Enter the Dragon!

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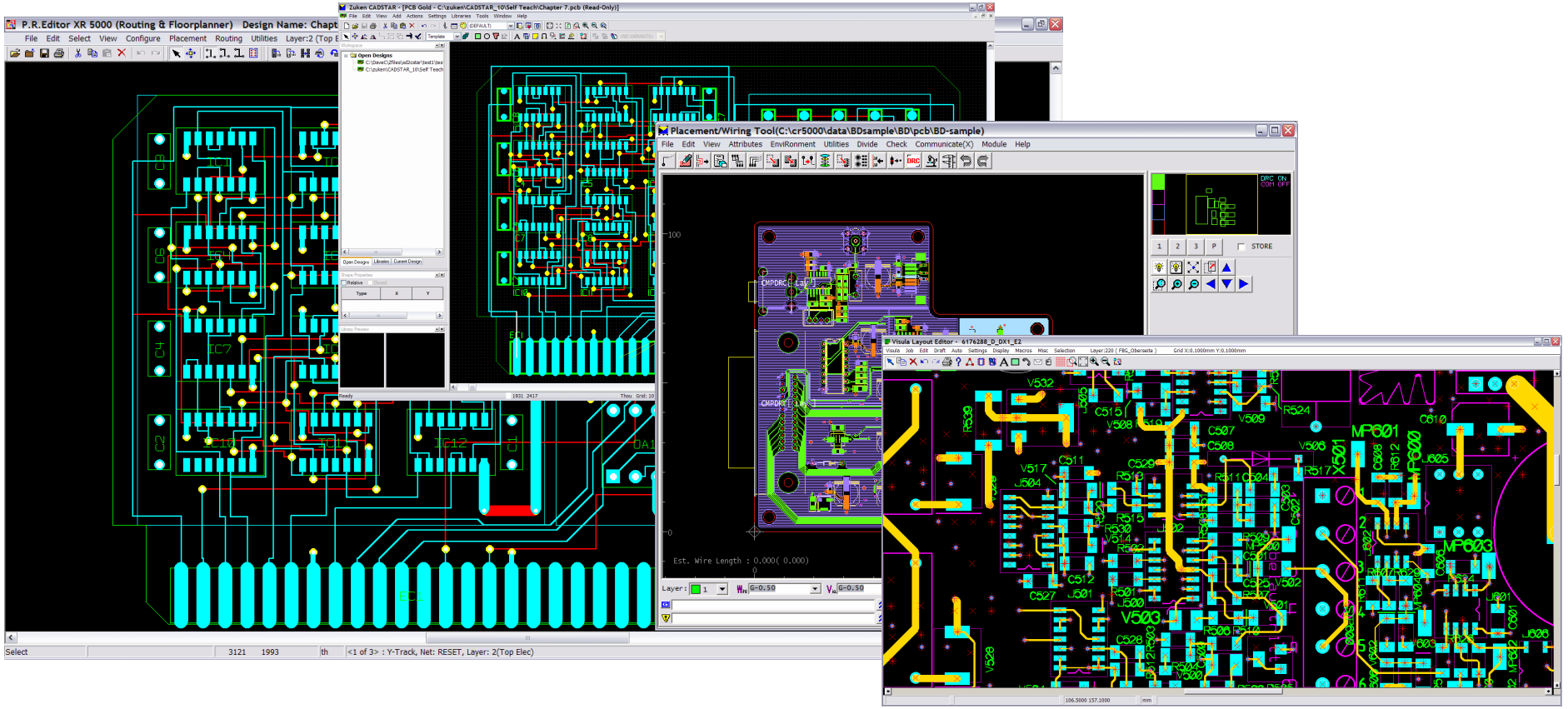
One Place & Route Editor - Many Hosts!

- Zuken's Place & Route Editor is delivered into multiple host CAD systems
  - CADSTAR, CR-5000 (and Visula)
- Zuken's philosophy has many advantages for CADSTAR



Zuken's Place & Route Editor

- Zuken's Place & Route Editor contains more than just **Interactive** Placing & Routing

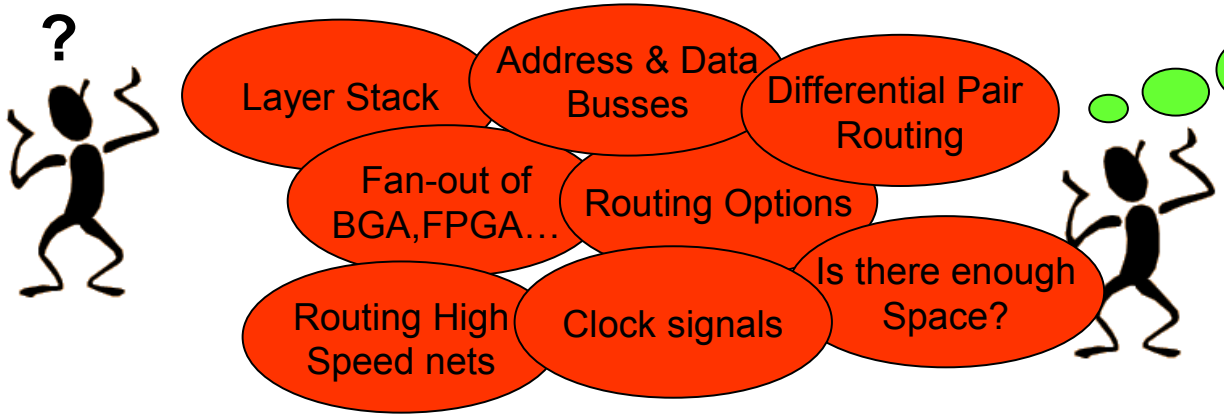
  - It offers **Placement** of components
  - It offers **Push-Aside** while moving components
  - It offers **Re-Route after Move**, so you hardly need manual updating of the routing pattern after moving a component
  - It allows to Route and Re-route your connections using Push-Aside and the **Activ-45 Router**, while your Design Rules are checked on the fly
  - It offers **Bus Routing** (also called Trunk Routing)
  - It offers **Interactive Lengthen or Delay Controlled Routing**
  - It offers **Impedance Controlled Routing**
  - It offers **Differential Pair Routing**
  - And many more…

Zuken's Place & Route Editor

- **So having all this great Interactive Place & Route functionality, why would YOU need an Auto Router?**
- **WHO is actually using an Auto Router?**
- **WHY don't people like Auto Routing?**

Why Many People Don't Like Auto Routing?

- Main reasons people don't like auto routing:
  - Too complicated to set up (a kind of black art)
    - Options may be confusing (or too many options)
    - Often don't know how an option may affect a result
    - You need to be an expert in the tools, it takes time to setup
  - As a result it may not have completed the design
    - If number of failures are too great, time to manually complete may be as long as interactively routing the whole design from start!
  - The routed results may not look like it were routed interactively (aesthetics)
    - Often quality of routing is judged by appearance rather than fit for purpose
  - Results might actually not fit for purpose
    - Skew in Differential Pairs
    - Lengths are too long and you might need to re-work the place



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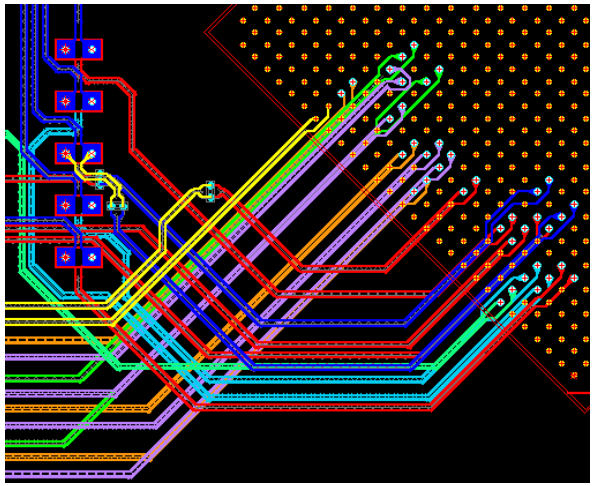
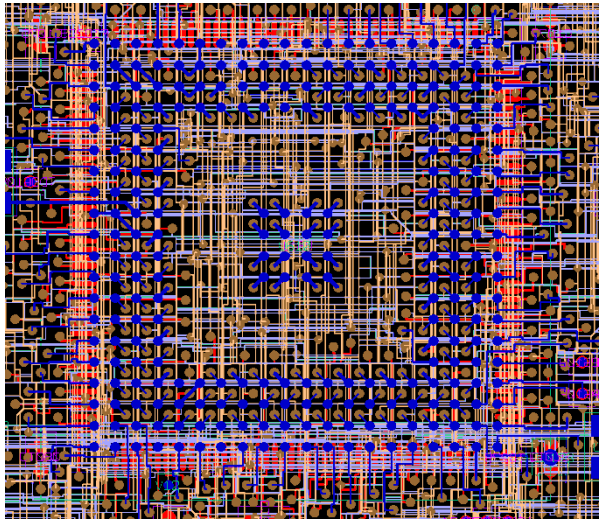
Do I need an Auto-router?

- Design cycle times need to be reduced
  - Competitive markets
  - Manual routing can be slow and expensive
  - Set up time will be small compared to manual routing time (if of course the routing results are good)
- Increased complexity in technology means interactive routing is impractical
  - Too much to think about for one person, too many constraints
  - Chip manufacturers even produce guidelines on how to design using their chipsets
- High-speed design is increasingly driven by the engineer
  - Not being traditionally a routing expert
  - Requires automation to do the job more effectively





Getting interested?

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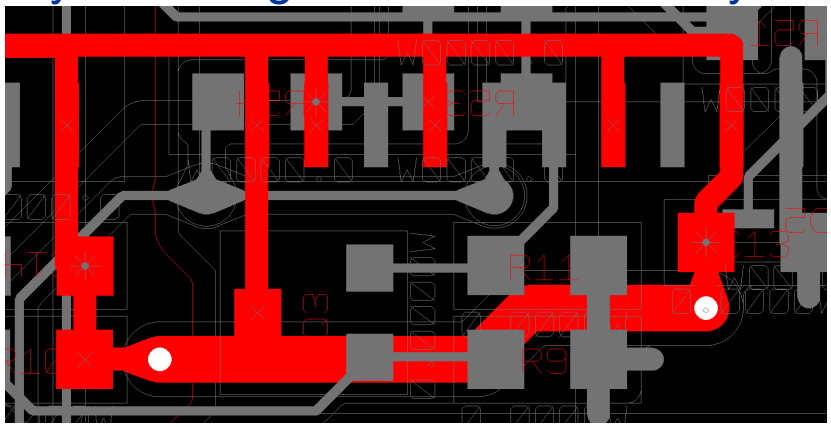
Zuken's new Auto-router Technology

How is the Autorouting process different from Manual Routing?

- Routing your design using the Dragon Routing Platform is different from routing manually
- Manual routing allows flexibility with design settings
- For Example:
  - You can route manually changing track widths to fit through gaps
  - Design rules may be ignored when routing manually
  - The Autorouter can only use the optimal or necked width
  - The Autorouter can only ever work to the given design rules
  - You will need to change these rules in order to improve completion in the cases where you have ignored these manually



How do you Approach a Complex Routing Task?

- How do you approach a complex routing task?
- You
  - Establish key facts about design
    - Layers, number of nets, High speed requirements, Diff Pairs...
  - Break problem down into a series of smaller tasks in priority order
  - Identify any routing blockers and resolve these
    - Conflicting/unachievable constraints
    - Placement/Design rule problems
  - Start the routing process
  - Iterative improvement to optimise/finalise routing

- What kind of automation is required to optimise this process?

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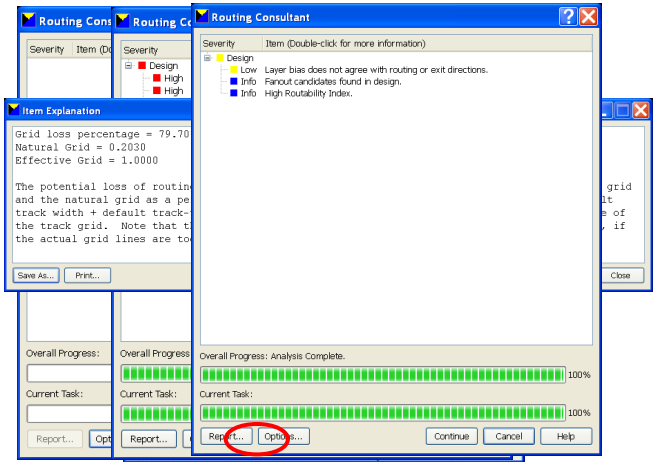
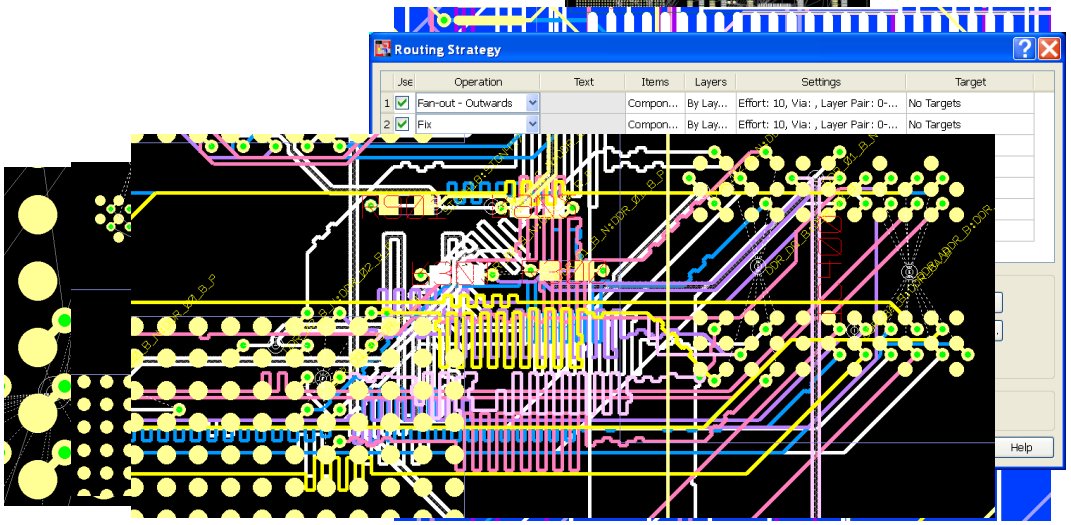
Enter the Dragon

Dragon™
AutoRouting Platform 龍





Strategy and **Routing Targets** are two key concepts introduced by Dragon. All or part of a strategy can be run. If targets are set for a strategy step automatic updates to router settings can be made during repeat of a step in order to meet a target. Strategies can also be saved/reloaded, allowing repeatability and reuse across designs.

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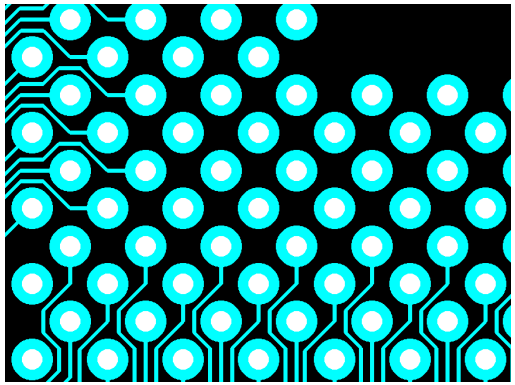
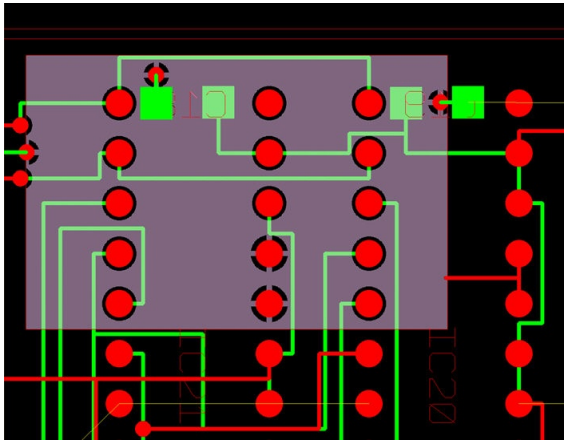
Overview of New Dragon Modules – Prodigy

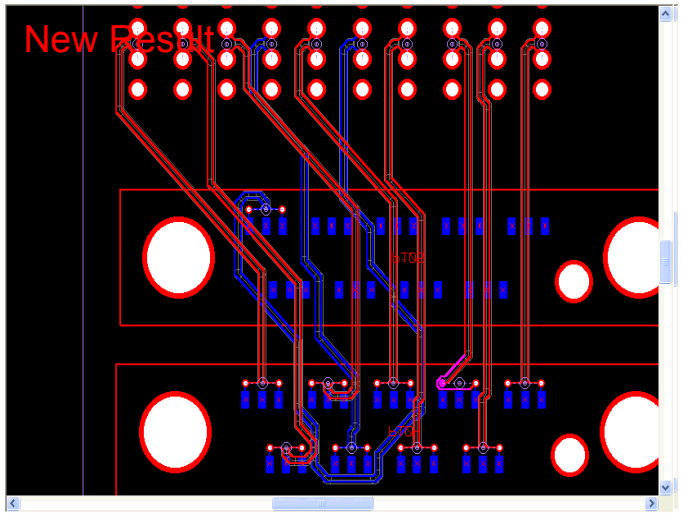
- Prodigy - New tuned, native 45-degree Autorouter
  - Optimised for high performance in high density areas
  - Optimised for achieving shortest total net length and via counts
  - Supports the same functionality as the existing Autorouter
- More exit directions for pads
  - NE,SE,SW,NW added allowing greater flexibility for routing
  - Any – allowing any angle from a pad. E.g Round pads
- Autorouting to positive copper
  - Will make use of auto-repour functionality in existing router to repour areas of affected copper

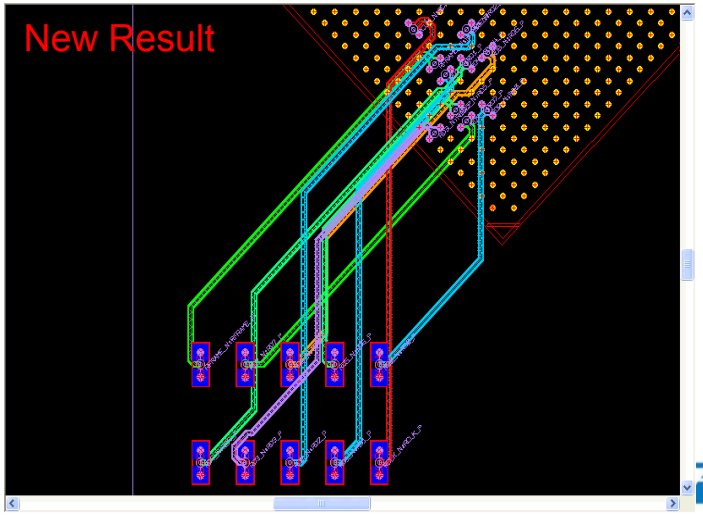




Overview of New Dragon Modules – Paragon

- Paragon - Integrated, innovative Differential Pair routing
  - 45-degree differential pair autorouting based on recent advances in network theory
- Functionality
  - Does not remove any fixed pre-routed sections of Differential Pair
  - Improved completion
    - 45-degree routing of Differential Pairs
    - Enhanced rip up and re-try (can allow multiple passes)
  - Minimises skew and uncoupled length by concurrently considering multiple ‘gather point’ locations





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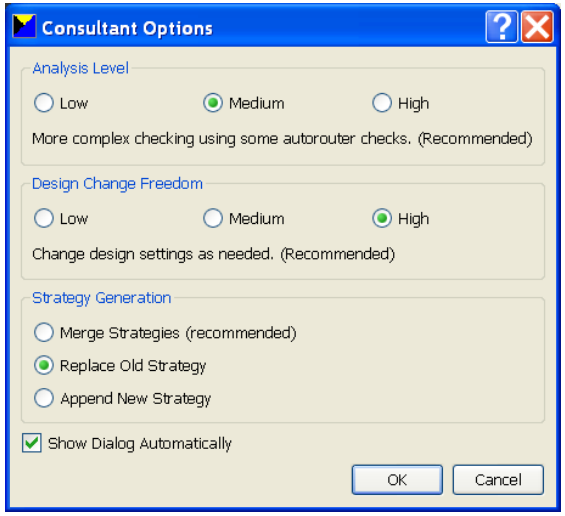
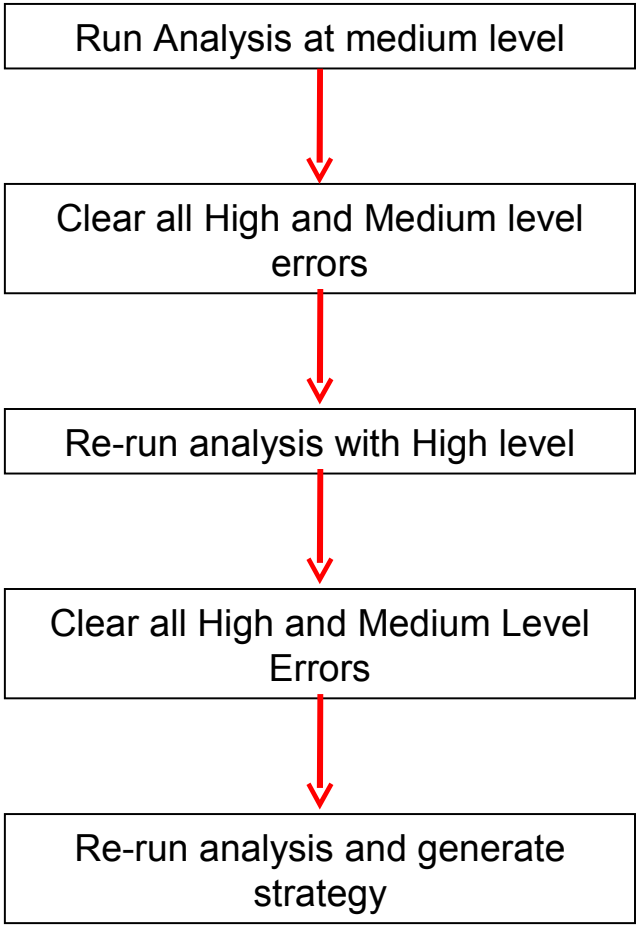
How Do I Use Dragon?

- A suggested work flow for using Dragon
  - Run Routing Consultant on your design
  - Fix High and Medium level errors and re-run analysis
  - Strategy Generation
  - Refinement of strategy
  - Running the routing strategy
  - Review and iterative refinement of strategy and routing results
- Following slides give some more detail and examples

Running the Routing Consultant

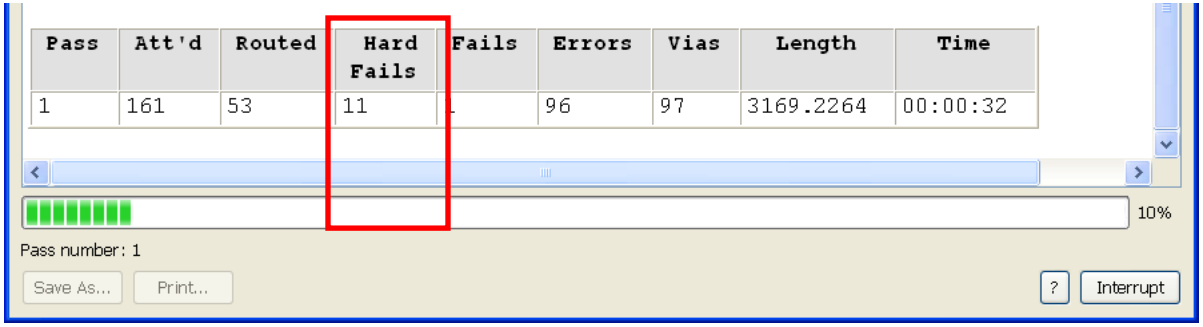
- Run the Routing Consultant on your design before routing
- Routing Consultant will
  - Identify any potential routing blockers
  - Generate a first level strategy from which to base the routing of your design





Running the Routing Consultant

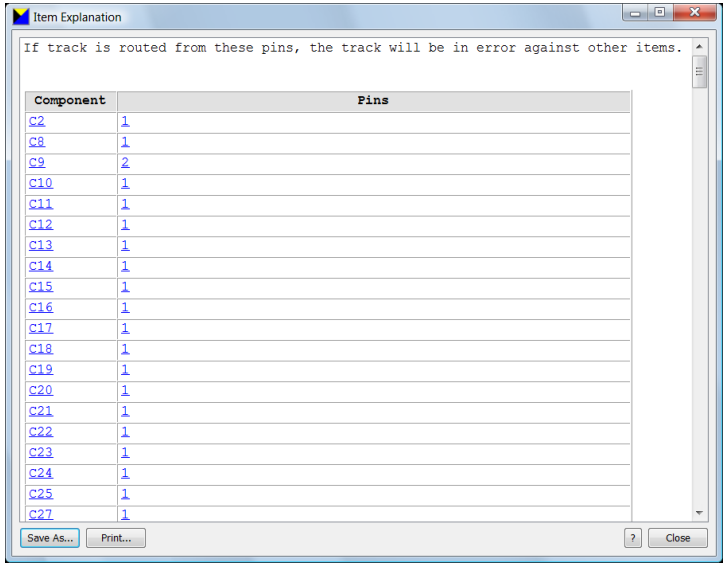
- Reasons for running the medium level checks first
  - The higher the level of checks the longer the run time
  - This will identify the first level or errors that should be cleared
  - High level checks will take longer if there are errors in the design that the medium level checks have already identified
- What type of errors should I clear?
  - You should resolve all High and Medium level errors
  - High level errors can result in ‘Hard Fails’ during the run of the Autorouter

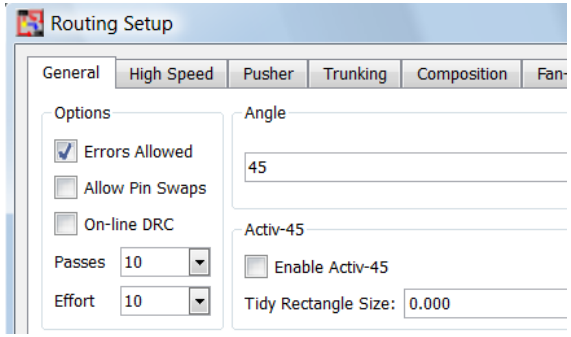


How do I investigate Consultant Errors?

Example - Potential Track to Item error

- Click on the hyperlink for the first pin in the report
- Try to manually route out of this pin with ‘errors allowed’ turned off and finish at a point away from the pin



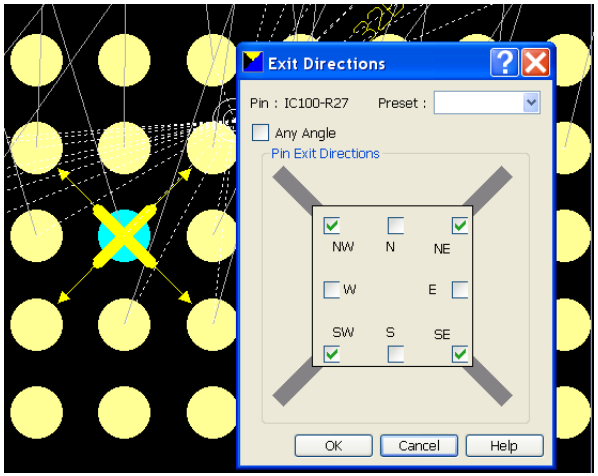


General Tab of Routing Setup

How do I investigate Consultant Errors?

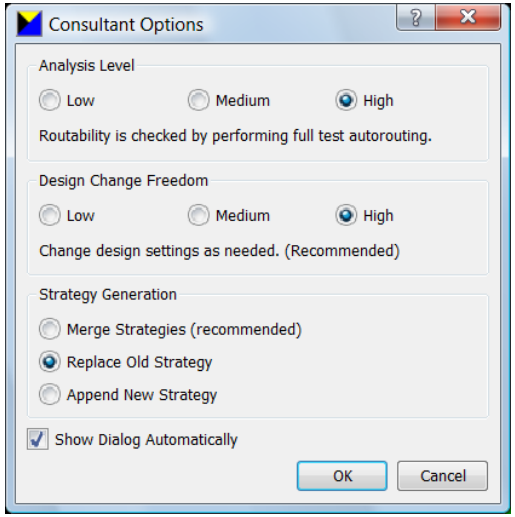
Example - Potential Track to Item error (contd)

- Run a batch check in the area around the route
- You may find that you have track to pin errors
  - Could be due to track width being too large
  - Could be a spacing problem
  - Could be an exit direction problem
- You could resolve this by modifying any of the above
  - The exit direction dialog now shows graphically on the canvas what the exit directions are



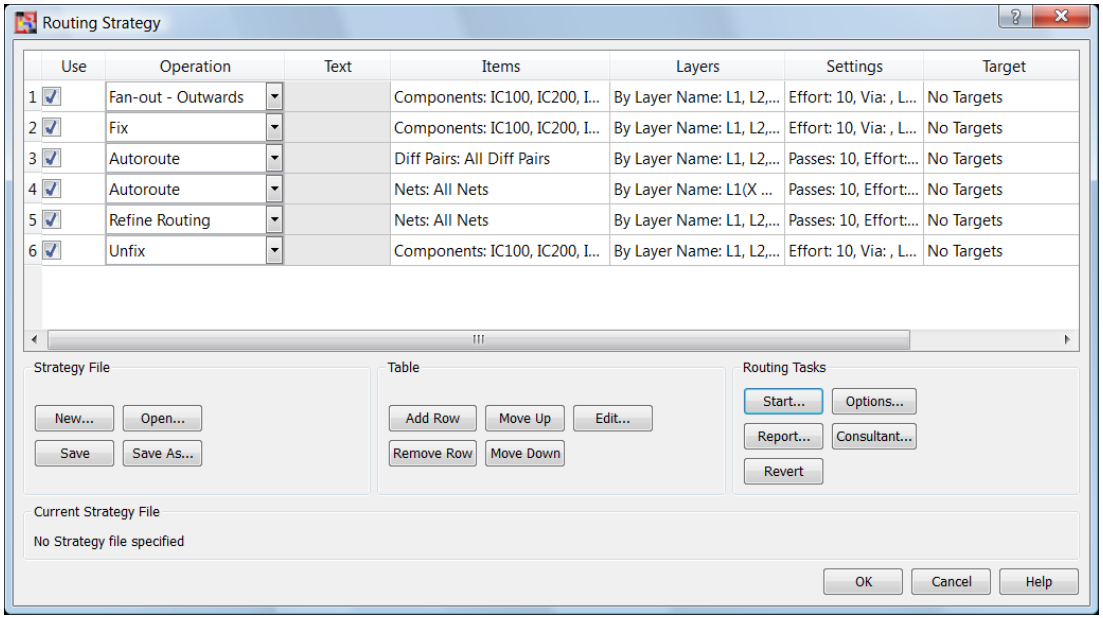
Strategy Generation

- After clearing the High and Medium level severity items press ‘Continue’ to generate a strategy
  - It is recommended that this is done with ‘Design Change Freedom’ set to high
    - Allows the consultant to modify design settings as required
    - This will generate a strategy without targets as the router will be able to modify settings as required to optimise routing results



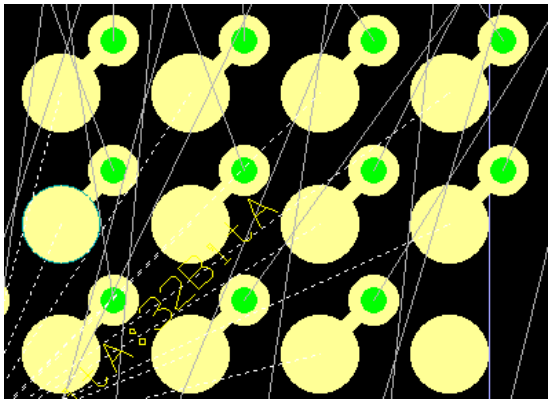
Strategy Generation

- The strategy generated will be a good basis from which to start routing your design
- Strategy generation will be updated in future releases as a result of user feedback
  - Will minimise the user interaction required with the strategy



Strategy Generation – Fan-out tips

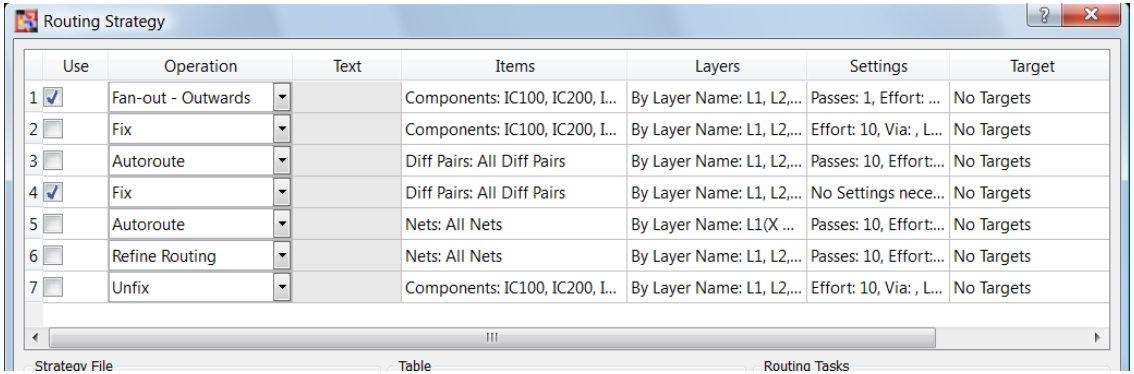
- The strategy generated will run a Fan-out in the outwards direction
  - This will generate an outwards pattern using a single via at the minimum Via to pin spacing for the design.
  - If there is a through hole via definition, then this is the one that will be used
- The fan-out generation can be altered to improve routing completion
  - Generate fan-out vias over the pads
  - Use Spiral vias
  - Limit the layer range of the fan-out
  - Use a different Via

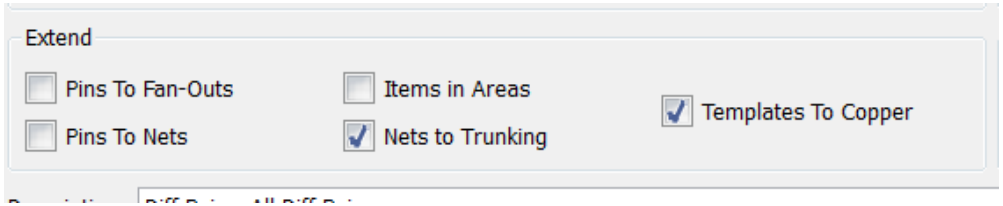


Default outwards pattern

Autoroute

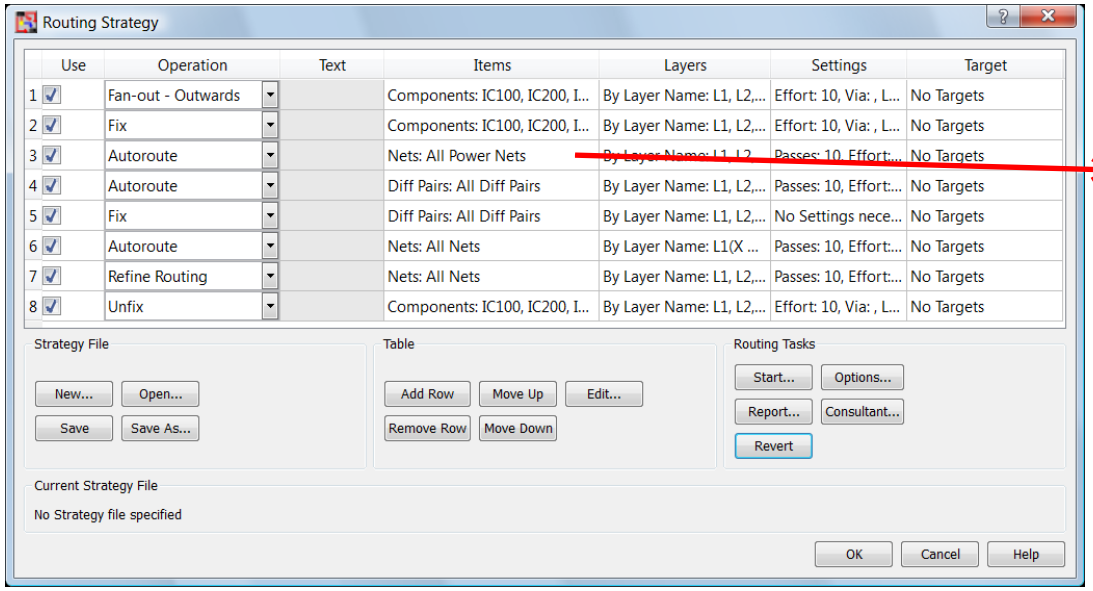
- High Speed designs will have two autorouting steps generated
  - One for the differential pairs
  - One for the single traces
- You may wish to add an extra step to the strategy in-between these to fix the diff pairs
  - This will stop the single trace routing modifying the Differential Pairs

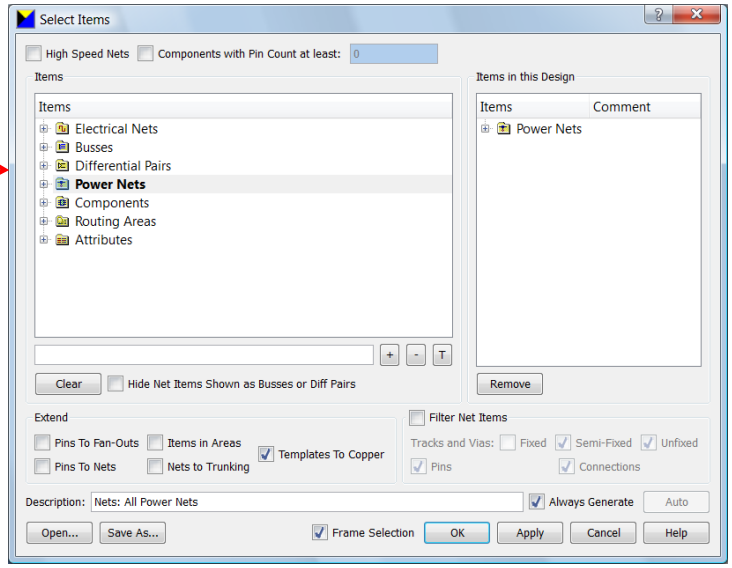




Autoroute

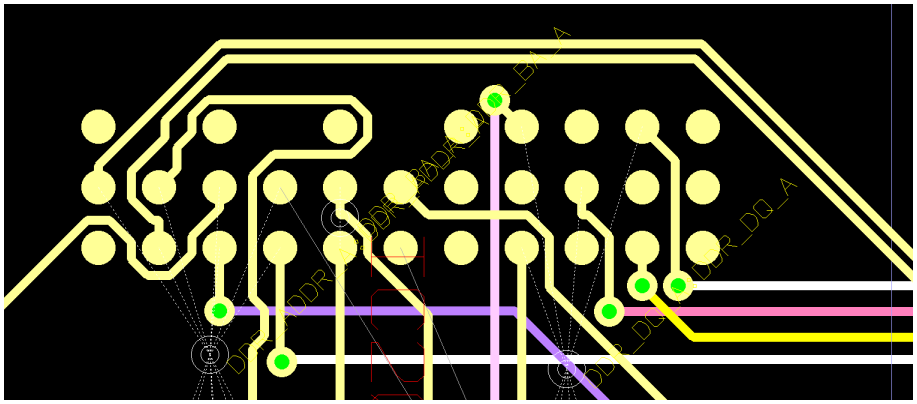
- You can add a step to route the power nets first
  - This could be before the routing of differential pairs
  - Your strategy may look as below



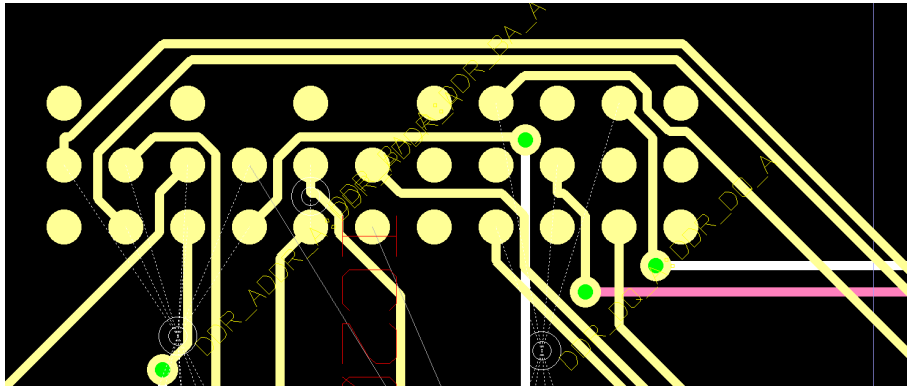


Refine routing

- It is recommended that you run the Refine Routing tool after completion of the autorouting steps
  - Will optimise net lengths
  - Will tidy up the routing pattern in some areas



Before



After