Powerful of CLIQUE

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Altera HK FAE

Architecture of FLEX Device

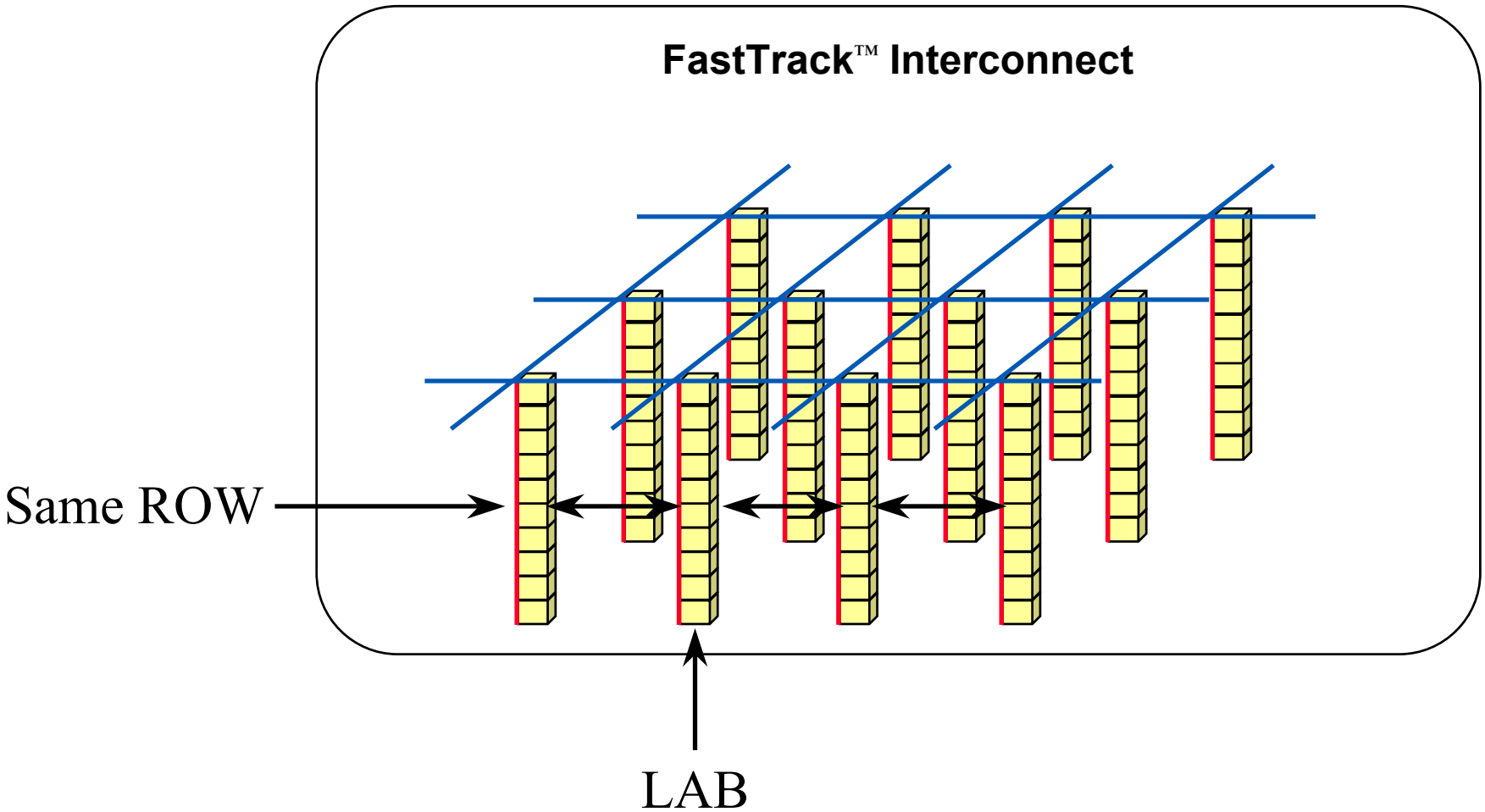
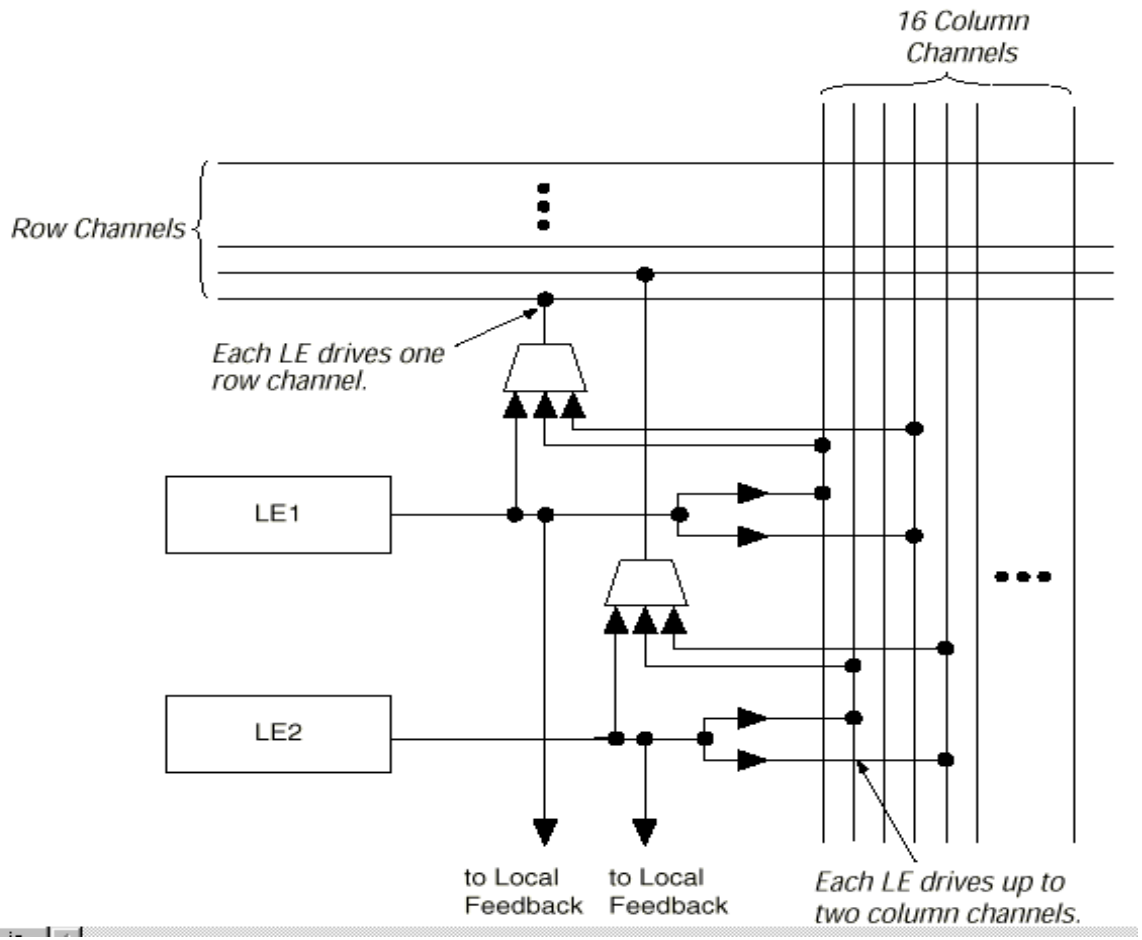


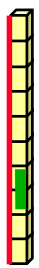
Figure 8. LAB Connections to Row & Column Interconnect



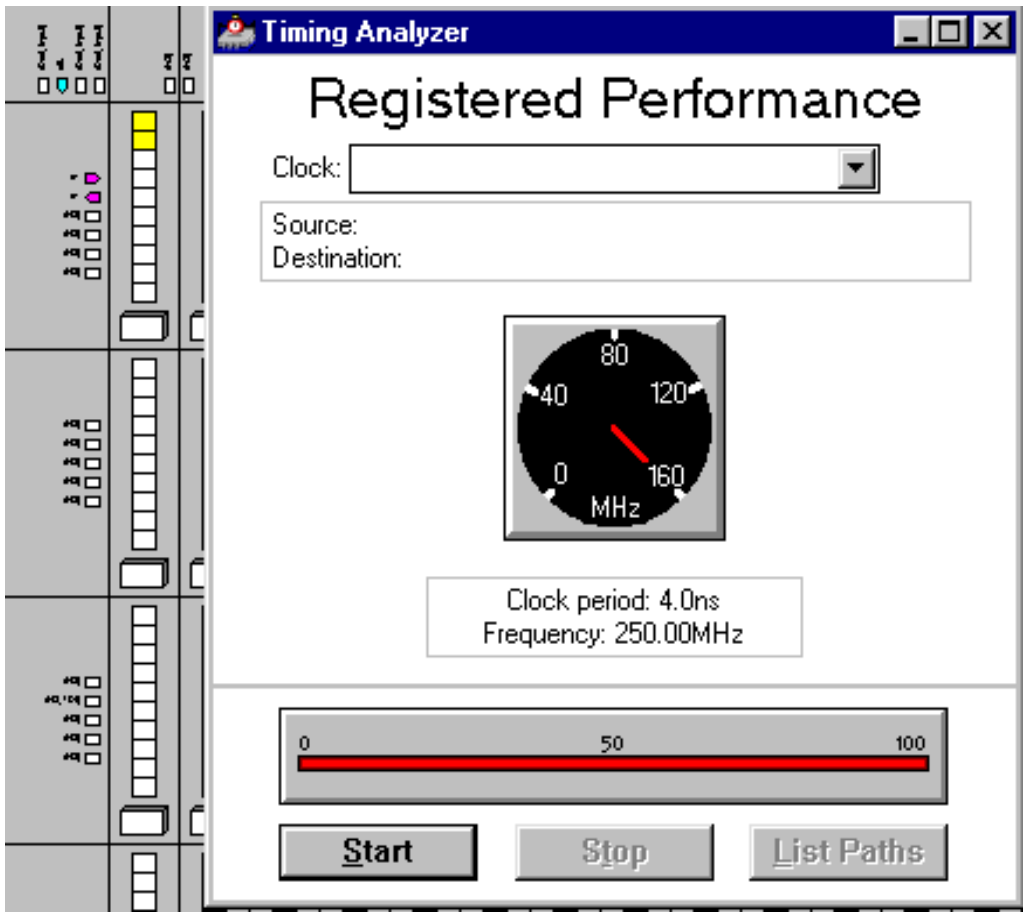
Three Routing Possibility

Routing 1

FastTrack™ Interconnect



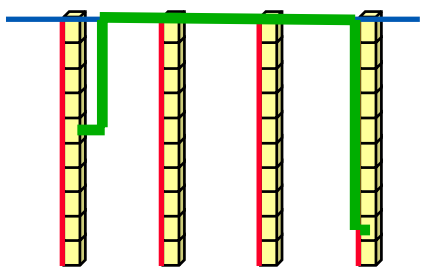
Minimum Delay
LC -> LC



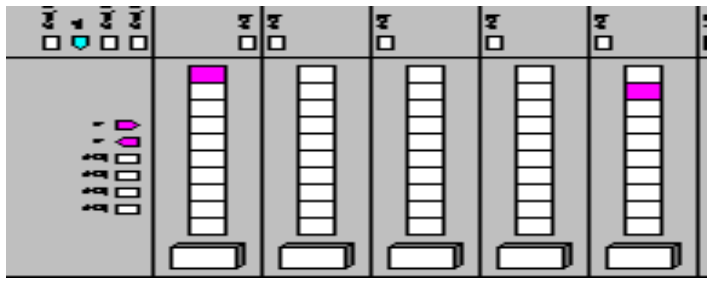
Three Routing Possibility

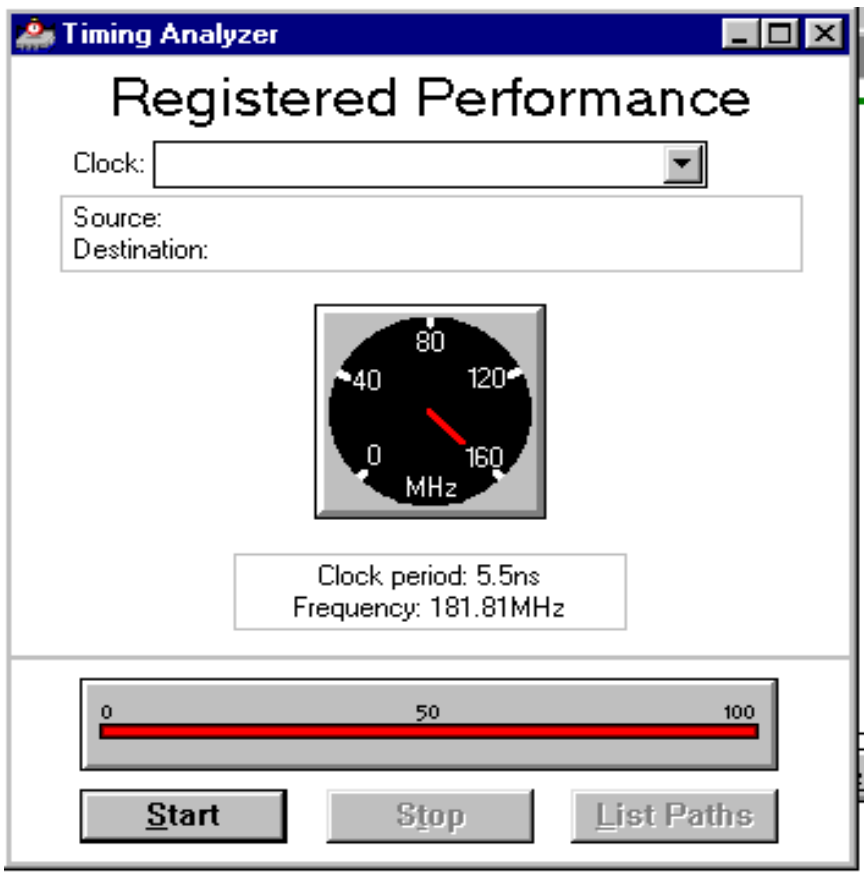
Routing 2

FastTrack™ Interconnect



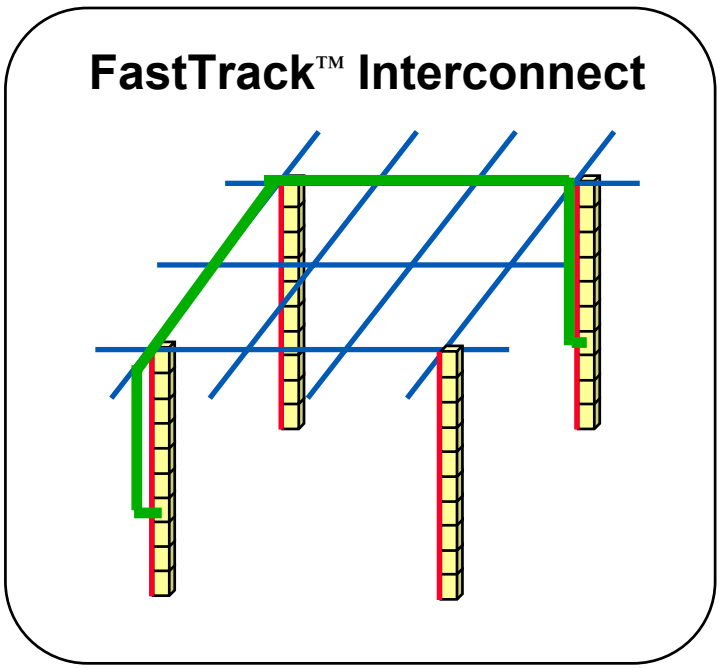
Medium Delay
LC -> ROW -> LC



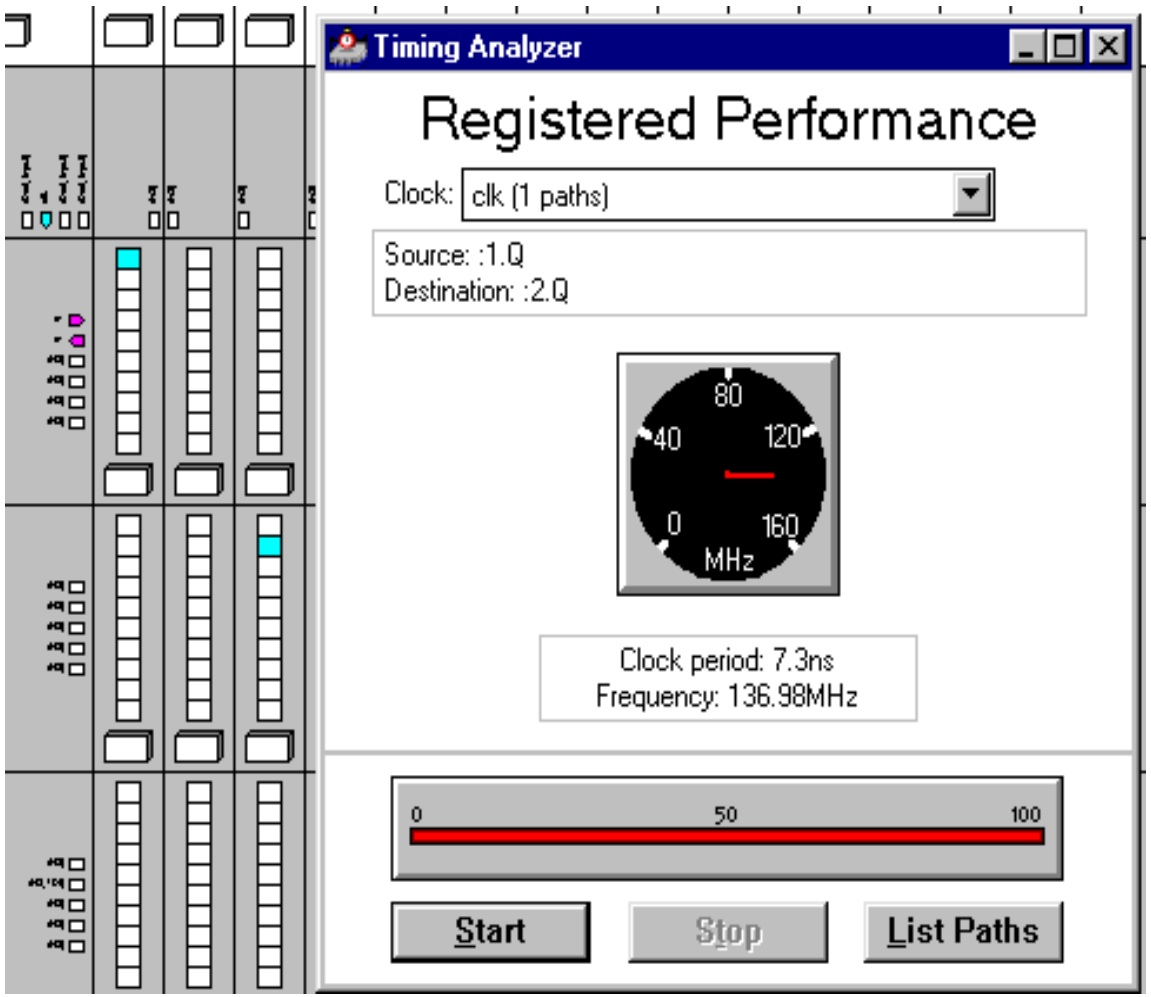


Three Routing Possibility

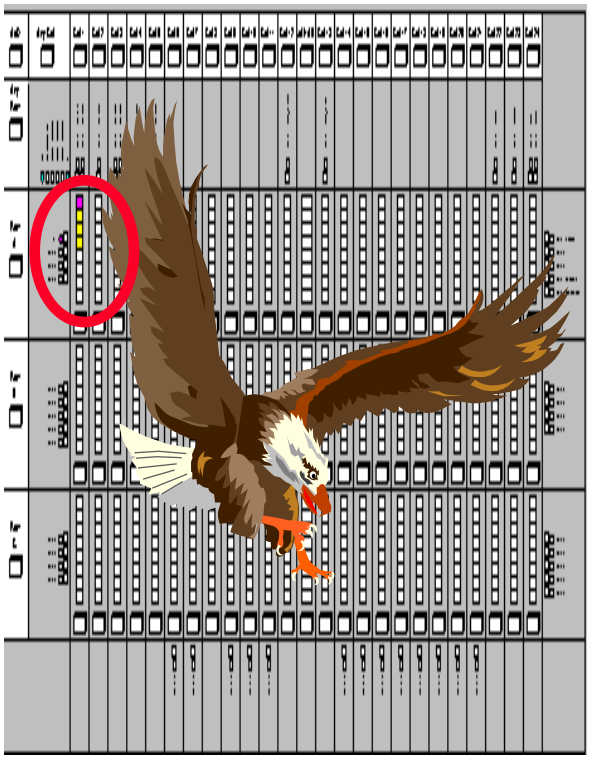
Routing 3

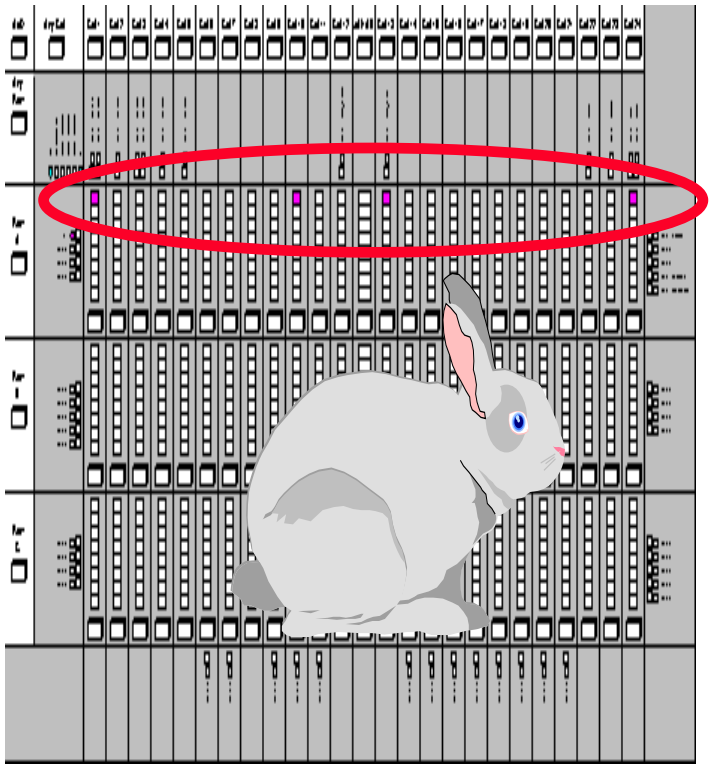


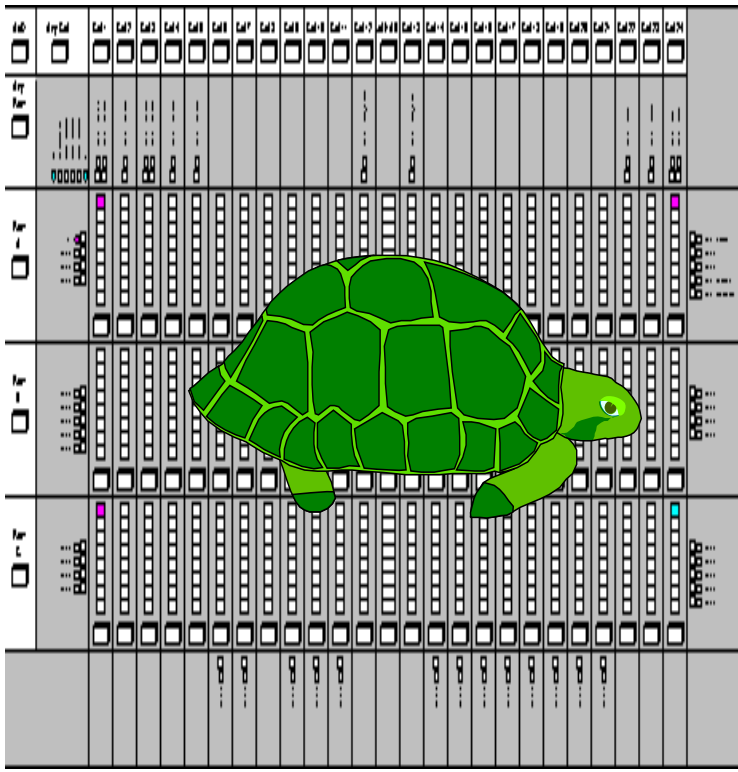
Maximum Delay
LC -> ROW -> COL -> LC



Which one faster ?





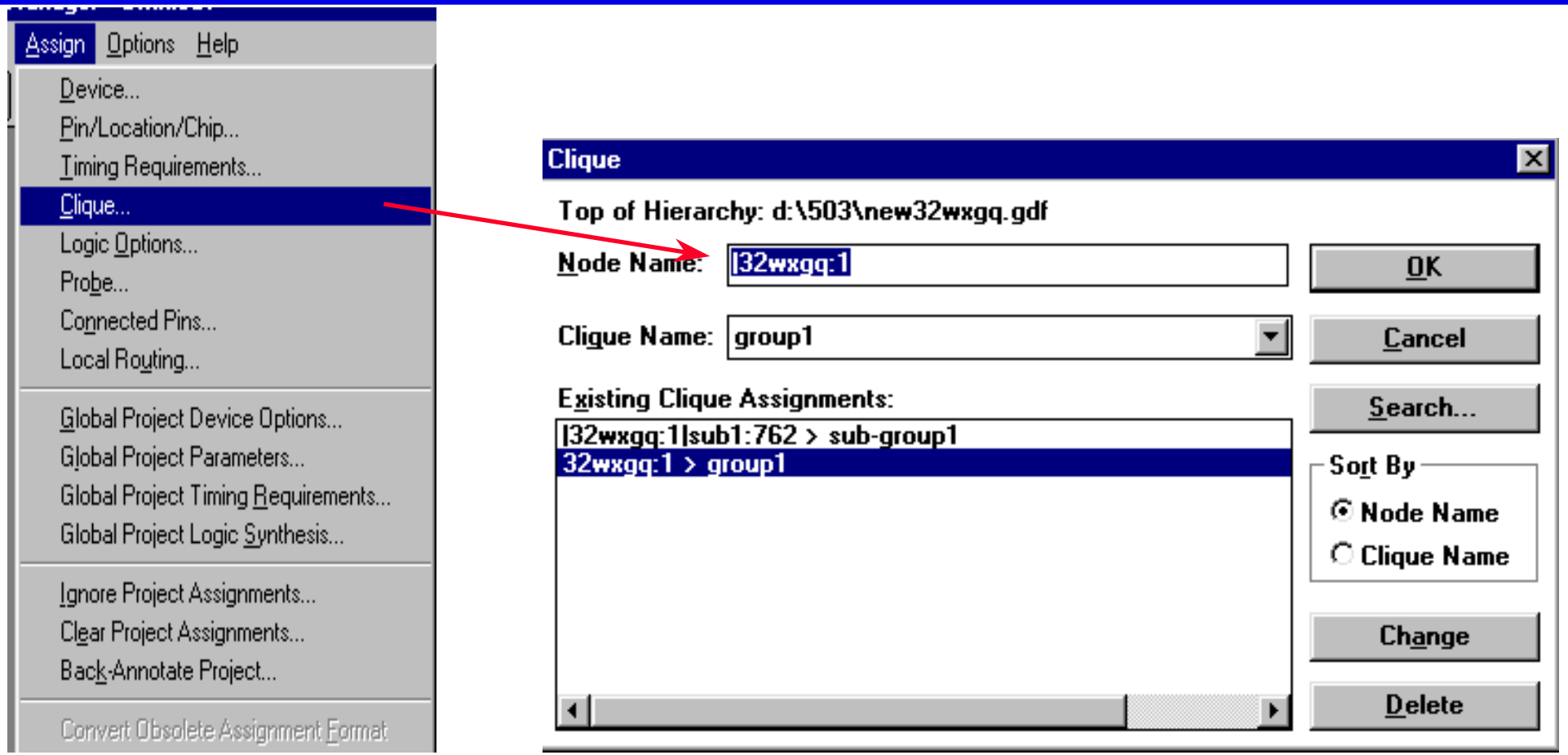


Which one runs FASTEST??

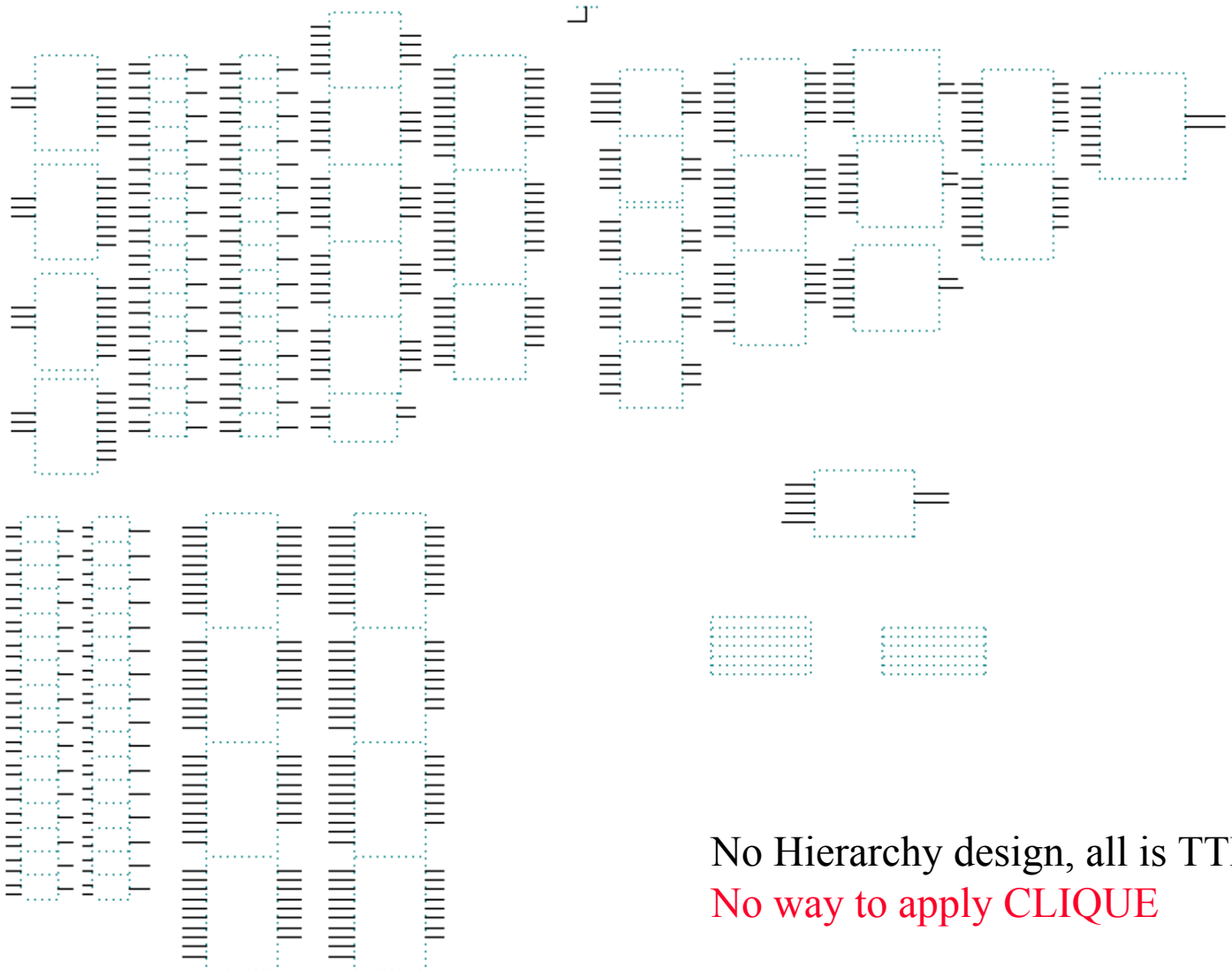
What is CLIQUE ?

- Clique is an option which provided by Altera Max+Plus II which used to
  - control the logic placement
  - force the logic placement within
    - the same LAB (no ROW/COLUMN trace delay) -- Highest speed
    - the same ROW (no COLUMN trace delay)

Where is this Option ?

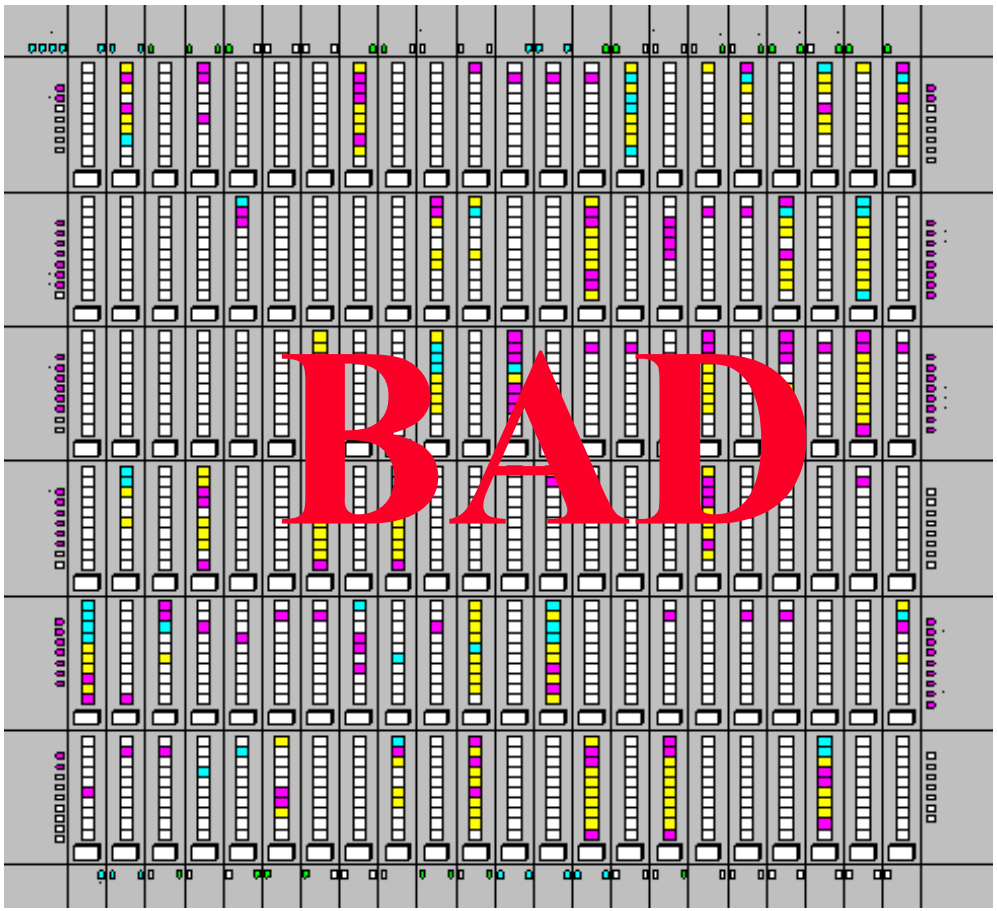


Example



No Hierarchy design, all is TTL,
No way to apply CLIQUE

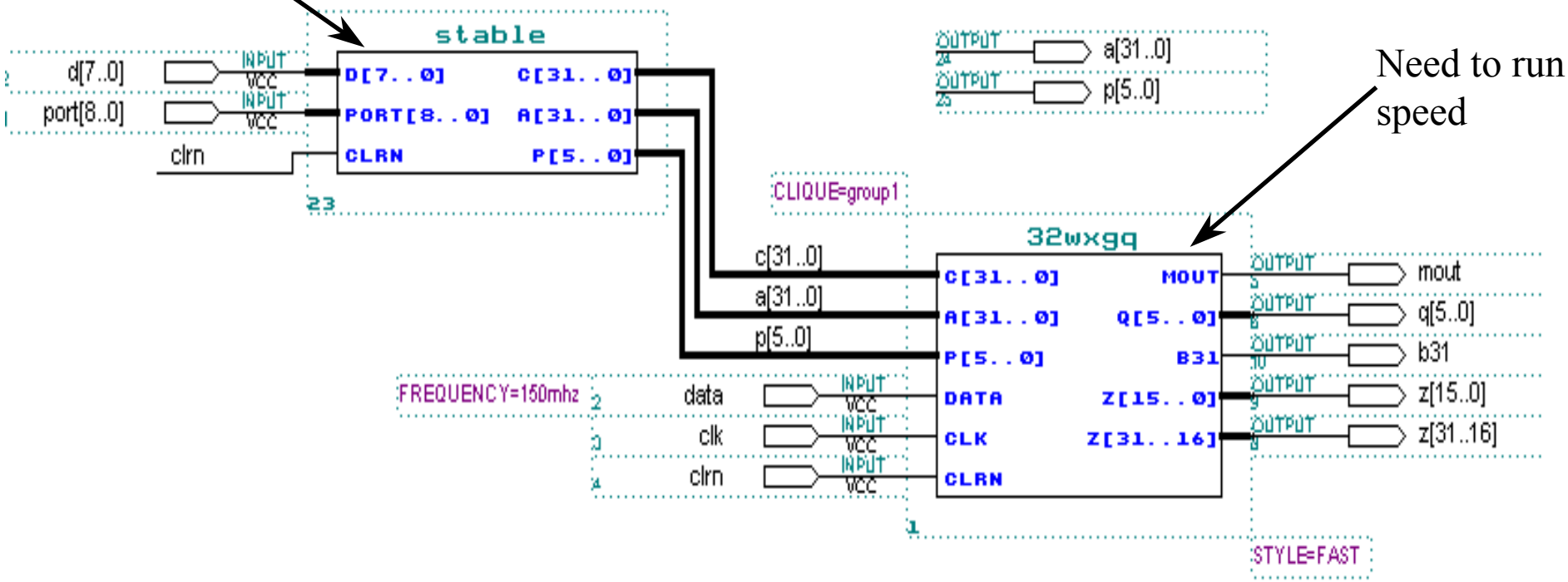
Floorplan Look



It only run at 77.56MHz

Only a Little Bit Effort Planning

Isolate the unrelate logic to different module



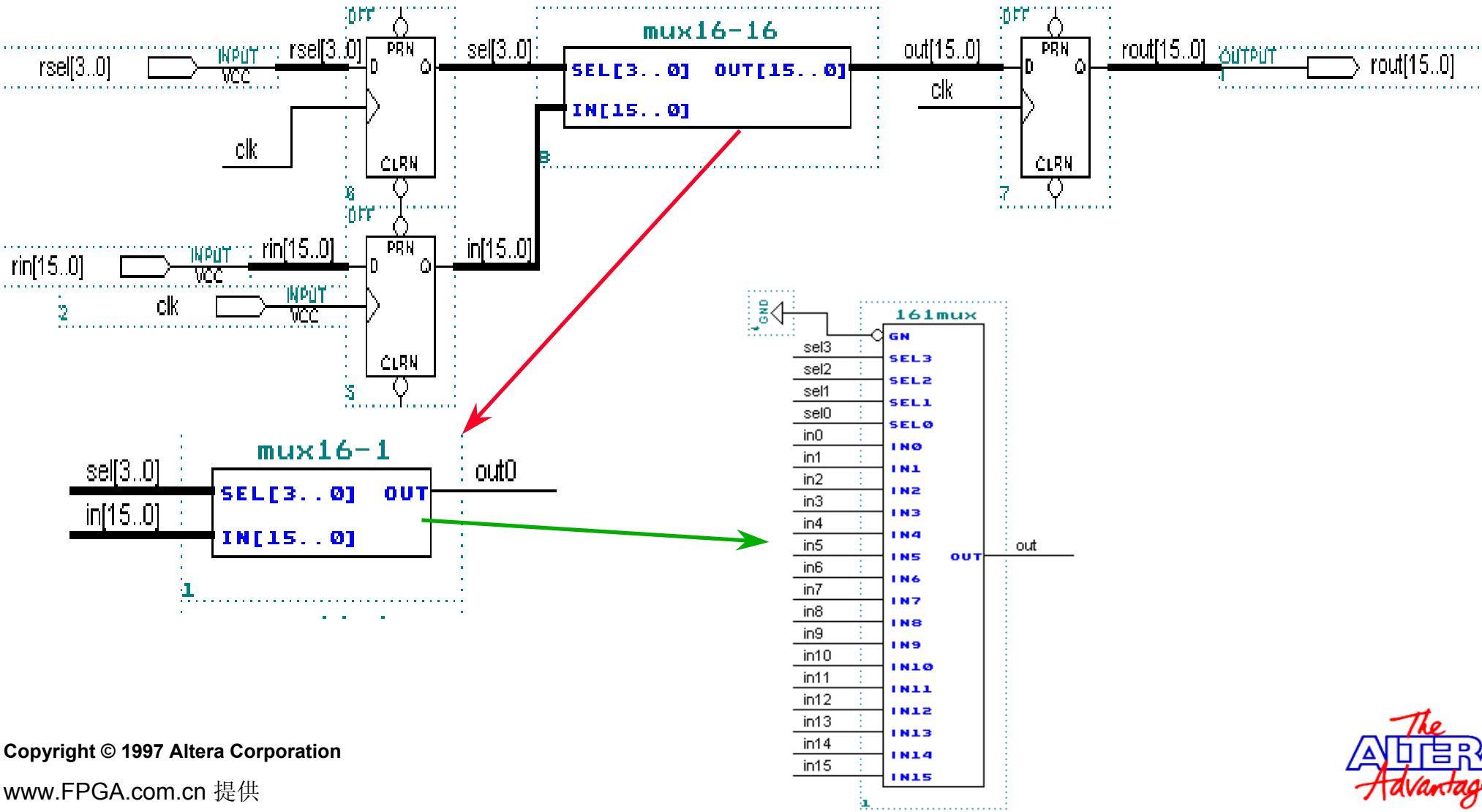
Change a flat design to 2 module

Floorplan Look

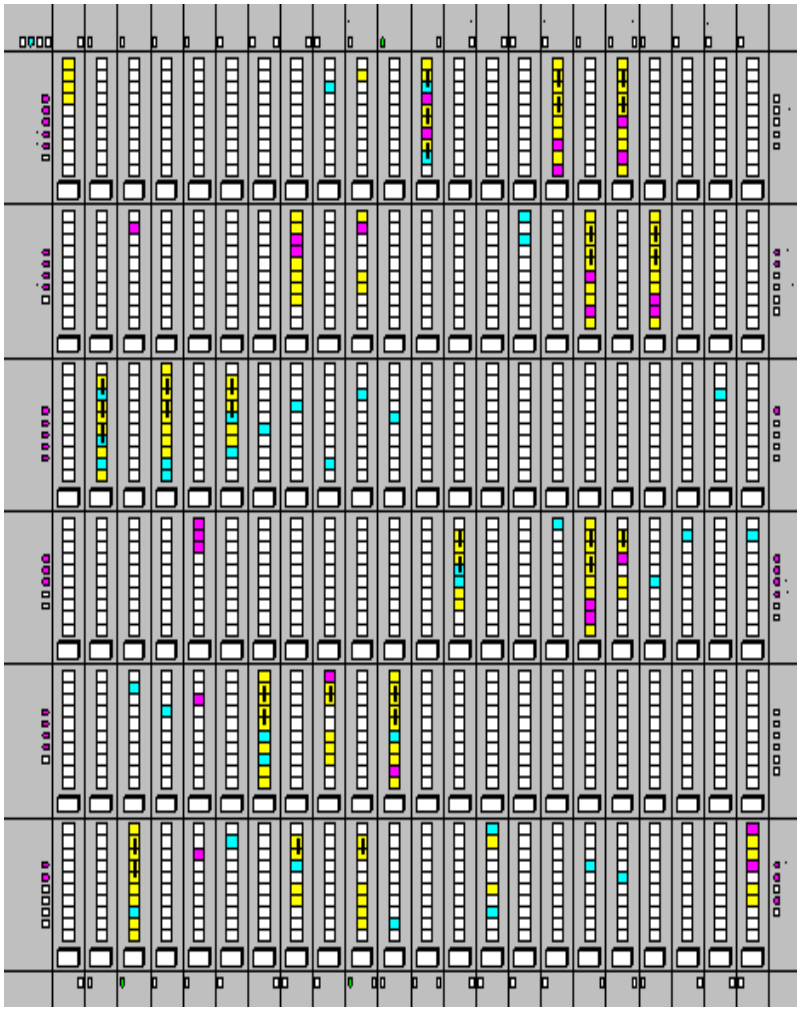
Register Performance

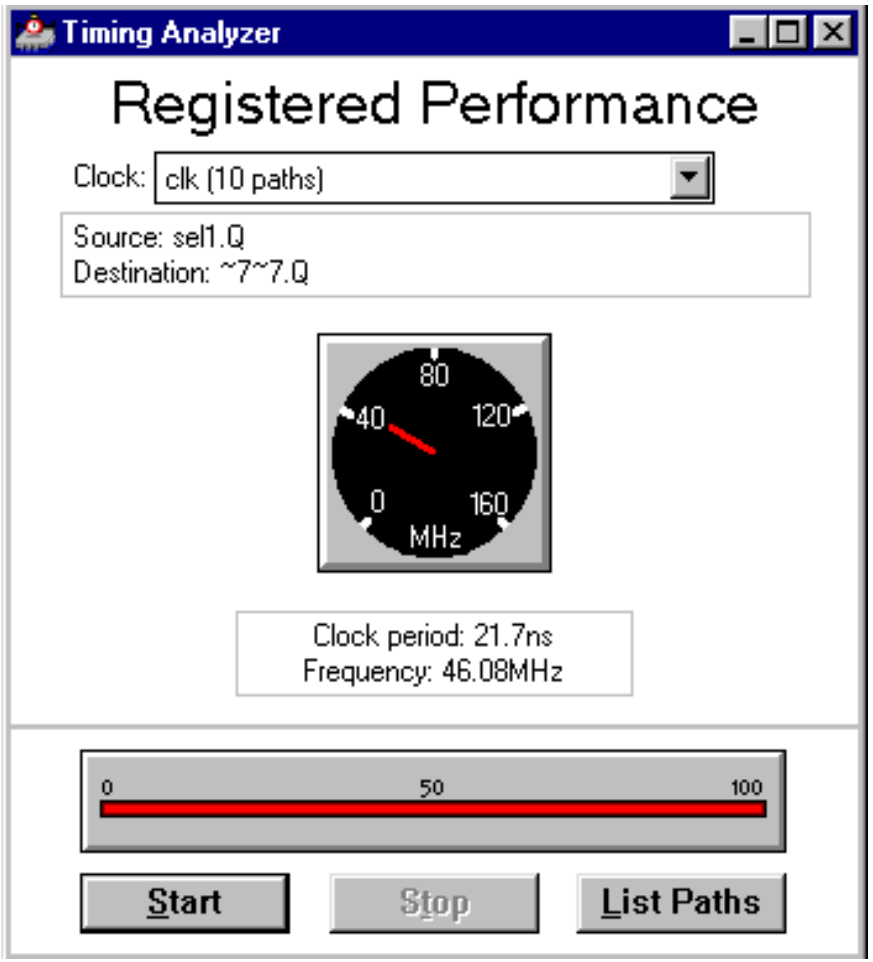
No logic change, only little bit planning in advance, the speed improve from 77.56Mhz to **138.88Mhz** (79% increase). Yes, it is so easy !!!!!!!

Use CLIQUE wisely

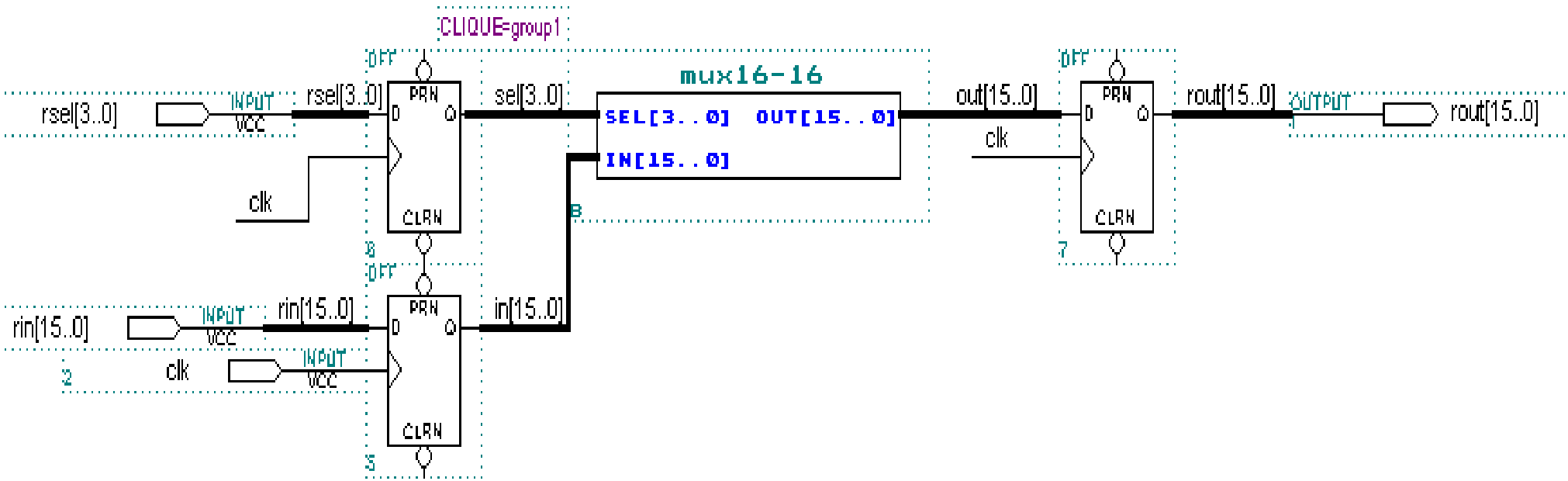


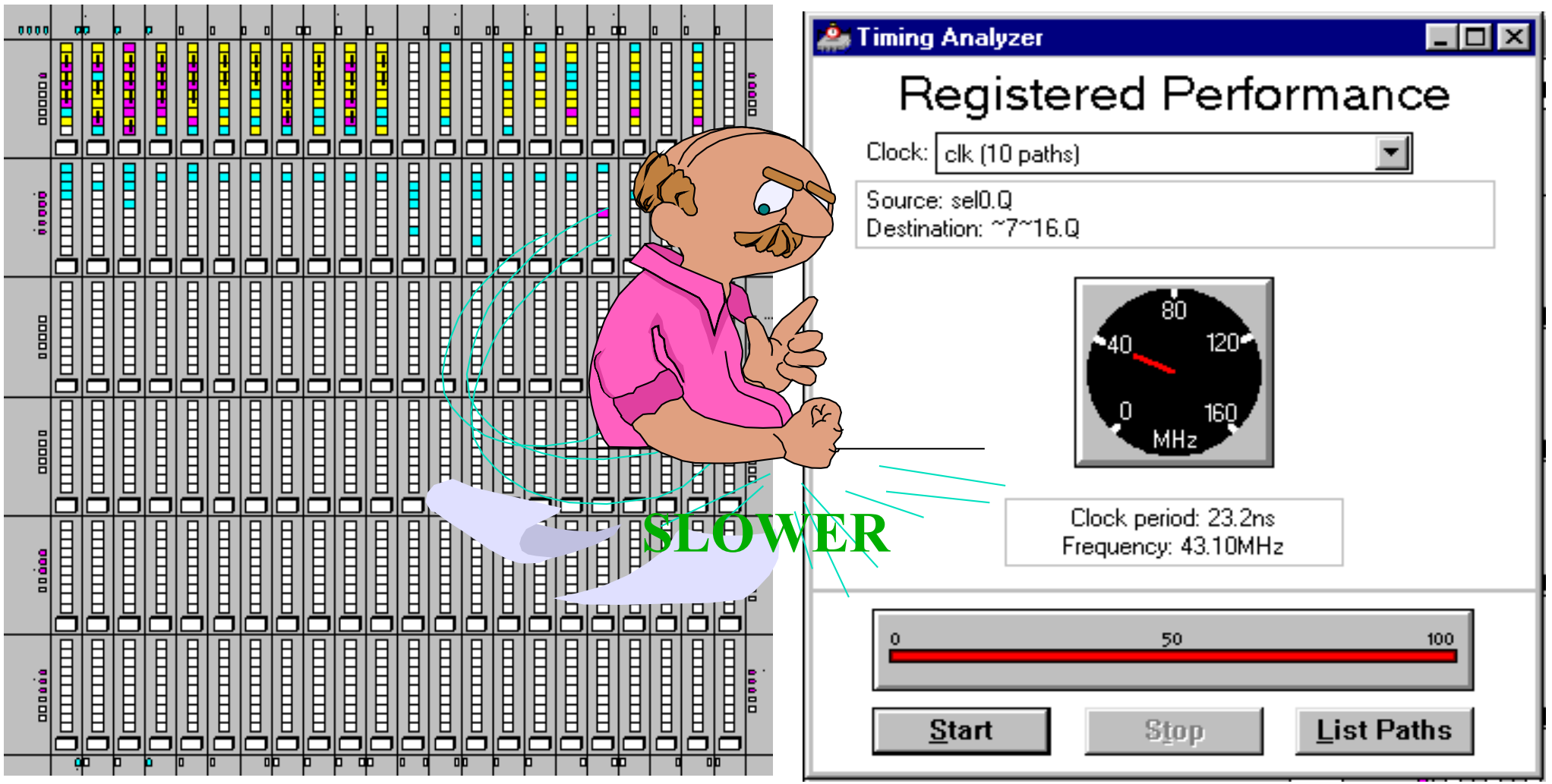
No CLIQUE apply





Apply CLIQUE to MUX16-16

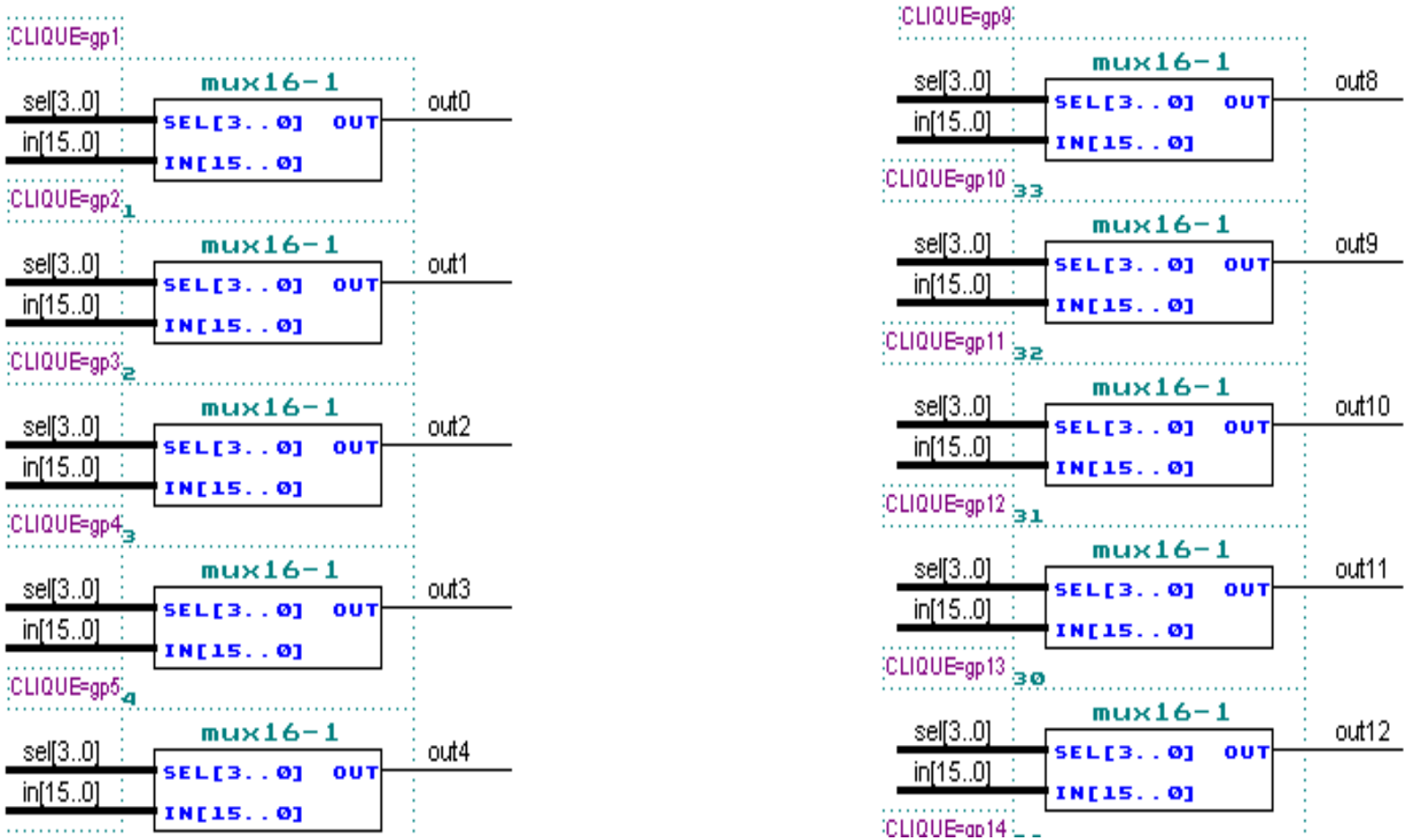


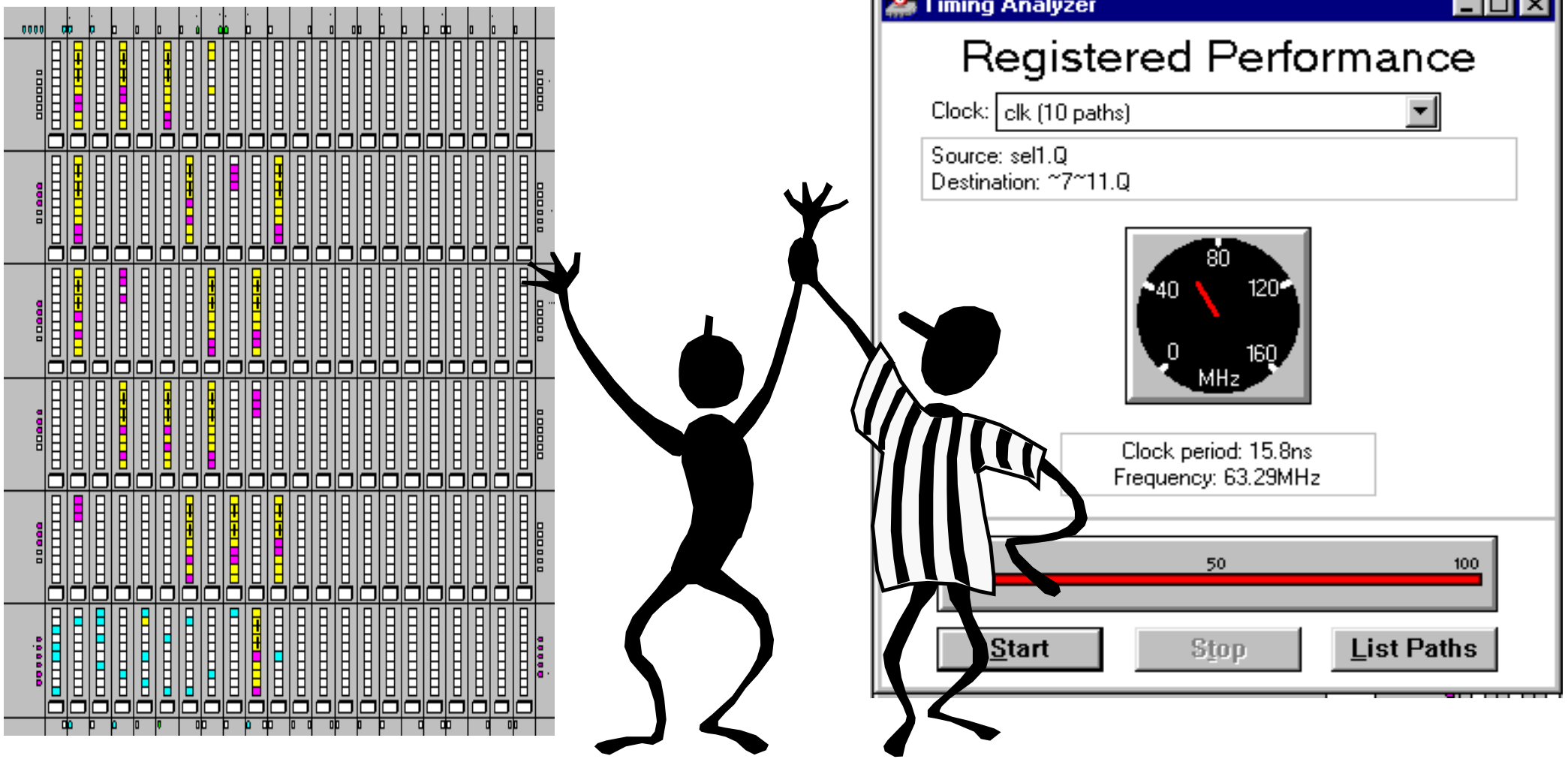


Why ?

- The 16x16 MUX is construct from 16 individual 16-to-1 MUX
- This 16 individual 16-to-1 MUX is no relationship with each other
- Apply CLIQUE to this 16x16 MUX means you force this 16 individual MUX place together
- Now this 16 individual 16-to-1 MUX somehow has relationship between each other through this CLIQUE application
- Is that CLIQUE is not GOOD ?

Apply CLIQUE to individual 16-1 MUX





So Easy, the performance increase by 37%

The ALTERA Advantage

Use CLIQUE wisely

- CLIQUE really help you to achieve HIGH SPEED design
  - if and only if apply it correctly
- Apply CLIQUE **ONLY** to the logic which having relationship with each other
- Breakdown your big design to smaller sub-module design will easier for apply CLIQUE
  - that is Floorplan in advance means for

THINK BEFORE CLIQUE

Design Revolution

- In the past, design is base on FUNCTIONAL partition
  - address decoder, state machine 1, state machine 2 etc.
- Todays, we are facing with HIGH SPEED DESIGN
- High Speed Design need a good floor planning in advance
- CLIQUE is a powerful tools to control placement

Good Floor Planning in advance + CLIQUE = HIGH SPEED DESIGN

Conclusion

Apply CLIQUE at the whole design = No CLIQUE at all !!!!!!