DATA CENTERS

Reference **Architecture II**

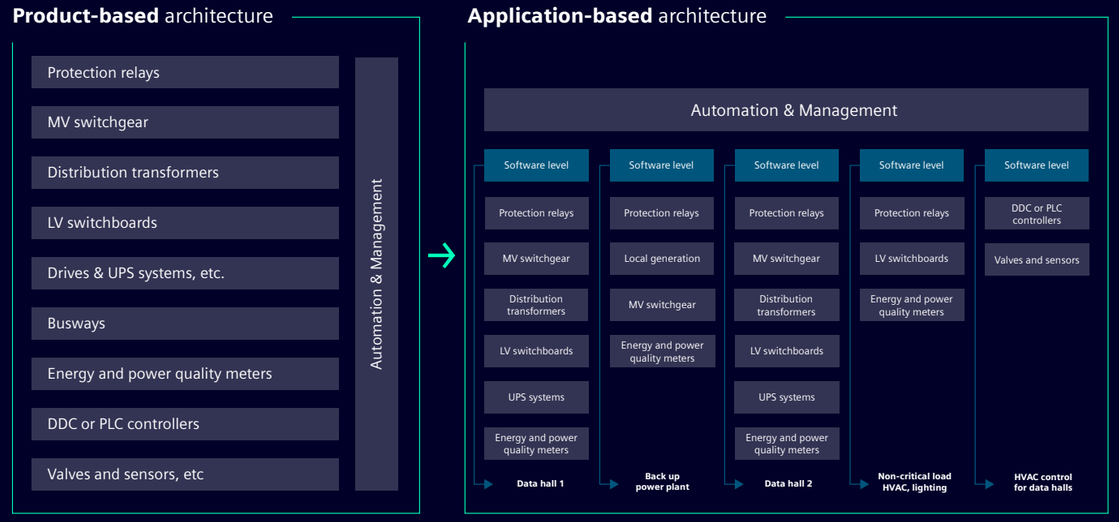
Redundant PLC-based architecture with remote connectivity
siemens.com/datacenters

Introduction

A reference architecture is a standardized blueprint that outlines the components, communication protocols, and functional relationships between the different systems and devices in a data center. It provides a unified framework to ensure seamless integration of various components, including those from third-party vendors. Furthermore, a reference architecture facilitates scalability and adaptability as a data center's requirements evolve.

This flyer outlines one possible design, implementation, and operation of a data center's monitoring, control, and management system – commonly referred to as the Building Management System (BMS) and Electrical Power Monitoring System (EPMS). By adopting this solution guideline, you will be in an even better position to enhance cost efficiency, reliability, and scalability.

Reference Architecture Concept



Going up to **Tier IV and beyond**

Industrial automation with programmable logic controllers (PLCs) supports a robust approach to achieving redundancy in data centers.

Even the highest classifications for redundancy defined by standards like the EN 50600 or the Uptime Institute may fall short of some data center investors' aspirations.

Today, data center customers are increasingly demanding assurances that their mission-critical applications can operate without disruption, even in the event of a major infrastructure failure. Operators can gain a competitive advantage by meeting this need for uninterrupted availability. Industrial automation with programmable logic controllers (PLCs) enables a level of resilience that can exceed the requirements of the top redundancy classifications.

And its advantages extend beyond the capabilities of PLCs. By integrating technologies such as sensors, actuators, and advanced software, industrial automation takes a holistic approach to enhancing resilience and efficiency to meet the demands of modern data center operations.

It also enables operators to better mitigate the risk of downtime, SLA infringement, and data loss. This puts them in a stronger position to protect their reputation and avoid potential financial losses.

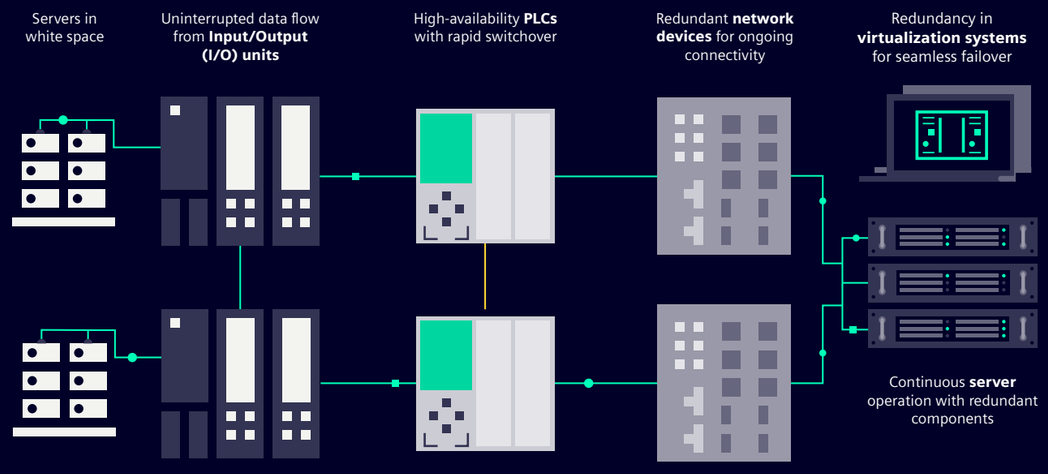
Impact on **every layer**

In data center architecture featuring such industrial automation redundancy, at the top of the infrastructure the BMS and EPMS oversee the physical components. Together they maintain optimal mechanical and electrical performance and ensure proper safety and security conditions for employees and visitors. At the application layer, this integrated redundancy in the BMS and EPMS ensures continuous monitoring, alarming, and management of the data center environment. That minimizes the risk of equipment failures and data center disruptions.

Aside from impacting the BMS and EPMS, industrial automation redundancy has an effect on just about every layer of data center architecture, including:

- **Input/Output (I/O) units:** Implementing I/O units with redundant power supply ensures uninterrupted data flow to the automation layer, even if a single power unit fails.
- **Controllers:** High availability is achieved with industrial PLC S7-1500R/H using redundant communications to connect the controller with redundant I/O models. These components offer a standard system feature of down to 50 millisecond switchover time.
- **Network devices:** Implementing redundant network devices ensures uninterrupted connectivity and data transmission in the event of a hardware failure or a cable disconnection.
- **Servers:** As the IT foundation of infrastructure management, servers process and store vast amounts of data. Redundancy here ensures continuous operation even if a single component fails, whether with power supply, memory, or a processing unit.
- **Virtualization systems:** These software platforms consolidate multiple servers onto a few physical machines, thereby enhancing resource utilization and scalability. Redundancy in virtualization systems ensures seamless failover and prevents downtime due to system failures.

Ring architectures in industrial automation deliver robust redundancy, scalable connectivity, and decentralized control via diverse paths. They eliminate single points of CPU, IO device and cable failure, and enable real-time communication and device replacement, ensuring high availability.



Deep dive: **Redundancy at the application layer**

A high availability configuration of the SCADA system ensures uninterrupted process monitoring and control in the case of a server failure.

A SCADA system provides comprehensive data center monitoring, enabling real-time and historical data collection, KPI definition, device assignment, and root cause analysis. Additionally, the system provides user-defined dashboards for customized data visualization and analysis. Its scalable architecture allows seamless expansion on any hardware, supporting existing plant expansion without disruptions.

Data centers designed to exceed Class 4 and Tier IV standards need to have a **SCADA system that can ensure uninterrupted process monitoring and control.** SIMATIC WinCC Open Architecture from Siemens offers the necessary configuration through a redundant system with a primary and a secondary server in a hot-standby configuration.

Here's a breakdown of the key aspects:

Hardware redundancy: Two servers are employed, with one being active and the other acting as a hot standby.

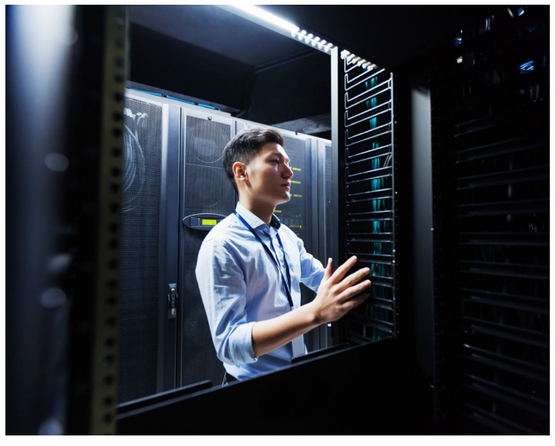
Data synchronization: The standby server continuously synchronizes data with the primary server in real time, ensuring both servers have identical information.

Failover mechanism: If the primary server fails, the system automatically switches to the standby server. This "on-the-fly" switch minimizes downtime and maintains data integrity.

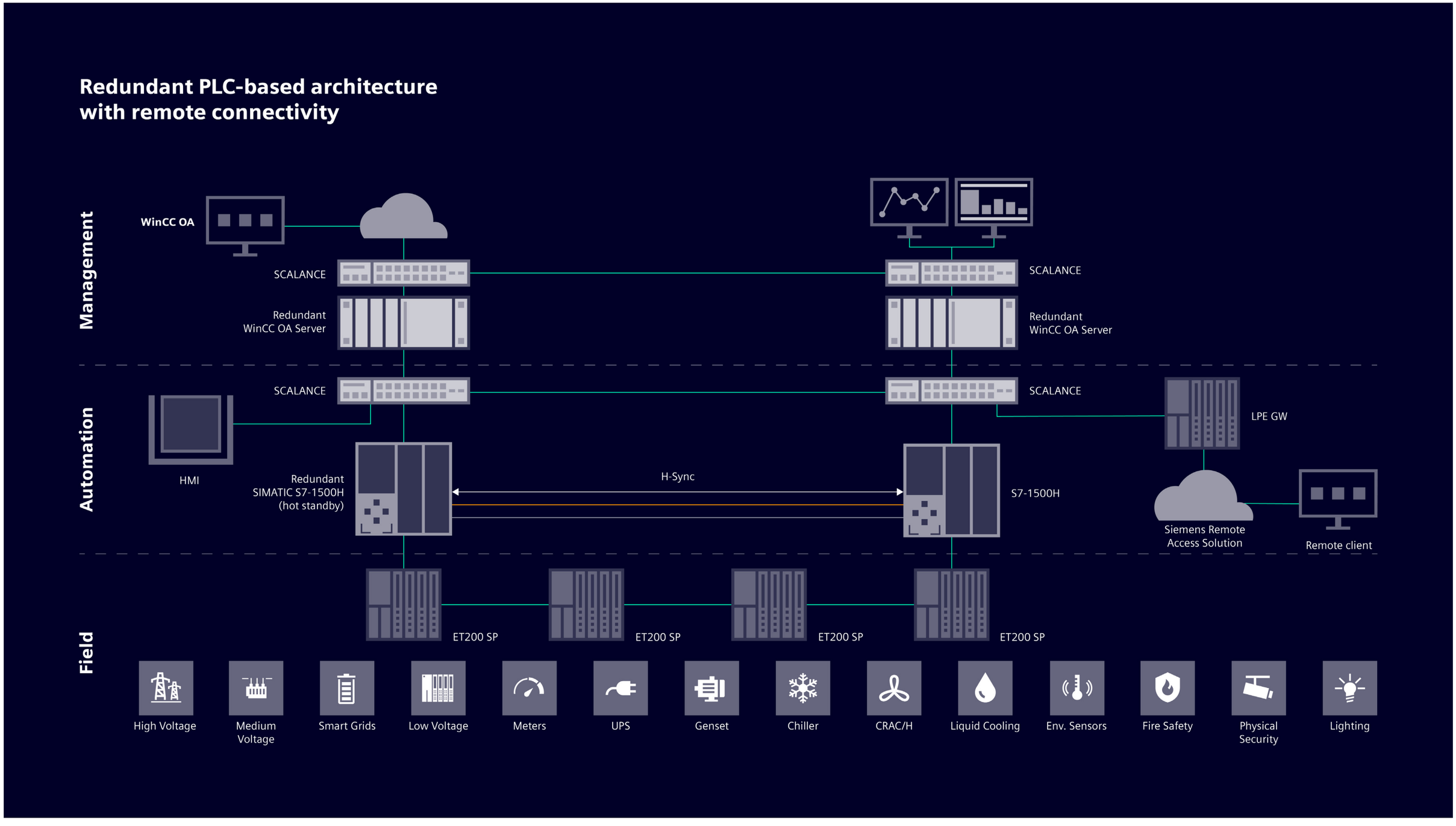
As a result, access to data or functions is always guaranteed. Yet there are other advantages of SIMATIC WinCC OA: The open software architecture enables customized solutions with **engineering encryption**, ensuring data security and integrity.

Object-oriented programming facilitates efficient engineering and flexible software expansion, minimizing downtime and optimizing operations.

Furthermore, the system offers flexible data availability through web-based reporting, providing remote access and real-time insights into data center operations. These features collectively enhance data center efficiency, optimize performance, and facilitate informed decision-making.



Reference architecture schematic



Advantages of **going beyond**

To receive certification from the Uptime Institute, data center operations are subjected to a rigorous evaluation process.

With SIMATIC industrial automation from Siemens, data center operators can easily achieve - and surpass - the most stringent redundancy standards, such as EN 50600 and Tier IV. Redundancy is inherently integrated, eliminating the need for extra programming or features. The benefits of this approach are substantial, including:

- **Unparalleled Uptime:** By eliminating single points of failure and ensuring continuous operation at every level, redundancy as standard feature virtually eliminates downtime, providing customers with the highest level of service availability.
- **Robust Disaster Recovery:** The ability to failover to redundant systems within milliseconds ensures business continuity and minimizes the impact of unplanned outages.
- **Enhanced Scalability:** Redundancy at every layer enables seamless scalability, allowing data centers to adapt to increasing demands without compromising performance or availability.
- **Improved Data Security:** By minimizing downtime and ensuring continuous operation, redundancy reduces the likelihood of data loss or corruption, protecting sensitive information and safeguarding business operations.

Siemens offerings that **support this reference architecture:**

SIMATIC WinCC OA

Build vendor- and platform-independent SCADA systems with software designed for large, complex applications and custom functionalities. Solutions are scalable and provide unlimited global access over the web, including native iOS and Android user interfaces or browser-based clients.

SIMATIC S7-1500 R/H PLC

These redundant industrial PLCs use redundant communication to the connected I/O units. The components offer a standard system feature of down to 50 millisecond switchover time.

SIMATIC ET200SP

This compact I/O system for the control cabinet combines a lean design with remarkable performance. You benefit from simple commissioning, individual scalability, maximum flexibility for your applications and a comprehensive range of modules.

SCALANCE

These network components form the basis for communication networks in industrial automation. They meet all requirements for highly efficient industrial networks and bus systems, whether for switching, routing, security applications, remote access or industrial wireless LAN.

Let's talk!

Fill in this contact fror to start a conversation with our data center experts.

Visit our website

Discover the Siemens data center offering and use cases that align with the strategic business goals.

Visit use case page

Discover more information and offerings for increased uptime with redundant automation design!

Published by
Siemens Switzerland Ltd

Smart Infrastructure
Global Headquarters
Theilerstrasse 1a
6300 Zug
Switzerland
Tel +41 58 724 24 24

For the U.S. published by
Siemens Industry Inc.

3617 Parkway Lane
Peactree Corners, GA 30092
United States

Article-No: SI-FlyerRefArchII-WWEN-2025-02
Status: 08/2025