Digital Twins and Smart Buildings

Create Smart, Sustainable and Healthy Buildings

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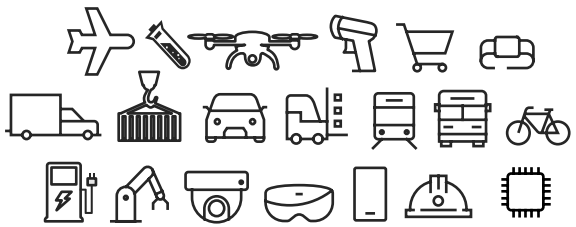
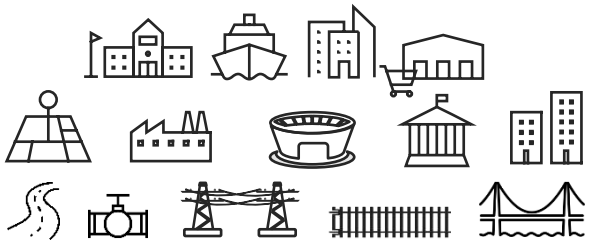
DIGITAL TWINS – FUSING PHYSICAL AND DIGITAL

A digital twin is a digital replica of a living or non-living physical entity

Physical World





Digital World

Data	Control		Data	Control		Data	Control
Things			**Places**			**People**	
Systems		→	**Context**		→	**Processes**	
Operations			**Insights**			**Experiences**	
Measure	Insight, Optimization		Measure	Insight, Optimization		Measure	Assistance, Task Completion

- Remote monitoring
- Fault detection
- Diagnostics & auditing
- Predictive maintenance

- Flow optimization
- Occupancy & utilization
- Space advise and analytics
- Asset tracking

- Employee, frontline worker, fan experience
- Productivity, comfort, satisfaction
- Location, wayfinding (indoor & outdoor)
- Mixed reality & cognition

Example Data Layers in a Building Digital Twin

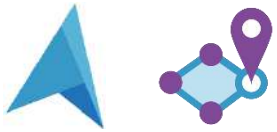
A complete **digital twin** solution is a data integrator that combines rich and complex data from a wide variety of sources into a consistent model that covers:

IoT Data

- Endpoint devices such as appliances, vehicles, or factory machines that connect, interact and exchange data
- Devices that aggregate, process & provide gateway capabilities for IoT endpoints

Structure

- Industry and domain specific ontologies
- Topology of modeled entities interconnected as a graph
- Brought to life with real time data from sensors and other data sources
- Always up to date representation of operational state



Geometry

- Abstract geometry e.g. maps
- 2D/3D design geometry e.g. CAD, BIM
- Real geometry e.g. Spatial anchors for AR/MR applications, spatial reconstruction scans

Behaviour

- Physics models - enabling simulation, using a model to study the behavior and performance of a system under different physical conditions and constraints
- Heuristic models – enabling advanced forecasting and optimization
- Deep reinforcement learning

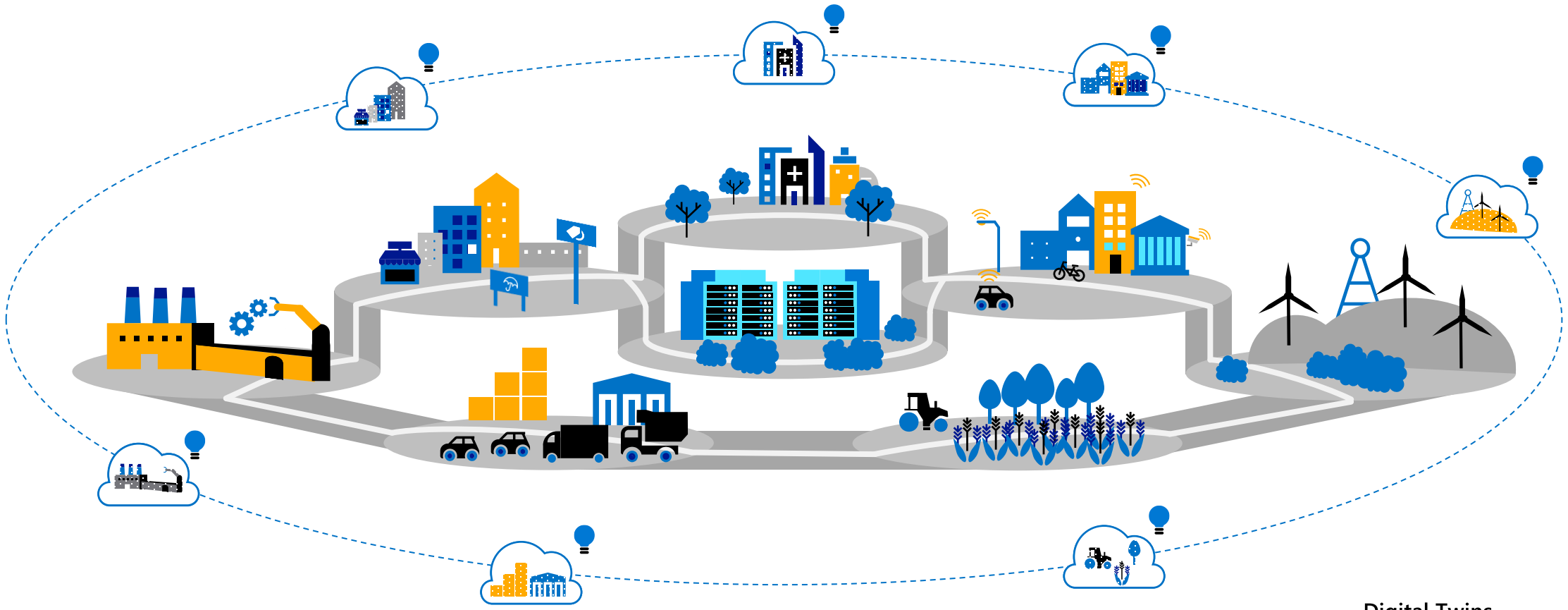
Time

- Data history - capture and process time series data for all signals flowing though and being processed by the model
- Topological history - capture how the structure and topology of the model evolves over time, with the ability to replay any part of this evolution

Business Data

- Information stored in traditional LOB systems (systems of record)
- People and business processes
- Live connections (vs. static imports)

Digital innovation is enabling new opportunities



Cloud
Globally available, unlimited compute resources

IoT
Harnessing signals from sensors and devices, managed centrally by the cloud

Edge
Intelligence offloaded from the cloud to IoT devices

AI
Breakthrough intelligence capabilities, in the cloud and on the edge

Digital Twins
Create living replicas of any physical environment, track the past and predict the future

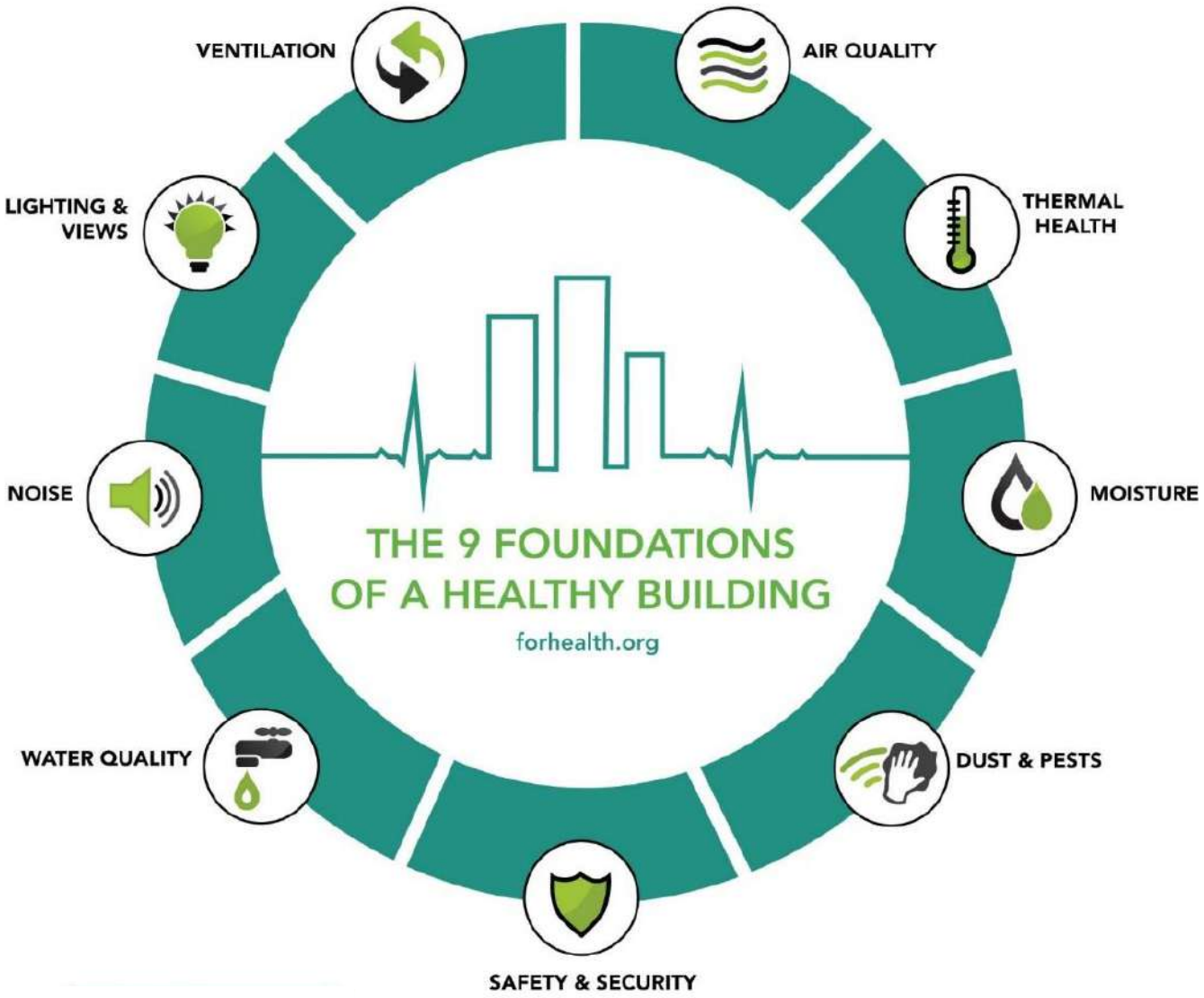
NA

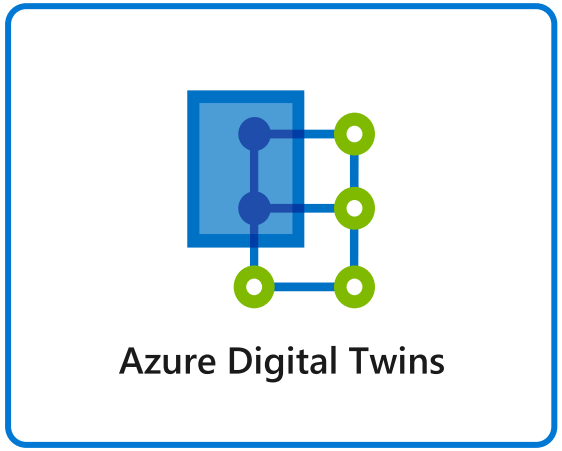
Business Driving Smart Places

Smart Places Drivers	
Sustainability	Most enterprise customers have sustainability targets and initiatives to reduce energy consumption and manage energy costs
Reduce Costs	Customers are always looking for opportunities to reduce costs associated with operating and maintaining real estate assets
Workplace	Modern, welcoming and healthy workplaces are needed to recruit and retain the best talent
Brand	Building to impress, to make a statement about your company and what you stand for

Working with leading partners around the world on how to ensure buildings are healthy in the COVID19 era

Employers have a responsibility to show their employees that their workplaces are healthy and safe places to be



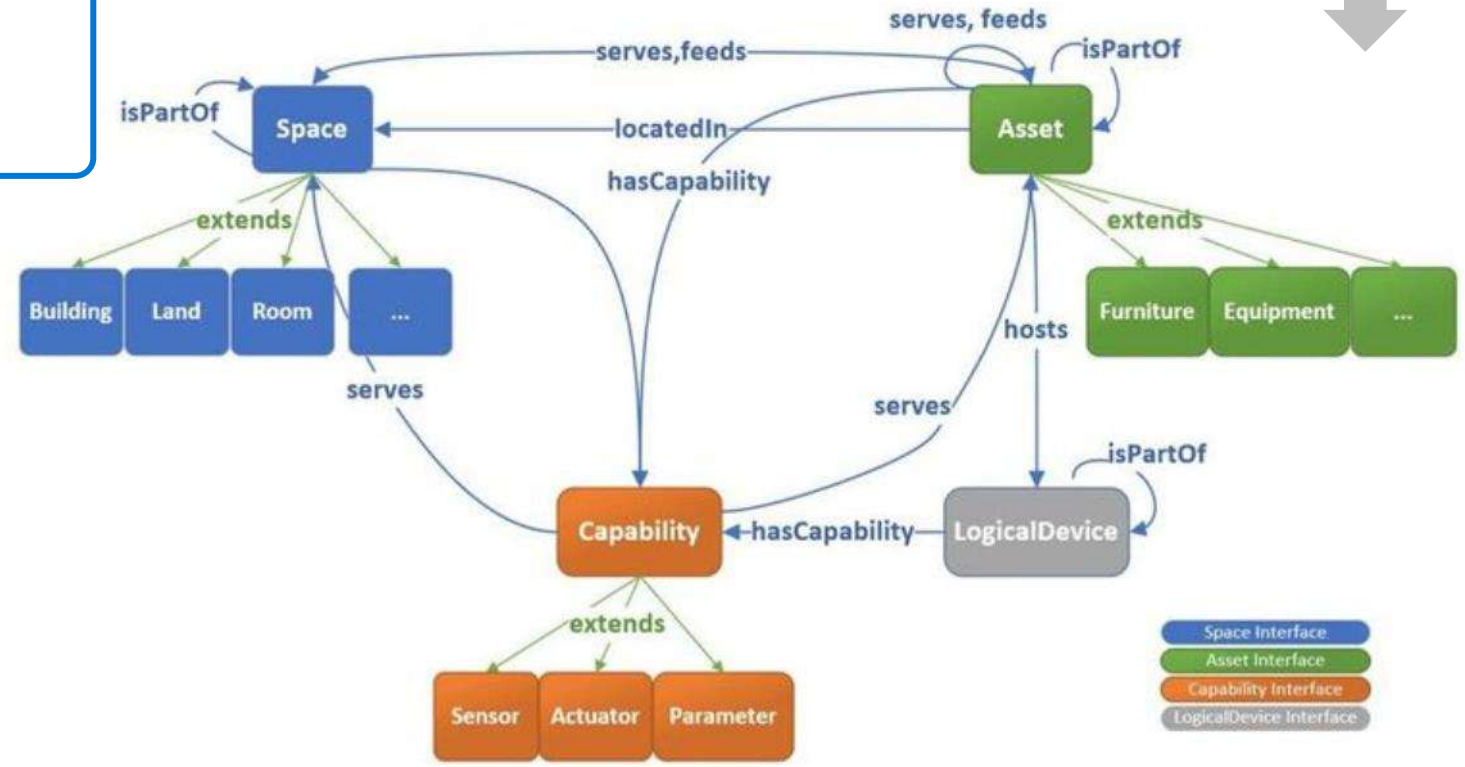


Azure Digital Twins is a Developer Platform for Next-Generation Solutions

Azure Digital Twins lets you:

- Quickly and cost-effectively create digital representations of their business environment
- Drive these models with real time data from IoT and other data sources
- Translate a device-centric view of the world into a business view
- Integrate custom data processing
- Represent cities, bulk production processes, buildings, construction sites, energy grids, etc etc
- Build solutions that support remote monitoring, maintenance, prediction, forecasting, simulation and optimization of operations

Azure Digital Twins



CLIENT APPS

Actions

Export

Cold Storage

Historical

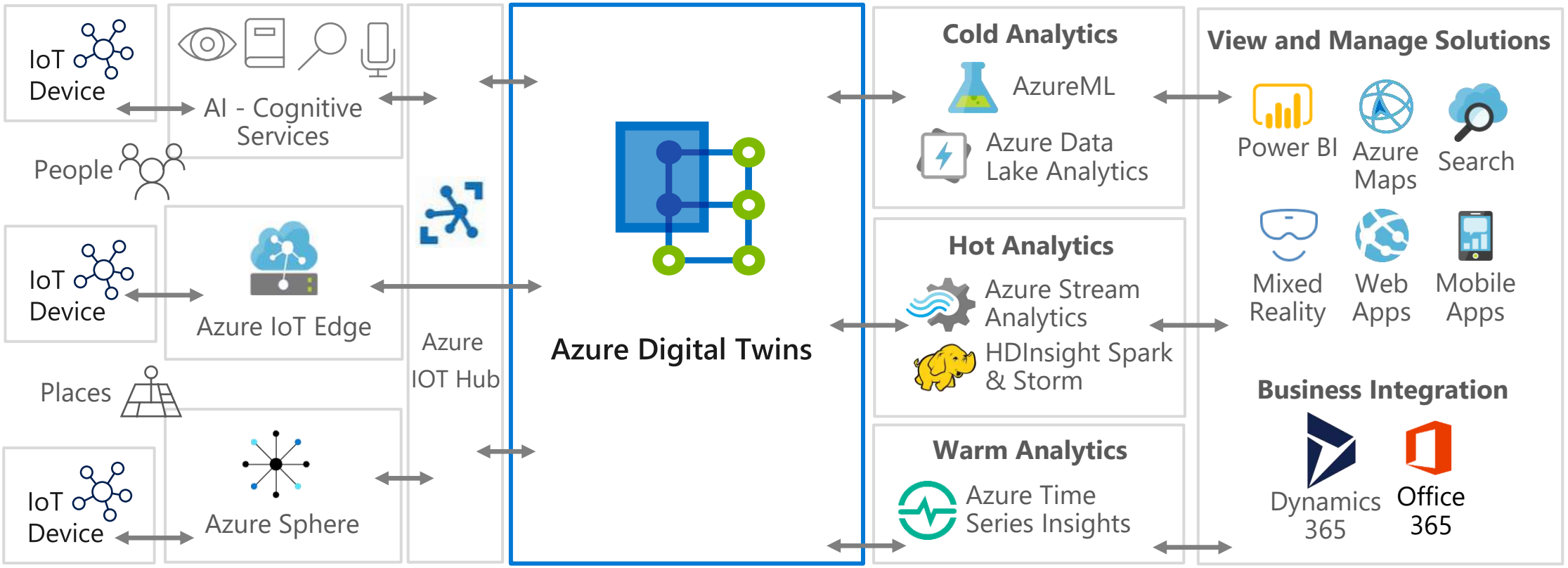
Analytics

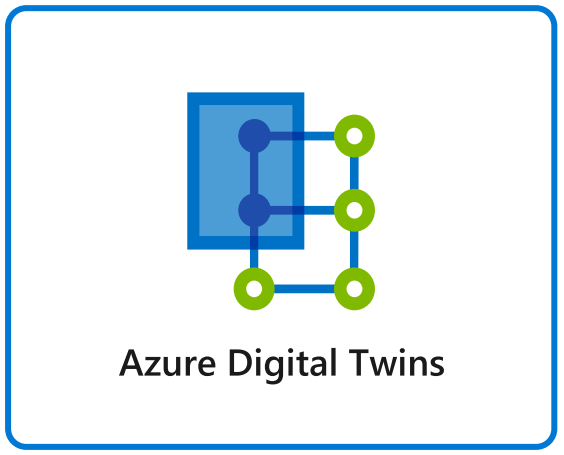
IoT EDGE

IoT HUB

AZURE DIGITAL TWINS

New Service - Azure Digital Twins





With Built in

- Global Scale
- GDPR
- Data Security
- Data Compliance
- Multitenancy
- Identity Management
- Role-Based Access and Control
- Relational Topology
- Extensibility to other Azure Services

Microsoft

UNDER THE HOOD

WillowTwin™ and Azure Digital Twins