

Grid Adoption at European Auto Firms

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Purpose of Study

- 1. To analyze the impact of European research initiatives including support from the European Commission, the Enabling Grids for E-Science (EGEE) and other European Grid efforts on Grid research, infrastructure evolution, and commercial grid adoption in Europe.
- 2. To identify future infrastructure needs in Europe based upon the growing adoption of Grids for research and business use.
- 3. To analyze the pattern of commercial Grid adoption that is likely to occur in Europe
 - What industries are likely to be the early adopters?
 - What impact Grid use will have on these industries and on Europe's economies?

Main Parts of Study

- Phase 1: Grid application adoption in autos, aerospace and financial services, and the impacts of this use on networks.
 - This work will last from June 2006 to September 2006.
- Phase 2: Grid application adoption on pharmaceuticals, telcos, and electronic design firms and their expected need for improved networks.
 - This work will last from October 2006 to December 2006.
- Phase 3: How research users and academic networks such as GEANT2 expect Grids to place new demands on networking infrastructure.
 - This work will last from January 2007 to April 2007.

Deliverables/Products of Study

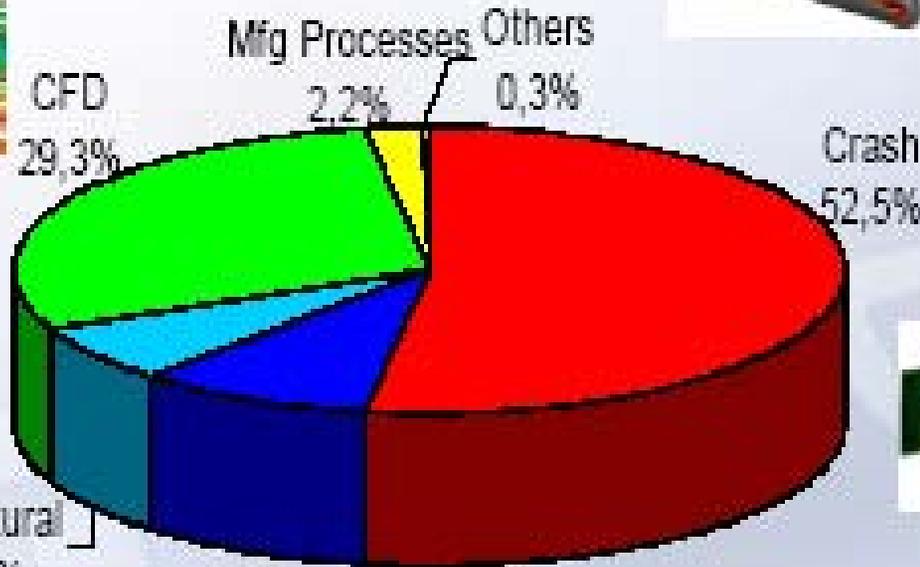
- A Special Report on how Grids will affect European communications infrastructure.
 - A first draft of this report will be available in November or December 2006. A final report should be completed by April 2007.
- A Written Report on how European Grid research is likely to evolve and the impacts it will have on infrastructure and commercial Grid adoption.
 - A draft of this report will be available by December 2006. A final report should be completed by May 2007.
- A Written Report on commercial Grid adoption in Europe based upon a study of industries that are leading European Grid adoption, such as financial services, aerospace, autos, electronic design automation health care, computers, and pharmaceutical industries.
 - A draft of this report will be available by January 2007. A final report should be published by June 2007

European Auto Firms and the Use of Grids

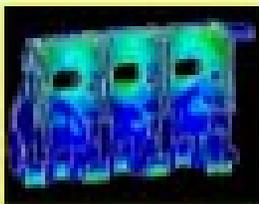
- Many European automakers and their suppliers use Grids for design and product development.
- In many cases, they are doing thousands of simulations a day using Grids.
- In a few cases, such as BMW, virtual cars are created in the production line.



Source: Christian Tanasescu, SGI, "Top20AutoSurvey of HPC Installations in the Automotive Industry"



CFD -
Computational
Fluid Dynamics

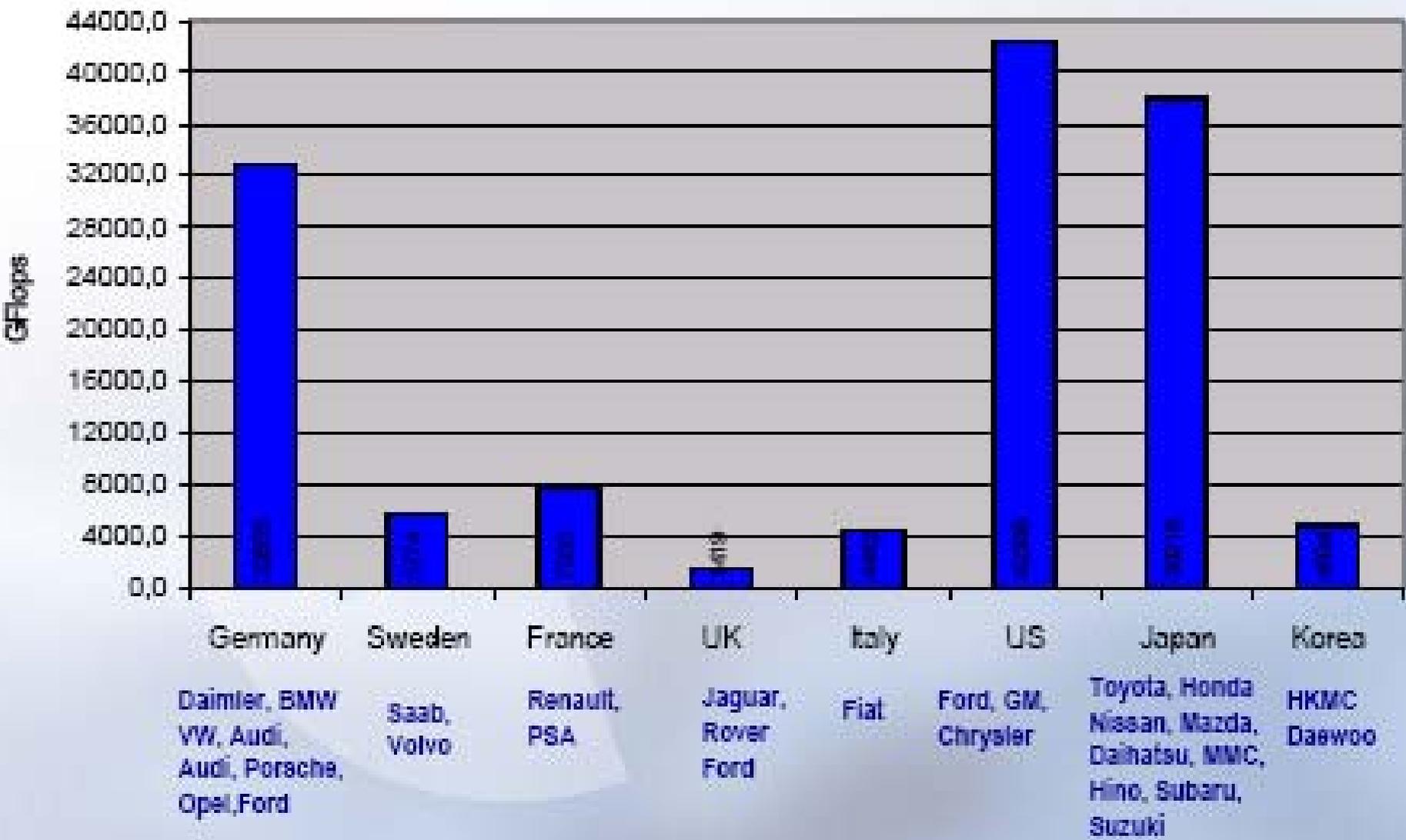


NVH - Noise,
Vibration,
Harshness



-**Crash** is the application segment #1
 -**CFD** is the fastest growing application segments (5% yty)
 -**NVH** the most demanding in terms of memory and IO bandwidth.

HPC in Automotive by Country - 2005



Benefits of Grids

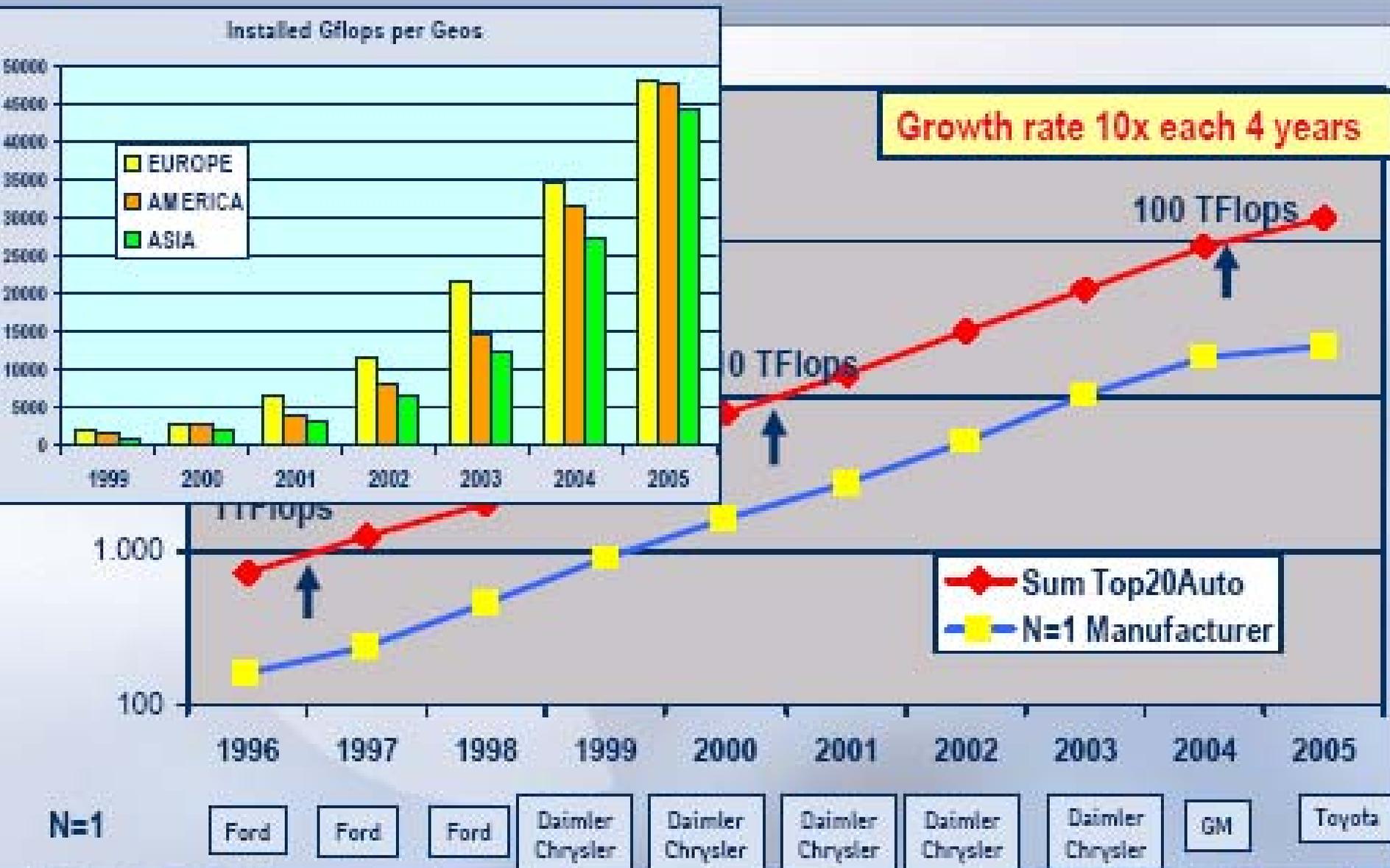
- Cost savings are dramatic.
 - 2003-6 -- 0% per year
 - 2007-10 -- 25% per year
 - 2011-14 -- 40% per year

Why are Cost Savings So Big?

- Auto firms are:
 - 1. Automating the entire design process
 - 2. Developing the tools for production as part of the vehicle design
 - 3. Beginning to use Virtual Cars in the Production Line. This could lead to far more extensive automation than today.
 - 4. Grids help automakers customize cars and even customize the type of ride.

Auto Firms are Expanding Grid Use

- European firms plan to launch Enterprise Grids in 2003 and Partner Grids in 2005
- The main period of growth for Enterprise Grids will be from 2006-9.
- The main period of growth for Partner Grids will be from 2008-2012.
- SOAs and virtualization will influence the creation of Enterprise and Partner Grids but not have a great influence on their adoption.



European Auto Grid Use Suggests a New Adoption Model

- The usual model of grid adoption is based upon hardware evolution -- starting with clusters
- A more pertinent model is one that addresses the increasing need for managing complexity.
 - A Pyramid Model addresses these needs

Accepted Model of Grid Adoption

Increasing IT Complexity

Virtualized Applications

Service Grid

Data Grid

Computing Grid

Infrastructure Optimization

Departmental Grid
Infra-Grid

Campus Grid
Intra-Grid

Enterprise Grid
Extra-Grid

Partner Grid
Inter-Grid

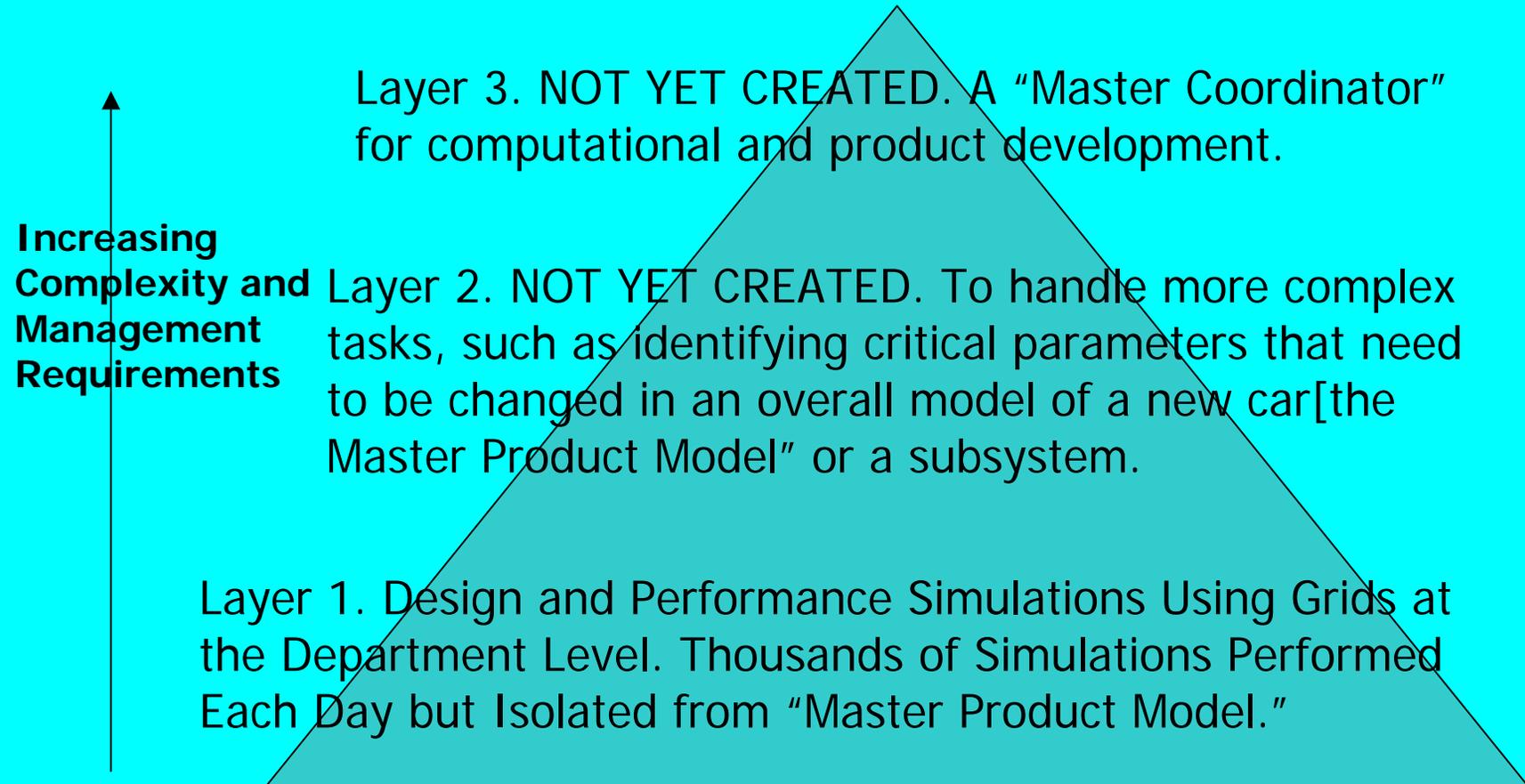
COMPUTE GRIDS let organizations gain more value from IT

ENTERPRISE GRIDS let firms improve business processes

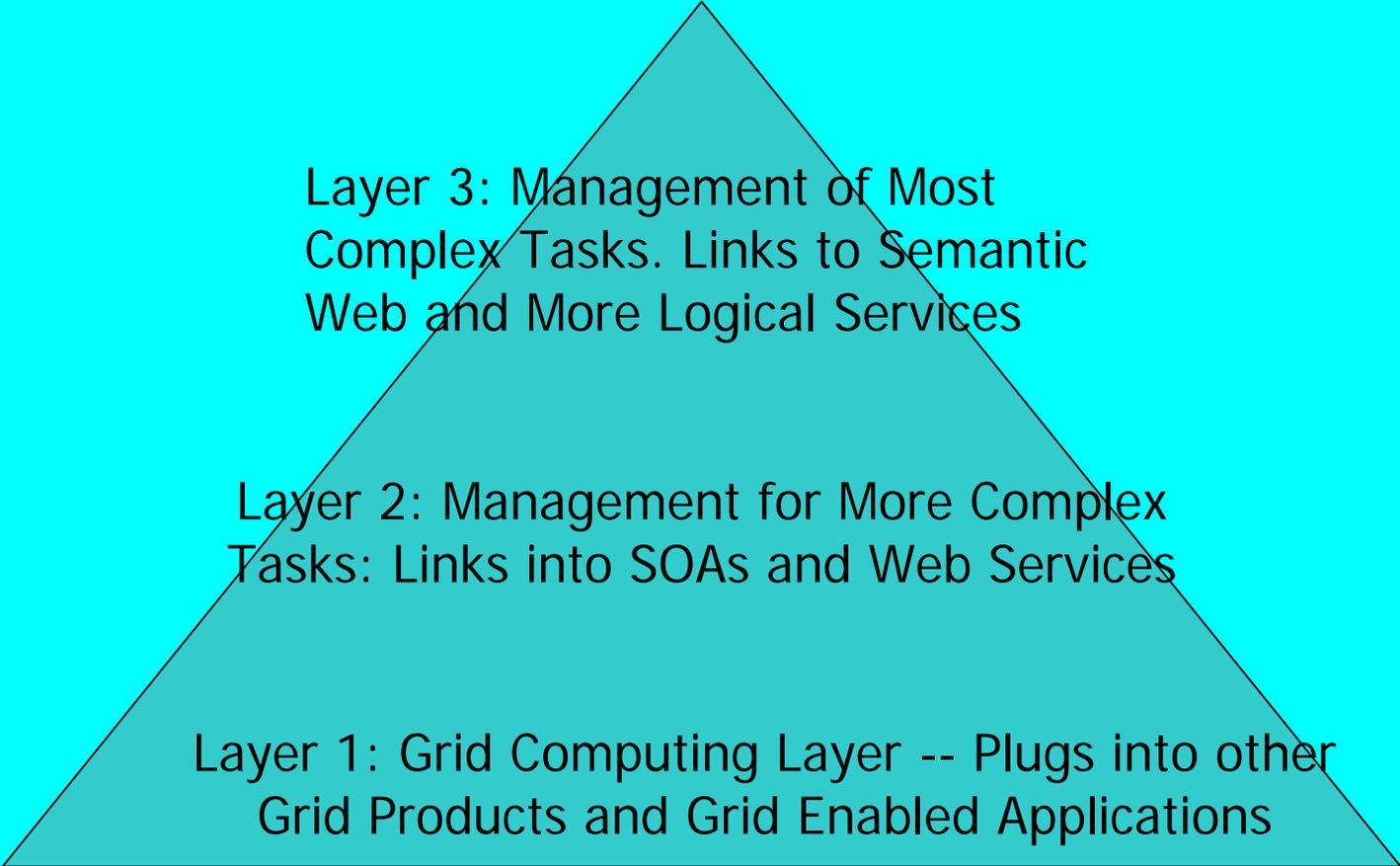
PARTNER GRIDS let firms interact/transact with customers, suppliers and partners. Permit work with same data between firms.

Increasing Organizational Complexity

Grid Pyramid for Auto Firms



The Grid Pyramid



Layer 3: Management of Most Complex Tasks. Links to Semantic Web and More Logical Services

Layer 2: Management for More Complex Tasks: Links into SOAs and Web Services

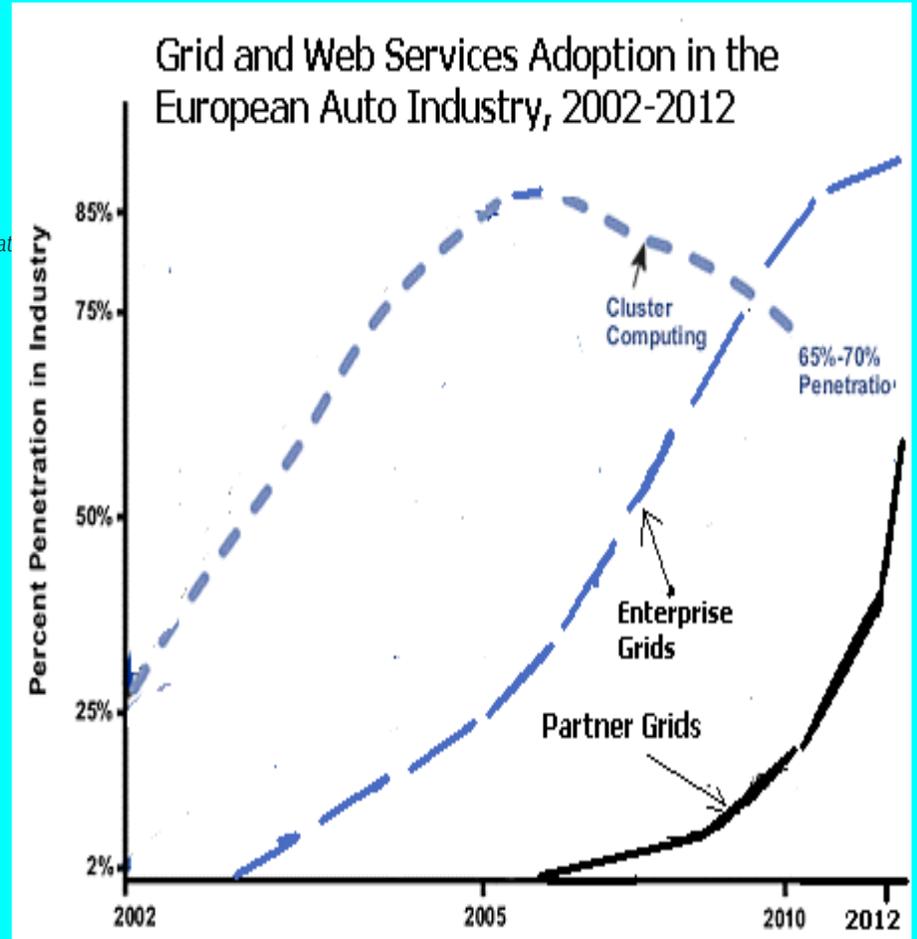
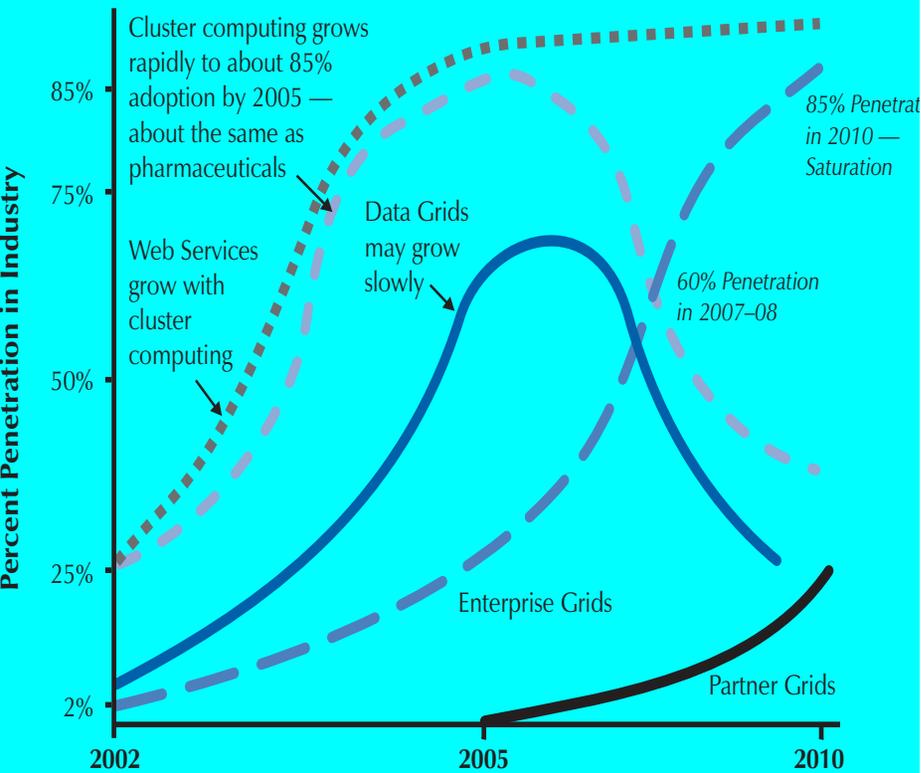
Layer 1: Grid Computing Layer -- Plugs into other Grid Products and Grid Enabled Applications

Comparing Patterns of Auto Grid Adoption

- US, European and Japanese auto firms are deploying Enterprise Grids at about the same pace. There are not great differences between them.
- In Partner Grids, although deployment in the US appears to be ahead, Japanese and European firms will deploy Partner Grids faster in the next few years.
- There are few differences, but European funded initiatives are very helpful for auto firms.

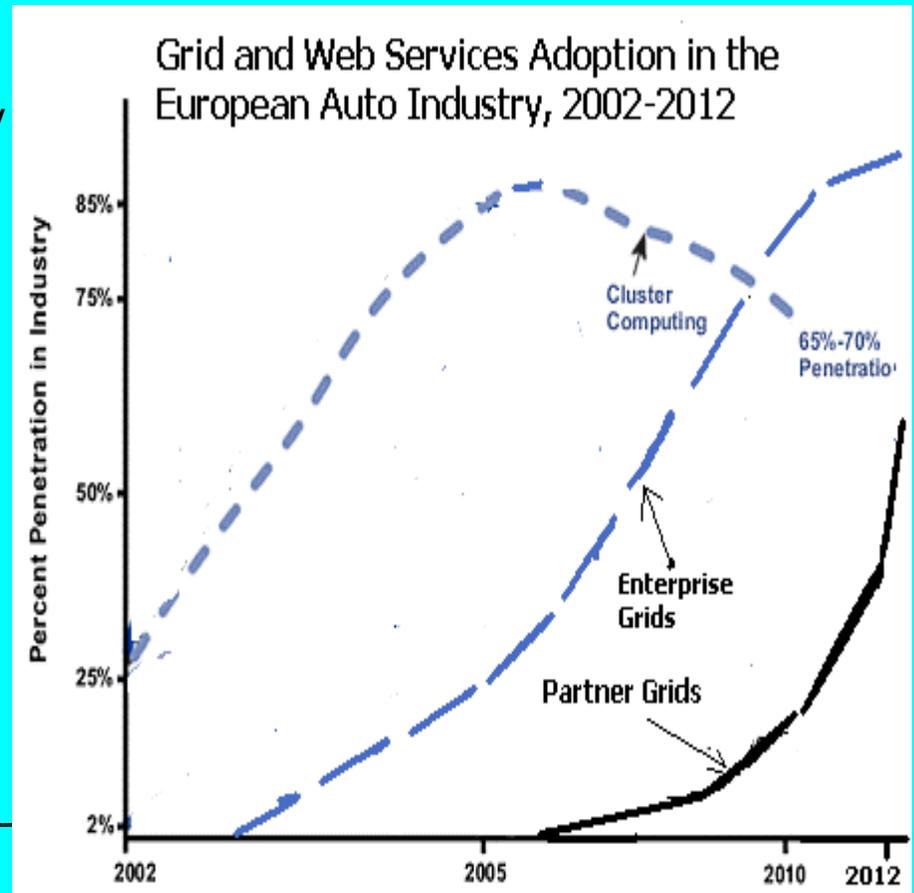
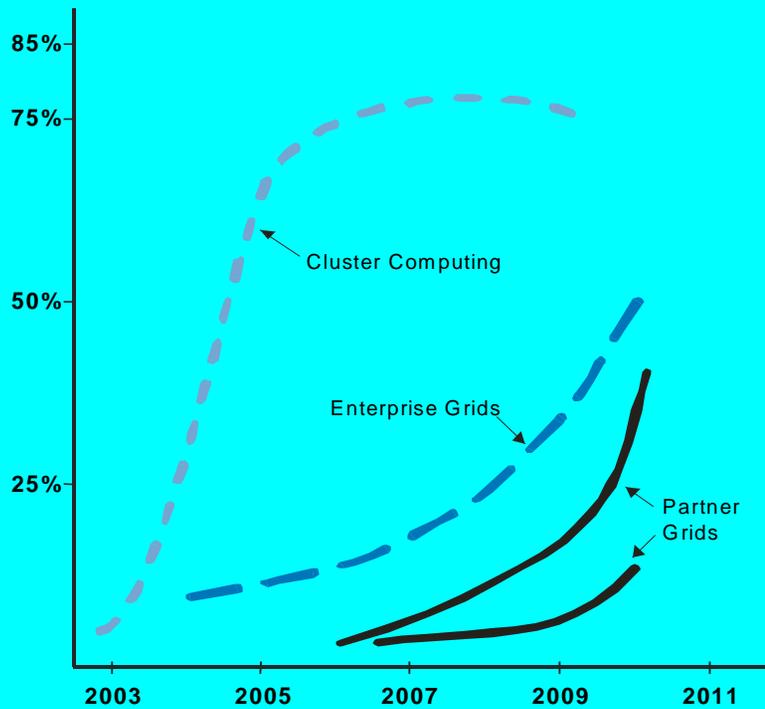
Auto Grid Adoption -US-EU

Figure 4: Penetration of Grids in Auto Industry — 2002 to 2010



Auto Grids - Japan and Europe

Figure 4: Penetration of Grids in the Auto Industry



European Automakers' Costs of Deploying Grids and SOAs

- In 2006-7, deploying a Grid costs ~400,000 Euros. Most costs are for middleware and systems integration. Deploying an SOA costs ~ 300,000 Euros
- In 2010-12, deploying a Grid will cost ~2.5 million Euros. About 1.5 MN Euro will be for the cost of computers/blades. To deploy an SOA will cost ~325,000 Euros.

What Factors will affect Auto Firms' Use of Broadband?

- Use of Grids, Virtualization, and SOAs
- Use of Virtual Grids between different R&D and product development centers
- Grids and Virtualization will require:
 - control of optical backplanes
 - better latency, QoS
 - Collaboration environments, keeping many groups using Grids up at the same time.

How Much will Grids Increase Broadband Demand?

- One early estimate is that broadband demand will increase by 20% per year every year from 2005-2012.
- Bandwidth will be driven by larger databases, sharing with partners, and greater complexity of calculations.

Conclusions

- European auto firms are adopting Grids to produce a wider range of cars and to offer more customization to customers.
- These aims mean that there is far more design and product development work and that firms need to simplify the production process.
- Grids mean firms will place new demands on infrastructure and use more bandwidth.