

*Avant!*

Mask EDA Workshop

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July 11, 2001

*Avant!*

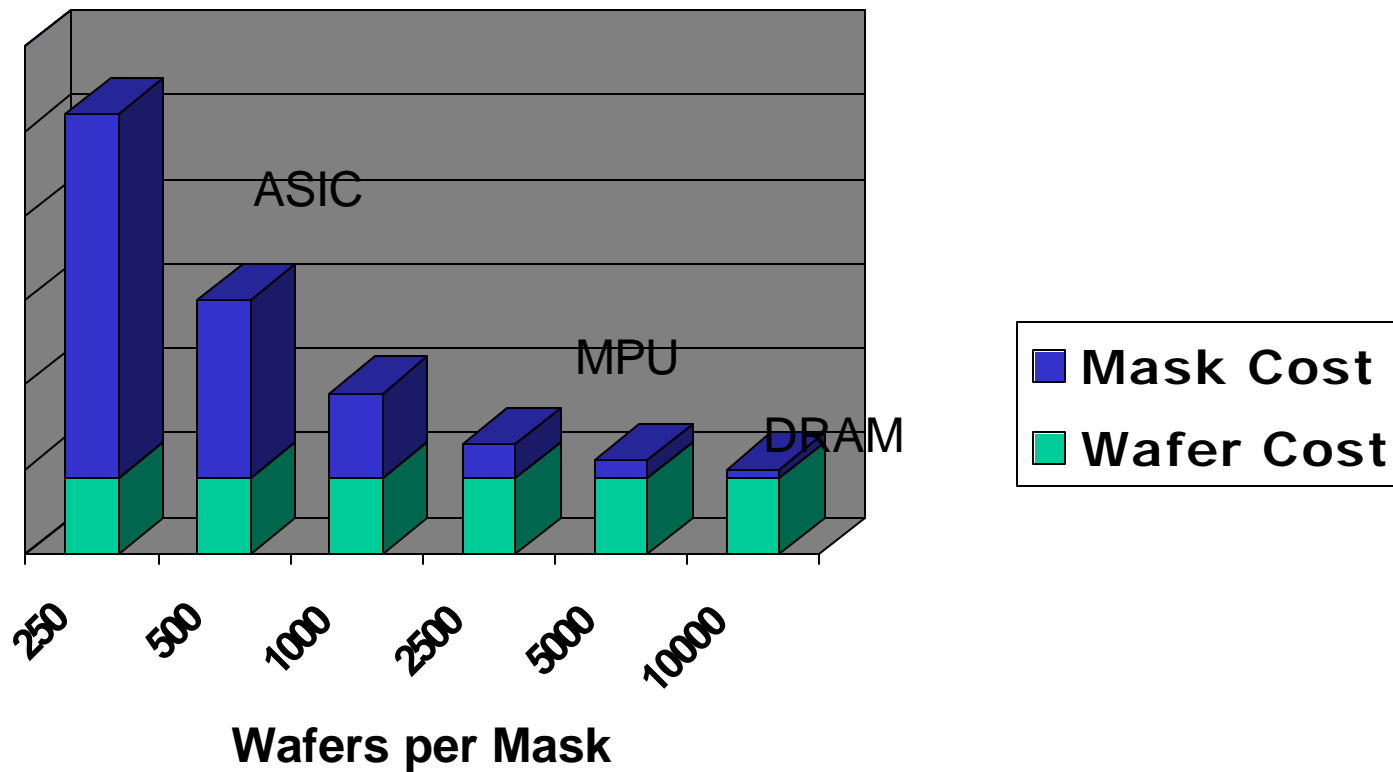
# Outline

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- Hierarchic processing issues for OPC and RET
- OPC data volume and mask-cost issues
- Scale and grid issues
- Scalable distributed processing
- Interchange data format

# NRE Costs

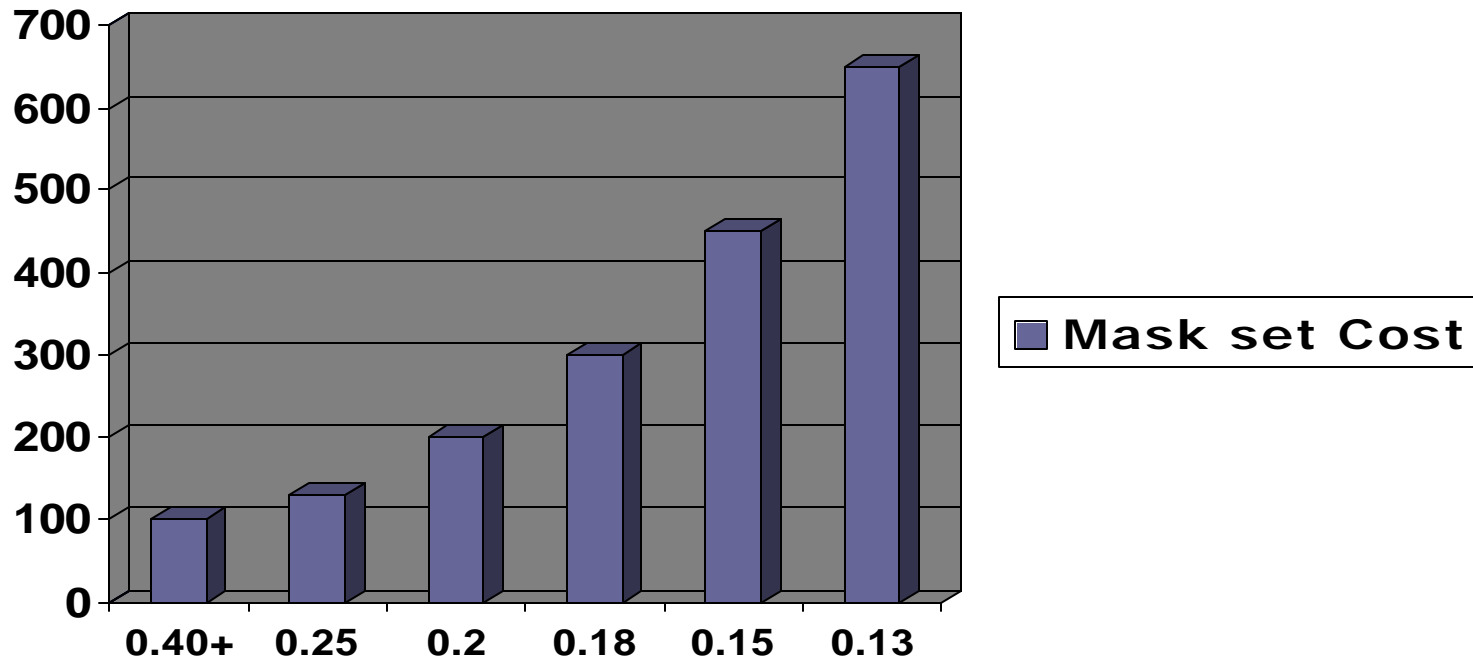
- ❑ Mask cost dominates low-volume Ics
- ❑ Half of all masks make < 570 wafers. (< 100,000 parts)



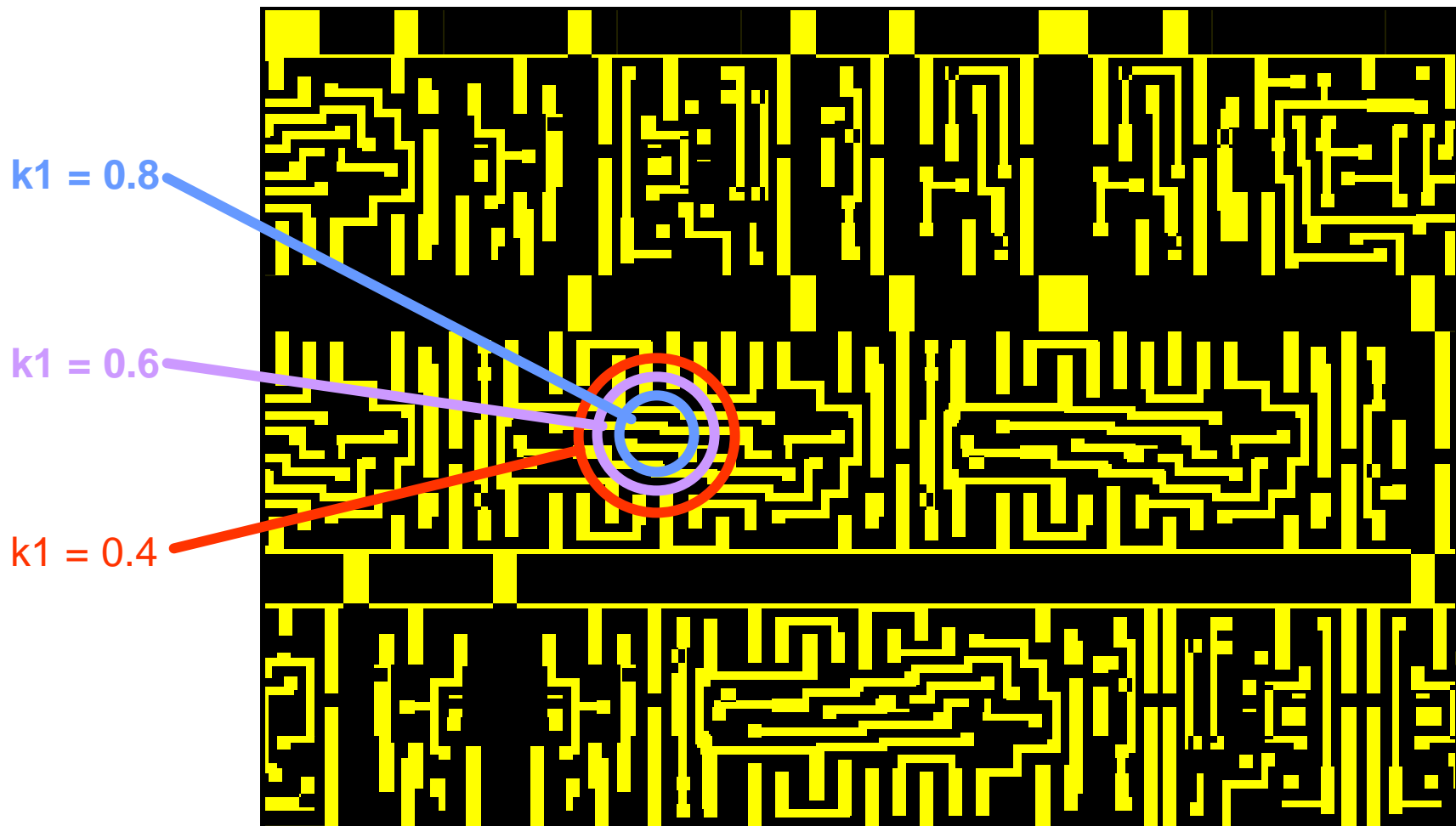
# Mask costs

## ❑ Cost of masks is skyrocketing

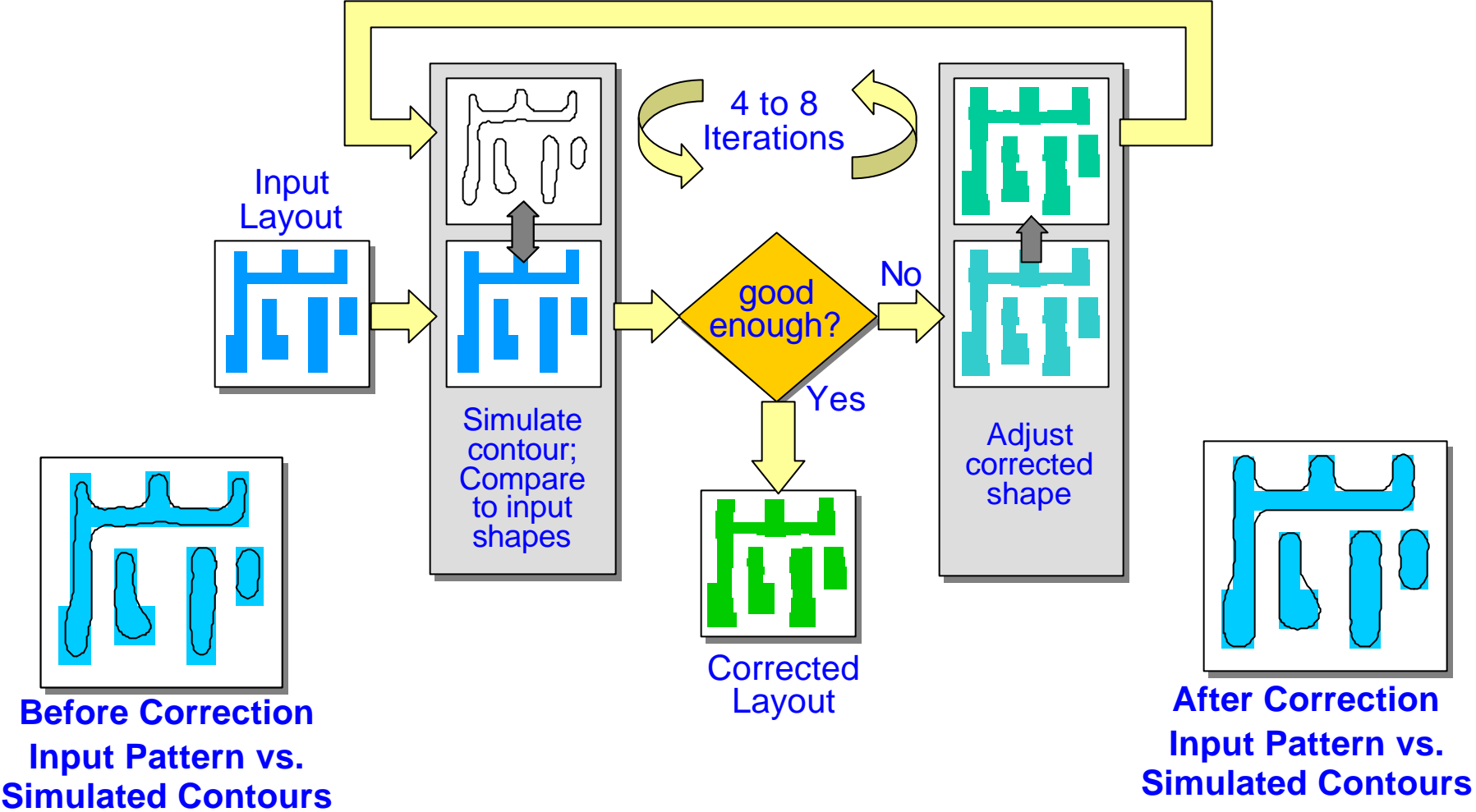
- ▶ Vector scan tools replacing raster scan:
  - More expensive tools.
  - Mask write time scales with pattern detail
- ▶ Increasing use of OPC/PSM/AF on more mask layers



# Optical proximity-effect influence ambit

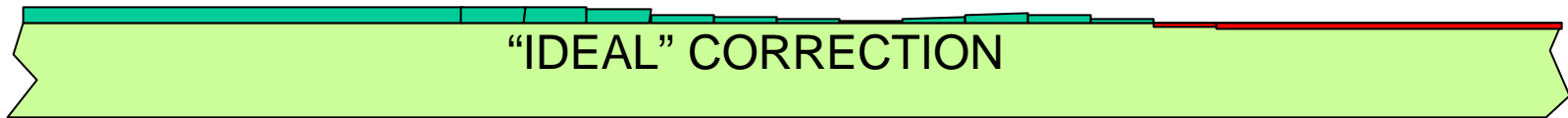


# Model-Based OPC



# Spatial tolerance filtering

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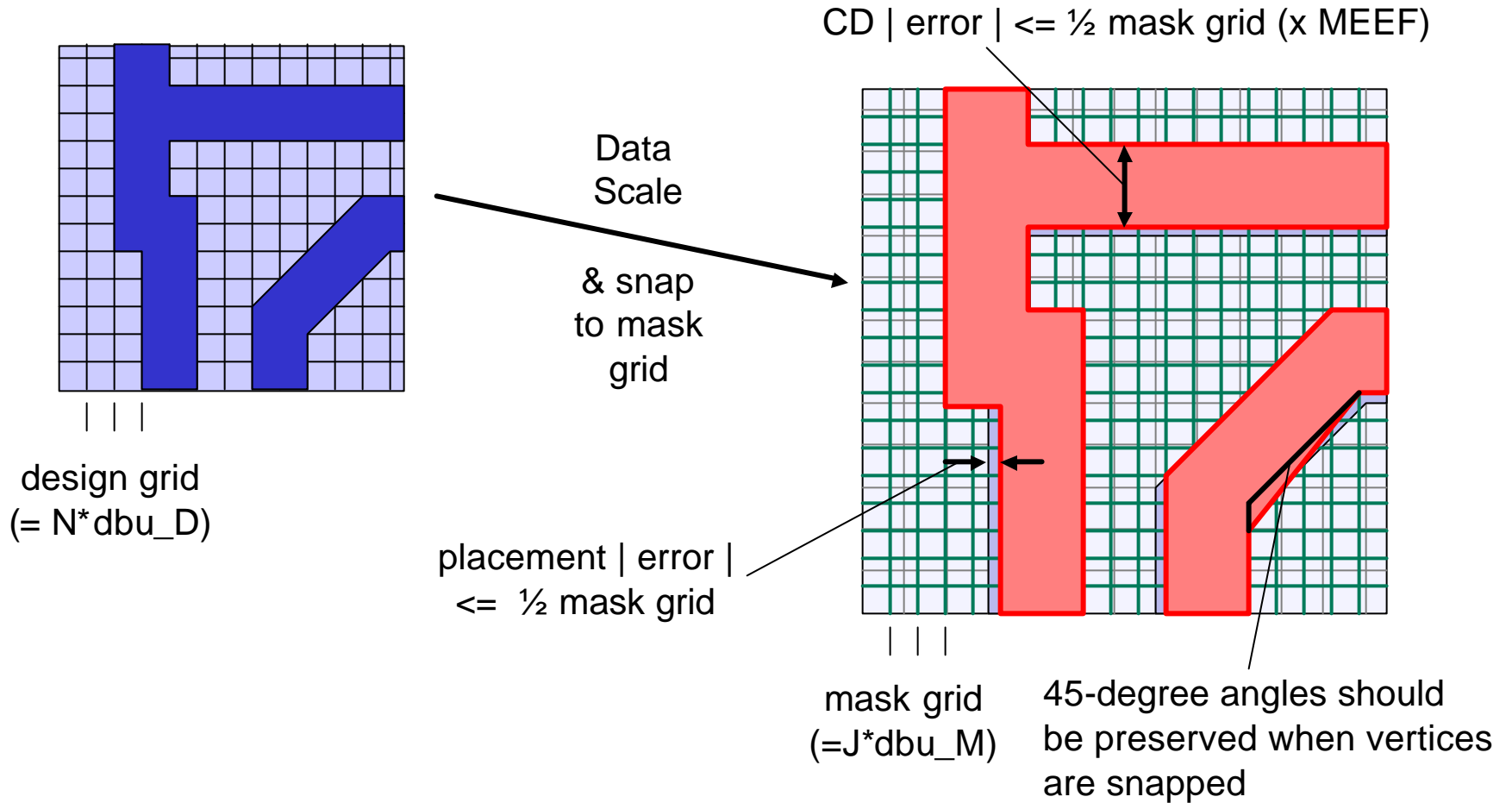


# Relative impact of data-reduction approaches

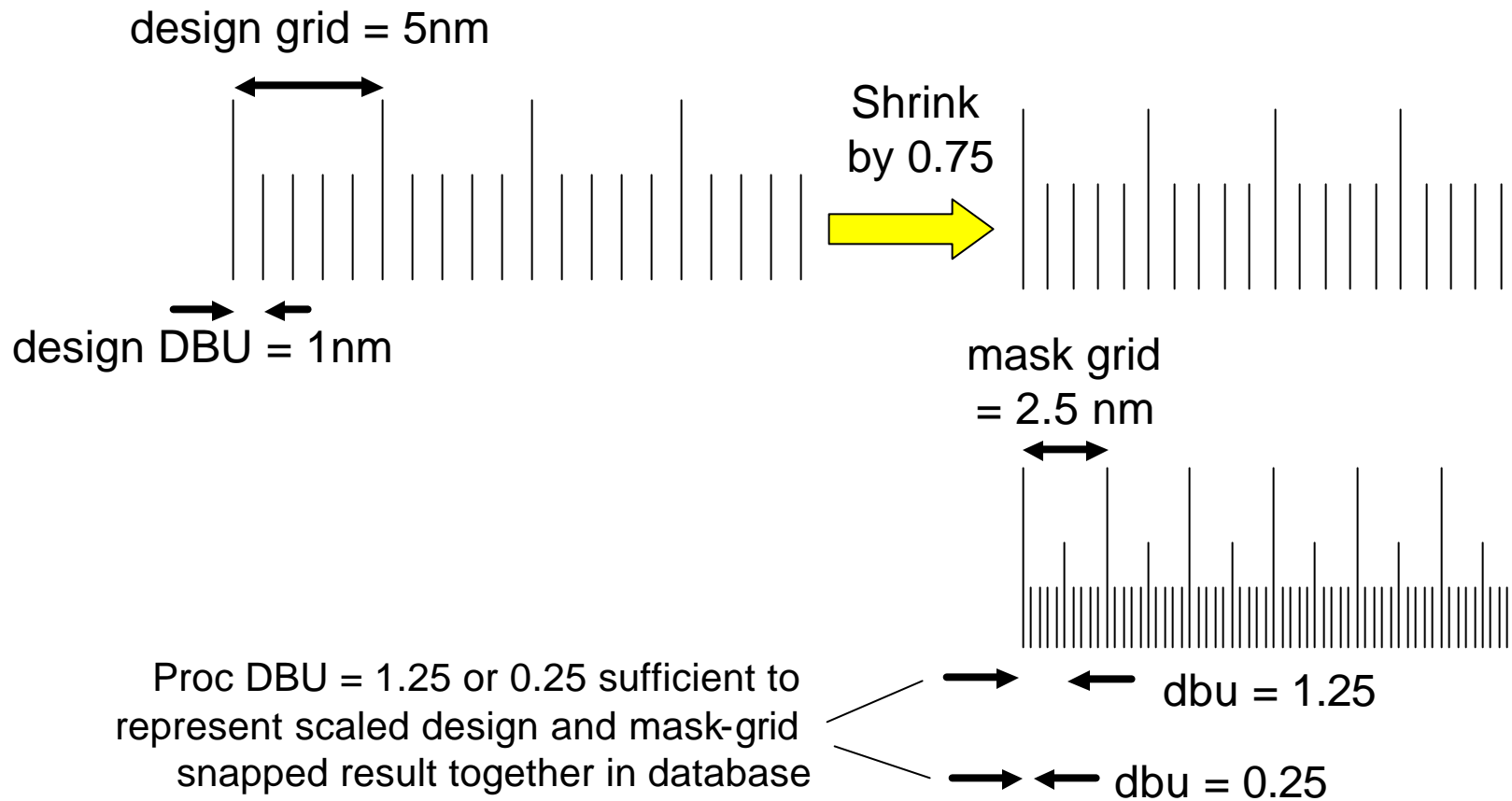
	CD error	GDS DB size	Fracture DB size	Mask write time
<input type="checkbox"/> OPC tolerance filtering	↑	↓	↓	↓
<input type="checkbox"/> Hierarchic tolerance	↑	↓	↓	—
<input type="checkbox"/> Frugal OPC	↑	↓	↓	↓
<input type="checkbox"/> Fracture-friendly OPC	—	↑	↓	↓

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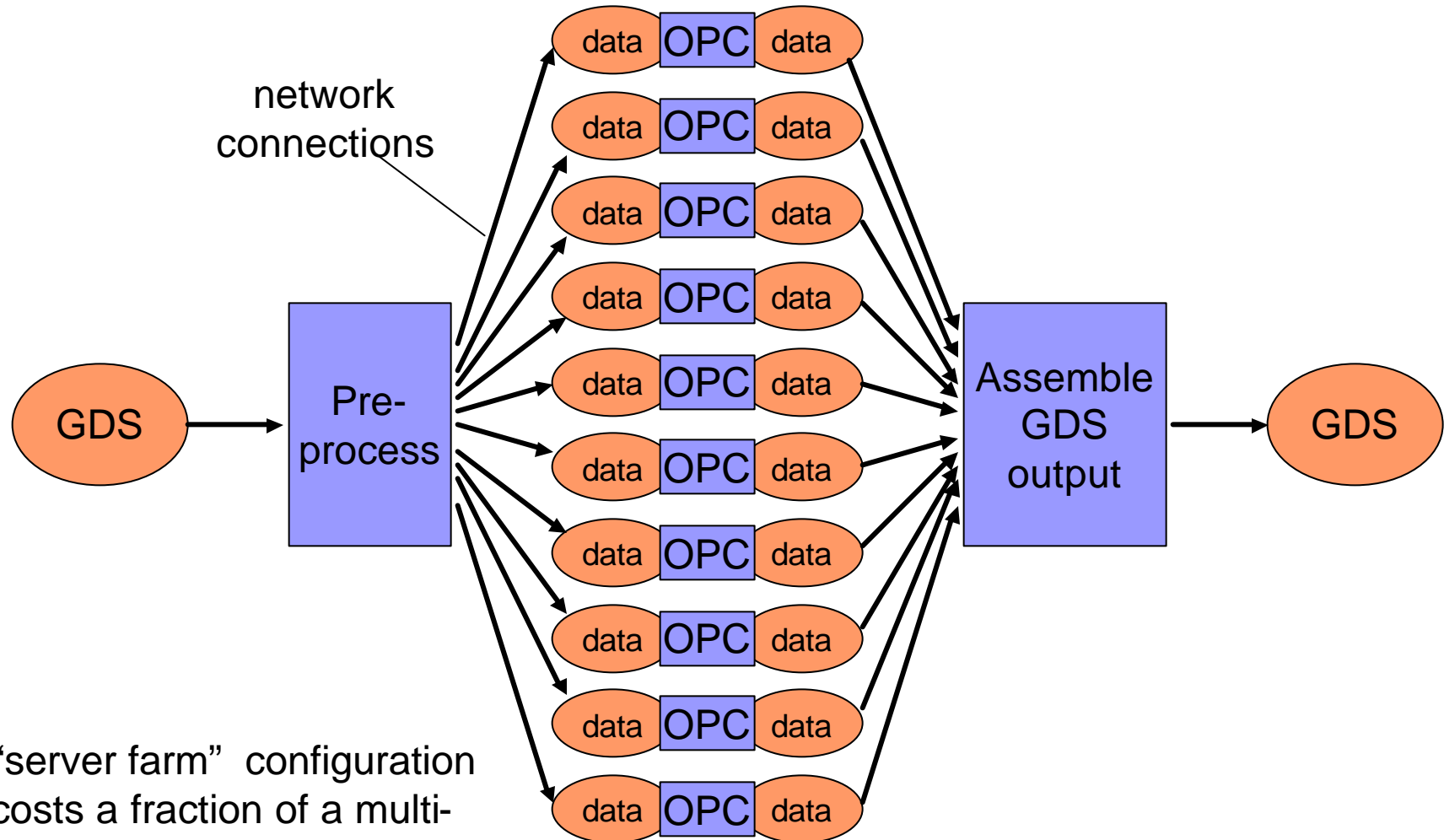
# Layout scale and grid issues



# Floating point internal grid prevents computational round-off errors



# Scalable distributed OPC processing



A “server farm” configuration costs a fraction of a multi-processor “mainframe” for the same performance

# Interchange data format

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- ❑ GDSII Stream is reasonable.
- ❑ Could support enhancements to Stream:
  - ▶ Compression schemes limited to elements.
  - ▶ New elements.
  - ▶ New data types (float, integer ...).
- ❑ Not thrilled with idea of brand new format.