

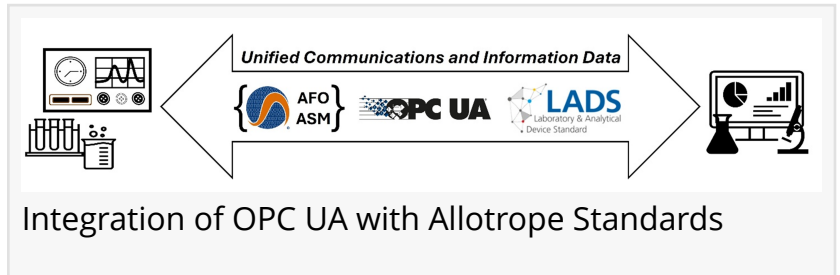
Breakthrough in Smarter Labs: Spectaris LADS Showcases Integration of OPC UA with Allotrope Standards

Now, communications and information data in the analytical lab are seamlessly interoperable

WASHINGTON, DC, UNITED STATES, May 20, 2025 /EINPresswire.com/ --

[Spectaris](#), [Allotrope Foundation](#) and

the [OPC Foundation](#) are proud to announce a major milestone in smarter labs by advancing semantic interoperability and structured data standards in laboratory environments: At the most recent, and now 8th hackathon, which took place on April 11, 2025 in Germany and once again featured various companies, from device manufacturers, software providers to even laboratory



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*Janet Cheetham, Chair,
Allotrope Foundation*

operators, a successful demonstration showcased the integration of Allotrope Foundation Ontologies (AFO) and the Allotrope Simple Model (ASM) into the OPC UA (Unified Architecture) framework.

The showcase was implemented by Dr. Matthias Arnold, CTO of the LADS OPC UA Joint Working Group, as part of the broader Spectaris initiative for networked laboratory equipment. The implementation demonstrated how AFO can be dynamically mapped into OPC UA nodesets and leveraged for generic or application-specific labeling of laboratory device data—offering a scalable, semantically

rich foundation for data management.

OPC UA is a modern Industrial Internet of Things (IIoT) architecture that enables secure, platform-independent communication and contextual data exchange across smart devices and systems.

“Communication and data standards for laboratory and analytical applications are two sides of the same coin: communication standards capture live data generated during experiments and result creation, while data standards document the results — along with critical context such as

who conducted the experiment, when, with what materials, and using which methods. Ideally, both should be built on shared definitions of entities and information elements,” said Dr. Matthias Arnold. “For the first time, the combination of OPC UA LADS and Allotrope Foundation framework enables seamless integration between communication and documented data. Ontologies like the AFO provide the conceptual foundation necessary to achieve true FAIR (Findable, Accessible, Interoperable, Reusable) data across laboratory environments.”

The success of this integration highlights the power of cross-organizational collaboration in driving digital transformation in the lab.

“The integration of Allotrope models into OPC UA represents a significant advancement for semantic interoperability in the lab,” said Stefan Hoppe, President of the OPC Foundation. “It allows end users to benefit from both open information models and an open, secure communication platform. This collaboration accelerates the journey toward harmonized and future-ready laboratory ecosystems.”

The Allotrope Simple Model (ASM) was also used to represent analytical results in two formats:

- As downloadable files via secure OPC UA file services
- As JSON objects embedded in the OPC UA, directly accessible via OPC UA clients

This approach maintains a direct linkage between each ASM element and its underlying AFO definition, enabling machine-readable semantics, traceability, and alignment with FAIR data principles.

“Open standards like Allotrope and OPC UA each play crucial roles in today’s laboratories—enhancing data quality and enabling seamless communication between systems. But as laboratory challenges grow more complex, true innovation demands interoperability across multiple standards. By federating these open standards, we unlock a scalable, semantically rich foundation for building the connected, digital lab of the future. This collaborative approach not only accelerates progress but also sets the stage for deeper, pre-competitive partnerships that drive industry-wide transformation” said Janet Cheetham, Chair, Allotrope Foundation.

This demonstration reflects the growing alignment between Allotrope Foundation and Spectaris over the past few years and highlights the practical value of harmonizing open standards across instrumentation, data modeling, and lab automation technologies.

Technical documentation and implementation artifacts will be made available to the broader community to encourage feedback, reuse, and future collaboration.

For more technical information please listen to the presentation from Dr. Matthias Arnold, AixEngineers here:

<https://opcfoundation-events.com/2025/05/01/opc-day-2025-international/#arnold>

For more information about the participating organizations, visit:

- Allotrope Foundation: <https://www.allotrope.org>
- Spectaris LADS – Networked Laboratory Equipment:
<https://www.spectaris.de/en/association/thespectarisindustries/networked-laboratory-equipment>
- OPC Foundation: <https://opcfoundation.org>

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