



TwinWor>X

MONITOR - VISUALIZE - CONTROL - OPTIMIZE

Optimizer

The Challenges



Real Estate Companies face numerous challenges:

- High Operational Costs:
- Inefficient Building Management
- Maintenance and Downtime
- Energy Management
- Tenant Comfort and Satisfaction
- Regulatory Compliance
- Asset Utilization and Space Management:

The complexity of managing multiple buildings and numerous systems across a portfolio demands a solution that can address these challenges in Real-Time within the process while also anticipating and mitigating future obstacles.

The Solution: TwinWorX Optimizer

Revolutionizing Building systems management with Autonomous Intelligence

TwinWorX Optimizer integrates two core technologies to create a seamless optimization platform:

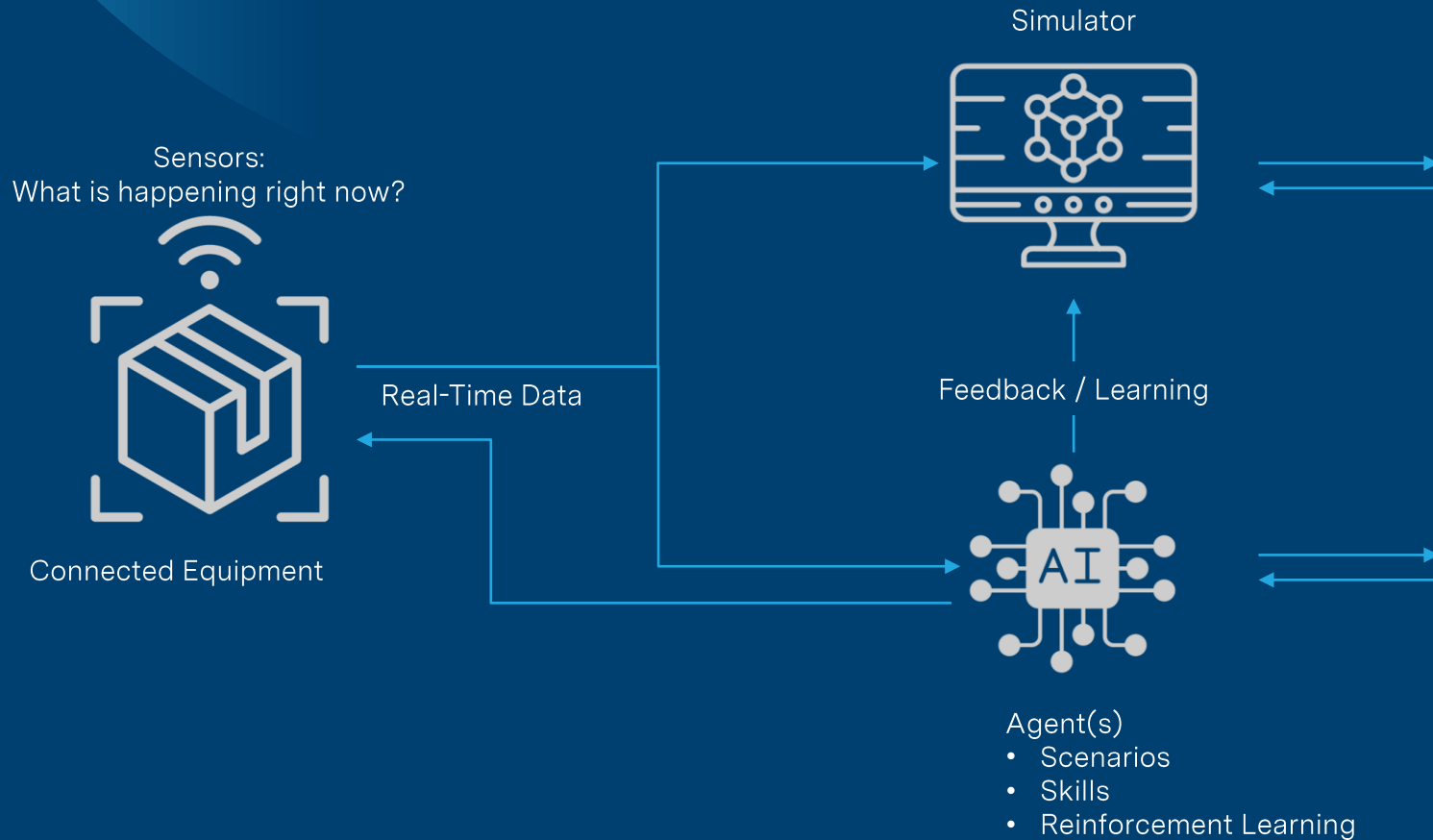
TwinWorX Digital Twins platform

- Dynamic, virtual model of building equipment
- Continuously updated with real-time data from sensors
- An accurate representation of physical assets for precise monitoring, simulation, and analysis.

Autonomous Intelligent Agents

- Machine learning algorithms to interpret data, predict outcomes, and make informed decisions.
- Identifying patterns and predicting potential failures, bottlenecks, trending towards tolerances, before they impact production,
- Autonomously optimize system processes, making recommendations and adjusting operational parameters in real-time

TwinWorX Optimizer



TwinWorX

MONITOR - VISUALIZE - CONTROL - OPTIMIZE

- What is happening right now?
- What do we predict for the future?
- What happens if I change 'x'?



- Recommendations: What operational change should be made?
- Action: Command And Control
- Autonomous Control

Key Features

Real-Time Data Analysis and Decision-Making

TwinWorX® Optimizer processes, stores and analyzes data in real-time, predicting potential deviations from optimal operating conditions, enabling immediate operational adjustments to optimize manufacturing processes.

Customizable Autonomous Agents

Tailor-made and configurable autonomous agents are designed to address specific process optimization needs, ensuring flexibility and adaptability for any manufacturing scenario.

Powerful Simulator

Create predictive models that forecast future operational conditions without the need for real-life experiments. Process operators could conduct what-if scenarios.

Adaptive Control

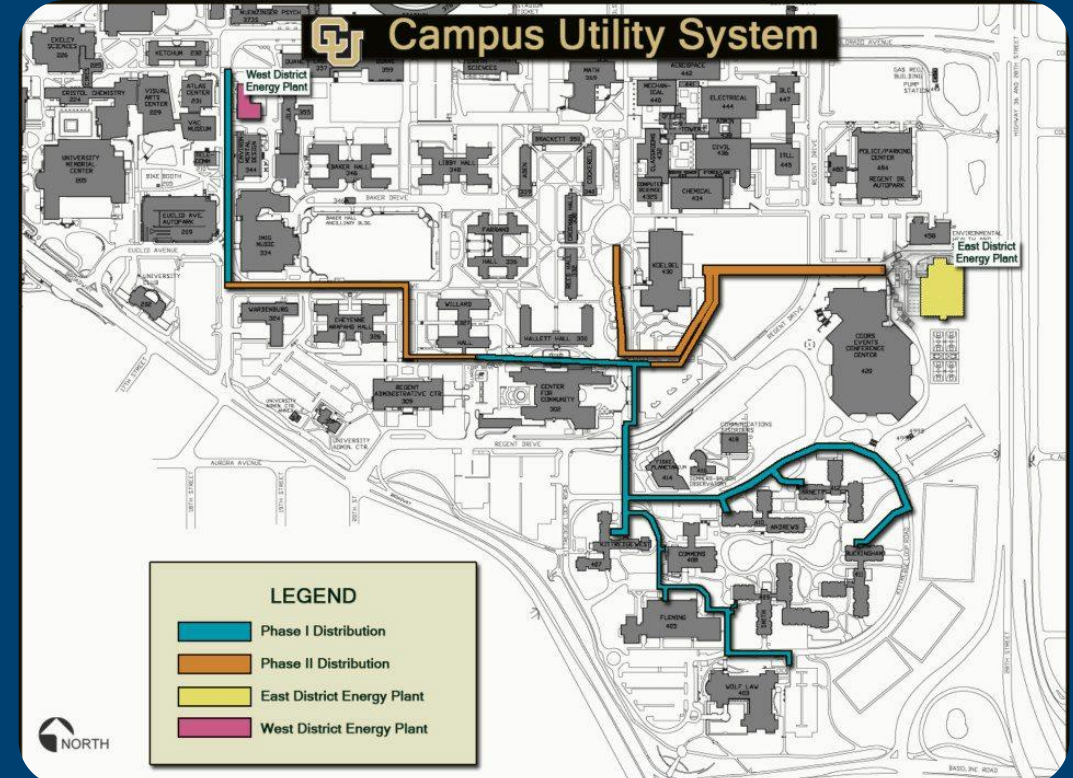
The agents makes recommendations or autonomously adjusts operational parameters to meet process optimization objectives.

Scalable and Secure

Designed to scale with your business, TwinWorX® Optimizer ensures your data is protected with the highest security standards.

Example – Chiller Optimization

- Optimize the control of the Chillers at the University of Colorado (EDEP – East District Energy Plant) for specific objectives
- Every simulation step is 15 minutes, and we simulate all variable changes based in the given actions
- Decision: Agent will send actions to decide when is better to use CH1, CH2 or HX1



Example – Chiller Optimization

Objectives

- Minimize Power
- Meet Temperature Set Point on Campus



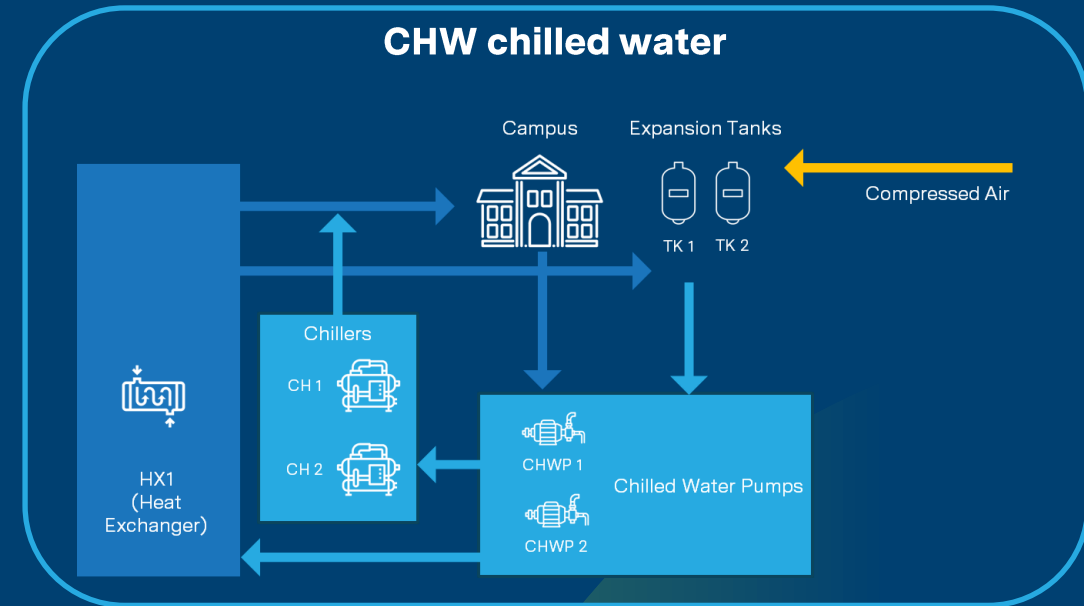
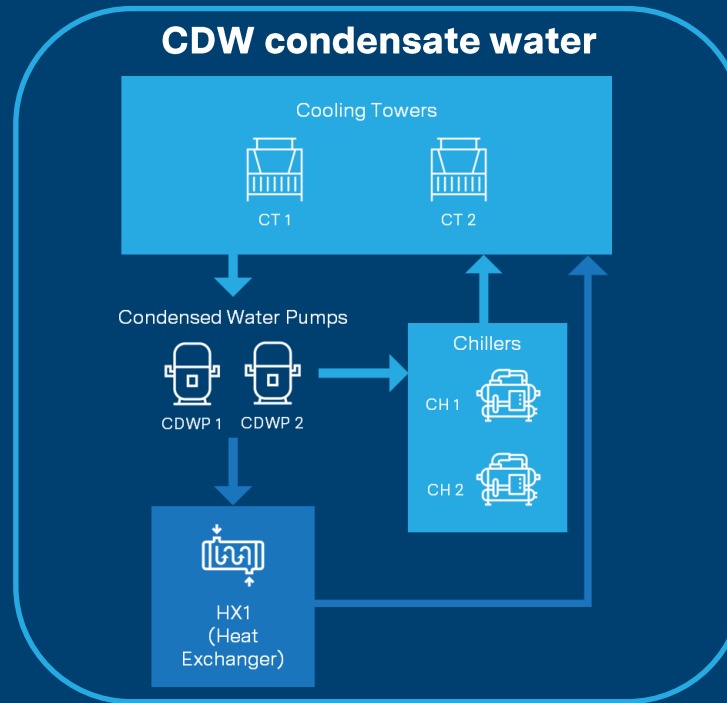
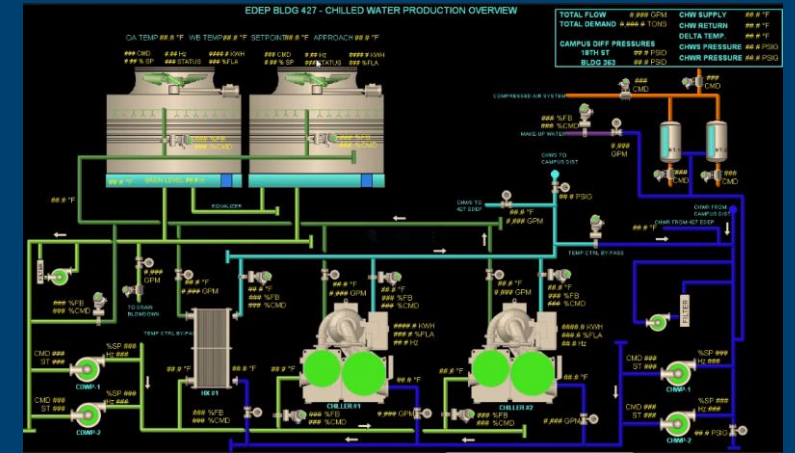
Chiller Simulation

State Variables

- CH1 – Flow and Temperature – CHW and CDW (R and S)
- CH2 – Flow and Temperature – CHW and CDW (R and S)
- HX1 – Flow and Temperature – CHW and CDW (R and S)
- Power
- Demand

Action Variables

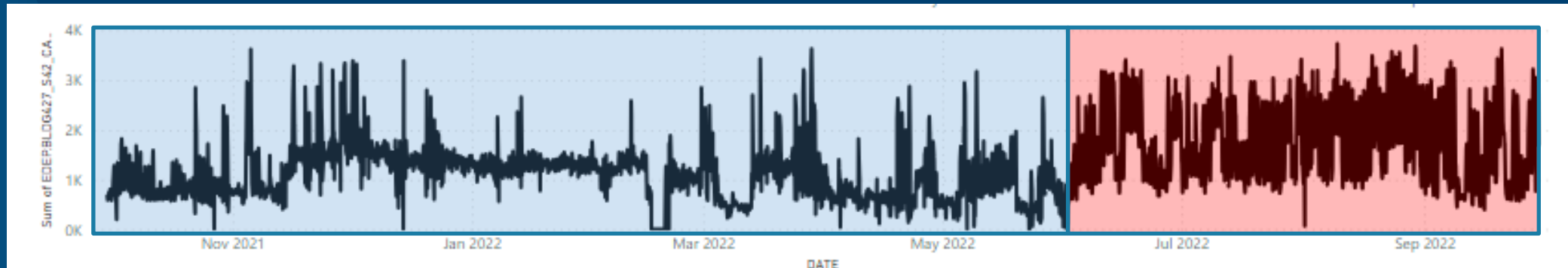
- On/Off CH1
- On/Off CH2
- On/Off HX1
- CH1 FT4203 CDW Flow
- CH2 FT4204 CDW flow



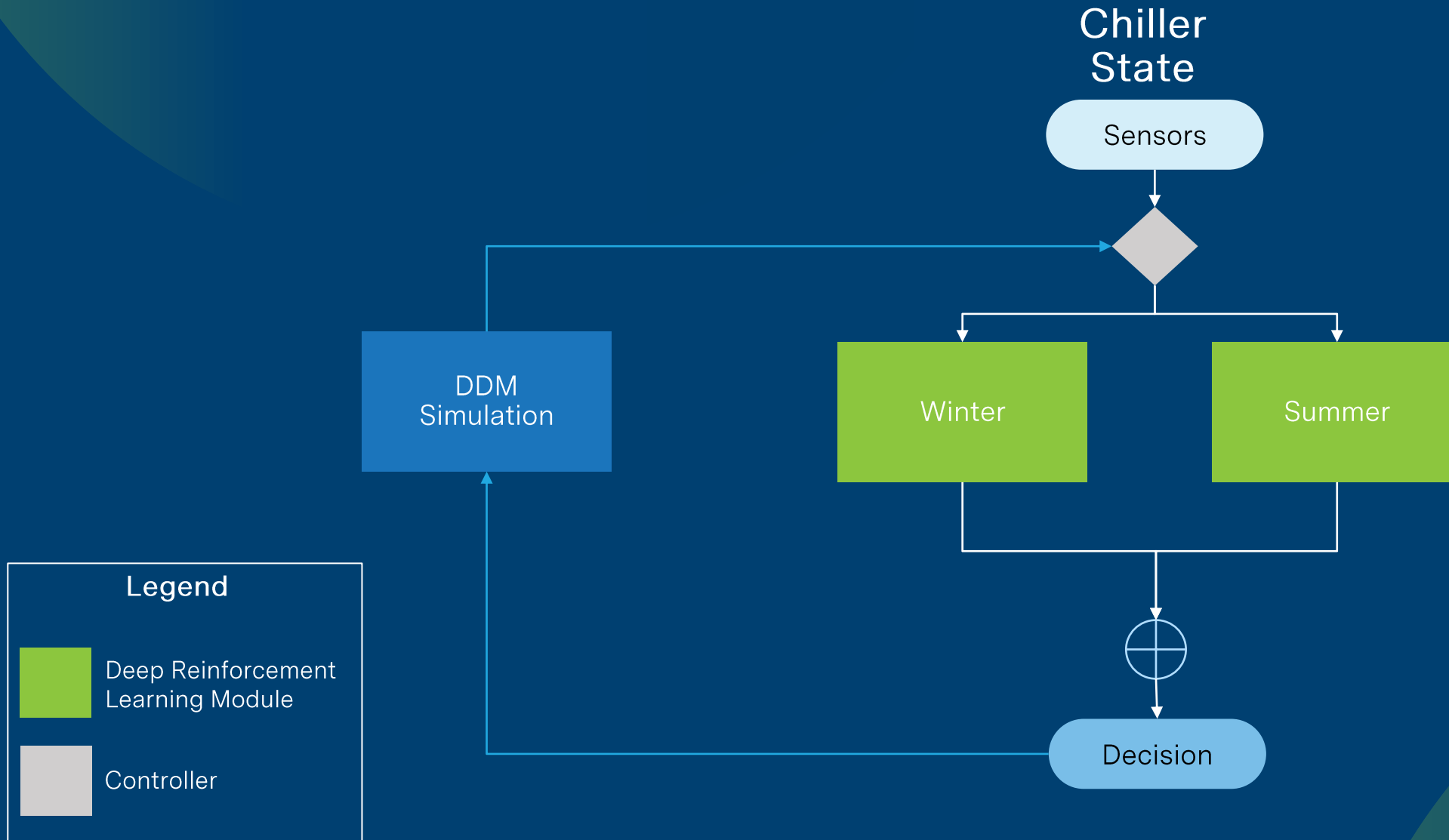
Developing the Autonomous Agent

Strategy

- To build the multi-skill agent we analyzed and separated the state space into two scenarios based on the demand behavior and weather conditions, Winter and Summer.

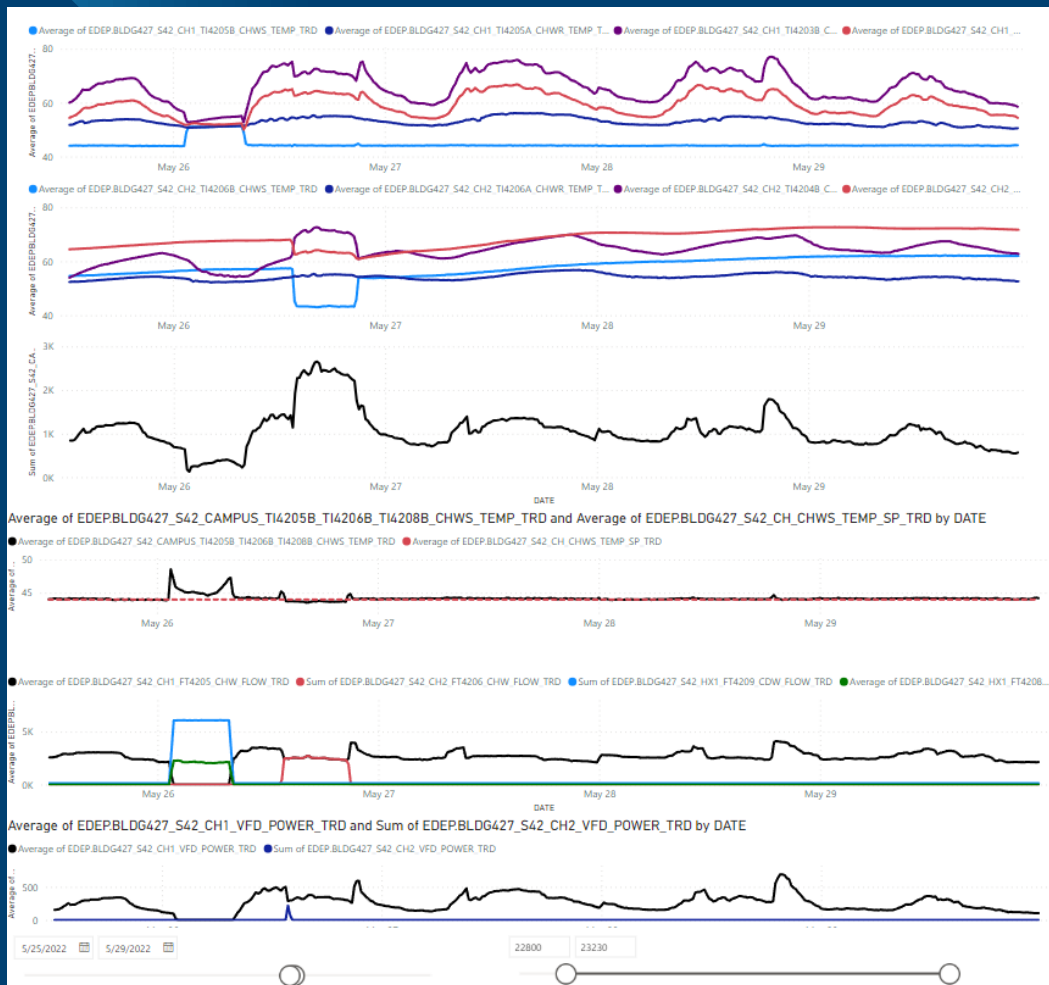


Autonomous Agent

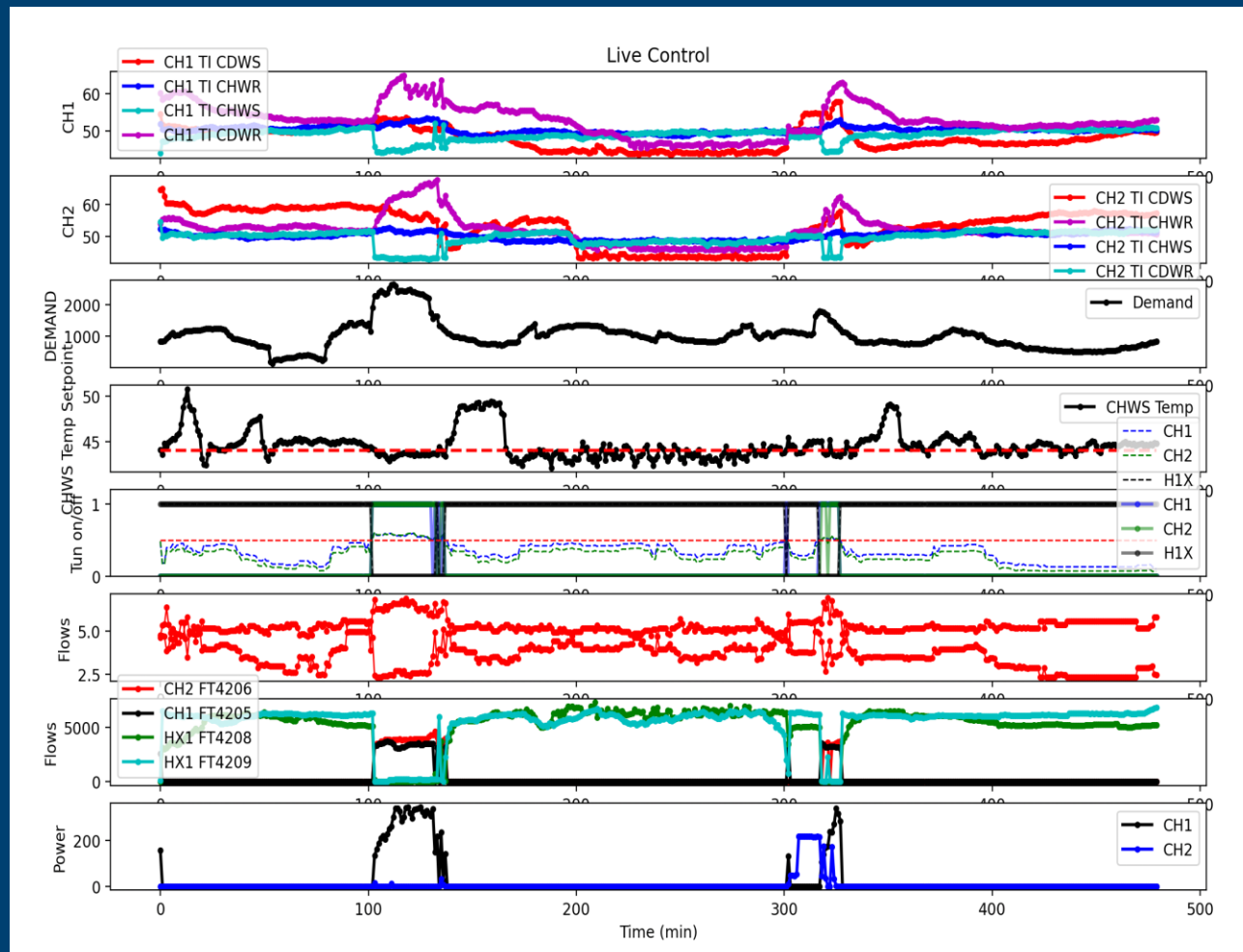


Agent Evaluation

Real Data



Autonomous Agent



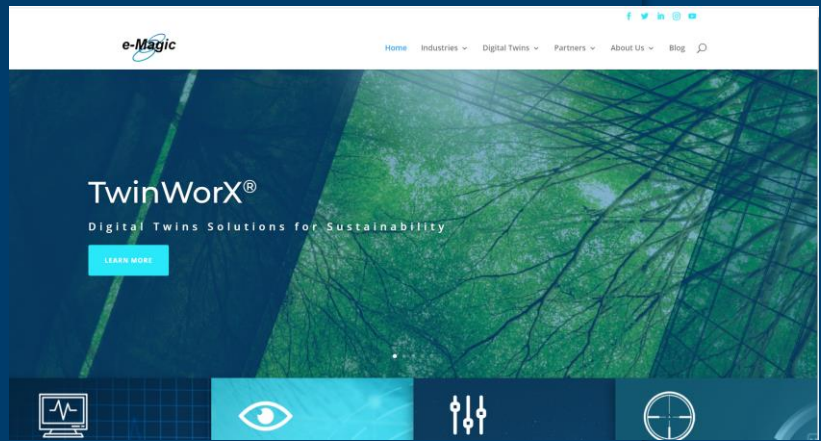
Benefits of Autonomous Intelligence



- **Operational Efficiency:** Streamline operations, achieve higher throughput, reduce downtime, and minimize waste, leading to significant cost savings and productivity gains.
- **Predictive Insights:** Anticipate maintenance needs and process adjustments, preventing costly downtime and ensuring continuous optimized operation.
- **Sustainability:** Optimize energy use and reduce waste, contributing to your environmental responsibility goals.

Start improving your operations with IoT and Azure Digital Twins

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