Blending Building Information with Smart City Data

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ABSTRACT. The increasingly urbanized world together with modernization and industrialization trends has led to the explosive growth of city information. Cities can be considered as data factories that daily produce a huge amount of data from different sources such as people, infrastructure, machines, events, sensors, and smart devices. In the context of Smart City, built environments play an important role and convey a lot of useful information that can be used to realize the Smart City goals. Currently, the Building Information Modeling (BIM) methods are used intensively to capture the building information. Conventionally, building models are used during the planning and construction phases of buildings and mainly address the static aspects of buildings. In the Smart City era however, the situation is changing. During the operation phase, buildings are now producing more data than ever before. This paper is aiming to address the data integration challenges of BIM in context of Smart City by utilizing the current research work in the Linked Data domain in order to facilitate the interoperability between and beyond BIM resources.

1   INTRODUCTION

In the early twentieth century, there were only 16 cities with over a million population [1]. Today this number has increased to more than 400 and in 2007 the number of people living in cities exceeded the number of those living in rural areas for the first time in human history [2]. By 2050, urban dwellers will likely account for 86% of the population in the more developed regions and for 64% of that in the less developed regions [3]. In urban areas, people spend a large portion of their time inside buildings and the built environment hence plays an increasingly important role in their daily lives.

Today our built environment is not only producing a huge amount of data, but, since the emergence of Internet of Things (IoT) and digital technologies, also starting to talk back and communicate with its inhabitants and the surrounding systems and processes. In this context, city organizations strive to find more efficient ways to benefit from this growing data and combine it with other available information resources in order to create smarter solutions.

Despite the wealth of BIM standards and the large amount of building-generated data, the communication between buildings and the urban infrastructure is hampered by a lack of efficient data management and BIM-oriented data integration solutions.

2 WEB OF BUILDINGS

Web of Buildings (WoB) is a uniform information space that connects various BIM schema and their corresponding instances (buildings) that are located in a specific geographic area (e.g., specific housing complex, district, or city). The WoB is established based on the current research work in the BIM and Linked Data domains and gives us a solid base for describing the building services in a machine-interpretable way [4]. To this end, BIM-based resources are processed, aligned, and reconciled to create this uniform and interconnected information space, which includes both static and transient data models.

Because the WoB is built upon Linked Data principles, eventually everything has a unique URI that can be dereferenced to retrieve information of the entity it represents in RDF format. Once the entity is dereferenced, the applications can identify new URIs in the retrieved information and continue to navigate the data space by dereferencing those URIs. The general architecture of the WoB is schematically depicted in Figure 1, which shows how building models will be available as high quality LOD resources for various data integration scenarios.
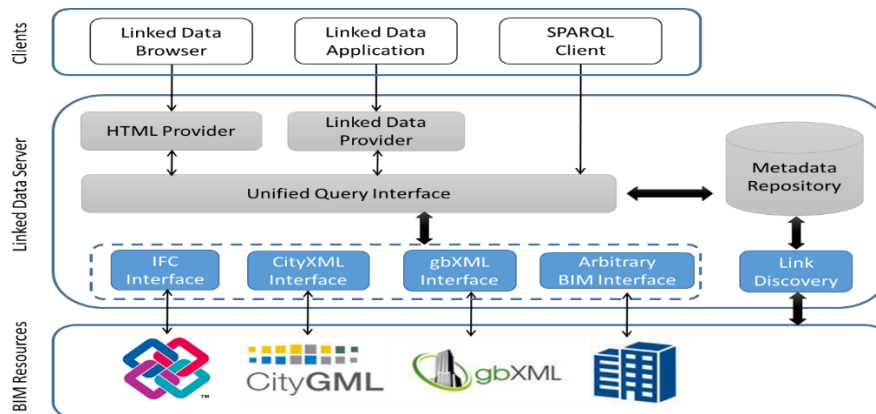

Fig. 1. Overview of the proposed data integration solution

3 REFERENCES

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