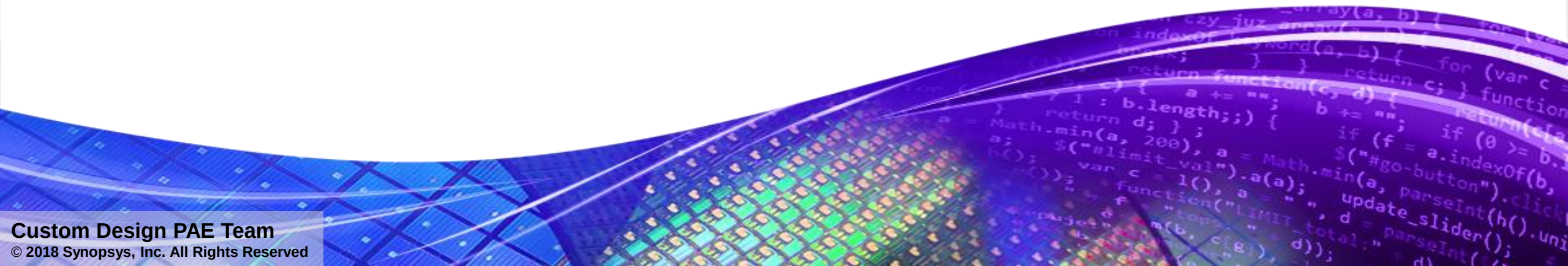
SYNOPSYS®
Silicon to Software™

Custom Compiler

Layout Editor (LE)
Abutment and Align Functions

O-2018.09

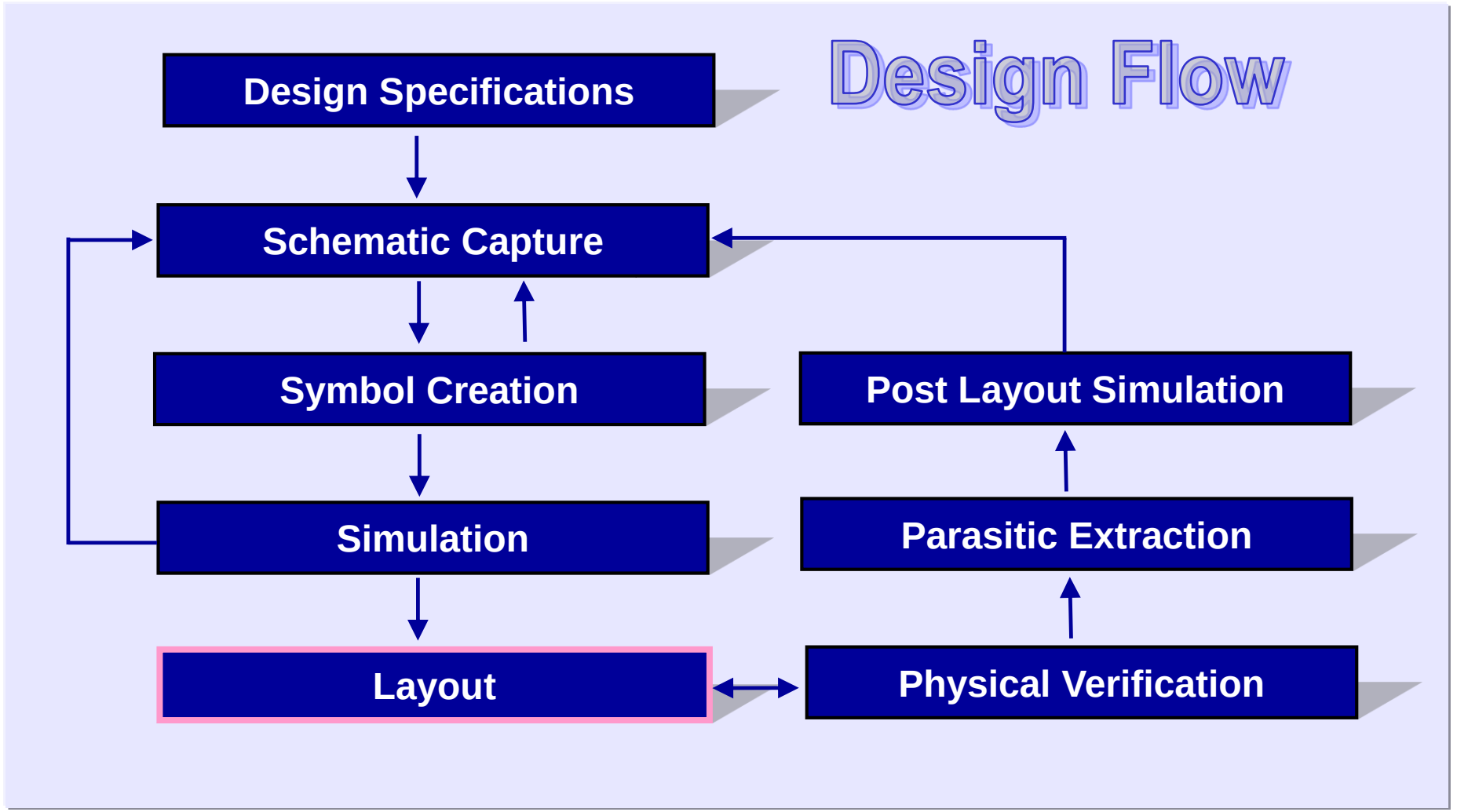


Custom Design PAE Team

Unit Objectives

- **After completing this unit, you will be able to:**
  - Use the abutment function to overlap pin shapes
  - Use the alignment function to align objects

Full Custom Compiler Flow

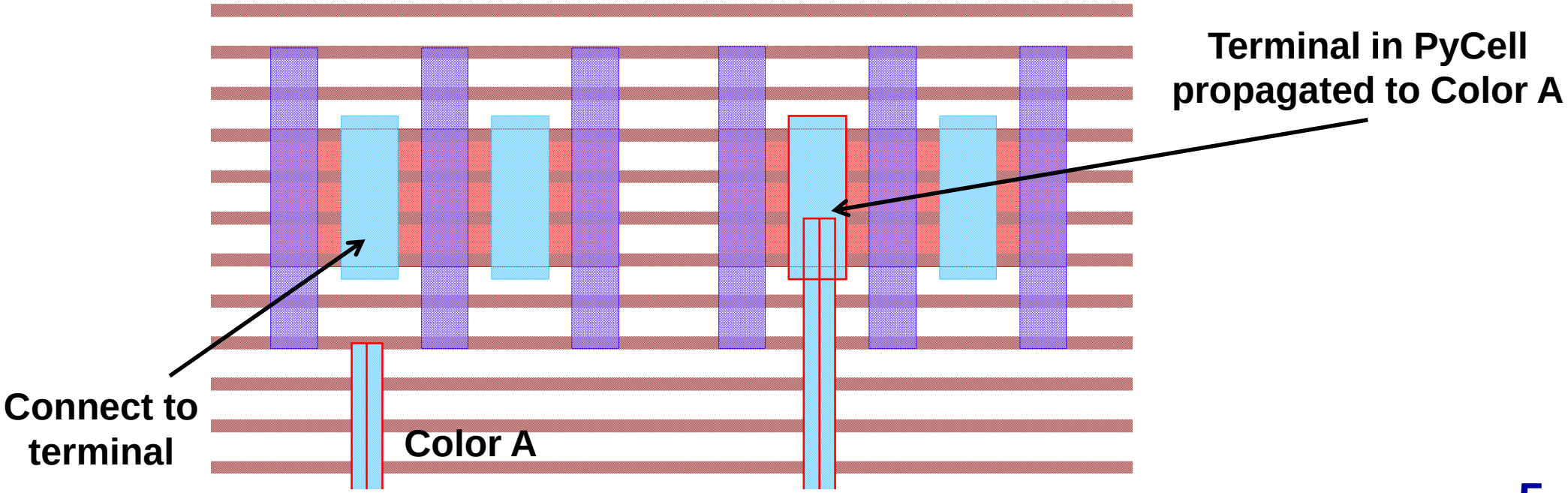


Pcell Abutment

- **Abutment**
  - Sharing of diffusion for layout compactness
- **Advantages of abutment**
  - Sharing pin shapes to create cell interconnections
  - Reduces layout area
  - Accelerated layout
  - Correct by design construction
- **Abutment function is written by Pcell author for Pcells abutment**
- **Global Preference leAutoAbutment should be ON to trigger abutment**
- **Abutment is also controlled by abutment option on Pcells**

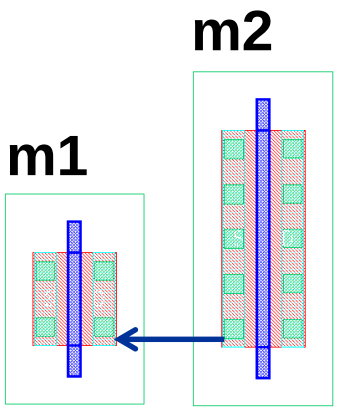
Hierarchy Connect

- Similar to abutment and triggered when the colored objects and the instances pins or custom vias shapes overlapped
- Works when leAutoHierConnect preference is on
- Uses user-defined TCL code that specifies process of connect and disconnect

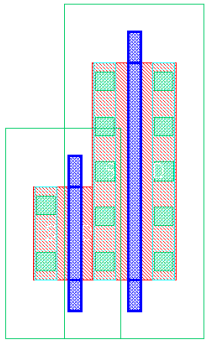


Pcell Abutment / Un-Abutment Triggers

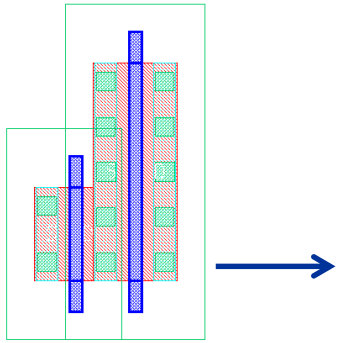
Pcells abutment is triggered when pin shapes overlap and abutment preference is on.



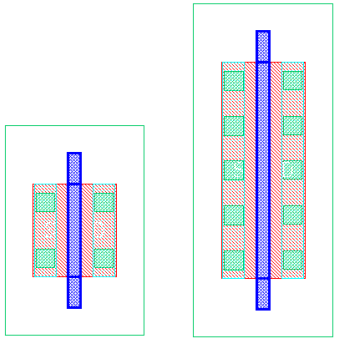
Move m2 over m1 to abut left/right pins



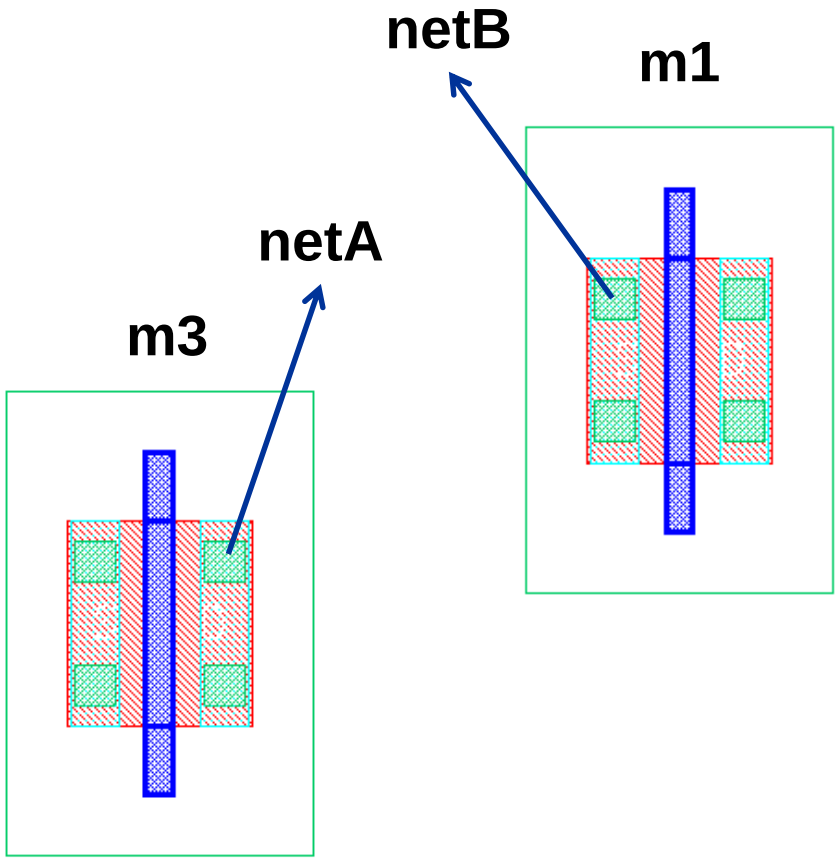
Pcells un-abutment is triggered when pin shapes no longer overlap/abut.



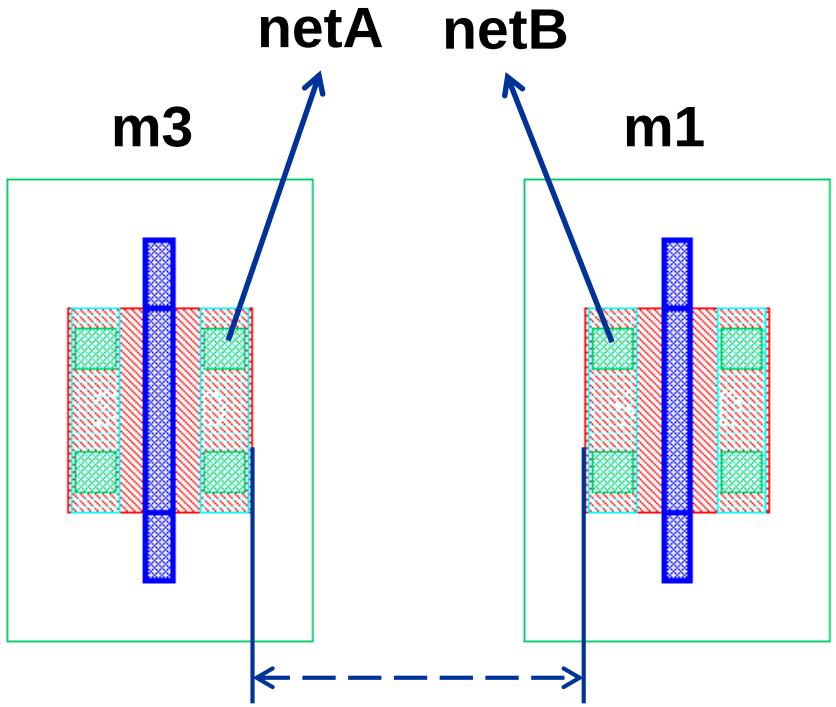
Move m2 away from m1



Pcell Abutment Rejection



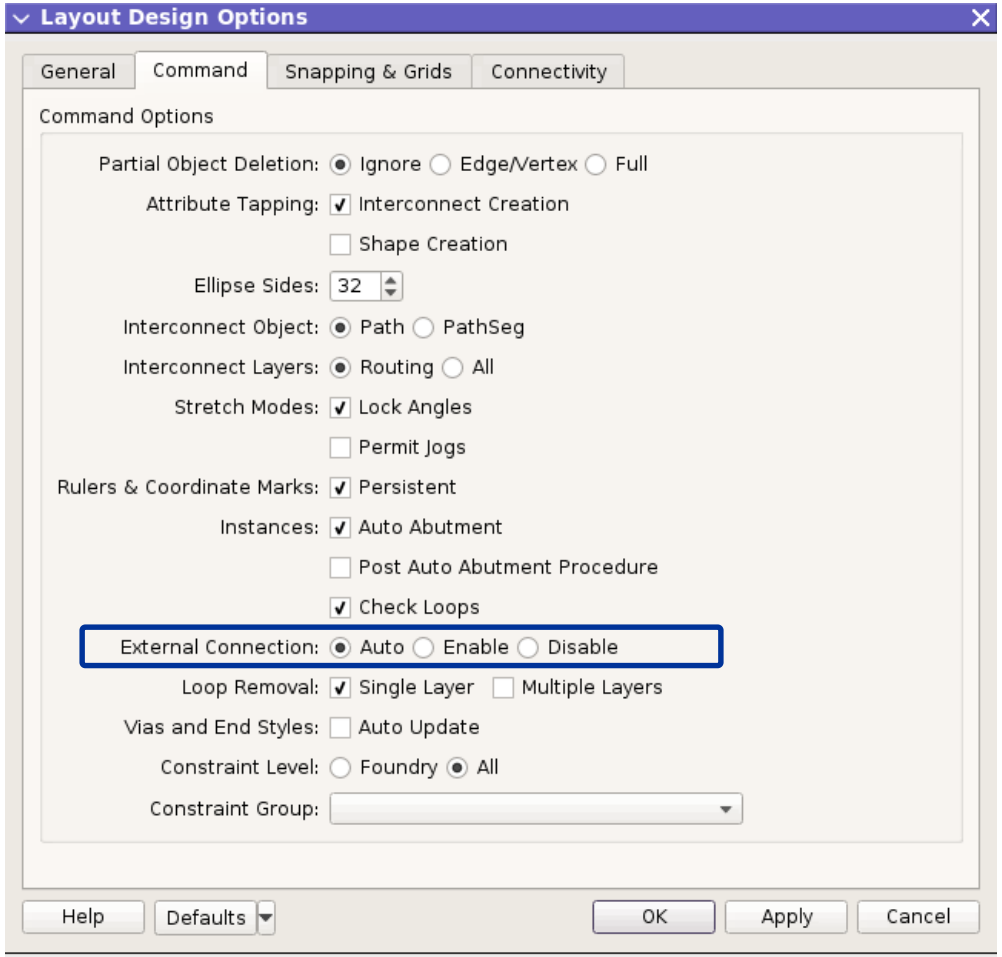
Move m2 to overlap m1 right terminal



Returned is spacing outside the terminals

External connection option for Abutment

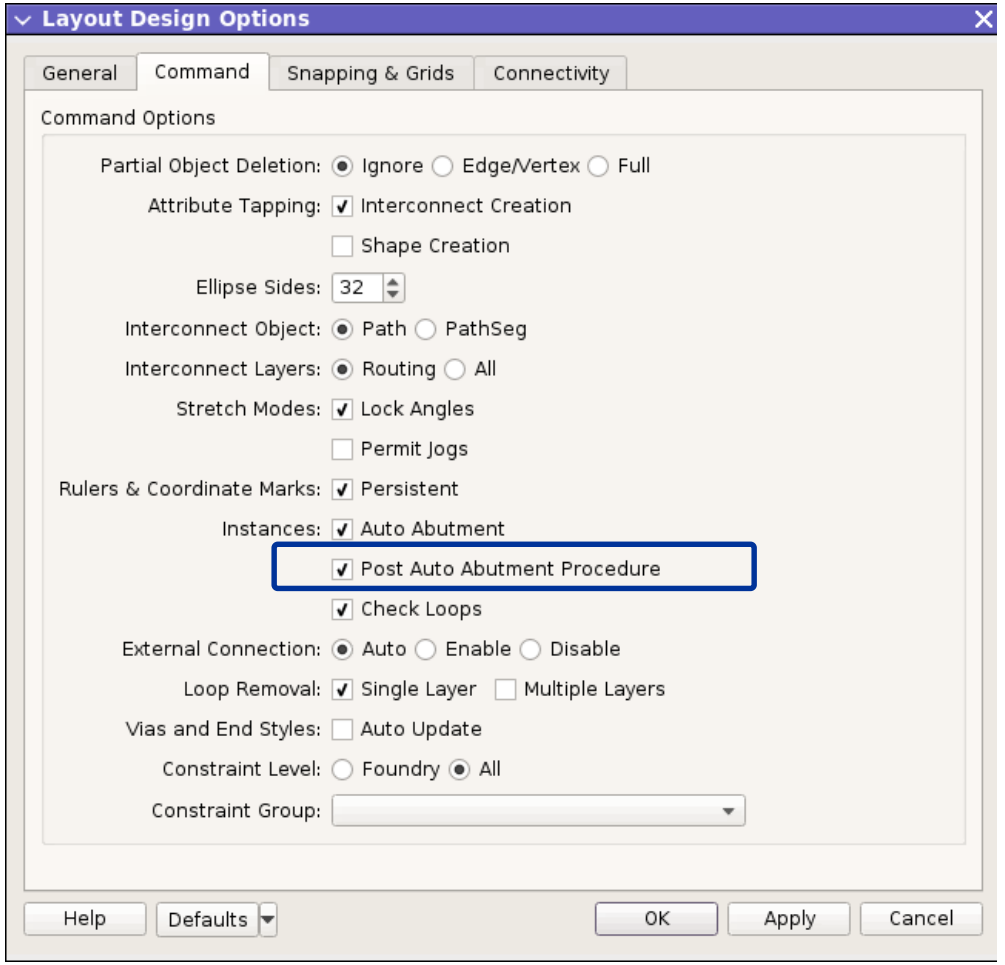
- **Option to control external connection of abutment, and support of external connection parameter/property look up**
  - Added with 3 values: Auto, Enable and Disable
    - Auto: first look for parameter/property. If parameter/property not defined, will abut as abutment proc does
    - Enable: Always keep terminals
    - Disable: Never keep terminals



Post Abutment Procedure

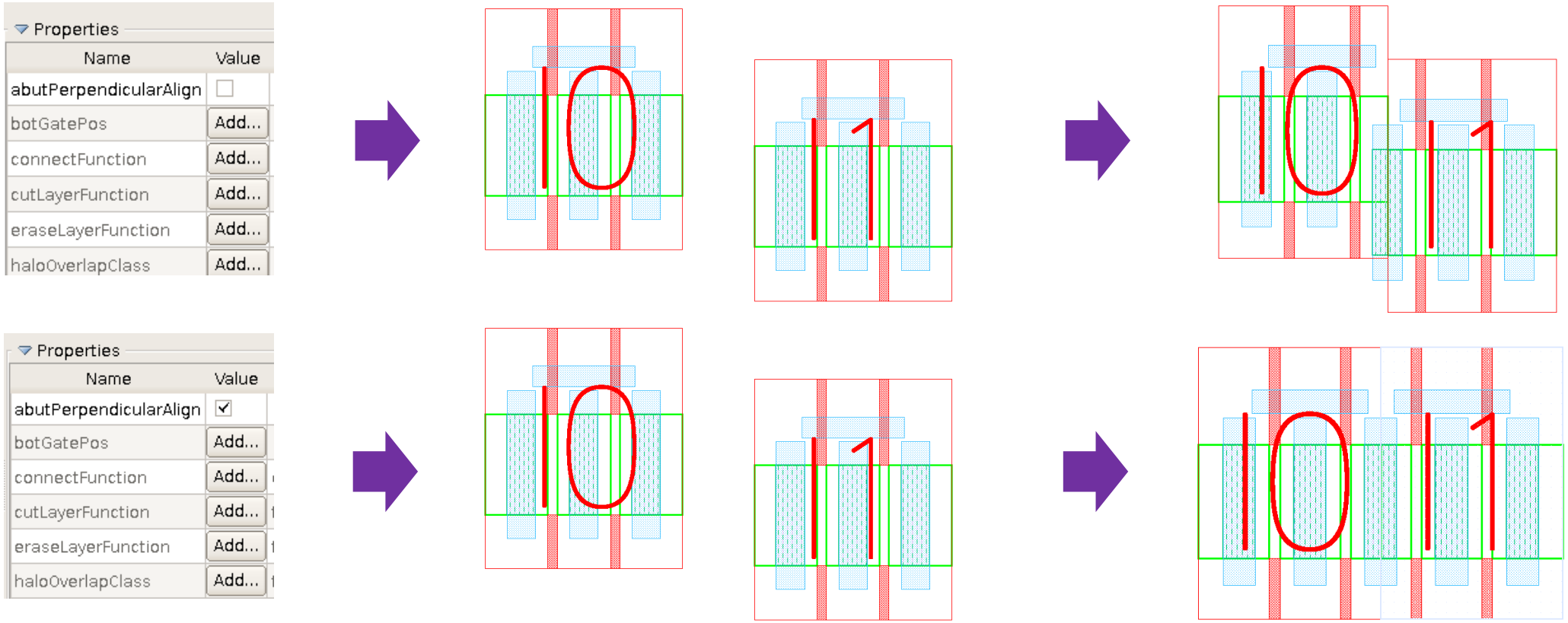
- **Allows to trigger user defined procedure after abutment performed**
  - Enabled from **Options → Design → Command**
  - Option name: Post Auto Abutment Connection
  - Preference name: *lePostAutoAbutmentConnection*
  - User defined post abutment procedure should have the following TCL signature:

    proc post_abut_proc_name {{InstId1 InstId2 ...}}
  - Required instance to have postAbutTrigger property with value “2”.



Perpendicular Align on Abutment

- **Feature allows to not align Pycell instances and Guard Rings when abut shifted vertically**
  - abutPerpendicularAlign optional Boolean property is used
  - Value must be set to false in Property Editor Properties section



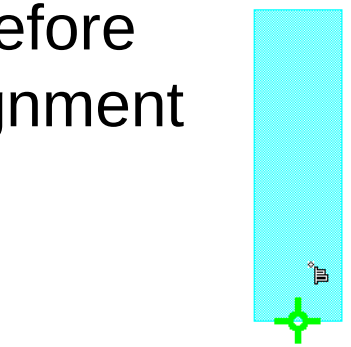
Align and Distribute Functions

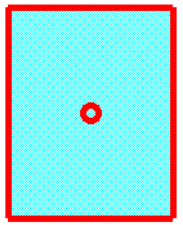
- **Invoked from Edit → Arrange→ Align or Edit → Arrange→ Distribute**
- **Alignment Function**
  - Adjust placement of an object/instance to another object/instance
  - Perform stretch function for shapes edges
- **Full/Partial selection alignment is allowed**
- **Supports**
  - Infix mode
  - Works in post selection mode

Align: Fully Selected

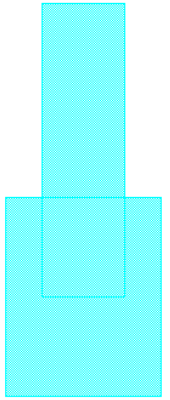
- **Alignment of fully selected objects**
  - Selection mode-Full
  - Source marked red and selected in center
  - Target marked green
  - Source center will be aligned with the center of target

Before Alignment



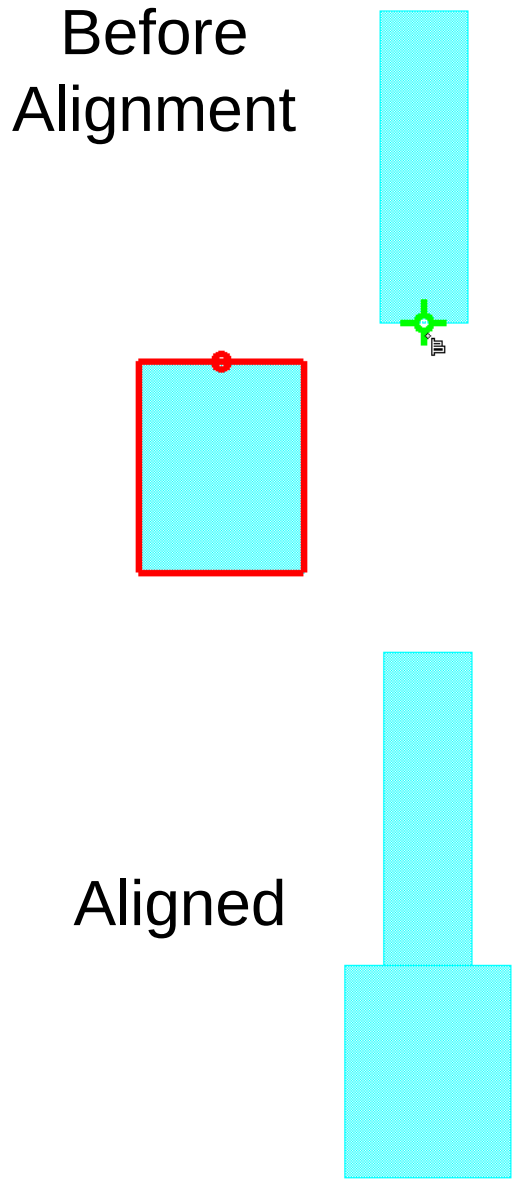


Aligned



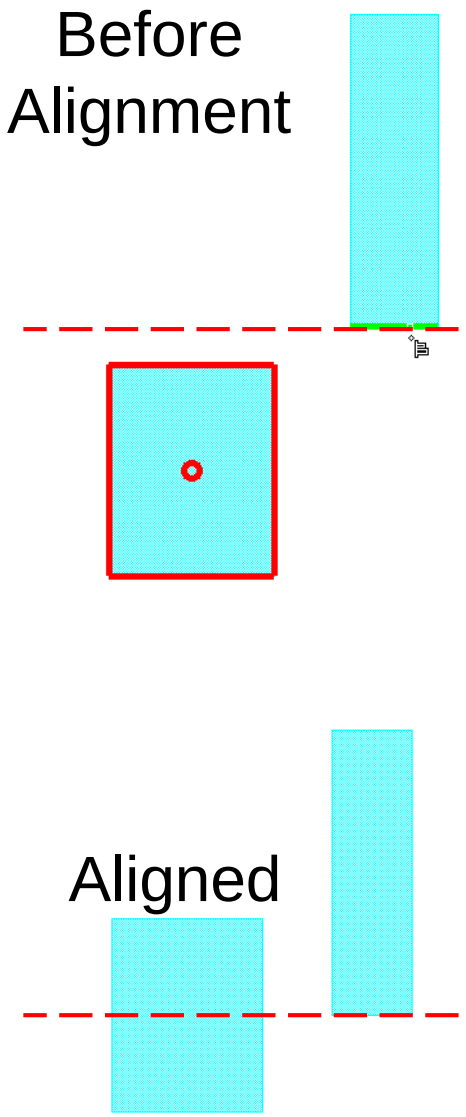
Align: Fully Selected

- **Alignment of fully selected objects**
  - Selection mode-Full
  - Source marked red and selected in top edge
  - Target edge center marked green
  - Source will be aligned with the center of the edge of target



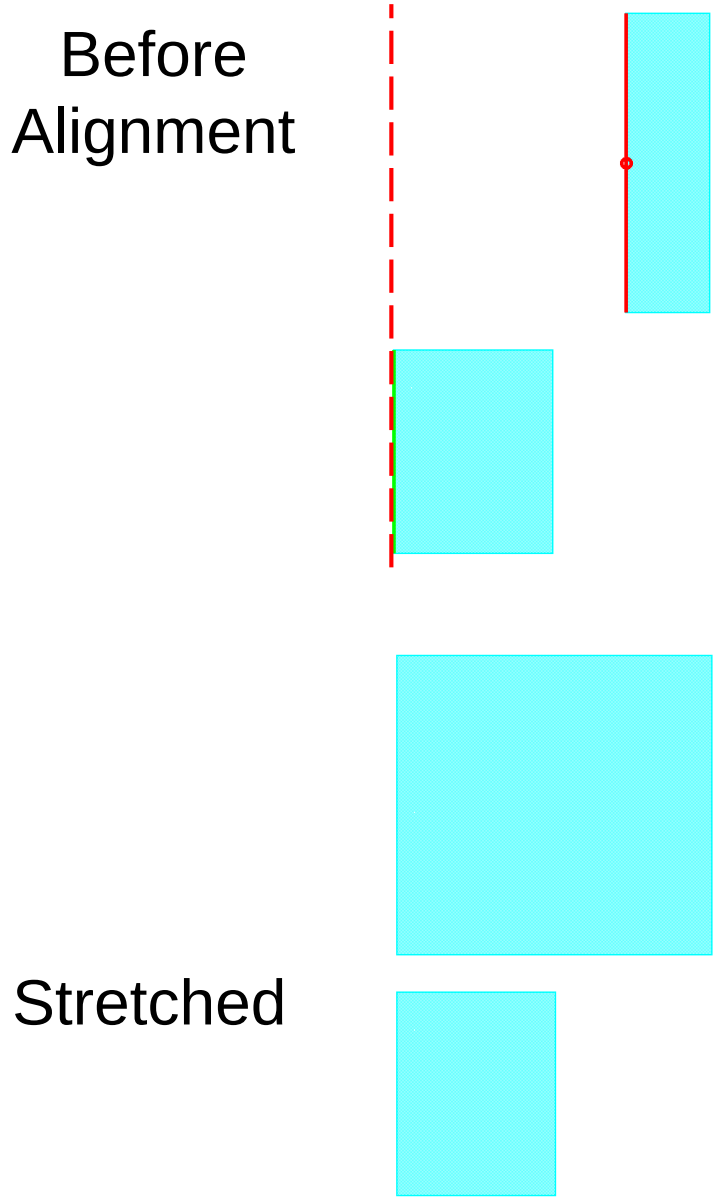
Align: Fully Selected

- **Alignment of fully selected objects**
  - Source marked red
  - Target edge marked green
  - Source center will be aligned with the line of the edge of target



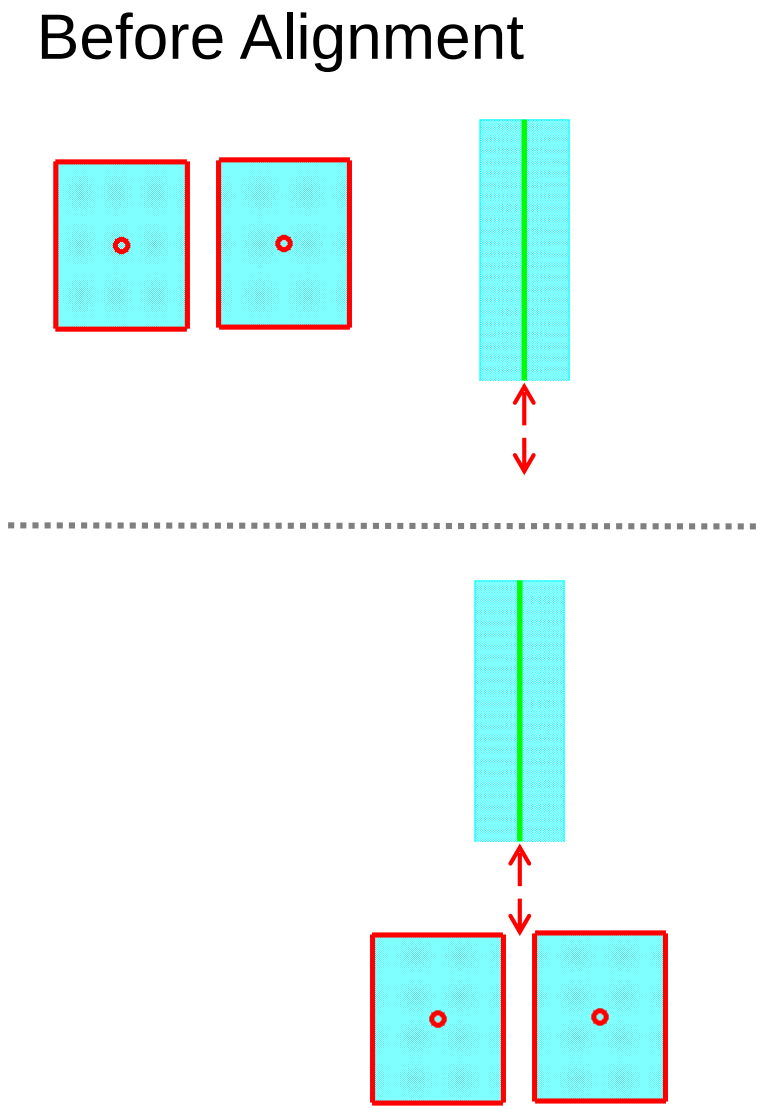
Align: Partially Selected

- **Alignment of partially selected objects**
  - Source edge marked red
  - Target edge marked green
  - Source edge will be stretched to target edge line



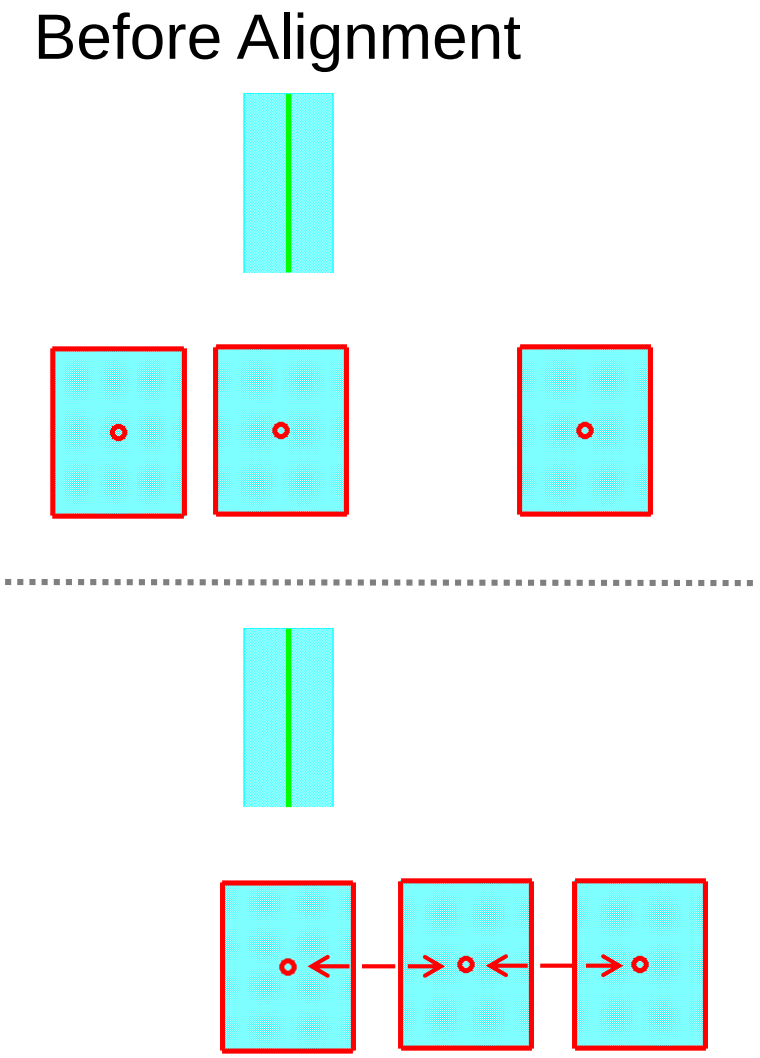
Distribute: Fully Selected

- **Alignment of several fully selected objects**
  - Source marked red
    - Hold Shift key and click to select several objects
  - Target edge marked green
  - Source center will be aligned with target line
  - Set ‘Align As Group’ ON
  - Switch to ‘Spacing’ and enter a spacing value
  - Set ‘Distribute From’ to Topmost



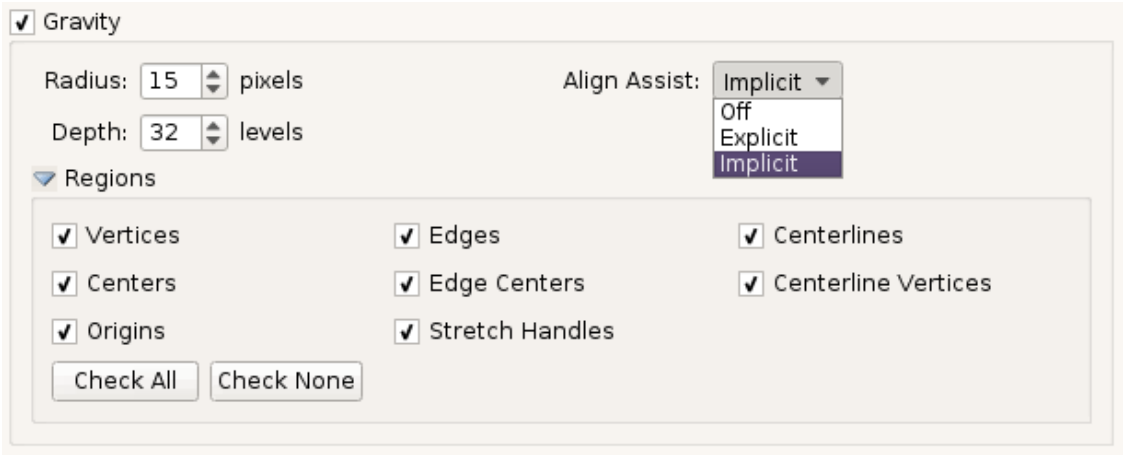
Distribute: Fully Selected

- **Alignment of several fully selected objects**
  - Source marked red
    - Hold Shift key and click to select several objects
  - Target edge marked green
  - Source center of first object will be aligned with target line
  - Set “Alignment Side” to Reference
  - Switch to ‘Pitch’ and enter a pitch value
  - Set ‘Distribute From’ to Leftmost
  - Objects are distributed with uniform pitch

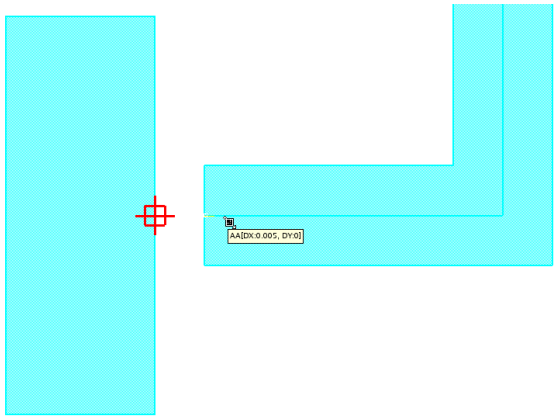


Auto Alignment Assistant

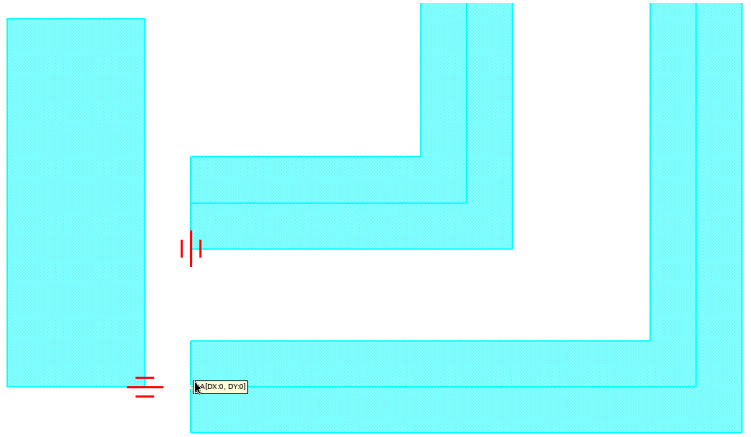
- **Options → Design**
- **Aligns during editing if Gravity is “on”**
  - Move, Stretch
- **Implicit**
  - Aligns cursor to edges



Single Align

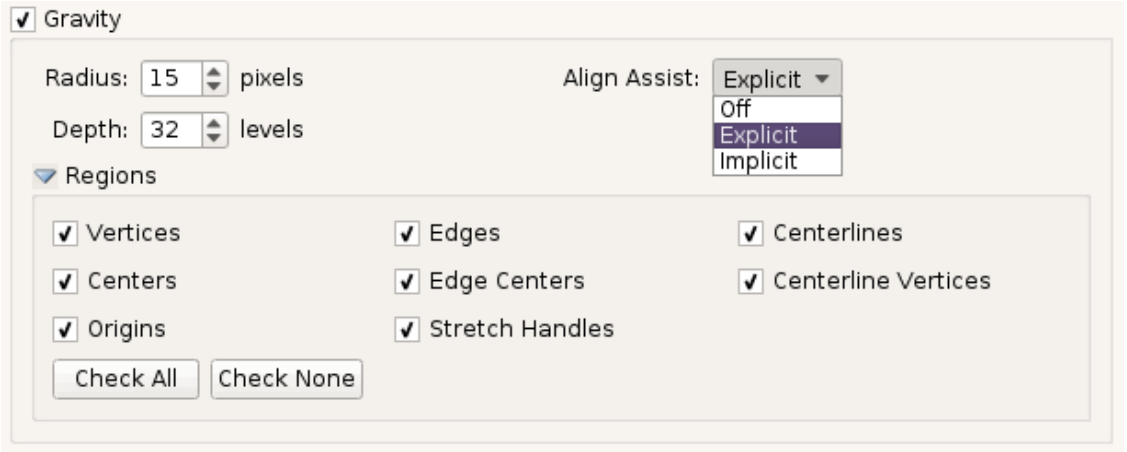


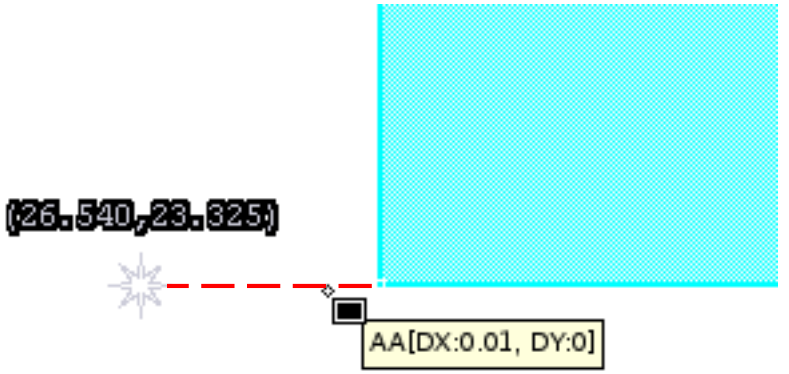
Multi Aligns



Auto Alignment Assistant

- **Options → Design**
- **Aligns during editing if Gravity is “on”**
  - Move, Stretch
- **Implicit**
  - Aligns cursor to edges
- **Explicit**
  - Aligns cursor to the center of coordinate markers
- **Tracks take precedence for paths**





Test For Understanding

- **Abutment adjusts placement of one instance with respect to another instance: True / False**

Lab 1: Layout Advanced Editing Functions

30 minutes

- **Goals:**
  - Build a mask layout of a differential amplifier by using:
    - pcells
    - Instance creation
    - Manual placement
    - Routing functions