Architectural Window

Computer networks as planning and integration tools

Prof. Dr.-Ing. DONATH Dirk, Dipl.Ing. HANSEN Stefan, Dipl.Ing. RICHTER Katharina

Bauhaus-University Weimar; faculty of Architecture, chair Computer Science in Architecture
Belvederer Allee 01, 99421 Weimar, Germany.
http://infar.architektur.uni-weimar.de

As building projects become increasingly more complex, the number of project participants increases as does their spatial distribution. An effective decentralised work process and co-operation is of increasing importance. The global computer network, the internet, has great potential and recent times have seen the development of a variety of techniques in this field. The project proposal described here is based upon this approach and also takes it a step further. A specific analysis of the subject and the subsequent identification of potential approaches formed the basis for an architectural application that brings the architect in contact with other project participants using the internet as a powerful yet simple and easy to use medium. The project is currently (2002) undergoing practice tests and academic investigation and is installed on a freely-accessible server.

***Keywords**: CAAD, Internet, integrated planning process, design collaboration, project management, design tools*

Motivation and Context

As building projects become increasingly more complex, the number of project participants increases as does their spatial distribution.

An effective decentralised work process and co-operation is of increasing importance. The global computer network, the internet, has great potential for improving information provision, communication, cooperation and coordination between project participants.

Current Situation

General approaches to the problematic are manifold and have in recent times spawned a large number of internet-based applications based on a variety of widely differing techniques and scientific approaches.

For the architect, the current situation appears nevertheless ambivalent:

On the one hand there are systems based upon 'Internet Based Project Management' (IBPM) which offer easily comprehensible benefits and performance improvement measurable in cost and time savings.

On the other hand, risks and uncertainty hamper this, in particular with regard to the slow consolidation of the branch and the resulting difficulties in the readjustment of roles.

It is clear to see that the potential offered by the medium of the internet remains not only unused by planning professions but also unrecognised.

At present the most common use of the internet is for personal presentation in the form of a homepage. Beyond this, architects are yet to make use of networked methods which support the planning activities of the architect in practice.

Internet Based Project Management – IBPM

Currently available internet based project management systems are characterised by two central aspects: The provision of a central database for all project participants that can be viewed and edited by all participants according to their respective rights of access. Principal aims are cost and time savings in comparison to traditional dispatchment methods and a more efficient project development through reduced redundancy and data which is continually up-to-date. The second central aspect is the integration of workflow and process modelling systems. The aim here is to simplify complex notification and communication processes through automation.

IBPM systems enable primarily an efficient exchange of information and documents, whereby the format the data takes plays a secondary role – the administrative handling of data is identical whether the data in question is text, a spreadsheet or a geometric drawing.

This fact also demonstrates a shortcoming of current IBPM systems with regard to their use in the building branch: the central information database for all those participating in a design and planning process is of geometric nature and is at present poorly supported with regard to its presentation and manipulation in the internet.

Architectural Content System – ACS

A new project at the InfAR Chair for Computer Science in Architecture at the Bauhaus-Universität Weimar (Hansen, 2002) is oriented towards new requirements placed on planning tools as the spatial distribution (decentralisation) of planning participants increases. A specific analysis of the planning process, an investigation of development possibilities of currently available systems and the subsequent identification of potential approaches formed the basis for an architectural application that brings the architect in contact with other project participants using the internet as a powerful yet simple and easy to use medium.

The system provides a client-server application whose user front-end can be used with any normal internet browser. The core of the application is centred around the communication and administration of planning decisions through a central digital database in SVG (scaleable vector graphic) format. Using a free plug-in these are viewable with the user's internet browser.

The application currently supports the two-dimensional abstracted representation in plan-form as the central information database (central model) as this still plays the central role in the planning process.

The application is naturally centred around this central database and the projection/presentation of its content is dependent upon the respective user's requirements:

The role and view principle

The system employs, much like most other IBPM systems, an authentification procedure with password to determine the individual users' viewing rights. Through the assignment of roles (e. g. administrator, architect, third-party specialists, guests…) a series of user groups are defined by the project administrator (Figure 1). In simpler projects this role is assumed by the architect. A user can have different roles in different projects.

Each request by a user, who through his or her password has been assigned a certain role, is presented according to a particular view. A view determines both access rights to the information as well as the form in which it is presented and is configurable by the project administrator (Figure 2).

Layer structuring and versioning

The principle means of information cooperation is through the concept of versioning based upon a structural layering of the information. Plan structuring in CAD-systems is well-known. In ACS the layers are used to organise the plan in terms of con-

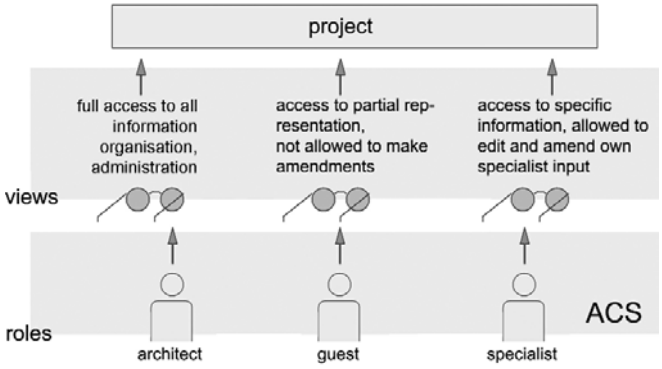

Figure 1. Roles, views and access rights in ACS

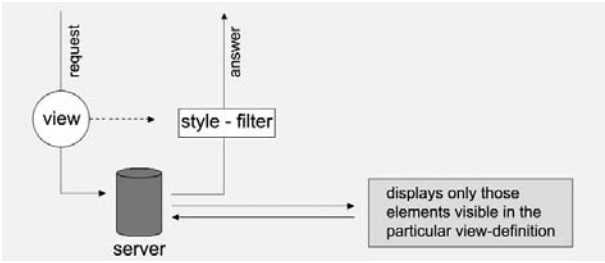

Figure 2. Connection of view and view-definition in ACS

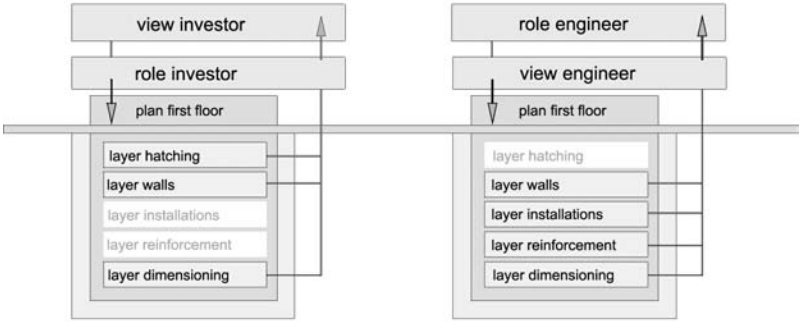

Figure 3. View-definition through combinations of layers

tent. Viewing is then defined through combinations of layers: The system uses layers which can be combined into plan representations (Figure 3). A pre-requisite of such a system is the consistent definition and use of layers.

Different versions (e. g. alternates) of individual layers within a plan can also exist and users with the appropriate rights can decide to make a particular layer version the display version for that layer. Decisions are logged by the system and can be displayed for each plan.

ACS and IBPM

Well-known IBPM functions such as messaging, scheduling, workflow support etc. have not been programmed or implemented in ACS at present.

ACS concentrates on handling visual planning information augmented with the annotations in text form etc. as it is this aspect that is the main shortcoming of existing systems. Its incorporation within larger IBPM systems is conceivable.

Technical realisation

The aim was to develop a generic and modular expandable application system for architects. The system employs the from the W3C internationally agreed and openly available web standard for geometric data representation – scalable vector graphics SVG. Main aspects of the system include:

- Absence of scripting languages,
- Implementation using server-side Java (J2EE-Standard),
- XML-based data exchange and editing,
- Clear separation of data content, logistic and representation,
- No hard-coded HTML, instead the use of XSLT,
- Infrastructure on the server employs only Open-Source project resources.

The basis format used for the geometric information, SVG, can also store images and text in addition to vector information. Text can be edited referenced and searched.

Future perspectives – further development

The application employs technologies which enable its extendibility at any time. As such the following functions could be realised within a short period of time: "geometry-based interactivity", such as a red-line-feature or a history channel. Manipulation of geometries is in principle not a problem and is dependent only upon better import/export filters in current CAAD-systems. The localisation in individual language versions is in principle only a matter of translation of the relevant user interfaces.

The project is currently (2002) undergoing practice tests and academic investigation and is installed on a freely-accessible server.

Conclusion – Traversing system boundaries

The initial investigations have shown that the problem of plan representation and manipulation in the internet is omnipresent: CAD-systems have as yet insufficient internet-connectivity. Naturally standard formats have been developed for necessary data interchange between systems, however, these are based upon a lowest common denominator and the conversion from the original format to a common format often involves loss of specific information.

The selection of the SVG format as the central data storage format for this project is founded on the one hand upon its explicit internet compatibility and on the other in its potential to become an important data exchange format for CAD-applications. SVG is currently not one of the standard export formats for CAD-systems. This limitation would be resolved by the use of a conversion program as part of the system. In the context of today's current technology, this would represent a major step towards the system's practical implementation and towards the vision of a continuous and integrative computer-assisted support of planning practice.

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