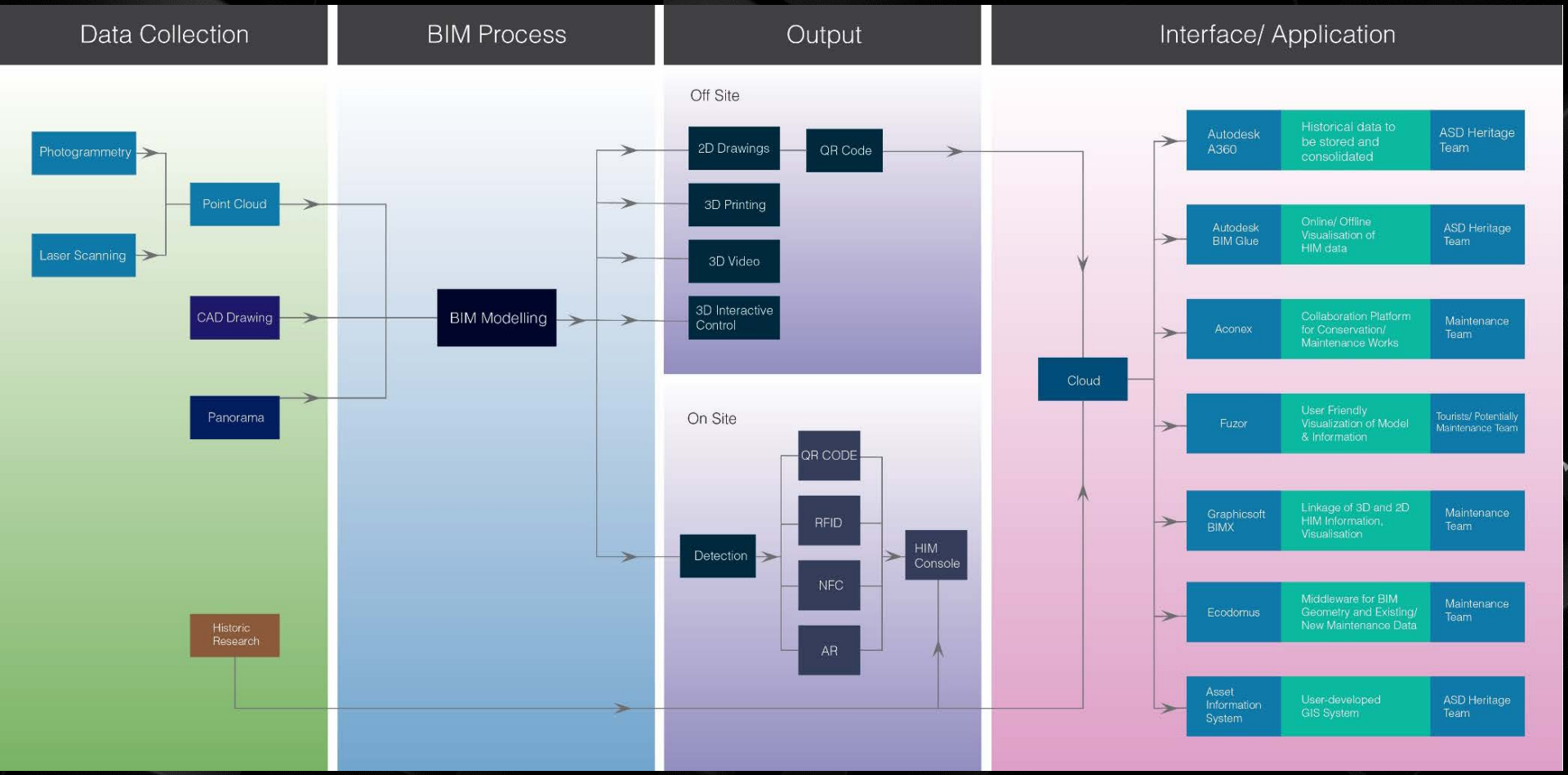
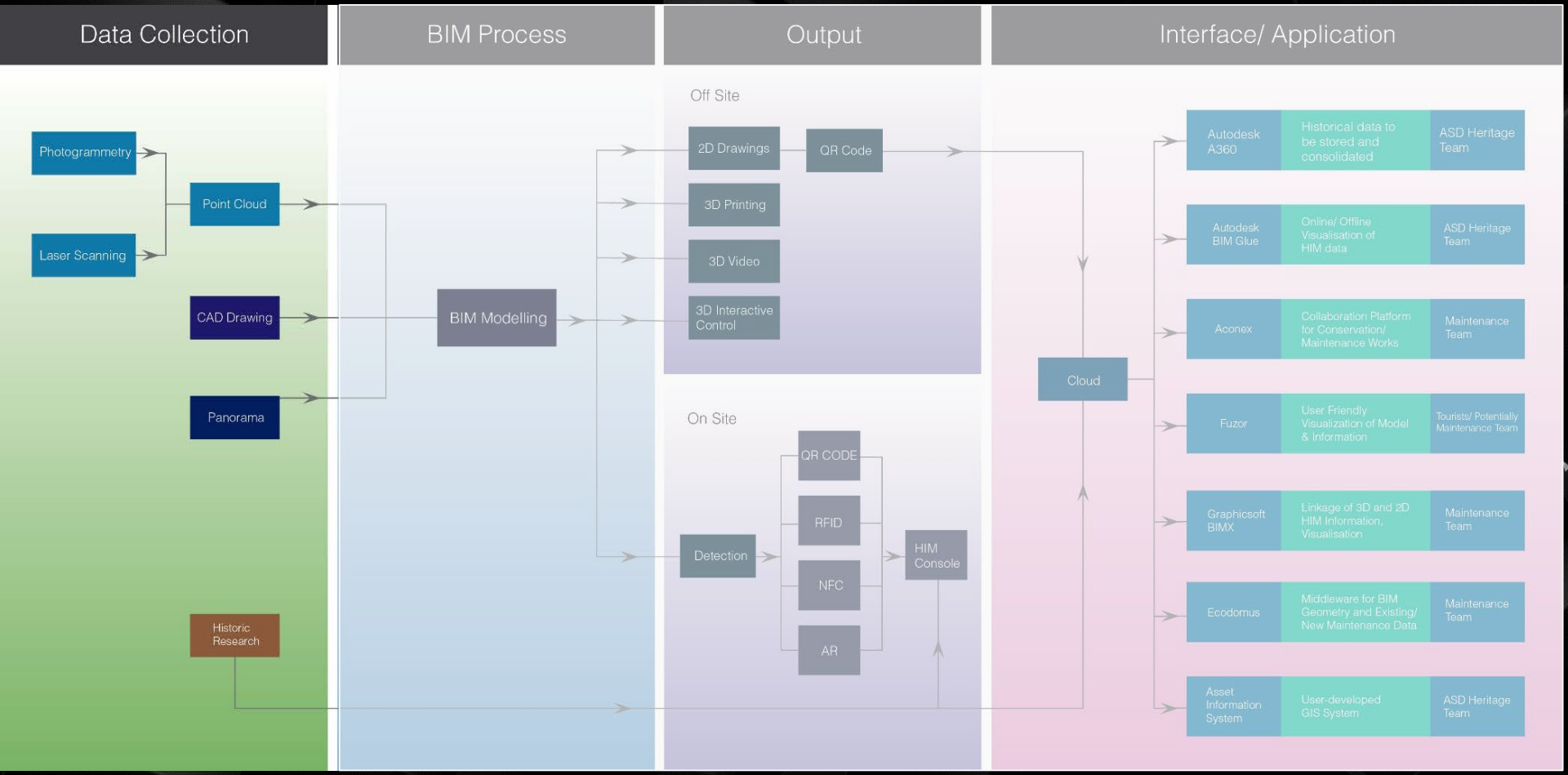
Prepare BIM for FM Implementation

David Fung
HKIA Registered Architect
HKIBIM Board Member BIM specialist
HKUSPACE, CHUHAI COLLEGE,
Department of Architecture, Associate Professor

Introduction


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team

Data Collection

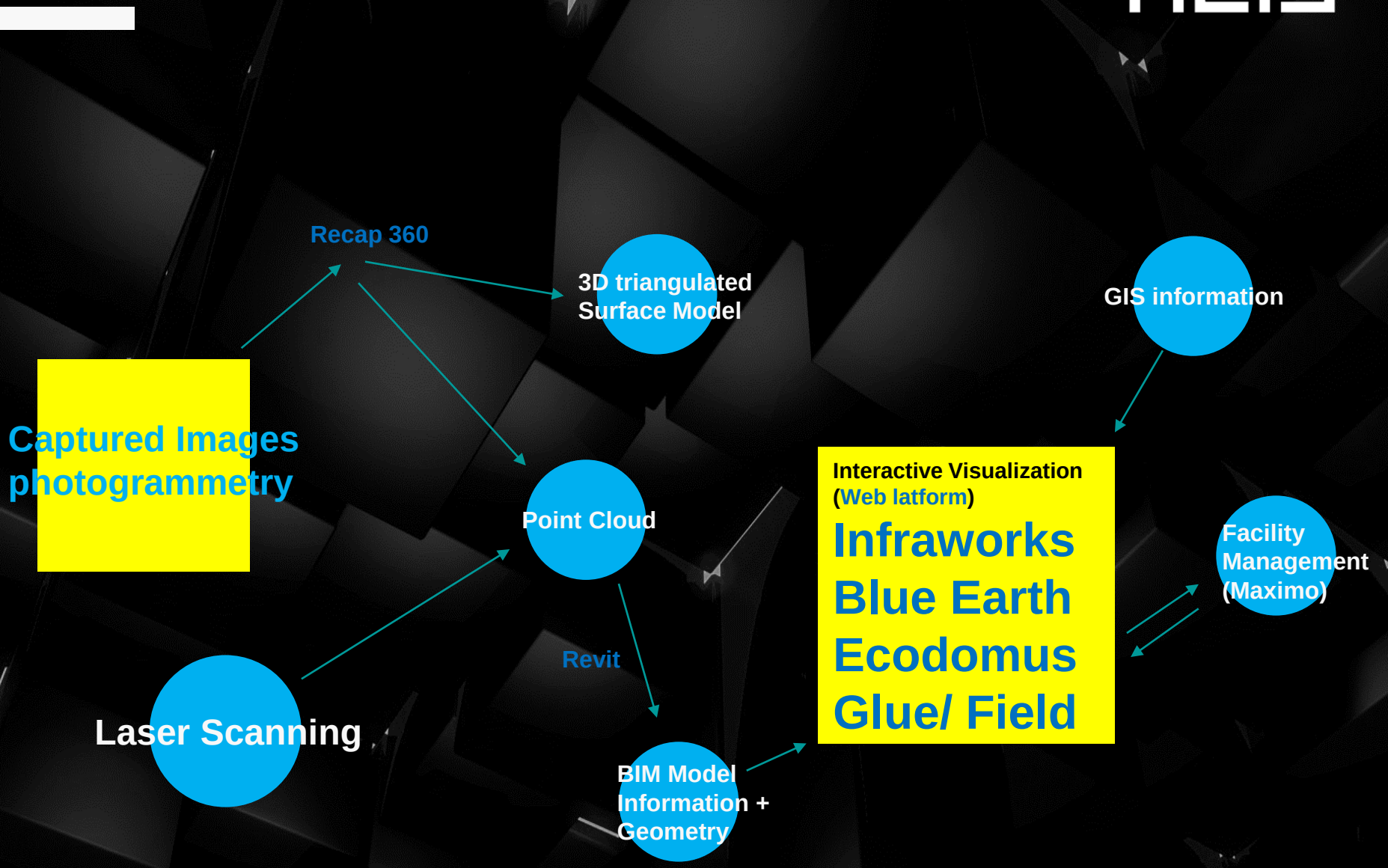
Point Clouds (Photogrammetry and Laser Scanning)
O&M Manual, Product Catalogue, Warranty, and etc.
Other Existing Information

As-built CAD drawings
Site Photos – Panorama
Traditional Site Photos

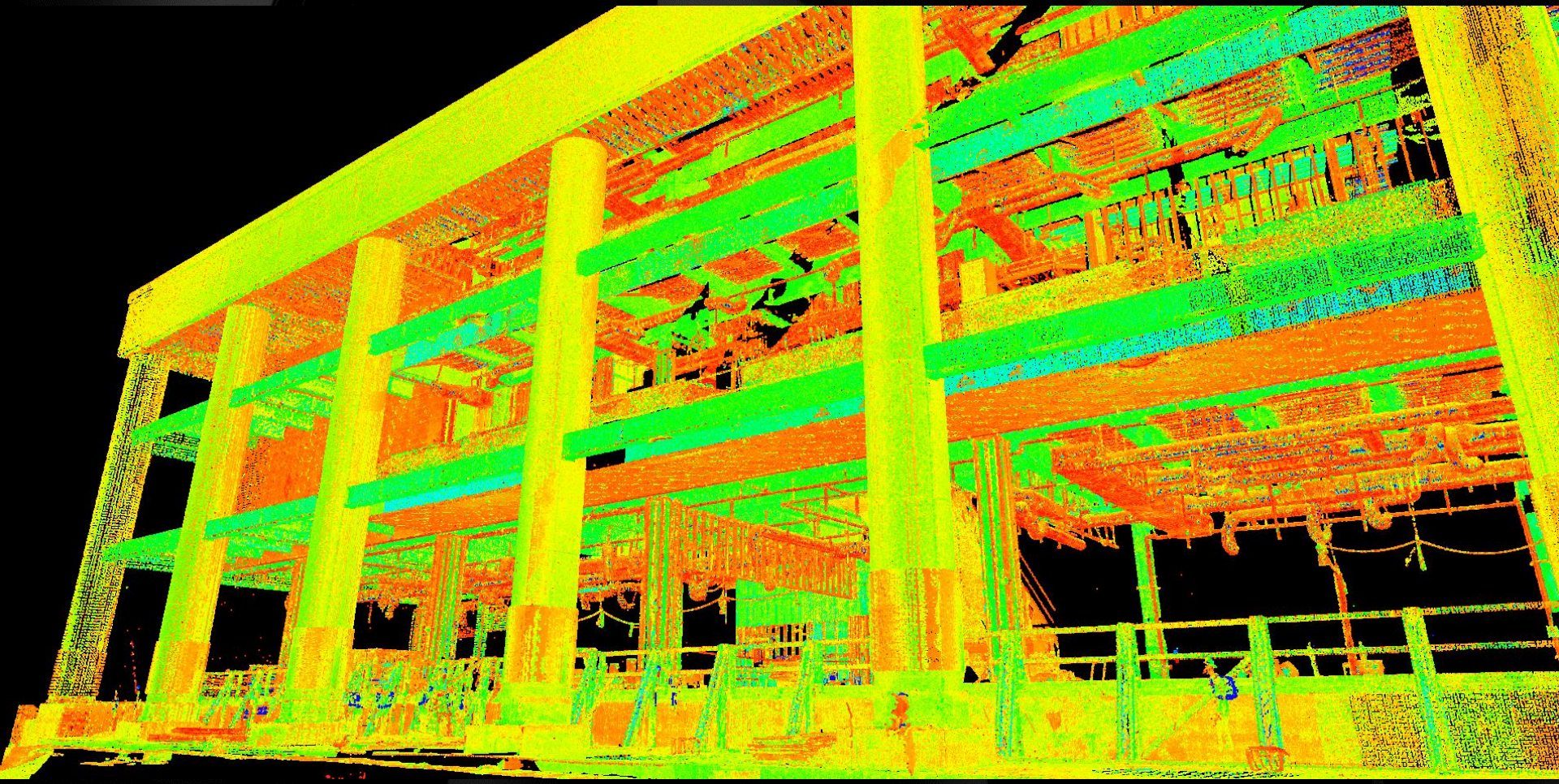
Photogrammetry

Unmanned Aerial Vehicle (UAV)
Take aerial photo of VPFS and its surrounding
High resolution camera
Autodesk Recap 360 - Point Cloud generation
Calibration with geo-information and dimensions from Laser scanning

By using the environment…


Recap 360
3D triangulated Surface Model
GIS information
Captured Images photogrammetry
Point Cloud
Interactive Visualization (Web latform)
Infraworks
Blue Earth
Ecodomus
Glue/ Field
Facility Management (Maximo)
Revit
Laser Scanning
BIM Model Information + Geometry


Laser Scanning

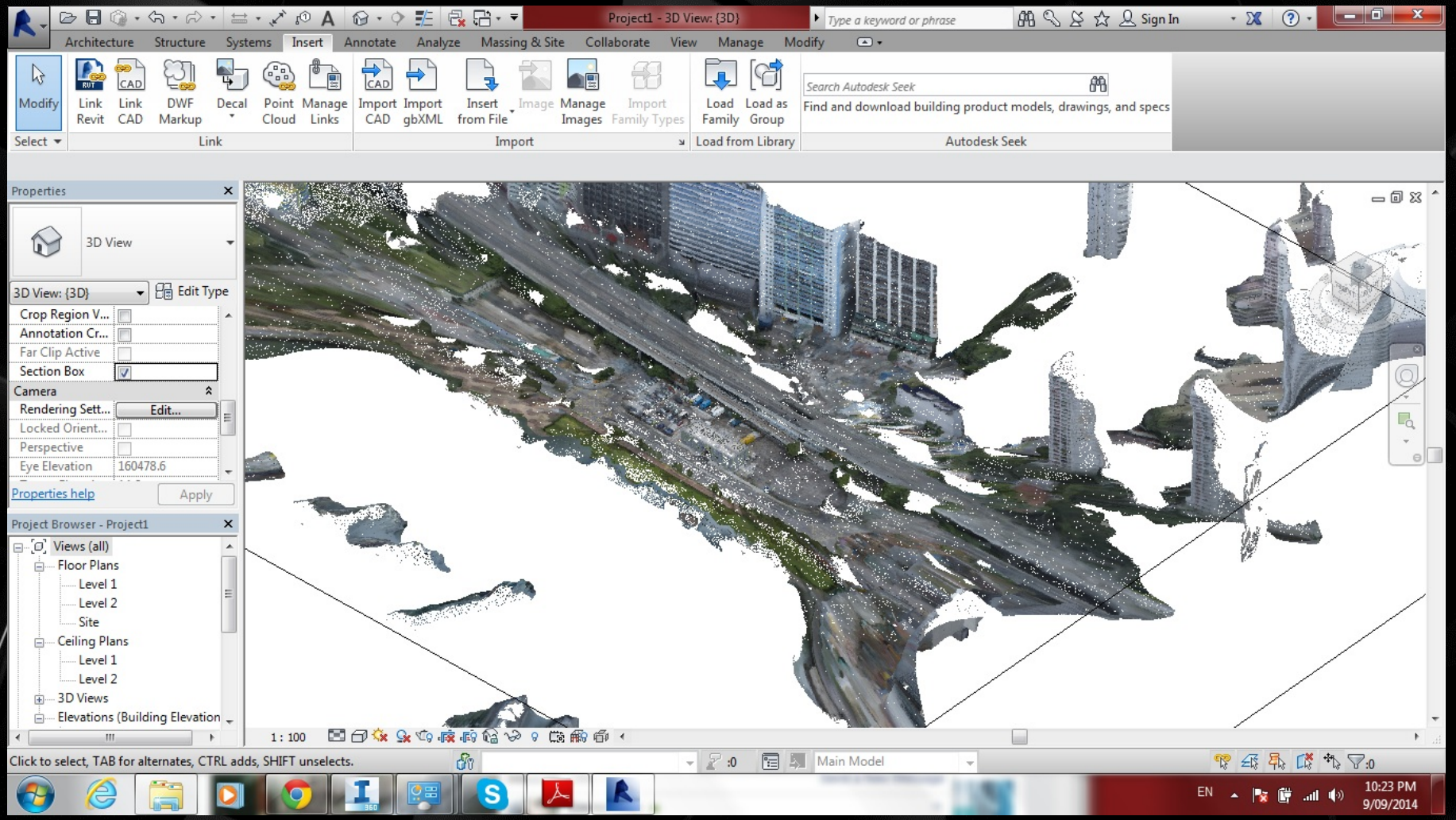



AND ERECTED IN

Captured Images
photogrammetry

Turn into Point Cloud

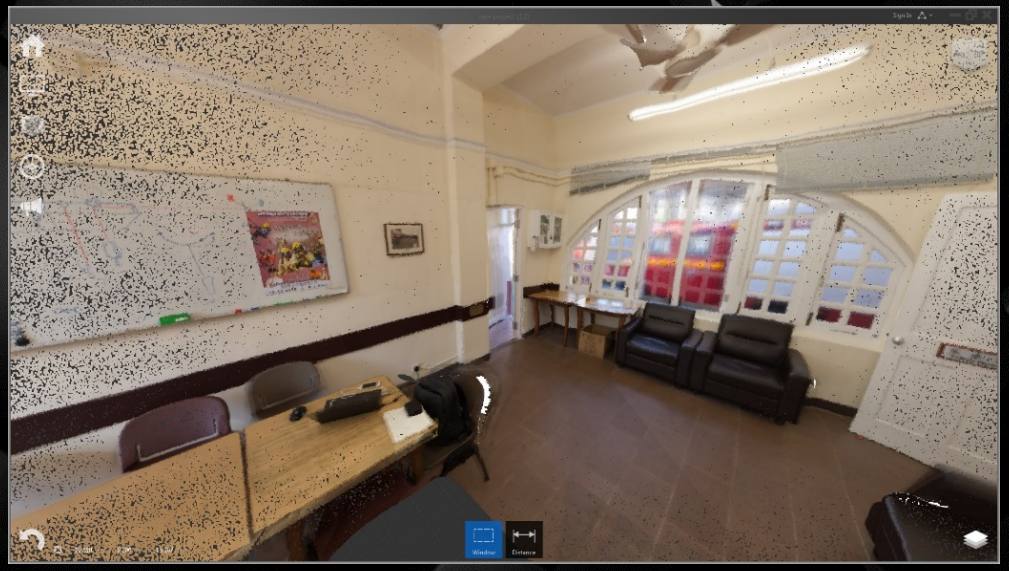
Point Cloud to BIM



Or give a bird’s eye view of the setting

Turn into Point Cloud

Close Range Photogrammetry



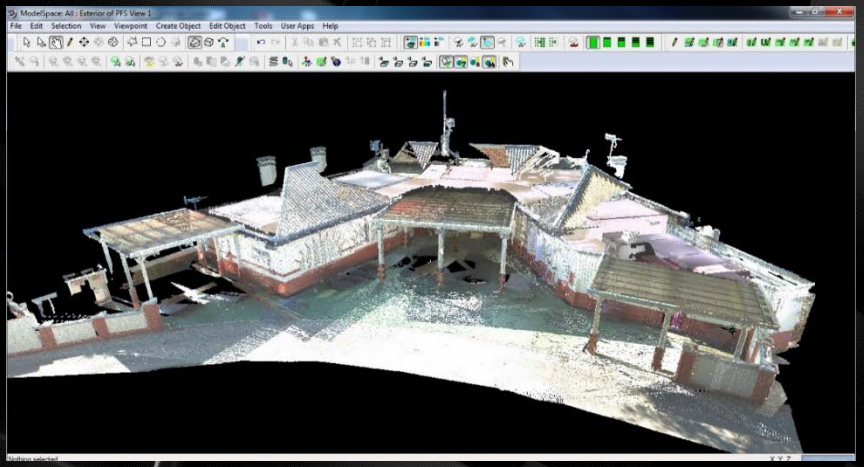

RENDERING
BIM MODEL
POINT CLOUD
REALITY

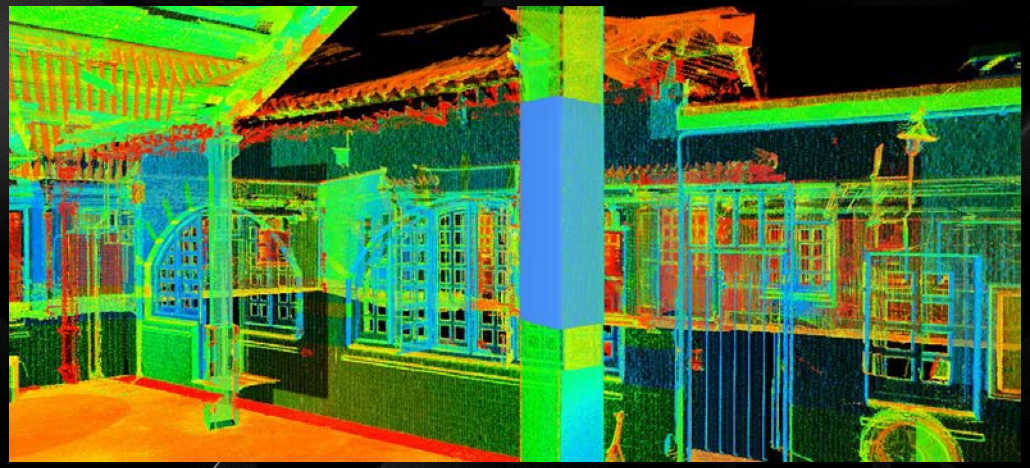
Laser Scanning

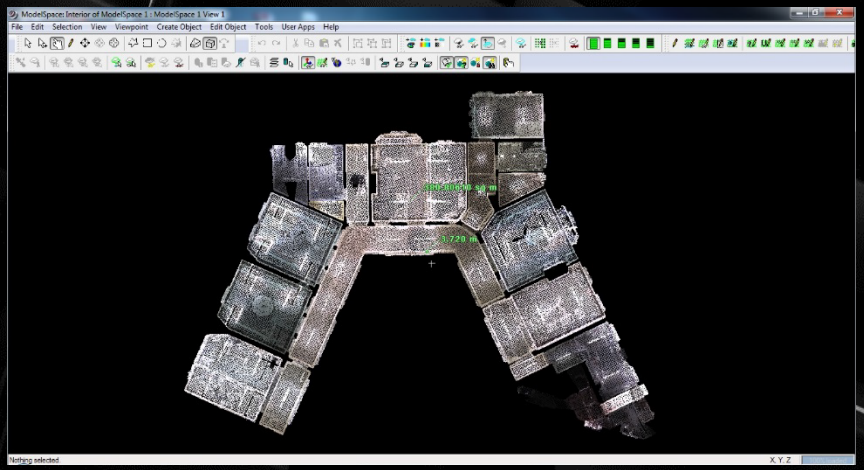
Collecting accurate dimensions
Widely used in Civil Engineering
Quick, efficient, accurate and precise
Resulting point cloud with true co-ordinates and above sea level
Internal and External Scanning of VPFS

Laser Scanning

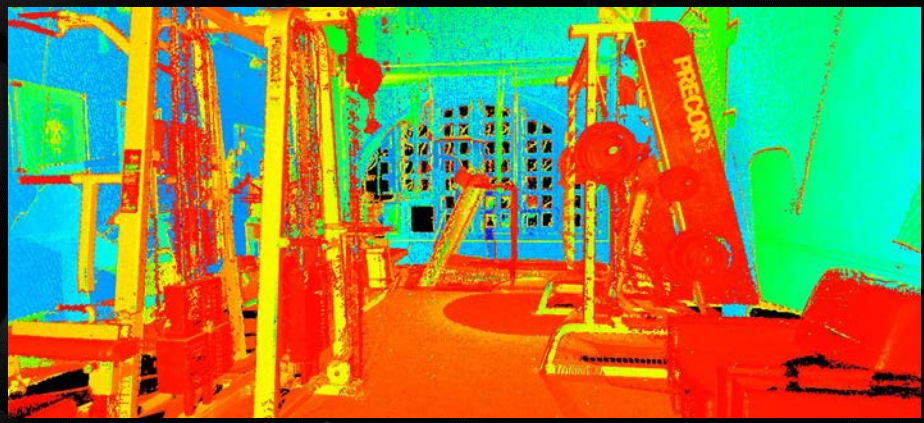
Laser Scanning

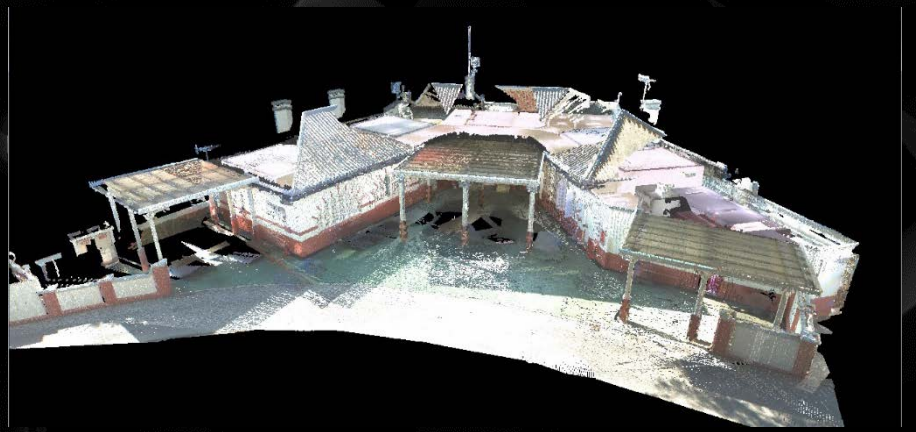




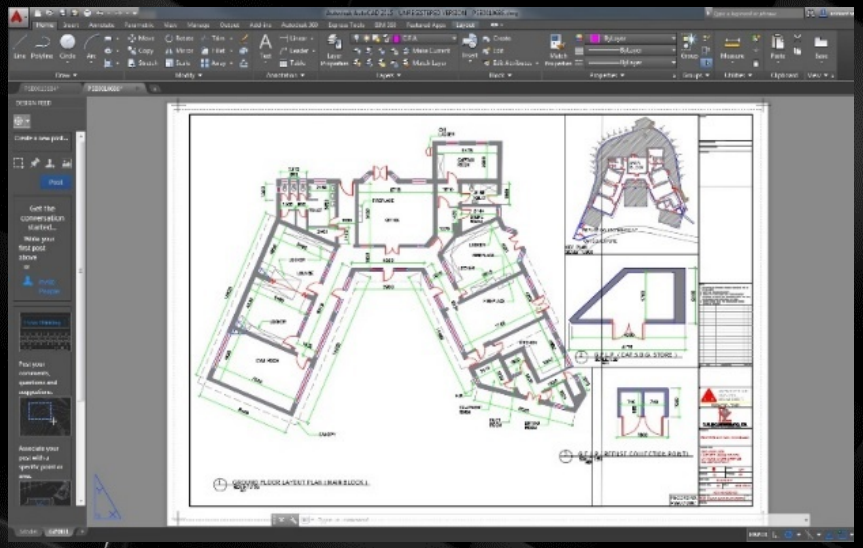


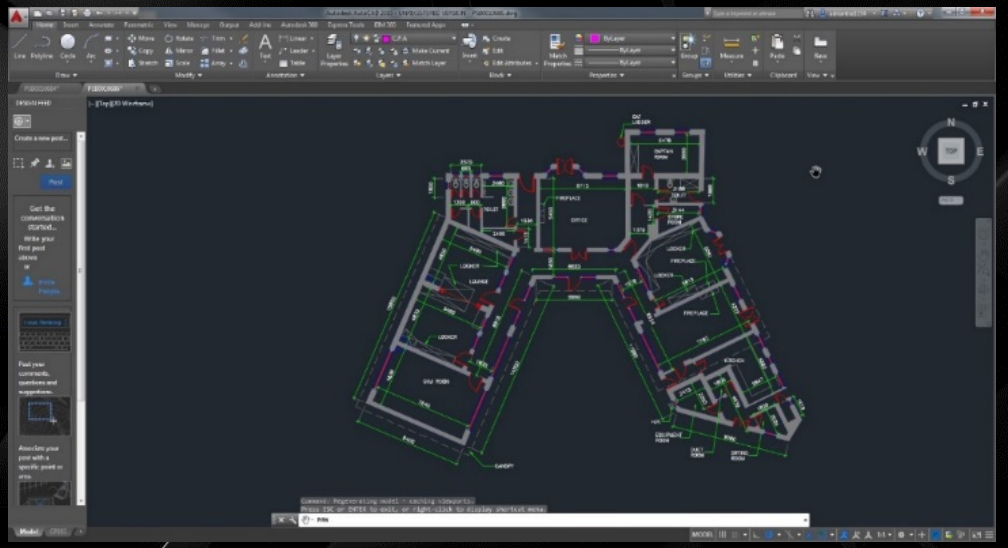
Laser Scanning

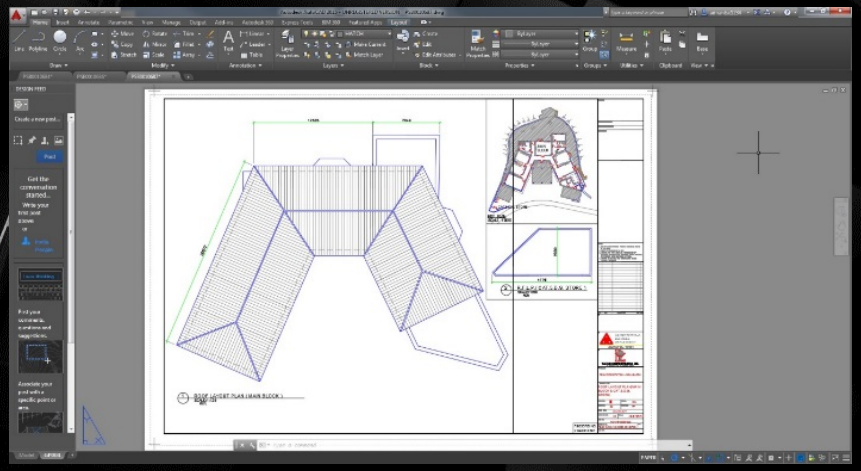


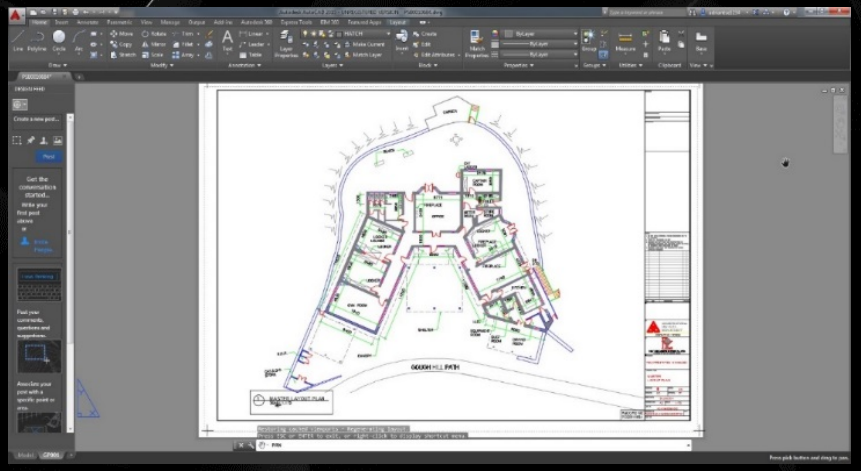


CAD Drawings



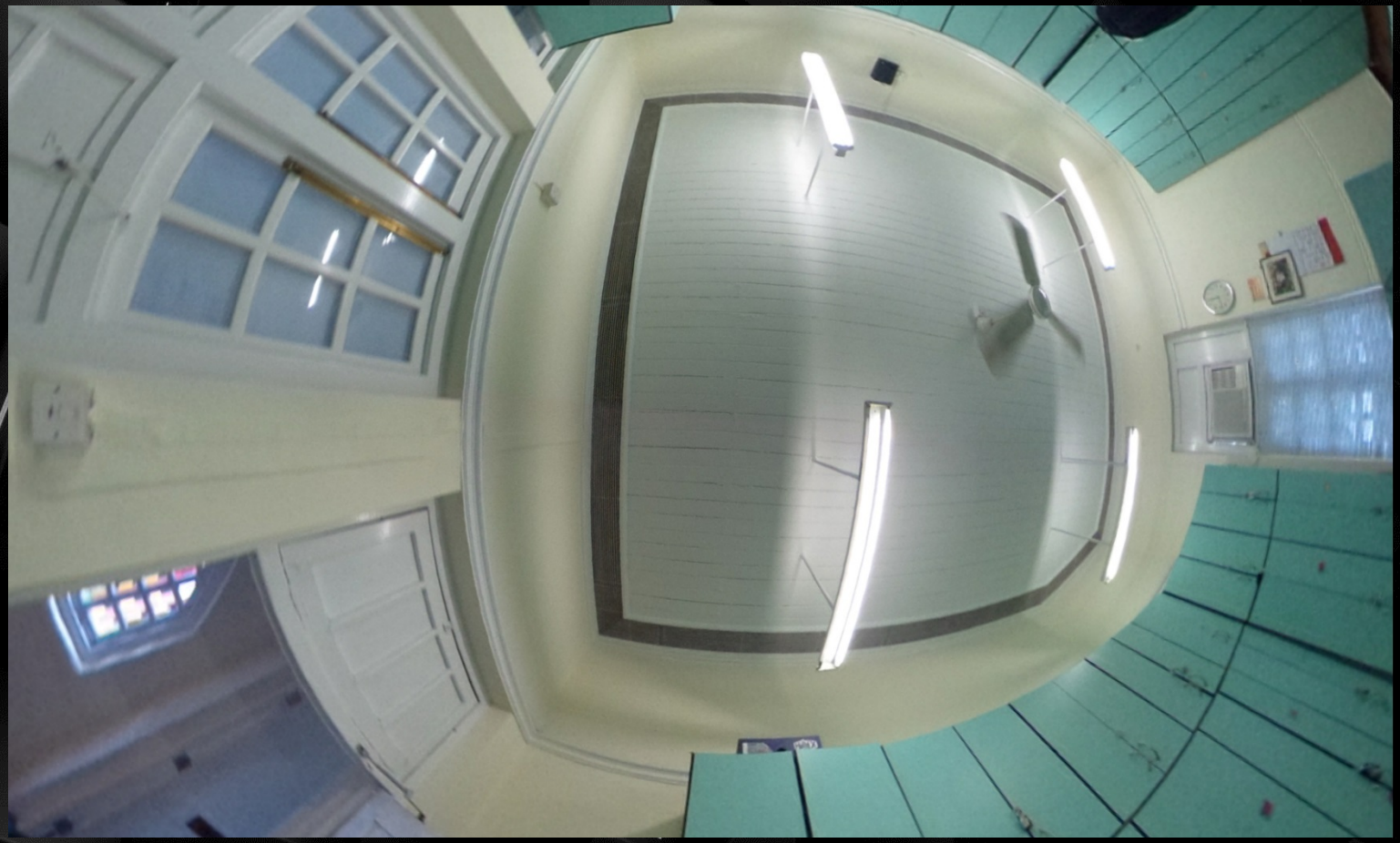




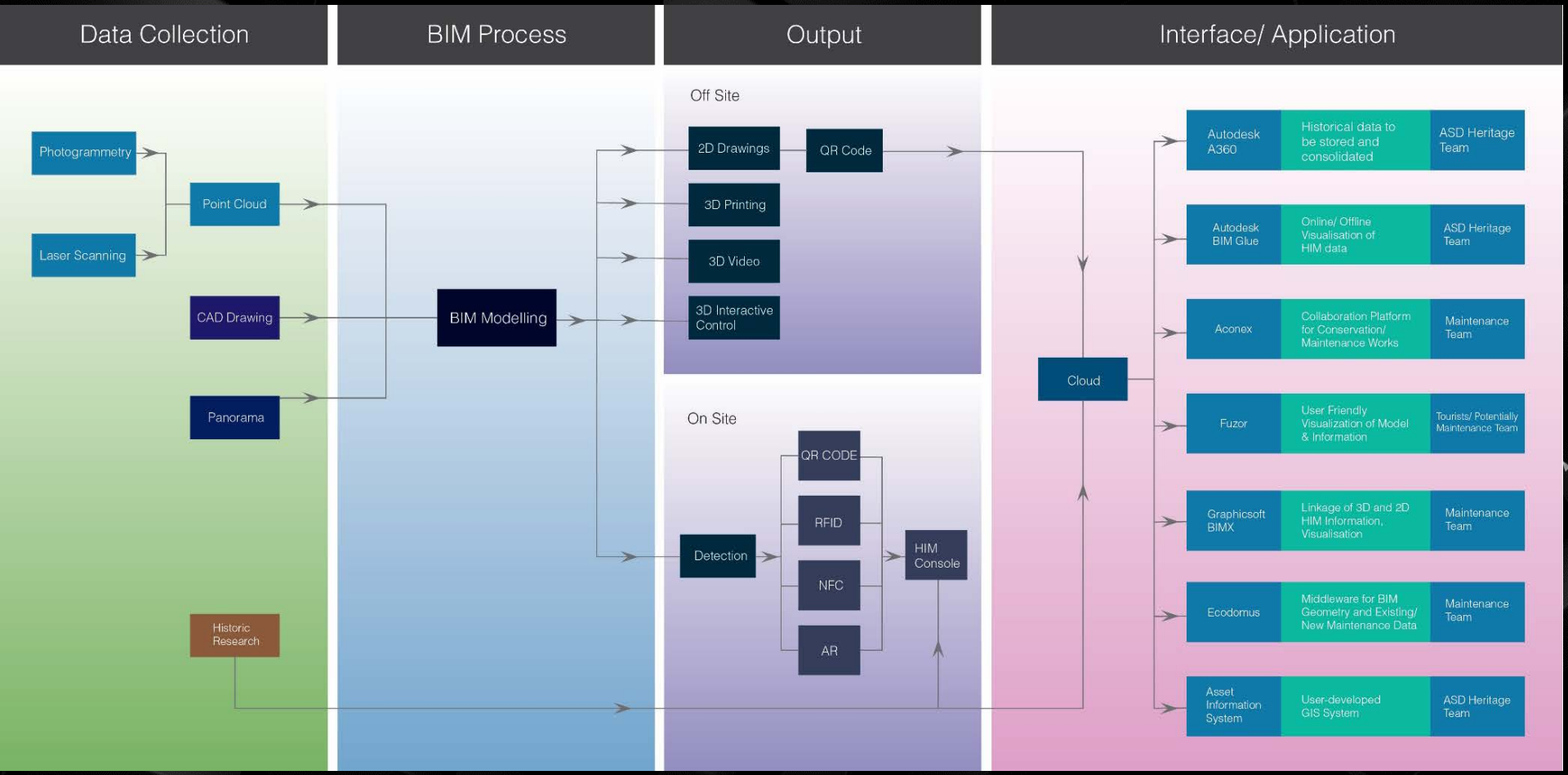


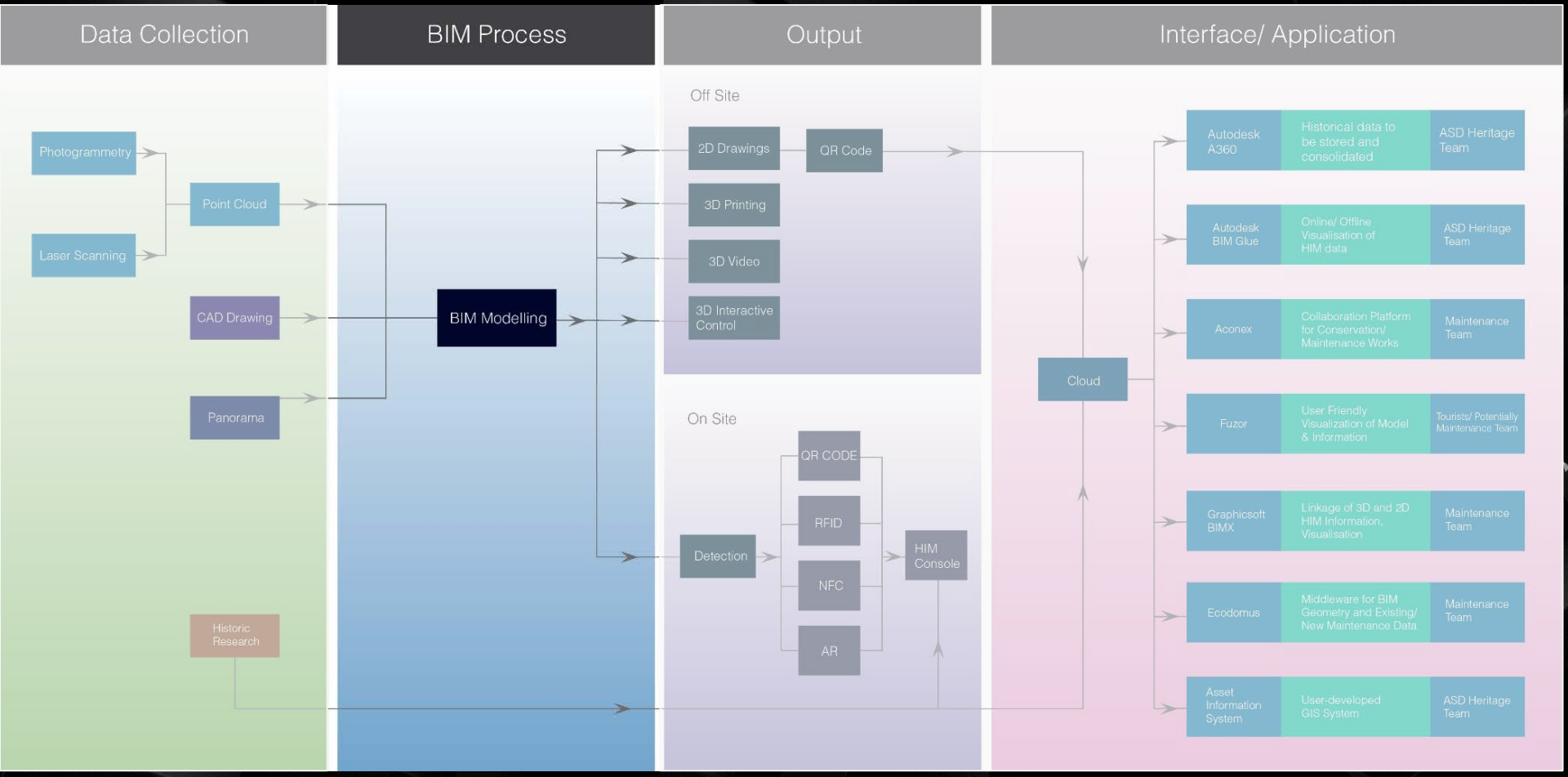
Panorama

Panorama



Panorama


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
Detection
QR CODE
RFID
NFC
AR
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team

BIM Process

Phasing

Significant application of BIM in HIM

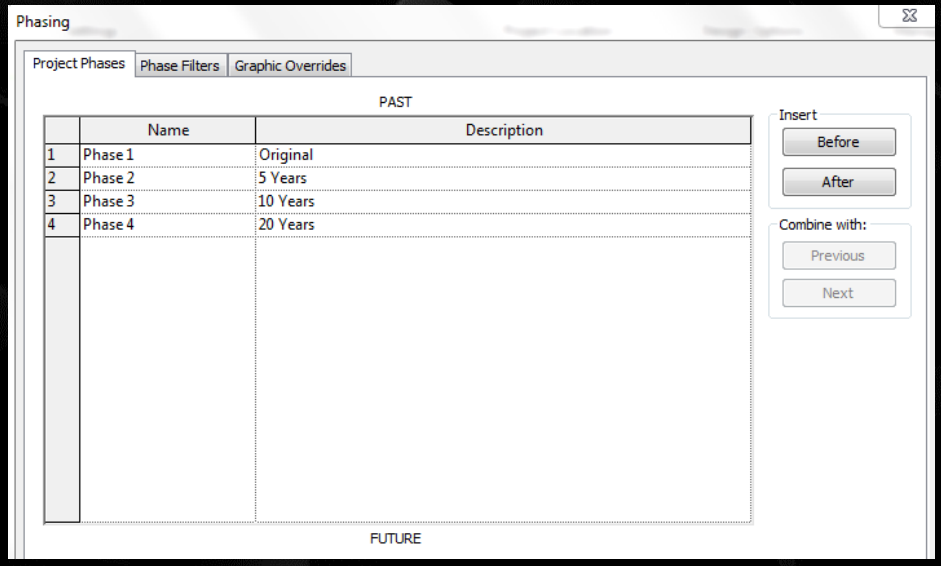
Any building component with two phase parameters

Phase created

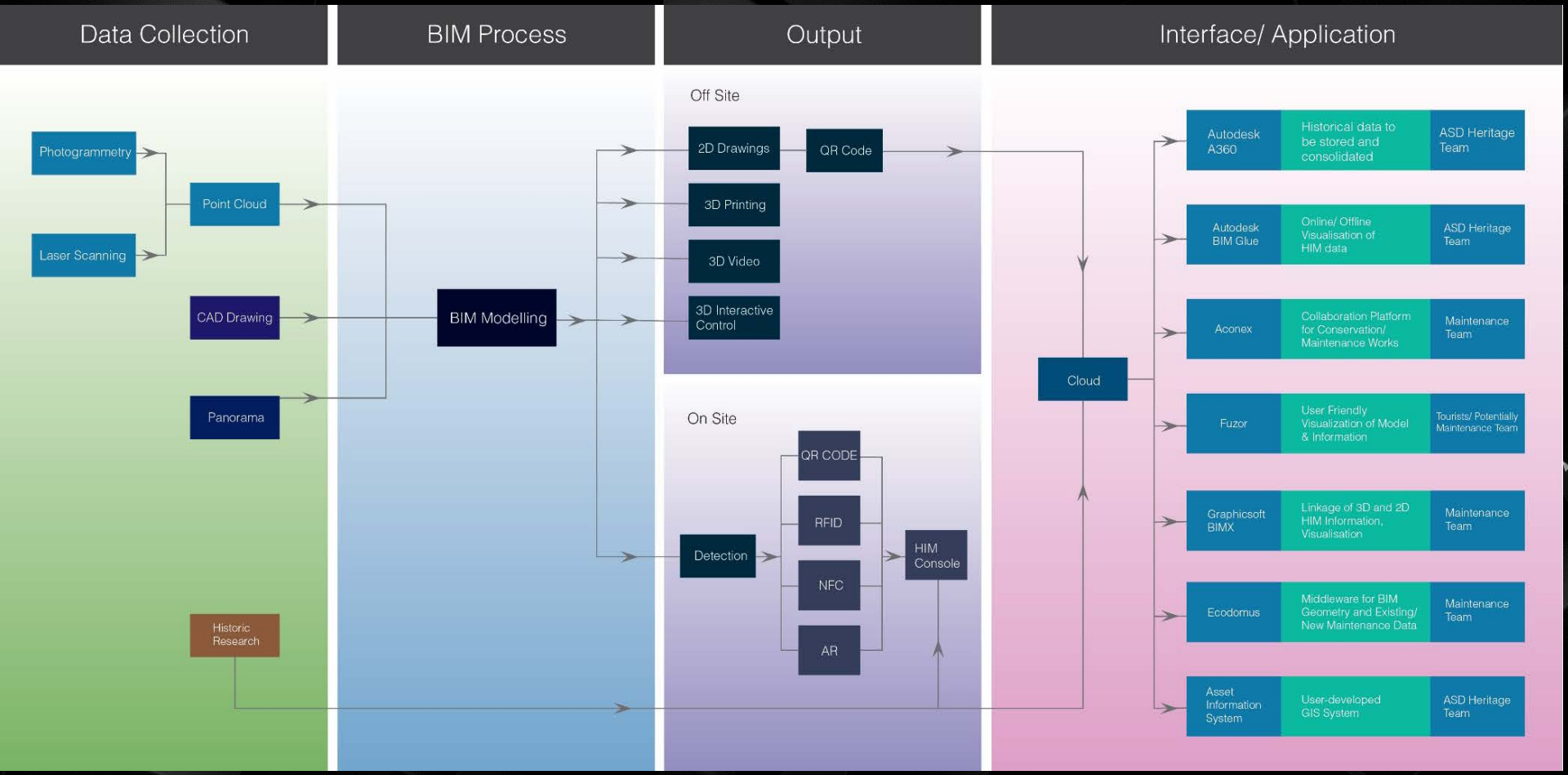
Phase demolished

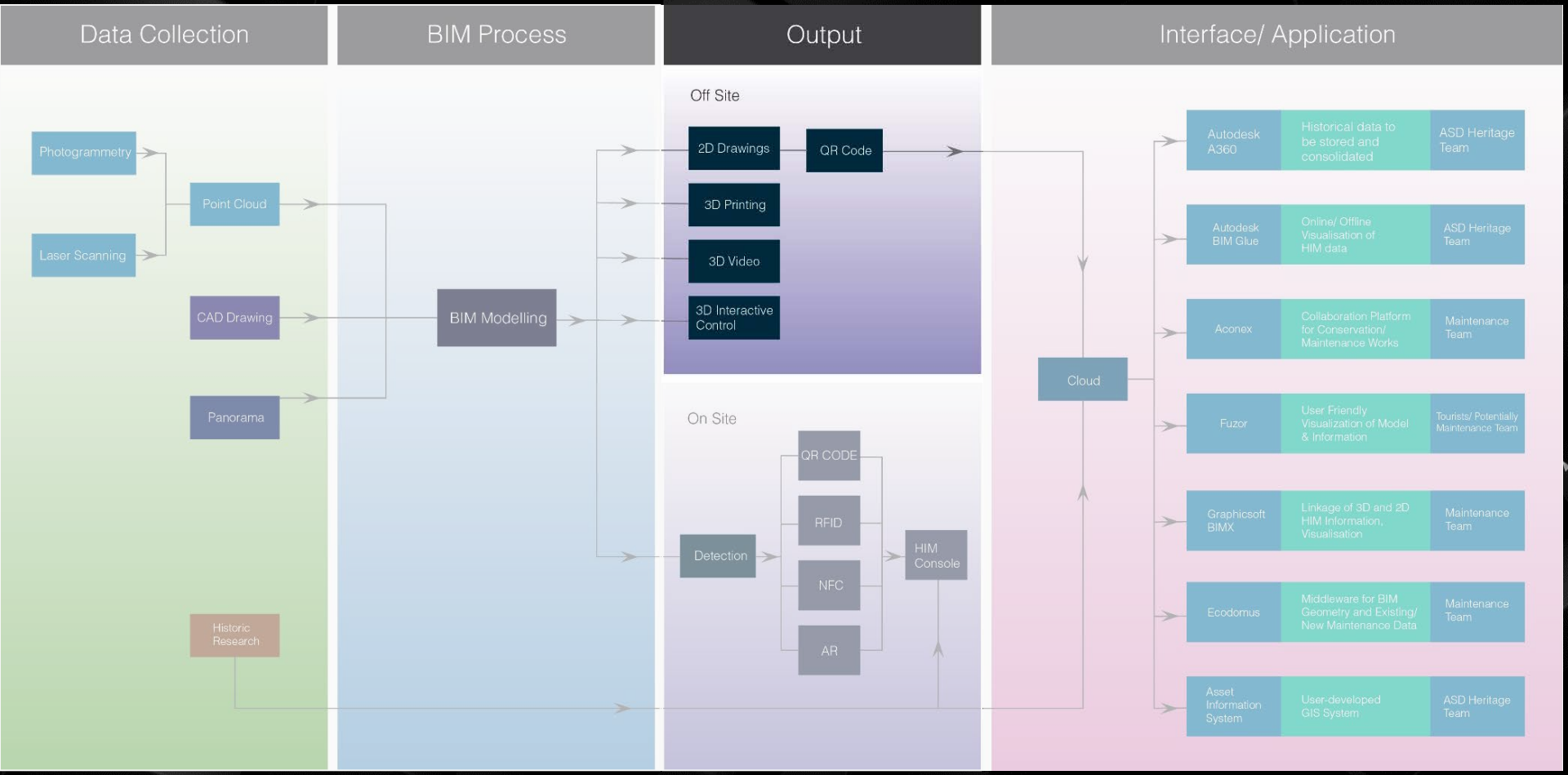
Subdivided into certain Phases

Illustrate the important historical changes



BIM Process


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
Detection
QR CODE
RFID
NFC
AR
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team

Output

Off Site

2D & 3D Drawings with Time factors + QR Code

Fuzor: Interactive Control and 3D Video

On Site - Detection

Near Field Communication (NFC)

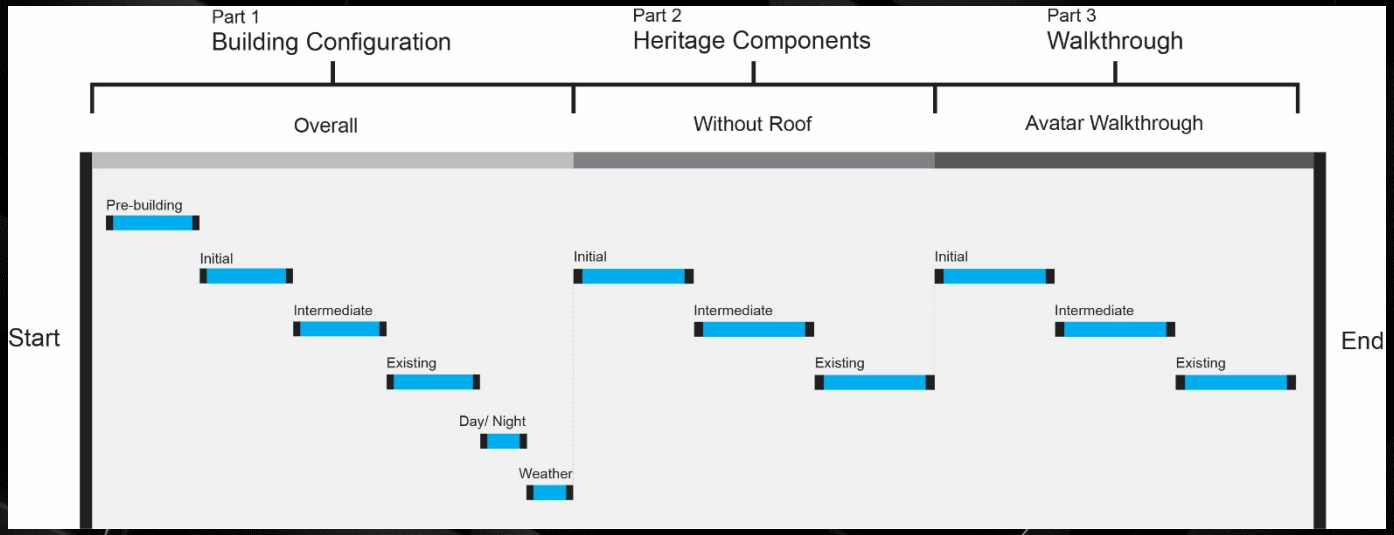
Radio-Frequency Identification (RFID)

Augmented Reality (AR) with different tracking methods

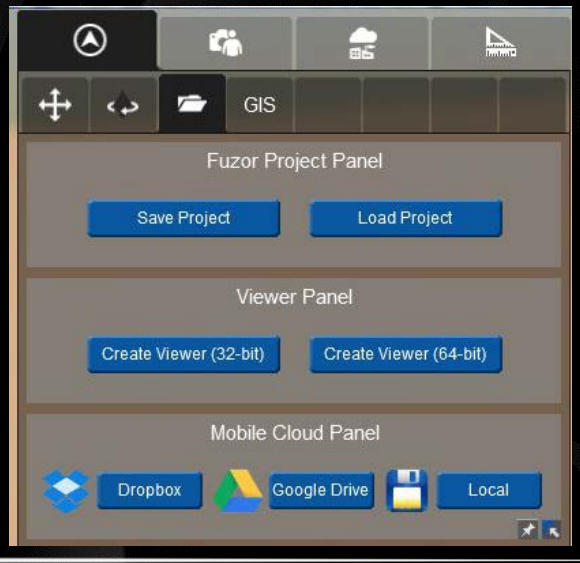
Output (Off-site) - 2D Drawings

Output (Off-site) - 3D Printing

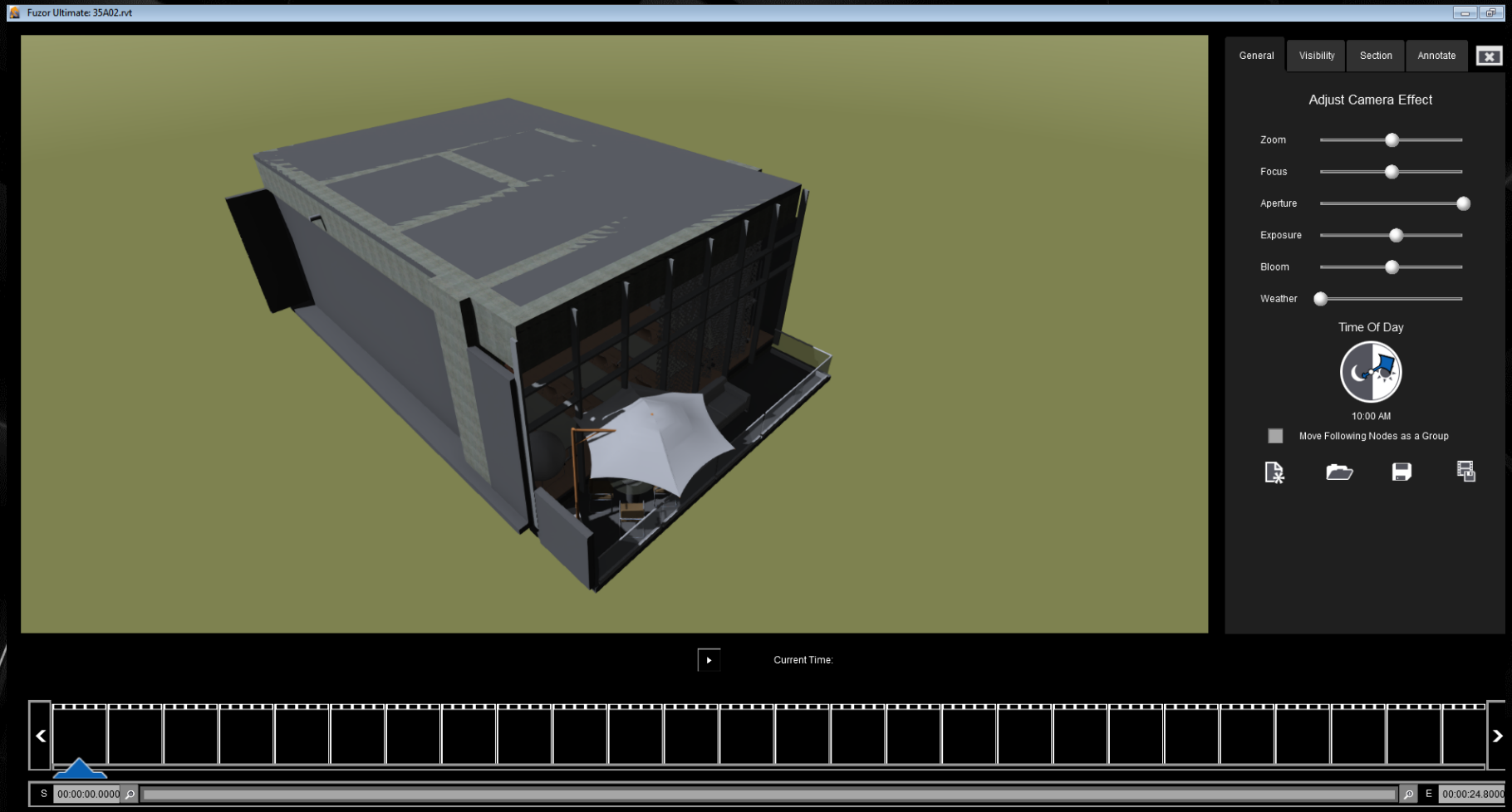
Output (Off-site) - 3D Video



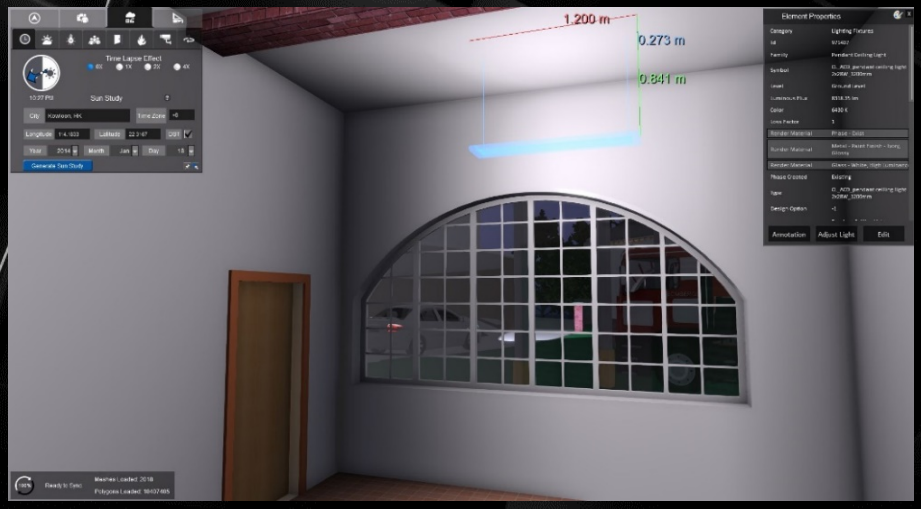
Output (Off-site) - 3D Video

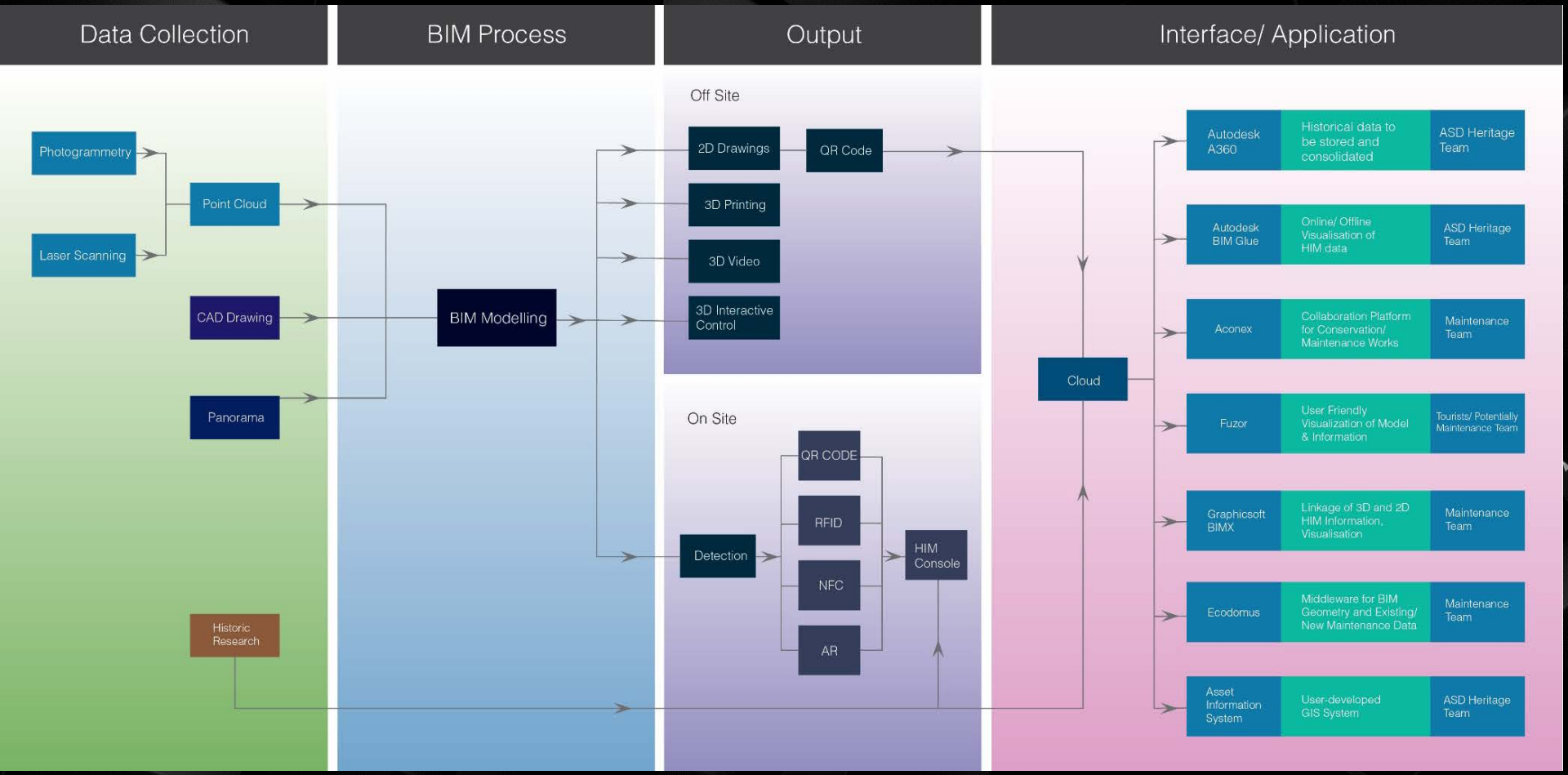


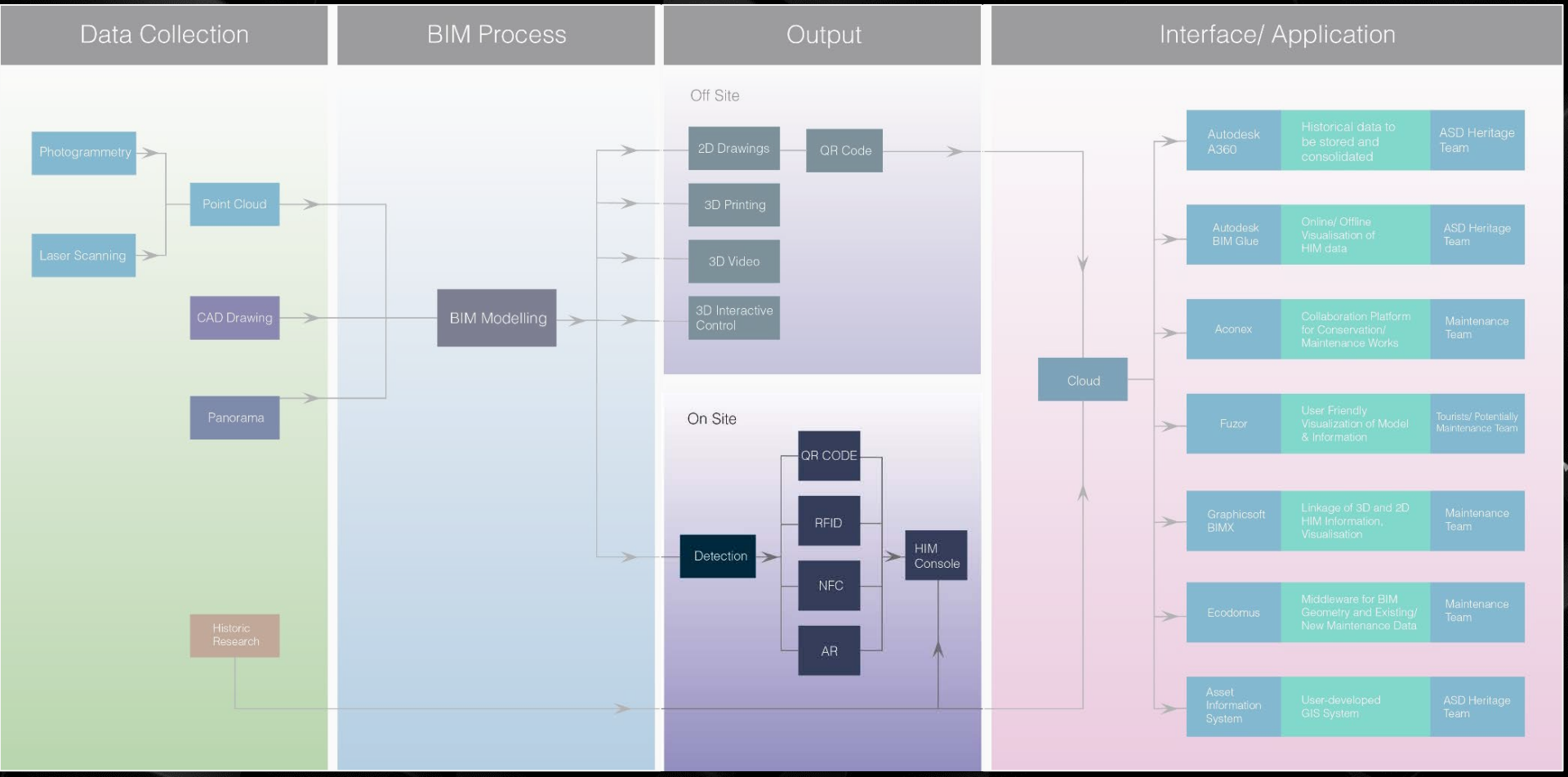
Output (Off-site) - 3D Video



Output (Off-site) - 3D Interactive Control




Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team

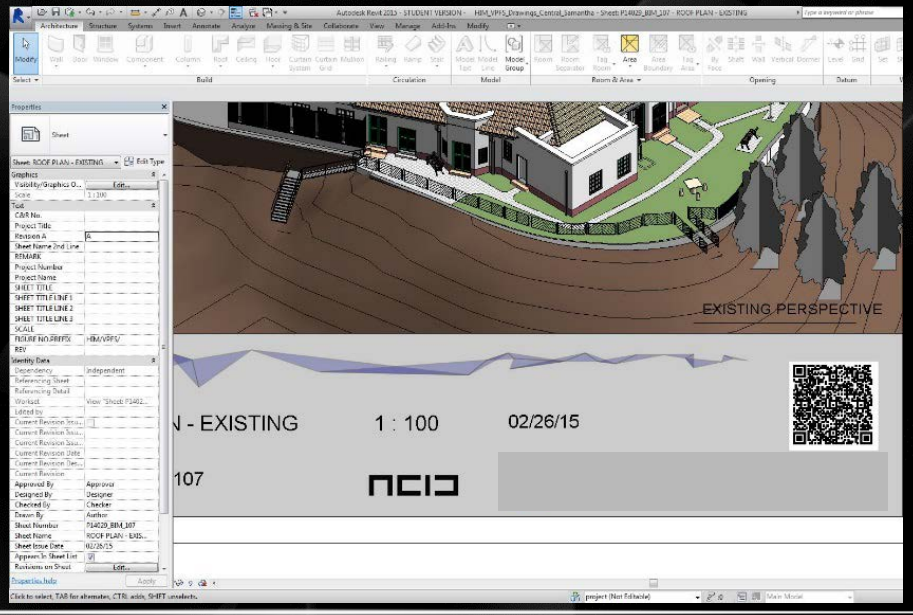

Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team

2D & 3D Drawings with Time factors + QR Code

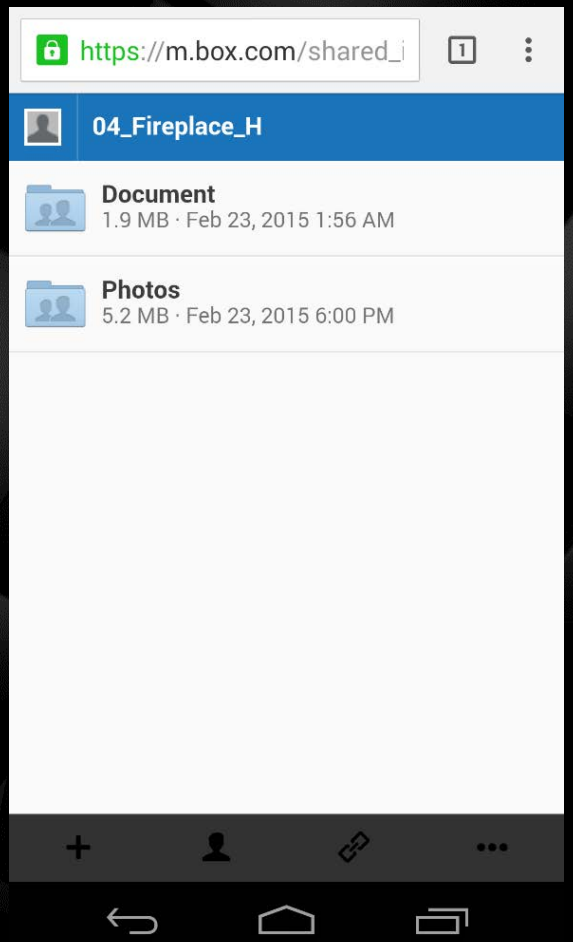
Traditional Plans, elevations and Sections can be generated with ease

3D presentation such as hiding elements, making elements transparent or temporary exploding different components

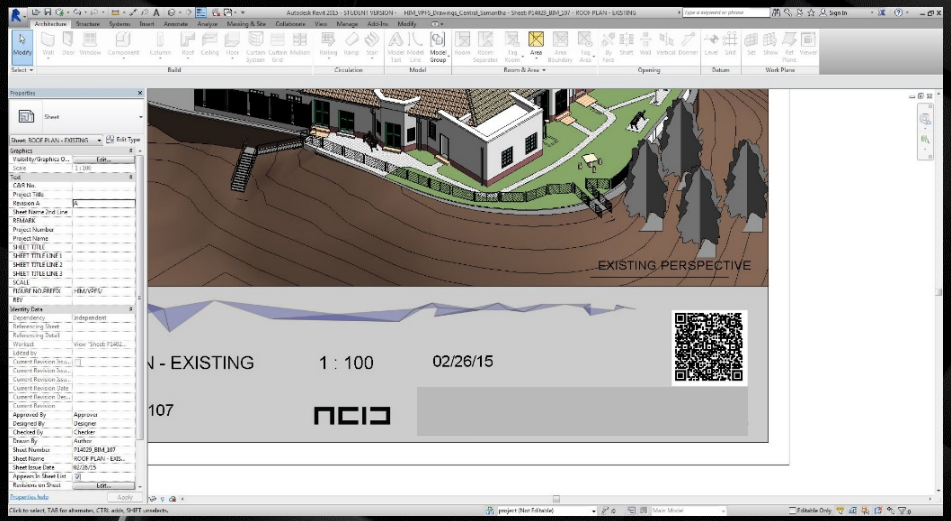
Incorporating a unique QR Code at each individual drawings brings the 2D and 3D representations together

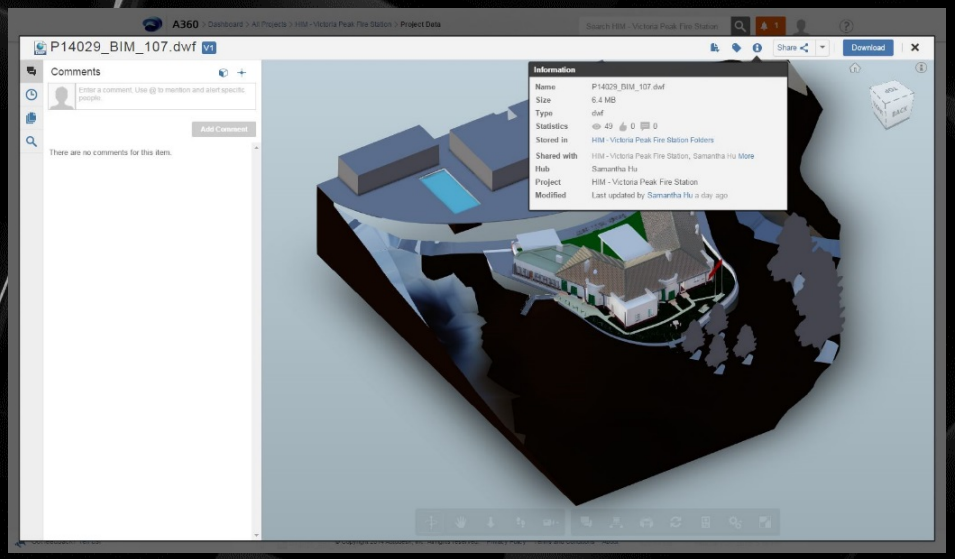


Output (On-site) – Detection - QR Code



QR Code on Drawings





Output (On-site) – Detection - RFID

Output (On-site) – Detection - NFC

NFC & RFID

NFC

Near Range Detection (5cm)

is capable of two way communication

be used for more complex interactions such as card emulation like Octopus Payment

RFID

Wide Range Detection (2-10m)

One way wireless communication, typically between an unpowered RFID tag and a powered RFID reader

Asset tracking in warehousing, Airport baggage handling, Livestock identification, etc.

NFC & RFID (Cont'd)

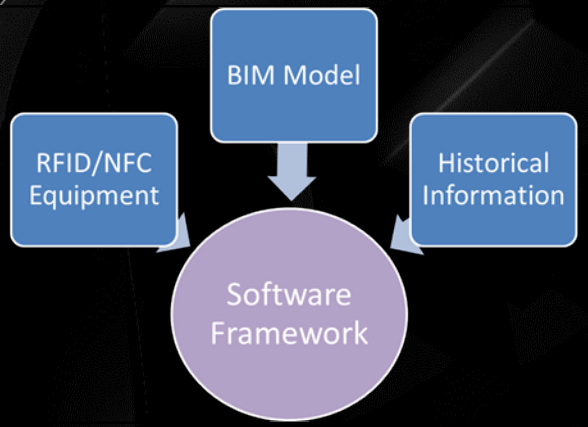
RFID & NFC technologies comparison table		
	UHF RFID	NFC
Frequency	800/960Mhz	13.56Mhz
Standards	EPC Gen2	ISO14443A
Communication	1 way	2 way
Reading Rang	2m ~ 10m	5cm
Scan Tags Simultaneously	Yes	No

NFC & RFID (Cont'd)

Software Framework

Integrate NFC/RFID and BIM by means of the application programming interface (API)

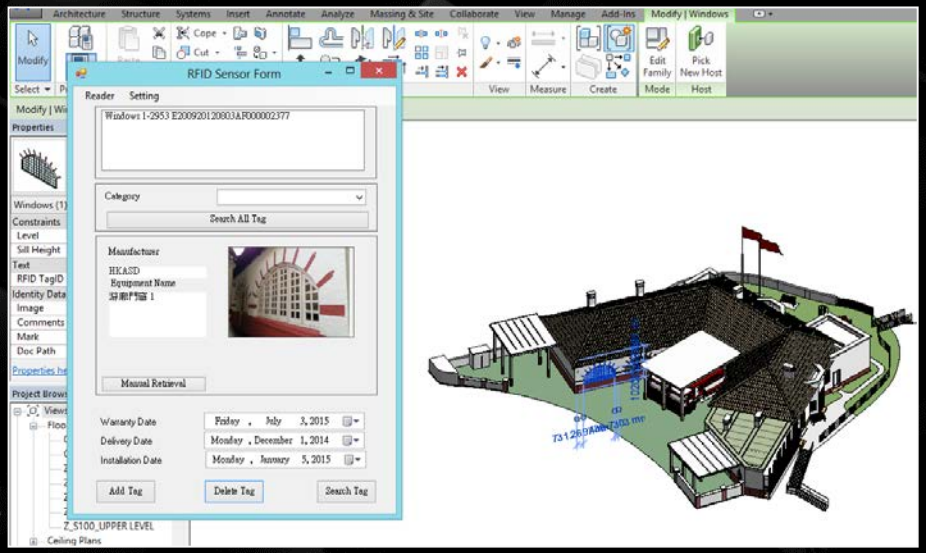
Revit plug-in software module connect with the RFID/NFC Reader API with a data file



NFC & RFID (Cont'd)

Provisioning

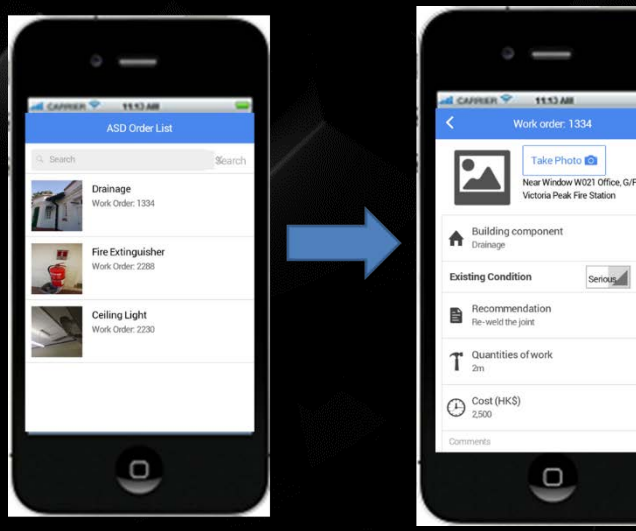
Create an Element Id directly in Revit API
Associate a unique integer value to the new Element Id
Associate the ID with the RFID/NFC tag Id directly



NFC & RFID (Cont'd)

NFC for Facility Management Mobile Application

Android mobile application
Information is retrieved from and input to the system in the back office manually
NFC tag
Staff can submit the inspection report and photo on site



Output (On-site) – Detection - AR

Augmented Reality

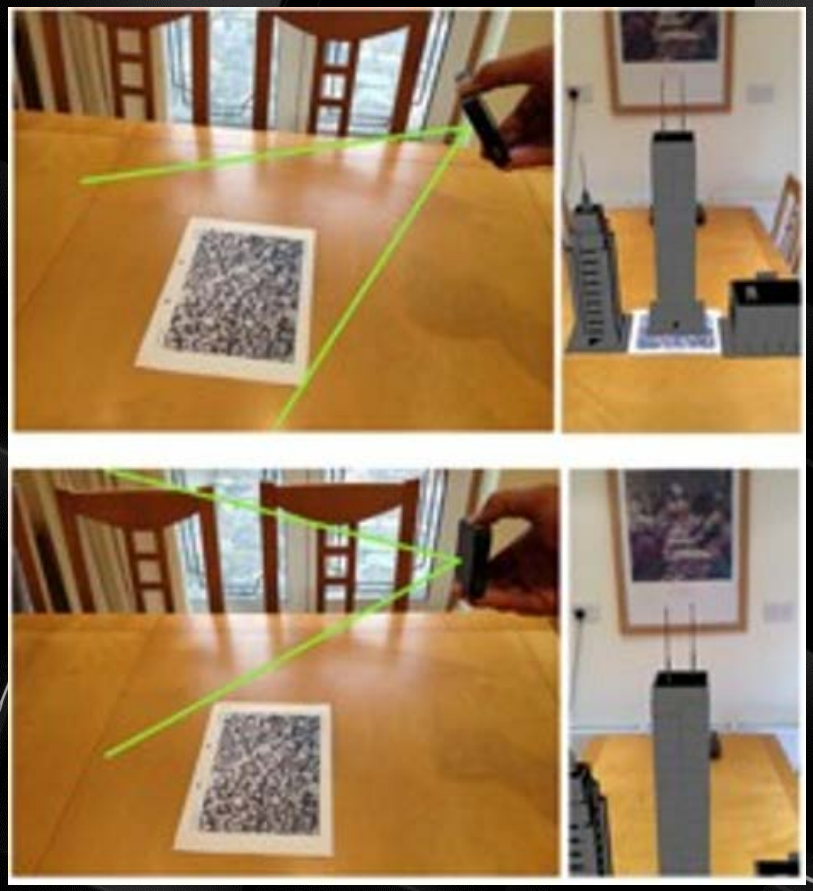
Augmented Reality is a live direct or indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data.

Mobile augmented reality systems use tracking technologies, such as:

Digital cameras and other optical sensors,
Accelerometers,
GPS,
Gyroscopes,
Solid state compasses,
RFID and wireless sensors

These technologies offer varying levels of accuracy and precision.

Augmented Reality



AR (Cont’d)

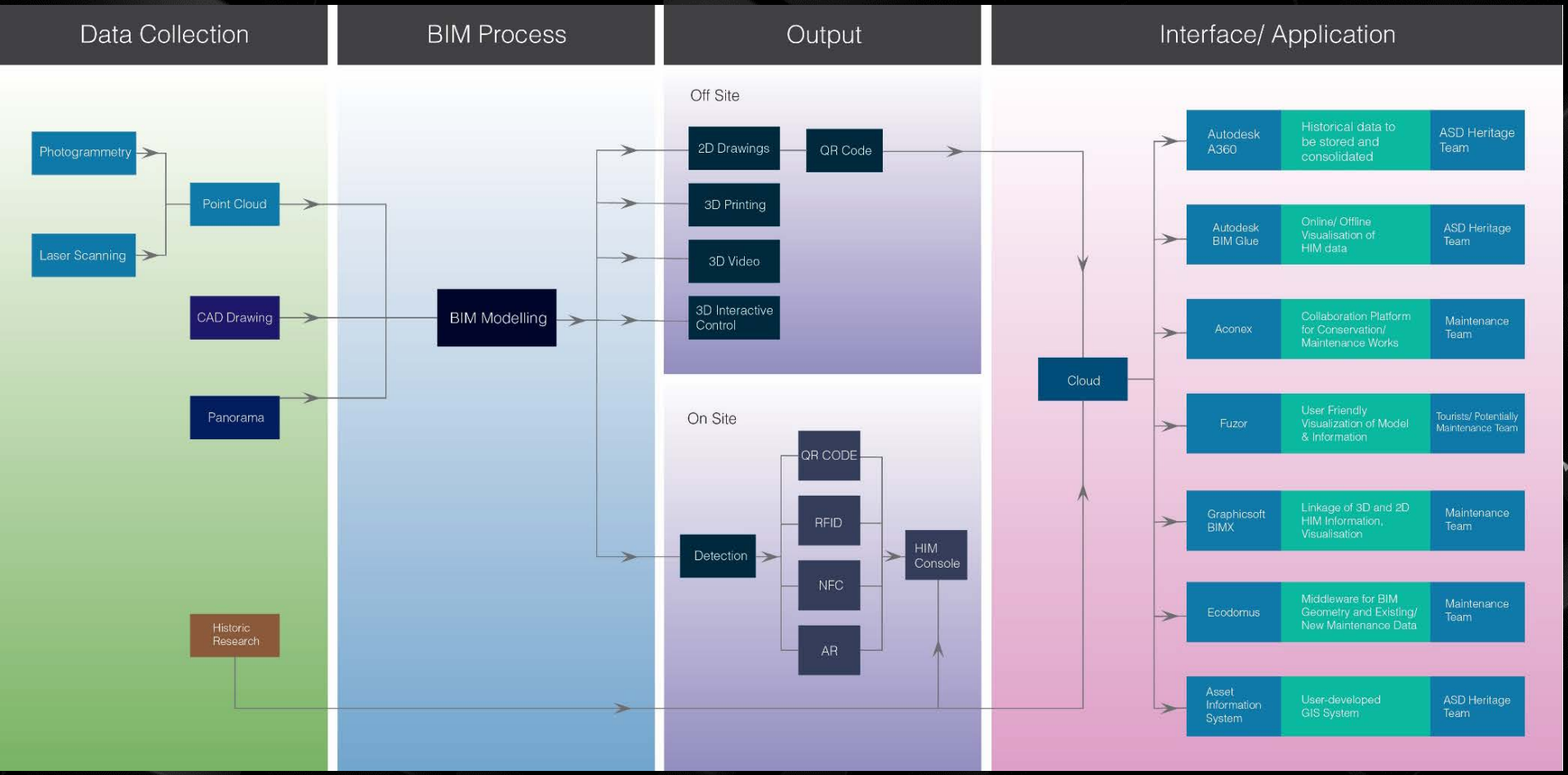
Various technologies are used in Augmented Reality rendering including:

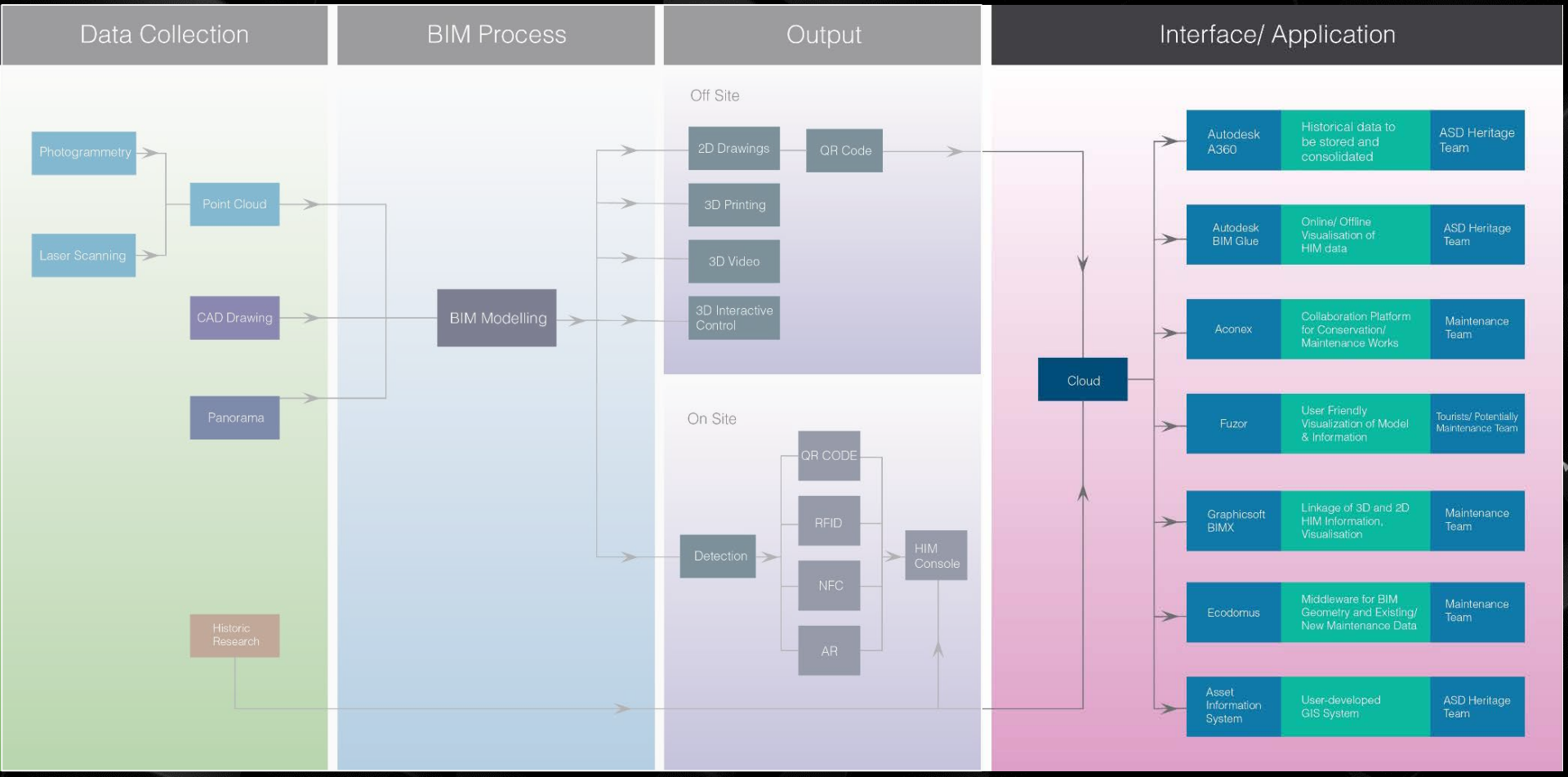
Optical projection systems
Monitors
Held devices
Display systems worn on one person

AR (Cont'd)

Tracking Methods:

- ❖ Display the building changes
- ➢ Outdoor positioning using Geographic information system(GIS)
- ❖ Display the unseen partition (Roof truss)
- ➢ Indoor positioning using Bluetooth Low Energy triangulation
  - ✓ iBeacon/Beacon
- ❖ Extended image-based tracking
- ❖ Object recognition and mapping

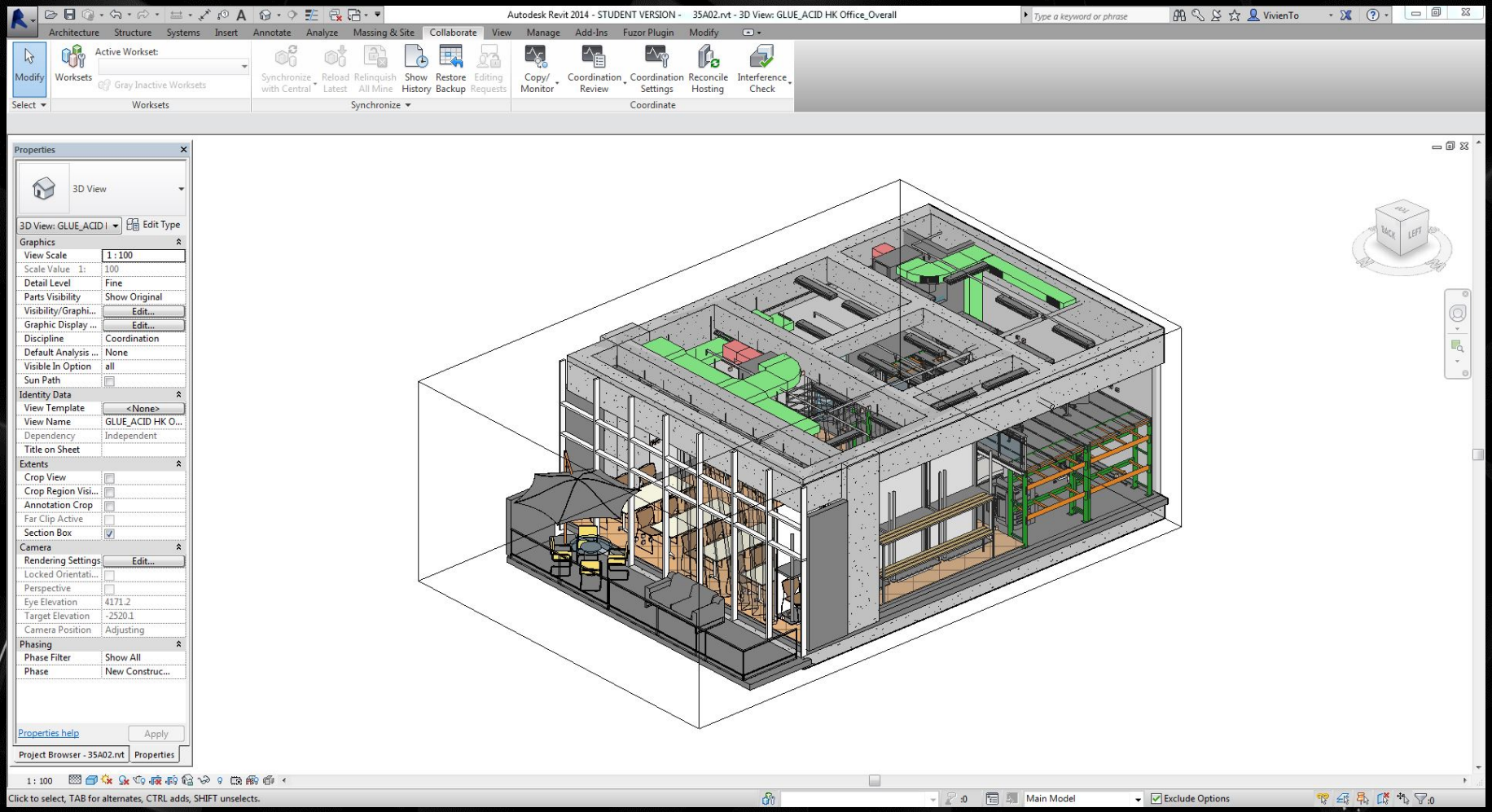

Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team


Data Collection
BIM Process
Output
Interface/ Application
Photogrammetry
Laser Scanning
Point Cloud
CAD Drawing
Panorama
Historic Research
BIM Modelling
Off Site
2D Drawings
QR Code
3D Printing
3D Video
3D Interactive Control
On Site
QR CODE
RFID
NFC
AR
Detection
HIM Console
Cloud
Autodesk A360
Historical data to be stored and consolidated
ASD Heritage Team
Autodesk BIM Glue
Online/ Offline Visualisation of HIM data
ASD Heritage Team
Aconex
Collaboration Platform for Conservation/ Maintenance Works
Maintenance Team
Fuzor
User Friendly Visualization of Model & Information
Tourists/ Potentially Maintenance Team
Graphicsoft BIMX
Linkage of 3D and 2D HIM Information, Visualisation
Maintenance Team
Ecodomus
Middleware for BIM Geometry and Existing/ New Maintenance Data
Maintenance Team
Asset Information System
User-developed GIS System
ASD Heritage Team

Interface / Application

- Autodesk A360
- Autodesk BIM Glue
- Aconex
- Fuzor
- Ecodomus

Autodesk A360

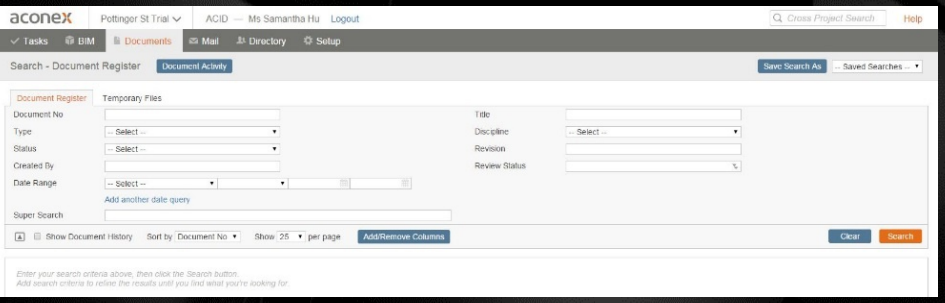


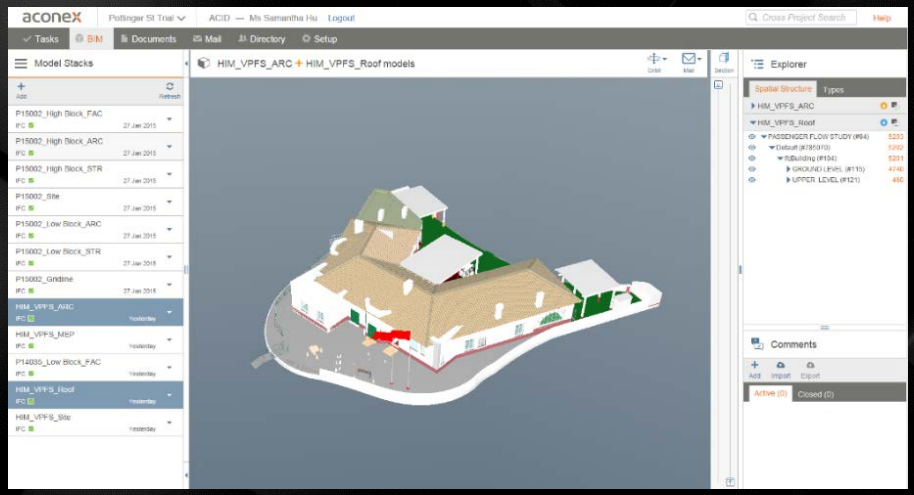
Autodesk BIM Glue

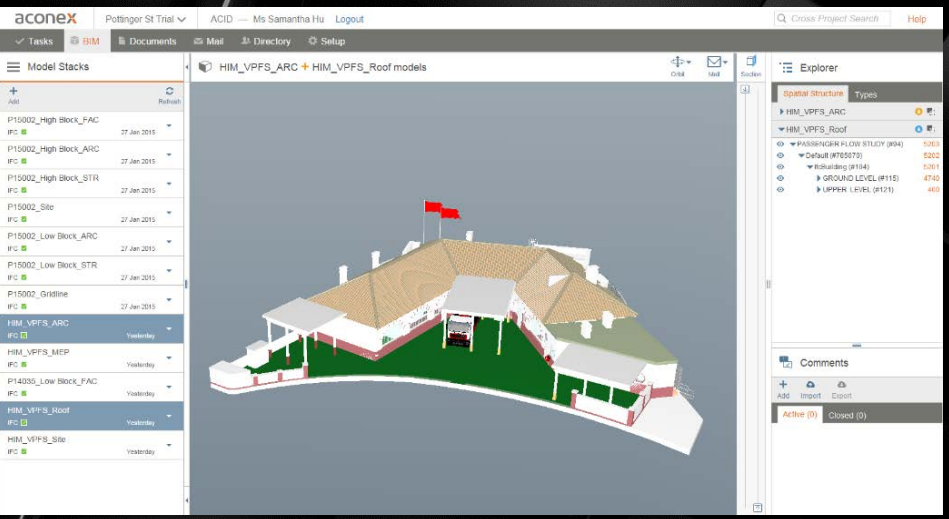
Autodesk BIM Glue

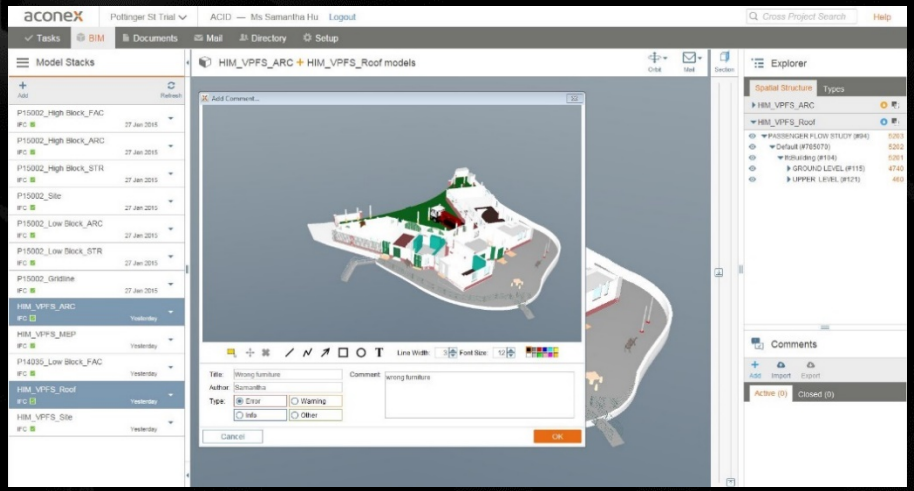
Autodesk BIM Glue

Aconex

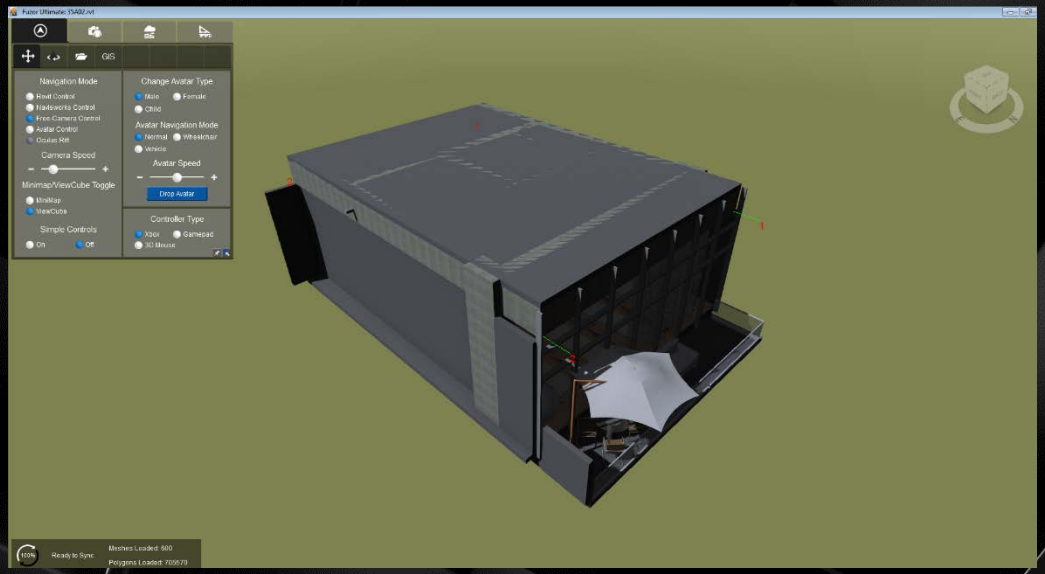

aconex
Search - Document Register
Document Register
Temporary Files

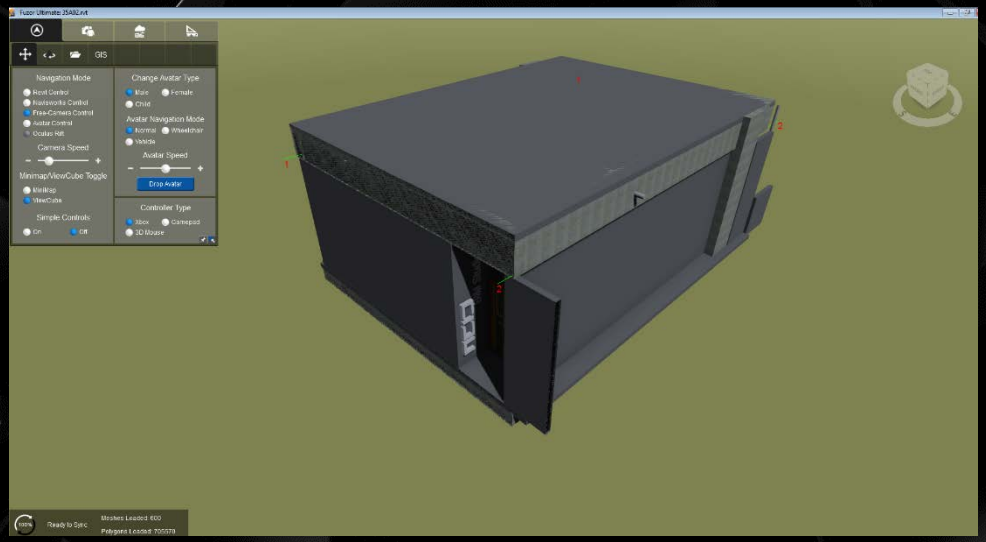

aconex
Model Stacks
HIM_VPFS_ARC + HIM_VPFS_Roof models
Explorer
Comments


aconex
Model Stacks
HIM_VPFS_ARC + HIM_VPFS_Roof models
Explorer
Comments


aconex
Model Stacks
HIM_VPFS_ARC + HIM_VPFS_Roof models
Explorer
Comments

Fuzor


GIS
Navigation Mode
Revit Control
Navisworks Control
Free-Camera Control
Avatar Control
Oculus Rift
Camera Speed
Minimap/ViewCube Toggle
Minimap
ViewCube
Simple Controls
On
Off
Change Avatar Type
Male
Female
Child
Avatar Navigation Mode
Normal
Wheelchair
Vehicle
Avatar Speed
Drop Avatar
Controller Type
Xbox
Gamepad
3D Mouse
Ready to Sync
Meshes Loaded: 800
Polygons Loaded: 705579


GIS
Navigation Mode
Revit Control
Navisworks Control
Free-Camera Control
Avatar Control
Oculus Rift
Camera Speed
Minimap/ViewCube Toggle
Minimap
ViewCube
Simple Controls
On
Off
Change Avatar Type
Male
Female
Child
Avatar Navigation Mode
Normal
Wheelchair
Vehicle
Avatar Speed
Drop Avatar
Controller Type
Xbox
Gamepad
3D Mouse
Ready to Sync
Meshes Loaded: 800
Polygons Loaded: 705579

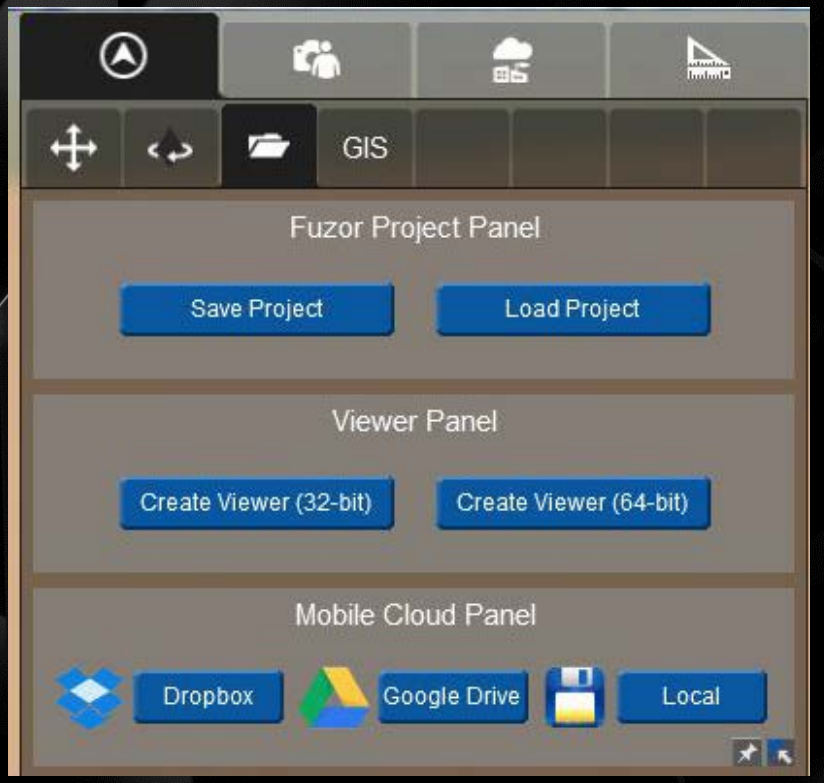
Fuzor


Fuzor Ultimate: 3SA02.rvt
HD Screenshot Settings
3840 x 2160
5760 x 3240
7680 x 4320
11520 x 6480
15360 x 8640
Take Screenshot
Cinematic Option
Take Cinematic
Walkthrough Video
Ready to Sync
Meshes Loaded: 600
Polygons Loaded: 705570

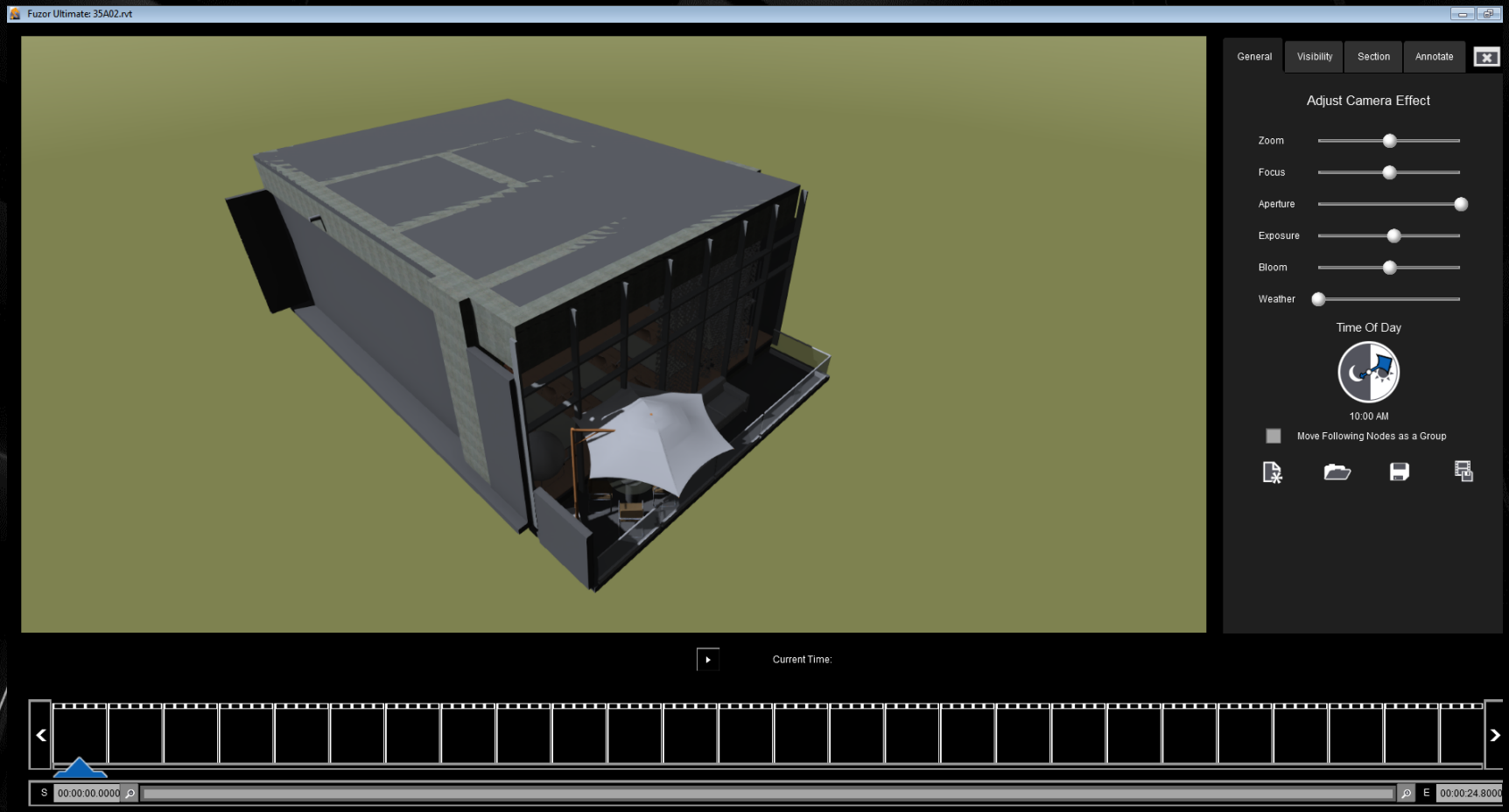
Fuzor


Adjust Camera Effect
Time Of Day


0.479 m
1.300 m
2.240 m


GIS
Fuzor Project Panel
Save Project
Load Project
Viewer Panel
Create Viewer (32-bit)
Create Viewer (64-bit)
Mobile Cloud Panel
Dropbox
Google Drive
Local

Fuzor

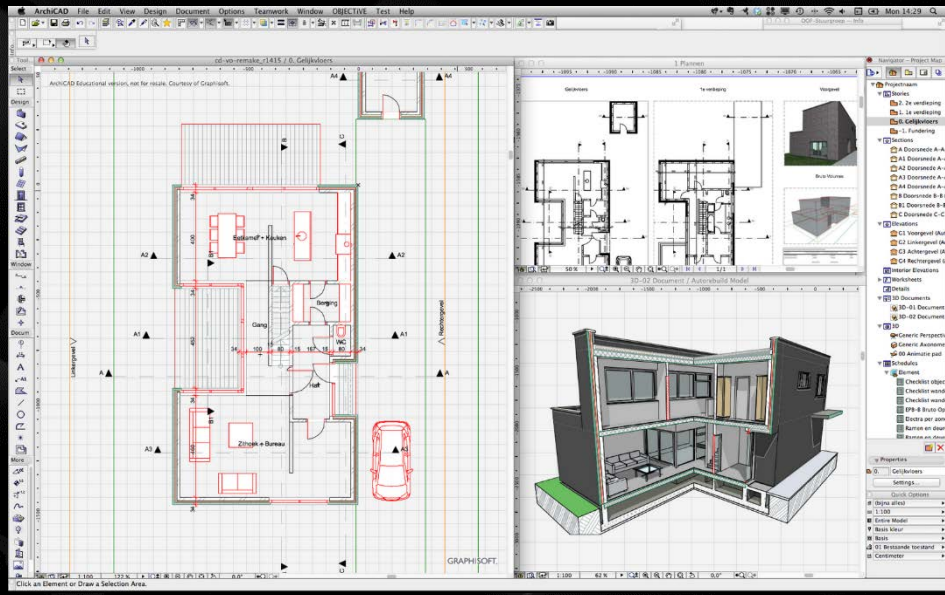

Fuzor Ultimate: 35A02.rvt
General
Visibility
Section
Annotate
Adjust Camera Effect
Zoom
Focus
Aperture
Exposure
Bloom
Weather
Time Of Day
10:00 AM
Move Following Nodes as a Group
Current Time:
S
00:00:00.0000
E
00:00:24.8000

Fuzor

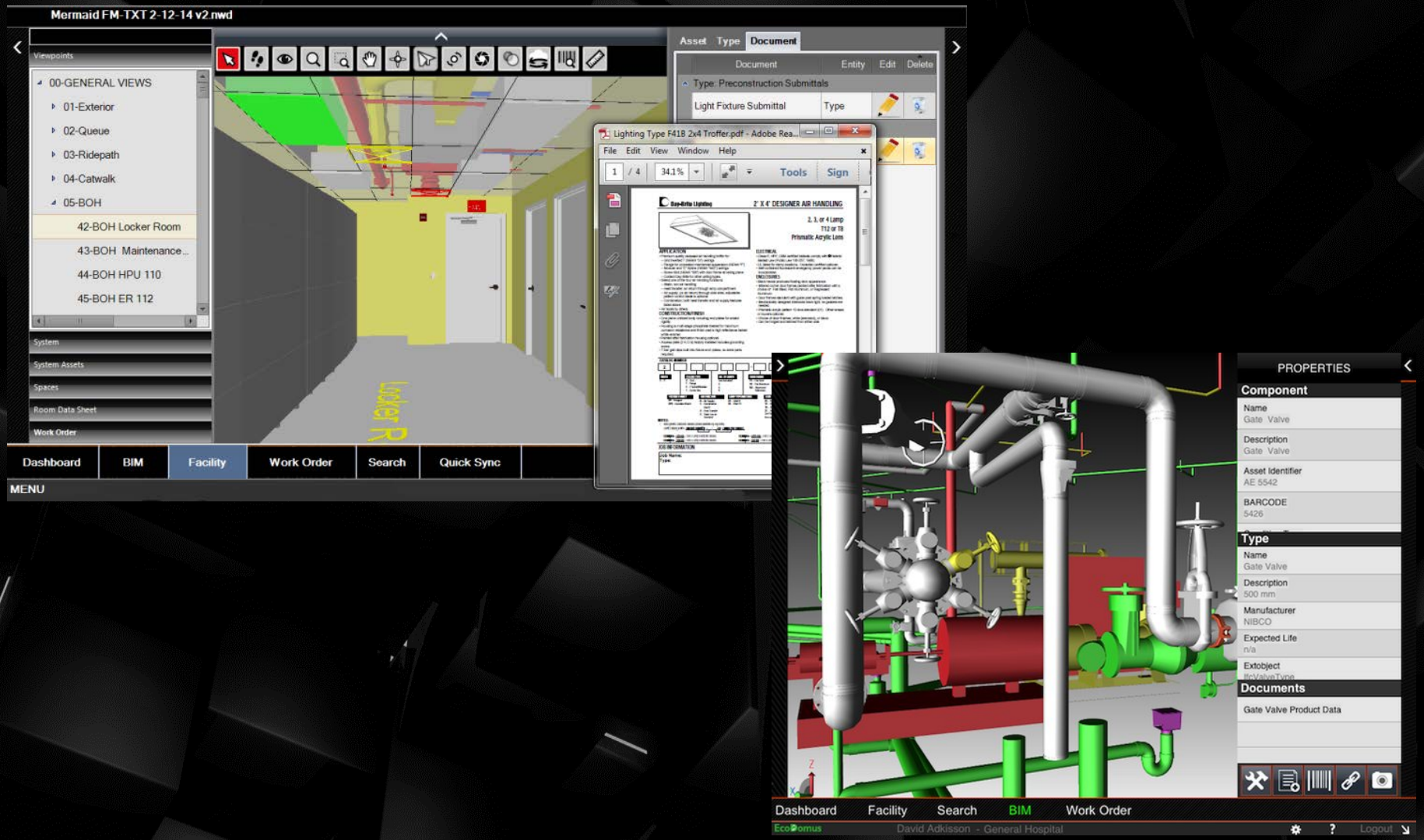

Avatar Customization
Fitness
Entourage Settings
Entourage Placement
Entourage Manager
Sedan Model
Male Business1
Male Business2
Element Properties
Annotation
Edit
0.370 m
4.270 m

BIMx


A-01.4 First floor
History
A-01.4 First floor
A-02.1 A1 Section
A-03.1 South Elevation
Favorites
History
Relevants
South Elevation


ArchiCAD
GRAPHISOFT

Ecodomus


Mermaid FM-TXT 2-12-14 v2.nwd
Viewpoints
00-GENERAL VIEWS
01-Exterior
02-Queue
03-Ridepath
04-Catwalk
05-BOH
42-BOH Locker Room
43-BOH Maintenance...
44-BOH HPU 110
45-BOH ER 112
System
System Assets
Spaces
Room Data Sheet
Work Order
Asset Type Document
Document Entity Edit Delete
Type: Preconstruction Submittals
Light Fixture Submittal Type
Lighting Type F418 2x4 Troffer.pdf - Adobe Rea...
File Edit View Window Help
Tools Sign
2' X 4' DESIGNER AIR HANDLING
Dashboard BIM Facility Work Order Search Quick Sync
MENU
PROPERTIES
Component
Name Gate Valve
Description Gate Valve
Asset Identifier AE 5542
BARCODE 5426
Type
Name Gate Valve
Description 500 mm
Manufacturer NIBCO
Expected Life n/a
Documents
Gate Valve Product Data
Dashboard Facility Search BIM Work Order
David Adkisson - General Hospital
Logout

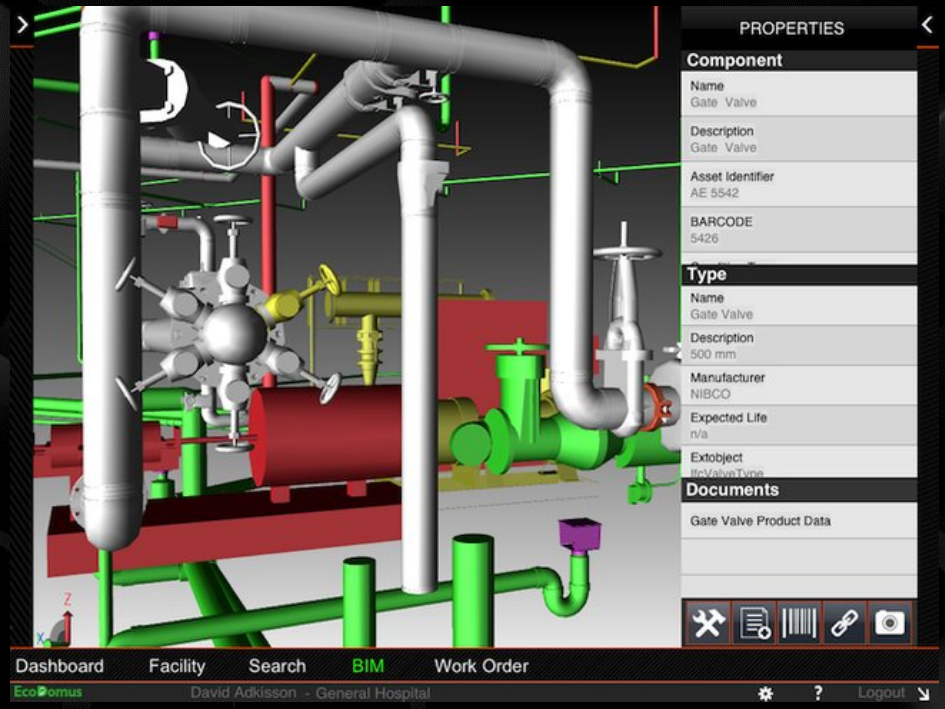
Ecodomus


Mermaid FM-TXT 2-12-14 v2.nwd
Viewpoints
00-GENERAL VIEWS
01-Exterior
02-Queue
03-Ridepath
04-Catwalk
05-BOH
42-BOH Locker Room
43-BOH Maintenance...
44-BOH HPU 110
45-BOH ER 112
System
System Assets
Spaces
Room Data Sheet
Work Order
Asset Type Document
Document Entity Edit Delete
Type: Preconstruction Submittals
Light Fixture Submittal Type
Lighting Type F418 2x4 Troffer.pdf - Adobe Rea...
File Edit View Window Help
Tools Sign
2' X 4' DESIGNER AIR HANDLING
Dashboard BIM Facility Work Order Search Quick Sync
MENU
LOGOUT


EcoDomus PM Desktop Client 1.5.8 - [Model Viewer]
Model Viewer
Properties

Ecodomus


Dashboard
Facility
Search
BIM
Work Order
Barcode
Demouser Demouser - Demo_House
Logout


PROPERTIES
Component
Name
Gate Valve
Description
Gate Valve
Asset Identifier
AE 5542
BARCODE
5426
Type
Name
Gate Valve
Description
500 mm
Manufacturer
NIBCO
Expected Life
n/a
Documents
Gate Valve Product Data
Dashboard
Facility
Search
BIM
Work Order
David Adkisson - General Hospital
Logout

Asset Information System