Project Haystack

connections

Journal of the Haystack Community - Solutions for Interoperable Device Data
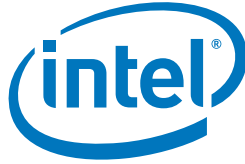
TAGGING THE WORLD OF DATA

• Conversations with the Community • Improving the Occupant Experience
• Tagging All Internet Things • Working Group Updates

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CHILLER PLANT CONTROLS AND OPTIMIZATION AT THE EDGE

ABOUT US

Conserve It is an international leader in HVAC solutions, having designed the award-winning plant room optimization software PlantPRO.

Located in Melbourne, Australia, The Conserve It team has a wealth of knowledge and vast experience in control and optimization systems that ensure the central plant equipment runs efficiently, minimizes energy consumption and maximizes cost savings.

PlantPRO® is an award-winning plant room optimisation and control software developed by Conserve It. It provides control of the chiller plant system in a way that delivers efficiencies beyond that of the individual components.

PlantPRO uses feedback from its on-board real time analytics, diagnostics, measurement and verification systems to continually readjust the chiller plant for optimal performance.

PlantPRO was named 2015 Product of the Year at the AIRAH Awards, one of the HVAC Industry's most prestigous awards.

WHY CHILLER PLANT CONTROL AND OPTIMIZATION?

- Chiller Brand and Compressor type agnostic so it works with any manufacturers chiller systems

- Provides up to 40% energy savings by using self learning and self adjusting controls and optimisation algorithms

- Provides on-board realtime analytics, diagnostics, reporting, measurement and verification to continually readjust the Chiller Plant for optimal performance

- Based on Niagara Framework and is Haystack compatible

CI534- EDGE CONTROLLER

Conserve It Edge IoT controllers are a new generation of IoT controllers using the Niagara Framework® with an expandable IO network. Purpose-built, the CI-534 delivers edge connectivity, data access and control for today's mid-sized facilities, plant-control, machine-to-machine and IoT applications that required smart edge technology.

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Semantic Tagging Passes an Inflection Point

by Therese Sullivan, BuildingContext.me
Managing Editor, Haystack Connections Magazine

Jack McGowan, a pioneer in energy services for buildings, once wrote, "As with nearly every other industry on the planet, the future of this business is directly linked with the World Wide Web. In fact the Web may have more to do with defining Direct Digital Control's (DDC's) future than any individual development in control theory, HVAC or building technology."

That was in January 2001 in Automated Buildings. Later that year, in the May edition of Scientific American, Tim Berners-Lee, inventor of the World Wide Web, defined the Web's future and, consequently, the future of DDC. In "The Semantic Web," he and his co-authors described "an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation."

Six years later in 2007, developers at Twitter made a giant stride toward the Semantic Web when they introduced the concept of the hashtag. Twitter hashtags proved how using easy-to-understand names for things was a very powerful way to foster cooperation across the Web. This use of linked data was soon picked up by Google+, Facebook, LinkedIn and other social media sites.

Different communities in the controls world have been evolving their own tagging approaches for almost as long. In February, a milestone was reached when ASHRAE announced that tagging organizations including Project Haystack, the Brick Schema initiative and BACnet would all be collaborating on a single global standard for machine-readable semantic descriptions of data. The ASHRAE Standard 223P announcement explains "Wide adoption of this standard will provide engineering and automation efficiency improvements and pave the way toward broad interoperability among applications, creating a competitive marketplace to the benefit of building owners."

That the controls industry has the discipline, respect for mission, and good sense to opt for collaboration over 'protocol war' is a win for everyone that wants better buildings as soon as possible. Data silos resulting from the siloed thinking of those responsible for different systems in buildings have been holding back Smart Buildings for long enough. When specifying engineers and controls contractors, as well as building owners and operators, insist on standardized semantic tags, the barriers impeding data flow will fall away. As Berners-Lee understood, self-describing language tucked into the metadata that accompanies pieces of machine-generated data can make it easy for computers and people to cooperate in the achievement of any goal, including keeping buildings operating according to design.

The Spring 2018 edition of *Project Haystack Connections* documents how fast the evolution toward smarter buildings can happen once building operational data has been tag-enabled. Both IT and OT contingents are recognizing that metadata tagging is key to clearing hurdles related to ease-of-use, unified data flow edge-to-cloud, data security and even adhering to new GDPR data privacy rules. Not to be missed is the fact that the storytellers in this issue — especially those that I interview in the Conversations section — are not solution vendors, but are from the ranks of design engineers, commissioning experts, smart building consultants and large-portfolio property managers.

From Jack McGowen, to Tim Berners-Lee, to the inventors and users of the hashtag, to this group of Haystack tagging end-users, a new vision of what direct digital control (DDC) in buildings could be is emerging. I hope you enjoy reading about it here first. 🕸

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- 🧭 Actionable Outcomes
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The Growing Reach of Project Haystack

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

The theme of this issue of *Project Haystack Connections* Magazine is "Tagging the World of Data". Given the continued growth and adoption of Haystack around the world, this theme is merited. But there is another aspect to the growing reach of Project Haystack that is equally important, and that is the use of Haystack across applications of all types - it's not just about building systems.

While building systems have been the place where Haystack gained traction and adoption, the Haystack methodology is not just about HVAC, temperature sensors, fans, meters, and building systems. The Internet of Things is bringing diverse smart devices into every aspect of the "built environment" – from our homes to high-rise commercial buildings, industrial facilities and agriculture. Since the earliest days of our efforts, we have always viewed the challenge as bigger than simply building systems, and we have made design decisions that enable Haystack tagging to be used in all types of applications and with all types of smart device data.

As smart devices proliferate into solutions no one could have ever imagined even a few years ago, and come from different suppliers around the world, the need for Haystack's data tagging methodology has become even more critical.

No matter what the singular application or solution an individual product addresses, the future demands that we be able to bring all of this data together efficiently and easily to provide maximum benefit to owners, occupants, manufacturers and service organizations. The easier it is to connect, exchange and interpret data, the better society can benefit from the value inherent in smart devices.

> *We've made design decisions that enable Haystack tagging to be used in all types of applications and with all types of smart device data beyond building systems.*

Accomplishing this goal is the mission of Project Haystack – making it easier to unlock value from the vast quantity of data being generated by smart devices including applications and devices that have not yet been contemplated. It's a big vision, but Project Haystack continues to prove it is well within our reach.

Intellastar

Analytics at the Edge

Tipify, our latest IoT Technology, is fully Distributed, Scalable and Secure providing the ideal platform to manage Smart Buildings, Energy, DSM and DERs.

Built using SkyFoundry's SkySpark Everywhere Distributed Architecture, Tipify runs on T-Star edge devices that integrate with existing systems and perform analytics and control.

These devices communicate with Tipify Enterprise Servers using the latest 4G LTE modems through Intellastar's Connect Data Service to create an end to end Technology solution.

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Interview with James McHale

Perhaps no other independent market research firm is following Smart Building technology more than Memoori. They have been closely covering building and energy management, lighting, physical security, and Smart Grid and Smart City topics. We asked Jim McHale for his take on the industry in light of the latest advancements in Semantic Data Modeling.

Q: What do you think of ASHRAE's announcement about collaboration on Data Semantic Modeling under Standard 223P?

A: A common data semantics system is going to reduce friction among all the data-driven solutions aimed at commercial and industrial building owners and operators. The Smart Buildings industry has been offering lots of technology to reduce energy costs, to improve facility management efficiency and real estate operations, to increase the performance of physical security and safety in buildings. However, what we have seen so far is "internet of a thing." That is, a lot of focus on one thing, be it lighting, video, physical access, etc. The work of standardizing tagging methods and schema could be the catalyst which rises us above the silos, cross-pollinates ideas, and eventually knocks down the barriers.

Q: Memoori is one of the foremost research firms covering startups and venture investing in the buildings space. What impact has VC investment had on innovation in Smart Buildings?

A: First a few stats: In 2016, we tracked $1.5B of venture funds invested in building-specific start-ups, and in 2017, $1.1B was invested. VCs operate with the belief that about 95% of the start-ups that they give money to will fail completely, 4% will turn into viable businesses that they can exit with a profit in a few years time, and 1% will be unicorns—that is companies with a $1B+ valuation. It is the unicorns that fund the whole thing. It is the one Spotify that pays for everything. Once startups get money, their thinking often reduces to 'Just get something out there, See what sticks.' It is a model that won't last forever. However, it has characterized the Internet wave, and it is now riding the Internet of Things wave of investing.

On the positive side, venture capital investment is bringing attention to the industry and bringing in people that want to disrupt and that want to add value. The buildings industry needs to attract new talent, so start-ups are making a critical contribution in this way. Startups are able to recruit for IT and cyber-security skills—professionals particularly in high demand. The potential rewards for working in smart buildings should be on par with others, and VC funding makes it possible to vy for this talent. Partnering with the right technology vendors is also important, and VCs can help make those matches. Their participation is certainly accelerating innovation in smart buildings.

Q: But, isn't aggressive marketing of a minimally viable product and a see-what-sticks attitude a mismatch to OT applications in the built environment where you are dealing with occupant comfort and safety, not to mention liability issues?

A: With technology products, there is always a lag between the hype and the reality. Gartner famously calls it the Hype Cycle. Technologies eventually do come out of the Trough of Disillusionment. Some Smart Buildings products are in the midst of that phase. Memoori covers video surveillance and VR analytics, for example. There is a lot of excitement around advanced graphics chips embedded into cameras that can do real-time analytics at the edge. Now cameras in buildings or on a street can operate as neural nets that can be fed rules and that can learn. They have the intelligence and processing power to operate with little to no human intervention. We're starting to be able to do this today. But, many in the video analytics market also have to face up to the fact that they oversold what they could do over the last 10 years. Solution vendors have to deal with early users complaints that 'The thing doesn't work.' In terms of market trust, they have to dig out of the Trough.

Q: With all the startups, IT companies and traditional big building equipment makers touting Internet of Things solutions, are we any closer to realizing the Buildings-IoT?

A: Undoubtedly we are putting more connected sensors into buildings now. But, we are nowhere near buildings that listen to themselves, that

> *"Technologies eventually do come out of the Trough of Disillusionment. Some Smart Buildings products are in the midst of that phase."*

understand what is happening inside their spaces, and that react to occupants and provide comfort and productivity. That is the B-IoT vision, and for it to be realized we need open standards that let us express

> *"If you are working with a client that really understands that people are their unique selling proposition, they will want to achieve the best environment."*

building data in a way that anyone interacting with the building can understand. When we can classify and semantically tag all the devices, equipment and other assets of a building using a common language, we will be getting closer to the full B-IoT vision.

Q: Among all the stakeholders in a building, who is in position to lead all this classifying and semantic tagging?

A: This next phase will push on faster if someone with sufficient controls programming experience, like a master systems integrator (MSI), can be in a position of influence from the earliest design phases in a project. Someone advocating for technology and a data strategy at the point when architects are laying their first plans, can really have an impact. This is the best time to consider questions like 'What cabling are we going to put in?, Is the lighting going to be connected? What impact will that have on the choice and placement of windows?' The goal is to have buildings that are outcome-based not output-based. Of course, much depends on the type of building owner. If you are working with a client that really understands that people are their unique selling proposition, they will want to achieve the best environment. It is such customers that will push for intelligent buildings, and eventually raise expectations about what a building can be across the board.

Q: Security concerns have to be taken into considerations from the earliest phases of design too. Do you think a secure B-IoT is possible?

A: I have seen some interesting solutions come out. Those who are responsible for IT architecture now know how to separate a building's operational systems from enterprise systems with virtual machines and firewalls. The IT experts can also establish procedures and policy around when

and how to update device software and how to make sure that code is patched when necessary. Properly securing a BAS and its data from edge devices to cloud connections is possible; but, it costs money and it needs the right people. The security cameras market has again demonstrated what can happen when you haven't done things properly. Customers and the public expect them to be professionally installed and there are instances where they have not been. Hackers have found and exploited these vulnerabilities. We've all read about this. We need to get the right people into the building industry, including cyber-security experts. And I believe that this is happening.

Q: Are we going to get to a point where we are selling buildings as a service, providing heating-as-a service, lighting-as-a-service, air-conditioning-as-a service, etc.?

A: Yes, we're getting there, and standards like a unified data semantics modeling standard under ASHRAE will help us advance. �

James McHale is Managing Director, Owner & Founder of Memoori, a consultancy company based in Stockholm, Sweden, providing independent market research, business intelligence and advice on Smart Building technologies.

Interview with Jim Meacham

ALTURA

Jim Meacham is a founding principal of Altura Associates—an engineering firm driving some of the world's most iconic real estate to new levels of energy efficiency and building performance. We asked him for his thoughts on where intelligent buildings technology and related managed services are going next.

Q: Altura is difficult to categorize because it is so far out in front in terms of energy management services. Could you describe your business?

A: Altura Associates offers building energy analytics, project implementation, and strategic advisory services to a wide range of clients across North America. Over the past five years, our business has become increasingly reliant on our ability to demystify and accelerate our clients' adoption of data-driven energy management.

Q: How does Haystack semantic tagging and data modeling methodology play into this business?

A: Haystack tagging has been a critical component of our standards and workflow to enable scalable, extensible, repeatable processes. We use it on every building project. Altura has rapidly grown our database of active building analytics implementations to over 50 million square feet and tens of billions of time-series data points. We would not be able to effectively manage the portfolio without Haystack, and we are proud to have been recognized for this work with the first Project-Haystack Award from the ControlTrends Awards 2017 poll. We are also pleased by ASHRAE's recent announcement that Project Haystack, the BACnet committee and Brick Schema are now collaborating on the semantic tagging of building data under the new proposed ASHRAE Standard 223P. Semantic tagging is an enabling technology for our analytics and energy reporting practices. Others approach this work at the utility meter and electric and gas submeter level. You are still 30,000 feet in the air when you start there. You also need a deep understanding of what is going on with the systems in a building to have a meaningful impact on the building owner's bottom line. Using the Haystack-enabled data platform that Altura's team implements during commissioning and retrofits, we can gather detailed operational information from the bottom up. Bringing the tagging and engineering processes together, we've been able to grow the impact our energy reporting has

> *"Altura is pioneering a new class of service—full-lifecycle asset management in a tag-based environment...."*

on reducing utility costs and to garner wider-ranging and deeper insights from analyzing building operational data. We're finding ways for our customers to not only run their buildings better; but, in some cases, to run their businesses better. Altura was an early adopter of Haystack, and now we are pioneering a new class of service—full-lifecycle asset management in a tag-based environment.

Q: Could you provide more detail on this new service class? How does having tagged data change your workflow?

A: In traditional building energy management practices, analysts use Excel spreadsheets to create hierarchical and relational databases of meter and submeter data associated with equipment. With open APIs and Haystack, we have graduated from Excel spreadsheets. We now base our workflows around analytics and targeted feedback to the right people. Thoughtful implementation of tag libraries and comprehensive data management allow the use of a platform like SkySpark® to centralize critical asset data. Because we implement the Haystack standard in the design phase of new construction projects, the database is built on a standard framework throughout construction and operations. Executing with these data management tools takes more skill than simple Excel; however, we are seeing a broad range of business analysts, building operators, engineers, and project managers successfully gain these skills with minimal training and no programming experience.

Q: How do you guide your clients into adopting the Haystack methodology?

A: Where feasible, it is critical to lay the foundation for a project's data architecture starting with the commissioning process. Enforcing standardized tagging according to the Haystack methodology can seem like a lot of manual work in the beginning. However, this step ensures a database topology built such that anyone that needs the data going forward canintrinsically understand each modeled system and component.

Q: What can you say about Haystack's extensibility?

A: Haystack has shown the power of the tagging-based protocol for adding context to any type of data we collect in buildings. For example, when you add a new BACnet-compatible variable frequency device (VFD) into an IP protocol network today, already you can expect it to be easy to get all the operational trend data out. When you add Haystack tagging, you have a rich model that also captures contextual data like the make and serial number of the device, as well as relationships between this VFD and other VFDs, controllers and affiliated equipment in the building, campus and

global portfolio. Once we all agree and insist on tag-based data interoperability, the integration work that falls to specifying engineers, building commissioning agents, building operations engineers, facilities staff, and equipment and device makers all becomes easier. BACnet gets a whole lot more powerful as a common protocol too.

We have found the Haystack methodology to be valuable for more than just point identification. When a device shows up in the schema, you see all the contextual information, and you can push it over to the CMMS (computerized maintenance management

> *"Haystack has shown the power of the tagging-based protocol for adding context to any type of data we collect in buildings."*

system) for asset management. Altura has now built its own analytics tools and rule libraries to leverage the power of tagging. Some of these are specifically appropriate for asset management and the type of project management we do.

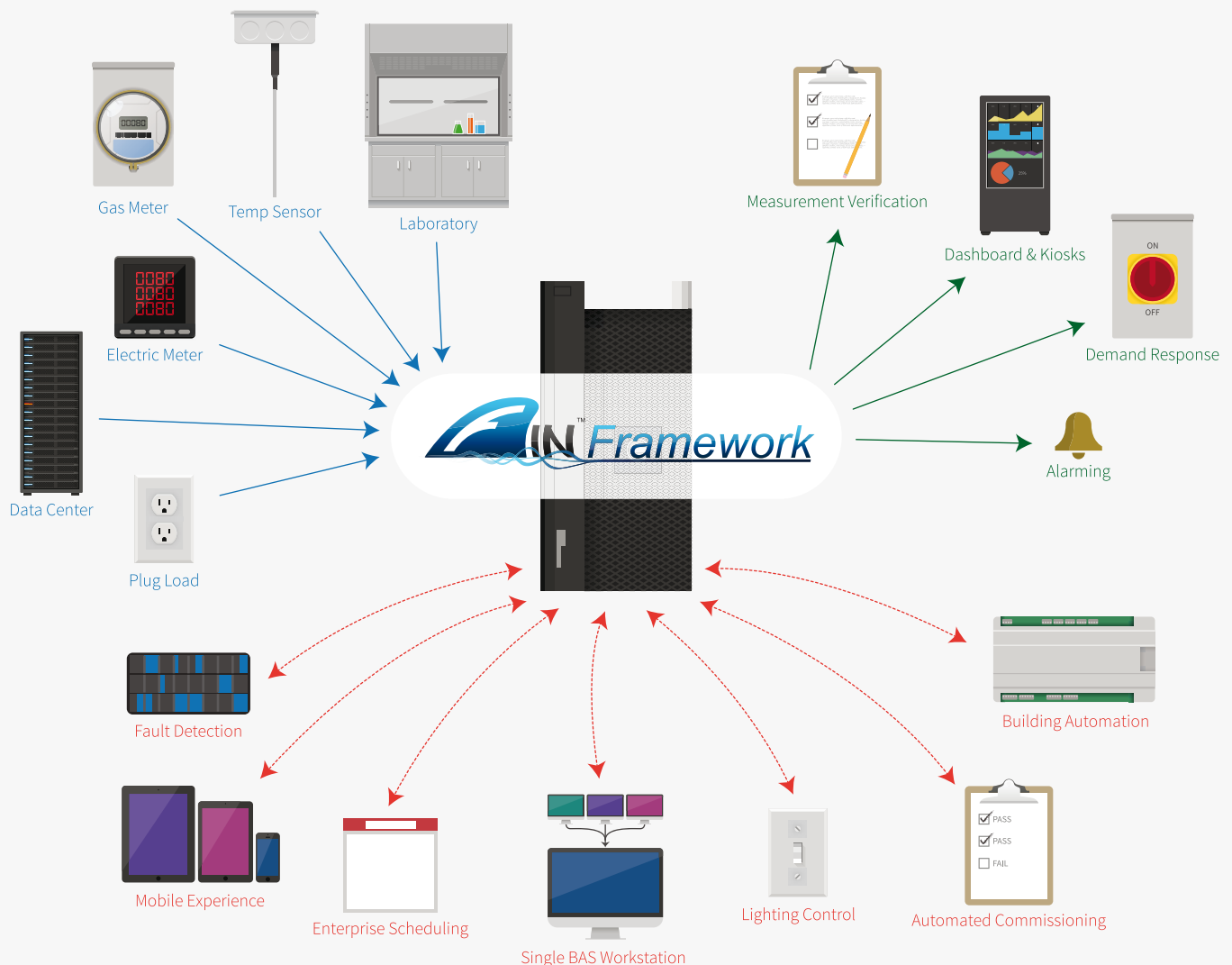**Q:** What do you think will happen next in the trend toward semantic data modeling?

A: What we would like to see now is more adoption, with the major building automation brands contributing. If we can agree on tagging methodologies, the metadata can migrate into the hardware controllers and equipment — it will be native to a system. If controllers and equipment have embedded tagging at the hardware or firmware level, for example, much of its self-describing labeling will already be there when a new VFD is installed into a BACnet/IP network. The bottom line is that transformative cost savings and process improvements are possible when data standards are allowed to break down the barriers that form between different commercial equipment and software in a building. Haystack is empowering exactly this sort of transformative work and is only set to become more effective as adoption grows and the ASHRAE unified data semantic modeling effort continues. 🏴

James Meacham, MS/ME, co-founded Altura Associates which delivers a combination of energy engineering, data analytics, and corporate sustainability expertise. Altura works with clients to design and implement programs which reduce energy, water, waste, and greenhouse gas emissions worldwide.

What is FIN?

FIN is 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 tagging and data modeling to provide unprecedented capabilities and functionally. The Haystack open standard also provides options and choices for the best combination of solutions from the wider collaborative Haystack community.

Gas Meter

Temp Sensor

Laboratory

Electric Meter

Data Center

Plug Load

Measurement Verification

Dashboard & Kiosks

Demand Response

Alarming

FIN Framework

Fault Detection

Building Automation

Mobile Experience

Enterprise Scheduling

Single BAS Workstation

Lighting Control

Automated Commissioning

J2INNOVATIONS

Interview with Ruairi Barnwell

DLR Group

Ruairi Barnwell leads the Building Optimization enterprise within DLR Group, a global integrated Architecture & Engineering firm. DLR Group is an early adopter of the Architecture 2030 Challenge and an initial signatory to the AIA 2030 Commitment and the China Accord. We asked Ruairi to describe how design engineers are deploying Haystack tag-enabled analytics platforms.

Q: How is the fast-advancing field of data analytics changing how high-performance buildings are designed?

A: Data is increasing transparency and accountability. This in turn is fueling growth in smart building technologies and encouraging more building-industry professionals, including specifying engineers, to develop expertise in wrangling insight from data. It is a virtuous cycle encompassing three major activities:

1. Closing the design loop with building operational data
2. Creating actionable intelligence from building performance data
3. Using the ROI from deeper energy savings as a platform for creating smarter buildings

Q: What do you mean with the phrase 'Close the Design-Operations Loop?'

A: Design teams rarely get enough feedback about how their product is performing after it has been delivered, and operations teams rarely have opportunity to offer input when a building is being designed. Building operational data delivered to the right people at the right time has potential to heal this major disconnect. With analytics, the design industry can evolve from a reliance on predicted EUI's to gauge successful projects, to a bigger focus on outcomes and actual post-occupancy building performance data. Our energy codes and third-party certification programs are evolving also, with outcome-based compliance paths. These rely on verifying actual building data for certification, rather than predictions and promises to adhere to best practices.

 In light of today's more stringent minimum energy code requirements, and as Zero Net Energy buildings become a realistic target for projects, optimizing building performance early in the design, with a feedback loop from operations experts on maintaining peak performance long-term, is now a must, not an option. With the advent of data analytics, the design industry has better tools to succeed with validating high-performance building design strategies, quantifying their return on investment, and measuring and verifying their impact on overall building performance.

Q: At what points in the Design-to-Construction phases are you bringing in results from real building operational analytics?

A: As my DLR Group colleague [Amarpreet Sethi explained in a recent video](), our goal is always to analyze building performance data early in the design process to bring quantitative insight to the decision-making process. Design team members are typically first to assume how occupants will use the building. These behavioral predictions factor into simulations that look at key high-performance building indicators relative to energy consumption, indoor air quality (IAQ), occupant thermal comfort and overall user experience.

Data analytics are also used extensively in the commissioning of building systems prior to final handover. Critical to ensuring that design strategies are executed as intended, connected-commissioning (CCx) approaches help us to optimize the design during construction as needed to deliver the building at peak performance on Day One of occupancy. For example, a building performance data analytics platform makes it practical to evaluate 100% of the results streaming from controllable points during the Functional Test phase, i.e. every terminal unit, rather than a 10% or 20% sampling.

Once a building is instrumented for analytics, systems engineers can check in on their designs at will, often remotely through a secured cloud interface. Over the long-term, this feedback loop will help us to ensure that efficient design strategies persist and are continually optimized based on the ongoing dynamic needs of the end user.

When design teams have a framework in place for inherent validation of post-occupancy building performance, they can apply the same rigor of analytics to the building's operational data set as has traditionally been done with the design data model.

Q: What is the Design Engineering team's role in turing operational data into actionable intelligence for your clients over the life of a building?

A: Our buildings are overflowing with data points. We have utility bill data, metered data, building automation system controls trended data, IAQ data,
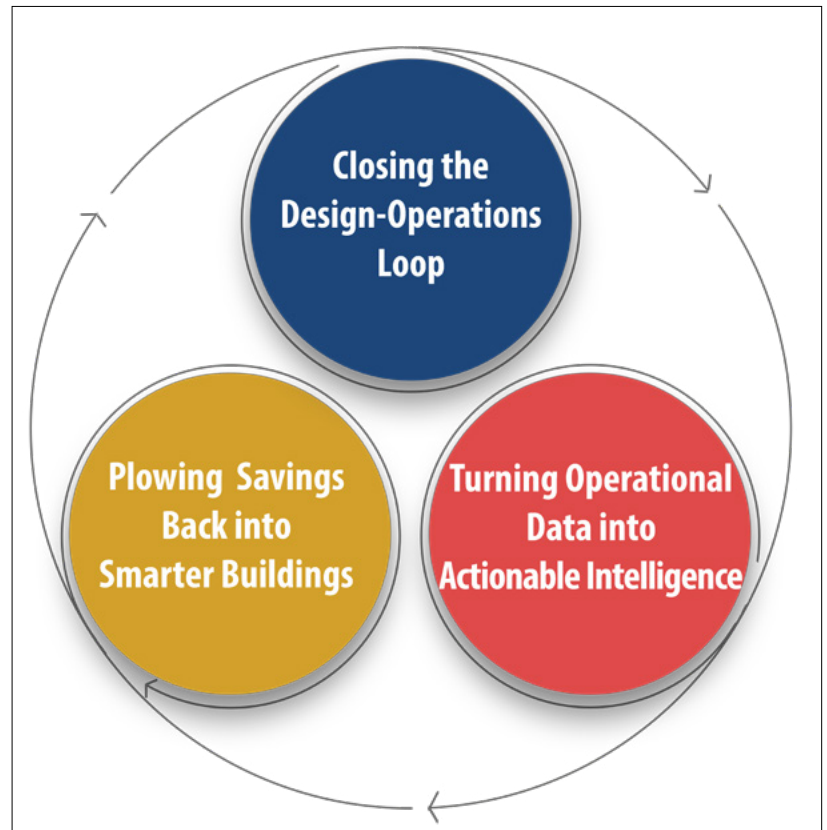
A Virtuous Cycle is kicked off when design engineers deploy building operational analytics in their workflows in Design-to-Construction phases.

and that is just the start. Operational fault detection and diagnostics (FDD) data analytics and tools have long been deployed by Building Performance Analysts and Facility Managers to make sense of all this data. Users have pushed the industry toward open protocols like BACnet and the use of semantic data modeling like Project Haystack because these make the job of normalizing data for analysis so much easier. DLR Group has pioneered the use of semantic, or tag-based, data analytics frameworks to optimize ongoing operation of building systems and to inform design-phase energy modeling with the vast quantities of actual operational building data available post occupancy. The live data can come from automation systems, smart meters and from apps on the smart tablets and phones carried by facilities managers and occupants. Energy models that incorporate operational data can constantly update, like 'living models.'

Operational analytics reveal the data patterns of building systems and find anomalies in operations that cannot be uncovered through conventional analysis. As a result, we can establish a data platform from which we can leverage actionable intelligence and use these insights to facilitate a process to achieve deeper energy

savings, increased occupant comfort and a proactive approach to building maintenance—all of which impact facility operational financials and enhance user experience.

Q: How about the third activity you mentioned, *Plowing Energy Savings Back into Smarter Buildings*? What is the design engineer's role in that?

A: The third phase of the virtuous cycle is all about what you can build once you have laid the foundation for deeper energy savings through the enhanced ability to collect, visualize and analyze operational building performance data. A hard reality is that adoption of new technology is still often justified by the ROI of energy savings. This is true despite the well-documented benefits of enhanced occupant health, well-being and productivity, in addition to operational efficiencies gained with smart building technologies. To date, these benefits are just not as easily quantifiable and 'real' to building owners as the dollar and cents reported on their energy bills. The good news is that operational data analytics are helping us find new and deeper layers of energy savings, with very attractive ROI's and resulting financial benefits. Operational data analytics for deeper energy savings have become the gateway to more powerful smart building strategies.

> *"With analytics, the design industry can evolve from a reliance on predicted EUI's to gauge successful projects, to a bigger focus on outcomes and actual post-occupancy building performance data."*

From the data gathering framework, it is a short path to deploying indoor air quality monitoring, thermal comfort optimization, occupancy awareness, personalized lighting controls, real-time conference room scheduling — all smart building apps with investment returns that are more difficult to quantify today, but likely to deliver much greater value to property owners and tenants over the long run.

Q: More smart building features mean more Internet connectivity and software in buildings. Are your clients resistant due to concerns about their facility teams' IT sophistication or cyber security worries?

A: One of the ways we reassure them is to explain that standard metadata tagging helps to simplify working with all the resulting data and maintaining compliance with cyber-security best practices. Project Haystack fills this role and is the leading semantic standard in the market today. With a tagging-based framework, operational data models express not just a basic identifier and time-stamped measurement, but also carry contextual metadata describing a piece of equipment or device, as well as its relationships to other devices and systems in the building. Tagging can convey hardware make, model and version numbers, as well as firmware and software update status. Eventually the metadata can extend to BIM documents further strengthening the feedback loop between design decisions and real-world results.

"The good news is that operational data analytics are helping us find new and deeper layers of energy savings, with very attractive ROI's."

The technology to do all of this is already in place. This revolution in operational data analytics is a call to action for the architectural design industry to be ready to harness its power. Leveraging these benefits will be critical as we continue on our path to carbon neutrality, through aggressive energy reduction, while balancing increased expectations for enhanced occupant comfort and user experience in our high-performance buildings. ⚓

Ruairi Barnwell , Principal, DLR Group, leads the Building Optimization team. He earned his Building Services Engineering degree from the Dublin Institute of Technology, Ireland's leading sustainable building engineering program. His aim is to elevate the built environment and restore order to the climate for future generations.

Interview with Sarah Boll

Utah Division of Facilities Construction and Management

Utah's High Performance Building Standard includes explicit provisions about using analytics and Haystack standard semantic tagging. A link to this Utah standard is included in the recently released Haystack Reference Implementation. We talked to HPB Program Director Sarah Boll to learn more about the State's naming, tagging and analytics strategy.

Q: What is the charter of the Utah Division of Facilities Construction and Management?

A: To provide professional services to assist State entities in meeting their facility needs for the benefit of the public. The Division of Facilities Construction and Management (DFCM) is the building manager for all State owned facilities. DFCM is responsible for all aspects of construction of State Facilities, including assisting the Utah State Building Board in developing its recommendations for capital development projects and allocating capital improvement funds.

Q: Has Utah legislated any energy-efficiency or energy performance disclosure requirements for facilities? What are you doing to meet these?

A: In 2006, the Utah Legislature voted to "Undertake aggressive programs to reduce energy use in state facilities in order to reduce operating costs of government and to set an example for the public." This was a directive amended to the state's energy efficiency policy. DFCM provides support to the Governor's Office, the Utah Building Board, and the Legislature in interpreting and complying with this

directive. In 2015, we published our High Performance Building (HPB) Standard to provide guidance to all of our facilities teams as well as our product and service partners regarding how to meet the State's buildings energy standards. We also manage a State Building Energy Efficiency Program for existing buildings.

Q: When did Utah DFCM first introduce the use of building analytics into its practices?

A: Building analytics were introduced officially in the 2015 HPB Standard in 2015. The challenges that arise from non-standardized equipment naming

"By doing this once thoroughly and explicitly, we hoped to save our project and facility teams any time and effort they would otherwise put into naming, and increase the chances of long-term success with analytic tools."

and tagging are well known among big-portfolio facilities managers deploying analytics. So when we rolled out this new standard we also included a suggested list of points and tags for building analytics based on Project Haystack. We invested time and energy into building out this comprehensive Haystack tagging library. By doing this once thoroughly and explicitly, we hoped to save our project and facility teams any time and effort they would otherwise put into naming, and increase the chances of long-term success with analytic tools.

Q: What has been the reaction to this tagging tool?

A: Facilities loves the idea of standardized equipment naming and tagging. Also, designers and installers have been happy to have a standard. There are always varying opinions about equipment names. The industry across the country has evolved a number of norms. In the end, not everyone will agree with every name and tag choice; but, everyone agrees that a standard is the way to go.

Q: Is there someone in the initial design charette for new projects that understands the possibilities of tag-enabled controls and building analytics?

A: Yes, the commissioning authority.

Q: To what degree are you requiring that anyone responsible for setting up controls use your HPBS naming and tagging guidelines?

A: At this time, this requirement is only for new construction projects and major renovations that include a controls upgrade. We have not yet tries to retro-fit this system into existing buildings.

Q: Are you integrating your building analytics platform with Computerized Maintenance Management System (CMMS) so that you can better track discovered faults to work orders and resolution?

A: There are a couple of Higher Ed Institutions working on this right now.

"We have seen an increased value from analytics in our commissioning process. More items are found and corrected during warranty…"

Q: You were previously an Energy Manager for the University of Utah. The U of U was just awarded Engineering News Record Magazine's 2017 Best of the Best Healthcare Project prize for the Farmington Health Center. Was that project tag-enabled?

A: Yes - it used the first version of the HPBS tagging list.

Q: What can you say about the value and savings that have come as a result of tag-enabled analytics and, consequently, analytics-enabled operations in State of Utah buildings to date?

A: We have seen an increased value from analytics in our commissioning process. More items are found and corrected during warranty. Facility managers that use building analytics in SkySpark® have noted that it gives them a much better view into their buildings, which decreases their reliance on controls operators for information. This in turn reduces operator work load and increases the rate at which facilities can correct or even predict problems. It is a Win-Win. ⚒

Sarah Boll is the High Performance Building Program Director for Utah's Division of Facilities Construction and Management. She has been an Energy Manager and Sustainability manager for the University of Utah and for New York University. She holds an MS in Environmental Protection and Management from the University of Edinburgh and a BS in Biological Sciences from Tulane University.

Interview with Scott Lanigan & Craig Payne

IntelligentBuildings®

Project Haystack member IntelligentBuildings® provides smart-building consulting, building cybersecurity solutions and managed services for commercial, corporate, campus and government real estate organizations. It is now leading the charge toward standardized point naming and tagging across their clients' buildings and portfolios.

When deploying multiple technologies like analytics, Computerized Maintenance Management Systems (CMMS), and Building Information Modeling (BIM), one of the many challenges is engineering the systems and the data so they create synergies. By implementing a standard point naming and tagging strategy, you can significantly limit this challenge. Project Haystack member, Intelligent Buildings (IB) is now leading the charge toward standardized point naming and tagging across their clients' buildings and portfolios.

"Many of our clients are beginning to implement data-driven operations," explains Scott Lanigan, Intelligent Buildings' Senior Managing Consultant. "At IB, we hold that you don't always have to be revolutionary, but you do always have to be leading your client along the right evolutionary path. Standard names and tagging schema are definitely the next evolutionary step, and our clients are embracing that fact."

IB clients are starting to require that all new construction and major systems upgrades adhere to a data normalization plan, and everyone involved in the integration of various systems, point naming, and metadata tagging needs to understand the new requirements. IB finds itself in the role of creating a reference document that project teams and contractors can follow. Craig Payne is the IB Senior Consultant with the most experience authoring such documents. He says, "We want to capture more than just point-

> *"We want to capture more than just point-naming. The objective is to make it easy to track key performance data for single buildings, campus systems, or nationally connected systems."*

naming. The objective is to make it easy to track key performance data for single buildings, campus systems, or nationally connected systems. Our data normalization documents include extensive appendices that provide even more detail about how assets should be named and tagged, with graphical examples of equipment all broken down by type of equipment and

desired zone control strategy. We strive to cover every control scenario that the contractor may encounter. A lot of client portfolios are so large and include so many different types of HVAC, lighting, and energy systems that it can be an expansive list. We make sure that our dictionaries align with the latest Haystack specifications and align well with industry standards. This is a great tool for our clients, and hopefully more of the industry will follow suit."

As Scott Lanigan explains, "Standardized processes are going to reduce duplication of effort for every project. It's part of our job to get individual facility managers to quit doing one-off's and prevent contractors from doing their own thing, particularly where naming and tagging are concerned. We're finding that, if you get clear requirements in the right hands early enough—right before or during the submittal process—there is no pushback and there is no added cost. In fact, getting the naming and tagging right from the start will return nothing but benefit and savings through better decision-making over the life of the building."

> **" There was no pushback from any company regarding the need to support standardized tagging. They are either already doing it or it is top on their roadmap."**

IB has been working over the last year with their clients' stakeholders to hone this process of developing the point naming and tagging documents. Though every client's approach is a little different, the underlying use of the standard is the same. The document goes through several internal client reviews during initial creation, as well as to BAS industry manufacturers for their input and review.
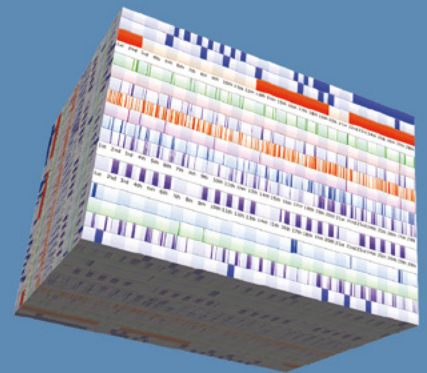
"Since the ASHRAE announcement of BACnet, Project Haystack and Brick Schema collaboration, there is a lot of movement on tagging among manufacturers. There is a mix in the level of tagging support each vendor now

> ***"It is companies that maintain a large number of BAS units that recognize the great benefits that come from metadata alignment across a portfolio. They are thrilled that this is the direction the industry is moving..."***

has for the Haystack library and the BACnet approach. But, there was no pushback from any company regarding the need to support standardized tagging. They are either already doing it or it is top on their roadmap. They all understand this is where the industry is headed," said Payne.

"Some first users of our data normalization documents have been helpful and enthusiastic supporters," explained Craig Payne. "Multiple engineers have praised the standards as needed for years and client specialists have contributed to the further refinement of the documents by pointing out duplications and areas needing more description. Many contractors are utilizing the documents to build template designs for their own clients to streamline implementation."

"National-level systems integration and energy management companies definitely get it," adds Lanigan. "When they can count on having consistent point naming, tags that mean something, and data where it needs to be, they know it will be a lot easier, cheaper and faster to do data analytics. It is companies that maintain a large number of BAS units that recognize the great benefits that come from metadata alignment across a portfolio. They are thrilled that this is the direction the industry is moving, and I wouldn't be surprised if this sparks a trend among many big portfolio holders."

"So this is a major lift, but only a first step. At this stage, this is more about capturing the point-object necessities for better building control and supporting our clients' CMMS efforts, than about looking at macro-trends across the portfolio. Obviously,

implementing this approach is not an overnight effort. But, normalizing this data is going to have a big ripple effect. It will encourage portfolio owners to integrate their energy metering and equipment trends to their analytics platforms and running analytics at a portfolio level. As our clients build their tag libraries, more people will realize the value of the data. At some point, the practice will reach critical mass. For projects that today adhere to the tagging conventions and methods set down in the document, we are already seeing change. We know which clients should be held up as Best Practice leaders," Lanigan summarizes.

Craig Payne identifies the next likely step on the evolutionary path toward smarter buildings: "The more facts and attributes that you can add to these data points and systems, the more you can know about them. Tagging is going to enable more automated cyber-security maintenance, for example. Today, an IT or facility manager keeps a spreadsheet and records each update to the programming logic of a particular piece of equipment. People are human and such spreadsheets get out of date. A better practice is to markup asset data models with vendor ID, firmware version, software version as tag items on systems. These can then be queried and rolled up into one report. Then you are assured of current information and the

> ***"Tagging is going to enable more automated cyber-security maintenance..."***

ability to enforce cyber-security compliance across a portfolio."

With the support of consultants like Lanigan and Payne, IB clients are demonstrating the stages of data sophistication that big portfolio holders will evolve through before they arrive at truly smart buildings. They will go from ad-hoc naming and tagging, to data alignment, to portfolio-wide analytics, and then to more automation in all the ways they operate buildings, especially cyber compliance. It will soon be difficult for any company engaged in building construction or operations & maintenance to opt out of this evolution. Maybe it is a revolution? �

Contributed Article

Improving the Occupant Experience with Haystack

by Patrick Coffey, Chief Technology Officer, VRT Systems

VRT SYSTEMS

Here is how Haystack's interoperability and semantic modeling capabilities helped VRT Systems developers quickly build a solution that provides building occupants with a window into their data in real time and in an easy manner.

As Smart Building owners and operators seek to enhance user experiences and provide better data transparency, solution providers and equipment vendors are having to go beyond their traditional solutions and deliver more to their clients. Amongst this buzz of IoT solutions, overcoming general adoption barriers and choosing the right technology to meet current and future demands is difficult. For VRT, one clear standout for IoT in buildings is Project Haystack. The Haystack methodology has clear and numerous benefits in Smart Buildings for data analytics, as demonstrated in this use case.

The Problem

Making the building operational data available to occupants can have positive economic and social benefits, for example:

- Monitoring air quality and other metrics related to wellness and improving staff productivity.

- Monitoring utility data to reduce energy and water consumption (and cost) and lower greenhouse gas emissions.

The Green Building Council of Australia (GBCA) also recognises these benefits, and awards Green Star points for residential building developers that provide utility data to occupants in real-time.

However, there is a technical gap between the operational data produced by the many different systems that permeate buildings, to making this data freely available to occupants. With this gap there are two key challenges:

- Centralising the operational data from multiple meter types in an organised manner so all interested parties can access it.

- Providing a secure window for each party to freely view only their data online.

In 2016, VRT Systems initially faced these challenges for a customer in Sydney, and we built a web application , TenantView, that sits on top of our existing Haystack server, WideSky, which provides building occupants online access to their data in real-time on their own devices (smart phones and tablets) in a secure manner.

How we solved it with Haystack

Step 1: Integrate the data to a Haystack server and host online
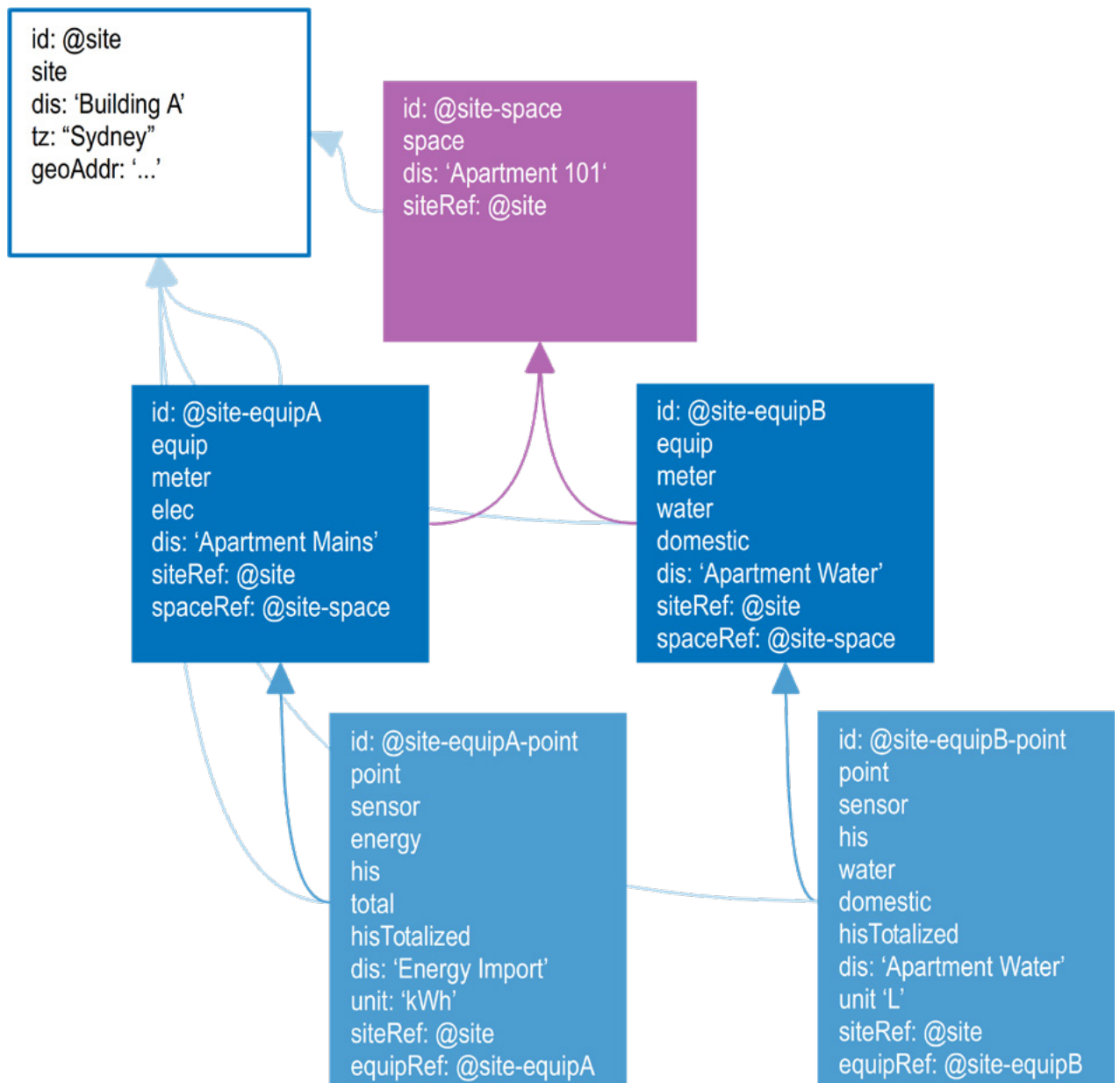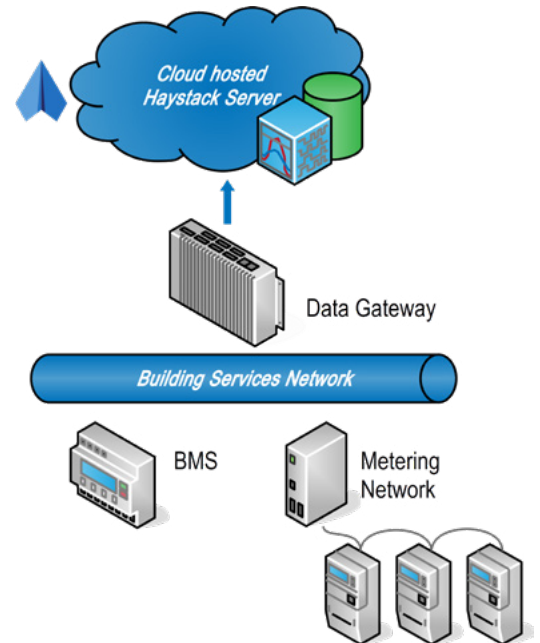
Using common industry protocols, e.g. BACnet, Modbus, M-bus, etc. we integrate building systems into a secure online data service that is built on Haystack and has fast time-series data support. If a vendor has already modeled their system in Haystack or used nHaystack in a Niagara based product, 'Great!.' This makes this step a breeze.
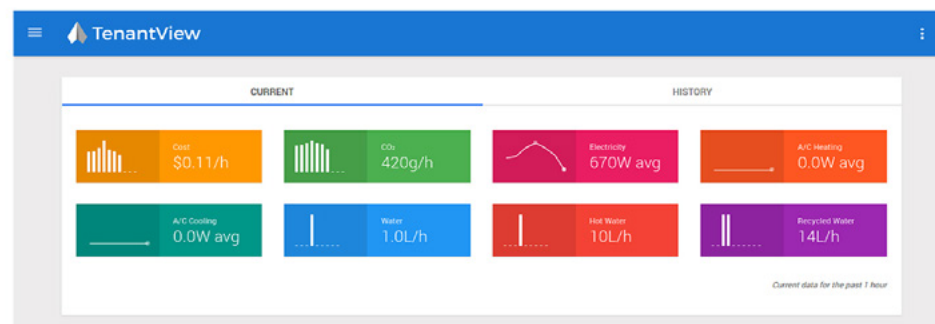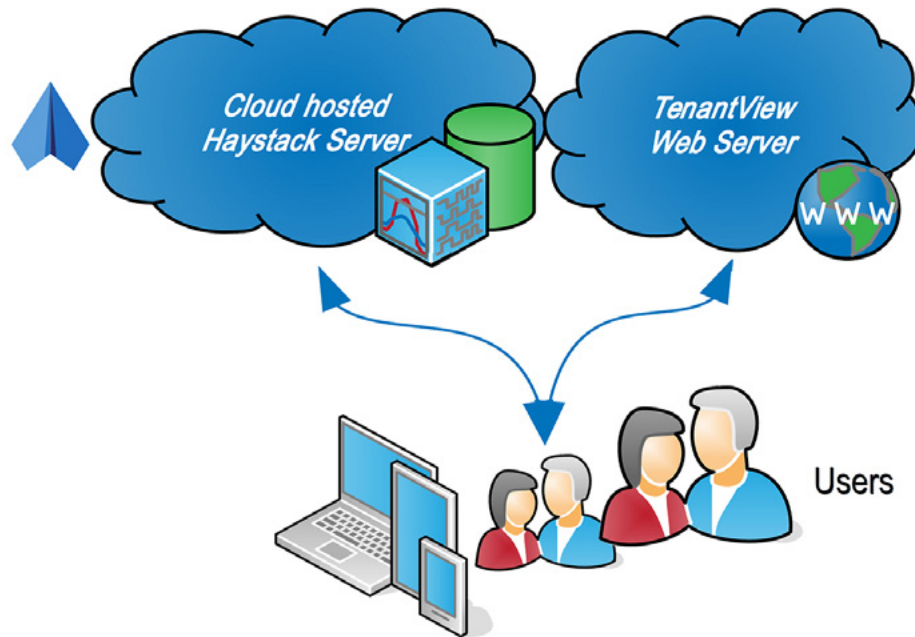
Step 2: Model the data in Haystack

We use Haystack semantic modeling techniques to relate the equipment monitoring the various spaces or tenancies within a building. In our case we need to lay out individual space entities for representing the various spaces or tenancies, and link these to the relevant 'equip' entities. For example an energy meter links to a residential apartment.

Step 3: Build a web app that uses the Haystack API

We used existing Haystack client source code to build a web-based app written in node.js. During development we realised we could rely on our haystack server to the point where we didn't need to use another database in the back-end. We instead followed the Haystack methodology and extended the semantic model to store the additional data we needed. As our Haystack API implementation supports Create, Read, Update and Delete extensions, we could also

Cloud hosted Haystack Server

Data Gateway

Building Services Network

BMS

Metering Network


```
id: @site
site
dis: 'Building A'
tz: "Sydney"
geoAddr: '...'
```

```
id: @site-space
space
dis: 'Apartment 101'
siteRef: @site
```

```
id: @site-equipA
equip
meter
elec
dis: 'Apartment Mains'
siteRef: @site
spaceRef: @site-space
```

```
id: @site-equipB
equip
meter
water
domestic
dis: 'Apartment Water'
siteRef: @site
spaceRef: @site-space
```

```
id: @site-equipA-point
point
sensor
energy
his
total
hisTotalized
dis: 'Energy Import'
unit: 'kWh'
siteRef: @site
equipRef: @site-equipA
```

```
id: @site-equipB-point
point
sensor
his
water
domestic
hisTotalized
dis: 'Apartment Water'
unit 'L'
siteRef: @site
equipRef: @site-equipB
```

provide a seamless experience for admins to manage and invite users to view their data using only a browser.

Our Results

While having success in both commercial and residential applications, the 'Built on Haystack' architecture allows VRT to constantly offer TenantView as a value-add for projects that already have Haystack as part of the solution. One of our notable applications is the Barangaroo South project, which is a $6B redevelopment by LendLease and Sydney's largest urban renewal project since the 2000 Olympics. Our WideSky solution provided metering and monitoring systems for utility services in Barangaroo's first residential buildings, and TenantView helped them gain Green Star points from GBCA for the construction project. LendLease eventually reached a 6 Green Star rating for both buildings.

Since 2016, we have employed the same techniques to deliver TenantView in other market segments, e.g. for a complete commercial building, the Floth Head Office in Brisbane (viewable live through the VRT Living Lab online demo site), and for a large commercial tenancy, the Commonwealth Bank in the Diasho building 180 Brisbane. Both of these projects also achieved 6 Green Star ratings.

The world never stands still. The first version of TenantView was delivered prior to the introduction of GDPR and related regulations. We are now in the process of upgrading to support these as part of a planned deployment covering thousands of new apartments in multiple buildings across Australia. Haystack will help. 🏴

Patrick Coffey is the CTO of VRT Systems, developer of WideSky, an IoT platform with inherent support for Haystack semantic modeling. He is focused on how better user experience can speed the uptake of Smart Buildings.

Tagging All Internet Things to Create Virtual Visibility

by Ken Sinclair, Editor/Founder, AutomatedBuildings.com

Name calling, which in the past was discouraged, has become a mandatory requirement for your connected creations. I'm calling them Internet Things — the new meaning of IT .

Creating Virtual Visibility while Talking Transparency and Creating a Digital Twin? How do all these words fit together? As part of the building automation world which is converging with the Information Technology world, we are on a never-ending transformation. Fellow sojourners, we need to talk about Transparency which implies openness, communication, and accountability. We need to begin operating in a way that thoughts, feelings, and motives are easily perceived, and it is easy for others to see what actions are performed. It is a significant shift for us to be open to transparent thinking.

So if we are to be transparent, we need to create a strong virtual identity while increasing our visibility, and making all that we do machine-readable and open to machine self-learning and AI evolution. For machines to use information, we need to tag IT. "IT" is our Internet Things. Without tagging, no person nor machine will be able to find and further the value of our connected creations in the Big Data blizzard.

The importance of tagging was underscored in several of my last columns and highlighted by the ASHRAE announcement that the BACnet committee, Project

Haystack and Brick Schema 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.

Other organizations are working on tagging everything, well, almost everything. TagItSmart is changing the way products can be tracked and monitored. Its goal is to combine the power of functional inks with the pervasiveness of digital (e.g. QR-codes) and electronic (e.g. NFC tags) markers, to embed cheap sensing capabilities into zillions of mass-market products. This Infogram shows the value of tagging from creation to recycling.

Just in case one of these tagging standards is not the correct one, creators can always leave enough space to re-tag to a different one. If Internet Things are machine readable, there is plenty of space to work with, and best of all, complete flexibility for how IT will be used.

My Conclusion: you must tag Internet Things - every creation - and make them virtually visible. Tagging is not just a nice-to-have feature, but a mandatory part of future-proofing your IT creations. �

In addition to being editor/publisher of his own monthly magazine, automatedbuildings.com, Ken Sinclair is a regular contributor to Contractor Magazine and Facilities.net. Ken strives to be a Catalysis/Harbinger of the IoT future. His goal is to inform his readers of the future of Building Automation, which will involve the full embrace of IoT. Ken believes that systems will be smarter, self-learning, edgy, innovative, and sophisticated.

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

Light+Building Recap

by Scott Muench, V.P. of Marketing, J2 Innovations

BACnet Europe invited Project Haystack to present during their non-stop Open Building Automation Live program at this year's Light+Building. The Frankfurt-based fair was held from March 18 through 23 and attracted more than 220,000 trade visitors from 177 countries. My presentation, "Today's Intelligent Buildings with Project Haystack," covered semantic modeling and the *step change* that is happening in our industry. I delved into applications examples available today!

One big highlight from the event was the follow-up discussions we had around the BACnet press release. Bruno Kloubert, BACnet Interest Group Europe and MarDirect, introduced me. We had some in-depth discussions on how to provide a unified data semantic modeling solution to be adopted into BACnet.

Additionally, new discussions began with interest from KNX about the use of semantic modeling for electrical-install-focused products like lighting, switching, room automation, and electrical metering.

It's exciting to see that all the Open-Protocol standardization communities for devices and applications are beginning to participate in a unified way in the world of Big Data. Through the efforts of Project Haystack in collaboration with standards bodies such as BACnet and KNX, we are unlocking the power of intelligent building information. ⌧

IBTech@ARBS

by Richard McElhinney, Chief Software Architect, Conserve It

IBTech@ARBS was a dedicated precinct within Australia's only international air conditioning, refrigeration and building services trade exhibition, held May 8-10th in Sydney. My seminar "Introduction to Semantic Modelling Applications for Building Services and Systems" was well attended. Project Haystack was well represented at this conference, as Scott Muench was also in attendance. ⌧
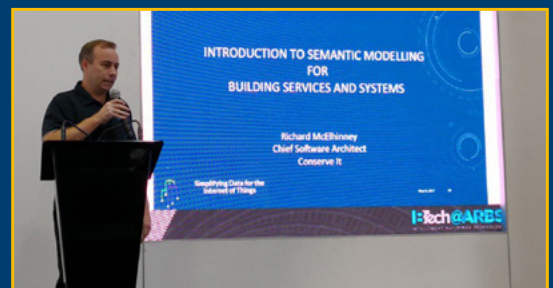
Niagara Summit '18

by Therese Sullivan, BuildingContext.me

Niagara Summit '18 in New Orleans reinvigorated Tridium's reputation for technological innovation and sought to inspire users to deploy the Niagara framework as an instrument of creativity. In his keynote, Jim Bland, Tridium President & General Manager, pointed out that people that know how to spin value out of data using the Niagara framework are at a moment of limitless possibilities. In his portion of the opening session CTO Kevin Smith highlighted Tridium's support for semantic interoperability and welcomed the ASHRAE news about BACnet, Haystack and Brick collaboration. He also announced that the next Niagara release will support exposing Haystack tags via the Haystack REST API to streamline tag-enabling Niagara data as part of integration projects. There was opportunity for deeper discussion and more audience participation about this in the breakout sessions about analytics and semantic interoperability. A session led by John Petze, Kevin Mamajek and Ed Merwin entitled 'Tagging data for successful analytics and mass deployment to the edge' attracted an overflow crowd. Evidently, it's a topic that Niagara users are ready to learn more about. John Petze also introduced the topic of Project Haystack semantic data models and web services in the Analytics Panel discussion—another well attended session that included George Thomas from Cleveland Hospital and Jerry Gray of Enterprise Controls Group. You can download the presentations from these sessions and many more from the Niagara Summit downloads page. ⌘

Nordic Smart Building Convention

by Ken Sinclair, Editor, AutomatedBuildings

I am very pleased to be participating at the Nordic Smart Building Conference from June 6 - 7 in Helsinki, Finland. I will be moderating a panel discussion on "Empathic, Healing & Anticipatory Buildings." The Scandinavian countries have been pioneers in cell phone invention and innovation, particularly in how they humanize their technology, so I look forward to gaining insight on how some of the next bridges between people and technology will be built. In reviewing the reading material that has been published on the topic, it is clear to me that the rapid advance of applied technology has led to rapid changes in people's work habits and attendance patterns. Those managing

workplaces are facing a lot of complications and many moving pieces. The aim of this conference is "To not get lost in the digitalisation buzz and forget about the end value." industry leaders and pioneers will present on the human-centered steps to smart digitalisation. ⚒

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

#553

Champion: Patrick Coffey, VRT Systems

Haystack Reference Implementation

The Reference Model Working Group has released the document "Implementing Project Haystack: Applying Haystack Tagging for a Sample Building." This Working Group launched in late October 2017 and completed its goal by releasing this document publically in late February. John Petze contributed an initial document that showed the application of Haystack tagging to a sample project with 1 Site, 1 Equipment, and 1 Point associated with that equipment. Patrick Coffey took over as Champion and the work built momentum from there. This new resource takes the reader through the application of Haystack tagging for a sample project and includes a link to a highly developed tagging example for comprehensive application of Haystack. It covers the following building systems: AHU, FCU, VAV, Chiller, Cooling Tower, Boiler, Fan, Pump, Electric, Gas, and Domestic Hot Water. Already people are reporting that it is of great benefit to those just getting started with Haystack semantic modeling. ⌘

#551

Champion: Brian Frank, SkyFoundry

Haystack Type System

Haystack Working Group 551 has been active for about seven months to redesign how Haystack tags are defined and used to build data models. This effort will produce more flexibility to formalize how tags are combined and applied to data models. This will provide more precise semantics in models built with Haystack tags and enable more advanced tooling. We also hope to standardize how Haystack can be used with RDF technologies which are commonly used for ontologies outside of the IoT space. During this process we have begun collaboration with BACnet AP working group and also the team responsible for Brick. ⌘

Project Sandstar

#595

Champion:
Alper Uzmezler,
Anka Labs

Project Sandstar will change how we think about DDC. Ancient navigators of desert terrain used the stars to get them to where they wanted to go. We have Haystack tags to make that connection between cloud and edge. With the right tag attributions, we can sync up - or metamorph - data models whereever they reside. Put another way, we are working to solve the issue of proprietary kits for IO in this era of mobile Apps and inexpensive microprocessors. By integrating the Sandstar engine, Haystack and the Sedona BMS framework into a seamless whole, Project Sandstar will achieve hardware-independence, historical data-based control logic, and driver abstraction via the Haystack methodology. Our group is working to improve Haystack ops such that Sedona components can be created, changed, deleted and linked. It is paving the way for artificial intelligence to be utilized to generate and improve upon human-generated DDC code. You can learn a lot more about Project Sandstar by watching my demo as presented on ControlTalkNow.

Air Handling Units

#609

Champion:
Jay Heron

Our working group is interested in recruiting new members to gather a larger pool of industry expertise on our proposals. We currently have one proposal, covering the addition of heat recovery system tagging to AHUs.

Updates to Haystack+ Driver and Licensing

by Larry Andriunas, President of Kodaro, LLC

Kodaro is now offering two Haystack+ driver options with the basic functionality free to all users.

Since our last update to the Haystack community in the Fall and as a direct result of user feedback, we have made some changes to our Haystack+ driver licensing model. First and foremost, the basic driver is now free.

We began development on the Haystack+ driver last year because we needed N4 tagging to be truly supported by the Haystack protocol for accessing tags. Our analytics team was working on database integrations as part of our SkySpark, machine learning and custom analytics projects on N4 systems. We were working with nHaystack on AX systems and needed something that would do the same for our projects on systems using the new N4 framework.

Our Niagara developers worked tirelessly to add advanced functionality to the driver so that it not only established connection between the Haystack Rest API, Niagara 4 and other platforms like SkySpark, but took it a step further to make sync bi-directional and on-demand. We now include the Haystack+ driver as part of our new analytics package onPoint, and we sell the advanced features as a Haystack+ license.

Upon initial release, it was clear from the community that while the advanced features are essential time savers for experienced master systems integrators and complex analytics projects, they are a step beyond the immediate need for the Haystack protocol to apply to Niagara 4 databases. So we've separated the two driver options and are offering the Haystack+ driver with the basic functionality free to all users.

The free driver is available for download from our website, Kodaro.com, now and is fully supported on our community forum at community.kodaro.com. If at a later time you need the advanced bi-directional tagging functionality, you can purchase the license from one of our distributors and unlock the advanced features from the existing driver you'll have operating in your system. No additional download or install is needed for the advanced functions. ⚓

Larry Andriunas leads Kodaro's growing team developing software to unlock building data for improved occupant comfort, increased operational efficiency, and reduced energy costs.

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.

Wiki — Haystack Wiki: Source for docs, and tag definitions.

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

Niagara — NHaystack: Niagara module to add Haystack tagging and REST API

C++ — Haystack CPP: C++ Haystack client and server implementation

DART — Haystack DART: Client library for Dart programming language

Node — Node Haystack: node.js client/server implementation

Python — pyHaystack: Python client implementation

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

Download — NEW 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.

STACKHUB
The online repository for SkySpark, FinStack, & SkyArc products

UPLOAD   **SHARE**   **SELL**

- Upload Axon scripts, pod files, AX modules, or data files
- Share them publicly with everyone, or privately with selected organisations
- Sell them online, and protect your Intellectual Property with our unique licensing options

https://stackhub.org

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memoori

SMART BUILDINGS

Occupancy Analytics and In-Building Location Based Services 2017 to 2022

COMMERCIAL OFFICE SPACE

Published: Q1 2018

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.

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

KMC Controls
@kmccontrols

KMC filmed a KMC Commander install and IoT retrofit at a clinic in Michigan. Check it out. https://www.youtube.com/watch?v=XbDo6uF8gk

IOT RETROFIT: BALDWIN CLINIC

Watch a fast school zoning retrofit.

Conserve It
@Conserve_It

One of Dubai's largest shopping centres has dramatically reduced the energy consumption of its enormous chilled water plant by implementing PlantPRO. Within just six months energy savings of 4.9% have been achieved....

Smart pump control & ongoing monitoring translate to big savings.

Project Haystack
@haystackTagging

This year's Smart Buildings Best Practice Showcase at #Realcomm #IBcon features case study from Haystack Member Intel...

Breaking Data Silos with Project Haystack

Intel achieves significant ROI by unifying building operations data on one platform through tagging.

BUENO Systems
@buenosystems

BUENO's involvement with a predictive building maintenance program has resulted in cost & time savings at 222 Exhibition Street. ow.ly/5lzh30jCwz

Office tower realizes a 68% reduction in service calls about temperature and noise.

Lynxspring, Inc.
@lynxspring

A good look into Smart Enterprise #Energy Management for Retailers. Lynxspring technology and services in action: https://www.lynxspring.com

CASE HISTORY
SMART ENTERPRISE ENERGY MANAGEMENT FOR RETAILERS

Large telecommunications and wireless provider deploys smartbuilding technology across North American retail operations.

Project Haystack
@haystackTagging

UofUtah medical building is one of first to deploy State of Utah DFCM's #HighPerformanceBuilding Standard including #ProjectHaystack #metadata tagging. Wins @ENRnews award …

FARMINGTON HEALTH CENTER

University of Utah Healthcare Farmington Health Center has been named Engineering News Record Magazine's Best of the Best Healthcare Project for 2017.

Practices

Controlco
@Controlco_USA

Want more on the OT Network? Download our e-book for the top three benefits and tips for establishing your own #OTNetwork #SecureIoT #freeebook

Operational technology and a new building system architecture can help you stand out in a crowd of mechanical contractors while also helping support repeat business.

THE NEW building system architecture

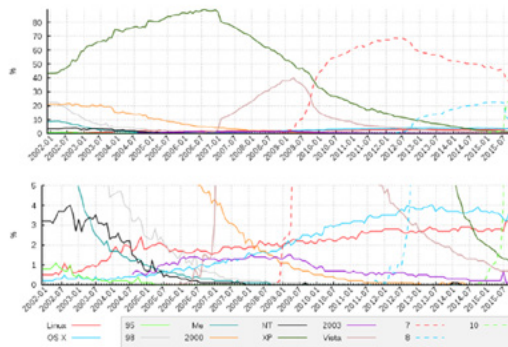**LEARN HOW IN OUR E-BOOK "THE NEW BUILDING SYSTEM ARCHITECTURE"**

DOWNLOAD

How operational technology can help mechanical contractors retain customers and compete in the world of IoT buildings.

IoT For All @iotforall

Why do you still find old Windows XP running in #Buildings? #FacilitiesManagement is an Old, $1T Industry that is finally being transformed by #IoT.

Matt Ernst, Commissioning Engineer believes that the digital infrastructure of building systems and our effective use of data can be 10x better than what it is today.

A User Experience (UX) designer weighs in on the challenges of getting the human interface for connected products right. She points out that it takes holistic design, and "At the most basic level, it's important to give the same features the same name across all interfaces."

Claire Rowland
@clurr

New post for @method_inc. on #UX #IoT design. Design for failure, business models, connectivity patterns, interusability and experience prototyping..

5 questions for connected product UX – Method Perspectives – Medi...
By Claire Rowland, Interaction Design Director, Method

Products

FIN Products
@finproducts

Did you know there are lots of cool gauges in FIN's Graphics Builder? Check out this recent update to learn all about them in our docs: http://bit.ly/2pIOH

FINtastic quick tips
[Doc update: Gauges]

J2 Innovations is now a part of Siemens Building Technologies, expanding its ability to deliver customized, cloud-ready applications with tools like this FIN Graphics Builder.

Legrand ✔
@Legrand

BRING OBJECTS TO LIFE
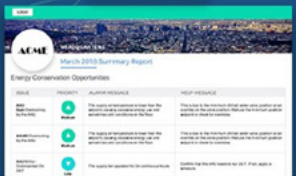Discover the Eliot program for a connected future Including Innovative energy management solutions for buildings -https://www.legrand.com/en/group/eliot-legrands-connected-objects-program …

Promotion of interoperability is part of ELIOT's approach to IoT.

KODARO **Kodaro Software**
Make data make sense @KodaroSoftware

Official launch of onPoint building analytics. Read all about it: http://markets.businessinsider.com/

Announcing onPoint
building analytics built for action

READ MORE

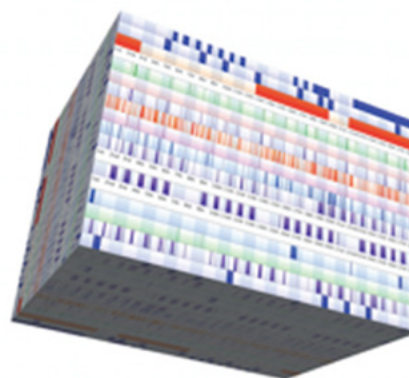*New building analytics platform that prioritizes action over alerts.*
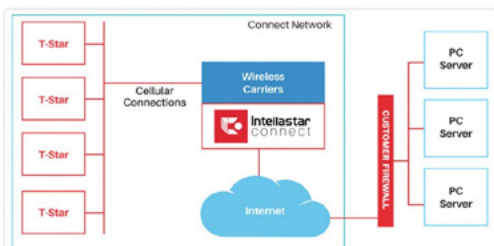
Tipify features a fully distributed architecture with T-Star edge devices, Tipify servers and Connect Cellular Data Services.

SkyFoundry's new Machine Learning Tools provide support for supervised learning for prediction and forecasting. Learn more at a SkyPosium this Fall.

Ad Directory

Project Haystack connections

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 autmotion products and sensors from leading international suppliers worldwide. Conserve It provides a range of unique products and services in this area.
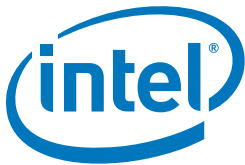
Intel has been leading the pursuit of Moore's Law for its entire existence. We have continuously advanced silicon technology and moved the capabilities of the industry forward. Today, the unmatched scope and scale of our investments in R&D and manufacturing ensure Intel continues to maintain industry 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.

Arup is an independent firm of designers, planners, engineers, consultants and technical specialists offering a broad range of professional services. Through their work, they make a positive difference in the world, highlighting their mission statement 'We shape a better world.' Investing heavily in research and development is important to Arup as it informs its approach to projects, and keeps it focused on future-proofing its designs and best practices.

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.

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.

Connexx Energy is a recognized leader and implementer of 'last mile' energy solutions for Smart Grid and Smart Buildings and is the developer of Connexxion, a versatile, secured Enterprise Energy Intelligence and Management platform for facility, energy, and business operational information. Connexxion streamlines the secure integration and creation of smart energy data into the corporate business intelligence layer. It enables users to simply and efficiently deploy intelligent energy practices to make real-time decisions and data driven calculations about the ongoing energy and operational performance of any building.

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.

Project Haystack

www.project-haystack.org