

What is Unified Namespace (UNS)?

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- What are the benefits of UNS?
- How does it differ from traditional industrial architectures?

What is Unified Namespace (UNS)?

A Unified Namespace, commonly referred to as UNS, is an architectural approach designed to simplify access to, maintenance of, and administration of data from all machines and systems within an organization. The goal is to establish a consistent naming structure for all data sources and publish them in a central location.

This approach makes data available to all resources, applications, and systems that need it, without creating direct point-to-point connections between each system and each data source. By decoupling data producers from data consumers, UNS provides a central overview of all available data and makes it significantly easier for users to find, understand, and use the right information.

The reason UNS has become increasingly important in recent years is the strong focus on Industry 4.0 and the Industrial Internet of Things (IIoT). These initiatives aim to compare and analyze data across the entire organization, which introduces new challenges; particularly with real-time production data that historically was not shared beyond its immediate use case. As a result, data was often named and structured in ways that made sense locally, but not to other systems or stakeholders.

When building a Unified Namespace, it is essential that the structure is intuitive and reflects the organization's real-world structure as closely as possible. This includes both high-level enterprise systems such as ERP, EAM, and SCM, as well as shop-floor systems like MES, HMI/SCADA, and CMMS. In addition, organizational events can be included—for example, when a batch is completed or when new raw materials arrive and are registered. By doing this, the UNS effectively becomes a digital twin which represents the total real-time state of the organization.

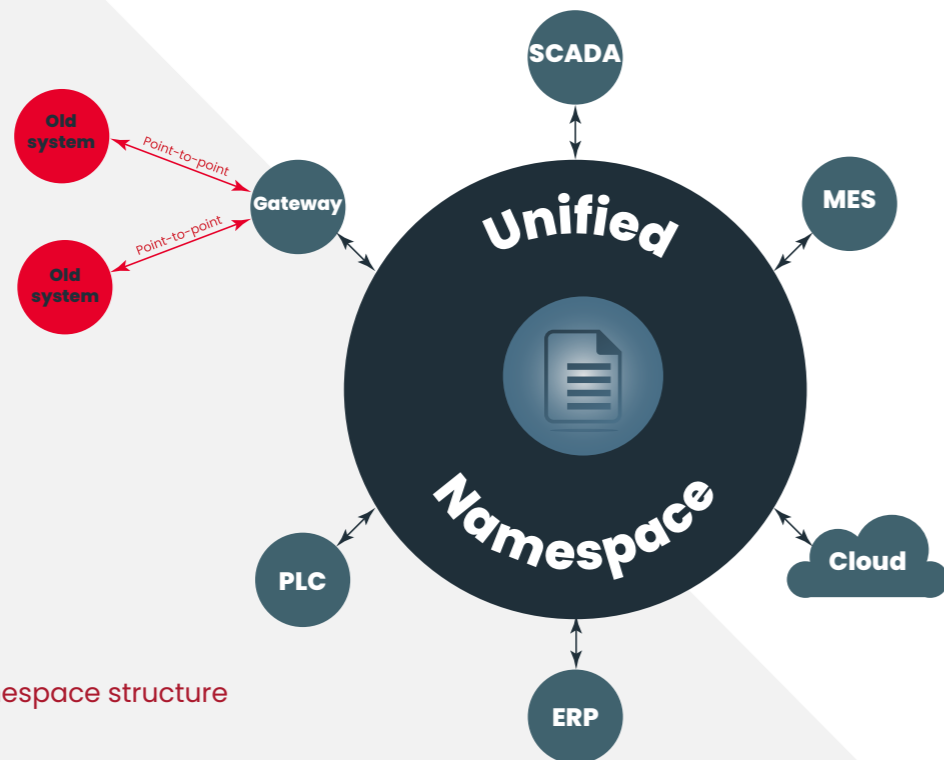
How does a Unified Namespace work?

The backbone of a Unified Namespace is a standardized IIoT protocol, most commonly MQTT, which enables all systems to communicate with each other in an effective way. All data is published to a central location, and events are categorized in a logical structure based on context and function.

Systems that are not natively IIoT-enabled can be connected through intermediary solutions that collect, structure, and publish data via MQTT. From this central hub, systems can subscribe only to the information that is relevant to them and receive updates whenever new data or events occur.

This creates a single data source for all systems. Existing point-to-point integrations with legacy systems can remain in place initially, but over time they can be replaced with modern, IIoT-compatible solutions. In this way, the digitalization process gradually accelerates, resulting in a smart ecosystem of systems that both publish and consume data.

With a well-designed network infrastructure, people, systems, and other stakeholders can gain direct access to relevant information regardless of location or function. This makes it easier to search for information, troubleshoot issues as they arise, and even anticipate unwanted conditions. Such an architecture is particularly well suited for AI and machine learning initiatives, which rely heavily on large volumes of accessible, well-structured data to identify patterns and correlations.



A Unified Namespace structure

Benefits of a Unified Namespace

- ## 1 Scalability

Publishing and consuming information through a central hub enables rapid connection of systems across the organization. Once data is published, there are no additional costs associated with new subscribers—unlike point-to-point architectures. Data only needs to be published once, regardless of how many consumers exist, which significantly reduces the load on individual systems.
- ## 2 Easier maintenance

Systems become easier and more cost-effective to maintain since they all connect to the UNS in the same way. The reliance on custom-built and vendor-specific interfaces is reduced, which in turn lowers the effort required when these systems change or evolve.
- ## 3 Simplified integration

Any system that publishes or consumes data becomes part of the organization's data ecosystem simply by connecting to the network. This eliminates the need for complex, custom integrations that are traditionally required to exchange data between different operational levels, resulting in lower integration costs.
- ## 4 Increased flexibility

Access to real-time information enables faster and more informed decision-making. This makes the organization more adaptable to both internal and external changes, an increasingly important capability, especially in the aftermath of disruptions such as those caused by the COVID-19 pandemic.

Why is UNS so important today?

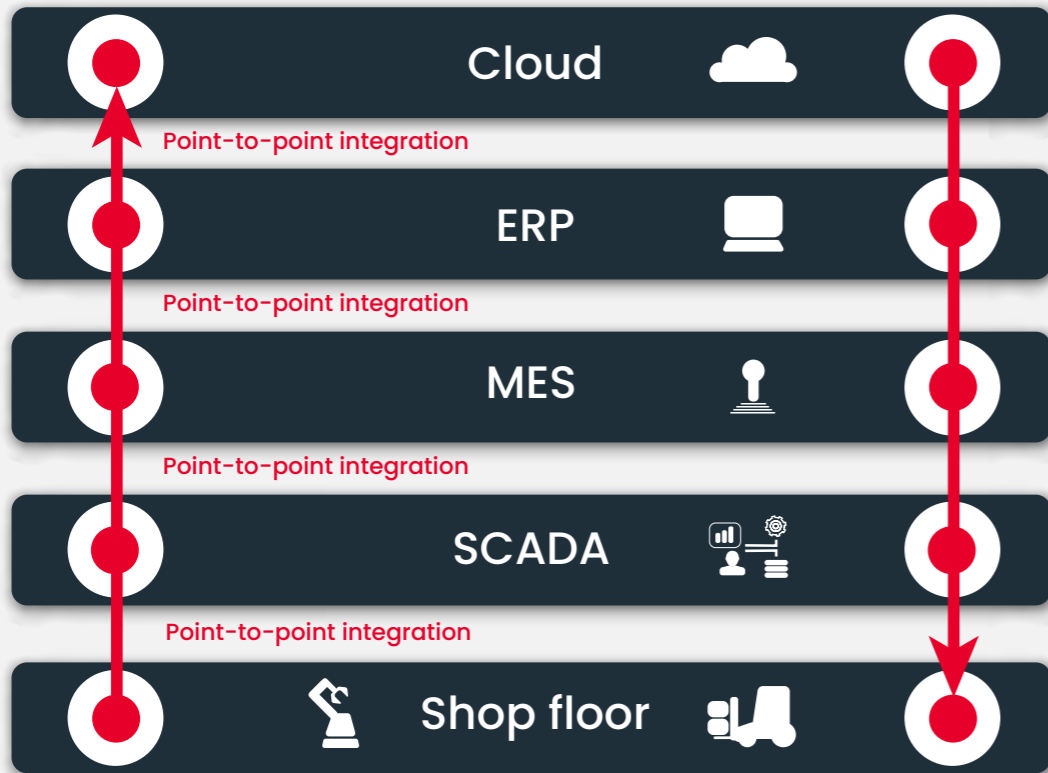
The cost of maintaining and administering systems increases with the number of connected clients. For this reason, the number of connection points must be kept low and administration centralized. In a Unified Namespace, each integration is done once, making it far more efficient in an environment where new initiatives constantly emerge and multiple stakeholders demand access to “their” data.

To fully understand the importance of UNS, it is useful to look back at the traditional industrial architecture that emerged in the 1990s and is still widely used today. Most existing systems are modeled according to a pyramid-shaped structure, where each factory is treated as a separate island.

Technically, this model divides systems into hierarchical layers, with cloud environments at the top and PLCs at the bottom. Each layer is connected through point-to-point integrations and is only allowed to communicate with the layer directly above or below it.

As data moves up through the layers of the pyramid, it is typically filtered, aggregated, or transformed to fit the needs and limitations of the receiving system. This means that only a subset of the original data is passed on, and contextual details are often lost along the way. Access to raw, high-resolution production data is therefore restricted, and making changes or adding new data consumers usually requires significant engineering effort and custom integrations.

While this architecture worked well when PC-based control systems and enterprise integration were first introduced, it requires data to be aggregated and simplified at each layer. As a result, it is poorly suited to today’s dynamic organizations and often leads to data loss or inaccessible information. Missing data negatively impacts data-driven decision-making and forces organizations to rely on intuition rather than facts.



Traditional architecture

What is the difference between UNS and the traditional model?

A practical example

A large plywood manufacturer wants to investigate whether predictive maintenance could be implemented for a veneer knife. The analysis relies on existing pressure, speed, and vibration sensors in the production line. To perform the analysis, time-series sensor data must be combined with downtime, quality, and maintenance data.

These four types of data are stored in four different systems. Using a traditional architecture, it can take approximately ten weeks for an external consultant to collect, synchronize, and normalize the data across all systems.

With a Unified Namespace, this process can be completed much faster, allowing the remaining project time to focus on the real challenge: building a model that determines the optimal time to replace the knife. This is just one of many industrial data analytics projects that share a common problem – a lack of accessible, well-structured data, which often causes projects to fail before real value can be created.



Want to learn more?

You should now have a general understanding of how a Unified Namespace works. If you would like further insights into how UNS can benefit your specific organization, you are very welcome to contact us.



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