

OPC DAY FINLAND 2017

11.10.2017 #OPCUA #OPCDAYFINLAND #AUTOMATION #OPCDAY

Data Exchange in the Process Industry (DEXPI) group and OPC UA companion specification



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Nikolaos Papakonstantinou, VTT

Overview

- Challenge of interoperability
- ISO 15926 standard, Proteus schema for P&ID and 3D data
- DEXPI Group - Data Exchange in the Process Industry
- OPC UA DEXPI Companion specification
- Progress made



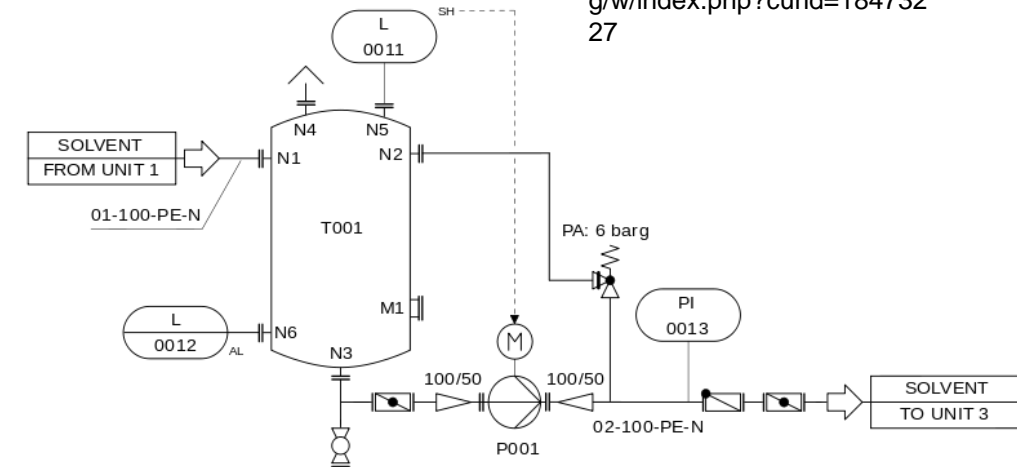
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Challenges...

- **Interoperability** between Computer Aided Engineering tools for Piping and Instrumentation Diagram (P&ID) development is very poor
- A business interest for vendors is to **restrict** their customers to their platform (**vendor lock-in**)
- **This lack of interoperability is problematic** for the adoption of new methods based on Industrial IoT and data driven innovation.

	T001	P001
SERVICE	STORAGE TANK	FEED PUMP
DATA	DIAMETER: 1000 mm HEIGHT: 3000 mm CAPACITY: 2.4 m3	FLOW RATE: 5 m3/h DIFF. PRESSURE: 2.5 bar
DESIGN PRESSURE	30 barg	30 barg
DESIGN TEMP	50 °C	50 °C

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ISO 15926 standard



- “ISO 15926 Integration of life-cycle data for process plants including oil and gas production facilities”
- Initiated, maintained and enhanced by the **POSC Caesar Association (PCA)**
 - “A non-profit global-standardization member organization that shall promote the development of open specifications to be used as standards for enabling the interoperability of data, software and related matters” (<https://www.posccaesar.org/>)



<https://www.posccaesar.org/>

Proteus XML schema for exchanging P&ID and 3D data



- Started its life with the name “**XMpLant**”, the schema was managed by Noumenon consulting ltd. Now the XMpLant tools belong to Nextspace
- “Proteus” Fiatech project
 - **“The goal (of the Proteus project) was to determine the business requirements for and define the ISO 15926 model to support the exchange of intelligent P&ID and 3D models between different vendor systems.”** (<http://fiatech.org/component/content/article/196-project-deliverables/project-deliverables-information-management/1115-proteus-project>)
- Now the schema is called “Proteus”, it is used by ISO 15926 and it is managed by the ISO 15926 Information Models and Proteus Mappings (IIMM) Fiatech project (<http://fiatech.org/information-management/projects/1161-iso-15926-information-models-and-proteus-mappings-iimm>)



<http://www.nextspace.co.nz>



<http://www.fiatech.org/>

Data Exchange in the Process Industry (DEXPI) group



- Objective: “to **develop and promote a general standard for the process industry covering all phases of the lifecycle of a (petro)chemical plant**” (<http://www.dexpi.org/>).



<http://www.dexpi.org/>

- DECHEMA ->
 - -> Processnet (DECHEMA initiative)
 - -> DEXPI (working party of ProcessNet)



<http://processnet.org/en/>

- “ProcessNet is a joint initiative of DECHEMA and VDI-GVC and bundles all activities in process engineering, chemical engineering and technical chemistry”
(<http://www.dechema.com/en/Chemical+Engineering+ +ProcessNet-p-122836.html>)



<https://dechema.de/en/>

- DECHEMA: “Founded in 1926, this is a non profit organisation based in Frankfurt. It has over 5000 chemists, biotechnologists, and engineers as personal members as well as other organisations and company members” (<https://en.wikipedia.org/wiki/DECHEMA>)

DEXPI Group members

Owner / Operator:

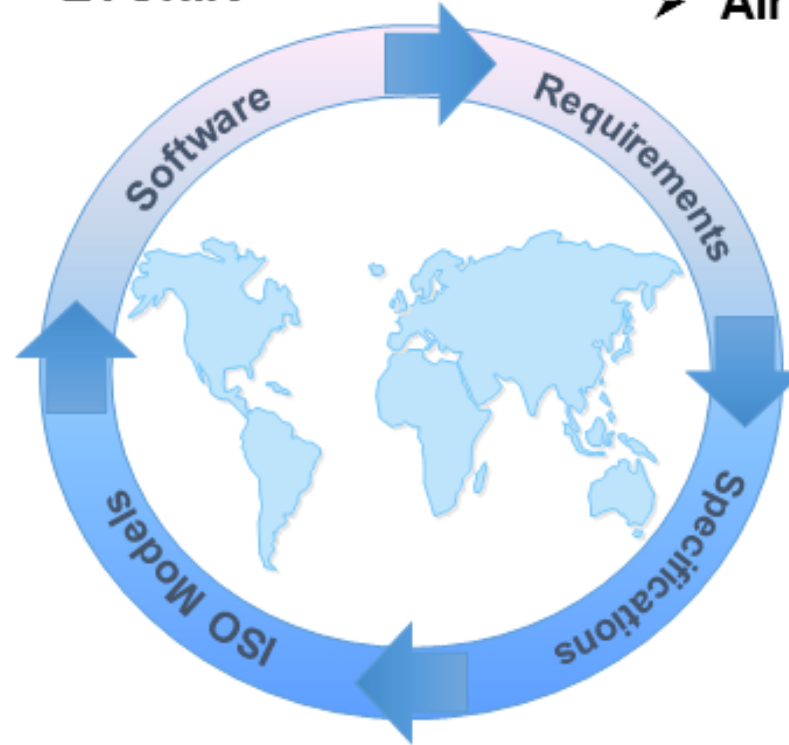
- BASF
- Bayer
- EVONIK

EPC:

- Air Liquide

CAE Vendors

- Autodesk
- Aveva
- Intergraph
- Siemens
- X-Visual
- eVision



Research

- AixCAPE
- VTT of Finland
- TU Berlin
- RWTH Aachen

ISO-Community

- FIATECH-IIMM (ISO 15926 Information Models and Proteus Mapping)
- Special Interest Group Instrumentation and Control

<http://www.dexpi.org/>

DEXPI Group - deliverables



- “The involved owner/operator companies from the DEXPI working group **will define a common data model which is based on the ISO 15926 standard.**
- **The CAE vendors will implement this common data model as the basis for data exchange and will deliver it as part of their default system configuration.**
- In addition, it is expected that CAE vendors agree on a **common exchange format** for the graphical representation of a P&ID and implement the result in their systems as well.”
(<http://www.dexpi.org/>)
- Latest specification: [“DEXPI Specification 1.2”](#)



P&ID Specification

Version: 1.2

Date: 2017-05-20

This specification is based on
Proteus P&ID Profile Schema 4.0.1 RC 2

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DEXPI Group – meetings between Owner/Operators and CAE vendors




- Every about 6 weeks there is a full day meeting in Frankfurt for extending the DEXPI specification, identifying **needed schema extensions** and **monitoring the progress of the CAE vendors**
- About twice a year there is a 2-3days “Hackathon” event, where **all vendors try to solve interoperability problems**.
- Owners/Operators are big enough to **motivate** CAE vendors. The interoperability progress is closely monitored.



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DEXPI Group – Test cases in GitHub



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This repository

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DEXPI / **TestCases**

Watch 10

★ Star 3

🍴 Fork 4

<> Code

🔔 Issues 5

🔗 Pull requests 0

📁 Projects 0

Insights ▾

📄 87 commits

🌿 2 branches

🏷️ 0 releases

👤 10 contributors

Branch: master ▾

New pull request

Find file

Clone or download ▾

 mthag fix readme md Latest commit 5Fa82Fd 10 days ago

 tests

Delete .I02V01.pptx

11 days ago

 tools/crawler

fix readme md

10 days ago

 README.md

clean up

2 months ago

 README.md

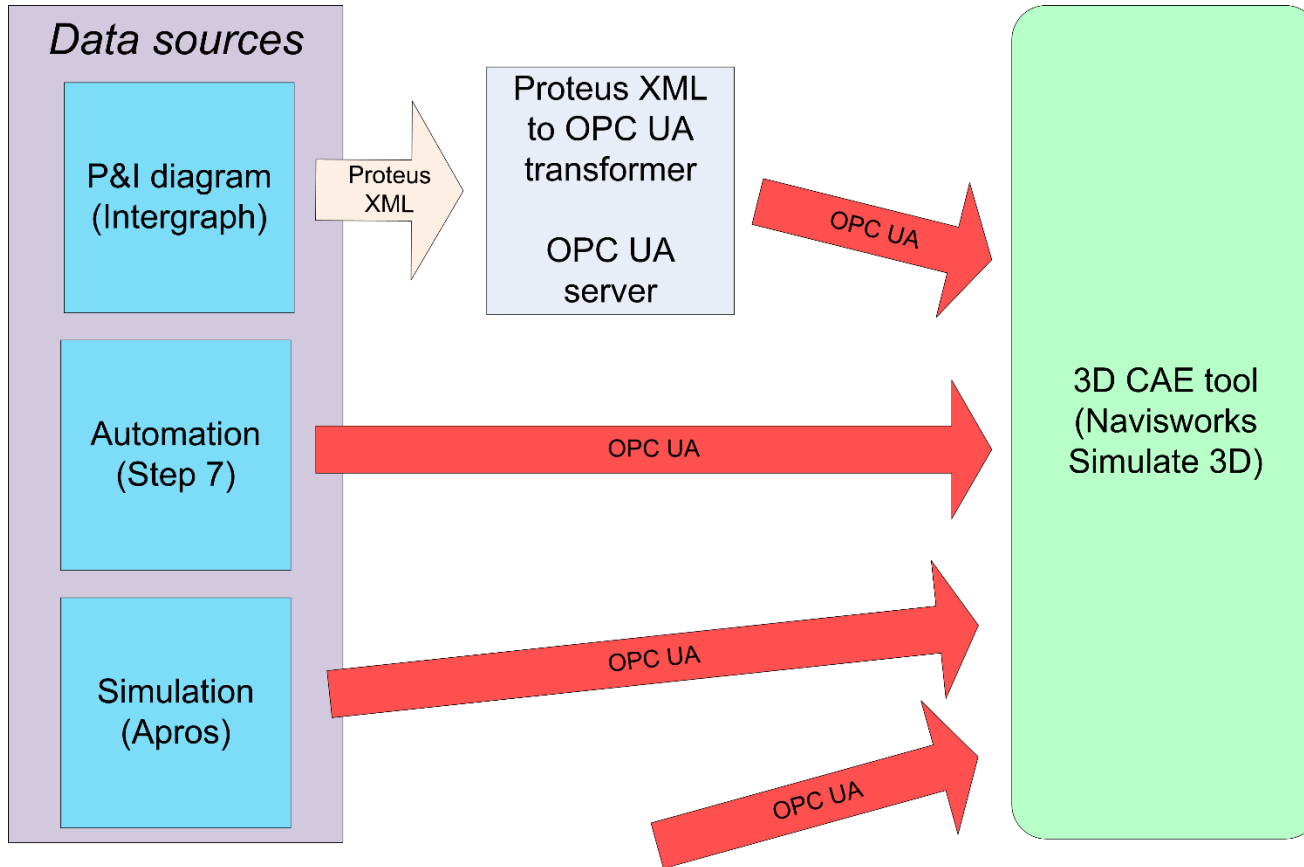
<https://github.com/DEXPI/TestCases>

Access P&ID data using Proteus XML over OPC UA, why?

- The goal of the DEXPI group is that its specification and the Proteus XML will enable the transfer of P&IDs between vendors
- A side-effect is that the P&ID data (a very important representation of industrial processes) are **free and open** to be used for other applications (e.g. data mining, interface with 3D models, process simulation)
- Standard access over OPC UA takes this openness to the next level, easy interface with industrial IoT frameworks



The big picture, data interoperability

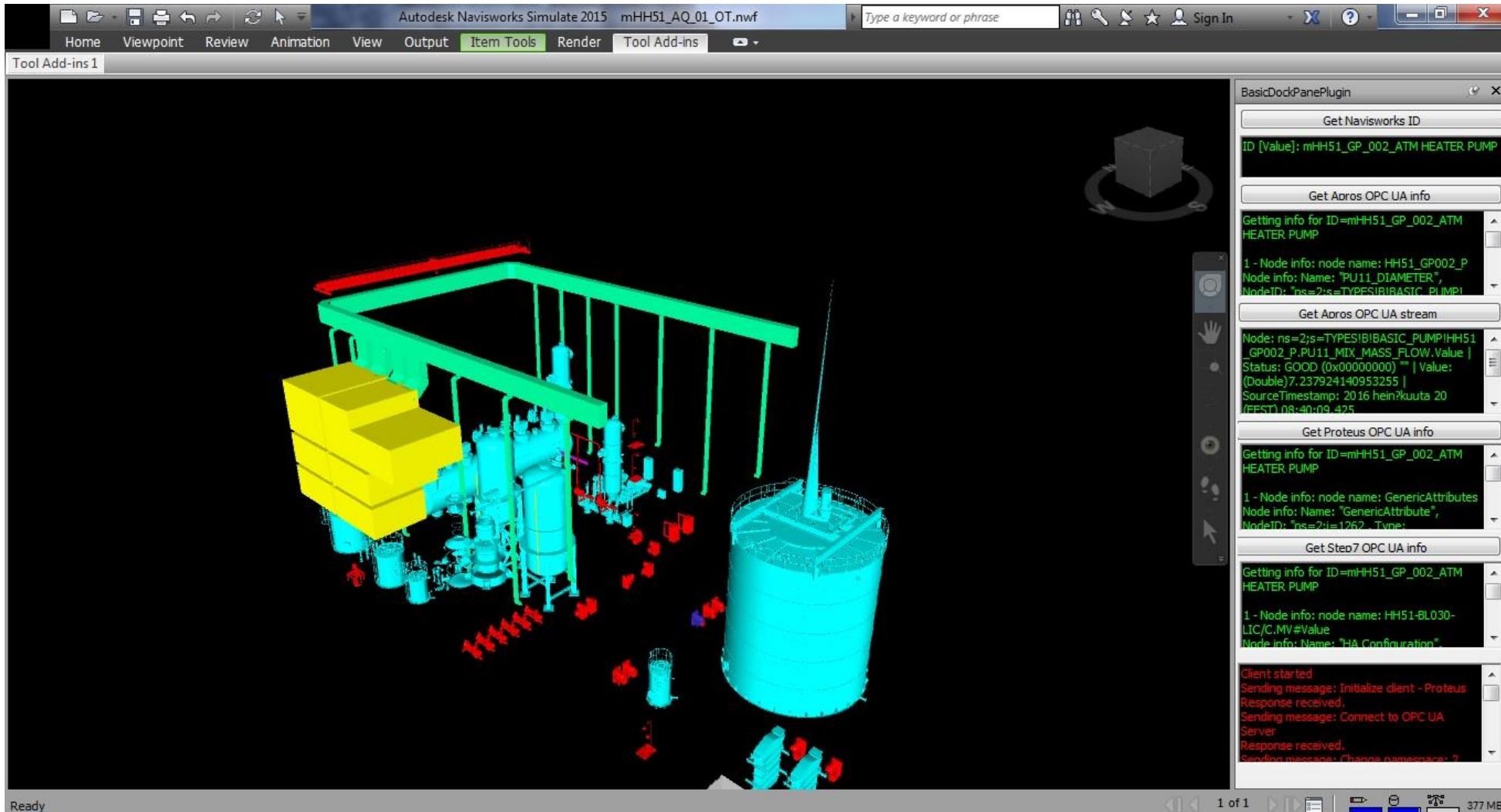


Additional data sources (not in the demo)

- * **UML models** -> XML to OPC UA transformer developed
- * **PLC automation software code** -> PLCopen XML to OPC UA specification is available
- * **Maintenance data**
- * **Static data** (e.g. Word/Excel/PDF files, pictures)

- The **OPC UA platform** provides homogeneous access to the different data sources
- In some cases **custom OPC UA transformers and servers** should be developed
- After we have access to all these data sources, **what are the questions worth answering?**

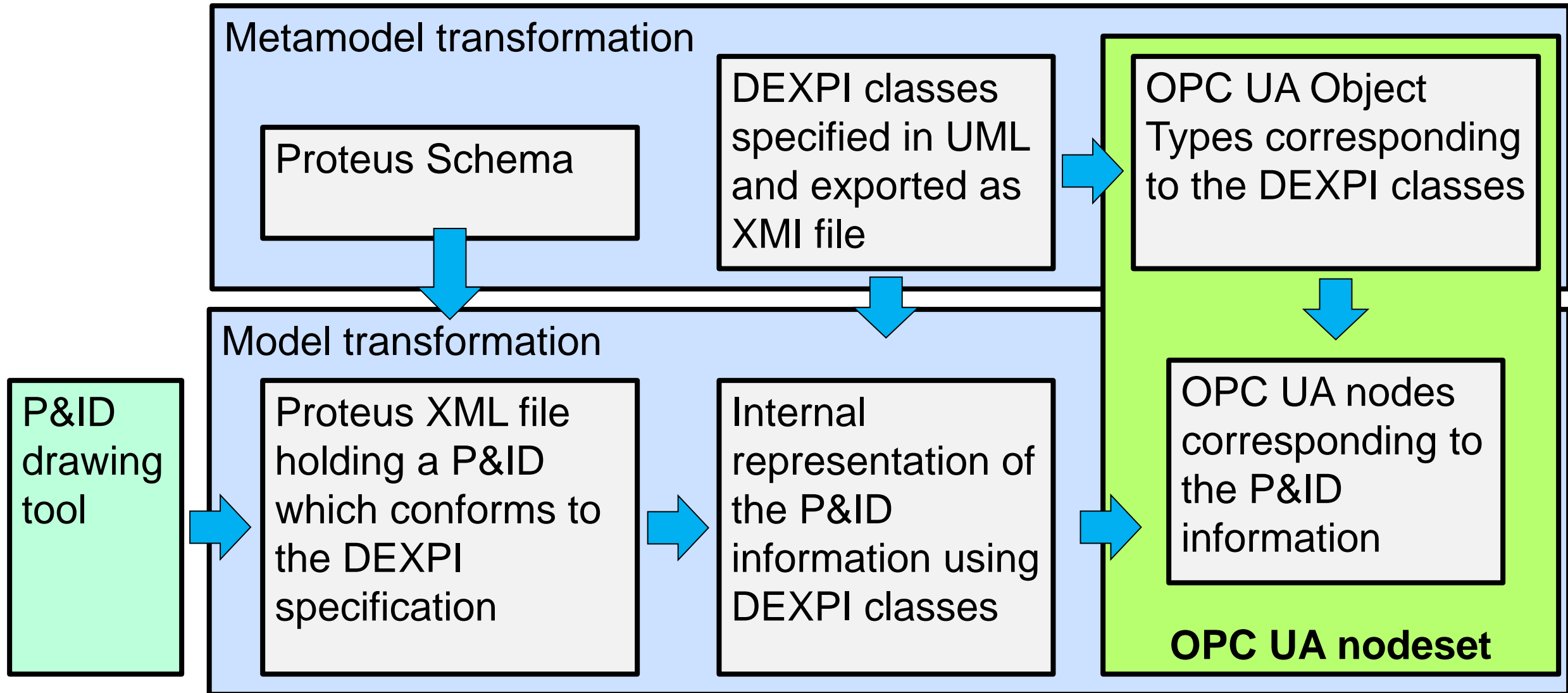
Access to plant data sources over OPC UA using the 3D model as gateway (past work)



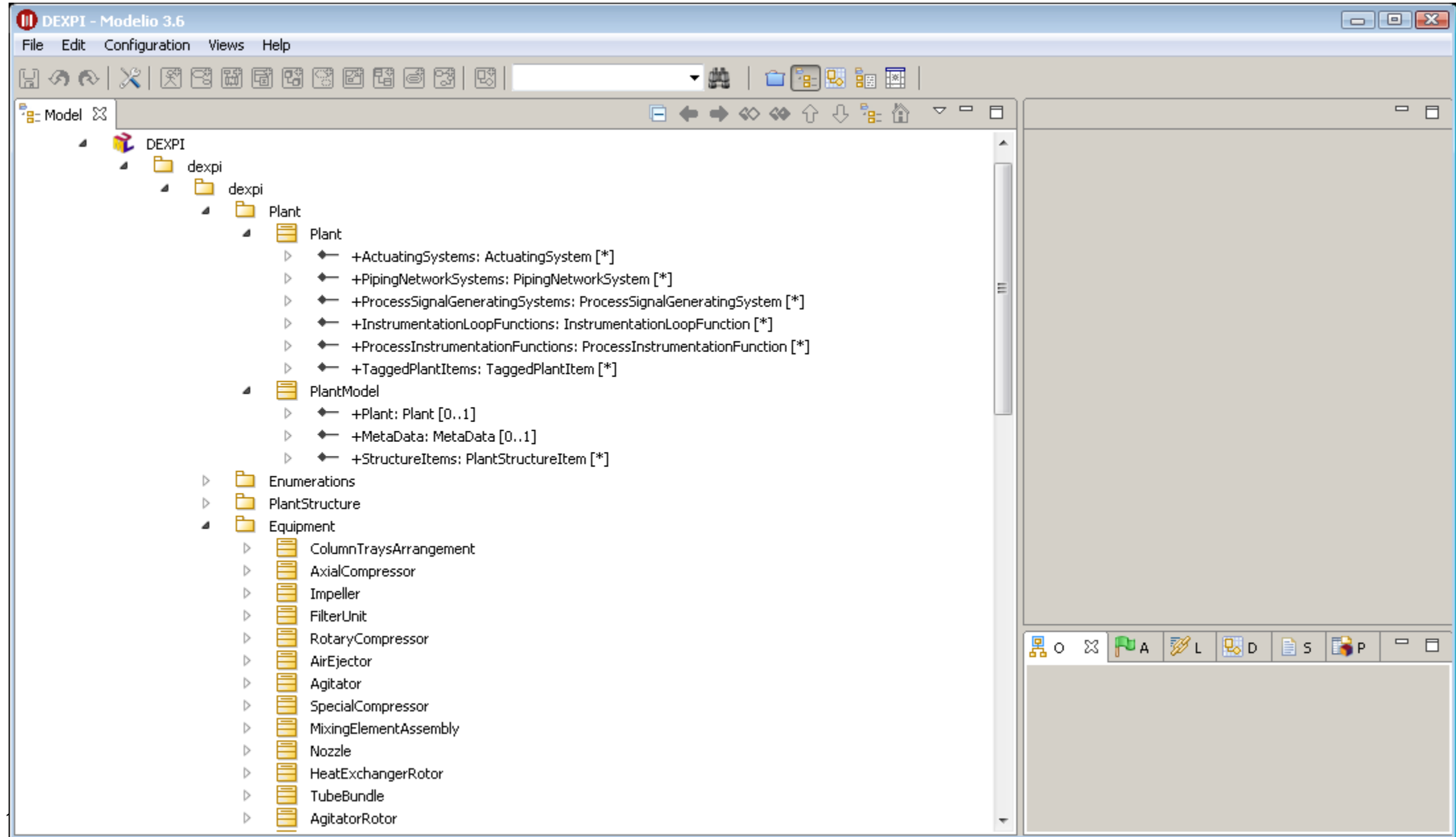
- MoU signing ceremony between DECHEMA / DEXPI group and the OPCF in the Hannover Messe event on the 25th of April 2017.
- **Nikolaos Papakonstantinou (VTT)** leads the working group, OPCF and DEXPI participate and provide support.
- The kick off meeting of the working group happened on the 18th of April 2017, four meetings so far.
 - **The invitation is still open to the OPCF members, if you are interested to participate to this working group, please contact me.**
- Possible ways to access the DEXPI specification are:
 - the Proteus schema
 - the DEXPI specification web endpoint
 - **the UML representation (XML export), which was selected**



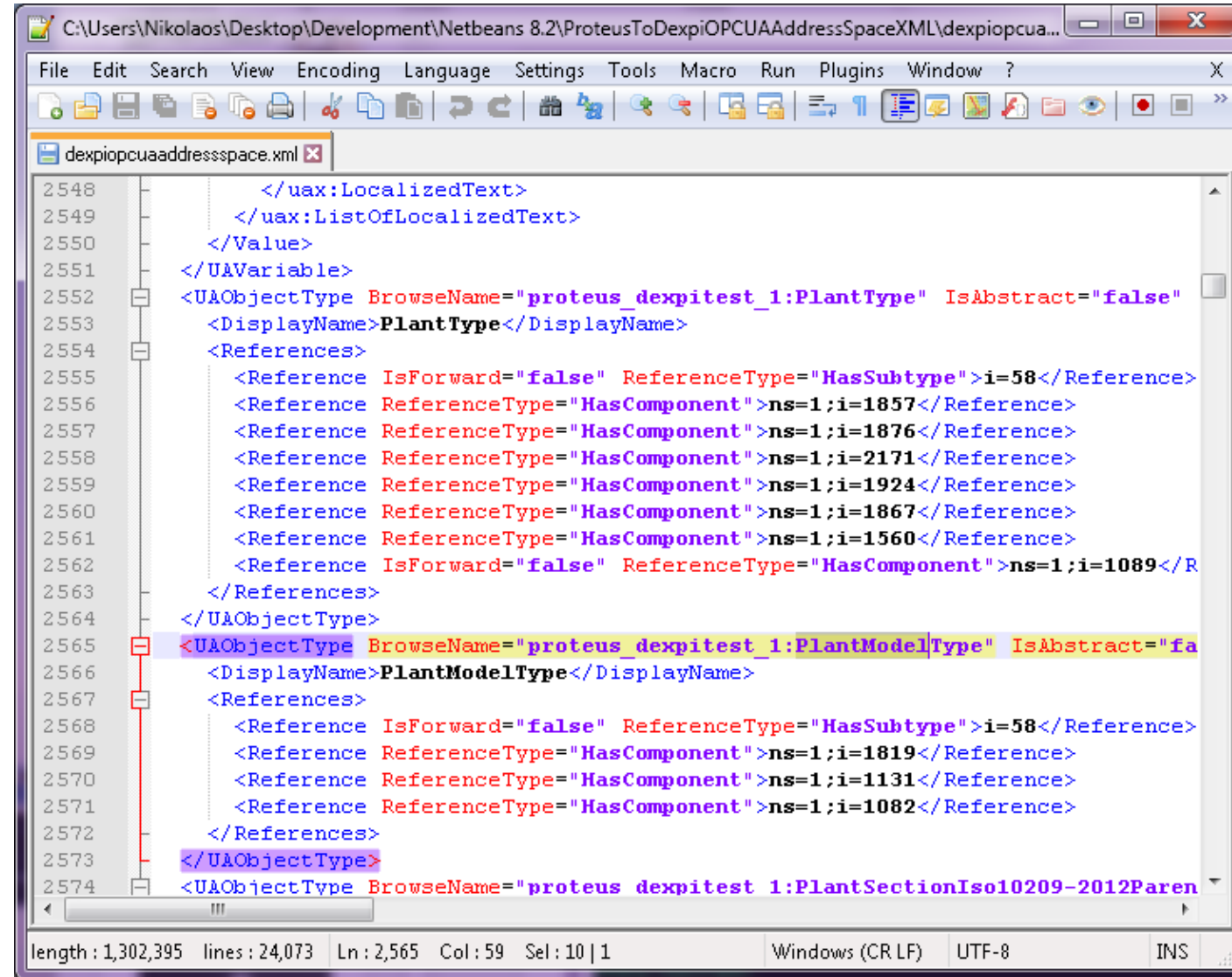
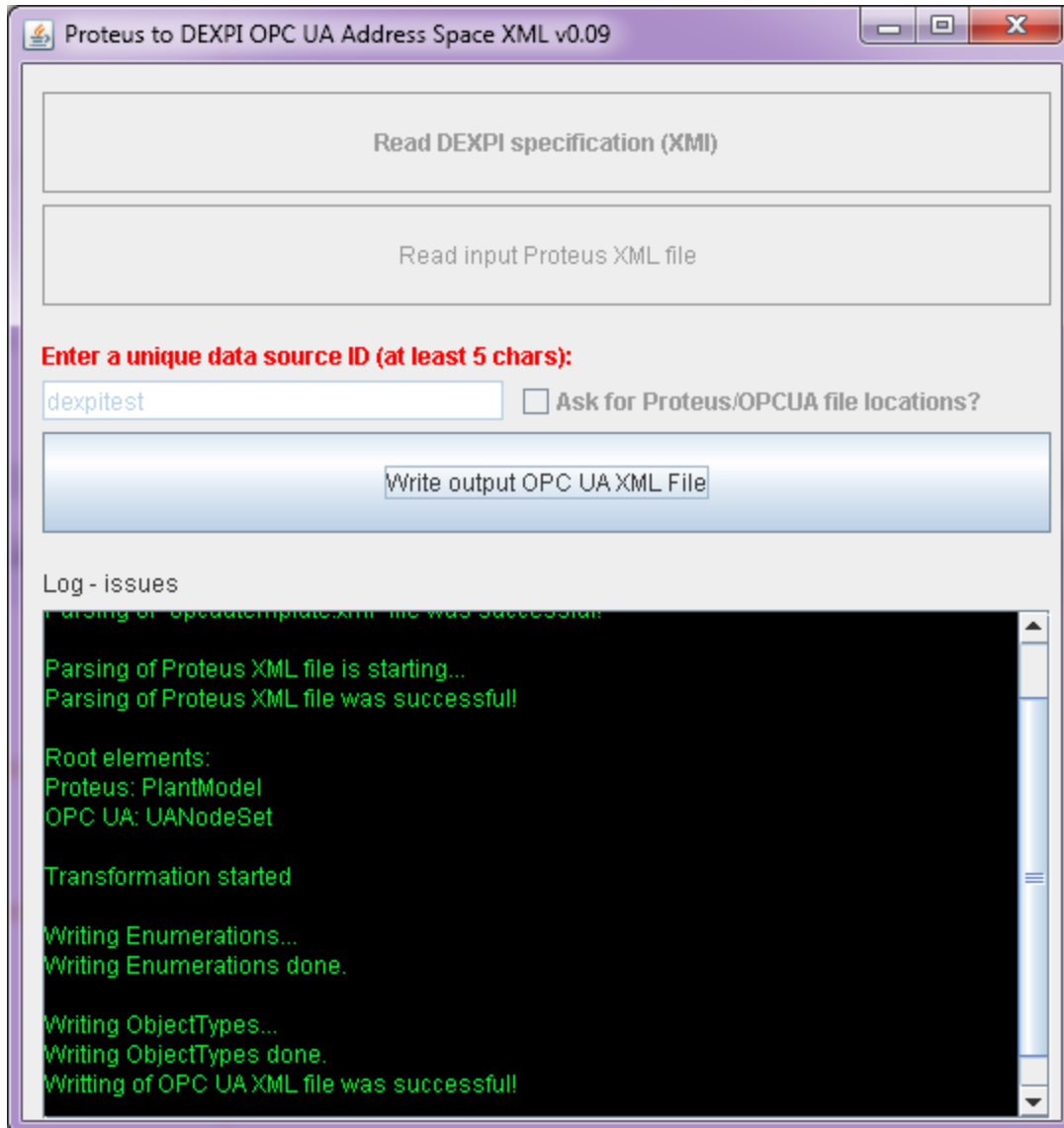
Proteus to DEXPI to OPC UA (overview)



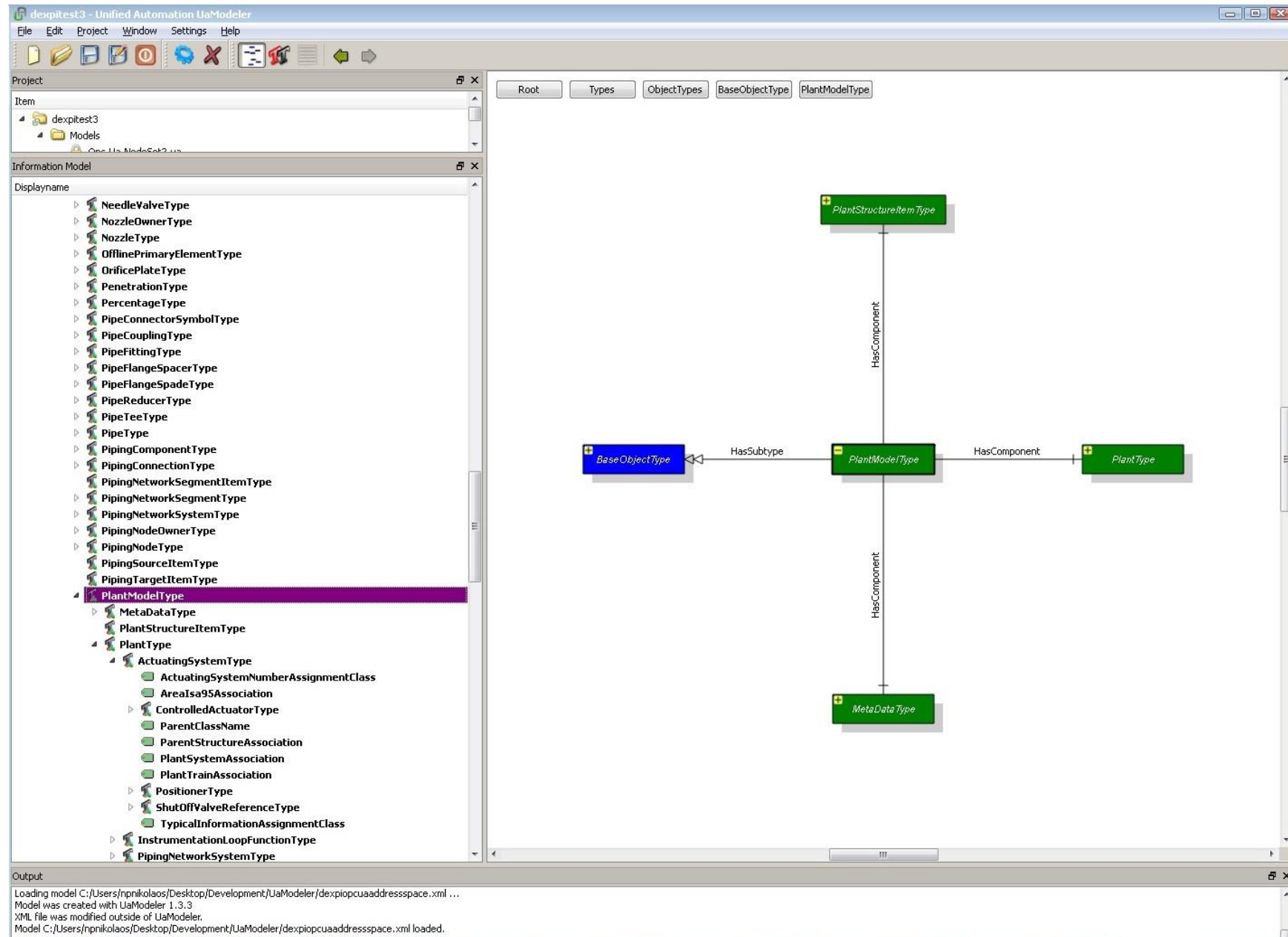
DEXPI classes as UML (Modelio)



OPC UA UML classes to OPC UA ObjectType nodes transformer tool



DEXPI OPC UA draft object types (UaModeler)



Questions?





VTT creates business from technology

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Thank you!

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