

# Master's Thesis

## « Models for Indoor Navigation and Location-Based Services »

### Background

Current navigation devices cover mainly the outdoor area. Usually, these devices carry the maps and road topology on built-in storage. In the recent past, Internet based devices have emerged and are still gaining popularity. These devices query databases on the Internet for route generation and presentation. Both kinds of devices rely on GPS as source for position information.

There is currently no such standard for the positioning within buildings. A global central storage for building data is most probably not wanted. Stakeholders may not be willing to distribute building data to entities outside their governance. Also, navigation and location requests may lead, due to access restrictions, to very different responses depending on who is using the service: An employee, maintenance staff, emergency forces or a visitor.

Various building properties have to be taken into account: First and most notable the 3-dimensionality and others like work load of elevators, access restrictions, . . . Building data may change rapidly (e.g. office staff), thus distributed building data, for example on memory cards, may soon be outdated. As a result, a federated approach seems more promising: Indoor navigation devices request map material and services from a building management system. After an authentication and authorization process, the system grants the services a specific user is cleared for. Local facility management keeps the data about the building and its topology up to date. If a user enters a building, the most recent data is accessed by the users' device.

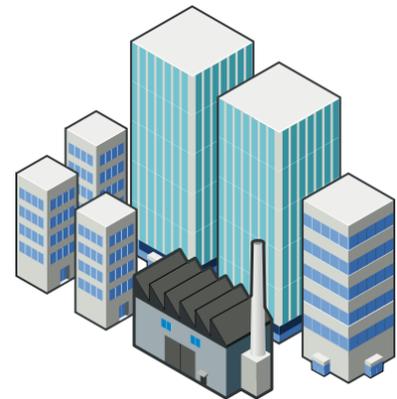
In order to model and manage the building data, formats for the data exchange and databases are required. The format to model different buildings has to be standardized in order to allow different devices with different capabilities regarding the user interface and user interaction to work with any building management system obeying the standard.

### Work Description

The goal of this work is the specification of a versatile building modeling language based on the Geography Markup Language (GML). Additionally, the transformations of the developed model from and to a database system (e.g. relational, object-oriented or geospatial information system) have to be specified as well.

### Requirements

Java, XML-Schema, Database Systems



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