The Dynamic District Informal Model Server

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Introduction

Renovation of domestic stock offers the potential to significantly contribute to reducing both housing shortages and carbon emissions. Access to integrated sources of information both at the building level and district level is key to supporting policy makers and decision takers.

However, interoperability issues between software systems and formats has limited the ability to share information

Objectives

This poster describes a software system, the Dynamic District Information Model (DDIM) Server, that mitigates these problems by providing an extensible, queryable information source. The server further supports inter-domain process definition through the provision of an notification service that can be used by software connecting to the server to order data exchange tasks.

Methodology

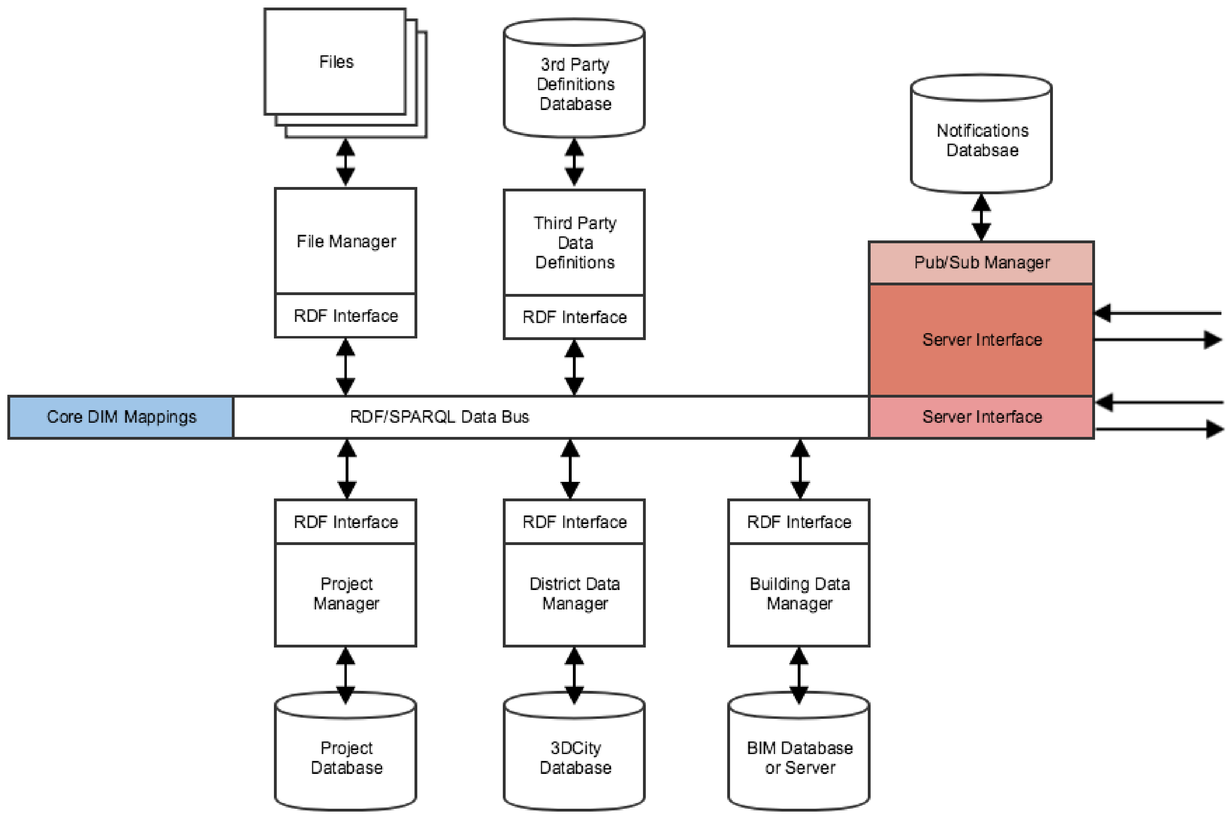
The DDIM implemented the following features to meet its objectives:

Provide a contextually rich, extensible core data storage model - by providing a contextually rich data storage structure, the server will provide a vertical view of a region or district through to individual rooms of buildings. Other entities will be attached at points along this vertical path, placing them in the context of the overall model. This is implemented using semantic web and linked data approaches

Provide a semantically rich query interface for the data structure - a SPARQL query interface is provided to allow semantically rich queries to query the data storage model. This goal specifically advances the data-application level by serving content in a flexible format that is not bound to any particular format or standard.

Provide a dynamic notification system that can be configured by other agents to enable a federation of systems to create processes - a publication/subscription notification system is provided to allow software components connecting to the DDIM Server to notify it and other attached software to of changes that have been made to stored data. This facility allows for the creation of loosely coupled software federations that can each execute some part of a software tool chain, using the DDIM both as an intermediate storage facility to facilitate transfer of data to other components in the chain, and as a communications mediator for the process.

Results



The Dynamic District Information Model Server (DDIMS) seeks to tackle these issues by providing the following functionality:

- The DDIMS can act as a core component of a federation of servers and tools, providing services such as user management, authentication and authorization; these are implemented through industry standard security frameworks;
- The server acts as a central store of data, providing a semantically unified view of multiple data formats that in of themselves provide views of varying granularity of the represented district; these include district level data in the CityGML format, building level data in the IFC format, along with file based data and add on data definitions to extend the core schema. The server acts as a central repository for a federation's data, removing data integrity risks associated with multiple versions of data, and centralizing security and other services;
- Provides an method to query the data store through a semantically expressive query interface. These queries can be across all related information stored in the data store. because of the expressive nature of the queries, extensive refactoring is not required to expose new views of information stored on the server, reducing maintenance costs and ensuring that the server is capable of dealing with unforeseen future requirements;
- The DDIMS' data store can be extended by consuming semantic definitions of new data that are framed in the context of the core data definition. The server will use these definitions to add new tables and interfaces to query these. This feature will also increase maintainability and relevance into the future;
- Finally, the server provides a subscribe/publish notification service that allow other actors on the federation of servers and tools to receive notifications when some other component has manipulated existing data or produced a new information artefact. This service facilitates asynchronous communications between components and admits integration of tools into complex, data driven processes, while maintaining a loosely bound federated structure that promotes ease of decoupling, allowing individual components to be replaced or modified without requiring extensive refactoring of other components.

Future work

The development of the server will continue by seeking 'real world' environments in which to which it can be applied.

Other data formats will be integrated.

Investigate the applicability of the software to other tasks such as information provenance.

Conclusions

The Dynamic District Information Model Server, that mitigates these problems by providing an extensible, queryable information source. It sought to ameliorate the effects of disparate data sources to produce a combined view of these sources through the use of linked data and semantic web approaches.

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