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Hybrid Architecture for Modern Industrial Operations

Modern plants need to scale visibility, analytics, and optimization, without compromising real-time control or reliability.

Traditional approaches struggle to achieve this balance. Pure on-premise architectures can limit cross-site visibility and restrict advanced analytics. Fully cloud-based models, while powerful, can introduce latency, availability, and security concerns that are not acceptable for industrial environments.

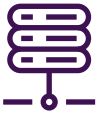
A hybrid architecture offers a practical path forward—combining deterministic control at the edge with enterprise-level data access, insight, and optimization.

A future-proof hybrid architecture separates control, data, and visualization into clearly defined layers:

Control & Data Acquisition Layer
Real-time control systems, including PLCs, SCADA, and field instrumentation, operate locally to ensure deterministic performance, safety, and high availability.

Operational Data Layer (Edge / Site Level)
Data is collected, buffered, and contextualized at the site level. This layer supports local operations, alarm handling, and short-term history while ensuring systems can continue running independently if connectivity is lost.

Enterprise Data Infrastructure Layer
Operational data from multiple sites is consolidated into a central environment. This enables standardization of asset models, governance, and cross-site visibility for performance benchmarking and decision-making.



Visualization & Operator Interface Layer
Operators and engineers access real-time and historical data through consistent, standardized HMI and visualization environments, ensuring clarity and faster response.

IT / Analytics Layer
Secure access is provided for reporting, advanced analytics, maintenance systems, and optimization tools—enabling data-driven decision-making at scale.

Architecture Patterns & Design Considerations

Common Deployment Patterns

- Site-centric hybrid: Local autonomy with central visibility
- Centralized data platform with edge nodes: Strong enterprise control with distributed data collection
- Hybrid with selective cloud integration: Cloud used for analytics and optimization, not control

Key Design Considerations

- Latency and availability requirements at each layer
- Network segmentation and cybersecurity zones
- Data integrity, time synchronization, and buffering strategies
- Scalability for new assets, sites, and systems
- Governance of data models and HMI standards

Migration Approach & Outcomes

A hybrid architecture does not require a full system replacement. It can be introduced incrementally:

Migration Approach

- Introduce operational data capture alongside existing control systems
- Standardize visualization and data models over time
- Centralize data access to enable cross-site visibility
- Extend analytics and optimization capabilities in phases

Operational Outcomes

- Faster troubleshooting and root-cause analysis
- More consistent operations across sites
- Reduced technical debt through decoupled architecture
- A scalable foundation for predictive maintenance, performance optimization, and sustainability reporting

Moving Forward

A well-designed hybrid architecture allows organizations to modernize without disrupting operations-bridging the gap between real-time control and enterprise intelligence.

If you're evaluating your current setup, now is the time to assess how your architecture supports not just today's industrial operations, but tomorrow's growth.

Contact us to discuss your current setup and see how AVEVA solutions can support your future operations.

Email: sales@gulf.avevaselect.com
www.gulf.avevaselect.com

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