Concern-Oriented Interfaces for Model-Based Reuse of APIs

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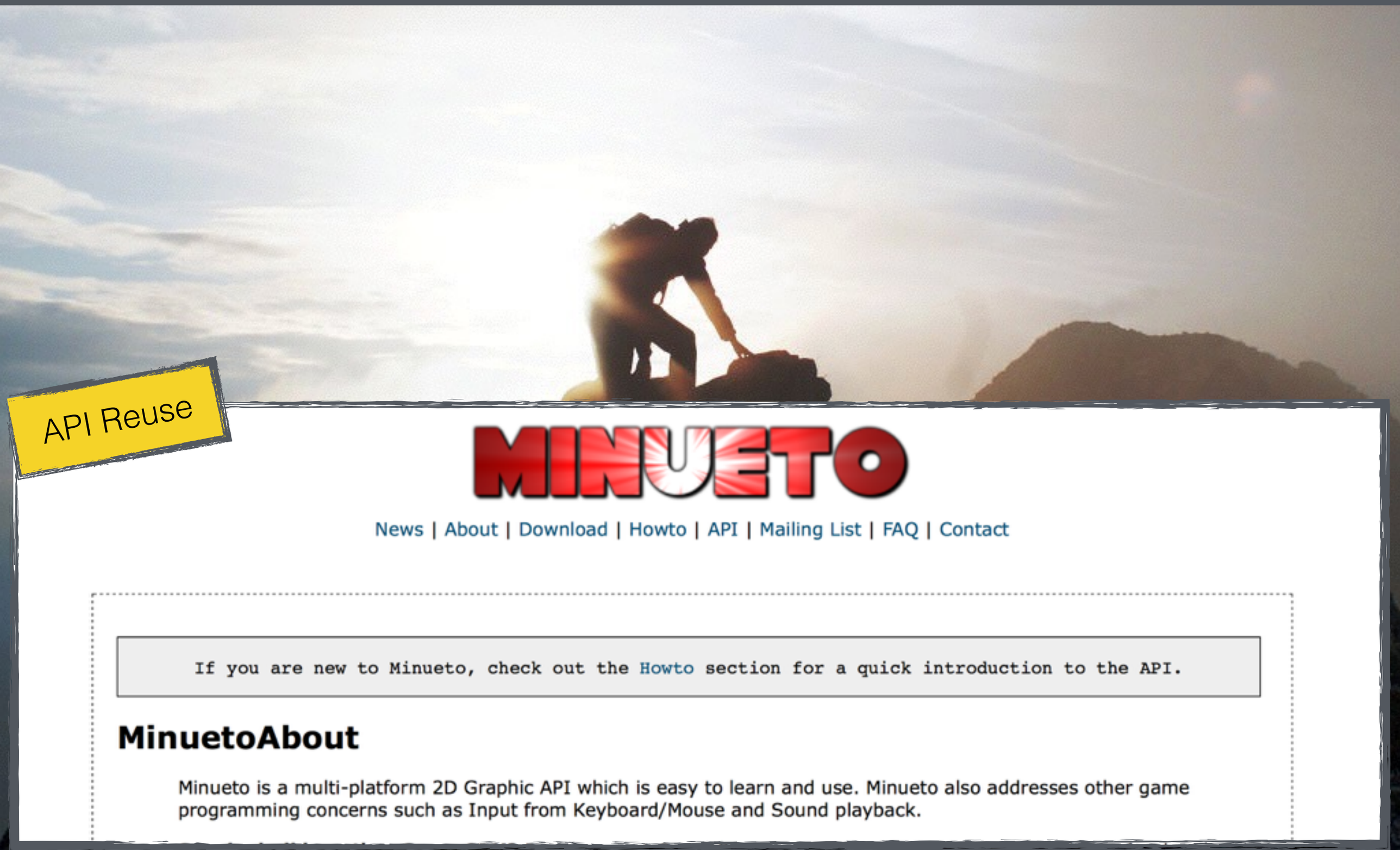
Jörg Kienzle

McGill University

API Reuse


API Reuse
MINUETO
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If you are new to Minueto, check out the Howto section for a quick introduction to the API.
MinuetoAbout
Minueto is a multi-platform 2D Graphic API which is easy to learn and use. Minueto also addresses other game programming concerns such as Input from Keyboard/Mouse and Sound playback.

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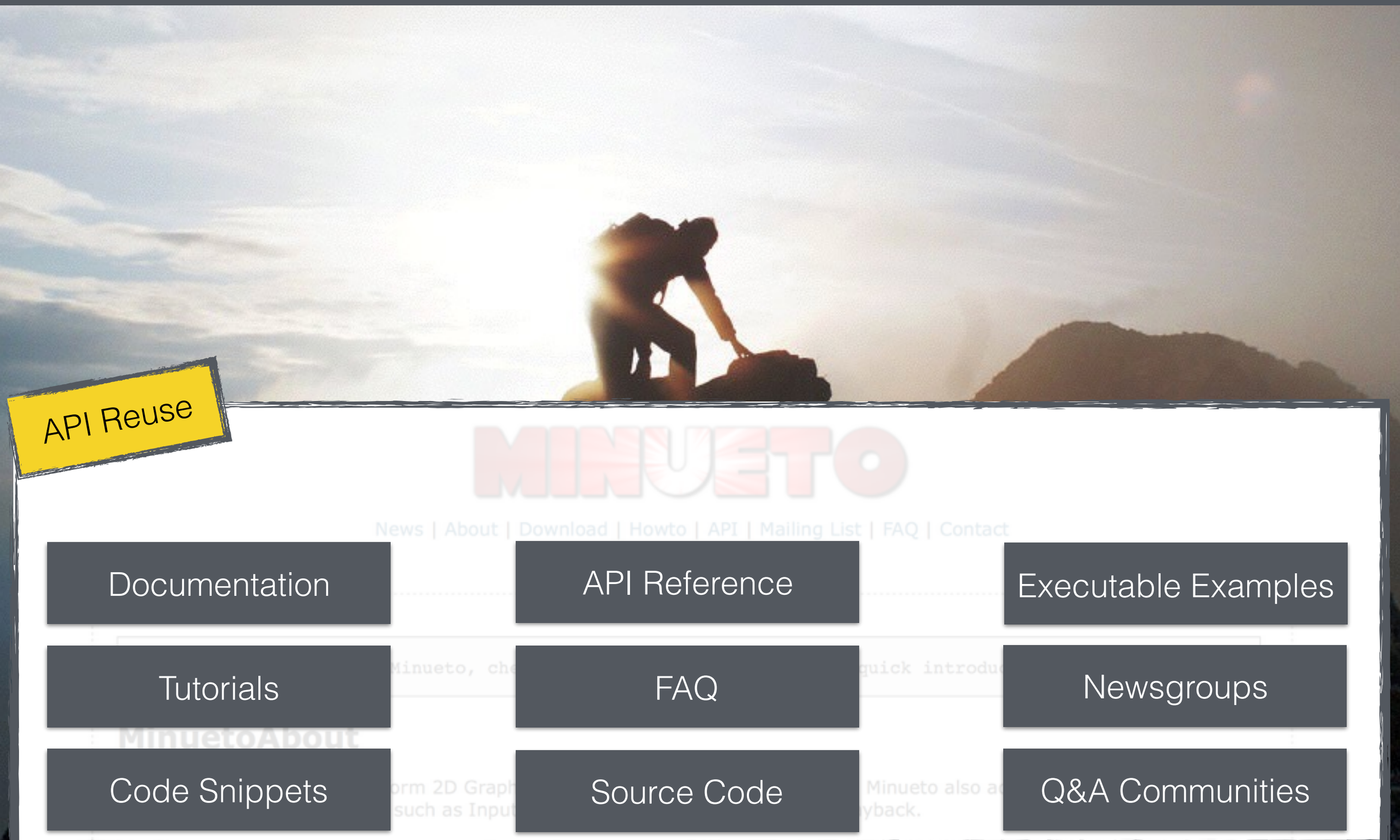
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API Reference
Executable Examples
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Code Snippets
Source Code
Q&A Communities

API Reuse

API Reuse

"(re)use is not free"

API Reuse

API Reuse

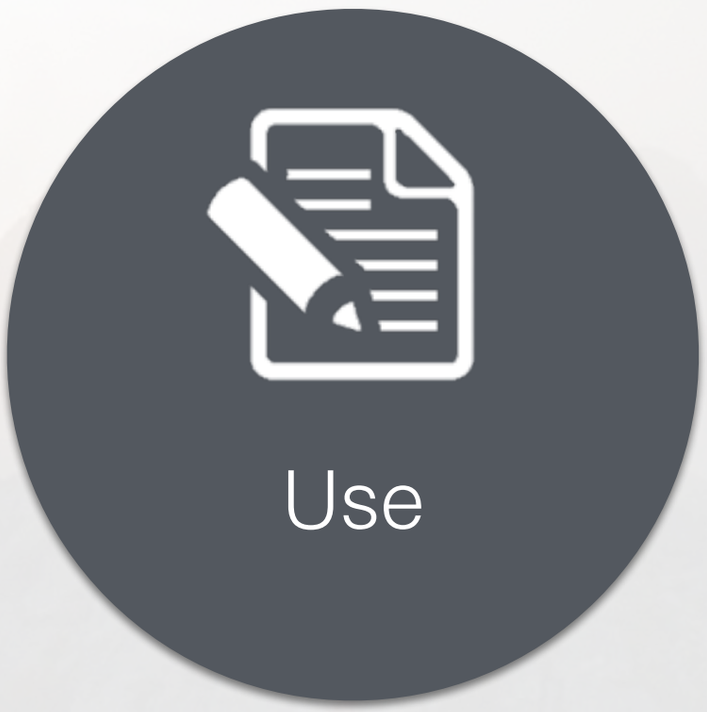
Understand

Adapt

API Reuse

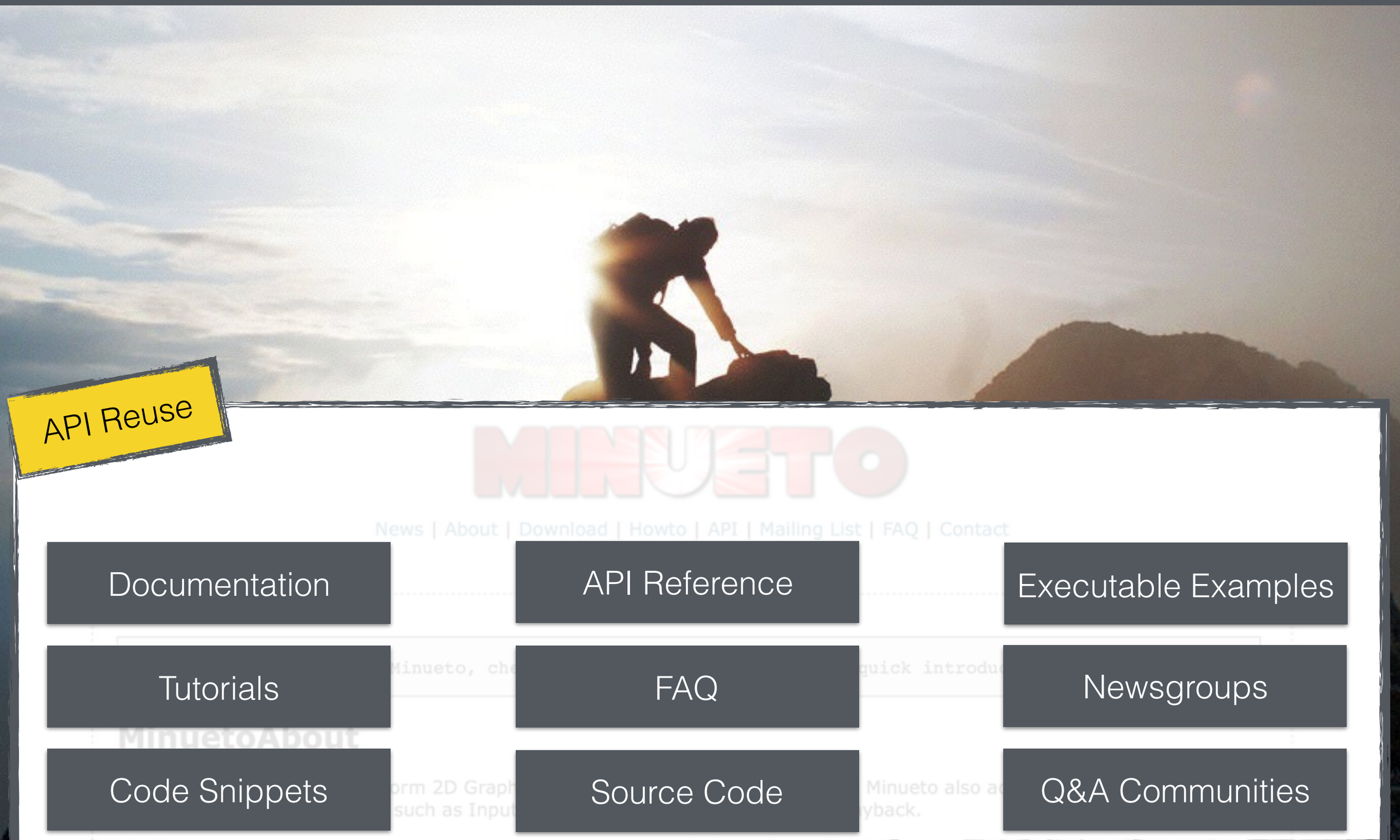
Understand

Adapt



Use

API Reuse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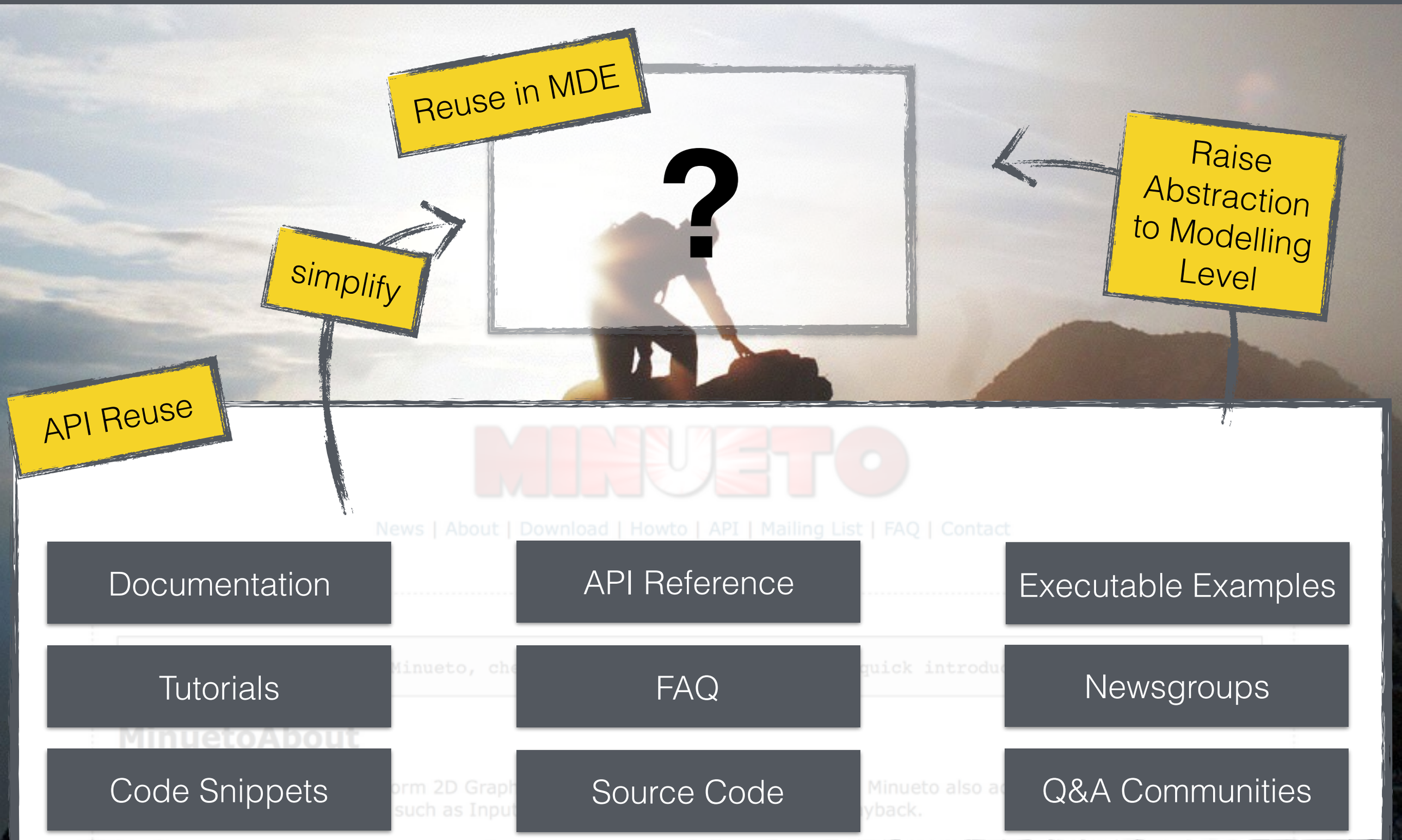
Reuse in MDE
?
simplify
Raise Abstraction to Modelling Level
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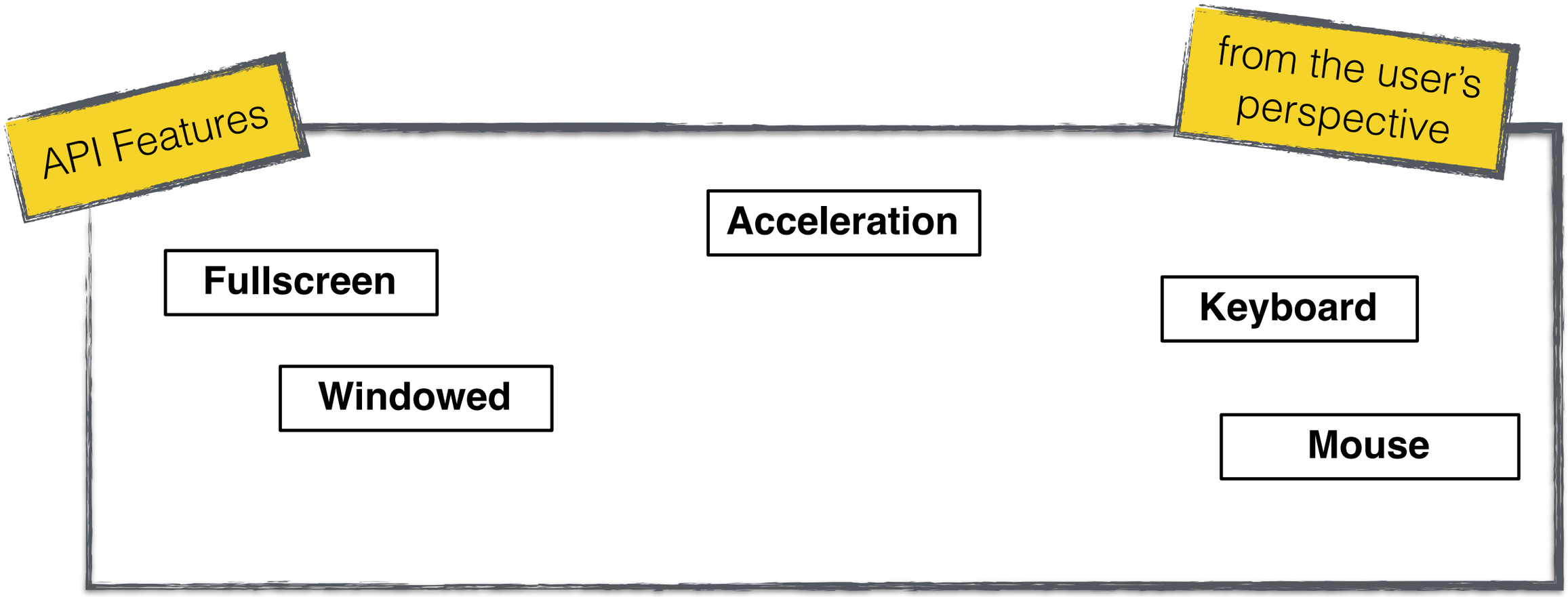
Reuse Vision in MDE

Reuse Vision in MDE



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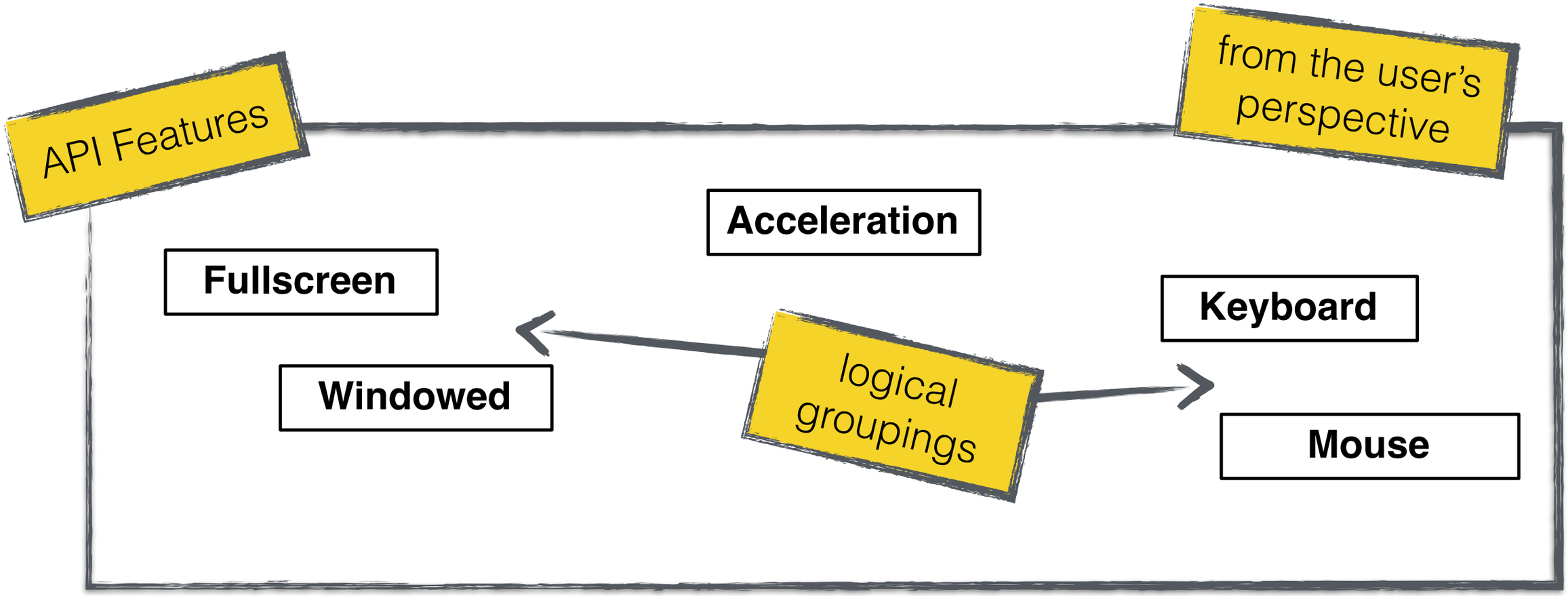

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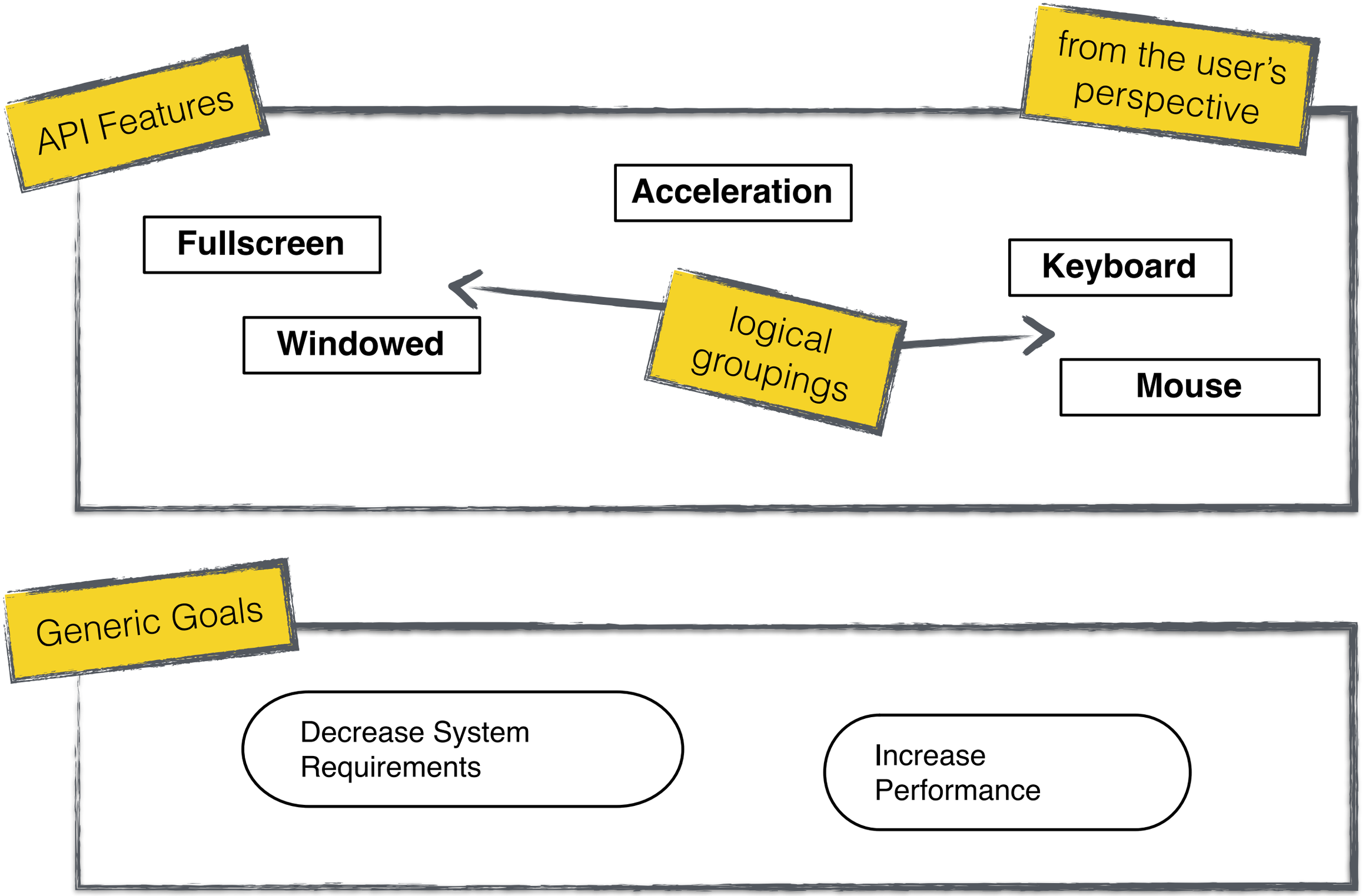

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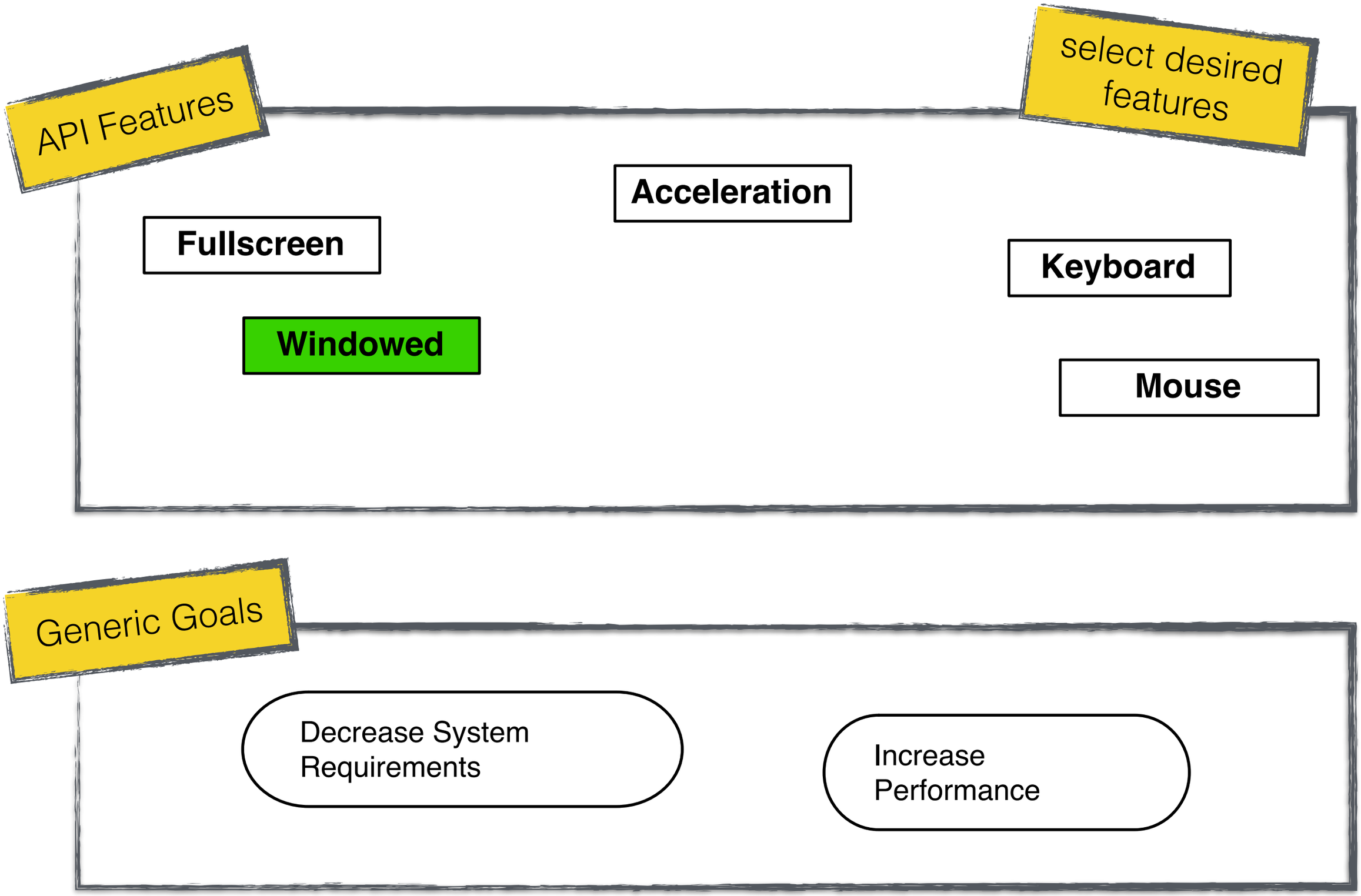


Reuse Vision in MDE

API Features

select desired features

Acceleration

Fullscreen

Keyboard

Windowed

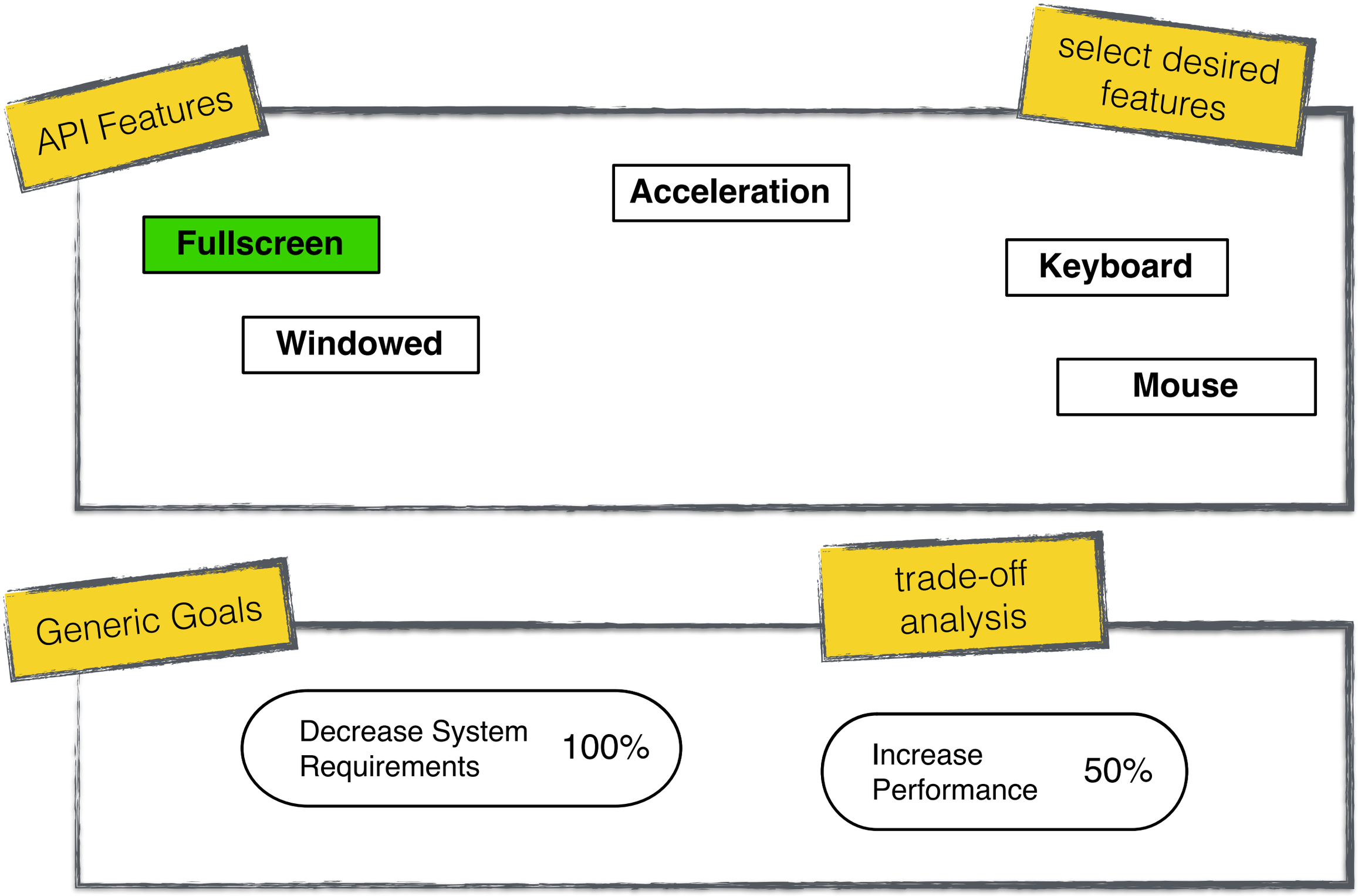
Mouse

Generic Goals

Decrease System Requirements 100%

Increase Performance 50%

Reuse Vision in MDE



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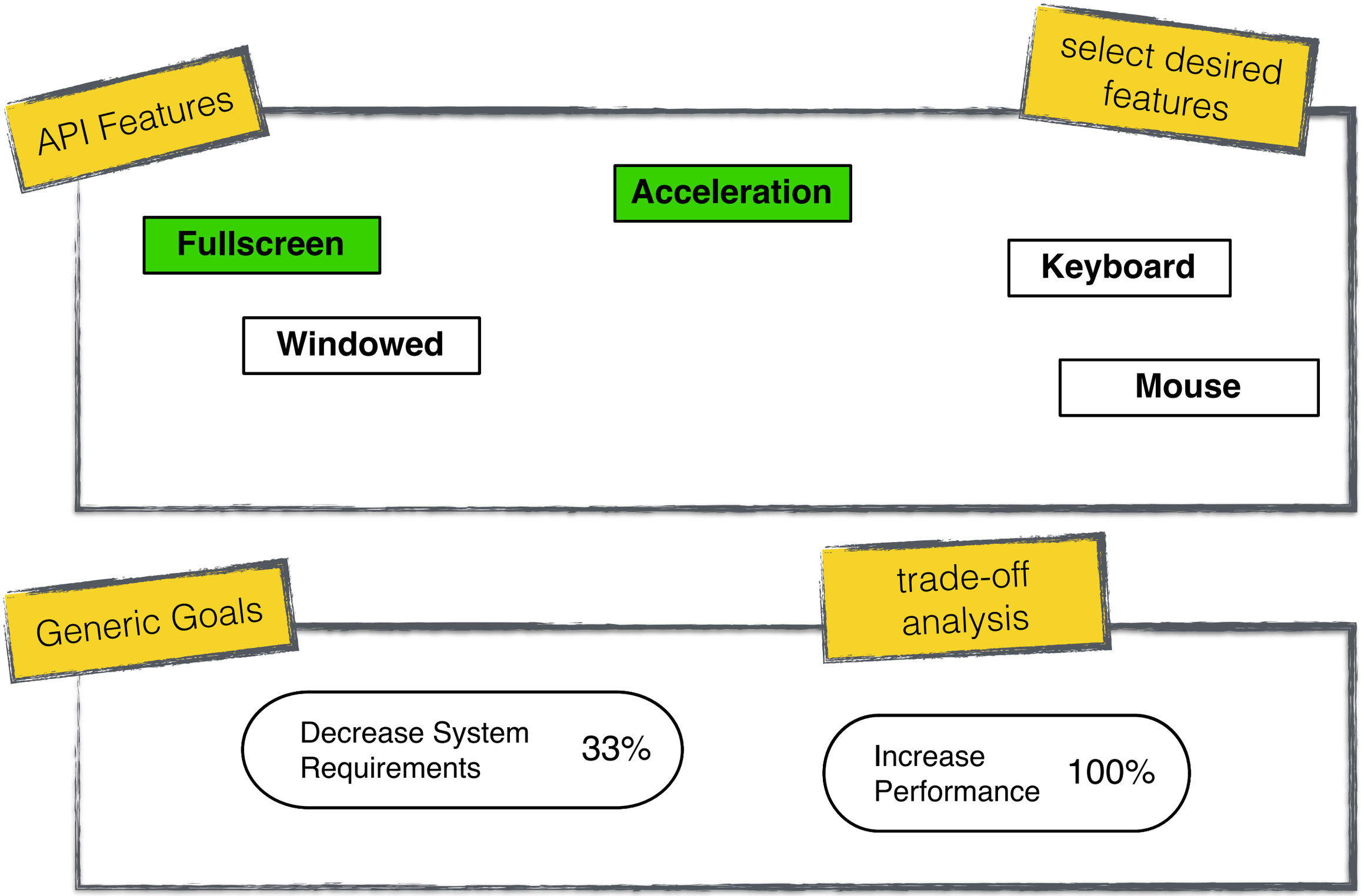
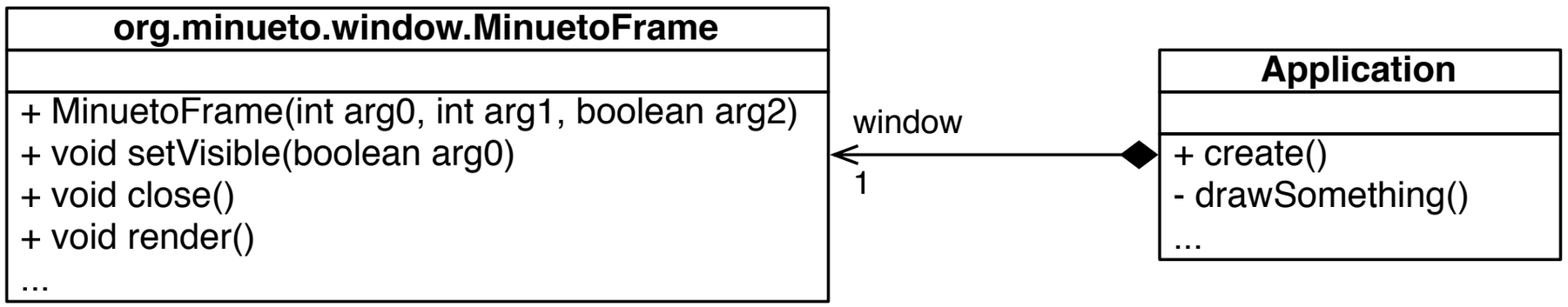


Reuse Vision in MDE

use API in design models

Reuse Vision in MDE

Structure



use API in design models

Reuse Vision in MDE

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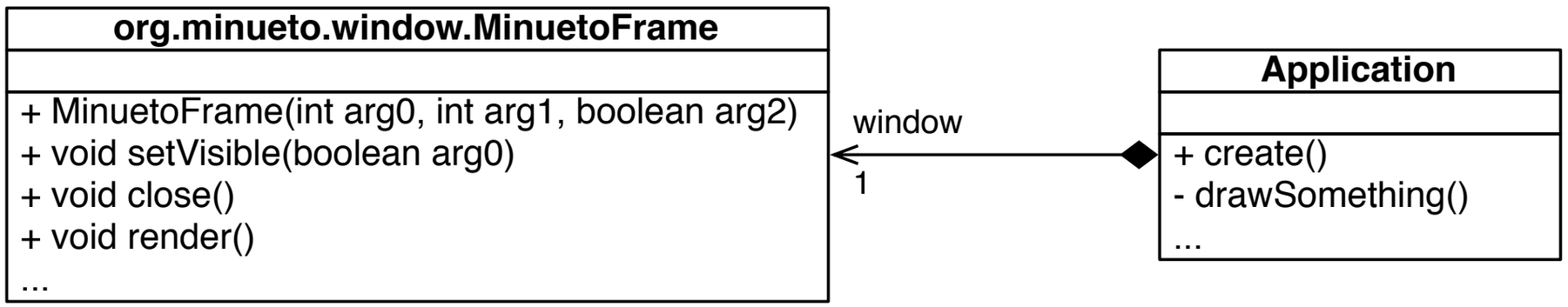
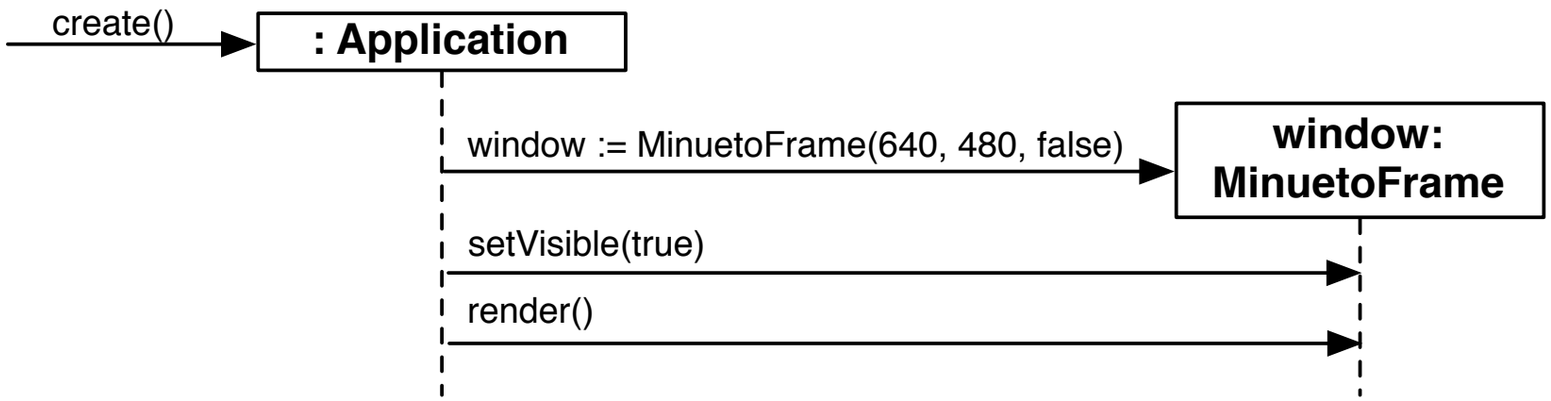


use API in design models

Behaviour



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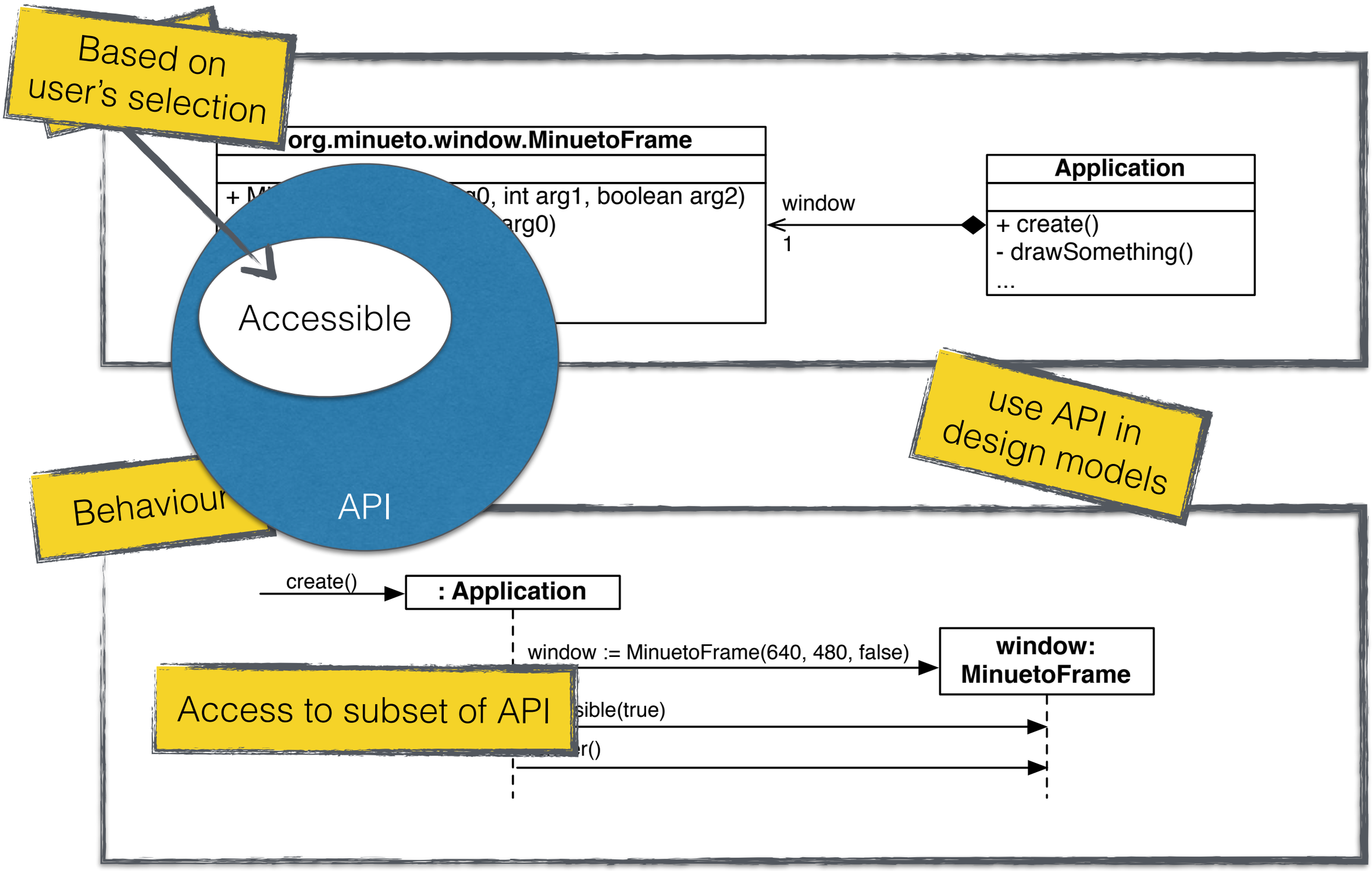

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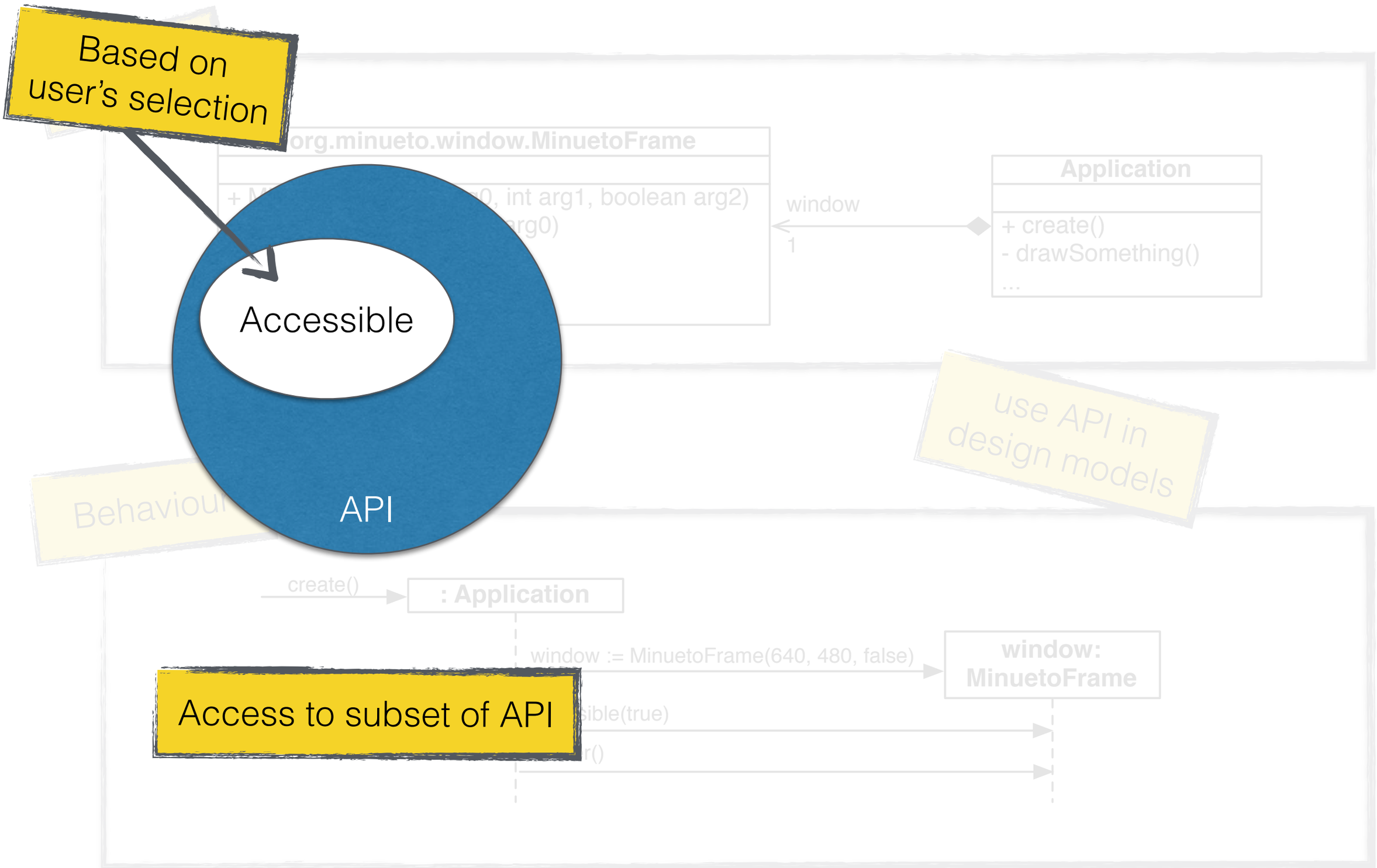
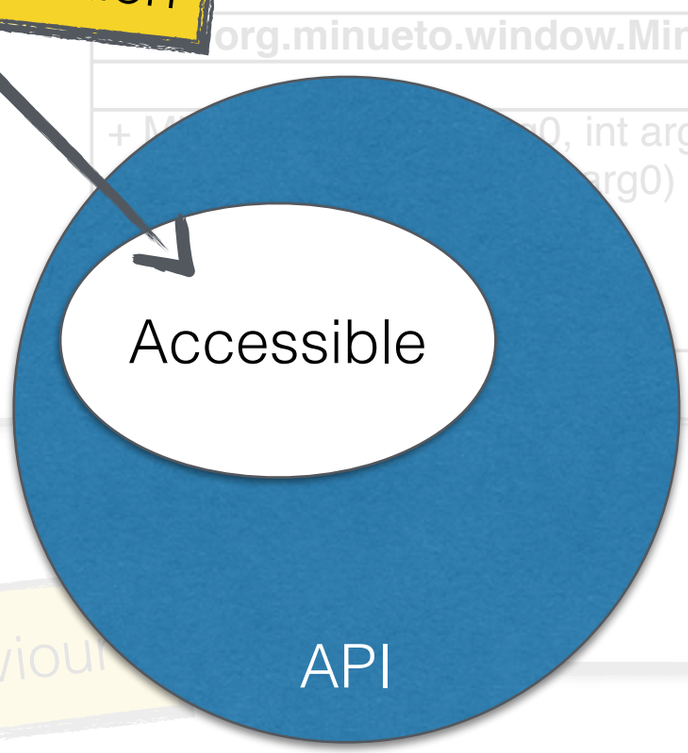


Reuse Vision in MDE

Based on user's selection



Access to subset of API

Follow Usage Protocol

How?

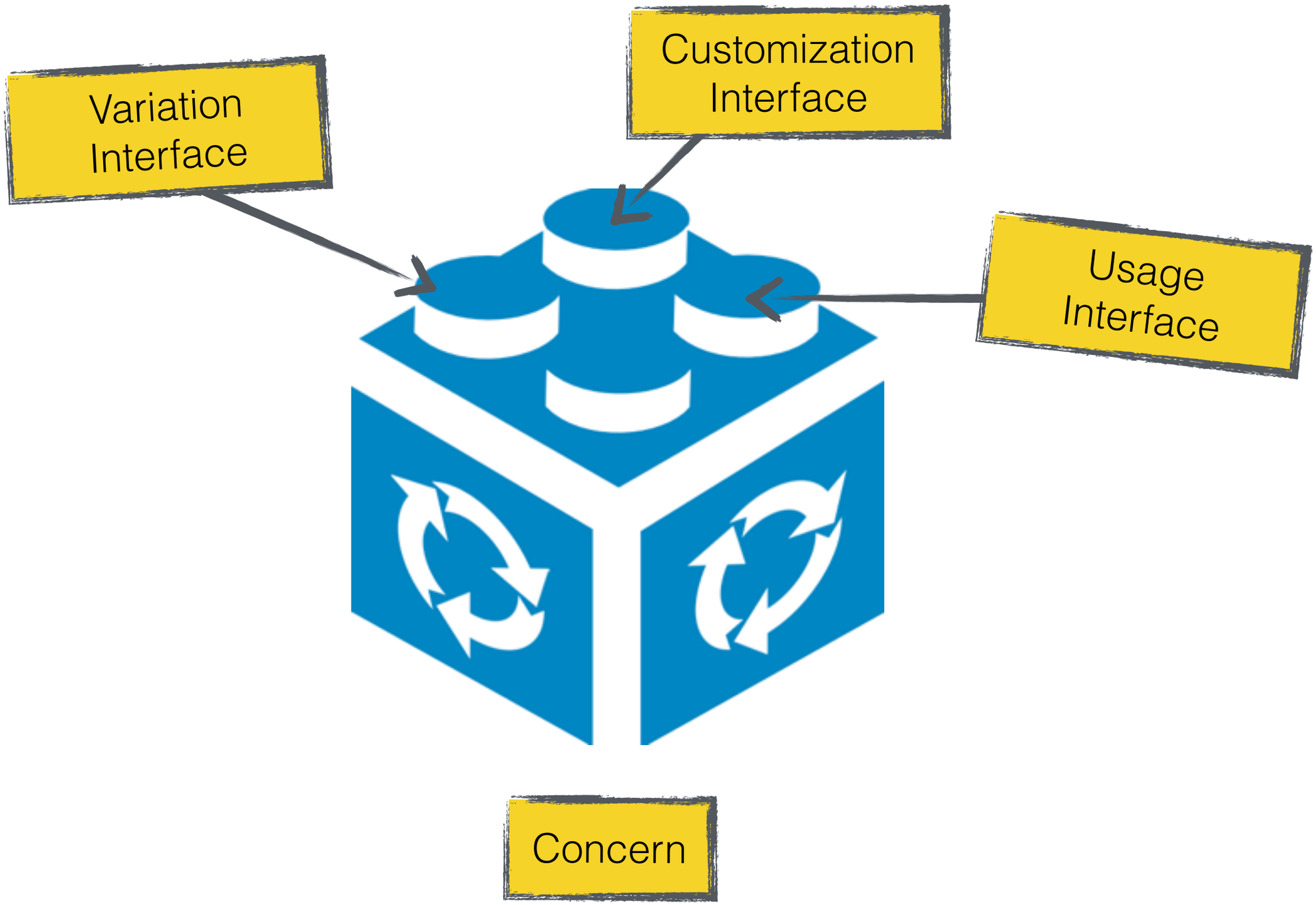
Use Concern-Orientation!

Concern — Unit Of Reuse

Concern

Use Concern-Orientation!

Concern — Unit Of Reuse



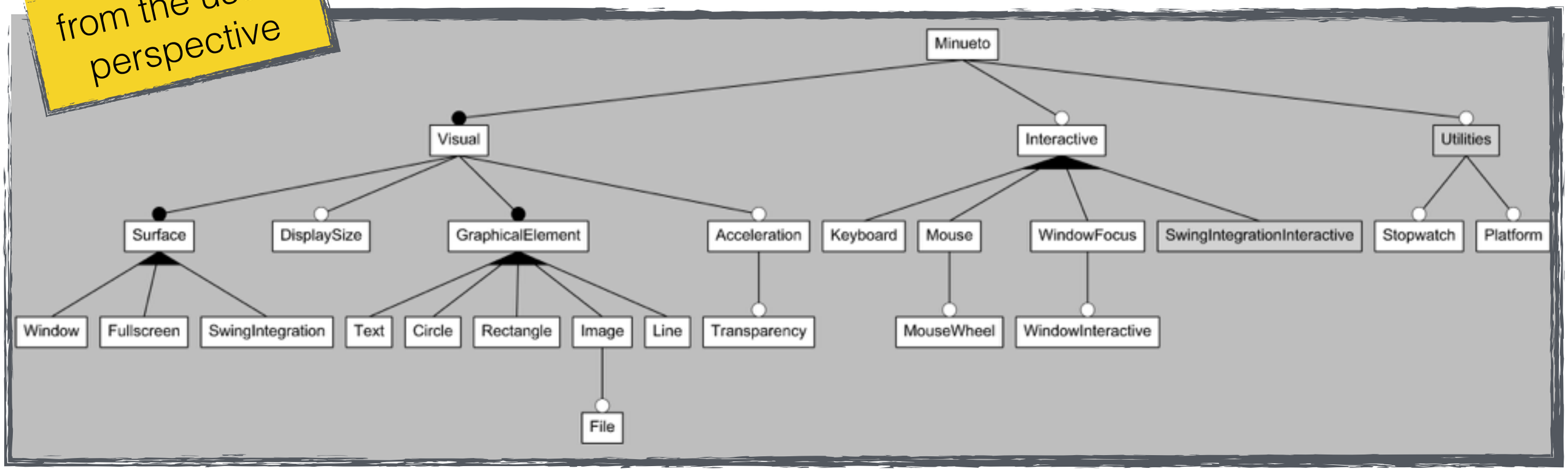
The Variation Interface

Feature Model of API

The Variation Interface

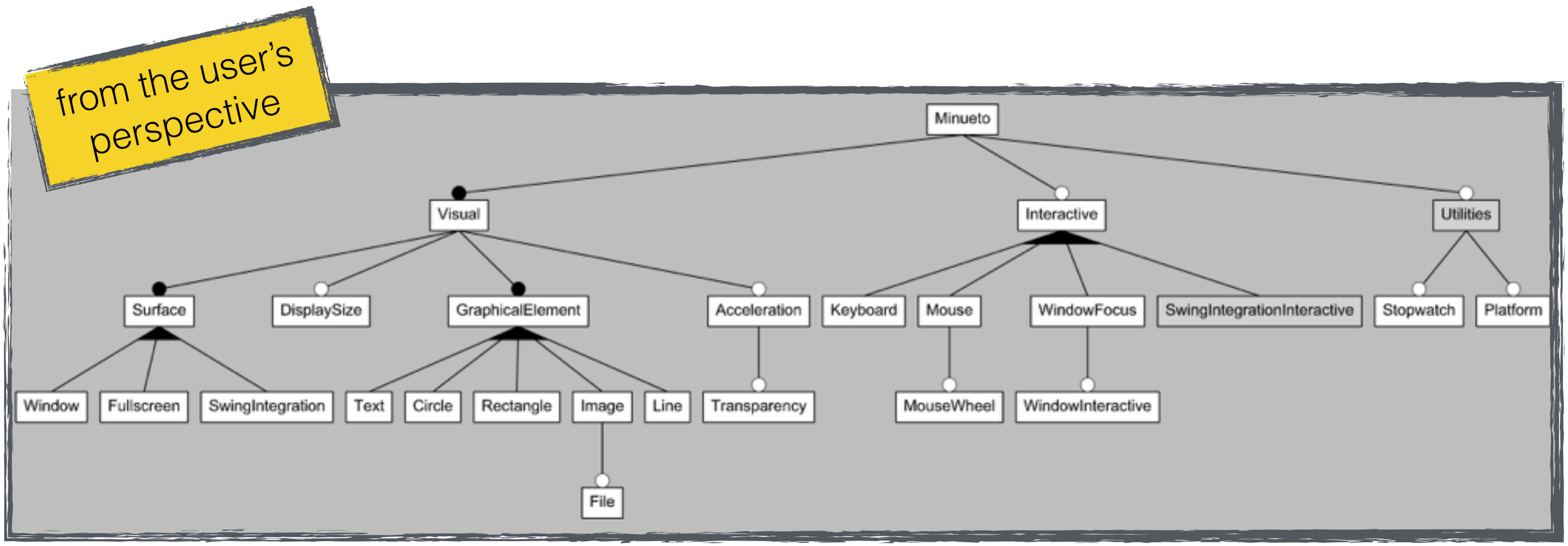
Feature Model of API

from the user's perspective



The Variation Interface

Feature Model of API



Created manually

Based on executable samples

The Variation Interface

High-level Goals

The Variation Interface

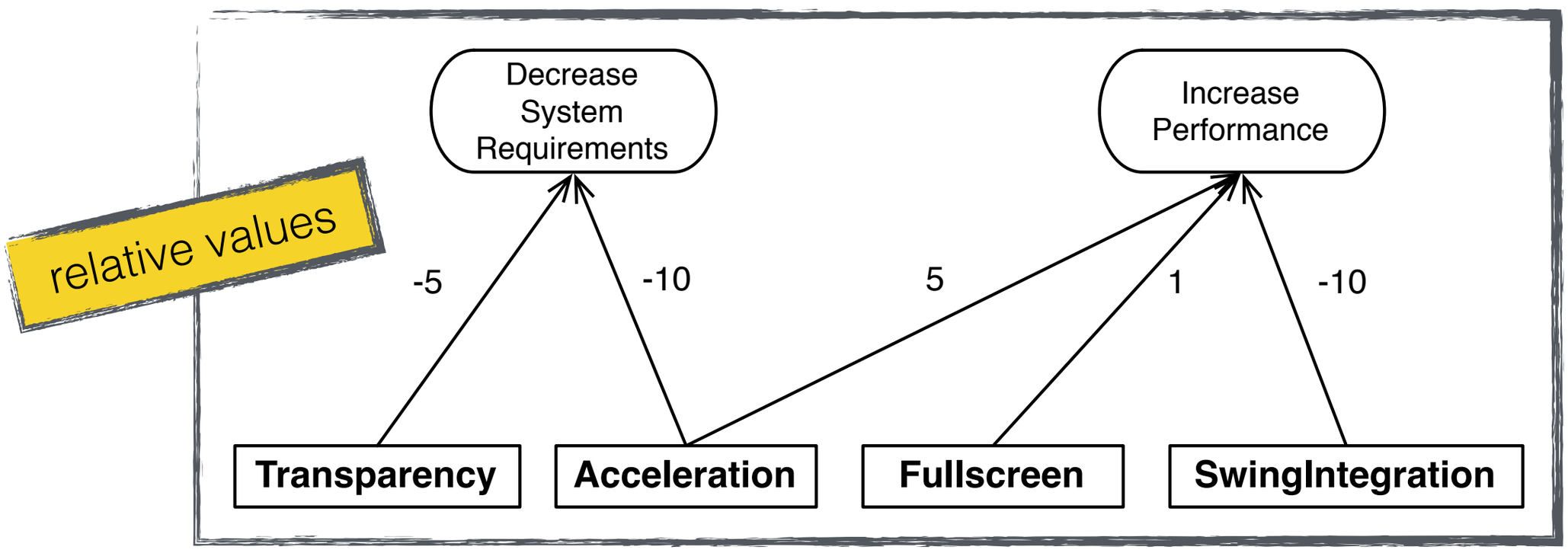
High-level Goals

Impact models

Features contribute to goals (impacts)

The Variation Interface

High-level Goals

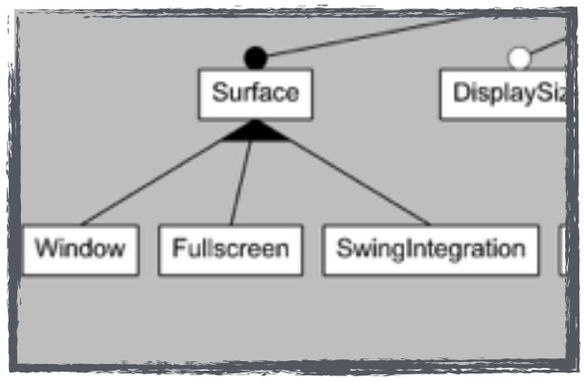


Impact models

Features contribute to goals (impacts)

The Usage Interface

Subset of the API



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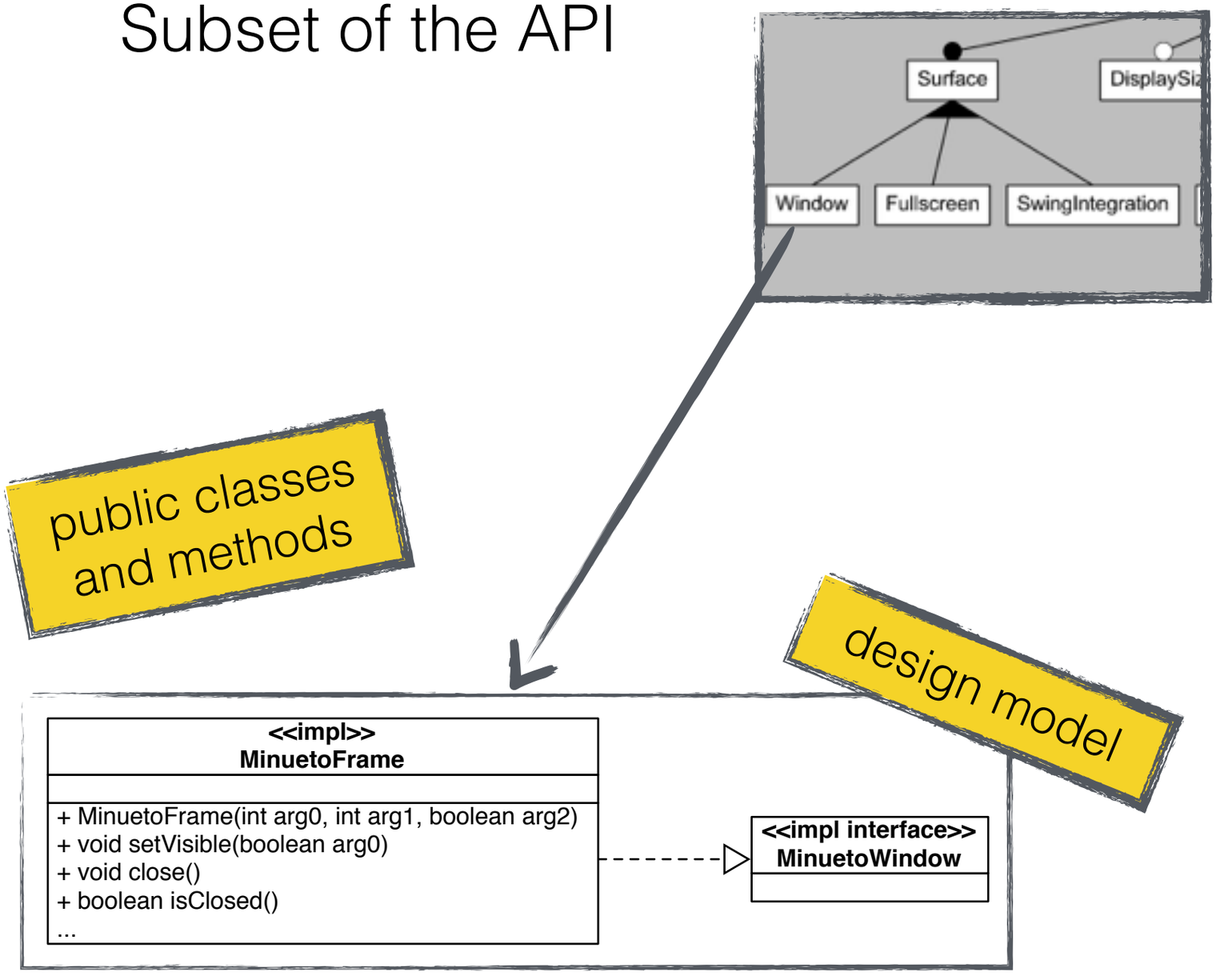

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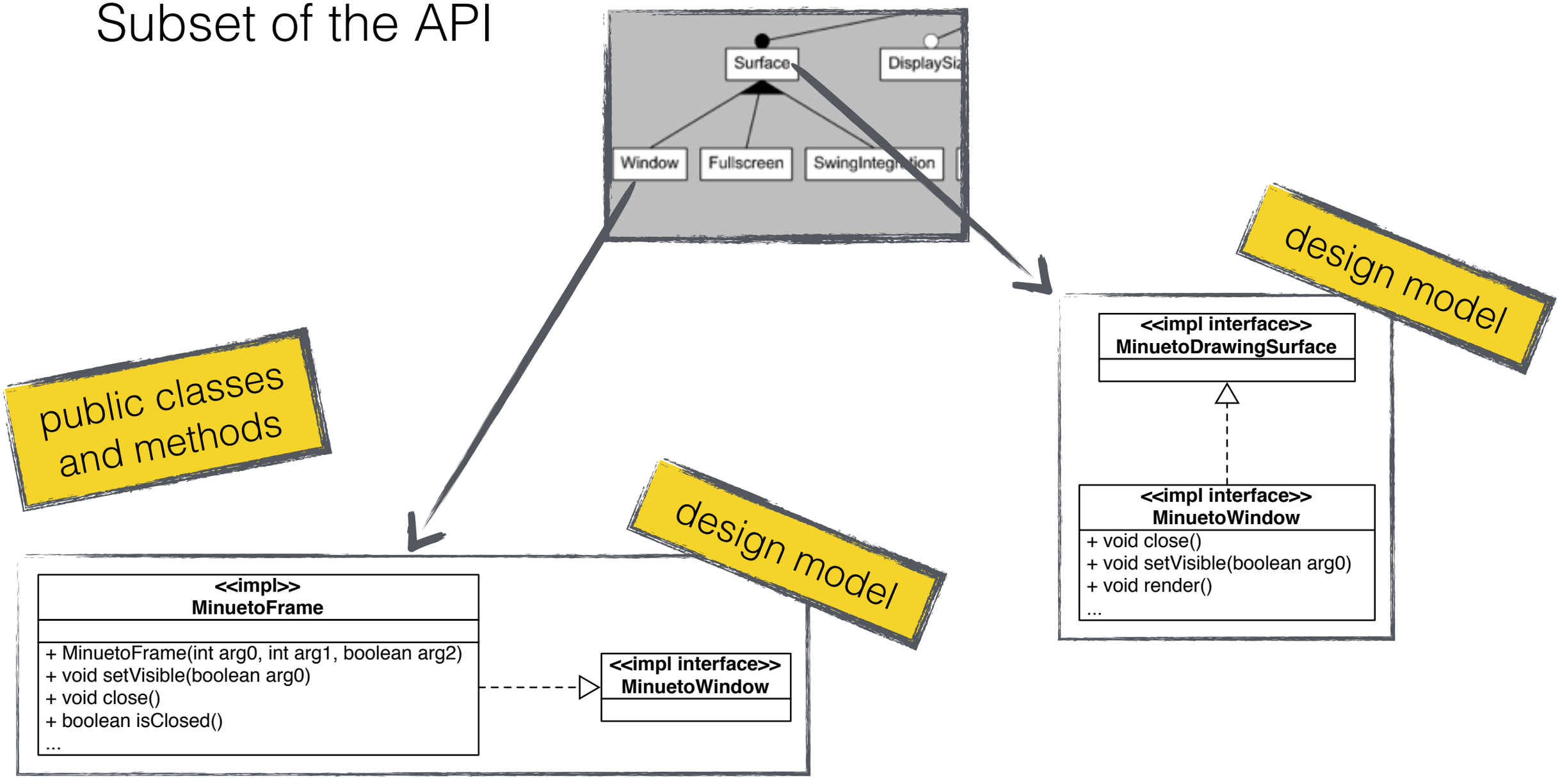

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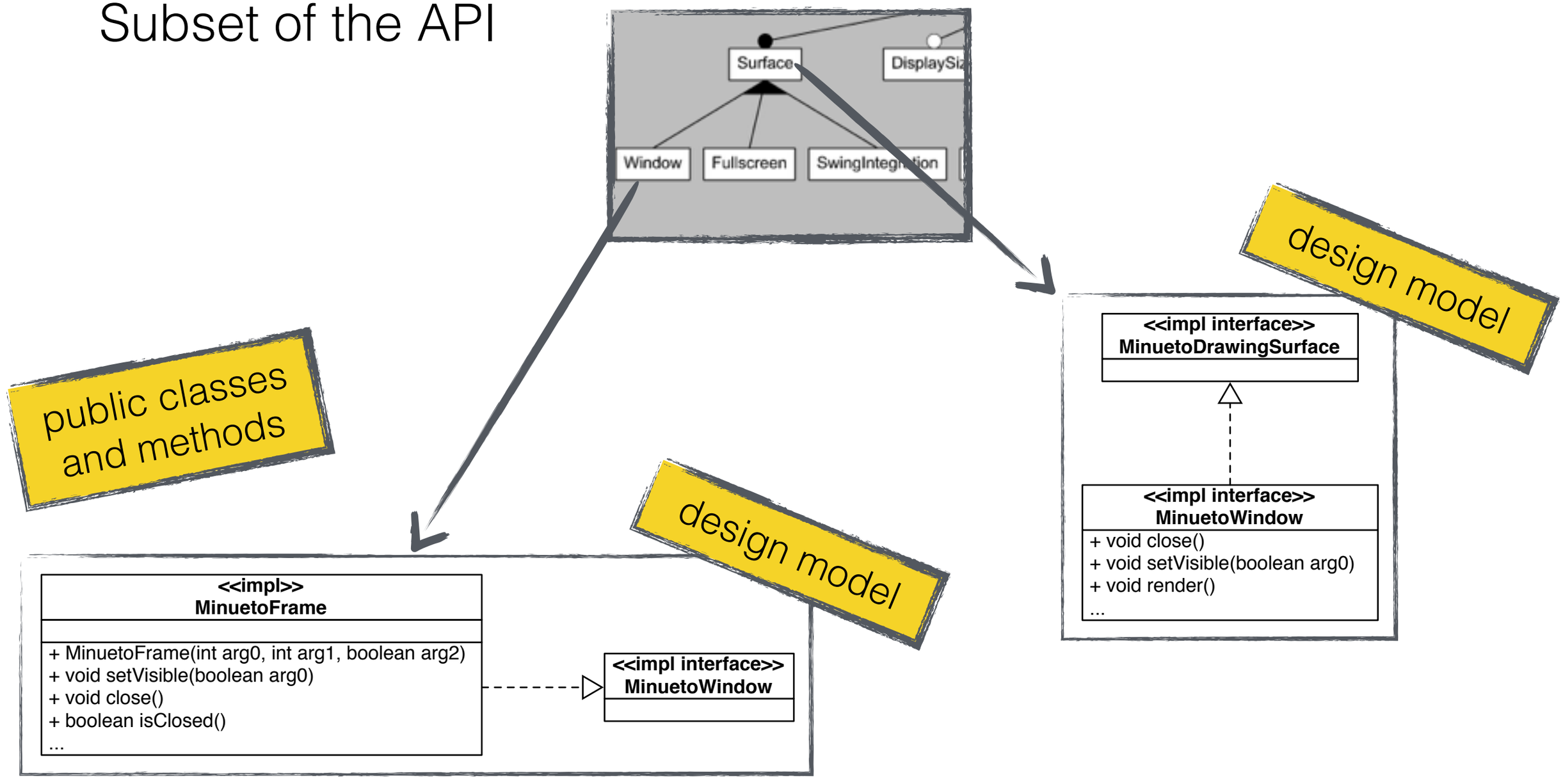
Subset of the API



API split across features

Can be split at operation level

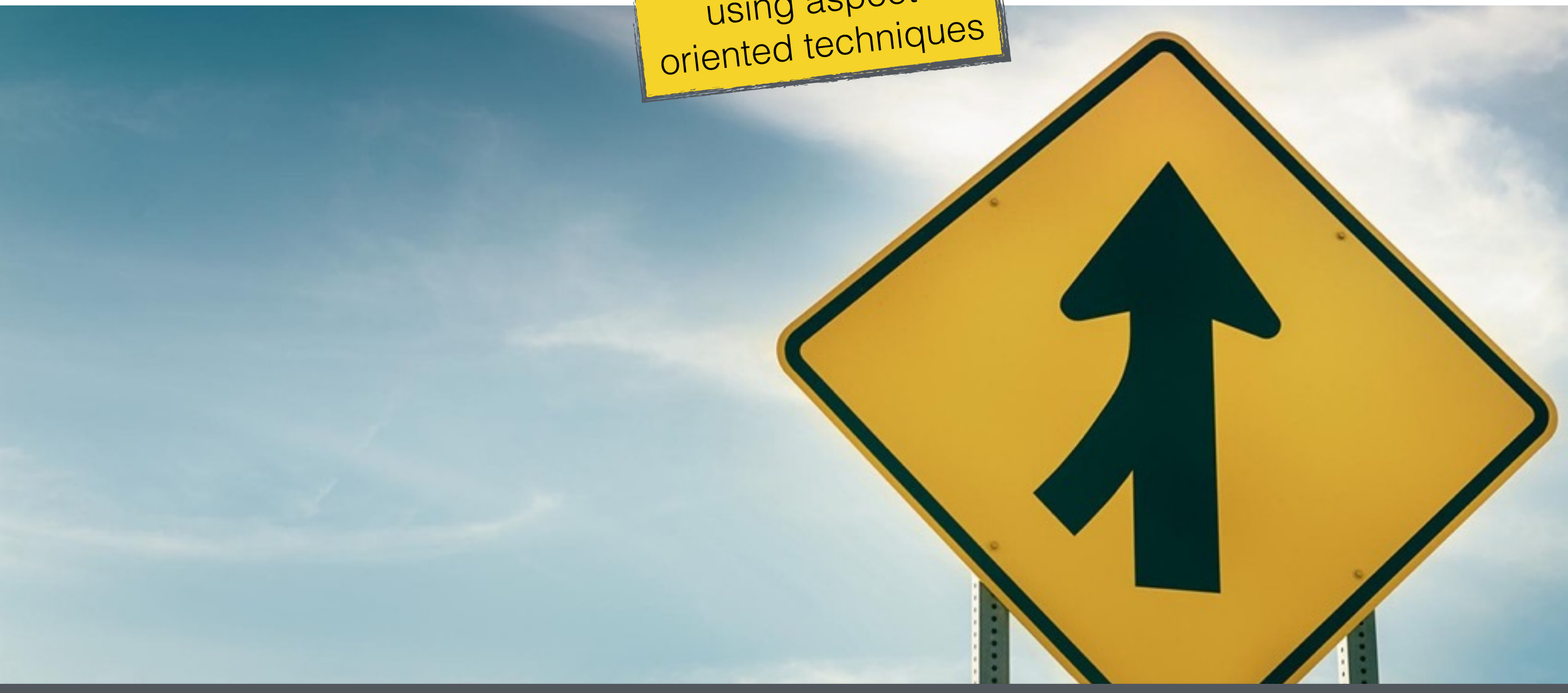
The Usage Interface

Composing subset of the API

The Usage Interface

Composing subset of the API

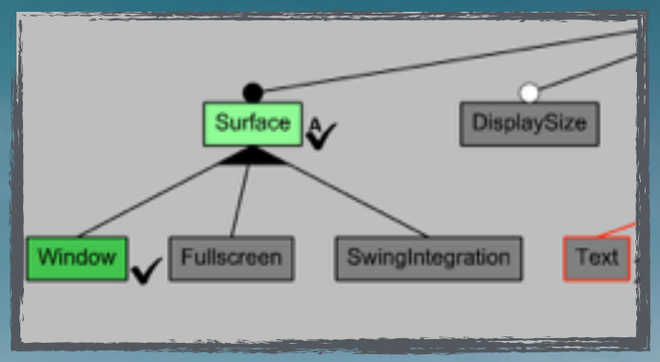
using aspect-oriented techniques



Merge classes and their operations

The Usage Interface

Composing subset of the API



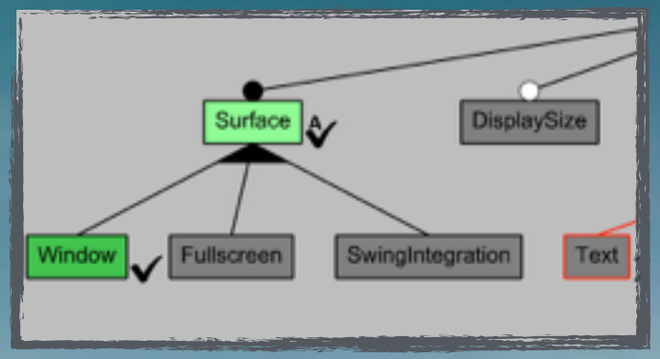
using aspect-oriented techniques

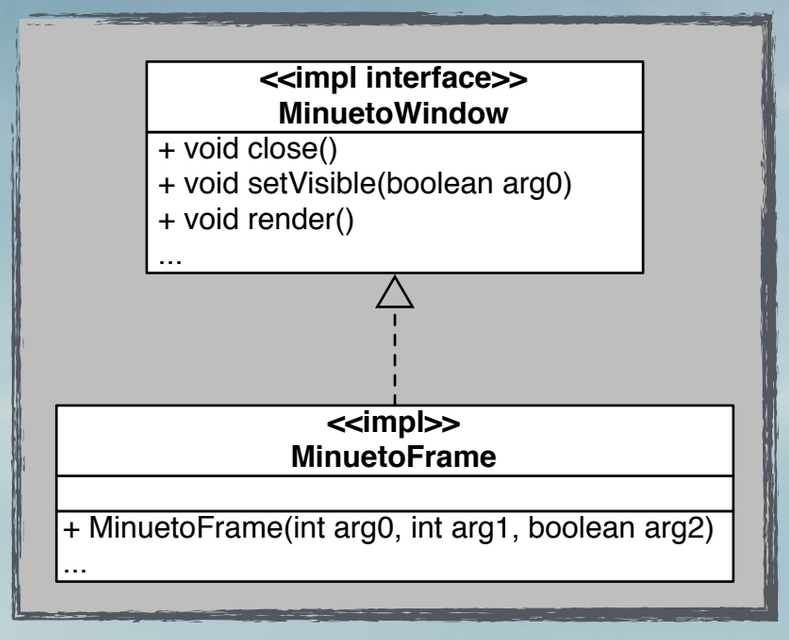
Merge classes and their operations

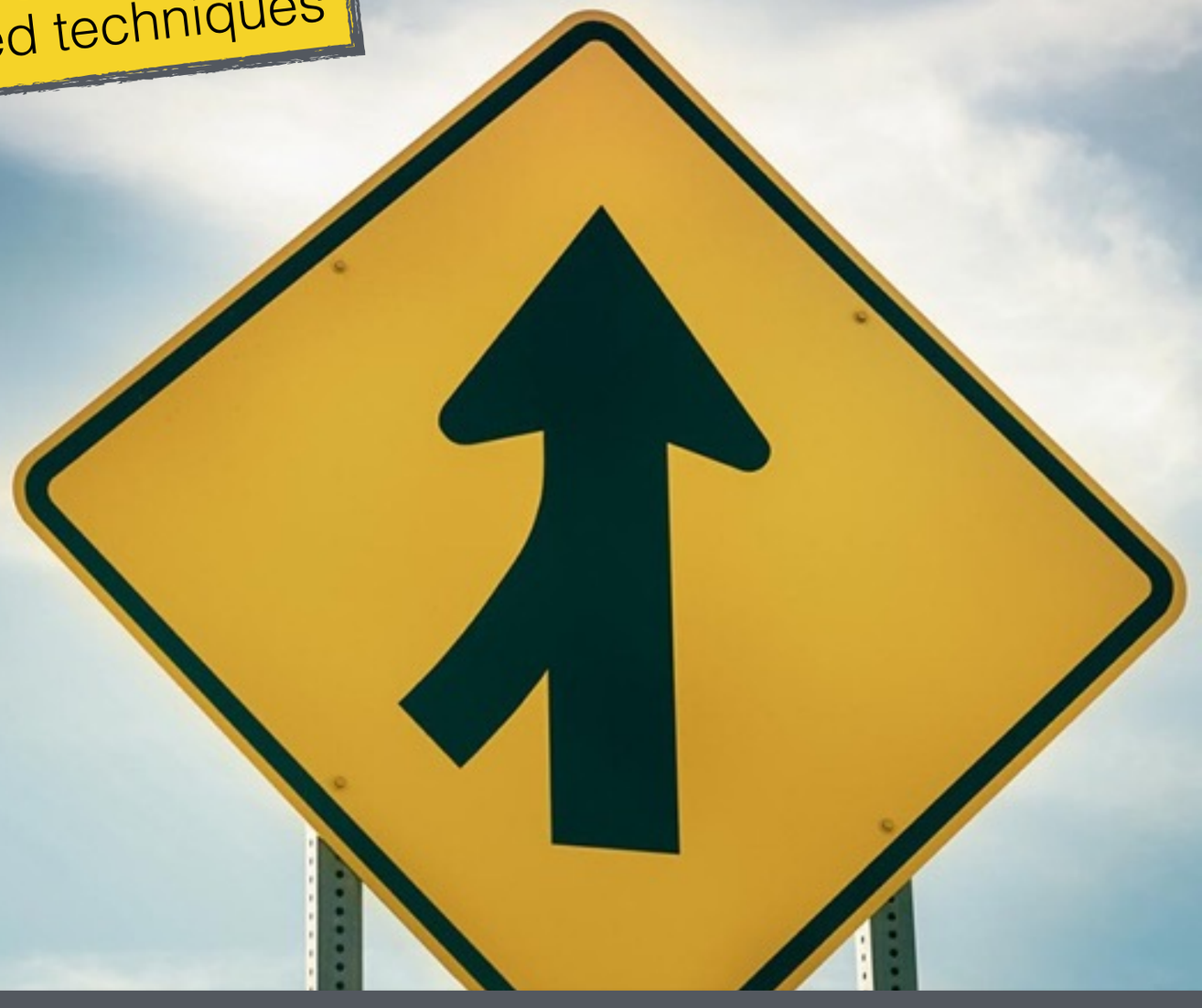
The Usage Interface

Composing subset of the API

using aspect-oriented techniques







Merge classes and their operations

The Usage Interface

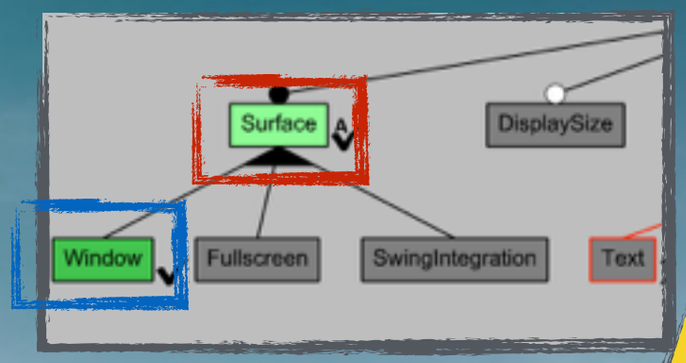
Composing subset of the API

Merge classes and their operations

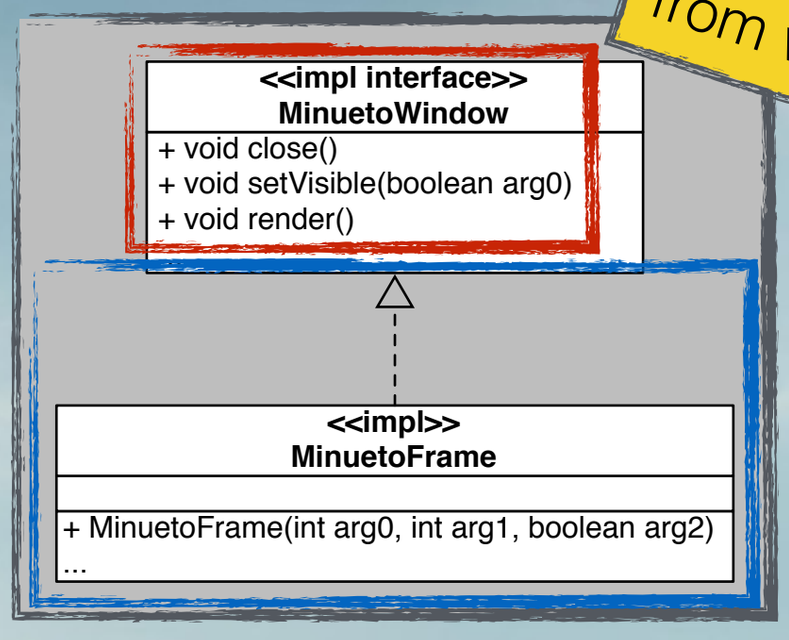
The Usage Interface

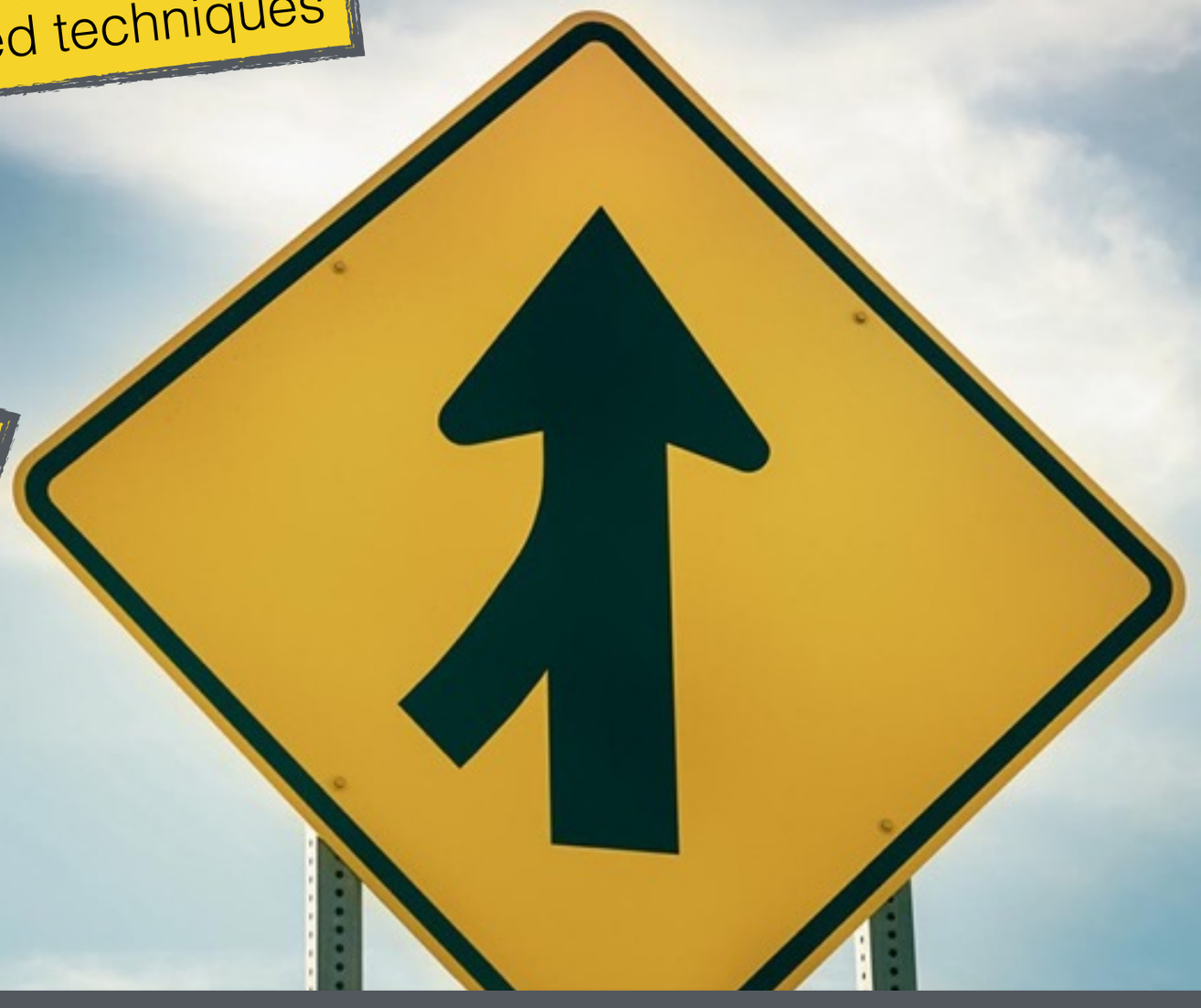
Composing subset of the API

using aspect-oriented techniques



tracing links: from which feature?





Merge classes and their operations

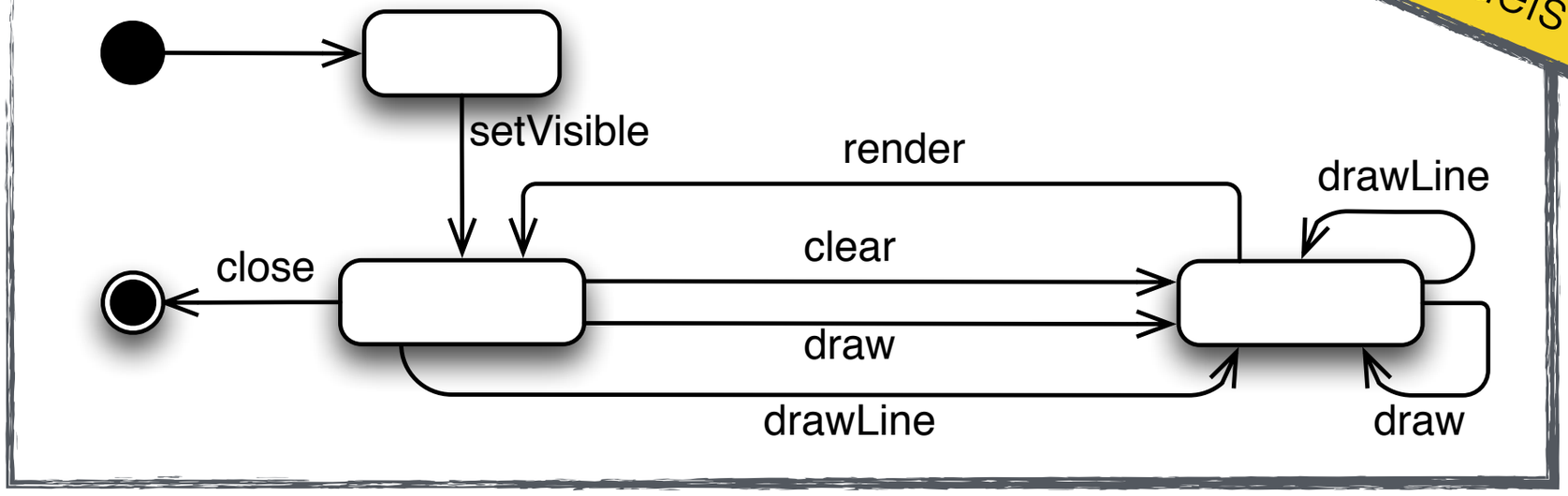
The Usage Interface

Follow The Protocol

The Usage Interface

Follow The Protocol

based on protocol models



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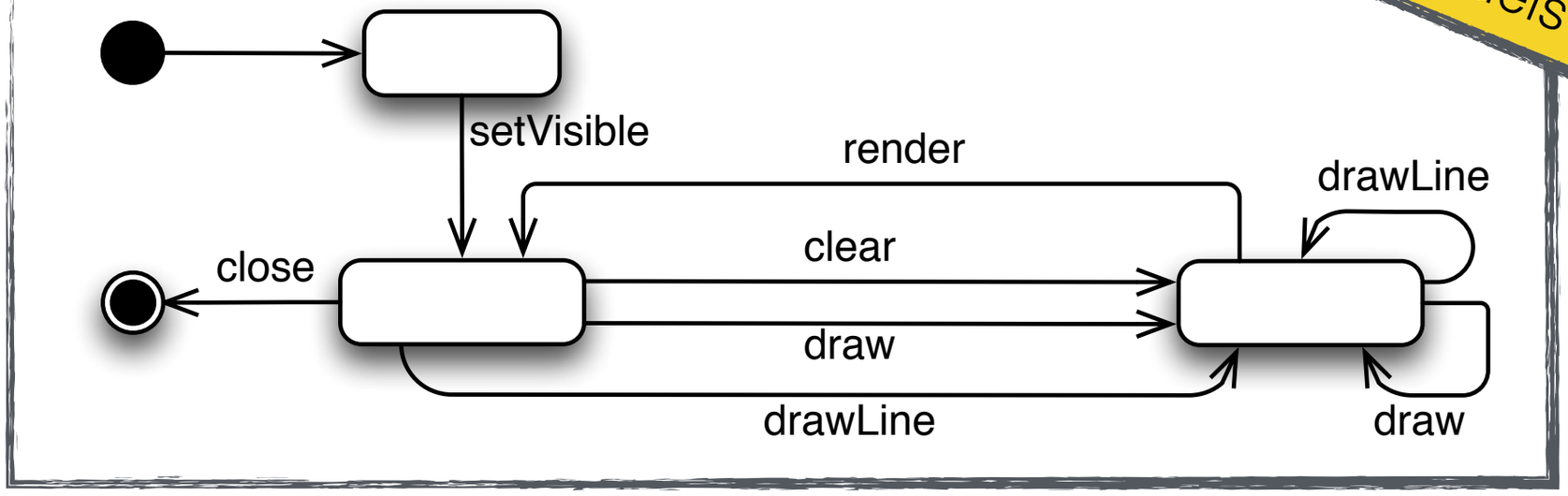
Follow The Protocol

based on protocol models



Supports composition

Avoid user mistakes

Three Interfaces

Three Interfaces

The Customization Interface

Three Interfaces

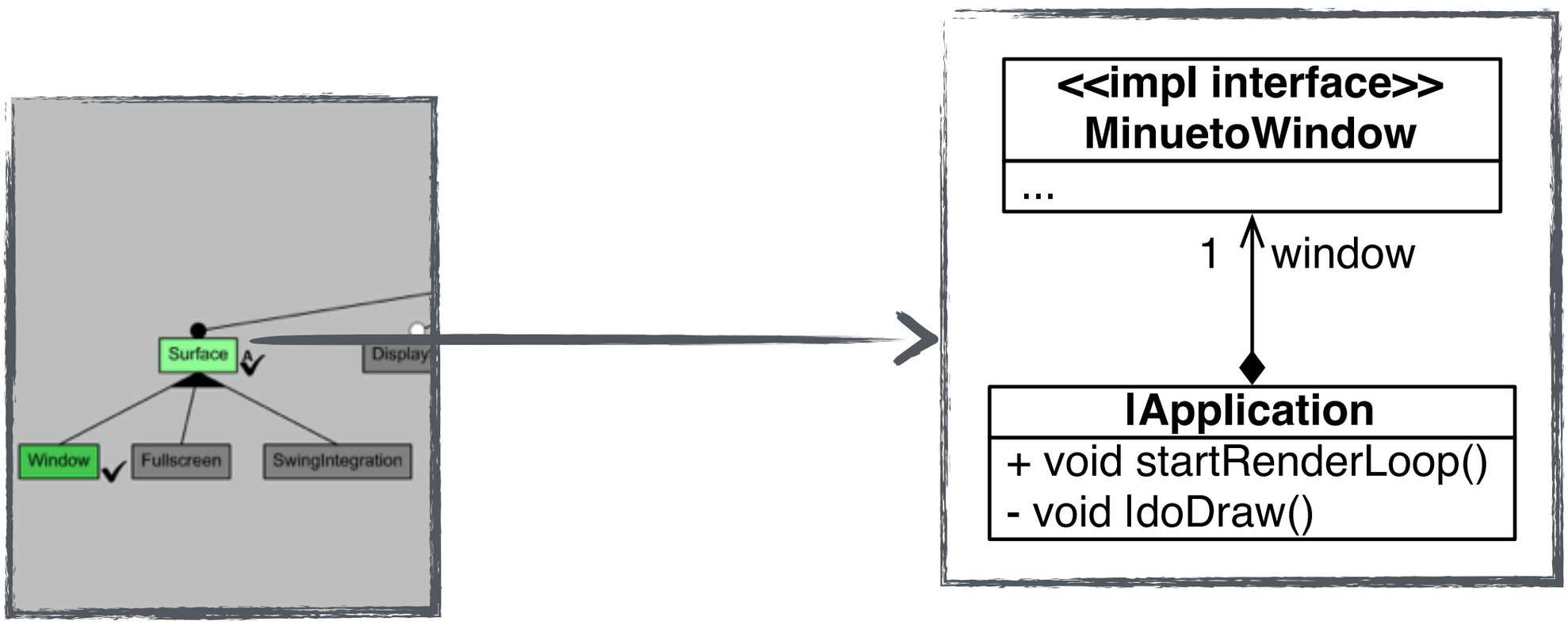
The Customization Interface

Provides partial structure and behaviour

Avoid user mistakes

Three Interfaces

The Customization Interface

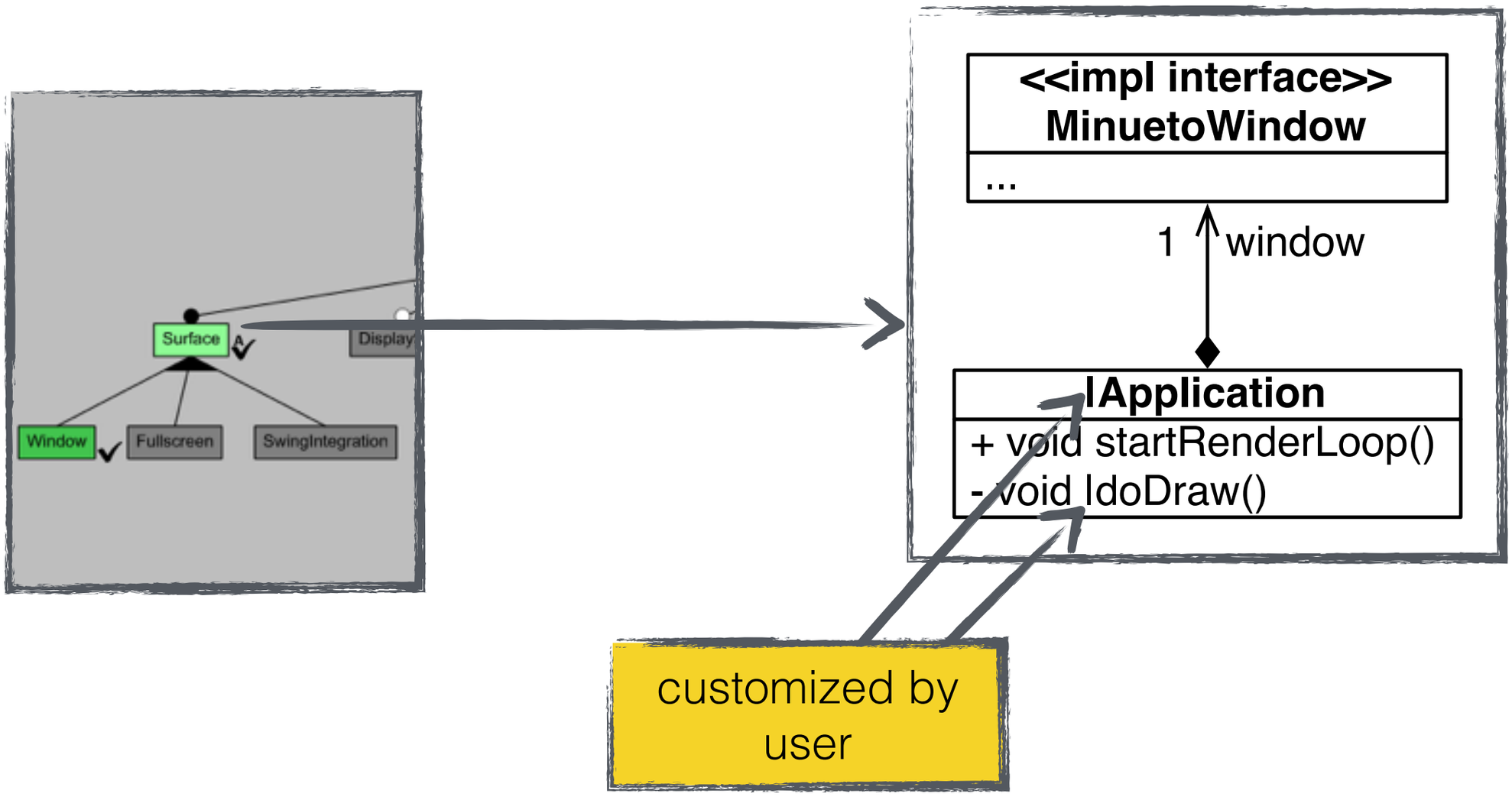


Provides partial structure and behaviour

Avoid user mistakes

Three Interfaces

The Customization Interface

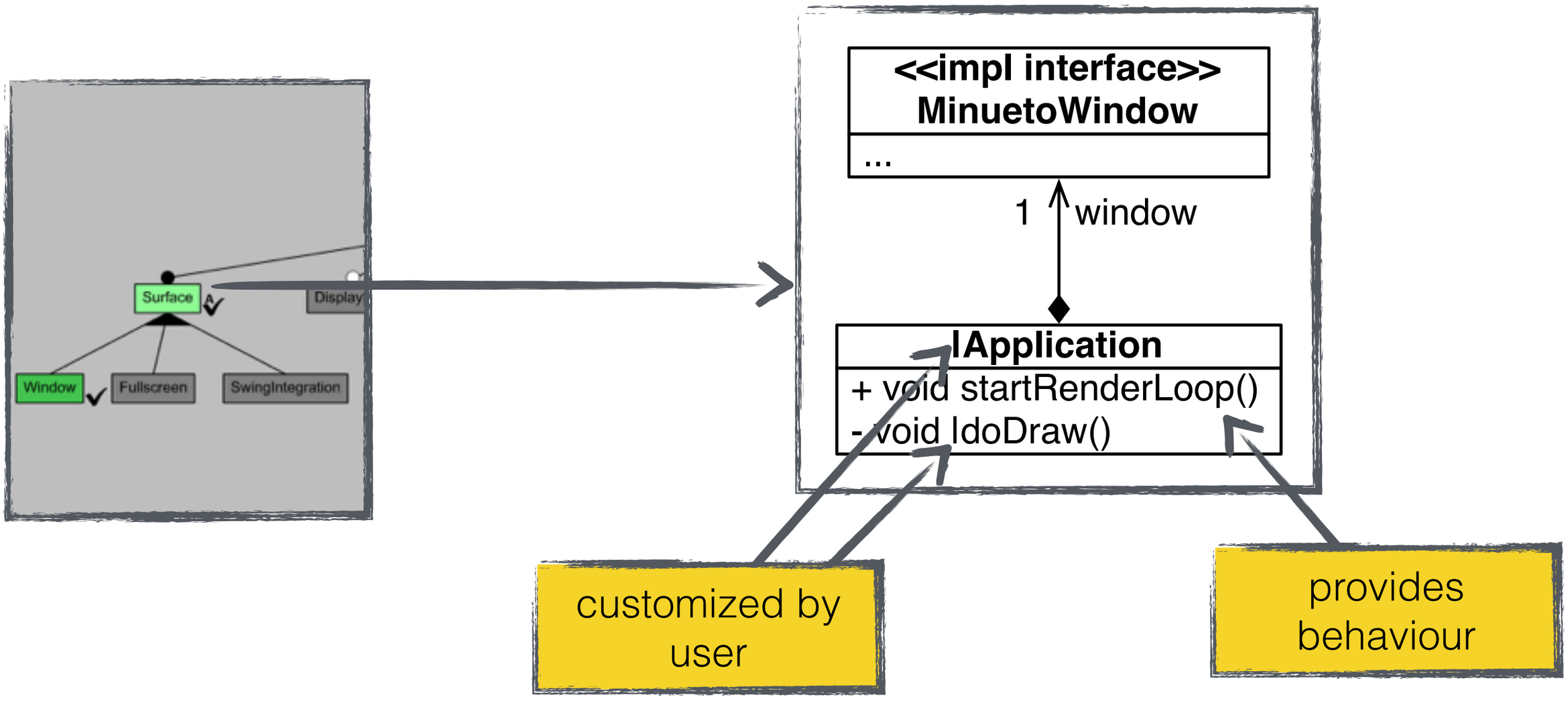


Provides partial structure and behaviour

Avoid user mistakes

Three Interfaces

The Customization Interface

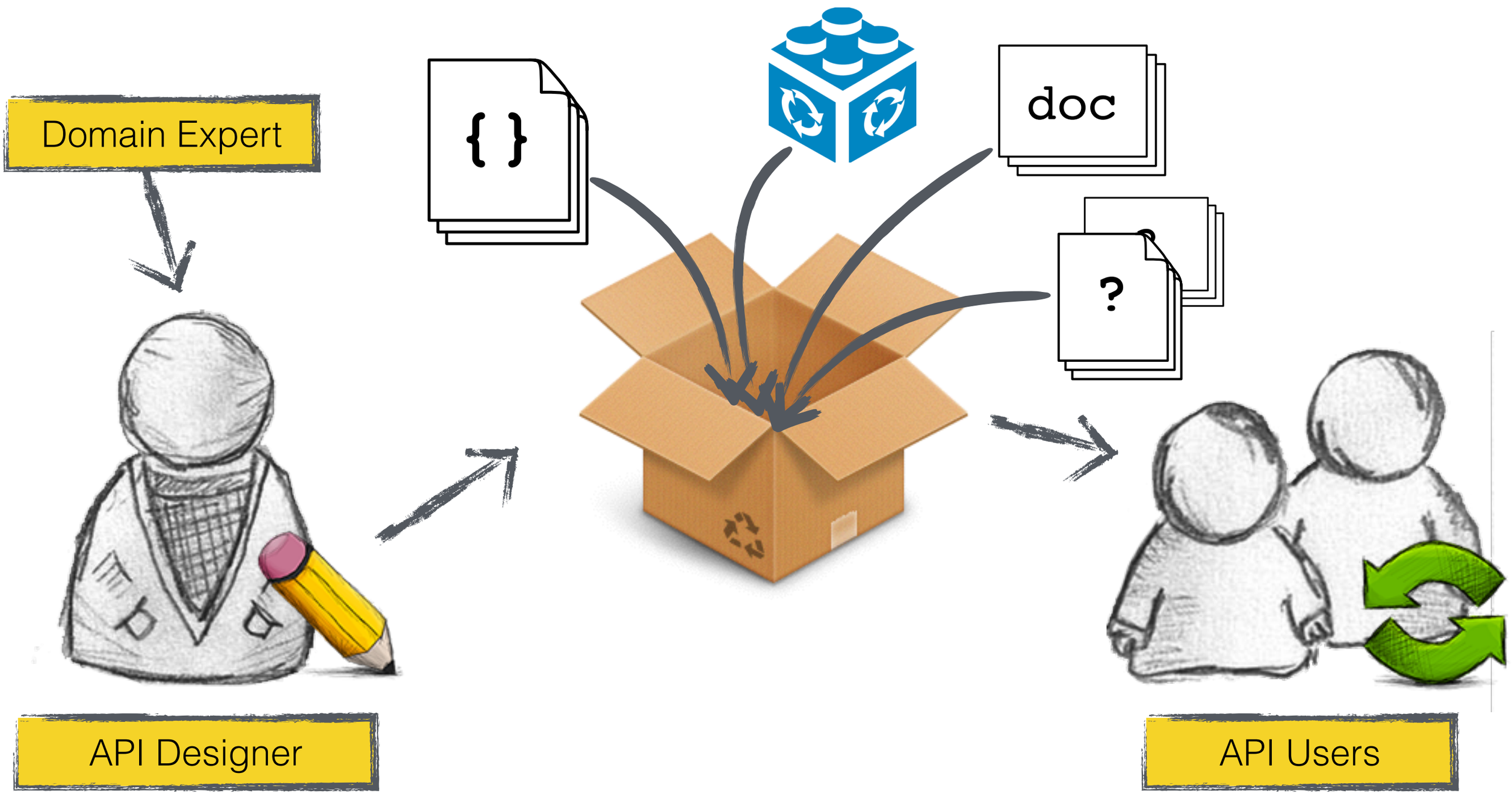


Provides partial structure and behaviour

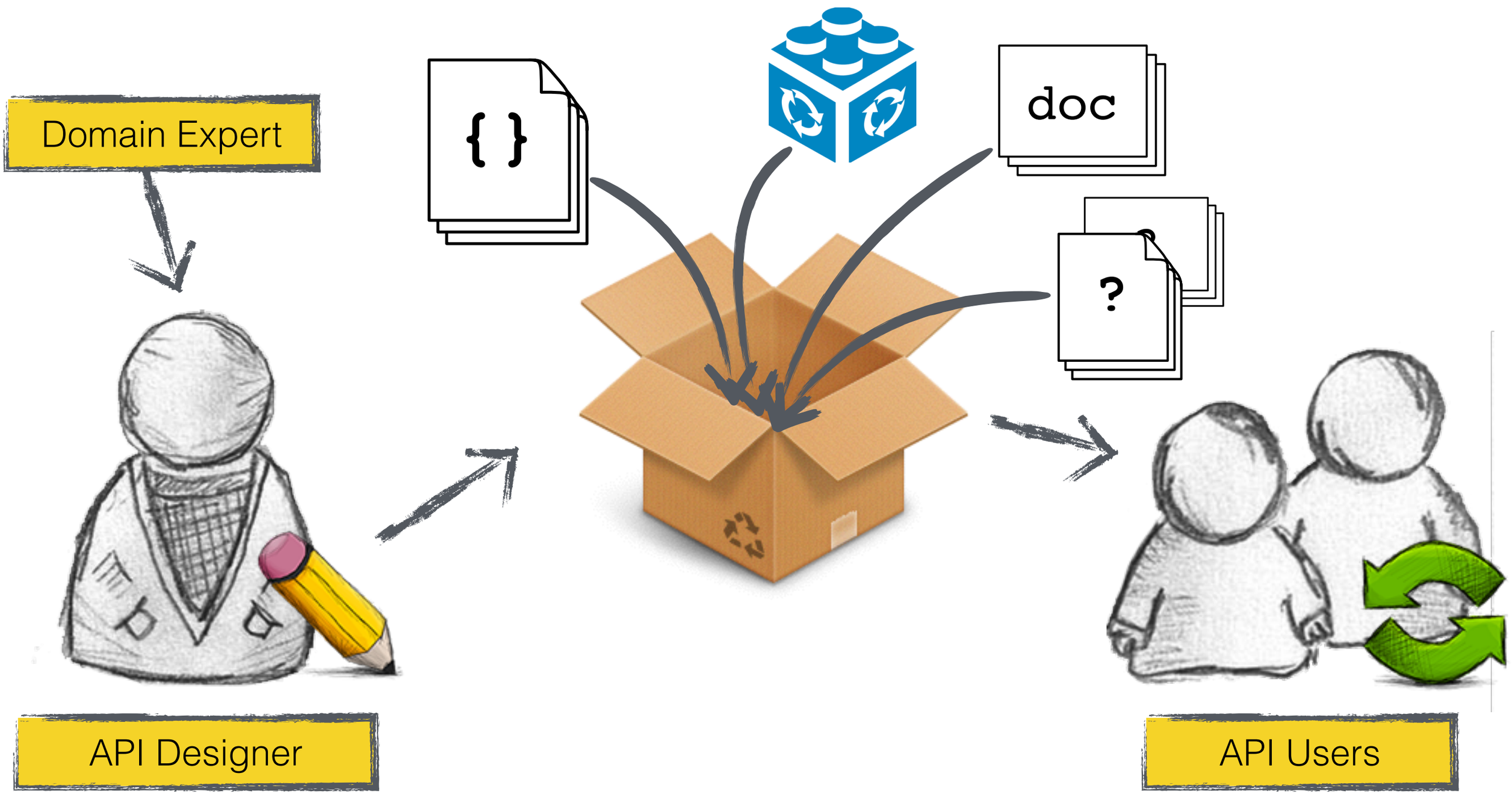
Avoid user mistakes

“Concernification”

Concernification



Concernification



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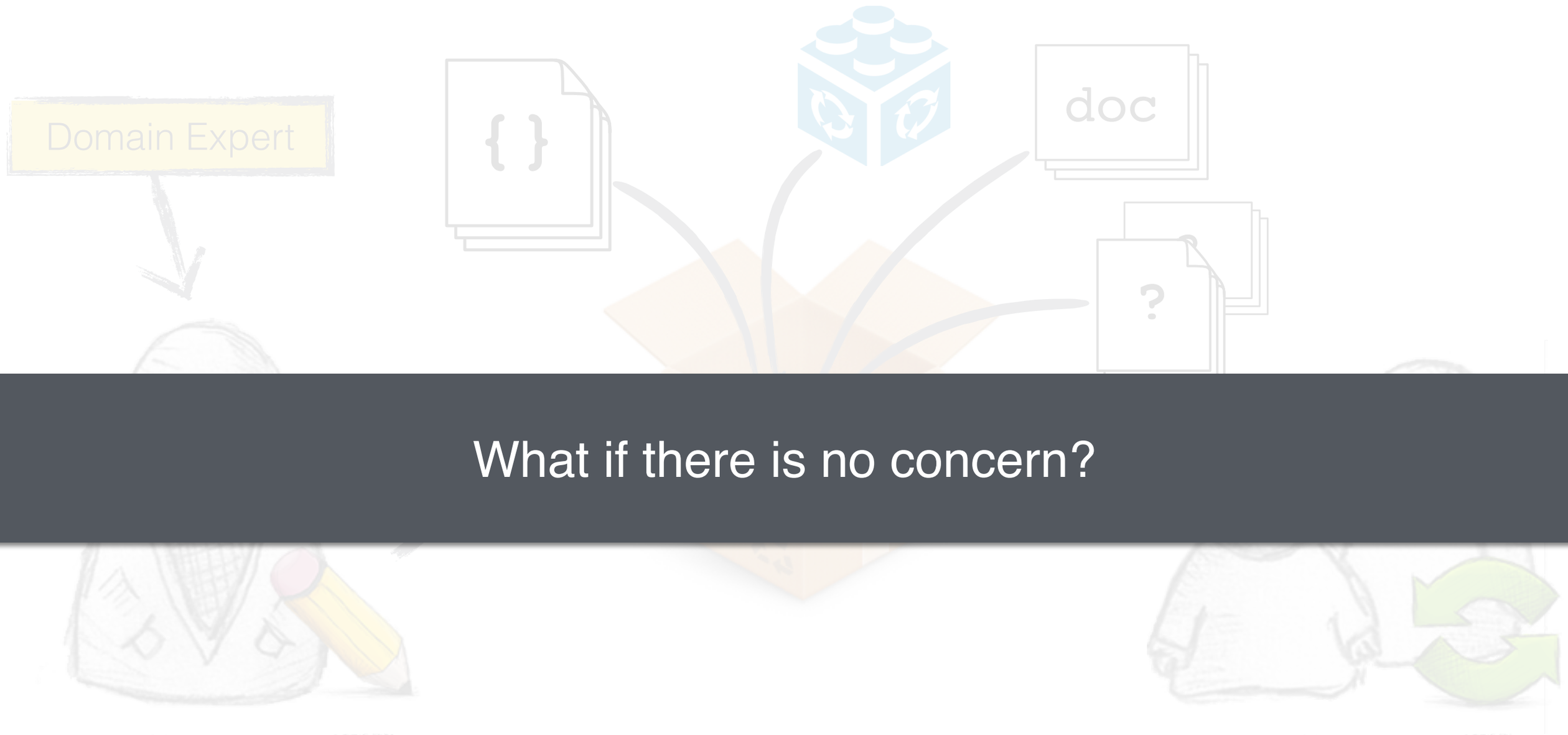
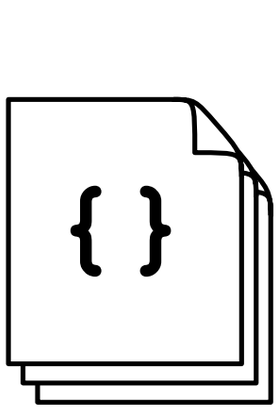


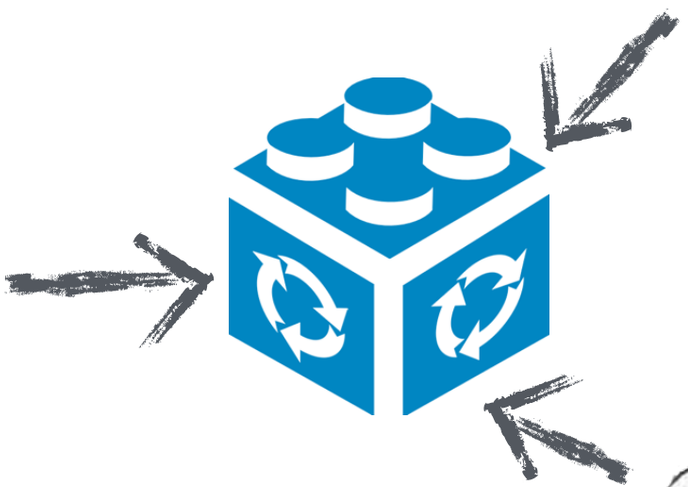
What if there is no concern?

Automated Concernification

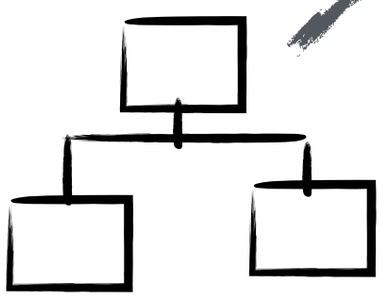
Use Executable Examples



how specific feature used?



Consider Structure

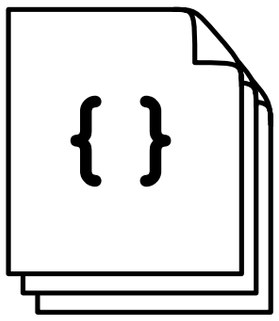


Extract feature model

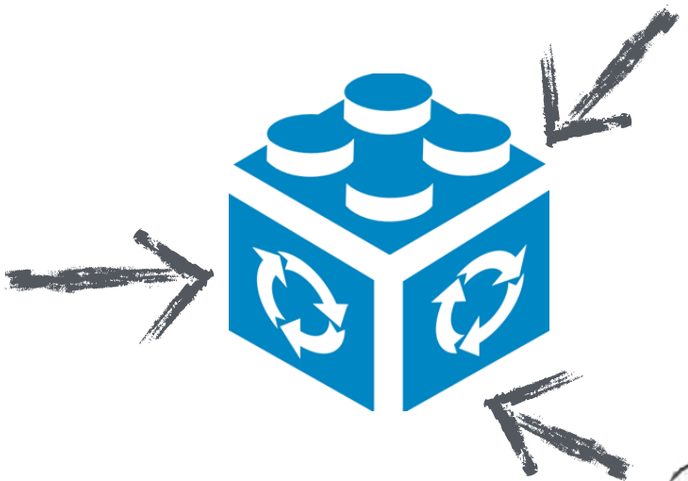
Help with initial concern creation

Automated Concernification

Use Executable Examples



how specific feature used?



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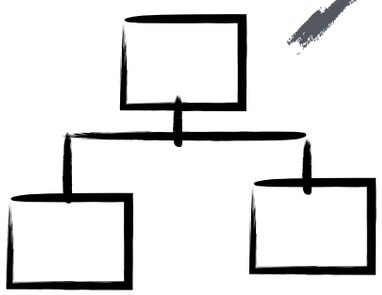
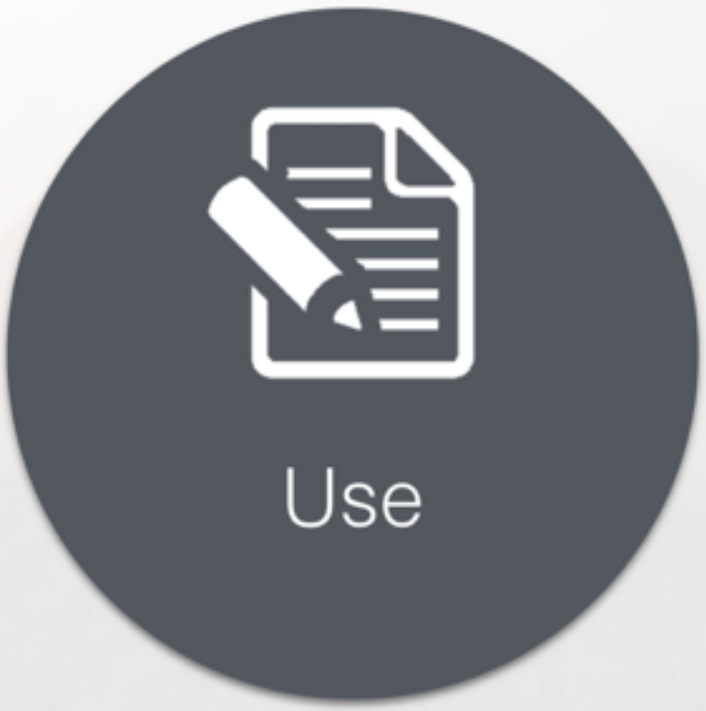


to be continued…

Extract feature model

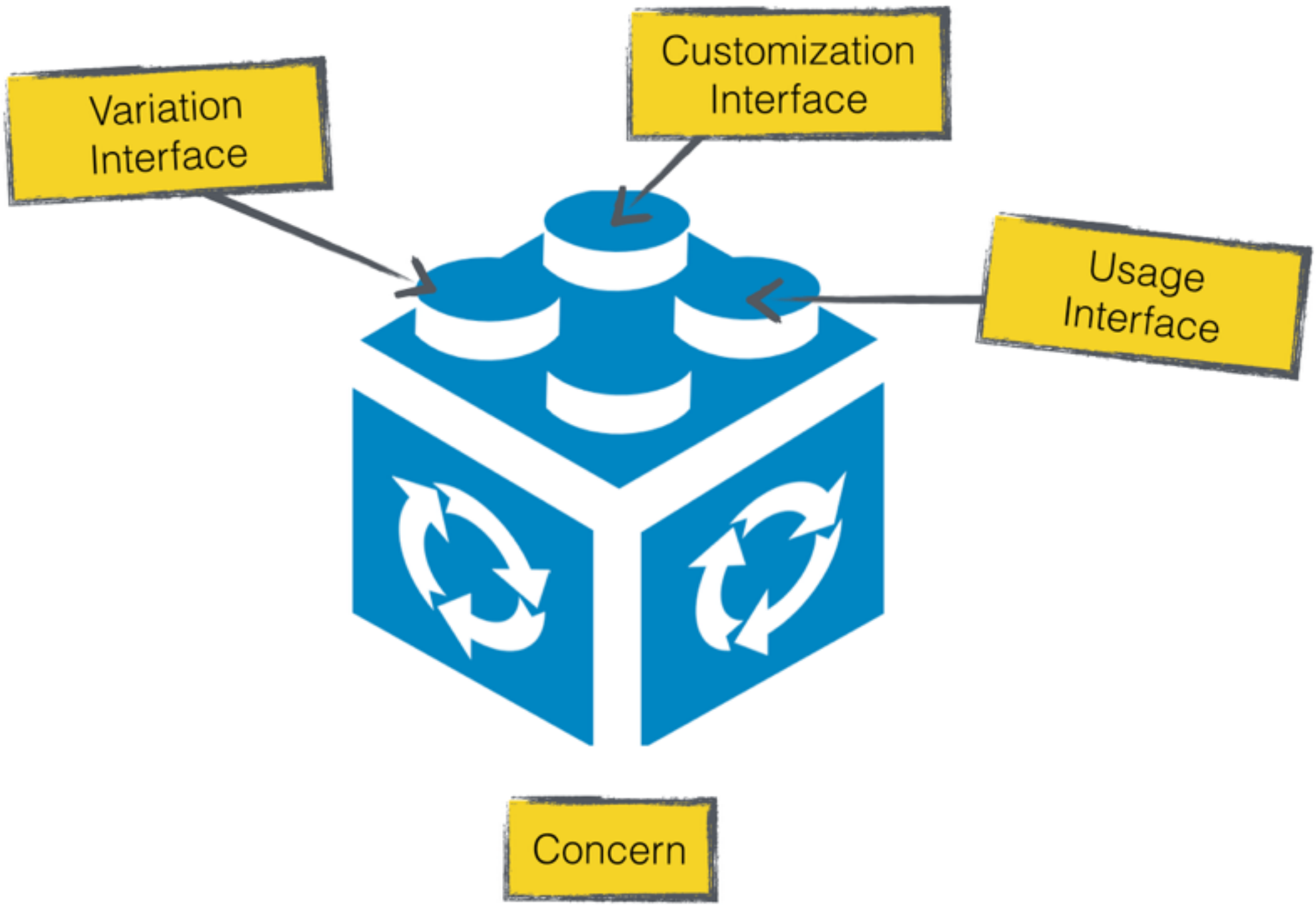
Help with initial concern creation

API Reuse

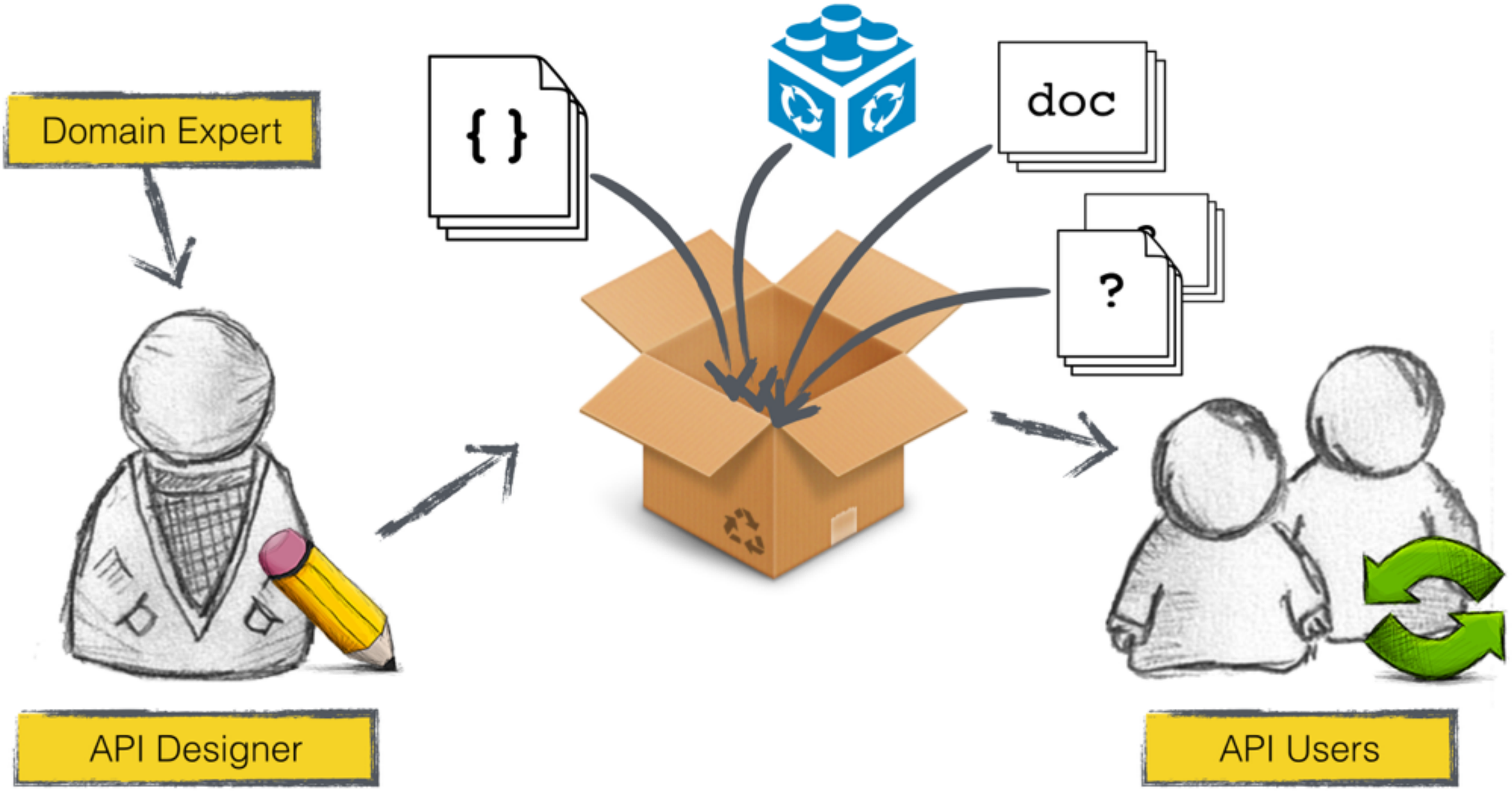


Use Concern-Orientation!

Concern — Unit Of Reuse

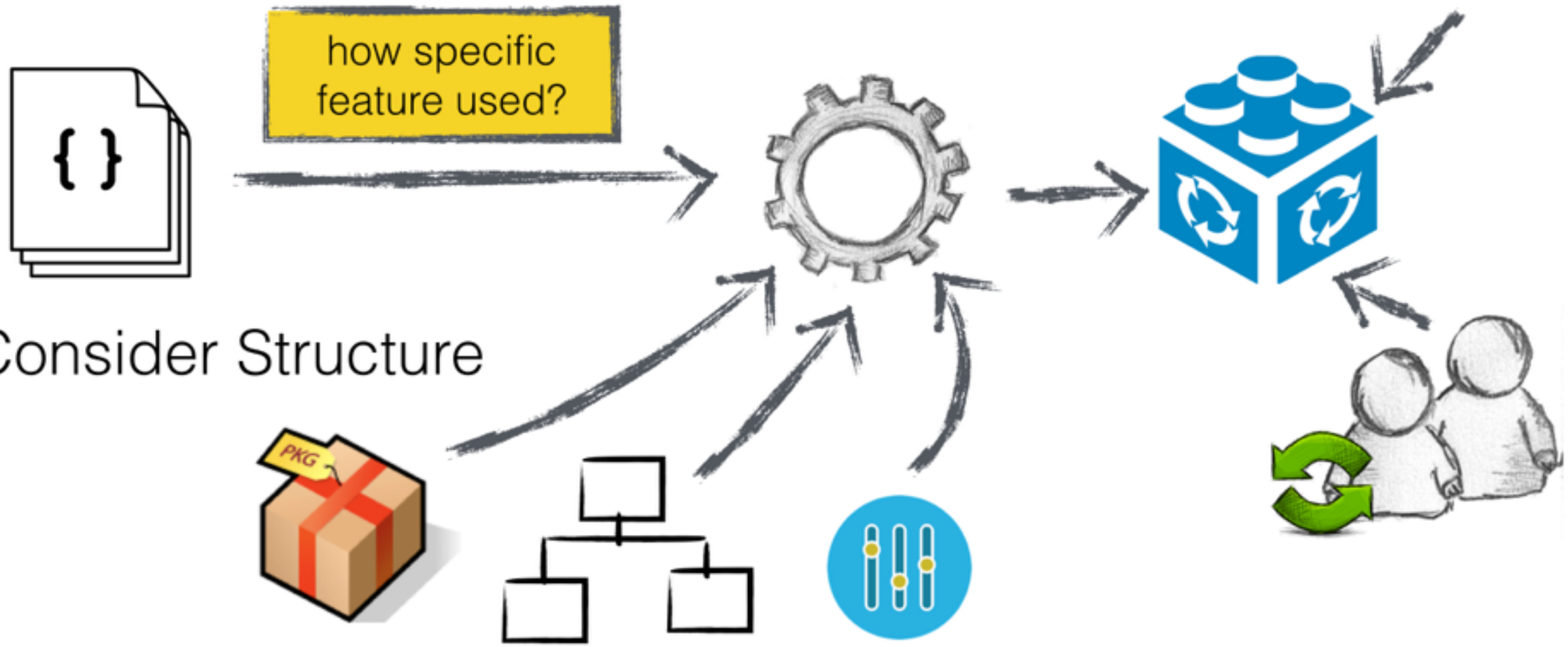


Concernification



Automated Concernification

Use Executable Examples



Consider Structure

Extract feature model

Help with initial concern creation

Future

Future

automation

Future

automation

real-world
frameworks

Future

automation

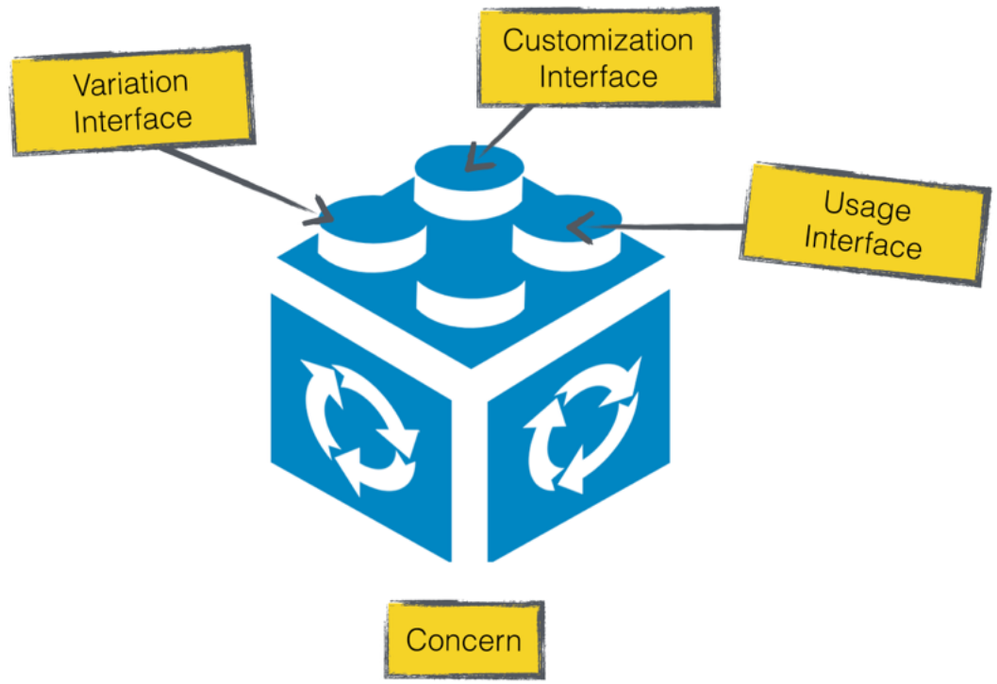
real-world frameworks

(user) studies

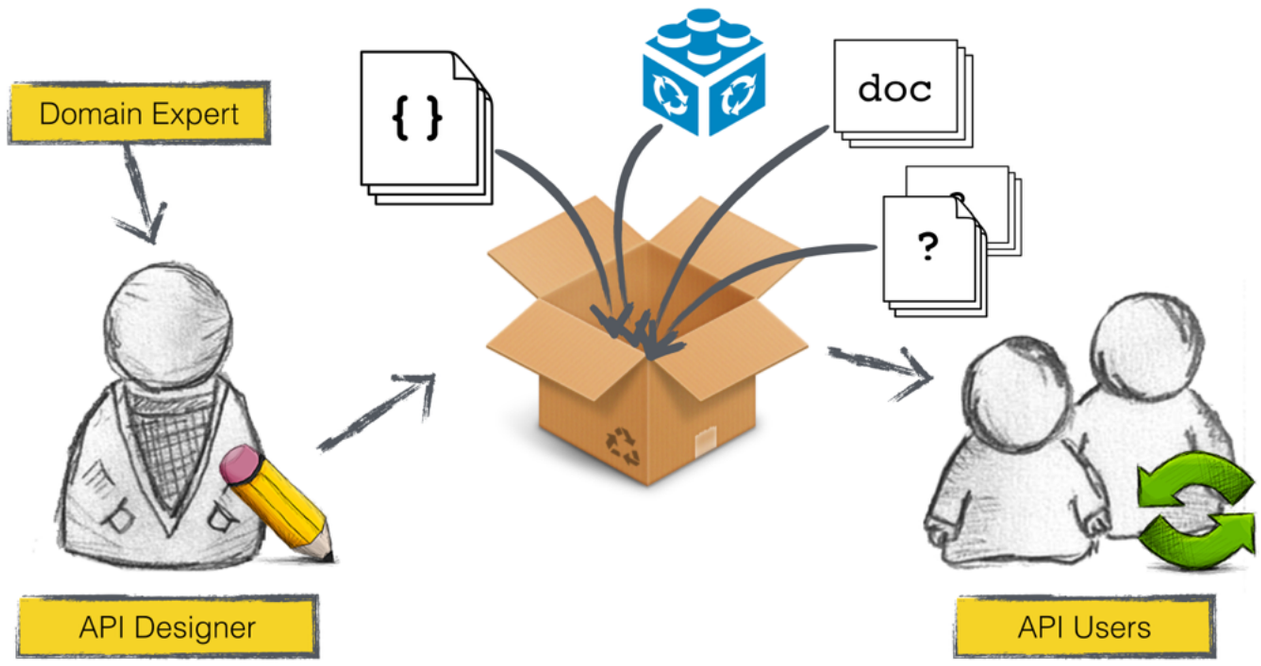
API Reuse

Use Concern-Orientation!

Concern — Unit Of Reuse

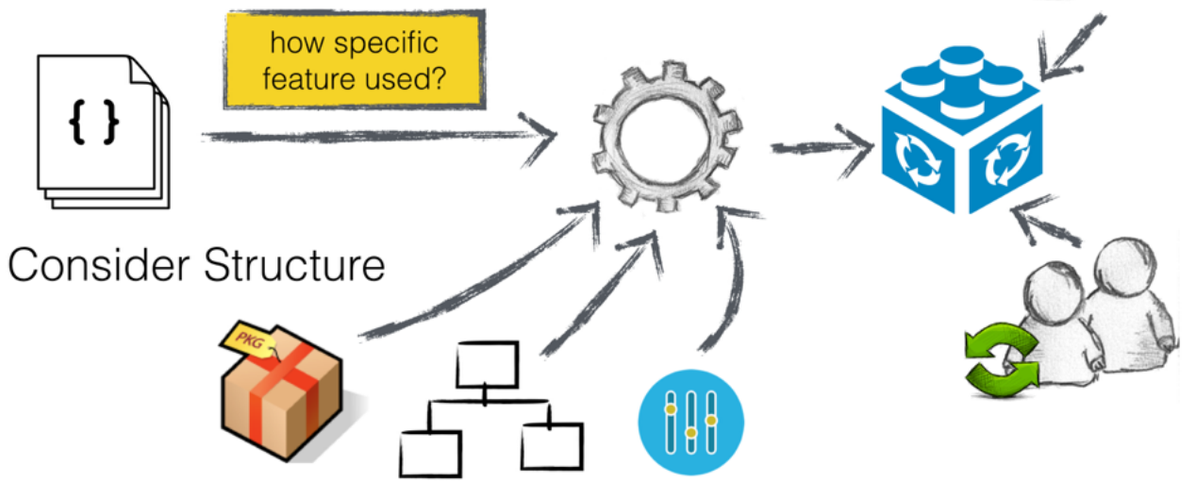


Concernification



Automated Concernification

Use Executable Examples



Extract feature model

Help with initial concern creation