Data centers & Communication networks

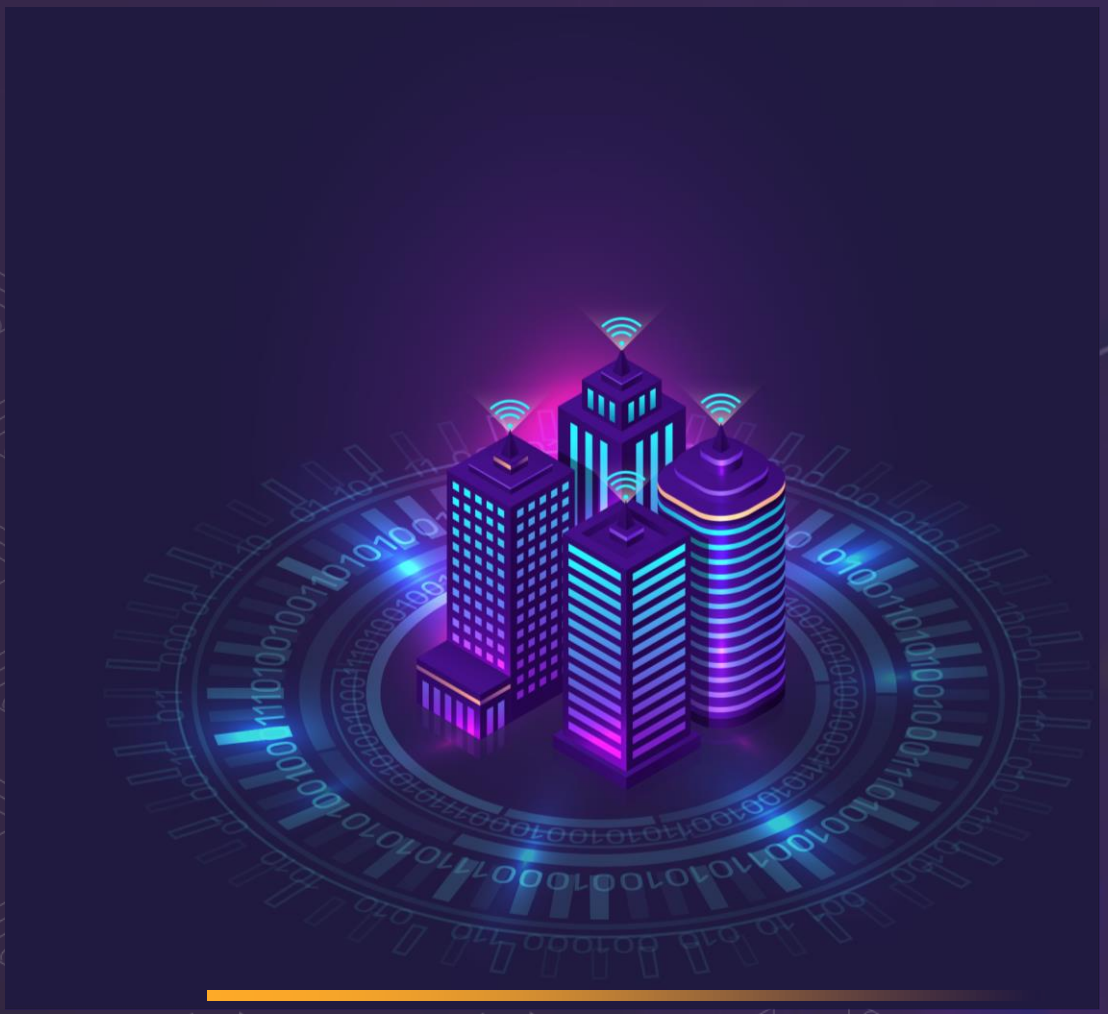
ASTRIKOS

S!aP cognus

INTELLIGENT WAY TO MANAGE YOUR DATA CENTER

Smart, Actionable, IoT-driven solutions for

operational excellence



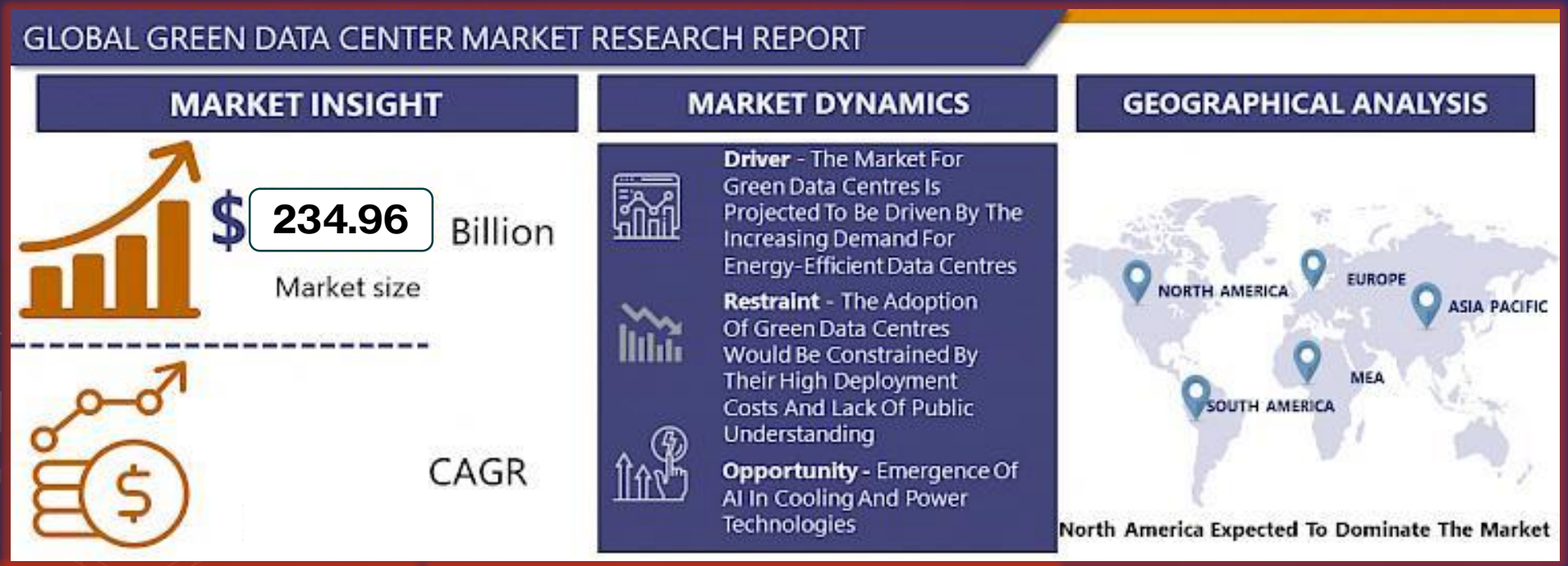
Astrikos.ai Platforms were founded on the principles of combining Platform Cooperativism and Sustainable Socioeconomic Models for the twenty-first century with **hyperscale** impact, addressing key infrastructure challenges in areas such as **Smart City Urban Analytics, Next Generation Data Centers, Health Infra, Smart Ports, Campuses, Smart Infrastructure and Industry 4.0/5.0**

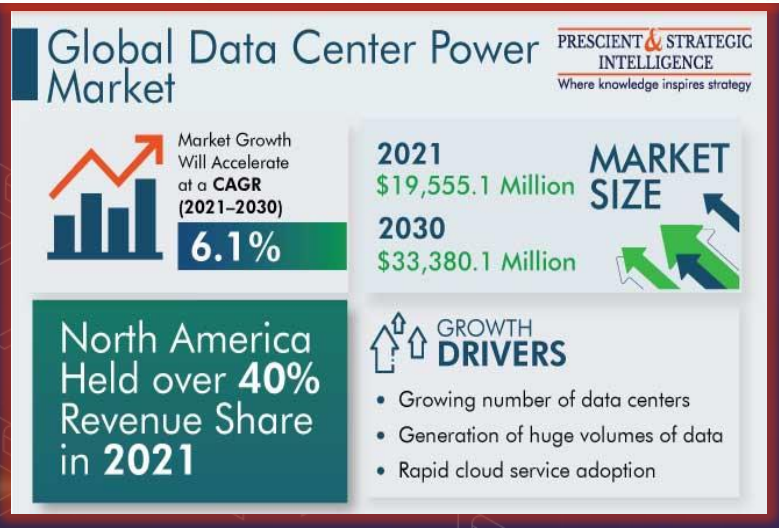
Geographical Coverage: India, ASEAN, Middle East, North Africa & North America

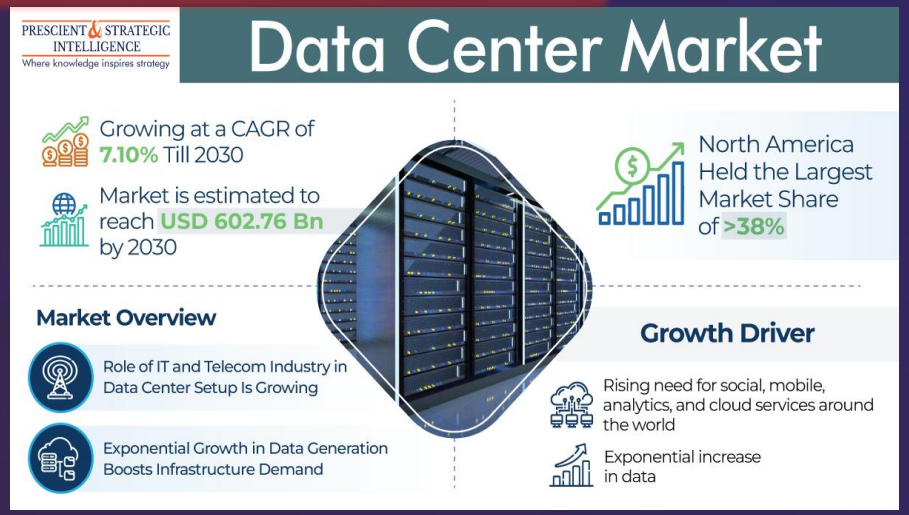
DATA CENTRE BUSINESS DRIVERS

Market Space – Trends – Problem Statement – Solution Statement

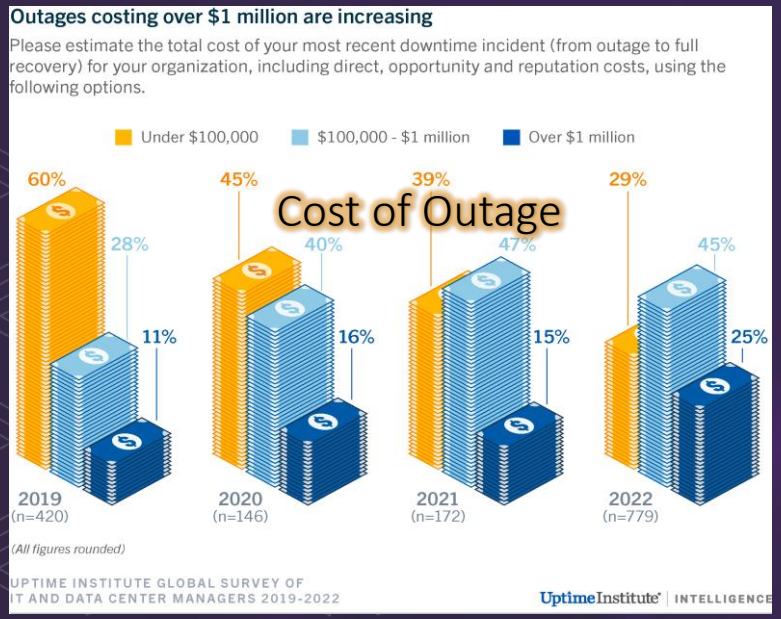
DATA CENTRE OPERATIONS : MARKET TRENDS…



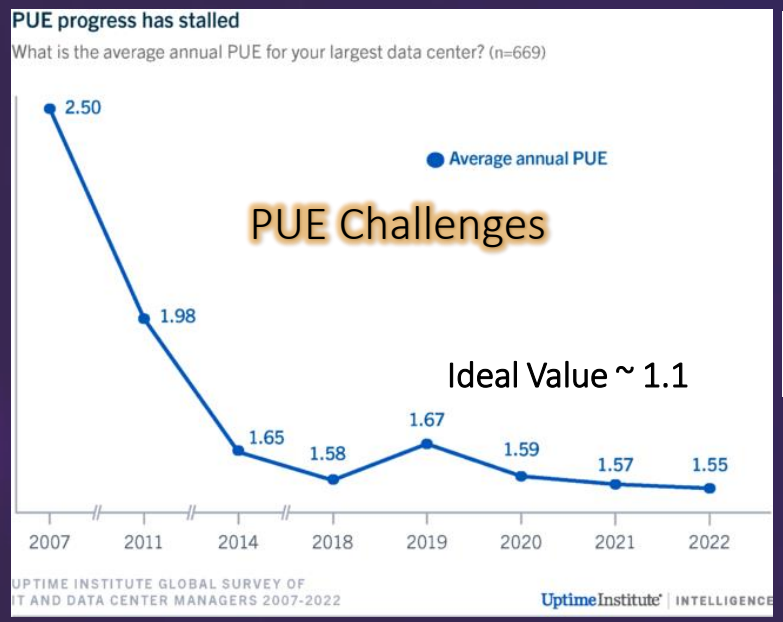




DATA CENTRE OPERATIONS : TRENDS OF CHALLENGES

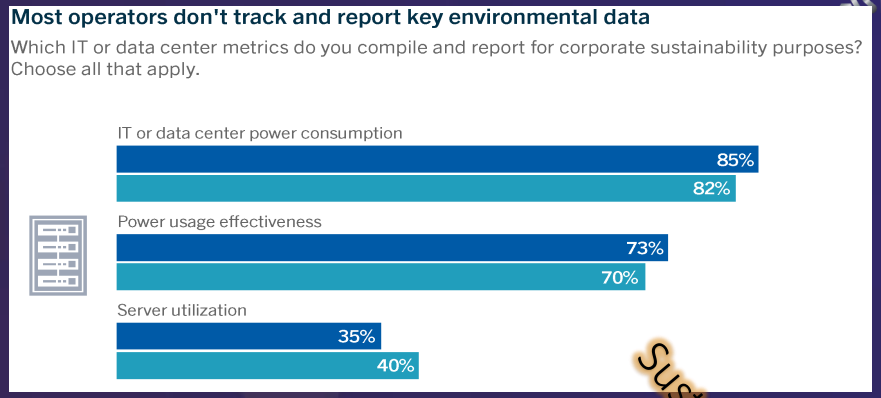


Cost of Outage

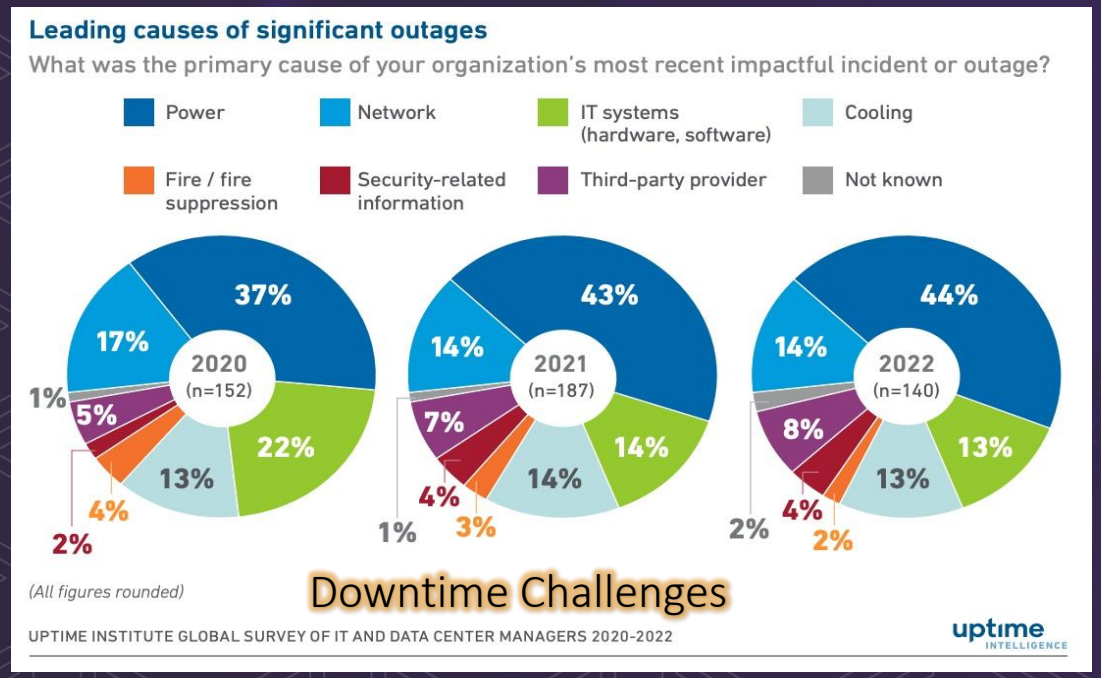


PUE Challenges

Ideal Value ~ 1.1

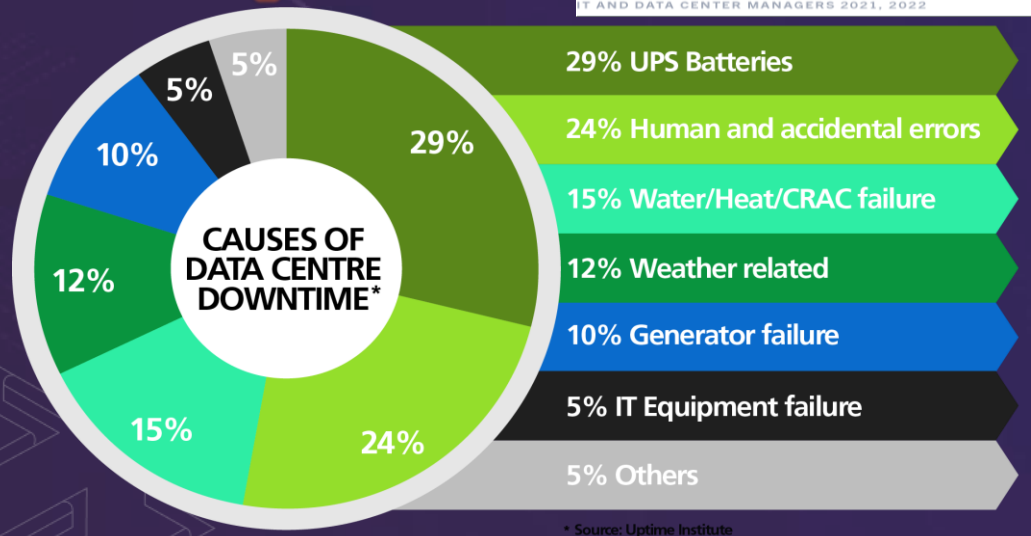


Sustainability



Downtime Challenges

Asset Challenges



DATA CENTRE OPERATIONS : CHALLENGES & SOLUTION

CHALLENGES IN INFRASTRUCTURE MANAGEMENT

Lack of **collaboration across disciplines** and departments causes delay in decisions

Discrete accountability and responsibilities management doesn't provide **holistic picture on lapses** of service level agreements (SLA)

High costs on **maintenance** and high spends due to **lack of transparency and lack of insights**

Sustainability is impacted due to lack of **standardization and unintelligent operations**

Energy conservation complexities – high investments and infrastructural design changes and costs involve in that

Complexities involved in Compliance to the global standards

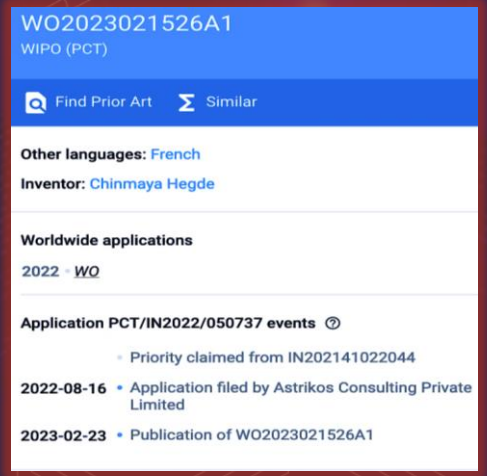
Lack of predictive and forecasting measures

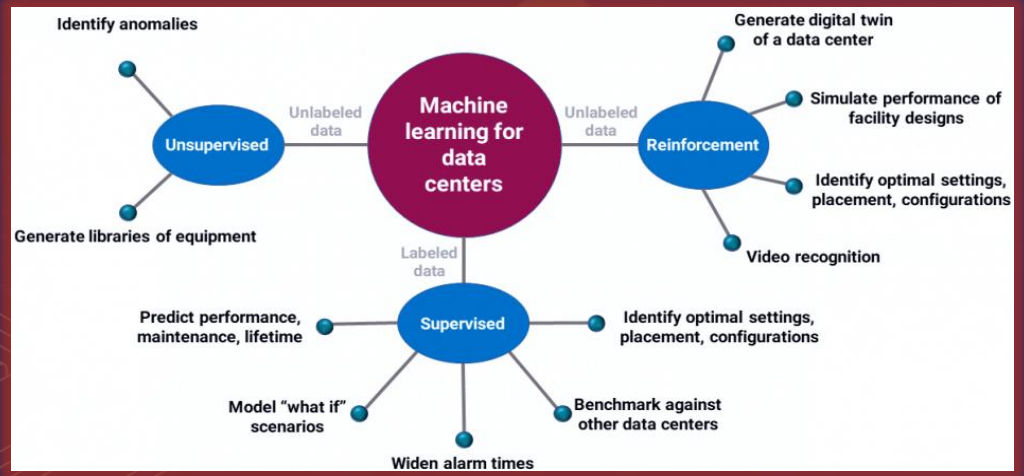
SOLUTION STATEMENT

SIaP SMART INTEROP ANALYTICAL PLATFORM

- Smart **Unified Management Platform** across disciplines **speeds up operations by at least 4 times**
- **Reduce manual intervention by System Driven Approach** to make equipment talk to the applications (ERP, CRM etc.) to enable **collective process improvement** by about 70%
- **Cost reduction** by converging infra elements to financial control systems powered with Predictive Analytics and Insights to reduce **mean time to response** (**MTTR**) – Targeted to reduce **40%** of total trouble tickets
- Self-Assessment framework for **Sustainability Audits and Inspections** – Forecasts for 12 months
- **Energy conservation** powered by Data Aggregation and Intelligence – Analyze IoT – OT – IT data (**Ranging 3% - 7%**)
- Self Audit and in-house **Gap Analysis Framework for Compliance** to the global standards:
  - Green infrastructure standards – IGBC etc..
  - TIA / Uptime Institute standards – TIA 498, Tier Standards for Date centres
  - World Council for City Data Standards – ISO 37120/37122 for Smart Cities
  - Sustainable Energy Management standards – ISO 50001
- Actionable Intelligence powered with Prescriptions and Advisories to amend **SOPs**

"INTERNATIONALLY PUBLISHED PATENT"





SCOPE FOR AI/ML IN DATA CENTRES

DATA CENTRE : UNIFIED OPERATIONS MANAGEMENT PLATFORM

SUPPLIER MANAGMENT | OPERATIONAL SUSTAINABILITY | CUSTOMER MANAGEMENT

UNIFIED OPERATION PLATFORM

UNIFIED DASHBOARD | WORKFLOW | DASHBOARDS | KPI | EVENTS/ALERTS | MACHINE CONTROL | HISTORIAN

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AI/ML DATA ANALYTICS PLATFORM

INTEGRATED PORTAL - S!aP Viz

IT/OT INTEGRATION LAYER

EQUIPMENT SUPPLIERS

OT SYSTEMS

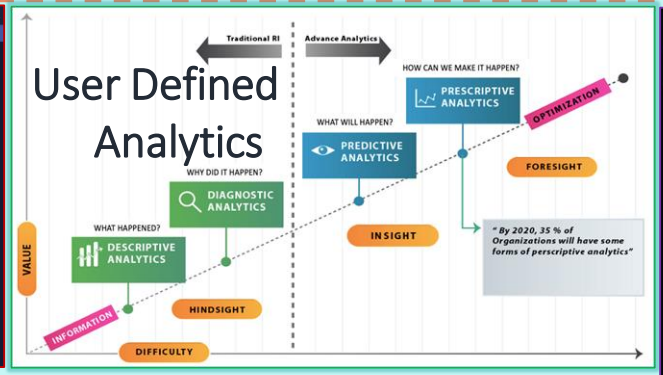
VM farm1 | VM farm2 | VM farm3 | VM farm4 | VM farm5

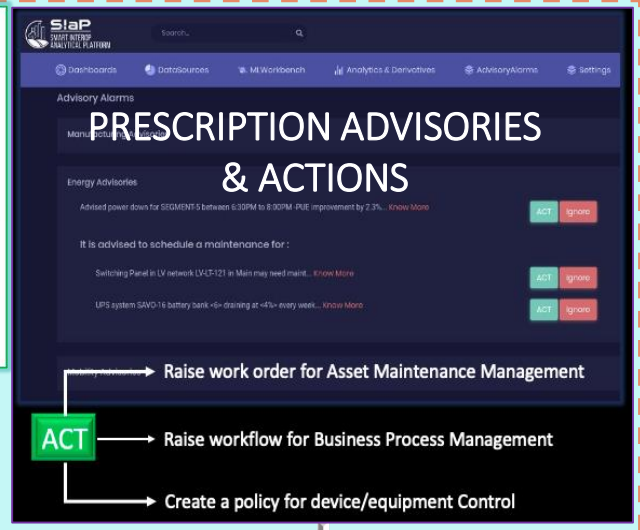
DATA CENTRE CUSTOMER

SERVICE LEVEL AGREEMENT
Response Time. Reliability, Flexibility

- Chillers
- Air handling units
- Variable speed drives
- Heat rejection
- Fan coil units
- Variable air volumes
- CRAC and In-row cooling units
- UPS/DRUPS
- Switchboards & Switchgear (MV, LV)
- Power & Power Quality Meters
- Breakers
- Transformers
- IT racks, IT pods
- CRAC
- In-row cooling units
- Access floor power & Environmental sensors
- PDU's, rack PDUs
- Fire Suppression System
- Water Leak Detection System
- Physical security
- Surveillance Management System

SERVICE LEVEL AGREEMENT
Uptime , Availability , Performance, Reliability , Flexibility





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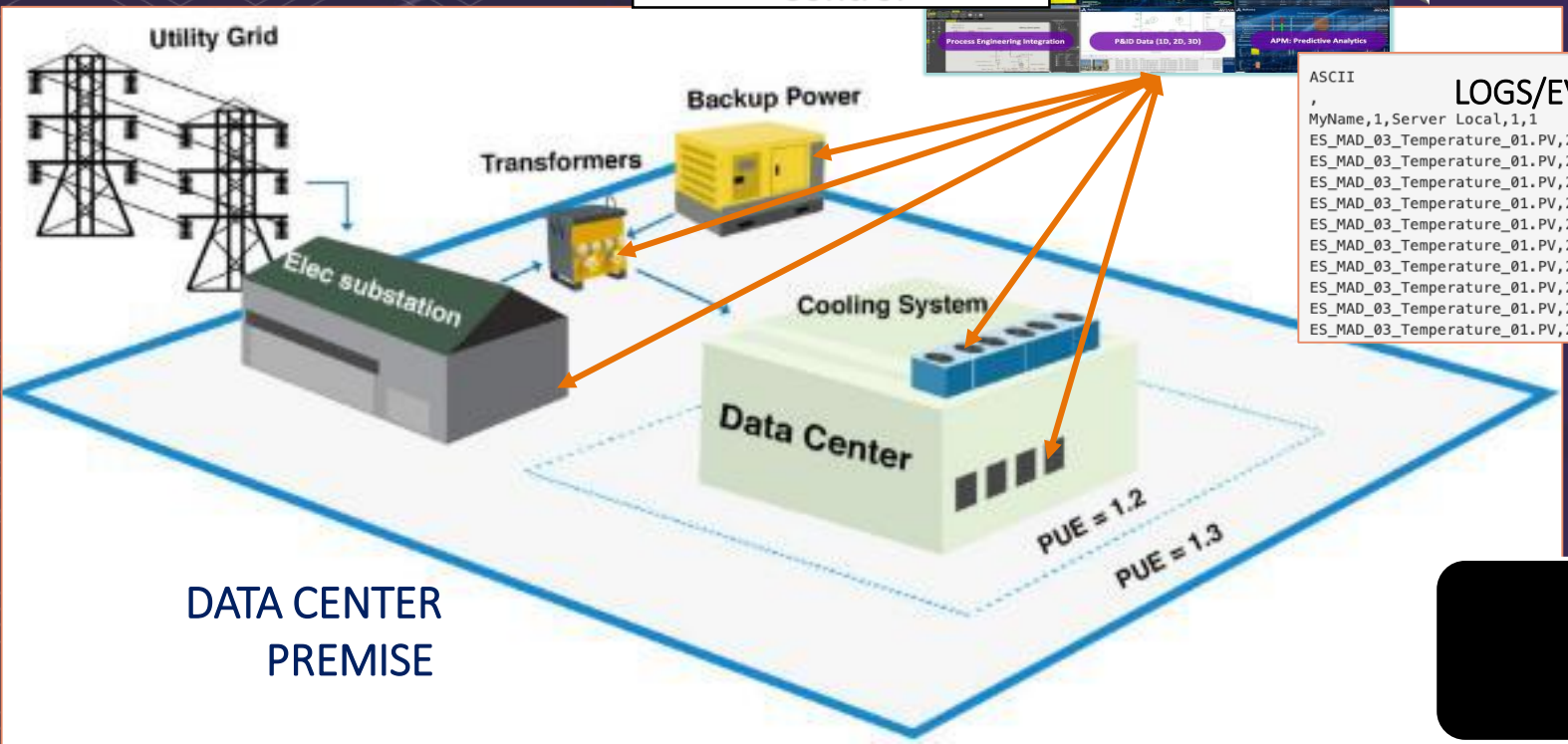
Unified Command & Control

API: ACTIONS LINKED BACK



DATA CENTER PREMISE

LOGS/EVENTS SAVED IN HISTORIAN

```
ASCII
,
MyName,1,Server Local,1,1
ES_MAD_03_Temperature_01.PV,2,2016/10/13,01:00:00.000,2016/10/13,02:00:00.000,0,10,192
ES_MAD_03_Temperature_01.PV,2,2016/10/13,02:00:00.000,2016/10/13,03:00:00.000,0,20,192
ES_MAD_03_Temperature_01.PV,2,2016/10/13,03:00:00.000,2016/10/13,04:00:00.000,0,10,192
ES_MAD_03_Temperature_01.PV,2,2016/10/13,04:00:00.000,2016/10/13,05:00:00.000,0,20,192
ES_MAD_03_Temperature_01.PV,2,2016/10/13,05:00:00.000,2016/10/13,06:00:00.000,0,10,192
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ES_MAD_03_Temperature_01.PV,2,2016/10/13,08:00:00.000,2016/10/13,09:00:00.000,0,20,192
ES_MAD_03_Temperature_01.PV,2,2016/10/13,09:00:00.000,2016/10/13,10:00:00.000,0,10,192
ES_MAD_03_Temperature_01.PV,2,2016/10/13,10:00:00.000,2016/10/13,10:30:00.000,0,20,192
```
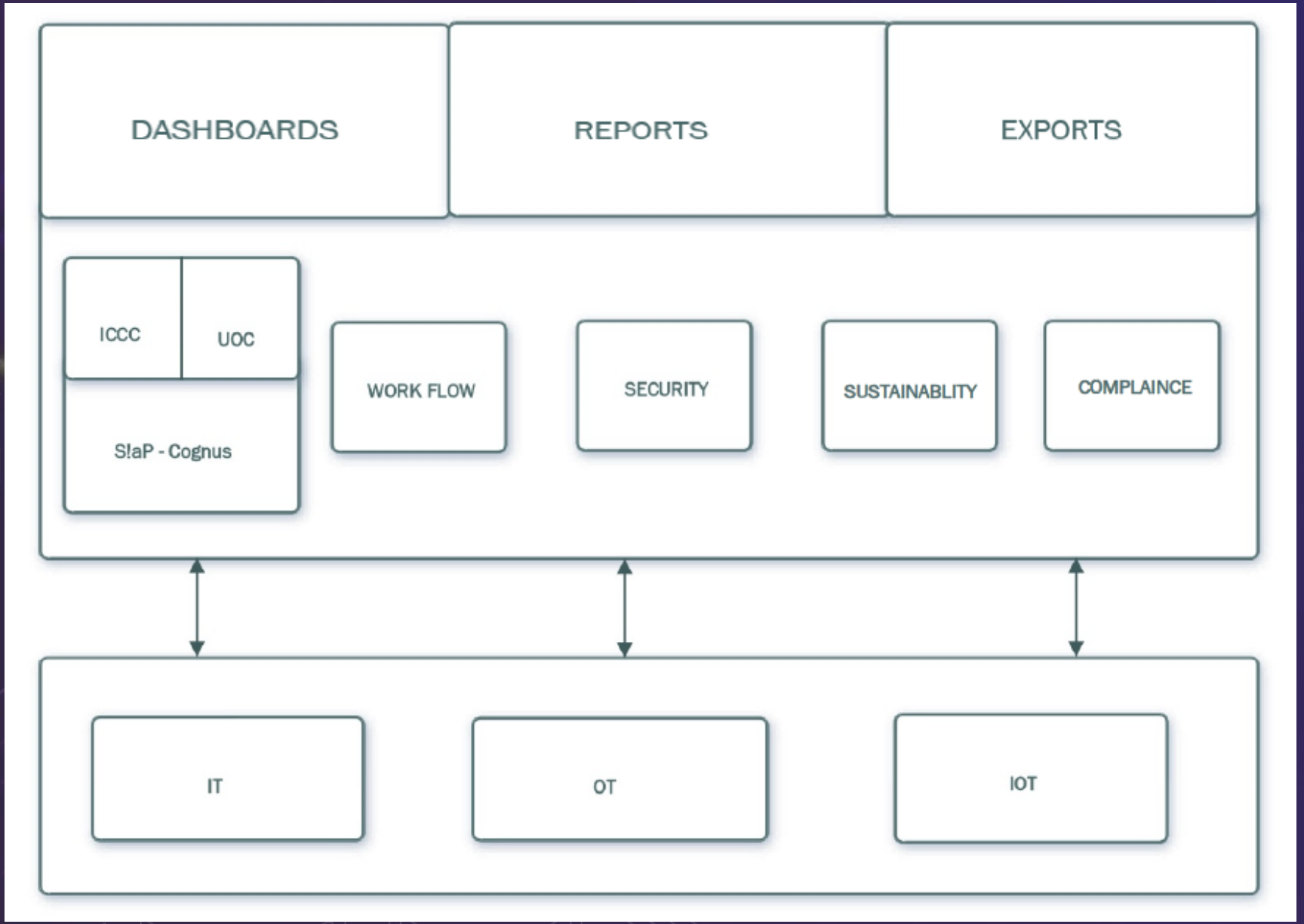

HISTORIAN LOGS EXPORTED

DATA CENTRE: DEPLOYMENT ARCHITECTURE

DATA CENTRE: SAMPLE USE CASE

AI ML DATA CENTRE: Functional diagram



DATA CENTRE Transition :

1. Upgrade Core Infrastructure	Astrikos can play a consultant role and provide technical inputs . Astrikos has established a robust partner eco system including OEMs
2. Implement Data Management and Processing Solutions	SIap architecture has a Historain and a data lake etc in the SIaP Data store (SIaP architecture diagram)
3. Integrate AI/ML Frameworks and Platforms	SIaP Cognus has built in bespoke tools librabry that is used by the SIaP product team and enginneering team to develop and manage perioidc productreleases
4. Optimize Energy Efficiency and Resource Management	These are features built into the SIaP Cognus product line
5. Enhance Data Center Security with AI	These are features built into the SIaP Cognus product line
6. Monitor, Manage, and Scale AI Workloads	These are features built into the SIaP Cognus product line
7. Train or Upskill Your Team for AI/ML Operations	A Proposal workshop is conducted for a client and followed up with a periodic Touch point meetings which includes training of users.
8. Enable Hybrid or Cloud AI Capabilities	SIap - COGNUS can be implemeted on-prem, on cloud and on a hybrid framework
9. Implement Compliance and Governance for AI	These are features built into the SIaP Cognus product line

Thank you

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Appendix

S!aP PLATFORM : HOW IT WORKS??

Analyzing the event logs from various equipment in DC

Detailed fault (RCA) analysis

Algorithm to predict the cause – effect scenario

Impact analysis by means of “what-if” analysis

Build data model run multiple simulation to train the models

Arrive at the optimization techniques

Provide prescription advisories to optimize with multiple options

Assist creating actionable policies, SOP, workflow , work-order

Framework for policy deployment and automation of actions

Visualize the performance

Performance feedback & Self improvement mechanism - Reports

Visibility into the health status and alarm conditions

COOLING SYSTEM

Return Air Temperature : 25 °C

Power Consumption : 146 kW

AHU 1 RAT High!

RENEWABLE ENERGY

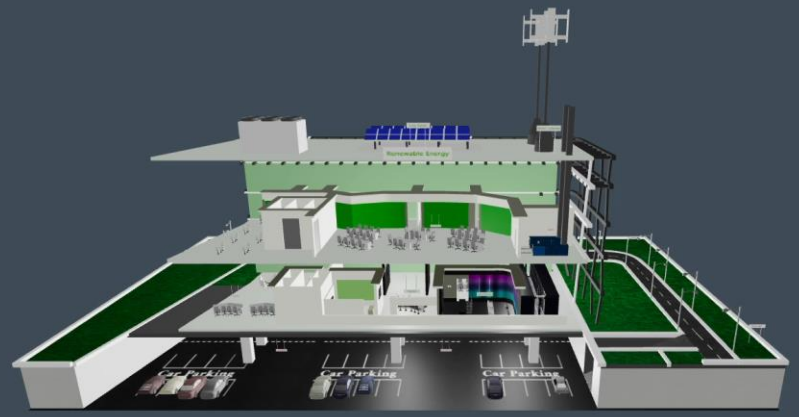
Wind Power

Energy Generation (Last Day) : 3.5 kW

Panel Status : 50 Active

Status : OK

More



DATA CENTER

Cooling Efficiency : 95%

PUE : 1.34

Status : OK

STREET LIGHTS

Functional lights : 19

Under Maintainence : 2

Status : OK

CAR PARKING

No of Occupies Slots : 10

Status : OK

Subsystem status

PACU-1A Operating Status

Schedule Status

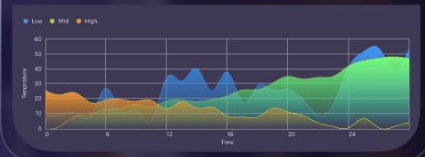
Operating Status: Manual

PACU-1B Operating Status

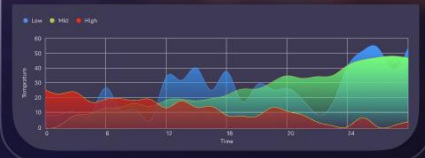
Schedule Status

Operating Status: ---

PACU-1A Sub Temperature (°C)



PACU-1B Sub Temperature (°C)



PACU Control

Master Enable

BMS/Thermostat Control: Thermostat

BMS Occupancy Mode: Occupied

Changeover Enable/ Time: 48.0 hrs

PACU-1A Control

Ready to Run: Not Ready

Fail Alarm: Normal

Fail Alarm Reset

Manual Run Command

Shutdown Command

PACU-1B Control

Ready to Run: Not Ready

Fail Alarm: Alarm

Fail Alarm Reset

Manual Run Command

Shutdown Command

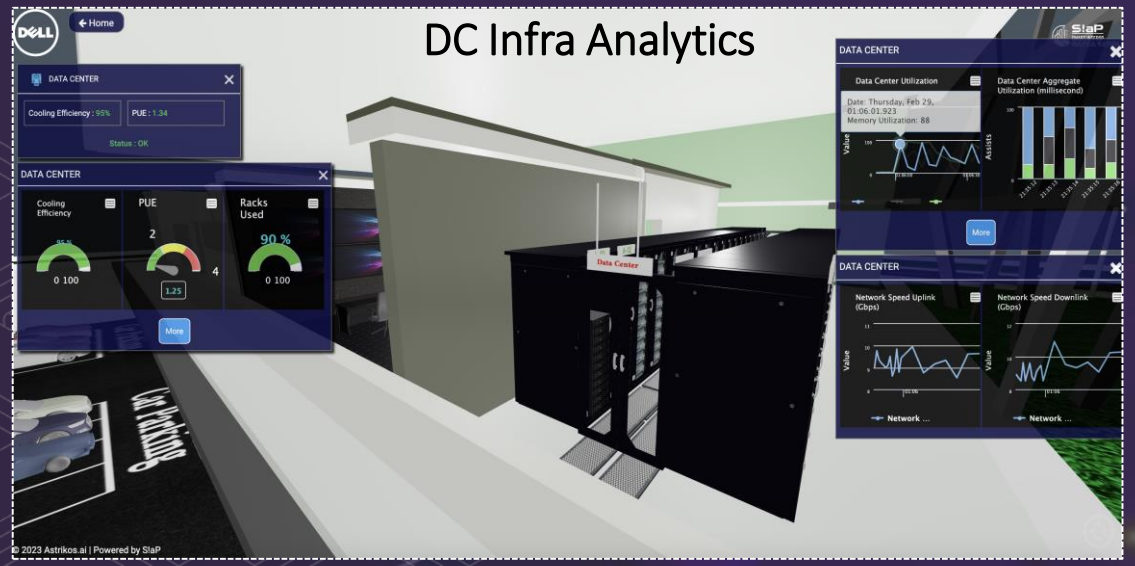
PACU-1B Sub Temperature (°C)

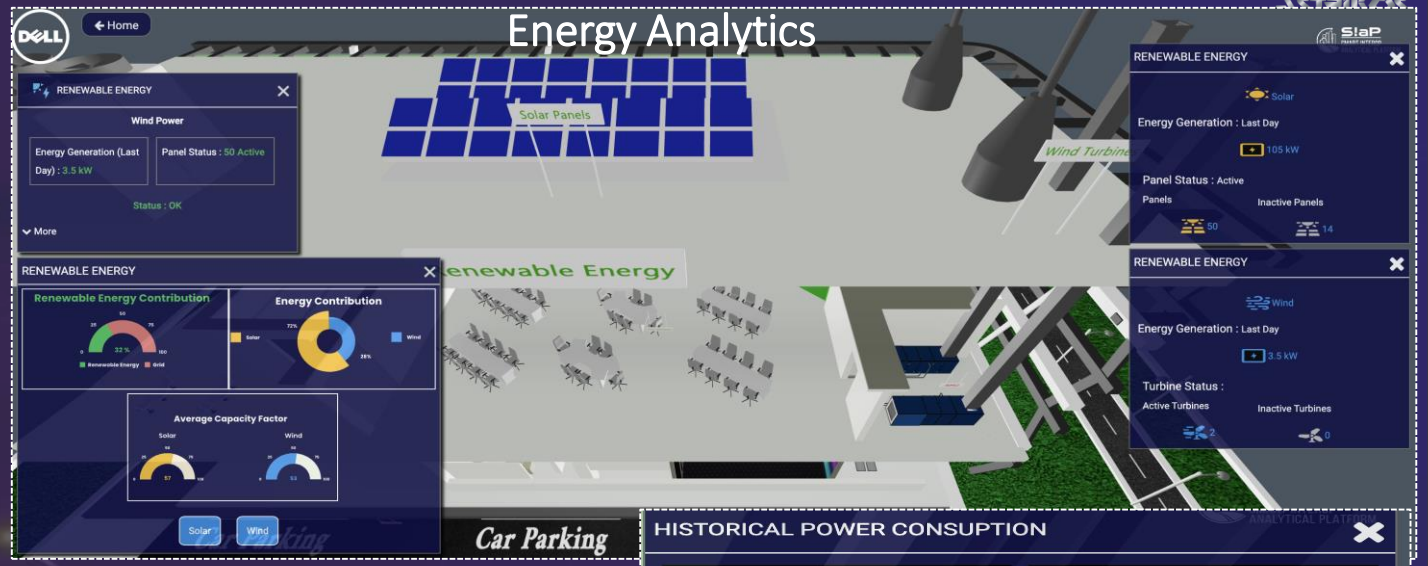
BMS Temp SP: 16.0 °C

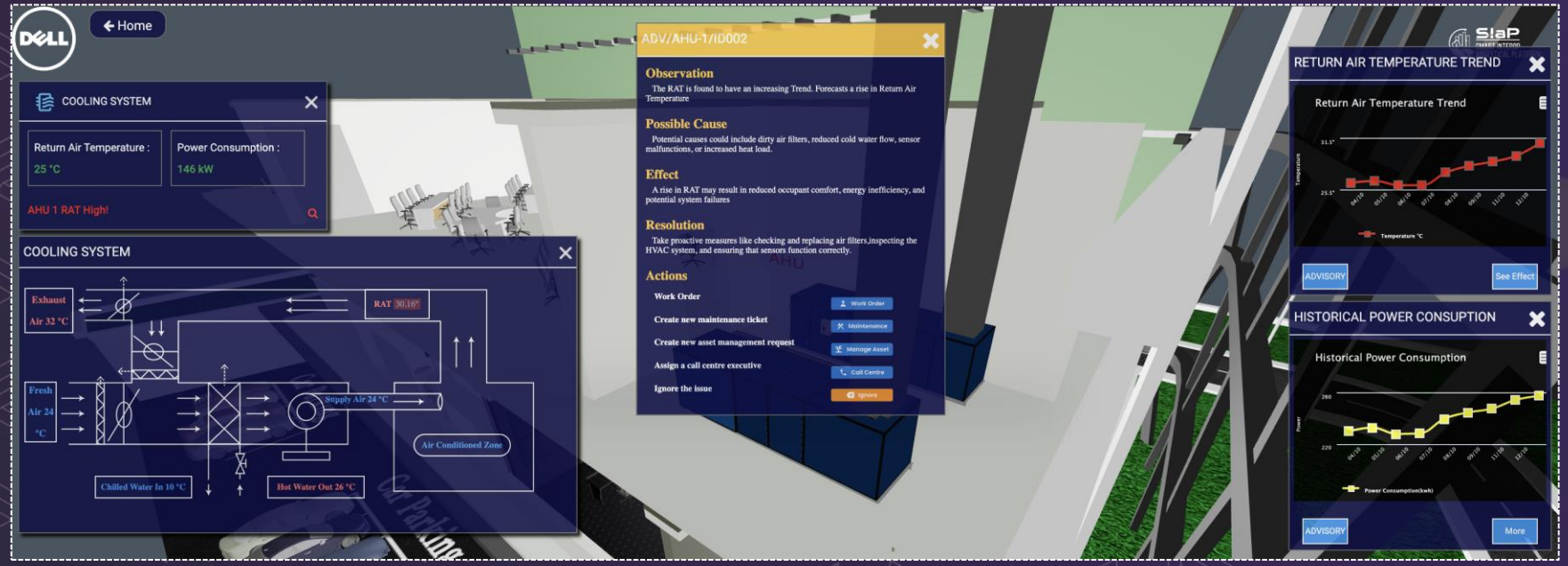
Thermostat Temp SF: Error! °C

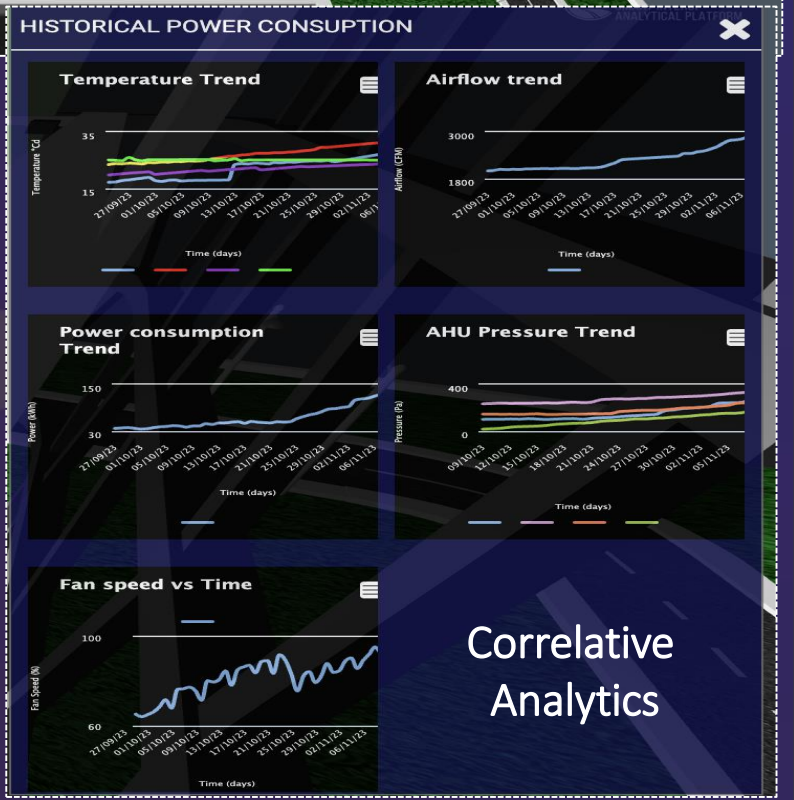
POWERED BY Astrikos.ai | S!aP SMART INTEROP ANALYTICAL PLATFORM

COGNITIVE ANALYTICS : PREDICTIVE SOP AMENDMENTS





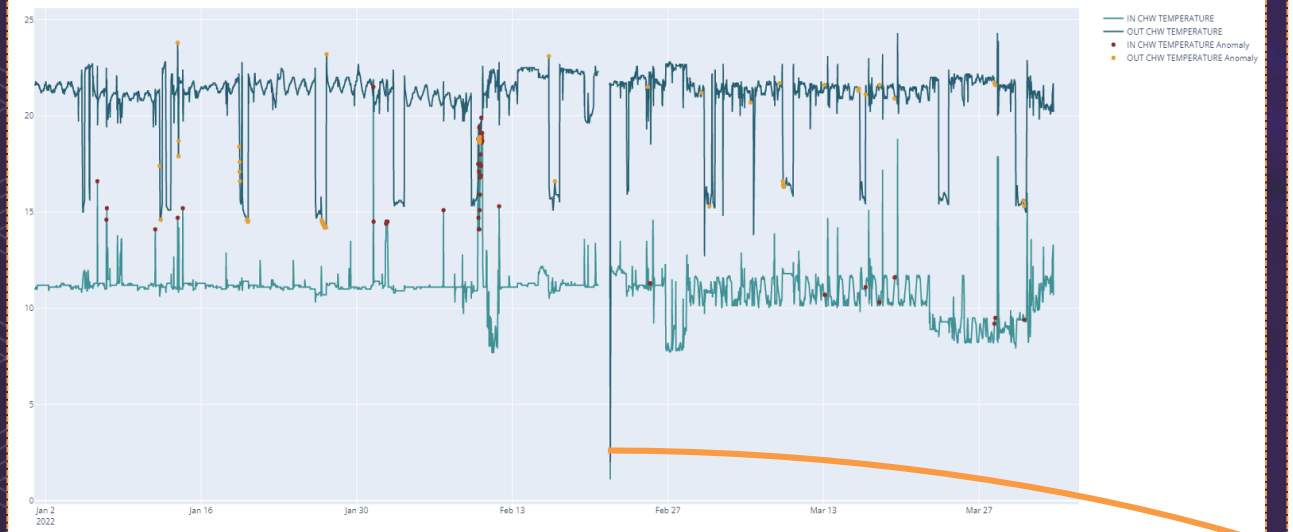




Cause/Effect Analytics – to – Predictive Maintenance

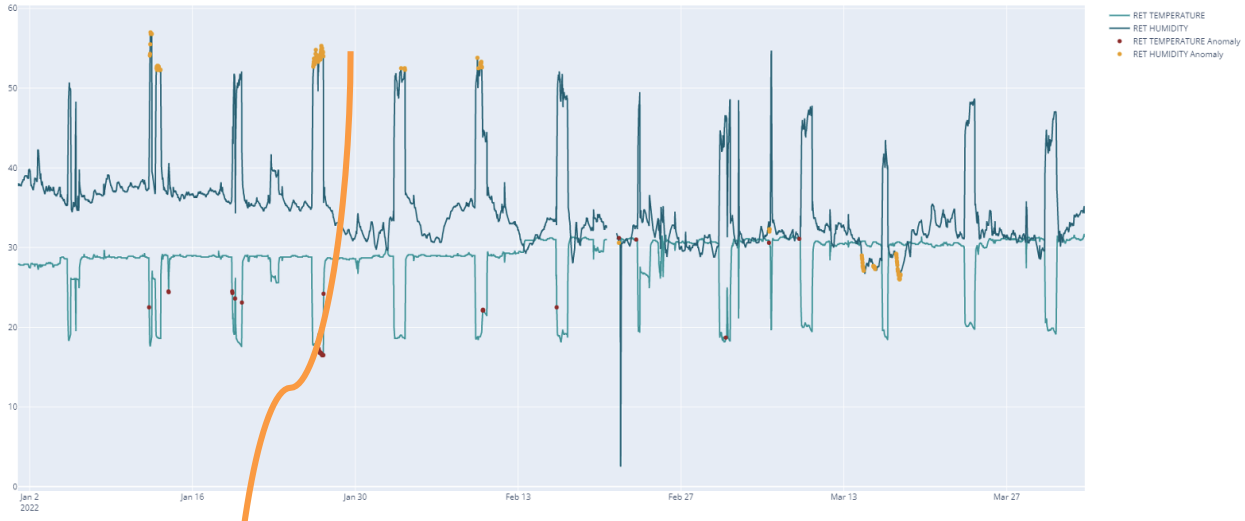
COGNITIVE ADVISORY: ANOMALY TREND BASED SOP AMENDMENTS

PAHU 1 – Chilled Water Temperature Anomaly Detection



Contamination Parameter : INCHW (0.011), OUTCHW (0.015)

PAHU 1 – Return Air Anomaly Detection

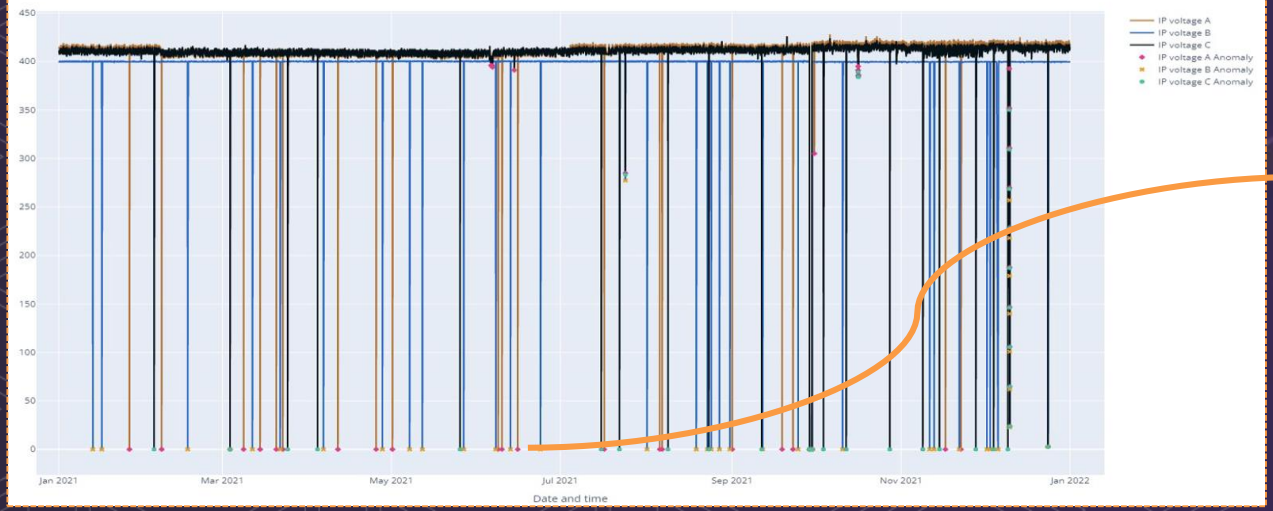


Contamination Parameter : Temperature (0.0087), Humidity (0.0265)

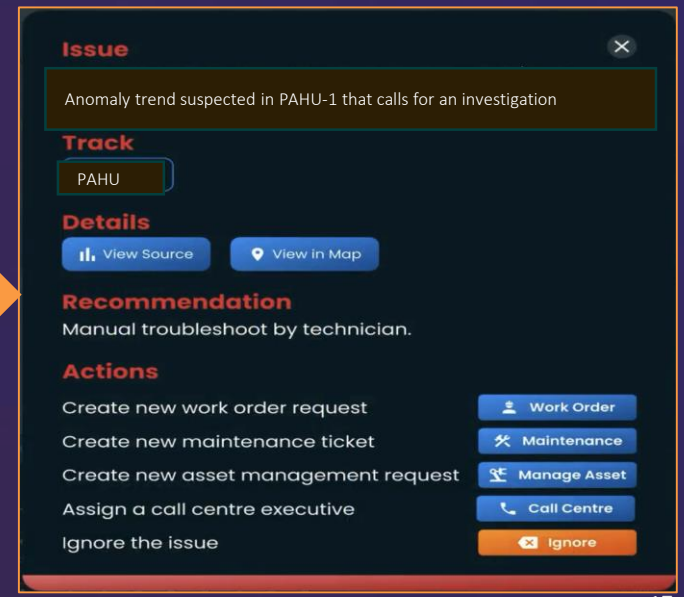
UPS 1.1 – Input Voltage – Anomaly Detection

Contamination Parameter : 0.005

UPS 1.1 3 Phase Input Voltage : Anomaly detection with Isolation Forest



Cognitive Advisories converted into SOP Amendments and Actionable Items



SELF ASSESSMENT FRAMEWORK: DATA CENTRE STANDARDS

TIA-942

ISO/IEC 30134

ENABLERS FOR SUCCESS

- Built-in data model framework for assessing more than 130 KPIs of :
  - Green & Sustainability Indices
  - Energy & Power Indices
  - Building Infra Indices
  - Cooling Efficiency Indices
- The platform acts as in-house Subject Matter Expert:
  - Creates INTERNAL AUDIT actions and reports
  - Realtime data evidencing for all the audit measures and parameters

DC OPERATIONS TRANSFORMATION : GREEN INDEX USECASES

UNIFIED MONITORING

- ❑ Ability to establish the unified monitoring of operations dashboards
- ❑ Ability to define and monitor KPIs
- ❑ All alerts and alarms escalation through workflow to stake holders
- ❑ Ability to track all interdependent operations between departments and make decisions
- ❑ Ability to enhance the underlying systems and add more use cases

Environment Monitoring

- Indoor Air Quality Tracking
- Indoor Air Quality Control
- COX Emission Tracking
- Renewable Energy Indices
- Carbon Neutral Roadmap

Energy Management

- Real Time Energy Monitoring
- BTU Analytics
- Deep HVAC Monitoring
- Lighting and Cooling Monitoring and Control

Water Management

- Smart Water Meters Connectivity & Management
- Water Quality and Quantity Monitoring
- Billing Management
- Real Time Notifications

CENTRALIZED ACCESS TO UNIFIED DATA → REALTIME INDICES AUDIT

Asset Management

- Digital Asset Register
- Workorder Management
- Purchase Order
- Real Time Tracking
- Life Cycle Management
- SLA Monitoring

Waste Management

- Quantity Monitoring
- Segregation Tracking
- Source Monitoring
- Reports & KPI's
- E-Wastage Tracking

Operations & Maintenance

- Transportation Management
- Space Management
- People Tracking
- User Experience
- Optimize FM Operations
- Predictive Maintenance

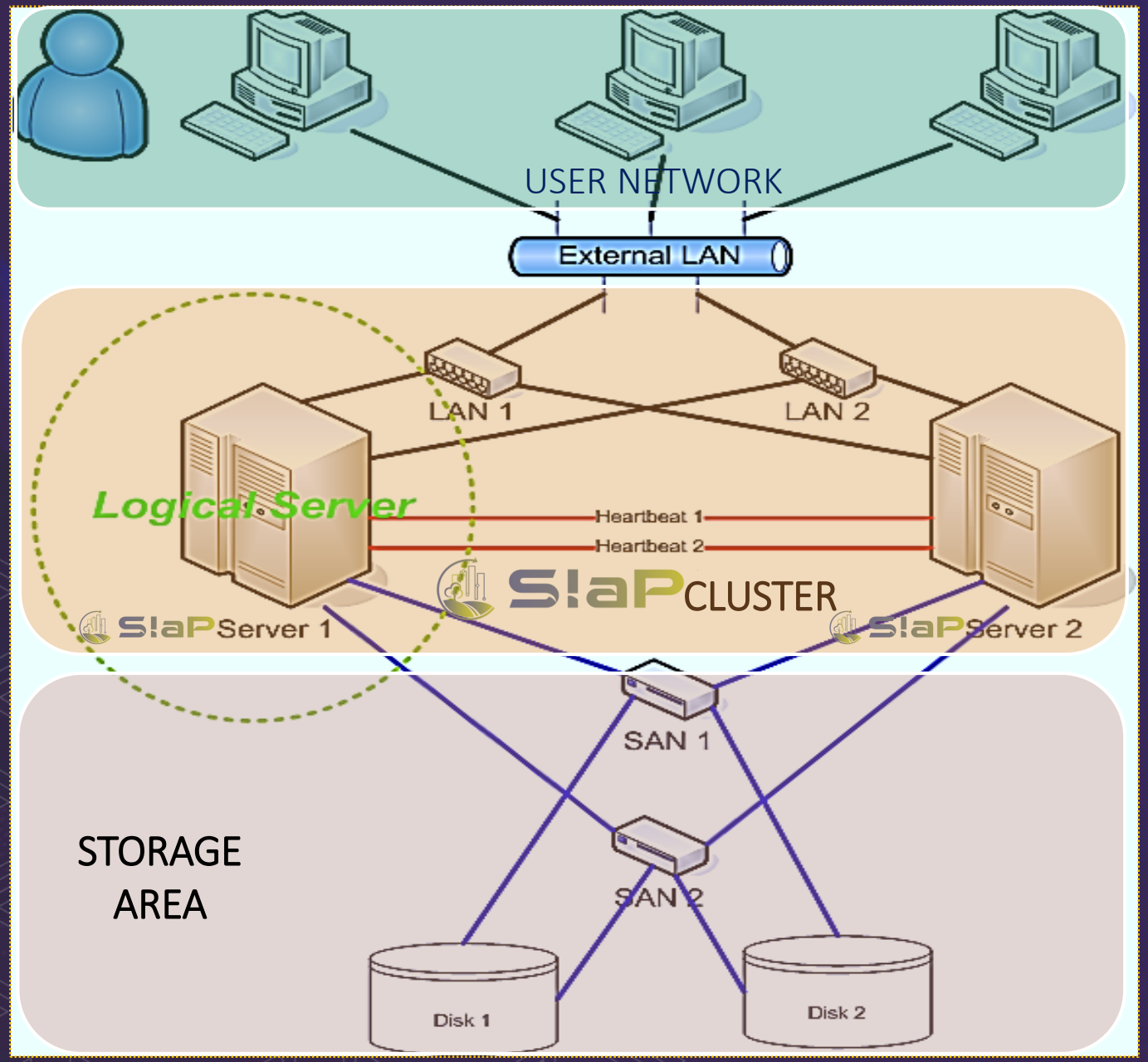
INTEGRATION PREREQUISITES : ALL OT/FACILITY SYSTEMS

Subsystem	Requisite from Subsystem	Parameters
Building Management System	Require OPC or BACnet or REST APIs from BMS to retrieve the historized data	As per standard APIs which covers everything in the aspect of data shareability
System: UPS, CSU, PAHU, PAC, PDU	Require OPC or BACnet or MODBUS or REST APIs to interact and integrate	As per standard all the data that is exposed by the subsystem communication protocol can be consumed
DCIM	Require REST APIs to integrate	As per standard APIs which covers everything in the aspect of data shareability
Other IT Systems	Require REST APIs to interoperate	As per standard APIs which covers everything in the aspect of data shareability

INTEGRATION PREREQUISITES : OTHER SYSTEMS

Subsystem	Requisite from Subsystem	Parameters
ITIL Help Desk Management & Network Management	Require REST APIs from Help Desk Management & NMS to retrieve tickets and FCAPS logs	As per standard APIs which covers everything in the aspect of data shareability
System: ERP, CRM, Contract Management and Financial Control System	Require REST APIs to interact and integrate	As per standard APIs which covers everything in the aspect of data shareability
Enterprise Asset Management System	Require REST APIs to integrate	As per standard APIs which covers everything in the aspect of data shareability
Other IT Systems	Require REST APIs to interoperate	As per standard APIs which covers everything in the aspect of data shareability

HIGH AVAILABILITY ARCHITECTURE



INFRA DIGITAL TWINS : IMMERSIVE OPERATIONAL EXPERIENCE

Owner-operators can minimize challenges with the help of digital twins: **1-2% revenue growth, 10-30% increase in planning efficiency, and 10-30% reduction in expenses**. Digital twins provide a single source of truth, allowing you to access data you can trust within minutes.

Reduce the decision time to 1 minute, as engineers have the right information at the right time.
(Source: McKinsey)[1]

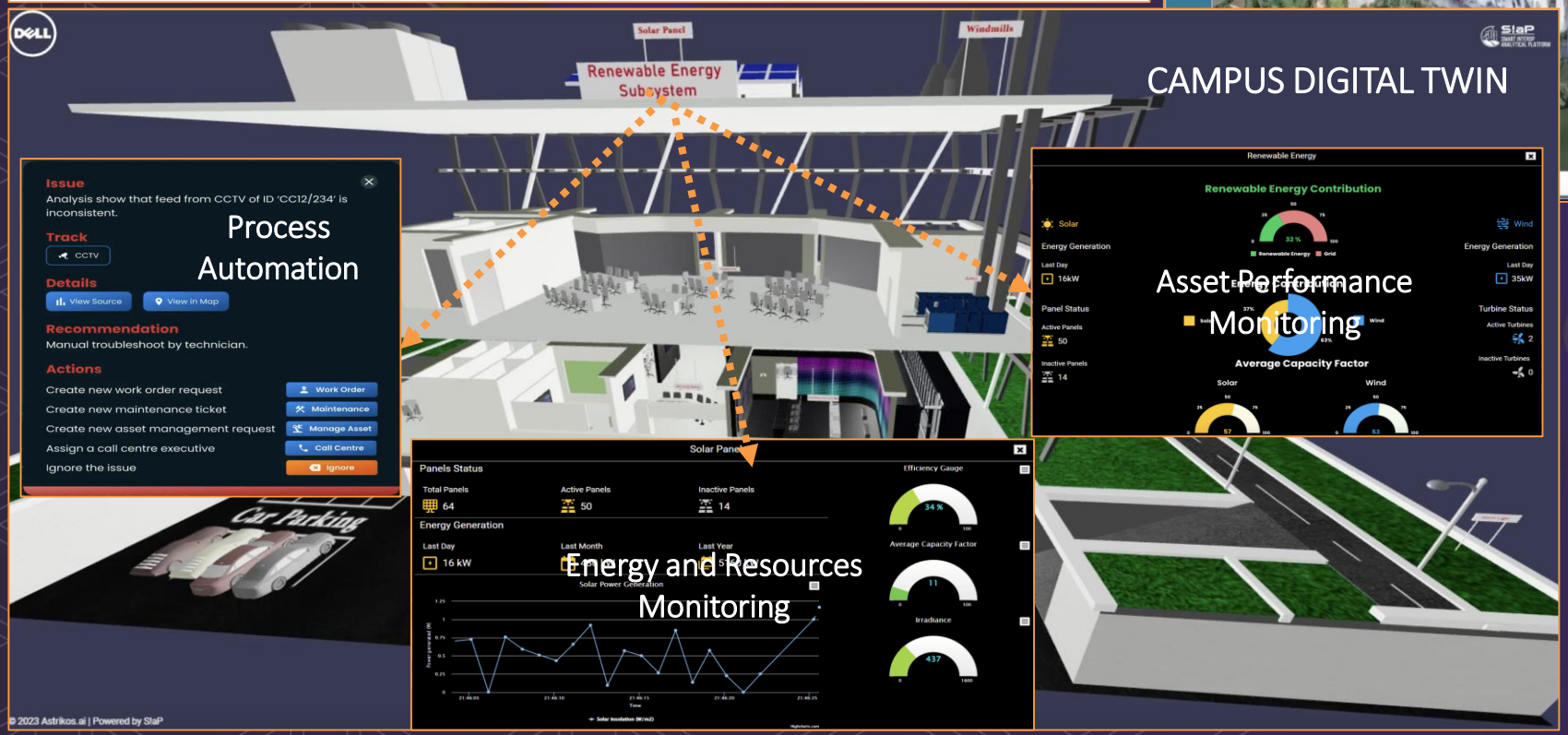
Reduce project-hours by 15% and keep workers engaged and productive.
(Source: McKinsey)[1]

Increase sustainability goals by lowering energy consumption in existing facilities, thereby increasing return on investment (ROI).
(Source: Ernst & Young)[2]

Digital twin technology provides tangible benefits to a company's P&L

Annual	Annual	One time
1% to 2% Revenue growth • Increased fill rates (on-time and in-full) • Increased speed-to-market • Increased strategic sales	**10% to 30%** Planning efficiency (SG&A) • Decreased manual intervention, duplication of efforts	**5% to 10%** Inventory reduction • Improved inventory visibility and reliability
Annual	**Annual**	**Annual**
5% to 10% Increased throughput • Revenue growth • Increased on-time delivery • Increased working capital	**10% to 30%** Reduced expenses • Reduced expedited logistics costs • Reduced returns • Reduced fines from shipment delays	**10% to 20%** Reduced inventory write-off • Reduced excess, obsolete, damaged inventory

COMMUNITY DIGITAL TWIN



CAMPUS DIGITAL TWIN

Process Automation

Asset Performance Monitoring

Energy and Resources Monitoring

ENABLERS FOR SUCCESS

- ❑ Integrated with real-time data from entities
- ❑ Visual triggering for proactive interventions and actions
- ❑ AI/ML models overlay for simulation of hypothetical scenarios