Collaborative Orthopaedic Research Environment

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Background

- Need for collaborative research in biomedicine
  - Develop a Virtual Research Environment which enables orthopaedic surgeons to collaborate remotely
  - Support orthopaedic surgeons in the design, analysis, review, and dissemination of experiments and trials

Background

- Re-engineer previous VRE (Virtual Orthopaedic European University, VOEU)
  - As a loosely coupled system
 - Use a web/grid services-based approach to an e-science VRE

E-science cycle
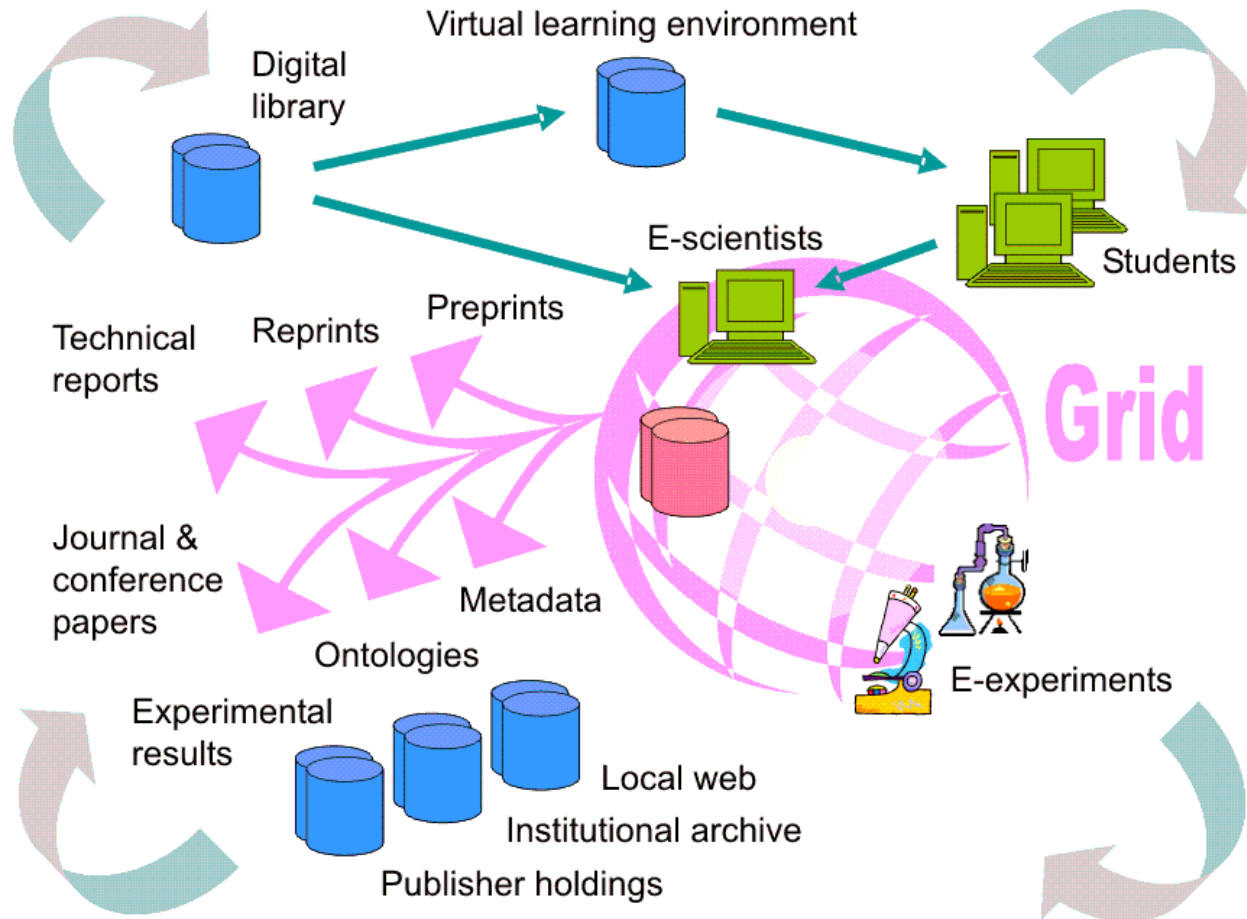
Aim

- Develop a Grid/Web service-based VRE for supporting a critical subset of the e-science cycle for orthopaedic surgeons:

  - Collate and analyse trial results
  - Organise internal project discussions and reviews
  - Produce technical reports and papers
  - Produce teaching and training materials

Required CORE support

- Creation of technical material (non-research material for education)
- Data analysis (from own trials or data entered from journals)
- Investigation and development of hypotheses (from own work or as meta or thematic reviews)
- Discussion and review of findings from own or others work
- Preparation of papers and reports, and submission for review

Required CORE support
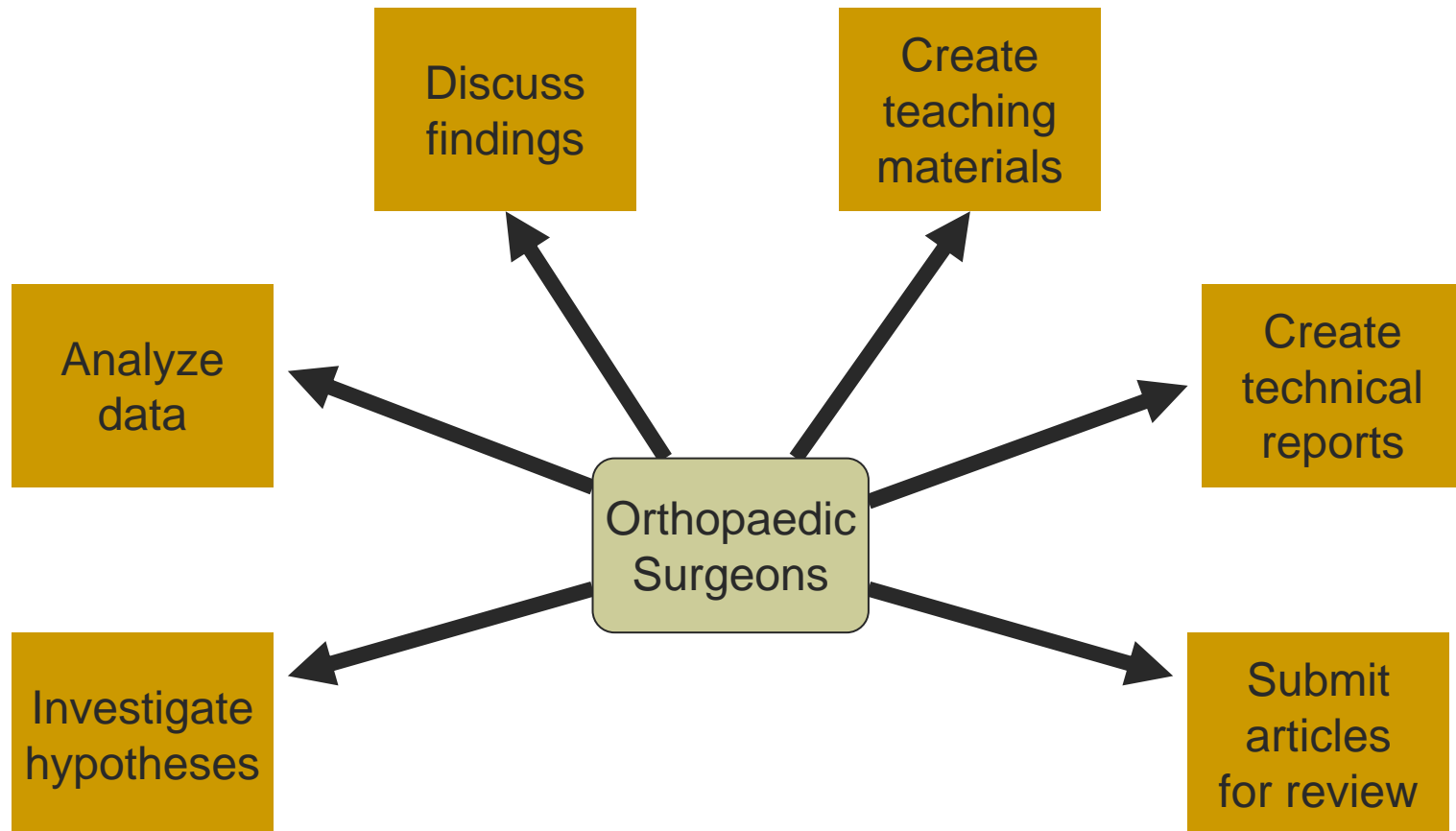
User requirements

- Virtual Research Environment should be easy to use (consultant surgeons are apparently low in patience)

- Contextualise resources and data presentation (adaptive user profile)

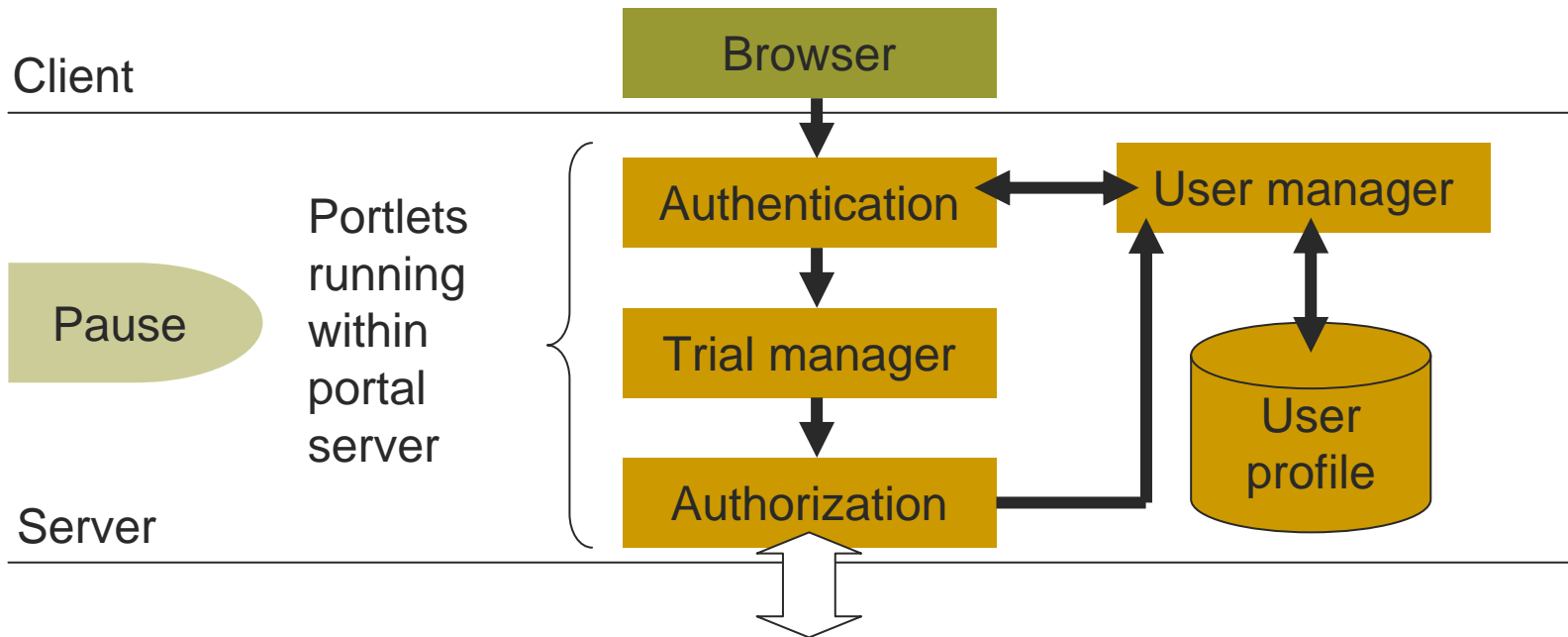- Run simulations with large scale data

- Provide secure access

CORE approach

- Re-engineer the VOEU tightly coupled system to a web service-based VRE

- Implement the VRE using Grid/Web services technology and Service-Oriented Architecture concept

- Use a portal as a presentation layer which aggregates, integrates, personalises and presents information, transactions and applications to user

CORE architecture

Client

Browser

Portlets
running
within
portal
server

Pause

Authentication ⟷ User manager

Trial manager

User profile

Authorization

Server

Services on intranet / internet

CORE architecture

Client

Browser

Portlets running within portal server

Authentication

User manager

Trial manager

User profile

Server

Authorization

Open Middleware (OMII)

Analysis

Data set manager

EPrints (doc repos)

Forum

GRID simulation

Services on intranet / internet
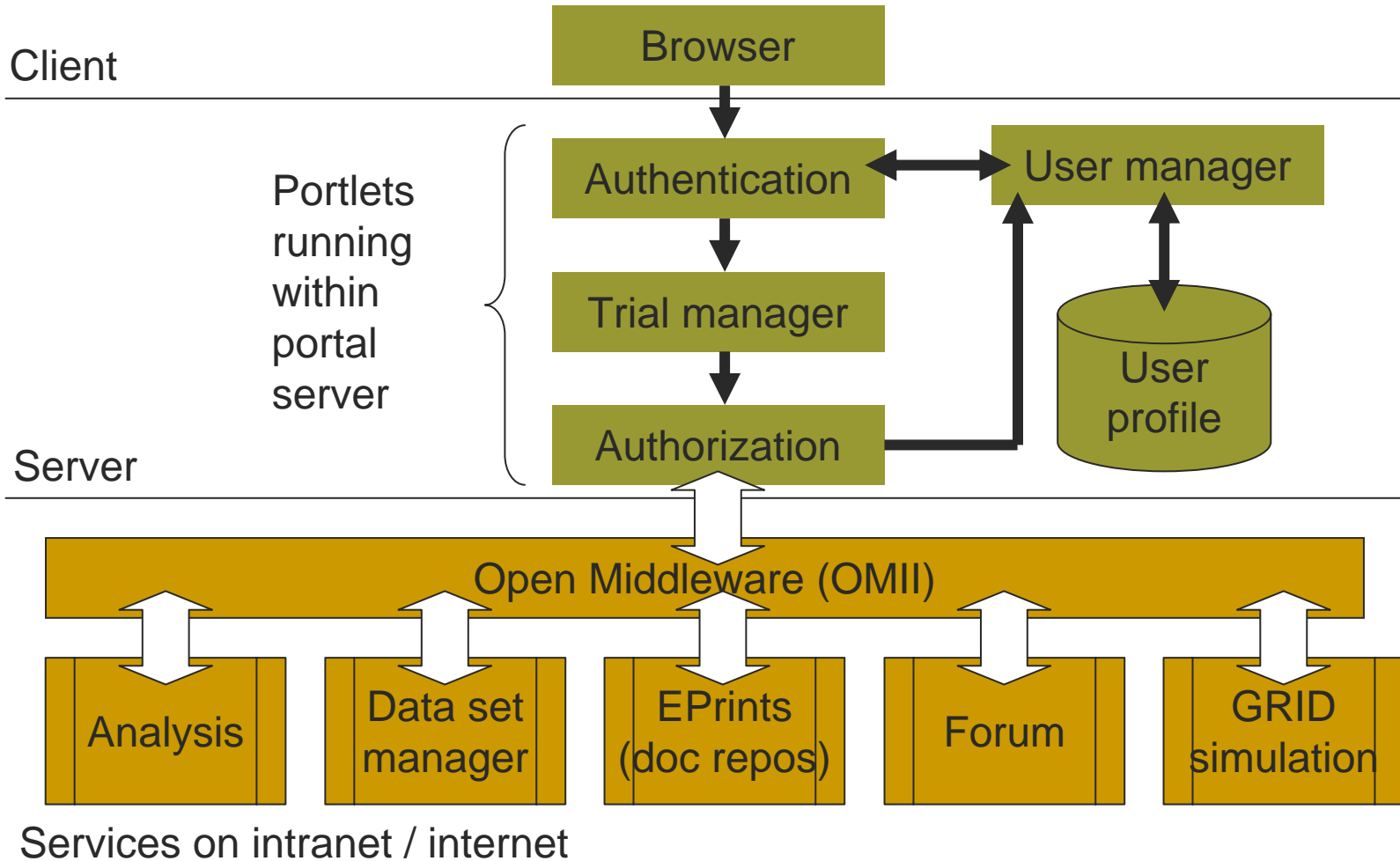
CORE architecture

- **Server level**
  - Portal -- act as a gateway between clients and a range of services/components
- **Middleware**
  - OMII -- end users can access Grid resources and applications in a trusted and secure environment
- **Services**
  - A set of web / grid services on intranet / internet

Portal and portlet

- The components within a portal are "portlets": Trial Manager, User Manager, Authentication, Authorisation, …

- Trial Manager controls the work flows for setting up experiments and submitting papers

Web/Grid services

- Analysis
  - A web service to perform analysis on dataset using statistical method
- Eprints
  - A web service to help submit and disseminate articles for reviewing between researchers
- Forum
  - A web service to support discussions between researchers

Web/Grid services

- **Data Set Manager**
  - A web service to handle trial related data
- **Grid Simulation**
  - A grid service to provide users with functionality for running simulations

Conclusion

- CORE is engineered as a loosely coupled system using SOA and Grid services

- The loosely-coupled architecture allows the system to evolve in accordance with the changing needs of its users

- Uses Grid services for the simulation, modelling and visualisation of bone and soft tissue biology, analysis of large scale experiments and the modelling of nanometric tissue units

Thanks!

- Questions, comments… ?

Client	**Browser**	
Portlets running within portal server	**Authentication** ↔ **User manager**	
	Trial manager	**User profile**
Server	**Authorization**	

Open Middleware (OMII)

Analysis	**Data set manager**	**EPrints (doc repos)**	**Forum**	**GRID simulation**

Services on intranet / internet