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Evaluating Domain-Driven Design for Refactoring Existing Information Systems

Final Master Thesis Presentation at Ulm University

Institute of Database and Information Systems

Hayato Hess | May 18, 2016

Agenda

Introduction

Challenges

Domain-Driven Design

Refactoring

Prototype

Introduction

Herbert Hayato Hess
- Computer Science Student at Ulm University
- Submitted Master Thesis

Dr. Jan Scheible
- MERCAREON's Employee
- Master Thesis Advisor

Mercareon

- Spin-Off of TRANSPOREON (Logistic software company)
- Located in Ulm and Kraków
- 28 Employees
- Main Product: Time Slot Management System

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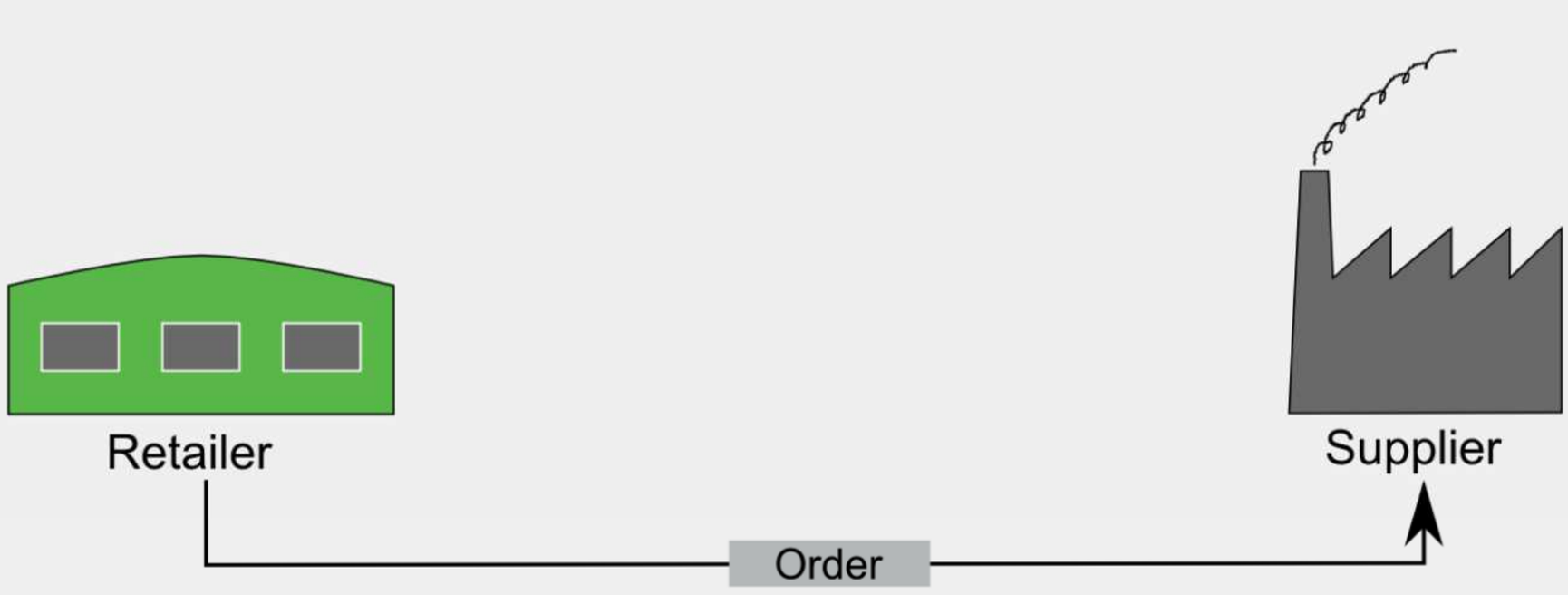

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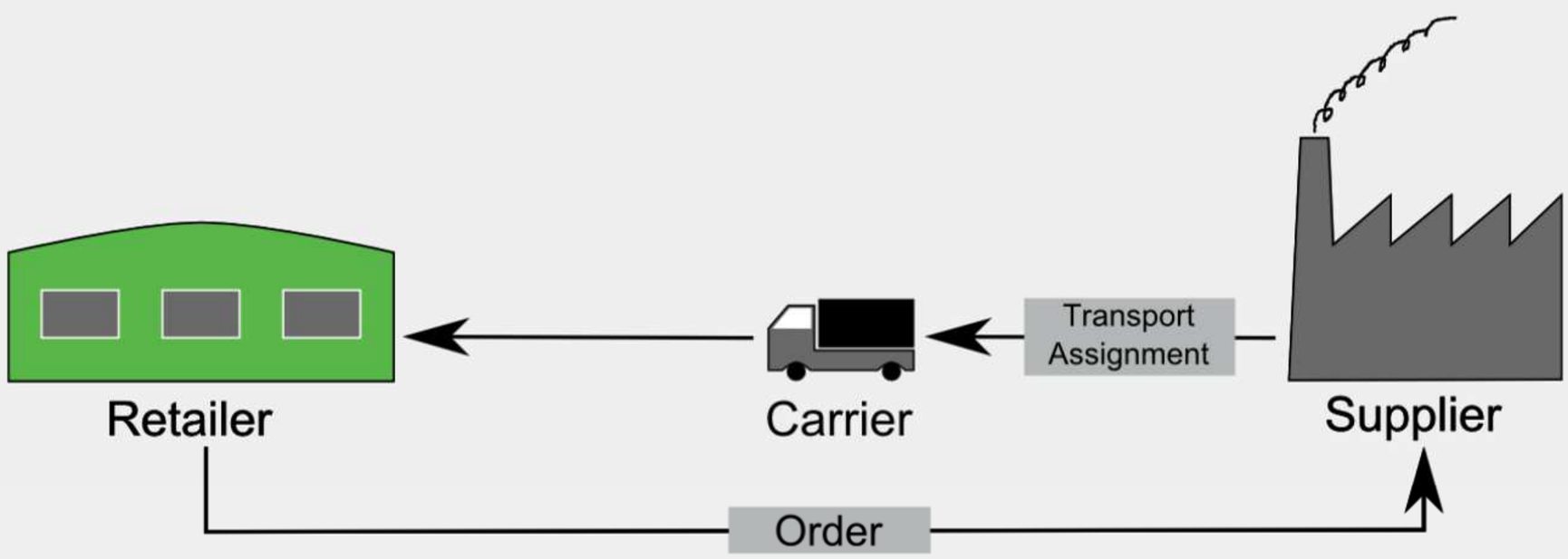

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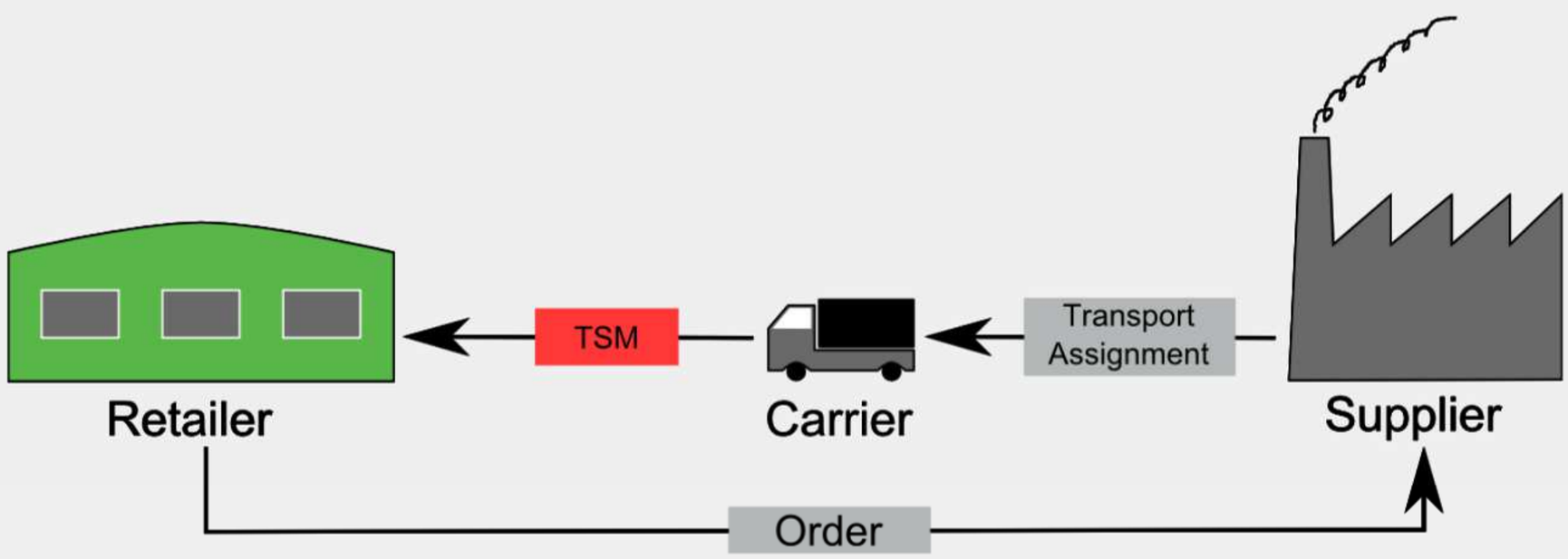

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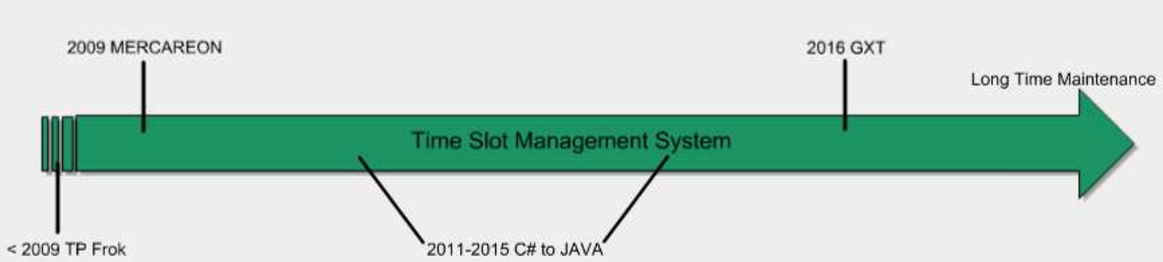
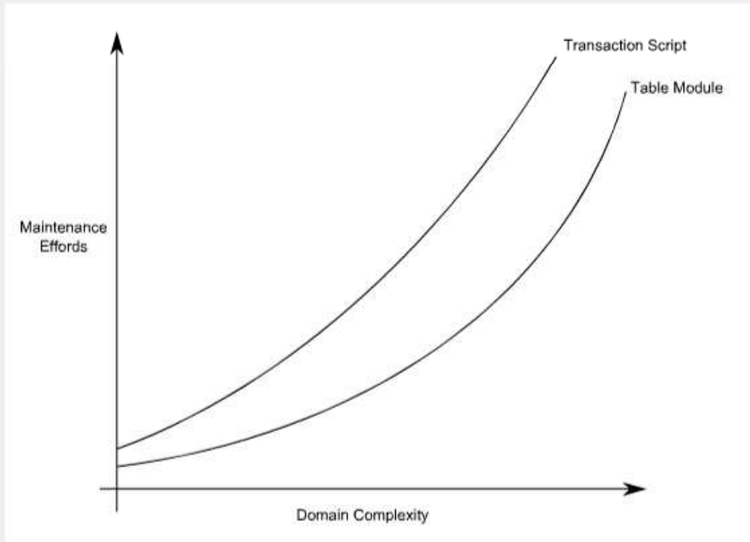
MERCAREON

Long time maintenance
- Add new features
- Improve existing features



Maintenance Challenges



Source: Martin Fowler. *Patterns of enterprise application architecture.*

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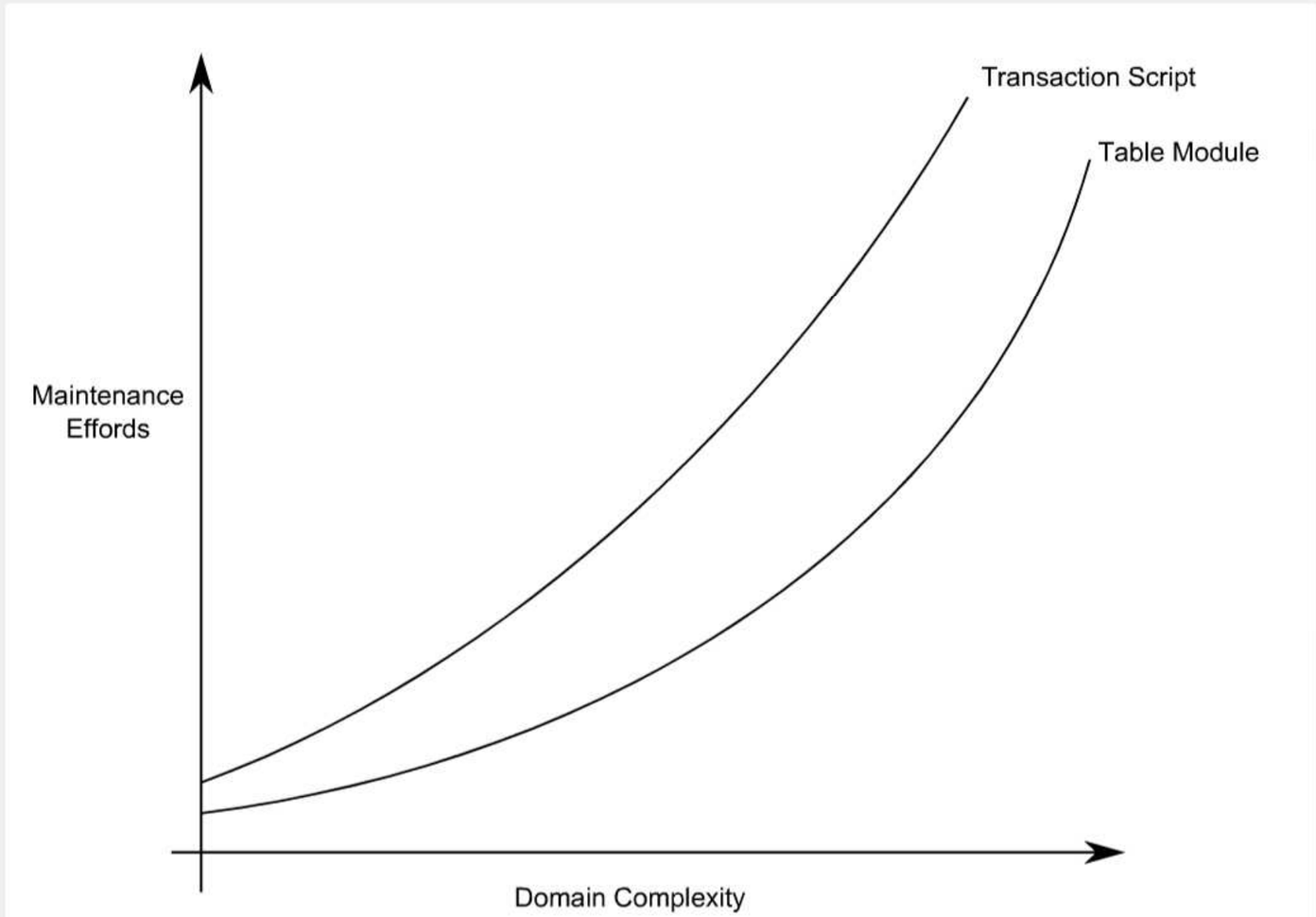

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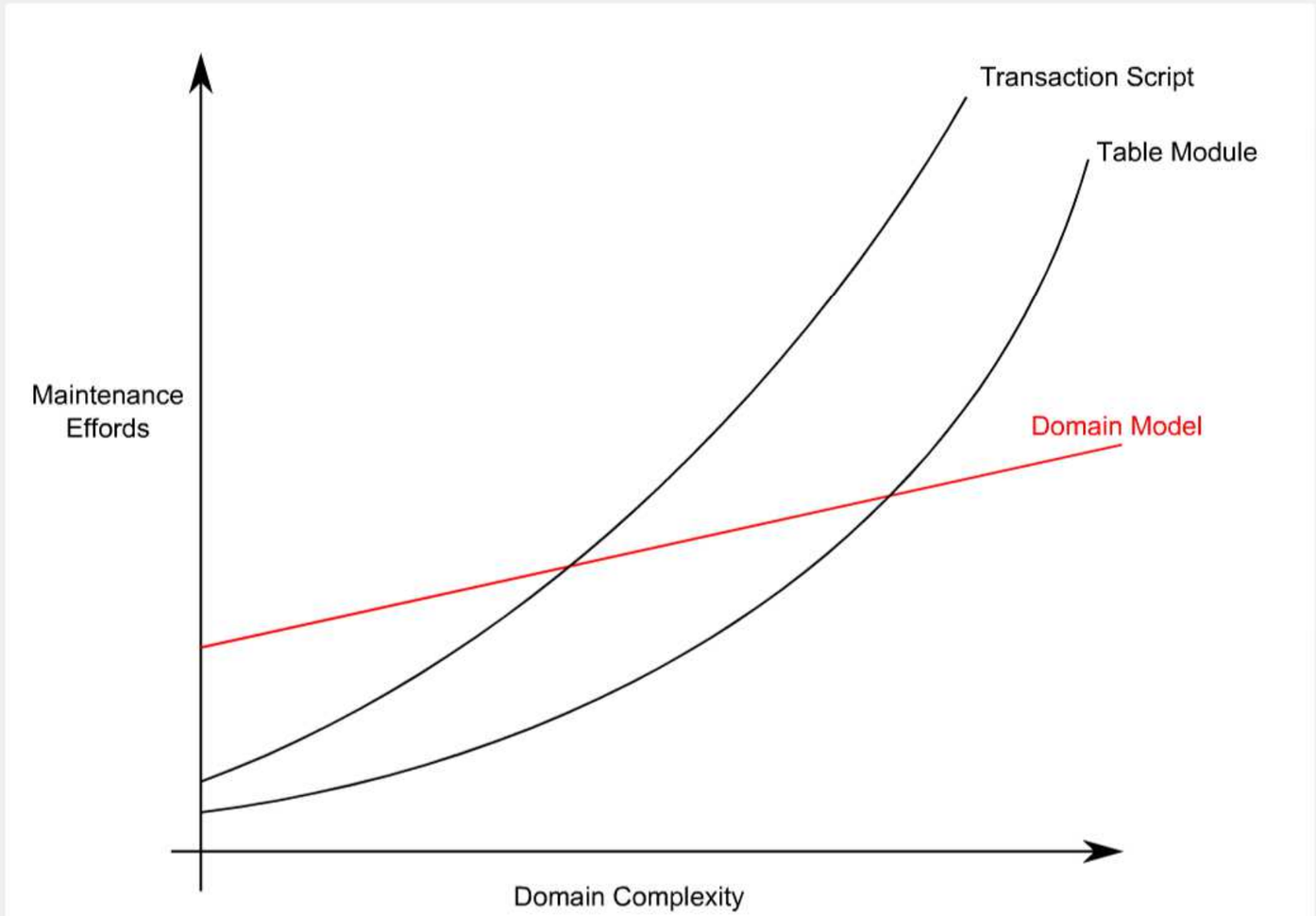

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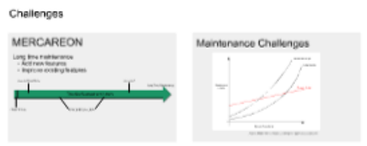

Domain-Driven Design

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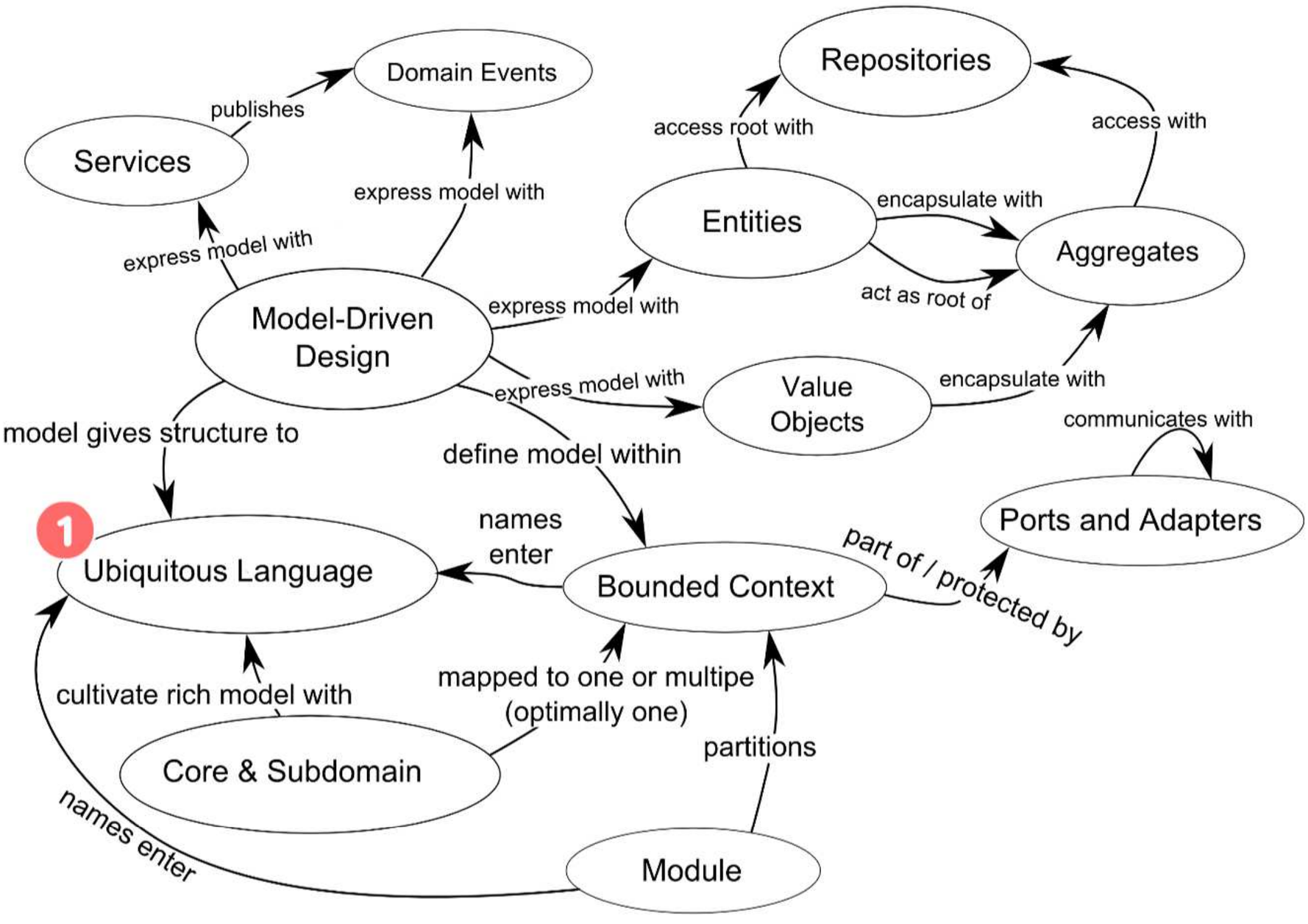
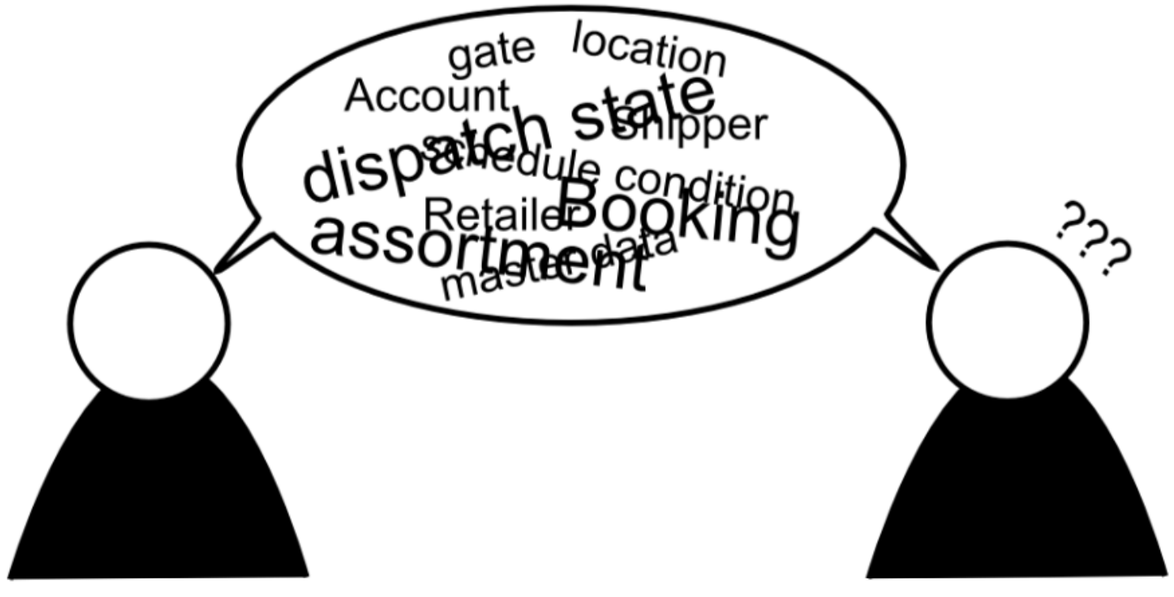
Domain-Driven Design



Ubiquitous Language

- Language shared by all involved parties
- Improves communication and prevents misunderstandings



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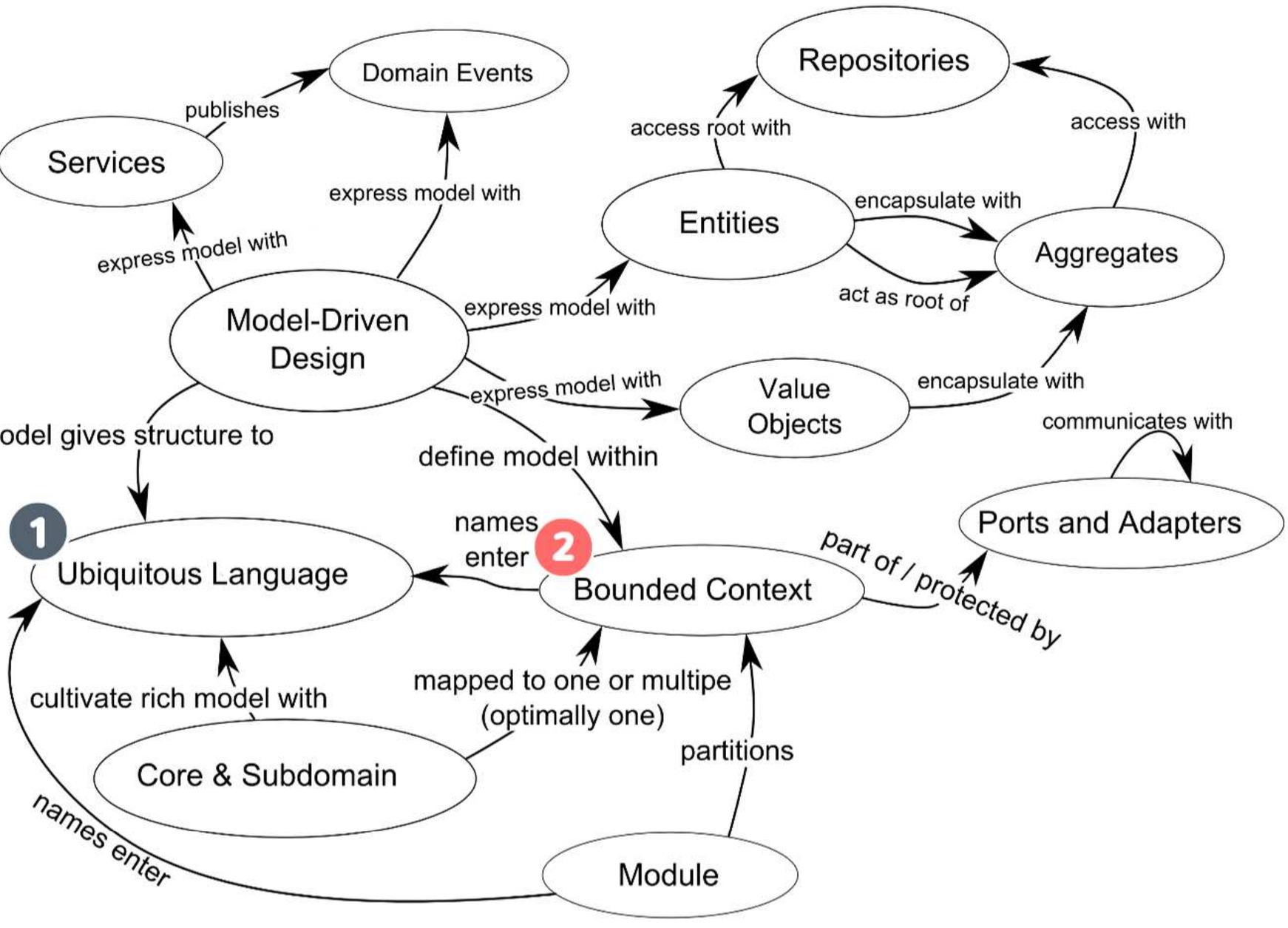
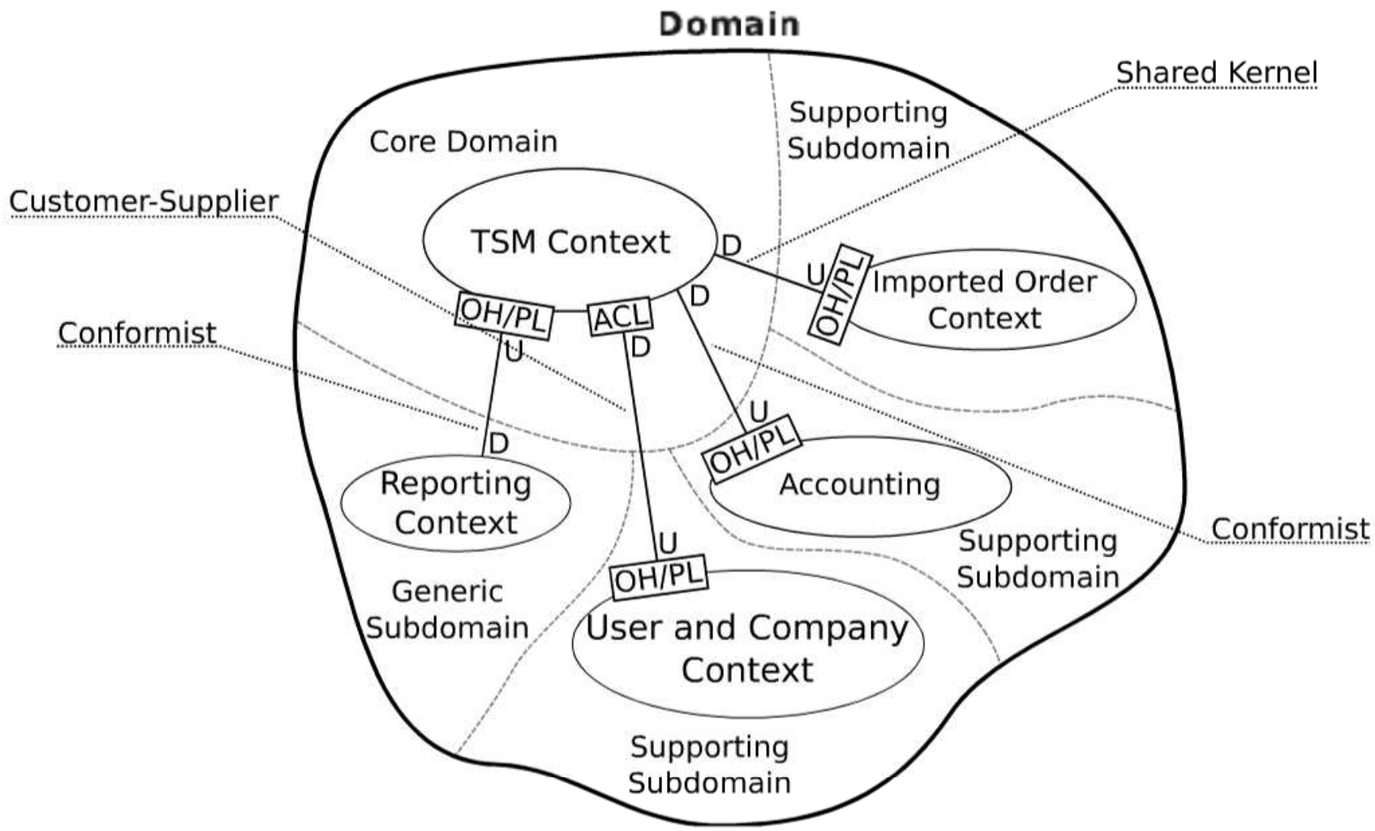


Bounded Contexts

- Ubiquitous Language Boundary
- Code, Database, Team Distribution Boundary



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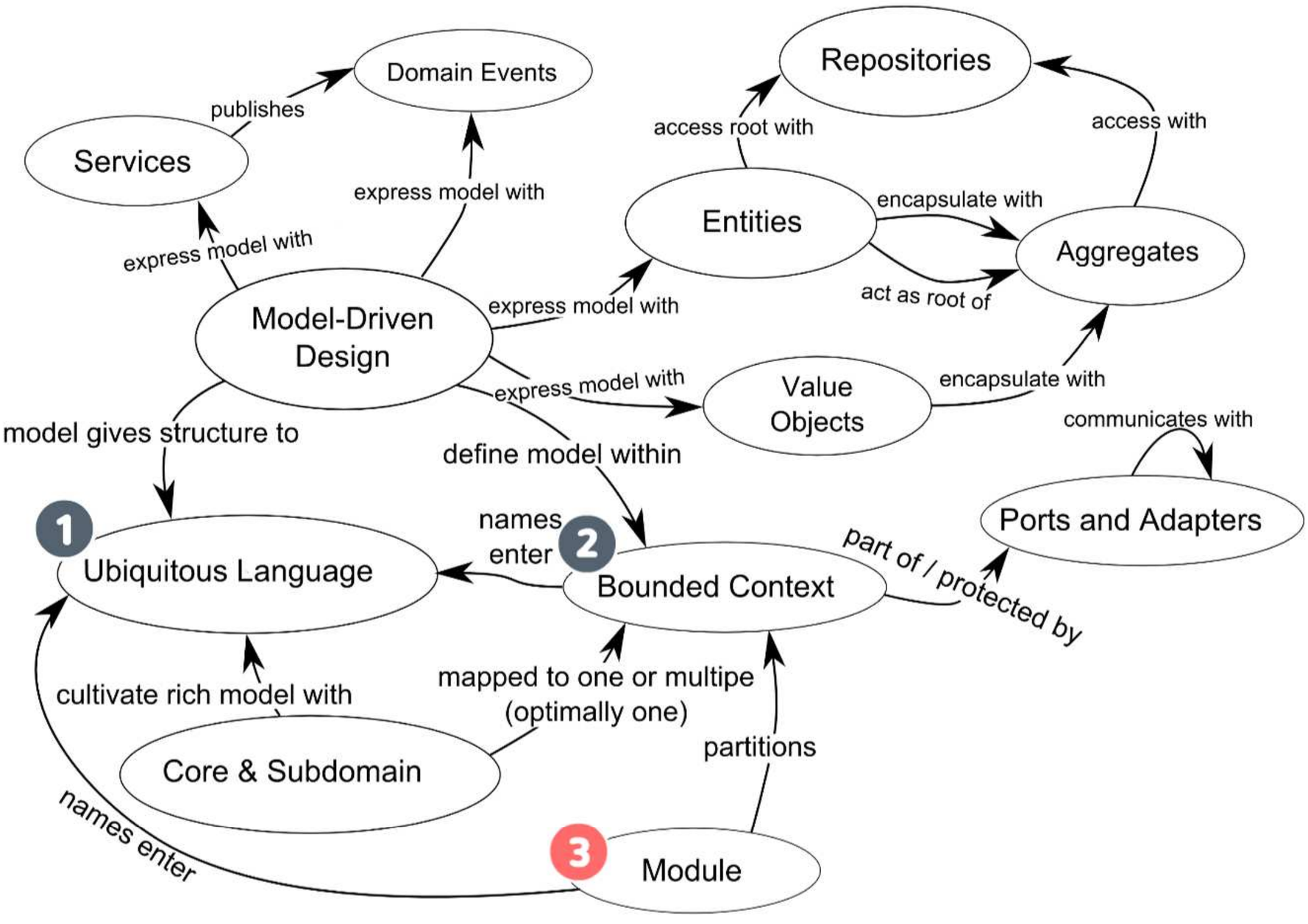
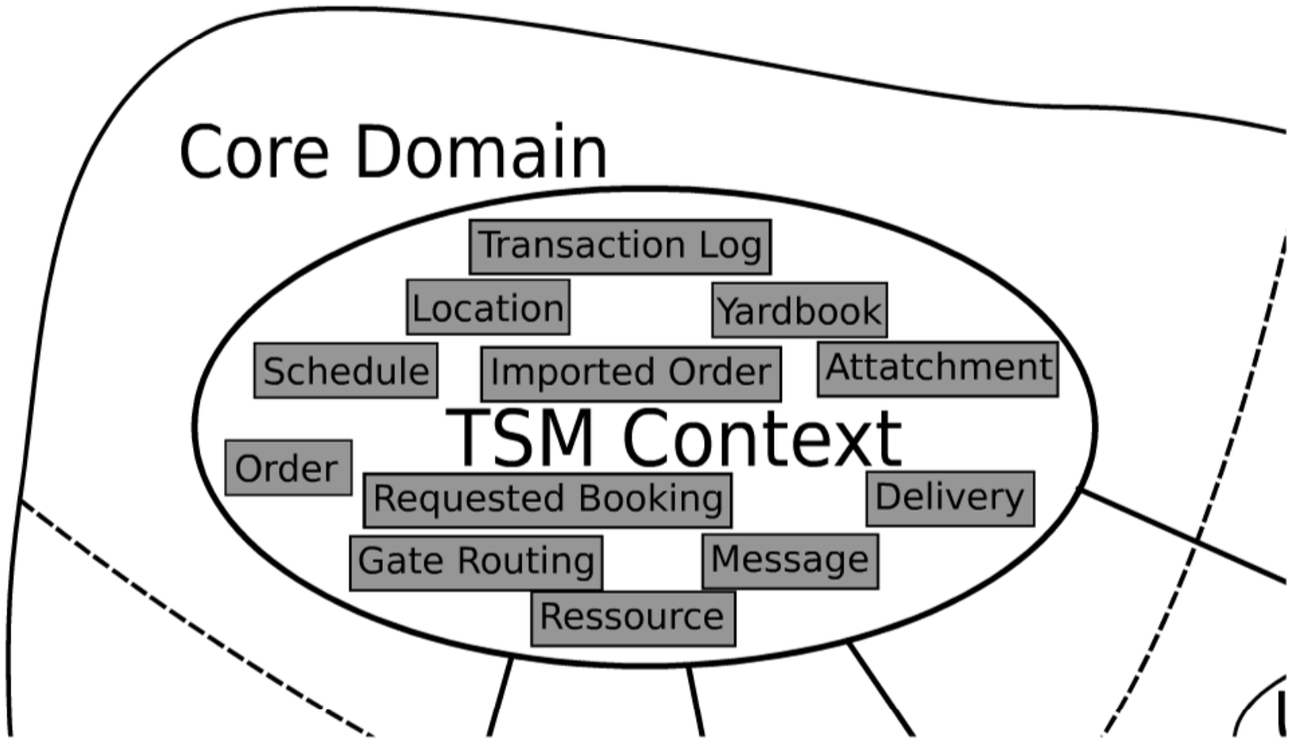


Modules

- Organize related concepts and tasks
- Reduce complexity
- Increase Cohesion
- Decrease Coupling



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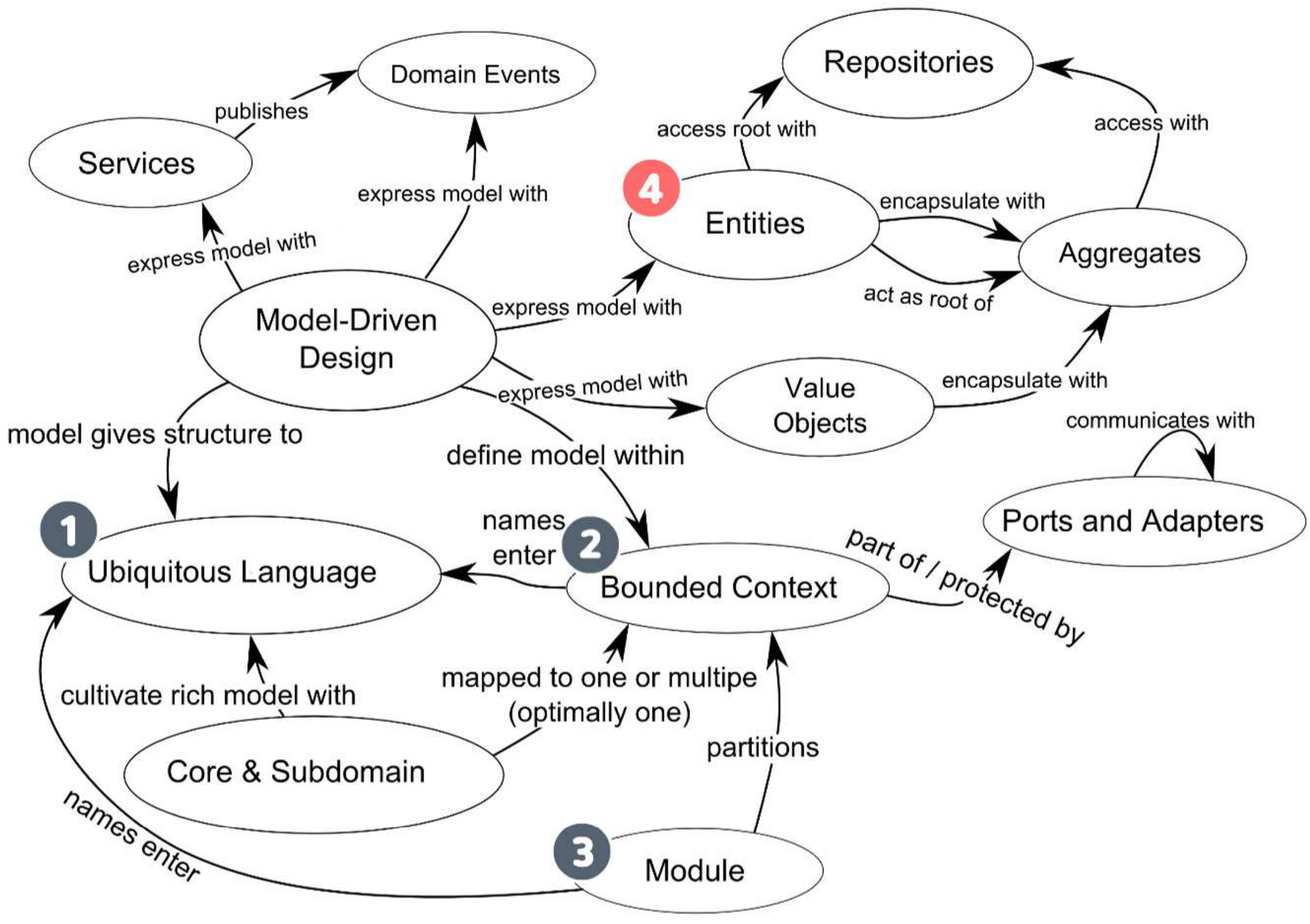
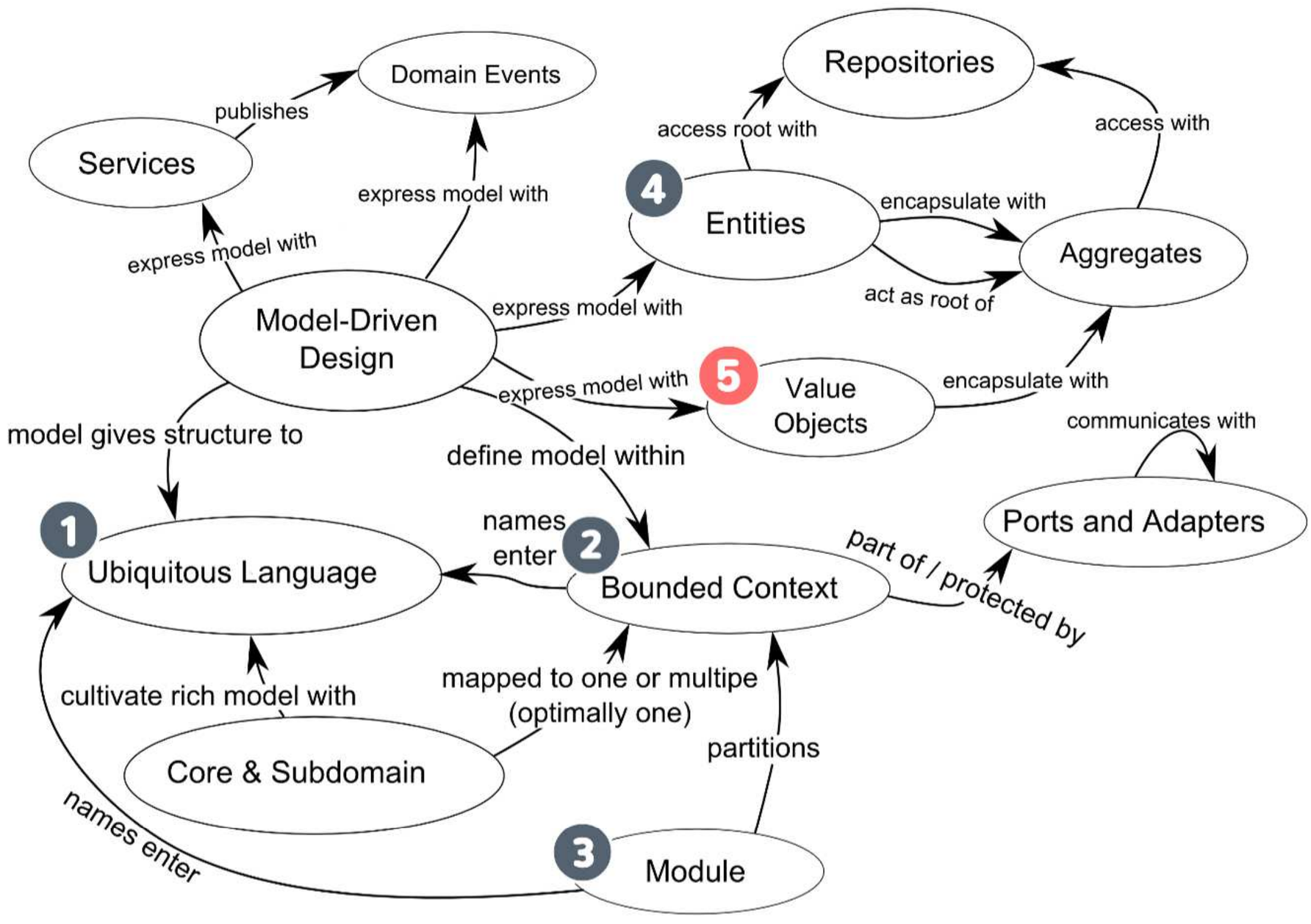


Entity

- Defined by its identity
- Unique beyond the life cycle of the system

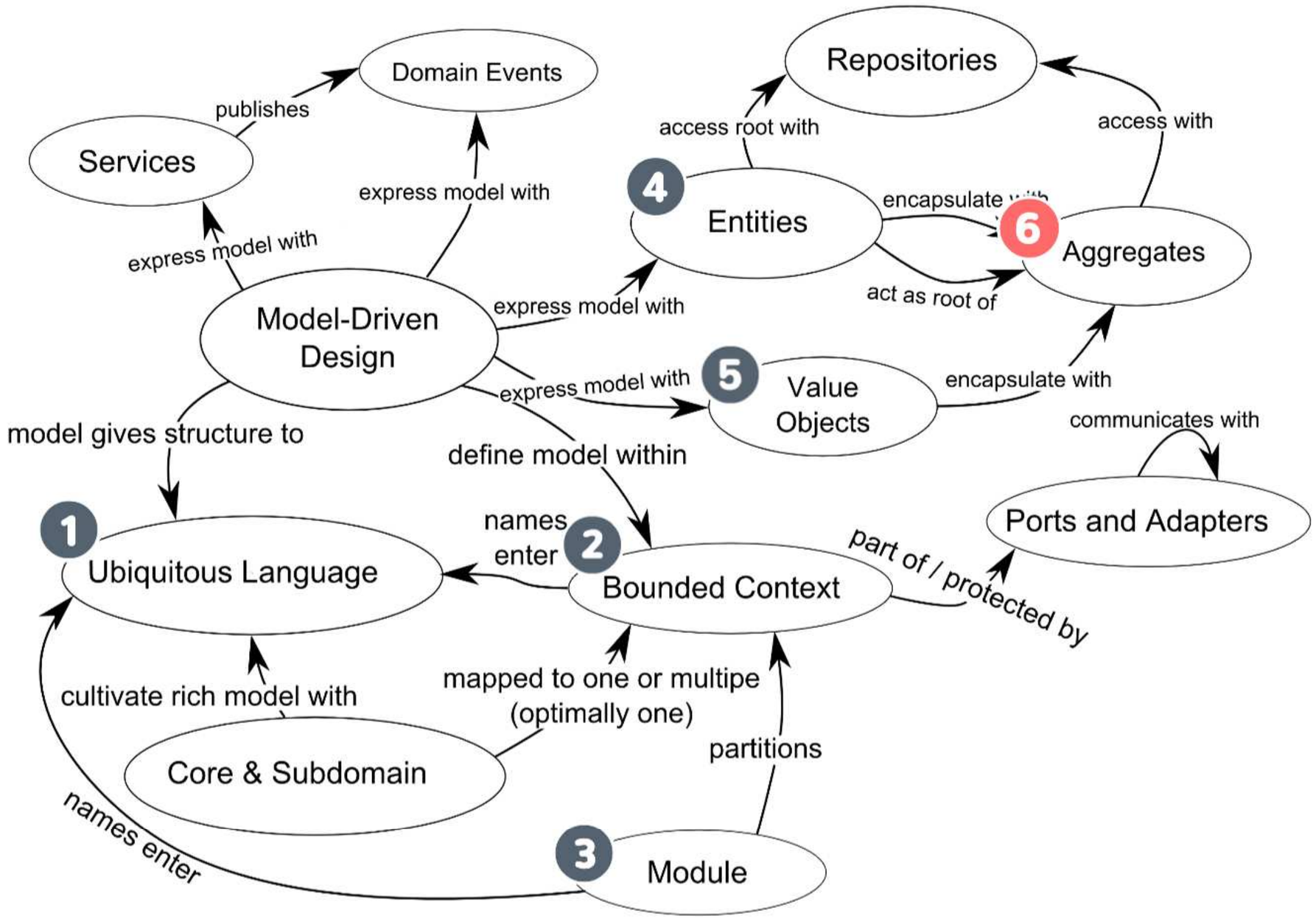
Domain-Driven Design



Value Objects

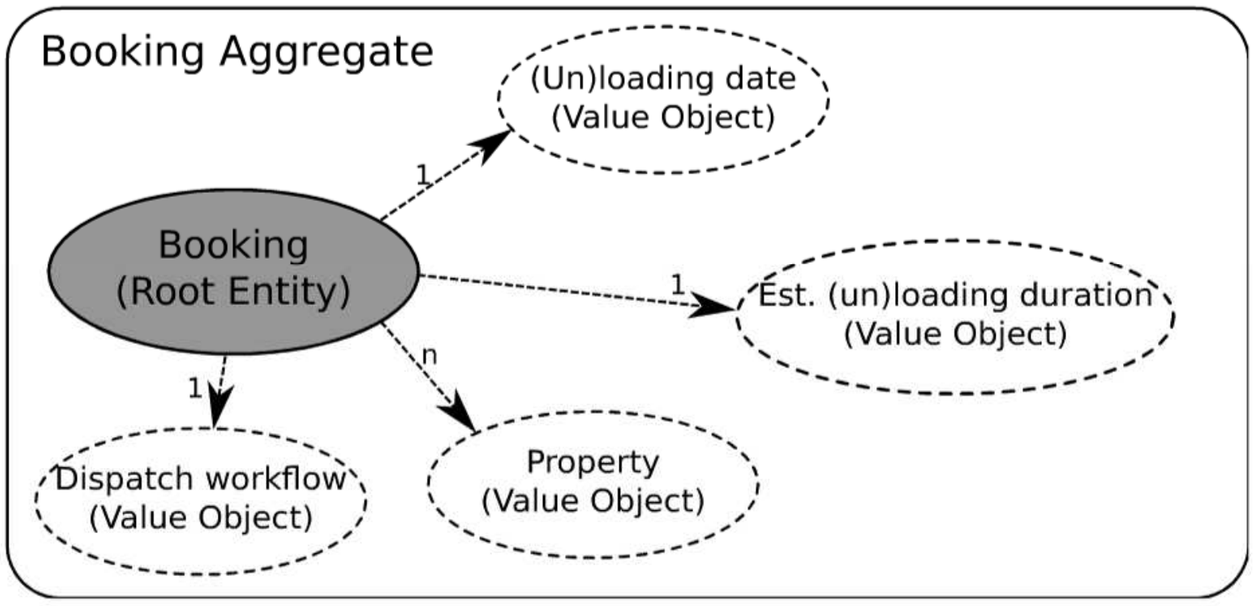
- Defined by its attributes
- Immutable
- When an attribute is changed, a new value object is instantiated

Domain-Driven Design



Aggregate

- One root entity
- Multiple entities
- Multiple value objects
- Consistency boundary
  - Transactions
  - Concurrency



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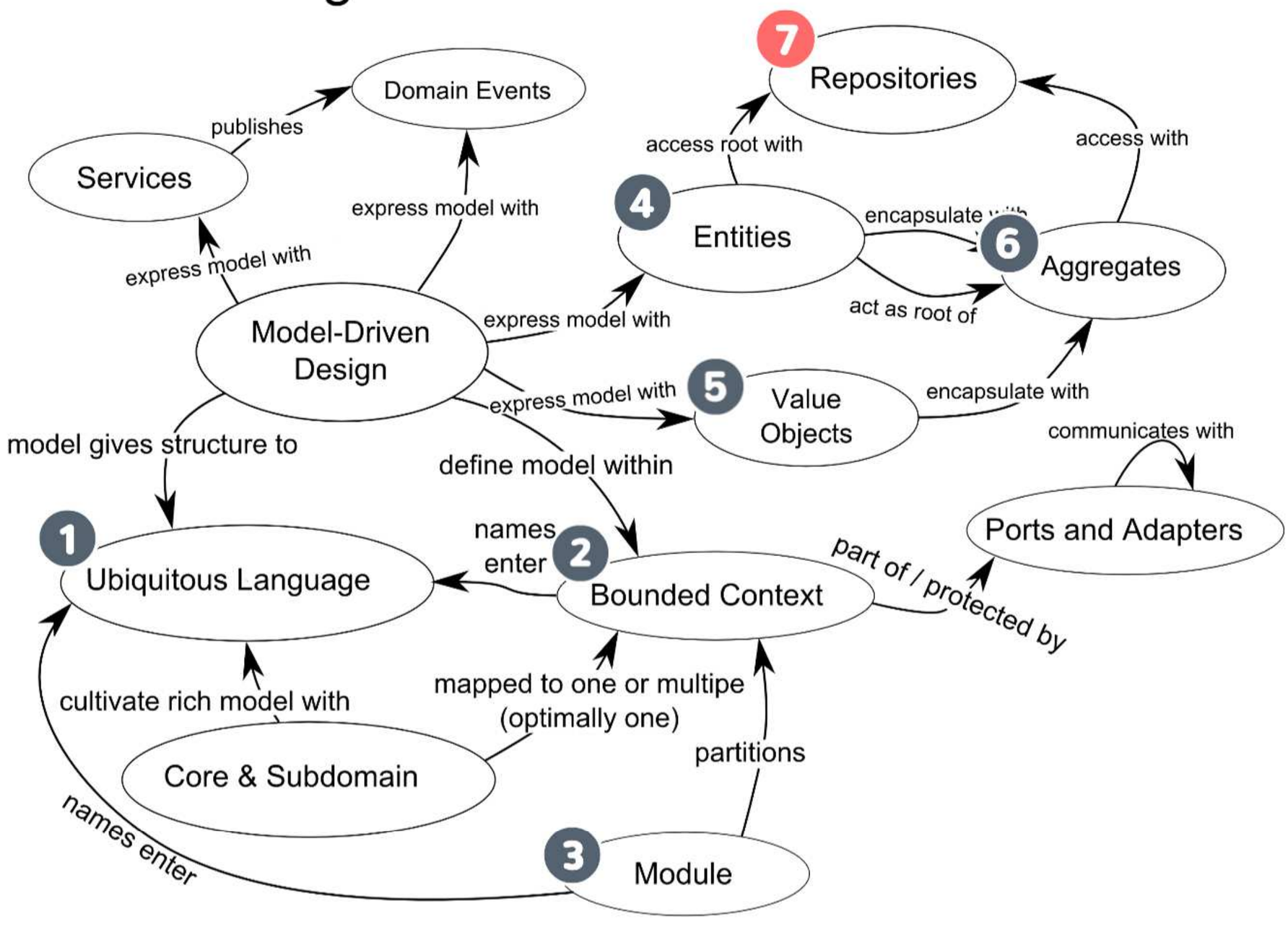
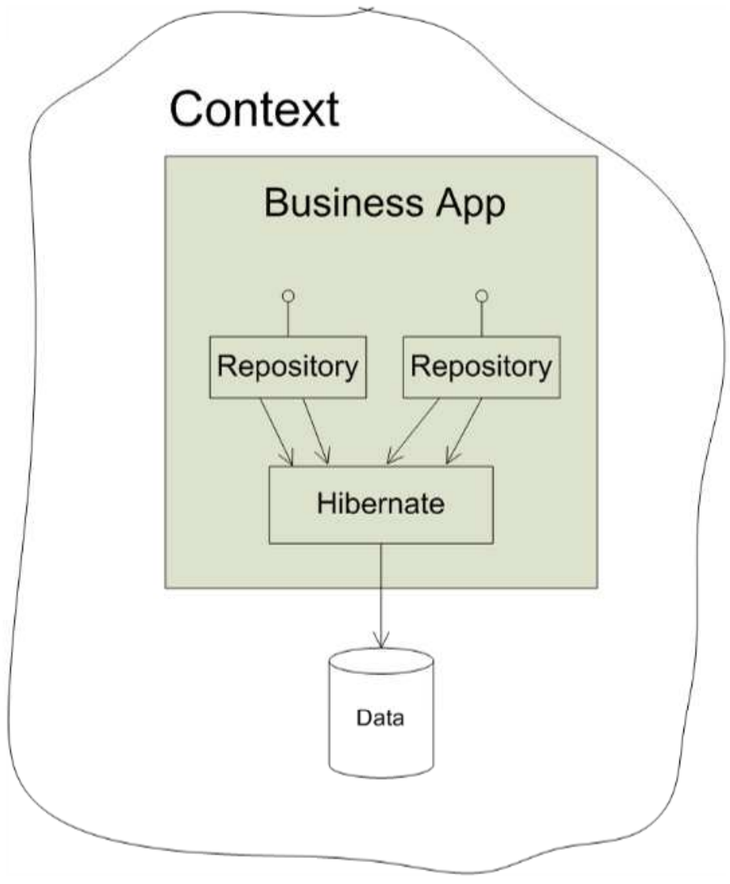


Repositories

- Provide access to aggregates
- Wraps data sources such as databases
- Implementation can be replaced for testing



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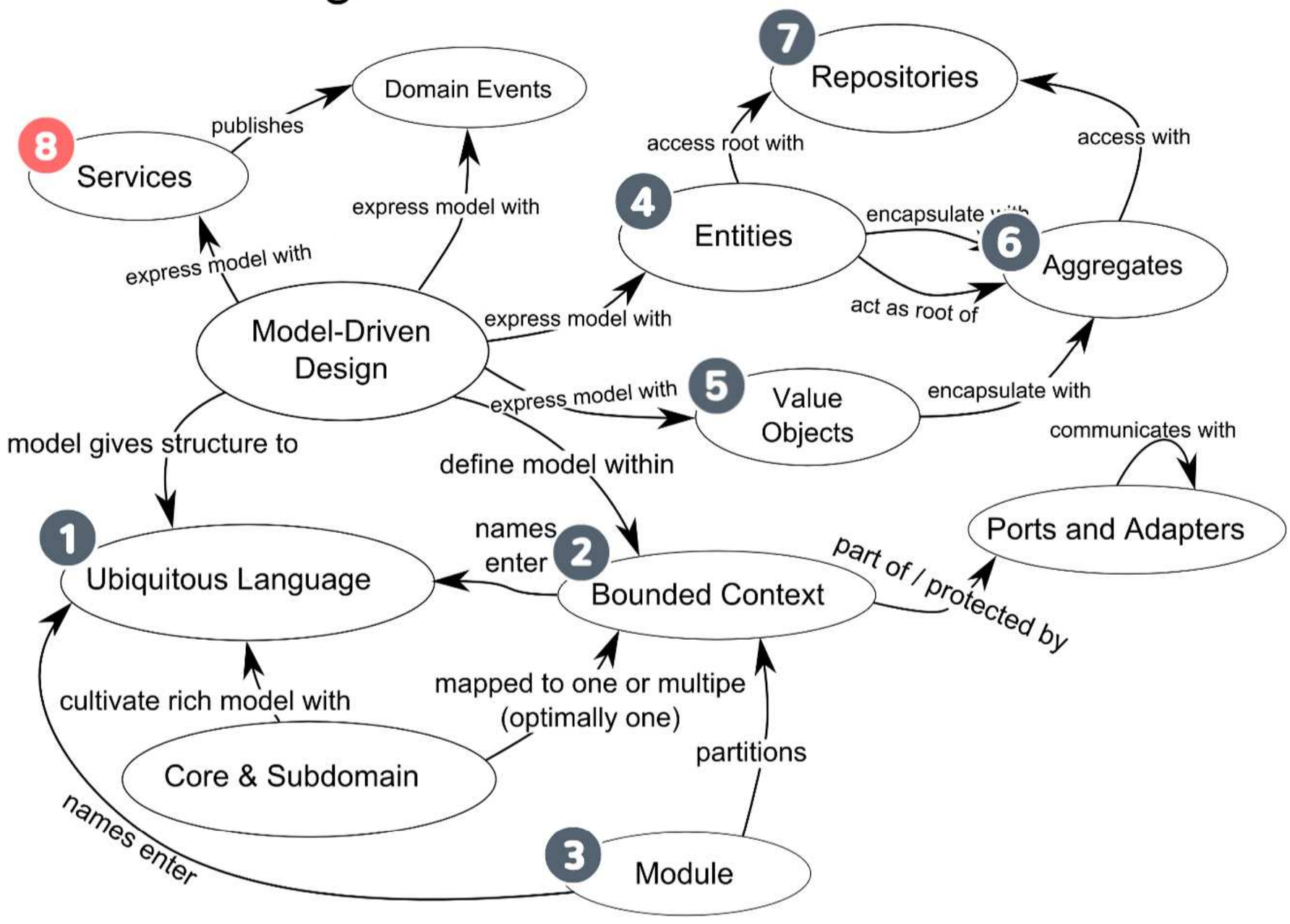


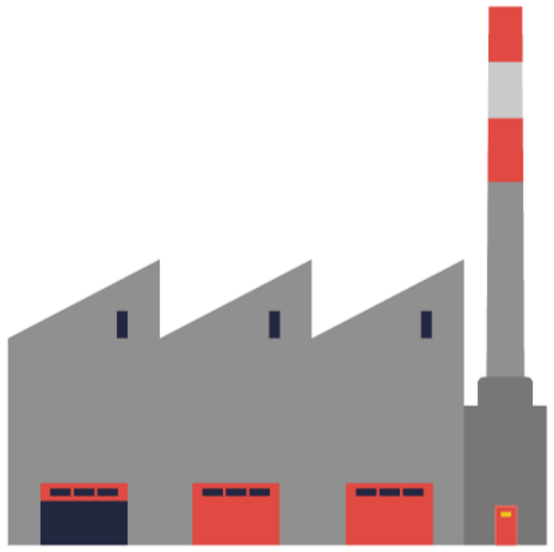
Services

Application Services

- Offer operations supported by the bounded context
- Can access repositories
- Controls the transactions & safety
- In charge of event based messaging

Domain Services

- Contains domain knowledge
- Encapsulates business logic that doesn't naturally fit within a domain object



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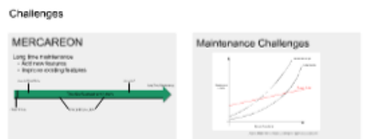


Domain-Driven Design

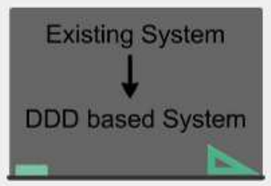
Refactoring

Prototype

Refactoring

Challenge

- Domain-Driven Design was not designed for architectural refactoring
- How to derive entities, value objects, aggregates, object methods and services?



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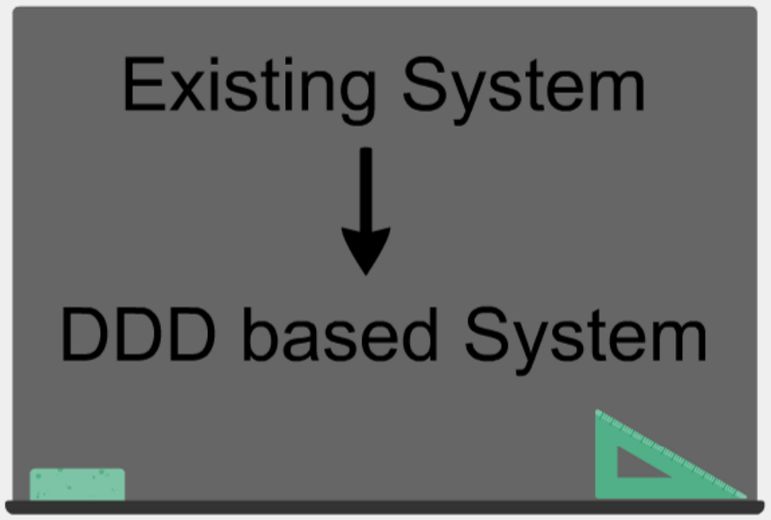

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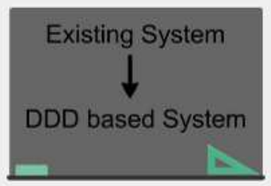
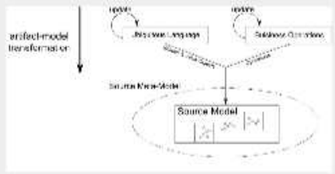


Solution: Model Transformations

Artifact - Model Transformation:
- Ubiquitous Language
- Buisiness Operations

> Source Model



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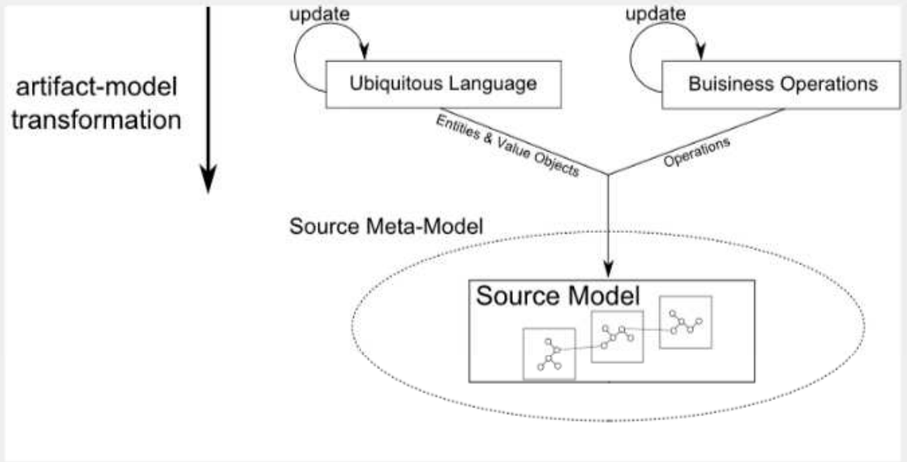

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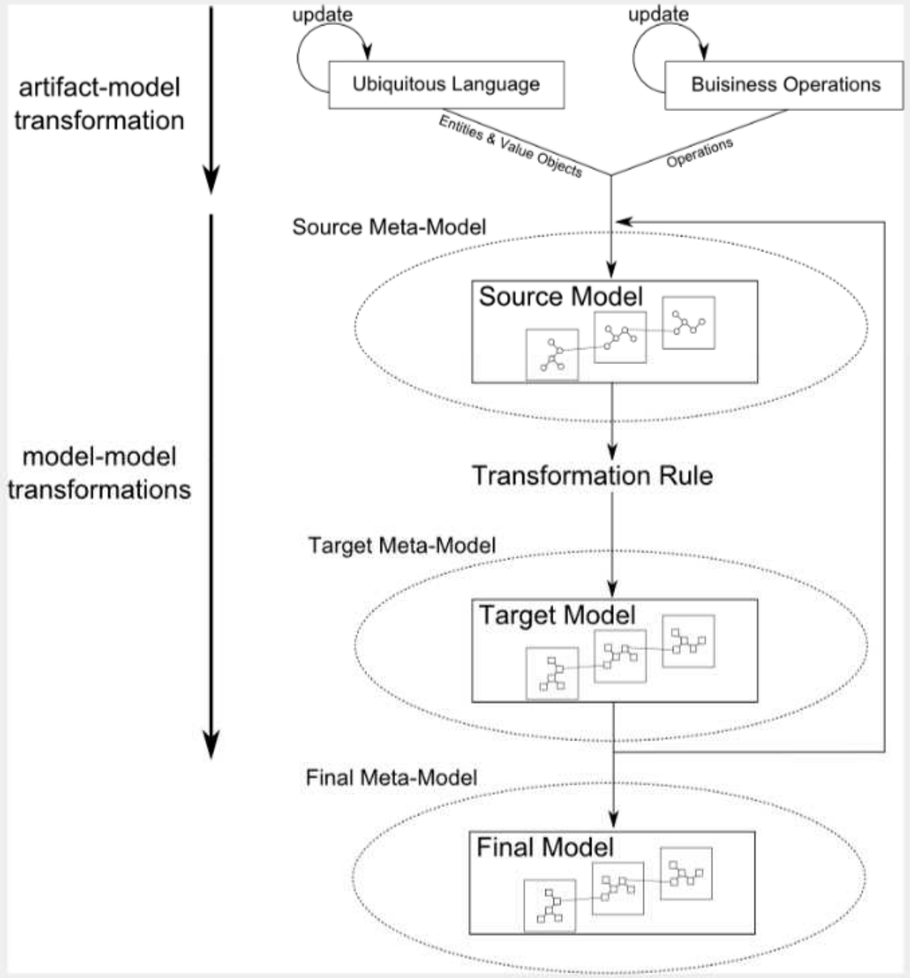
Model - Model Transformations:

- Source Model > Final Model



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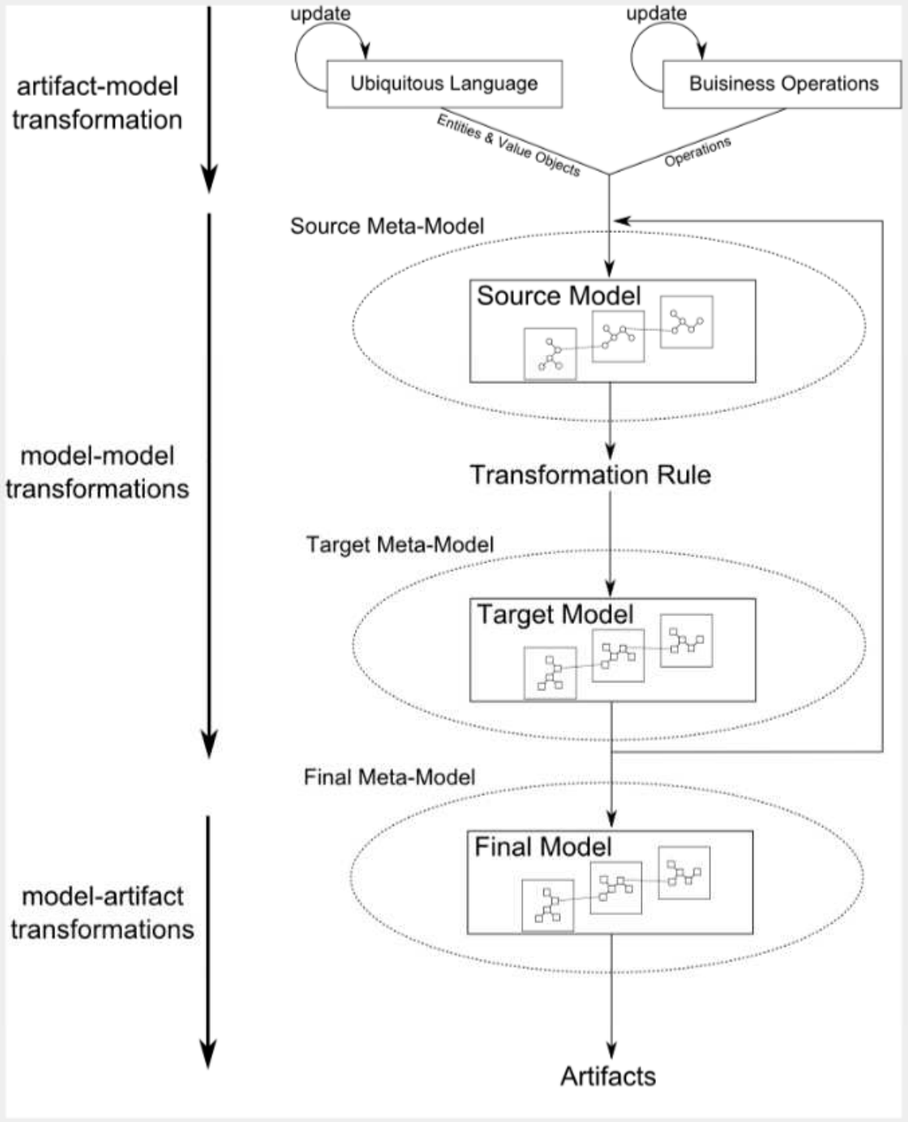
Model - Artifact Transformations:

- Final Model > Visualizations



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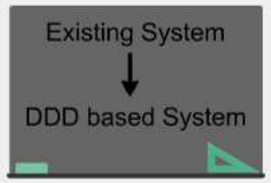

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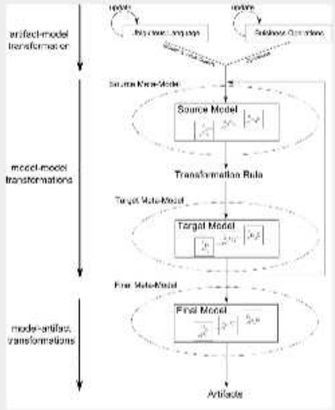

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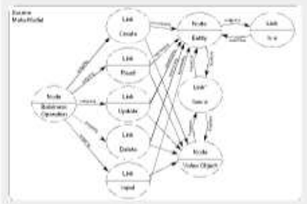

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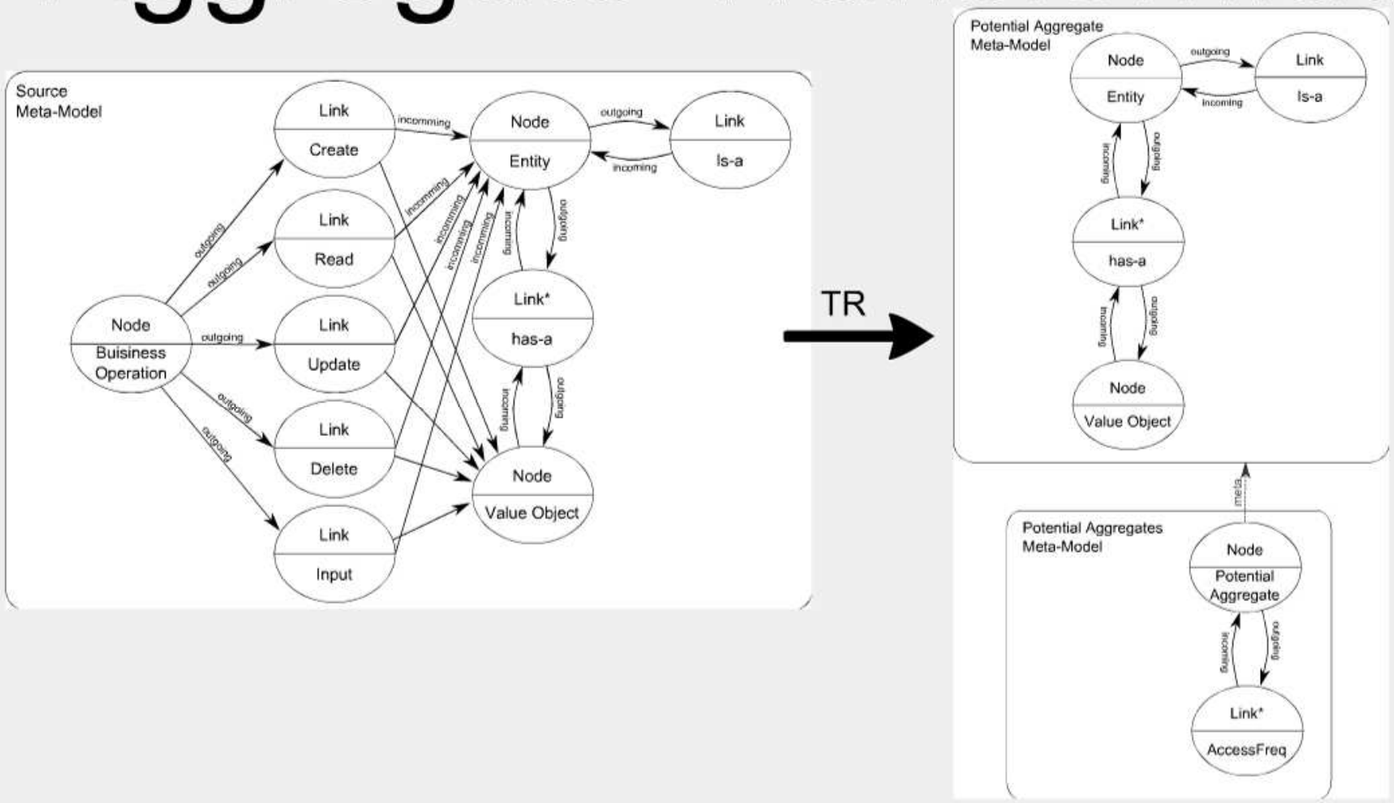

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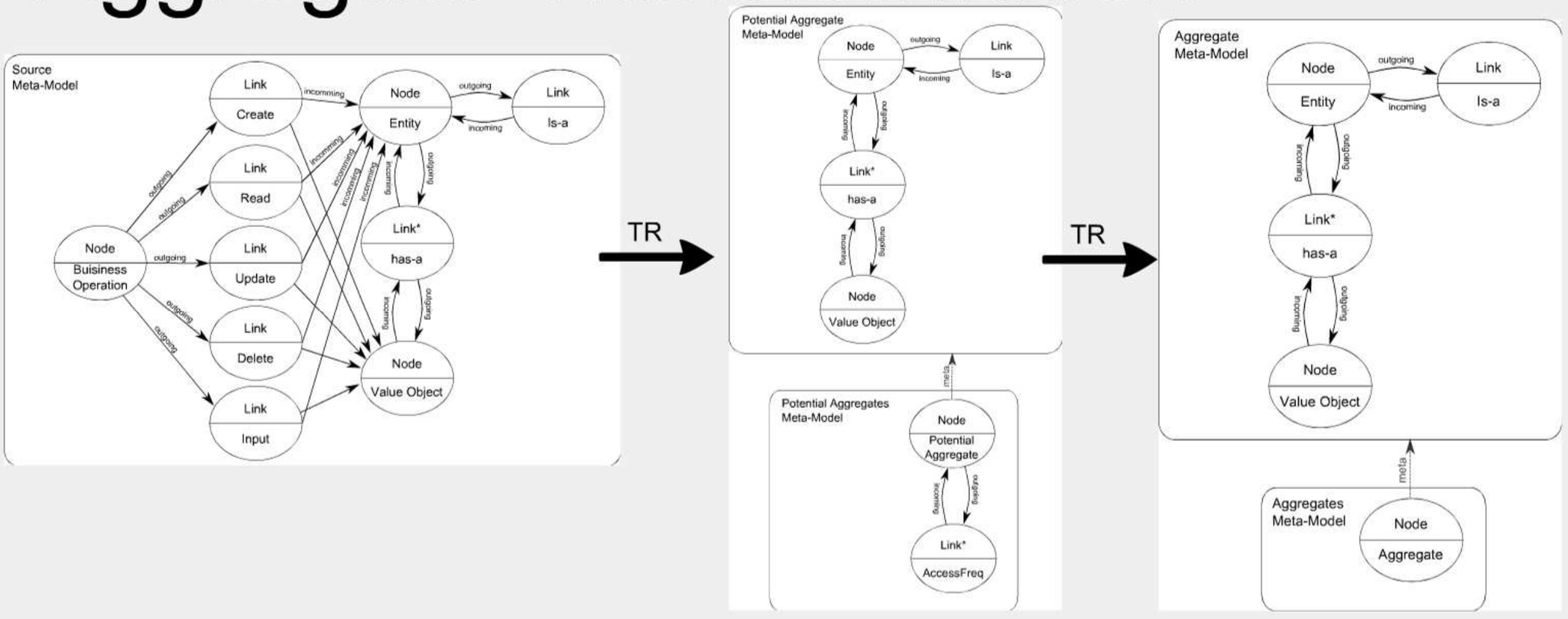

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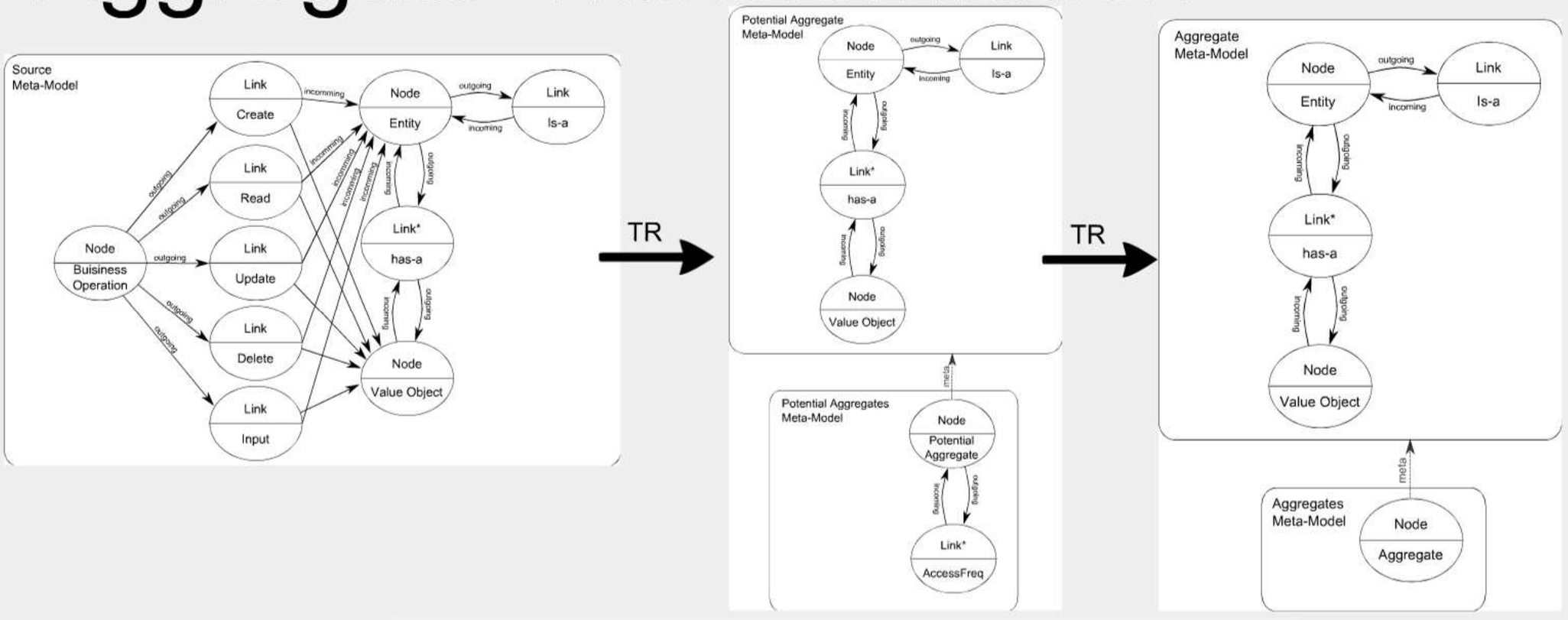
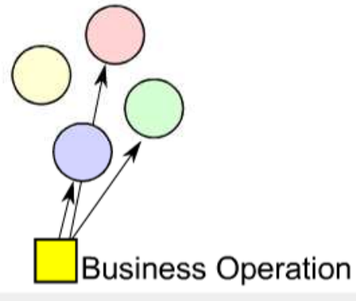


Entity & Value Objects



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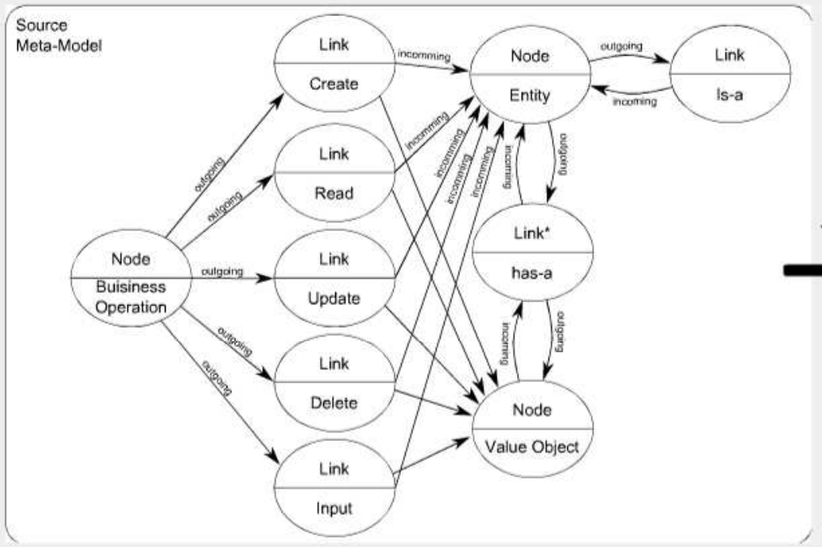

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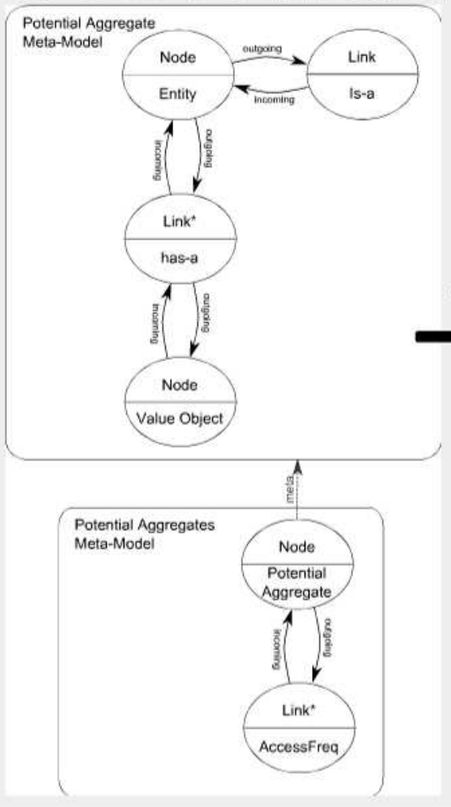

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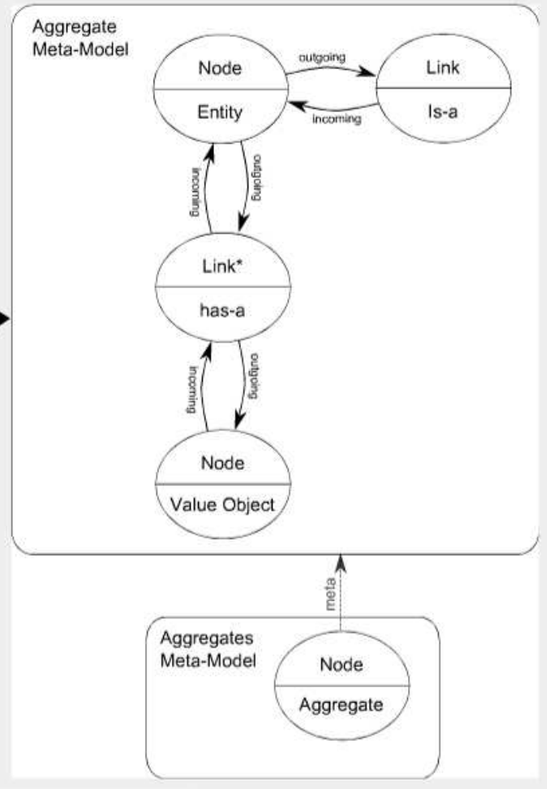

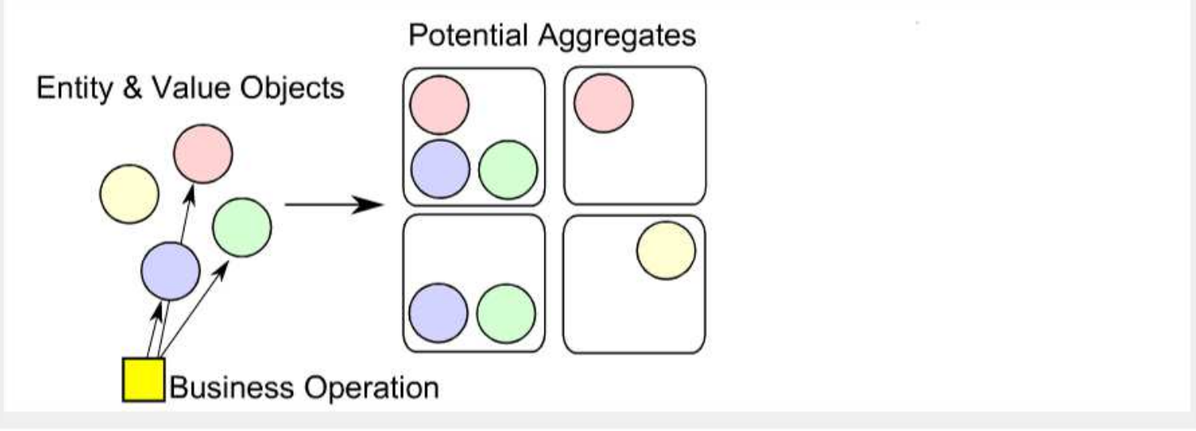

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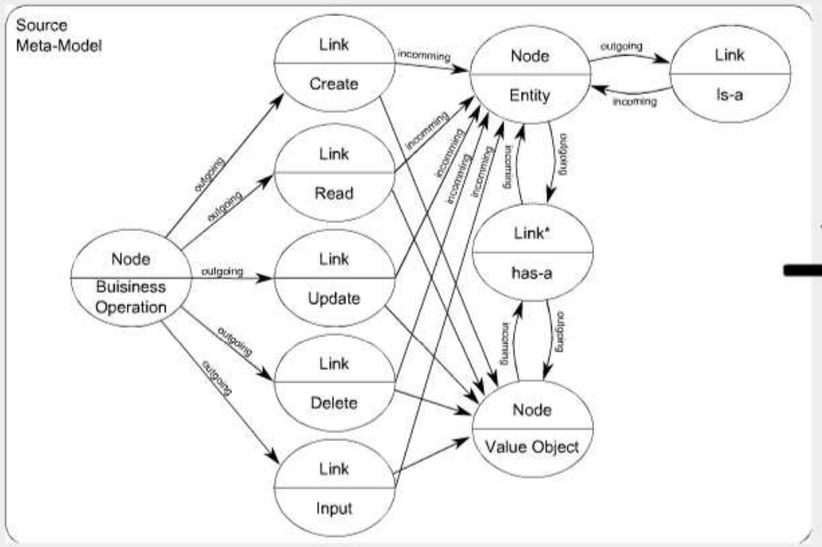

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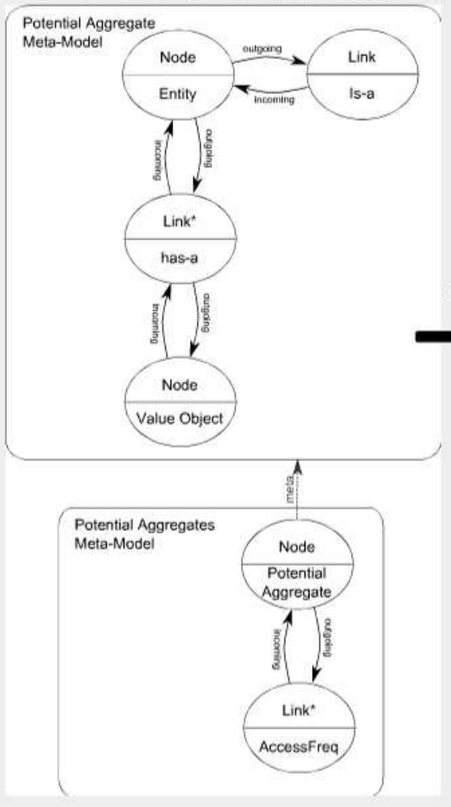

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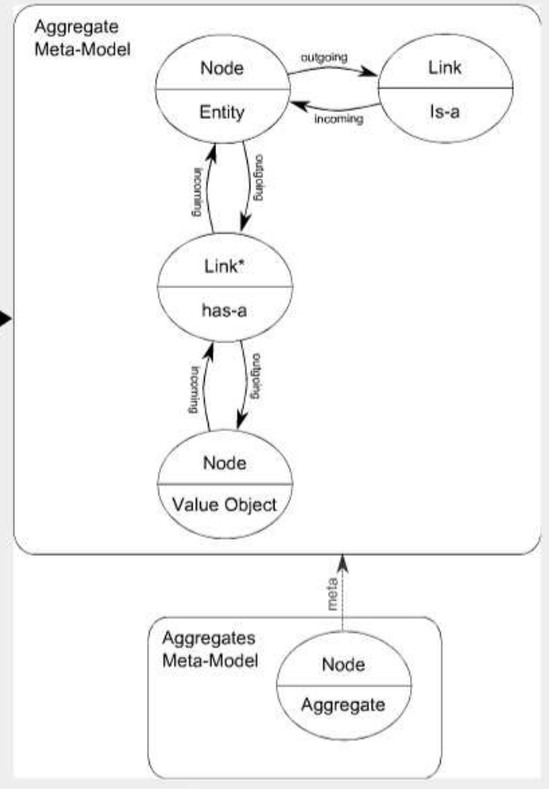

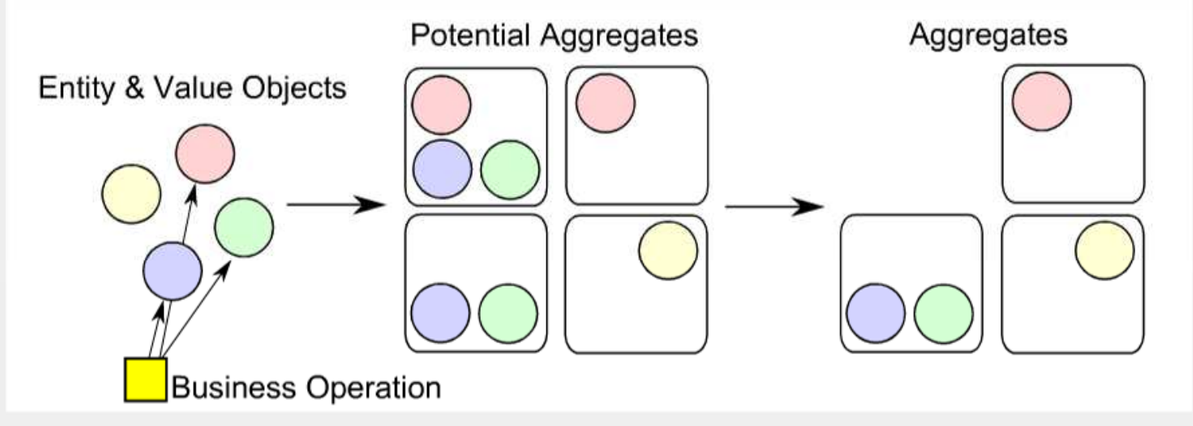

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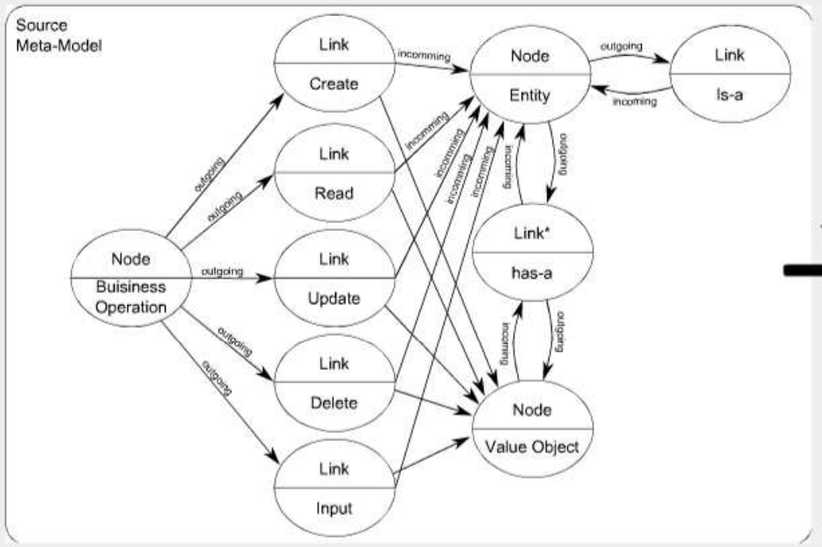

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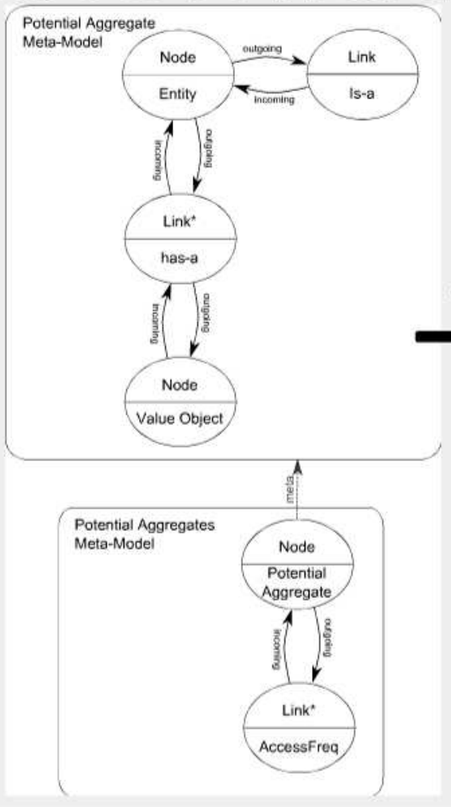

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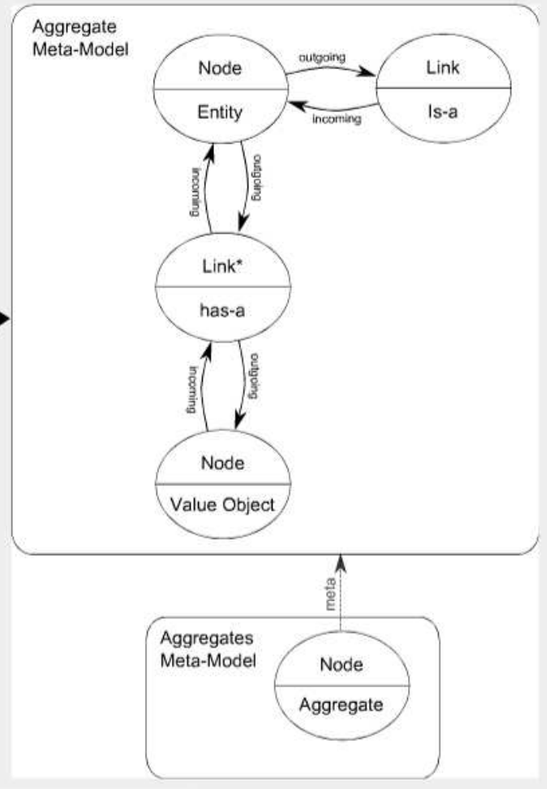

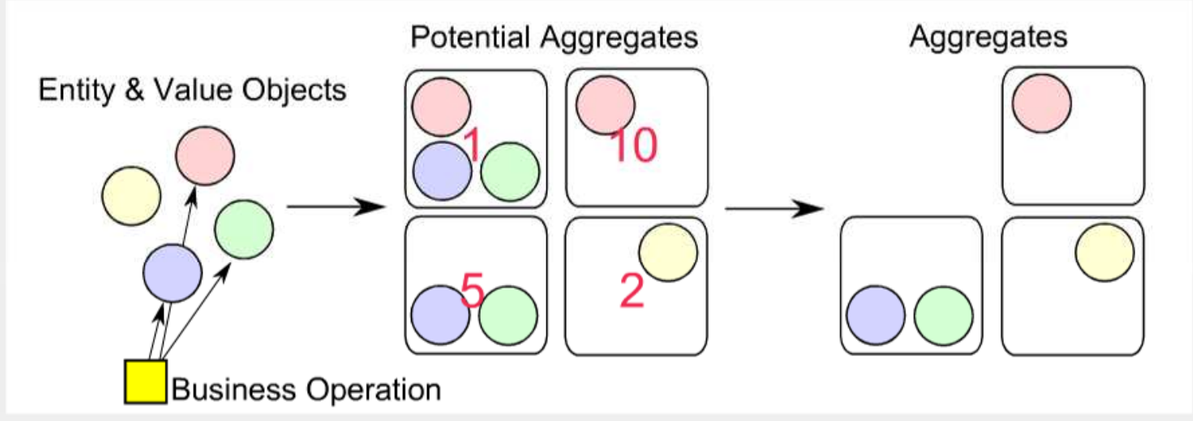

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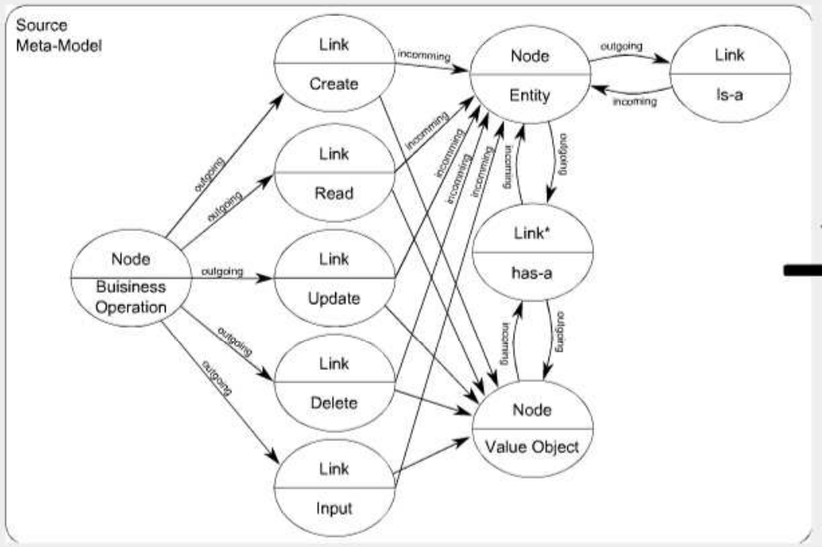

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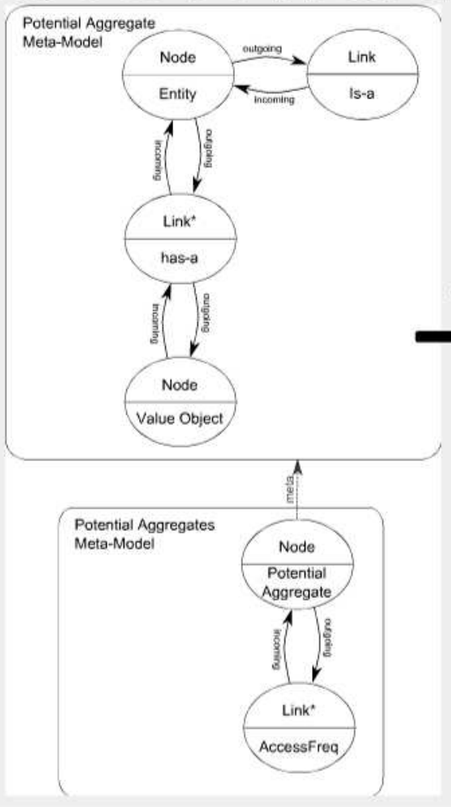

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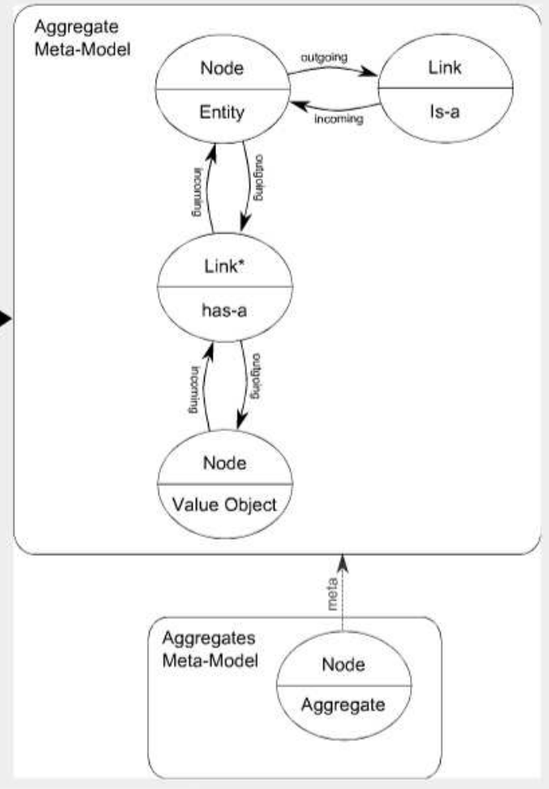
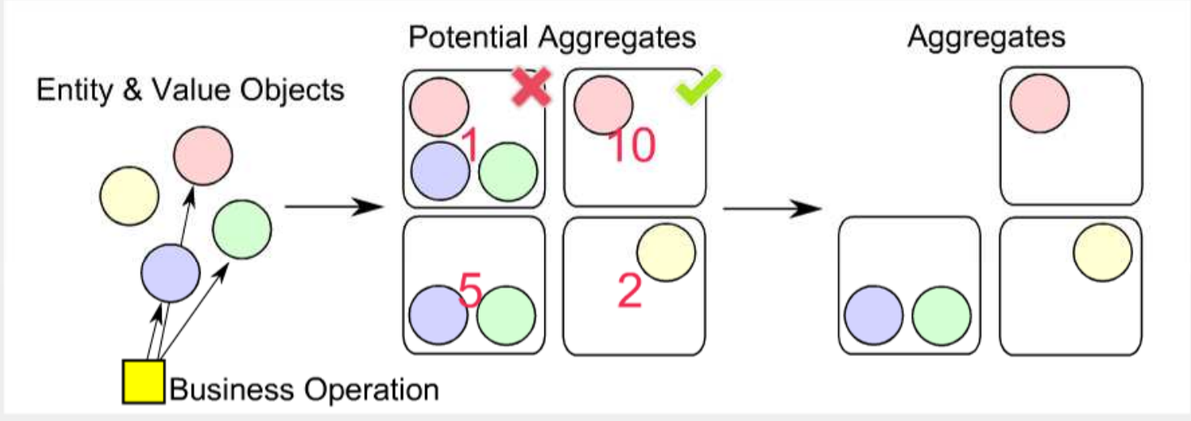
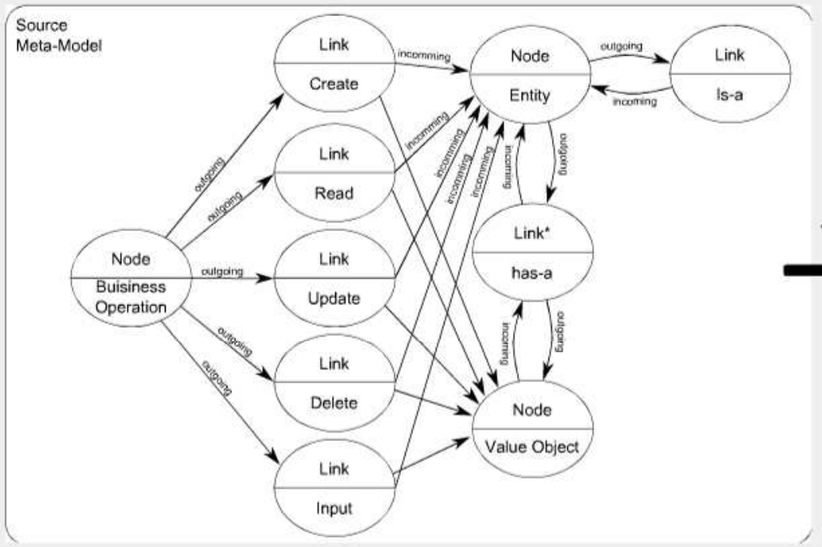




Aggregate Transformation



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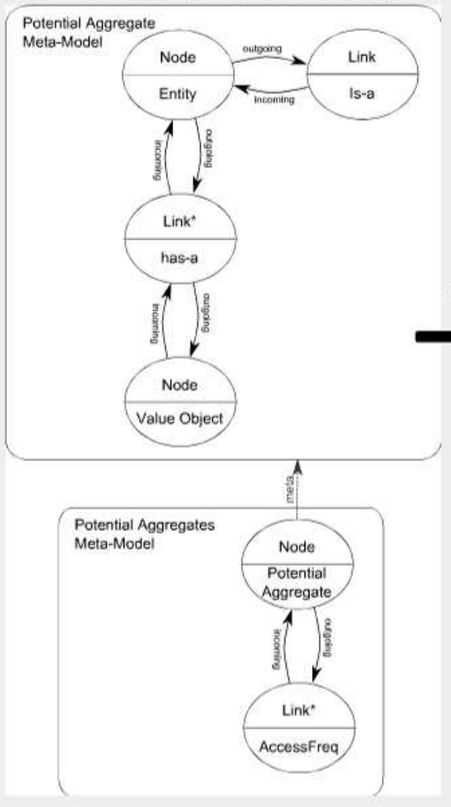

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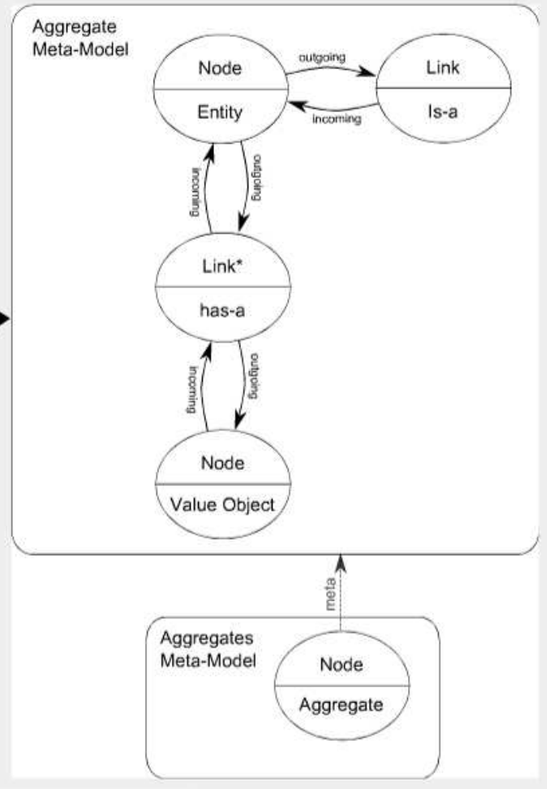

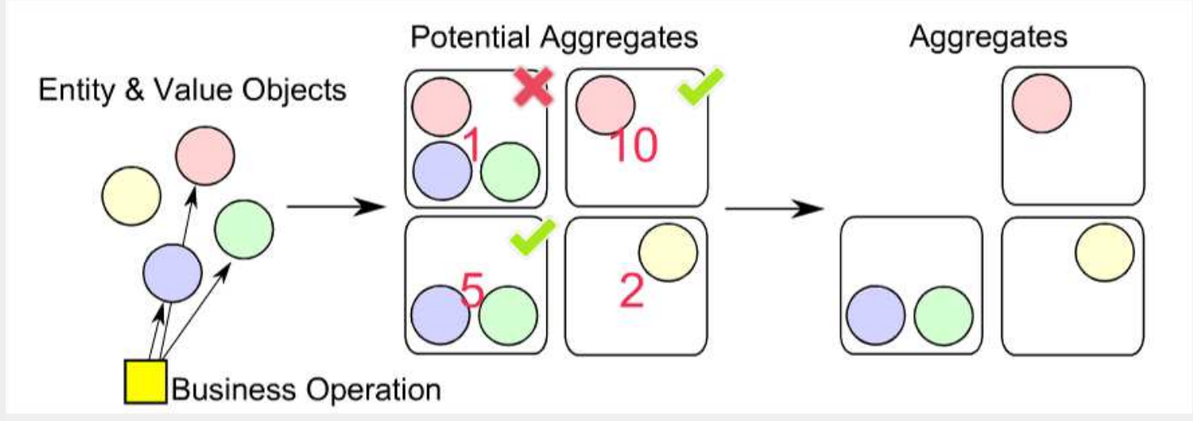

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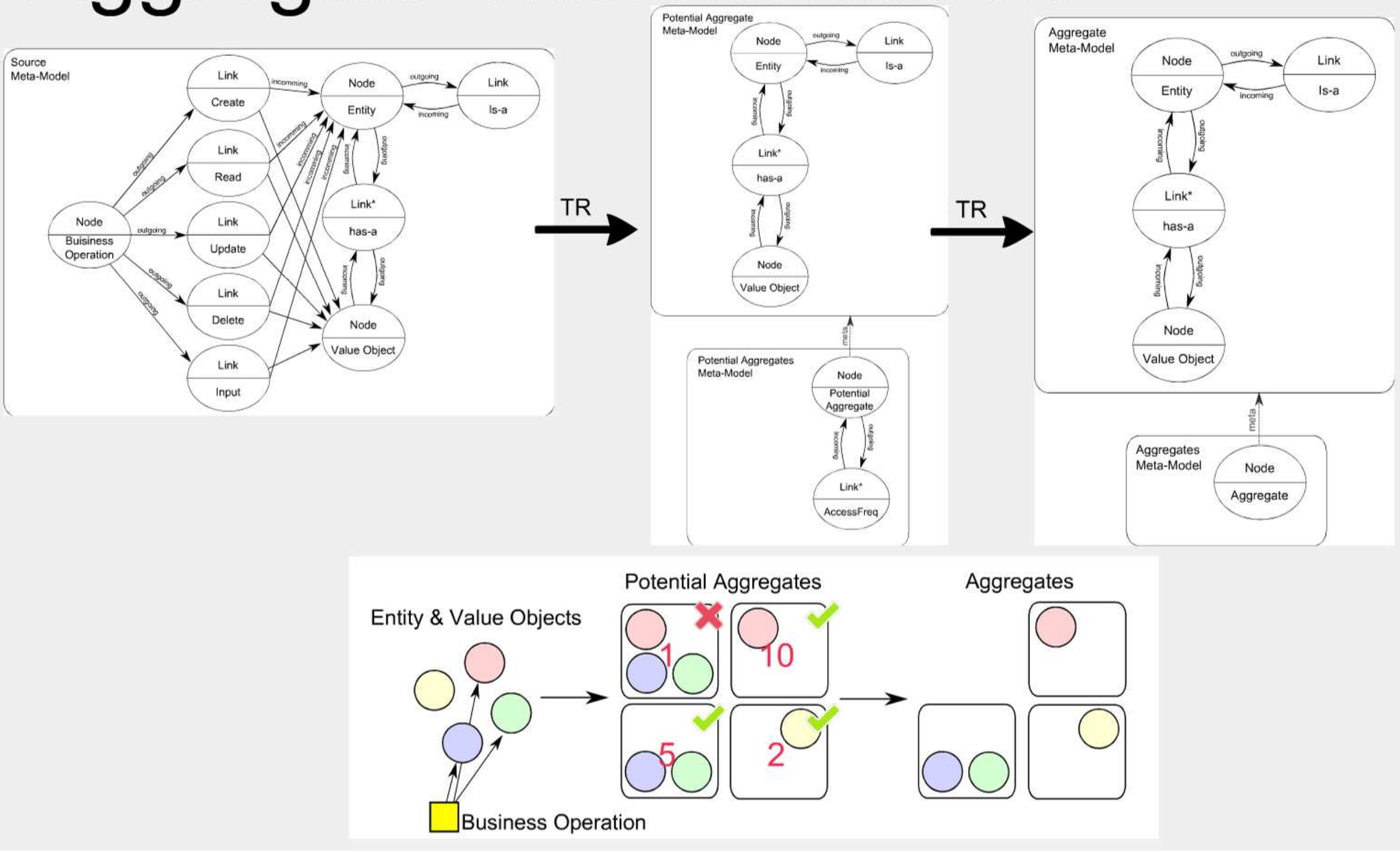

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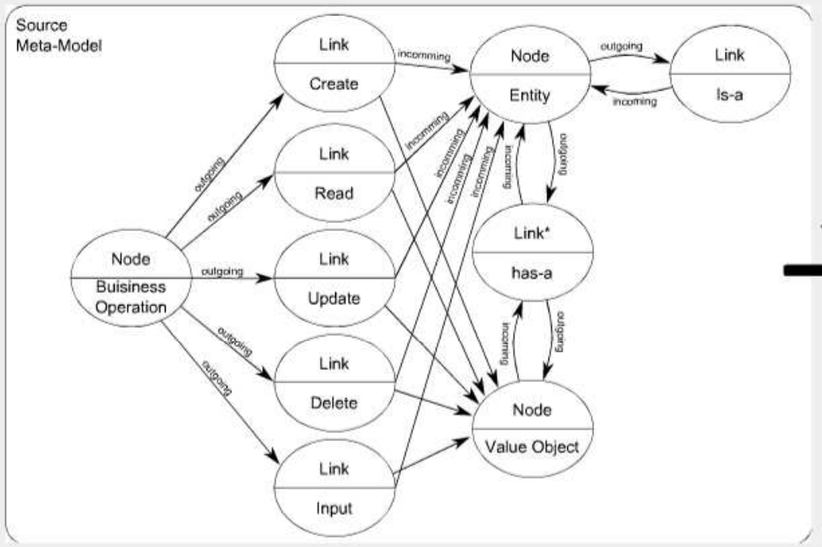

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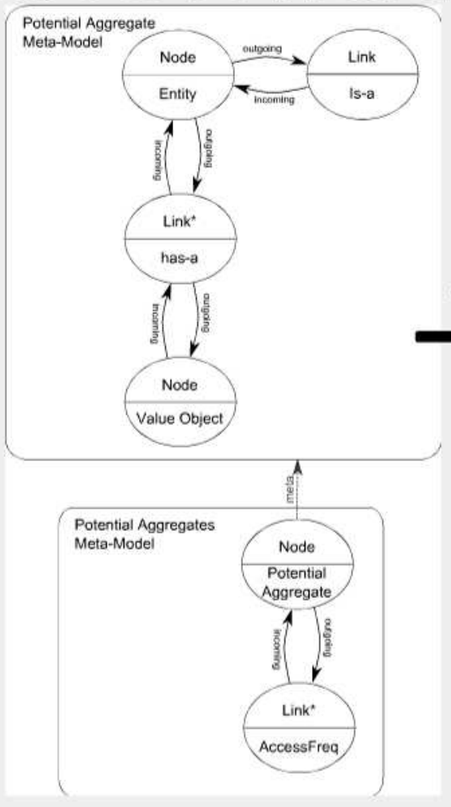

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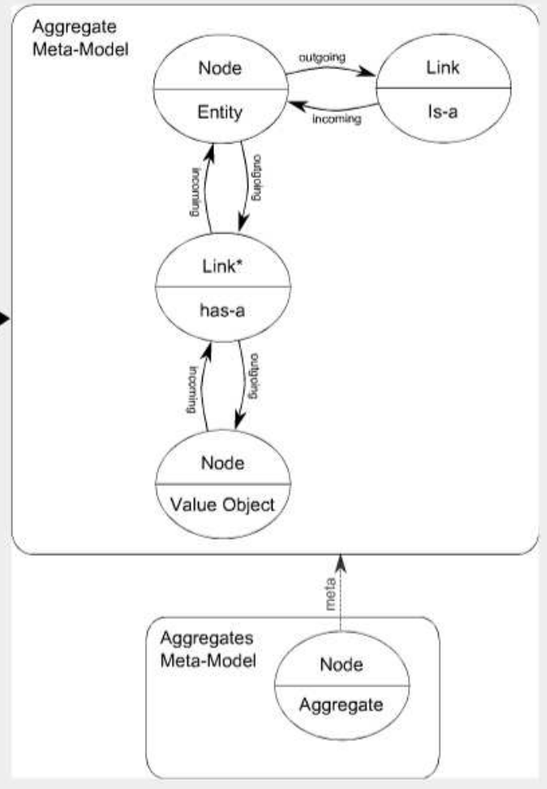


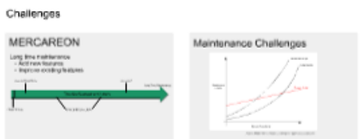
Excerpt of a Transformation Rule (TR):

$$\langle move \rangle ::= \text{Priority 1} : \text{BusinessOperation(bo)} \wedge \text{Entity(e)} \wedge (\text{Create(bo,e)} \vee \text{Read(bo,e)}$$
$$\vee \text{Update(bo,e)} \vee \text{Delete(bo,e)} \vee \text{Input(bo,e))} \wedge \text{name(e,eName)}$$
$$\rightarrow \text{Entity(newE)} \wedge \text{name(newE,eName)} \wedge \text{PotentialAggregate(p)} \wedge \text{partOf(newE, p)};$$

Agenda

Introduction

Challenges



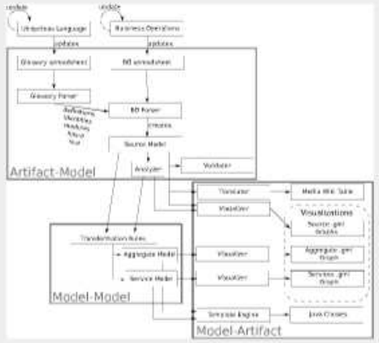
Domain-Driven Design

Refactoring

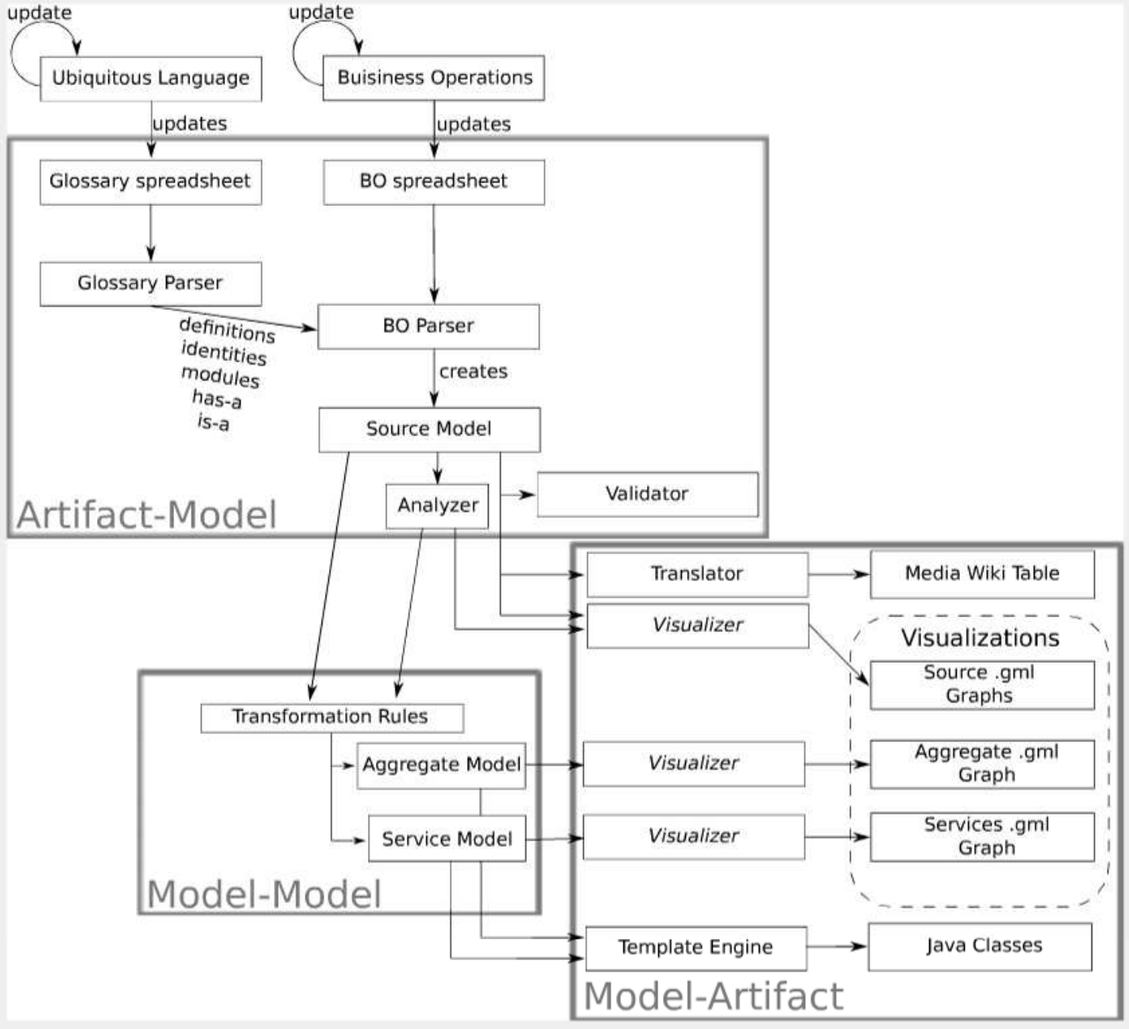
Prototype

Prototype

Architecture

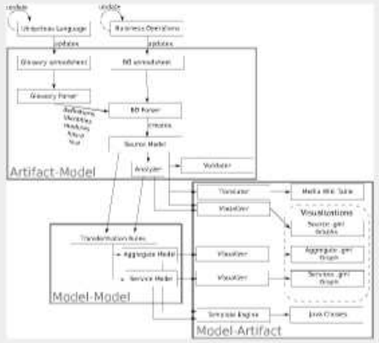


Architecture



Prototype

Architecture



Resulting Artifacts

Source Model

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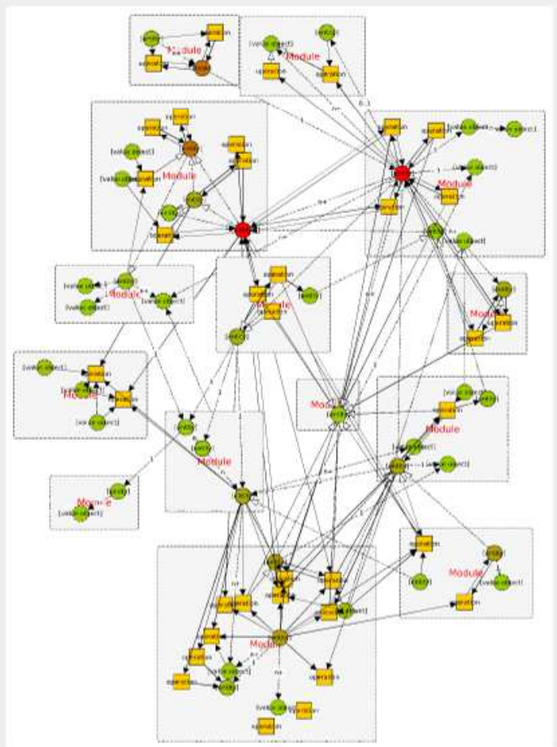
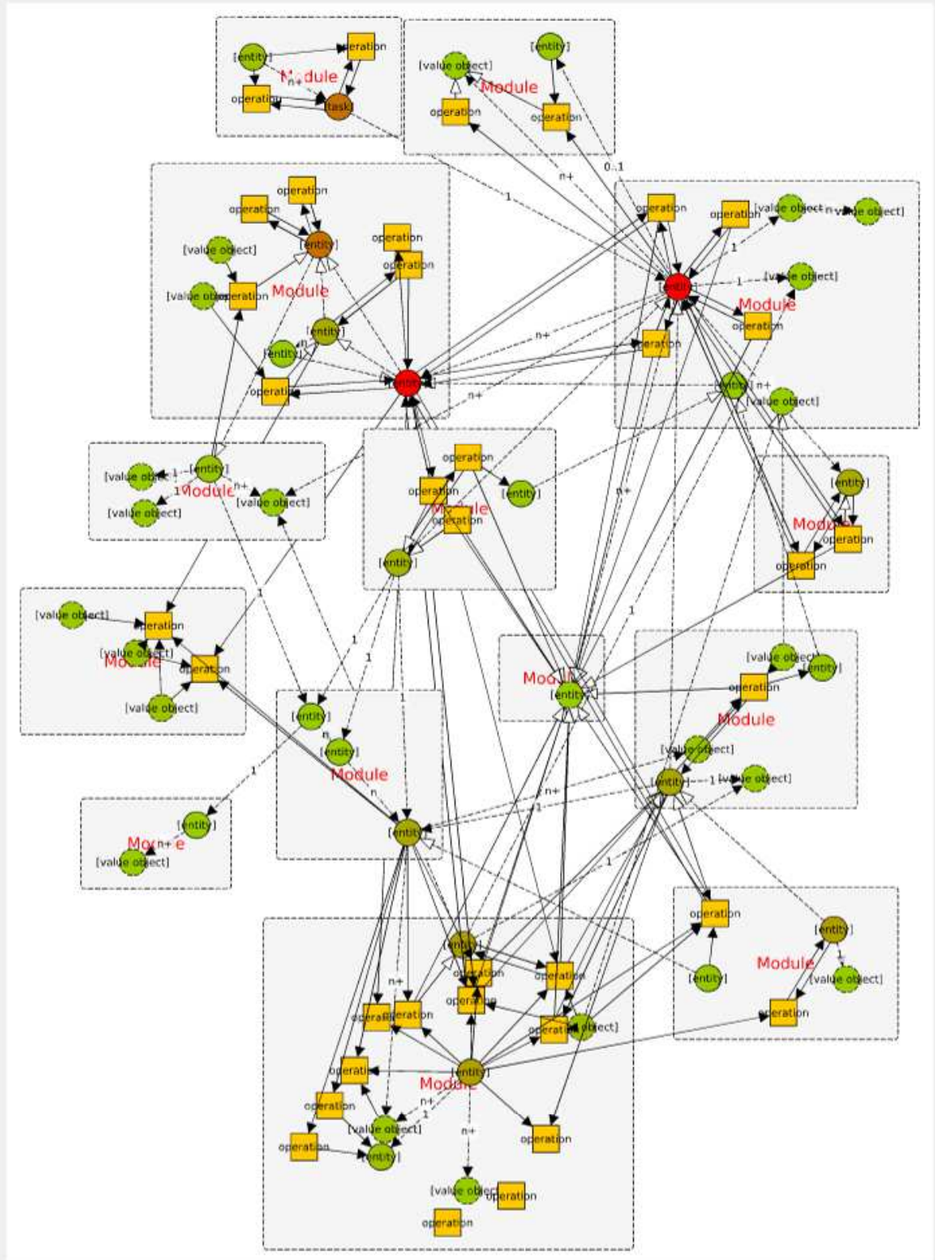
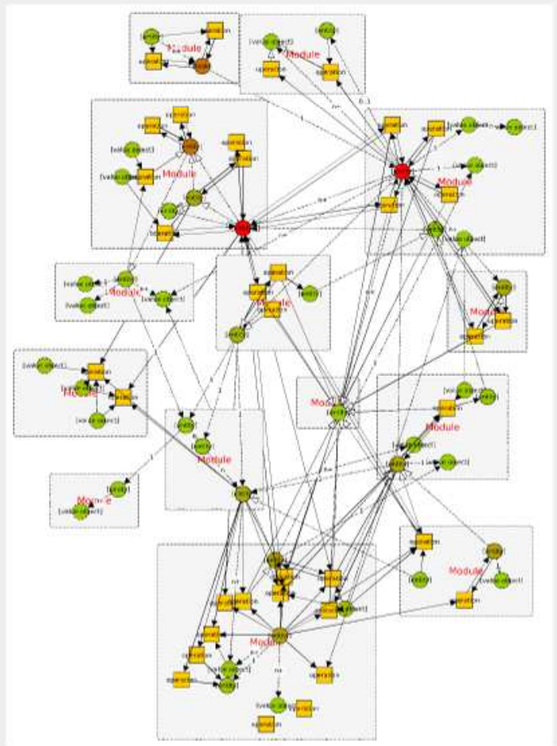


Source Model

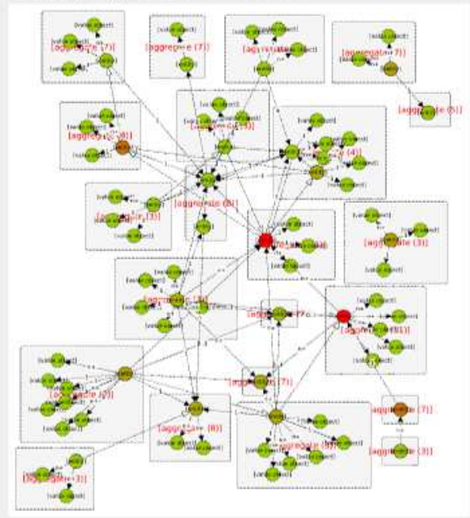


Resulting Artifacts

Source Model



Aggregate Model



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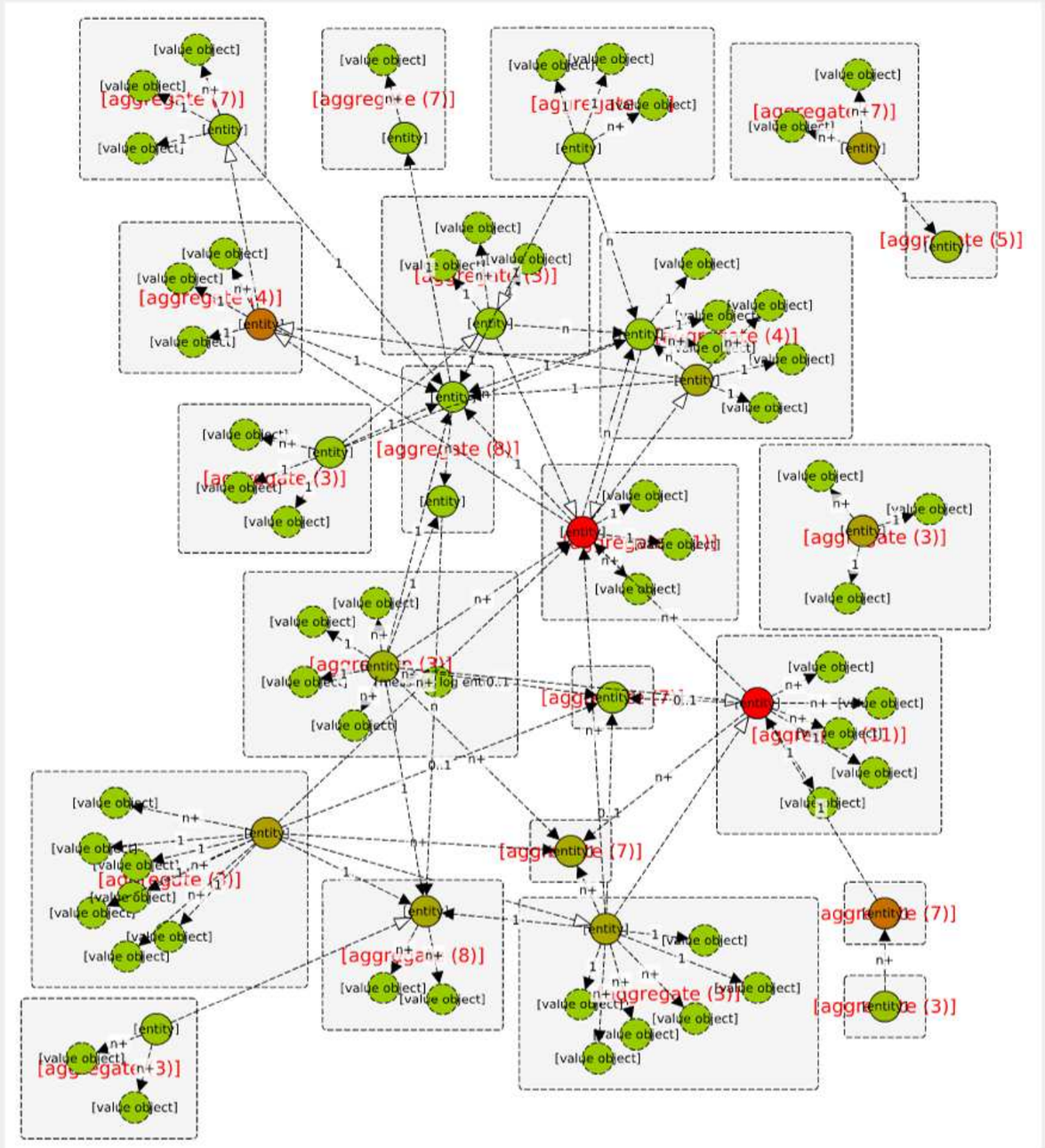

Resulting Artifacts

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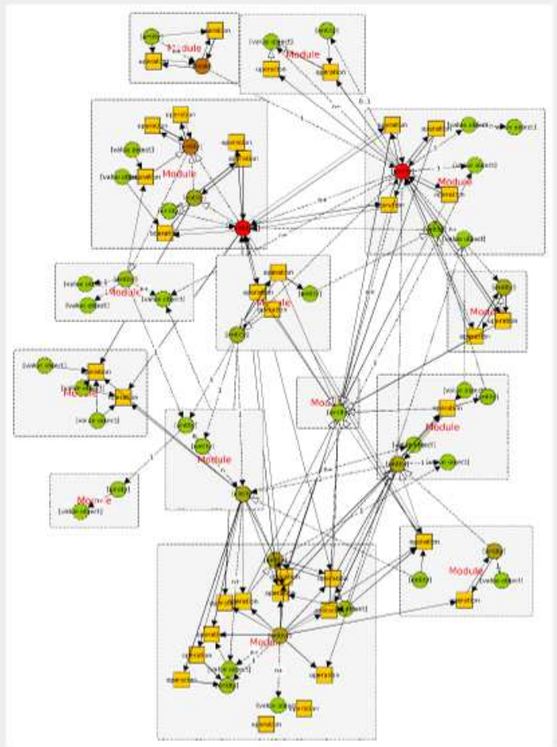

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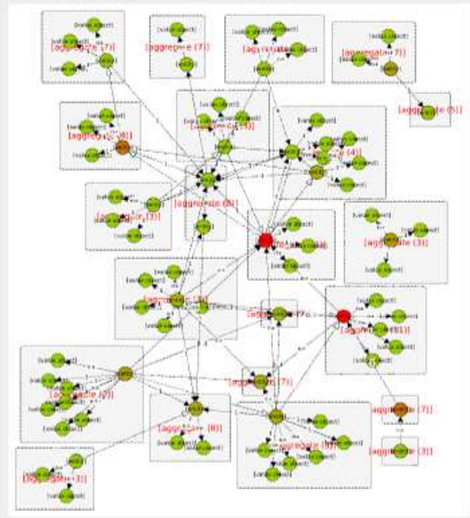
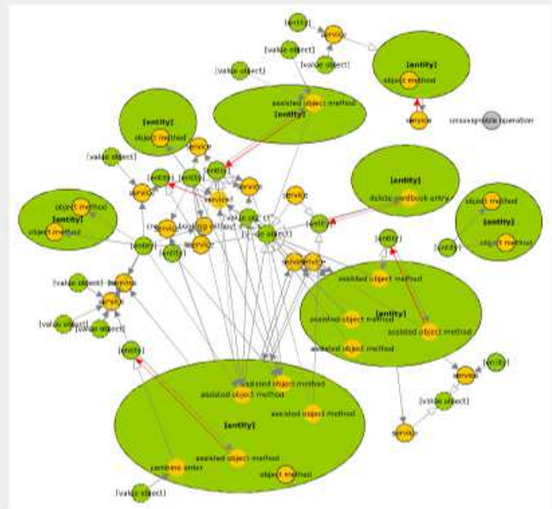
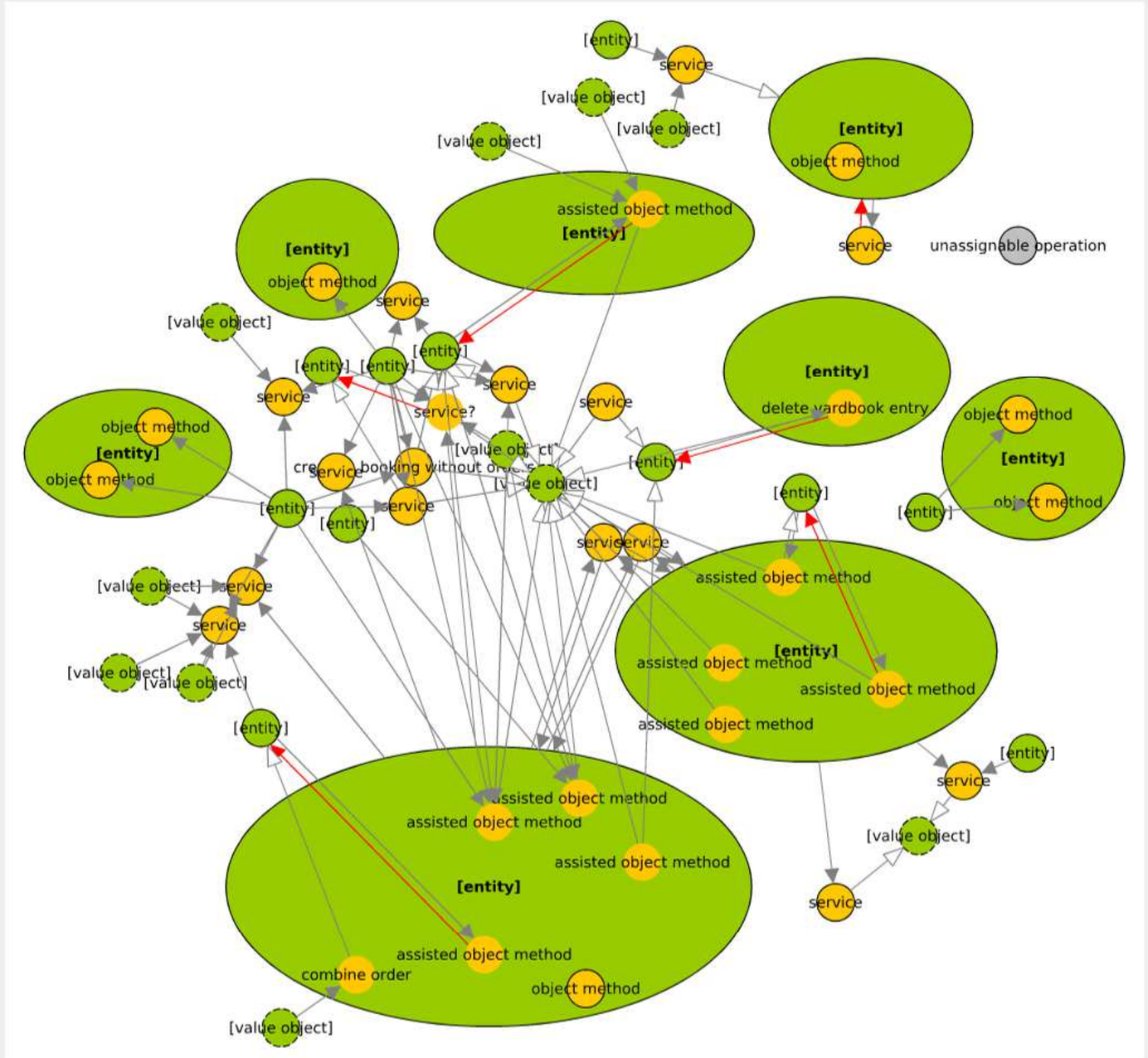


Service Model

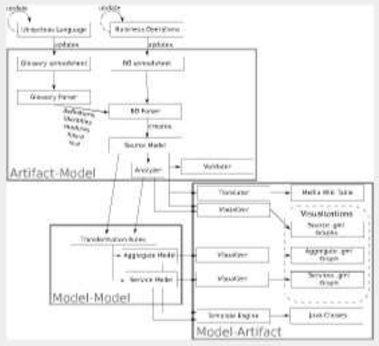


Service Model

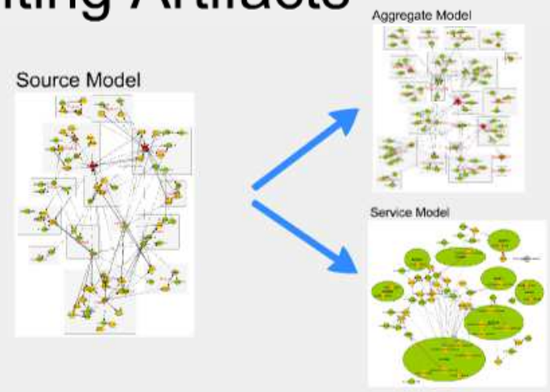


Prototype

Architecture

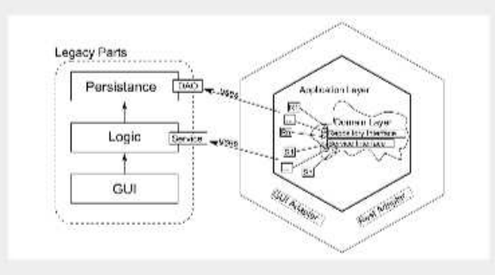


Resulting Artifacts



Refactoring Realization

- Bubble Context for the Liveyard View
- Communication With The Legacy System by utilizing Ports and Adapters



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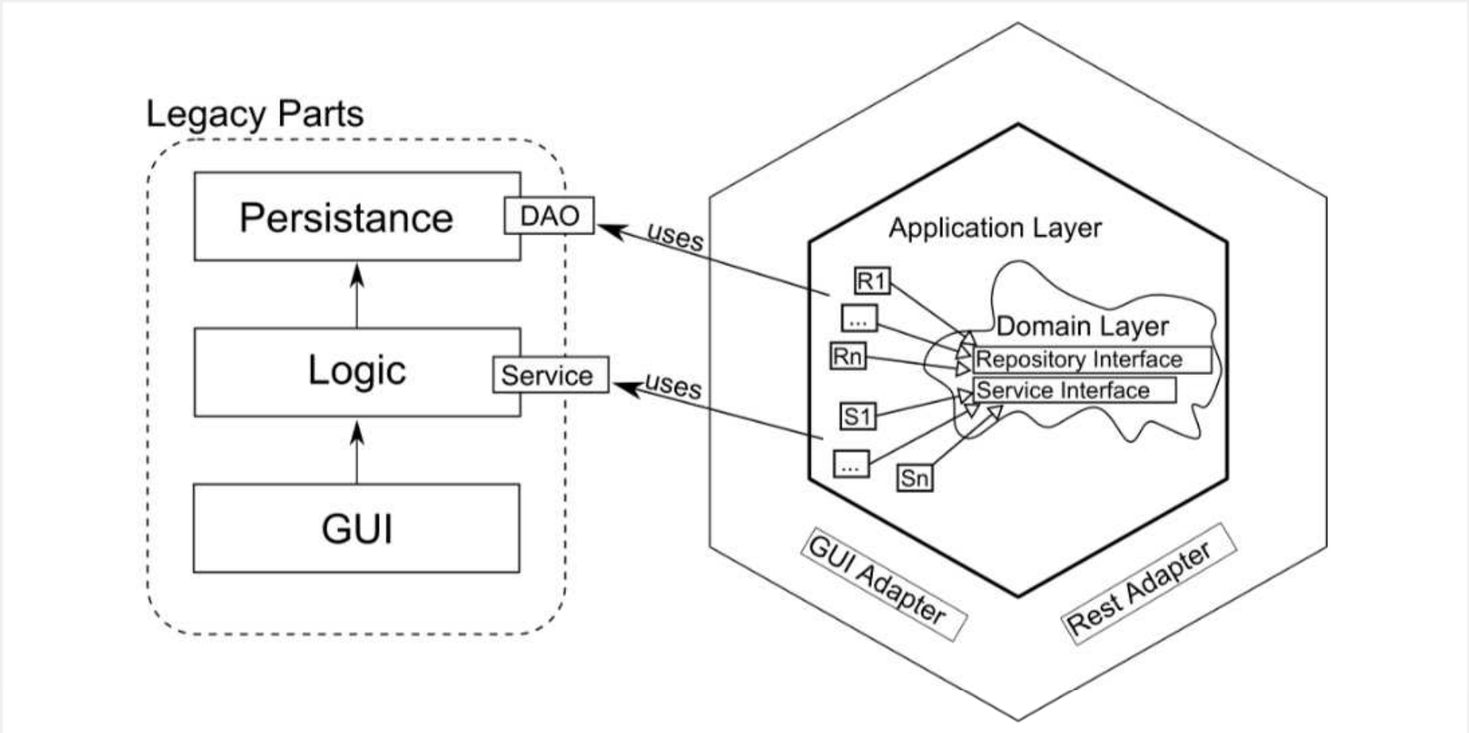
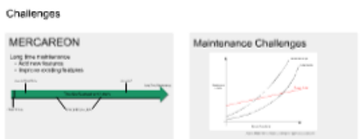


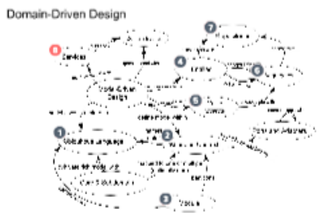
Thank You For Your Attention!

Introduction

Challenges



Domain-Driven Design



Refactoring

Prototype

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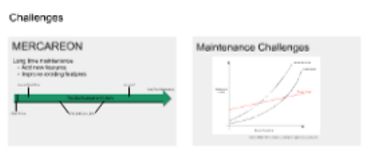

Domain-Driven Design

Refactoring

Questions?

Prototype