
SkySpark®
Analytics Software for the World of Industrial IoT
Find What Matters™ in the Data from Control Systems and Smart Sensors
SkyFoundry

SkySpark® Analytics automatically analyzes production, energy and equipment data to identify issues, faults, deviations and correlations, all of which are opportunities for improved performance and operational savings.

SkySpark helps process engineers, production managers and operators ***find what matters***™ in the vast amount of data produced by today's smart systems.

The Challenge – Turn Data Into Actionable Intelligence

From PLC's, DCS, SCADA, MES and even individual energy meters and Industrial IoT (IIoT) sensors – smart devices of all types are now capable of communicating valuable data about their operation and environment.

Access to this data opens up new opportunities for improved performance and the delivery of value-added services to reduce costs, extend equipment life, improve performance and validate investments in efficiency improvement measures.

Access to the data is just the first step in the journey, however. The new challenge is to effectively manage and derive value from the exploding amount of data available from these smart and connected devices.

SkySpark® Analytics by SkyFoundry directly addresses this challenge.

SkySpark can be applied to virtually all types of data. Applications include:

- Industrial Automation
- Energy Management
- Building Automation
- Data Centers
- Operational Historian
- Maintenance Repair Operations (MRO)
- Monitoring-based Commissioning
- Smart Services/Asset Management
- Telecommunications Infrastructure
- Agriculture

Automatically Analyze Operational Data

How do we let busy managers and operators know that something is worthy of their attention? Is it possible to make sense of operational data with minimal, or no, human intervention? Can we impart our knowledge of equipment systems to software to enable it to find issues, patterns, and faults? SkySpark® provides the solution.

SkySpark automatically analyzes data from automation systems, metering systems and other smart devices to identify issues, patterns, deviations, faults and opportunities for operational improvements and cost reduction. SkySpark is an open platform enabling data from a wide range of sources to be collected and continuously analyzed, helping owners and operators ***find what matters***™ in the data produced by their production environment.

Combining an extensive library of standard analytic functions and full user programmability, SkySpark allows domain experts to capture knowledge in "rules" that automatically run against the data produced by equipment (PLC 's, controllers, sensor, SCADA) placed at and around the production environment. The result – SkySpark tells process engineers or operators what they need to know about the performance of their machines or production process.

Collect – Manage – Analyze

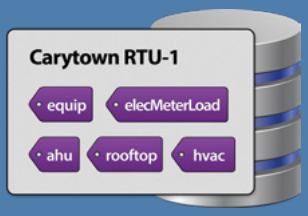
There are three basic steps to the analytics process using SkySpark. The first is to "get your data". SkySpark works with data of all types – whether via a live link to an automation system or smart meter, OPC UA Server connection, connection to an SQL database, import of historical data from Excel files, or a web service feed. SkySpark provides the features to acquire, manage, visualize and analyze your data.

SkySpark stores this diverse, multi-structured data in its specialized Folio database, which is designed specifically for high speed analysis of large volumes of "time-series" data.

Giving Data Meaning

When bringing together data from a variety of sources we need to represent the meaning of the various data items. Instead of relying on rigid conventional database schemas, SkySpark® uses a highly flexible "tagging" approach to capture semantic information that describes the data.

Tags describe units, descriptions, and relationships – the facts about the data. For example, an equipment system might have tags that define the production line it is located on and that it is a temperature of a specific part of a machine, the manufacturer, its operating schedule, and other associated parameters.



These tags provide the hooks that the SkySpark analytics engine uses to correlate and analyze the data. SkySpark follows a specific data tagging standard but you can always create your own tags.

Project Haystack
Founding Member

www.project-haystack.org

Automated Analytics - The Axon Engine

Automated analytics is accomplished with a unique data analysis "engine" called Axon, which processes rules and algorithms on your data. Axon includes a comprehensive library of data transformation and analysis functions for manipulating and analyzing data. The system implementer can draw from hundreds of standard analytic functions to implement rules that are appropriate for the specific characteristics and needs of their production facilities, machines, equipment, processes and project scope.

The library includes a full math package, statistical functions and machine learning algorithms. Define a rule once and activate it – SkySpark will ***automatically*** find the issue in new data AND historical data. Create new rules based on new observations or ideas at anytime – all without affecting your underlying systems. Build a library of reusable rules that look for the issues that matter to your application. The value of your library continues to build with every new rule you add.

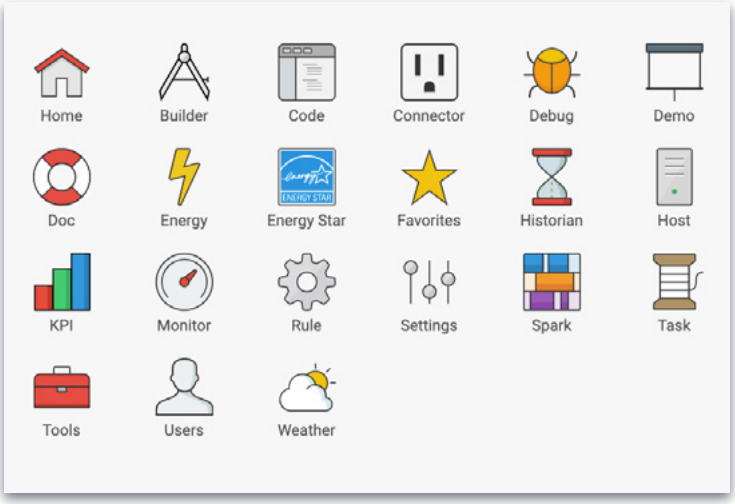
The Result – Know How Your Systems are Really Operating

When rules find a match, they create a "*Spark*" – our term for an issue that matters. SkySpark then ***automatically*** generates visualizations, notifications and reports that show the issue, time of occurrence, frequency, duration, and even cost. SkySpark can email notifications to operators and auto-generate reports in a range of formats including PDF, SVG, PNG and others.

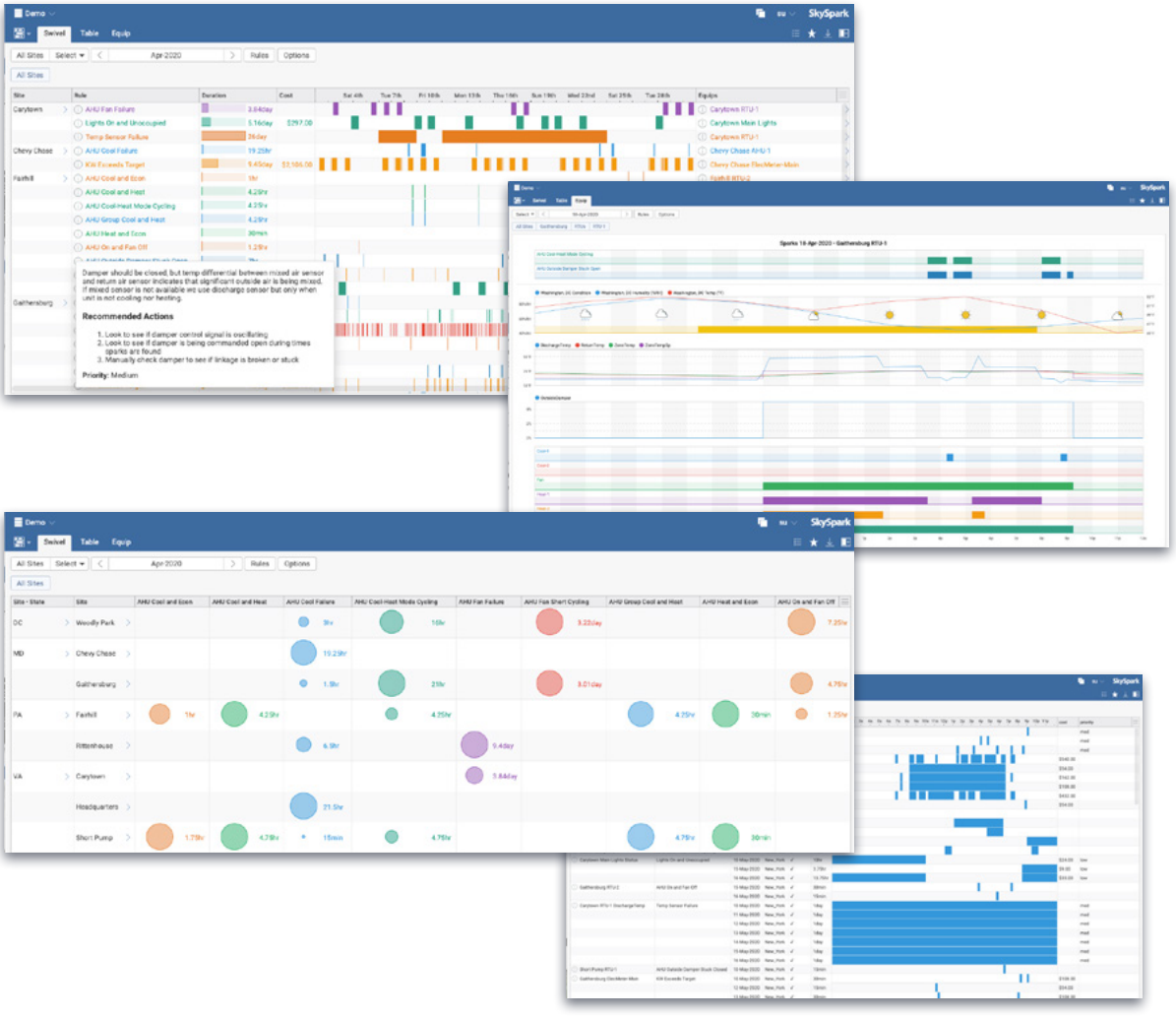
Built-In SkySpark® Apps Provide a Clear View of Data, Analytic Results, and Opportunities for Savings and Improved Performance

SkySpark® includes a rich set of applications to visualize your data and analytic results. All of these intuitive presentations are displayed in standard web-browsers using HTML5 technology – no plug-ins are required. SkySpark can also output analytic results to third-party applications via our open, published APIs.

While the SkySpark Axon engine continuously applies analytics to your data, the real value comes when those results are presented to you via SkySpark Apps – rich visual presentations that show how your systems are really performing.



SiteSpark App
Shows analytic results as timelines, bubble charts and tabular displays showing timing, duration, frequency, and cost of issues.

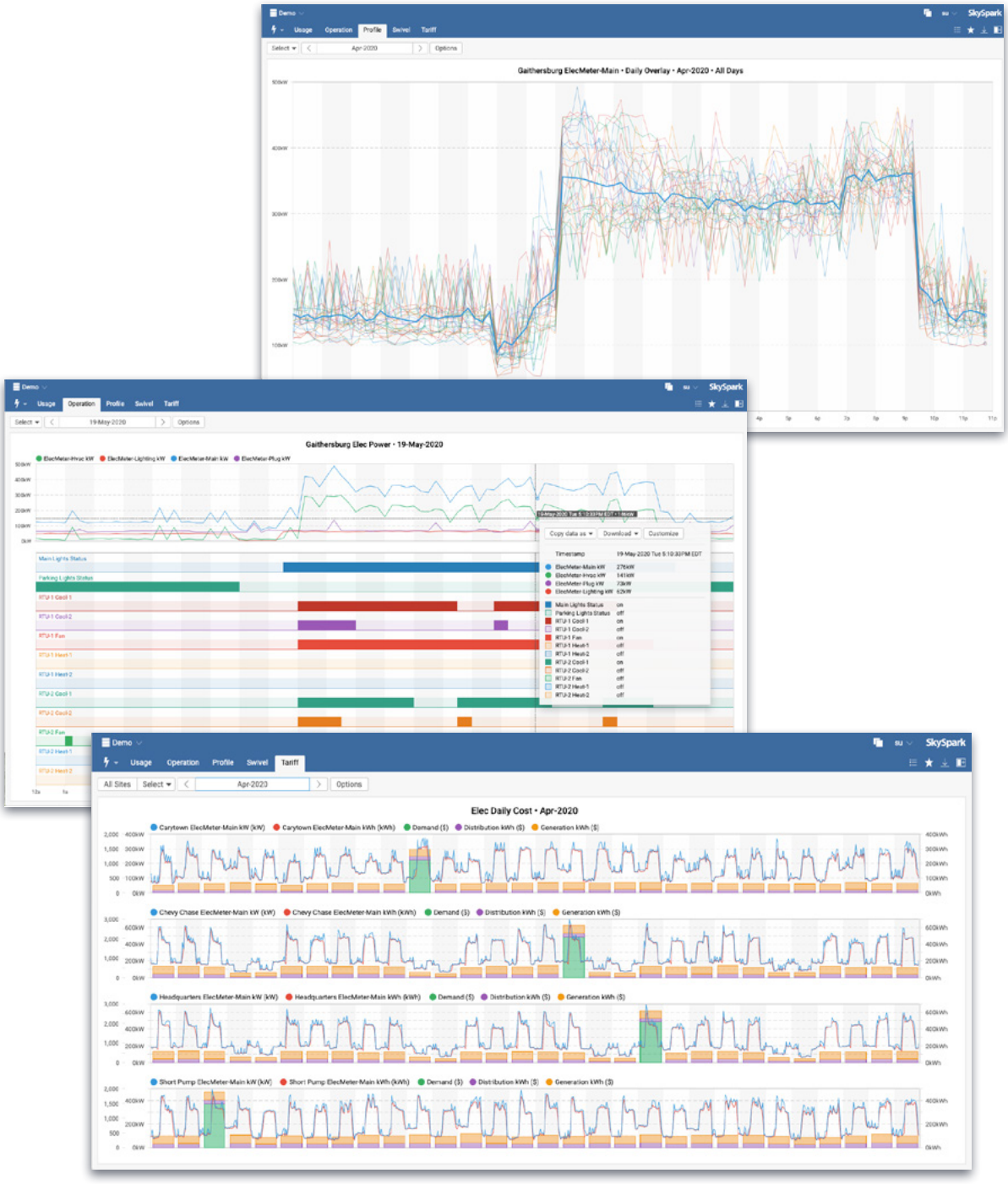


KPI App

Automatically calculates key performance indicators and presents them in “candle charts” for easy comparisons.

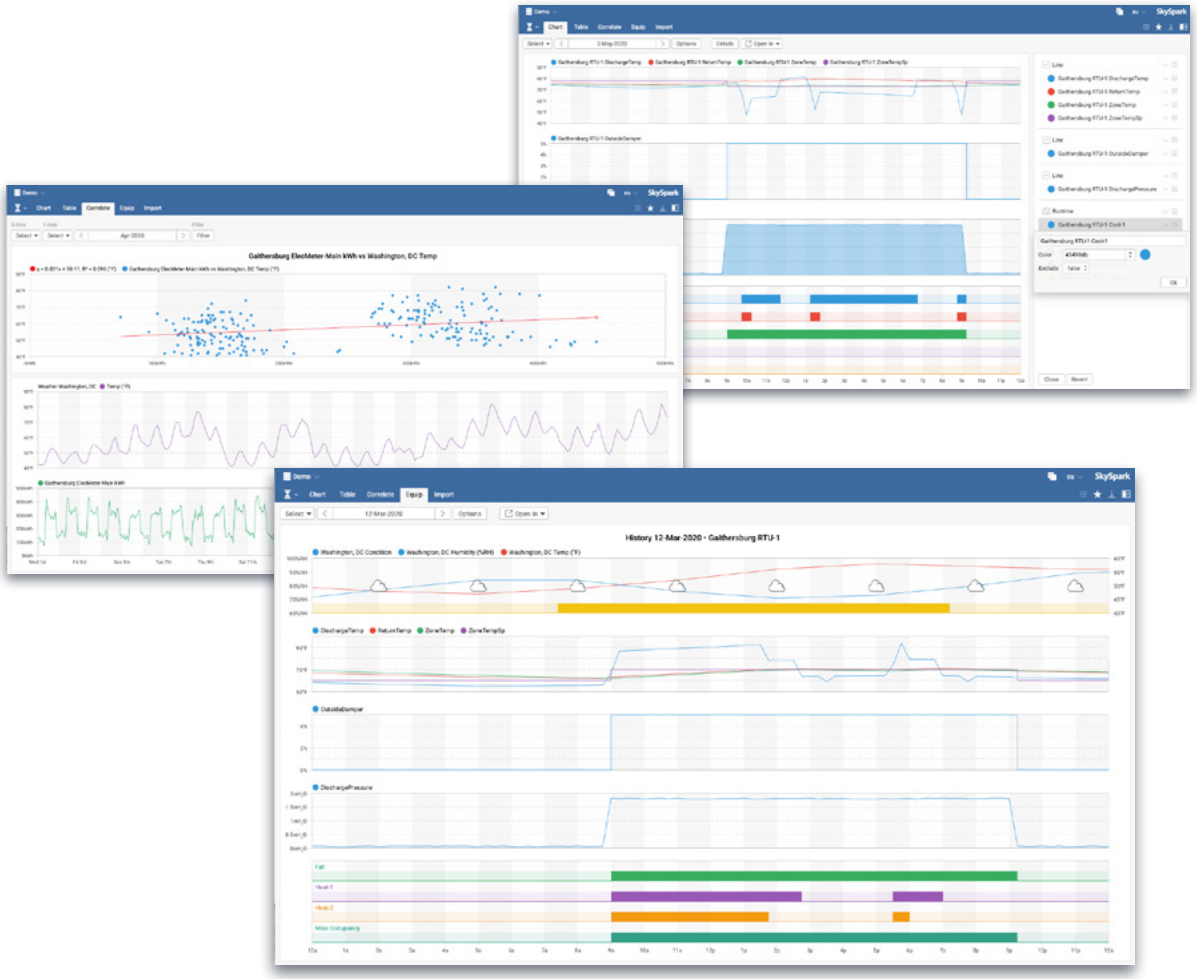
Energy App

Provides a comprehensive suite for analysis of energy resources including electrical demand, consumption, cost, as well as water and gas usage. The unique Operations view automatically aligns energy usage data with equipment operational status showing you exactly how your equipment systems and machines are affecting energy use.



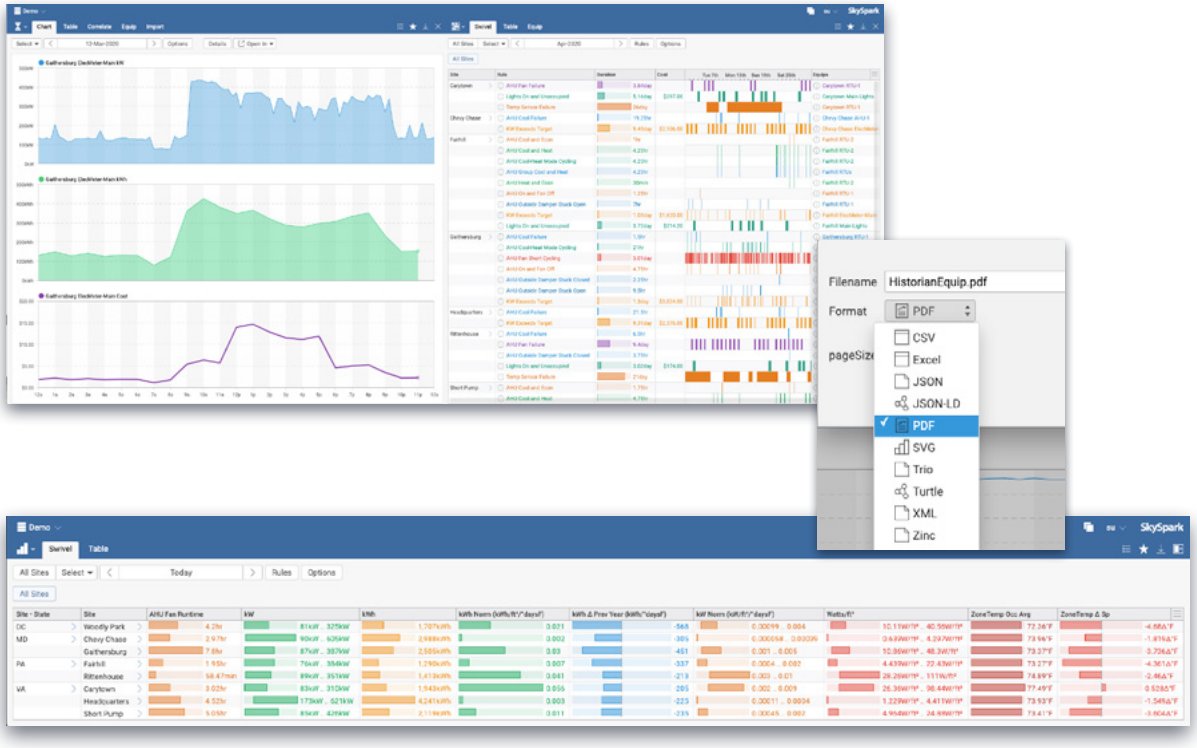
Historian App
Combines all types of data together along with analytic results to create views to meet specific needs.

Now includes **Equip View**, allowing easy navigation through the data associated with equipment systems without having to create graphics of equipment systems.



Any View Can Be A Report

All of the SkySpark® Apps allow you to turn any view into a report in a variety of formats, including PDF, or export the view for use in your favorite desktop word processing or publishing tools in formats including SVG, PNG, HTML, Excel and more.

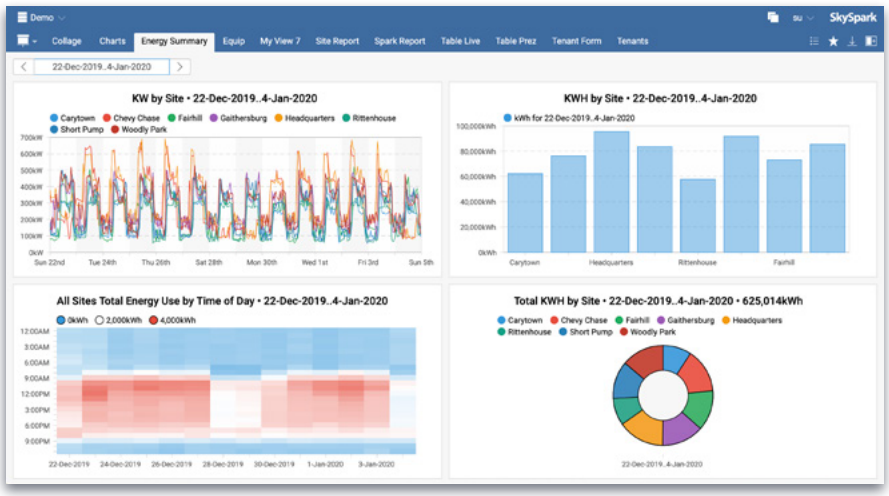


Assemble Custom Apps, Views and Reports Using SkySpark® View Builder

While users appreciate the efficiency that SkySpark® Analytics standard apps provide, some applications require customized presentations of operational data and analytic findings. The SkySpark View Builder tool solves this challenge by enabling users to create their own data visualizations, reports and fully interactive Apps without needing software development skills.

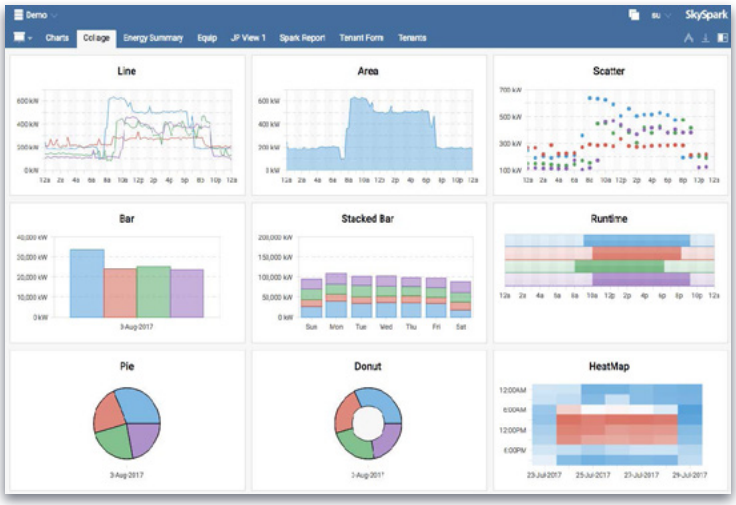
View Builder provides an extensive library of display widgets and a simple point-and-click tool for creating customized views. It enables users to easily create customized user interfaces by combining graphs, charts, tables, text, selection menus, data entry fields and more. Once created, views can be easily re-used and combined to further streamline presentation of analytics information to users.

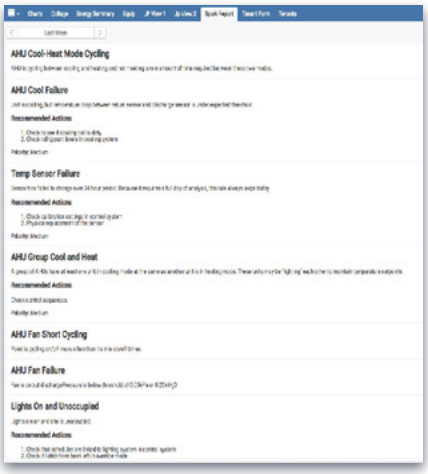
With View Builder, SkySpark combines all of the benefits of ***automatically*** generated analytics Apps with the ability for users to create their own customized views quickly and easily.



Built-in Data Display Widgets

With SkySpark View Builder you can build visualizations from a wide range of display widgets and combine them with formatted text and tables of data.





SkySpark® View Builder demonstrates SkyFoundry's commitment to providing users with maximum flexibility for delivering customized views and reports of data and analytic results with little to no software development skills, while providing more advanced users with the tools they need to create virtually anything they can imagine.

Create the Views You Want

The goal of SkySpark® View Builder is to enable users to create custom data visualizations without needing sophisticated software development skills. A Point and Click interface allows users to define the layout of views, Apps and Reports and specify the content to be displayed using standard SkySpark queries.

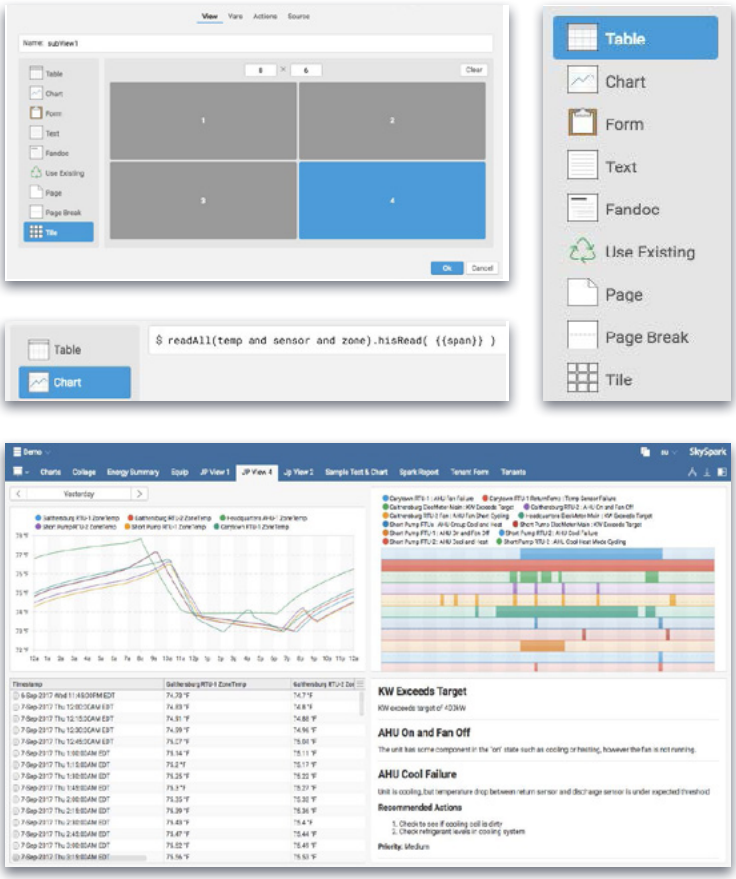
STEP 1 – Define a layout

STEP 2 – Choose the format the data will be displayed in each tile (chart, text, table)

STEP 3 – Select the data to be displayed in each tile.

The Result – A Custom App that allows users to choose the desired date range.

Tile 1 shows Zone Temp Values in a line graph, Tile 2 shows *Sparks* for the selected time period in *Spark Lines*, Tile 3 shows the Zone Temps in a scrollable table, and Tile 4 is the Help Screen for *Sparks* shown in Tile 2.



Reporting

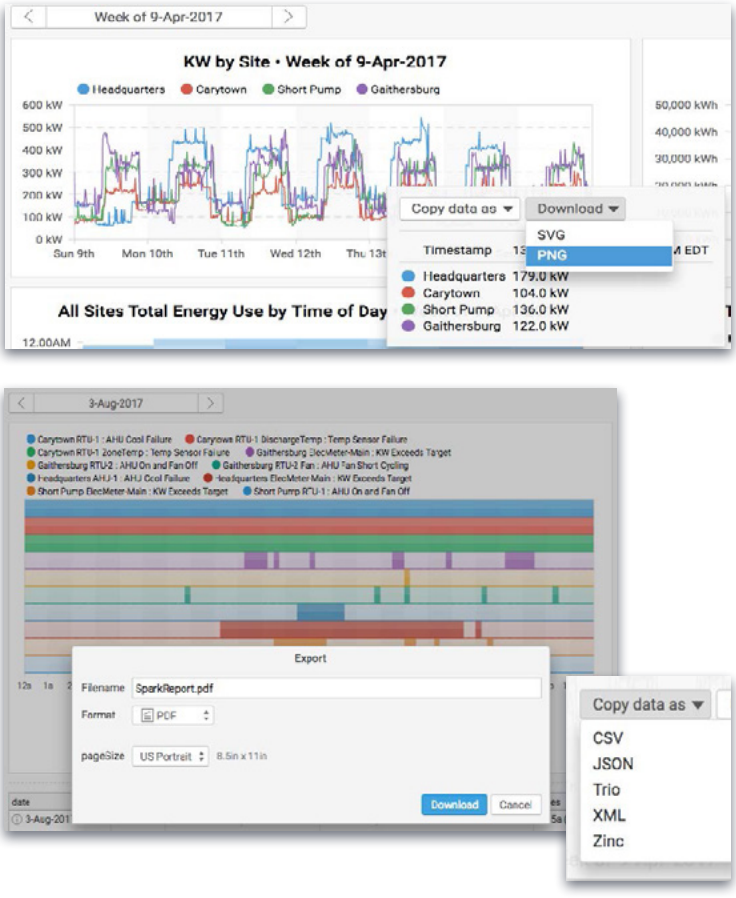
Not all users involved in data analysis work directly with the SkySpark Analytics software applications. Many team members need to be provided with conventional reports and View Builder provides a wide range of options for generating reports.

If it is on the screen, it can be made into a report that includes analytic results, rule descriptions, operator instructions and equipment system data.

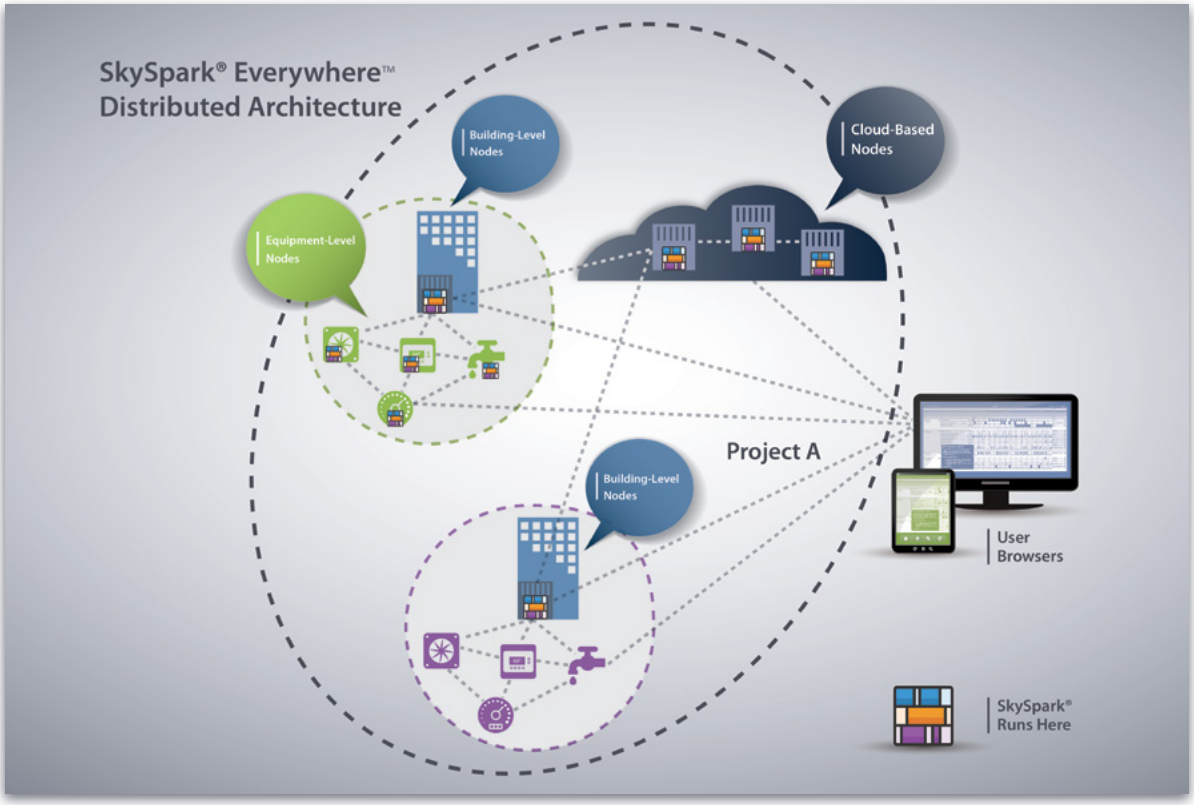
Choose portrait or landscape, add page breaks or export individual graphical elements as SVG files or PNGs, or copy data in different standard formats.

And, reports can be easily exported as a PDF documents.

Manually export reports with a click or schedule reports for automated generation and delivery as email attachments.



SkySpark® Everywhere™ Distributed Architecture



Deploy from the Edge to the Cloud

We hear lots of talk about the "cloud" as it relates to the IoT. In many cases it seems like the "cloud" is being presented as the solution to all things IoT. The reality is that it is not possible, cost-effective or desirable to transmit every piece of data from our devices to the cloud in order to gain value from the data. A true IoT architecture needs to recognize and embrace the highly distributed nature of the IoT and enable data processing at the edge as well as the cloud. The SkySpark® platform provides a software architecture that matches the reality of the IoT.

One of the most fundamental characteristics of the IoT is that it is a distributed computing challenge. Similar to how computer-based automation systems started in the 1980s with centralized computers and then moved to distributed-control architectures, the IoT is distributed by its very nature and requires software technology that supports that reality. SkySpark® Everywhere™ provides that technology.

Software functions need to be able to reside at every level of the architecture from the "edge" – for example, on a piece of equipment in an electrical closet or in a vehicle, to the production level – where data from multiple smaller nodes can be aggregated and analyzed, to the cloud to provide portfolio-level data analysis. SkySpark® Everywhere™ provides this capability.

SkySpark Everywhere allows systems of 2 to hundreds of SkySpark nodes to be connected in unified, near-seamless systems called clusters. Data collection, storage, management, analytics processing and visualization functions are performed by the individual nodes, while applications that present data and analytics results to users work as if the system were one, single unified server.

Benefits for Real-World IoT Applications

By implementing a true distributed architecture, SkySpark® Everywhere™ provides numerous benefits which directly address the needs of IIoT applications including:

Local Data Collection Ensures Reliability. Network issues, can interrupt data collection in cloud-dependent systems, resulting in loss of critical data. Data collection services operating at the edge ensure that data is collected by the local node where the risk of communication issues is far lower. The system still provides for synchronization of data to enable user access at the cloud level without the need for real time communication to edge devices.

Lower Data Transfer Costs. In addition to reliability, the SkySpark Everywhere distributed architecture can dramatically reduce data transfer costs in systems that rely on cellular networks for transmission of data to the cloud for processing. Only user requests for data, visualizations and reports are directed to the distributed nodes (instead of requiring all data be transmitted to the Cloud). The reduction in network usage and costs can be dramatic.

A Simpler User Experience. The fact that data and processing is distributed across multiple nodes is a complexity to be hidden from the average user. SkySpark Everywhere allows users to navigate their world as if it were a singular system. They choose to look at projects, sites, buildings, or vehicles – navigating by whatever logical entities make sense for their application. SkySpark Everywhere provides a streamlined, near seamless user interface across distributed systems.

Simpler Implementation. With only one platform to learn and one set of software tools to work with at all levels of the architecture, the result is faster development, an easier learning curve, and more reliable applications.

Options for Deployment at the Edge

In order to be effectively applied at the edge, costs have to be competitive. SkySpark® Everywhere™ software has been designed to run in everything from a small low-cost device, smaller than a deck of cards, to server clusters hosted in the cloud. Throughout the architecture, SkySpark provides the exact same software architecture, data model, functions and features.

With the advent of new IoT gateway hardware options, systems integrators and system designers have a greater choice in the hardware they use, reducing the risk of vendor lock-in and ensuring competitive pricing. With minimum processor specifications similar to those shown, SkySpark Everywhere can be deployed on a wide range of standard, easily available, low-cost edge devices.

Install at the Edge in Small Low-Cost IIoT Devices

SkySpark has been designed from the ground up to run in small, low-cost processor platforms that can be deployed at the edge – whether in equipment rooms or on equipment systems themselves. You get the entire SkySpark feature set – all data connectors, analytics and visualization capabilities. Multiple SkySpark nodes are combined into "clusters" that provide a seamless experience to the user while spanning the edge to the cloud.

SkySpark® Everywhere™

Minimum Edge Hardware Specifications

1 GHz Processor
512 MB RAM for up to 100 points

Our Test Platform:
http://beagleboard.org/black

Software:
Linux OS with a Java Virtual Machine

A Pricing Model to Support Use at the Edge

SkySpark Everywhere technology is one key part of this transformative solution, the other is the pricing model that lets you apply SkySpark in capacities as small as 10 points with a price that starts at $60 USD. This includes ALL of the features of SkySpark, not a reduced feature set or simple data collection agent.

Applications Across Factories of All Types

SkySpark® can be used in a wide variety of applications with equipment systems of all types. It's not tied to any one manufacturer's products or any type of device data. From factory commissioning and equipment fault detection, to energy analysis, load profiling, machine, line or plant benchmarking, asset performance tracking, process monitoring and energy reporting, SkySpark's fast, powerful and infinitely flexible analytics can provide results not possible with other tools.

SkySpark can be applied to virtually all types of data. Applications include:

- Industrial Automation
- Energy Management
- Building Automation
- Data Centers
- Operational Historian
- Maintenance Repair Operations (MRO)
- Monitoring-based Commissioning
- Smart Services/Asset Management
- Telecommunications Infrastructure
- Agriculture

You Control Your Data

SkySpark is sold as licensed software – install it on a local PC or server, or host it on your own cloud service. SkyFoundry never has your data – you're in control.

Maximum Flexibility - Deploy On-Premise, Cloud-Hosted, as a Desktop Tool, or Install at the "Edge"

An application for a broad range of managers. SkySpark® can be used as an end-use application by energy managers that are responsible for managing energy and equipment systems on a day-to-day basis. Maintenance managers can monitor their assets and production managers can monitor their production. The software can be locally installed "on-premise" on a laptop, desktop PC, or server, or hosted in the cloud and offered as Software as a Service. You can deploy SkySpark to meet the specific needs of applications from a single facility to thousands of sites.

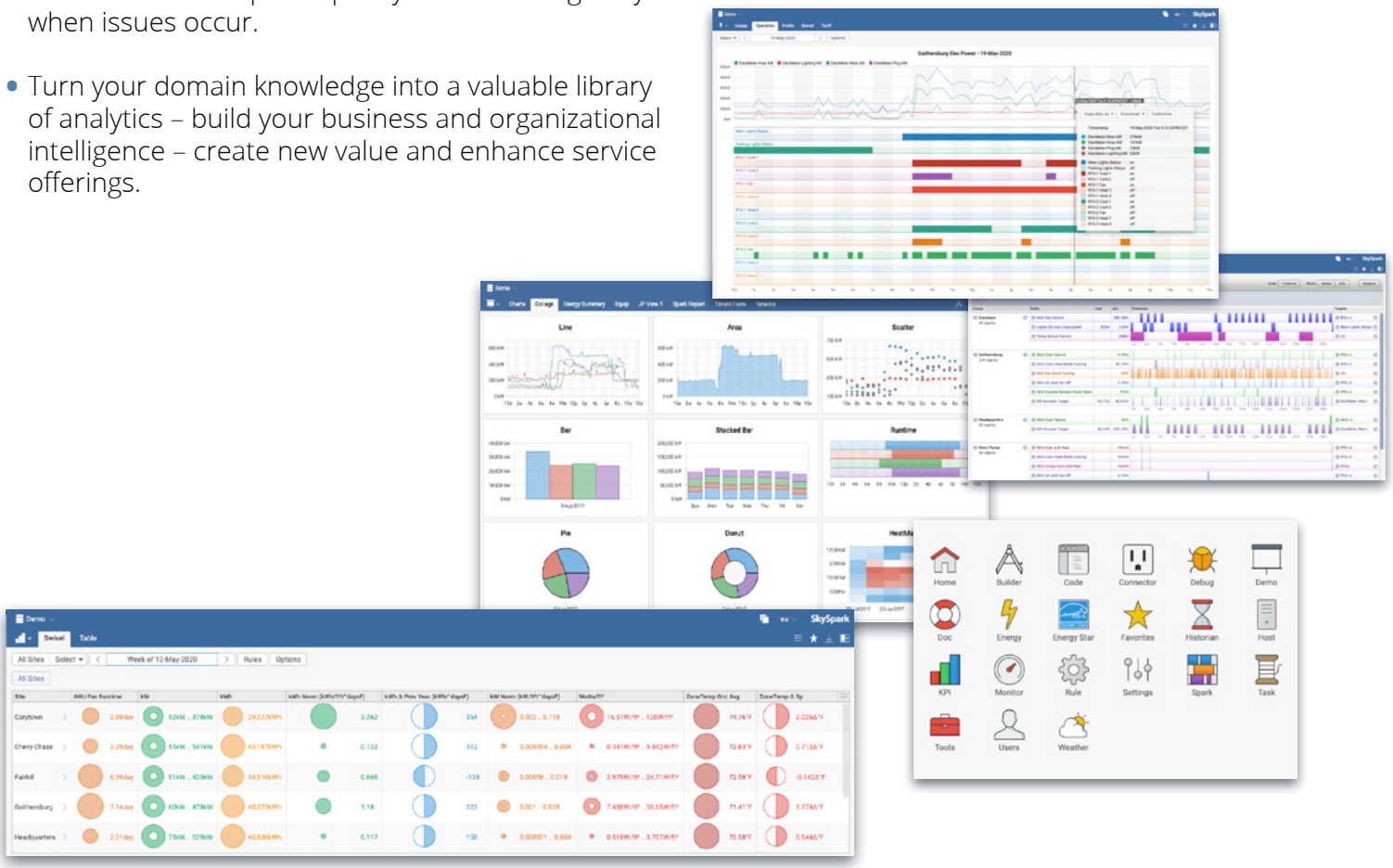
A tool for consultants, commissioning professionals and energy engineers. SkySpark is also a great tool for consultants involved in commissioning, Monitoring & Verification (M&V) and analysis. It can be used as a process tool for monitoring different complex processes and help process engineers optimize their production. They can use SkySpark to find patterns and issues based on their unique systems knowledge, greatly streamlining the process of providing reports and services to owners and operators and enabling them to cost-effectively provide Monitoring-Based Commissioning (MBCx). SkySpark enables consultants to leverage their domain knowledge to automate their work processes without having to build their own software platform.

A platform for integration with other applications and services. SkySpark can also be used as a backend database and analytics engine serving results to other applications. A complete set of published API's enables developers to integrate all of SkySpark's functionality with third party applications providing them the ability to embed sophisticated analytics capabilities in their own presentation environment.

The Benefits of Automated Operational Analytics

Enabling the Move to Data-Driven Production Management

- Identify the issues that matter to your customers, tenants, and operations staff – improve operational efficiency and effectiveness.
- Turn operational data into actionable issues easily and efficiently – eliminate data overload.
- Provide an automatic, ever-present, virtual expert constantly watching the operation of your environment – respond quickly and knowledgeably when issues occur.
- Turn your domain knowledge into a valuable library of analytics – build your business and organizational intelligence – create new value and enhance service offerings.



Contact Us

Learn more about how SkySpark Analytics can help your organization improve efficiency and reduce operating costs today.

Contact us at: **info@skyfoundry.com**

or on the web at: **www.skyfoundry.com**

SkySpark® EVERYWHERE

Find What Matters™

SkySpark® Specifications

Operating Systems Supported:

Microsoft Windows, Mac OSX, Linux.
SkySpark requires a Java Virtual Machine on the server. Java Version 1.8 is recommended.

System Requirements:

SkySpark will run on almost any computer from small Edge IoT device (in the class of a Beagleboard Black or Raspberry Pi), a laptop to a cloud service provider. Compute resources vary based on system capacity and the number of connectors used to acquire data. Capacity is measured by the number of points. A point is anything you are recording data for.

User Interface:

All SkySpark views are delivered in a standard web browser using HTML5 technology. SkySpark supports current versions of all major web browsers including Google Chrome, Microsoft Internet Explorer, Safari and Firefox.

Connectors for Data Access:

SkySpark includes the following data connectors: Modbus TCP, OPC UA, MQTT, SQL Database via JDBC, CSV data import, BACnet IP, Haystack, SkyFoundry REST API, Energy Star Portfolio Manager, and Lightweight Directory Access Protocol for centralized user credential management. SkySpark also provides a Connector Development Toolkit enabling the creation of custom connectors.

Export Formats Supported:

PDF, PNG, SVG, Excel, CSV, HTML, Text, JSON, Zinc and Trio.

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