Expedition Enterprise
Plan and Vision

Son, Glenn
Sr. Corporate Application Engineer
Customer Support Division

May 2010
Disclaimer

- The roadmap information in this presentation is a direction for new features/capabilities expected in Expedition Enterprise.

- This roadmap is subject to change, without notification, at any time.
PCB is Central

- Integrated into total product development
- Is the bridge between systems and mechanical collaboration
- Impacts product quality and performance
- Major opportunity to drive productivity initiatives
Complete Product Development

Collaboration Across the Enterprise

Enterprise disciplines:
- FPGA engineer
- Mechanical engineer
- Manufacturing engineer
- Design chain

PCB design process:
- PCB engineer
- RF engineer
- Layout designer
- SI engineer
Meeting Enterprise Challenges

Pre-2004

- PCB, not enterprise focused
- Discrete PCB design tasks
- “Copy/paste” & “check in/check out” integration

Vision 2005

- Enterprise integration
- Enhance PCB development’s relevance in product development
- Drive concurrency & collaboration within EDA and to total system development

Reality - 2009

- Concurrent engineering & layout throughout the flow
- Constraint-driven design
- Multi-discipline collaboration
- Integrated simulation and analysis
- Design to manufacturing bridge
<table>
<thead>
<tr>
<th>Major Product Initiatives</th>
<th>Other Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expedition Enterprise 2005</td>
<td>RSI acquired by Mentor Graphics</td>
</tr>
<tr>
<td>Advanced Fabrication Support</td>
<td>Kick-off on RF Co-design</td>
</tr>
<tr>
<td>Expedition Enterprise 2007</td>
<td>Flomerics acquired by Mentor Graphics</td>
</tr>
<tr>
<td>Enterprise-wide Design Visualization</td>
<td>Kick-off on ECAD/MCAD Collaboration</td>
</tr>
<tr>
<td>Mixed-Signal Simulation</td>
<td>ECAD/MCAD Collaboration Standard Endorsed</td>
</tr>
<tr>
<td>Topology Planning &amp; Routing</td>
<td>valor</td>
</tr>
<tr>
<td>Design-to-Manufacturing</td>
<td>Definitive agreement for acquisition</td>
</tr>
<tr>
<td>Design for Manufacturability</td>
<td>ECAD/MCAD Co-Design</td>
</tr>
<tr>
<td>Distributed Auto-routing</td>
<td>DDRx Signal Simulation</td>
</tr>
<tr>
<td>Distributed Auto-routing</td>
<td>Power Integrity Analysis</td>
</tr>
<tr>
<td>Design-to-Manufacturing</td>
<td>Mechanical Analysis</td>
</tr>
</tbody>
</table>

Timeline:
- 2005: RSI acquired by Mentor Graphics
- 2006: Kick-off on RF Co-design
- 2007: Flomerics acquired by Mentor Graphics
- 2008: Kick-off on ECAD/MCAD Collaboration
- 2009: ECAD/MCAD Collaboration Standard Endorsed
Delivering on the Vision
Differentiated Technology

Hierarchical schematic and/or table-based concurrent design entry

Optimized FPGA on board

Integrated RF design

Dynamic ECAD/ MCAD collaboration

Universal design visualization

Optimized design to manufacturing

Process customization

Enterprise-wide library and data management

Concurrent constraint definition, integrated across the flow

Formal or informal design reuse

Integrated mixed-signal simulation

System-level thermal analysis

Fast, accurate SI / PI / EMI analysis

Concurrent team layout

Distributed auto-routing

Advanced fabrication support (HDI, flex, embedded components, COB)
Expedition Enterprise
Design Creation
Design Creation

“Correct-by-Design” Engineering

- Improve team productivity through improved software flow diagnostics & quality
- Increase product quality with improved design reuse
- Communicate engineering intent through symbolic floor planning
- Accelerate constraint definition with a graphical topology editor & formula wizard
- Significantly reduce design time through system-level design description & implementation
Advanced Constraint Definition

- **Graphical topology editor**
  - Allows users to graphically define topologies
  - Create relationships between components
  - Add constraints in an intuitive manor

- **Formula wizard**
  - Enhance usability for the input of formulas
    - Similar approach to Excel
    - User can quickly build relationships between nets, pin-pairs, etc.
iCDB Framework Diagnostics

Report Examples (EE2007.9)

Slow Access Warning

Diagnostics Journal

Utility Tray

“Green Status” Notification

Critical Warning - Lost Connection
Symbolic Floor-Planning

- Front-end application for design engineers to express and analyze placement intent plus route planning to guide the PCB design
  - Symbolic representation of data in 3D
  - Schematic-driven
  - Integrated with analysis tools
  - Push intent into Expedition PCB
System and Architecture Design

- Creation & management of synchronized system level views
- System level design verification & documentation
- Automatic board extraction for PCB as defined in electrical views
Expedition Enterprise Simulation
Simulation

Minimize Costly Design Re-spins

- Increase product reliability with vibration & stress analysis
- Improve design quality through customized DRCs
- Reduce design time with mixed signal simulation integrated into the flow (libraries, constraints)
- Improve time to results with fast, accurate AC & DC power integrity analysis & optimization
- Improve product performance & reduce design time through dynamic analysis & feedback during all phases of design
Design Validation

- Verification throughout the whole design process
  - Schematic, placement, routing
- Verification in multiple design areas
  - SI, EMC, manufacturing, test, etc.
- Hazards displayed in Expedition flow
Customized DRC

- Flexible and custom DRC on design data (schematic, placement, routing, planes,....)
- Capture users “learned” methodologies (company IP) by allowing custom DRCs in addition to standard rule sets

Diagram showing various DRC scripts and categories such as Best Practices, Specialized Rules, CES, and Quick Expert Scripts. The diagram also includes a visual explanation of signal trace crossing slot open at one end and the return current flowing around a slot creating a loop antenna.
Design for Reliability

Highly Accelerated Life Testing (HALT)

- Virtual prototyping of vibration and stress analysis
  - Prior to hardware build
  - Reduces design re-spins
  - Increases product reliability
  - Integrated with PCB and MCAD systems

Product Plans

3 Weeks

or

3 Hours
Design for Reliability

Enhanced Thermal Analysis with FloTHERM

- Transfer of complete PCB and layout description from Expedition to FloTHERM
- Push button solution: translator appears in Expedition to write a file which can be loaded into FloTHERM
- Enabling 3D modelling for prediction of airflow and temperature
- Fully-integrated library capability supporting JEDEC standards for component thermal models.
Expedition Enterprise Layout
Layout & Routing

Drive Individual & Team Design Productivity

- **Improve individual productivity** with native any-angle routing, improved object interaction & display control
- **Accelerate layout** with routing aids including path mgmt, ‘sketch’ routing & ‘heuristic’ routing
- **Simplify placement** with symbolic group planning & manipulation
- **Enable advanced technology adoption** with native rigid-flex support
- **Improve team collaboration** with dynamic exchange of changes with analysis & viewing applications
Environment Productivity

- Improved user interactions
  - More context sensitivity
  - Enhanced object-action methodology support
  - Native object manipulation
  - Global selection and viewing control
  - New display control layout with embedded GUI customization
    - Visibility & selectability control integrated into a single dialog
Placement Productivity
Component Explorer

- Drives all placement and planning
  - Tree navigator view for hierarchical groups with a list of parts within the group
  - Allows schematic hierarchy to drive placement planning
  - Supports user-defined hierarchical grouping of parts
Placement Productivity
Hierarchical Group Placement

- Top down hierarchical approach to placement and planning
  - Allows schematic hierarchy to drive placement planning
  - Supports user defined hierarchical grouping of parts
  - Planning groups are visualized within graphics as a container of related parts
  - Parts and sub-groups can be graphically dragged out of groups within graphics

Not Committed in Product Roadmap
Improved Collaboration

- Streaming communications from the XtremePCB design session enable improved collaboration across applications allowing incremental layout changes to be dynamically seen
  - Architecture will allow support of asynchronous analysis
  - Support non-layout applications joining a session and receiving real-time incremental changes
  - Applications can receive incremental updates while the layout is in process

Not Committed in Product Roadmap
Advanced Topology Support

- Enhanced virtual pin support
  - Intelligent automatic VP placement for complex topologies, T-shape and H-tree
  - Support for complex differential pair topologies
  - Additional user control over VP location

Product Plans
Batch DRC Performance

- Batch DRC to support up to 4 processors for parallel execution
- Plane verification algorithms improved
- For example, a large customer designs:
  - 66k pins, 23k parts, 11k nets, 57k connections, 1500+ plane shapes, 18 layers
  - DRC analysis time decreased
    - 2 hours & 36 minutes to 45 minutes
Route Productivity

- Native any-angle routing
  - Full gloss and push/shove of any angle routes with arcs
  - Automatic tuning with arcs for any angle traces
  - Enhanced Dynamove of any angle routes with arcs

- Fiber weave routing support
  - Constraint for max length allowed parallel to fibers
  - User controlled interactive routing angles
  - Improved “push back” for routing parallel patterns
Route Productivity

- **Undo Auto Route**
  - Enabling user to revert back prior to auto routing
  - Results can be reviewed, reverted and re-run with different settings

![Auto Route Window](image-url)
Route Productivity

- Diff Pair Interactive Routing
  - Interactive Plow of Diff Pairs or Multiplow of multiple Diff sets will have improved pad entries supporting better convergence and symmetry.
  - Improvements to Diff Pair entries minimize the amount of post routing manual cleanup.
Routing Productivity

Net Explorer

- Quickly find & organize nets
  - Nets organized by constraint class, net classes, bus, diff pairs, tuned, matched, ordered, and topology
  - Hierarchical grouping of nets
  - User-defined net filters and graphical marking attributes

Not Committed in Product Roadmap
Routing Productivity
Improved topology planning/routing

- Driven by net explorer GUI
- Bus paths placed & manipulated like normal traces within environment
- Bus paths can be placed for any random bundle of nets
- Bus paths can be created from a sketch
- Optional push/shove between bus paths/traces and other bus paths
- Tighter integration between bus path placement and routing
- Routing results appear to be manually routed
Routing Productivity

**Sketch Routing**

- Capture user intent and quickly auto-route nets with the appearance of manual routing. User intent is defined by a user drawn sketch.
- General sketch direction guides automatic routing of connections.
- Connections can be any random set of connections.

*Product Vision*

Sketch then Route

Not Committed in Product Roadmap
Routing Productivity

Heuristic Routing

- To complete dense designs with manual like routing results, layer bias must be localized based on placement or existing routing
- Auto router learns/interprets designer’s intent
  - Interactive teaching process via route planning
  - Automatic interpretation based on placement, planning and existing routing
Design in 3D

- Collision detection
- 3D placement
- Design rules checking
- Thermal analysis
- Fabrication & assembly

Based on the most complete and accurate 2D footprint, 2.5D and 3D electronic part content
Enabling Collaboration

- Enable Xtreme collaboration across the flow
- ECAD/MCAD collaboration
  - Partner with additional MCAD vendors to promote Pro-Step schema
Expedition Enterprise Manufacturing
Expanding the Footprint
...Design to Manufacturing

- PCB Fabrication
  - Advanced manufacturing technologies
  - Design for Fabrication
  - Enhanced processes with Valor

- PCB Assembly
  - Streamlining NPI
  - Optimizing manufacturing with real-time process monitoring
  - Highest first-pass yields
  - Started with RSI and advanced with Valor

Mentor Graphics Acquires Valor Computerized Systems, Ltd.

WILSONVILLE, Ore., March 18, 2010—Mentor Graphics Corporation (NASDAQ: MENT), the market and technology leader in electronic design automation (EDA) and systems analysis solutions, today announced completion of the acquisition of Valor Computerized Systems, Ltd. for net consideration valued at about $50 million. Mentor paid approximately 5.6 million shares of Mentor stock and $32.5 million in cash. Immediately prior to closing Valor had cash of approximately $29 million. Valor’s revenues for its last reported full year ending December 31, 2008 were approximately $40 million.

Valor products are the world’s leading software for printed circuit board (PCB) design for manufacturing (DFM) and manufacturing execution (MES) systems. Valor’s solutions target three key segments in the PCB manufacturing market: design of the physical layout of the PCB, fabrication of the bare PCB, and assembly of PCB components. With the acquisition of Valor, Mentor is now positioned as the only EDA supplier to provide the electronics industry with a PCB systems solution from concept through manufacturing.

“Valor’s expertise and products in the manufacturing segment are an excellent fit to Mentor’s in the PCB design area as together we provide a concept-through-manufacturing design solution to our customers,” stated Henry Potts, vice president and general manager of the Systems Design Division of Mentor Graphics. “This acquisition will reinforce our number one position in PCB design while enabling Valor to leverage the strengths of Mentor and accelerate their delivery of differentiated design for manufacturing and manufacturing execution products.”
Mentor PCB Coverage

PCB Design

Process Engineering

Manufacturing

- Schematic Library
- Functional Simulation & Test
- Layout Design
- High Speed & Thermal Analysis
- Schematic-Level DFT
- Physical Library
- DFT Analysis
- DFF Analysis
- In-Circuit Test Prep.
- Assembly Process Prep.
- Fab Process Prep.
- SMT MES
- Manual Assembly MES
- Quality MES

© 2010 Mentor Graphics Corp. Company Confidential
www.mentor.com
Valor PCB Coverage

PCB Design

- Schematic Library
- Physical Library
- Functional Simulation & Test
- Schematic Design
- Schematic-Level DFT
- Layout Design
- High Speed & Thermal Analysis

Process Engineering

- DFT Analysis
- DFA Analysis
- DFF Analysis
- In-Circuit Test Prep.
- Assembly Process Prep.
- Fab Process Prep.

Manufacturing

- SMT MES
- Manual Assembly MES
- Quality MES
Integrated Design to Manufacturing

- Schematic Library
- Functional Simulation
- Schematic Design
- Schematic-Level DFT
- Layout Library
- Layout Design
- Thermal Analysis
- DFT Analysis
- DFA Analysis
- DFF Analysis
- In-Circuit Test Prep.
- Assembly Process Prep.
- Fab Process Prep.
- SMT MES
- Manual Assembly MES
- Quality MES

PCB Design

Manufacturing Optimization

Manufacturing Execution

Product Vision
Why Mentor?
Why Mentor?

- Delivering solutions for TODAY’s challenges
- Planning for TOMORROW’s challenges
- Providing know-how to maximize your investments

Ensuring PCB Development Success