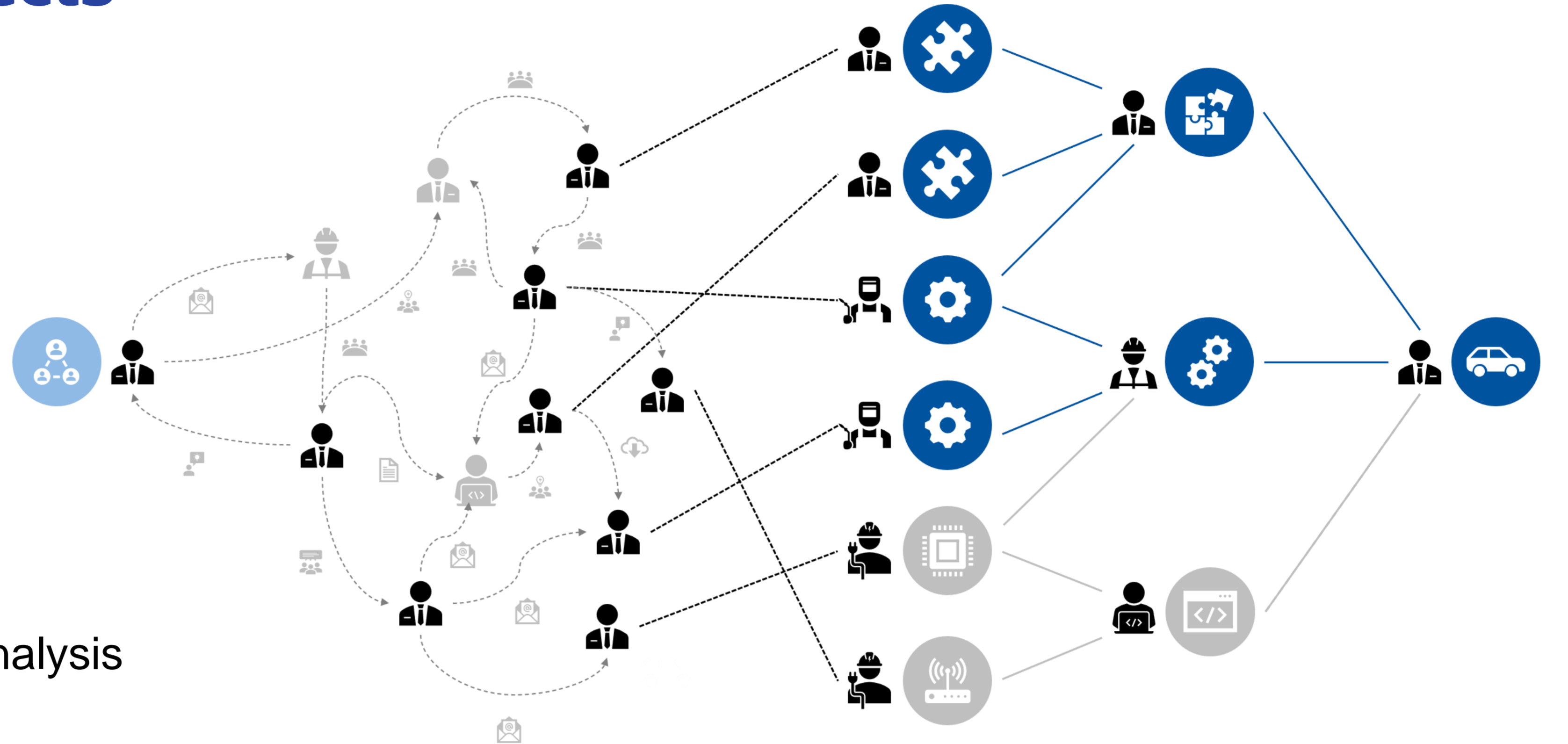


Artifact-Based Analysis for Systems Engineering

The need for Artifact-Based Analyses

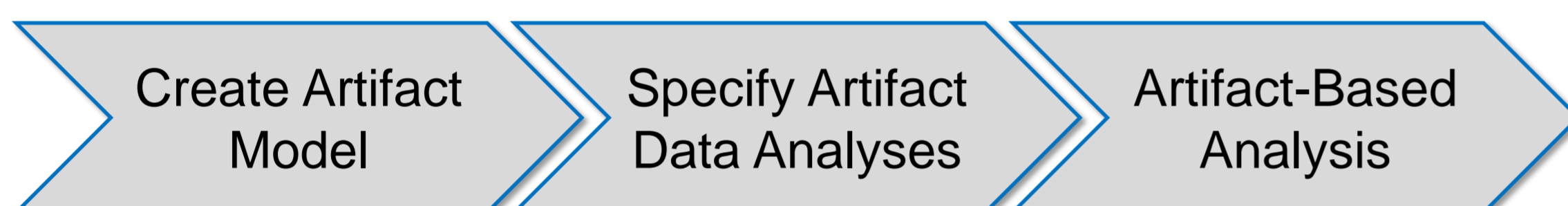
Understanding Engineering Projects

- During system development, various project participants contribute artifacts relevant to a project using a multitude of software tools
- This results in several problems:
 - Increasing project complexity
 - Unclear project structures
 - Complicated ways of communication
 - Complex relations between project relevant artifacts
- Artifact models and the paradigm of artifact-based analysis tackle these problems

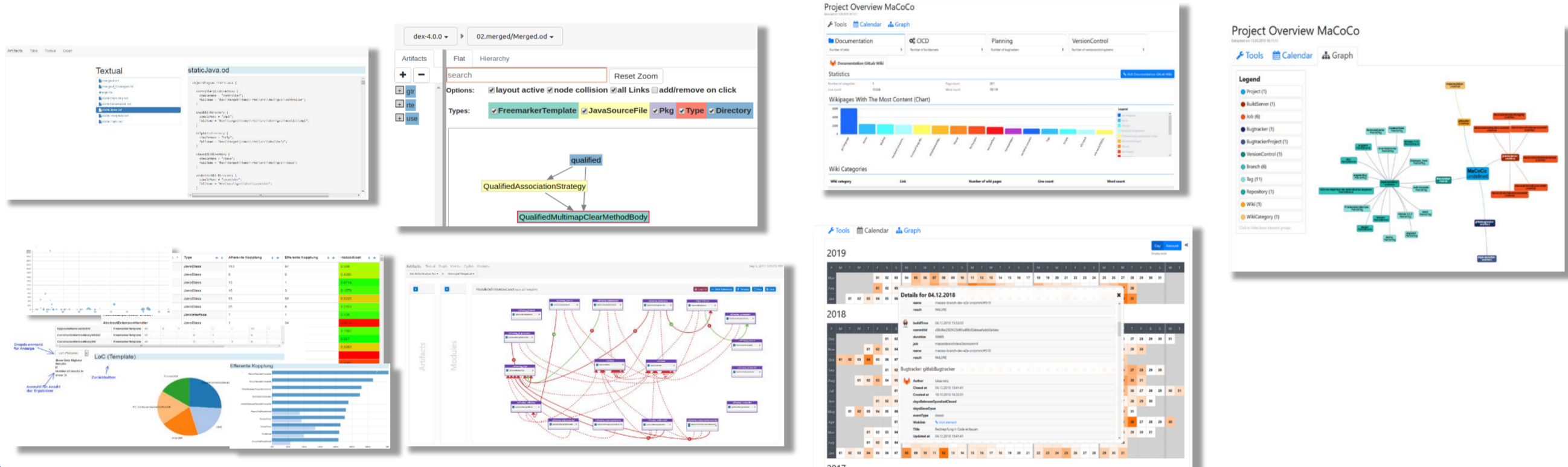


Methodological Guidance for Artifact-Based Analysis

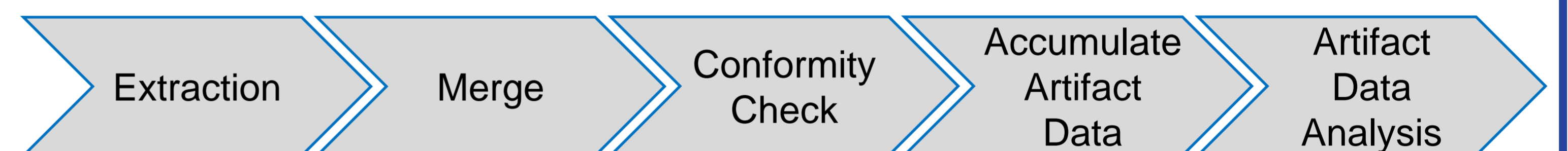
Towards a Sustainable Artifact Model



- Creation of **project specific artifact models** with high degree of reusability
- Specification of **automated artifact analyses** based on the project specific artifact model
- Application of **the artifact-based analyses**



Performing Artifact-Based Analyses

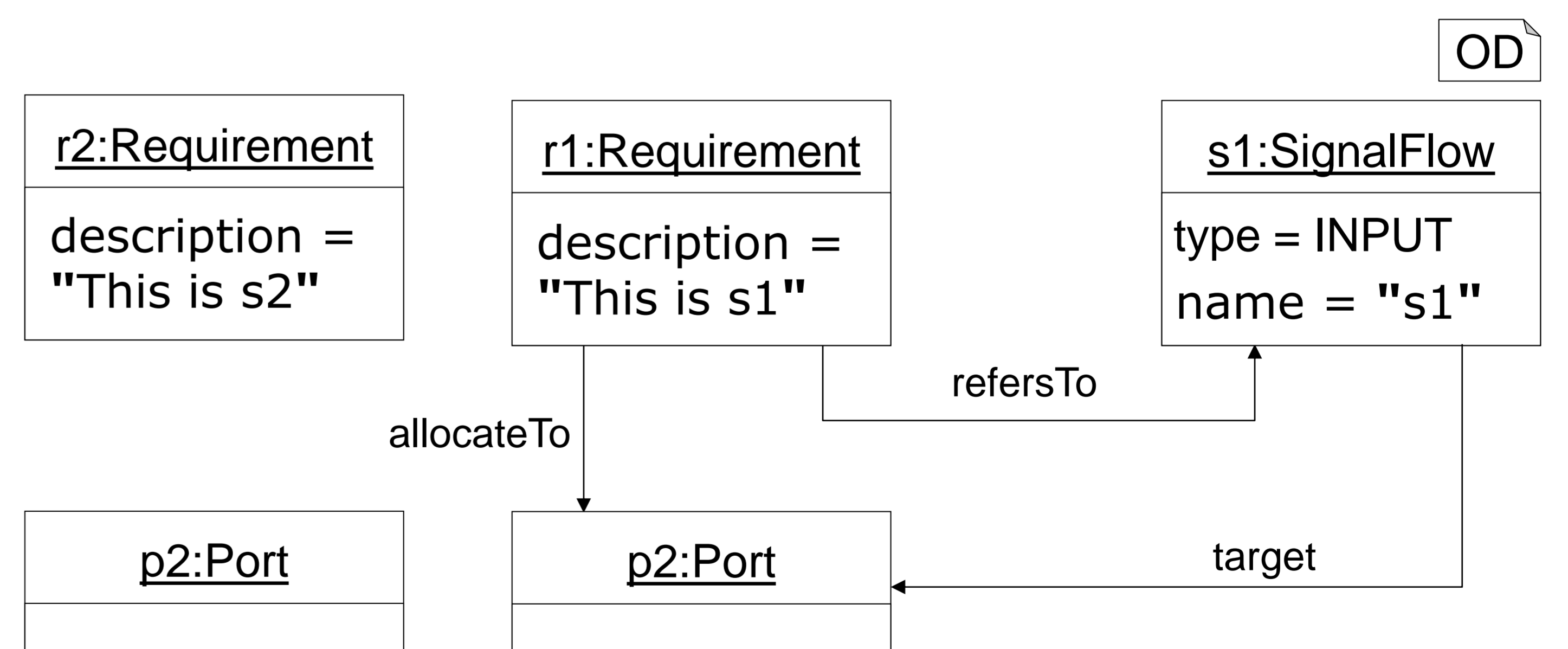


- **Extraction** of artifact data
 - Static analysis of artifacts
 - Dynamic extraction of tool data at runtime
- **Merging** single extraction results to obtain complete data
- **Conformity checks** to ensure the artifact data is correct
 - Structural checks against the artifact model
 - Conformity constraints provided by the artifact model
- **Accumulate artifact data** by calculating additional information
- **Artifact data analysis** to provide metrics, visualizations, architecture conformance and project specific analyses

Results

Modeling Language support for Artifact-Based Analysis

- **Class Diagrams (CD)** model the structure of artifact models:
 - **Classes** model relevant elements of the domain under investigation, e.g., types of artifacts or tools
 - **Associations and compositions** model types of relations between the elements
- **Object Diagrams (OD)** model the artifact data:
 - **Objects** represent instances of artifact model elements, e.g., specific artifacts or tools
 - **Links between objects** represent the relations of specific elements
- **The Object Constraint Language (OCL)** has multiple purposes within the context of artifact models:
 - Constraints further refine the structure of CDs
 - Constraints define specific analysis for ODs



```
context SignalFlow s, Port p, Requirement r inv:
  r.refersTo == s implies r.description.contains(s.name)
  && ((s.type == INPUT && r.allocateTo == s.target) ||
    (s.type == OUTPUT && r.allocateTo == r.source))
```