CREDIT SUISSE

Model Transformations

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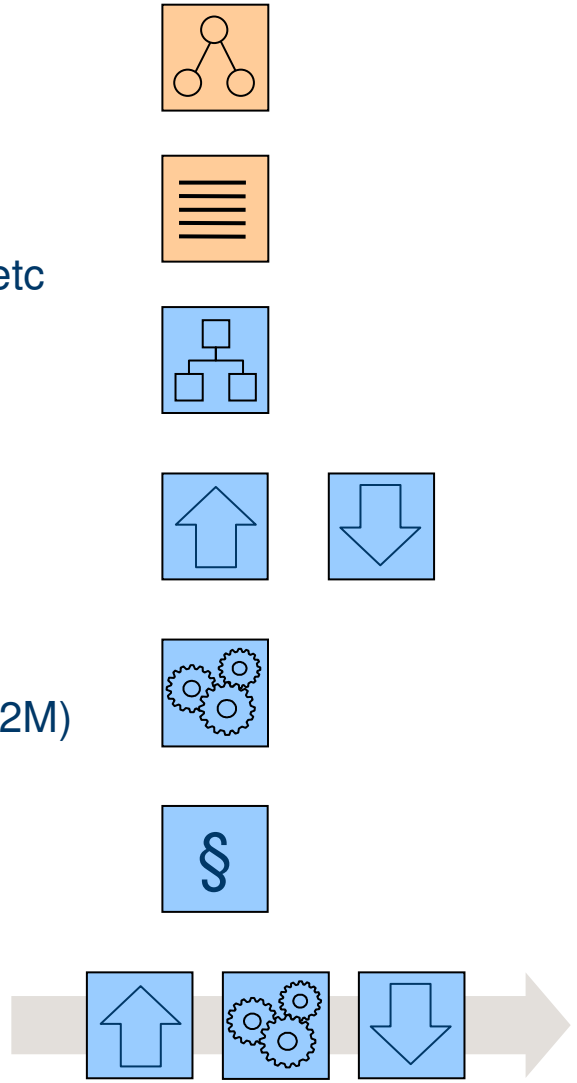
Model Transformations

- Applied in more than 7 different IT platforms and their projects at Credit Suisse,
- Over the timespan of three years,
- Code generation to increase productivity as main purpose
- Strong diversity in automation requirements
  - Input formats, generated artefacts, model abstraction level and enrichment expectations, etc
- OpenArchitectureWare as generator framework
  - versions 4.2, 4.3 and 4.3.1
- Eclipse 3.3 and 3.4, models based EMF/Ecore
- UML editors and text editors as modeling tools

Concepts and building blocks

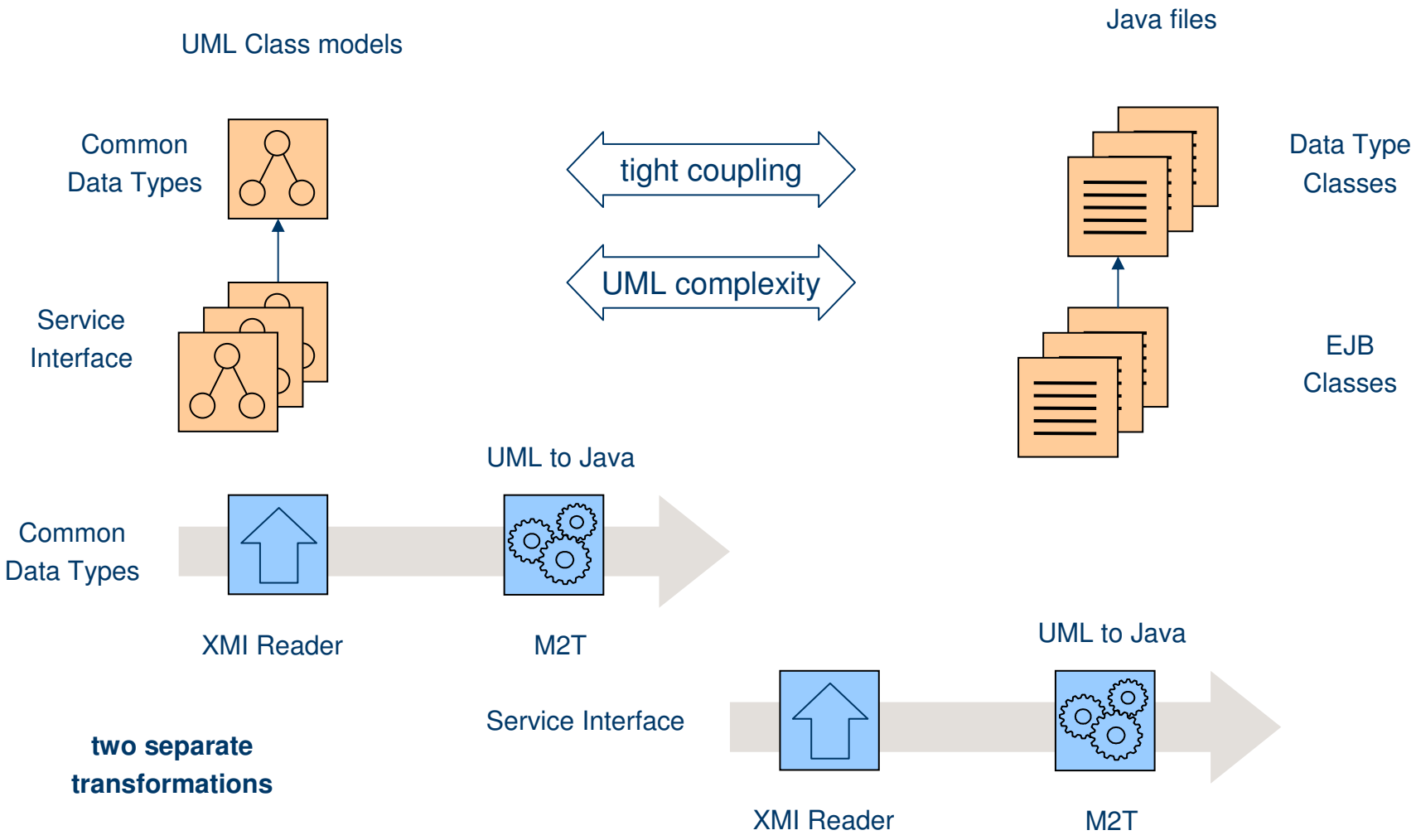
- Models
- Generated Artefacts
  - Program Code, Test code, Deployment configuration, etc
- Metamodels (Architecture concept models)
- Readers, Writers (concrete syntax)
  - XML, UML/XMI, Java Beans, etc
- Transformations
  - Xpand (model to text, M2T), Xtend (model to model, M2M)
- Validation
  - Check (oAW), OCL and Java: Eclipse Validation Framework
- Transformation Workflow
  - Model slots as interface between workflow components



Global Services as Enterprise Java Beans

- Java classes for EJB implementation, client and types need to be generated
- Service interface definitions specified as UML class models
- Common data types are specified in separate UML class model
  - Service interface definitions reference common data types
  - Data types are managed independently
- Initial estimates: 50 services and >100 types, >10 Java classes per service
- Changes in common types to be expected, iterations
- Quick and dirty solution, two weeks implementation time
- Disadvantages:
  - code templates difficult to maintain (UML metamodel knowledge required)
  - memory demand too high for batch generation

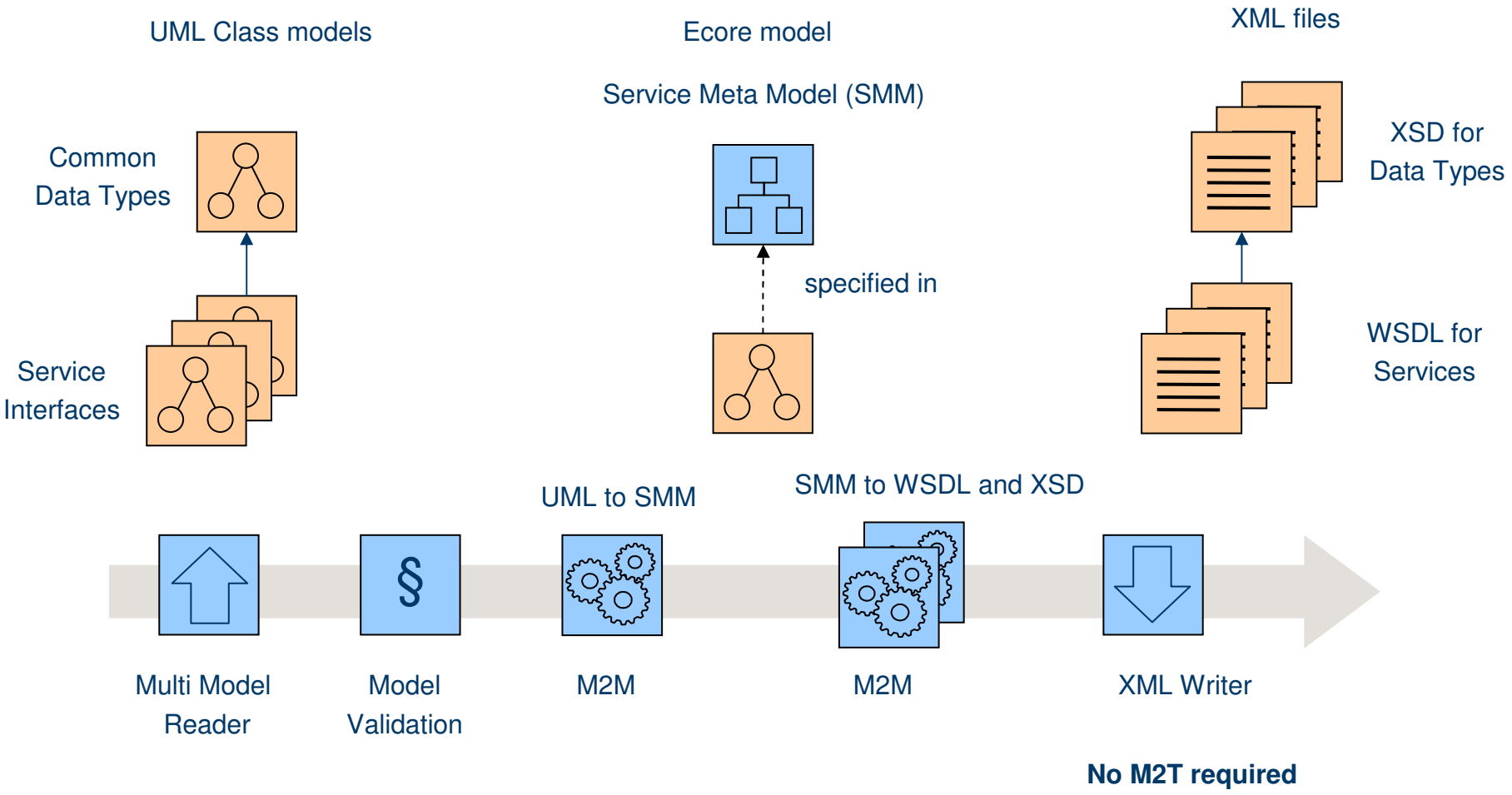
Global Services as Enterprise Java Beans



Global Services implemented as Webservices

- WSDL and XSD files need to be generated
- Same input as for EJBs, UML models with references to common data types
- Replaces EJB generator solution
- Independent lifecycles for services and data types, independent versioning
- One WSDL per service plus XSDs for common data types
- Dedicated metamodel introduced for global service concepts
- Advantages:
  - UML transformation decoupled from code generation
  - batch generation better supported

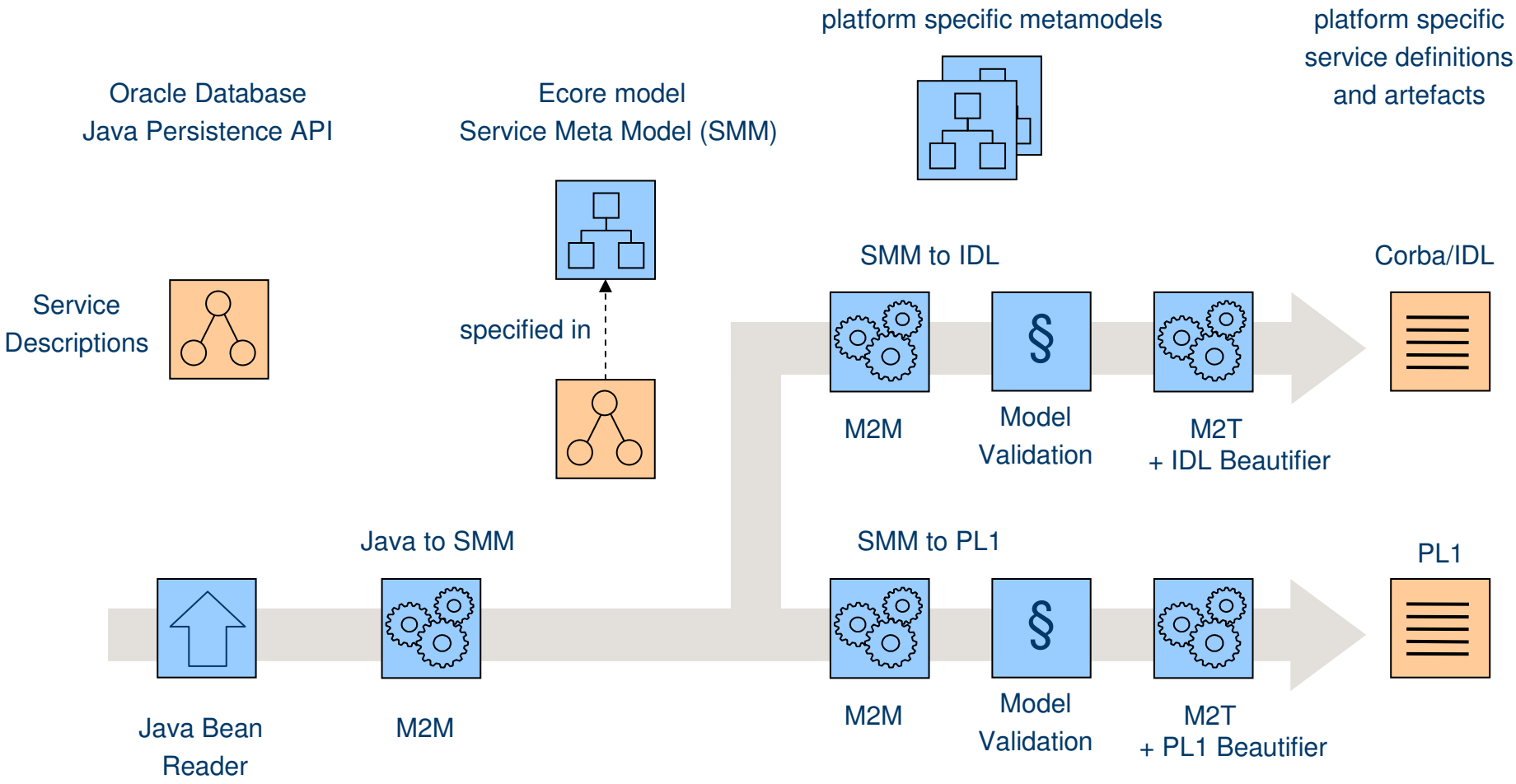
Global Services implemented as Webservices



Interface Management System

- System for managing service descriptions and generating platform specific artefacts
  - IDL, PL1 Stubs, WSDL, etc
- Consists of a central database, a web application for queries and modifications, and a set of generators
- Service descriptions are specified and reviewed in a platform independent way
  - service metamodel
- Platform specific models are assembled as intermediary step

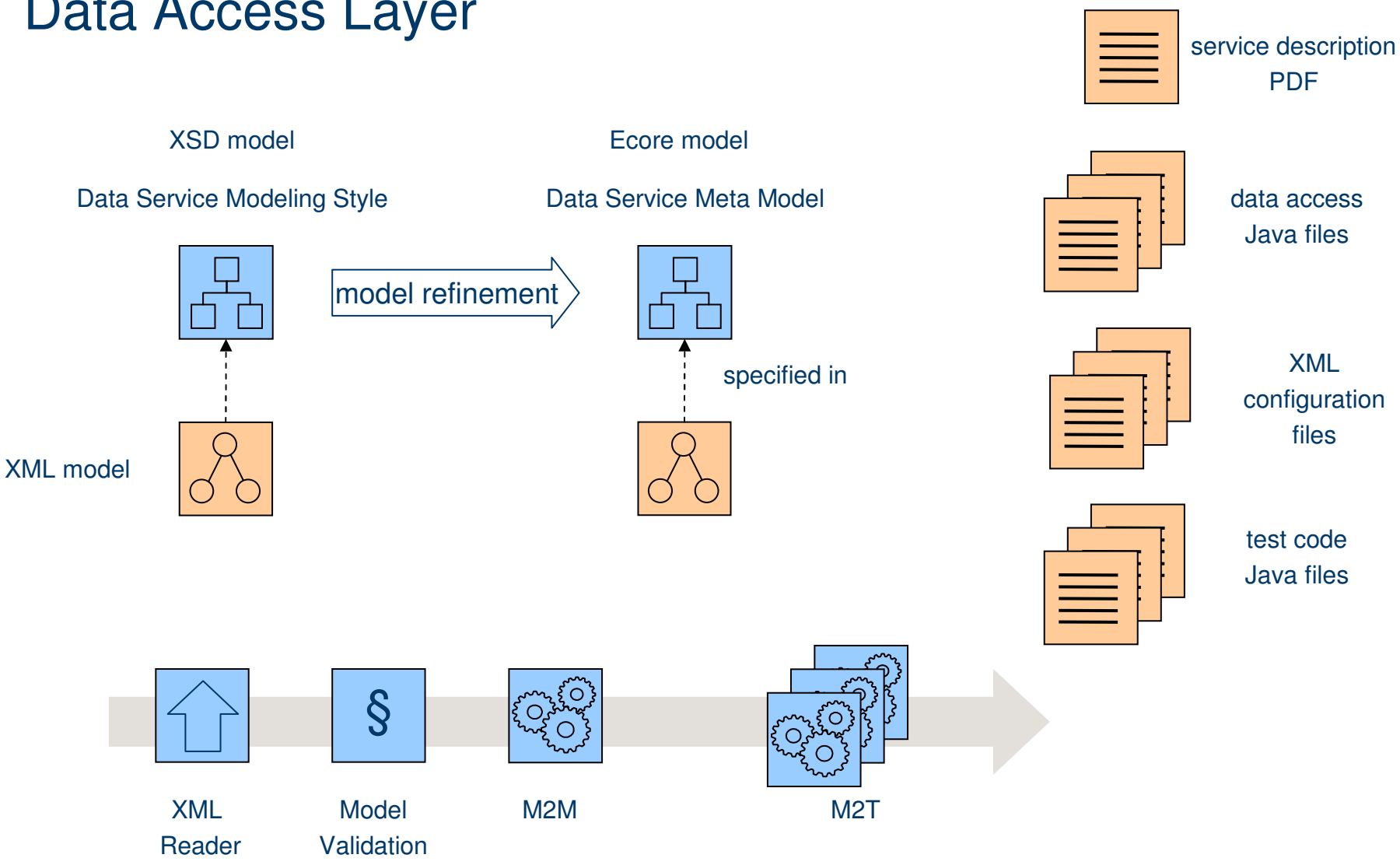
Interface Management System



Data Access Layer

- Java classes for EJB 3.0 implementation with JPA usage need to be generated.
- Tasks: operation auditing, data access authorization, queries, CRUD operations, input validation, technical fields, exception handling
- Initial DSL based on XML schema definition for quick prototyping and existing experience with XML
- XSDs impose design restrictions to metamodels
  - tree structure, element references, inheritance, etc

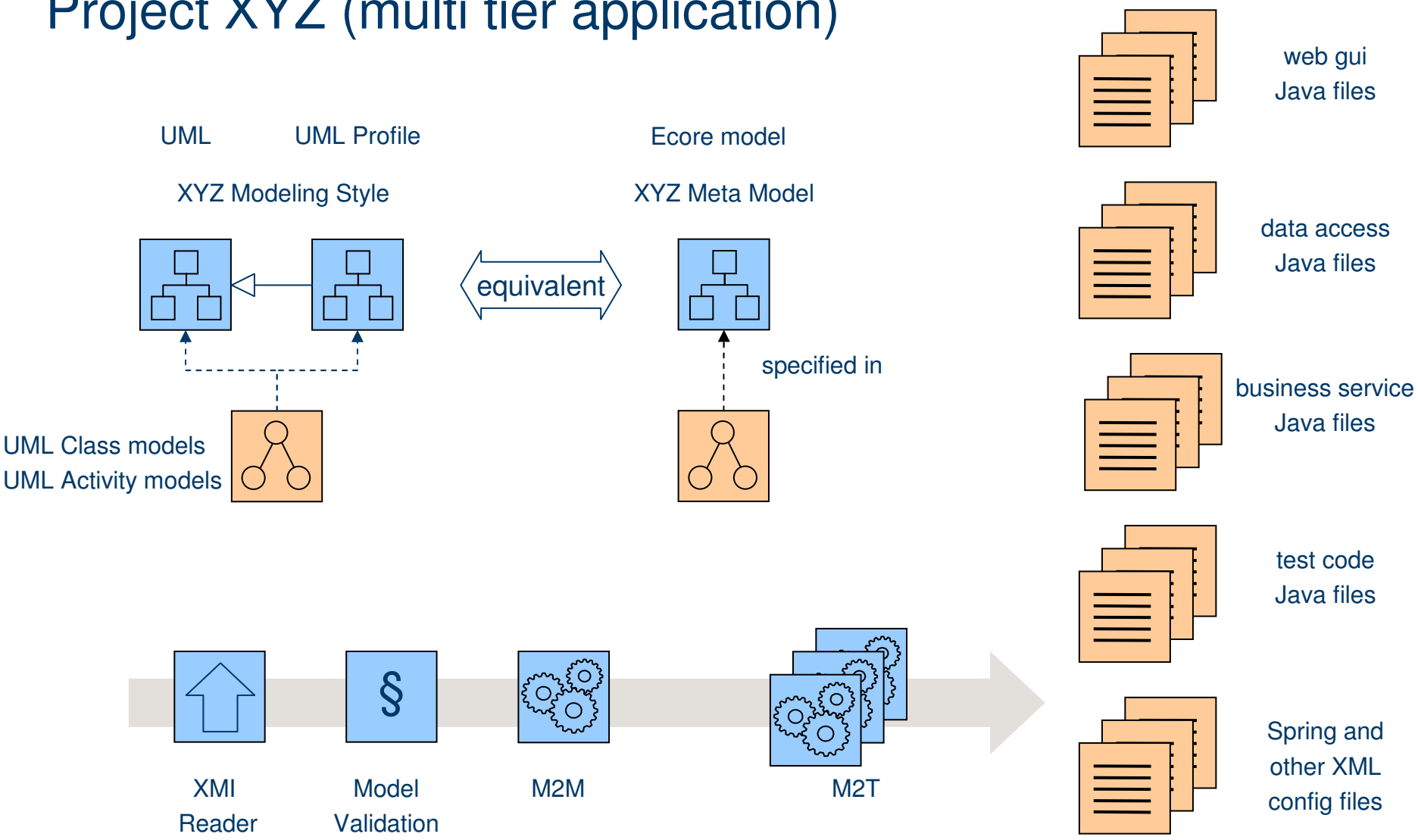
Data Access Layer



Project XYZ (multi tier application)

- Large project with the goal to maximize automation during software development. Commitment to model the different layers of the planned solution (presentation, business and data)
- UML as modelling standard within organisation.
  - Technology choices for tooling.
- Models are expressed in a domain specific language (UML + UML Profile)
- Software designers are supported with tailored modelling tools
  - Tooling pallette, model validation, collaboration schemes
- UML class models for component definition, UML activity models for business logic

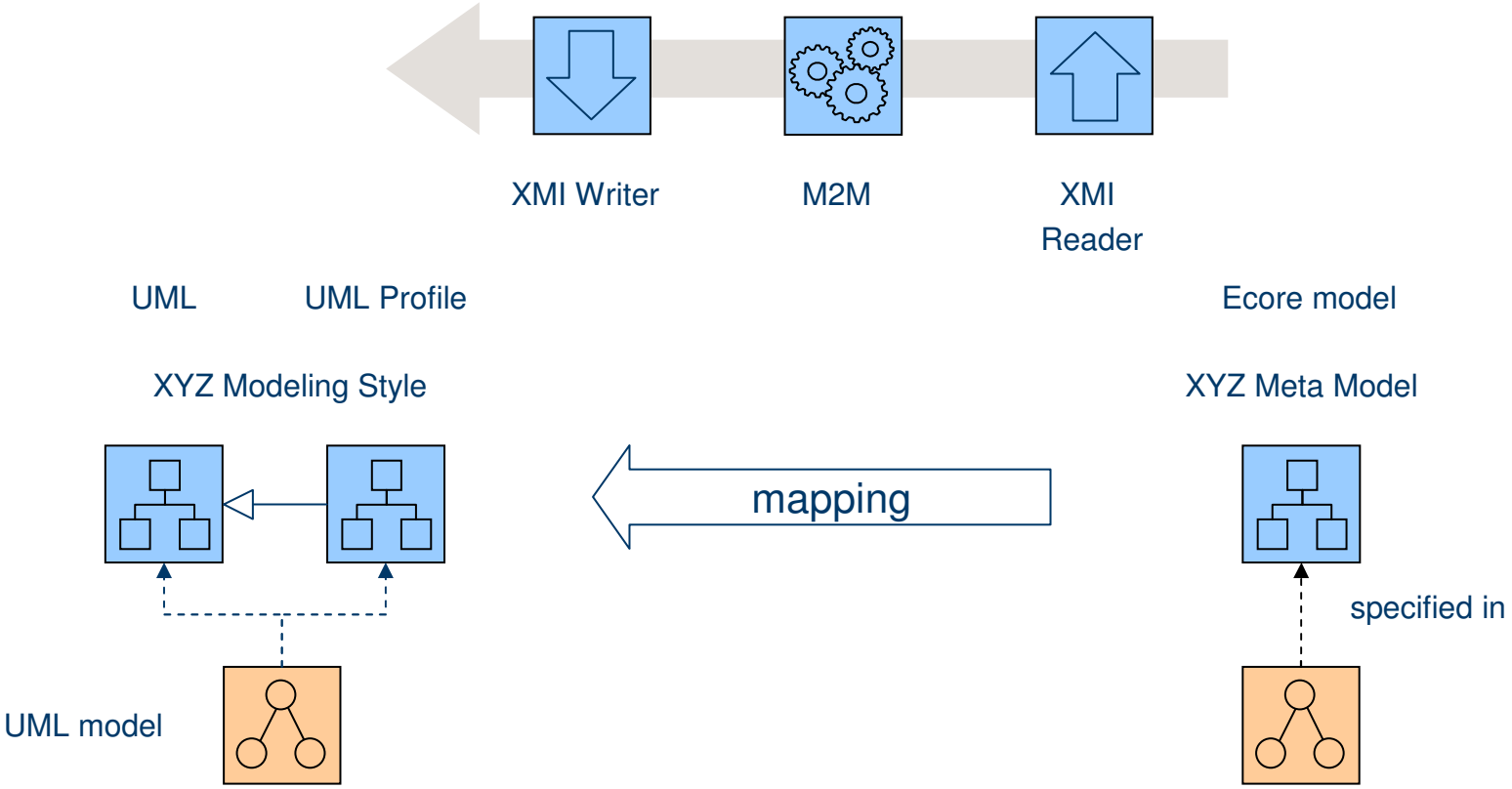
Project XYZ (multi tier application)



UML Profile generation

- Disadvantage of creating manually a dedicated UML profile in addition to the meta model
- Better to generate the UML profile from the metamodel
  - technical conversion, no semantic changes
- A DSL mapped to UML can use UML elements, i.e. not all concepts need to be expressed as part of a new UML profile.
  - example: NamedElement for elements containing an attribute "name"
- UML Profile elements
  - Stereotypes, properties, inheritance, associations, enumerations, primitive types, constraints

UML Profile generation



Lessons learned

- Metamodel requirements for modeling and generating are different
  - dedicated metamodels with an explicit M2M transformation, more flexibility for the modeling style, less complexity and restrictions for the transformations
- No code generation based directly on UML
  - Code templates (M2T) are best created and maintained based on a specific metamodel tailored to the solution domain
- Static content in code templates needs to be independently maintainable
  - Most software engineers prefer to work with M2T than M2M transformations => keep M2T transformations simple
- Check for existing workflow components
  - example XMLWriter

Model Transformations

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- Questions