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Project Overview

IT in use in the construction industry needs to find the right balance between, on the one hand, integrated information infrastructures, tools and systems, and, on the other hand, the organisational peculiarities and complexities intrinsic to this sector. There is a need to support smooth co-operation between non co-located teams, and the co-ordination of their work and activities in an environment that promotes trust and social cohesion. This overall infrastructure should give construction project participants increased flexibility, and effective access to project information regardless of its form, format, and location.

The need for inter-enterprise information management in dynamic virtual environments has now become a core necessity for enterprises collaborating and operating under the modulus operandi of virtual enterprises. This is a theme that was addressed by the OSMOS project, which was harnessed to develop an Internet based groupware environment to support non co-located teams in project-based industries such as construction. The environment is configured to support the "plug-and-play" of distributed services interacting with each other through OSMOS without necessarily knowing if the other exists or not. As such, end users can "plug-and-play" document management, cost control, facilities management, etc. services and access them through a single location. Additionally, there is the capability of for example associating an "object" from one system, with that of another, without each "third party service" physically communicating with each other.

OSMOS has been realised through the collaboration of consortium members from Finland, France, Sweden and the United Kingdom. Starting in January 2000, the project was concluded in March 2002.

Goals:

The major goals of the OSMOS project were:

1. Specify Internet-based services for collaboration between dissimilar construction applications and semantic cross-referencing between the information they manipulate.

2. Specify Internet-based services allowing the co-ordination of interactions between individuals and teams in a Construction virtual enterprise.

3. Specify a model-based environment where the release of, and access to, any shared information (including documents) produced by actors participating in projects is secure, tracked, and managed transparently.

4. Provide low entry level tools (cheap and user-friendly) to small enterprises to act and participate in construction virtual enterprises.

5. Set up two OSMOS Internet-based team work service providers for the purpose of the project, and ensure their take-up as commercial offers after the completion of the project.

The Basic OSMOS Infrastructure

The OSMOS project has yielded a collection of solid models enforced and executed through an API. On top of this, several tools have been developed to enable users to invoke API methods and get back responses (available both as Java objects and XML strings). The basic tools (reference implementation) developed include:

1. Service Management Tool: This tool provides functionality to a Server Administrator to manage the server. Main functionalities include the registration and management of different core and third party services, API invocation logging, etc.
2. VE Server Administration Tool: This tool is a web-based environment for facilitating the configuration and maintenance of the OSMOS platform in term of projects, organisations, employees, etc. It is to be noted that this tool is a simple interface to relevant API calls for initialising a VE project.

3. VE Project Administration Tool: This tool is basically a subset of the VE Server Administration tool and is developed in particular to configure and manage a particular VE project. Once a project has been set-up, control is passed over to a "VE Project Administrator" who then uses this tool to configure and manage it.
4. Web-based Information Browser: This tool acts as a low-level entry environment to the OSMOS workspace. In simple terms, the objective of this tool is to present and expose to VE participants based on their roles and associated access rights, the different objects and their associated service methods to which the VE participants have access.

OSMOS is proud to mention the realisation of three commercial implementations of its findings in terms of infrastructure development and implementation by its end-users. The OSMOS-SGTi implementation in France by DERBi enables the OSMOS infrastructure in parallel with a document management system, RyhtiWeb developed by Olof Granlund in Finland is a powerful virtual enterprise manager supporting the OSMOS infrastructure in addition to numerous facilities management modules, and the OSMOS-Dokumenbanken integration developed for JM by Carasoft supports the OSMOS infrastructure in addition to a document management and email handling system.

Main Results:

The main results of the project that concerned the Finnish partners (Olof Granlund and VTT) were:
- Generic virtual enterprise process model
- OSMOS conceptual models
- OSMOS API
- OSMOS business process recommendations
- OSMOS reference implementation (Basic OSMOS infrastructure)
- OSMOS middleware solution (X-layer)
- Finnish implementation (RyhtiWeb) - this is now a commercial software that is being deployed
- OSMOS Final Report

Note: The public results of the project are downloadable through the OSMOS public website (http://cic.vtt.fi/projects/osmos)

The OSMOS Impact:

The results and overall impact of the OSMOS project is perhaps best understood through a comparison with the "traditional" way of doing business in one-of-a-kind project based industries such as construction.
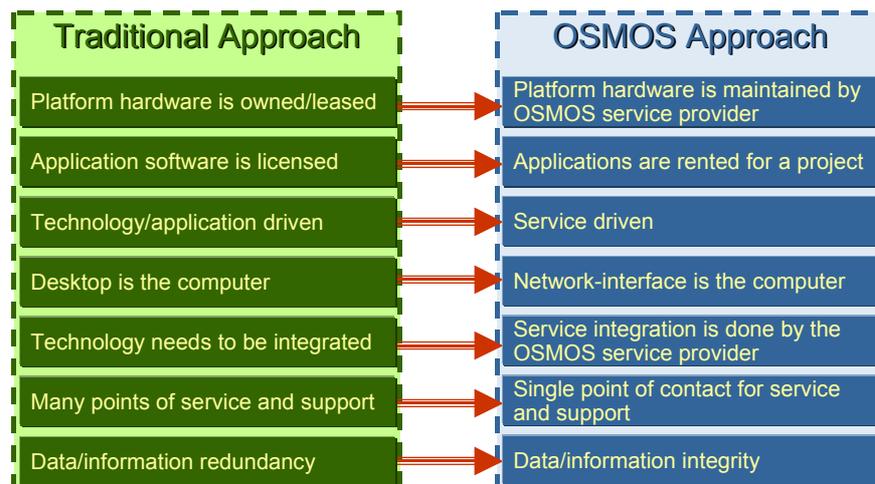
The Finnish Experience: Facilities Management

Facilities management involves the participation of different actors from different organisations, all engaged to perform, report, or manage certain tasks. The typical mode of operation is that of the virtual enterprise. Main actors involved in facilities management include building users, maintenance personnel, facility managers, consultants, maintenance managers, etc. It is to be noted that not only do these different actors come from different organisations, but at a given time are involved in the management of multiple facilities with different actors. In such situations involving multiple actors and facilities, the challenge is to provide information content and services to not only the right people at the right time, but through an interface that does not necessitate persons to switch their mode and application of working from one project to the next. This calls for a single entry point for individuals to "plug-and-play" and hence interact with multiple applications through a single interface.

From RTD Results to Practical Applications

The key challenge here was to first identify organisational needs in terms of requirements for a virtual enterprise management solution that would manage projects, actors, roles, access rights, enable plug-and-play between heterogeneous data sources and applications all through a unified single interface. While research and academic partners such as VTT focussed on robust models and the core RTD aspects of the solutions, end-users such as Granlund endeavoured to translate these findings to practical applications for commercial use.

Granlund have been a lead provider of facilities management software to the facilities management sector. A core tool used by many global clients has been Ryhti. Initially available as a windows client based version, the tool provides several modules providing distinct functionality and services over a facilities management database. These modules include: maintenance, help desk, long term planning, energy monitoring, technical, document management etc. The main challenge for Granlund in the OSMOS project has been to make available a web-based version of Ryhti in addition to creating an infrastructure for facilitating the facilities management virtual enterprise. The later has been achieved through the development of two integrated tools: the GranlundWeb Browser, and the Granlund VE manager.

The GranlundWeb browser is a generic HTML-based tool that provides basic access to a virtual enterprise's project data and services. It is based on the core OSMOS models for access and service invocation. The main focus is the ability to handle and respond to requests made by both Ryhti's facilities management services in addition to external third party services.
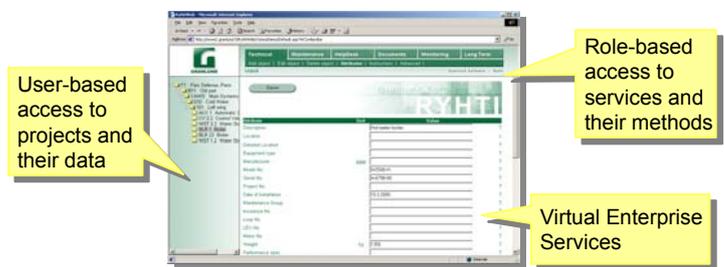
The GranlundWeb Browser

The Granlund Virtual Enterprise Manager is primarily an administrative tool that is used for the basic instantiation and configuration of a virtual enterprise, its participants, and used services. The tool basically:

- Manages users and roles
- Manages projects
- Allows any web-based service to be registered and used in the virtual enterprise
- Controls access to registered services through a role-based model

The Granlund VE Manager

The Case of Senaatti Properties

Senaatti Properties is a government owned enterprise responsible for managing and letting property assets of the Finnish state. Buildings include universities, offices, prisons, and defence buildings. Currently Senaatti Properties own more than 2600 facilities of which up to 2000 are in a facilities management database for facility management purposes.

With limited personnel (200), there is a need for external business partners to support the facilities management process. A first step in this direction has been the recent (March 2002) introduction of a new web-based document management system (DOCS). The purpose of this system is to provide access to facility documents such as: technical drawings, operational and maintenance manuals, rental contracts, etc. With many business partners, the establishment of roles and access rights to the documents alone is becoming increasingly difficult through the current implementation. Furthermore, FM data and documents are not integrated. The problem is to be efficiently resolved through the OSMOS based tools developed by Granlund.

Benefits of the OSMOS Solution through Granlund Tools

The main challenge for Granlund in providing a solution to Senaatti Properties was to provide access for external business partners to both FM data and related services through a controlled and integrated mechanism. Main benefits delivered through the Granlund solution include:
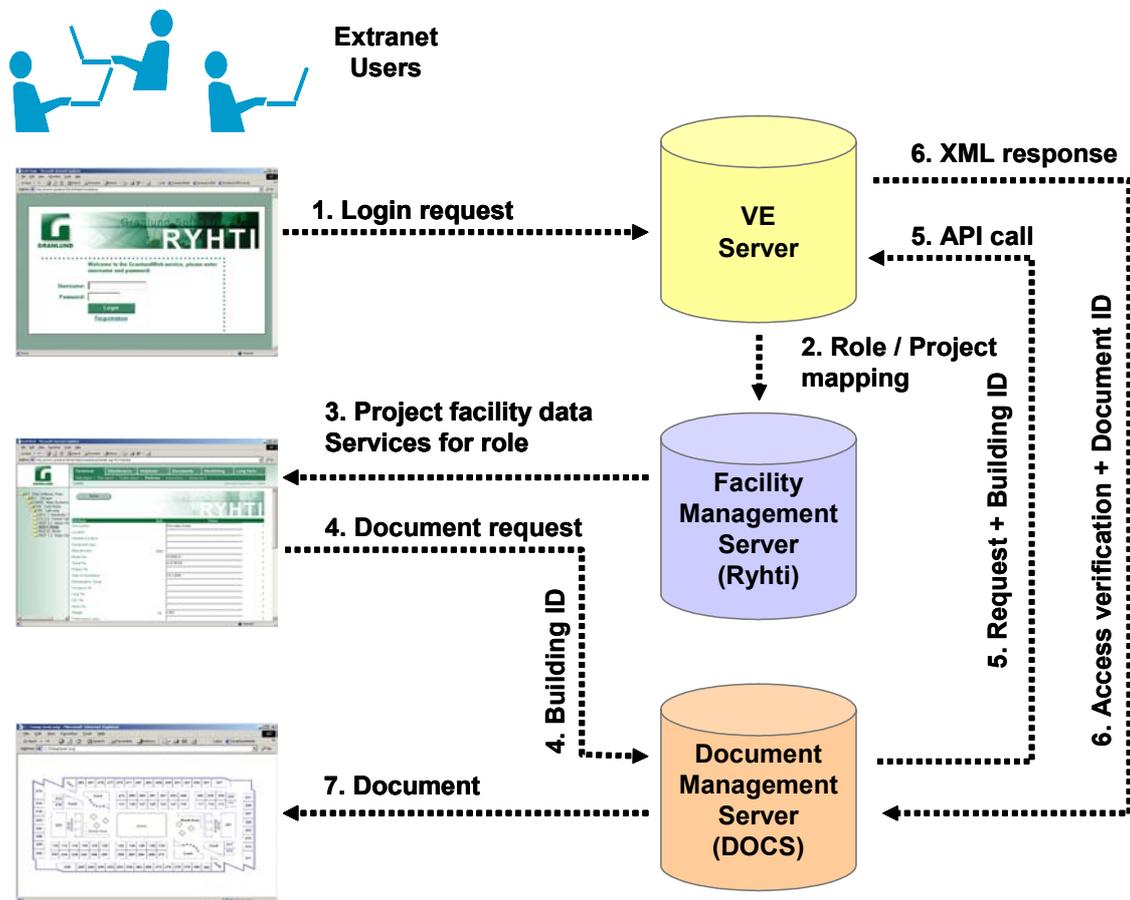
- One logical interface to all building related data
- Simplified access control to document data through roles/services and projects
- Links though cross-referencing between buildings (FM data) and documents
- An flexible interface to add and integrate other additional external services

Implementation Framework

Initially, the system is configured in terms of actors, roles, access rights, projects, available services and service methods, etc. using the Granlund VE manager. The configuration details are stored in the VE server. A step by step procedure of the internal dynamics of the system from the perspective of the end-users (extranet users) is as follows:

1. An end-user logins in through the GranlundWeb Browser which sends a login request to the VE server.
2. The VE server checks the login request and if valid, performs a role to project and available service mapping before forwarding the details of the same to the facilities management server.
3. The facilities management server exposes and presents to the end-user the project facility data and services to which he/she has access rights to.
4. A user may invoke certain facilities management services or request a document related to an object. The document request is in the form of sending a Building ID to the document management server.
5. The document management server cannot directly act on a Building ID alone and needs more information. To get this information, a request is made to the VE Server in the form of an API call.
6. The VE Server receives the request from the document management server, checks the credentials of the user requesting, and sends back to the document management server access verification in addition to the Document ID for the document to which the user has access.
7. The document management server releases the document to the user.

It is to be noted that all happens through a single user interface and that access rights based on predefined roles are enabled through the VE server and not the document management system.

Implementation Framework for Senaatti Properties

Key Finnish Contacts:

Granlund is the largest engineering company in building services consulting in Finland. Founded in 1960, it employs 270 people, and is privately owned (mainly by the employees). The company's main activities are building services design, facilities management consulting, and development of design and facilities management software.	http://www.granlund.fi
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VTT - Technical Research Centre of Finland, is the largest research establishment in the Nordic countries and one of the largest in Europe. The research group of VTT Building and Transport involved in the OSMOS project focuses on four main activities: design methodology, project management, information networking and product data technology.	http://www.vtt.fi
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