

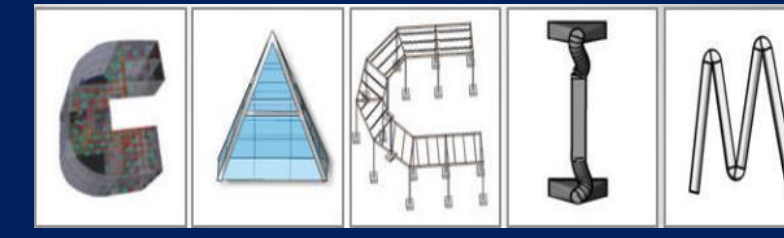


Blueprint for Digital Twin Implementation at UF Campus



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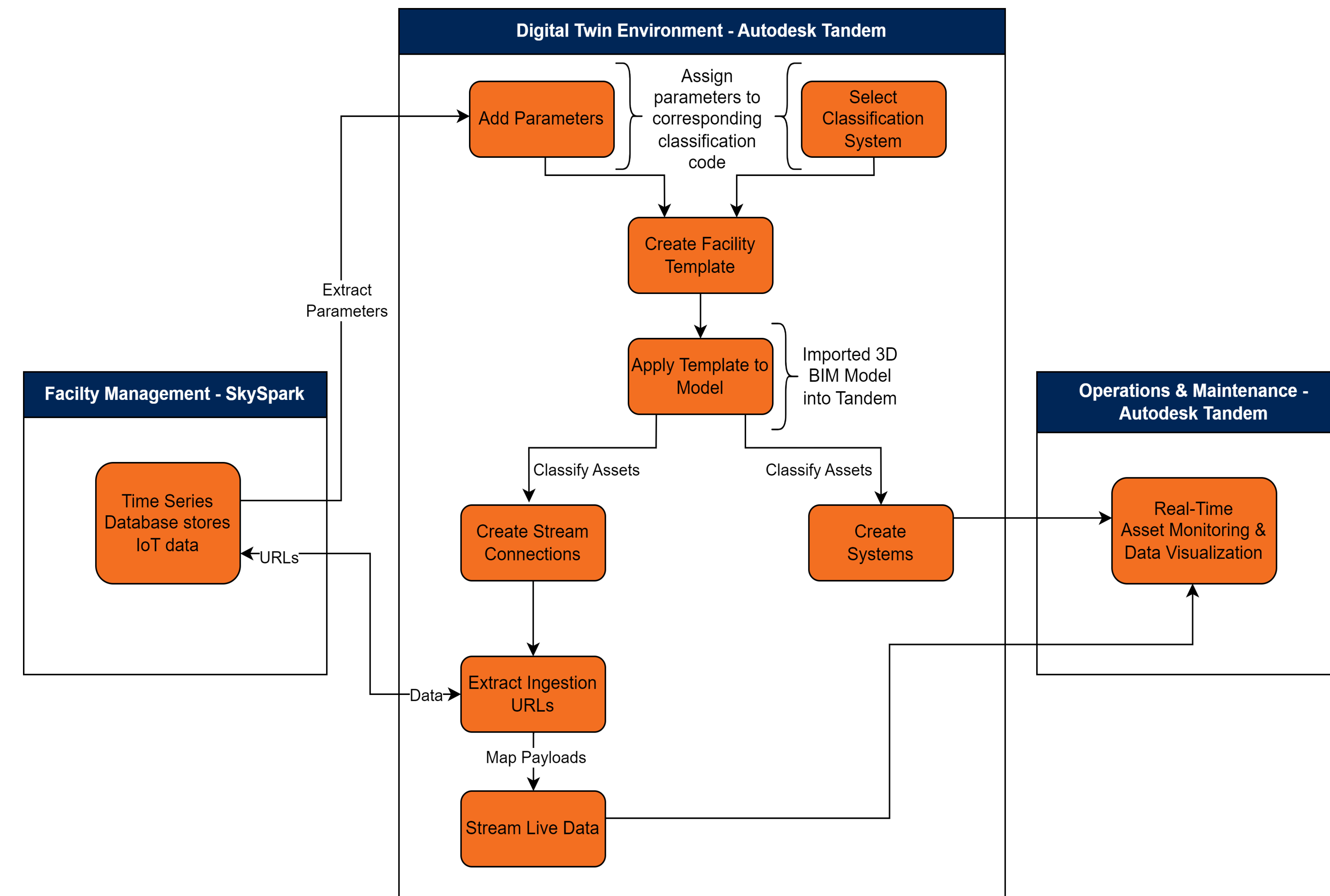
Background

- Digital Twin is defined as a digital replica of a real-world asset. (Segovia & Garcia-Alfaro, 2022)
- CoClass, Uniclass, and OmniClass are classification systems that are suitable for use during the facility management phase due to their faceted structure, functional grouping approach, adherence to open standards, and alignment with international standards. (Kula & Ergen, 2018).
- Operations and maintenance is the longest and most resource-consuming phase of the building lifecycle, accounting for 65% of annual facility management costs (Eastman et al., 2011).
- Asset tracking provides detailed insight on equipment performance, better fix/replace decision making, as well as real-time access to building asset documentation: O&M manuals, cut sheets, warranty tracking, etc.

Objectives

- Select an asset classification system suitable for facility management.
- Integrate SkySpark data points as parameters in Autodesk Tandem, using facility management naming convention.
- Create a scalable facility template for DT implementation throughout all buildings on UF campus.
- Apply the template to create a Status Twin for Heavener Hall.

Implementation Workflow



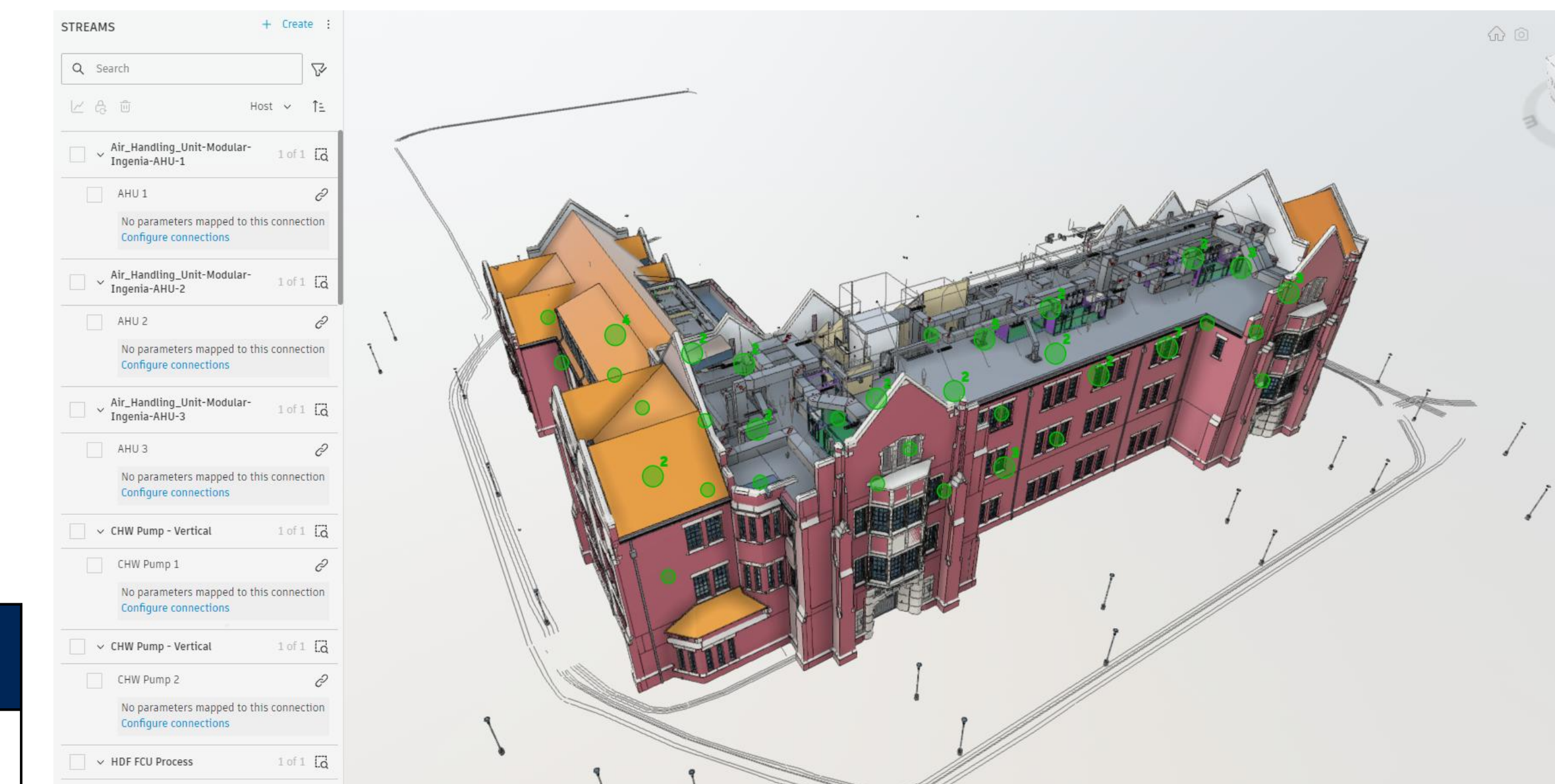
Grouping	Time Series Data Points
0065 - HEAVENER HALL - Dev5075	CHW Temp
0065 - HEAVENER HALL - Dev5075	CHW Vlv %
0065 - HEAVENER HALL - Dev5075	Cool Coil DAT
0065 - HEAVENER HALL - Dev5075	Cool Coil DAT SP
0065 - HEAVENER HALL - Dev5075	DAP
0065 - HEAVENER HALL - Dev5075	DAP SP
0065 - HEAVENER HALL - Dev5075	DAT
0065 - HEAVENER HALL - Dev5075	EAD Status
0065 - HEAVENER HALL - Dev5075	EAT
0065 - HEAVENER HALL - Dev5075	EF Current
0065 - HEAVENER HALL - Dev5075	EF Power (instant kW)
0065 - HEAVENER HALL - Dev5075	EF Spd
0065 - HEAVENER HALL - Dev5075	EF Status
0065 - HEAVENER HALL - Dev5075	EF Voltage
0065 - HEAVENER HALL - Dev5075	OA Hum
0065 - HEAVENER HALL - Dev5075	OAD %
0065 - HEAVENER HALL - Dev5075	OAT
0065 - HEAVENER HALL - Dev5075	PHT DAT
0065 - HEAVENER HALL - Dev5075	PHT DAT SP
0065 - HEAVENER HALL - Dev5075	PHT Vlv %
0065 - HEAVENER HALL - Dev5075	RAD Status
0065 - HEAVENER HALL - Dev5075	RH Vlv %

Time Series Data Points in SkySpark

Name	Category	Data Type	Unit
Chilled Water Temperature (AHU)	HVAC	Number	*F > Temperature
Chilled Water Valve Position (AHU)	HVAC	Number	% > Factor
Cool Coil Discharge Air Temperature (AHU)	HVAC	Number	*F > Temperature
Cool Coil Discharge Air Temperature Set Point (AHU)	HVAC	Number	*F > Temperature
Discharge Air Pressure (AHU)	HVAC	Number	In-wg > Pressure
Discharge Air Temperature (AHU)	HVAC	Number	*F > Temperature
Discharge Pressure Air Set Point (AHU)	HVAC	Number	In-wg > Pressure
Effective Discharge Air Pressure Set Point (AHU)	HVAC	Number	In-wg > Pressure
Exhaust Air Damper Status (AHU)	HVAC	Number	
Exhaust Air Filter Differential Pressure (AHU)	HVAC	Number	In-wg > Pressure
Exhaust Air Humidity (AHU)	HVAC	Number	%RH > Factor
Exhaust Air Temperature (AHU)	HVAC	Number	*F > Temperature
Exhaust Fan Current (AHU)	HVAC	Number	A > Current
Exhaust Fan Power (AHU)	HVAC	Number	KW > Power
Exhaust Fan Speed (AHU)	HVAC	Number	% > Factor
Exhaust Fan Status (AHU)	HVAC	Number	
Exhaust Fan Voltage (AHU)	HVAC	Number	V > Electrical Potential
Filter Differential Pressure (AHU)	HVAC	Number	In-wg > Pressure
Heat Recovery Unit (AHU)	HVAC	Number	% > Factor

Asset Parameters in Autodesk Tandem

Results



Data Streams Setup – Autodesk Tandem



Asset Classification and Live Data Streams – Autodesk Tandem

Conclusion

Digital Twins have the capability to provide comprehensive real-time data, 3D visual models, and inventory management to assist in guiding community initiatives and enabling data-driven decision-making for facility management personnel. This template is to serve as a guide for implementing Digital Twins at a campus or city level.

References

- Kula, Behlul & Ergen, Esin. (2018). Review of Classification Systems for Facilities Management.
- Segovia, M.; Garcia-Alfaro, J. Design, Modeling and Implementation of Digital Twins. Sensors2022,22,5396. <https://doi.org/10.3390/s22145396>
- Eastman, C. M. (1999). Building Product Models: Computer Environments, Supporting Design and Construction. CRC Press: Boca Raton, FL, USA.