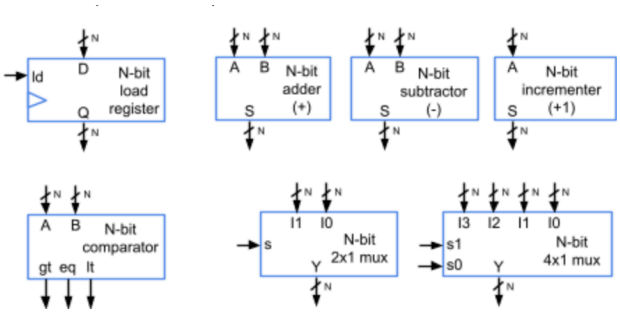
Reading 16

16.4 Datapaths for HLSMs

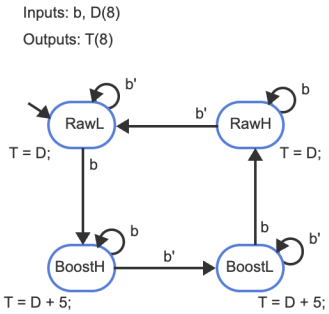
- Implementing a HLSM as a circuit requires first creating a datapath.
- A datapath is a circuit that supports the data operation and data storage parts of system behavior.

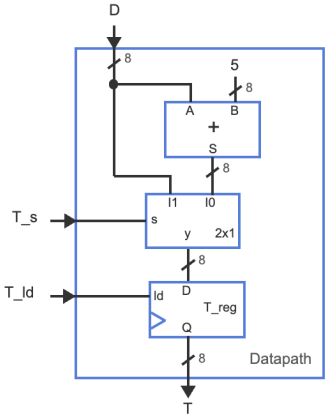
- Sample datapath components!



- Instantiate means to introduce an item into a circuit.
- Each institicated item is called an instance.

- Ex





16.5 Assigning and reading variables

- Each register's update occurs nonideally on the next rising clock edge.
- This is an issue if a HLSM assigns a variable a next value and reads that variable in the same state.
- So within a datapath, the read should be from that next value, not from the variable register's output, since that register has a one-clock-cycle delay.

16.6 HLSMs to circuits: RTL Design

- HLSM can be implemented as a circuit called a custom processor.
- A custom processor is a circuit consisting of a controller and datapath.

- The process of capturing behavior as an HLSM and converting to a circuit is known as register-transfer-level design, or RTL design.

- FSM inputs and outputs are the controller's inputs and outputs.

- A registered output is an output immediately preceded by a register. Benefits include:
  - A registered output prevents glitches from appearing on outputs. A glitch is an undesired temporary 1 (or 0) on a signal, commonly caused by nonideal delays in a circuit.
  - A registered output shortens the longest register-to-register path in a circuit.

- In addition to registering every datapath output, a custom processor registers every control output too, achieved by placing a D flip-flop at each control output. Such registering also ensures all custom processor outputs have the same timing, which is discussed in a later section.

- Registered control outputs: