Bounded Context Relationships

> Bounded Contexts are independent but NOT *isolated* from other BCs around them; models in BCs collaborate to fulfil requirements of a system

Bounded Context Relationships

Symmetric Relationship

- 2 BC that are dependent on each other

Bounded Context Relationships

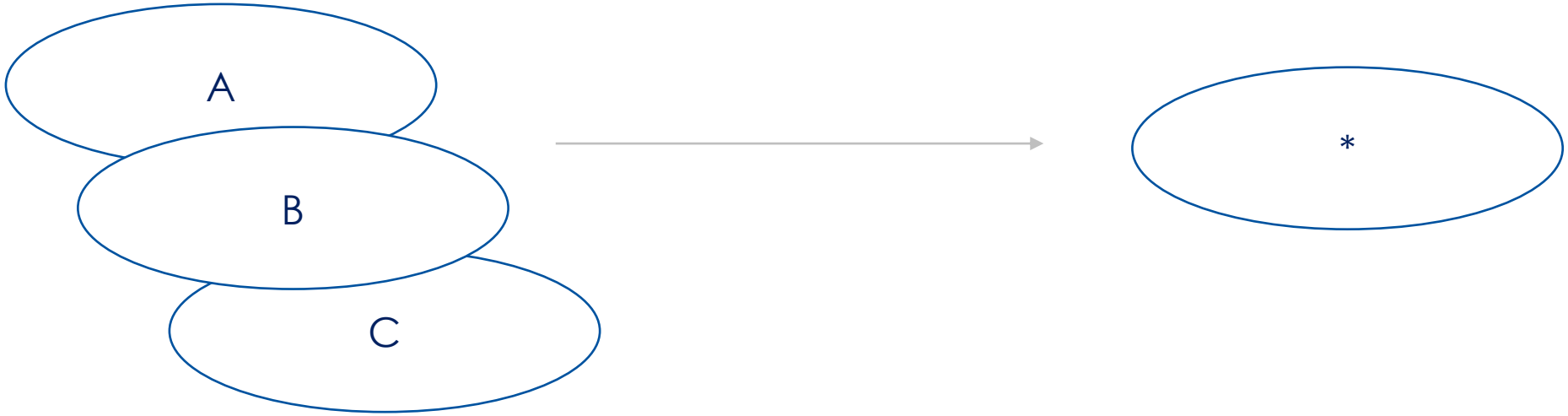
Asymmetric Relationship

- One BC depends on another BC

Bounded Context Relationships

One to Many Relationship

- Multiple BC depends on One BC



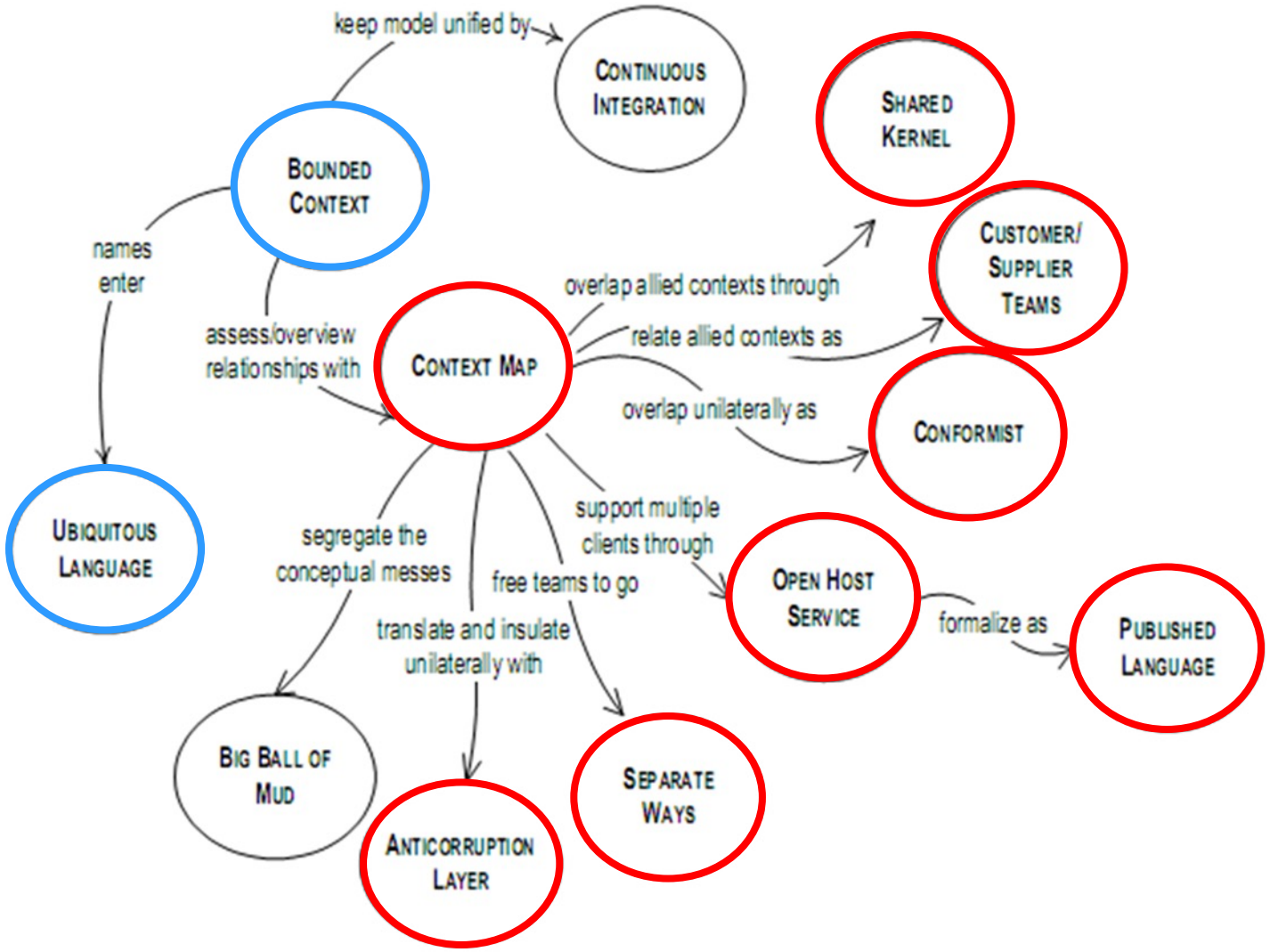
Bounded Context Relationships

Strategic Relationship patterns

- Defines the dependency relationship between BCs

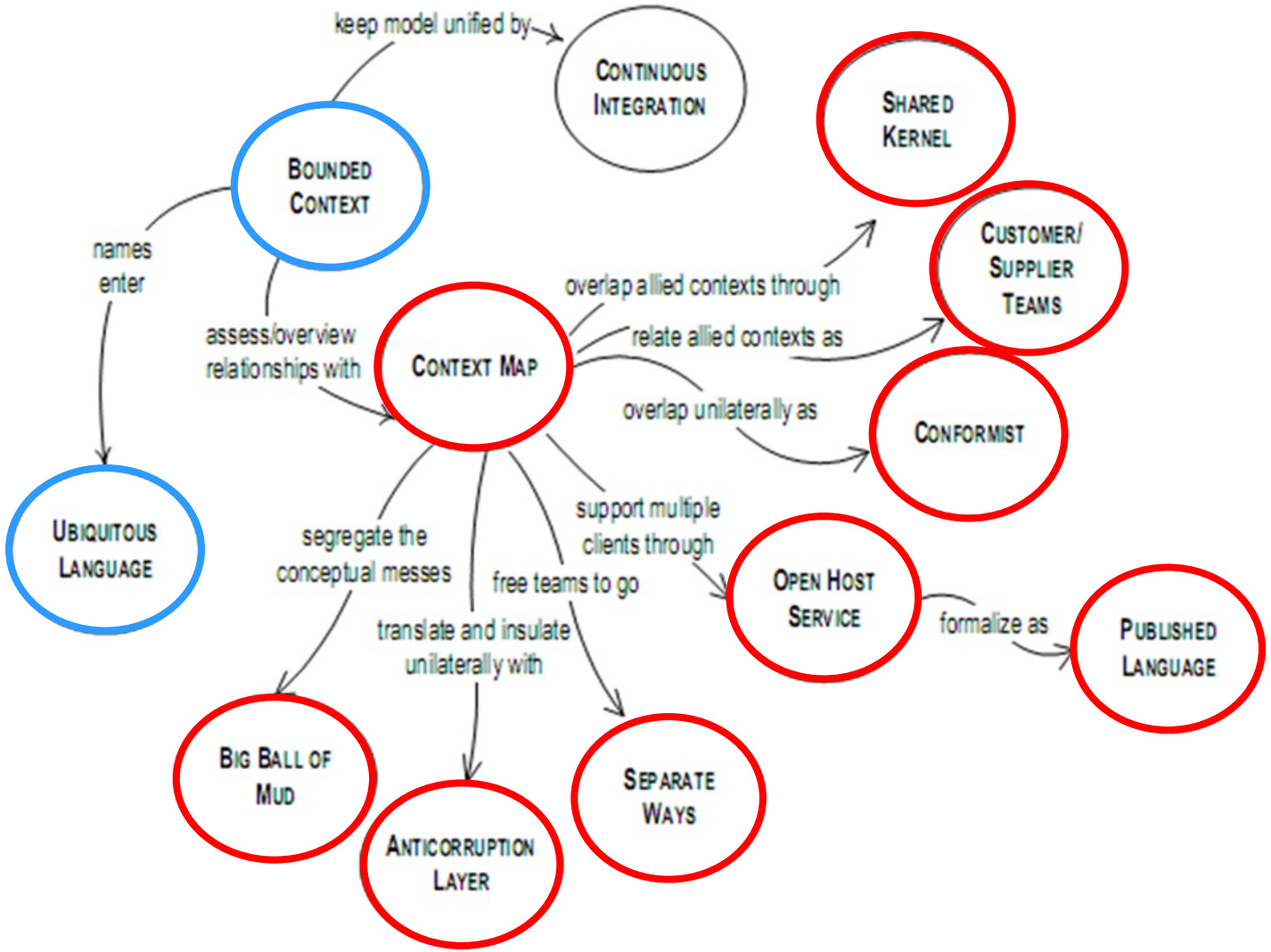
Bounded Context Relationships

Relationship Patterns



Bounded Context Relationships

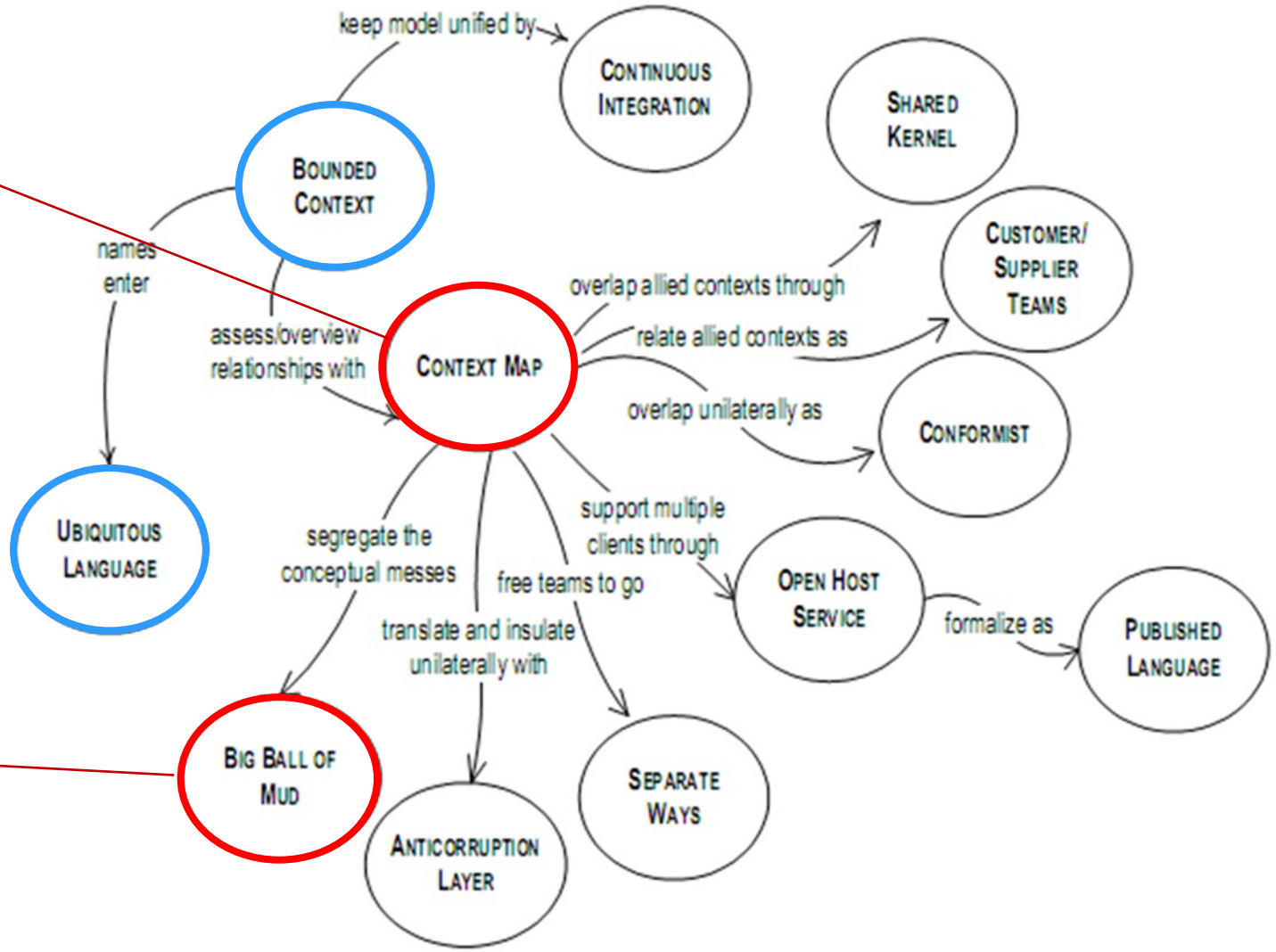
DDD Strategic Patterns



Bounded Context Relationships

Visual Representation

Anti Pattern



Bounded Context Relationships

Section objective

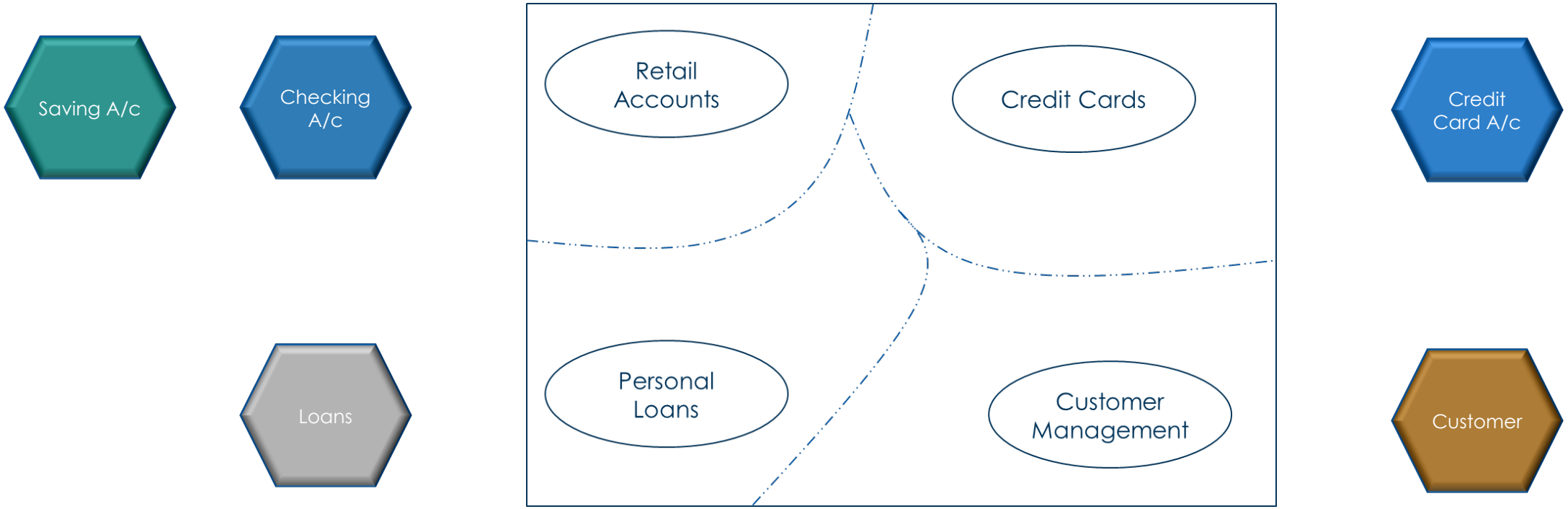
1. Big Ball of Mud
2. Context Maps
3. Symmetric Relationship : Separate ways , Partnership, Shared Kernel
4. Asymmetric Relationship: Customer-Supplier, Conformist, Anti Corruption Layer
5. One-to-Many Relationship: Open Host Service, Published Language

BC : Maintaining the Integrity

- BC A will refer to models in BC B
- This will lead to contextual confusion !!!

DDD Strategic Patterns

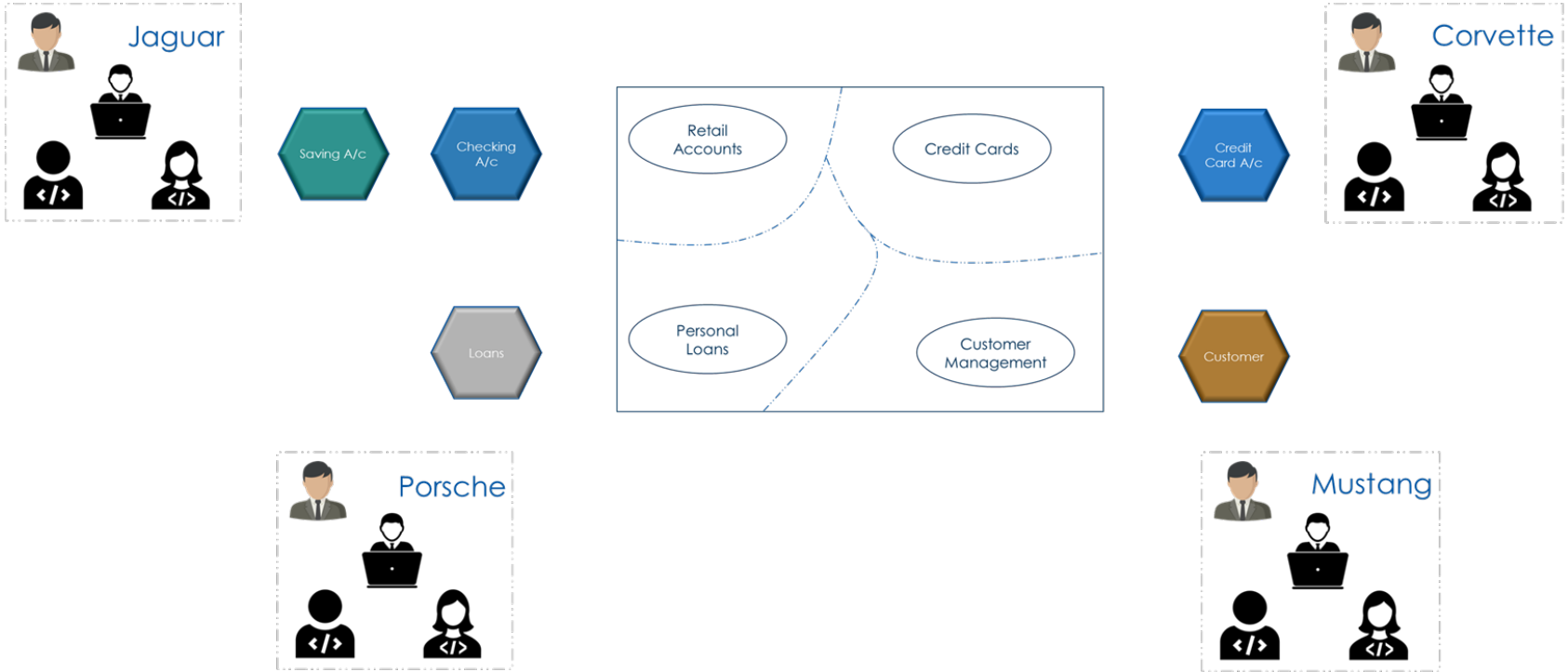
Microservices development



DDD Strategic Patterns

Maintain the Integrity of models across Microservices

To ensure teams can work on Microservices Independently



Relationship between BCs

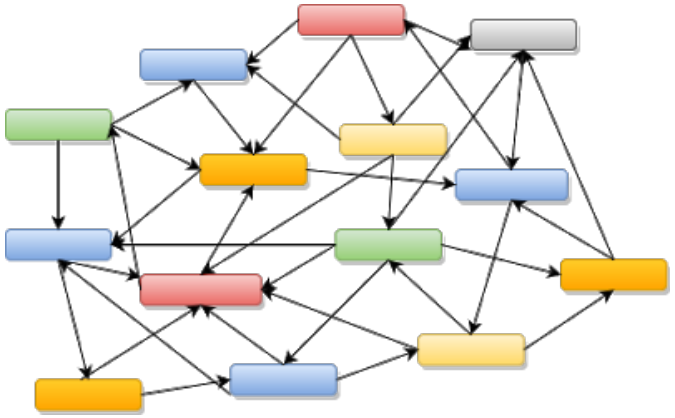
Managing the Bounded Context Dependencies

1. Big Ball of Mud
2. BC Dependency challenges
3. Context Maps

Unmanaged BC Relationship

Leads to Big Ball of Mud

- Haphazardly structured model
- Leads to spaghetti-code
- Mostly created by unregulated growth | fixes over time



Big Ball of Mud refers to an Anti-Pattern

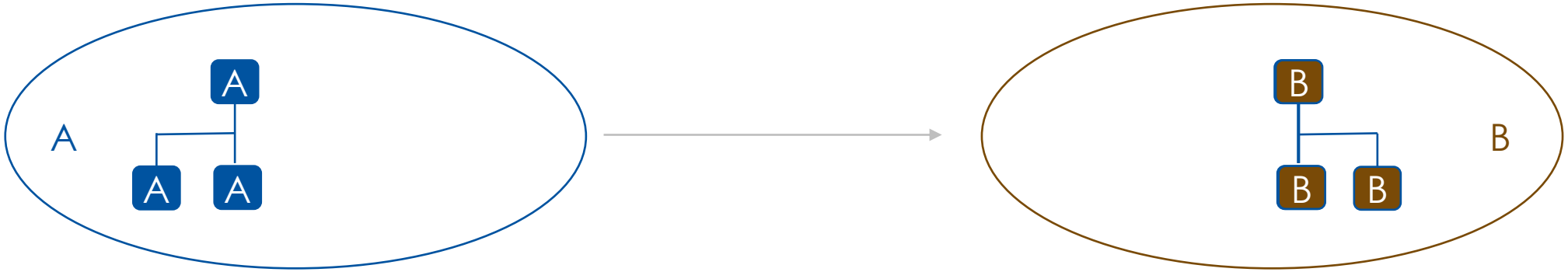
BC dependencies

Relationships need to be managed otherwise:

- Loss of model integrity
- Loss of Team's ability to operate independently

Bounded Context - Dependencies

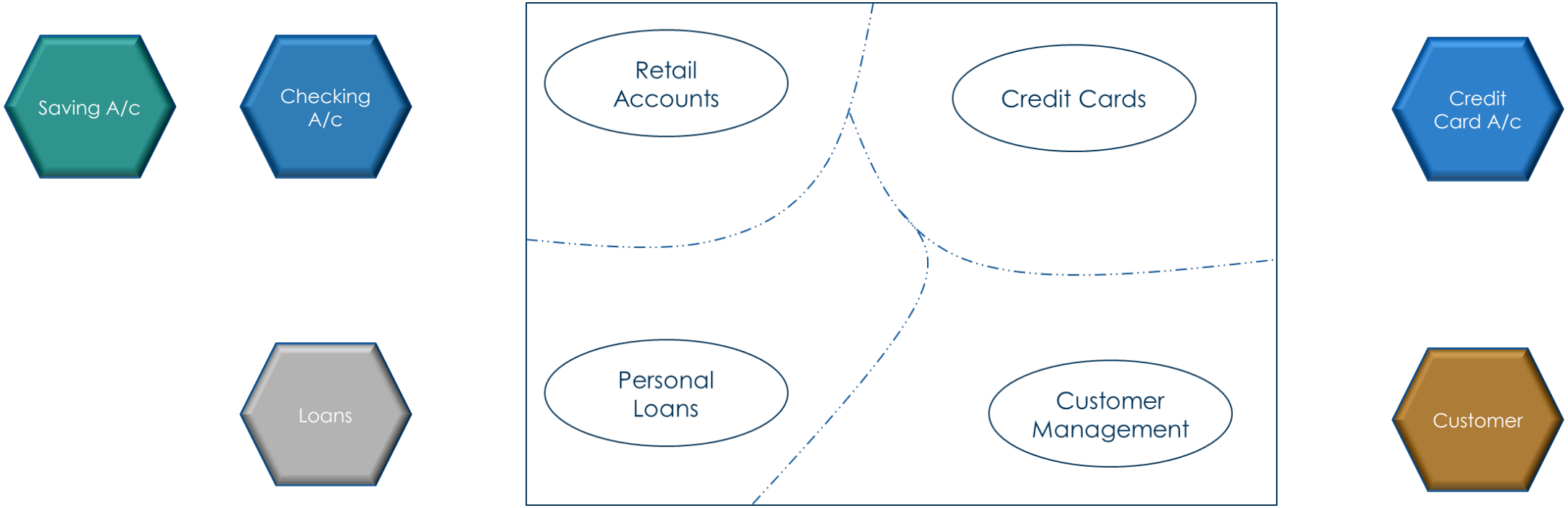
Negatively impacts the model's integrity



Loss of model integrity

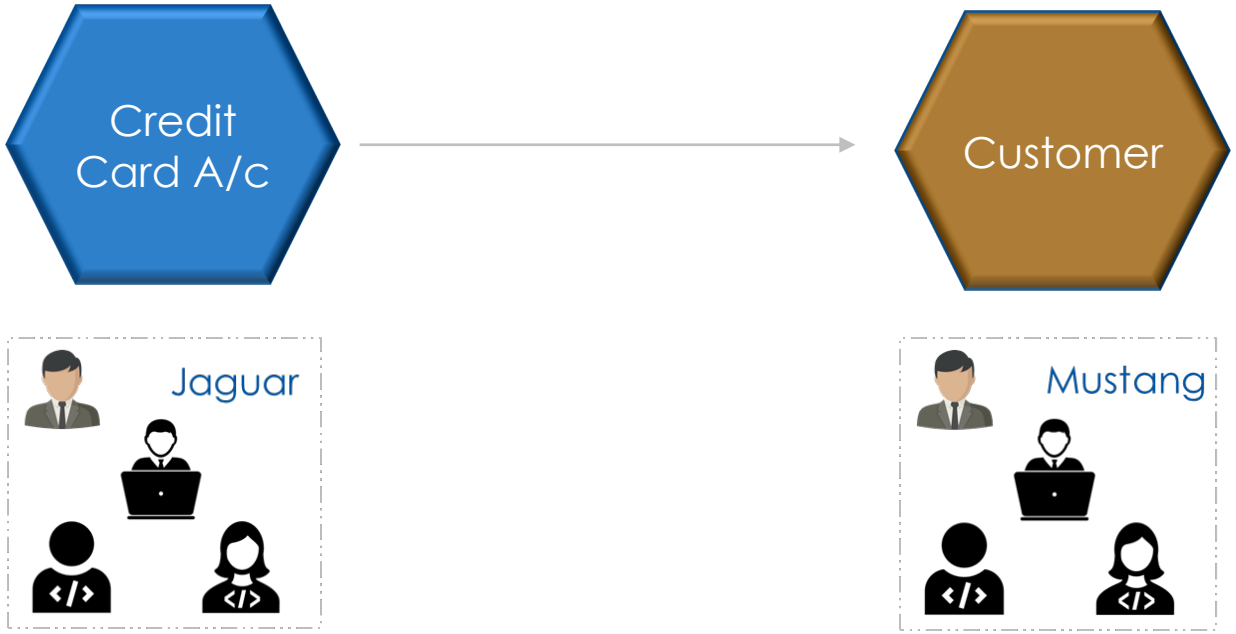
Bounded Contexts => Microservice(s)

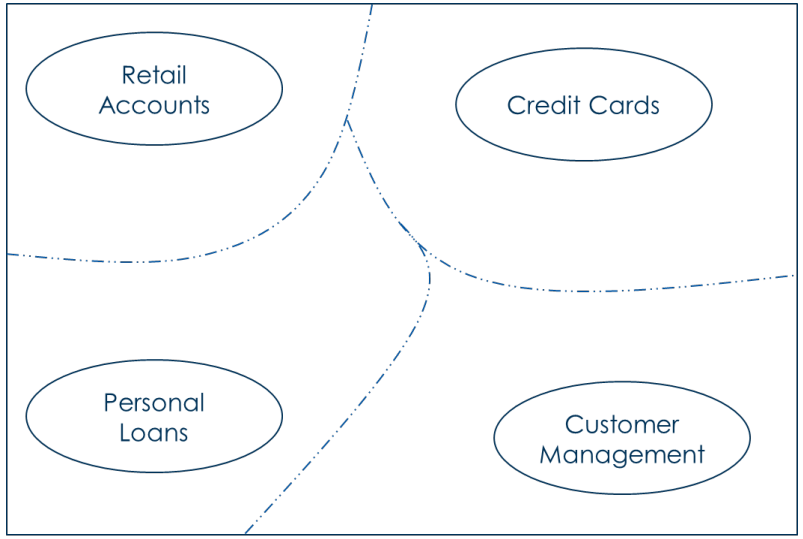
Each BC is translated into one or more microservices



Bounded Context - Dependencies

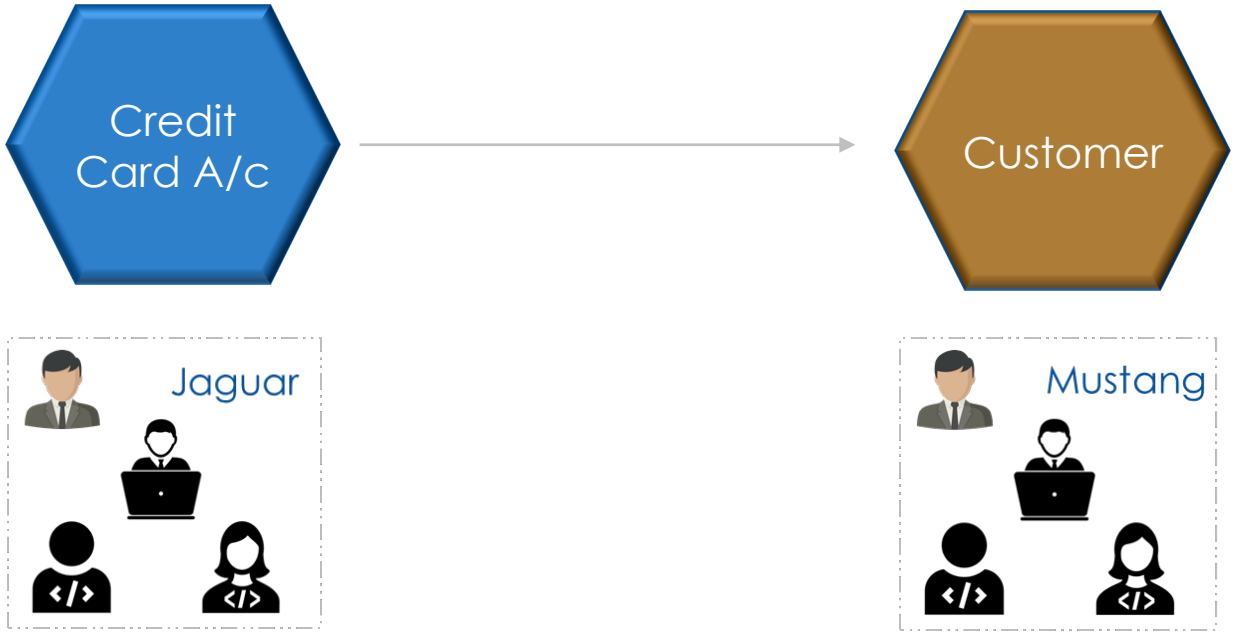
Translates to Microservices dependencies





Bounded Context - Dependencies

Translates to Microservices dependencies



Loss of agility

Loss of Team's ability to operate independently

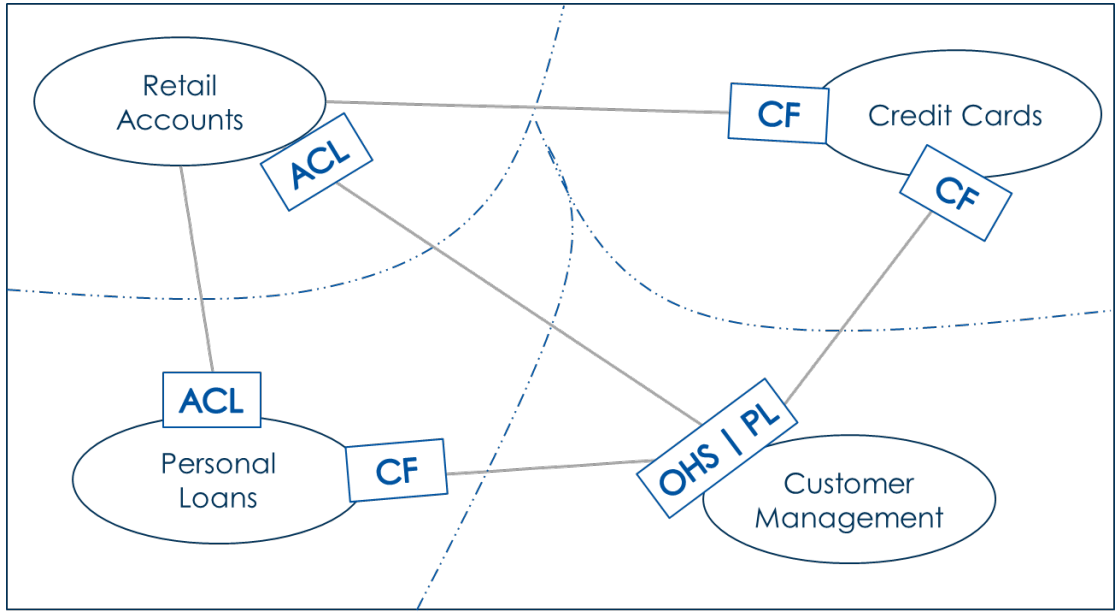
Manage the BC Relationships

Microservices teams use DDD patterns

- Remember "Big Ball of Mud" is an anti-pattern ☺
- Document the relationships using Context Maps

Context Maps

> A visual representation of the system's Bounded Contexts and relationships (a.k.a. integrations) between them



Benefits of Context Mapping

- Easy to understand the big picture
- Helps in understanding the inter dependencies
- Gauge the Level of Collaboration needed between teams
- Helps with refinement of the BCs | models

Quick Review

- Avoid creating *Big Ball of Mud*
- Use well defined relationship patterns in your models
- Document the relationships using Context Maps

Symmetric Relationship

Independent | Interdependent Bounded Contexts

1. Separate Ways
2. Partnership pattern
3. Shared Kernel

No Relationship between BCs

The BCs are truly *Independent* of each other

Teams work autonomously

Opportunity to Re-use may exist but "*loss of autonomy*" is a concern !!!

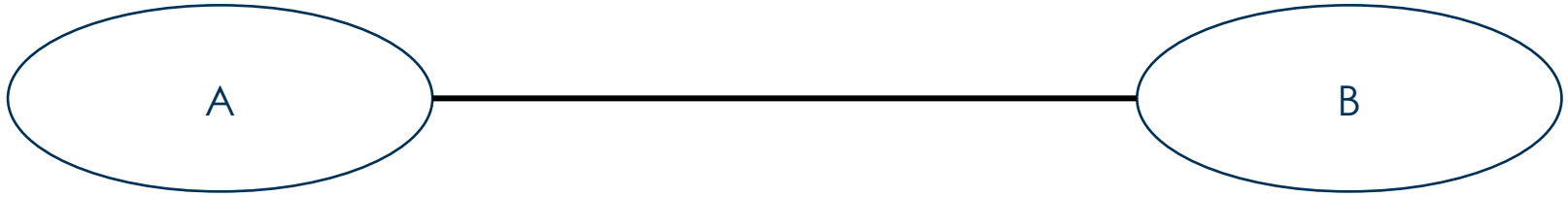
Separate Ways Pattern

Independent applications | services for the BCs

Teams work at their own pace to meet the business goals !!!

Symmetric Relationship | Bidirectional Dependency

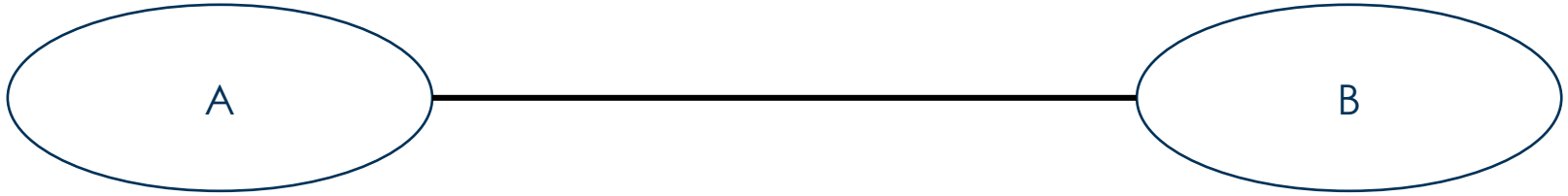
The BCs are dependent on each other



High levels of COUPLING between the BCs

Partnership Pattern

Translates into Microservices that have mutual dependencies

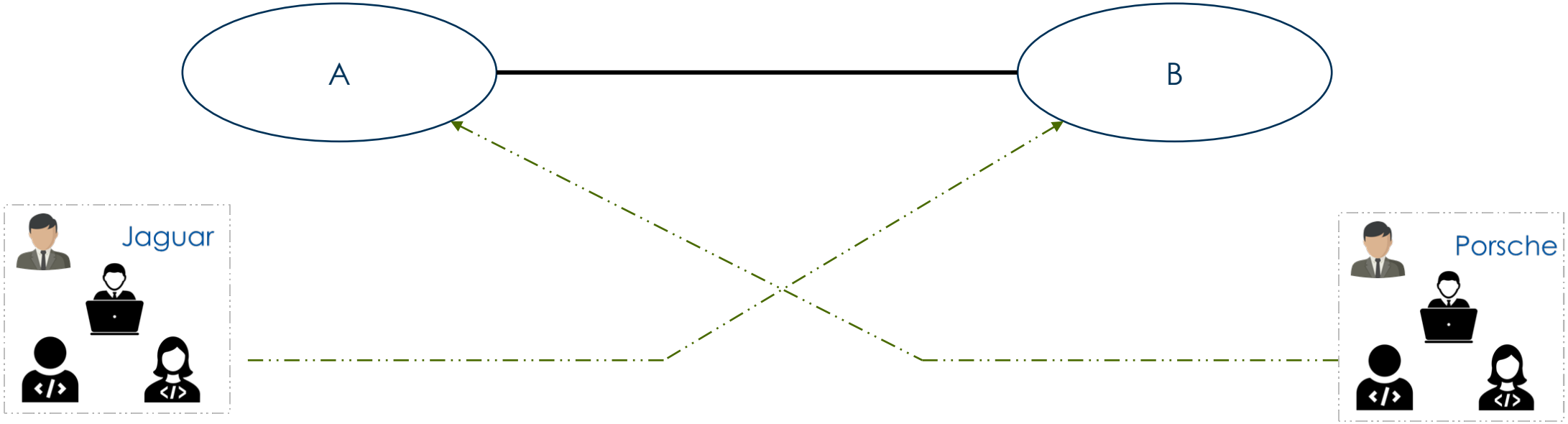


Teams Depend on each other

Teams are no more independent ☹

Partnership Pattern

Translates into Microservices that have mutual dependencies

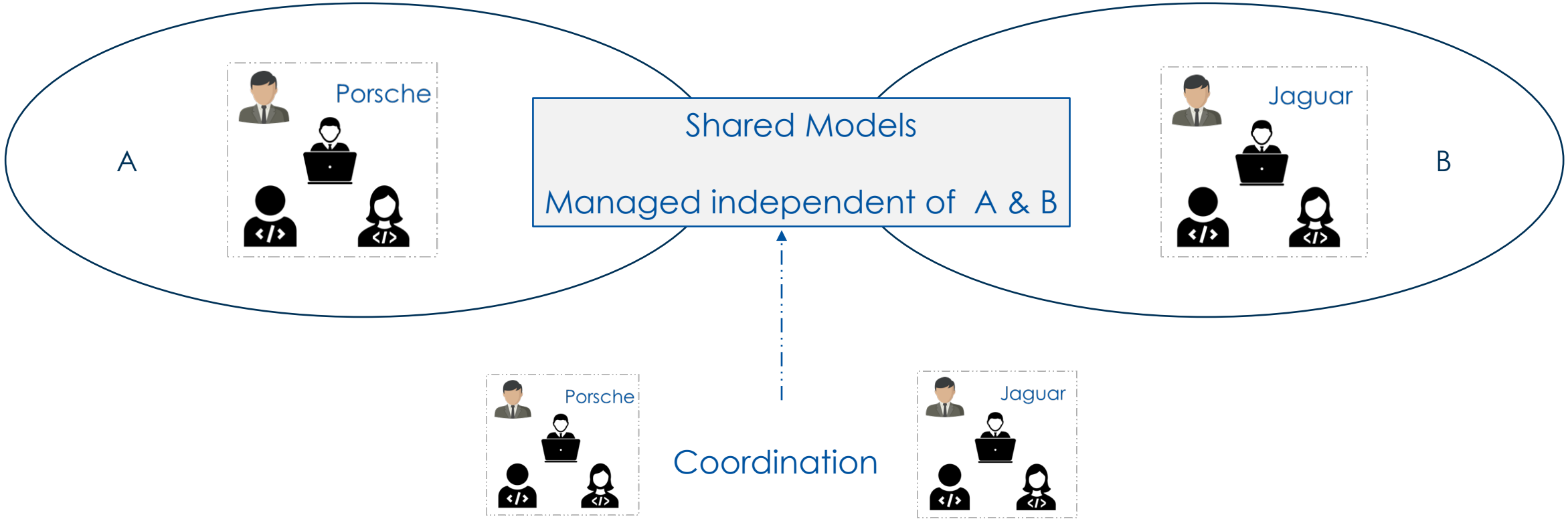


Learn Business Models & Ubiquitous Language!!

Teams are no more independent ☹

Solving to Partnership

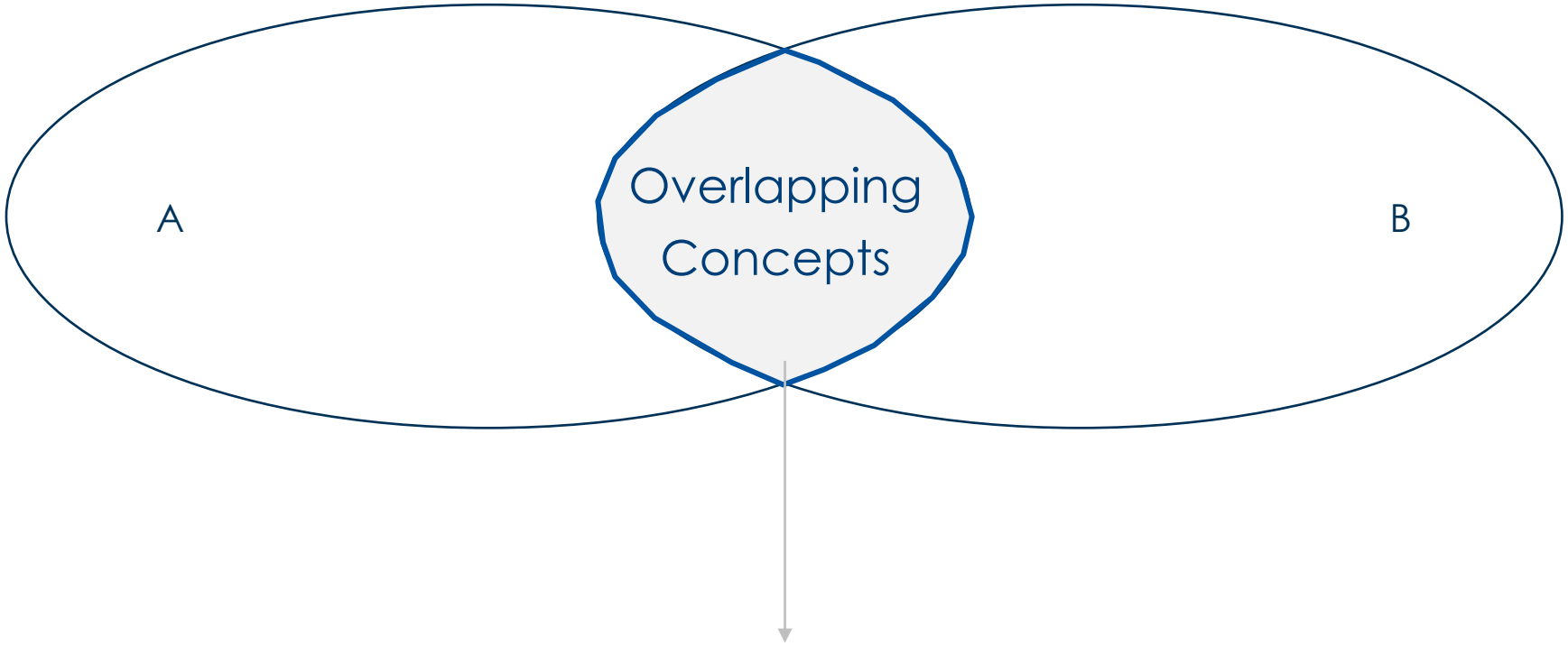
Demarcate the boundaries for shared models



Shared Kernel Pattern

Pattern: Shared Kernel

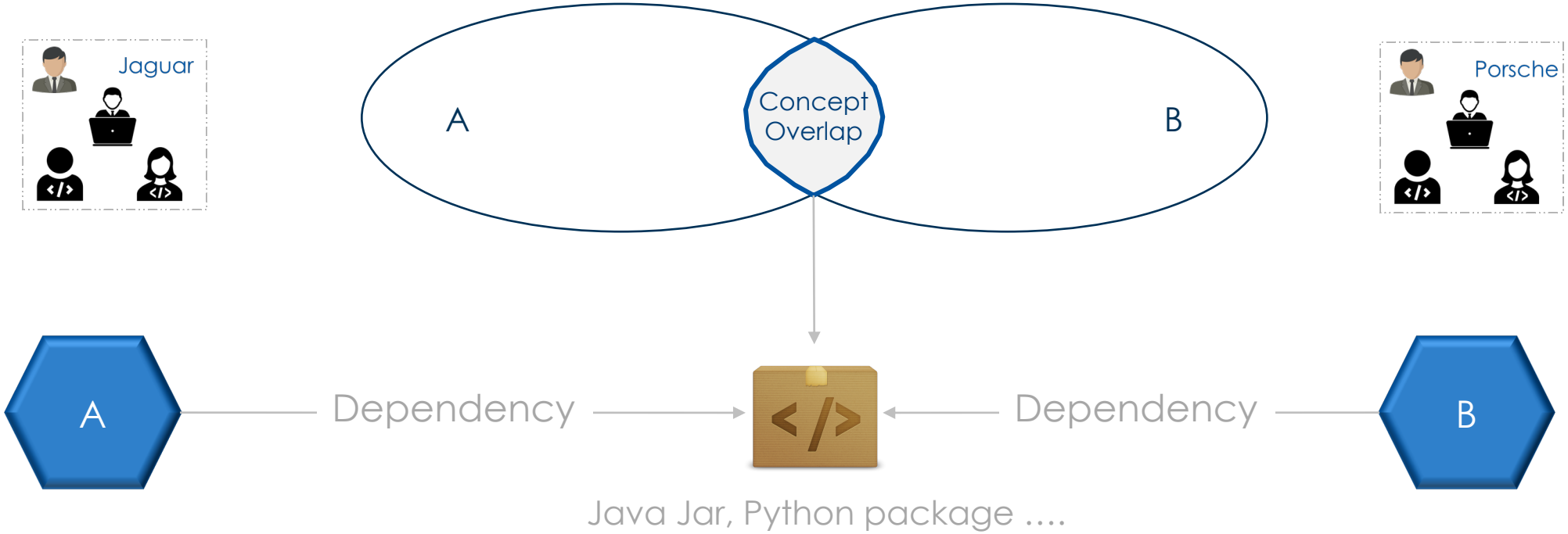
Create a common model for the overlapping concepts



Shared domain model & business language for 'A' and 'B'

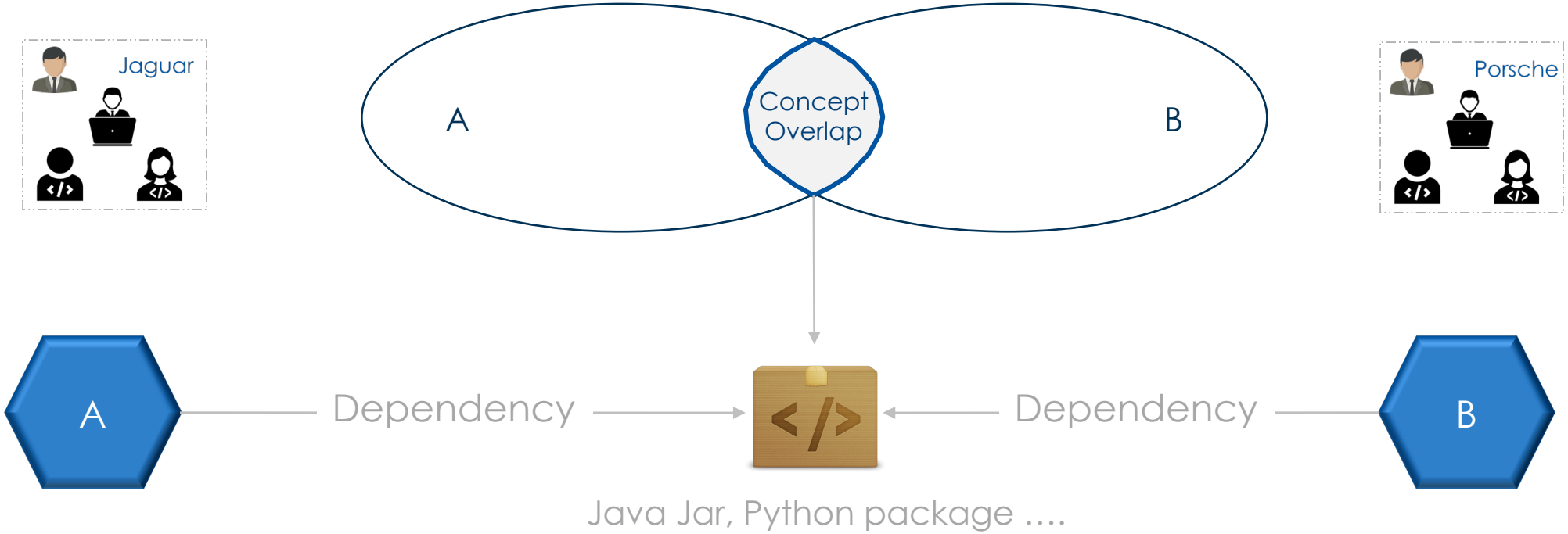
Shared Kernel Realization

May be implemented as a shared library



Shared Kernel Realization

May be implemented as a shared library



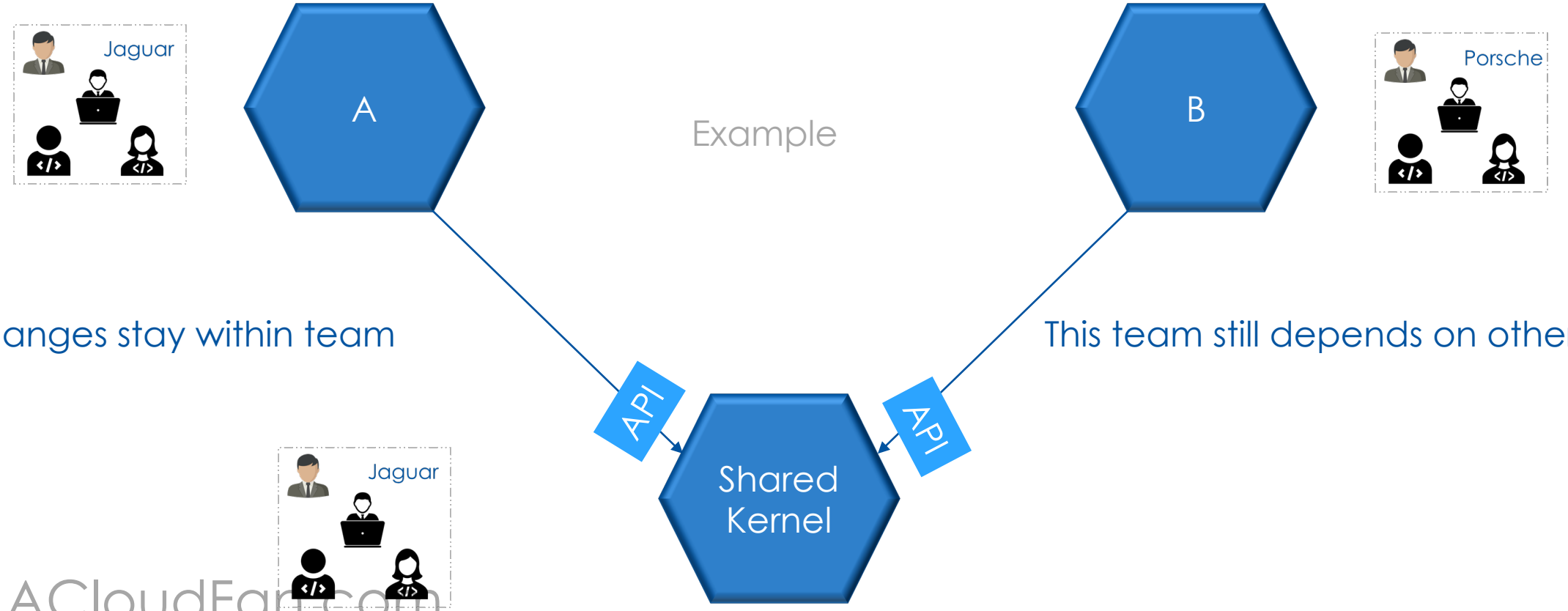
Shared Kernel Management

OK for a small library - small set of shared concepts

Difficult to maintain the integrity of the boundaries of the Bounded Contexts

Shared Kernel grown too big?

Consider extracting the kernel as separate BC



Quick Review

Separate Ways	Teams can work on BC independently
Partnership	Teams MUST coordinate to make changes
Shared Kernel	Coordination needed ONLY for making changes to the shared components

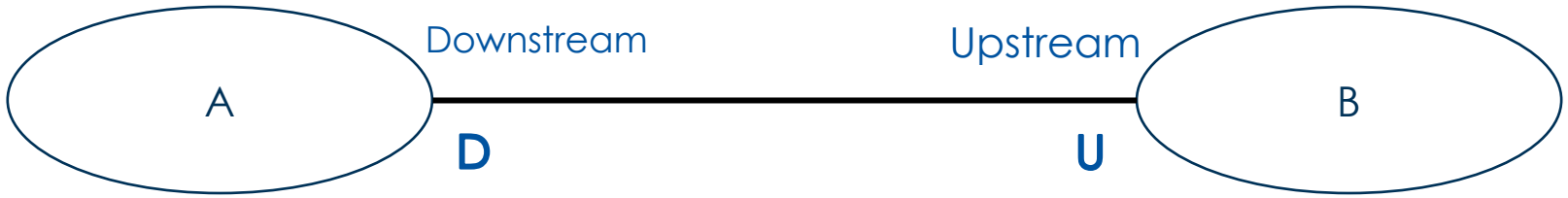
Asymmetric Relationships

One Bounded Context depends on the other

1. BC Roles : Upstream & Downstream
2. Customer-Supplier Pattern
3. Conformist Pattern
4. Anti Corruption Layer Pattern

Asymmetric Relationship | Unidirectional Dependency

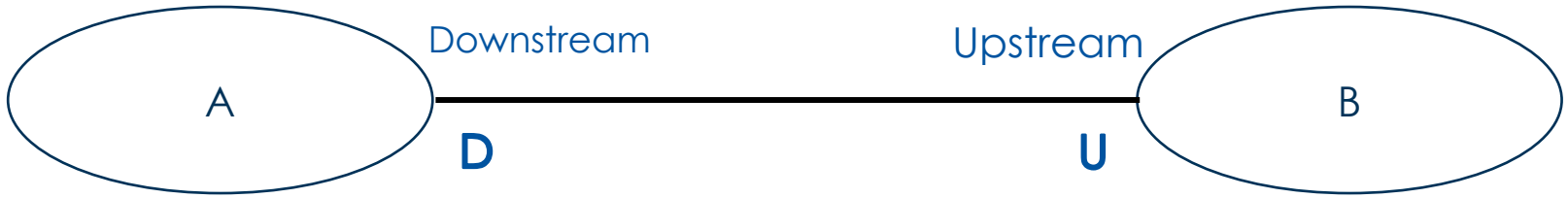
One BC depends on another BC



Bounded Context A has knowledge of models in Bounded Context B

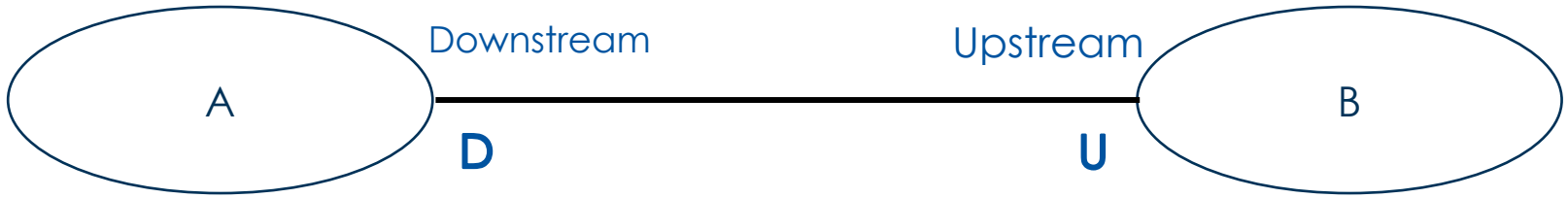
NOTE: Does NOT indicate the flow of data or information

Functionality



Upstream BC exposes functionality & models that are consumed by the Downstream BC

2 Possibilities



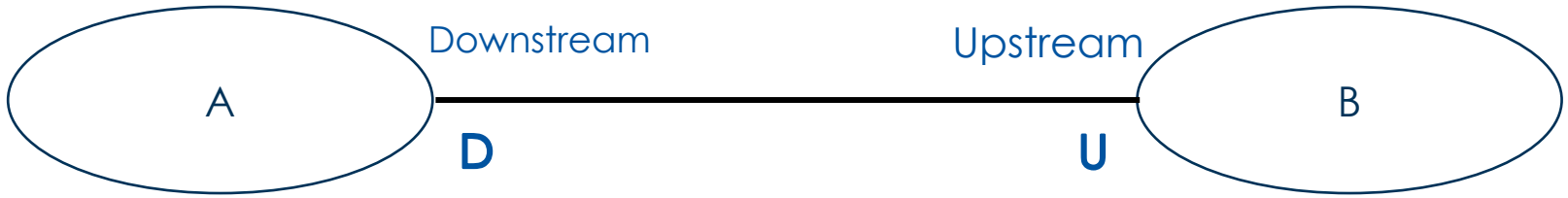
1

Upstream BC exposes models based on needs of Downstream BC

2

Upstream BC exposes models with NO consideration to needs of Downstream BC

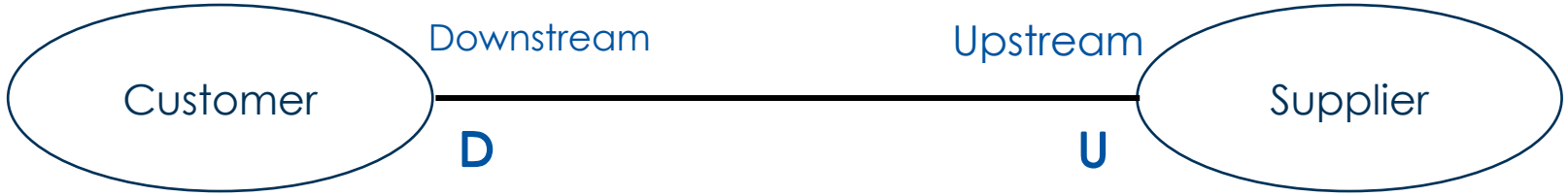
BC Roles: Upstream & Downstream



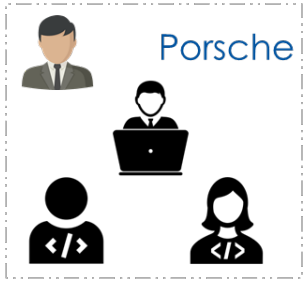
1

Upstream BC fulfils some specific needs of Downstream BC

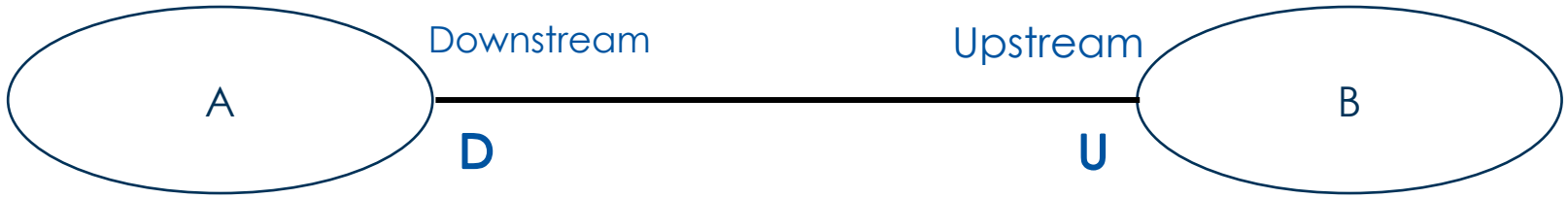
Customer-Supplier Pattern Realization (example)



Supplier adjusts to fulfil needs of the customer



Downstream accepts Upstream models



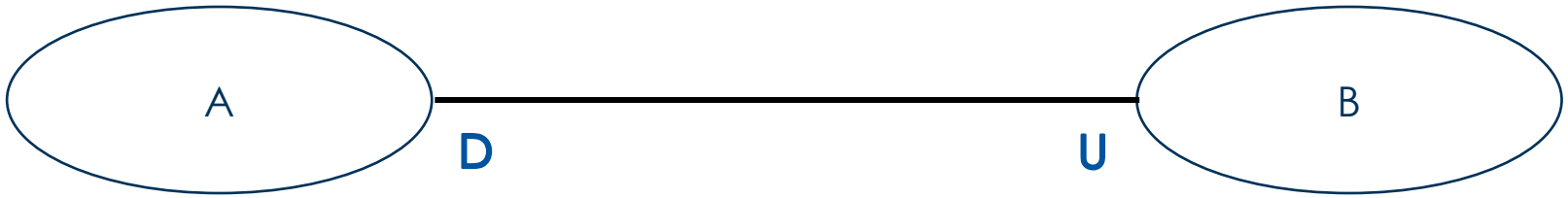
2

Upstream BC exposes models with no regard to ANY Downstream BC

Downstream BC accepts models exposed by Upstream BC

Conformist Pattern

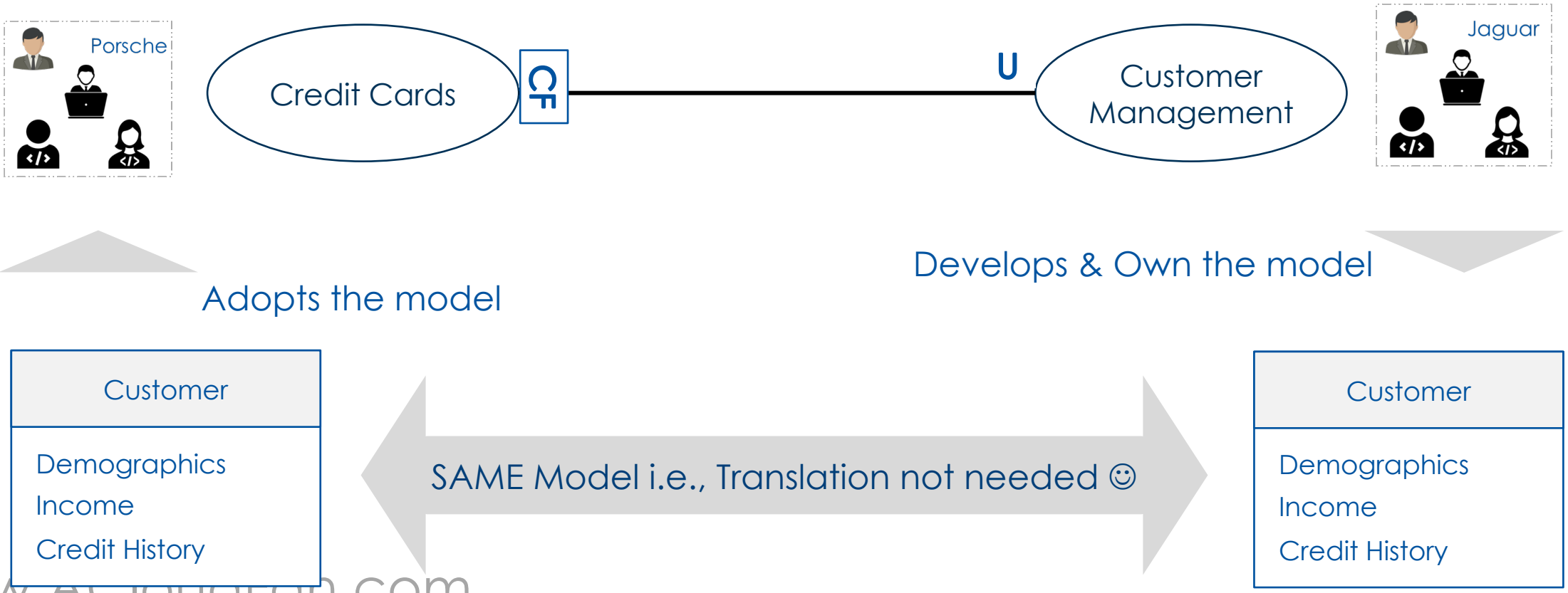
Downstream BC conforms to the Upstream BC Models



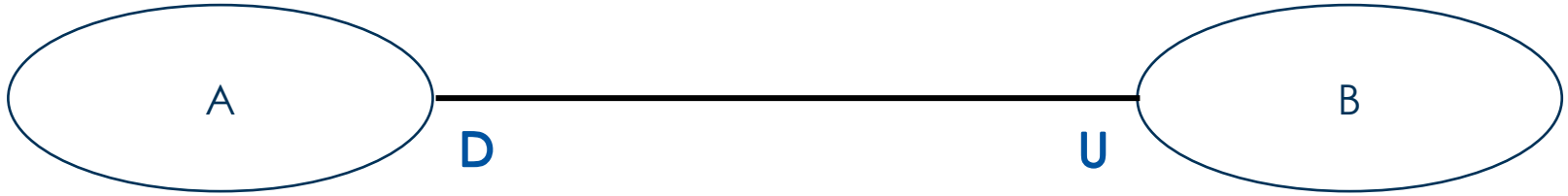
Depicted by using CF on Downstream

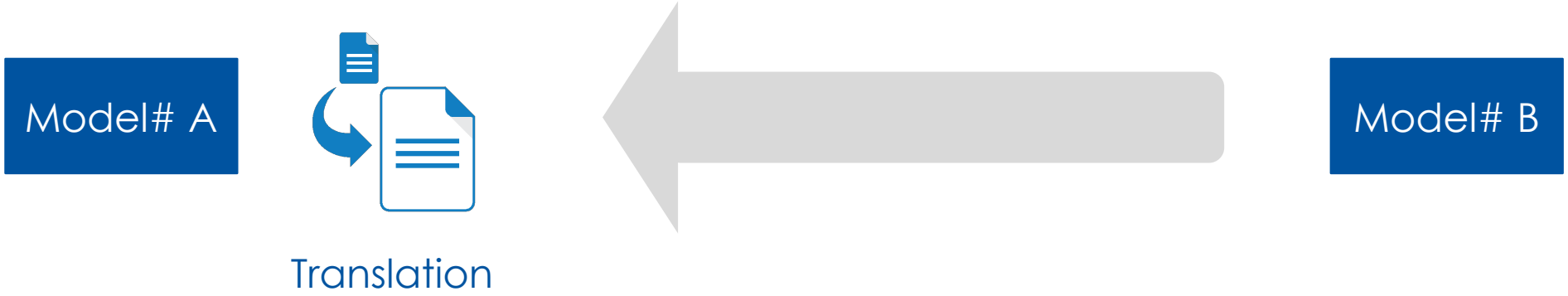
Conformist Pattern (Example)

Same model in use in both the BCs



What if Downstream is NOT Conformist?

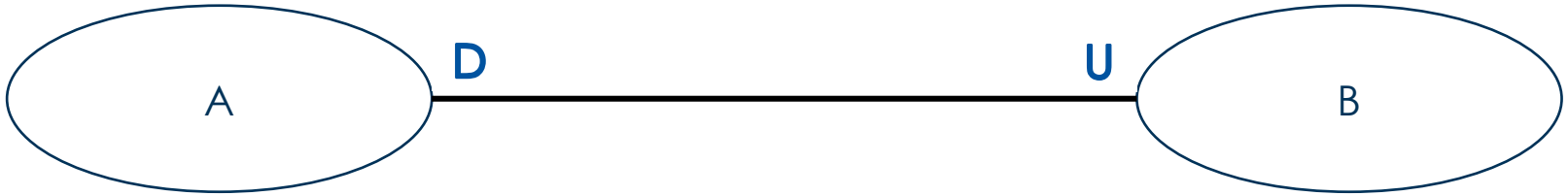




Downstream BC isolates the translation logic in a separate layer

Anti Corruption Layer - Pattern

Protect the BC from corruption

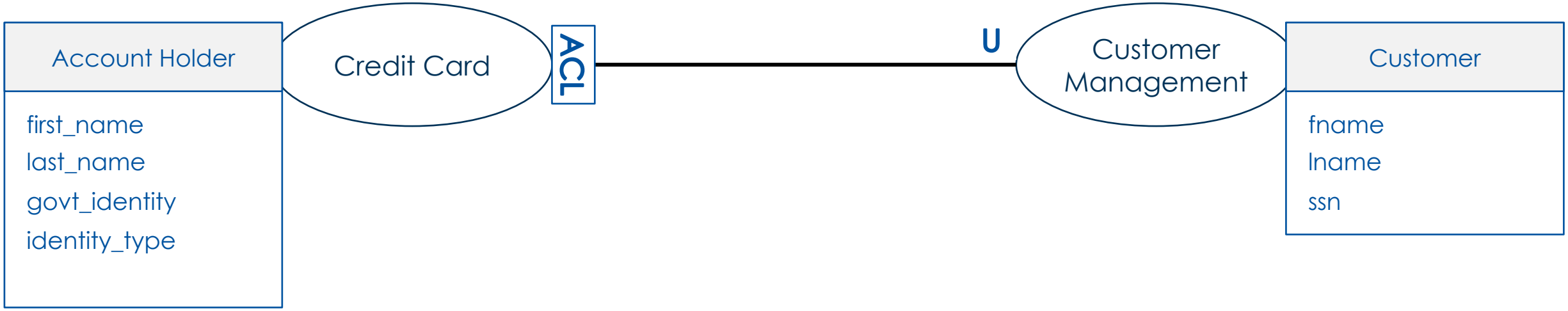


Depicted by using ACL on Downstream

Downstream BC uses ACL to translate the Upstream Models

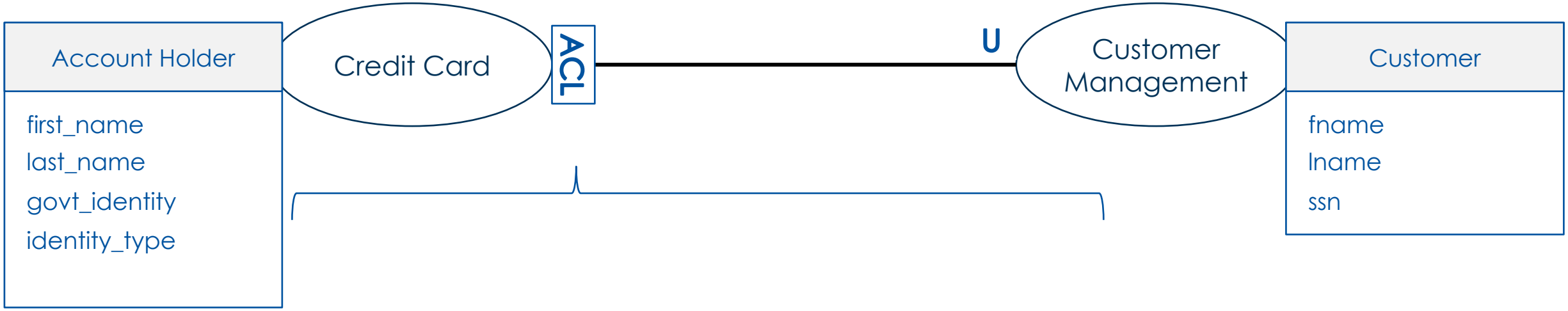
ACL Pattern (Example)

ACL translates from upstream model to downstream model



ACL Pattern (Example)

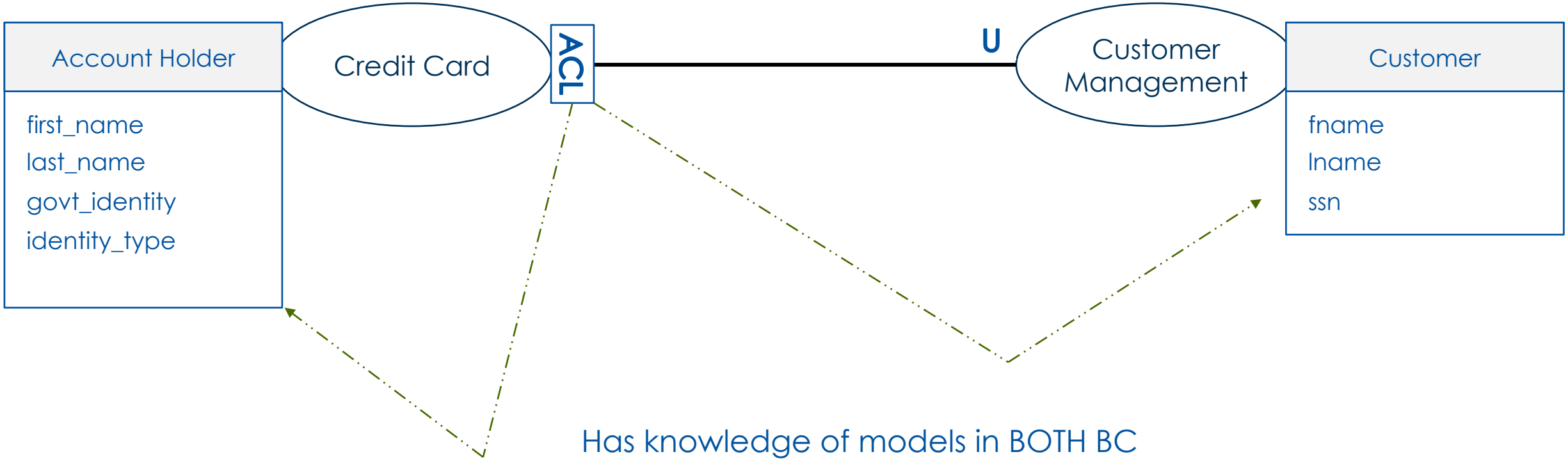
ACL translates from upstream model to downstream model



= "ssn"

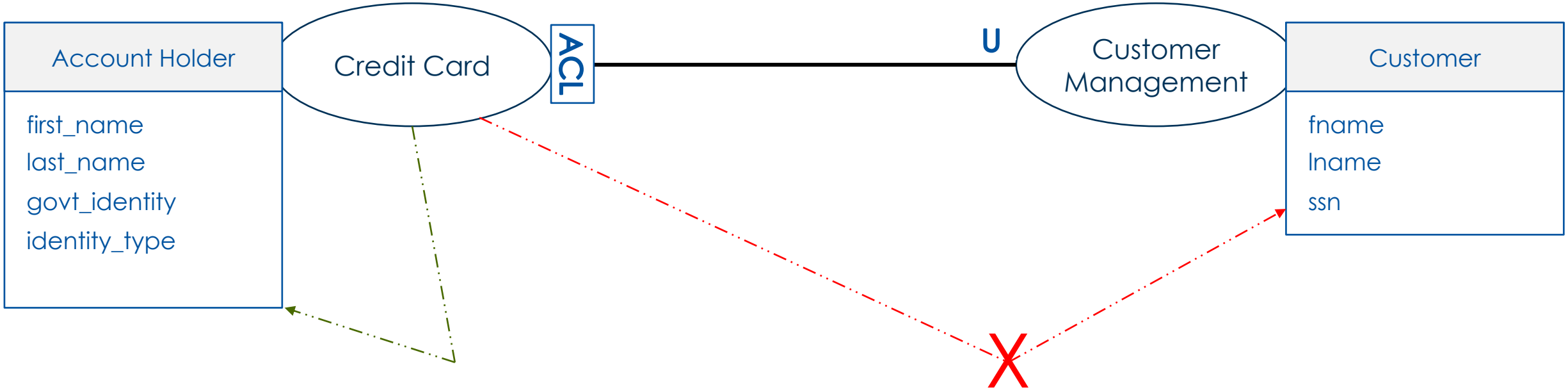
ACL Dependencies

ACL has knowledge of BOTH BC models



Downstream BC Dependencies

Downstream BC has NO knowledge of Upstream BC Model



Has knowledge of its own models

Has knowledge NO Knowledge of Upstream models

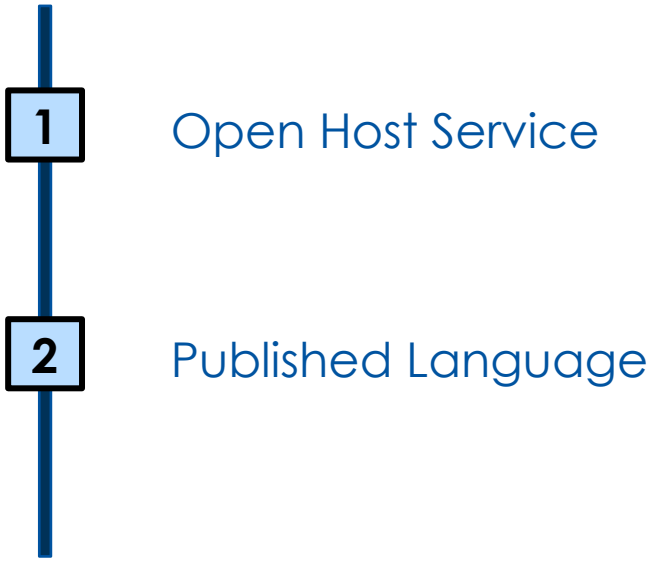
Downstream protected from Upstream changes by way of ACL

Quick Review

Asymmetric Relation	Downstream BC depends on the Upstream BC
Customer-Supplier	Upstream BC adjusts to the needs of Downstream BC
Conformist	Downstream conforms to the Upstream Models Upstream has no knowledge of Downstream
ACL	Protects the Downstream from Upstream i.e., model translation isolated to the ACL layer

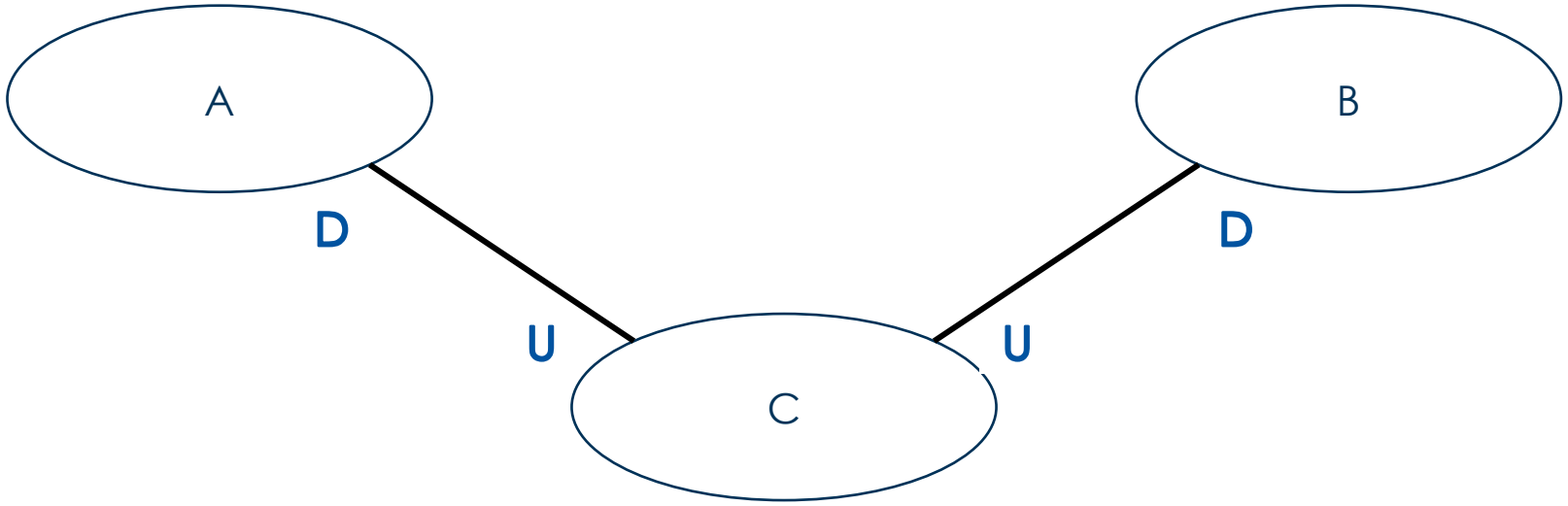
One to Many Relationship

Multiple Bounded Contexts depend on one Bounded Context



One to Many Relationship

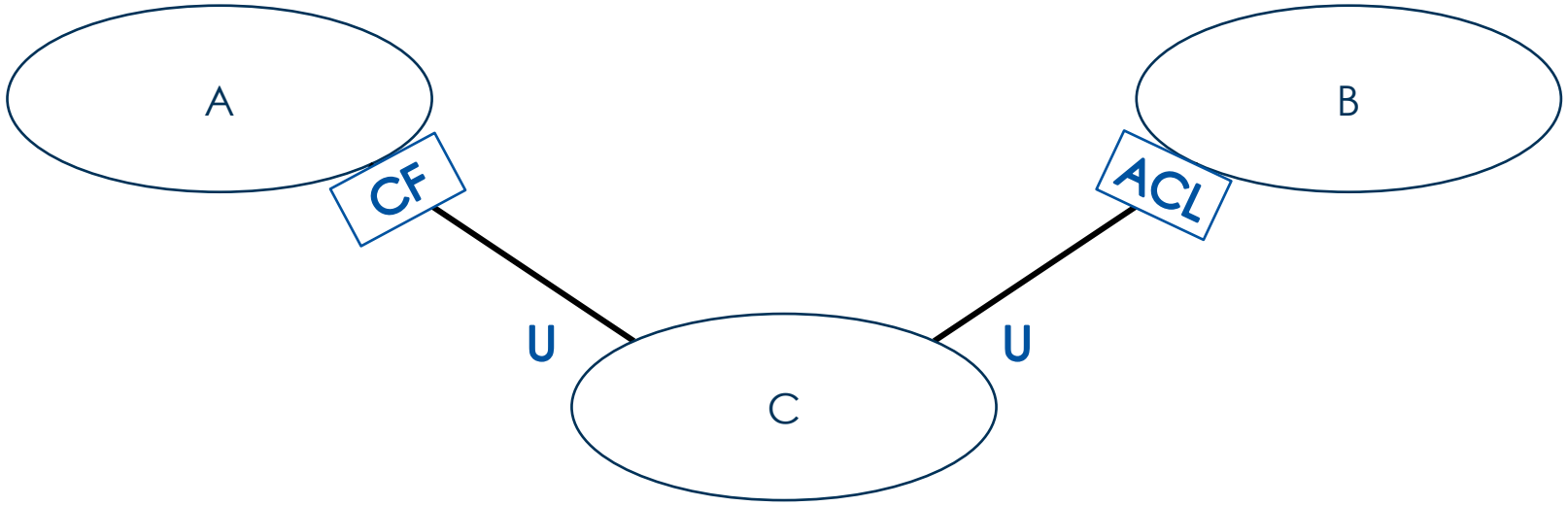
Upstream provider offers common services to other BC's



The Upstream provides common integration model for all Downstream(s)

One to Many Relation

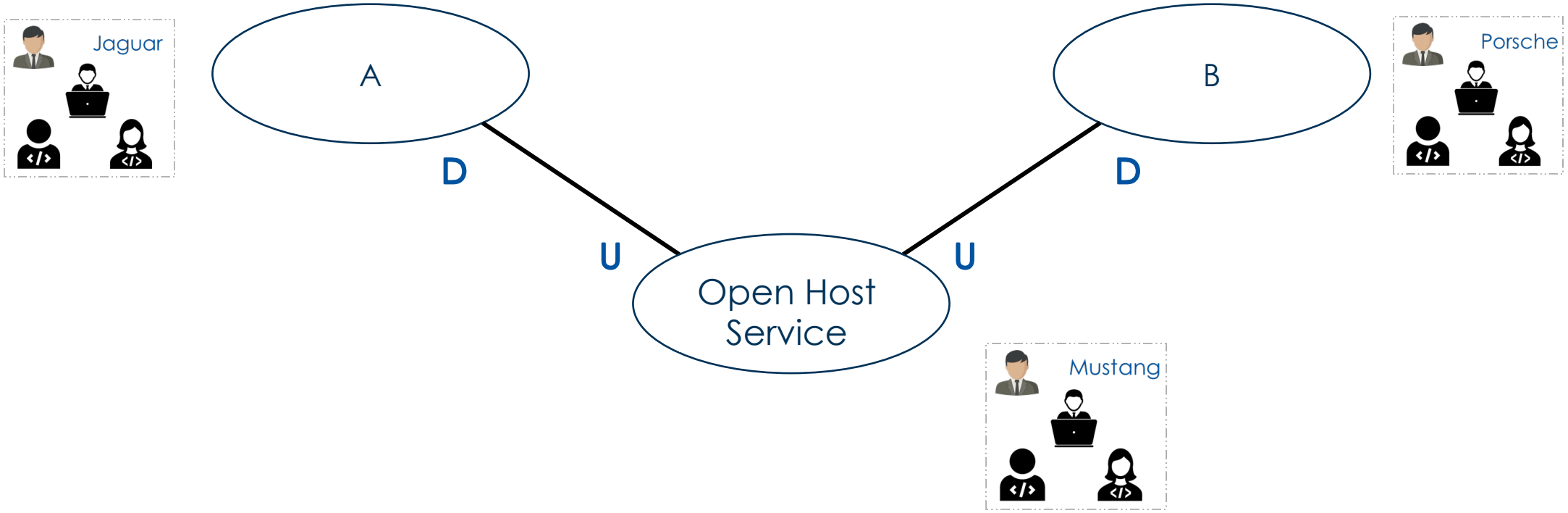
Downstream may *Conform* or use *ACL*



Example: A is a Conformist B is using ACL for protection

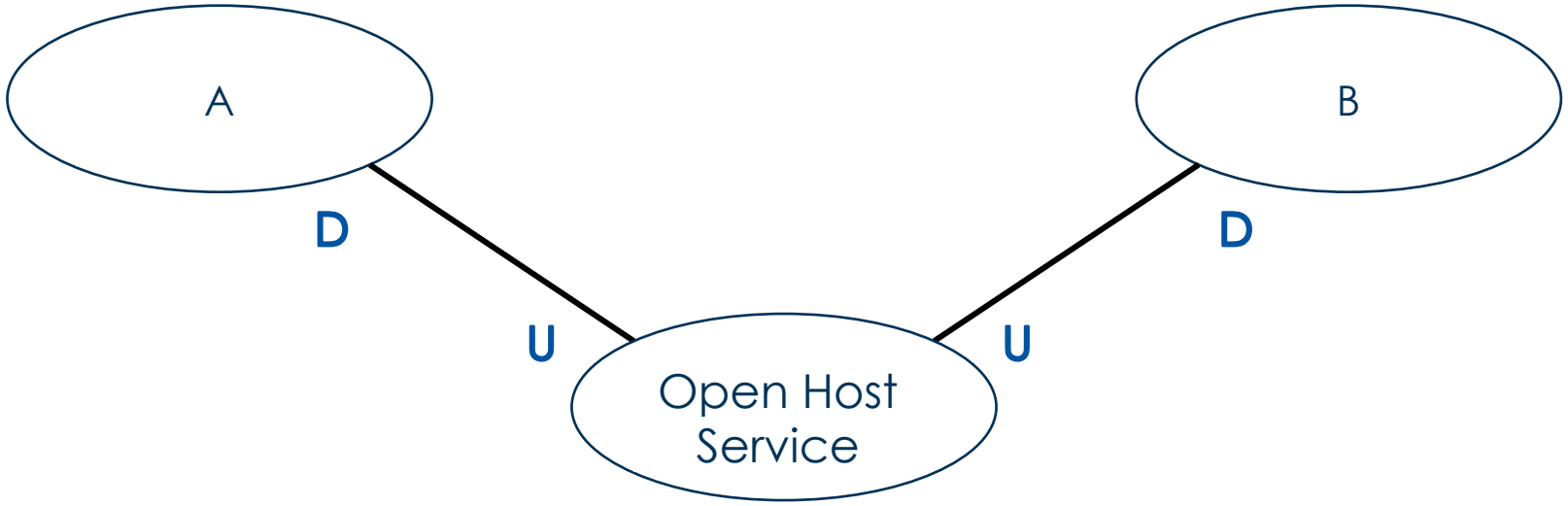
Services Realization

Teams assigned to the BC work independently



Open Host Service - Pattern

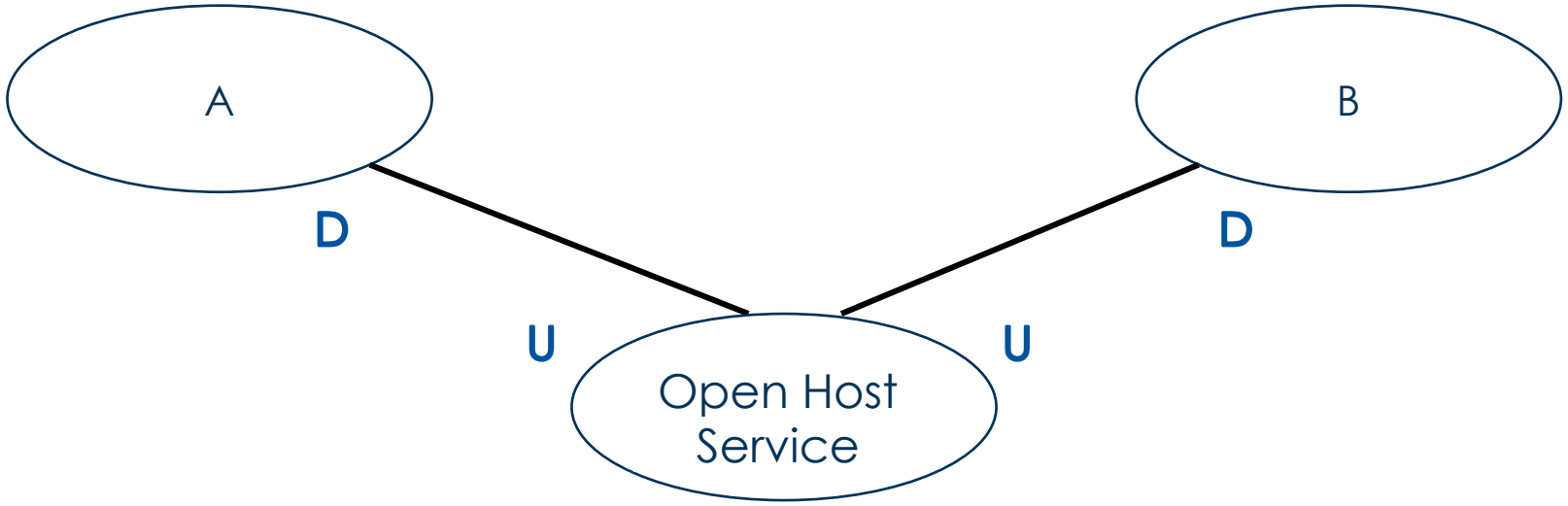
Upstream provides common services to Downstream(s)



Depicted by placing OHS in front of Upstream

Open Host Service - Pattern

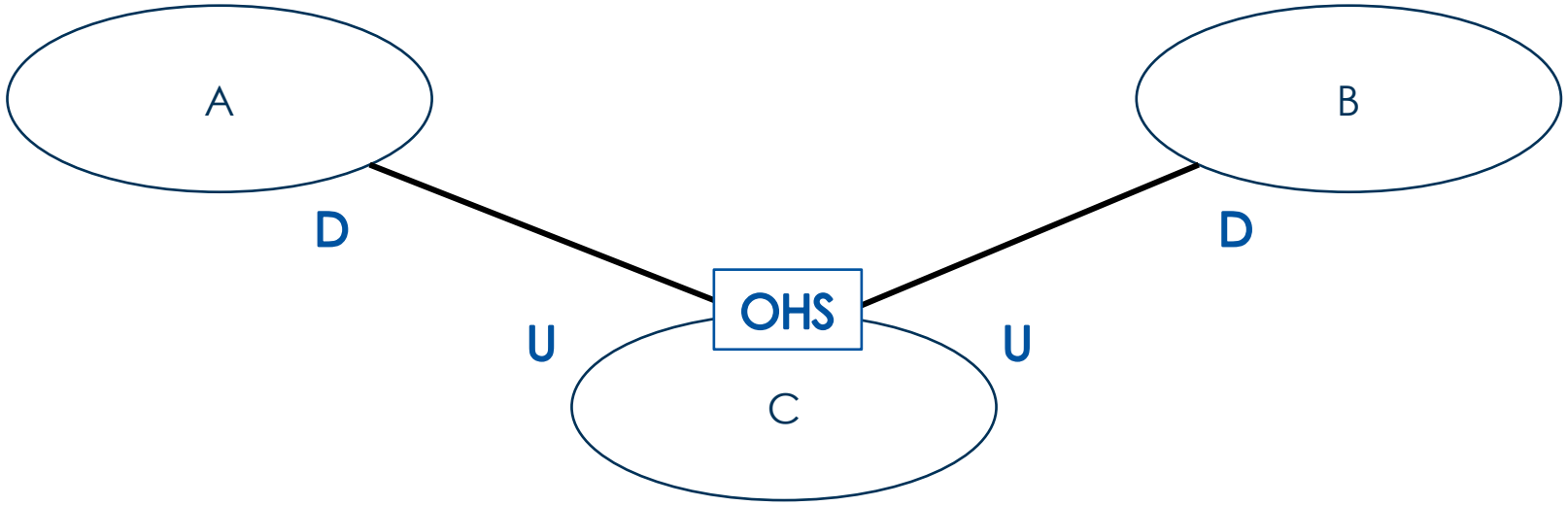
Upstream provides common services to Downstream(s)



Depicted by placing OHS in front of Upstream

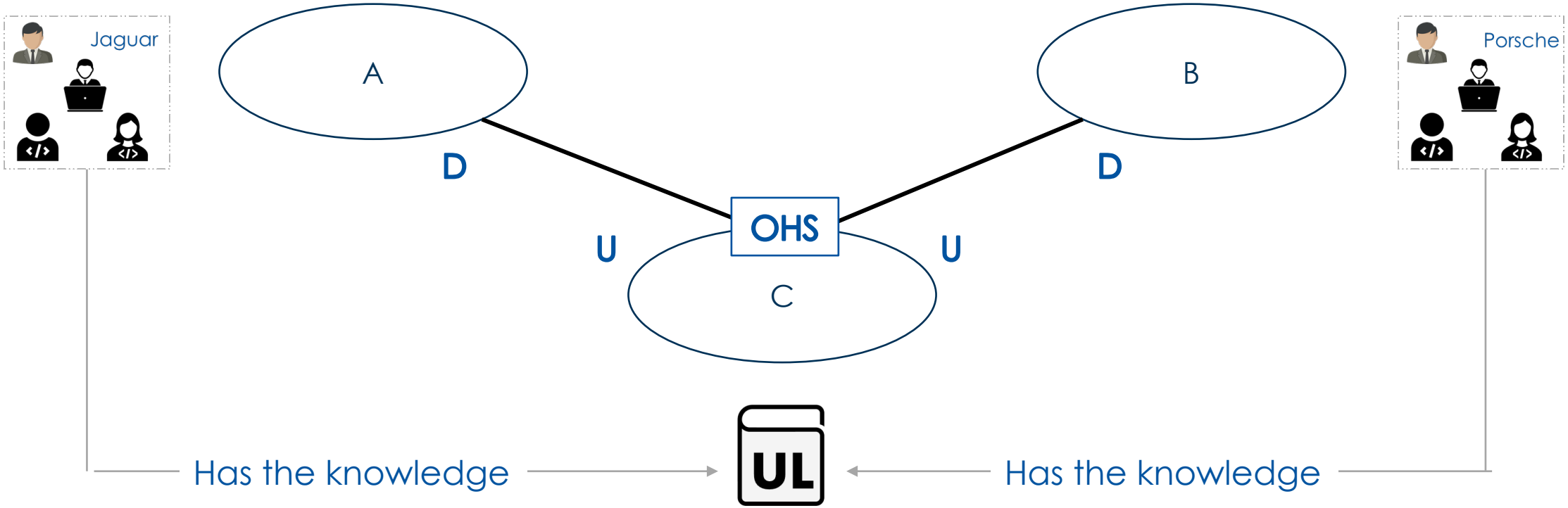
Common Language

OHS publishes a common Language for the Integrations



Common Language

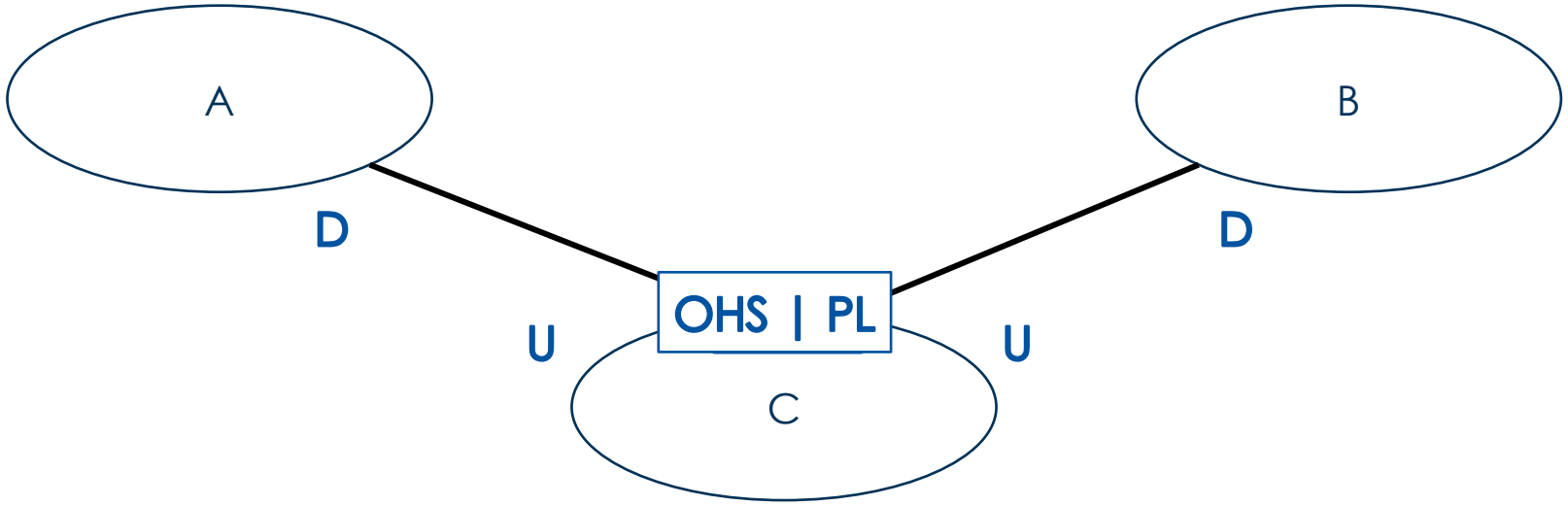
This common language is well accepted by Downstream



Published Language - Pattern

Published Language - Pattern

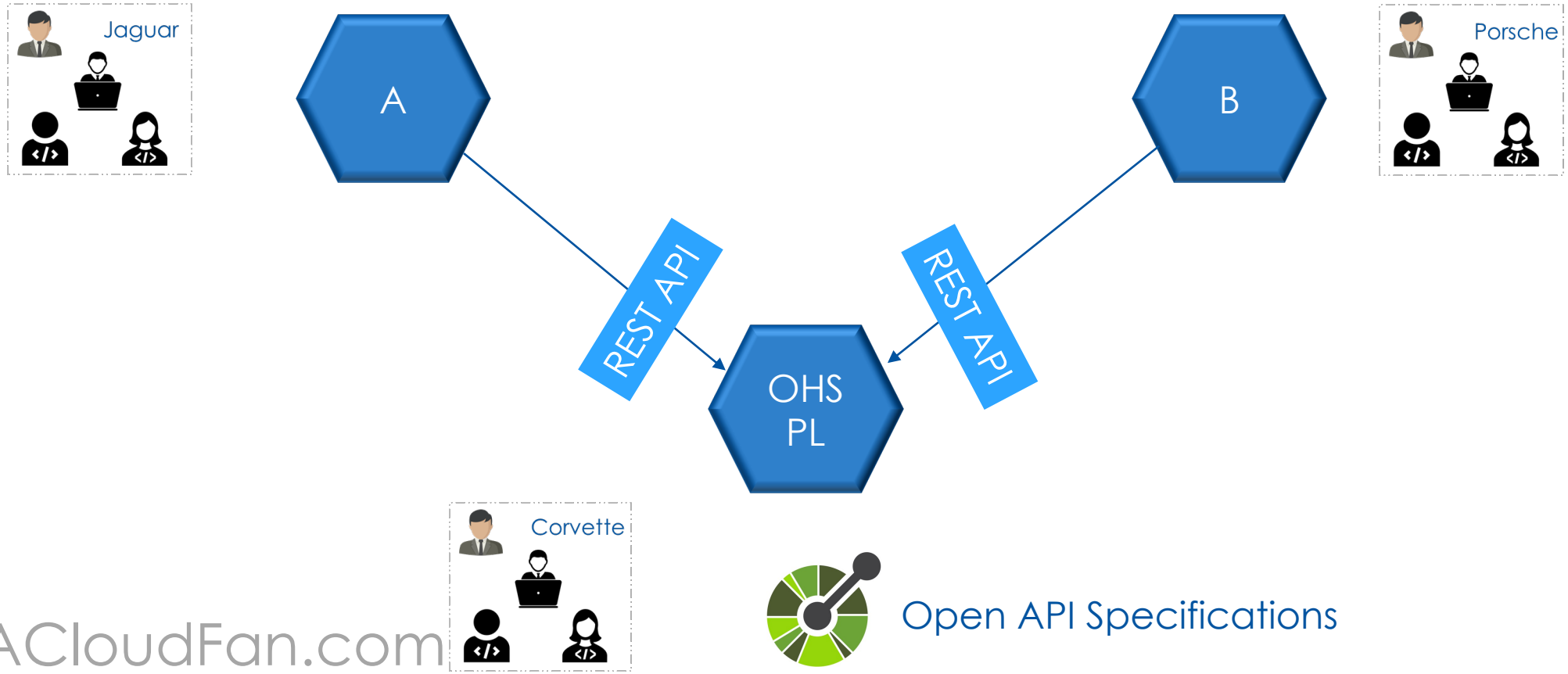
Common Language used by the OHS



Depicted by placing PL in front of Upstream

OHS | PL Realization Example

Functionality exposed by OHS BC is well accepted



Quick Review

Open Host Service (OHS)

Upstream BC exposes common services

Published Language (PL)

Common Language created managed by the team for OHS

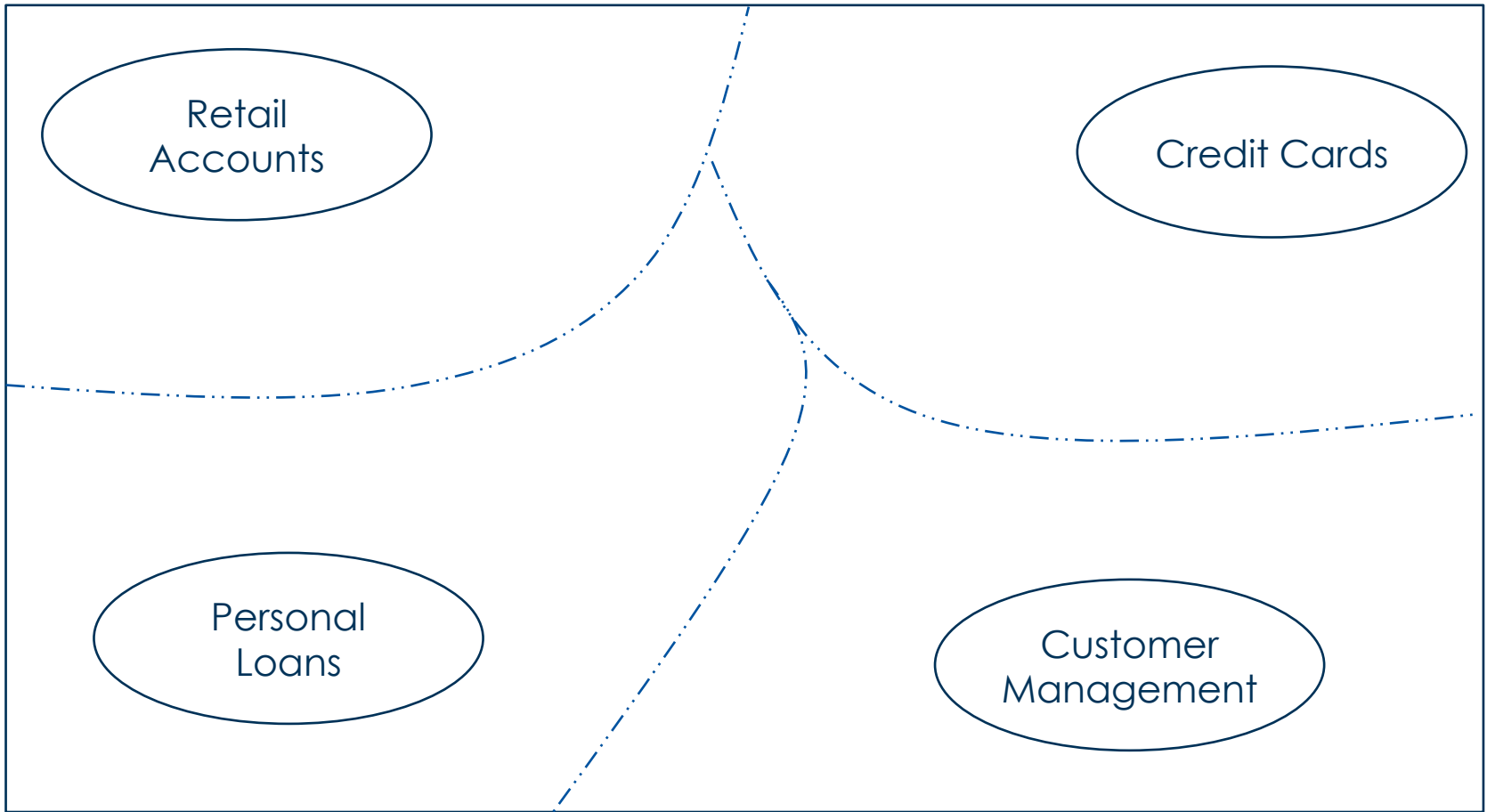
Context Mapping for *Bank*

Context Mapping in Action

1. Setting up the Context Maps
2. Identify the impact of change in one BC on other BC

Use the Bounded Contexts for the Bank

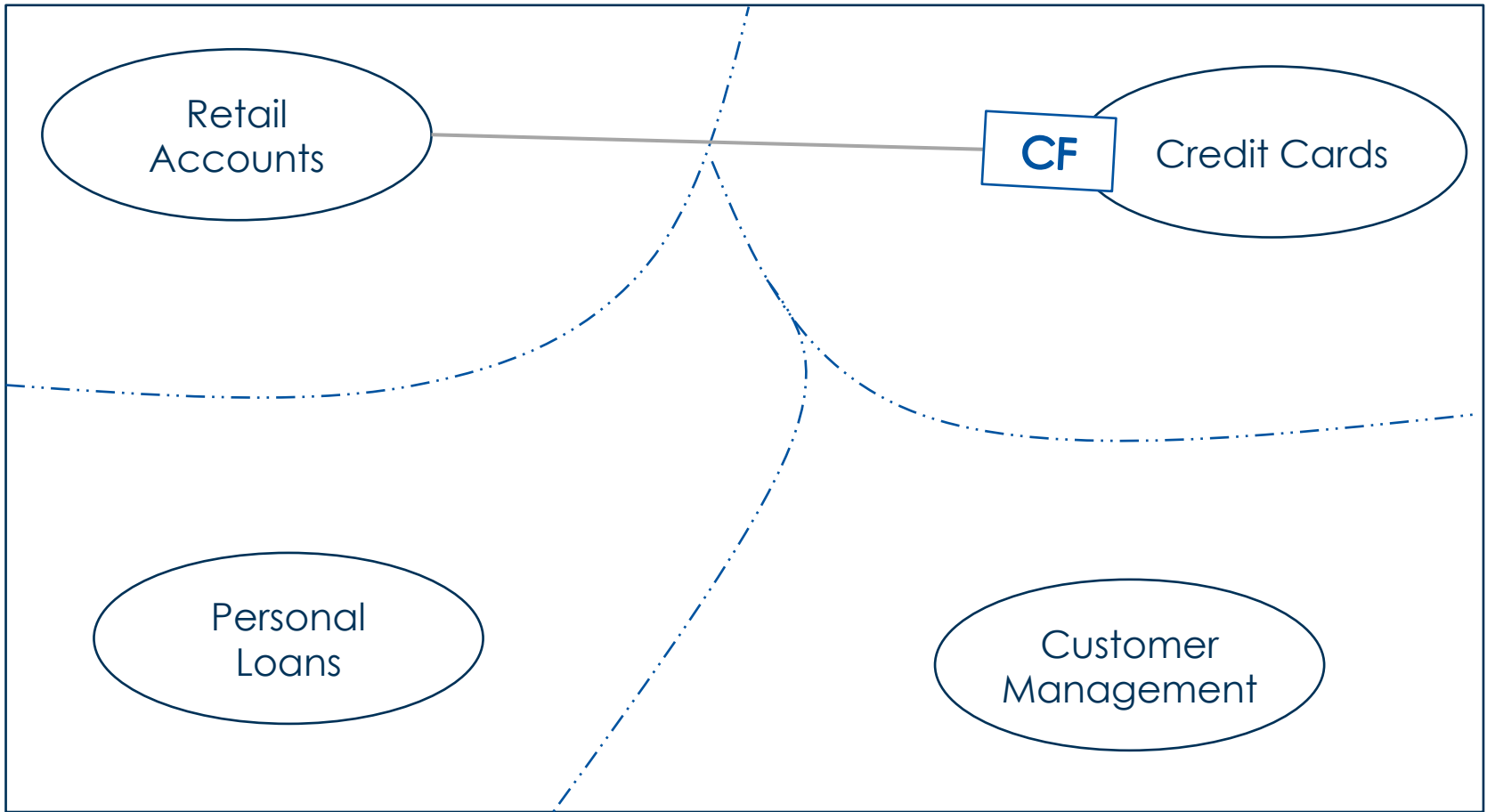
Two Part Exercise



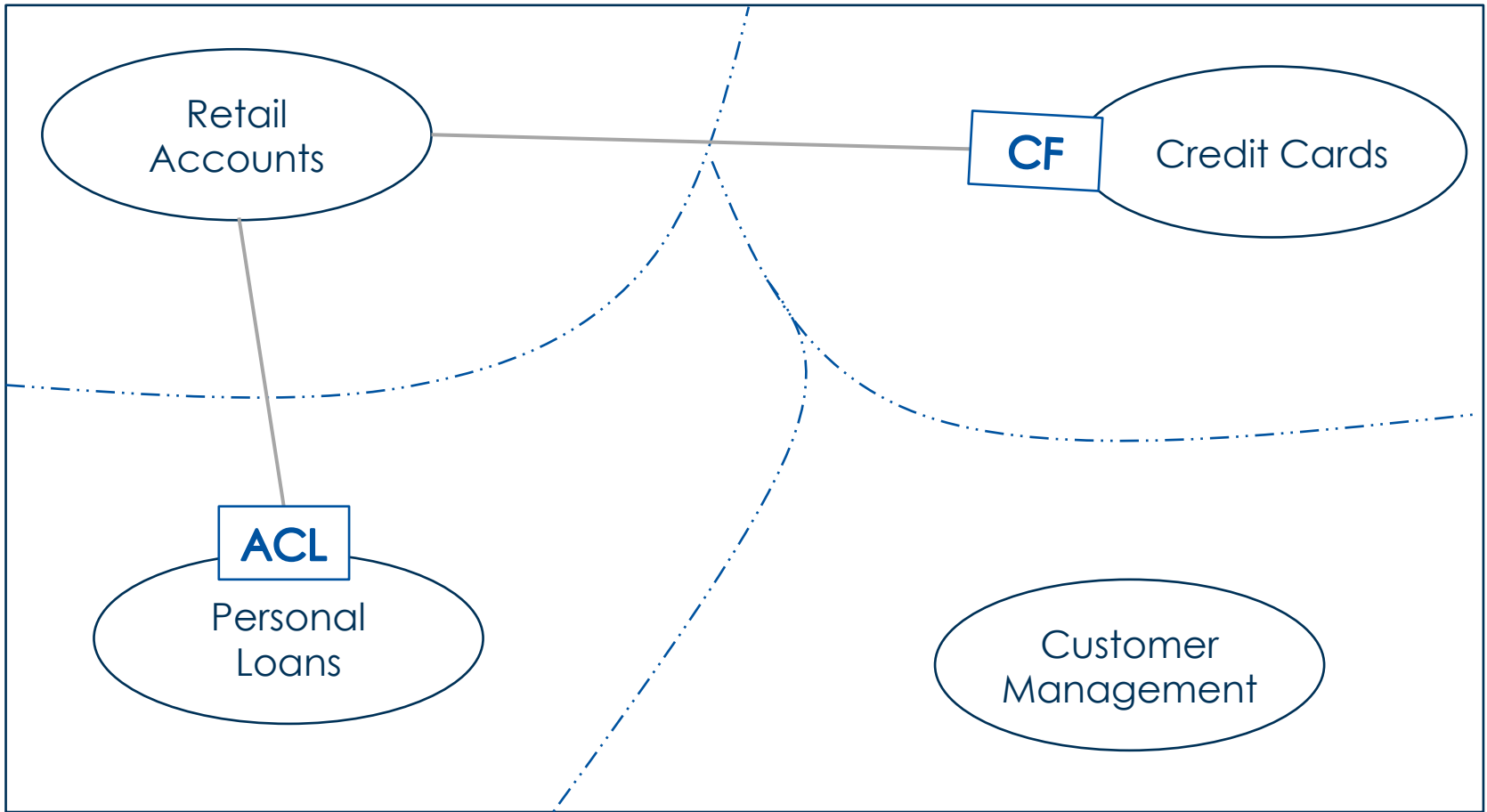
Part - 1

Decide the kind of pattern in use

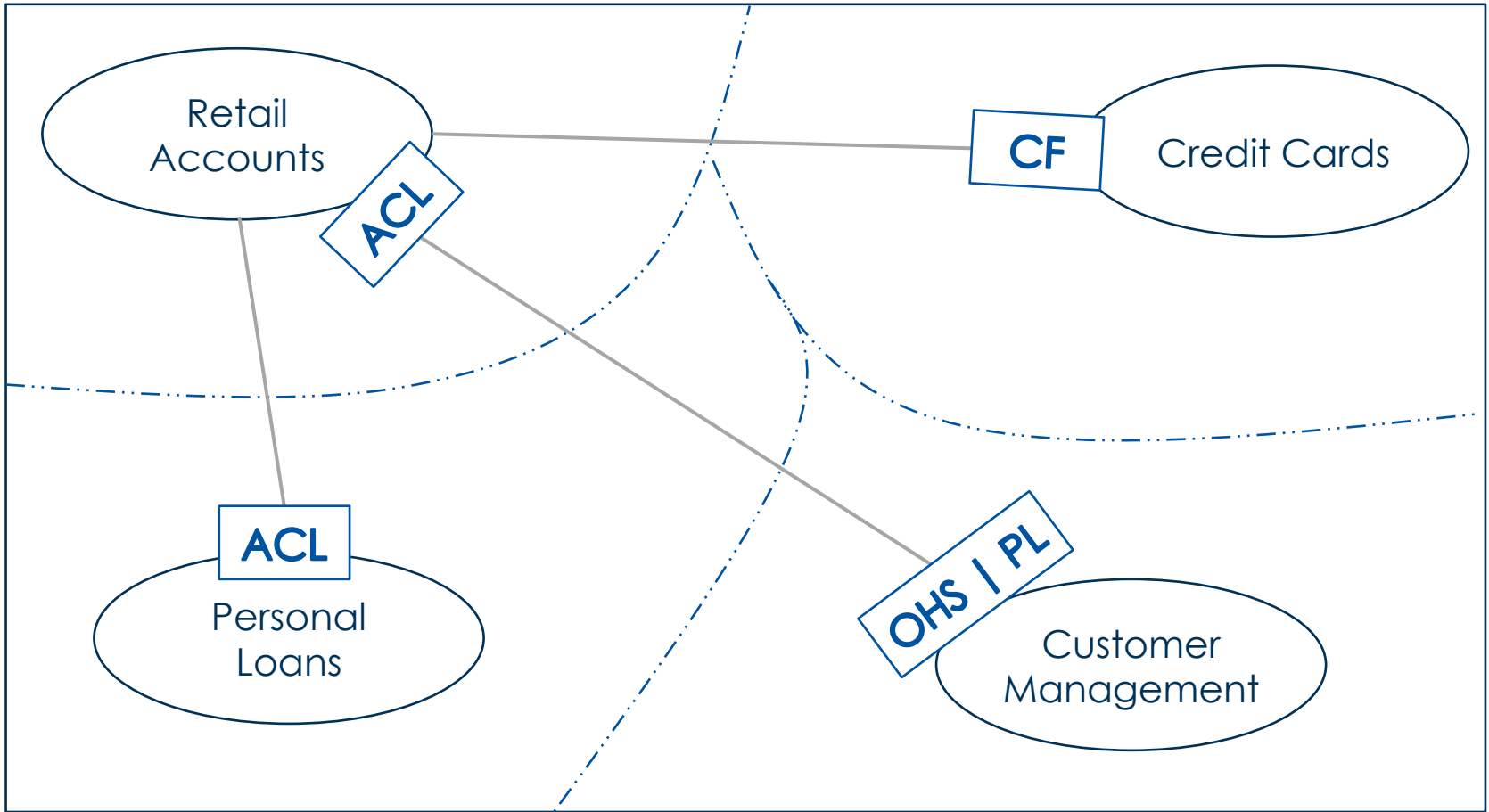
Credit Cards BC depends on Retail Accounts & has decided to accept the models



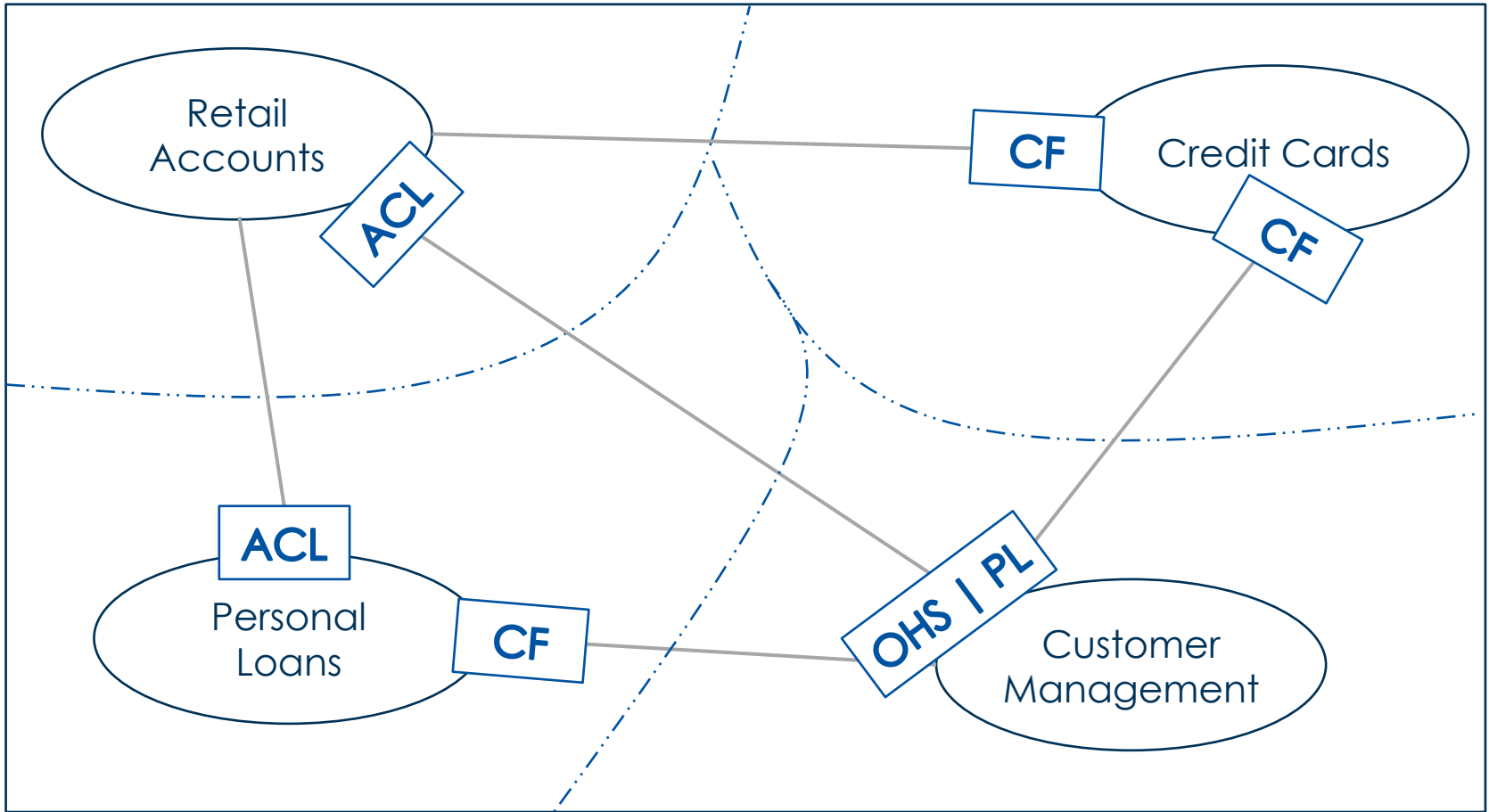
Personal Loans team using the Retail Accounts function but concerned about the use of outside model with their BC



- Customer Management is exposing a common set of services
- Retail Accounts uses the common services with protection



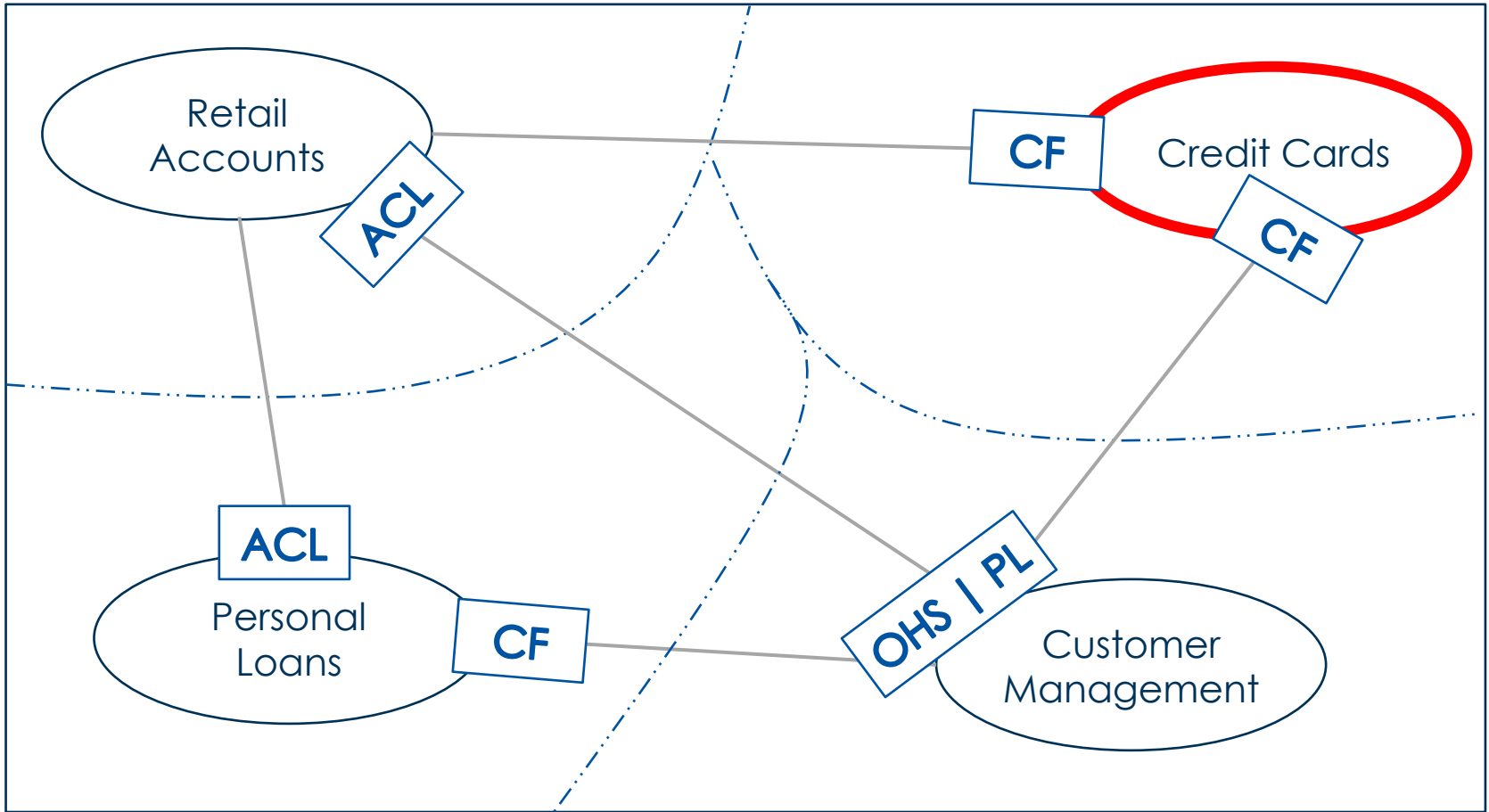
Personal Loans & Credit Cards Teams decided to use the common services & accept the OHS models



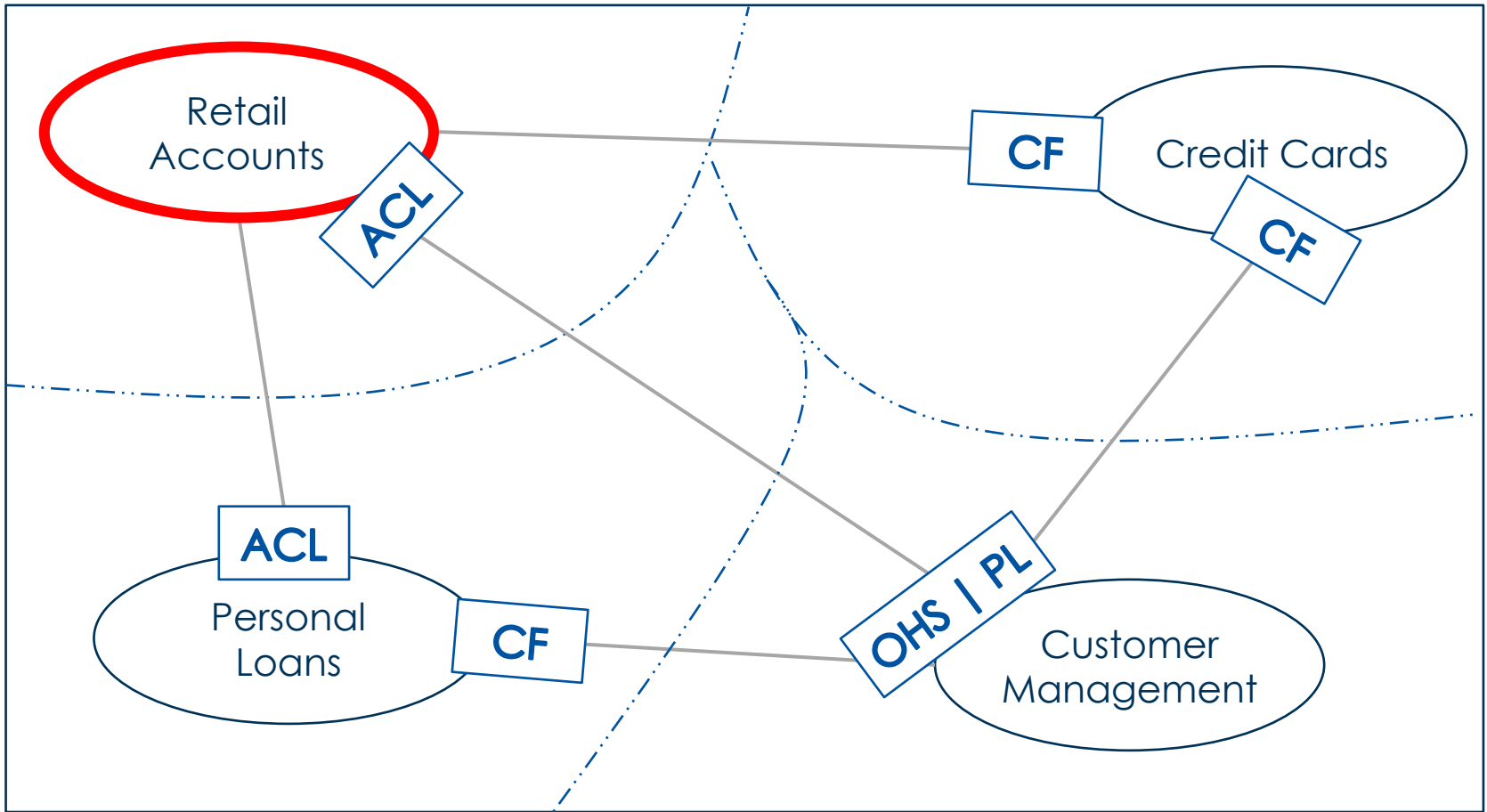
Part - 2

Interpretation of the Context Mapping

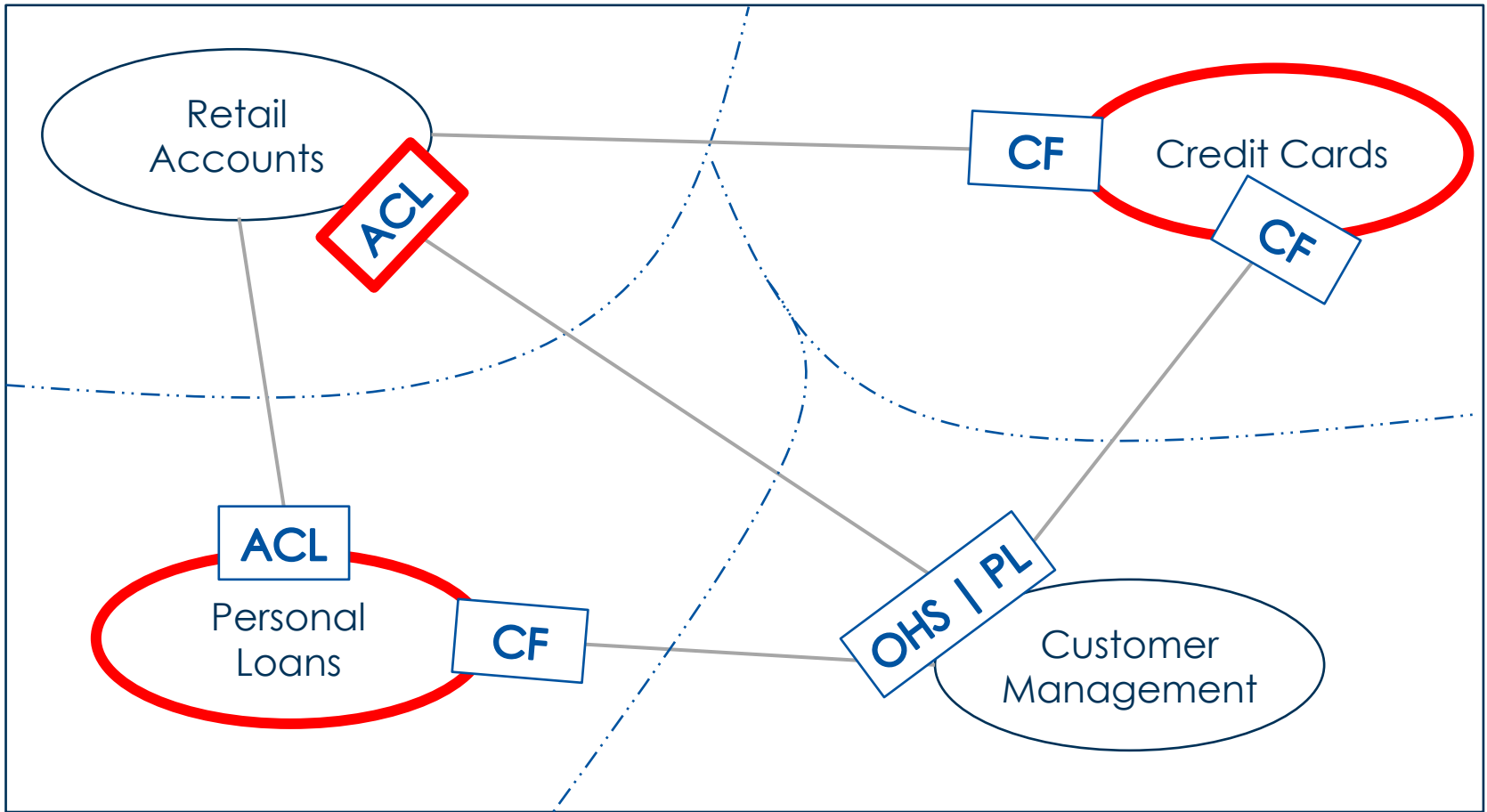
Which BC is expected to be MOST influenced by changes in other BCs? Why?



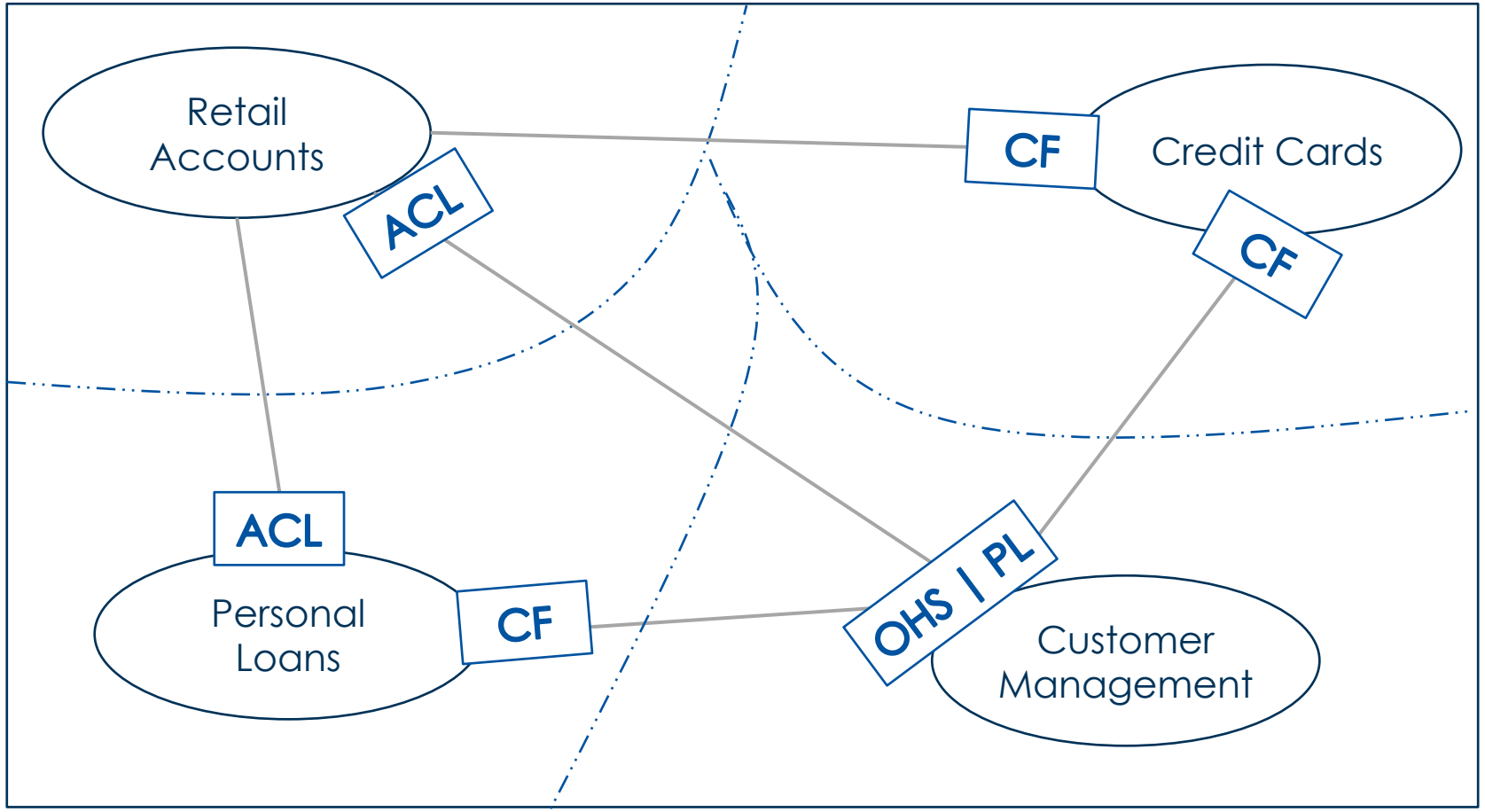
Which BC is NOT expected to be influenced by changes in other BCs? Why?



What all will need to be adjusted if there is a change in the integration model exposed by OHS?



Example of Bank's Context Mapping



BC Interactions | Dependencies