

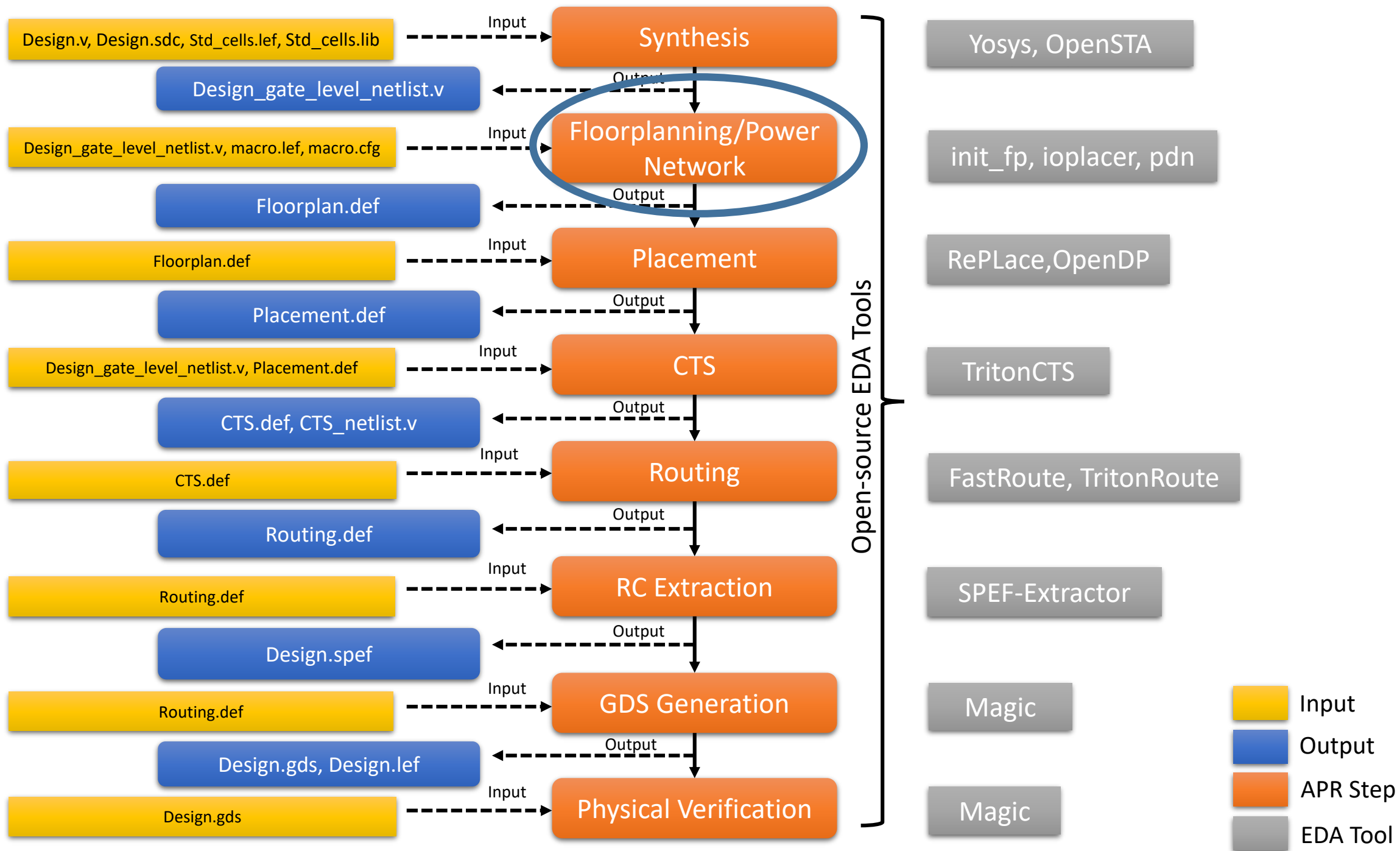
Floorplanning

Workshop Session 4

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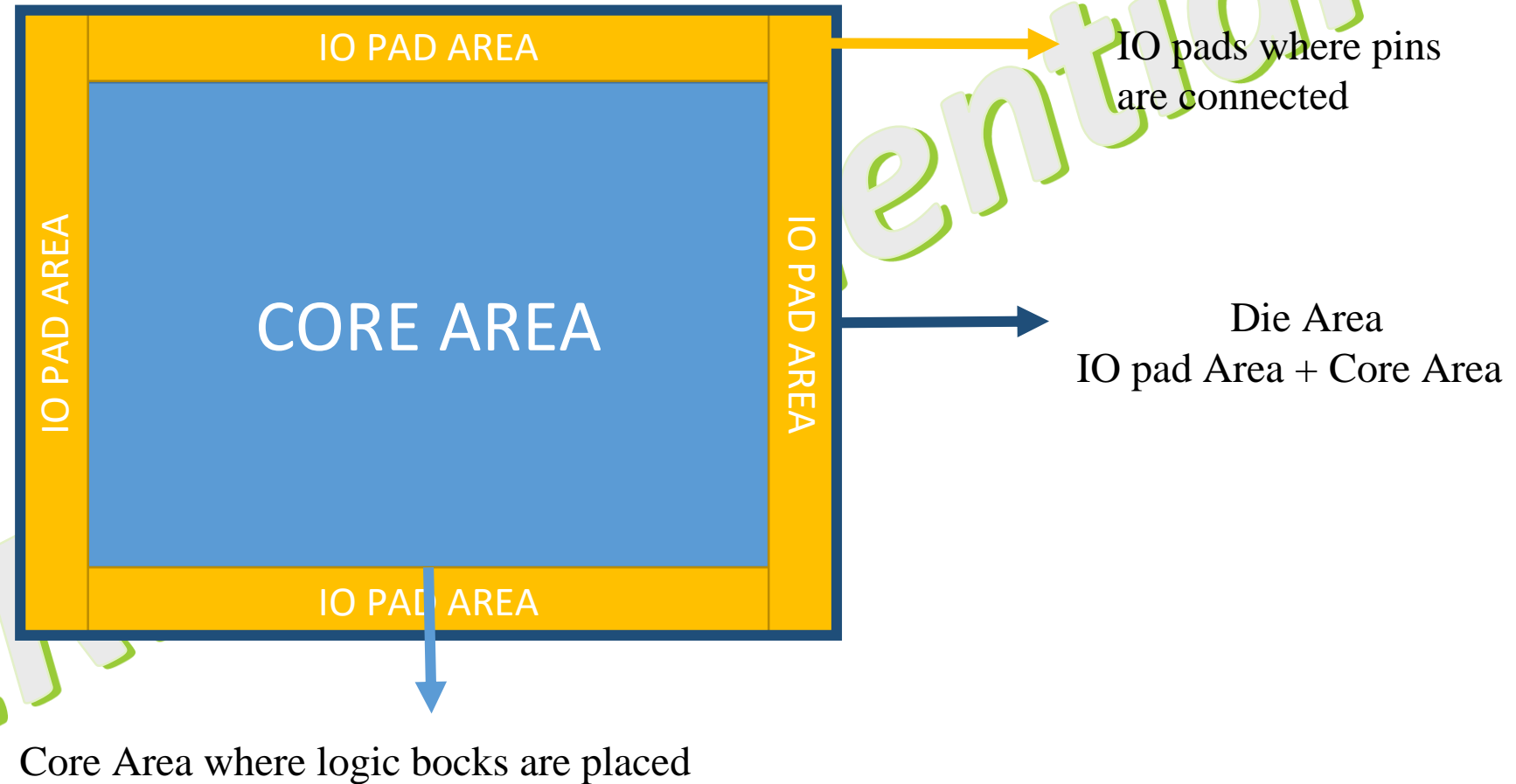
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 - Row Formation
 - Number of Rows
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- Core Utilization
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- LAB PRACTICE

Floorplanning

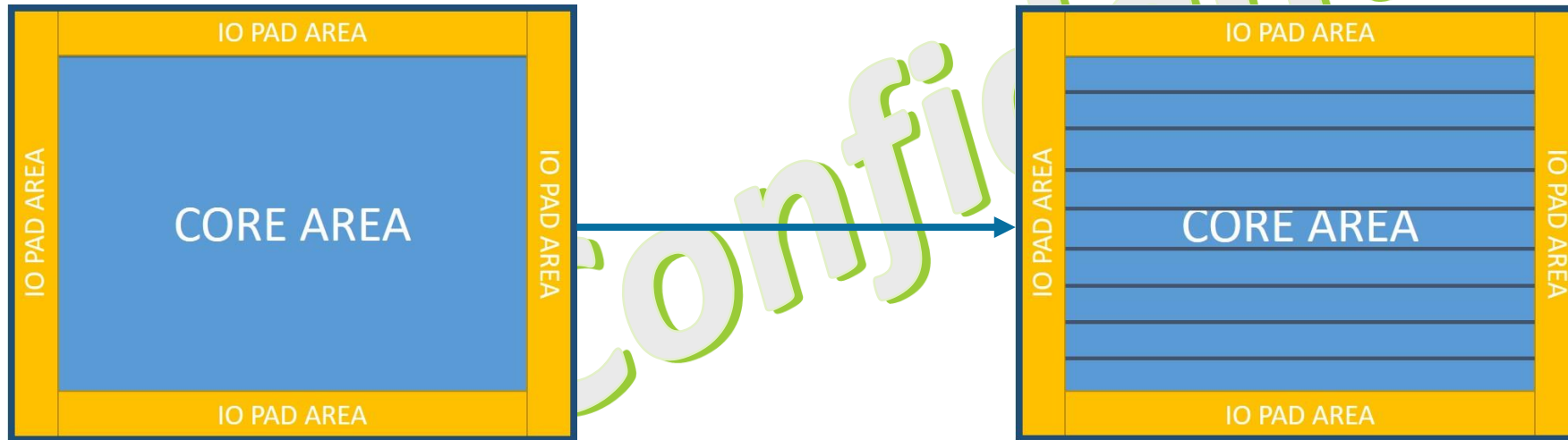
- What is Floorplanning?
 - Defining the area of the chip
 - Die area
 - Core area
 - Formation of rows
 - Height of rows
- Metaphorically speaking,
 - Acquiring the land/plot to build the house

Die Area vs Core Area



Row Formation

- Formation of rows is carried out after deciding the area



- Why Rows?
- How are the rows decided?

Row Formation

$$\text{Number of Rows} = \frac{\text{Core Area Height}}{\text{Standard Cell Height}}$$

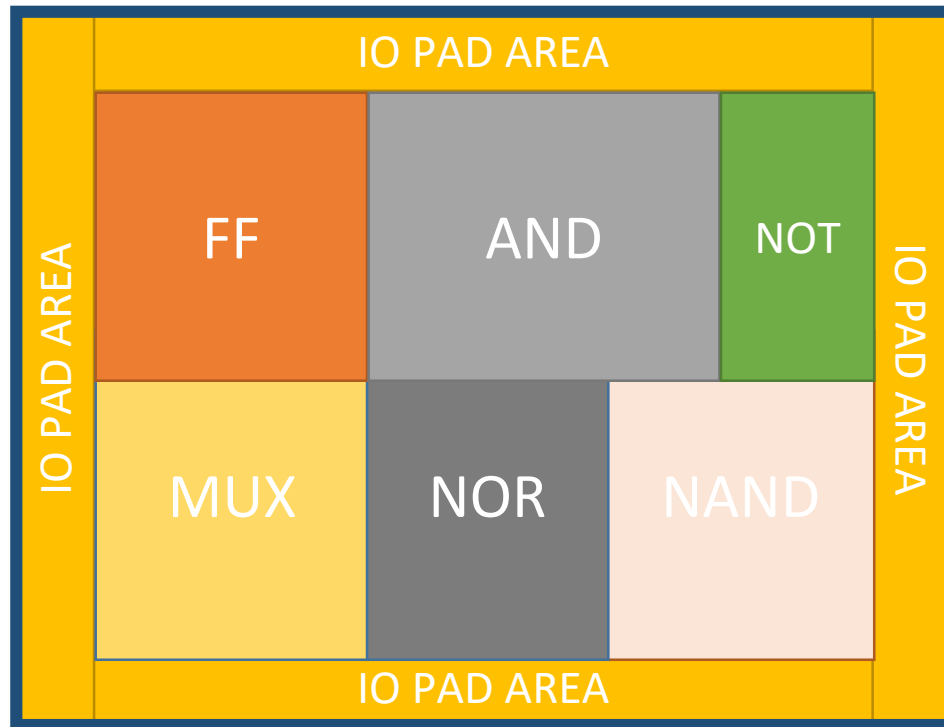
- For the above formula to work both the parameters must be constant.
 - Core area height is constant [as discussed earlier]
 - Standard Cell Height?
 - There are a large number of cells [AND, OR, NOT, NOR, flops, etc.]
 - Who's height to use in the formula?
- The height of every standard cell is the same
 - In Skywater 130 nm, the height is 2.72 um



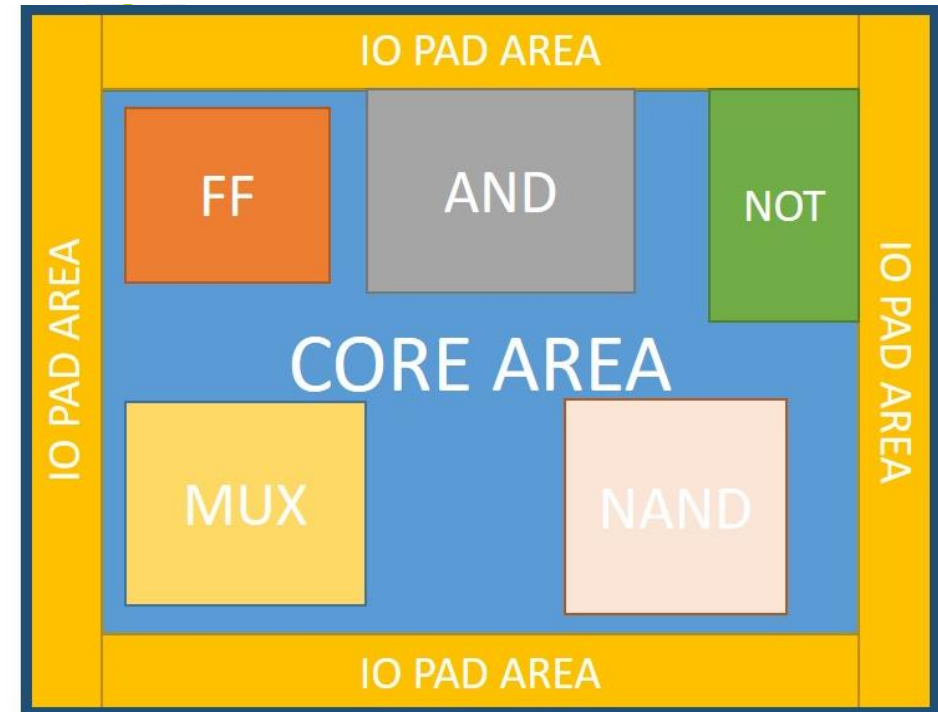
Core Utilization

$$\text{Core Utilization} = \frac{\text{Standard Cells Area} + \text{Macros Area}}{\text{Total Core Area}}$$

Core Area with 100 % Utilization

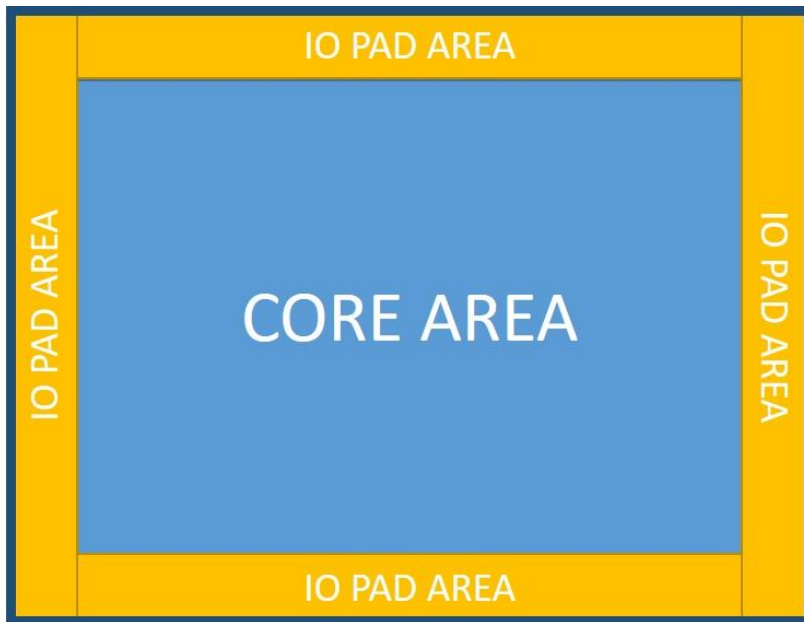


Core Area with less than 100 % Utilization

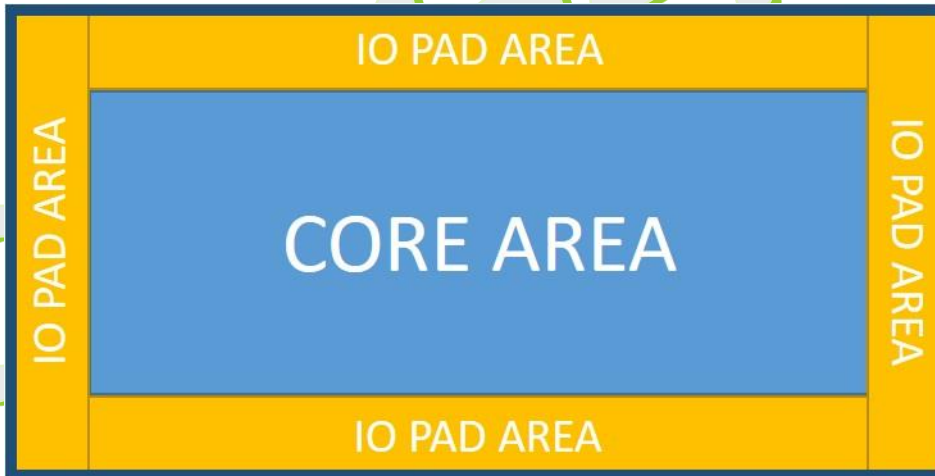


Aspect Ratio

$$\text{Aspect Ratio} = \frac{\text{Height of Core}}{\text{Width of Core}}$$



Aspect Ratio = 1



Aspect Ratio = 0.5

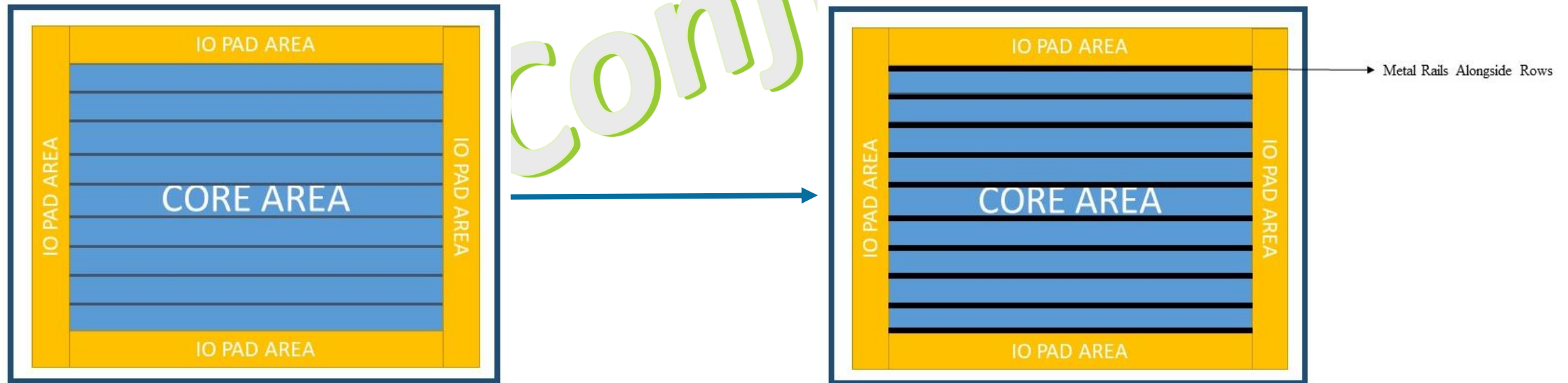


Aspect Ratio = 2

Power Distribution Network

- PDN distributes the power from the external source to the internal standard cells.
- The aim is to provide power to the standard cells without the voltage drop

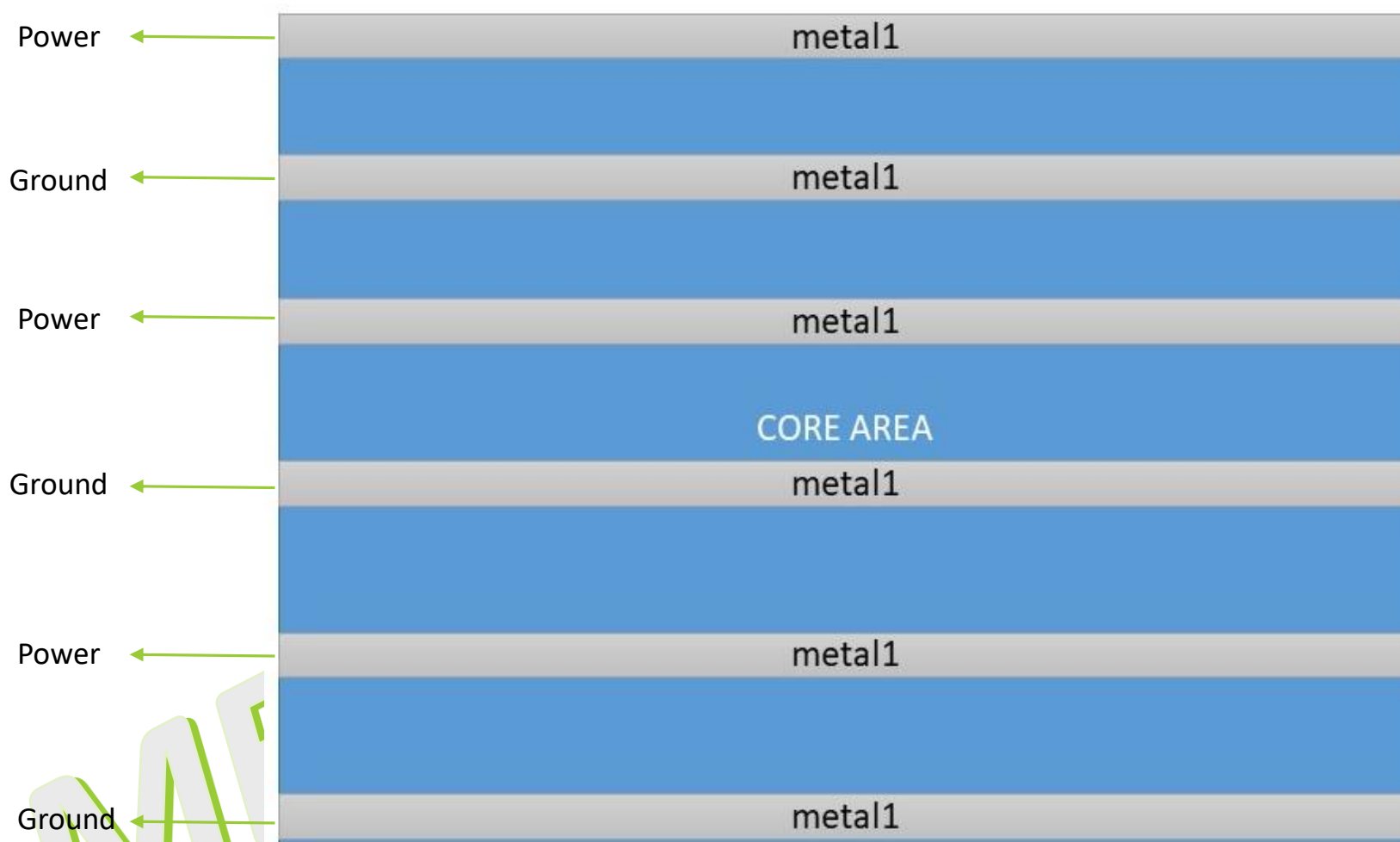
The process starts with inserting metal rails along the rows



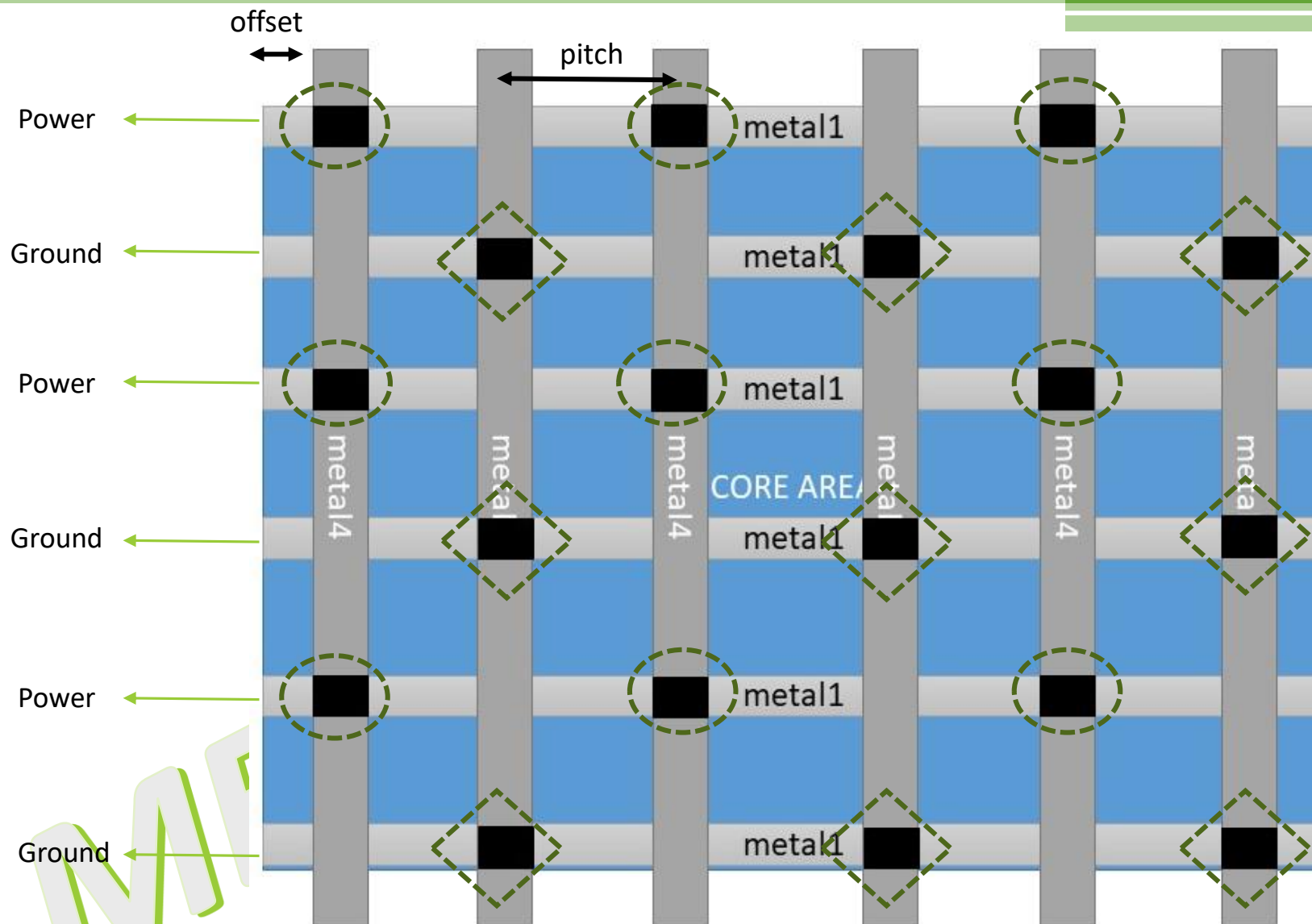


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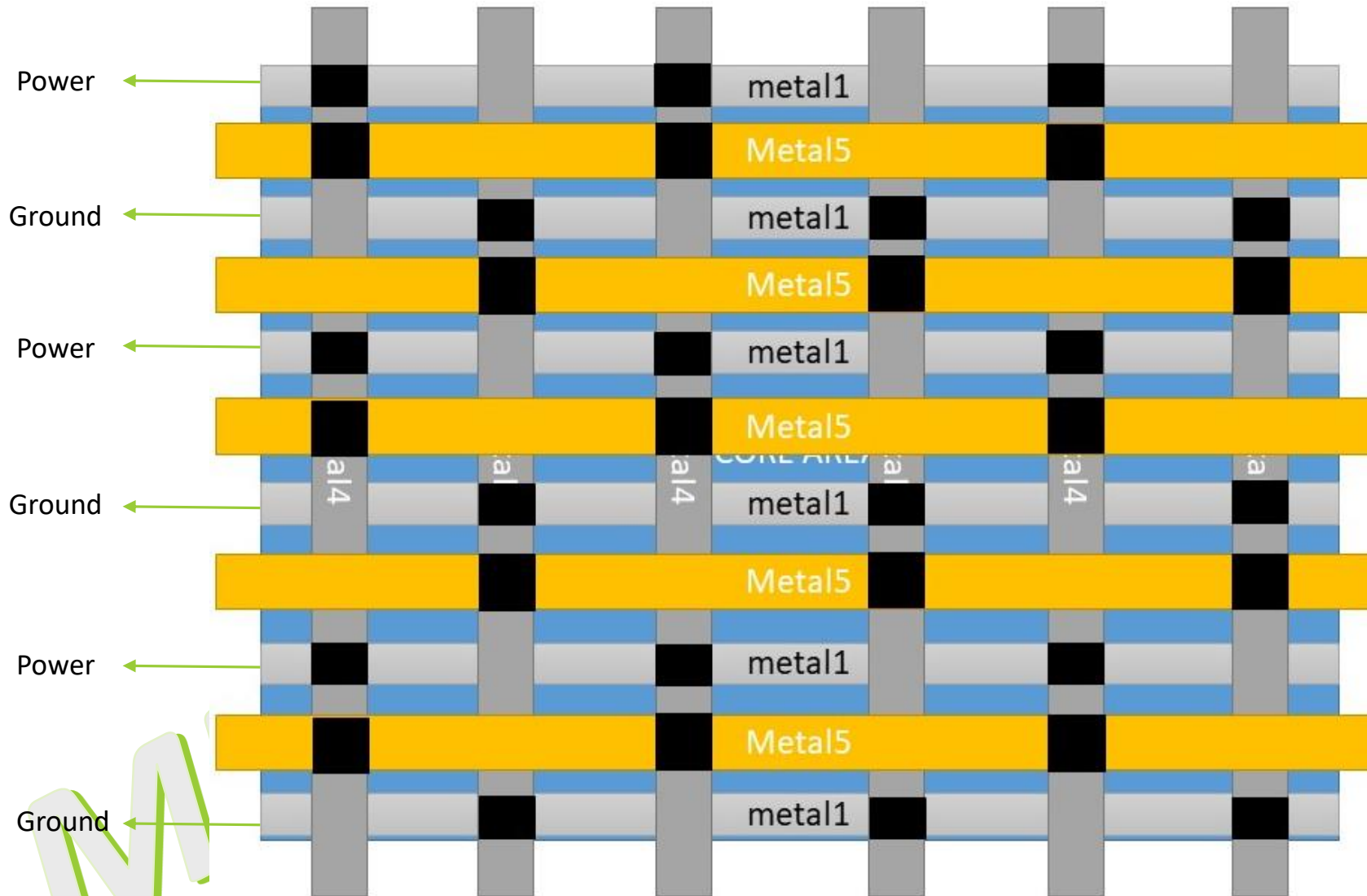
- We start by placing the metal rows
- Note that each layer is either power or ground



Vertical straps are then inserted
Power and ground are separated and
they don't overlap

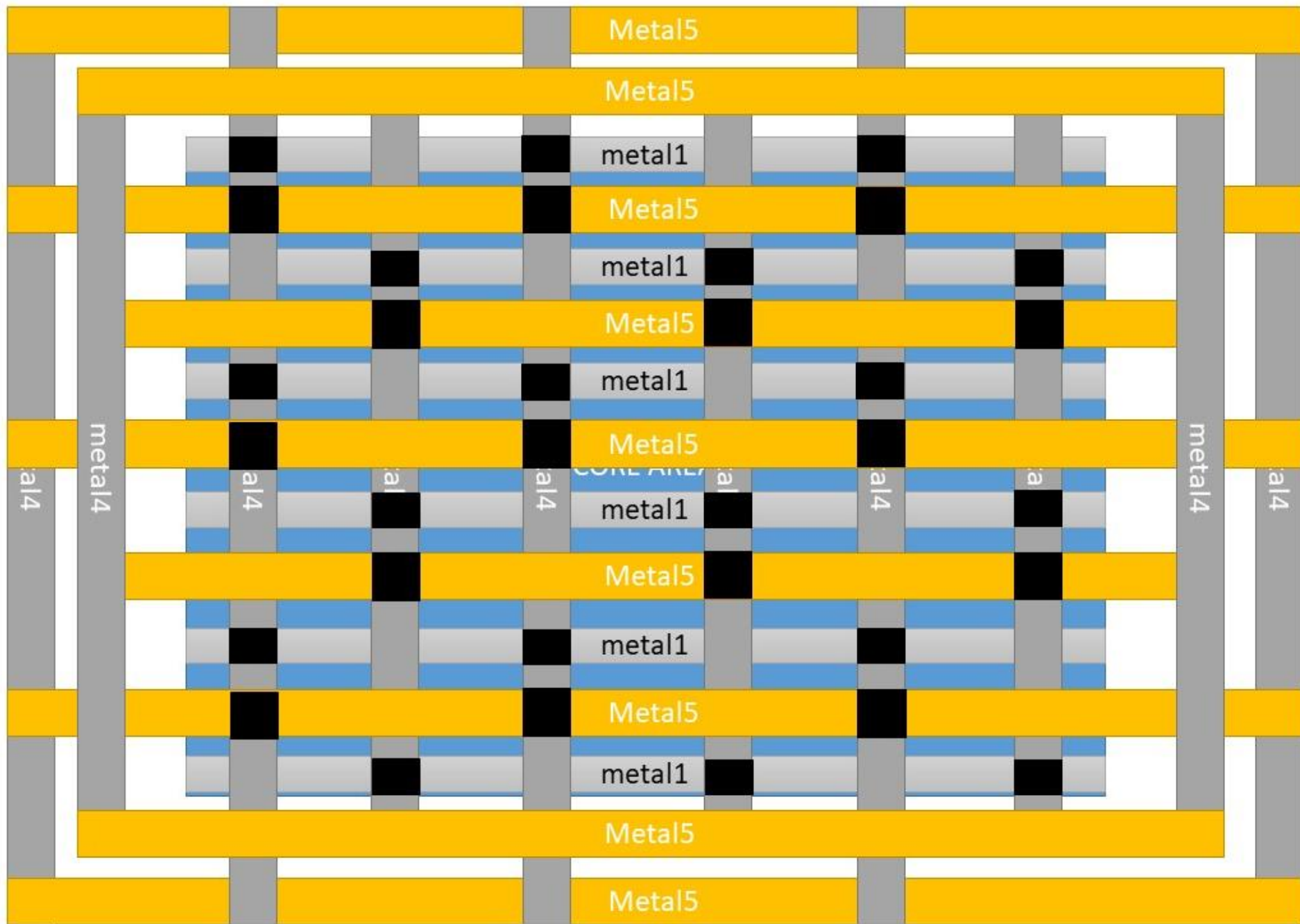
*Pitch: The center to center between 2
adjacent straps*

*Offset: The distance from the edge of the
core to the first metal layer*



Horizontal straps are then inserted
Power and ground are separated and
they don't overlap

The complete power grid but without
power ring



The complete power grid with power rings

Conclusion

- The area and number of rows are fixed at the floorplan step
- Core utilization and aspect ratio are used when the die area is not defined
- Power distribution network follows:
 - Metal rails
 - Vertical Strips
 - Horizontal Strips
 - Power Ring

LAB PRACTICE

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