SEMANTIC INTEROPERABILITY WITH SYSML V2

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PTC

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WHAT IS A DIGITAL THREAD?

"A digital thread is an interconnected flow of relevant data that defines a product throughout its lifecycle."

SYSML V2

An OMG® Systems Modeling Publication

OMG Systems Modeling Language™ (SysML®)

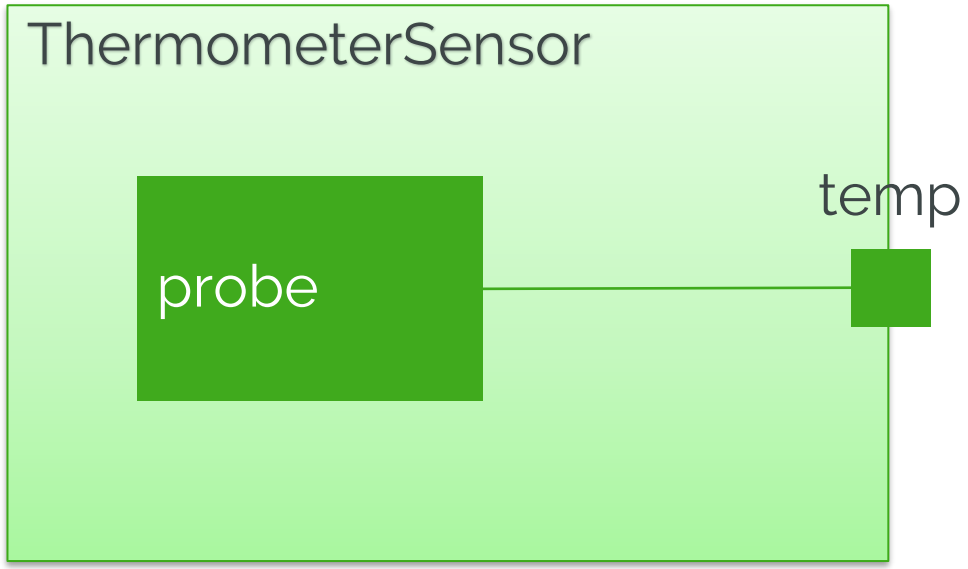
Version 2.0

BACKGROUND ON SYSML V2

- For a current status and some background on SySML v2, we refer to the slides of Sanford Friedenthal presented at an OMG Technical Meeting last year: https://www.omg.org/cgi-bin/doc?syseng/25-03-04.pdf

- This year, the Arrowhead fPVN project had a chance to present their results at OMG, promising a unique collaboration between Arrowhead, ISO and OMG

SYSML V2 THERMOMETER



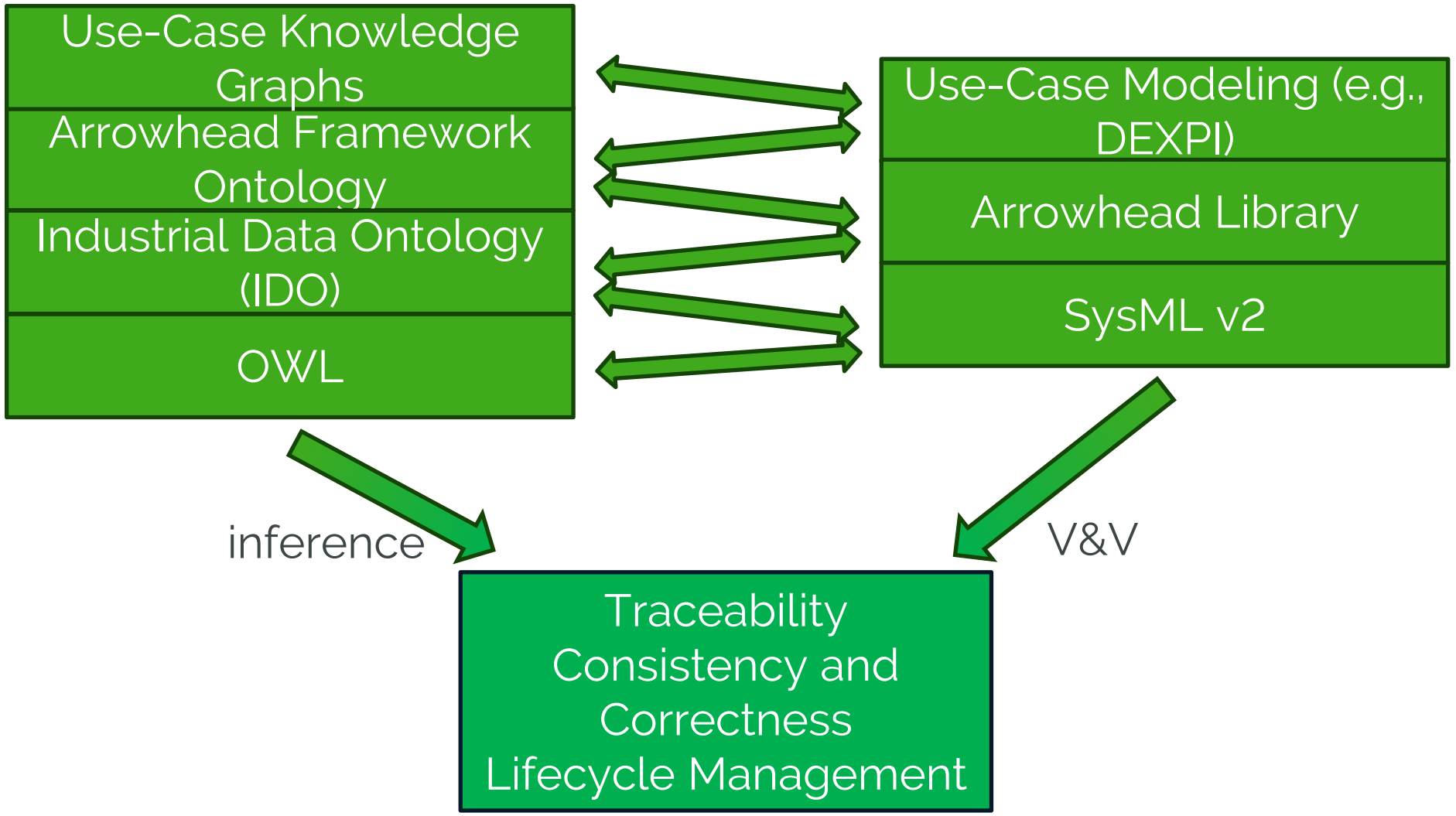

```
part def ThermometerSensor {
    // The physical sensing element
    part probe: TemperatureProbe
    // Expose the temperature as a
measurement via a port
    port temperatureOut: out data port {
        feature temp: Real
    }
    // Define internal connection from
probe to output port
    connect probe.temperature to
temperatureOut.temp
}
```

INDUSTRIAL DATA ONTOLOGY

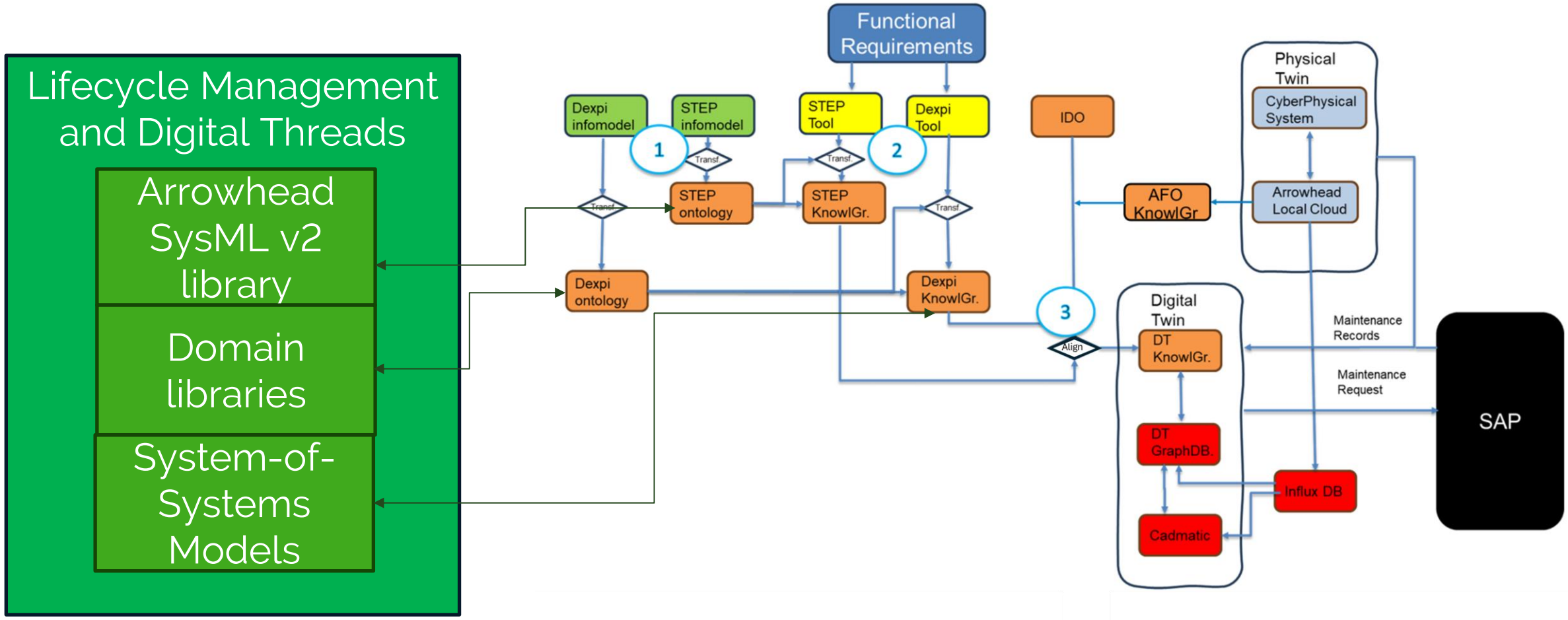
IDO THERMOMETER

```
# Define the sensor as a physical artefact
Class: ex:ThermometerSensor
    SubClassOf: lis:PhysicalArtefact,
                lis:hasPart some ex:
    TemperatureProbe,
                lis:hasFunction some ex:
    TemperatureSensing
# Define the function performed by the probe
Class: ex:TemperatureSensing
    SubClassOf: lis:Function
# Define the output data representation
Individual: ex:SensorReading001
    Types: lis:ScalarQuantityDatum
    Facts: lis:datumValue "22.5"^^xsd:float,
           lis:datumUOM ex:degreeCelsius,
           lis:quantifiesQuality ex:
```

SYSML-IDO CO-MODELING FOR THE DIGITAL THREAD



TOWARDS A SOA DIGITAL ENGINEERING PLATFORM



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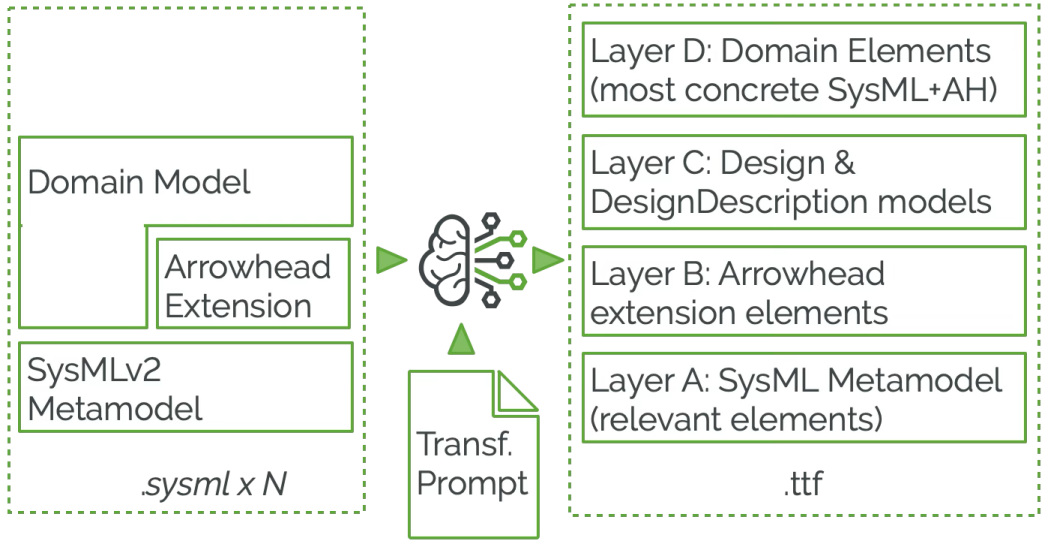
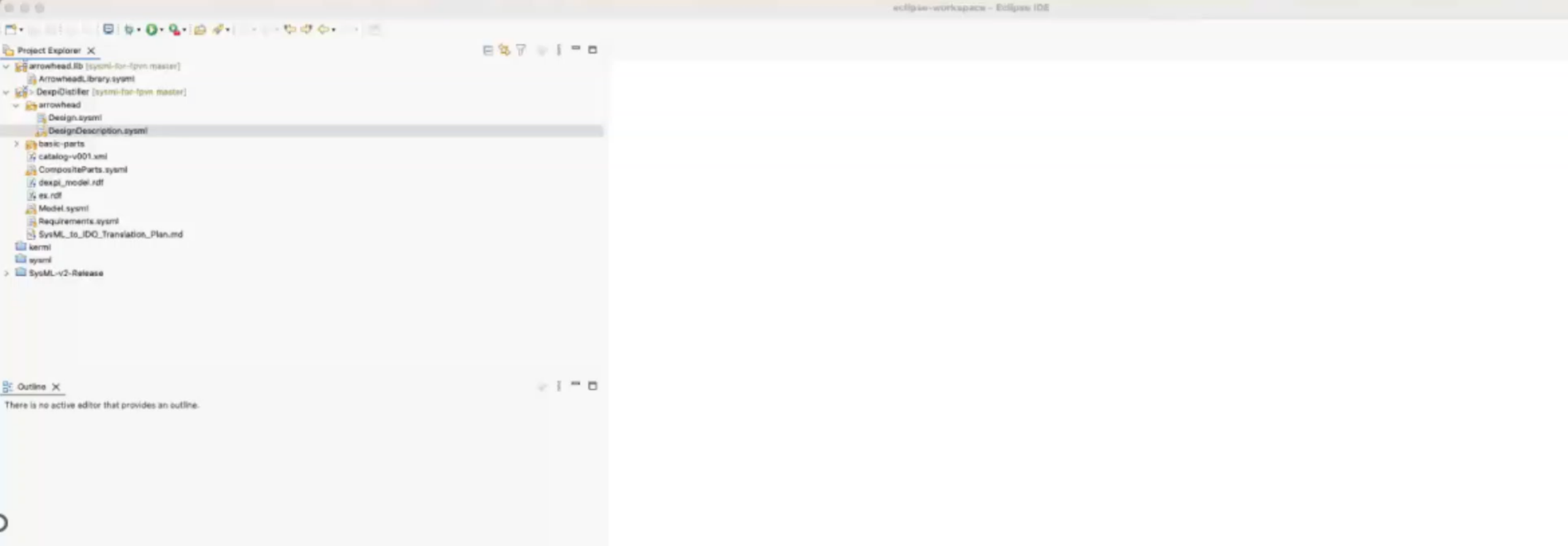
LLM-ASSISTED ONTOLOGY ENGINEERING: SYSML & ARROWHEAD -> IDO

LLMs can perform most of the mechanical and semi-philosophical steps required to transform a SysMLv2 model into an ontology reasonably well!

- Abstraction level identification
- Meta-level flattening: MOF to TBox/ABox
- Cross-ontology alignment & mapping
- Fixing inconsistencies
- **TBox/ABox gap reasoning**





AI-POWERED ALIGNMENT - DEMO