EMIS STACK

Integration   Historian   Applications   Control

An EMIS stack comprises interconnected components, including integration drivers that transfer data to and from the EMIS scope, a historian that stores time series data in a database, applications that subscribe to the time series data and provide capabilities for the user, and controls that work with applications and provide feedback or execute supervisory control actions. *Illustration by James Dice and Fred Zietz, NREL.*
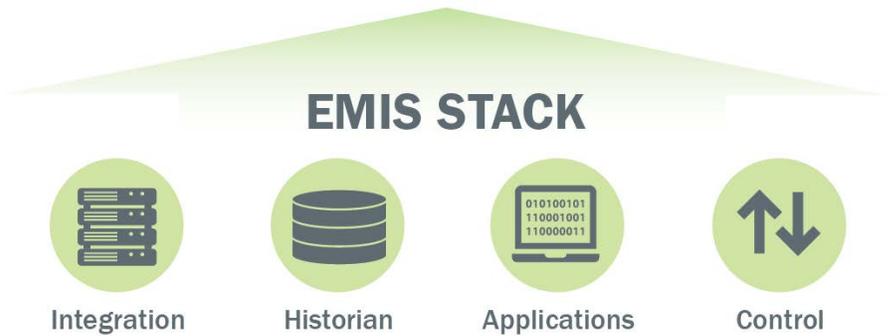
Best Practices for Energy Management Information Systems Metadata Schemas

The Federal Energy Management Program (FEMP) promotes best practices for impactful utilization of Energy Management Information Systems (EMIS) at federal facilities. This best practice document is part of a series of fact sheets created to help accelerate the market adoption and use of EMIS in the federal sector. The use of standard naming conventions and a metadata schema, which may be referred to as 'data tags,' improves the ability of the EMIS to consistently analyze, visualize, and derive value from operational data.

Common Data Point Issues

Common point naming, tagging, and metadata schema issues include, but are not limited to, the following:

- Lack of standardization in building automation system (BAS) and advanced metering infrastructure (AMI) point naming across facilities

- Lack of quality assurance to ensure BAS or AMI points are correctly labeled and spelled, and point names include all necessary information prior to EMIS integration

- A need for consistency in enumerations and value mapping for digital points in the BAS (e.g., 0=closed, 1=open versus 0=open, 1=closed)

- Lack of visibility in setpoints or control parameters when they are embedded in code rather than exposed via standard variables in the BAS (e.g., BACnet analog values)

- Lack of standardization in AMI and BAS data units, incorrect units or scaling, or missing unit information

- EMIS provider use of proprietary point naming and tagging conventions, which can hinder data transfer or sharing between multiple EMIS solutions.

To help address these issues, this fact sheet highlights best practices for use of metadata in an EMIS stack, which can significantly reduce the initial time required to deploy an EMIS. For further detail on the benefits and use of EMIS at federal facilities, see FEMP's *Energy Management Information Systems Technical Resources Report*.

EMIS Stack and Metadata Best Practices

Implementing the following best practices prior to deploying an EMIS can help ensure that metadata is accurate and EMIS stack components are deployed as quickly and successfully as possible.

Load-Balancing Capabilities Are Important for Integration

The integration components of the EMIS stack manage communications between the scope systems and the historian, including translation between protocols. Communication is dependent on the responsiveness of the systems and the quality of the building's communication networks. Many BAS local area networks are not designed for heavy data acquisition, meaning large or frequent data requests can compromise local BAS controllers' ability to perform basic control functions. Therefore, as a best practice, integration should include either a load-balancing capability that restricts network traffic as needed to preserve performance across the EMIS scope (AMI, BAS, and so on), or the system should be set up to synchronize trend logs in batches instead of constantly polling for new values, to cut down on network traffic.

A Well-Functioning Historian Requires Accurate, Organized Metadata

The historian stores time series data and associated metadata in one or more databases and provides data on request to applications. The value of accurate, well-organized metadata cannot be overstated. Incorrect metadata can directly affect accuracy in the interpretation of measured values, cascade into incorrect operation of upstream EMIS applications, or create confusion in identifying the correct system or equipment for calibration or repair.

Deploy a Standardized BAS and AMI Point Naming/Data Model

Systematic metadata naming and tagging—from point to equipment and then to integration with automatic fault detection and diagnostics—is critical to a well-functioning stack. Similar to the Transmission Control Protocol/Internet Protocol used for the modern internet and business networks, a BAS network requires extensive planning and maintenance. Standardized device identification, network and point naming, trunk size, and enumerations should be applied to all BAS points. Some modern BAS also allow for metadata tags to be applied directly in the BAS.

Agencies should ensure the underlying systems connecting to the EMIS, such as the BAS and AMI, have gone through a standardized naming/tagging practice prior to installing the integration drivers and building the EMIS historian. This standardization should be adopted across the entire portfolio and in all projects, including new construction or retro-commissioning work.[1]

All setpoints and control parameters should be exposed in the BAS as variables for remote monitoring in the EMIS. When there is no tag or name for a certain type of point, it is important to document any customizations. As users develop naming standards, they should include human- and machine-readable point names, standard equipment types, required points, and metadata schema.

Utilize a Standardized Point Tagging and Metadata Model in the EMIS

A standardized BAS and AMI point naming and enumeration process significantly reduces the time to import data via the integration driver and structure data in the historian database. Standardized BAS and AMI point names often enable the automatic application of tags via the EMIS software.

The EMIS provider and agency should identify an agreed-upon metadata schema that they want to use at the beginning of the project, including a data dictionary for all terms used in the schema and a data taxonomy with categories and subcategories for the defined terms.

The specific version of the metadata schema should be noted, as well as whether the schema is an adaptation or extension of another existing schema. The technology provider is required to provide appropriate metadata for all data integrated with the EMIS in alignment with the schema or tagging system selected for the project.

For the metadata model, the agency and EMIS provider should consider using Project Haystack,[2] an open-source initiative using a semantic model to streamline work with BAS, AMI, or Internet-of-Things data. If using Project Haystack, it is important to keep naming and tagging up to date with the most recent version of Project Haystack.

Project Haystack is not the only way to tag systems—BrickSchema[3] and ASHRAE Standard 223P, Designation and Classification of Semantic Tags for Building Data, are being developed to help standardize the naming and tagging process. Regardless of the BAS point names and EMIS tags applied (e.g., Haystack tags), the name and tag should fully disambiguate the point from all other possibilities—within an EMIS, no two points should have identical tags.

Use Machine Learning Algorithms to Automatically Apply Point Names and Tags

EMIS software providers are also beginning to integrate machine learning algorithms that can help to automate the process of naming and tagging data points in the historian. After scanning the points and pulling data into the EMIS, machine learning can then name and tag the points based on certain parameters with limited human input. Applying machine learning algorithms to automate portions of the point naming tagging process, combined with the other best practices outlined in this fact sheet, can significantly reduce EMIS installation costs, improve overall EMIS functionality, and allow for seamless data transfer across EMIS vendors and platforms.

Learn More About EMIS

Download the Energy Management Information Systems Technical Resources Report at energy.gov/eere/femp/articles/energy-management-information-systems-technical-resources-report.

For questions about EMIS, email Jason Koman at Jason.Koman@ee.doe.gov and Jefferey Murrell at Jefferey.Murrell@ee.doe.gov. ∎
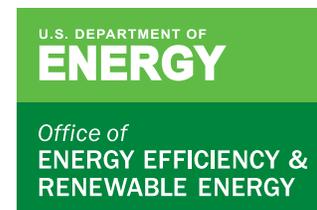
> Implementing building communication network and metadata best practices prior to deploying an EMIS can help ensure that metadata is accurate and EMIS stack components can operate successfully.

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[1] The U.S. General Services Administration (GSA) GSA Data Normalization for Building Automation Systems document established standardized requirements for BAS point naming, implemented Project Haystack tagging requirements, and clarified the fields required for matching assets to BAS equipment across the GSA portfolio: https://imlive.s3.amazonaws.com/Federal%20Government/ID2250425023170724085084882623431 72231156/Exhibit_B.pdf.

[2] https://project-haystack.org/

[3] https://brickschema.org