Apollo Guidance Computer
6.375 Final Presentation

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Objective

The purpose of our project was to make a working emulator of the Apollo Guidance Computer.

Our primary goal was to pass the verification suite.

Secondary goals included:
- reaching 10 million instructions per second
- successfully running actual Apollo programs (i.e. Luminary)

Challenges
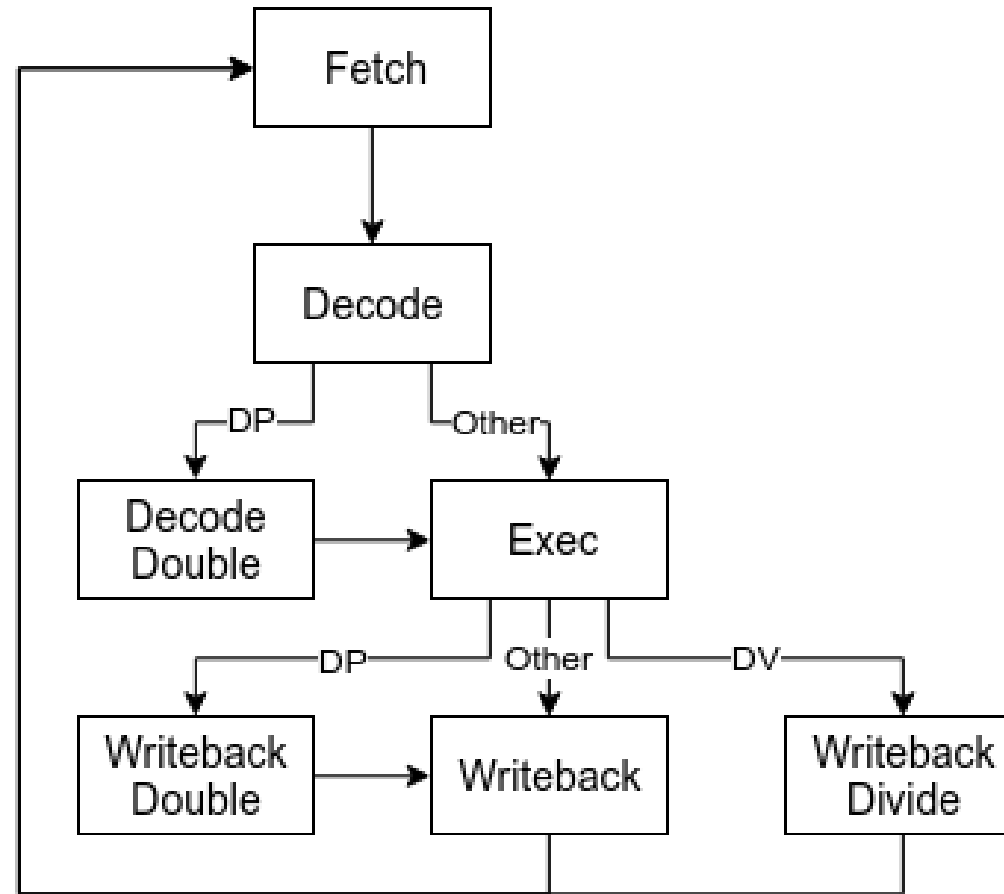
Convoluted instruction set
- ◦ Special cases
- ◦ Memory architecture

Found one interesting bug after passing the verification suite in simulation.
- ◦ Synthesized and met timing, but didn't pass.
- ◦ Two port BRAMs

Debugging self-modifying code

Stages

Results

Passed verification suite

Synthesized and met timing at 50 MHz
◦ Top speed of 12.5 million instructions per second
◦ Used 10.69% of slice LUTs, 2.95% of slice registers, and 4.46% of BRAM tiles

Failed to run Luminary and Colossus (LM and CSM software)

Successfully ran a custom thruster control program