SYNOPSYS®
Predictable Success

IC Compiler 2010.03 Incremental Training

Route Editing

Agenda

1. Editor DRC
2. Edit-in-Place

Editor DRC

- Overview
  - Provides interactive DRC for various route editing operations
  - Provides interactive command checking for DRC violations on specified nets
  - Editor DRC violations are generated during route editing operations so they are not lost when the operation is committed
  - Incremental updates to the editor DRC errors

Editor DRC

- GUI
  - Edit>Editor DRC>Run DRC
- UI

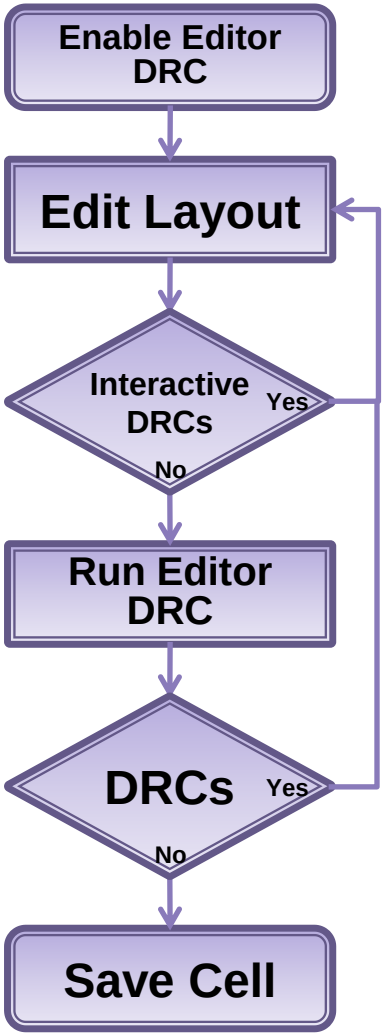
```
gui_check_drc_errors -of_objects objects
   [-limit_area {llx lly urx ury}]
   [ -filter_layers layer_list ]
   [-honor_ndr]
   [-type check_types]
   [-filter_same_net]
   [-max_errors num]
   [-max_shapes num]
   [-report_for_of_objects_only]
```

Editor DRC

- User Benefit
  - Interactive DRC violations displayed in real time
  - Avoid DRC errors during route editing
  - Rerun DRC after committing route editing operation
  - Can find, record, and debug DRC errors
- Flow Recommendation
  - Prerequisites for using feature
    - You must explicitly set DRC On to enable interactive design rule checking during route editing
  - Feature can be used preroute and postroute
- License Requirement
  - Galaxy-PNR (IC Compiler, IC Compiler-XP)

Editor DRC

Flow



- Turn on Editor DRC (Edit > Editor DRC > Enable DRC)
- Choose route editing tool
  - Advanced Route Tool
  - Stretch Wire Tool
  - Window Stretch Tool
- Edit layout
- Fix interactive DRC violations
  - DRCs persistent during session
- Run Editor DRC (Edit > Editor DRC > Run DRC)
  - Selected Nets
  - Incremental DRC violations saved to error cell

Editor DRC

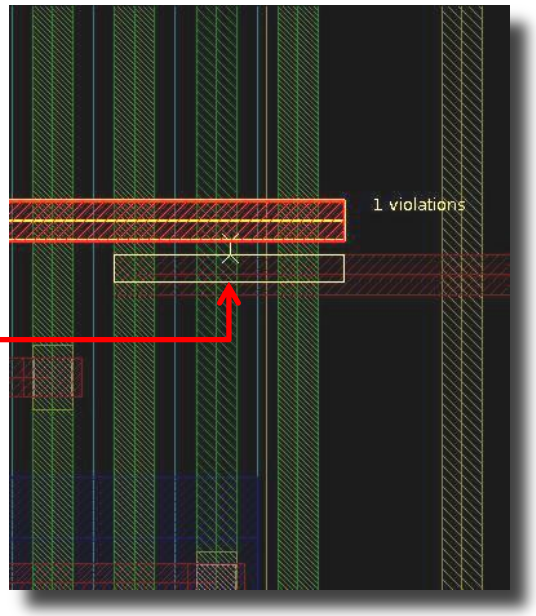
Supported Operations

- DRC with real-time feedback
  - Advanced Route Tool
  - Stretch Wire Tool
  - Window Stretch Tool
- DRC check upon commit with no real-time feedback
  - Undo and redo
  - Delete
  - Create (route, shape, via, terminal)
  - Move and resize
  - Split, cut, cut object shape by fixed object
  - Move pins on edge
  - Copy object
  - Add to object
  - Set object shape
  - Reshape object
  - Rotate, align, distribute, spread and expand objects
  - Area push
  - Spread wires

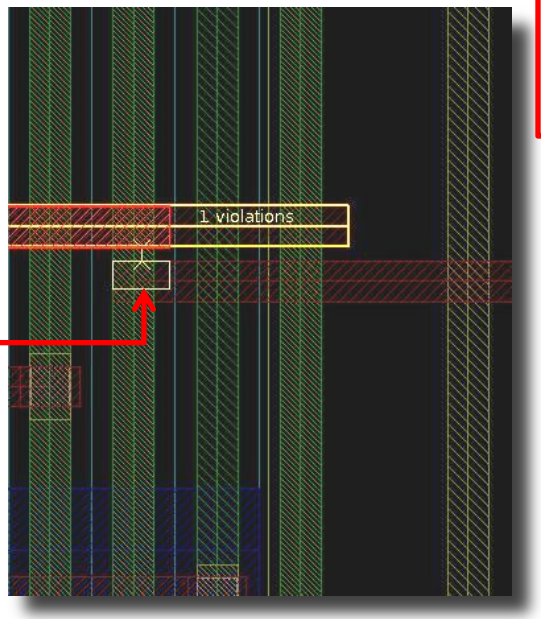
Editor DRC

Interactive DRC Layout View Example

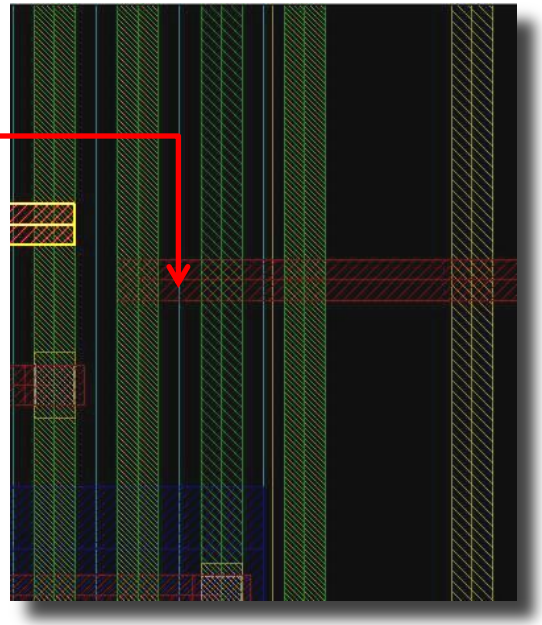
Interactive DRC detected
Figure 1



Interactive DRC live update
Figure 2



Commit shows DRC avoided
Figure 3

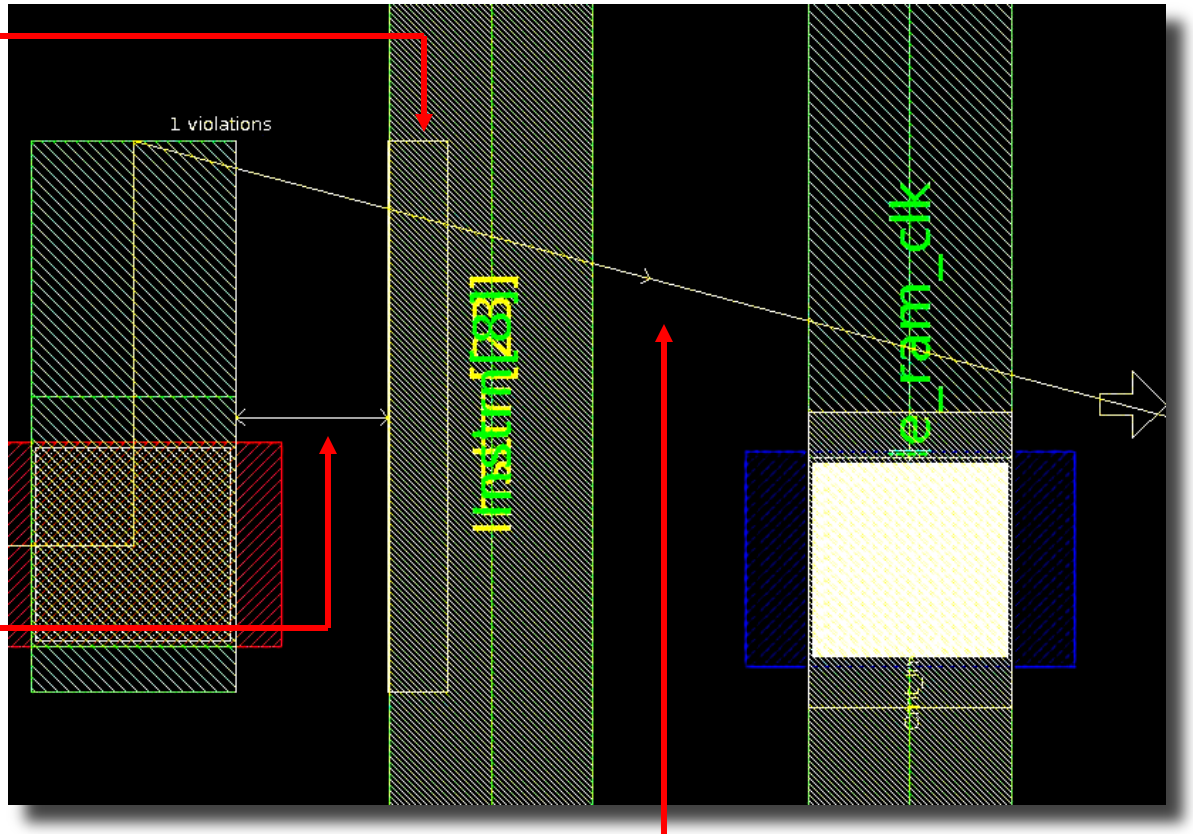


Stretch Wire Tool – Stretch net right to left

Editor DRC

Real-Time Feedback of DRC Violations

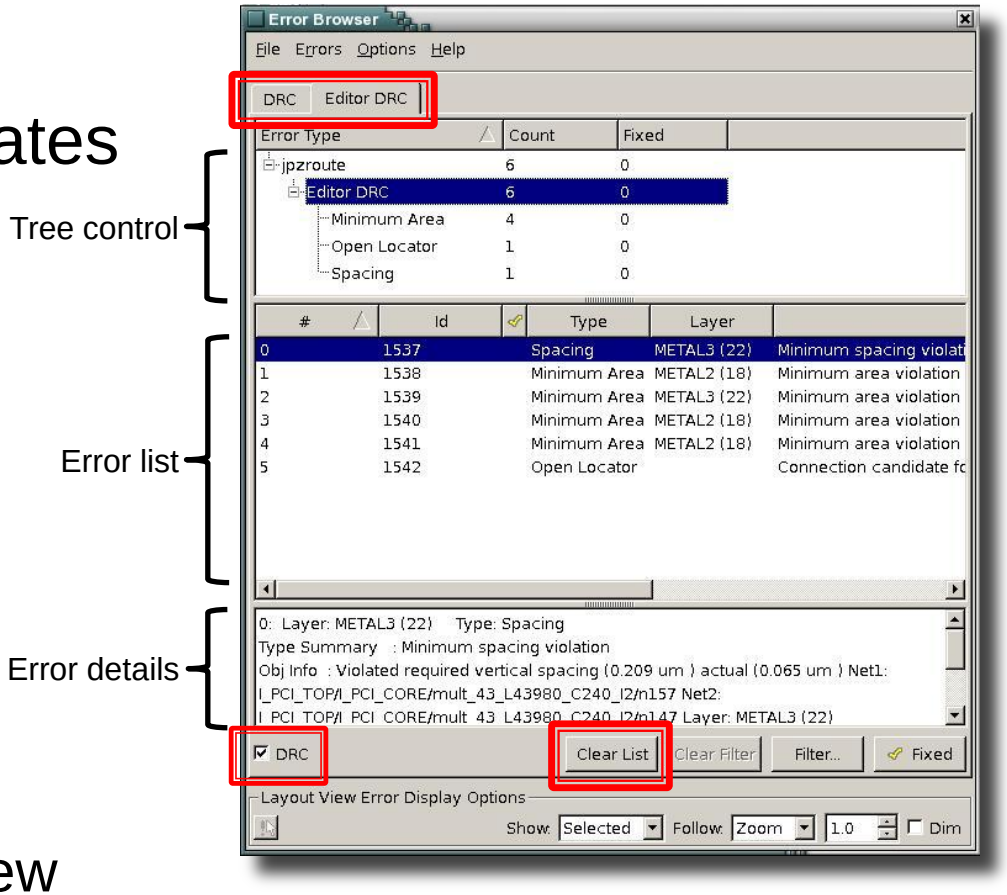
- Violation box
  - Marker Box Empty
    - Spacing required
  - Marker Box X
    - Short detected
- Spacing violation arrow
- Advanced Route Tool flyline



Editor DRC

Error Browser Enhancements

- Tabbed view differentiates
  - Batch verification
  - Interactive verification
- Additional control
  - Editor DRC mode
  - Clear error objects
- Incremental update
  - Updates to the error view reflected in both error view and layout view



Editor DRC

New Error Type and Error View

- Error browser view type added
  - Editor DRC
- Error view named with _edrc suffix
  - i.e. <*design_cell_name*>_edrc
- Interactive DRC errors saved to the error view
  - Associated with the current design
- Progressive update of shape causing violation
  - Updates Editor DRC error view
- Fix of the shape causing violation
  - Error removed automatically from Editor DRC error view

Editor DRC

Error Type and Error View (2)

- Incremental updates apply only to the editor DRC error view
  - No incremental updates to error views produced by
    - Detail router
    - **`verify_drc`**
    - **`verify_lvs`**
    - **`gui_check_drc_error`**

- Editor DRC error view persistence
  - Error view cleared and removed when DRC mode disabled
  - Errors of disabled type removed from error view when specific rule check disabled
  - File > Save As in Error Browser dialog box saves the error view as <*design_cell_name*>.sedrc
    - Saving the error cell causes it to no longer be incrementally updated

Editor DRC

- Limitations
  - Redistribution layer routing is not supported for Editor DRC

- Further Information
  - Man pages available
  - "Finding and Fixing Editor DRC Violations" section in Appendix A of the *IC Compiler Implementation User Guide*, version D-2010.03

Agenda

1. Editor DRC
2. Edit-in-Place

Edit-in-Place

- Overview
  - Provides cross hierarchical editing support
    - Edit any child cell in the context of the current design
  - Supports different cell views
    - CEL, FRAM (cannot save), ILM (cannot save)
- Benefit
  - Allows you to perform operations on the open subcell
  - You can run any IC Compiler Tcl command or corresponding GUI command, including but not limited to floorplanning, editing, routing, clock tree synthesis, etc.
  - Ability to log and replay edit-in-place operations
- Flow recommendation
  - Prerequisites in using feature
    - You must first select one and only one cell instance
  - Feature can be used pre- and post-route

Edit-in-Place

- GUI
  - Edit>In Place>Push
  - Edit>In Place>Pop
  - Edit>In Place>Pop to Top
- UI

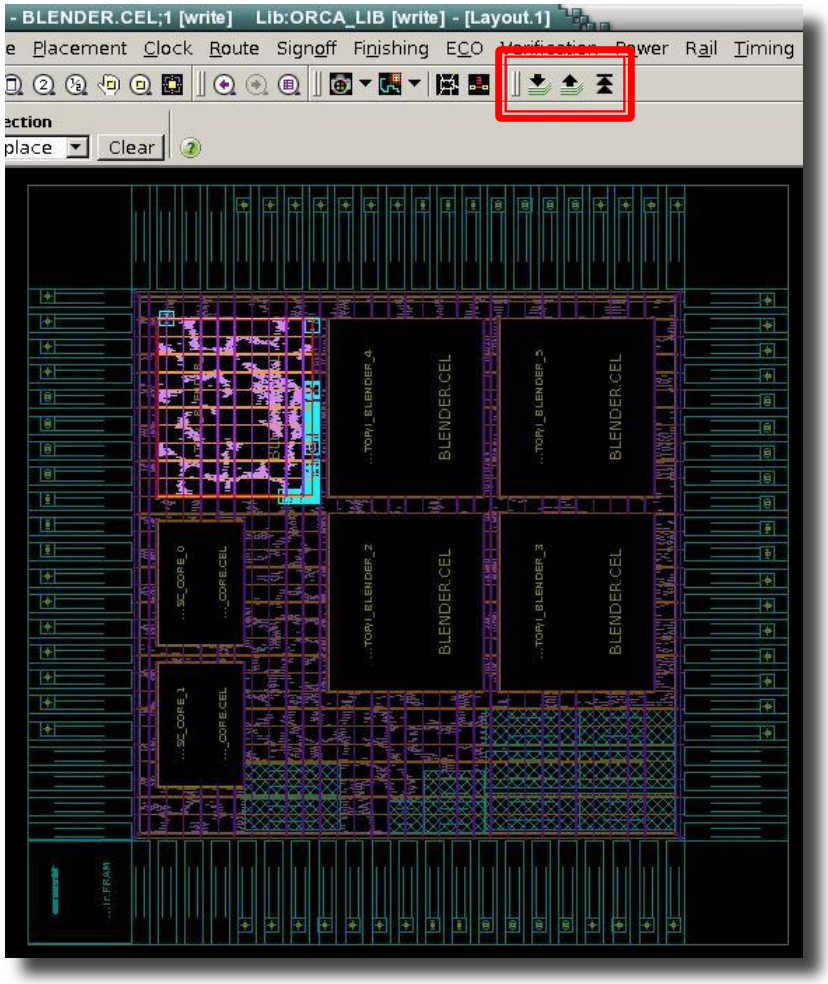
```
change_working_design
  -push collection_or_instance_name

change_working_design -pop

change_working_design -pop -level 0
```

Edit-in-Place

Mode

- Edit-in-Place mode
  - The state of layout window when pushed down in the hierarchy
- Edit-in-Place toolbar
  - Toolbar inactive until a hierarchical cell is selected

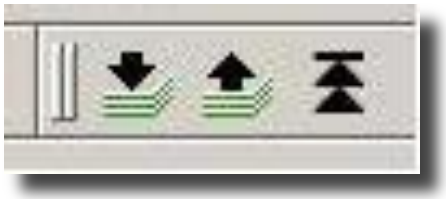
  - Toolbar shown active



New Features in D-2010.03

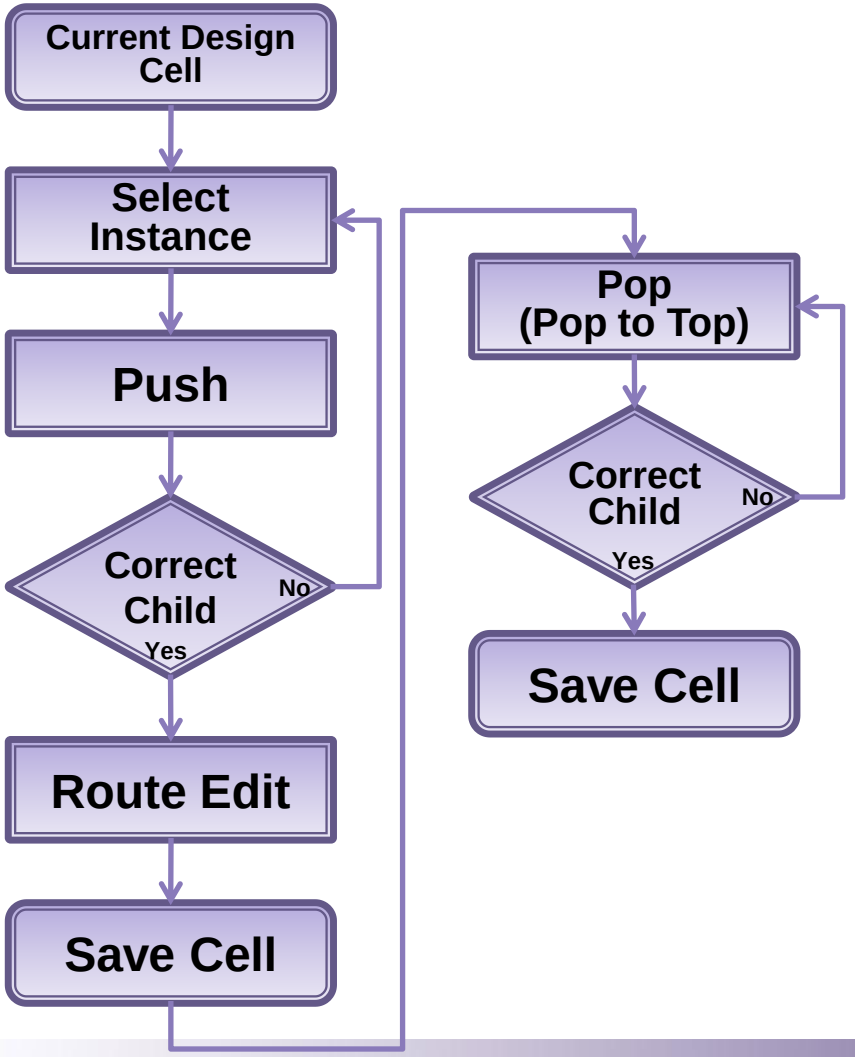
Edit-in-Place (Operations)

- Edit-in-Place Operations
  - Push
    - Edits any child in the context of the current design cell
  - Pop
    - Quits current edit-in-place operation and switches the layout environment to the parent cell one level higher
    - Pop operation keeps previous edit cell open
      - Allows pushing back to that cell faster.
    - It is your responsibility to save the cell
      - If you forget, the GUI prompts you to save the changes when you exit the application
      - By default, save is hierarchical
  - Pop to Top
    - Quits all edit-in-place operations and switches the layout window environment back to the top design



Edit-in-Place

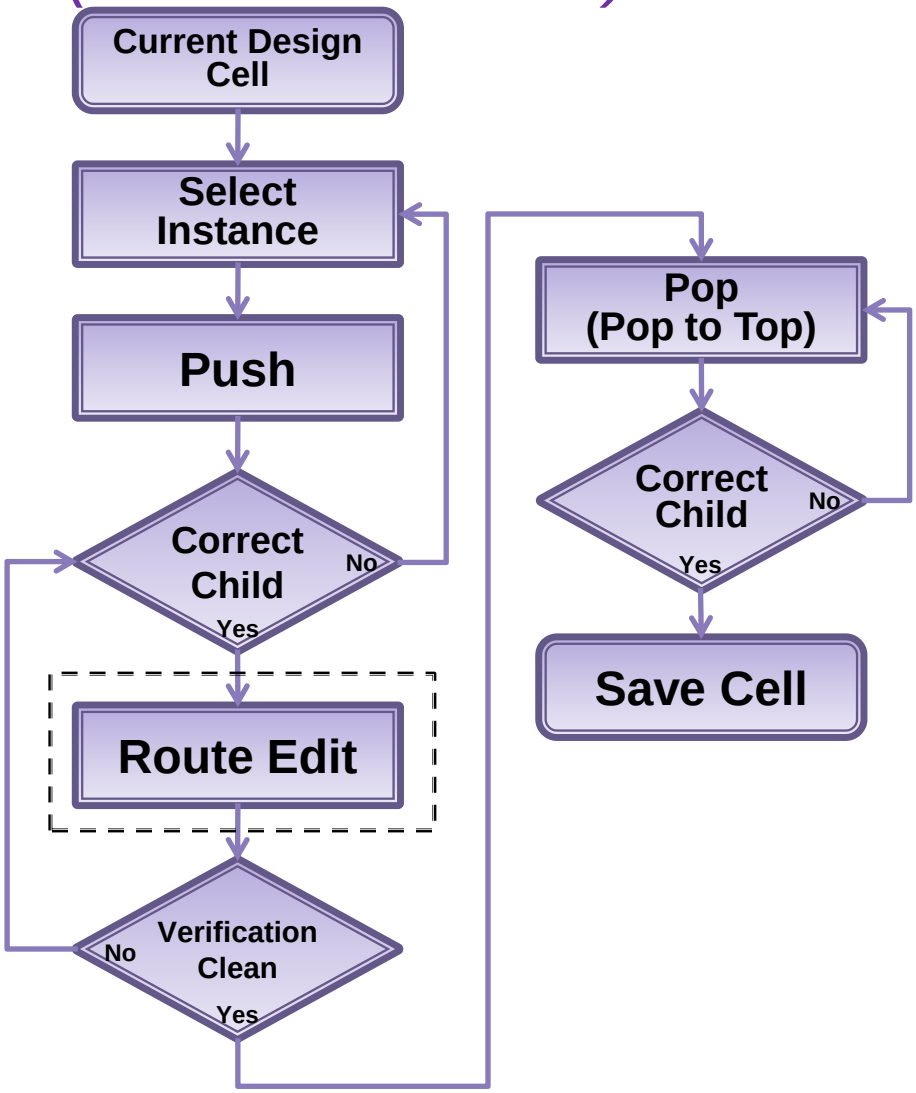
Push (Flow)



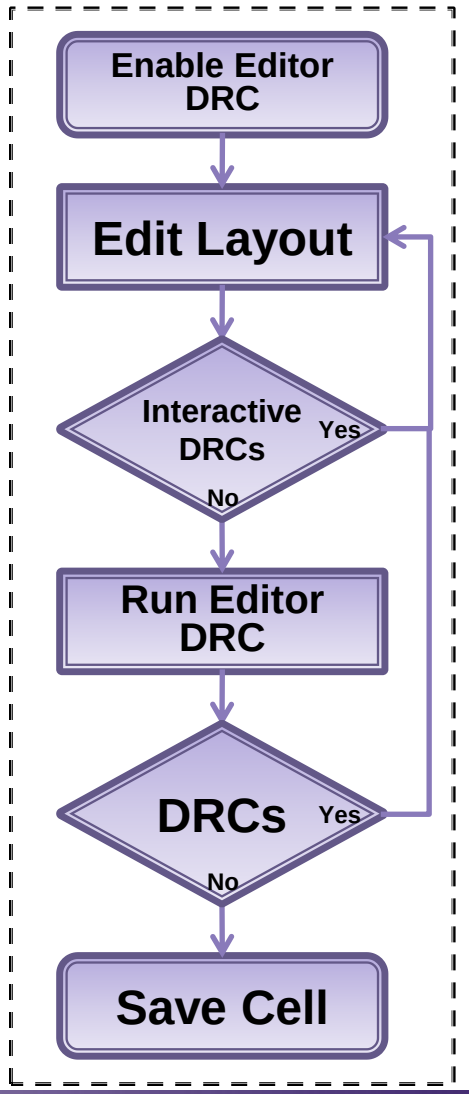
- Open design cell
- Select the cell to push
- Perform route editing
  - Enable DRC (optional)
- Pop to top
- Save design
- Run verification
  - Incremental DRC (optional)
  - `verify_drc`
  - `verify_lvs`

Edit-in-Place

Push (Editor DRC Flow)



Route Editing Flow



Edit-in-Place

Editing

- You cannot modify, create, or delete objects outside of the current edit cell
  - To edit objects in the parent cell, you have to pop to that cell first
  - To edit objects in the child cell, you have to push to that cell first
- The undo stack is cleared by any edit-in-place operation

Edit-in-Place

- Limitations
  - N/A

- Further Information
  - Man pages available
  - "Editing Cells on Hierarchy Levels Below the Primary Design" section in Appendix A of the *IC Compiler Implementation User Guide*, version 2010.03

IC Compiler Route Editing 2010.03

Summary

- Real time feedback with Editor DRC
- Edit-in-Place for hierarchical editing

Predictable Success