Topology Router

- The Intelligence of an Engineer
- The Skill of a Designer
- The Speed of Auto-Routing

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Challenges

- **Reduction of design-cycle time for products that are typically designed manually**

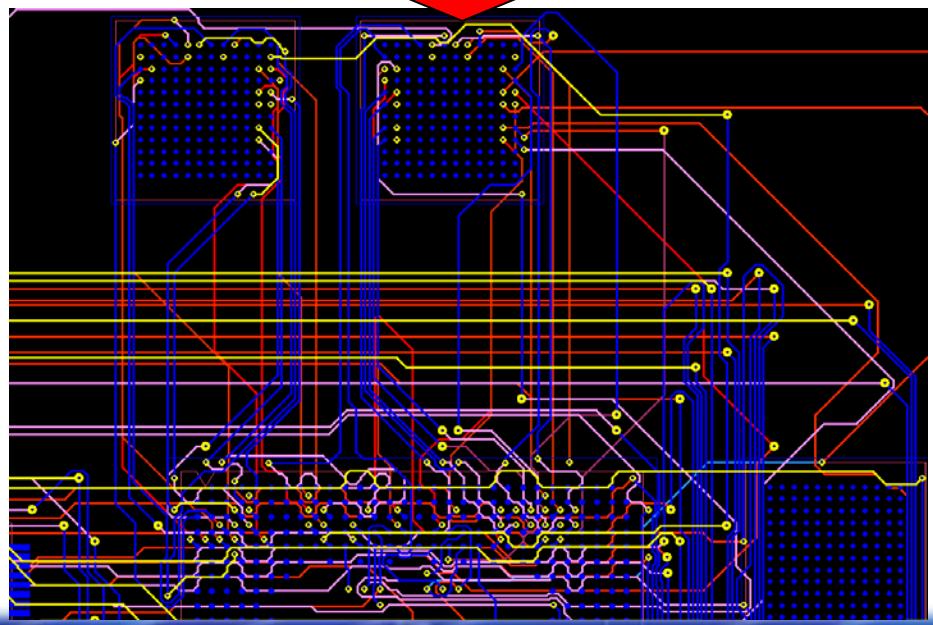
- **Optimization of space and layers to produce competitive products**
  - **Layer count = cost**
  - **Small form factor with highest functionality**

- **Engineer to designer communication**

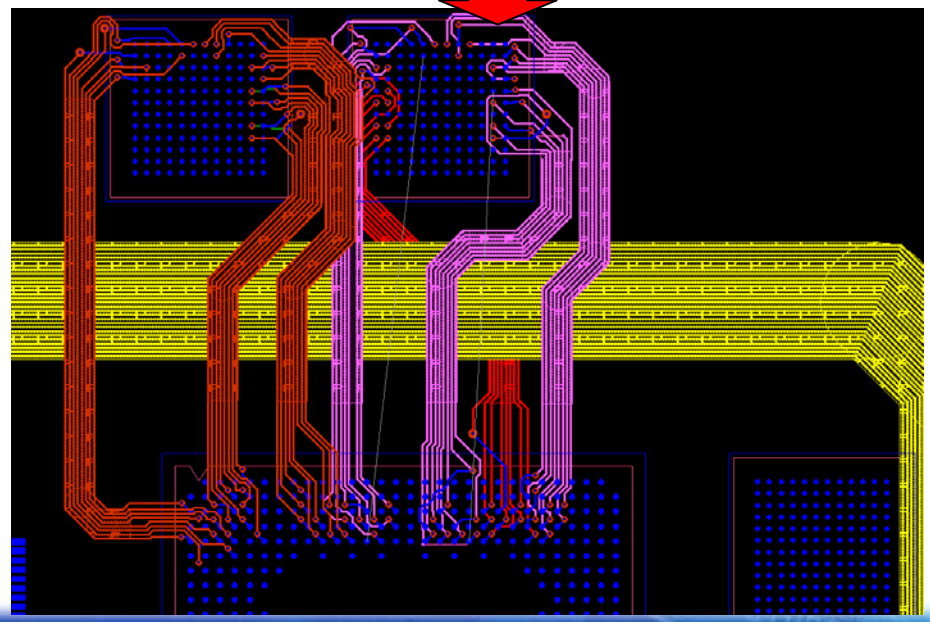
Bus Routing

- **Auto-routers:**
  - Are much faster than manual routing
  - Produce electrically correct and manufacturable results
- **But:**
  - Manual routing can produce denser and higher quality results

Auto-routers do this.
They route one net at a time.

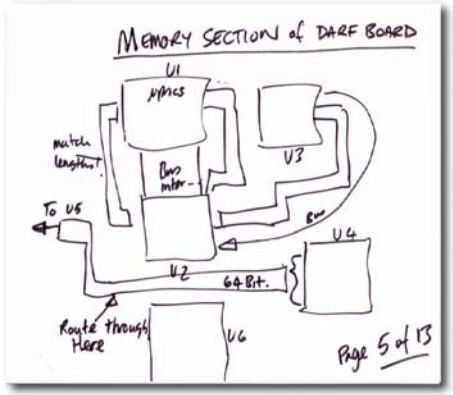


Designers do this.
They recognize patterns and flows.



Bus Routing

Typical Design Process



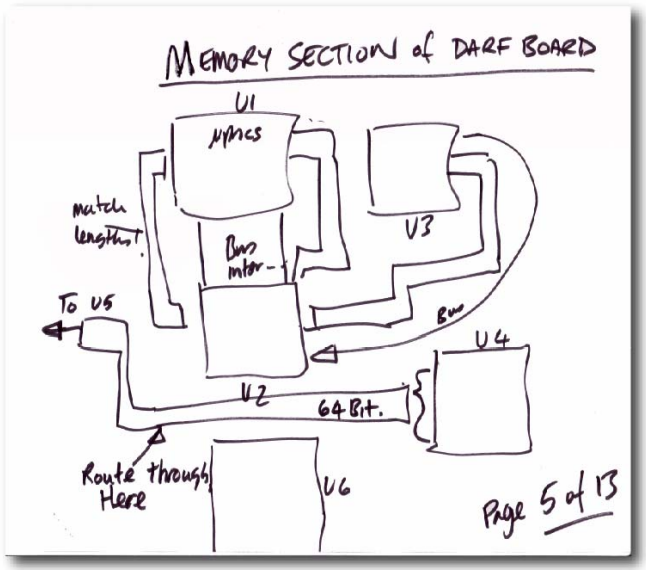
- **Design engineer**
  - **Typically sketches the physical bus systems and sub-systems architecture on paper**
  - **Specific placement and bus interconnect guidelines r**
  - **Tries to determine if placement & estimated routing will meet delay requirements**
  - **May have to give guidance "over board designer's shoulder"**

- **Board designer**
  - **Looks for potential routing patterns and space that flow from component to component**
  - **Plans ahead, knowing why a particular group of traces must route in a certain path on a specific layer (delay)**

Bus Routing

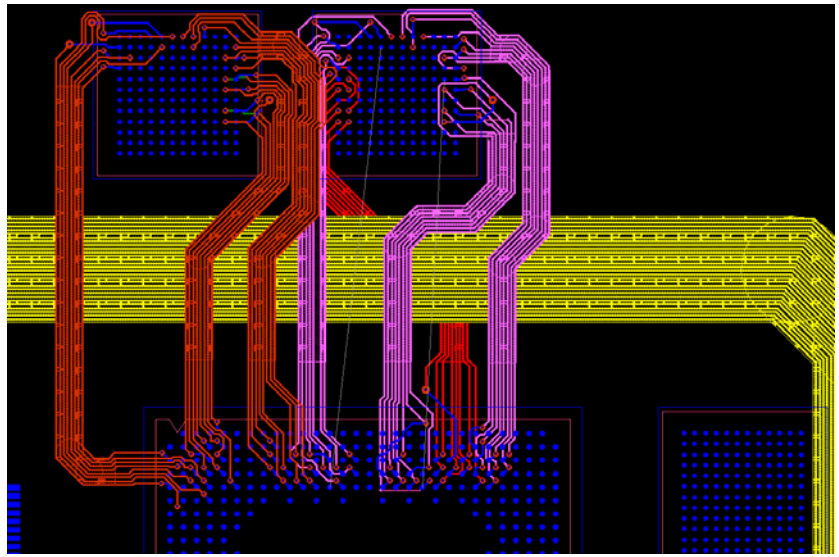
Old methodology

Paper Planning



Engineer

Manual Routing



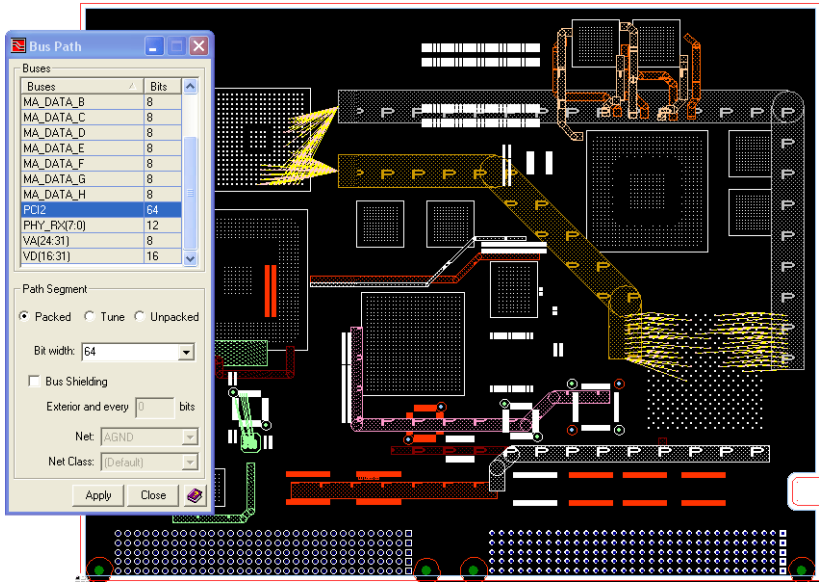
Designer

Bus Routing

Topology-Driven Design with Engineer/Design Collaboration

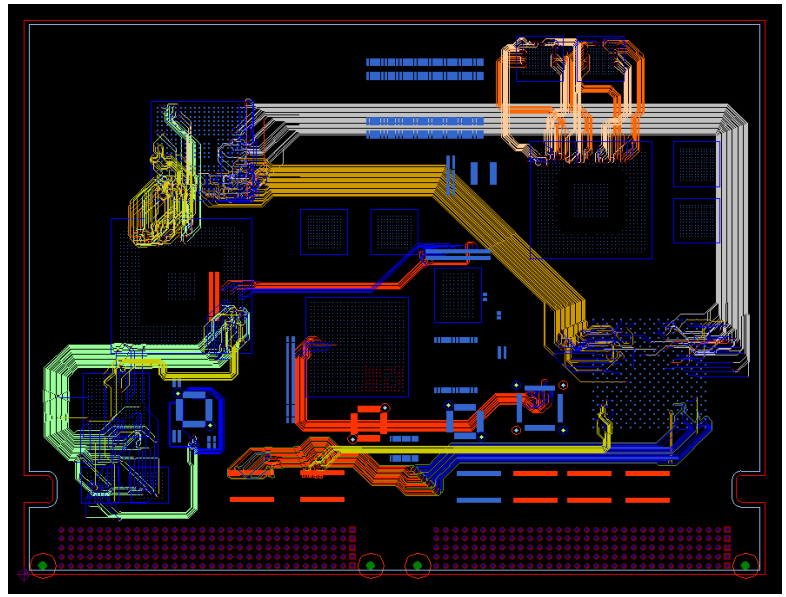
New methodology

Topology Planner

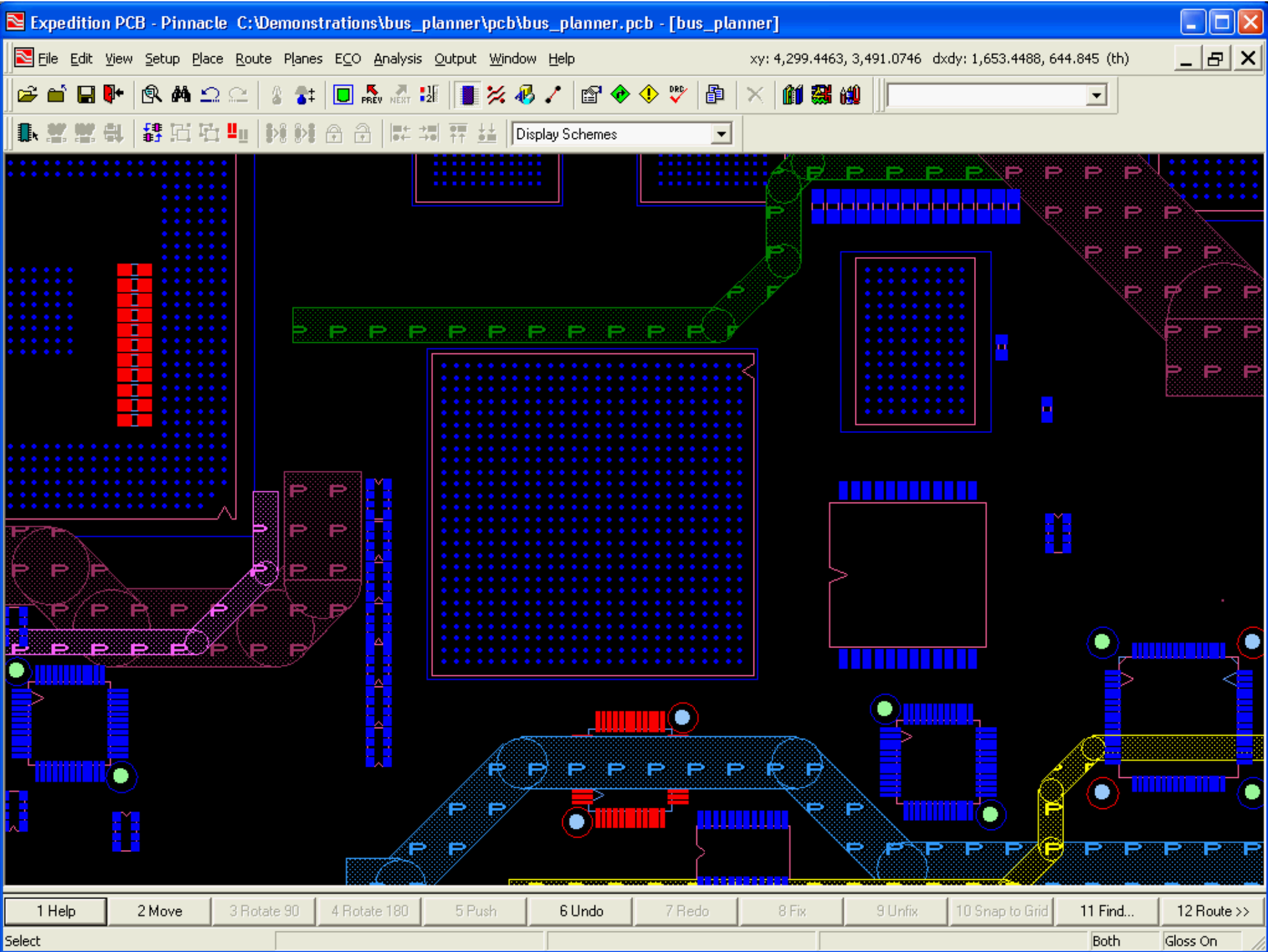


Engineer Plan

Topology Auto-Router



Auto-Route Result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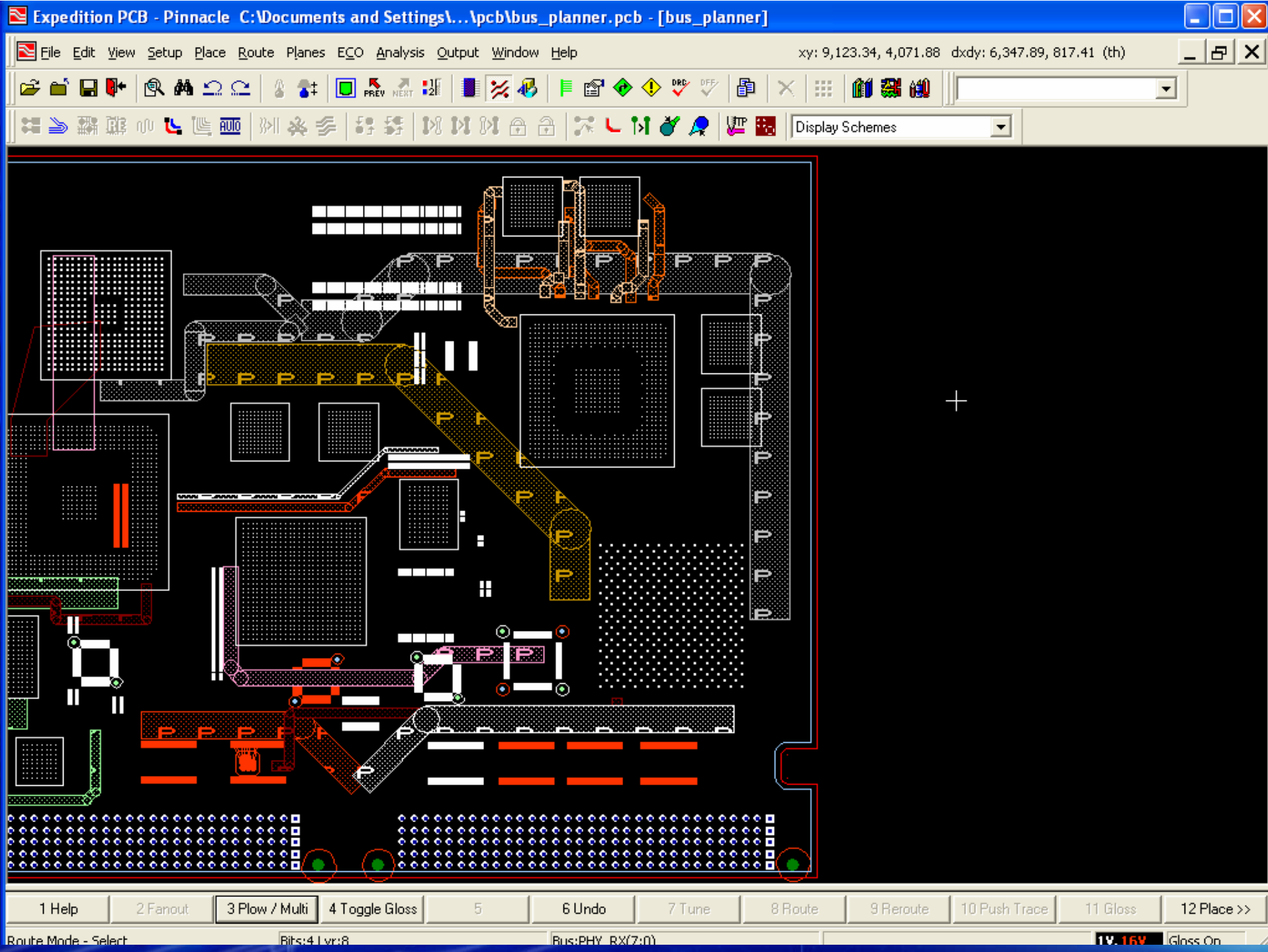
Display Schemes
1 Help
2 Move
3 Rotate 90
4 Rotate 180
5 Push
6 Undo
7 Redo
8 Fix
9 Unfix
10 Snap to Grid
11 Find...
12 Route >>
Select
Both
Gloss On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xy: 9,123.34, 4,071.88 dxdy: 6,347.89, 817.41 (th)
Display Schemes
1 Help
2 Fanout
3 Plow / Multi
4 Toggle Gloss
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6 Undo
7 Tune
8 Route
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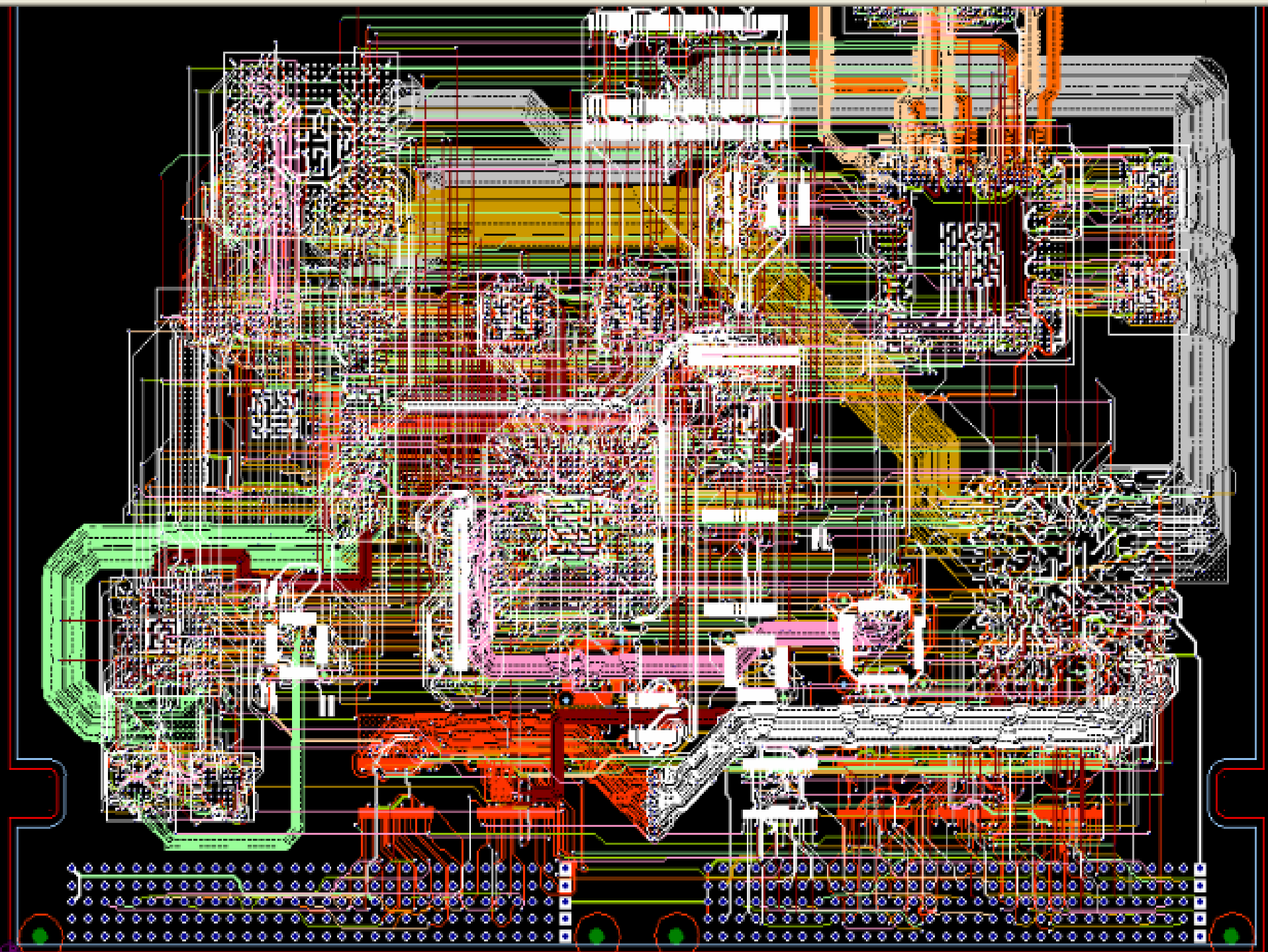
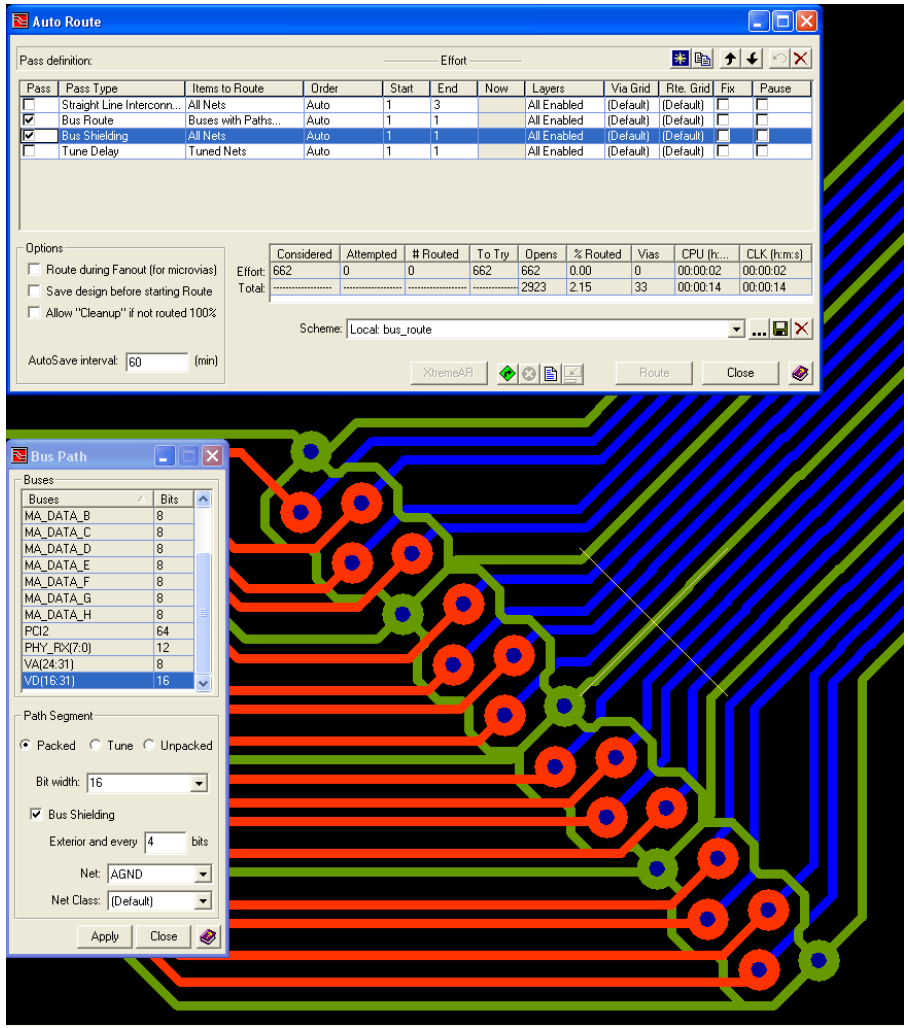
10 Push Trace
11 Gloss
12 Place >>
Route Mode - Select
Bits:4 Lyr:8
Bus:PHY_RX(7:0)
Gloss On



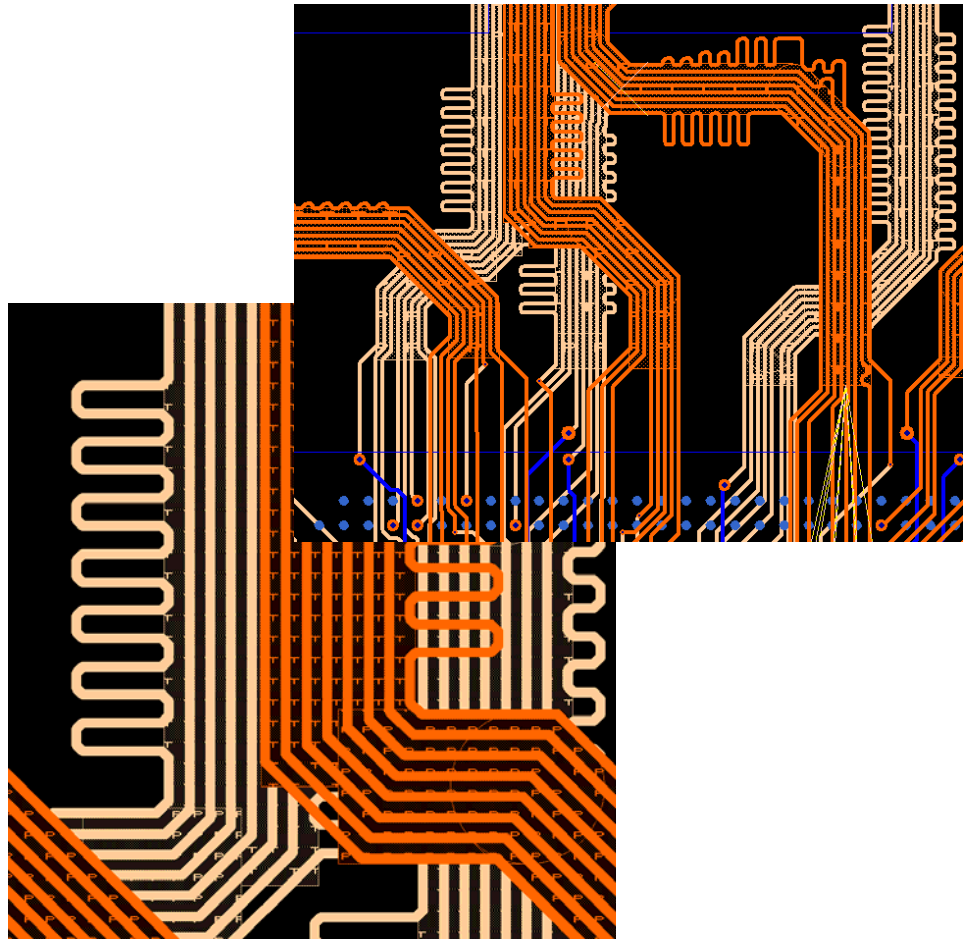
Special Routing Controls

- **Bus with shielding**



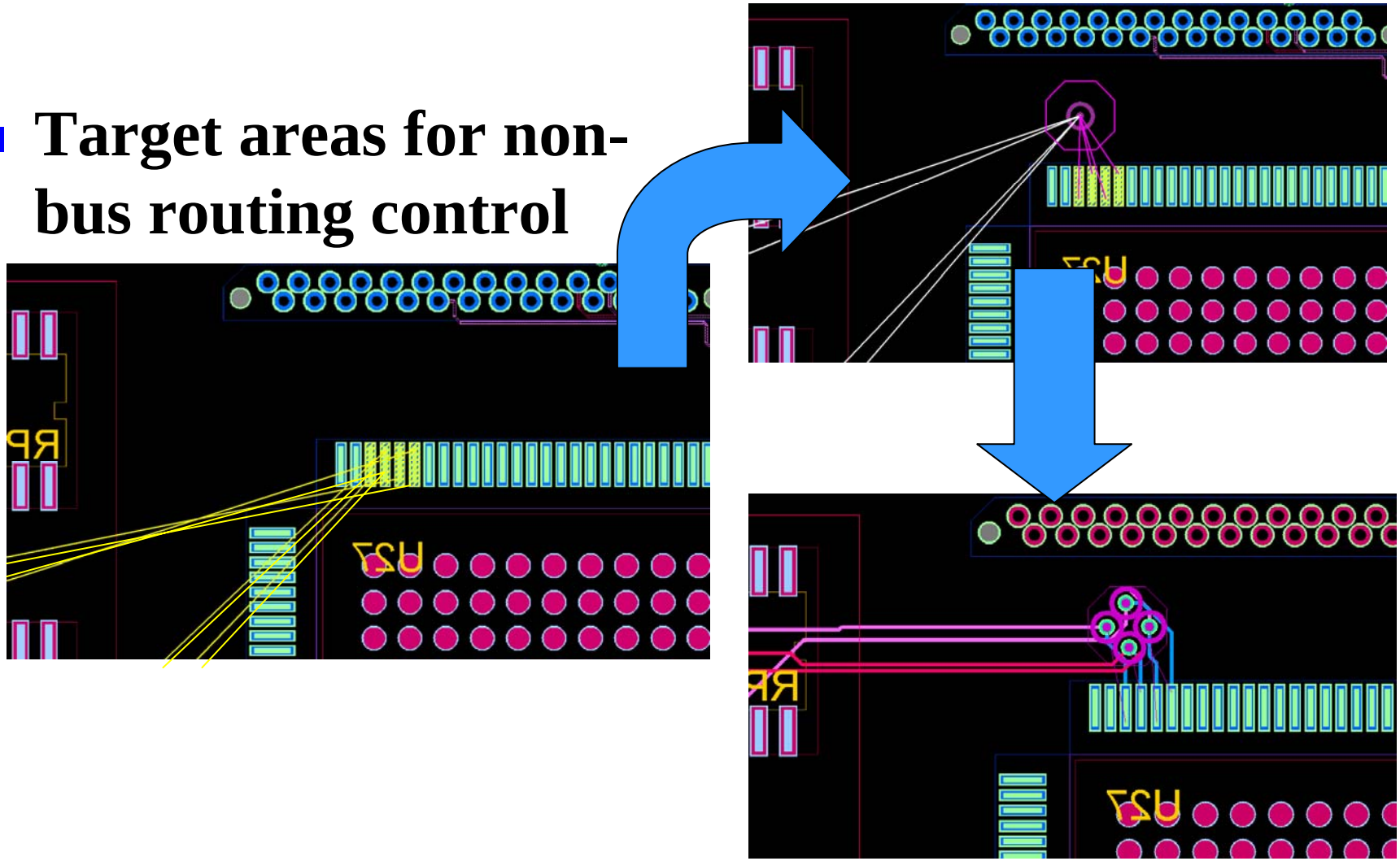
Special Routing Controls

- **Designated high-speed tuning areas**



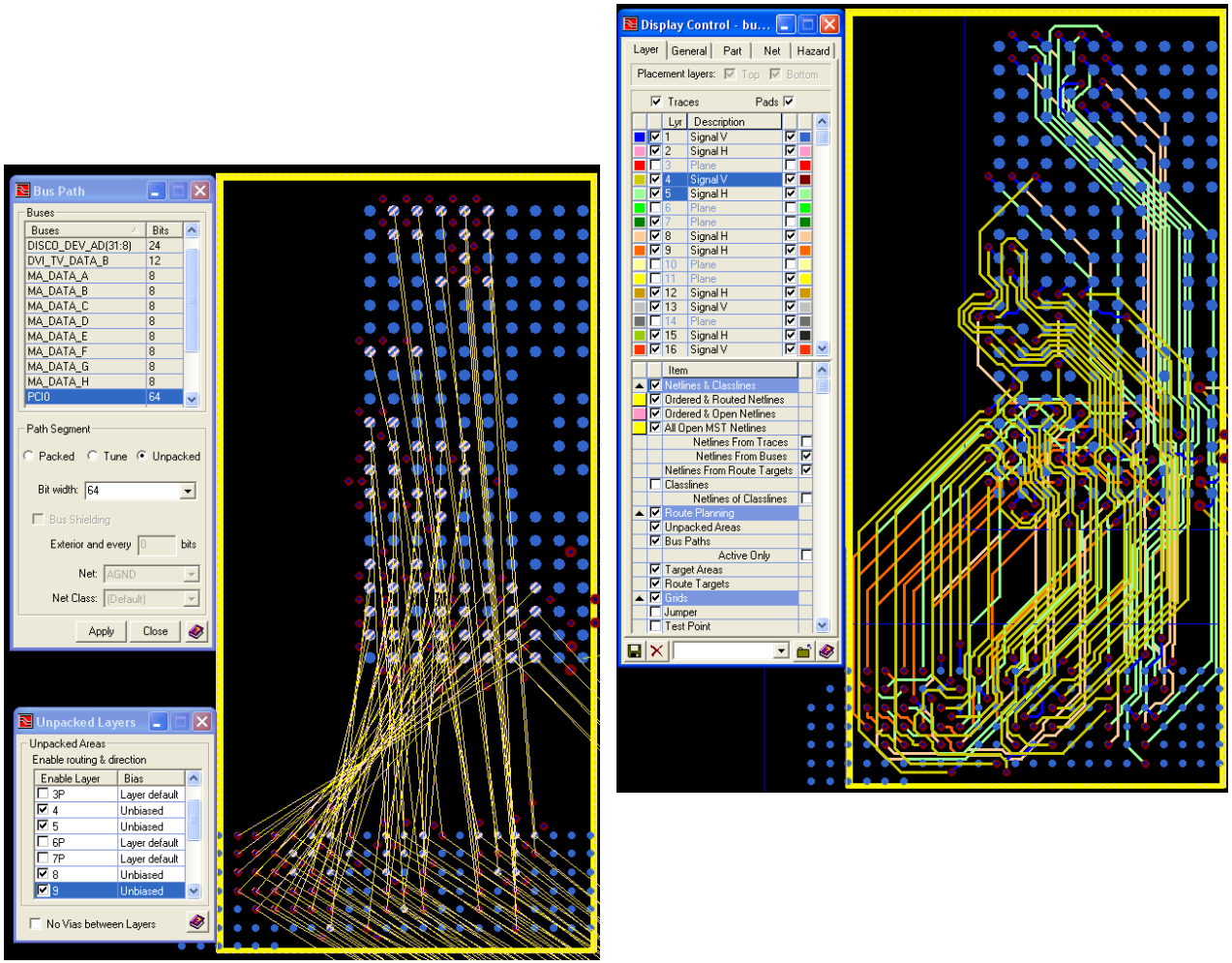
Special Routing Controls

- Target areas for non-bus routing control



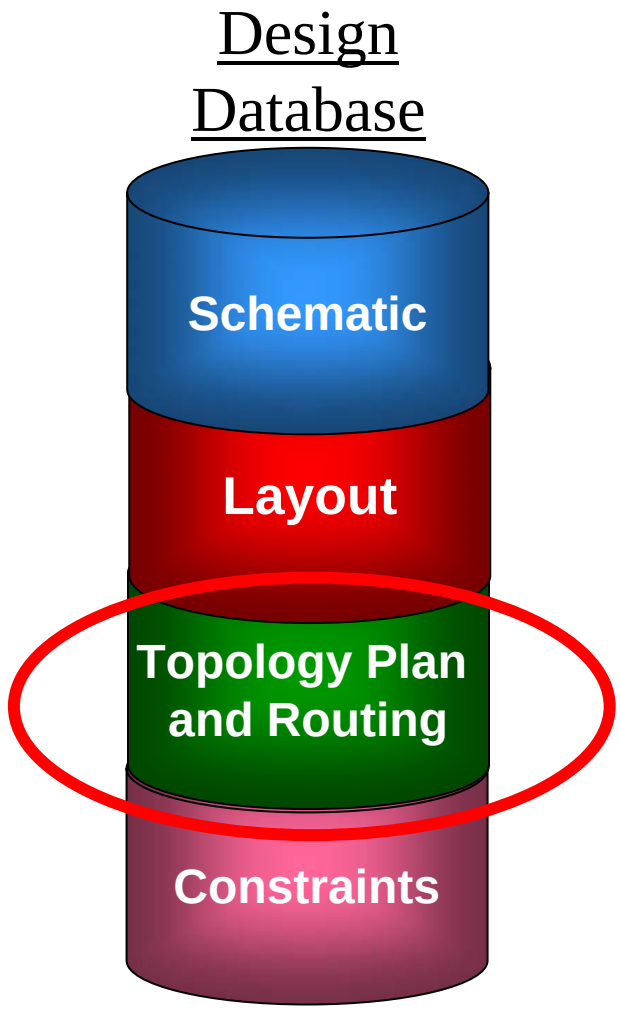
Special Routing Controls

- **Routing bias control areas**



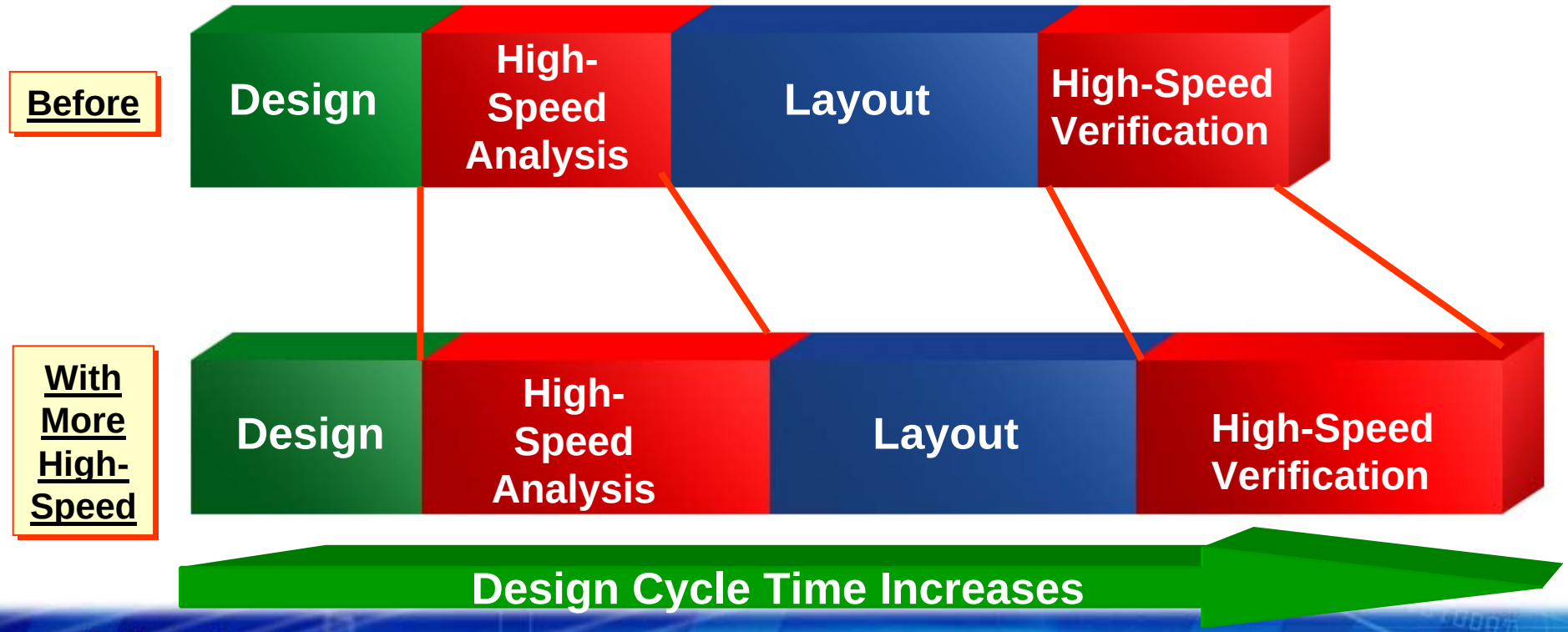
Design Iterations and Reuse

- **Topology plan and routing becomes part of design database**
  - **Design team can iterate to best solution without re-entry – performance and cost optimization**
  - **ECOs are easily implemented – reduced design cycle time**
  - **Database can be re-used in future products, "design reuse" – productivity and quality**



Japanese Computer Supplier, Challenge

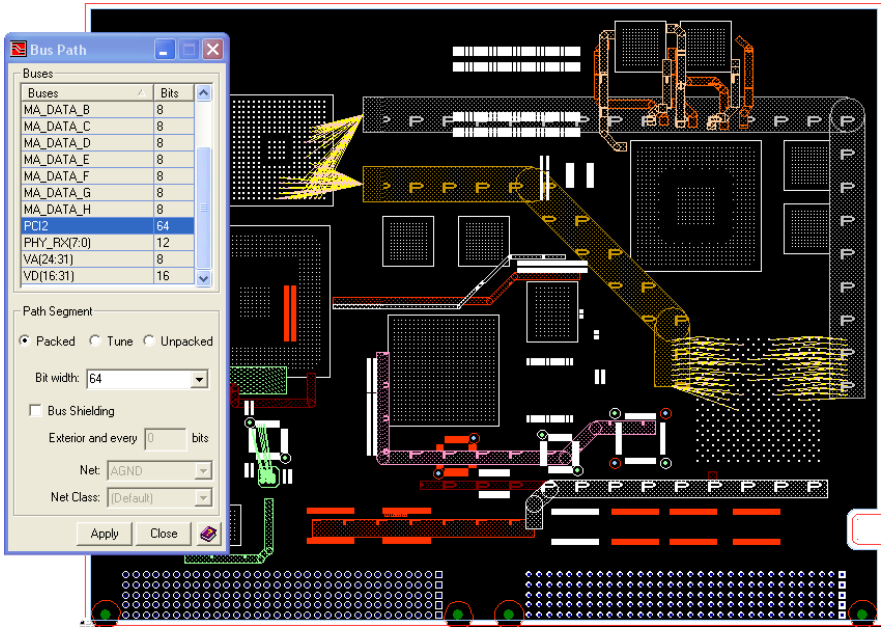
- Increase in high-peed nets is requiring more time in analysis and verification
- Result: Trend to longer design cycle time, missing time-to-market windows



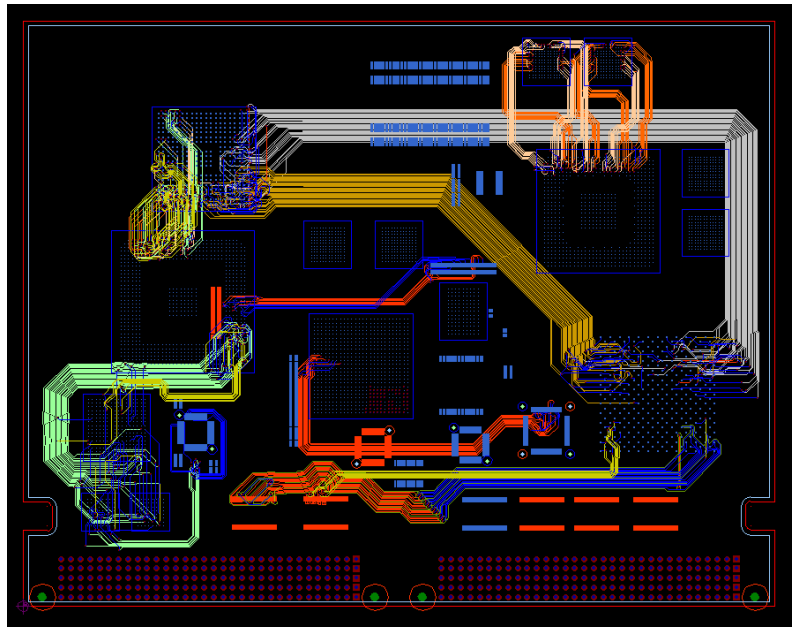
Solution Approach

Reduce manual layout time by 50%

- Worked with Mentor to develop “Topology Router”
- Mimics expertise of CAD designer with speed of auto-router



Engineer Plan

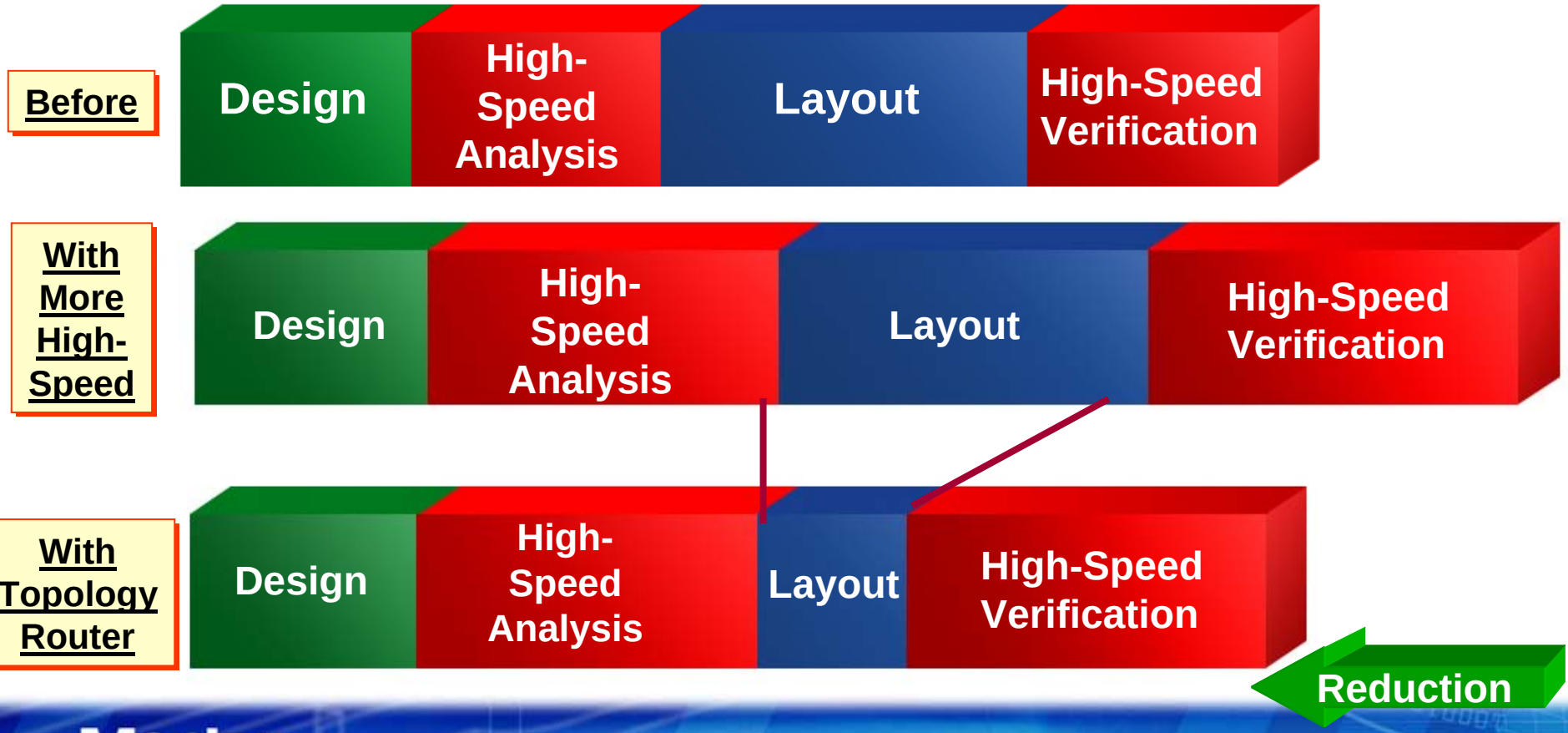


Auto-Route Result

Results with Topology Router

- **"With the Topology Router technology, we will reduce our layout time by at least 50%, allowing more time for high-speed verification, and still meet our time-to-market schedules."**

  - Japanese computer supplier

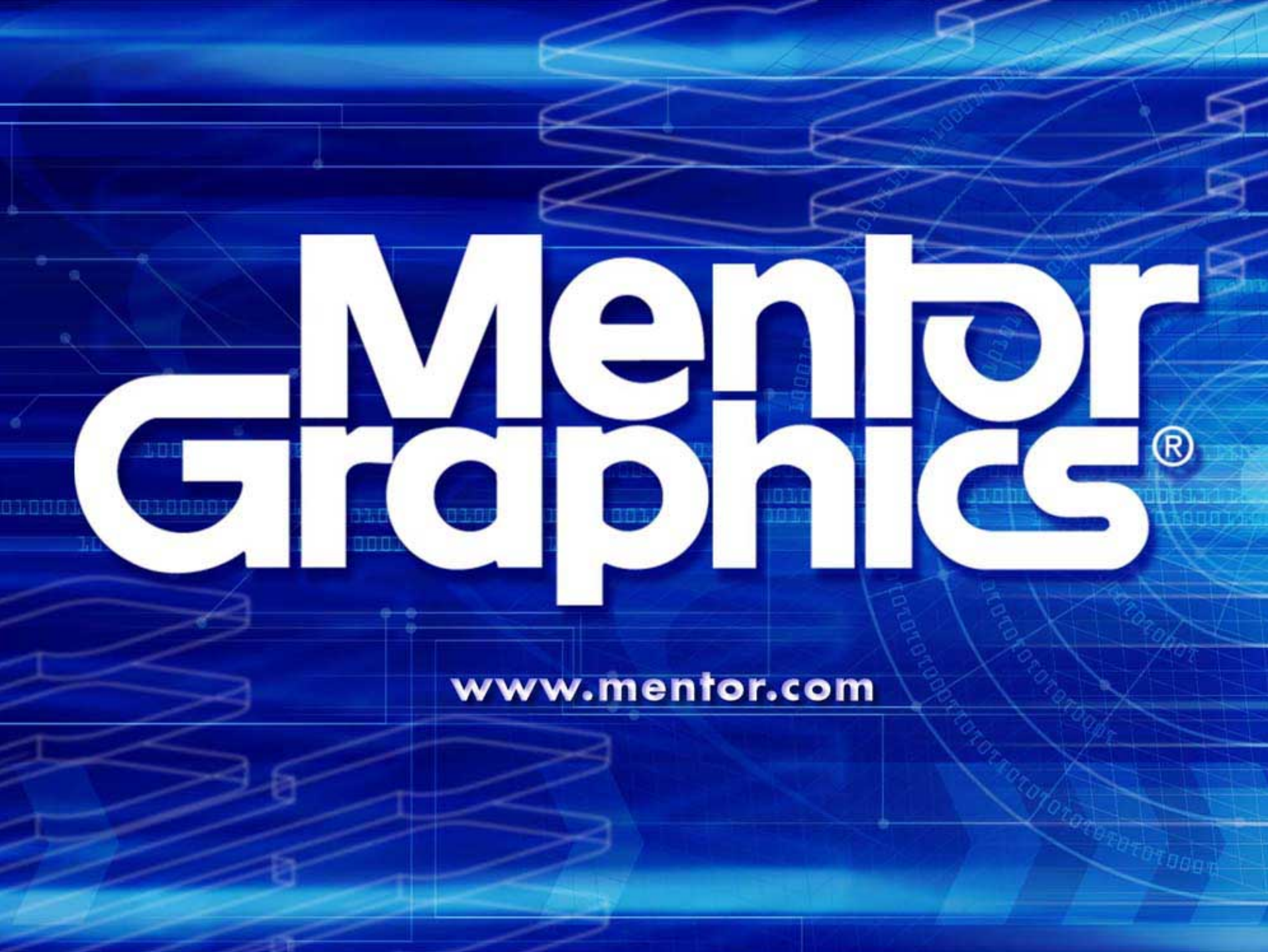


Benefits of Topology Router

- Reduced product design cycle time – capitalize on auto-routing speed
- More compact designs – mimics the expertise of an experienced designer
  - More functionality in smaller spaces

- Higher quality designs
  - Manufacturability
  - Performance

- Efficient re-use of design databases in future products
- Engineer to designer communication – no more paper or over the shoulder!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