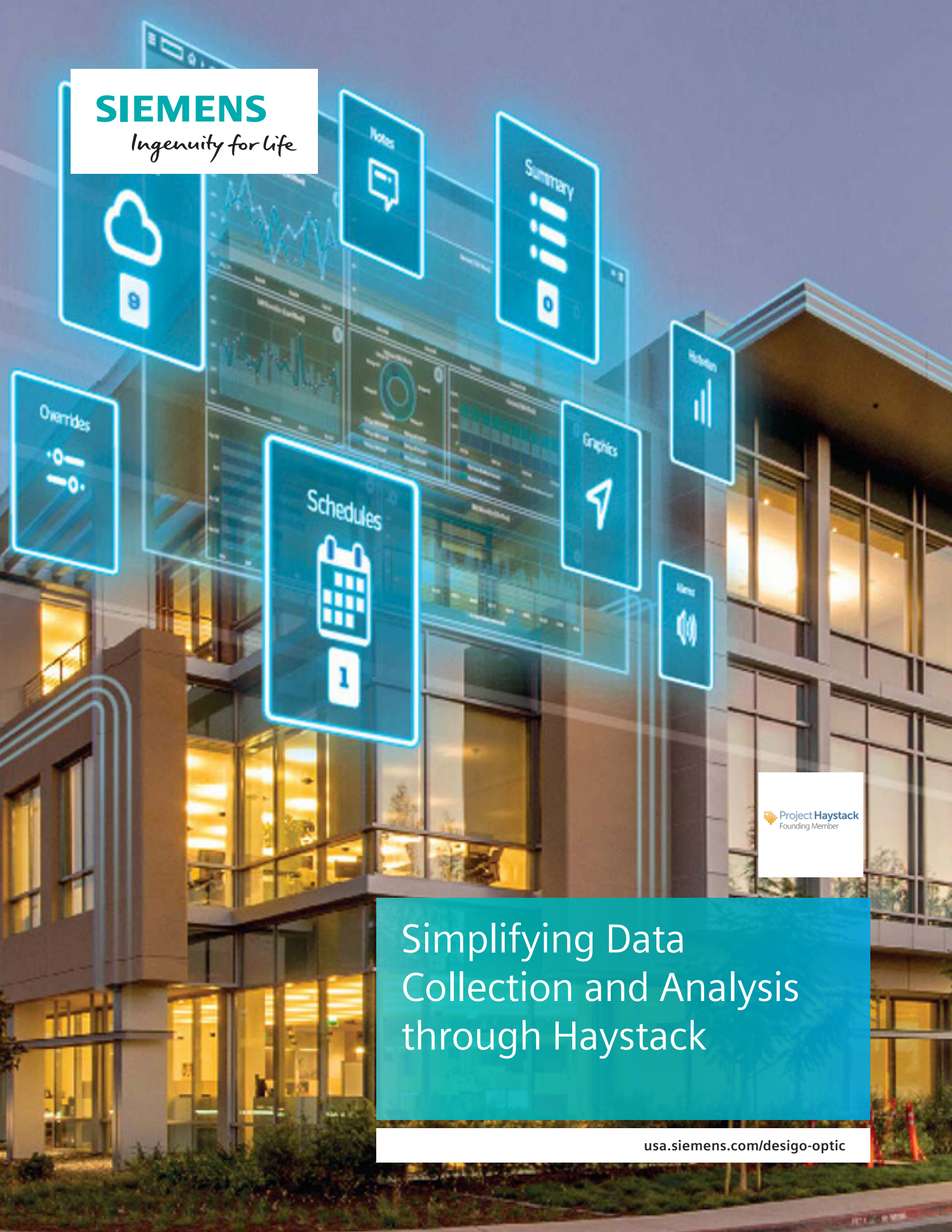


Simplifying Data Collection and Analysis through Haystack

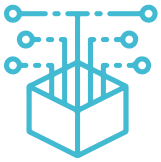
usa.siemens.com/desigo-optic

Haystack puts meaning and context into data

The advent of Project Haystack unlocks a streamlined way to work with data through an open source initiative

The growing reach of Project Haystack

Project Haystack is an organization whose goal is to define a standardized way to apply tagging principles that helps interpret the data that flows from modern buildings through building automation systems (BAS). "Tagging" the data enables it to be discovered and understood by application software, thereby enabling its transformation into actionable information that help manage the building's performance. Data tags, or metadata, provide the tools to extract data from today's equipment and devices that carry key information. Once tagged, management and analytics software can process this data to help make key decisions for the building's long-term performance.



Global trends in technology are making it increasingly cost effective to access and collect data about the operations and energy usage of buildings. We are now inundated with data, which presents a new problem: how to make sense of it. Most operational data today has poor semantic modeling and requires a manual, labor intensive process to map the data before value creation can begin. In order to make data more informative and meet customers' demands, system integrators utilize the arduous task of naming standards and taxonomies.

The advent of Project Haystack unlocks a streamlined way to work with data through an open-source initiative. Semantic data models and web services are standardized with the goal of making it easier to decipher vast quantities of data being generated by the smart devices that permeate our buildings and factories. Applications include automation, control, energy, HVAC, lighting and other environmental systems.

Project Haystack encompasses the entire value chain of building systems and related intelligent devices.

By applying Haystack tagging standards, owners and consultants can specify that Haystack conventions are used in their BAS to ensure costeffective analytics and management of their buildings. System integrators and manufacturers who utilize Haystack technology into their projects and products are positioned for the future of value-added services.

Tagging enables data visibility

Haystack helps normalize the data with tags. The tags tell you what the data is, and allows it to be easily recognized for dealing with analytics and finding issues and problems. Traditionally, each building project was configured uniquely, which made it hard to exchange and analyze data. Pulling in data required remembering what name it was associated with and assigning that point to a device. The process took a considerable amount of time and resources to get that done. Using Haystack tagging transforms the situation by making it easier to pull in data. Data is now shared with more system-oriented details and can therefore be abstracted and processed by analytics applications more thoroughly.

Metadata is information that describes the data characteristic and how it is applied. It can be used to describe locations, sites, equipment type and point type. It also normalizes data types to provide more useful information.

Metadata, can be used to streamline activities for the system integrator such as point setup, graphic creation and programming. It also can enable workflow efficiency by turning data into useful information and provide context and meaning. By using Haystack tagging, a consistent model can be constructed.

System integrators can locate points and data, and pinpoint where that data is coming from, thereby becoming more detailed and granular with that data, which can be process variables such as temperature or pressure, or events such as alarms.

Haystack is a protocol

Haystack is more than just a set of tag definitions, it is also a protocol. The process of integrating multiple systems can be simplified since the Haystack protocol is more enhanced than the BACnet standard. The ASHRAE organization, which manages the BACnet standard, recognizes the value of tagging, and engaged in formal discussions with Project Haystack[1] to explore how Haystack definitions can be included in future versions of the BACnet standard.

BACnet is one way to bring data in. Haystack works like BACnet in that regard because it's a protocol, a communication method. However, Haystack simplifies it and the data transfer is more stable than BACnet. As a result, the data from Haystack is more refined than data from BACnet.

Haystack over RESTful protocol is an open protocol for data discovery within systems.

This, along with nHaystack, allows data to be pulled in over a communication method such as HTTP or HTTPS. It offers a cleaner and more seamless integration compared to other integration methods. From an IT standpoint, it can be less resource-driven compared to other protocols.

BACnet over IP uses UDP. Since UDP is a connectionless protocol, messages are broadcast on the building management network regardless if another device is receiving information. It can cause a broadcast storm on the network if it's not managed properly, which will cause issues with communication, as well as device failures. However, Haystack over RESTful protocol works through TCP, a connection-oriented via a handshake that takes place. Instead of just broadcasting data across a network, the handshake results more directed traffic, thus lessening traffic on the network. The network installation is much cleaner and IT-friendly compared to BACnet.

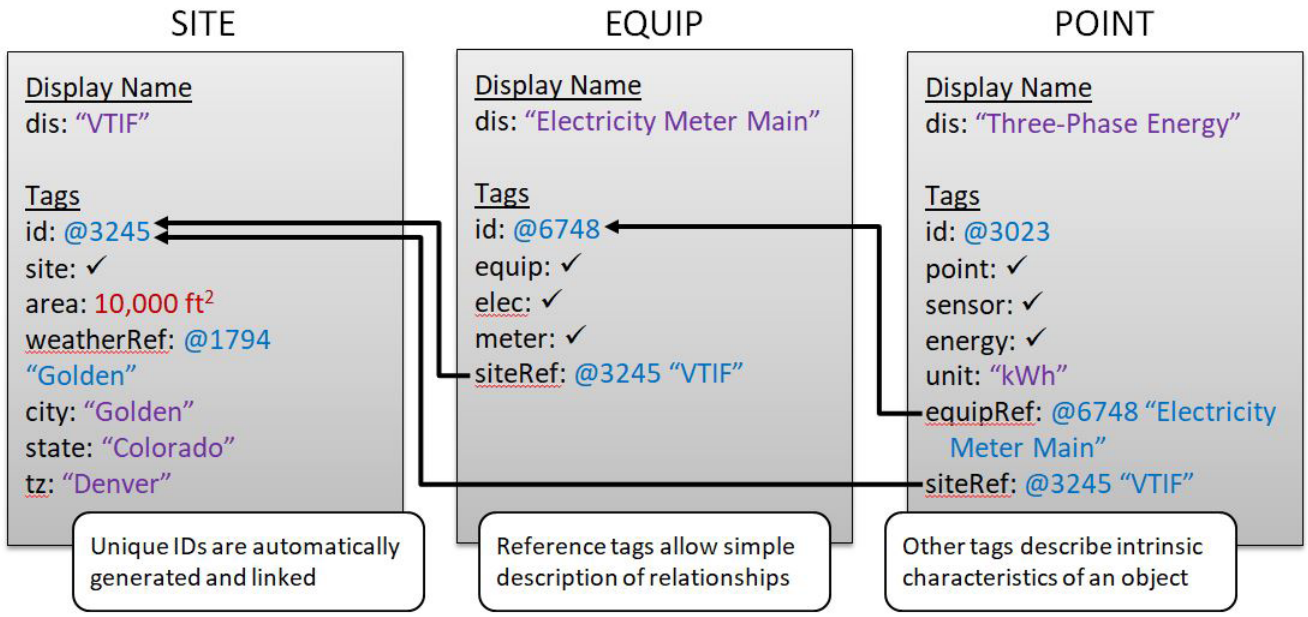
nHaystack is an open-source module available from Project Haystack. It allows integration of Tridium's legacy AX and newer N4 systems; and provides a truly open system. In addition, nHaystack enables Niagara systems to act as either servers or clients in the Project Haystack format via a RESTful protocol. Using nHaystack, external applications receive data that includes essential metadata (tags) to describe the meaning of the data.

When acting as a server, nHaystack automatically generates standard tags for all the control points in the system. This feature allows for connecting immediately to a Niagara Station via Haystack once the nHaystack module has been installed without requiring further configuration. It makes discovering the points in the station as easy as issuing a simple query.

The nHaystack module has notable advantages and key features, including:

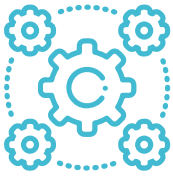
- The ability to include metadata tags as part of Niagara data structures allows external applications to automatically interpret the meaning of data acquired from a Niagara system.
- The Haystack protocol is efficient and includes features that coalesce requests to minimize network traffic and message size.
- The nHaystack module includes extensive features to unify real-time and historical data structures in Niagara, which greatly simplifies access to data and presentation in third-party applications.
- The Haystack REST API (application programming interface) tightly defines the relationship between client and server machines, allowing third parties to integrate easily with equipment and data.
- It provides drop-in support for the Haystack REST API on a Niagara 4 system.
- It unifies the component and history namespaces.
- It allows for arbitrary queries of the station based on Haystack tags.
- It makes it easy to create a site-equip-point hierarchy view of the system.
- It provides a standard Niagara 4 driver so remote Haystack servers can be modelled

The Power of Reference Tags



Why interoperability matters

Haystack has become more interoperable among systems.



Siemens' Desigo Optic, (a front-end graphic user interface (GUI) that allows you to control and schedule buildings and monitor alarms and trends) uses Haystack. As the Internet of Things (IoT) progresses forward, the industry requires more devices able to offer and relativize data. This extends from control level devices, such as air handling units and central plants, to edge devices like VAV terminal units and fan coil units.

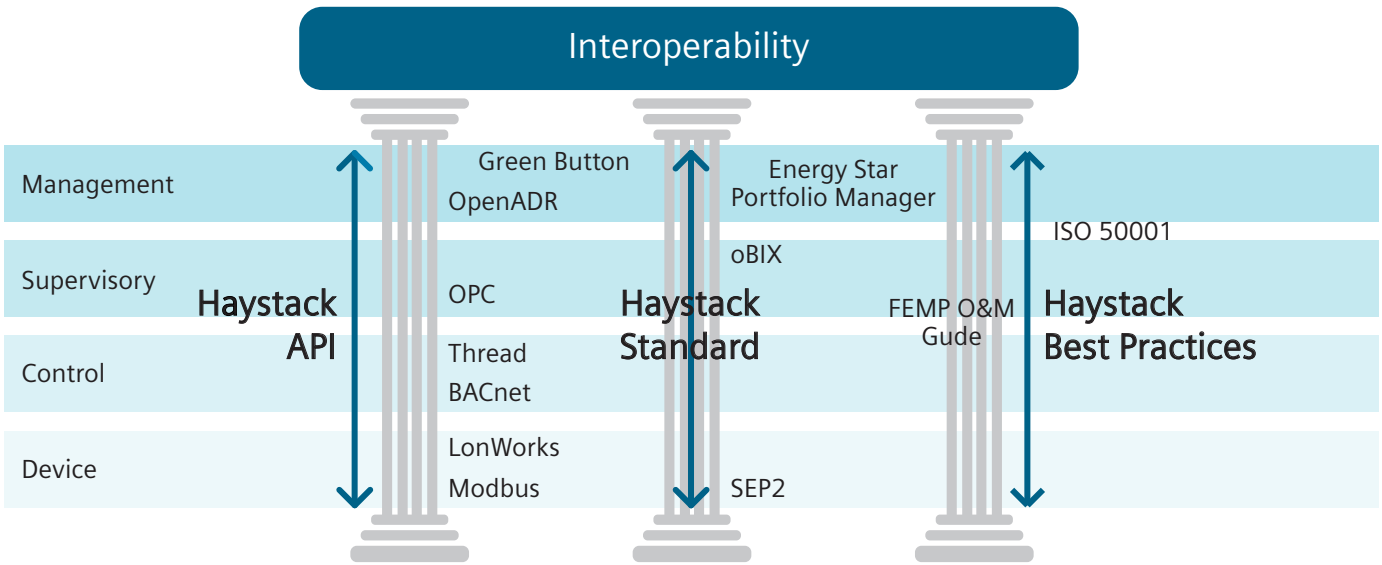
In computing, interoperability is the ability of systems or software to exchange useful information. If two computer systems are not interoperable, they cannot accomplish tasks without human intervention.

Putting people in the loop to perform data exchange and control actions is time-consuming and expensive. It is preferable that computers do the work with machine-to-machine (M2M) communication. This is as true for BAS as it is for the rest of the IoT and the Internet in general. There are three pillars of interoperability needed for data acquisition and control systems to successfully interact: technical, informational and organizational. Project Haystack impacts each of these in a holistic way.

Technical interoperability is the ability of devices and systems to exchange data and control signals. It includes the hardware, software and communication standards necessary to send and receive messages. Imagine sending a message to someone: technical interoperability is the common alphabet and writing convention.

In the building automation space, the industry has made substantial progress in the technical aspect of interoperability with the implementation and adoption of standardized open protocols (BACnet, Modbus, and others), but they have reached their limits.

Three Pillars of Interoperability



Open protocols have helped multiple device manufacturers interoperate at the control and supervisory level.

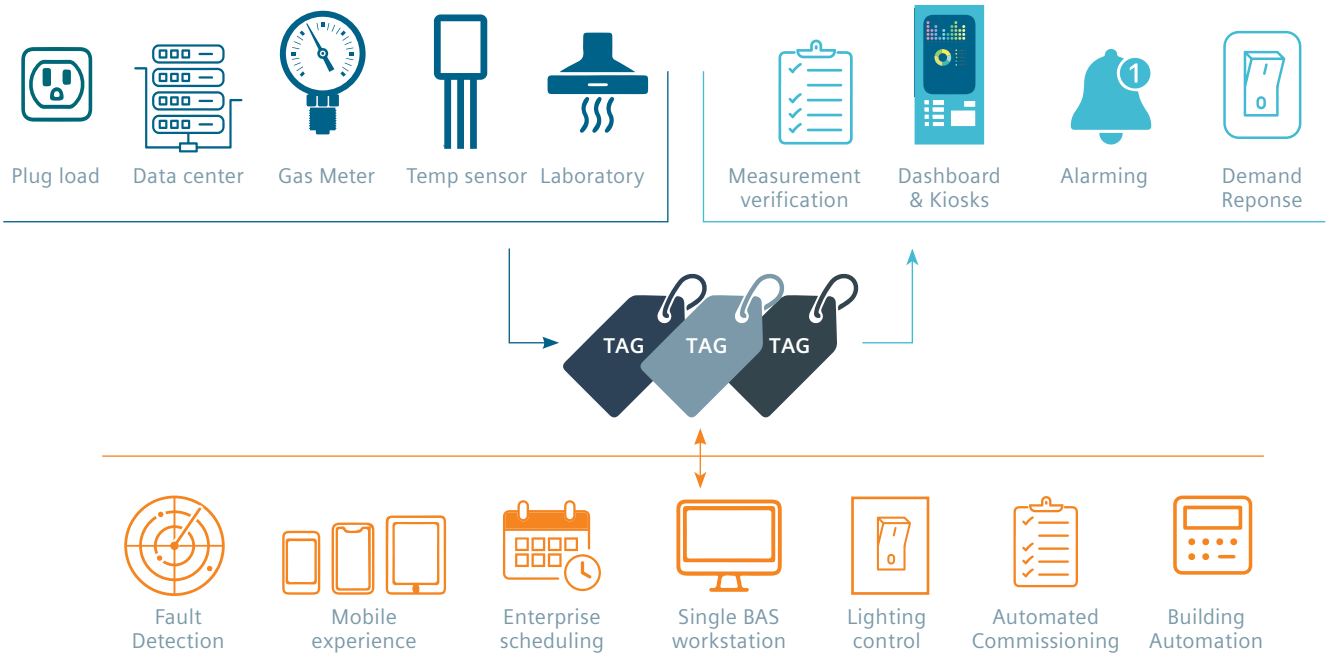
The problem is it has been difficult for supervisory and management level applications to effectively process the data efficiently and effectively. Many BAS vendors offer their own proprietary communication standards as well as a pathway to an open standard.

From the control level, open protocols have helped them adhere to openness at the building level but proprietary was still utilized at the enterprise level for work-around to some of the communication challenges open protocols face.

Through this open architecture, communication among devices, point characteristics such as trending and alarms exist in a common ecosystem.

Not only do devices and systems need to transmit and receive data, but they also need to understand it. Informational interoperability allows computer systems to interpret and act on the data they receive by examining metadata (information about the data) that accompanies each data stream. Consider informational interoperability as using a common language and dialect; where both parties agree on the meaning of the words.

Give Data "Meaning" across all Devices for all Apps



Through Haystack's well-defined software API, it is easier for applications to connect to device-and-control level information. Project Haystack is available through open-source code and can be applied t o any building application. In addition, Ha ystack allows us to embed useful information about the data being transmitted.

In a traditional BAS, connected devices share an alphabet (the communication protocol) but have no concept of a shared language. Therefore, it falls on the BAS programmer to supply all of the informational interoperability required to make things work by connecting one data stream to another and linking data to multiple applications. Through the use of Project Haystack tags and data models, data from control and edge level devices can be more integrated into informational models – often automatically through software tools, such as Desigo Optic.

Siemens' CFG3.F100 embedded controller comes preloaded with a license that can support up to 1000 data points with the full array of features for Desigo Optic, providing single-discipline building decision makers with a more modular growth process.

Project Haystack is flexible and extensible. Once all the devices in a system utilize Haystack standards, they can interpret and understand the data being exchanged.

The final step in interoperability is implementing common policies, procedures and practices that ensure the smart building's long-term viability. While some of these practices are automated, most require people, too.

Building owners implement effective O&M for systems and equipment using best practices such as the Federal Energy Management Program's Operations and Maintenance (FEMP O&M) Best Practices Guide. ISO 50001 also supports organizations in all sectors to use energy more efficiently; through the development of an Energy Management and Information System (ENMS). Using energy efficiently helps organizations save money as well as helping conserve resources and tackle climate change.

Haystack contributes in two important ways to organization interoperability. First, organizations can leverage the informational aspects of Haystack's data model to define standards for commissioning equipment, creating control programs, performing analytics and other tasks focused on operational efficiency.

Second, members of the Haystack Community, working through the Project Haystack forums and the Haystack Connect conference, are collaborating to create information about effective strategies and best practices for leveraging the Haystack standard to operate buildings more efficiently and cost-effectively.

For effective human understanding and M2M communication, all parties using tags to capture information must agree on common tag definitions and data conventions. Together, these definitions and conventions create a common data model. Through this model, Project Haystack can represent large systems; such as air handlers, chillers, boilers and VAV systems.

Interoperability offers many benefits. For the system integrator, interoperability promises workflow improvements, reduced setup time and labor and standardization. End users gain easily scalable systems, with no proprietary layers, which lets them receive critical information at a moment's notice.

Learn more about Desigo Optic and Haystack tagging for efficient building automation.

Visit usa.siemens.com/desigo-optic.

References

1. Feb. 28, 2018, “ASHRAE’s BACnet Committee, Project Haystack and Brick Schema Collaborating to Provide Unified Data Semantic Modeling Solution,” ASHRAE

Siemens Industry, Inc.
Smart Infrastructure
1000 Deerfield Parkway
Buffalo Grove, IL 60089
Tel: (847) 215-1000

07/20, Part# 153-SBT-2103