Sketch to feasibility via HFDM

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Learning Objectives

- Understand how to approach data manipulation through Forge and HFDM.
- Learn about integration of different system through Forge and HFDM.
- Learn about cloud real time data exchange via HFDM.
- Web cloud development with Forge services.

Description

Today, technology allows us to automate design through parametric design technologies. However, what if we could go to the next stage and address the artistic touch as well? Most designers still feel more comfortable sketching an idea before they go to a CAD system. It is also easier and more engaging to sketch something in front of a client; at the same moment, we remove the intimacy by placing a computer between people. This problem is now gone. Using the Forge HFDM technologies, we are capable to translate design sketch, via an iPad, to a real time mass study with feasibility capabilities. Furthermore, this can be displayed in a web browser with different data streams to interact with different web micro services.

Speaker(s)

Marc Durand

As the Director for Digital Disruption for Atkins Middle East and Africa, his deep technical expertise, entrepreneurial skills and high-level strategic planning brings a new expertise and strength to capitalize on the technological growth opportunities that exists in our markets today. With over 15 years' experience in leading roles in technology/AEC firms he has led technology research and development, implementation and project delivery across several tech firms in Germany France, including Faust Consult, Burt Hill, 3D Kyvoss and most recently in UAE as a partner with iTech a management consultancy firm and provider of Building Information Management (BIM) technology services.

His appointment to Atkins enables full implementation of the Atkins digital strategy across the region. His focus is on enabling creation of new revenue streams

He is originally from Boulogne Sur Mer, France, where he completed his Master's Degree in Industrial Data Processes at the University of Littoral, Cote d'Opale France. My family and I relocated to the United Arab Emirates (UAE) in 2007.

Mustafa Salaheldin

As a multi-disciplinary subject-matter expert, Mustafa Salaheldin is one of the fewest professionals in the Digital Transformation field who has a strong technical experience of BIM and is mastering the full-stack application development at the same time.

Beside his Bc.S. in Computer and systems engineering, he is LEED GA certified, Autodesk Expert Elite, Microsoft certified applications developer and Autodesk Authorized Developer.

I used to work for Engineering Consultants Group (ECG) in Egypt as the head of BIM R&D where he started up the BIM implementation and automation there.

Mustafa joined WS Atkins & Partners in Dubai, which became after a part of the SNC-Lavalin company in Canada, as the Head of the Digital Design Development.

Due to his expertise in developing cloud-based applications, he became the lead of the Digital Transformation inside SNC-Lavalin using cutting-edge cloud technologies from various vendors like Autodesk, Google, Amazon and Microsoft to develop the business ecosystem.

Later in the first quarter of 2018, he got his promotion as Data Science Manager to lead the R&D inside Atkins.

Introduction

HFDM is the core technology we're using to put "Data at the Center". Rather than passing files around to try to implement disjointed workflows, data can be centralized and accessed by a variety of client applications and services.

What is HFDM?

HFDM puts data at the center of Forge application development, enabling developers to build rich and collaborative, data-centric applications and reactive systems at scale. The Forge HFDM data service is a central hub that stores and communicates rapidly changing data between different clients, apps, and connected services while keeping all users in sync.
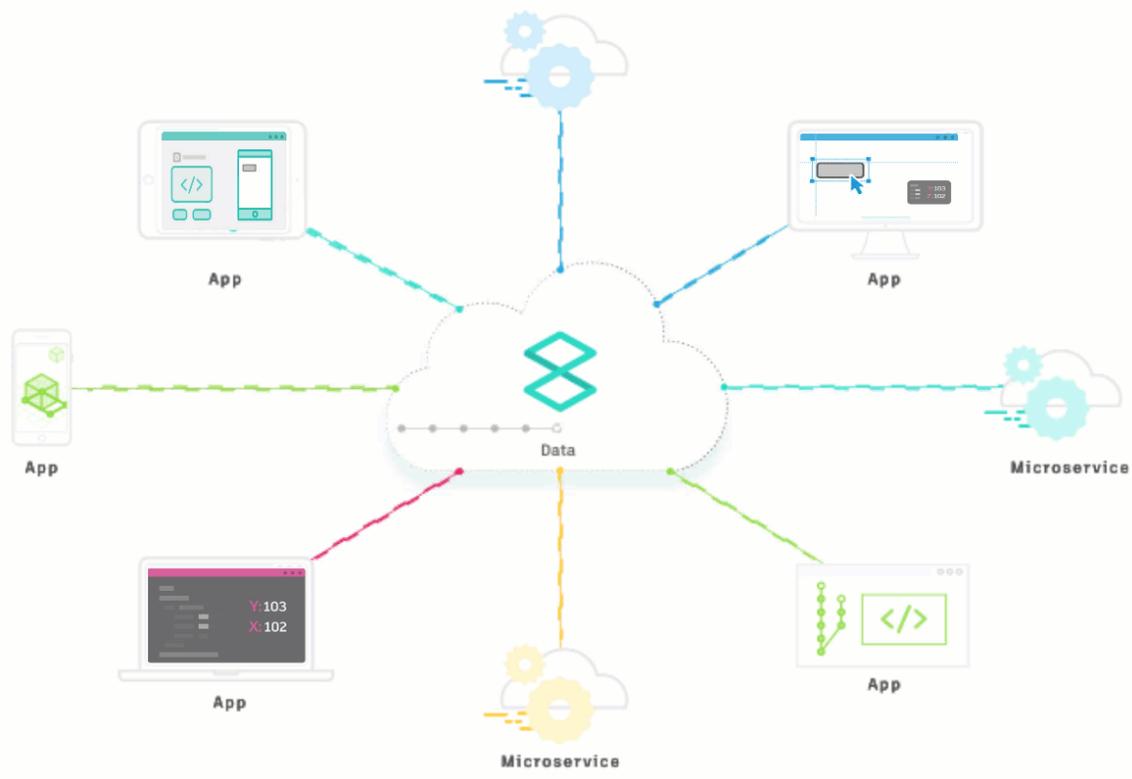

Fig.1 Data at the Center

You can see HFDM as being a cross breed between the revision control system of a fine-grained revision control system in the asynchronous branching and merging of Git with the real-time collaborative nature in a non-locking shared state of Google Docs. So essentially, HFDM is a service that allows you to efficiently store and process data on the cloud, and allows multiple clients to collaborate with each other without necessarily locking the state.

Real-time, Collaborative, Distributed, Revision Control System

Fig.2 HFDM Model

Why HFDM?

HFDM is at first a little bit difficult to understand. We aim to turn into a full cloud based project delivery, and the management of files become more and more time consuming. What if we could remove the file-based workflow and focus on what matter, the data.

However, the best way we think about is to imagine the data being at the center and developing different interface to display the same data in different ecosystems. Imagine you have a Revit ® building room schedule, you plan to export it to Indesign ® to have a slick presentation, but also link it to an excel sheet for analytic and finally report it in word. The idea from the HFDM is to connect all these applications together so when a change is happening in one app, the rest update automatically. Imagine the creative team wants to change the color in Indesign ®, wouldn't it be nice to have all excel and Revit ® color code updated? Now it is possible with HFDM.

We of course used HFDM in a way more in-depth workflow to facilitate design. Our goal is to use search technology to retire technology.

Understand how to approach data manipulation through Forge and HFDM

Using HFDM micro services, we are now able to connect data and user interface on a different scale. Our idea was to simply empower our creative designer by lifting the technical time-consuming effort out of their hand.

Project Caterpillar

In this class, we are going to talk about the application "Caterpillar", which we have been developing in SNC-Lavalain Atkins, based on the HFDM technology. Four main components compose the application:

1. The HFDM component
2. The Data Binder component (Layer Binding, Extrusion Binding, Mesh Binding, Solid Definition Binding)
3. The 2D Sketcher, link to the ESRI map services for GIS triangulation
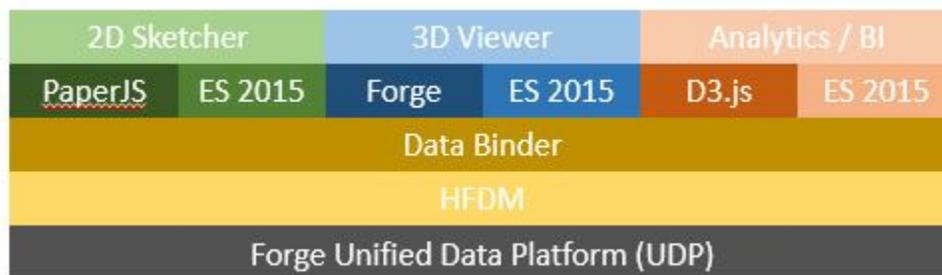4. The 3D Viewer, to interact with the masses
5. Analytics Dashboard

Fig.3 Project Caterpillar Framework

How it works

The first step is to setup a project by cropping a static image from the ESRI/Google Map
The static image is to be saved in the no-SQL Database (Firebase / MongoDB / DynamoDB).
Once the image is saved the 2D sketcher is to be open with the image as its background
The 2D sketcher provides sets of shapes drawing and editing tools.
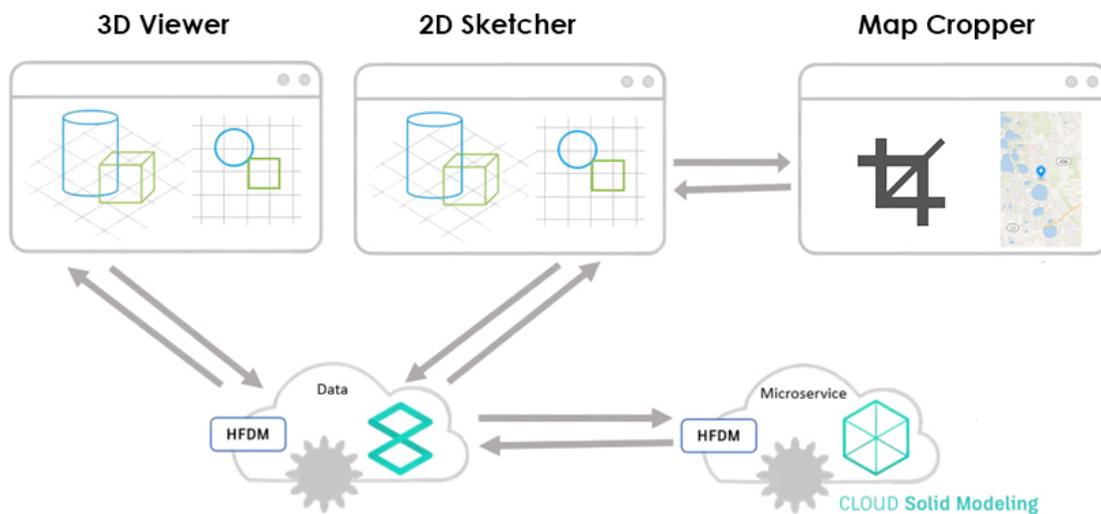Once the drawing is done the 3D viewer is to be updated in Real-time by the HFDM platform.

Fig.4 HFDM micro services integration

Learn about integration of different system through Forge and HFDM

It is obvious now that we can integrate different applications and platforms together using the HFDM technology. Some of those applications could be:

1. Sketch Mass Study
    a. sketch on iPad Pro
    b. shape to primitive geometry detection
2. HFDM processing data
    a. primitive to mass
    b. mass morphing from recipes
3. Web to display output
    a. output 3d model (forge)
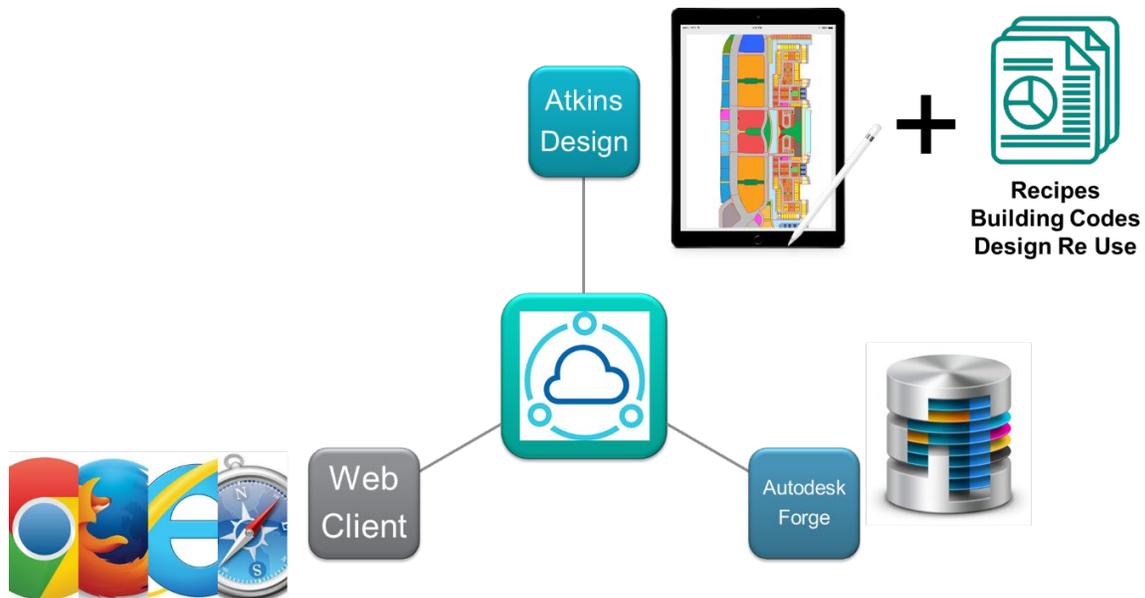   b. analytics and dashboard

Fig.5 Project technology mapping

Learn about cloud real time data exchange via HFDM

As HFDM is a part of the Forge platform, it became so easy to integrate it with different components of Forge. Making advantage of this privilege, we managed to push the model geometry and data back and forth between Forge Viewer and HFDM. This allows us to create models in the Forge Viewer then send it to HFDM for further processing and file creation.
On the other hand, we are able to extract information from the model directly using HFDM to build dashboards, insights and reports.
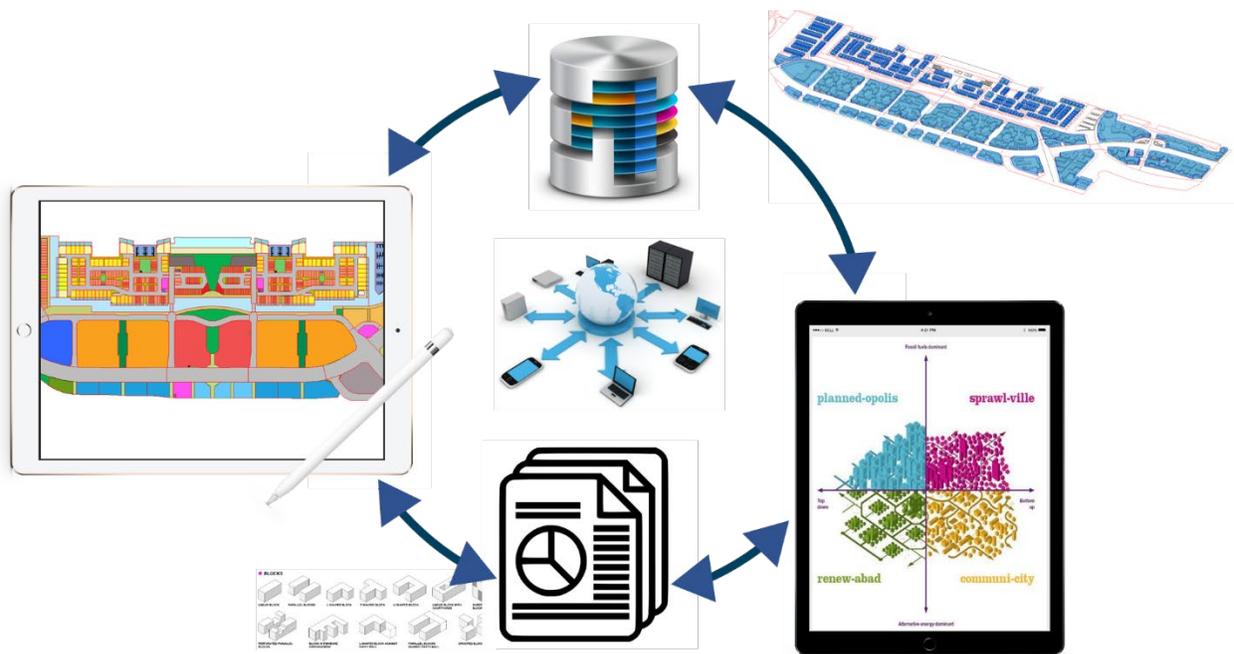

Fig.6 HFDM at the center of the app

Web cloud development with Forge services

Real time project progress and analytic is now possible. HFDM allows us to now add an interface to all data source, giving us access to real time reporting. Now the cherry on the cake is that if you alternate the data flows, you back feedback your own design as well.
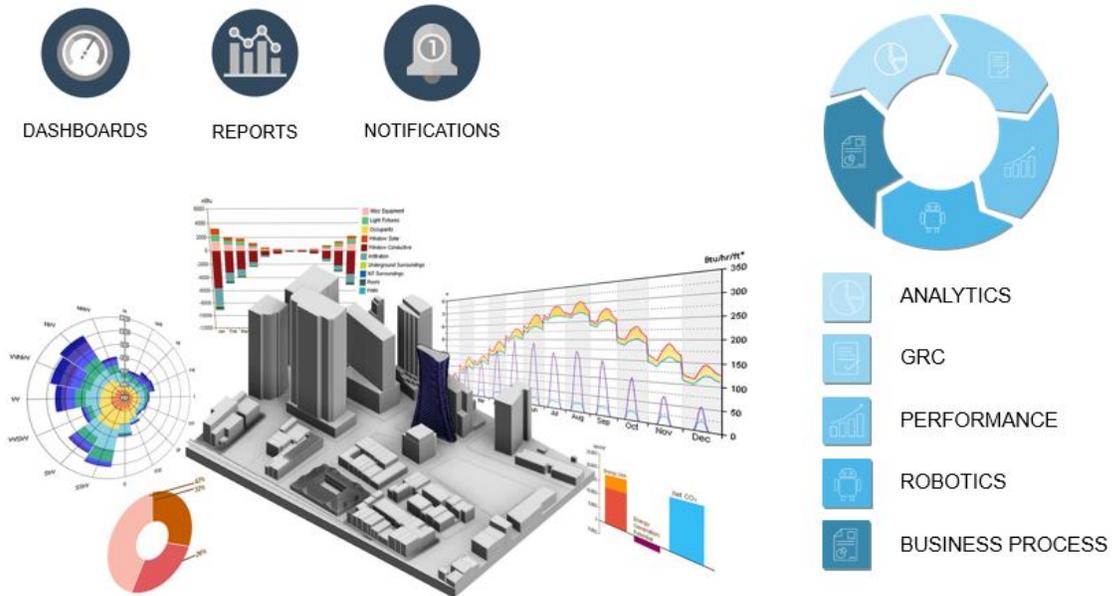

Fig.7 HFDM to real time analytic

Conclusion

The design and engineering world is about to go through a major disruption from single user focused, file based "monolithic", hard to learn, desktop CAD to deeply collaborative, highly tailored, and simple to use "database on the cloud" CAD experiences. These workflows will be enabled by the Forge High Frequency Data Management (HFDM) SDK and Forge App Framework - the tools Autodesk is using to build next generation products such as Quantum and Fusion Web.