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Interoperability of Virtual Organizations on Complex Semantic Grid

InteliGrid project: lessons learned and future work

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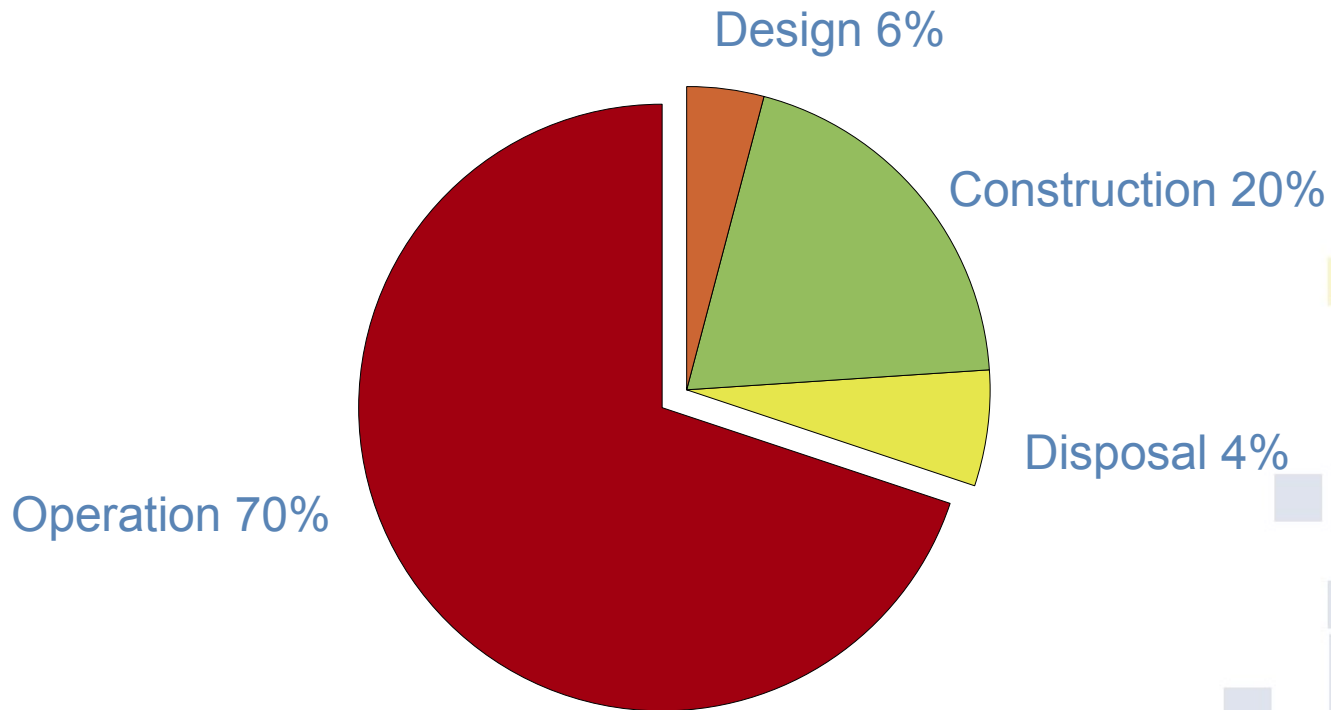
Information Society
Technologies

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Faculty of Civil and Geodetic Engineering
Institute of Civil Engineering, Earthquake Engineering and Construction IT
Chair of Construction Informatics



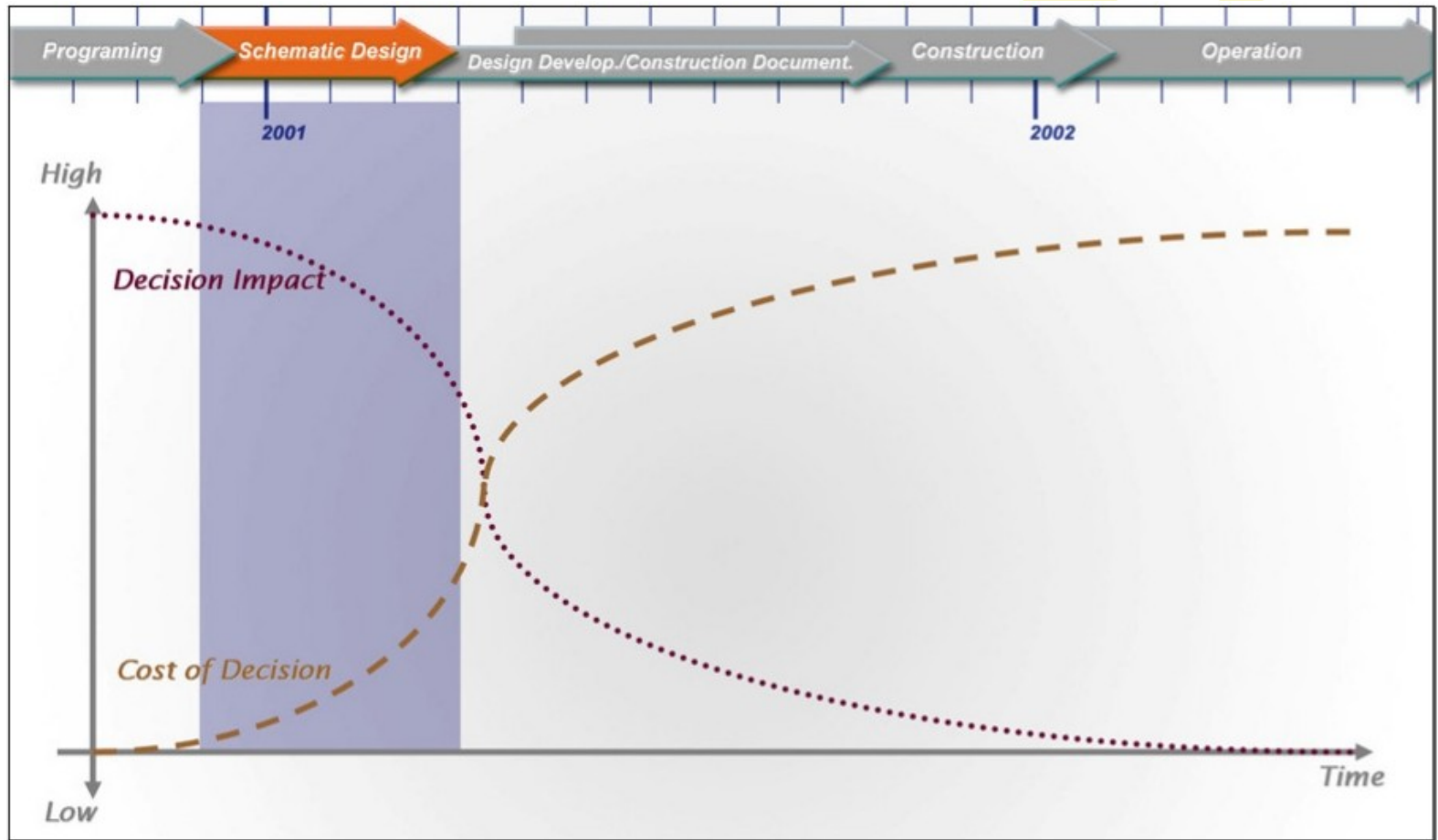
- InteliGrid overview
 - vision and context
 - architecture
 - results
- Lessons learned and future work
 - grid technology
 - semantic technologies
 - technology adoption: push vs. pull
 - business models
- Conclusions

Construction process is fragmented



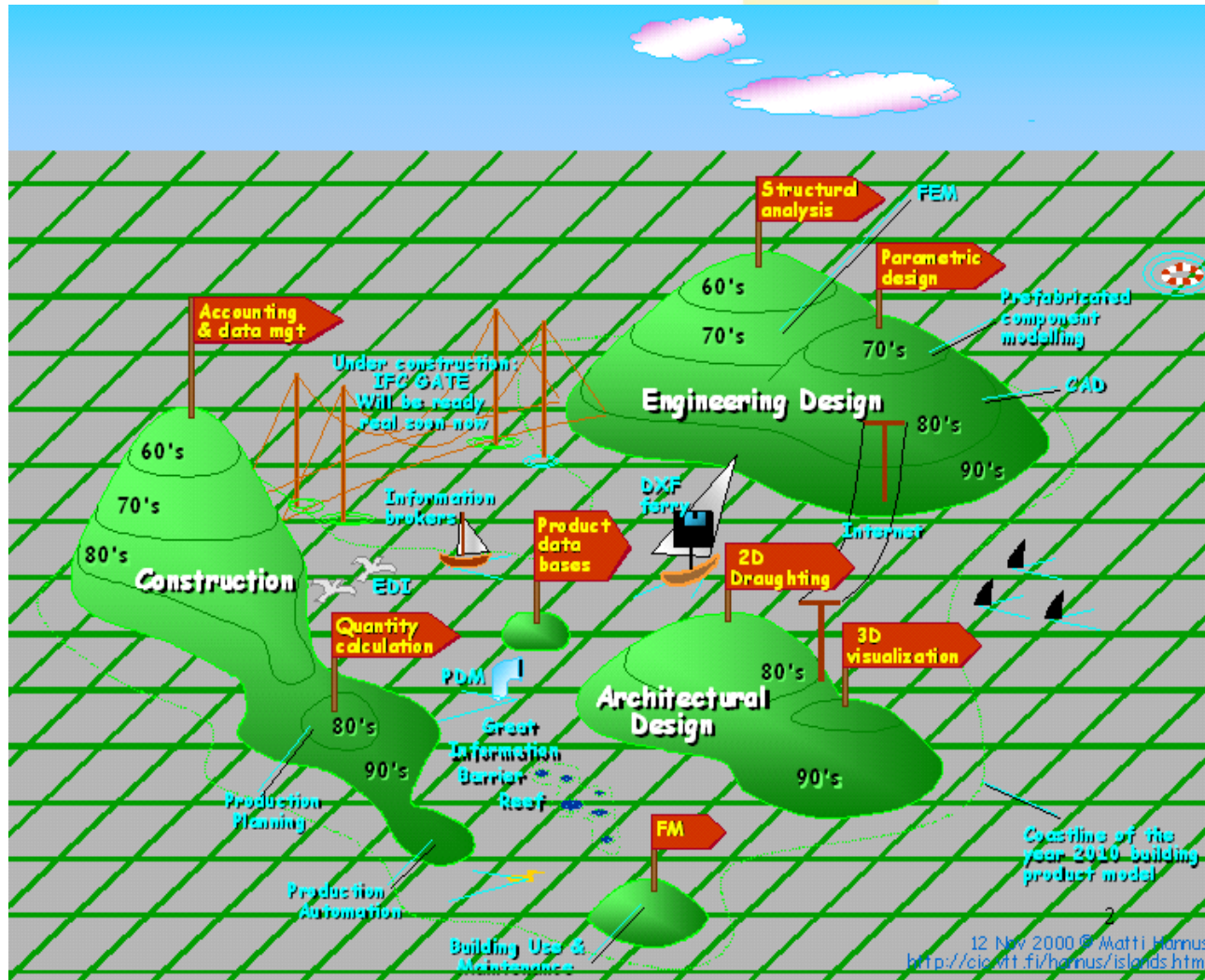
Source:
The Building Information Model: A Look at Graphisoft's Virtual Building Concept,
Cyon Research White Paper, January 2, 2003

Relative influence level of a decision



Source:
PM4D Final Report, CIFE Technical Report Number 143,
Martin Fischer and Calvin Kam, October 2002

Islands of automation



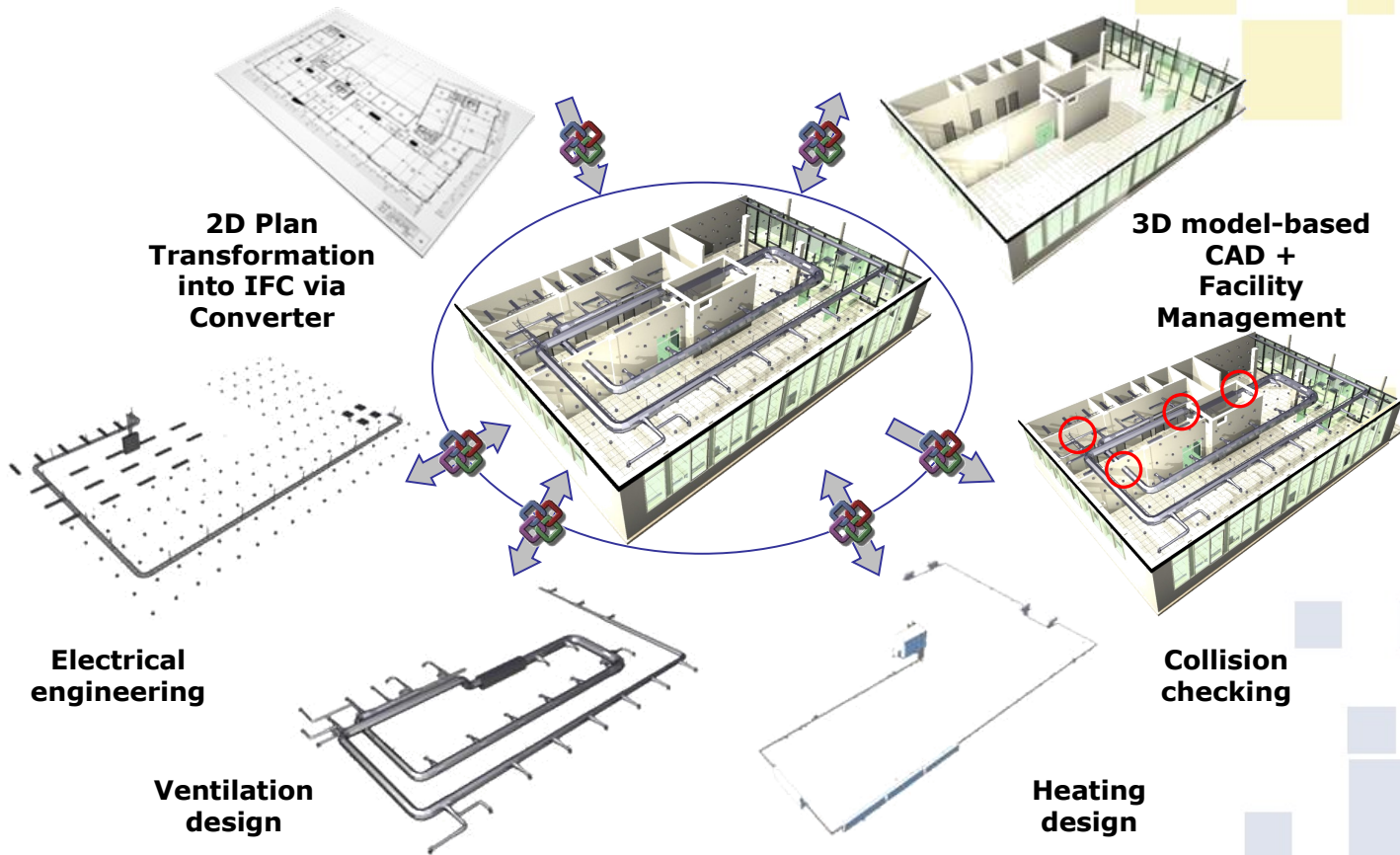
Source:

M. Hannus & P. Silen, "Islands of Automation",
<http://cic.vtt.fi/hannus/islands/>, 1987, (updated by M. Hannus, 2002)

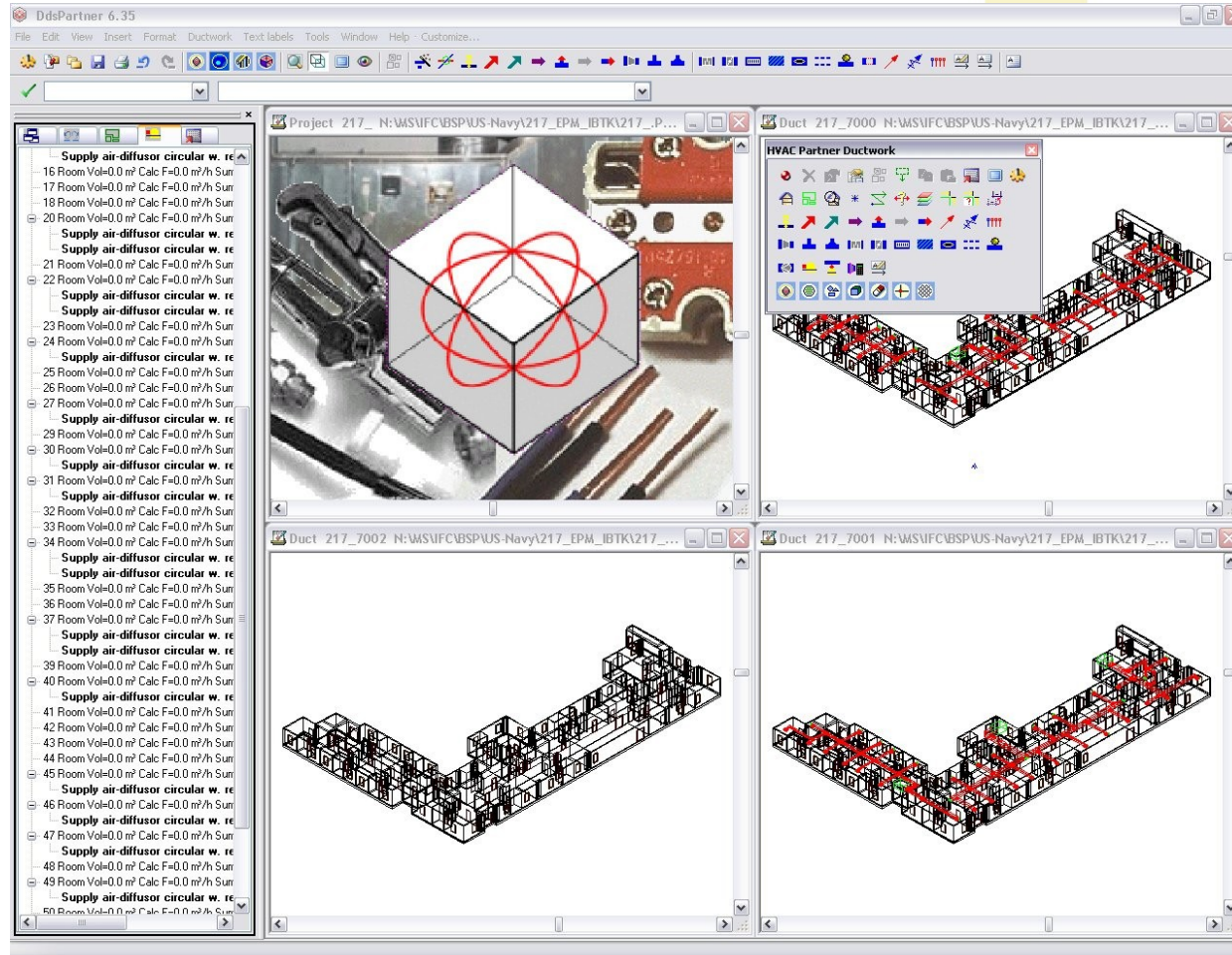
Buildig Information Model (BIM)

- Addresses the following core assumptions about the building process:
 - Design evolves from the “fuzzy” to the specific.
 - Design is an iterative process.
 - Multiple design variations are created in the early phases of a project.
 - Architects do not want limitations either in the form or the size of the design.
 - Architects would like to spend more time designing and less time documenting.
 - Communication is an essential component of the design process.
- Is supported by many software vendors
 - Interoperability issues

SMART integration ...



... enables SMART actions ...

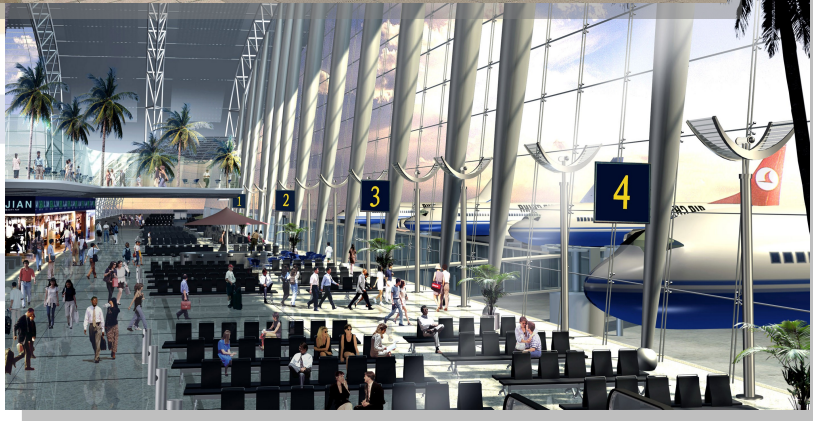


... and different use cases.



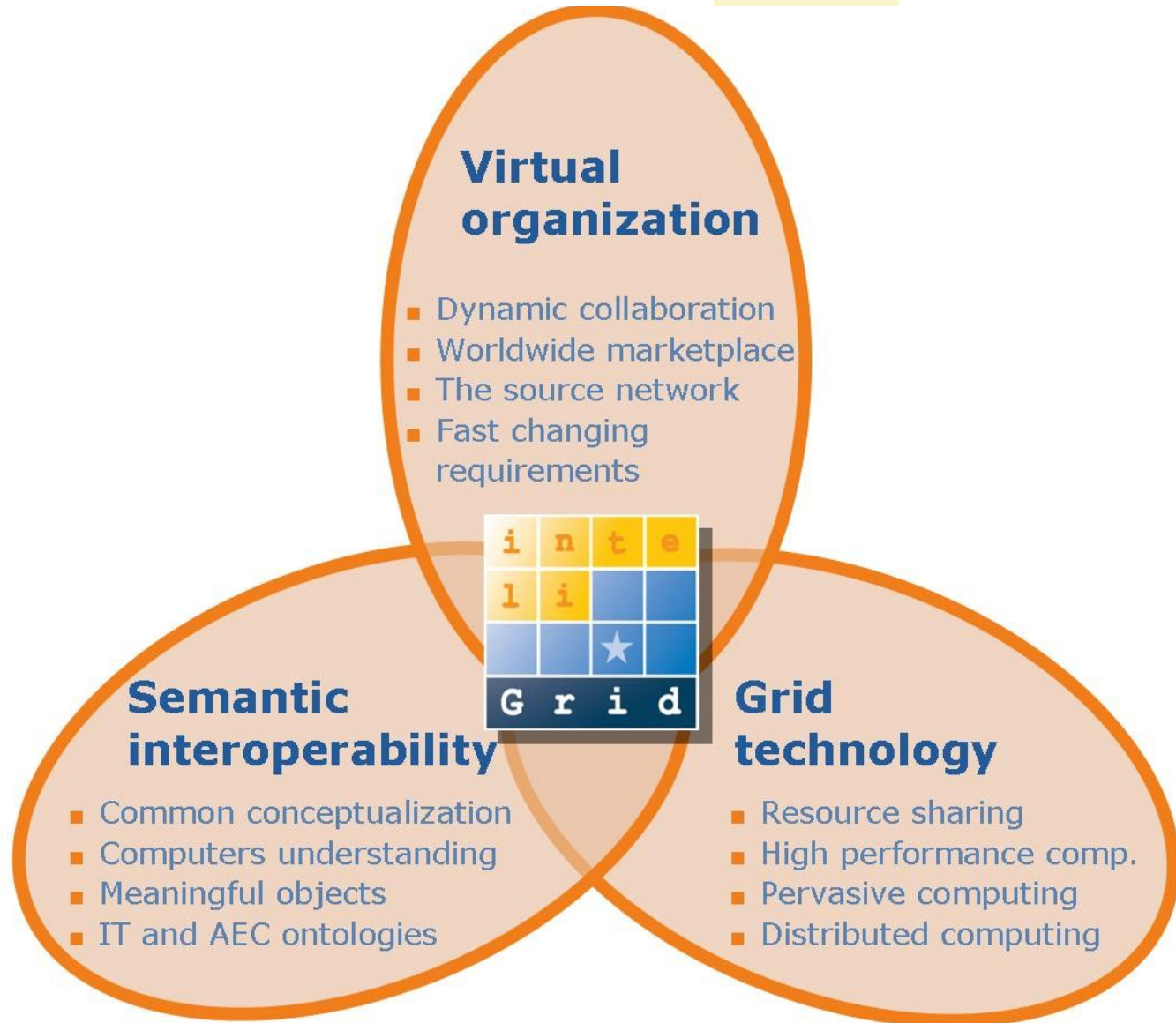
InteliGrid context

- European large scale engineering industries
 - huge number of experts
 - a wide range of software and hardware resources
 - dynamic virtual organization
 - secure information sharing
- Engineering domains
 - construction
 - automotive
 - shipbuilding
 - ...



InteliGrid is providing information infrastructure

InteliGrid technologies



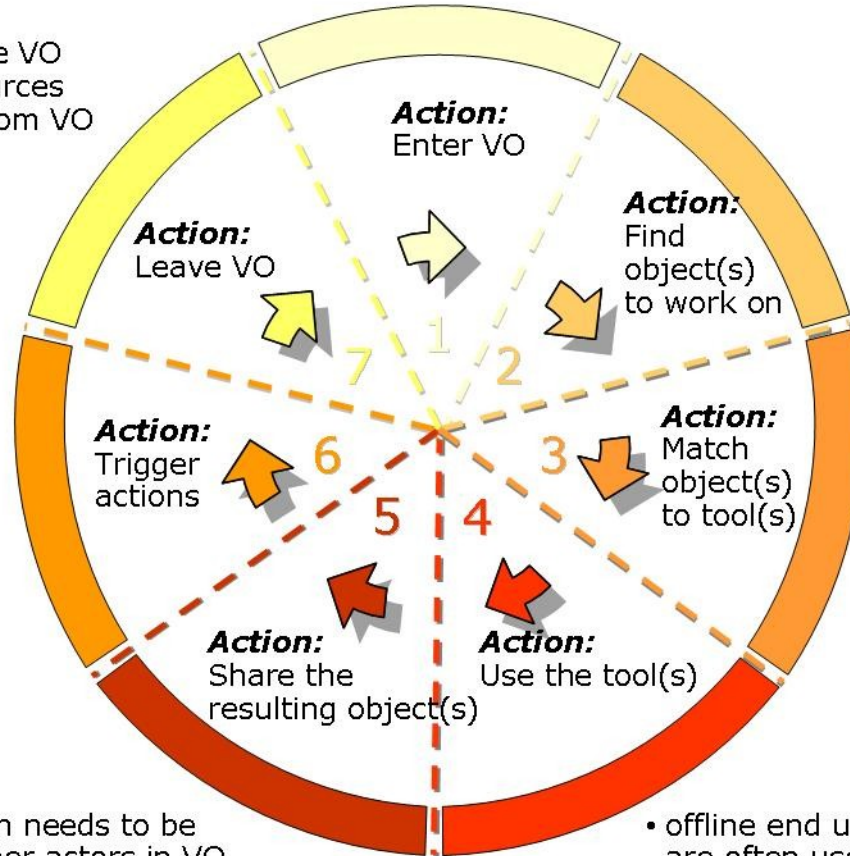
Generic end-user scenario

- users have prescribed roles
- role based authentication
- simple but maintain high level of security

- end-users leave VO
- unshared resources are removed from VO

- new actions or processes can be triggered based on new information

- new information needs to be shared with other actors in VO
- local data annotated and shared with VO

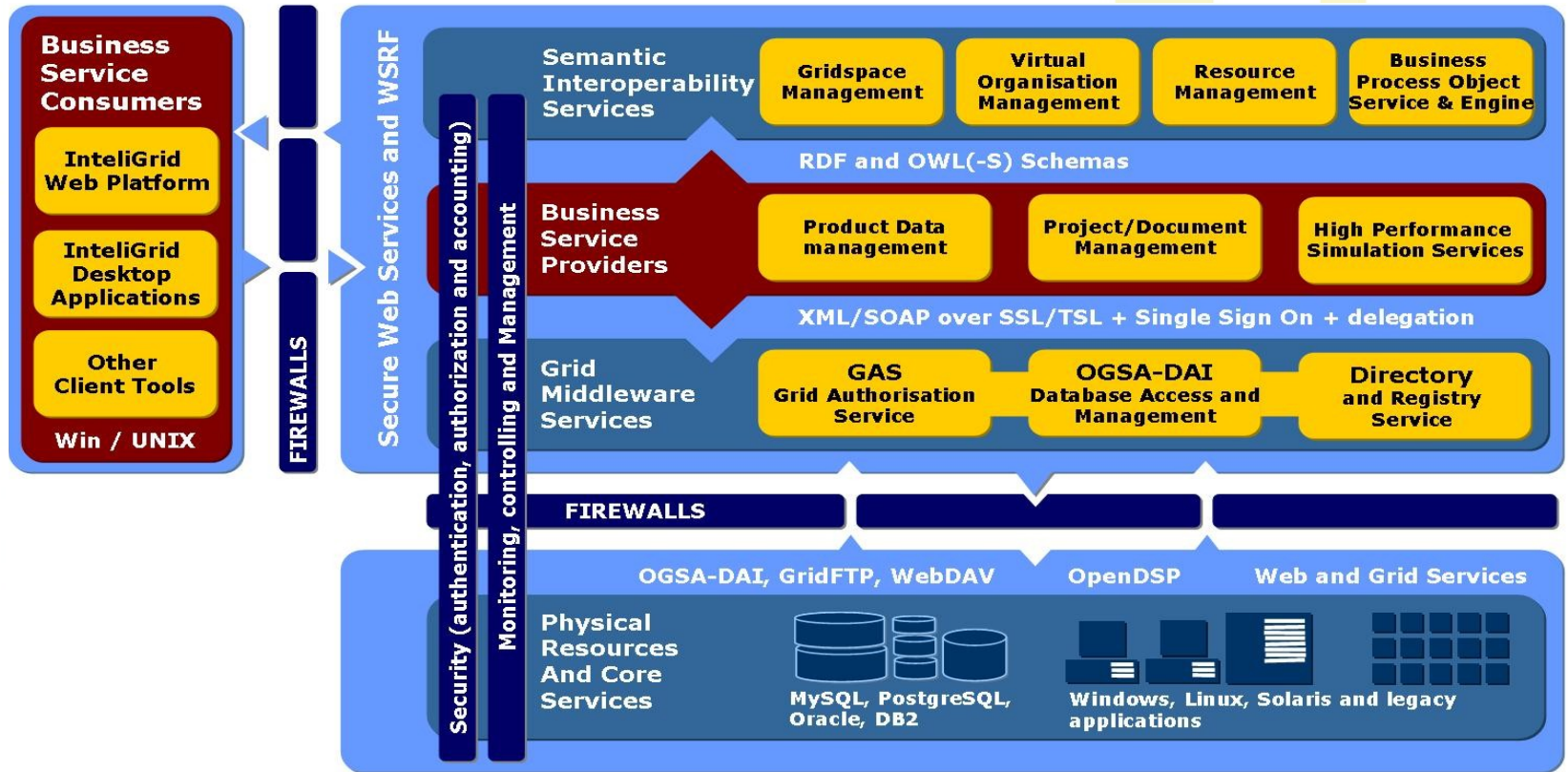


- fine grained role-based access policy for all VO resources
- use semantic query to find objects

- tools usually known in advance
- VO defined explicit and implicit rules what tools can be used

- offline end user applications are often used
- data needs to be available locally

InteliGrid architecture

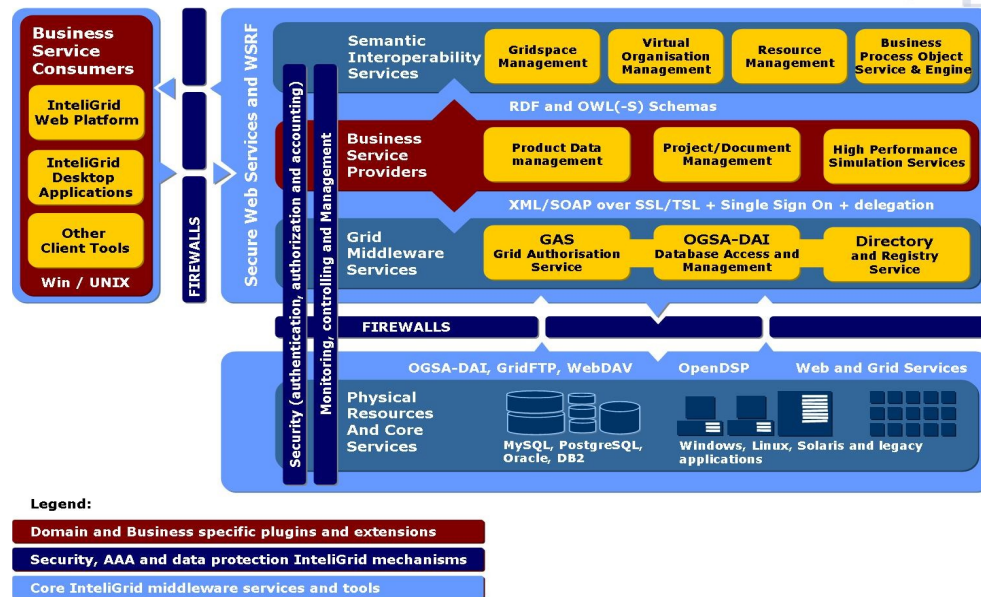
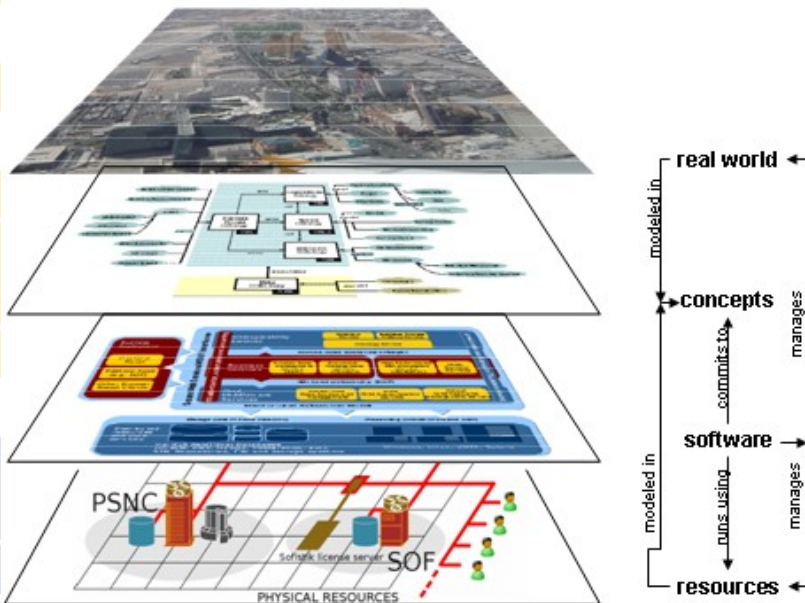


Legend:

- Domain and Business specific plugins and extensions
- Security, AAA and data protection IntelIGrid mechanisms
- Core IntelIGrid middleware services and tools

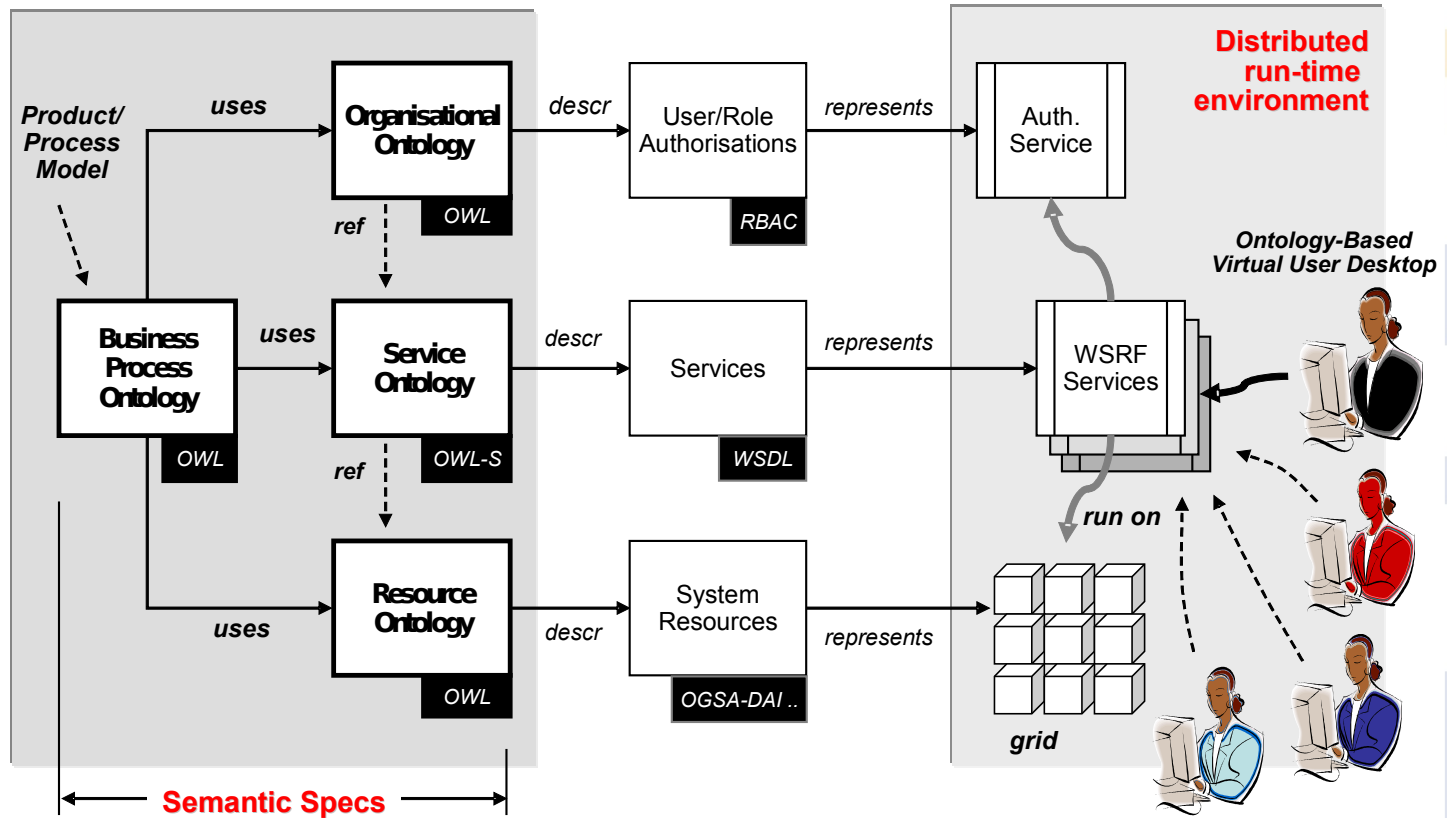
InteliGrid results

Semantic grid architecture



InteliGrid results

- Semantic grid architecture
- Ontology framework



- Semantic grid architecture
- Ontology framework
- Service
 - OGSA-DAI extensions: WebDAV, PMD, security
 - Open DRMAA Service Provider
 - Ontology services: gridspace, VO, services, resources, business process objects

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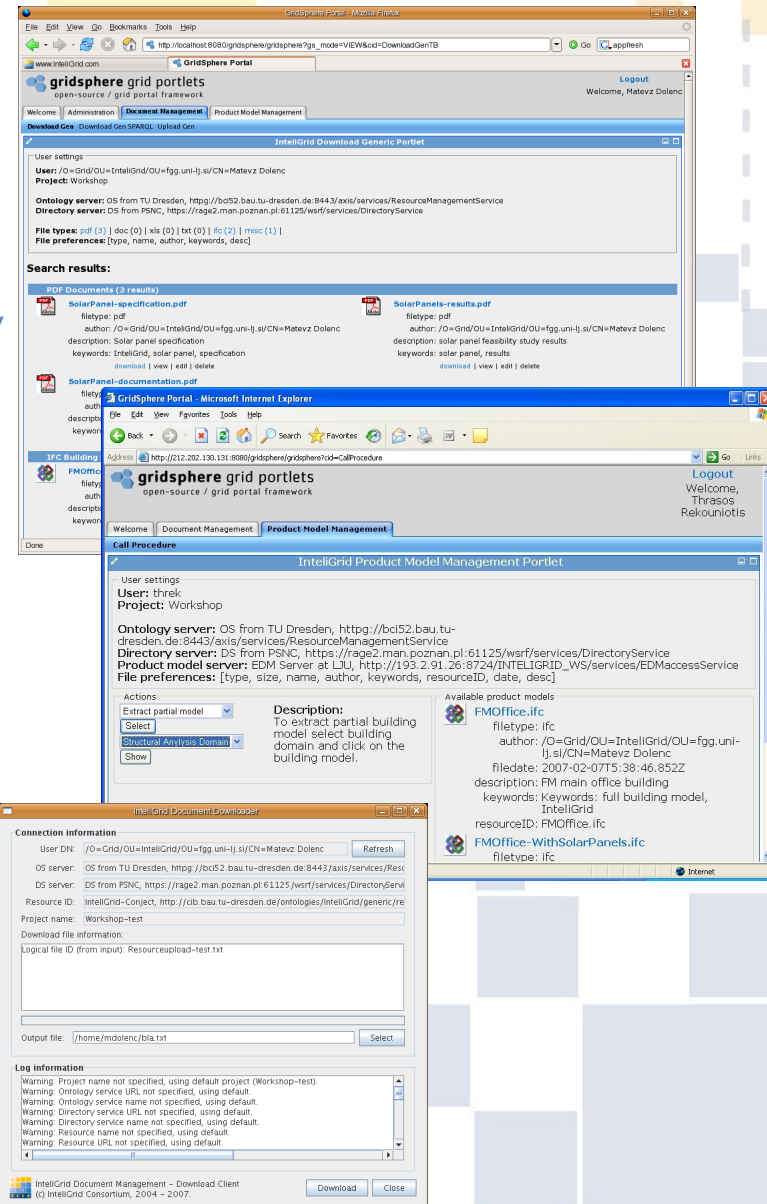
■ Clients

- Ontology management

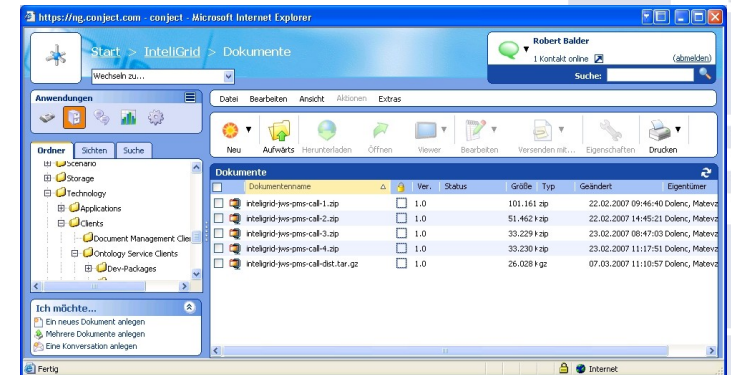
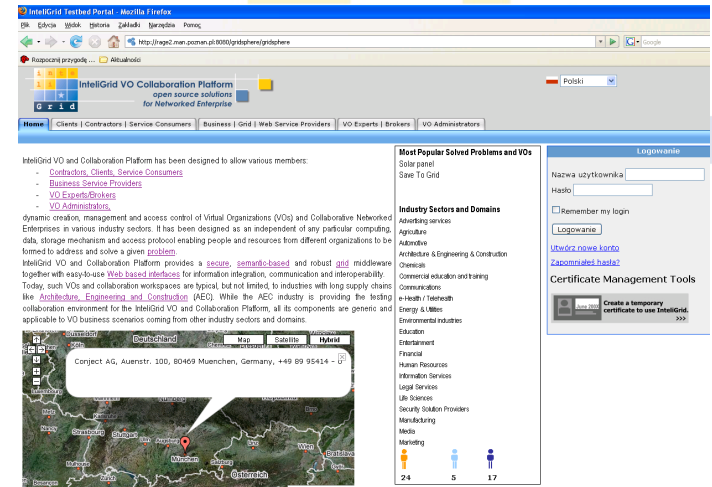
The image displays three screenshots of InteliGrid client applications:

- InteliGrid Gridspace Management Client:** Shows a list of persons and a 'Specify Person Details' dialog box. The dialog includes fields for ID, Grid Dist. Name, Family Name, Given Name, Middle Names, Profile Titles, Suffix Titles, and Addresses.
- InteliGrid VO Management Client:** Shows the 'Assign to (one) Actor (many) Roles' interface. It features a list of actors on the left and a list of roles on the right, with buttons for assigning roles to an actor and removing roles from an actor.
- InteliGrid BPO Manager:** Shows a tree view of BPO types on the left and a detailed view of a BPO on the right. The detailed view includes a description, involved activities, and a list of activities with their respective resource classes and definitions.

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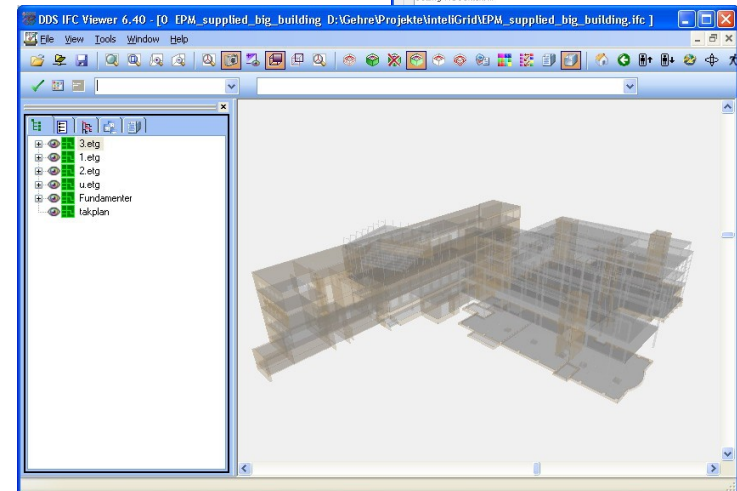
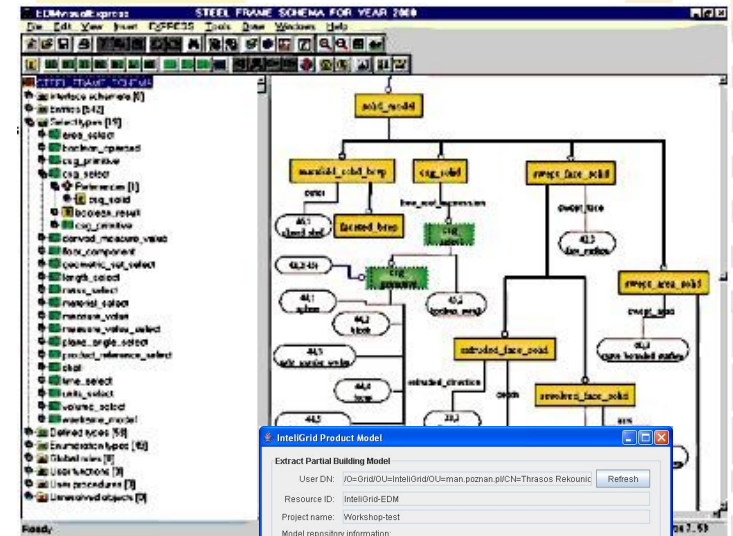


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- Grid enabled applications
 - EDMmodelServer™



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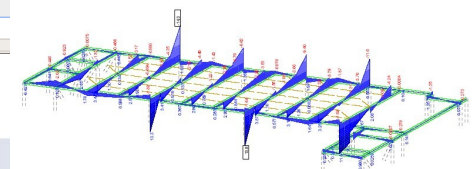
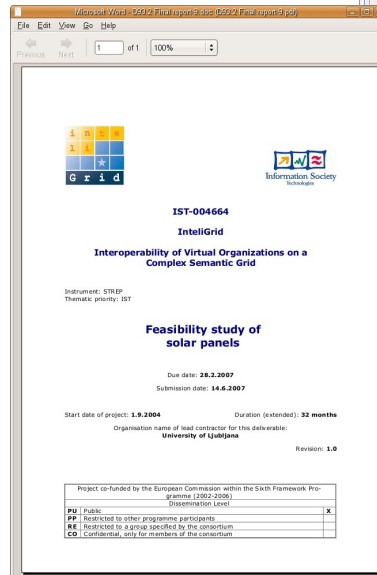
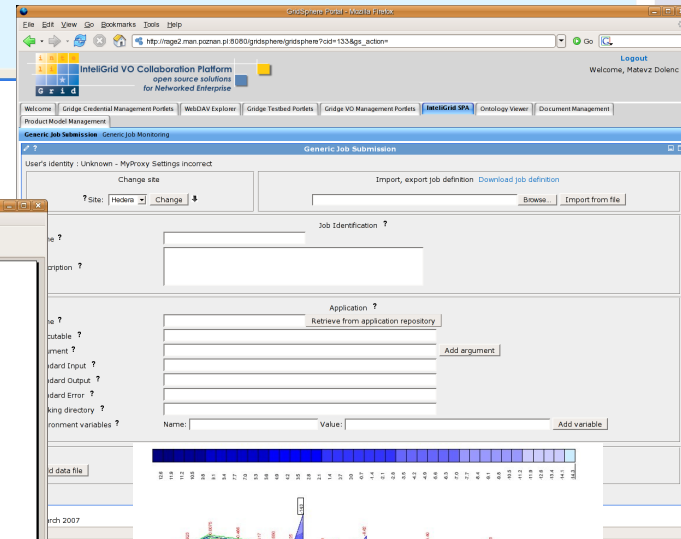
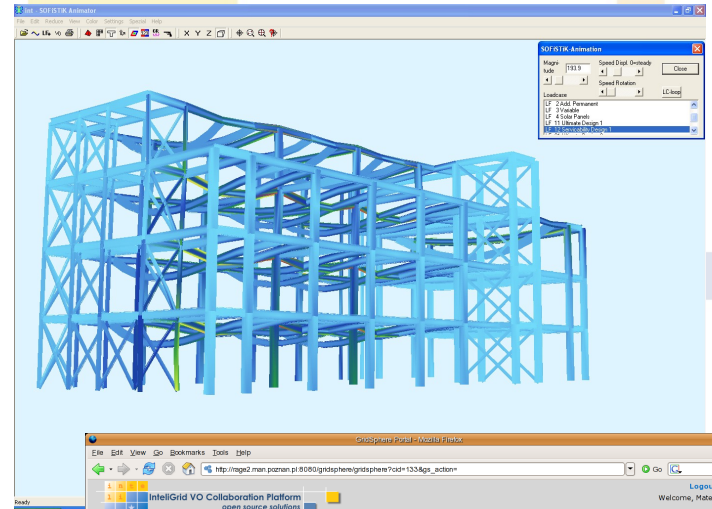
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Grid enabled applications

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■ Technology

- Combining multiple cutting edge technologies
- Stability / standardisation
- Service-oriented architecture
- Ontologies
- Interoperability on data level

Lessons learned

- Technology
 - Combining multiple cutting edge technologies
 - Stability / standardisation
 - Service-oriented architecture
 - Ontologies
 - Interoperability on data level
- Generation of knowledge
 - Multiple technology domains
 - End-users involved in technology/system development
 - End-user understanding and acceptance

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 - Collaboration infrastructures
 - Plug-and-play environment
 - Registration of resources
 - Pushing technology

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Requirements: "5S Grid"

- **security**
 - industry eager to move to a ground-up secure environment
- **simplicity**
 - must work seamlessly with current client applications and operating systems
- **stability & standards**
 - a need for stable long-term specifications
- **scalable service orientation**
 - well accepted and known
- **semantics**
 - must support rich, domain specific semantics

Problems: "5S Grid"

- **security**
 - dynamic security polices, legal issues
- **simplicity**
 - SME companies, many without IT departments, push vs. pull
- **stability & standards**
 - WS vs. Grid services, interoperability
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 - standardisation of domain specific ontologies, taxonomies, classifications, ...

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