WINTER 2019

Project Haystack

ISSUE 05

connections

Journal of the Haystack Community - Solutions for Interoperable Device Data

Enabling the Data Revolution in the Built Environment

• Conversation with a Real Estate Developer • Simplifying Tagging
• Open Frameworks • Working Group Updates

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CONTENTS

EDITORIALS

CONTRIBUTED ARTICLES

PROPERTY MANAGERS VIEW

MEMBER PROFILE

FROM THE SPEAKER PODIUM

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CONTENTS *cont'd*

UPCOMING EVENTS

WORKING GROUP UPDATES

TOOLS FOR DEVELOPERS & INTEGRATORS

SOCIAL MEDIA CURATION

DIRECTORIES

CHILLER PLANT CONTROLS AND OPTIMIZATION AT THE EDGE

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Don't Quote Me Now!

by Robin Bestel, Managing Editor, Haystack Connections Magazine

Welcome to the Winter 2019 issue of the Project Haystack Connections Magazine, covering the past six months of 2018 in the life of tagging data and a look at the next 6 months in 2019, as the organization gears up to handle a busy schedule with so much to be accomplished.

As a first-time, full-fledged editor of this publication, I can't thank everyone enough for their guidance and cooperation to produce this publication that attempts to help keep, now a world-wide audience, informed about the activities initiated and supported by the members of Project Haystack.

In 2019, the biggest event planned to bring this community together again is **Haystack Connect 2019**. It is being held May 13 - 15 at the Paradise Point Resort & Spa in San Diego, California. The two years since the last conference has flown by and so much has happened since, it is sure to fill the 2 1/2 day schedule packed with technical sessions that won't want to be missed.

Haystack Connect sponsorships are available, which include space in the Sponsor Showcase, abstracts for speaker presentations are being solicited now, and early-bird registration is in full swing. Information about the conference appears in our Upcoming Events section, but details can be found at **www.haystackconnect.org**.

On to the rest of my editorial comments. You may be asking now why "Don't Quote Me Now" is the title here. As the editor and receiver of the many contributed articles, information on new Tools that support Haystack, and WG updates, my largest edit consisted of removing the quotes around nearly every mention of tagging! Another inflection point crossed! From what I have read, studied, reviewed, tagging is now standard nomenclature in this business of BIoT, smart buildings, IIoT, smart devices, sustainability, semantic modeling, and many more I am not thinking of right now.

I would like to take this opportunity to thank Therese Sullivan, the previous editor of Connections, for her contribution to this issue. For our **Property Manager's View** section, Therese traveled to Detriot, Michigan, went to the top of one of Woodward Avenue's renovated 19th century buildings and interviewed Joe Pattenaude, Director of Building Systems at Bedrock, a full service commercial real estate firm specializing in strategic development and helping revive downtown Detroit. One thing I will point out before everyone reads the interview, he is adimate that contractors or integrators working on a Bedrock project must tag what they are doing and specifies Haystack tagging to get all the naming to conform to one system.

For this issue, our **Contributed Articles** section consists of 6 articles from the Haystack community, and the **Tools for Developers and Integrators** section encompasses products and services that support, automate and simplify tagging and the Haystack methodology. Project Haystack **Working Groups** submitted updates to their work. Past activities supported by Project Haystack are noted, as well as upcoming ones that we want to encourage everyone, members and supporters, to get involved with.

Here, I will reiterate from the previous issue and written by Therese, "the industry has the discipline, respect for mission, and good sense to opt for collaboration over 'protocol war', as a win for everyone that wants better buildings as soon as possible. When specifying engineers and controls contractors, as well as [real estate developers,] building owners and operators, insist on standardized semantic tags, the barriers impeding data flow will fall away."

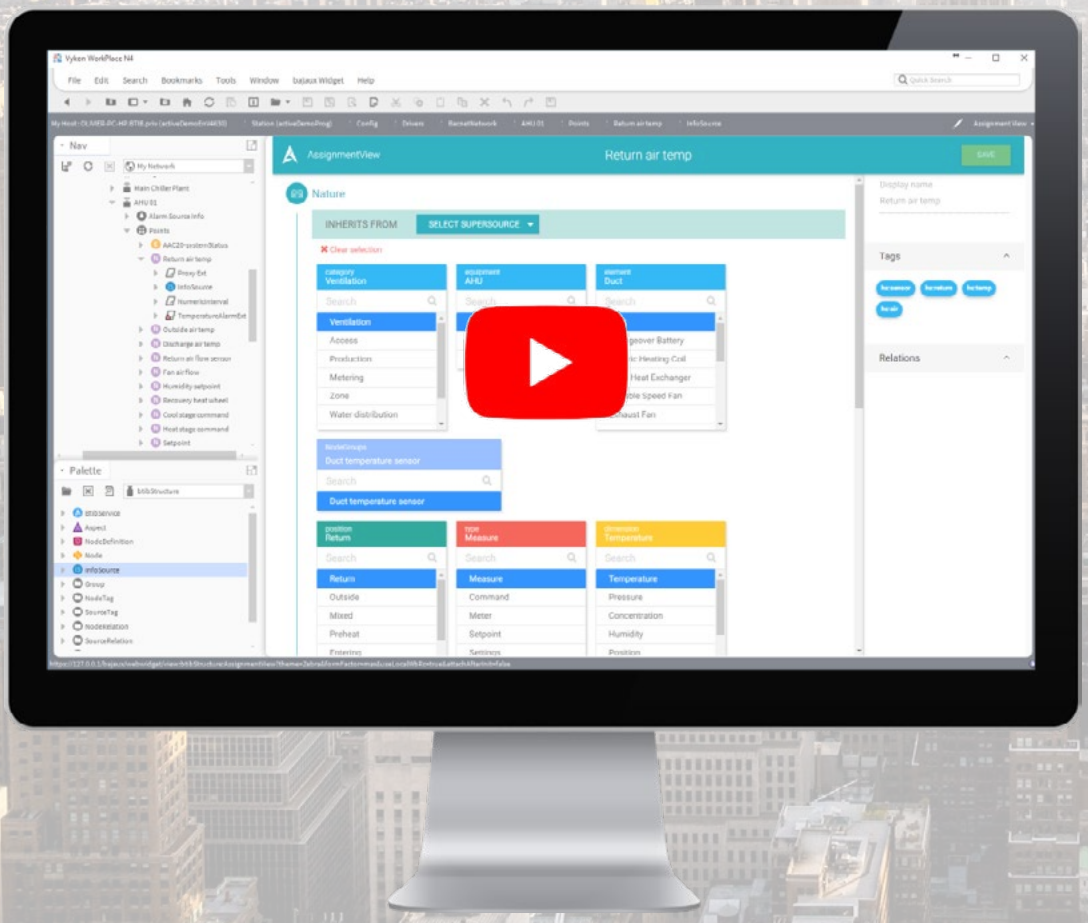
The Winter 2019 issue of Project Haystack Connections Magazine documents less to convince readers of the importance of tagging and more about how best it is being done. My congratulations to the Haystack Community, there's alot in here that's working!

BTIB

Niagara System Integrator?

Save a lot of time using the built-in Niagara tagging engine

Watch the demo



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The Growing Reach of Project Haystack

by John Petze, Executive Director and Marc Petock, Executive Secretary

This year marks the 8th anniversary of Project Haystack and the 4th Haystack Connect conference. From the start of the organization by a handful of people in March of 2011, through our conferences in 2013, 2015, and 2017, this 5th publication of our Haystack Connections magazine, and the many speaking engagements we have participated in, the open-source Project Haystack initiative has grown globally. Today, it is clear that Project Haystack has become the most widely-adopted and fully-developed approach to "marking up" device data, an essential requirement to successfully exploit the value of device data.

In addition to the many articles and resources you will find in this issue of Haystack Connections magazine, we want to make special mention of the upcoming Haystack Connect 2019 (**www.haystackconnect.org**) Conference, taking place May 13-15 in San Diego, California at the Paradise Point Hotel.

We are proud to continue producing this unique event. There are lots of conferences and events in our industry, so why Haystack Connect? First, it is driven by the community and not controlled by a single company. Second, it is the only event dedicated to the topic of data semantics and modeling for the Building Internet of Things (BIoT). Third, Haystack Connect is the place where an entire community of companies, researchers, practitioners, technologists and end users on the leading edge of utilizing device data and driving business outcomes, come together to share their technical and business knowledge in an open environment. Fourth, it is focused on the challenge of working with data from the ever-growing number of smart devices, equipment systems, and software applications in the built environment. It is wide in scope as community members highlight the needs and challenges encountered in real-world applications and share their experiences and solutions, all built on the foundation provided by the Project Haystack tagging methodology.

Expect to hear from companies and people from around the world sharing their understanding, knowledge, best practices and solutions that are making the "semantic facility" a reality. You will see software applications that streamline data tagging, hardware products that embed tagging in the end device, control logic that automatically finds its targets and much more. All moving the industry closer to true plug-and-play functionality and more intelligent systems..

2018 was a significant year for the Project Haystack organization. We achieved numerous milestones, including an increase in the number of contributors and working groups, the announcement of collaboration with BACnet and Brick to pave the way for a single, unified approach to data tagging for the BIoT applications, and the continued acceptance and specification of Project Haystack globally.

Today, well over 15,000 facilities are known to use Haystack tagging. Government agencies are specifying its use and numerous suppliers of software and hardware products have built Haystack tagging into their products - all of which has been driven by the community.

While we opened this message with the statement that the Haystack methodology has become the most widely adopted and fully developed approach to "marking up" device data, that doesn't mean our efforts are complete. The building automation industry and society in general, are just beginning to learn how to use data and exploit the value it contains. New challenges, deeper understandings, more input from different viewpoints and diverse applications, will continue to drive the work of the organization and the volunteers of Project Haystack and Haystack Connect.

The board would like to take this opportunity to thank them all and we look forward to our gathering in May of the Project Haystack community at Haystack Connect 2019.

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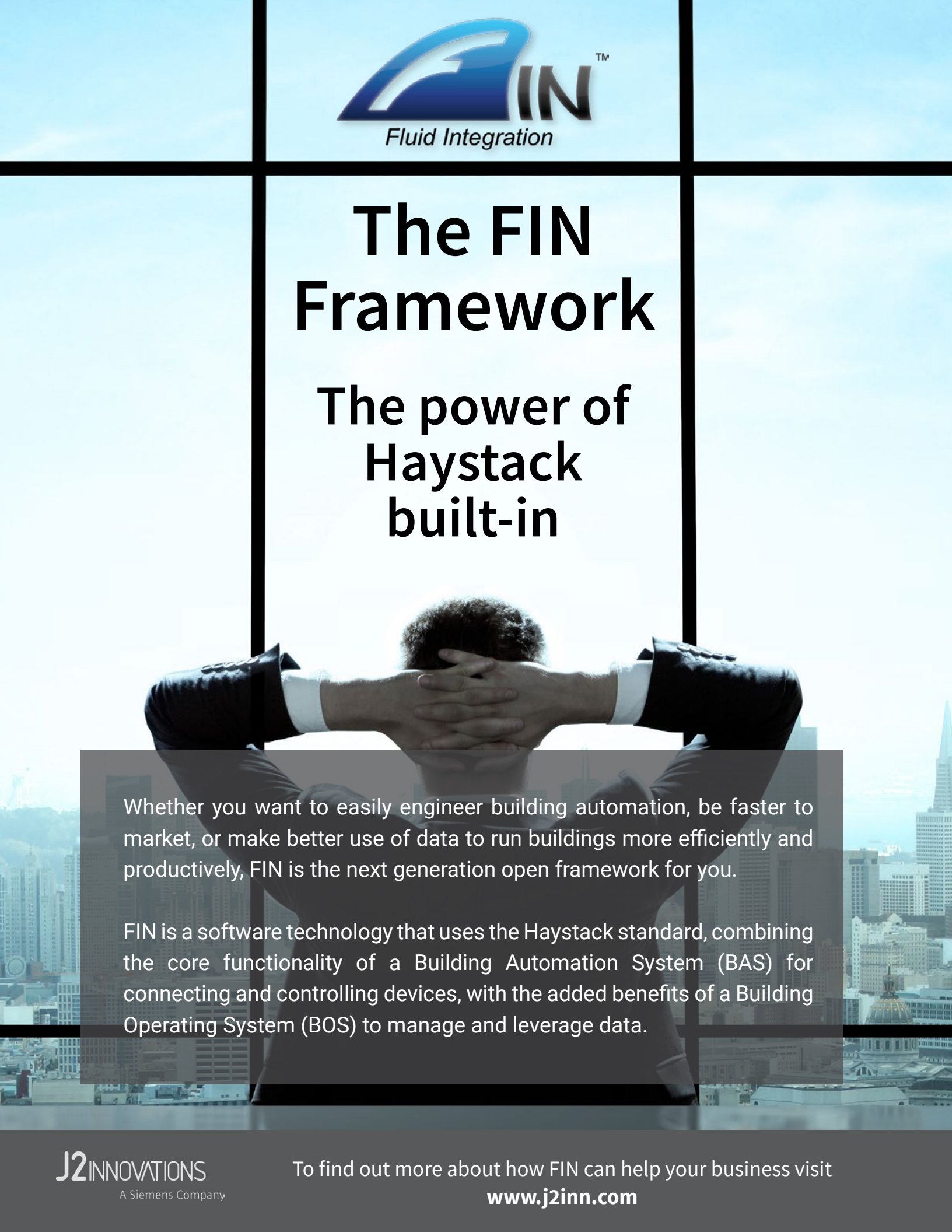

Whether you want to easily engineer building automation, be faster to market, or make better use of data to run buildings more efficiently and productively, FIN is the next generation open framework for you.

FIN is a software technology that uses the Haystack standard, combining the core functionality of a Building Automation System (BAS) for connecting and controlling devices, with the added benefits of a Building Operating System (BOS) to manage and leverage data.

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Simplifying Data Collection and Analysis through Haystack

Using open-source wireless technologies, hear how one company is simplifying the collection and analysis of data using the Haystack methology and tagging.

Rapid metropolitan and commercial growth in recent years has greatly increased demand for smart buildings. This in turn has influenced building owners, managers and systems integrators to seek out new technology to provide cost-effective solutions to support building operation.

Sensors and equipment provisioned for remote control, allows a building operator to be significantly more efficient in managing their expanding responsibilities. The emergence of IoT and low-cost, widespread wireless data has enabled asset managers to connect smaller and smaller systems, further expanding their scope.

The result is huge volumes of data being collected from millions of assets with few solutions available to sort this data, process it and present it. As a smart cities company, we often experience this bulk data sorting and presentation dilemma as we strive to provide meaningful information and insight to our clients. The work of Project Haystack has enabled us to solve this challenge.

The implementation of Haystack tagging is best explained through a simple, three-step process we use when retrieving and processing data for our clients.

1) Data Collection

First, the data needs to be collected from the site, and how this is achieved depends on the individual building. For example, if it is an existing site and the analysis is to be performed in the cloud, we must interface with the main BMS to query and transfer the data to our database. At a recent site, the main BMS used the Tridium Niagara software platform. To collect the data from the site we installed the Niagara Haystack Extension and deployed a python script that uses the pyhaystack library. The data was then streamed from the site to our platform in the cloud.

2) Data Storage

Second, the data needed to be permanently stored in a reliable and scalable way. To achieve this, we added tags following the standards specified by Project Haystack, in order to efficiently query this data.

Here's an example of the tags added to a thermal energy meter's energy point for one of our clients:

id: @C.Drivers.BacnetNetwork.Block_A.TEM.TEM_CHW_A1.points.Energy

clientRef: @XXX_XXX

countryRef: @Australia

stateRef: @NSW

regionRef: @Sydney

siteRef: @XX_XXX_XX_XXX

buildingRef: @Block_A

floorRef: @Lower_Ground

equipRef: @TEM_CHW_A1

dis: "Energy"

kind: "Number"

unit: "MWh"

point

his

chilled

water

thermal

energy

meter

sensor

active

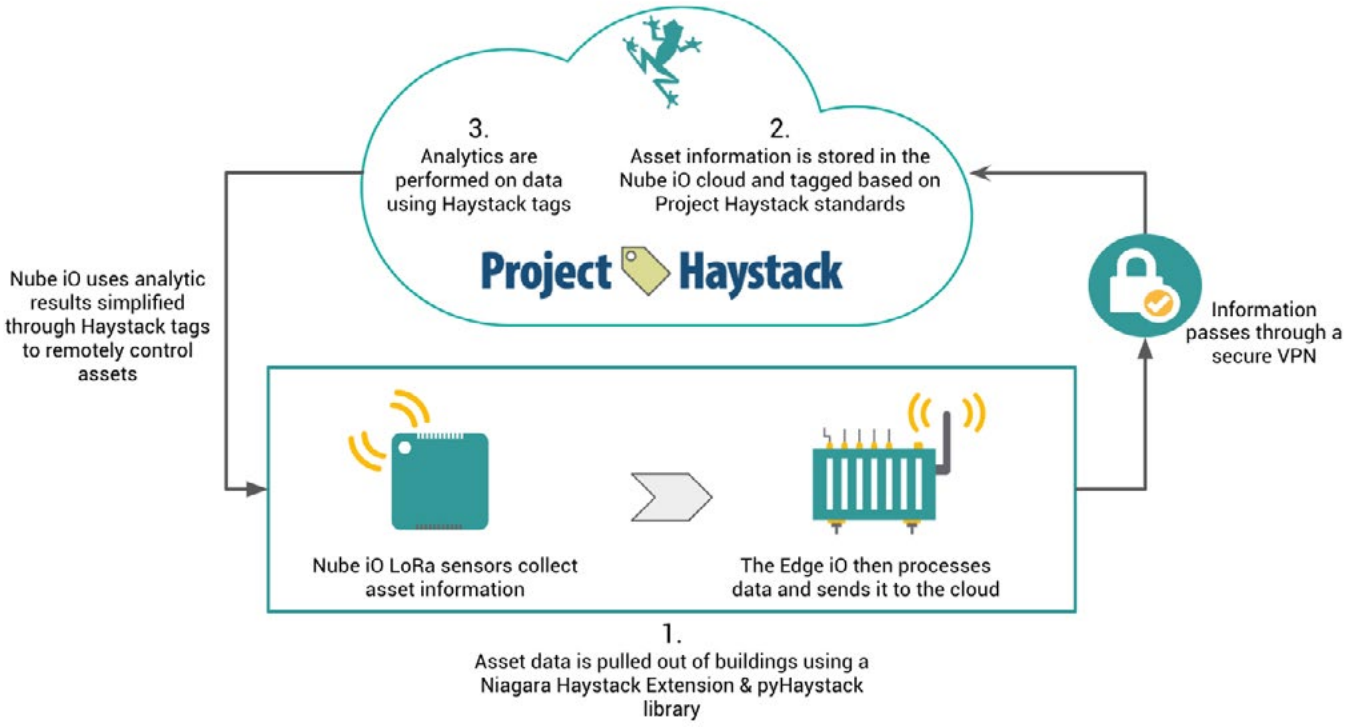
"Use of Haystack tagging has been instrumental in our ability to provide meaningful information to our clients, as well as simplifying our workflow when processing building data."

These tags are used to describe data points, which improves the data analytics process and enables a certain degree of automation to be implemented. Here we specified the geographic location of the asset, the location within the building, and markers of the asset. Using Haystack helps to reduce this setup process and allows for immediate integration of newly added systems to a monitoring platform.

3) Data Analysis

Finally, analysis of the data is performed. The use of Haystack tags enables alerts and analytics to be quickly and easily implemented with a large amount of flexibility.

For example, say we manage multiple sites with multiple PAC units and want to apply a rule that monitors the supply air temperature, return air temperature, fan status,



and compressor status in order to detect if the difference between the return/supply air temperature is below a certain threshold while the unit is cooling. If we were to do this without tags we would have to manually select each point for each PAC unit at each site, and this could be thousands of points. Using tags allows us to simply specify the tags that describe the points we need to monitor and then the appropriate data is processed by the new algorithm. This assists with bulk logic modifications and updates when information is pushed back into buildings.

The use of Haystack tagging has been instrumental in our ability to provide meaningful information to our clients, as well as simplifying our workflow when processing building data. As more and more assets are being introduced to smart buildings, Haystack tagging is becoming an industry standard for sorting data.

Aidan Pickard is the CTO and Co-Founder of Nube iO, a smart building automation company based in Australia. Nube iO has designed an end-to-end smart building solution which helps facility managers to remotely control their buildings, reduce energy, reduce maintenance costs and improve comfort conditions of building environments.

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Project Haystack Associate Member

Tagging and Open Frameworks – A Winning Combination

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"Building automation combines my passion for energy saving, with my interest in architecture and technology. IoT-related developments over the last few years are disrupting the market in exciting ways. The FIN open framework, offers the potential to automate and simplify how building systems are configured and commissioned, all based on an open tagging standard."

When a technology is new, it tends to be expensive, proprietary, and difficult to implement. This was certainly true of computers and it has also been true of building automation systems. As the computer industry has followed Moore's law with exponentially increasing computing power, the cost of computer hardware has fallen dramatically, while the software running on it has increased hugely in complexity and capabilities. Meanwhile, there has been a similar decline in hardware costs in the building automation market, but the reduction in cost has not been as dramatic as in the computing world. This is because for the most part, manufacturers have offered systems for which they have designed all the elements: the software, firmware, and hardware. In the computing world, developments by IBM, Microsoft, and the Linux Foundation, as well as the Open Source software movement, have led to a very different progression, as hardware, communications, and software platforms have become more standardized and "open". Those of us who have spent our careers in the Controls industry can recognize many parallels, and some significant differences.

Whilst it has suited BMS and other building related system manufacturers to offer proprietary solutions, pressure from end users (who don't like to be tied to one manufacturer) has led to the widespread adoption of open protocol standards (at least in the BMS, lighting and electrical markets); enabling multiple systems to talk to each other. However, because of the way buildings are contracted, each sub-system has developed separately, and each discipline has developed its own standards. The result today is a plethora of "standard" protocols which are used by the various sub-systems in a building; BACnet for HVAC, DALI and KNX for lighting, Modbus for electrical metering and power management, M-Bus for heat metering, etc. Some protocols, like LONworks, managed to gain traction in multiple segments, but its adoption has declined in recent years. So, although people still dream of having "one standard to rule them all" the reality is much messier, and the challenge of how to get systems talking to one another remains. In addition, the advent of wireless and IoT technologies has further compounded the issue.

So whilst automation systems hardware costs have fallen over time, the configuration costs required to deliver the building solutions have not. This is because applications engineering for control strategies and supervisory graphics are still created manually, which requires a higher skill level of the engineers or consultants. There have been various attempts at using standard applications, but these have been manufacturer specific and less than wholly successful.

To properly address the multi-protocol issue, an open framework platform is needed, enabling the data from various sub-systems to be "normalized", so it can be

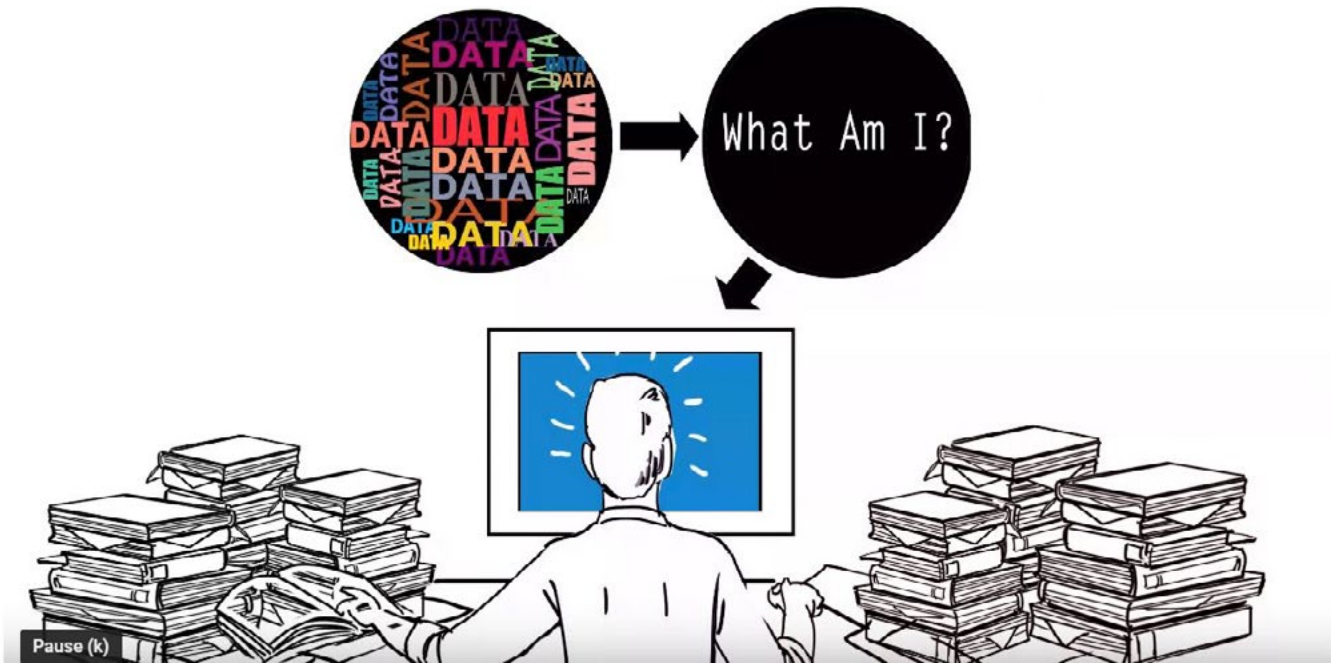
processed in a common way. In the North American market, and to a lesser extent in some European markets, Tridium's Niagara Framework has become a popular way to deal with the integration challenges in modern buildings, hugely helping controls specialists to deliver single supervisory solutions across multiple sub-systems. However, Niagara has not provided the whole answer, as there has been an increase in the complexity of engineering required for integrations. As the existing protocol standards do not communicate the metadata or context associated with all the measured and controlled parameters in a common way, human engineering effort is still needed to "connect the dots" and enable the systems to interact in a meaningful way. What has been missing is data tagging, which can provide the context needed for software applications to understand the meaning of the data. Recognizing the significance of tagging led the founders of the Project Haystack to create this open source project back in 2011. Since then, many companies are seeing the value of standardizing the metadata associated with their products so that interoperability between disparate systems can become a reality.

In the building automation world, before the advent of tagging, engineers configuring systems had to rely on data labels (usually a single text field of 16-32 characters) to understand where the connected device fits into the system. While humans can usually figure out the meaning of the abbreviations used in such labels, automation software cannot since there has not been a labelling standard. Typically, each project uses a different syntax depending on the specific consultants and engineers working on the job. Automation software that natively supports data tagging provides a huge advantage, enabling most of the otherwise manually engineered tasks associated with configuring a system to be automated (which saves as much as 80% of the engineering time on some tasks).

Imagine a world in which such inter-communication between systems happened automatically, without requiring manual intervention and all building data can be visualized in the required format with relatively little engineering effort. Haystack tagging, used within an open framework, makes this possible. In systems in which all the data is tagged, one can almost fully automate the generation of plant schematics, floorplans, dashboards, alarms and energy reports, as well as deliver real-time fault and performance analytics across different functional systems - not just the BMS.

Project Haystack is now gaining significant traction globally, and there are now formal discussions with ASHRAE (the originators of the BACnet standard) and Brick (a more recent IT inspired initiative), to evolve a common approach for the future. As the use of Haystack tagging grows, the scope of the agreed tags will extend well beyond building services systems to encompass business software, such as meeting room and hot desk booking, CAFM/CMMS, asset management, car parking, etc.

This is why open frameworks and tagging are vital for the future of the building automation industry and its integration with the increasing range of business and IoT solutions



being deployed in buildings. Currently none of the major BMS, lighting, fire detection and other manufacturers have developed software in their proprietary systems that natively enable such tagging, nor do they provide a way to automate the management of the data from multiple system sources. In contrast, open frameworks are designed from the ground up to handle data from multiple sources and protocols, which makes the process of engineering integrated systems with common visualization much easier.

For the first time, automation of the graphics creation, alarms, dashboards and reports has become a reality. The huge time saving in the engineering of the BMS and related building systems, as well as the potential for new functionality and diagnostics, is a game-changer for the automation industry.

"For the first time, automation of the graphics creation, alarms, dashboards and reports has become a reality."

There is little doubt now that the future of the buildings sector will rely on open systems using a tagging standard connected via IP networks and IT-derived messaging standards, with hardware largely available independent of the software that provides the applications.

For more information about the benefits of Haystack tagging, read: **The Strategy and Payoffs of Meta-Data Tagging**

Chris Erwin recently joined J2 Innovations, the developers of the FIN open framework, as V.P. of Sales for EMEA and Asia.

OpenStreetMap: A Tagging Comparison With Haystack

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Project Haystack and OpenStreetMap tags model extremely different real-world entities, which motivates differences in the underlying database location and scope. What follows are ideas to consider in usage patterns and directing future growth of the tagging standard.

OpenStreetMap is an open, community-driven project whose aim is to create a freely-accessible and editable map of the earth. Think of it like the Wikipedia of geographical data, where users contribute map data using local knowledge, GPS traces, and aerial imagery. Consumers or developers can then use the data at little to no cost. OpenStreetMap promotes the ideals of information freedom, which is in direct contrast to many costly and proprietary geographical datasets such as Google Maps. Its popularity and reliability have been steadily growing since its start in 2004 with over 1 million contributors, 4.3 million registered users, and 3 million changesets per day as of November 2018[1]. A project of this size certainly doesn't come without organizational difficulties! It needs well-documented, consistent standards on how to differentiate between, for example, a bike path and a freeway, or a police station and a flower shop, so that every user can contribute individually while still maintaining a consistent, reliable database. This is done using a semantic tagging model that is similar to Haystack. As an older and more widely used project, the OpenStreetMap tagging standards can offer an interesting model to compare Haystack against both as a tagging scheme and as an open-source project, and can help determine where Haystack excels and where future improvements could potentially be focused.

In general, the Haystack tagging methodology framework and tag names tend to be cleaner. Both Haystack and OpenStreetMap are "freely-tagged", meaning that any name-value tag pair can be applied to any database record. Haystack is explicit in the different kinds of values that are allowed, whereas in OpenStreetMap every tag value is a string with specific formatting standards for numbers, time-spans, etc.[2] Interestingly, OpenStreetMap has no equivalent to the Haystack "marker" value, instead using a value of "true" or "yes" to indicate simple tag presence. OpenStreetMap allows tags to be further distinguished by including a colon in the tag name, for example "maxspeed:forward", whereas Haystack has accomplished this by camel-casing, like in "chilledWaterPlant". Finally, OpenStreetMap does not define any schemas for commonly combined tags, although most typical usage implies them. Instead, it has fallen to the graphical OpenStreetMap database editors to build explicit schema definitions for most commonly tagged objects, leading to some inconsistency and disagreement. In contrast, the Haystack community is currently developing a "type system", which scopes and organizes tags, making the tagging combinations explicit within the standard itself. This, when implemented, can be referenced by database editing software to help ensure that tags are used in consistent combinations.

[1] https://wiki.openstreetmap.org/wiki/Stats
[2] https://wiki.openstreetmap.org/wiki/Tags

OpenStreetMap Tagging of the Statue of Liberty

Documentation for the tagging systems differ greatly, with OpenStreetMap using the open-source Wikipedia-like MediaWiki software[3], and Haystack using an open-source website written in Fantom[4]. The features of each are extremely divergent, so we will only discuss a few of the relevant differences. MediaWiki allows registered users to create or update tag pages using an intuitive graphical interface, and pages have recorded, viewable histories to track changes. Each tag page has an associated discussion forum to allow community members to communicate about improvements. Users can add pages to their watchlist to get notifications when the page or discussions are updated.

Using MediaWiki, when a user wants to modify a page, they follow this process:

1. Start a discussion on the tag discussion page
2. Those watching the page respond
3. Collectively, they decide if and how to modify the page
4. They implement the changes in real time via the graphical page editor

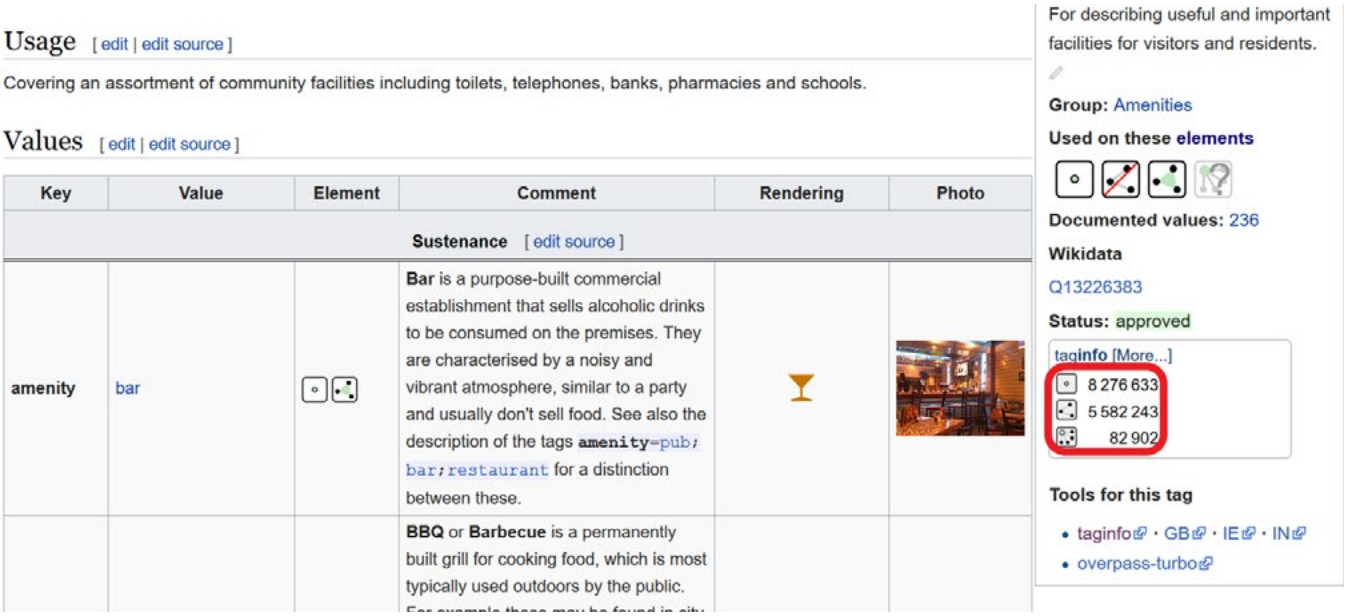
On the Project Haystack site, this is typically the process:

1. Discussion begins on the general forum
2. Community members monitor and review all forum posts for topics that fall within their area of expertise
3. If enough support is gathered on a topic, a working group is formed from the forum post
4. The working group develops a proposal, which then is reviewed by the community at large
5. If more support is gathered, it is approved
6. The changes are implemented via a pull request to the Haystack website code repository, following approval by the owners of the Haystack website repository and host machine.

Project Haystack's documentation process makes discussion, approval, and implementation much more difficult as compared to OpenStreetMap, especially for users who are not able to program. The documentation system for OpenStreetMap allows for existing standards to be protected by user-stewards that watch the pages for changes, while also allowing for exploratory users to easily begin extending the tagging scheme to cover new use-cases.

Project Haystack and OpenStreetMap tags model extremely different real-world entities, which motivates differences in the underlying database location and scope. OpenStreetMap is intended as a single, worldwide database while Haystack is conventionally deployed on a smaller level, perhaps one Haystack database per facility, campus, or owner. This centralized database gives the OpenStreetMap tagging standard a distinct advantage in terms of growth: The actual tag usage can be queried and analyzed. On the right-hand side of any OpenStreetMap Wiki tag page (for example, the "amenity" tag[5]), you will find the number of records on which that tag occurs. There are additional tools that summarize the geographical location of those records, the different values of the tag, and how often that tag coincides with another. These tools increase visibility on tag usage,

[3] https://www.mediawiki.org/wiki/Project:About
[4] https://bitbucket.org/project-haystack/haystackws/src
[5] https://wiki.openstreetmap.org/wiki/Key:amenity



Usage [edit | edit source]

Covering an assortment of community facilities including toilets, telephones, banks, pharmacies and schools.

Values [edit | edit source]

Key	Value	Element	Comment	Rendering	Photo
			Sustenance [edit source]		
amenity	bar		**Bar** is a purpose-built commercial establishment that sells alcoholic drinks to be consumed on the premises. They are characterised by a noisy and vibrant atmosphere, similar to a party and usually don't sell food. See also the description of the tags `amenity=pub; bar; restaurant` for a distinction between these.		
			BBQ or **Barbecue** is a permanently built grill for cooking food, which is most typically used outdoors by the public.		

For describing useful and important facilities for visitors and residents.

Group: Amenities

Used on these elements

Documented values: 236

Wikidata

Q13226383

Status: approved

taginfo [More...]

8 276 633
5 582 243
82 902

Tools for this tag

- taginfo · GB · IE · IN
- overpass-turbo

Amenity OpenSteetMap wiki page. The red box indicates the number of records containing the amenity tag.

adoption, and overlap, which is extremely helpful to the OpenStreetMap community when making decisions on standards. Unfortunately, the distributed style of Haystack databases makes these statistics nearly impossible to aggregate in totality. However, an incomplete picture could still be useful. Tagging statistics, at least in some part, could be achieved by promoting the inclusion of optional tag aggregation reporting systems into Haystack database software. These could be reported to a centralized server that helps to inform the Haystack community on existing trends and adoption and guide them toward areas that would benefit from standardization.

The Haystack methodology is extremely useful in modelling smart device data and it has come a long way since its inception in 2011. Compared to the OpenStreetMap tagging standard, Haystack is exceptionally advanced in some important areas, like its solution to formalized tag combination schemas. In other areas, it could potentially be enhanced by borrowing ideas from older, larger tagging projects. Particularly, a documentation system that empowers users to more easily improve and expand the standard could promote user engagement and ownership. Aggregated statistics about tag usage could be used to determine current usage patterns and direct future growth of the tagging standard. With these improvements Haystack tagging could grow and improve at an accelerated rate.

Jay Herron is a Software Engineer at BuildingFit, which offers a wide range of services focused on the SkySpark® Analytics platform. He is an active contributor to Project Haystack and leads the AHU Working Group. In his free time, he contributes to OpenStreetMap in the Salt Lake City, Utah area.

A Critical Component In Data Management Planning

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Thoughts on how having a data management plan and strategy empowers companies to make good fact-based decisions that will drive better business outcomes.

Data has changed the way companies in every industry does business and manages performance. Data is now an irreplaceable asset. Today's buildings, facilities, devices, meters, sensors and equipment generate a huge amount of data that can be used to derive useful information to drive business outcomes and operational value. The only way to use this data in an appropriate and efficient way is to have a good data management plan which includes ways to identify it, access it, collect it, organize it and analyze it.

However, data can be bewildering and meaningless. We have so much data available at our fingertips, what are the real pieces of data we truly need and what is just noise? When it comes to data, we need to move past "data drowning" and get to a point where we collect, sort and exchange the critical information that directly correlates to improving our operations and meets our business outcomes.

Data management planning is a critical step in the data value chain, but regrettably, it has been confusing and misunderstood. Many organizations know that data is extremely important, but they are frustrated because they are not getting enough or the right value from the data they are gathering. Unfortunately, often this is done without proper planning and a data strategy.

Blessing or Curse

If you're lost, you would clearly consider the data provided by a map as a blessing. Why don't we view the data produced by our buildings systems in the same way – a map to lead us to our goals of better overall financial performance? We now see that the Internet of Things and the big data "story" has been both a blessing and a curse. It has evolved to become the fundamental organizing schema for all intelligent equipment and devices to share data and information, but the dilemma lies in that data solutions today can analyze some data, but not all data. The ability to normalize different data types and blend diverse data sets requires planning, a strategy, tools, and technologies. Without data management planning that includes a strategy and the right tools, users are only scratching the surface of the full value of their data.

When it comes to data, many conversations start by focusing on the technology and what type of technology do I use. When that happens, initiatives can falter — not delivering the insights needed to drive the intended results and outcomes. A robust, successful data and analytics function encompasses more than a mound of technologies. Having the right tools is critically important, but too often executives overlook or underestimate the significance of the type of data and organizational

components required to build a successful data and analytic function.

What's the best way to build effective data capabilities? Start by developing a strategy that includes a clear understanding of what you hope to accomplish, the business outcomes and how success will be measured.

Over the past decade, data solutions have revolutionized how organizations manage finances, supply chains, sales, and labor, but little has addressed how they use and value facility operational data in relation to managing their core business.

As important as this is, it is essential to have a data strategy and plan in place. This means integrated data access and exchange from the enterprise, to down to the control level and out to the edge. And in our world of buildings and facilities having a data strategy and management plan is something that is crucial to the success of a building's operational performance and maintaining a comfortable and productive workplace environment.

Data combined with analytics has changed the way companies in every industry does business and manages performance. When it comes to data planning within the built space, most building operations departments do not have a defined "data management plan or strategy." What passes often consists of storing data to a database associated with the Building Management System and an occasional look at the data. With this type of approach, the information is limited to just those systems monitored or managed by the building management system.

A good data management plan with a defined strategy is an important component in dealing with data and analytics deployment and should include all the operational data and information required to manage a building's performance. It should contain a set of processes and technologies that define, unifies and manages the data that is common for all the devices and systems and essential to all areas within an organization.

Data planning should look at all the operational data and information required to manage a building's performance. Start by identifying what data is available. Categorize it to identify the data and information that different people and groups involved with the building's operations need

to have to perform their work. Much of the data will be from points on building systems, but other data may come from other business systems. For example, asset data, energy bill data, service, and repair data, all of which may come from systems outside of the facility management department or even outside the organization. Identify where the data exists; how it must be accessed, collected, how it will be exchanged and estimate the volume. In all of these cases, it's highly beneficial to decide on a "standardized dictionary" for your data. The standardized dictionary would include naming conventions and semantic modeling using tags.

Standardize what you call things. Multiple naming conventions in an existing building or portfolio of existing buildings are the largest and most time-consuming issue involved with implementing an integrated building management system. If you are working with existing systems, however, you may not have that luxury. You will have to deal with the names that already exist in the systems. A multi-building campus with buildings built at different times with different contractors is likely to have multiple names and tags for similar pieces of equipment. You don't want to end up with ten different names for air handlers or pumps.

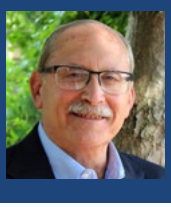
This is where Project Haystack comes in. The unique flexibility of the Haystack methodology and tagging allows you to add uniform data descriptors to your data, no matter what their original names may have been. You don't have to disturb or change your end system – the tags that describe the meaning of your data can be added at their entry point to higher level applications. Project Haystack is an open-source, community-based standardization effort which provides a "markup language" for data. It provides a data-tagging methodology that can be used in a wide variety of systems and applications, and standard equipment models to enable you to define and describe the meaning of data from smart devices in a way that can be consumed by other applications and systems. Once your data is tagged, software applications can automatically interpret, consume, analyze and present data because they can interpret its meaning.

"The unique flexibility of the Haystack methodology and tagging allows you to add uniform data descriptors to your data, no matter what their original names may have been."

There's no point in collecting inaccurate data. To get the most accurate information you'll need to 'tune-up" the building systems and check the calibration of sensors and meters. The building systems themselves should be regularly re-commissioned or utilize monitoring-based commissioning by using analytics software. Data is a corporate asset that when used can empower organizations to make more informed, fact-based decisions that drive better outcomes.

Summary

A data management plan empowers companies to seek and make good fact-based decisions that drive better outcomes. Connecting to it, collecting it, storing it, ensuring its integrity, analyzing it, and using it to make better business decisions and develop a comprehensive strategy. Determining who controls and who owns the data and what is done with it will lead us down some interesting paths. Furthermore, as data velocity is on the rise, companies must be able to analyze it and get actionable advice instantaneously. It is not about more data, but rather asking the right questions to get the right data, understand it and help solve specific problems and address specific issues.



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Contributed Article

Open Source Tools Enabling Smart Connected Buildings

Intellimation

The combination of Volttron and Haystack provides a vendor neutral, open source, inexpensive middleware layer that decouples the data acquisition and data modeling from the application layer. Now, application developers can focus on their applications without having to worry about how to get the data.

In 2014, Intellimation shifted its business focus away from traditional BAS installations to energy-efficient retrofits in existing buildings leveraging a new type of software called AFDD/Analytics (Automated Fault Detection and Diagnostics/Analytics). This was the day I was waiting for, when widespread adoption was just around the corner. Back in 2007, I saw my first demonstration of this type of software from Cimetrics, one of the early pioneers in this arena. I was convinced that this type of software was broadly applicable to every building with a DDC control system. Besides Cimetrics, I credit Interval Data Systems, and Facility Dynamics for pioneering this software category.

We started deploying AFDD/Analytics in 2014 for our first and still largest client, the Washington, DC Department of General Services (DGS). DGS owns and operates 400 buildings, approximately 30 million sq. ft. made up of schools, office buildings, rec centers, libraries, police and fire, etc. As early adopters, they were willing to push for more comfortable, lower cost, lower carbon buildings, and a more energy efficient and sustainable city. Energy efficient buildings is a major step to the Sustainable DC 2.0 goal "In just one generation - 20 years - the District of Columbia will be the healthiest, greenest, and the most livable city in the United States".

We quickly learned that data acquisition/trending was a major hurdle to deploying AFDD/Analytics. All these tools need trended data. We tried using the existing/native BAS for trending, but this was cumbersome, time consuming, and different for every BAS system type. What we needed was a universal trending appliance that would work with any/every BAS. None existed at the time, but we learned of sMAP (simple monitoring and actuation profile), which was software developed at UC Berkley by the two founders of Comfy (Stephan-Dawson-Haggerty & Andrew Krioukov) along with Professor Steve Culler. So, in the summer of 2014, we convinced Comfy there was a market need for a trending appliance and they created Trendr (or made it available for commercial use).

"In just one generation - 20 years - the District of Columbia will be the healthiest, greenest, and the most livable city in the United States."

We started installing Trendr boxes (sMAP software running on a small industrial PC) at the edge. The boxes were installed in the building, on the BAS network, and pushed data to a central database in the cloud. We then built a connector to an AFDD/Analtyics tool. Not only did we install Trendr's in D.C. City owned buildings, but we started installing them for other AFDD/Analytics software vendors who needed BAS trend data throughout DC, Philly, & NYC (including the Empire State Building).

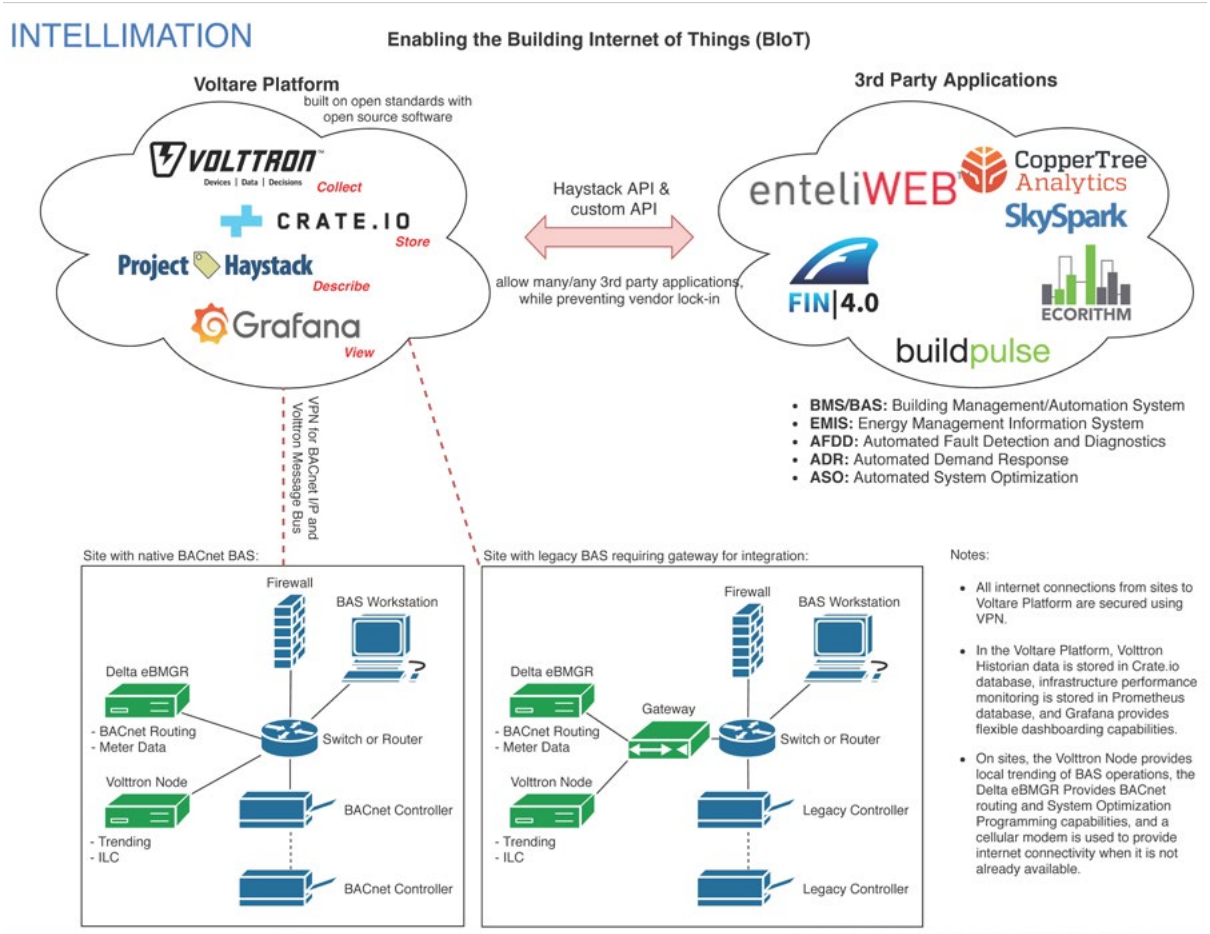
Unfortunately, the Trendr product was short lived. In the middle of 2016 Comfy decided to stop selling Trendr and focus their effort on the Comfy product. Fortunately, we had already been aware of and following development of another software tool called Volttron. Volttron was developed by Pacific Northwest National Laboratory (PNNL) as a building to grid connectivity and application platform.

We met with the PNNL Volttron team in Philadelphia along with Dr. Jin Wen of Drexel University who was using Volttron as the data acquisition layer for her R&D of a novel analytics solution. We went all in on transitioning from Trendr to Volttron as our data acquisition and trending platform. We replaced all our Trendr boxes with Volttron boxes and continue to deploy Volttron in D.C. and now with other clients in Philadelphia, NYC, and throughout the east coast.

Next major hurdle to widespread deployment of AFDD/ Analytic was a metadata tagging standard. In 2015 we reviewed Project Haystack, ASHRAE's developing standard 223P, and the work of David Culler's group at UC Berkeley, the Brick Schema. At the time, I thought, unfortunately, we might be in for another standards war like the Lon vs BACnet war that played out during the 2000's. So, I was very pleased to see the announcement in Feb 2018. "The ASHRAE BACnet committee, Project Haystack and the Brick initiative announced they are actively collaborating to integrate Haystack tagging and Brick data modeling concepts into the new proposed ASHRAE Standard 223P for semantic tagging of building data". The combination of a single semantic tagging standard with a single communication standard BACnet, places BIoT well ahead of IIoT in terms of the adoption curve.

So we incorporated Haystack tagging into our Volttron deployments, along with the Haystack Rest API. Although we currently use Crate.io for storing both the time-series data and the Haystack tags, Volttron supports other databases including InfluxDB, MongoDB, & MySQL. PNNL has also added a tagging agent based on Haystack tags: https://volttron.readthedocs.io/en/develop/specifications/tagging_service.html

We deploy a Volttron instance at the edge (in the building) running on an industrial Intel NUC, and Volttron Central running in AWS that talks to all the edge instances. The edge instance will cache any data if it loses connection with Volttron Central. Besides the BACnet driver, Volttron includes drivers for Modbus, OBIX, DNP3, SEP3, and an OpenADR agent.



The combination of Volttron and Haystack provides a vendor neutral, open source, inexpensive middleware layer that decouples the data acquisition and data modeling from the application layer. This allows 3rd party application developers to focus on their applications without having to worry about data acquisition.

This Volttron/Haystack combination also prevents vendor lock-in and the "lock-em and loot-em" business strategy that our industry has practiced for too long. This is particularly valuable for portfolio owners who can deploy Volttron/Haystack and use any combination of applications, change applications easily, and keep their data acquisition, tagging, and data storage separate from the vendor.

Although most of our present deployments are only acting as a trending device (read present value), Volttron also has an actuator agent that can write to objects. We are currently piloting an Intelligent Load Control (ILC) agent that does active demand management by writing to set-points.

Making data acquisition, tagging/modeling and storage, open, standard, and inexpensive will help accelerate the deployment of **Smart Connected Buildings** and we think the combination of Volttron and Project Haystack will play a large role. Intellimation is not the only firm deploying Volttron. There is a growing ecosystem and we welcome others to join the group.

To learn more about Volttron:
https://volttron.readthedocs.io/en/develop
https://volttron.org
https://projects.eclipse.org/projects/iot.volttron

Terry Herr is the Founder and a Managing Partner of Intellimation, LLC, a Master Systems Integrator focused on the BIoT space. Terry has 30 years of experience in Building Automation, is a licensed Master Electrician and has a BS in Physics.

A Byte's Journey Within A Next Generation Building Automation System

This article describes how the open source "Project SandStar" and the power of Project Haystack are revolutionizing data transport.

Existing Data Journey Within Legacy Building Automation Systems

Project SandStar is an open source effort that integrates three components into a seamless whole:

- SandStar GPIO engine to handle real-time connectivity to I/O for sensors and actuators activated based on Haystack tags
- The open source Sedona control engine to provide real-time programmable control logic
- Haystack to semantically model and configure the control points

Data creation within existing Building Automation Systems starts in that micro controller. Inputs and outputs are defined within a hardcoded method and data passes into direct digital control engine that is proprietary for individual controls companies. From here, byte is generated, and the bytes transfer start with a transport protocol like BACnet. When we talk about a byte, we mean a single value that is generated for any specific point at a given time. Within existing BAS, the data transfer also requires the data conversion from different technologies. Data is transmitted via serial bus communication thus requiring us to convert that data to IP centric communication. This requires human intervention during the conversion process of network technologies. We will explain the benefits of utilizing haystack and how we achieved data transport without human effort.

Let the data transport journey begin with the power of Project Haystack and Project SandStar.

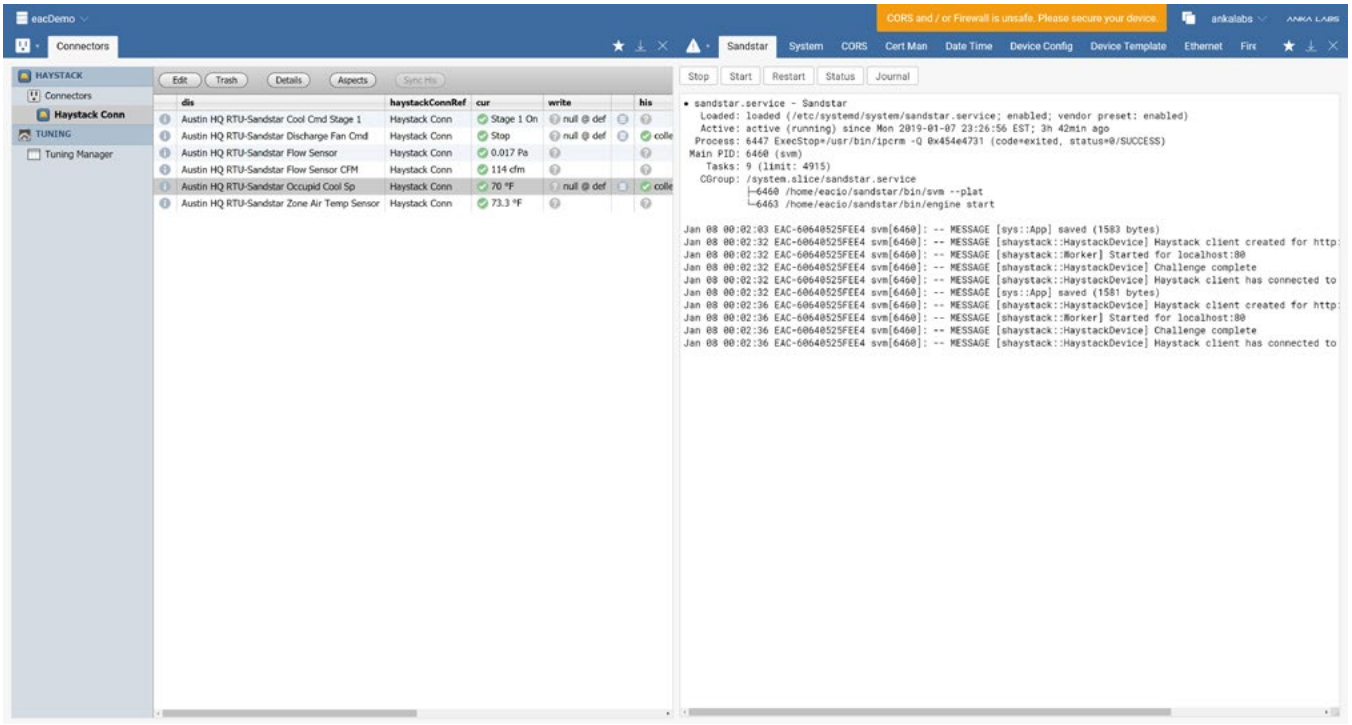
Project SandStar and Haystack Bytes Journey to Analytics and Mobile

Data generation port transport within project haystack is also utilizing haystack tags. Data that is generated within electronics is read via the SandStar engine. Let's call this data "raw" data. Raw data turns into (cook)ed data which we will call "cur" data, which is also part of the Haystack methodology and tags. Actually, we can come up with a good explanation of this strategy. We bring raw food and we turn them into consumable food via applying heat and adding spices. Heat and spices in SandStar terms are called "conversion tags". These tags literally define the meaning of the port and how we will consume that specific data, in a specific method we would like to consume it. For example, we have a tag called thermistor3K to define resistance type but we can choose to consume it as a Fahrenheit or Celsius. The conversion happens with the unit tag that is defined on the specific point. The three-tiered approach to conversions simplifies the data generation right at the edge device utilizing Haystack tags.

Graphcommons 3-tiered connection graph network.

Record editor defines port of the controller.

The Data Journey Begins



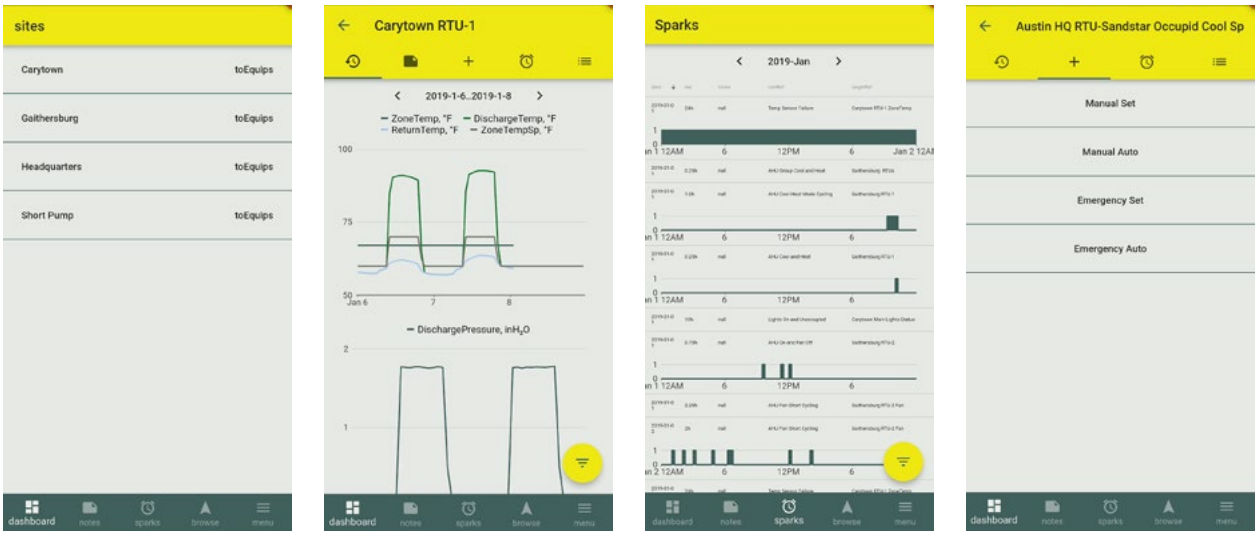
Within SandStar we have Haystack service running and at the embedded device which connects to SkySpark, within the same device. Since the data is already Haystack tagged, clustering enables us to pass the data to the cloud through the arcBeam. Accessing data is also simplified since the data is already fully tagged with meaningful properties, that we are required to only ask questions that are important for control.

Within Project SandStar, we are eliminating the utilization of legacy serial buses. SandStar will always utilize IP-centric networks such as Ethernet, Wi-Fi or THREAD (Project Loom Haystack-based protocols). This eliminates human intervention at every point of the journey of the data generated at the edge.

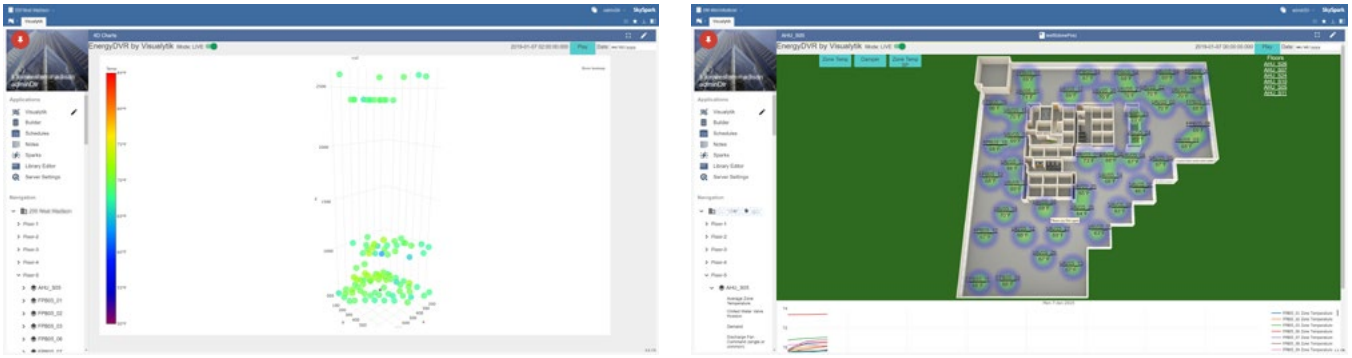
In the next section, we present examples of commercial applications that exploit the integration of SandStar and Haystack that show the potential to provide real-world solutions.

Haystack in Your Hands -> Mobilytik
A Mobile UI Enabled by Haystack Tagging

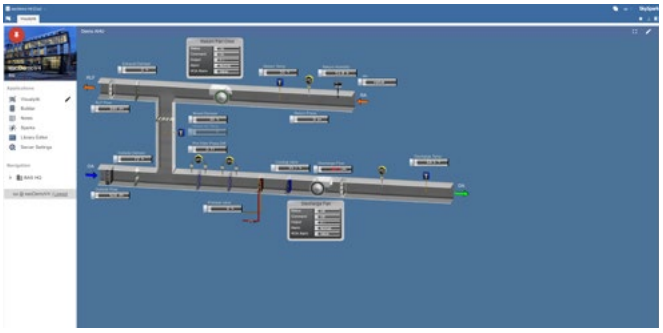
Haystack encapsulated data enables us to generate applications at the edge, in the browser, in the cloud. Since the data during generation is encapsulated with Haystack tags on how we transfer from the edge to fog network, generating a GUI for a mobile application is also simplified. We wrote an application within five months called “Mobilytik”. The idea of the application is to simplify daily processes that facility managers and end-users use for actions that are repetitive. The goal of the application was to provide a location-based, context-sensitive app. Context is currently focused on simple tags which are site and equip.

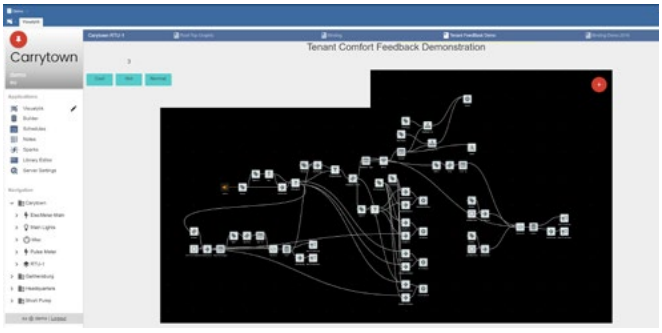


Haystack on Browser and Block Programming-> Visualytik
Enabled by Haystack Tagging



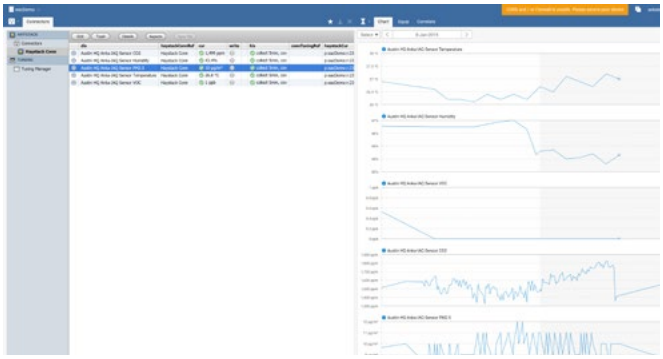
The same device that has visited the mobile app can also visit the browser. The bytes journey within a browser has a different methodology. JavaScript Haystack clients make calls to see the Haystack server in which the Haystack byte gets transferred. The byte changes shape and form based on block programming that runs within the browser. The idea is to generate advanced widgets that can be used multiple times on multiple pages for different goals. This could be a simple gauge to an advanced gauge with different background colors. The idea of the visualization could be a feedback loop from the tenant. Haystack bytes turn into human-to-machine interaction. Haystack bytes can also turn into a 4D map of the whole building within a 3D space with a 4th dimension of color.





The Haystack Byte Journey is Just Beginning

We believe the journey of a Haystack byte from generation to consumption is just beginning. Data generation from a simple Haystack-enabled thermostat or indoor air quality sensors are just the beginning of the transformation of control devices utilizing Haystack.

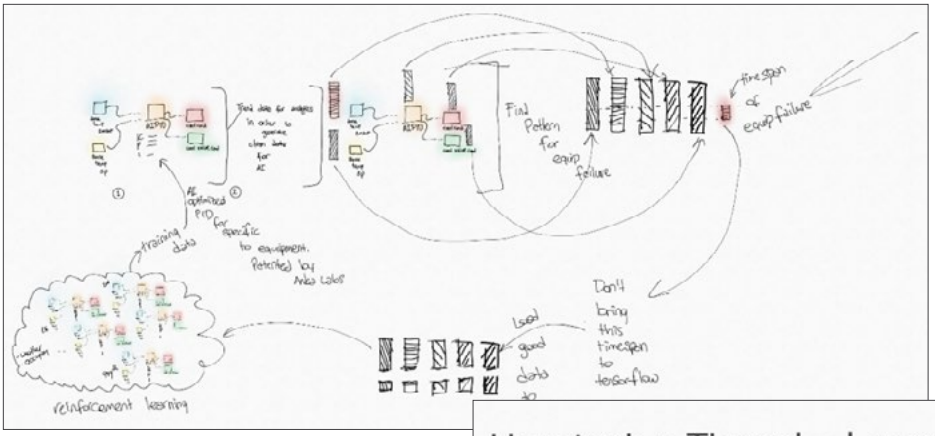


From the Haystack byte consumption side, we will see more use cases in artificial intelligence and blockchain.

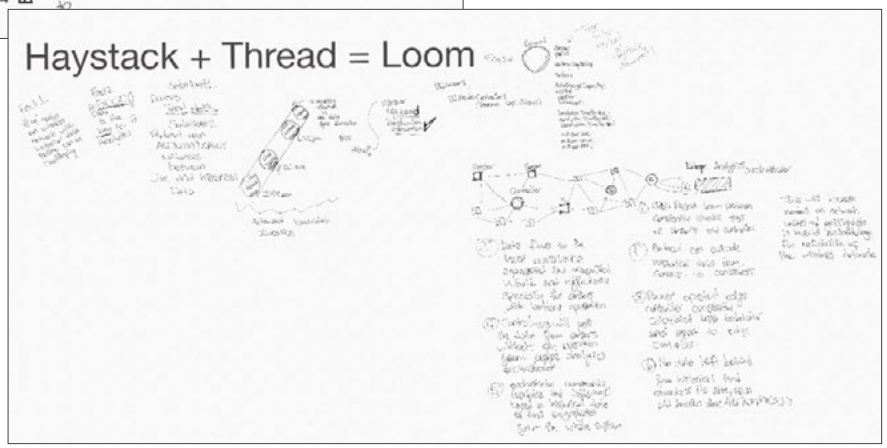
On the transportation of Haystack bytes, look for an automated historian synchronization protocol called Project Loom that will run on Thread Wireless (another open technology).

As you can see, we generated Haystack bytes in many forms, consumed that data in a browser and in mobile devices and applied analytics. Our goal is to expand the journey of a Haystack byte to new platforms while enhancing the transportation methodologies with Haystack technology.

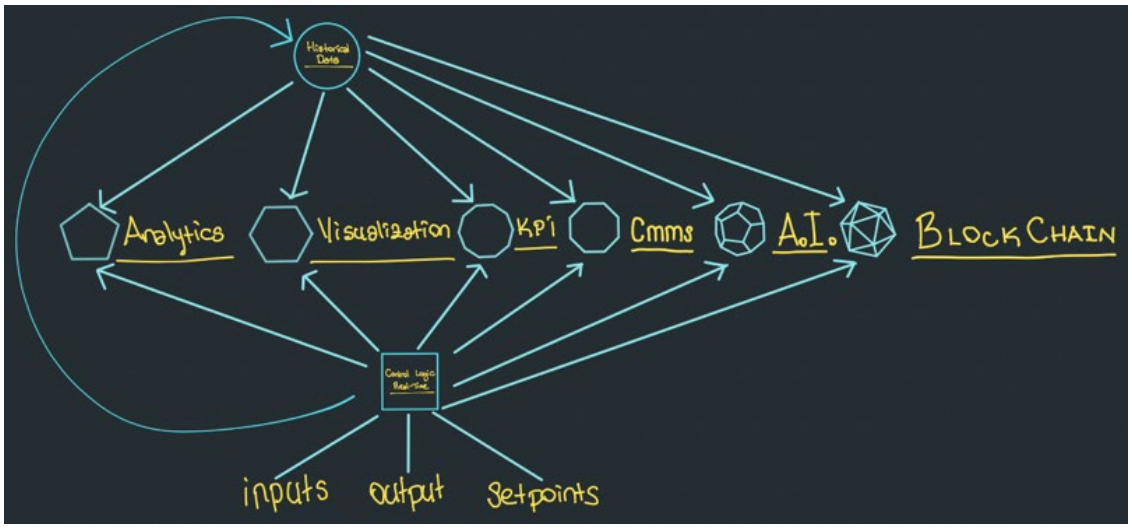
Join our **Project SandStar Working Group** in order to bring the data revolution the BAS industry needs to the next level.



Tensor flow-infused PID loops.



Automated historian sync on Thread Wireless.



All with the power of Haystack.

Alper Üzmezler is a Managing Partner of BAS Services & Graphics, LLC, an innovator in Building Automation Technology and BAS Analytics delivery that reduces implementation and facility management energy costs.

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Haystack Connect is known for the quality of its technical program, which is driven by the Project Haystack community. Presentations focus on the real-world challenges in integrating diverse systems and data and are delivered by individuals leading the effort to streamline data interchange through the use of Project Haystack technology.

The Project Haystack Technical Committee has put out a call for speakers. Share your expertise and submit a proposal today. Tracks, topics and submission guidelines can be found on www.haystackconnect.org/speakers.

Property Manager's View

Interview with Joe Pattenaude

BEDROCK — DETROIT —

Back in November, as holiday decorations and the seasonal ice rink were starting to go up in Detroit's city center, Therese Sullivan, Customer Marketing Leader with Tridium, traveled to the top of one of Woodward Avenue's renovated 19th century buildings to meet Joe Pattenaude, Director of Building Systems at Bedrock, a full service commercial real estate firm specializing in the strategic development of urban cores. Here is the conversation that ensued:

TS: I've heard other **Bedrock** real-estate leaders describe what is happening here, but it is another experience to come to downtown Detroit and see all the new construction and major renovations happening. From the Shinola Hotel [a partnership between Shinola and Bedrock LLC] to all the big office towers going up and the many retailers and restaurants attracting street traffic, it feels so vibrant here. Detroit is not the stereotype of an abandoned, rust-belt city anymore. What is the Bedrock formula?

JP: As always, Detroit is an energetic place with geographic advantages for growing a business. Young educated people that want an affordable urban lifestyle are attracted here. Canada is just over the bridge, so people have an international perspective. And, there is hockey! The cranes everywhere are the most obvious signal of the massive change underway. What you might not see at first glance is that we are creating an experience for everyone that comes to Detroit. Operationally-advanced facilities are the only way you get that feeling of something exciting and new rising up here, something businesses want to be a part of and a place you might want to live.

TS: What do you do to ensure a building infrastructure that supports the 'operationally advanced facilities' that new Detroiters are starting to expect?

JP: We gut the buildings and remake them from the inside out, starting with a top-of-the-line technology infrastructure. Niagara Framework provides the core of that. When a building has a BMS, we don't want to rip and replace. We use Niagara to bring the data streaming from that BMS into the Niagara Framework where it is normalized and accessible for combining with data from other equipment and devices, so that we have a centralized console to spin all this data into the valuable information that we need to better build and manage our properties.

"Operationally-advanced facilities are the only way you get that feeling of something exciting and new rising up here, something businesses want to be a part of and a place you might want to live."

TS: I noticed in the Bedrock Detroit Smart Building Specification that you spell out clearly in the Installing Contractor Scope section (Point #7) "Tag all points as per Haystack Tagging Conventions." Then in the Master Integrator Scope section: "Verify all points have been integrated with all required points and tagged properly." How is all that tagging and verifying working out for you?

JP: Any contractor or integrator that works on a Bedrock project must tag what they are doing. We specify Haystack tagging to get all the naming to conform to one system, to the best extent possible. The biggest thing that tagging is bringing is the ability to bake-in associations. So, we can look at any piece of equipment or device, an individual VAV, for example, and answer the questions 'What systems are serving data to this asset?' and 'To what systems does this asset serve data?'

I measure the value delivered by tagging, and any of our investments into a better interface into building operational data, in terms of the efficiency of my team. This ROI is so much bigger than energy saving metrics. We are a core group of about 17 controls & integration engineers managing the OT networks for the almost 100 properties that Bedrock has across the city. Every hour of a building engineer's time is very valuable. We don't want them struggling with a controls system interface or resorting to printing out time-series logs and trying to interpret them manually. If we can make them more efficient through naming and tagging, that they know is correct from the start, and provide them with a user interface and analytics software that makes the point of the data obvious, we can shave time off their day. We can measure that improvement in terms of reduced operational costs.

TS: Do the financial managers at Bedrock agree that this is a good way to measure ROI?

JP: Yes, they get it for the most part. If I get pushback, it is not about the value of enforcing our Smart Building specification on new construction or a major controls retrofit, rather there might be questions about the need to invest in the integration work to bring the data from all our existing parking garages into our central building data system. Consider last weekend, when we had a time-change from Daylight Savings Time. These events can trigger a lot of calls about scheduling problems with parking garage equipment. Getting garages tagged and integrated is work that will pay for itself in just two such time changes.

TS: You mentioned that your team is overseeing OT networks in buildings. Where do you stand on the question of running operational data over the same IP network as the IT data that runs enterprises?

JP: One of Bedrock's first Detroit properties was One Campus Martius, home to Quicken Loans. Understanding how to optimize an IT network for banking applications is how Quicken catapulted into its current position as the largest retail lender in the US. I don't want my operational data needs to be at the mercy of a network designed for banking. What a nightmare! OT and IT are completely different applications. While every operational asset across all properties will eventually be IP addressable, I need to be able to optimize the network for OT data.

"Any contractor or integrator that works on a Bedrock project must tag what they are doing. We specify Haystack tagging to get all the naming to conform to one system, to the best extent possible."

TS: So to sum this up, where do you think you are on this OT journey?

JP: During 2017 and 2018, my focus was on building a controls and data integration platform that would make my team more efficient in its role of managing our OT networks. My plan for 2019 is to focus on the roll-out of this integration platform and OT data to the facilities teams at each property to make them more efficient. I see on the horizon, in 2020 and beyond, the opportunity to open our OT data to tenants – for example, retailers – to use for better business outcomes for them.

Interview with Jake MacArthur

buildingfit

The newest member of Project Haystack, BuildingFit, has been deploying analytics and advance energy management strategies across millions of square feet of facilities for decades. They are using Haystack semantic tagging and the REST API on a daily basis.

BuildingFit was developed from decades of experience in deploying analytics and advanced energy management strategies across millions of square feet of facilities through their parent organization, ETC Group.

"As anyone in this industry knows, buildings are complicated. There is no platform that works for everyone 'out of the box'. Every client has a specific challenge - and we do love a challenge – so we suddenly found ourselves with deep expertise in a range of analytic tools and practices that had been proven to work for a lot of buildings!" explains Jake MacArthur, Monitoring and Analytics Director at BuildingFit.

"Because we are both energy engineers and programmers, our tools really work. We understand the end-users needs and perspectives because ETC Group still uses BuildingFit, and we understand the system integrator challenges from our work within client organizations. BuildingFit was created to serve other engineering firms, controls contractors, service providers and building managers."

"At BuildingFit, we are focused on applying analytics to data to enable action. There is a lot experience built into the foundation of our products, as well as continuous machine learning. We use a range of data science techniques to efficiently determine which data points are valuable and how to accurately tag them. That's the complicated part," describes Jake.

"We use a range of data science techniques to efficiently determine which data points are valuable and how to accurately tag them. hat's the complicated part."

"This is amazing from the point of view that the quality of the data has increased exponentially. But we didn't just want to make the data better – we also wanted to make it seem easy, or at least easier than ever, for the person working with that data through actionable reporting. We also wanted to make it really easy to communicate to others. The only things that really get

done are those things that are proven problems, making it easy to prioritize them, and those things that can be communicated clearly. We've solved those two things."

BuildingFit is using Haystack semantic tagging and the REST API on a daily basis. "We know that standard tagging and interoperability are key components to creating value out of data," said Jake. "We have joined Project Haystack as Associate Members to further support the mission of standardized data tagging. We can create our own internal standards, but we also believe that the collective community can offer more diverse insight and provide scale to the standard."

" We know that standard tagging and interoperability are key components to creating value out of data. We have joined Project Haystack as Associate Members to further support the mission ."

BuildingFit, like many companies now, doesn't want to spend time hunting down the data, they just want to be able to leverage easily accessible data. And, develop the cool new tools!

Demand for speakers on Haystack and semantic data modeling is up at events around the world and a few community members have risen to the call.

IECON 2018

Project Haystack in Other Vertical Applications

Project Haystack is not limited to building equipment applications. The Haystack methodology can be applied to virtually any type of equipment system or device data. John Petze, Executive Director of Project Haystack, spoke at IECON 2018, the 44th Annual Conference of the IEEE Industrial Electronics Society.

The industrial automation market has a need to make data self-describing and easy to work with across different applications. John's presentation and panel discussion was very well attended.

Memoori Webinar

The Evolution of Data and Analytics in the Built Environment

Project Haystack is proud to have sponsored the 2018 Smart Buildings Series of free monthly Memoori Smart Building Research Webinars. On November 6th, Memoori talked with our own John Petze, Executive Director and Marc Petock, Executive Secretary of the Project Haystack Organization about how unified semantic modeling is helping companies navigate the sea of data now coming out of Commercial Smart Buildings.

What Was Discussed:

- Buildings are now awash in a sea of data! The new problem companies face is how to make sense of all this data!
- How Project Haystack is collaborating with BACnet and the Brick Schema to provide a unified Semantic Data Modeling solution.

More about the 2018 Smart Buildings Series, visit: https://www.memoori.com/tag/webinar.

2019 Events

AHR EXPO 2018

Tuesday, January 15
10:30 am - 11:30 am | B311

Since the ASHRAE announcement of the BACnet/Haystack/Brick Schema collaboration, there is a lot of movement on tagging among manufacturers. There is a mix in the level of tagging support each vendor now has for the Haystack library and the BACnet approach, but, there is no pushback regarding the need to support standardized tagging. They are either already doing it, or it is on their roadmap. They all understand this is where the industry is headed as the industry learns to utilize smart device data to reduce operating costs and create value for building owners and operators.

This session will introduce Project Haystack, the open-source initiative which is recognized as the most developed and deployed solution for "marking up" equipment system data. Examples of the use of data tagging in navigation, control, graphics, analytics, and reporting will be covered. The session will also include an overview of the work of the Project Haystack community to advance Haystack tagging as the "markup language" for device data.

PRESENTED BY: AutomatedBuildings.com.

Tuesday, January 15
1:30 pm - 2:30 pm | B311

We will build on last year's Sixth Annual Connection Community Collaboratory — A Panel of Industry Thought Leaders Deliver a Successful Session Moderator Ken Sinclair, Automated Buildings, was joined by a panel of veteran industry experts: Marc Petock, Trevor Palmer, Troy Davis, George Thomas, and John Petze at the Sixth Annual Connection Community Collaboratory held at the AHR 2018 in Chicago. The session was very well-attended by a mixed audience of Manufacturers, Building Owners, Engineers, System Integrators, and HVAC Contractors — and began with each panel member giving an overview of their perspectives on a range of current industry topics such as IoT, Edge Devices, Edge Processing, and the impact of IoT micro-controllers — advancing into several highly interactive discussions. Ken Sinclair summed up the success of the collaboratory best saying, "In the past, our sessions have primarily focused on software, analytics, and protocols. For the first time ever, hardware started to enter into the conversation with the likes of Raspberry Pi's, Beagle boards, Amazon Echos, and Hey Google's; a very interesting transition, which led to some extremely interesting discussions."

Topics: Best Practices/Application Optimization, Building Automation & Control, Building Design, Facility/Building Management, Trends
PRESENTED BY: AutomatedBuildings.com.

Haystack Connect 2019

Haystack Connect 2019 is organized and produced by the Project Haystack Organization - an open source community of people and companies who share the vision that a connected, collaborative community can move the industry forward in ways that no single supplier can! The Project Haystack Organization is a 501(c) nonprofit trade association supported by its member companies, other organizations and individuals. The event builds on the inspiration and mission of the community to address the challenges of making smart device data work seamlessly across applications of all types.

The building automation, energy efficiency, and IoT markets have a variety of events. Some are under the control of a single manufacturer. Some are large conferences where the needs of systems integrators, technology vendors and their customers are lost in a sea of unrelated products and content that are not relevant. Haystack Connect directly serves the needs of the community that is on the leading edge of applying smart data, smart devices, smart equipment and smart building technologies to create a more efficient and sustainable world.

BECOME A SPONSOR

BECOME A SPEAKER

THE VENUE

Paradise Point Resort & Spa
1404 Vacation Road San Diego, CA 92109
Reservations: BOOK NOW
Website: www.haystackconnect.org

WG Working Group Updates

Tagging initiatives are made official by launching a Working Group with a defined proposal and good visibility. Join a WG now!

#551

Haystack Kind Reference

Champion:
Brian Frank,
SkyFoundry

Haystack Working Group 551 has been busy for the last year and expanded its scope to include collaboration with BACnet AP-WG and Brick Schema.

The goal of WG 551 is to develop a new meta-model to define Haystack tags. Enhancing the meta-model used to define tags allows more precise semantics in our data models and ontologies. Capturing these definitions and data models in a new machine-readable format is a key enabler for improved Haystack documentation and tooling. WG 551 has generated several prototypes to redefine the meta-model for tag definitions. The new model includes enhancements to relationships and the query language. We are also developing a standardized export format for RDF to use for linked data. The goal is to have a complete proposal written up to be presented at Haystack Connect 2019 in San Diego in May.

#626

RESET Standard and Air Quality Tags

Champion:
Cory Mosiman,
WSP USA

The goal of Working Group 626 is to standardize the tagging convention for RESET Indoor Air Quality monitors. RESET is a sensor-based and performance-driven building standard and certification program for Indoor Air Quality. Achieving RESET certification goes beyond simply installing the monitors, and requires:

1. Monitor needs to be certified (basically, ensuring quality of sensor and the data points it must capture)
2. Projects must use a RESET Air Accredited Data Provider (QLEAR, not sure if others…)
3. Occupants must be able to see hourly indoor air quality data
4. Live data display in public spaces
5. Accessible live data

We are only attempting to tackle Item 1 of the above list. As such, the purpose of our working group is to simply stub out the required tags to:

1. Identify sensors that are RESET certified: potentially use the 'marker' tag: airQuality
2. Identify how to best model these multi-sensors – are they a standalone equip?
3. Identify the grade of the sensor: ["A", "B", "C"]
4. Identify tags and unit types to associate. So far, we have:

```
{
// Particulate Matter 2.5. This is an atmospheric pollutant of fine particles with
// an aerodynamic diameter of 2.5 micrometers or less
def pm25 : Marker
 pointUnits: ["µg/m³", "ppb"]

// Particulate Matter 10. This is an atmospheric pollutant of fine particles with
// an aerodynamic diameter of 10 micrometers or less
def pm10 : Marker
pointUnits: ["µg/m³", "ppb"]

// Carbon dioxide level
def co2 : Marker
pointUnits: ["ppm"]

// Total volatile organic compound (TVOC). This is a general term applied to the
// overall total volatile organic compouns (VOCs) detected. TVOC detection is
// used to simplify reporting when VOCs are present.
def tvoc : Marker
pointUnits: ["µg/m³", "ppb"]
}
```

Tools for Developers & Integrators

Active-Framework: Tagging Done Faster

BTIB

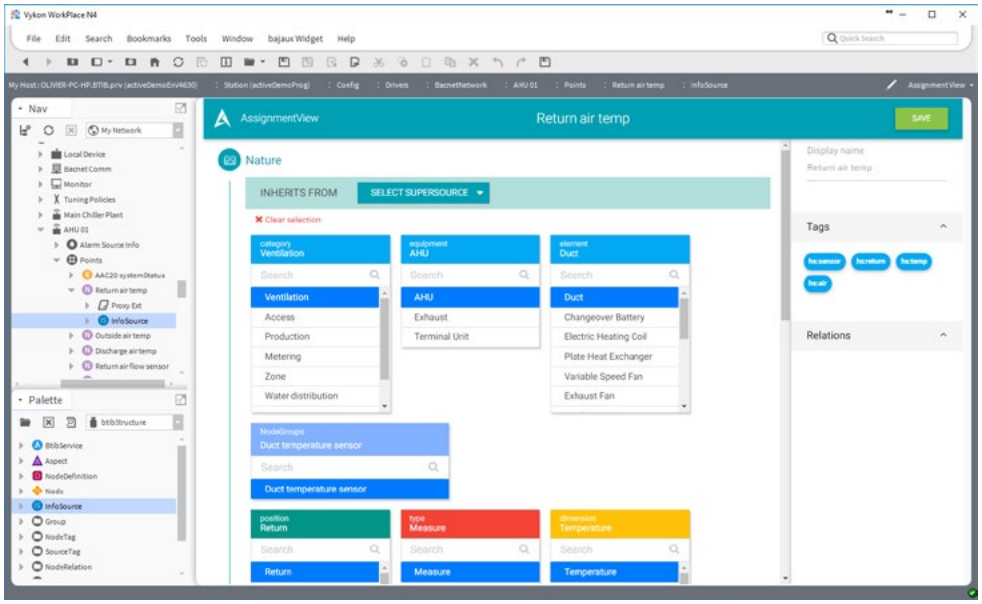
Applying the right combination of Haystack tags is easier now for the Niagara community. BTIB's Active-Framework is a decision tree that helps System Integrators.

For example, you just have to select Duct Temperature Sensor to get HVAC, temperature, sensor and air tags. It feels intuitive as you look for it through Ventilation -> AHU -> Duct and get only sensors known to be in a duct of an AHU. BTIB has also built tools to tag elements massively: Excel sheets, batch tools or rules that can be applied to existing data depending on the context.

Tagging is not just for Analytics. Thanks to BTIB engine, it can set up the entire supervision automatically, based on the semantic. For example, describing a point as a Temperature will add some features like logs or alarms automatically. Then, describing this temperature as being part of an AHU would add the right widget into the corresponding AHU synoptic. The more the system is tagged, the more operations are done automatically inside the Niagara Framework.

It is a big incentive to engage more System Integrators to use Haystack at the commissioning step because they don't lose time anymore but even save quite a lot. Preparing a Building Automation System for Analytics is the first stage to get ready for the future, and it can be done now almost for free as we mutualize tagging.

For more information, visit **www.btib.fr**



Olivier Poumeyrol leads BTIB's development team, providing productivity tools to System Integrators to decrease engineering time and human error.

Streamlining the Interchange of Data from BACnet Devices

LYNXSPRING

Streamlining the interchange of data from BACnet devices and building systems, Lynxspring's Onyxx® BH311 BACnet to Haystack Data Pump provides network communication and data exchange. Acting as a BACnet client device, the Onyxx Data Pump manages all BACnet/BACnet/IP/Ethernet or BACnet MS/TP devices connected to it and enables BACnet to Haystack protocol translation and BACnet points to be translated to manageable Haystack points.

Lynxspring's Onyxx BACnet to Haystack Data Pump makes it possible to access data at every level of the architecture and serve it up to the Cloud.

Features

- Easy Set-Up, Programming, Configuration and Installation
- 10/100 Mbps Ethernet port with auto-negotiation
- BACnet to Haystack network communication and data exchange
- Handles the protocol translation, translating BACnet points to manageable Haystack points
- Manages all BACnet/IP/BACnet/Ethernet and BACnet MS/TP devices connected to it
- Compatible with all Haystack servers
- Direct connect with a standard browser
- 3GB of data storage onboard
- Pushes data and protects integrity
- Local data storage—capacity 30 days

To learn more, visit: **www.lynxspring.com**

Marc Petock is Executive Secretary on the Board of Project Haystack and Chief Marketing & Communications Officer at Lynxspring, Inc. Lynxspring is a Founding Member of Project Haystack and leading developer and manufacturer of smart building technologies and solutions.

Tools and Techniques for Tagging (and Beyond)

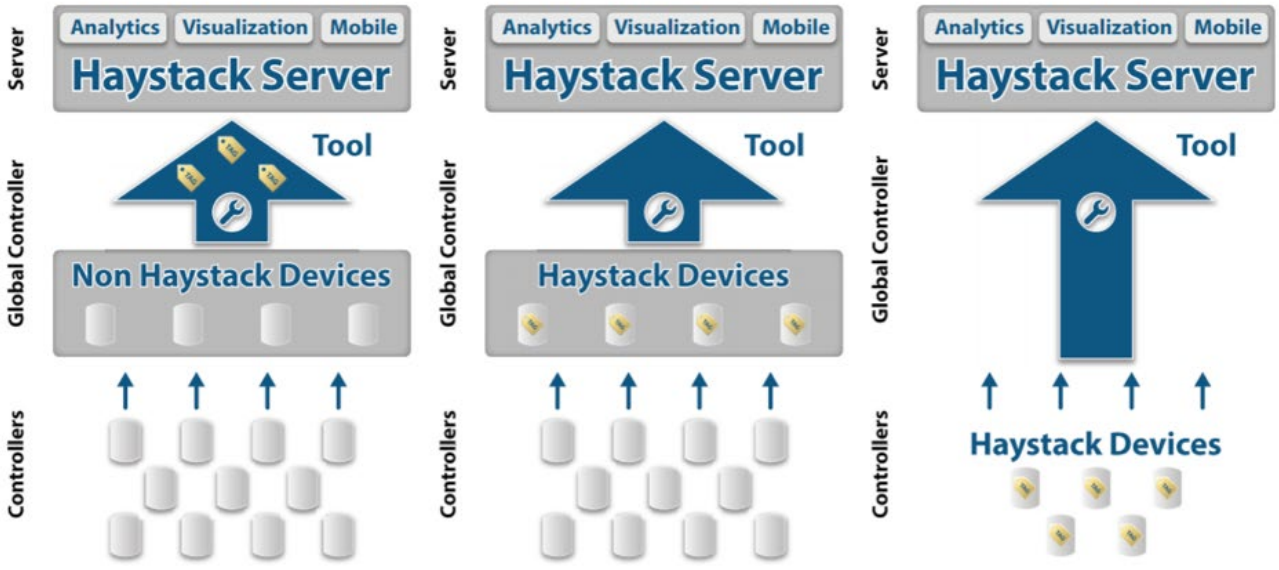
J2INNOVATIONS
A Siemens Company

When talking to clients, engineers, and owners about the powerful benefits of tagging and data modeling, the question ultimately comes up "So how do I get tagged data into my system and isn't a lot of work?" A fair question and concern, particularly coming from the perspective of traditional software tools and techniques that historically are very labor intensive, and the perception that additional configuration/engineering is required. I'll address this topic first conceptually by describing the options and approaches to add metadata to a project; then I will get more specific with an example of a toolset and workflows that are leveraged in a typical FIN framework-based project.

Where Do Tags Live?

First, the basics. In order to gain the full benefits from a tagged, the foundational concept is that data from the connected world must be "self-describing" in order for software applications to "just work." Simply put, the database needs to contain the tags and conform to standard data models as described in the open source initiative, Project Haystack.

Let's look at where tags can exist in some typical architectures and use cases:



Tags applied in server level application

Tags exist in network controllers

Tags exist in end devices

Much of the connectable world already exists as legacy systems comprised of global and device level controllers, therefore tags need to be applied at the server level. This can happen using a variety of tools and techniques (which I'll detail a bit latter), generally during the database creation phase of a project.

As more manufactures come to market with their devices modeled and data already documented with Haystack tags, the ability to programmatically add devices and associated points becomes fundamentally simpler for tools to accomplish. Typically, at the global or network controller, libraries and templates can be used to dramatically reduce labor needed to build databases for applications to utilize.

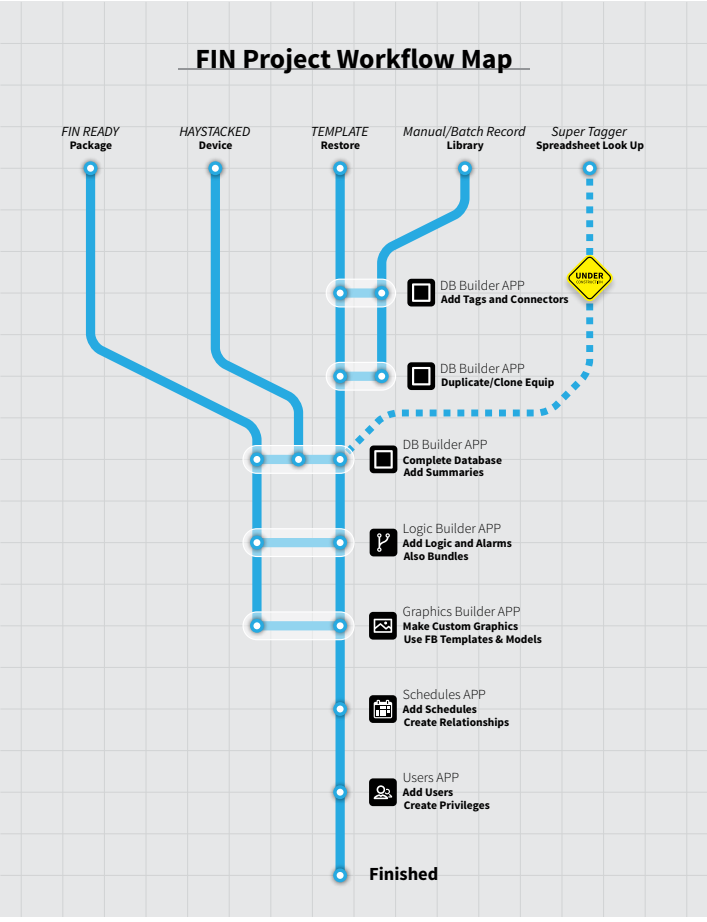
Taking it one step further, when more and more products come from manufacturers that natively speak the Haystack protocol at the end device level, we will achieve the holy grail of interoperable and self-describing smart devices! The labor needed to implement solutions becomes nearly zero since the tags exist in the devices, and the data can be simply queried from the applications that need it.

Tools and Workflows for Tagging

Let's look now at details of the tools and workflow ramifications of these various architectures. The good news is that there are a lot of options and techniques available to take care of the task of getting a tagged and modeled database. Because of the different architectures and variety of projects, there are multiple tools that can be used along the path to a completed project.

The most common approach when faced with large project of legacy data is what I call the "Super Tagger". This is a collection of tools and techniques I've seen used, ranging from Excel macros to powerful AI scripts. This approach looks at existing point data (typically point names), and tries to work out meaning and relationships. Often the integrator uses an iterative process to look for commonality and repetitive point types, in order to batch edit the tags and refine the database.

The next two approaches are very similar in that they can programmatically add tags to the database, dramatically speeding up the process. "Templates and Libraries" take advantage of a well-defined and consistent model



As you can see from the map, these are the various options for database creation and the steps needed to create a typical BAS/IoT solution.

at either the point or device level. For example, if data points have been consistently named by a manufacturer of controllers, then a library can quickly be created to add tags based on discovering those points. Even better, if standard applications can be identified, then templates for entire pieces of equipment can be modeled and imported with their tags! Then with power tools such as cloning, duplicate collections of points can be created for each instance of typical equipment.

Finally, when a device is native Haystack (meaning the tags already exist in the device), this "Haystacked" device requires no tools since with a simple query using the Haystack protocol, makes the device data instantly available! Imagine a world of "Haystacked" devices and servers that seamlessly share device data with applications with no extra work required!

Taking it to Another Level

One final thought, we could take the use of tools and templating beyond creating the database, to include other aspects of a typical BAS/IoT solution. By using Open Frameworks [link to Chris's article], we can both leverage the power of tagging and application specific tools to even further automate the process. Manufacturers now have the ability to deliver "FIN ready" devices that will dynamically: get modeled in the database, create supervisory control logic, provide alarm routines, start collecting historical data, and generate their own graphical user experiences!

More information is available at **www.j2inn.com**

B. Scott Muench is V.P. of Marketing at J2 Innovations, a Founding Member of Project Haystack. J2 brings powerful engineering tools, visualization and software technology to those involved in BAS installations.

Automating Haystack Tagging

ONBOARD

By offering a subscription-based service for automating data standardization to Haystack, Onboard Data is helping facilities teams and software providers eliminate the laborious task of manual Haystack Tagging. By minimizing the time and pain of deploying smart building analytics, will drive greater adoption and realization of the benefits.

Onboard leverages pre-existing point names, interval data and its data library, combined with its machine learning approach, to normalize raw building data and generate consumable tags for Skyspark® Analytics. Our team also works with clients to support custom tags as needed, while also ensuring version control and alignment with the evolving Haystack/BRICK/ASHRAE 223P standards.

Skyfoundry supports our effort to create automation tools for users in order to streamline data classification for consumption by Skyspark. Users are always looking to reduce the effort required for this time-consuming tagging process. This manual process has been a bottleneck on the market for building analytics. Now, less time spent on managing data means more time guiding clients to execute on prescribed energy saving measures. Smart projects get off the ground and opportunities to impress clients are missed without trusted data!

More information is available at **www.onboarddata.io**

Ryan Holy is the CEO and Co-founder of Onboard Data. The Onboard team members have more than fifteen years of experience in the smart building analytics and energy industries. Onboard was founded in 2018 and is based in Cambridge, Massachusetts.

nHaystack Upgraded. Beta Testers Wanted.

TRIDIUM

An upgraded version of nHaystack has just been completed by Tridium's engineering team under the direction of Richard McElhinney, Manager of the nHaystack Project, Project Haystack Board Member, and Chief Software Architect of Project Haystack Founding Member ConserveIT.

nHaystack is an open-source Niagara 4 module that enables Niagara stations 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 meta data (tags) to describe the meaning of the data.

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

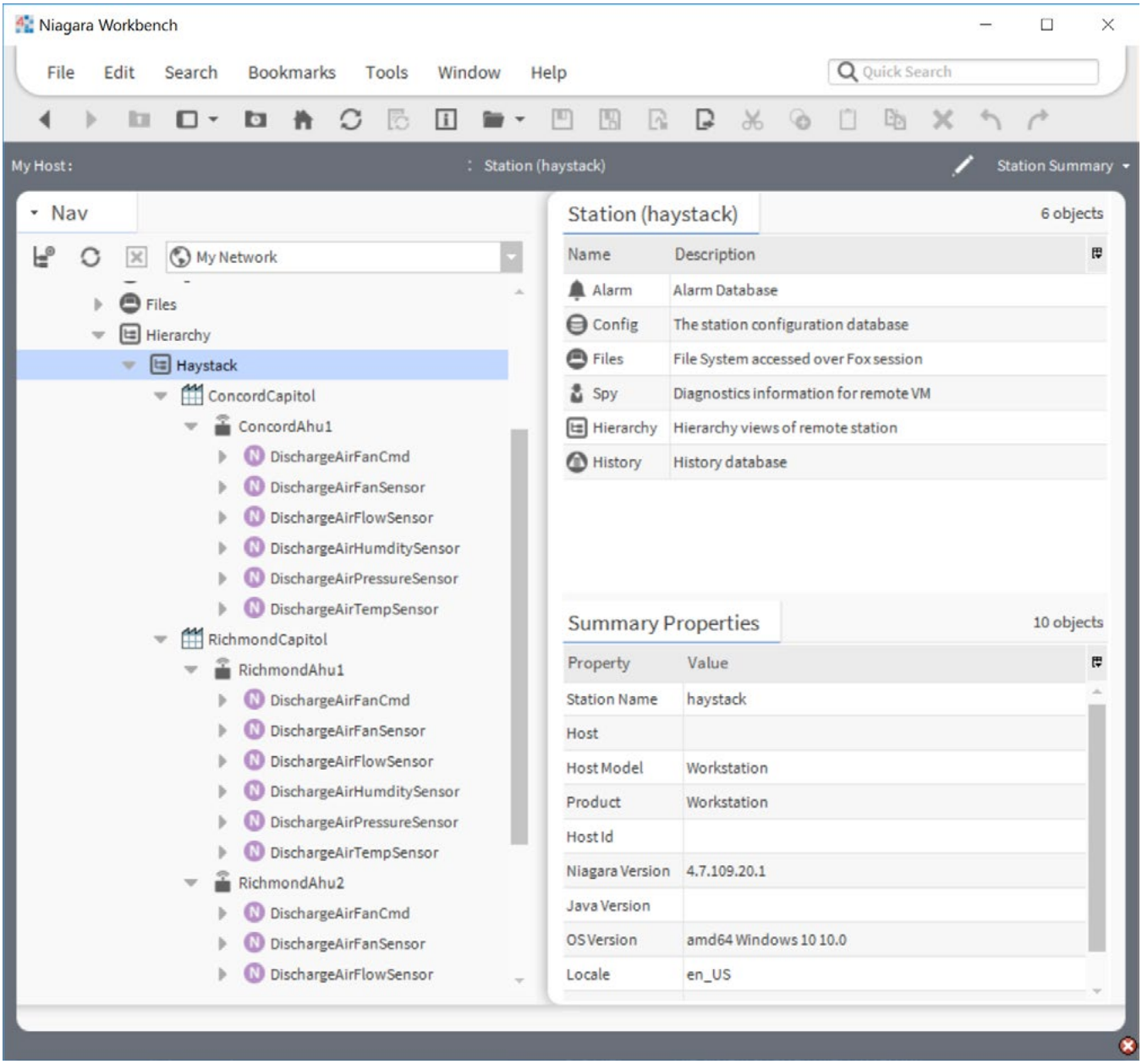
nHaystack-as-a-server also streamlines the process of adding user-specified Haystack tags to Niagara systems, by providing a GUI tool that allows users to add the tags directly to Niagara components. Once tags have been defined, the data associated with the Niagara components, including the tags, are available over the REST communications interface. This combination of the tagging tool and the Haystack protocol "engine" reduces the effort involved in connecting Niagara data to external software applications.

This new upgraded version of nHaystack will be a great time-saver for system integrators that have made an investment in Haystack tagging and also want to use the new Niagara 4 tagging features, including Search, Hierarchies and System Database. With nHaystack, there is no need to manually create Niagara Haystack tags for data previously contained in the Haystack slots.

"This new upgraded version of nHaystack will be a great time-saver for system integrators that have made an investment in Haystack tagging."

Those tags will be delivered over the Haystack protocol automatically. Tags can be added and edited with Niagara facilities or with the familiar nHaystack GUI tool.

Haystack Hierarchy

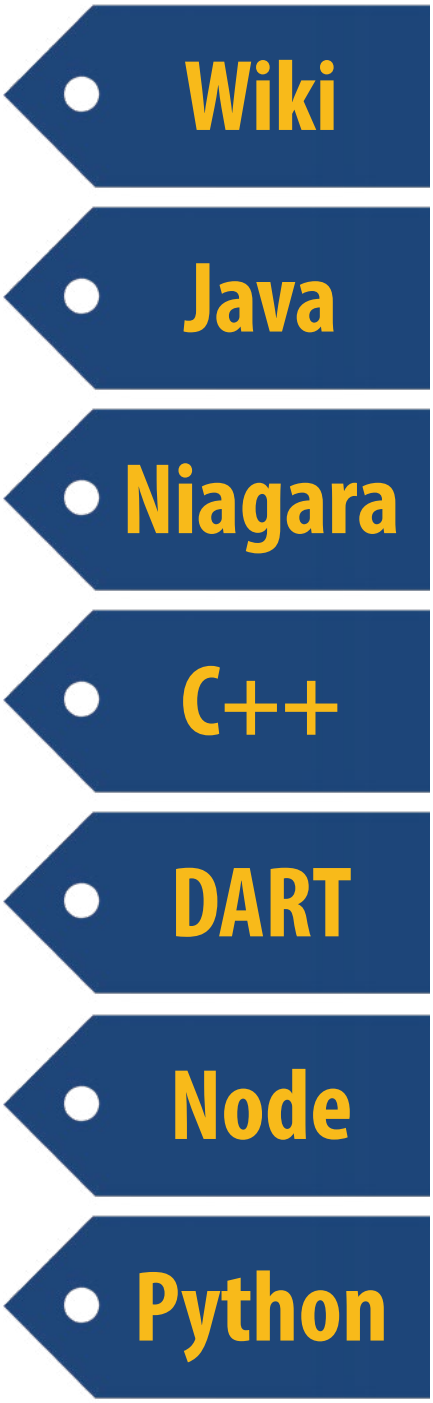


Learn more about nHaystack and find official builds at **https://stackhub.org/package/nHaystack**.

This nHaystack upgrade supports and accelerates effective data tagging toward the goal of semantic data interoperability of all devices in a smart system. For nHaystack, next steps include beta testing of this version. Anyone interested in participating in the beta program can contact Richard McElhinney.

Eric Anderson, a Software Engineer, has been working on tagging and tag hierarchies since he joined Tridium in 2015. Tridium created and continues to enhance the Niagara Framework®, an open platform that facilitates system integration and control.

The Project Haystack community develops and freely offers a range of reference implementations to enable product manufacturers and application developers to quickly implement Haystack tagging and communications in their products.



Haystack Wiki: Source for docs, and tag definitions

Haystack Java Toolkit: Light weight J2ME compliant client and server implementation

nHaystack: New Updated Niagara module to add Haystack tagging and Niagara REST API for AX and N4

Haystack CPP: C++ Haystack client and server implementation

Haystack DART: Client library for Dart programming language

Node Haystack: node.js client/server implementation

pyHaystack: Python client implementation

Check out these documents and audio resources to quickly come up to speed on Project Haystack tagging benefits and the methodology.

Download Detailed Reference Implementation Document. "Implementing Project Haystack: Applying Haystack Tagging for a Sample Building."

Download Harbor Research whitepaper with technical overview. Defines the concept of tags, breaking down and explaining the essential data elements.

Listen Audio Stream of "Making Internet of Things Device Data Just Work!" a Memoori webinar featuring John Petze and Marc Petock on Project Haystack.

Open REST API Description. Explains simple mechanism to exchange tagged data over web services

Download Haystack Guide Specification. Now available in English, **French and Chinese.**

Download CABA whitepaper that outlines how to use Haystack tagging in applications related to buildings, energy, and facility management.

Want to get involved in the Project Haystack open-source community? There are a number of ways and levels of involvement.

Contribute your expertise: Participate in the Project Haystack open **forum discussions**.

Join a Working Group: Project Haystack has members working together on developing tag sets and resolving other challenges related to particular topics. See the list of active Working Groups that you could join today **here**.

Become a Member: Project Haystack Corporate Associate Memberhip has many advantages. Email us to learn more at **projecthaystackinfo@gmail.com**.

BE A SPONSOR

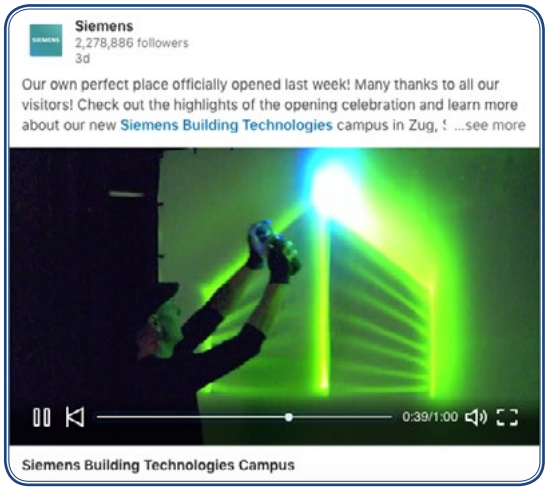
Social Media Curation

Here is some of the information shared by the Haystack members on Twitter and LinkedIn. Follow their tweets and shares to learn about Haystack-enabled new projects, products and practices.

Projects

Intel bringing data analytics and visualization to smart factories.

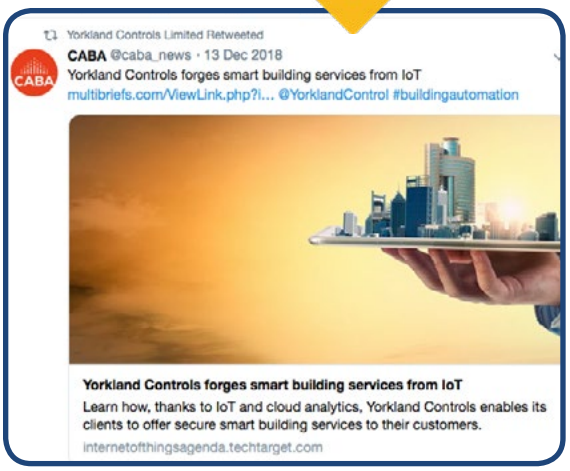
Arup project for Rutgers University secures LEED Silver Certification.



Siemens opens new SIEMENS BUILDING TECHNOLOGIES campus.

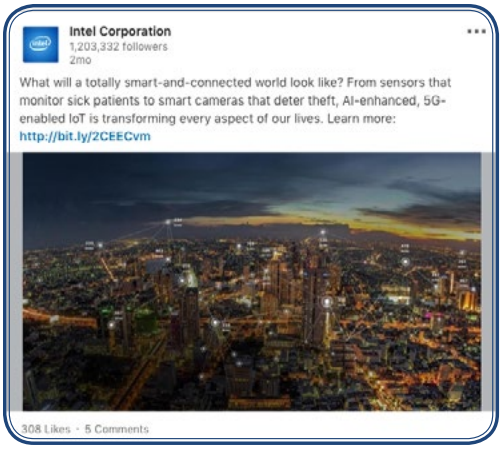
Lynxspring and FSG Energy completed a BAS & EMS System.

Practices

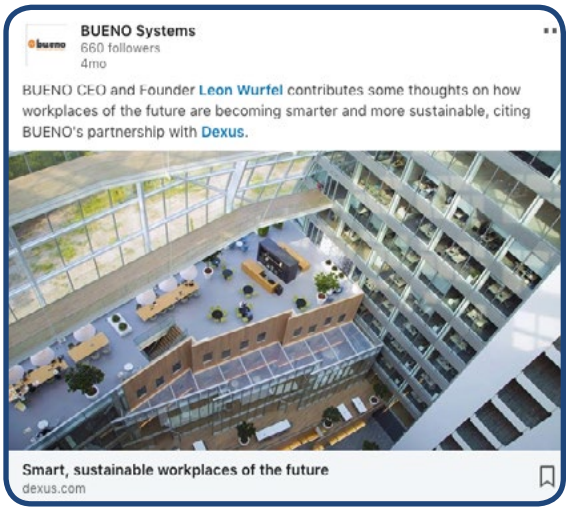


How workplaces of the future are becoming smarter and more sustainable.

Is IoT really underpinning the Intelligent Built Environment? Read it in Forbes.



What a totally smart-connected world might look like thanks to 5G.



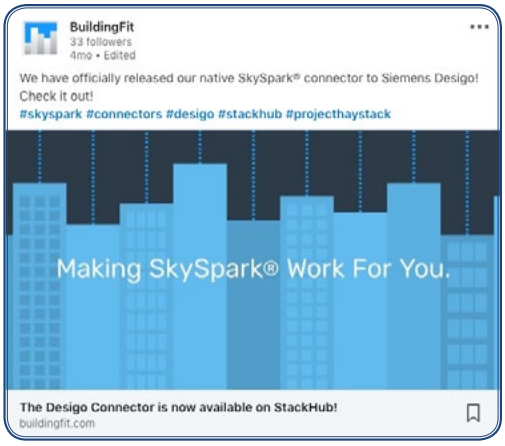
How workplaces of the future are becoming smarter and more sustainable.

Your Building is Talking. Are You Listening?

Products

Highlighting FIN framework in Siemens Desigo Control Point.

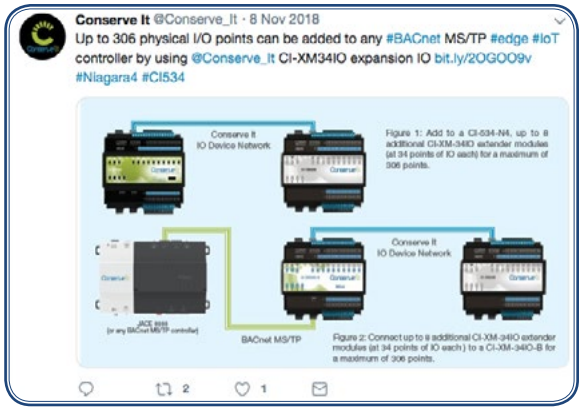
Intellastar's latest IoT technology, Tipify, for Smart Buildings and Smart Grids.



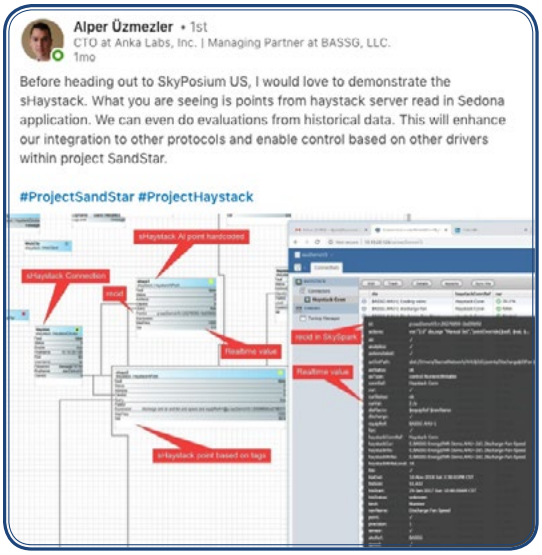
New Project Haystack member BuildingFit releases native SkySpark connector to Siemens Desigo.

Kodaro's Dell Gateways and Niagara 4 Port compatible with latest version of Niagara.

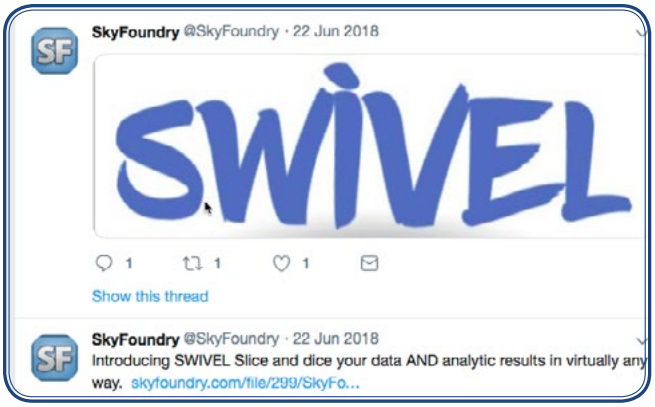
KMC Conquest line of powerful edge devices.



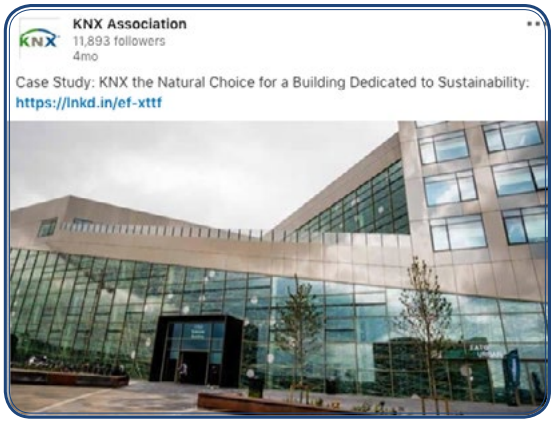
Conserve It Controller adds up to 306 I/O points for BACnet MS/TP.



Demonstration of sHaystack.



Slice and dice your data and analytics results using SkyFoundry's new SWIVEL tool.



Case Study from Project Haystack member KNX Association.

Ad Directory

Project Haystack connections

Become an Advertiser

The Haystack Connections Magazine advertising program is a cost-effective way for companies that provide complementary products and services to reach the growing and dynamic Project Haystack Community. This community is at the very forefront of intelligent buildings and the IoT. Haystack Connections is a premier advertising vehicle to reach this prime audience. With 8,000+ known readers, it is an incredibly cost-effective advertising opportunity. For rate info, email robin@haystackconnect.org.

Members

Founding Members

Conserve It was founded in 2007 with a focus on centrifugal chiller efficiency systems. Over time it has diversified into complete HVAC&R plant management including monitoring, reporting and controls, energy performance contracting, energy management consulting and distribution of industrial and building automtion products and sensors from leading international suppliers worldwide. Conserve It provides a range of unique products and services in this area.

Intel has been leading the pursuit of Moore's Law for its entire existence. We have continuously advanced silicon technology and moved the capabilities of the industry forward. Today, the unmatched scope and scale of our investments in R&D and manufacturing ensure Intel continues to maintain industry leadership and drive innovation to provide our customers and consumers with leading-edge products in high volume.

J2 Innovations brings powerful engineering tools, visualization and software technology to those involved in BAS installations. J2 is the developer of FIN Stack, a software technology that combines the core functionality of a Building Automation System (BAS) for connecting and controlling devices with the added benefits of a Building Operating System (BOS) to manage and leverage data. The technology uses Project Haystack tagging and data modeling to provide unprecedented capabilities and functionally.

As a leader in electrical and digital infrastructure solutions for all types of buildings, Legrand helps enhance everyday life for its customers. Legrand's Eliot program (Electricity and IoT) is speeding the deployment of Legrand's connected devices and accelerating the evolution of connected buildings. Eliot is powering development of new Legrand products for the benefit of private and professional users alike.

Lynxspring is changing the way devices, systems and people communicate and collaborate across enterprises and out to the edge. Its technologies, solutions and services are enabling users to go further to manage and operate their facilities and equipment smarter, safer, securely, more efficiently, and at peak performance levels. It is remaking the way control systems are built, secured and distributed with brands like JENEsys®, JENEsys® Edge™ and Onyxx® brands.

Siemens Building Technologies consists of three Business Units: building automation (BAU): control products and systems (CPS); fire safety and security (FSS). These business units combine offerings for building security, life safety and building automation within one company as a service and system provider, and as a manufacturer of respective products. By virtue of the unique combination of these business sectors, the company occupies a leading position worldwide.

SkyFoundry's mission is to provide software solutions for the age of the "Internet of Things". Areas of focus include building automation and facility management, energy management, utility data analytics, remote device and equipment monitoring, and asset management. SkyFoundry products help customers derive value from their investments in smart systems.

Associate Members

Accu-Temp Systems is committed to delivering safe, comfortable environments for its customers. It leverages tools like secure mobile devices, cloud computing and advanced analytics. It offers systems integration services that help building owners protect their investment in existing direct digital controls, extending their useful lifetime while enjoying next-generation access and control.

Altura Associates is a professional services firm that goes beyond the traditional consulting model. Our team works closely with our client organizations to develop programs that offer immediate and lasting impacts, build capacity, and drive long-term value. The team combines expertise in mechanical/electrical engineering, energy management, environmental science, and financial analysis.

BASSG is an innovator in building automation technology and BAS analytics delivery. Its BASSG branded in-house developed easy-to-deploy, multi-system software tools reduce BAS implementation and facility management energy costs. BASSG also has multiple distributorships and can be a one-stop provider for everything-BAS at unbeatable value.

BUENO is the Australian leader in data and information driven operational property services. BUENO delivers superior data related and technology driven services based on fault detection, optimization and business intelligence that simplify their clients operations and enhance their effectiveness across all building sectors and building information systems.

BuildingFit creates unique solutions for clients to ensure a proper fit between SkySpark® and their team. We do this through site construction, analytics, custom programming, SkySpark® Apps, reports, training, SkySpark® Licensing. BuildingFit is a SkyFoundry endorsed SkySpark Essentials provider.

The Continental Automated Buildings Association is an international not-for-profit industry association dedicated to the advancement of integrated technologies for homes and buildings. The organization supported by an international membership of over 300 organizations involved in the design, manufacture, installation and retailing of products relating to home and building automation.

EMA is a new and innovative association that is dedicated to advancing the quality of energy management products and services for the benefit of the building owner. The founding members are certified Energy Management Professionals (EMP), a program that was developed by ACG, the world's leading association of certified commissioning authorities. Management of the program has been transferred to EMA.

Intellastar Technology is at the Intersection of Smart Buildings and Smart Grid. The InferStack Software Platform is deployed in Servers and T-Star Field Devices, communicates over Intellastar Connect Cellular Data Service, to provide a complete technology to deliver Smart Buildings and Smart Grid solutions.InferStack connects to the in-building systems to provide Energy Monitoring and Analysis, Analytics for Fault Detection and Diagnostic, Control for Plant Optimization--all features to make a smart building and reduce energy consumption and waste.

Intelligent Buildings, LLC, a nationally recognized smart real estate advisory services company, provides planning and implementation of next generation strategy for new buildings, existing portfolios and smart communities. Their work includes "The Smartest Building in America", the largest energy analytics project in North America, the smart buildings standards for the U.S. and Canadian governments, conception and management of a Clinton Global Initiative and the recently released Intelligent Buildings CyberSafe service.

Associate Members

IoT Warez develops custom software that helps technologies communicate together.From state of the art data centers to environmentally conscious facilities, our software development team is capable of building solutions that connect anything and everything. IoT Warez offers a suite of hosted software options that provide customized solutions. Our platform-as-a-service connects multiple brands of software into one platform that can be remotely managed from a smart device.

KMC Control is an American manufacturer of open, secure, and scalable building automation solutions. From secure hardware devices to smart and connected software, KMC delivers embedded intelligence and optimized control.. It is committed to providing industry-leading Internet of Things-enabled automation solutions with leading tech suppliers to increase comfort, convenience and to help reduce energy usage.

KNX Association represents KNX technology now used in applications for lighting and blind control, security systems, HVAC, monitoring, alarming, water control, energy management, smart metering as well as household appliances, audio/video and more. KNX provides a single, manufacturer-independent design and commissioning tool (ETS), with a complete set of supported communication media and configuration modes. It is approved as a European and an International standard.

Kodaro expands building system connectivity through dynamic software developed for the Internet of Things. It helps contractors, controls companies and end-users find value in building data gathered from the edge to the cloud. It develops software to create more connectivity between systems, giving increased access to better data, not bigger data. Kodaro's goal is to provide actionable analytic information, developed from real-world expertise with all building systems.

SensorFact is a cloud-based data acquisition and storage service for sensor data. It allows for sending sensor data from one location, through their pointCollex technology or directly to their pointCollex API, to a client account in sensorFact. Once there, clients can name, organize, tag, monitor, and choose which sensors data to store long-term. In addition, sensor data is available to share or integrate with other systems.

Tridium is a world leader in business application frameworks—advancing truly open environments that harness the power of the Internet of Things. Our innovations have fundamentally changed the way people connect and control devices and systems. Our products allow people and machines to communicate and collaborate like never before. They empower manufacturers to develop intelligent equipment systems and smart devices for enterprise and edge assets.

VRT has been pioneering the provision and support of industrial information solutions since the mid 1980s. Its main business is implementing solutions based on real-time information to improve operational efficiency and safety, and to reduce risks related to business continuity. To meet the increasing demands in the areas of smart buildings and smart cities, VRT has developed its own cloud technology-based IoT management platform, WideSky®.

Yorkland Controls has roots in distributing and warehousing heating control products such as Flame Safeguard and Burner and Boiler Management Systems, and has expanded into new markets including Building Automation, Lighting, Security and Energy Services. It works to promote the advantages of controls to the industries and markets that it serves and to demystify available technology for its customers.

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