**Conceptual Rationale and Mapping Strategy**

This document provides an overview of the motivations and mapping strategy decisions underlying the SHACL shapes developed for the risk-based ontology validation of the AI Act.

**1. Purpose of SHACL Validation**

The SHACL shapes were created to enforce constraints from the AI Act, such as:

* Risk classification (e.g., HighRiskAI)
* Documentation requirements (e.g., TechnicalDocumentation, ComplianceCheck)
* Post-market monitoring and incident handling

These shapes ensure that all RDF data or ontologies using this model comply with regulatory requirements and the logical structure based on the AI Act.

**2. Mapping Strategy**

**AI Act Focused Modelling**

Each shape targets a specific regulatory requirement, modeled as:

* sh:NodeShape for AI Act class constraints (e.g., AI\_System, HighRiskAI)
* sh:PropertyShape for property constraints (e.g., must include PostMarketMonitoringPlan, must have SystemIdentifier)

**Concept Validation**

All shapes focus exclusively on terms from the ai: namespace. These include:

* ai:hasTechnicalDocumentation
* ai:requiresFundamentalRightsImpactAssessment
* ai:requiresCorrectiveAction
* ai:hasComplianceActivity, etc.

**3. Validation Focus**

The SHACL shapes validate:

* Presence of mandatory properties for AI system classes
* Compliance structure for system lifecycle (e.g., registration, post-market monitoring, suspension logic)
* Requirements for technical, human oversight, and cybersecurity documentation

**4. Justification for SHACL Use**

SHACL provides a robust and declarative way to:

* Validate ontology design patterns
* Support internal AI Act compliance workflows
* Facilitate documentation, debugging, and automated governance

This file supplements the shapes in SHACL\_SHAPES.ttl and serves as a reference for reviewers, developers and auditors working with AI Act-specific ontologies.