SYNOPSYS®
Predictable Success

IC Compiler 2010.03 Incremental Training

Relative Placement

Agenda

1. Relative placement GUI enhancement
2. Physical-only cell handling
3. Placement control for relative placement groups
4. Convergence of relative placement
5. Support plan groups in the relative placement flow

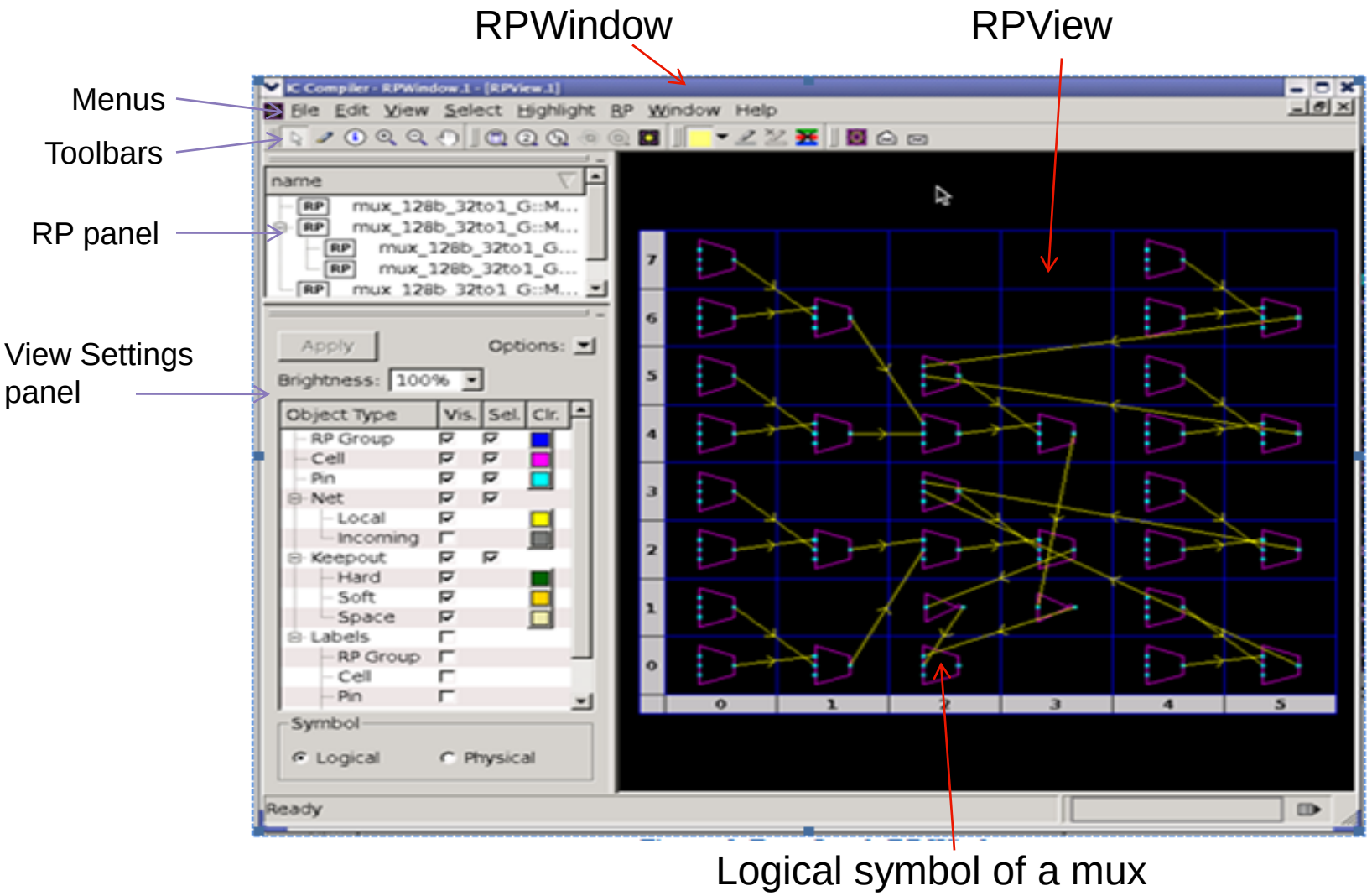
Relative Placement GUI Enhancement:

Introduction

- Overview
  - A new relative placement (RP) grid view (*RPView*) inside the new RP window *(RPWindow)* enables RP users to view and analyze cells inside the RP group before placement
- UI
  - No change
- User Benefit
  - Provides upfront visualization and connectivity analysis reducing iterations and enabling quick turnaround time

Relative Placement GUI Enhancement:

Relative Placement Viewer in RP Window



Relative Placement GUI Enhancement:

Features in RPWindow

- Features in *RPWindow*
  - A centralized area for defining, modifying, and analyzing relative placement groups
  - A RP panel to select any relative placement group in the design
  - Enables you to examine the contents of a relative placement group in the *RPView*
  - Relative Placement View Tool toolbar features for the active relative placement group

Relative Placement GUI Enhancement:

Features in RPView

- Features in *RPView*
  - Relative placement hierarchy browser
  - Logical and physical symbol views of cells in the grid view
  - Net connectivity in grid view
  - Zoom-in and zoom-out of hierarchical relative placement groups
  - Cross-selection between all views
  - Expand and collapse of hierarchical relative placement groups

Relative Placement GUI Enhancement:
Flow

- Flow Recommendation
  1. To open *RPWindow*
     - From the Layout window: Placement > New RP Window
     - From a top window: Window > New RP Window
  2. To open *RPView* for the selected relative placement group
     - From the *RPWindow*: View > New RP View of Selected RP
  3. To open relative placement hierarchy browser
     - From the *RPWindow*: View > New RP Hierarchy View
     - From the Layout window: Placement > New RP Hierarchy View

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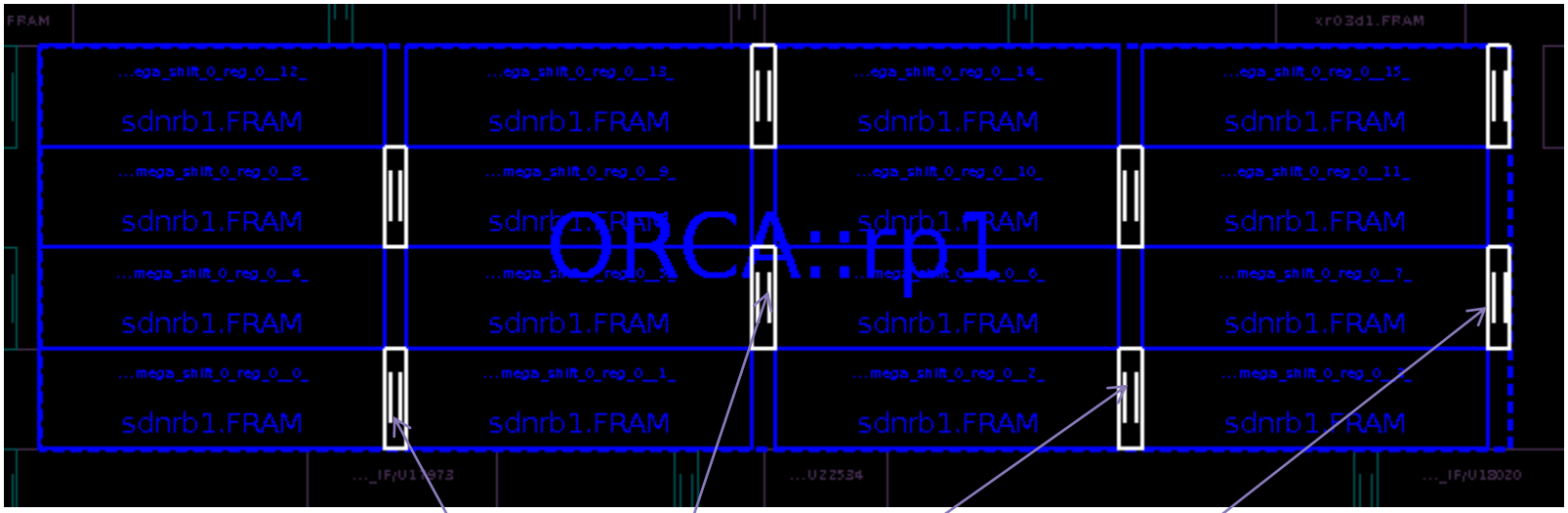
Physical-Only Cell Handling:

Physical-Only Cell as Element of RP Group

- Overview
  - Enables physical-only cells as elements of relative placement groups
- UI
  - A new **`-physical_only`** option is added to the **`rp_group_references`** command
- User Benefit
  - Allows manual addition of physical-only cells into relative placement groups

Physical-Only Cell Handling:

Physical-Only Cell as Element of RP Group



Tap cells as elements of a relative placement group

Physical-Only Cell Handling:

Physical-Only Cell as Element of RP Group

Flow recommendation: sample script

```
...
...
### remove fixed attribute for all tap cells ###
set_object_fixed_edit [get_cells -all {tapfiller!tap_!tap!3450 \
tapfiller!tap_!tap!3451 tapfiller!tap_!tap!3502 \
tapfiller!tap_!tap!3503 tapfiller!tap_!tap!3552 \
tapfiller!tap_!tap!3553 tapfiller!tap_!tap!3604 \
tapfiller!tap_!tap!3605}] false

### create the RP group and add tap cells to it ###
create_rp_group rp1 -design ORCA -columns 8 -rows 4
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3450 -column 1 -row 0
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3451 -column 5 -row 0
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3502 -column 3 -row 1
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3503 -column 7 -row 1
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3552 -column 1 -row 2
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3553 -column 5 -row 2
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3604 -column 3 -row 3
add_to_rp_group ORCA::rp1 -leaf tapfiller!tap_!tap!3605 -column 7 -row 3

### add other rp cells ###
add_to_rp_group ORCA::rp1 -leaf
I_ORCA_TOP/I_SDRAM_IF/mega_shift_0_reg_0__0_ -column 0 -row 0
...
...

set_rp_group_options -x_offset 300.00 -y_offset 200.00 \
[get_rp_groups -top]

set_dont_touch [rp_group_references] true

create_placement
legalize_placement
```

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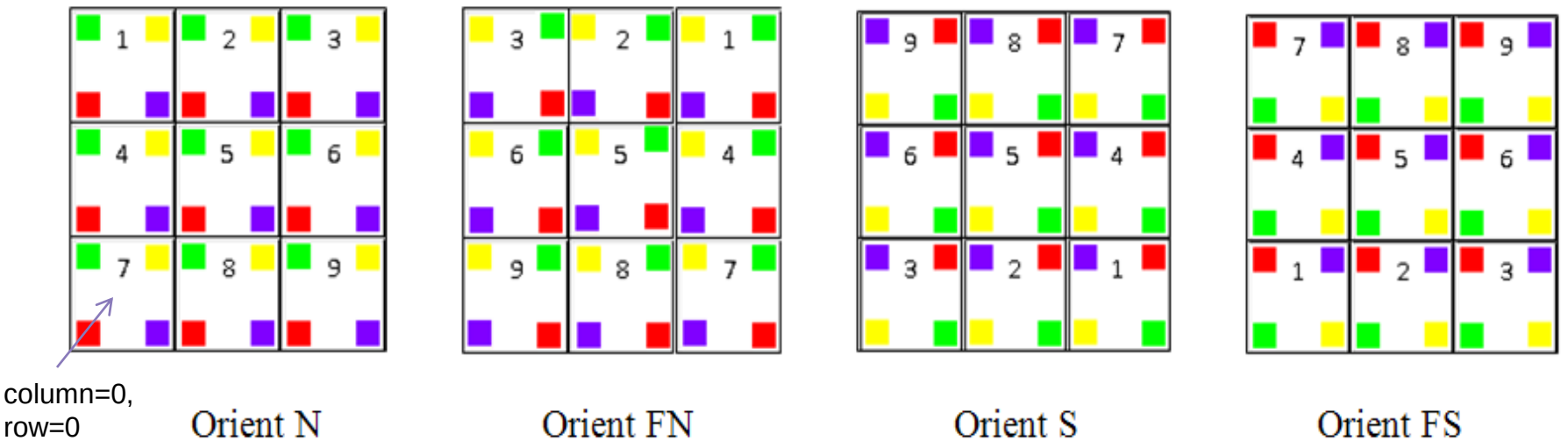
Placement Control for Relative Placement Groups:

Orientation Support for Relative Placement Groups

- Overview
  - All N, FN, S, and FS orientations are supported with their RP cell's legal orientations also flipped
  - The cell orientations are changed only if they are legal at the site rows corresponding to the placer-given locations



Placement Control for Relative Placement Groups :

Orientation Support for Relative Placement Groups

- UI
  - Add **-group_orient** option to the following commands:
    - **create_rp_group, set_rp_group_options, report_rp_group_options** and **write_rp_groups**
    - Values for **-group_orient** are **default | N | FN | S | FS**
      - Default: IC Compiler chooses a suitable orientation for that RP group
- User Benefit
  - Better user control of placement for relative placement groups
- Flow Recommendation
  1. Load in design and setup
  2. Read in relative placement constraints **(create_rp_group, add_to_rp_group)**
  3. Run **set_rp_group_options -group_orient FN \ [all_rp_groups]**
  4. Run **create_placement**
  5. Run **legalize_placement**

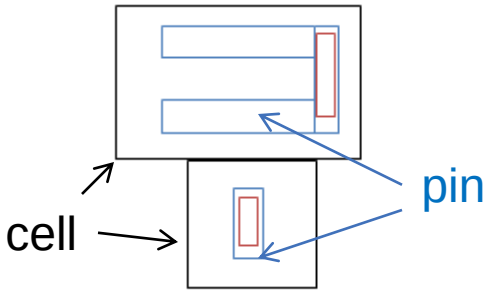
Placement Control for Relative Placement Groups:

Automatic Orientation Optimization for RP Cells

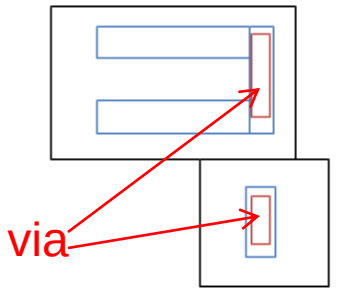
- UI
  - Add **`-cell_orient_opt`** to the following commands:
    - **`create_rp_group`, `set_rp_group_options`, `remove_rp_group_options`,`report_rp_group_options` and `write_rp_groups`**
    - Default value is **`false`**
- User Benefit
  - Better wire length through automatic orientation optimization of RP cells during **`psynopt`** and **`place_opt`**
- Flow recommendation
  1. Load in design and setup
  2. Read in RP constraints (**`create_rp_group`**, **`add_to_rp_group`**)
  3. Run **`set_rp_group_options -cell_orient_opt \ [all_rp_groups]`**
  4. Run **`place_opt`**

Placement Control for Relative Placement Groups:
Via Region Alignment

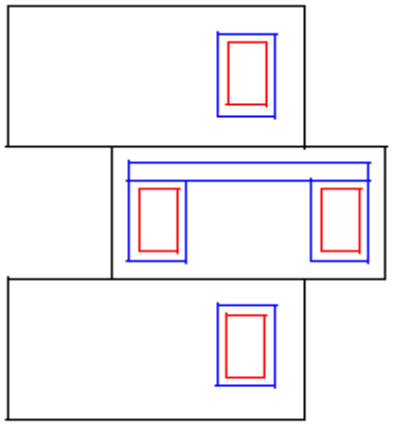
- Overview
  - Align pin column based on via region alignment
- UI
  - No change
- User Benefit
  - Makes straight routes easier for the router
  - Minimizes the column width of a relative placement group when a pin has more than one via region



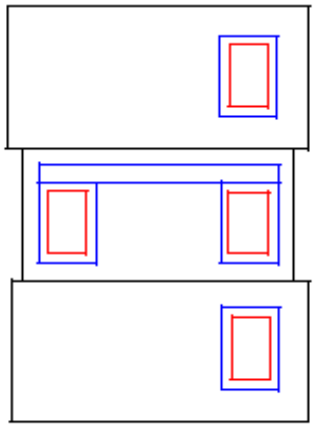
Pin alignment



Via region alignment



Aligned on the pin center



Aligned on the right via region

Placement Control for Relative Placement Groups:
Via Region Alignment

- Flow Recommendation
  1. Load in design and setup
  2. Run `create_rp_group rp -design top -columns 1 -rows 2`
  3. Run `add_to_rp_group top::rp -leaf rp_cell1 -column 0 \ -row 0`
  4. Run `add_to_rp_group top::rp -leaf rp_cell2 -column 0 \ -row 1`
  5. Run `set_rp_group_options -alignment bottom-pin \ [get_rp_group rp] -pin_align_name out -group_orient N`
  6. Run `set_attribute rp_cell1 rp_orientation {N FS}`
  7. Run `set_attribute rp_cell2 rp_orientation {FN S}`
  8. Run **`create_placement`**
  9. Run **`legalize_placement`**

Placement Control for Relative Placement Groups:
Buffering Controls for RP Groups

- Overview
  - Allow or disallow buffer insertion within RP groups and RP nets during **`psynopt`** and **`route_opt`** on a per group basis
- UI
  - Two options are added to **`create_rp_group`**, **`set_rp_group_options`**, **`write_rp_groups`**, **`remove_rp_group_options`**, and **`report_rp_group_options`**
    - **`-auto_blockage`** disallows buffer insertion within RP groups during **`psynopt`** and **`route_opt`**; default is **`false`**
    - **`-disable_buffering`** disallows buffer insertion for RP nets during **`psynopt`** and **`route_opt`**; default is **`false`**

Placement Control for Relative Placement Groups:
Buffering Controls for RP Groups

- User Benefit
  - Prevents detour of RP nets
  - Avoids buffer insertion inside RP region to reduce congestion and improve QoR
- Flow Recommendation
  1. Load in design and setup
  2. Read in RP constraints
  3. Run `set_rp_group_options -auto_blockage \ -disable_buffering [get_rp_group *]`
  4. Run `place_opt`

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Convergence of Relative Placement:
clock_opt Size-Only Flow

- Overview
  - Relative placement structures are maintained during the **`psynopt`** stage in the **`clock_opt -size_only`** flow
- UI
  - No change
- User Benefit
  - Reduce relative placement structure breakage

Convergence of Relative Placement:

clock_opt Size-Only Flow

- Flow Recommendation
  1. Load in design and setup
  2. Read in RP constraints
  3. Run `set_rp_group_options \ -cts_option size_only \ [all_rp_groups]`
  4. Run `clock_opt -only_psyn`
  5. Run `check_rp_groups -all`

Convergence of Relative Placement:

Movement of RP Groups During Post-CTS Legalization

- Overview
  - When CTS is done for a design containing relative placement groups, further legalization to relative placement groups is restricted to a small displacement while preserving the relative placement structure
- UI
  - No change
- User Benefit
  - Improve quality of relative placement group placement

Convergence of Relative Placement:

Movement of RP Groups During Post-CTS Legalization

- Flow Recommendation
  1. Load in design and setup
  2. Read in RP constraints
  3. Run `set_rp_group_options \ -cts_option size_only \ [all_rp_group]`
  4. Run `clock_opt -only_cts`
  5. Run `psynopt`

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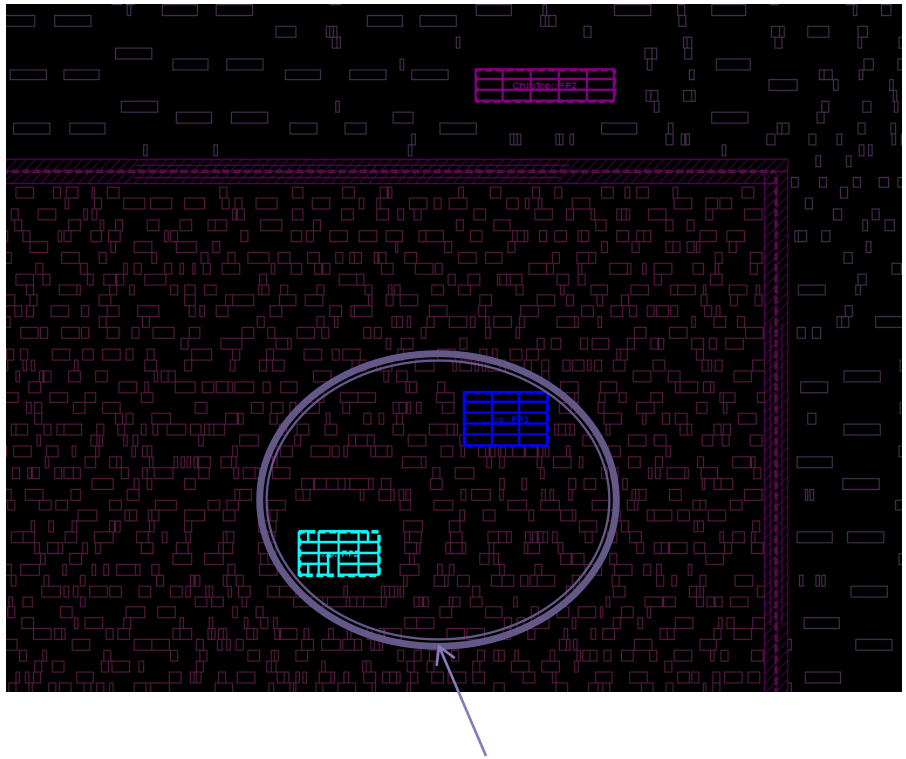
Support Plan Groups in RP Flow:
Introduction

- Overview
  - Enable placement of RP groups inside plan groups in the design planning flow
- UI
  - No change
- User Benefit
  - Correct (plan-group-aware) placement of relative placement groups inside plan groups

Support Plan Groups in RP Flow:
Flow

- Flow Recommendation

1. Load in design and setup
2. Define plan groups
3. Read in RP constraints
4. Run `create_fp_placement\ -no_legalize`
5. Run `legalize_placement`



2 relative placement groups placed inside a plan group

Summary of Relative Placement Updates

- GUI Enhancements (A new relative placement (RP) grid view (*RPView*) and the new RP window *(RPWindow)*) enables easy analysis of RP cells
- You can now place physical only cells as elements of relative placement groups
- Enhanced support for the orientation of Relative Placement cells and groups as well as support for via region alignment
- Relative placement structures are maintained during the **`psynopt`** stage in the **`clock_opt -size_only`** flow
- Placement of RP groups inside plan groups in the design planning flow is now supported

Predictable Success