Static Timing Analysis (STA)

Lecture #06: Characteristics of Timing Arc (Part #03) - Slew

Video Lecture Link

Static Timing Analysis (STA) – Characteristics of Timing Arc

Characteristics of Timing Arc :

1) Delay

2) Unateness

3) Slew

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3) Slew:

- Transition delay is defined as the time taken by signal to rise from 20% to the 80% of its maximum value. This is known as “rise time”.
- Transition delay is typically measured in nanoseconds
- Slew is the rate of transition measured in **Volts/Nanoseconds**
- Similarly “fall time” can be defined as the time taken by a signal to fall from 80% to the 20% of its maximum value.
- This transition time used for delay calculations are based on the timing library (.lib files).

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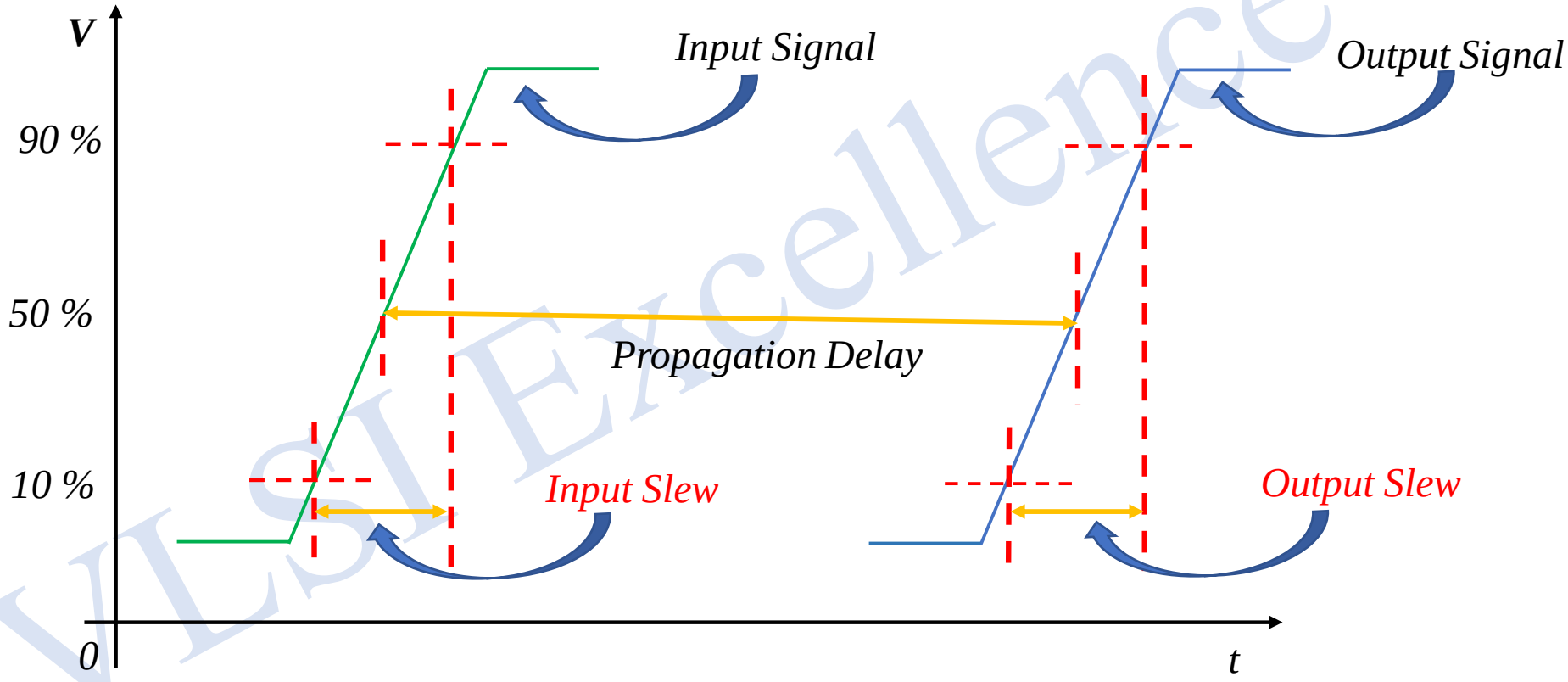

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How STA tool Calculates Input Transition Time Using Slew :

STA tool use the slew threshold values from the library to calculate the transition time.

For example STA tool calculates the rise time using slew_lower_threshold_pct_rise of 20% and slew_upper_threshold_pct_rise of 80%

Similarly, fall threshold values for fall time

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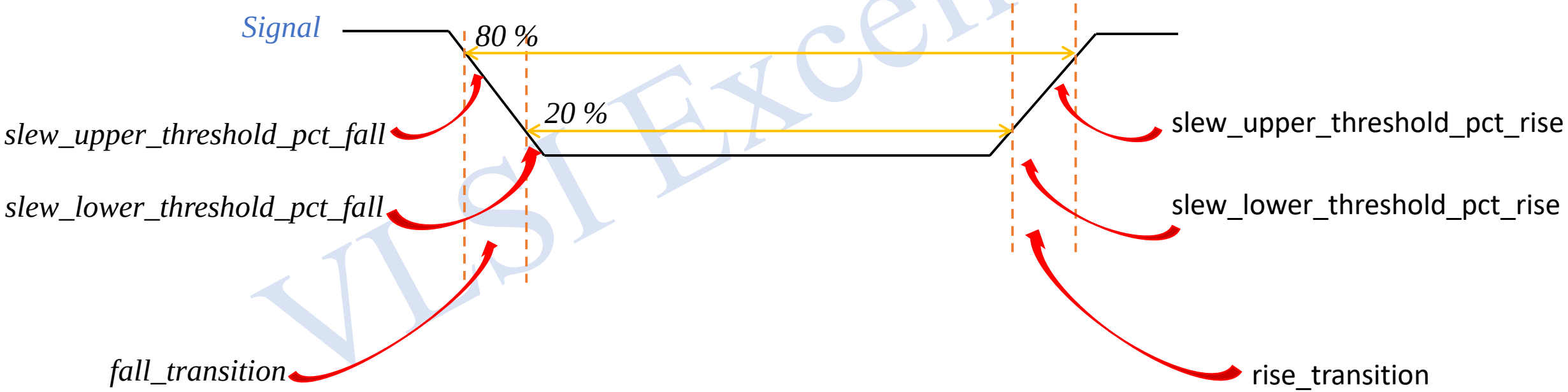
The graph below shows transition time being measure from 80% to 20% of the falling signal for the fall transition time (aka fall slew), and from 20% to 80% for the rise transition time (aka rise slew)



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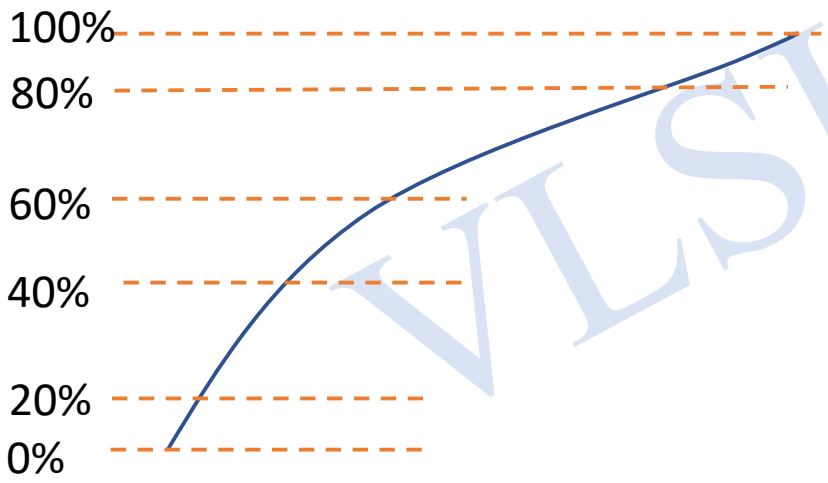
Example – Slew Threshold

Slews are typically measured in a small voltage range (40 – 60%) to capture a more linear portion of the transition.

Example : Slew is measured as 0.10 at a range of 40-60% (20% swing). The library slew thresholds are 20 -80% (60%swing) , then this slew is calculated as 0.10 *(60/20) = 0.30



slew_lower_threshold_pct_rise : 20.00
slew_upper_threshold_pct_rise : 80.00
slew_derate_from_library : 0.50
input_threshold_pct_fall : 50.00
output_threshold_pct_fall : 50.00
input_threshold_pct_rise : 50.00
output_threshold_pct_rise : 50.00
slew_lower_threshold_pct_fall : 30.00
slew_upper_threshold_pct_fall : 70.00

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Note: STA tool reads the output transition time from the cell library and use it as the input transition time to the next cell in the path.

Example:

---------- form timing lib

rise_transiton (){

Index_1 ("0.10, 0.15, 0.20, 0.25); // ROW Number

Index_2 ("0.005, 0.010, 0.0025, 0.0030"); // Column Number

Values ("0.00400, 0.1200, 0.23789, - - 0.1234" , "0.2123, 0.34567, 0.2345, - - - 0.8786");

}

Given: Input rise transition = 0.10 and Output load = 0.010, Then Output transition time is 0.1200

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