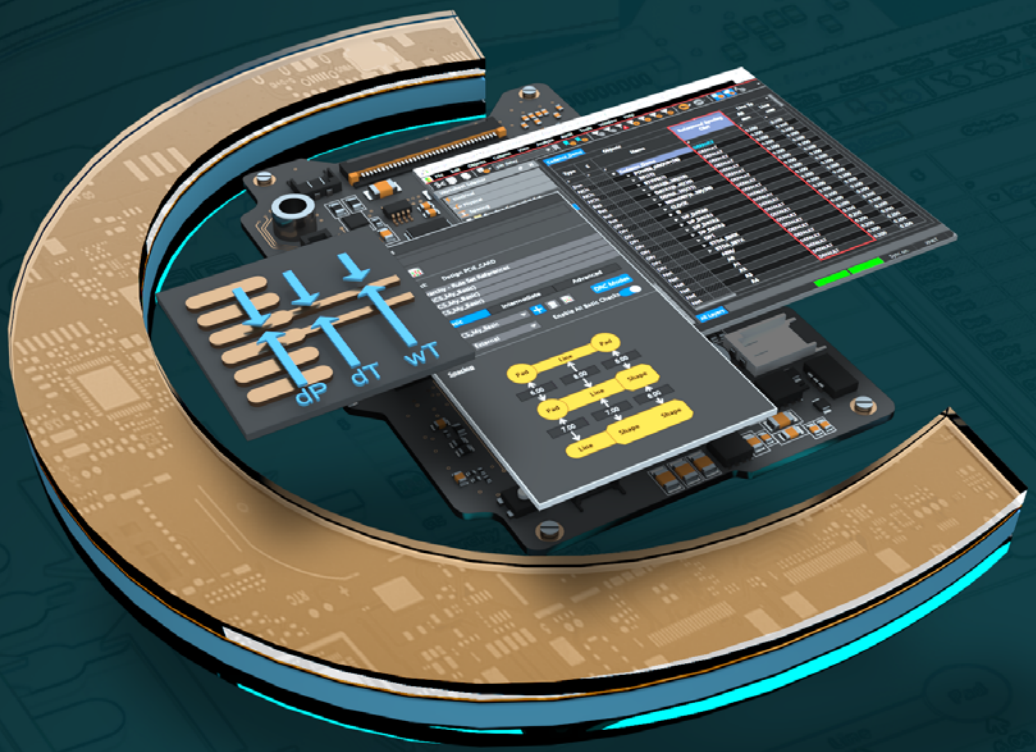
DESIGN **GUIDE**

cadence®

OrCAD X Constraint Management Guide

Part 4 of 5



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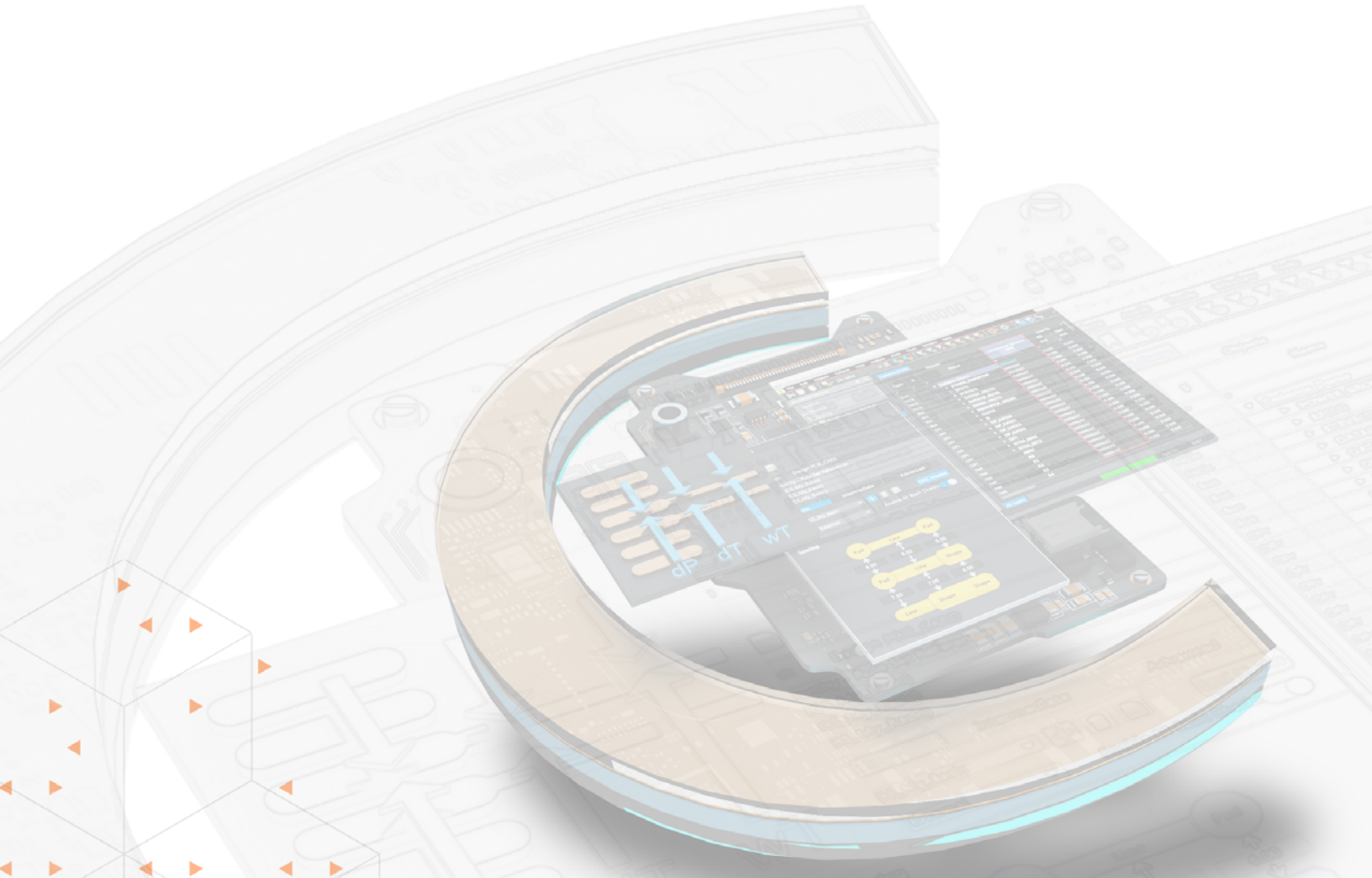


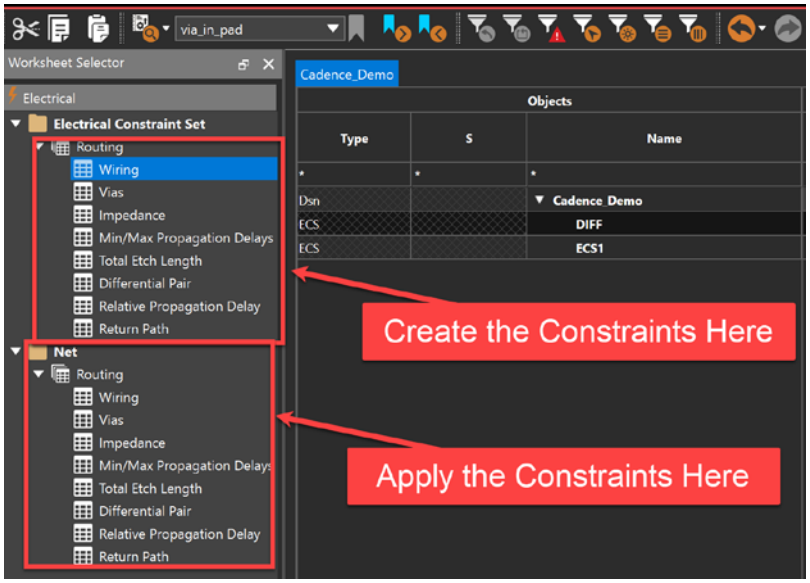
Part 4 – Constraints Optimization

Constraint Efficiencies

Constraint Sets

These are reusable groups of electrical constraints.

- **Implementation in Constraint Manager:**
  - Open the Constraint Manager and navigate to the “Electrical” category
  - Navigate to any worksheet, like Routing > Wiring then right click on the design name and select “Create Electrical CSet”
  - Define constraints for relevant parameters depending on your worksheet category (like Topology Schedule, Vias, impedance, Total Etch Length, etc.)
  - Apply the EC Set to specific nets or net classes as needed but in the Net folder within the respective constraint domain
- **Benefits:**
  - Ensures consistent electrical rules across multiple designs
  - Simplifies management of complex electrical constraints
  - Reduces time spent on constraint setup for new projects
  - Ensures consistency across different designs within an organization



Modular Approach To Constraint Management

Applying constraints in a layered, Venn diagram-like structure for flexibility and ease of management

- **Implementation in Constraint Manager:**
  - Create base-level constraint sets for general rules
  - Define more specific constraint sets for particular design areas or net classes
  - Use the constraint priority system to manage which rules take precedence
- **Benefits:**
  - Provides flexibility to apply general rules with specific exceptions
  - Simplifies management of complex rule interactions
  - Allows for easy visualization of constraint hierarchy

Schematic to PCB Constraints

Set constraints in the schematic then transfer to the PCB side from Capture to Presto.

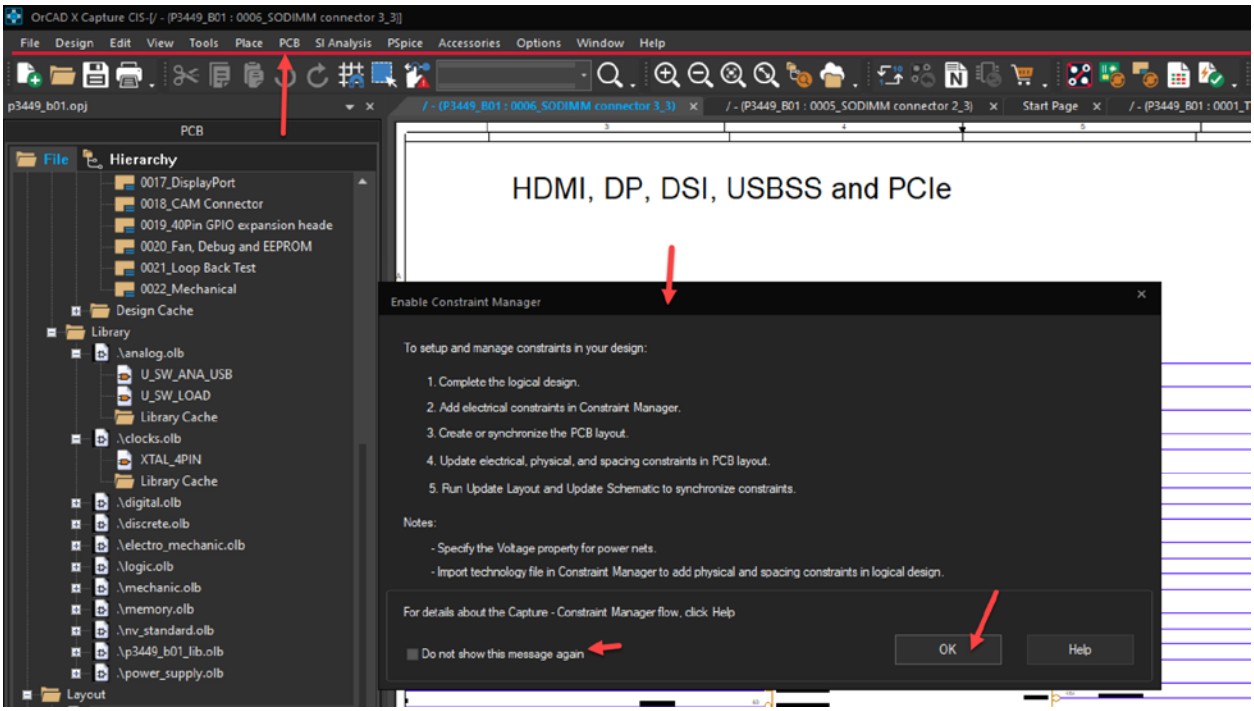
Image: Showing the flow of constraints from schematic to PCB, highlighting the Constraint Manager in the schematic phase.

Purpose: To establish and transfer design constraints from the schematic phase to the PCB layout phase, ensuring a robust design foundation.

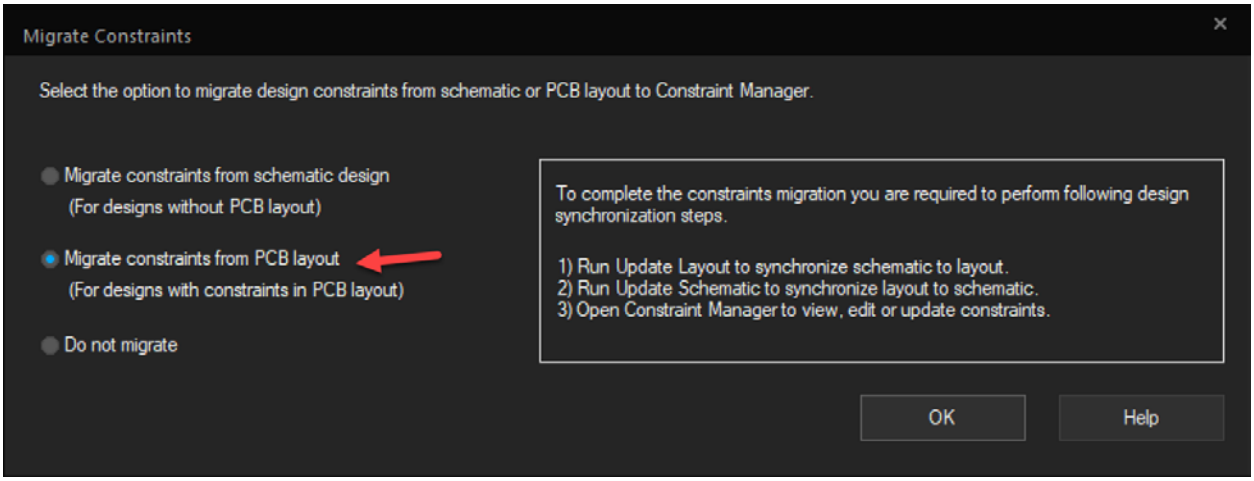
Tip: In modern hardware and PCB design, constraints should always start from the schematic, then transfer to the PCB. Any changes in the PCB constraints and features should be synchronized with the schematic as well, but the schematic must always drive the constraint management. Let's explore the Constraint Manager in OrCAD X Capture to Presto PCB Editor.

Steps:

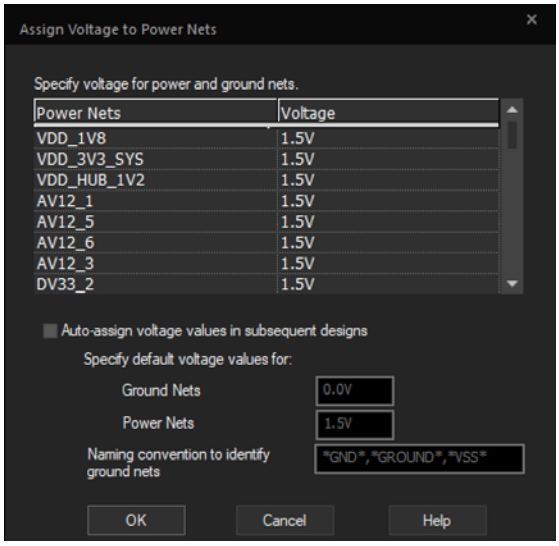
1. Open the Constraint Manager in OrCAD X Capture (schematic tool) by going to the menu and selecting **PCB - Constraint Manager**. The Enable Constraint Manager prompt may appear.



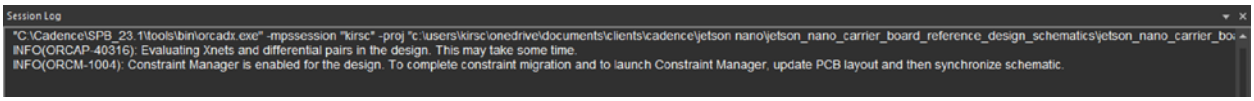
2. Check the "Do not show this message again" box, then the Migrate Constraints window will appear.
3. If you already have a PCB layout with constraints, you should select the Migrate constraints from the PCB layout option.



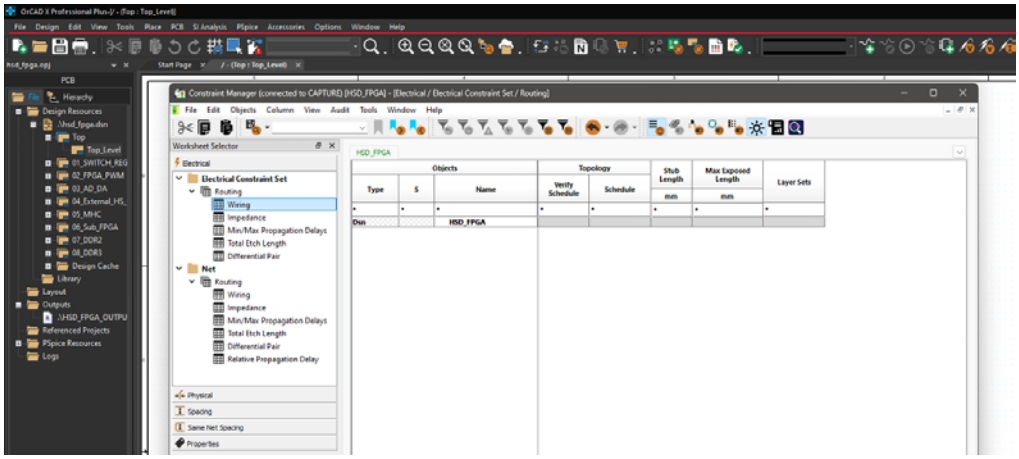
4. If you choose the first option, be sure to set your units.
5. When ready, click OK.
6. We went with option 2, so we have some more steps to perform as listed in the previous window.
7. You may be prompted to Assign voltage to Power Nets.



8. You can choose to Auto-assign voltage values in subsequent designs if you want, but we will leave it blank for now. Click OK.
9. Nothing will appear to happen, but if you go to the Capture menu and choose View - Session Log, it will pull up what happened in the panel at the bottom of the tool.



10. The session log also reminds us of the next steps to fully activate and synchronize the Constraint Manager.
11. Once you have performed the PCB - Update Layout step and then the PCB - Update schematic step, go to PCB Constraint Manager. The Constraint Manager window will appear.



12. Now you have access to set the constraints you want on the schematic side before even getting into the PCB layout.
13. You may also define your differential pairs, establish your Constraint Sets as needed, and apply them to all your nets.

14. Those rules will then be transferred to your PCB environment so that the layout engineer can start on the right foot, so to speak with their PCB design.
15. Notice some differences in the Electrical Constraint Set where you can define Noise margin in the Electrical Constraint Set > Reflection/Edge Distortions worksheet.
16. When done with your constraint setups, use the menu in Capture to select PCB - Update Layout… to move constraints to OrCAD X Presto PCB Editor.
17. Verify transferred constraints in the PCB Constraint Manager.

Reason for Capture Constraint Manager: Early constraint definition in the schematic phase allows for proactive design decisions, reducing iterations and improving overall design quality.

Impact: Streamlines the design process, ensures consistency between schematic and PCB, and facilitates informed decisions on stackup and material selection based on electrical requirements.

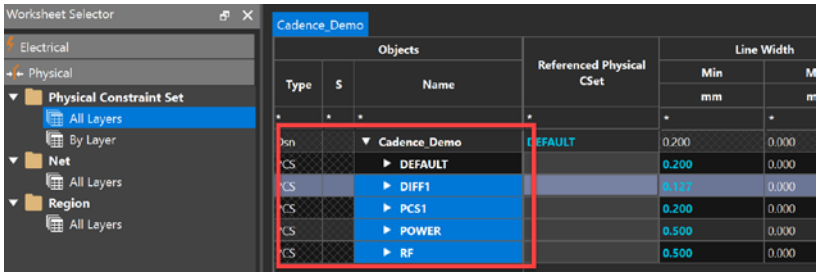
This approach emphasizes “real engineering design powered by early constraints,” moving away from the “wing it, review it, iterate” cycle and potentially reducing the number of board respins required.

Importing and Exporting Constraints

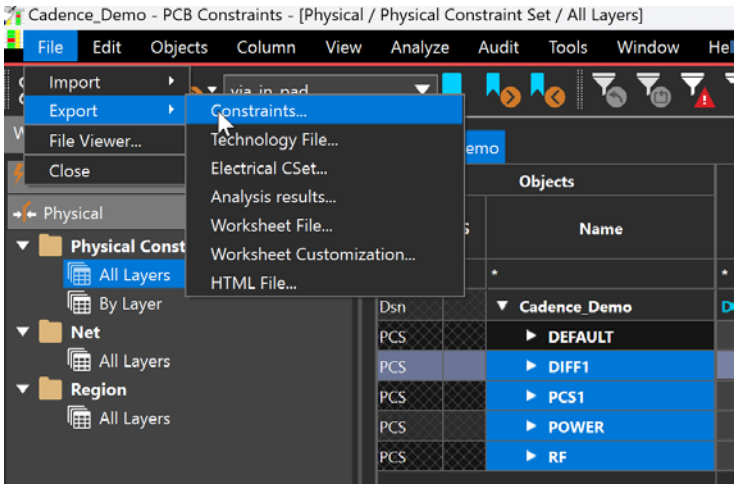
In this section you learn how to export constraints, which features to select, the impact they have on a design for other engineers and how you can use them in future projects immediately.

Here are some steps for exporting and importing constraint manager files in OrCAD X, along with the benefits:

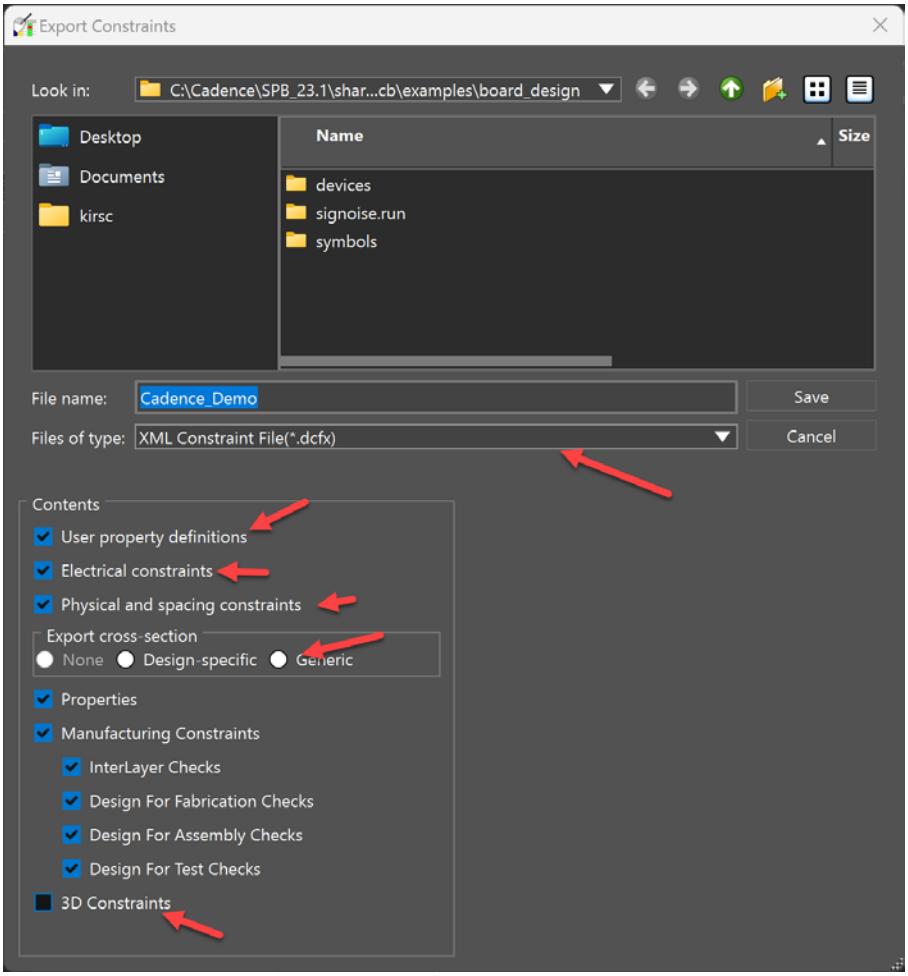
- **Implementation in Constraint Manager:**
  - Create standardized constraint sets for common design elements as mentioned in the previous section
  - Select/Highlight the Constraints you want to export, as shown below.



- Use the “Import/Export” feature to save and load constraint sets
  - In the Constraint manager go to File - Export - Constraints…

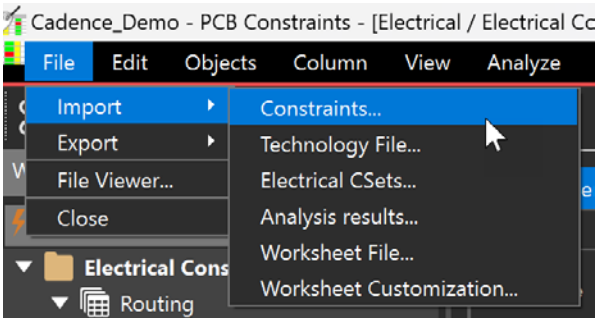


After some time, it will open all the options

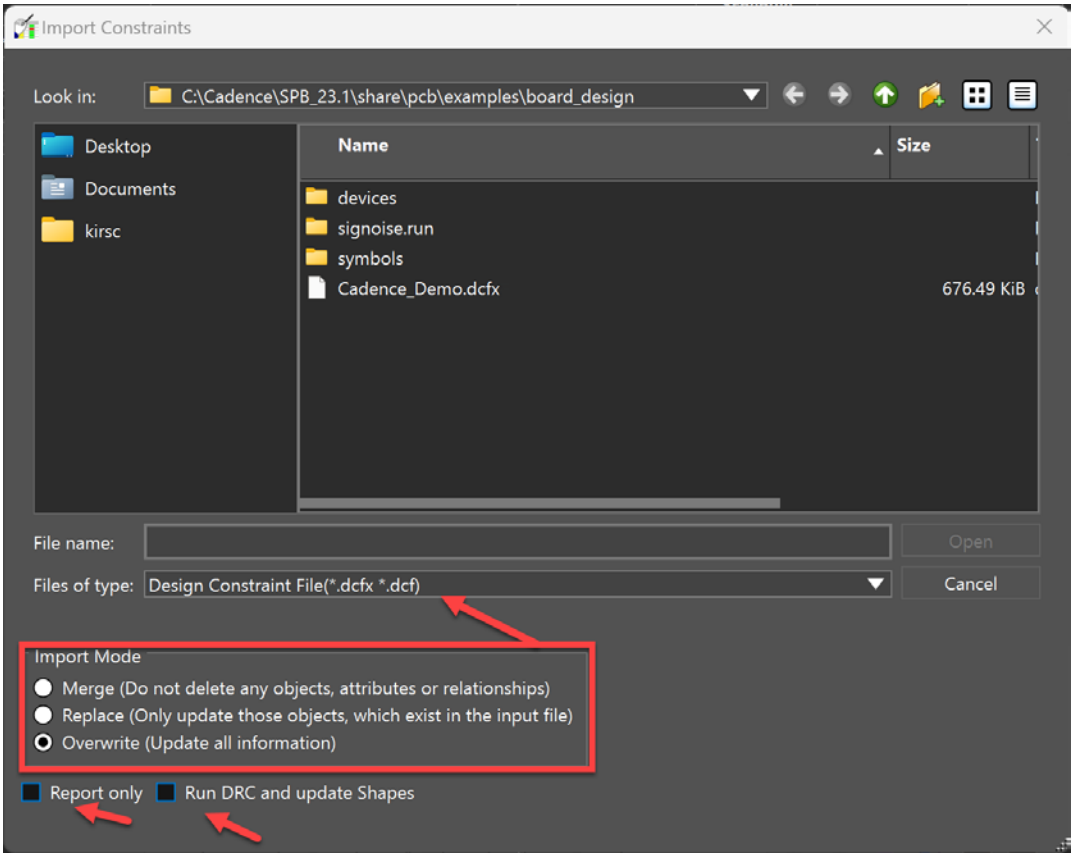


- Apply saved constraint sets to export and apply to new projects as needed
- Click Save and that will save your constraint file

- Importing Technology Constraint Files
  - Similar to how you exported your constraints into a file, you can import that same file into a completely different design
  - In the Constraint Manager in any design, choose File - Import, then choose from your options (Constraints…, Technology File, Electrical Cset)



If you choose **Constraints…**, an Import Constraints window will appear allowing you to Merge, Replace or Overwrite any existing constraints. Choose the options very carefully so as to not corrupt your existing design (and always have a backup of your design)



- If you choose to import a technology file, that will include constraints and additional data, like cross-sections
- In either scenario, select your file then click Open
- Constraint Manager will update itself and the design based on what you chose to import

Benefits of exporting and importing constraints:

- **Reusability:** Engineers can apply consistent constraints across multiple designs or projects, saving time and ensuring design consistency
- **Collaboration:** Team members can share constraint sets, promoting standardization across the organization
- **Version control:** Constraint files can be versioned and stored separately from design files, allowing for easier management of design rules
- **Efficiency:** Reduces the need to recreate complex constraint sets for each new design, potentially saving significant time and effort

While importing predefined constraints can be highly beneficial, engineers may still need to review and adjust them for specific project requirements. The practice of starting with a standard set of constraints and then customizing as needed often strikes a good balance between efficiency and design optimization.

Conclusion to Part 4 - Constraints Optimization

In Part 4 of the OrCAD X Constraint Management Guide, we explored optimization techniques to enhance the efficiency of constraint management. By leveraging features such as ECSets, schematic-to-PCB constraints, and the modular approach, designers can streamline their workflow and ensure consistent application of constraints across various projects. These productivity tools are essential for maximizing design efficiency and achieving superior results.

As we transition into Part 5, the Project Example, we will apply the concepts and techniques covered in the previous sections to a real-world project. This part will provide a practical demonstration of constraint management in action, using the Cadence Demo FPGA project as a case study to highlight the implementation and impact of constraints in a complex design environment.