AUTODESK UNIVERSITY

Digital Twins with Autodesk and Unity

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Master in Construction Management

From drawing boards to the future

From where we came from and to where we are going

“BIM is a set of interacting policies, processes and technologies generating a methodology to manage the essential building design and project data in digital format throughout the building's life-cycle”

Source: Bilal Succar - 2018

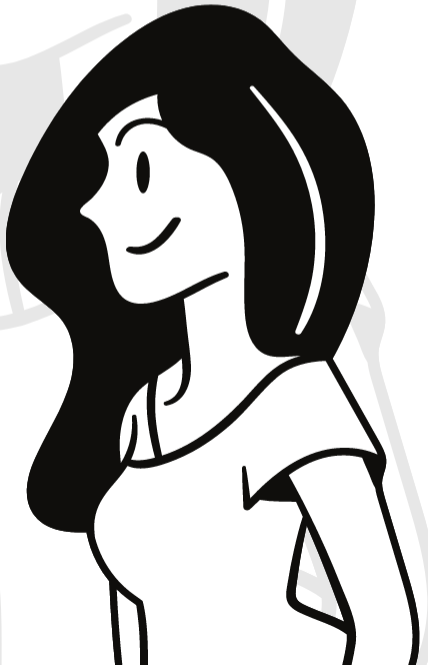
Internet of Things describes the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data

Source: https://www.oracle.com/br/internet-of-things/what-is-iot/

Augmented Reality/Virtual Reality Refers to computer-generated simulations that integrate the real world (AR) or are entirely self-contained (VR).

Source: https://www.pcmag.com/encyclopedia/term/arvr

Digital Twins



Definition

“A digital twin is a virtual representation of real-world entities and processes, synchronized at a specified frequency and fidelity.”

Digital Twin Consortium
(https://www.digitaltwinconsortium.org/glossary/index.htm#digital-twin)

Definition

“Digital Twins use real-time and historical data to represent the past and present and simulate predicted futures.”

Digital Twin Consortium
(https://www.digitaltwinconsortium.org/glossary/index.htm#digital-twin)

Definition

“Digital Twins are motivated by outcomes,

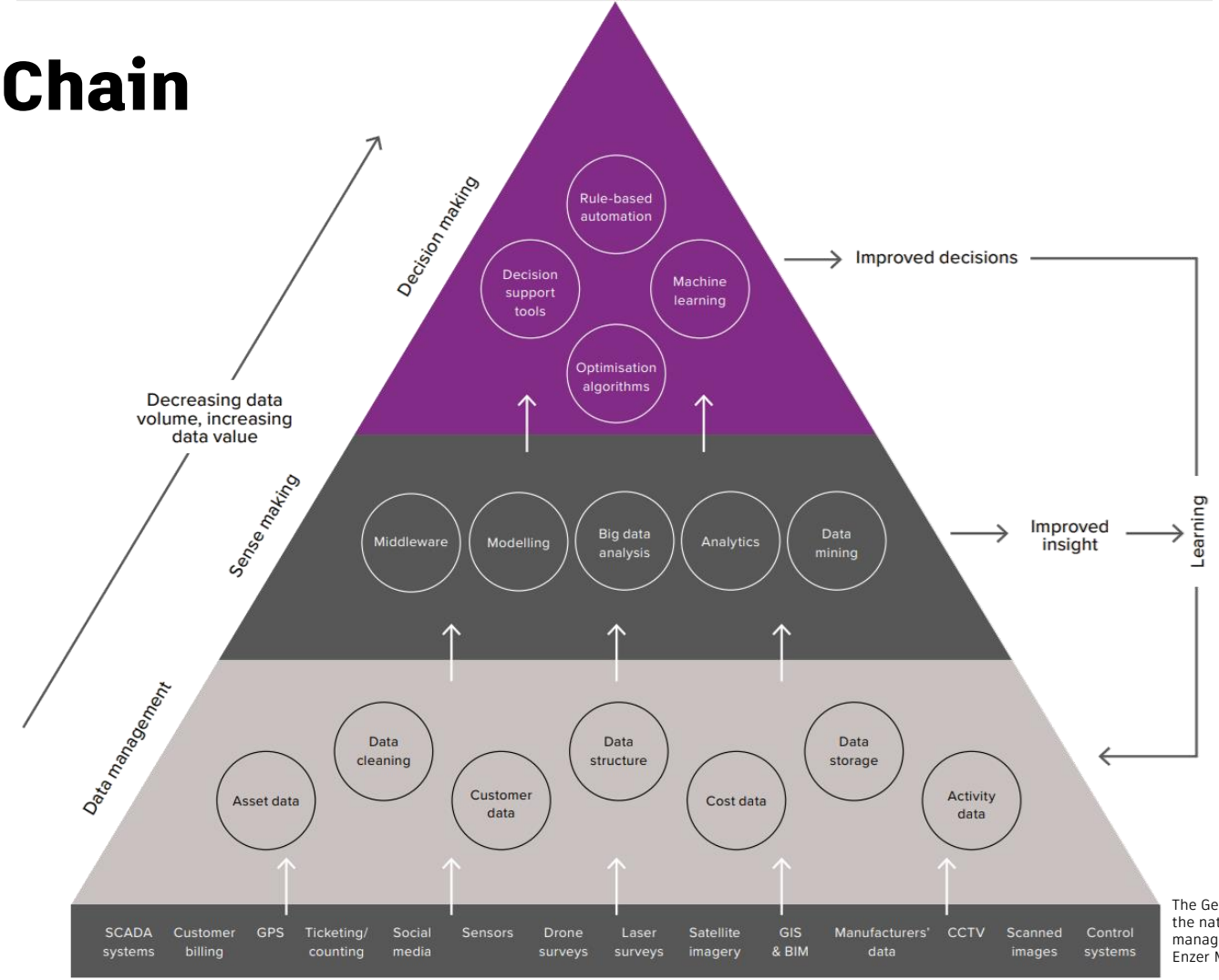
tailored to use cases, powered by integration,

built on data, guided by domain knowledge,

and implemented in IT/OT systems.”

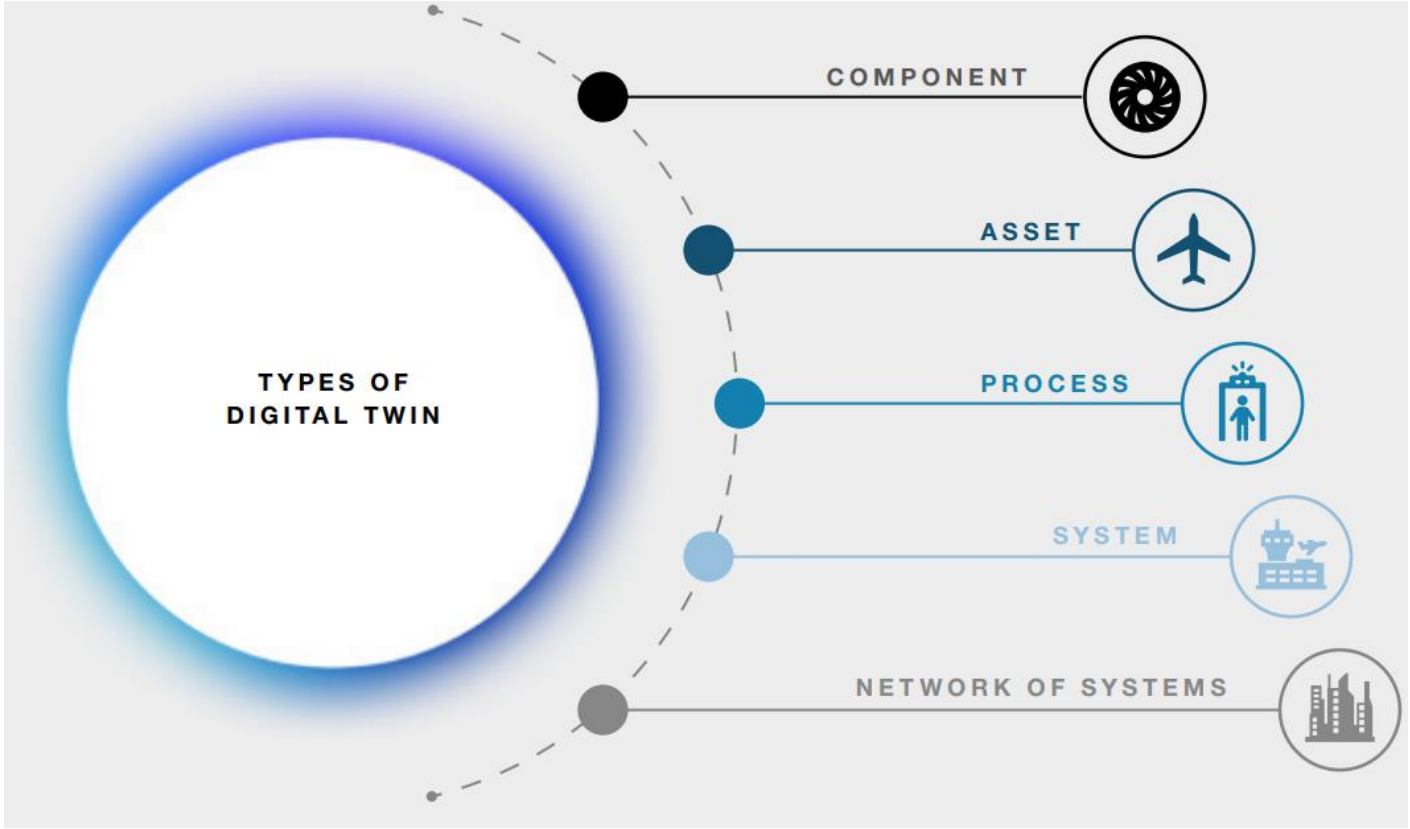
Digital Twin Consortium
(https://www.digitaltwinconsortium.org/glossary/index.htm#digital-twin)

Value Chain



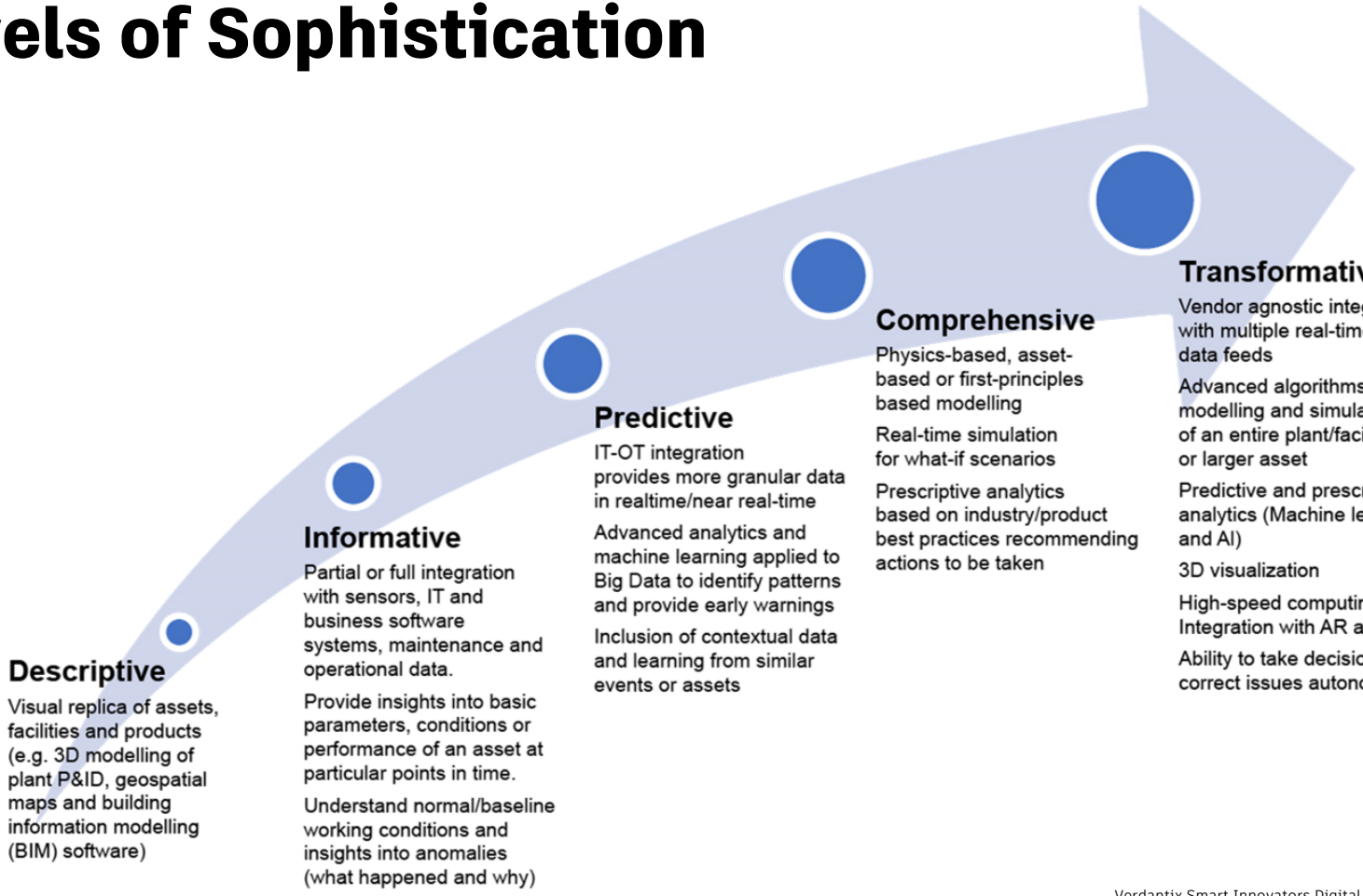
The Gemini Principles: Guiding values for the national digital twin and information management framework (2018) - Bolton A, Enzer M, Schooling J et al.

Types of Twins



Digital twin: towards a meaningful framework (ARUP)
(https://www.arup.com/perspectives/publications/research/section/digital-twin-towards-a-meaningful-framework)

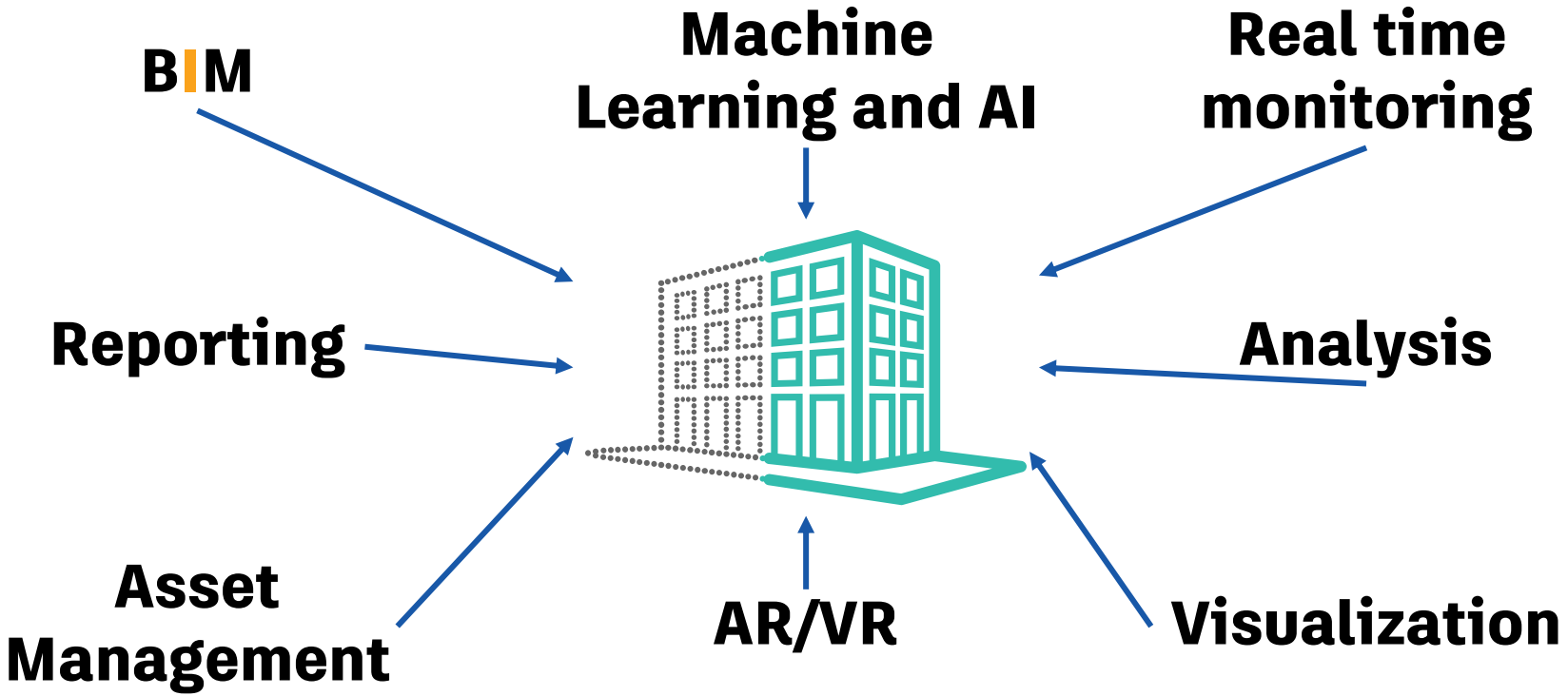
Levels of Sophistication



Verdantix Smart Innovators Digital Twins for Industrial Facilities (https://www.verdantix.com/newsroom/press-releases/verdantix-says-that-digital-twins-operate-at-five-different-levels-of-sophistication)

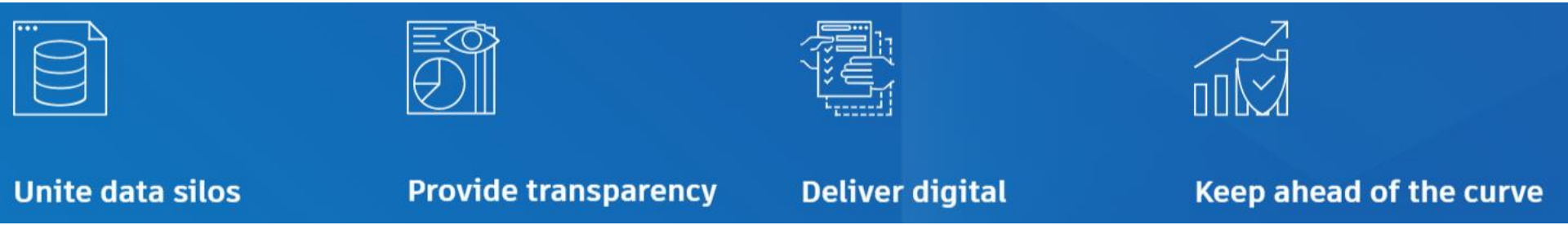
From A to the BIM to the Digital Twin

What we need to be focusing on right now



From A to the BIM to the Digital Twin

Key benefits: Design and Construction



From A to the BIM to the Digital Twin

Key benefits: Operations

Accelerate operational readiness

Operate through a single pane of glass

Insight across your portfolio

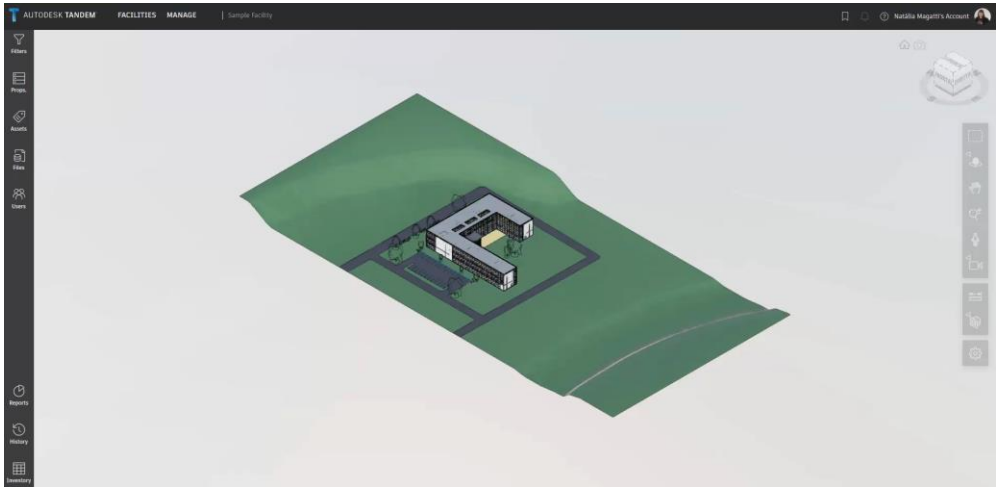
Future-proof your built asset

Ok, but… how?

Tandem

Autodesk

Autodesk Tandem is a **cloud-based digital twin technology platform**. It enables projects to **start digital and stay digital**, transforming rich data into business intelligence.



AUTODESK TANDEM™

Source: https://intandem.autodesk.com/ (text) | Speaker Files (video)

Tandem

Autodesk

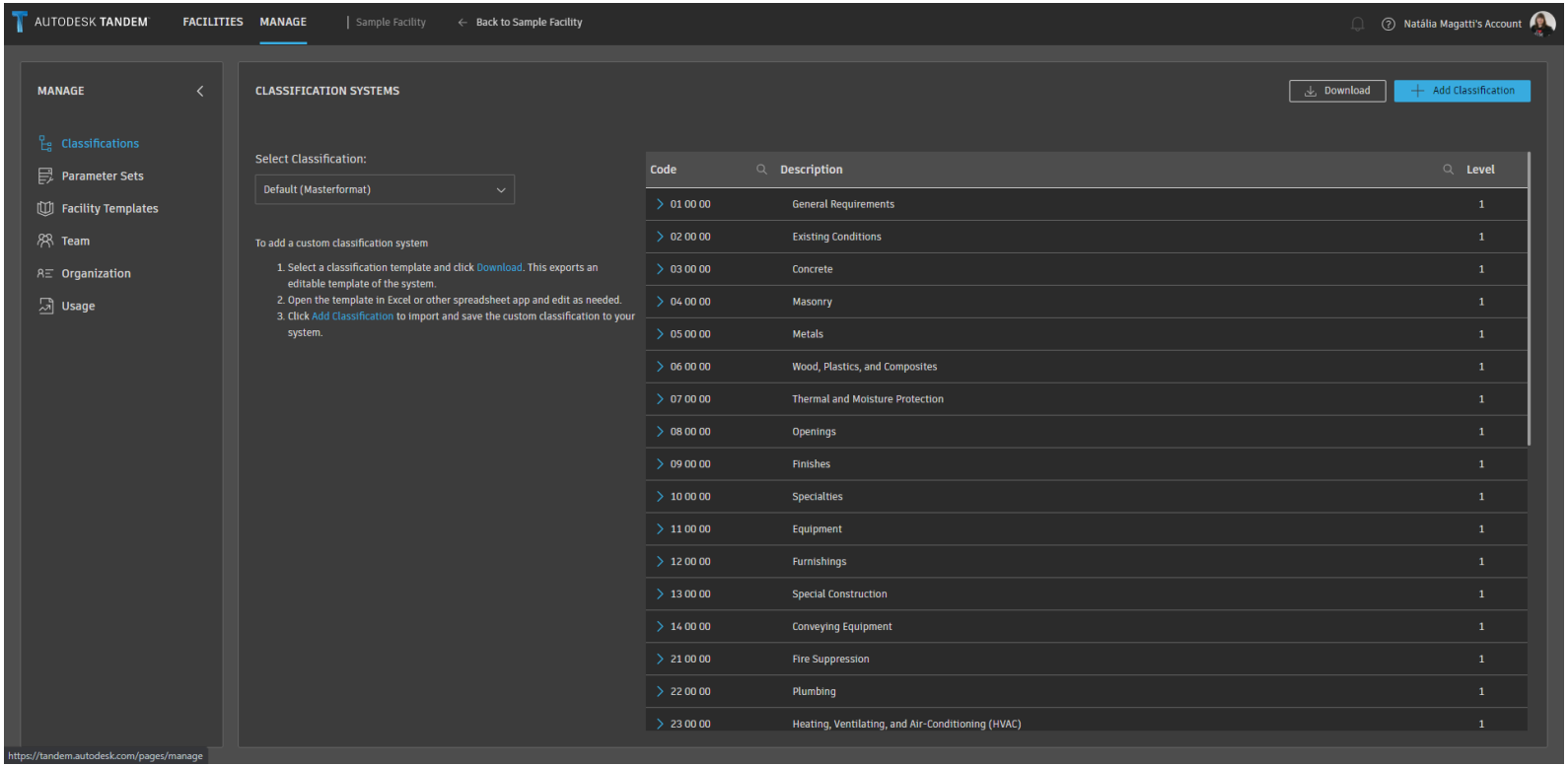
Unlimited number of facilities and users with up to 1,000 tagged assets.

With Facility Templates, your teams can either follow industry standards, use those standards as a starting point, or build their own.

With Autodesk Tandem, project teams can contribute to a single digital hub capturing required data for a digital handover.

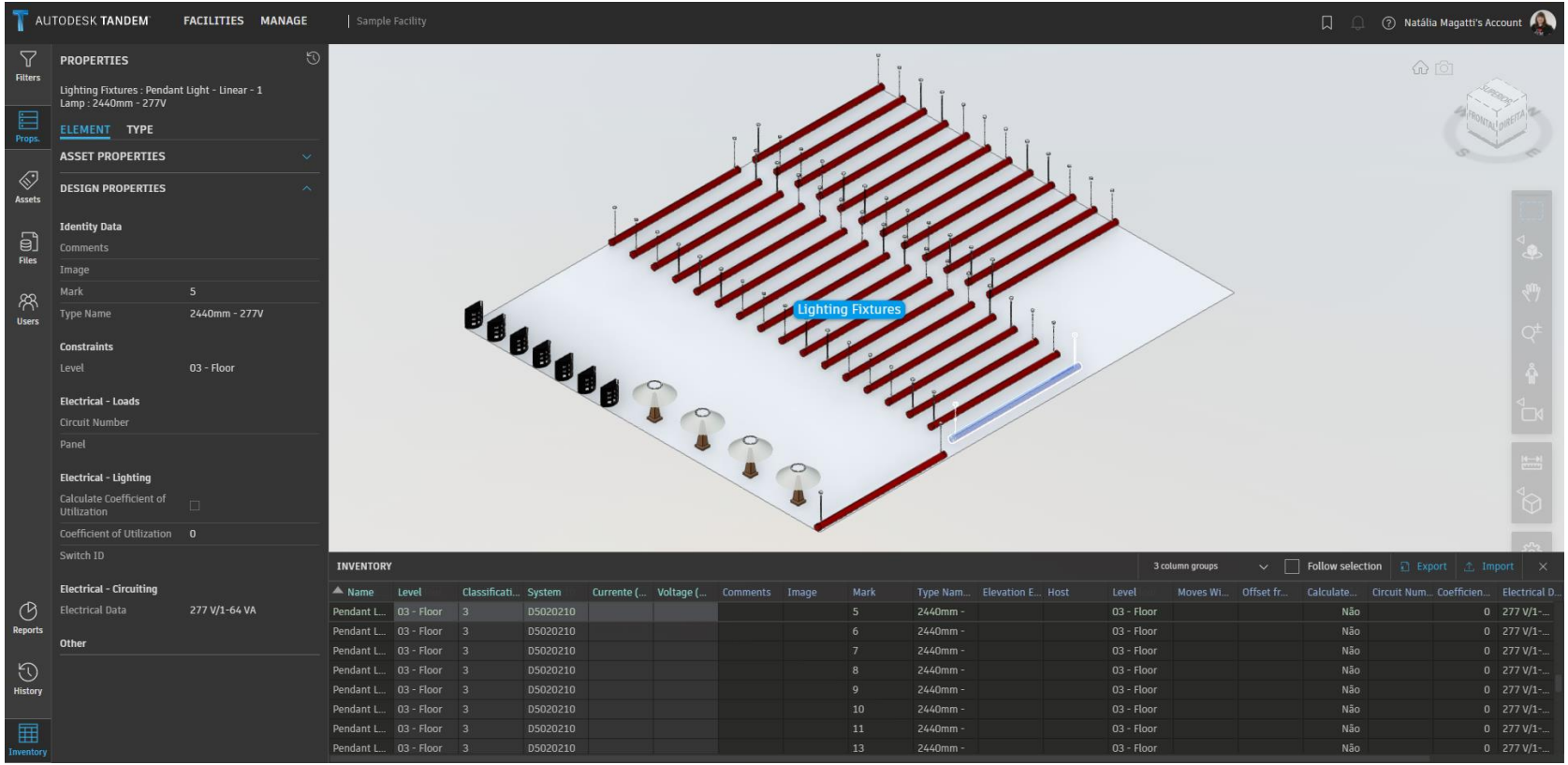
Tandem

Categories, Templates and Parameter sets



Tandem

Element Properties



Tandem

Visualization

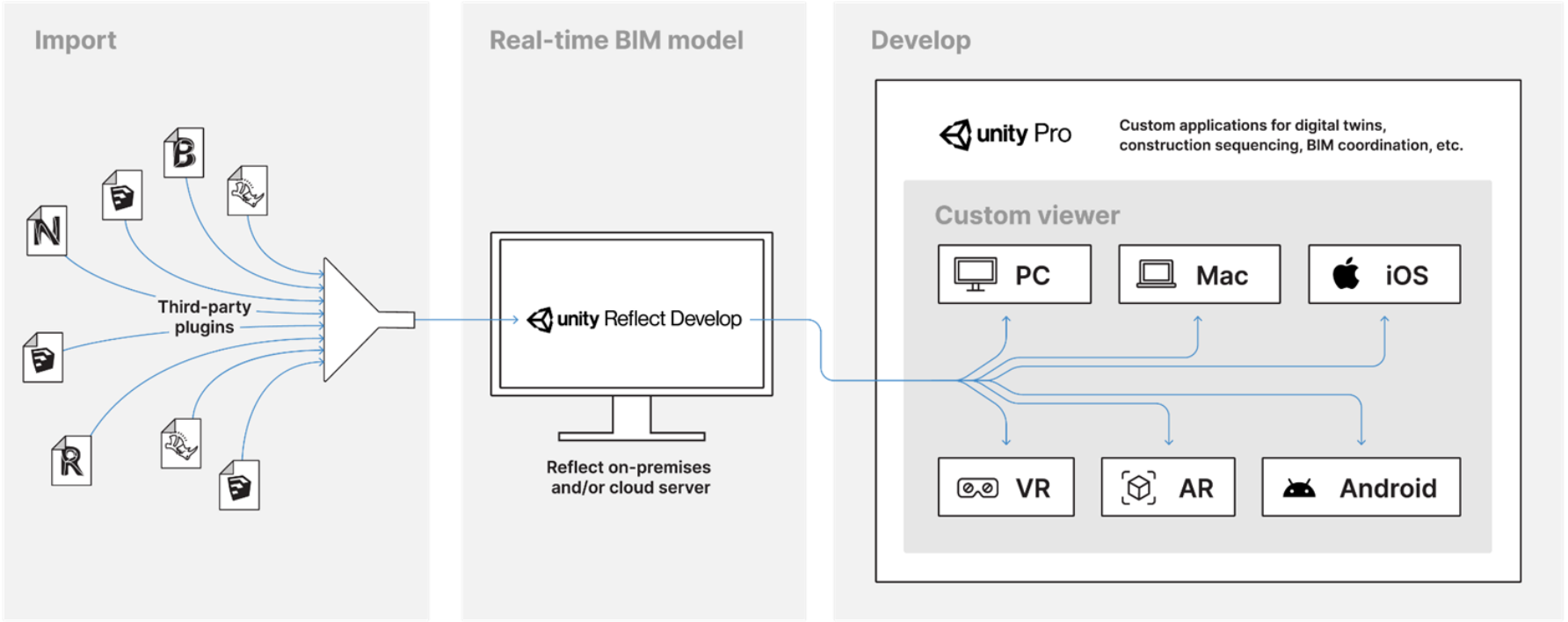

unity


unity
AUTODESK.

INTRODUCING

How it works

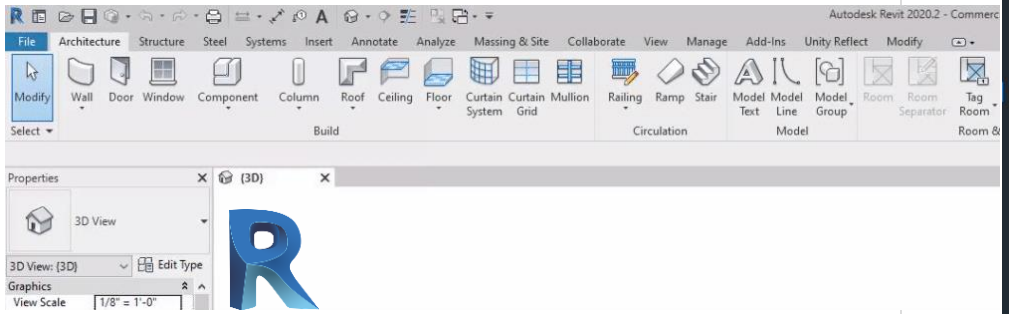
Unity Reflect + Unity Pro



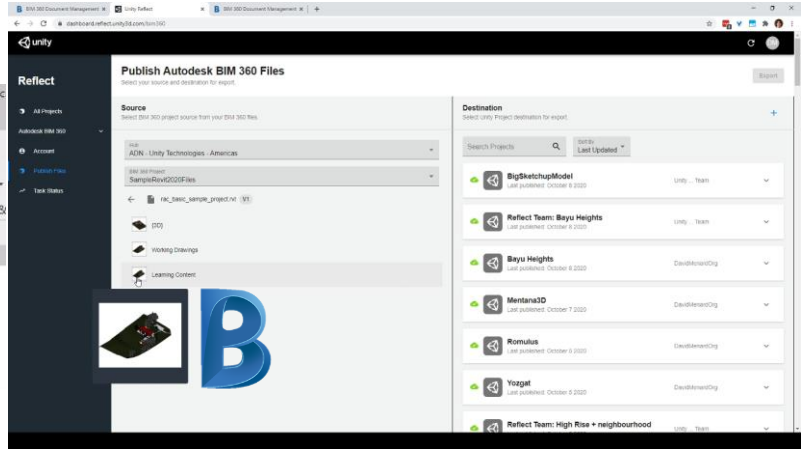
Connectivity

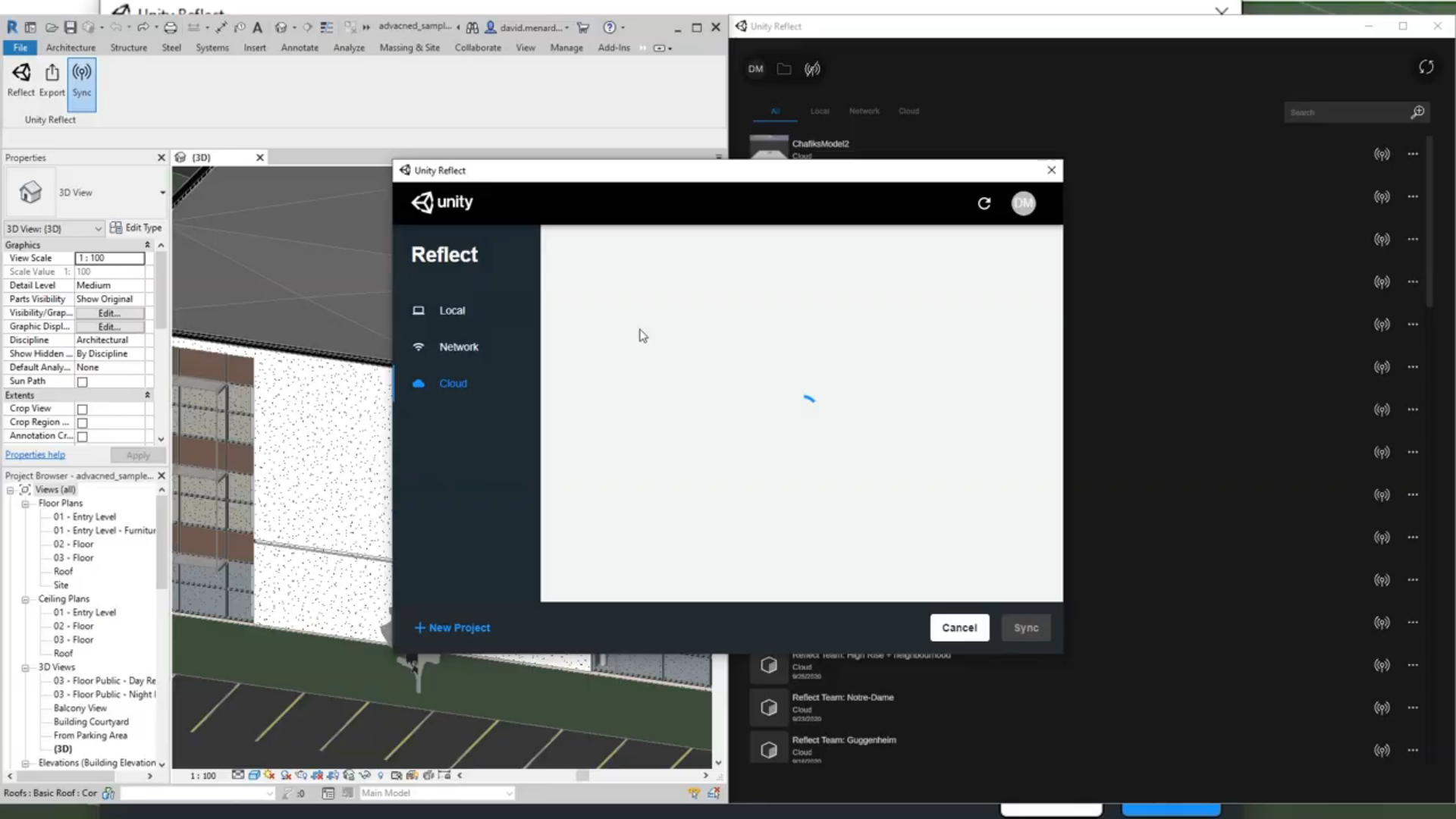
Autodesk plugins

Revit & Navisworks



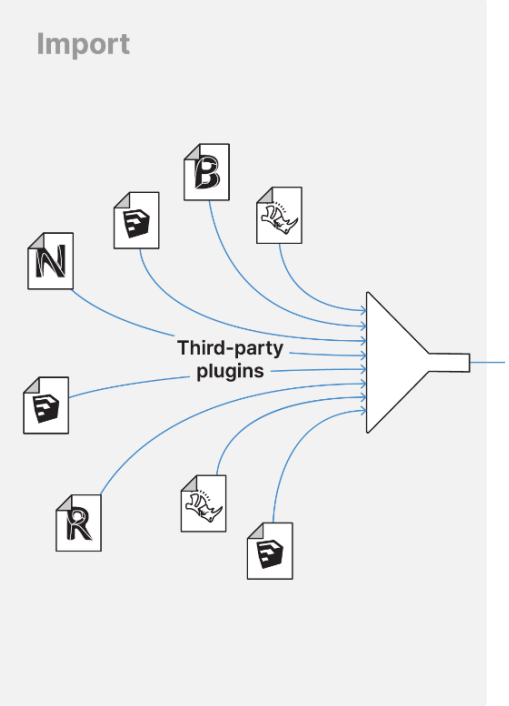
BIM 360 / Autodesk Docs

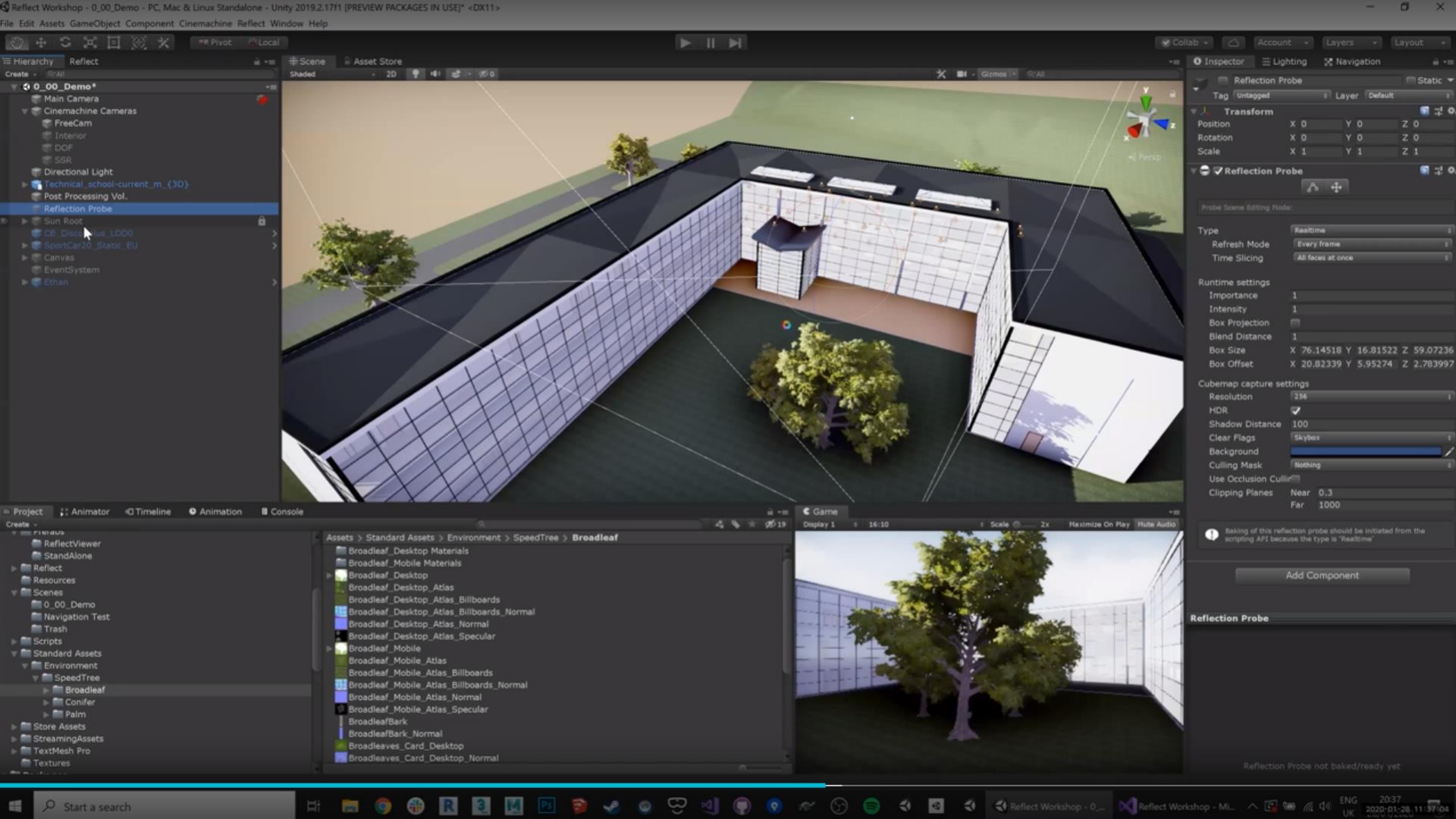


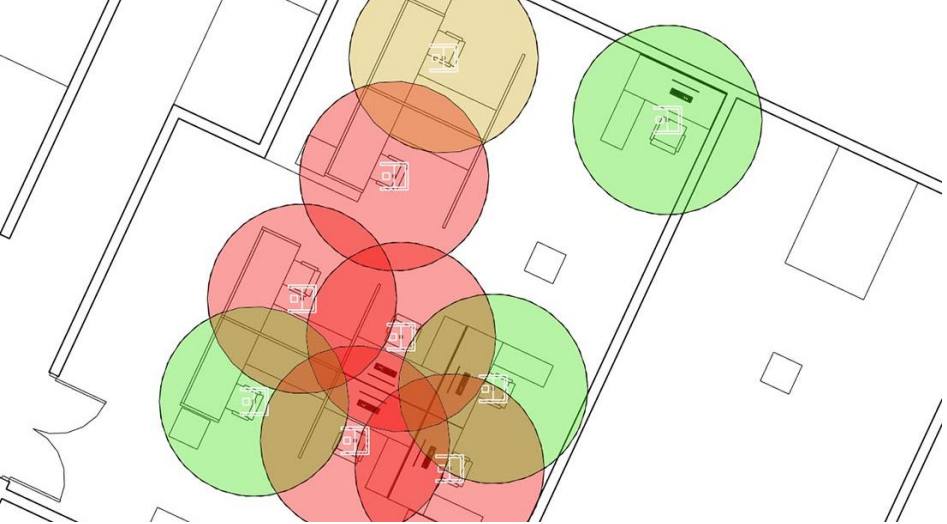

File
Architecture
Structure
Steel
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Reflect
Export
Sync
Unity Reflect
Properties
3D View
3D View: {3D}
Edit Type
Graphics
View Scale
1 : 100
Scale Value 1:
100
Detail Level
Medium
Parts Visibility
Show Original
Visibility/Grap...
Edit...
Graphic Displ...
Edit...
Discipline
Architectural
Show Hidden ...
By Discipline
Default Analy...
None
Sun Path
Extents
Crop View
Crop Region ...
Annotation Cr...
Properties help
Apply
Project Browser - advacned_sample...
Views (all)
Floor Plans
01 - Entry Level
01 - Entry Level - Furnitur
02 - Floor
03 - Floor
Roof
Site
Ceiling Plans
01 - Entry Level
02 - Floor
03 - Floor
Roof
3D Views
03 - Floor Public - Day Re
03 - Floor Public - Night
Balcony View
Building Courtyard
From Parking Area
{3D}
Elevations (Building Elevation
{3D}
1 : 100
Roofs : Basic Roof : Cor
Main Model
Unity Reflect
unity
DM
Reflect
Local
Network
Cloud
New Project
Cancel
Sync
Unity Reflect
DM
All
Local
Network
Cloud
Search
ChafiksModel2
Cloud
Reflect Team: Notre-Dame
Cloud
Reflect Team: Guggenheim
Cloud

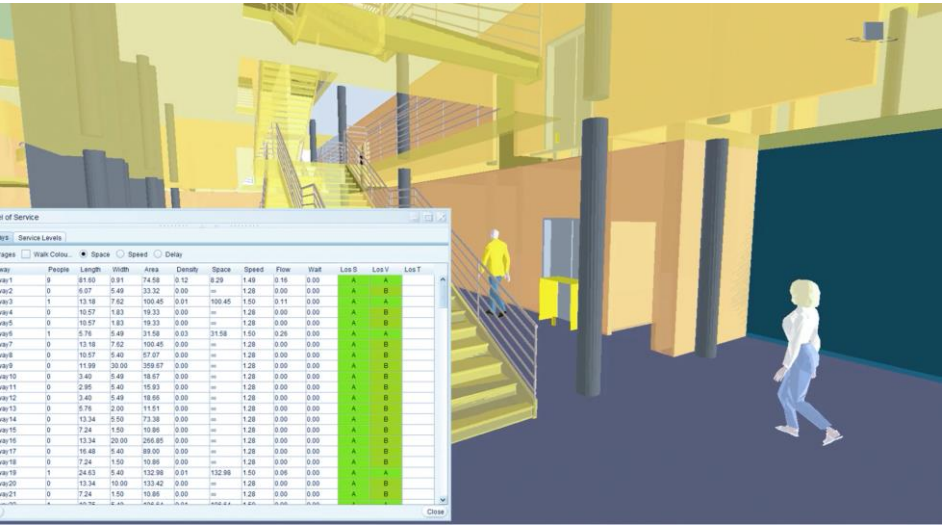
Unity Reflect w/o customization

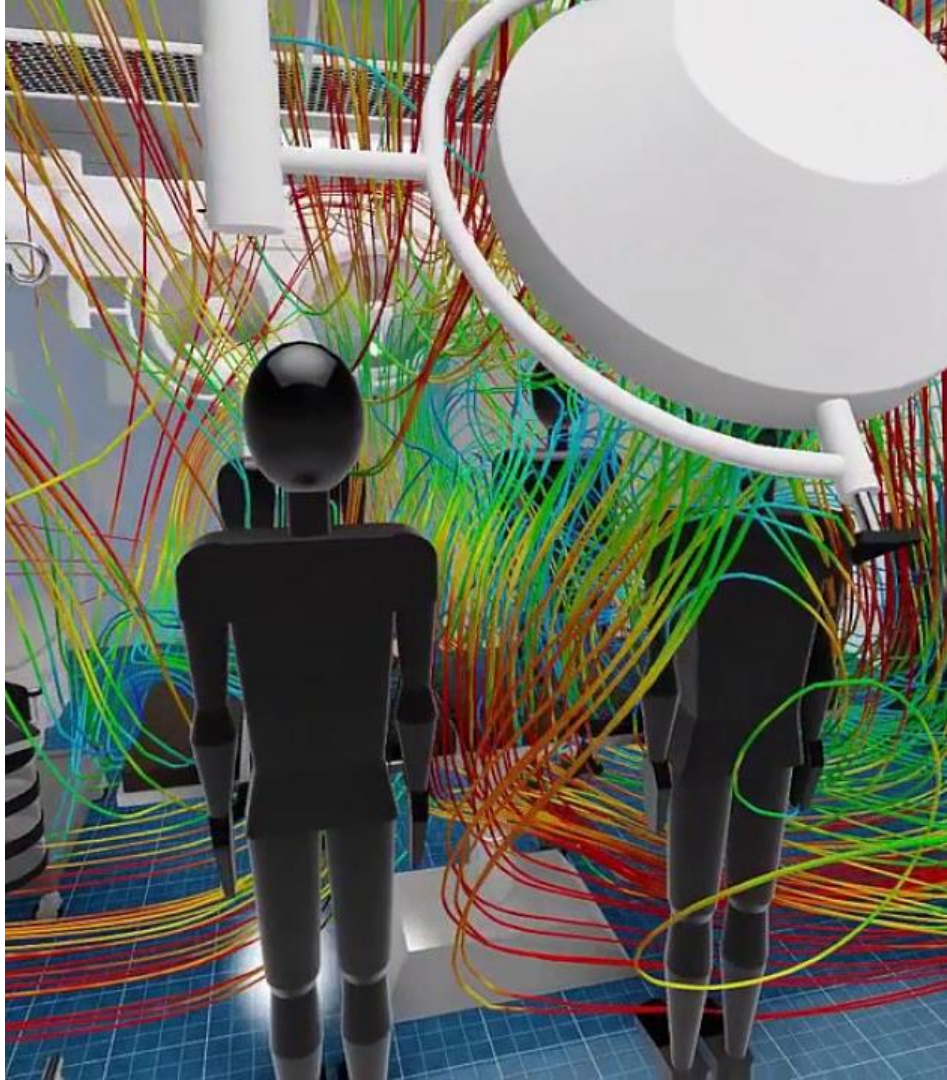
Augmented Reality




Reflect Workshop - 0_00_Demo - PC, Mac & Linux Standalone - Unity 2019.2.17f1 [PREVIEW PACKAGES IN USE]* <DX11>
File Edit Assets GameObject Component Cinemachine Reflect Window Help
Hierarchy
Reflect
Create
0_00_Demo*
Main Camera
Cinemachine Cameras
FreeCam
Interior
DOF
SSR
Directional Light
Technical_school-current_m_(3D)
Post Processing Vol.
Reflection Probe
Sun Root
Canvas
EventSystem
Ethan
Scene
Asset Store
Shaded
2D
Gizmos
Persp
Inspector
Lighting
Navigation
Reflection Probe
Static
Tag
Untagged
Layer
Default
Transform
Position
Rotation
Scale
Reflection Probe
Probe Scene Editing Mode:
Type
Realtime
Refresh Mode
Every frame
Time Slicing
All faces at once
Runtime settings
Importance
Intensity
Box Projection
Blend Distance
Box Size
X 76.14518 Y 16.81522 Z 59.07236
Box Offset
X 20.82339 Y 5.95274 Z 2.783997
Cubemap capture settings
Resolution
256
HDR
Shadow Distance
100
Clear Flags
Skybox
Background
Culling Mask
Nothing
Use Occlusion Culli
Clipping Planes
Near 0.3
Far 1000
Baking of this reflection probe should be initiated from the scripting API because the type is 'Realtime'
Add Component
Reflection Probe
Reflection Probe not baked/ready yet
Project
Animator
Timeline
Animation
Console
Create
ReflectViewer
StandAlone
Reflect
Resources
Scenes
0_00_Demo
Navigation Test
Trash
Scripts
Standard Assets
Environment
SpeedTree
Broadleaf
Conifer
Palm
Store Assets
StreamingAssets
TextMesh Pro
Textures
Assets > Standard Assets > Environment > SpeedTree > Broadleaf
Broadleaf_Desktop Materials
Broadleaf_Mobile Materials
Broadleaf_Desktop
Broadleaf_Desktop_Atlas
Broadleaf_Desktop_Atlas_Billboards
Broadleaf_Desktop_Atlas_Billboards_Normal
Broadleaf_Desktop_Atlas_Normal
Broadleaf_Desktop_Atlas_Specular
Broadleaf_Mobile
Broadleaf_Mobile_Atlas
Broadleaf_Mobile_Atlas_Billboards
Broadleaf_Mobile_Atlas_Billboards_Normal
Broadleaf_Mobile_Atlas_Normal
Broadleaf_Mobile_Atlas_Specular
BroadleafBark
BroadleafBark_Normal
Broadleaves_Card_Desktop
Broadleaves_Card_Desktop_Normal
Game
Display 1
16:10
Scale
2x
Maximize On Play
Mute Audio
Start a search
ENG
UK
2037
2020-01-28




Service Levels
Space
Speed
Delay
Close



Digital Twin – Sensors (IoT)

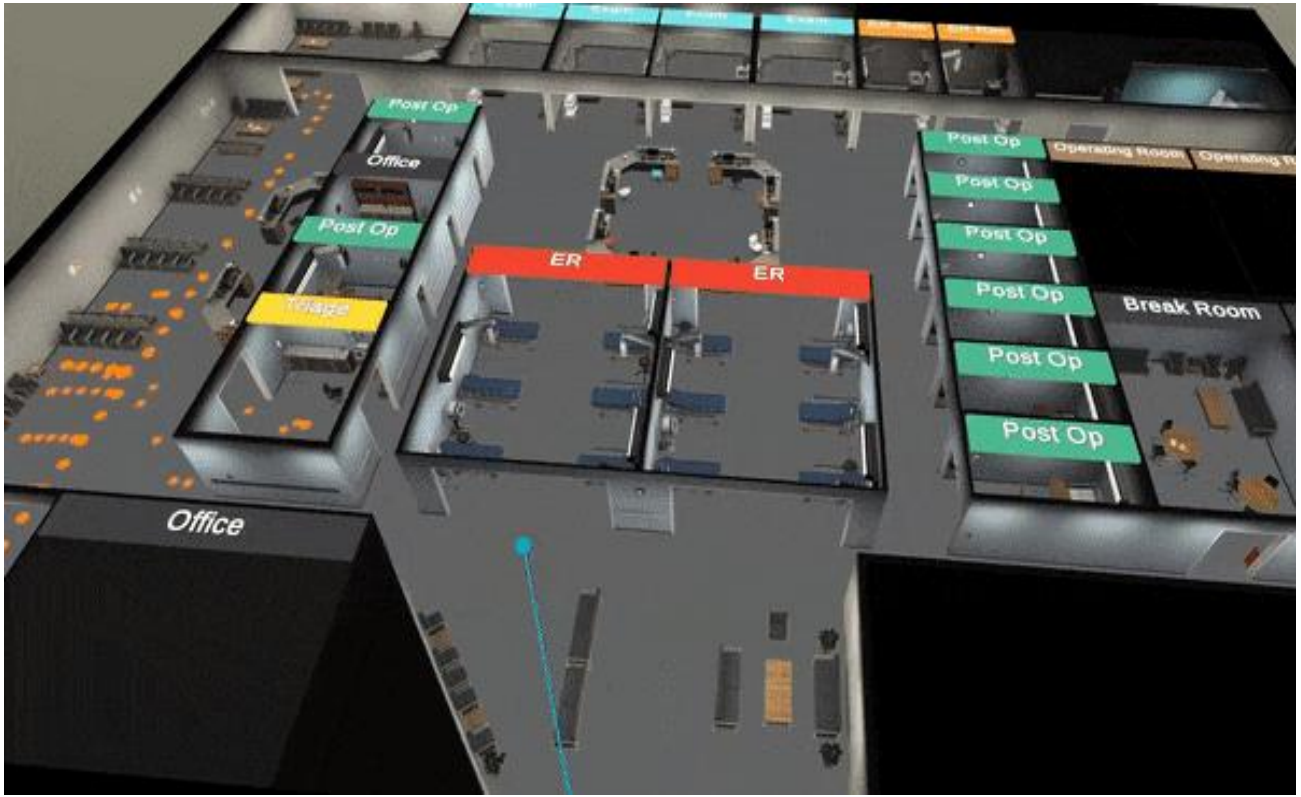
i.e.: Schineider HQ – AEC Collection + Forge

Digital Twin – CFD & BI

i.e.: Booz Allen Hamilton – Autodesk Assets + Unity Reflect + Unity Pro

Digital Twin – AI + Budgeting

i.e.: Booz Allen Hamilton – Autodesk Assets + Unity Reflect + Unity Pro



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