Abstraction puts the ‘unified’ in Unified Namespace

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The Unified Namespace (UNS) architecture pattern has proven to be an effective means to opening industrial data access up to the entire business, but the road to implementation is not without a few speed bumps.

First, as industrial companies start to establish their hierarchy and build their UNS, they may find it difficult to get their data to follow their own rules. By its nature, UNS architecture draws from a multitude of different data sources, most of which present data in unique formats. Even superficially similar assets can format the data they generate in completely unique ways, and differences in data generated by wholly different machines, systems, and PLCs are even more stark. To limit problems in creating and operating a UNS, some industrial companies simply publish data from each system and device directly to an MQTT broker in their own topic namespace. This practice is not truly a UNS, and it offers little of the data accessibility and usability promised by this architectural pattern.

Second, the UNS topic space typically follows the hierarchy: Site, Area, Line, Zone, Cell, and Asset. At each level, the information may include data from multiple systems including PLCs, SCADA, MES, CMMS, QMS, ERP, etc. On the consuming side, many users have unique needs that the UNS alone may not be able to meet.

These challenges are what make consistent, easily scalable abstraction a critical part of your UNS.

At HighByte, we define a UNS as a consolidated, abstracted structure by which all business applications can consume real-time industrial data in a consistent manner. Today, we want to focus on the ‘abstracted’ portion of that definition and how the Intelligence Hub acts as an abstraction layer to prepare any data for all UNS users.

The importance of robust abstraction

One could say that abstraction is responsible for the “unified” part of “Unified Namespace.” The UNS’ abstraction layer ensures that data fits the UNS’ naming convention and hierarchy instead of the underlying sources of the data. That means labeling individual values, combining data from multiple systems, and placing the data in the correct hierarchical position. Within each tier of UNS hierarchy, datasets must be assembled, contextualized, and standardized according to the UNS’ semantics.

Abstraction often comes back into play on the data consumer side as well. Some systems simply do not have the ability to consume data presented according to your UNS’ defined semantics, so data must be reformatted according to consumer needs on a case-by-case basis. Subscriber-side abstraction can recontextualize data after the data has been requested, altering the payload from the UNS’ semantic format to whatever the consuming system requires.

The role of HighByte Intelligence Hub

The Intelligence Hub has the complete toolkit needed to contextualize data to and from your UNS. From the moment the data is generated at the source, the Intelligence Hub adds the proper context to meet the

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UNS' semantic requirements, whatever they may be. Once the data has been requested, the Intelligence Hub comes into play again, recontextualizing the requested data on behalf of the subscribed system to ensure the data can be consumed.

In the Intelligence Hub, contextualization usually begins with Conditions. Conditioning allows users to prepare data for modeling by resolving fine-point transformations. This is where minor changes can be dealt with, such as setting the right resolution and cadence or summarizing constant data flows into usable datasets. Conditions' aggregate feature can summarize or calculate values for raw data streams, ensuring the data resolution fits the application. The deadband feature can set minimum change filters to prevent logging and reporting insignificant changes. Using the array of custom conditions, users can refine and transform their data to perfectly fit the necessary format—in this case, UNS requirements.

After passing through Conditions, data is ready to be fully defined and structured according to the needs of the UNS using the Models feature. HighByte Intelligence Hub models can be built to standardize datasets to fit the standards outlined by the UNS, ordering the datasets, applying context that adds logical names and units of measure, and combining data from multiple sources. From there, the models can be templatized and extended to similar assets for rapid, scalable onboarding.

When data streams are requested from the UNS, the Intelligence Hub again acts as an abstraction layer, recontextualizing the data to fit whatever the consuming system needs. While many consuming systems will have no problem ingesting the consistent UNS format, others have unique requirements, especially solutions that are not specifically designed for the industrial market. Using the same modeling capabilities that puts data into the UNS format, the Intelligence Hub can be used to generate unique models for specific systems, ensuring that data is ready for use, no matter the consuming system.

Finally, models can be used to create curated payloads, combining multiple datasets from different layers to deliver the exact dataset users need for their applications. You can read more about using Intelligence Hub to create complex payloads in this post.

Wrap Up

A fully-fledged UNS delivers simple, straightforward, and logically organized data access in a browsable hierarchical structure. Publishing data system-by-system into an MQTT broker does not make a UNS and will not solve your data access problems. To unlock this architectural pattern's true value, you need to surround it with the right tools and practices. The Intelligence Hub provides the abstraction capabilities needed to maintain the integrity of the UNS, while creating enough flexibility to meet the diverse needs of the industrial data infrastructure.

If you're ready to see what HighByte Intelligence Hub can do firsthand, join our free trial program. Gain access to the latest release, product resources, and a HighByte team member to help guide you through your evaluation.

About HighByte

HighByte is an industrial software company founded in 2018 with headquarters in Portland, Maine USA. The company builds solutions that address the data architecture and integration challenges created by Industry 4.0. HighByte Intelligence Hub, the company's award-winning Industrial DataOps software, provides modeled, ready-to-use data to the Cloud using a codeless interface to speed integration time and accelerate analytics. The Intelligence Hub has been deployed in more than a dozen countries by some of the world's most innovative companies spanning a wide range of vertical markets, including food and beverage, health sciences, pulp and paper, industrial products, consumer goods, and energy. Learn more at https://highbyte.com.

About the Author

John Harrington is the Chief Product Officer of HighByte, focused on product management, customer and partner success, and company strategy. His areas of responsibility include market research, customer use cases, product priorities, go-to-market, and financial planning.

John is passionate about delivering technology that improves productivity and safety in manufacturing and industrial environments. He has spent his 25-year career both delivering software to manufacturers and working for manufacturers in operations roles. This experience has given him a unique perspective on how suppliers and end users each play an integral role in implementing new technology solutions.

John has a Master of Business Administration from Babson College and a Bachelor of Science in Mechanical Engineering from Worcester Polytechnic Institute.

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