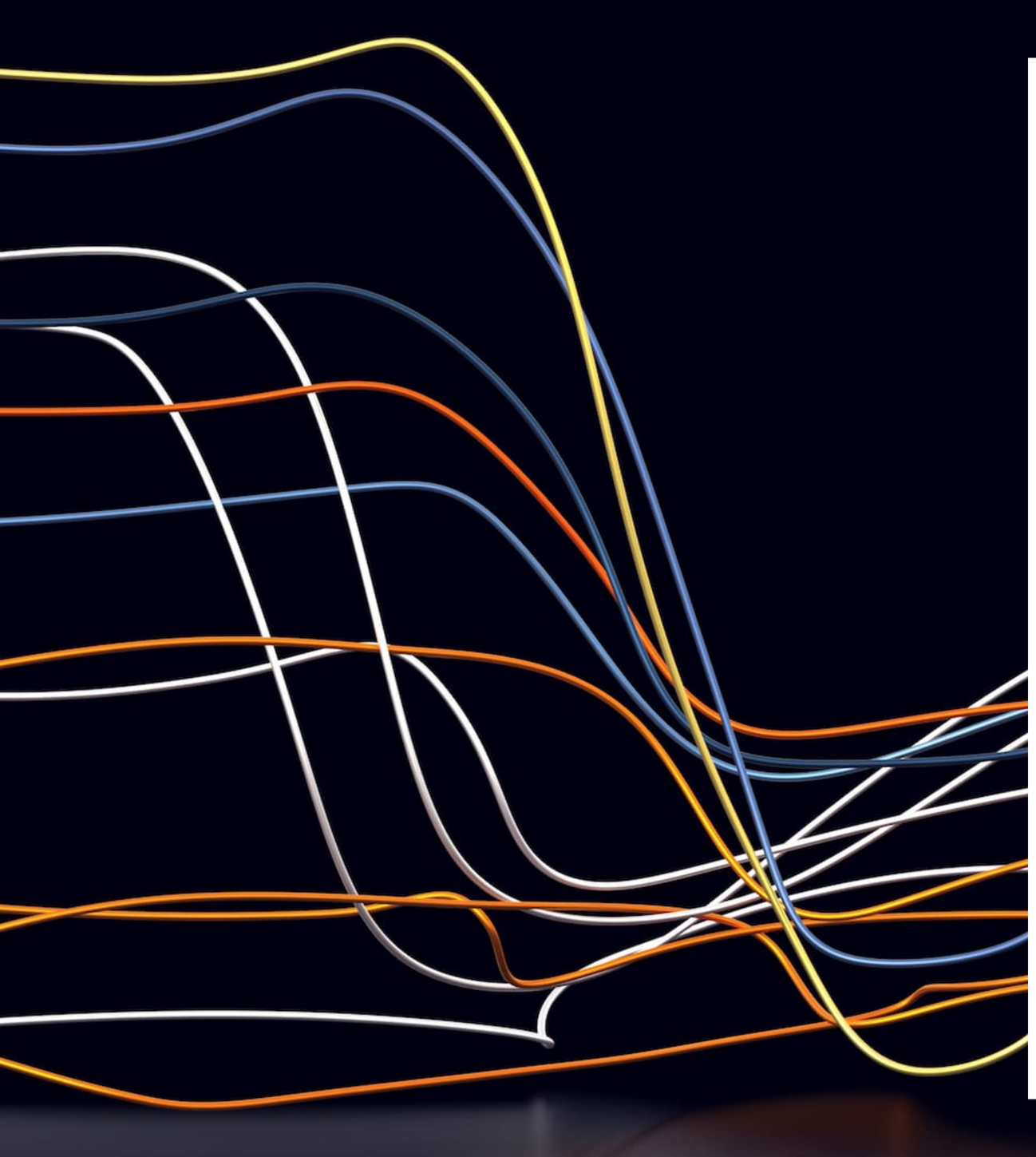


Cohesion

in Modeling and Design

INNOQ

MICHAEL PLÖD

FELLOW

Michael Plöd

Fellow at INNOQ

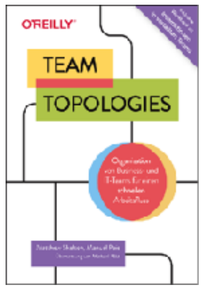
Socials: **@bitboss** (@mastodon.social / .bsky.social)

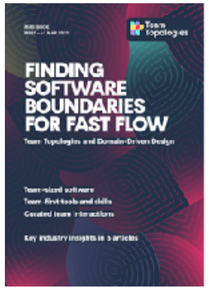
LinkedIn: https://www.linkedin.com/in/michael-ploed/

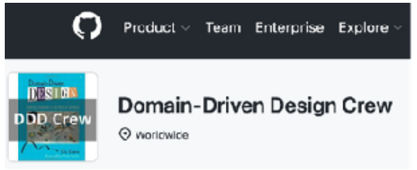
Current consulting topics:

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

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







Modularity

Let's revisit some basics first

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

Modularity is a specialization of Separation Of Concerns

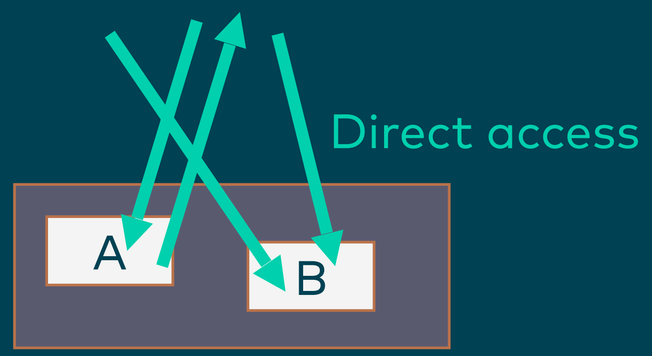
Information Hiding

Protection of data and internal logic of a component against access from the outside (= encapsulation)

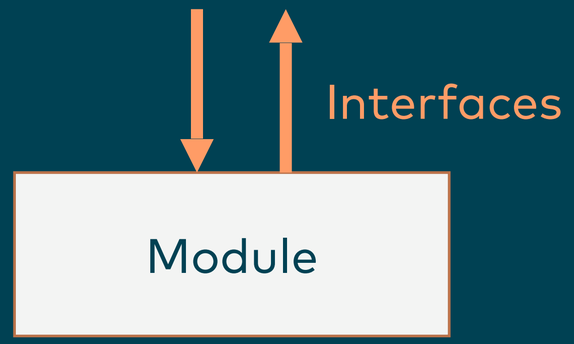
Use of modules via interfaces

In programming languages/UML realized e.g., by:

- public (+)
- private (-)
- protected (#)
- package (~)



Open Module



Encapsulated building block

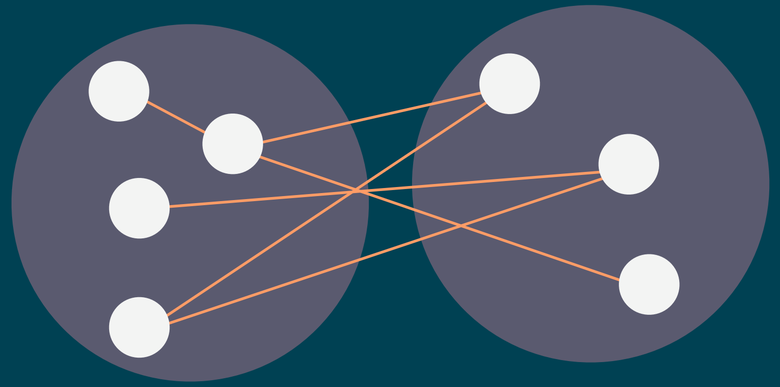
Loose coupling

Low dependency between building blocks

The goal is low / low dependencies between building blocks

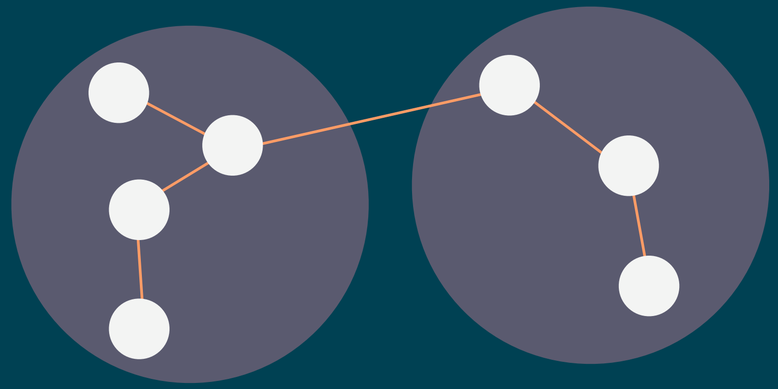
Bad: High coupling

- Low maintainability / changeability / extensibility / comprehensibility
- High vulnerability to error spreading (something completely different gets broken after changes)



High coupling

Loose coupling



High cohesion

Defines how closely a module is related in terms of content

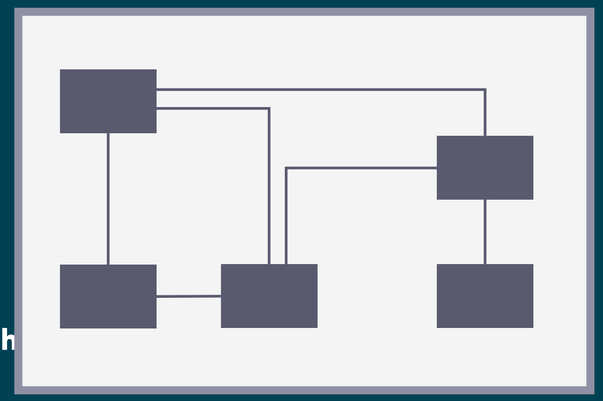
Building block of high cohesion completes tasks that belong together in terms of content

Building block with low cohesion done

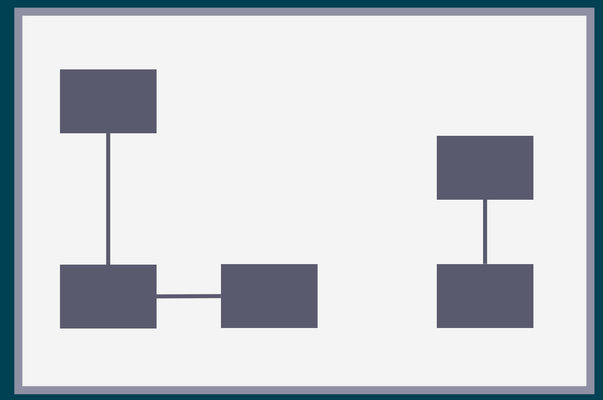
- × No related tasks
- × Too many tasks

Explicit criteria for "Cohesion" necessary!

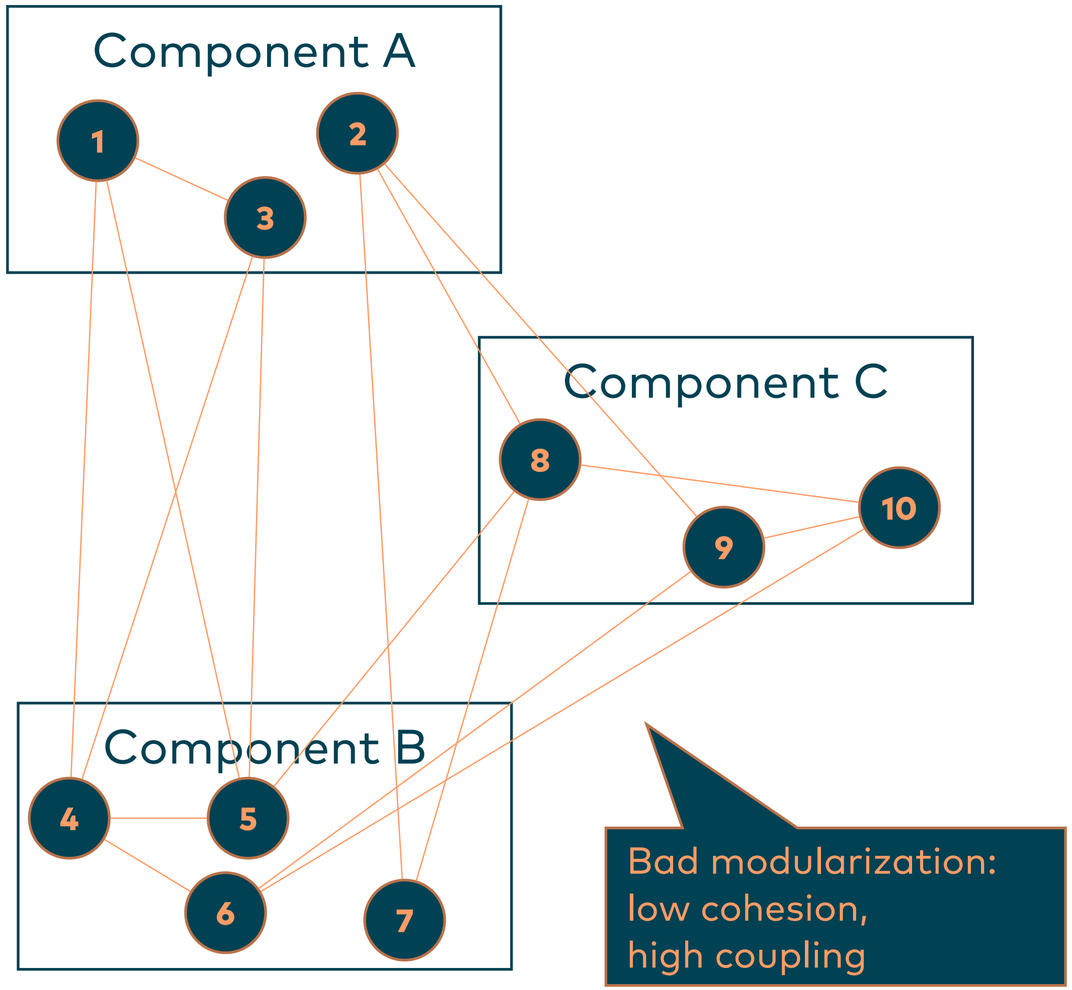
High

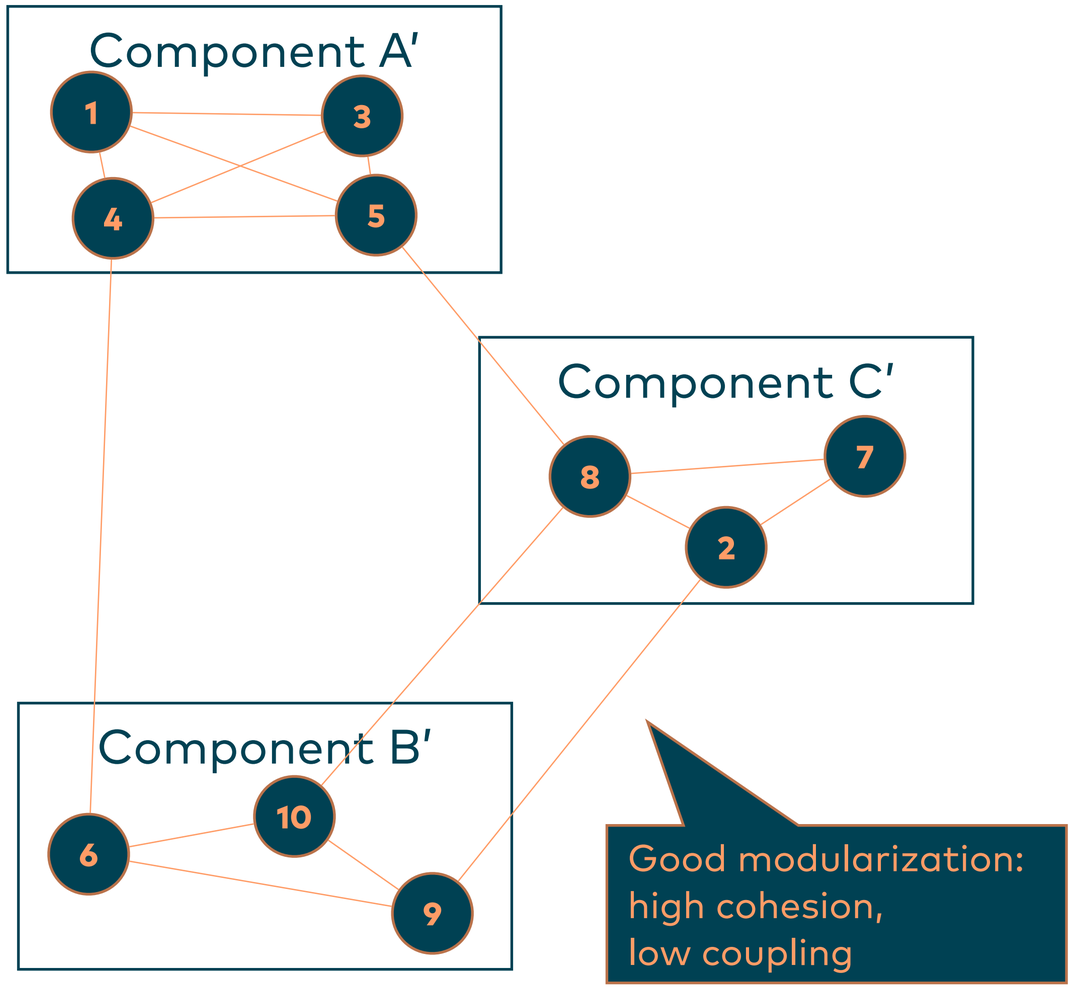


Low cohesion



Modularization, coupling & cohesion





Modularity

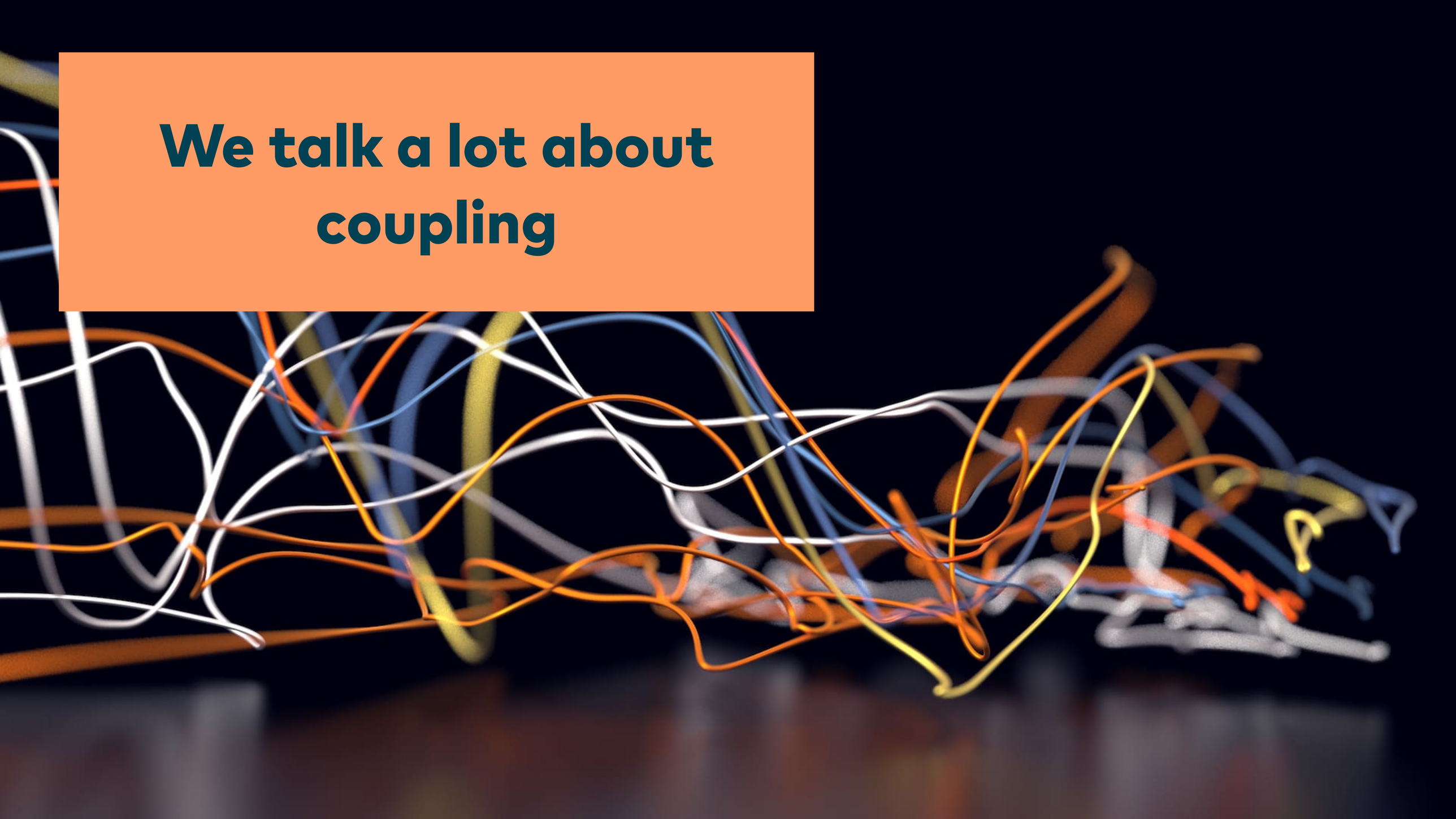
is a specialization of SoC and about

information hiding

loose coupling

high cohesion

We talk a lot about coupling

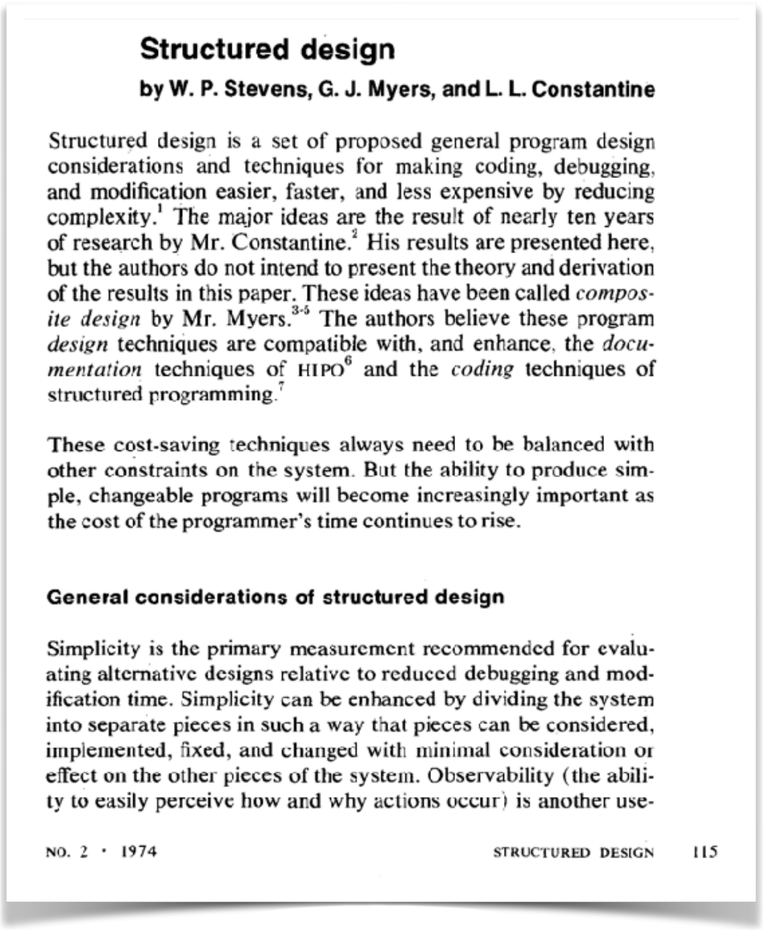


„Coupling is reduced when the relationships among elements notin the same module are minimized. There are two ways of achieving this

minimizing the relationships among modules

and

maximizing relationships among elements in the same module“



Structured design

by W. P. Stevens, G. J. Myers, and L. L. Constantine

Structured design is a set of proposed general program design considerations and techniques for making coding, debugging, and modification easier, faster, and less expensive by reducing complexity.[1] The major ideas are the result of nearly ten years of research by Mr. Constantine.[2] His results are presented here, but the authors do not intend to present the theory and derivation of the results in this paper. These ideas have been called *composite design* by Mr. Myers.[3-5] The authors believe these program *design* techniques are compatible with, and enhance, the *documentation* techniques of HIPO[6] and the *coding* techniques of structured programming.[7]

These cost-saving techniques always need to be balanced with other constraints on the system. But the ability to produce simple, changeable programs will become increasingly important as the cost of the programmer's time continues to rise.

General considerations of structured design

Simplicity is the primary measurement recommended for evaluating alternative designs relative to reduced debugging and modification time. Simplicity can be enhanced by dividing the system into separate pieces in such a way that pieces can be considered, implemented, fixed, and changed with minimal consideration or effect on the other pieces of the system. Observability (the ability to easily perceive how and why actions occur) is another use-

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

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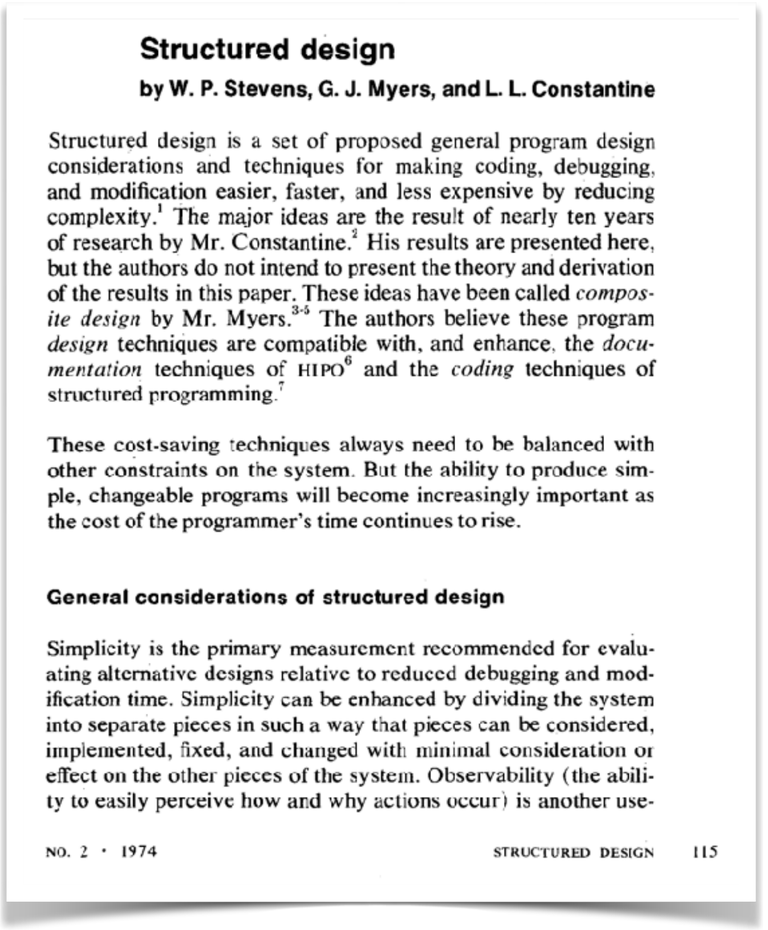

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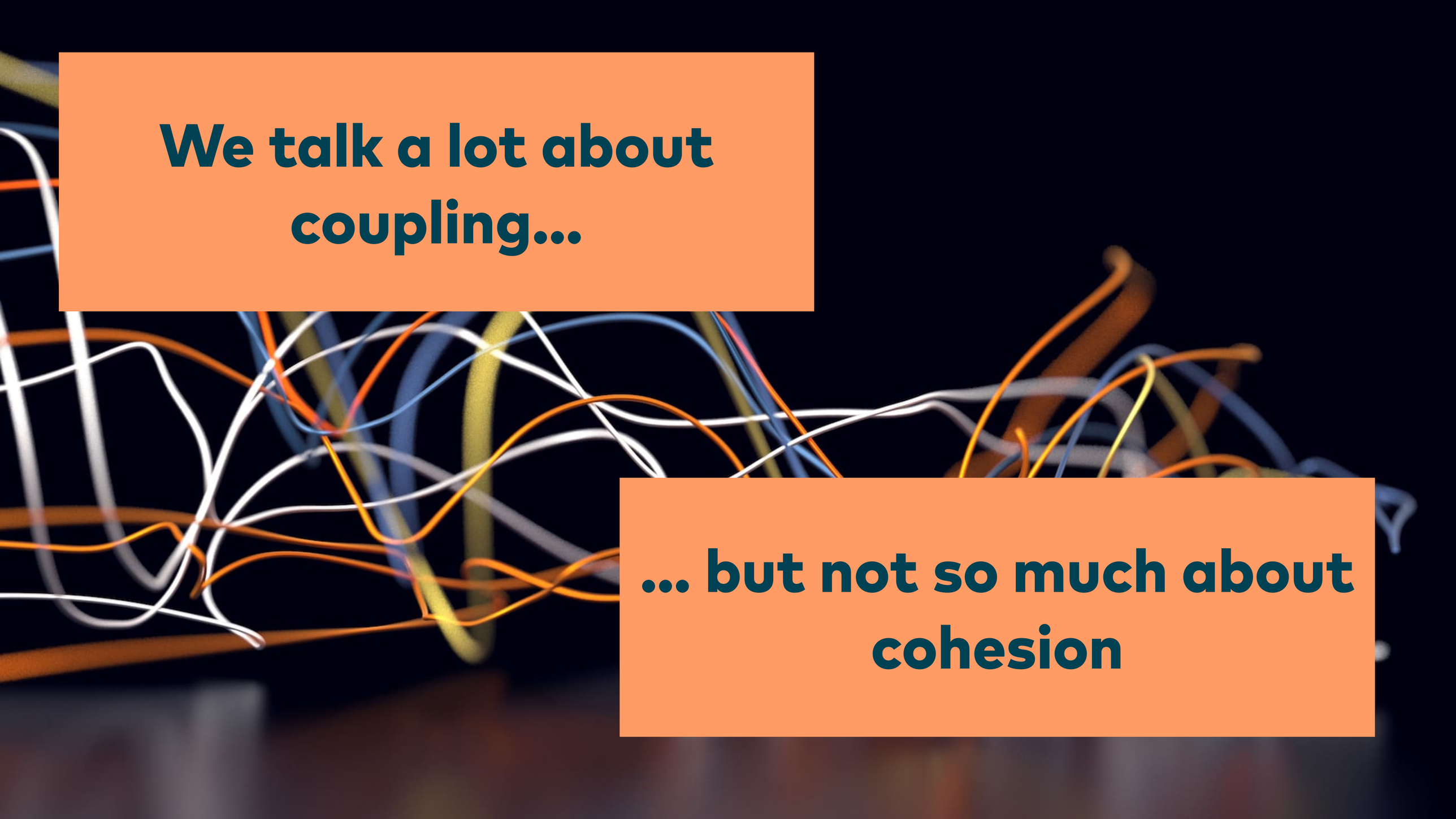
We talk a lot about coupling...
... but not so much about cohesion

COHERERE

Latin verb

cohereo,
coheres,
coherere,
cohesi,
cohesum

- to stick/cling/hold/grow together
- to adhere
- to embrace
- to touch
- to adjoin
- to be in contact

Cohesion

Is not just some IT thing

Cohesion

Chemistry

Force of attraction between molecules of the same substance. This is related to intermolecular forces, such as hydrogen bonds in water or van der Waals forces in non-polar molecules.

Sociocultural Anthropology

Strength of cultural, social, or kinship ties that bind a community or group together. Social cohesion in traditional societies often stems from shared customs, rituals, and kinship structures that maintain group identity and solidarity.

Soil Mechanics

Attraction between particles within a soil, typically due to moisture or the presence of clays, which can hold the particles together. Cohesion helps determine the stability of soils and their ability to form aggregates, affecting erosion resistance and soil strength.

Sociology and Psychology

Degree of connection and unity within a group, often measured by how well members stick together, cooperate, or share a common identity. Social cohesion refers to the strength of relationships and the sense of solidarity among members of a community.

Linguistics

Ways in which different parts of a text or discourse are connected to create meaning. It includes grammatical and lexical linking, such as pronouns, conjunctions, and repetitions, which help to unify a text.

Civil Engineering

Ability of construction materials, like concrete or soil, to hold together. The cohesive forces in these materials contribute to their overall structural stability.

Common Terminology

- Force of attraction
- Ability to form aggregates
- Degree of connection
- Ability to hold together
- Contribution to structural stability
- Strength of ties
- Connection to create a meaning

Which of these perspectives are relevant for cohesion in IT?

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ALL

Software Architecture:

Structural Cohesion

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Work in organization:

Social Cohesion

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In terms of cohesion we should broaden our perspective:

The mental model that influences the perspective on attraction of concepts and models is heavily driven by the organization which embodies the social ties and customs of the people talking to each other during the design and modeling work.

Cohesion is only of a limited technical nature but let's start with Cohesion in Software Architecture

Cohesion

in

Software Architecture

A few quotes and definitions from renowned resources

In computer programming, cohesion refers to the degree to which the elements inside a module belong together.

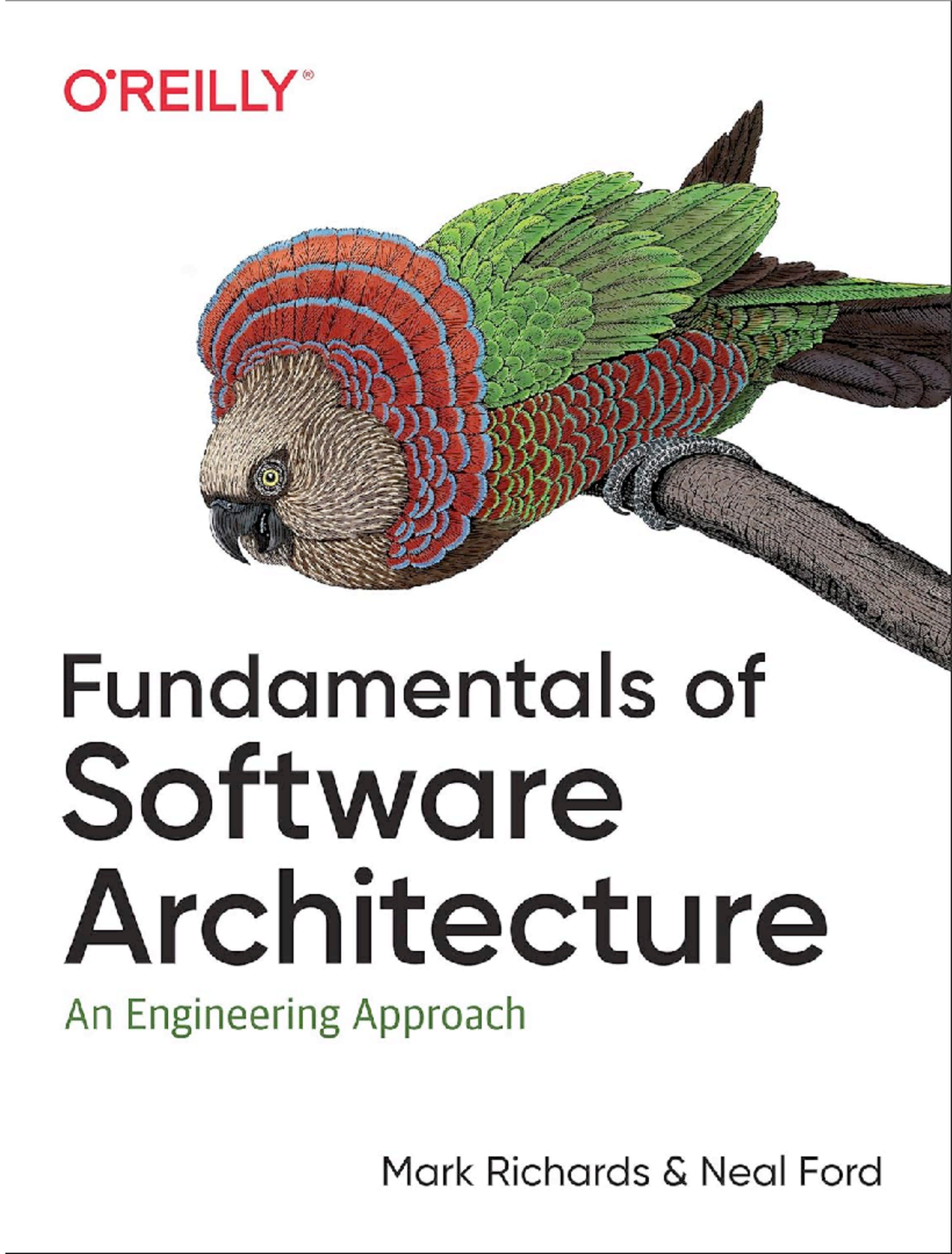
In one sense, it is a measure of the strength of relationship between the methods and data of a class and some unifying purpose or concept served by that class. In another sense, it is a measure of the strength of relationship between the class's methods and data.

WIKIPEDIA

https://en.wikipedia.org/wiki/Cohesion_(computer_science)

Cohesion refers to what extent the parts of a module should be contained within the same module.

In other words, it is a measure of how related the parts are to one another.



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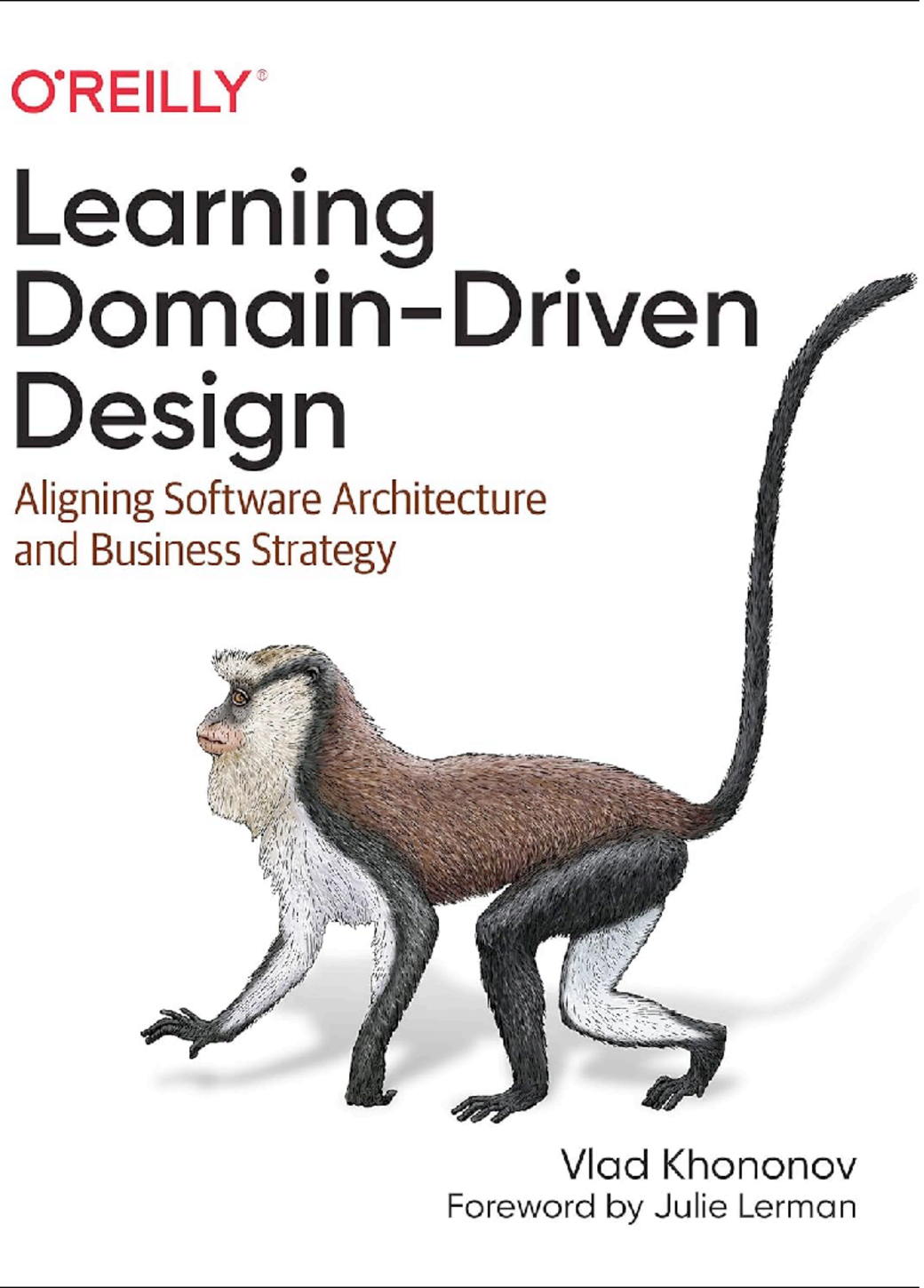


Cohesion is about grouping related business capabilities together in a single module or Bounded Context, reducing unnecessary complexity and dependencies.

7 Levels of SMC Cohesion

SMC stands for the authors of the Structured Design paper: Stevens, Myers, Constantine

7 Levels of SMC Cohesion

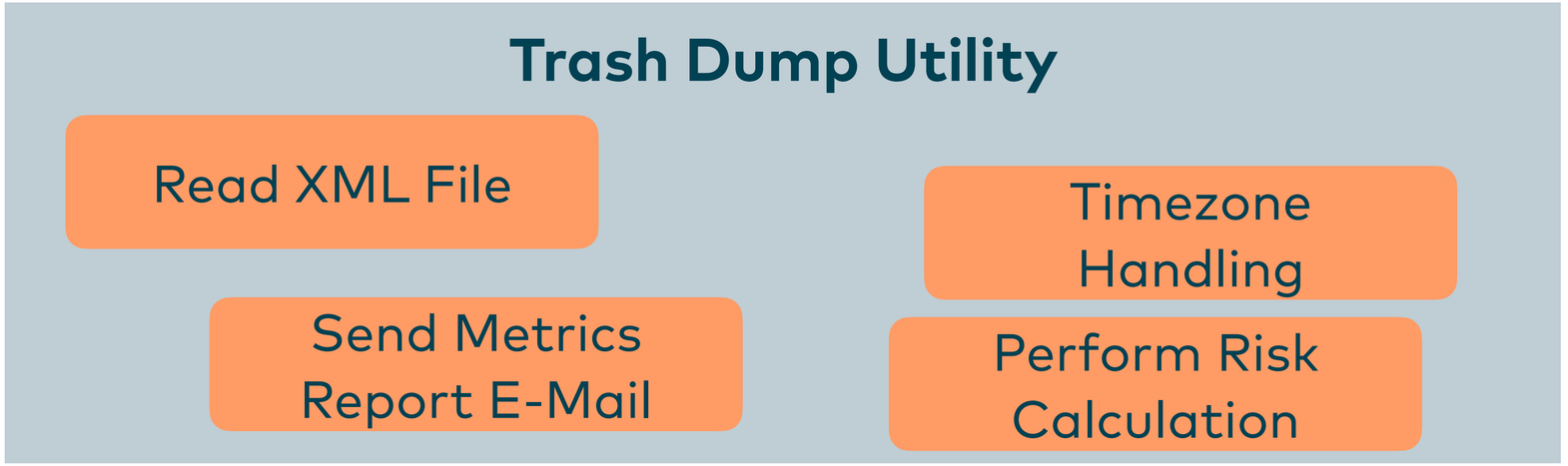
Functional Cohesion	The elements of the module are grouped because they all contribute to performing a single, well-defined task. Every part of the module is essential to its overall functionality.
Sequential Cohesion	The elements of the module are grouped because the output from one element serves as input to another. This type of cohesion exists when functions are interdependent in a linear chain.
Communicational Cohesion	The elements of the module are grouped because they operate on the same data or contribute to the same data structure.
Procedural Cohesion*	The elements of the module are grouped because they always follow a specific sequence of execution, even if they are not closely related by purpose.
Temporal Cohesion	The elements of the module are grouped because they are executed at the same time, such as initialization or cleanup operations.
Logical Cohesion	The elements of the module are related only by their category or type. A module might contain different functions that are logically related but perform different actions.
Coincidential Cohesion	The elements of the module have no meaningful relationship with each other. They are grouped together arbitrarily, often as a result of being developed at the same time.

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.
* was added later

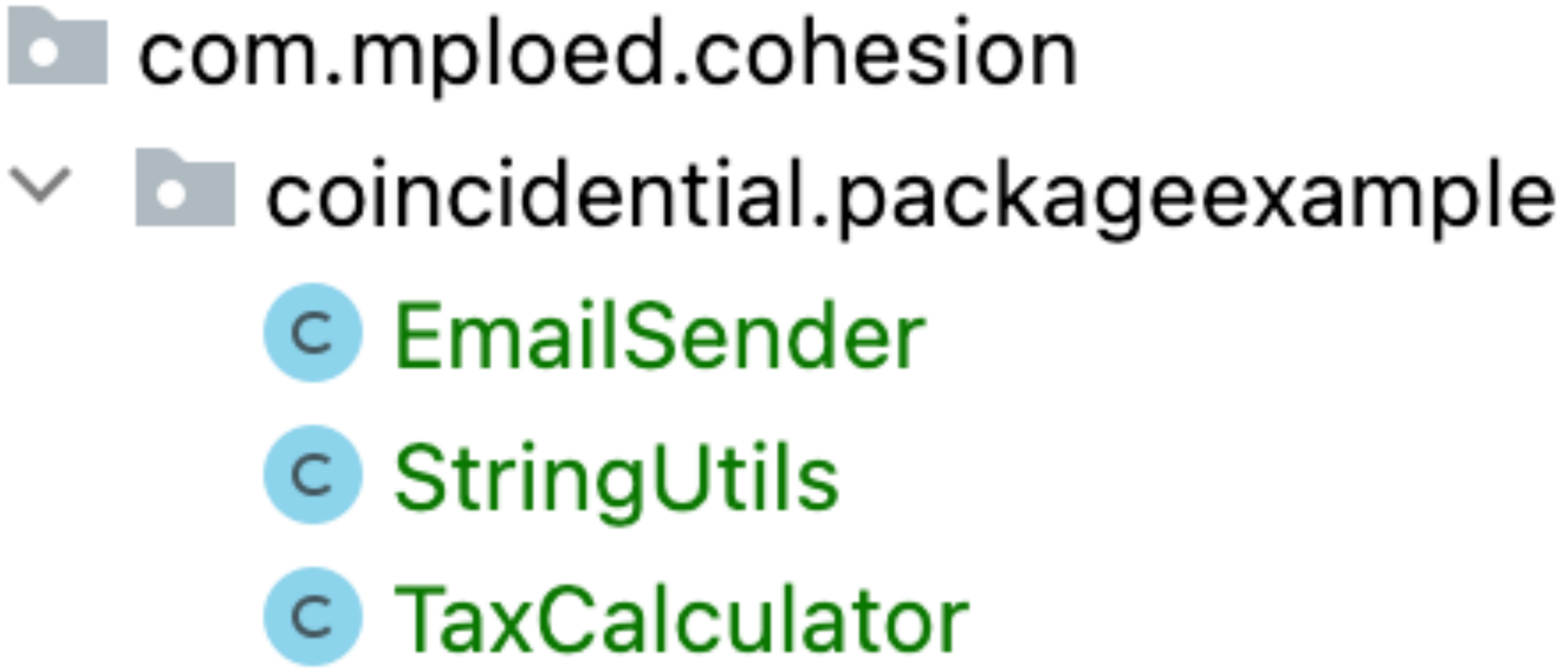
Level 1 of 7: Coincidential Cohesion

The elements of the module have no meaningful relationship with each other. They are grouped together arbitrarily, often as a result of being developed at the same time.

Example: A utility module that contains a collection of unrelated functions, like formatting text, calculating a sum, and reading a file.



Level 1 of 7: Coincidential Cohesion

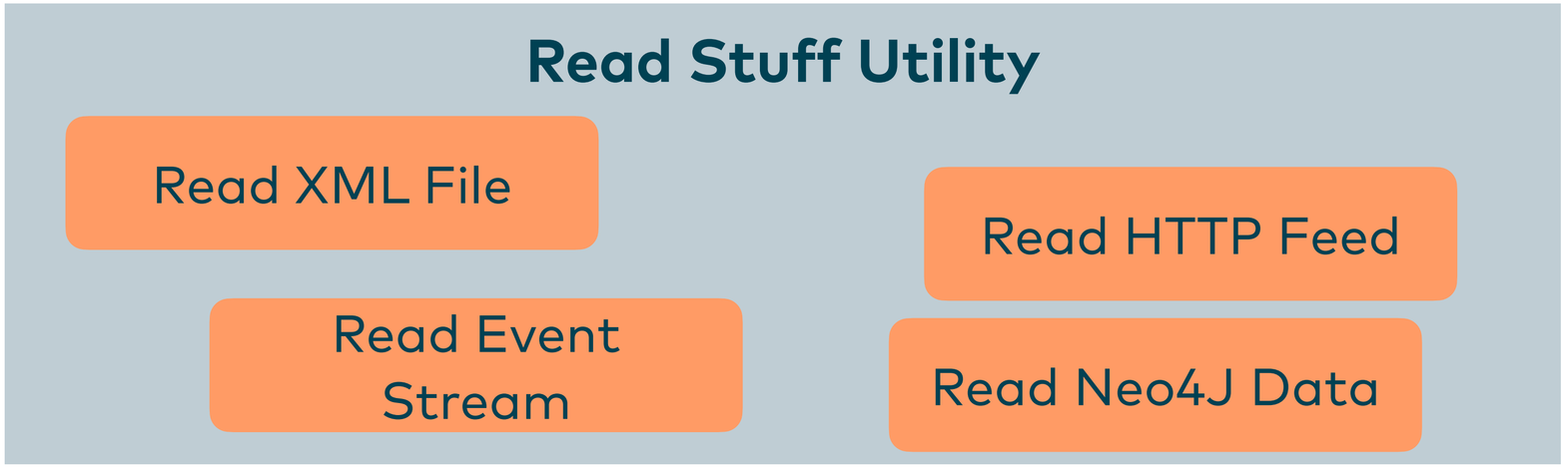


https://github.com/mploed/cohesion-examples

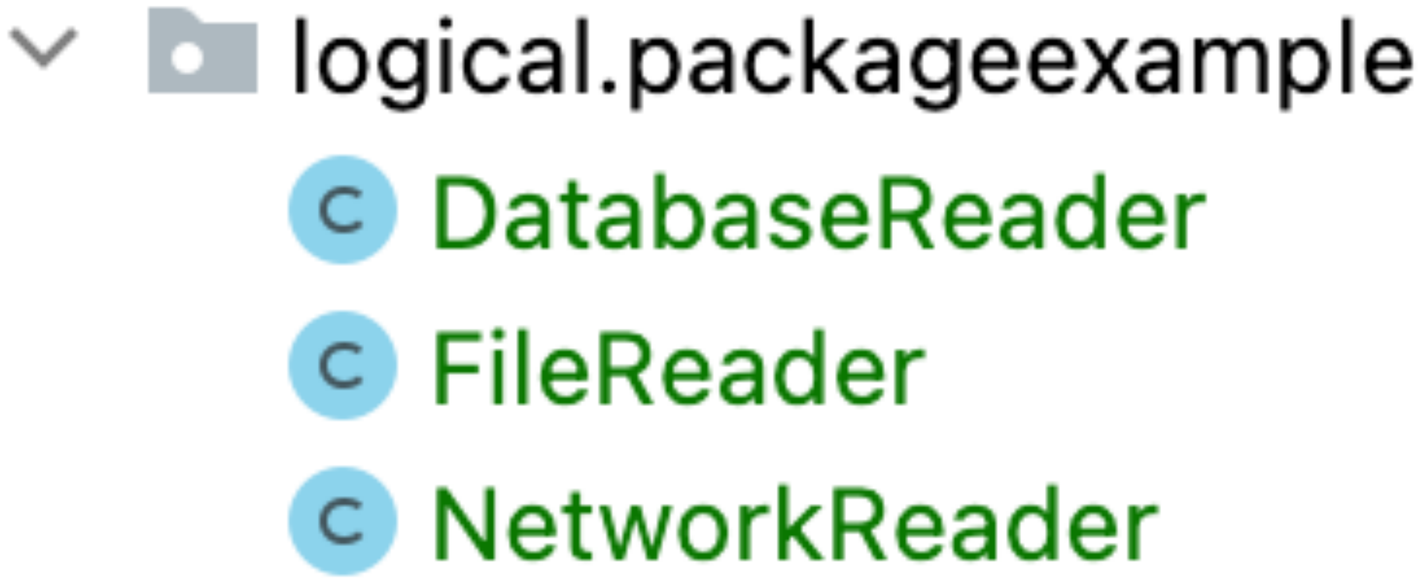
Level 2 of 7: Logical Cohesion

The elements of the module are related only by their category or type. A module might contain different functions that are logically related but perform different actions.

Example: A module containing multiple I/O operations such as reading from a file, reading from a database, and reading from a network, reading from a message broker, all grouped because they are “read” operations.



Level 2 of 7: Logical Cohesion

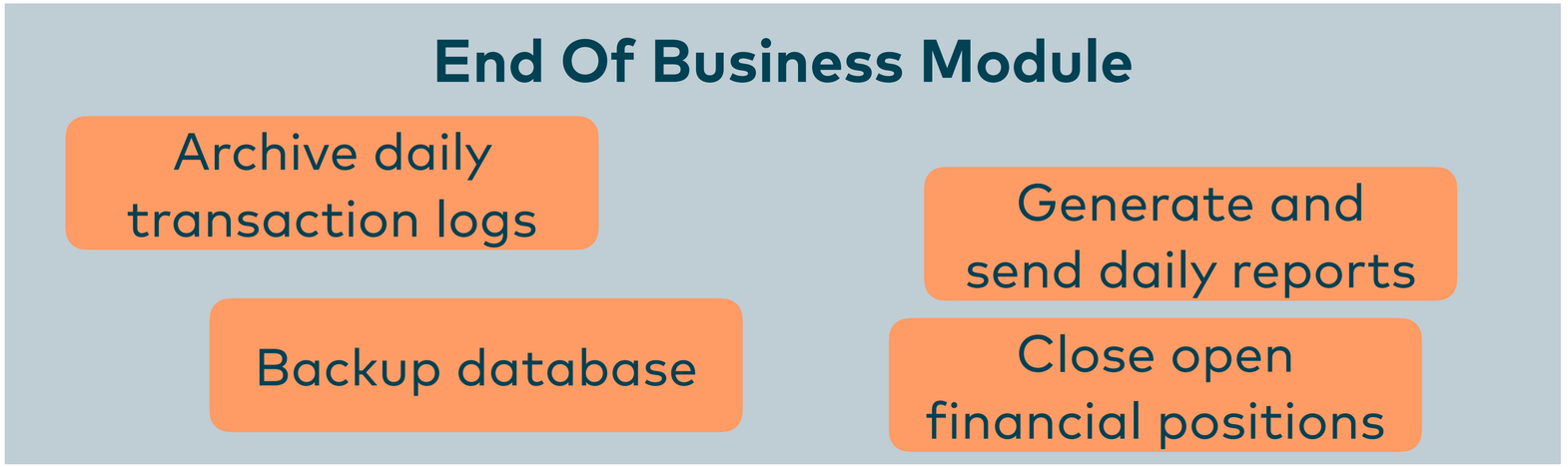


https://github.com/mploed/cohesion-examples

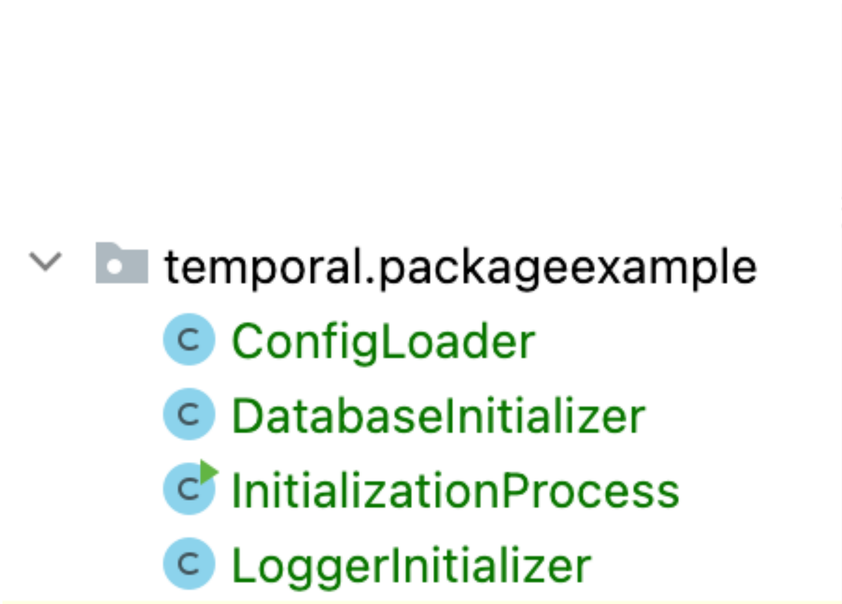
Level 3 of 7: Temporal Cohesion

The elements of the module are grouped because they are executed at the same time but actually they are unrelated to each other. Characteristics of Logical Cohesion + relationship in time

Example: Operations are performed at the end of the business day, though they serve different purposes (logging, reporting, and data backup).



Level 3 of 7: Temporal Cohesion



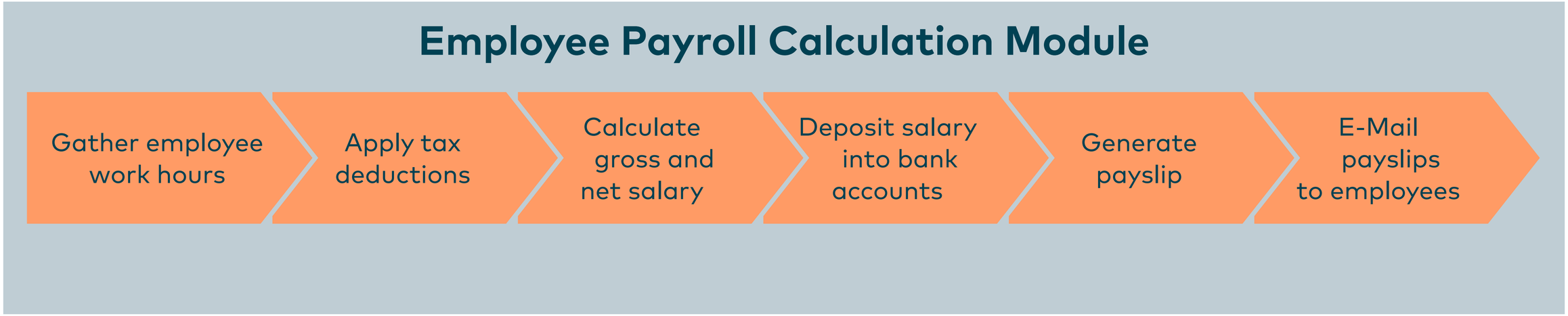

```java
new *
public class InitializationProcess {
    new *
    public static void main(String[] args) {
        ExecutorService executor = Executors.newFixedThreadPool( nThreads: 3);

        executor.submit(ConfigLoader::loadConfigs);
        executor.submit(LoggerInitializer::initializeLogger);
        executor.submit(DatabaseInitializer::initializeDatabase);

        executor.shutdown();

    }
}
```

https://github.com/mploed/cohesion-examples

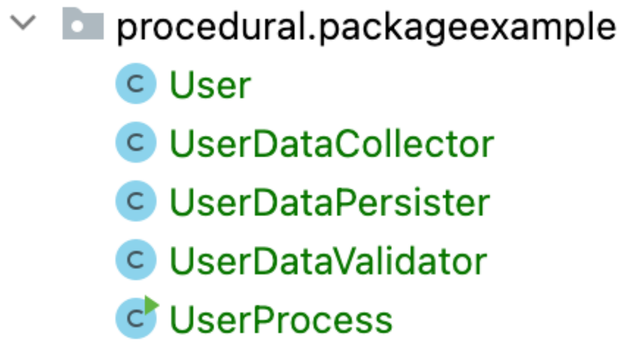
Level 4 of 7: Procedural Cohesion

The elements of the module are grouped because they always follow a specific sequence of execution, even if they are not closely related by purpose.

Example: Steps must be performed in a specific order during payroll processing, but they cover different concerns such as financial calculations, tax management, and payment handling.



Level 4 of 7: Procedural Cohesion



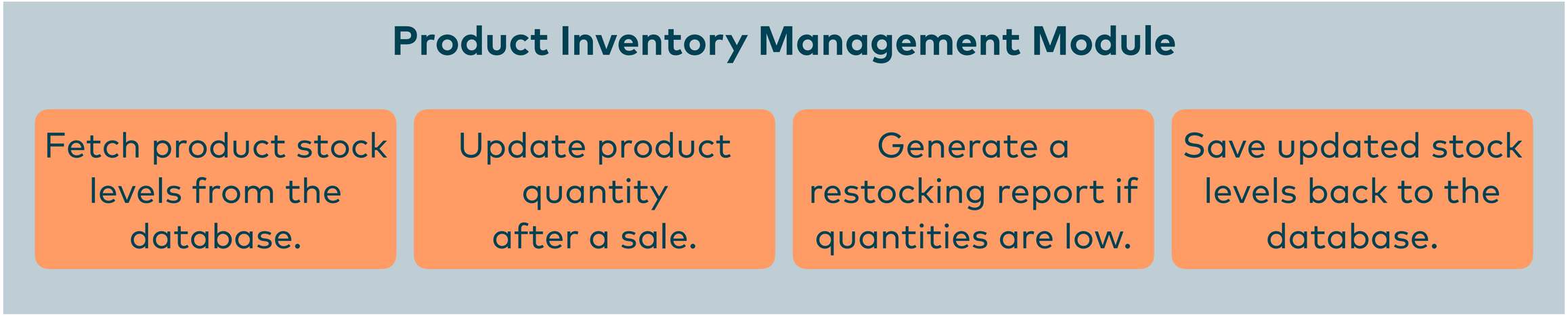

```java
public class UserProcess {
    new *
    public static void main(String[] args) {
        User user = new UserDataCollector().collectUserData();
        if(EmailValidator.emailValid(user.getMail())) {
            EmailSender.sendEmail(user.getMail(), message: "Hello world!");
        } else {
            System.out.println("User email is not valid");
        }
    }
}
```

https://github.com/mploed/cohesion-examples

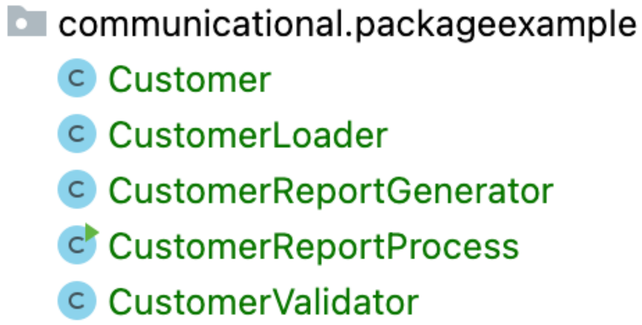
Level 5 of 7: Communicational Cohesion

The elements of the module are grouped because they operate on the same data or contribute to the same data structure. Stronger bond than lower levels because of reference to the same data.

Example: All operations share the same inventory data, performing various tasks like updating, reporting, and saving the stock levels, but working on the same product inventory.



Level 5 of 7: Communicational Cohesion



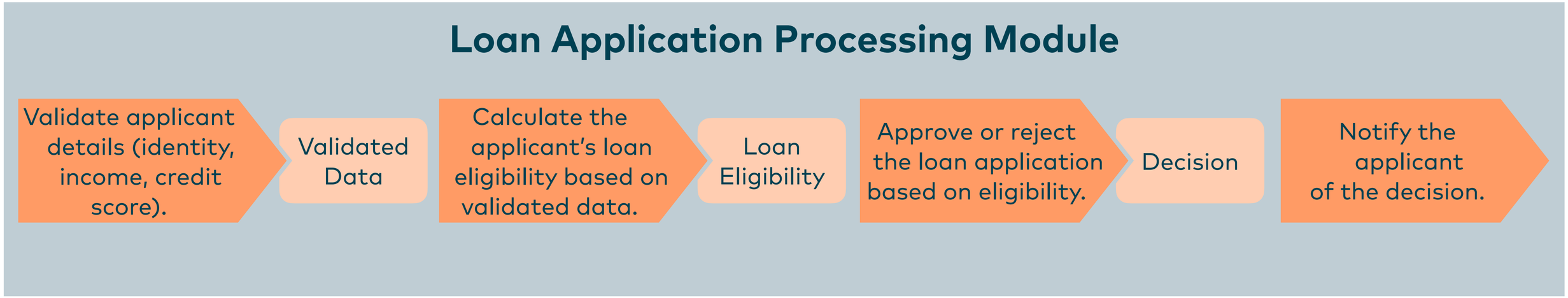

```java
public class CustomerReportProcess {
    new *
    public static void main(String[] args) {
        Customer customer = CustomerLoader.loadCustomer( id: 1);

        if(CustomerValidator.validateCustomer(customer)) {
            CustomerReportGenerator.generateReport(customer);
        }
    }
}
```

https://github.com/mploed/cohesion-examples

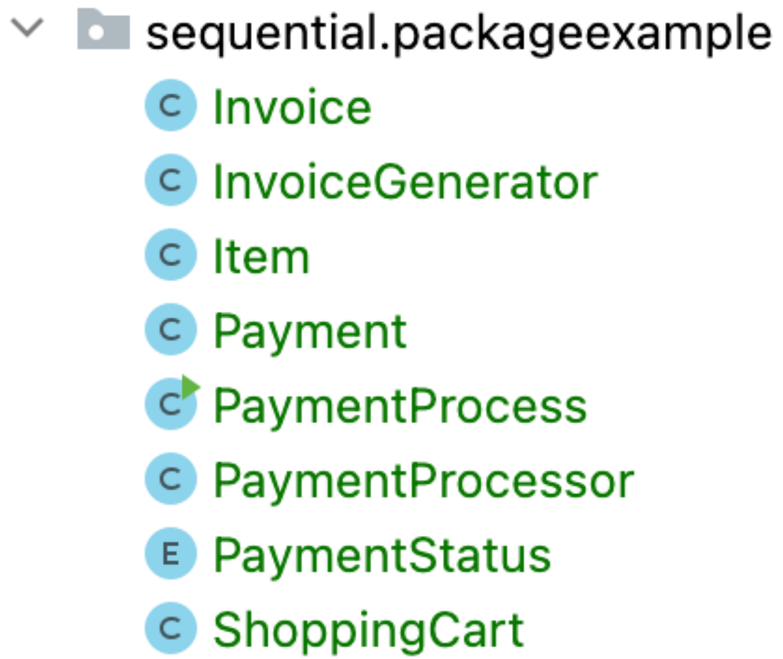
Level 6 of 7: Sequential Cohesion

The elements of the module are grouped because the output from one element serves as input to another. This type of cohesion exists when functions are interdependent in a linear chain.

Example: The loan eligibility calculation requires validated applicant details, and the approval decision is based on the eligibility result. The final step notifies the applicant of the decision, creating a clear sequential flow.



Level 6 of 7: Sequential Cohesion



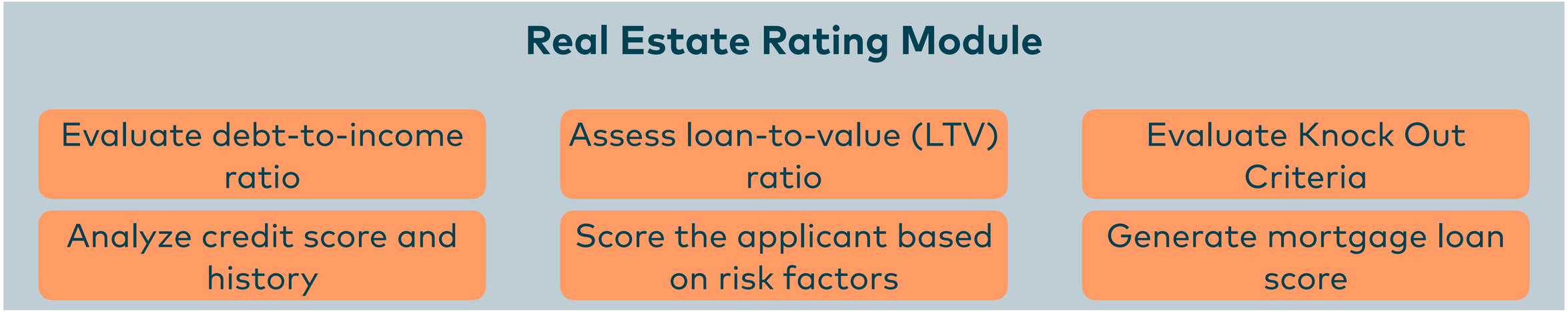

```java
public class PaymentProcess {
    new *
    public static void main(String[] args) {
        ShoppingCart shoppingCart = new ShoppingCart();
        shoppingCart.addItem(new Item( name: "Item 1",  price: 19.99));
        shoppingCart.addItem(new Item( name: "Item 2",  price: 29.99));
        shoppingCart.addItem(new Item( name: "Item 3",  price: 39.99));

        Payment payment = PaymentProcessor.processPayment(shoppingCart);

        if(payment.getStatus() == PaymentStatus.PAID) {
            Invoice invoice = InvoiceGenerator.generateInvoice(payment);
            System.out.println("Invoice generated: " + invoice);
        } else {
            System.out.println("Payment failed");
        }


    }
}
```

https://github.com/mploed/cohesion-examples

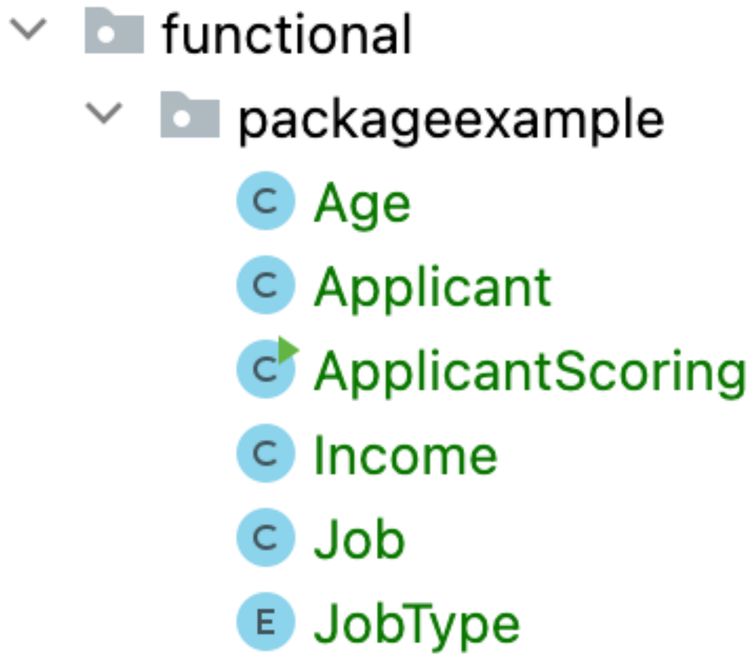
Level 7 of 7: Functional Cohesion

The elements of the module are grouped because they all contribute to performing a single, well-defined task. Every part of the module is essential to its overall functionality.

Example: All operations are centered on the single task of scoring a mortgage loan applicant. Every operation contributes directly to completing the goal of assessing the applicant's eligibility and risk for a mortgage loan.



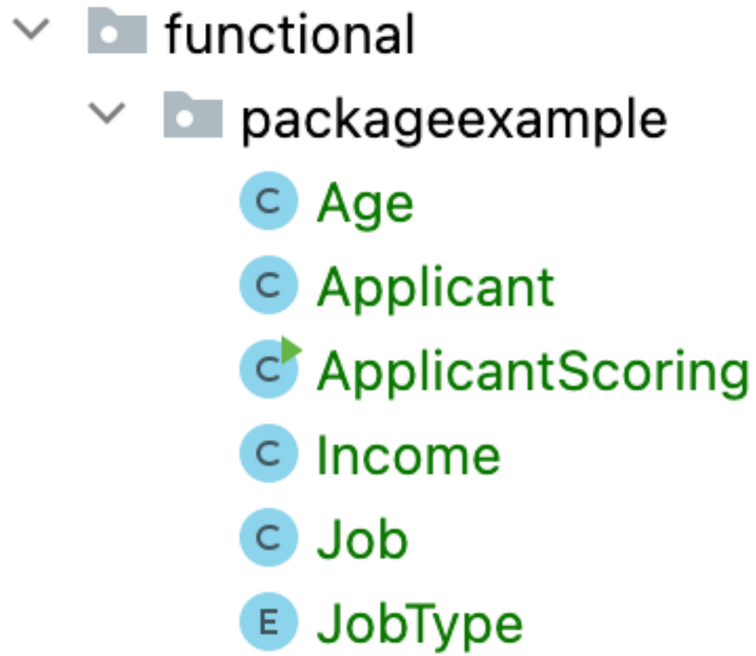
Level 7 of 7: Functional Cohesion




```java
public class ApplicantScoring {
    new *
    public static void main(String[] args) {
        Job job = new Job(JobType.JUNIOR_DEVELOPER);
        Income income = new Income(3000);
        Age age = new Age(32);

        Applicant applicant = new Applicant(age, income, job);

        int creditScore = applicant.calculateCreditScore();

        System.out.println("Credit score: " + creditScore);
    }
}
```

https://github.com/mploed/cohesion-examples

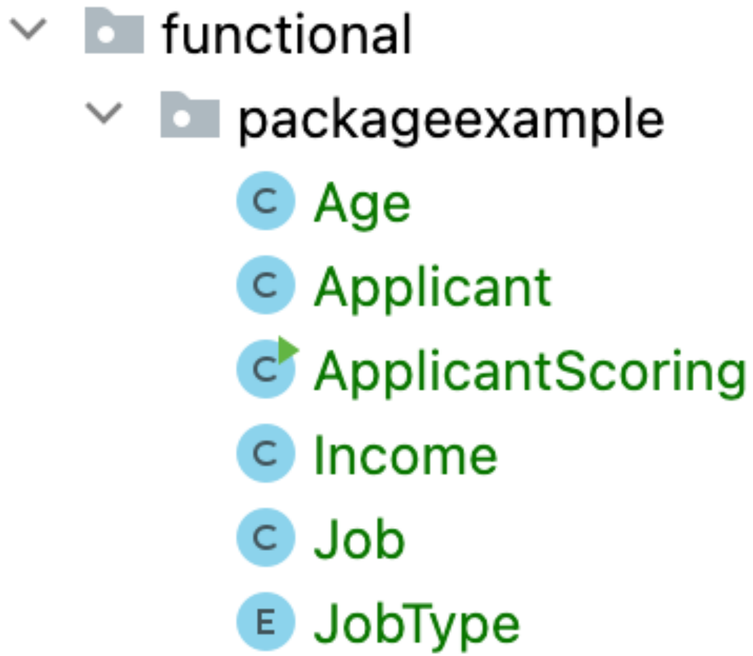
Level 7 of 7: Functional Cohesion continued




```java
public class Applicant {
    2 usages
    private Age age;
    2 usages
    private Income income;
    2 usages
    private Job job;

    1 usage  new *
    public Applicant(Age age, Income income, Job job) {...}

    1 usage  new *
    public int calculateCreditScore() {
        int score = 0;
        score += age.score();
        score += job.score();
        score += income.score();
        return score;
    }
}
```

https://github.com/mploed/cohesion-examples

Level 7 of 7: Functional Cohesion continued




```java
public class Age {
    6 usages
    private int age;

    1 usage  new *
    public Age(int age) {
        this.age = age;
    }

    1 usage  new *
    public int score() {
        if (age < 18) {
            return 0;
        } else if (age < 25) {
            return 25;
        } else if (age < 45) {
            return 35;
        } else if (age < 55) {
            return 30;
        } else if (age < 65) {
            return 0;
        } else {
            return 0;
        }
    }
}
```

https://github.com/mploed/cohesion-examples

Metrics

for

Cohesion

Metrics for measuring cohesion

Lack of Cohesion in Methods (LCOM 1-4)	
Tight Class Cohesion (TCC)	Information Flow-based Cohesion (ICH)
Loose Class Cohesion (LCC)	Class Cohesion (CC)
Cohesion Among Methods of Class (CAMC)	Degree of Cohesion (DC)

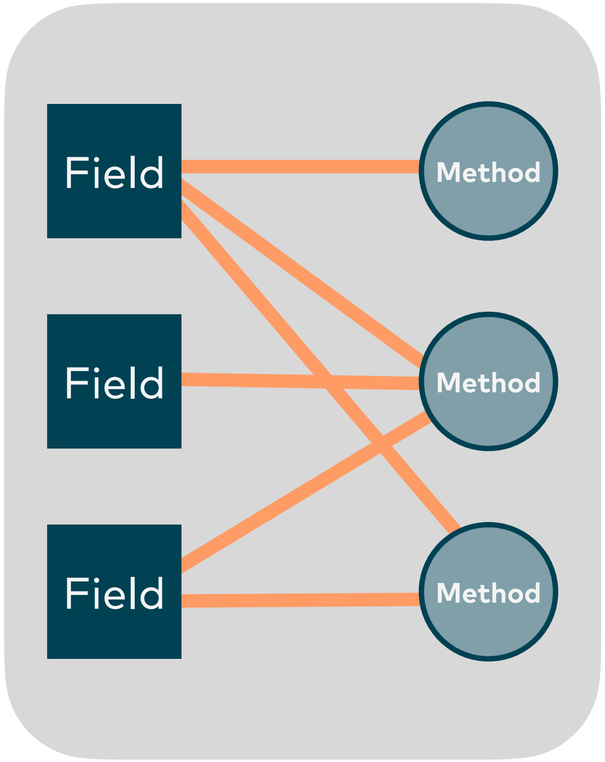
Chidamber & Kemerer LCOM Family

LCOM measures how disjointed the methods of a class are. A high LCOM value indicates that methods are not working on the same data, suggesting low cohesion.

Variants: There are different versions of LCOM, such as LCOM1, LCOM2, LCOM3, etc., with slight variations in how they are calculated.

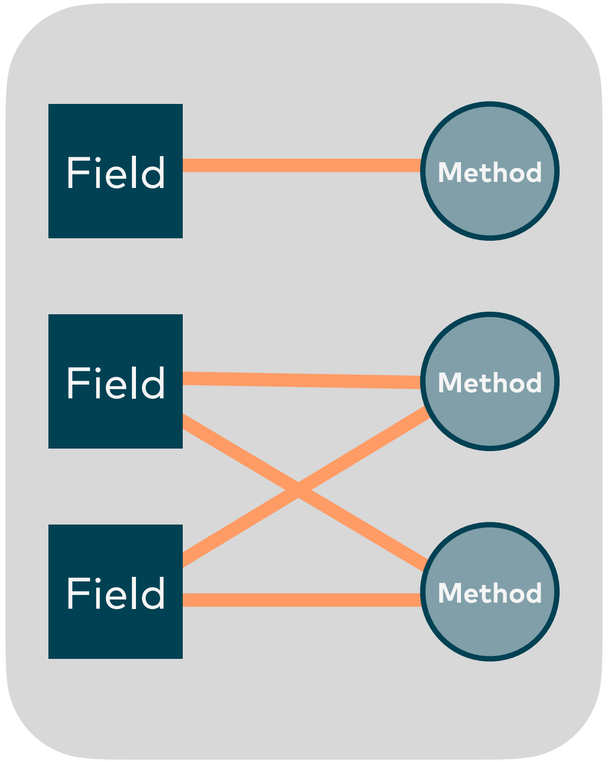
Formula (LCOM1): Count pairs of methods that do not share instance variables and subtract from the pairs that do. A higher result indicates lower cohesion.

LCOM Family



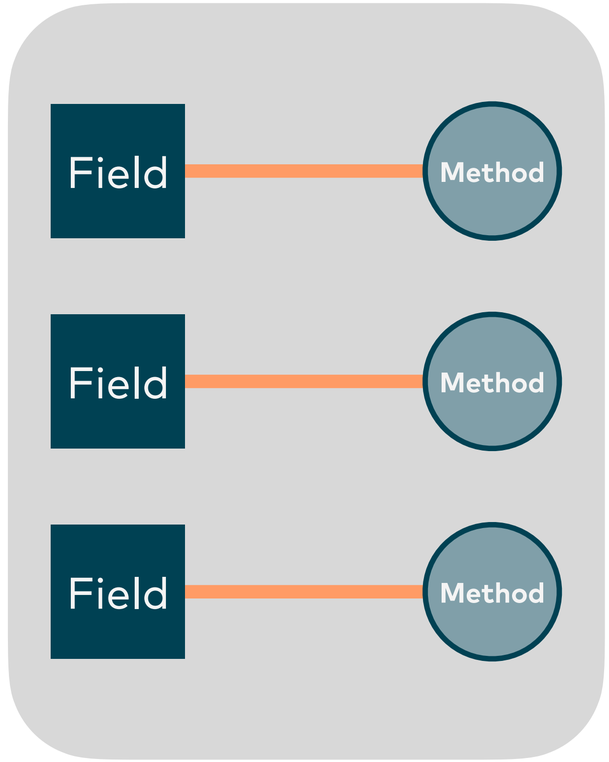
Low LCOM score (0)

High Cohesion



Medium LCOM score (1)

Moderate / Mixed Cohesion



High LCOM score (3)

Low Cohesion

Inspired by Richards, Ford. Visualization in Fundamentals of Software Architecture p. 43, O'Reilly 2020

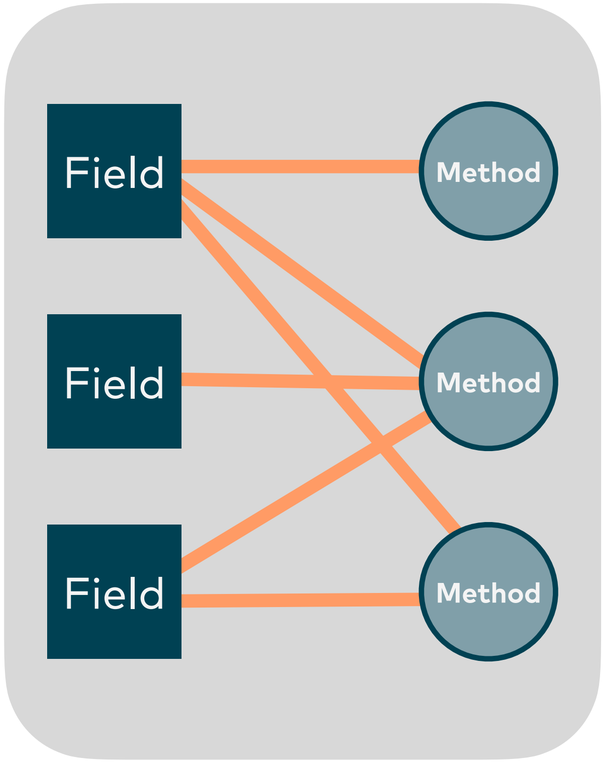
Tight Class Cohesion (TCC)

TCC measures the ratio of pairs of methods that access at least one common attribute to the total number of method pairs. A higher TCC indicates higher cohesion. This metric provides a fine-grained measure of how related the methods of a class are through shared data.

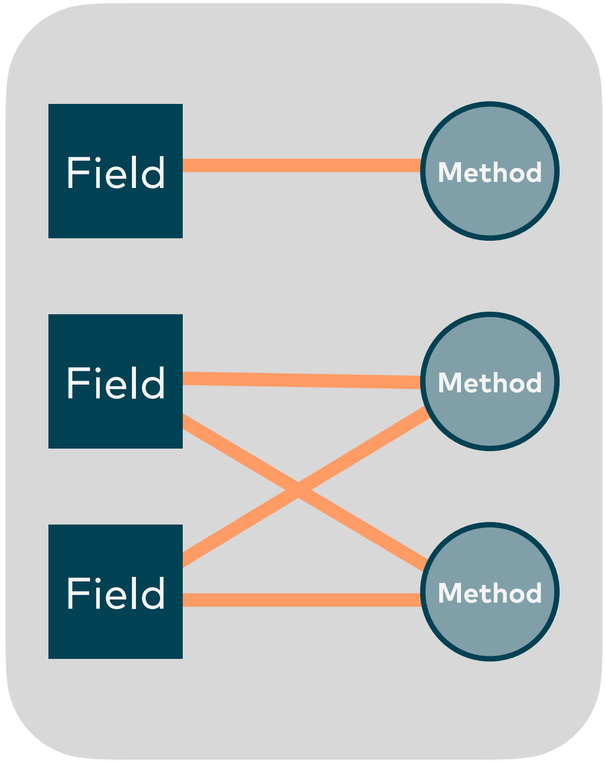
Formula: TCC = (number of method pairs that share attributes) / (total number of method pairs).

Range: TCC values range from 0 (low cohesion) to 1 (high cohesion).

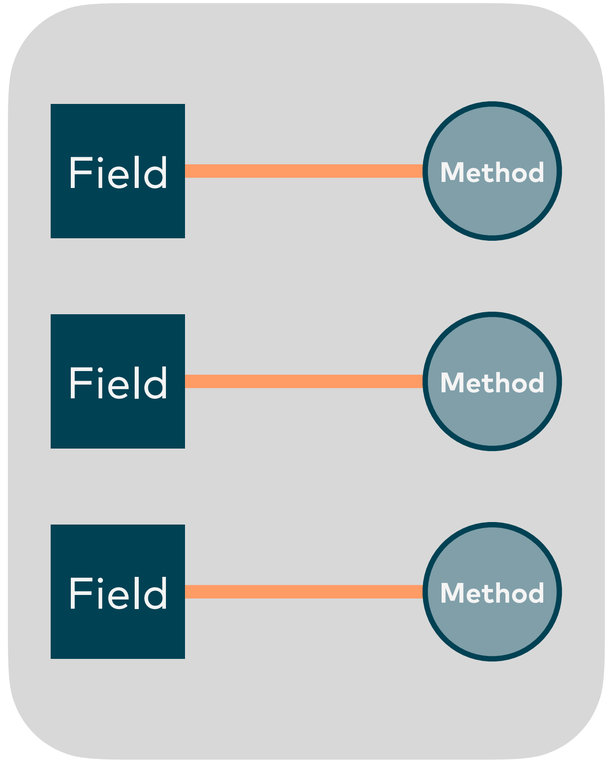
TCC



1 (3 / 3)



0,67 (2 / 3)



0 (0 / 3)

Inspired by Richards, Ford. Visualization in Fundamentals of Software Architecture p. 43, O'Reilly 2020

Don’t blindly believe in metrics!

Context matters

The evolution of their results is more interesting than a temporal snapshot

Never show metrics to non-IT folks EVER!

The golden rule of metrics

Non Linear Scale

- Functional Cohesion
- Sequential Cohesion
- Communicational Cohesion
- Procedural Cohesion
- Temporal Cohesion
- Logical Cohesion
- Coincidential Cohesion

Functional Cohesion is stronger than all of the others

Logical on Coincidential Cohesion are weaker than all of the others

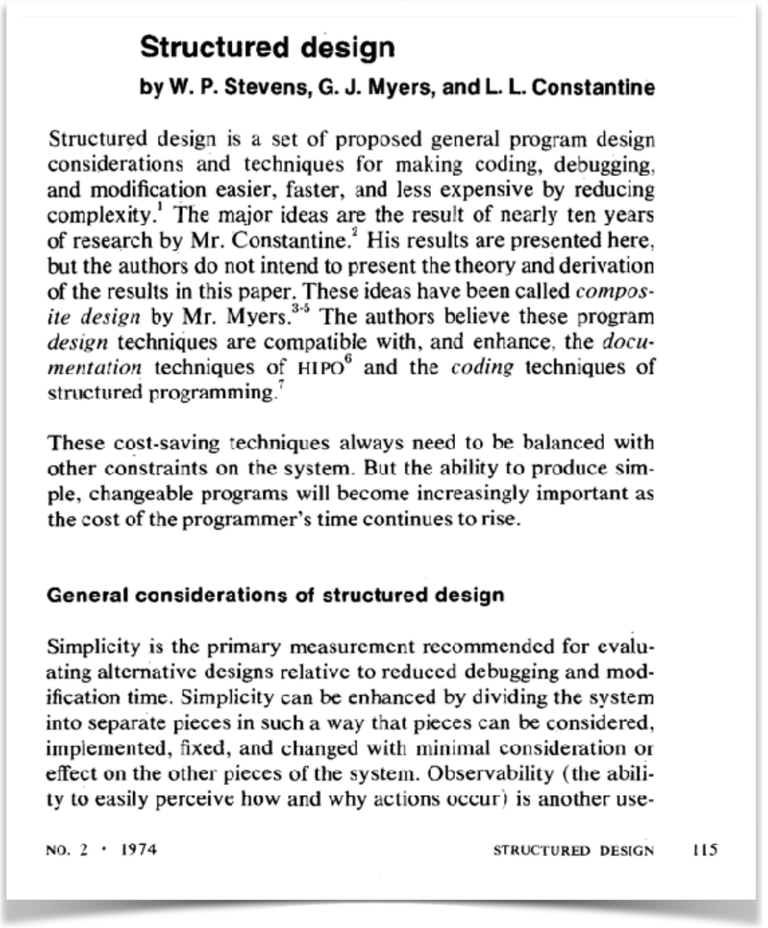
Higher levels of binding often include characteristics of the lower ones and add relationships

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

How do we achieve Functional Cohesion?

Cohesion
and
Purpose

„A useful technique in determining whether a module is functionally bound is writing a sentence describing the function(purpose) of the module, and then examining the sentence. “



Structured design

by W. P. Stevens, G. J. Myers, and L. L. Constantine

Structured design is a set of proposed general program design considerations and techniques for making coding, debugging, and modification easier, faster, and less expensive by reducing complexity.[1] The major ideas are the result of nearly ten years of research by Mr. Constantine.[2] His results are presented here, but the authors do not intend to present the theory and derivation of the results in this paper. These ideas have been called *composite design* by Mr. Myers.[3-5] The authors believe these program *design* techniques are compatible with, and enhance, the *documentation* techniques of HIPO[6] and the *coding* techniques of structured programming.[7]

These cost-saving techniques always need to be balanced with other constraints on the system. But the ability to produce simple, changeable programs will become increasingly important as the cost of the programmer's time continues to rise.

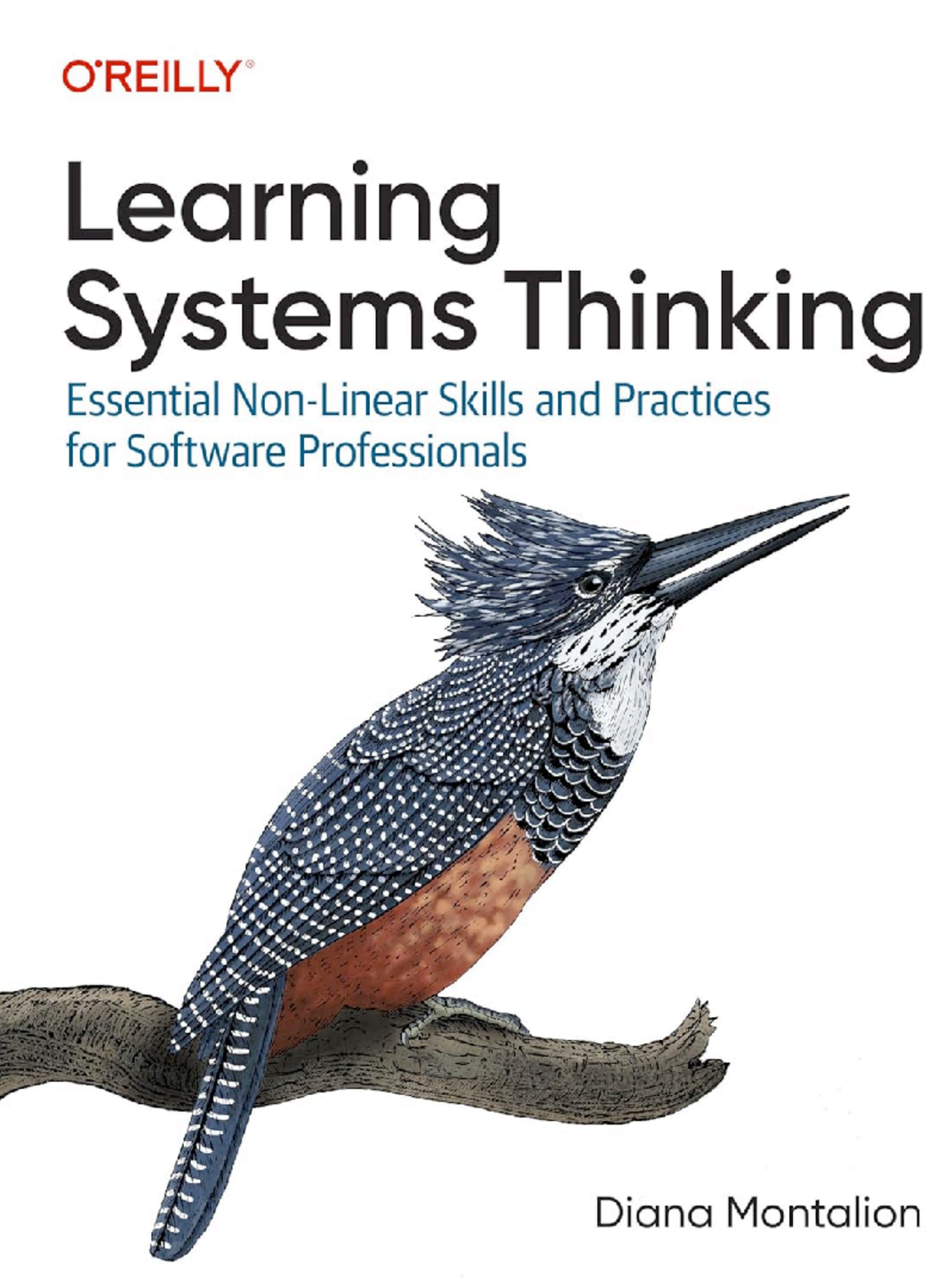
General considerations of structured design

Simplicity is the primary measurement recommended for evaluating alternative designs relative to reduced debugging and modification time. Simplicity can be enhanced by dividing the system into separate pieces in such a way that pieces can be considered, implemented, fixed, and changed with minimal consideration or effect on the other pieces of the system. Observability (the ability to easily perceive how and why actions occur) is another use-

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

Purpose

Specific Functionality	A module's purpose is to perform a specific task or set of tasks without interfering with other modules unless necessary
Clear Objectives	The purpose of a module should align with the overall system architecture and contribute to achieving the system's goals.
Focussed Responsibility	Purpose fosters a clear, focused responsibility, which helps in reducing complexity and improving the system's overall architecture
Boundary	Purpose defines a boundary of what a module should do and ensures that each component within it serves that purpose



Before diving into solutionizing, define the problem and why it's valuable to solve.

Problem Space

WHAT

is the challenge we need to solve?

Solution Space

HOW

do we solve the challenge?

Problem Space

Value Proposition

WHAT

is the challenge we need to solve?

Business Model

Business Challenge

Environment

User Needs

Problem Space

This is the starting point, we need to break this down to smaller parts in order to manage the complexity of a system

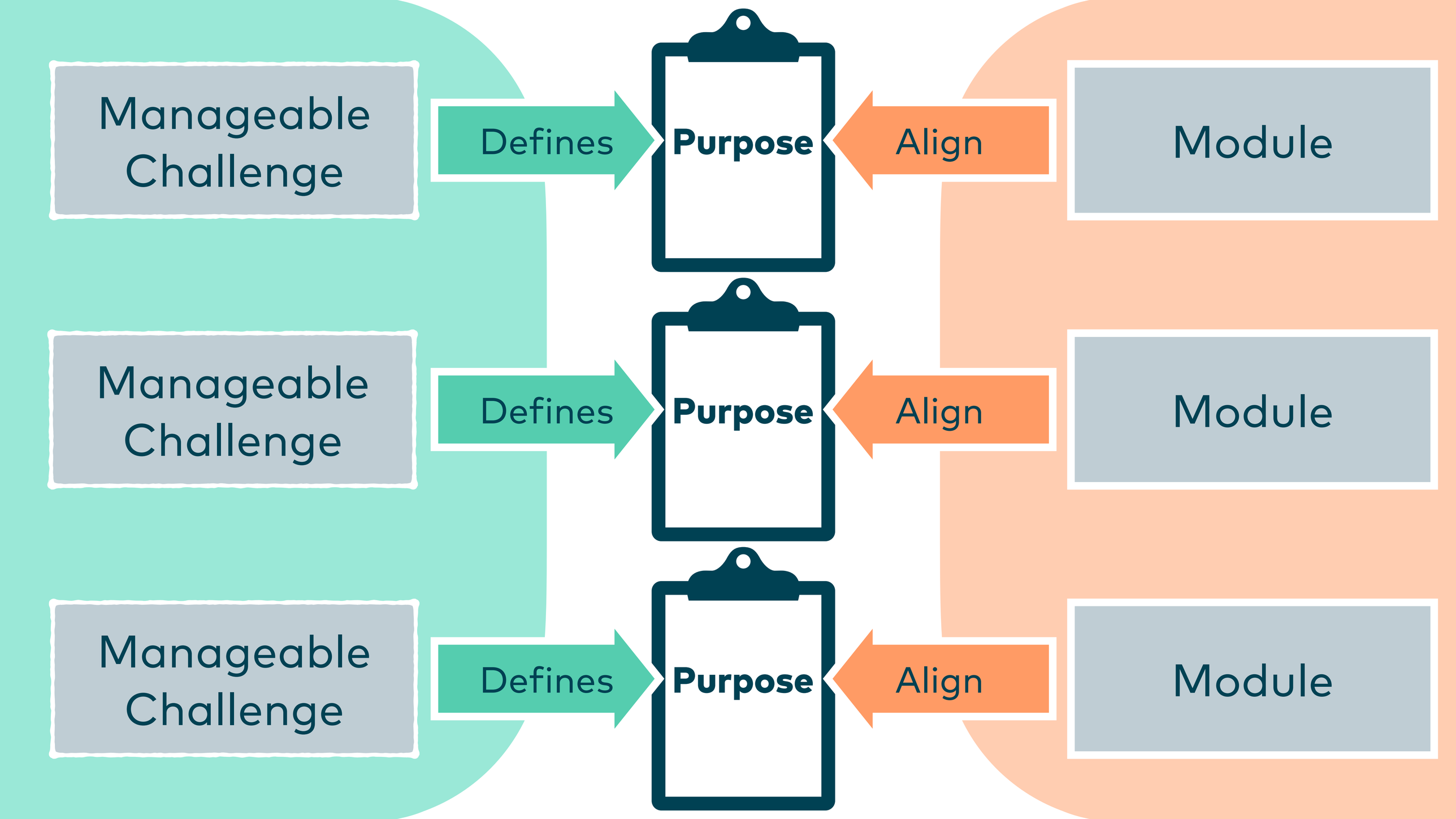
Problem Space

WHAT

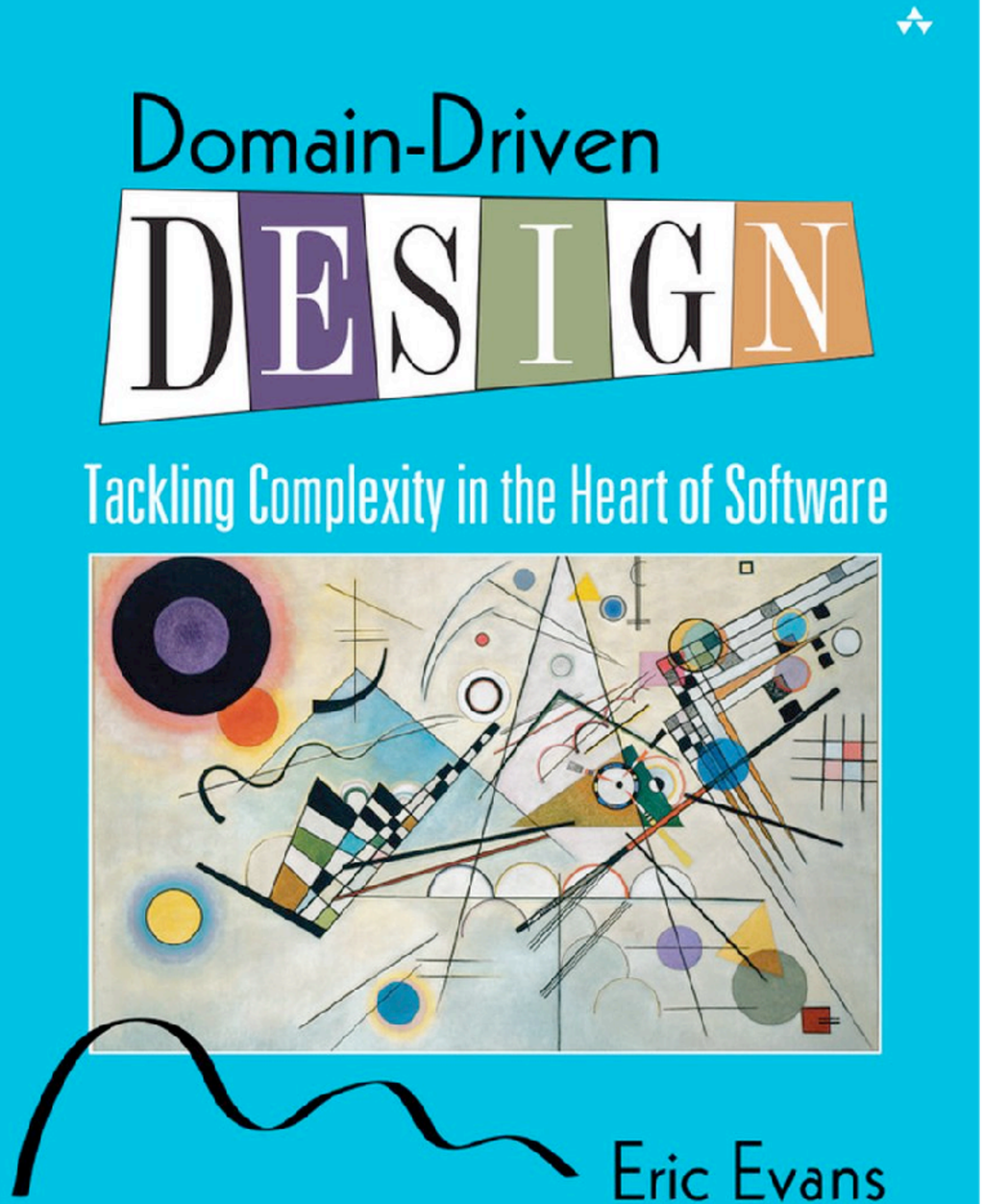
is the challenge we
need to solve?

BIG COMPLEX

Challenge


Manageable Challenge
Defines
Purpose
Align
Module
Manageable Challenge
Defines
Purpose
Align
Module
Manageable Challenge
Defines
Purpose
Align
Module

Purpose & Cohesion
in
Domain Driven Design



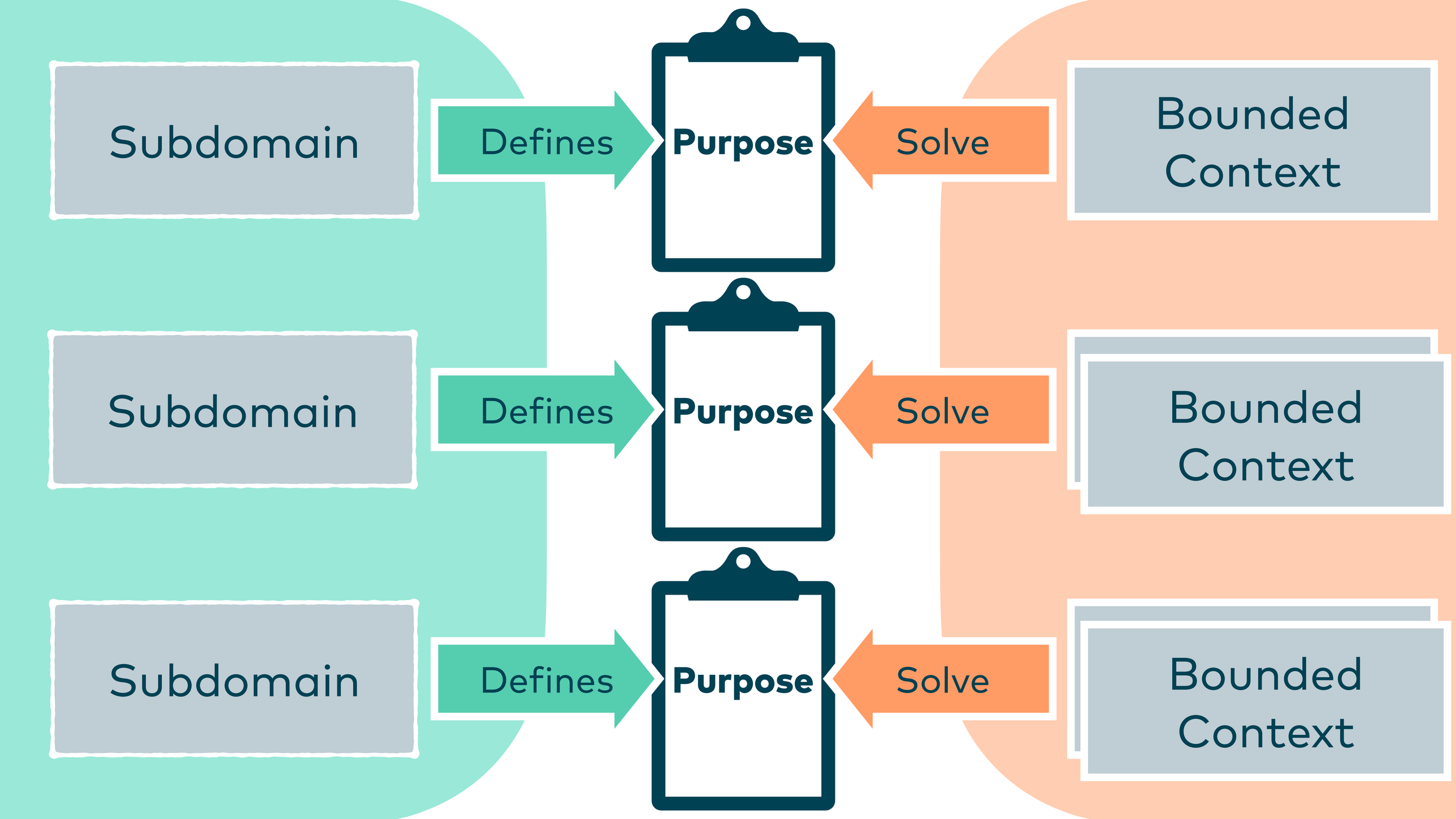
A model in a Bounded Context should have high cohesion, meaning that it forms a coherent whole around a single, unified purpose.

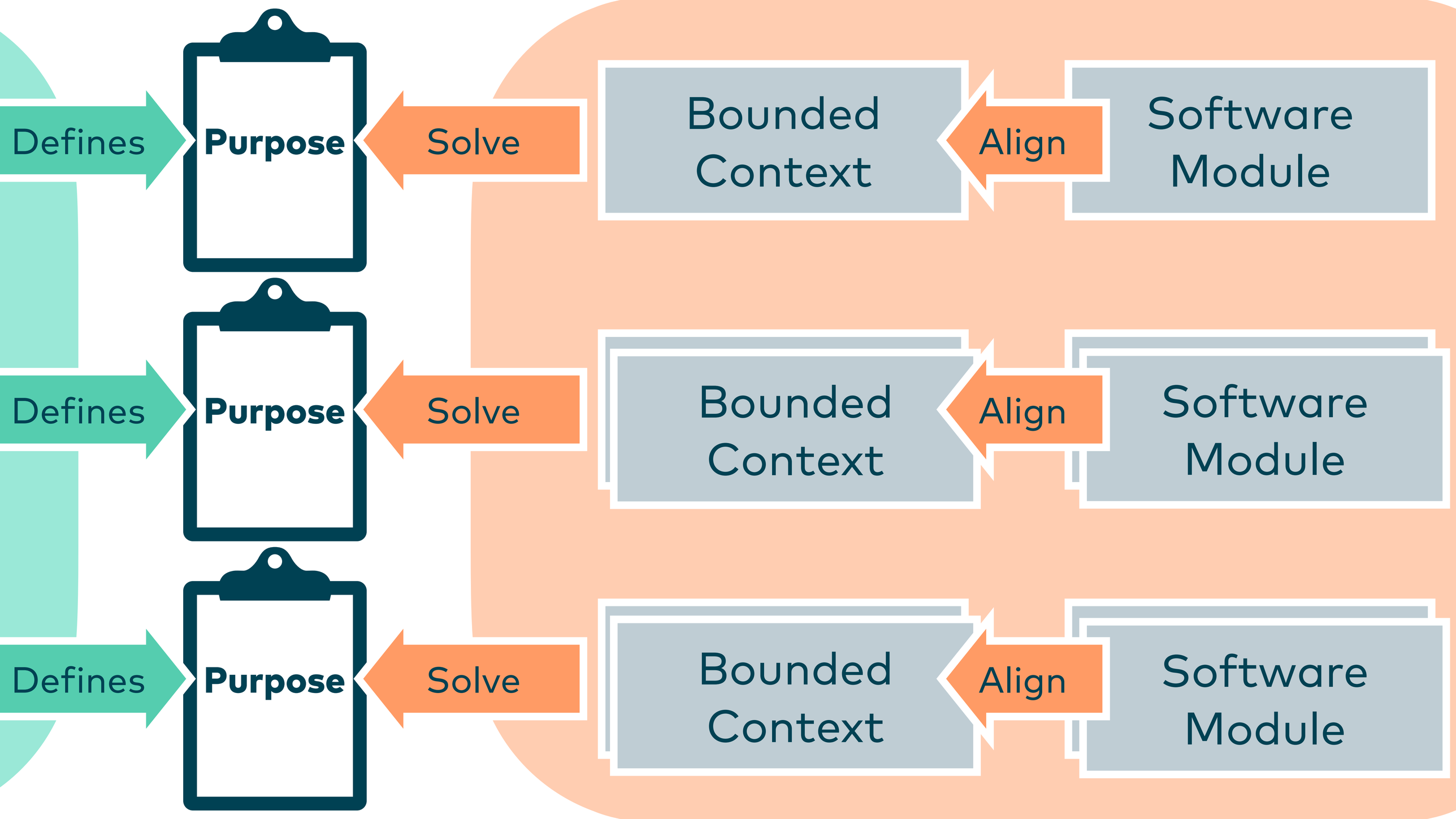
Problem Space

WHAT

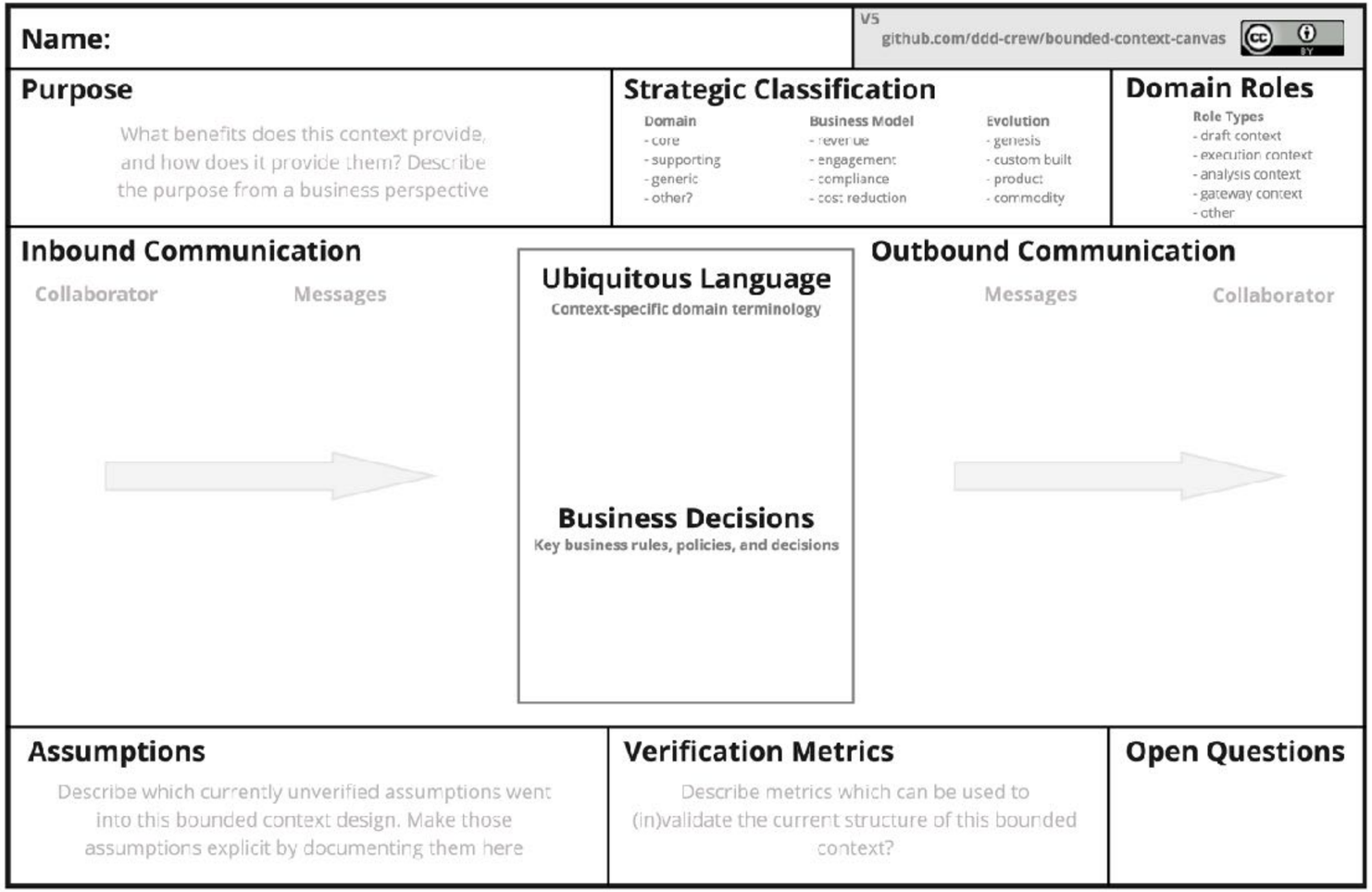
is the challenge we
need to solve?

DOMAIN


Subdomain
Defines
Purpose
Solve
Bounded Context
Subdomain
Defines
Purpose
Solve
Bounded Context
Subdomain
Defines
Purpose
Solve
Bounded Context


Defines
Purpose
Solve
Bounded Context
Align
Software Module
Defines
Purpose
Solve
Bounded Context
Align
Software Module
Defines
Purpose
Solve
Bounded Context
Align
Software Module

Bounded Context Design Canvas



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

Bounded Context Design Canvas

Name:

Purpose

What benefits does this context provide, and how does it provide them? Describe the purpose from a business perspective

The Structured Design paper describes heuristics for determining the level of cohesion based on the textual description of the purpose.

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

Sequential or communicational Cohesion

If you check at least one of the following criteria:

- Sentence has to be a compound sentence
- Contains a comma
- Contains more than one verb

Then the module is probably performing more than one function

Therefore, it probably has sequential or communicational binding

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

Sequential or temporal Cohesion

If the sentence contains words relating to time such as:

- First
- Next
- Then
- After
- When
- Start

Then the module probably has sequential or temporal binding

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

Temporal Cohesion

If the sentence contains words such as:

- Initialize
- Clean-Up
- Ramp-Up
- Tear-Down

Then the module probably has temporal binding

Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

Functional Cohesion

If the predicate of the sentence doesn't contain a single specific object following the verb

Then the module is probably functional bound

Example:

- Edit All Data implies logical binding
- Edit Credit Application may imply functional binding

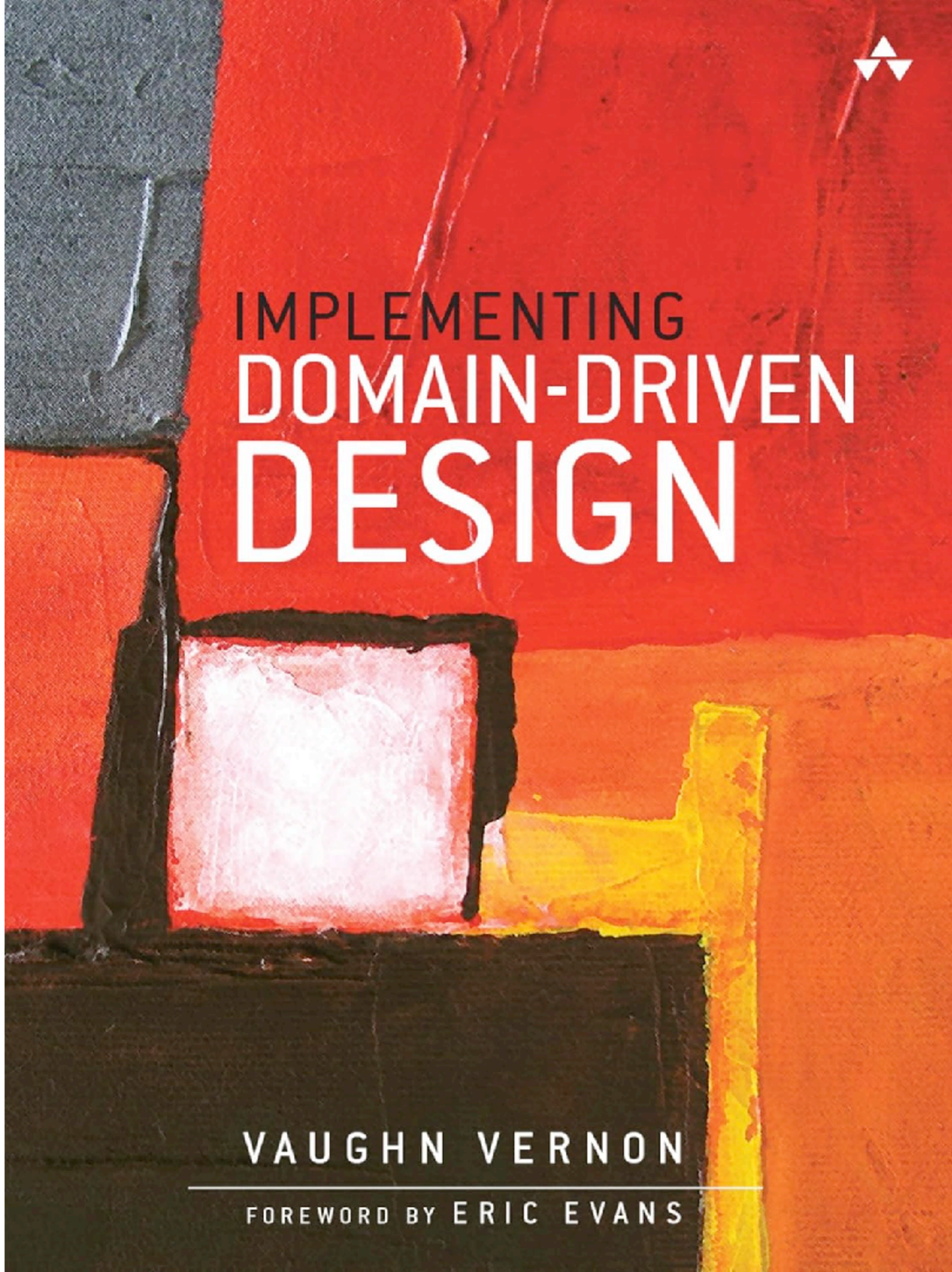
Wayne P. Stevens, Glenford J. Myers, Larry L. Constantine, **Structured Design**, IBM Systems Journal, 13(2):115-139, 1974.

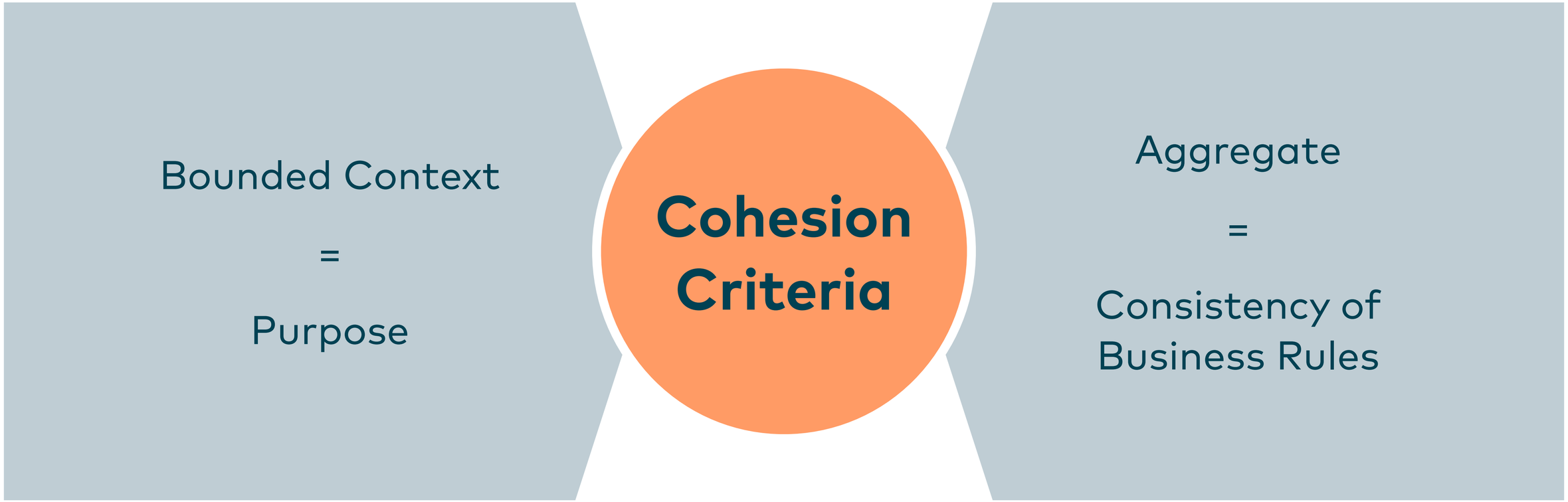
High cohesion is essential to **Aggregate** *design. Each Aggregate should fully encapsulate a business concept, keeping its responsibilities focused and manageable.*

...

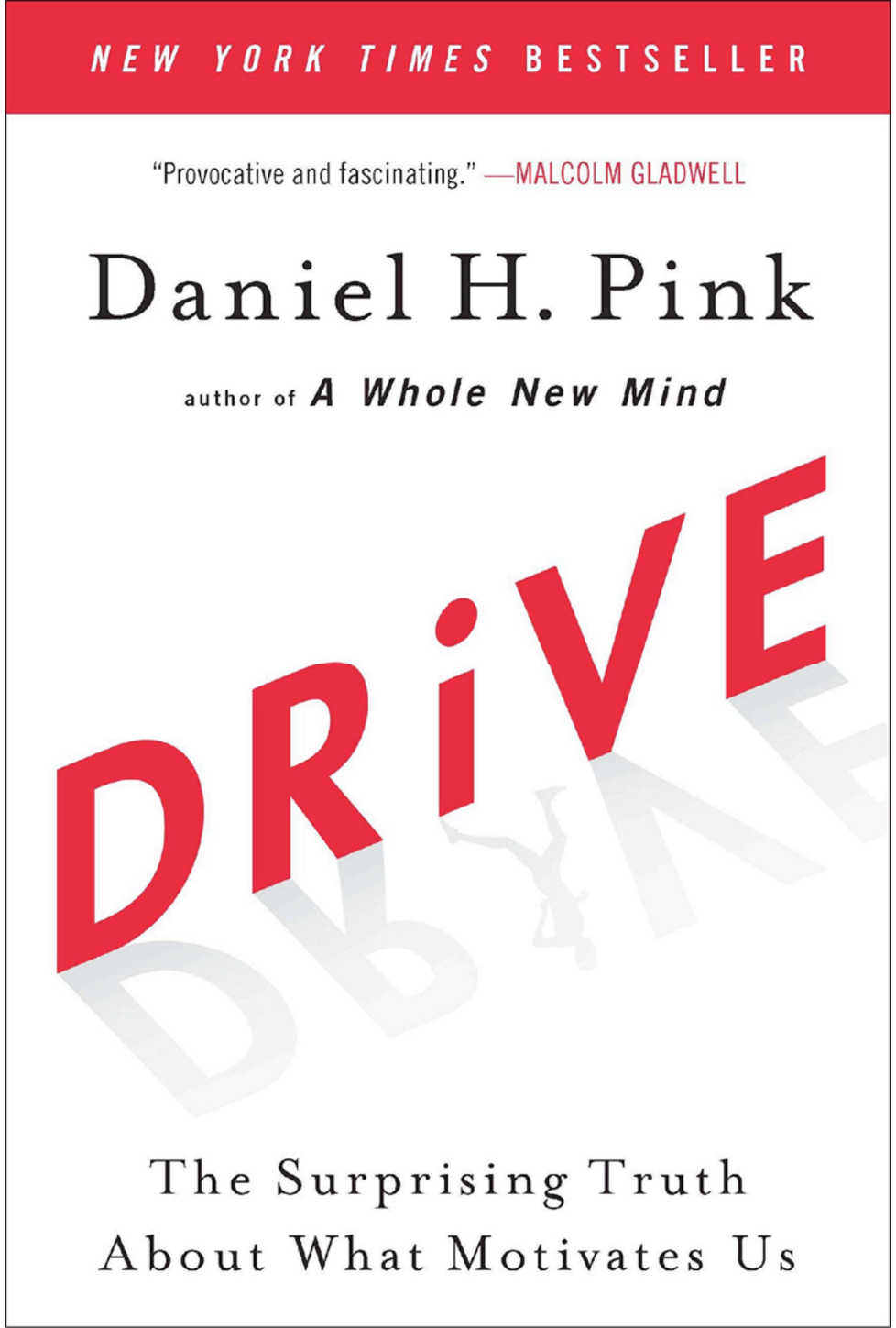
When trying to discover the Aggregates in a Bounded Context we must understand the model's true invariants.

An invariant is a **business rule that must always be consistent**.




Bounded Context
=
Purpose
Cohesion Criteria
Aggregate
=
Consistency of Business Rules

Purpose
in
Teams & Organizations



Autonomy

Desire to direct one's own life and refers to the freedom to choose how, when, and what tasks to perform.

Mastery

Desire to improve continuously and become better at something.

Purpose

Motivation to do work that aligns with a greater cause or mission, beyond just personal gain.

Autonomy

Desire to direct one's own life and refers to the freedom to choose how, when, and what tasks to perform.

Teams are loosely coupled in organizational terms, cross-team coordination is greatly reduced.

Mastery

Desire to improve continuously and become better at something.

The members of a team can master the domain complexity of their area of responsibility and get better at it.

Purpose

Motivation to do work that aligns with a greater cause or mission, beyond just personal gain.

The area of responsibility of a team has a designated and distinct functional purpose.

We need (module) boundaries in software which enable teams to achieve these ideas

Autonomy

Teams are loosely coupled in organizational terms, cross-team coordination is greatly reduced.

Mastery

The members of a team can master the domain complexity of their area of responsibility.

Purpose

The area of responsibility of a team has a designated and distinct functional purpose.

Domain or Business Architecture

Defines

Align

Align

Software Architecture

Team Organization

Cohesion

in

Modeling Work

Remember?

Software Architecture:

Structural Cohesion

Sociocultural Anthropology

Strength of cultural, social, or kinship ties that bind a community or group together. Social cohesion in traditional societies often stems from shared customs, rituals, and kinship structures that maintain group identity and solidarity.

Soil Mechanics

Attraction between particles within a soil, typically due to moisture or the presence of clays, which can hold the particles together. Cohesion helps determine the stability of soils and their ability to form aggregates, affecting erosion resistance and soil strength.

Chemistry

Force of attraction between molecules of the same substance. This is related to intermolecular forces, such as hydrogen bonds in water or van der Waals forces in non-polar molecules.

Civil Engineering

Ability of construction materials, like concrete or soil, to hold together. The cohesive forces in these materials contribute to their overall structural stability.

Work in organization:

Social Cohesion

Sociology and Psychology

Degree of connection and unity within a group, often measured by how well members stick together, cooperate, or share a common identity. Social cohesion refers to the strength of relationships and the sense of solidarity among members of a community.

Linguistics

Ways in which different parts of a text or discourse are connected to create meaning. It includes grammatical and lexical linking, such as pronouns, conjunctions, and repetitions, which help to unify a text.

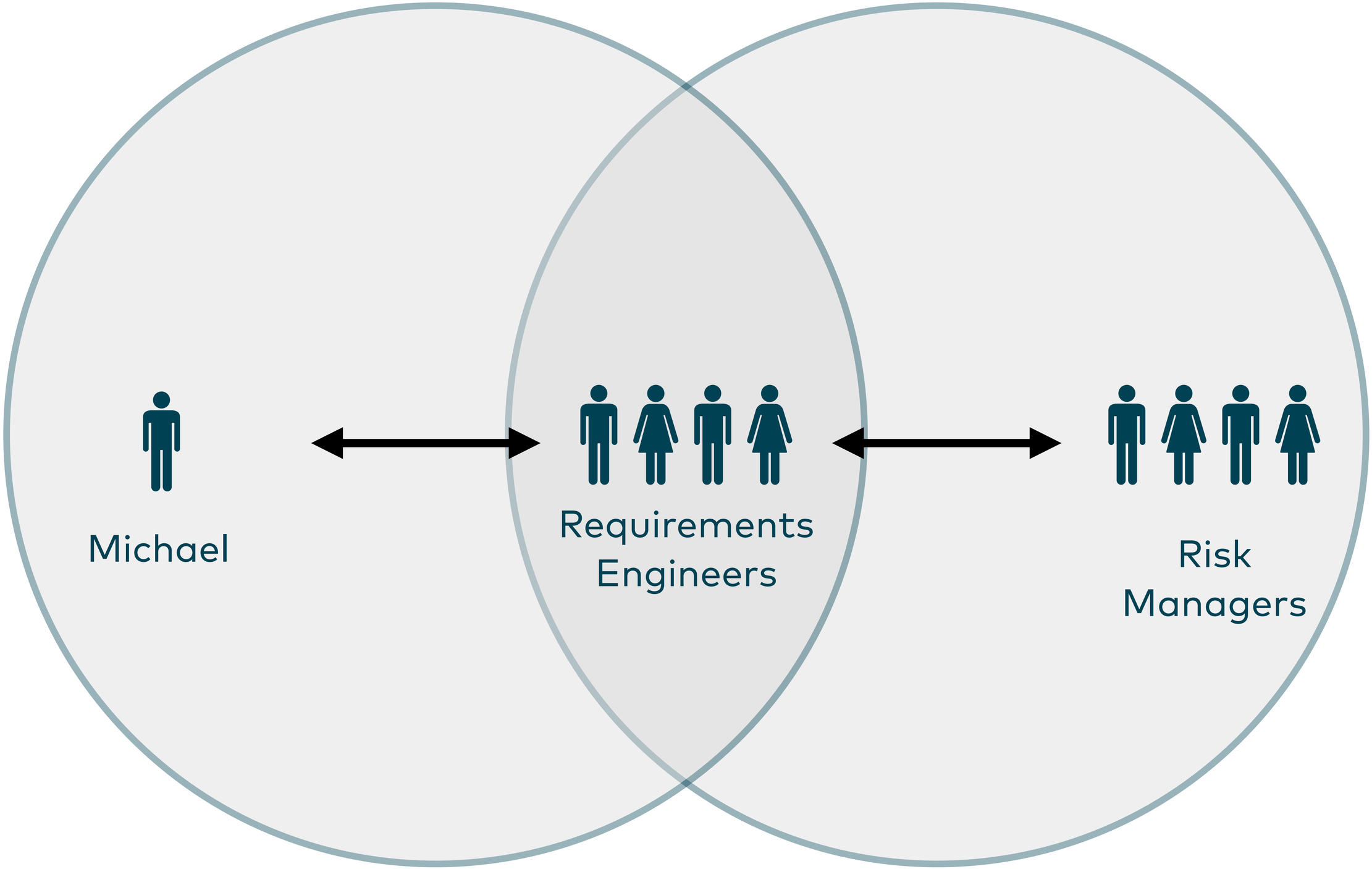
„It is not the domain experts knowledge that goes into production, it is the assumption of the developers that goes into production"

Alberto Brandolini

Erfinder des EventStormings

Let me tell you a story

Michael as a young developer for a mortgage loan scoring engine


Michael
Requirements Engineers
Risk Managers

I had a great and thorough specification

Let’s look at the business rules

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).

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

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

Total amount of loans > collateral value is a nogo criteria

Probability of repayment from credit agency query = points

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

< 120 points: red

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

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

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

>= 120 points: green

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

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

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

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

My perspective on cohesion:

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

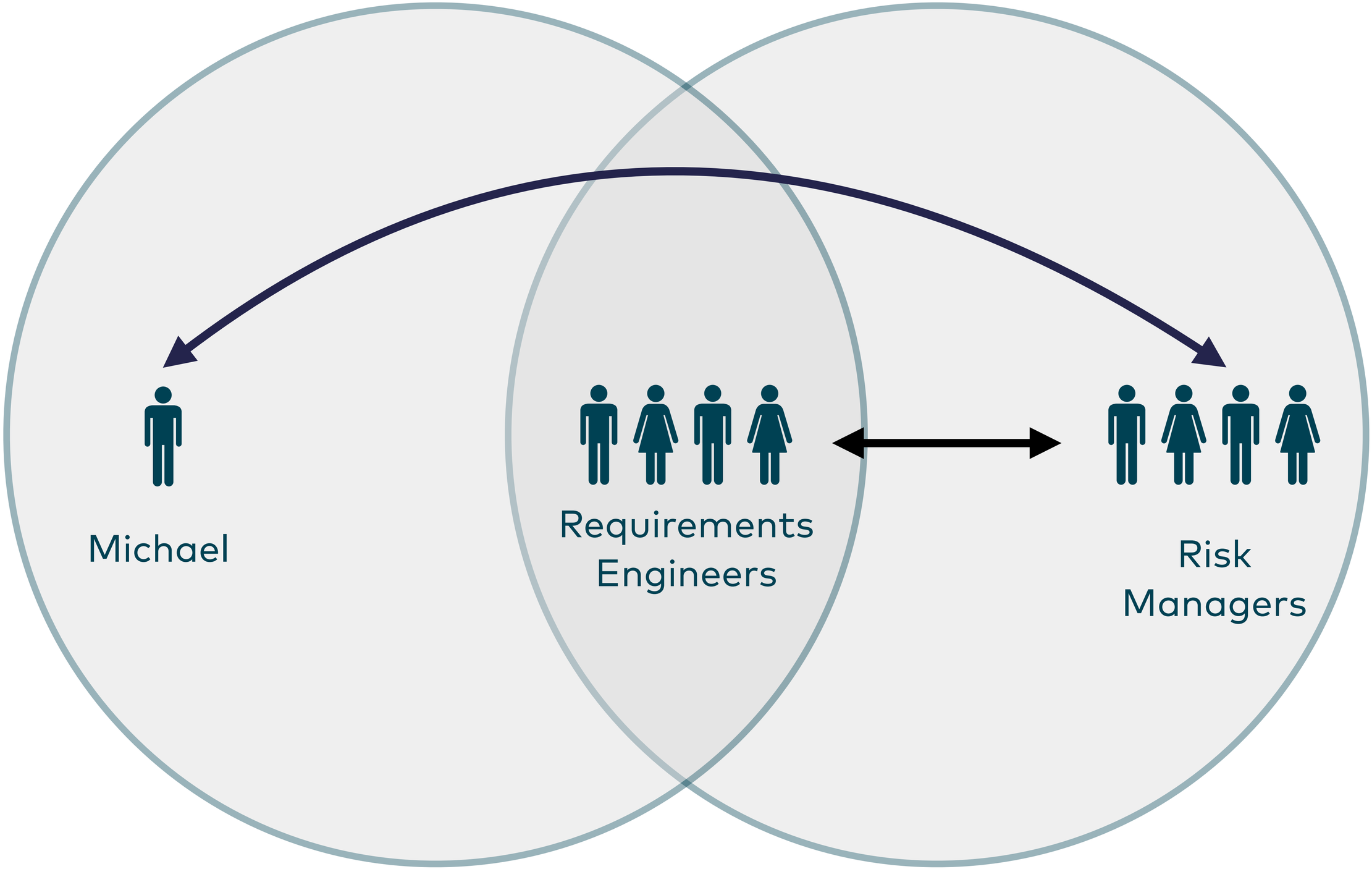
One nogo-criteria present: red (independent of amount of points)

< 120 points: red

>= 120 points: green

So I built my scoring engine according to that structure which I assumed in my head which roughly looked like this

The acceptance test and a change in communication


Michael
Requirements Engineers
Risk Managers

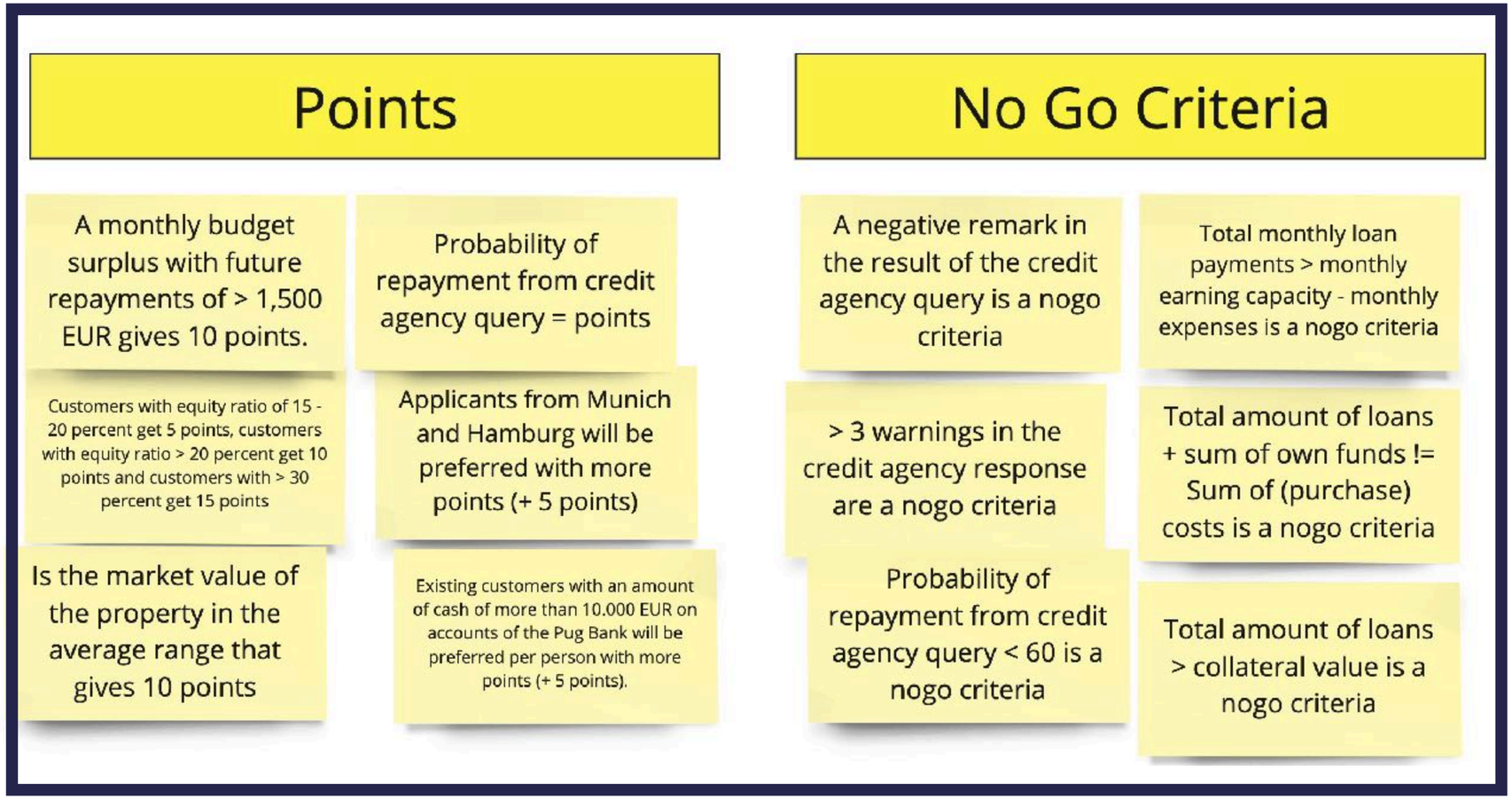
I developed a bad gut feeling but go-live was fine, just two minor bugs.

But then came a new requirement...

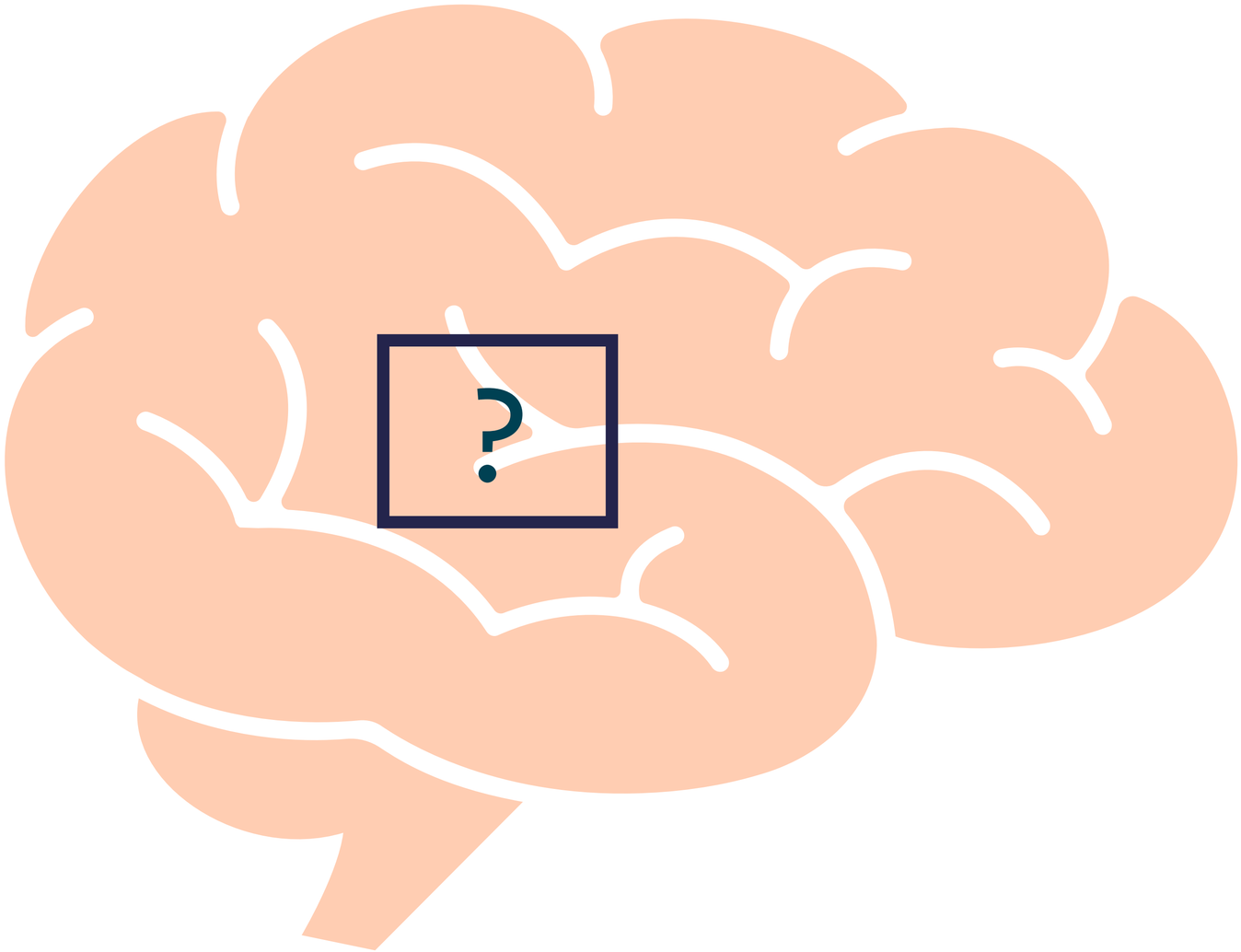
We want to see if a red scoring can become green with more own funds

if yes: how much more money do the applicants need?

Michael: „this affects nearly everything“

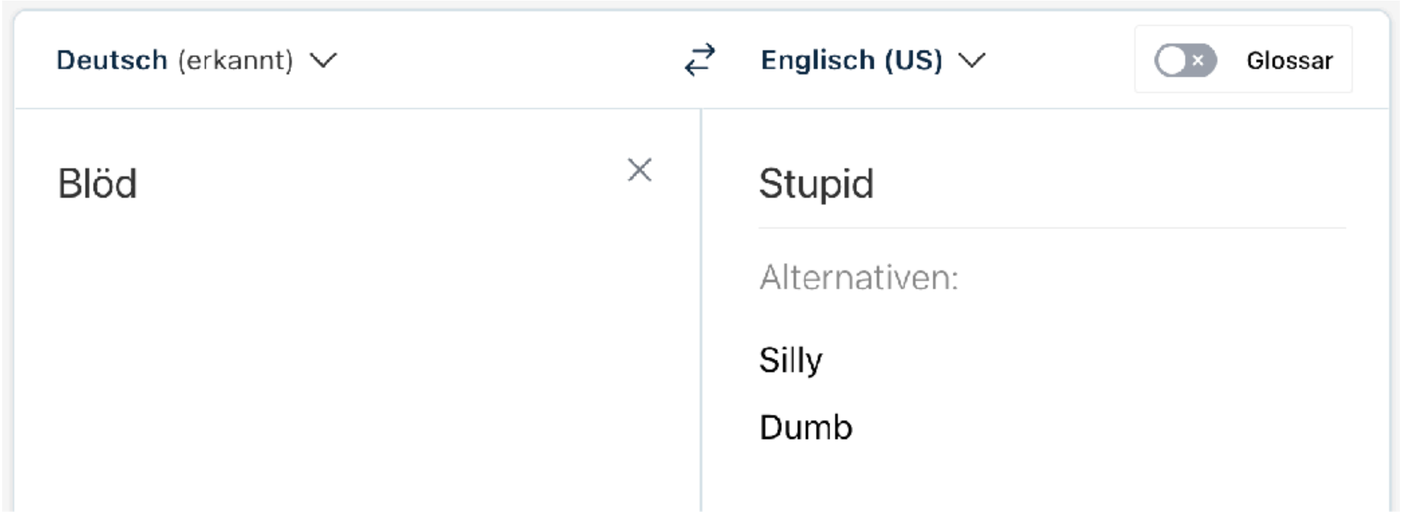


Risk Management: „no, it's only in one part"



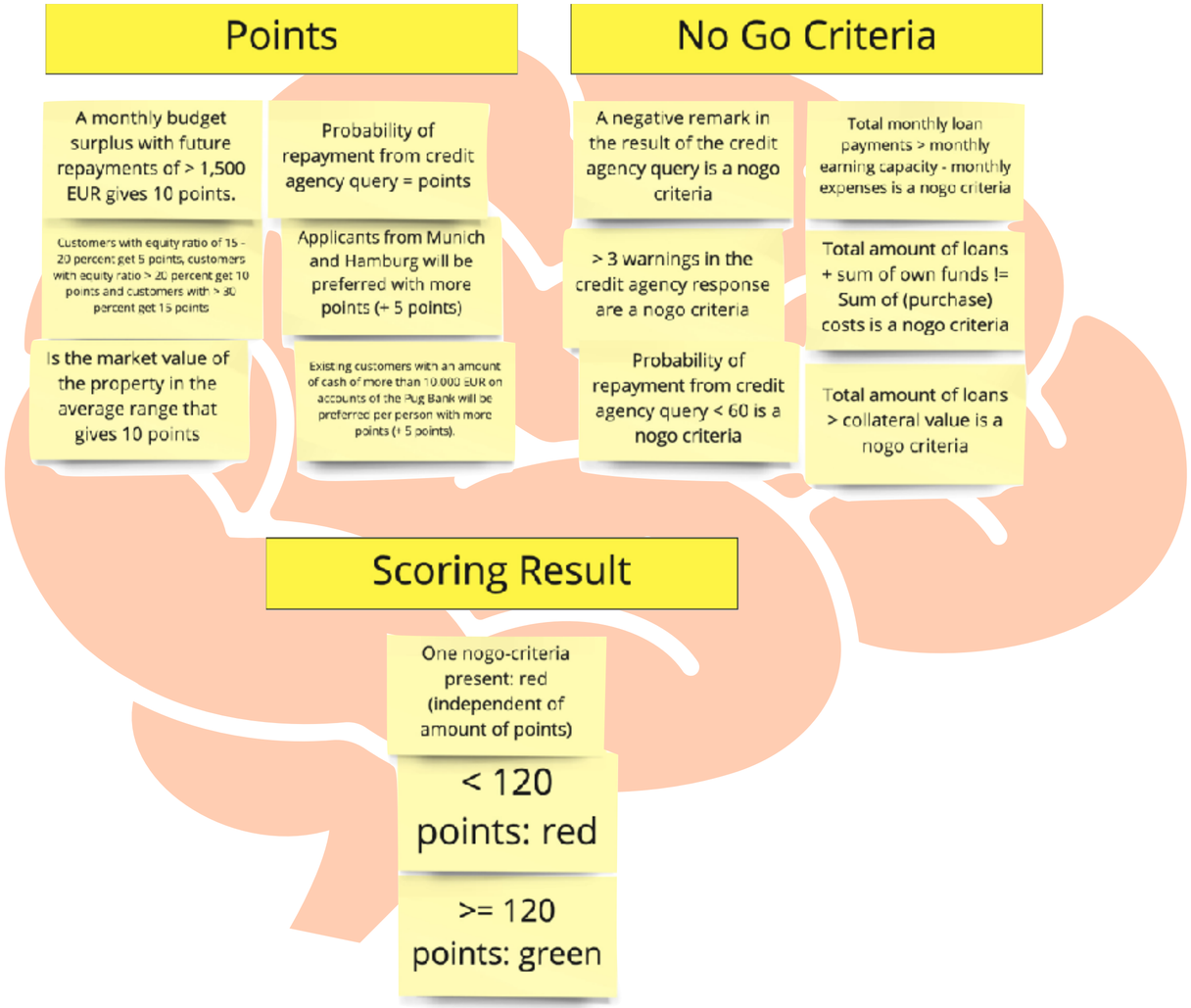
The risk managers started to think that I do my surname justice

(just replace the P in Plöd by a B)



Risk Management perspective on cohesion

We had different mental models



Everyone was right, from their perspective

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)

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

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

Scoring Result

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

< 120 points: red

>= 120 points: green

I refactored my code to their mental model and the new requirement was suddenly very easy to implement

„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

Sociocultural Anthropology

Strength of cultural, social, or kinship ties that bind a community or group together. Social cohesion in traditional societies often stems from shared customs, rituals, and kinship structures that maintain group identity and solidarity.

Work in organization:

Social Cohesion

Sociology and Psychology

Degree of connection and unity within a group, often measured by how well members stick together, cooperate, or share a common identity. Social cohesion refers to the strength of relationships and the sense of solidarity among members of a community.

Linguistics

Ways in which different parts of a text or discourse are connected to create meaning. It includes grammatical and lexical linking, such as pronouns, conjunctions, and repetitions, which help to unify a text.

If you only talk to your

„highly cohesive“ group of people with
„highly cohesive“ perspectives and
„highly cohesive“ biases and
„highly cohesive“ behaviors and
„highly cohesive“ attitudes

You run a fundamental risk of getting boundaries that

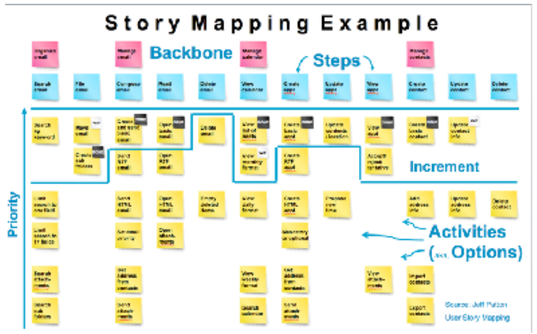
LACK FUNCTIONAL COHESION

Model with an uncohesive group

for

Cohesive Modules

DOMAIN
Storytelling



EVENT
MODELING

Use collaborative modeling methods

EVENT
STORMING

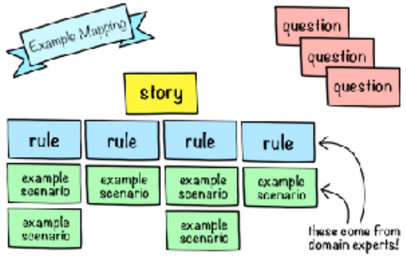


Image for example mapping taken from: https://openpracticelibrary.com/practice/example-mapping/
Image for user story mapping taken from: https://www.hanssamios.com/dokuwiki/how_do_we_build_and_maintain_context_when_all_we_have_is_a_backlog_list

THANK YOU!

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