Pipeline Architecture

Pipeline
Data Hazards
Branch Hazards
Data Hazards

- Software: nop
- Hardware: stall
Branch Hazard
Branch Hazard

Accelerate Branch Target Computation
Accelerate Branch Detection
Branch hazard

MIPS: Always execute instruction after branch. Assembler responsible for filling slots, use nop when other instruction cannot be found.

Fills slot in previous sequence, blue instruction always executes!
Remaining stages of branch instruction not useful, but one instruction per cycle maintained
PC
Instruction Memory
4
MUX
ADD
Registers
ALU
CTRL
MUX
MUX
Data Memory
MUX
MEM
WB
IF
ID/RF
EXE