

Hands-on Visual Communication for Software Architecture

Using technical diagrams to take your
project from presentation to production



Jacqui Read

Consultant Software Architect
Founder, ReadTheArchitecture.com



tinyurl.com/jcqvcw



@tekiegirl



JacquiRead.com

Effective visual communication



Patterns & Antipatterns

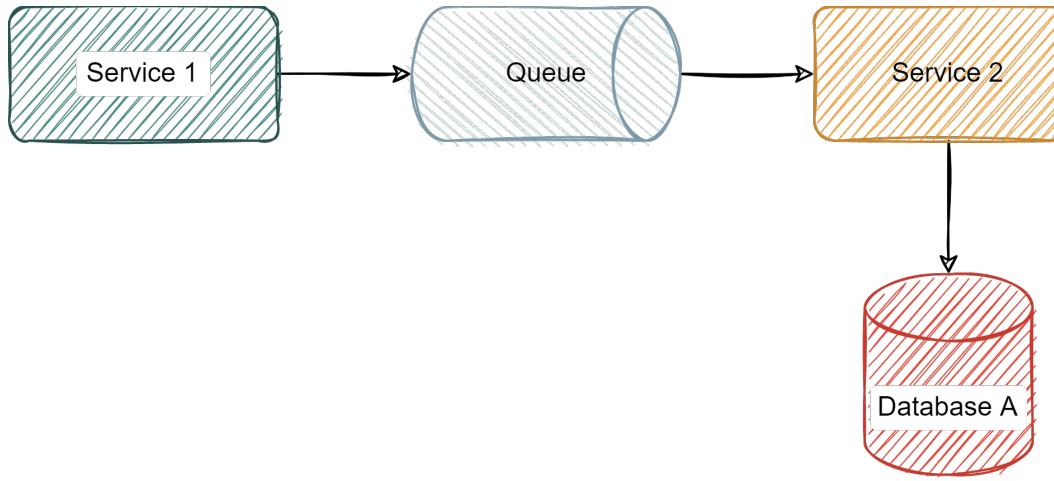
Avoid pitfalls and improve your
diagrams

Introduction

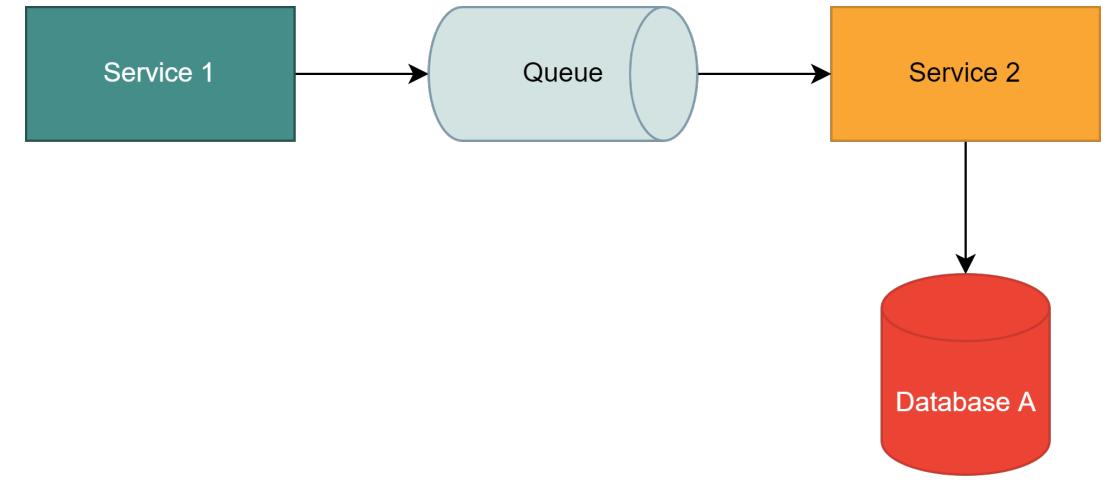
Communication Essentials

the foundations of successful visual communication

Style Communicates



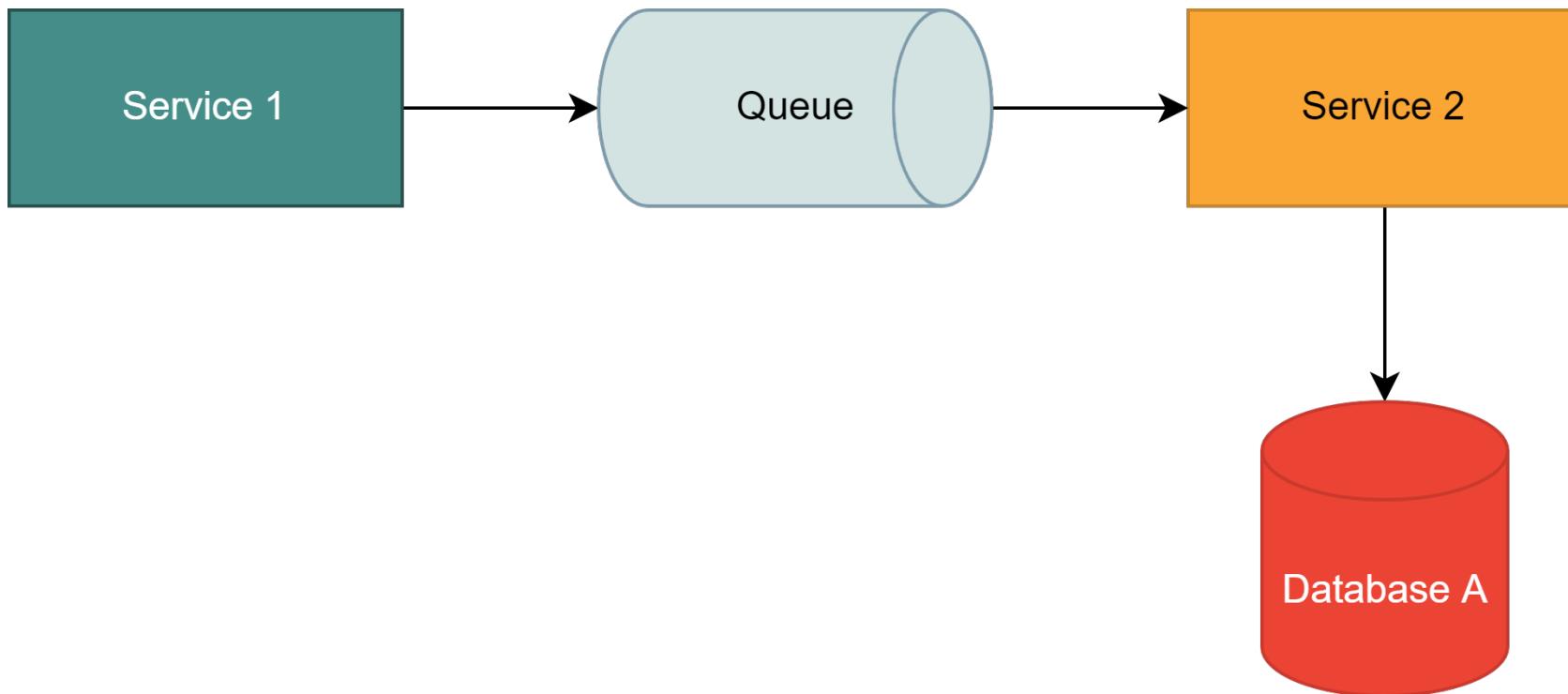
1



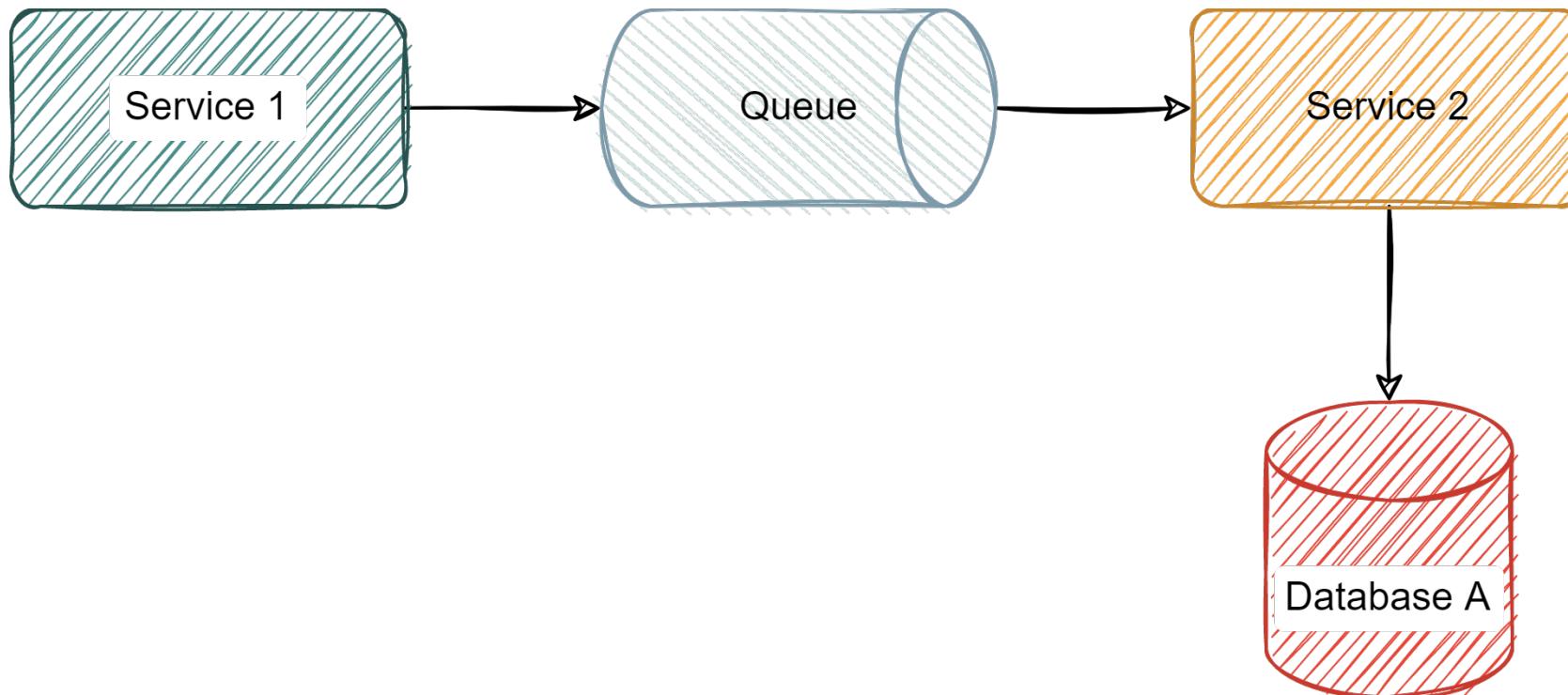
2

Use style to visually
communicate to your audience

Style Communicates



Style Communicates



Pattern

Meta Style

AKA: using style to communicate

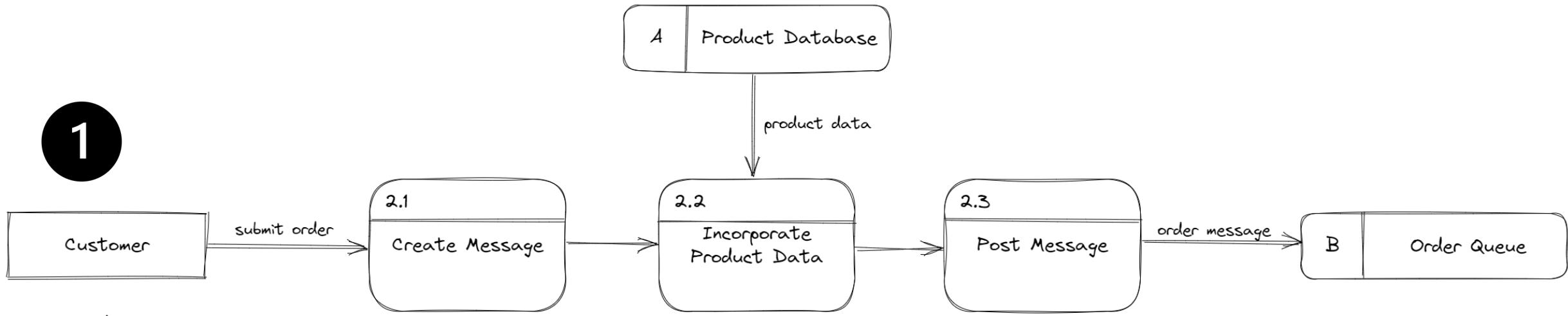


Use style to your advantage

Avoid miscommunication

Which style is correct?

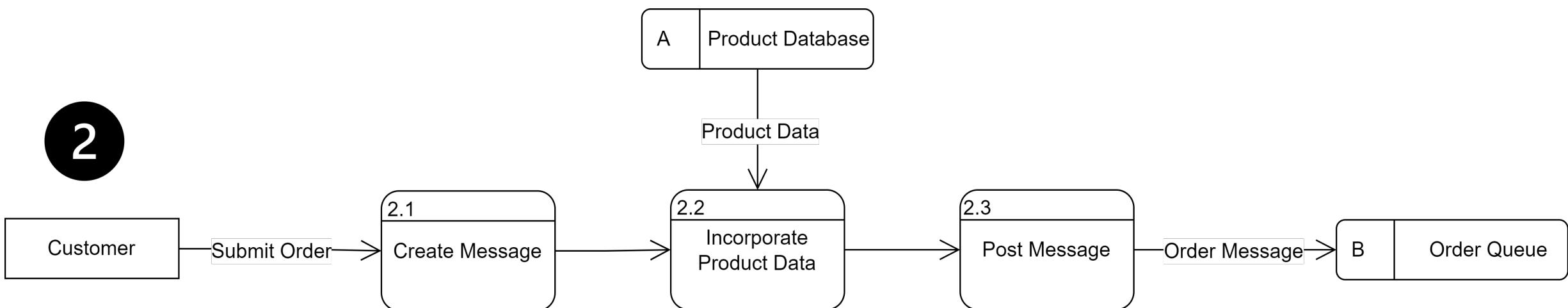
1



Web Application

Data Flow Diagram: products & orders - 2. Create Order

2



Web Application

Data Flow Diagram: products & orders - 2. Create Order

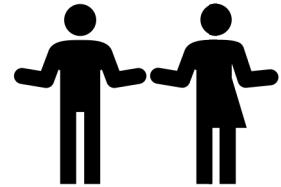
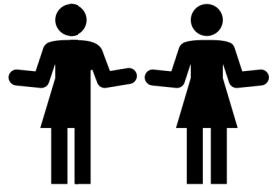
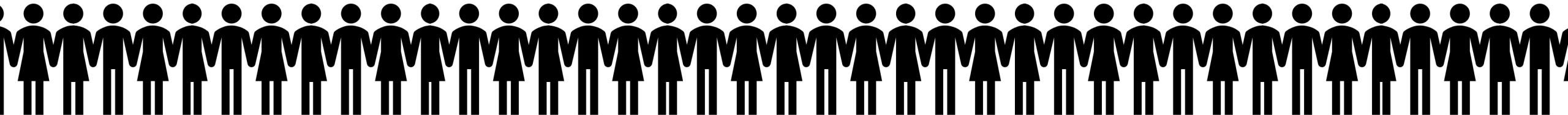
Pattern

Face in the Crowd

AKA: know your audience



Different audiences need
different levels of detail and
different types of diagram



Who is your
diagram for?



Think about these

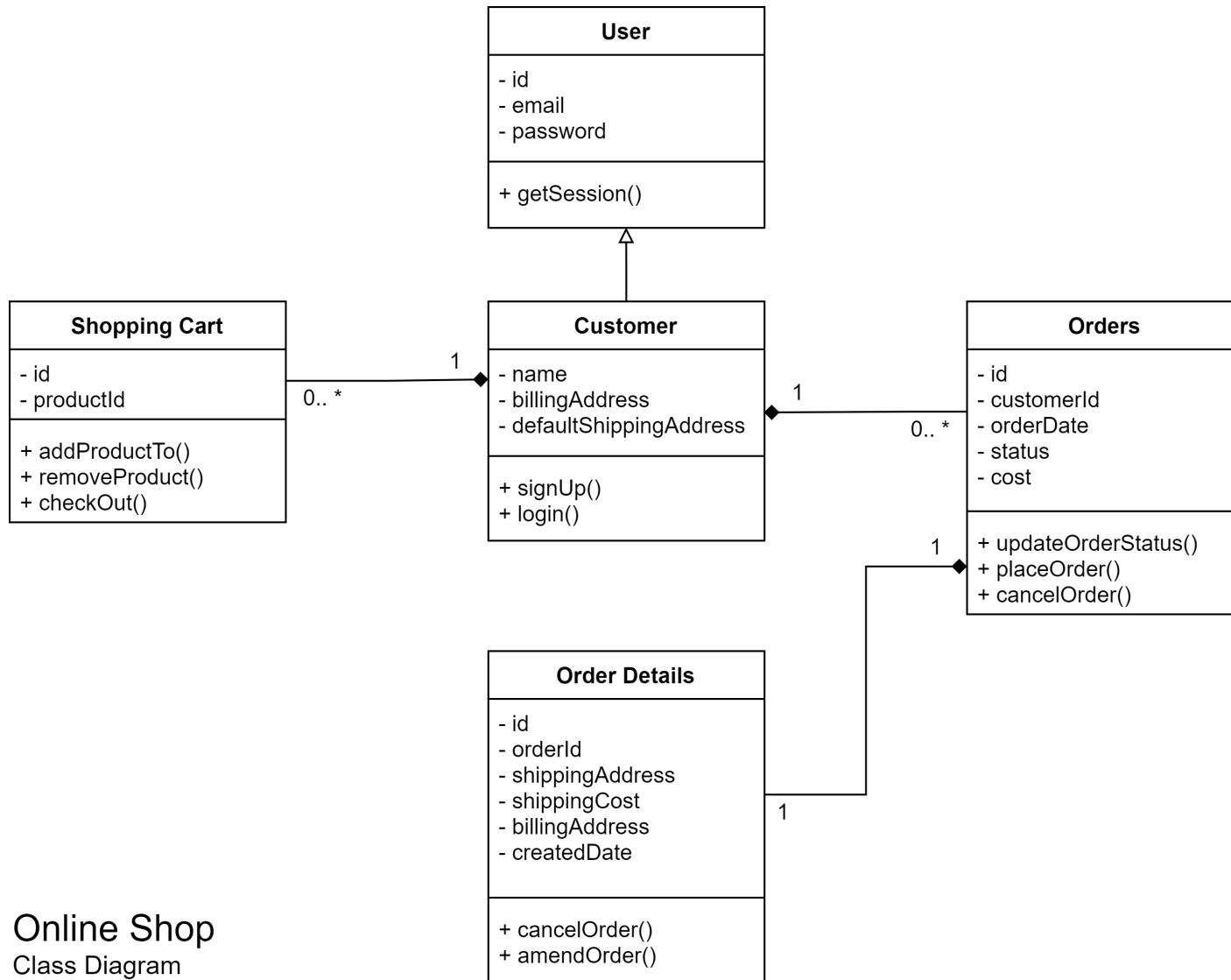
What is their technical
understanding?

What level of detail do
they need?

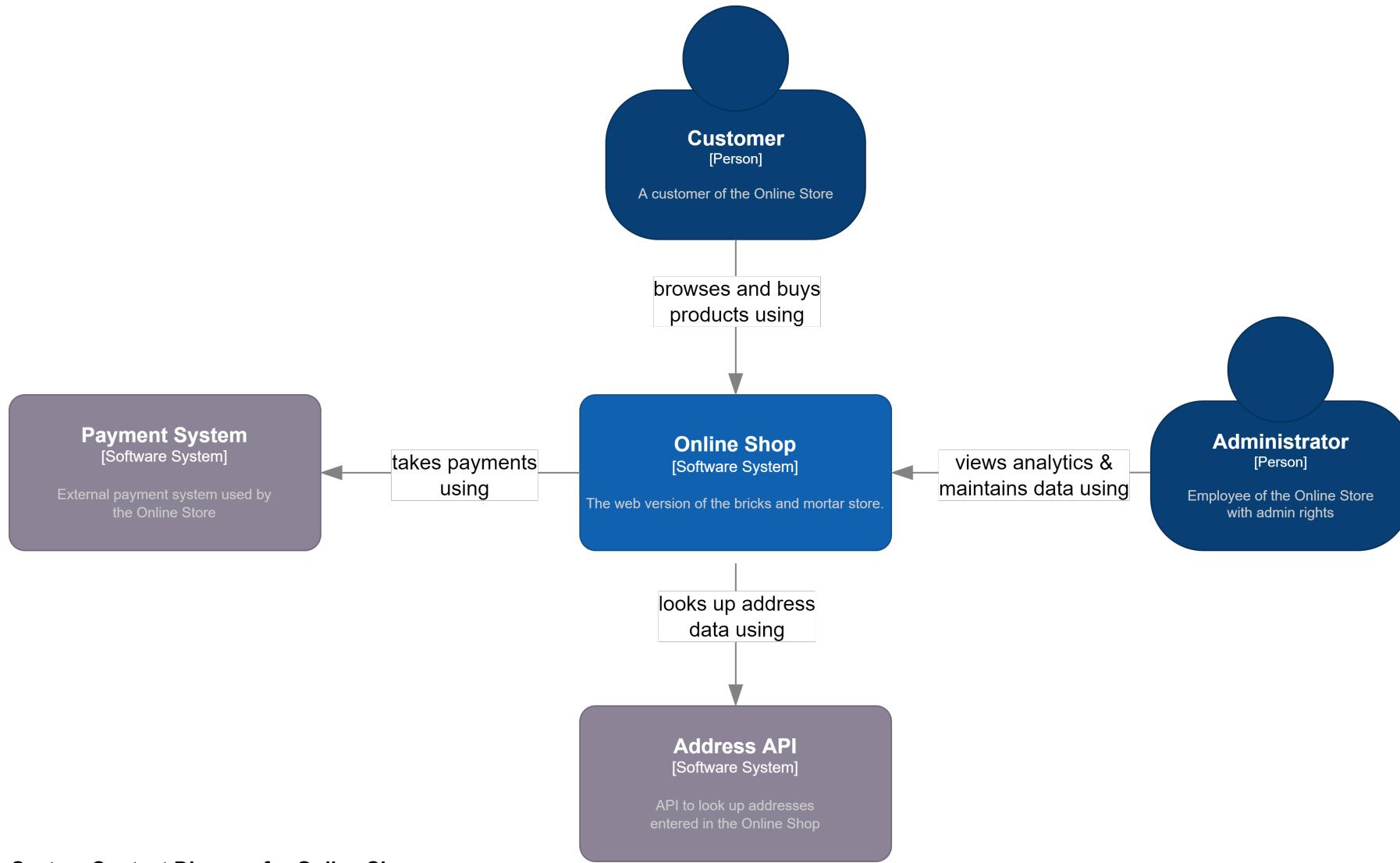
What do they want
from you?

What do you want
from them?

Who is this for?



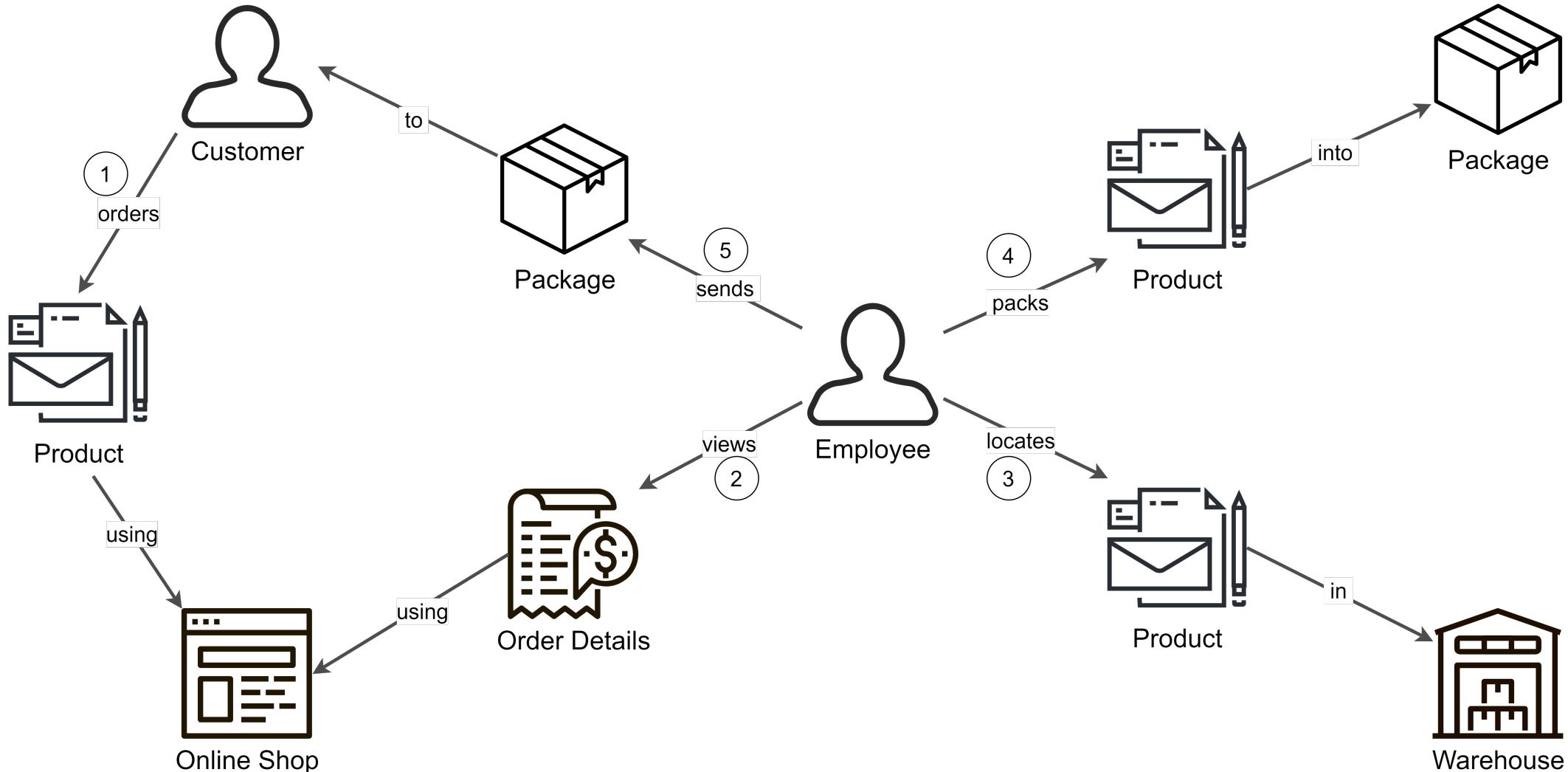
Who is this for?



System Context Diagram for Online Shop

Showing the high-level interactions with the Online Shop system.

Who is this for?



Online Shop

High-Level Domain Story | Customer orders and receives a product

Antipattern

Multi-Storey Diagram

AKA: mixing levels of abstraction



A 'Sin' in Coding

Presentation

Business

Persistence

Database

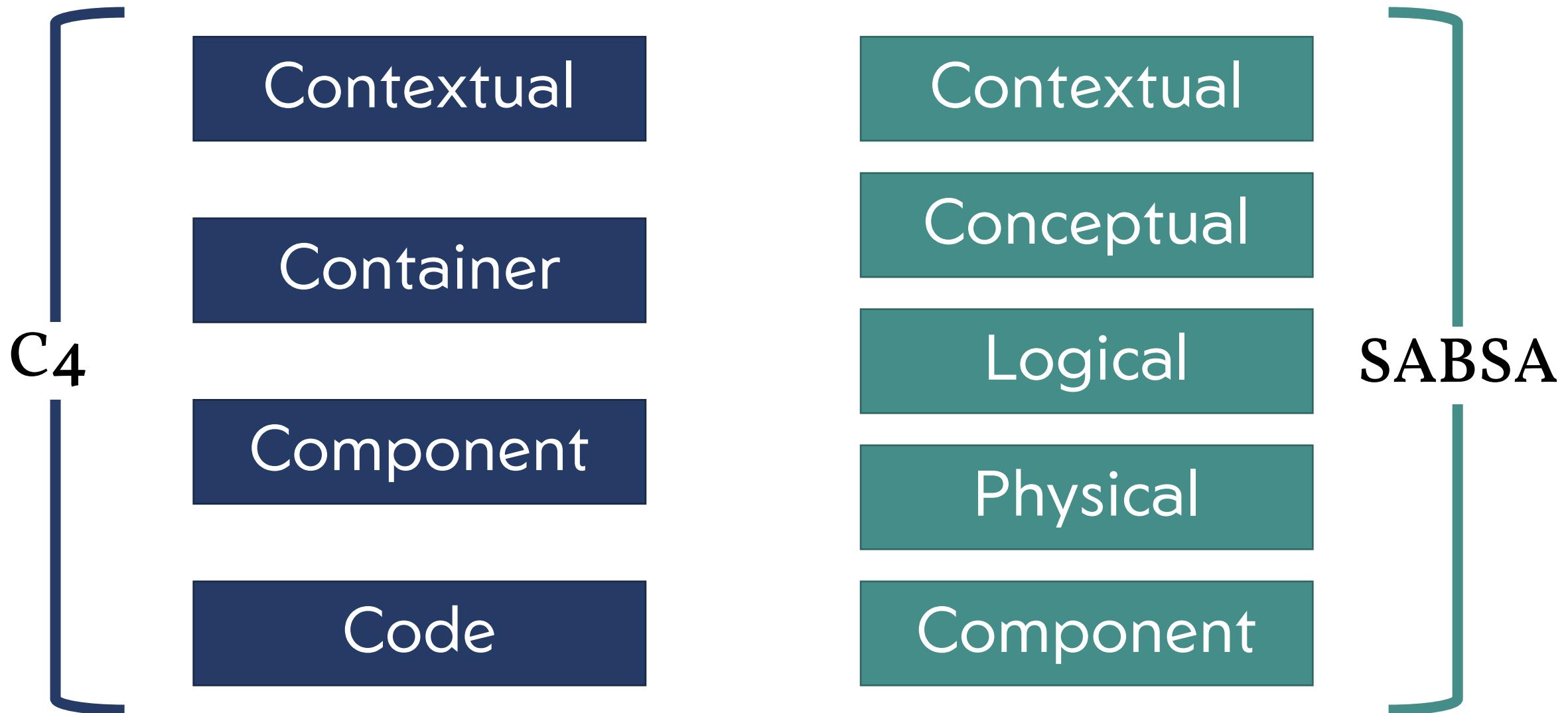
Presentation

Application

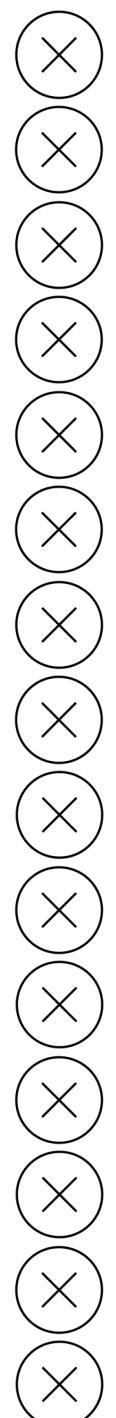
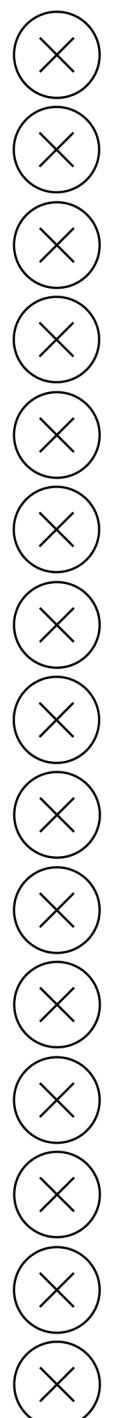
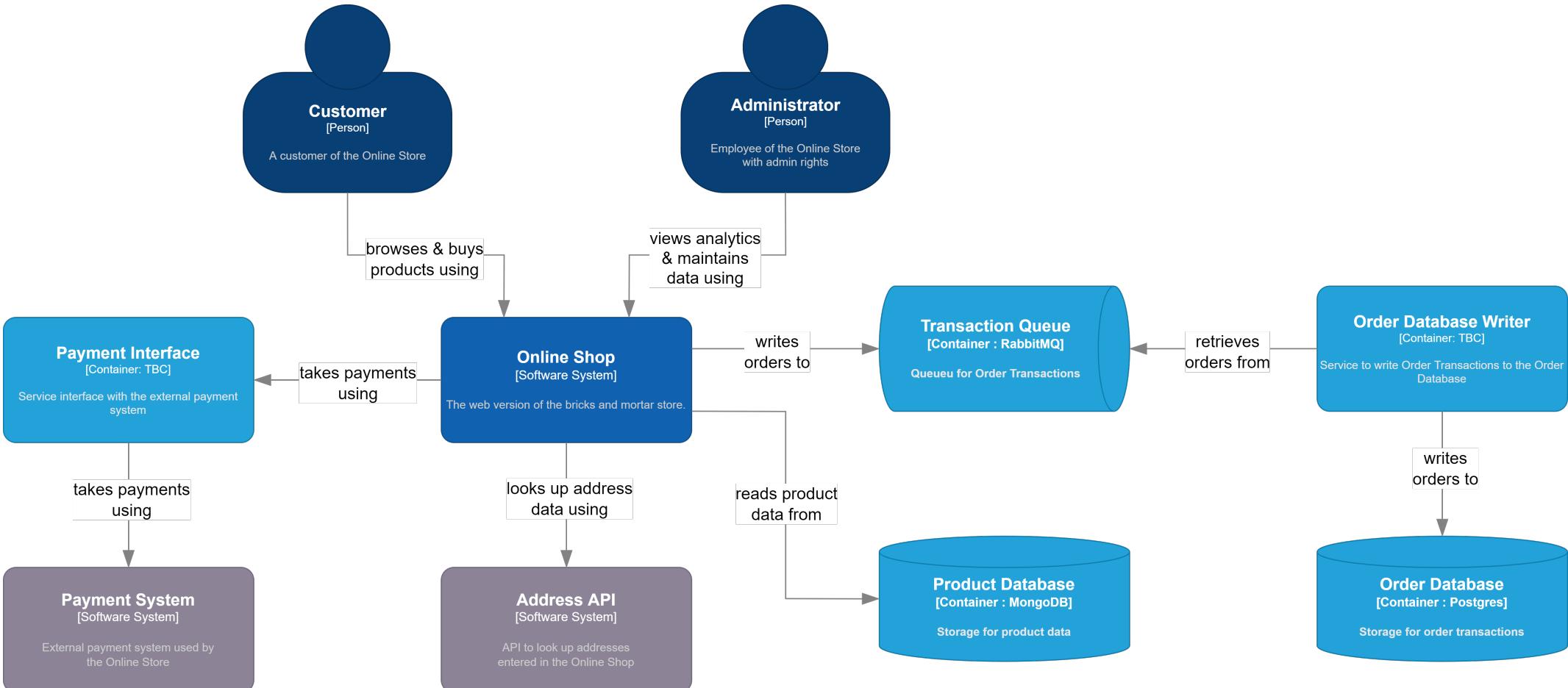
Domain

Infrastructure

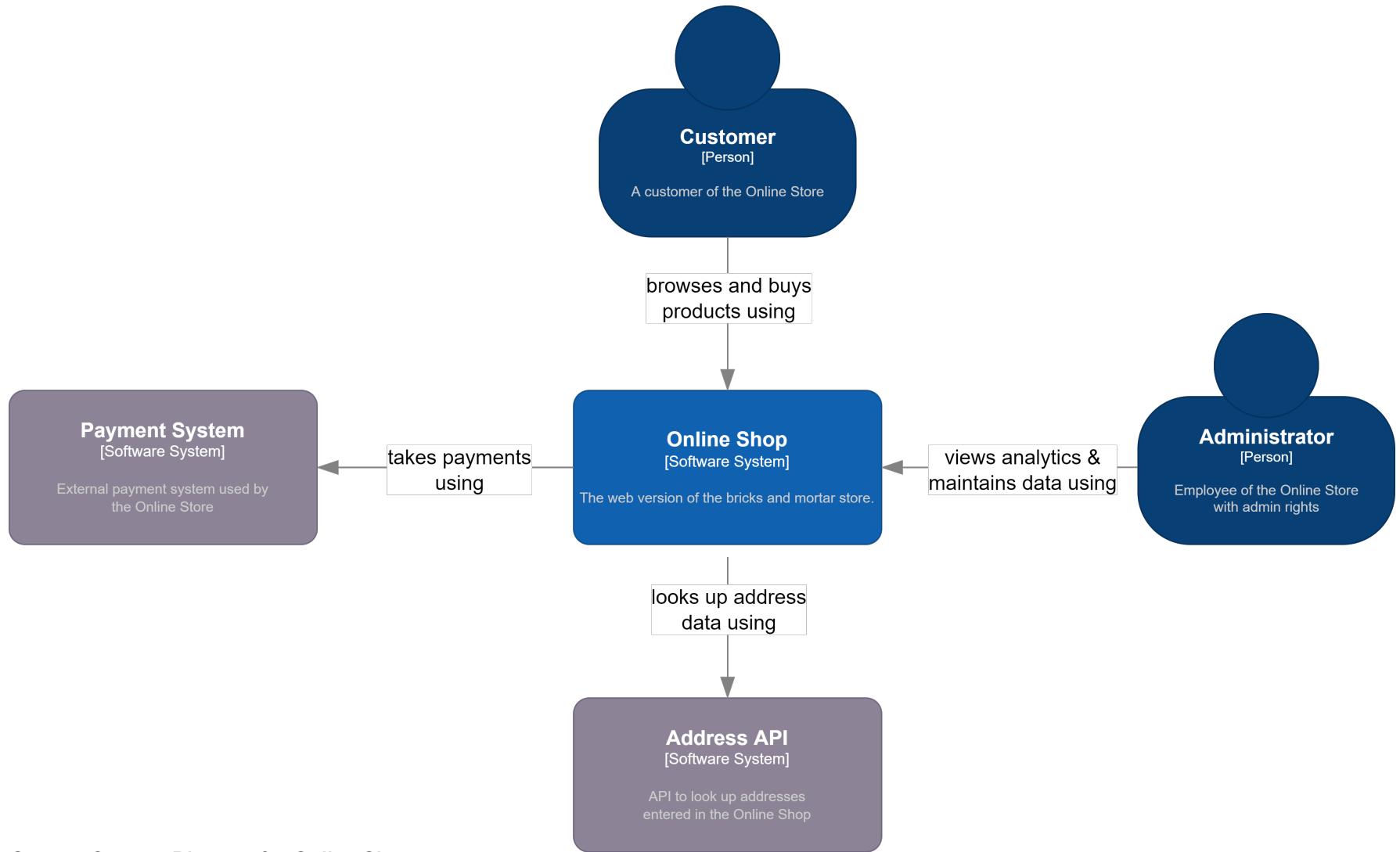
Levels of Abstraction in Architecture



What's wrong here?



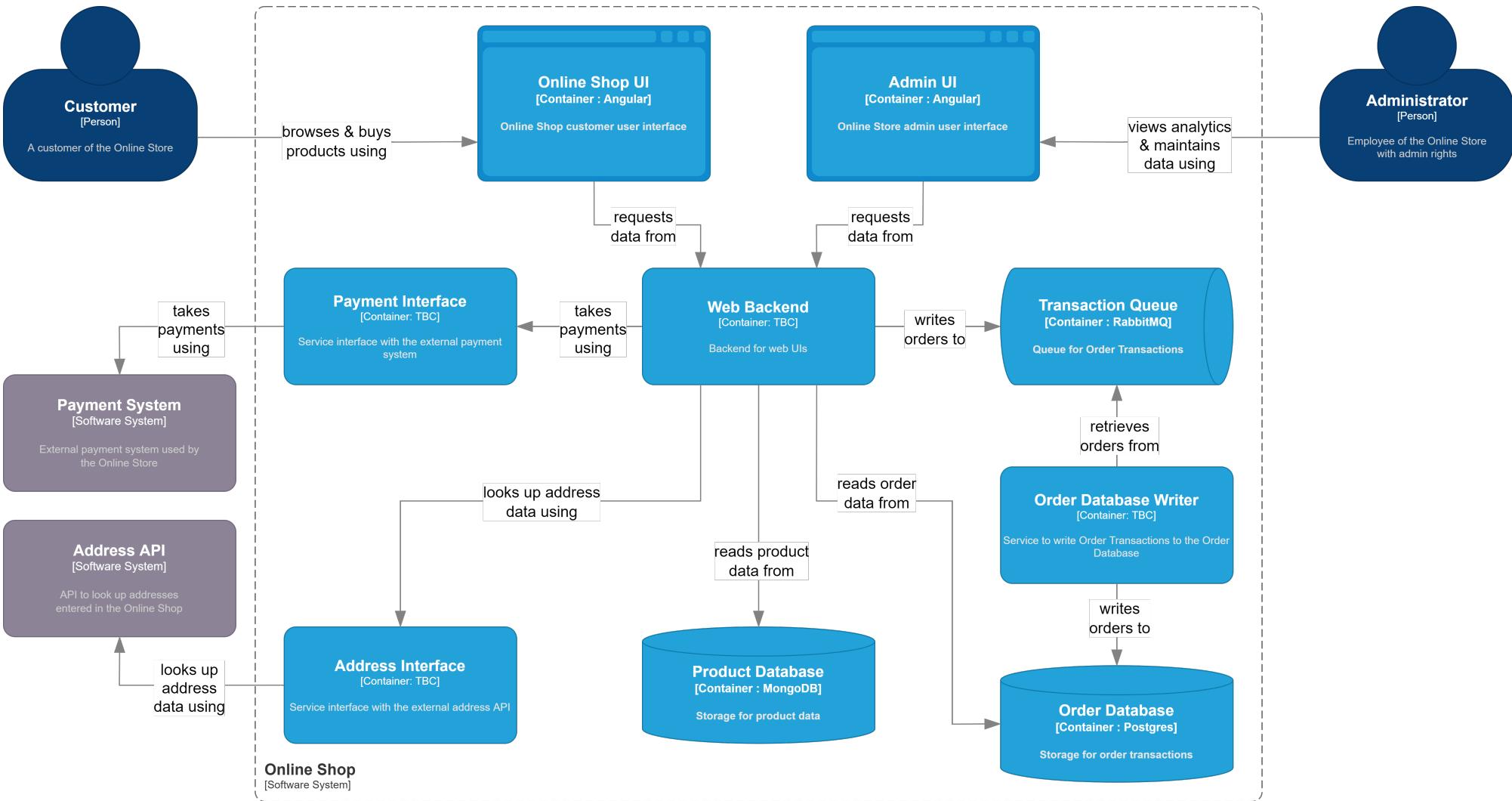
Context Diagram



System Context Diagram for Online Shop

Showing the high-level interactions with the Online Shop system.

Container Diagram



Container Diagram for Online Shop

Showing the high-level interactions within the Online Shop system.

Mixing levels of abstraction
causes confusion

Clarify the Clutter

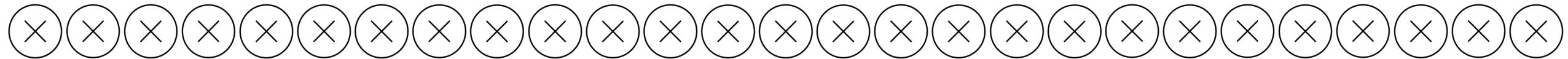
less can definitely be more

Antipattern

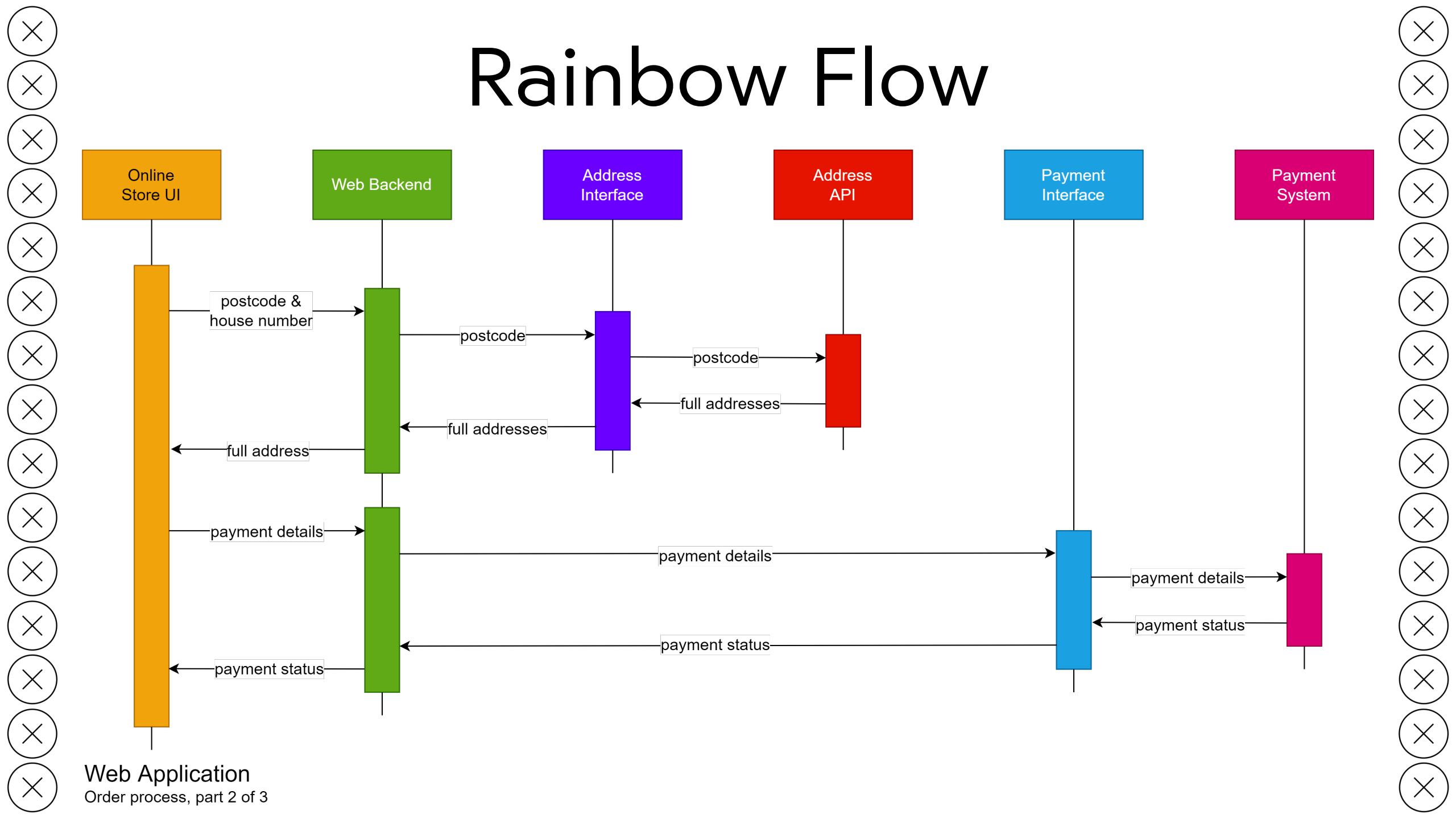
Explosion of Unicorns



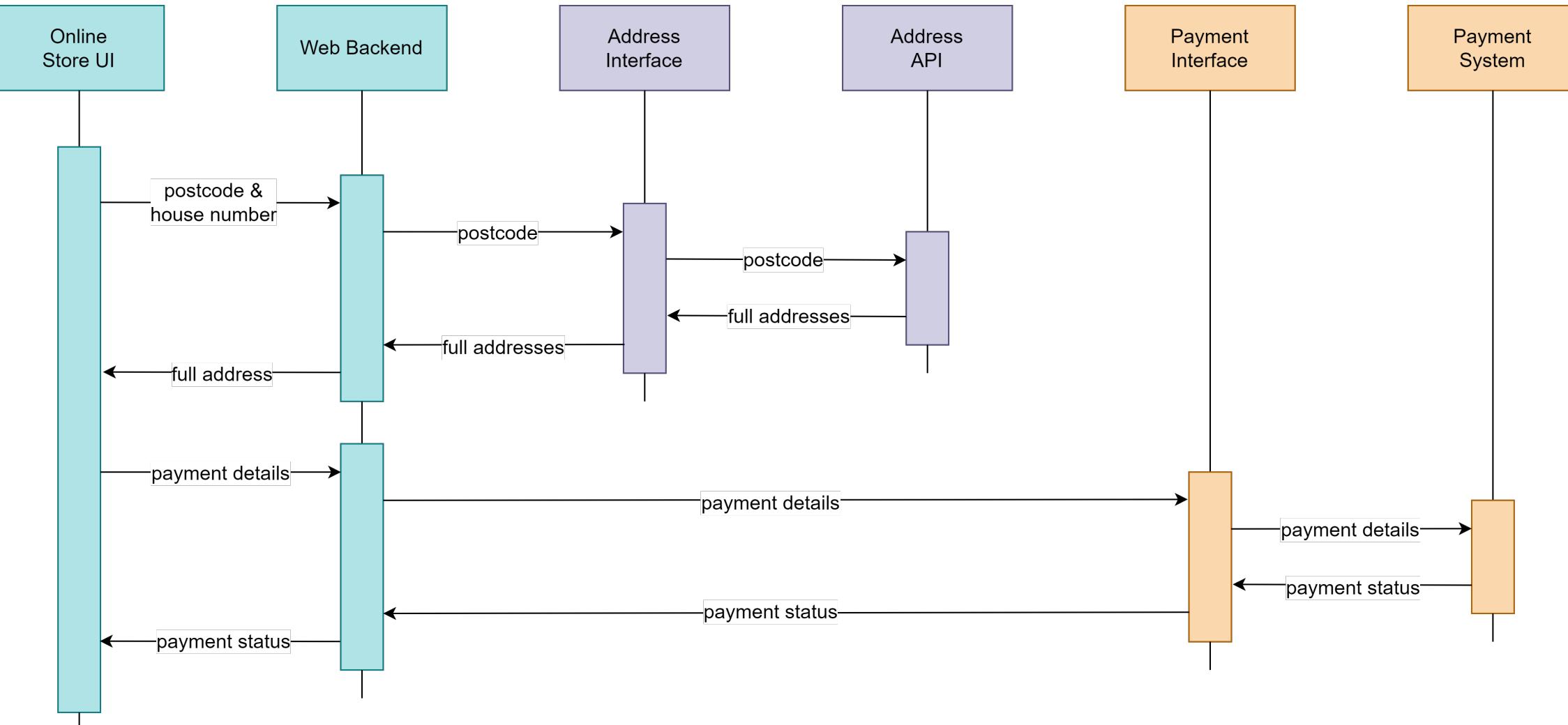
AKA: Too many colours



Rainbow Flow



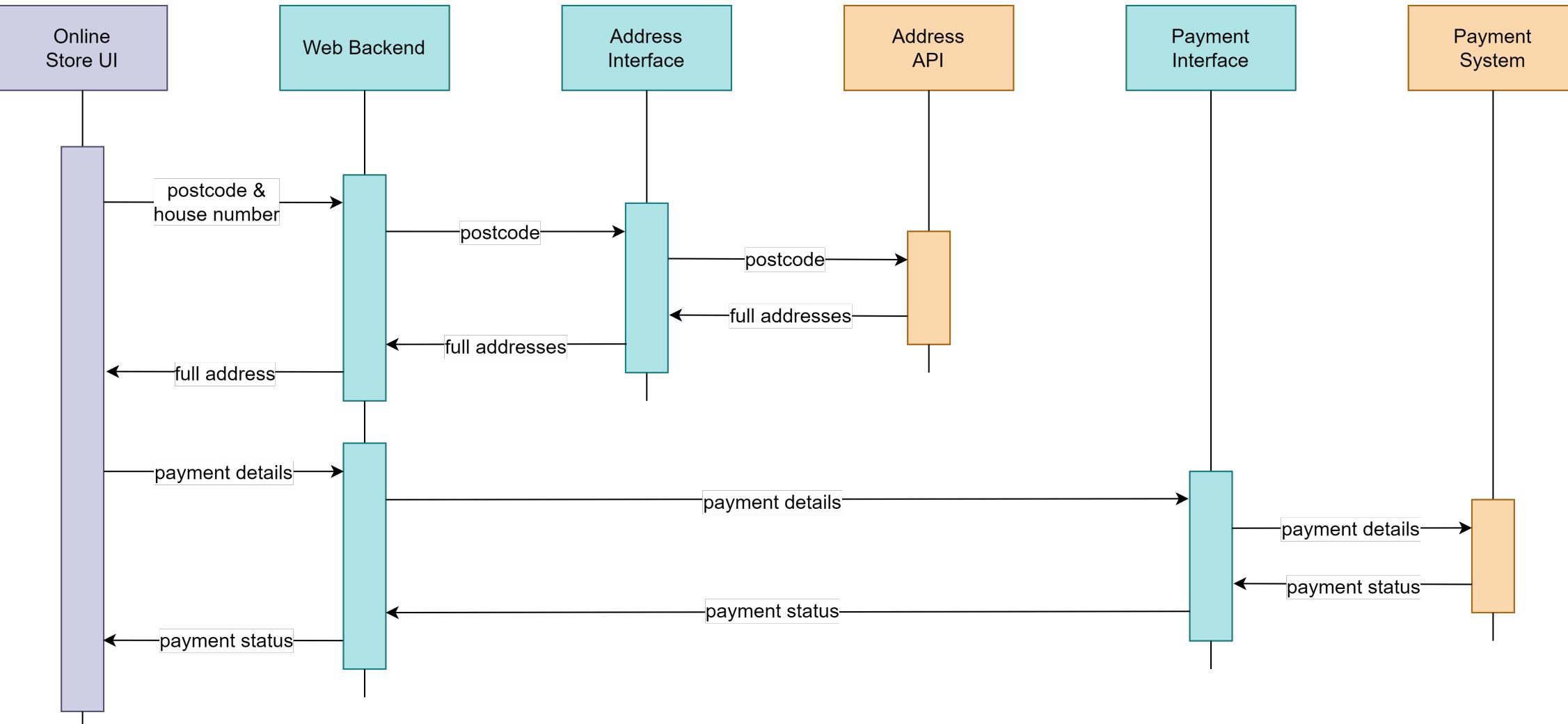
Group by function



Web Application

Order process, part 2 of 3

Group by type



Web Application
Order process, part 2 of 3



Minimise your colour palette

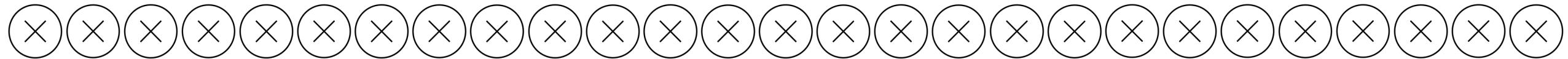
Use colour to aid
communication

Antipattern

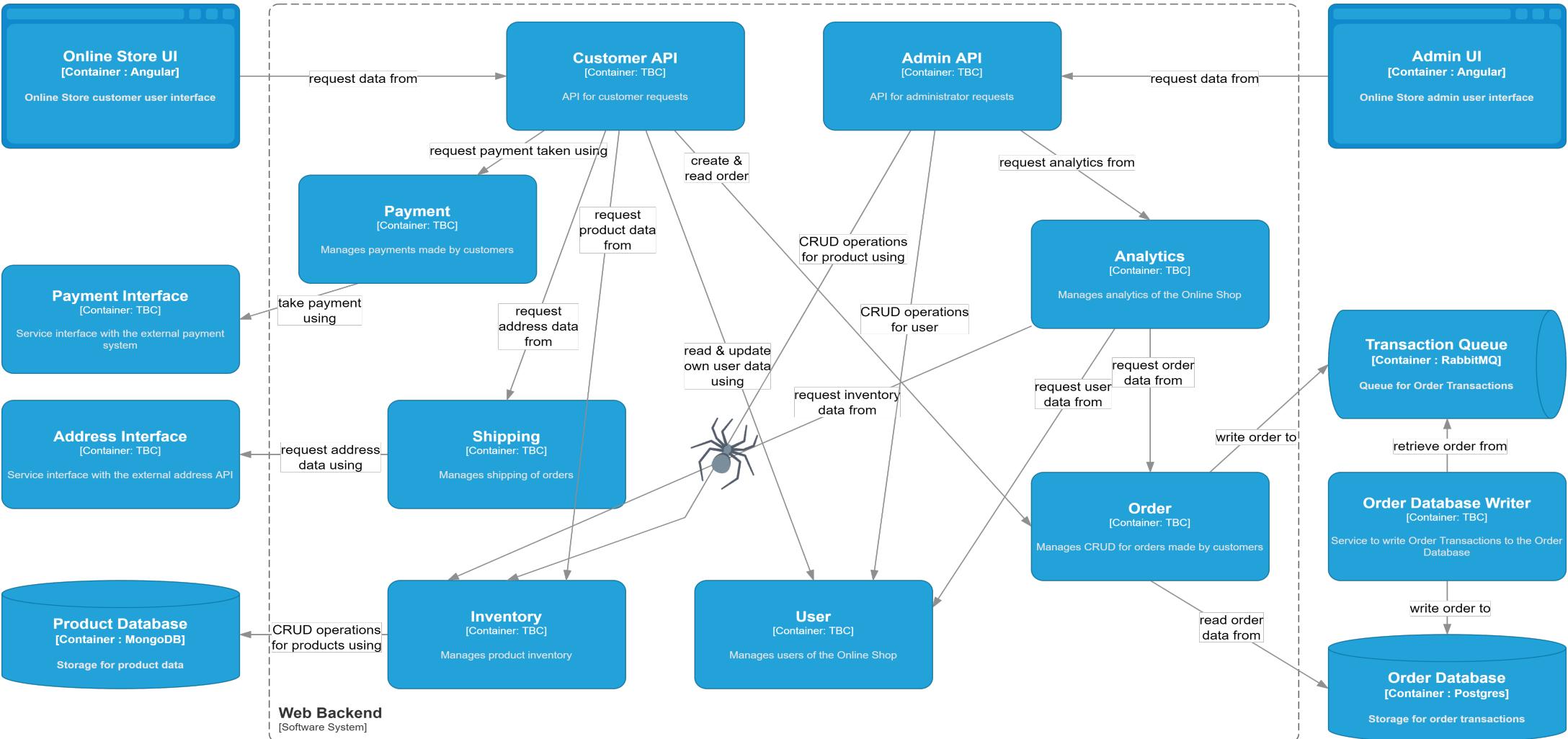
Spider's Web



AKA: unclear relationships



Welcome little fly...



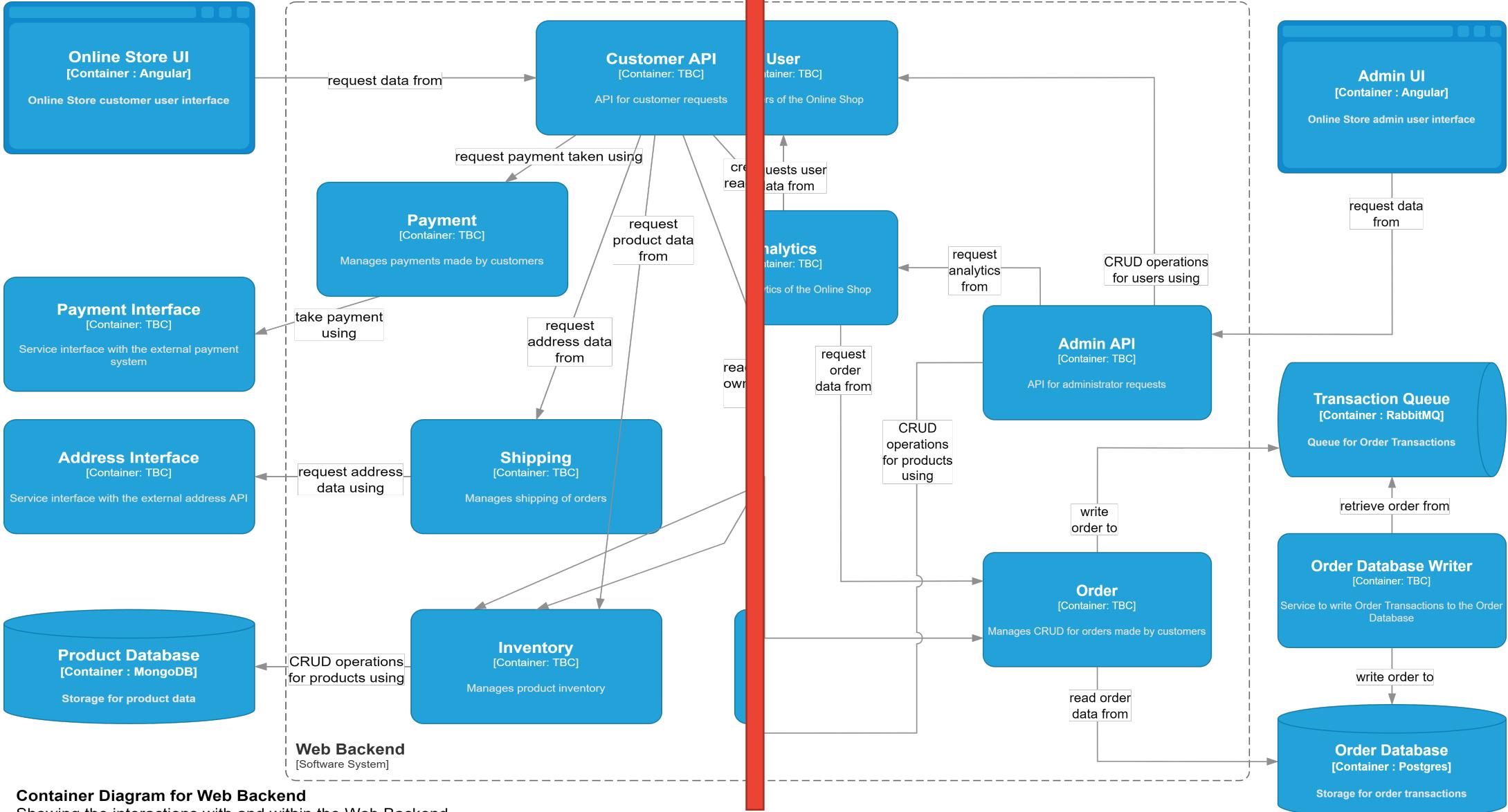
Container Diagram for Web Backend

Showing the interactions with and within the Web Backend.

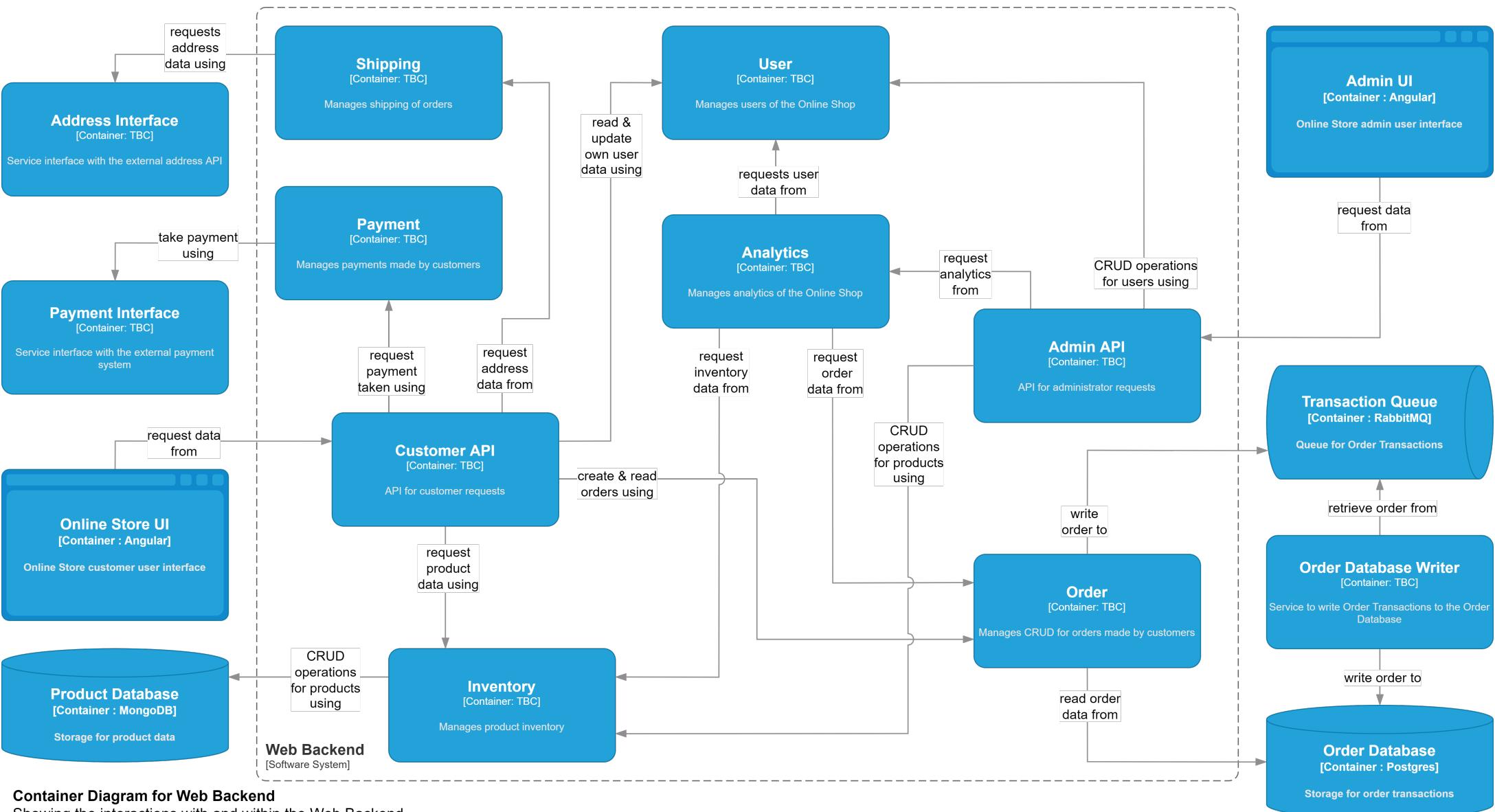
Do

- Remove unnecessary information
- Split up diagrams when necessary
 - e.g. security and logging
- Minimise lines crossing & use obvious line jumps
- Standardise the position of the relationship label
 - unless it adds clarity to have it somewhere else
- Use angled lines to make relationships clearer

Tangled vs. Untangled



Untangled



Diagrams are free

Pattern

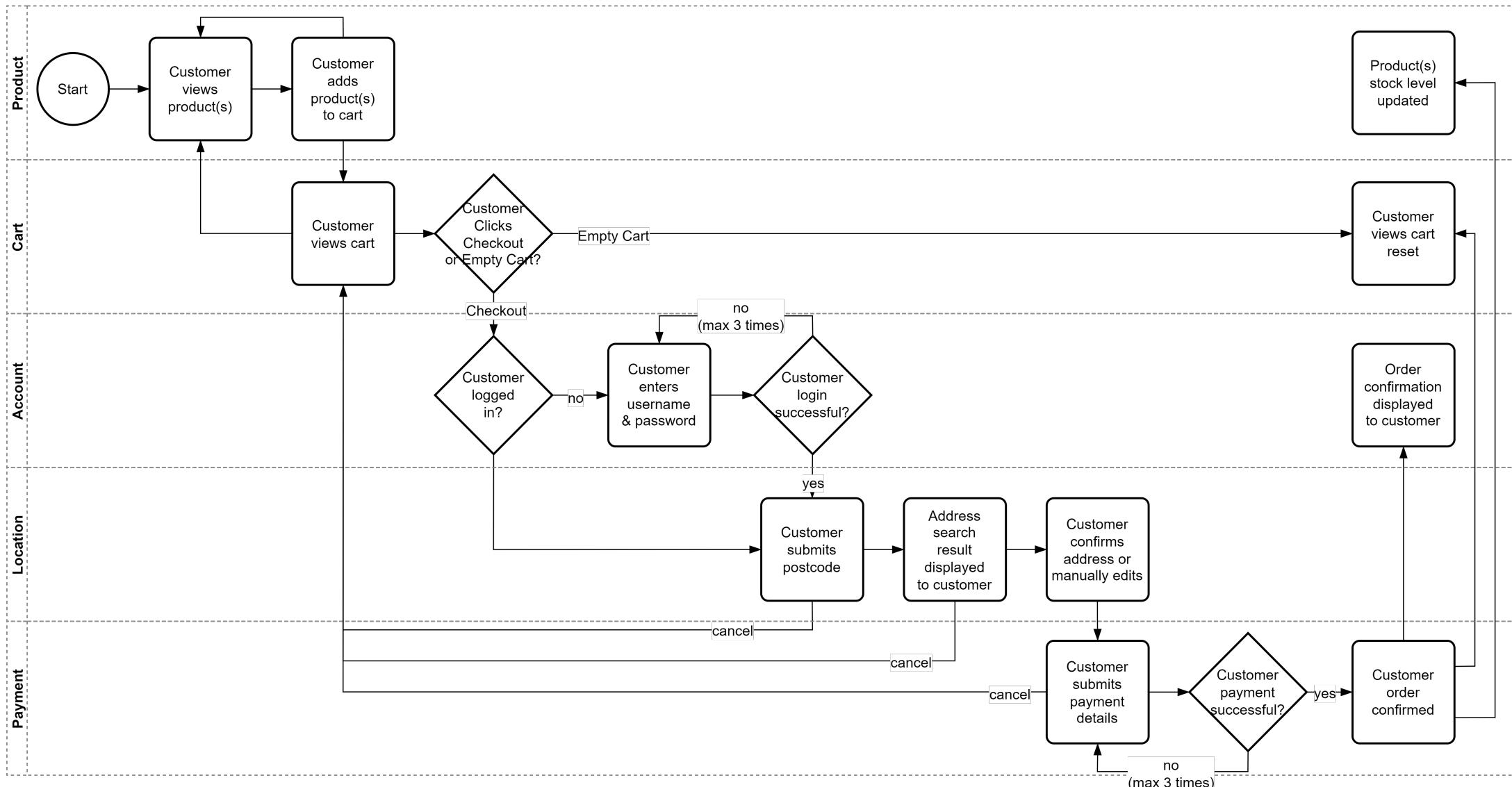
Notes on a Theme



AKA: remove excess text from the main diagram



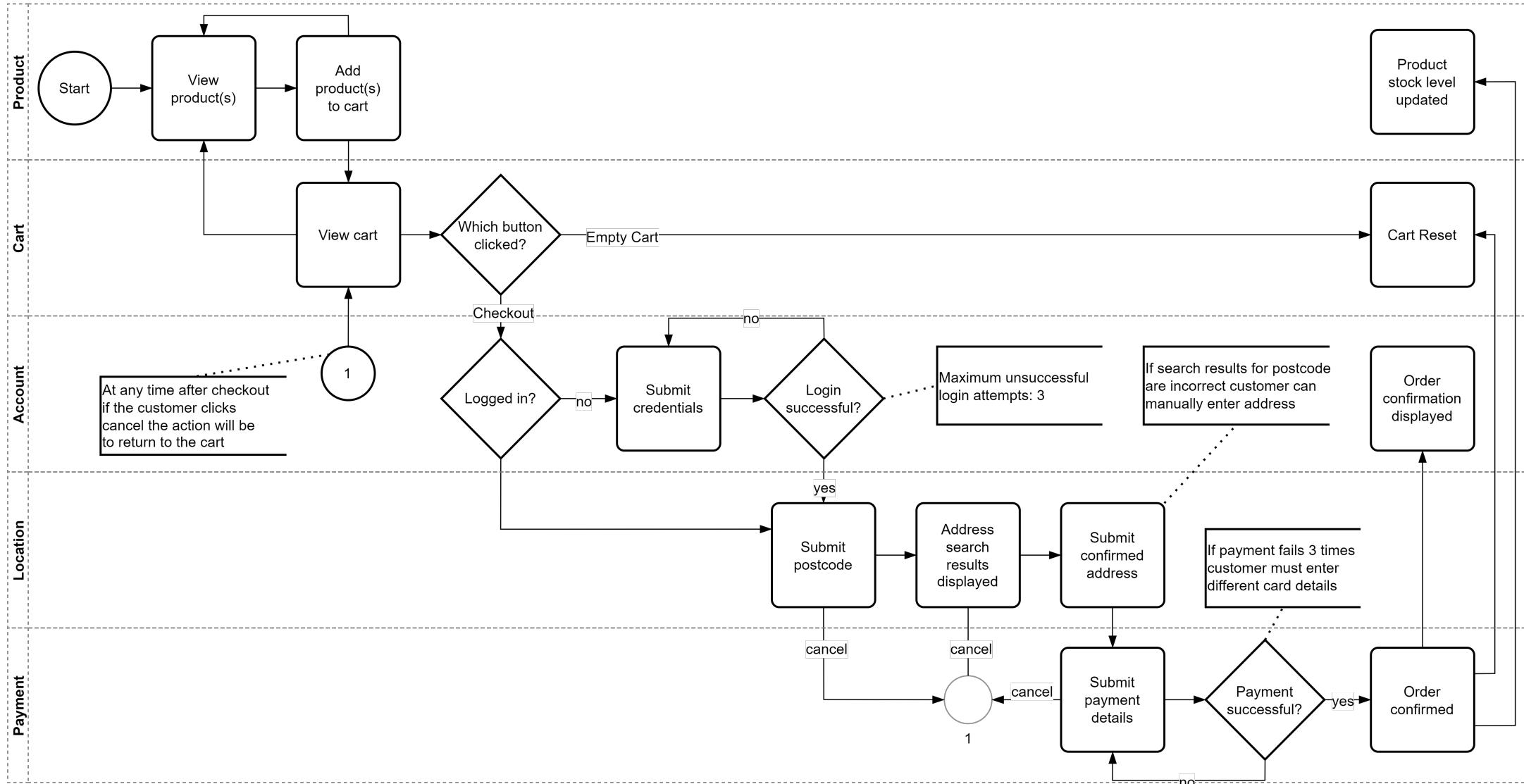
Too much text



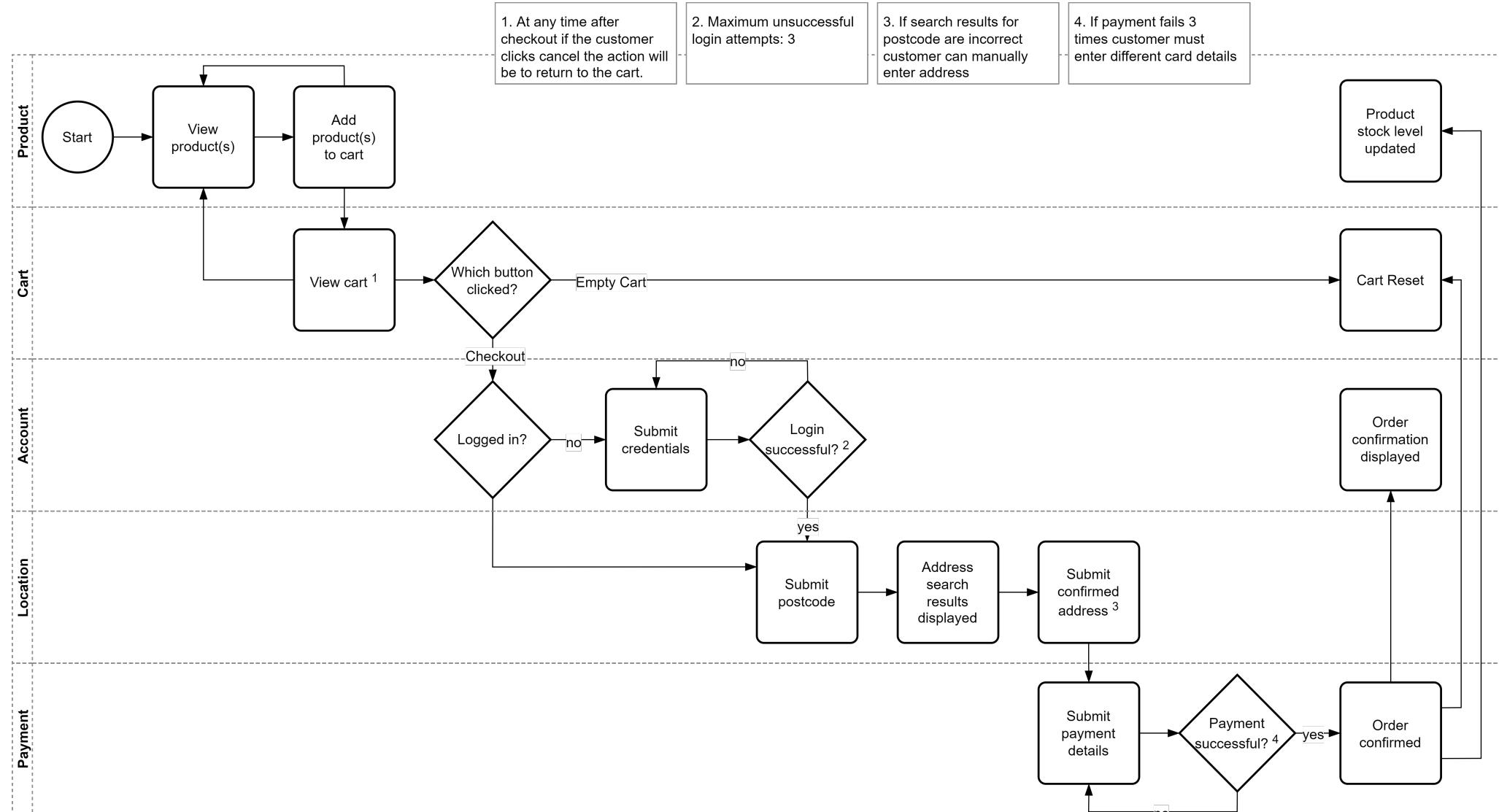
Do

- Remove unnecessary text completely
- Move excess, but required, text to notes or annotations
- Use notation methods to cut down on visual clutter
 - e.g. on- and off-page references in a Flow Chart
- Replace visual clutter, such as excess arrows or lines, with references to notes

Annotations & References



Referenced Notes



Web Application

Customer order process flowchart with error handling : Customer POV

Not all information needs to be
in the main diagram

Accessibility

go beyond screen-readers in your accessibility
considerations

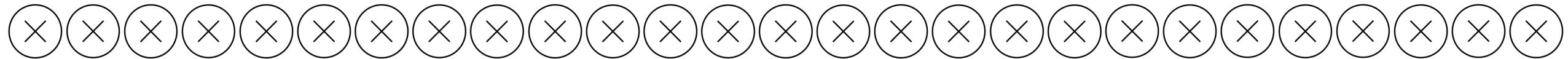
What disabilities /
impediments /disadvantages do
we need to cater for?

Antipattern

Colour is Key



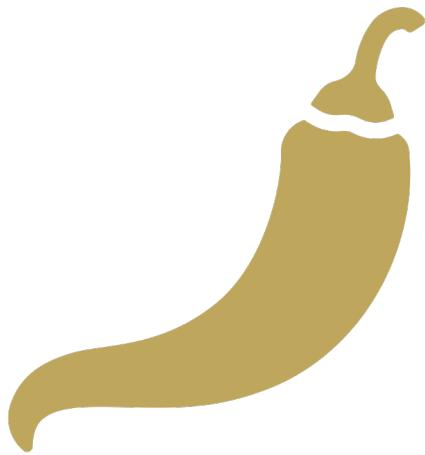
AKA: relying on colour to communicate



Can you pass me the yellow one?



a



b



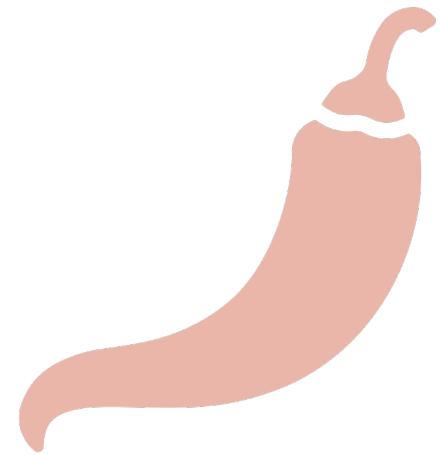
c



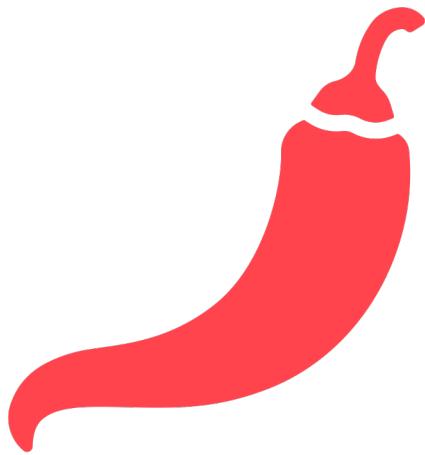
d

Simulated Protanopia

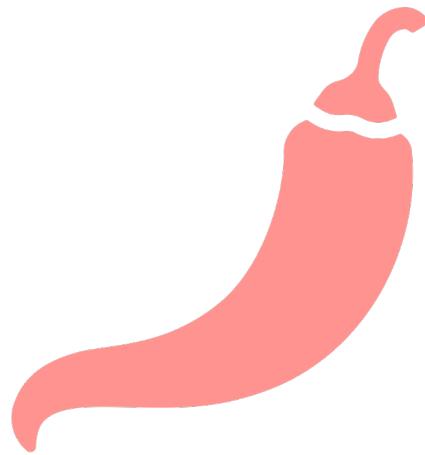
Can you pass me the yellow one?



e



f



g

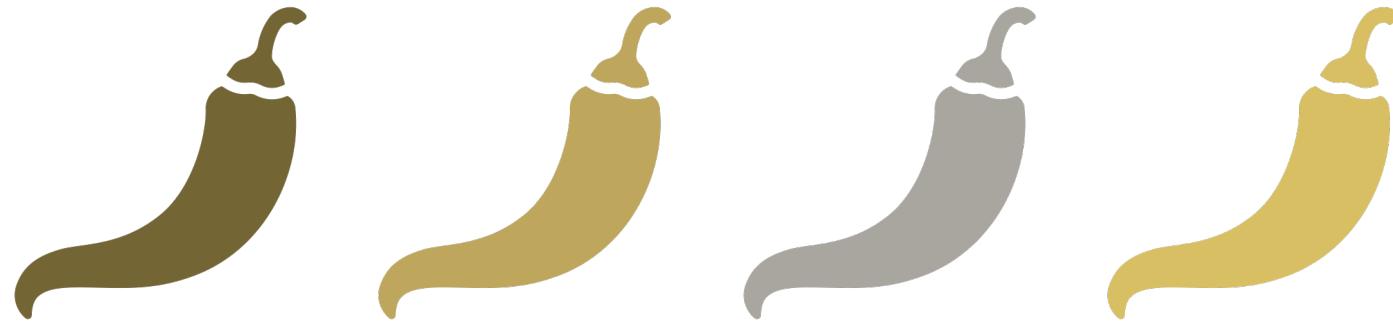


h

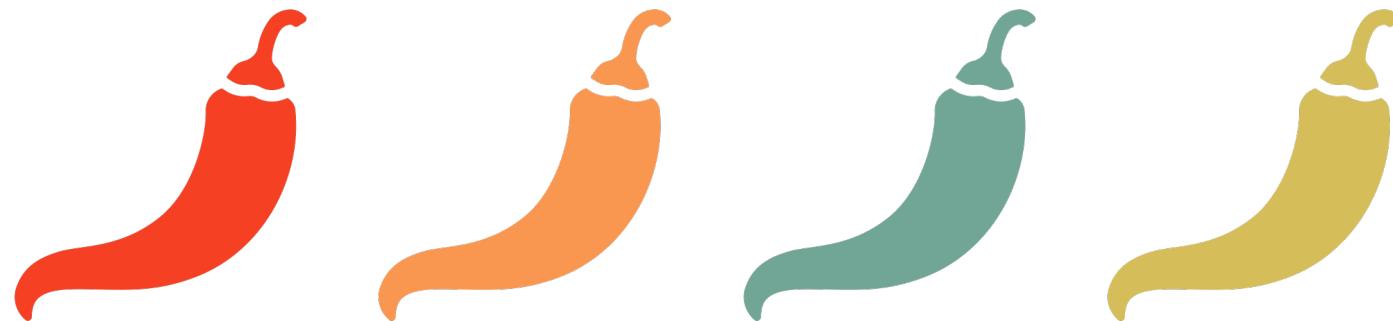
Simulated Tritanopia

Can you pass me the yellow one?

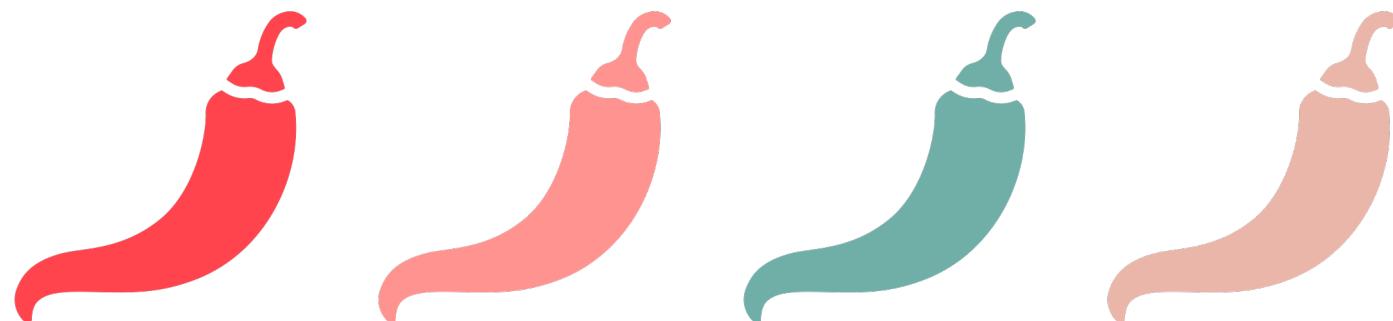
Protanopia



Standard



Tritanopia



Protanomaly



Deuteranomaly



Tritanomaly



Protanopia



Deuteranopia



Tritanopia



Achromatopsia



Approximately 4.5% of the world's population is colour vision deficient

i in 12 men &
i in 200 women
are colour blind

More than 350 million people
worldwide

rainbow - Ecosia - Images + ecosia.org/images?q=rainbow

ECOSIA rainbow

Q All **Images** News Videos Maps More Settings

Search region: United Kingdom All sizes All colors All types Any time All layouts All usage rights

God's Rainbow Rainbow Color Art Rainbow Drawing Rainbow Art Awesome Rainbow Fire Rainbow Rainbow Candy Rainbow Fabric Rainbow Kids Rainbow Stuff Rainbow Neon Lights Pretty Rainbow

Tritanopia Tritanomaly Achromatopsia Achromatomaly Low-Contrast

The rainbow's colors in Cottontail Fizz are in t...
www.reddit.com

The Rainbow | ferrebeekeeper
ferrebeekeeper.wordpress.com

Rainbow Sky | By popular d...
www.flickr.com

Big Horn Rainbow...
fineartamerica.com

A Full Double Rainbow - Burnsland - Photo...
www.burnsland.com

Rainbow ~ Jineralknowledge
jineralknowledge.com

There is a common element in the pass...
www.democraticunderground.com

Double Rainbow | First time to spot a double...
www.flickr.com

301 Moved Permanently
rainbowveins44.wordpress.com

Strange and mysterio...
strangesounds.org

Striking Double Rainbow Photograph by Brent Thomas
fineartamerica.com

Ravishing Rainbow...
www.boredart.com

Colorful Rainbow Photos | AmO
amolife.com

The 14 Most Beautiful Rainbow Photos...
mostbeautifulthings.net

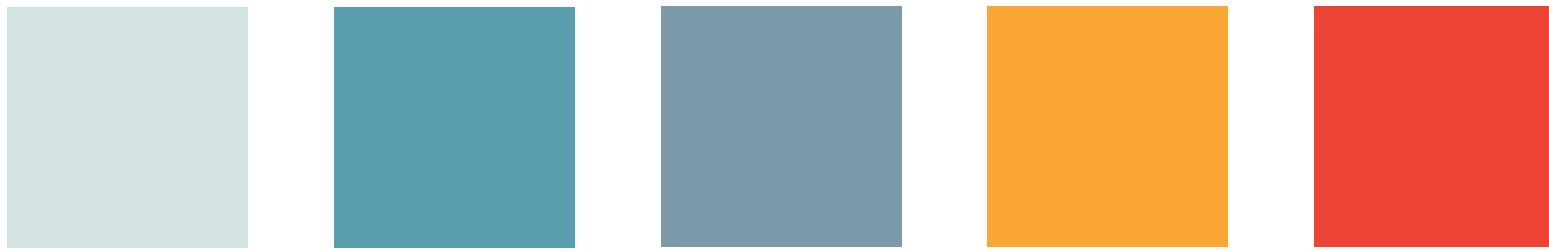
The Rainbow Connection—To Physics
www.sciencefriday.com

Bill's Log: A Rainbow of Pro...
bills-log.blogspot.com

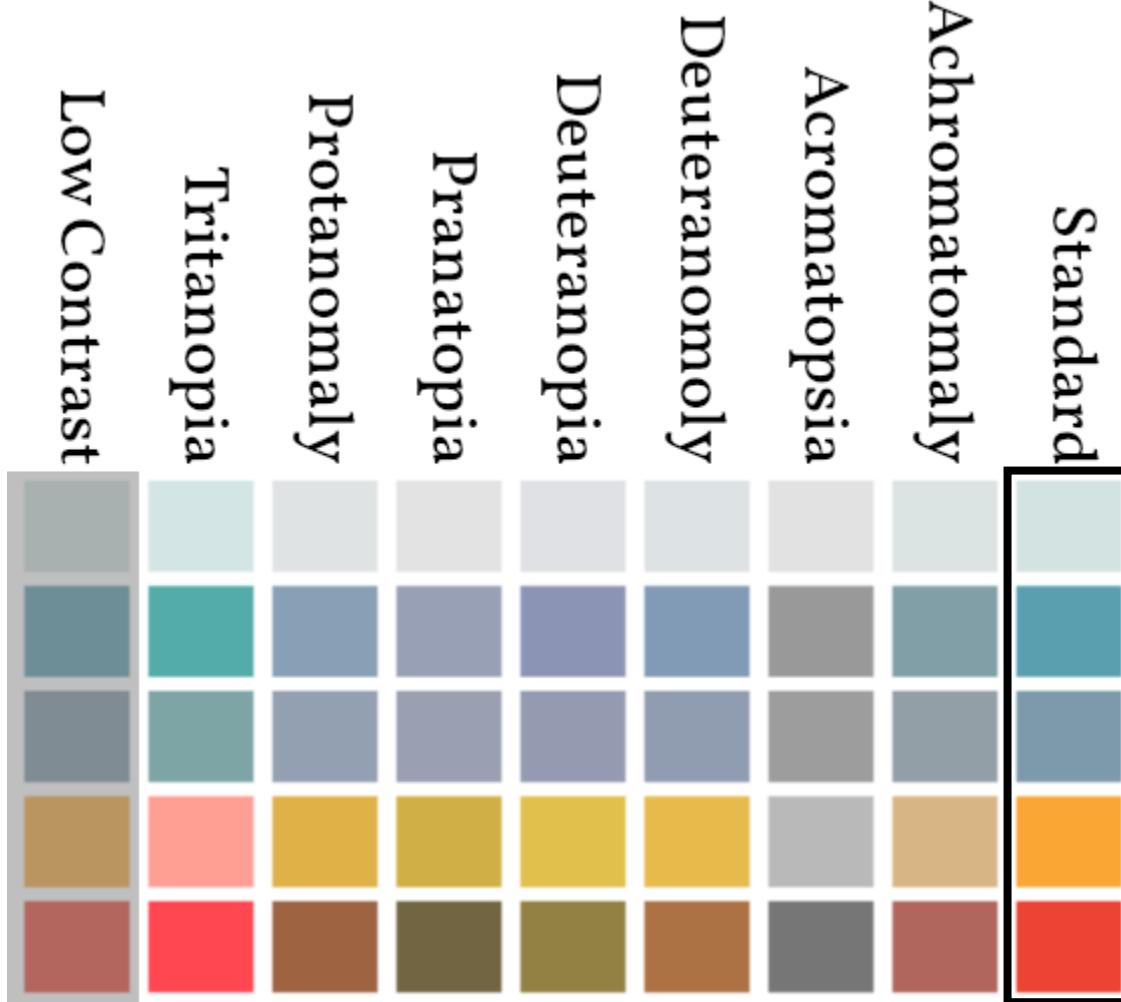
Amazing rainbow! : Adelaide
www.reddit.com

What causes a double rainbow? | The Weather Guys
wxguys.ssec.wisc.edu

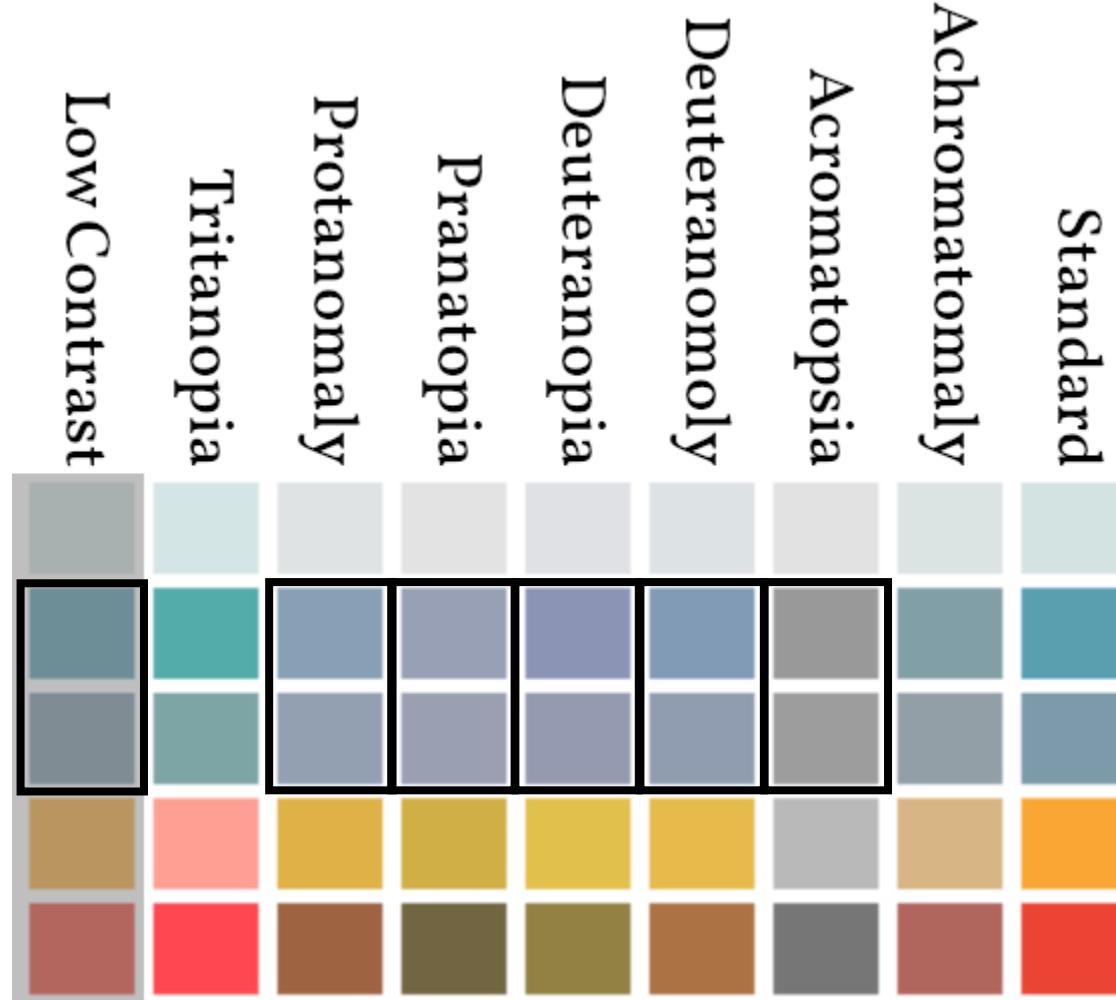
A palette I created



A pallet I created



A palette I created



An accessible palette I created

Standard

Achromatomaly

Acromatopsia

Decentralization

Pranatopia

Protanomaly

Iritanopia

Low Contrast



Don't rely on colour alone

Diagrams.net Standard Colours



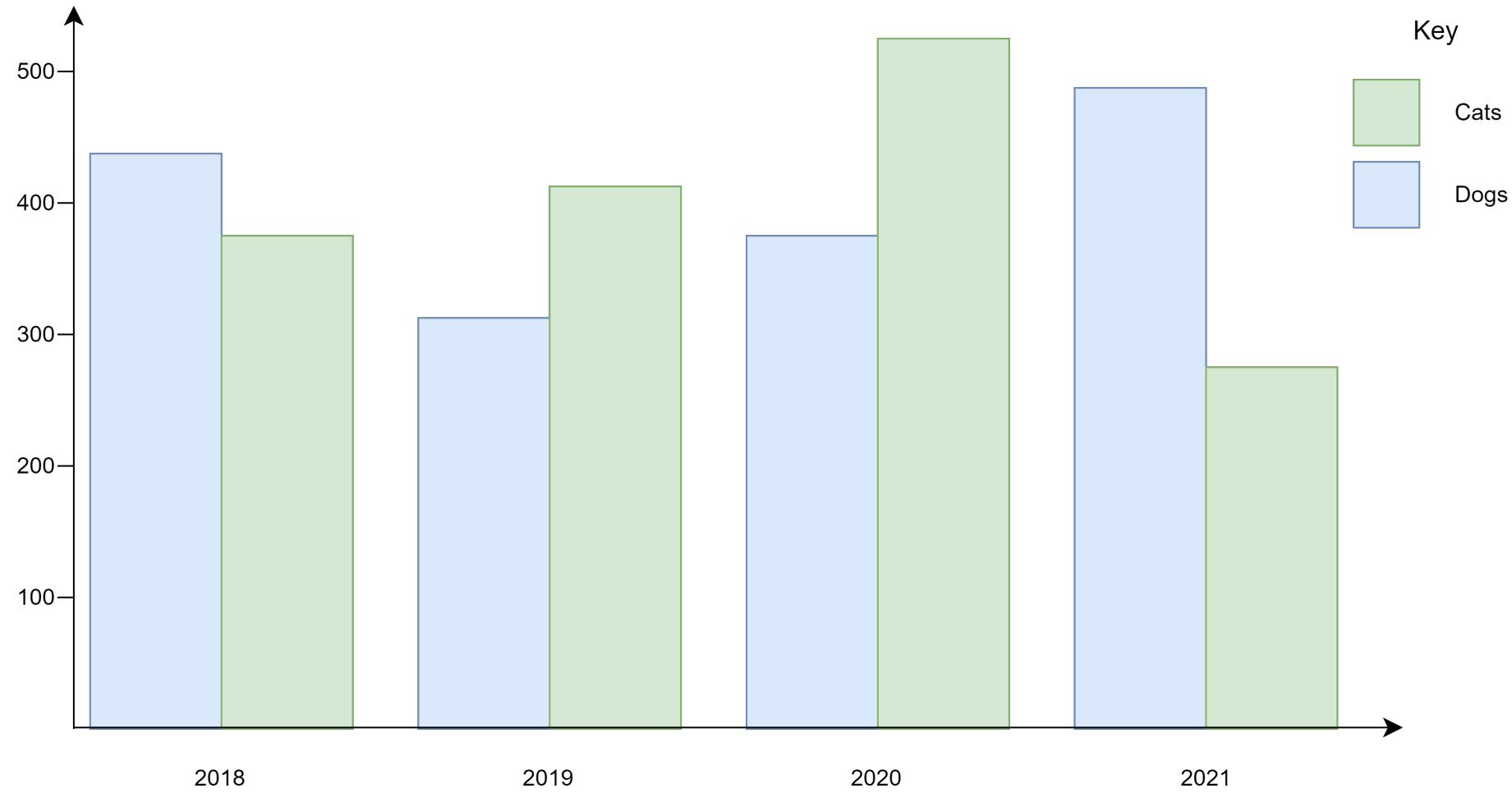
Deuteranopia Simulated



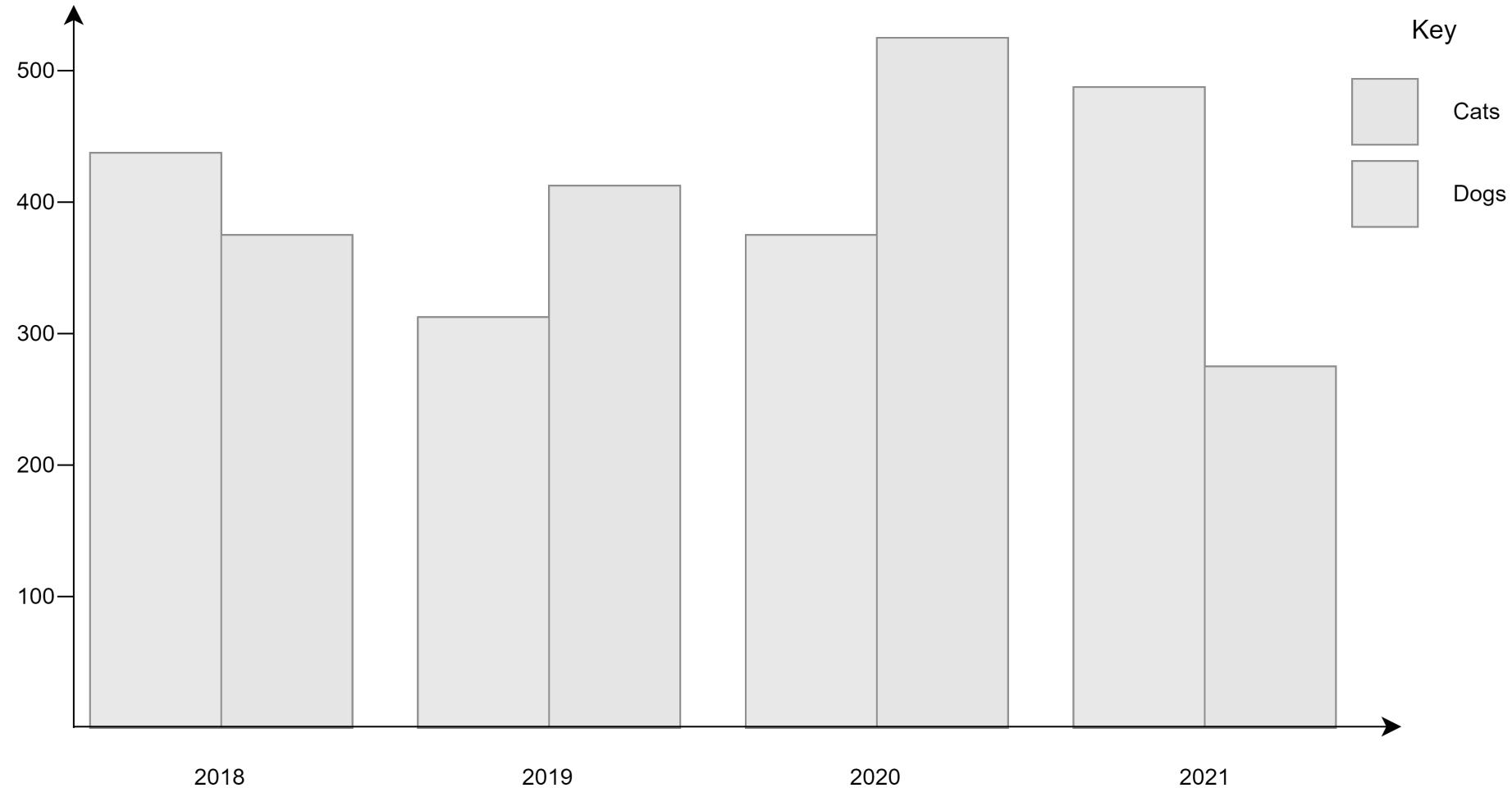
Colour-Deficiency-Friendly

Use a colour-blind simulator

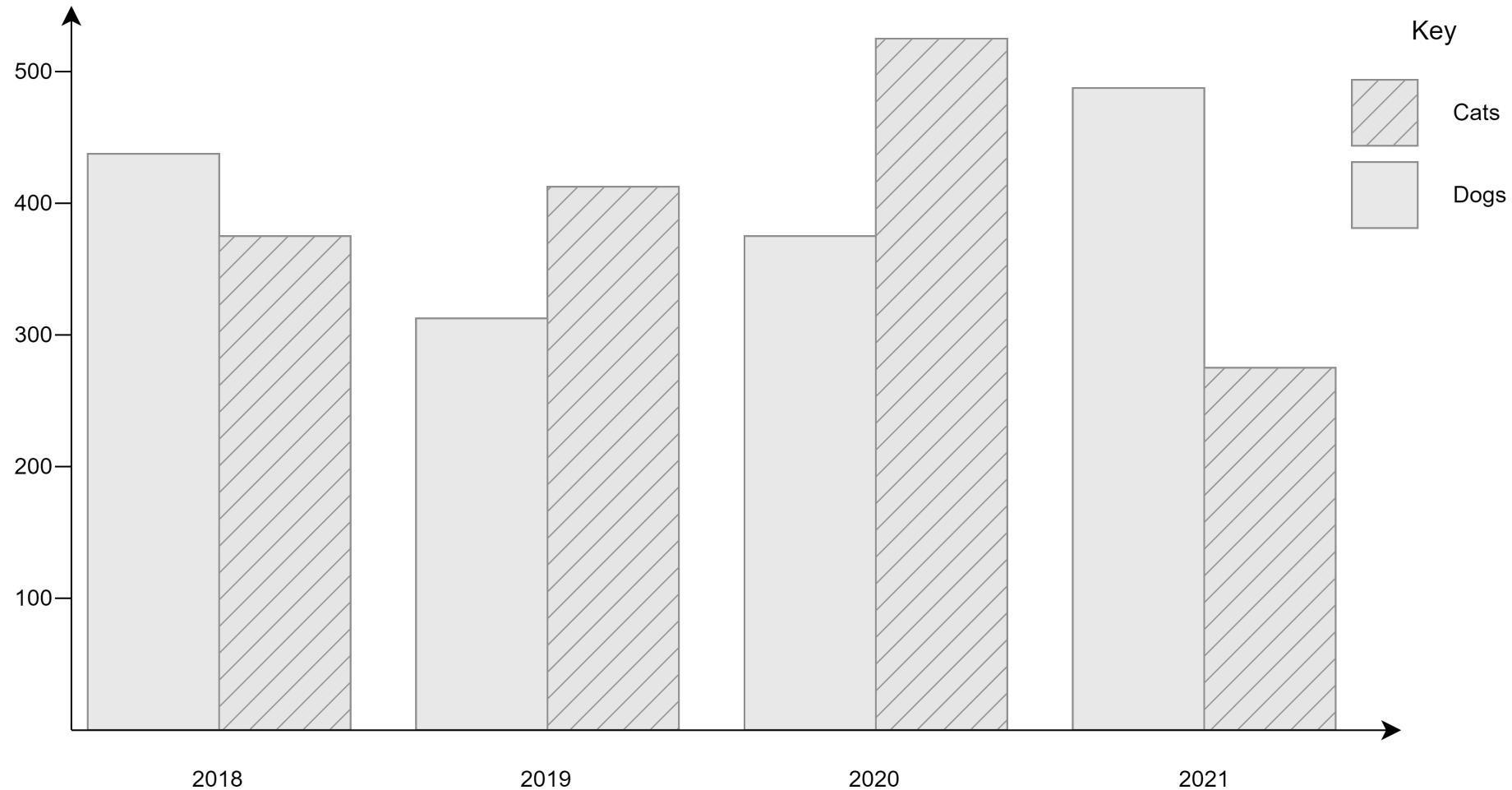
Colour is key?



What about greyscale?



Use pattern



Use symbols



Do

- Use patterns, symbols or labels, along with colour
- Choose colours with different saturation levels
- Use a colour deficiency simulation tool to check your palettes
- Consider monitor and projector colour calibration
- Consider if your diagram will be shown in greyscale

A take-away question for you:

Is your corporate/software palette
colour-deficiency-friendly?

Pattern

Written in Legend

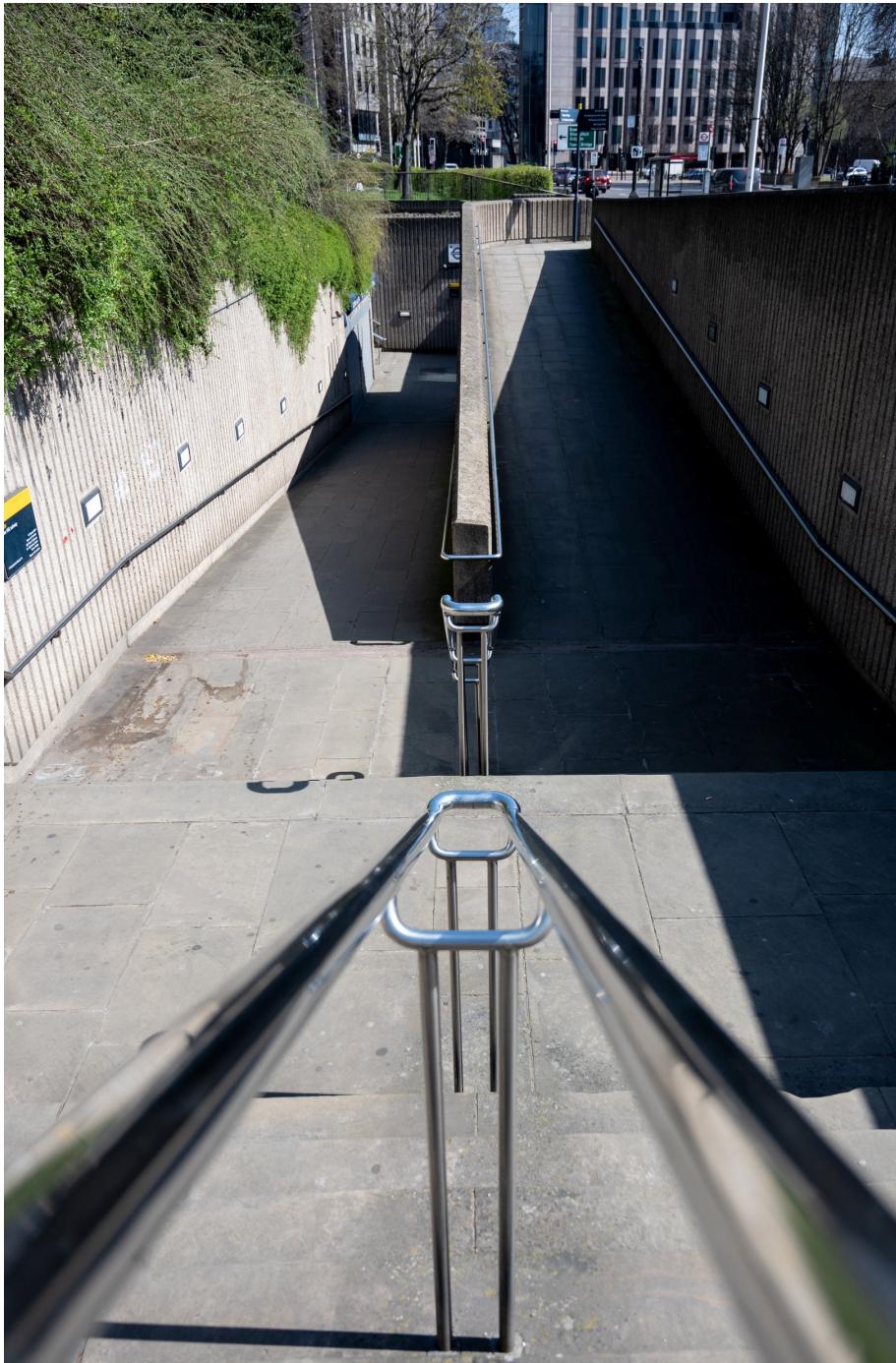


AKA: use a key or legend

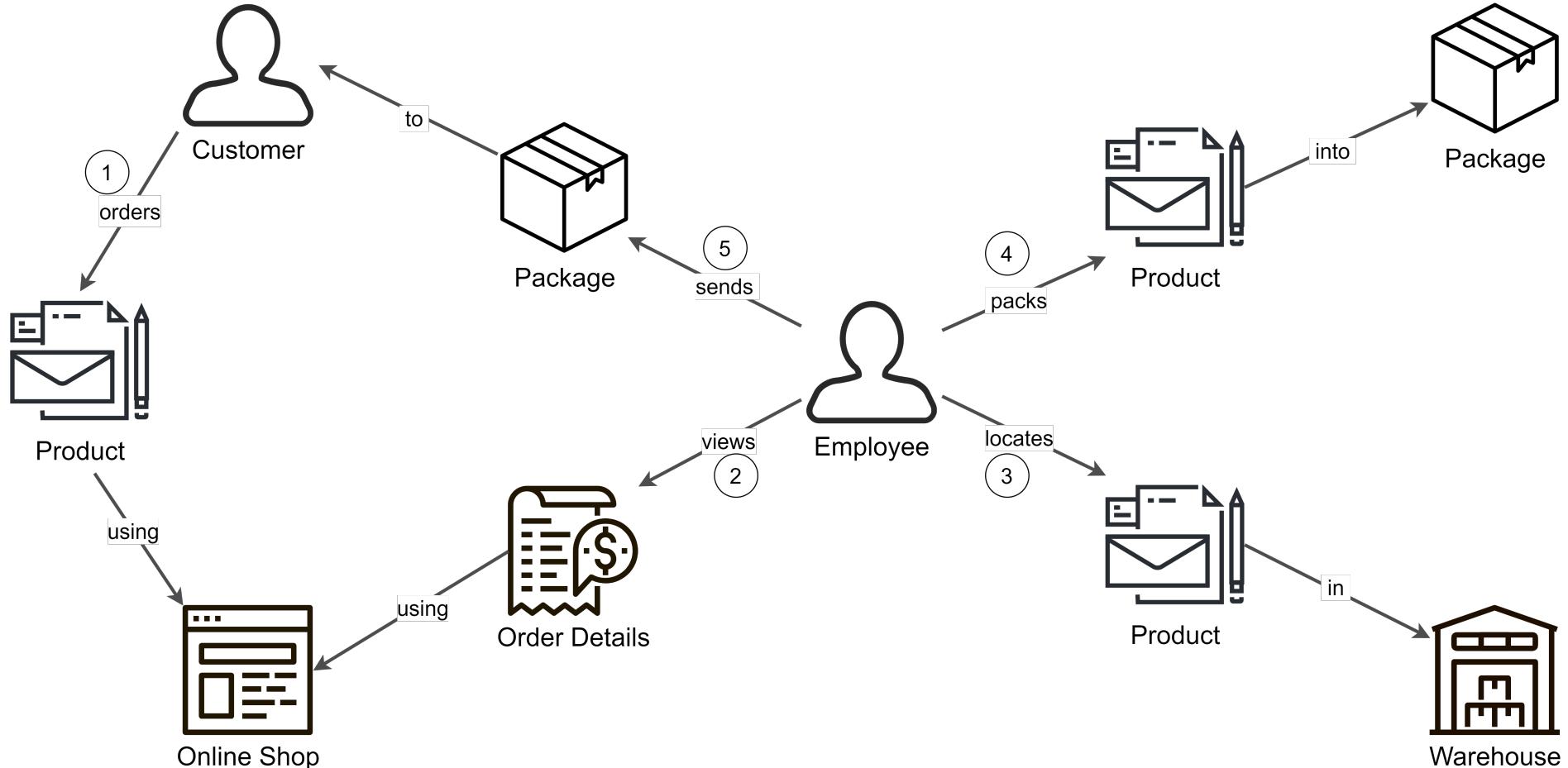


Don't rely on your audience
having specific knowledge

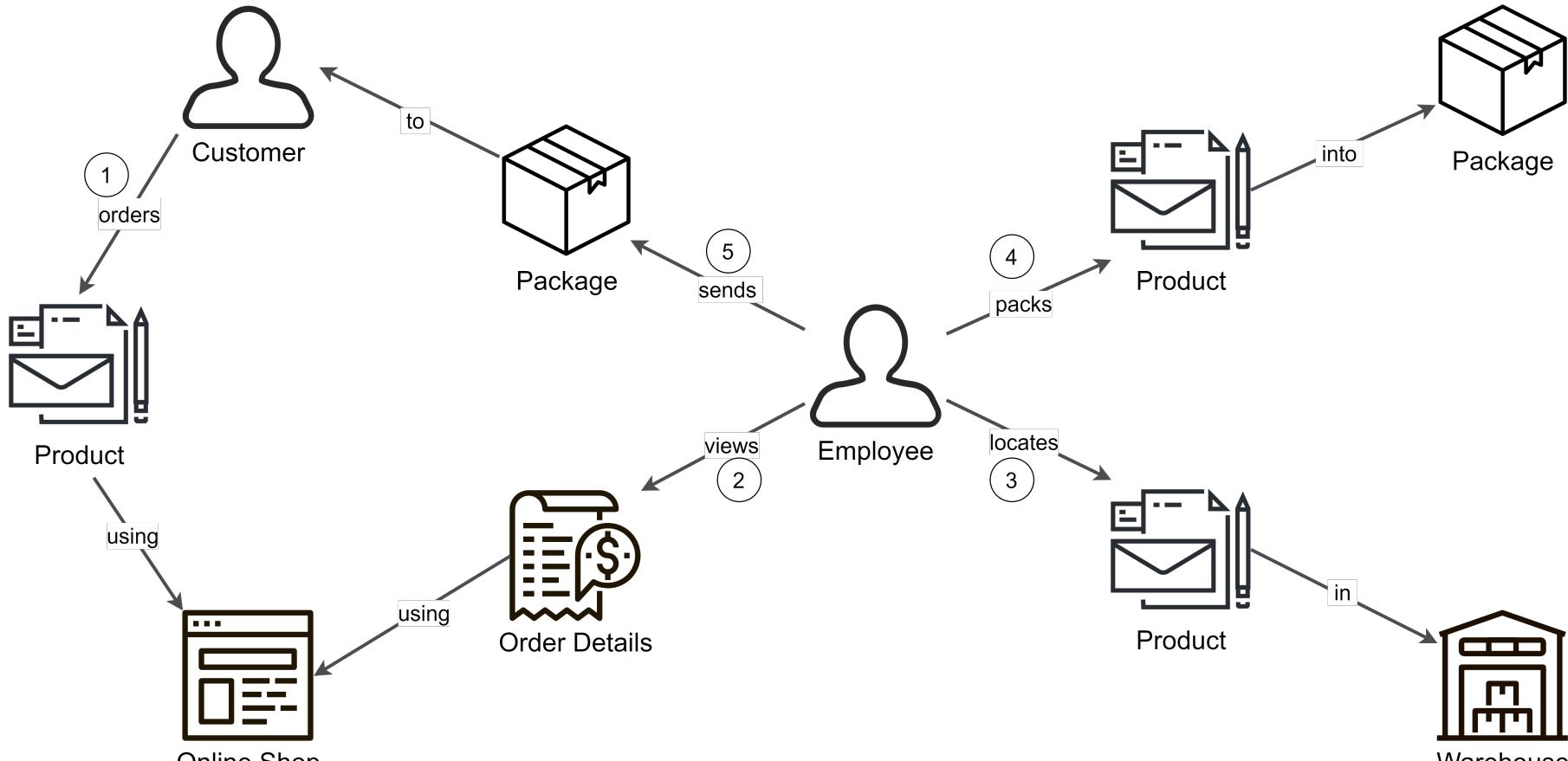
It's a balancing act



Seems obvious? No.



Make it Explicit

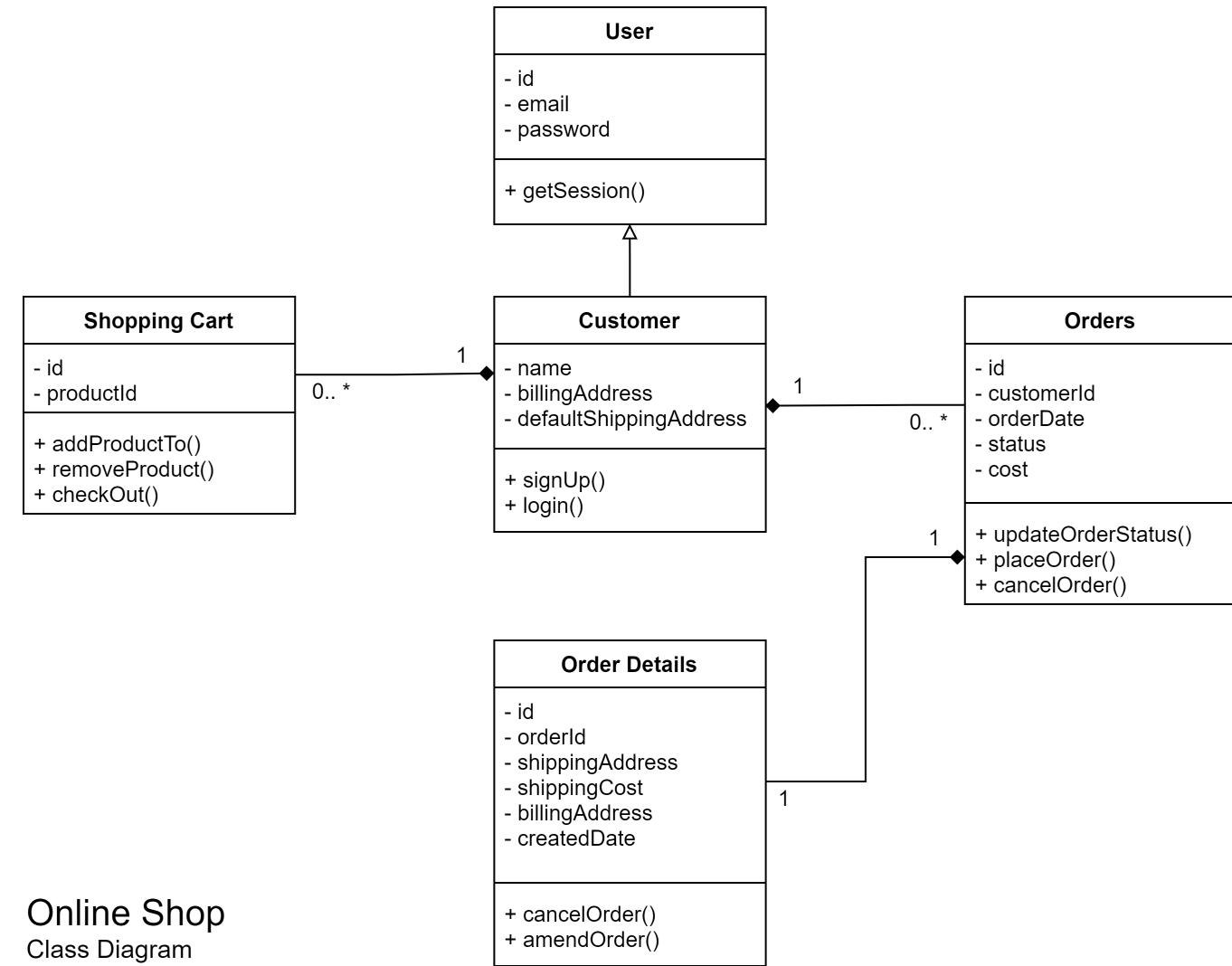


Online Shop
High-Level Domain Story | Customer orders and receives a product

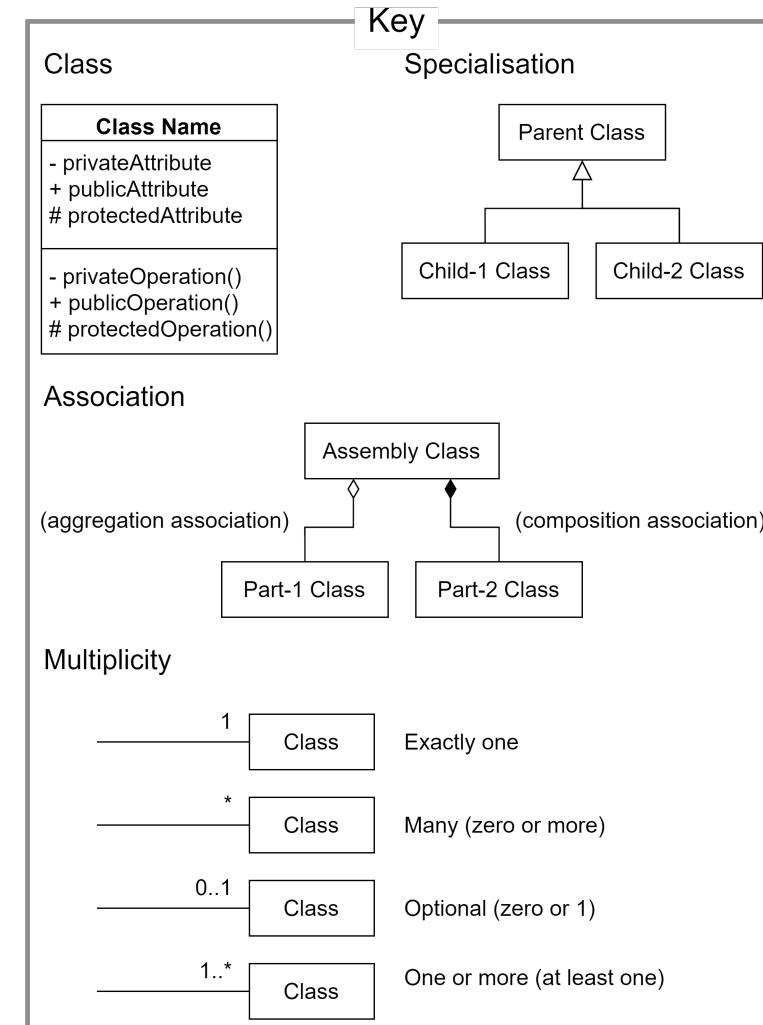
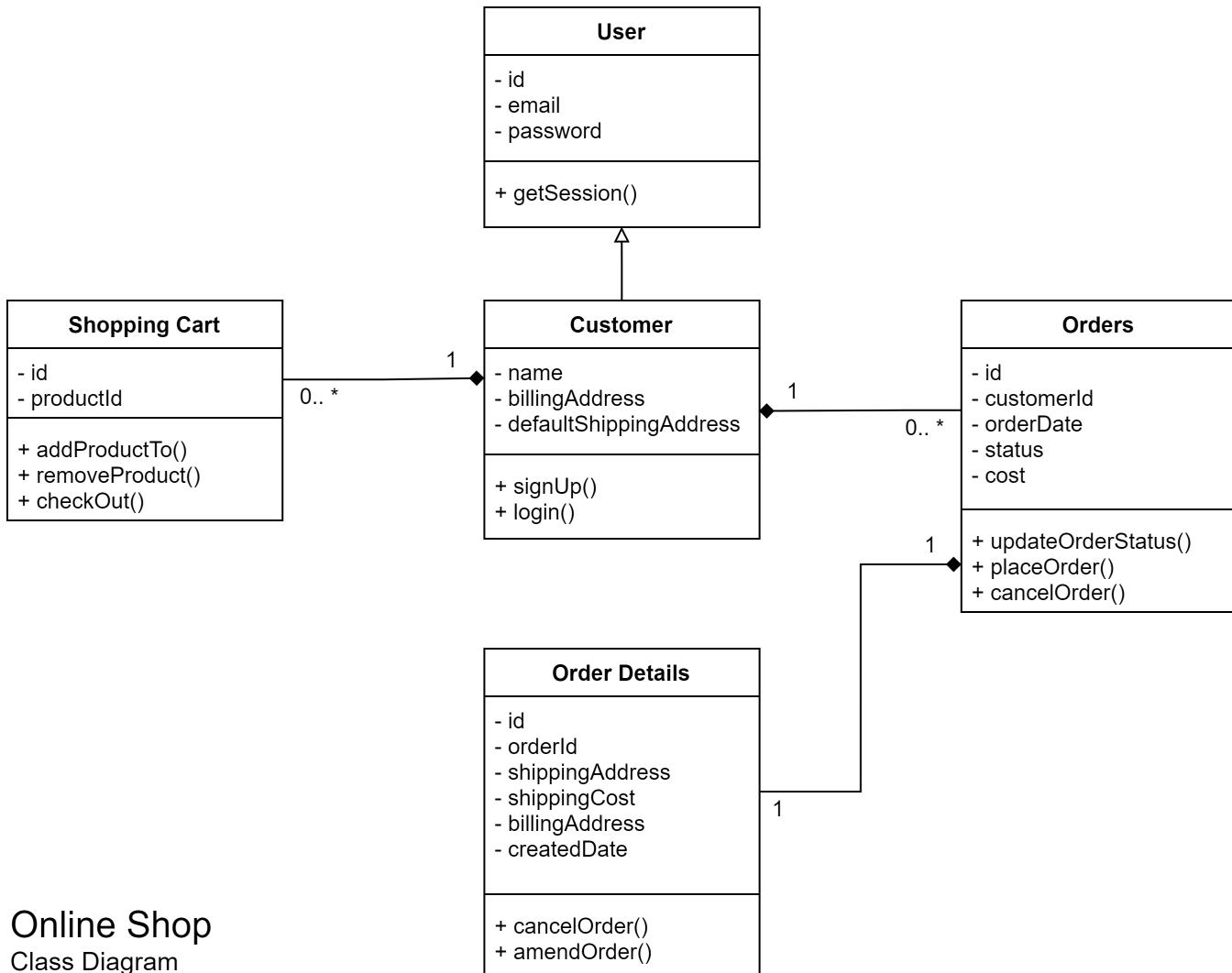
Key	
1	order of sequence
2	description and direction
	Person
	Physical Package
	Physical Product
	Financial Data
	Physical Location
	System Interface

Don't leave it open to
interpretation

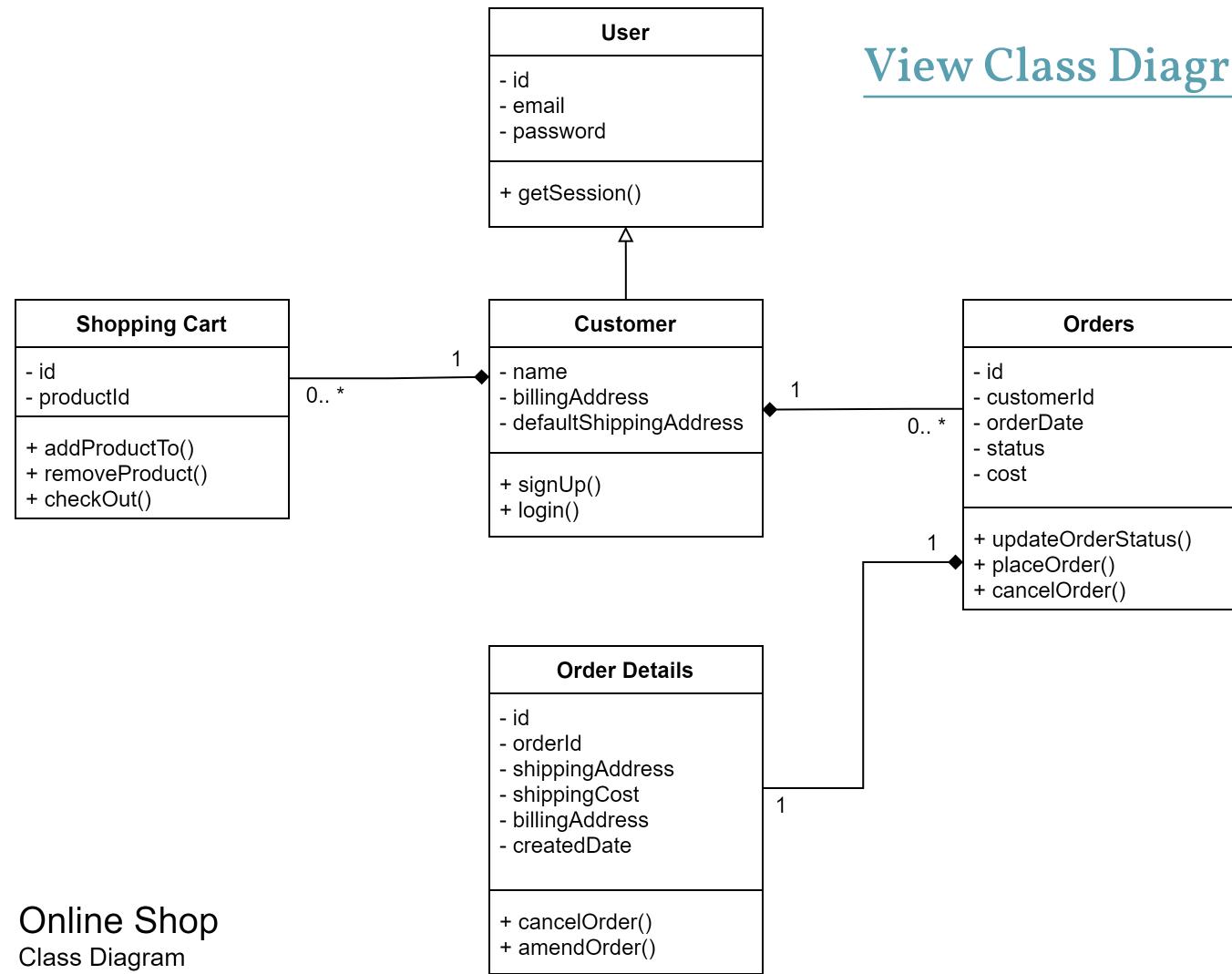
UML, easy? No.



Online Shop Class Diagram



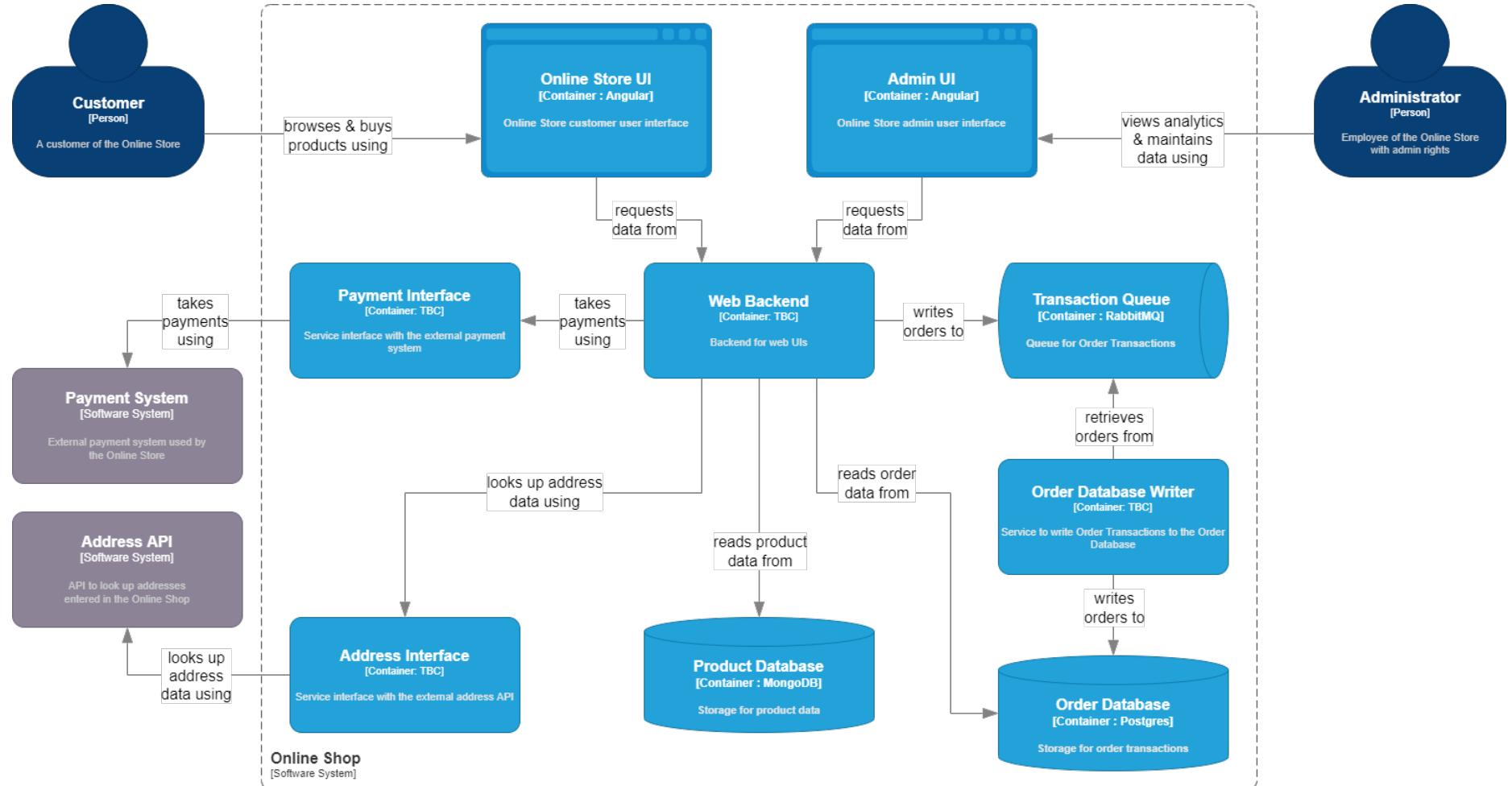
UML Reminder



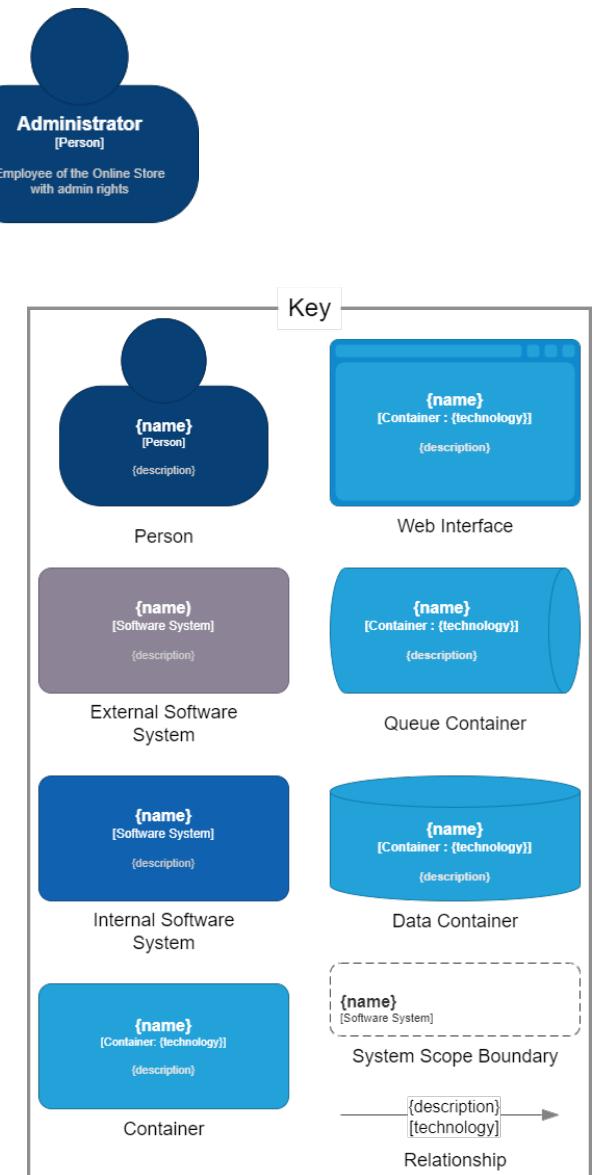
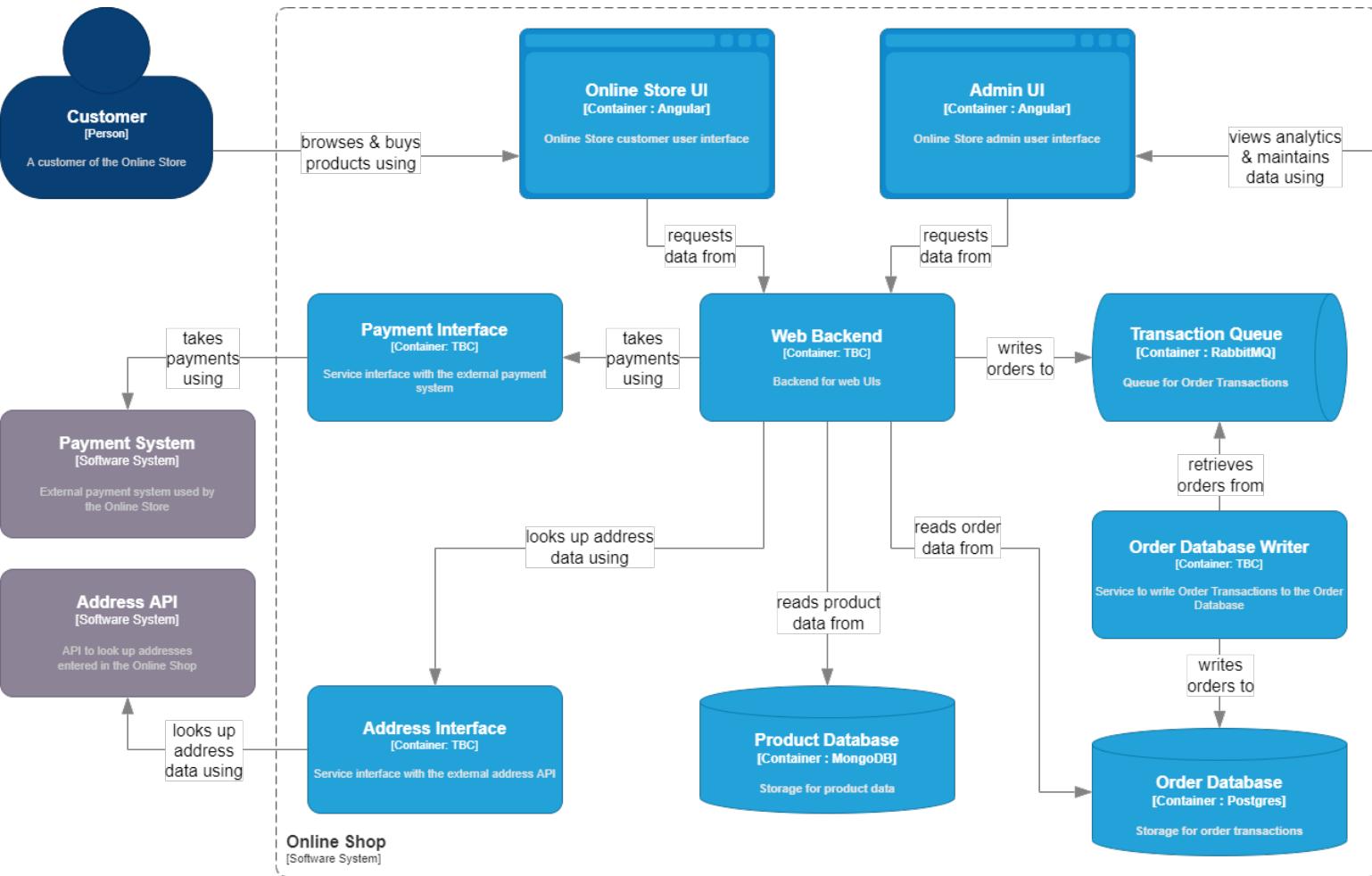
[View Class Diagram Key/Legend](#)



C4, that's obvious? No.



Explained

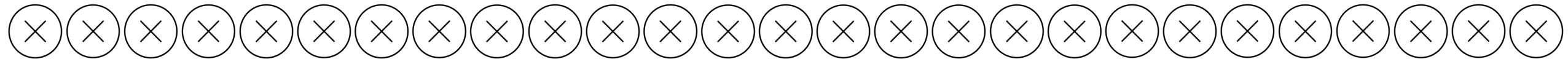


Limit your assumptions

Antipattern

MLAH

AKA: Multiple-Letter Acronym Hell



Only use defined acronyms

Do

- In speech, say the acronym, and say the definition afterwards
- In written form define the acronym the first time you write it, or in a key or glossary

A few acronyms you may know...

or not

DRY:

Don't Repeat Yourself

DFD:

Data Flow Diagram

SPA:

Single Page Application

BLT:

Bacon Lettuce & Tomato

BLT?

Business Leadership Team Basic Language Translator

Bulk Loading Tool

Be Like That!

Acronyms can mean different things to different people

It's easy to fall into thinking
that others have the same
understanding as you

✓
✓
✓
✓
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✓
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✓
✓
✓
✓
✓

Next time you use an acronym...

think
SIDI

State It
Define It



Pattern

Pure & Simple

AKA: use simple and concise language



Are you being clear?

Dyslexia

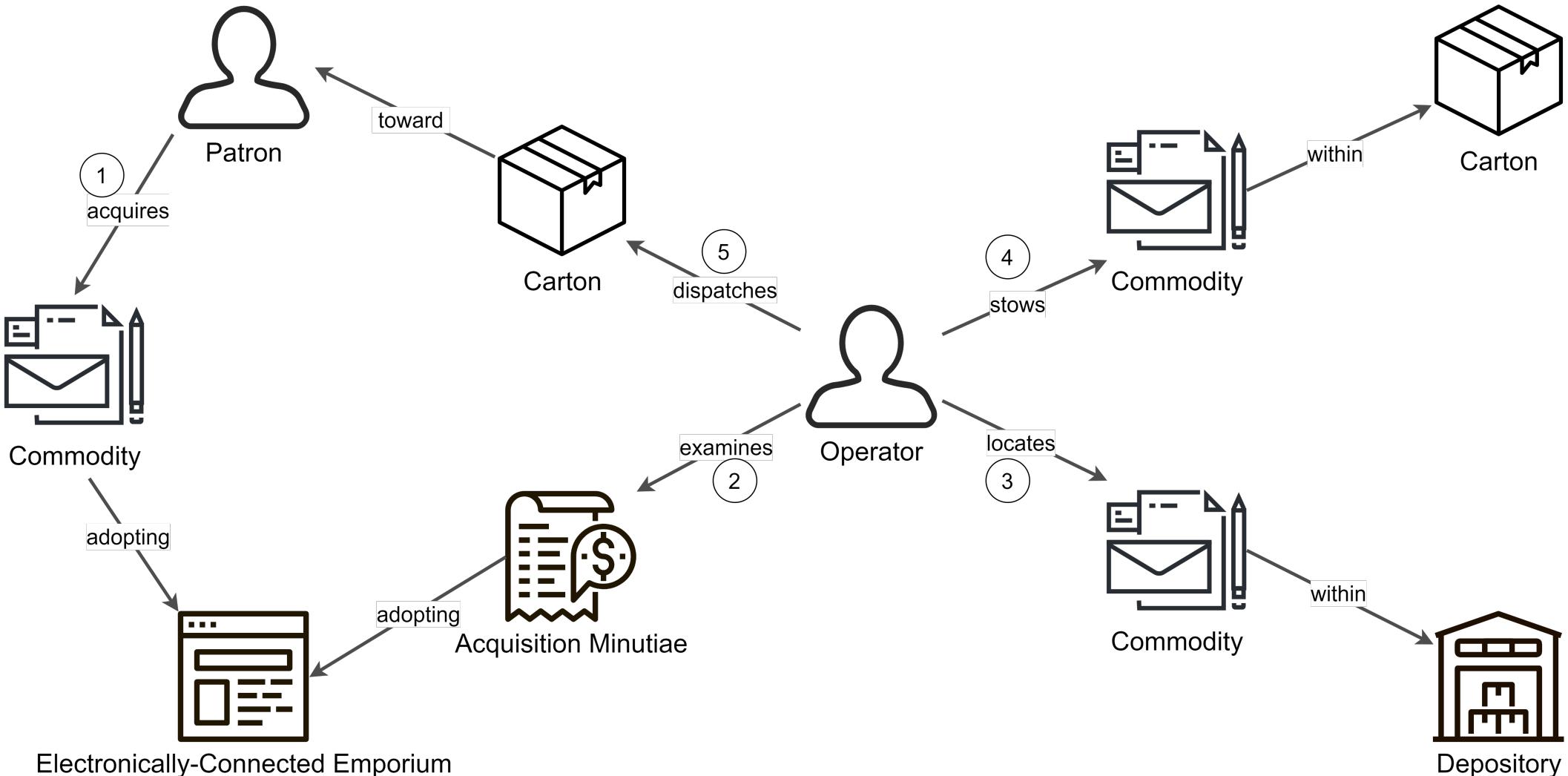
Slower visual processing

Non-native speakers

Anyone: vocabulary

A person is not disabled;
it is their environment that
disables them.

Pardon?

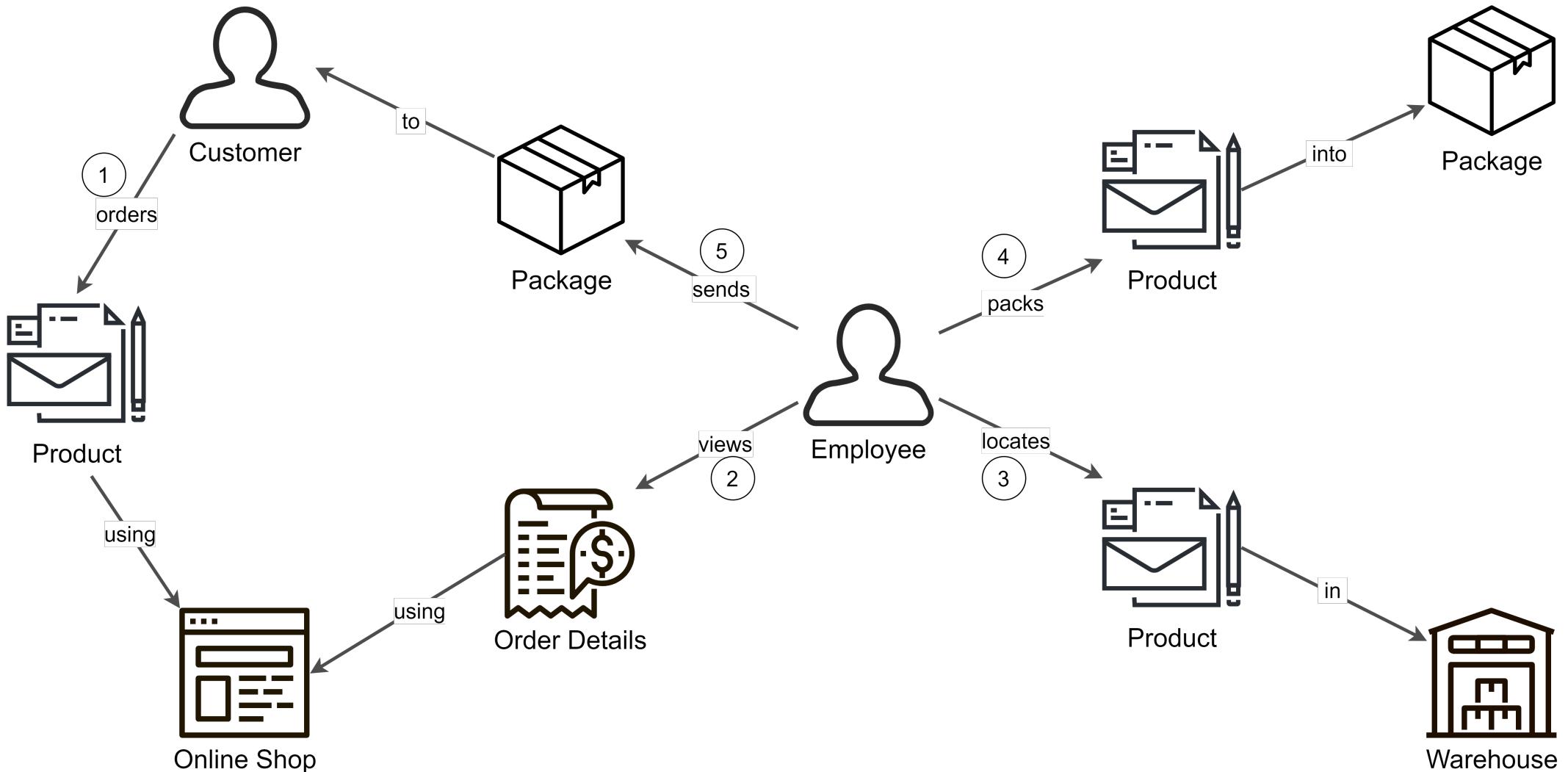


Electronically-Connected Emporium
High-Level Domain Narrative | Patron acquires a commodity

Do

- Use simple and concise language
- Use a glossary for any needed complex or domain vocabulary
- Avoid idioms and sarcasm
 - **Concise:** covering much in few words; brief in form but comprehensive in scope; succinct;
 - **Glossary:** a list of terms in a special subject, or field, with definitions.
 - **Idiom:** an expression whose meaning is not predictable from the usual meanings of its constituent elements, as *kick the bucket* or *hang one's head*

Simplified



Online Shop

High-Level Domain Story | Customer orders and receives a product

Locate: find, discover the place of

Narrative

tell your audience a story to get your message across

Listen, and you will realize that
we are made not from cells or
from atoms. We are made from
stories.

- Mia Couto

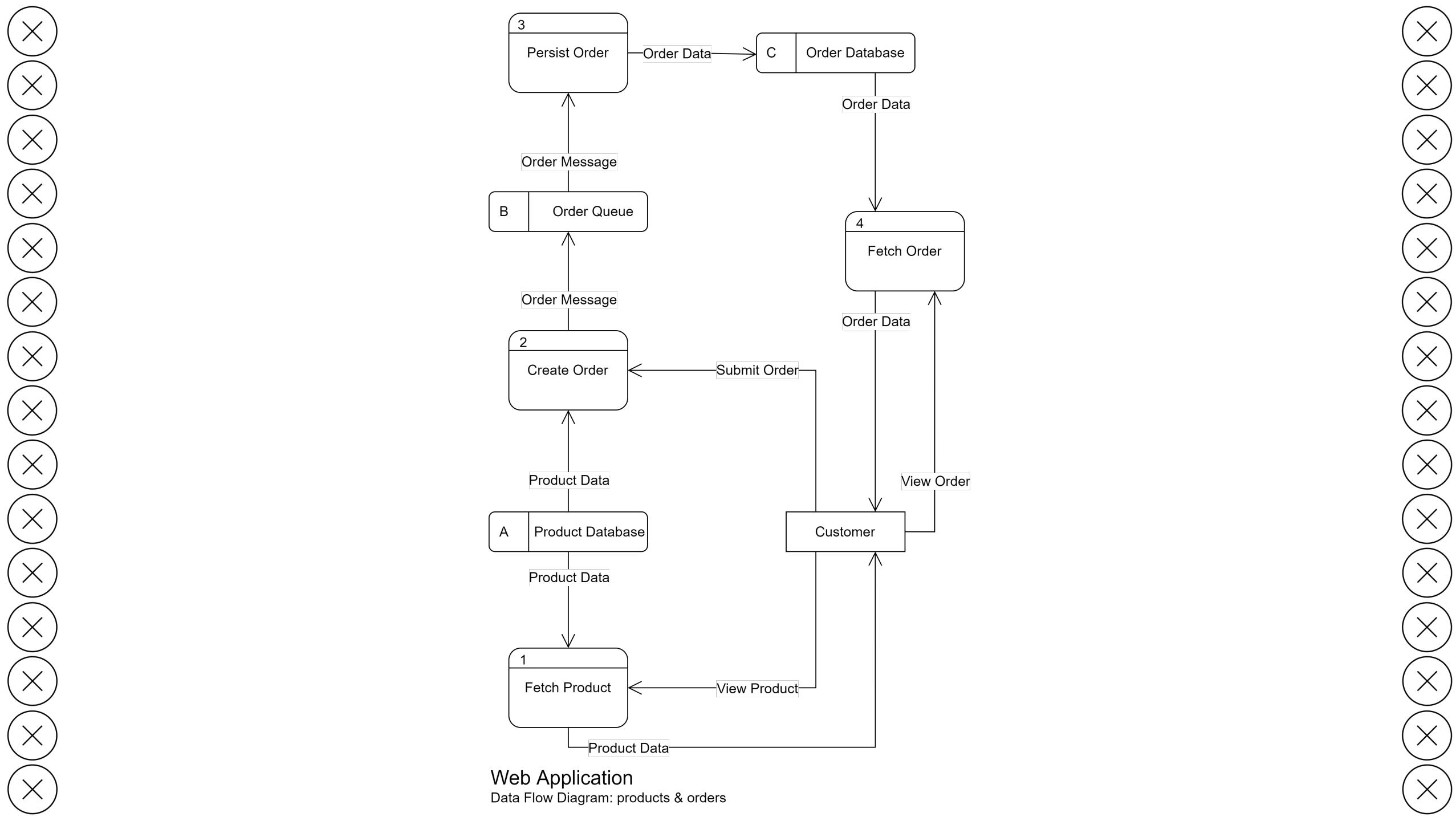
Pattern

A push in the right direction

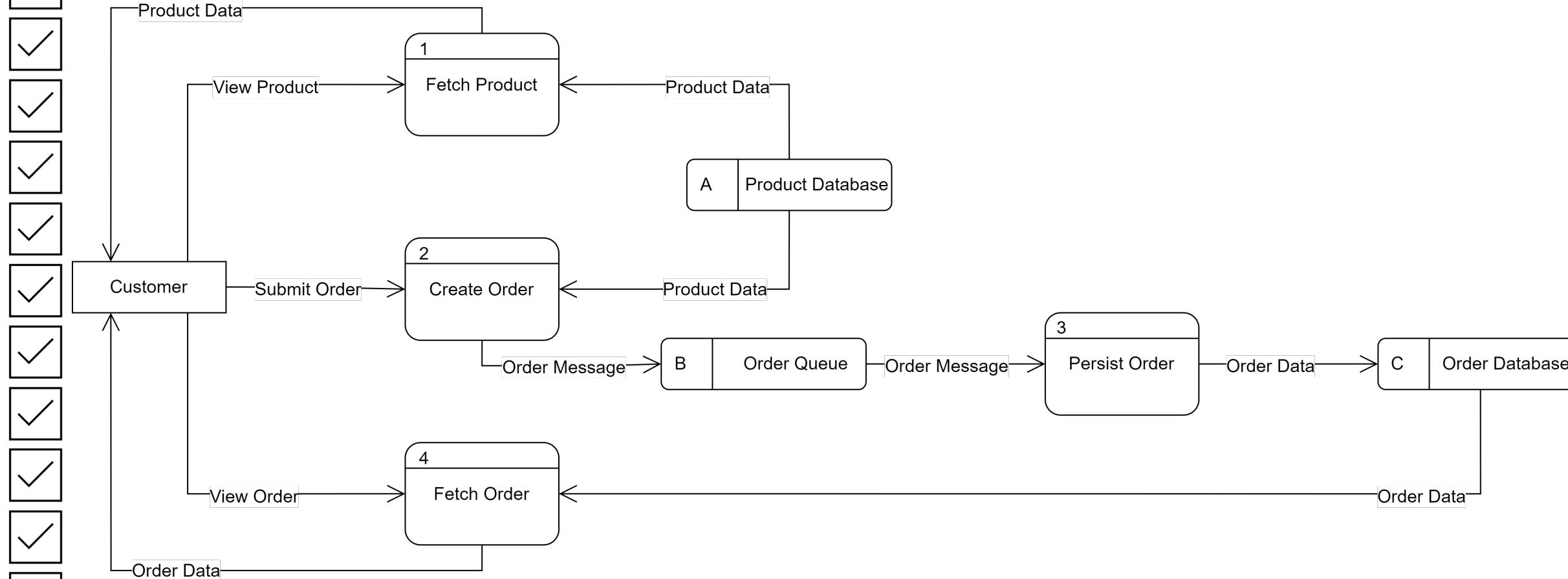
AKA: match the diagram flow to expectations



All diagrams have a flow of information



Let's match expectations

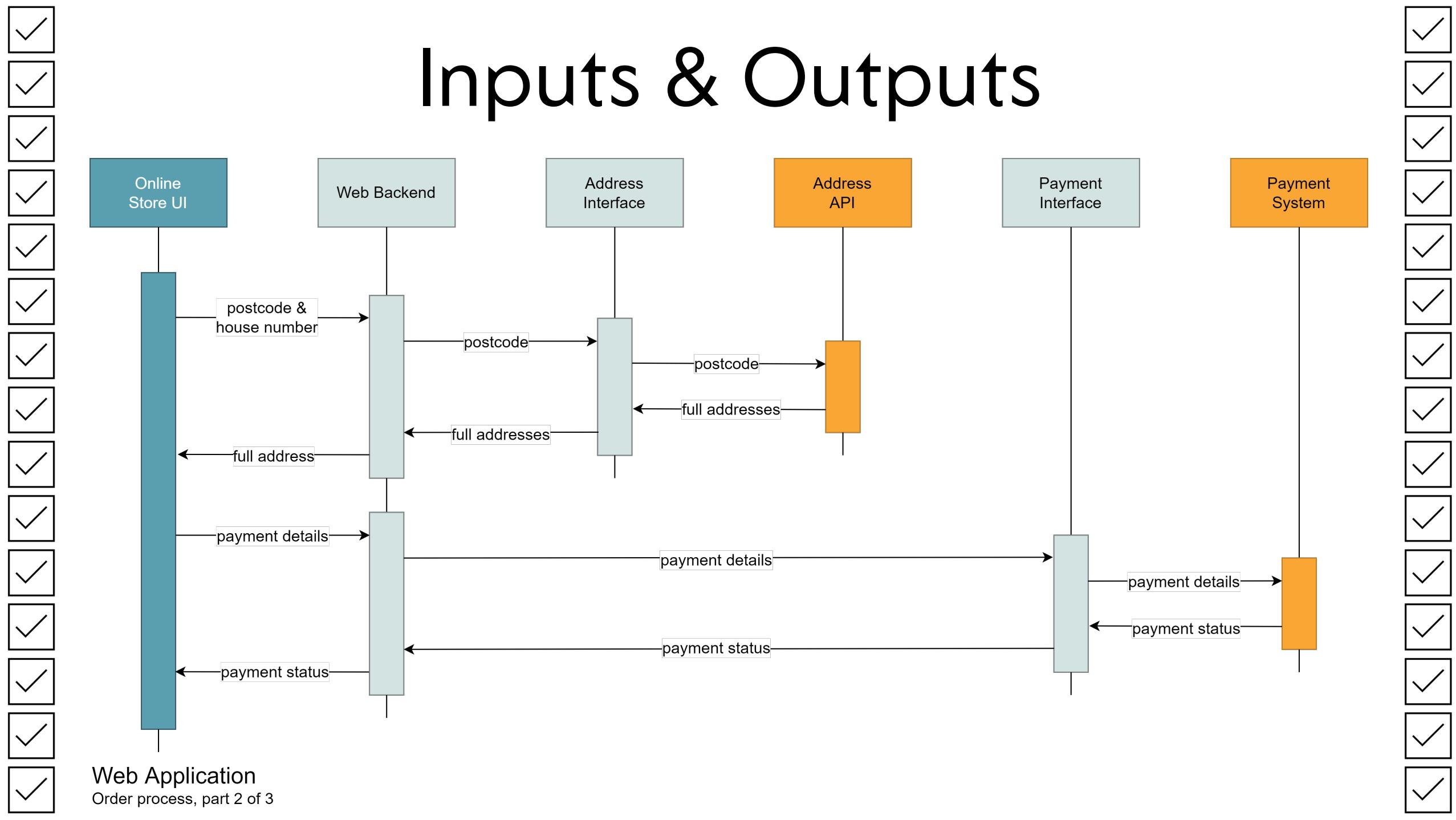


Web Application

Data Flow Diagram: products & orders



Inputs & Outputs



Consider how your audience
will read the diagram

Pattern

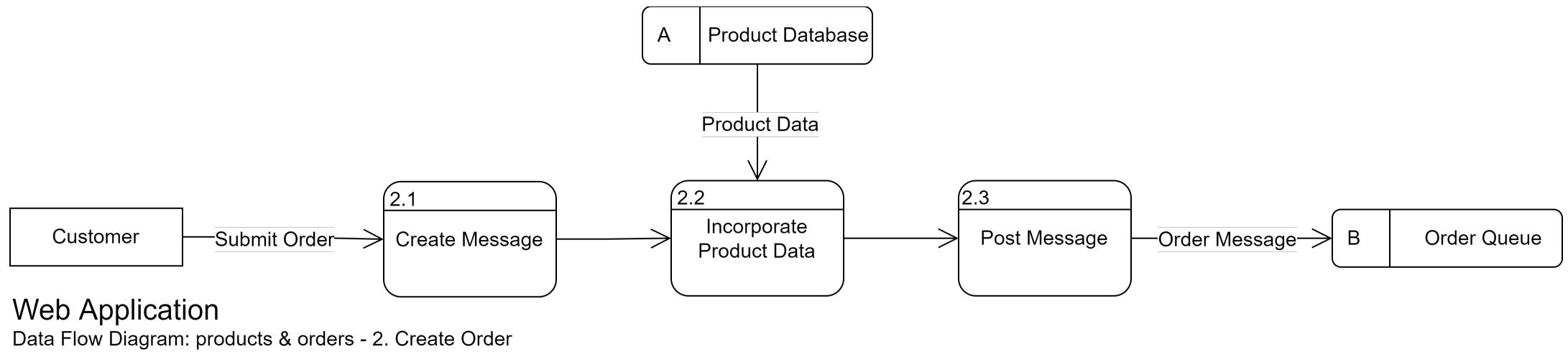
Show them the pirate ship!

AKA: enthrall your audience with context

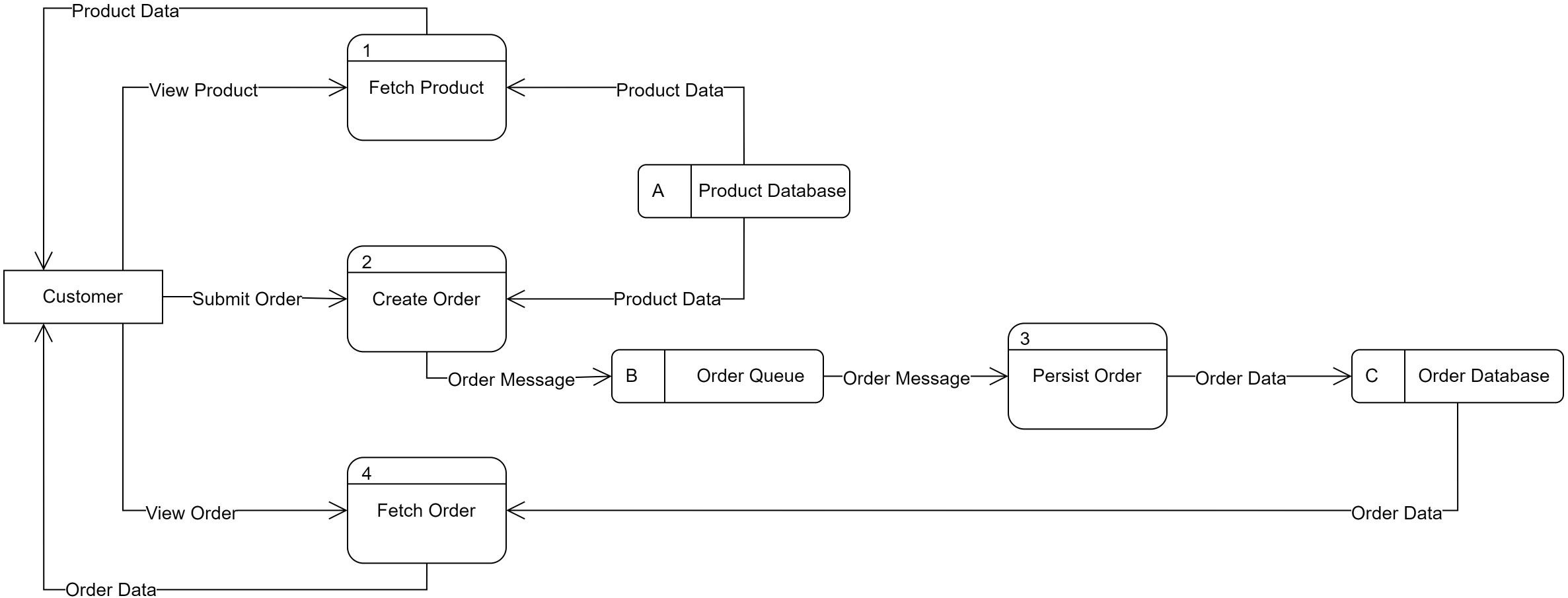




First impressions?



Top Level DFD

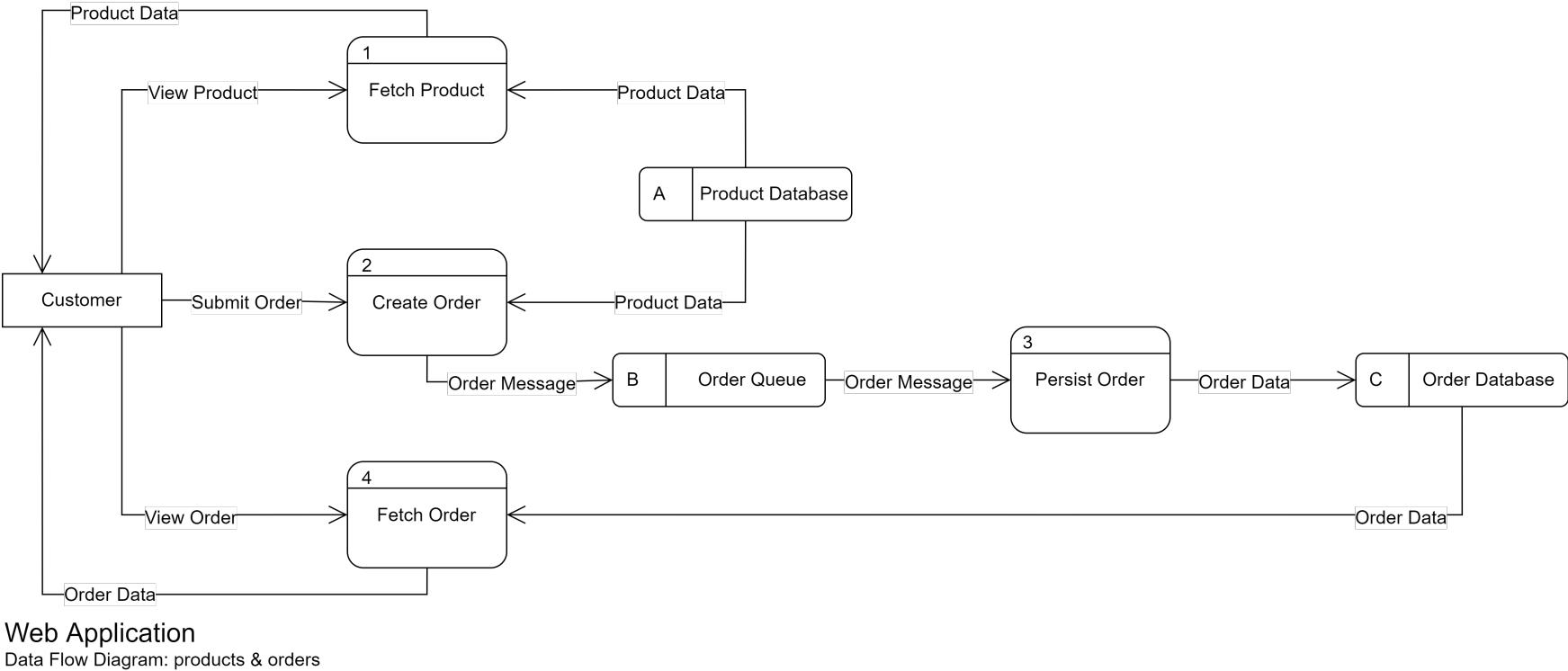


Web Application

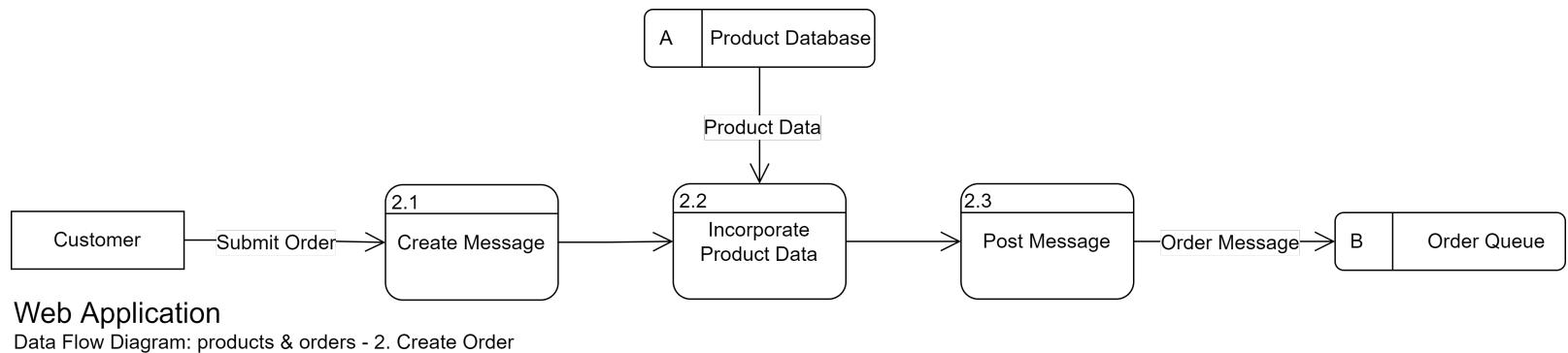
Data Flow Diagram: products & orders

DFDs Order

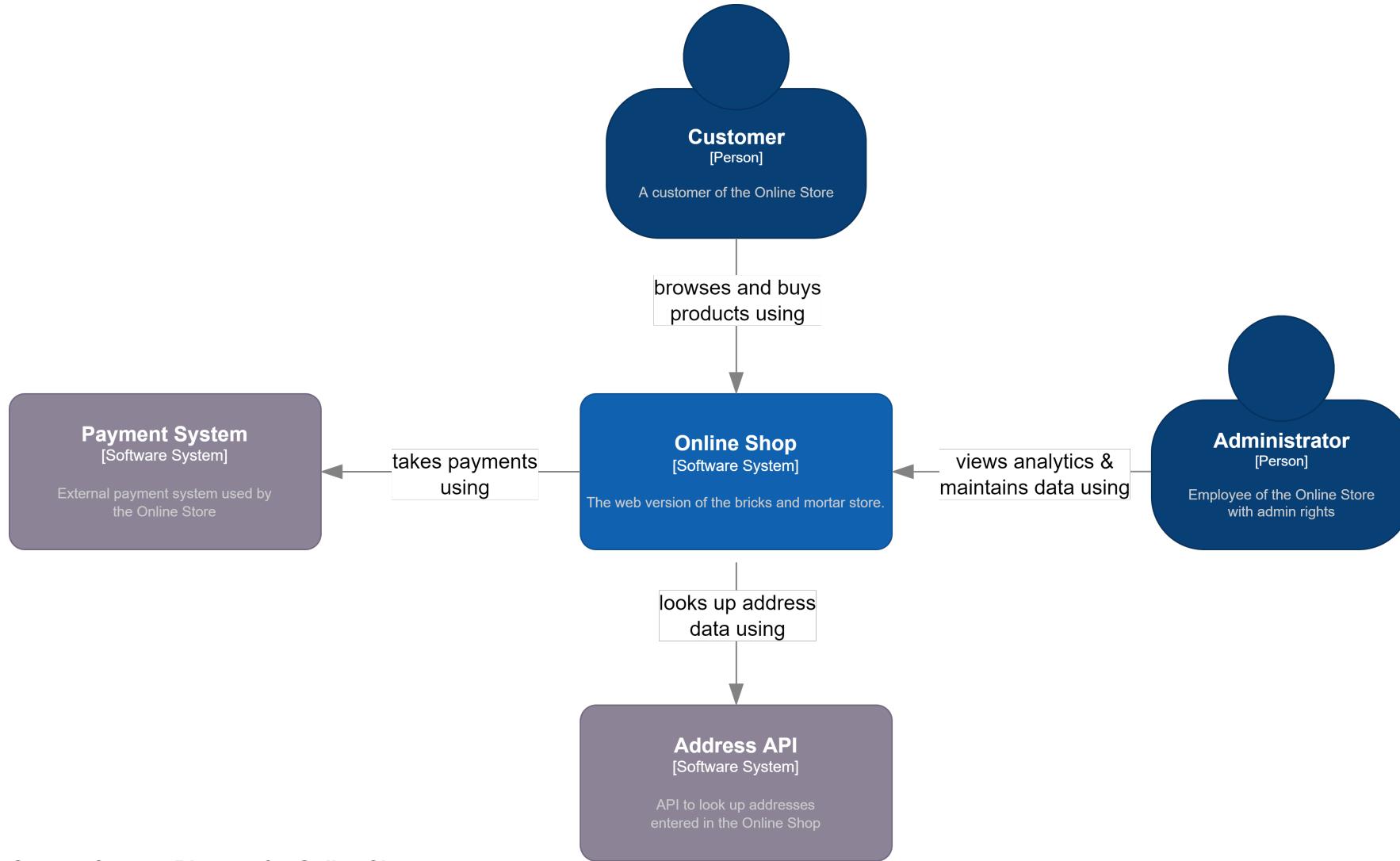
1



2



Context? Go for C4!

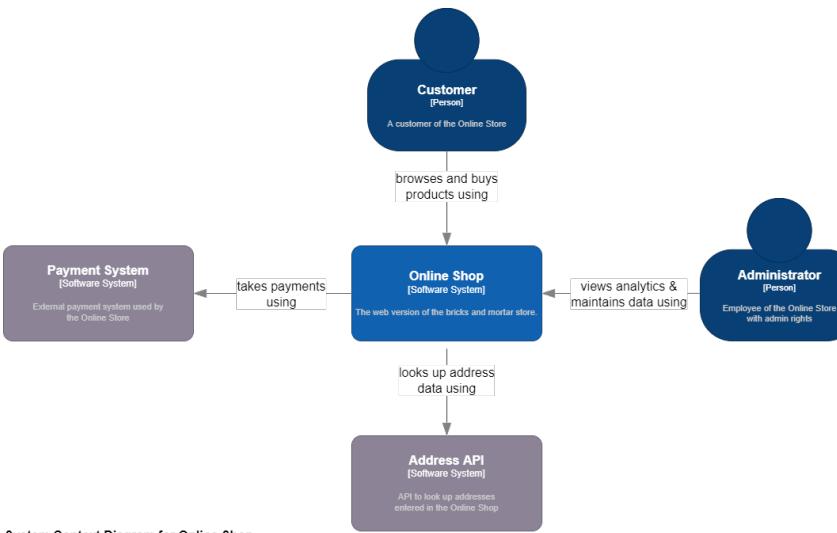


System Context Diagram for Online Shop

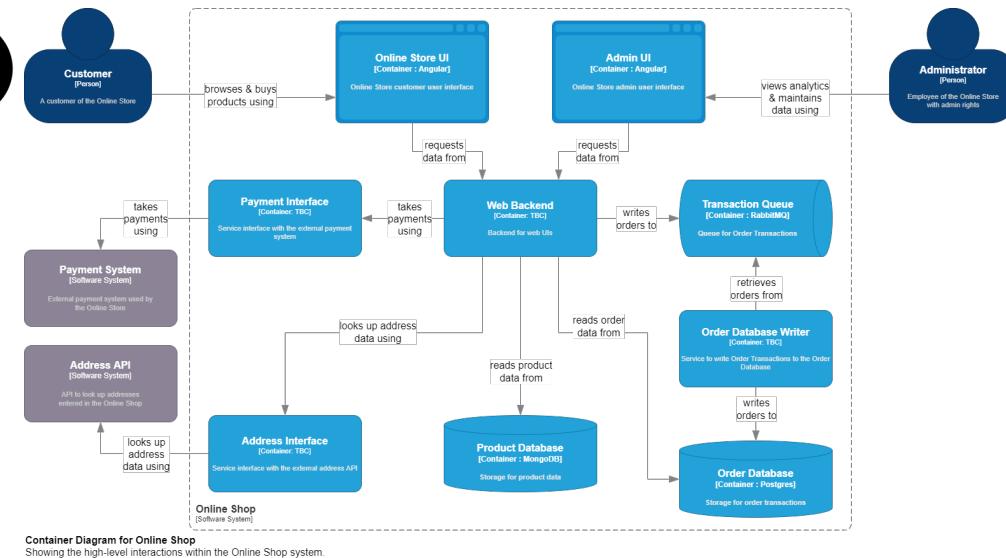
Showing the high-level interactions with the Online Shop system.

Create Narrative

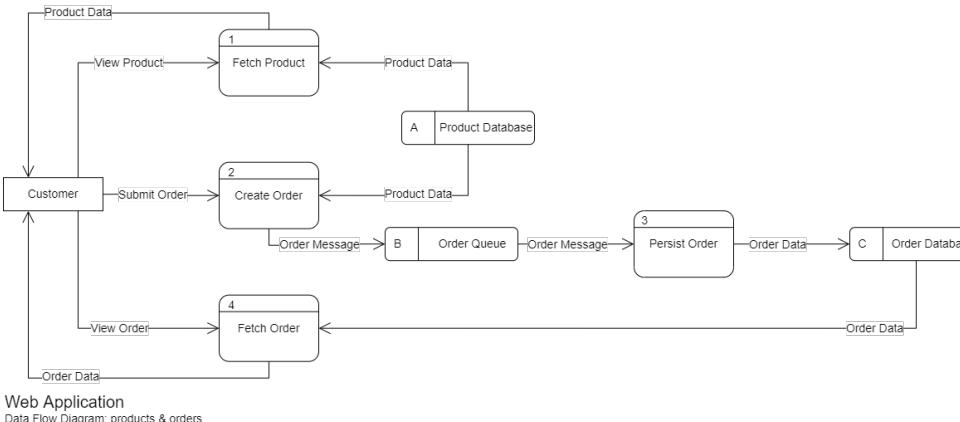
1



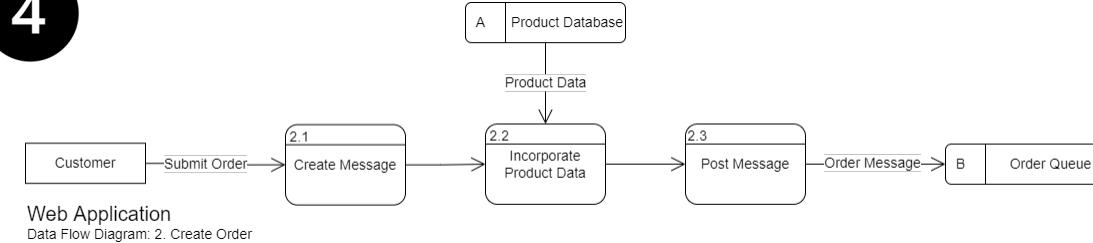
2



3



4



Fill in the narrative gaps

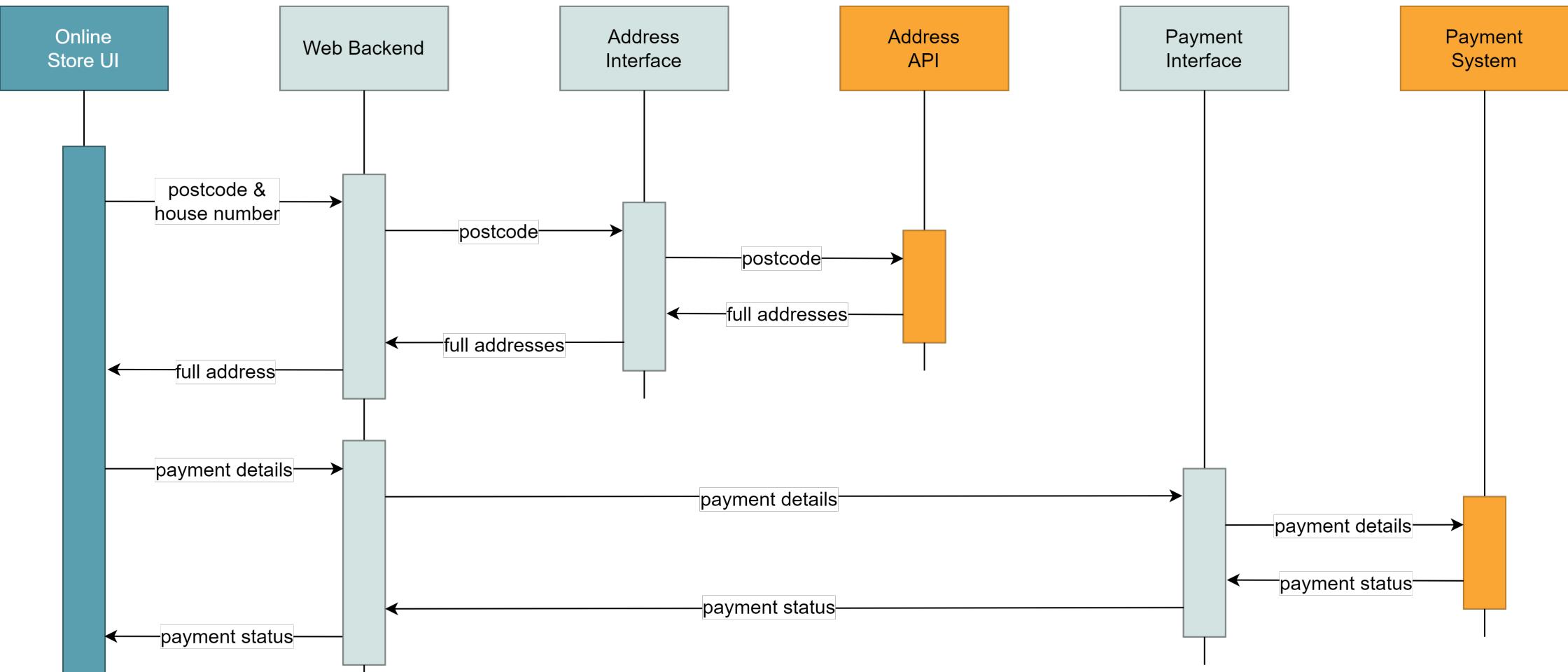
Pattern

Beside the Point

AKA: ensure relationships are clear



Uni-Directional

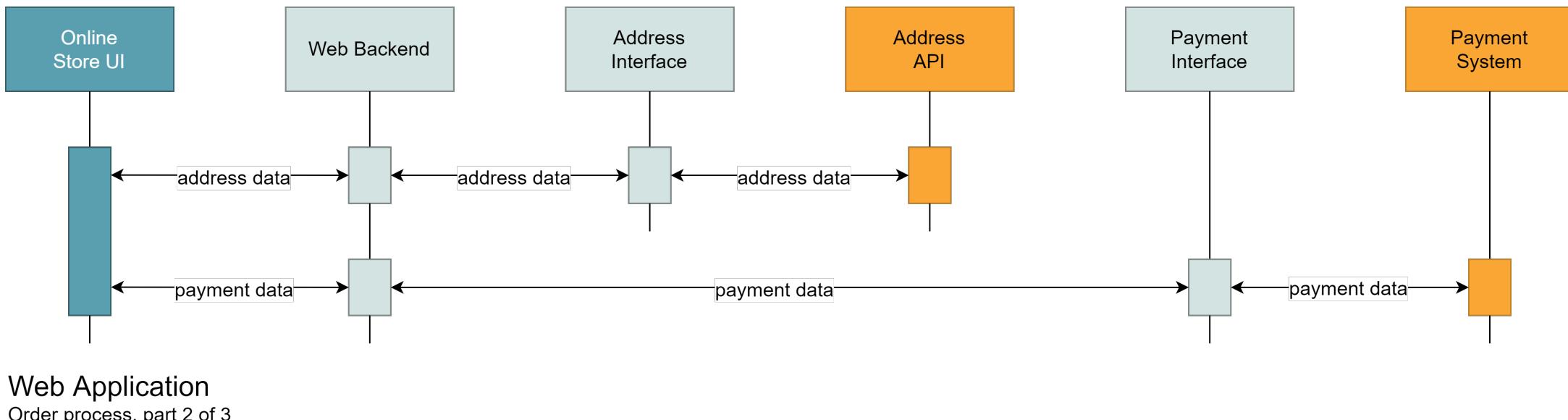


Web Application

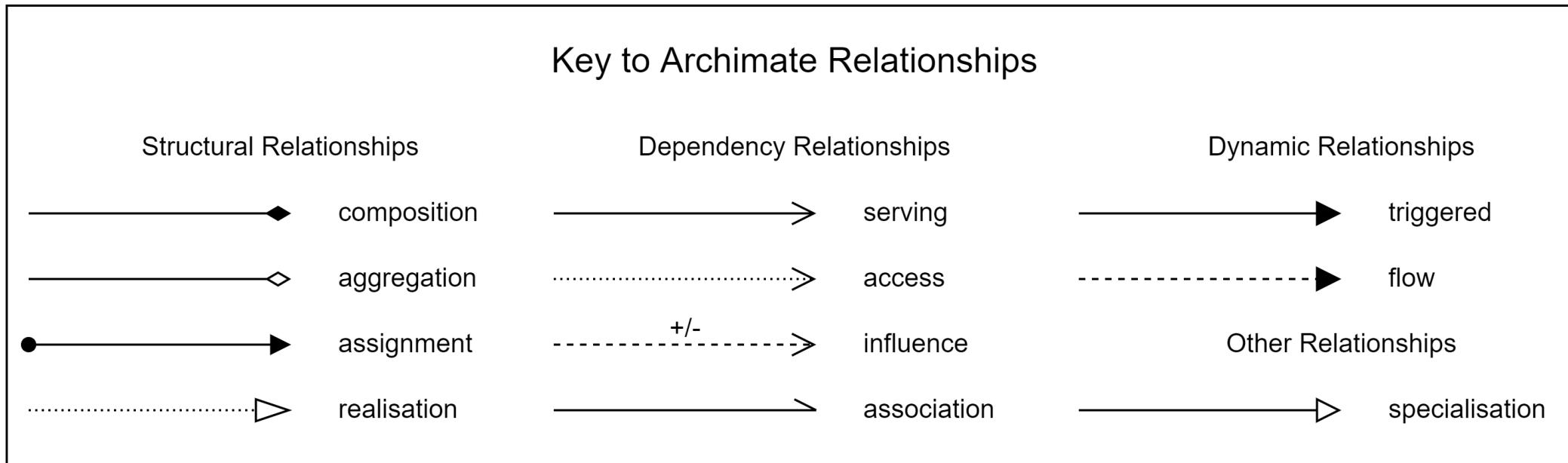
Order process, part 2 of 3

Don't

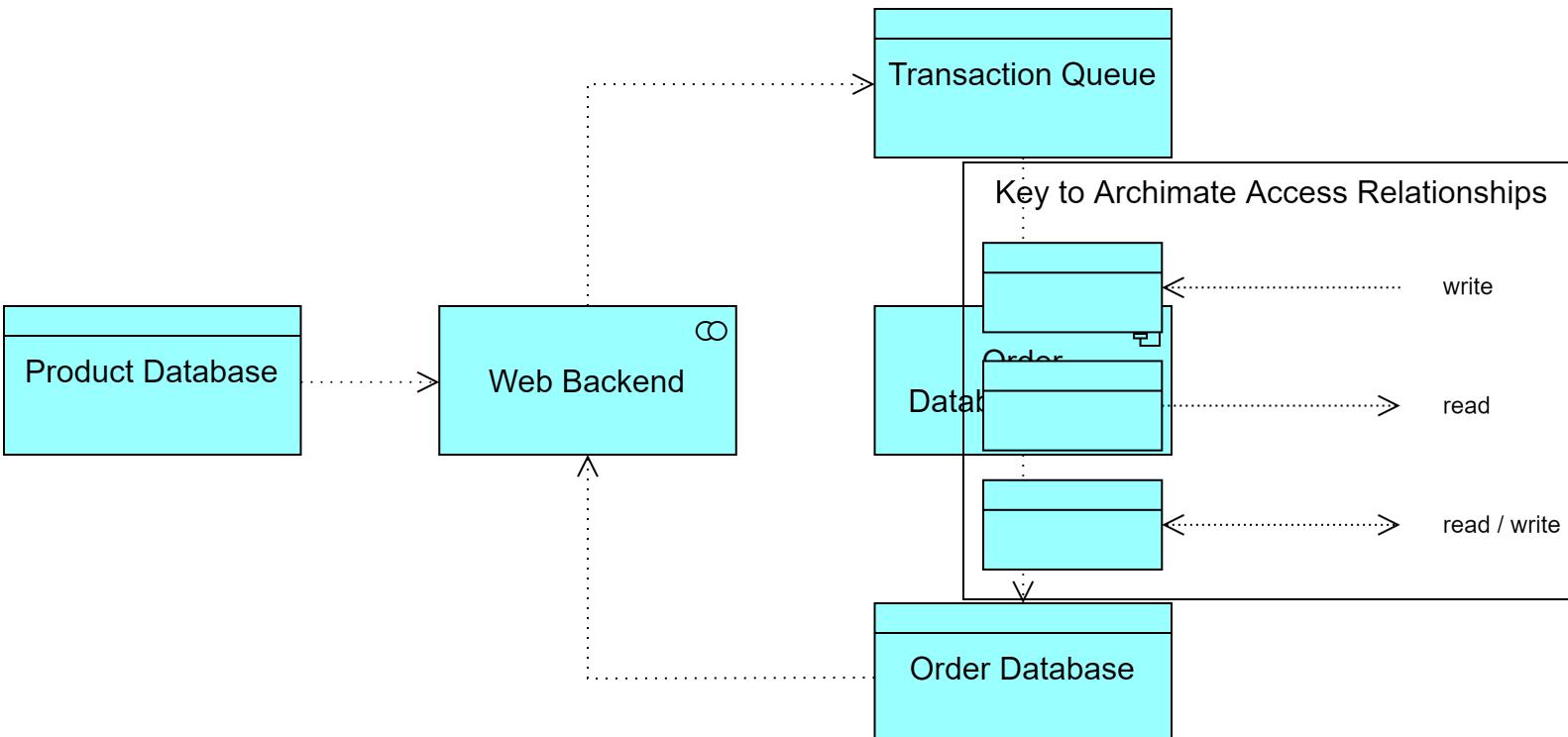
be tempted to combine arrows which do not have the same meaning



Archimate Relationships



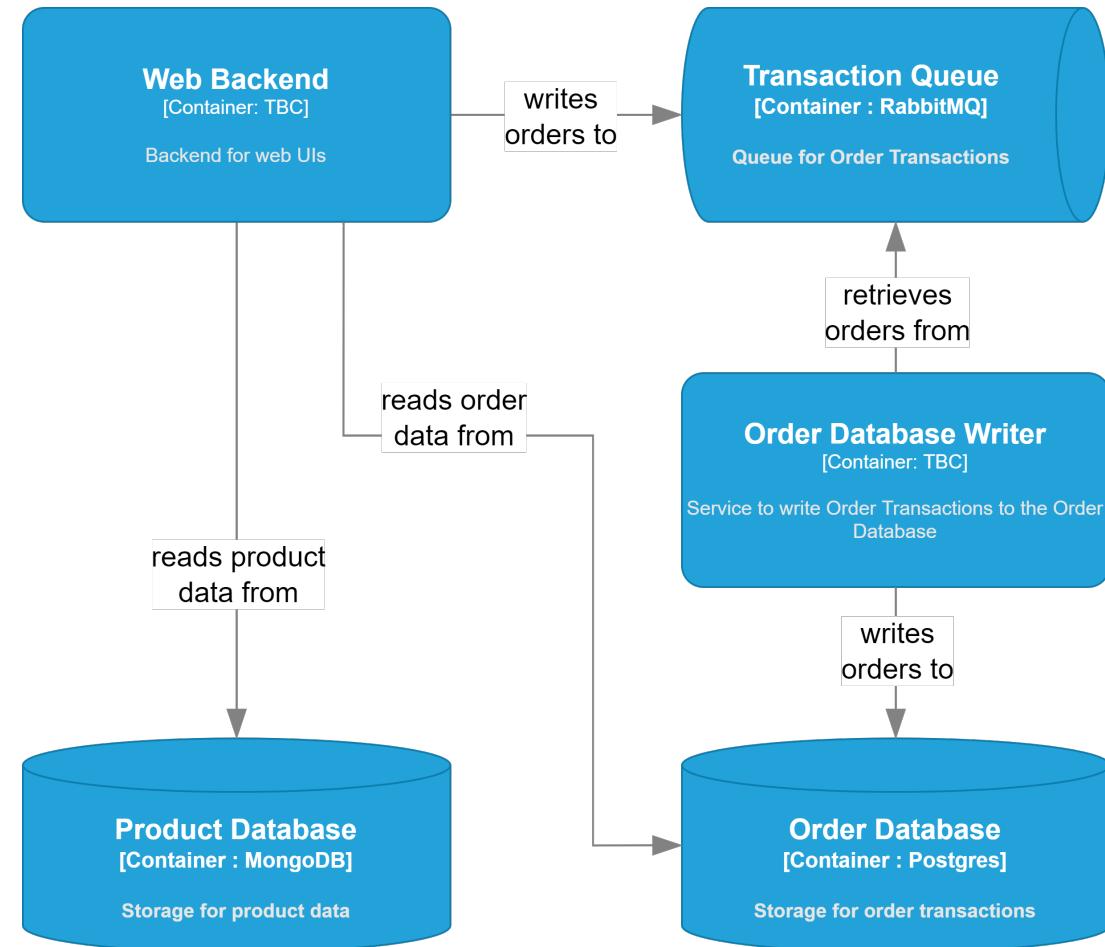
Archimate Data Access



Archimate Data Access for Online Shop

Showing data access for the Web Backend in the Online Shop system

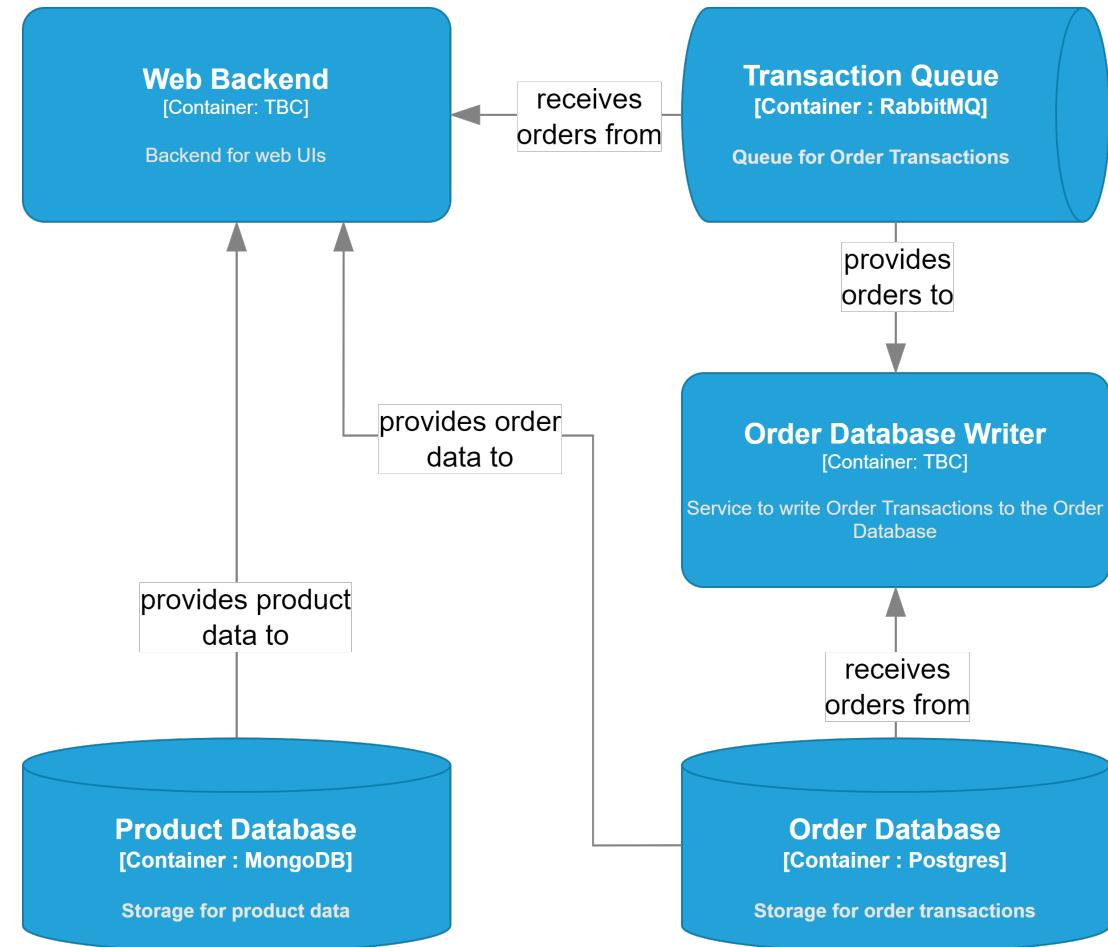
What does your audience need?



Container Data Access for Online Shop

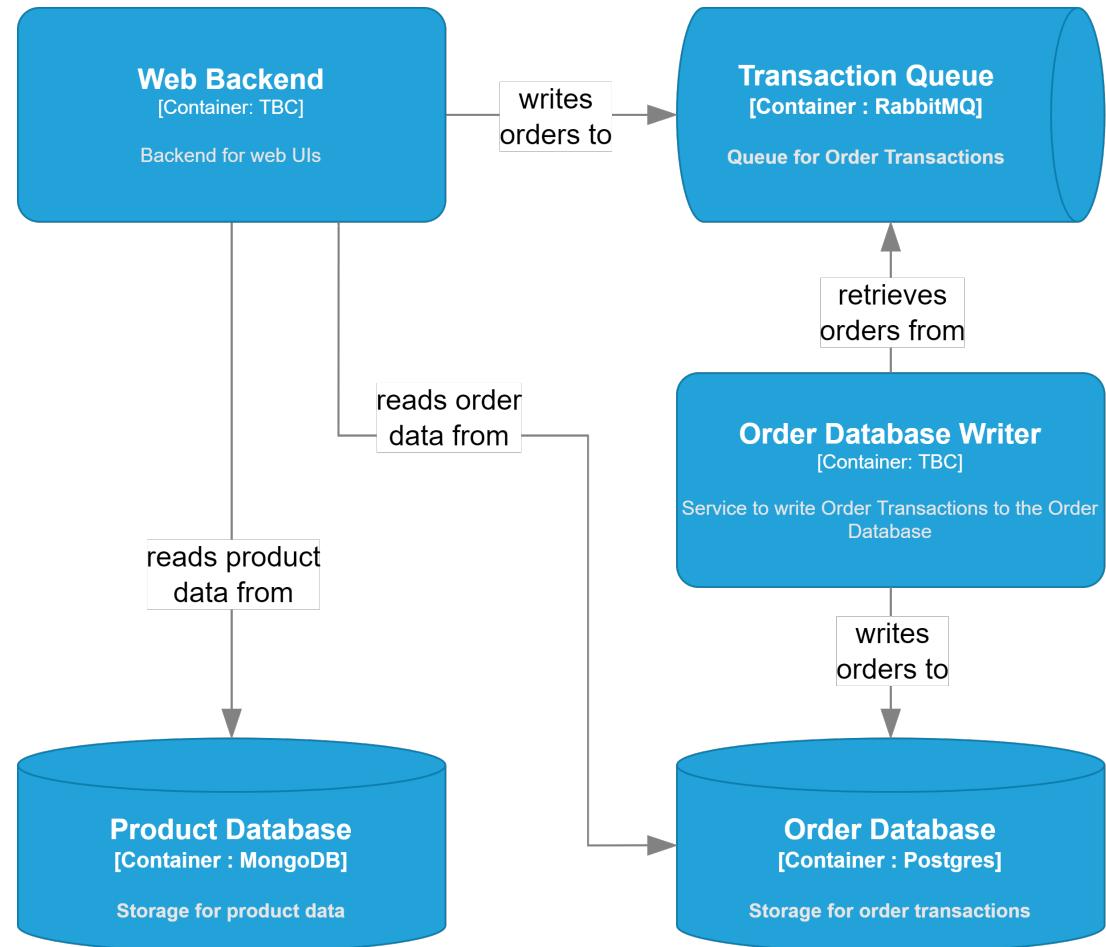
Showing data access for the Web Backend in the Online Shop system

Reverse!



Container Data Access for Online Shop
Showing data access for the Web Backend in the Online Shop system

Sensical



Container Data Access for Online Shop

Showing data access for the Web Backend in the Online Shop system

Relationships tell a story.
Make it clear.

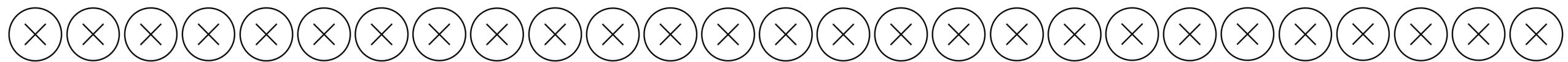
Notation

select the best standard to communicate successfully

Antipattern

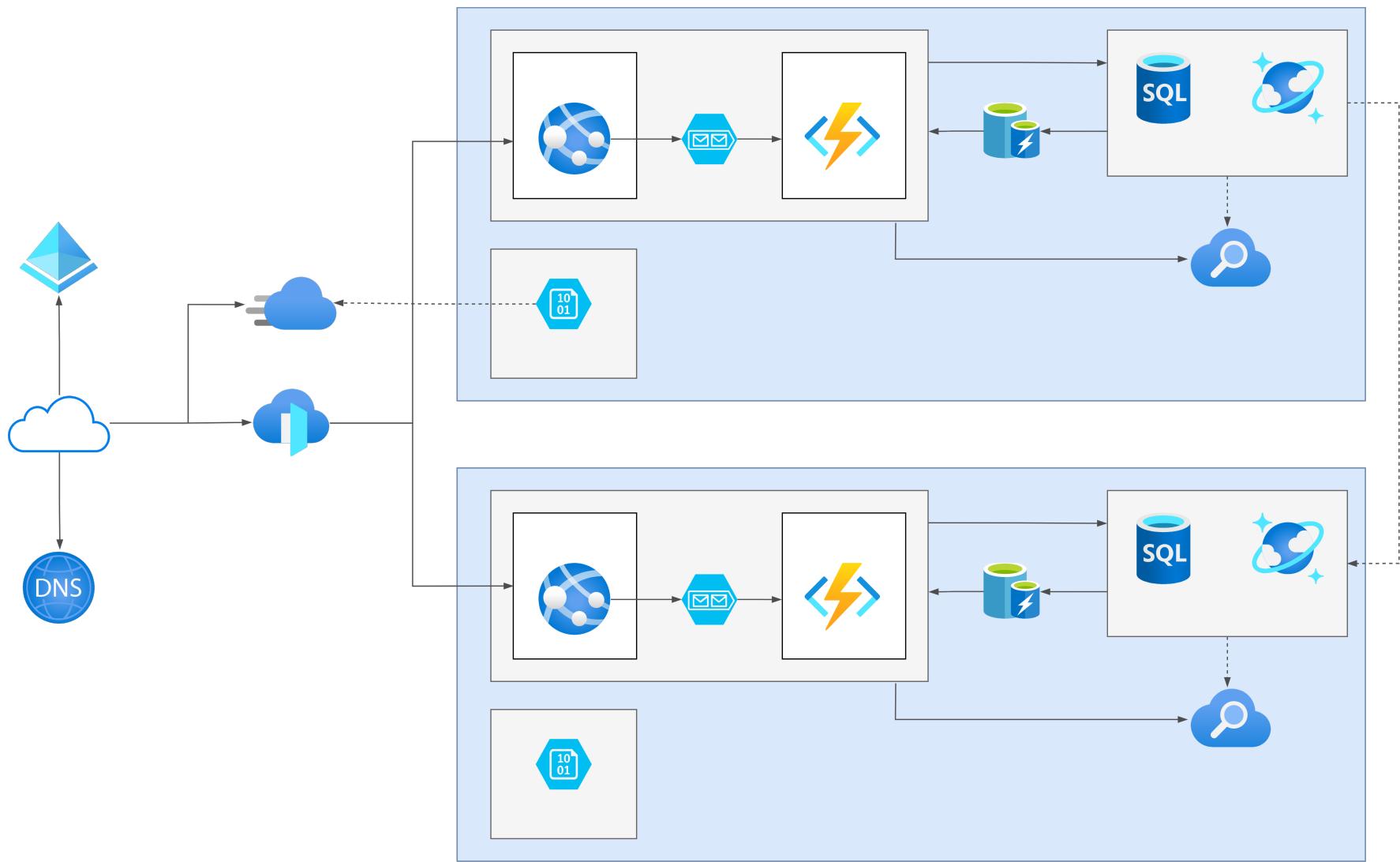
Iconic

AKA: Using icons to convey meaning

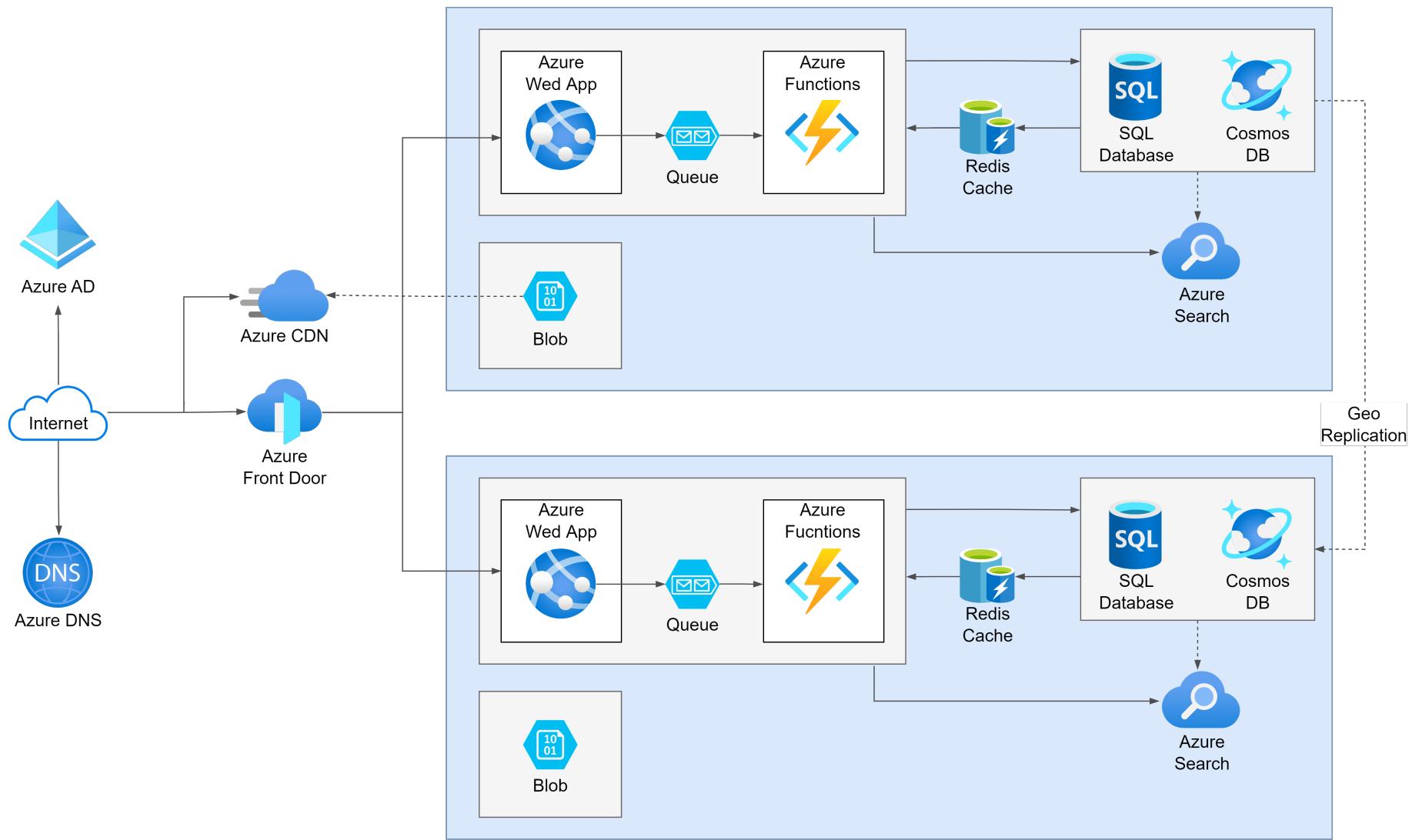


Cloud Provider icons have
become a notation

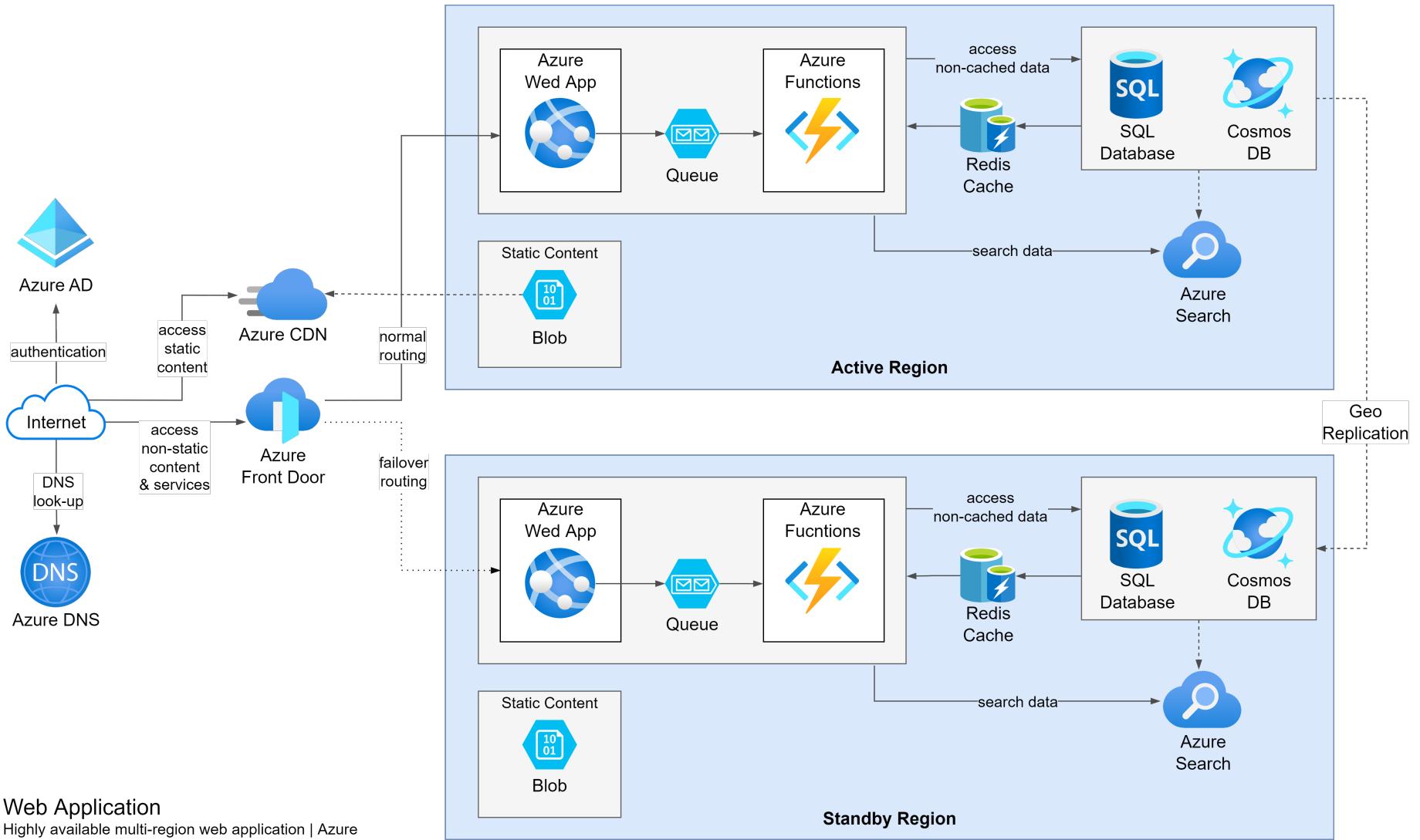
Just icons!



Some labels



Communication!

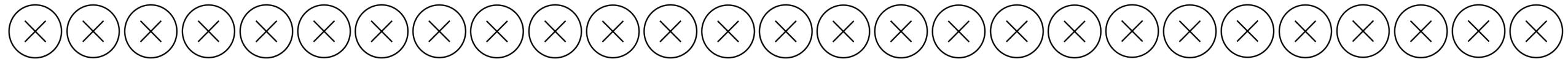


Use icons in addition to labels

Antipattern

Not-So-Unified Modelling Language

AKA: using UML when it's not useful



UML is useful

UML Diagram Types

Structural

Behavioural

Profile

Class

State Machine

Timing

Deployment

Object

Communication

Sequence

Package

Component

Usecase

Activity

Composite
Structure

Interaction
Overview

UML Diagram Types

Structural

Behavioural

Profile

Class

State Machine

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Component

Usecase

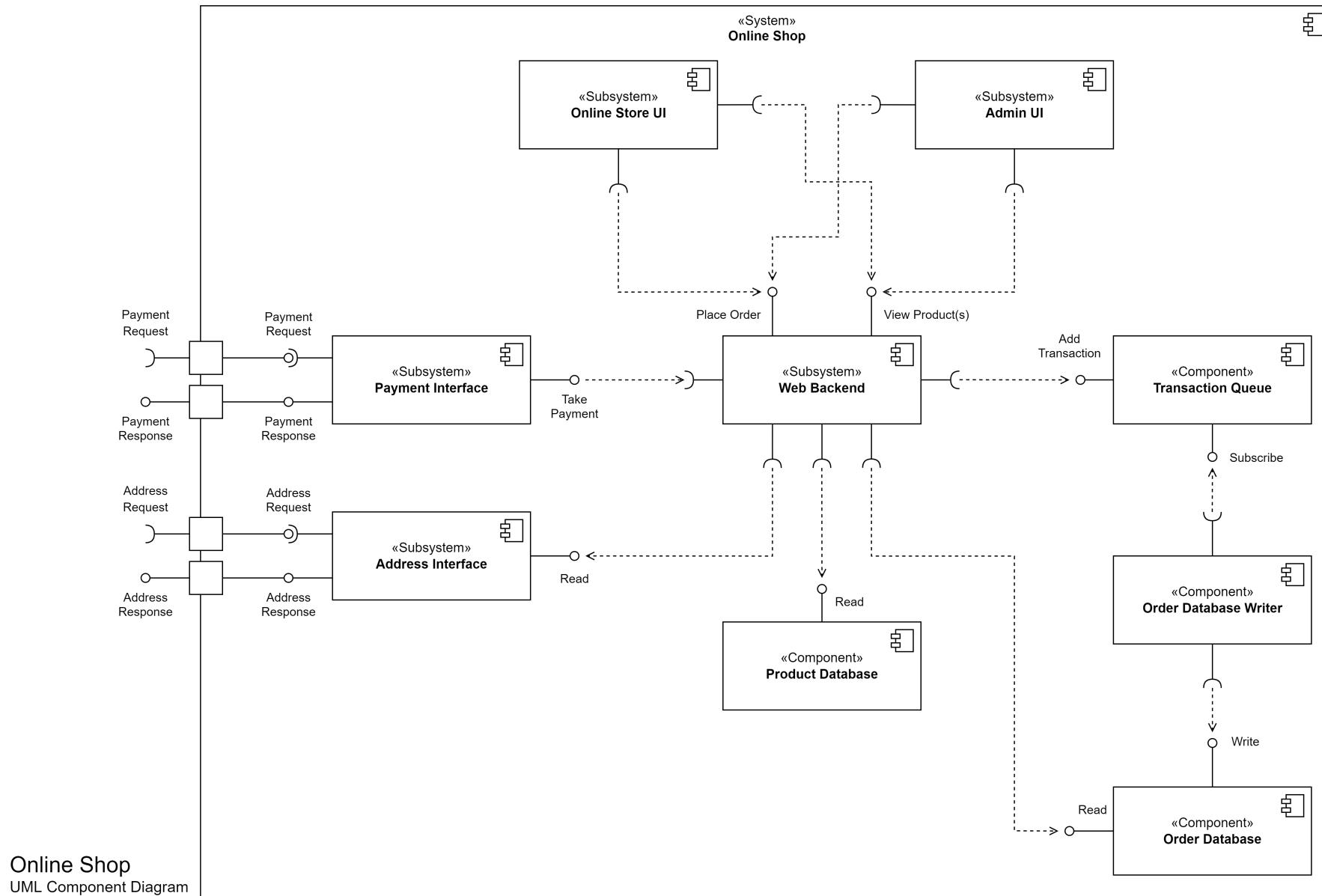
Activity

Composite
Structure

Interaction
Overview

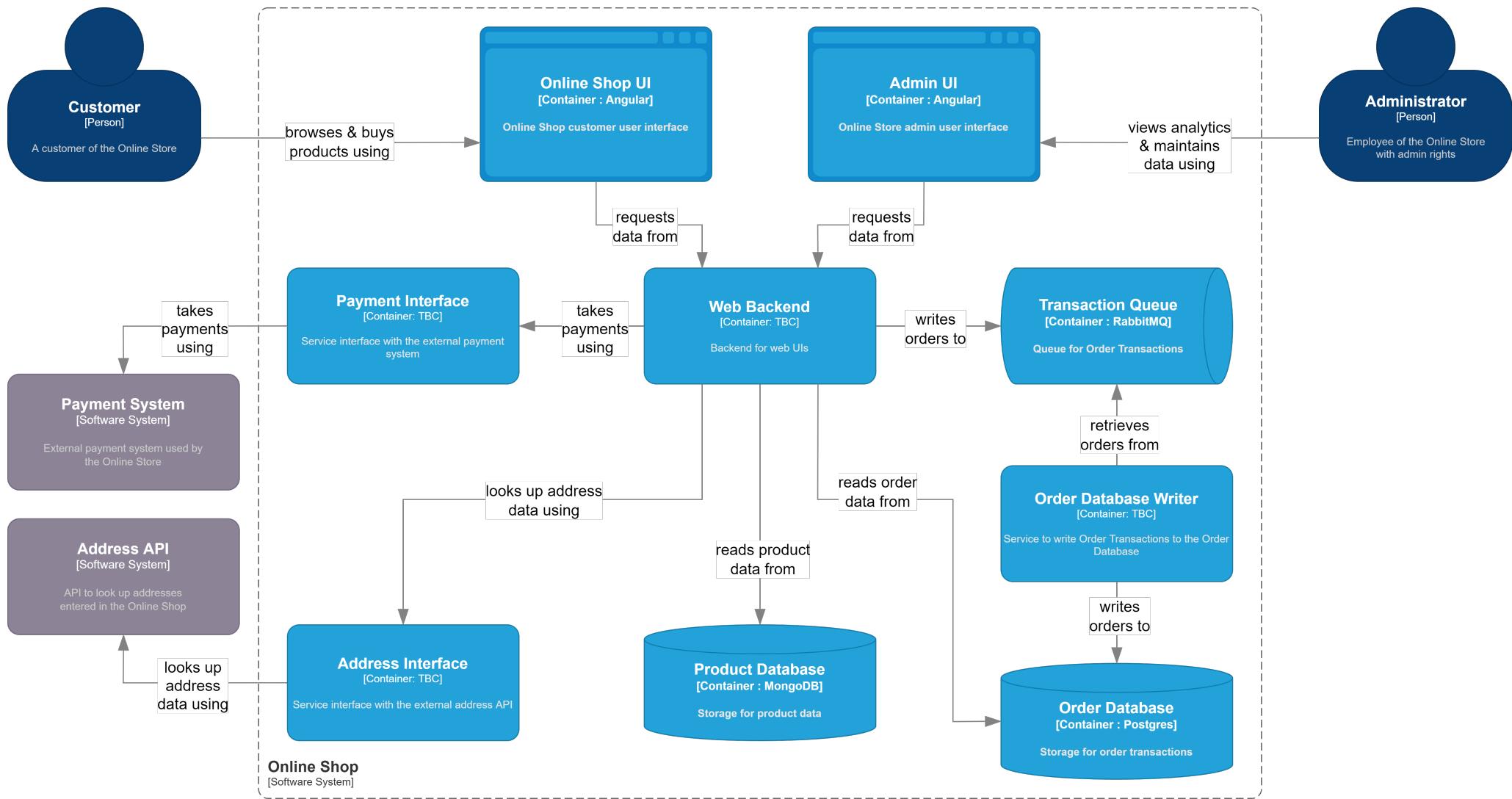
What does your audience need?

UML Component



Keep it simple and
straightforward

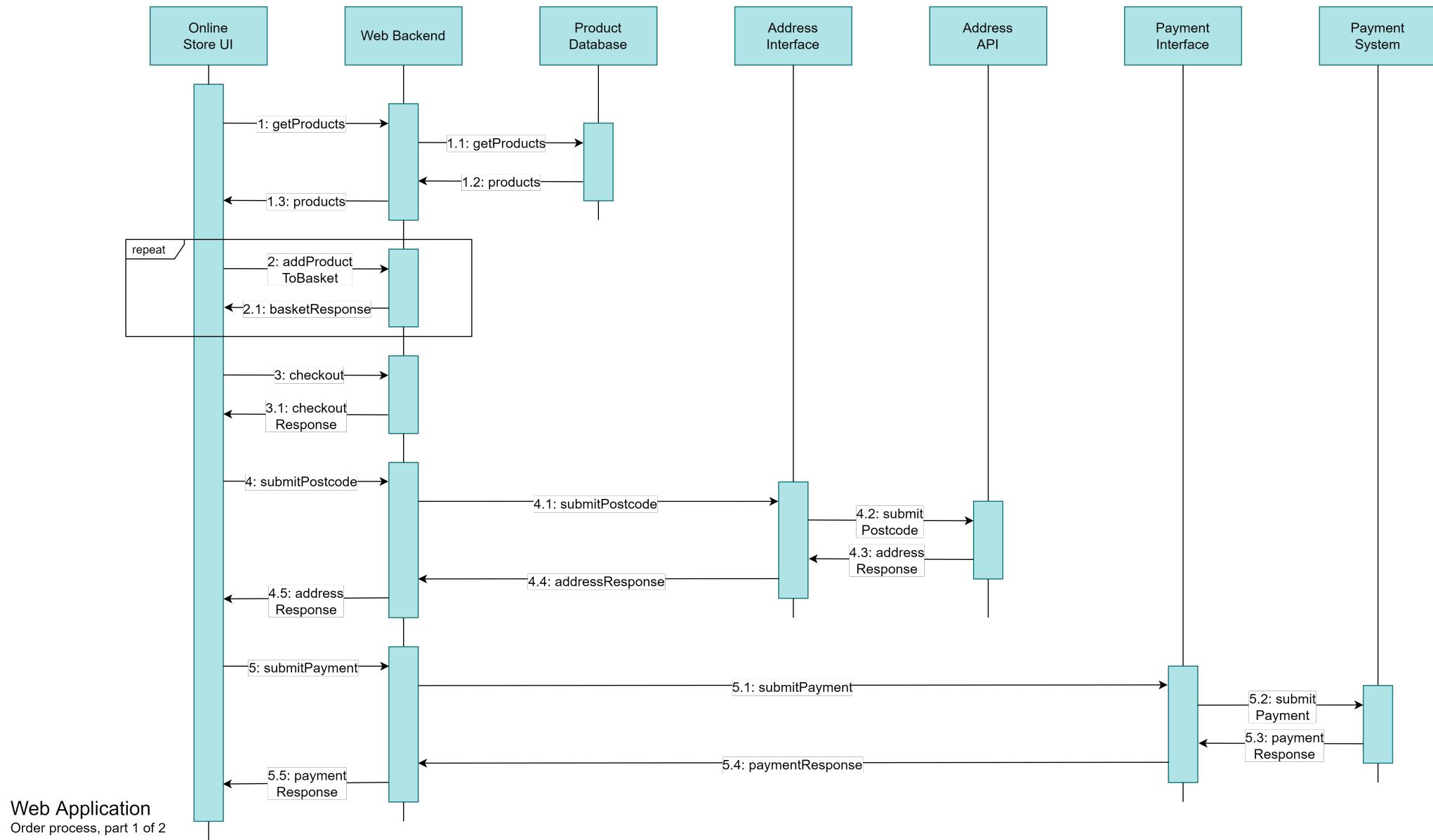
C4 Container Diagram



Container Diagram for Online Shop

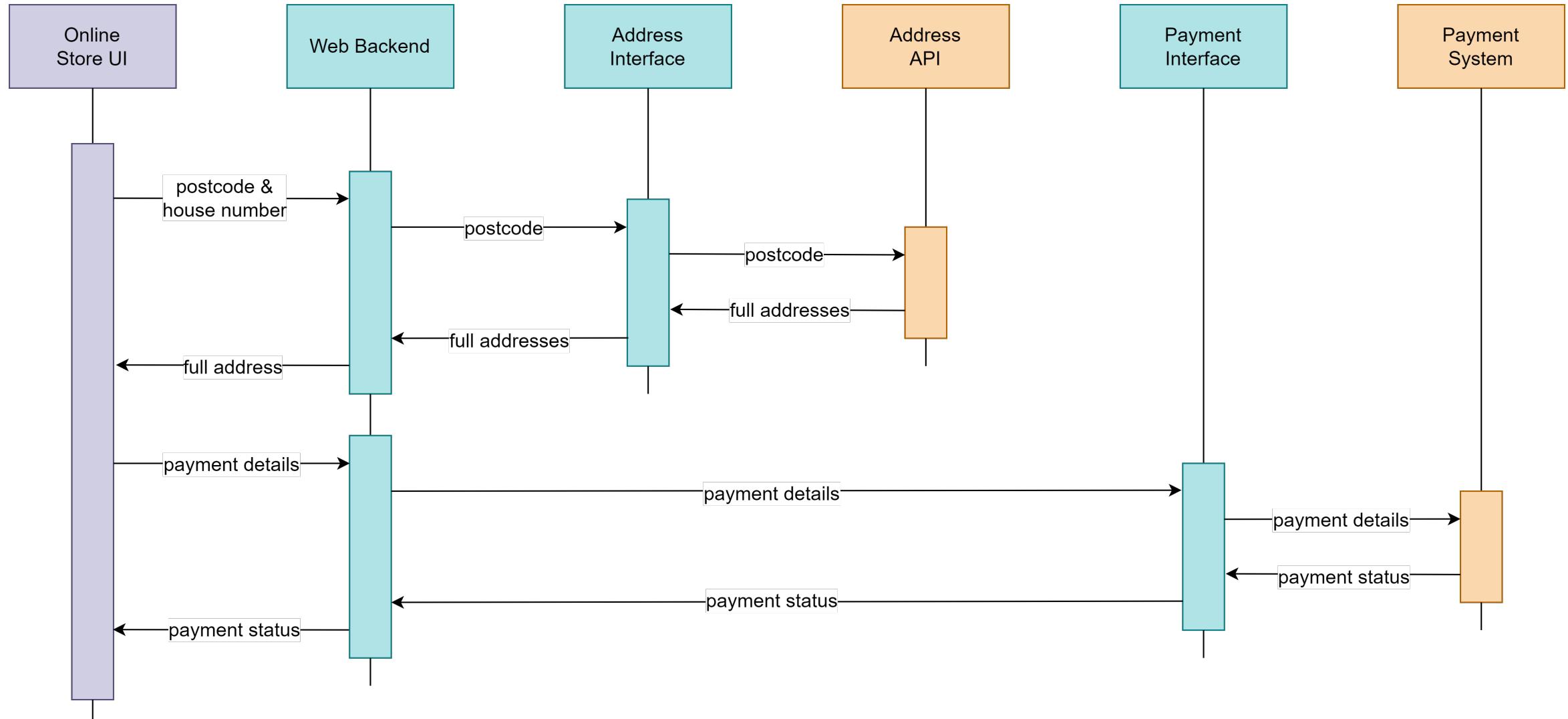
Showing the high-level interactions within the Online Shop system.

UML Sequence



How long until it is
out-of-date?

Simplified Sequence



Web Application

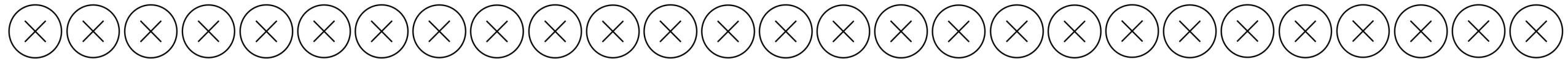
Order process, part 2 of 3

Use UML for good reason

Antipattern

Structures Behaving Badly

AKA: mixing structure and behaviour



UML Diagram Types

Structural

Behavioural

Profile

Class

State Machine

Timing

Deployment

Object

Communication

Sequence

Package

Component

Usecase

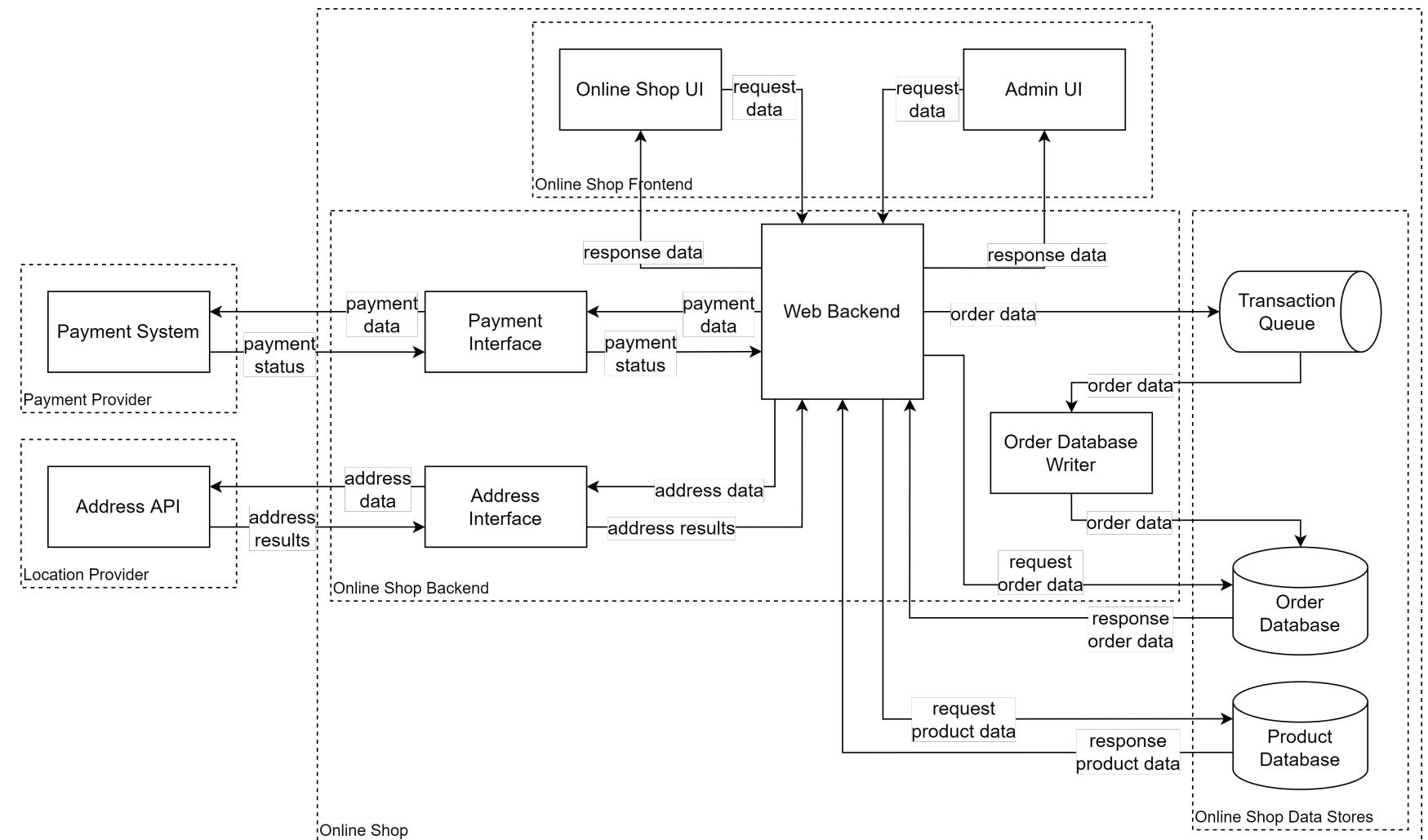
Activity

Composite
Structure

Interaction
Overview

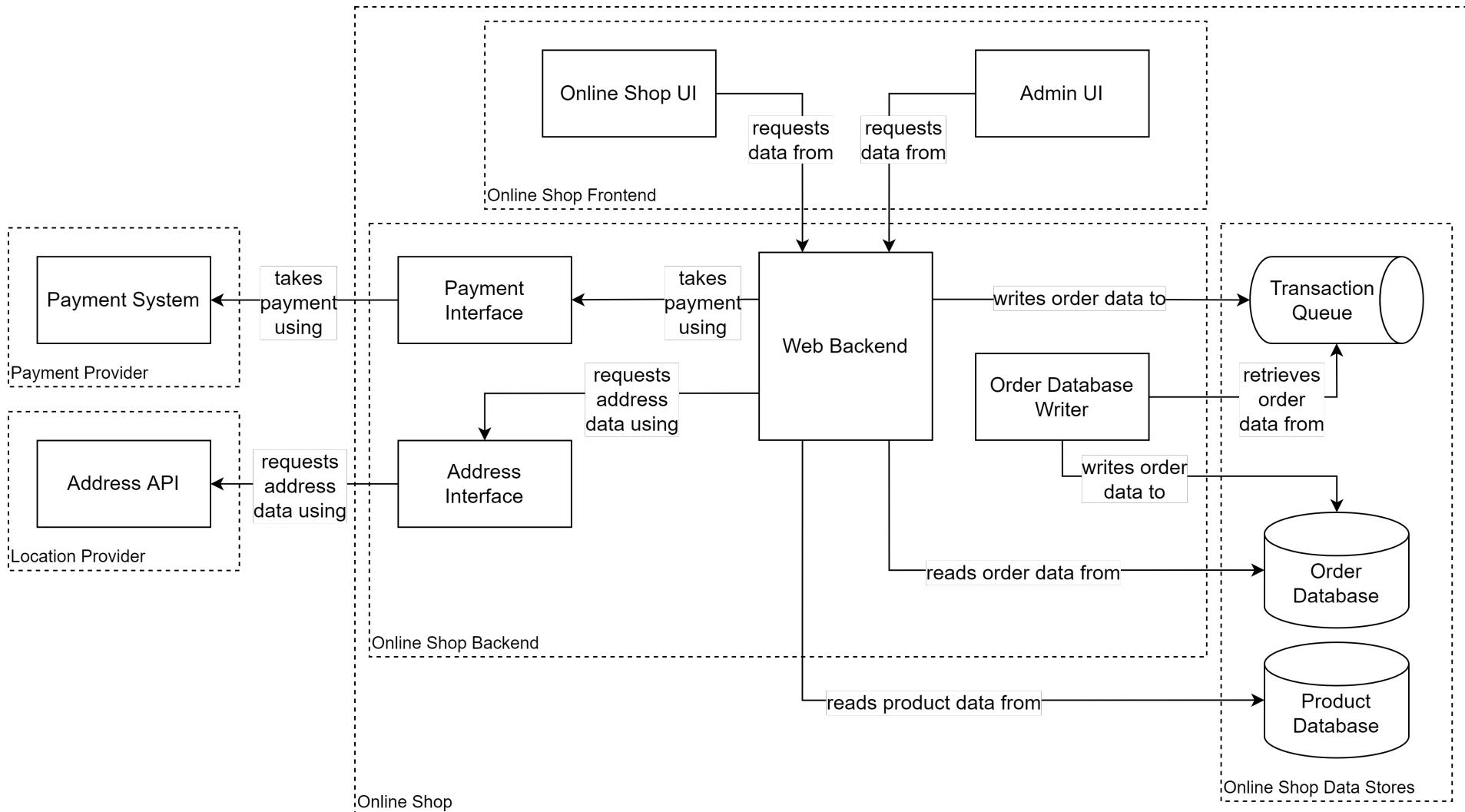
Structure and behaviour in one
diagram is confusing

Mixed Messages



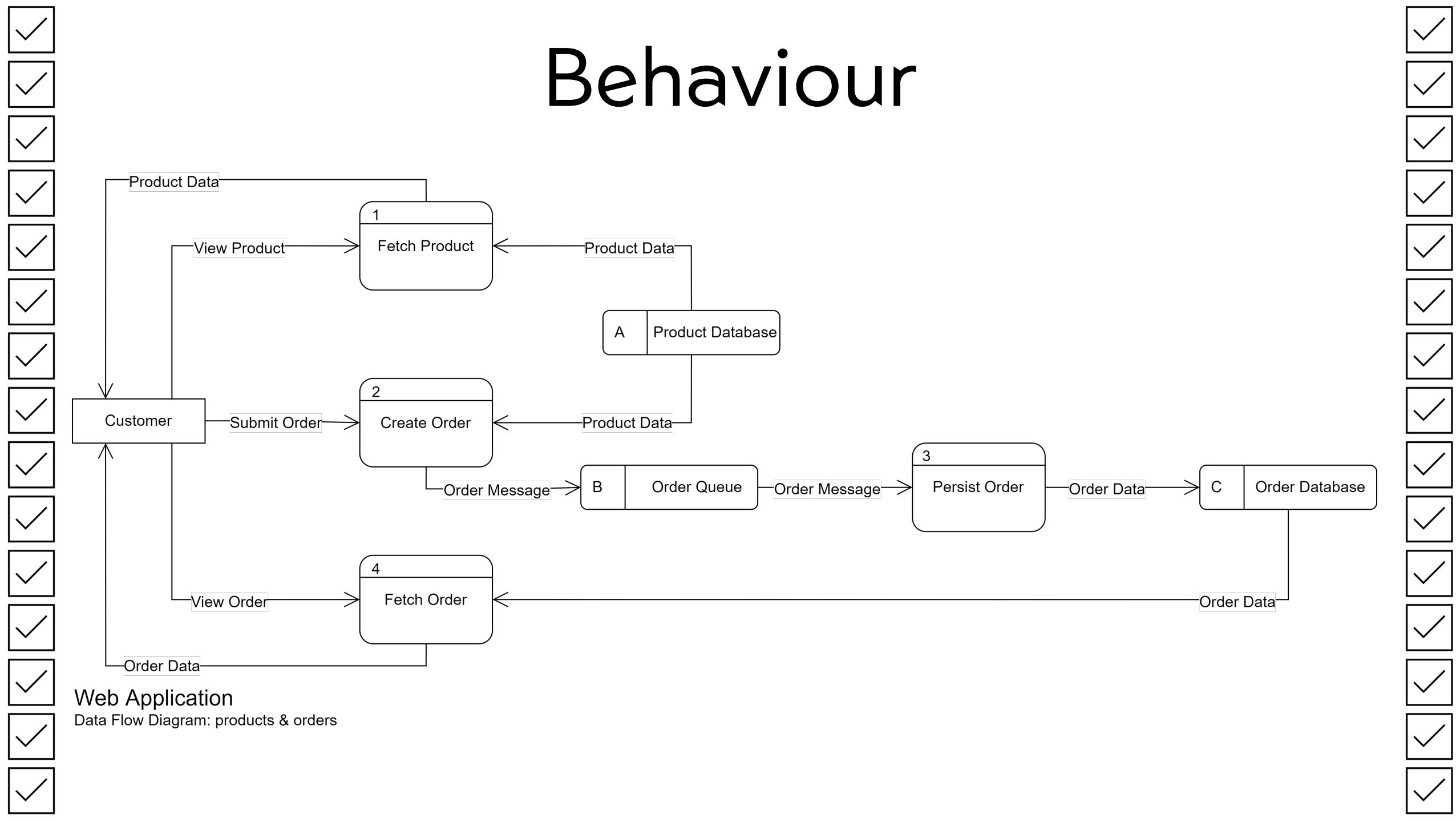
Online Shop Web Application
Conceptual Diagram

Structure



Online Shop Web Application
Conceptual Diagram

Behaviour

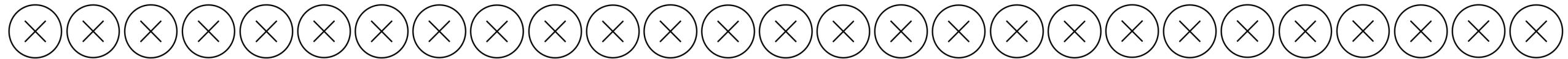


Apply the single responsibility
principle to diagrams

Antipattern

Unconventional

AKA: going against common expectations





https://commons.wikimedia.org/wiki/File:Steve_Jobs_WWDC07.jpg

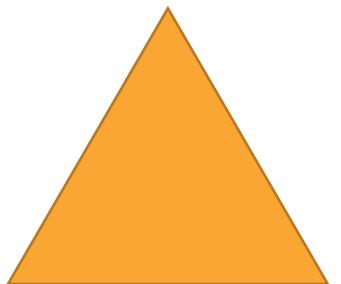
communicate, not confuse

Common expectations

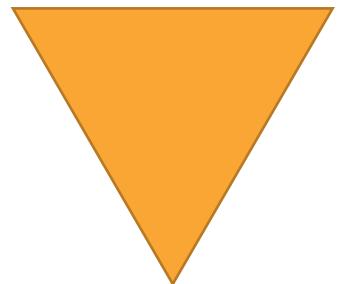
Direction

Colour

Shapes & Symbols



stability



instability



order



formality

Common expectations

Direction

Colour

Shapes & Symbols

Technology

have your justifications ready

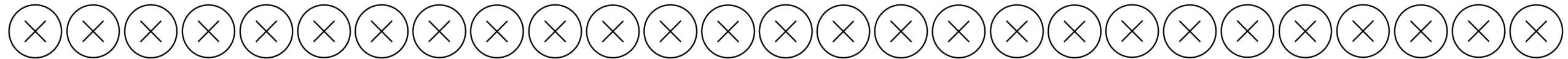
Composition

arrange your visuals for ultimate clarity

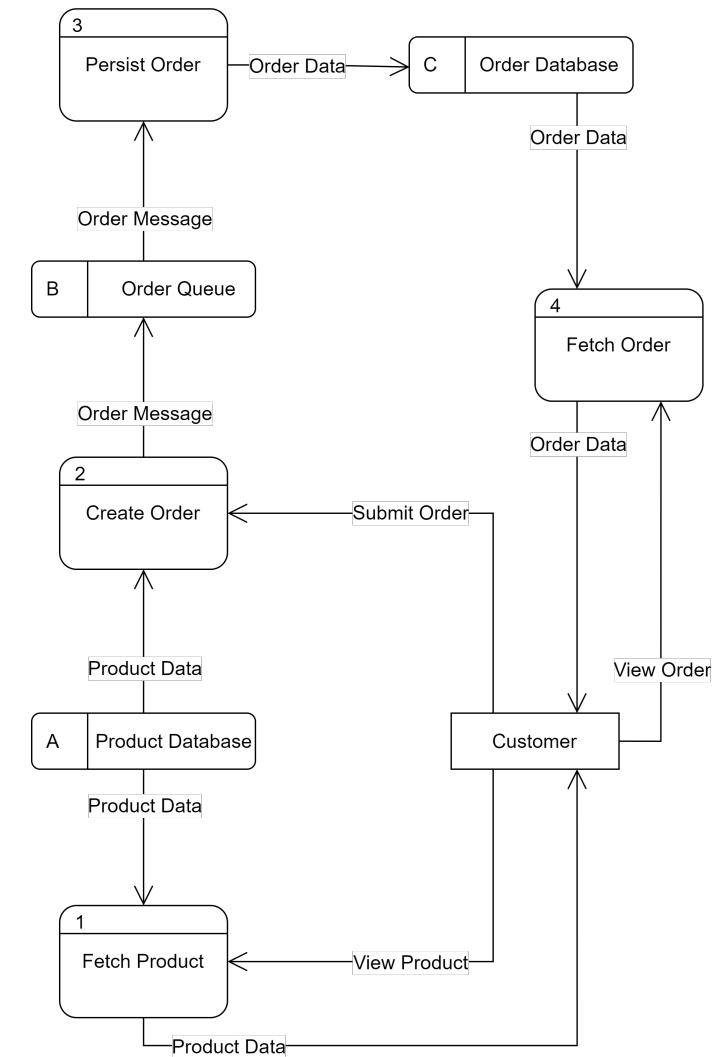
Antipattern

Portrait Gallery

AKA: using the wrong orientation for your format



Wrong Orientation



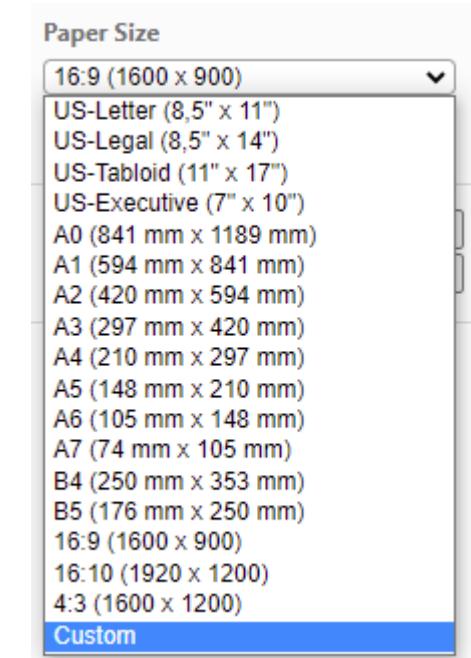
Web Application

Data Flow Diagram: products & orders

Do

Choose the appropriate orientation when you create a diagram

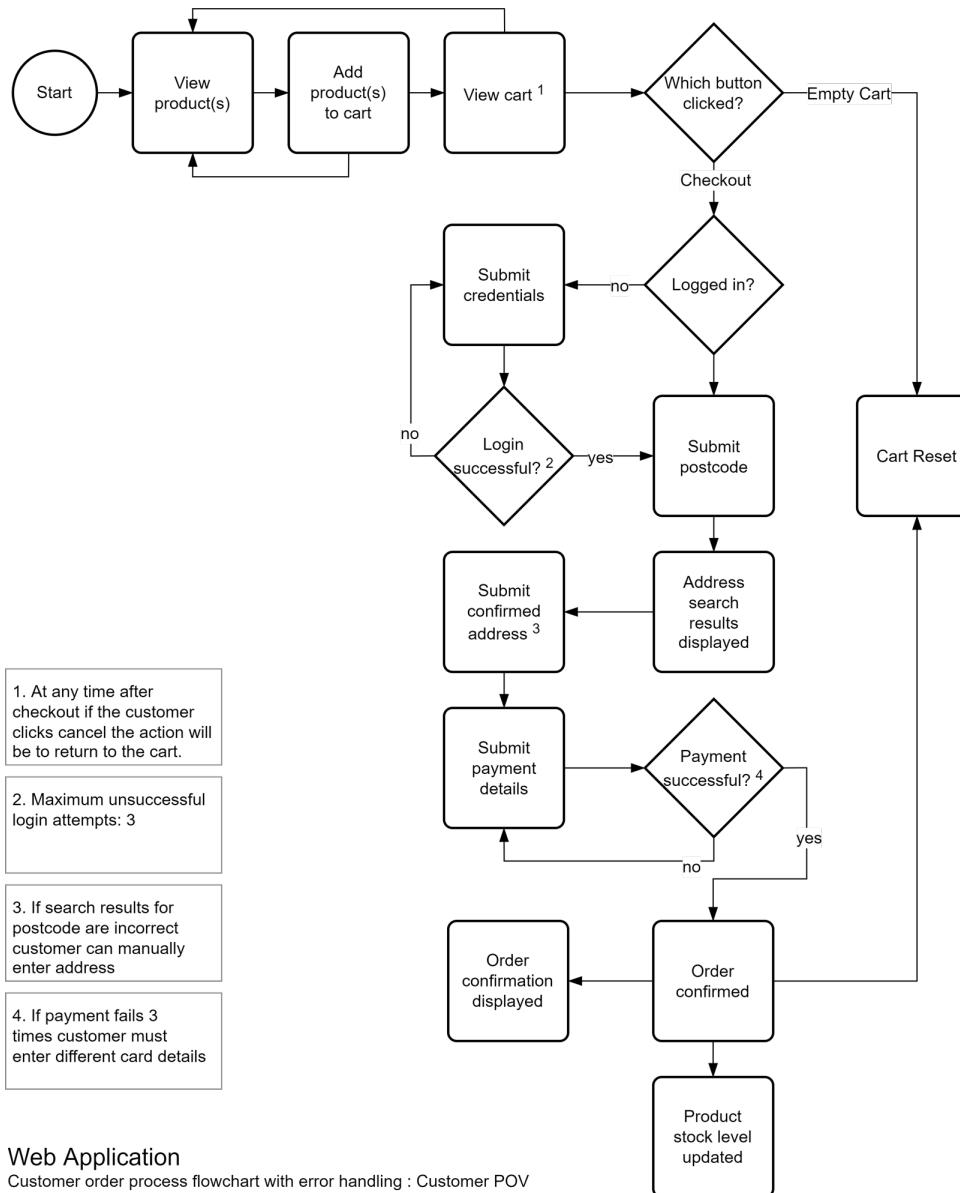
- This will generally be landscape
- For screens & slides - 16:9



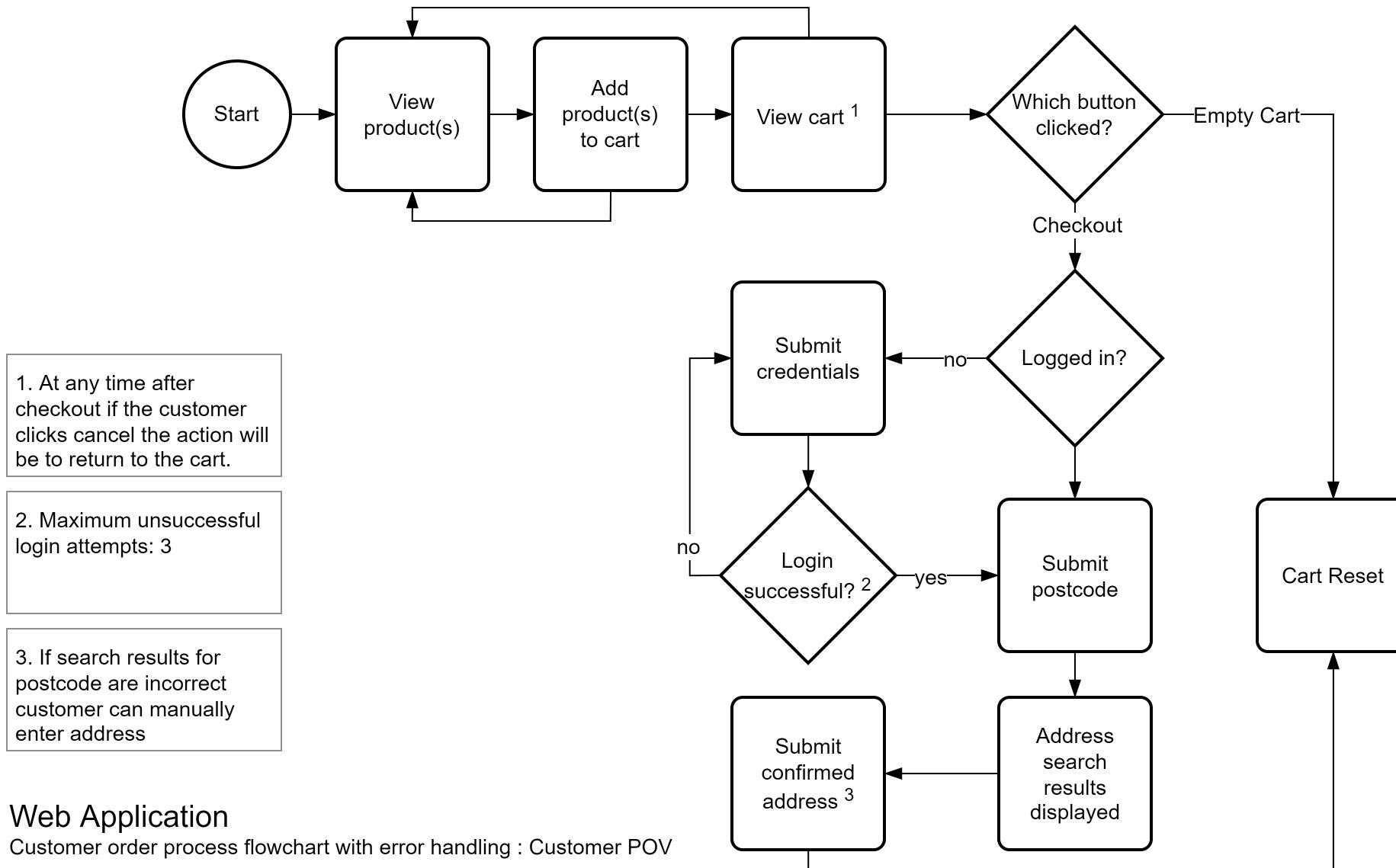
Paper size options
in Diagrams.net
(formally Draw.io)

Be prepared to ‘zoom-in’ or
hide parts of the diagram

Start with the overview...

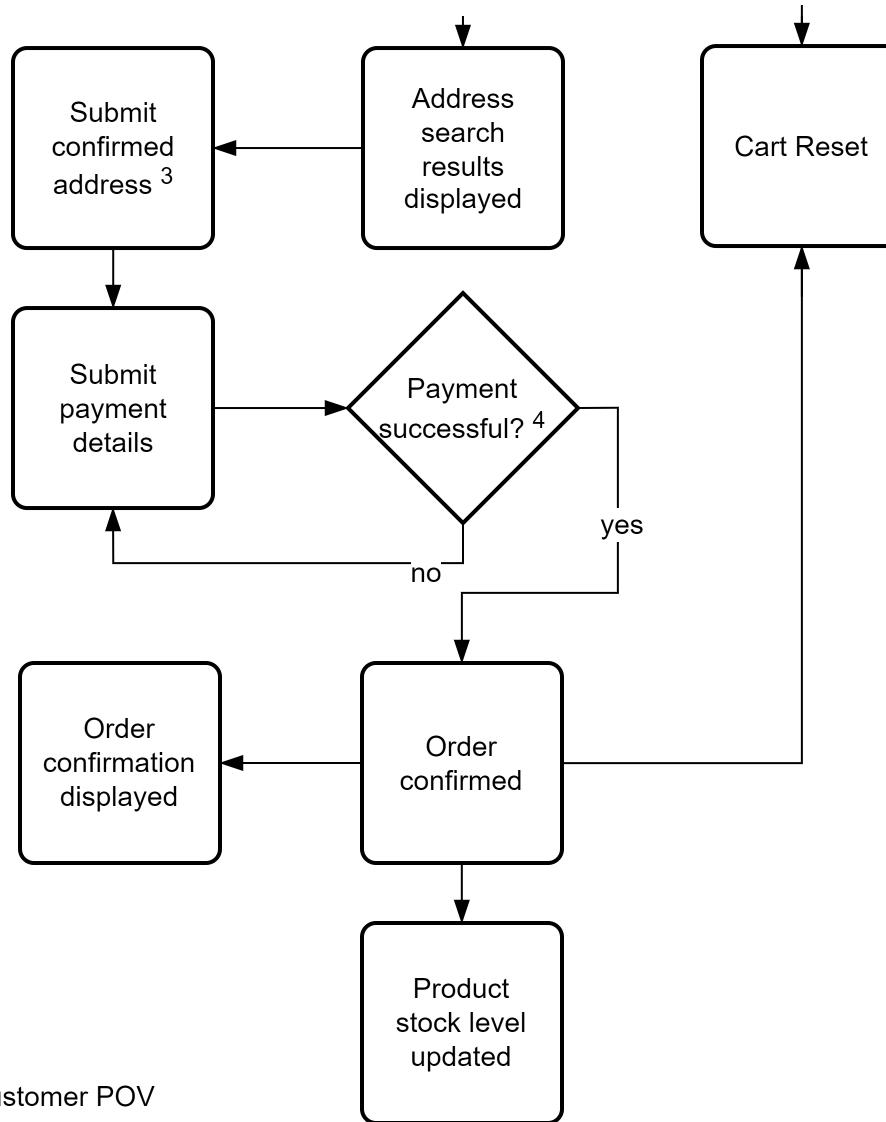


Legible



Move on...

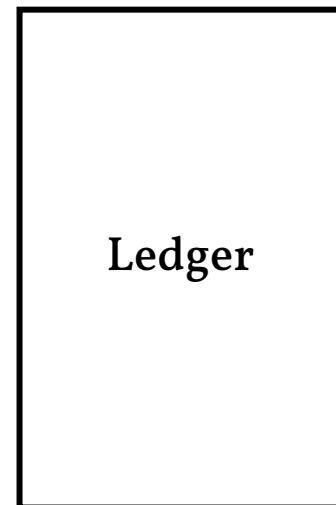
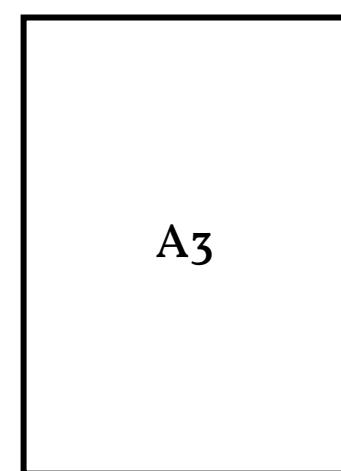
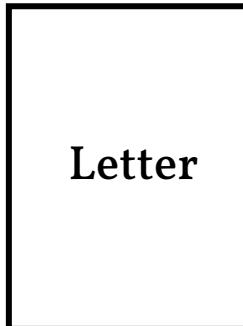
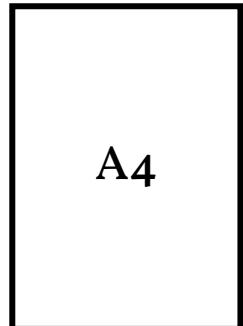
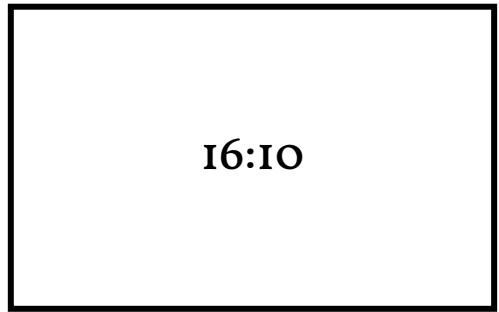
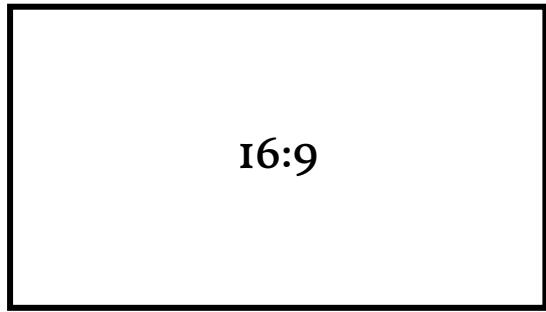
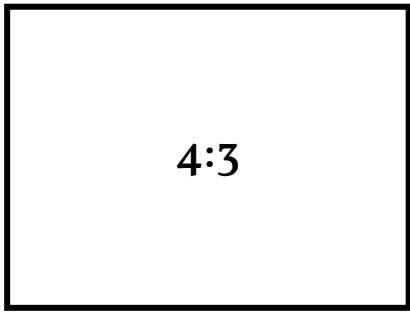
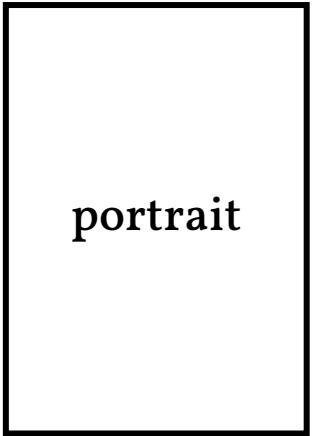
1. At any time after checkout if the customer clicks cancel the action will be to return to the cart.
2. Maximum unsuccessful login attempts: 3
3. If search results for postcode are incorrect customer can manually enter address
4. If payment fails 3 times customer must enter different card details



Web Application

Customer order process flowchart with error handling : Customer POV

Orientation & Ratio



Pattern

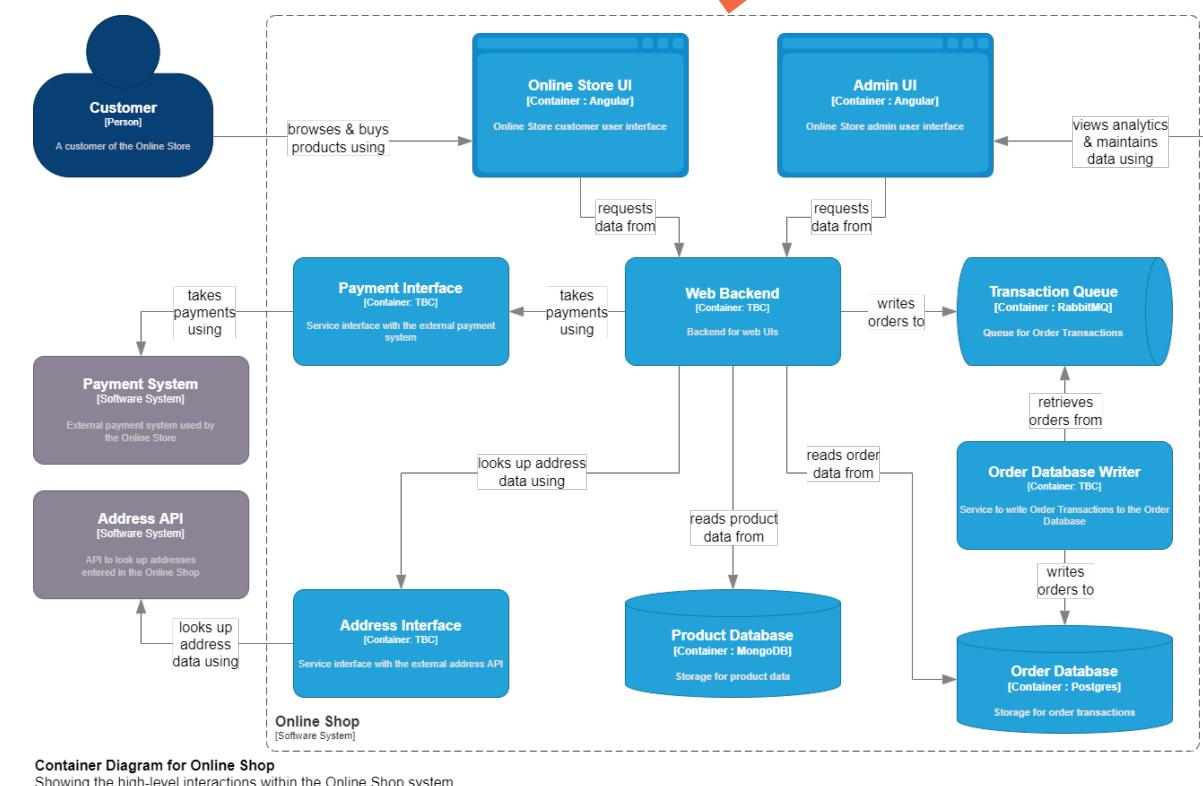
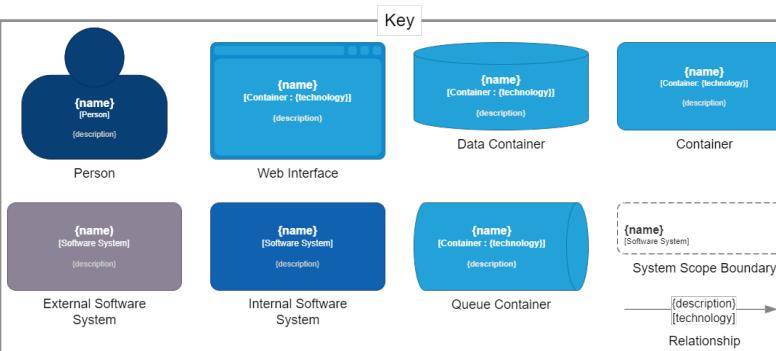
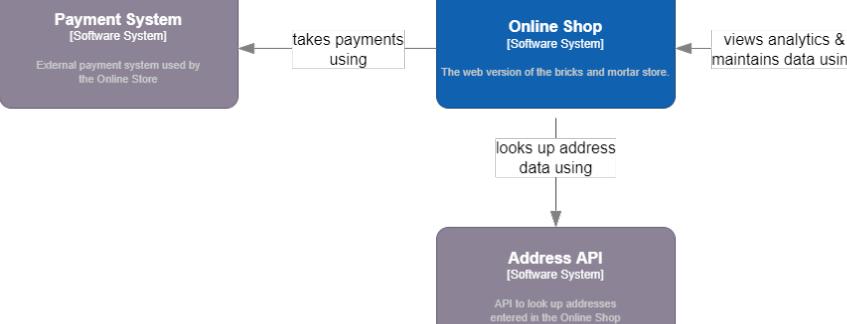
Connect the Dots

AKA: Representational Consistency
– connecting levels of abstraction

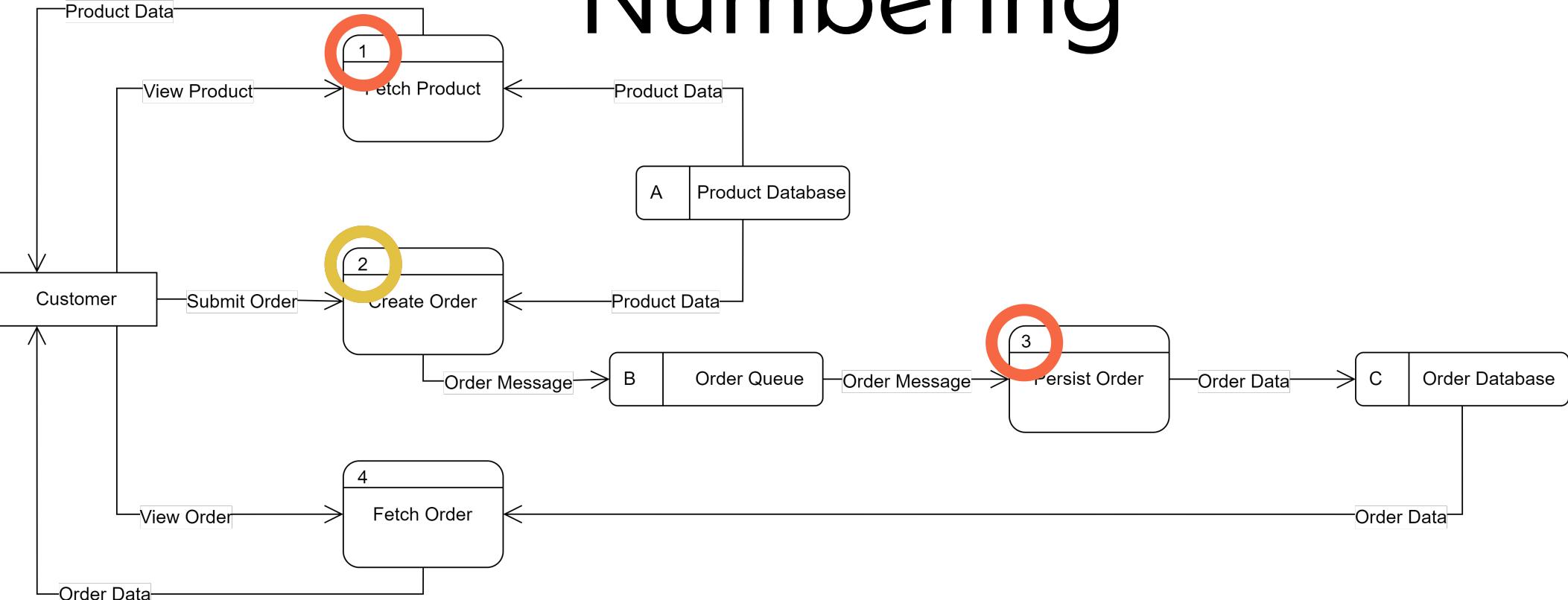


Navigating between levels of abstraction must be easy

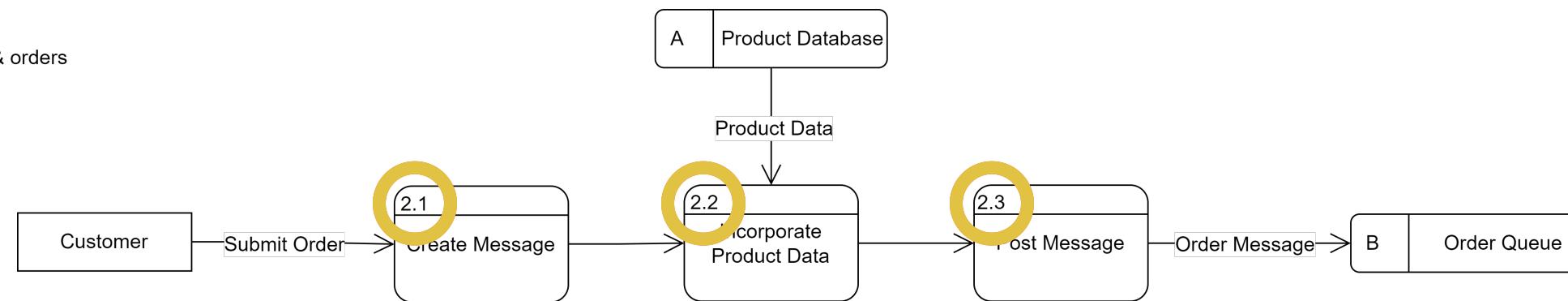
C4 Levels



Numbering

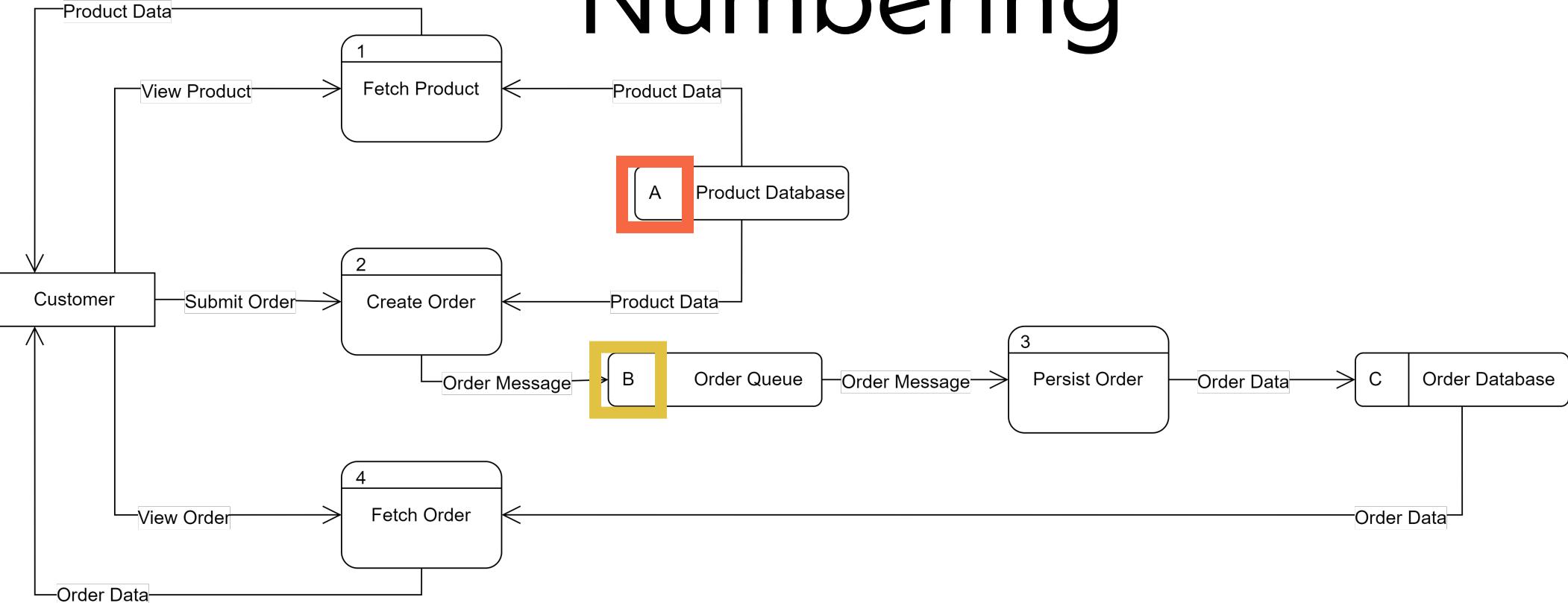


Web Application
Data Flow Diagram: products & orders

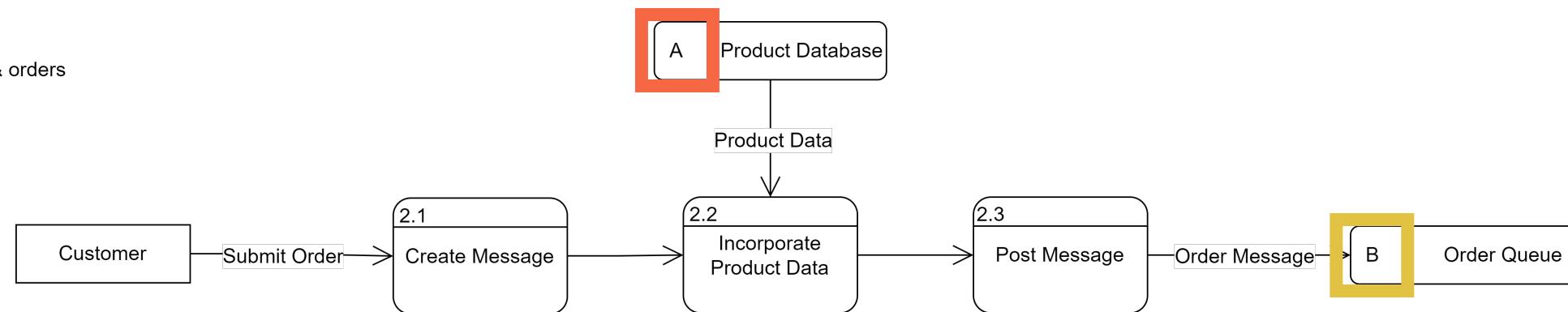


Web Application
Data Flow Diagram: products & orders - 2. Create Order

Numbering

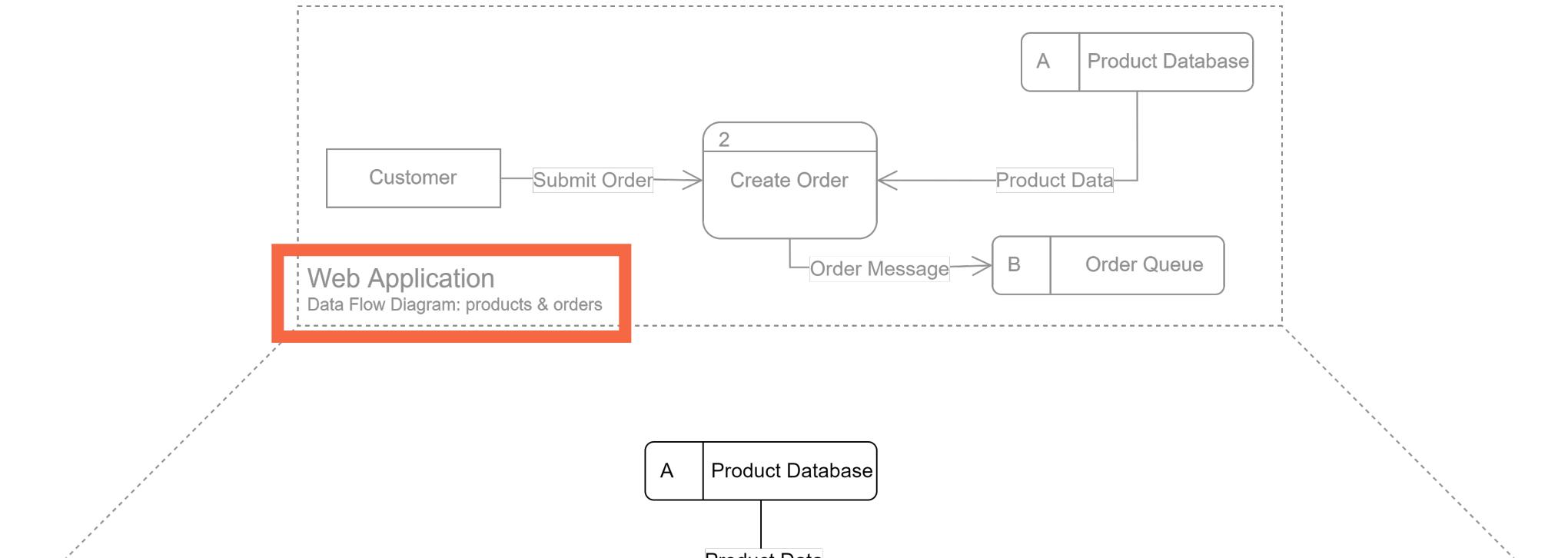


Web Application
Data Flow Diagram: products & orders



Web Application
Data Flow Diagram: products & orders - 2. Create Order

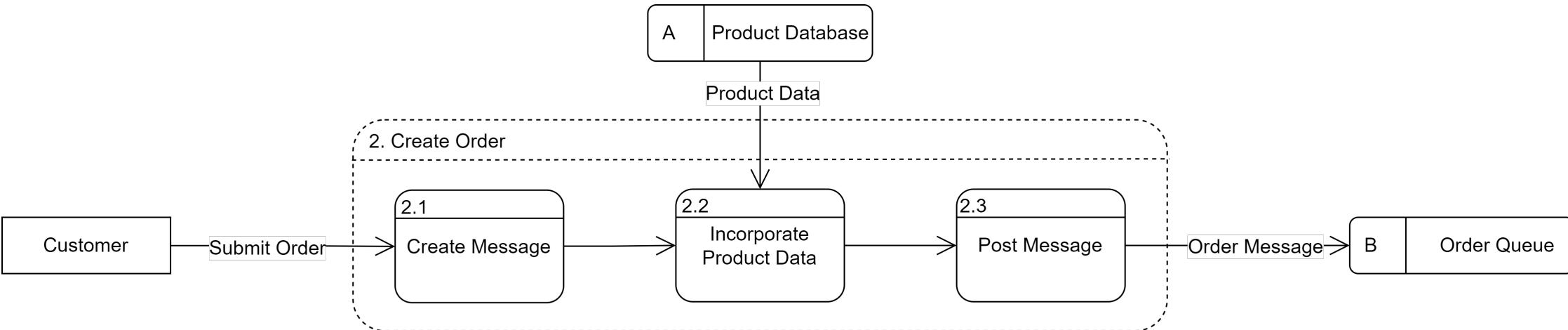
Be explicit



Web Application
Data Flow Diagram: products & orders - 2. Create Order



C4-like Reference



Web Application

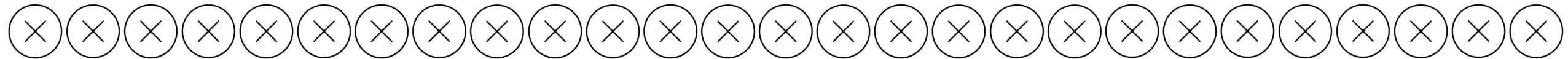
Data Flow Diagram: products & orders - 2. Create Order

Make explicit references to
other levels of abstraction

Antipattern

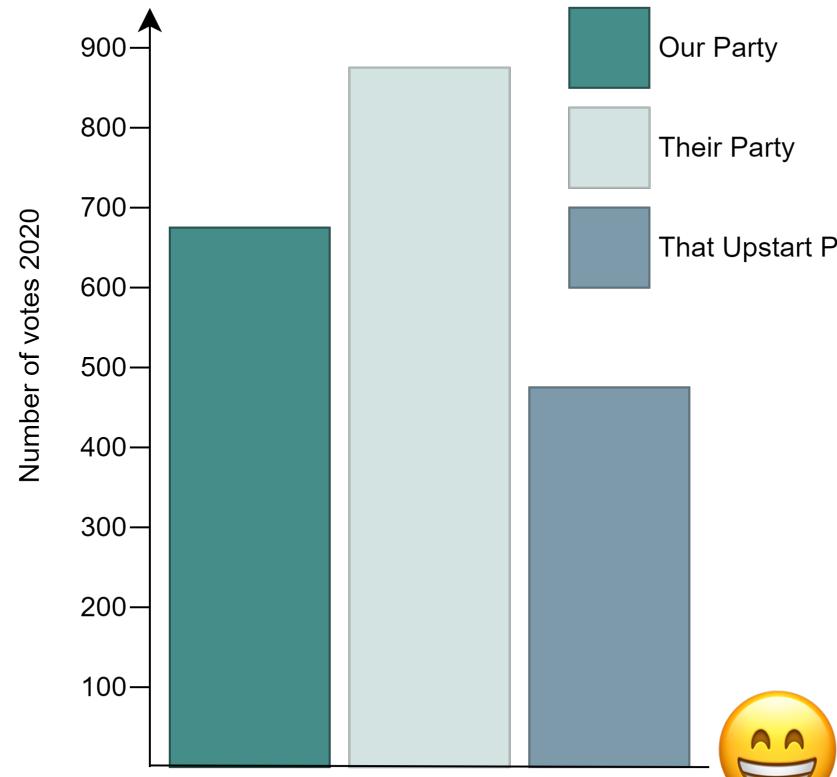
Misleading the Court

AKA: distorted composition



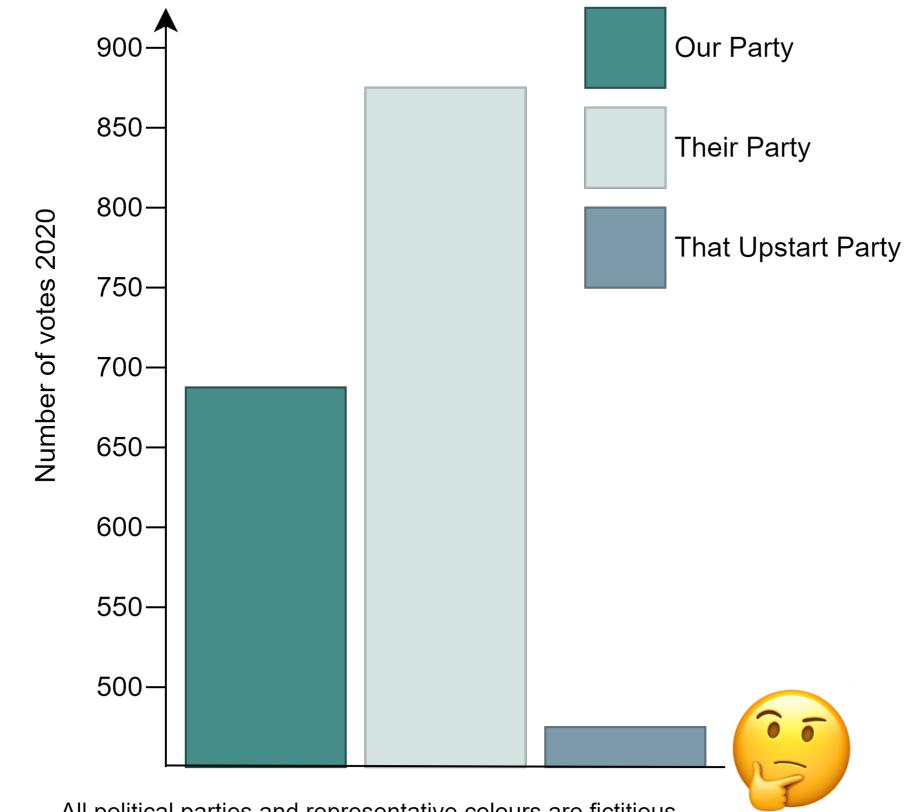
Baseline Tweaks

Our Party can win the local elections!



All political parties and representative colours are fictitious.
No reference is intended to any real political party.

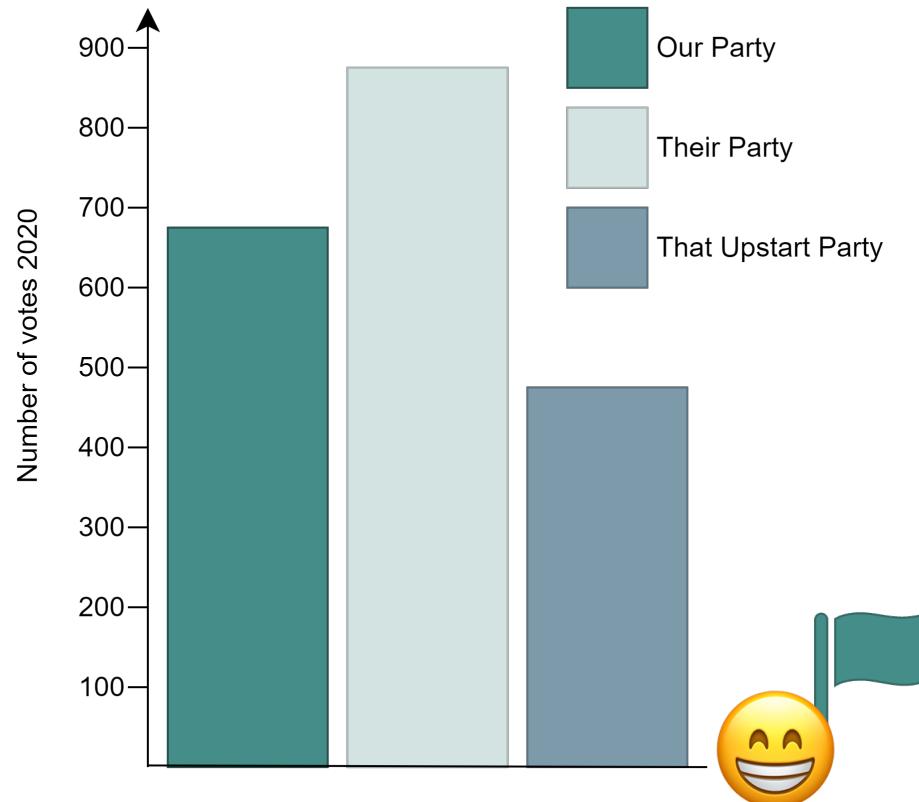
Our Party can win the local elections!



All political parties and representative colours are fictitious.
No reference is intended to any real political party.

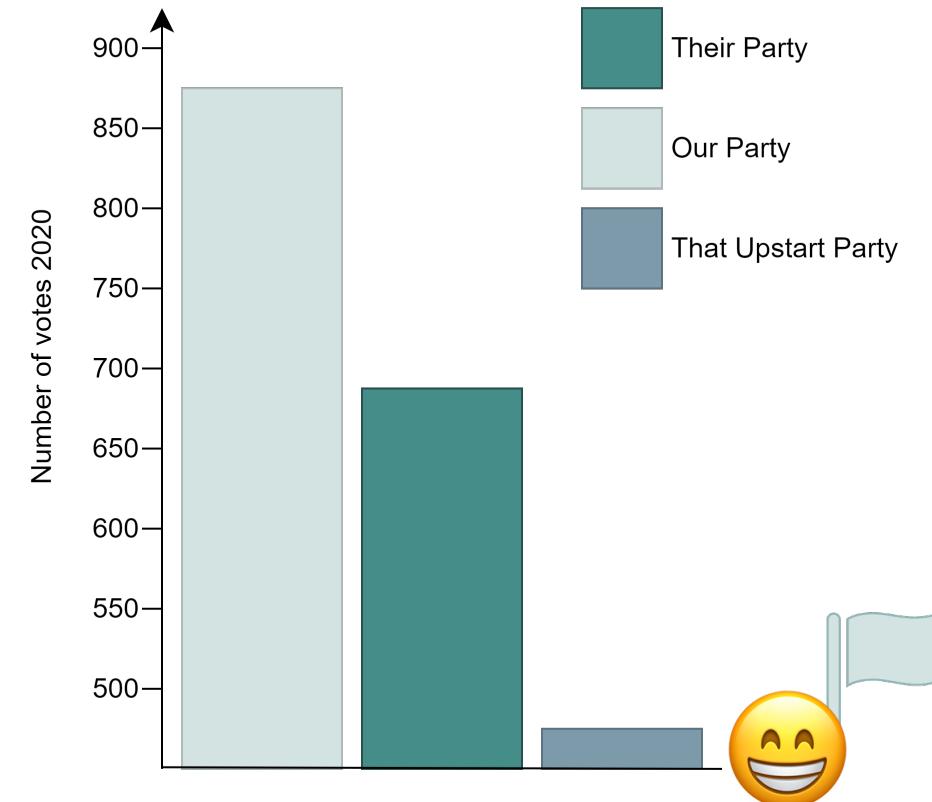
Baseline Tweaks

Our Party can win the local elections!



All political parties and representative colours are fictitious.
No reference is intended to any real political party.

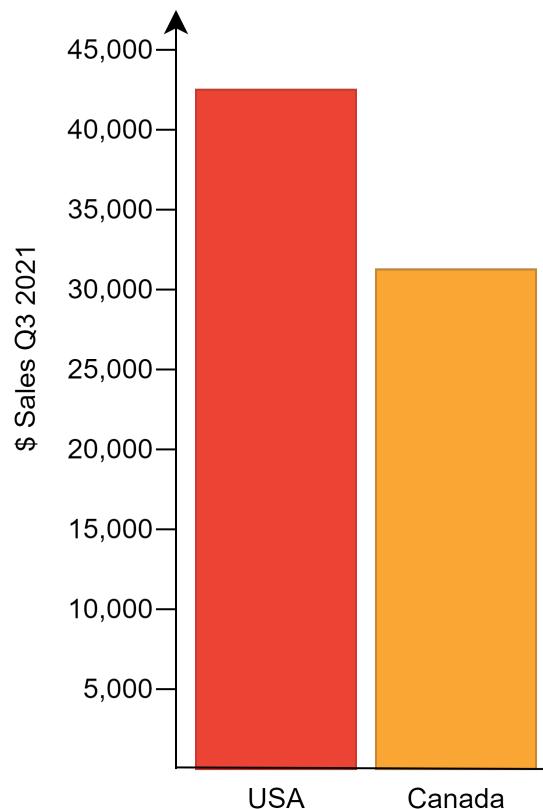
Our Party can win AGAIN at the local elections!



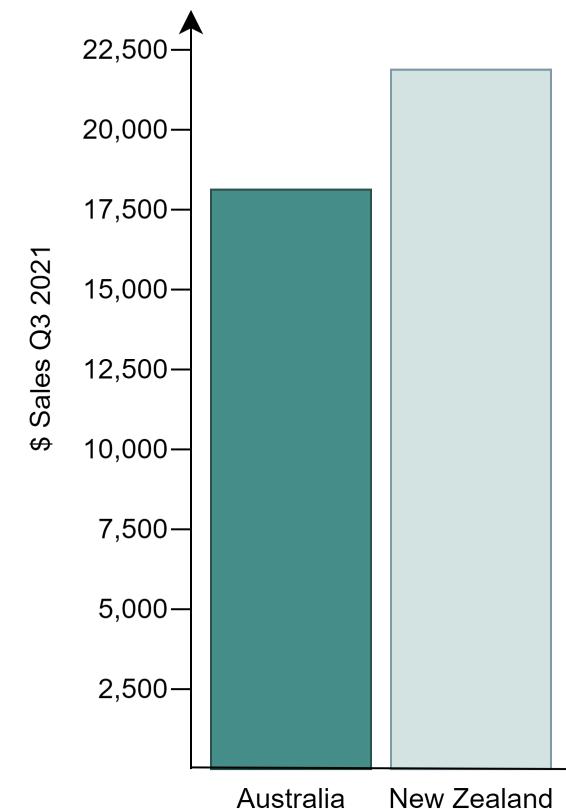
All political parties and representative colours are fictitious.
No reference is intended to any real political party.

Misleading Comparison

North America

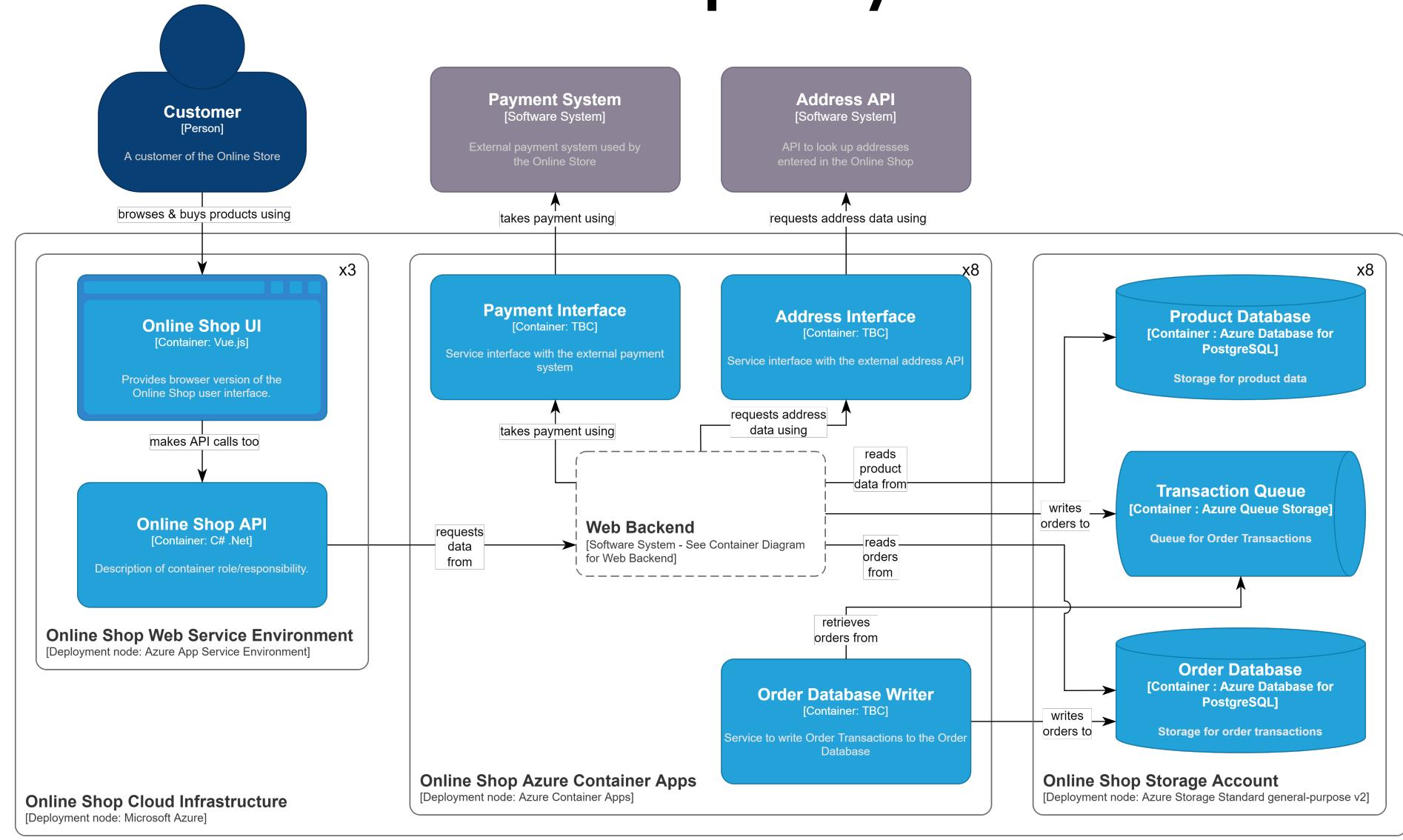


ANZ



In software diagrams we don't
have an agenda to mislead

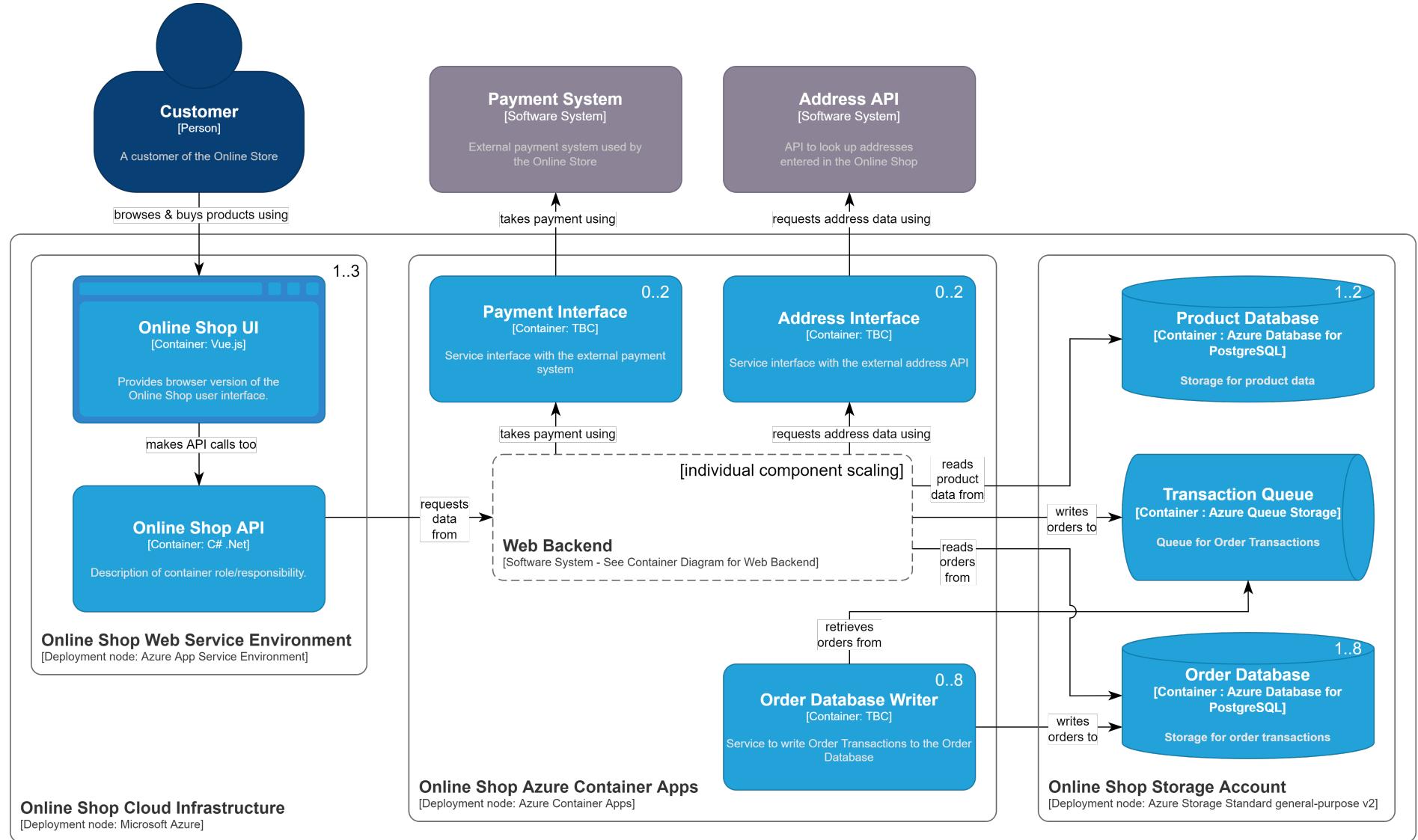
Scaled Deployment?



Deployment diagram for Online Shop | Production | Customer

Deployment scenario diagram for customer production environment of the Online Shop

More realistic view



Pattern

Strike a Balance

AKA: create a visual balance



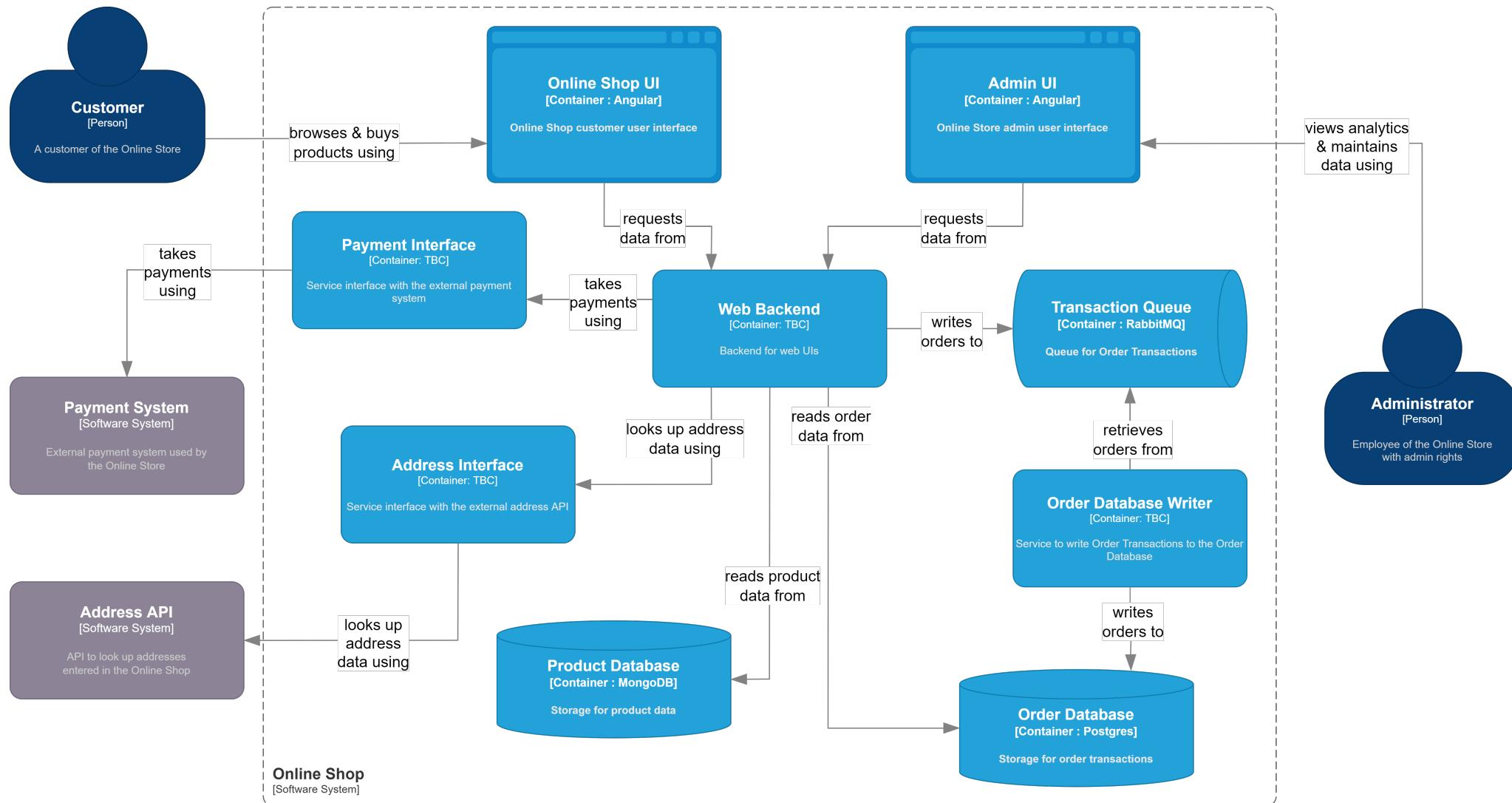


**Balance is an innate,
fundamental human
expectation.**

- Alvalyn Lundgren

Balance is not all about
symmetry

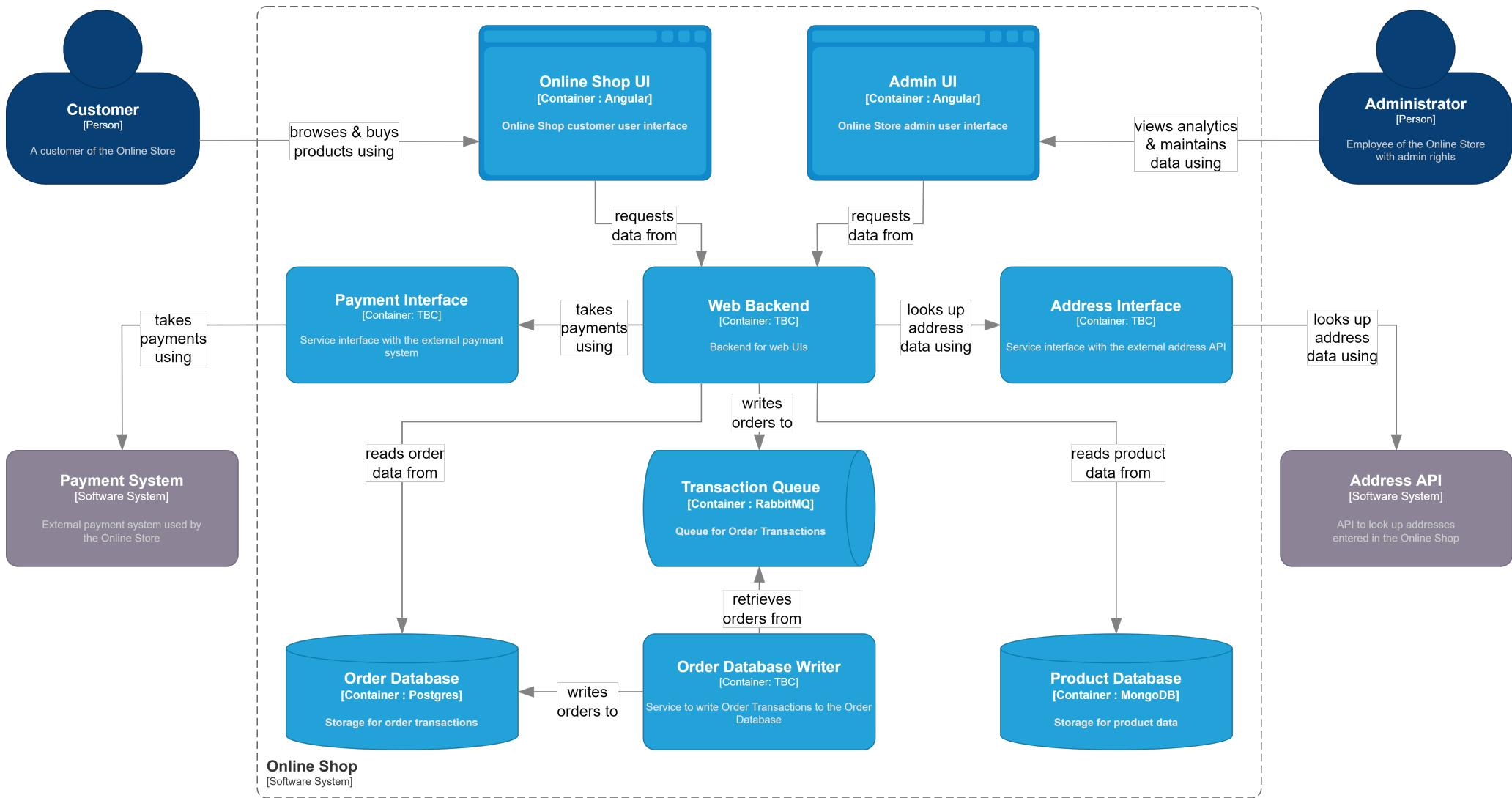
Unbalanced C4



Container Diagram for Online Shop

Showing the high-level interactions within the Online Shop system.

Satisfying C4



Container Diagram for Online Shop

Showing the high-level interactions within the Online Shop system.

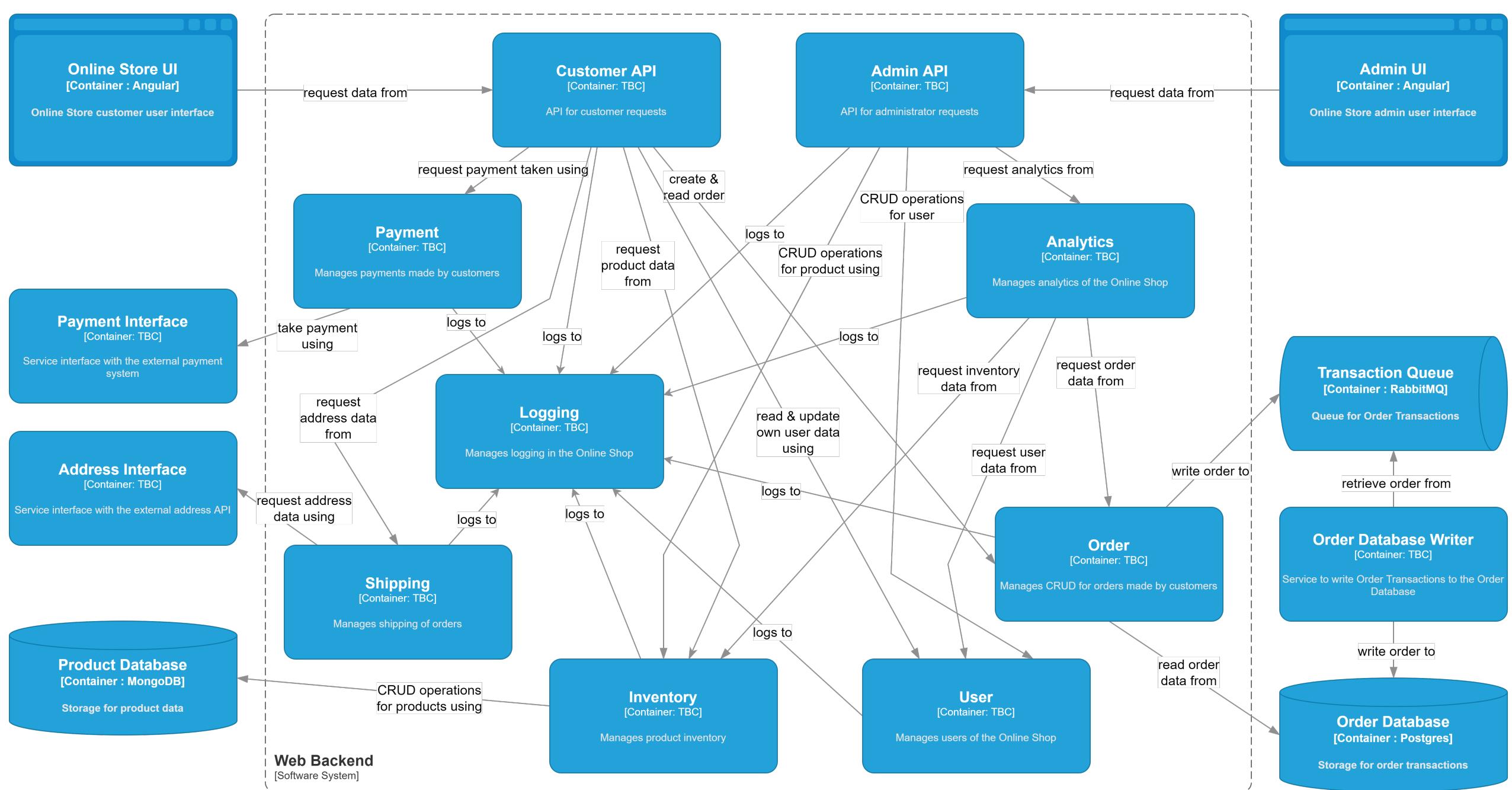
Don't sacrifice clarity for
balance

Use balance to enhance clarity

Summary

You can now apply all these

- Meta Style
- Face in the Crowd
- Multi-Storey Diagram
- Explosion of Unicorns
- Spider's Web
- Notes on a Theme
- Colour is Key
- Written in Legend
- MLAH
- Pure and Simple
- A Push in the Right Direction
- Show Them the Pirate Ship
- Beside the Point
- Iconic
- Not-So-Unified Modelling Language
- Structures Behaving Badly
- Unconventional
- Portrait Gallery
- Connect the Dots
- Strike a Balance



Container Diagram for Web Backend

Showing the interactions with and within the Web Backend.

Thank you



Jacqui Read

Software Architect
Founder, ReadTheArchitecture.com



@tekiegirl



JacquiRead.com