

Communicating Software Architecture

Using technical diagrams to take your
project from presentation to production



Jacqui Read

Consultant Software Architect
Author of *Communication Patterns*



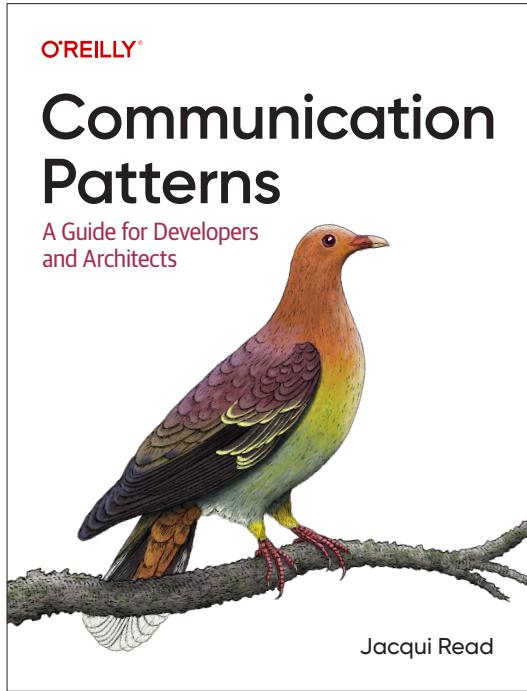
fosstodon.org/@tekiegirl



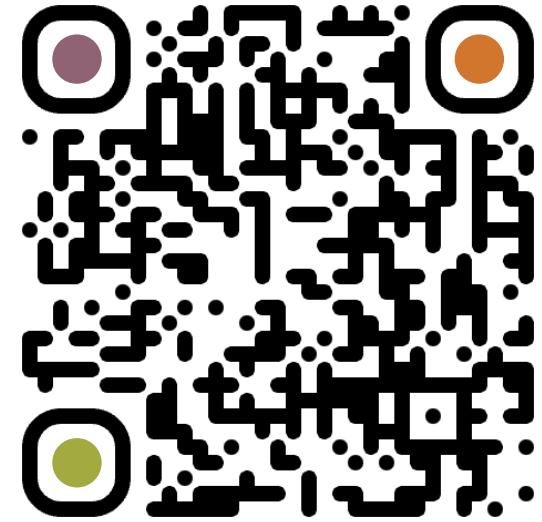
linkedin.com/in/jacquelineread



JacquiRead.com



CommunicationPatternsBook.com



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fosstodon.org/@tekiegirl

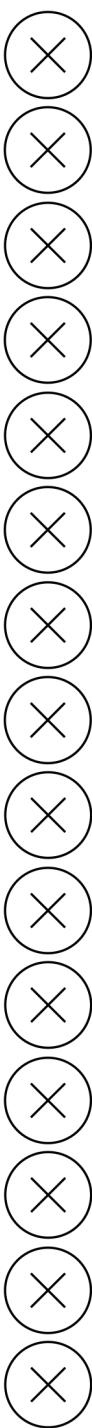


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Effective visual communication



Patterns & Antipatterns

Avoid diagram pitfalls and
deliver impact

Communication Essentials

the foundations of successful visual communication

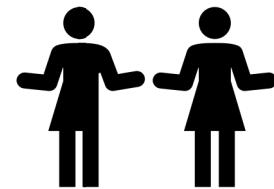
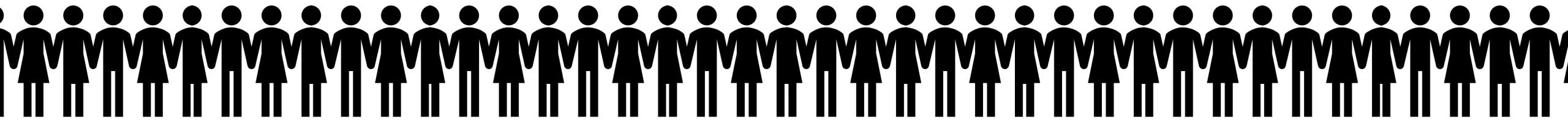
Pattern

Face in the Crowd

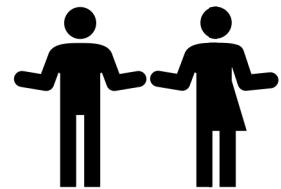
AKA: know your audience



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?

Think about these

What is their technical understanding?

What level of detail do they need?

Think about these

What is their technical
understanding?

What level of detail do
they need?

What do they want
from you?

Think about these

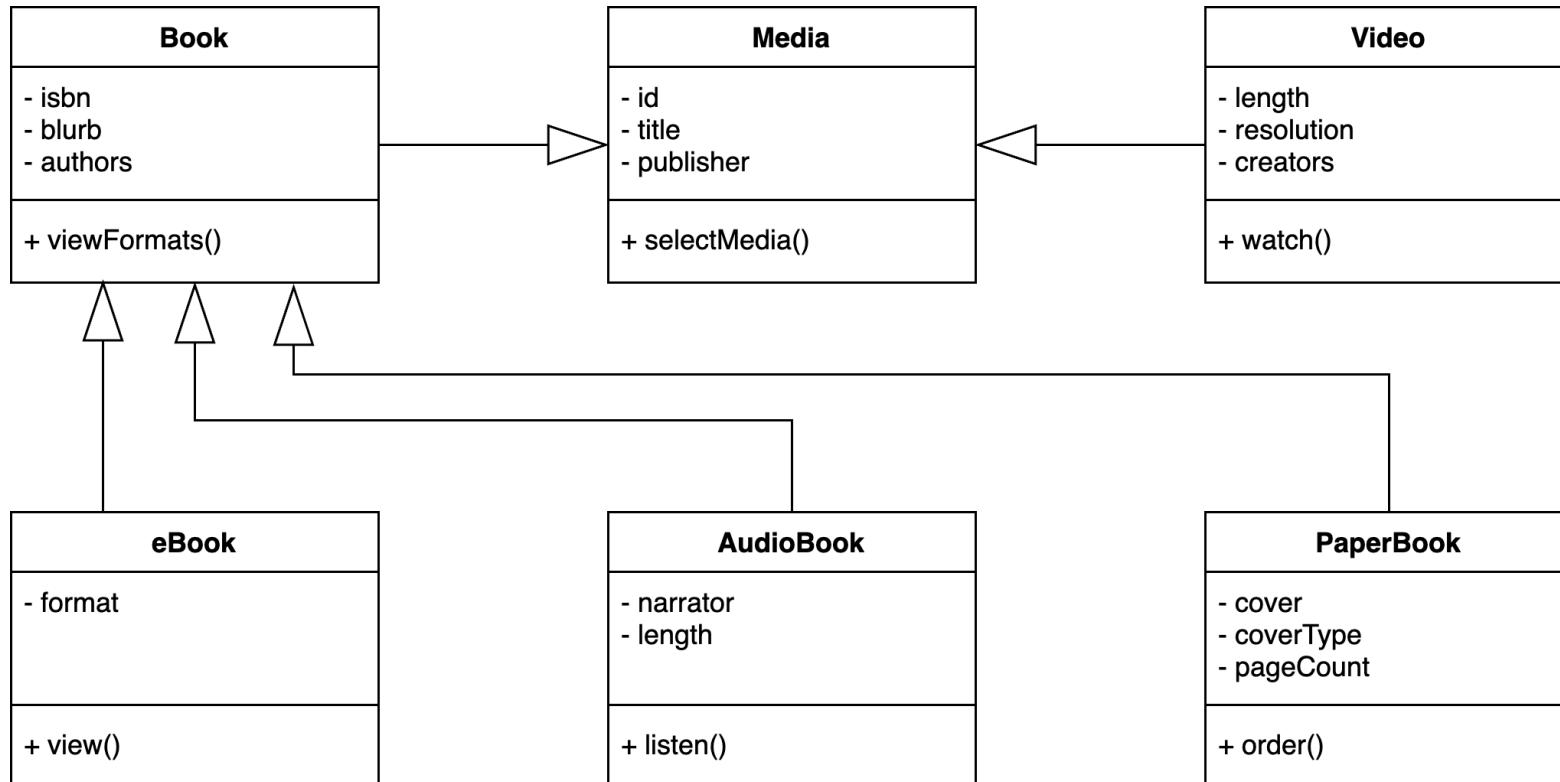
What is their technical understanding?

What level of detail do they need?

What do they want from you?

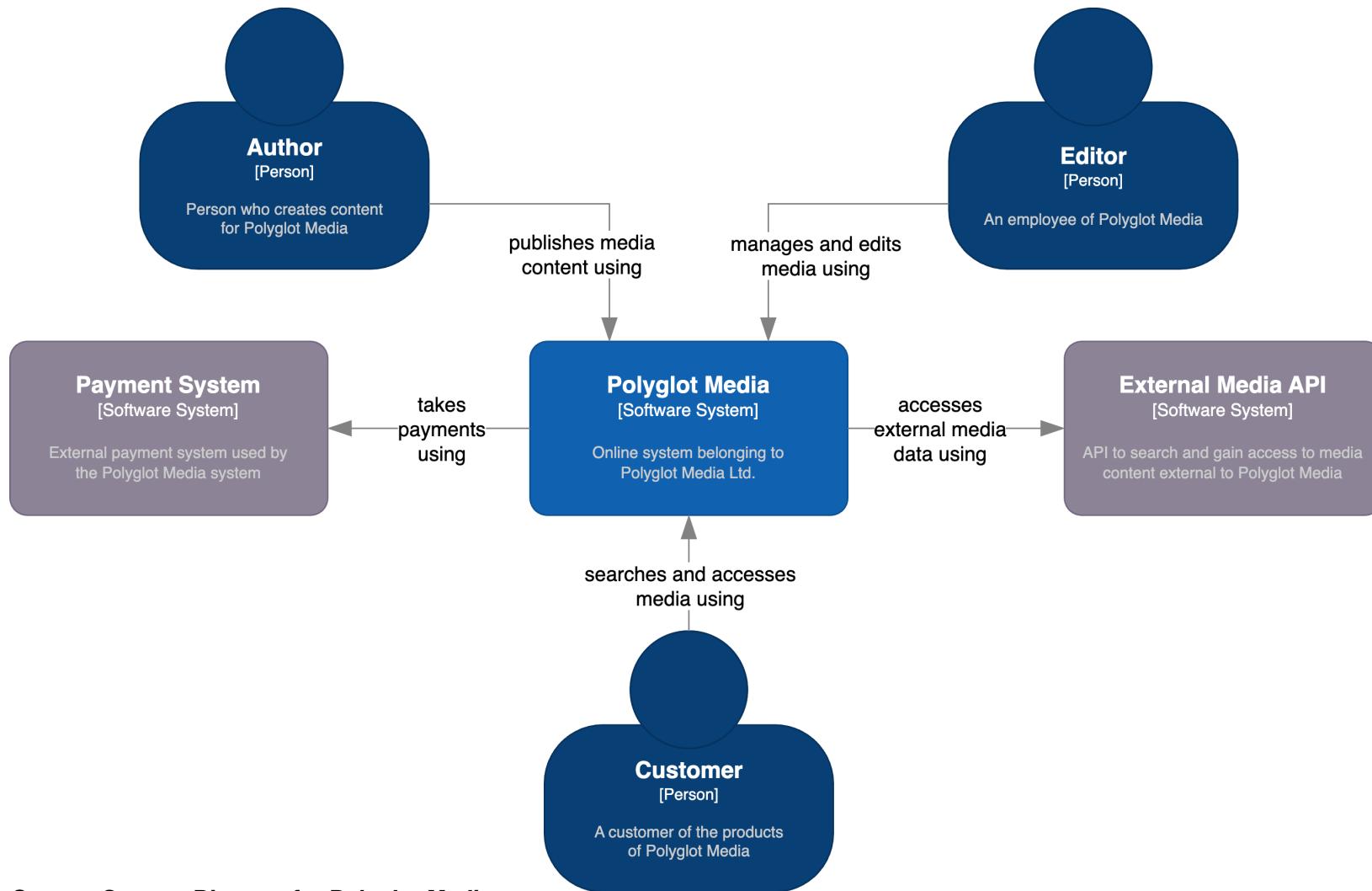
What do you want from them?

Who is this for?



Media
Class Diagram

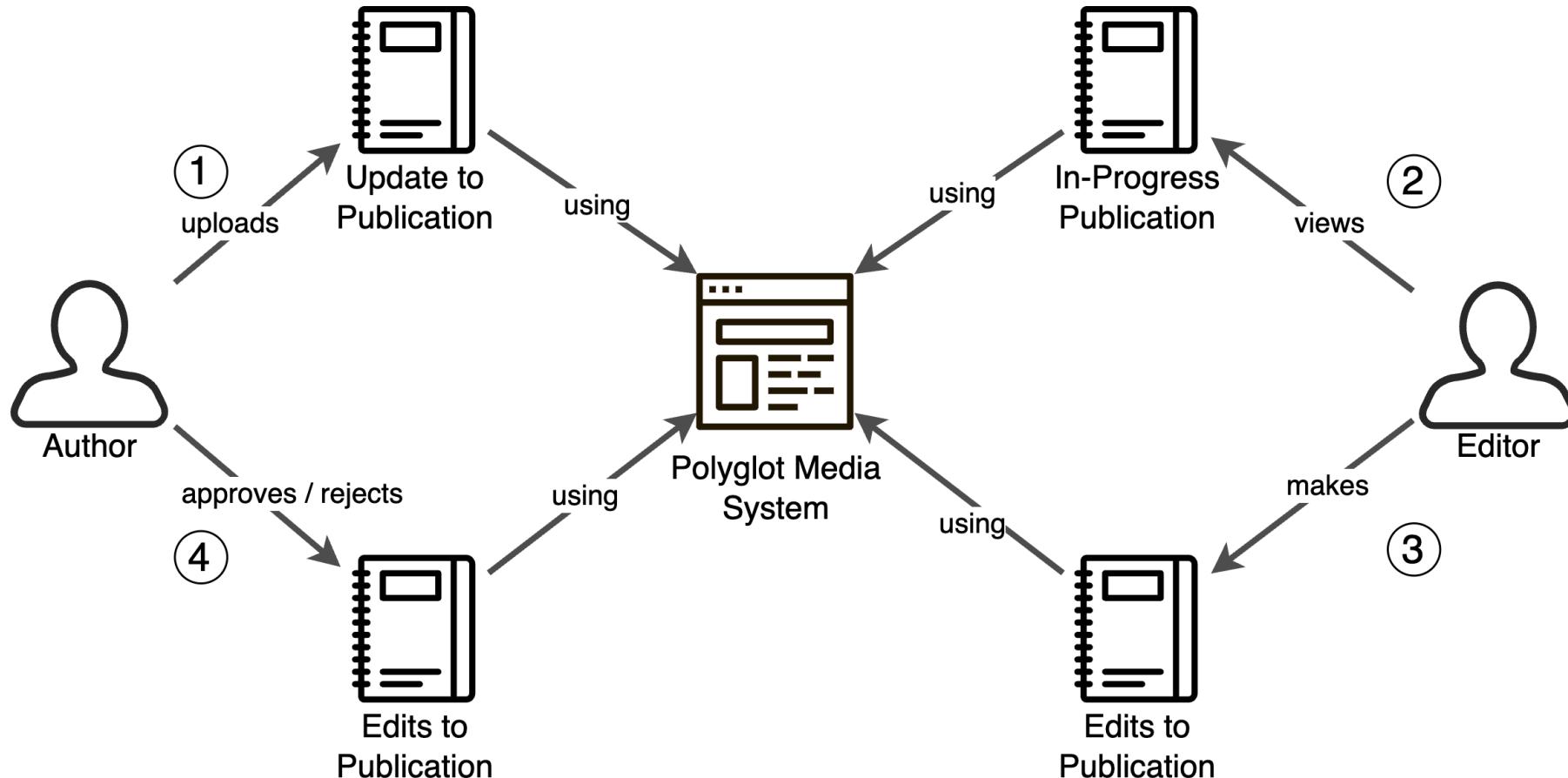
Who is this for?



System Context Diagram for Polyglot Media

Showing the high-level interactions with the Polyglot Media system.

Who is this for?



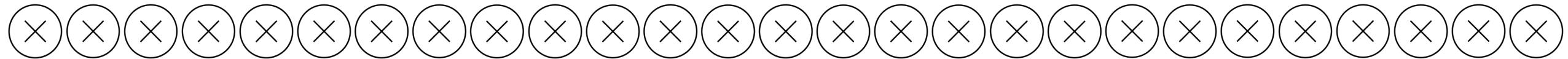
Polyglot Media

High-Level Domain Story I Publication editing process

Antipattern

Multi-Storey Diagram

AKA: mixing levels of abstraction



A 'Sin' in Coding

Presentation

Business

Persistence

Database

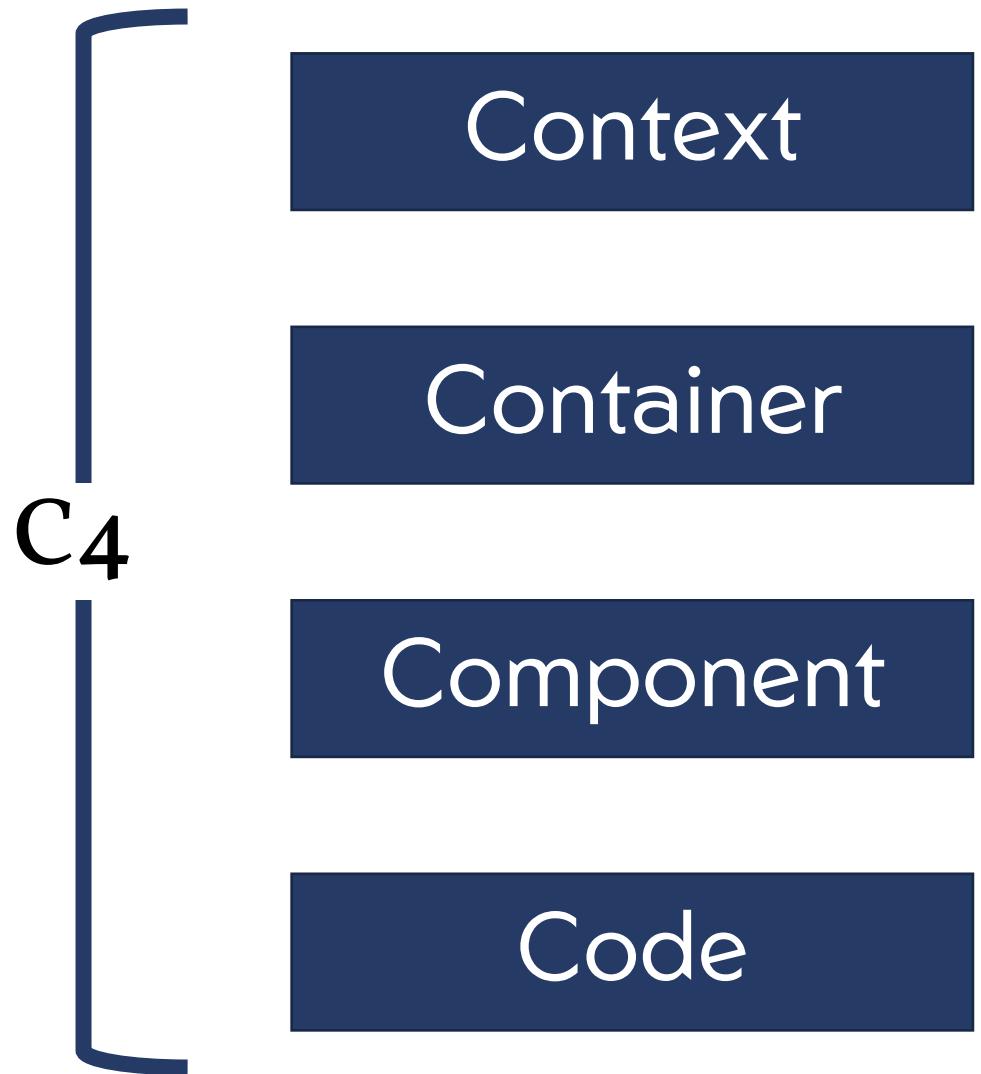
Presentation

Application

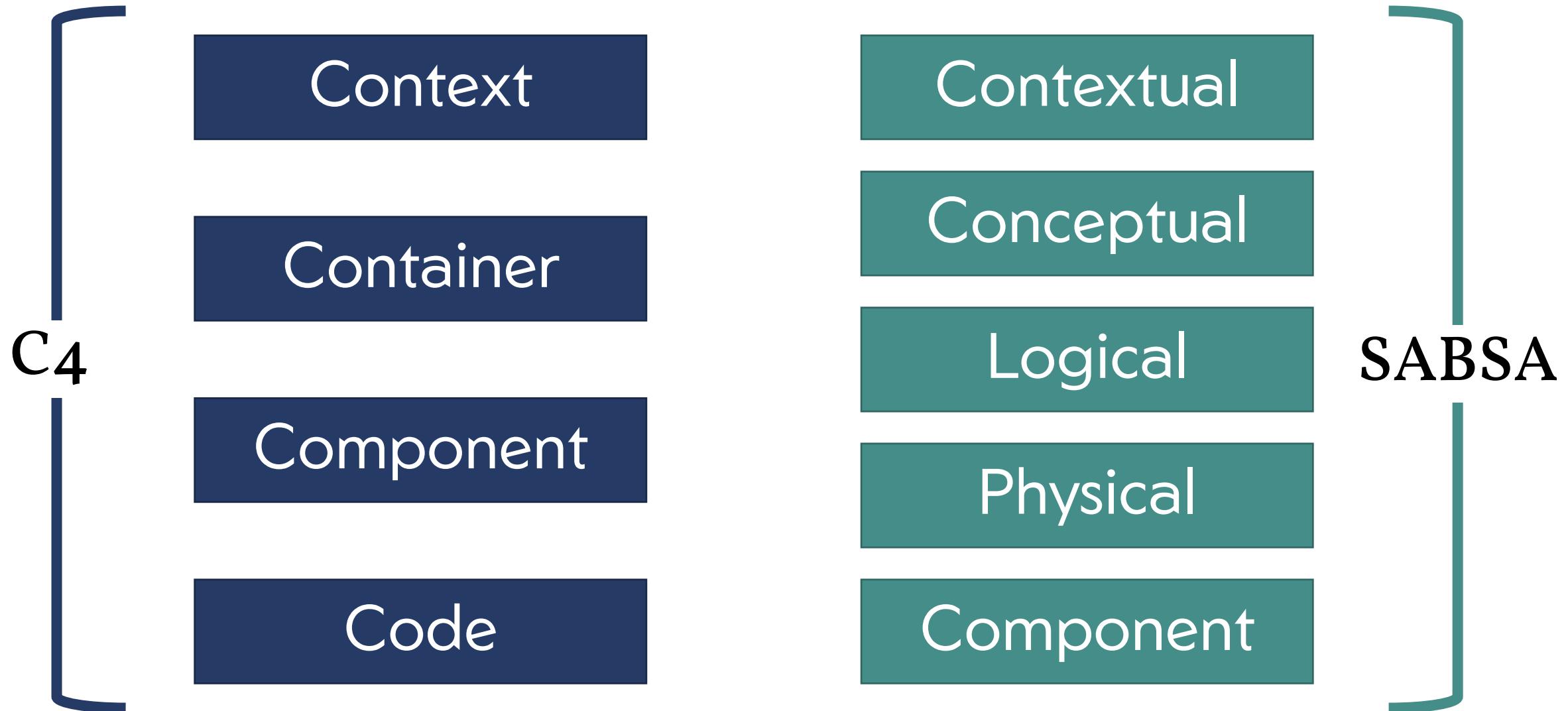
Domain

Infrastructure

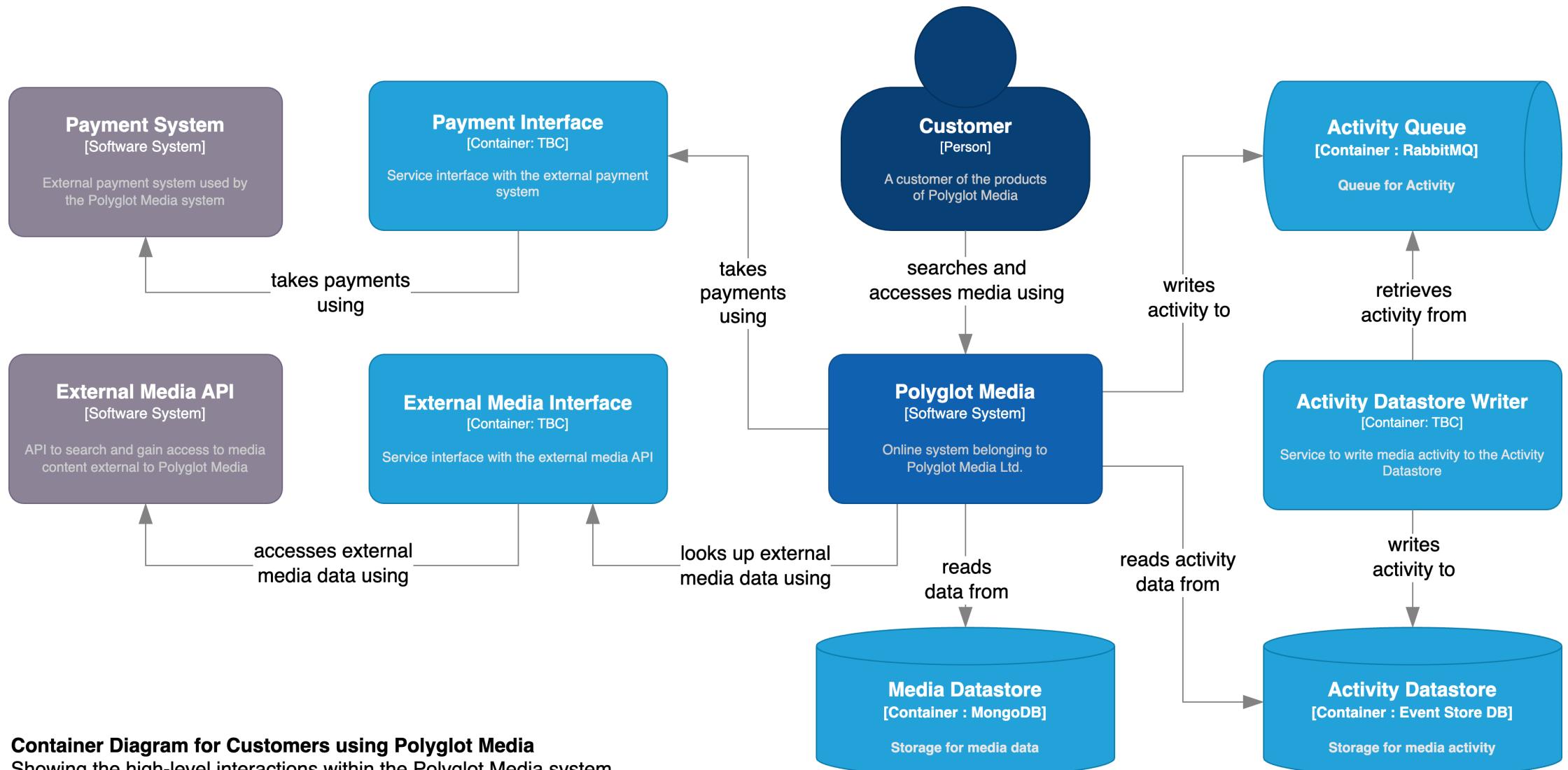
Levels of Abstraction in Architecture



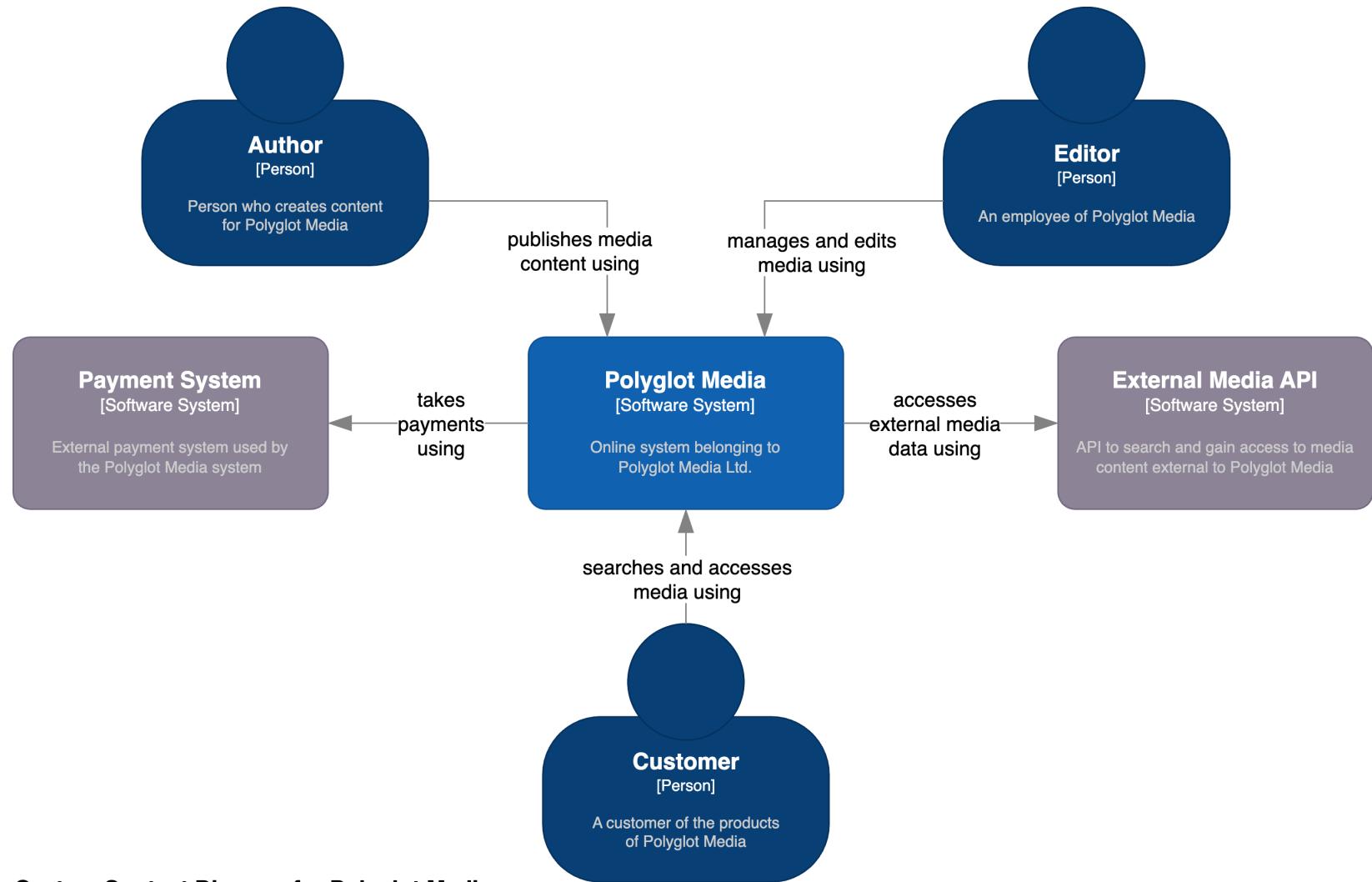
Levels of Abstraction in Architecture



What's wrong here?



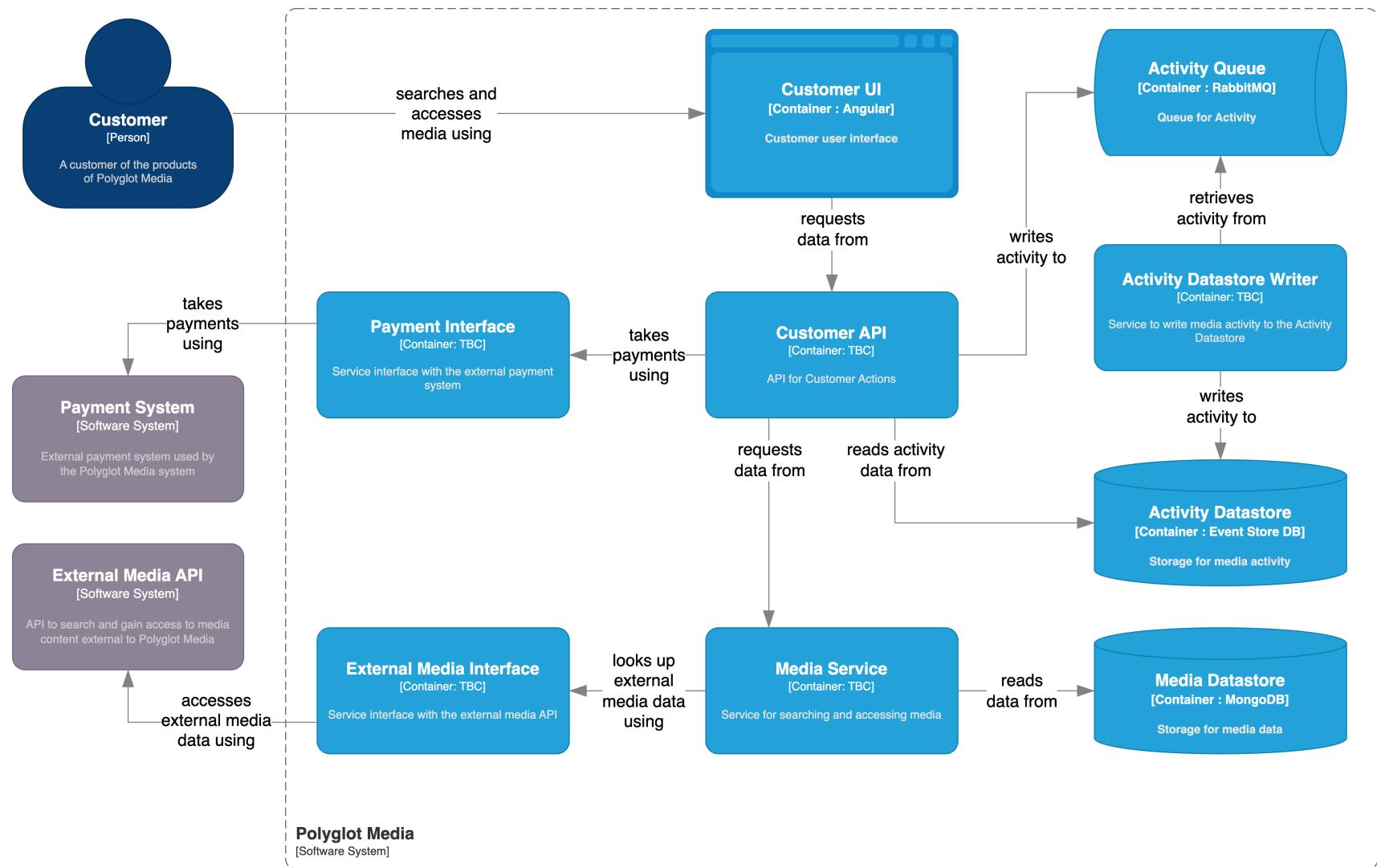
Context Diagram



System Context Diagram for Polyglot Media

Showing the high-level interactions with the Polyglot Media system.

Container Diagram



Container Diagram for Customers using Polyglot Media
Showing the high-level interactions within the Polyglot Media system.

Mixing levels of abstraction
causes confusion

Pattern

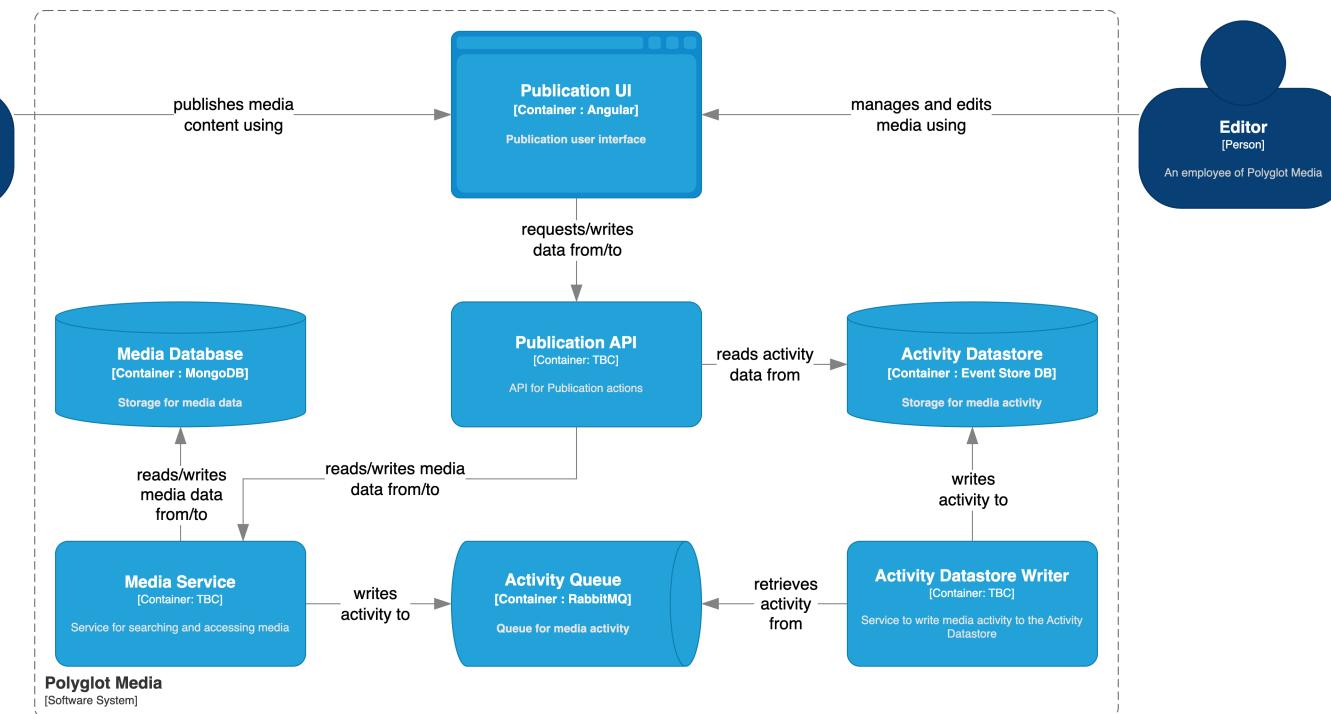
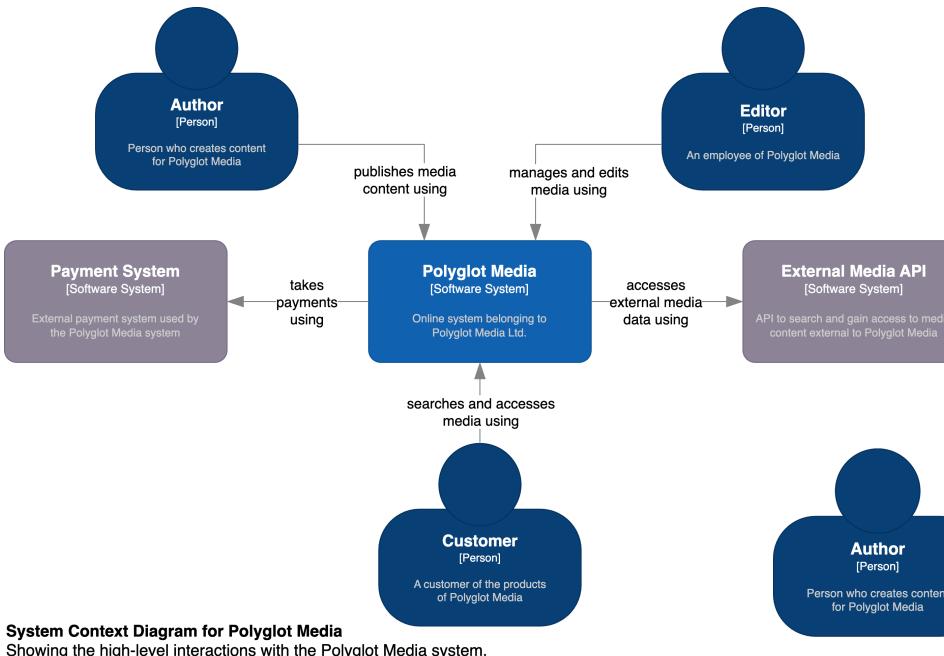
Connect the Dots

AKA: Representational Consistency
– connecting levels of abstraction

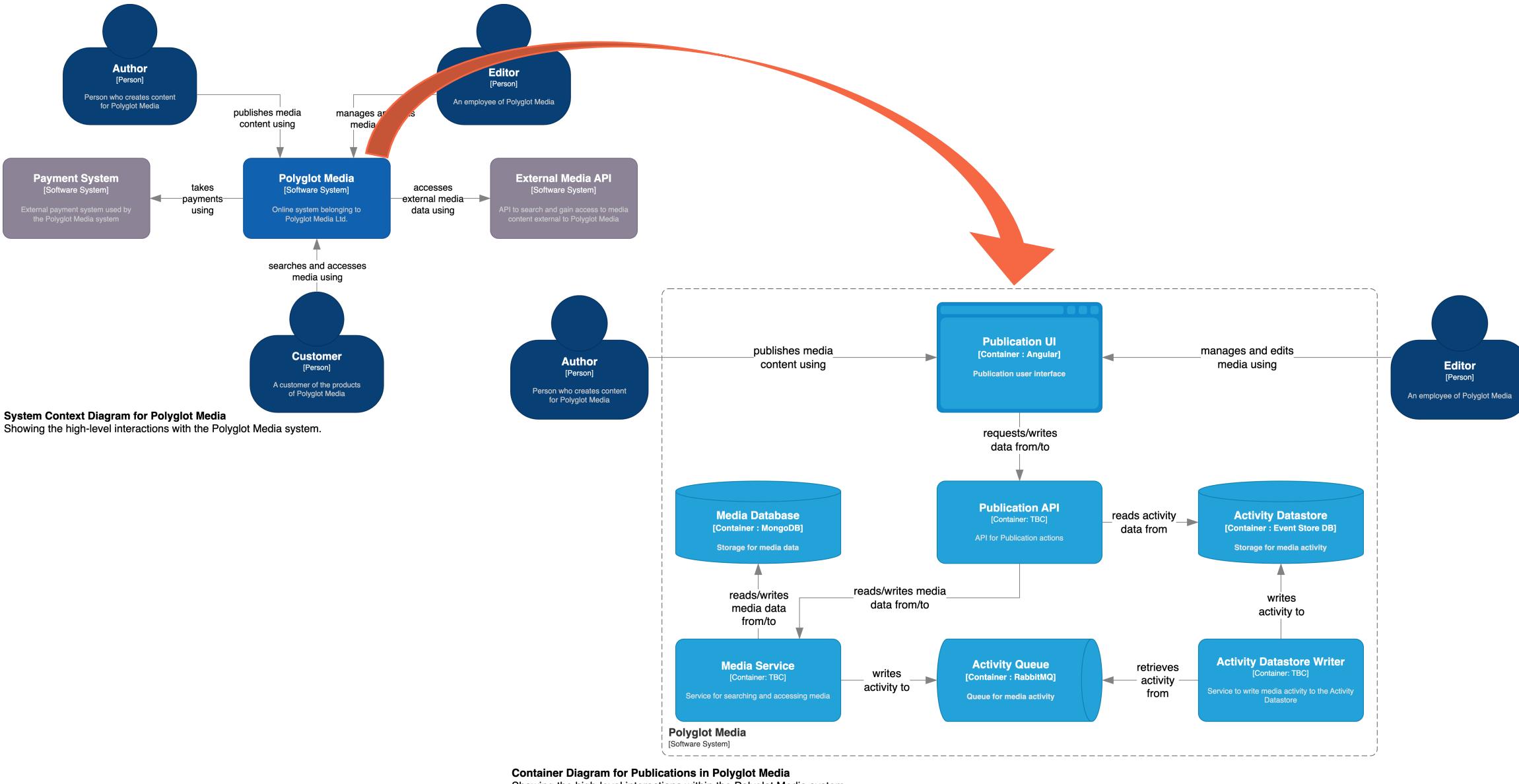


Navigating between levels of abstraction must be easy

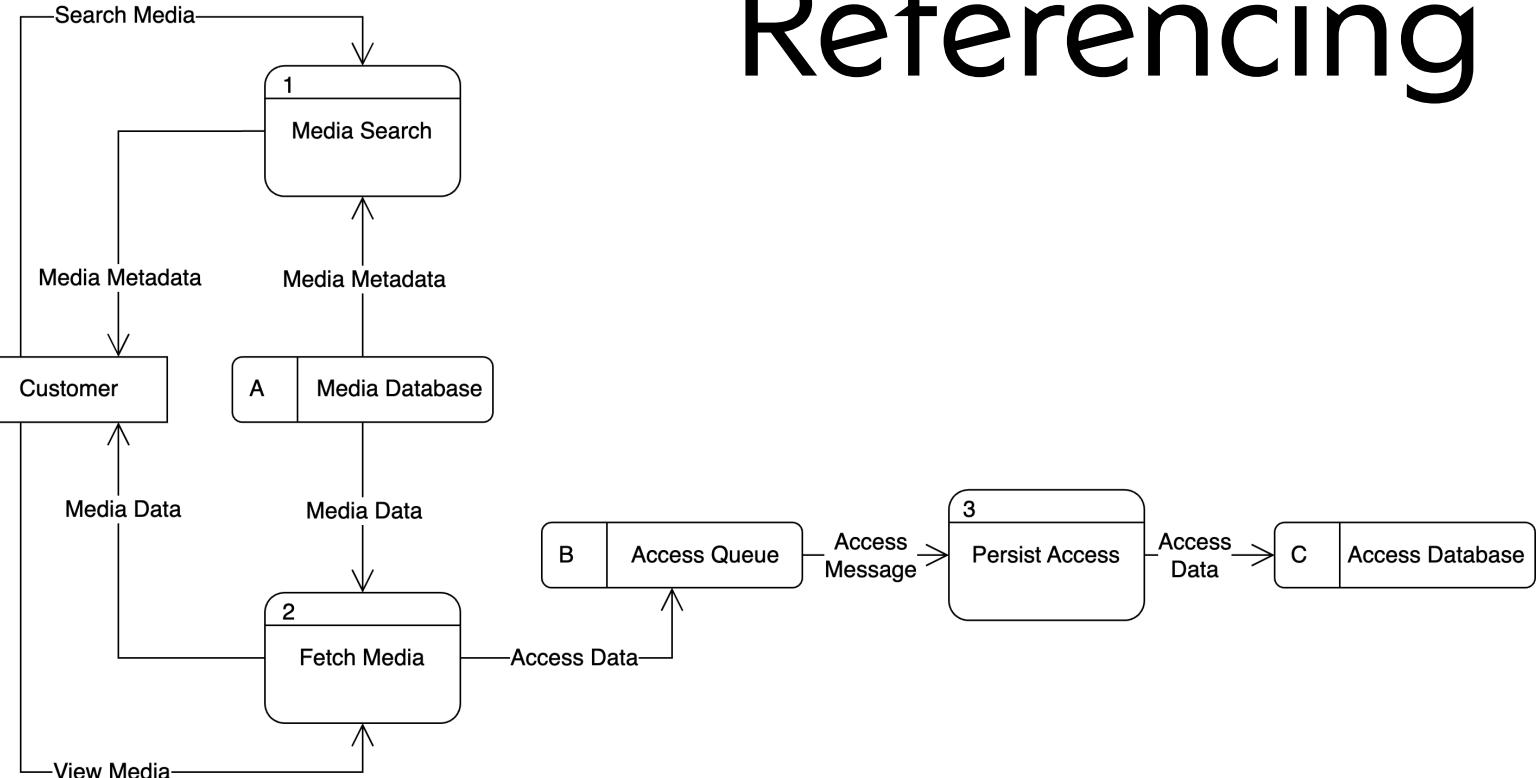
C4 Levels



C4 Levels

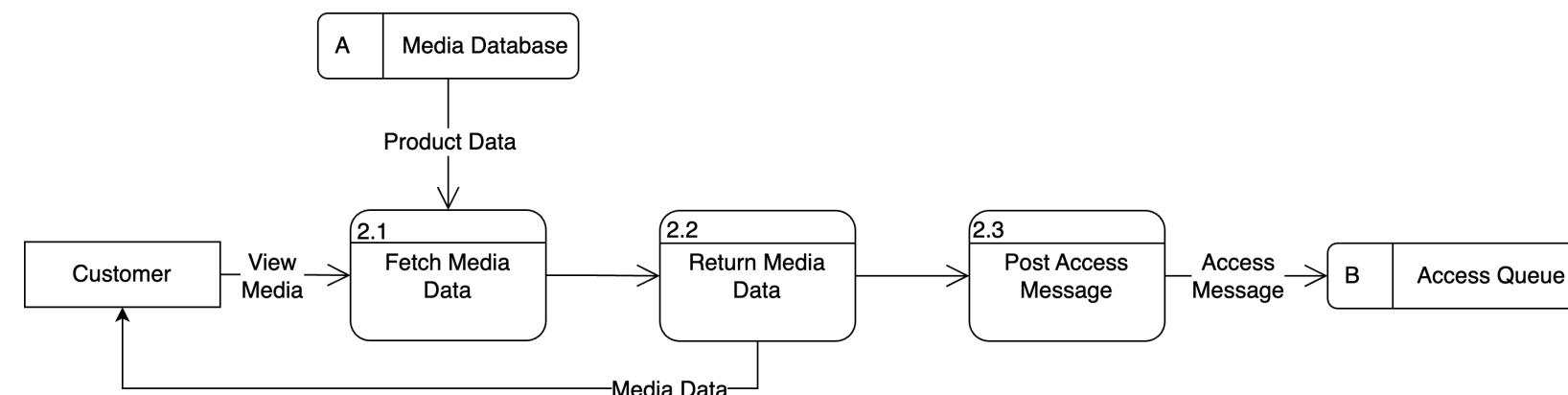


Referencing



Polyglot Media

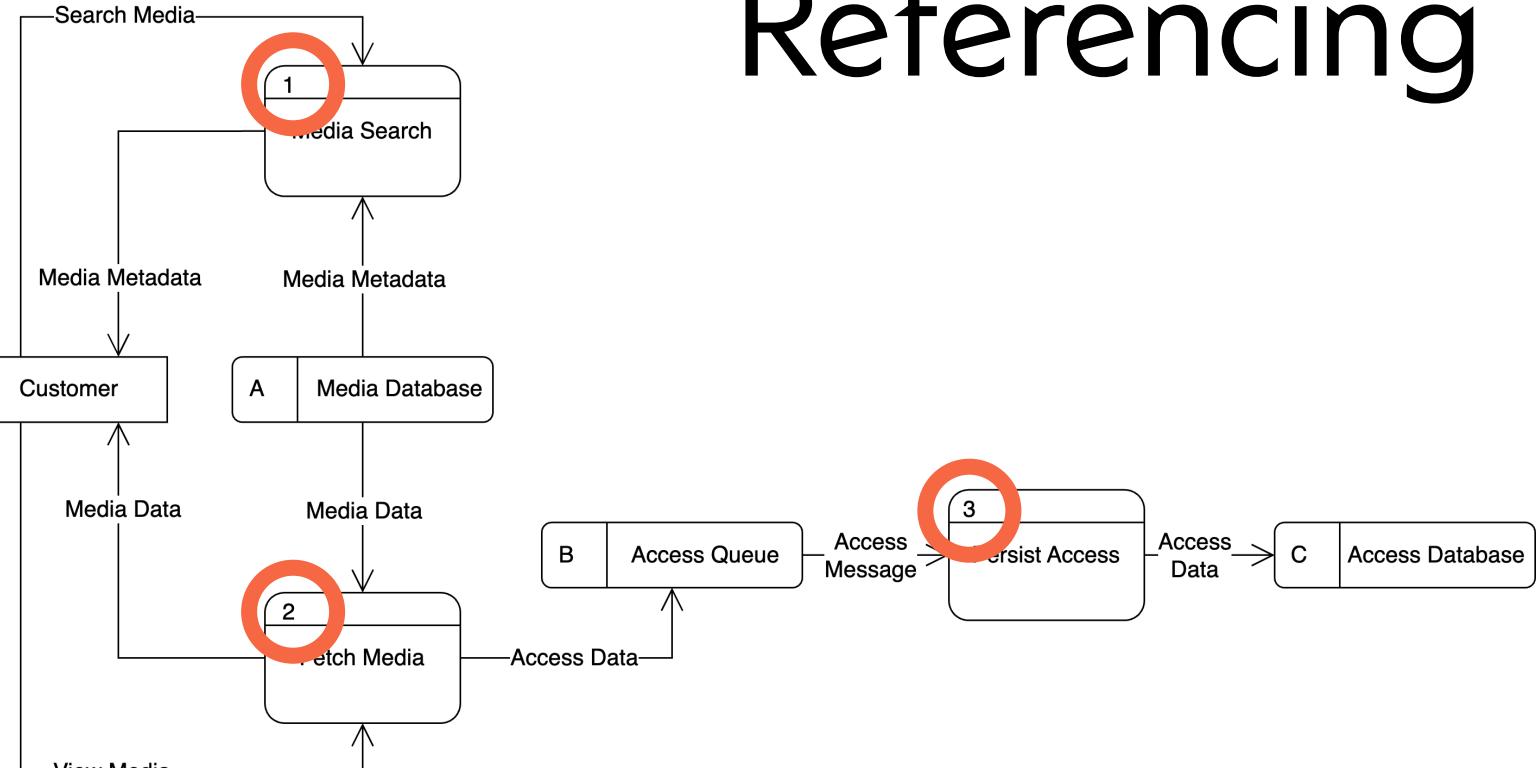
Data Flow Diagram: media search, view and access analytics



Polyglot Media

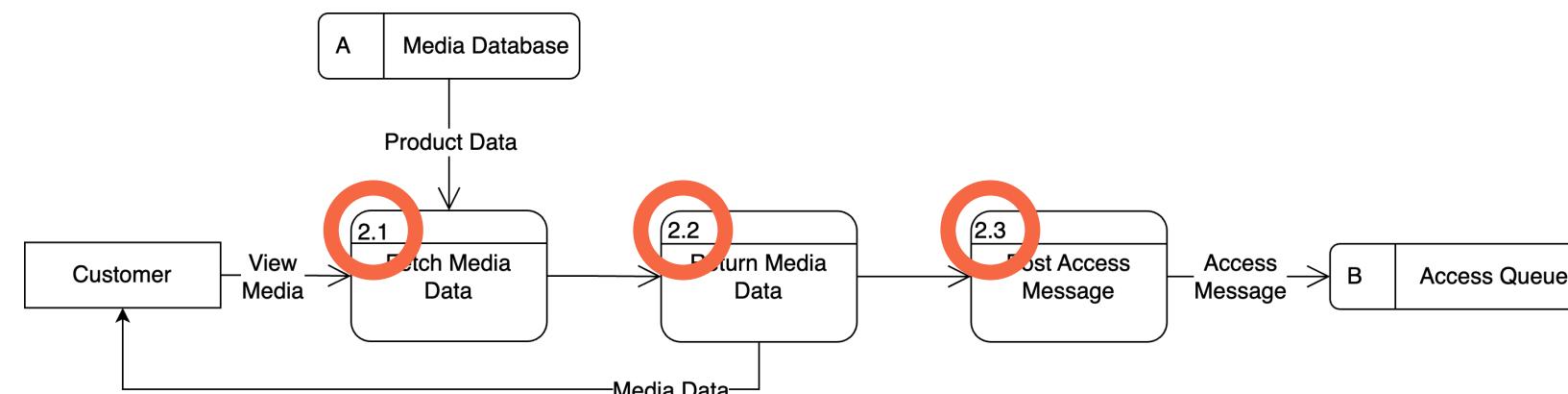
Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

Referencing



Polyglot Media

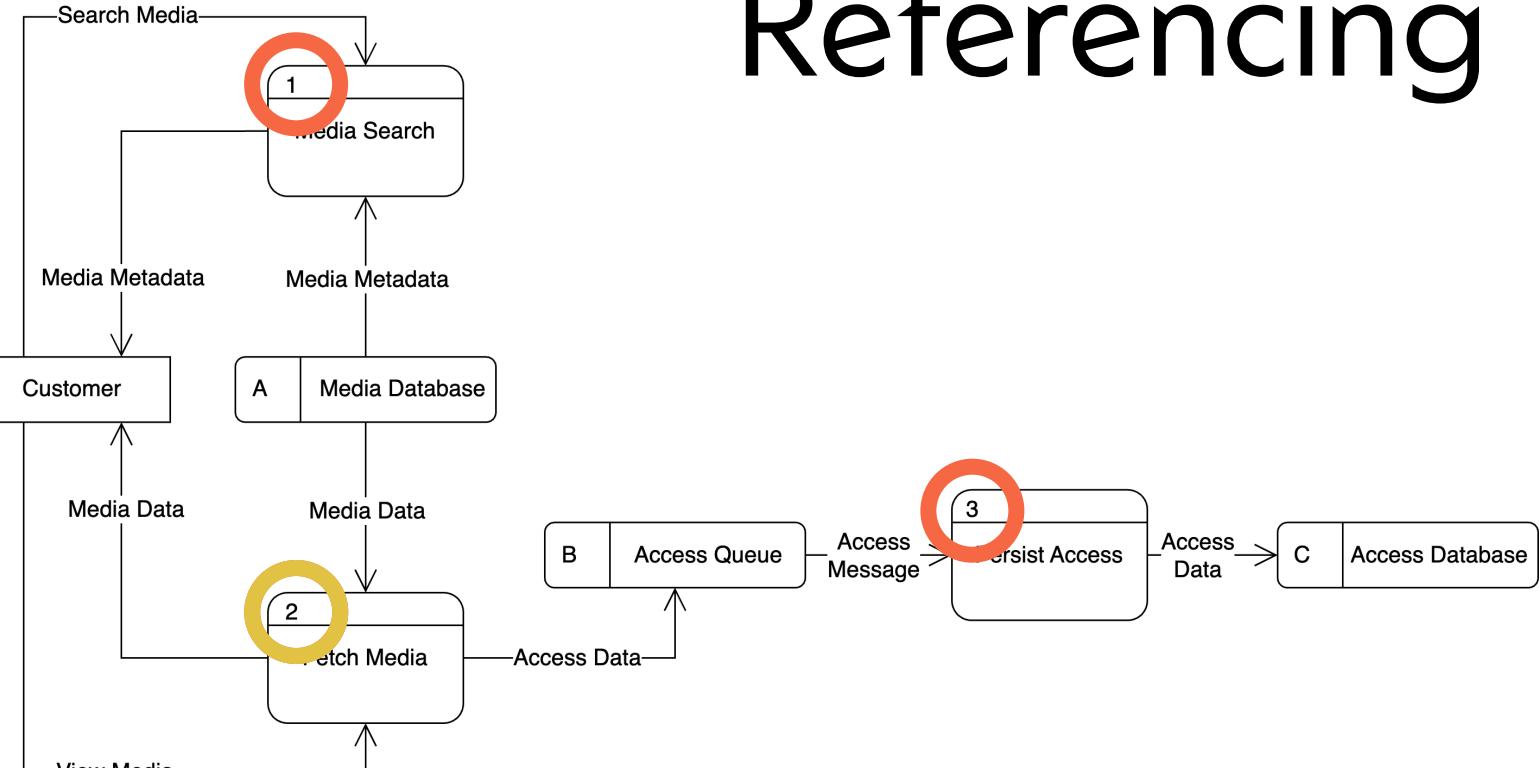
Data Flow Diagram: media search, view and access analytics



Polyglot Media

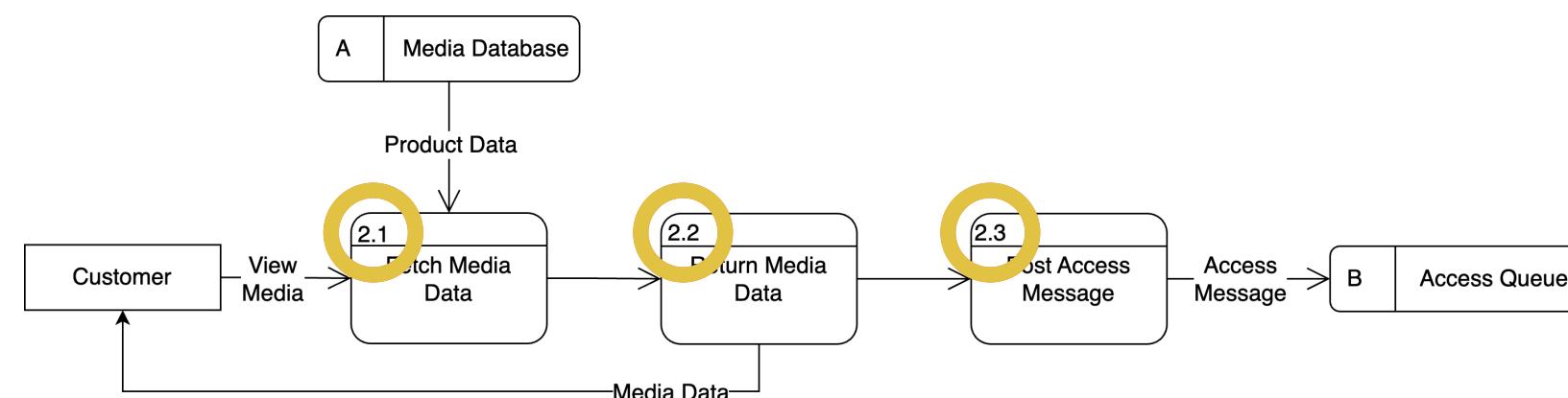
Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

Referencing



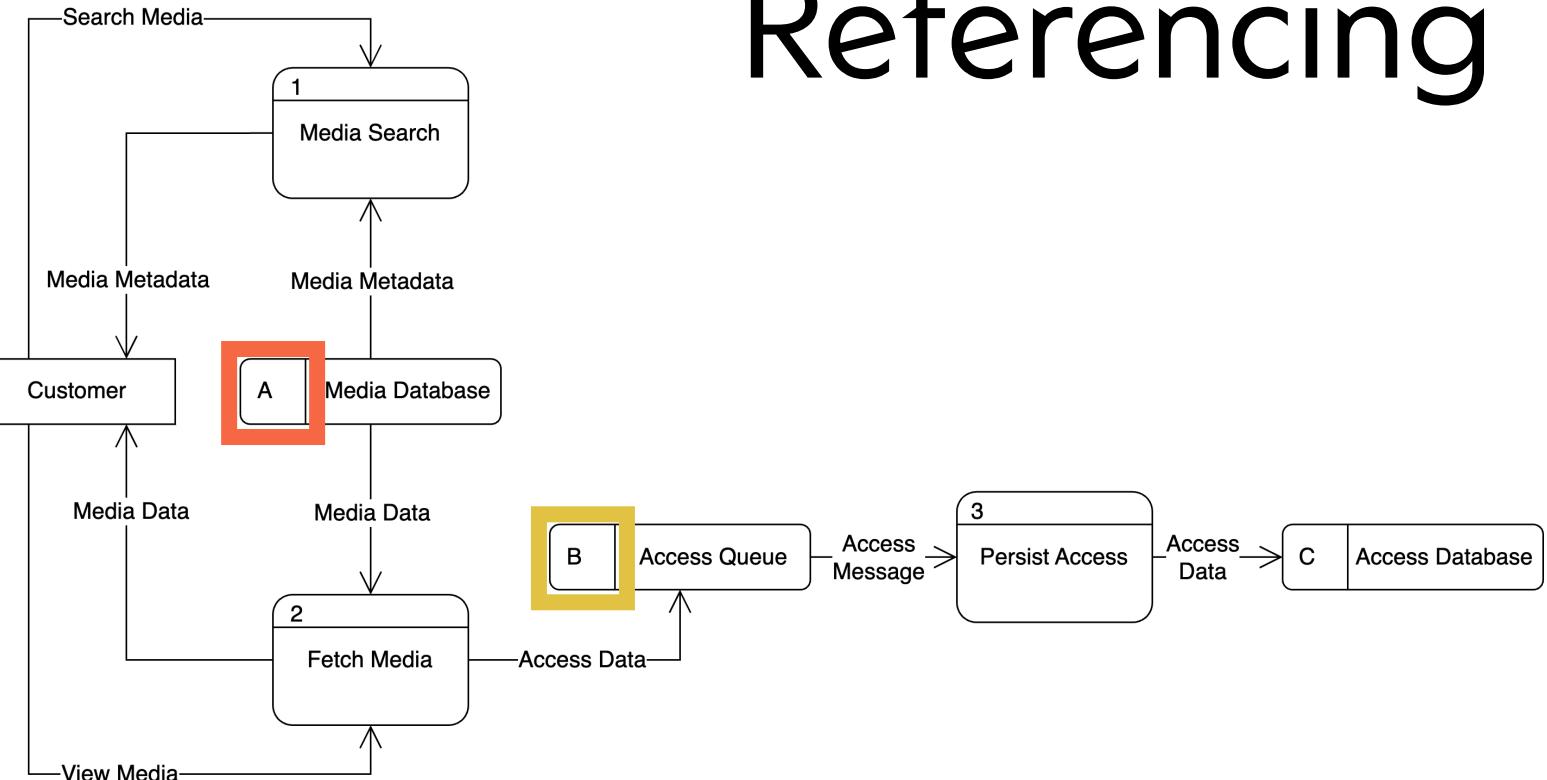
Polyglot Media

Data Flow Diagram: media search, view and access analytics

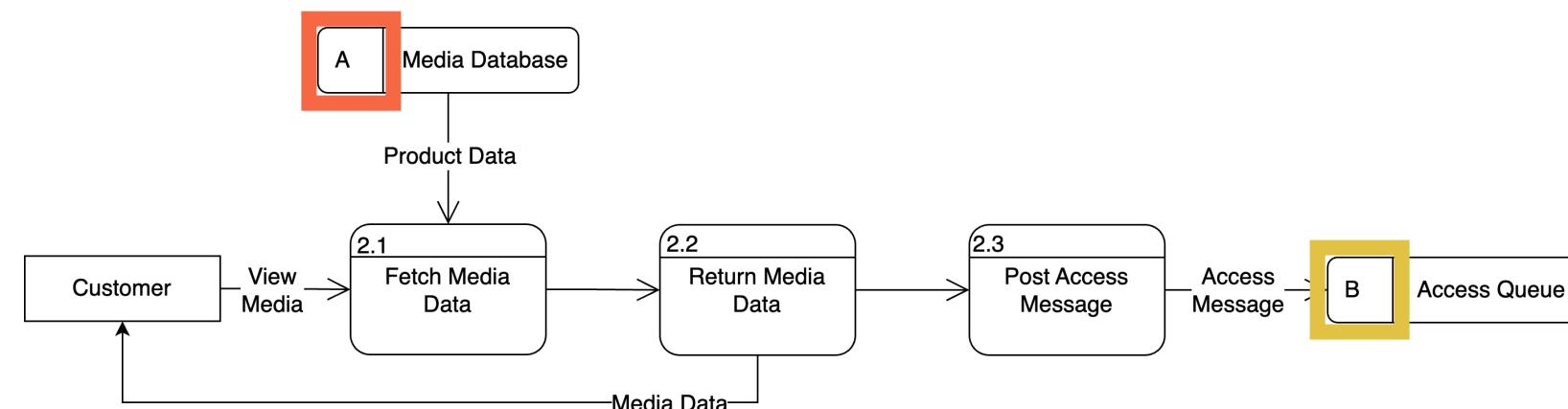


Polyglot Media

Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

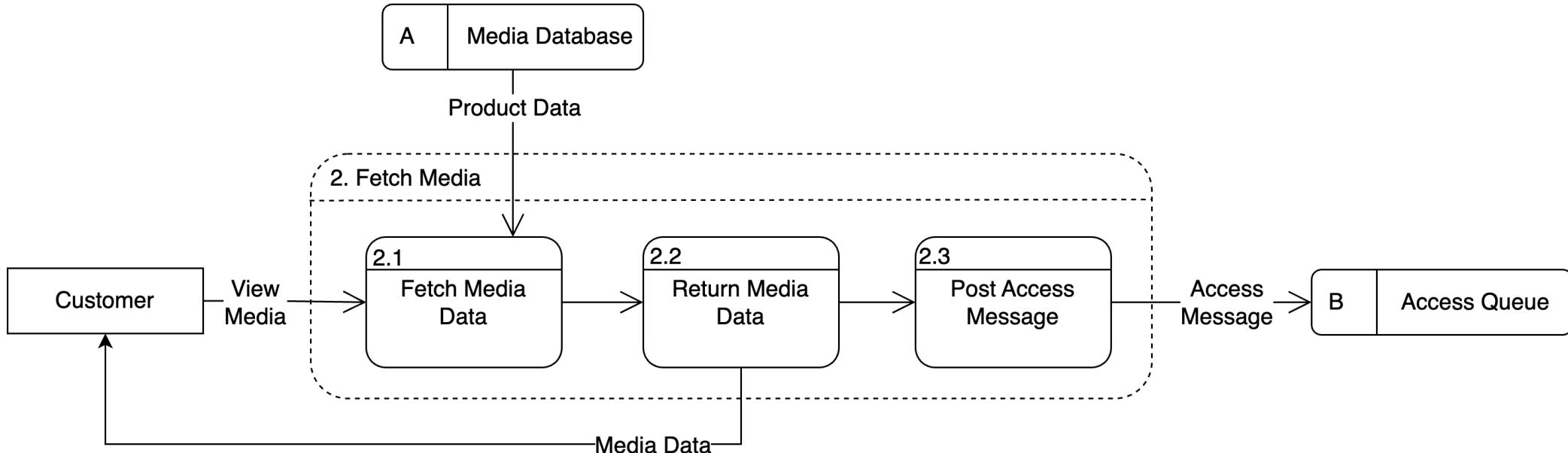
**Polyglot Media**

Data Flow Diagram: media search, view and access analytics

**Polyglot Media**

Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

C4-like Reference



Polyglot Media

Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

Make explicit references to
other levels of abstraction

Clarify the Clutter

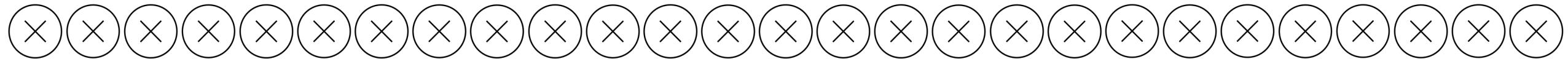
use less to say more

Antipattern

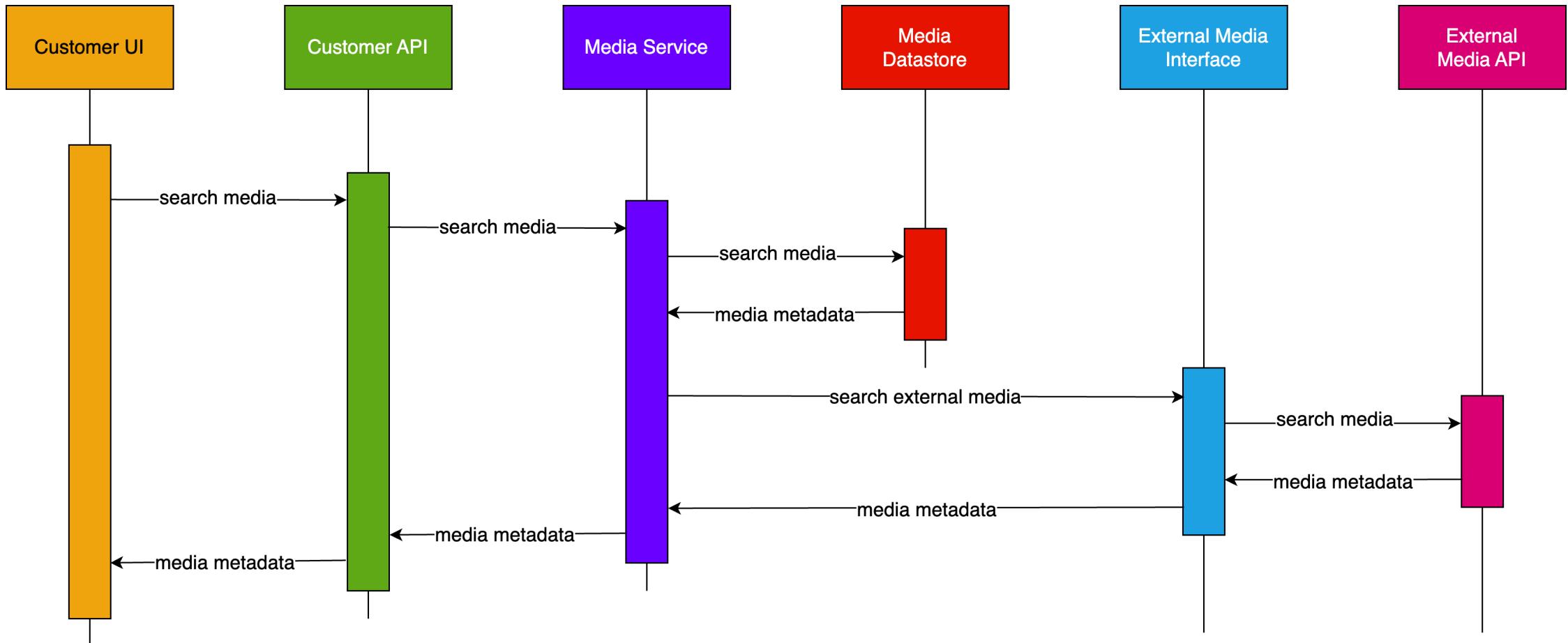
Explosion of Unicorns



AKA: Too many colours

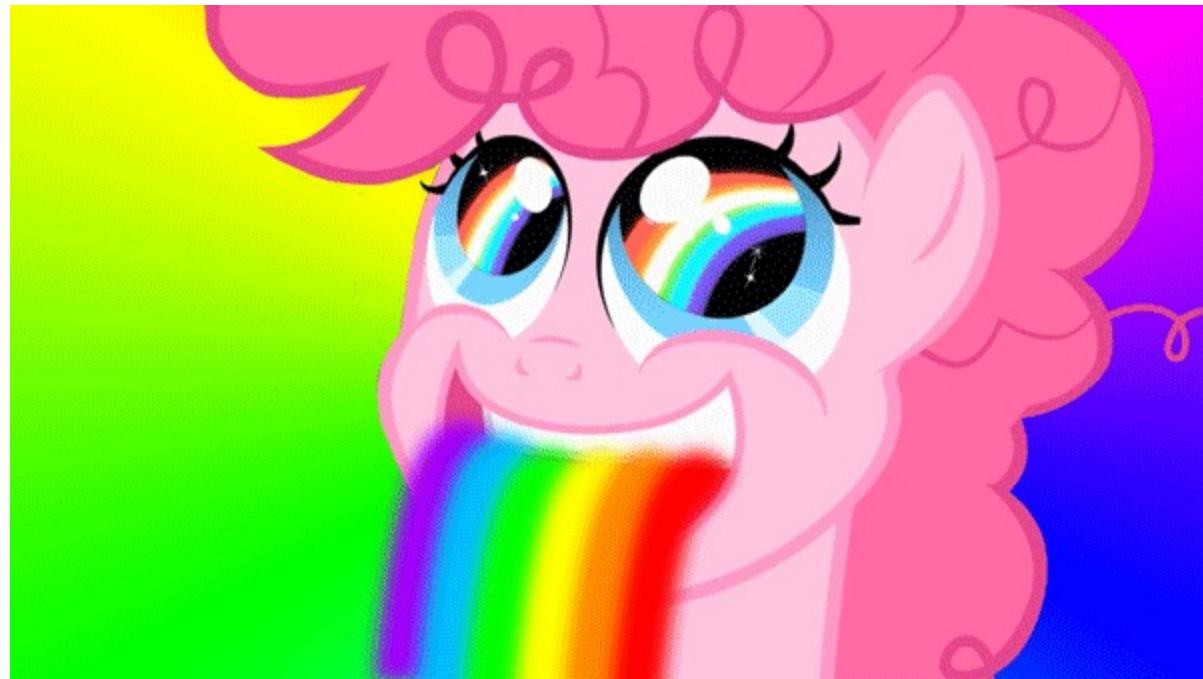


Rainbow Flow



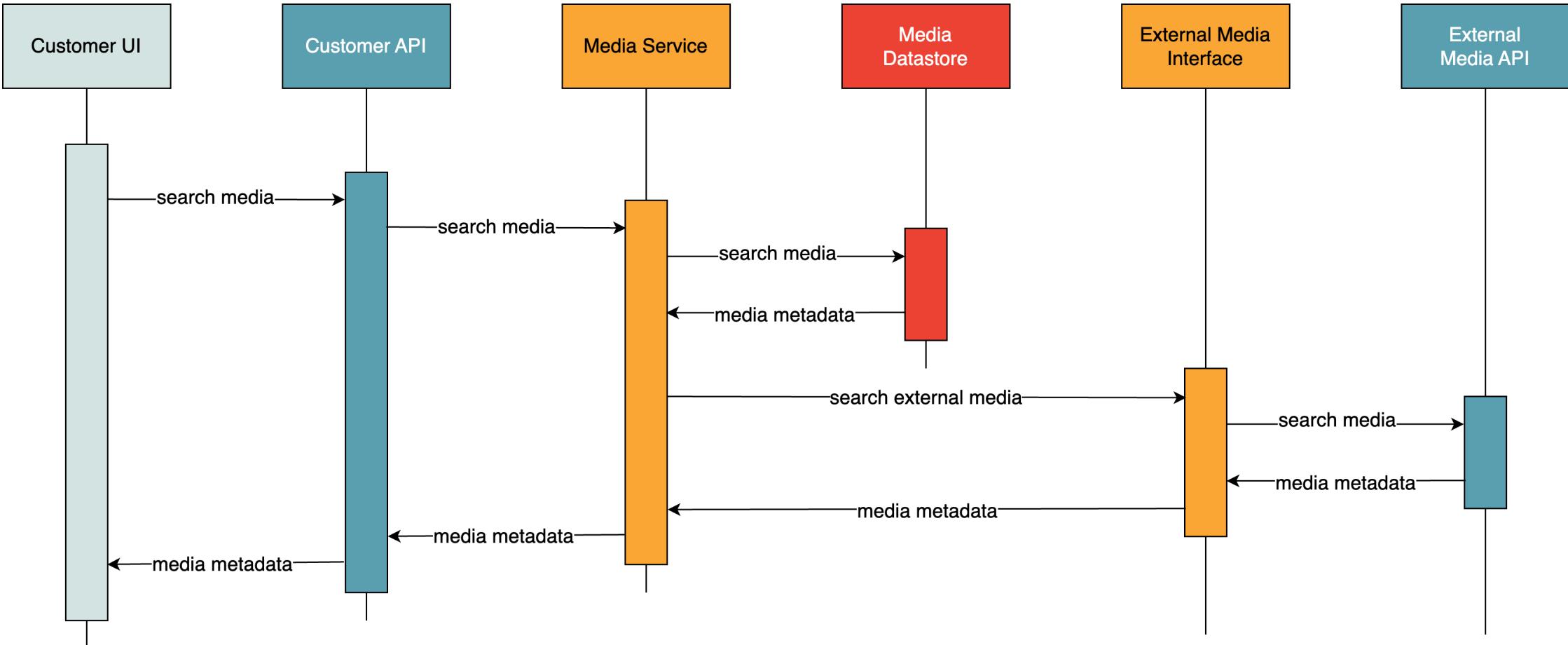
Polyglot Media

Media search process, internal and external media



<https://tenor.com/view/rainbow-unicorn-rainbow-unicorn-gif-12940218>

Group by type or function



Polyglot Media

Media search process, internal and external media

Key: User Interface Application Programming Interface Service/Interface Datastore

Minimise your colour palette

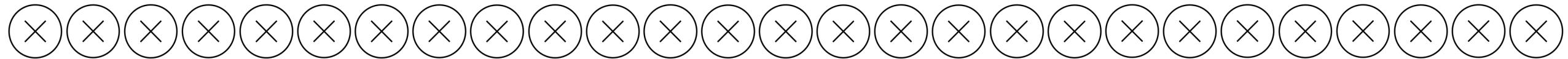
Use colour to aid
communication

Antipattern

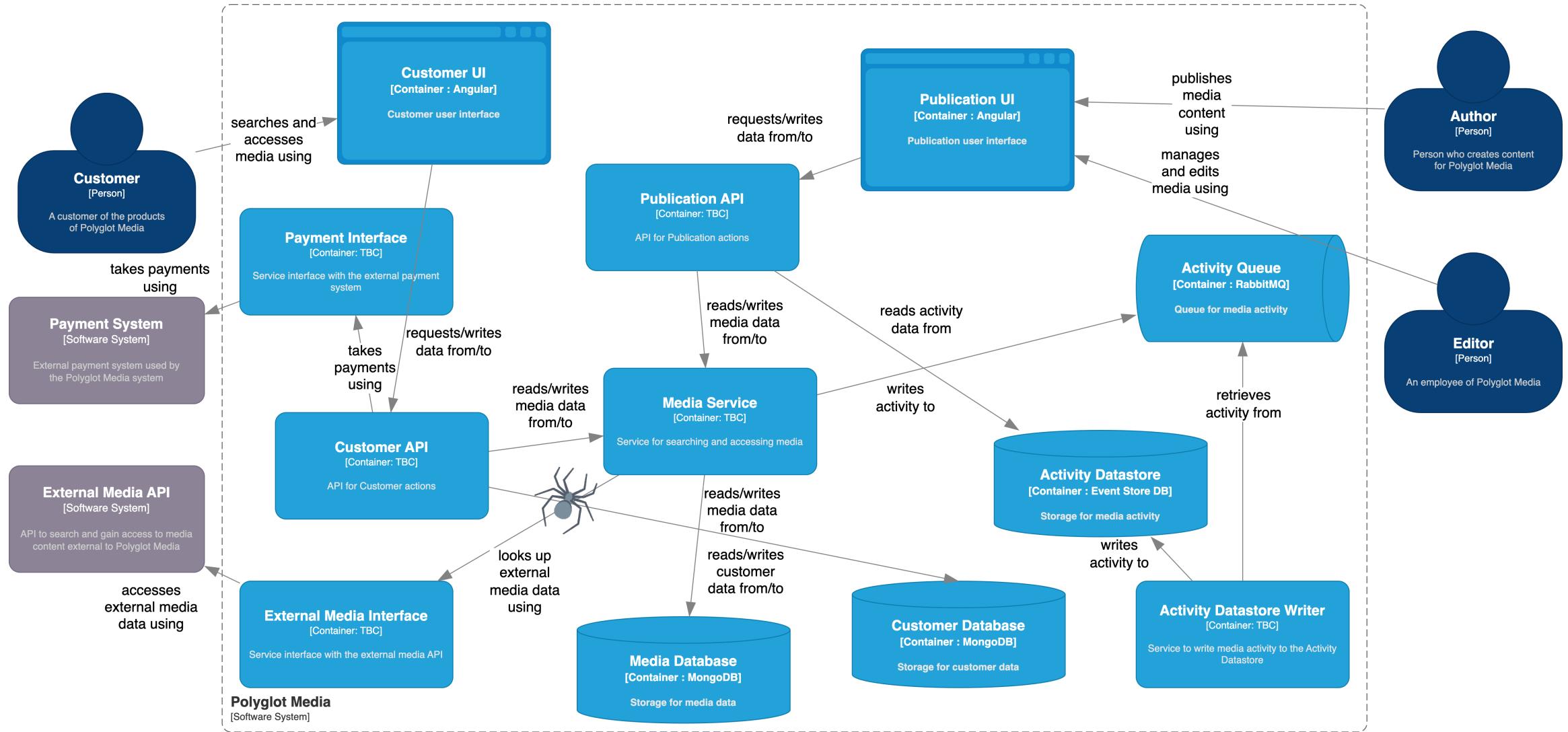
Spider's Web



AKA: unclear relationships



Welcome little fly...



Container Diagram for Polyglot Media

Showing the high-level interactions within the Polyglot Media system.

Do

Remove unnecessary
information

Do

Remove unnecessary
information

Split up diagrams when
necessary

Do

Remove unnecessary
information

Split up diagrams when
necessary

**Minimise lines crossing &
use obvious line jumps**

Do

Remove unnecessary
information

Split up diagrams when
necessary

Minimise lines crossing &
use obvious line jumps

**Standardise the position of
the relationship label**

Do

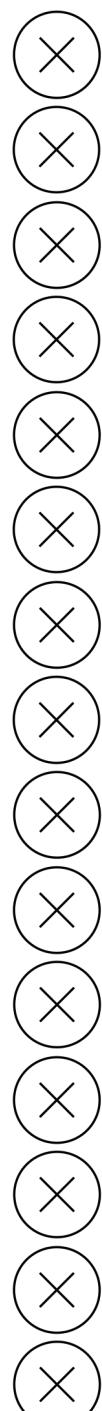
Remove unnecessary
information

Split up diagrams when
necessary

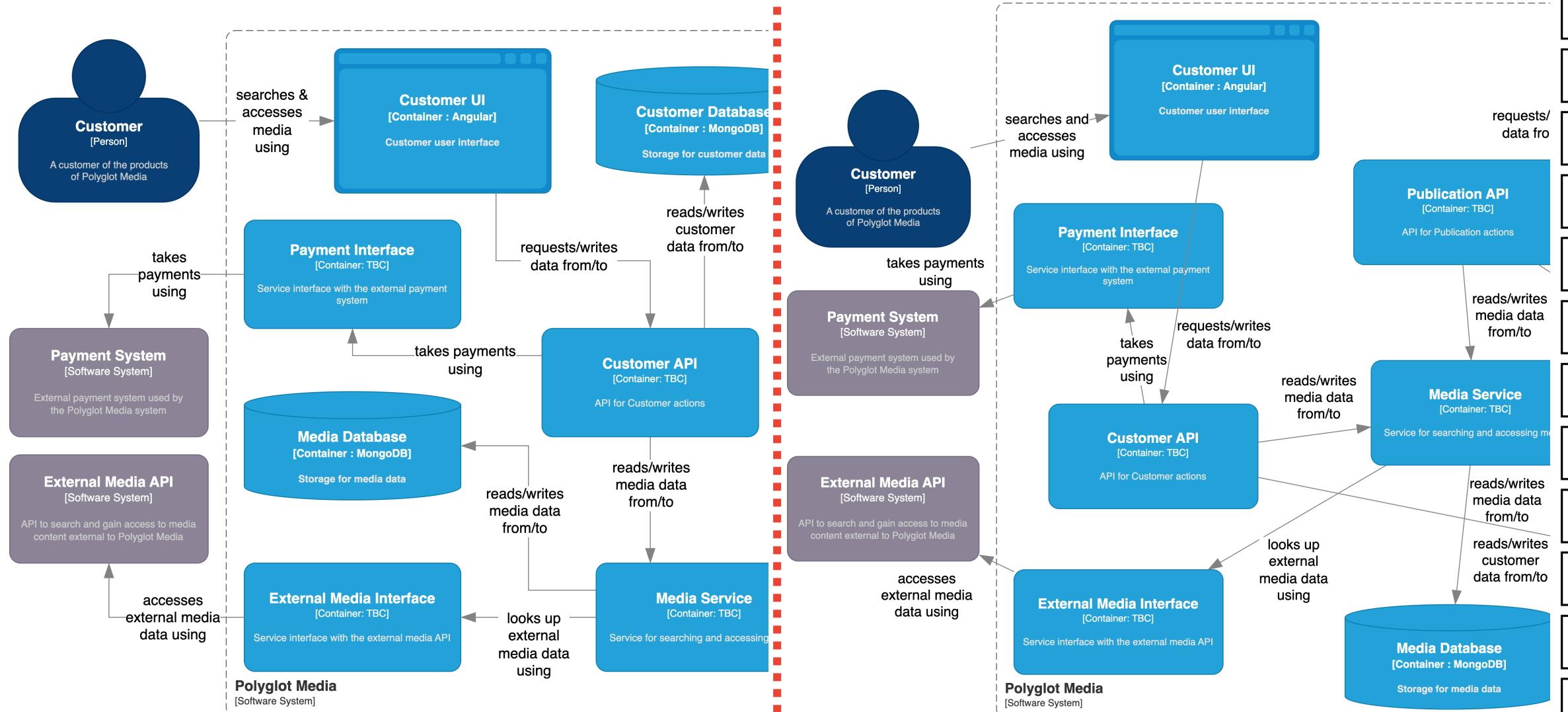
Minimise lines crossing &
use obvious line jumps

Standardise the position of
the relationship label

Use angled lines to make
relationships clearer



Untangled vs. Tangled

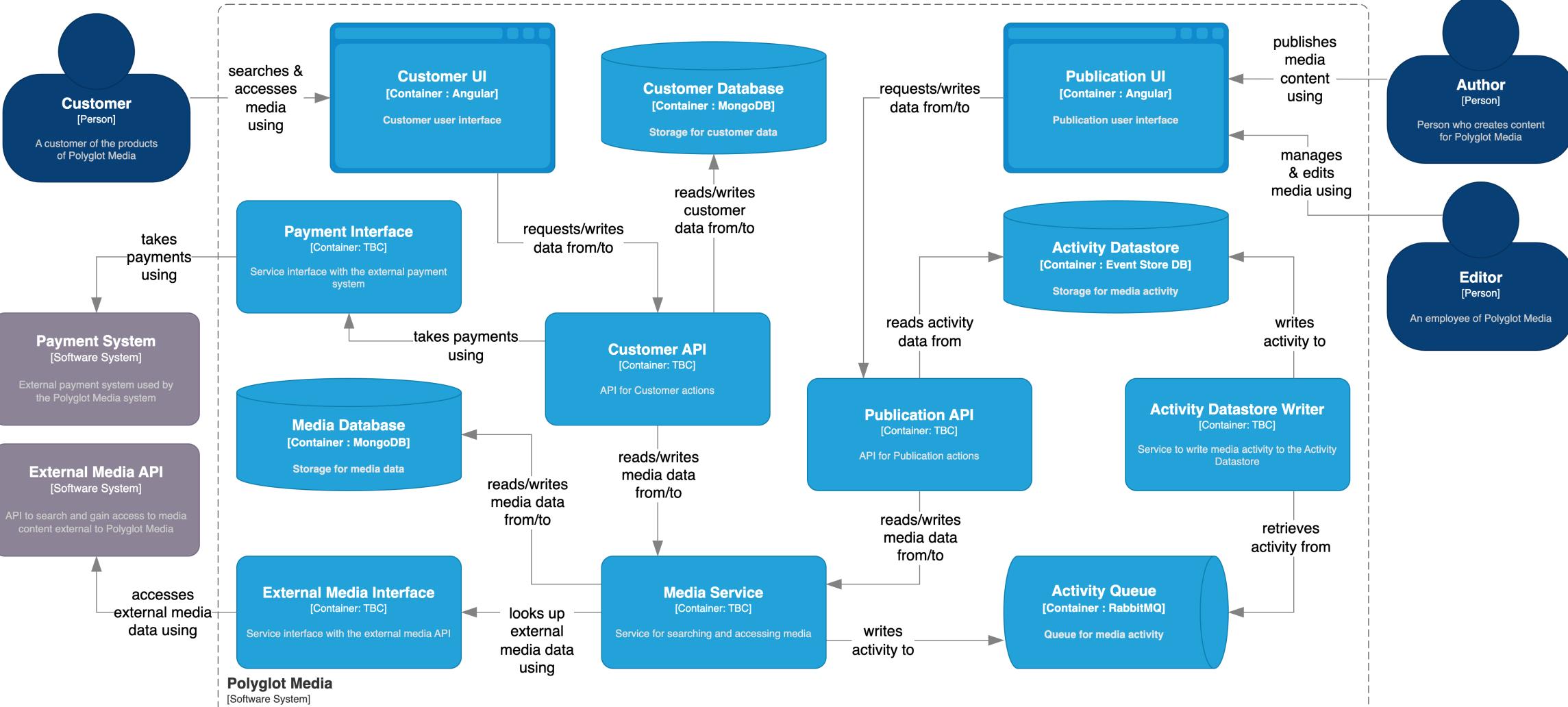


Container Diagram for Polyglot Media
Showing the high-level interactions within the Polyglot Media system.

Container Diagram for Polyglot Media
Showing the high-level interactions within the Polyglot Media system.



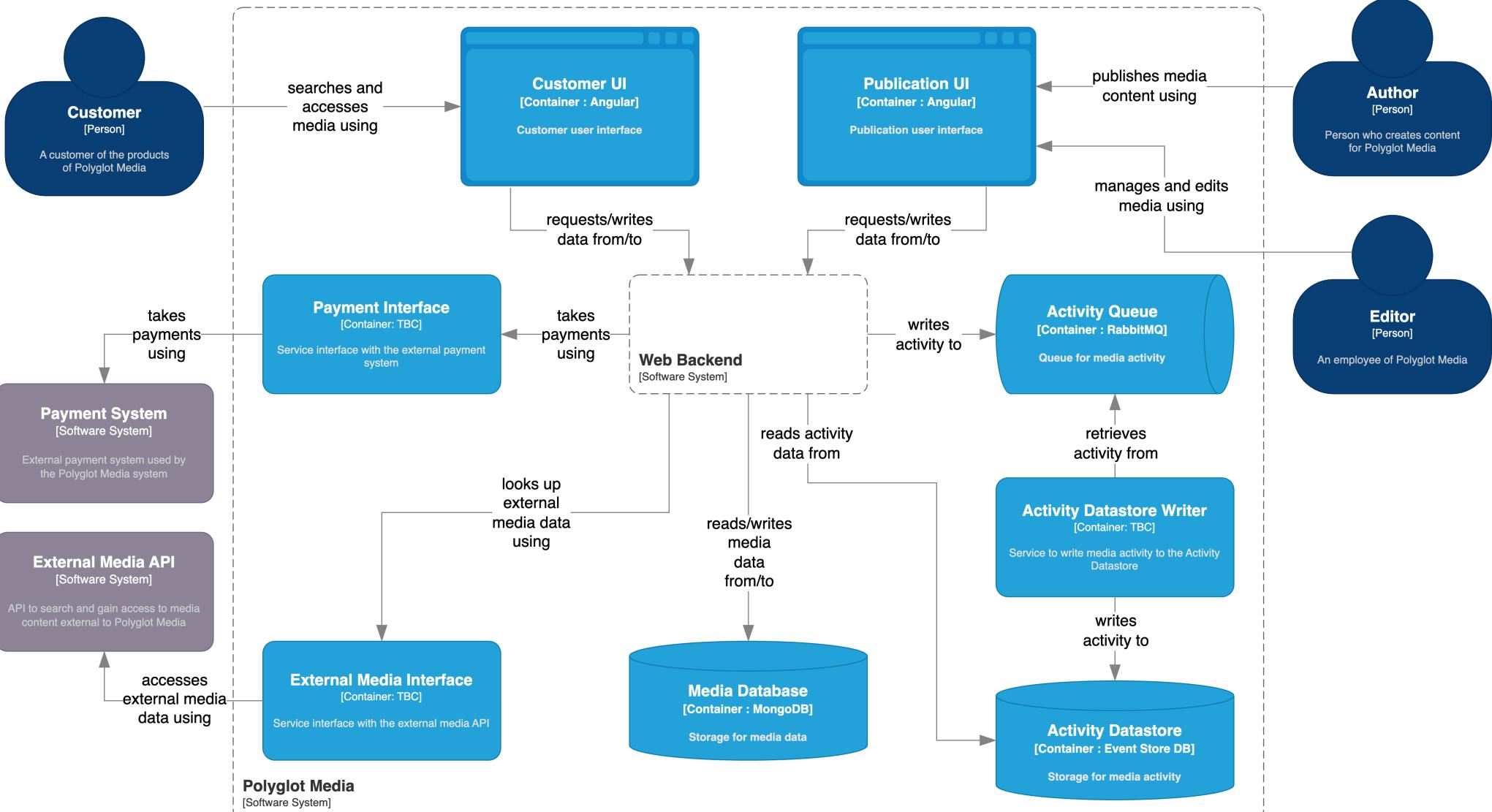
Untangled



Container Diagram for Polyglot Media

Showing the high-level interactions within the Polyglot Media system.

Reduced



Container Diagram for Media in Polyglot Media
Showing the high-level Media interactions within the Polyglot Media system.

Diagrams are free

Pattern

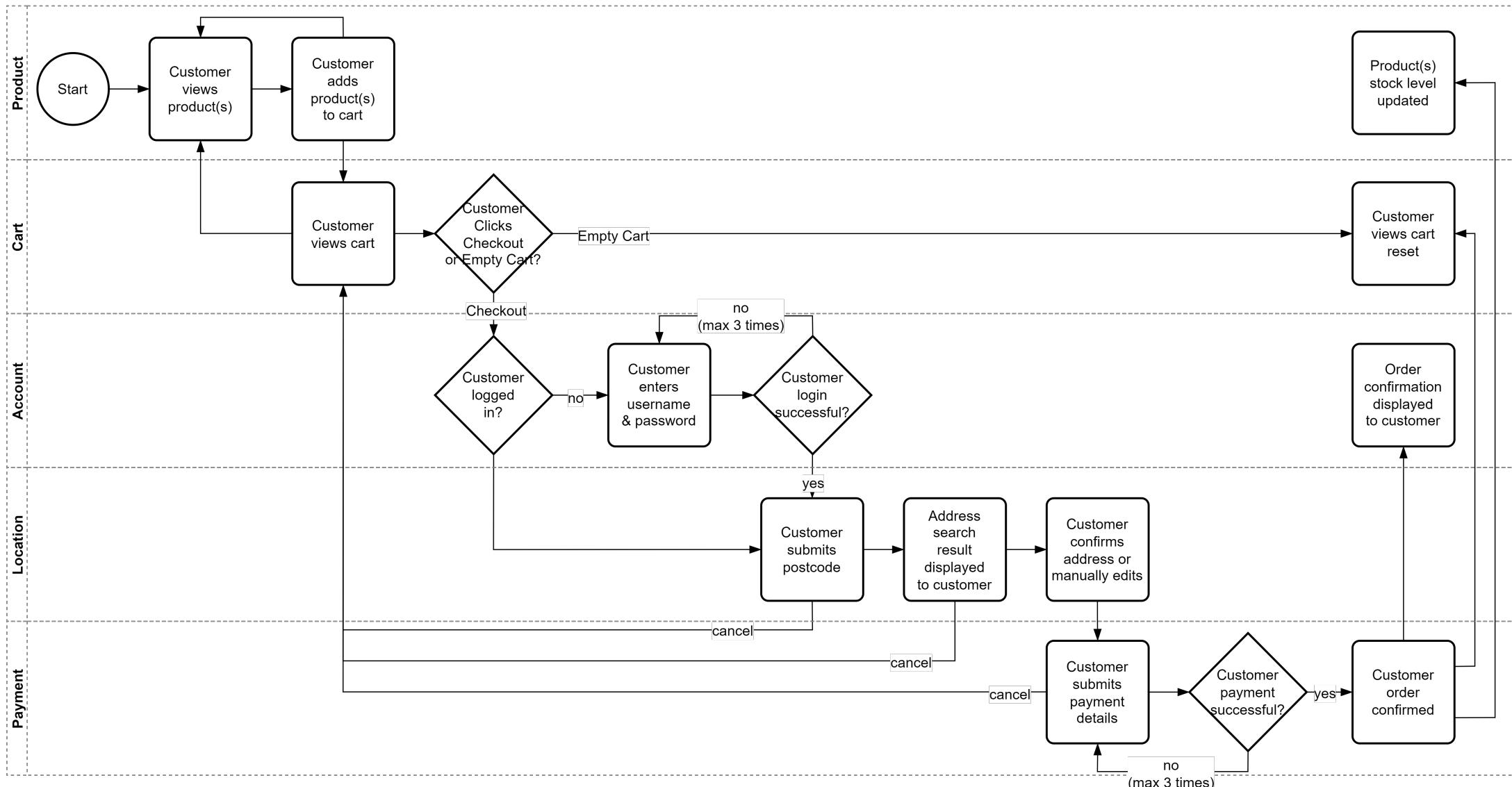
Notes on a Theme



AKA: remove excess text from the main diagram



Too much text



Do

**Remove unnecessary text
completely**

Do

Remove unnecessary text
completely

**Move excess, but required,
text to notes or annotations**

Do

Remove unnecessary text
completely

Move excess, but required,
text to notes or annotations

**Use notation methods to
cut down on visual clutter**

Do

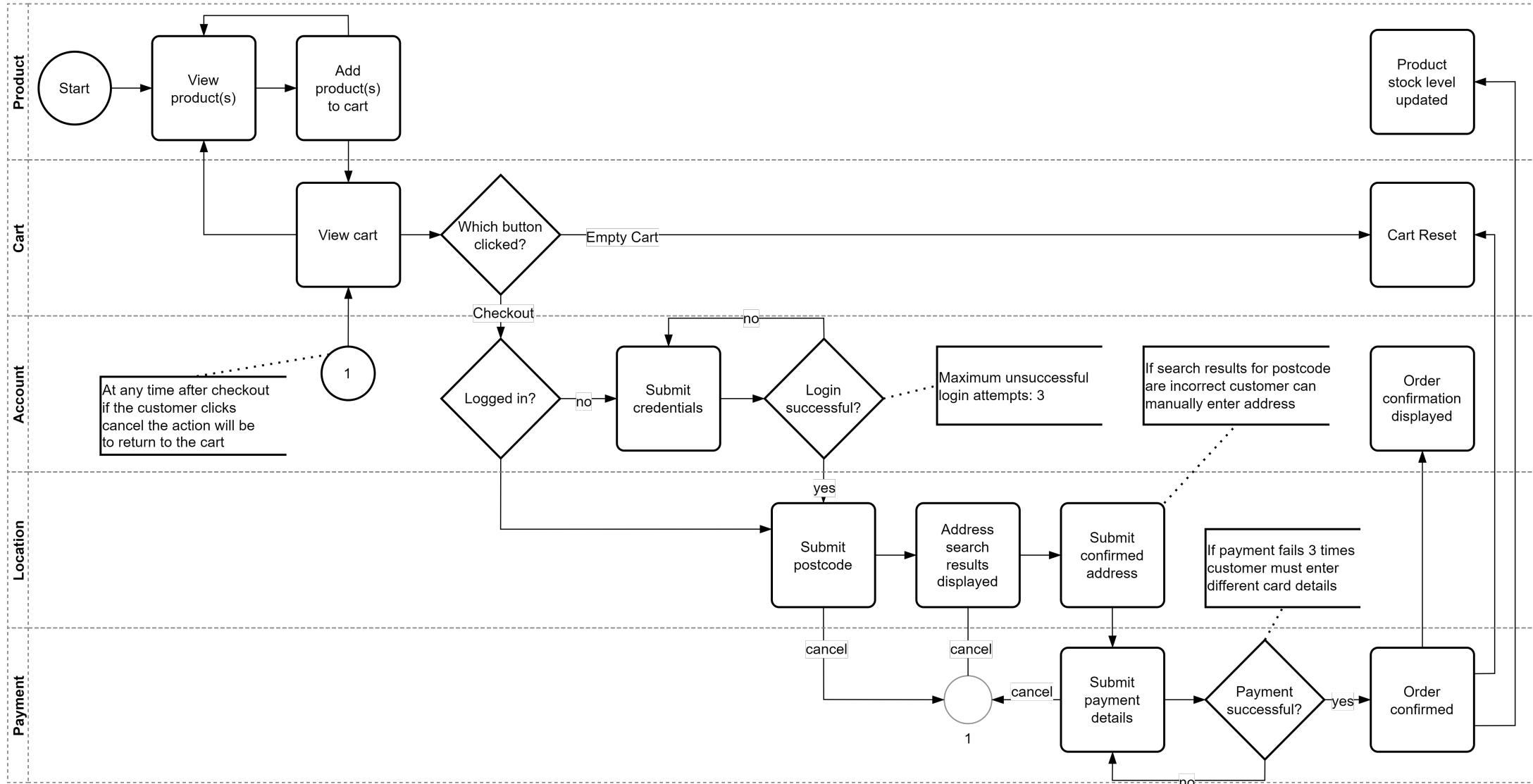
Remove unnecessary text
completely

Move excess, but required,
text to notes or annotations

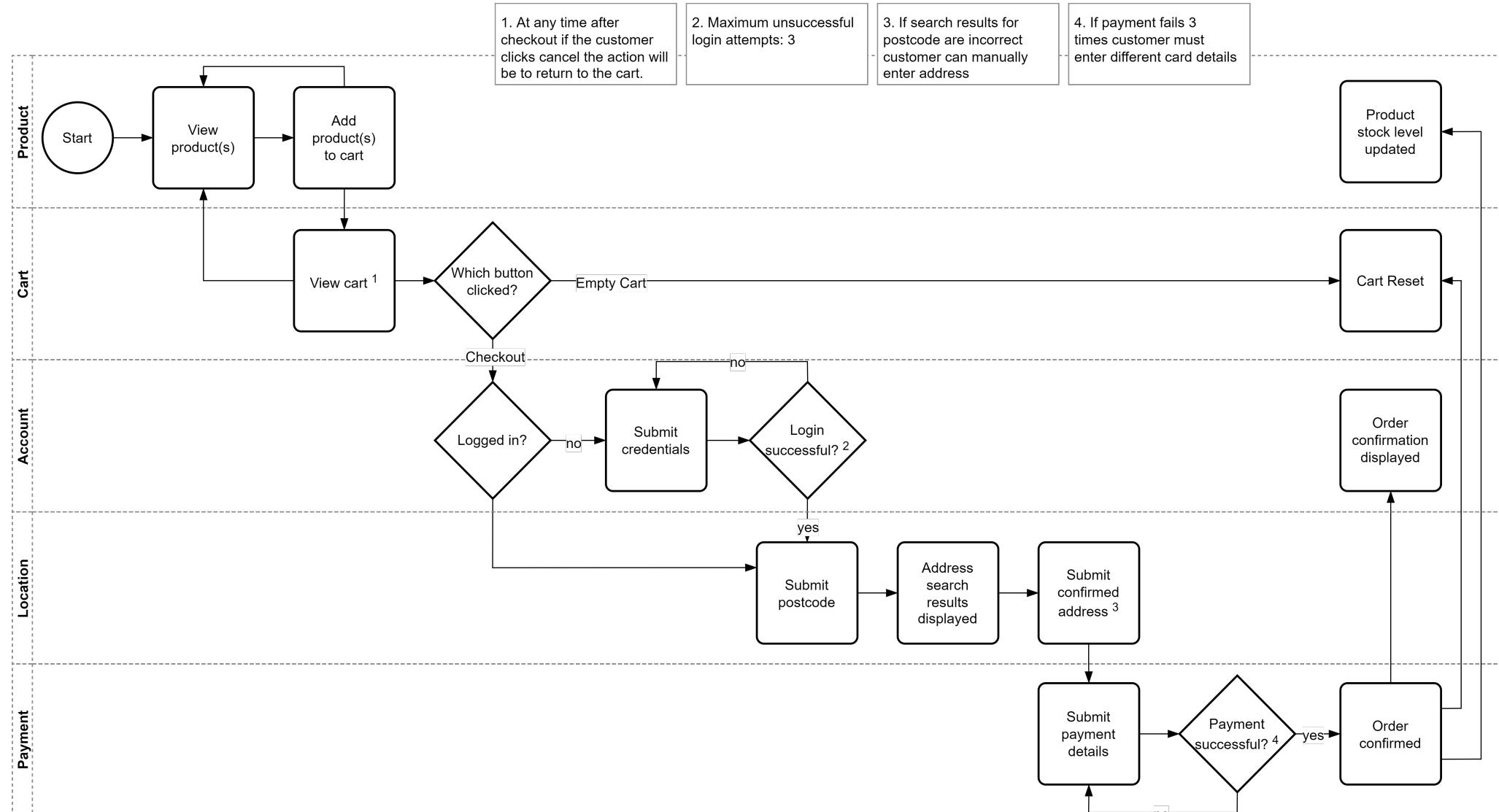
Use notation methods to
cut down on visual clutter

**Replace visual clutter with
references to notes**

Annotations & References



Referenced Notes



Not all information needs to be
in the main diagram

Accessibility

go beyond screen-readers in your accessibility
considerations

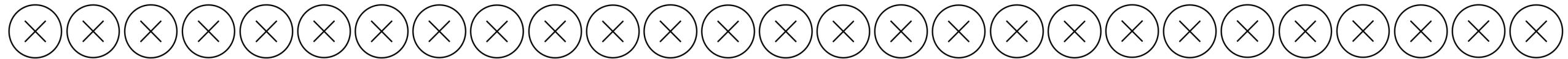
What disabilities /
impediments /disadvantages do
we need to cater for?

Antipattern

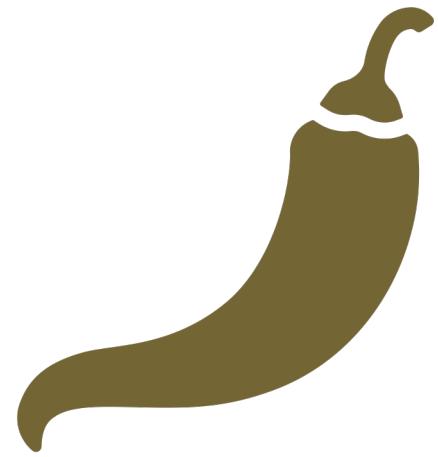
Colour is Key



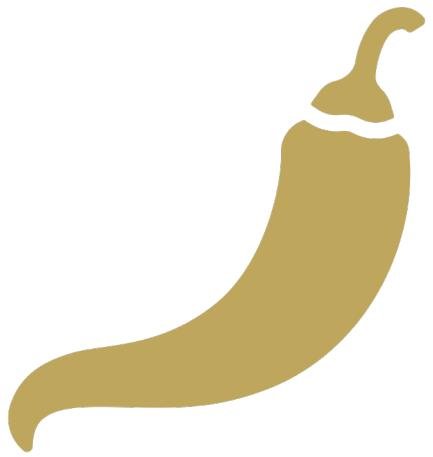
AKA: relying on colour to communicate



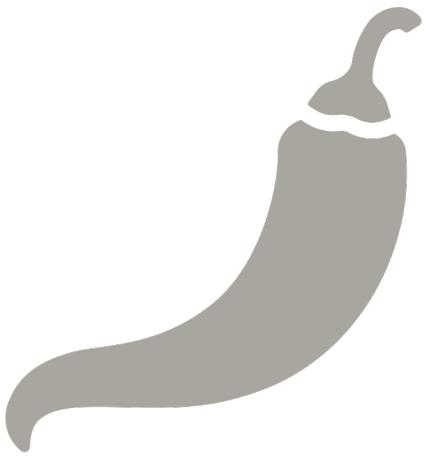
Can you pass me the yellow one?



a



b



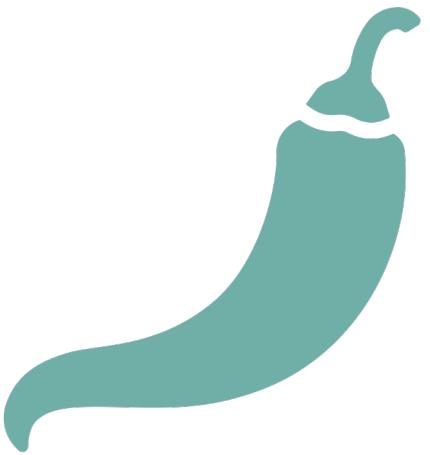
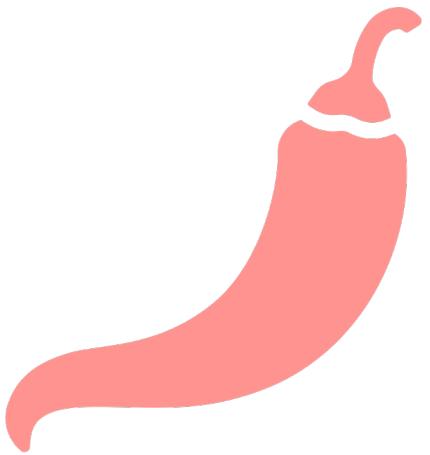
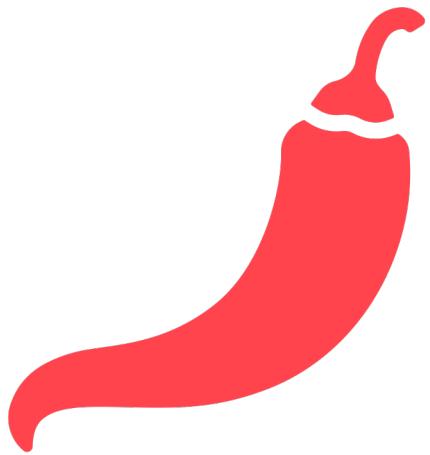
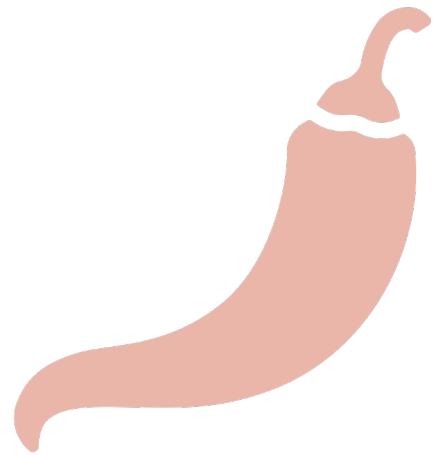
c



d

Simulated Protanopia

Can you pass me the yellow one?



e

f

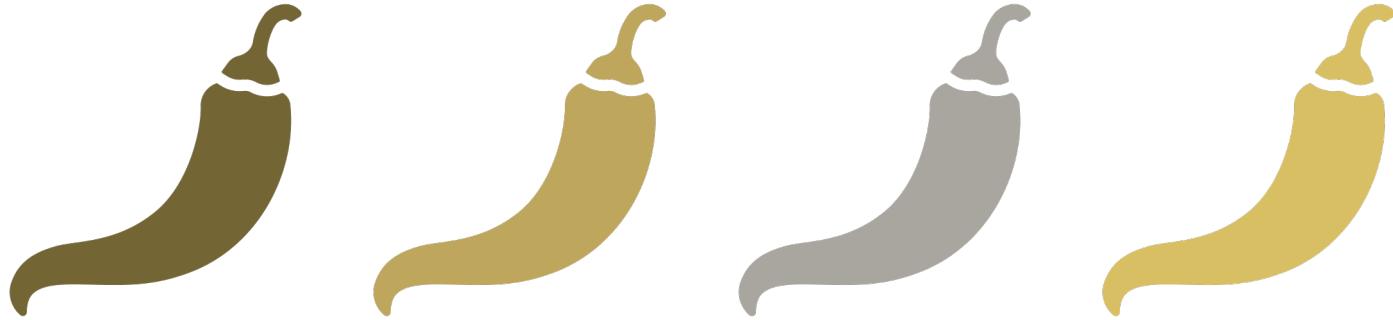
g

h

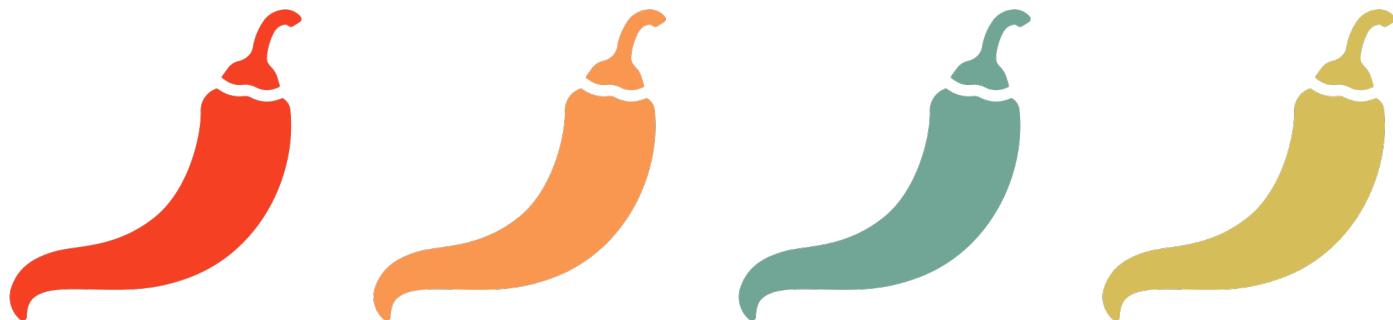
Simulated Tritanopia

Can you pass me the yellow one?

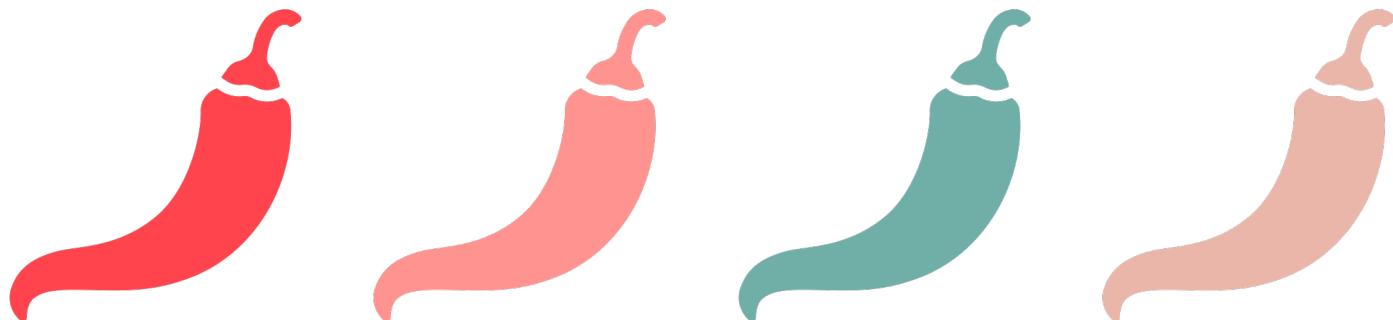
Protanopia



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 + e

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

Normal Protanopia Protanomaly Deutanopia Deutanomaly ✓ 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...
www.mostbeautifulthings.net


The Rainbow Connection—To Physics
www.sciencefriday.com


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

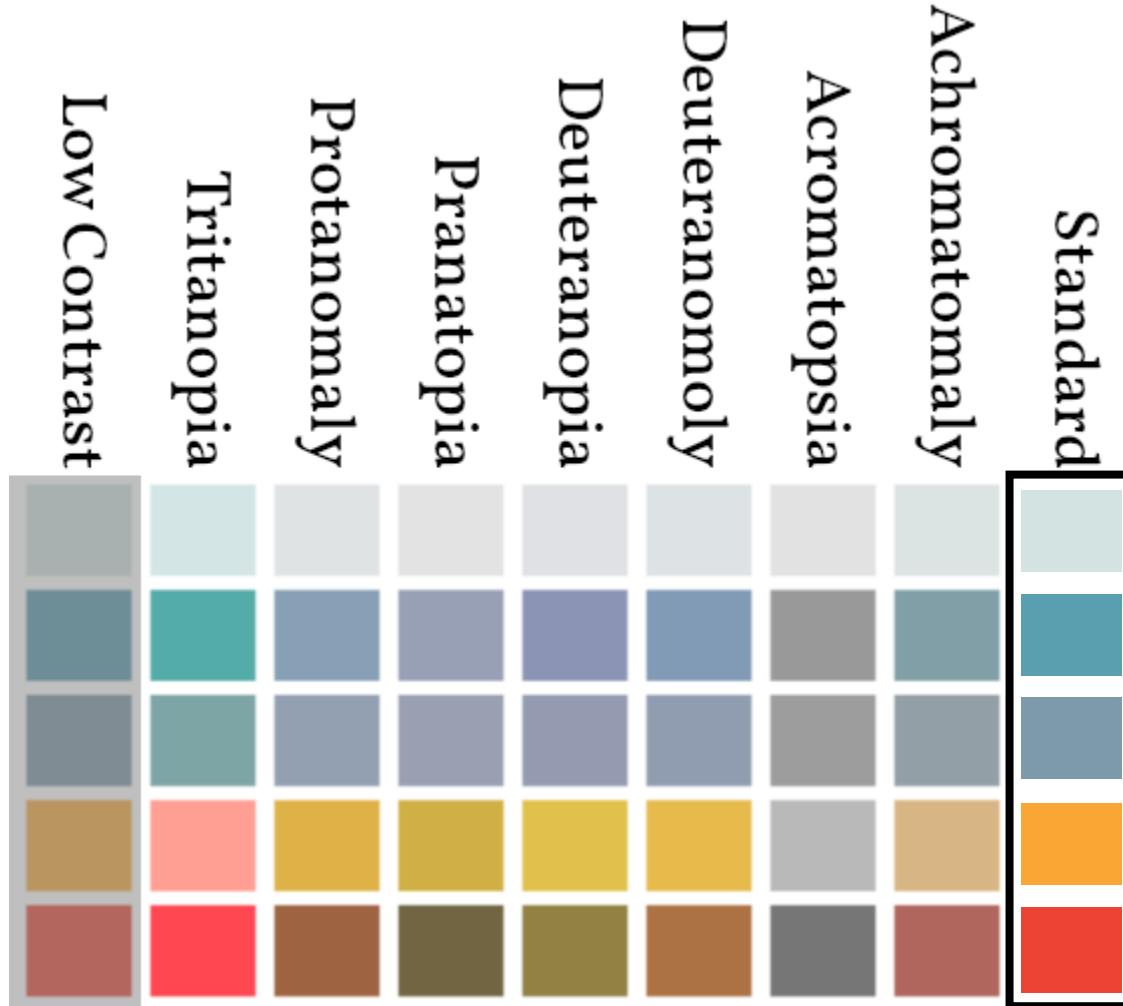

Amazing rainbow! : Adelaide
www.reddit.com


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

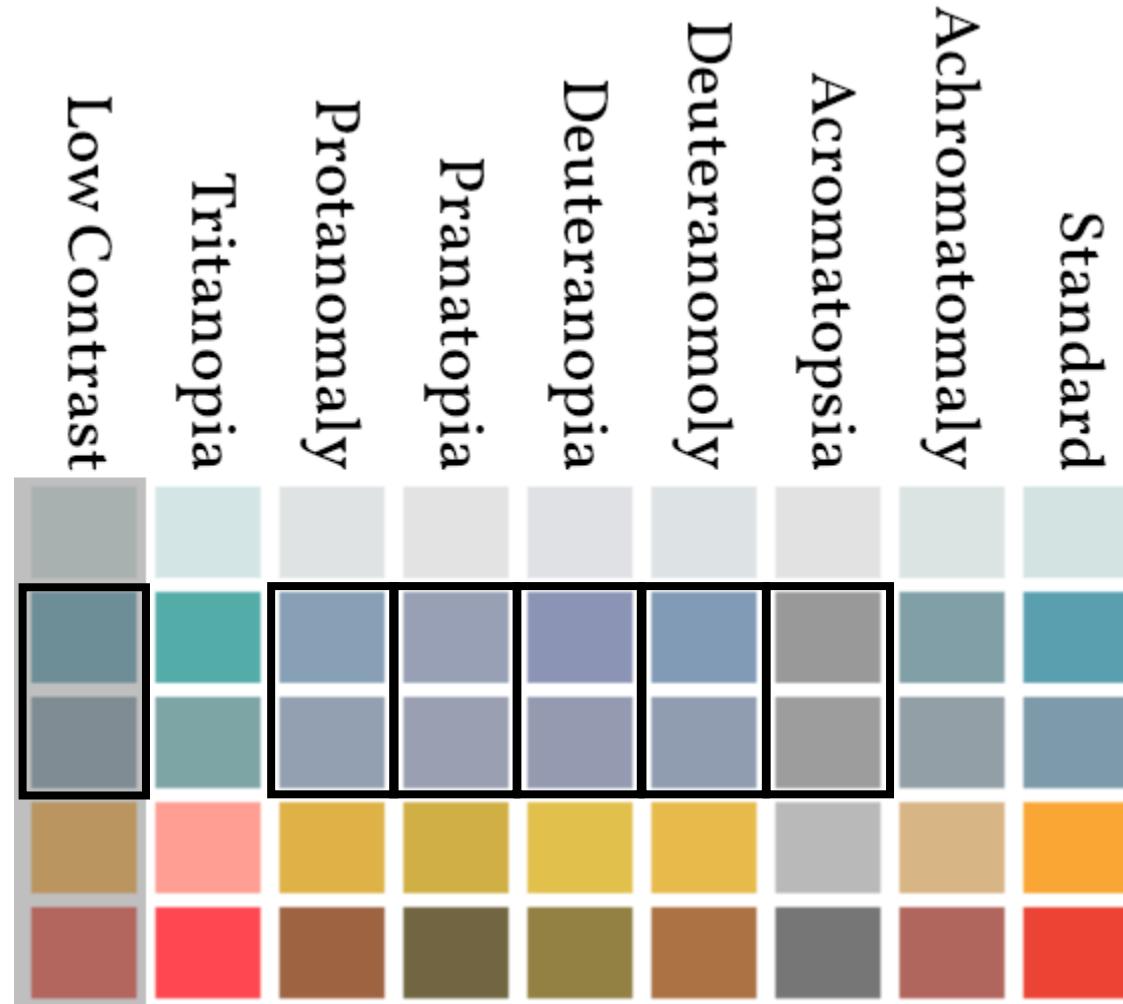
A palette I created



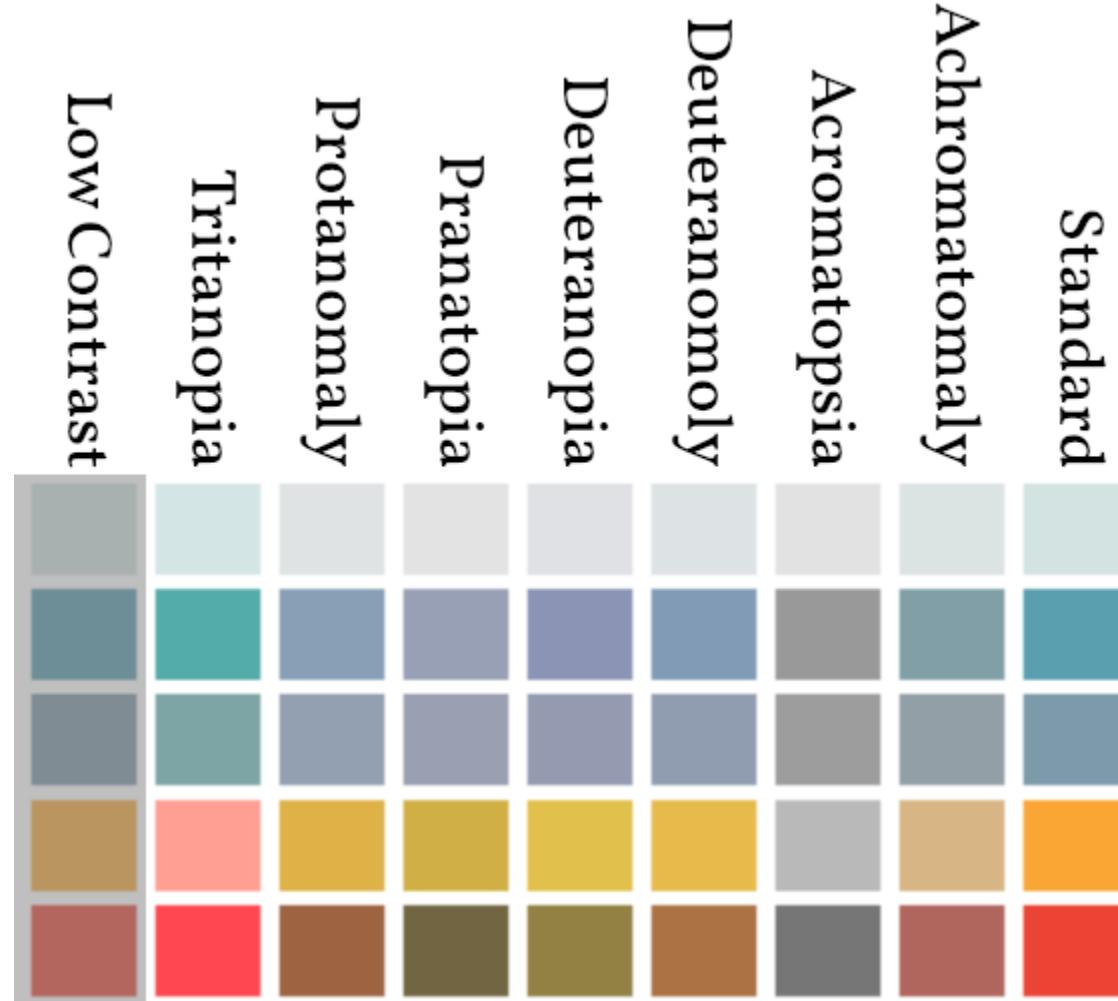
A pallet I created



A palette I created

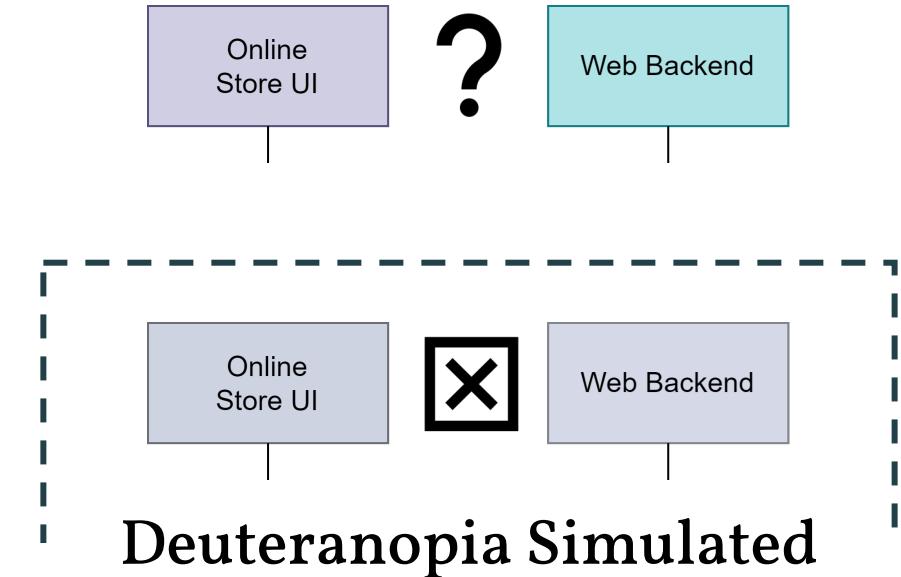


An accessible palette I created

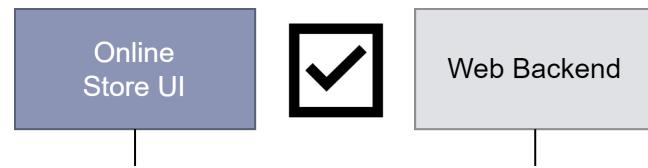
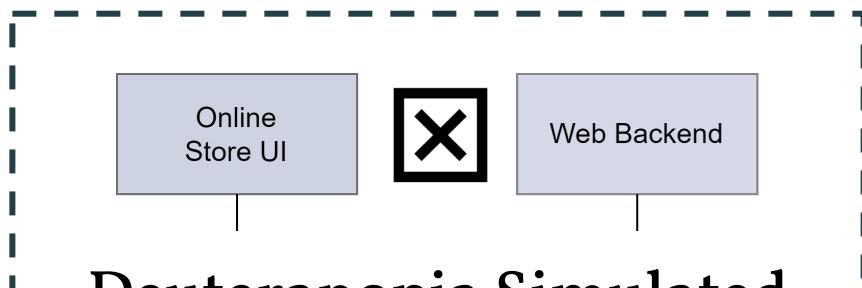
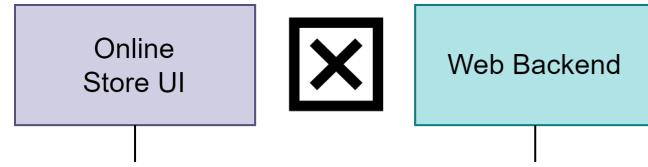


Use a colour-blind simulator

Draw.io Standard Colours



Draw.io Standard Colours



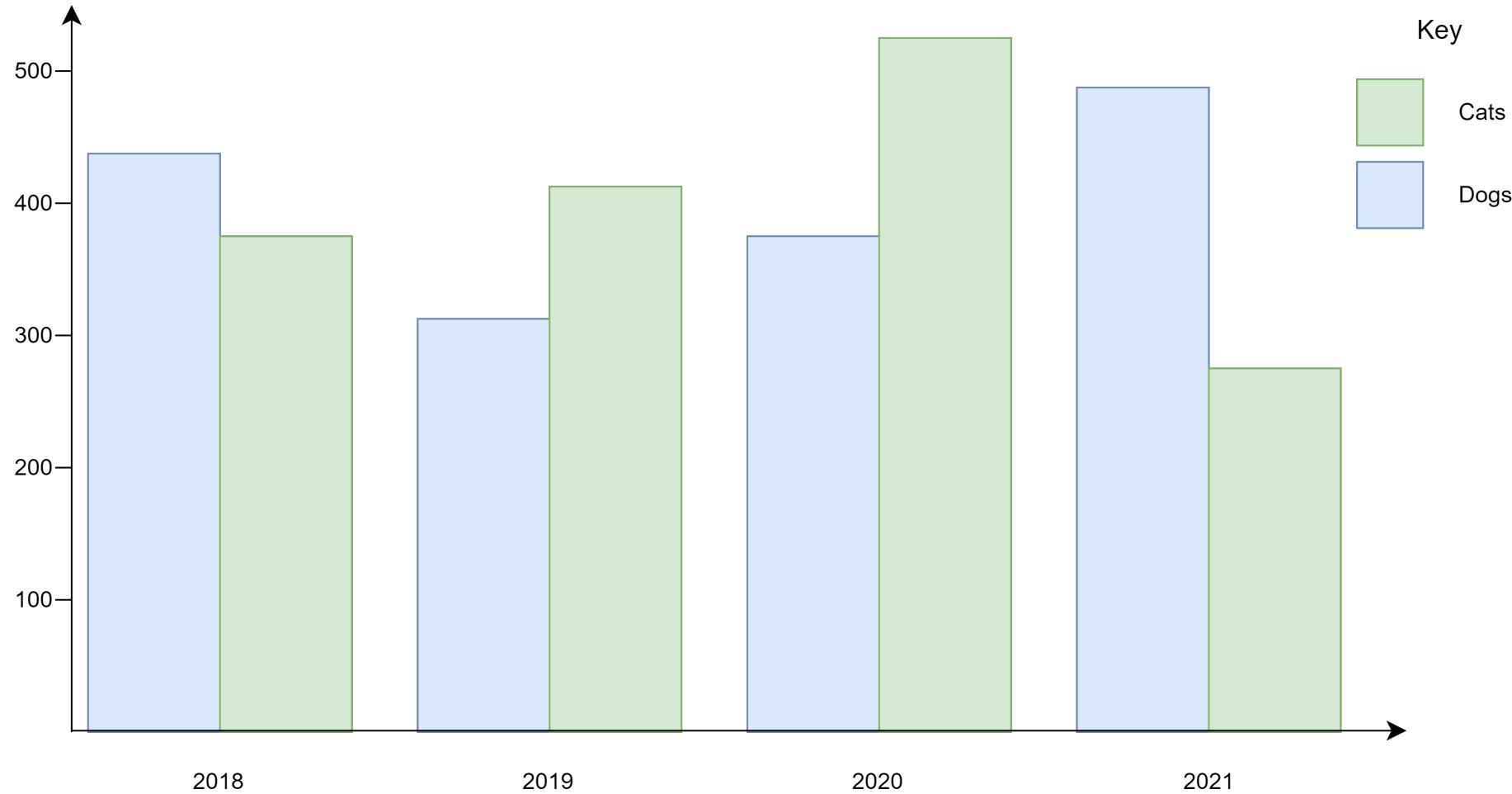
Deuteranopia Simulated



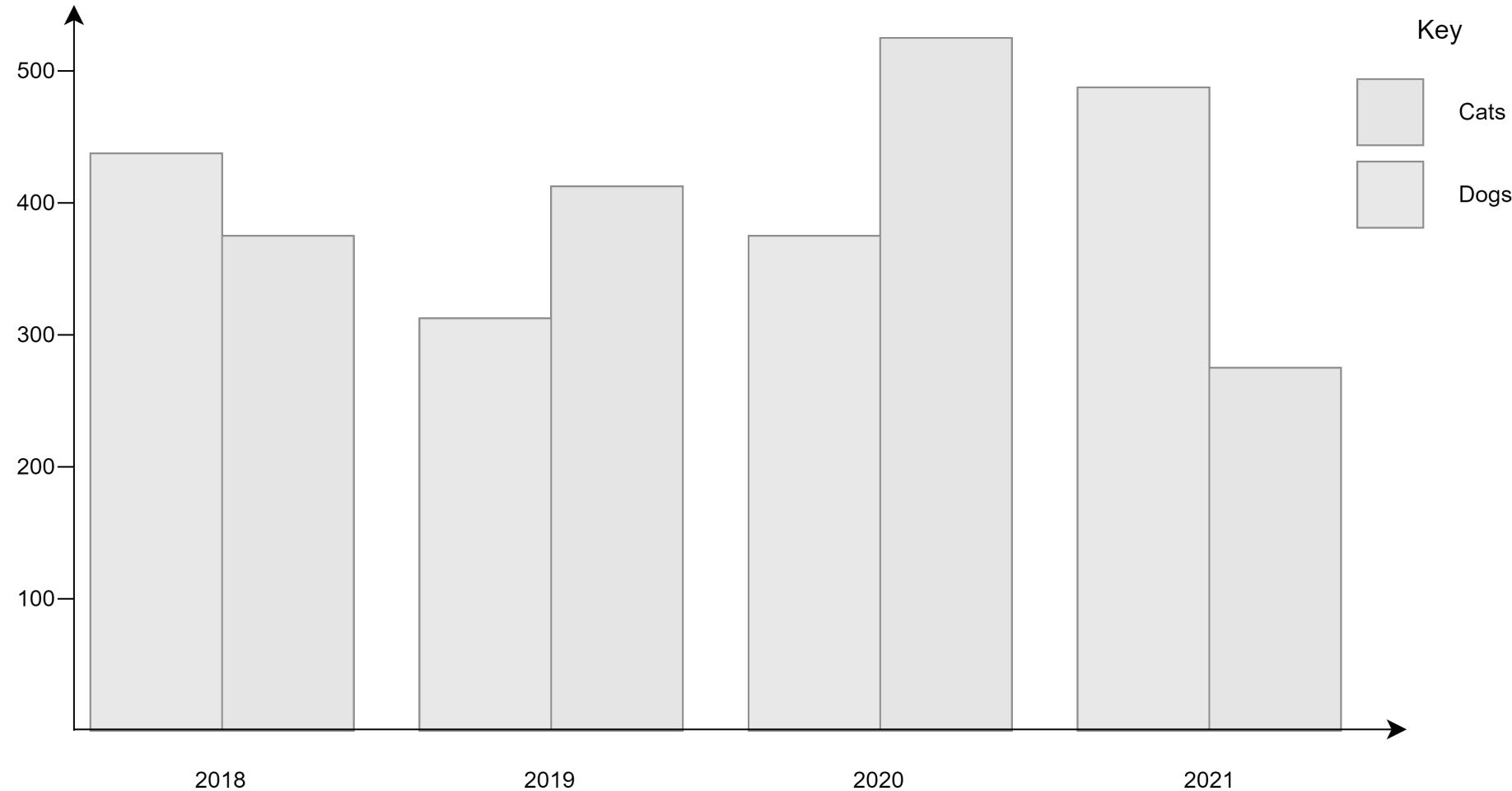
Colour-Deficiency-Friendly

Don't rely on colour alone

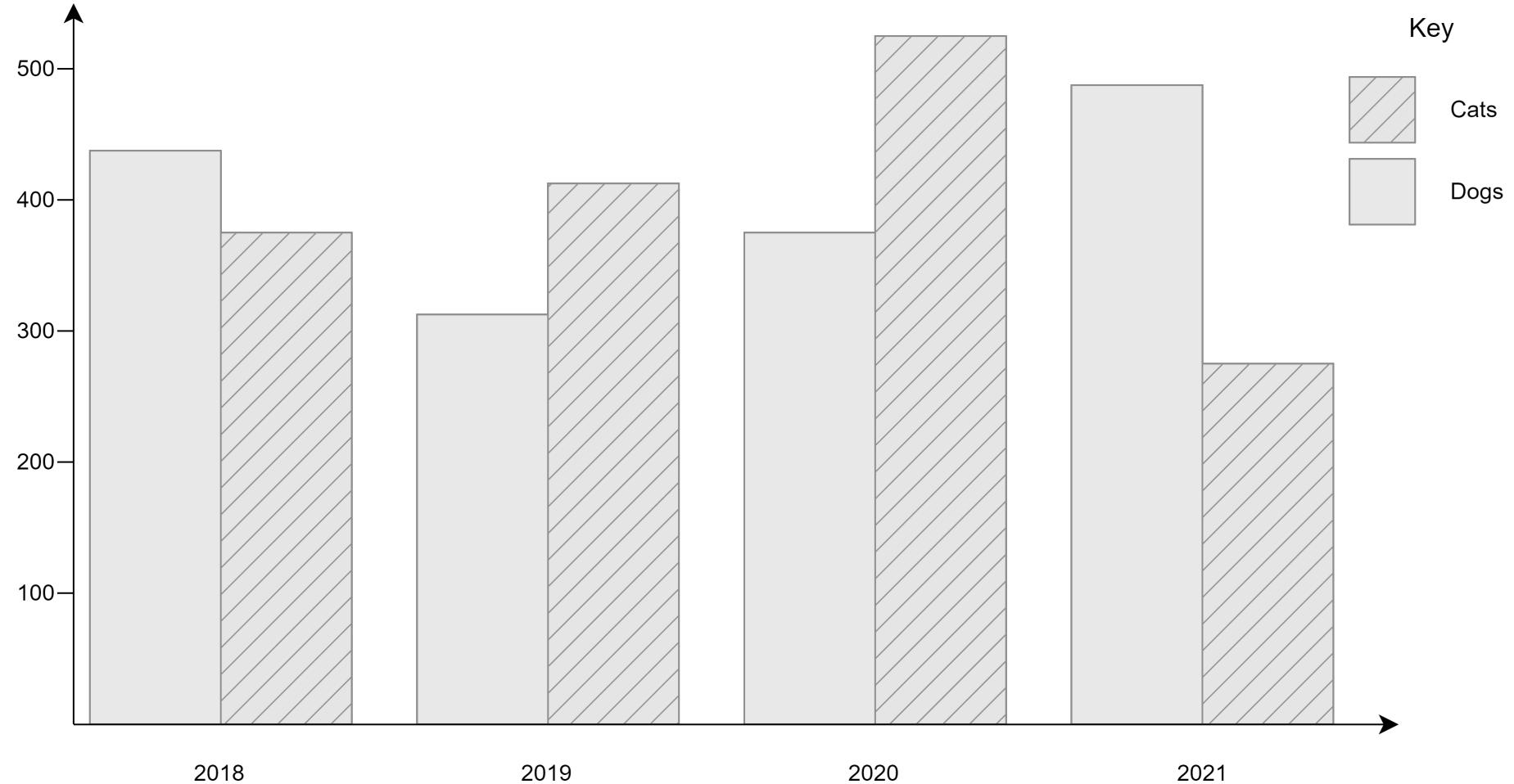
Colour is key?



What about greyscale?



Use pattern



Use symbols



Do

Use patterns, symbols or
labels, along with colour

Do

Use patterns, symbols or labels, along with colour

Choose colours with different saturation levels

Do

Use patterns, symbols or labels, along with colour

Choose colours with different saturation levels

Use a colour deficiency simulation tool

Do

Use patterns, symbols or labels, along with colour

Choose colours with different saturation levels

Use a colour deficiency simulation tool

Consider monitor and projector colour calibration

Do

Use patterns, symbols or labels, along with colour

Choose colours with different saturation levels

Use a colour deficiency simulation tool

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

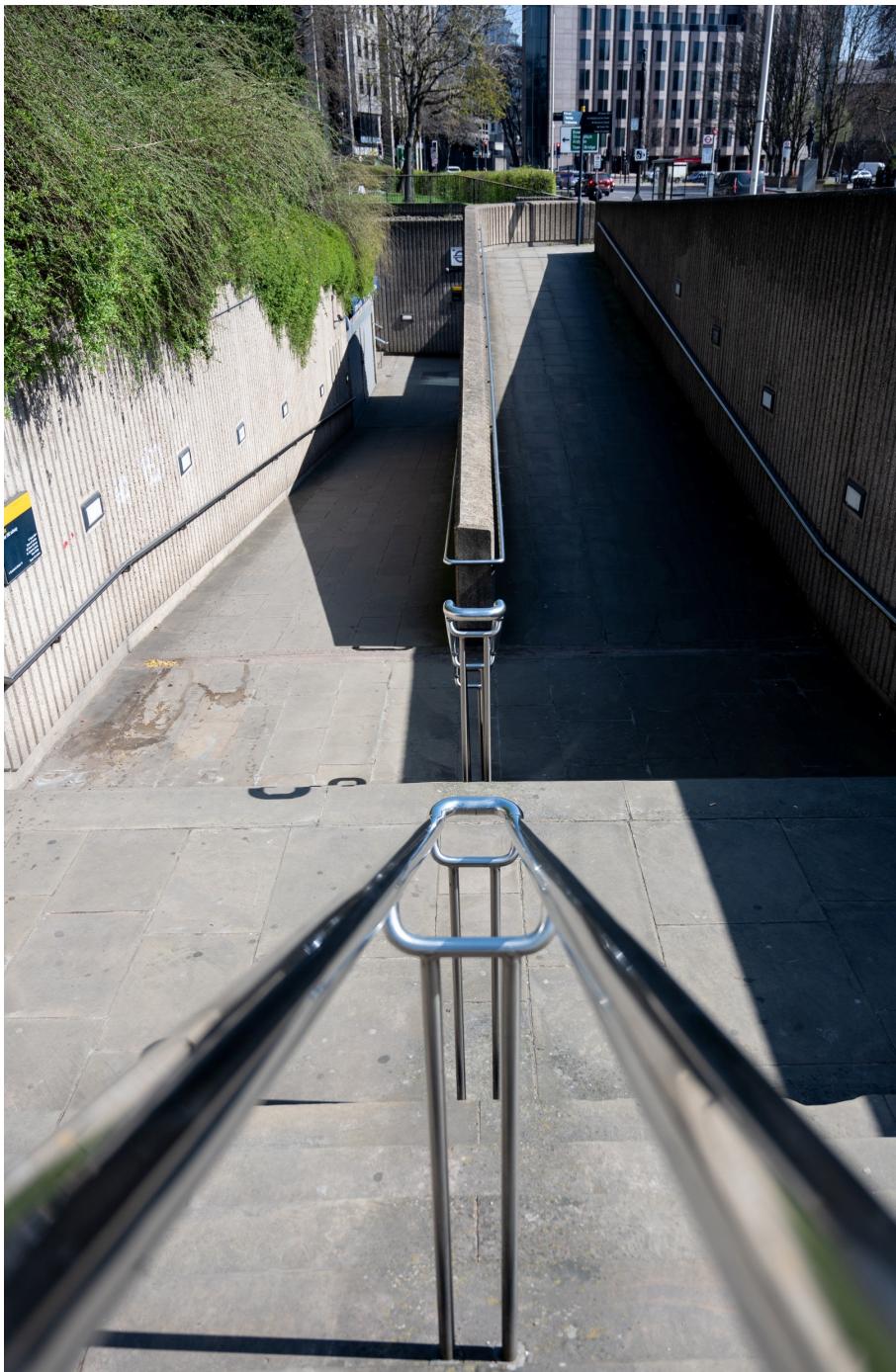


AKA: use a key or legend

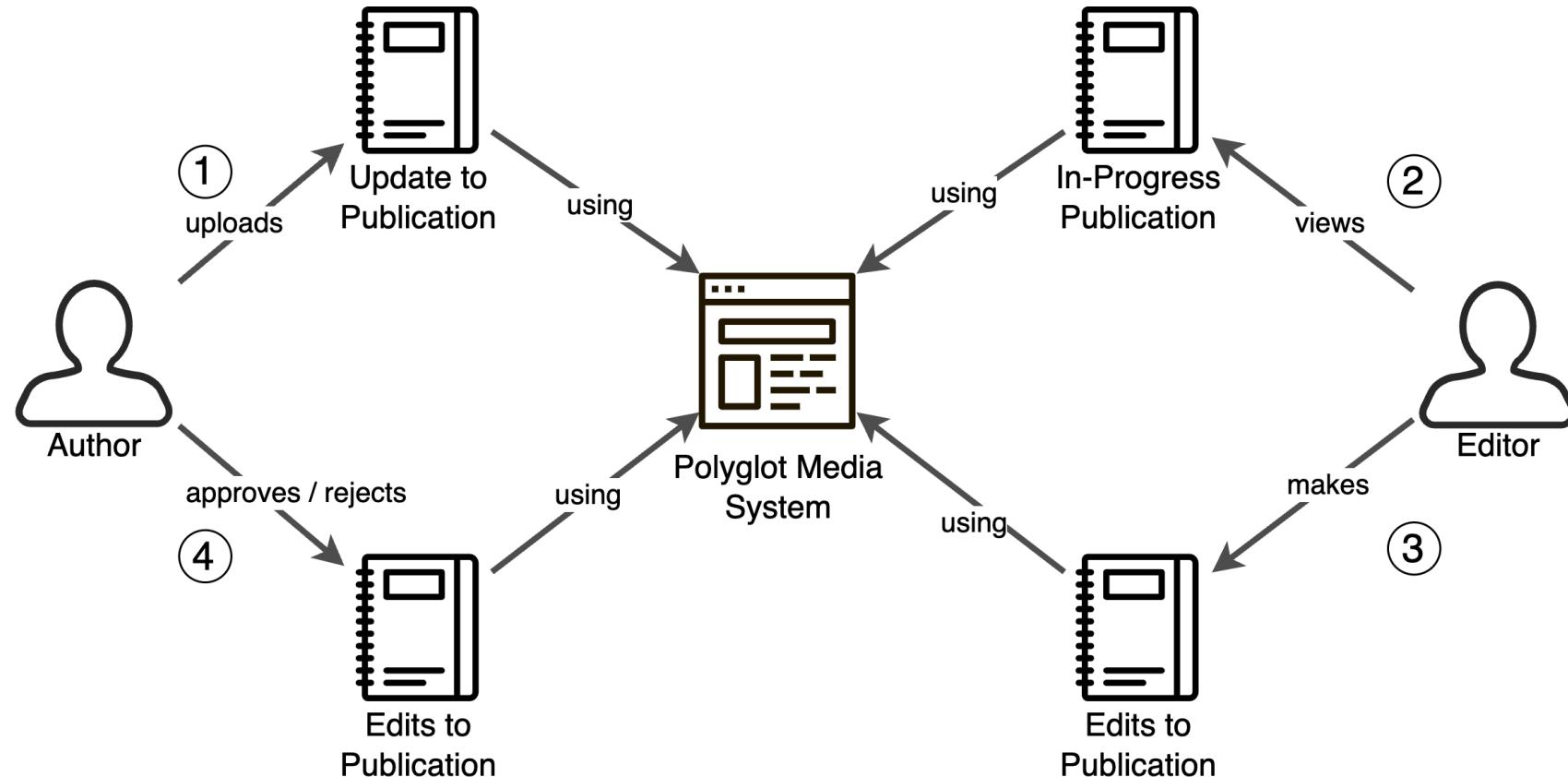


Don't rely on your audience
having specific knowledge

It's a balancing act



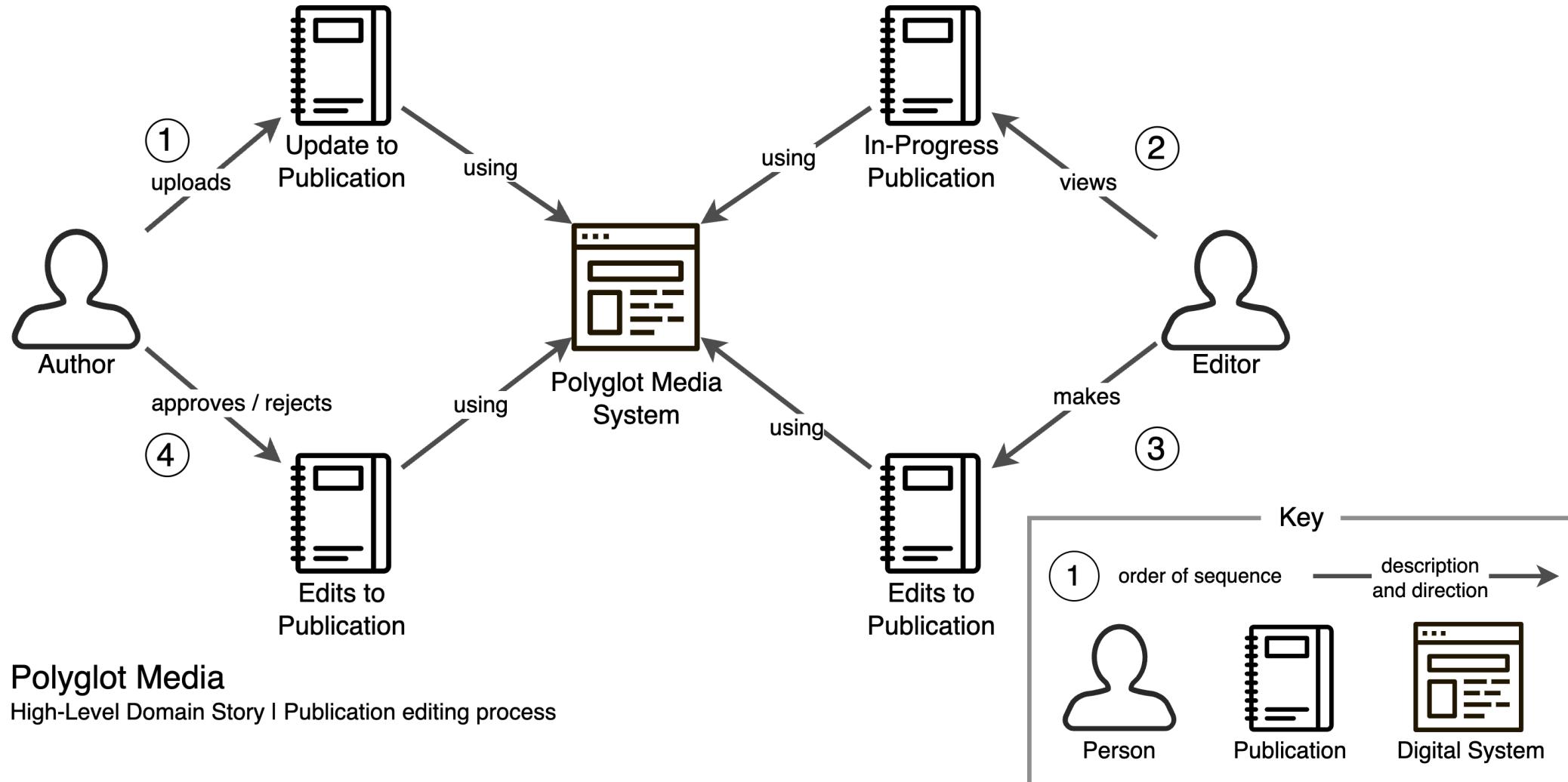
Seems obvious? No.



Polyglot Media

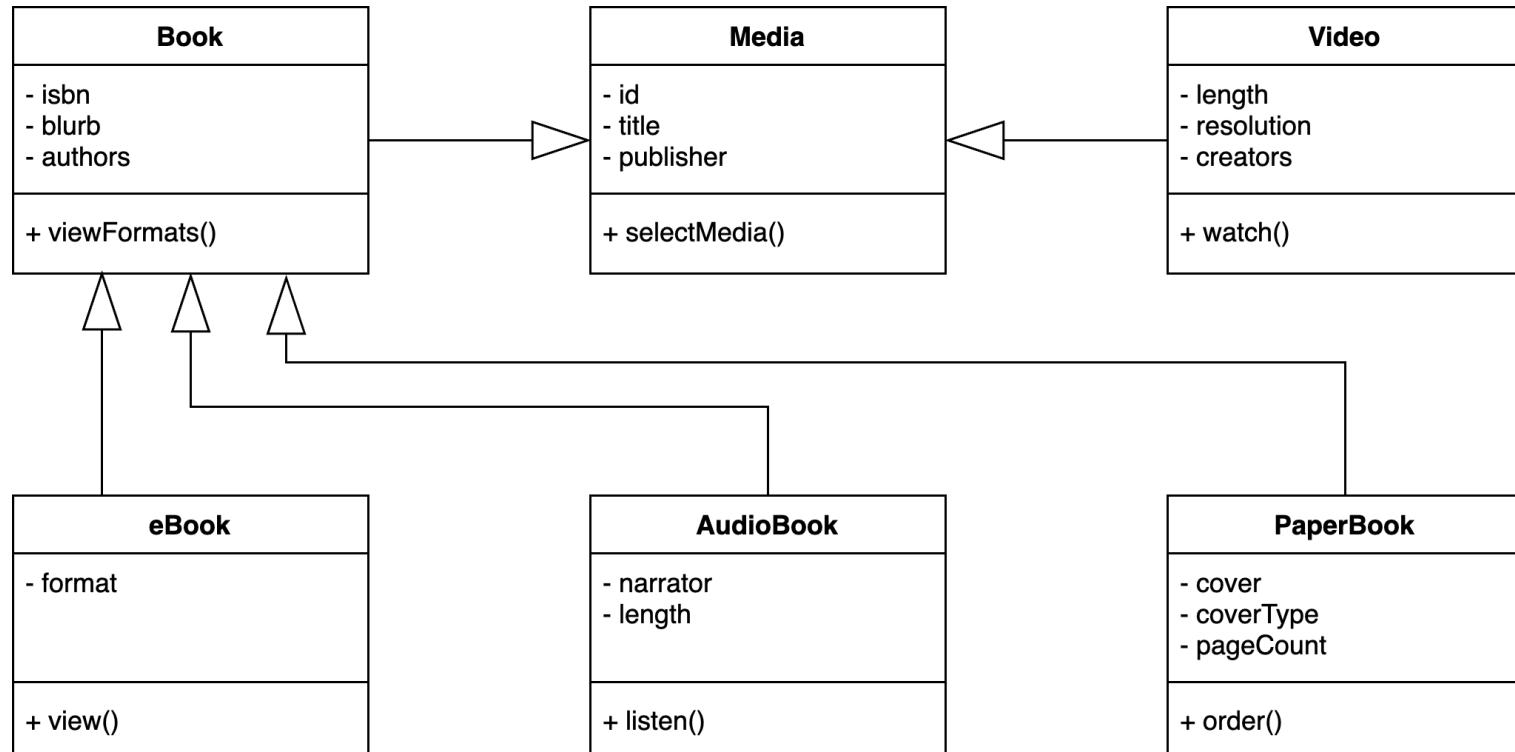
High-Level Domain Story | Publication editing process

Make it Explicit



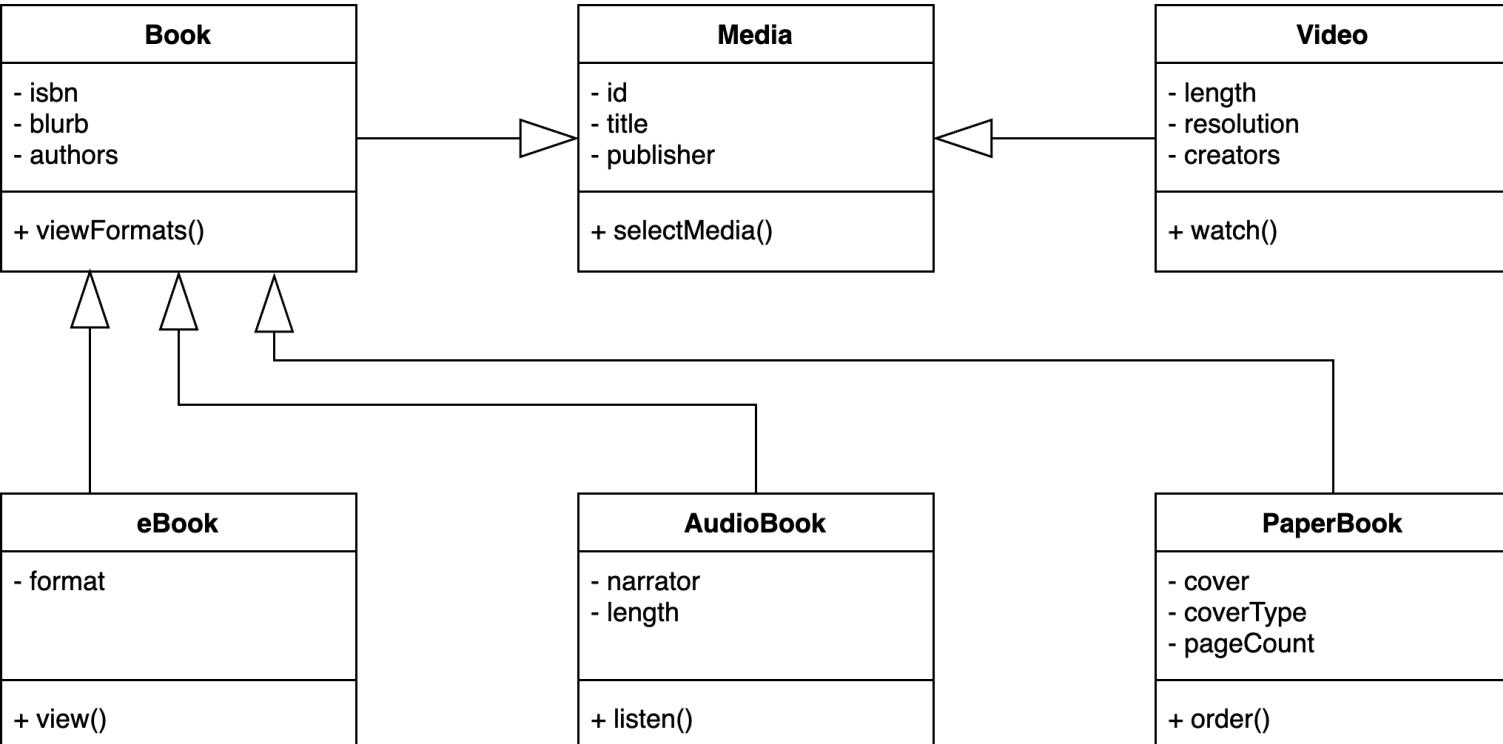
Don't leave it open to
interpretation

UML, easy? No.

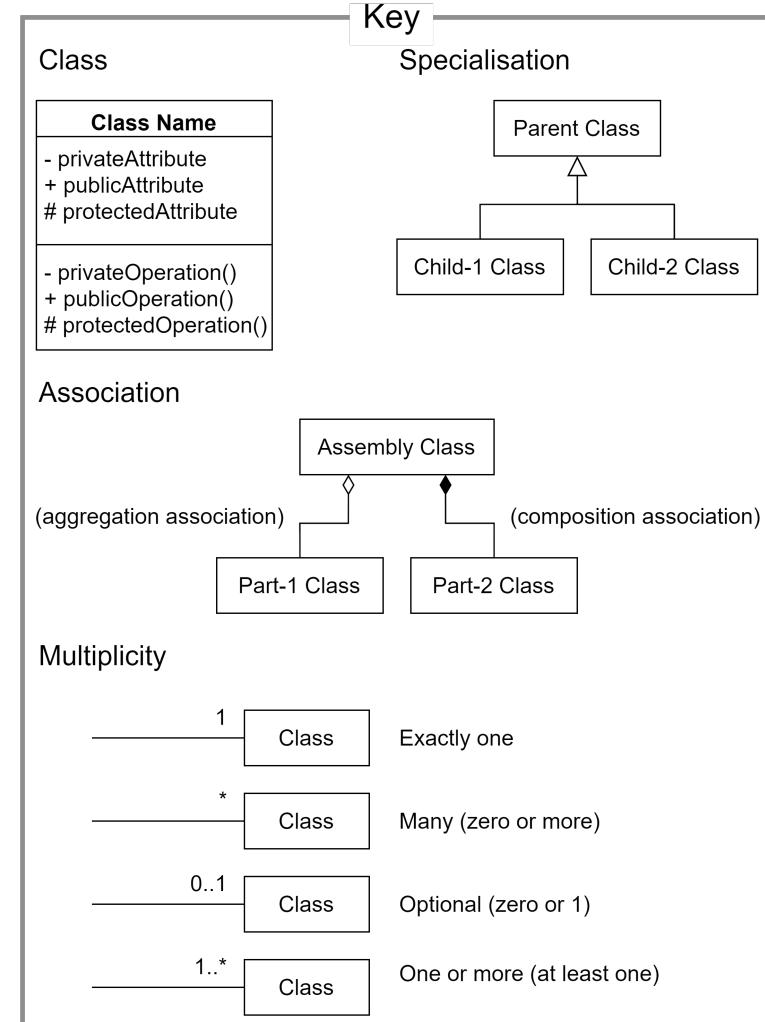


Media
Class Diagram

UML Reminder

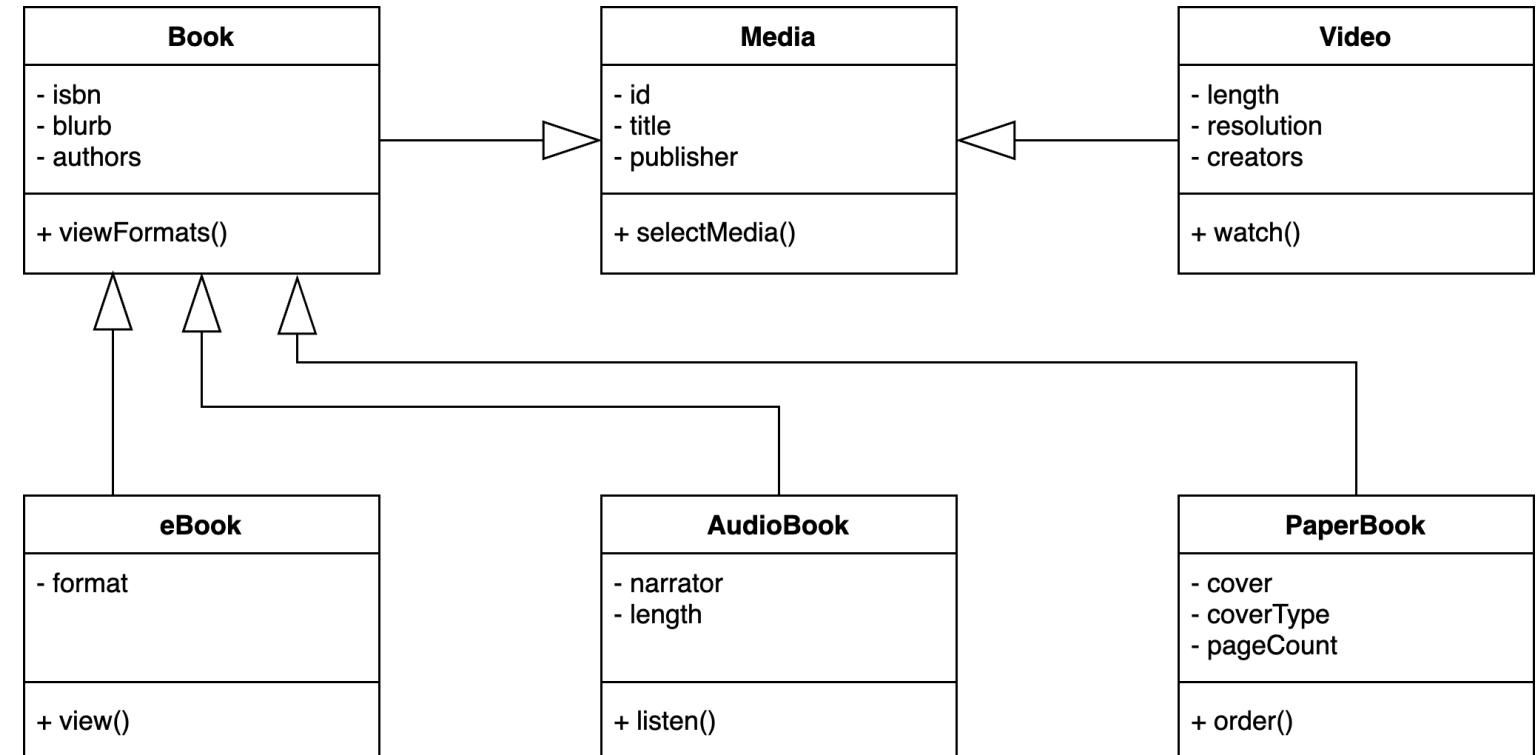


Media
Class Diagram



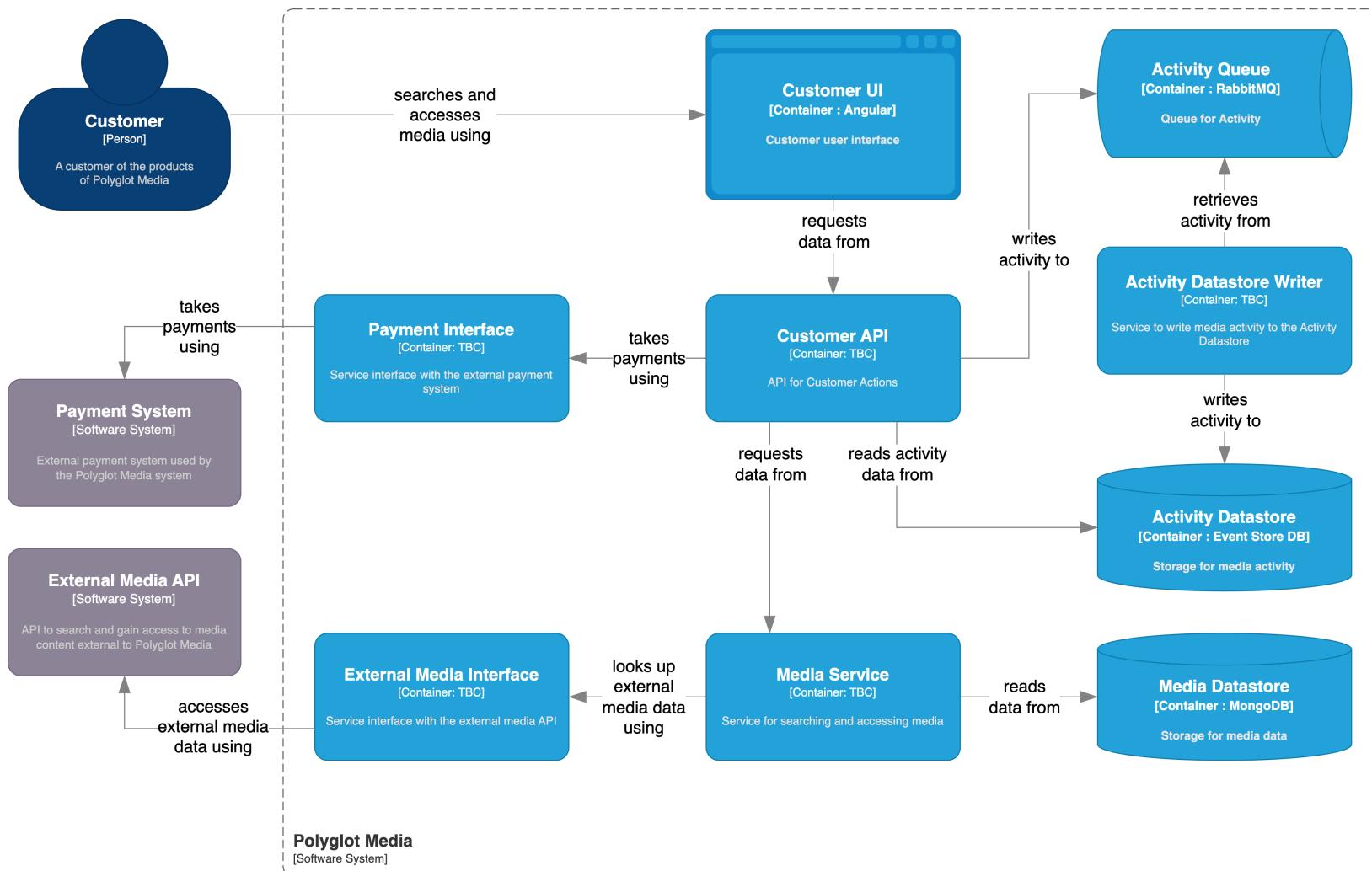
UML Reminder

[View Class Diagram Key/Legend](#)



Media
Class Diagram

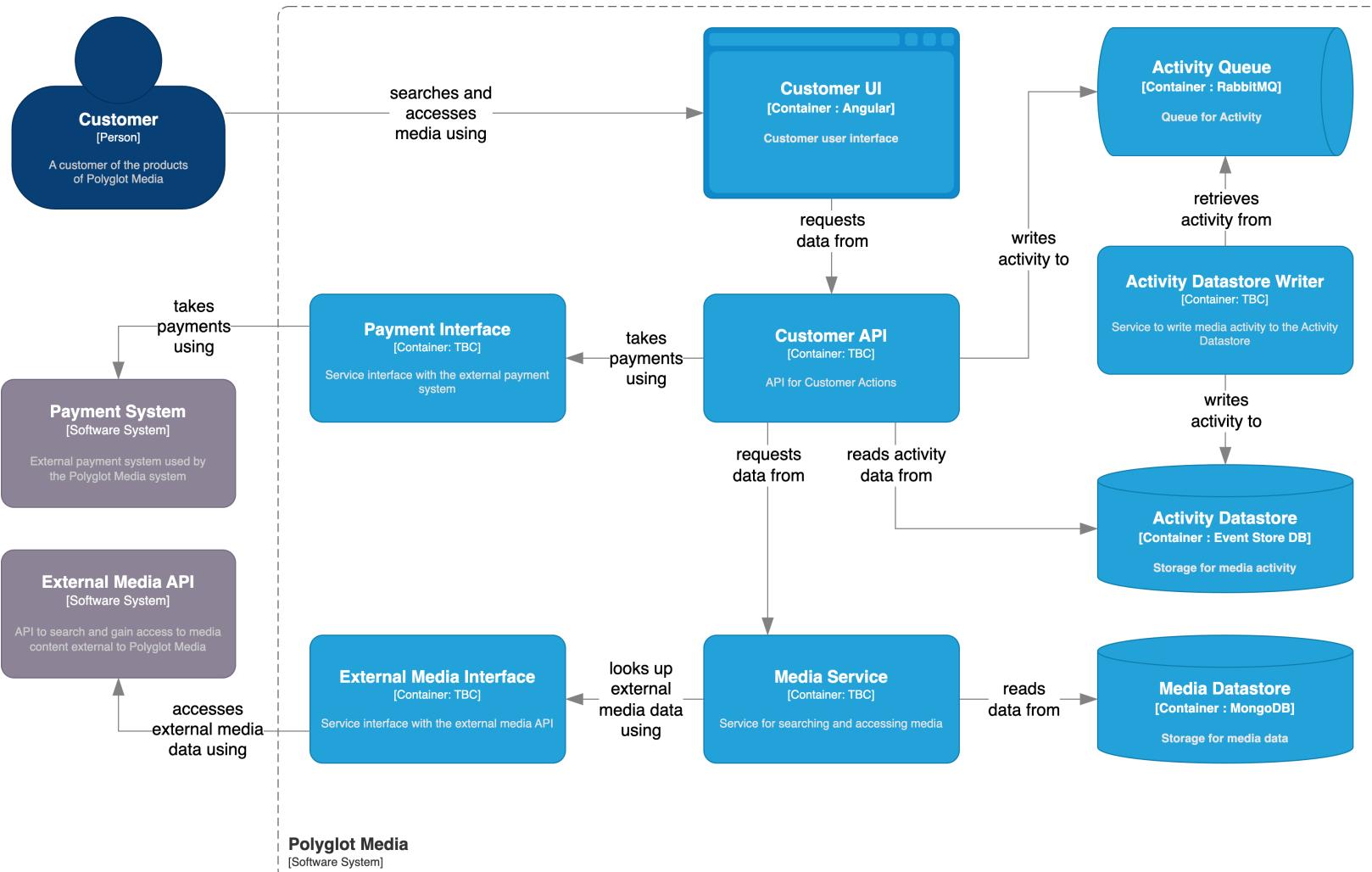
C4, that's obvious? No.



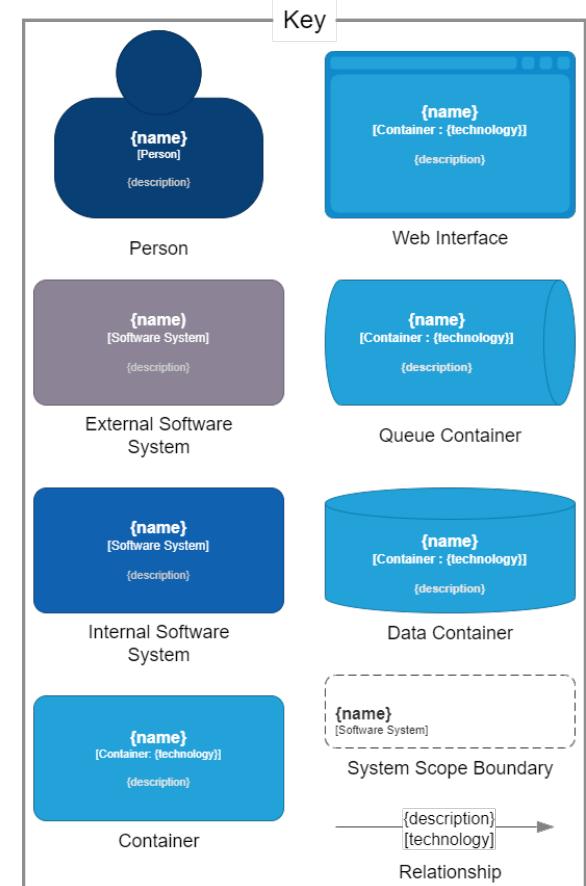
Container Diagram for Customers using Polyglot Media

Showing the high-level interactions within the Polyglot Media system.

Explained



Container Diagram for Customers using Polyglot Media
Showing the high-level interactions within the Polyglot Media system.

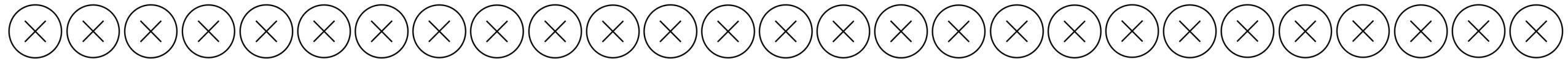


Limit your assumptions

Antipattern

MLAH

AKA: Multiple-Letter Acronym Hell



Only use defined acronyms

Do

In speech, say the acronym,
and say the definition straight afterwards

Do

In speech, say the acronym,
and say the definition straight afterwards

**In written form, define the acronym the first time you
write it, and/or in a key or glossary**

A few acronyms you may know...

or not

DRY:

A few acronyms you may know...

or not

DRY:

Don't Repeat Yourself

DFD:

A few acronyms you may know...

or not

DRY:

Don't Repeat Yourself

DFD:

Data Flow Diagram

SPA:

A few acronyms you may know...

or not

DRY:

Don't Repeat Yourself

DFD:

Data Flow Diagram

SPA:

Single Page Application

BLT:

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

BLT?

Business Leadership Team

Basic Language Translator

BLT?

Business Leadership Team

Basic Language Translator

Bulk Loading Tool

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



Next time you use an acronym...

think
SIDI

✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
Next time you use an acronym...

think
SIDI

State It
Define It



Narrative

tell your audience a story to get your message across

After nourishment, shelter and companionship, stories are the thing we need most in the world.

- Philip Pullman

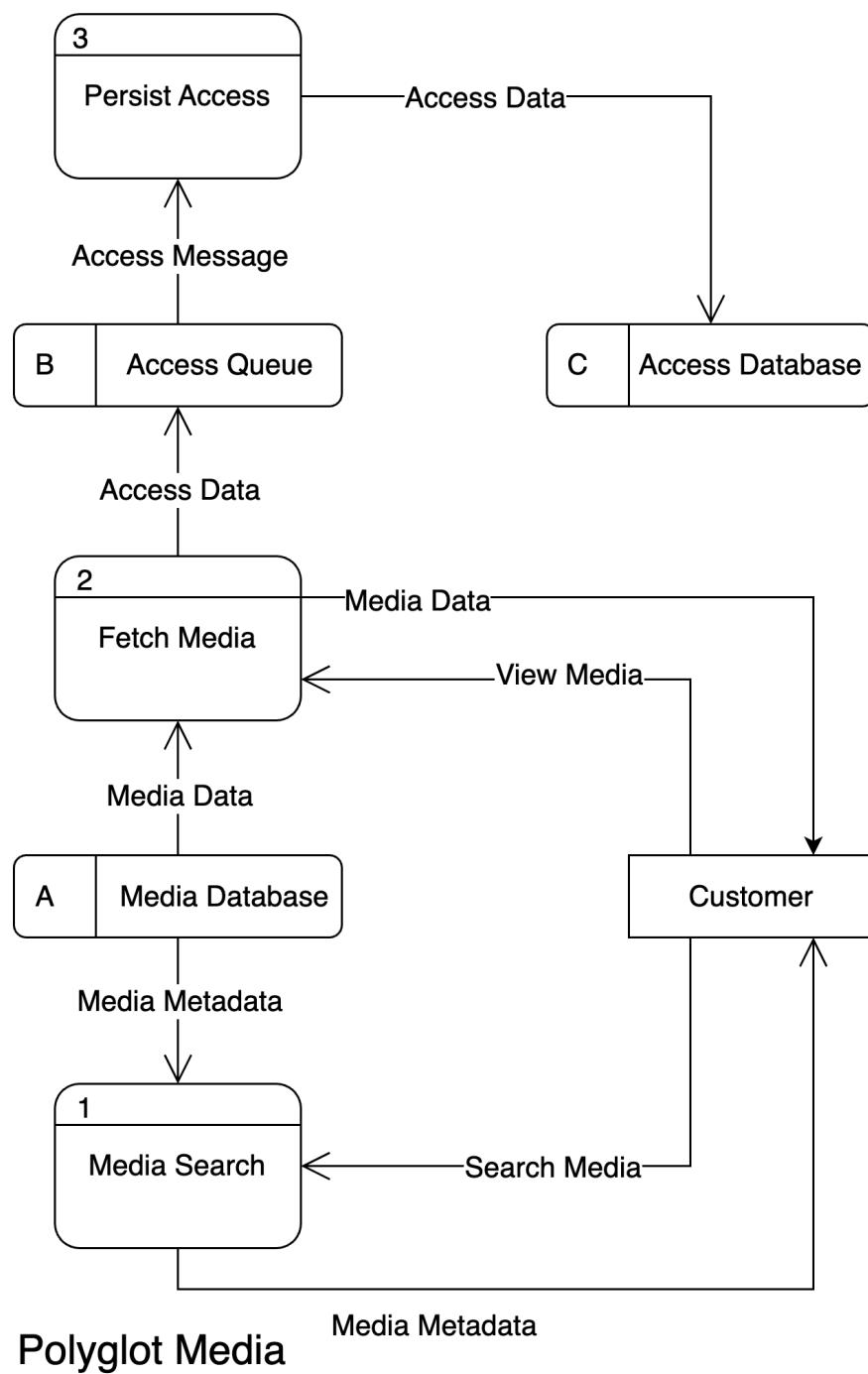
Pattern

A push in the right direction

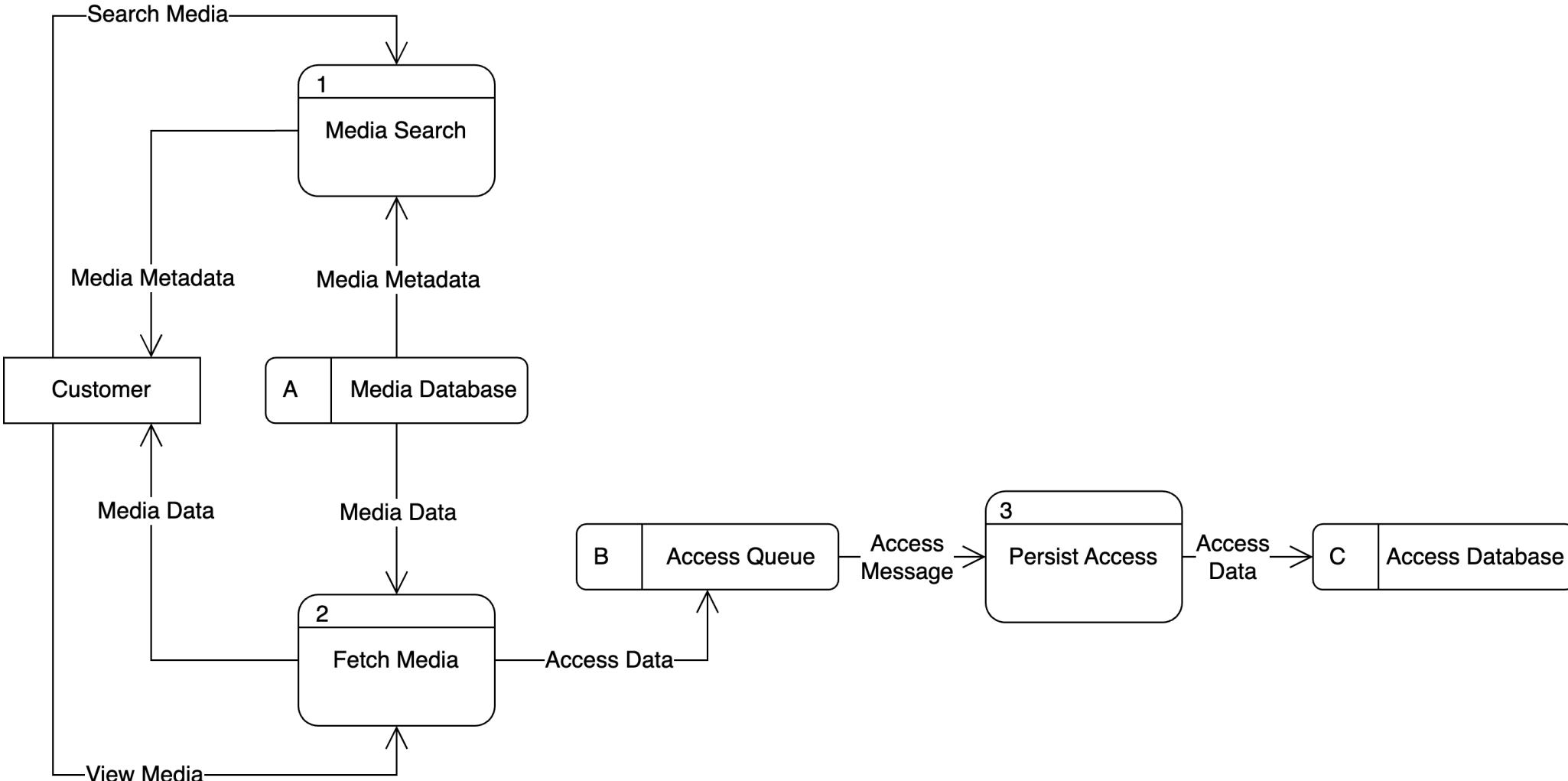
AKA: match the diagram flow to expectations



All diagrams have a flow of information



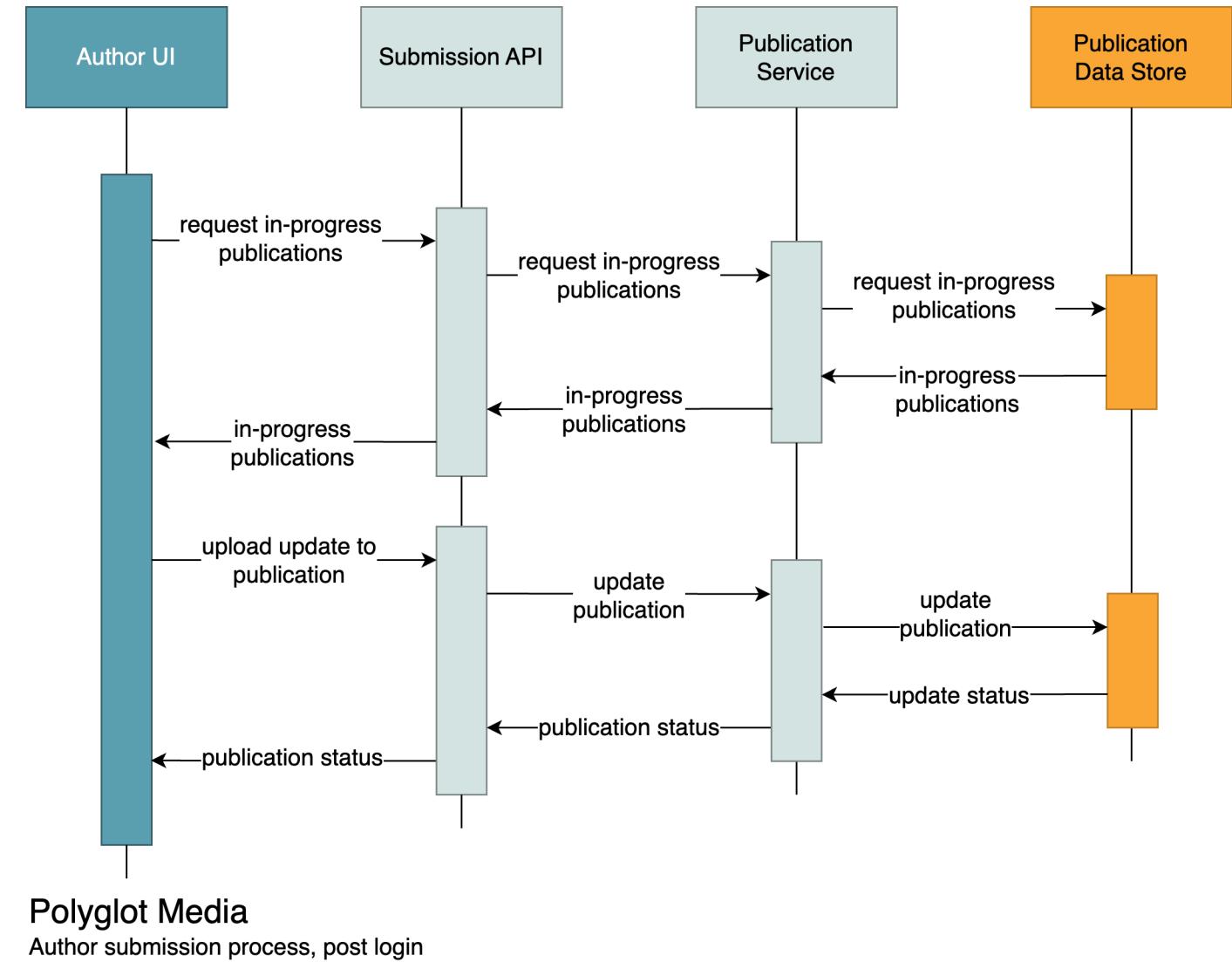
Let's match expectations



Polyglot Media

Data Flow Diagram: media search, view and access analytics

Inputs & Outputs



Consider how your audience
will read the diagram

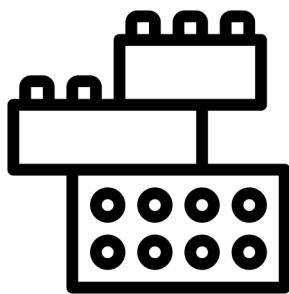
Pattern

Show them the pirate ship!

AKA: enthrall your audience with context



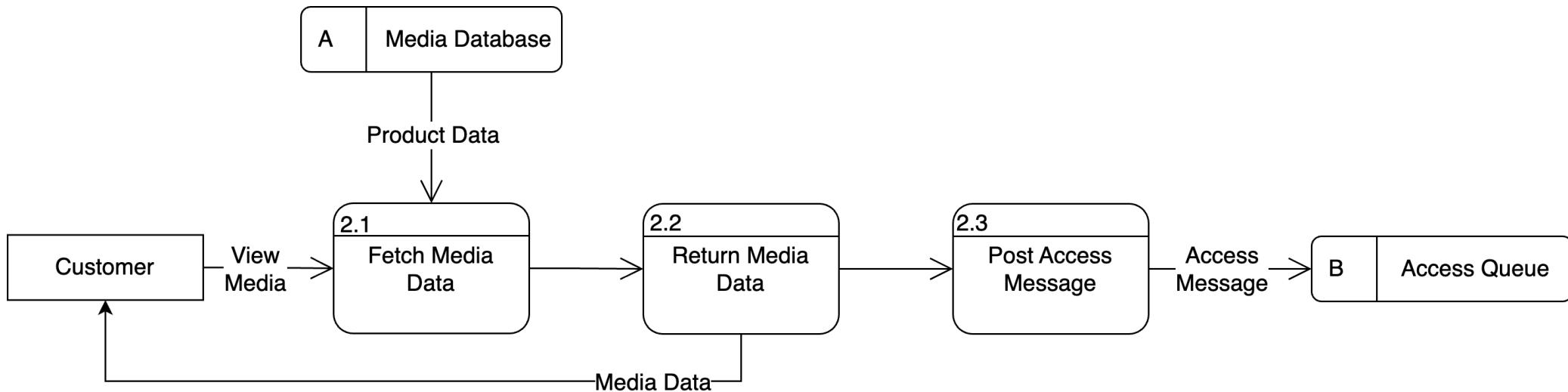




When you look at the cover of a box of LEGOs
you don't see a picture of each individual
brick that's inside. Instead, you see the
picture of an exciting, fully assembled model,
... positioned in a life-like pirate's bay with
cliffs and sharks.

Gregor Hohpe, The Software Architect Elevator

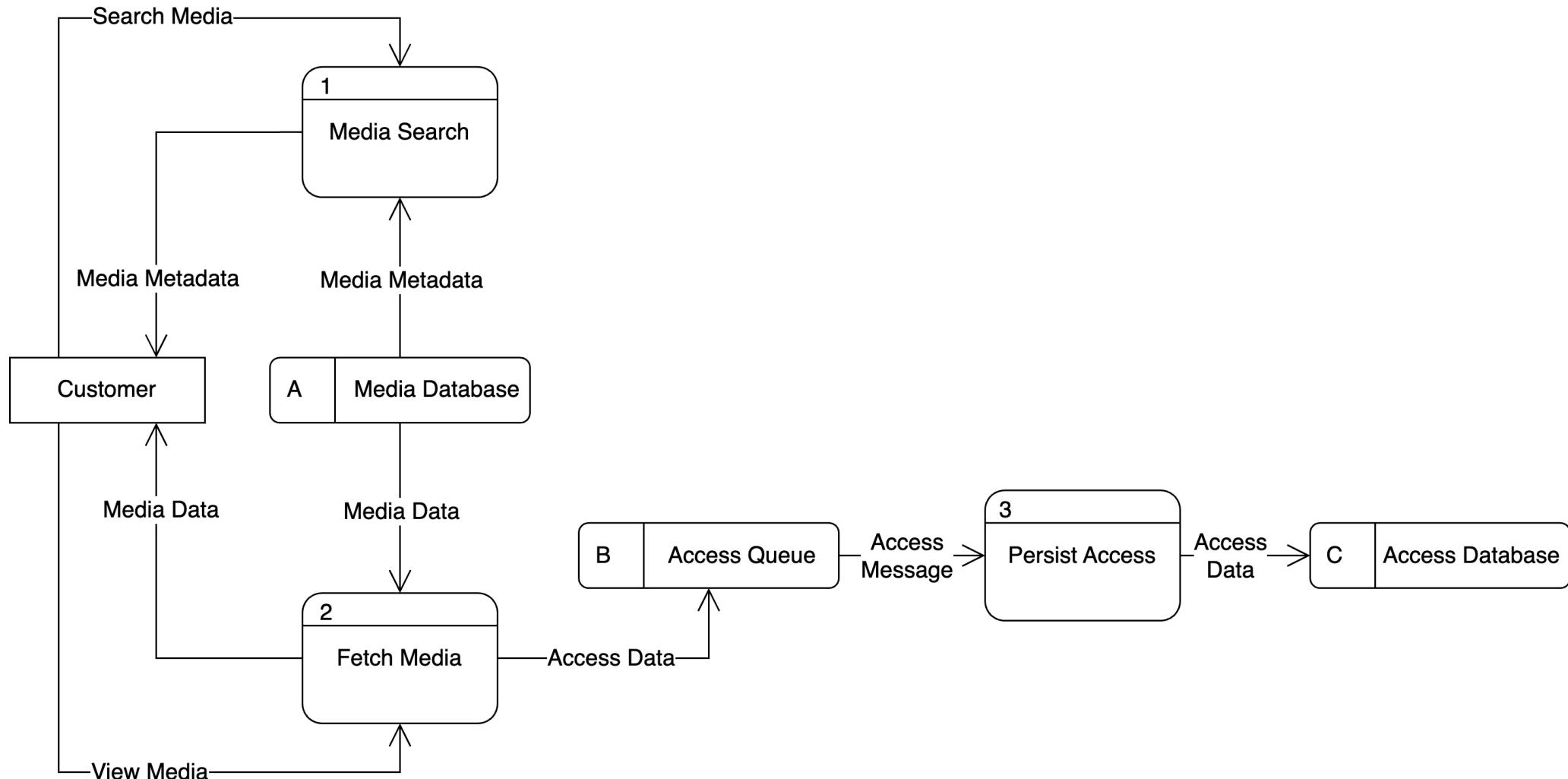
First impressions?



Polyglot Media

Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

Top Level DFD



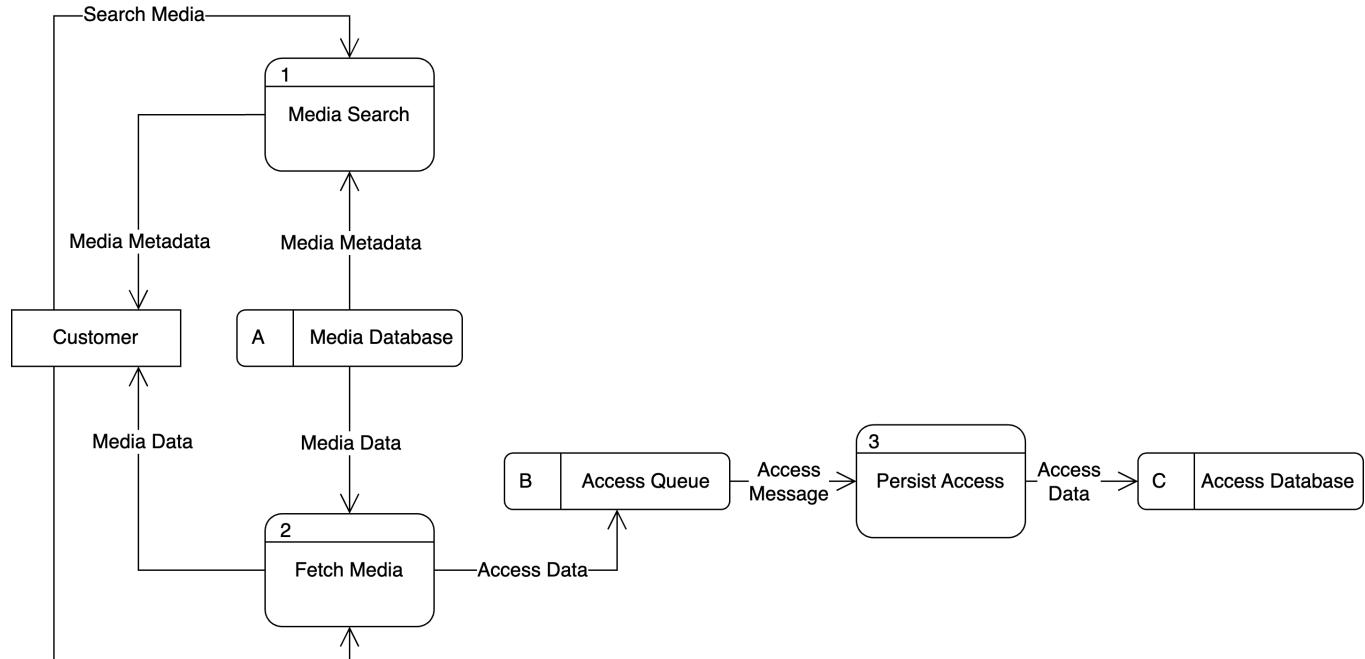
Polyglot Media

Data Flow Diagram: media search, view and access analytics

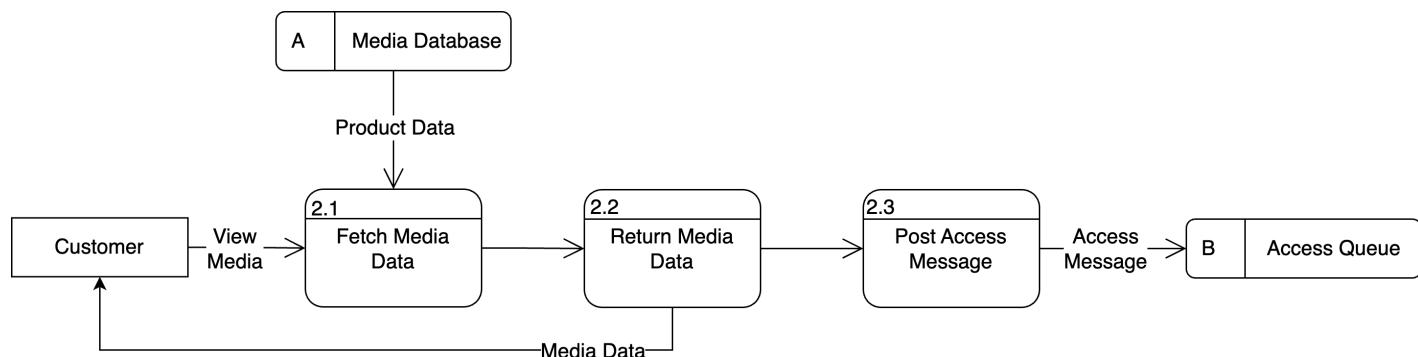


DFD Order

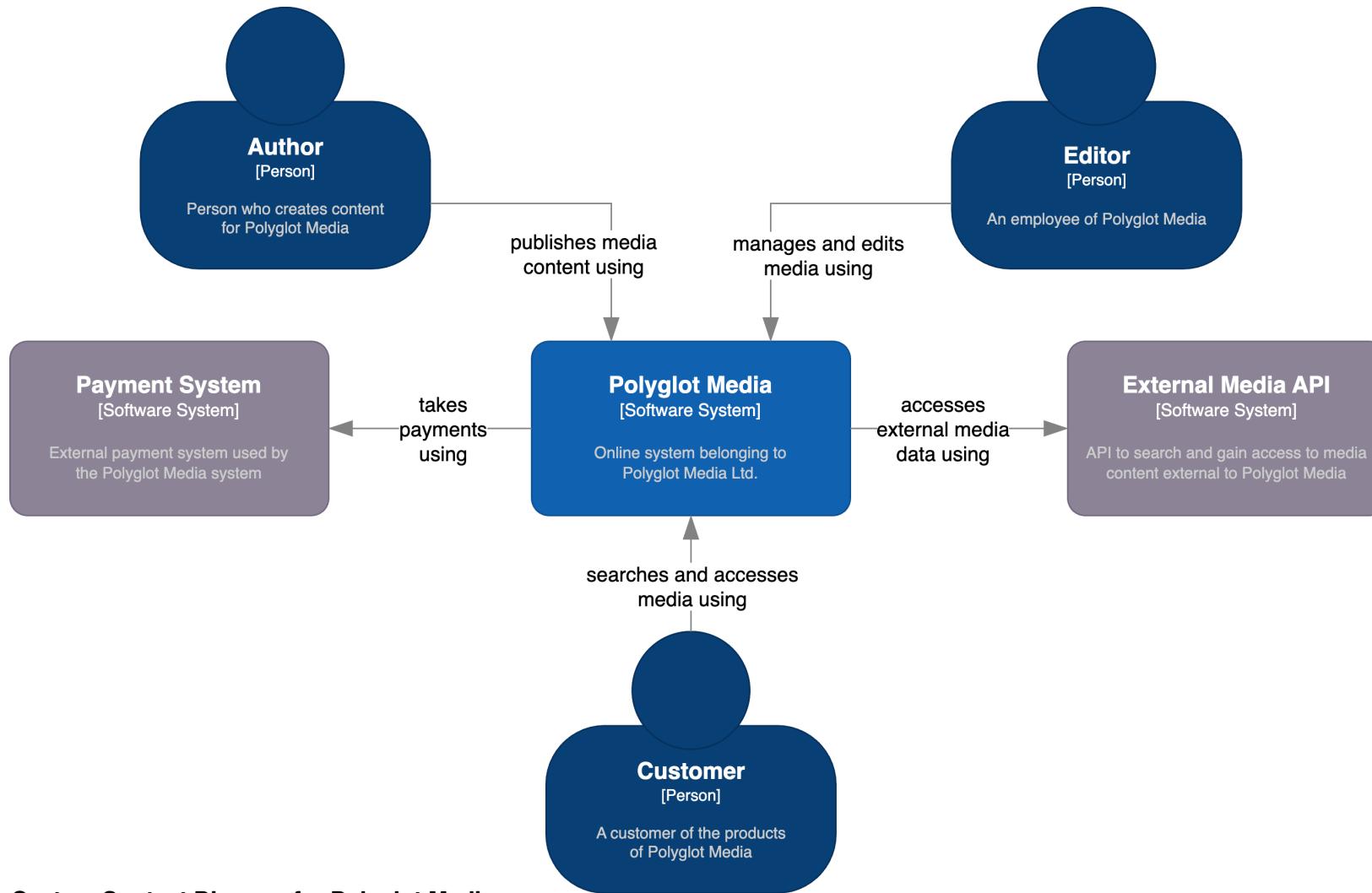
1



2



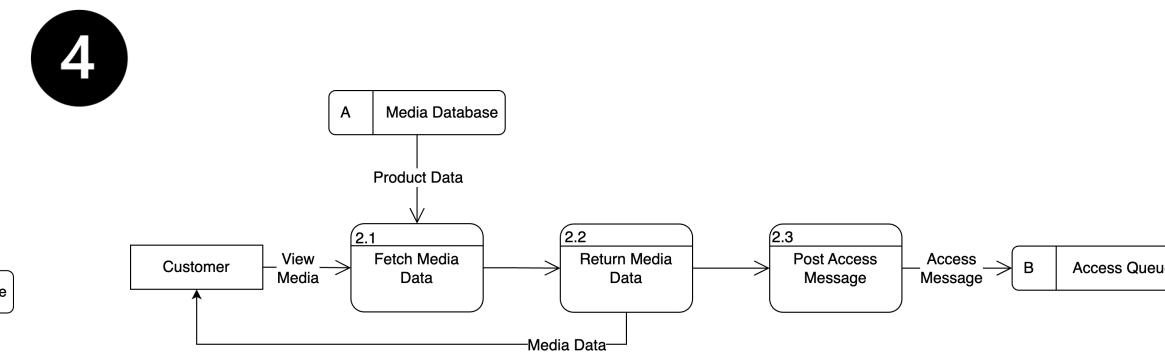
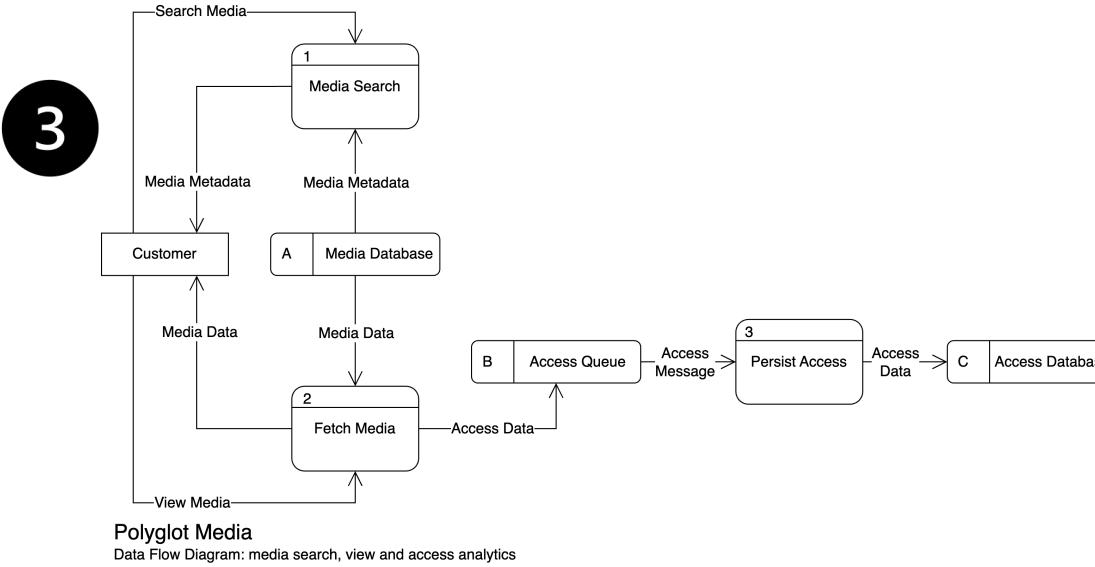
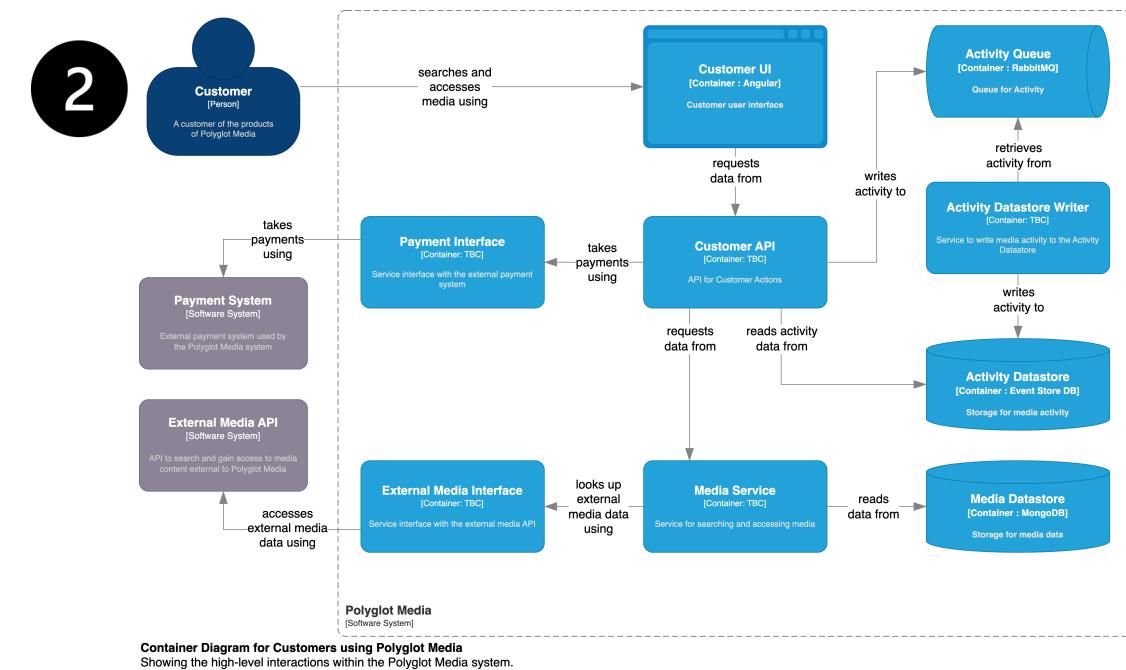
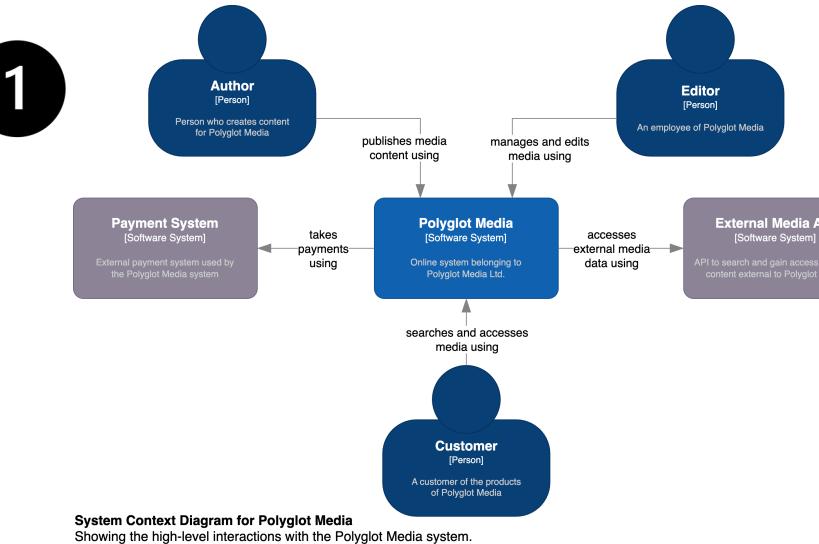
Context? Go for C4!



System Context Diagram for Polyglot Media

Showing the high-level interactions with the Polyglot Media system.

Create Narrative



Fill in the narrative gaps

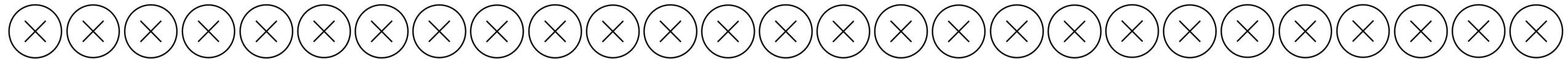
Notation

select the best standard to communicate successfully

Antipattern

Not-So-Unified Modelling Language

AKA: using UML when it's not useful



UML is useful

UML Diagram Types

Structural

Behavioural

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

Timing

Deployment

Object

Communication

Sequence

Package

Component

Usecase

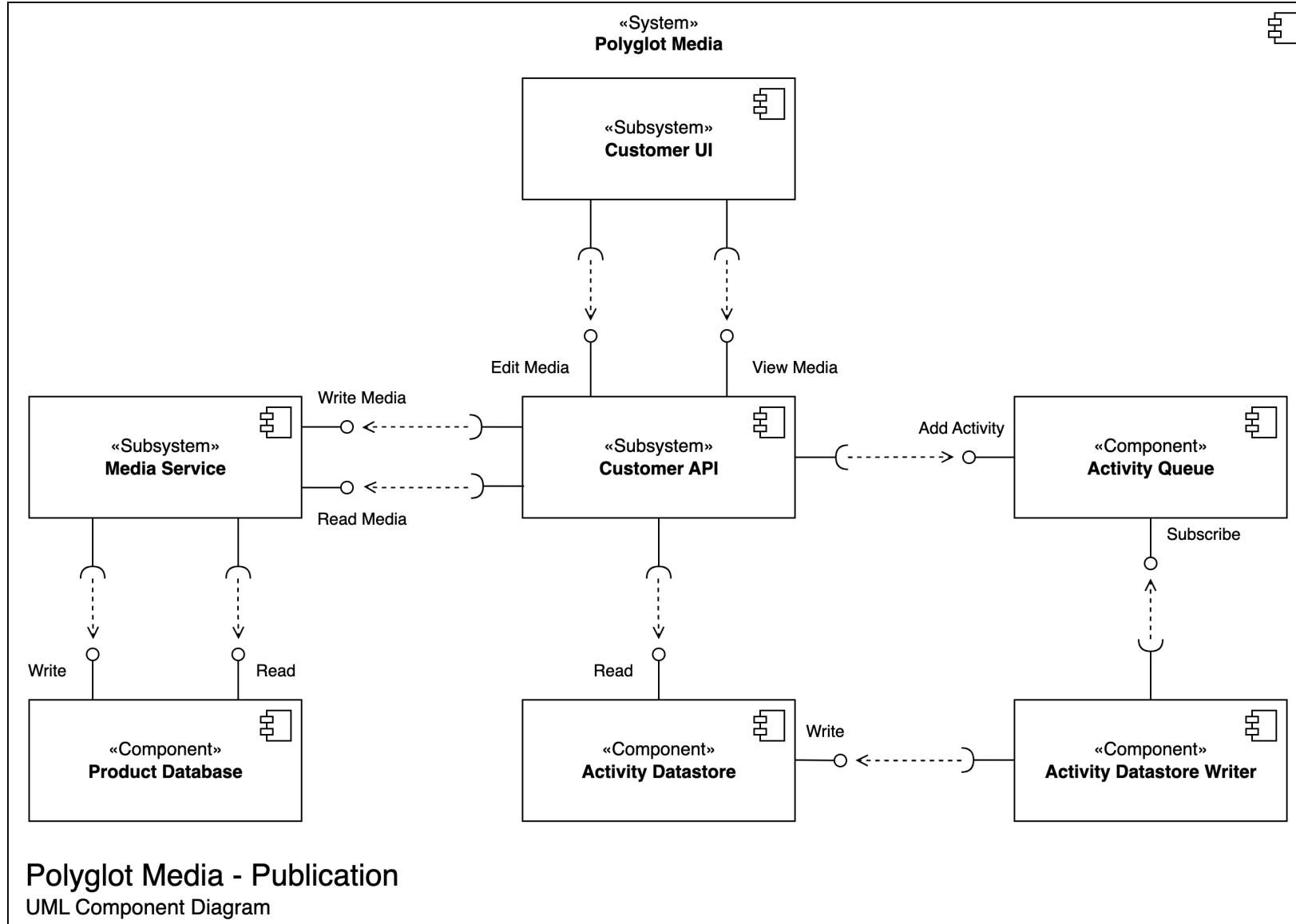
Activity

Composite
Structure

Interaction
Overview

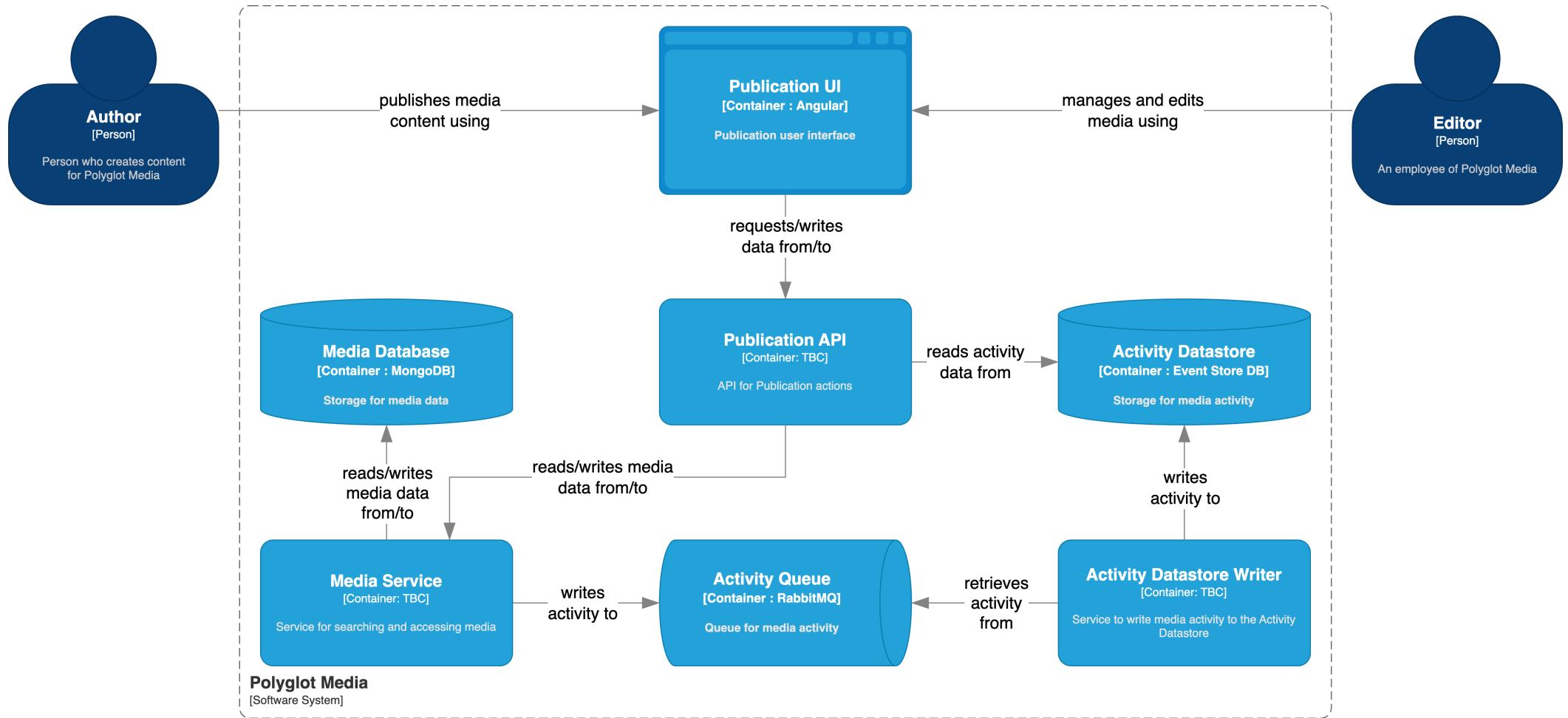
What does your audience need?

UML Component



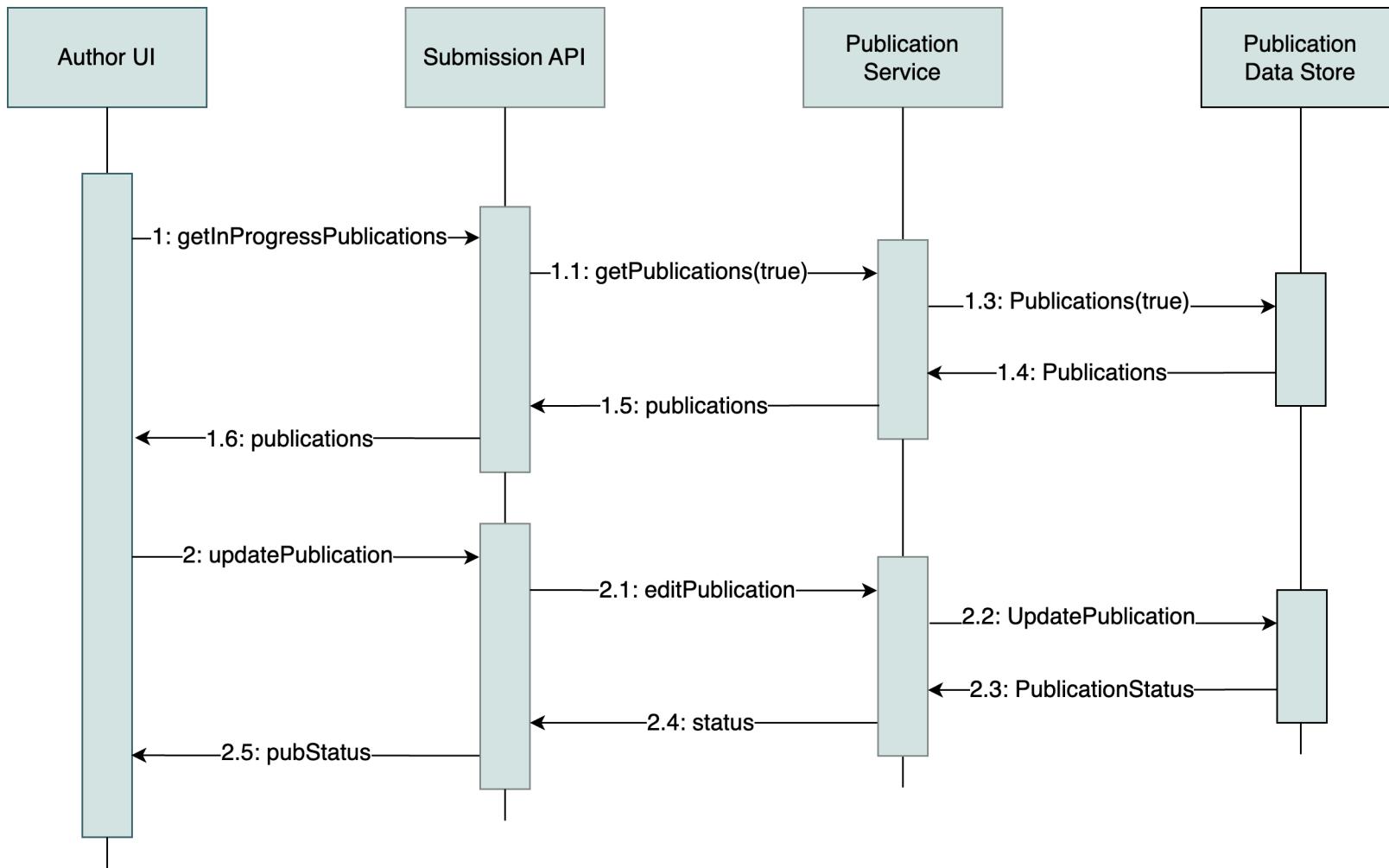
Keep it simple and
straightforward

C4 Container Diagram



Container Diagram for Publications in Polyglot Media
Showing the high-level interactions within the Polyglot Media system.

UML Sequence

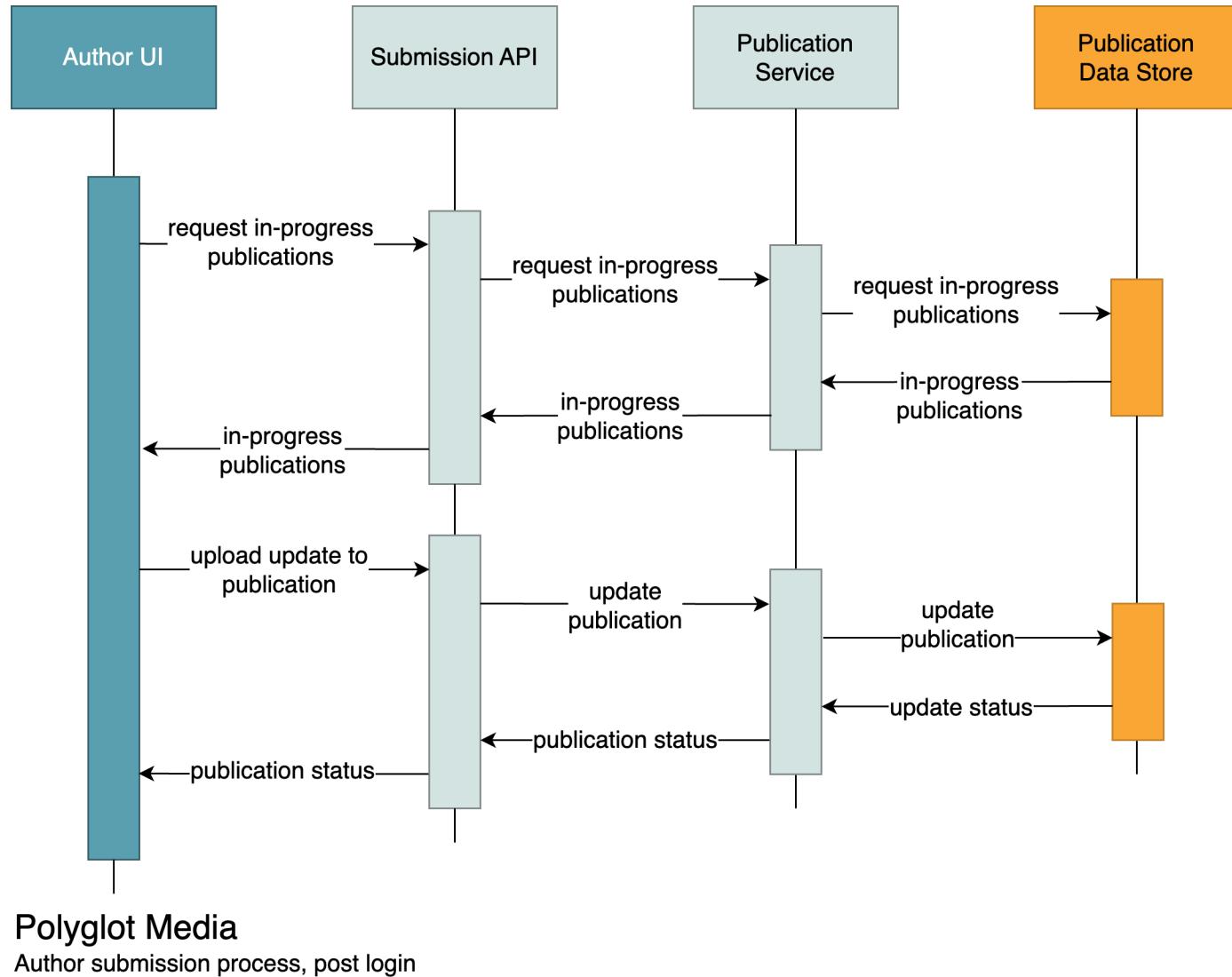


Polyglot Media

Author submission process, post login

How long until it is
out-of-date?

Simplified Sequence

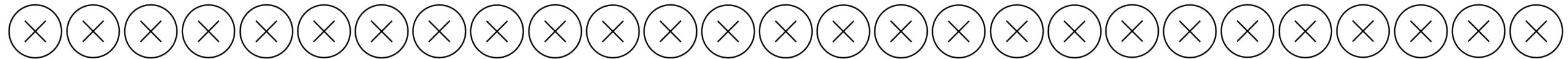


Use UML for good reason

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

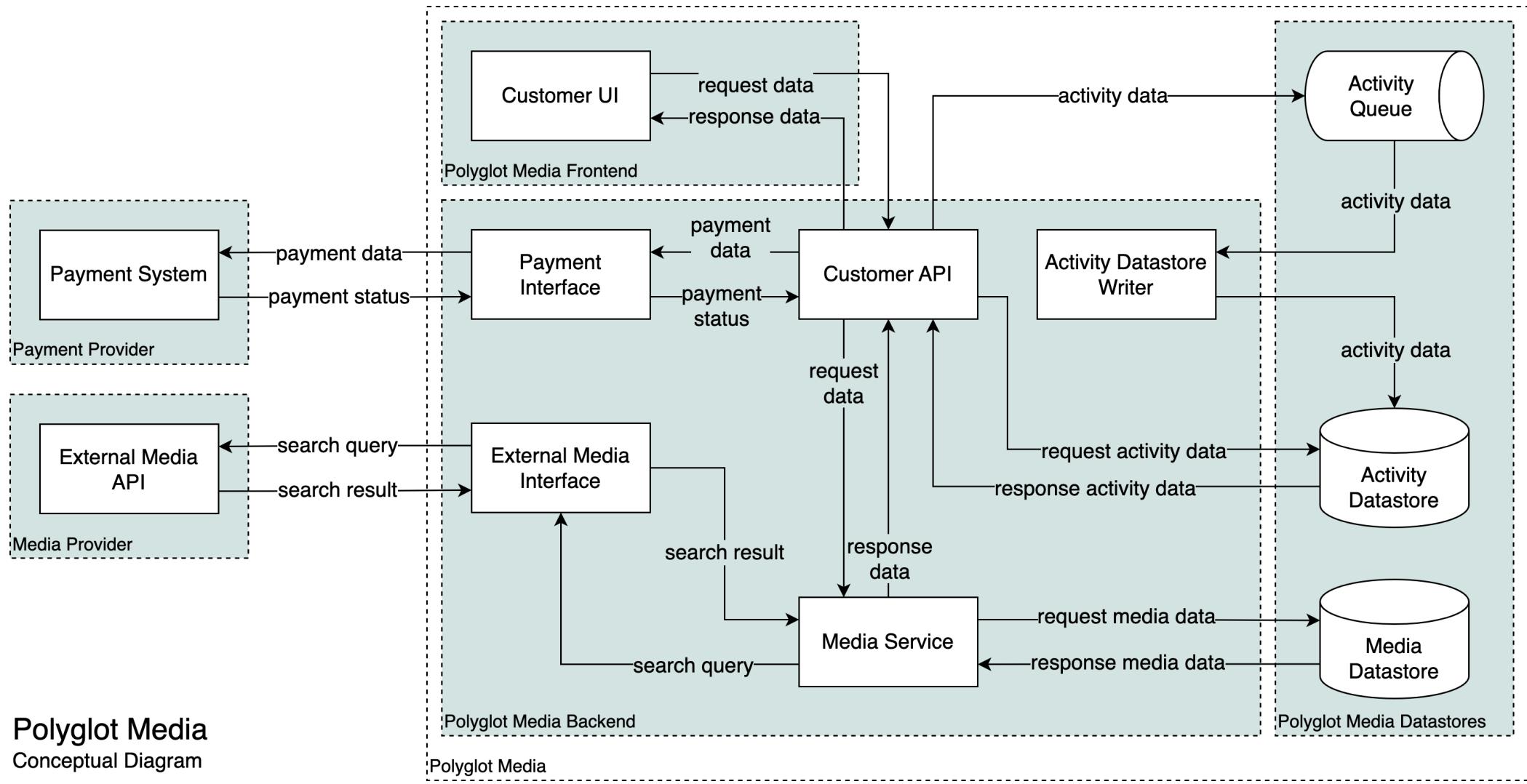
Activity

Composite
Structure

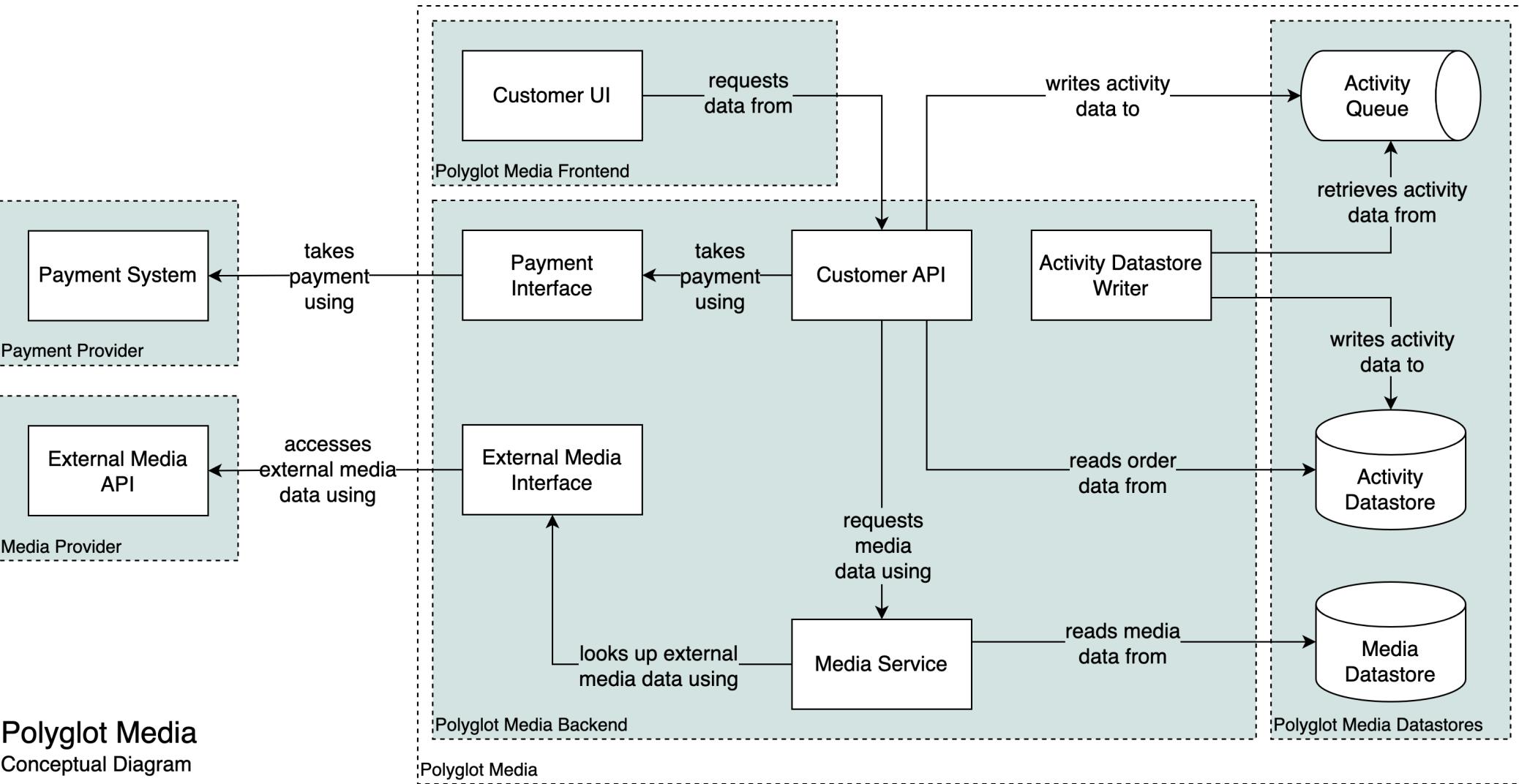
Interaction
Overview

Structure and behaviour in one diagram is confusing

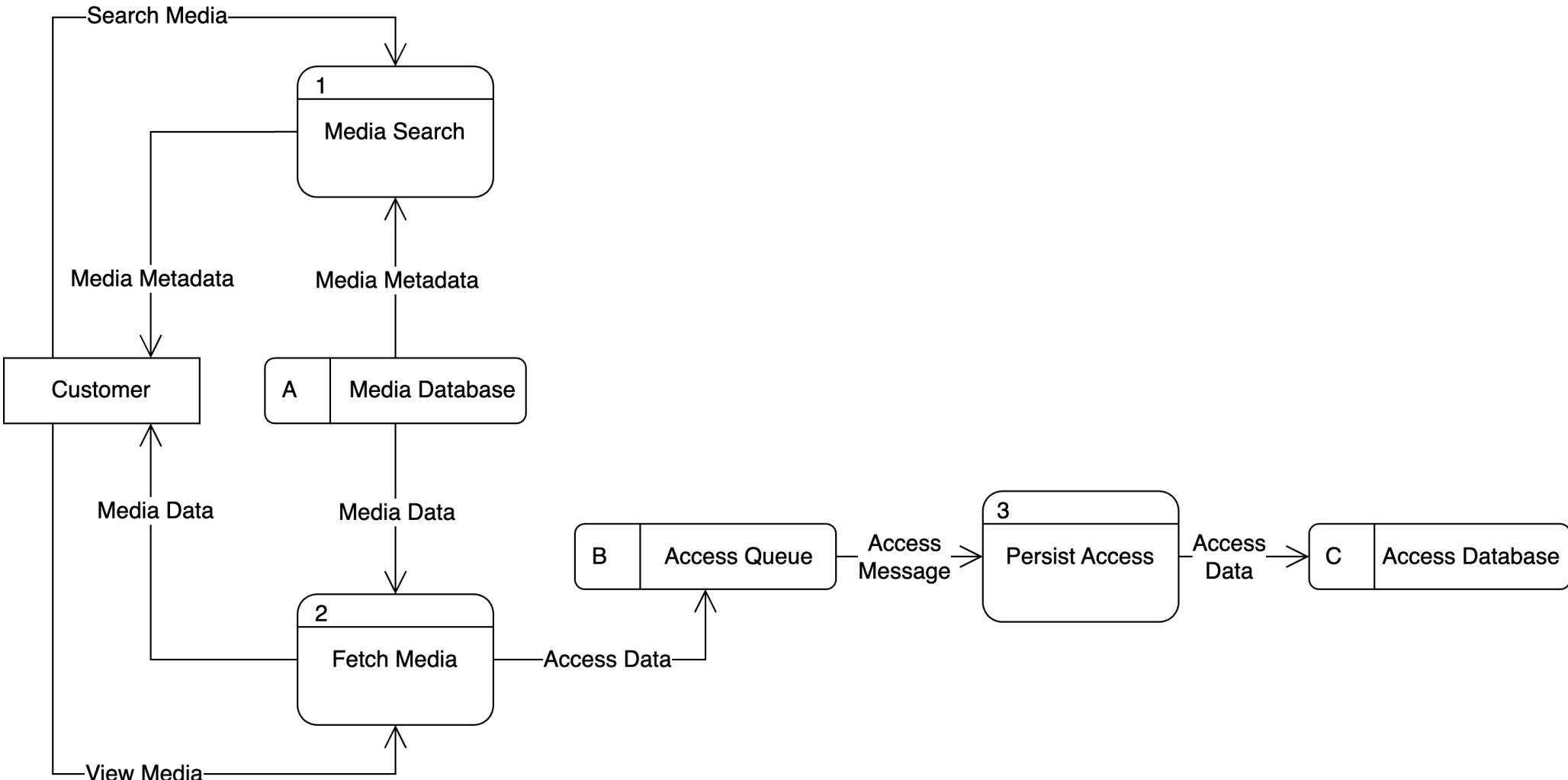
Mixed Messages



Structure



Behaviour



Polyglot Media

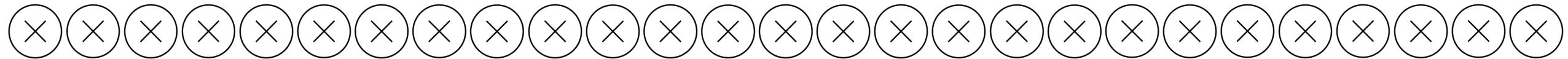
Data Flow Diagram: media search, view and access analytics

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

Common expectations

Direction

Colour



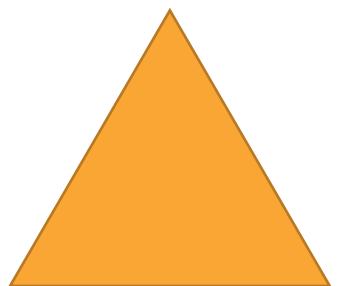
<https://www.flickr.com/photos/redoxkun/4981092520>

Common expectations

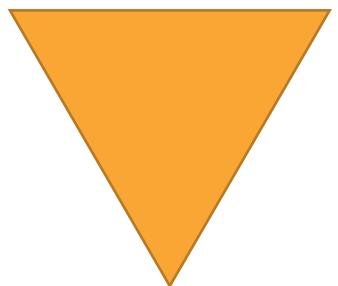
Direction

Colour

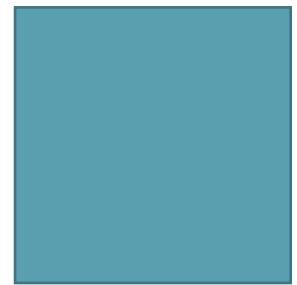
Shapes & Symbols



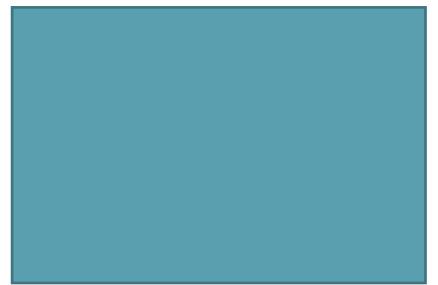
stability



instability



order



formality

Common expectations

Direction

Colour

Shapes & Symbols

Technology

have your justifications ready

Composition

arrange your visuals for ultimate clarity

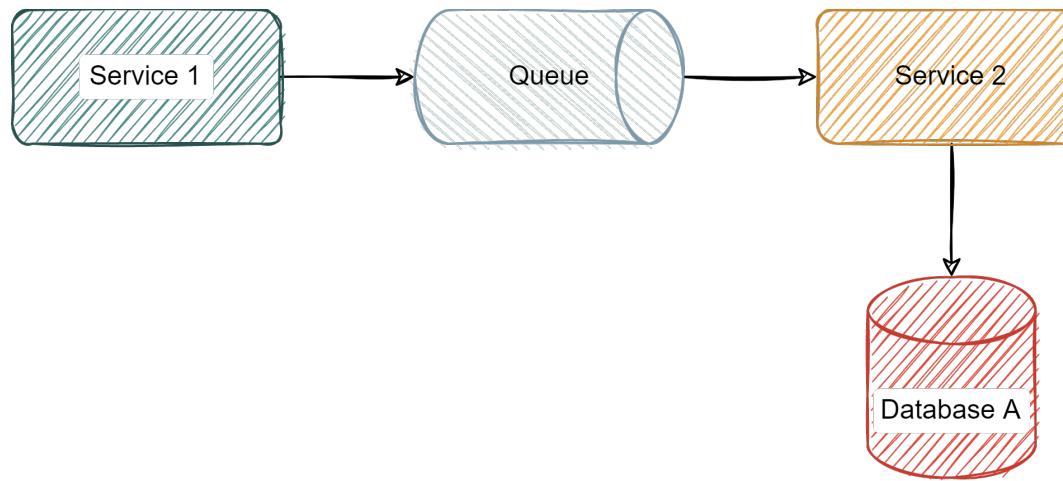
Pattern

Meta Style

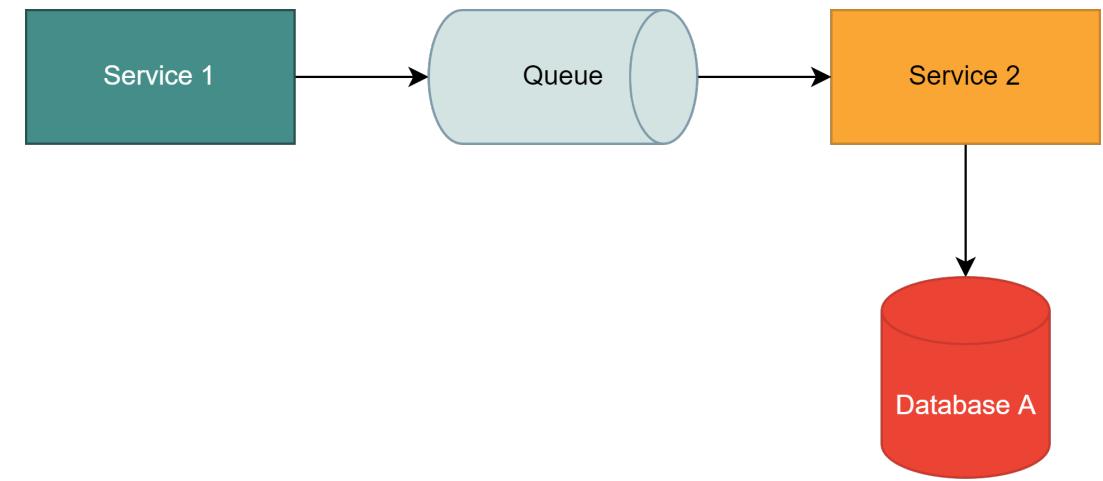
AKA: using style to communicate



Style Communicates



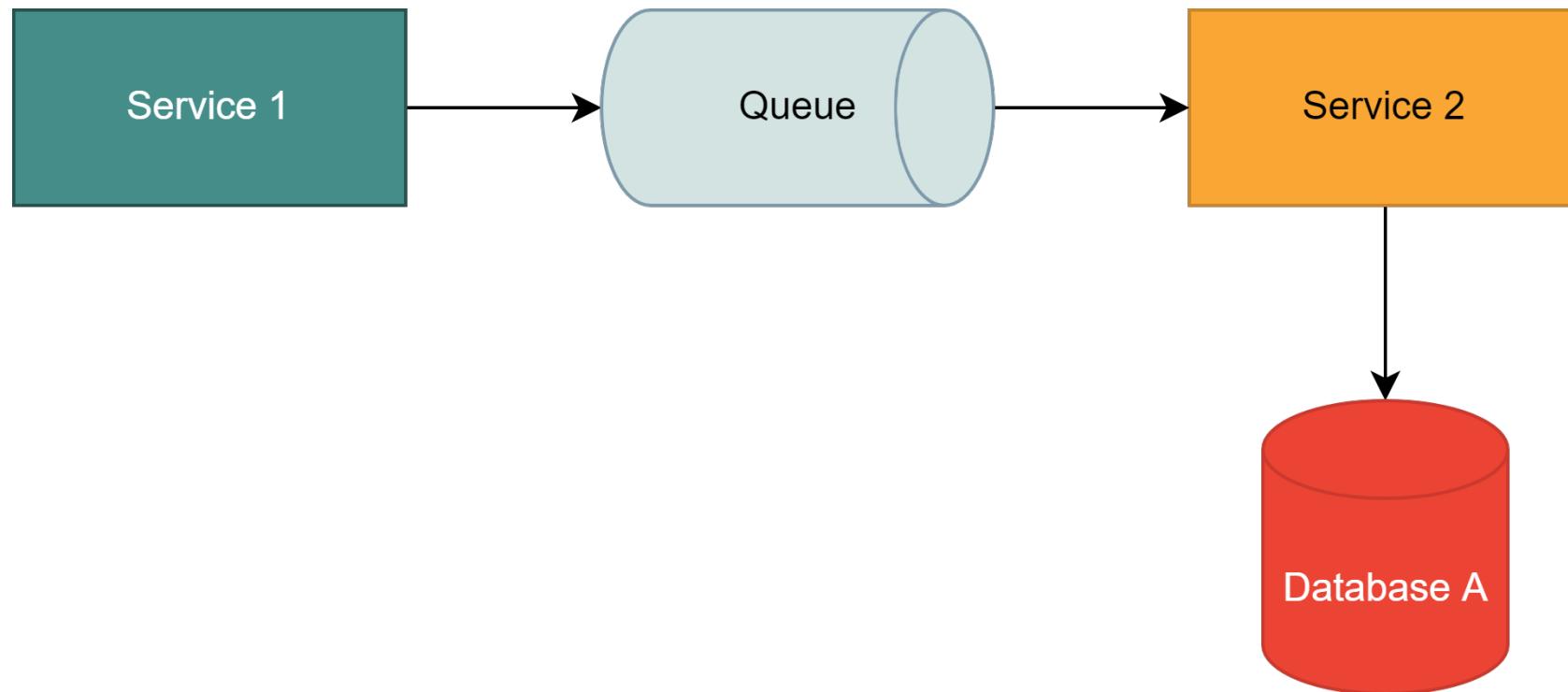
1



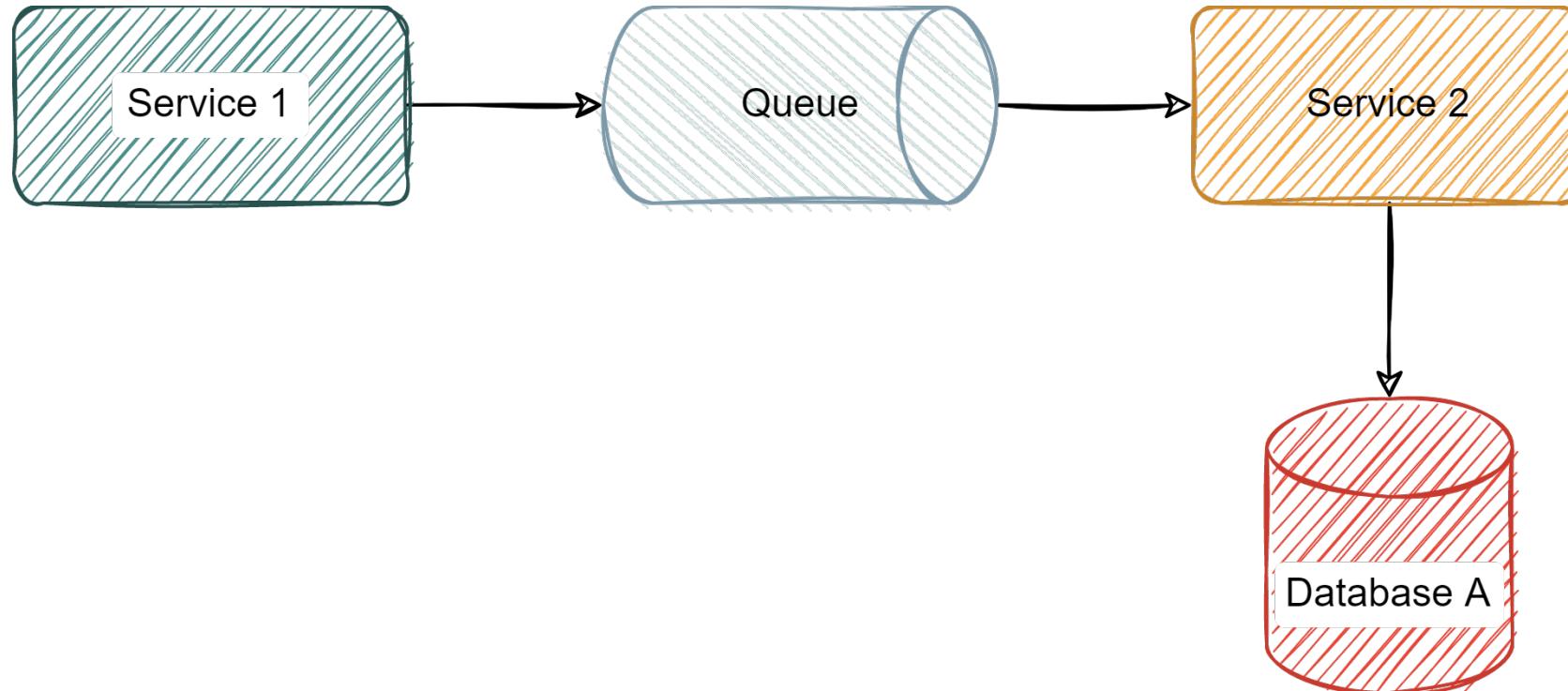
2

Use style to visually
communicate to your audience

Style Communicates



Style Communicates

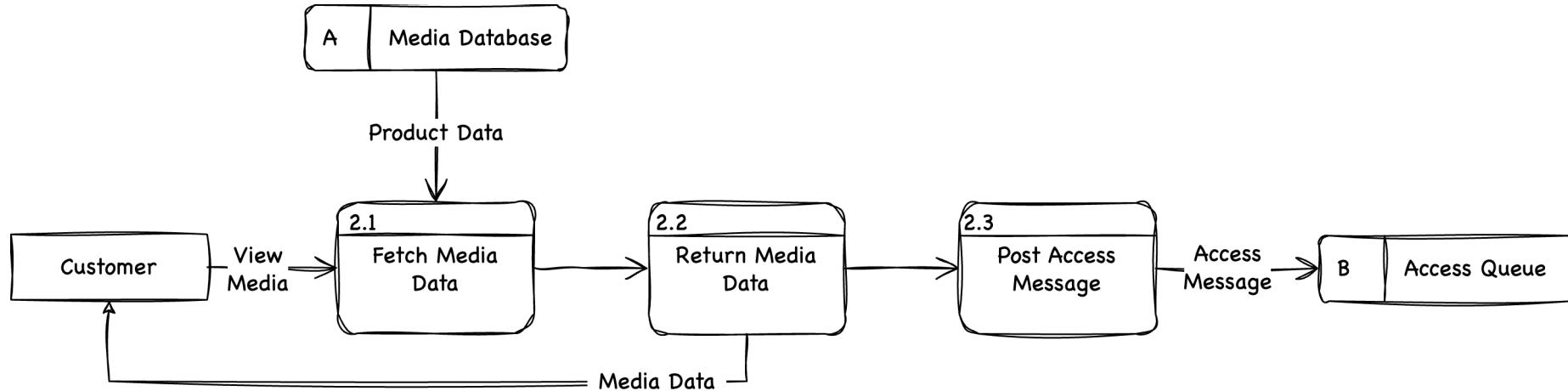


Use style to your advantage

Avoid miscommunication

Which style is correct?

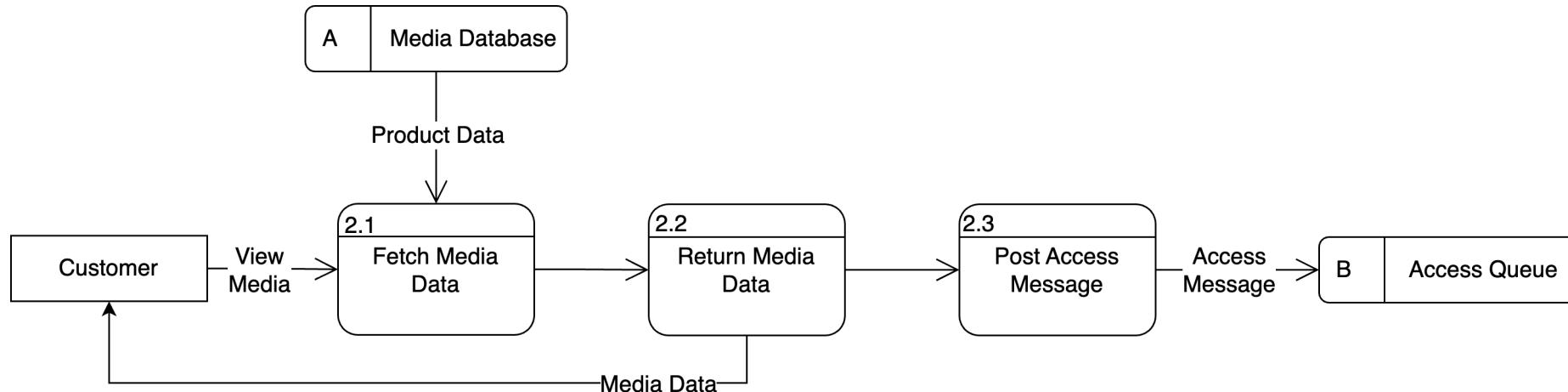
1



Polyglot Media

Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

2



Polyglot Media

Data Flow Diagram: media search, view and access analytics - 2. Fetch Media

Pattern

Strike a Balance

AKA: create a visual balance



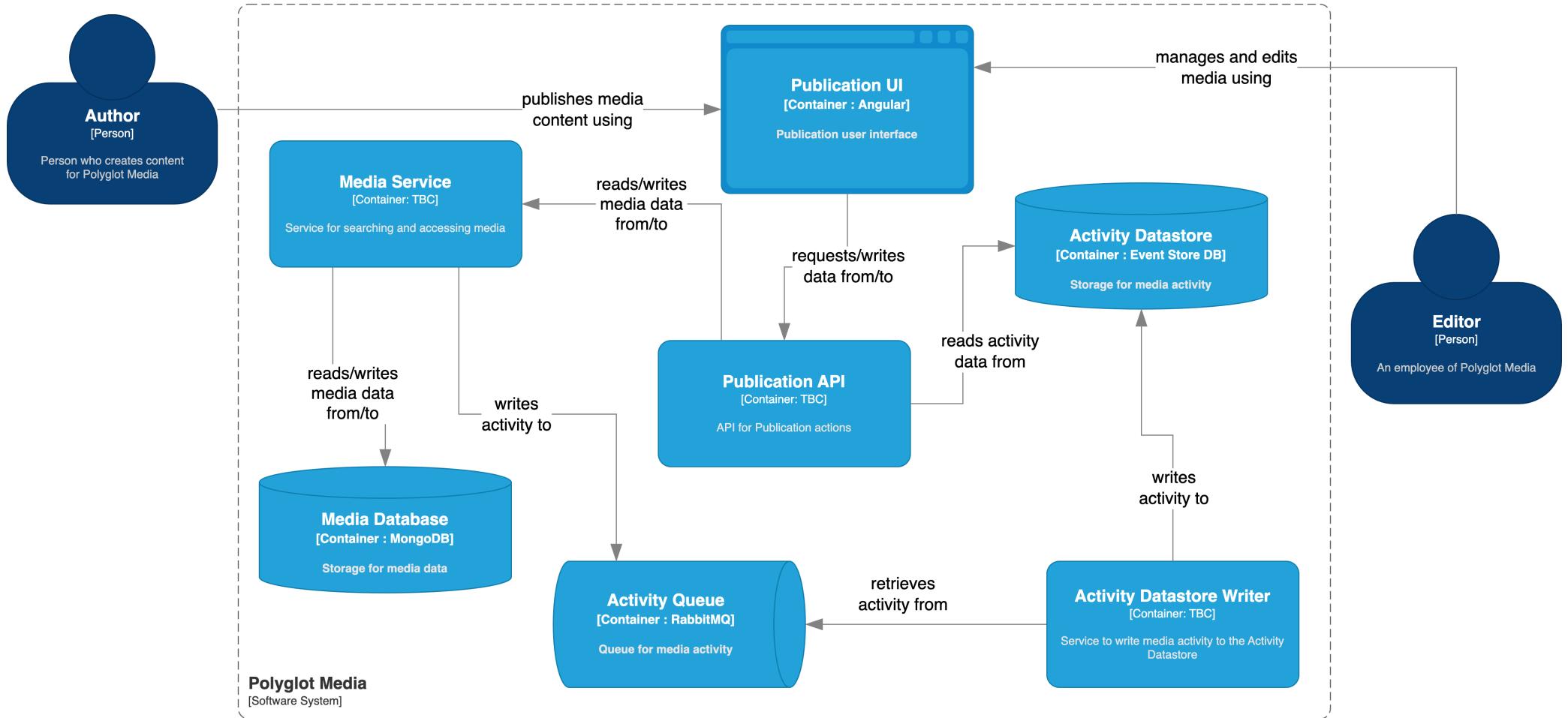


Balance is an innate,
fundamental human
expectation.

- Alvalyn Lundgren

Balance is not all about
symmetry

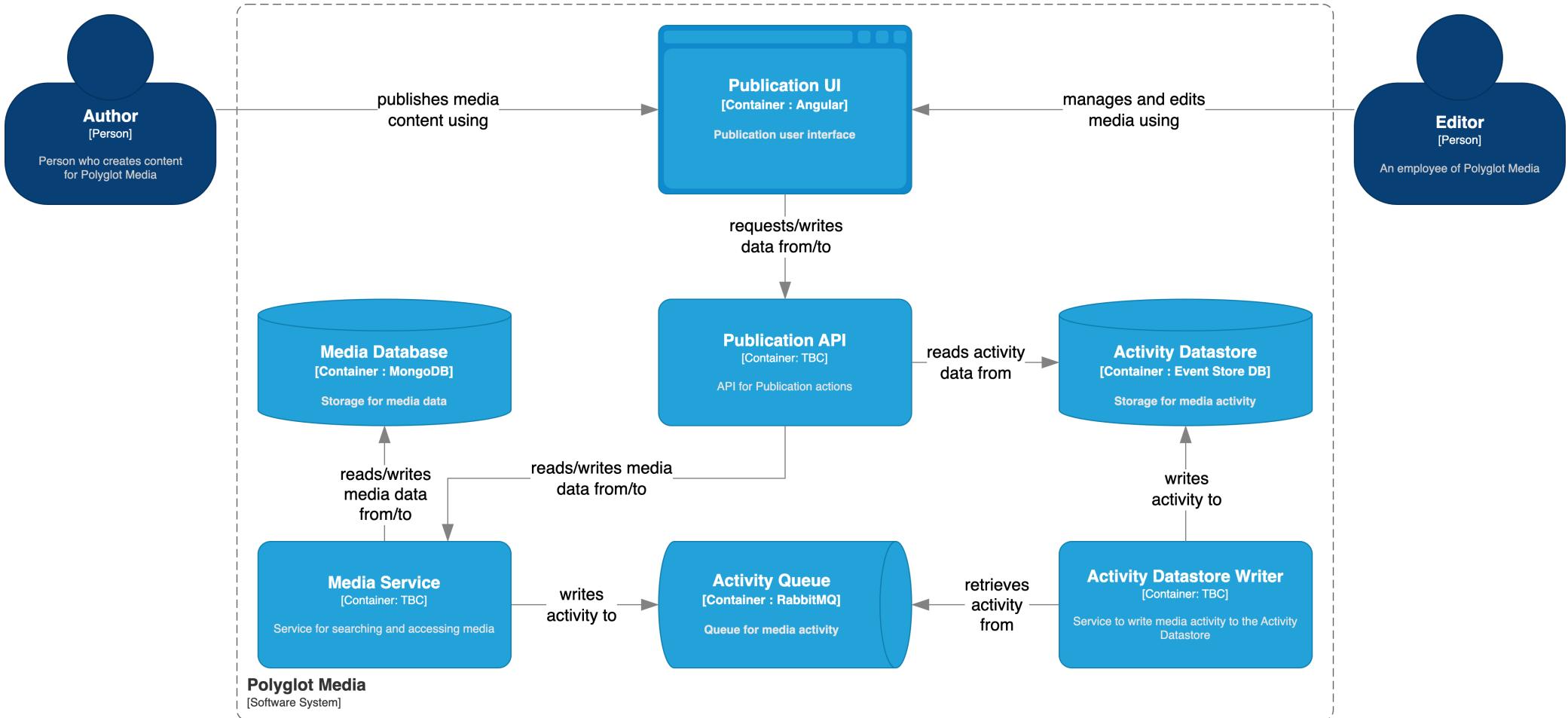
Unbalanced C4



Container Diagram for Publications in Polyglot Media

Showing the high-level interactions within the Polyglot Media system.

Satisfying C4



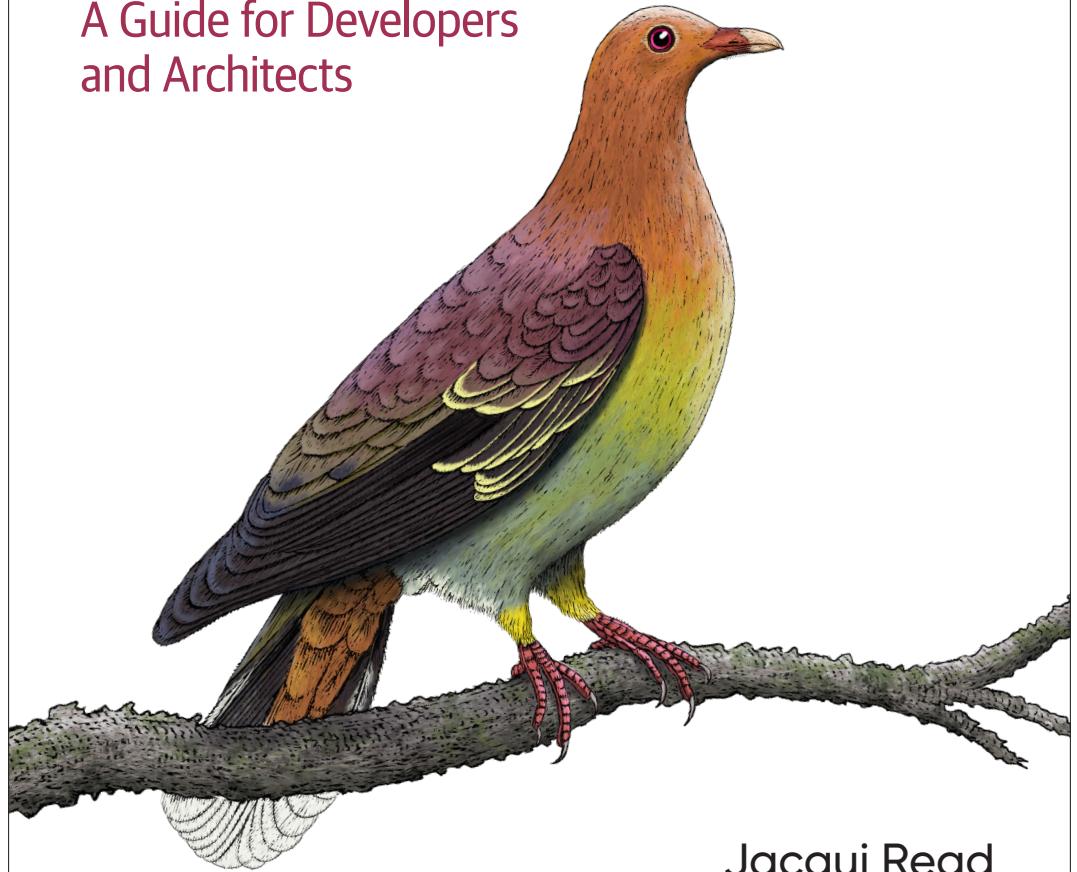
Don't sacrifice clarity for
balance

Use balance to enhance clarity

O'REILLY®

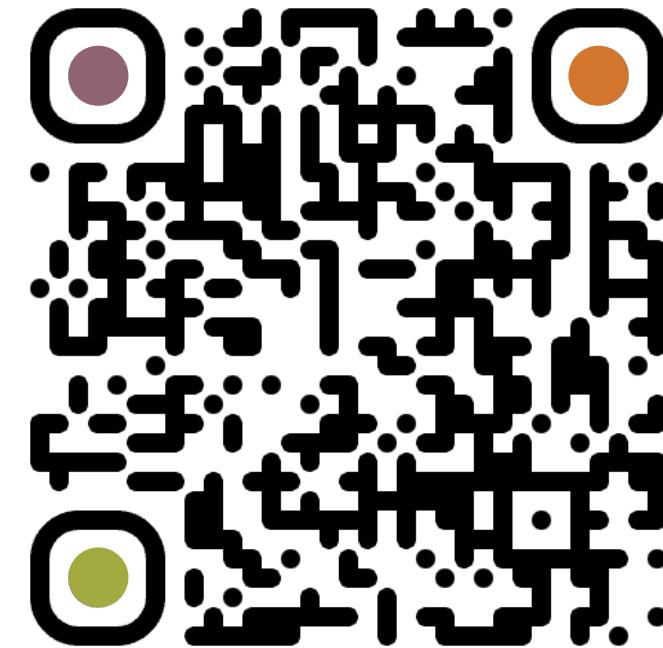
Communication Patterns

A Guide for Developers
and Architects

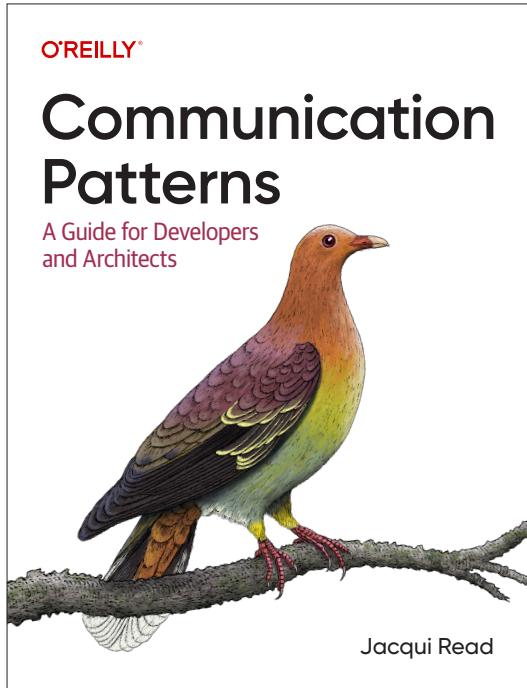


Jacqui Read

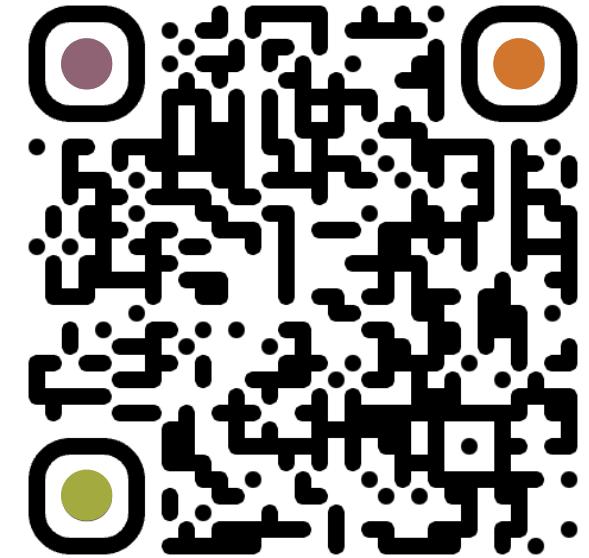
CommunicationPatternsBook.com



Thank you



CommunicationPatternsBook.com



Jacqui Read

Consultant Software Architect
Author of *Communication Patterns*



fosstodon.org/@tekiegirl



linkedin.com/in/jacquelineread



JacquiRead.com