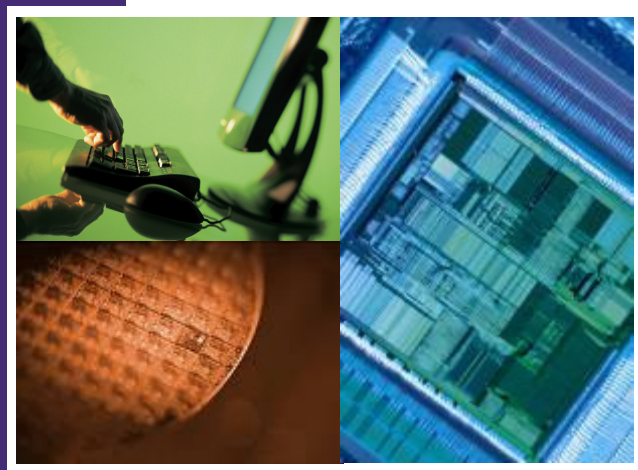
Will MPSoCs make the adoption of ESL tools finally mandatory?

Joachim Kunkel
VP/GM
Solutions Group



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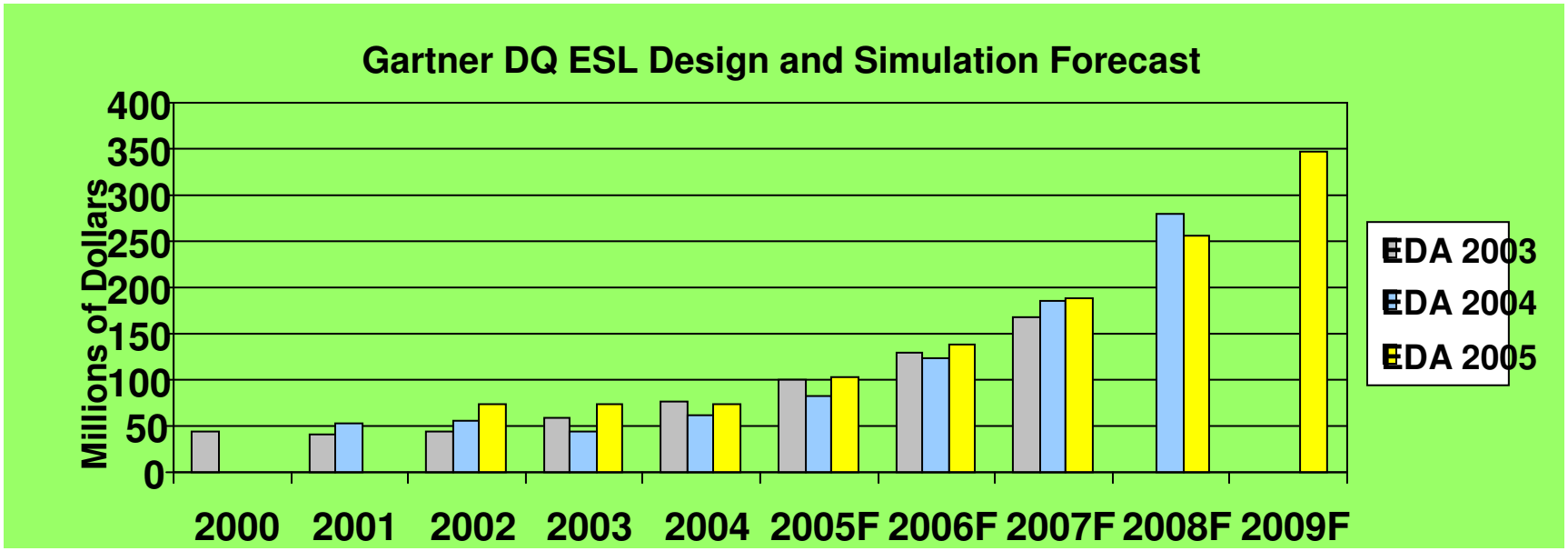
The ESL Tool Market

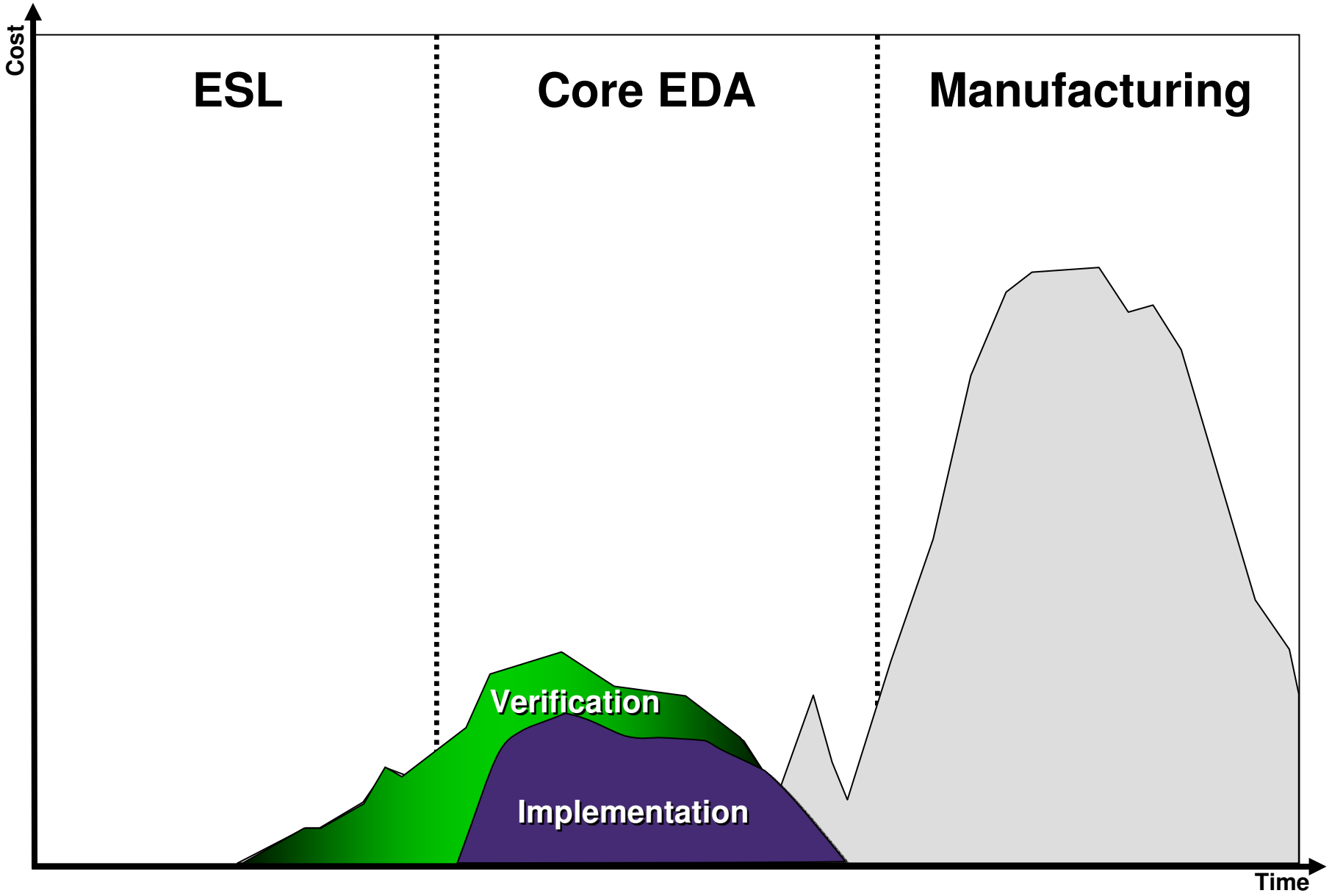


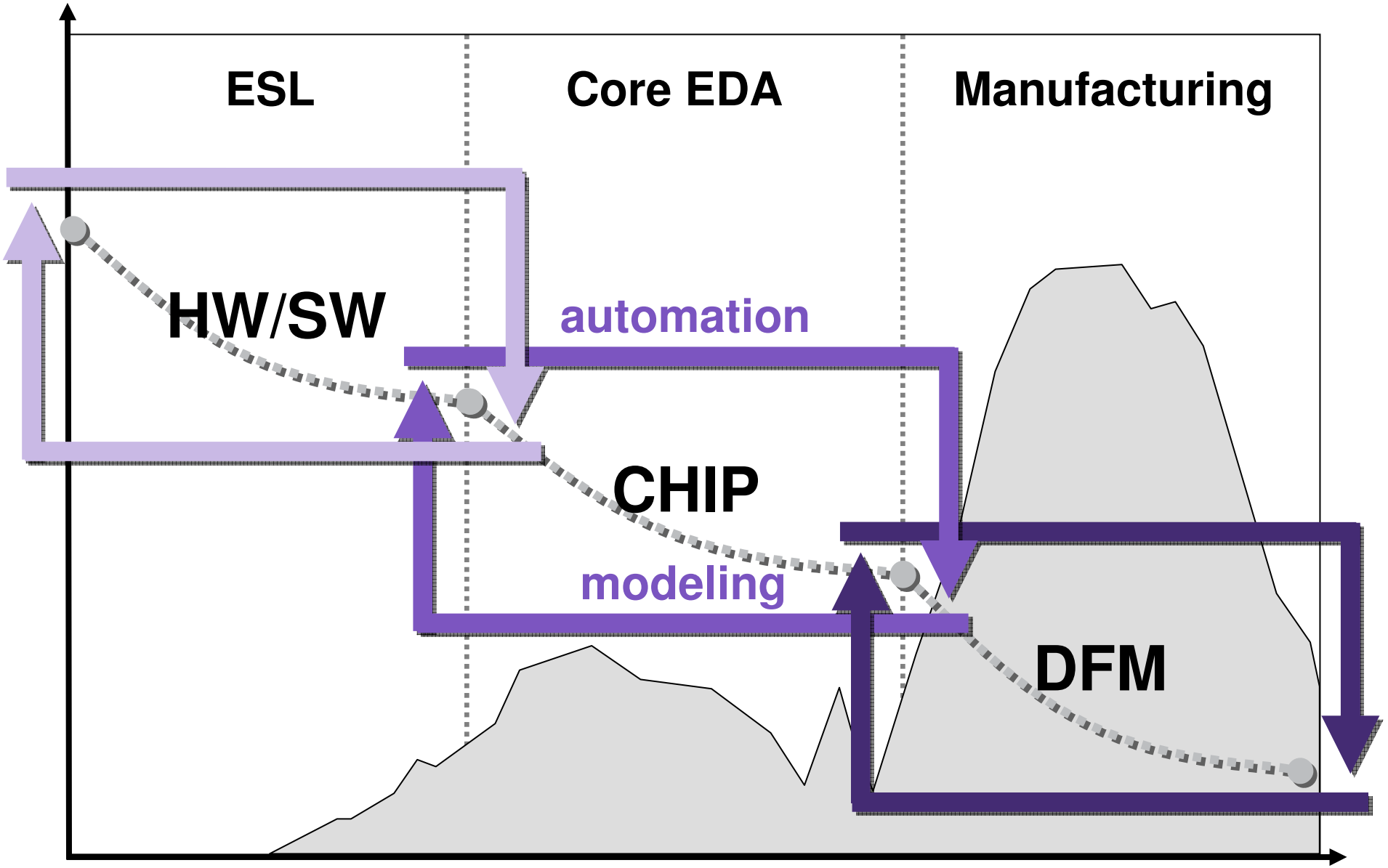
- "2004 was a good year for ESL, except for the numbers. ESL tool sales was down 11 percent in 2004."
- "We have forecast a five-year 35.7 percent CAGR for the ESL market, but we hope it will be higher, because this market needs explosive growth to pull the world of EDA out of its doldrums."

source: Gartner DQ - Market Trends: Electronic Design Automation, Worldwide, 2005

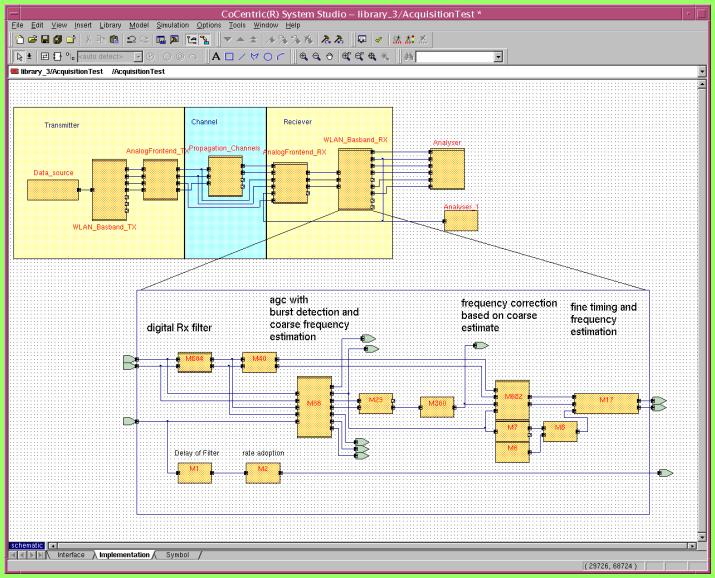
What is ESL Design?

- "Electronic System Level Design"
- "Design Above RTL"
  - does not say what it is, only what it is not
  - sounds awkwardly hardware centric
- "Concurrent Design of Hardware and Software"
  - some will add "From a single specification", which implies "In the same language"
- "I can't define ESL Design for you but I can tell you when I see it."





Designing Components
Data Processing Dominated



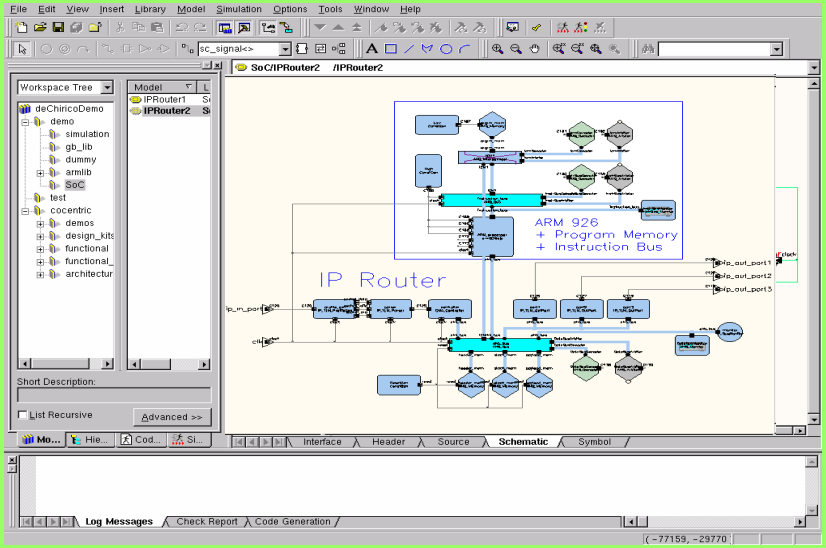
- C/C++/SystemC executable specification is the result of optimizing an algorithm in the context of the system
  - COSSAP/System Studio, SPW, Simulink, Roll Your Own
  - MATLAB -> C/C++/SystemC

- Implementation from C/C++/SystemC
  - hard wired logic - Forte, Catapult, Synfora, Bluespec, ...
  - ASIPs - LISATek, TARGET, ... ARC, ARM, Tensilica, ...

Designing Components
Data Processing Dominated

- **Will we see more usage of ESL tools because we are developing MPSoCs?**
  - **methodology is reasonably well established and adopted**
    - **there is room for growth (from very low levels) in the implementation area**
  - **need for tools is a function of the number of data processing dominated algorithms to be implemented**
    - **many of these algorithms are specified in standards**
      - **transmission, compression, etc.**
    - **if the number of companies who need an implementation of a specific algorithm is large, somebody will develop and license it as IP**

Designing With Components



- IP-XACT XML description is the result of optimizing the architecture of an SoC
  - SystemC TL Models of components
  - System Studio, Platform Architect, ...

- Implementation from SPIRIT IP-XACT XML description and SPIRIT IP-XACT compliant implementations of components ('IPs')
  - coreAssembler, Platform Express, Roll Your Own

Designing With Components

- Will we see more usage of ESL tools because we are developing MPSoCs?
  - adoption of flow is embryonic
    - today mostly limited to architectural analysis
    - unless a large number of components (SystemC TL Model AND Semiconductor IP!) are available to the designer this is some form of 'Custom ESL Design'
  - need for tools grows as the number of components to be integrated into an SoC grows, but
    - gated by component availability (models and implementation)
  - ... and none of this is the result of us developing MPSoCs

MPSoC

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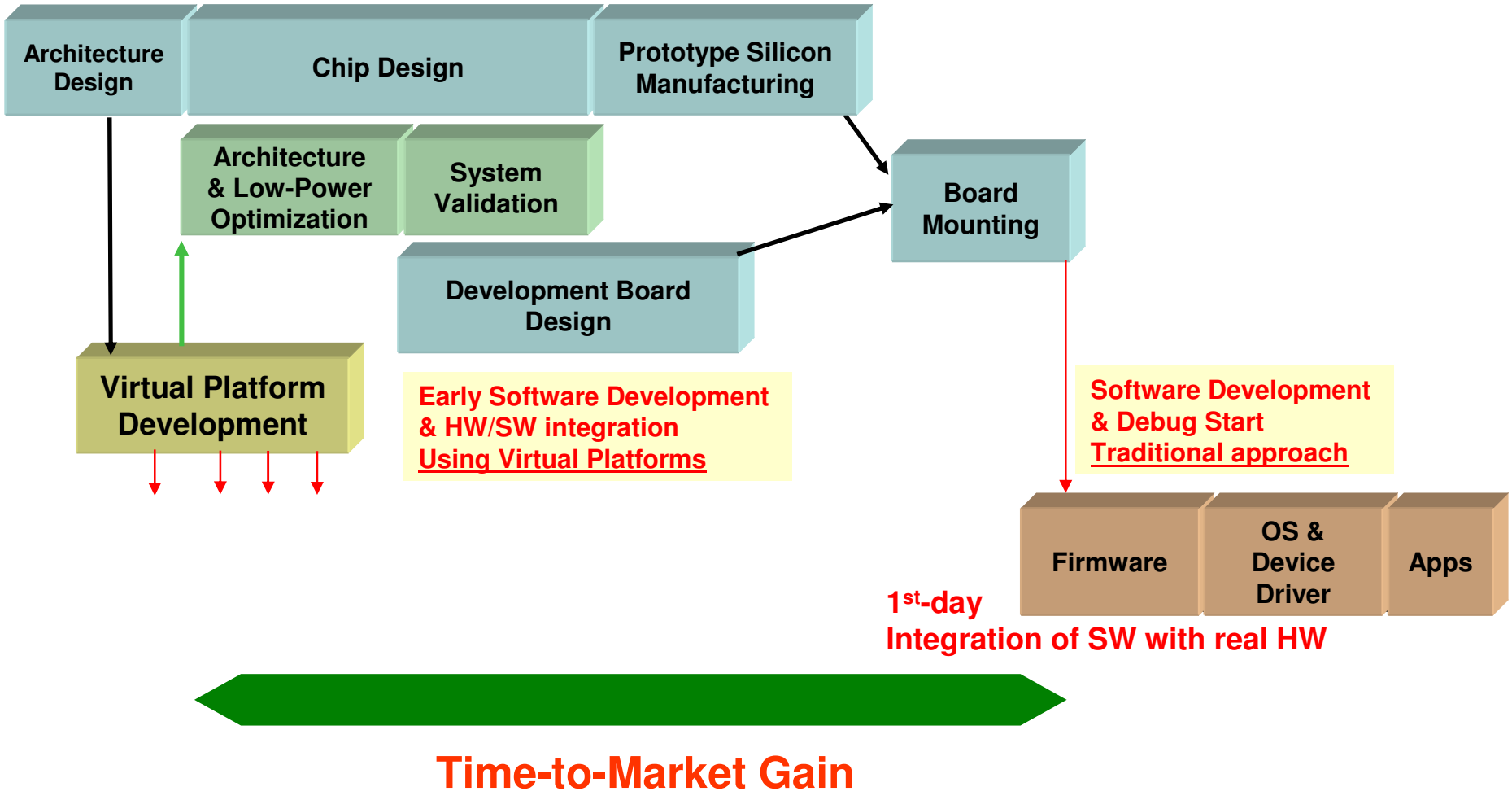
Multi-Processor SoC

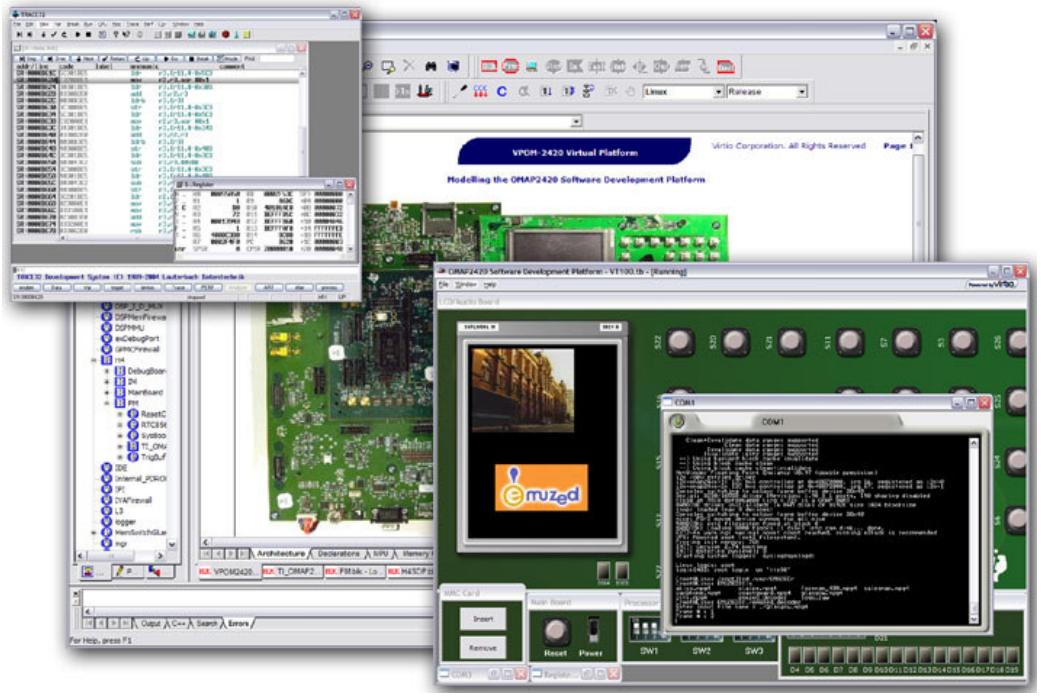
SW Development in the (M)PSoC Era

The Need for Virtual Platforms



Virtual Platforms
ESL Tools for Software Developers

- A Virtual Platform is a fully functional software model of a complete systems
  - SoC, board, I/O, and user interface
- Executes unmodified production code
  - drivers, OS, and applications
- Runs at up to 50 MIPS
  - boots OS in seconds



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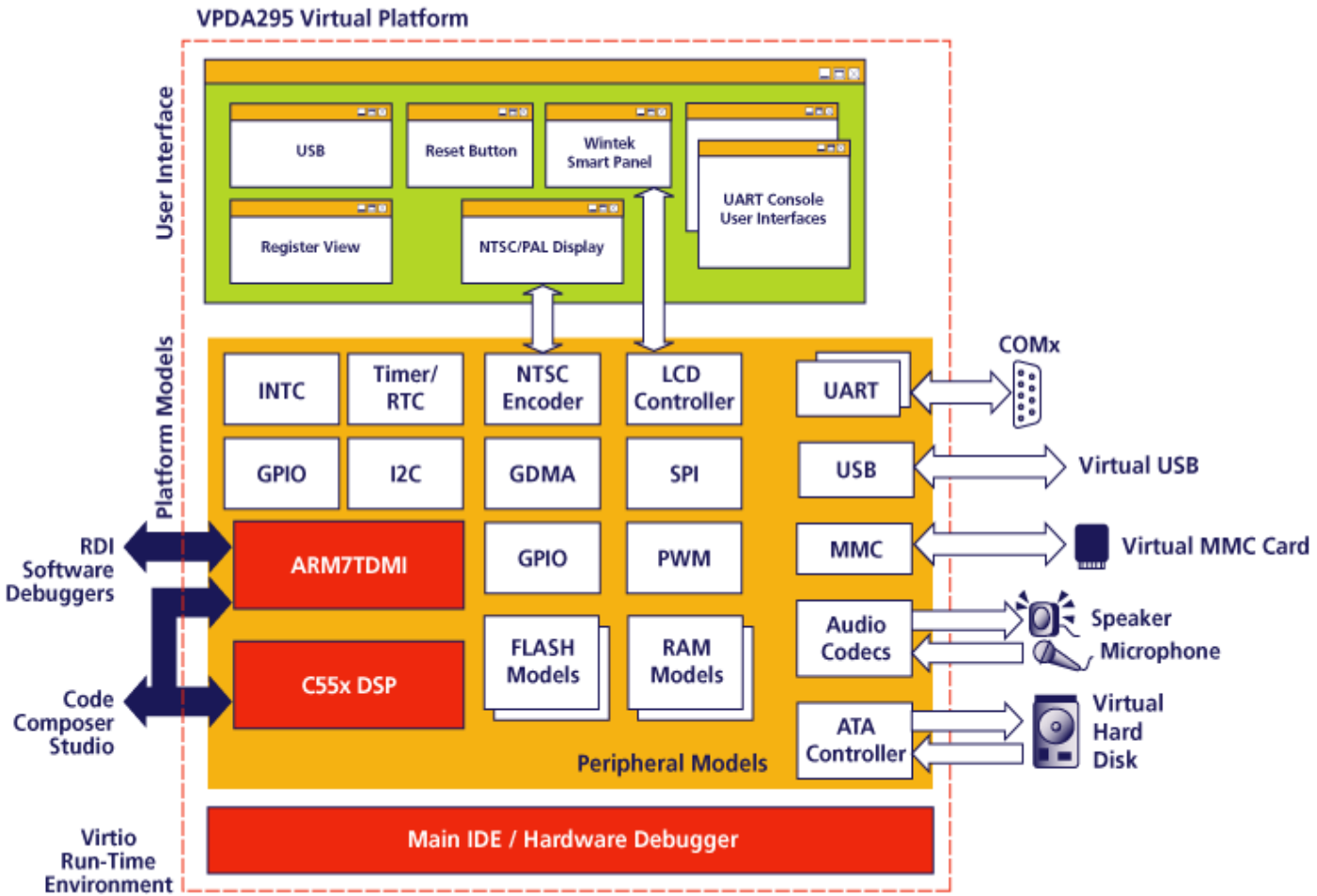
SW Development On Virtual Platforms

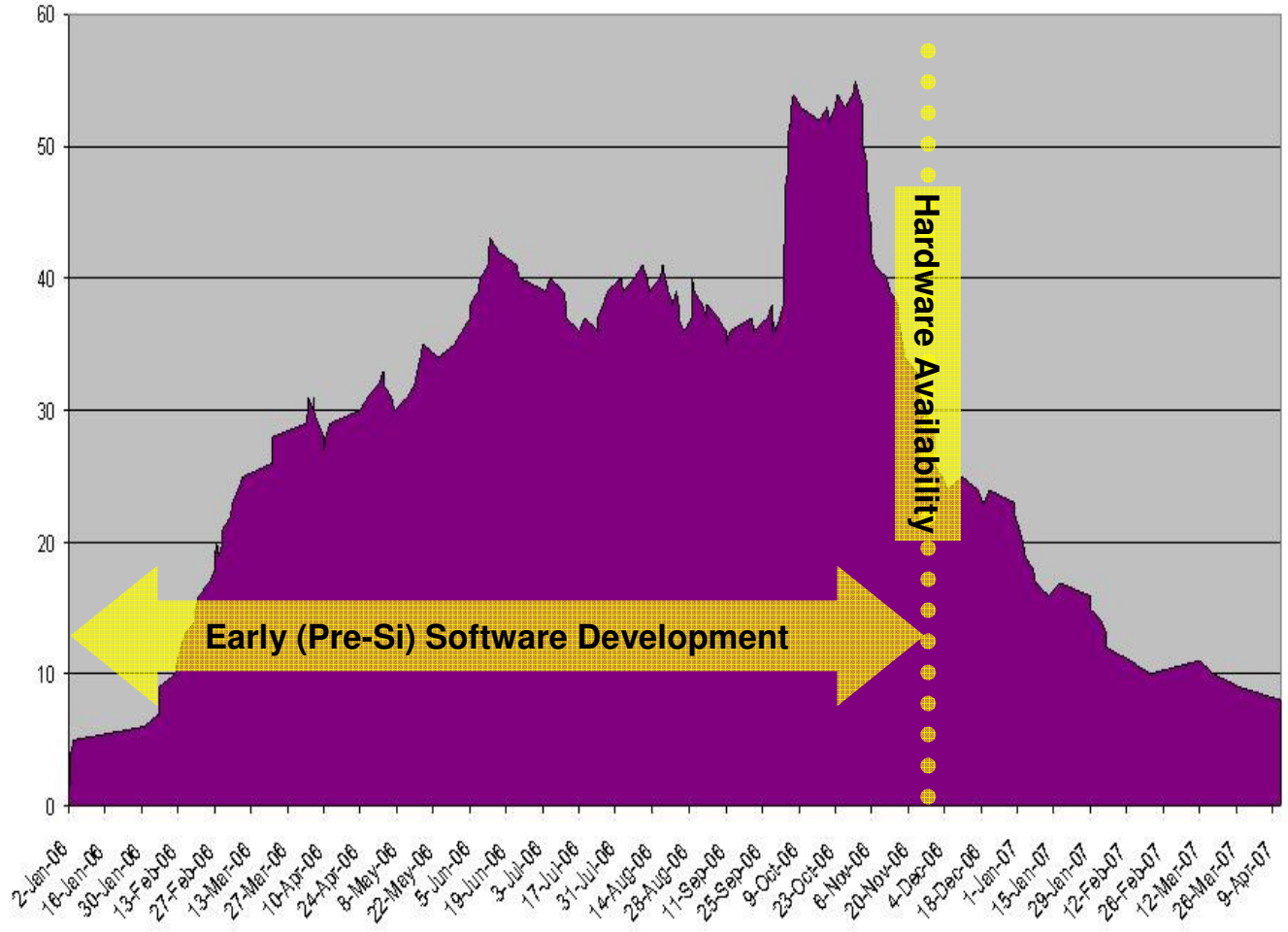
- Device testing (flash) utilities
- Board-level diagnostics
- (Secure) applications
- Power management layer
- L2/L1 Modem Protocol Stack Software
- Inter-Processor Communication (IPC)
- (DSP) CODEC development
- DSP RTOS porting
- New OS kernel development
- Driver development (storage, connectivity, ..)
- OS base ports
- Boot & (secure) ROM code / firmware

Applications
Operating System
Devices Drivers
HAL

Running Unmodified Code
Requires Modeling of Complete Context



Virtual Platform Usage
A Case Study



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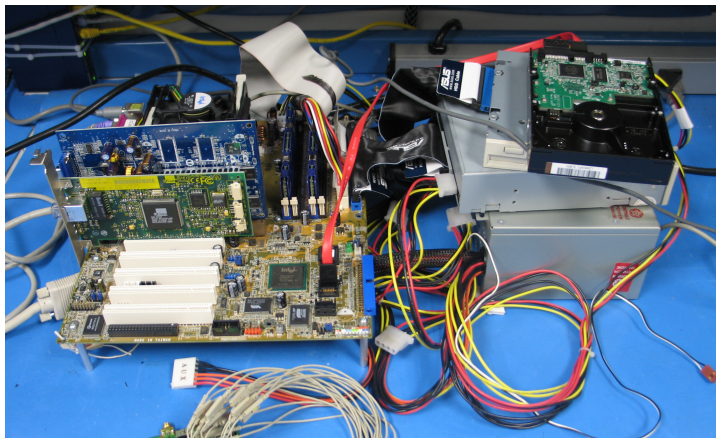
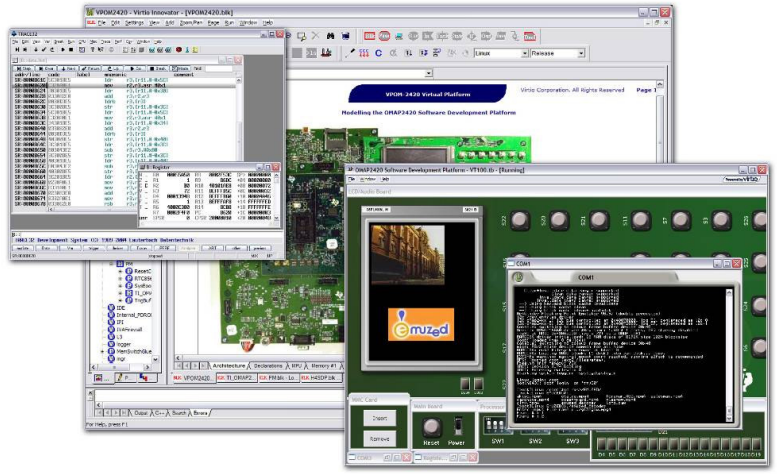
Virtual Platforms

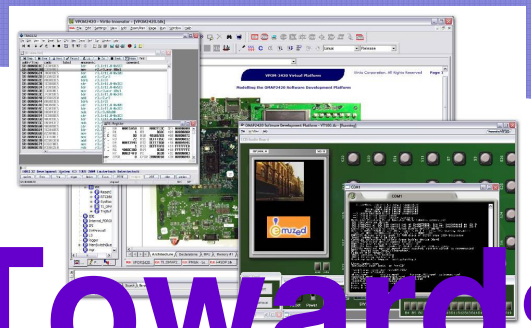
It's Like Hardware – Only Better!



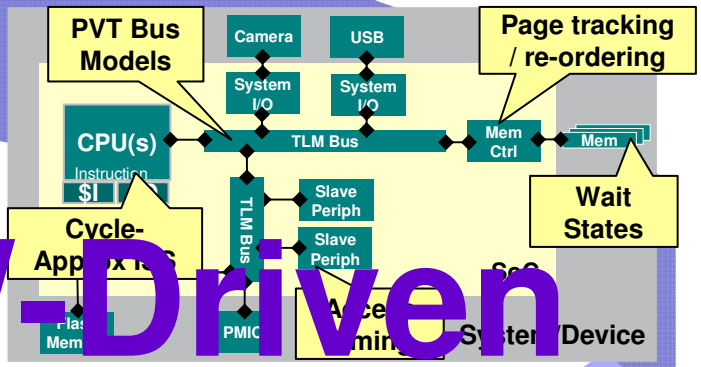


Early Availability	available before the chips come back from the fab and boards have been debugged
Enhanced Debugging	full visibility and control with non intrusive access to all components
Easy to Deploy	minimal user ramp up time and logistical effort to distribute and update

Early (pre-Si) SW Development
Early System integration

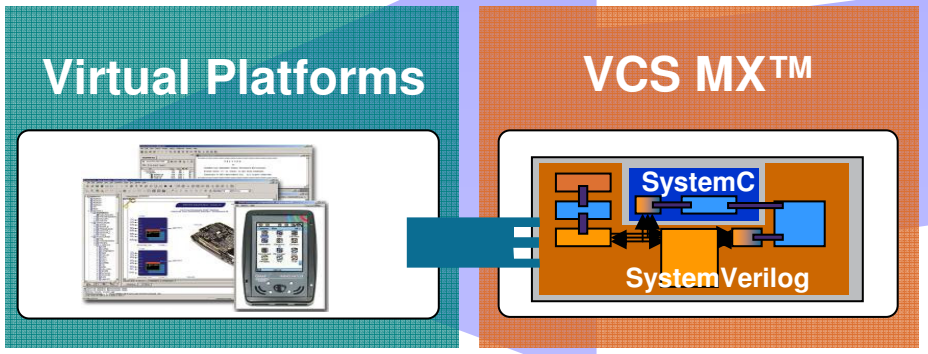


SW-Driven Architecture
Analysis and Optimization

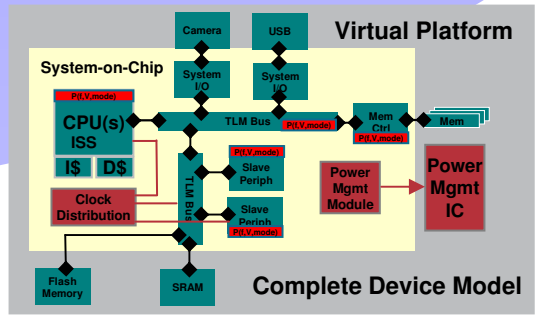


Towards SW-Driven Product Development

System Verification



SW-Driven Power Analysis and Optimization



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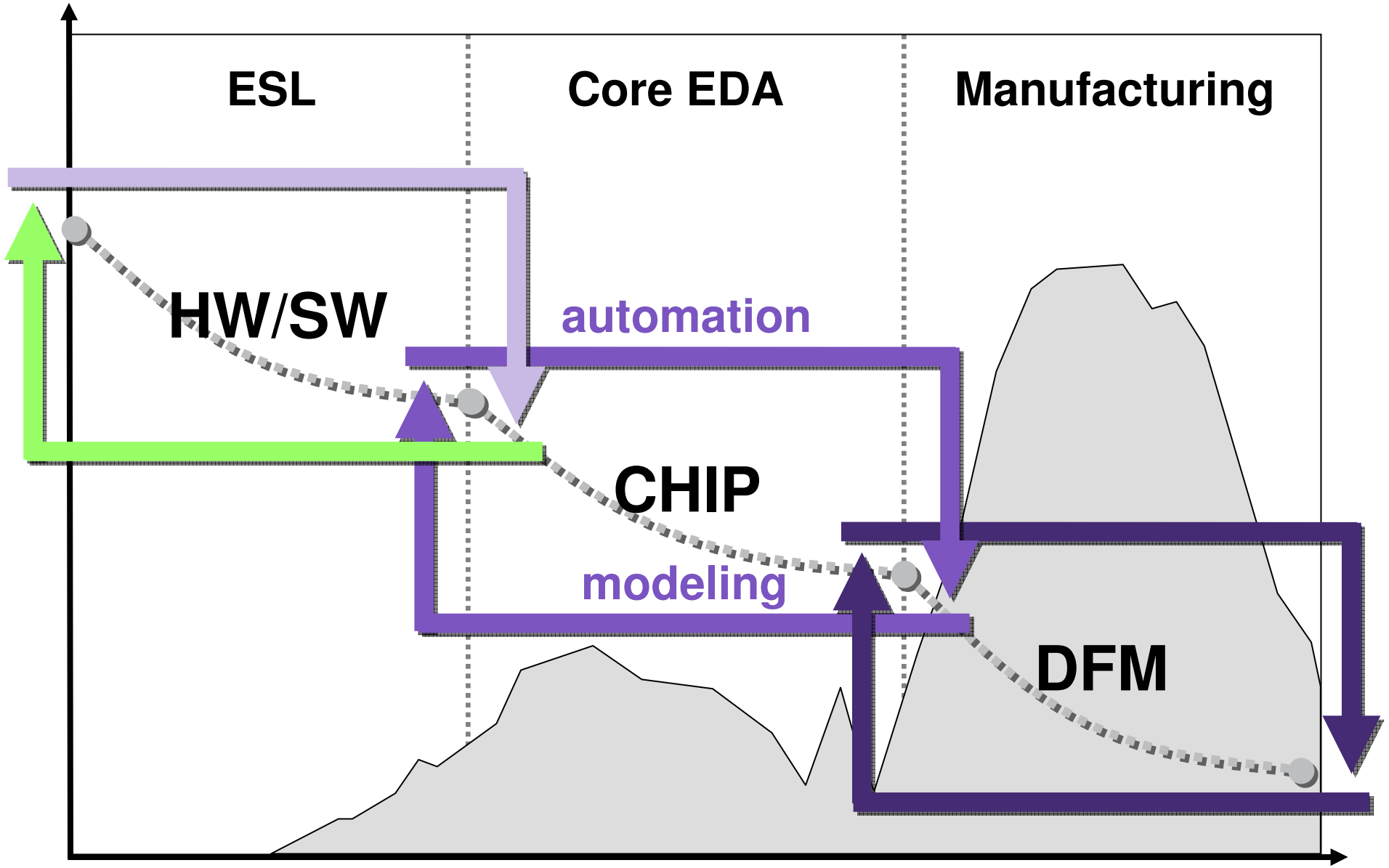
Virtual Platforms
Are we there yet?

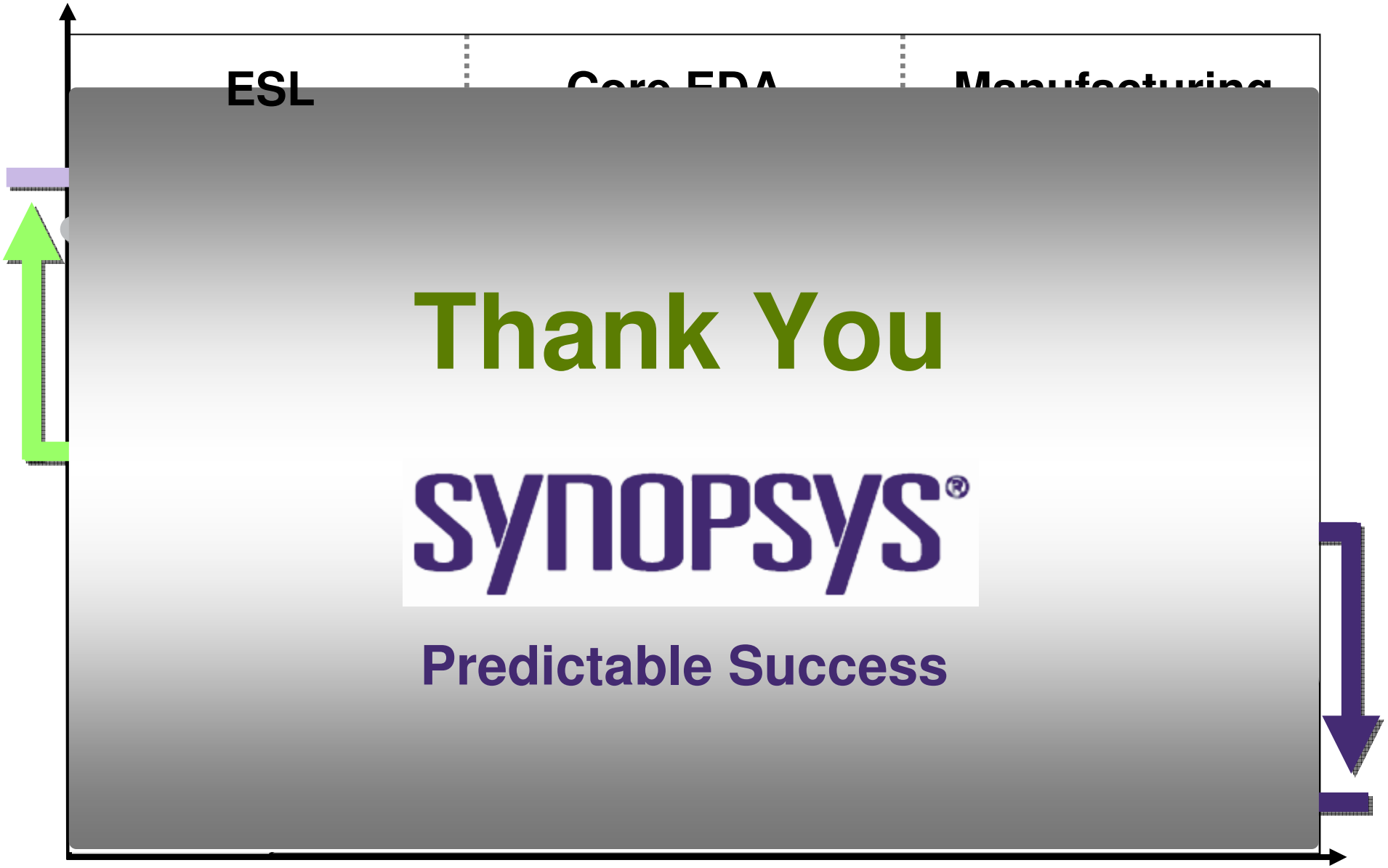
- Virtual Platforms are being used today at many semiconductor companies
  - programmable platforms SoCs
- We are starting to see adoption of Virtual Platforms by the device makers

- BUT ... the effort required to develop a Virtual Platform is a function of the availability of SystemC TL Models of the components

Will MPSoCs make the adoption of ESL tools finally mandatory?

- Implementing components from executable specifications in C/C++/SystemC is seeing some renewed interest
- Today's *Custom ESL Design* flow for designing with components is not compelling
  - progress is gated by the availability of ready to use components (SystemC TL Models AND Semiconductor IP)
- Large software content combined with fad/fashion nature and tight market windows for MPSoC-based designs in the consumer electronics space are creating an opportunity for Virtual Platforms




ESL
Thank You
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