Complex routing design rules and the ISPD 2018/2019 Initial Detailed Routing Contests

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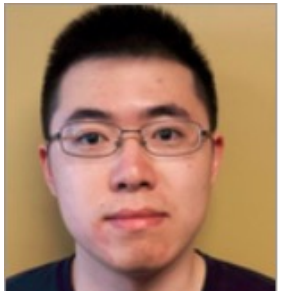
Contest Organizers

Gracieli Posser
Contest chair

Stefanus Mantik
Benchmarks



Yixiao Ding
Benchmark testing

Amin Farshidi
Vice chair

Wen-Hao Liu
Past chair

William Chow
Evaluation

Routing complexity

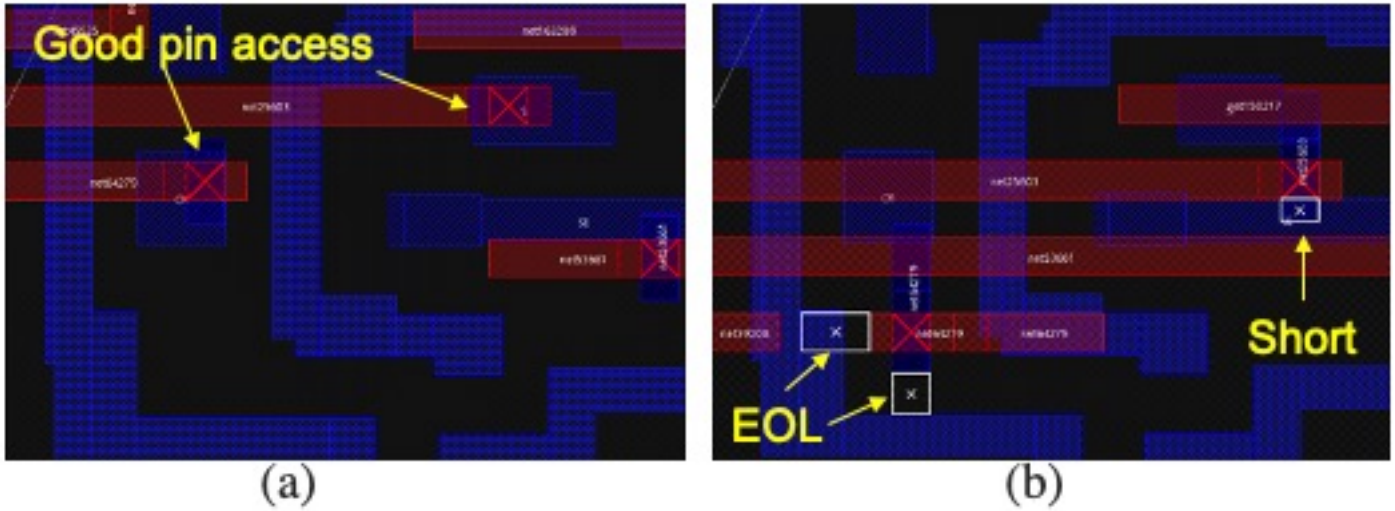
- Complexity on the design rules on new technology nodes
  - 5.8 LEF file has more than 1K
  - challenging and timing consuming
- Many rules, like:
  - spacing table
  - end-of-line (EOL) spacing
  - cut spacing
  - min area rule
  - parallel run spacing
  - adjacent cut spacing
  - corner-to-corner spacing

ISPD 2018 and 2019 contests

- Goals:
  - provide advanced routing rules and industrial designs to academia and EDA community
  - conduct leading routing research on the modern real designs
- Achievements so far:
  - new advanced research on routing
  - the benchmarks are used by academia not only for routing, but also to validate solutions on different Physical Design problems:
    - reinforcement learning (RL) based routing
    - partitioning tools
    - unified global-detailed routing
    - Synchronous reinforcement learning framework to search for net ordering strategies in detailed routing automatically with the objective to reduce the number of violations.

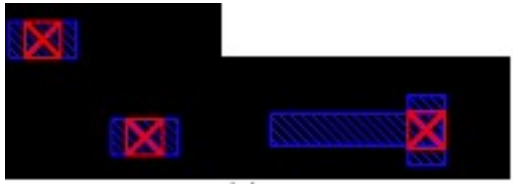
Routing Challenges

- Memory and runtime control
- Pin-access location selection

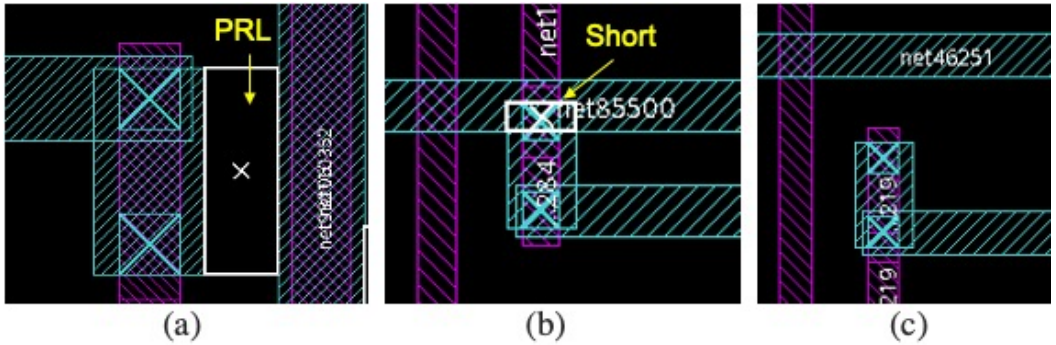


Routing Challenges

- Via selection
  - Vertical or horizontal

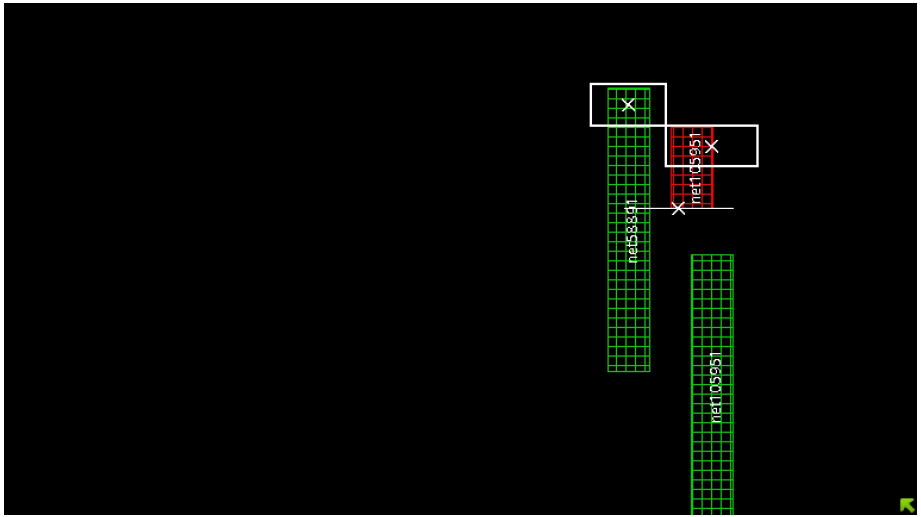


  - Double cut via



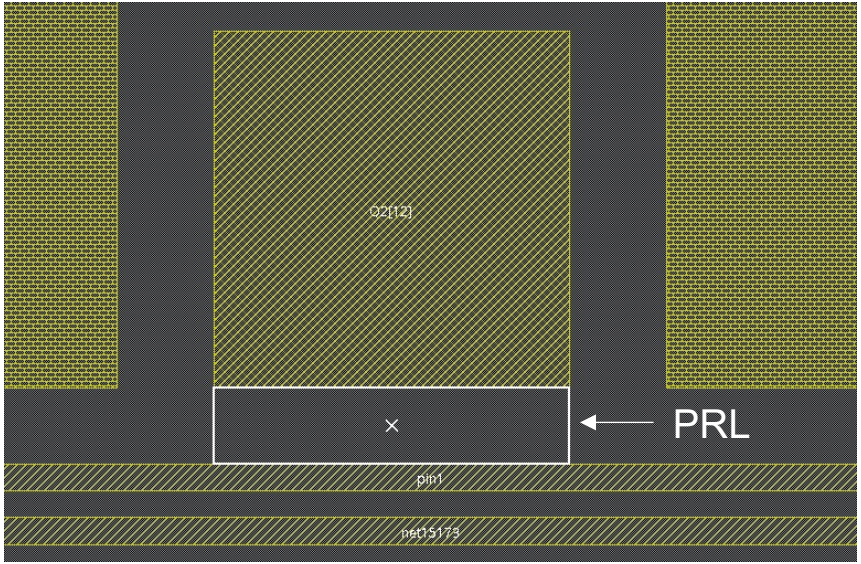
Routing Challenges

- Patch wire insertion



Routing Challenges

- Routing and instance blockages



Routing Challenges

- Non-default rule (NDR) handling
  - In the below example, NDR wire takes 3 tracks instead of 1 track for a standard wire
    - Wire is wider, then width + space blocks the two neighbor tracks