# Course: Domain Driven Design & Microservices for Architects

## Section:  Development Environment Setup

http://acloudfan.com/

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Contact: raj@acloudfan.com

Discount Link to course:

https://www.udemy.com/course/domain-driven-design-and-microservices/?referralCode=C5DCD3C4CC0F0298EC1A

# Dev Environment Setup

Follow along to setup your environment

1. IntelliJ IDE
2. Project Repositories & Branches
3. UML diagram with PlantUML

## Integrated Development Environment (IDE)

IntelliJ Community Edition but others IDE(s) are fine too:


https://www.jetbrains.com/idea/download

## Git Repositories

# Code & UML models

https://github.com/acloudfan/MSFA-ACME-**Sales**-v1.0.git

https://github.com/acloudfan/MSFA-ACME-**Products**-v1.0.git

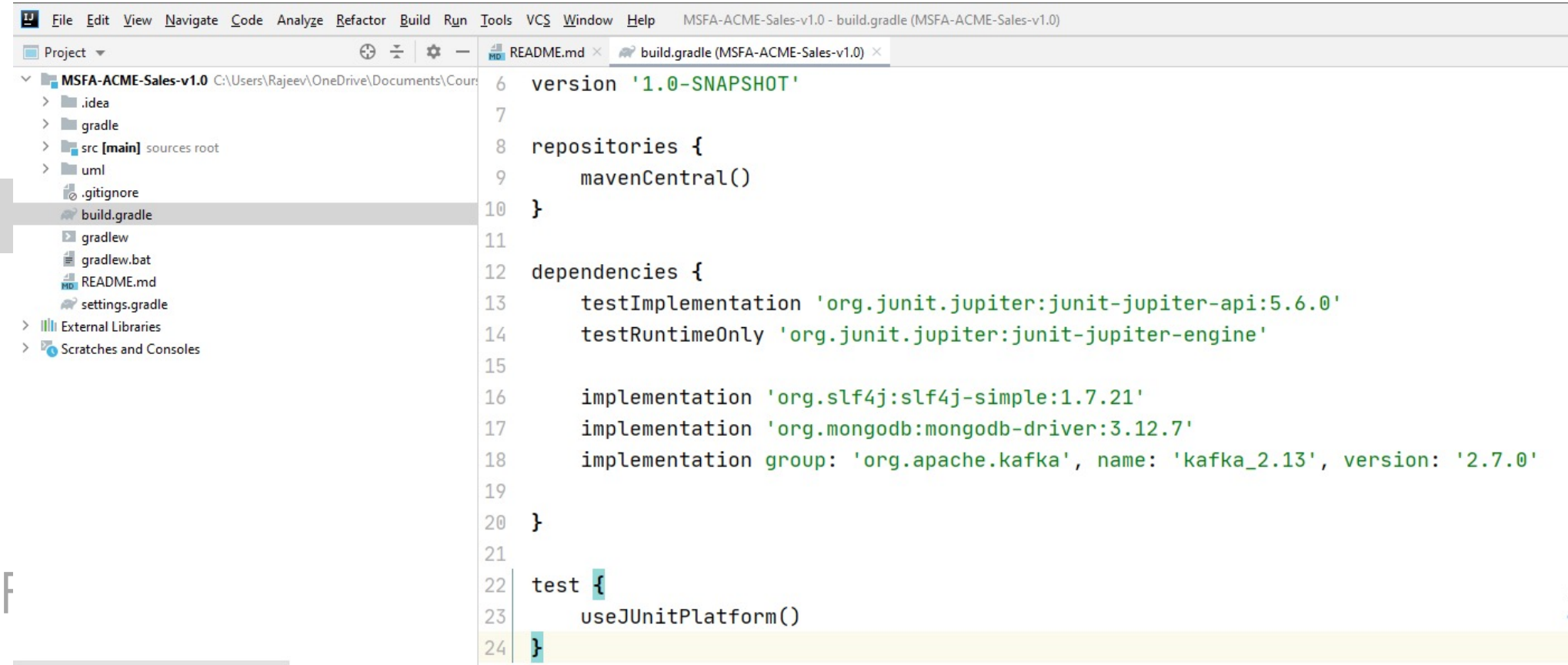
Each Repository to be setup in a separate IntelliJ project

# Gradle for dependencies

https://gradle.org/

## Build automation tool

build.gradle

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## Organization of Code

Code is organized in multiple branches

Switch to appropriate branch as instructed

UML available under the directory /uml

## UML Modelling

Course uses UML for modelling the microservices

## Plant UML

# https://plantuml.com/

> Plant UML is used to draw UML diagrams, using a human readable text description
>
> It is a drawing tool NOT a modelling tool as it does not enforce any modeling constraint

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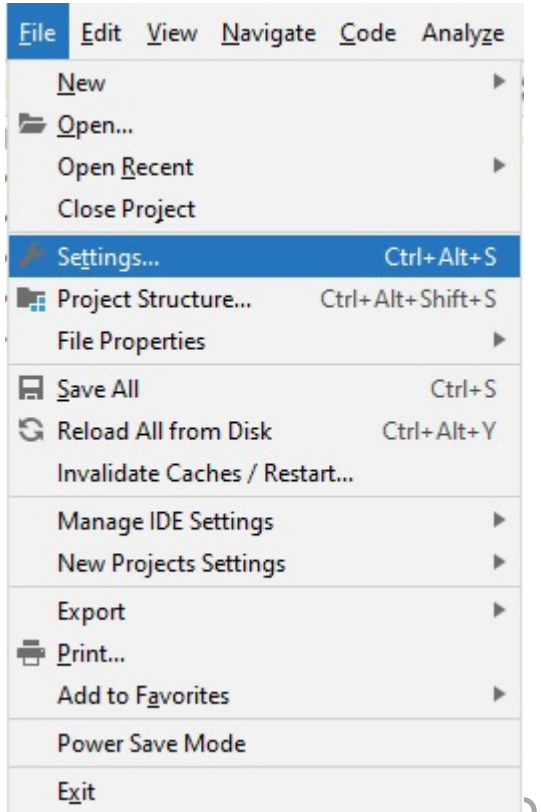
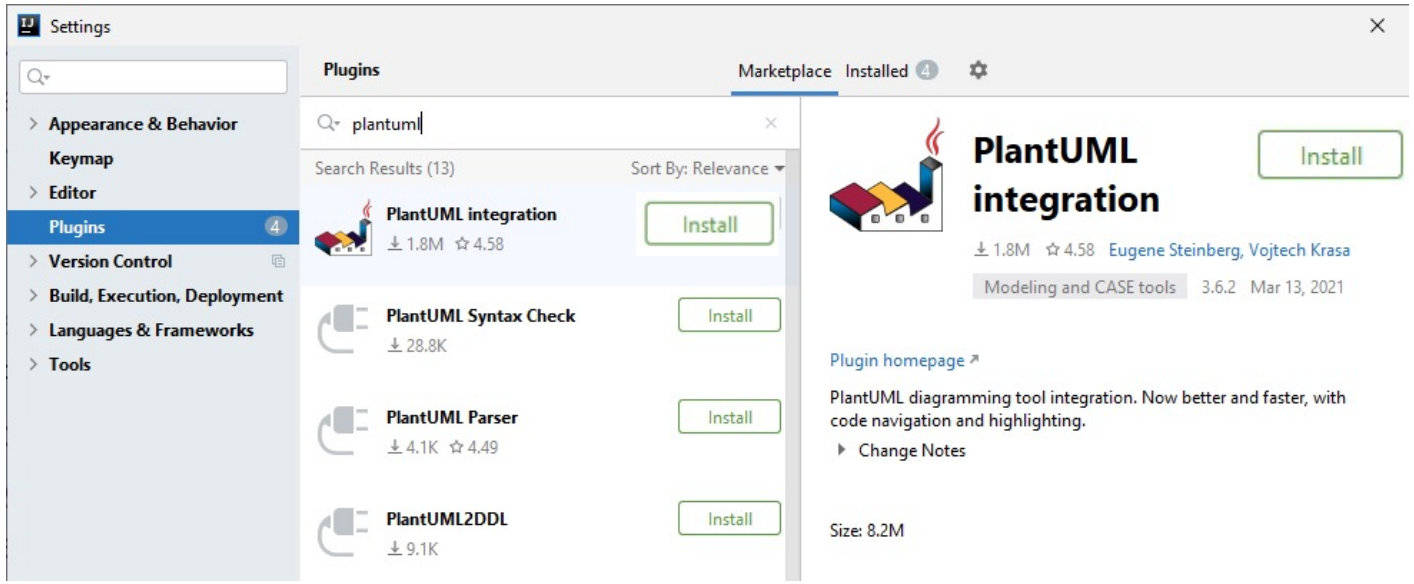
# IntelliJ Extensions

## Extension for UML models

**PlantUML integration**

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## Plant UML Extension Issue

Plant UML has a dependency on GraphViz library

Issues with PlantUML extension after the installation?

please follow instructions at the link below to install the Graphviz

https://plantuml.com/graphviz-dot

# Quick Review

## Development environment setup

- Project should not be showing any errors
- UML diagrams are showing up

# Microservices Architecture

What is Microservices Architecture?

Benefits of adopting Microservices architecture?

What does an organization need to adopt MSA?

# Microservices Architecture

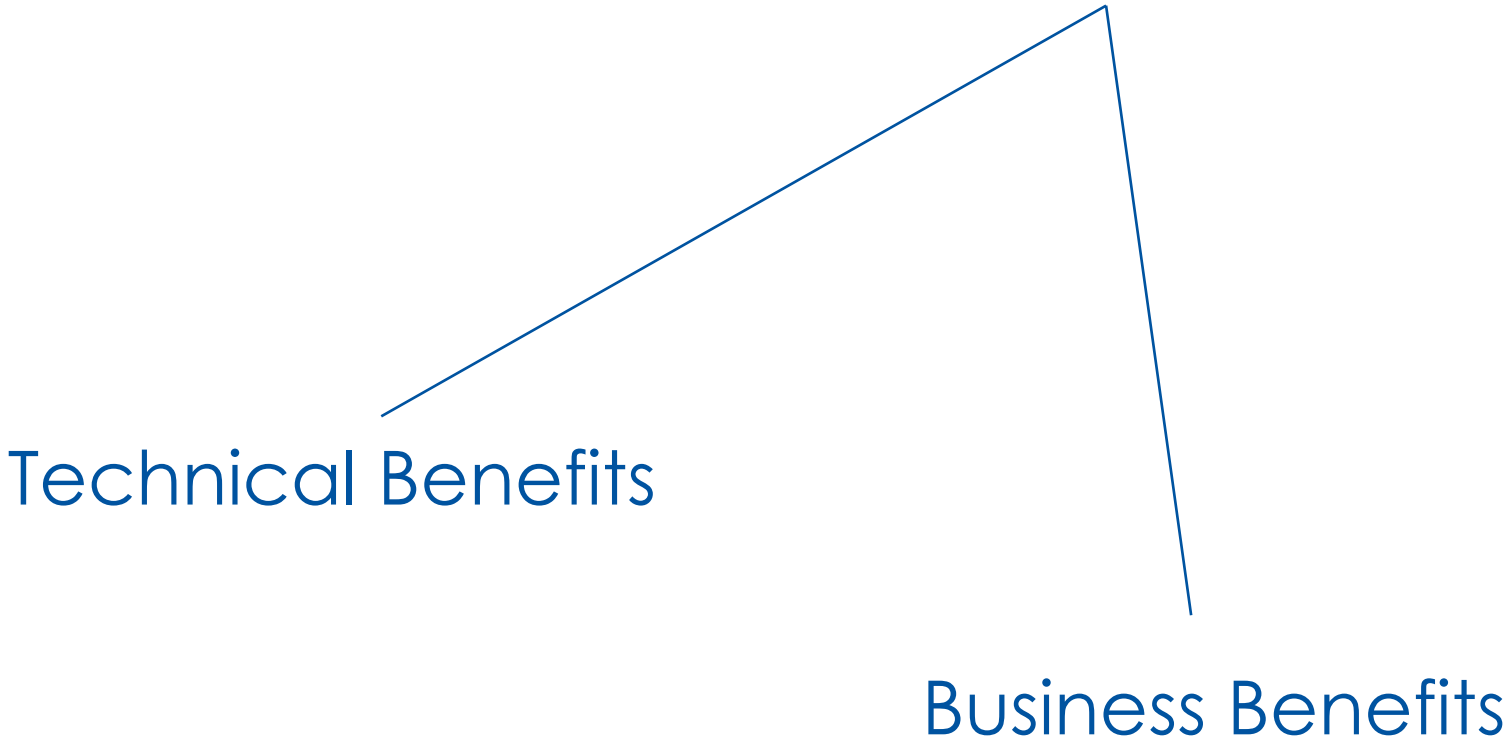
What is Microservices Architecture?

Benefits of adopting Microservices architecture?

What does an organization need to adopt MSA?

# Benefits of Microservices

Why should an organization adopt Microservices?



# Adoption of MSA

## IT Teams need support from Business & IT Leaders

- Leaders need to be educated
- Leaders should see clear value

Objective is to build support and commitment for adoption of MSA

## Section objective

1. Introduction to Microservices
2. Business & Digital Transformation
3. Business benefits of Microservices
4. Building a business case for Microservices
5. Approaches for building Microservices applications

# Microservices Architecture

Arranging an app as a set of independent services

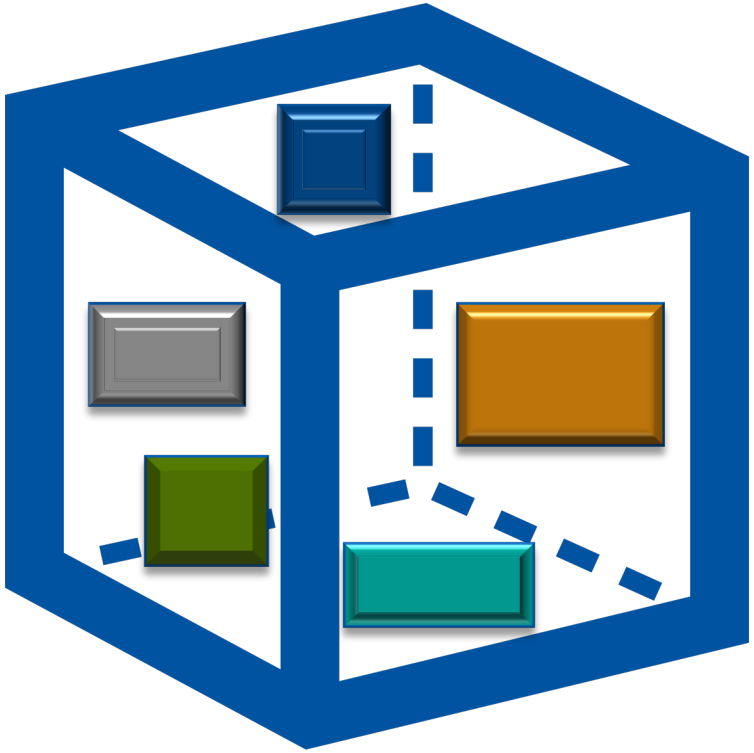

Monolithic Architecture

Microservices Architecture

Realization of MSA

## Characteristics : Monolithic Architecture

# A traditional way of building applications



- Modular
- Huge code bases
- Tight coupling between components
- Teams organized by technology & business
- Changes require coordination between teams
- Spans across multiple business functions

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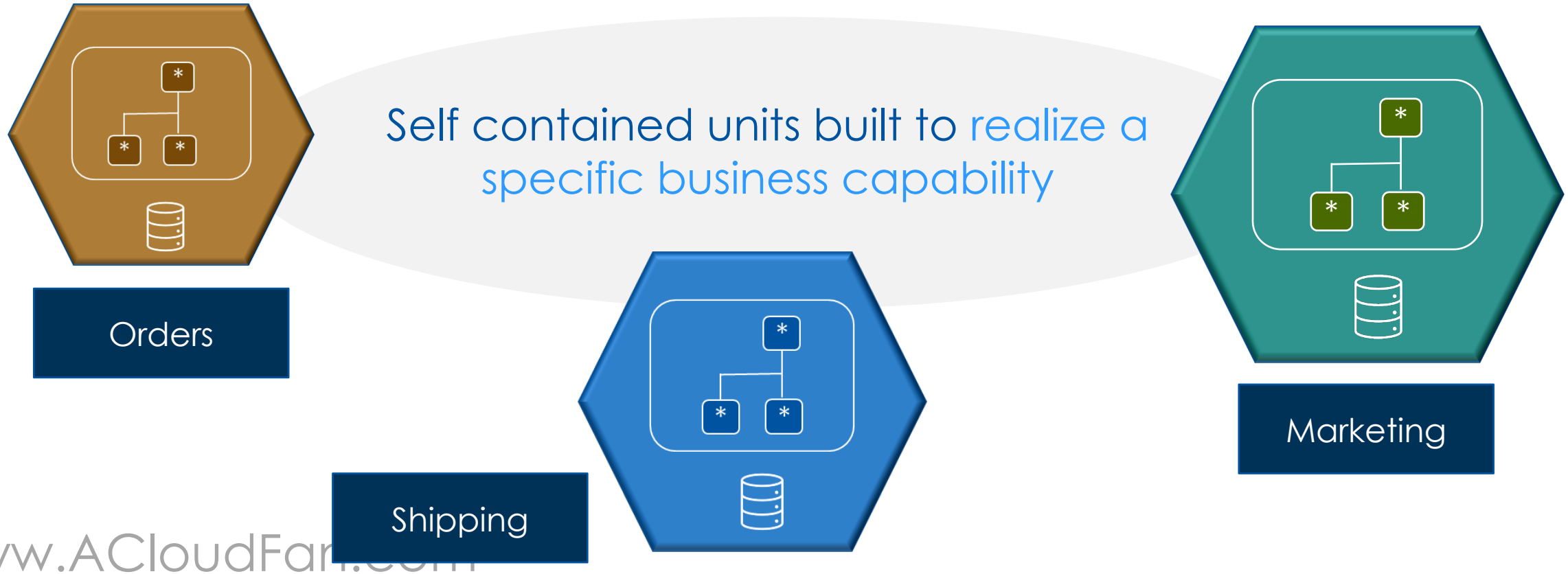
## Microservices Architecture

> Arranges an application as a collection of loosely coupled services. In a microservices architecture, services are fine grained, and the protocols are light weight
>
> - *Wikipedia*

# Microservice

## A service in a MSA is referred to as a Microservice

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# Microservice

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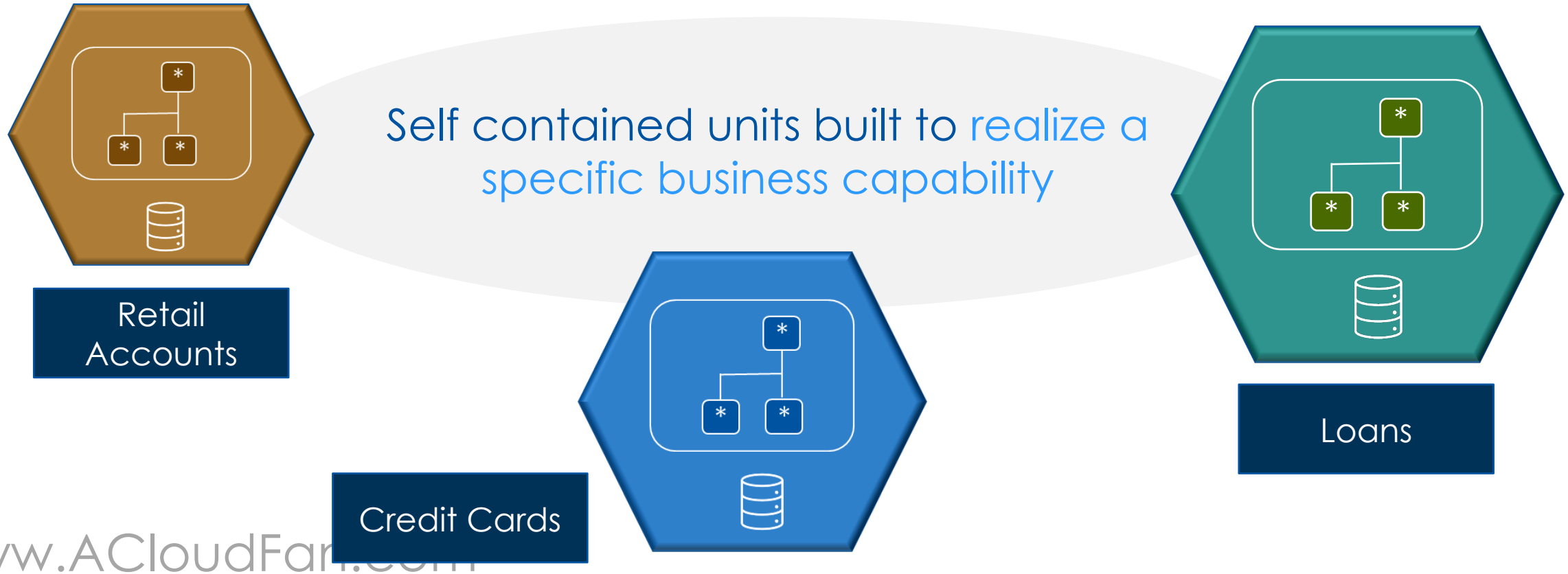


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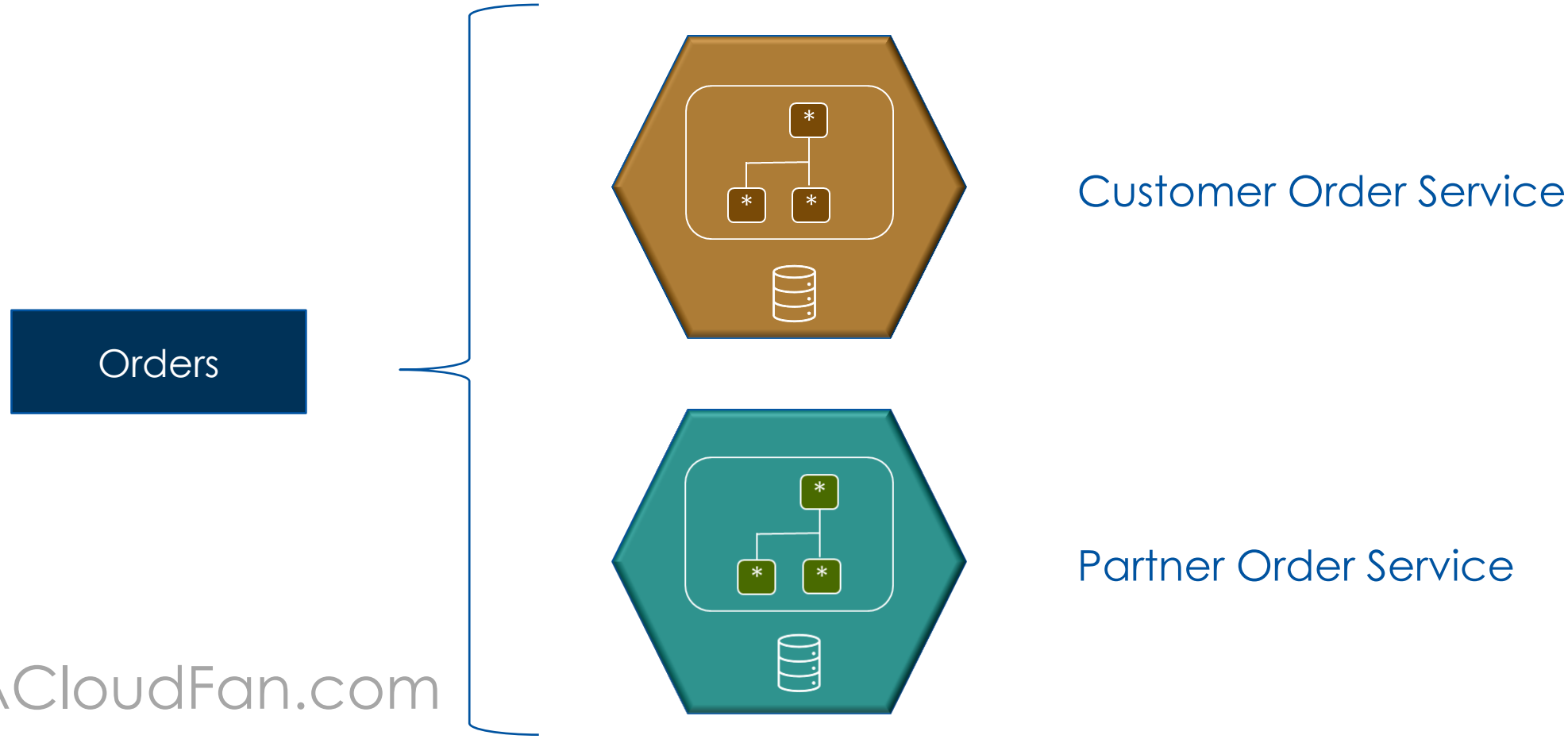
## Business capability & Microservice

# May be realized by one or more Microservice

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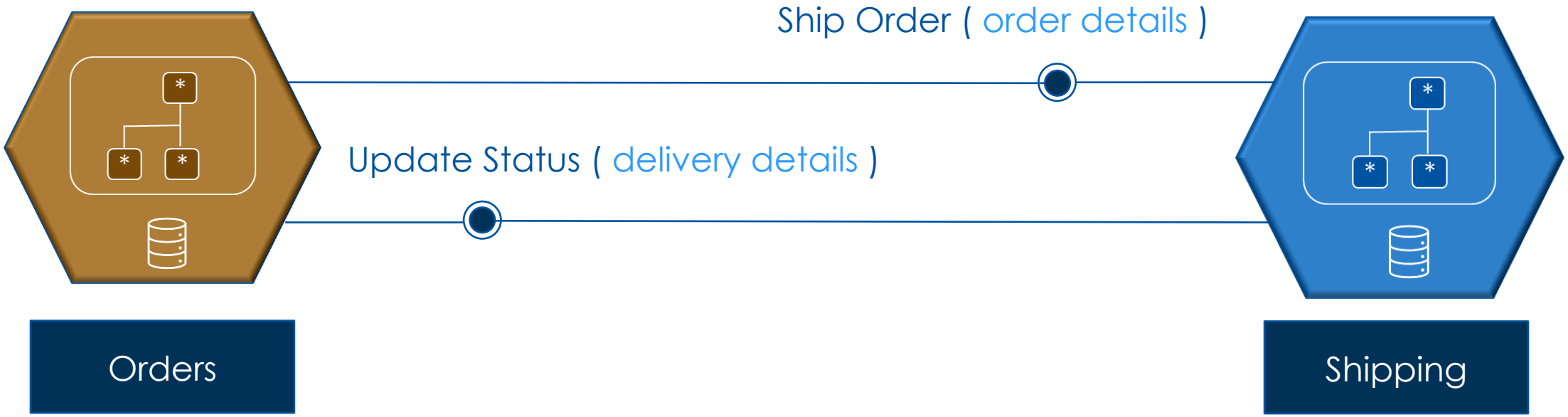
Since Microservices are organized around business capabilities, discovering the optimal domain boundaries is essential to ensure independent nature of the services

## Domain Driven Design

Bounded Contexts = Well defined business capability boundaries

# Microservices Contracts

## All interactions are via well-defined contracts

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## MSA Realization

1. Identify business capability (domain) boundaries
2. Map the domain scope to Microservice(s)
3. Assign ownership of each service to a team
4. Teams coordinate to define contracts i.e., interactions

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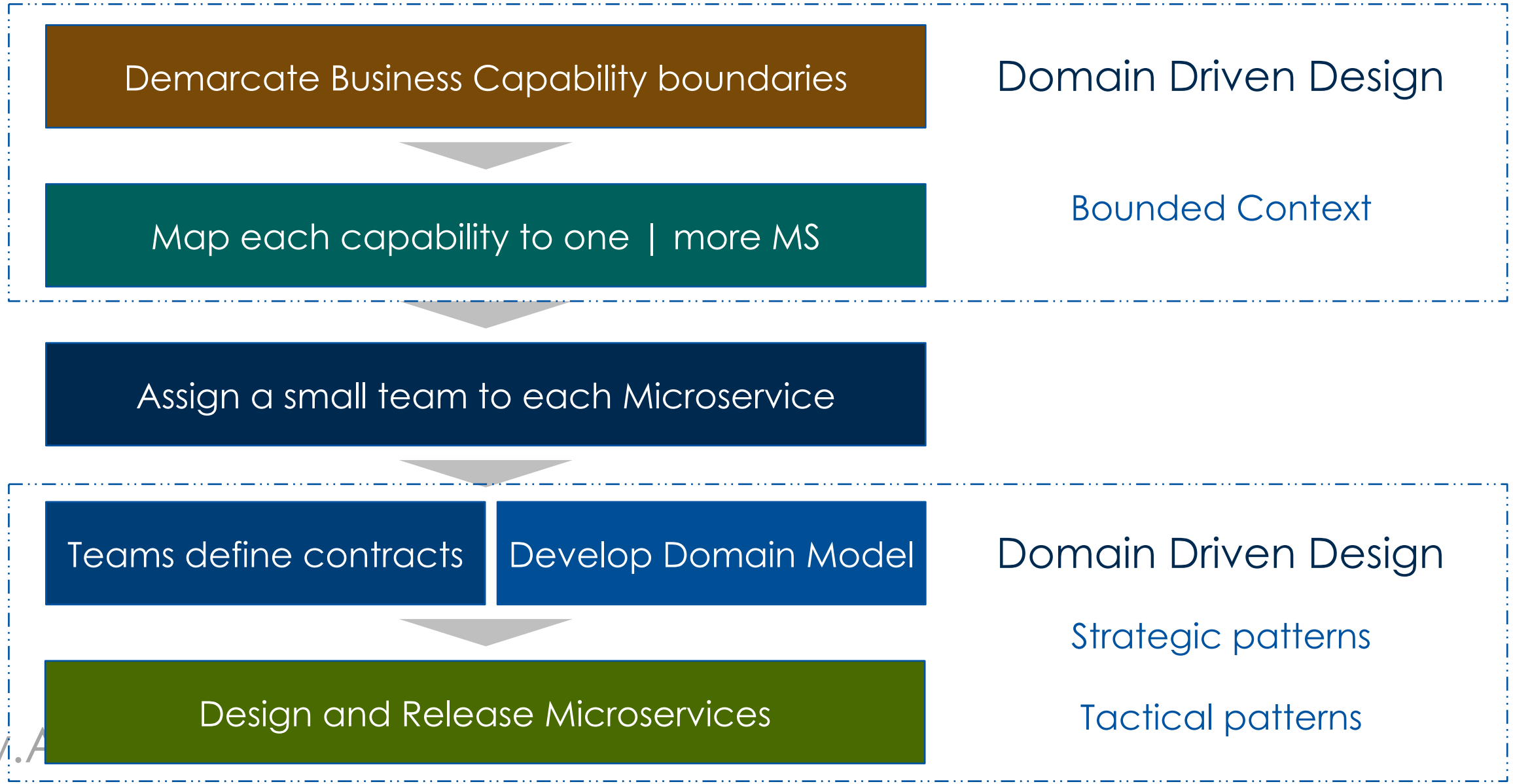
# MSA Realization

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## Business Benefit of MSA?

Helps the business change at a faster pace

# Business Transformation & MSA

Transformation = A thorough or radical change in form or appearance

1. Business & Digital Transformation
2. Why do businesses need to transform?
3. How does MSA enable Transformation?

## Business Transformation

> Business Transformation is an umbrella term that is used for referring to fundamental changes in how an organization conducts its business


Packaged Software
to
Subscription model

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## Business Transformation

> Business Transformation is an umbrella term that is used for referring to fundamental changes in how an organization conducts its business


Online Bookstore
to
Marketplace

## Business Transformation

> Business Transformation is an umbrella term that is used for referring to fundamental changes in how an organization conducts its business

Computers
to
iPod, iPhones, iPad, Music Store

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## Why do businesses transform?

- Environmental changes e.g., new regulations
- Competitive pressure e.g., rapid rollout of new products
- New opportunities e.g., innovative technology
- Customer demands e.g., expects immediate response

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## Examples




Continuous changes * Diversification * New products & services

## Digital Transformation

> Digital Transformation is the process of using digital technologies to
>
> 1. meet the needs of transformed business processes
>
> 2. create innovative customer engagement mechanisms

# Digital Transformation supports the Business Transformation initiatives

# Digital Transformation

> Reimagining of business in the digital age is digital transformation

# Examples




# Digital Transformation


Integrated supply chain inventories across network


Physical bank to a digital bank


Heavy use of AI/ML, API, Analytics, etc

# What happens to businesses that do not transform?


1997 - Started a in-mail-DVD subscription model
2007 - Started streaming service using digital

BLOCKBUSTER®

Failed to transform its business in time, to counter the threat posed by Netflix & newer digital technologies !!!

Netflix started a subscription model for DVD by mail in 1997



Netflix started streaming service in 2007. It rapidly transformed its business by leveraging the new digital platforms !!!

## Continuous Transformation

# Transformation is not a one-time initiative

- Businesses need to change on a continuous basis
- Rapid changes are needed in systems and applications
- Organizations need to keep up pace with new and evolving technologies

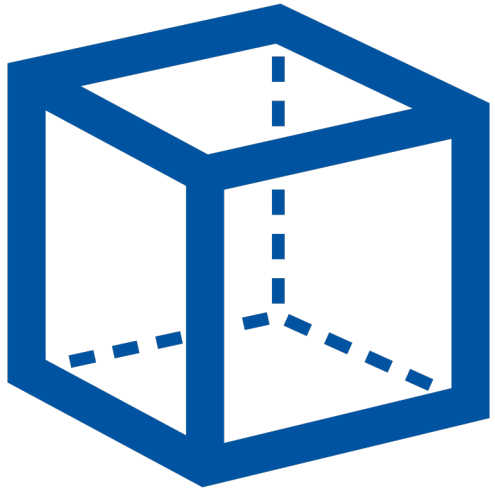
## Example : Continuous Transformation

# Continuous change + Adoption of digital technologies


- Amazon Prime Video
- Amazon Web Services
- Alexa
- Appstore
- Amazon Drive
- Echo
- Kindle
- Fire tablets
- Fire TV
- Kindle Store
- Music
- Music Unlimited
- Amazon Digital Game Store
- Amazon Studios
- AmazonWireless

## Transformation and Software

# Old ways of building software hinders transformation !!

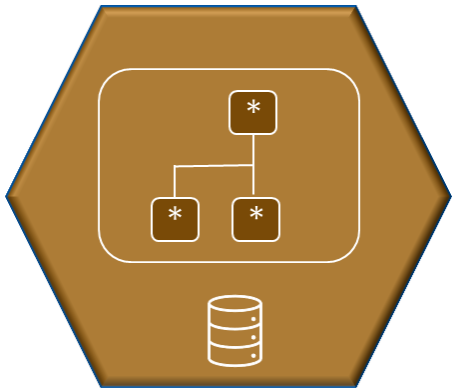


- Changes are slow
- Hard to integrate with newer digital technologies

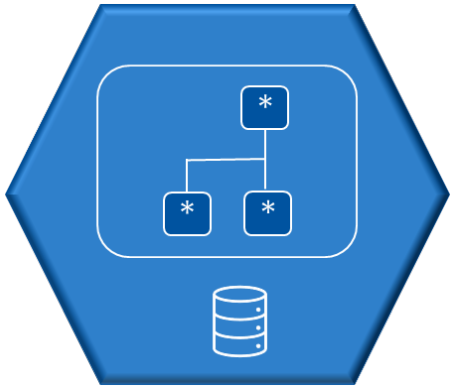
**Microservices Architecture addresses these challenges !!!**

## HOW does MSA help?

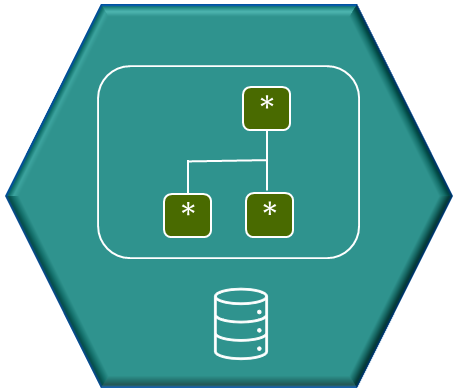
# Change isolated to a set of Microservices !!



Retail Accounts



Credit Cards



Loans & Mortgage

Transformation of Credit Cards requires changes only in this MS

Thus, Bank can achieve its transformational goals at a faster pace

# Quick Review

Organizations need to continuously Transform

Rapid changes to IT systems

Rapid adoption of new digital technologies

Speed to market is the key

Microservices architecture enables transformation

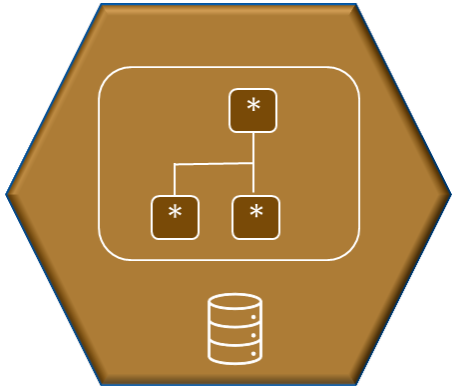
# MSA : Business perspective

Business benefits of adopting Microservices Architecture

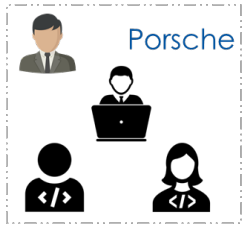
1. Microservices teams
2. Business capabilities and Microservices
3. Business benefits of MSA

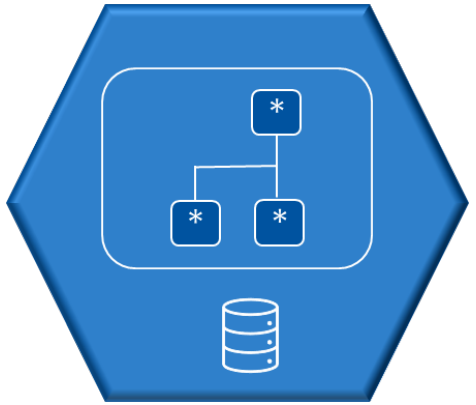
# Microservice Ownership

## Each service is built & operated by a small team



Orders

Shipping

Teams are cross functional & supported by domain expert

## Two-Pizza Teams


Team size: ~8

> We try to create teams that are no larger than can be fed by two pizzas; we call that the two-pizza team rule
>
> *- said Bezos*

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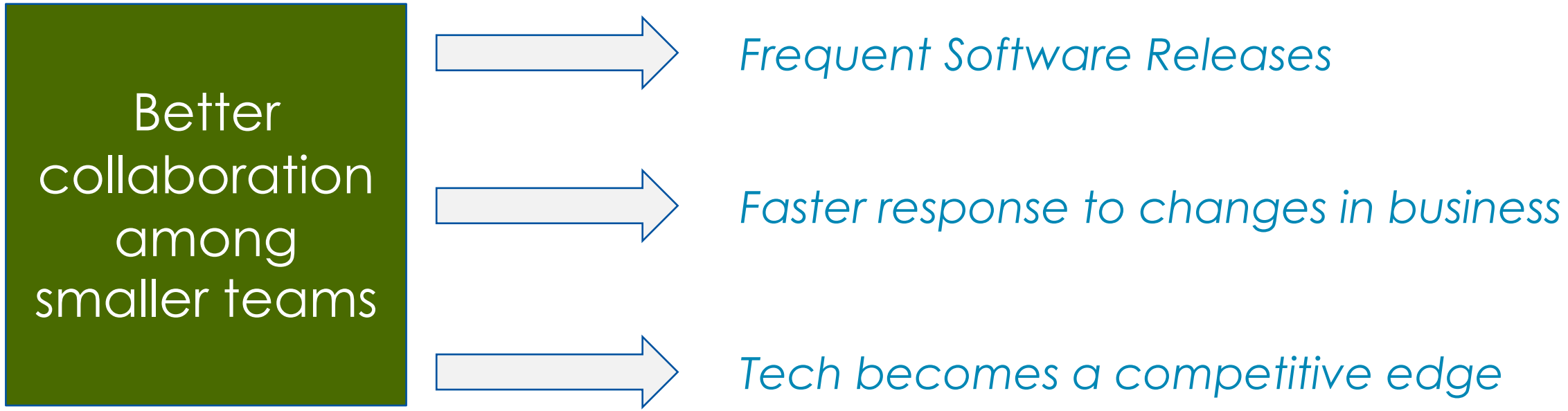
https://docs.aws.amazon.com/whitepapers/latest/introduction-devops-aws/two-pizza-teams.html

# Two-Pizza Teams

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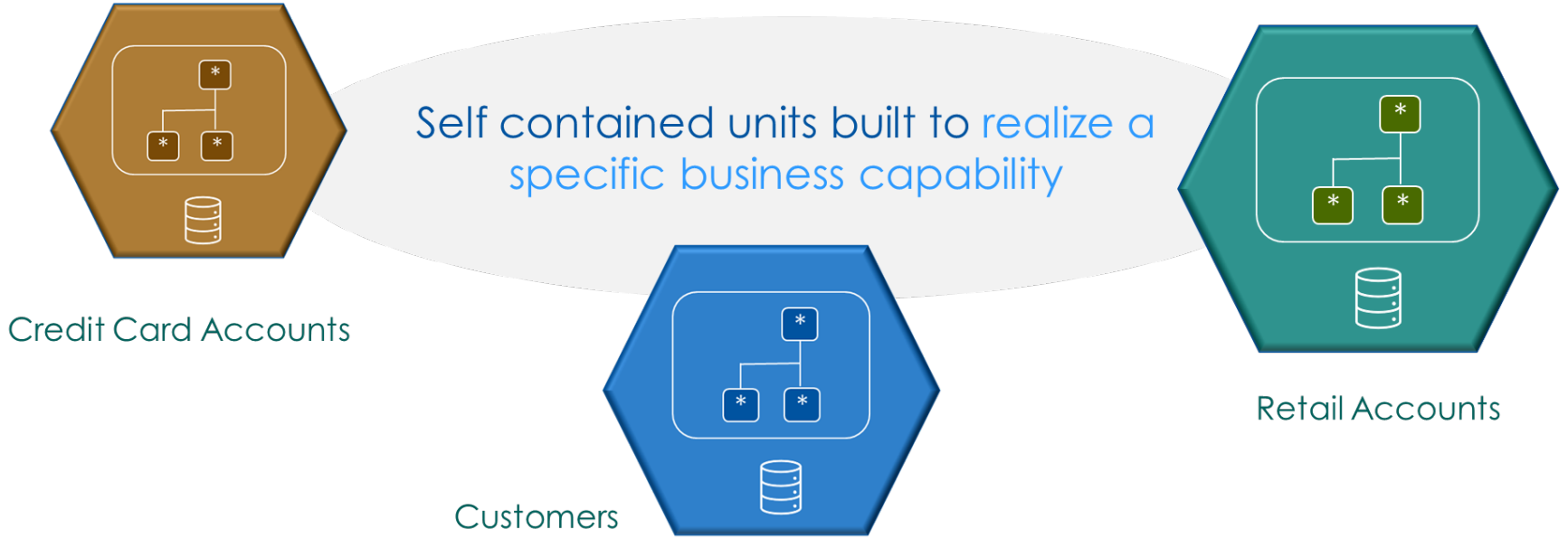
https://docs.aws.amazon.com/whitepapers/latest/introduction-devops-aws/two-pizza-teams.html




# Why are MS organized around business capabilities?

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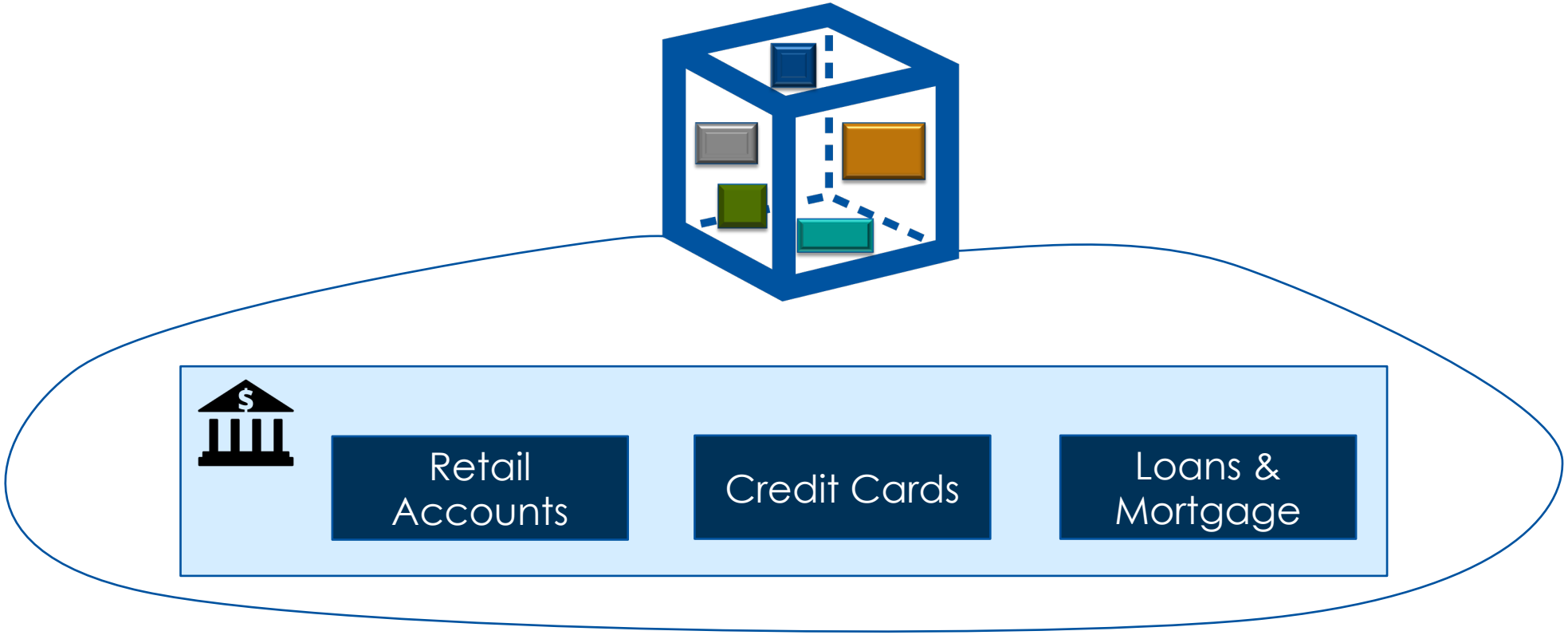
## Why organize around business capabilities?

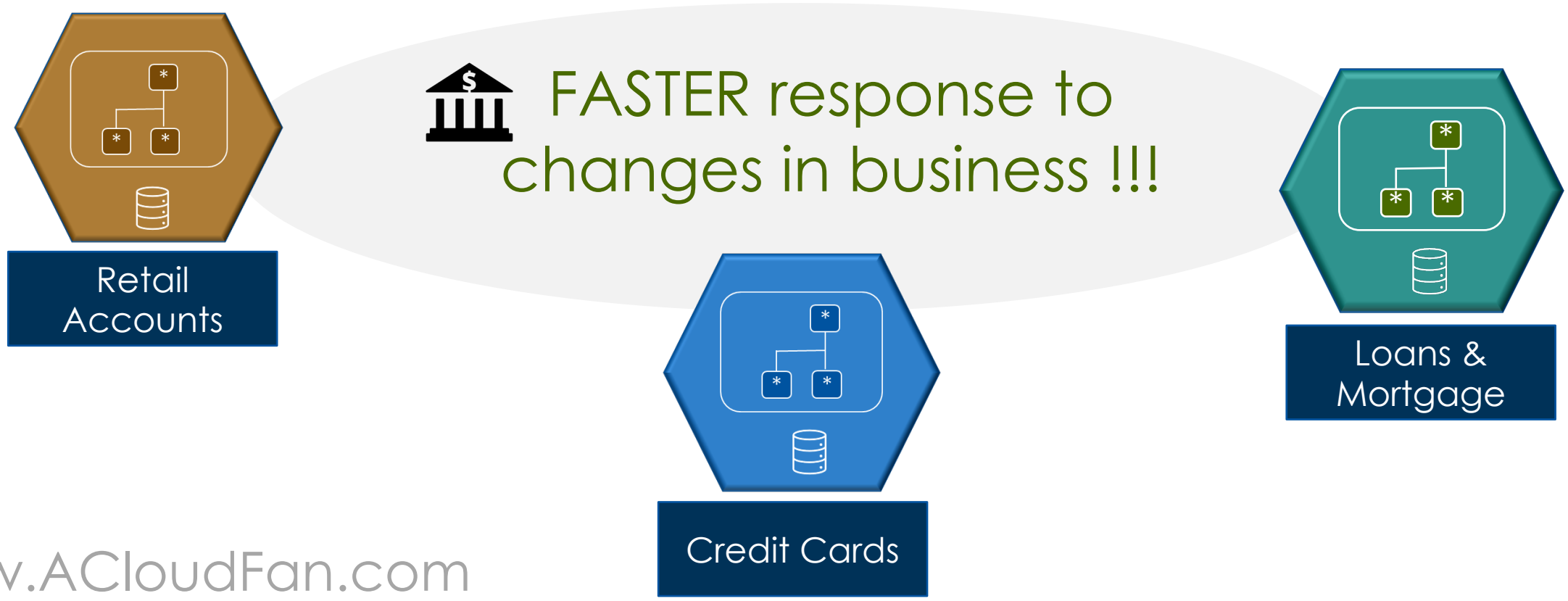
- Each service can evolve independently




Bank will be slow to release new products in the market ☹

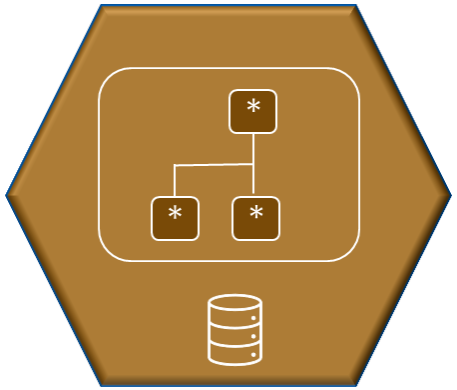
## Why organize around business capabilities?

- Each service can evolve independently

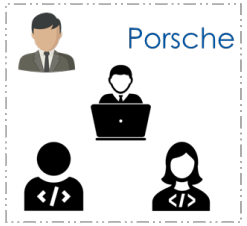


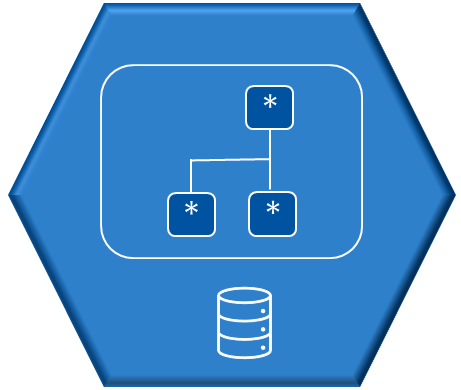
# Why organize around business capabilities?

- Makes it easier for IT Teams to understand the business



Retail Accounts

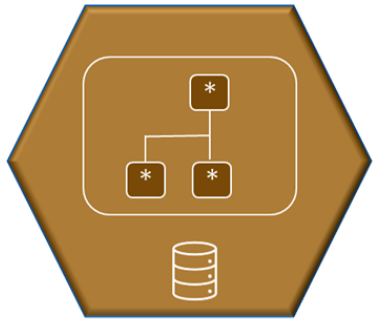



Credit Cards

IT Teams don't need to dive deep into ALL business capabilities !!!

## Why organize around business capabilities?

# HIGHER Alignment with business priorities




Retail Accounts

- New release every 2 Weeks

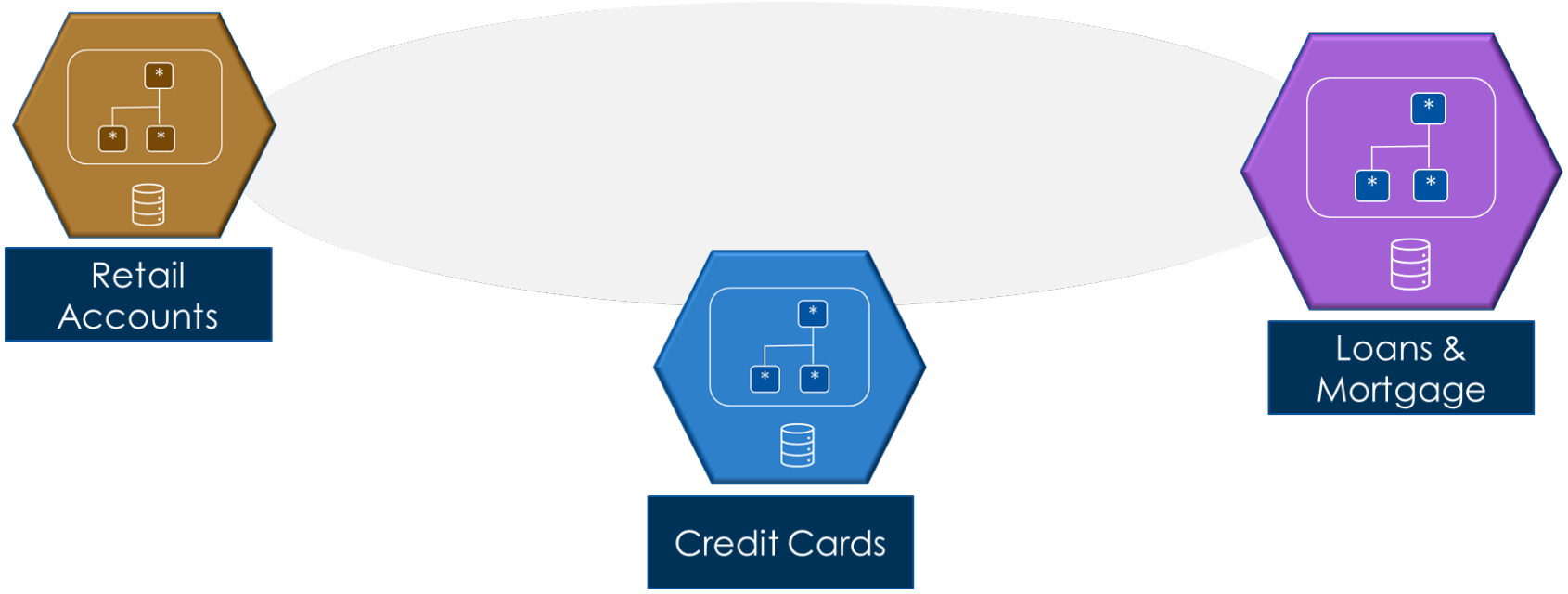

Loans & Mortgage

- New release every Day

No time spent on managing conflicting priorities

## Why organize around business capabilities?

- Services are easily replaceable




No impact on other services if contracts are not changing

## Microservices Architecture

Key to rapid transformation => faster speed to market

> Microservices Architecture is an enabler | catalyst for continuous business transformation

IT teams move at the same speed as the business !!

## Critical Success Factor

# Carving out the business scope of Microservices

If NOT done correctly

- Teams will be inter-dependent
- Loss of advantage of MSA

**This is where Domain Driven Design comes into picture !!!**

## Business benefits

Faster response to changes i.e., better agility

Easier to build and maintain

Improved productivity & quality

Services are replaceable with zero | minimal impact

# Quick Review

Small Teams => Faster speed to market

Microservices are organized around Business capabilities

Enables the IT Teams to operate independently

MUST carve out appropriate business scope to stay independent !!!

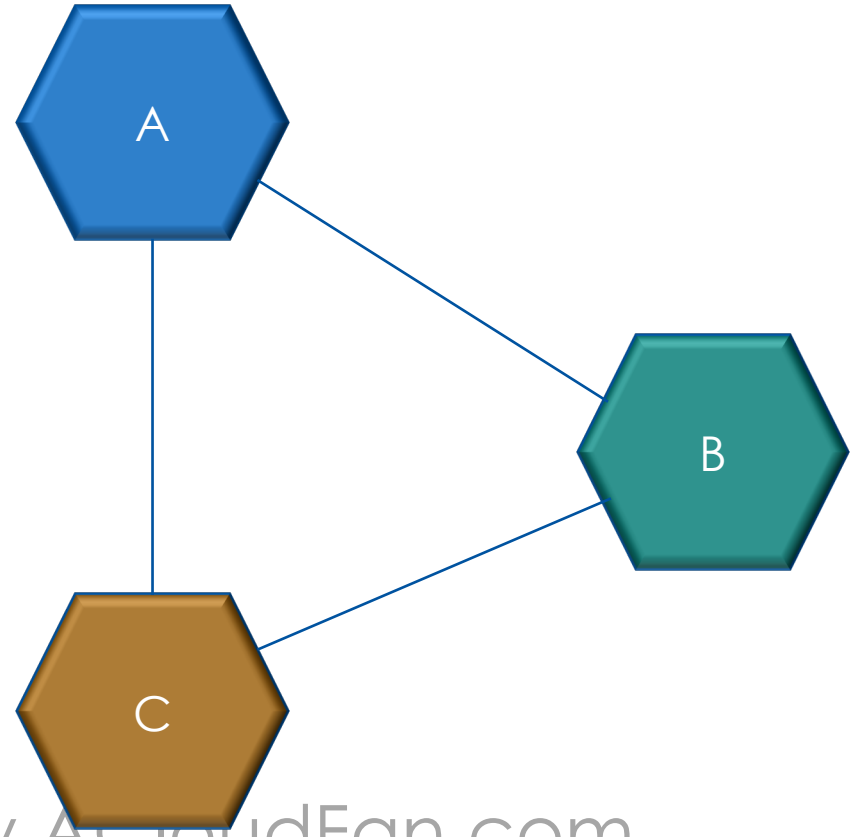
# MSA : Technology Perspective

Pros & Cons of Microservices

1. What is a Microservice Architecture?
2. Pros of MSA
3. Cons of MSA

# Microservices Architecture

## Loosely coupled set of services




- Services interact over network
- Light weight protocol - HTTP
- Independent codebases | deployments
- Decentralized governance
- Well defined business scope

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## Loose coupling

# Services are loosely coupled

- Least amount of dependency between services
- ONLY external interfaces are known to consumer services
- Interactions are over the network

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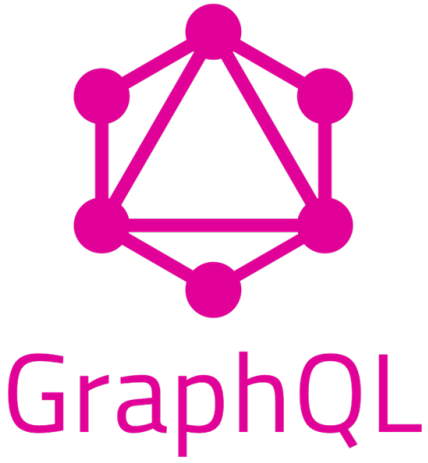
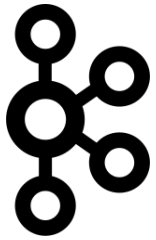
## Service interactions

# Services expose interfaces as API/HTTP

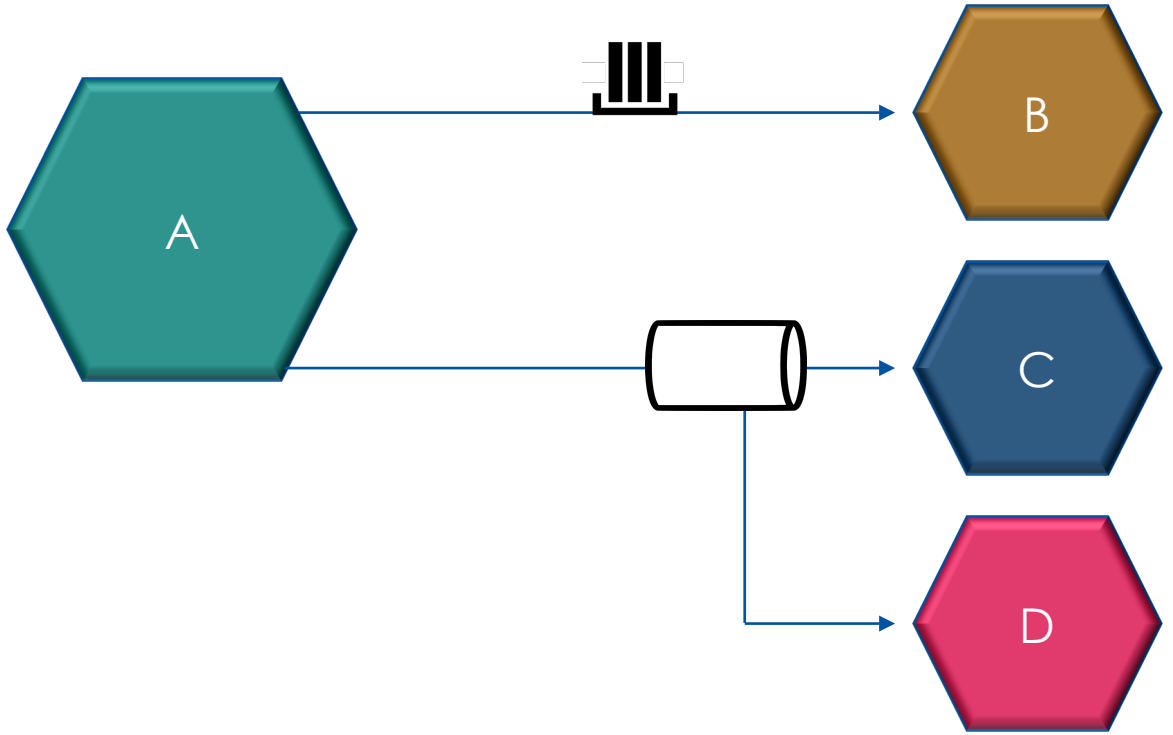
## Service interactions

# Messaging is commonly used



RabbitMQ

Apache ACTIVEMQ

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# Advantages of Microservices Architecture

## Pros of MSA

### Changes are easier to manage

- No impact on other services
- No | Minimal coordination with other teams
- Regression testing needed ONLY for changed service

## Pros of MSA

# Deployments are independent

- Each team controls the frequency of deployments

- Higher productivity & Faster delivery

## Pros of MSA

# Polyglot microservices

- Each team may decide on tech stack


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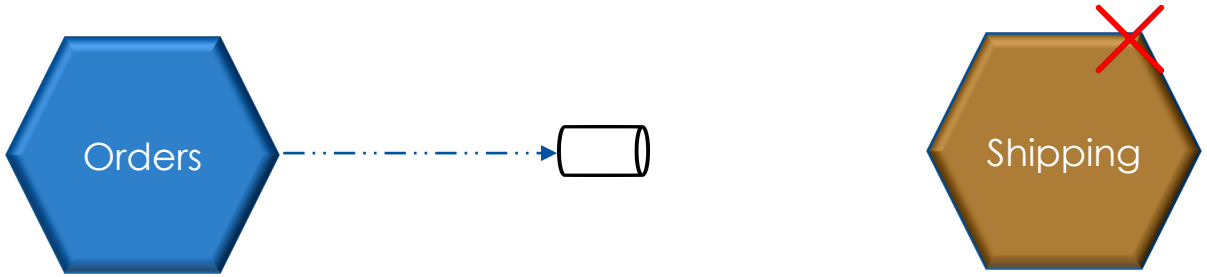
- Some experts urge caution against using too many languages

# Failure isolation

- Failure in one service will not bring down entire system




- Orders held as messages in a stream

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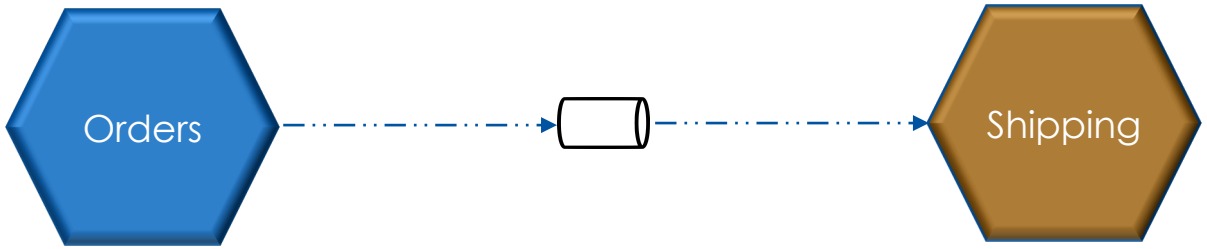
# Failure isolation

- Failure in one service will not bring down entire system




- Orders processed by the service

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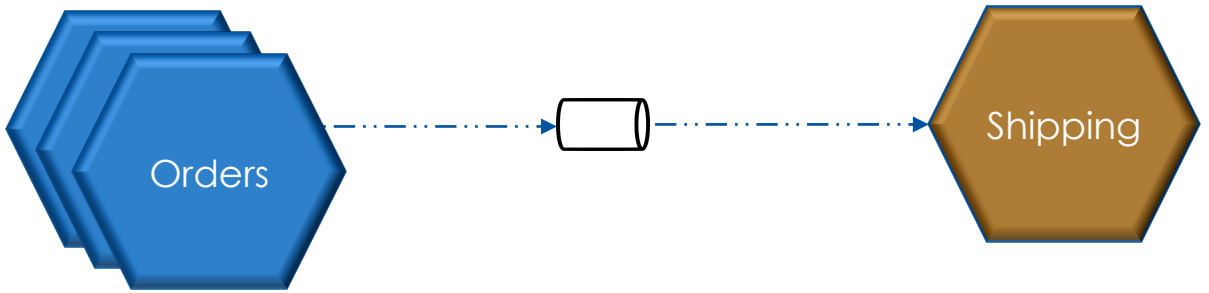
# Service Scalability

- Each service can scale independently

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# Disadvantages of Microservices Architecture

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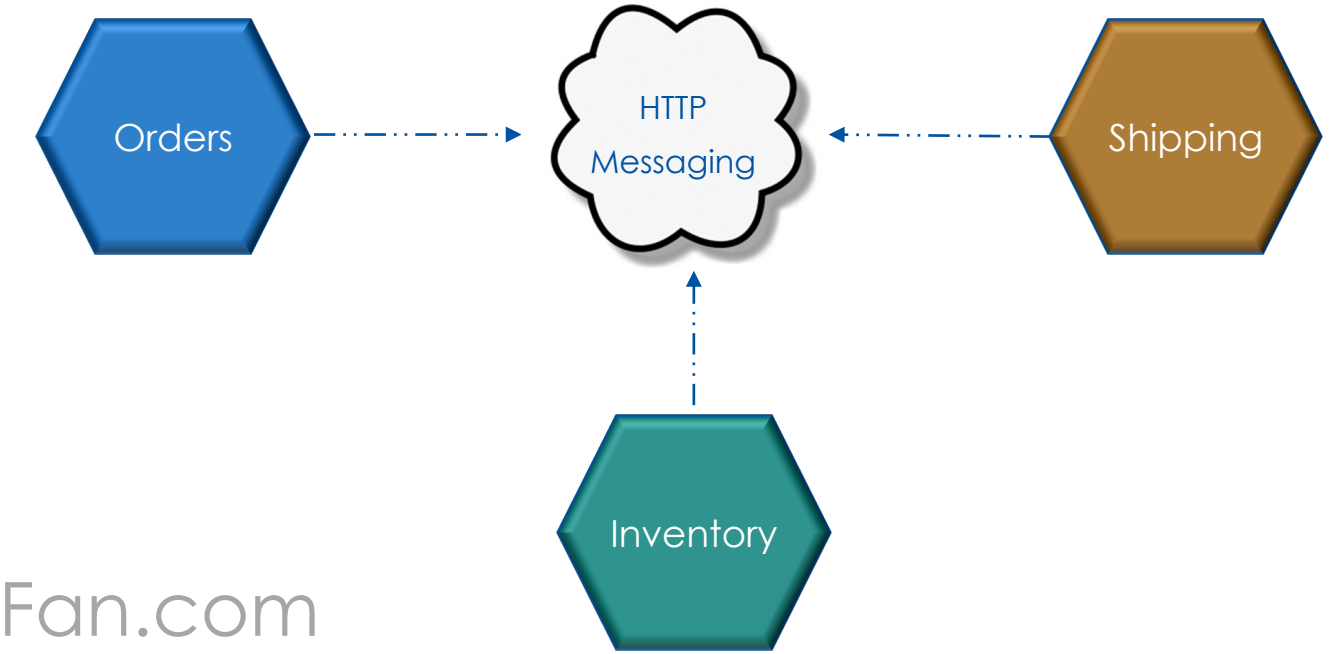
# Cons of MSA

- Poor performance due to network overheads

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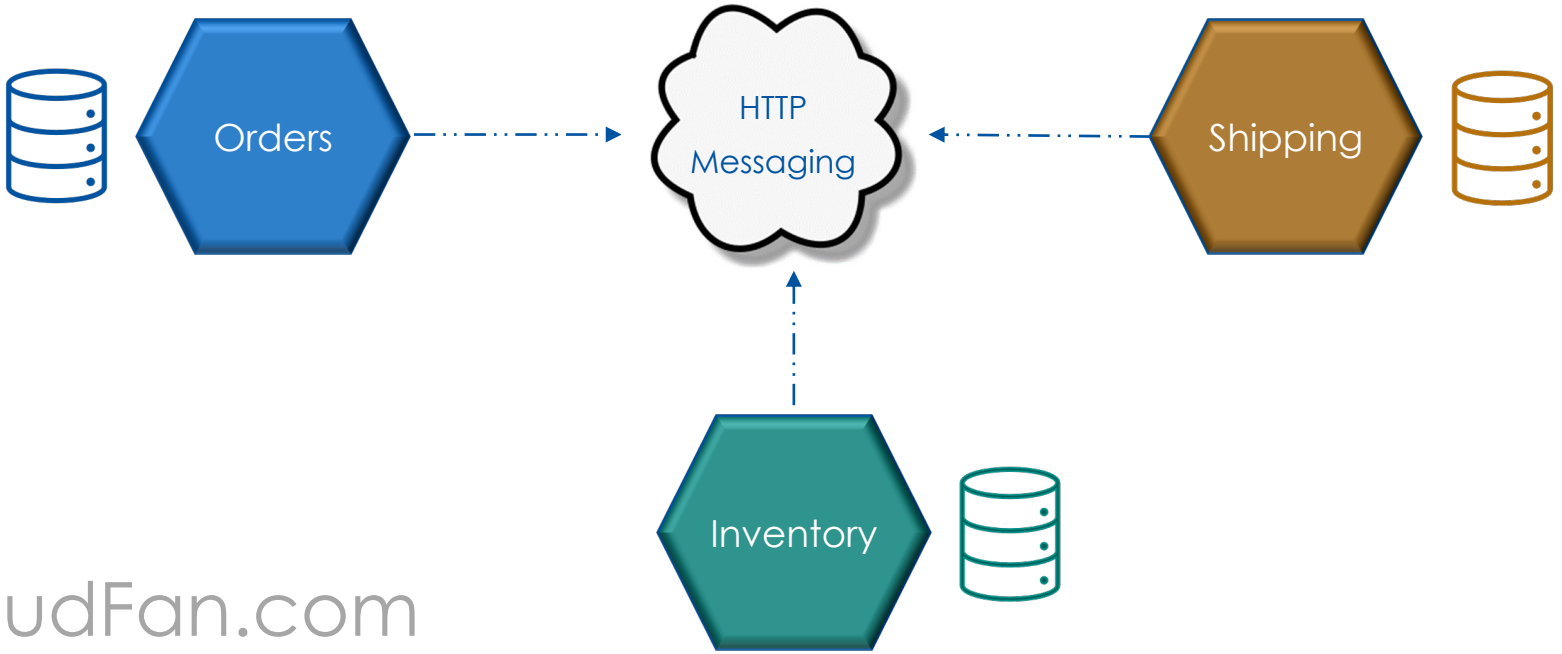
# Cons of MSA

## Complexity in managing data integrity

- Each Service manage its own Database
- Traditional  Tx mechanisms don't work

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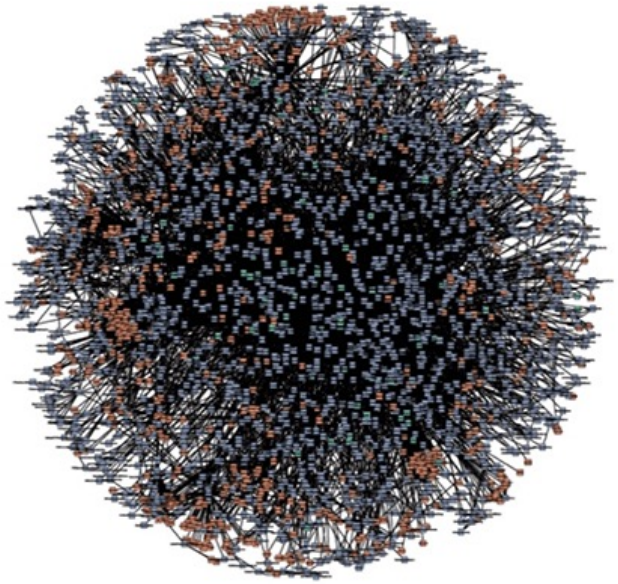
## Cons of MSA

- Harder to monitor | debug



amazon.com

NETFLIX

## Cons of MSA

- Requires investment in new technologies
  - Infrastructure
  - Tools
  - Skills development

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## Cons of MSA

# Security threat

- Each service exposes interfaces (API)
- Expanded attack surface

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# Quick Review

## Pros:

- Change management
- Deployments

Speed to market

- Failure isolation
- Service Scalability

Better quality

## Cons:

- Poor n/w performance
- Monitoring is a challenge
- Data management
- Security management

# Adopting & Building Microservices

Building Microservices Applications

1. What is needed for MSA?
2. Building a business case
3. Brownfield Vs. Greenfield MS projects

## Adoption of MSA

- Acquire resources with new IT skills
- Invest in technology e.g., Cloud, Containers
- Change in processes e.g., DevOps
- Change in culture e.g., Faster decisions

**Commitment from Business & IT Leaders**

## Role of an Architect

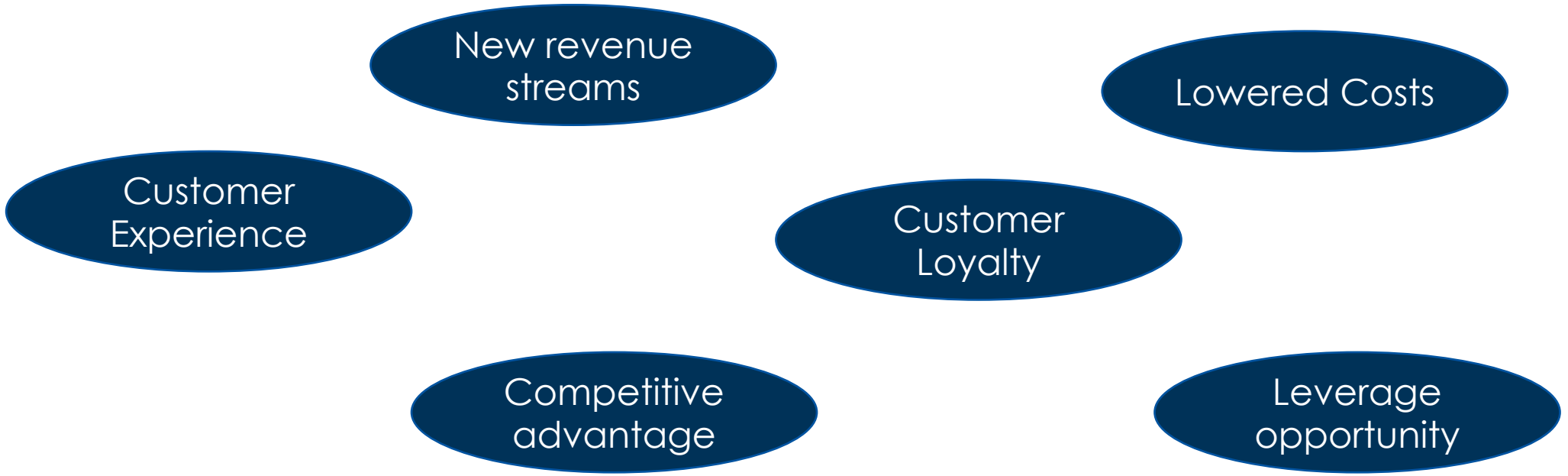
# Guide & Educate the Business & IT teams

IT Leader

Business Case for MSA adoption specific to your organization !!!

## Think Business

# Think of *Business impact* not Technology !!!



## Messaging examples

> With Microservices architecture we can release our software every 6 weeks rather than every 3 months like we do today

> IT can help business cut down the product development process to 6 weeks which is ~50% faster than our competitor !!

# Messaging examples

> Our monolith apps are difficult to change hence, adopting new digital technologies has been slow. We need to invest in MSA technologies to be able to move faster.

> Adoption of new digital technologies can help the business achieve the goal of increasing the Lifetime Value of our customer as MSA provides a foundation for faster adoption of these new digital technologies.

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# Business Case

Doesn't have to be a 50 pages long formal document !!!

5 to 7 slides are fine too ☺

## Business Case

- Clearly layout the Business value *(quantify)*
- Have a roadmap
- Describe what you need to be successful
- Do a PoC to prove the value

## Microservices or Not?

# Think of *Business impact* not Technology !!!

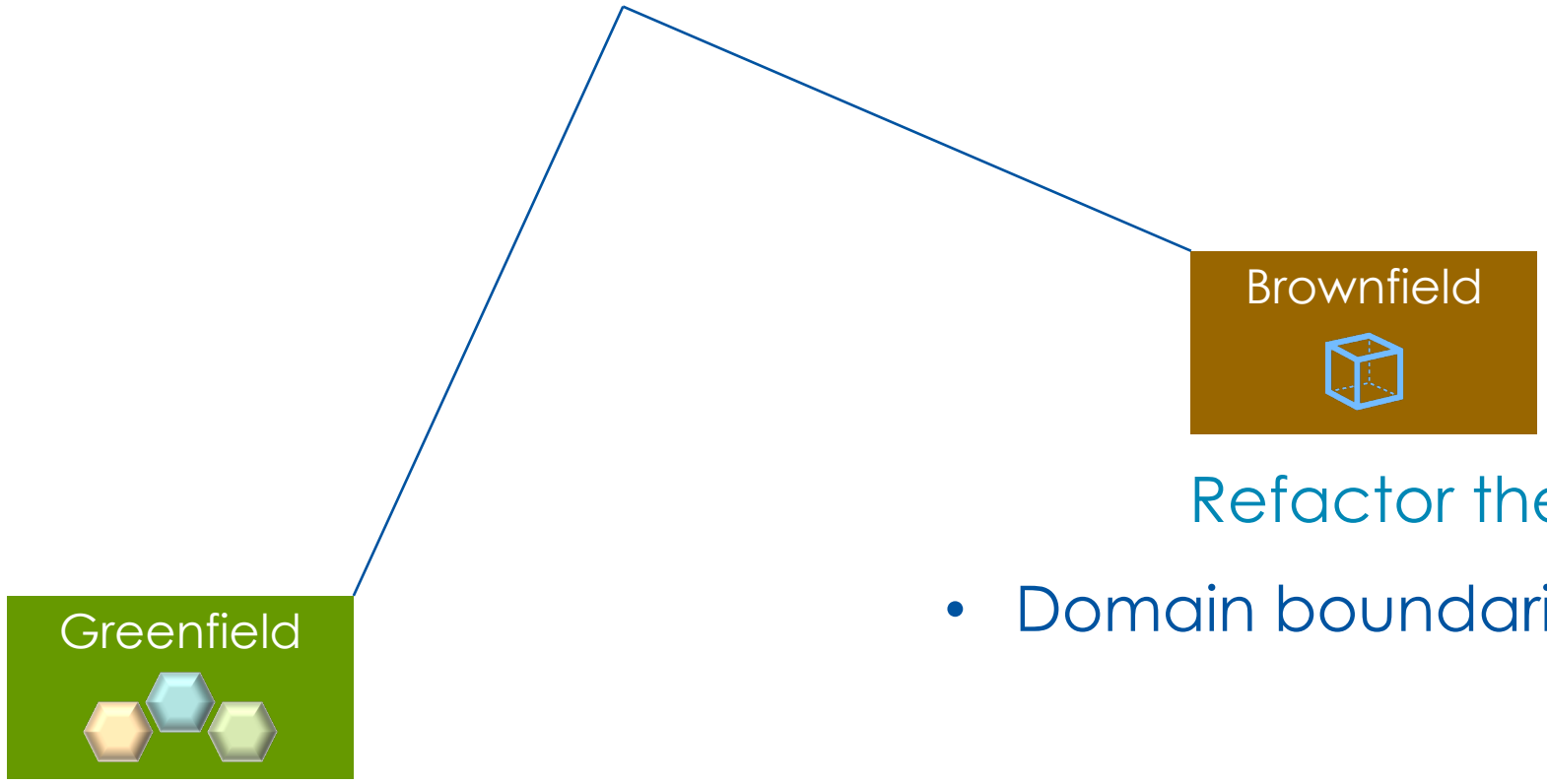
IT Leader

What would be the benefit of MSA

to my organization's business?

## Microservices projects

# There are two types of Microservices projects




Refactor the existing monolithic app

- Domain boundaries are somewhat known

New application to be built ground up

- Domain boundaries are NOT known

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Brownfield

# Dealing with legacy technologies & IT debt

Refactor

- Convert application to MSA

Big bang

Incremental | Evolutionary

Replace

- Build a new app ground up !!

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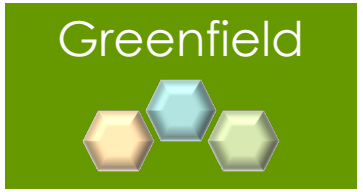
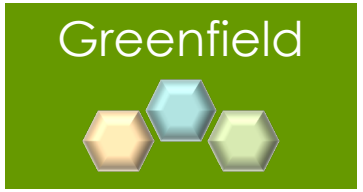



# Options to build MSA

Ground up

- Availability of technology & tools
- Organization's readiness e.g., DevOps practices, processes




# Options to build MSA

Ground up

Monolith First

- Build a well-designed monolith app
- After some experience peel off parts to create MS



https://martinfowler.com/bliki/MonolithFirst.html

# Quick Review

## Specific Business benefit to your organization

## Microservices Project