Asset Performance (NEMA)

Benefit from Strategic Maintenance Approach for Critical Assets

EcoStruxure Power Digital Application

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EcoStruxure™ Power

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Overview

Context of Application

In the past, equipment maintenance for circuit breakers, Uninterruptible Power Supplies (UPSs), motors, etc. was performed using a preventative or reactive approach. This means that devices were serviced periodically (typically every 1 to 2 years), upon failure, or upon the occurrence of a problem. Therefore, some equipment was maintained more often than necessary, whereas other equipment could have benefited from more frequent maintenance. Preventive and condition based maintenance on the other hand optimizes maintenance, and performs the right maintenance at the right time.

Problem to Solve

The facility/energy manager needs to:

- Move from reactive or preventative to condition-based (predictive) maintenance strategies for critical assets like circuit breakers, gensets, transformers, etc.
- Gain visibility into the health of critical assets and maintain them when necessary.
- Enhance their maintenance strategy with expert services to determine the optimal time to maintain critical assets.
- Streamline and optimize maintenance spending.

Purpose of the Application

Aggregate and analyze asset health data

- At Edge Control level: LV circuit breakers, UPSs, generator batteries, and power quality equipment
- Within Asset Advisor: MV/LV circuit breakers, MV/LV transformers (dry/oil-immersed), variable speed drives, and connected motors

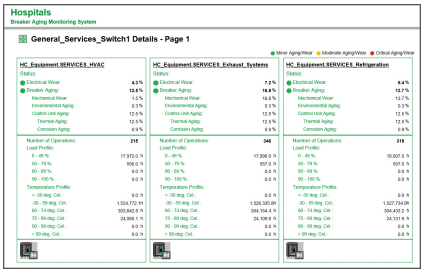
Offer a condition-based predictive approach, with tangible benefits for facility managers:

- Increase visibility of asset health across the entire system
- Streamline inspections using continuous asset health monitoring
- Optimize maintenance planning with analytics and expert advice

Application Outcomes

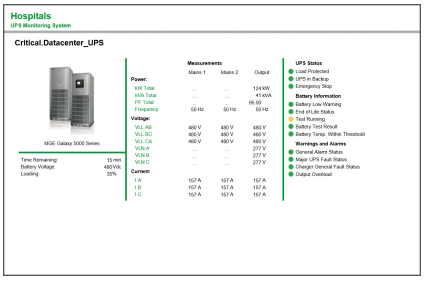
Live Data Display

- Circuit breaker asset monitoring diagram (% of electrical and mechanical wear, % of environmental and control unit aging, number of operations, and load and temperature profiles)



Aging Diagram for Circuit Breakers

- UPS monitoring diagram (measurements, UPS status, battery information, pre-alarms, and alarms)



UPS Monitoring Diagram

- Power quality mitigation equipment diagrams
- Generator status diagrams

Reports

- Circuit Breaker Aging Report
- UPS Health Report
- Generator Battery Health Report

These reports provide the right information to help decide when to maintain circuit breakers, UPSs, and generator start batteries.

Notifications

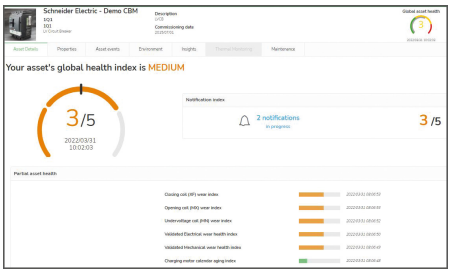
- SMS and/or email notifications can be sent for fast analysis and action.
- Email notifications are also available to send reports and non-critical information.

Cloud-Based Analytics and Services

EcoStruxure Service Plan powered by EcoStruxure Asset Advisor provides remote monitoring, asset management consulting, and on-site maintenance activities with recommendations from our Schneider Electric service experts.

It includes:

- Monitoring and alarms with remote notifications in the event of electrical asset condition anomalies
- Predictive analytics to help determine remaining equipment lifetime and other health indicators
- Condition-based asset maintenance triggered by a maintenance index



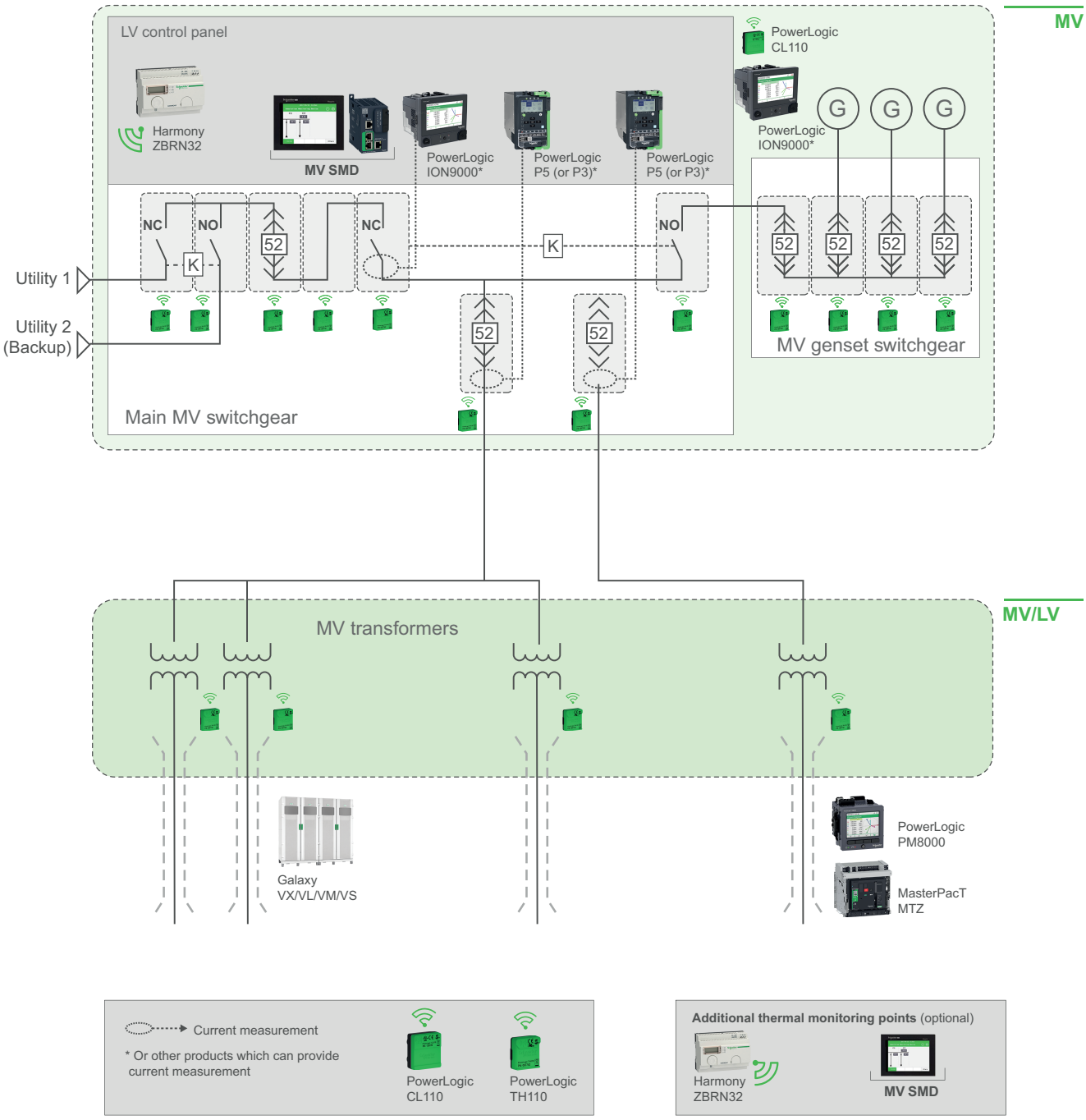
EcoStruxure Asset Advisor Asset Health Dashboard

EcoStruxure Asset Advisor Risk Level Dashboard

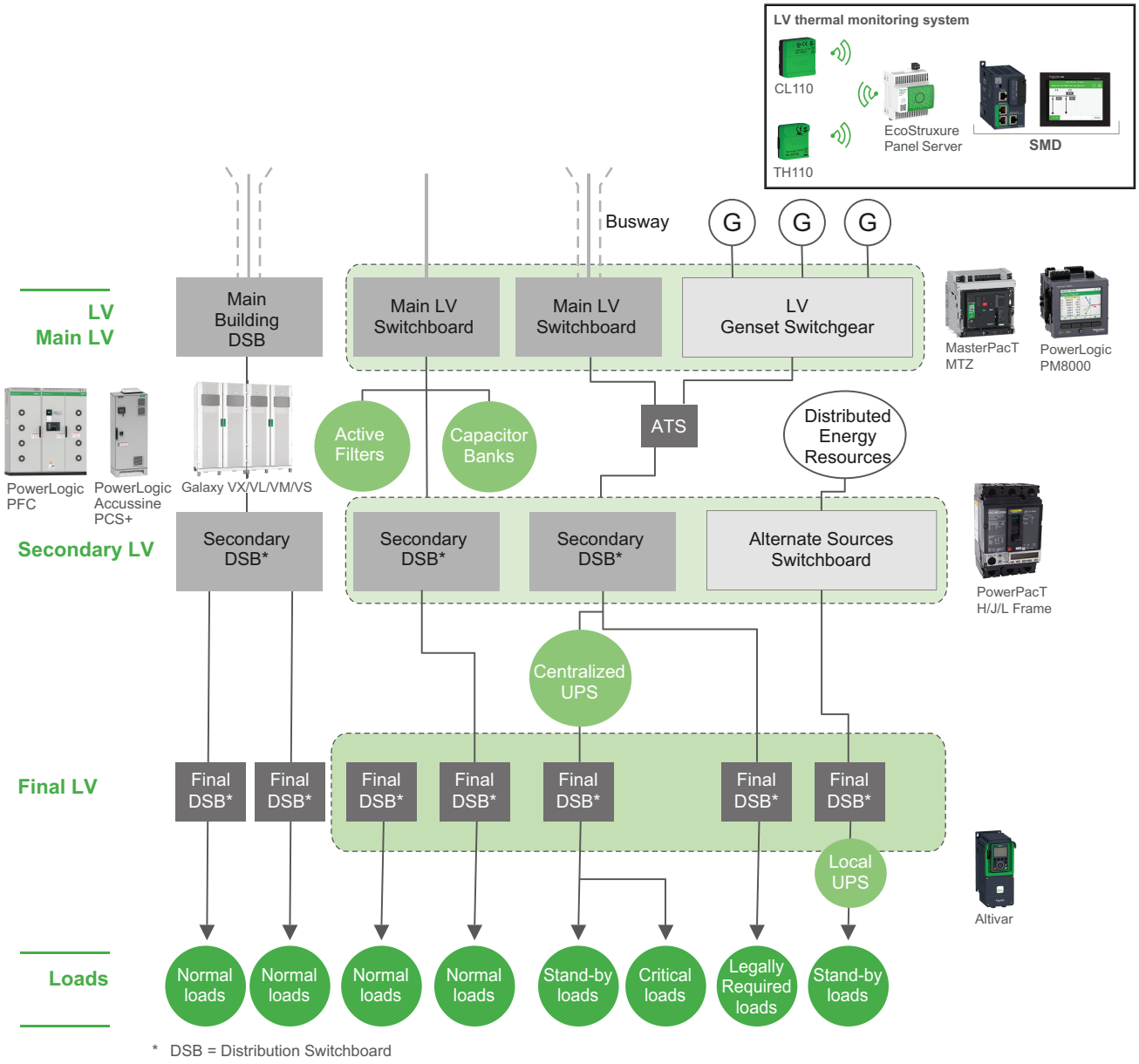
Electrical Architecture

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Asset Performance application. For more simplicity, the diagram has been split in two.

Upper Part (MV) of the Electrical Architecture



Lower Part (LV) of the Electrical Architecture



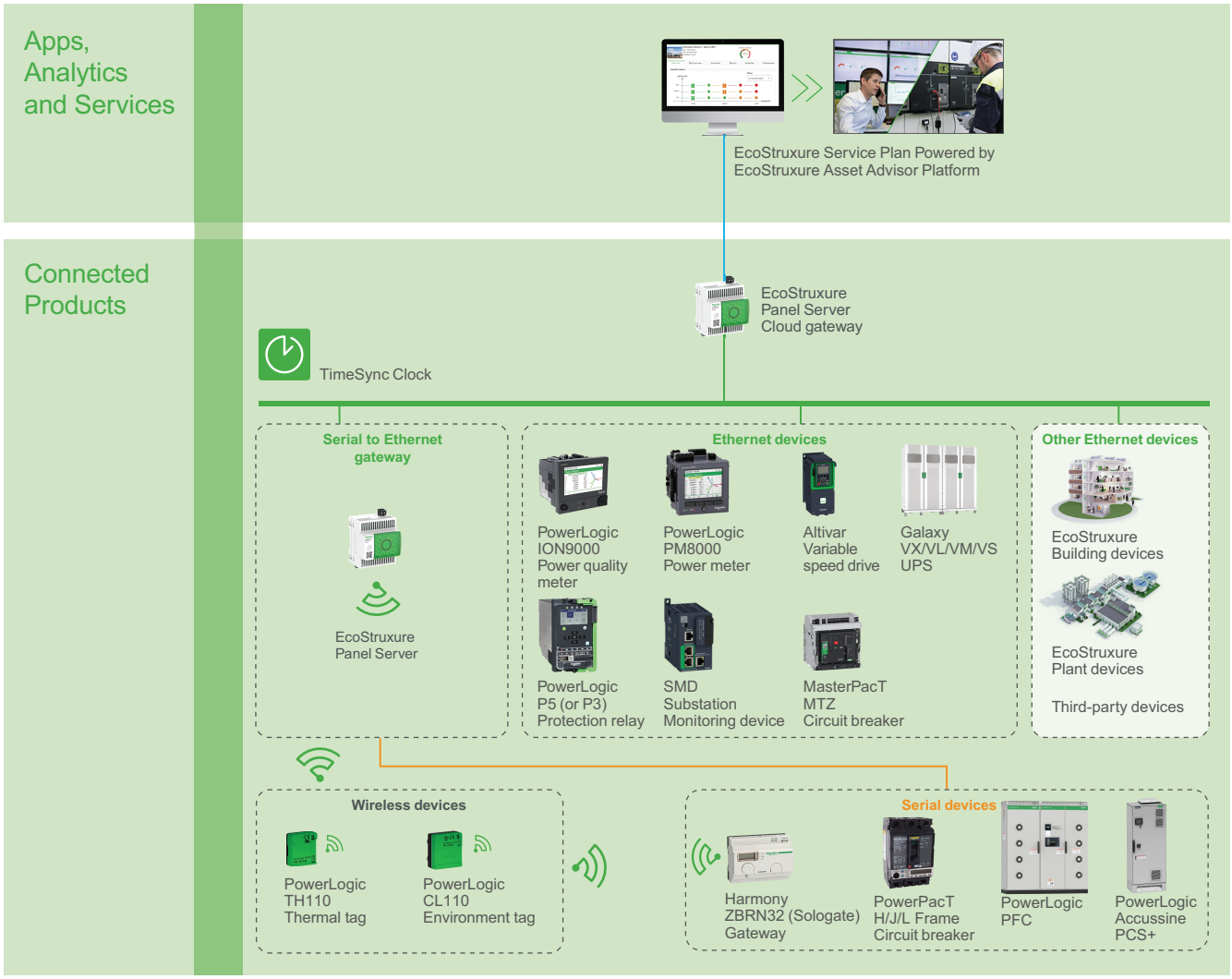
* DSB = Distribution Switchboard

Digital Architecture

With Connected Products and Remote Services

In this architecture, the data is collected and recorded from all connected products using a cloud gateway (EcoStruxure Panel Server). It is then passed on to the EcoStruxure Asset Advisor platform and interpreted by experts as part of the EcoStruxure Service Plan.

The recommended digital architecture for the application is shown below:



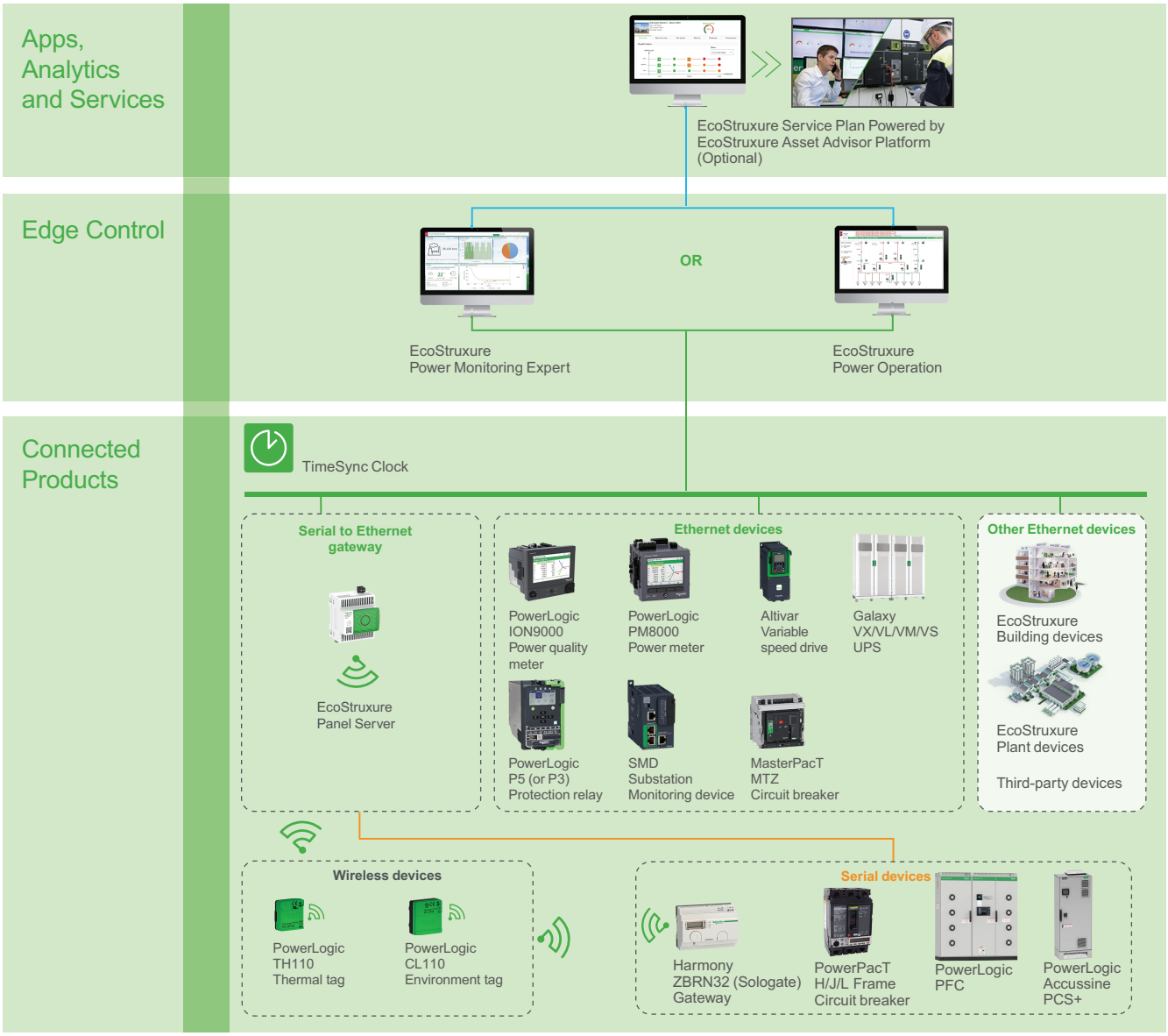
Ethernet - public LAN/WAN
Ethernet - technical LAN
Serial
Wireless - 2.4 GHz

With Connected Products, Edge Control Software, and Optional Remote Services

In this architecture, the data is collected from all connected products either directly over Ethernet or via gateways. This data is then recorded and processed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization, analysis, and reporting.

As an option, data from EcoStruxure Power Monitoring Expert or Power Operation can be passed on to the EcoStruxure Asset Advisor platform and interpreted by experts as a part of the EcoStruxure Service Plan.

The recommended digital architecture for the application is shown below:

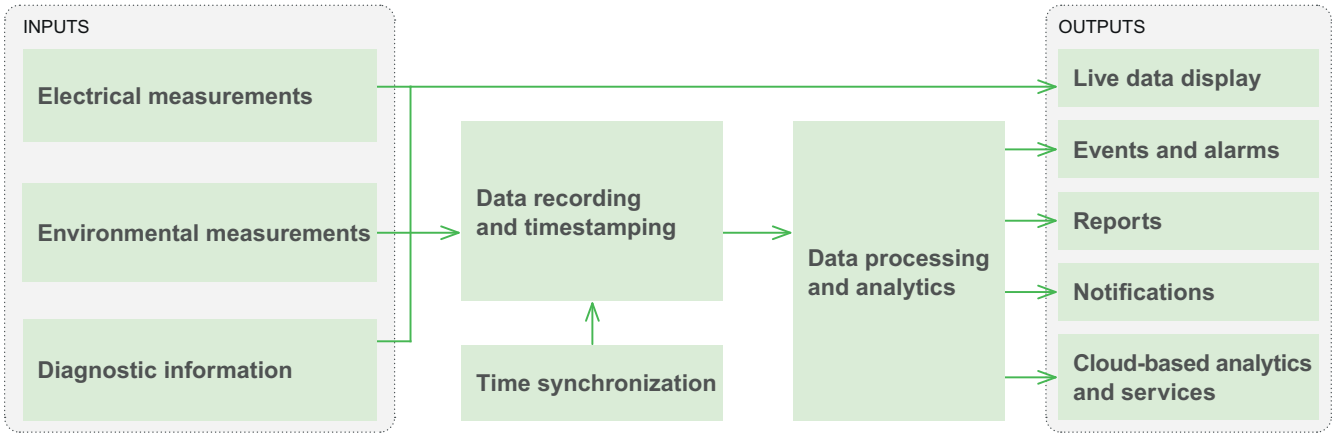


Ethernet - public LAN/WAN
Ethernet - technical LAN
Serial
Wireless - 2.4 GHz

System Description

Data Flow

The Asset Performance application can be broken down as follows:



Inputs

Data is collected from the following equipment types to implement the Asset Performance application:

- MV switchgear
- MV circuit breakers
- MV/LV oil transformer
- MV/LV dry-type transformer
- Generator
- Generator batteries
- LV switchboards
- LV circuit breakers
- LV busway
- UPS
- Variable speed drives
- MV/LV motors
- PowerLogic PFC
- PowerLogic AccuSine PCS+

Electrical Measurements

Depending on the asset, electrical measurements and status information can be provided by:

- **Power meters** such as PowerLogic ION9000, PM8000, HDPM6000


PowerLogic ION9000


PowerLogic PM8000


PowerLogic HDPM6000

- **Protection devices** such as PowerLogic P5/P3, MasterPacT MTZ, PowerPacT H/J/L


PowerLogic P5


PowerLogic P3


MasterPacT MTZ


PowerPacT H/J/L

- **UPS controller** such as Galaxy VX/VL/VM/VS


Galaxy VX/VL/VM/VS

- **Variable speed drive** (VSD) such as Altivar


Altivar VSD

Examples of electrical measurements are as follows[1]:

- 3-phase currents and voltage
- Active, reactive power
- Cumulative breaking current (kA²)
- Trip circuit, auxiliary voltages

Environmental Measurements

Environmental measurements are provided by the PowerLogic TH110 and PowerLogic CL110 thermal and environment tags that can be connected to a Substation Monitoring Device (SMD).

- Temperatures from cables, busbar, and windings
- Ambient temperature and humidity (PowerLogic CL110)


PowerLogic TH110


PowerLogic CL110


Substation Monitoring Device (SMD)

Diagnostic Information

Diagnostic data is provided by each of the connected products mentioned previously. It includes[1]:

- Contact wear

1. This is not a comprehensive list. Other data may be available and contribute to asset health analytics.

- Number of operations (open/close, trip, draw out)
- Time for operation (trip, charge)
- Output velocity and torque
- Drive thermal status

Data Recording and Timestamping

For advanced connected products such as the PowerLogic ION9000, PM8000, MasterPacT MTZ, PowerLogic P5, and PowerLogic P3, the previously mentioned data is recorded and timestamped onboard.


PowerLogic ION9000


PowerLogic PM8000


MasterPacT MTZ


PowerLogic P5


PowerLogic P3

For other connected products or third-party devices, depending on the chosen digital architecture, data recording and timestamping is performed by the Edge Control software (EcoStruxure Power Monitoring Expert), by EcoStruxure Asset Advisor, or by EcoStruxure Panel Server when directly associated with EcoStruxure Asset Advisor.


EcoStruxure Power Monitoring Expert


EcoStruxure Asset Advisor


EcoStruxure Panel Server

Timestamping of digital data, while not critical for asset performance, should be accurate to ±1 second for consistency and data integrity.

For a comprehensive overview of device recording and timestamping capabilities, refer to Data Recording and Time Synchronization Capabilities of EcoStruxure Power Connected Products.

Time Synchronization

To have a consistent chronological view of all events that take place throughout the facility, the date and time should be accurately distributed to connected products and other management systems.

Time synchronization can be performed through various technologies (PTP, NTP, SNTP, etc.). An external master clock may be required and connected to a GPS antenna to reach the expected time precision.


TimeSync Clock

Data Processing

In the Asset Performance application, data processing consists of evaluating data from critical connected assets and applying advanced analytics to identify potential risks.

A first level of asset diagnostics, monitoring, and alarming, as well as some simple analytics are computed in EcoStruxure Power Monitoring Expert and Power Operation for on-premise, self-serve reporting (for example, low voltage circuit breakers, UPSs, generator batteries).

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

More advanced analytics, such as predictive analysis and recommendations for maintenance optimization, are available with EcoStruxure Asset Advisor. They are typically recommended for highly critical, capital intensive assets.

For a summary breakdown, see the table of available asset health analytics below:

Location	On-Premise		Cloud-Based
	Edge Control		Preventive/Predictive Advisor Services
Equipment	Monitoring and Alarming	Simple Asset Health Analytics	Advanced Asset Health Analytics and Recommendations
MV switchgear	●		●
MV circuit breakers	●		●
MV/LV oil transformer	●		●
MV/LV dry-type transformer	●		●
Generator	●		●
Generator batteries	●	●	●
LV switchboard	●		●
LV circuit breakers	●	●	●
LV busway	●		●
UPS	●	●	
Variable speed drives	●		●
MV/LV motors	●		●

Outputs

Display of the following outputs is performed by EcoStruxure Power Monitoring Expert, Power Operation, or via the Asset Advisor web platform.

EcoStruxure
Power Monitoring Expert

EcoStruxure
Power Operation

EcoStruxure
Asset Advisor

Live Data Display

Live diagnostics data from monitored equipment can be visualized if the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) is in the architecture.

Events and Alarms

Asset related events and alarms can be raised in EcoStruxure Power Monitoring Expert and/or Power Operation in real time, or near real time, depending on the system configuration. These include MV switchgear and transformer environmental conditions (temperature and humidity), busway junction temperatures, breaker health (aging) and other simple diagnostics (communications, status, etc.).

Reports

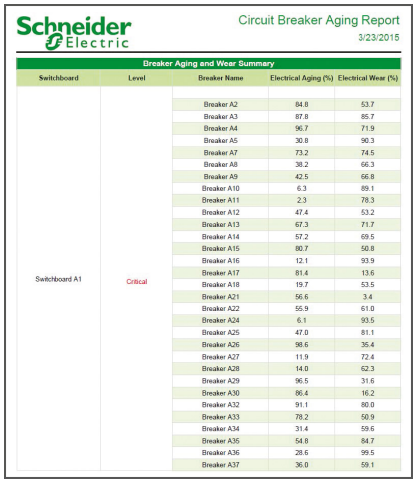
Reporting is available for asset health analysis with Edge Control Software (EcoStruxure Power Monitoring Expert and Power Operation).

It includes:

Low Voltage Circuit Breaker Aging Report [2]

The circuit breaker aging report shows the status of circuit breaker aging and wear in your electrical system. The following LV circuit breaker ranges are supported:

- MasterPacT MTZ 1/2/3
- MasterPacT NT
- MasterPacT NW
- PowerPacT P/R Frame 630b-3200
- PowerPacT H/J/L Frame


Schneider Electric
Circuit Breaker Aging Report
3/23/2015
Breaker Aging and Wear Summary

Switchboard	Level	Breaker Name	Electrical Aging (%)	Electrical Wear (%)
Switchboard A1	Critical	Breaker A2	84.8	53.7
		Breaker A3	87.8	85.7
		Breaker A4	96.7	71.9
		Breaker A5	30.8	90.3
		Breaker A7	73.2	74.5
		Breaker A8	38.2	66.3
		Breaker A9	42.5	66.8
		Breaker A10	6.3	89.1
		Breaker A11	2.3	78.3
		Breaker A12	47.4	53.2
		Breaker A13	67.3	71.7
		Breaker A14	57.2	69.5
		Breaker A15	80.7	50.8
		Breaker A16	12.1	93.9
		Breaker A17	81.4	13.6
		Breaker A18	19.7	53.5
		Breaker A21	56.6	3.4
		Breaker A22	55.9	61.0
		Breaker A24	6.1	93.5
		Breaker A25	47.0	81.1
		Breaker A26	98.6	35.4
		Breaker A27	11.9	72.4
		Breaker A28	14.0	62.3
		Breaker A29	96.5	31.6
		Breaker A30	86.4	16.2
		Breaker A32	91.1	80.0
		Breaker A33	78.2	50.9
		Breaker A34	31.4	59.6
		Breaker A35	54.8	84.7
		Breaker A36	28.6	99.5
		Breaker A37	36.0	59.1

Low Voltage Circuit Breaker Aging Report

UPS and Generator Battery Health [3]

Reporting for assets such as generators, generator batteries, and UPSs can be found in the Backup Power Testing Application section.

2. Requires the Breaker Performance Module in EcoStruxure Power Monitoring Expert and Power Operation.
3. Requires the Backup Power Module in EcoStruxure Power Monitoring Expert and Power Operation.

Notifications [4]

There are various options for remote notifications depending on the selected architecture:

- Simple diagnostic notifications based on data from supported connected products in the Edge Control software (Schneider Electric circuit breakers, protection relays, UPS, etc.)
- Preventive maintenance notifications based on EcoStruxure Asset Advisor Preventive analytics for Schneider Electric MV/LV equipment
- Proactive/Predictive analytics alerts and recommendations with EcoStruxure Asset Advisor Predictive for Schneider Electric MV/LV equipment and third-party equipment

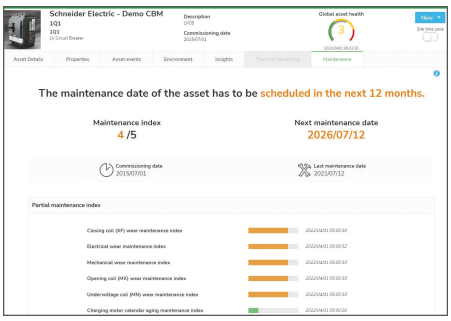
Cloud-Based Analytics and Services

EcoStruxure Service Plan powered by EcoStruxure Asset Advisor provides remote monitoring, asset management consulting, and on-site maintenance activities with recommendations from our Schneider Electric service experts.

It includes:

- Continuous asset monitoring and alarms
- Web portal and mobile app consultation with 24/7 remote support
- Remote notifications in the event of electrical asset condition anomalies
- Predictive analytics to help determine remaining equipment lifetime and other health indicators
- Customized reports with recommendations on asset health condition and optimized maintenance plan
- Condition-based asset maintenance triggered by Maintenance Index
- Optimized maintenance plan and proactive recommendations from Schneider Electric experts

EcoStruxure Service Plan powered by EcoStruxure Asset Advisor platform



EcoStruxure Asset Advisor Maintenance Index

4. For notifications in EcoStruxure Power Monitoring Expert and Power Operation, the Event Notification Module is required.

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