Supporting Collaborative Working of Construction Industry Consortia via the Grid

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Overview

• Project concept
• The Product Supplier Catalogue Database (PSCD)
• Security architecture (L. Joita)
• User management (P. Burnap)
• Data management (J.S. Pahwa)
• Conclusion and further work
Project Concept

• AEC (Architecture/ Engineering/ Construction) Industry projects involve many individuals and companies forming a consortium for the duration of a project

• Consortia members are geographically dispersed

• Product/Service Manufacturers and Suppliers databases (if existent!) are heterogeneous

• Product/Service Manufacturers’ product information is plentiful and the majority is unstructured and unreachable

• Solution? – A universal product supplier catalogue in the form of a database
The PSCD

• ActivePlan Solution Ltd has produced 2 software packages: ActivePlan (AP) application and Product Supplier Catalogue Database (PSCD) application.

• PSCD application – Grid-enabled data management tool that provides the data structure for storing information across a number of product suppliers database.
The PSCD

Product definitions groups

Poll and connect to relevant databases at run time

Specification creation and management keep suppliers up to date

Product supplier databases

User applications and users

supplier databases managed by suppliers connected via the grid.

COVITE
activeplan Cardiff University
The PSCD

• Software tools used:
  - Apache Tomcat web server
  - Microsoft IIS web server
  - Globus 2.2.4
  - Java CoG 1.1a
  - Servlet, ASP, JSP, VBScript
Security architecture

- Security considerations:
  - Authentication
  - Authorization
  - Confidentiality
  - Integrity
Grid Security Infrastructure (GSI)

- GSI uses the Public Key Infrastructure (PKI), X.509 certificates and Secure Socket Layer (SSL)
- X.509 certificates provide users with a unique global identification
- Authorization to access a resource is controlled by a mapping between the user’s distinguished name and a local Unix/Linux ID via a grid-mapfile
Grid Security Infrastructure (GSI)

• X.509 Certificate:
  subject     : C=UK,O=eScience,OU=Cardiff,L=WeSC,CN=liviu joita
  issuer      : C=UK,O=eScience,OU=Authority,CN=CA,E=ca-operator@grid-support.ac.uk
  start date  : Tue Nov 12 15:33:51 GMT 2002
  end date    : Wed Nov 12 15:33:51 GMT 2003

• Distinguished Name:
  CN=liviu joita,L=WeSC,OU=Cardiff,O=eScience,C=UK

• Main advantages of using GSI:
  ➢ Single sign-on
  ➢ Users do not have username/passwords, instead they have public/private key pairs and identity certificates
Security architecture

1. A user has to have a valid proxy certificate. The user submits their proxy certificate to the Tomcat authentication server (AS) via a web interface.

2. Tomcat AS authenticates the certificate and obtains the local user name for the PSCD application from the Grid-map file.

3. Tomcat AS passes the local user name to the IIS server that runs the PSCD system. IIS checks the username to its local DB and creates a session for that user.

4. User preferences are applied to the ‘index’ page of the PSCD system and the user is presented with the home page of the application.
User Management

• A user may take on several different roles in various consortia

• Examples: Project Manager, System Administrator, Generic Client

• Different user roles come with various associated responsibilities and authorities

• How do you manage the front-end of the web application?
  – logging a user into the system
  – determining their role in the system based on database information
  – presenting the user with the appropriate interface for their role
User Interface

Logged user details including user name, role and associated company

User navigation menu corresponding to user role
Allows permitted user functions to be loaded in the main frame of the application window
Discount Service

- creating system logic for allowing users to mimic real industry relations and obtain discounts

- user may be logged into the system as a virtual organisation consisting of a single person user or as a member of single or possibly multiple consortia

- When dealing with suppliers, person P may get a 2% discount on orders with supplier X, but when they deal with supplier X as a member of consortia A, they get a 5% discount. As a member of consortia B, they may get a 10% discount

Legend

P = single person user
C = consortia
S = Authentication server
M = supplier/manufacturer
Data Management

• The mechanism for the creation of product definitions (Product Class) by the Product Class Database (PCD) based on the specifications of the product.

• The creation of specifications based on the Specification Types.

• Versioning of Product Classes and its specifications to support new and evolving features of the products.

• Subscription of Product Classes by the suppliers for creating the actual products in their database.
The Product Class and its various specification types

- **Product Class**
  - Specification
    - Value
    - Specification Group
      - Specification
      - Sub-Specification Group
        - Table Spec
        - List Specification
          - List of Column Specifications where each column specification has list of values relative to other column specification values.
    - Product Class Specification
  - List Specification
    - Value
    - Value
    - ...
  - Sub Product Class Specification
Grid enabled Multiple Database Search Service (MDSS)

- Service oriented grid enabled MDSS for searching the products across a large number of supplier databases using the Open Grid Services Architecture (OGSA) model.

- Identification of the databases to be searched using the metadata.

- Creation of instances of grid search search services for the consortia based on their particular requirements.

- Customisation of search services and its reuse by defining the service data.
Grid enabled Multiple Database Search Architecture
Conclusion and further work

- PSCD provides a login interface based on GSI mechanism provided by Grid middleware and Java CoG toolkit. The secure connection will be implemented in future.
- It will be examined the new security mechanism provided by GT3 and the applicability in the context of the project.
- The user management system needs to incorporate logic to calculate discount from manufacturers based on the identity if a user acting as a single user or a member of a consortia.
- The storage location for this metadata must be determined.
- PSCD system aims to enable:
  - the creation of Product Classes and their subscription by the product suppliers
  - the ability to search for the desired products using the OGSA based MDSS.