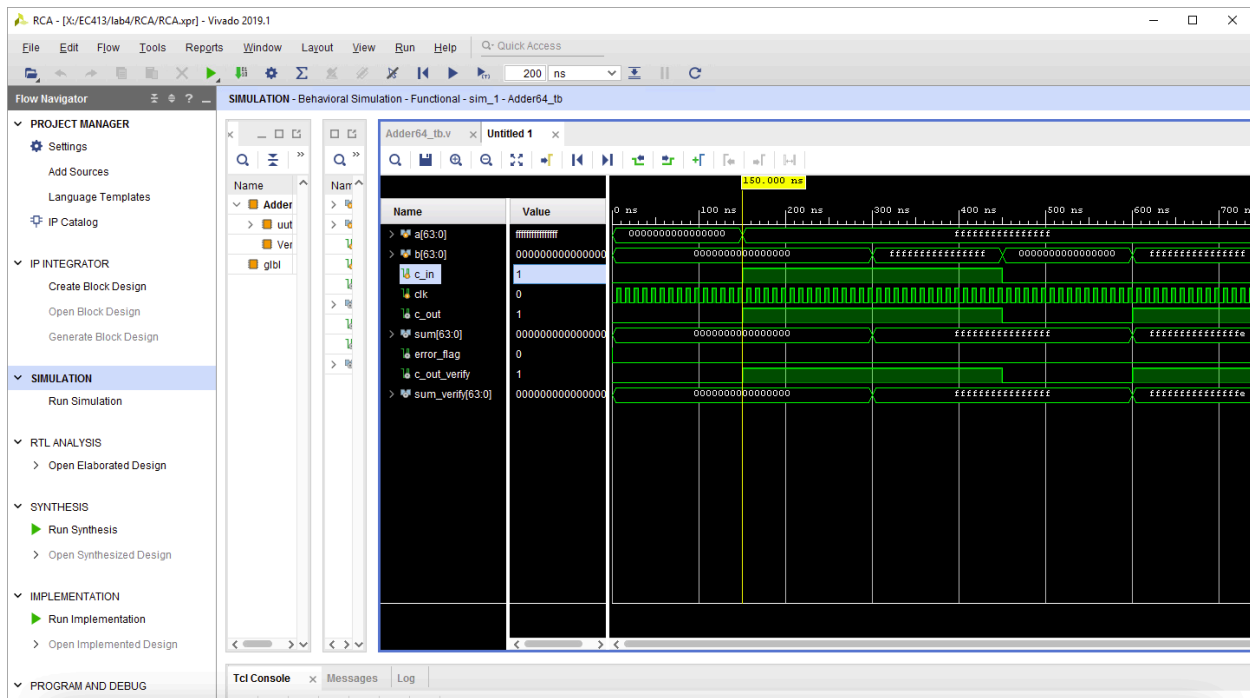


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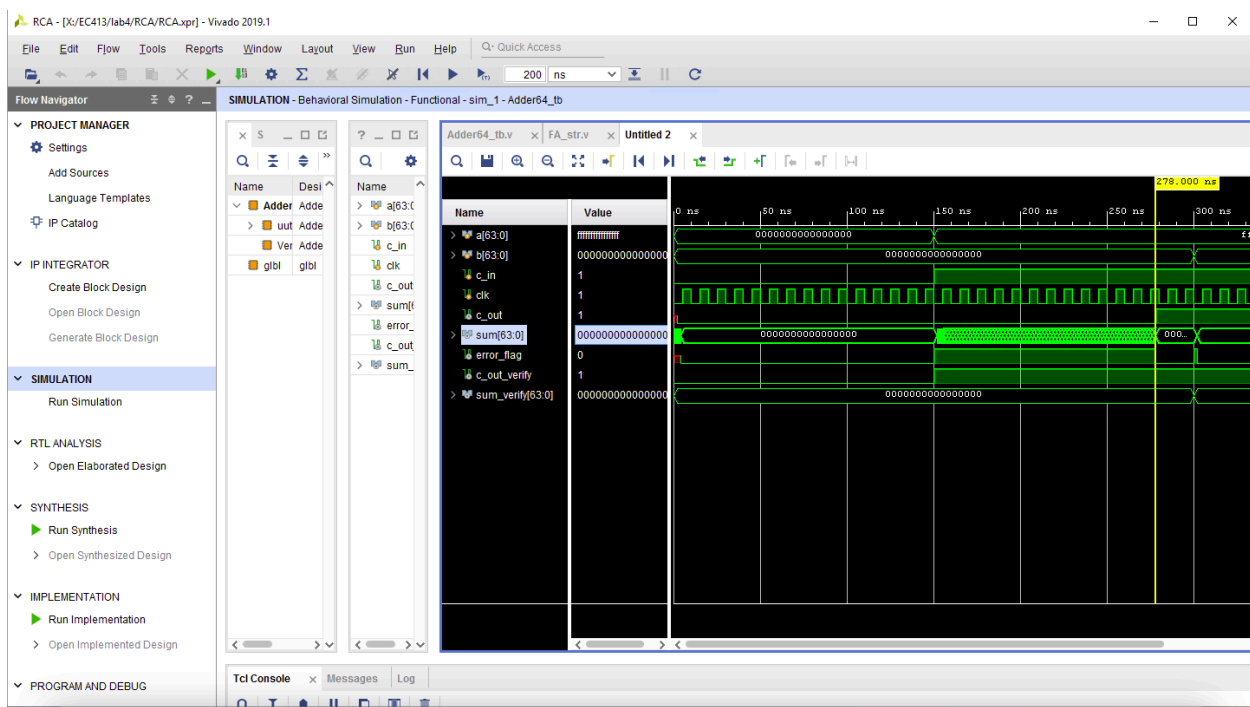
Lab 4

The modules that I used to build the 64-bit RCA are: 16-bit adders, 4-bit adders and the full adders. The 4 bit adders consist of 4 full adders, the 16-bit adders consist of 4 4-bit adders and the 64-bit adder consists of 4 16-bit adders.

Waveform without a delay:



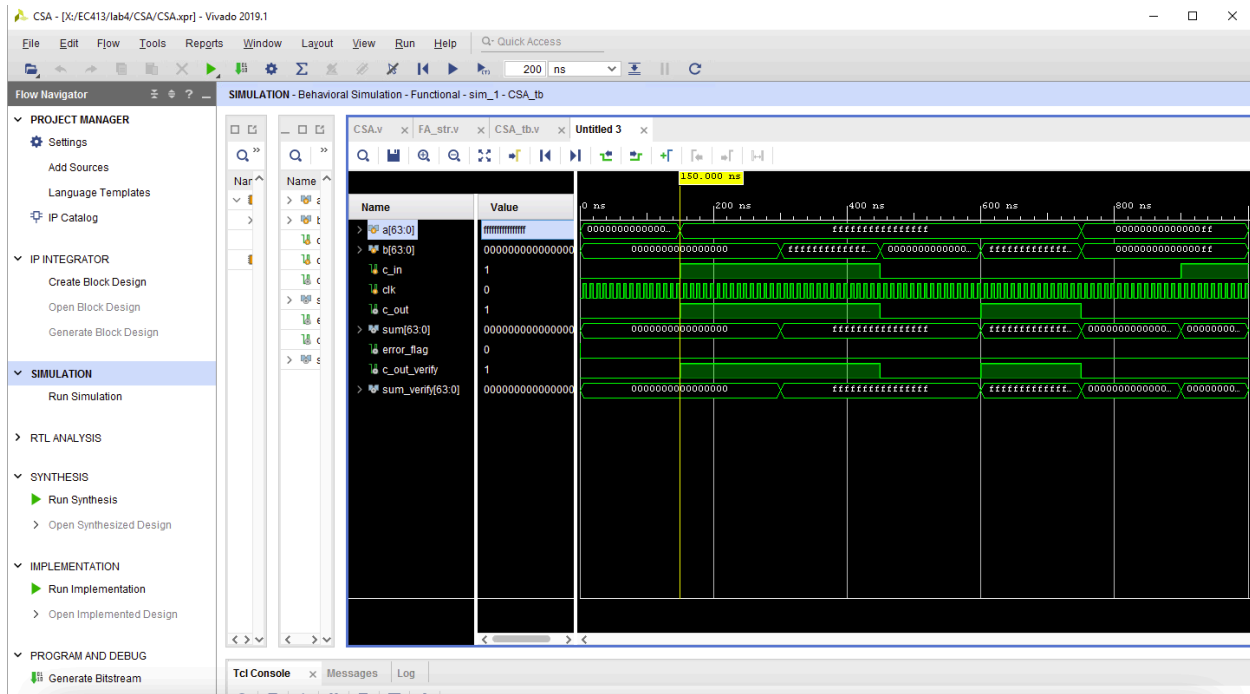
Waveform with a delay:



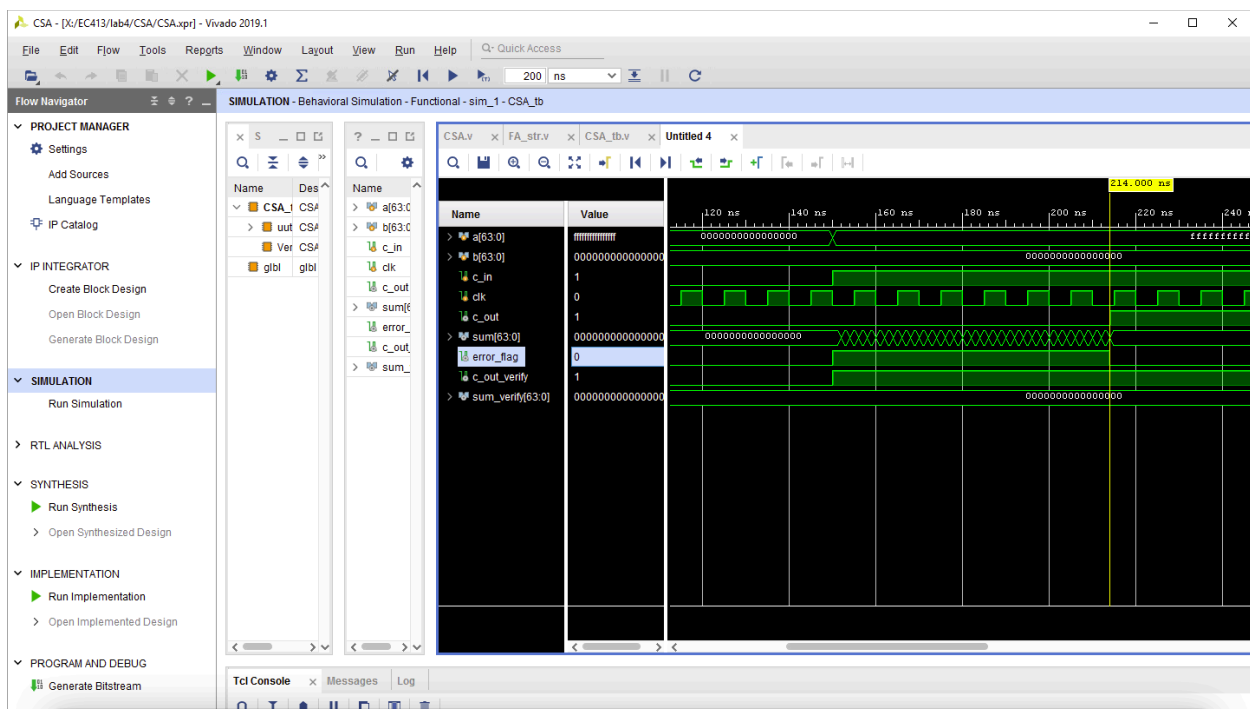
So the time delay for the RCA was 128 ns (278 - 150). This was expected since each full adder has a delay of 2 ns and to make a 64-bit RCA one needs 64 full adders. Therefore, $2 * 64 = 128$ ns, as shown on the diagram.

The CSA is made out of 32-bit adders and a 32-bit MUX. 32-bit adders consist of 16-bit adders.

Waveform without a delay:



Waveform with a delay:



The delay of the CSA is 64 ns (214 - 150), which is expected since 2 out of the 3 32-bit adders are working in parallel. This means that the delay matches the expected delay. However, this is not the true delay since there should be a 2 ns delay for the MUX, but for the purpose of this lab it is ignored.