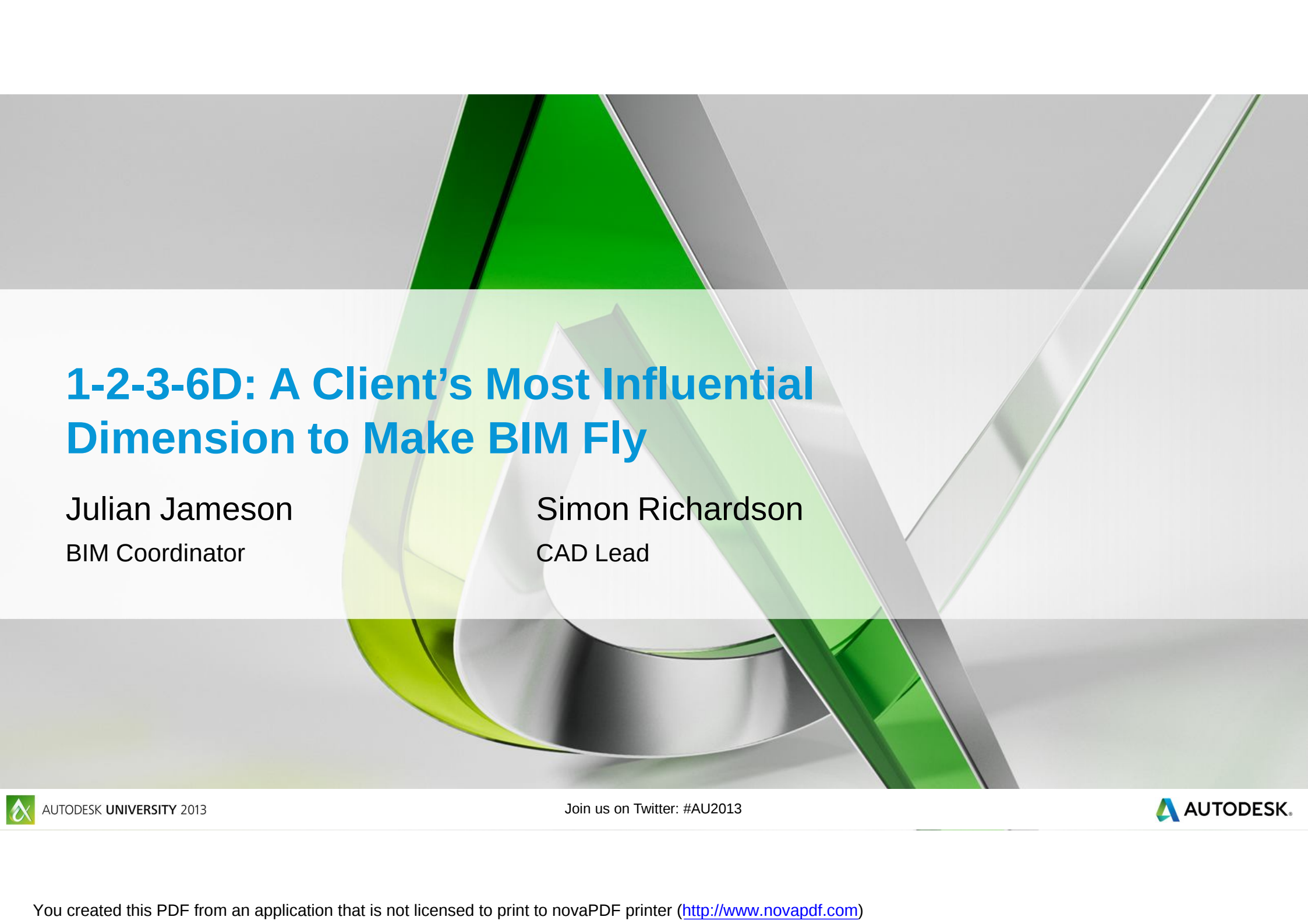




# 1-2-3-6D: A Client's Most Influential Dimension to Make BIM Fly

Julian Jameson  
BIM Coordinator

Simon Richardson  
CAD Lead



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# Julian Jameson – BIM Coordinator



## **BIM Coordinator**

*Graphical Data Team  
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West Sussex, United Kingdom  
RH6 0JW*

Mobile: +(44)7976 901885

Email: [julian.jameson@gatwickairport.com](mailto:julian.jameson@gatwickairport.com)

Julian, a BIM Coordinator who has over 15 years' experience in the AEC industry (10 years as a Public Health Engineer using various CADD software, with more than four years using Autodesk® Revit®) specializing in BIM, Revit and other BIM tools.

He is influential in furthering BIM implementation at Gatwick, engaging various internal stakeholders with the BIM process and seeking to help them understand how they can benefit from encompassing BIM as a way of working.

He is also working with Gatwick's external project architects, engineers & contractors to try and get the best out of BIM.



# Simon Richardson – CAD Lead



## **CAD Lead**

*Graphical Data Team  
Gatwick Airport Ltd  
Jubilee House, Gatwick Airport  
West Sussex, United Kingdom  
RH6 0JW*

Mobile: +(44)7709 300710

Email: [simon.richardson@gatwickairport.com](mailto:simon.richardson@gatwickairport.com)

Simon has worked at Gatwick for over 23 years. He has seen the Airport transition from drawing boards to complex 3d models via Mainframe CAD systems and 2d CAD products. He brings a wealth of knowledge gleaned from various Design, Engineering, Master planning and Asset Management related roles. As the Gatwick Airport CAD Lead, Simon is responsible for the provision and storing of over 60 years worth of As-built design Information.

He is currently heavily involved in Gatwick's BIM transformation strategy, integrating legacy data with the large amount of BIM data being produced as a result of the airports \$1.8 billion investment in new and refurbished facilities. This has involved bringing the existing teams CAD/BIM skills up to speed along with recruiting the right staff to increase Gatwick's knowledge base



# Class summary

Gatwick Airport is the busiest single-runway airport in the world and the second largest in the UK. They are currently partway through a \$1.6-billion capital investment program for both building refurbishments and large infrastructure projects up to 2014. Gatwick recently received accreditation for PAS 55 (asset management) and is using these processes to optimize asset management.

As Gatwick's Building Information Modeling (BIM) maturity increases, they are starting to use models for improved communication and stakeholder engagement. Most significantly, they are exploring the use of COBie to provide an improved hierarchy within CMMS and as a protocol for moving data from BIM to facilities management.

This class provides an overview of tight integration between Autodesk® BIM authoring and review tools and IBM Maximo®. We demonstrate how to integrate asset data with Maximo throughout the life of a project and how the data can be reused to begin future projects



# Key learning objectives

At the end of this class, you will be able to:

- Explain the process of uploading assets from Autodesk® Revit®-based software to Maximo using various methods, such as IFC, COBie, or direct transfer
- Use improved navigation of 3D models directly linked to Maximo to visually identify assets
- Describe business integration opportunities with design information flowing to construction, to facilities management, and back to design
- Explain how a virtual building handover improves business



# Structure of Presentation

|                                                   |
|---------------------------------------------------|
|                                                   |
| A few facts about Gatwick                         |
| Gatwick's 2020 Vision                             |
| BIM lifecycle improvement                         |
| Current BIM to AIM (Asset Information Management) |
| REVIT/Maximo Integration Proof of Concept         |
| BIM-AIM Improvements – Current and Future         |
| Real world issues to consider                     |
| Passenger Simulation Modelling                    |
| So where next ?                                   |
| Lessons learnt – A summary                        |

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# A few facts about Gatwick



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# Gatwick Airport: A few facts

Open 24 hours a day, 365 days a year. Serving 25% of London and South East 34 million people annually utilising Gatwick via 250,000 flights per annum

*70 airlines,  
serving over  
240 destinations*

*4 sq. miles of  
estate*

*227 buildings*

*23,000 staff on  
site*

*Contributes 3  
Billion Dollars to  
the UK economy  
annually*



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# Investing in Gatwick

- \$1.9 billion spend on development to 2014 with a further \$1.5 billion planned up to 2018
- Includes:
  - Terminal developments
    - New Security halls
    - Baggage halls and systems
    - New piers
  - Airfield programme
    - Runway resurfacing
    - Taxiways
  - Operational efficiency
  - Security development programme
  - IT transformation
  - Railway links
  - Capacity expansion



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# Gatwick's 2020 vision



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# BIM Lifecycle Improvement

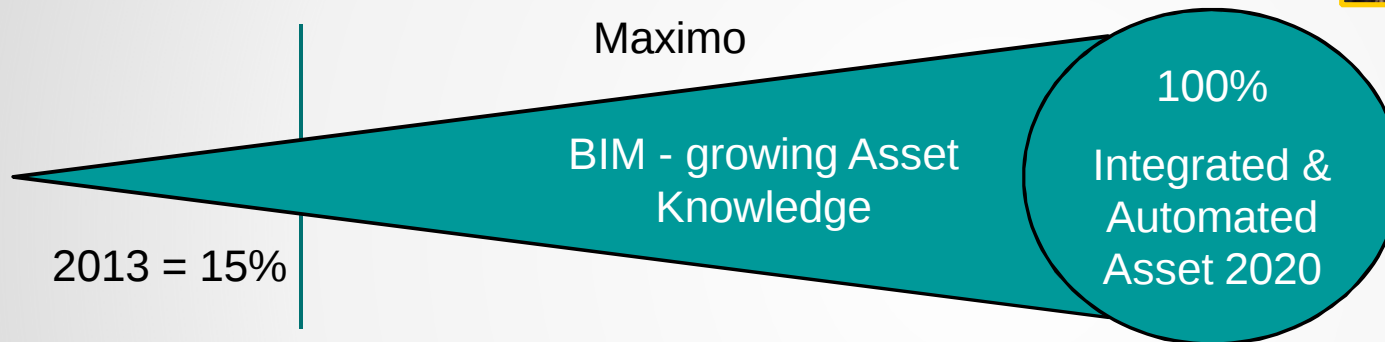


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# Our Aim

Data enhanced by contractors -  
owned by GAL



***Integrated BIM data  
systems leads to:***

***Informed and efficient  
decision making at all levels  
of the business***



Contractor Built



GAL Maintained



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# Why is Gatwick prioritising BIM ?

- OPEX costs - An estimated 2/3rds of a facility's lifecycle
- Gatwick has standards and process autonomy – many arise from BAA and T5 days
- Heavy involvement through overall process so better understanding of BIM implementation
- Industry Standards :- BS1192:2007, PAS1192-2, PAS1192-3, CPIC documents, etc.
- A driver for industry :- UK Government mandate requires *'Government will require fully collaborative 3D BIM (with all project and asset information, documentation and data being electronic) as a minimum by 2016.*
- The UK Government initiative called the “Government Soft Landings” (GSL)
  - Common sense approach to early data sharing and stakeholder/operator engagement.
  - GSL and AIM are powered from BIM.



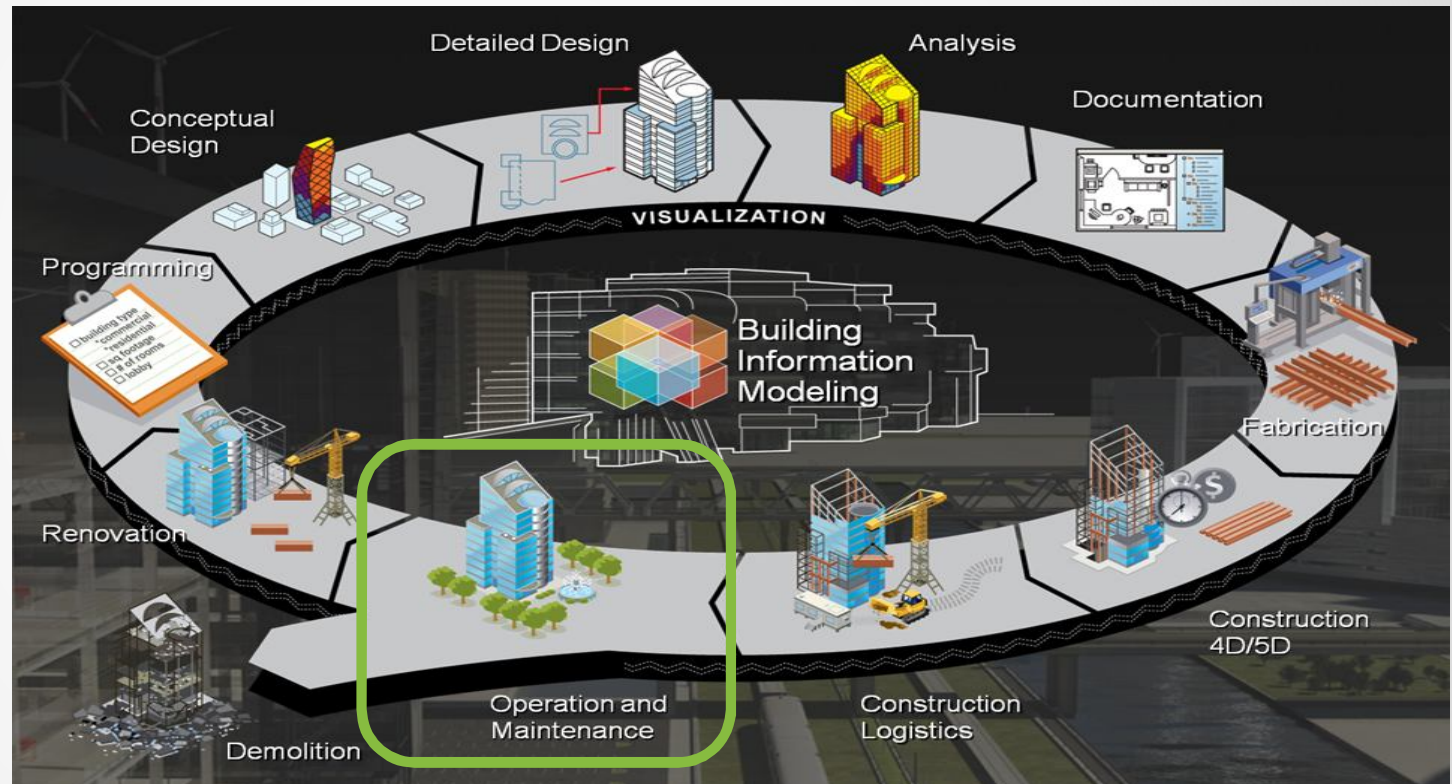
# Targeted Selection

Which segment could provide the best Return On Investment (ROI) ?

- *3D Authoring & Coordination*
- *4D Scheduling*
- *5D Quantities*
- *DfMA*
- *6D Asset Information Modelling (AIM)*

For GAL –

6D- AIM was judged to have the biggest impact & ROI



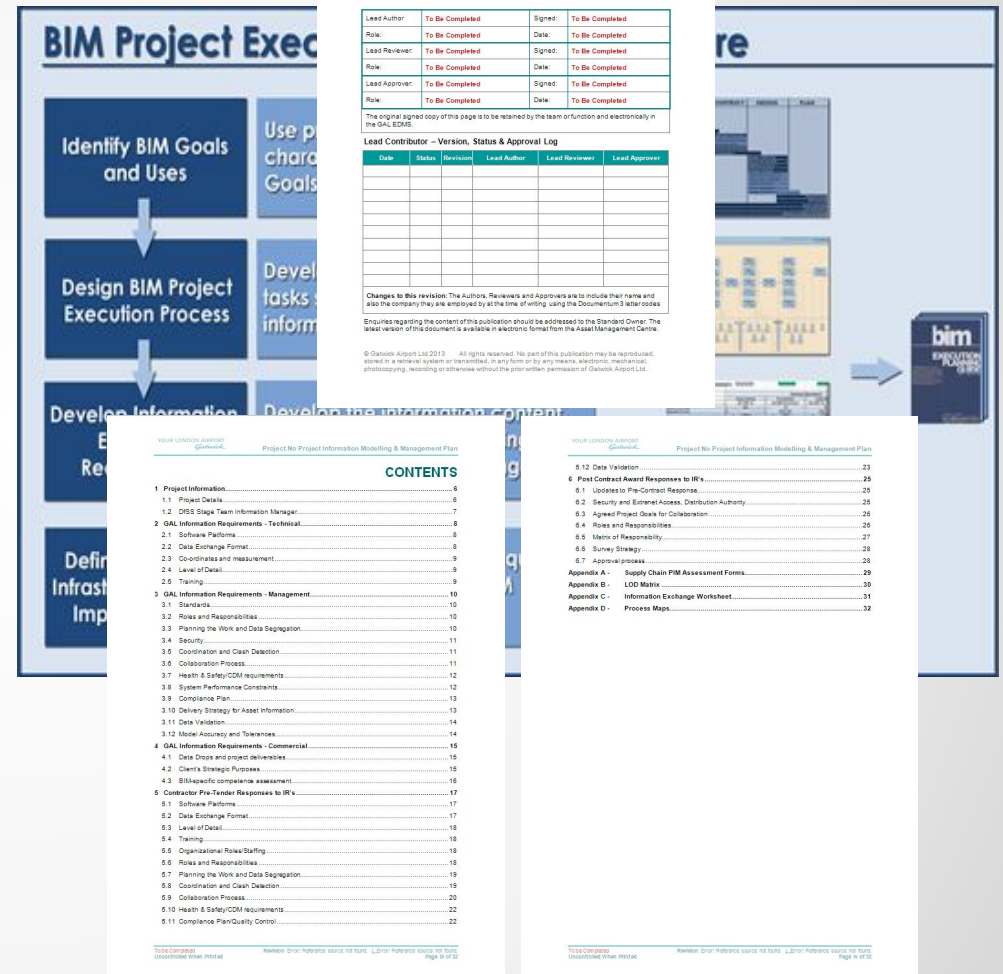
# Begin With the End in Mind

The “6 P’s” acronym is extremely relevant to BIM

- Proper
- Planning
- Prevents
- P (insert as required!)
- Poor
- Performance

Good BIM foundations all start with

- Clearly defined Client Information Requirements for each stage of the project.
- Project BIM Execution Plan and supporting documentation



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# Current BIM to AIM



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# What models are available

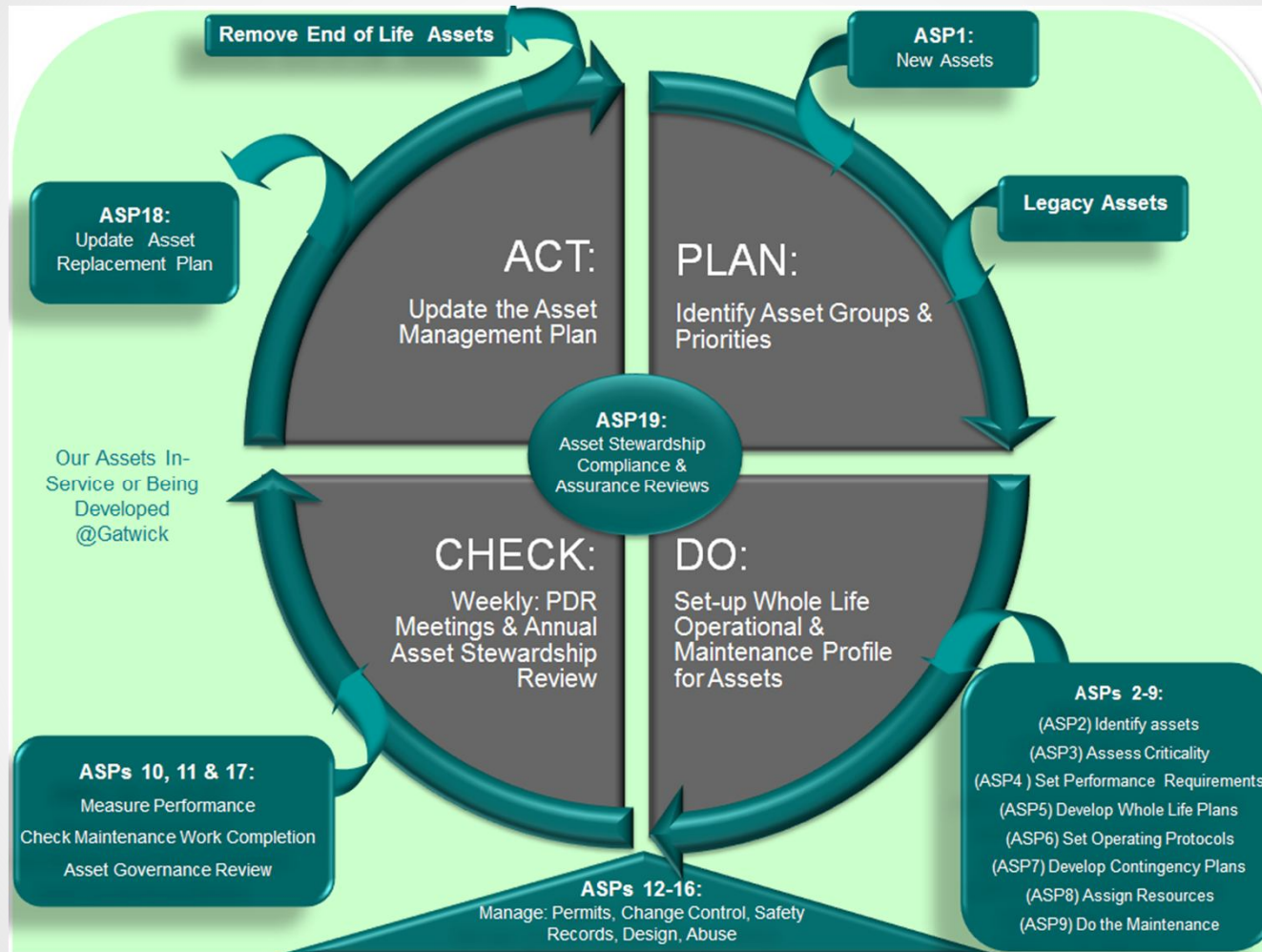
- Currently we have 13 projects worth £300 million delivering models using REVIT
- Every contract let over £1 million must deliver BIM Compliant datasets
- This equates to roughly 190 models spanning the various phases and disciplines
- Our team are currently undertaking a 9 month intensive programme to construct Architectural Revit models of all the Building assets within the estate not covered by projects. Roughly 170 buildings

Emphasis up to now has been on delivering and supporting BIM for construction projects.

There is a move now to broaden this remit and look at the full lifecycle of the facilities and BIM for Asset Management



# Gatwick PAS 55 Process



# Gatwick's current Asset Management setup

Gatwick currently utilising IBM MAXIMO 5.2

| Asset Description | AFC1 Code | AFC2 Code | AFC3 Code | AFC Name                      | AFC COMBO   | General Information | Location      | Location Code | Level | Grid Reference | Project Asset Reference |
|-------------------|-----------|-----------|-----------|-------------------------------|-------------|---------------------|---------------|---------------|-------|----------------|-------------------------|
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A1             | P1                      |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A2             | P2                      |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A3             | P3                      |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A4             | P4                      |
| 9000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A5             | P5                      |
| 9000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A6             | P6                      |
| 9000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A7             | P7                      |
| 9000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A8             | P8                      |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A9             | P9                      |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A10            | P10                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A11            | P11                     |
| 9000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A12            | P12                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A13            | P13                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A14            | P14                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A15            | P15                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A16            | P16                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A17            | P17                     |
| 6000 RC PILE      | 237       | 280       | 000       | Tunnels & SubwaysBored Piles- | 237-280-000 | Columns, Piling ca  | Jubilee House | 20720         | T.o.P | A18            | P18                     |

Asset data provided via excel spread sheets:-

- Comprising of 62 columns
- Filled in by up to 5 separate people

Up to 6 months after handover



# Current AIM Issues

Data not linked directly to models

Limited asset capture

## Hierarchy

- System based hierarchy rather than mix of Location & System

## Locations

- Locations are too large – Technicians have issues locating faults

## Process

- Traditional, labour intensive process completing the Asset Loader
- No data added until end of construction at handover

## Time taken to receive data

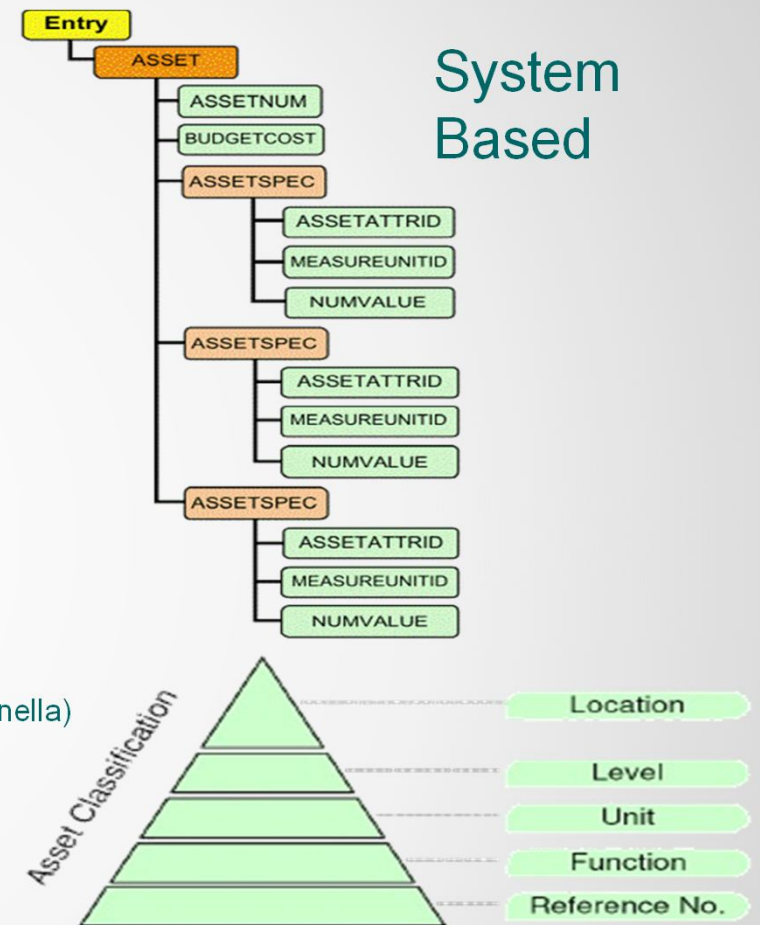
- Up to 8 months before the data is loaded into Maximo
- Mandatory records manually inputted by GAL prior to receiving Project data (i.e. Legionella)

## Time taken to input data

## Work Orders

- 70% work orders raised against incorrect assets

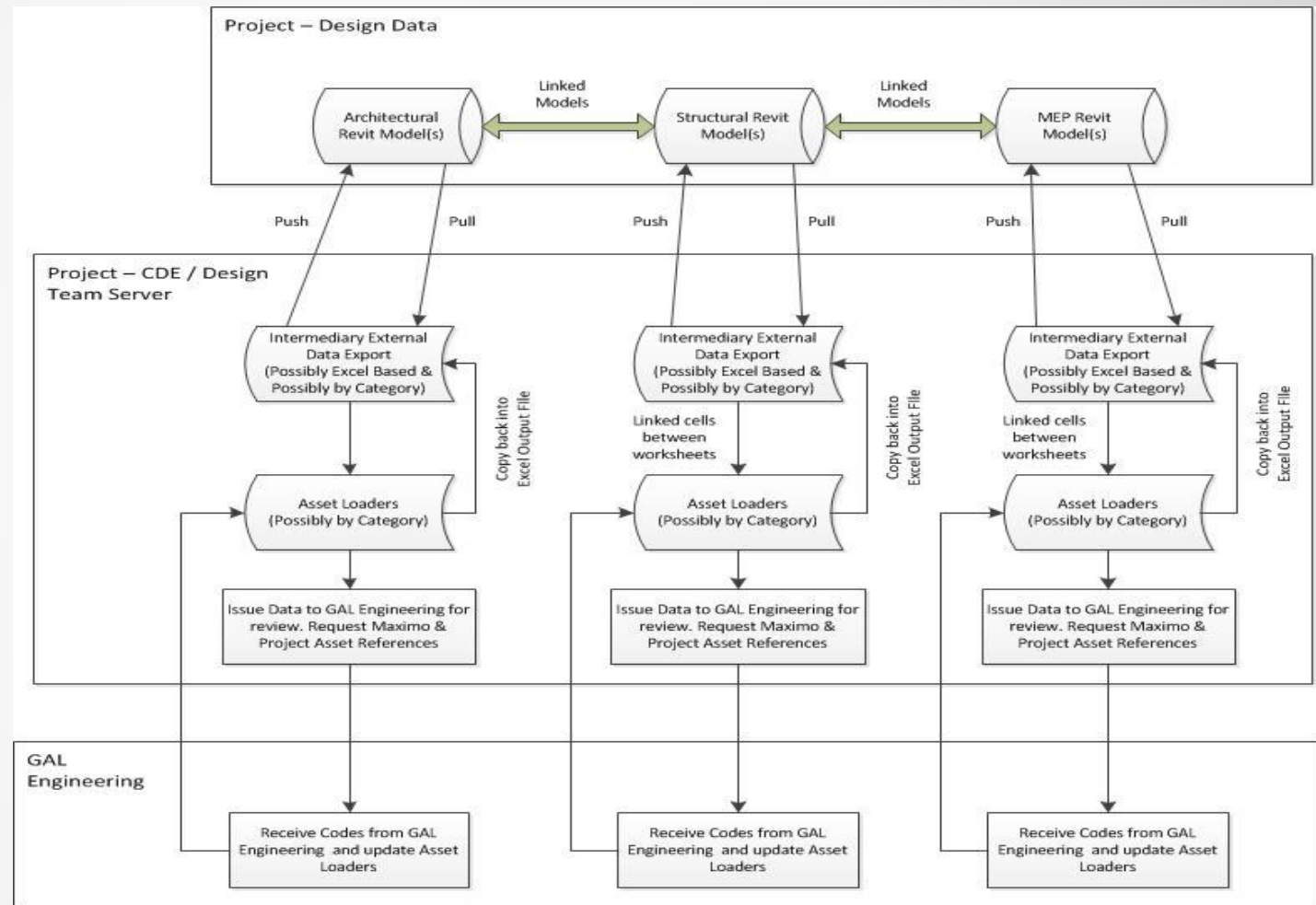
**Need to address these issues to improve synergy with our Asset Stewardship Procedures**



# Gatwick's current Asset Management setup

A simple process improvement:-

- Data exchange for multiple Revit models
- Use of a Revit Add-in to Excel workbook
- Linked cells between Workbook and Asset Loader
- Bi-directional data transfer



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# REVIT/Maximo Integration Proof of Concept



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# Initial Solution and Proof of Concept

IBM approached Gatwick with an initial approach to address some of the issues with the current system and have worked with us for the past year on a proof of concept which tightly integrates Maximo version 7.5 with our BIM Authoring tools (REVIT and Navisworks) and indirectly with Autodesk BIM 360 Field

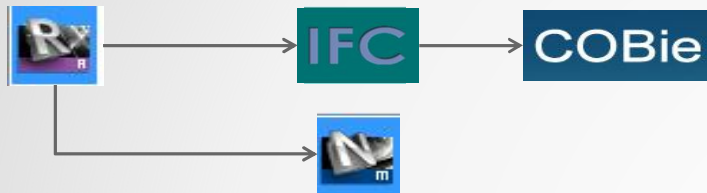


Concept design model

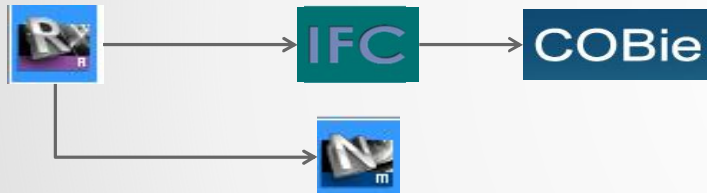


# How it works

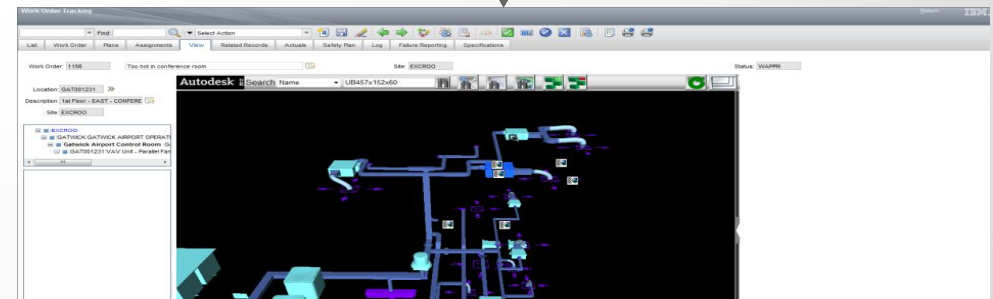
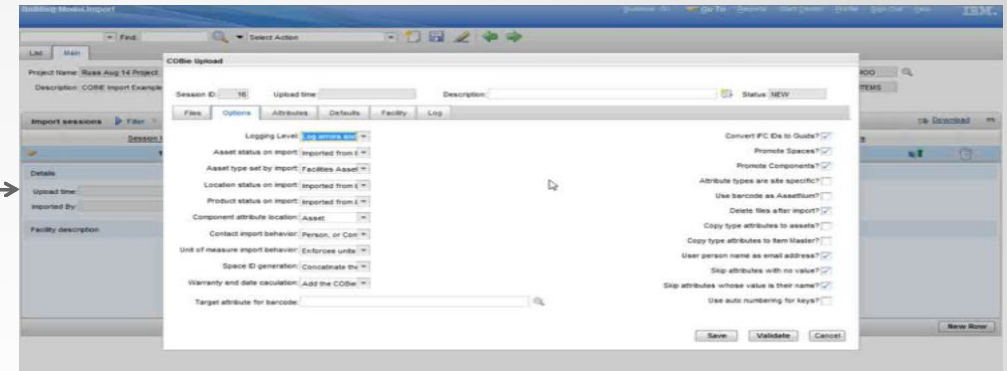
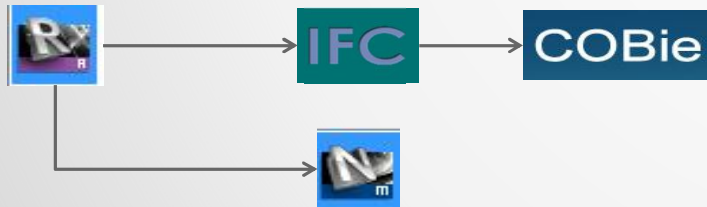
## Architectural Model



## Structural Model



## MEP Model



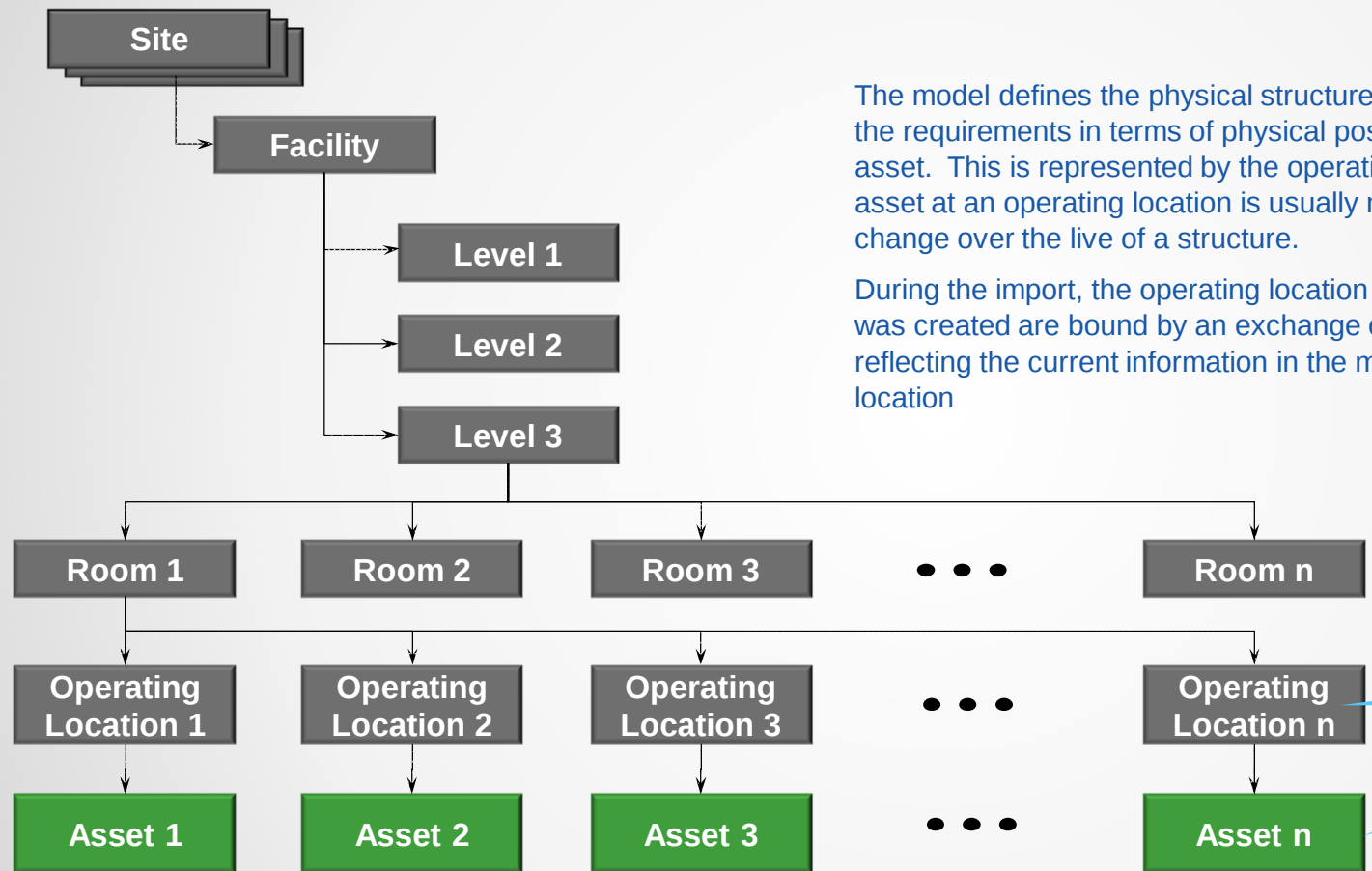
**One off import process**

# How it works in an ideal world

- IFC generated using in-built tool or Autodesk Add-in (recommended)
- IFC can be viewed in many tools
- COBie can be generated using:-
  - Free tools like BimServer.org or xBIM
  - Purchased tools like Solibri Model Checker
- COBie attribute tab is mapped to Maximo specifications
- Create a new project in Maximo
- Select the COBie Excel file to upload and which tabs to import
- Specify required options for data upload and some data validation
- Map the project to the Navisworks model to be used for visualisation (note that the Navisworks file will contain search sets to link elements to data.)
- “Bind” the Navisworks objects to the Maximo data through “field mapping” taking care to include a unique key link (typically Parameter Name=GUID)
- Get managing the assets!!



# Structure of imported BIM data



The model defines the physical structure of the building. Essential it requires the requirements in terms of physical position, space, and specification for an asset. This is represented by the operating location in Maximo. The exact asset at an operating location is usually not know at design time and may change over the live of a structure.

During the import, the operating location and the model element from which it was created are bound by an exchange of identities. In addition an asset reflecting the current information in the models is created at each operating location

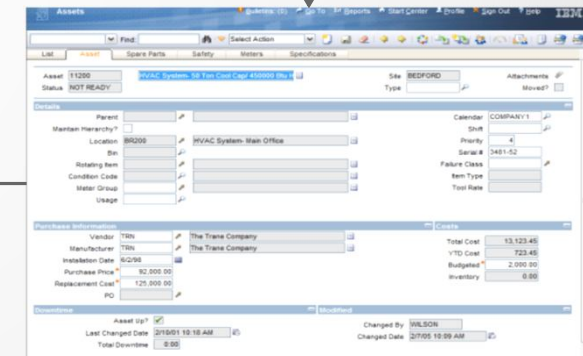
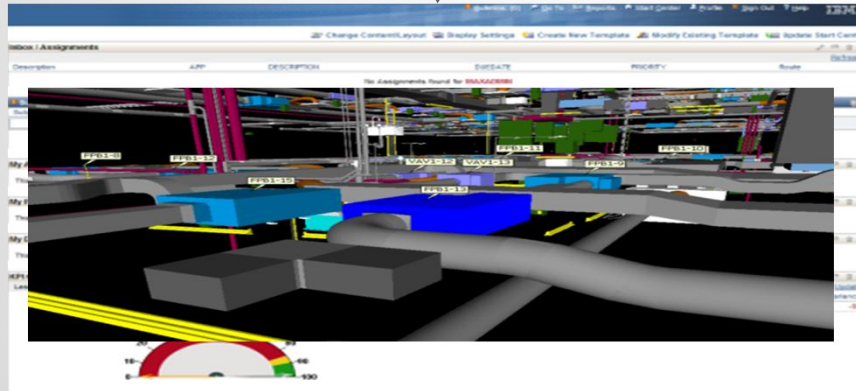
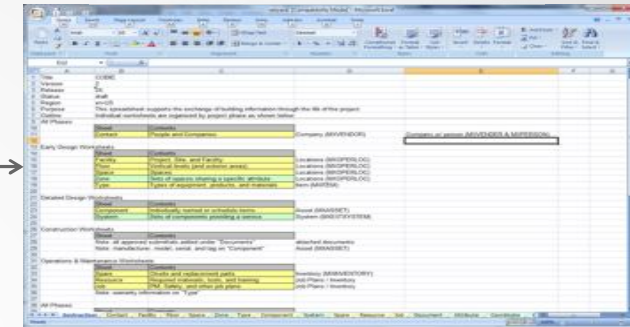
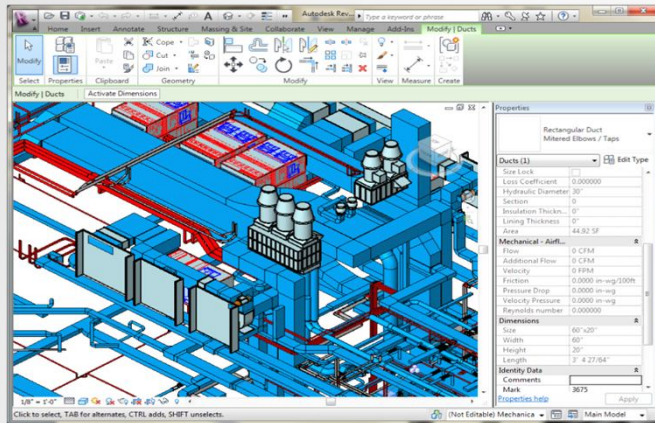
There is a 1-to-1 mapping between operating location and asset

# REVIT/Maximo Integration

COBIE = Construction Operations Building Information Exchange

## COBie Exported from Revit

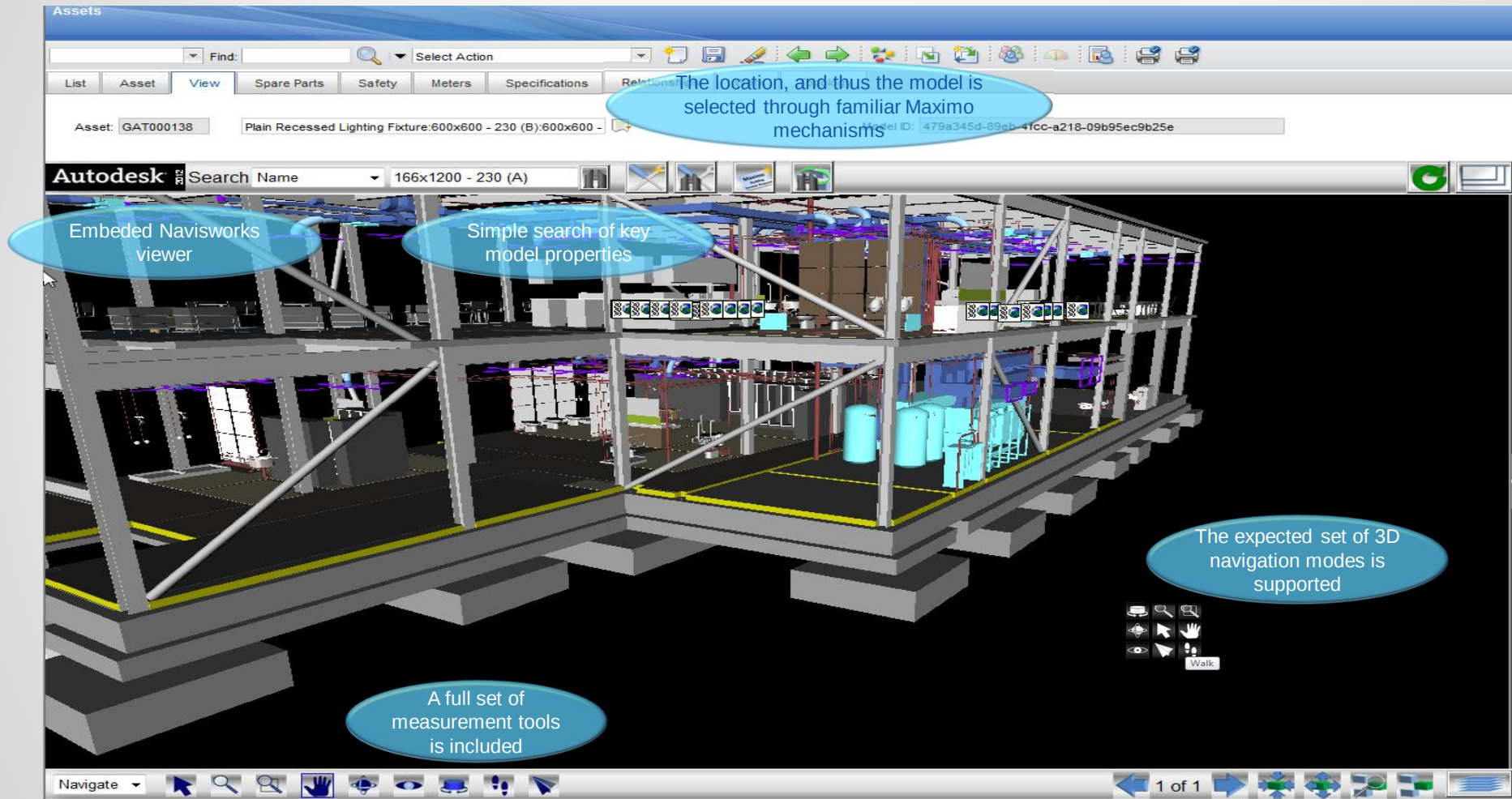
Autodesk  
Revit



Two way, 3D navigation in Maximo  
using Navisworks Manage

COBie Imported into Maximo

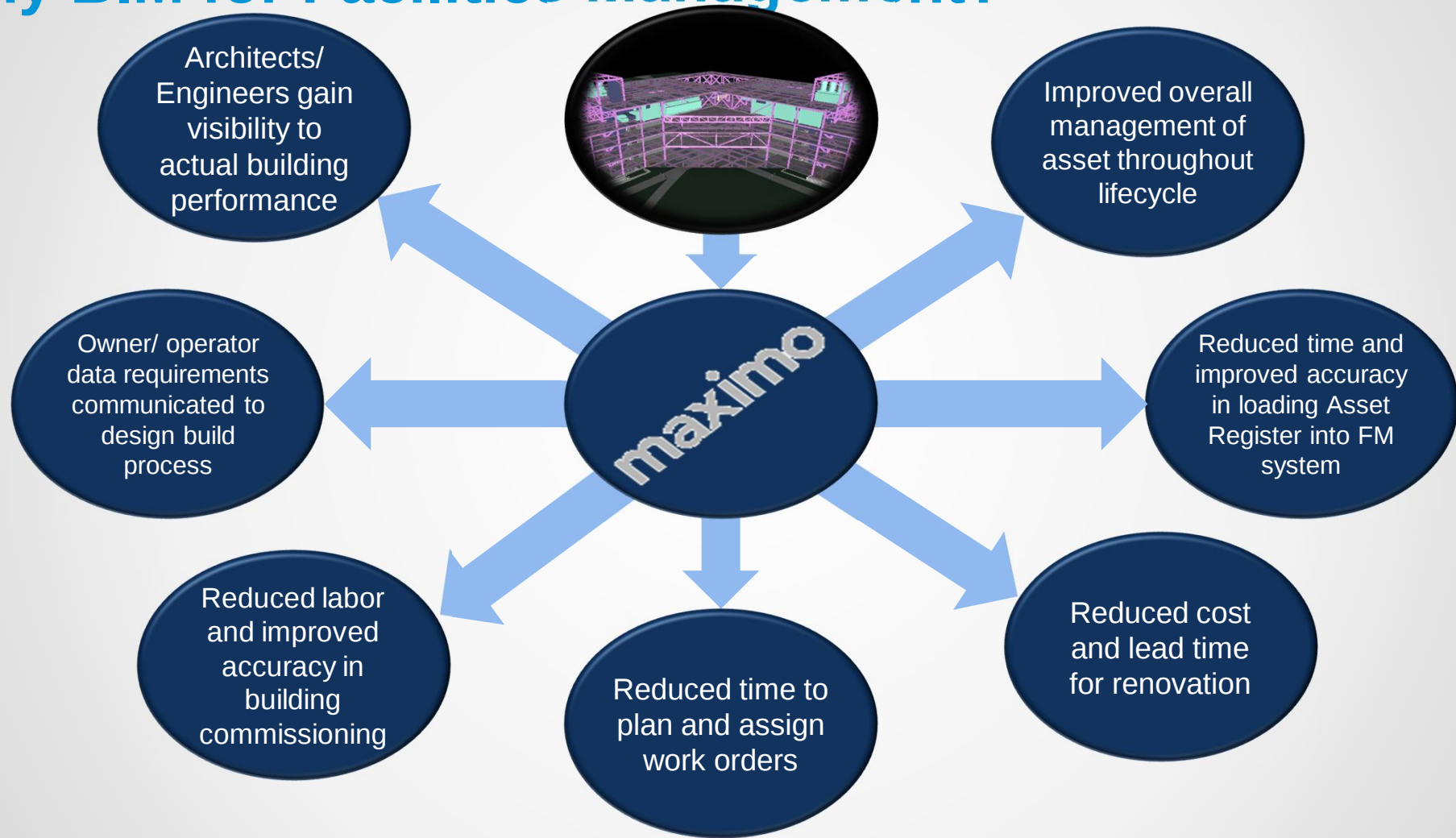
# BIM Visualization in Maximo - Features



# BIM Visualization in Maximo - Demo



# Why BIM for Facilities Management?



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# BIM-AIM Improvements – Current and Future



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# Process Enhancements

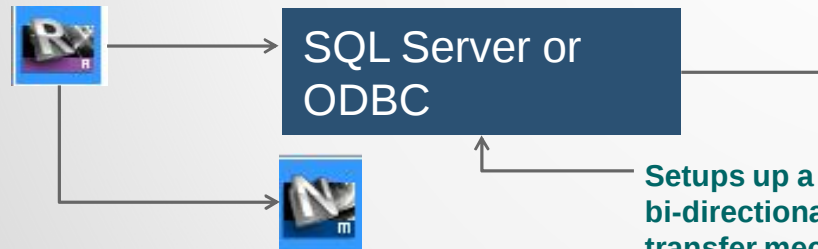
## Current Process Revit Model(s)



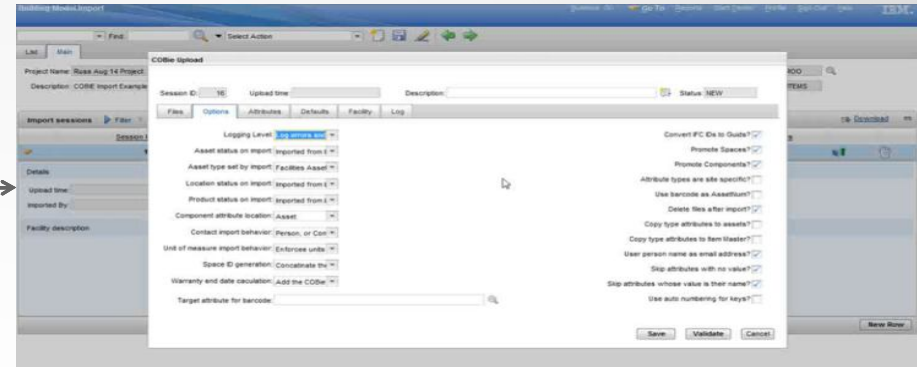
## Possible Process Enhancement Revit Model(s)



## Possible Further Process Enhancement Revit Model(s)



Setups up a potential  
bi-directional data  
transfer mechanism

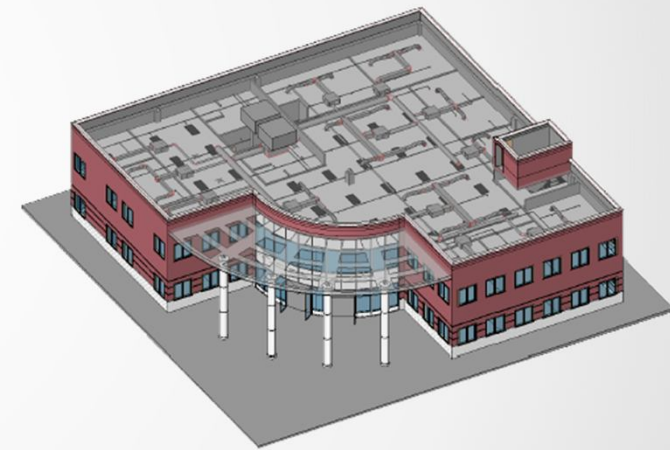


# COBieToolkit

- Developed and provided by Autodesk
- More direct method of creating COBie
- Requires specific COBie parameters to be loaded into the project or families
- Requires user to potentially have greater understanding of COBie than using IFC method
- Possibility for excessive data incorporation in Revit models?? i.e warranties, etc.

COBie for Autodesk® Revit® 2013

Using the COBie Add-in  
Demonstration Application for  
Autodesk Revit 2013



This document helps you get started using the Add-in application for COBie developed for use with Autodesk Revit 2013 software.

Autodesk's building information modeling (BIM) solutions help make facility lifecycle management practices easier, more efficient, and less costly. An Add-in application (small software program) has been developed using the Revit API software development toolkit, for use in Revit Architecture to accommodate project data management for the current COBie standard.



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## Real World Issues to consider



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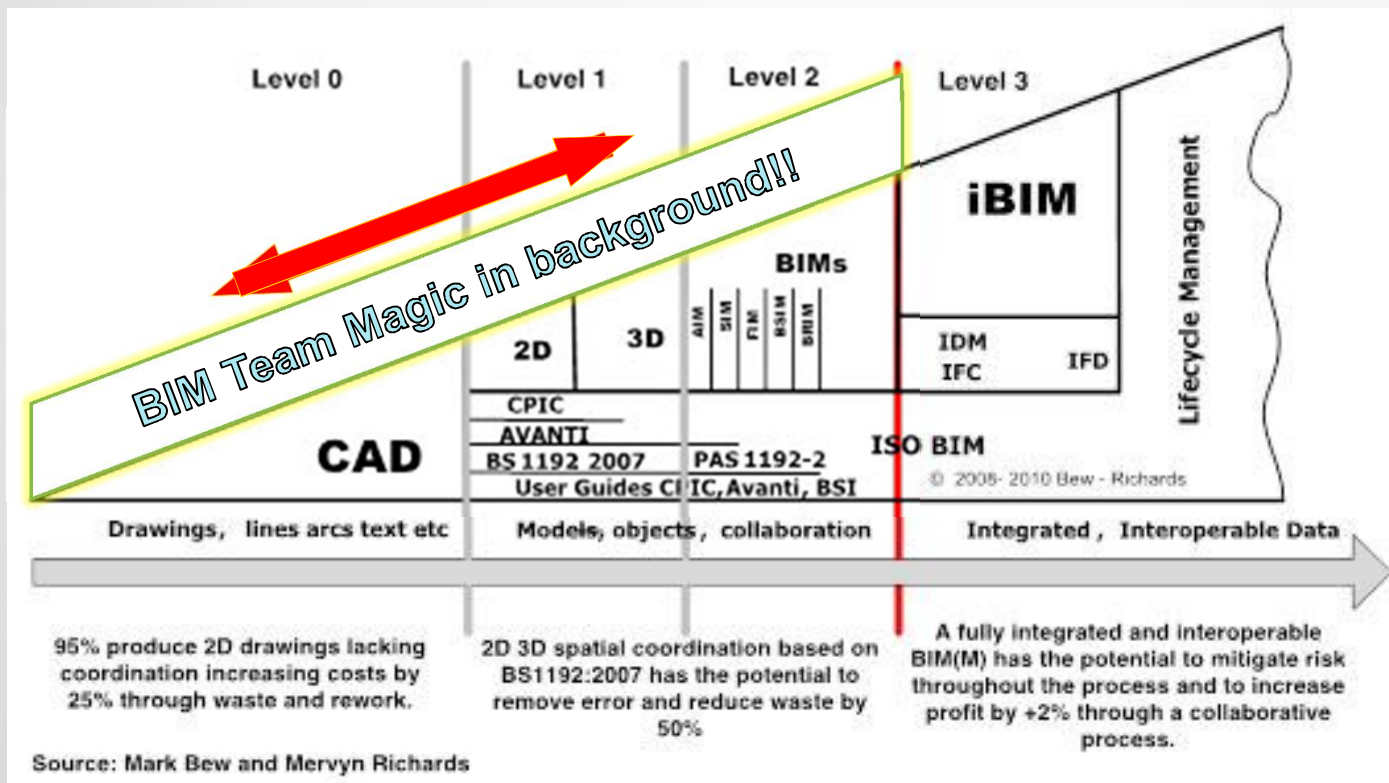
# General BIM/AIM Issues Currently Experienced

- GAL have a specified deliverable format but teams need other tools.
  - Impacts on the supply chain – time/cost/re-work
  - Impacts on GAL – Multiple As-Built data formats/time/re-work
  - Impacts on next project – Possibly wrong format for contractor
- Software skills, costs and technology adoption issues in the Supply Chain
  - As a project progresses – BIM maturity generally decreases
  - Same generally goes for software/technology capability
  - Reluctance to change existing processes – ‘Little BIM’ or less?
  - More to do with Project teams than company strategy?
  - Pockets of Excellence in companies?
- Lack of process and/or tool knowledge/understanding throughout industry



# BIM Estimate by Phase on GAL projects

UK Gov BIM  
Strategy Target  
2016



Only by working with others both internally and externally will we achieve “The Magic”



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# OPEN BIM Network – IFC/COBie Trial

- Part of Building Research Establishment (BRE)
- Merged with buildingSMART
- Not to be confused with any other Open BIM Networks
- Participants - 11 Tier 1 contractors (and us)
- Supported by multiple vendors and companies
- Gatwick provided the Real-life models
- Gatwick set deliverables & classification
- Northumbria University - academic/background stuff
- Purpose was to investigate Open Standards issues
  - (IFC Composition, Federation, COBie creation, Validation and Change Management)
- Presentations link - <http://www.bre.co.uk/page.jsp?id=3223>
- Final report due at end of year



# Trial Aspirations – Evaluation & Education

- Increased knowledge
  - Help us to understand what we need to ask for
  - And what we don't!!
- Validation of data – strategy ideas
  - We need to be able to review and audit the data
  - Prevent “Rubbish In” – “Rubbish Out”
  - What to consider if using IFC for auditing / soft clashes
- Improved CMMS integration and controlled data quality
  - Whether to “IFC - COBie” or just “COBie”
  - More than just “push a button” and accept result?
- Fact not fiction
  - What works and what doesn't



# Useful Outcomes (Some Unexpected)

- COBie by default, provides a Structured data hierarchy
  - COBie hierarchy compliments GAL PAS55 accreditation
- Questions raised about what we want and why
  - Classification – Which one, Why, For What purpose?
  - Do we need anything other than our Asset Function Codes?
  - What's required to get “good data” – validation requirements, standards, etc?
- Behavioural benefits
  - Identify root causes of “problem models”
  - Identify areas where shared learning is required
  - Help us to communicate requirements better
  - Improve our standards to help educate others working for us



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# Passenger Simulation Modelling using Oasys Massmotion



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# Introduction



Oasys approached Gatwick Airport to demonstrate their MassMotion simulation tool for Airport terminals

## Pier 5 Domestic gateroom congestion

As a MassMotion simulation modelling trial, this gateroom chosen for its known and expected future congestion problems.

BIM information on gate room dimensions were provided in order to set up the model.

Other assumptions provided by Gatwick:

- Forecast busy day linked schedule, covering all NT Domestic/CTA flights
- Gate reporting profiles from survey data
- Domestic facial reconciliation process time, boarding start time, boarding rate, and disembarkation rates
- Routes taken by arriving passengers, and queue direction for boarding passengers



# MassMotion process

Oasys  
YOUR IDEAS BROUGHT TO LIFE



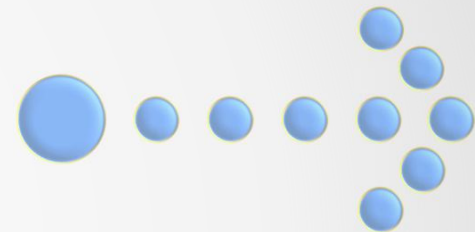
Revit - IFC



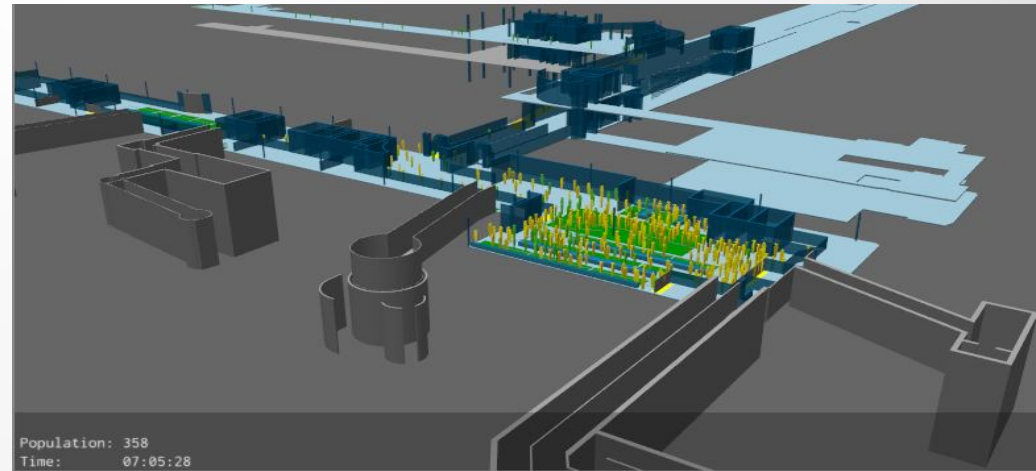
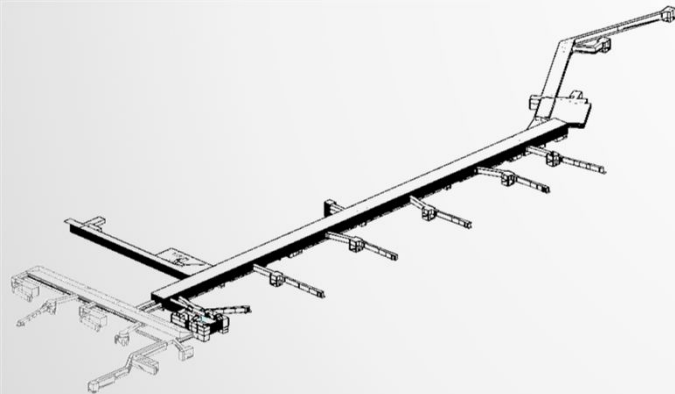
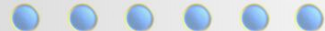
MassMotion  
workbench



MassMotion  
simulation &  
analysis



Timetables

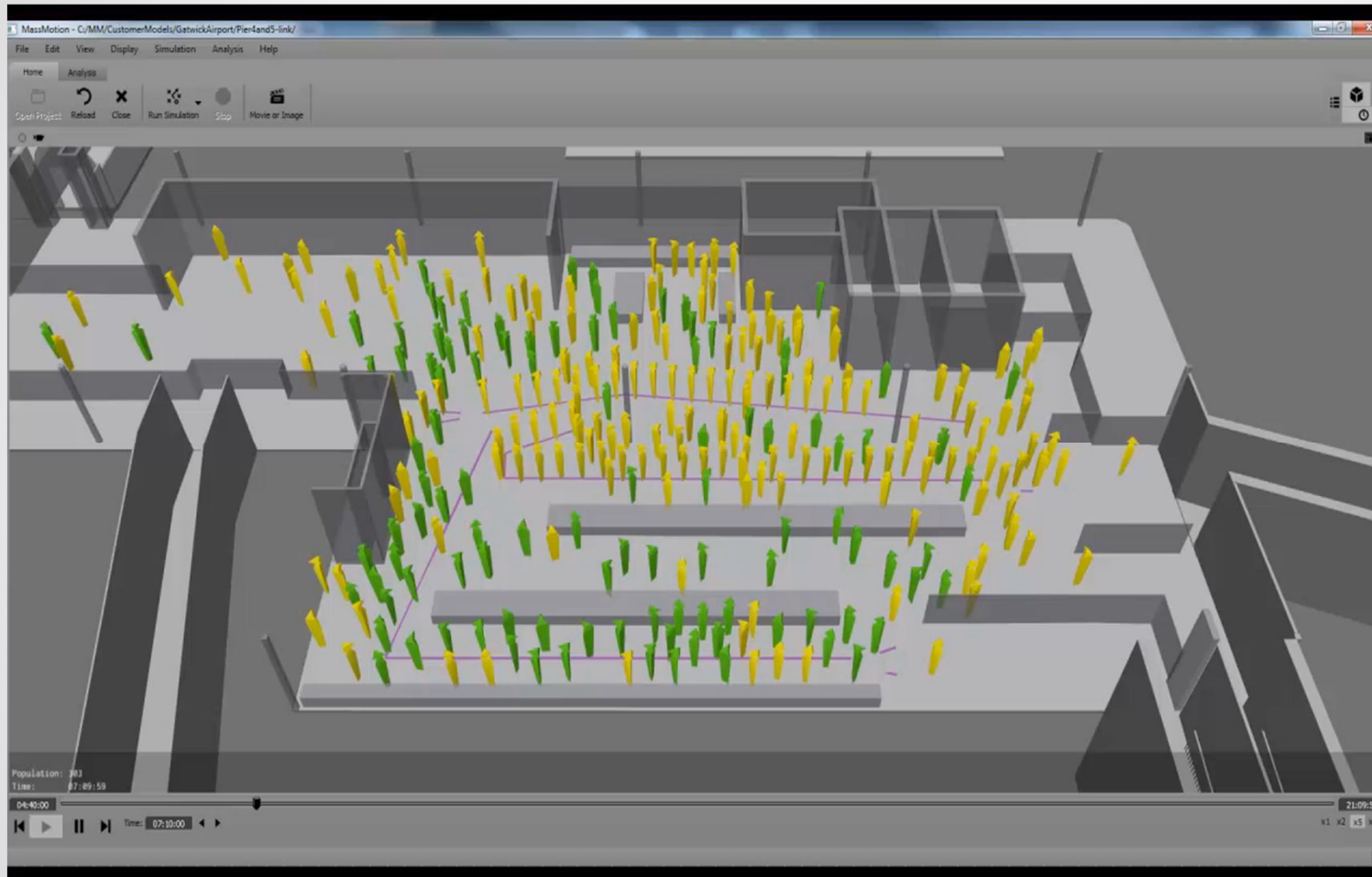


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# Mass motion Demo

*Oasys*  
YOUR IDEAS BROUGHT TO LIFE

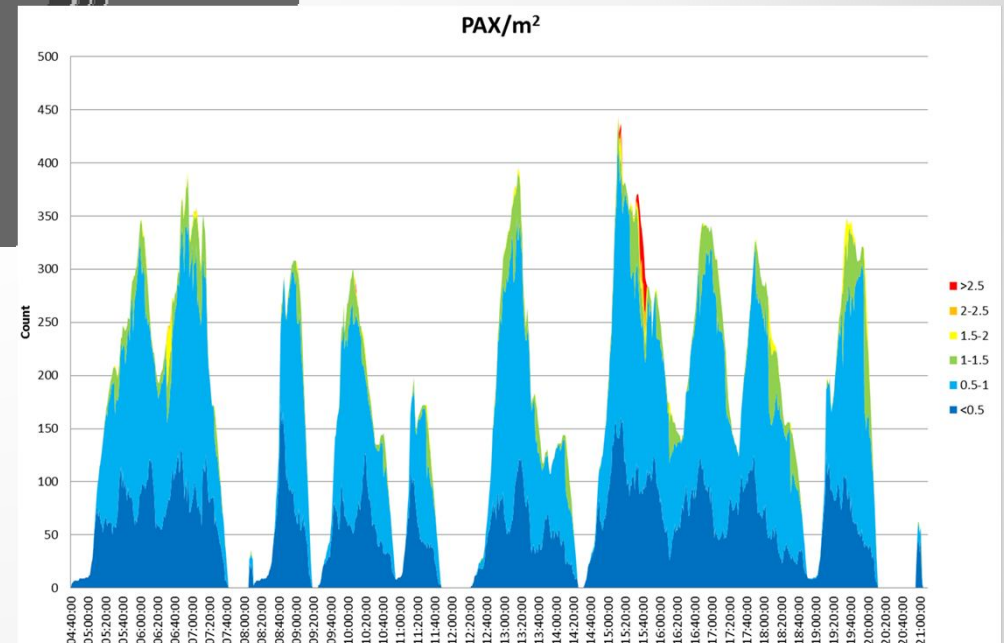
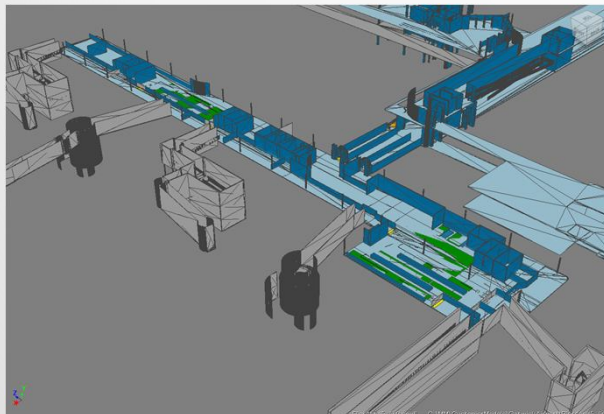
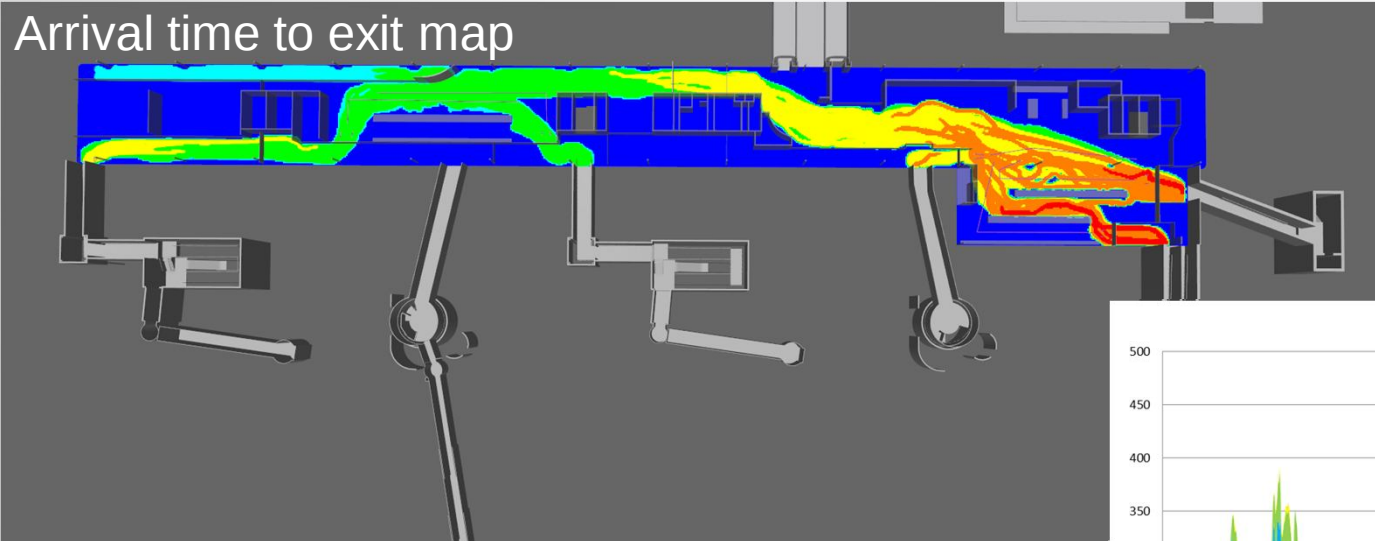


# Mass Motion Outputs

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Arrival time to exit map



Passenger Density Graph

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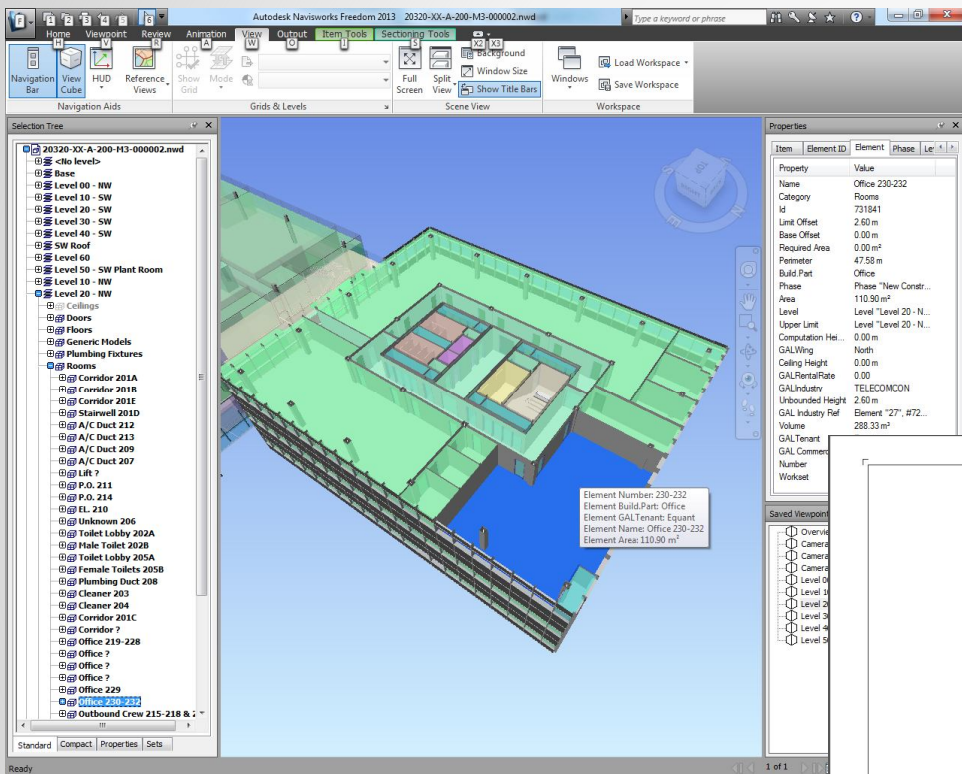
# Commercial BIM Integration



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# Commercial BIM Integration



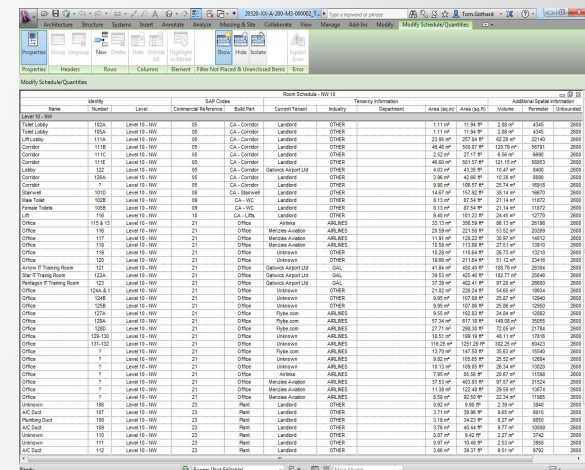
### Navisworks view with room objects (showing quick properties)



## Tenancy Plan



## Room type plan



## Revit Room Schedule

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So where next ?



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# Cloud based BIM Tools

We are investing in other mobile cloud technology to assist out teams.

These include:-



CDM-C  
EHS  
Field Engineers  
GDT – surveys  
Reporting tool



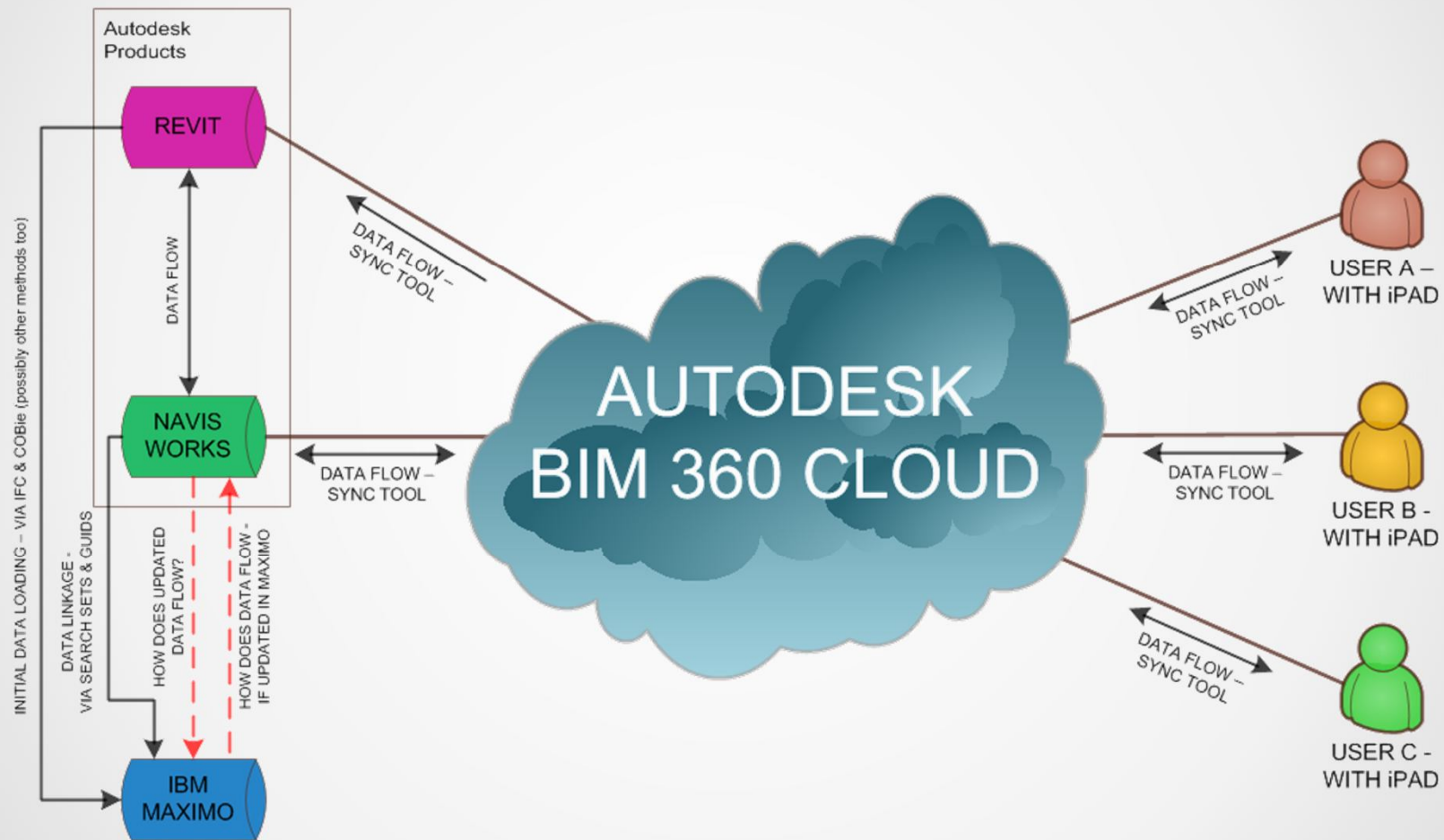
Project Teams  
Surveys  
Design Reviews



Gatwick Teams use it  
to view drawings in  
the field  
(e.g Fire service)



# BIM 360 Field & Maximo Interface Possibilities



# Mobile Working

Tablet screen showing a CAD drawing management interface. The top bar displays 'GAL\_Legacy on Pc3326' and 'Simon Richardson'. The main content area shows a drawing titled '3DR\_20206-10-GA-263-000005\_VABp.DWF' with a 'Revision' section. Below this is a 'Location' section with fields for Site, Airport, Location, Building No, and Building Name. The 'Drawing No' section includes 'Drawing No.' and 'Rev No.'. The 'Drawing Title Information' section has fields for Title 1, Title 2, Title 3, Title 4, and Title Sheet. The 'Originator' section includes 'Originator', 'Originator Initials', 'Added By', 'Date', 'Drawn By', 'Date', 'Checked By', 'Date', and 'Approved By'.

Tablet screen showing a 'Document Menu' with options: 'View Document', 'Open', 'Email', 'Take Off-Line', 'Upload to Buzzsaw', 'Revisions', '3DR\_20206-10-GA-263-000005\_VA...', 'Incoming References', 'No Incoming References Exist', 'Outgoing References', and 'No Outgoing References Exist'.



We will be looking to make our CAD Data Mobile using a bespoke App written by Excitech to connect to our Drawing management system (Bluecielo Meridian)

AND Integrate it with Maximo

MaximoWO interface showing a 'Work List' with 'Work List Items (6)' and a 'Refreshed' timestamp. It includes a 'Create New' section with buttons for 'WO', 'SR', 'Incident', 'Problem', 'Change', and 'Release'. The bottom shows 'Modified Worklist Records: 2'.

IBM Maximo AM interface showing a list of assets with columns for Asset, Description, and Location. The list includes items like 'Printer - Color', 'AEM - INVCOST filed issue CENT...', 'ASSET1', 'AEM Asset 4', 'AEM Asset 4', 'AEM asset 02', and 'Asset AEM 01'.

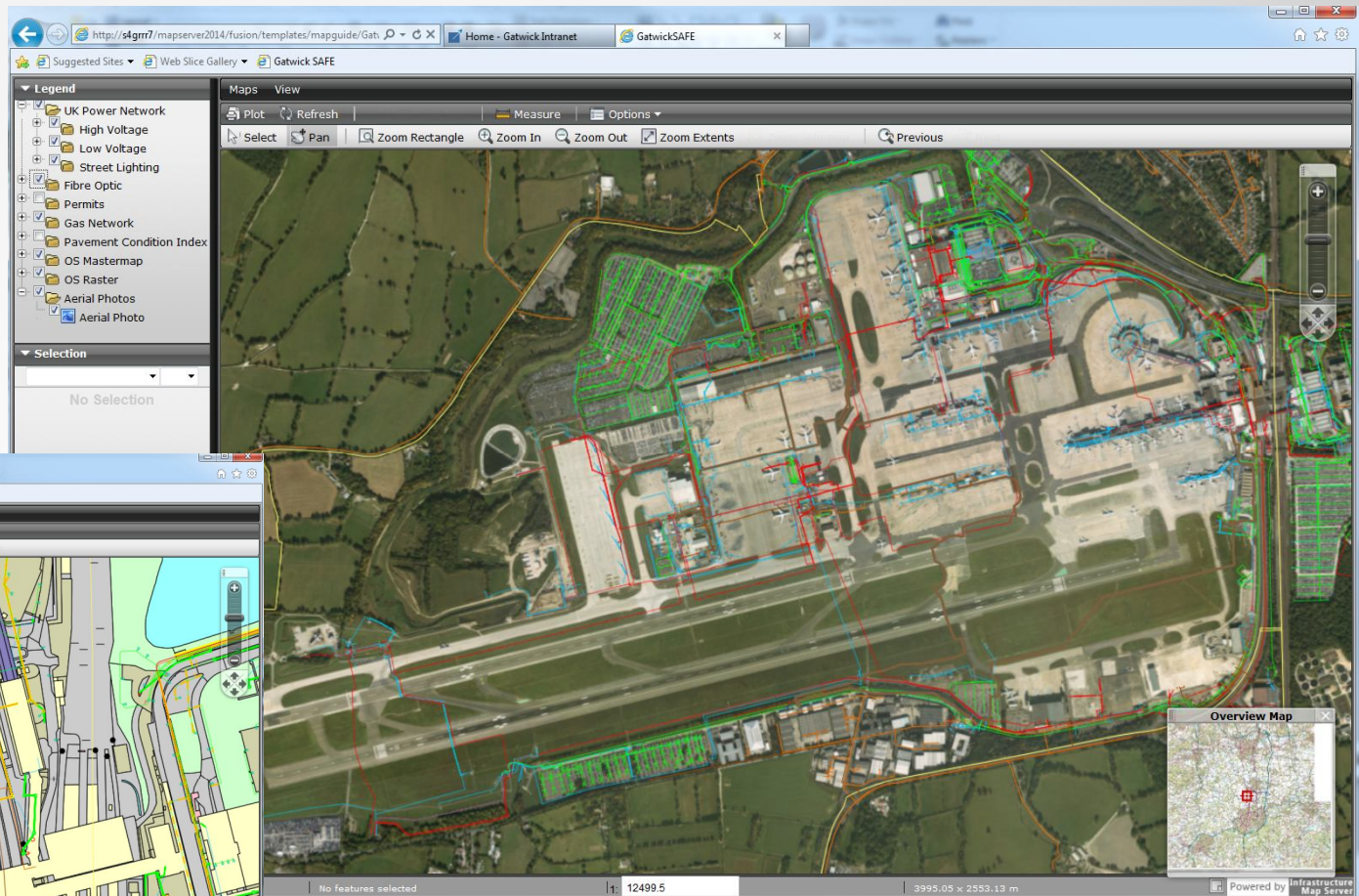
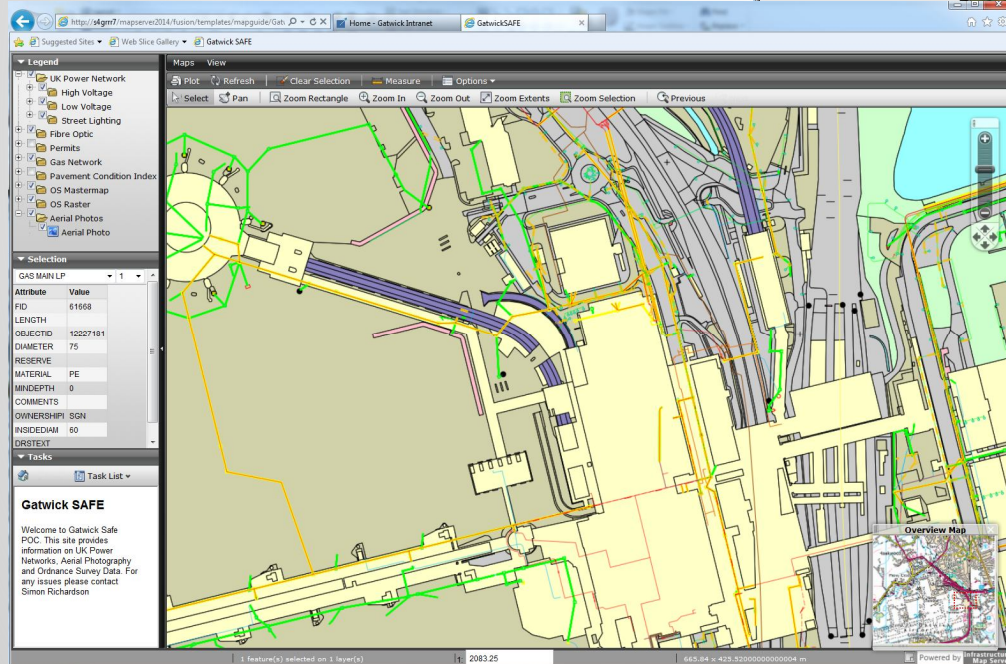
Maximo interface showing details for a specific asset, including 'Asset Specifications', 'Asset Meters', and 'Scan Parts'.

Mobile app interface showing a 'Work Status' screen with a 'Find' search bar, 'Work Orders' list, and 'Work Order' details for 'Air Filter - Check-out' and 'Fire Door Cable Broken'.

# Gatwick SAFE

Service Avoidance Field Environment

- Buried Services GIS Database
- Under Development to promote Service avoidance Culture
- Constructed using AutoCAD Map 3D and Infrastructure Map Server for distributed version



Looking to connect SAFE to CMMS system via some to be determined “middleware”

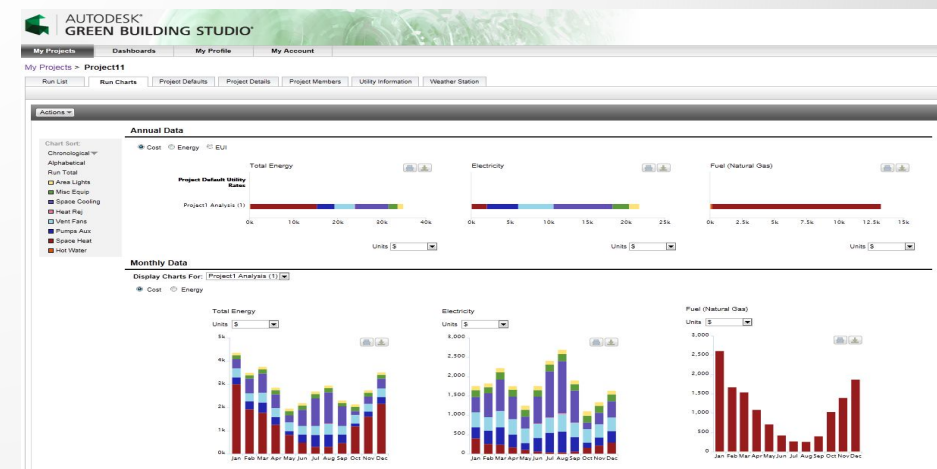
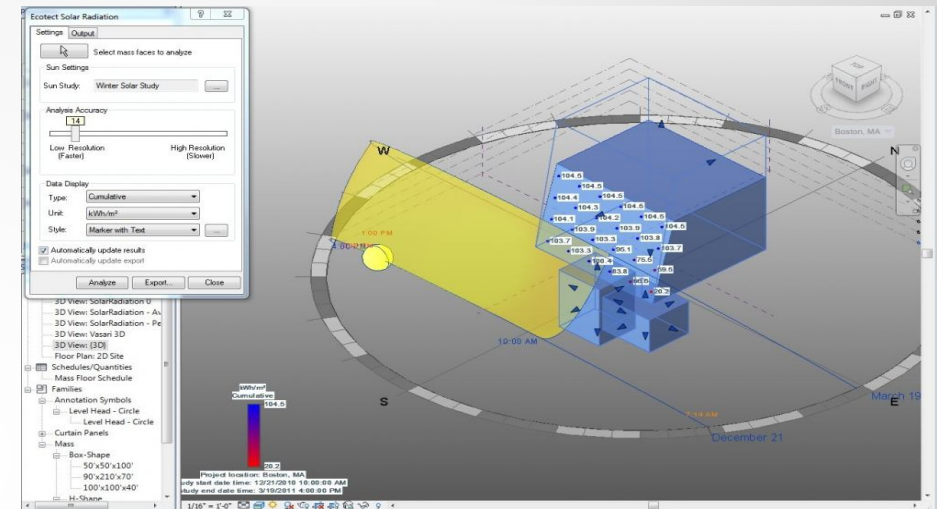
# Conceptual Energy Analysis / Solar Radiation Analysis

Typical tools :-

- Revit
- Vasari
- Green Building Studio

Typical Applications/Benefits:-

- Perform energy analysis checks on design internally.
- Conceptual energy analysis during early project stages.
- Solar radiation studies to determine optimum orientations, shading, etc.



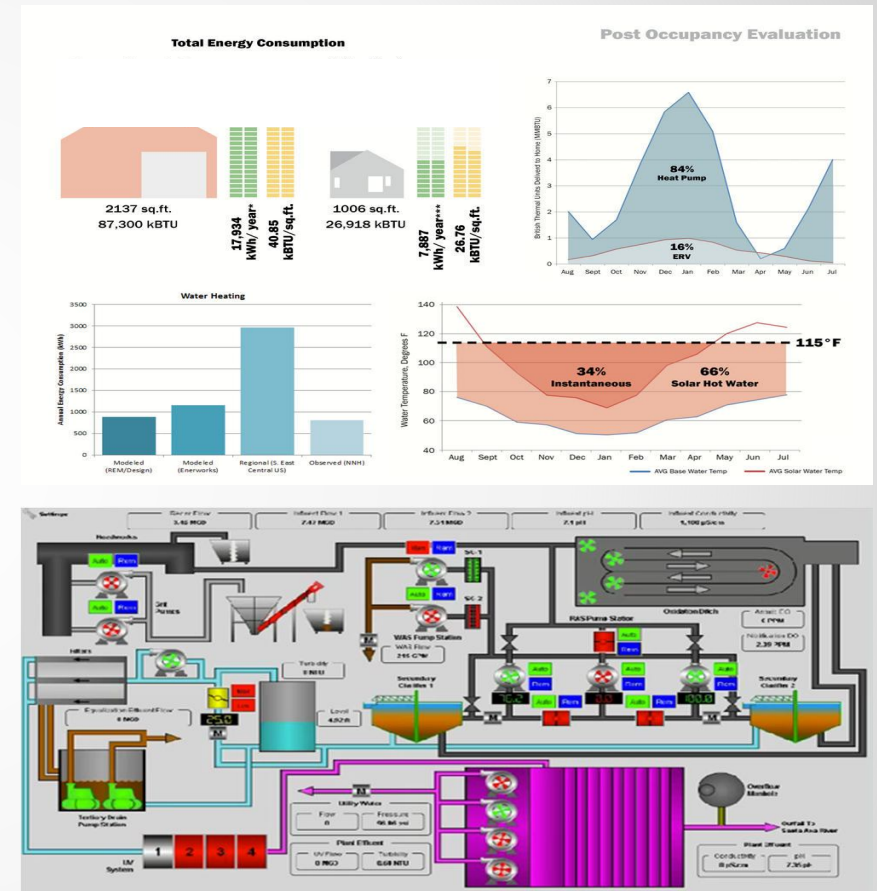
# Post Occupancy Evaluation & Monitoring

The British Council for Offices summarises that:-

*A POE provides feedback of how successful the workplace is in supporting the occupying organisation and individual end-user requirements*

For the BIM cycle to be complete, lessons need to be learnt and fed back into the process.

Using analytics and monitoring of key equipment/areas, the results could help drive down energy usage and waste whilst improving the design, operation and maintenance of our assets.



# Infraworks

- Using Infraworks to support our 2<sup>nd</sup> Runway Master planning exercise
- Will be a useful tool for stakeholder engagement and optioneering

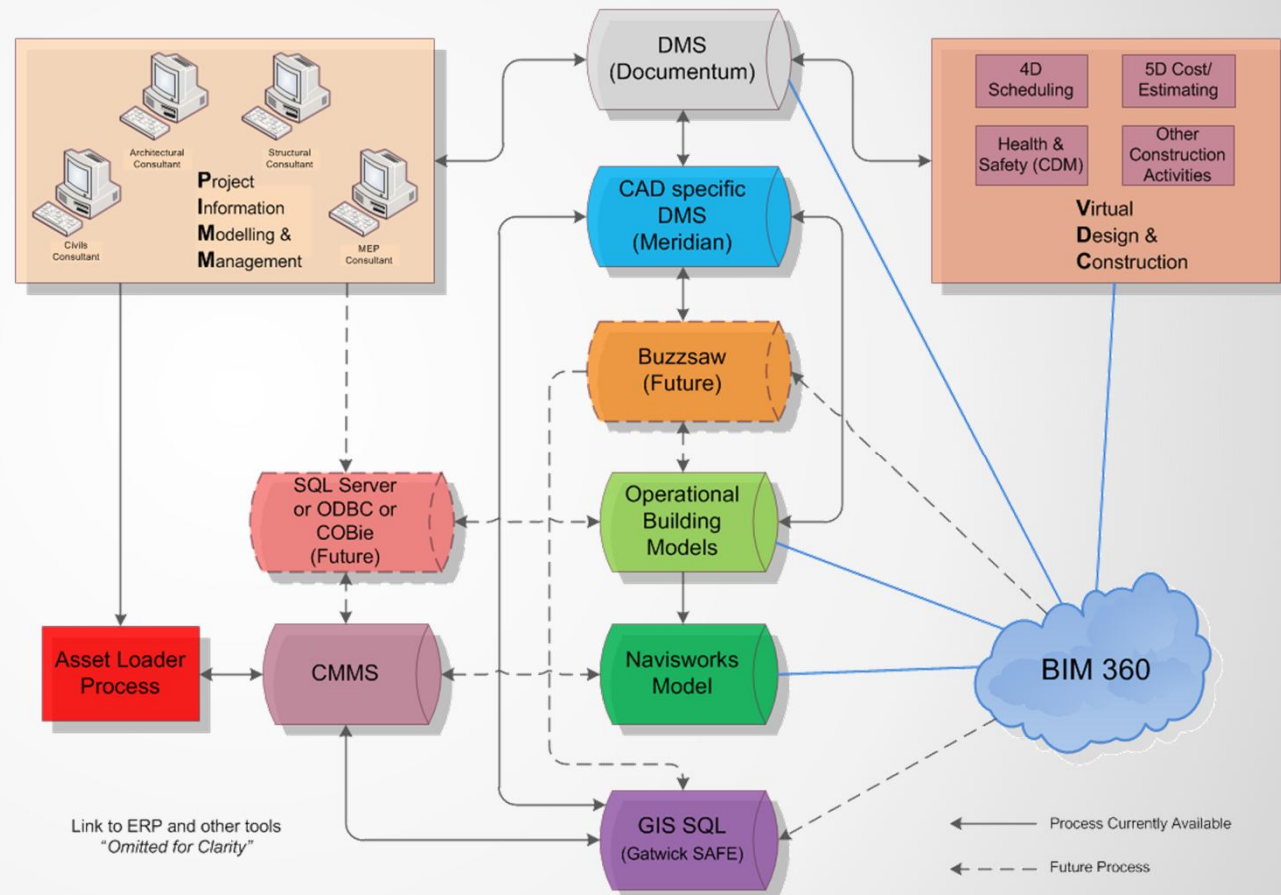


# Lessons Learnt – A summary



# Systems Architecture linking AIM data and tools

- Initial attempt at linking GAL BIM tools & systems
- Connections focus on post-Construction data
- Future opportunities require further investigation once primary connections have settled
- Other data connections used during design and construction are not covered to avoid confusion
- Business data connections are also not covered



# BIMplementation Advice – Brief Summary

- No such thing as a “BIM Button” for **any** part of the process
- Planning is imperative – Micro (Project) & Macro (Business)
- BIM Skills – both process and software. Also Internal & External
- Clear communication of Information requirements – Int & Ext
- Clear understanding of Stakeholder requirements - Int & Ext
- Good documentation and processes (QMS) - essential
- Don't sit back and rely on industry to deliver what **you want**
- IT departments – work hard to get them on board
  - Define infrastructure requirements
  - Understanding of Construction and its assets
- Adopting Industry BIM Mandates – “What's in it for us as a client?”
- Interoperability – how much and why?
- Data Validation / Auditing ability – Absolutely essential
- There are and will be more – these are just some key ones



# We would like to thank ....

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Thanks for attending today -  
Any questions ?



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