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DRESDEN concept

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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

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- **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:

ČERVENKA CONSULTING

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

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Technische Universität Dresden
Institut für Bauinformatik
Germany

Leonhardt, Andrä und Partner

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
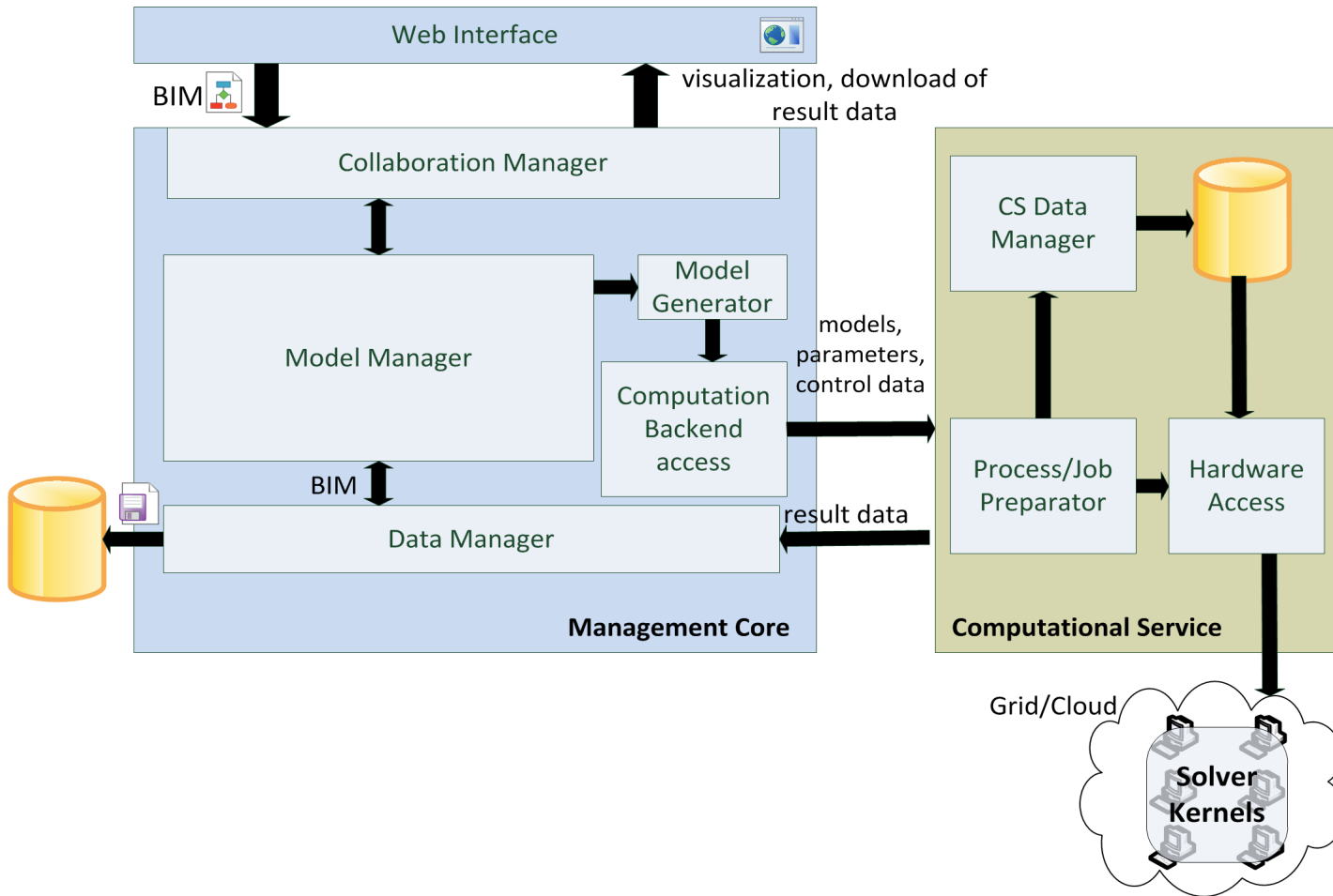- **Collaboration** support

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
  - UNIC⬤RE 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
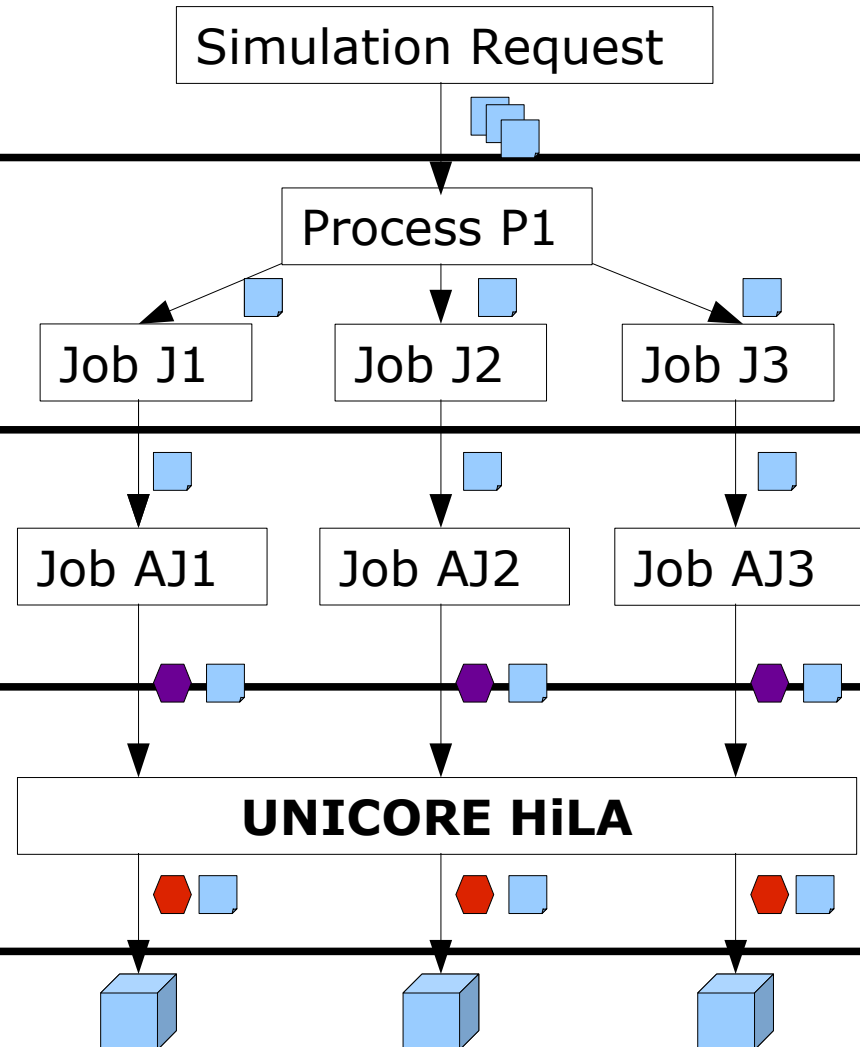- Under active development
- active community

model file

batch file

Simulation Request

Process Layer
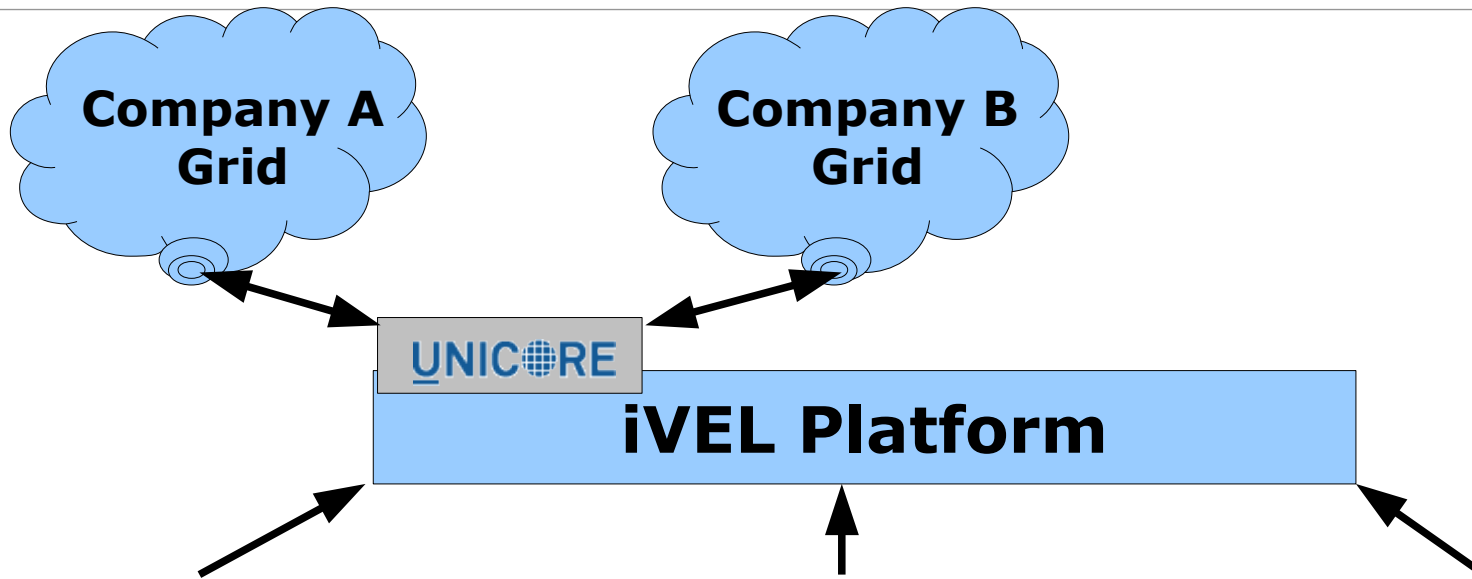
Process P1

Job J1   Job J2   Job J3

Algorithm Layer

Sofistik
Atena
...

Job AJ1   Job AJ2   Job AJ3

Hardware Layer

Server
UNICORE Grid
Cloud

UNICORE HiLA

Grid Nodes

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**Company A
Grid**

**Company B
Grid**

UNICORE

iVEL Platform

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- **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

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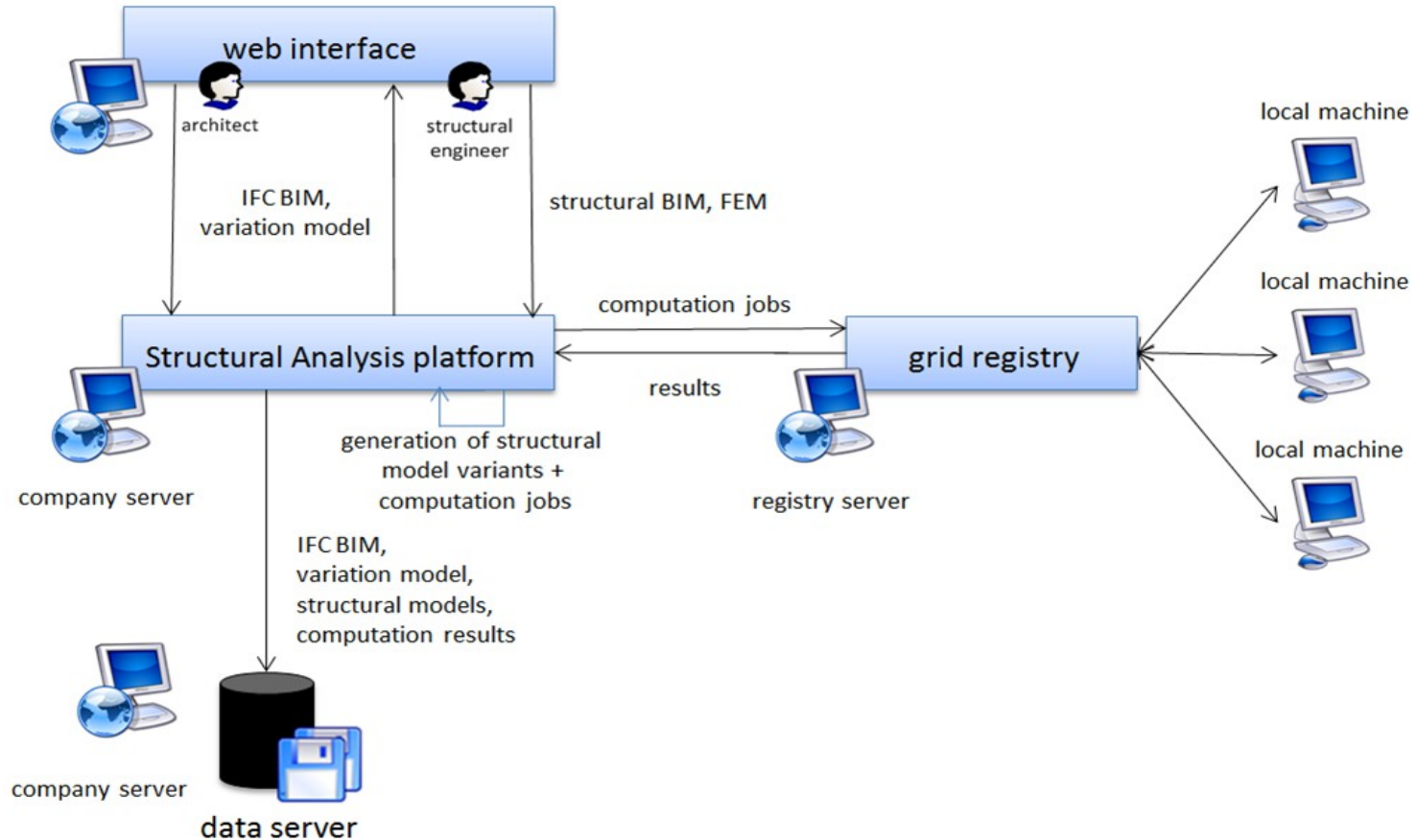# Thank you for listening!

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Figure x: Distributed execution of simulation tasks