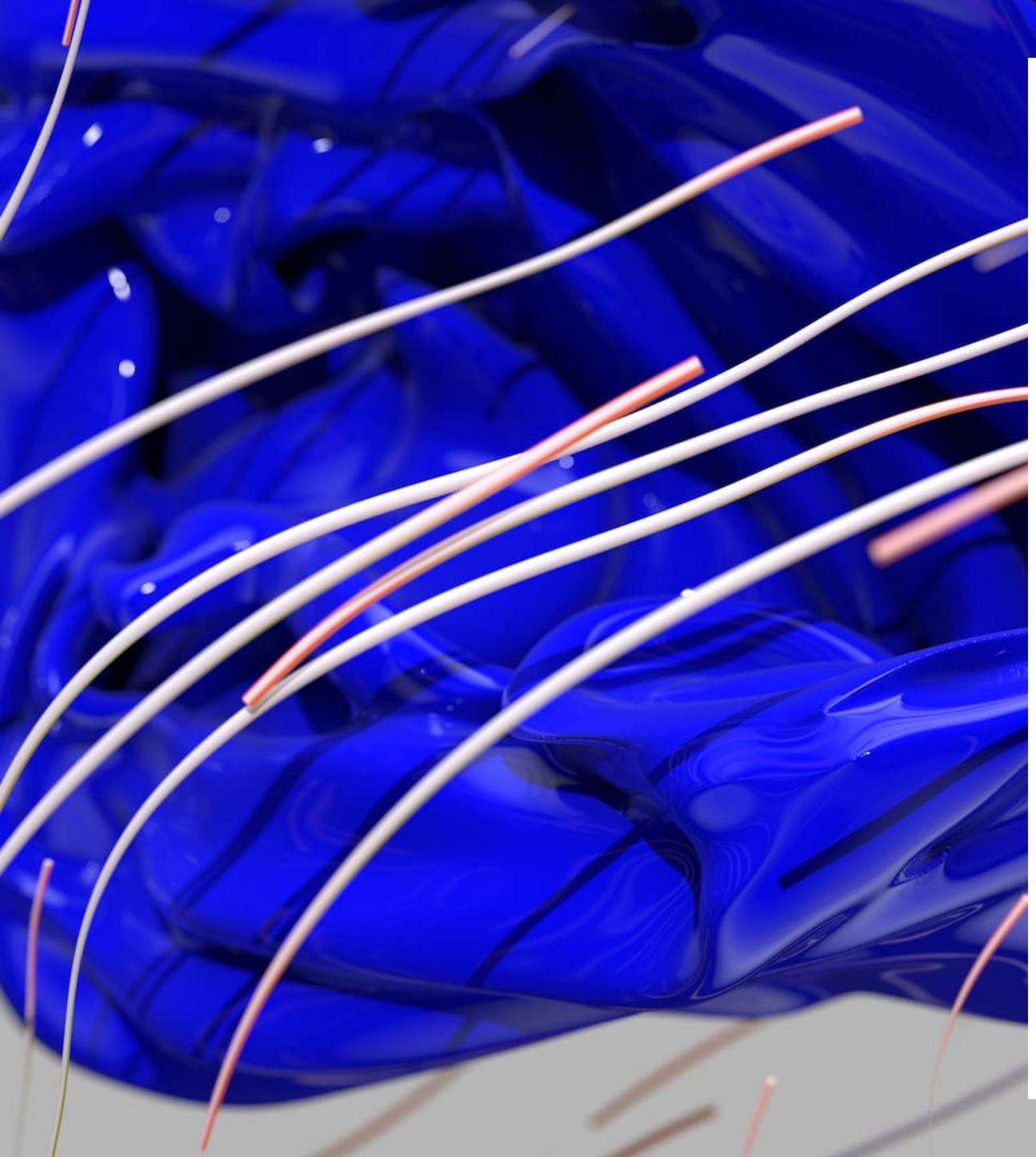


Getting Modules Right

with Domain Driven Design

INNOQ

MICHAEL PLÖD

FELLOW

Get my DDD book cheaper

Book Voucher: 7.99 instead of (min) 9.99
http://leanpub.com/ddd-by-example/c/speakerdeck

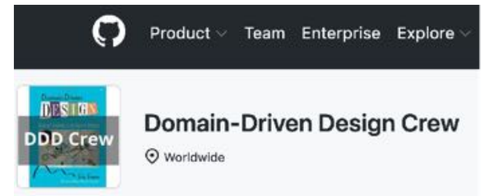
Michael Plöd

Fellow at INNOQ

Follow me on Twitter under @bitboss

Current consulting topics:

- Domain-Driven Design
- Team Topologies
- Transformation from IT Delivery to digital product orgs



Regular speaker at (inter-)national conferences and author of a book + various articles

Separation of Concerns
is the division of complex systems according to responsibility

Modularity

is a specialization of SoC and about

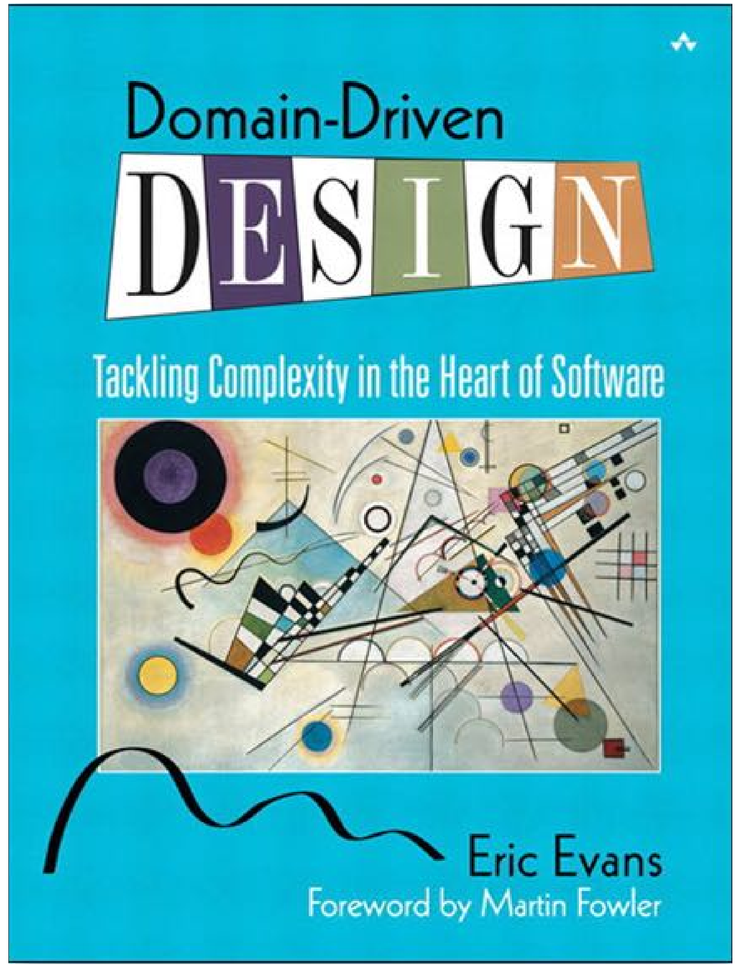
information hiding

loose coupling

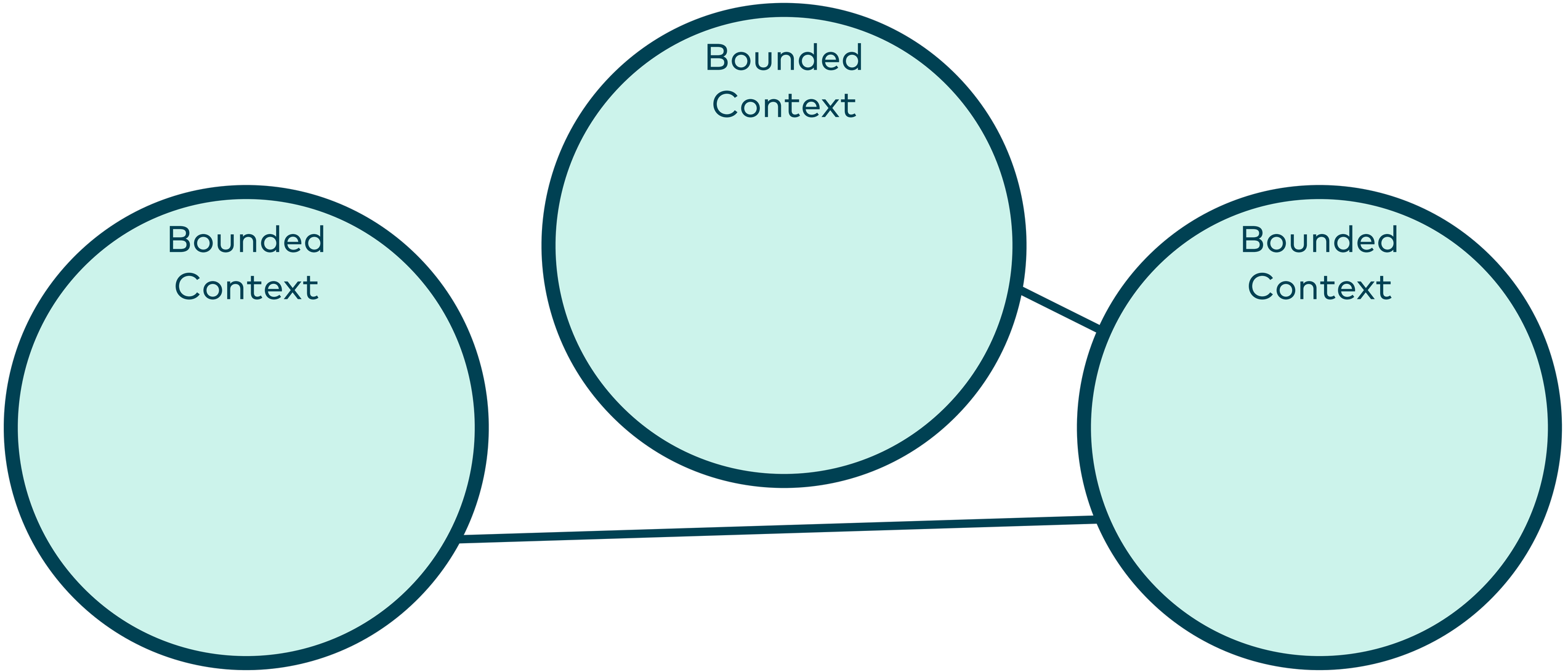
hiah cohesion

Domain Driven Design

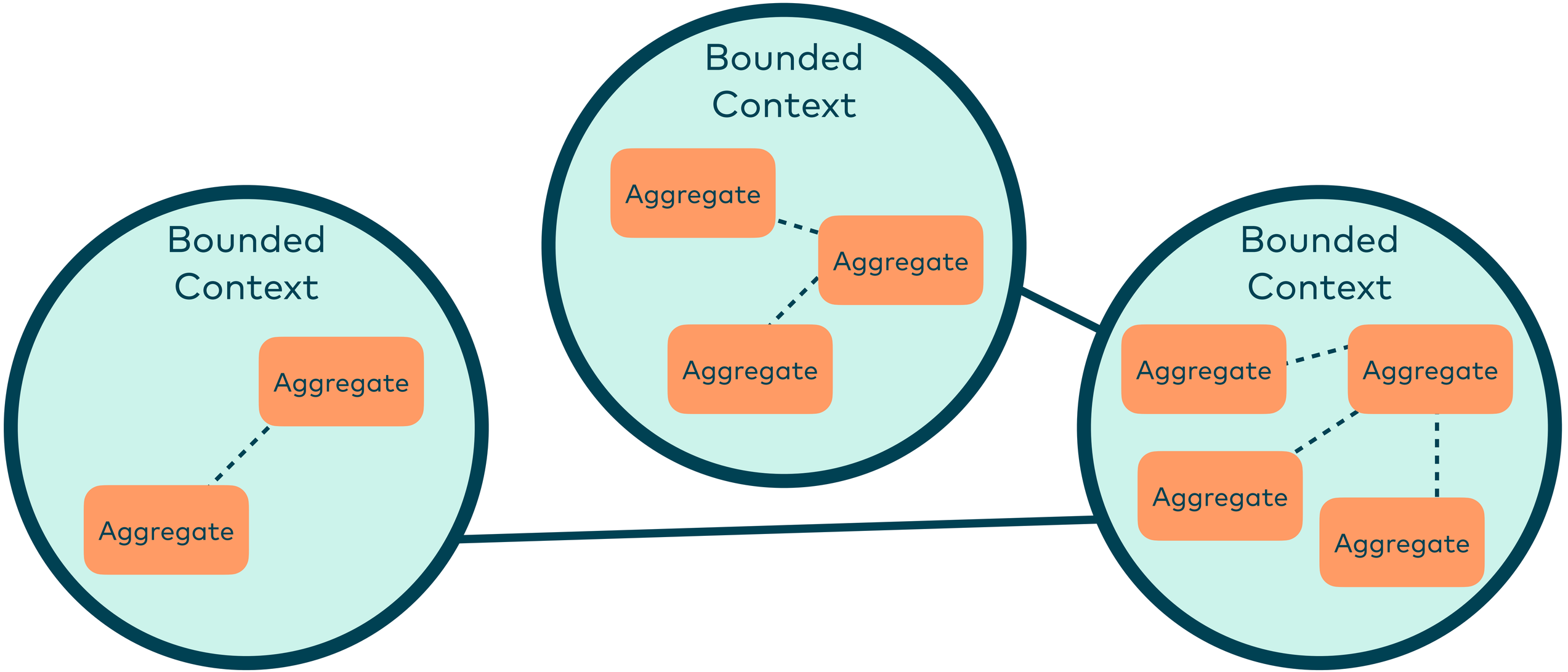
has great modularization **concepts** (Bounded Context, Aggregate) and an **iterative approach** for the identification of modules



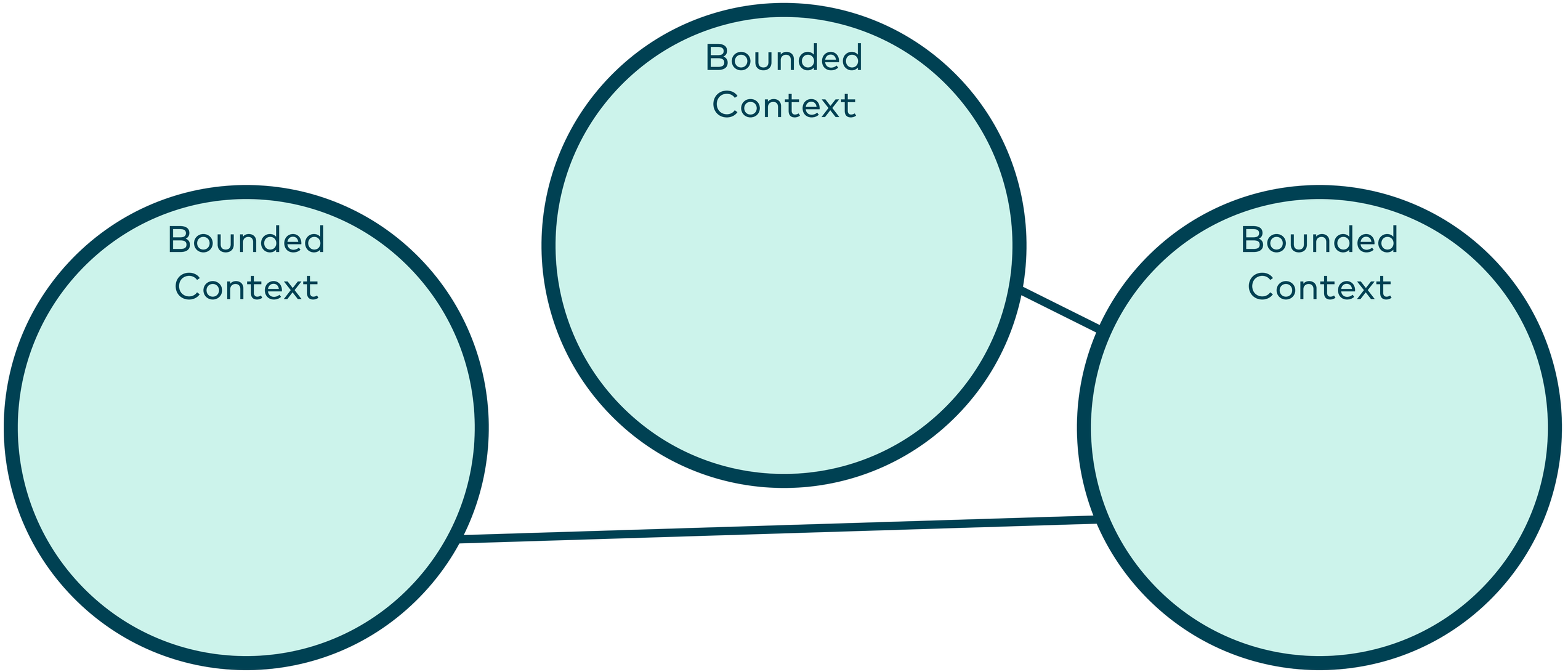
Module Granularity in DDD



Module Granularity in DDD

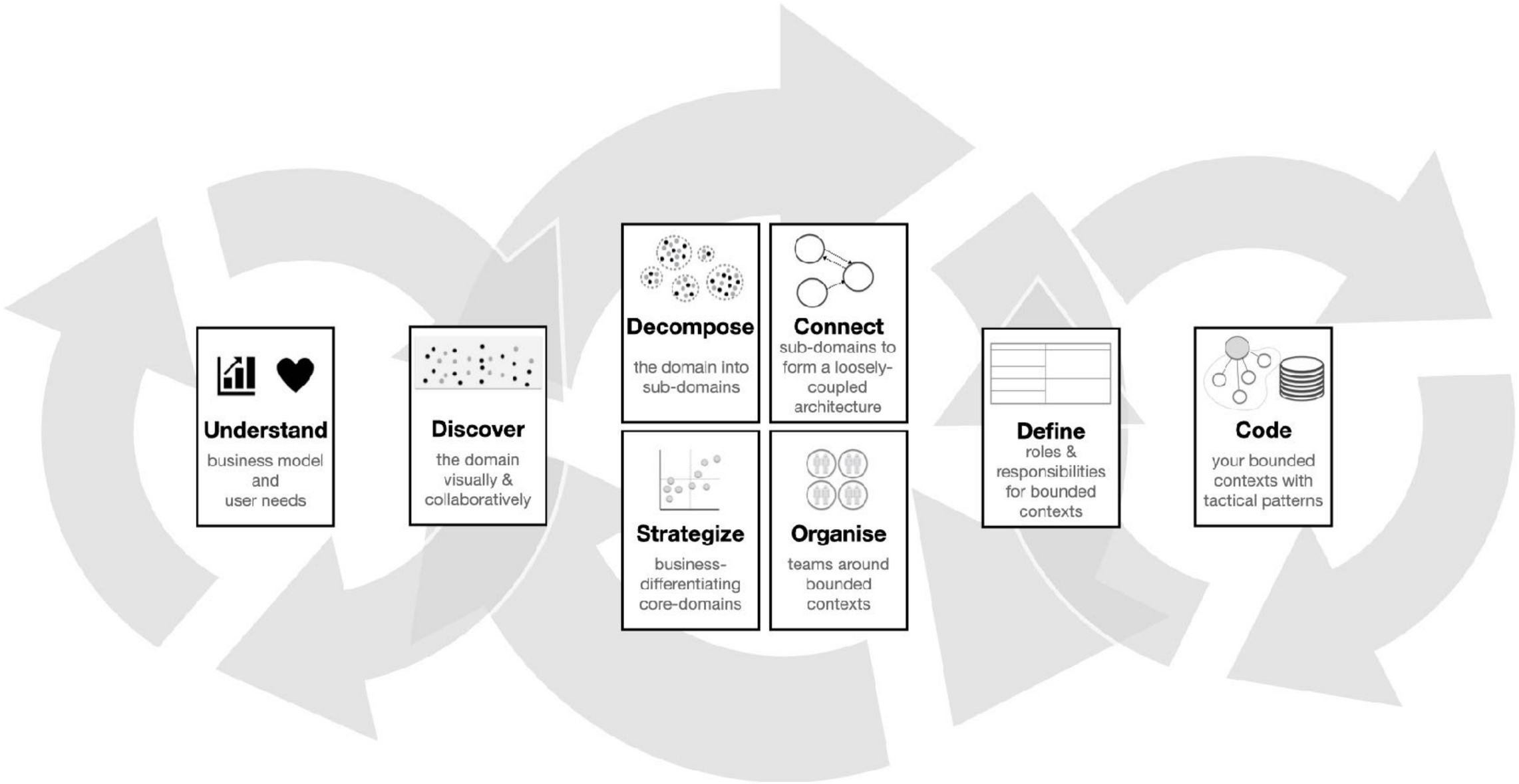


Let's start with Bounded Contexts



Domain-Driven Design Starter Modelling Process

A starter process for beginners, not a rigid best-practice. DDD is continuous, evolutionary, and iterative design.



https://github.com/ddd-crew/ddd-starter-modelling-process

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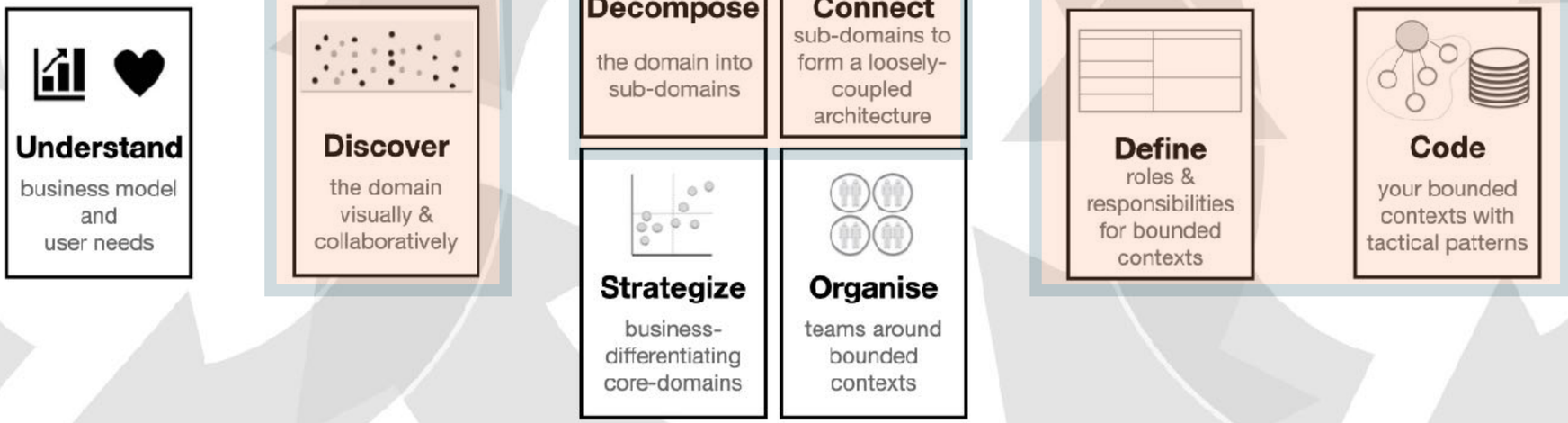

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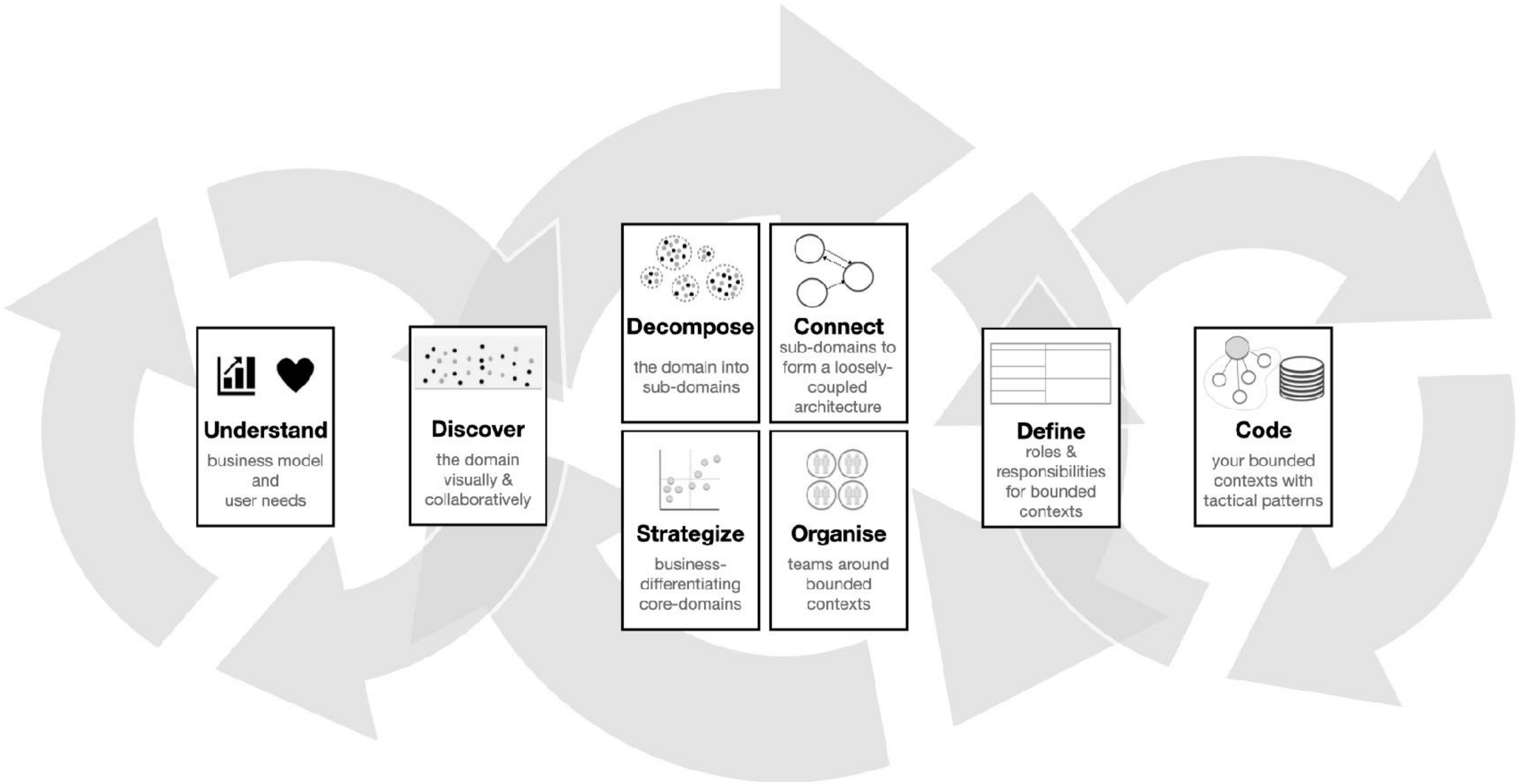

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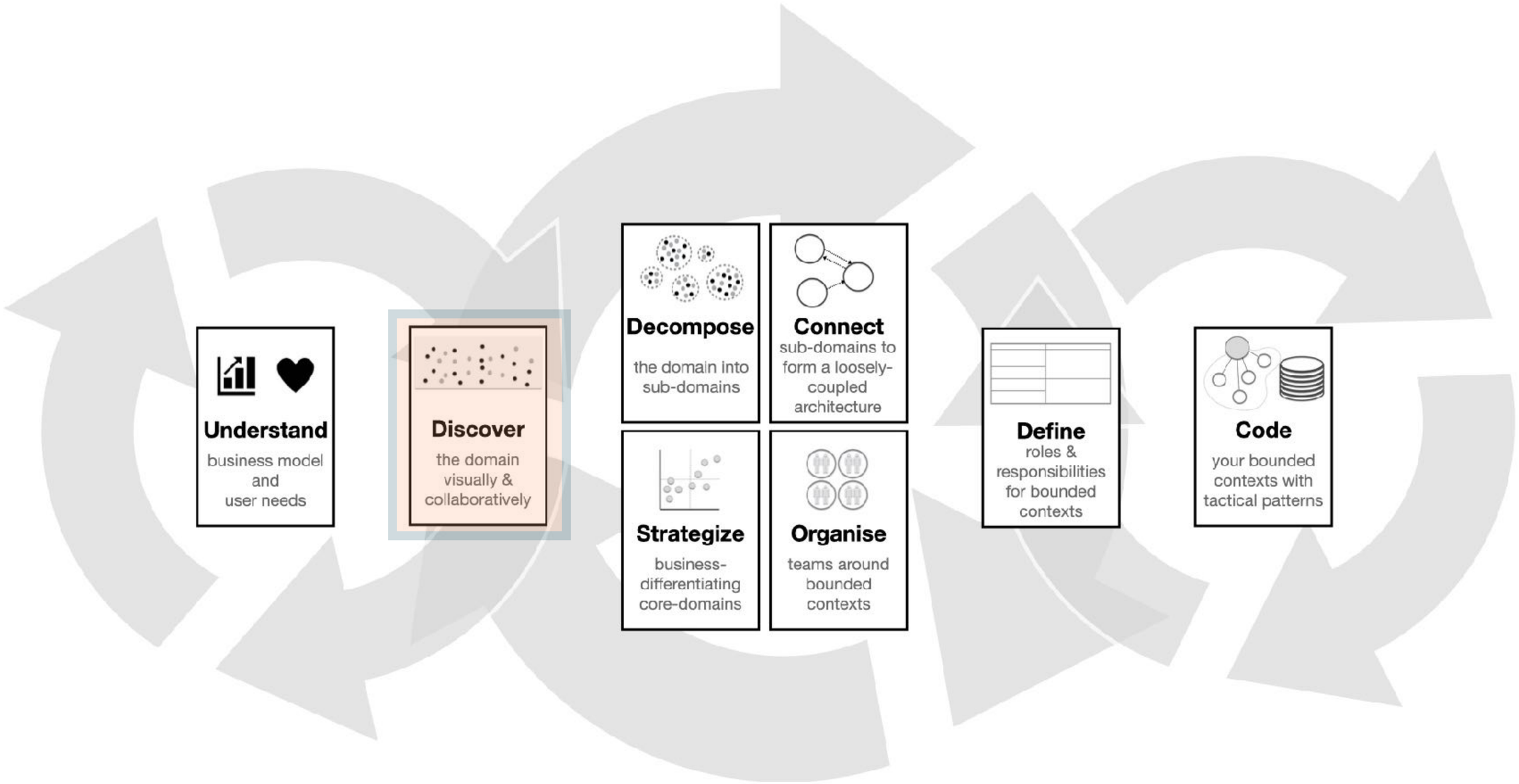
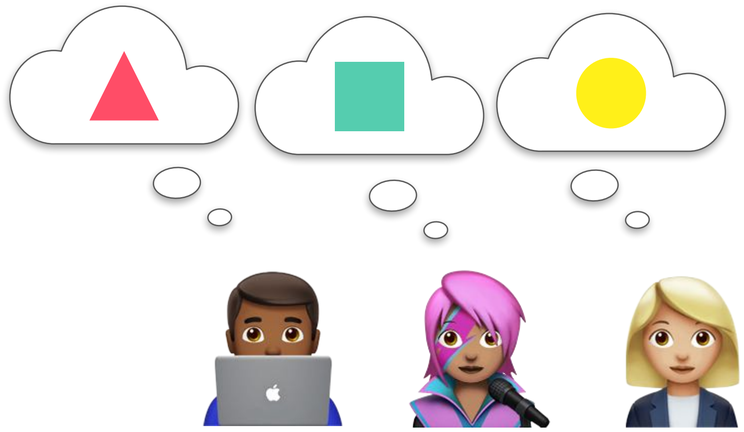


https://github.com/ddd-crew/ddd-starter-modelling-process

„It is not the domain experts knowledge that goes into production, it is the assumption of the developers that goes into production"

Alberto Brandolini

Inventor of EventStorming



„good that we all share the same opinion"

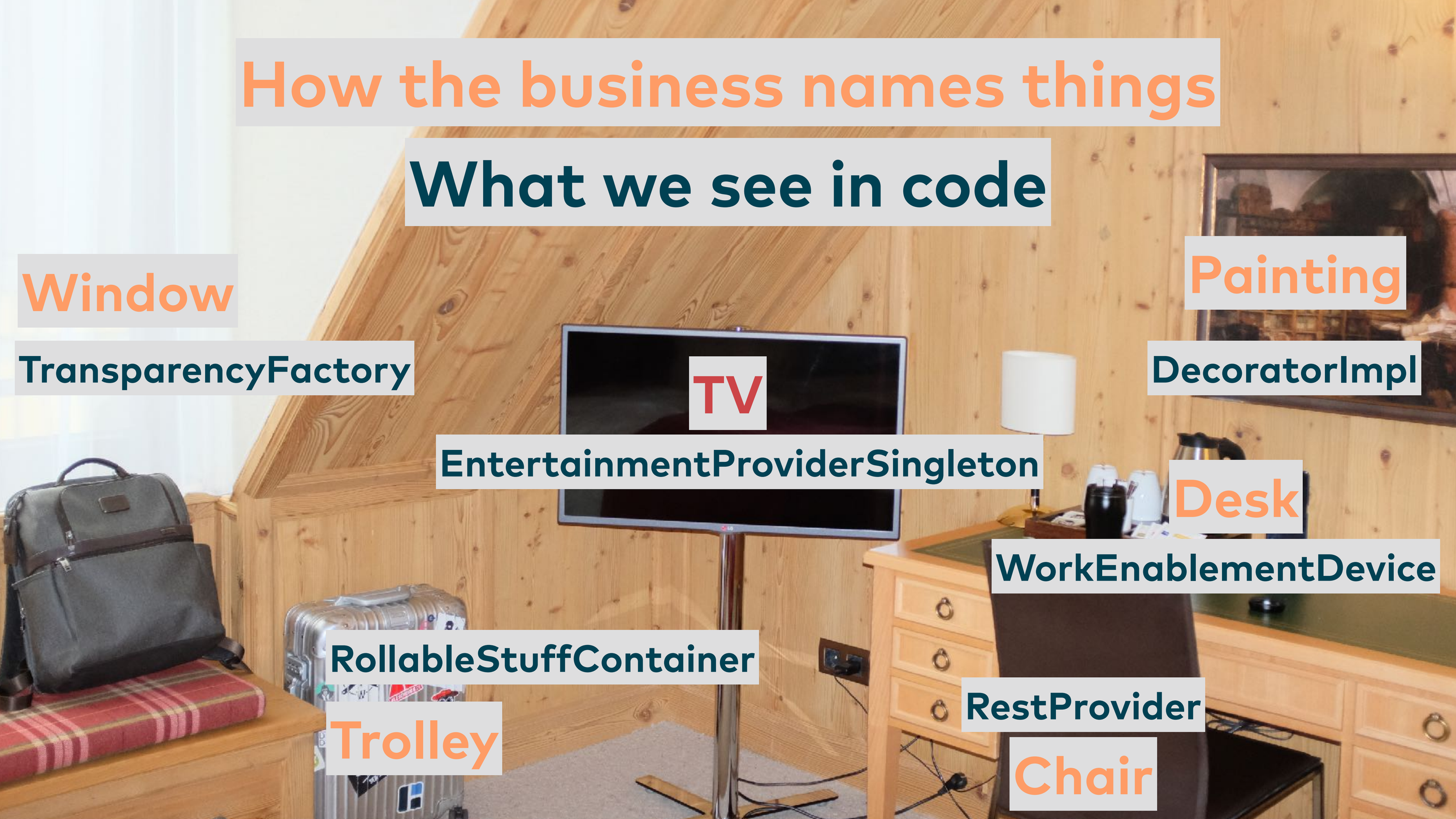
Inspiriert durch Jeff Patton & Luke Barren

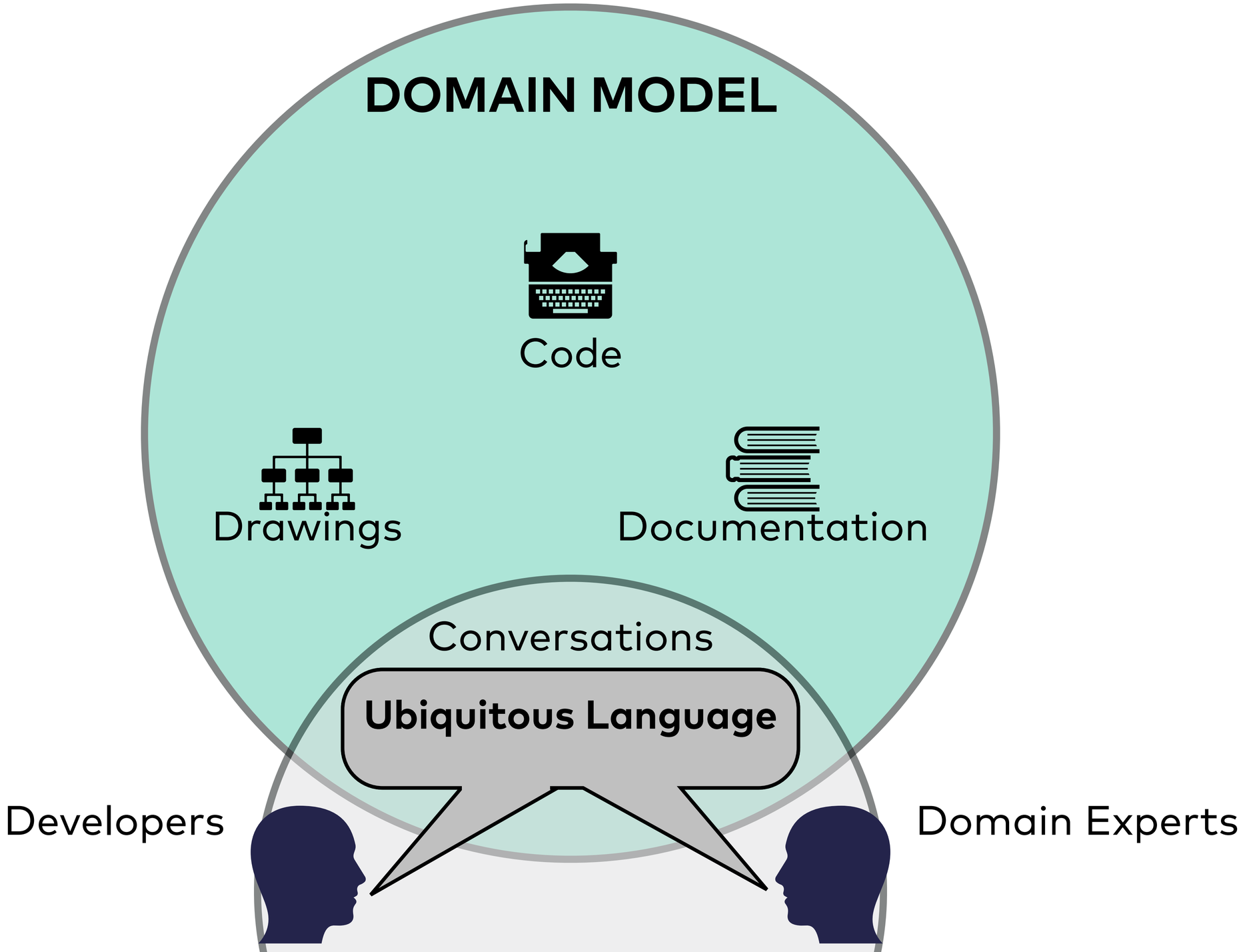
Domain expert knowledge is essential

for doing Domain Driven Design

we need direct collaboration

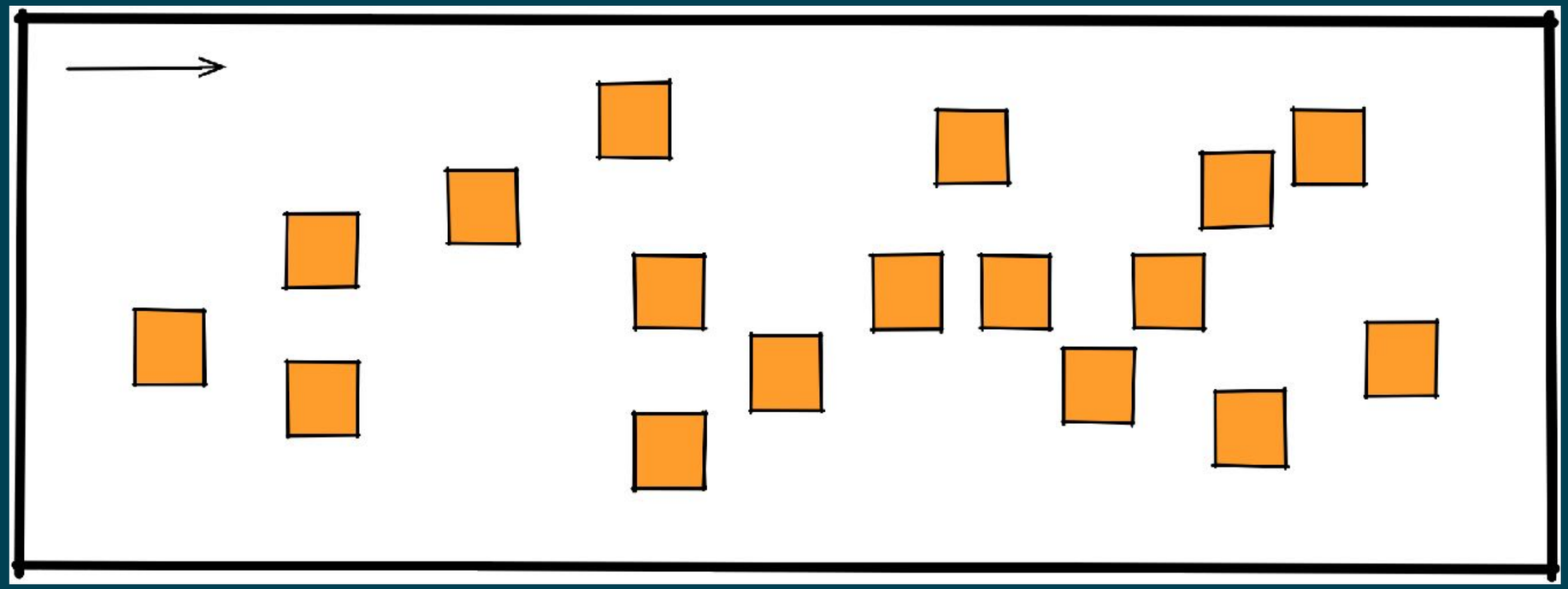
How the business names things


How the business names things
What we see in code
Window
TransparencyFactory
TV
EntertainmentProviderSingleton
Painting
DecoratorImpl
Desk
WorkEnablementDevice
RollableStuffContainer
Trolley
RestProvider
Chair


DOMAIN MODEL
Code
Drawings
Documentation
Conversations
Ubiquitous Language
Developers
Domain Experts

Event Storming

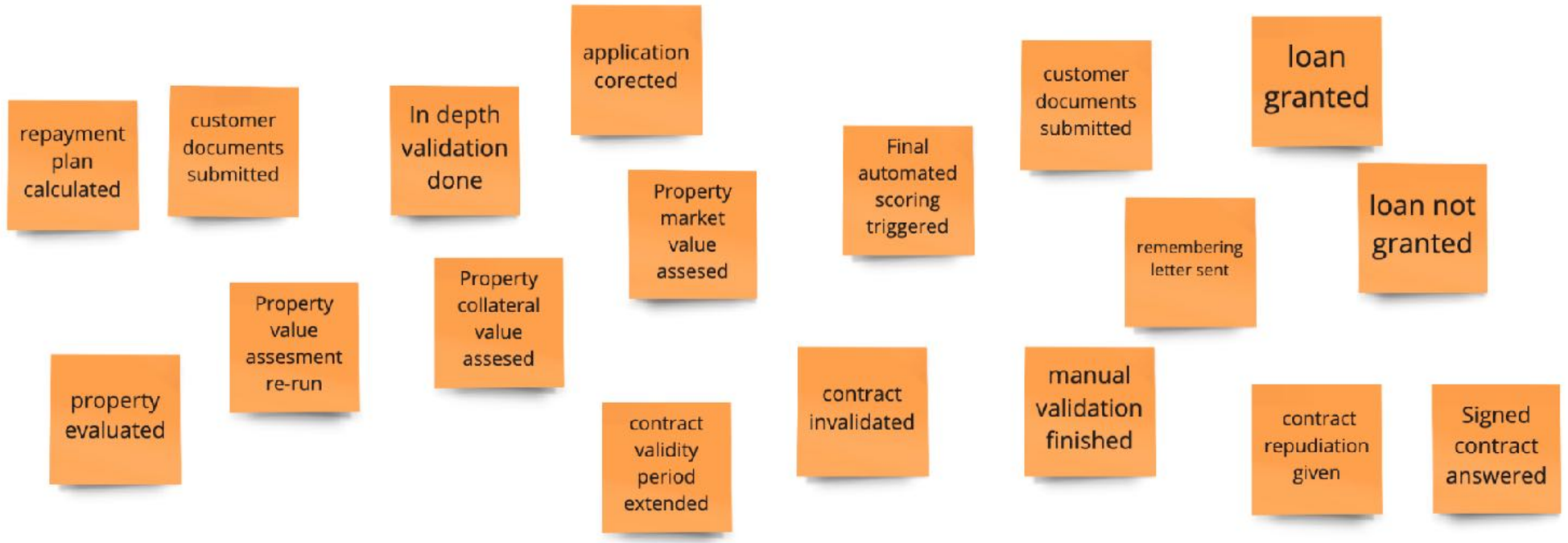
is a direct collaboration workshop for various stakeholders of a piece of software



Chaotic Exploration

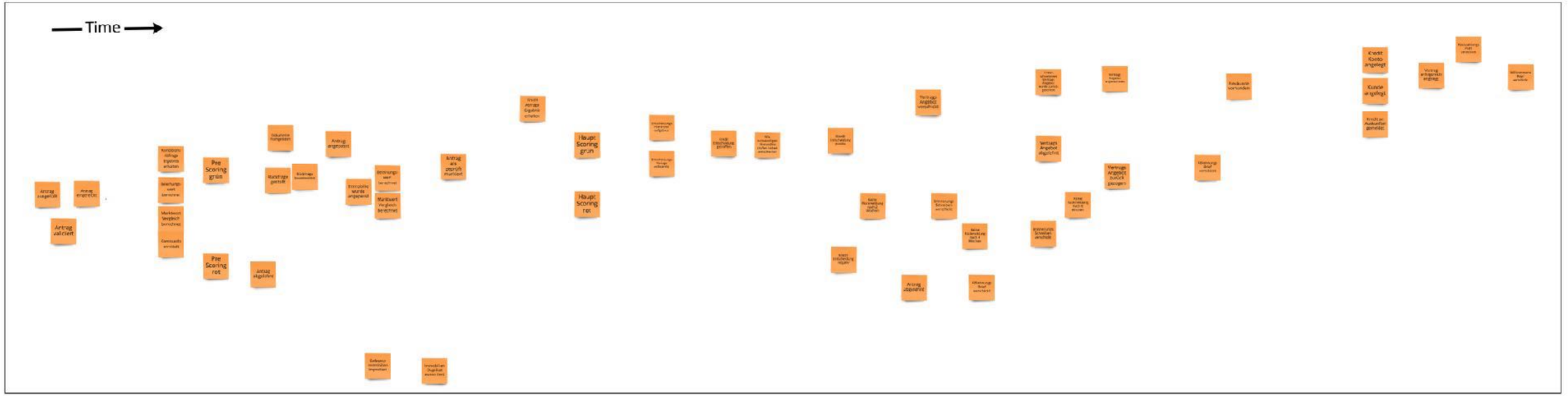
Domain Event

A Domain Event is the main concept of EventStorming. It is an event that is relevant for the domain experts and contextual for the domain that is being explored. A Domain Event is a verb at the past tense. The official EventStorming colour is orange.



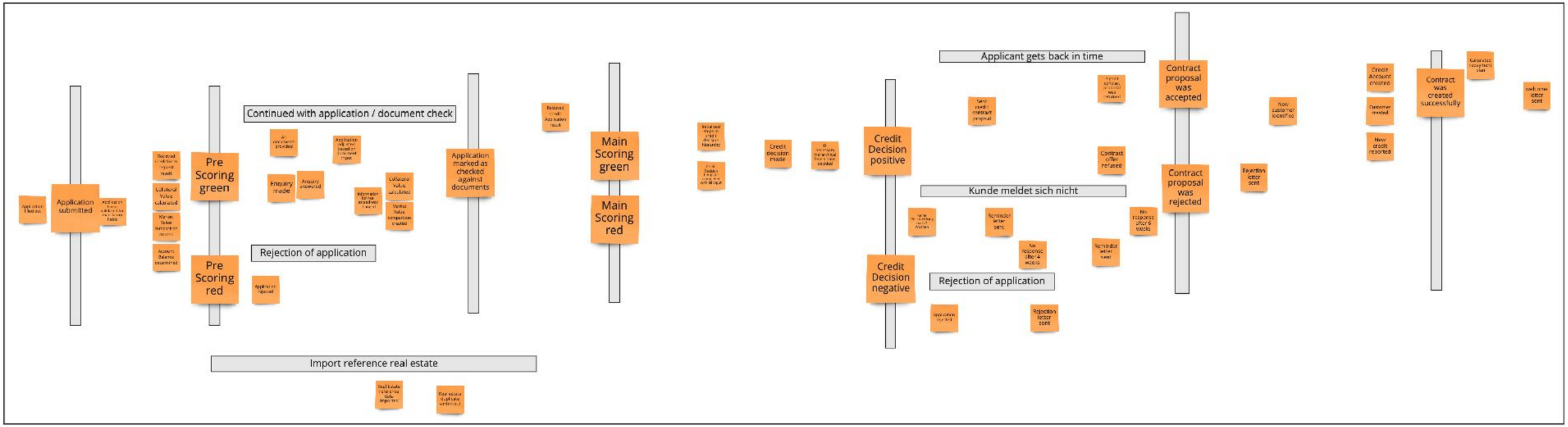
Enforcing the timeline

In a second step we sort those events along a timeline. This will ignite quite a few discussions and may take some time.

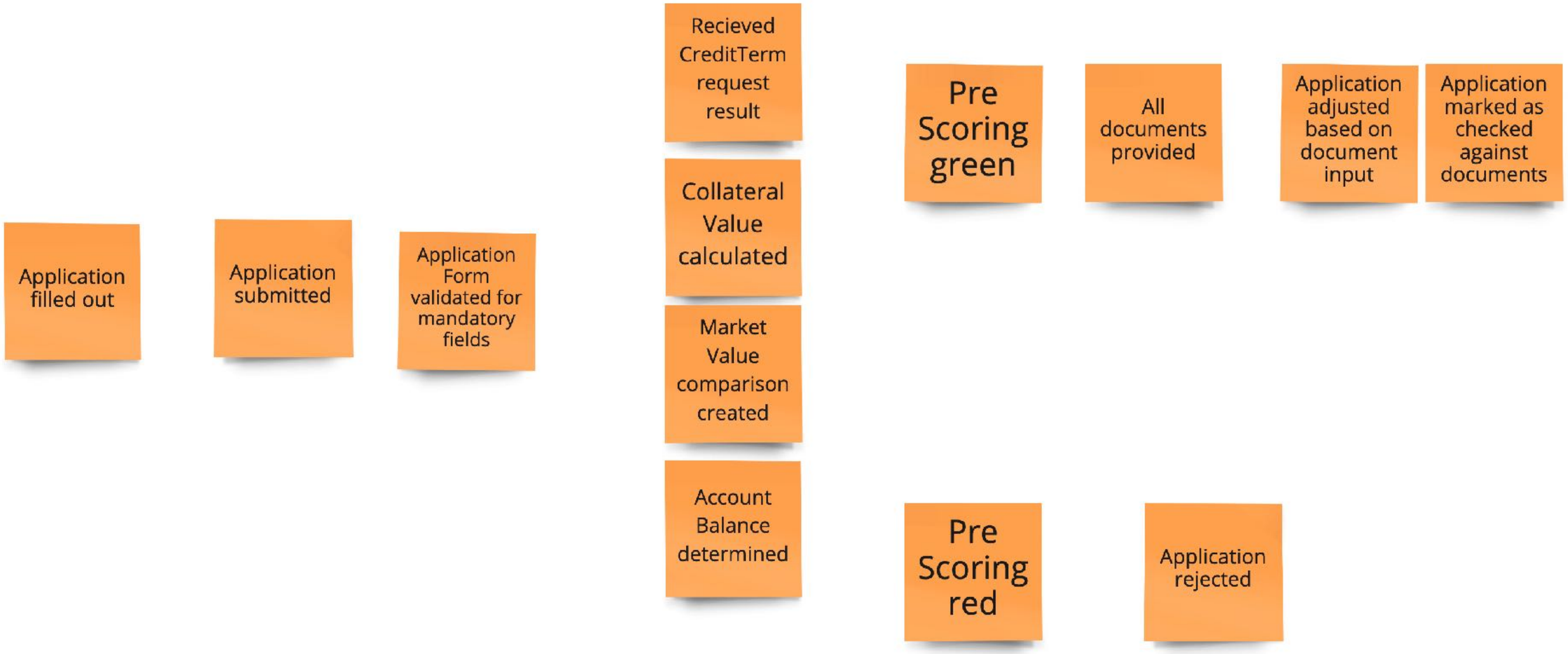


Pivotal Events & Swimlanes

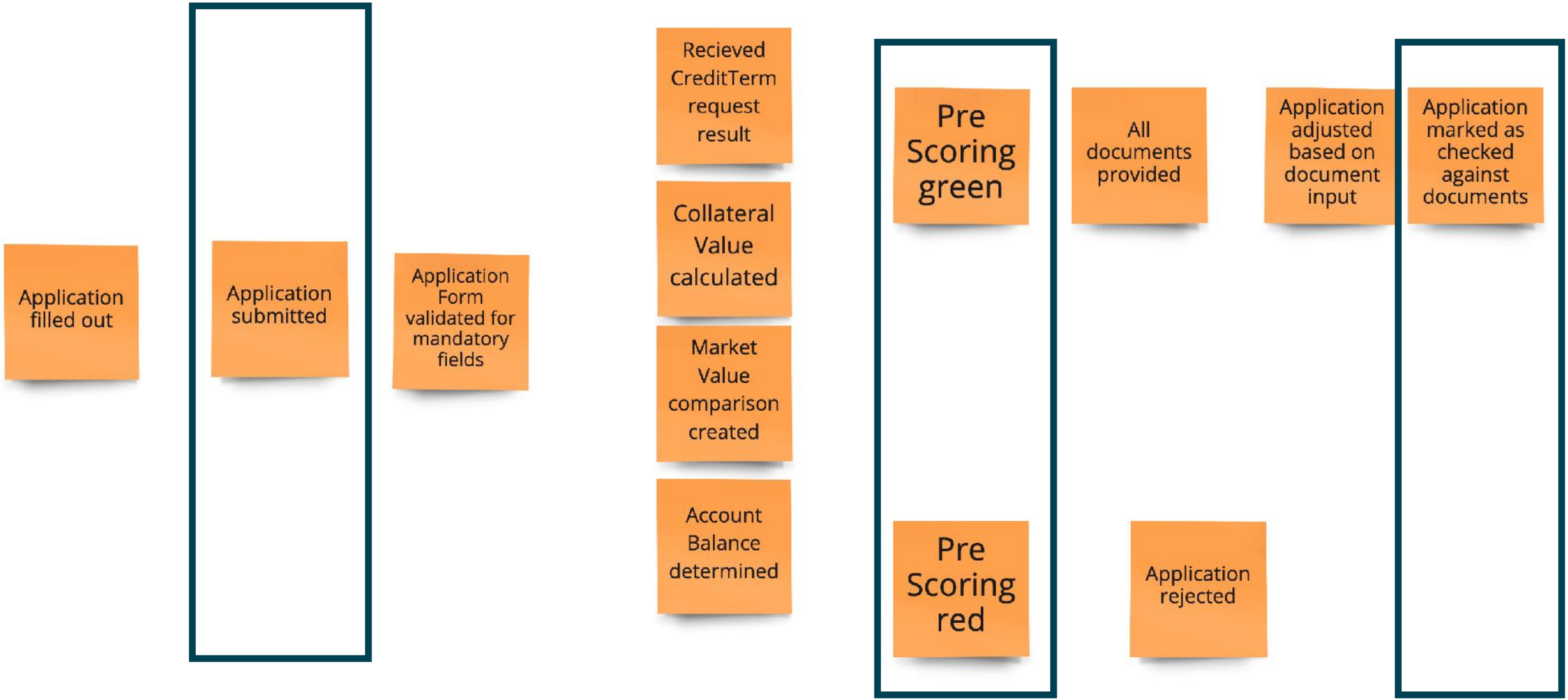
Mark those events that are very important. Those are your pivotal events. You may also highlight parallel streams of activity with swimlanes.



Quiz: which of these events are pivotal?



Quiz: which of these events are pivotal?



Domain-Driven Design Starter Modelling Process

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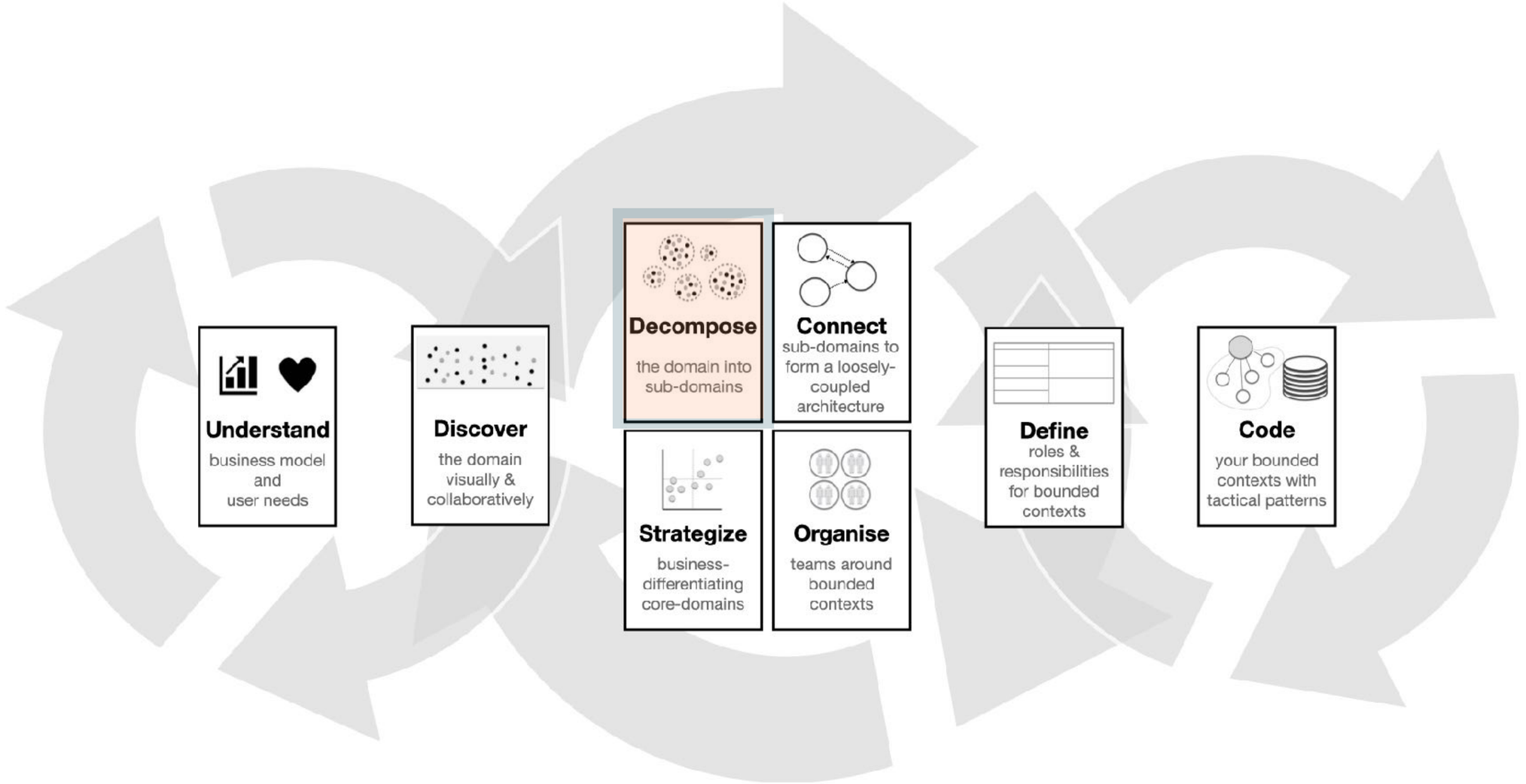
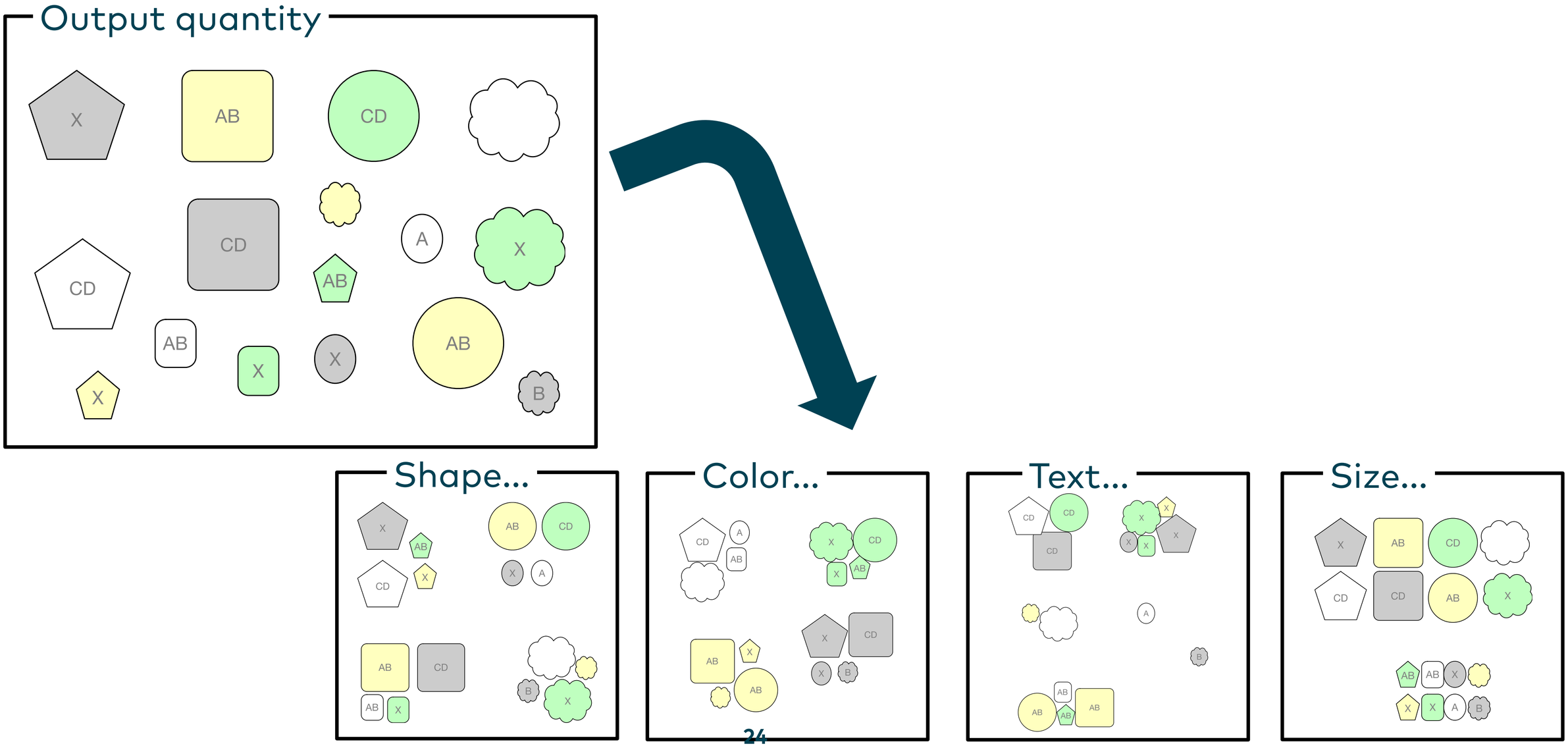


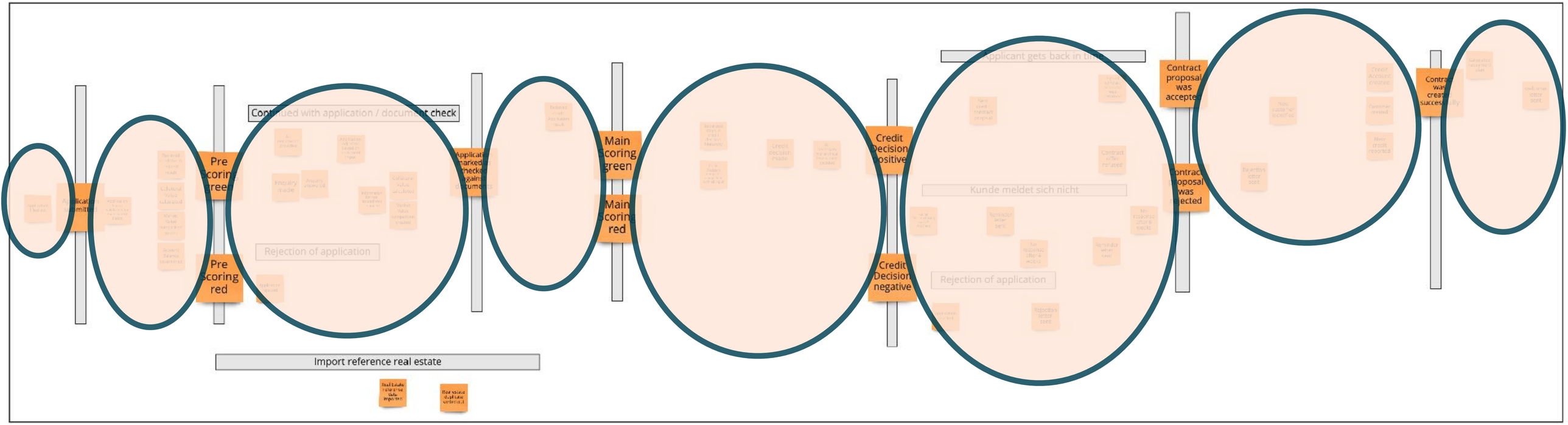
https://github.com/ddd-crew/ddd-starter-modelling-process

There are many choices to group domain concepts



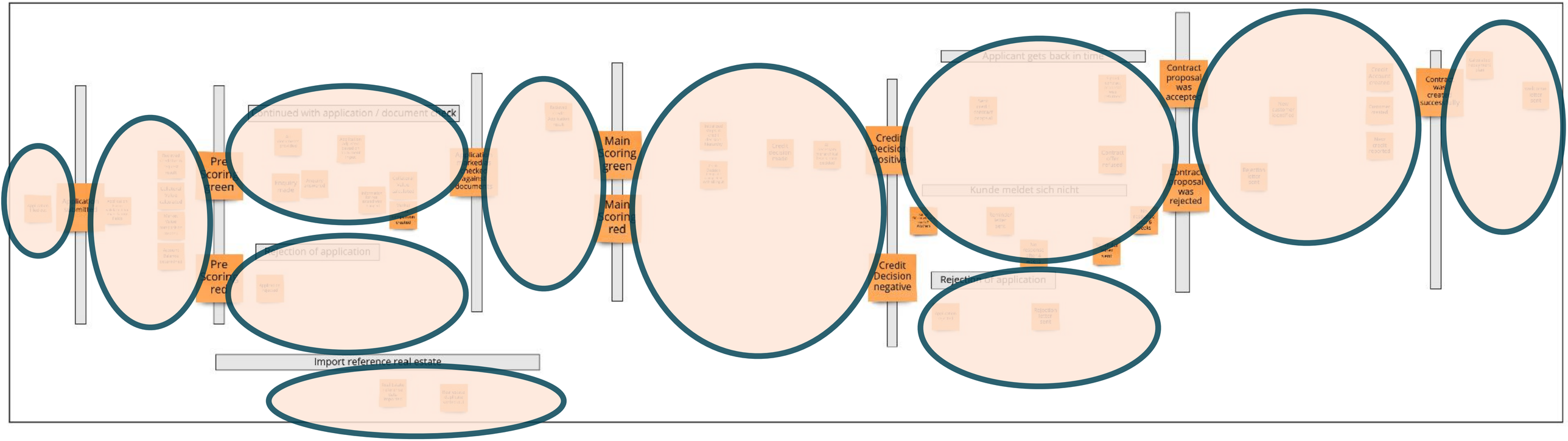
Boundaries between Pivotal Events

Heuristic: A pivotal event will probably sit on a boundary of a module



Mind the swimlanes

Heuristic: Swimlanes can help you in identifying further cohesion criteria

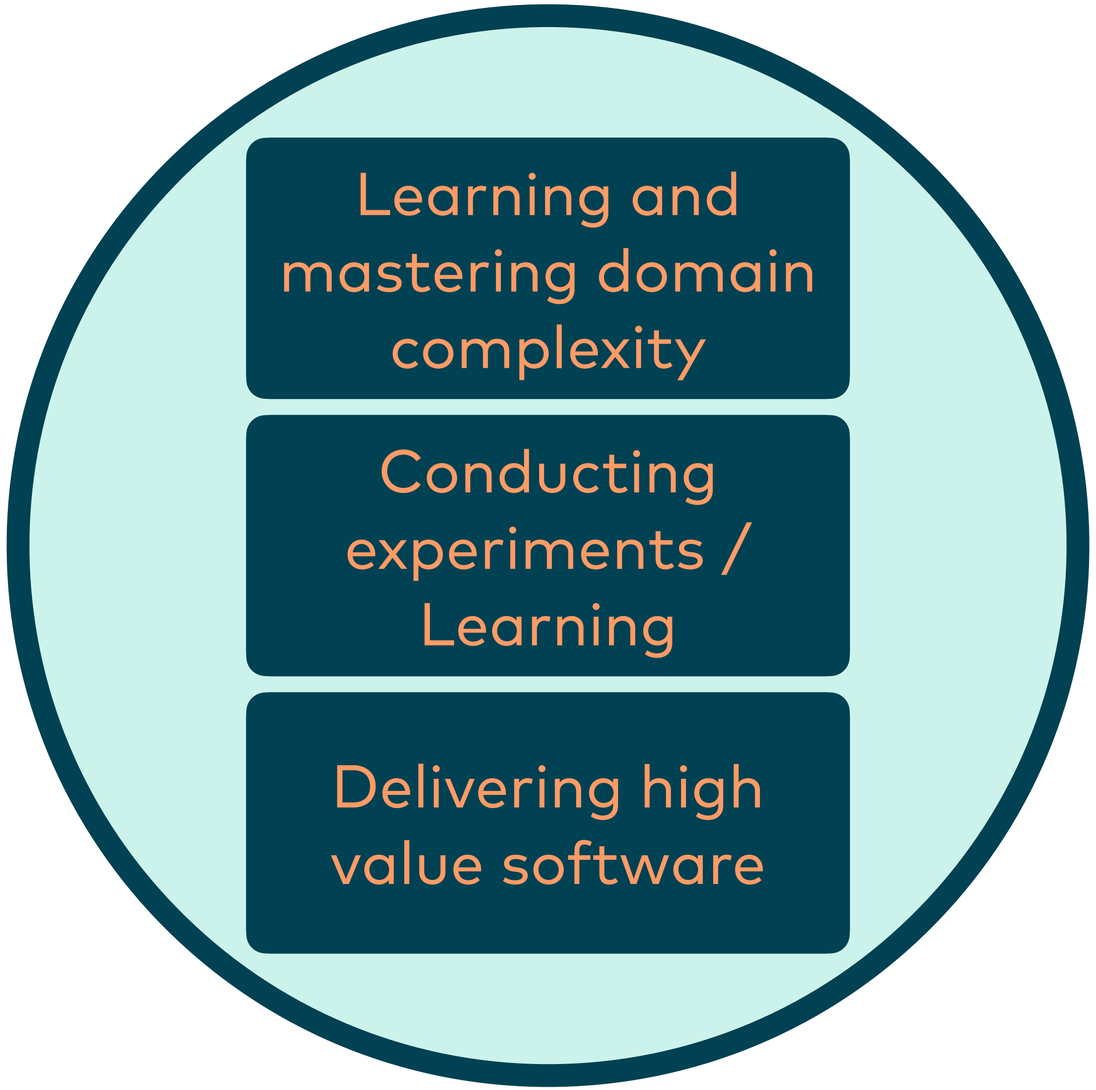


A Bounded Context is a boundary for a model expressed in a consistent language tailored around a specific purpose

Bounded Context

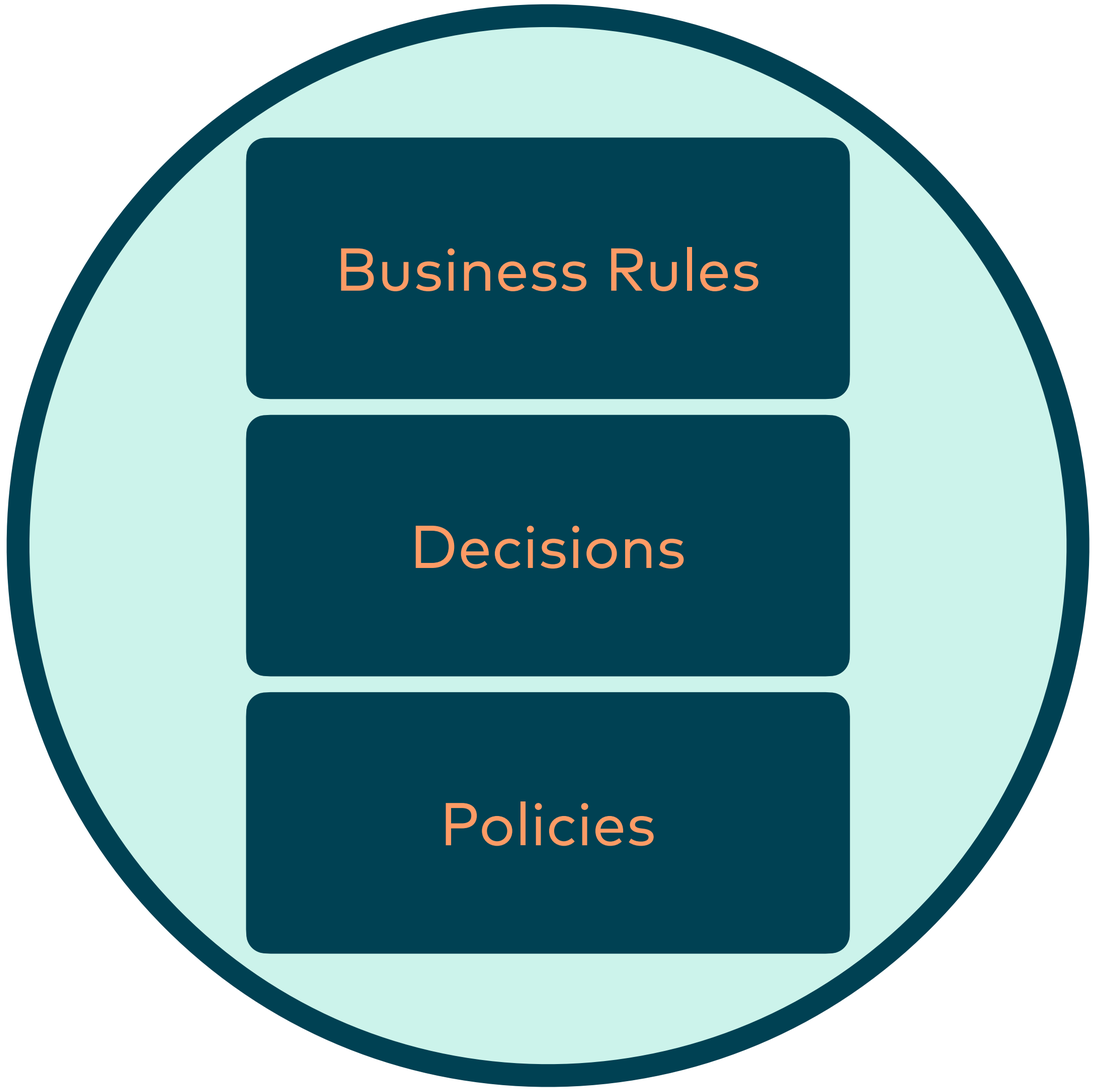
A Bounded Context is a **boundary** for a model expressed in a consistent language tailored around a specific purpose

Boundary



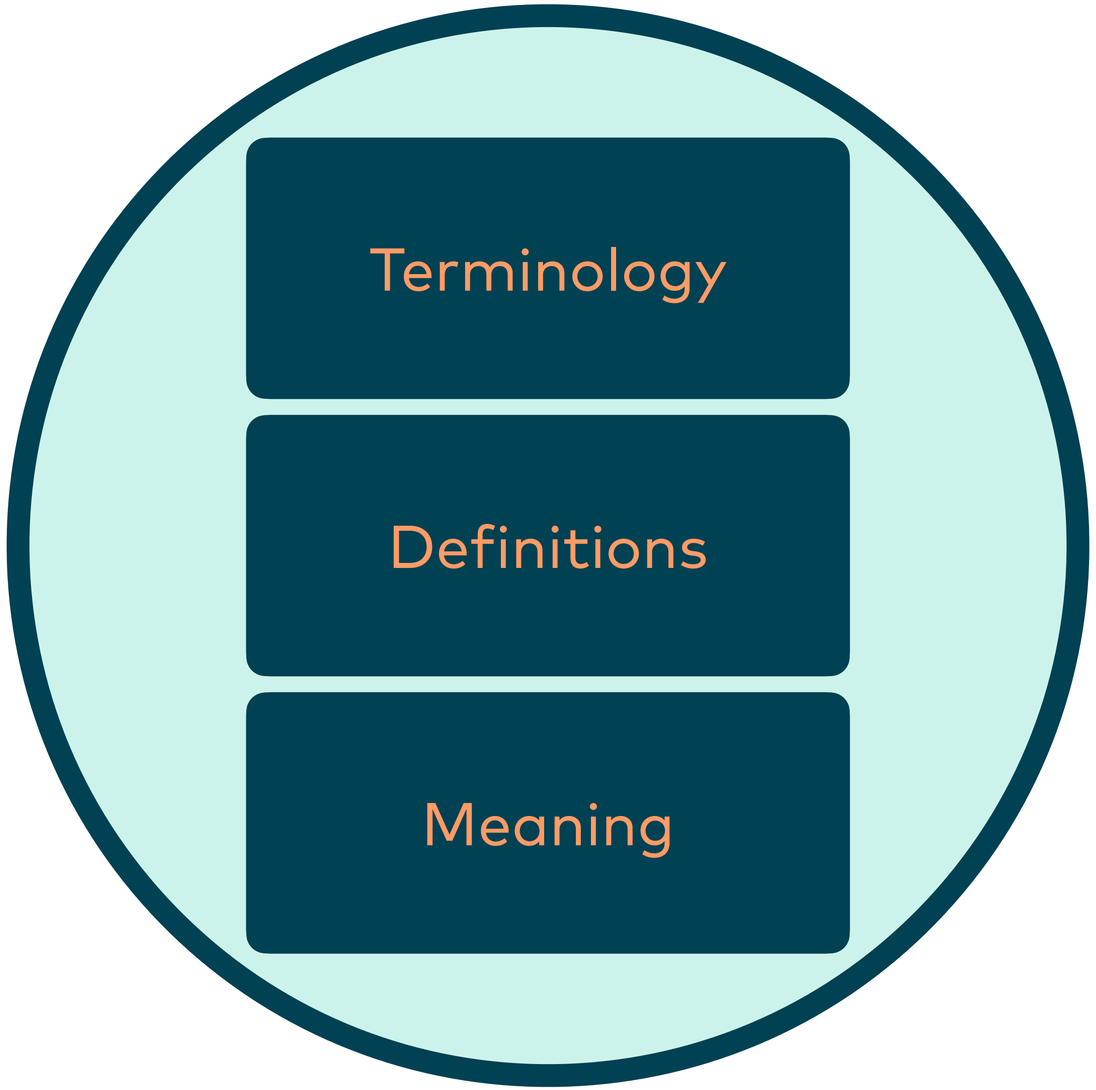
A Bounded Context is a boundary for a **model** expressed in a consistent language tailored around a specific purpose

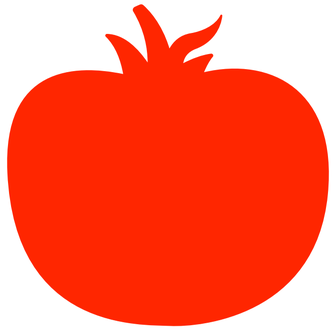
Boundary for a **model**



A Bounded Context is a boundary for a model expressed in a **consistent language** tailored around a specific purpose

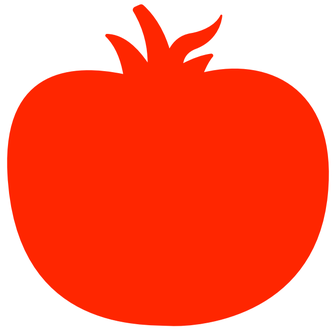
Language





What is a tomato?

A fruit or a vegetable?



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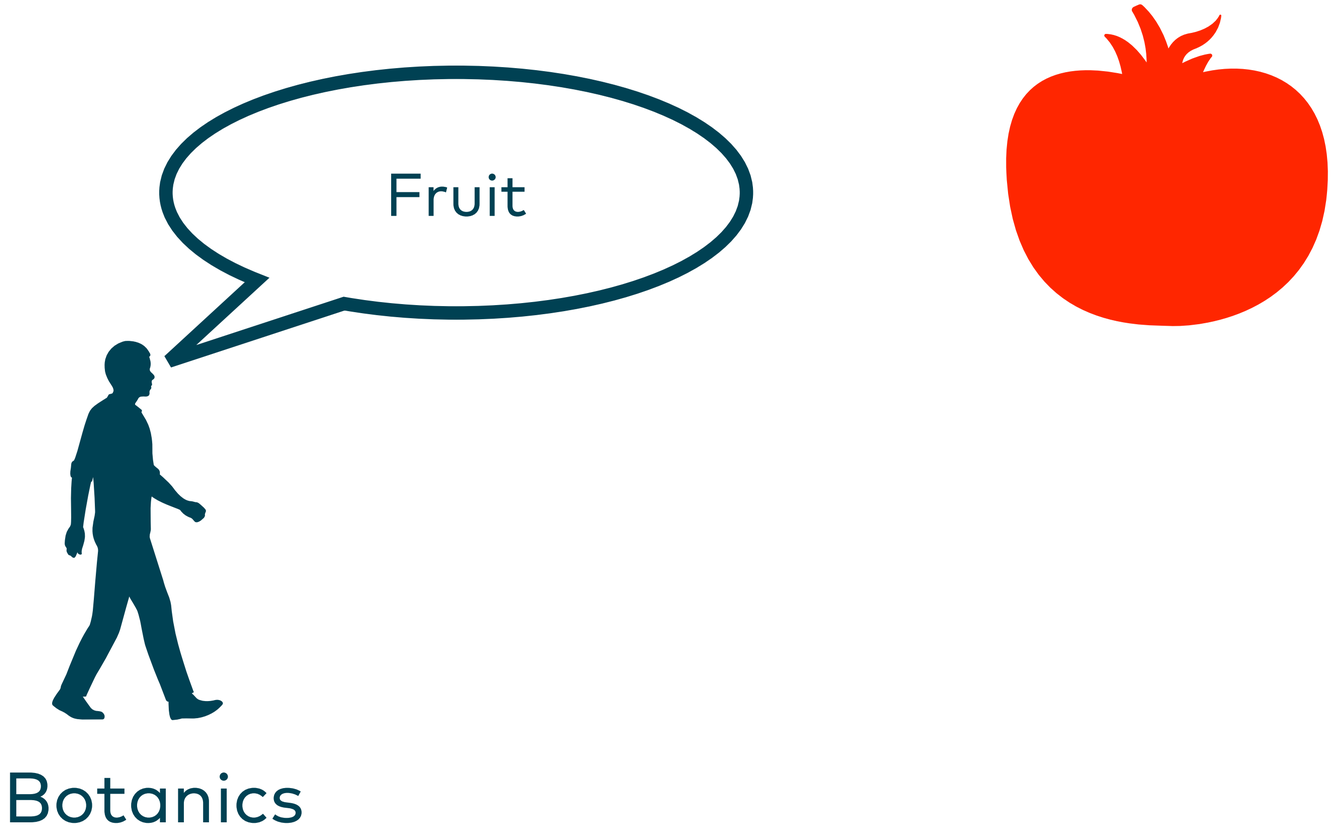

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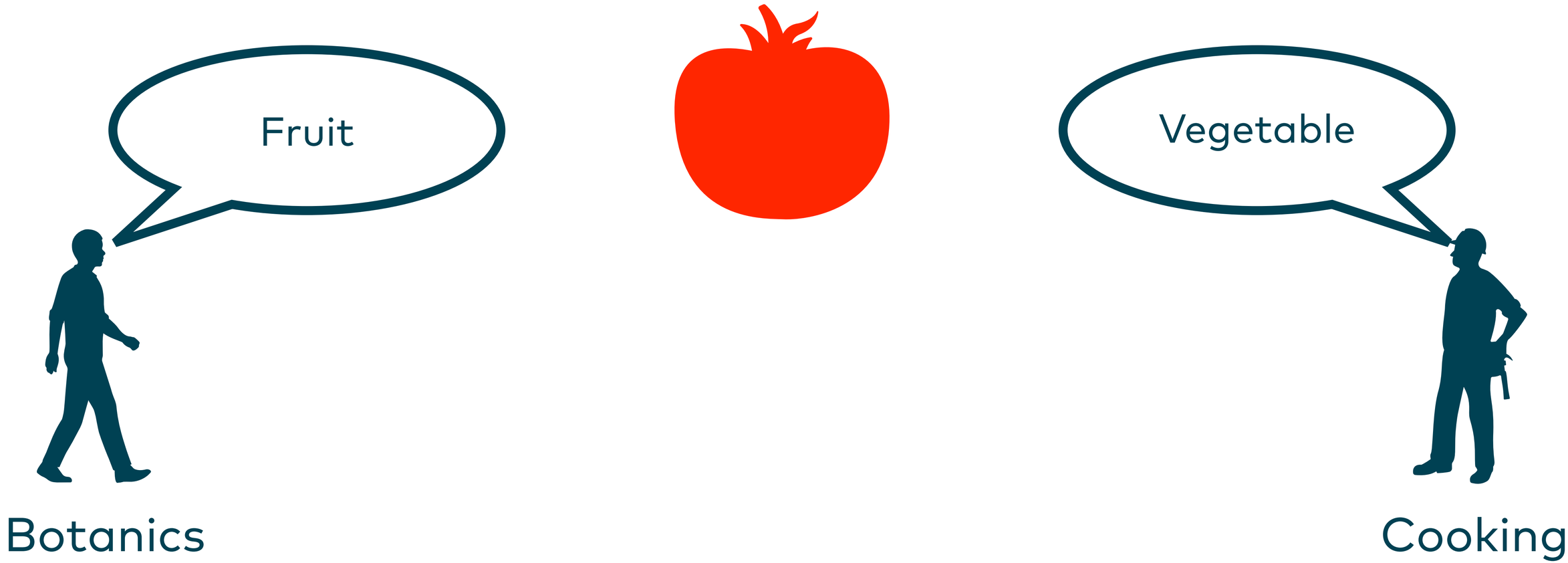

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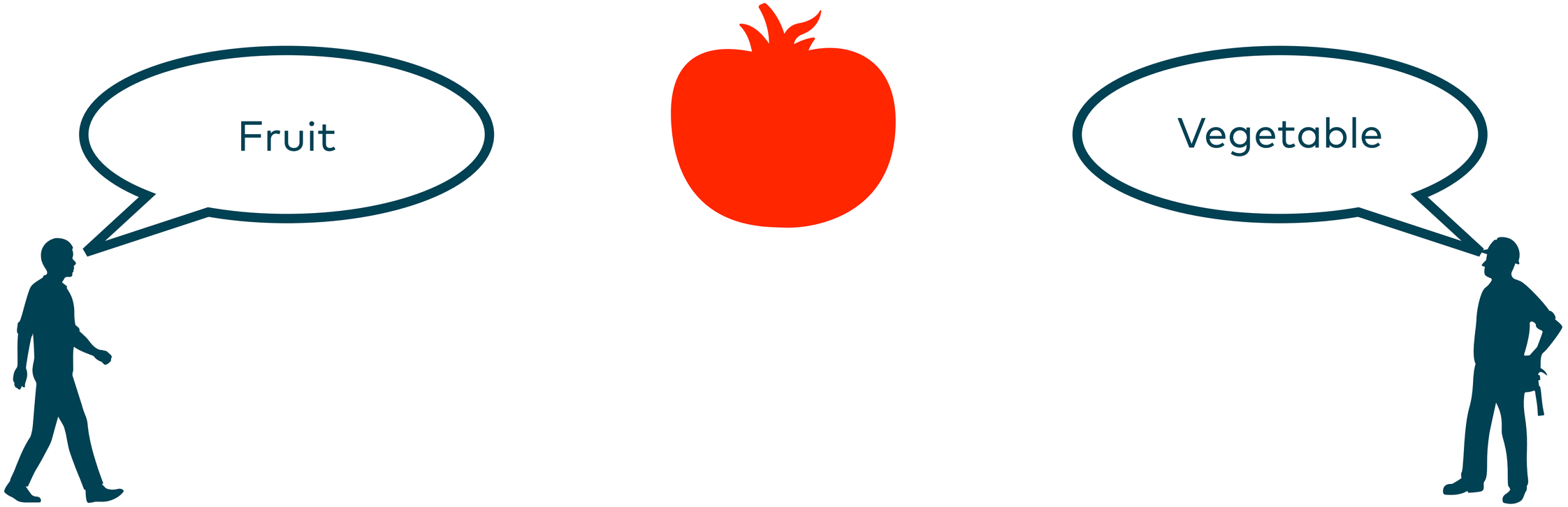

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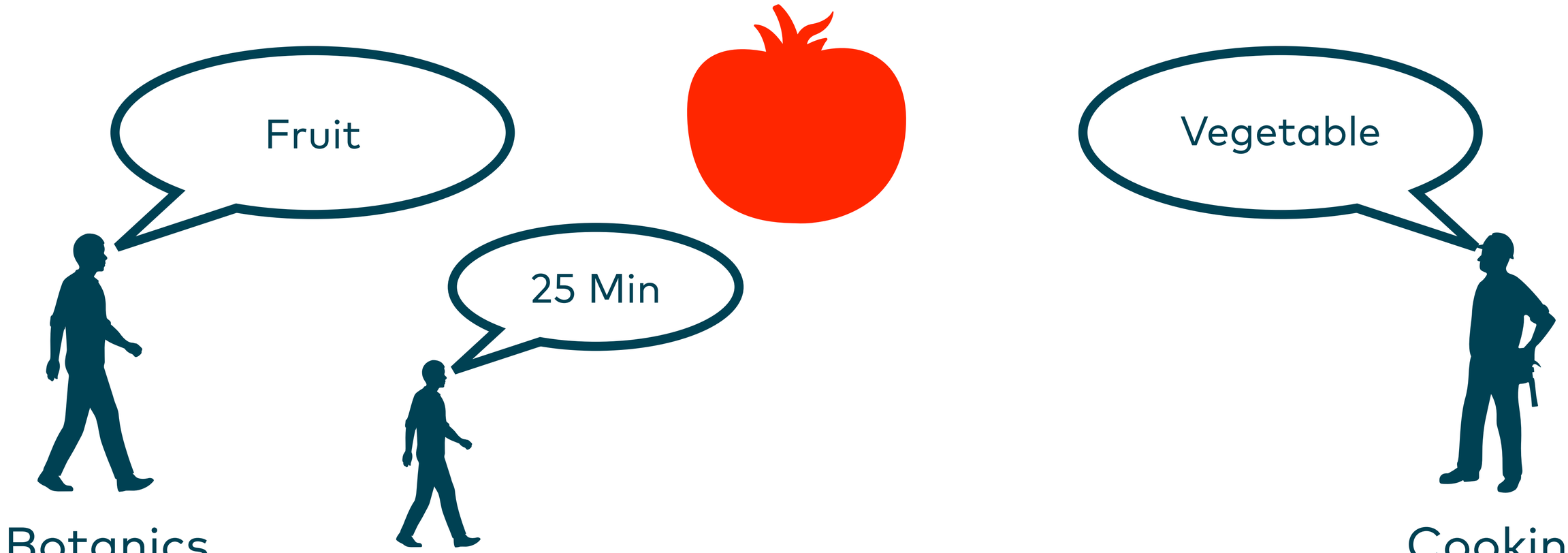

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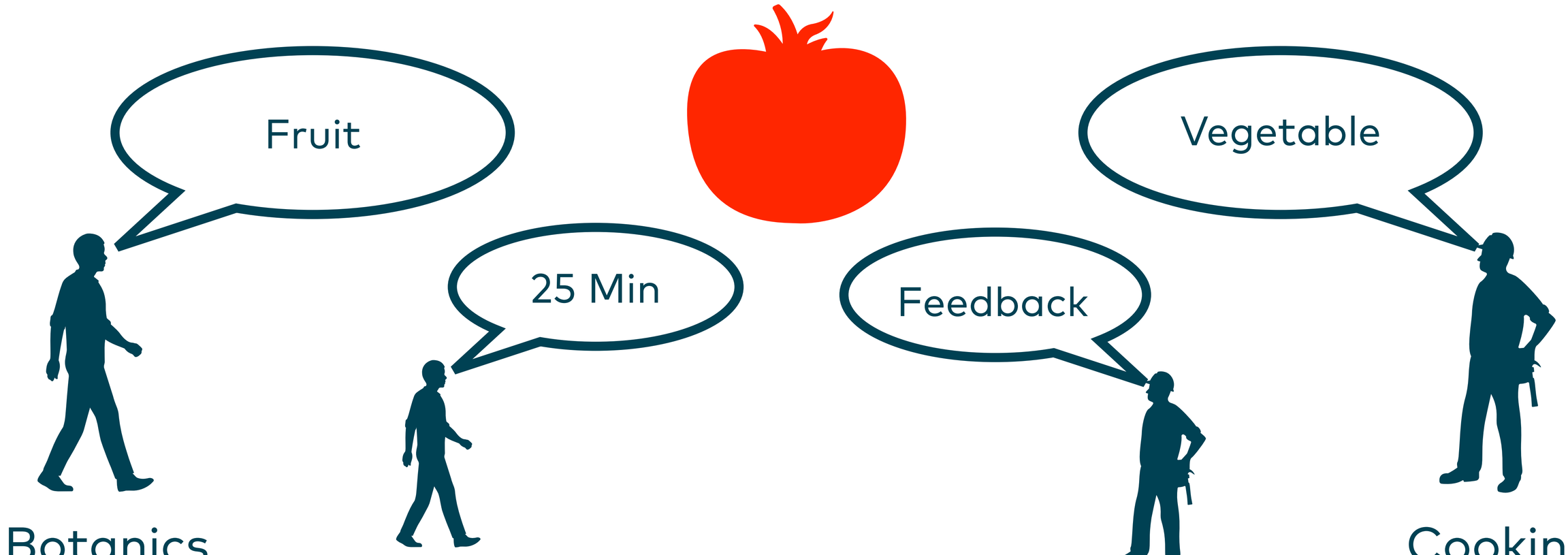
A fruit or a vegetable?

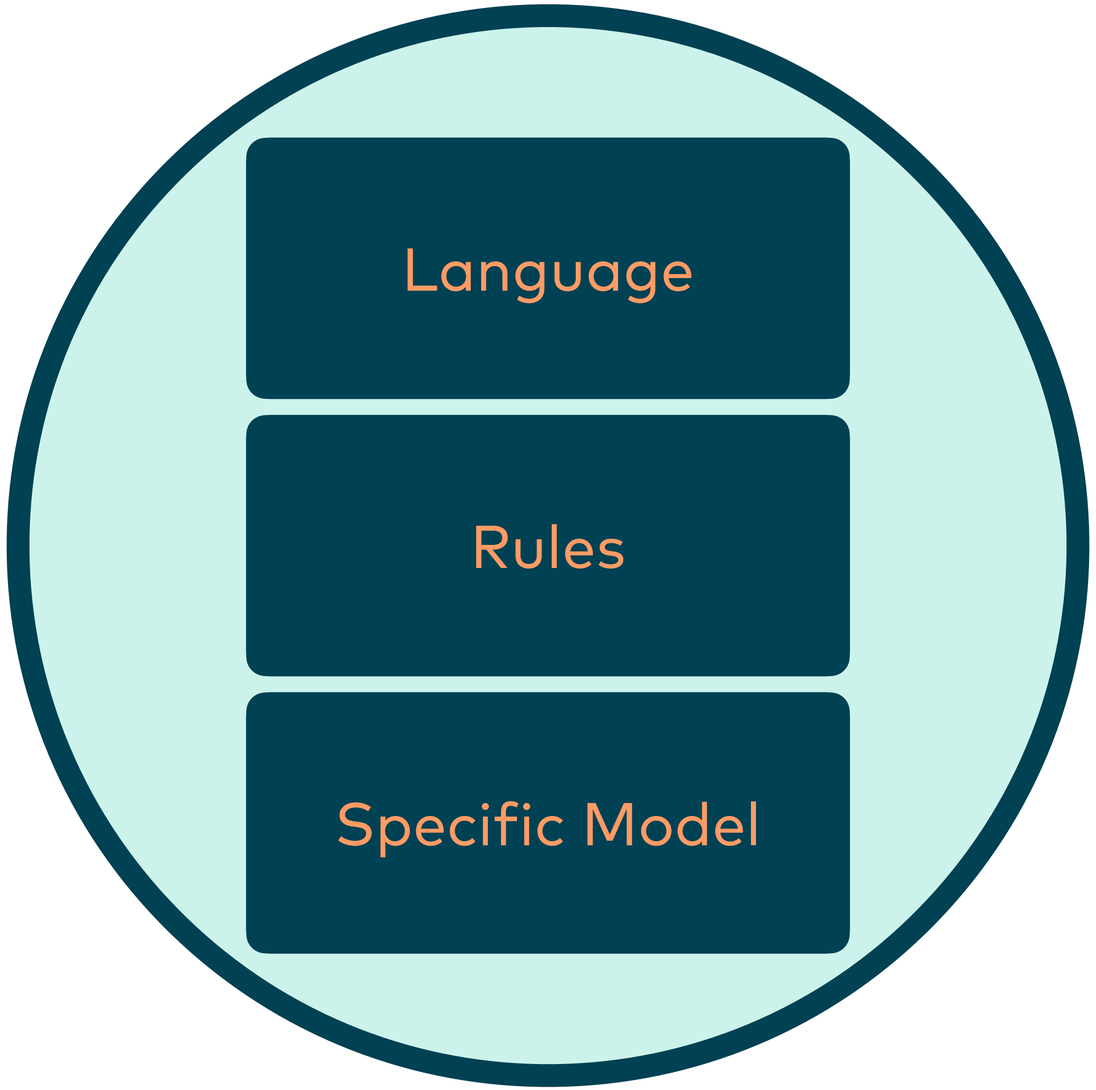


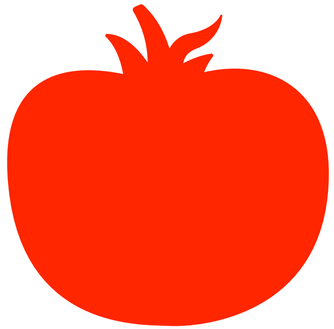
What is a tomato?

A fruit or a vegetable?

A Bounded Context is a boundary for a model expressed in a consistent language tailored around a specific **purpose**

Purpose





The Bounded Context is not about the

Botanics-US Customs-Cooking-Time management-Feedback
Tomato

It aims at specific models tied to a specific purpose

Some IT conference

Room planning

Selling tickets

Registration of visitors

Handling of payments

Lunch planning

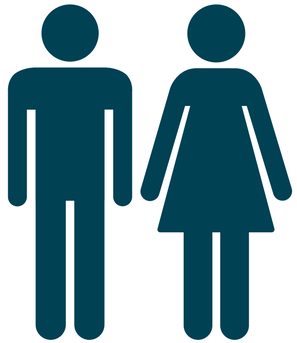
Printing of badges

YOU at some IT conference

Room planning

Selling tickets

Registration of visitors



Handling of payments

Lunch planning

Printing of badges

You can group concerns

Registration of visitors

Selling tickets

Handling of payments

Room planning

Lunch planning

Printing of badges

Don't Repeat Yourself

YOU at some IT conference

Room planning

Selling tickets

Registration of visitors

Customer
customerNumber
firstName
lastName
address
birthday
twitterHandle
lunchPreferences
sessionRegistrations
paymentDetails
company
jobDescription

Handling of payments

Lunch planning

Printing of badges

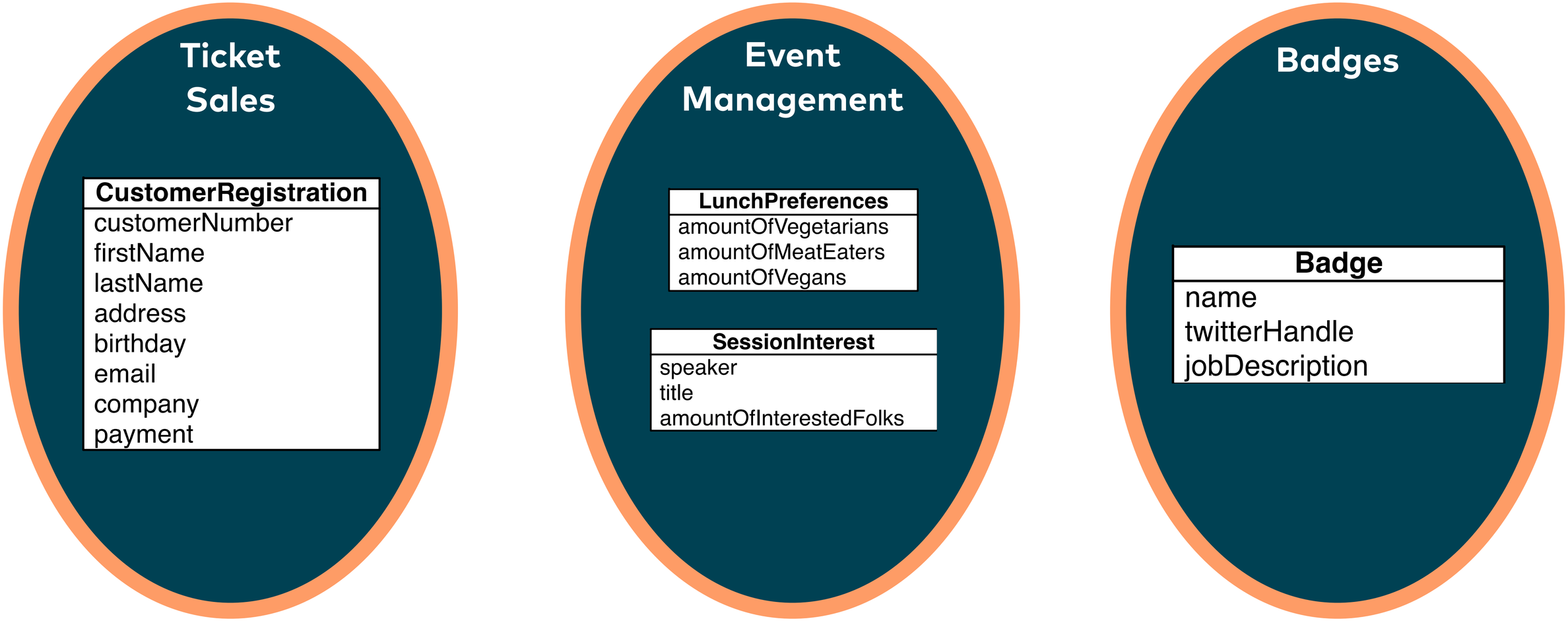
A Bounded Context is a boundary for a model expressed in a consistent language tailored around a specific purpose

Bounded Context

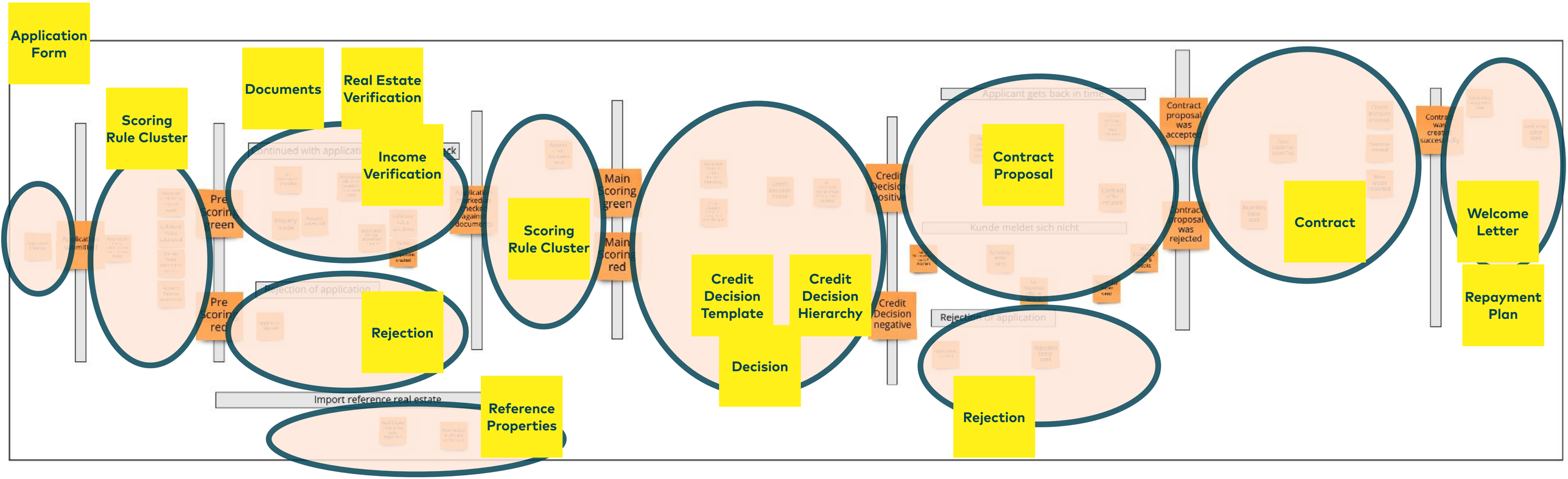
This has no purpose at all and the language is also not specific here

Customer
customerNumber
firstName
lastName
address
birthday
twitterHandle
lunchPreferences
sessionRegistrations
paymentDetails
company
jobDescription

Maybe those are interesting bounded context candidates?



Look for terminology



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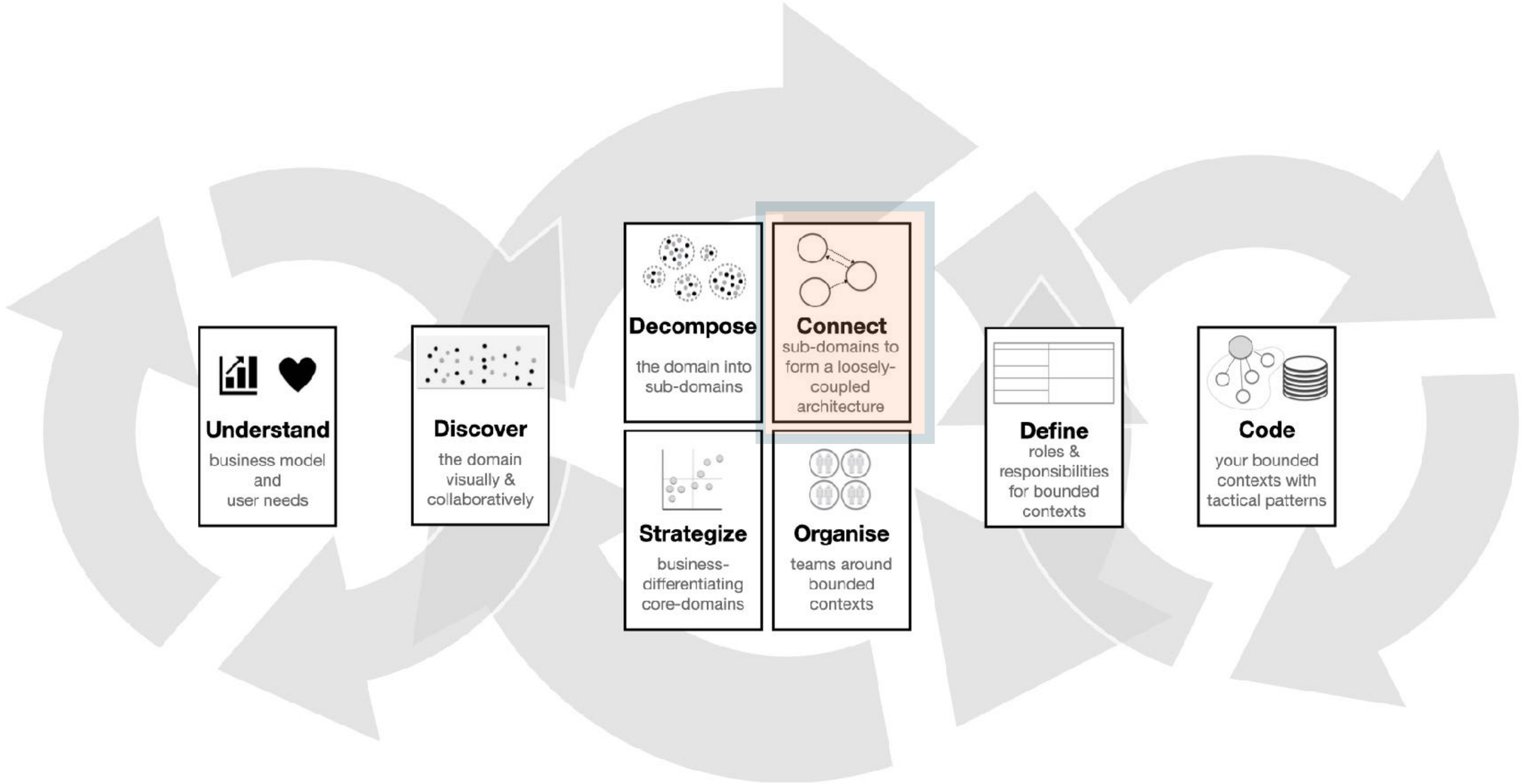
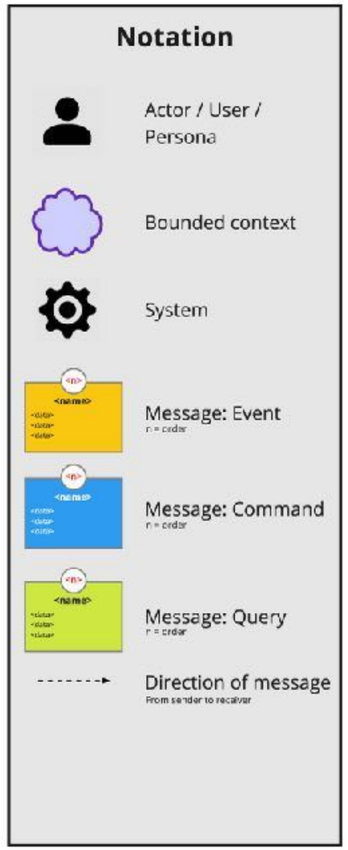


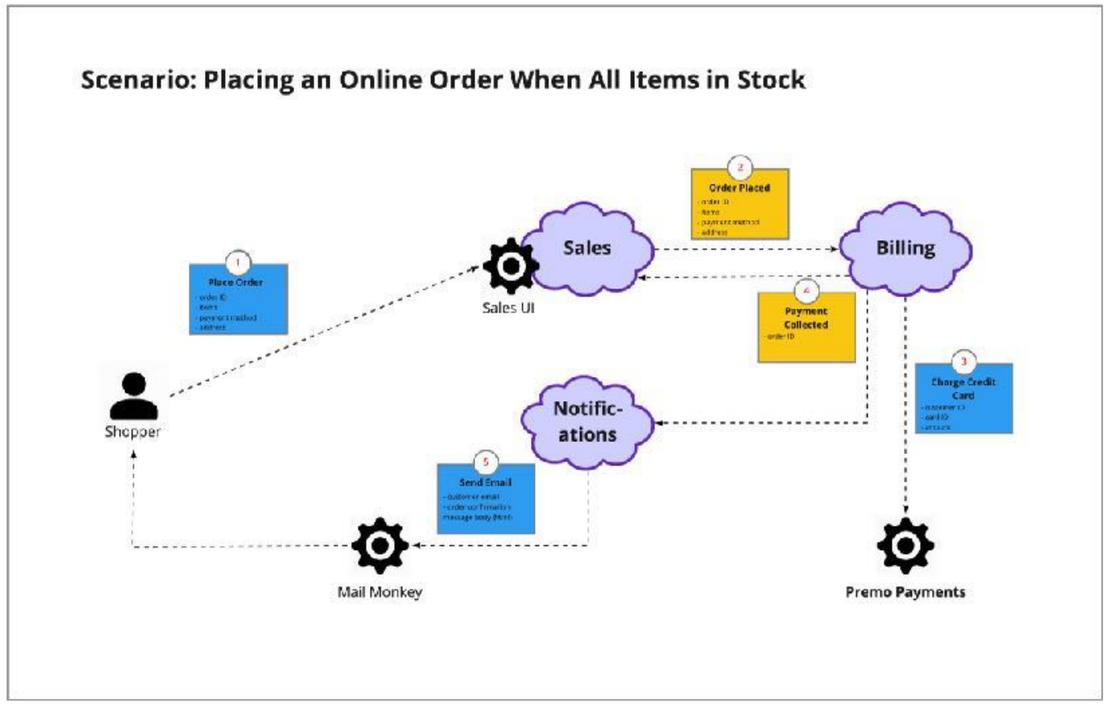
https://github.com/ddd-crew/ddd-starter-modelling-process

Domain Message Flow Modelling

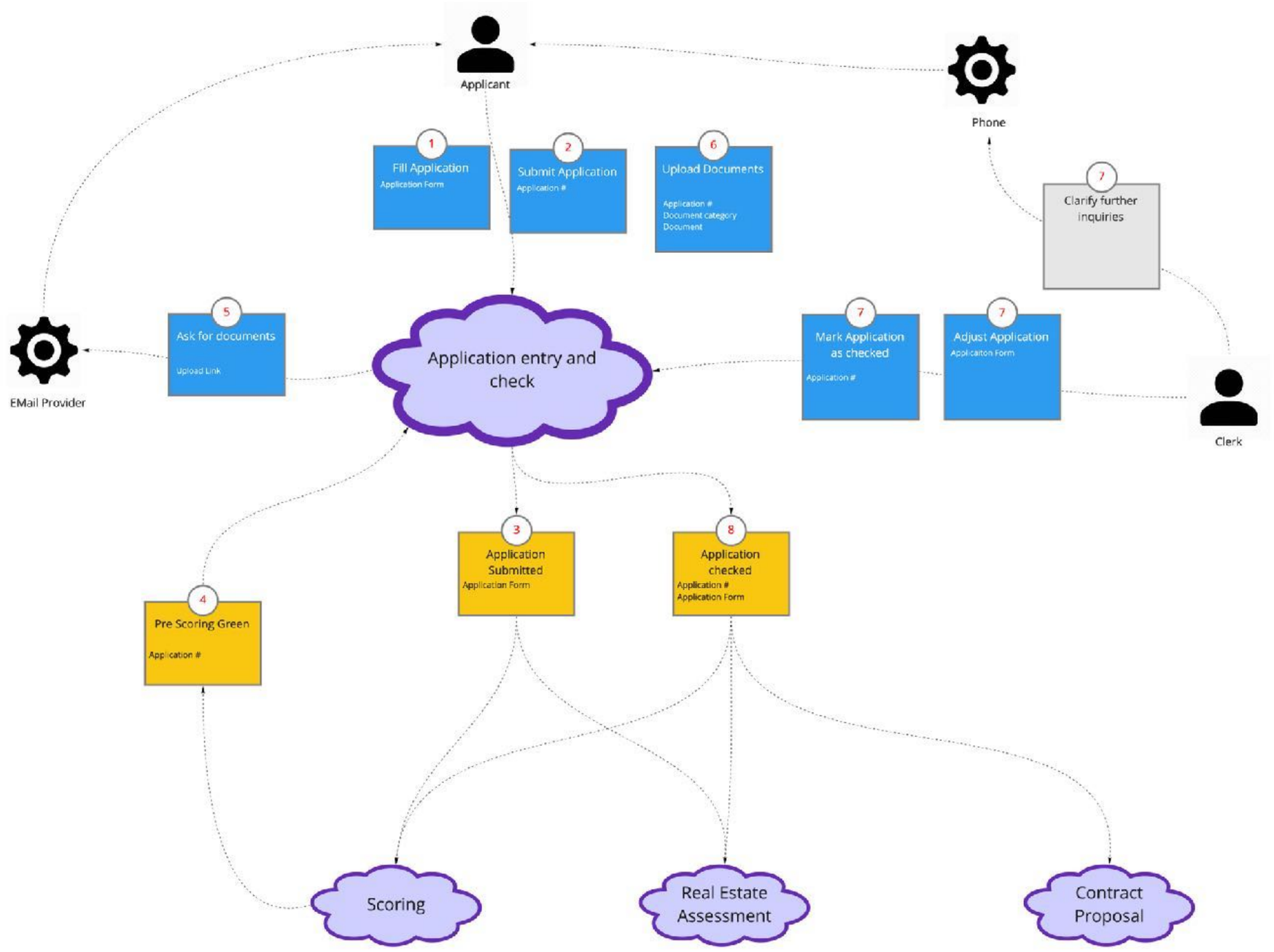
A Domain Message Flow Diagram is a simple visualization showing the flow of messages (commands, events, queries) between actors, bounded contexts, and systems, for a single scenario.



Example



Source: https://github.com/ddd-crew/domain-message-flow-modelling


Applicant
Phone
1
Fill Application
Application Form
2
Submit Application
Application #
6
Upload Documents
Application #
Document category
Document
7
Clarify further inquiries
5
Ask for documents
Upload Link
EMail Provider
Application entry and check
7
Mark Application as checked
Application #
7
Adjust Application
Application Form
Clerk
3
Application Submitted
Application Form
8
Application checked
Application #
Application Form
4
Pre Scoring Green
Application #
Scoring
Real Estate Assessment
Contract Proposal

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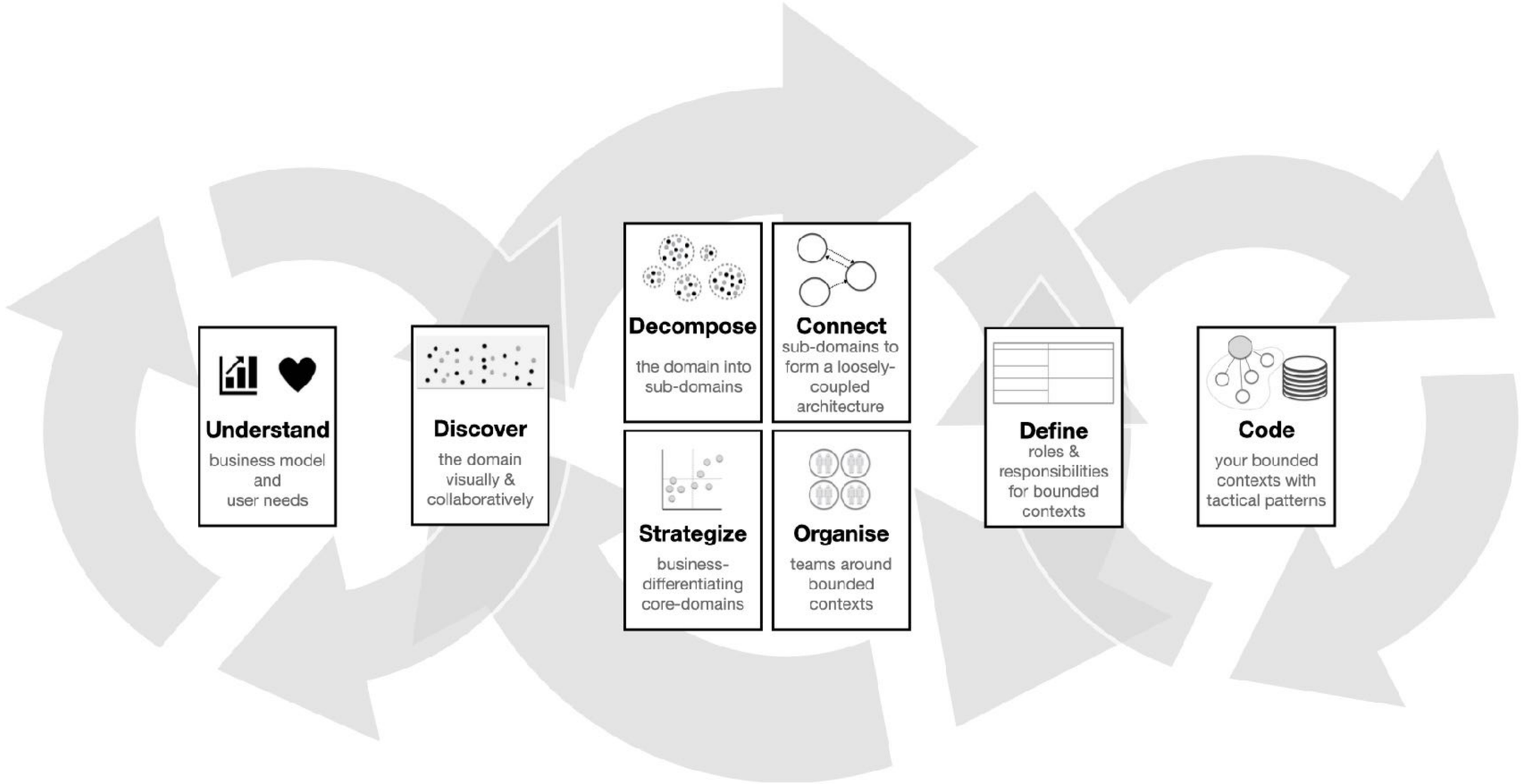

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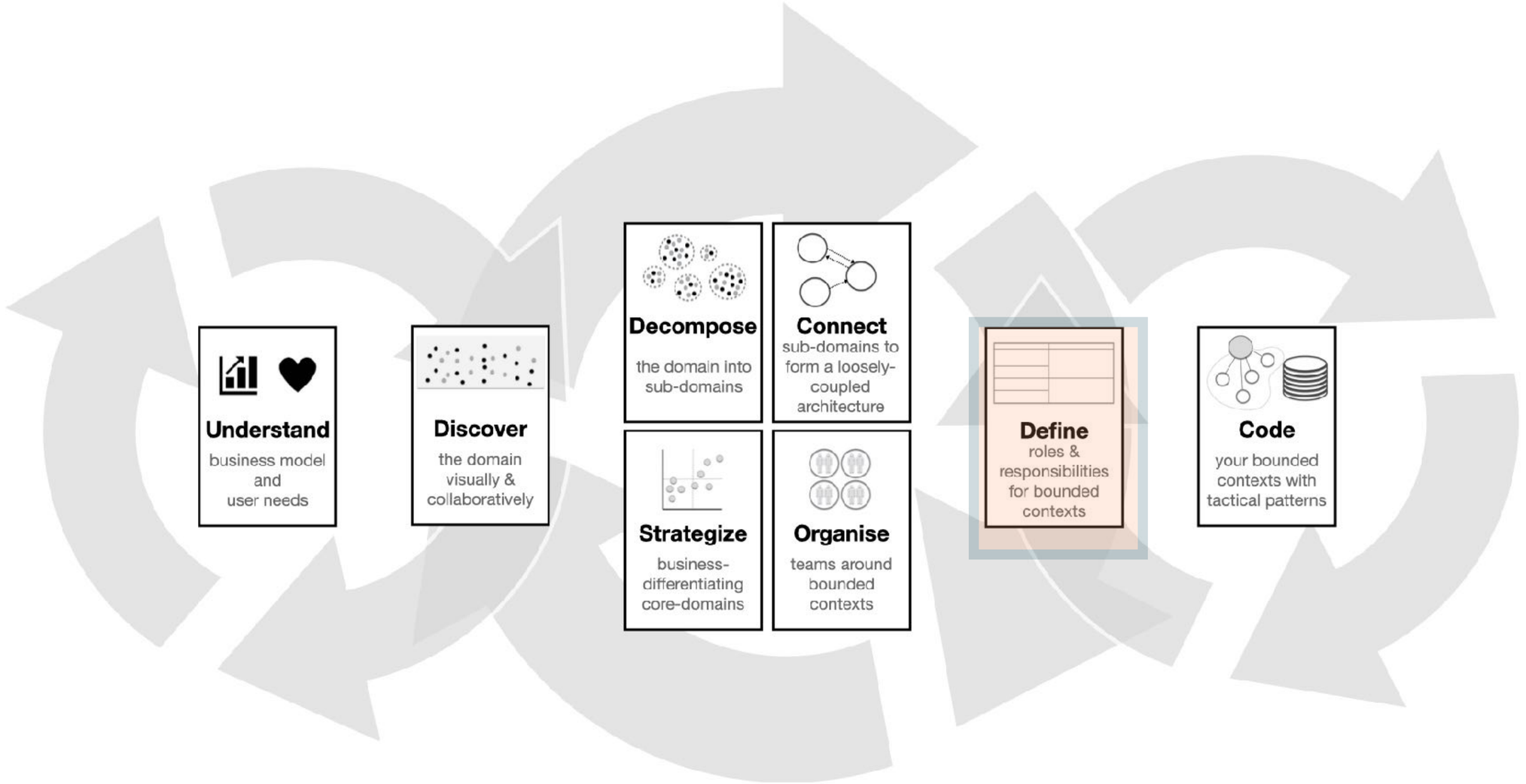
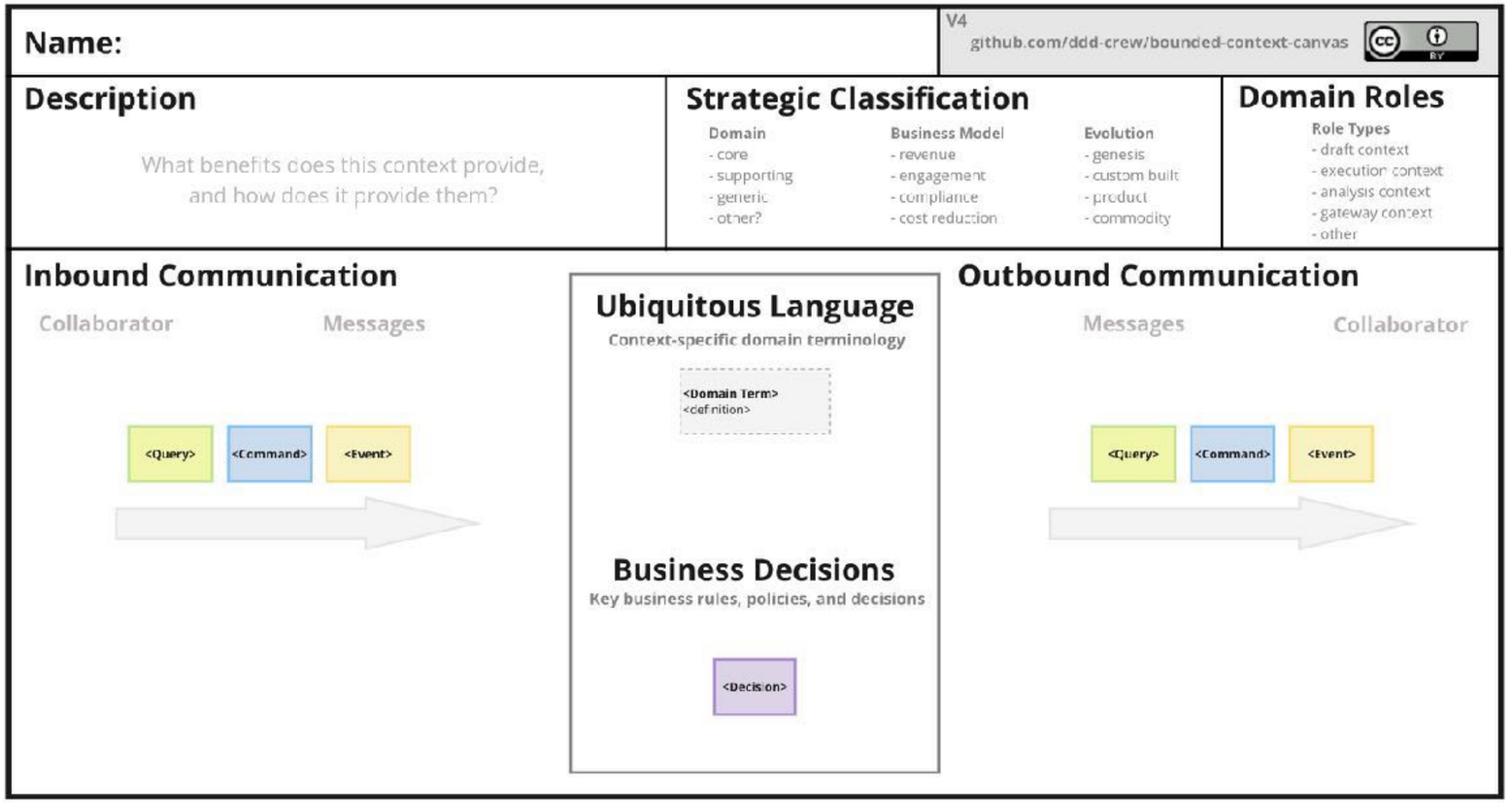


https://github.com/ddd-crew/ddd-starter-modelling-process

Bounded Context Design Canvas

The canvas guides you through the process of designing a bounded context by requiring you to consider and make choices about the key elements of its design, from naming to responsibilities, to its public interface and dependencies.



Source: https://github.com/ddd-crew/bounded-context-canvas

Name: Application entry and check

V4
github.com/ddd-crew/bounded-context-canvas

Description

Registration and submission of mortgage applications by applicants including validation, generation of application number and automatic plausibility check. Further upload of documents (e.g. pay slips, bank account statements and exposé) and check of the application against the documents including clearance.

Strategic Classification

Domain
- **core**
- supporting
- generic
- other?

Business Model
- revenue
- **engagement**
- **compliance**
- cost reduction

Evolution
- genesis
- **custom built**
- product
- commodity

Domain Roles

Engagement Context

Inbound Communication

Collaborator	Messages
Applicant	Create new Application, Fill Application, Submit Application, Upload Documents
Clerk	Adjust Application, Mark Application as checked
Scoring	Pre Scoring Green

Ubiquitous Language

Context-specific domain terminology

Application Form
The mortgage application form which contains all necessary information

Application Number
The number which identifies an application.

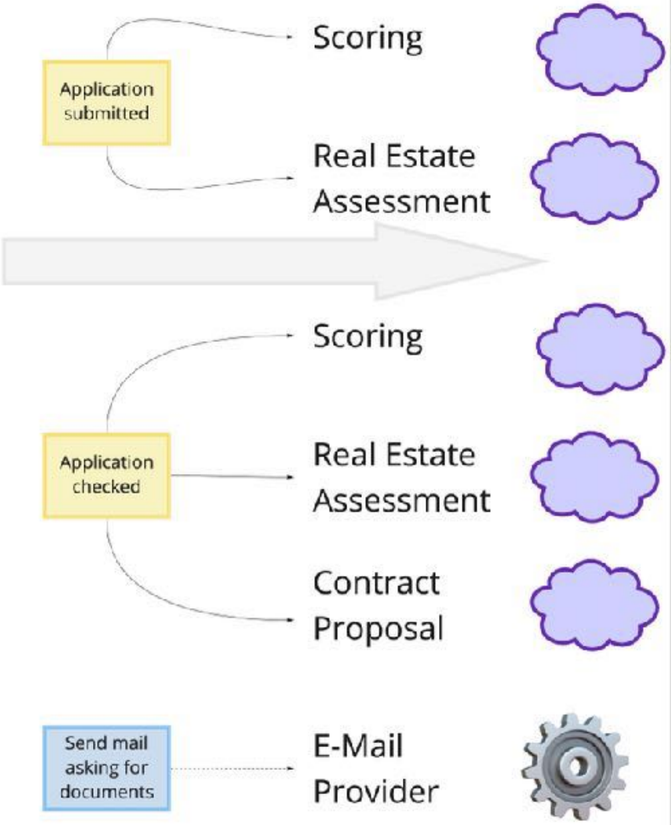
Document
Documents provided by the application which prove entries in the application form. (e.g. pay slips, bank account statements and exposé)

Business Decisions

Key business rules, policies, and decisions

- Validation for mandatory fields
- Identification of eligible applications
- Cross-field plausibility check rules
- Determination of required documents

Outbound Communication



Think about

COHESION

Name: Application entry and check

V4
github.com/ddd-crew/bounded-context-canvas

Description

Registration and submission of mortgage applications by applicants including validation, generation of application number and automatic plausibility check. Further upload of documents (e.g. pay slips, bank account statements and exposé) and check of the application against the documents including clearance.

Strategic Classification

Domain	Business Model	Evolution
- core	- revenue	- genesis
- supporting	**- engagement**	**- custom built**
- generic	- compliance	- product
- other?	- cost reduction	- commodity

Domain Roles

Engagement Context

Inbound Communication

Collaborator	Messages
Applicant	Create new Application
	Fill Application
	Submit Application
Applicant	Upload Documents
Clerk	Adjust Application
	Mark Application as checked
Scoring	Pre Scoring Green

Application Form
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Application Number
The number which identifies an application.

Validation for mandatory fields

Identification of eligible applications

Cross-field plausibility check rules

Determination of required documents

Document
Documents provided by the application which prove entries in the application form. (e.g. pay slips, bank account statements and exposé)

Outbound Communication

Messages	Collaborator
Application submitted	Scoring
	Real Estate Assessment
Application checked	Scoring
	Real Estate Assessment
	Contract Proposal
Send mail asking for documents	E-Mail Provider

Name: Application entry

V4
github.com/ddd-crew/bounded-context-canvas

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Registration and submission of mortgage applications by applicants including validation, generation of application number and automatic plausibility check.

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Domain Roles

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Inbound Communication

Collaborator	Messages
Applicant	Create new Application
	Fill Application
	Submit Application

Outbound Communication

Messages	Collaborator
Application submitted	Scoring
	Real Estate Assessment

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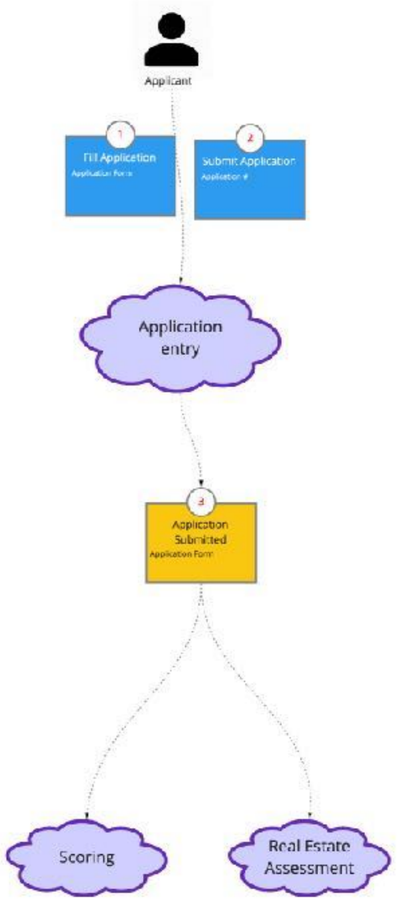


Name: Application check

V4
github.com/ddd-crew/bounded-context-canvas

Description

Further upload of documents (e.g. pay slips, bank account statements and exposé) and check of the application against the documents including clearance.

Strategic Classification

Domain	Business Model	Evolution
- core	- revenue	- genesis
- supporting	- engagement	- custom built
- generic	- compliance	- product
- other?	- cost reduction	- commodity

Domain Roles

Engagement Context

Inbound Communication

Collaborator	Messages
Applicant	Upload Documents
Clerk	Adjust Application, Mark Application as checked
Scoring	Pre Scoring Green

Ubiquitous Language

Context-specific domain terminology

Earnings Check

Application Number
The number which identifies an application.

Document
Documents provided by the application which prove entries in the application form. (e.g. pay slips, bank account statements and exposé)

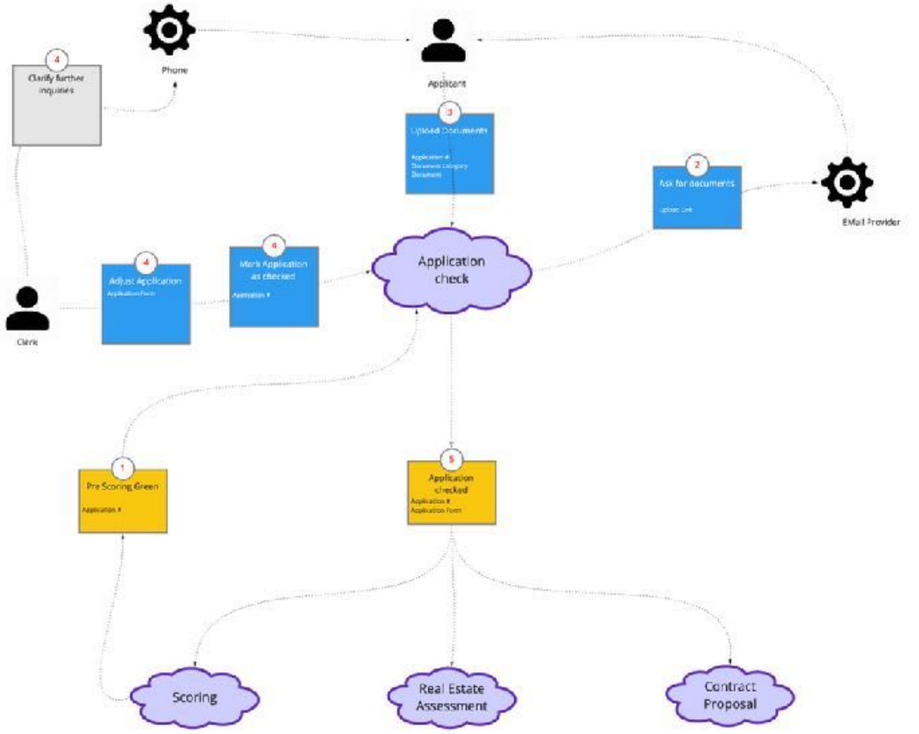
Business Decisions

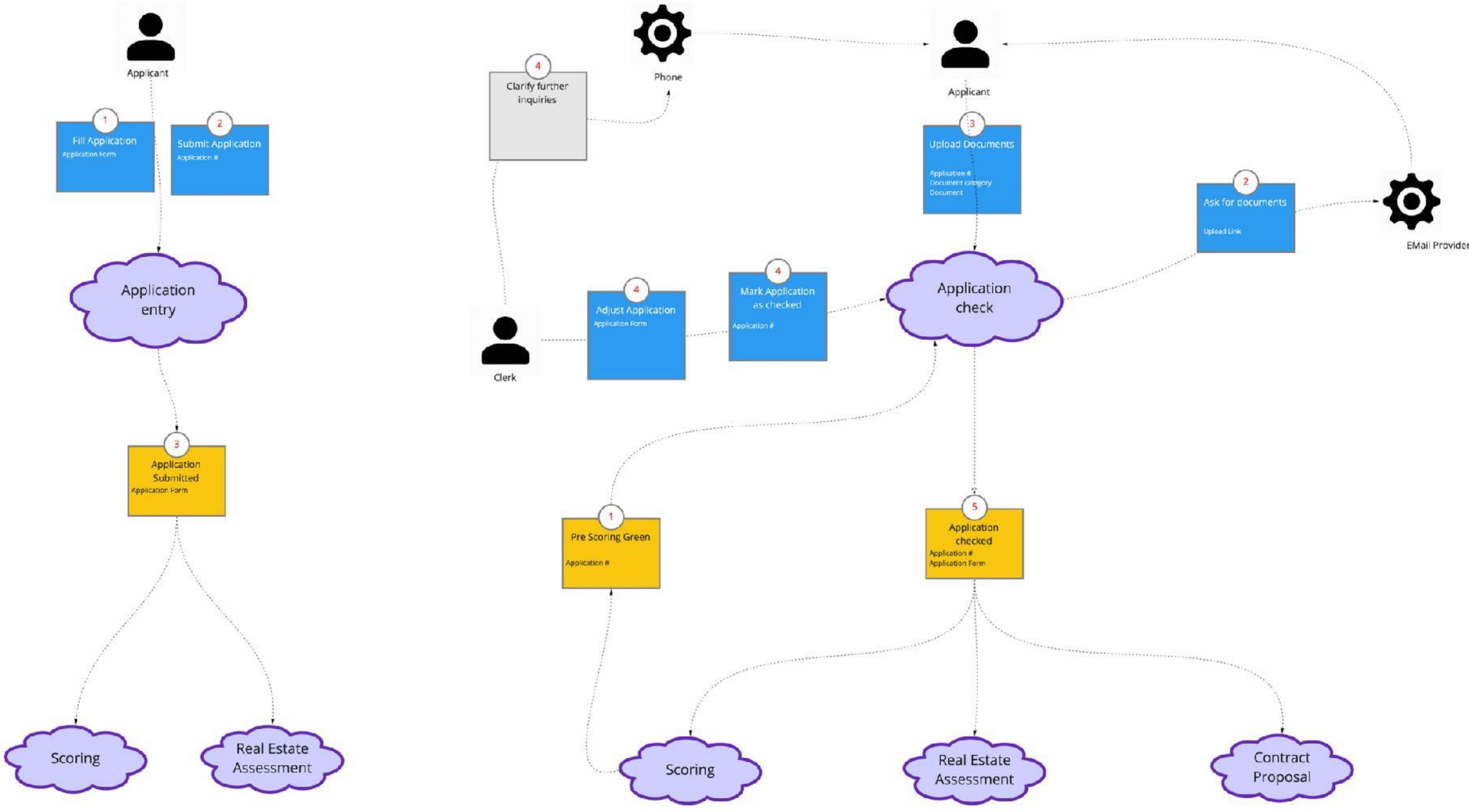
Key business rules, policies, and decisions

- Identification of eligible applications
- Cross-field plausibility check rules
- Determination of required documents

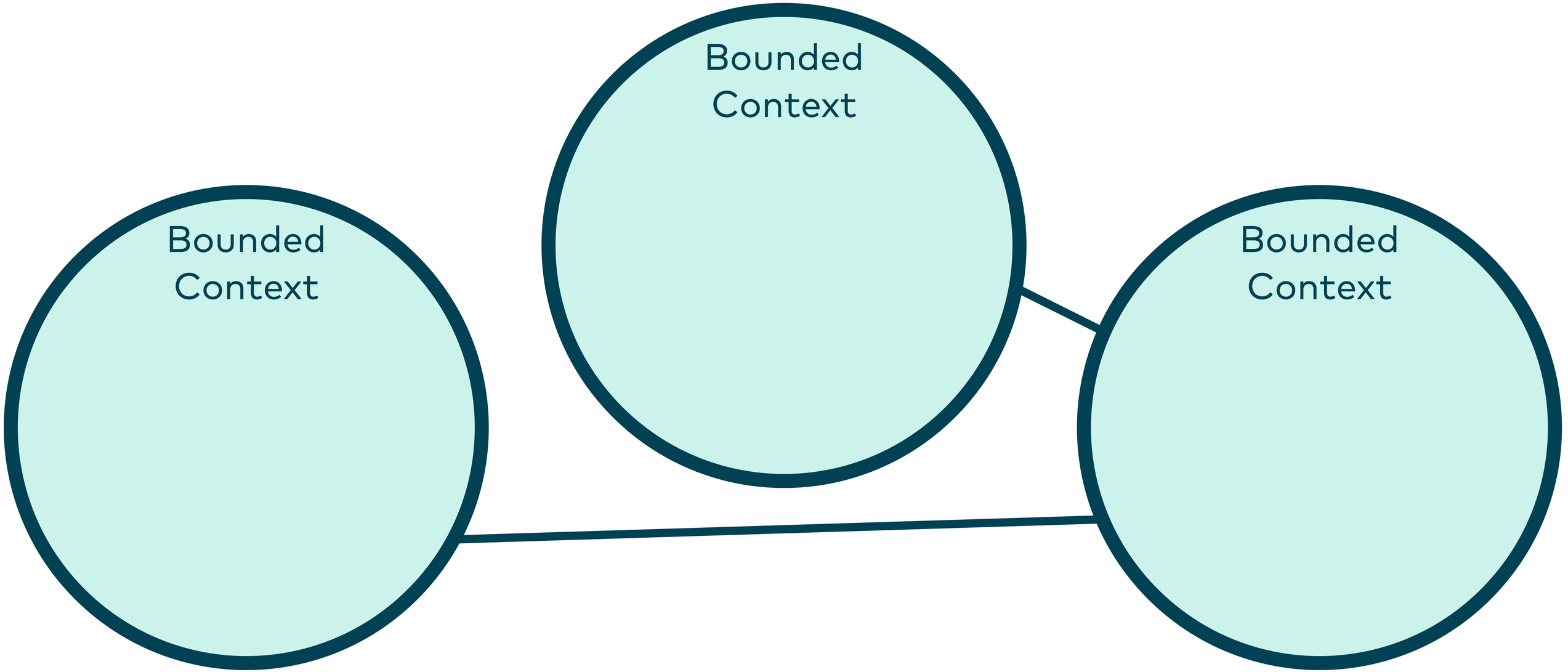
Outbound Communication

Messages	Collaborator
Application checked	Scoring
Application checked	Real Estate Assessment
Application checked	Contract Proposal
Send mail asking for documents	E-Mail Provider

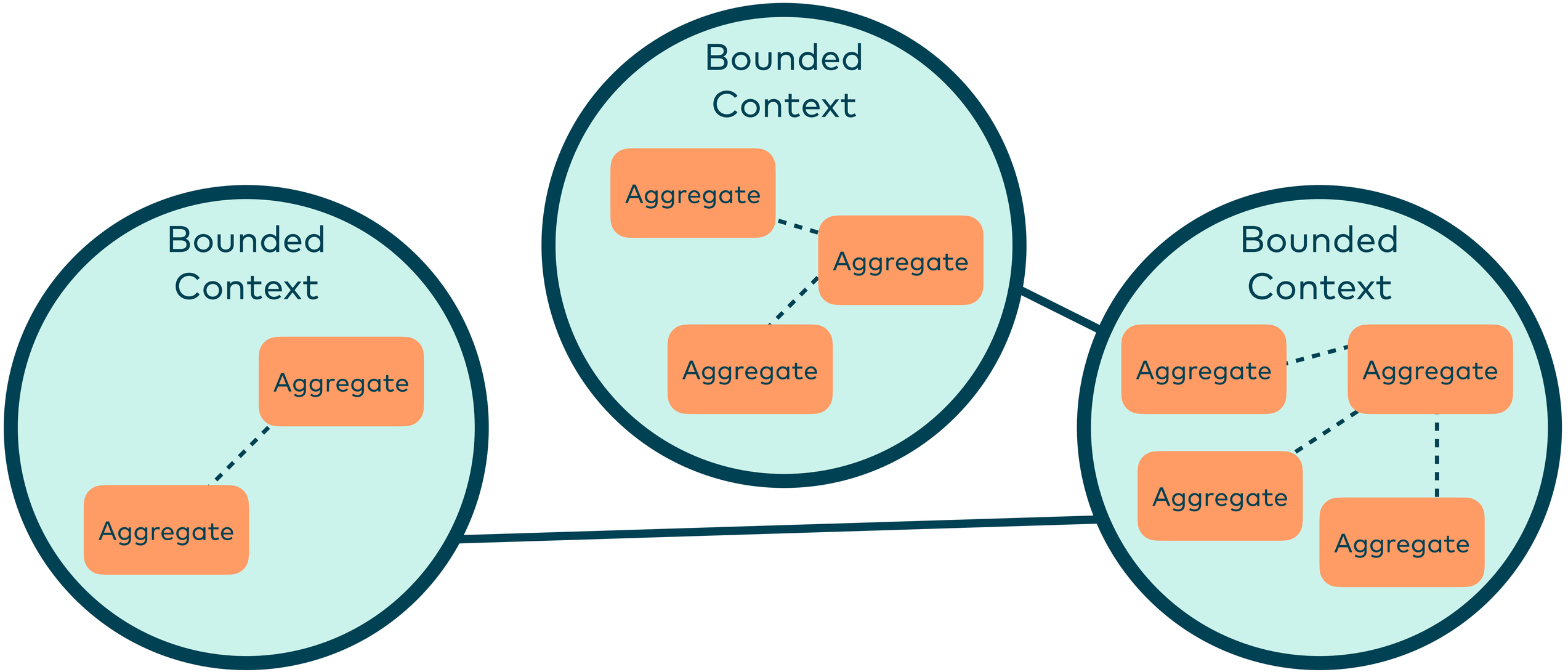



Applicant
1
Fill Application
Application Form
2
Submit Application
Application #
Application entry
3
Application Submitted
Application Form
Scoring
Real Estate Assessment
Phone
4
Clarify further inquiries
Clerk
4
Adjust Application
Application Form
4
Mark Application as checked
Application #
Application check
Applicant
3
Upload Documents
Application #
Document category
Document
2
Ask for documents
Upload Link
EMail Provider
1
Pre Scoring Green
Application #
5
Application checked
Application #
Application Form
Scoring
Real Estate Assessment
Contract Proposal

Let's dig into the Bounded Contexts

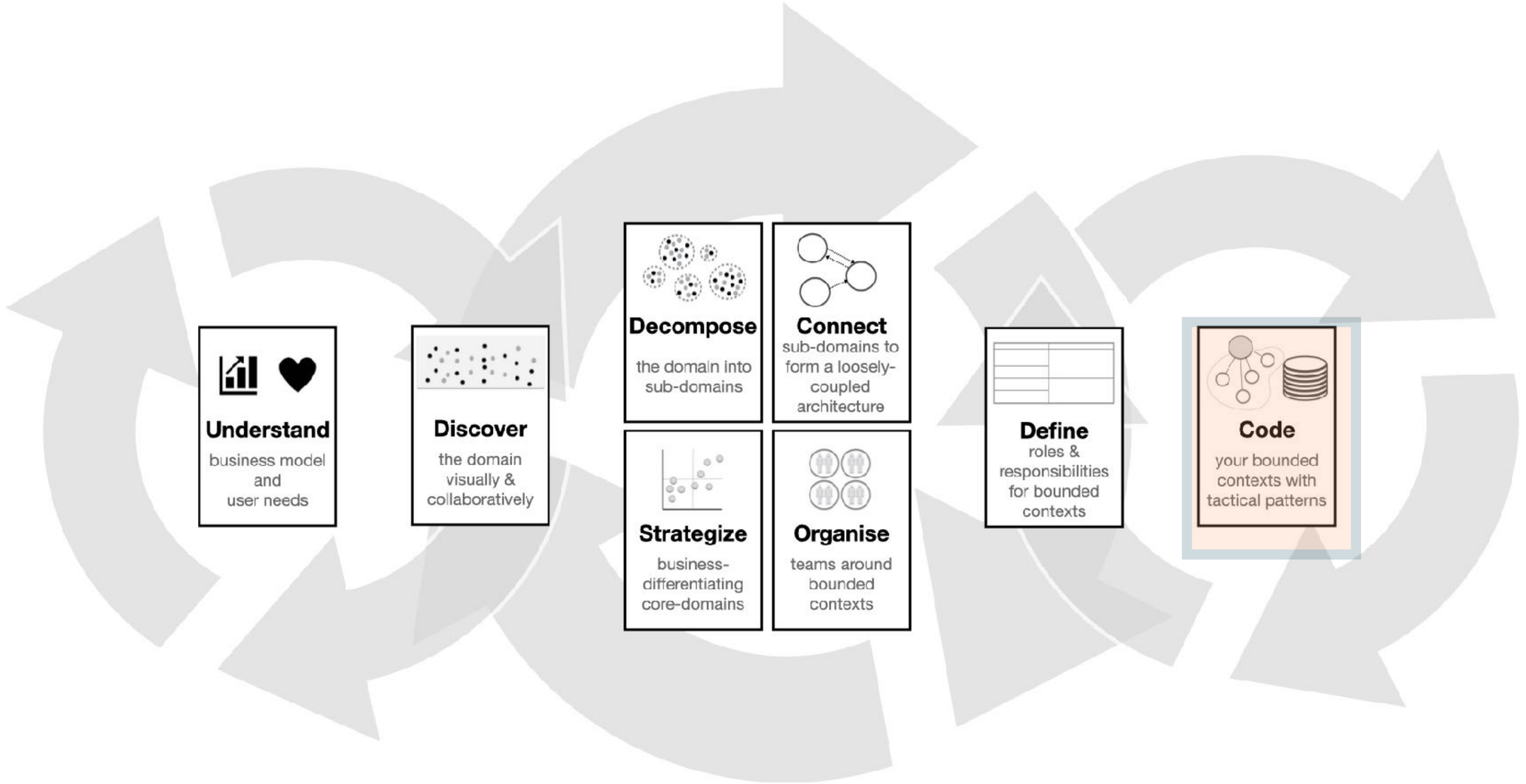


Let's dig into the Bounded Contexts



Domain-Driven Design Starter Modelling Process

A starter process for beginners, not a rigid best-practice. DDD is continuous, evolutionary, and iterative design.



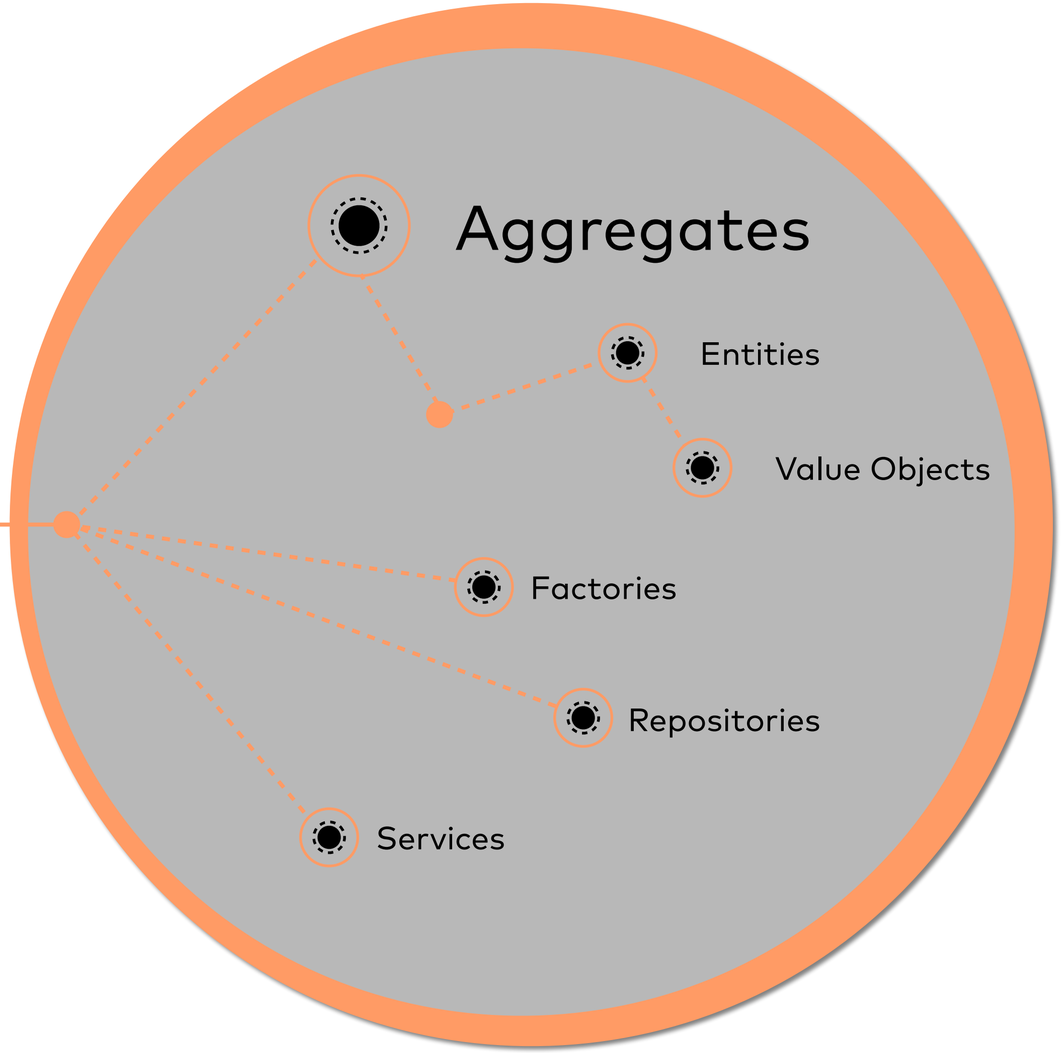
https://github.com/ddd-crew/ddd-starter-modelling-process

Everything from here on is inside a Bounded Context

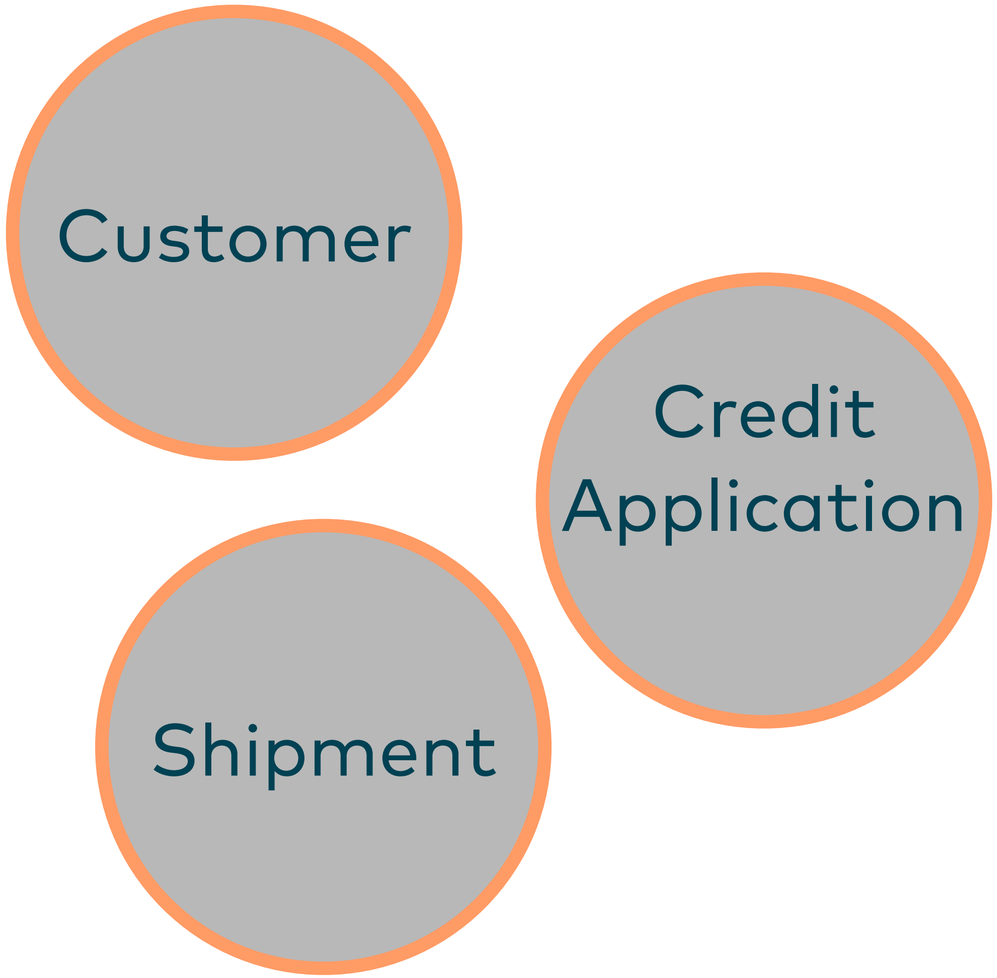
We are now talking about more fine grained modules

TACTICAL DESIGN

helps us with regards to evolvability of microservices



Entities

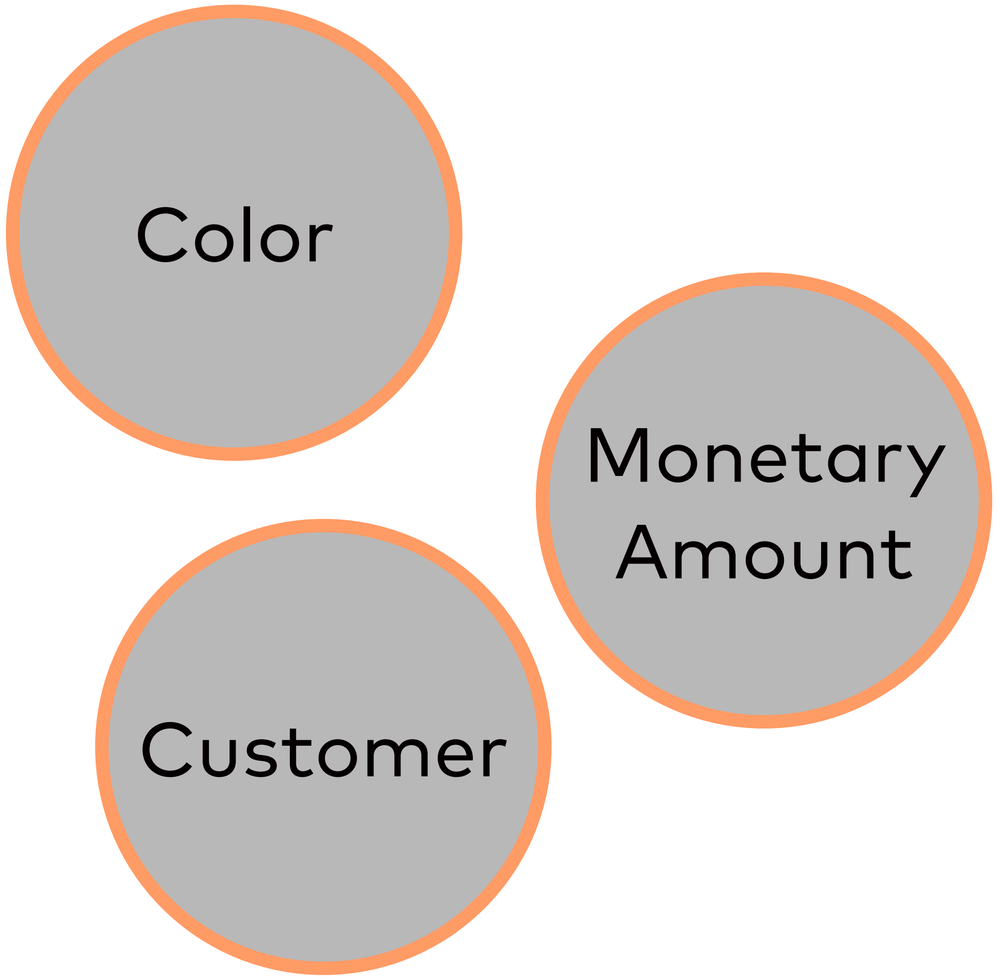


Entities represent the core business objects of a bounded context's model

Each **Entity** has a constant identity

Each **Entity** has its own lifecycle

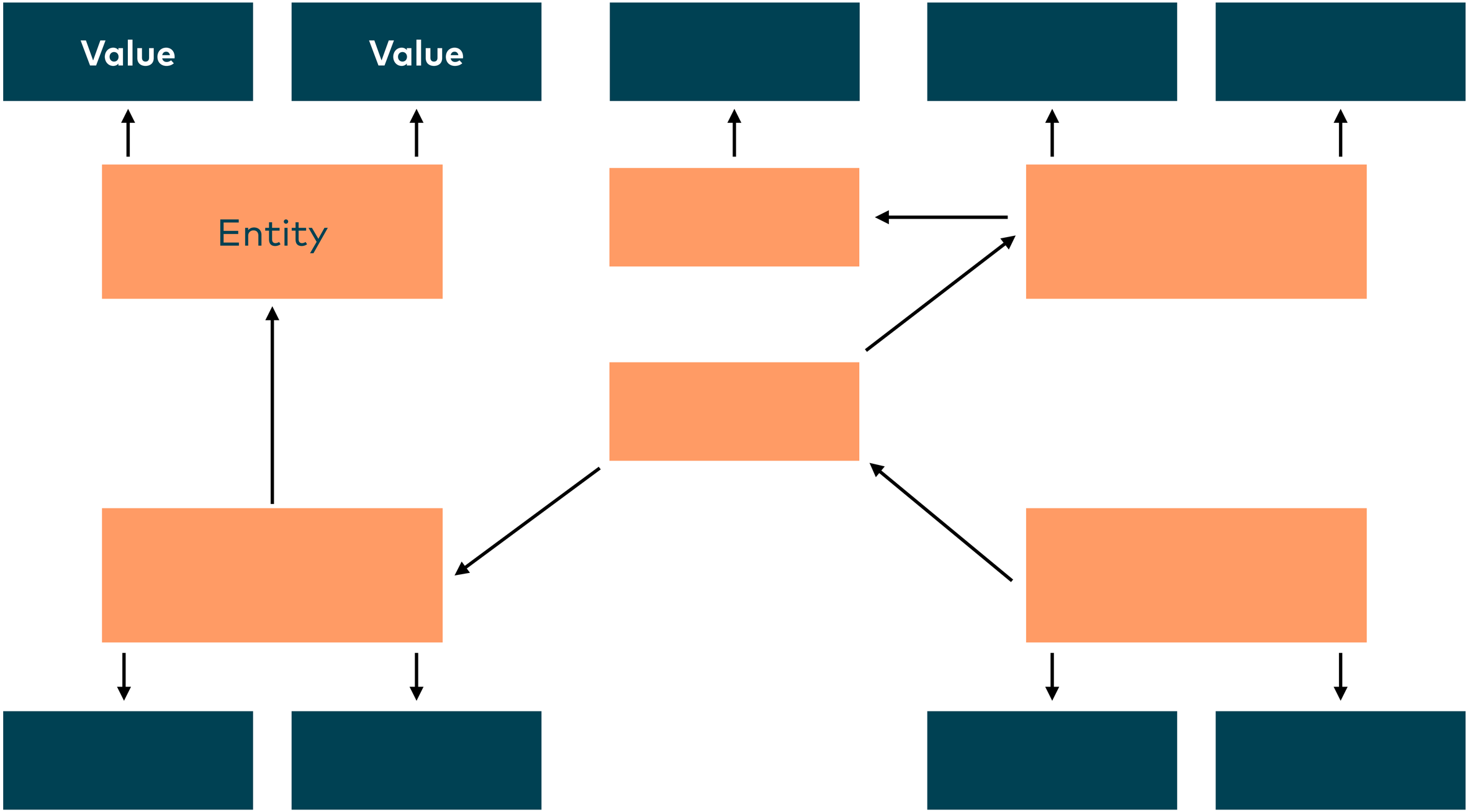
Value Objects

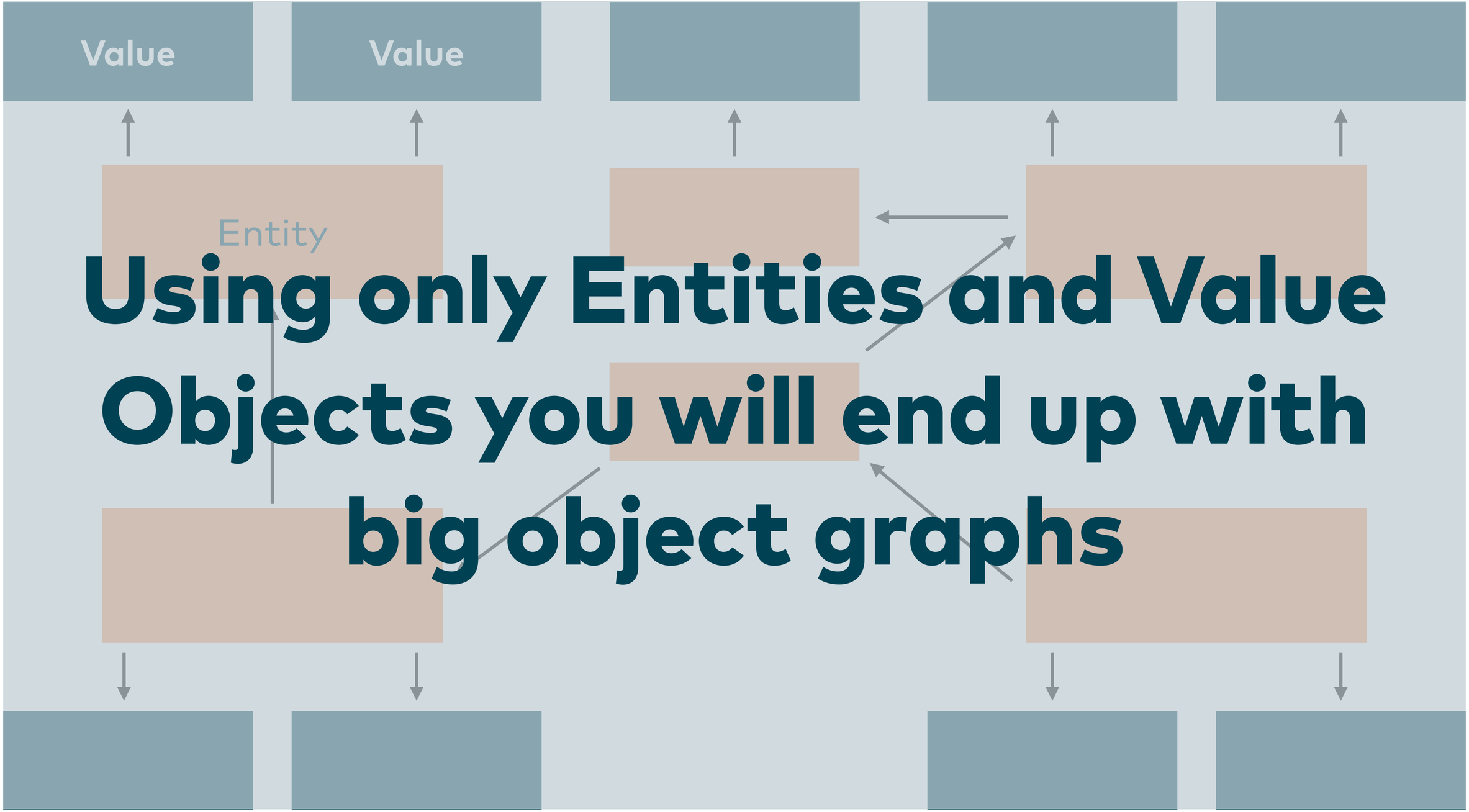


Value Objects derive their identity from their values

Value Objects do not have their own lifecycle, they inherit it from Entities that are referencing them

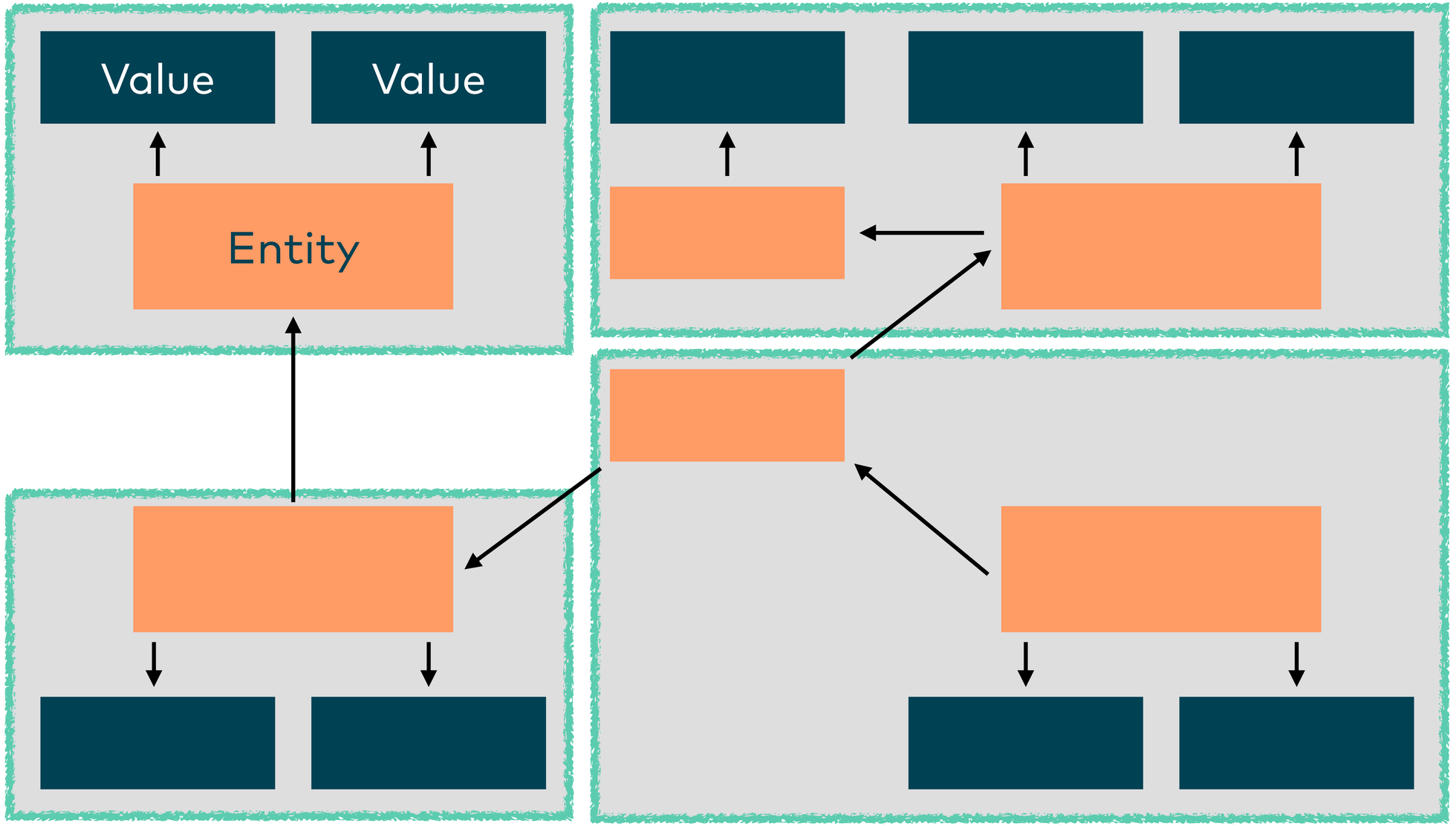
You should always consider value objects for your domain model


Value
Value
Entity

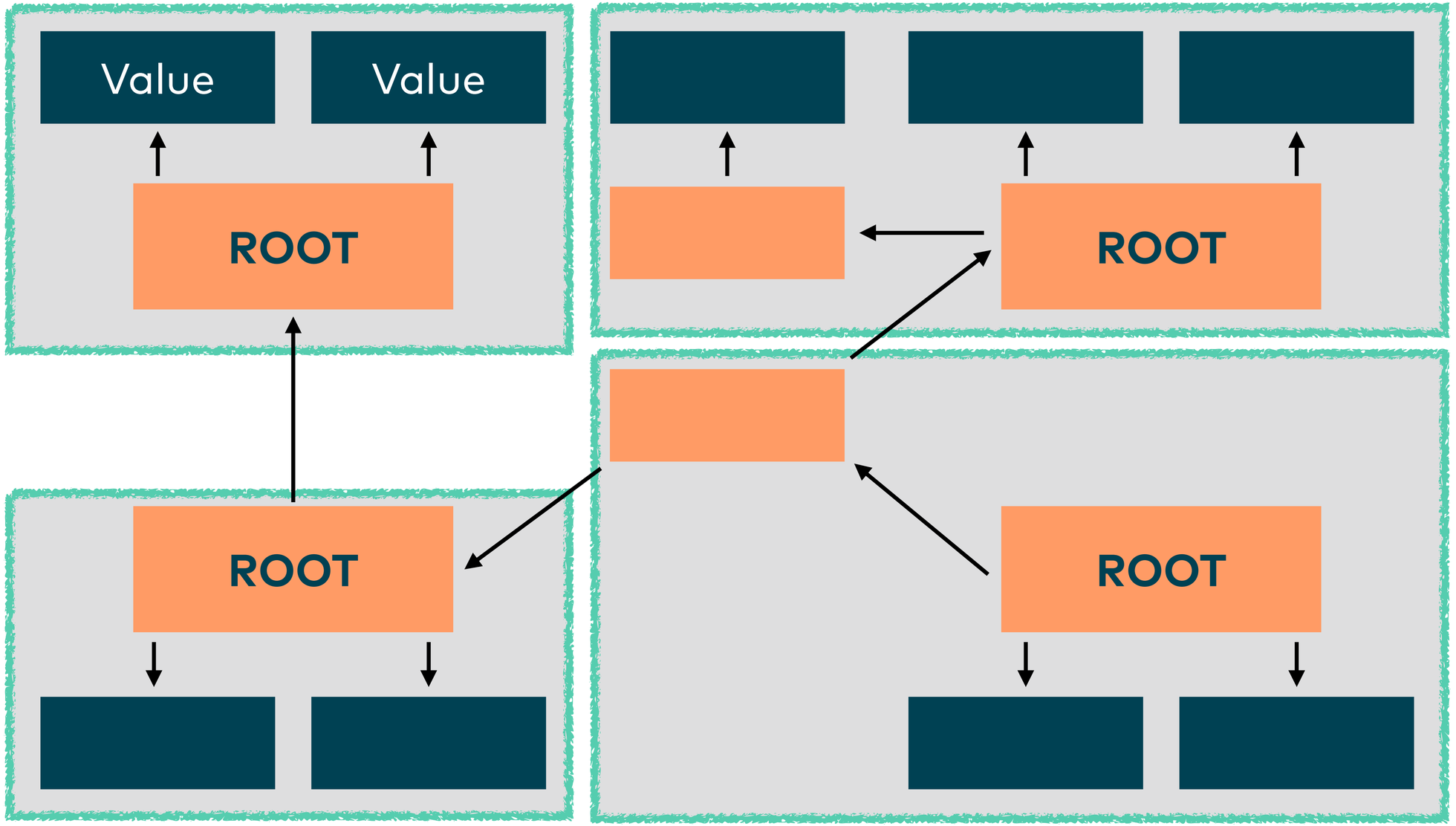


Using only Entities and Value Objects you will end up with big object graphs

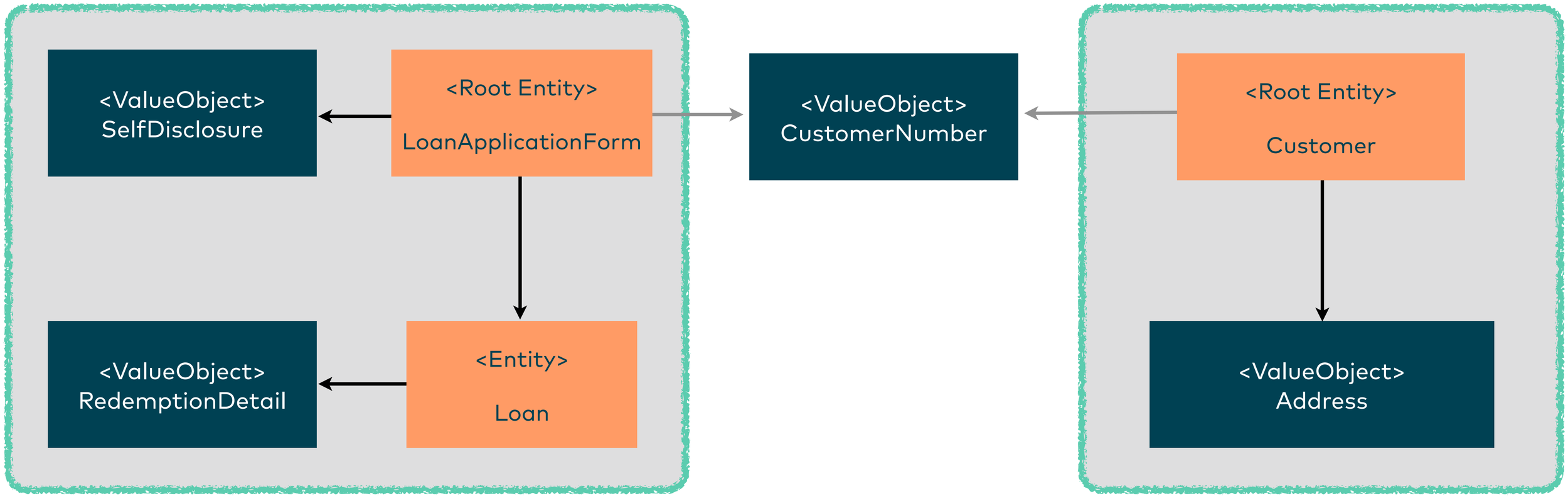
Aggregates group Entities and Value Objects

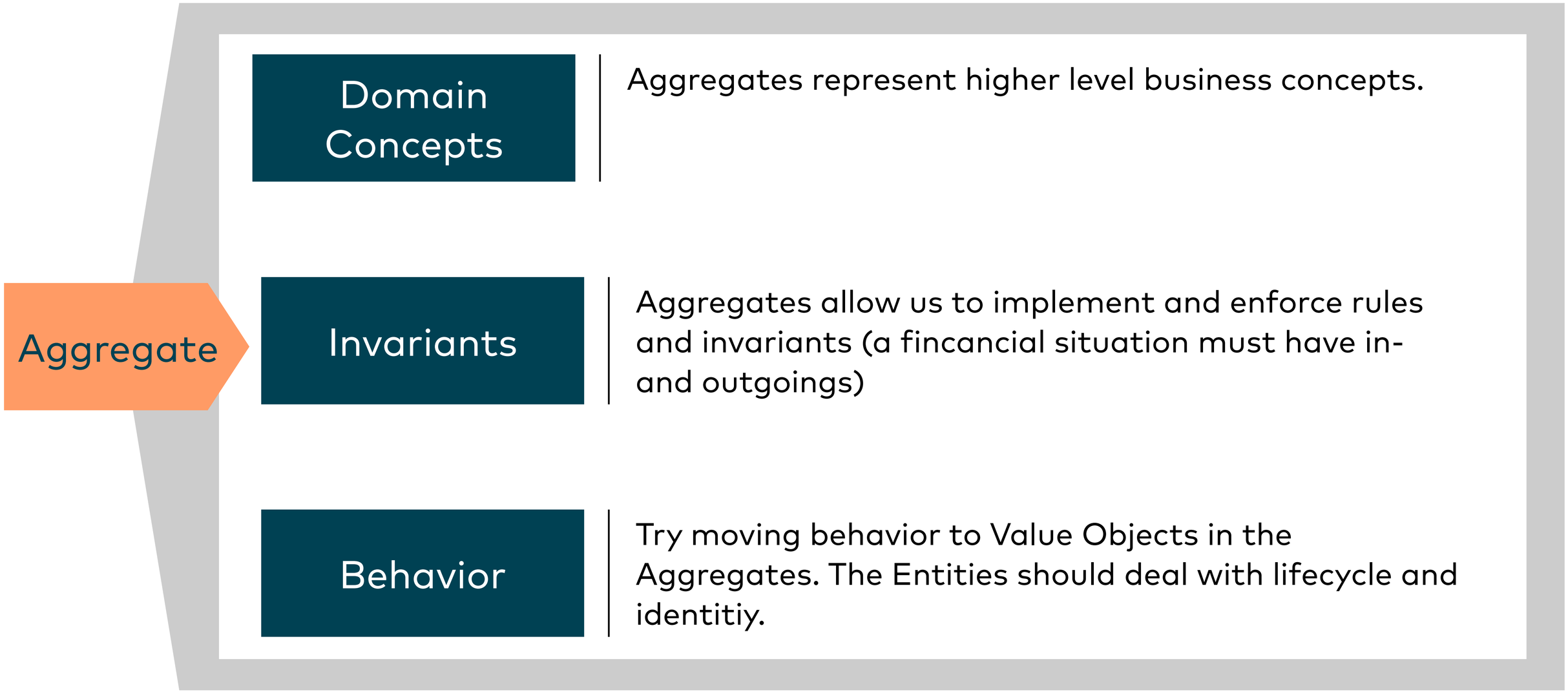


Each Aggregate has a Root Entity, aka Aggregate Root



Consider using Value Objects as indirect references between Aggregates




Aggregate
Domain Concepts
Aggregates represent higher level business concepts.
Invariants
Aggregates allow us to implement and enforce rules and invariants (a fincancial situation must have in- and outgoings)
Behavior
Try moving behavior to Value Objects in the Aggregates. The Entities should deal with lifecycle and identitiy.

Hints

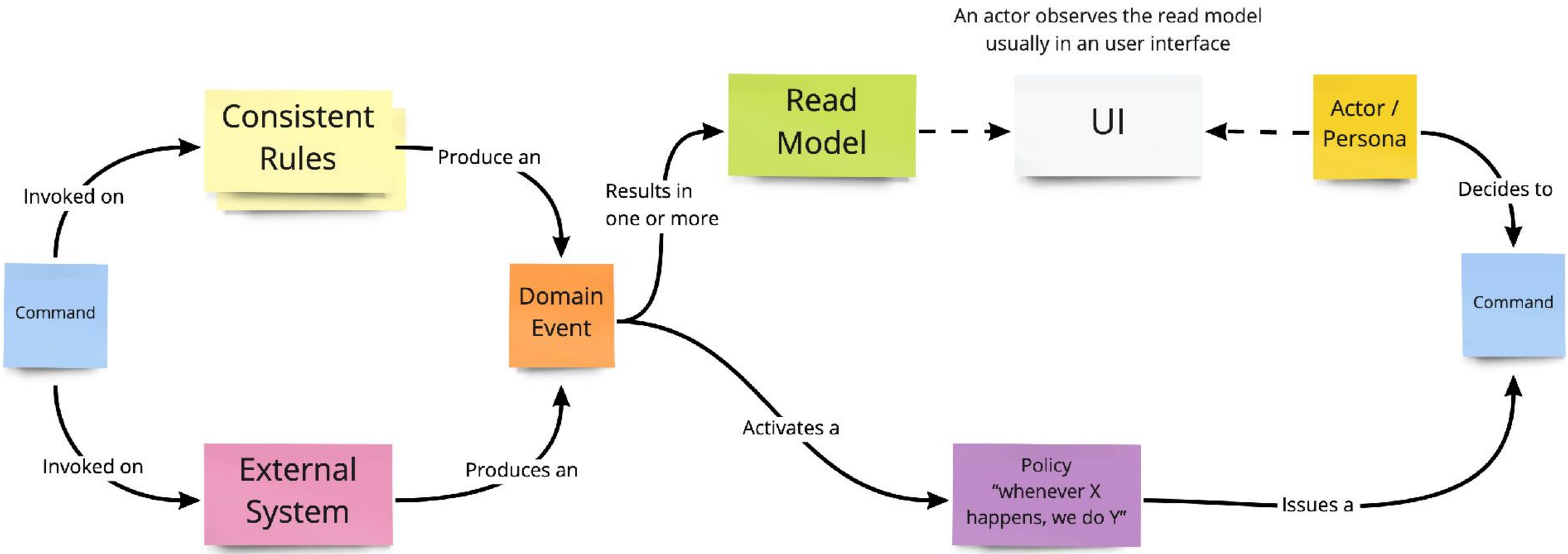
Small	Prefer small aggregates that usually only contain an Entity and some Value Objects.
Reference by Identity	Do not implement direct references to other Root Entities. Prefer referencing to Identity Value Objects
One TX per Aggregate	Aggregates should be updated in separate transactions which leads to eventual consistency
Consistency Boundaries	Take a look which parts of your model must be updated in an atomically consistent manner

Design Level EventStorming

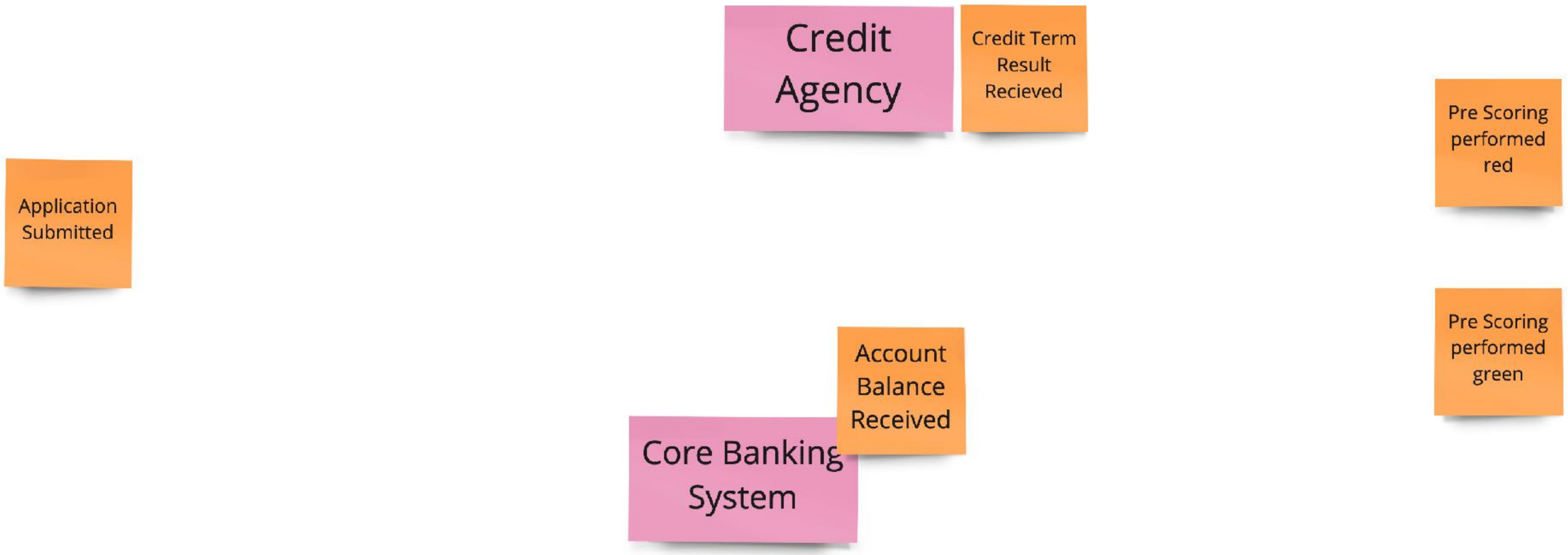
helps you to

identify and design aggregates

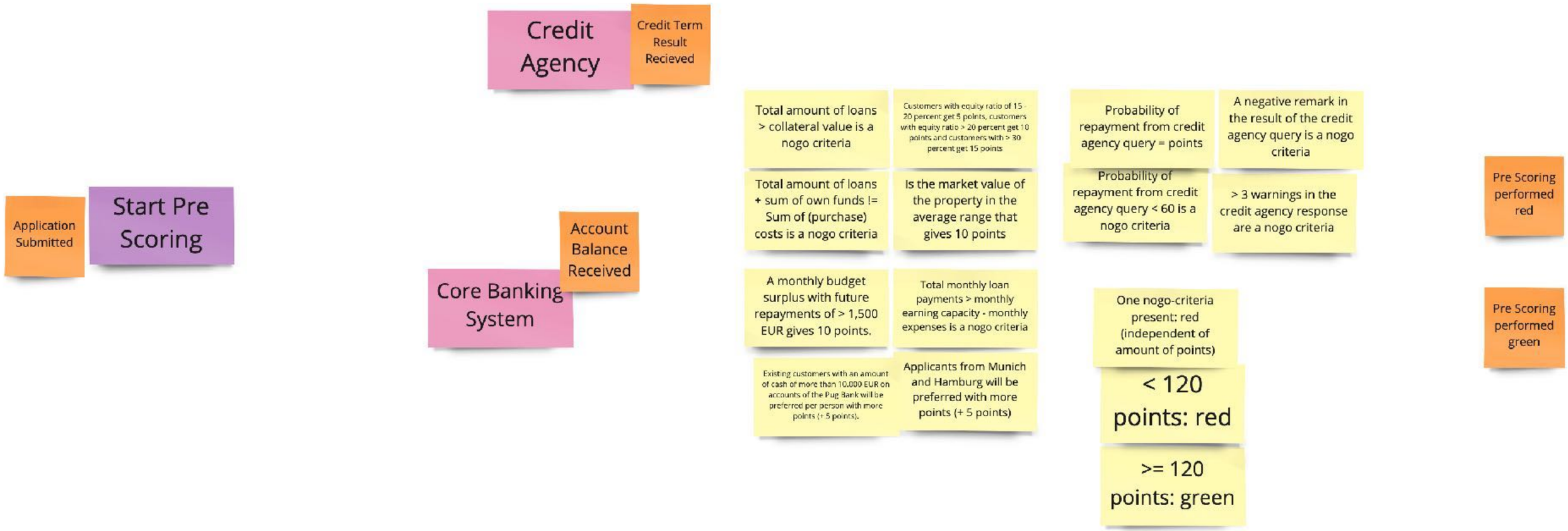
Design Level EventStorming



Starting point



Chaotic Exploration on business rules



Which grouping of the rules is the right one?

Points

A monthly budget surplus with future repayments of > 1,500 EUR gives 10 points.

Probability of repayment from credit agency query = points

Customers with equity ratio of 15 - 20 percent get 5 points, customers with equity ratio > 20 percent get 10 points and customers with > 30 percent get 15 points

Applicants from Munich and Hamburg will be preferred with more points (+ 5 points)

Is the market value of the property in the average range that gives 10 points

Existing customers with an amount of cash of more than 10.000 EUR on accounts of the Pug Bank will be preferred per person with more points (+ 5 points).

No Go Criteria

A negative remark in the result of the credit agency query is a nogo criteria

Total monthly loan payments > monthly earning capacity - monthly expenses is a nogo criteria

> 3 warnings in the credit agency response are a nogo criteria

Total amount of loans + sum of own funds != Sum of (purchase) costs is a nogo criteria

Probability of repayment from credit agency query < 60 is a nogo criteria

Total amount of loans > collateral value is a nogo criteria

Scoring Result

One nogo-criteria present: red (independent of amount of points)

< 120 points: red

>= 120 points: green

Applicant Rule Cluster

Existing customers with an amount of cash of more than 10.000 EUR on accounts of the Pug Bank will be preferred per person with more points (+ 5 points)

Applicants from Munich and Hamburg will be preferred with more points (+ 5 points)

Monthly Cash Flow Rule Cluster

A monthly budget surplus with future repayments of > 1,500 EUR gives 10 points.

Total monthly loan payments > monthly earning capacity - monthly expenses is a nogo criteria

Real Estate Financing Rule Cluster

Total amount of loans > collateral value is a nogo criteria

Customers with equity ratio of 15 - 20 percent get 5 points, customers with equity ratio > 20 percent get 10 points and customers with > 30 percent get 15 points

Total amount of loans + sum of own funds != Sum of (purchase) costs is a nogo criteria

Is the market value of the property in the average range that gives 10 points

Credit Agency Rule Cluster

Probability of repayment from credit agency query = points

A negative remark in the result of the credit agency query is a nogo criteria

Probability of repayment from credit agency query < 60 is a nogo criteria

> 3 warnings in the credit agency response are a nogo criteria

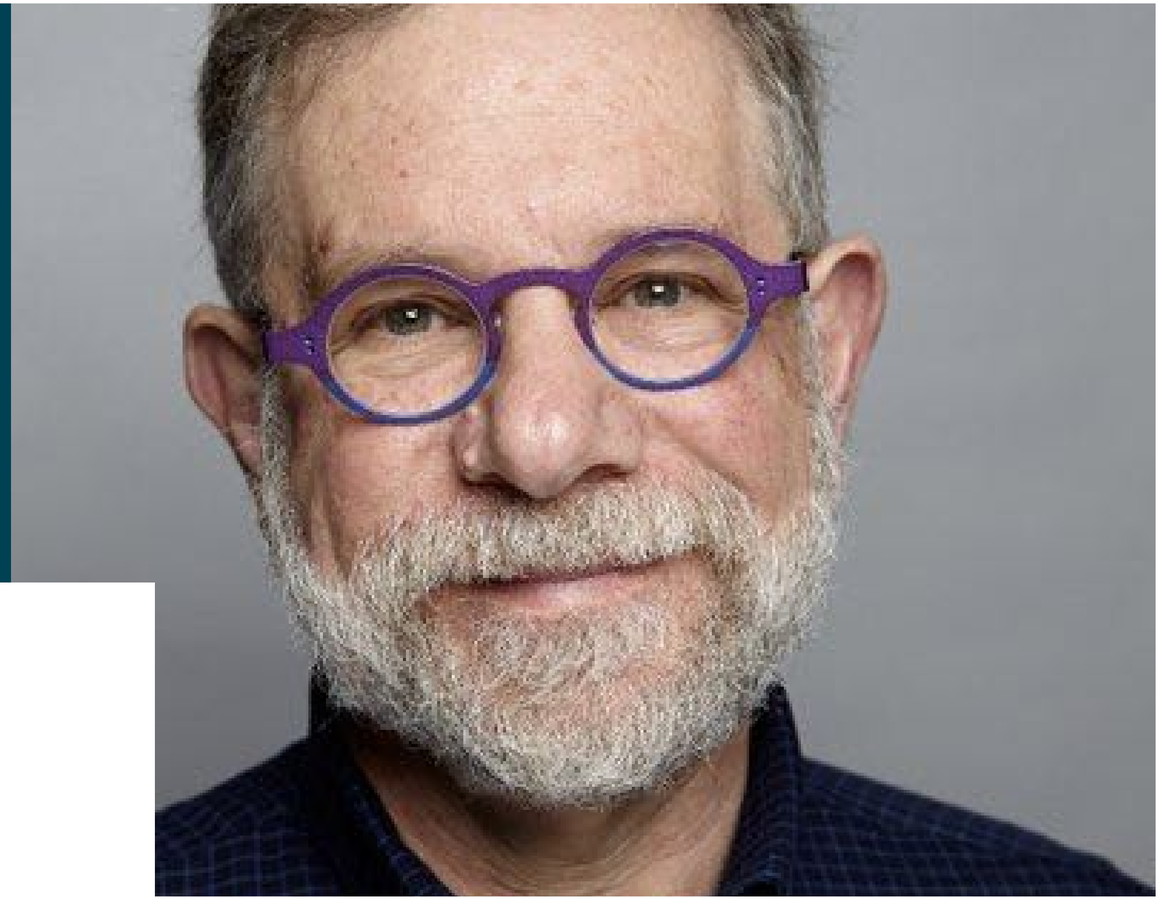
Scoring Result

One nogo-criteria present: red (independent of amount of points)

< 120 points: red

>= 120 points: green

„the key to incremental architecture is to build on a framework that can accommodate change… that framework is the domain…. By modeling the domain, you can more easily handle changes to the domain“



Allen Holub

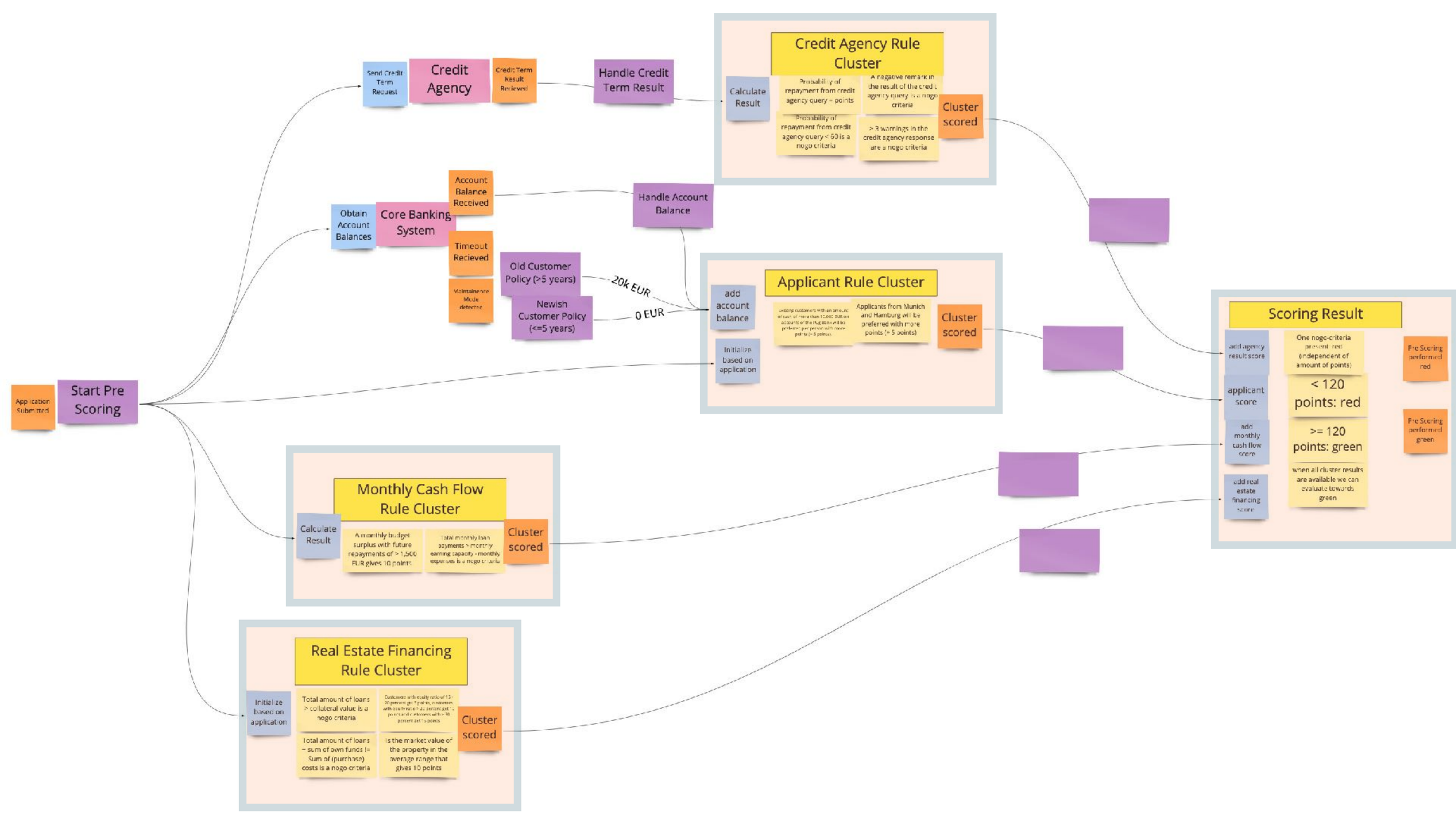
https://holub.com

These groups are great candidates for aggregates!

Mind the difference between this approach and the classic object oriented analysis and design (OOAD)

OOAD usually starts with nouns as class candidates, then goes to attributes and then verbs (methods)

DDD starts with behavior (verbs) and looks then on structures


Application Submitted
Start Pre Scoring
Send Credit Term Request
Credit Agency
Credit Term Result Recieved
Handle Credit Term Result
Credit Agency Rule Cluster
Calculate Result
Probability of repayment from credit agency query = points
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Probability of repayment from credit agency query < 60 is a nogo criteria
> 3 warnings in the credit agency response are a nogo criteria
Cluster scored
Obtain Account Balances
Core Banking System
Account Balance Received
Timeout Recieved
Maintainence Mode detected
Handle Account Balance
Old Customer Policy (>5 years)
Newish Customer Policy (<=5 years)
20k EUR
0 EUR
add account balance
Initialize based on application
Applicant Rule Cluster
existing customers with an amount of over 12,000 EUR on accounts of the highest tax preference per person with more points (+ 5 points)
Applicants from Munich and Hamburg will be preferred with more points (+ 5 points)
Cluster scored
Monthly Cash Flow Rule Cluster
Calculate Result
A monthly budget surplus with future repayments of > 1,500 EUR gives 10 points
Total monthly loan payments > monthly earning capacity - monthly expenses is a nogo criteria
Cluster scored
Real Estate Financing Rule Cluster
Initialize based on application
Total amount of loans > collateral value is a nogo criteria
Customers with equity ratio of 15 - 20 percent get 7 points, customers with equity ratio > 21 percent get 5 points and customers with > 30 percent get 3 points
Total amount of loans - sum of own funds (= Sum of (purchase) costs is a nogo criteria
Is the market value of the property in the average range that gives 10 points
Cluster scored
Scoring Result
add agency result score
One nogo-criteria prevent red (independent of amount of points)
Pre Scoring performed red
applicant score
< 120 points: red
add monthly cash flow score
>= 120 points: green
Pre Scoring performed green
add real estate financing score
when all cluster results are available we can evaluate towards green

Thanks!

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Michael Plöd

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