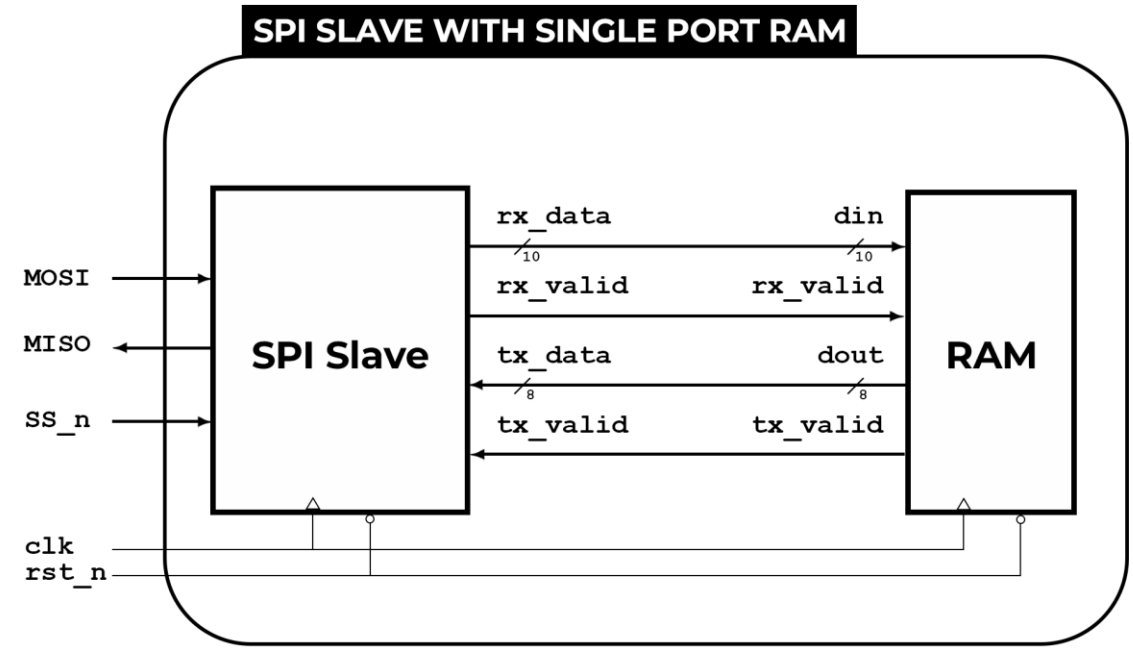
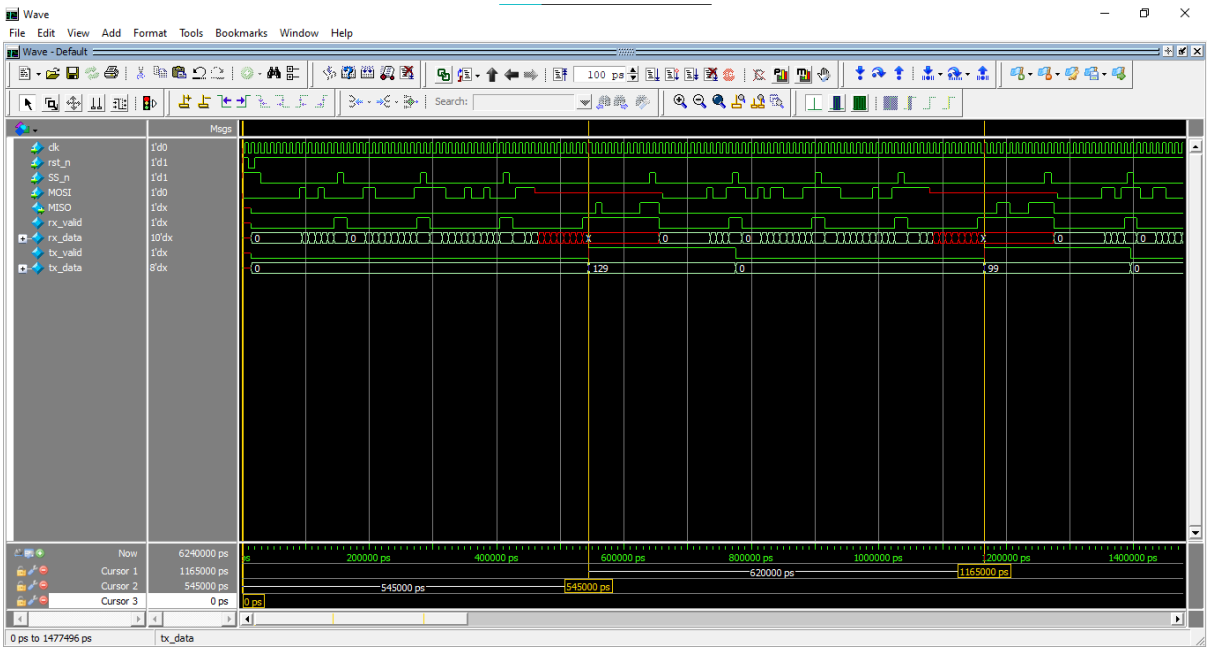
SPI Slave with Single Port RAM



Mohamed Atef Yousef Moawad
Ahmed Tarek Abdallah Mohamed
Mohamed Mahmoud Mohamed

QuestaSim snippet



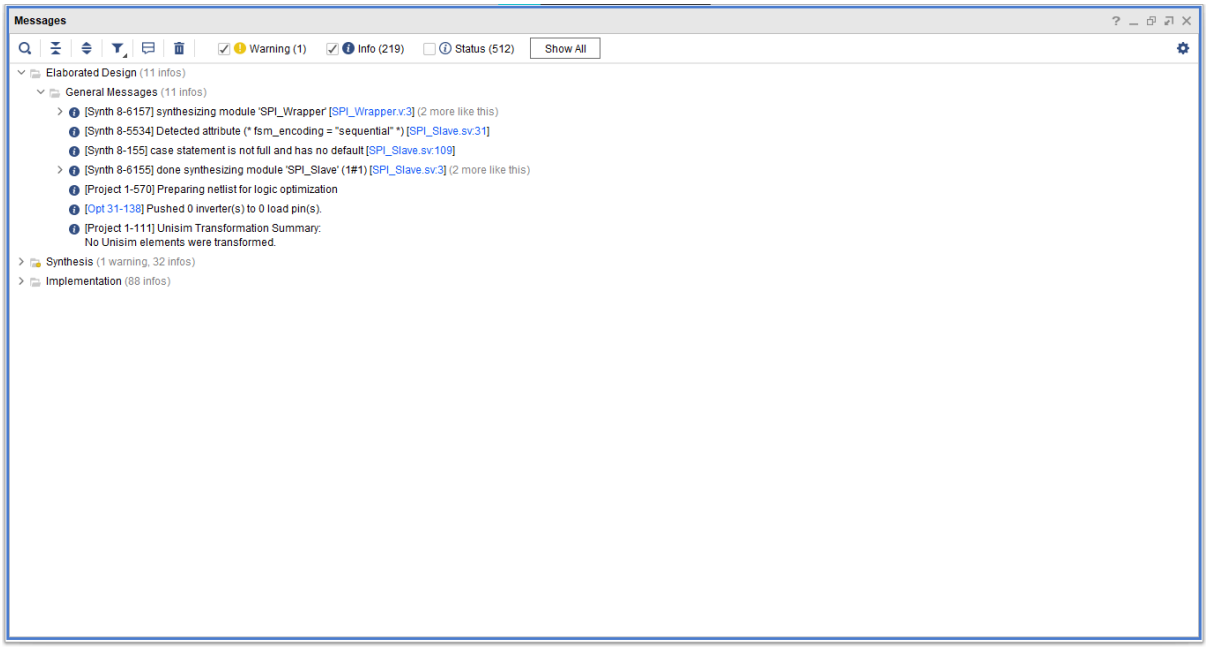

```
# ------------------------- Test Case 1 -------------------------
#
# Master Operation: Transmitting Write Address:  36
# Master TX Started. Control Bits: 000, Transmitted Data: 00100100
# Master TX Completed.
#
# Master Operation: Transmitting Write Data: 129
# Master TX Started. Control Bits: 001, Transmitted Data: 10000001
# Master TX Completed.
#
# Master Operation: Transmitting Read Address:  36
# Master TX Started. Control Bits: 110, Transmitted Data: 00100100
# Master TX Completed.
#
# Master Operation: Receiving Read data
# Master RX Started. Control Bits: 111
# Master RX Completed. Received Data: 129
#
# [MATCH] Addr =  36, Expected = 129, Received = 129
#
# ------------------------- Test Case 2 -------------------------
#
# Master Operation: Transmitting Write Address:   9
# Master TX Started. Control Bits: 000, Transmitted Data: 00001001
# Master TX Completed.
#
```

```
# Master Operation: Transmitting Write Data:  99
# Master TX Started. Control Bits: 001, Transmitted Data: 01100011
# Master TX Completed.
#
# Master Operation: Transmitting Read Address:   9
# Master TX Started. Control Bits: 110, Transmitted Data: 00001001
# Master TX Completed.
#
# Master Operation: Receiving Read data
# Master RX Started. Control Bits: 111
# Master RX Completed. Received Data:  99
#
# [MATCH] Addr =   9, Expected =  99, Received =  99
```

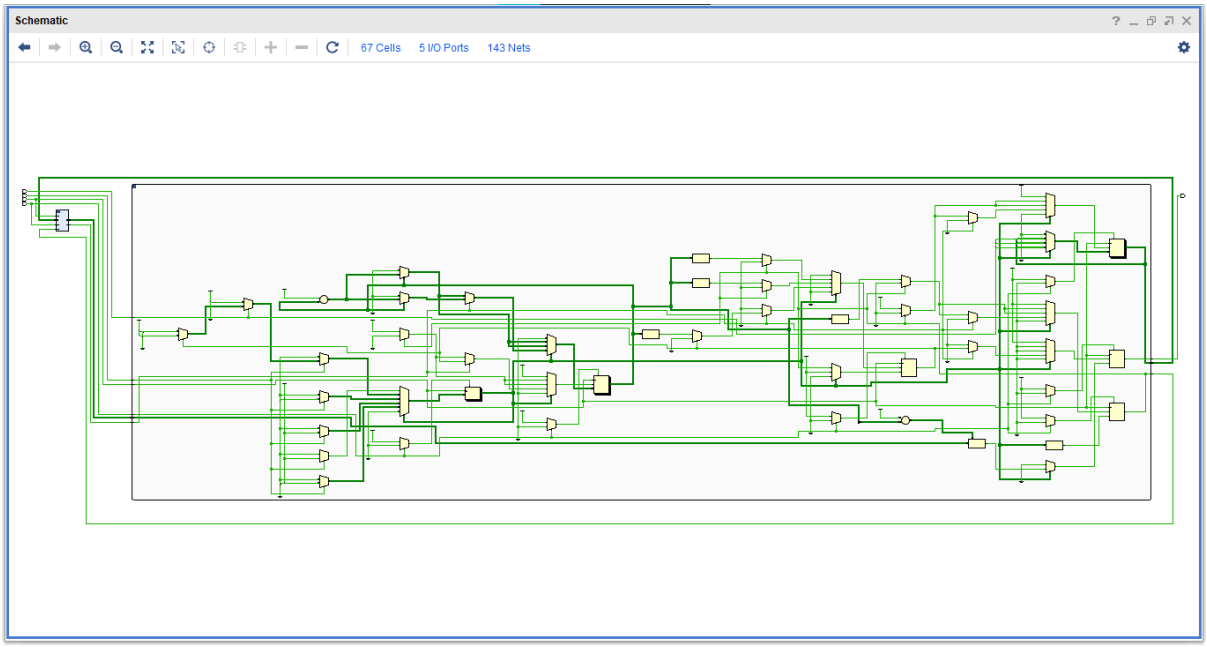
```
(* fsm_encoding = "sequential" *)
```

Elaboration

“Messages” tab

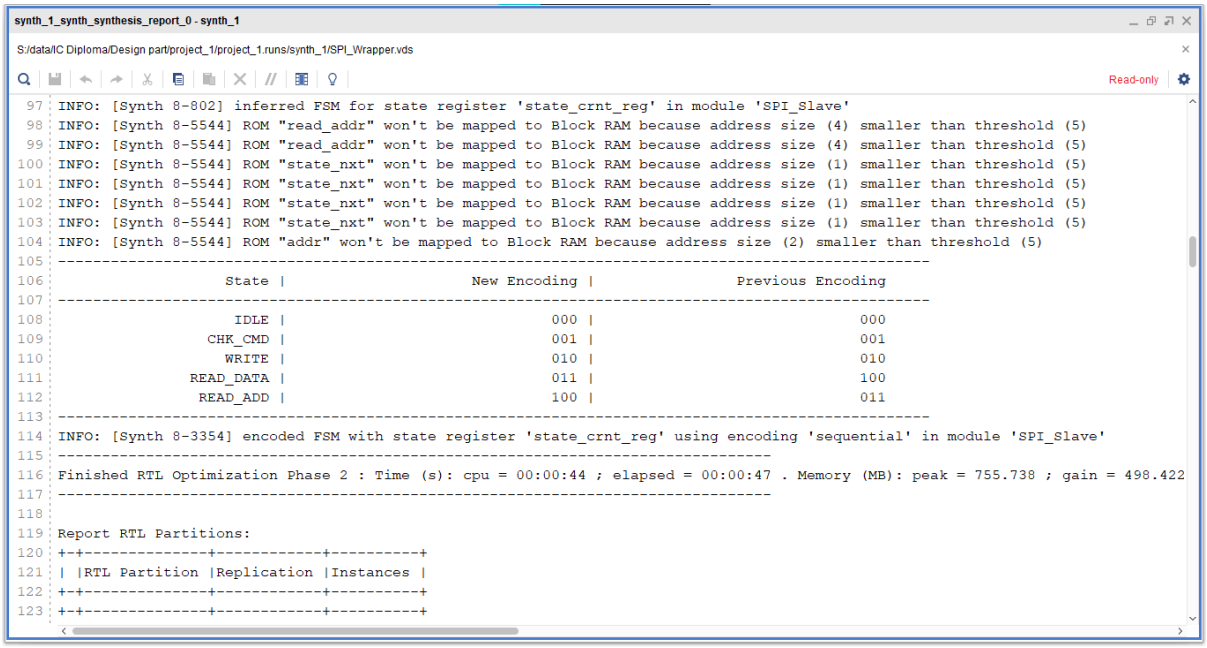


Schematic snippet

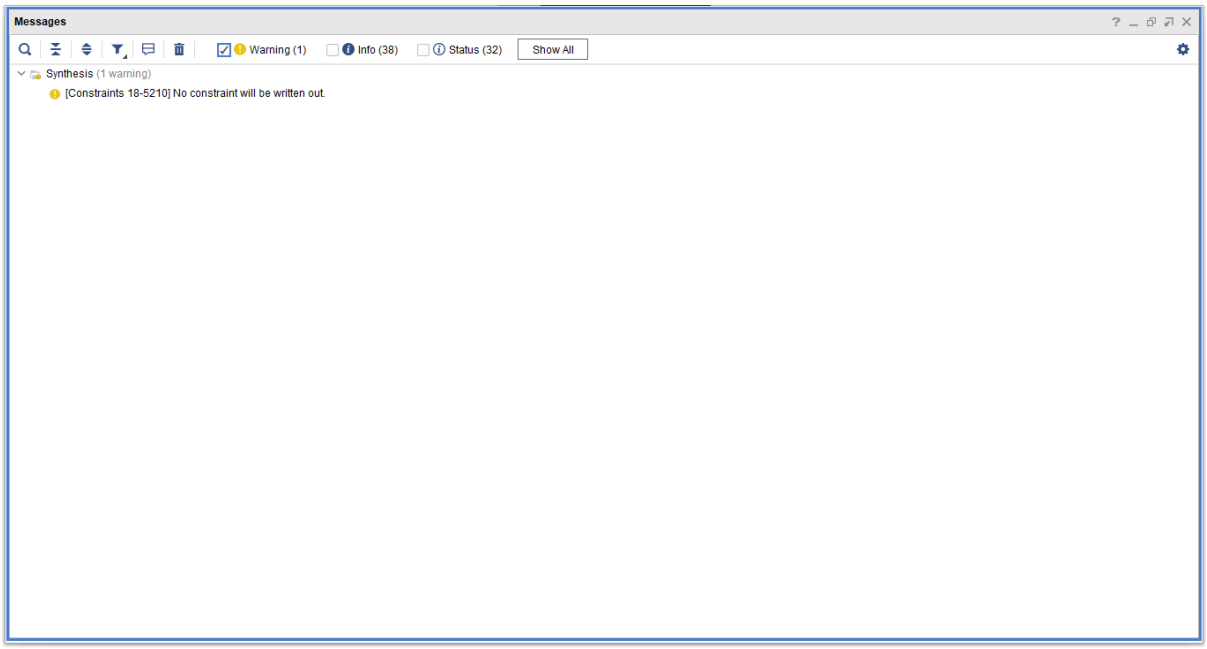


Synthesis

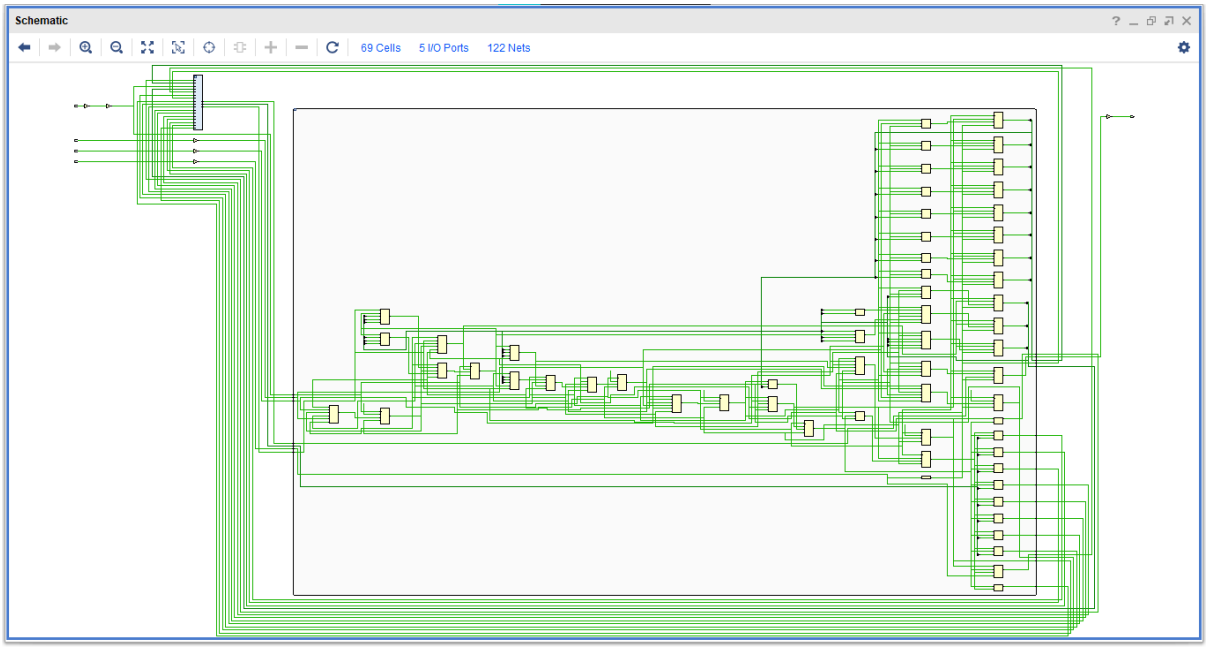
Synthesis report



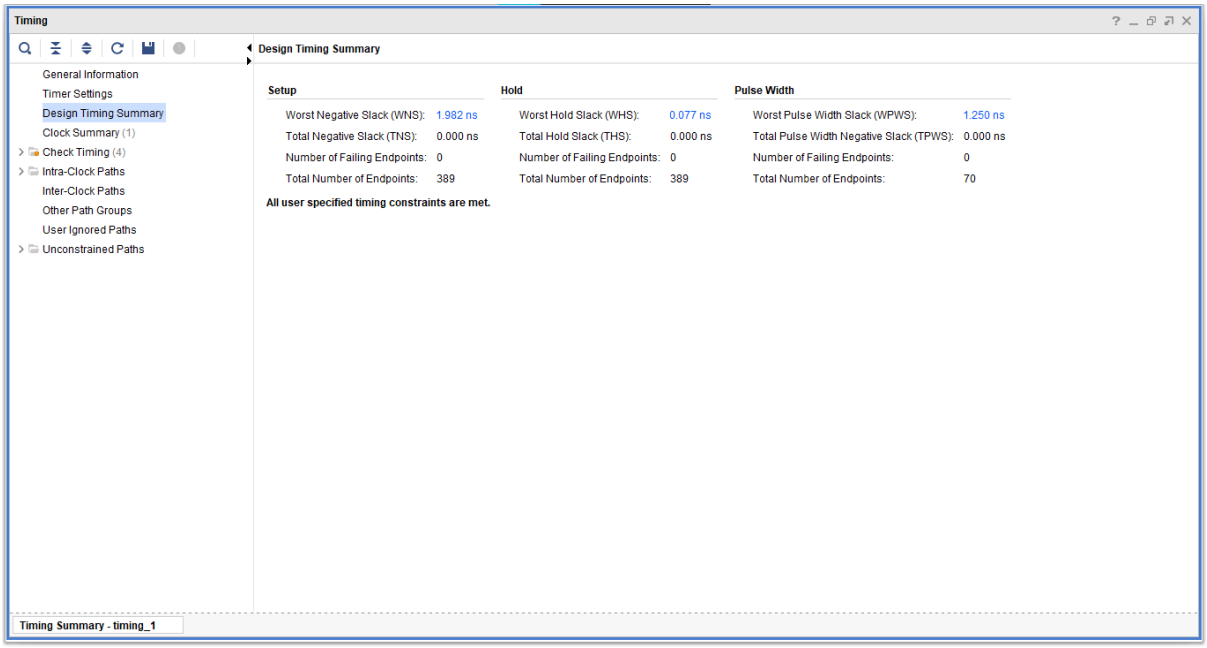
“Messages” tab



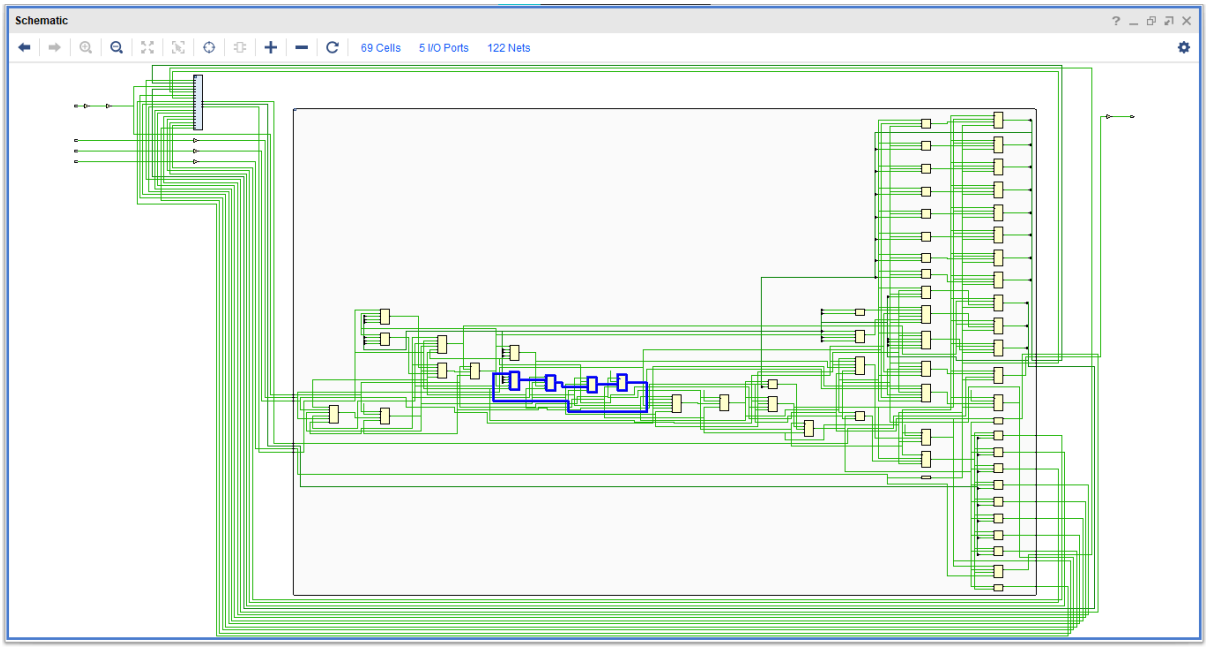
Schematic snippet



Timing report

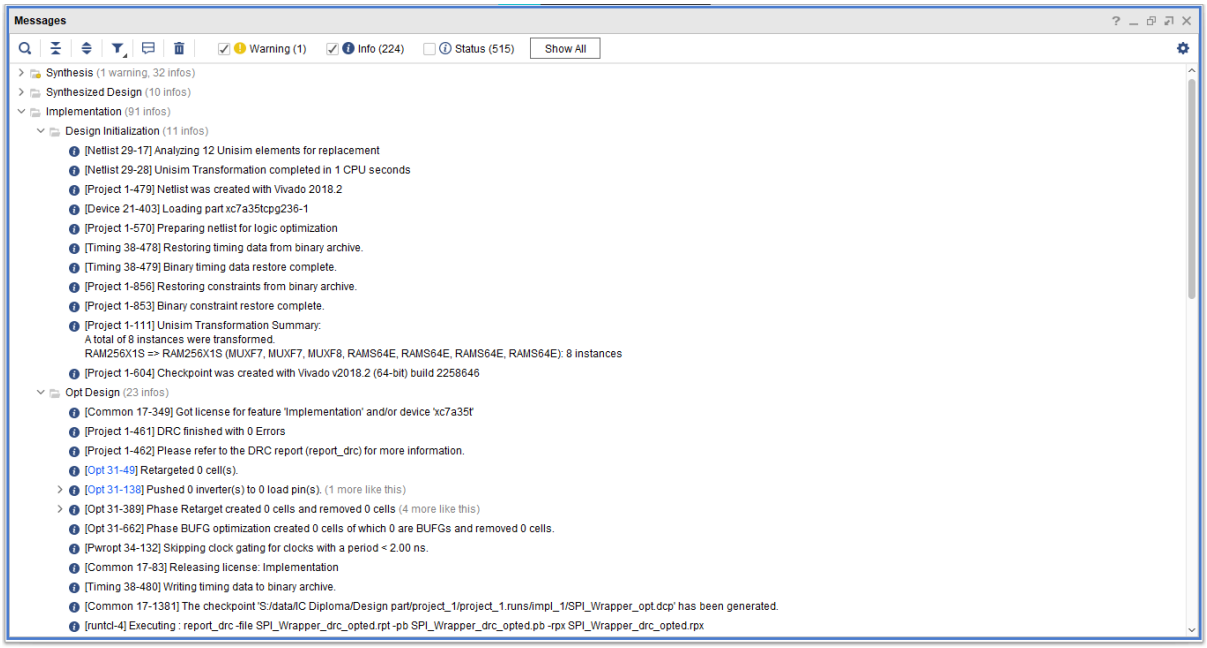


Critical path

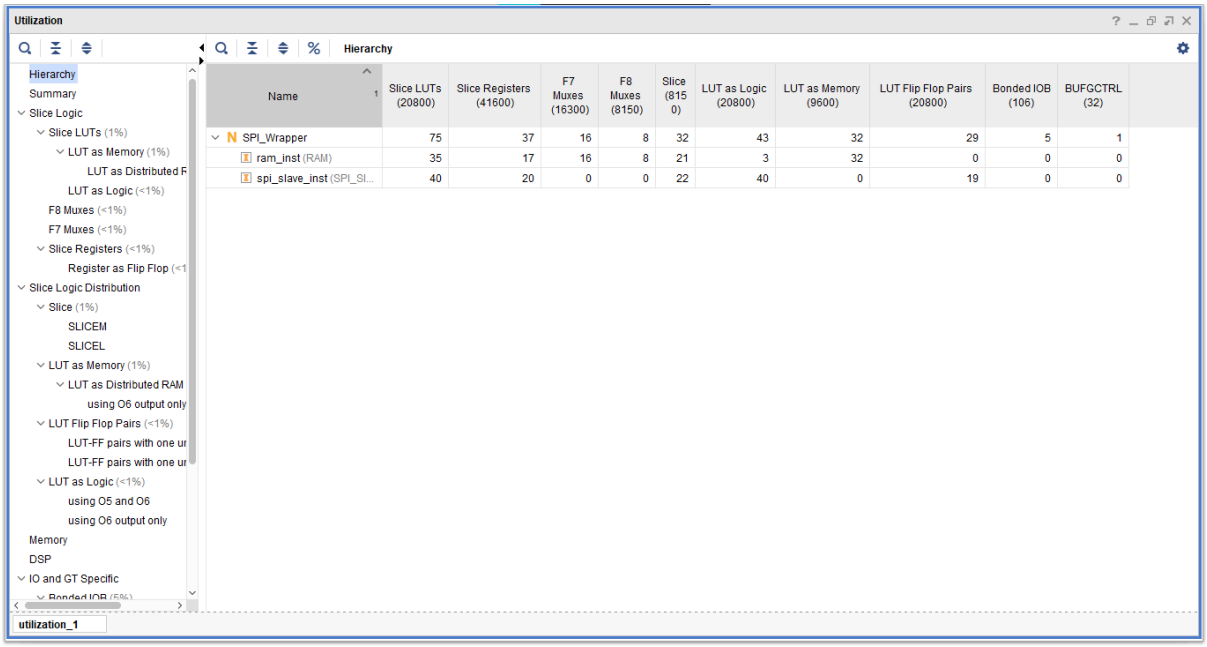


Implementation

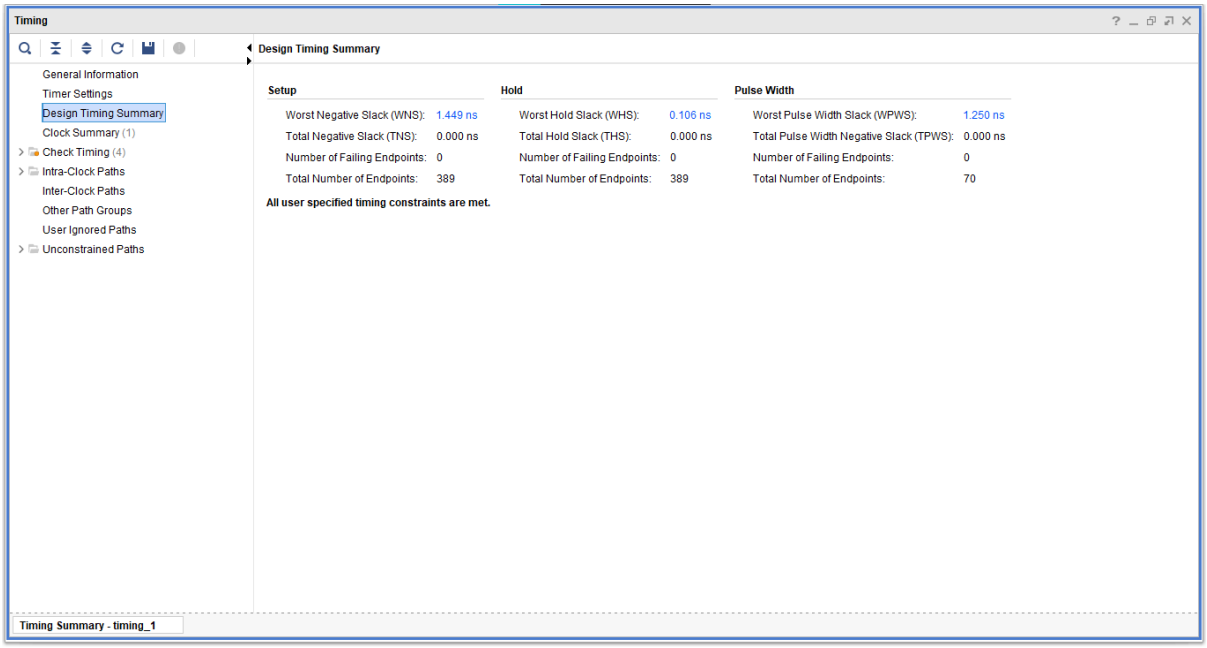
“Messages” tab



Utilization report

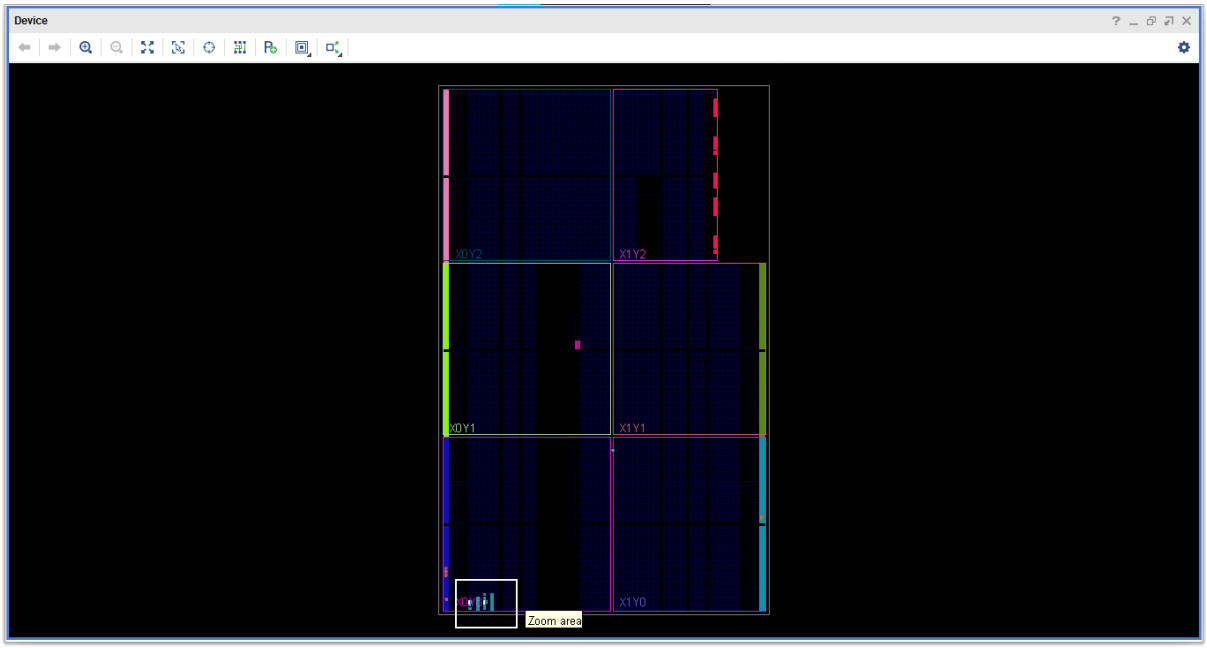


Timing report

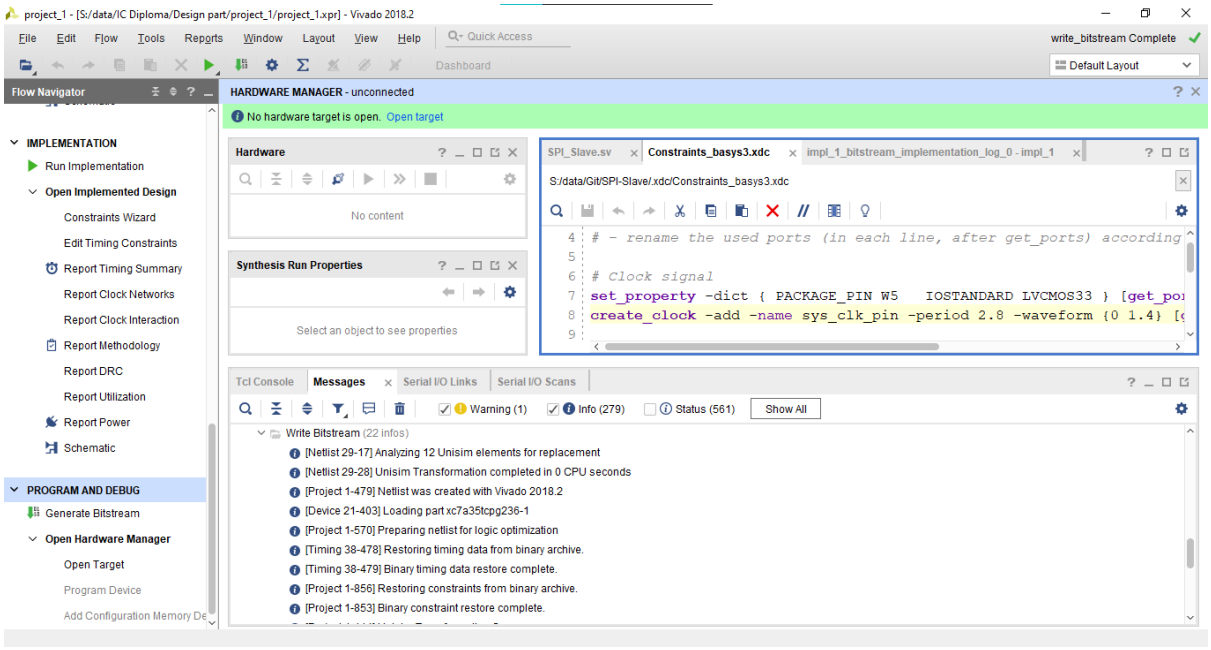


$$WNS = 1.449\,ns$$

Device snippet



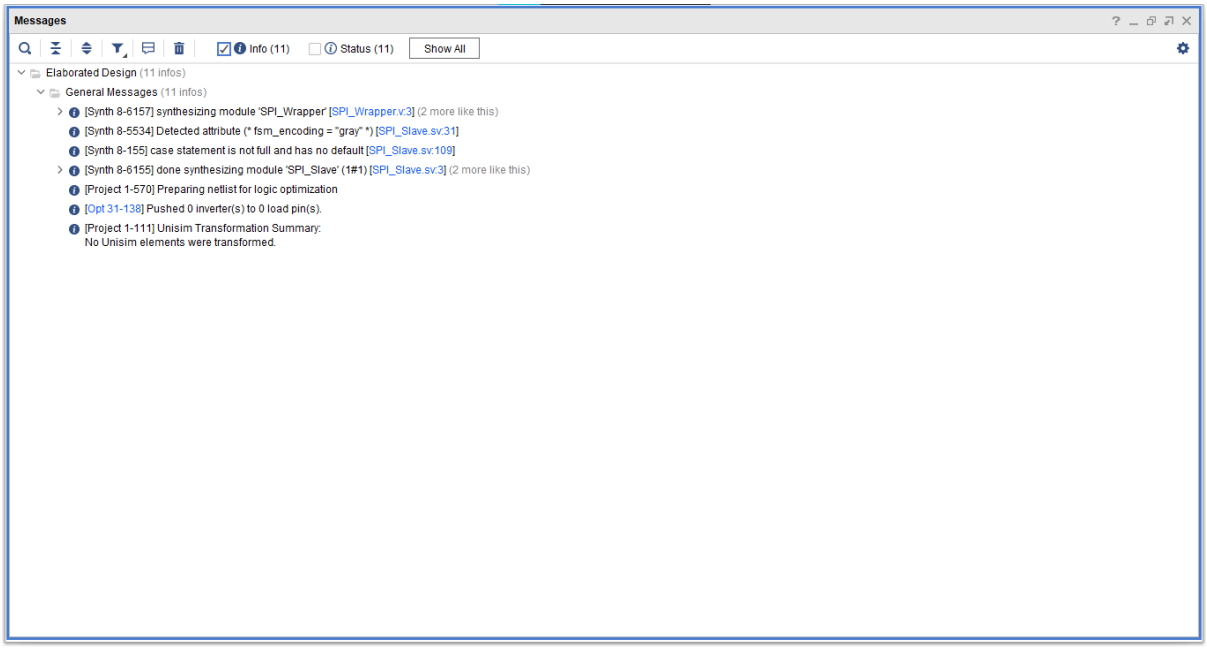
Bitstream Generation



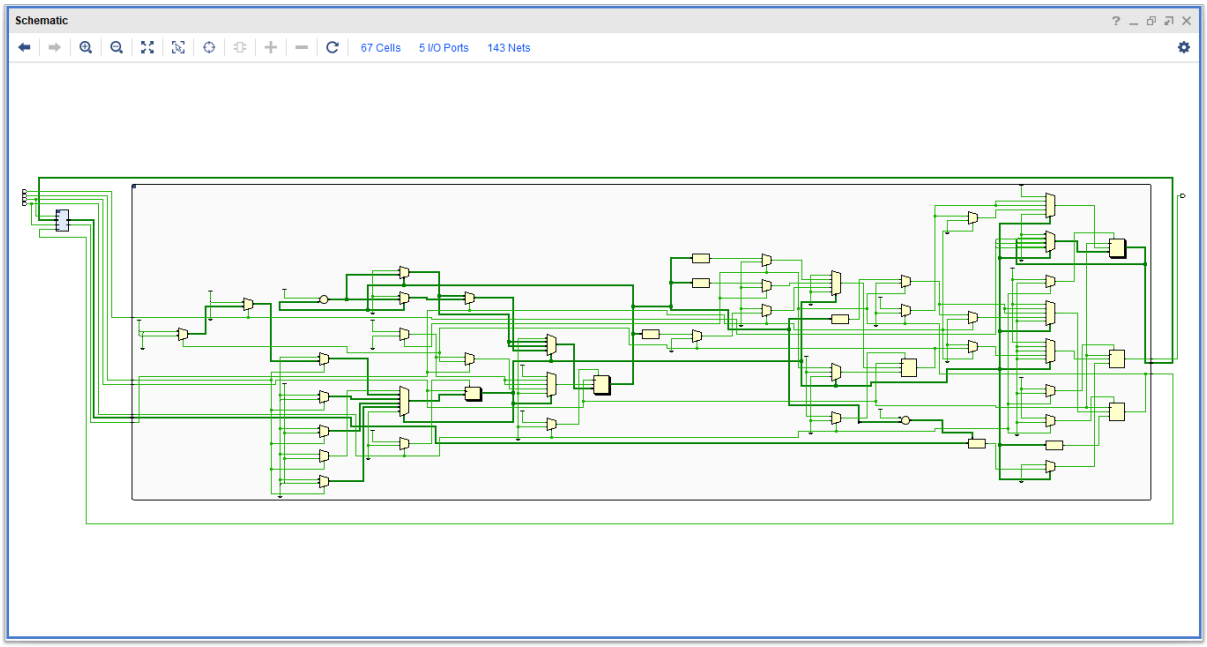
```
(* fsm_encoding = "gray" *)
```

Elaboration

“Messages” tab

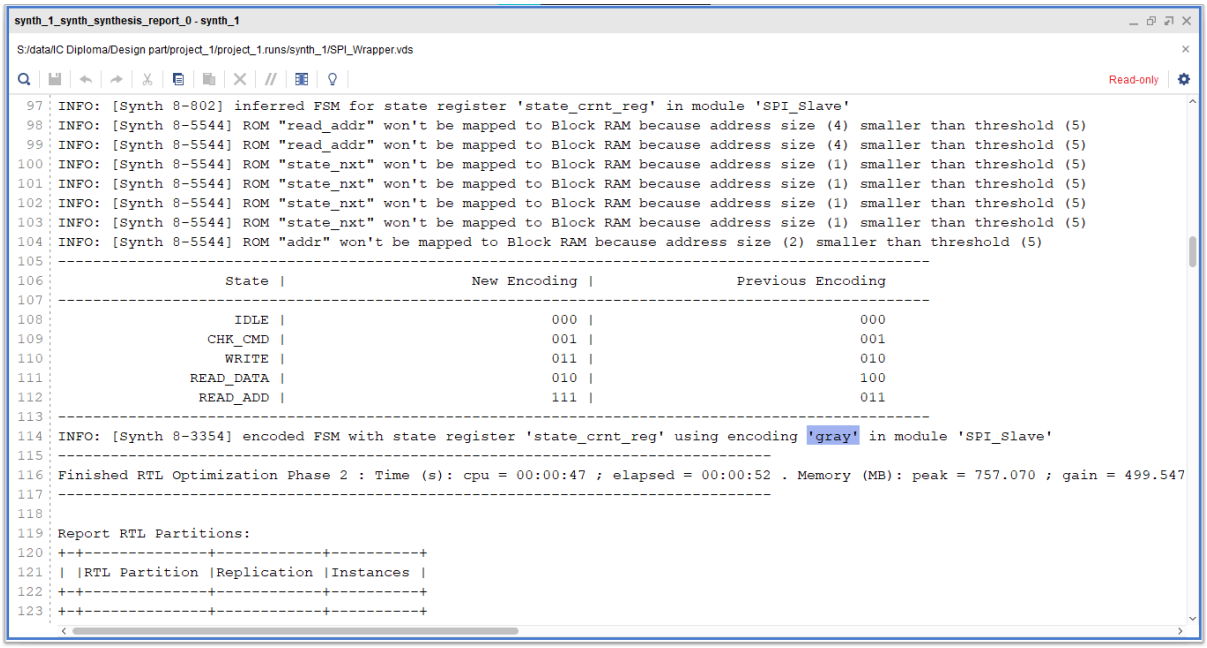


Schematic snippet

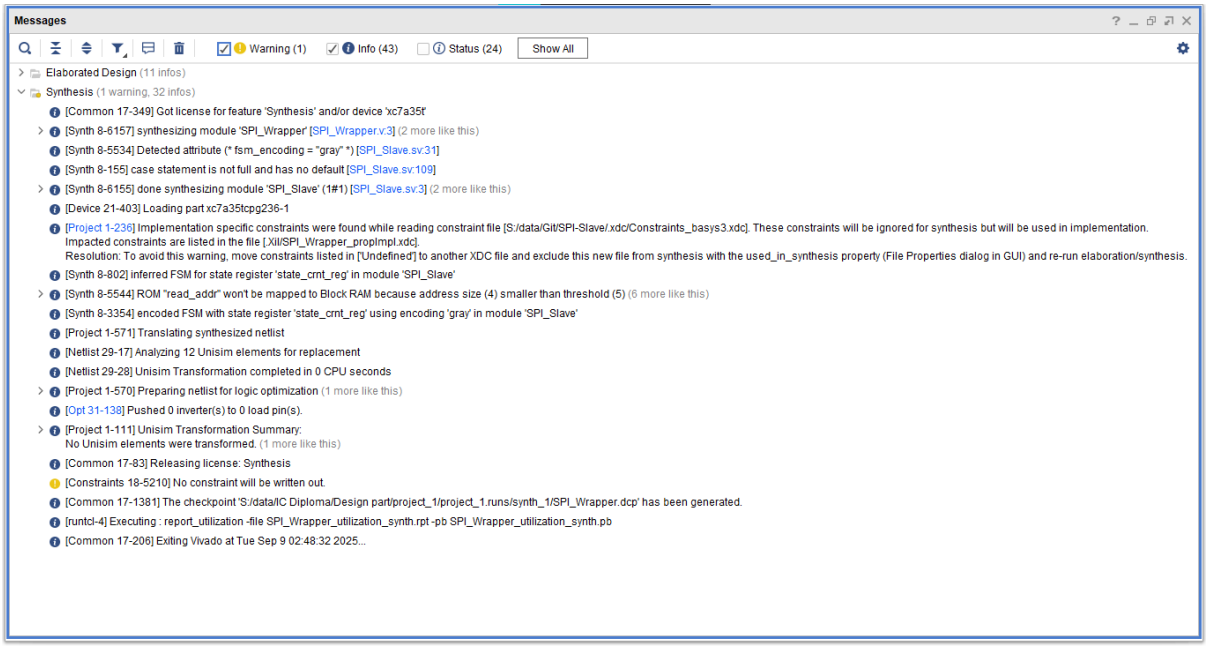


Synthesis

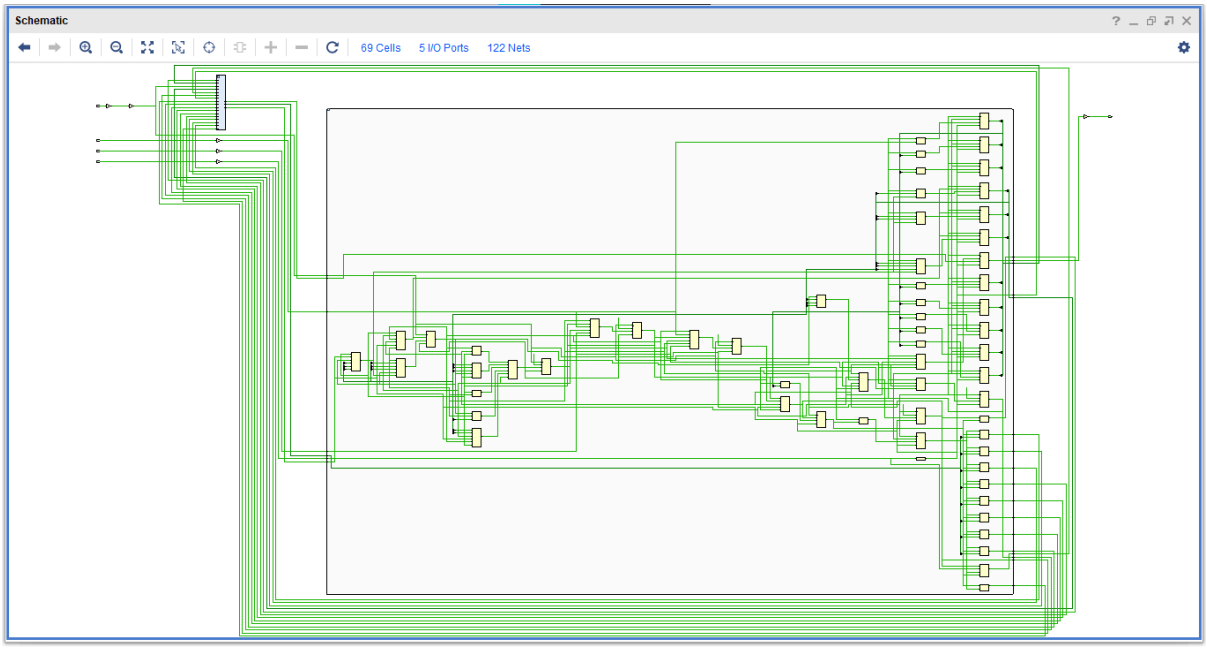
Synthesis report



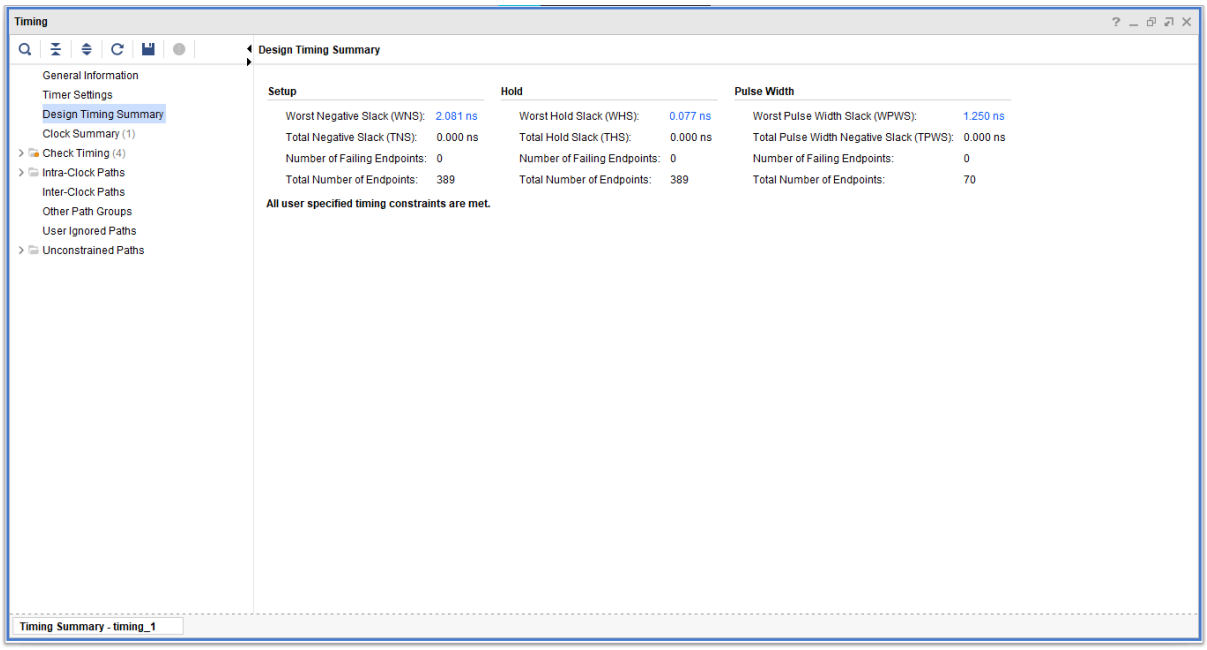
“Messages” tab



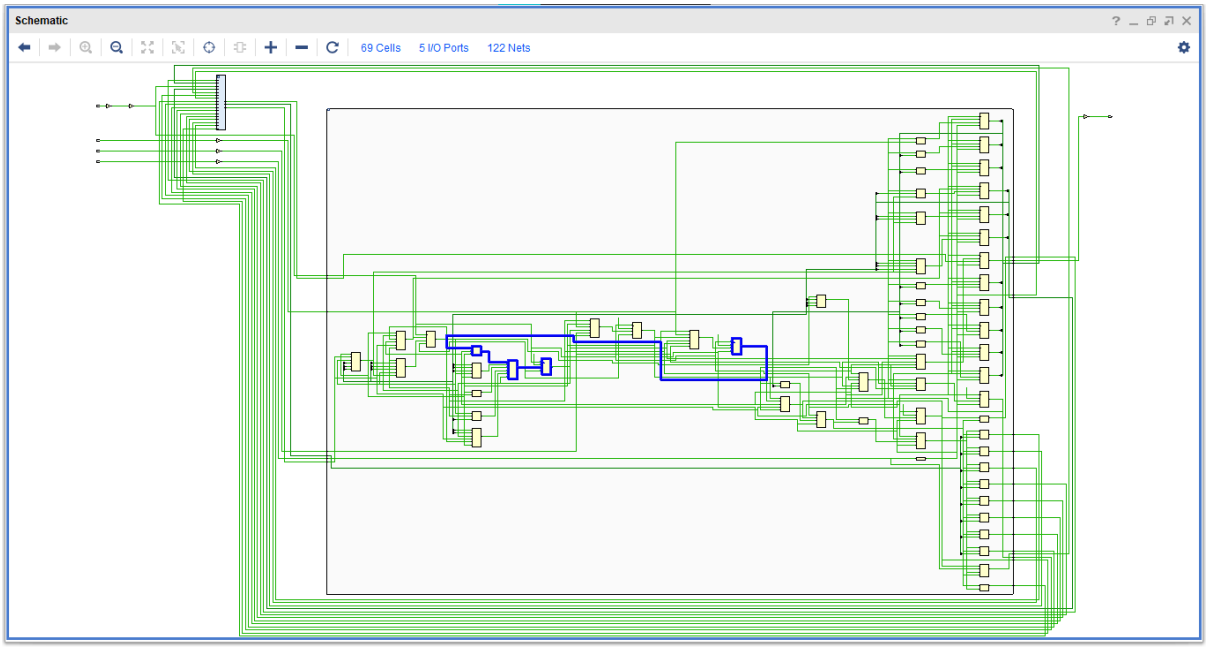
Schematic snippet



Timing report

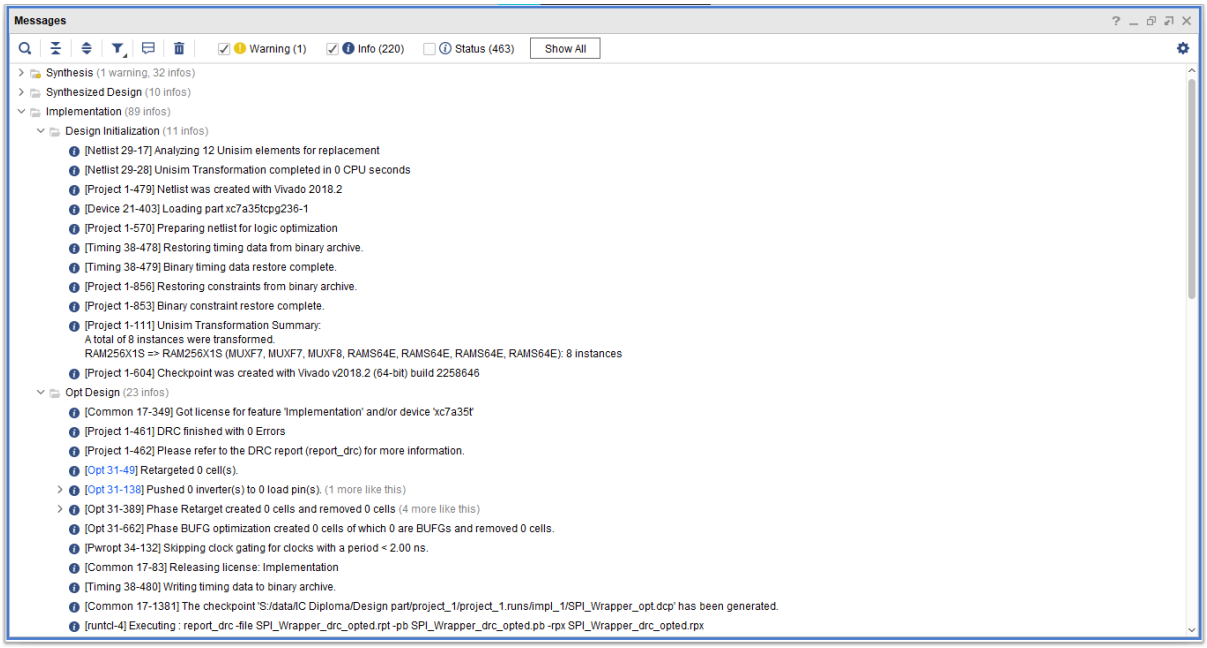


Critical path

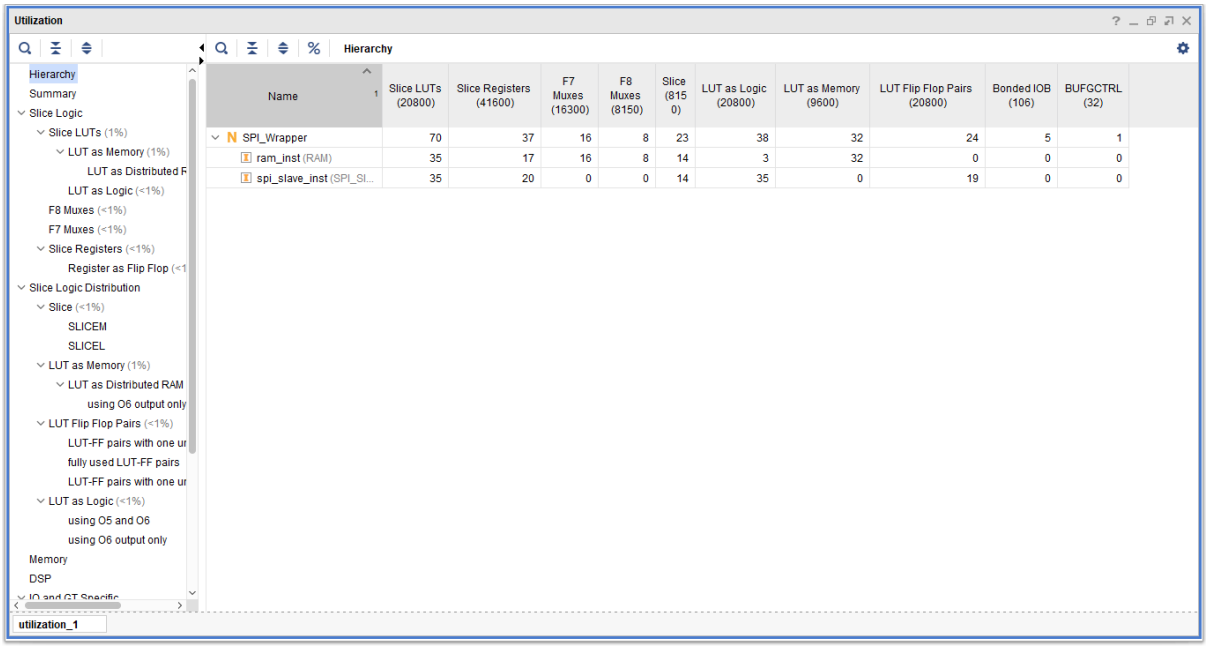


Implementation

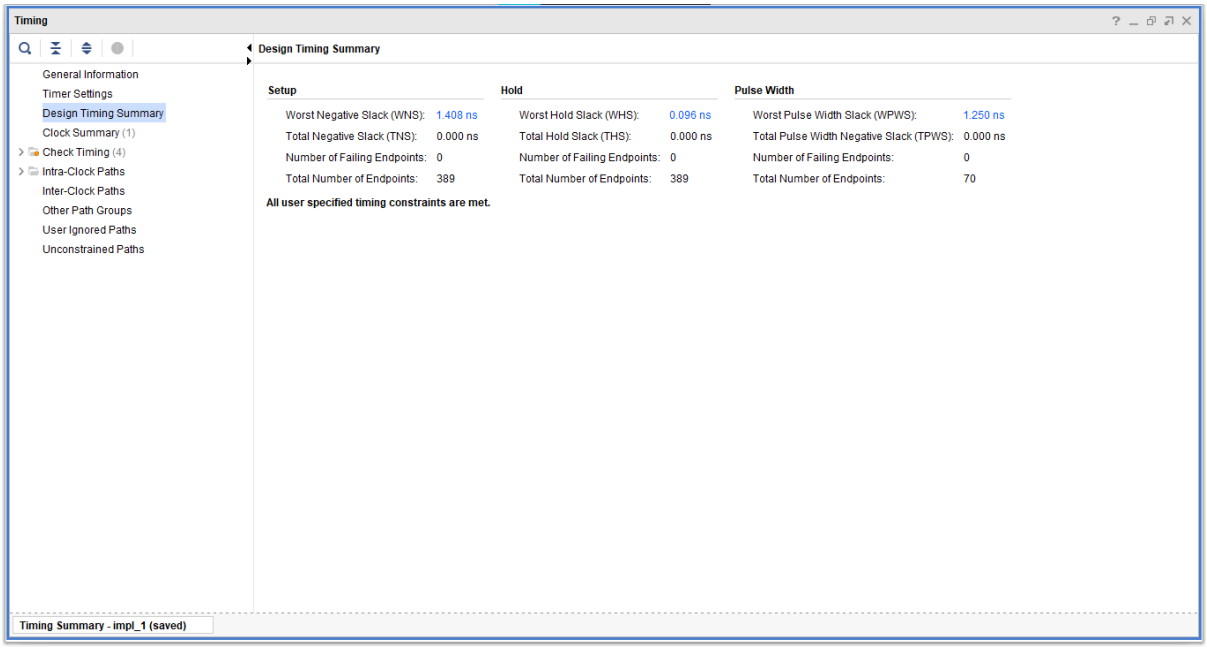
“Messages” tab



Utilization report

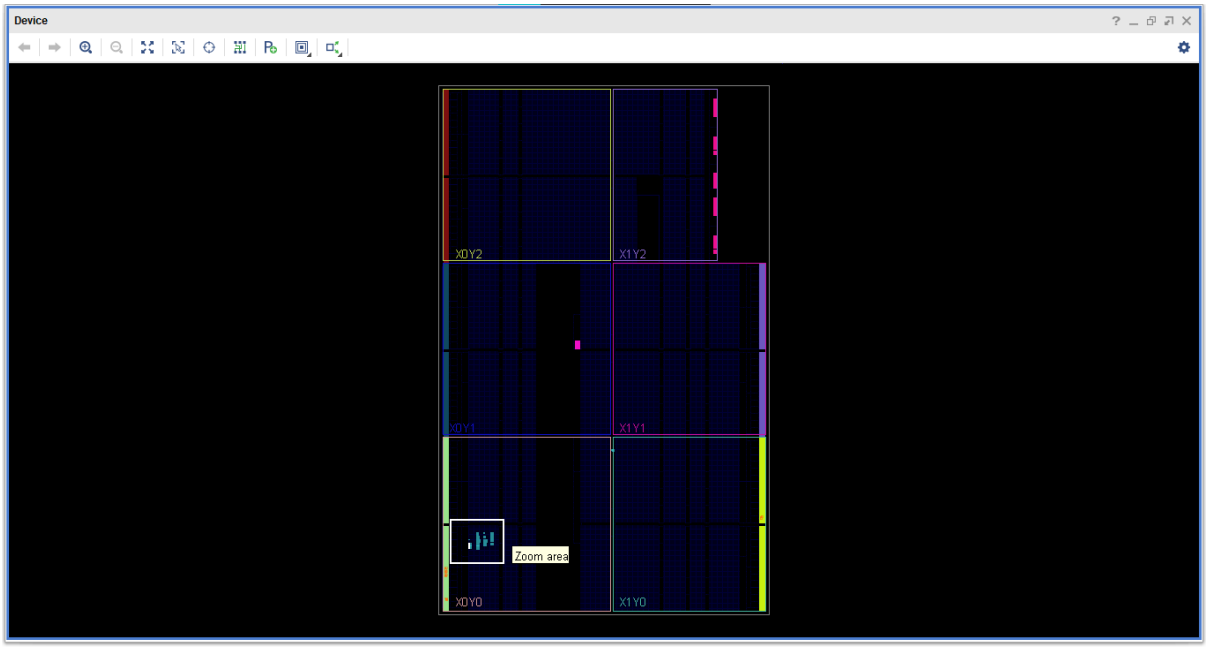


Timing report

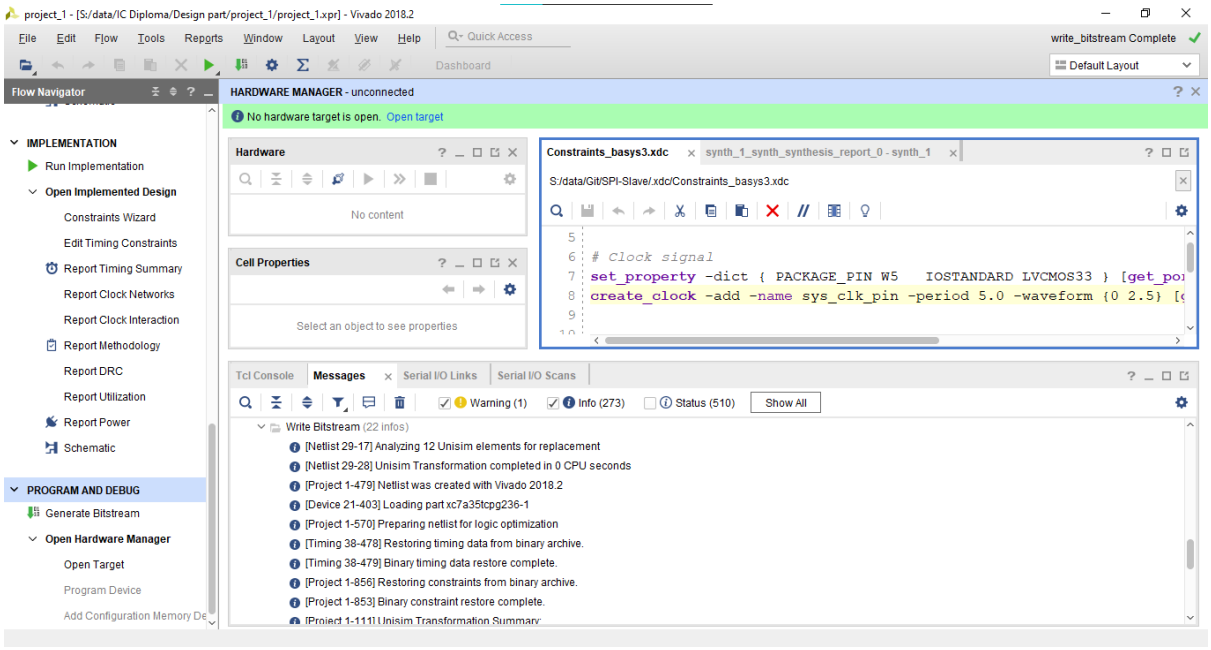


$$WNS = 1.408\,ns$$

Device snippet



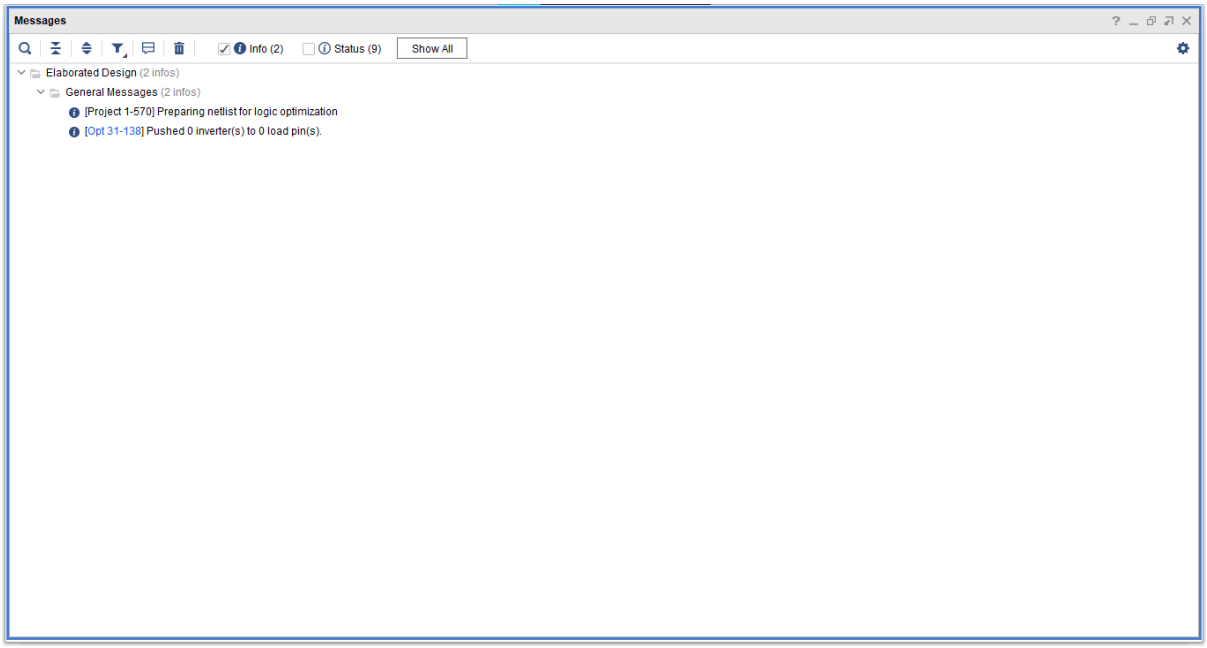
Bitstream Generation



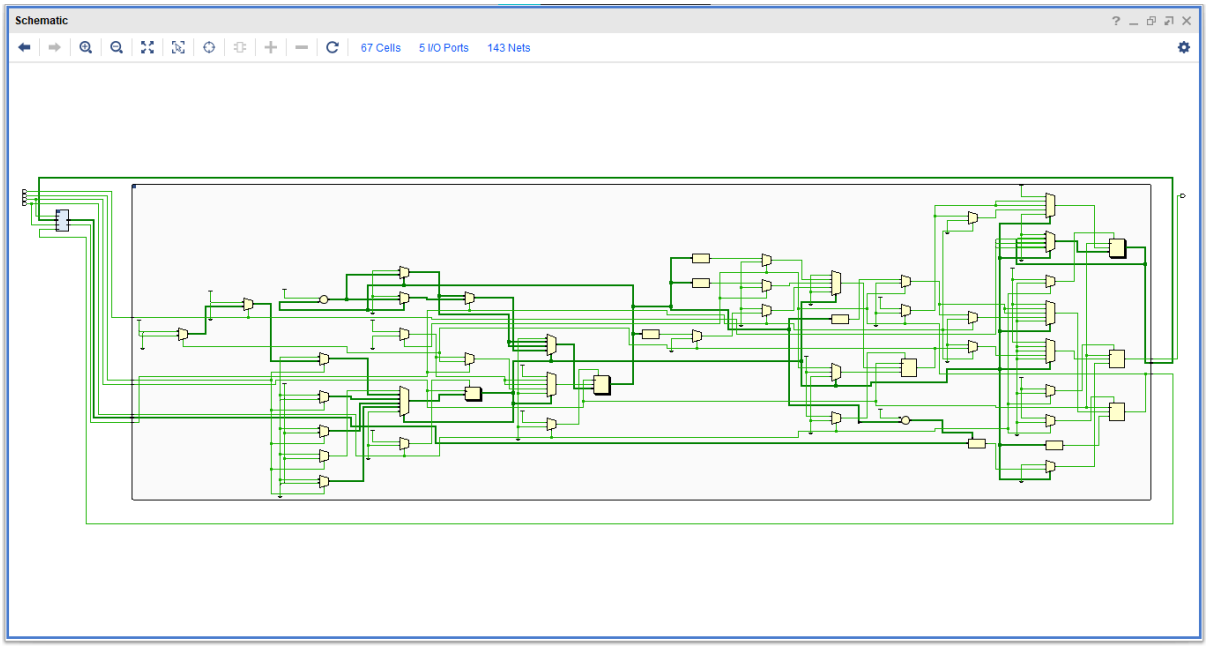
```
(* fsm_encoding = "one_hot" *)
```

Elaboration

“Messages” tab

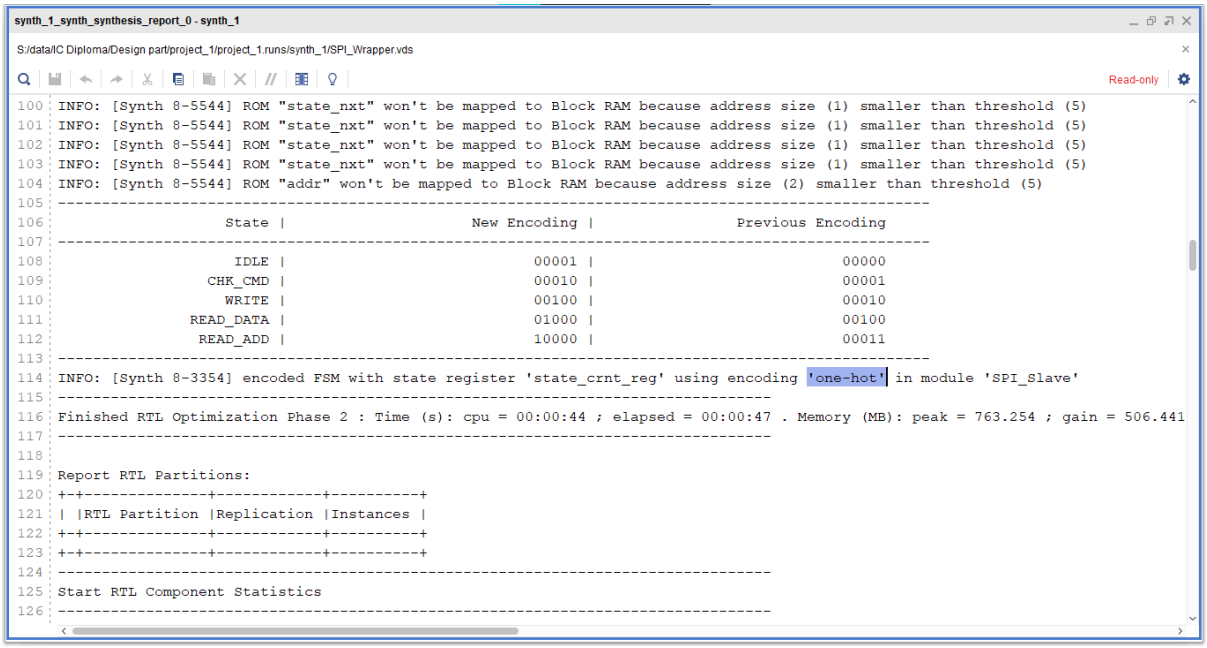


Schematic snippet

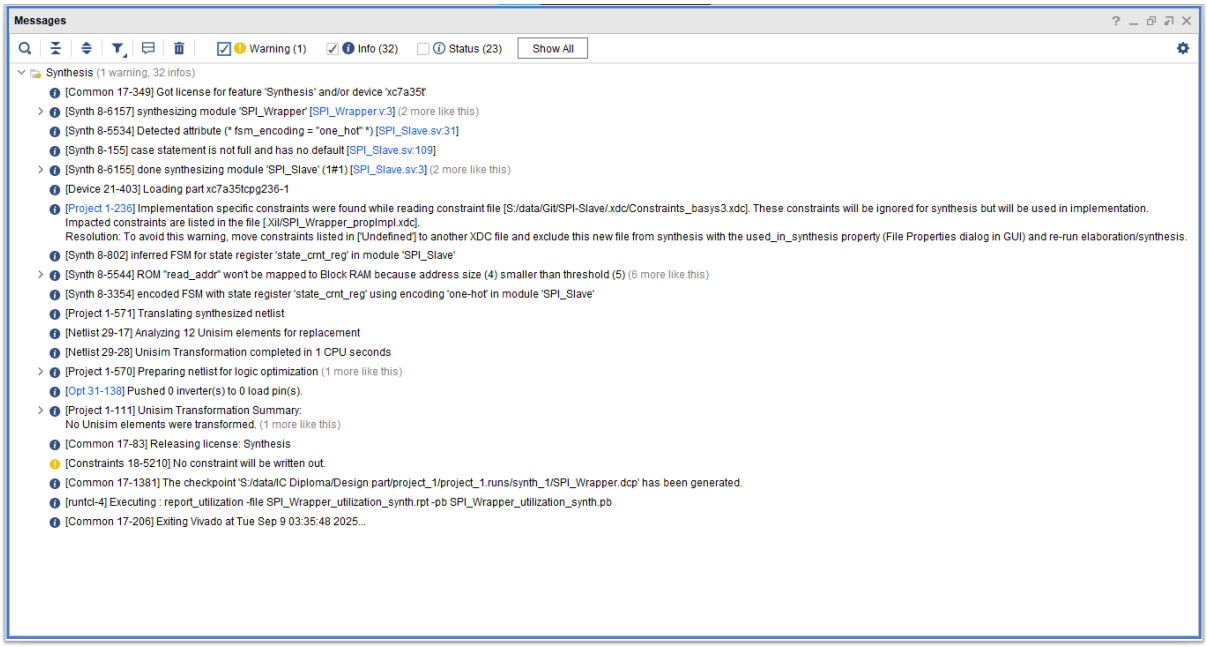


Synthesis

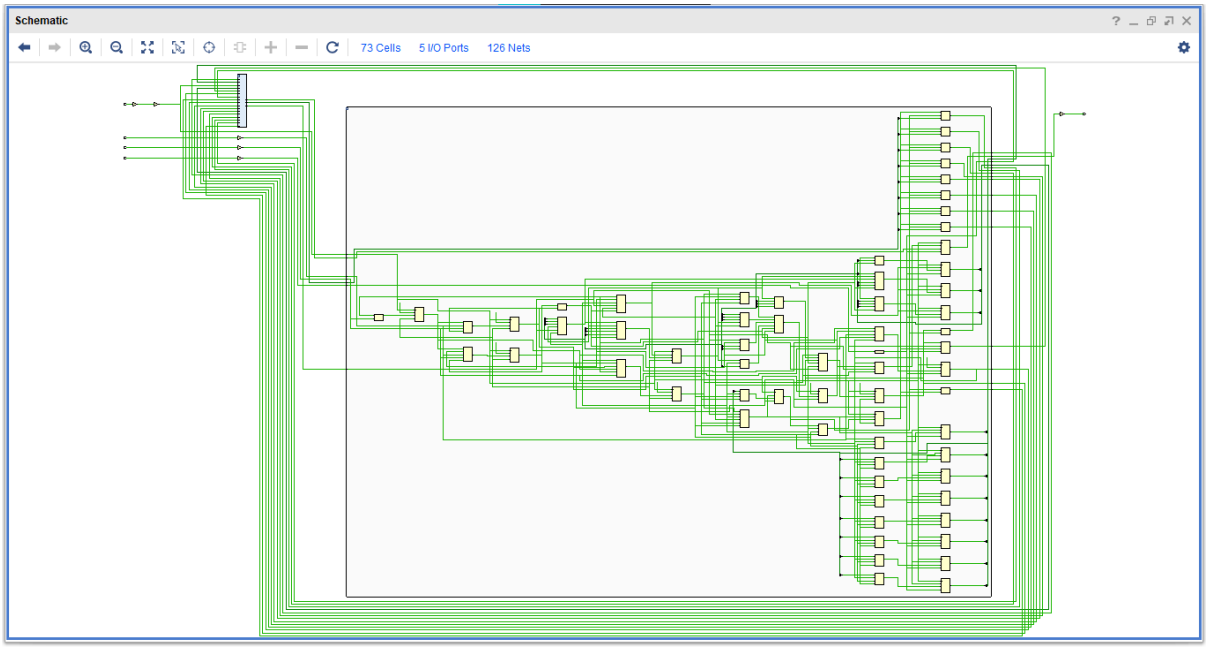
Synthesis report



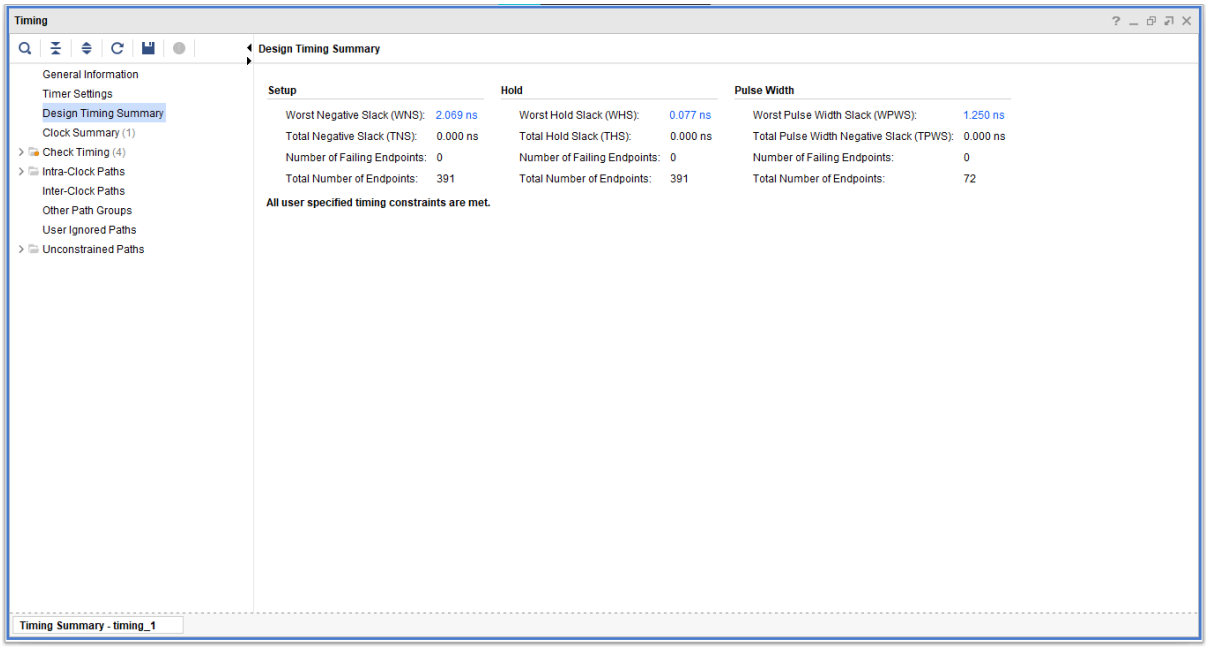
“Messages” tab



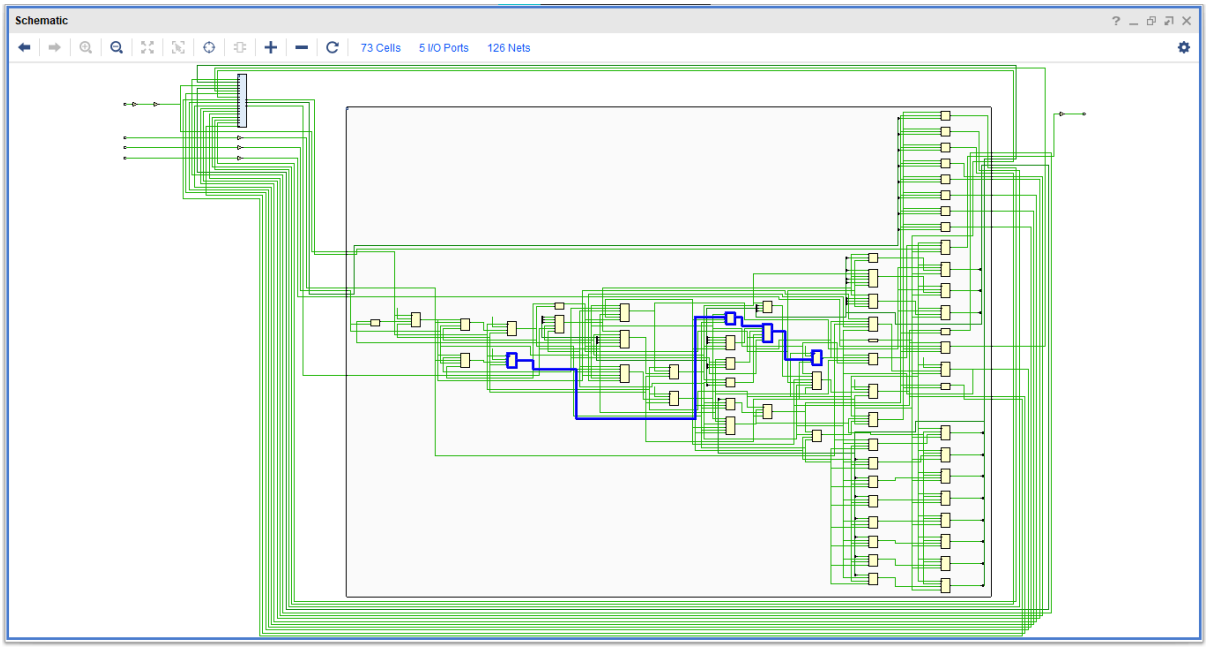
Schematic snippet



Timing report

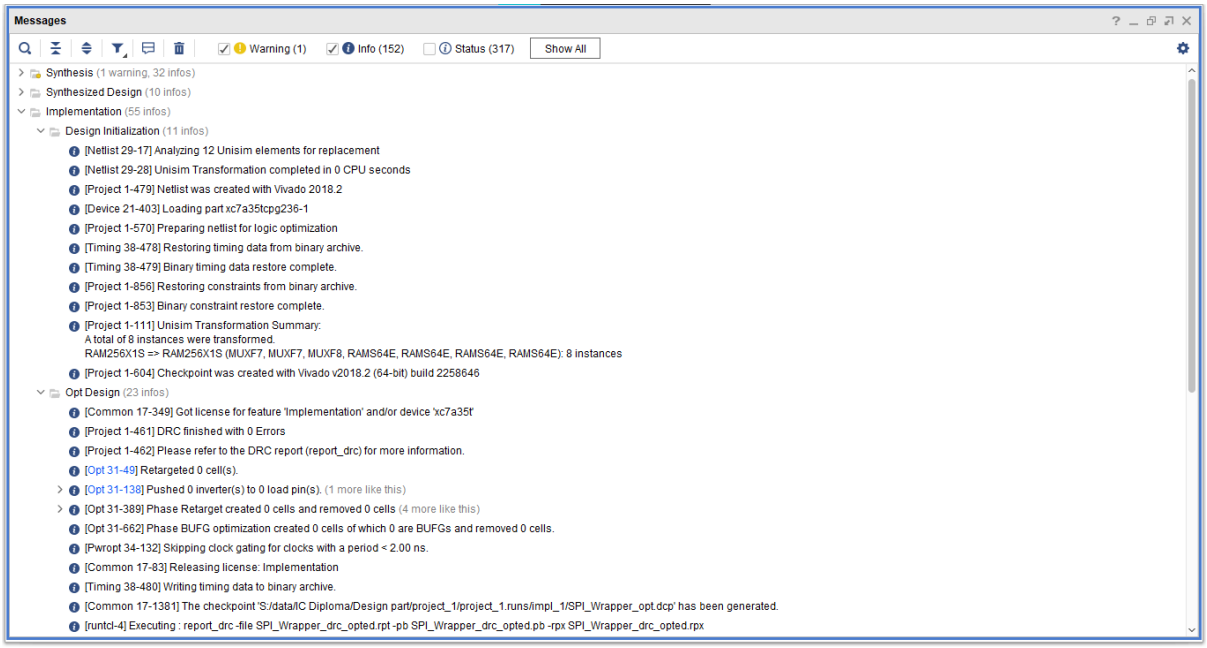


Critical path

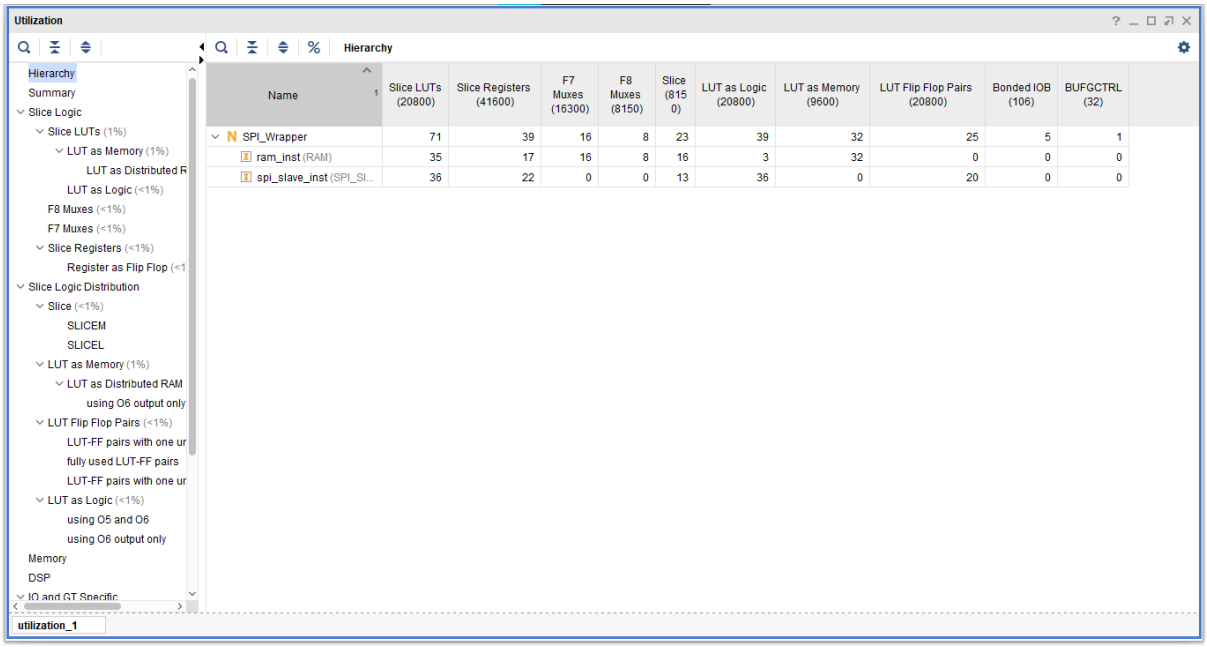


Implementation

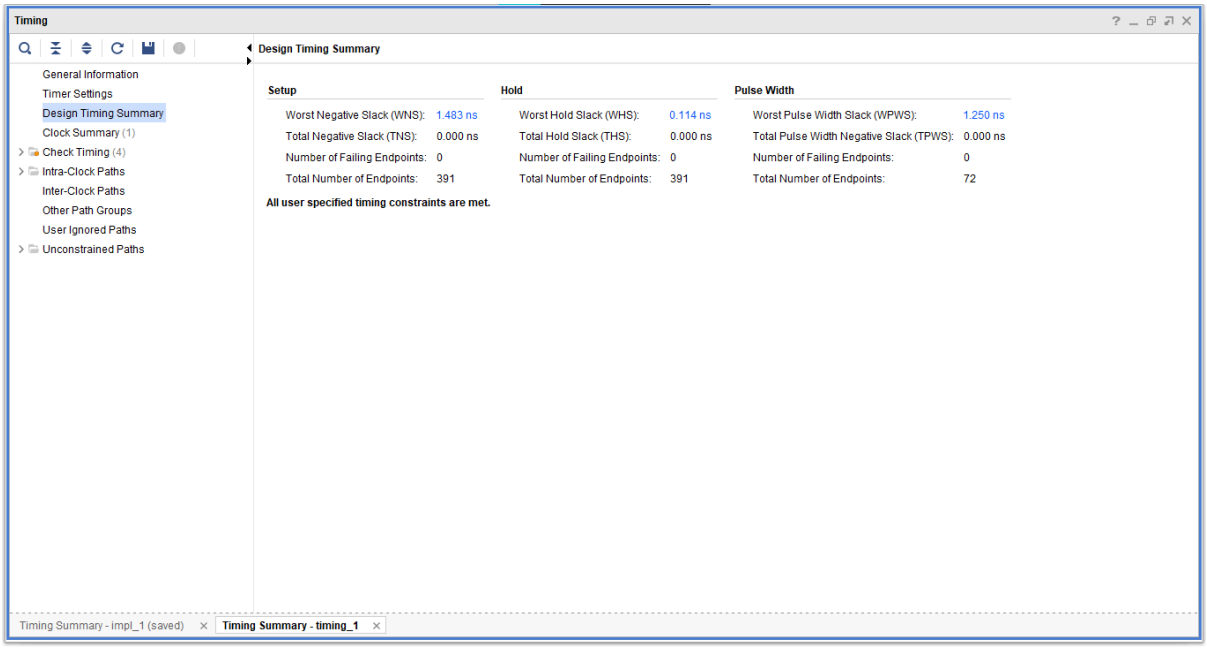
“Messages” tab



Utilization report

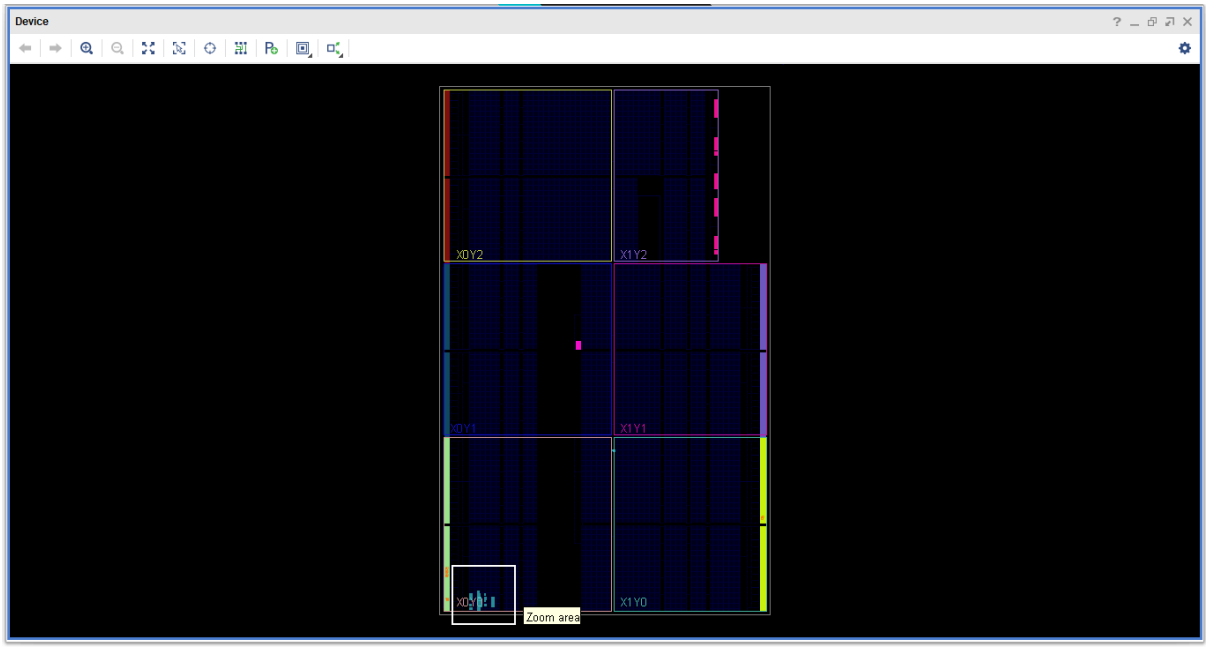


Timing report

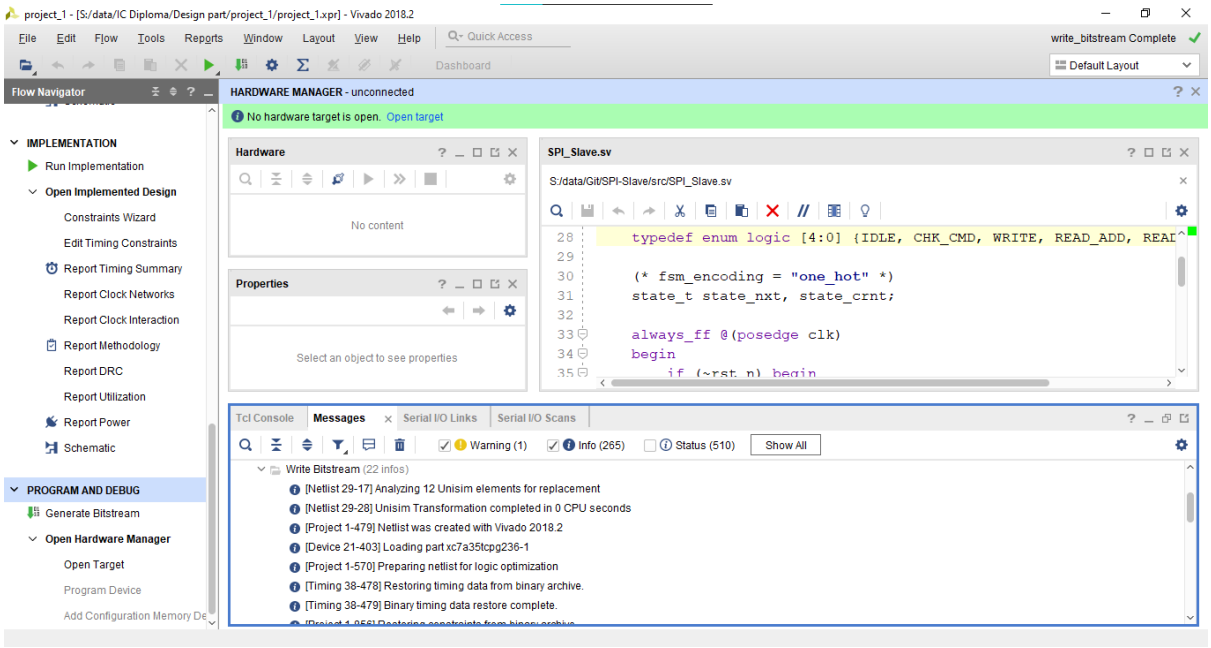


$$WNS = 1.483\,ns$$

Device snippet



Bitstream Generation



The fsm encoding that achieved the highest positive setup slack is the one will achieve the highest frequency `(* fsm_encoding = "one_hot" *)`