

BIMaaS

**Sophisticated Common Data Environment (CDE) with
BIMaaS Platform**

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1. Introduction to BIMaaS Platform

BIM as a Service (BIMaaS) is a cost-effective platform for construction and asset data using Building Information Modeling (BIM) standards. BIMaaS is the only enterprise grade, open-source platform for integrating data across infrastructure projects, asset management and facility management.

Continuous innovations with Cloud and Open-Source software, together with BIM standards have led to our new range of BIM products. This platform is free to end-users. Our vendor-neutral BIMaaS platform is powered by WS02, which is a proven open-source middleware platform running billions of enterprise-critical transactions per year and empowering customers like Boeing and eBay.

BIMaaS provides six key advantages for enterprises and empowers BIM Level 2 compliance much faster.

- *Share - Share asset data across internal departments and third party suppliers to manage projects more efficiently and effectively.*
- *Collaborate - Work together with internal and external teams for simplified inter-operability in multi-organisation projects.*
- *Analyse - Make informed management decisions by analysing both design models and operational asset information in one platform.*
- *Visualise - Generate a 'one common truth' 3D model for buildings, infrastructure and projects.*
- *Govern - Ensure all parties adhere to BIM standards and simplify proof of BIM compliance (which will be mandatory for many projects from 2016 onwards).*
- *Learn - Use past knowledge and data to design new infrastructure projects better, and smarter.*

In this white paper, we deep dive into “Share” and “Collaborate” components of BIMaaS platform. In the complex world of AEC industry today, a construction project has many stakeholders involved and different software applications are being used. Bringing people and data together will be a challenge. In this white paper, we will elaborate how BIMaaS platform’s integration capability helps to solve these business problems to achieve a sophisticated common data environment.

2. What is Common Data Environment?

A common data environment is a single source of information when it comes to graphical, non-graphical, structured and unstructured data. It does not necessarily enforce that data should be stored in a single place. Data could be in disparate locations residing in heterogeneous data formats but connected into a single source in a federated manner. It then provides a way for all stakeholders to search and collaborate, avoiding duplications and mistakes. Moreover, it brings information to their fingertips as and when it is needed.

Publicly Available Specification – PAS 1192: 2 Specification provides a guideline on how CDE should be implemented. According to this, in a common data environment, it should facilitate following key environments.

- Work in progress – This is to facilitate working data set for stakeholders which is not approved yet.
- Shared – This is to facilitate collaboration between stakeholders. Working data could be moved to a shared environment for review and edit between teams.
- Published – This is to facilitate data which was signed off by the necessary stakeholders. Once it is signed off, data cannot be changed.
- Archive – This is to facilitate the archival of signed off data when the project or project milestone is completed.

A correctly implemented CDE should illustrate the above characteristics. One of the other key things emphasized by the PAS 1192:2 is the authority of the information. Ownership of the information remains with the originator although it is shared between stakeholders. Only the originator is allowed to change the information, unless necessary permissions are granted to other users. The below *figure 1* depicts the CDE based on the PAS 1192:2.

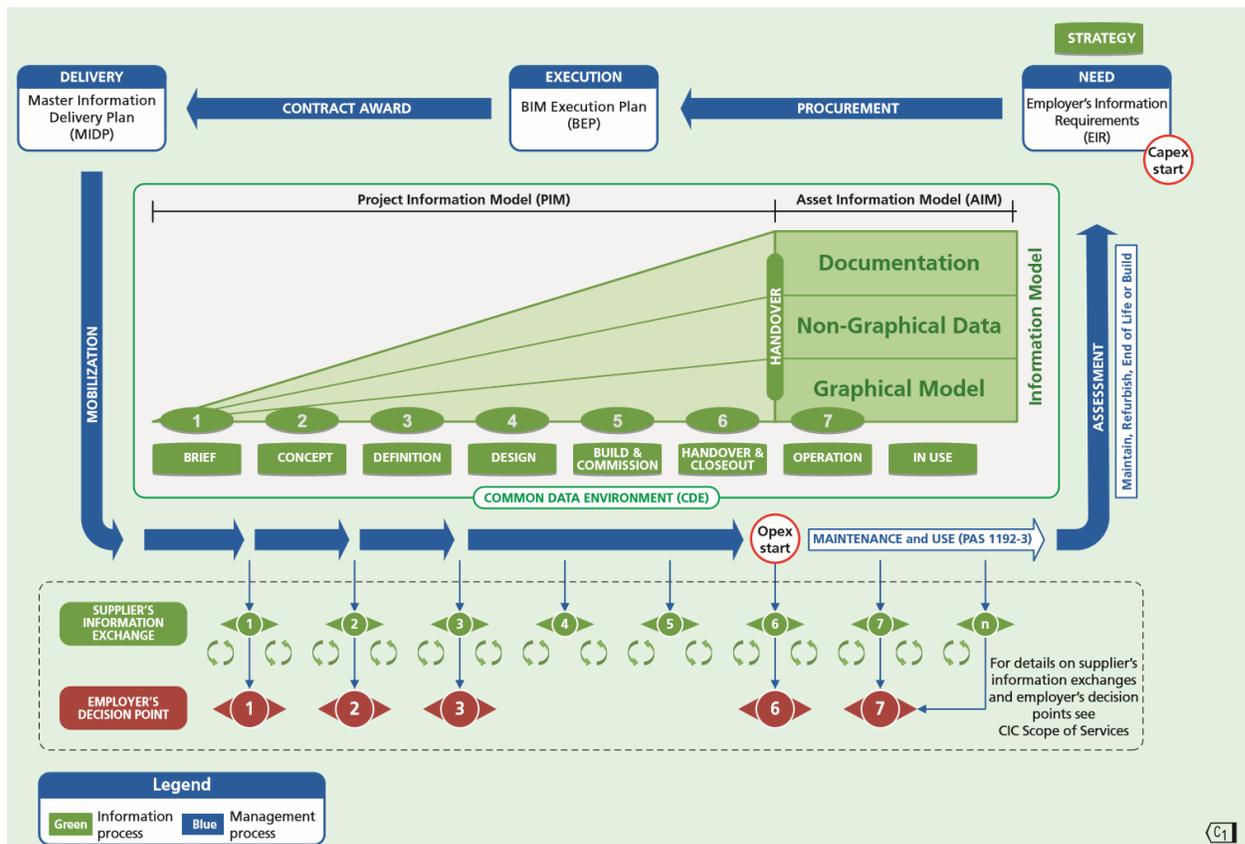


Figure 1

CDE is applicable for new construction projects, as well as completed facilities that need to be operational. In both scenarios, it generates information that has to be captured and brought into a single source, AKA, Common Data Environment.

3. Real World Challenges without a Common Data Environment

A typical construction project consists of 3 main phases. Design, Construction and Operations. The design phase is vital. Traditionally, architects start with the conceptual design of the construction by working with the client requirement. HVAC engineers and MEP engineers participate later in the design process based on the design requirements of the architect. Once the conceptual design is converted to a construction ready model, the actual construction kicks off. Project managers will get involved and the cost and schedule is managed accordingly.

The problem with the above model is unforeseen surprises. A slight miscalculation from the structural engineers could go unnoticed until construction is started. This could cause rework, causing an unnecessary increase in cost. It will also impact the schedule of the project.

On the other hand project costing and schedule management is also rapidly adjusted during the construction phase to make the high demands of the client. Usually 50% to 70% of the capital expenditure is committed during the conceptual phase of the project and this leaves very little room for project managers to adopt to ever changing project demands.

The common data environment provides a complete solution by giving all stakeholders a view of “one truth” with integrated information.

4. BIMaaS Integration Engine

When it comes to large enterprise integrations, it is costly in all aspects. Building a CDE could be considered as a large enterprise integration between systems, data and people. The integration team should have a great deal of understanding the environments, its data and end goals of integration. Typically, with solutions architecture team and a set of expensive software, the integration cost could rise to millions of dollars. One of the key reasons here is, in a typical CDE integration, most technologists try to convert heterogeneous data into canonical format to make sure they complement the characteristics of common data. This comes with a price of developing adapter mechanism for every type of data coming into the CDE. The *figure 2 below* depicts this.

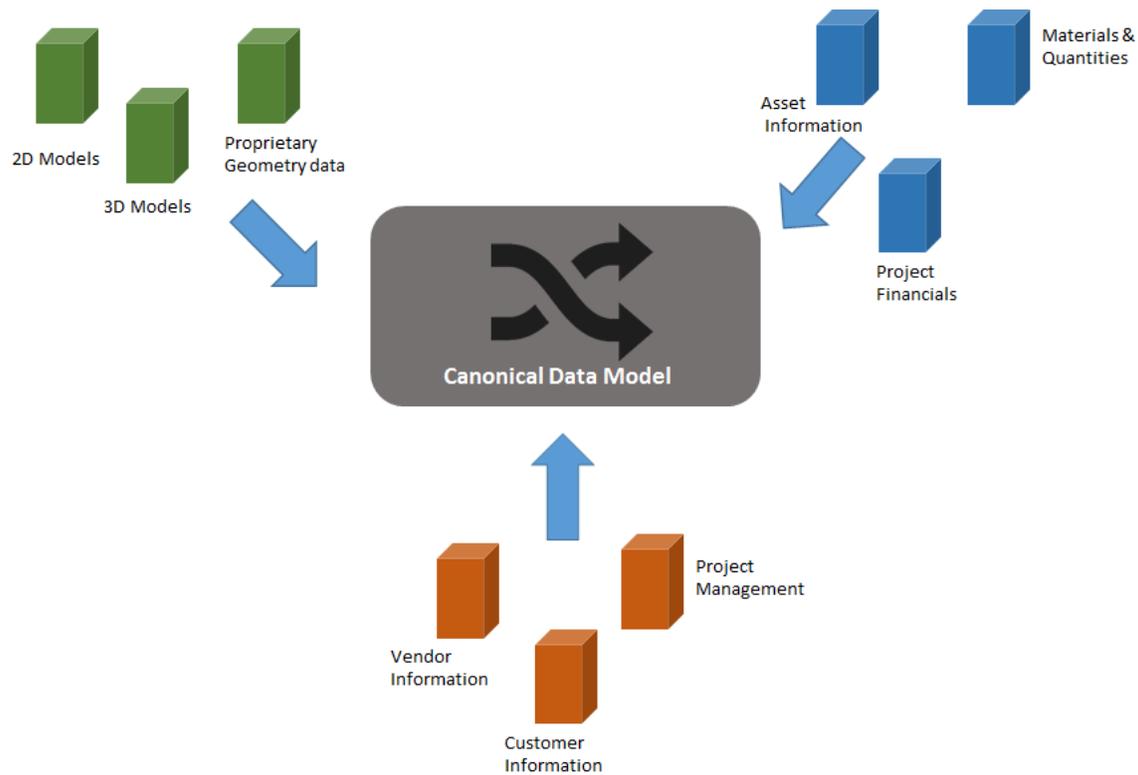


Figure 2

BIMaaS customers can be assured of the ability to fast track to BIM level 2 compliance. BIMaaS makes CDE possible by simplifying data integration. BIMaaS has WSO2 middleware components as the underlying architecture. WSO2 middleware provides a great level of sophistication in terms of scalability and robustness. BIMaaS platform is offered as an open source solution, under the same license as WSO2 middleware, under Apache 2.0 license. This equates to an immediate saving of millions of dollars, that one would spend for proprietary license for commercial integration products that would be used to build a common data environment.

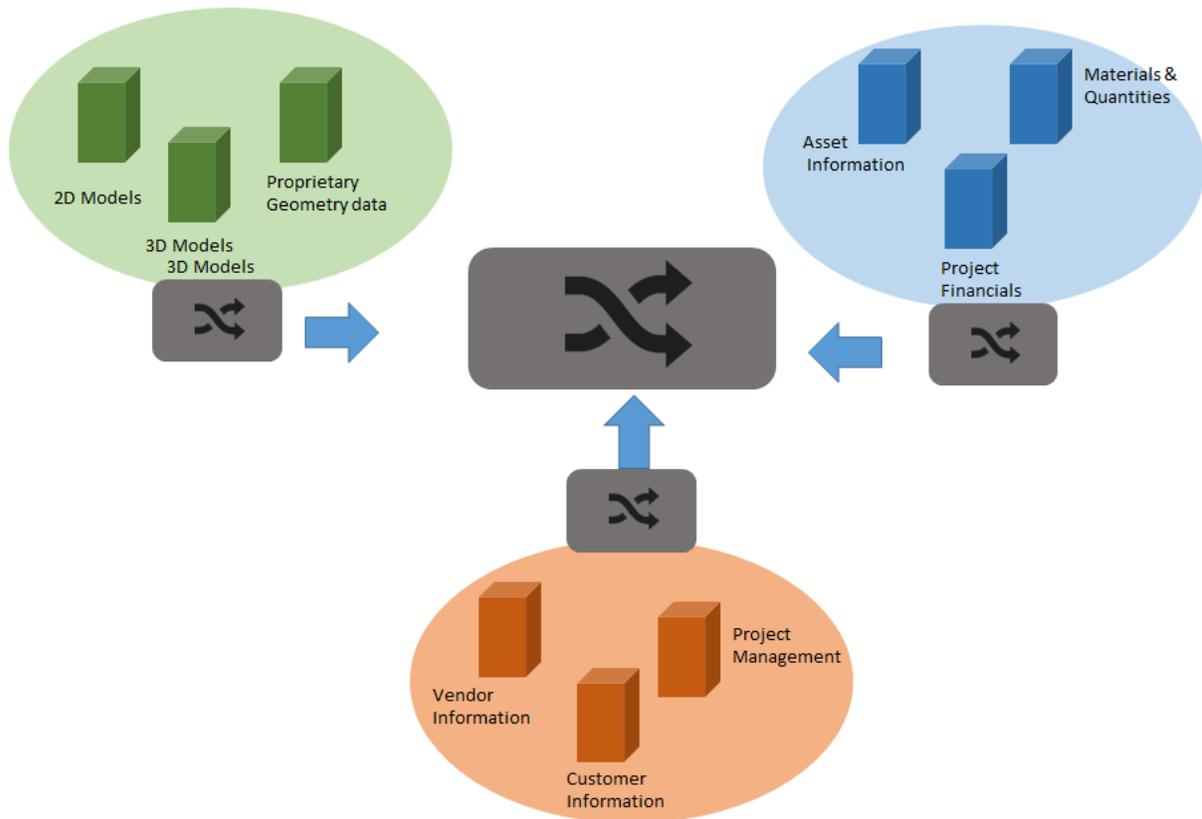
BIMaaS integration engine is built using several components from WSO2 middleware.

- **WSO2 Enterprise Service Bus** – This acts as the broker for different domains in a common data environment. It is responsible for receiving data, transforming it to the required message format and channeling it to the necessary points. Using these ESB brokers for different domains in the enterprise eliminates the canonical approach explained in the diagram above. All the data for a specific domain could be transformed before getting into to common data environment by applying similar transformation logic. The best part is, there could be multiple ESB brokers for each domain with a unique responsibility for this transformation. WSO2 ESB is lean, quite light and running different instances for each business domains is much simpler.
- **WSO2 API Manager** – The API Manager component is used to expose the data communication interfaces with an API. This gives the BIMaaS platform a massive capability. Unlike common

data integration scenarios, where APIs has to be developed and introduce an enterprise level change; API Manager provides an out of the box capability of exposing functionality via HTTP or SOAP protocols. BIMaaS uses API Manager to develop its common data environment API and also uses its API Store component for easy discovery of API for the enterprise.

- WSO2 Identity Server – When it comes to the common data environment, security is paramount. BIMaaS uses Identity Server as its underlying security mechanism. According to PAS 1192:2, the information originator has ownership of the information. When it comes to the shared environment, not every stakeholder may have access to all information. Ensuring secure access in an enterprise application, with disparate teams with different authentications will become an absolute complexity. Identity Server component of WSO2 middleware has a proven capability of security features with scalability in mind. BIMaaS provides the capability for adopting a mix of information security mechanisms, while providing a single and a simple interface for authentication.
- WSO2 Data Services Server – Is is always a challenge to integrate proprietary data (none graphical and none file based). Technologists typically expose the databases for reading and writing data with some adopters. This introduces complexity on data security, application performance etc. With WSO2 Data Services Server, BIMaaS exposes data as a service. The consumers of this service are unaware of the underlying database mechanism. This provides a great deal of encapsulation that is much needed for the common data environment.

BIMaaS integration engine is built with all the components above. With another ESB broker, information orchestration is accomplished. The figure 3 below depicts the BIMaaS integration engine.



5. Conclusion

Building a common data environment (CDE) for BIM has been made easy with the BIMaaS platform. Unlike proprietary data integration software, the solution does not cost millions; as the BIMaaS platform could be simply downloaded as an open source solution. Further the incorporation of WSO2 middleware as the underlying architecture provides a sense of leanness and increases the scalability of the platform by tenfold. In the problem space of enterprise grade data integration, BIMaaS is a proven solution provider that complements Service Oriented Architecture (SOA) and adheres to best integration patterns with WSO2 ESB.