The Establishment of A Territorywide BIM Data Repository

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HKIS BIM Conference 2020 11 December 2020





 Under Smart Government, it recommended the adoption of BIM, development of Common Spatial Data Infrastructure, and creation of 3D Digital Map

- More and more quality BIM Data are available at government and private development projects, but they are not easy to exploit in a broader context
 - Fragmentation in sharing of BIM Data
 - Problems of identifying, accessing or using data
 - Gaps in standard BIM Data

 Those problems hinder the sharing of BIM data across Bureaux and Departments (B/Ds) as well as integration of BIM Data and 3D Map of Lands Department



Timeline of Development of BIM Data Repository

Phases of Development

BIM Data Repository Consultancy Study	Phase 1 – Cloud- based BIM Data Repository	Phase 2 – Creation of 3D Map with BIM	Phase 3 – Development of BIM API
(6 months)			







- Define Development Roadmap of BIM Data Repository
 System
- Recommend Data Formats
- Provide functional requirements
- Develop a Proof-of-Concept application of BIM/GIS integration

BIM Data Repository Consultancy to Define the Roadmap



- Phase 1 Establish a Cloud-based BIM Data Repository for centralized management and sharing of BIM information across Works Departments
- Phase 2 Extend the BIM Data Repository to support 3D map data creation
- Phase 3 Develop open web APIs for BIM Data Repository to facilitate use of BIM data and provide different applications

Data Model Recommendation



- Object-based approach
- Model change tracking compatible with IFC schema
- Store and manage BIM models in both native and open IFC format
- 3D GIS model in open CityGML format
- Open data approach supports and encourages development of software-independent applications

Key Functional Requirements of BIM DR

- Support **data management**, **sharing** and **exchange** of the design and as-built BIM models among Works Departments
- Provide a **centralized platform** to store and manage BIM Models
- Develop a web application to facilitate searching, viewing and locating all available BIM data
- Administrative and monitoring tools for BIM data conversion
- Provide open APIs to facilitate system interfacing and integration

Development of PoC Application

City-Level 4D Application on Open BIM + Open GIS

Web viewer





IFC

Open BIM Database









4D Decision Support

- Visualizes different scenarios along with metrics
- Simulating, predicting, testing
- Provide insights to policy makers with deeper considerations and analysis on different factors to help formulate strategies



Reference: Conceptual research prototype developed in 2015 for QEZ in Doha, Qatar Stanford University | CIFE

Current Status of PoC – 4D Simulation

New Development Area of FLN

n





Construction period: roughly 2021 - 2030

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LC Paper No. CB(1)61/12-13(05)

DevB, CEDD, PD

Development Plan





- Common repository integrating BIM and GIS based on Open BIM and Open GIS
- Demonstrate the **technical feasibility** of **combining BIM data and 3D GIS** information into a single application
- Dynamic interface that can be used to visually simulate different scenarios of urban planning
- Simulate and predict mid- to long-term metrics that can support the decisions of the government leaders.
- Improve public engagement with the provision of rich 3D geographical web interface for better handling of enquiries from public

Phase 1 – Cloud-based BIM Data Repository



- Implement a Cloud-based BIM Data Repository System
- Establish scalable and sustainable system infrastructure
- Facilitate BIM data sharing and collaboration
- Provide a centralized platform for managing BIM data in Objectbased approach
- Support integrating BIM and GIS data in a single environment

Conversion of BIM Models

The System will store the data in its Native & IFC format

IFC will be converted to CityGML Attribute list is pre-defined before conversion and subject to the open

format limitation Full Set FC DESCRIPTION DETAILS 14109NT RLP AR VC Visitor Center arch incoming Conversion **Full Set** CE1314-ACM-C2-X-M3-BS-SP BS Sewage pumping station Citv**GML** CE1314-ACM-C2-X-M3-CV-RD-N Road layout Engine CE1314-ACM-C2-X-M3-CV-TREE-N Tree planting CE1314-ACM-C2-X-M3-GE-RW-N Retaining wall Road Sign CE1314-ACM-C2-X-M3-RDTS-N Extraction / Filter List applied. Extraction / CE1314-ACM-C2-X-M3-ST-BR-N Footbridge FK2 Filtering It can be managed by BIMDR Filtering CE1314-ACM-C2-X-M3-ST-SP Stru Sewage pumping station Departmental Administrator / CE1314-ACM-C2-X-M3-UU-11kV-N Underground 11kV cable System Administrator CE1314-ACM-C2-X-M3-UU-ATC-E Existing utilities cable CE1314-ACM-C2-X-M3-UU-DRA-E Existing drainage CE1314-ACM-C2-X-M3-UU-DRA-N Drainage works Shareable BIM models a a a calor ou Civil 3D Extracted Extracted Civil 3D Revit C3D R Extracted Revit Extracted First Phase Development of KTN and FLN NDA

C2 MODEL

Prototype of the BIM Data Repository



Integrating BIM and 3D Spatial Data



Line-of-sight Analysis



Viewshed Analysis



Walking through the BIM model



BIM Data Repository Prototype

[BIM Data Repository]



Lands Department 地政總署







- Extract BIM model elements for 3D Map creation and updating
- Automate and streamline the workflow from BIM to GIS
- Enrich the 3D Map features and analytical capabilities

3D Digital Map to Be Delivered in 2023







Territory-wide 3D Visualization Map with Individualized Buildings

3D Indoor Map of 1,250 buildings Territory-wide 3D Pedestrian Network

BIM Data Provides Rich 3D Content for 3D Map



Enrichment of 3D Map using BIM Models



BIM helps to enrich 3D Maps

3D Digital Map Streamlines the Construction Life Cycle



Phase 3 – Development of BIM API



- Share BIM elements with open standard web services Application Programming Interface (API)
- Enhance the BIM data adoption and integration
- Provide BIM analytical features
- Access rich BIM context without the need of BIM software
- Simplify system integration with BIM

Provide Flexibility of Accessing BIM Data



Walls



Floors



Curtain Walls Panels



Doors





Potential Use Cases of BIM API













And more...



3 Phases Connected To Create Digital Twin of Hong Kong

The object-based BIM elements enables creation of 3D map objects **BIM APIs** facilitate BIM

data access down to object level for application development

BIM Data Repository establishes a **centralized platform** for managing object-based BIM elements



- Establish a **centralized and sustainable digital infrastructure** for managing BIM data across government departments
- Provide a single source of BIM data access on the cloud
- BIM data are harmonized in an open format, eliminate dependency on BIM software and version
- Open APIs provide ease of access and integration to the BIM data. No BIM software is necessary
- Enrich the context of **3D Map** to better support **Smart City** development

