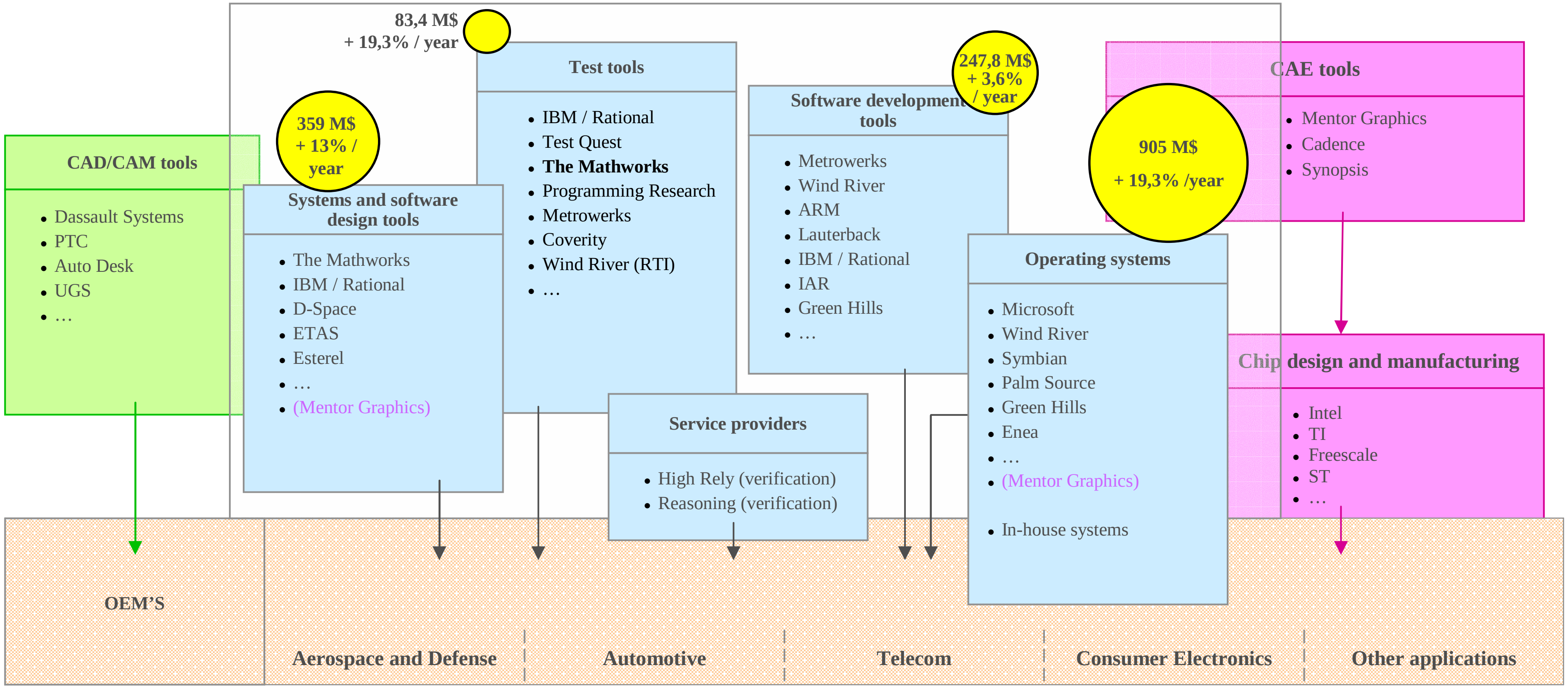
Technology transfer in the embedded system

Daniel Pilaud

- **Summary of the embedded market analysis**
- **Scade and PolySpace experience**
- **Possible trends**

- **The "embedded software tools" industry : a total market of about 1500 M$, with still a lot a small players, surrounded by major players of the "development tools" industry which could influence its future**



Main trends seams

(Sources : VDC July 2006, PolySpace's user-day,)

OS

- Bundling OS/development tools, in response to the pressure on prices
- Growing importance of :
  - embedded Linux
  - OS supplied by chip manufacturers

Development tools (unbundled)

- A need for higher value, more integrated offering (i.e. debugger included in the basic offering)
- More and more competition from the bundle "OS + tools"
- Growing requirements on standardization, interoperability, …

- **Customers more and more concerned by the challenge of critical software**
- **The trend towards more systematic and more rigorous development processes (CMMI, …) seems not so obvious for non critical software**
- **A selling process for tools, moving towards higher levels in the customer organization**

Design tools

- Growing need for more integration between :
  - system and software
  - design and test
- Growing market for the "model-based" design and code generation

Test tools

- Static analysis is more and more used
- Debate about the efficiency of "unit tests"
- Evolution towards the "model-based" testing

- strong growth potential for all product segments, except development tools
- good correlation between design and test tools, in terms of dominant applications (AED, Automotive)

Segment n° 1 Segment n° 2

in M€	OS and middleware 2004		OS and middleware 2007	Development tools 2004		Development tools 2007	Design tools 2004		Design tools 2007	Test tools 2004		Test tools 2007
• **AED**	91	+ *19,3%*	154		+ *7,0%*	60		+ *14,9%*	173		+ *20,5%*	40
• **Telecom / DataCom**		+ *14,6%*	267		+ *7,7%*	74	66	+ *11,7%*	92	14 [1]	+ *19,5%*	24
• **Automotive**	29	+ *22,1%*	54	37	+ *7,9%*	46		+ *13,5%*	162		+ *20,9%*	25
• **Consumer Electronics**		+ *24,5%*	729	46	+ *7,6%*	57	15	+ *12,0%*	21	13	+ *21,3%*	24
• **Others**	229 [1]	+ *13,2%*	332	57 [1]	- *12,0%*	39	53 [1]	+ *10,0%*	71	19 [2]	+ *15,1%*	29
TOTAL	**905**	+ ***19,3%***	**1 536**	**248**	+ ***3,7%***	**276**	**359**	+ ***13,1%***	**519**	**83**	+ ***19,3%***	**142**

OS and middleware: (1) of which 129 Industrial Automation

Development tools: (1) of which 13 Industrial Automation

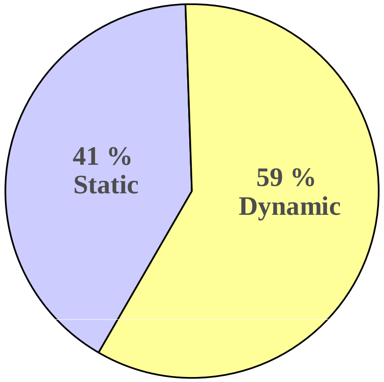
Design tools: (1) of which 25 Industrial Automation

Test tools: (1) of which ~7 M$ for TestQuest; (2) of which 8 Medical

■ A more precise vision of these two product segments

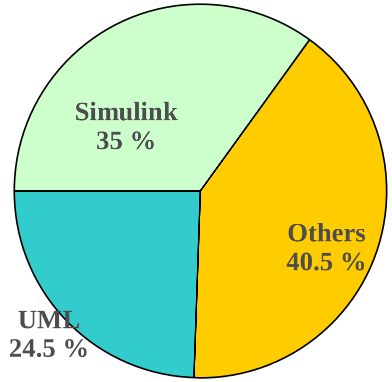
- **Test tools**

  TOTAL 2004 : 83 M$



- **Design tools**

  TOTAL 2004 : 359 M$



(July 2005
VDC)

Conclusion

- The design tools market is in the way of consolidation: IBM, Mathworks and new players
- Testing tools will be more and more integrated in the global offer (partnership or consolidation).
- Free software tools is a question mark for this market

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Scade and Polyspace experience

- Starting point:
  - Technology push
  - Based on real differentiation
  - Market needs was expressed (internal tools SAO, SAGA) or Ariane 5 experience
- First phase
  - A lot of money for development and maintenance
  - Market niche and Moore approach
  - Relationships with research labs decrease
- Second phase
  - From niche player to global offer (consolidation or larger offer)

Polyspace and Scade experience

- In Europe, Technology transfer tools (European project, national funding, early stage specific actors…) seems quite successful for the first step

- The demonstration has to be done for the second step

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Possible trends

- Two kind of process will be widely used:
  - High ceremonial process (CMMI , DO178 B,….) for critical software
    - Quality is the first priority
    - Certification authorities pressure
    - New version of the software is viewed as a new project
    - Reuse is a key word: Part of the previous software will be reused in the new project
  - Agile process
    - Time to market is the first priority
    - Software is viewed as a product
    - The model is not Airbus, or Boeing process : it is Microsoft or DS or The Mathworks process
    - Maintenance is a key word :Features will be added to the previous version and bugs are fixed for the next release
    - Periodic versions (each one year….)
    - New business model???

Possible trends in the future (tools)

- High ceremonial process;
  - Modeling tools : game over for new entrants (except big companies such as DS or Mentor graphics who start from adjacent markets or niche player in the level of system design)
  - Opportunities for verification tools before consolidation
  - Opportunities for tools which help the reuse

- Agile process:
  - Partial (re) verification is the key (non regression testing, non regression verification…)
  - Link between marketing and R and D should be facilitated

Conclusion

- Technology transfer:
  - Key points (learned from Paul)
    - Listen the market needs
    - Understand the current best practices
    - Build the differentiation with a solid scientific results
  - And others
    - A lot of money is needed
    - Marketing is important too!!!