



## Pipeline

- Allowing 3 cycles for each of the caches, there are 10 pipeline stages
- The Forwarding controller controls the forwarding of data from pipeline stages after execution stage to dependent instructions to enable faster execution.
- CacheReady signals from both caches are used to stall or bubble the pipeline during an instruction or data miss
- At a instruction cache stall only the pipeline stages upto EX are halted, the remaining stages are allowed to run while adding bubbling instructions. At a data cache stall, whole pipeline is stalled.
- The forwarded data are multiplexed at the decode stage to shorten the critical path at the EXE stage. Therefore a neighboring instruction dependency will require a single cycle bubble of the pipeline