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IC Compiler 2010.03 Incremental Training

Design Planning: Time Budgeting, Hierarchy Management, and GUI Enhancements

Agenda

- Timing Budgeting
  - Support for multiply instantiated module (MIM) Designs
  - Fast time to budget
- Hierarchy Management
  - Cross-hierarchy push-down and push-up enhancements
- GUI
  - Pin analysis enhancements
  - Budgeting report

Timing Budgeting Support for Multiply Instantiated Modules

- Overview
  - Enhances `allocate_fp_budgets` to consider all instances of a MIM module
  - Generates one SDC file that captures the strictest constraints for all soft macros in the MIM set

- UI
  - **`select_mim_master_instance`**
  - **`allocate_fp_budgets`**
    `-file_format_spec sdc/m.sdc`

Timing Budgeting Support for Multiply Instantiated Modules

- User Benefit
  - If budgeting according to master names, the tool generates only one file for each set of MIMs
  - Having one SDC file for each set of MIM soft macros allows you to run optimization only once
  - No need to run optimization several times with the different constraints generated for each MIM

MIM Virtual Flat Flow

Flow Recommendation

```
read_verilog $netlist_file
uniquify_fp_mw_cel -store_mim_property {inst_names}
report_mim
initialize_floorplan
create_fp_placement
create_plan_group
shape_fp_blocks
create_fp_placement
copy_mim  -type {placement blockage}

synthesize_fp_rail
set_fp_flow_strategy -plan_group_aware_routing true
#(no feedthroughs on MIM plan groups)
set_fp_pin_constraints
route_global

optimize_fp_timing
analyze_fp_routing -finalize_pins_feedthroughs {}

select_mim_master_instance
check_fp_timing_environment
allocate_fp_budgets -file_format_spec  sdc/m.sdc
check_budget_result

commit_fp_plan_groups
report_mim
```

Timing Budgeting Support for MIM

- Limitations
  - The results of the `check_fp_budget_results` command do not change when MIM budgeting is used
- Further Information
  - You can generate one file for each MIM soft macro by budgeting according to the instance names

Fast Time To Budget

- Overview
  - Achieve reasonably accurate budgets with high-fanout synthesis, feedthrough in-place optimization, and virtual in-place optimization only
    - No need to run in-place optimization in design planning
  - Multicorner-multimode and ILM flows are supported

- UI
  - `allocate_fp_budgets`
    `[-exploration]`

Fast Time To Budget

- User Benefit
  - Eliminates the need to have an optimized netlist as a budgeting prerequisite
- Flow Recommendation
  - Initial placement
  - Create plan groups
  - Hierarchical placement
  - High-fanout synthesis
  - Plan-group-aware routing
  - Finalize routing
  - Feedthrough in-place optimization
  - Virtual in-place optimization
  - **`allocate_fp_budgets -exploration`**
  - Commit hierarchy

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- Timing Budgeting
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- Hierarchy Management
  - Cross-hierarchy push-down and push-up enhancements
- GUI
  - Pin analysis enhancements
  - Budgeting report

Cross-Hierarchy Push-Down and Push-Up Enhancements

- Overview
  - Many new features were added in 2010.03 to support various cross-hierarchy push-down and push-up scenarios in the hierarchical design flow

- UI
  - `push_down_fp_objects`
  - `push_up_fp_objects`

Cross-Hierarchy Push-Down and Push-Up Enhancements

- User Benefit
  - Ability to push objects up and down per layer base
  - Ability to specify a margin around the boundary of a soft macro for push down to avoid potential DRC issues when performing place and route on the soft macro
  - Ability to specify the type of the resulting object after push down – Original type or corresponding blockage type
  - Ability to push up objects that were not previously pushed down
  - Ability to push up selected child-level objects
- Flow Recommendation
  - Apply these commands after plan groups have been committed into soft macros

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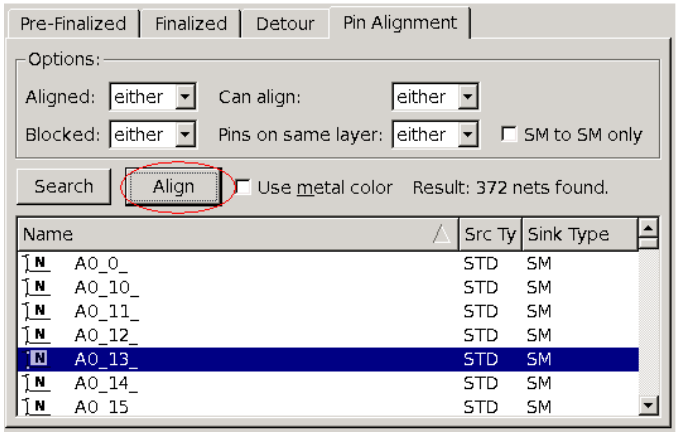
GUI: Pin Analysis Enhancements

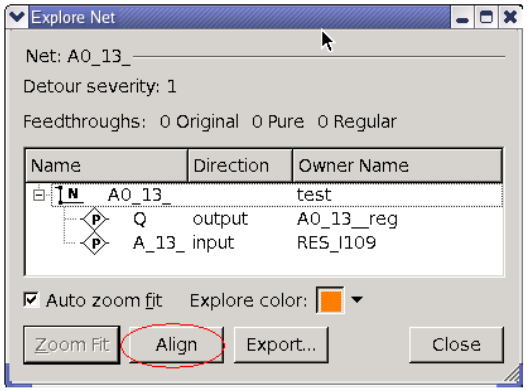
- Overview
  - Integrated pin position update during pin alignment
  - Export and report from the pin analysis tool
  - Pin analysis tool enhancements:
    - Disjoint voltage area support
    - Annotation of voltage area names with module names
    - Annotation of signal direction on soft macro pins
  - Support check pin assignment GUI

- UI
  - Pin Assignment > Pin and Feedthrough Analysis

GUI: Pin Analysis Enhancements

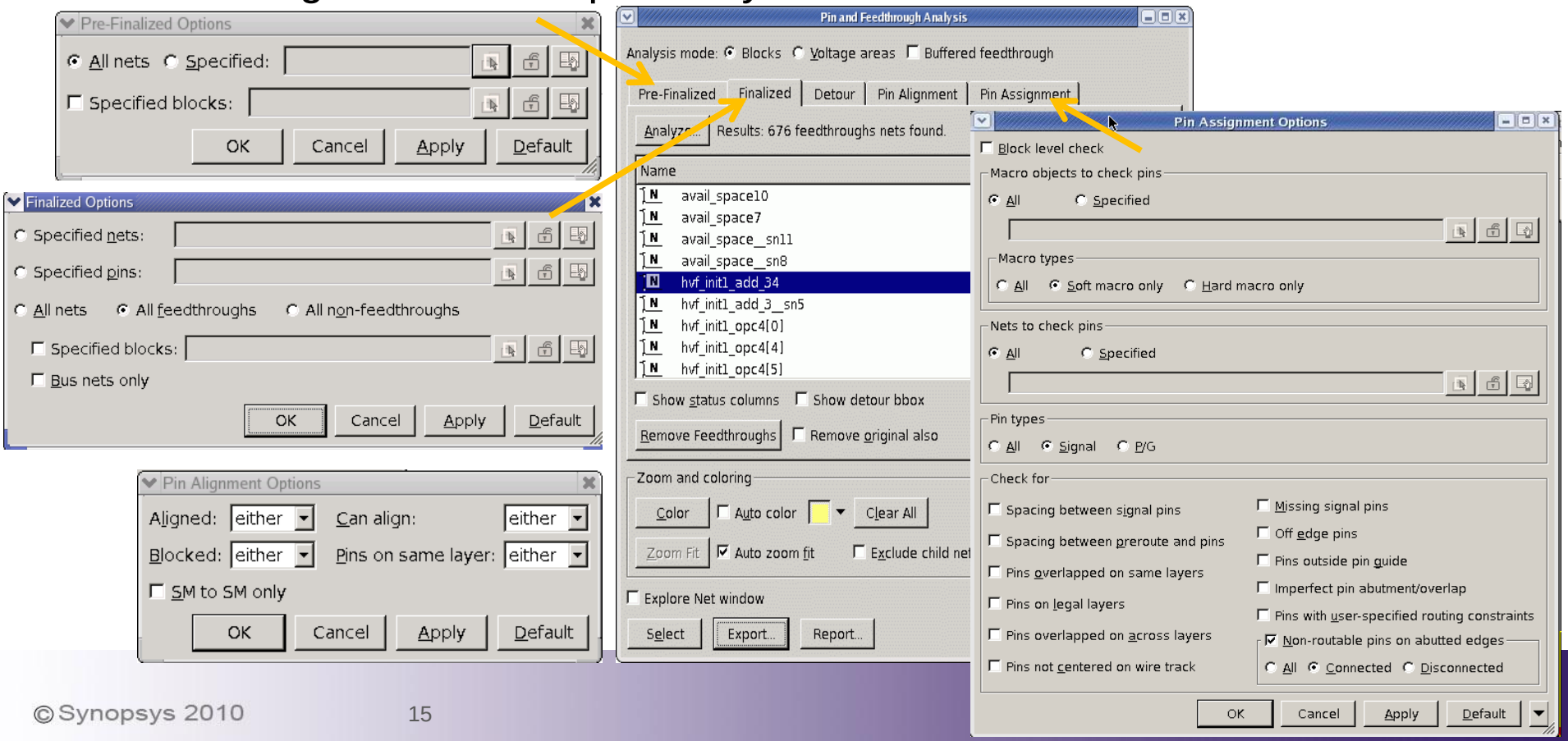
- User Benefit
  - Click Align button to physically align the pin
  - Pin alignment can be performed more easily





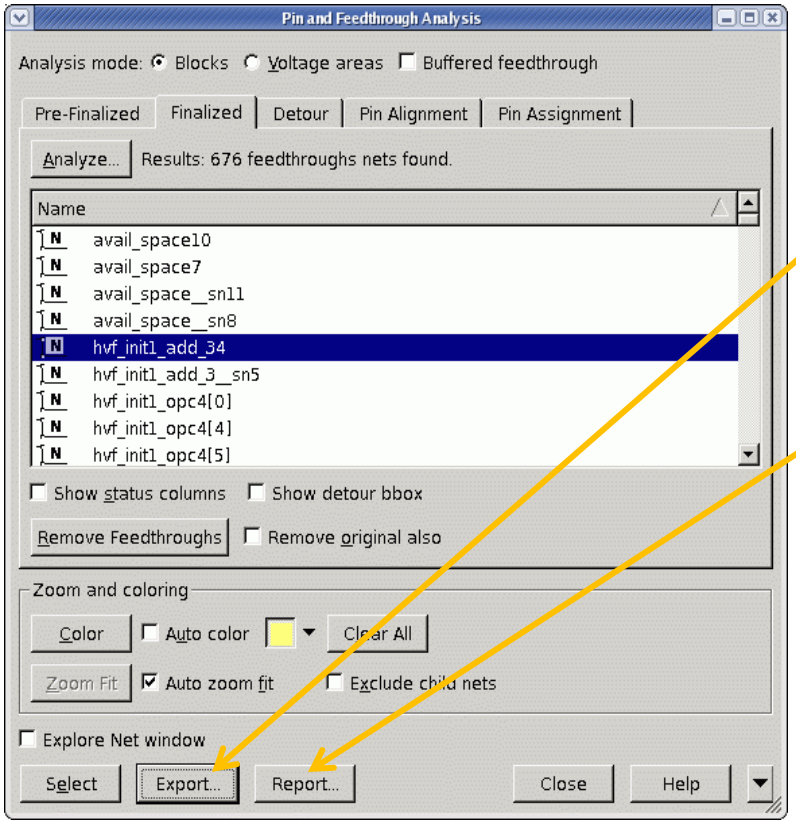
GUI: Pin Analysis Enhancements

- User Benefit (Continued)
  - Integrated pre-finalized, finalized, detour, pin alignment, and pin assignment in one pin analysis tool



GUI: Pin Analysis Enhancements

- User Benefit (Continued)
  - Export and report from pin analysis tool

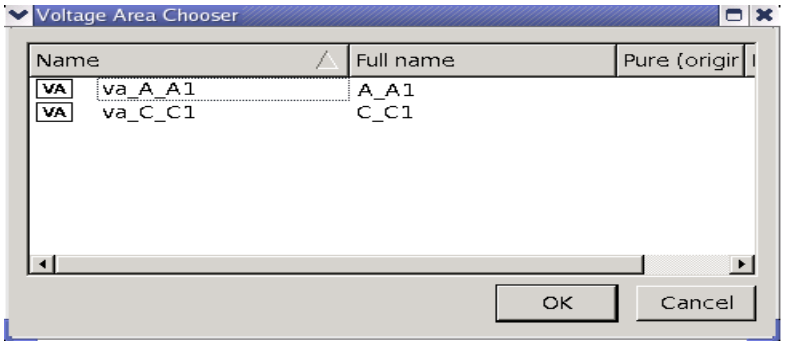


Click Export: IC Compiler displays a window for entering a file name that will store the listed feedthrough nets

Click Report: IC Compiler displays the following window and triggers different report-generating Tcl commands

GUI: Pin Analysis Enhancements

- User Benefit (Continued)
  - Pin analysis tool enhancements:
    - Disjoint voltage area support
      - Correctly process and display connections to / feedthroughs across disjoint voltage areas
    - Voltage area names are annotated with the module names



GUI: Pin Analysis Enhancements

- User Benefit (Continued)
  - Pin analysis tool enhancements:
    - Annotation of signal direction on soft macro pins
      - In the layout view, a soft macro pin is annotated so that the signal direction of the pin is clearly visible
        - » Example:
          - On the top of the pin there is on of the following marks:
            - ‘O’ if the pin is an output pin
            - ‘I’ if the pin is an input pin
            - ‘IO’ if the pin is an input-output pin

GUI: Pin Analysis Enhancements

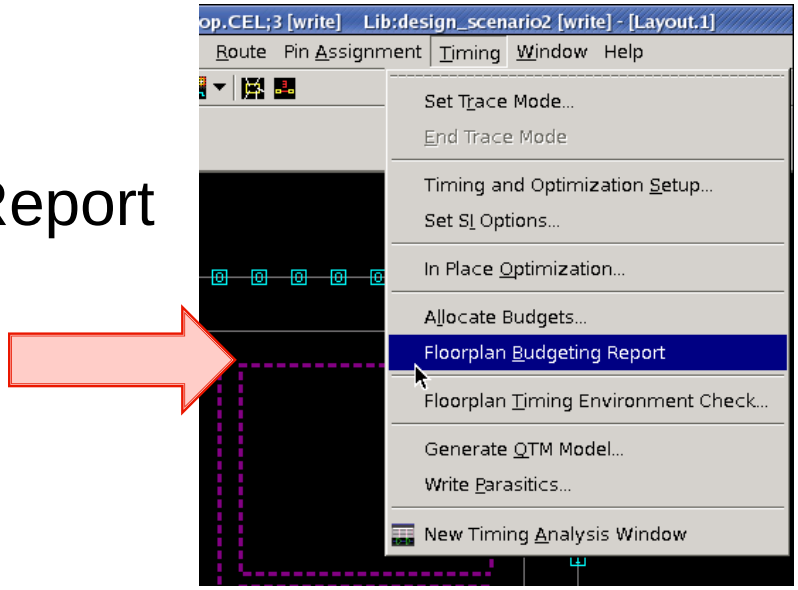
- Flow Recommendation
  - The pin analysis tool can be used
    - After plan-group-aware routing (PGAR) (`route_zrt_global`)
    - After finalizing the routing (`analyze_fp_routing -finalize {`*`plan_groups`*`}`)
    - After committing the hierarchy (`commit_fp_plan_groups`)

GUI: Budgeting Report

- Overview
  - Checks the budgeting result using the GUI
  - The GUI tool is implemented based on the `check_fp_budget_result` command

- UI

  Timing > Floorplan Budgeting Report



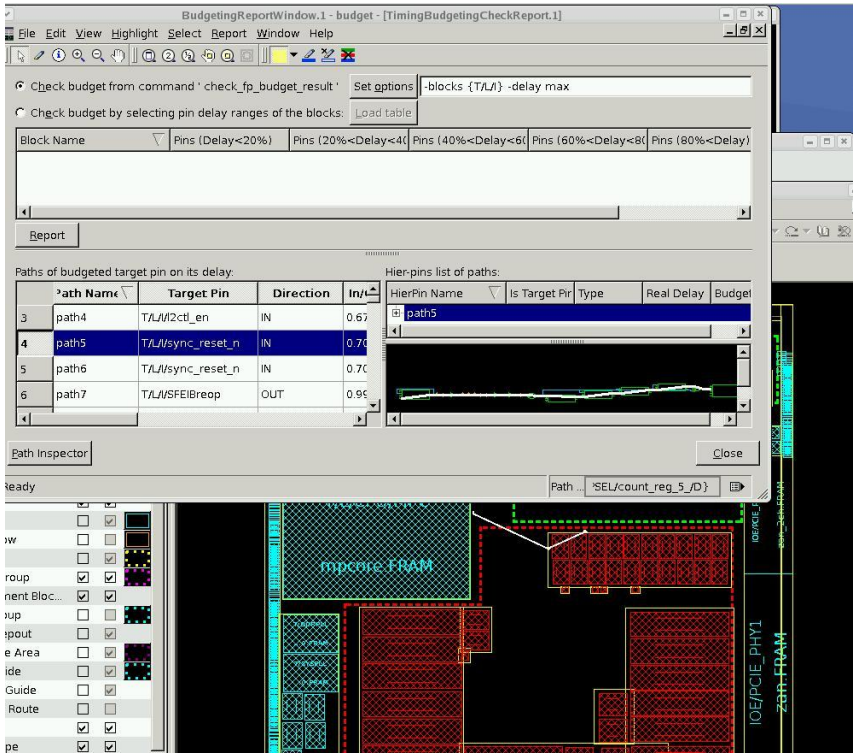
GUI: Budgeting Report

- User Benefit
  - The analysis report breaks down the paths into segments corresponding to each hierarchy block
  - Helps to analyze the budgeting results

- Flow Recommendation
  - Run the budgeting report following the timing budgeting command

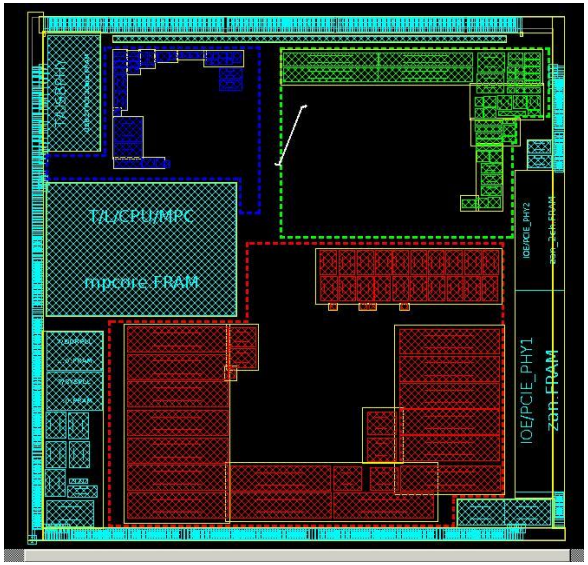
GUI: Budgeting Report

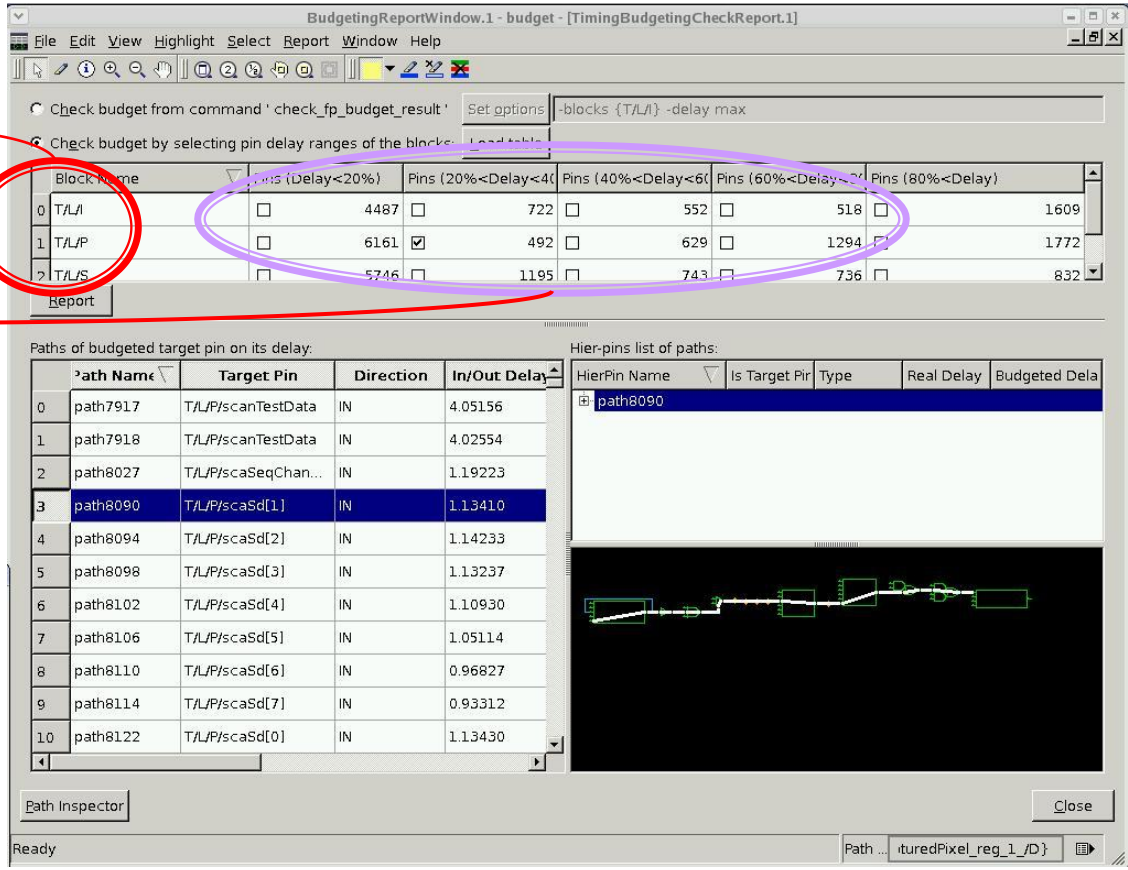
- Example
  - Report one block budgeting
  - Cross-path highlighting



GUI: Budgeting Report

- Example
  - All blocks can be reported together
  - Pin delay range





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GUI: Budgeting Report

- Limitations
  - Timing budgeting and the budgeting report must be run in the same session

Summary of Design Planning Updates

Module 3

- MIM support added for generating timing budgets (`allocate_fp_budgets`)
- Budgeting support in exploration mode
- Enhancements that enable you to push objects up/down objects after plan groups are committed into soft macros
- Integrated Pin & Feedthrough Analysis GUI tool
- The GUI budgeting reporting tool and how it helps you to analyze budgeting results

Predictable Success