National Cheng Kung University

Department of Electrical Engineering

Introduction to VLSI CAD (Spring 2023)

Lab Session 7

SOM

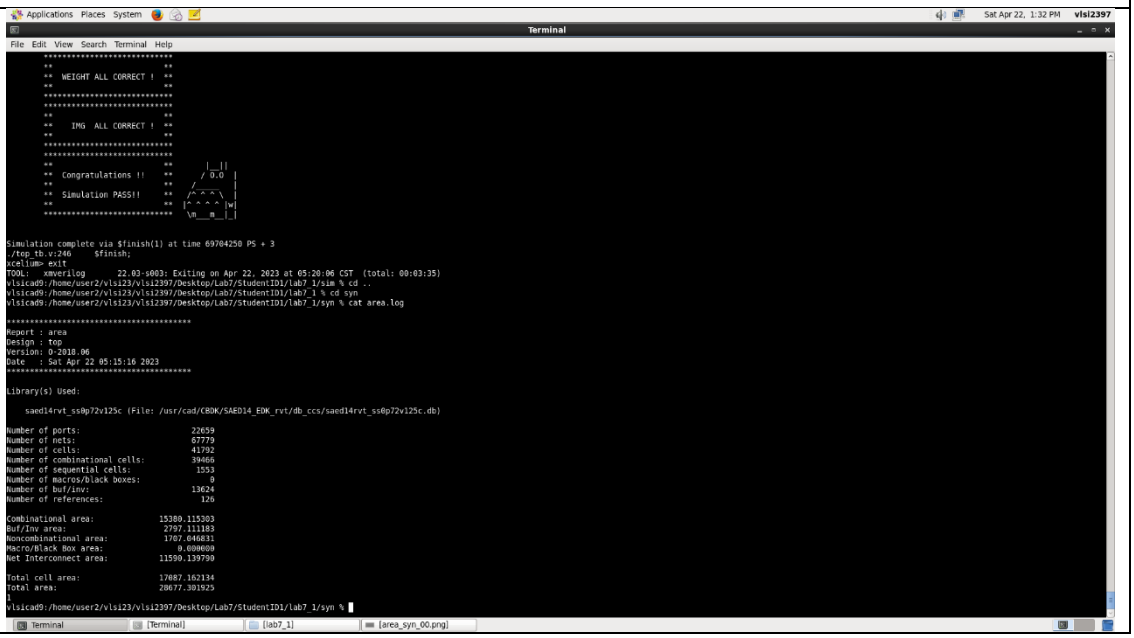
Name	Student ID	Contribution ratio
曲致駿	E94096306	30%
陳慕丞	E94096097	70%
Check list		
Part	Points	Marks(Y/N)
Lab7_1 RTL pass	10	Y
Lab7_1 SYN pass	15	Y
Lab7_2 RTL pass	10	Y
Lab7_2 SYN pass	15	Y
Superlint >= 90%	5	Y
Simple baseline	10	Y
Strong baseline	5	Y
Boss baseline	5	Y

DEADLINE 4/26(三) 23:59

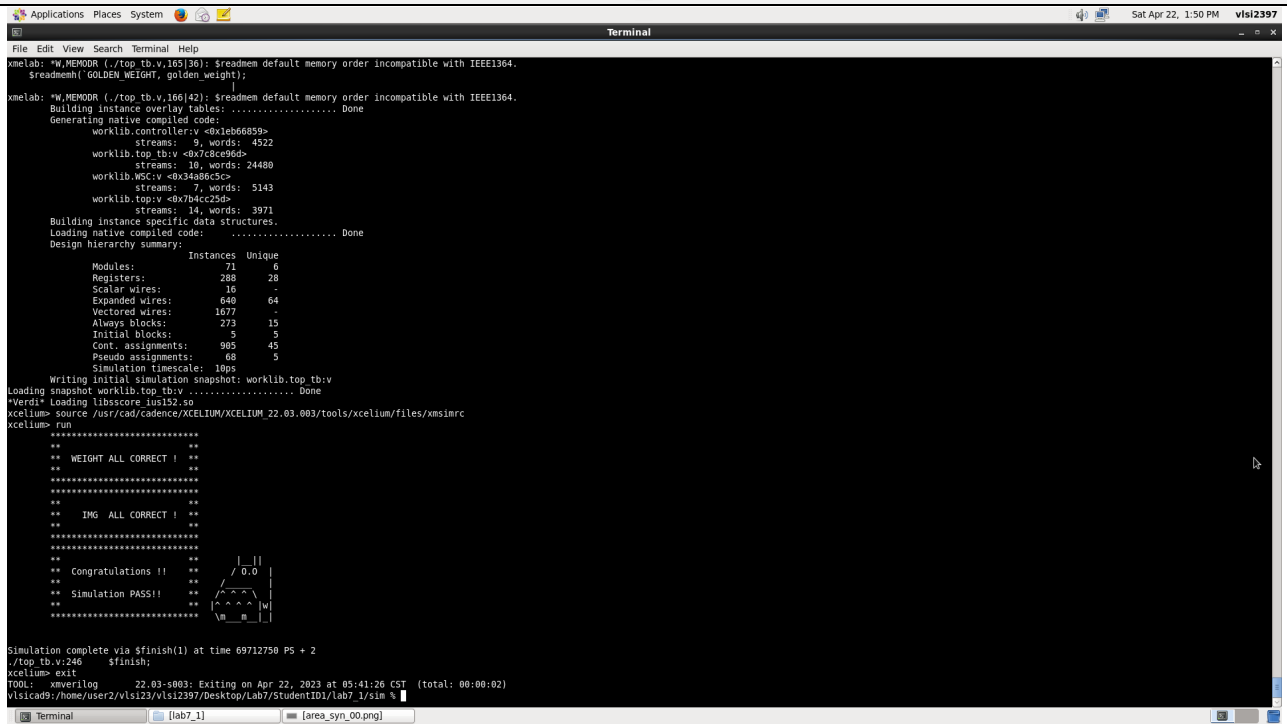
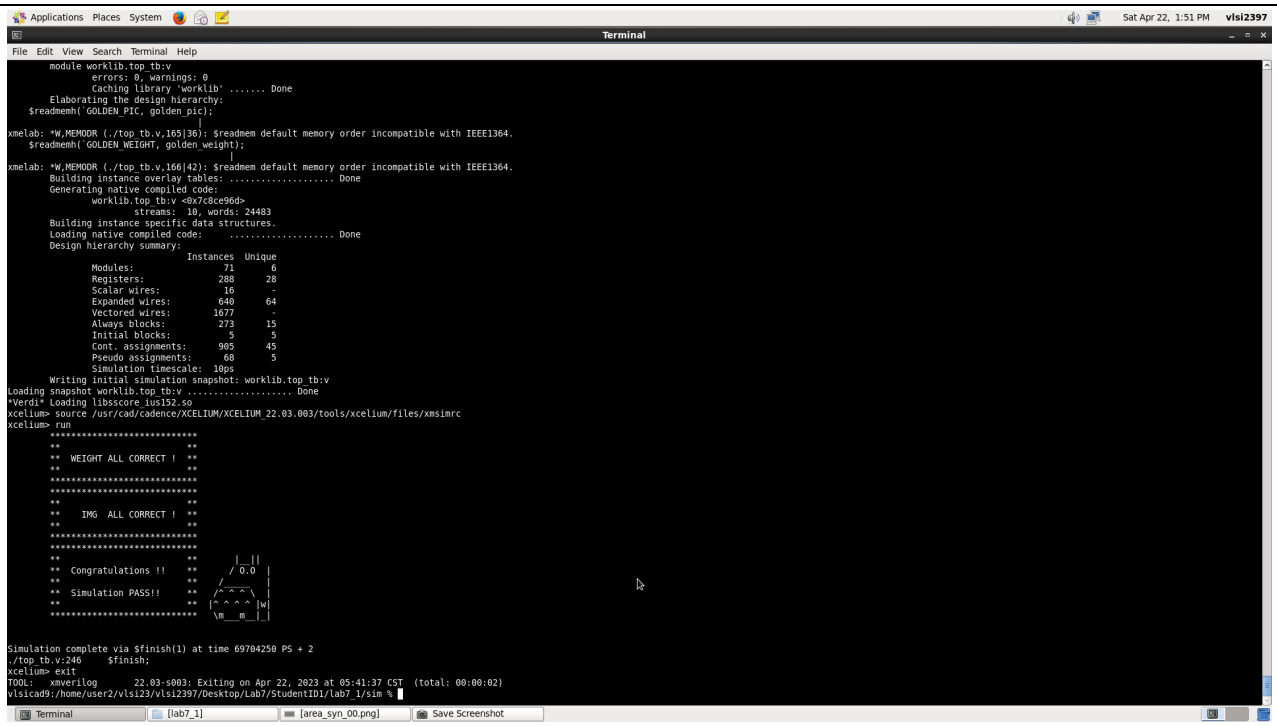
(1) Lab7_1 PA result : (must fill your PA, otherwise PA will get 0 grade)

Lab7_1					
CYCLE(ns)	Tb0(ns)	Tb1(ns)	Tb2(ns)	Tb3(ns)	Area(um^2)
8.5	69704.25	69704.25	69704.25	69704.25	17087
PA = (tb0+tb1+tb2+tb3)*area			4764146079		

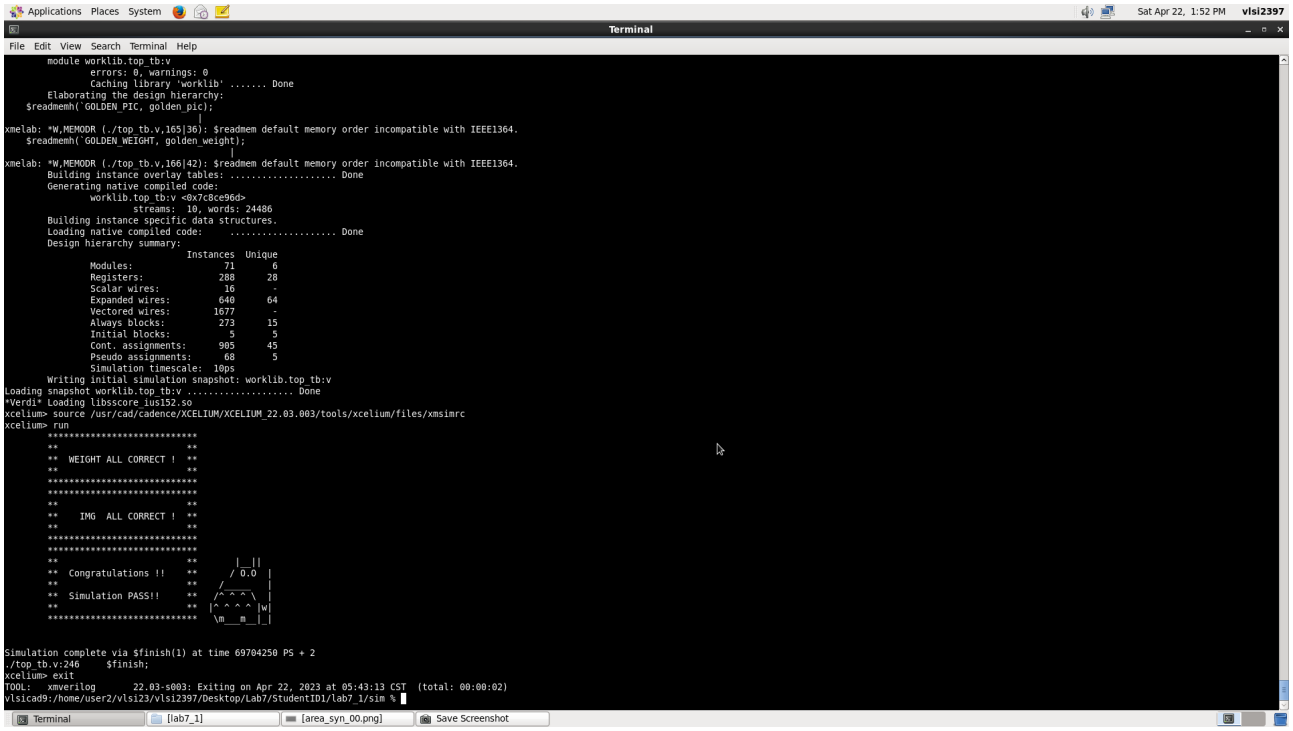
(2) Show area.log screenshot, need to reveal total cell area.

Lab7_1	
area.log	

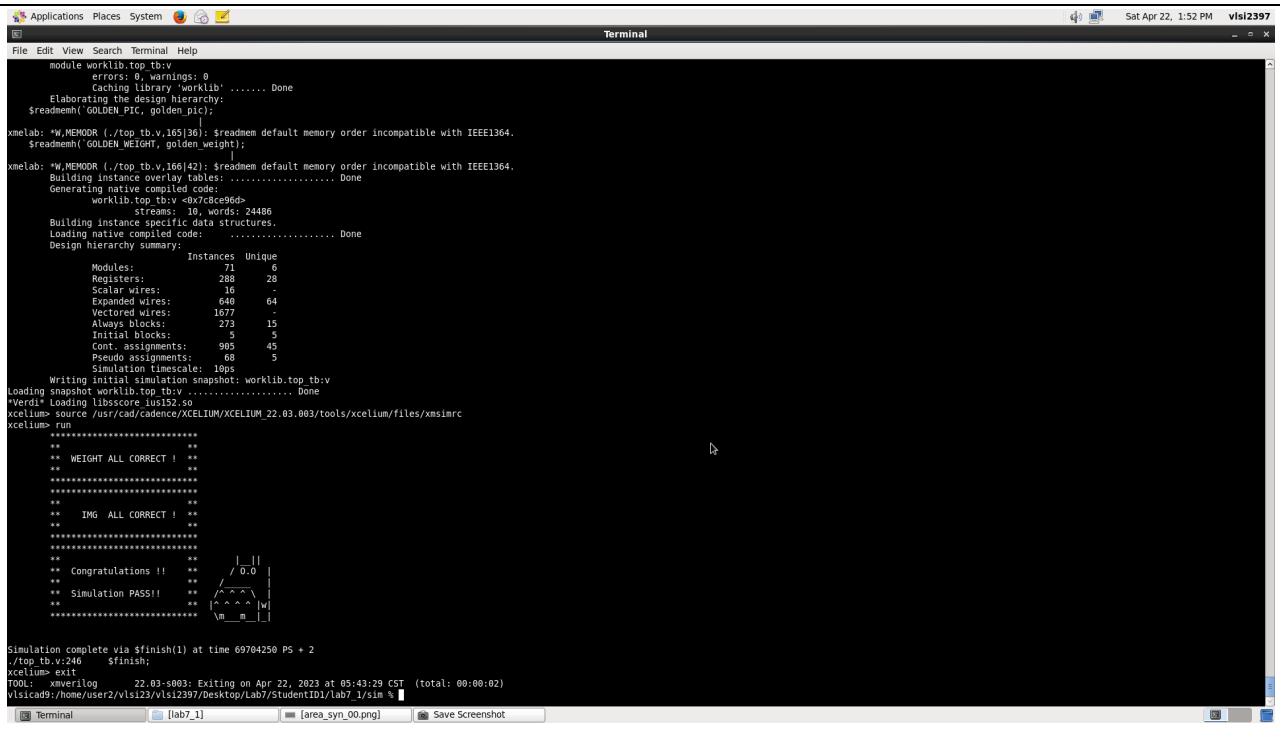
(3) Show simulation result (terminal screenshot), need to reveal simulation time

Lab7_1	
RTL tb0	
RTL tb1	

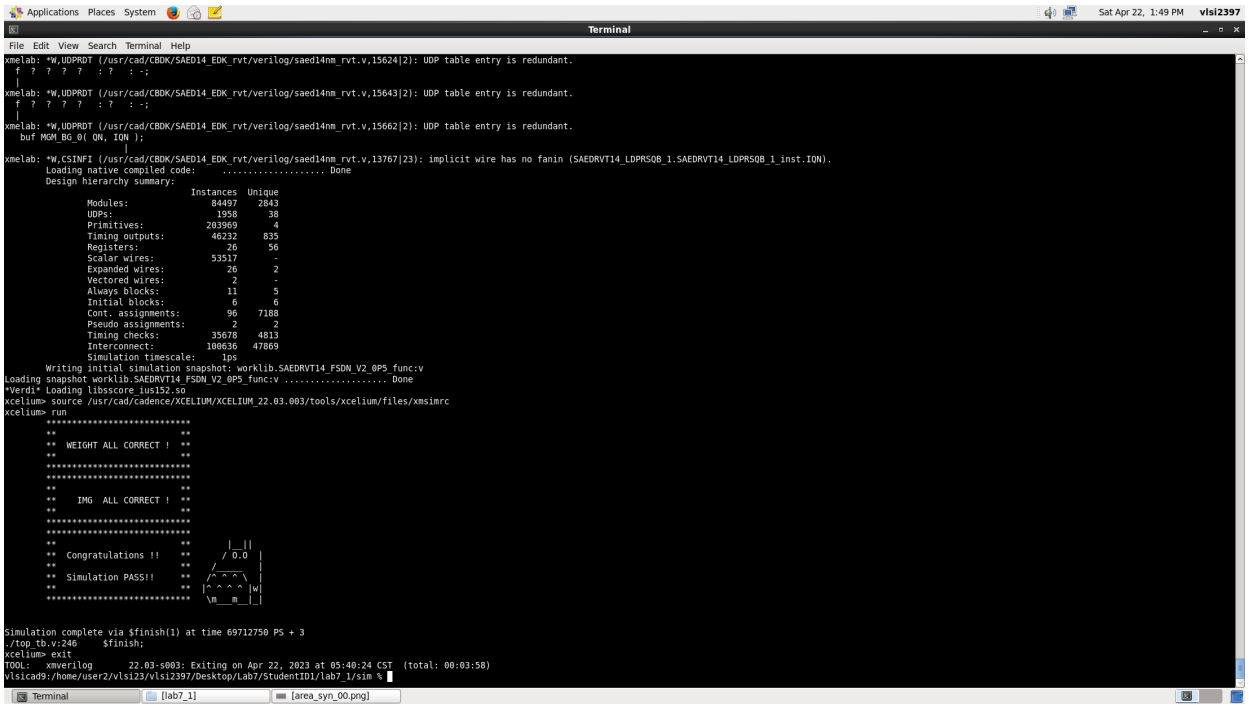
RTL tb2



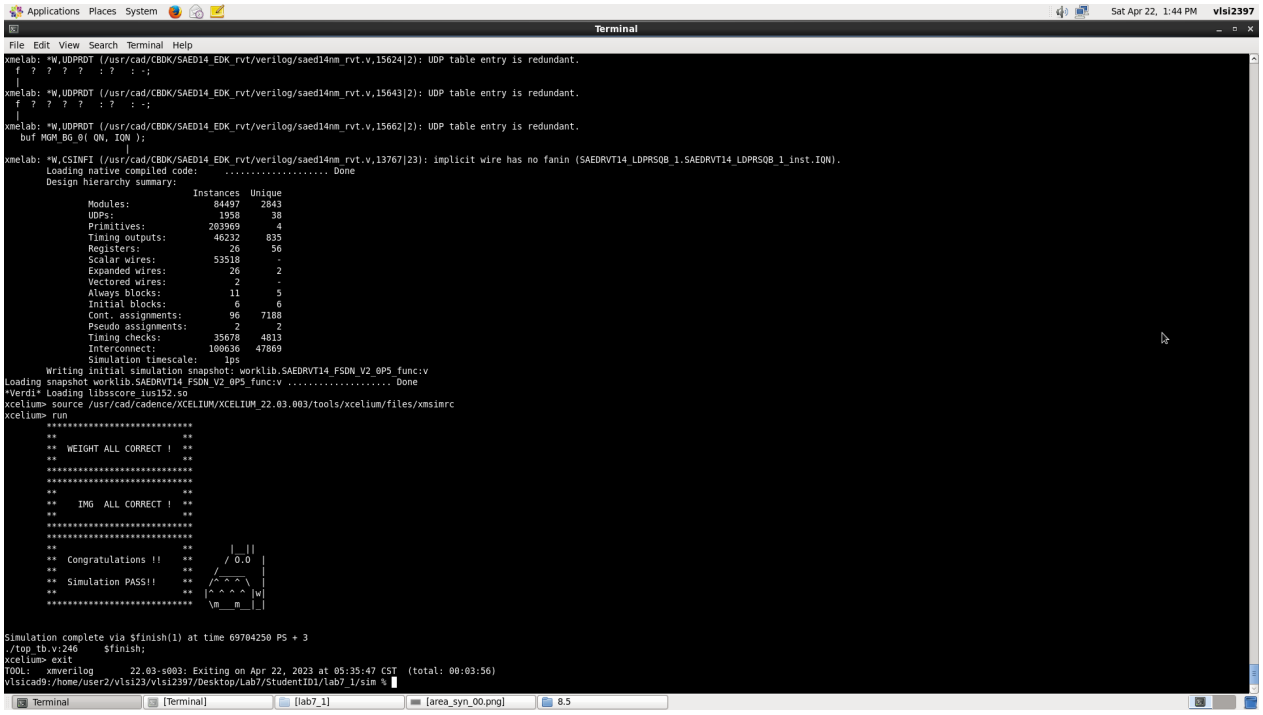
RTL tb3



SYN tb0



SYN tb1



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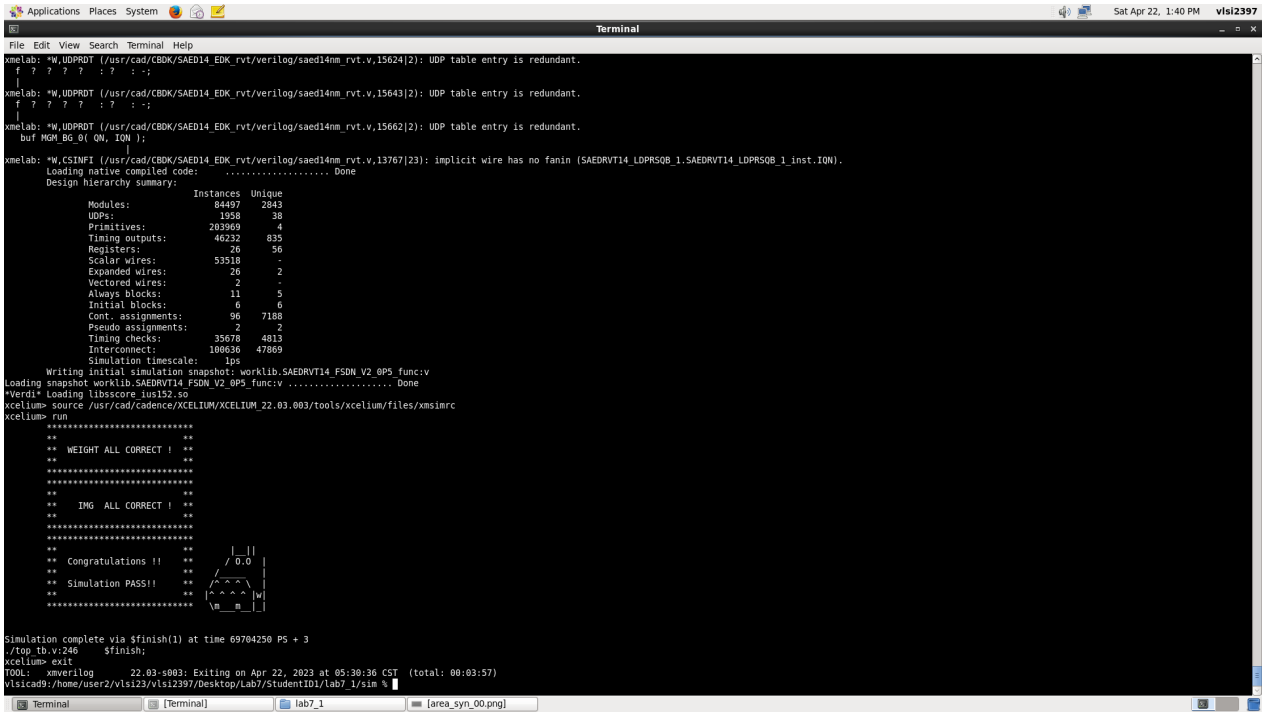
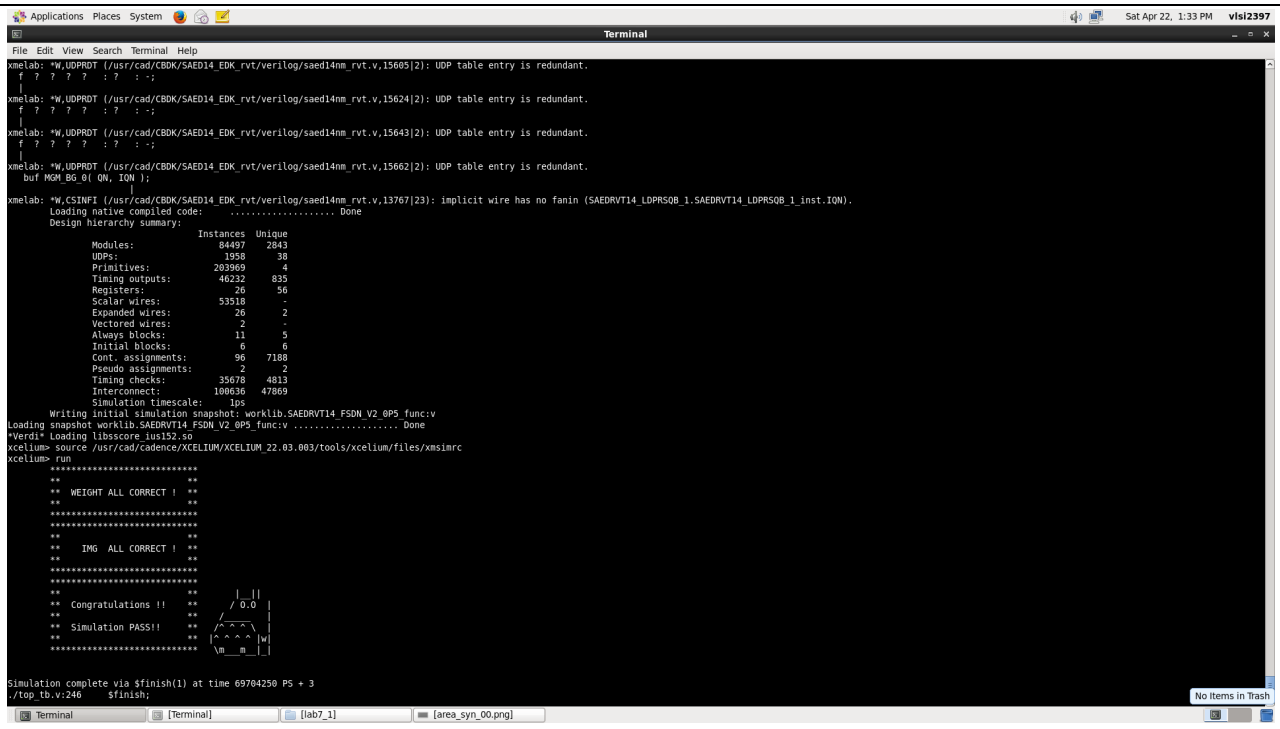
SYN tb2

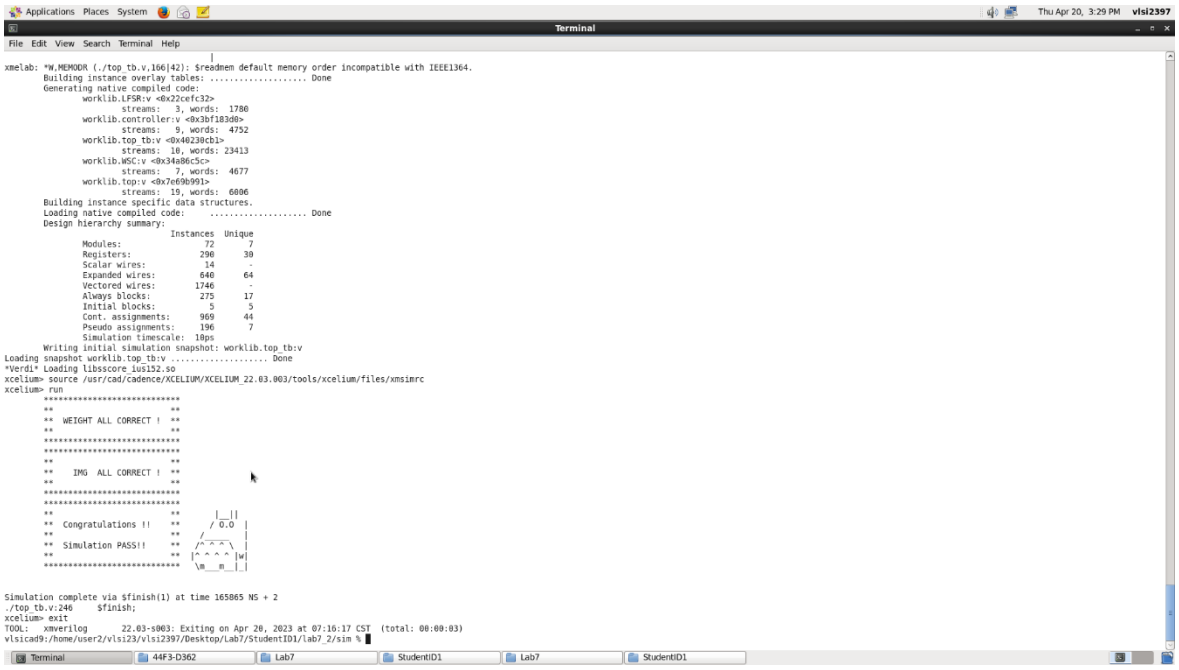


SYN tb3

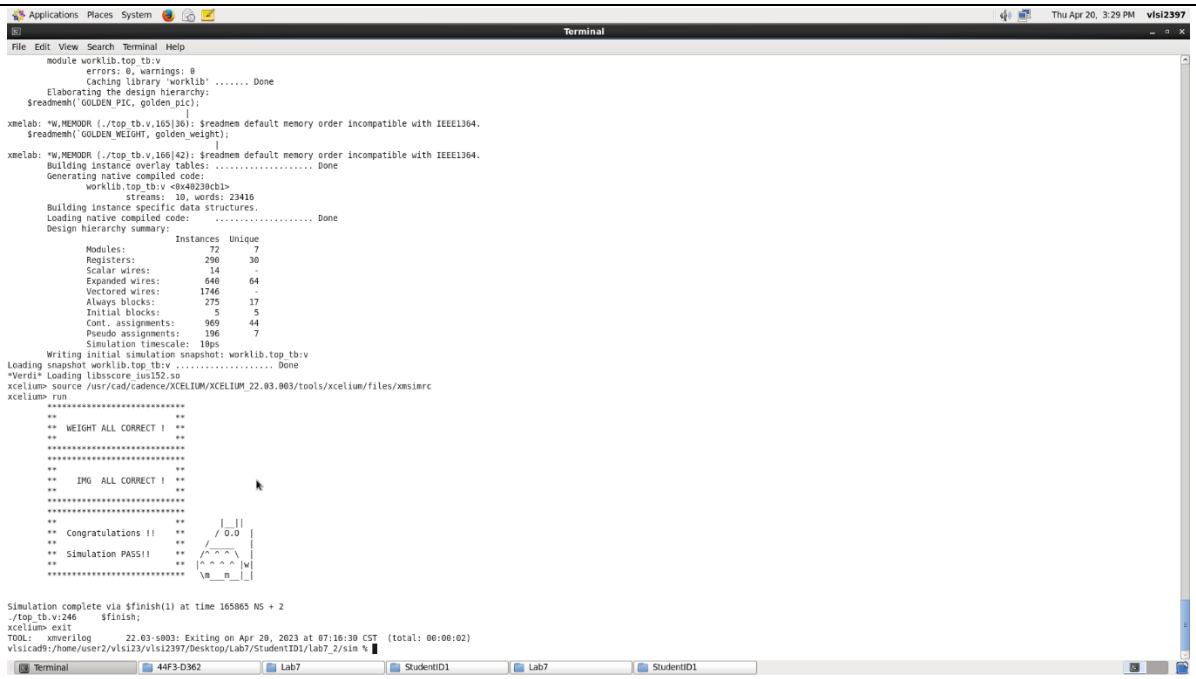


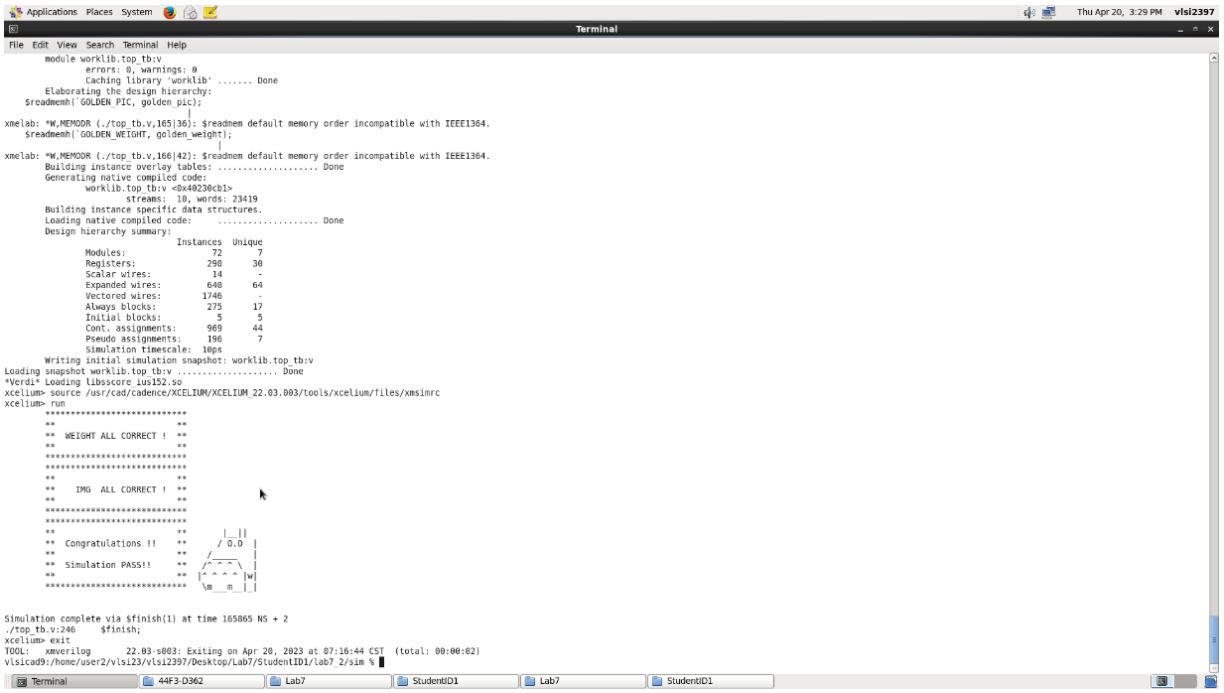
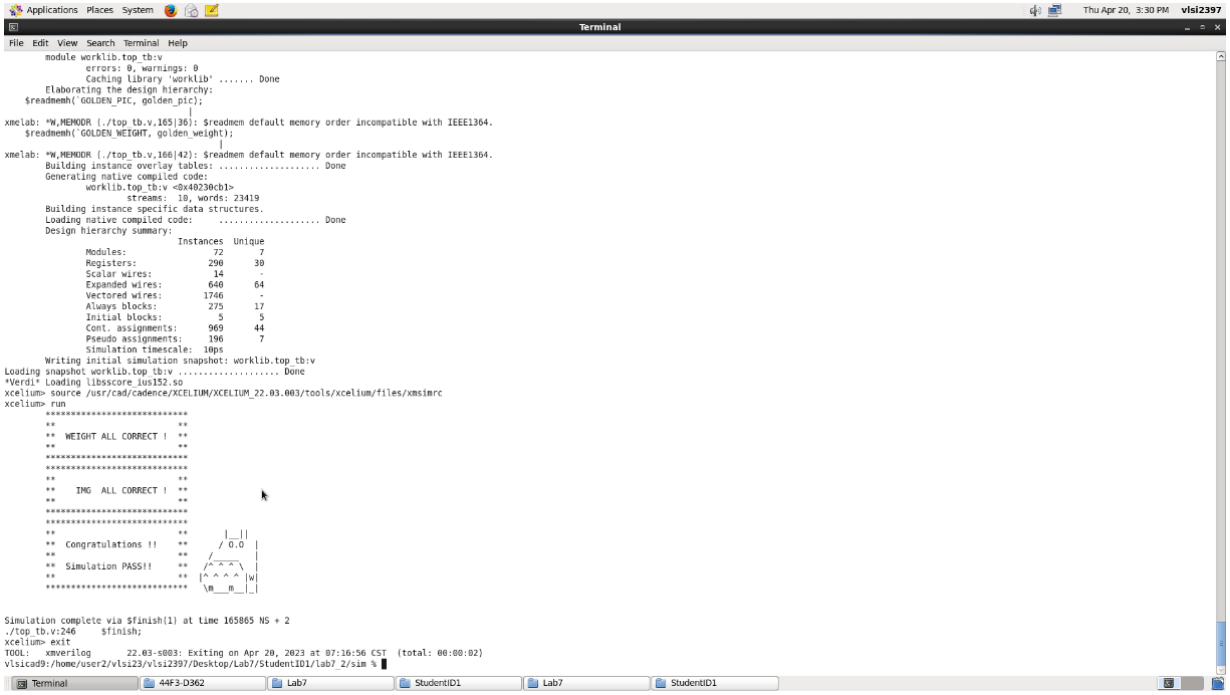
Lab7_2

RTL tb0

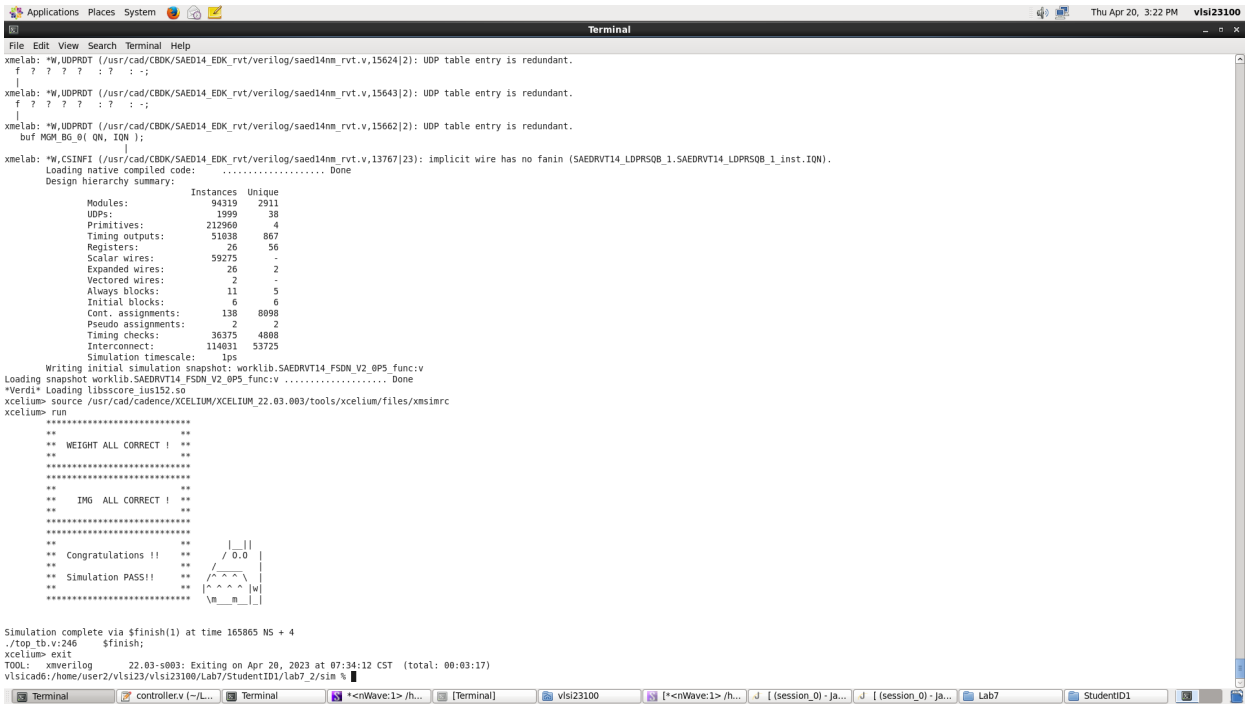


RTL tb1

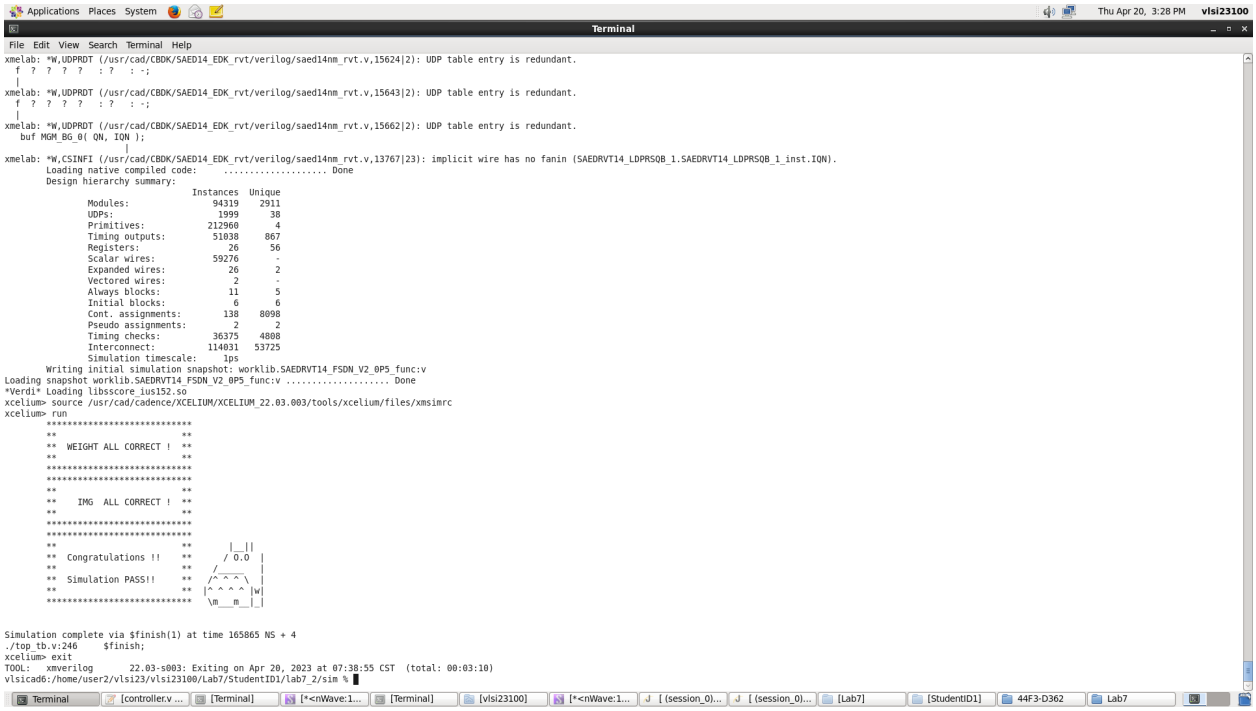


RTL tb2	
RTL tb3	

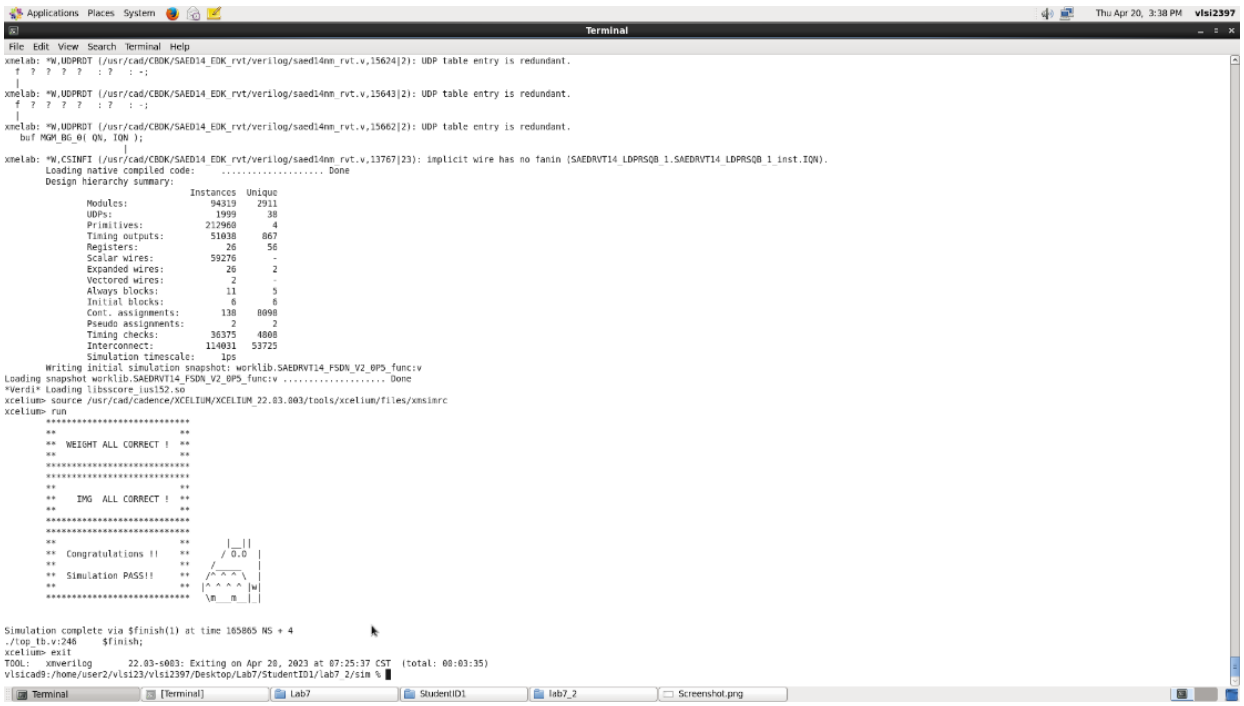
SYN tb0



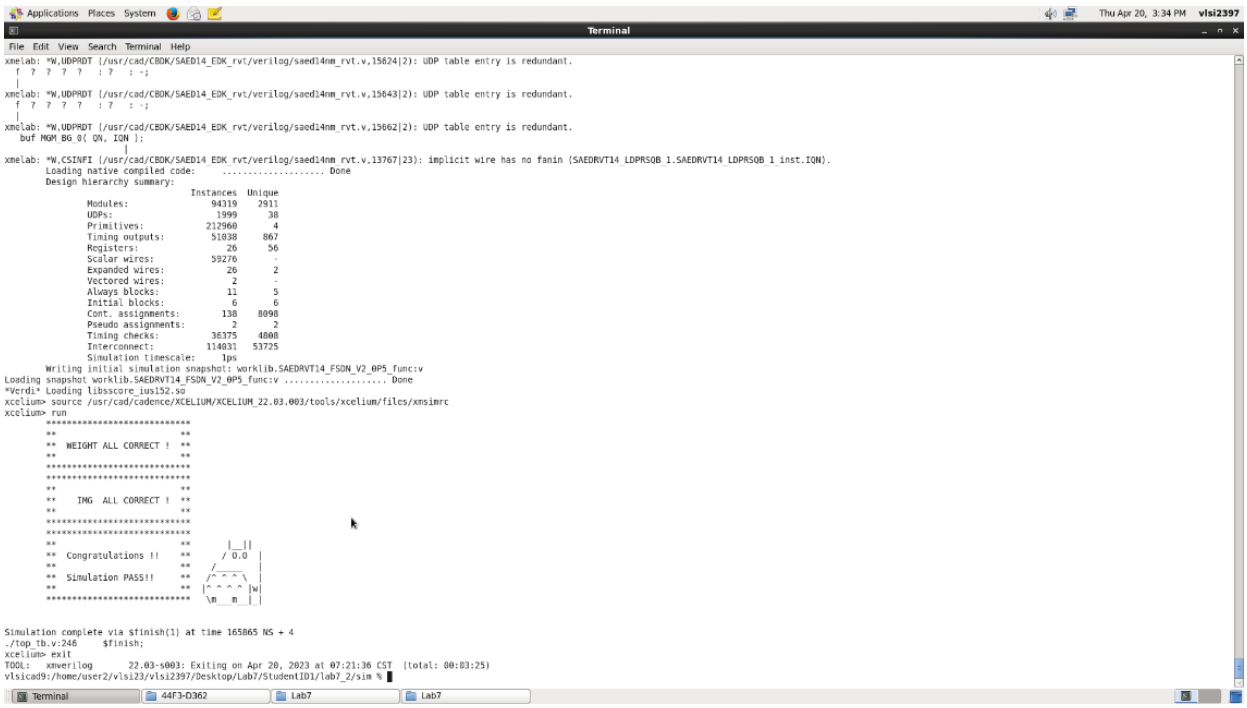
SYN tb1



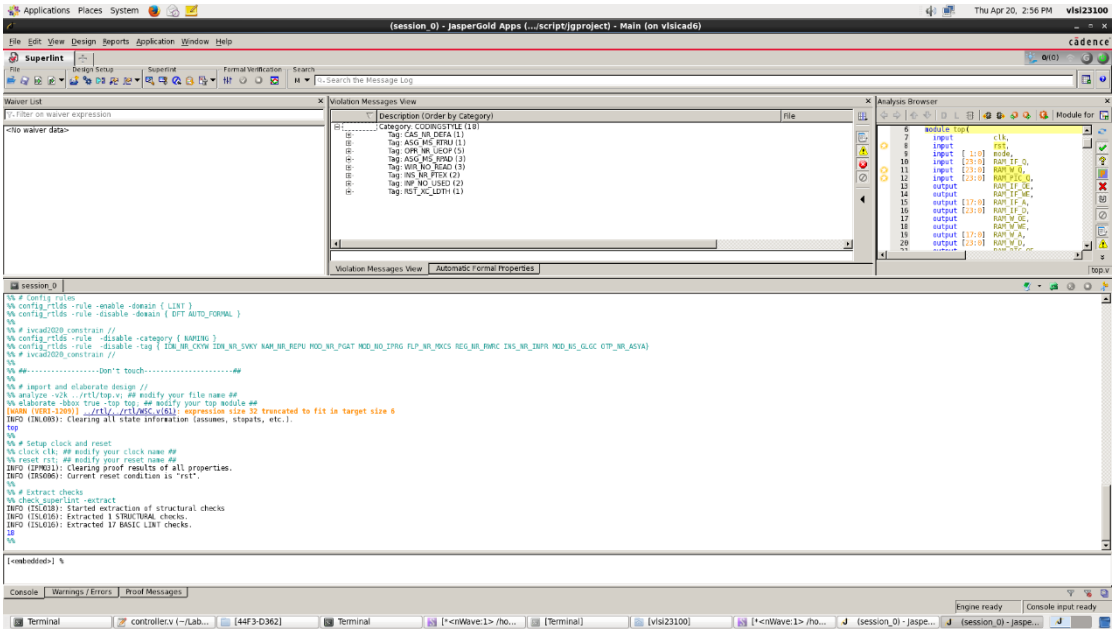
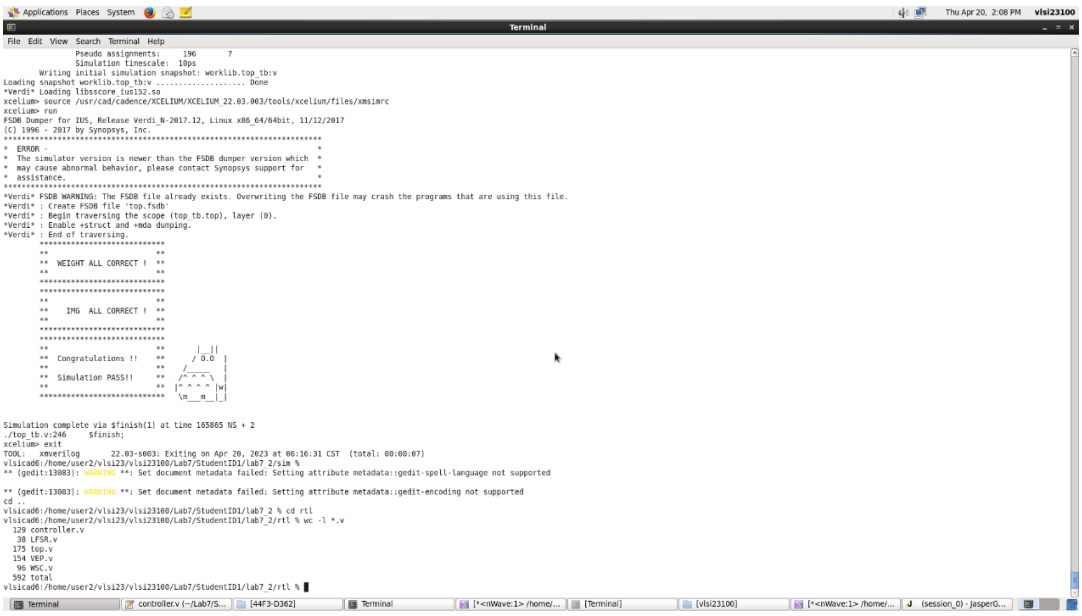
SYN tb2

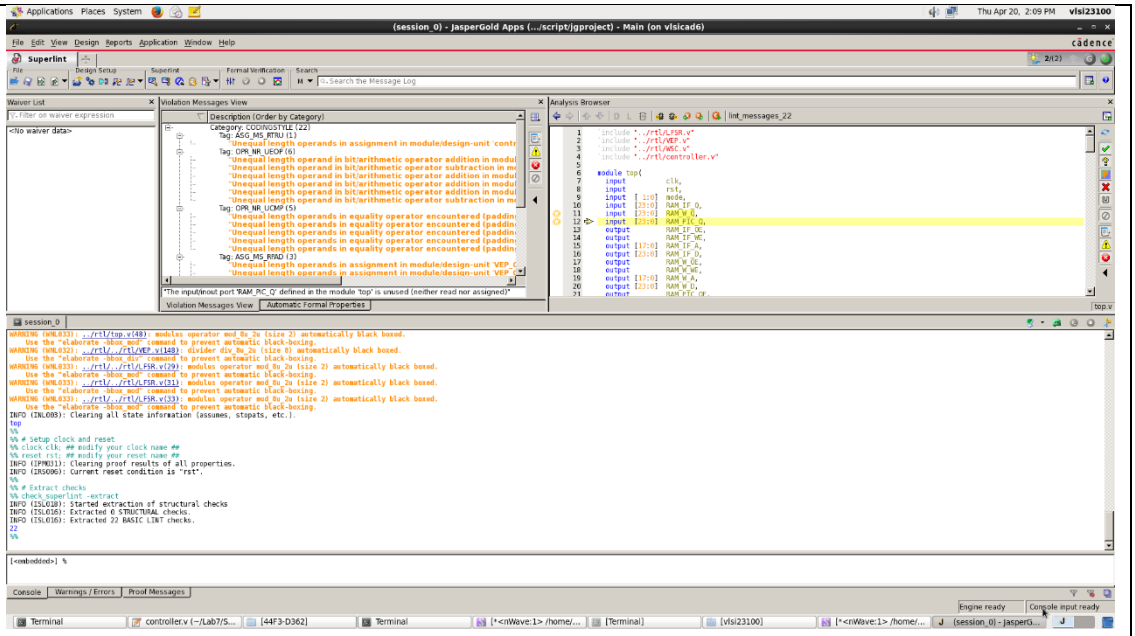


SYN tb3



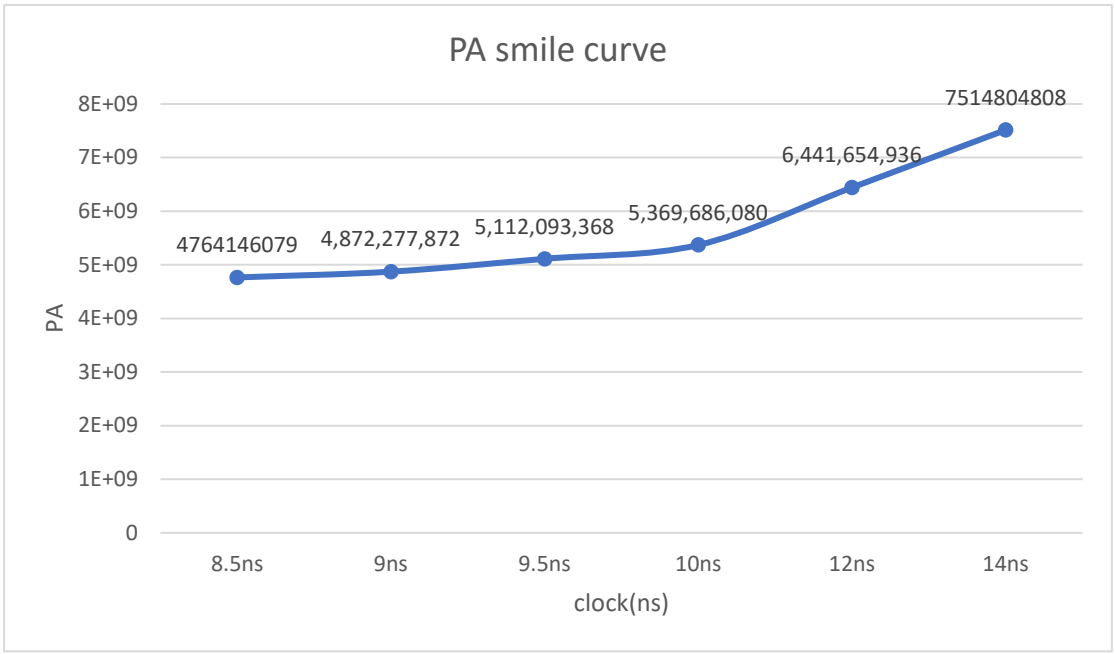
(4) Show SuperLint coverage

superlint	
Lab7_1	 Total:512 lines  (1-18/521) = 96.5%
Lab7_2	



(1-22/592) = 96.5%

(5) Draw smile curve of your design



(6) Lessons learned

What is the Self-Organizing Map (SOM)?

In SOM, a set of neurons is arranged in a two-dimensional grid, and each neuron is associated with a weight vector. During the training process, the algorithm iteratively updates the weight vectors of the neurons based on the input data, which causes the neurons with similar weight vectors to be located close to each other in the output space. The neurons that are closest to the input data are called the "winning neurons," and they represent the input data in the output space. The weights of the neighboring neurons are also updated in a way that depends on a neighborhood function that decreases over time.

How we use Manhattan distance in this course?

In this course, the Manhattan distance is used as a measure of distance between the weight vectors of the neurons in the Self-Organizing Map (SOM) network and the input vectors. The Manhattan distance between two vectors is defined as the sum of the absolute differences between their corresponding components. In the context of SOM, it is used to find the neuron whose weight vector is closest to the input vector during both the training and inference phases. The neuron with the smallest Manhattan distance is called the winner neuron and is used to update its weight and the weights of its neighbors in the training phase, and to assign a value to the corresponding pixel in the output image in the inference phase.