SOC Design

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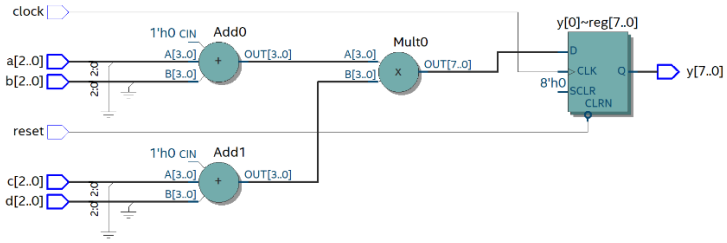
최가온(학번: 2019009261)

[Homework 1] Non-Pipeline vs. Pipeline

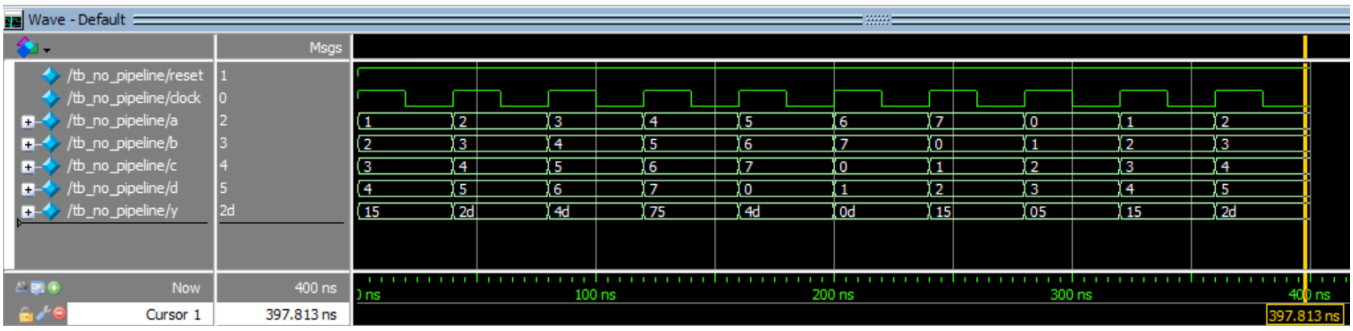
[Github Link] https://github.com/Gaon-Choi/ITE4003/tree/main/Week07/no_pipeline

[1] Non-Pipeline Structure

1-1) RTL Viewer Schematics



1-2) Waveform Result



1-3) SDC File

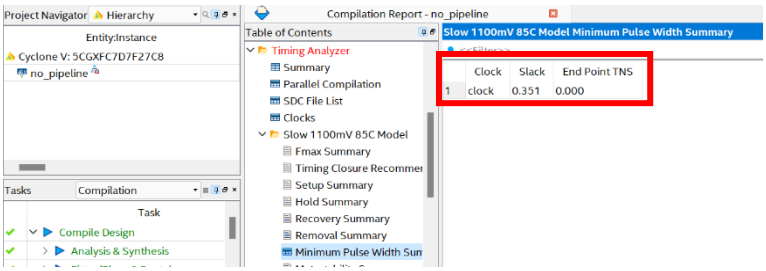
```
##
## DEVICE  "5CGXFC7D7F27C8"
##

#**************************************************************
# Time Information
#**************************************************************
set_time_format -unit ns -decimal_places 3

#**************************************************************
# Create Clock
#**************************************************************

create_clock -name {clock} -period 5.000 -waveform {0.000 0.600} [get_ports {clock}]
```

1-4) Slack Value and Maximum Frequency



Slack value $= 0.351$

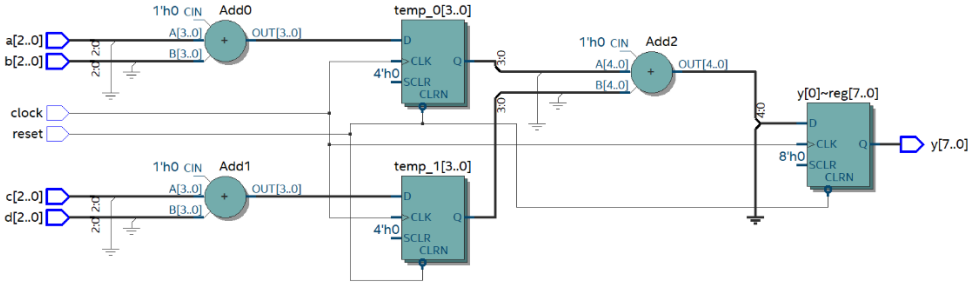
Chip Delay $=$ Clock $-$ Slack value $=\ 5.0 - 0.351 = 4.65$

$$\text{Maximum Frequency} = \frac{1}{\text{Chip Delay}} = \frac{1}{4.65} = 215MHz$$

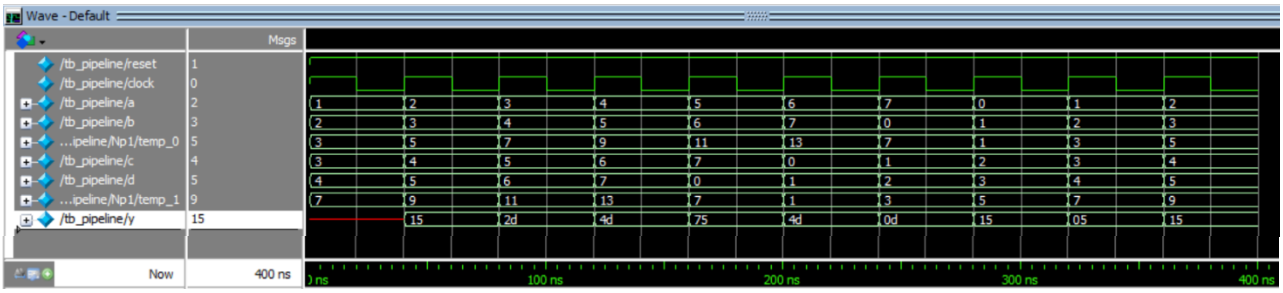
$$\text{latency} = 0.5ns + 1.2ns + 10ns = 11.7ns$$

[2] Pipeline Structure

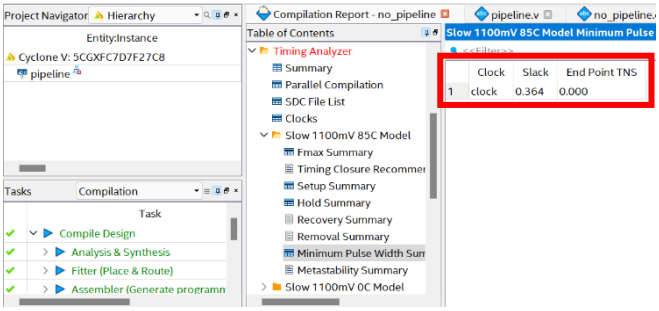
2-1) RTL Viewer Schematics



2-2) Waveform Result



2-3) Slack Value and Maximum Frequency



Slack value $= 0.364$

Chip Delay $=$ Clock $-$ Slack value $=\ 5.0 - 0.364 = 4.636$

$$\text{Maximum Frequency} = \frac{1}{\text{Chip Delay}} = \frac{1}{4.636} = 215.70MHz$$

$$\text{latency} = \max(0.5ns + 1.2ns + 10ns) = 10.0ns$$