AVICORE TECHNOLOGY

aviCore is a modern, secure platform for real-time industrial data, offering integrated analytics, visualization, and reporting through a unified, hierarchical architecture. Unlike legacy SCADA systems, it's designed from the ground up to address today's cybersecurity, interoperability, and data modeling needs.

aviCore

Avista Realtime Systems, LLC
avistarts.com
info@avistarealtime.com
410 205 2484
7389 Washington Blvd #108
Elkridge, MD 21075

AVISTA REALTIME SYSTEMS

Summary

aviCore is a modern platform for real-time data communication, analytics, visualization, notifications, and reporting—built specifically for today's industrial and utility environments. Unlike legacy SCADA systems, which were developed in an era where cybersecurity, interoperability, and analytics were not central to their design, aviCore was engineered from the ground up with these critical needs in mind. As a result, it delivers robust performance for real-time industrial data while inherently addressing today's cybersecurity and integration challenges.

aviCore employs a unified architecture across all system functions. Rather than relying on a flat data model, it organizes system data into a structured hierarchy of locations, devices, and points. Attributes such as quality flags and timestamps are preserved end-to-end—from field devices to the headend. Moreover, aviCore supports free-format point values, allowing rich data—including diagnostics and metadata—to be transmitted and visualized without custom configurations or middleware.

This hierarchical model is consistently applied across HMIs, event sequences, reports, notifications, and analytics, enabling intuitive navigation and a seamless user experience across all components.

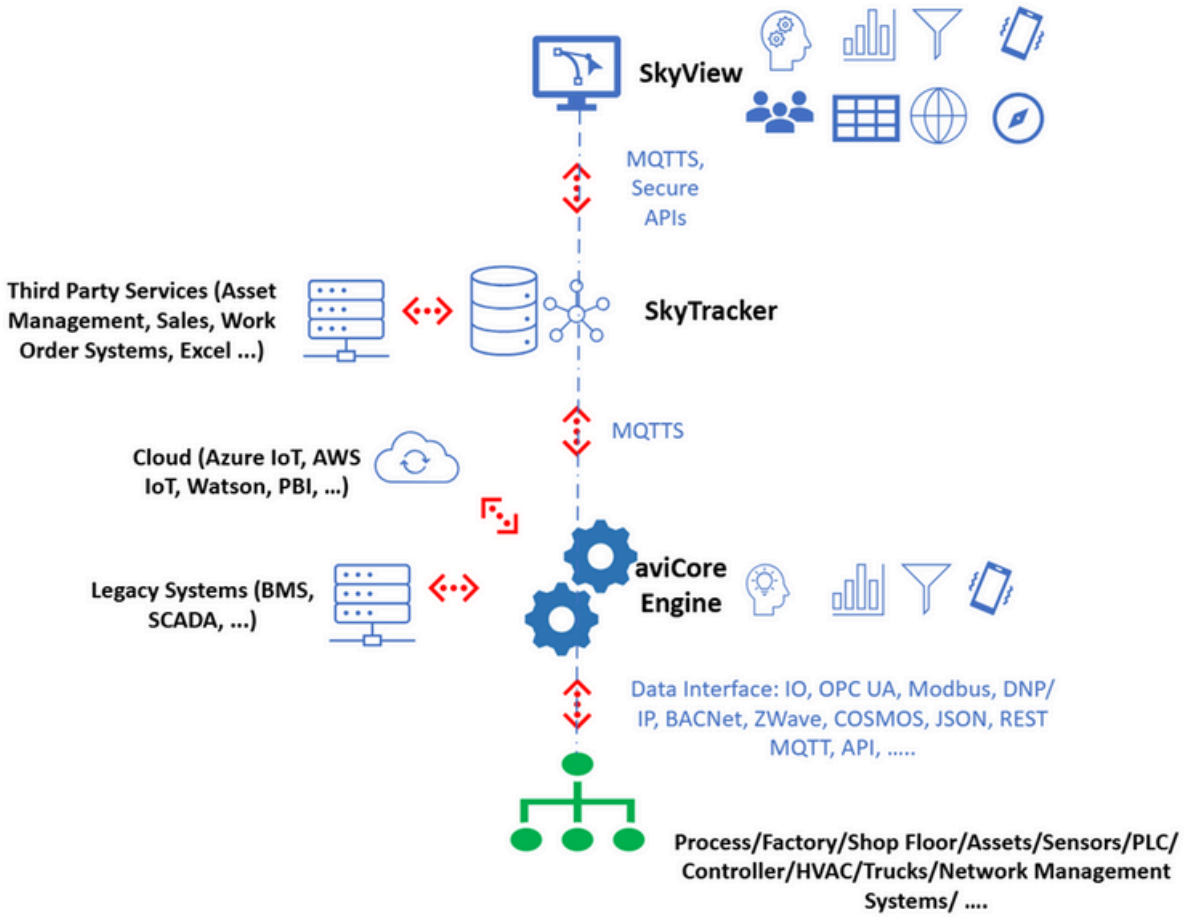
Trused By

Federal Aviation Administration (FAA)	We deployed aviCore at the client's call center to monitor UPS status, generator health, server room temperature and humidity, and network performance. The system provided real-time alerts, historical trends, and centralized visibility to enhance operational reliability.
U.S. Department of Agriculture (USDA)	In this aviCore project, we integrated with the fire alarm system and used Blackberry's notification API to distribute real-time alerts via calls and messages, ensuring immediate response and streamlined emergency communication across the organization.
City of Hagerstown, Maryland	We implemented a solution based on the aviCore Platform to monitor lift stations by interfacing with existing Modicon and Allen-Bradley PLCs, capturing real-time pump and level data, generating alarms, and providing centralized visibility to improve maintenance and operational efficiency.
Hagerstown Light Department, Maryland	aviCore monitors the electric municipality's substations and reclosers using DNP3 protocols, supporting various recloser and relay types. It collects real-time status, events, and analog data, enabling centralized visibility, automated notifications, and enhanced situational awareness.
Town of Smithsburg, Maryland	aviCore monitors five clean and wastewater stations, interfacing with various relay panels, PLCs, and controllers. It unifies data collection, enables remote visibility, generates alerts, and supports proactive maintenance across all sites.

Architecture

The aviCore platform consists of three core components:

1.Engine – The real-time data processing and communication backbone.
2.SkyTracker – The module for event recording, audit trails, and diagnostics.
3.SkyView – The visualization and HMI interface for operators and analysts.



aviCore Engine

The aviCore Engine is a high-performance, real-time data communication and decision-making platform designed for both Linux and Windows environments. It features an open, modular architecture that is hardware-agnostic, enabling deployment across a wide range of industrial systems and computing platforms—from embedded devices to enterprise servers.

aviCore organizes data using a structured hierarchy of Location → Device → Point, ensuring consistent navigation, traceability, and contextual awareness across the entire system. Attributes such as timestamp, quality, and extended metadata are preserved end-to-end, from field sensors to the headend.

The platform supports native integration with a wide range of protocols and services, including SNMP, OPC UA, GPS, and location services. It is optimized for deployment over cellular and satellite networks, with built-in support for VPNs and secure communication channels, ensuring encrypted and authenticated data flow in remote and mission-critical environments.

aviCore can be easily integrated with leading PLC platforms such as Emerson, Phoenix Contact, and others. It supports custom C# libraries, allowing users to embed or interface with existing applications, including building management systems (BMS) and specialized automation tools.

An embedded scripting engine enables the development of edge intelligence and control logic, while the platform's extensibility allows for the addition of advanced applications such as machine learning at the edge, computer vision, and other AI-driven functions.

With its scalable architecture and unified data model, aviCore delivers a flexible, secure, and future-proof foundation for modern SCADA, IIoT, and industrial automation systems.

SkyTracker

SkyTracker is a high-performance time-series database and data broker designed to capture, store, and serve real-time industrial data as a secure and scalable historian. It acts as a critical link between edge devices and enterprise systems, enabling continuous data flow across modern SCADA and IIoT environments.

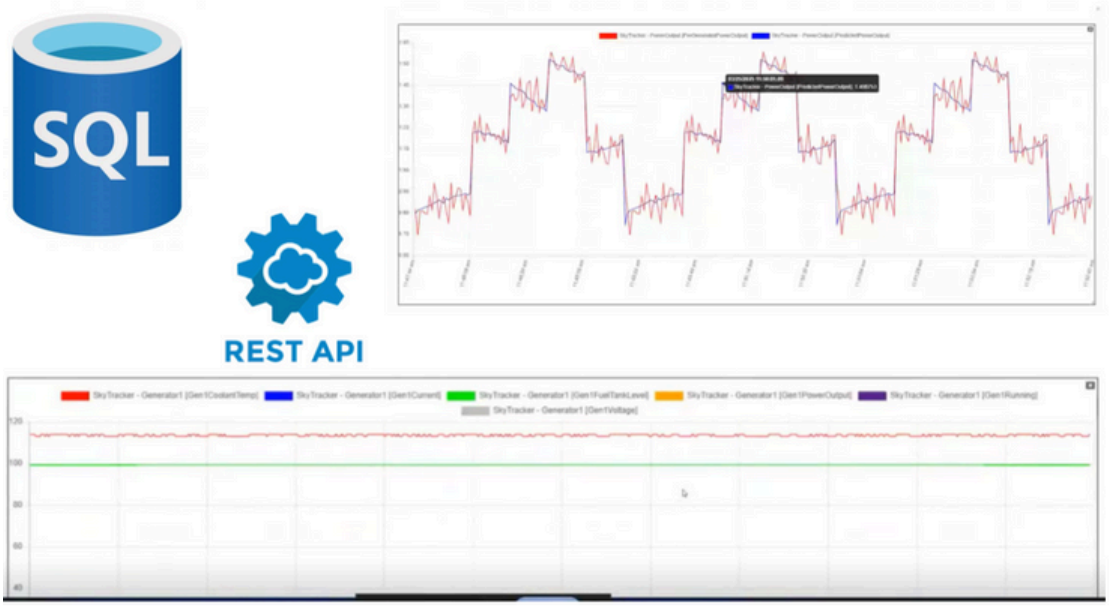
A key advantage of SkyTracker over traditional time-series solutions is its tight integration with the aviCore Engine. The API is structured to follow the same hierarchical model—Location → Device → Point—making data queries intuitive and consistent across all applications. This alignment streamlines development and eliminates the need for complex tag mapping or manual data reconciliation.

SkyTracker also supports automatic schema generation by importing configuration files directly from the aviCore Engine. This removes the need to manually build or maintain a headend database, ensuring seamless synchronization between field configurations and historical data storage.

Security is a core feature of the platform. All data transfers from edge components are secured using mutual SSL certificate authentication, ensuring both encryption and identity verification. In high-security environments, SkyTracker can use existing corporate databases or business processes as its data backbone to meet compliance and governance requirements.

For real-time interoperability, SkyTracker can broker field data to third-party systems using secure MQTT links or REST APIs, enabling live integration with analytics platforms, asset management tools, or cloud-based services. Additionally, advanced users can build their own data processing or visualization applications by interfacing directly with the SkyTracker infrastructure.

SkyTracker combines real-time performance, enterprise integration, and robust security in a single platform—simplifying data flow from the edge to decision-makers.

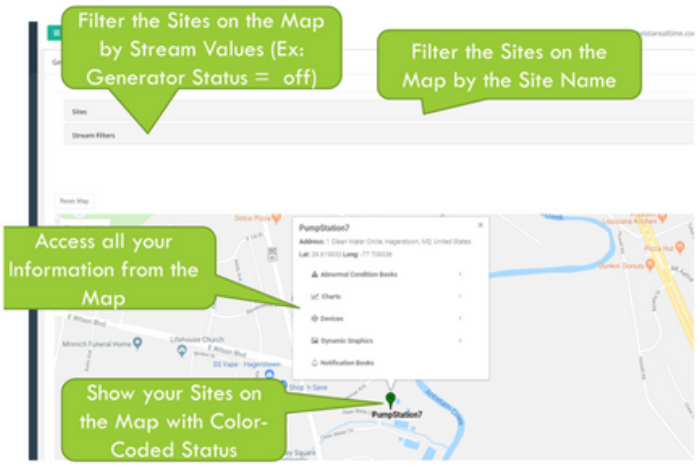


SkyView

SkyView is the visualization, notification, geolocation, and analytics layer of the aviCore platform. It lets users pinpoint distributed assets on an interactive map, apply color-coded alarm indicators to site pins, and drill down for detailed, asset-specific HMIs, charts, lists, and alarm summaries. Administrators can upload site-configuration files—exported directly from the aviCore Engine—to auto-build the same data hierarchy in SkyView, eliminating manual re-entry and keeping the visualization perfectly aligned with the underlying model.
Access is governed by role-based security: user groups determine who can view, edit, or acknowledge each asset, screen, or alarm, and those same groups drive targeted notifications. SkyView authenticates via OAuth 2.0 and supports optional two-factor authentication (2FA) for enhanced protection. All users, hierarchy, and configuration data reside in a central database that can integrate seamlessly with the client's existing data platforms, maintaining consistency across the entire solution stack.

SkyView-Global Views

SkyView provides a global map-based interface that allows users to visualize all monitored sites in real time. Sites are displayed with color-coded status indicators for quick assessment of operational conditions. Users can filter the map based on site names or specific stream values such as equipment status, enabling focused monitoring and fast identification of issues across geographically distributed assets.

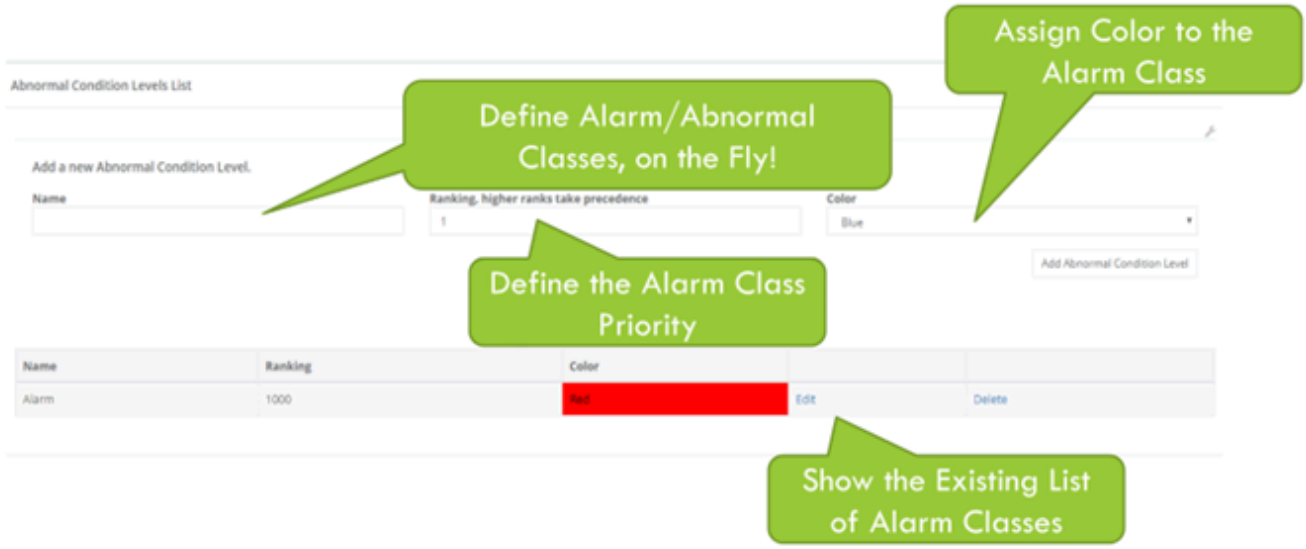


SkyView-Dashboards

SkyView's dashboard feature allows users to create personalized views of key performance indicators using configurable tiles. Dashboards can be customized by rearranging and adding as many tiles as needed, providing flexibility to monitor what matters most. This on-the-fly configurability empowers operators to build situational awareness dynamically and adjust their view based on evolving operational needs.

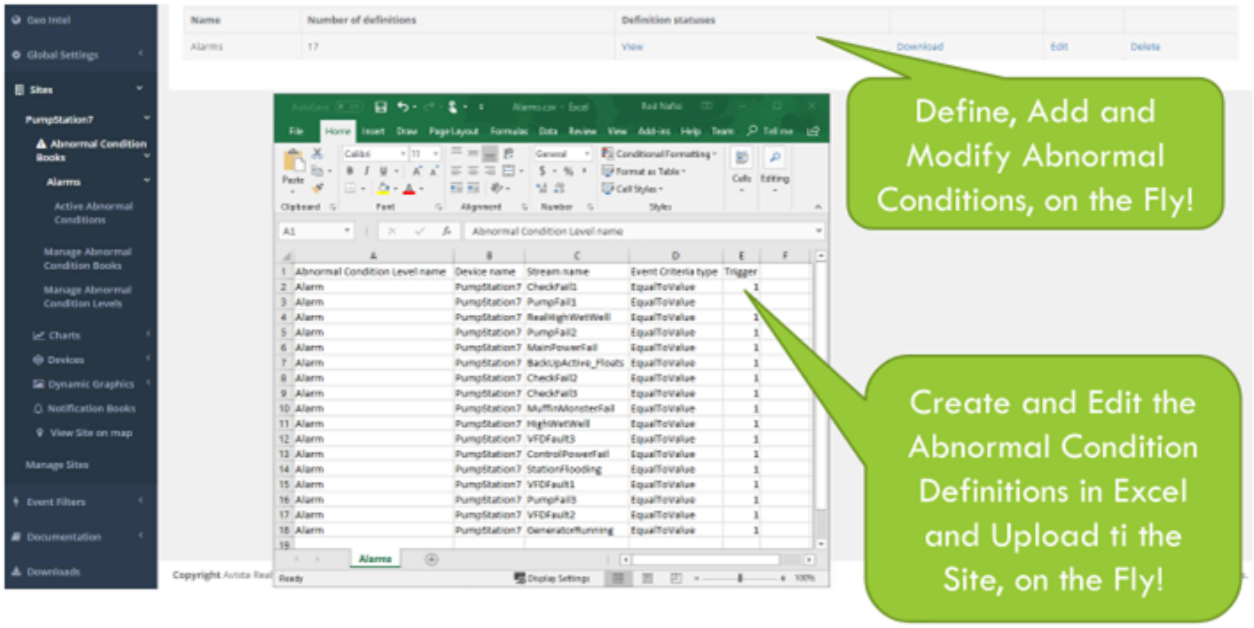
SkyView-Abnormal Conditions (1)

SkyView's dashboard feature allows users to create personalized views of key performance indicators using configurable tiles. Dashboards can be customized by rearranging and adding as many tiles as needed, providing flexibility to monitor what matters most. This on-the-fly configurability empowers operators to build situational awareness dynamically and adjust their view based on evolving operational needs.



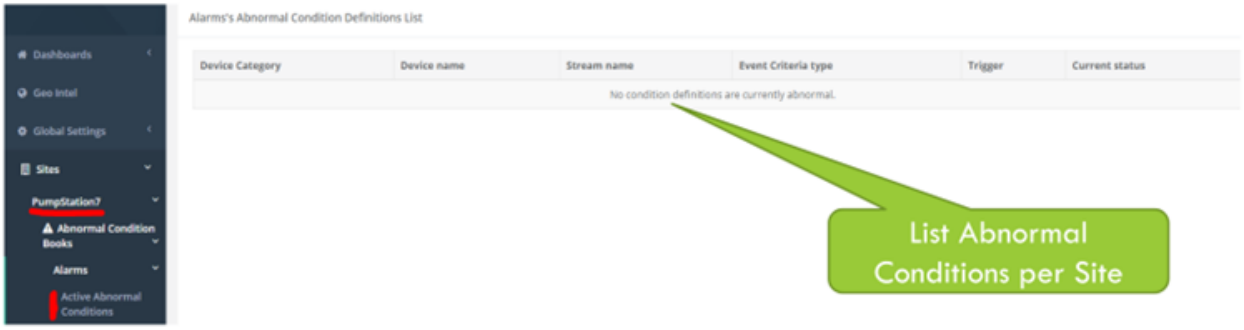
SkyView-Abnormal Conditions (2)

SkyView supports on-the-fly creation and modification of abnormal conditions through both the platform interface and Excel-based definitions. This flexibility enables users to efficiently manage the alarm logic for their systems and quickly adapt to changing operational requirements without requiring system downtime or external support.



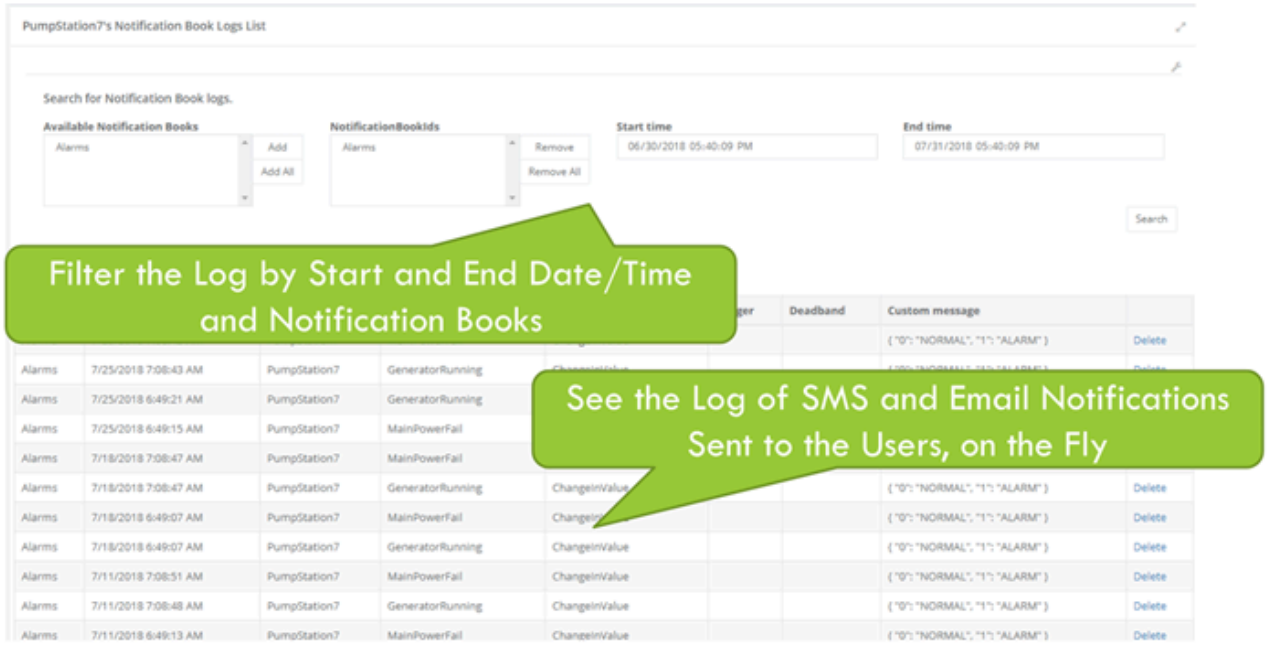
SkyView-Abnormal Conditions (3)

The platform provides a consolidated list of active and historical abnormal conditions by site, allowing operators to track alarm frequency and behavior per location. This visibility supports trend analysis, maintenance planning, and the identification of problematic assets or recurring issues.



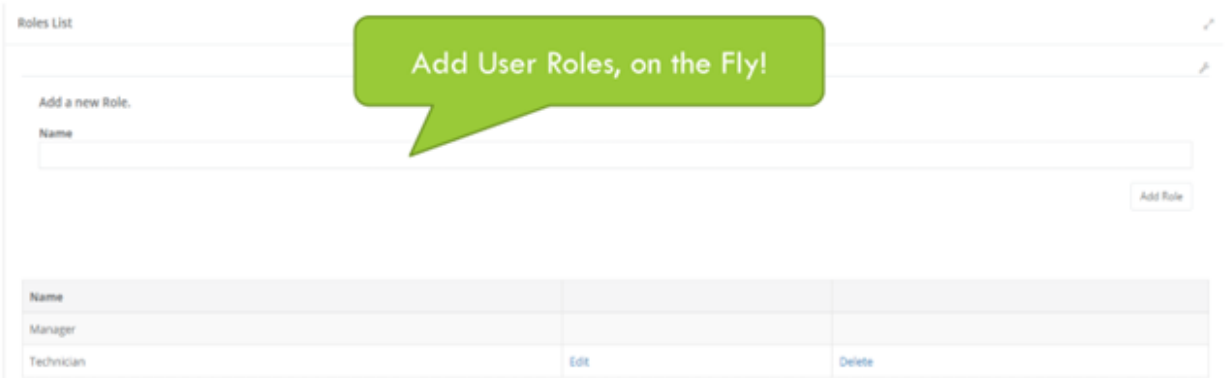
SkyView-Abnormal Conditions (4)

SkyView logs all SMS and email notifications related to abnormal conditions, giving users access to a searchable history of alerts sent to personnel. Filtering options by date/time and recipient groups (notification books) enhance auditability and ensure effective communication tracking during and after critical events.



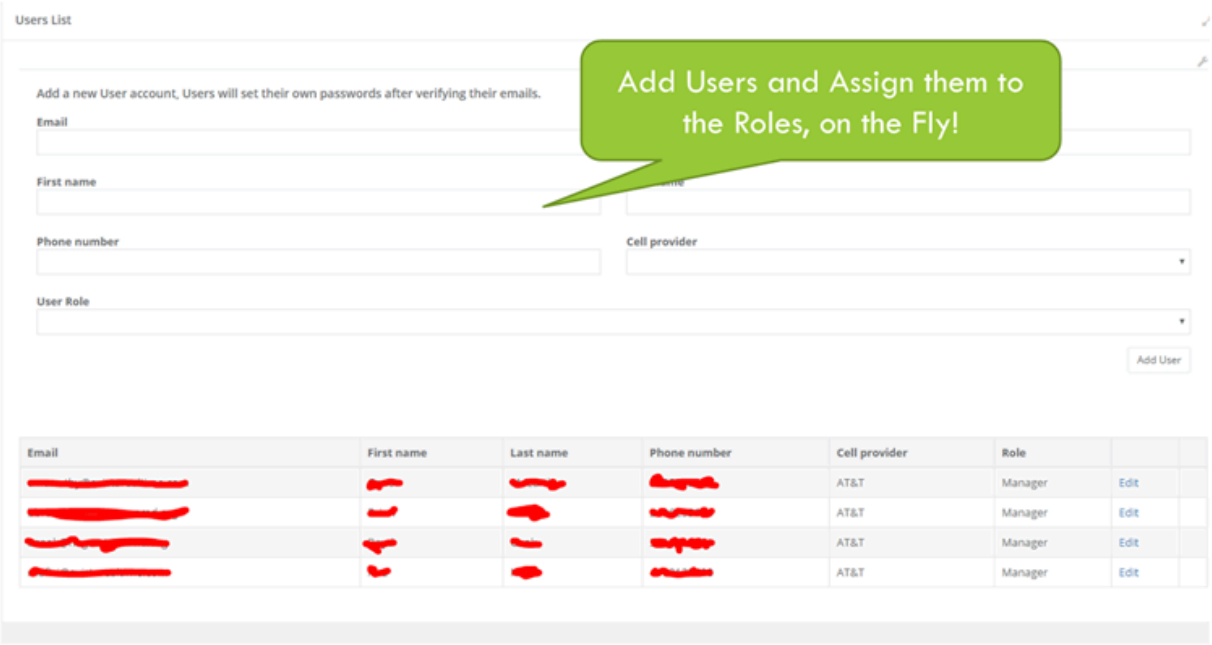
SkyView-Roles

SkyView features a flexible role-based access control system that allows administrators to define and assign user roles on the fly. This ensures that users have access only to the functionalities and data relevant to their responsibilities, supporting both security and operational efficiency.



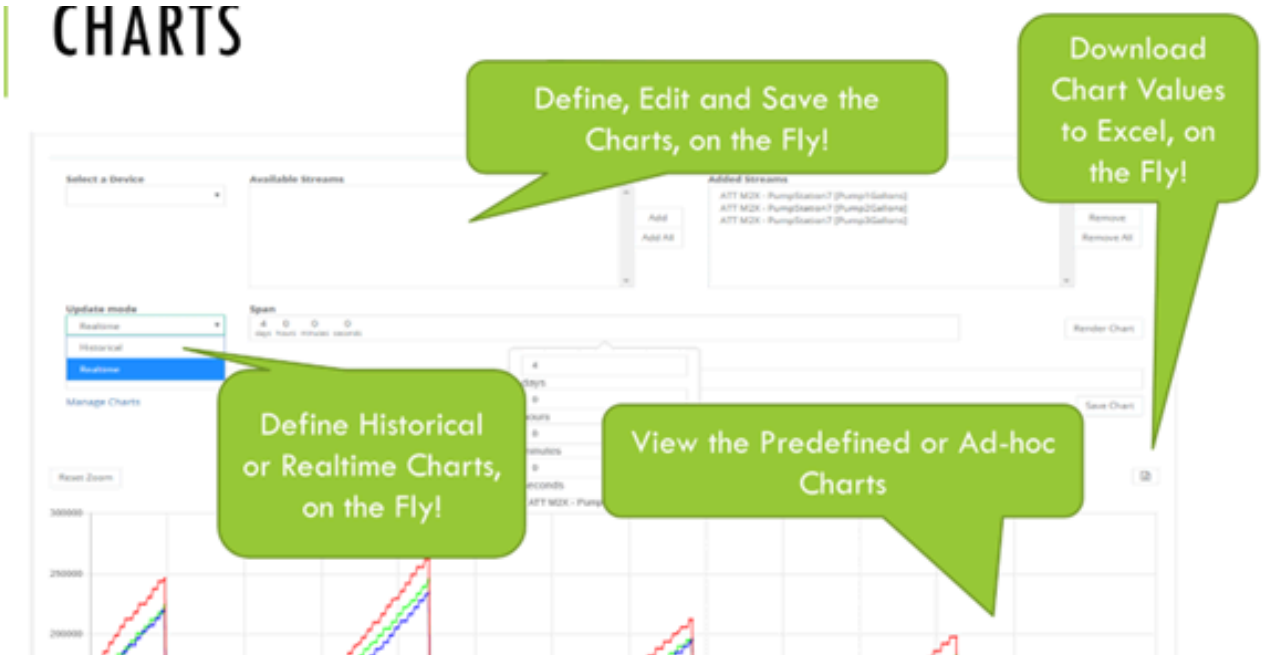
SkyView-Users

The platform allows for quick addition of new users and assignment of roles, supporting scalable deployments and team collaboration. This user management interface simplifies onboarding and ensures consistent access control as the system grows or shifts across operational teams.



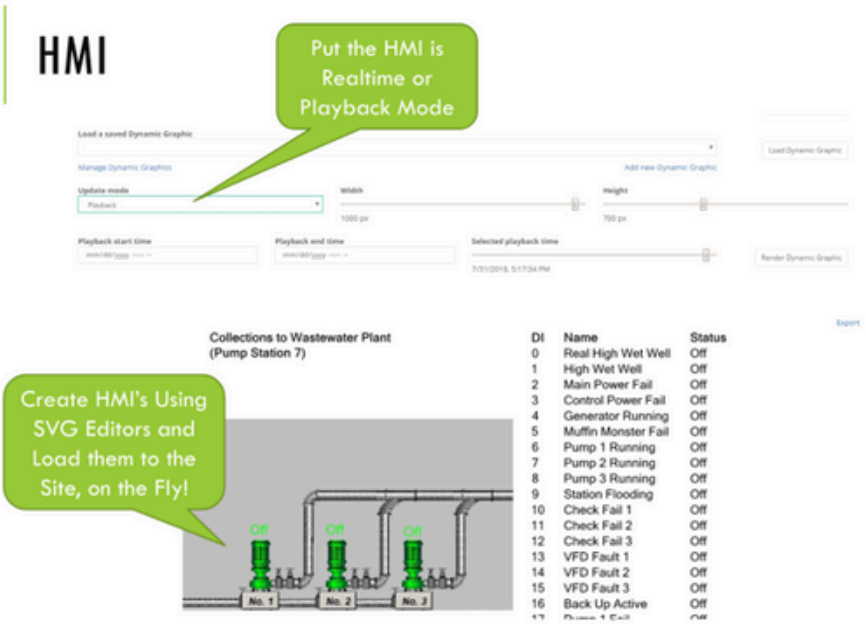
SkyView-Charts

SkyView enables users to define, edit, and save both historical and real-time charts dynamically. Charts can be created ad hoc or from predefined templates and exported to Excel for further analysis. This feature supports advanced data visualization and performance tracking in a user-friendly interface.



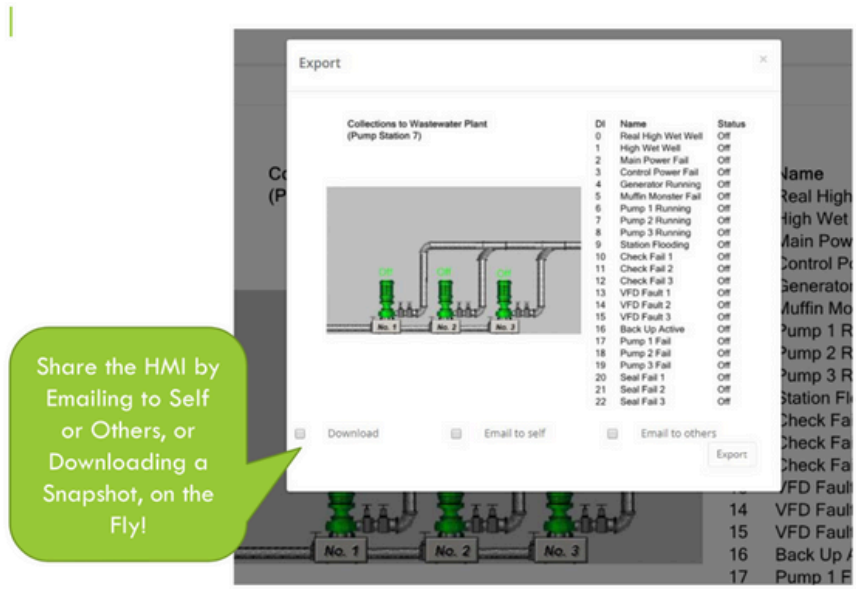
SkyView-HMI(1)

The Human-Machine Interface (HMI) in SkyView supports both real-time and playback modes. Users can create custom HMIs using SVG editors and deploy them to specific sites. This visualization capability enhances operator interaction with remote assets and provides intuitive control and monitoring views.



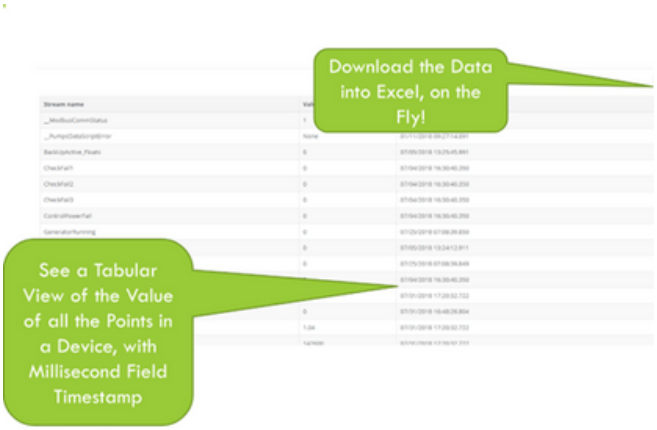
SkyView-HMI(2)

Users can share HMI screens by email or download snapshots directly from the interface. This feature improves collaboration and documentation by allowing quick distribution of visual status reports to internal teams or external stakeholders.



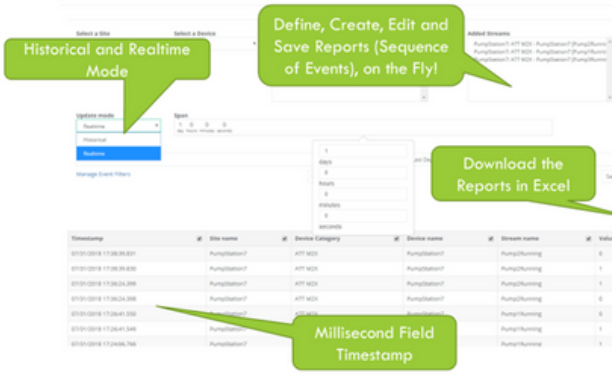
SkyView-Tabular Data

SkyView offers a detailed tabular view of device point values, including millisecond-level field timestamps. This high-resolution data can be exported to Excel, supporting engineering analysis, compliance verification, and troubleshooting system with precise time alignment.



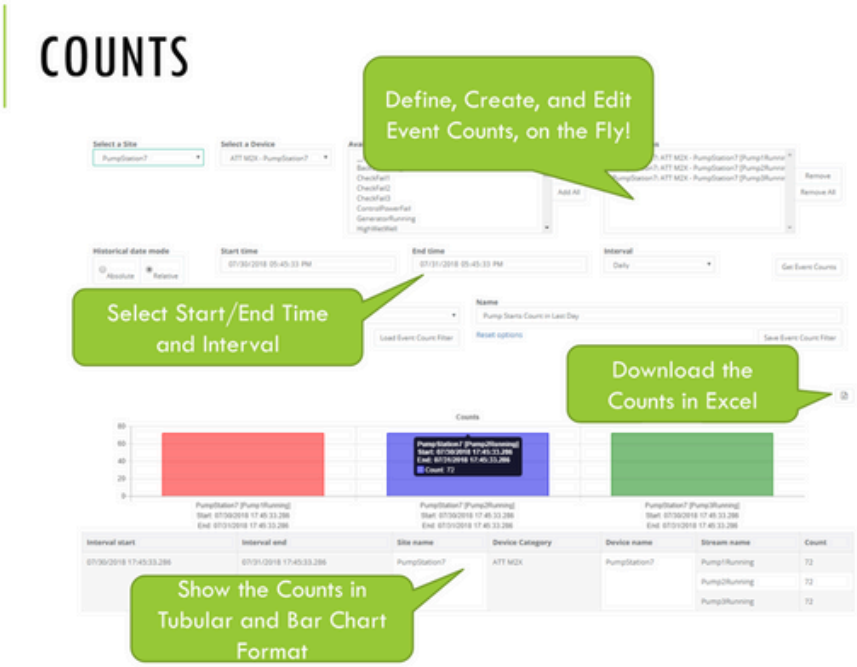
SkyView-Sequence of Events

The Sequence of Events (SOE) reporting tool captures and organizes time-stamped system events in real time or from historical data. Users can define, edit, and export SOE reports to Excel, which is essential for root cause analysis, incident reconstruction, and regulatory reporting.



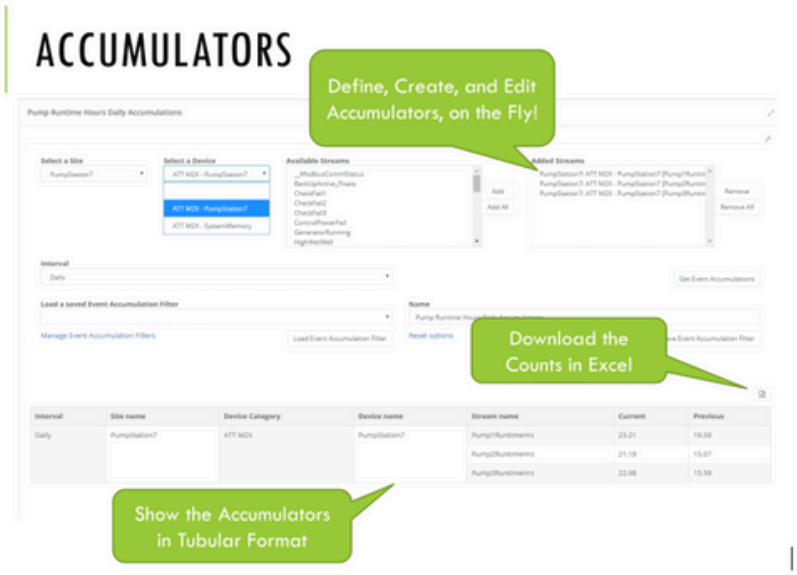
SkyView-Counters

SkyView includes a statistical summary tool that displays event counts in tabular or bar chart formats. Users can define count intervals, start/end times, and export the results, providing valuable insights into the frequency and distribution of system events over time.



SkyView-Accumulators

The platform supports accumulators for tracking values over time, such as energy usage or flow totals. These can be configured, viewed, and exported in Excel, giving operators a reliable method for analyzing cumulative metrics across devices or systems.



Implementation Variations

aviCore is offered in two deployment models: SaaS and on-premises. The SaaS version is fully managed by Avista, including hardware, updates, security, and communication costs. The on-premises version runs within the customer's network, offering full control for secure or isolated environments.

aviCore SaaS Deployment

aviCore is offered as a fully managed Software-as-a-Service (SaaS) solution, purpose-built for secure, real-time monitoring, control, and analytics across industrial and utility systems. In this model, Avista handles the entire system lifecycle—from data acquisition to cloud hosting, cybersecurity, and connectivity—freeing customers from the burden of managing SCADA infrastructure.

We provide the aviCore Engine pre-installed on industrial-grade hardware, configured to interface with your field equipment via standard communication protocols (e.g., Modbus, DNP3, OPC UA, SNMP) or hardwired I/O. This field unit securely collects real-time data and transmits it to the aviCore Cloud via encrypted cellular or satellite links, with all communication costs covered in the subscription.

aviCore SaaS Deployment-Continued

As part of the SaaS model, Avista also manages:

1.Cloud hosting with built-in redundancy and high availability
2.Automatic updates, including all patches and security enhancements
3.End-to-end cybersecurity, including mutual TLS authentication, VPN support, and secure firewalls
4.24/7 system monitoring and support

Typical Customers for aviCore SaaS Deployment:

1.Renewable energy developers and operators managing solar, wind, and battery storage sites across dispersed geographies
2.Utilities and cooperatives monitoring remote assets such as reclosers, capacitor banks, metering points, and DER interconnections
3.Water utilities and rural districts with limited IT staff and multiple small facilities (e.g., pump stations, tanks, remote sensors)
4.Facility and campus managers seeking centralized oversight of energy, water, or environmental systems across multiple buildings or locations
5.Industrial OEMs and service providers offering monitoring and support for customer-deployed assets or equipment fleets
6.Critical infrastructure owners needing fast deployment and secure cloud-based visibility without managing local servers
7.Data centers and colocation providers requiring centralized monitoring of critical infrastructures such as power distribution, cooling systems, generators, and environmental sensors—with built-in alerting, redundancy, and secure remote access

The SaaS model is ideal for organizations that want a low-maintenance, scalable solution with minimal IT overhead, centralized access, and built-in connectivity over cellular or satellite networks. It enables fast deployment, secure operations, and ongoing support—without requiring the customer to manage infrastructure, databases, or communication paths.

aviCore On-Premises Deployment

The on-premises deployment of aviCore is designed for organizations that require full ownership and control over their infrastructure, data, and security. In this model, the aviCore Engine and associated components are installed on local servers or industrial PCs within the customer's facility, operating entirely inside their private network.

aviCore can be completely air-gapped, making it ideal for high-security environments where external connectivity is restricted or prohibited. This ensures maximum protection against external threats and full compliance with internal cybersecurity policies.

aviCore On-Premises Deployment-Continued

Customers have the flexibility to apply their own security frameworks, including access control, firewall rules, and certificate management. In addition, aviCore can be configured to use customer-managed database systems as the backbone for configuration, real-time data, and historian storage supporting seamless integration with existing IT infrastructure and governance requirements.

The on-premises model supports standard industrial communication protocols (e.g., Modbus, DNP3, OPC UA), enables low-latency performance for control operations, and integrates with local PLCs, HMIs, and historian platforms. For hybrid use cases, aviCore can also mirror selected data to cloud or enterprise systems via secure, isolated paths, without compromising system isolation or security posture.

Typical Customers:

1.1.Electric utilities managing substations, distribution automation, or transmission infrastructure
2.Water and wastewater authorities with plant-level control systems
3.Transit agencies operating SCADA for rail, tunnels, or station systems
4.Defense and government facilities requiring air-gapped industrial control environments
5.Large industrial plants with internal IT/OT governance and cybersecurity policies

This deployment model offers the full power and flexibility of aviCore while giving customers maximum control over their systems, integration paths, and data security.

aviCore On-Hybrid Deployment

aviCore SaaS also supports hybrid deployment models. While data is streamed securely to the aviCore Cloud for centralized monitoring and analytics, the Engine can be configured to simultaneously send a copy of the data to a customer-owned or third-party control center. Likewise, remote control commands can be received through a dedicated secure path, isolated from the primary data channel to enhance cybersecurity and compliance.

This flexibility makes aviCore ideal for:

1.Distributed utility and renewable energy assets
2.Critical infrastructure facilities with limited on-site resources
3.Operations requiring centralized oversight with local control capabilities
4.Organizations seeking low-maintenance, high-security SCADA as a subscription service

aviCore Redundancy and High Availability

aviCore is a next-generation platform purpose-built to deliver site-level redundancy, application-layer failover, and high availability using open, scalable technologies. The SkyView interface is rendered through responsive web pages, allowing users to securely access the system from any modern browser without the need for local installations. This enables convenient, cross-platform access for operators, engineers, and administrators—whether they are in the control room or in the field. Unlike traditional SCADA systems that depend on proprietary, tightly coupled redundancy models, aviCore is designed from the ground up to support distributed, modular, and standards-based architectures. This makes it easier to deploy across a range of environments—on-premises, hybrid, or cloud—while maintaining performance, flexibility, and resilience.

In a high-availability configuration, multiple aviCore clusters operate in parallel. Each cluster contains its own instance of SkyTracker and SkyView. SkyTracker includes a data backbone, typically based on an SQL engine, and a broker service that securely ingests and manages real-time data from field devices using industrial protocols such as Modbus, DNP3, OPC UA, MQTT, and SNMP. These clusters are capable of functioning independently, processing and storing field data locally while maintaining synchronized operational states.

A load balancer coordinates access across all clusters. It intelligently routes user traffic—whether from desktop clients or mobile devices—to the most available and responsive node. In the event of maintenance, failure, or unexpected load spikes, users are automatically redirected, ensuring uninterrupted access, system reliability, and optimal resource utilization.

This architecture supports geographically distributed deployment, enabling operators to deploy clusters across multiple physical locations while maintaining a unified system view. Data from each site can be mirrored to a central server or cloud instance, enabling real-time replication, centralized analytics, and robust disaster recovery planning. Additionally, remote control commands and supervisory functions can be delivered over secure, isolated communication paths, preserving operational integrity and compliance.

By decoupling system functions and leveraging modern redundancy techniques, aviCore enables infrastructure owners to build robust, secure, and future-proof systems. It represents a major step forward from legacy SCADA systems—offering better scalability, lower operational risk, and faster recovery from failure, all without relying on proprietary or closed-loop redundancy models.

aviCore Redundancy and High Availability- Continued