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The Future of PCB design

Bas Hassink
Senior Application Engineer



Xpedition
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XPEDITION ENTERPRISE

HYPERLYNX PI VIRTUAL LAB

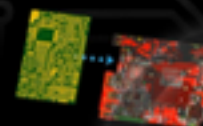
HYPERLYNX SI VIRTUAL LAB

CUSTOMER STORIES

Learn about the industry challenges that drove our implementation of the Xpedition VX release, as well as some product highlights.

View Webinar

Three Challenges Impacting Development Organizations

1
ChallengeAccelerating Design Complexity
»Modern PCB systems are highly complex2
ChallengeWorkforce Changes
»Shrinking workforce of dedicated layout designers
»Improving productivity rates in design

Introducing a Major Advance in PCB
Systems Design: Xpedition VX

ON-DEMAND WEB SEMINAR

Systems Aware Engineering
»Transitioning from stand-alone PCB projects to a
systems-based approach

60% total cycle time reduction in 1st project with Xpedition

Design spin reduction by **50%** through DFM integration

Reduced FPGA optimization time from 8 to 2 weeks **75%**

65% layout cycle time reduction through team design

Component research & selection **30%** faster

75% project cycle time reduction through team design and design reuse



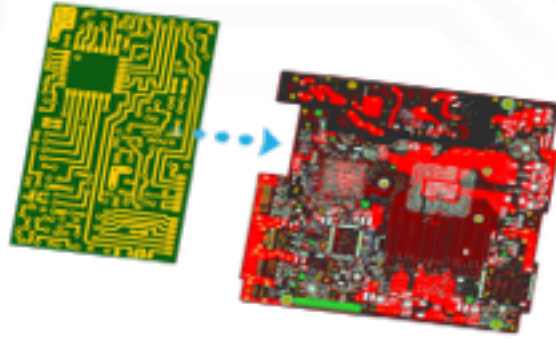
...takes you **from design to manufacture**
...helps you **deliver on a promise of innovation**

- ➔ Optimize flow to drive productivity and quality outcomes
- ➔ Decrease time to innovation and competitive product
- ➔ Reduce design cycles by 50% or more, while significantly improving overall quality and resource efficiency

The Next Generation of PCB Systems Design

Three Challenges Impacting Development Organizations

1 Challenge



Accelerating Design Complexity

- Modern PCB systems are highly complex

2 Challenge



Workforce Changes

- Shrinking workforce of dedicated layout designers
- Engineering graduate rates in decline

3 Challenge

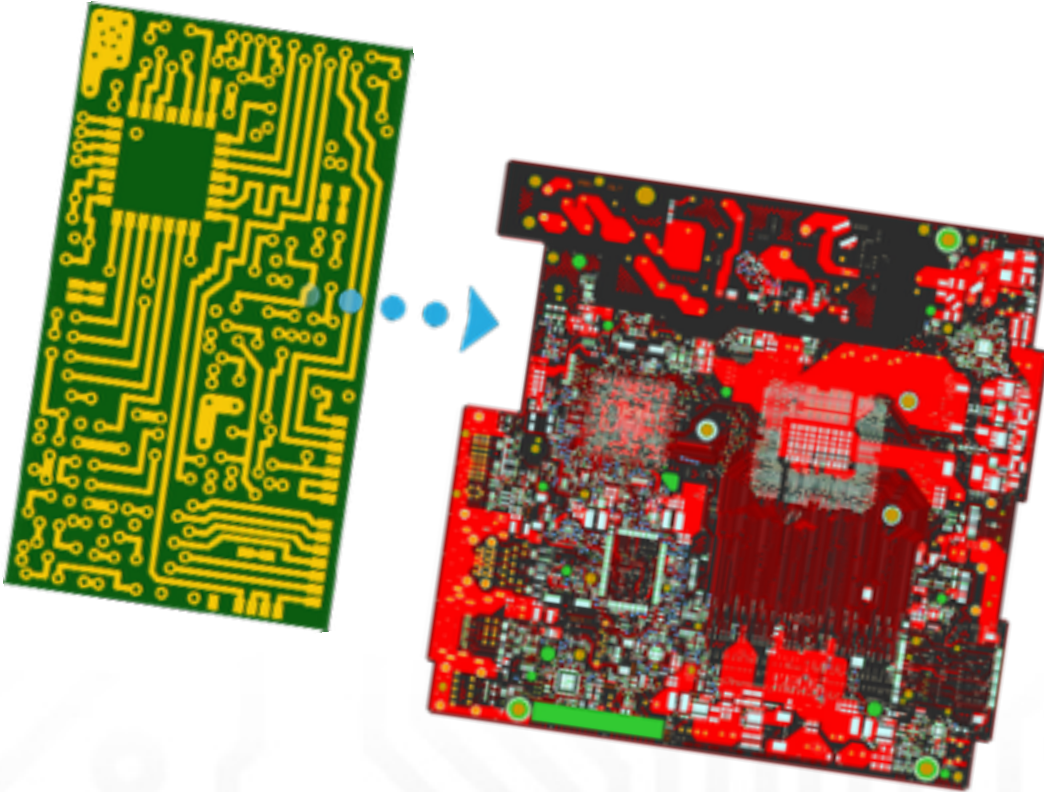


Systems Aware Engineering

- Transitioning from stand-alone PCB projects to a systems-based approach

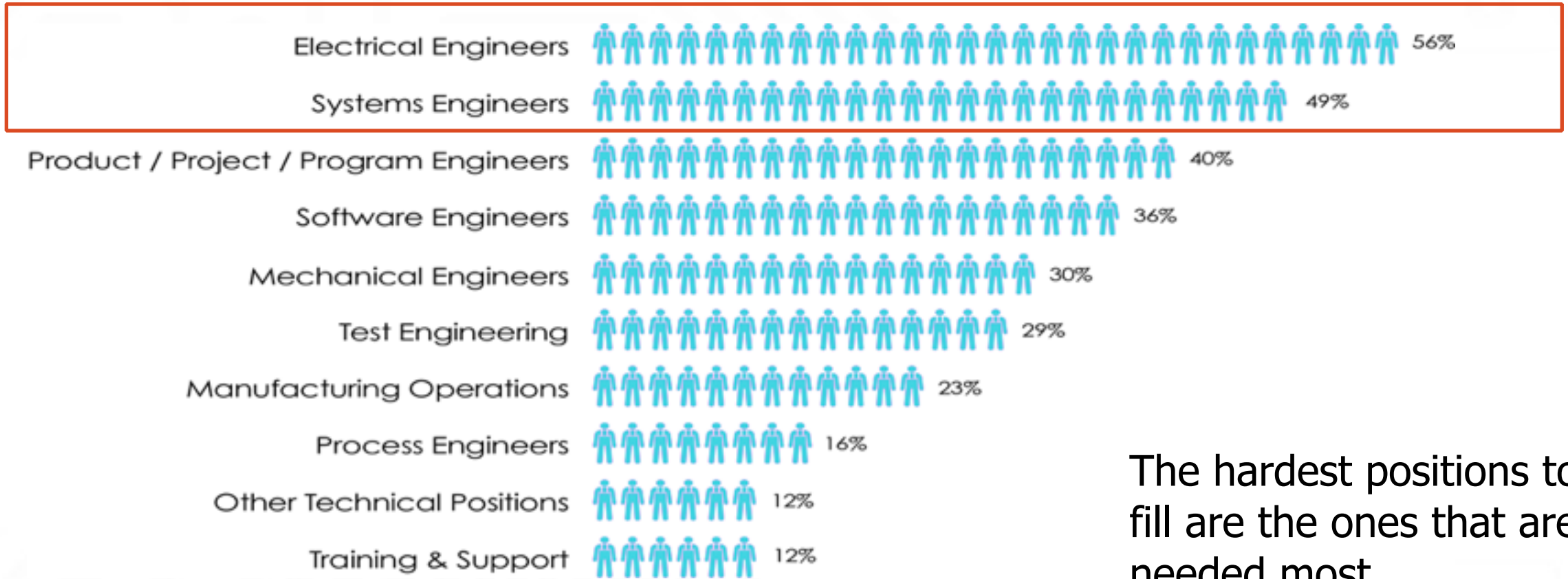
Accelerating Design Complexity

Systems are far more complex today than they were just five years ago.



- Demand for increased functionality
- Higher performance
- A smaller form factor
- Lower cost
- High manufacturability
- Faster design time

A Changing Workforce



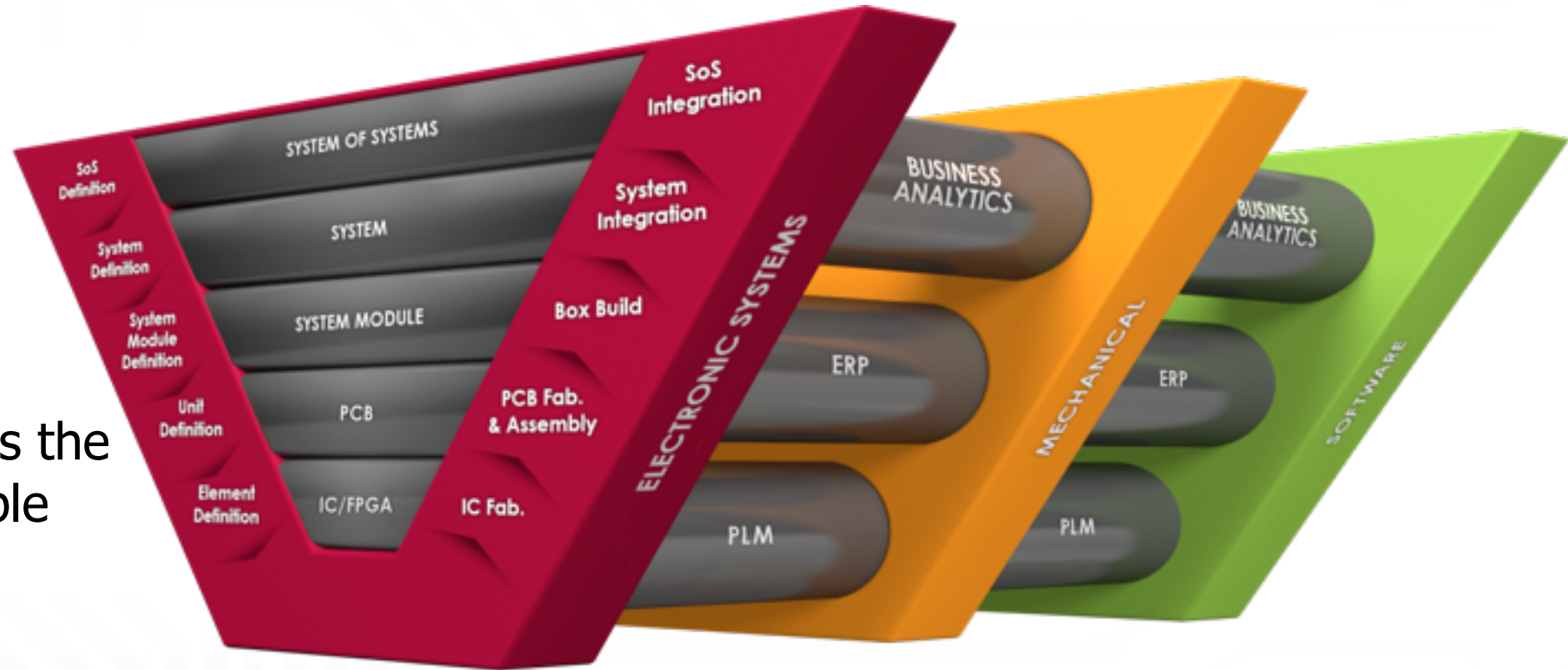
The hardest positions to fill are the ones that are needed most.

The engineering pipeline is running dry.

Source: Aberdeen Group, January 2013

Systems-Aware Engineering

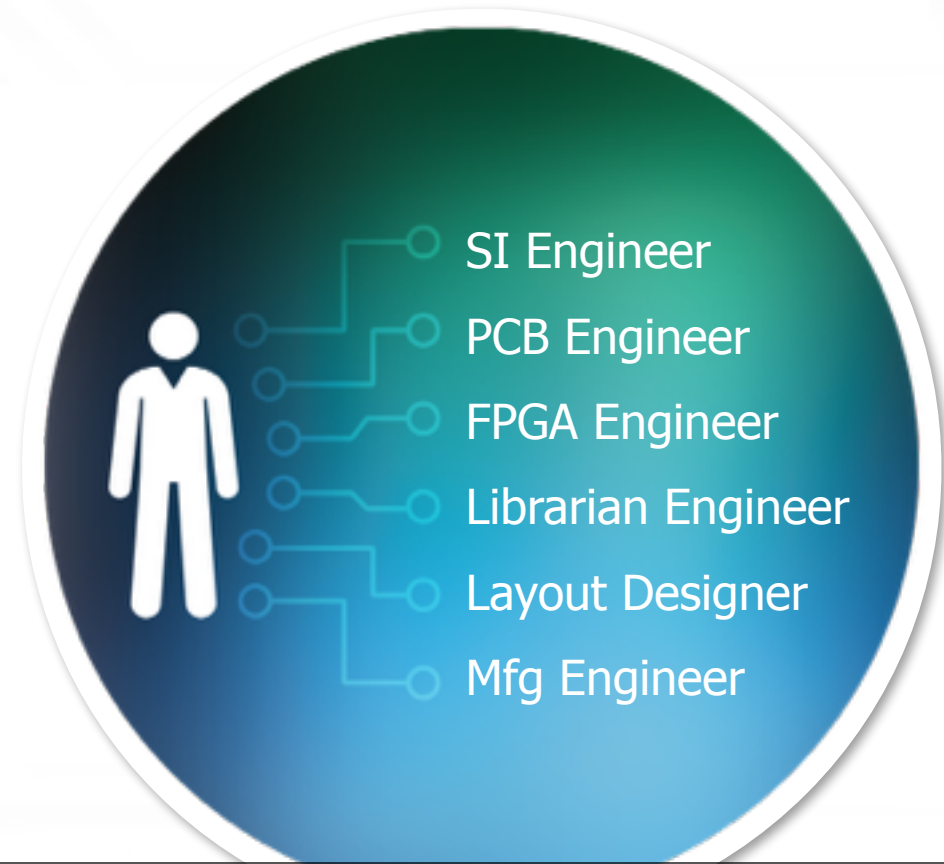
Any product requires the integration of multiple disciplines.



A New Breed of PCB Design Specialist

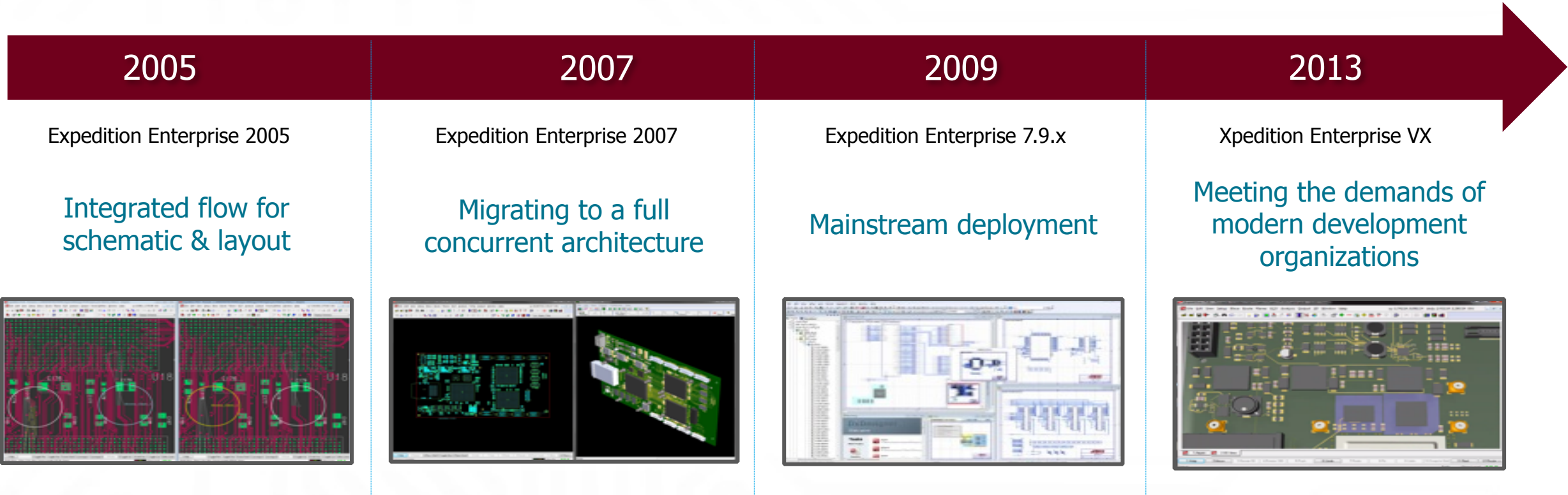
Facilitates Problem-Solving Across the Systems Development Spectrum

New systems complexity +
a changing workforce = the rise of
a new breed of PCB engineer



Design Tools Need to: Reduce Complexity, Increase Productivity, and Enable Organizations To Do More

The Xpedition Evolution



The Next Generation of PCB Systems Design

- Enables cross-domain collaboration
- Designed for new-breed of engineers
- Full system flow with common data backbone
- Facilitates dynamic design validation
- Increases individual & team productivity
- Lowers barriers for infrequent users
- Enables multi-board systems optimization
- Incorporates true parametric 3D
- Extends design footprint to manufacturing
- Enhances project management visibility
- Facilitates strategic decision-making
- Enables data integration with third parties

10 WAYS

1. Systems perspective
2. Design-through-manufacturing
3. No functional design gaps
4. Productivity through automation
5. Ease of use
6. Collaboration & extensibility
7. Concurrent design
8. Virtual prototyping
9. Range
10. Commitment

Agenda

- Environment
 - Placement / Planning
 - Routing Automation
 - 3D
-
- Please visit our booth for more information

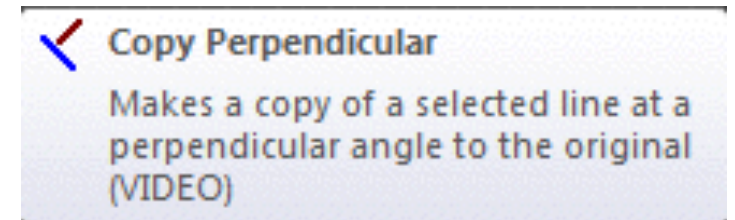
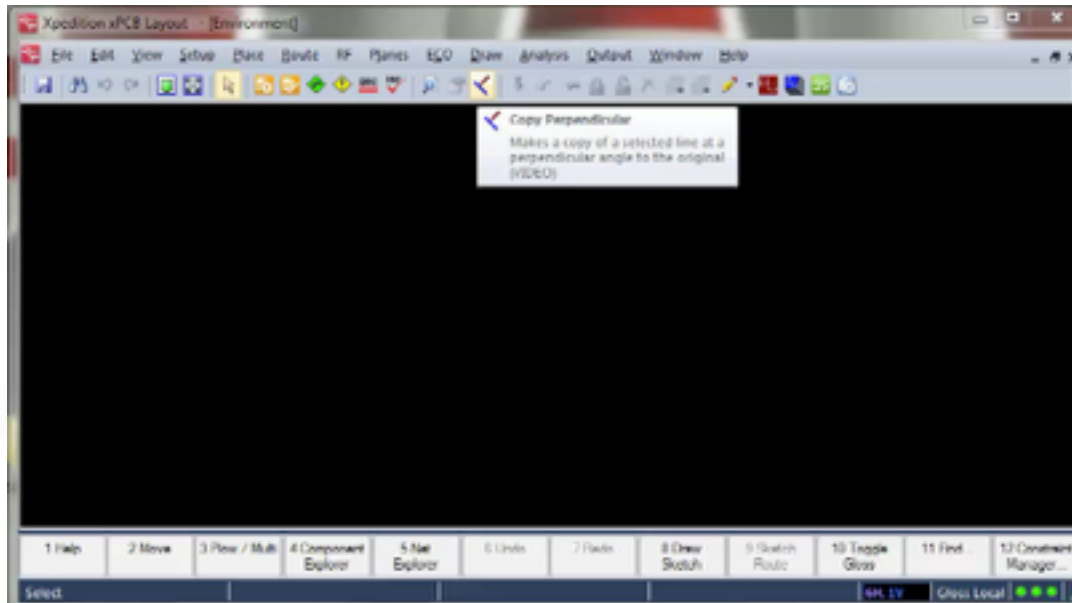
xPCB Environment - Toolbars

- Refreshed Interface with Personalization
- Enhanced Display control
- Select Mode
- Context Sensitive menus
- Hover Highlight

xPCB Environment – Toolbars

Many of the toolbar icons contain tooltips to help understand usage

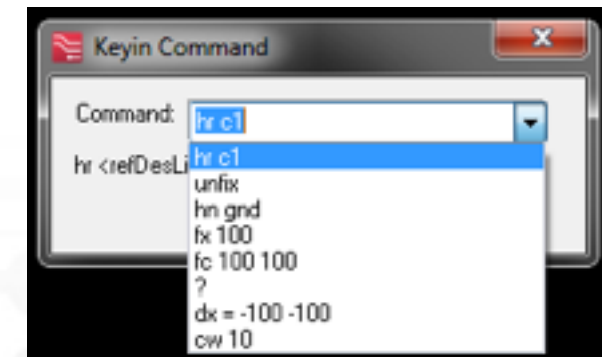
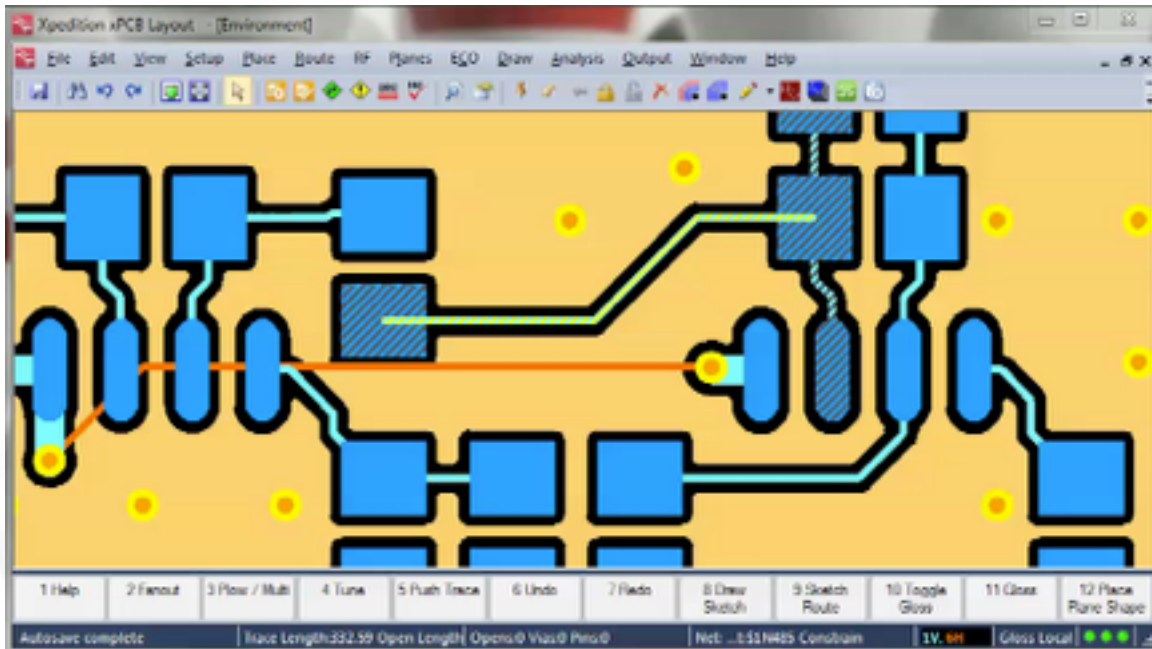
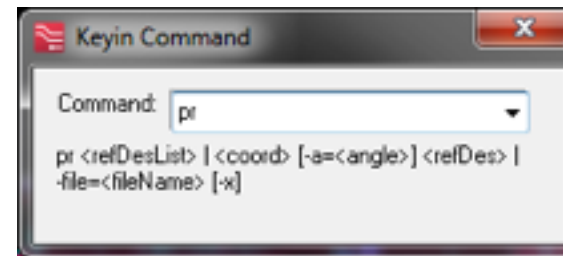
- ❑ Animations provide a brief video showing how to use the command.
- ❑ Quick-key commands are also display within the tooltip.



xPCB Environment – Keyin Commands

The Key-in command editor window will now appear when any command is typed-in using the keyboard.

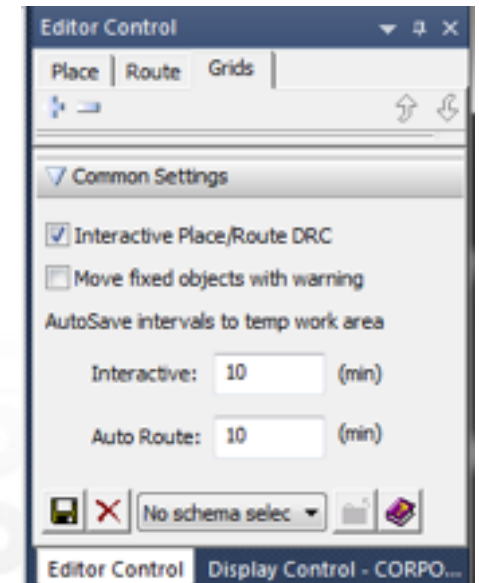
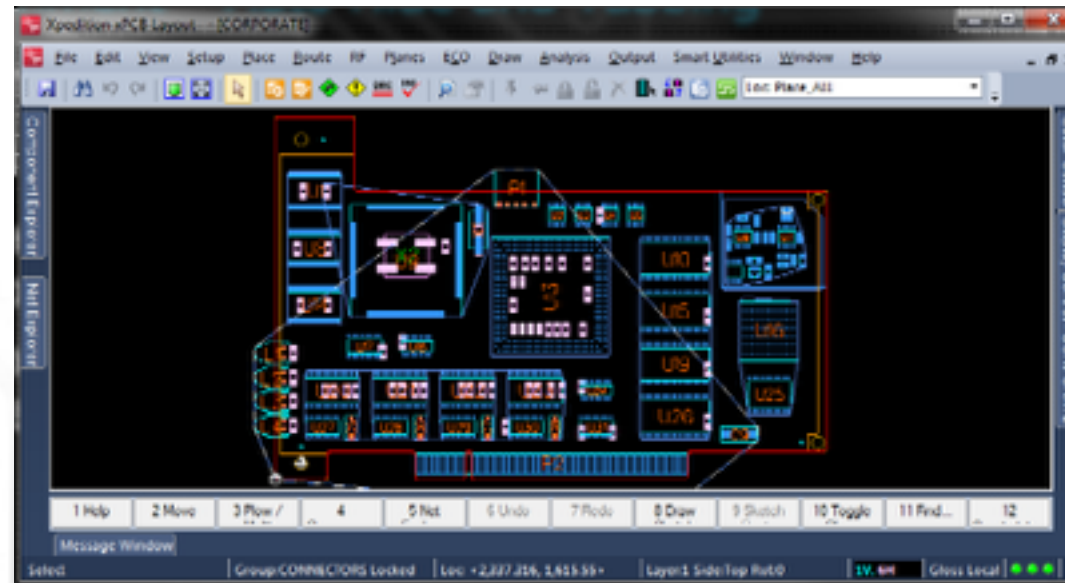
- Entering any letter will bring a list of potential commands up.
- <Backspace> to bring dialog up



xPCB Environment – Auto Hide and Tabbing

Auto hide and Tabbing of dialogs has been enhanced to help optimize the layout workspace.

- ❑ Auto hide allows the user to dock a dialog and have it close by simply repositioning the mouse cursor in layout.
- ❑ Dialog tabbing allows for the combination of dialogs within the same space.



xPCB Environment – Display Control

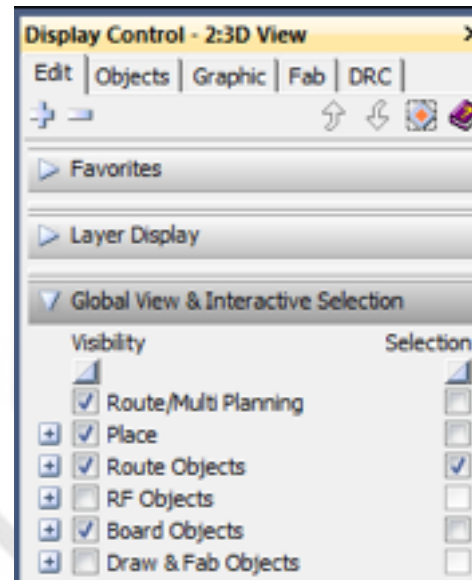
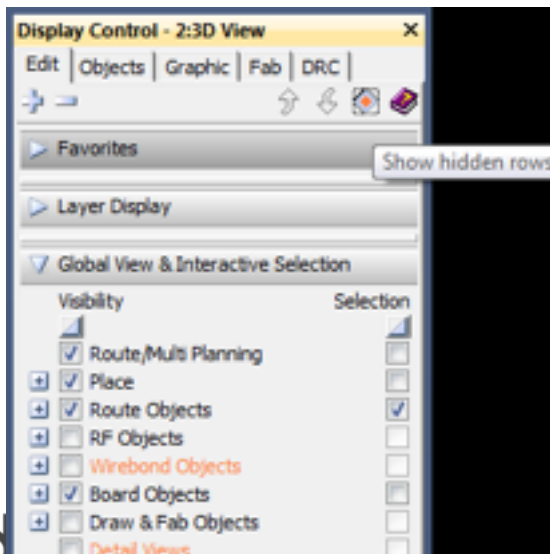
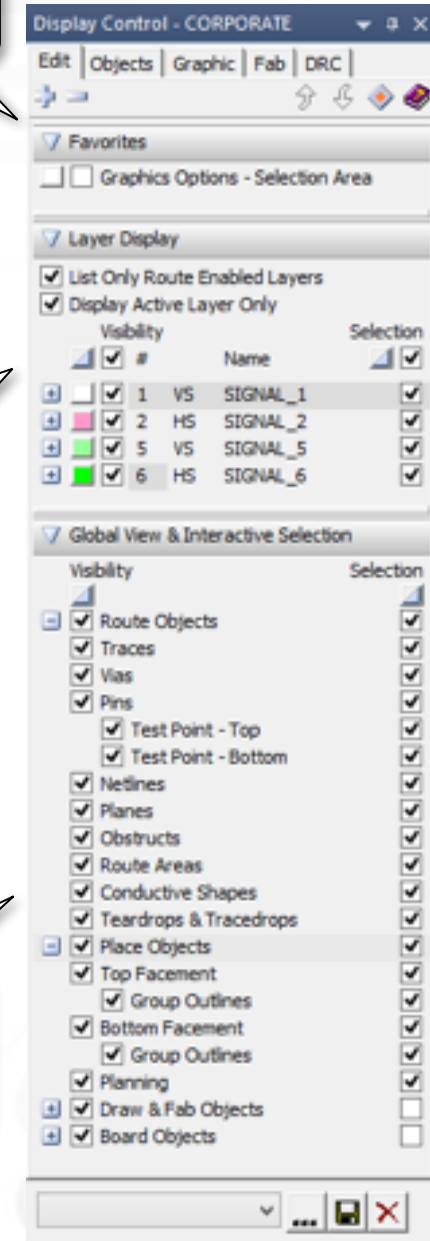
Intuitive, personalized, productive

- ❑ Redesigned to take advantage of the new user configurable design environment (Select Mode)
- ❑ Schemes may now be saved including toolbars.
- ❑ Favorites added for ease of use.
- ❑ Objects may be hidden from view.

Favorites

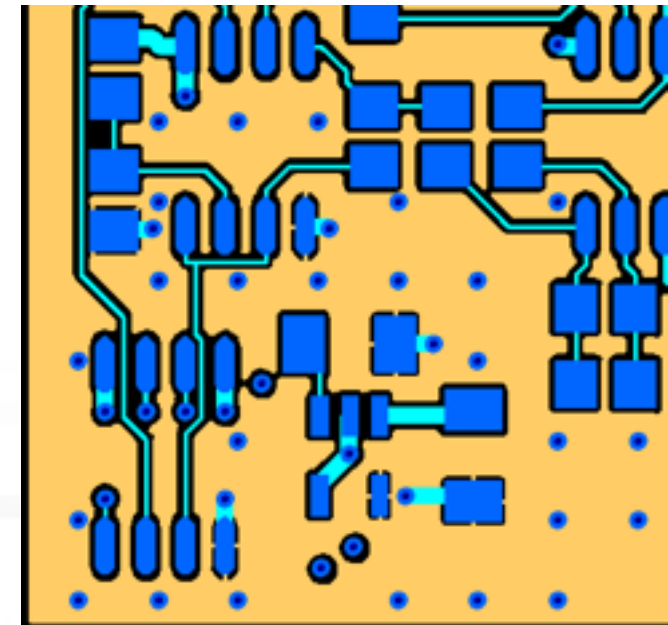
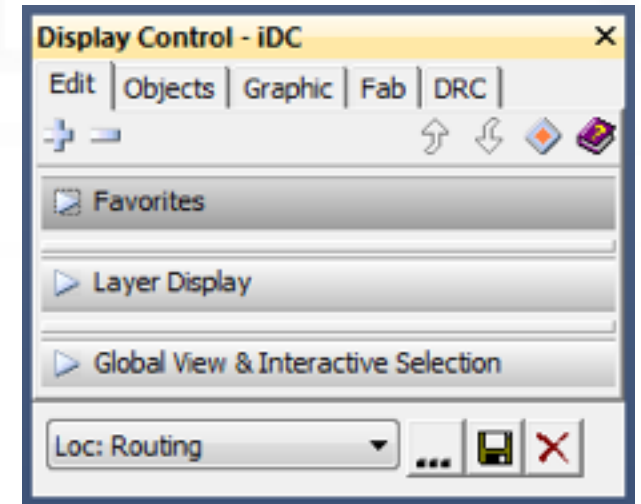
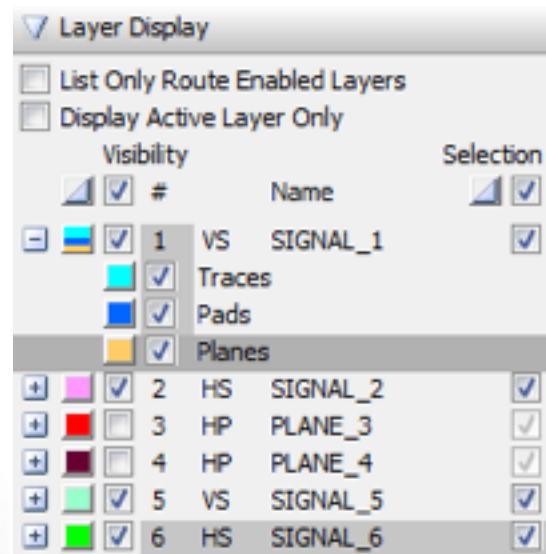
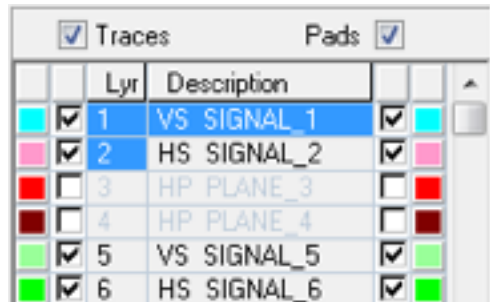
Improved layer control

Global view and selection control



xPCB Environment – Display Control

- ❑ New modified 'cleaner' look
- ❑ Re-organization of relevant display features
- ❑ Design and Graphic controls have been re-organized to more intuitive locations

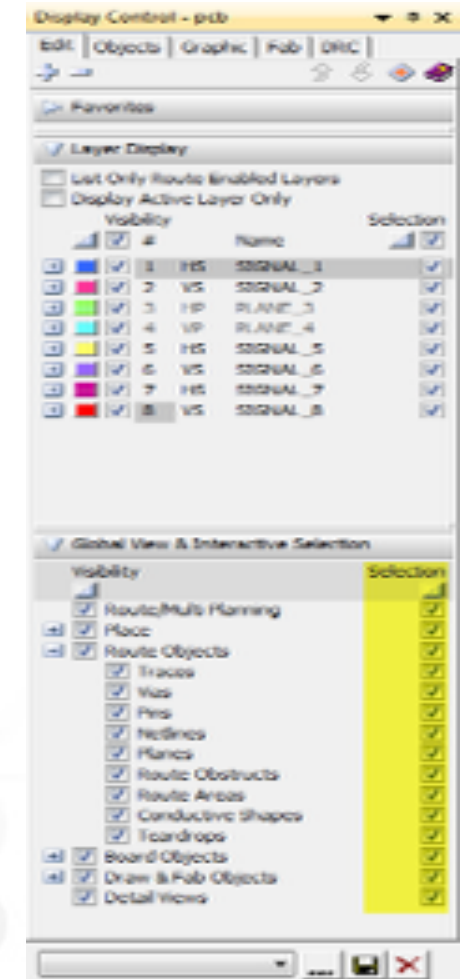


xPCB Environment – Select Mode



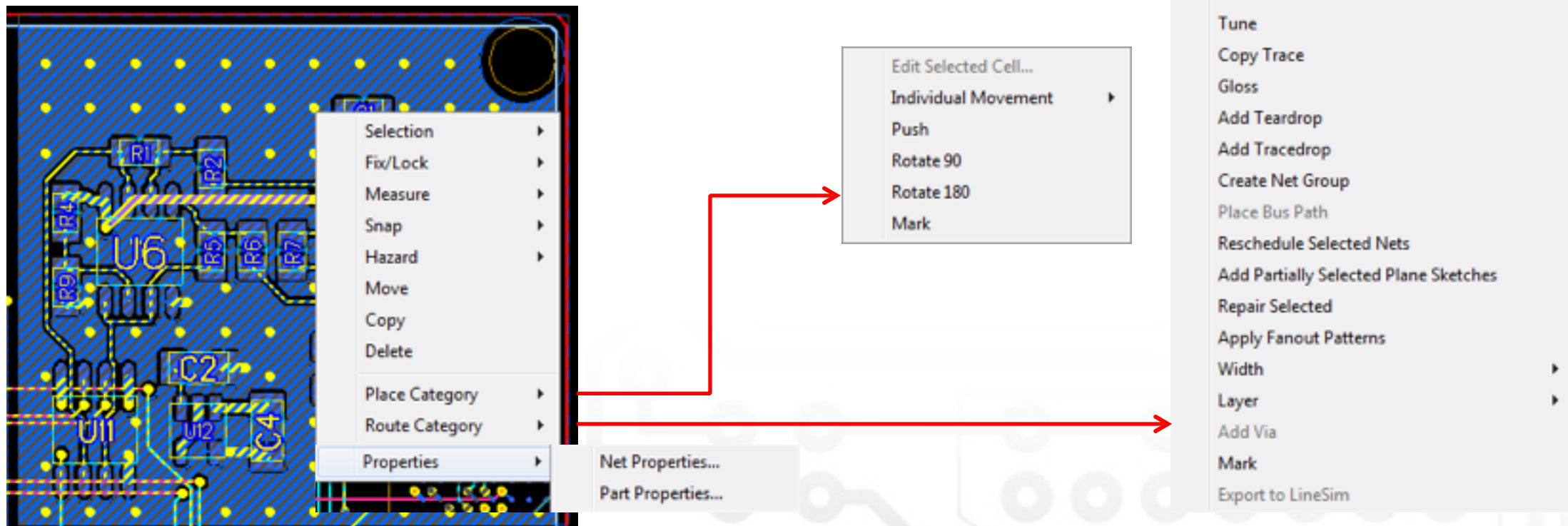
Selection Mode allows the designer to Place, Route and Draw without having to change modes

- ❑ Select Mode is driven by the Global View and Select section in the new Display Control dialog.
- ❑ Visibility and selectivity may now be user controlled.



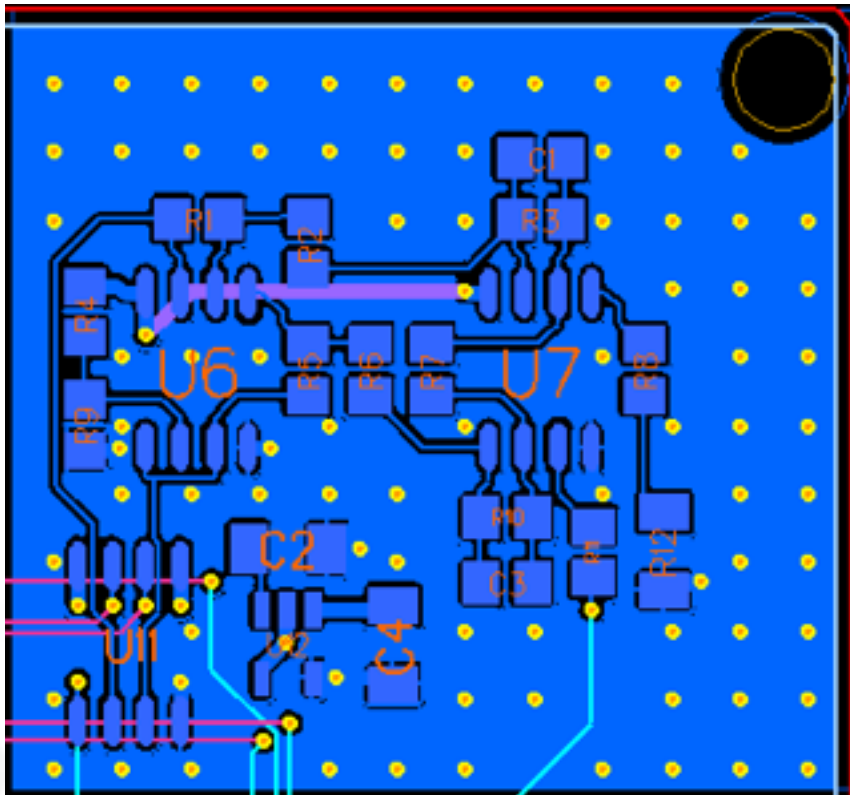
xPCB Layout Environment – Select Mode

- ❑ Selection Mode provides the ability to select multiple object types in a single selection
- ❑ The RMB context menus have been updated to be context sensitive depending on the object types you have selected.



xPCB Environment – Select Mode

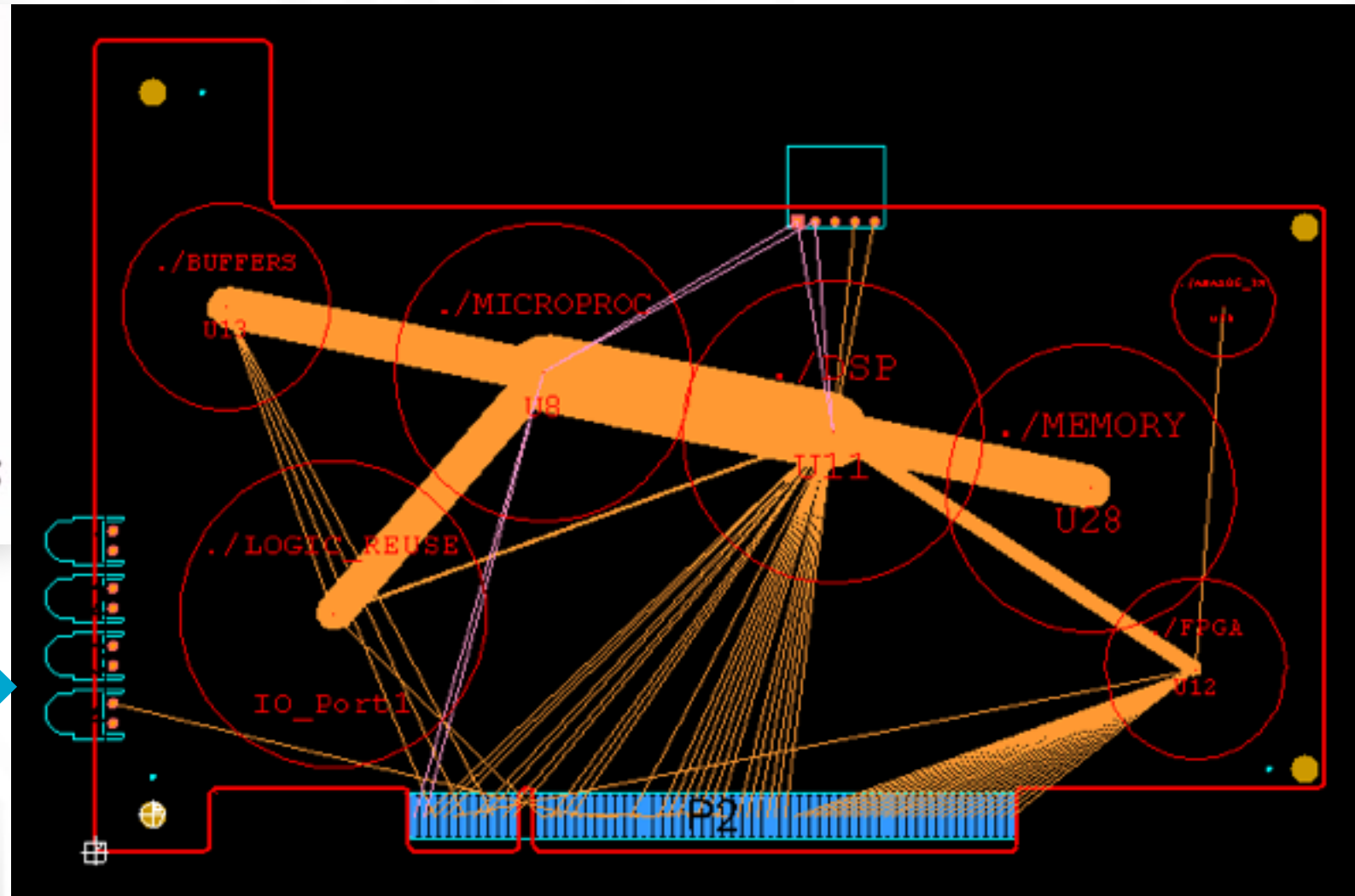
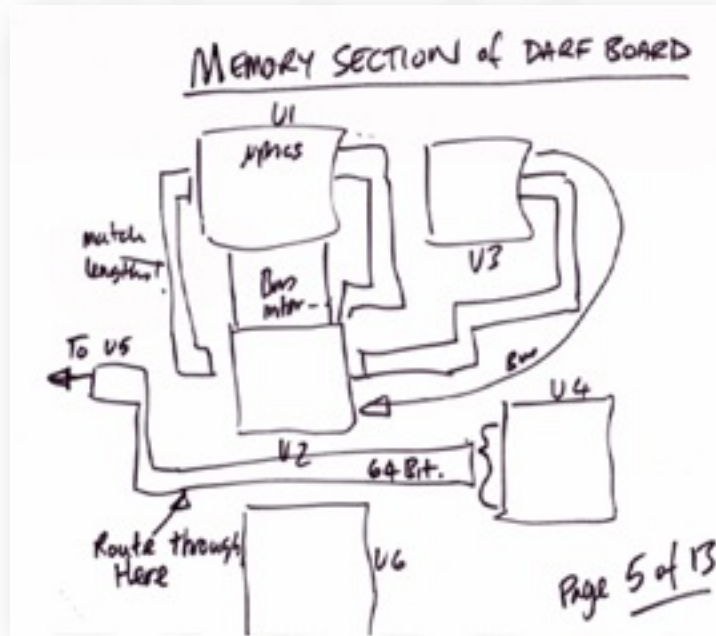
- ❑ The Selection List provides the user with the ability to manage the selected design objects



Selection List							
Object	Name	Description	Net Name	Net Class	Layer	Length (th)	Width (th)
Part	R12	102-RES - CC1206	\$10N6, GND	PWR_020_MIL	1	70.866	165.354
Part	U6	519-AD8639_IC - SO8	\$1N468, \$1N514, \$1N51	PWR_020_MIL	1	190	300
Part	U7	519-AD8639_IC - SO8	\$1N479, \$1N481, \$1N48	PWR_020_MIL	1	190	300
Part	U11	521-5V_IC - SO8NB	AD_CS1, Amp_Out, CKE	CLOCKS, PWR	1	190	300
Part	U12	520-LP2985_IC - SOT2	GND, LP2985_BYPASS	PWR_020_MIL	1	125	150
Trace		<3,917.42, 2,199.689>	SDA0	(Default)	2	1,097.891	5
Trace		<3,924.669, 2,217.189>	CKE0	CLOCKS	2	1,023.142	6
Trace		<4,597.5, 2,275>	<5,07> TXMEM	(Default)	2	472.5	5
Trace		<4,677.31, 2,045>	<5,1> STRBMEM	(Default)	2	467.69	5
Trace		<4,708.688, 2,070>	<5> D1MEM	(Default)	2	476.312	5
Trace		<4,875, 1,745>	<4,875> AD_CS1	(Default)	5	385	5
Trace		<4,975, 2,075>	<4,975> AD_CS1	(Default)	1	60	5
Total Items: 177. Selected: 1							
<div>Fit View</div> <div>Blink It</div> <div>Define Sort Order</div> <div>Remove from Selection</div>							

Environment Short Demonstration

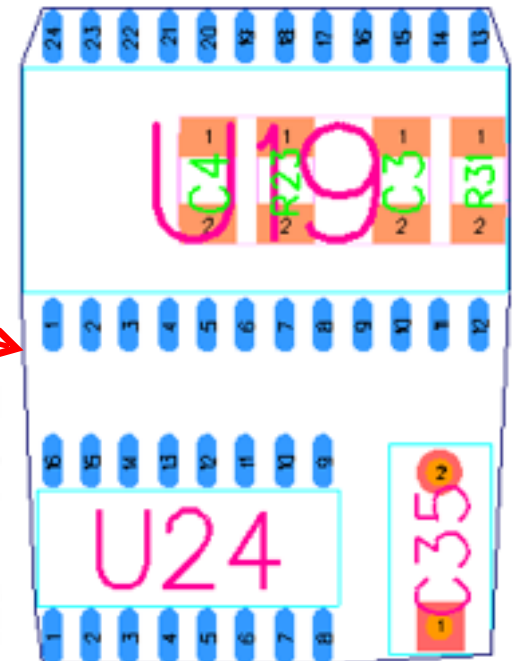
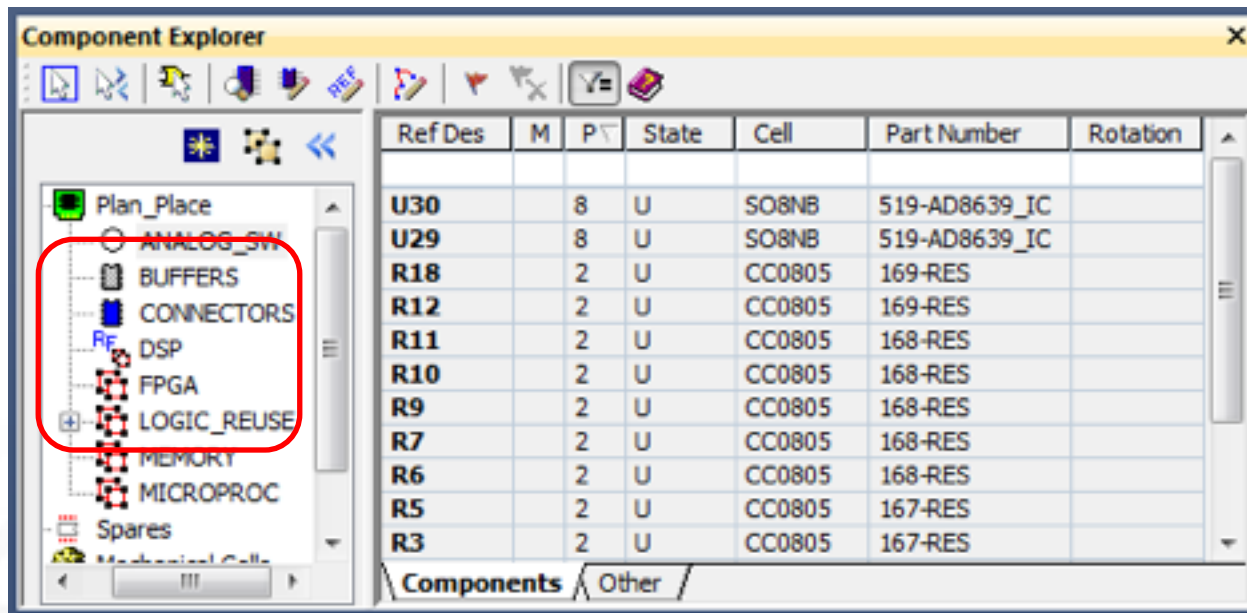
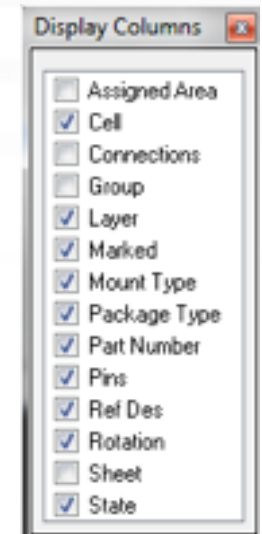
Planning and Placement - Improved Methodology



Planning & Placement – Component Explorer

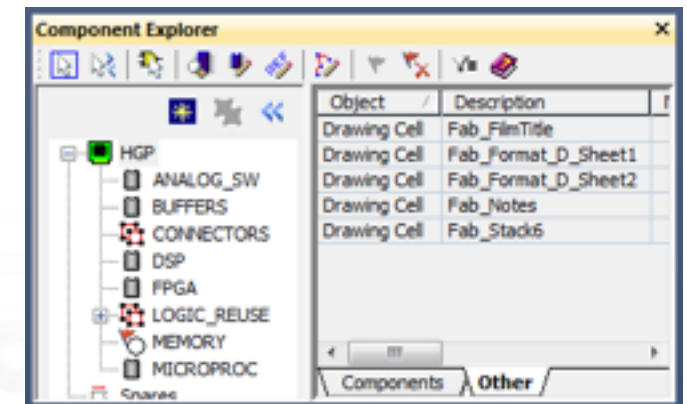
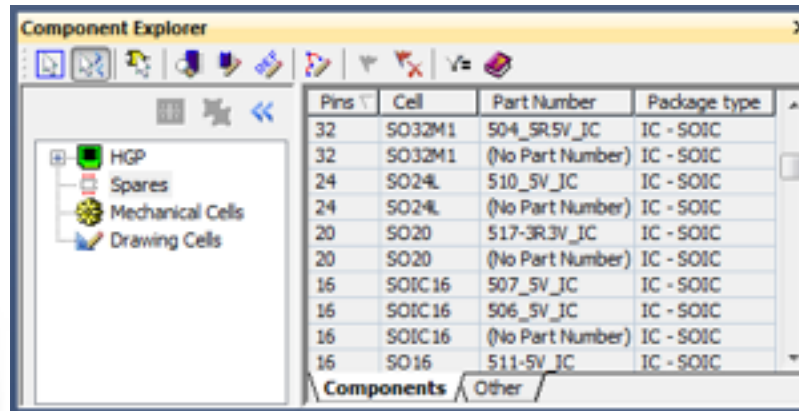
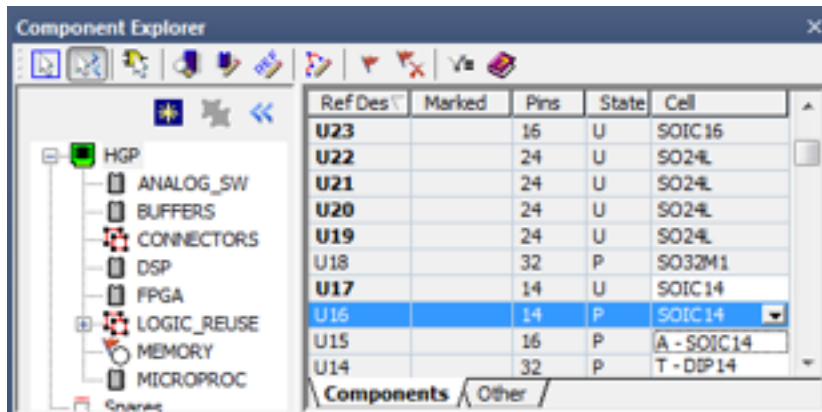
User interface drives all planning and placement

- ❑ Collaboration between schematic and layout
- ❑ Spreadsheet personalization
- ❑ Drag and Drop management of individual parts or groups



Planning & Placement – Component Explorer

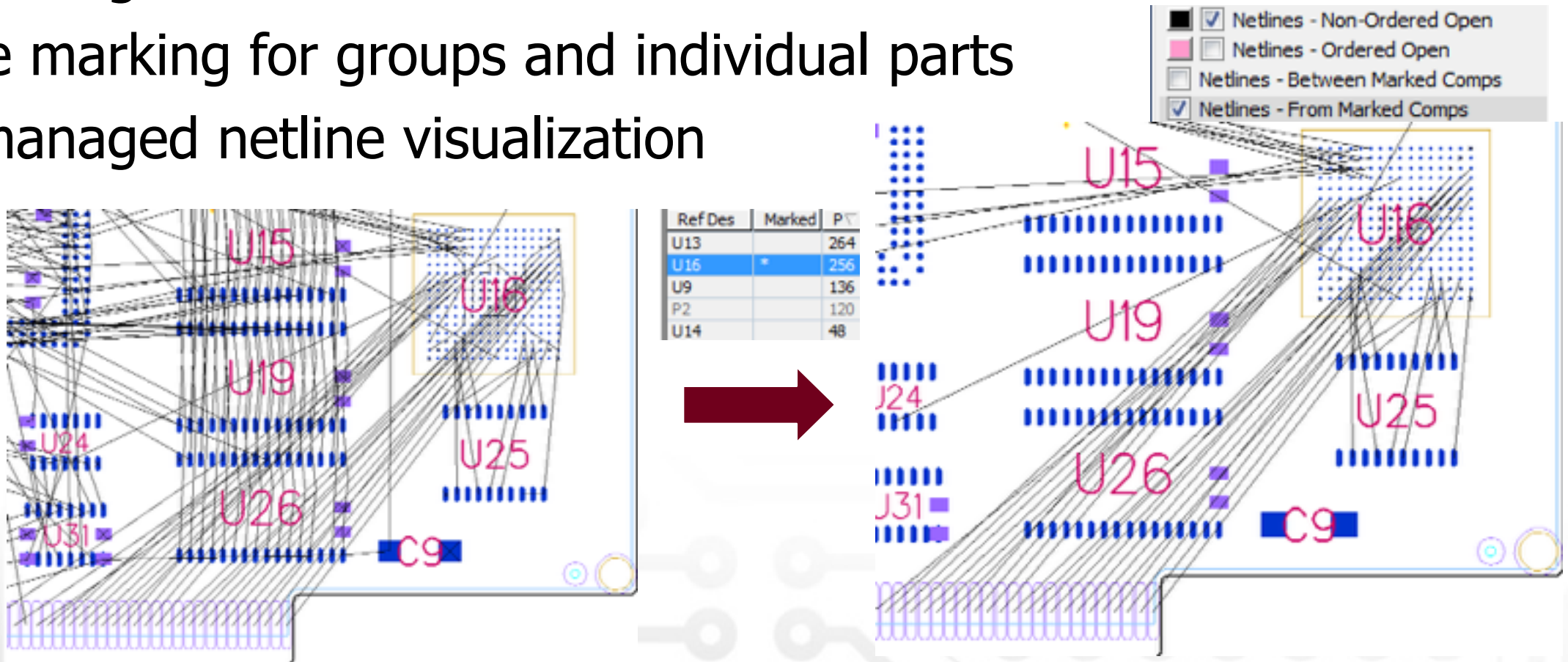
- ❑ Alternate footprints
- ❑ Access spares, mechanical parts and drawings



Netline Visibility – Component Explorer

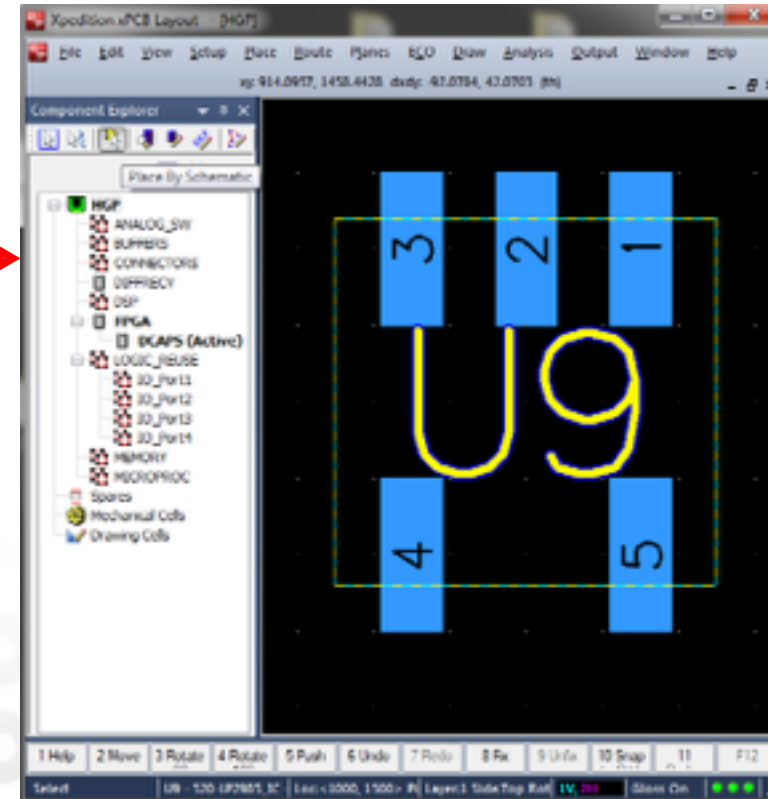
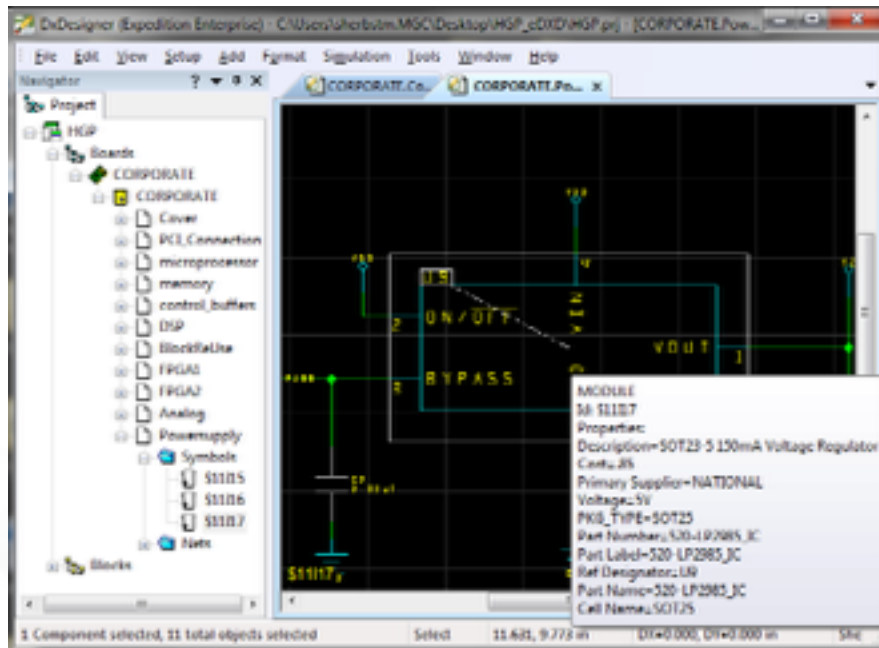
Enhanced visibility control to speed the placement process

- ❑ User managed netline visualization
- ❑ Netline marking for groups and individual parts
- ❑ User managed netline visualization



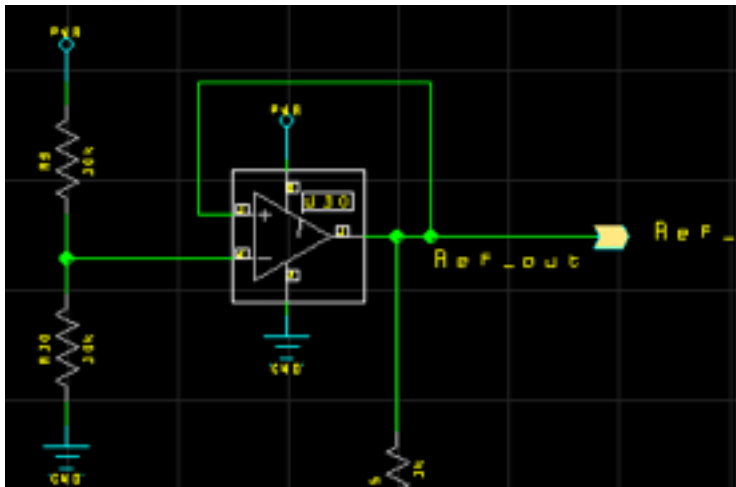
Crossprobing - Component Explorer

- ❑ Place by Schematic and Cross probing
- ❑ Options from within the Explorer interface
- ❑ From schematic or embedded view

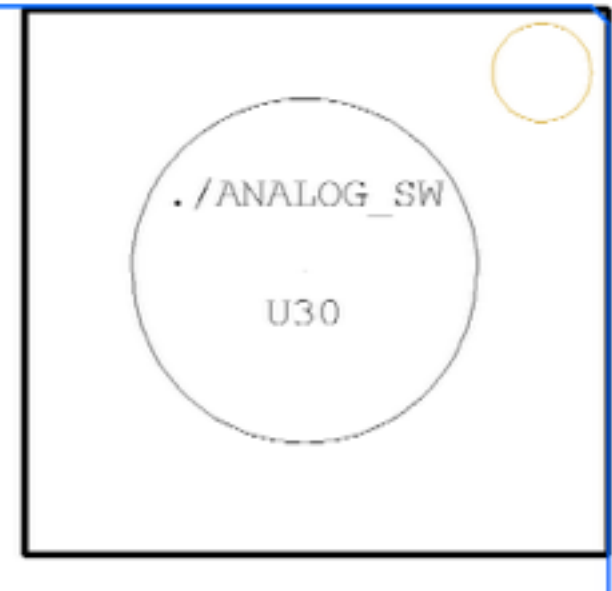
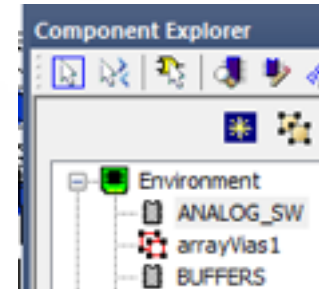


Engineering Intent – Component Explorer

❏ Clusters and Rooms



<input type="checkbox"/> Cell Name	SO8NB
<input checked="" type="checkbox"/> Cluster	ANALOG_SW
<input type="checkbox"/> Level	STD
<input type="checkbox"/> Model	AD8638
<input type="checkbox"/> PARTS	2
<input type="checkbox"/> PKG_TYPE	SO8NB
<input type="checkbox"/> Part Number	519-AD8639_IC
<input type="checkbox"/> Ref Designator	U30
<input checked="" type="checkbox"/> Room	ANA
<input type="checkbox"/> SIM_MODEL	
<input type="checkbox"/> SIM_MODEL_FILE	



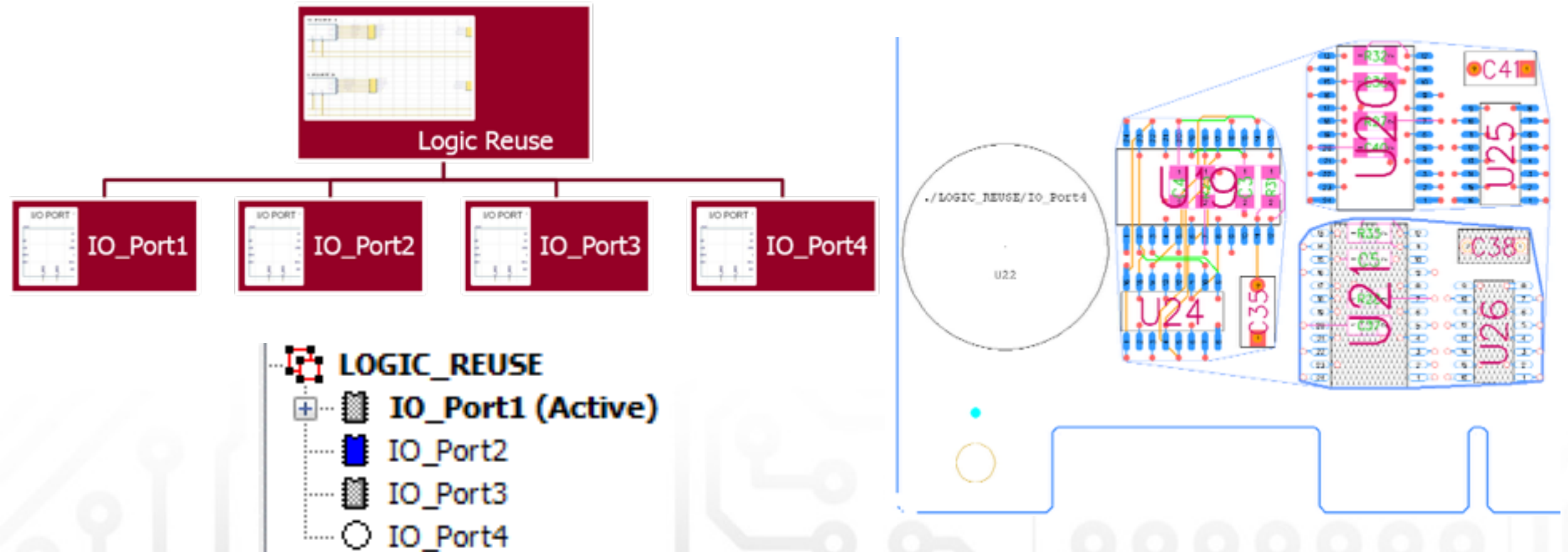
A screenshot of the 'Component Explorer' window showing a table of components. The table has the following columns: Ref Des, Marked, Cell, Part Number, Group, and Assigned Area.

Ref Des	Marked	Cell	Part Number	Group	Assigned Area
R1		CC0805	167-RES	.ANALOG_SW	RM - ANALOG
R2		CC0805	168-RES	.ANALOG_SW	RM - ANALOG
R3		CC0805	167-RES	.ANALOG_SW	RM - ANALOG
R4		CC0805	168-RES	.ANALOG_SW	RM - ANALOG
R5		CC0805	167-RES	.ANALOG_SW	RM - ANALOG
R6		CC0805	168-RES	.ANALOG_SW	RM - ANALOG
R7		CC0805	168-RES	.ANALOG_SW	RM - ANALOG
R8		CC0805	169-RES	.ANALOG_SW	RM - ANALOG
R9		CC0805	168-RES	.ANALOG_SW	RM - ANALOG
R10		CC0805	167-RES	.ANALOG_SW	RM - ANALOG
R11		CC0805	169-RES	.ANALOG_SW	RM - ANALOG
R12		CC1206	102-RES	.ANALOG_SW	RM - ANALOG



Hierarchical Group Placement – Component Explorer

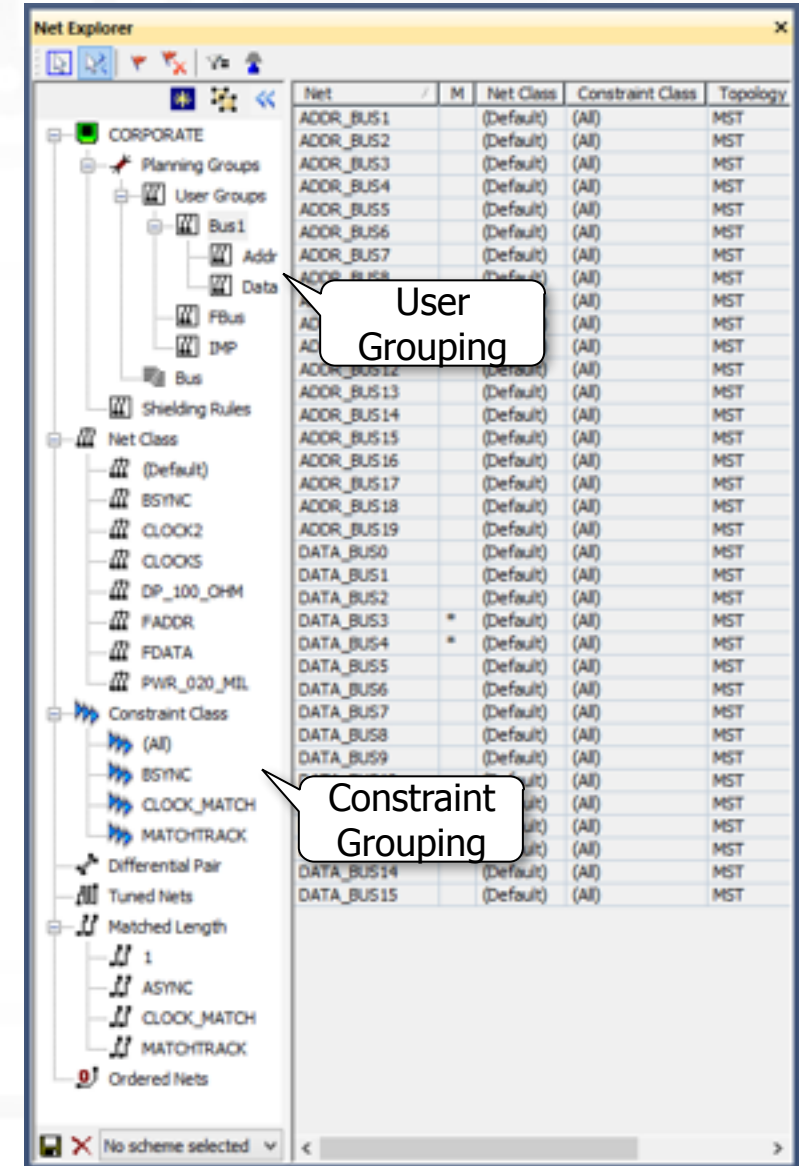
- ❑ Full Copy, Move circuit capability for hierarchical groups



Plan & Placement Short Demonstration

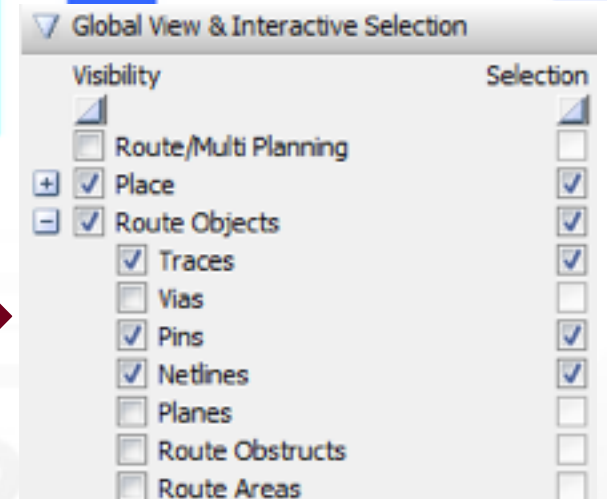
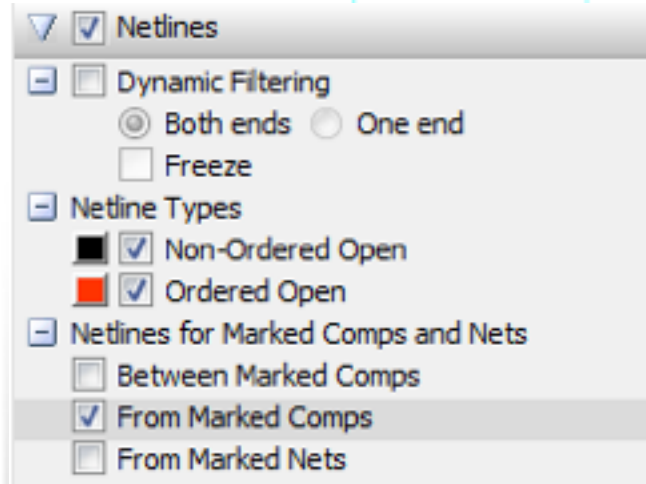
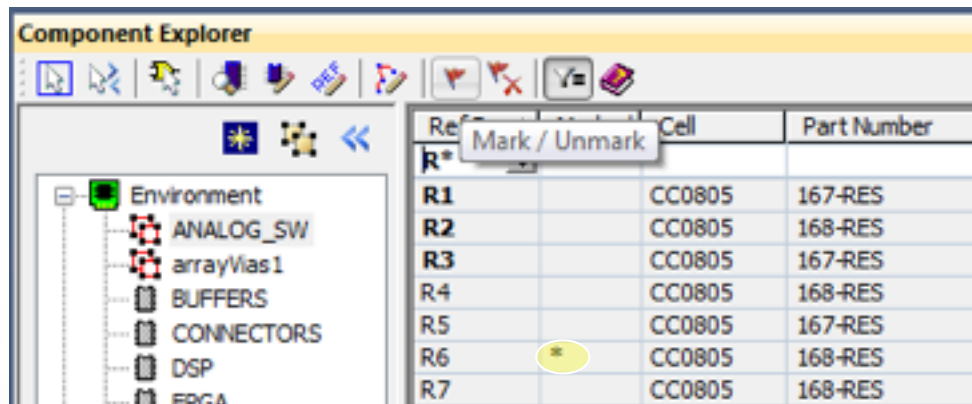
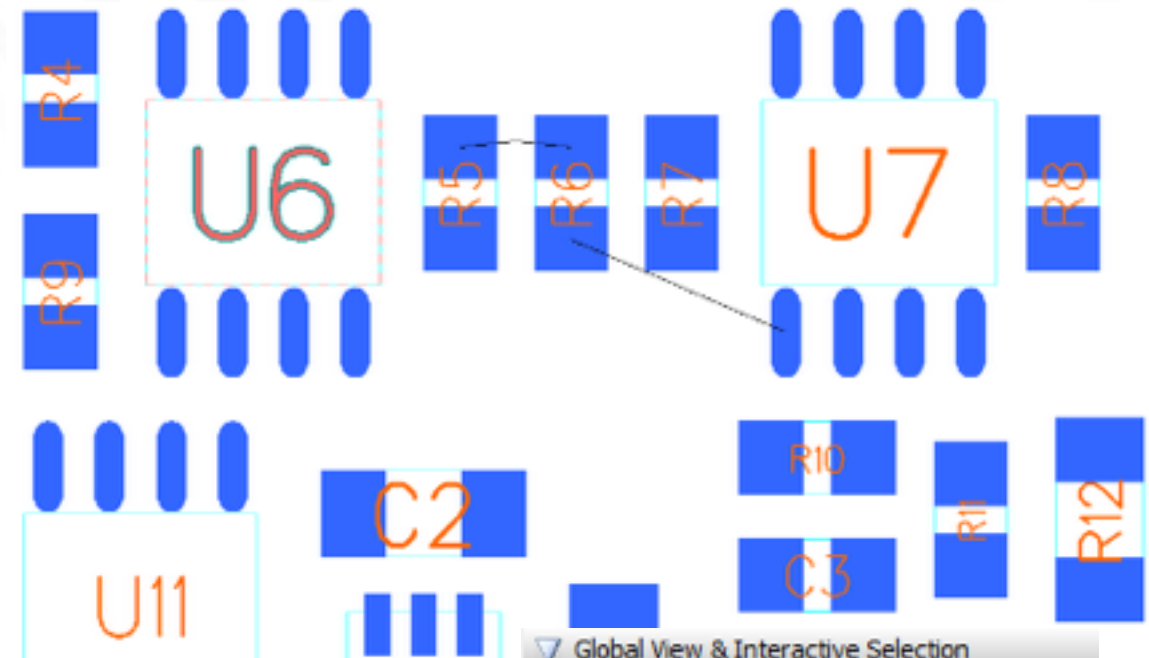
Net Explorer

- ❑ **Net Explorer** allows a designer to get quick access to the engineer's intent via constraint grouping as well as designer based Groupings of nets to help organize planning strategies
 - **Navigator** view allows the creation and management of user groups as well as showing nets organized by constraints
 - **List** view displays all nets based on selected user or constraint grouping
 - Full cross probing between GUI and/or graphics
 - Support for Net and Group Marking used for additional netline visibility control



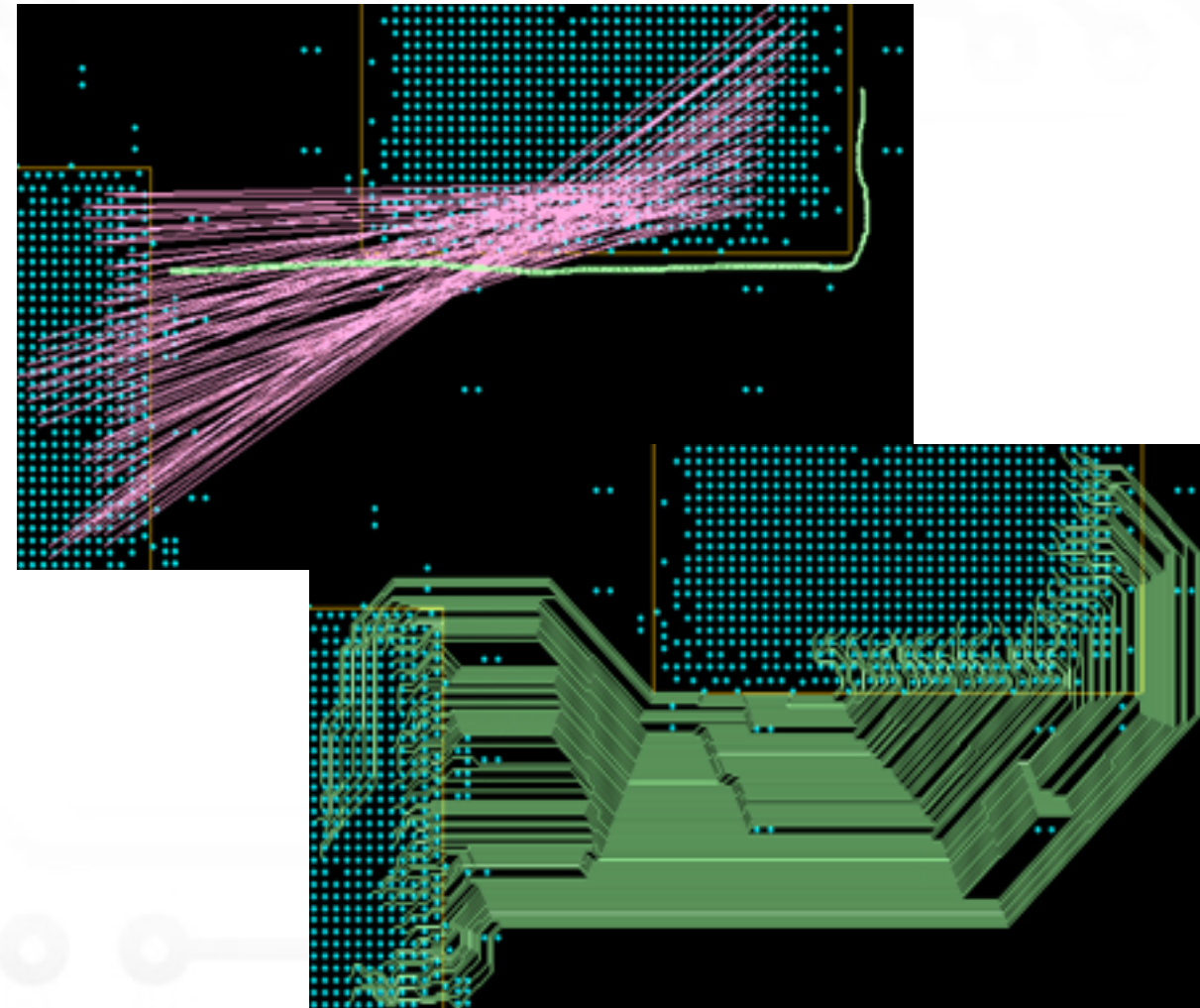
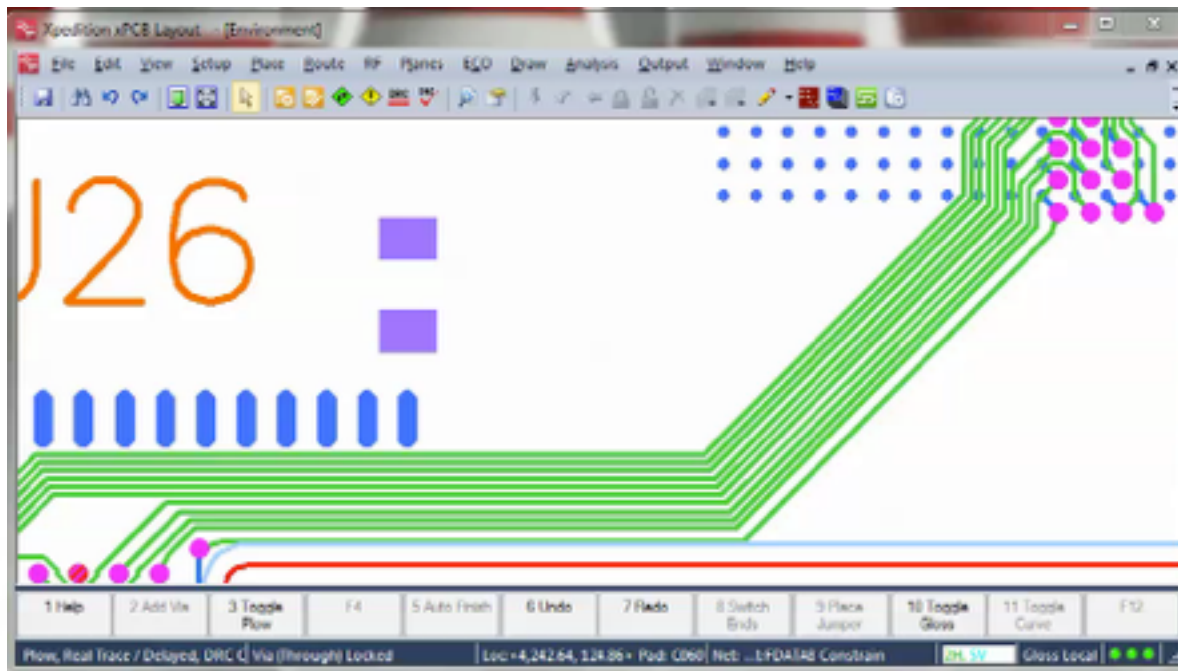
Netline Visibility – Net Explorer

- Netlines are now selectable design objects.
- Visibility and Selection are controlled through the GV&S tab in the new display control dialog.



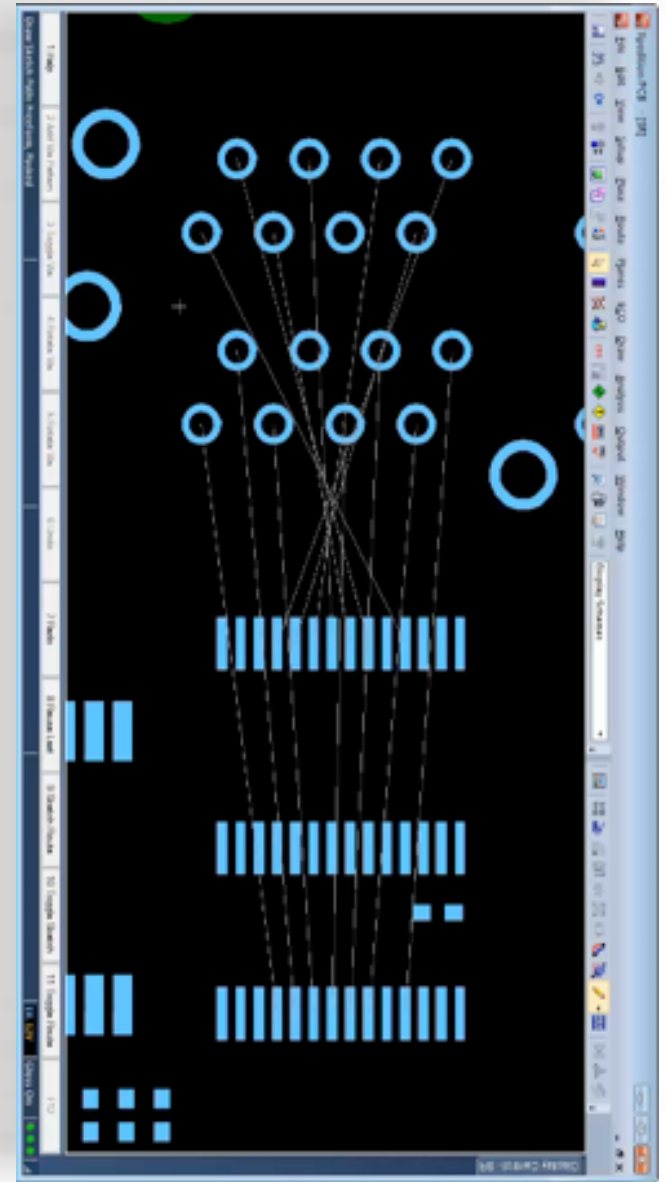
Xpedition Routing Automation

- ❑ Sketch Router / Hug Router
- ❑ Real Trace Plow



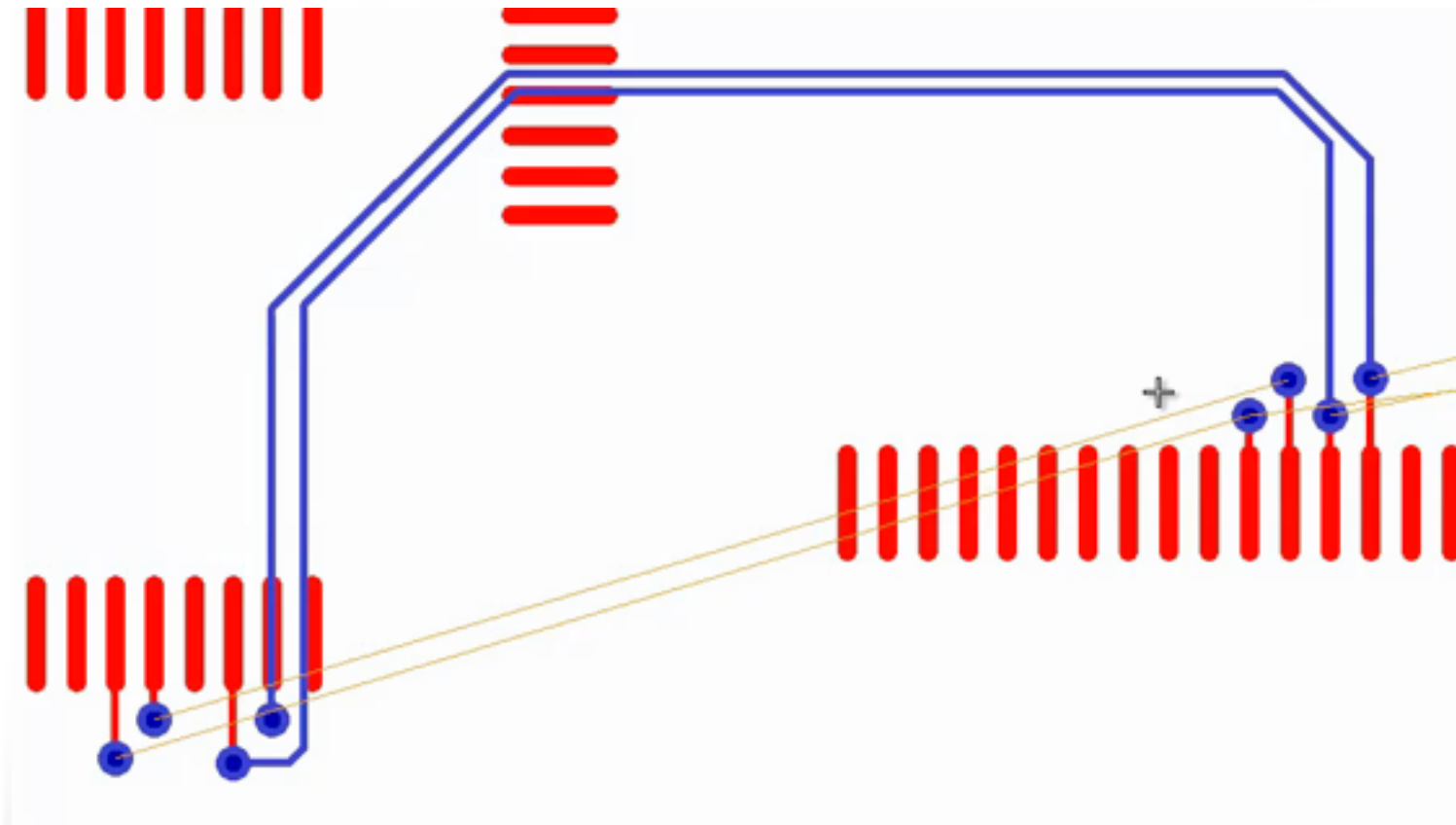
Xpedition Routing Automation - Sketch Router

- ❑ Select Netlines, Draw path, Route!
- ❑ Select Netlines, Route!
- ❑ Draw path, auto select netlines Route!
- ❑ Select netlines or pads or vias or traces
- ❑ Free form or Angled path options

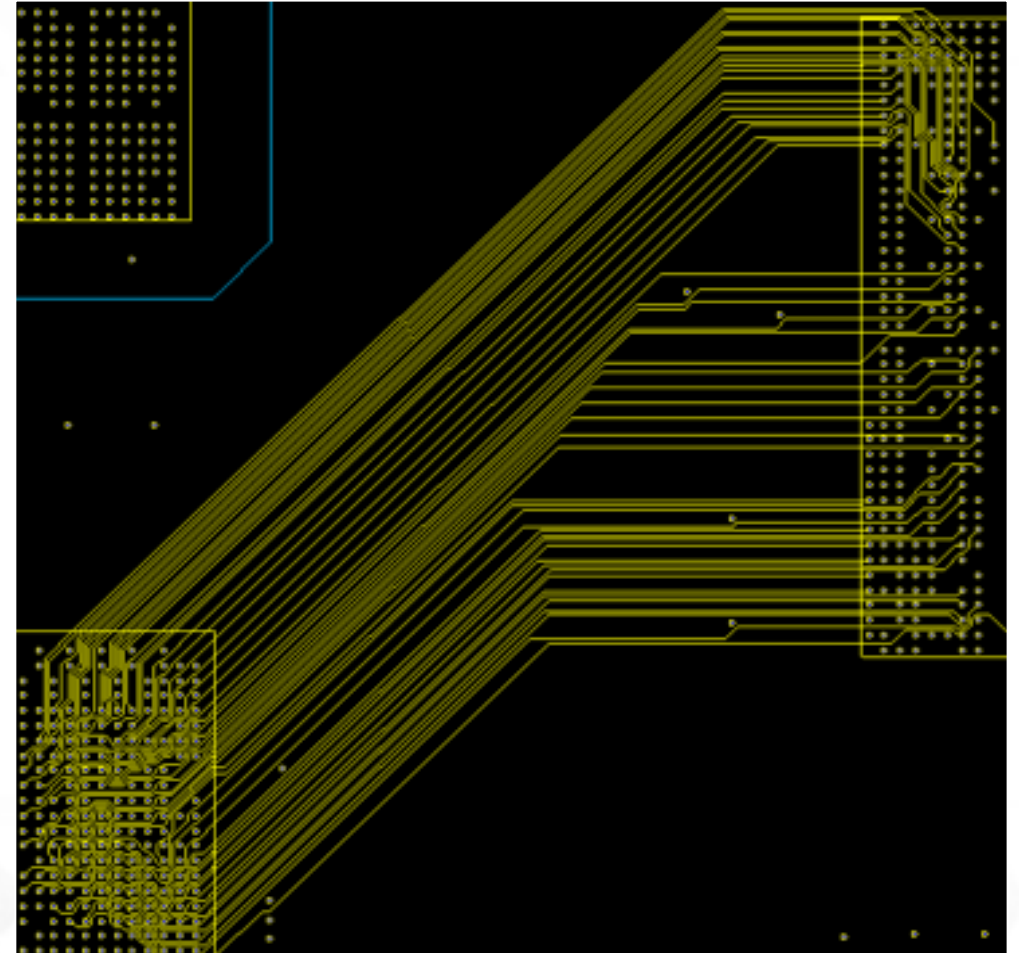
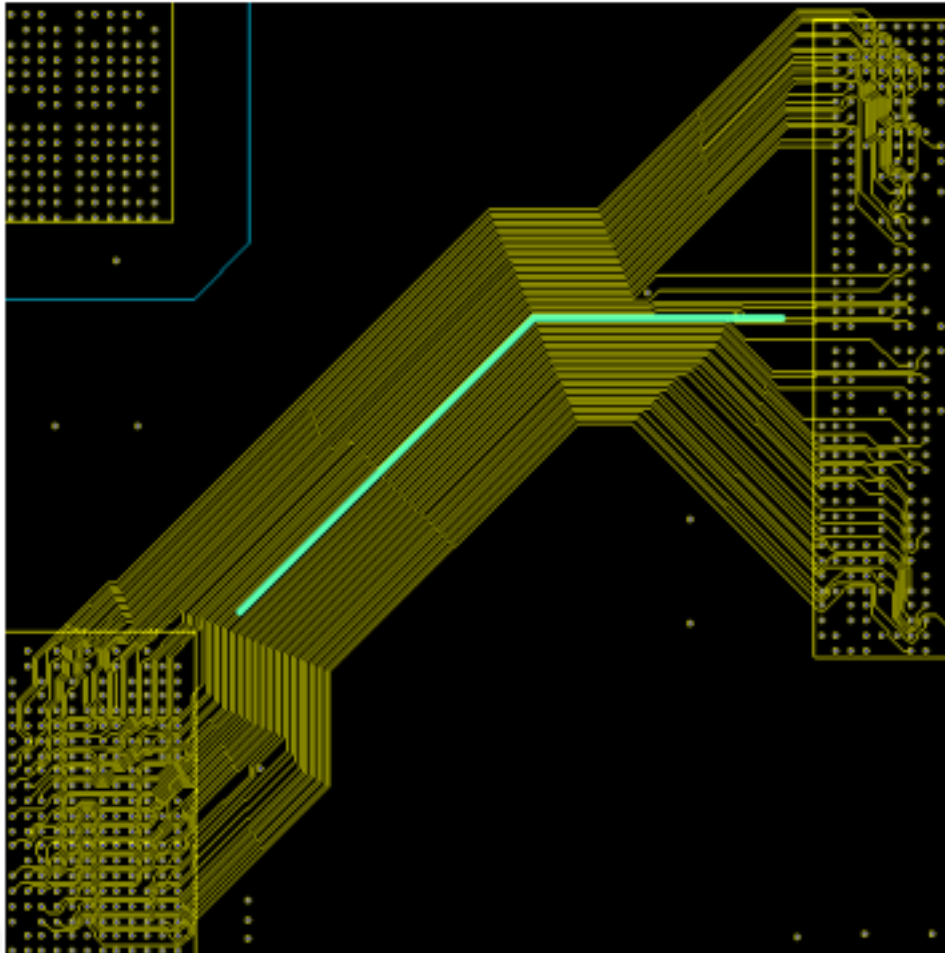


Xpediton Routing Automation - Hug Router

- ❑ Supplements Sketch Router
- ❑ Hugs Existing routes
- ❑ Free to use any allowable layer and vias.



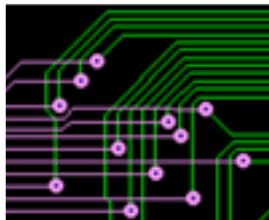
Sketch - Packed / Unpacked



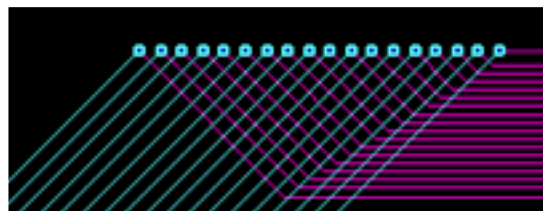
Sketch - Via Patterns

❑ Automatic – Software chooses

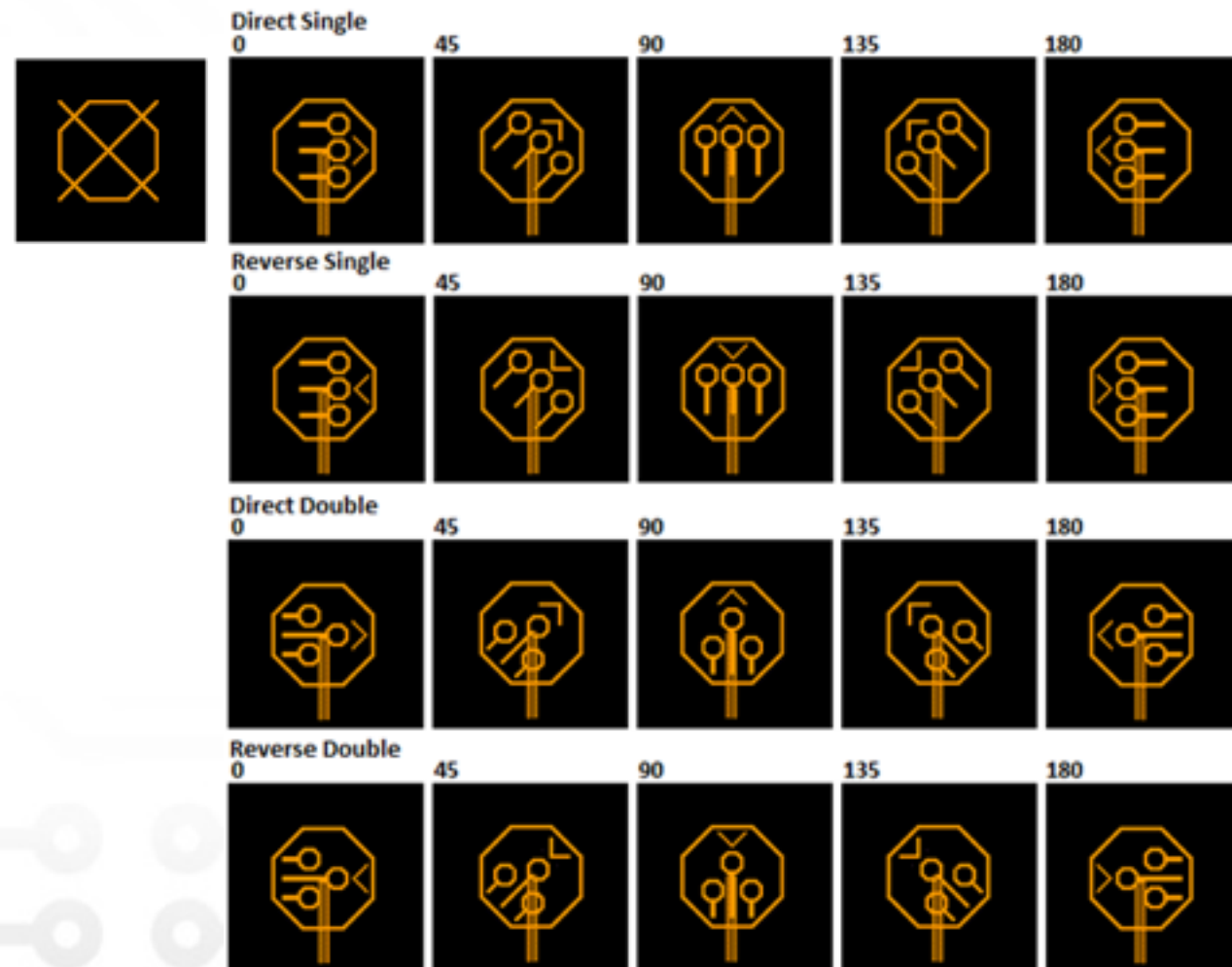
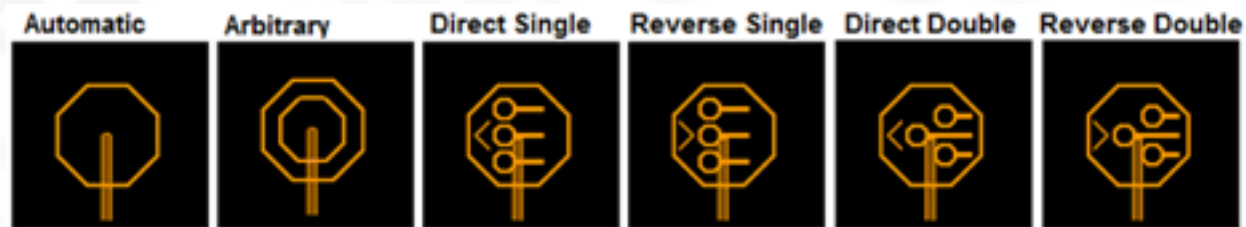
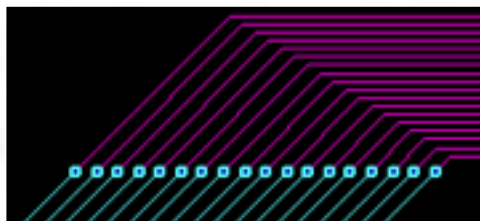
❑ Arbitrary



❑ Direct / Reverse

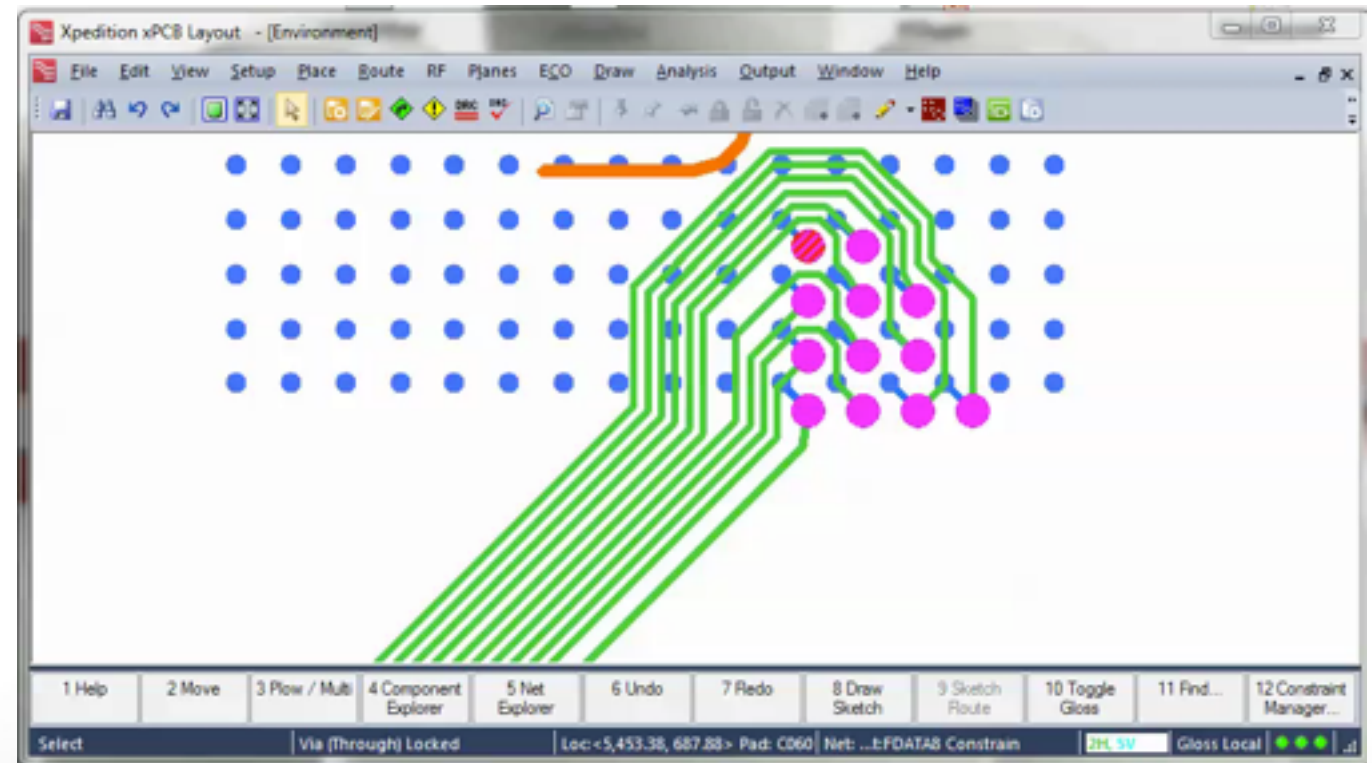


❑ Single / Double



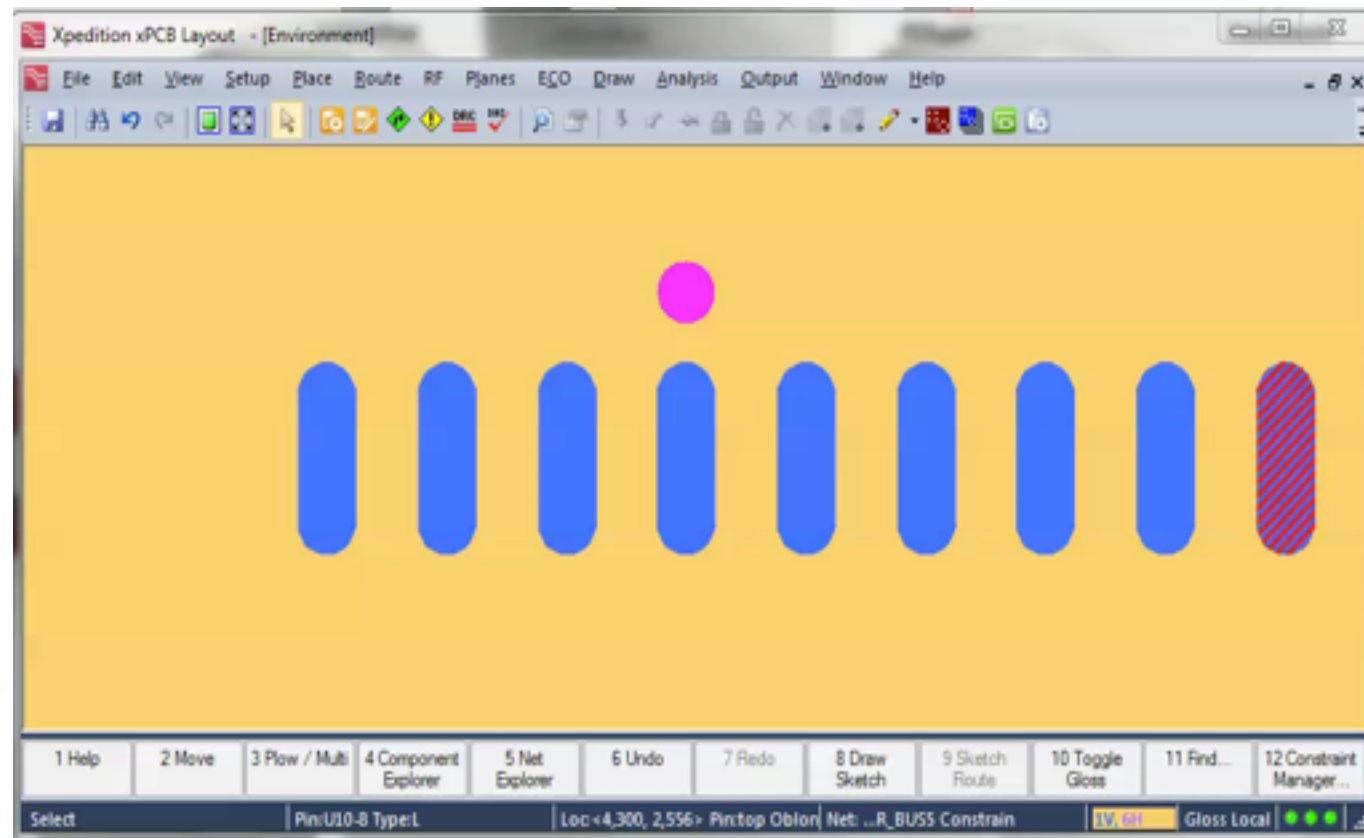
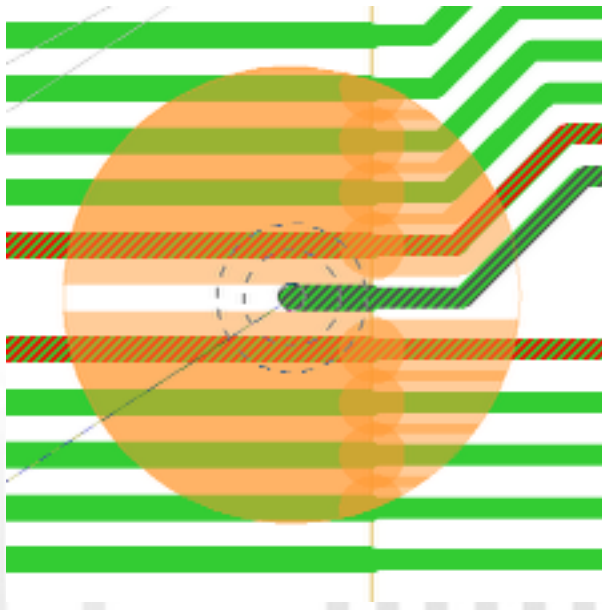
Xpediton Routing Automation - Real Trace Plow

- ❑ Improved interactive routing
- ❑ Reduced mouse clicks
- ❑ Higher quality
- ❑ Delayed / Dynamic Push Shove



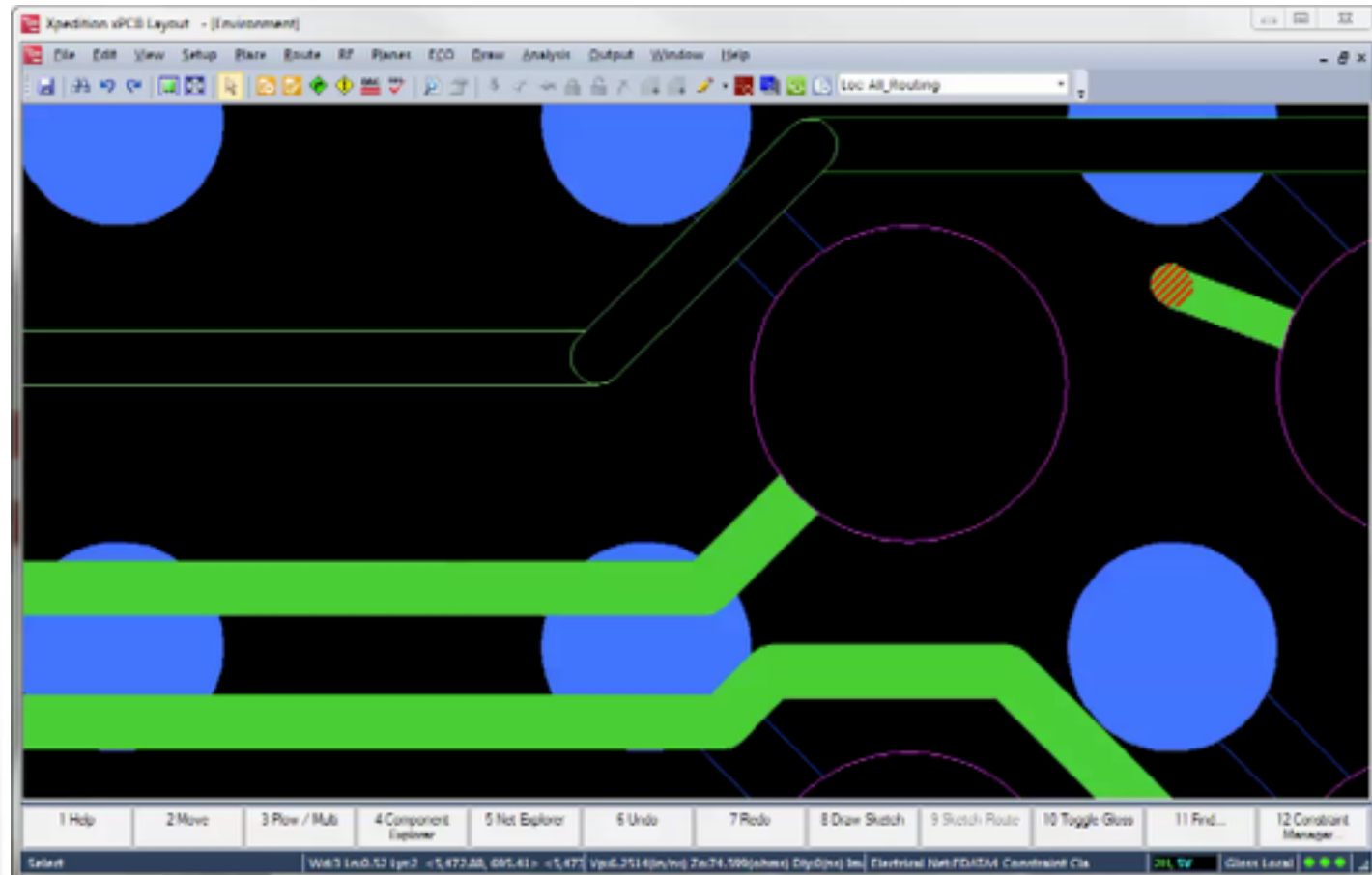
Xpedition Routing Automation – Active Clearances

- ❑ Displays clearance information in real time during plow
- ❑ Adjustable size and color
- ❑ Toggle on / off with RMB
- ❑ Delayed/Dynamic Push Shove

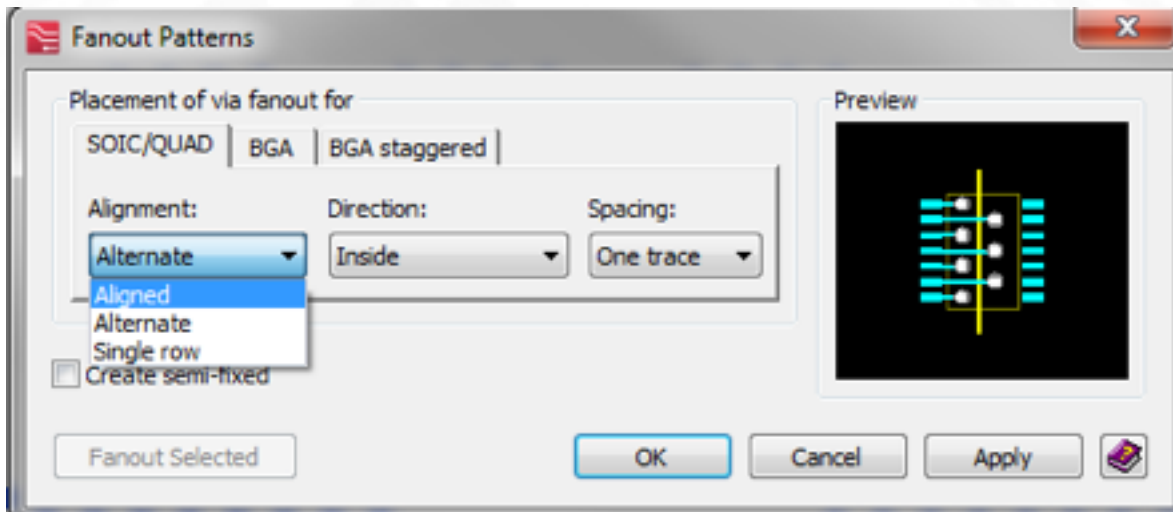


Xpedition Routing Automation – Prohibit Violations

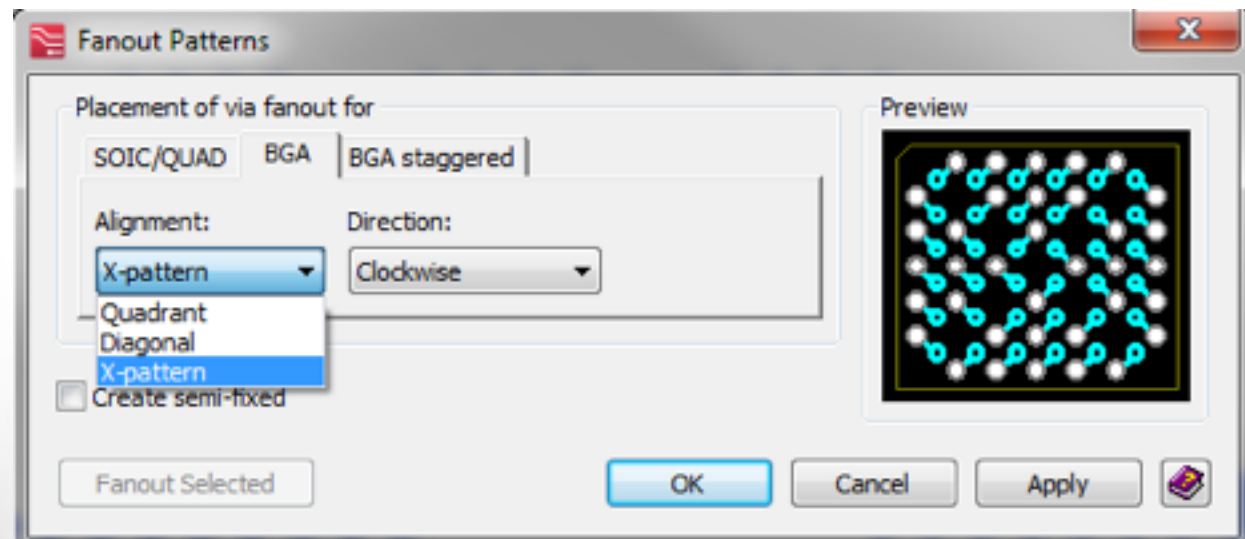
- ❑ Context Sensitive Online DRC
- ❑ Affects only the area surrounding real trace plow
- ❑ Toggle on / off with RMB



Xpedition Routing Automation - Fanout Patterns



- ❑ Multiple Pattern Types
- ❑ Apply to selected footprints
- ❑ Follows Net Class rules



Xpedition Routing Automation - Tuning Patterns

- ❑ New Sawtooth Tuning
- ❑ Handles Diff Pair Tolerance
- ❑ Automatic Phase matching



Differential Pair Tol		Differential Pair Phase Tol		
Max (th) (ns)	Actual (th) (ns)	Max (th)	Distance Max	Actual
		50	500	
		50	500	

Tuning Patterns

-Tuning pattern rules-

Minimum spacing: 10 (th)

Preferred minimum height: 10 (th)

Maximum height: 75 (th)

Miter ratio: $\frac{2 \cdot R}{\text{Width}} = 2$

Serpentine: ☒ Regular height ☐ Irregular height ☐ Prevent

Trombone: Prevent

Non-Serpentine: Prevent

☐ Use arcs ☐ Allow vias in any pattern ☒ Prevent stairsteps

-Diff pair balancing-

☒ Sawtooth tuning ☐ Uncoupled tuning

Sawtooth length: 3 X Trace width

Maximum sawtooth height: 2 X Spacing

-Tuning iterations-

Reduce length: Low Add length: Exhaustive

-AutoTune options-

Effort: ReTune Only Automatic urgency: + At End of Effort Interactive urgency: Off

Applies to both interactive and automatic tools.

OK Cancel Apply

Routing Short Demonstration

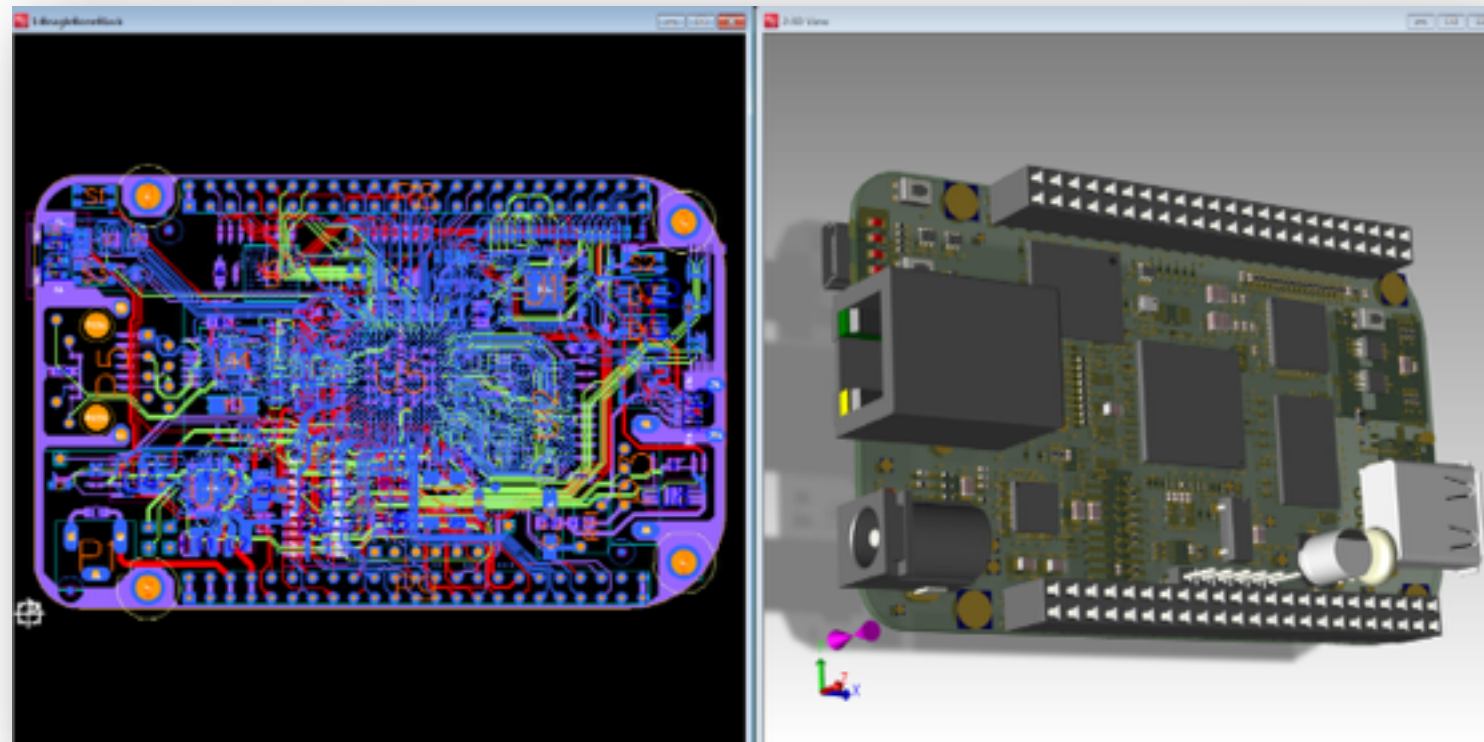
Why 3D In PCB Design?

- ❑ Reduces PCB ↔ MCAD design iterations
- ❑ Eliminates problems found late in a design cycle
- ❑ Improves collaboration via 3D visualization
- ❑ Enriches visualization for complicated structures

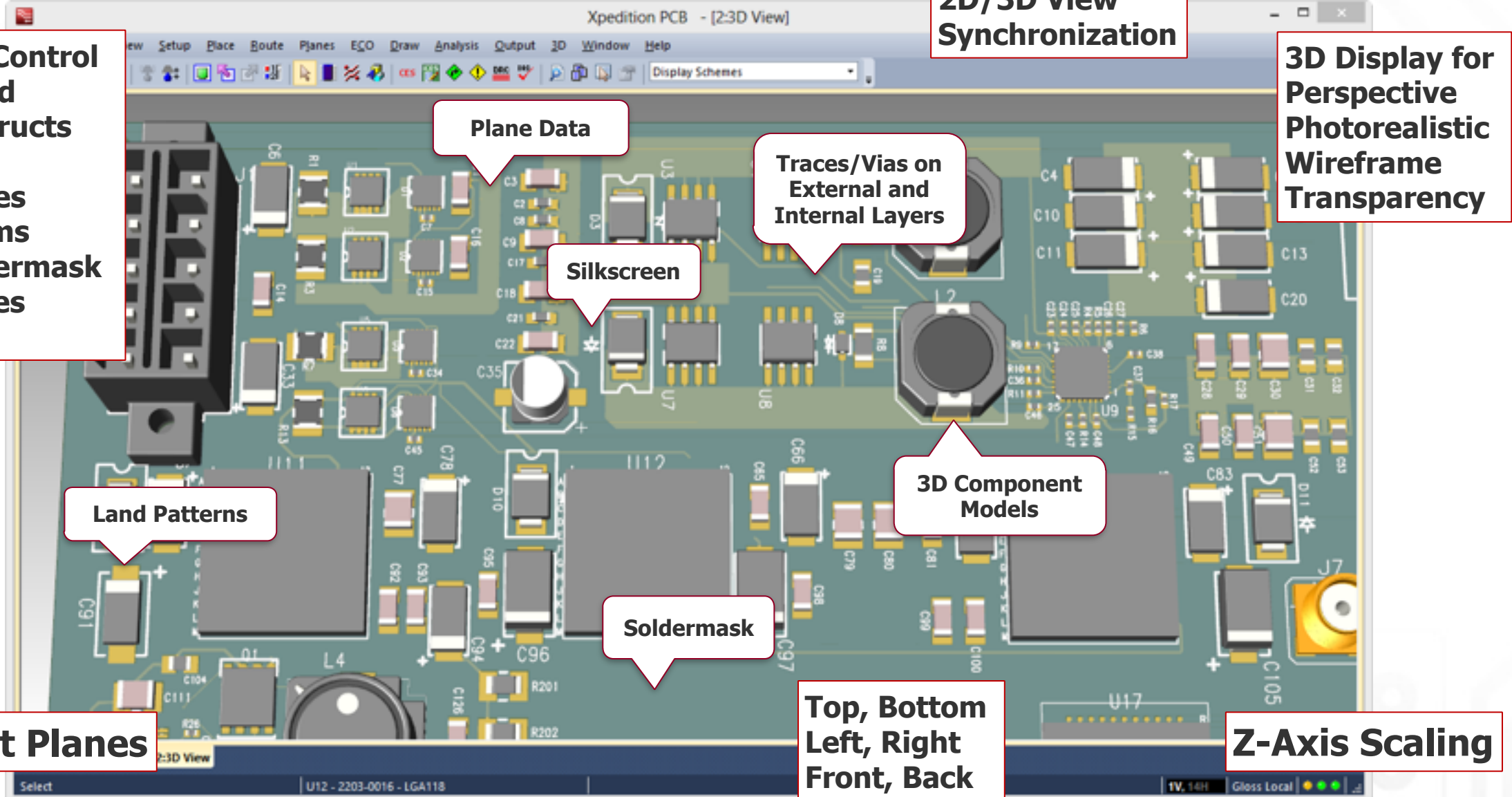


Introducing Xpedition 3D

- ❑ True parametric 3D mechanical kernel
- ❑ Enterprise library, design and mechanical support
- ❑ 3D model library with over 4.4M manufacturing parts
- ❑ Photorealistic visualisation
- ❑ 3D constraints with dynamic validation



Full 3D Photorealistic Realization



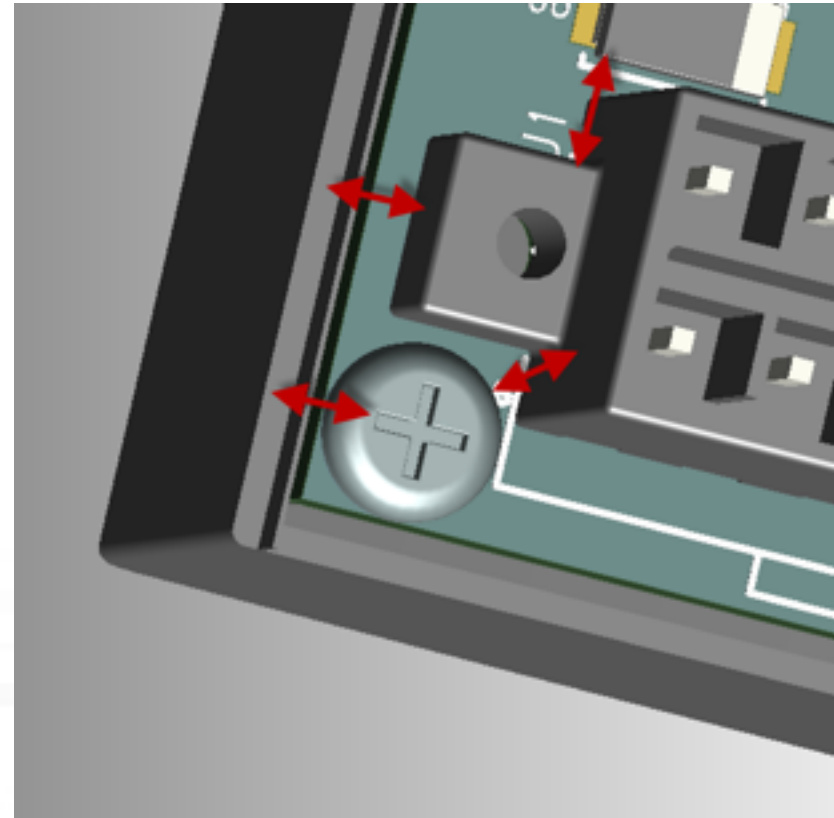
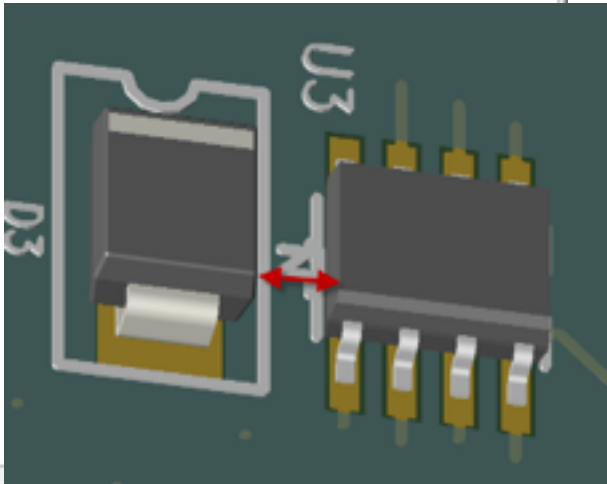
3D Constraint Management

3D Constraints

Constraints	Minimum XY (th)	Minimum Z (th)	Optimal XY (th)	Optimal Z (th)
Any to Any	5	2.5	10	5
Active Board to Assembly	0	0	0	0
Component to Mechanical	5	0	10	5
Component to PCB Assembly	25	25	25	25

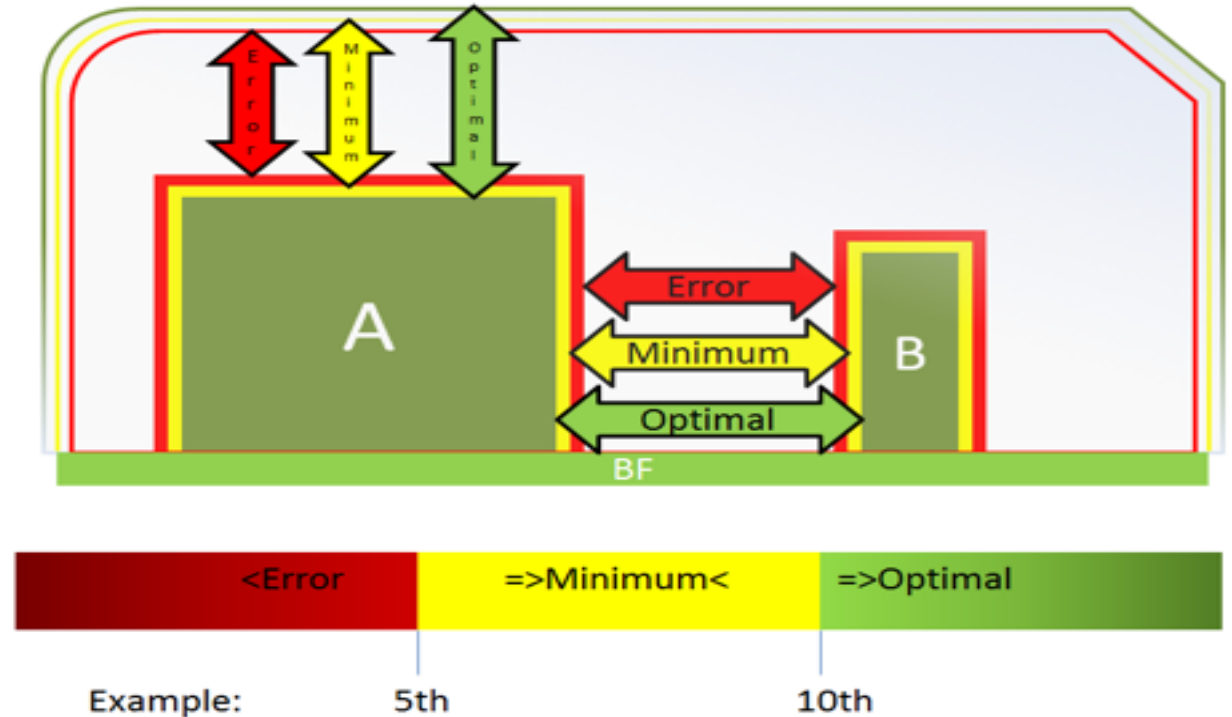
▶ Add Constraint...

- Bond Wire to Assembly
- Bond Wire to Board Edge
- Bond Wire to Component
- Bond Wire to PCB Assembly
- Component to Assembly
- Component to Board Edge
- Component to Component
- Mechanical to Assembly
- Mechanical to Mechanical
- Mechanical to PCB Assembly
- PCB Assembly to Assembly
- PCB Assembly to PCB Assembly

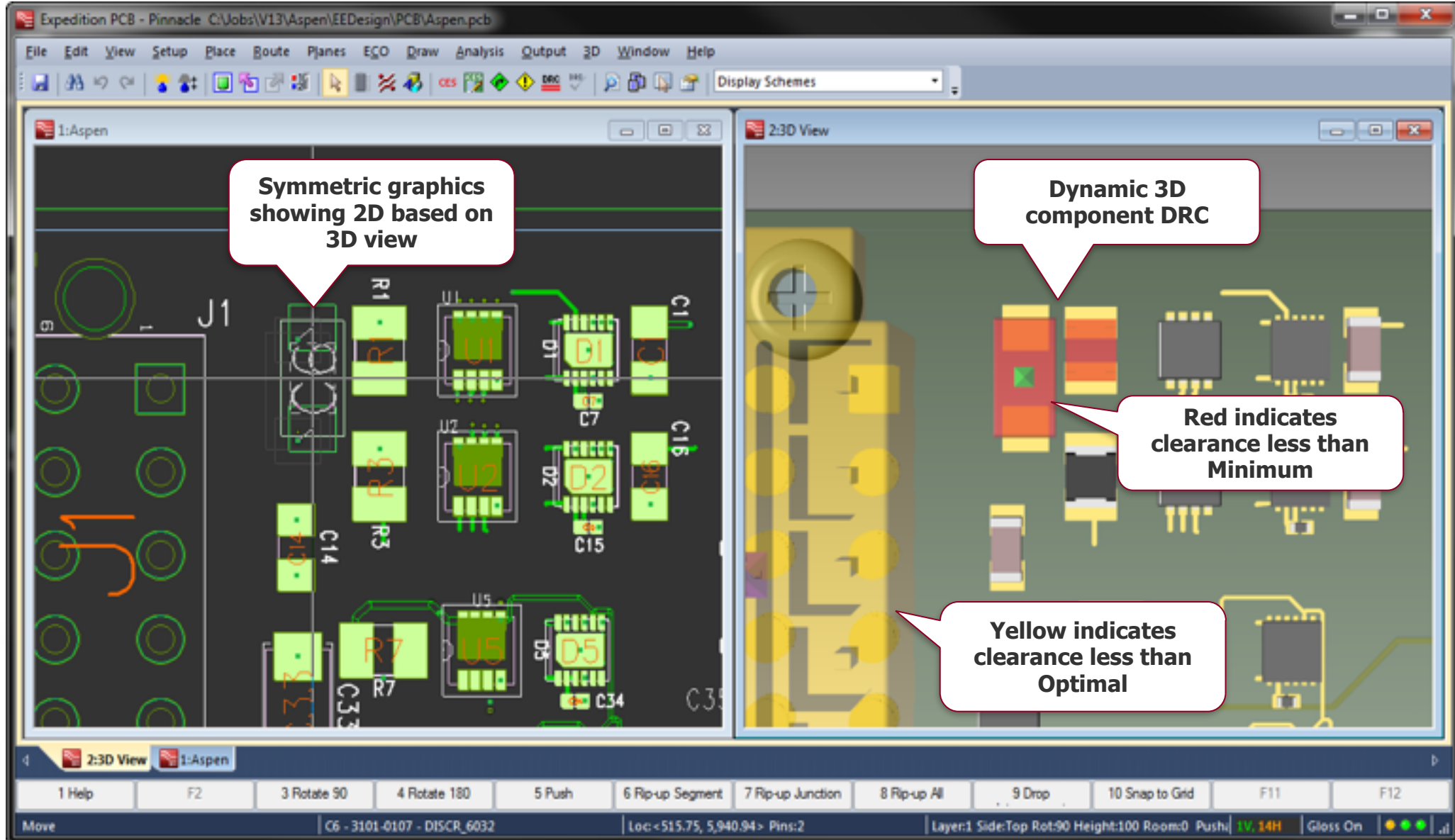


3D Constraint Validation

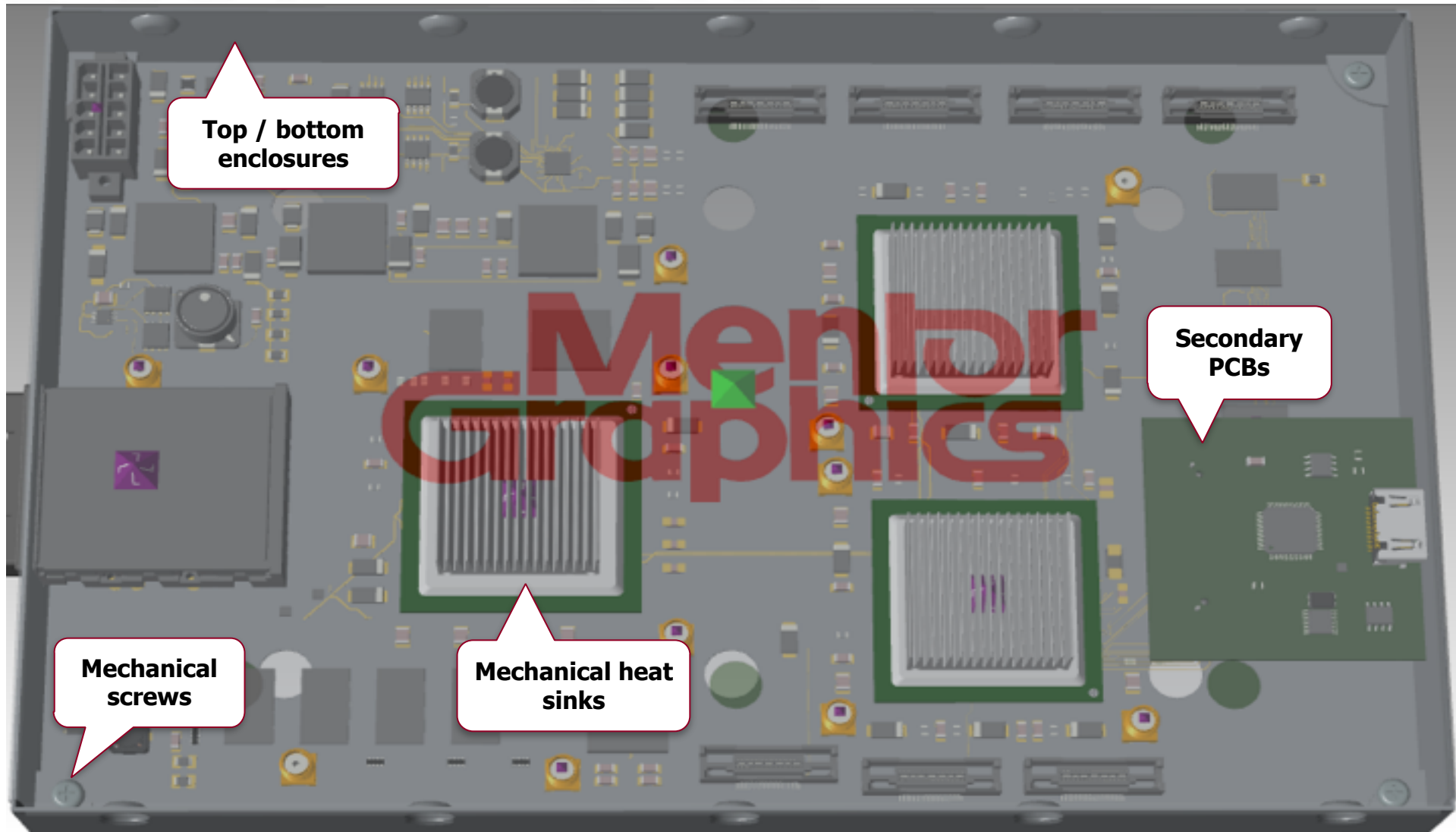
- ❑ Xpedition 3D includes dynamic, online, and batch DRC
 - Dynamic collision detection
 - Full batch 3D DRC
 - Minimum and optimal constraint ranges
 - Independent XY & Z rules
 - 3D instance rule over-ride



Component Planning And Placement

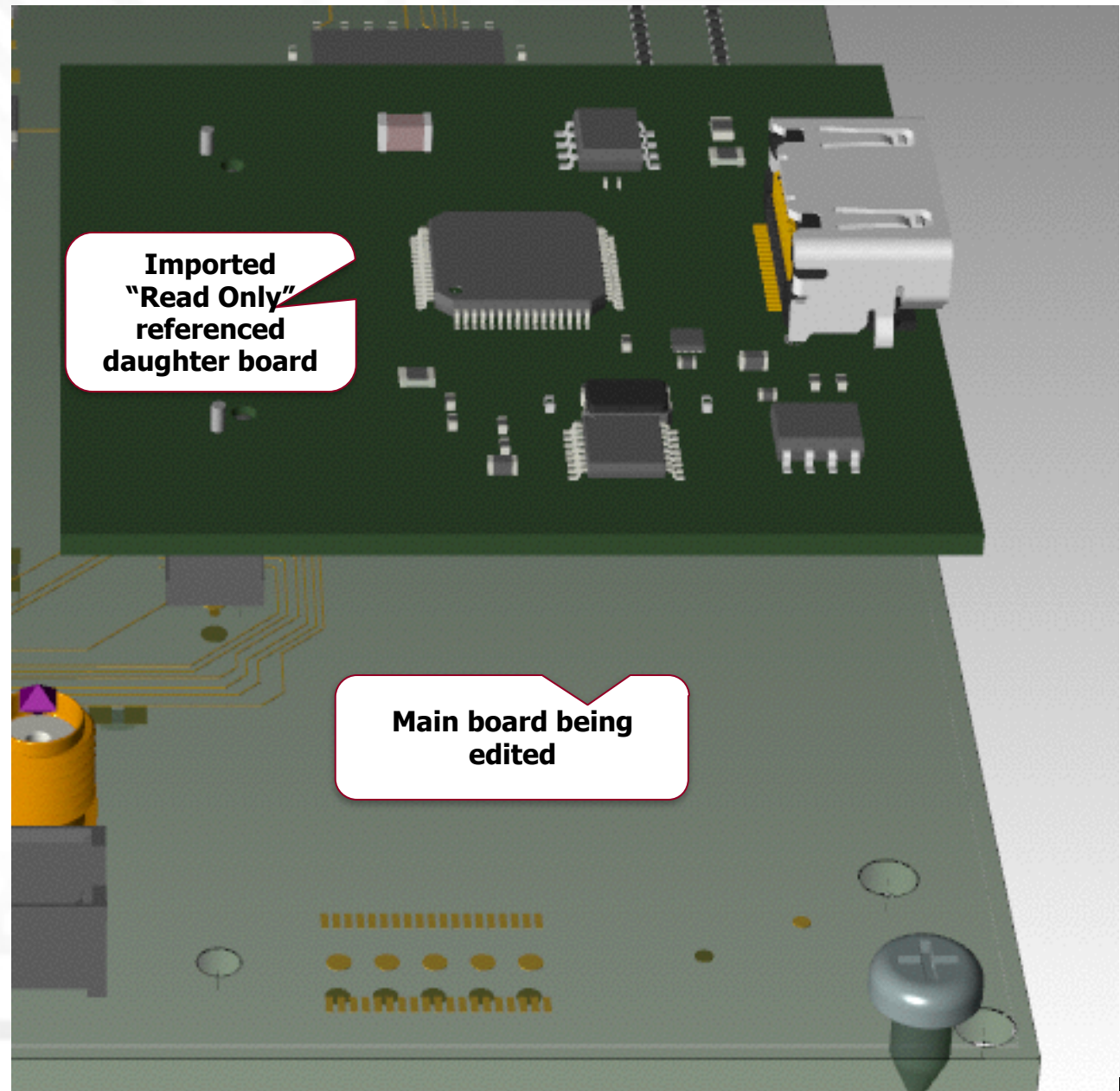
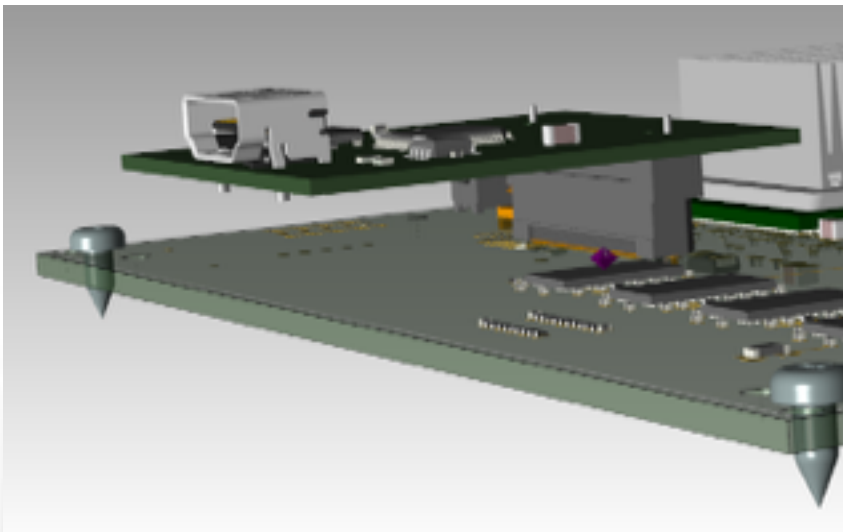


Import Of MCAD STEP / SAT Solid Models



Multi-Board 3D Modeling

- ❑ Import other Xpedition PCBs into edited design
 - DRC checking
 - Full measurement



3D Visualization 3D Planning & Placement Short Demonstration



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