System Level Design Tools

Who needs them, who has them and how much should they cost?

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CODES/ISSS
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The First Order SLD Trends

*Design gap is the difference between available gates and possible gates per silicon process.*

**Moore’s Law**

IP-based Design at Higher Abstraction Level

**Design Gap**

**Software Complexity**

**Embedded SW & Processors**

**Multiple, Application-Specific Processors**

**Algorithmic Complexity**

*Processor Performance*

*Battery Power*

```
module lcd_panel_controller;
reg panel_1, panel_2;
reg numeric_input, alpha_input;
event blank, latest_input;
begin
```

Dataquest

Design Productivity Gap

```
0 50 100 150 200 250 300
```

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Who Needs SLD Tools?

Who:
- Algorithm Developers
- System Architects
- Embedded software developers/System Integrators

For what:
⇒ Functional validation of the system specification
⇒ Architecture optimization and IP integration
⇒ Firmware development and HW-SW co-verification

Source: IBS, November 2002

Software effort overtakes hardware effort at 130 nm.
Architecture effort overtakes physical design at 90 nm.
## Semiconductor Co’s Using SLD Tools

<table>
<thead>
<tr>
<th>2002 Rank</th>
<th>Supplier</th>
<th>2002 Sales (Billions)</th>
<th>SLD In Production Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intel</td>
<td>$25.26</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Samsung</td>
<td>$8.63</td>
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</tr>
<tr>
<td>3</td>
<td>Toshiba</td>
<td>$6.45</td>
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</tr>
<tr>
<td>4</td>
<td>ST Micro</td>
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</tr>
<tr>
<td>5</td>
<td>TI</td>
<td>$6.24</td>
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<tr>
<td>6</td>
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<td>$5.69</td>
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<td>$5.25</td>
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<tr>
<td>8</td>
<td>Motorola</td>
<td>$4.78</td>
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</tr>
<tr>
<td>9</td>
<td>Philips</td>
<td>$4.36</td>
<td>Considering</td>
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<tr>
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<td>Hitachi</td>
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<th>2002 Rank</th>
<th>Supplier</th>
<th>2002 Sales (Billions)</th>
<th>SLD In Production Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
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<td>12</td>
<td>Fujitsu</td>
<td>$3.23</td>
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<tr>
<td>13</td>
<td>Matsushita</td>
<td>$3.14</td>
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<td>14</td>
<td>IBM</td>
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<tr>
<td>17</td>
<td>AMD</td>
<td>$2.66</td>
<td>Considering</td>
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<td>20</td>
<td>Rohm</td>
<td>$2.39</td>
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</tr>
</tbody>
</table>

Source: Dataquest, 2003 and CoWare data

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Who Has SLD Tools?

<table>
<thead>
<tr>
<th></th>
<th># of Companies</th>
<th>Average % of Revenues Spent on EDA Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top-tier IC Vendors</td>
<td>5</td>
<td>3.0%</td>
</tr>
<tr>
<td>Top-tier IC Vendors</td>
<td>8</td>
<td>1.9%</td>
</tr>
<tr>
<td>Bottom-tier IC Vendors</td>
<td>9</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Source: IBS, November 2002

- The most successful semiconductor companies
- (And, of course, the Systems Houses)
SLD Tools Deliver Business Value

Example – Sony

- Sony Micro-MV DCR IP7
  - First to Market
  - $1699 Retail Price
  - Utilized CoWare

- Panasonic PV-DC252
  - 7 Months Behind
  - $999 Retail Price
  - Did Not Use CoWare

Greater Revenue, Increased Gross Profit, And Reduced R&D Operating Expense
Performance, Cost, Design Cycle of System LSI

System level has a large impact

80% of performance/cost determined

20% of overall development time

How Much Should SLD Tools Cost?

Factors Driving Prices Down

- "Free"/In-house Solutions
- In-house Cost of Ownership
- Semi’s give away tools - fill the fab
- High value-add in small niches
- Highly differentiated value-add

Commoditization

Factors Driving Prices Up

- Competition
- Shake-out
- You get what you pay for at every stage and nothing is "free"!

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