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iVEL – A grid-based Virtual Engineering Laboratory

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- **Huge amount of simulations / parametric studies** during building design process
 - SMEs lack of ability to **bundle** their available **computing resources** for complex simulations
 - Requirements for software systems:
 - **Automation** of simulations
 - (semi-) automatic generation of model instances
 - **Storage** / filtering / evaluation of results
 - Advanced **information management**
 - **Collaboration** possibilities
 - **location independent**
- provide distributed users a shared platform with computational power, accessible from arbitrary devices

- **Virtual Structural Engineering Laboratory**

- „A Cloud-/Grid-based Virtual Laboratory for Non-Linear Probabilistic Structural Analysis“
- Funded by German Federal Ministry of Education & Research and *EUROSTARS*
- Duration: 36 months (12/2012 – 11/2015)
- Partners:



Cervenka Consulting, s.r.o.
Praha, Czech Republic



Technische Universität Dresden
Institut für Bauinformatik
Germany



Leonhardt, Andrä und Partner
Beratende Ingenieure, VBI, GmbH
Dresden

- **Service-oriented architecture** (modular extension possible)
- **Layered, component based** structure, well-defined interfaces
- Integration of **computational kernels** as **web services**
 - Enables porting of computations to **grid-/cloud** environment
- **Web** browser **based** user interaction
- **Collaboration** support

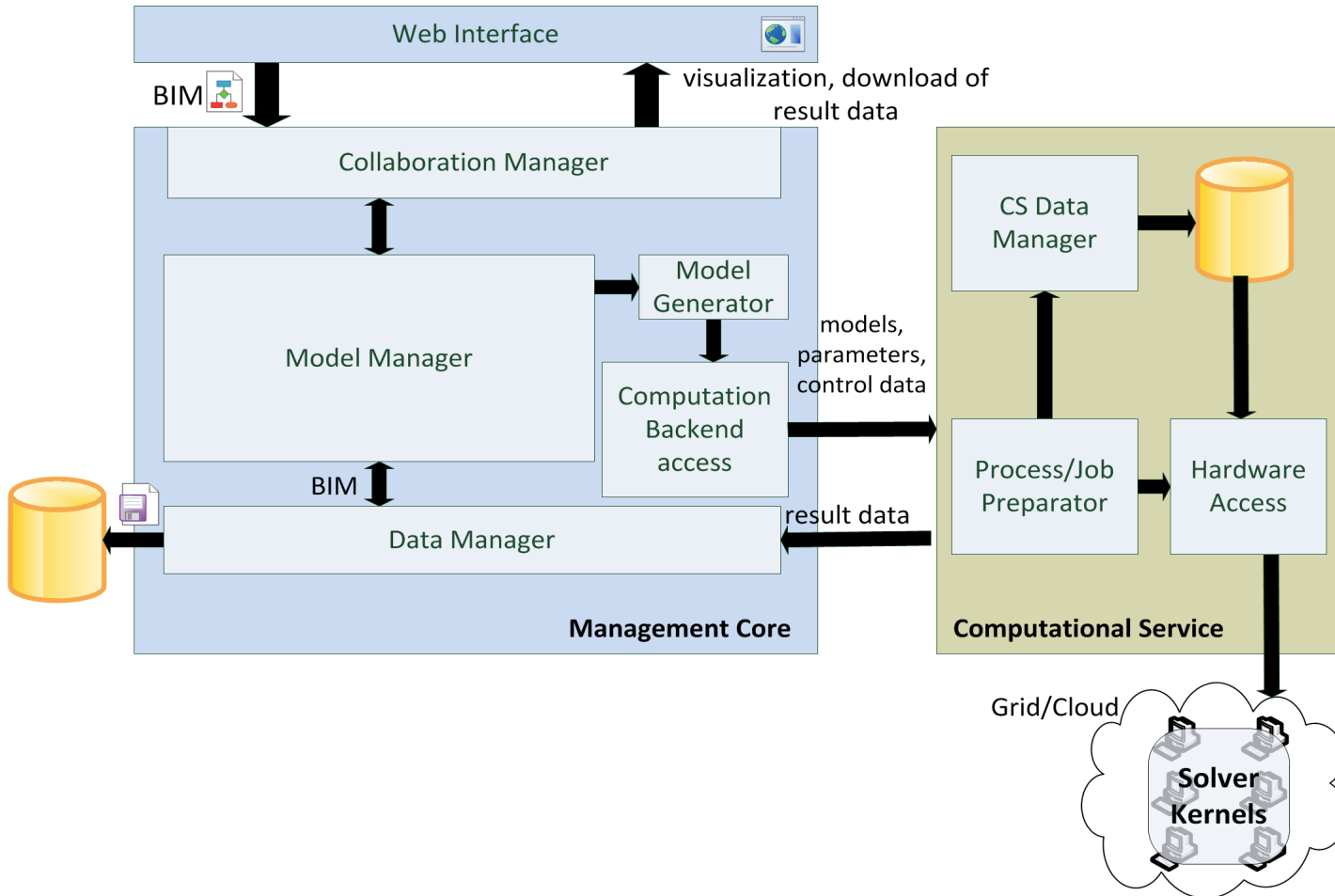




Figure x: iVEL top-level architecture

- Centralized data management
- Decentralized computation of simulations
- Flexible selection of computation infrastructure by user:
 - **HPC server** owned by company for sequential computation of huge models
 - **UNICORE** based **private grid** consisting of employee's machines for parallel computation
 - **Public HPC cloud** (if local resources are not sufficient)

- MS Windows compatible
- Java API
- Huge functional range
- Under active development
- active community

-  model file
-  batch file

Process Layer

Simulation Request

Process P1

Job J1

Job J2

Job J3

Algorithm Layer

Sofistik
Atena

Job AJ1

Job AJ2

Job AJ3

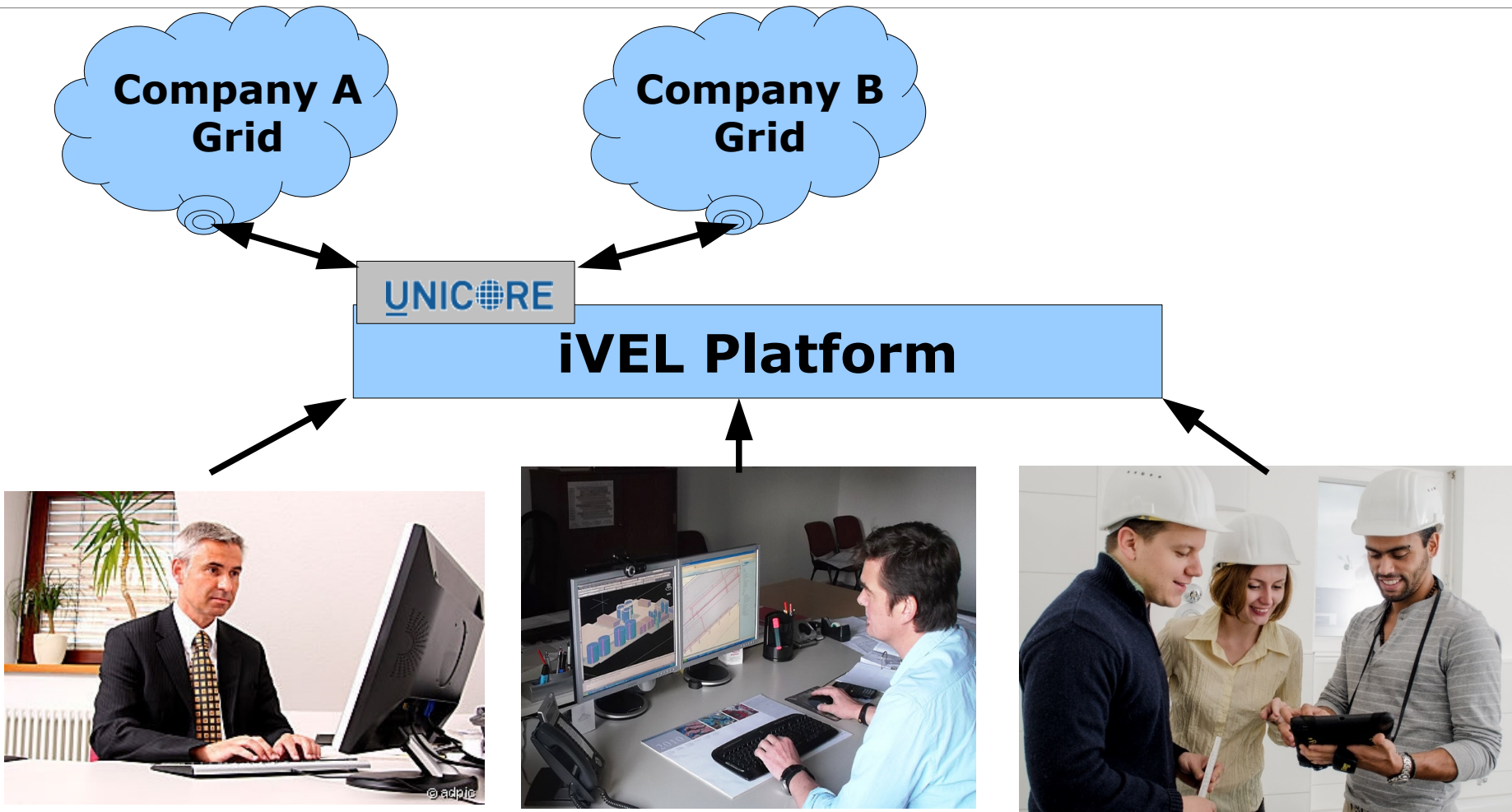
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Hardware Layer

Server
UNICORE Grid
Cloud

UNICORE HiLA

Grid Nodes



- **Utilization of workflow system** for effective schedule of pre-, main- and postprocessing tasks
- **Utilization of resource descriptions** ~
 - Definition, exploitation
- **Integration of FILESPACE** of nodes as active storage element

Thank you for listening!

Michael Polter

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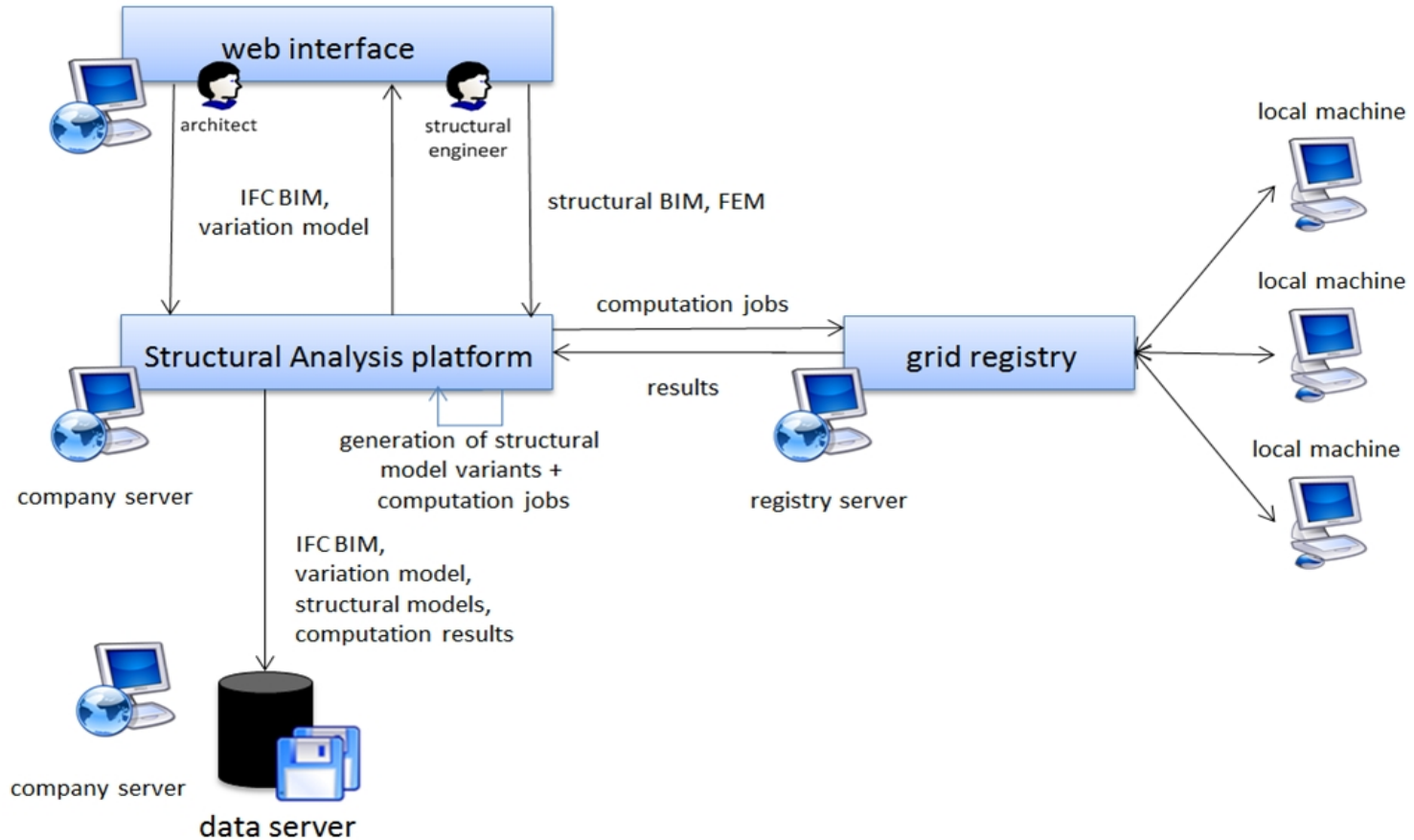


Figure x: Distributed execution of simulation tasks

