In-Class Activity 12-1

1 Activity 1 - Data Hazards

Consider the following instruction sequence:

\[
\begin{align*}
\text{add} & \quad t0, s1, s2 \\
\text{beq} & \quad t0, $zero, \text{LABEL} \\
\text{sw} & \quad t4, 0(t0)
\end{align*}
\]

Determine what each instruction is doing on each clock cycle. For each instruction, determine:

- When it reads its input
- When it calculates a value
- When it stores the result back
- When it determines what the next instruction will be

2 Activity 2 - Forwarding

Simulate the following sequence of instructions. Do NOT insert any stalls. For the EX phase of each instruction, determine:

- Were the values read in ID correct?
- If not, what pipeline register currently contains the not-yet-written values?

Draw a pipeline diagram, showing the dependencies:

\[
\begin{align*}
\text{sub} & \quad 2, 1, 3 \\
\text{and} & \quad 12, 2, 5 \\
\text{add} & \quad 13, 2, 2 \\
\text{or} & \quad 14, 5, 2 \\
\text{sw} & \quad 15, 100(2)
\end{align*}
\]