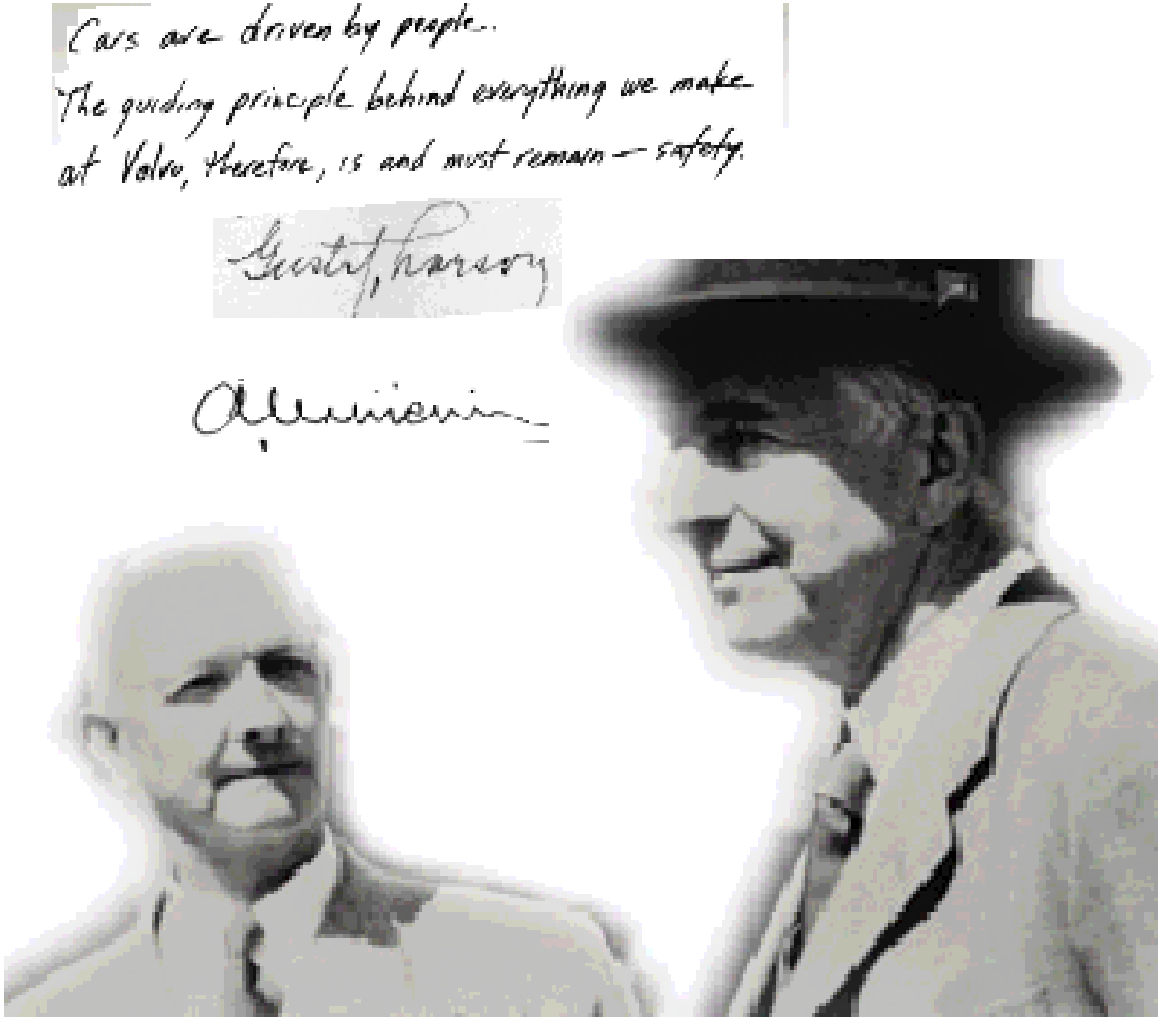
Hans Folkesson

Senior Vice President R&D
Volvo Car Corporation



Safety, quality, reliability and responsibility are the core of our operations, our products and our behaviour

our heritage

The sustainable, the practical, the simple and the long-term have been prioritised.
Volvo represents human values in combination with a modern business culture.

S

S80

S60

S40

V

V70

V50

XC

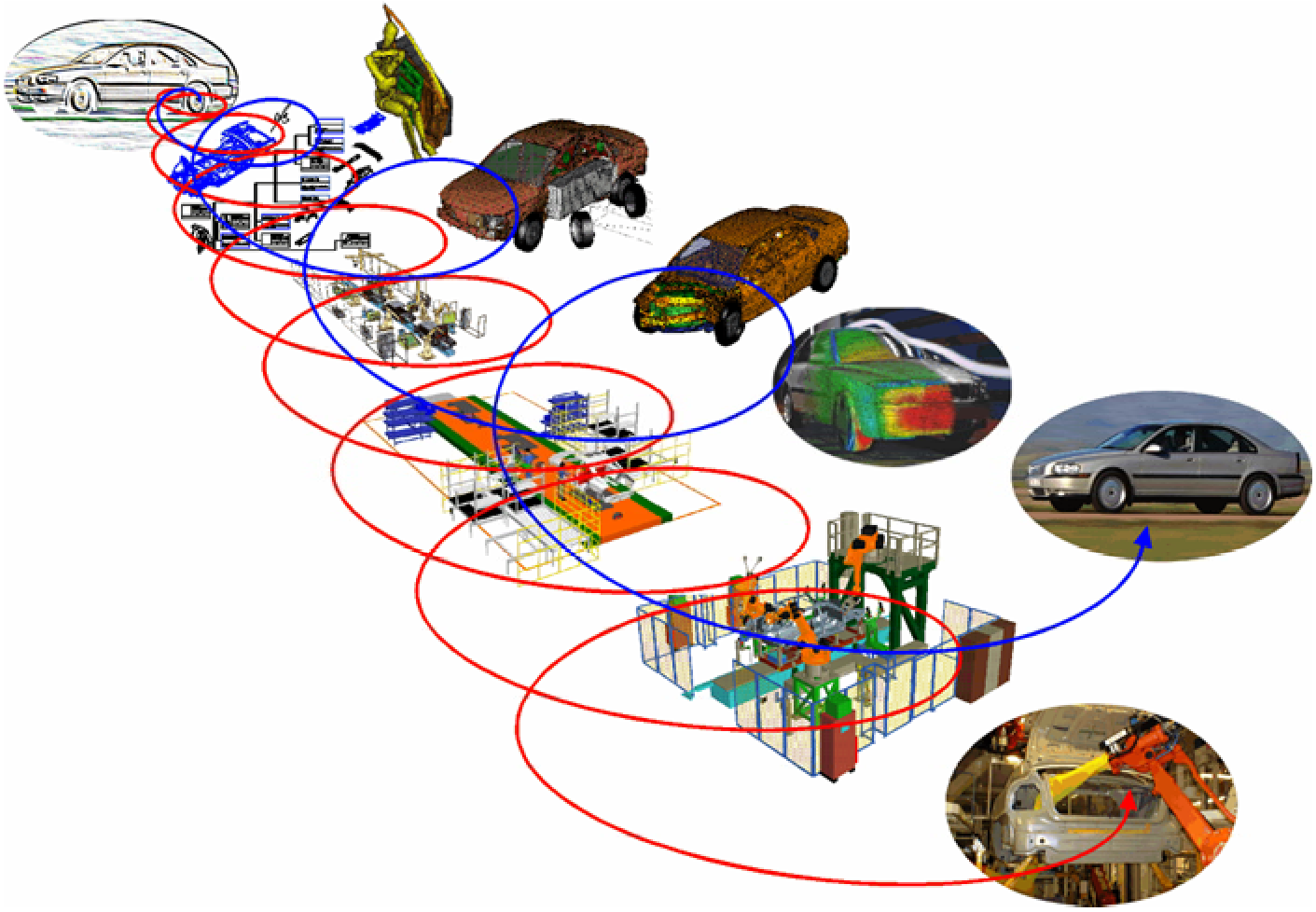
XC90

XC70

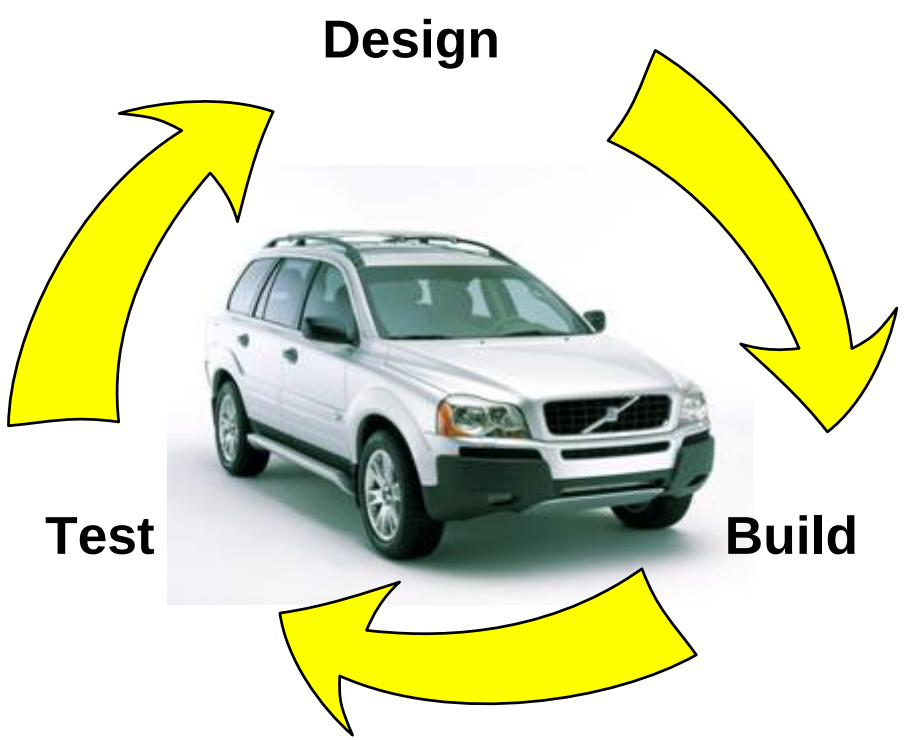
C

C70

Parallel Development - virtual product & process development

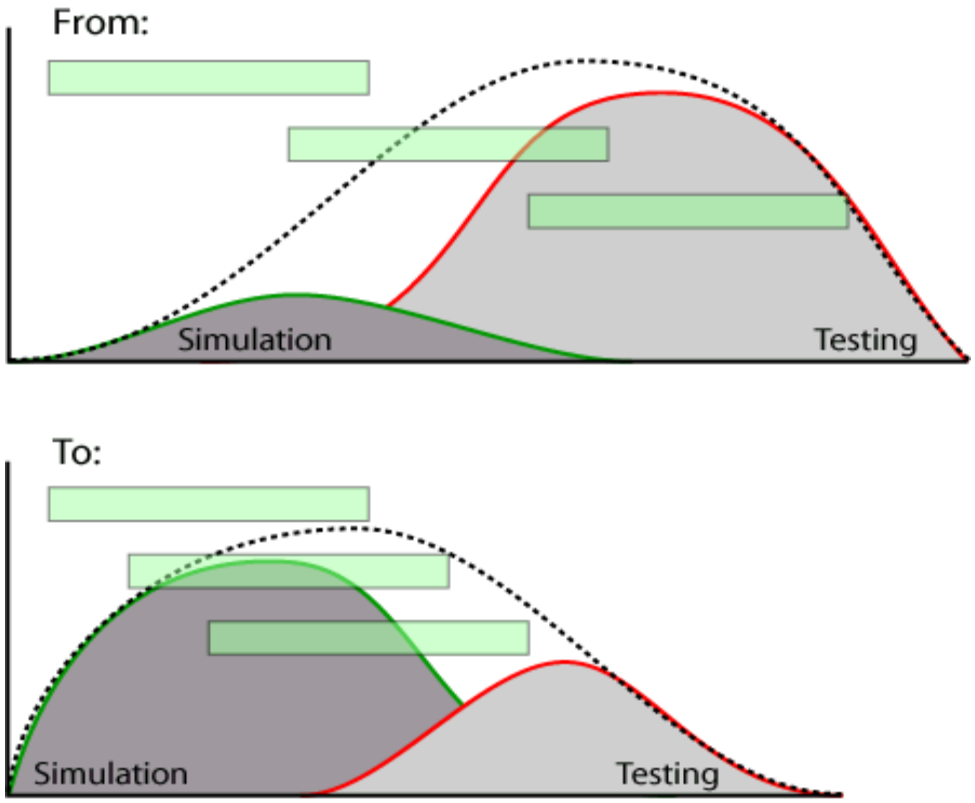


The Challenge



- Increased demands from society (e.g. energy efficiency)
- Increased demands from the customers
- More complex product
  - PT for alternative fuels
  - advanced safety/security systems
  - new electrical features
- Increased pace in product development
  - from design-build-test in one year...
  - … to two months with virtual methods
- Global Product Development

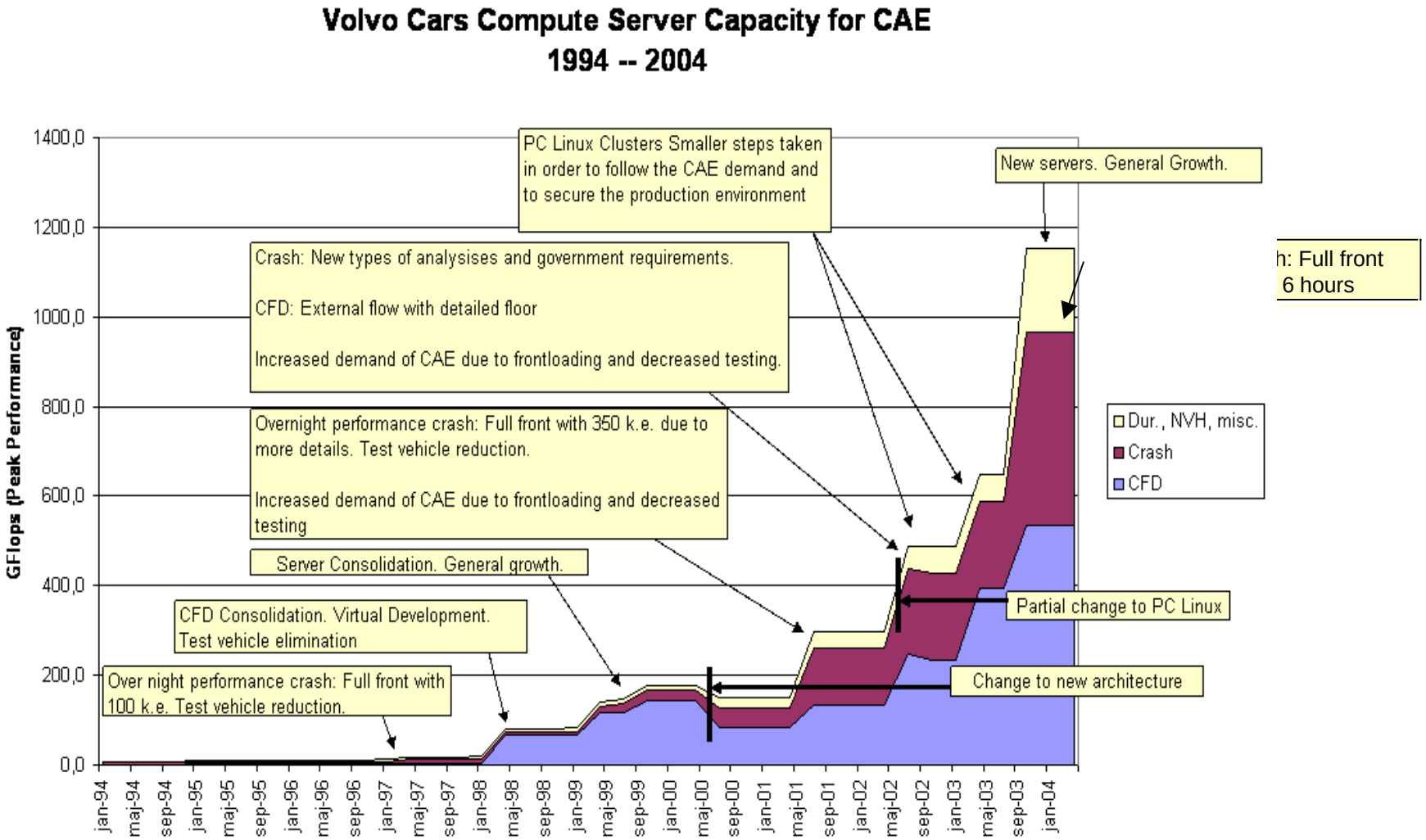
The Challenge: Frontloading of the Development Process through Virtual Tools



Vision:

- Complete development in a virtual environment
- Production tools are ordered based on simulation results
- First complete car is built from production tools and in production facilities
- Final verification is done in physical cars
- Common data available for everyone

Enabler



h: Full front
6 hours

Confidence scale in Virtual development

Level 4 - Analytical Sign-Off

- ordering of manufacturing equipment from analytical results

Level 3 - Analytical driven development

- analytical results used as the only basic data for decision-making to a significant part of the decisions
- computation and experience exceed 50% of the development
- testing used as a complement

Level 2 - Test driven development with analytical support

- analytical tools support the decisions made from test results (analysis financed by car program)

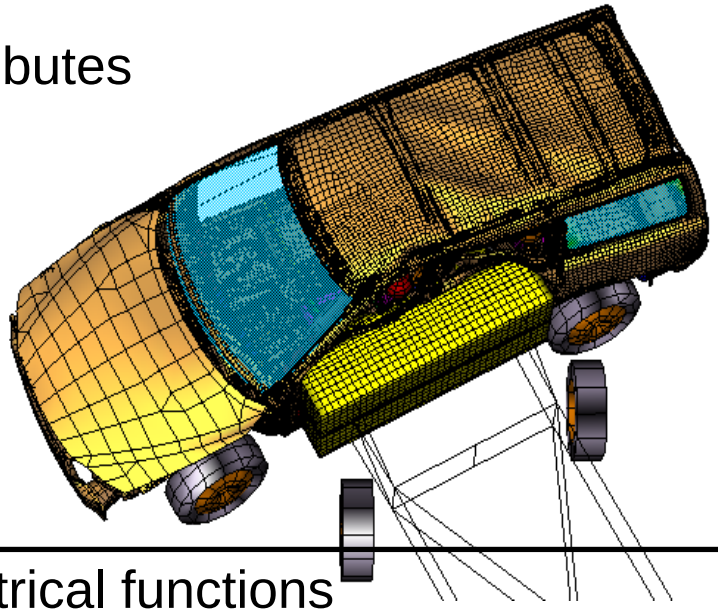
Level 1 - Test driven development

- analytical tools are available but are not used in development projects (i.e. AE projects and method development)

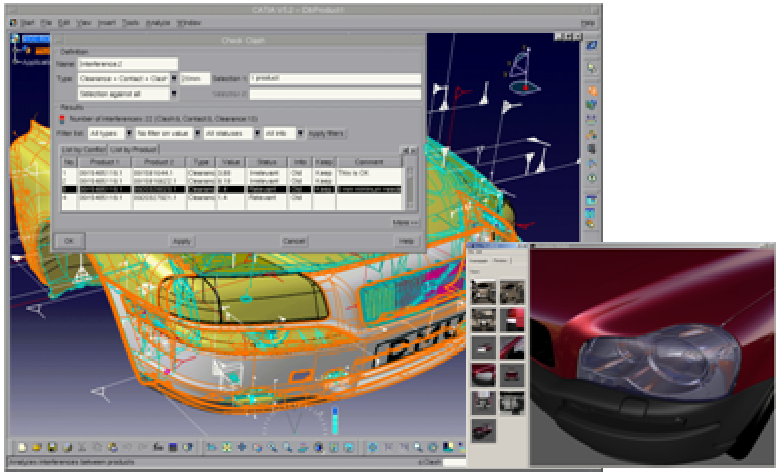
Level 0 - No analytical operations

Four Aspects of Virtual Development

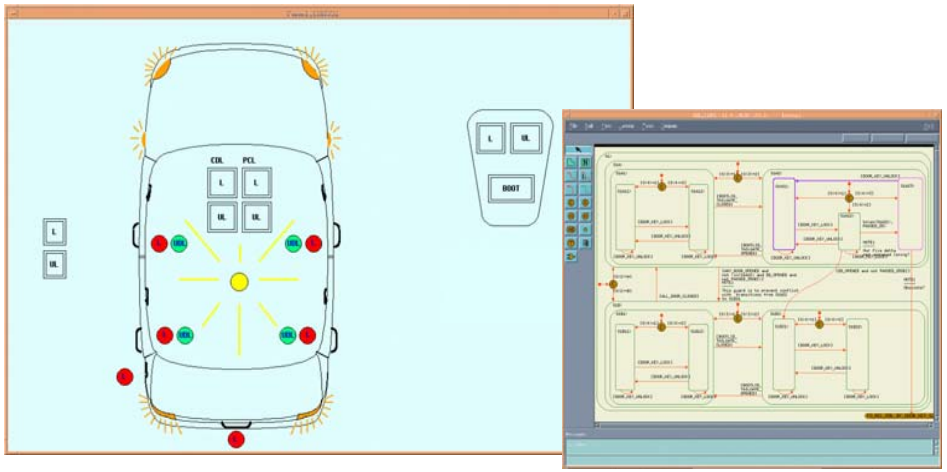
Attributes



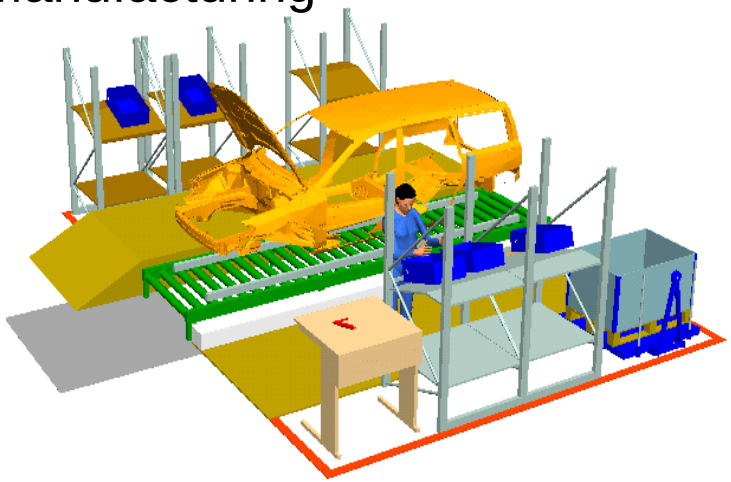
Geometry



Electrical functions

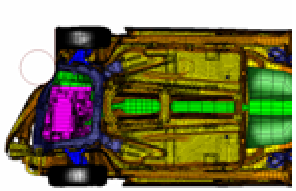
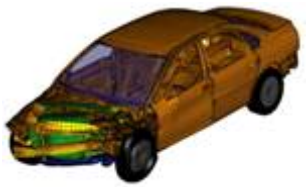
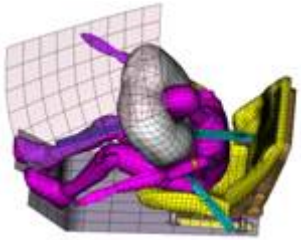


Manufacturing

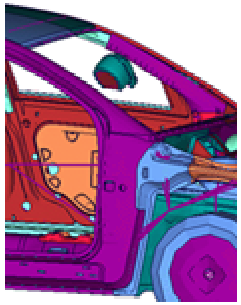


CAE

Front/Offset Crash

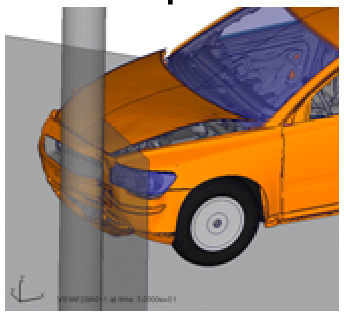





Head impact

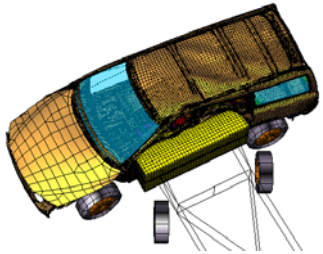


Pedestrian

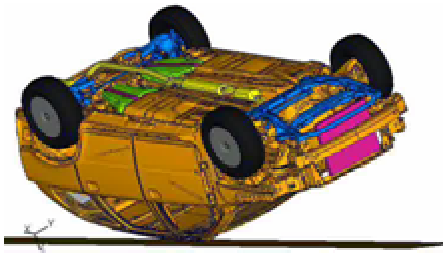
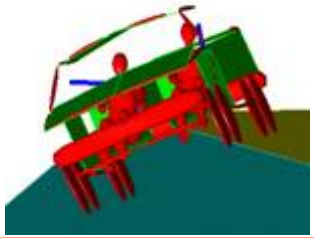
Low speed



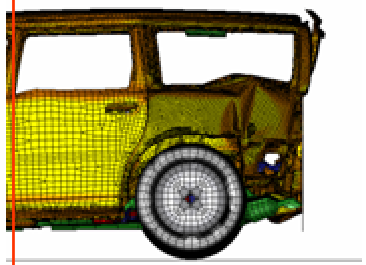
Side Impact


Rollover

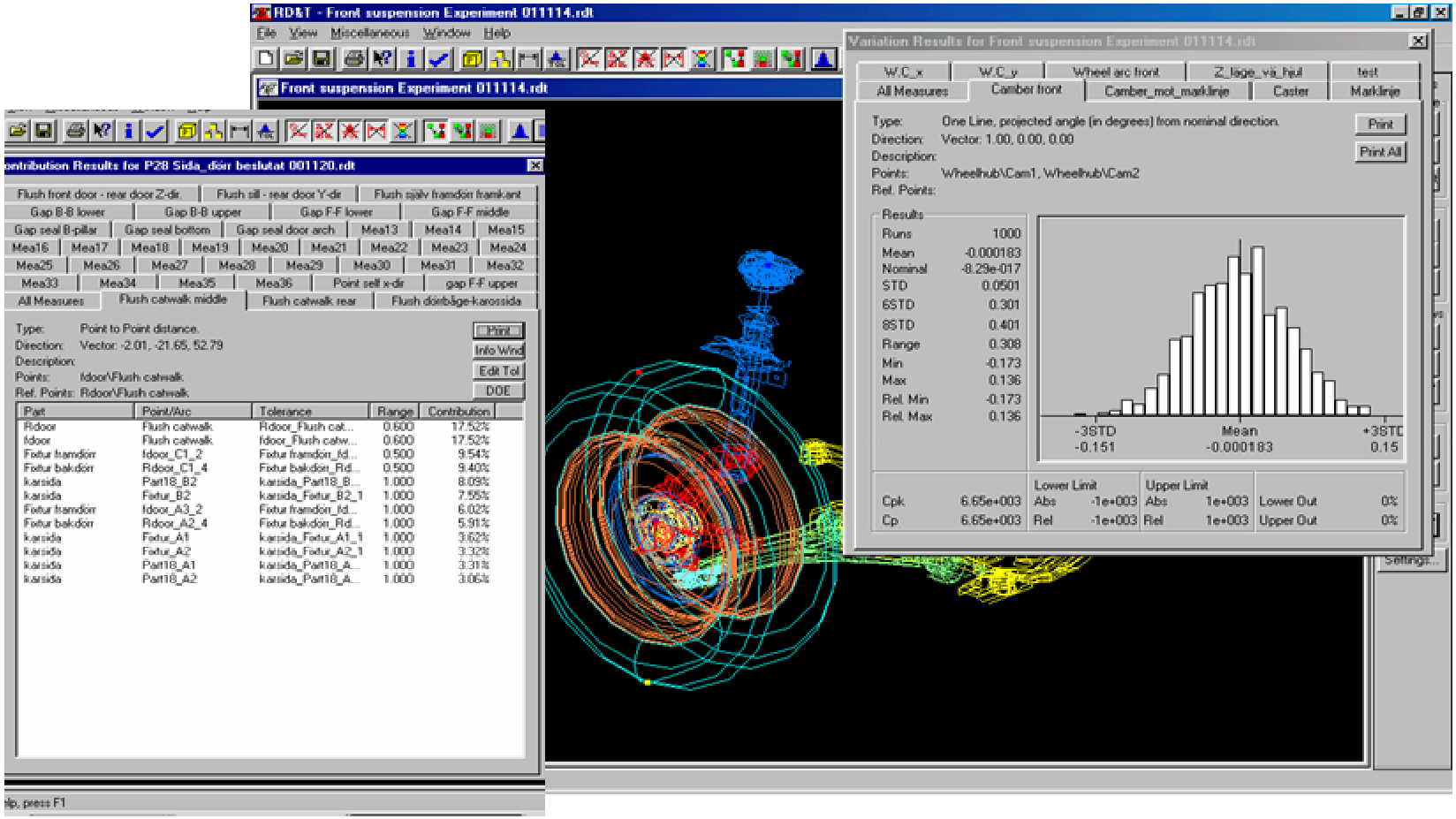

Rear Impact



Virtual crash testing (new S40/V50)

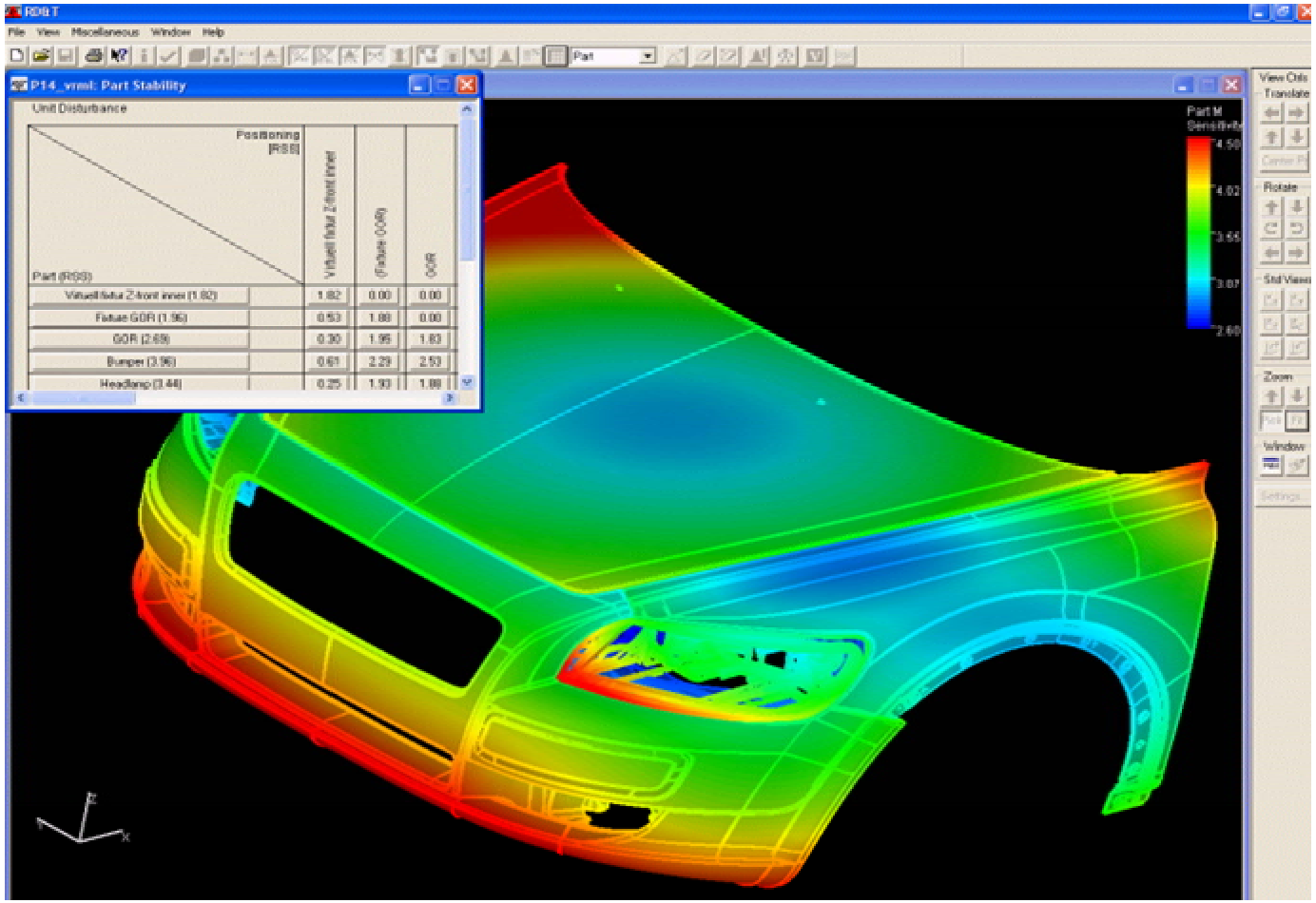
- 6000 virtual crashes
- 6 physical test cars in development stage
- Increased amount of decisions are made from virtual results

Variation and contribution analysis



Used to predict the outcome of the total tolerance chain in critical function and demand sections.
Used to establish requirements per delivery unit and process.

Stability analysis (RDoT: Robust Design and Testing)



Used to evaluate the robustness of master- and sub ordinate systems.
Used early in the product development process to establish these systems.

The Future for Virtual Development

- Considerable progress in the confidence of virtual methods in core areas will be followed by a focus on how CAE and inexpensive, fast physical testing can be consolidated

- The challenge is not to argue for the worthiness of virtual development, but to make decision on virtual results and show business profit

- New tools and methods are needed to meet the increased complexity in product development
  - ”Systems engineering”
  - roboust design
  - multi disciplinary optimization, …

The Future for Virtual Development

- Virtual development has to be available to more users:
  - Secure that the virtual information model can be transferred and shared Design, R&D, manufacturing, …
  - Secure that the virtual information model can be continuously updated with new information requirements, quality, …
  - Secure that the virtual information model can be shared seamless between suppliers and business units

- Assure that virtual development becomes a part in the every day activities.

The Future for Virtual Development

- The future for the use of virtual development tools is based on a fast, as well as a financially attractive way, of transferring an ever increasing amount of technical data.