Lost in Abstraction

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innoQ

https://www.innoq.com

What is a Smart Home?

innoQ

Smart Home

is NOT a connected device

is NOT a cloud service

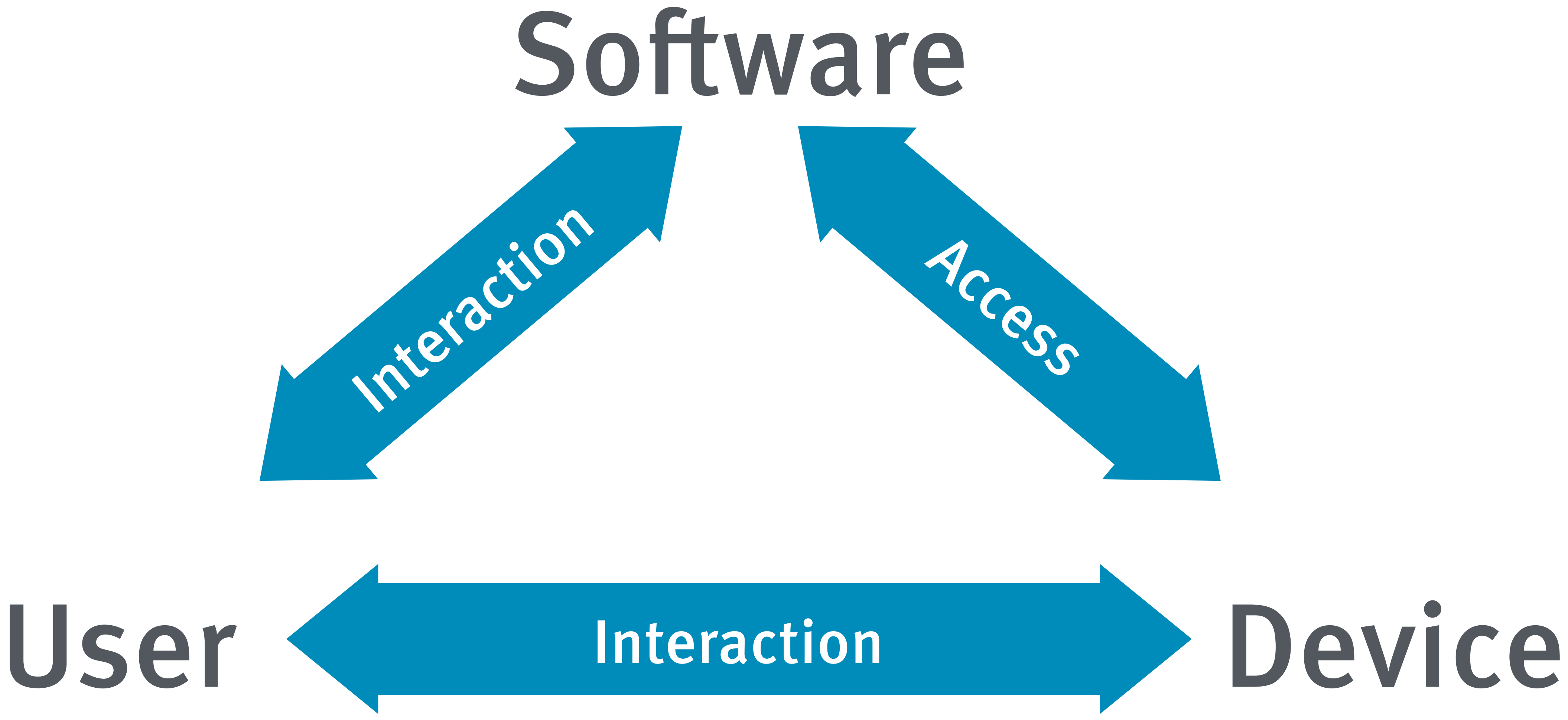
is NOT a single product

“A dwelling incorporating a **communications network** that connects the key electrical appliances and services, and allows them to be remotely **controlled**, **monitored** or **accessed**.”

2003 UK Department of Trade and Industry - http://goo.gl/7PW8Gv

It’s a **system of things** which support the occupants **use cases.**

Smart Home participants



Software

User

Device

Interaction

Access

Interaction

The user’s expectations

Flexibility: Cover custom use cases

Extensibility: Installation extension

Sustainability: Long term benefit

Avoid vendor lock-in: Should be extensible

U

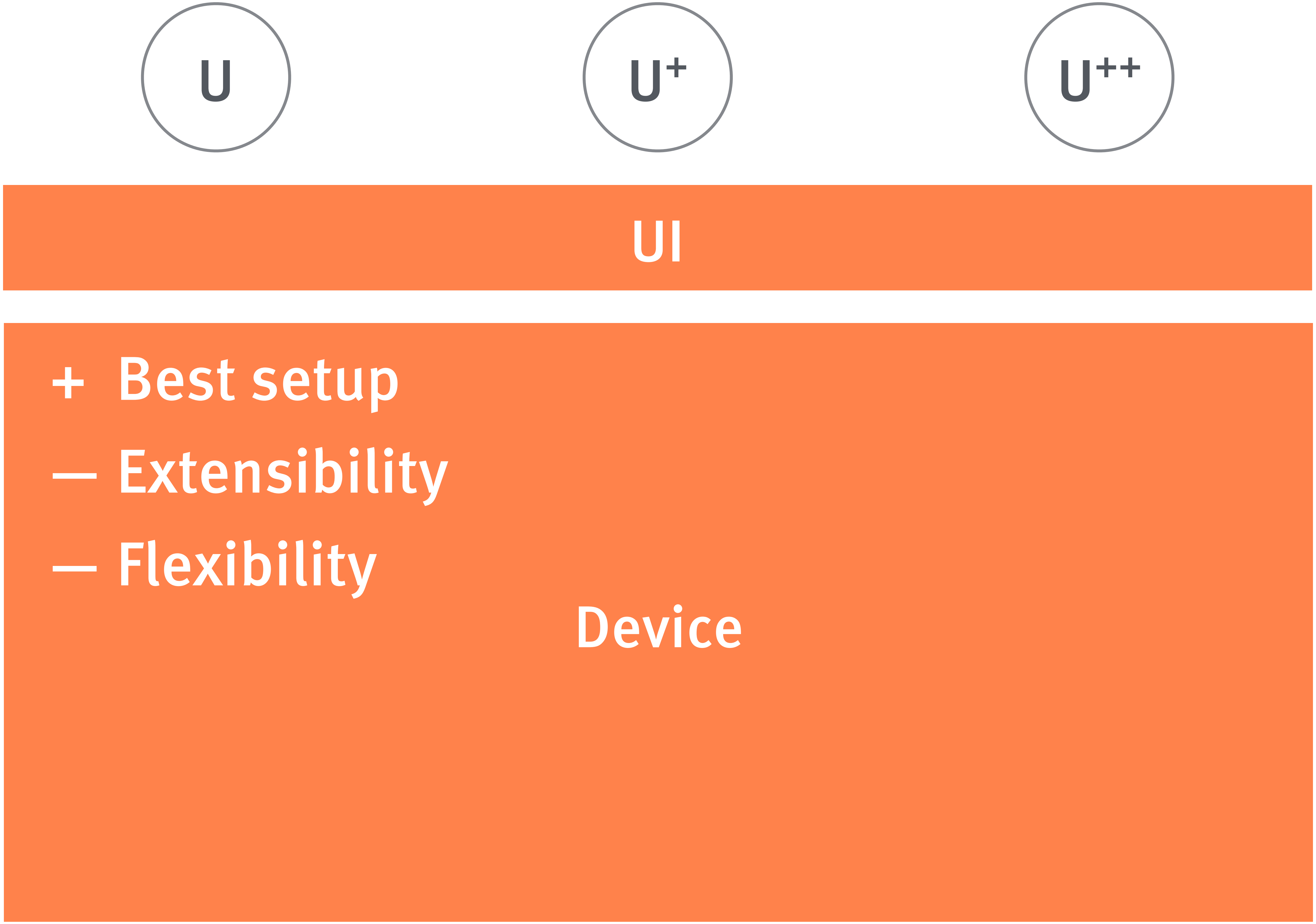
Passive User

U^+

Ambitioned User

U^{++}

Expert



U

U^+

U^{++}

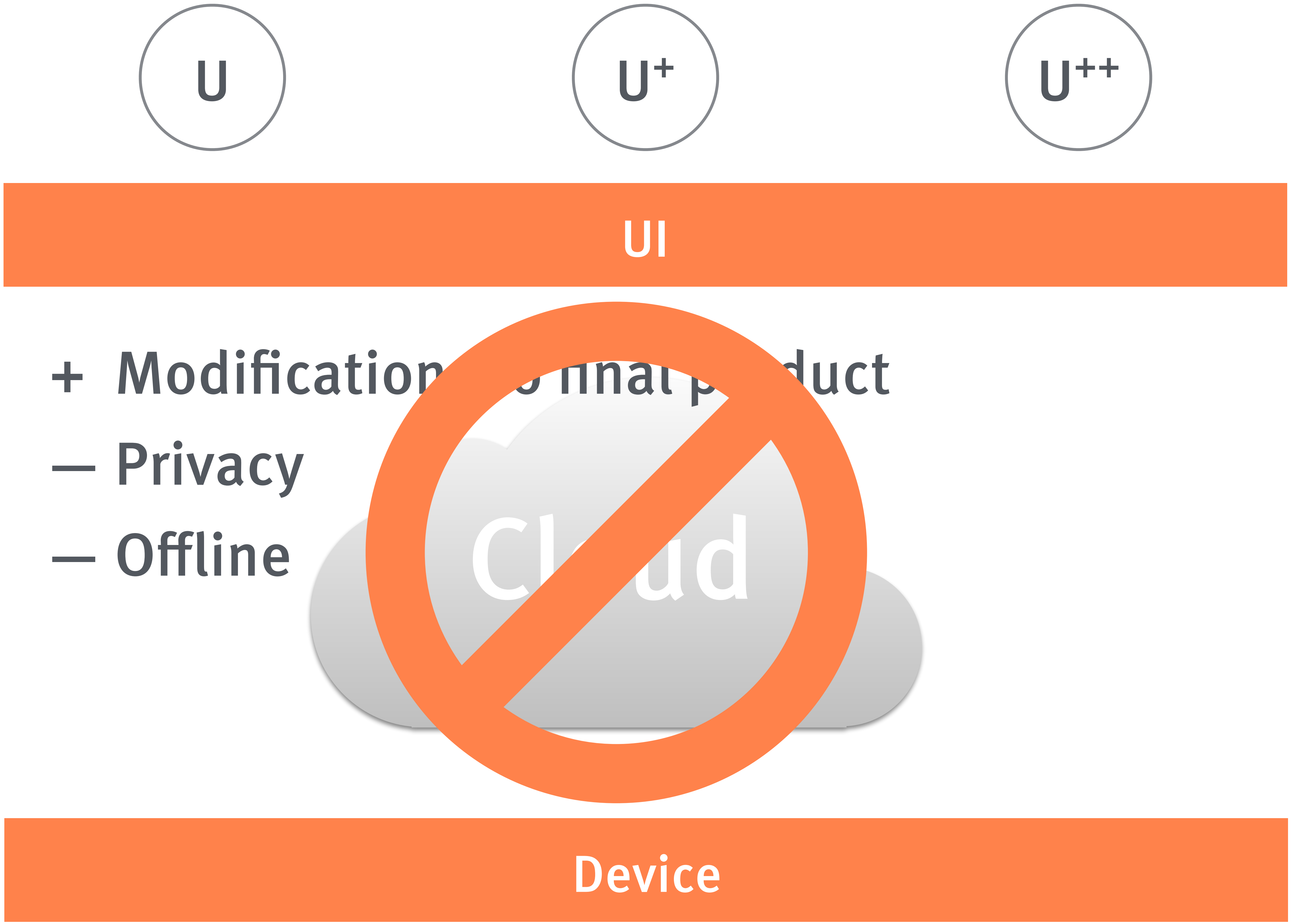
UI

+ Best setup

— Extensibility

— Flexibility

Device



U

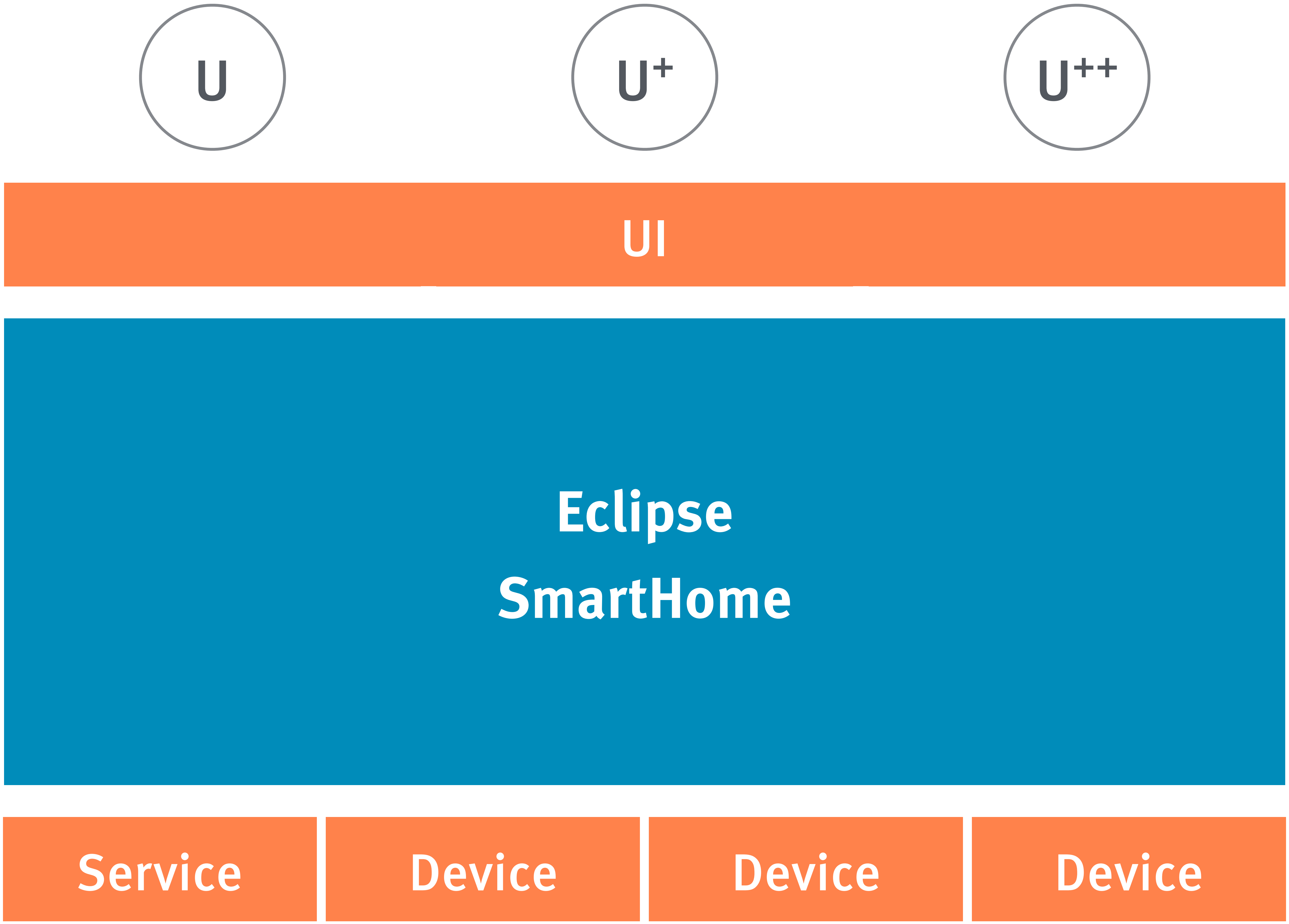
U^+

U^{++}

UI

- + Modification to final product
- — Privacy
- — Offline

Device



U

U^+

U^{++}

UI

Eclipse SmartHome

Service

Device

Device

Device

Eclipse SmartHome (ESH)

Eclipse SmartHome

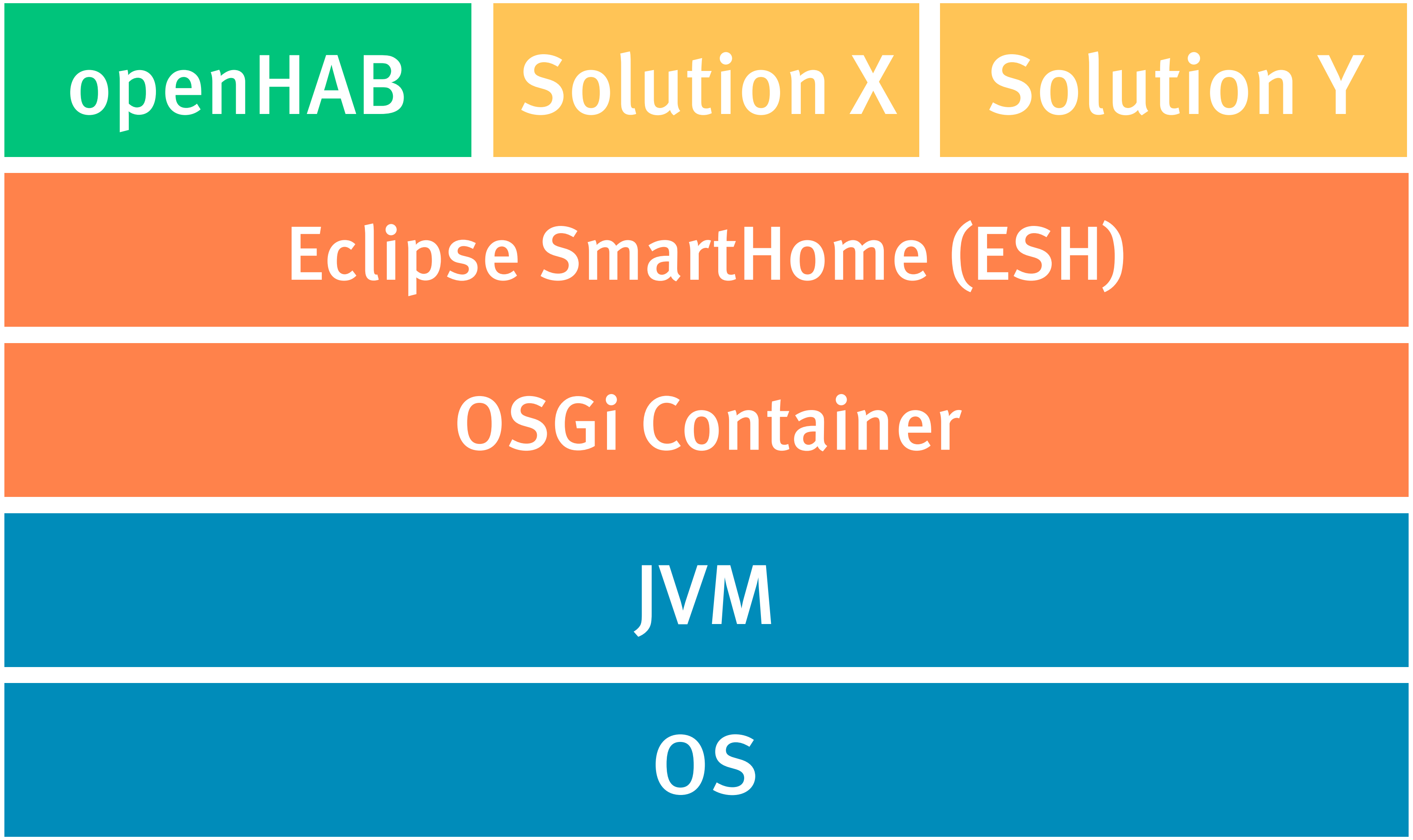
- An open source Internet of Things framework
- Java OSGi based Project
- Eclipse Public License
- Since 2014
- Base of openHAB
- Requirements: Java >= 6
- Base of successful commercial Projects

What you get

- Structure to handle IoT devices
- Web-Interfaces, Apps, Examples
- More than 100 already supported things
- Documentation
- Commercial support available
- Large and active community

What you do not get

- Hardware
- A Java license



openHAB

Solution X

Solution Y

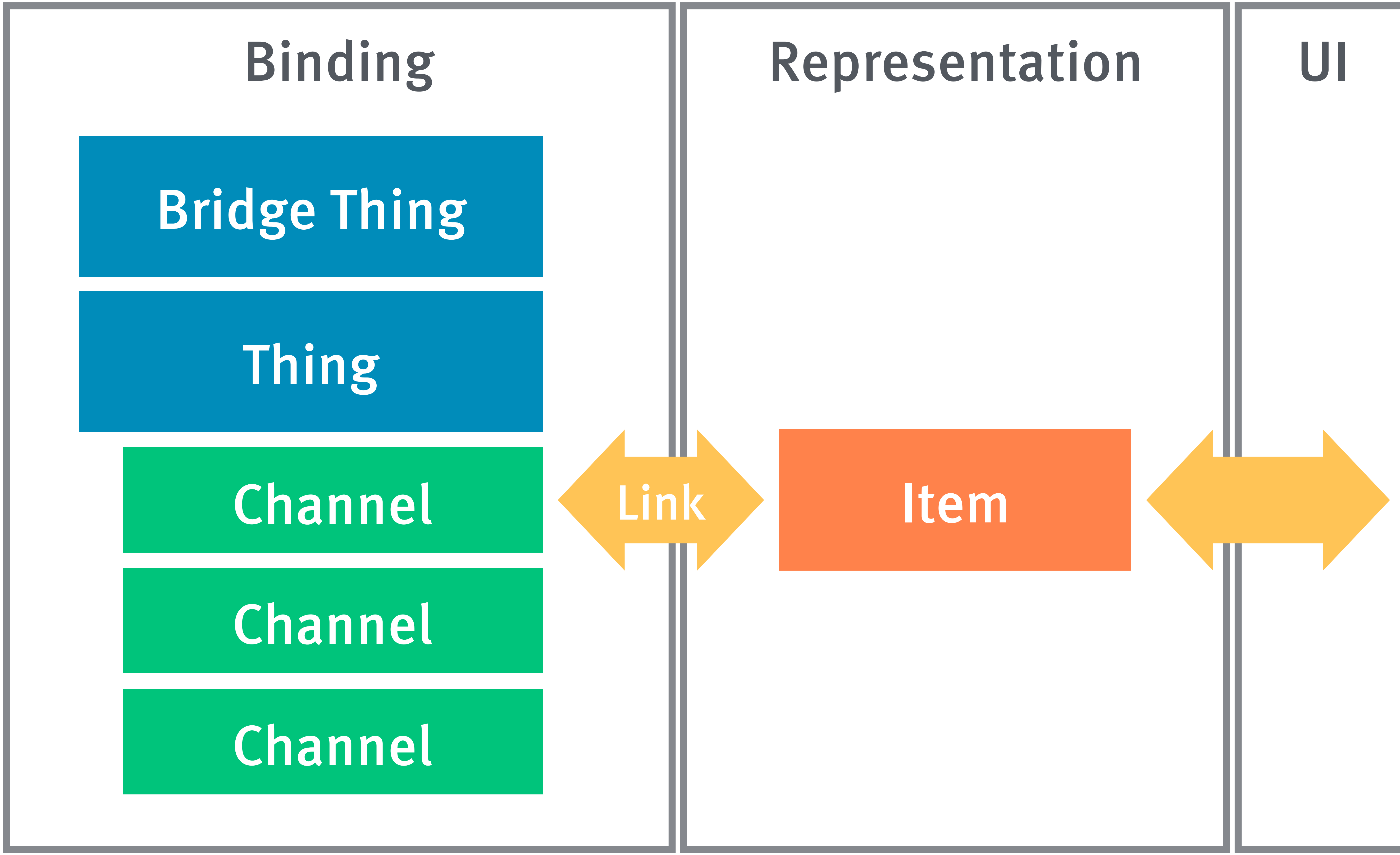
Eclipse SmartHome (ESH)

OSGi Container

JVM

OS

How to **use** this?



Binding

Bridge Thing

Thing

Channel

Channel

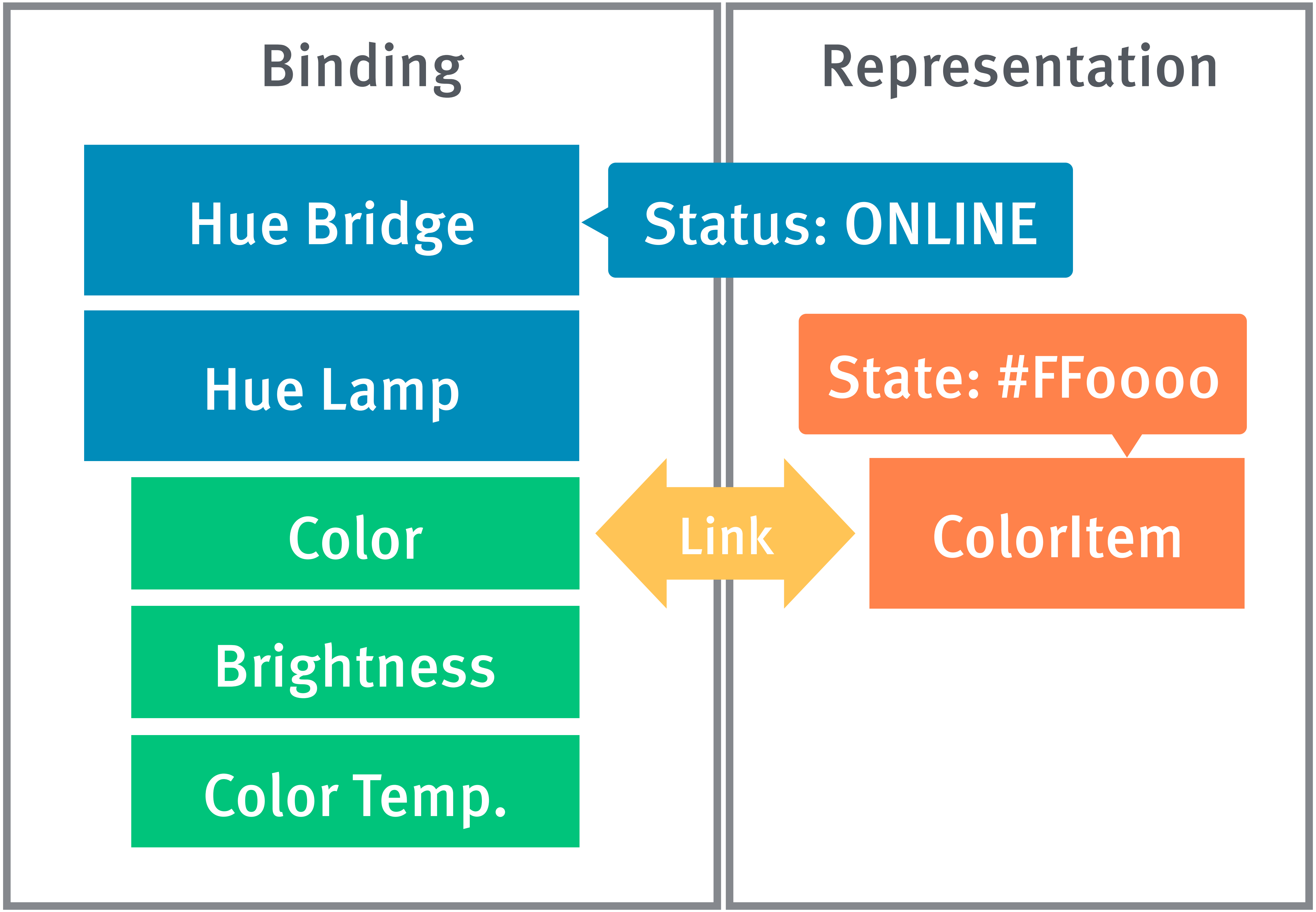
Channel

Link

Representation

Item

UI



Binding

Representation

Hue Bridge

Status: ONLINE

Hue Lamp

State: #FF0000

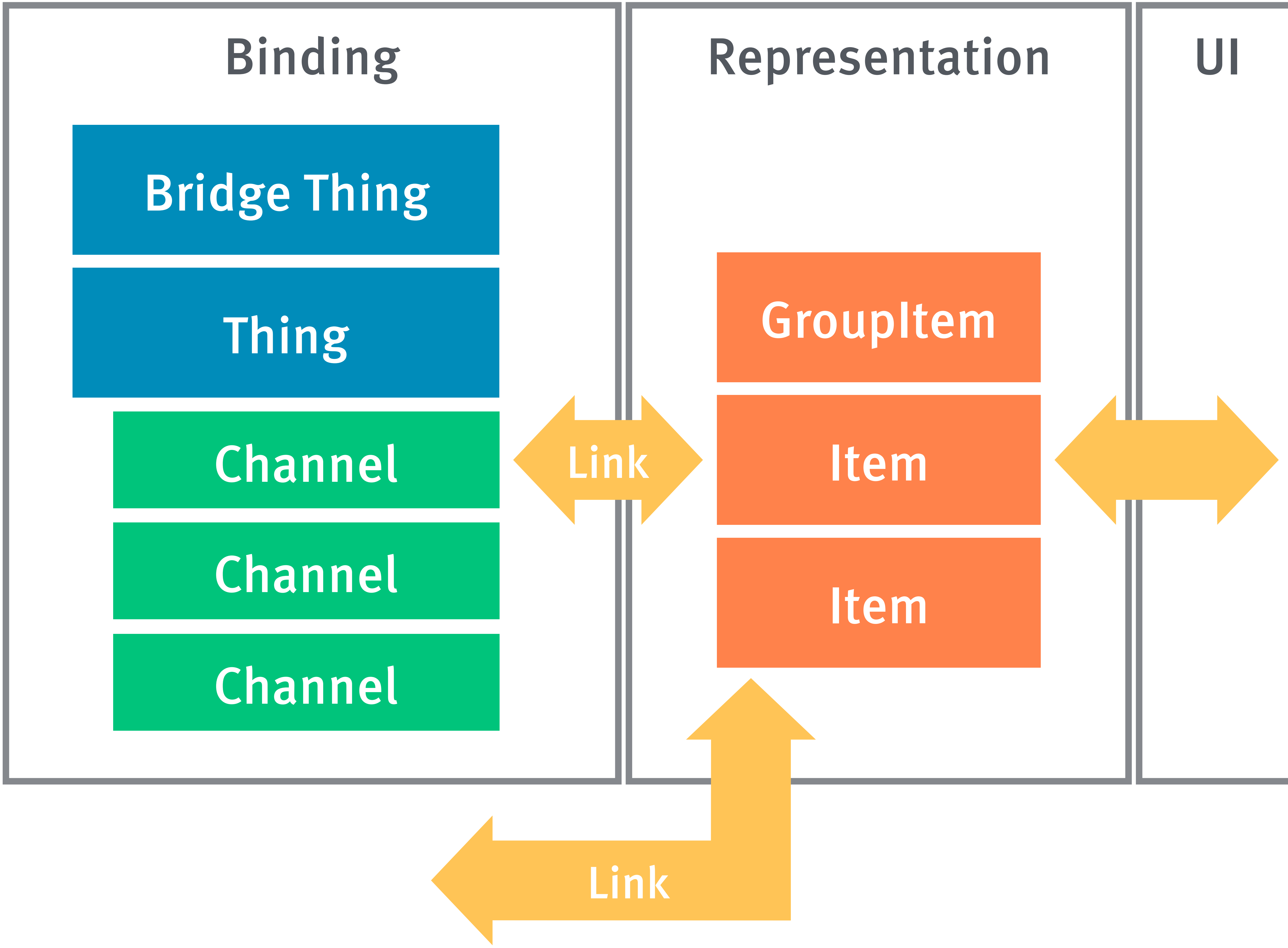
Color

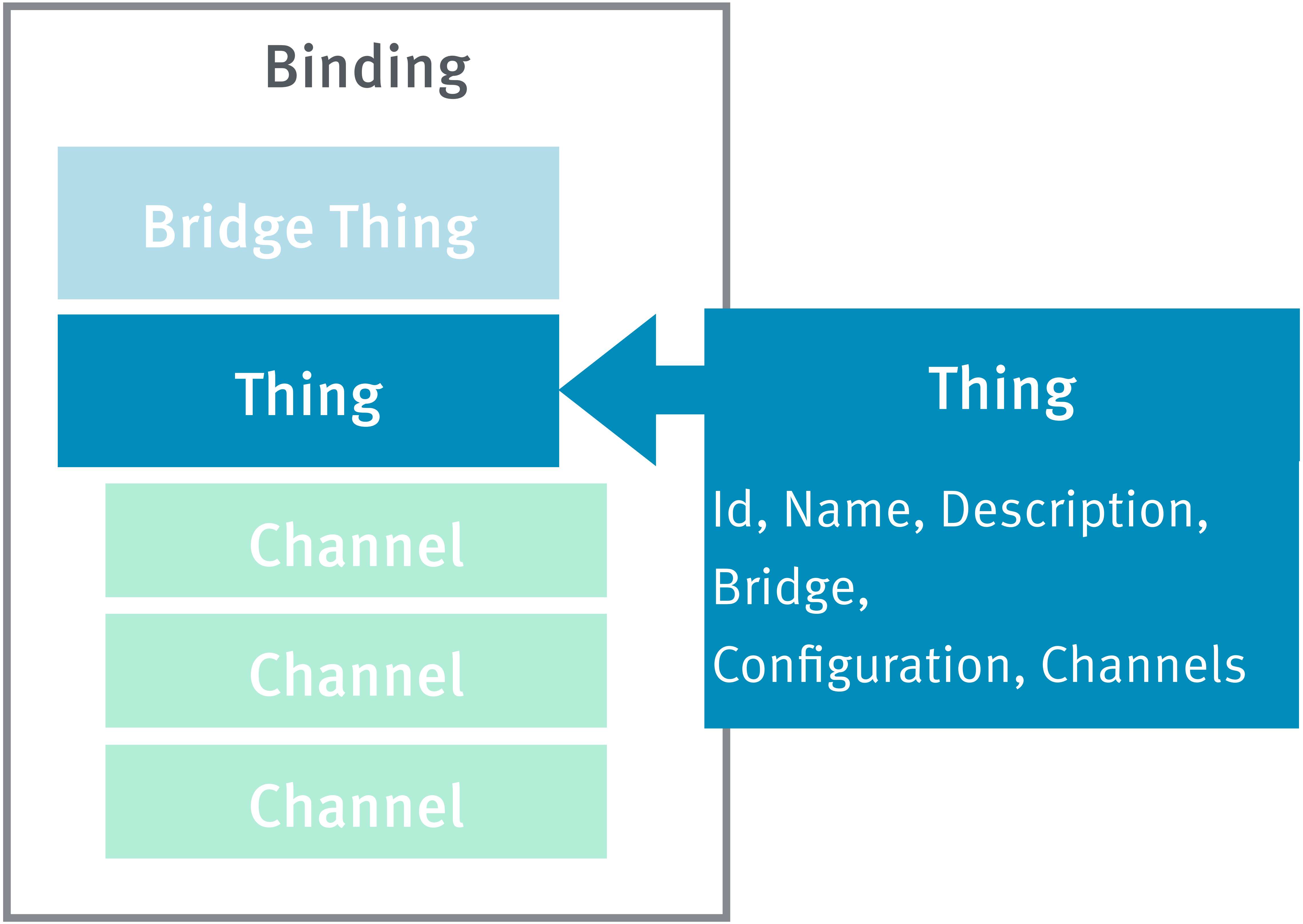
Link

ColorItem

Brightness

Color Temp.


Binding
Representation
UI
Bridge Thing
Thing
Channel
Channel
Channel
Link
GroupItem
Item
Item
Link



Binding

Bridge Thing

Thing

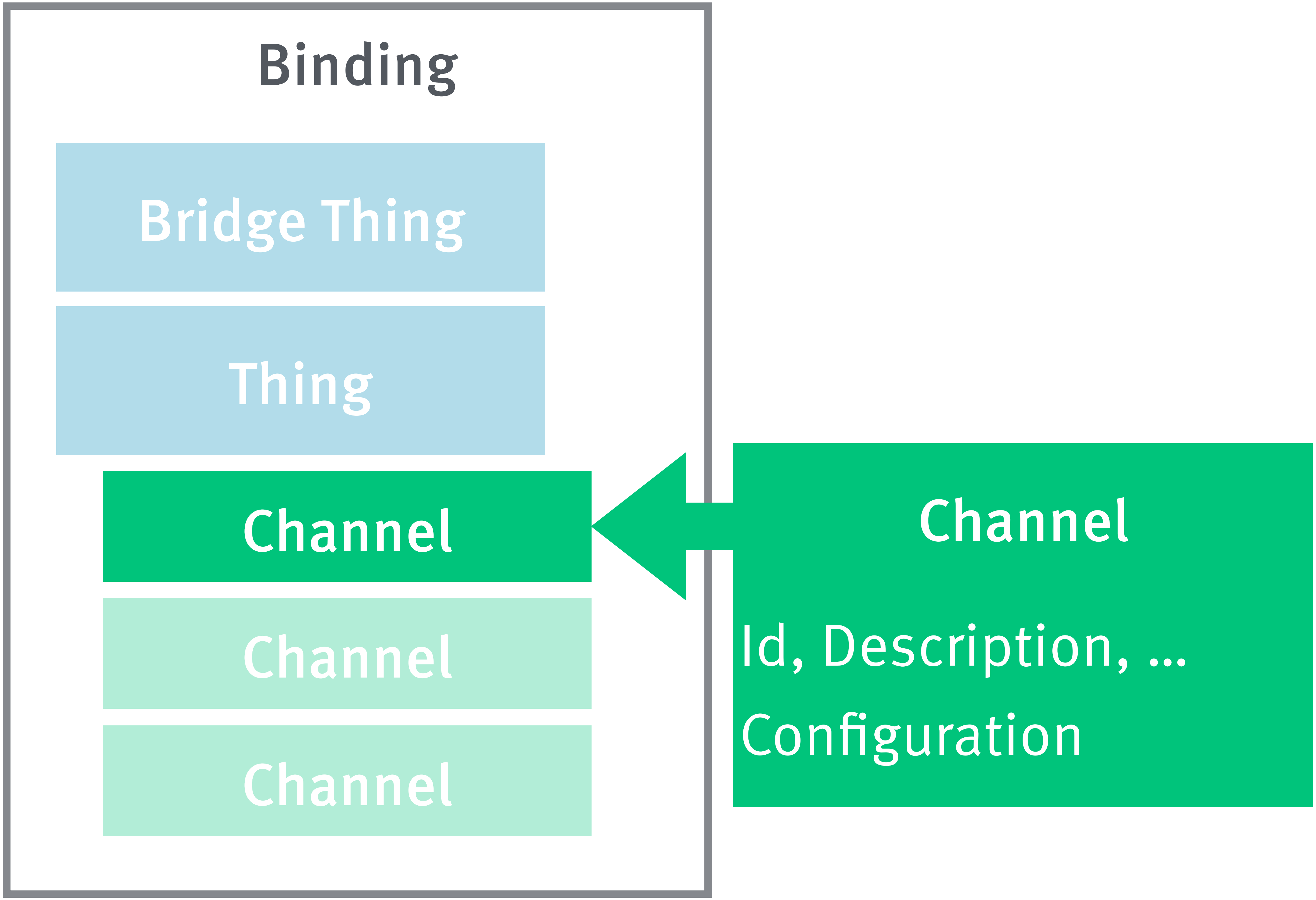
Channel

Channel

Channel

Thing

Id, Name, Description,
Bridge,
Configuration, Channels



Binding

Bridge Thing

Thing

Channel

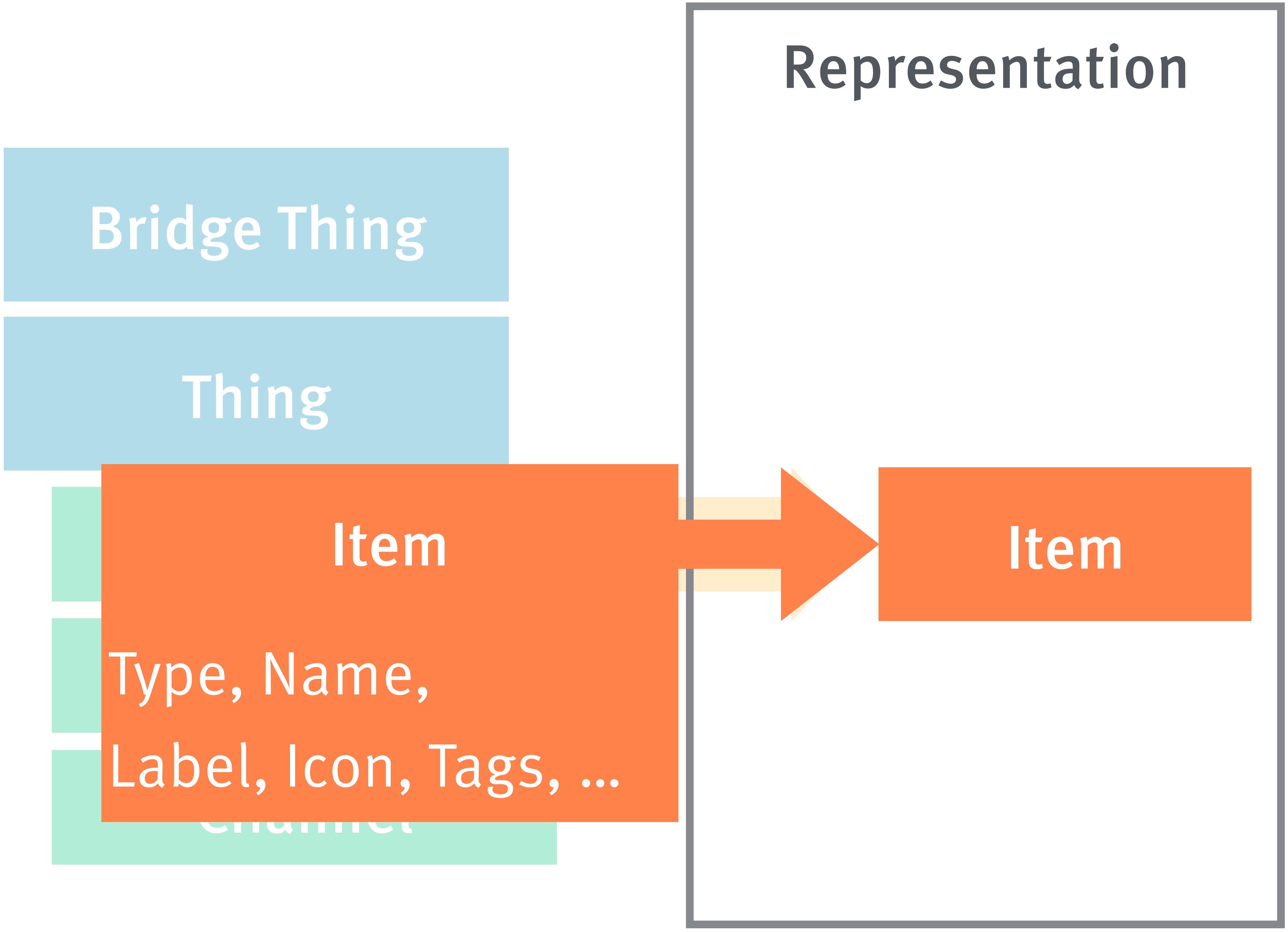
Channel

Channel

Channel

Id, Description, …

Configuration



Representation

Bridge Thing

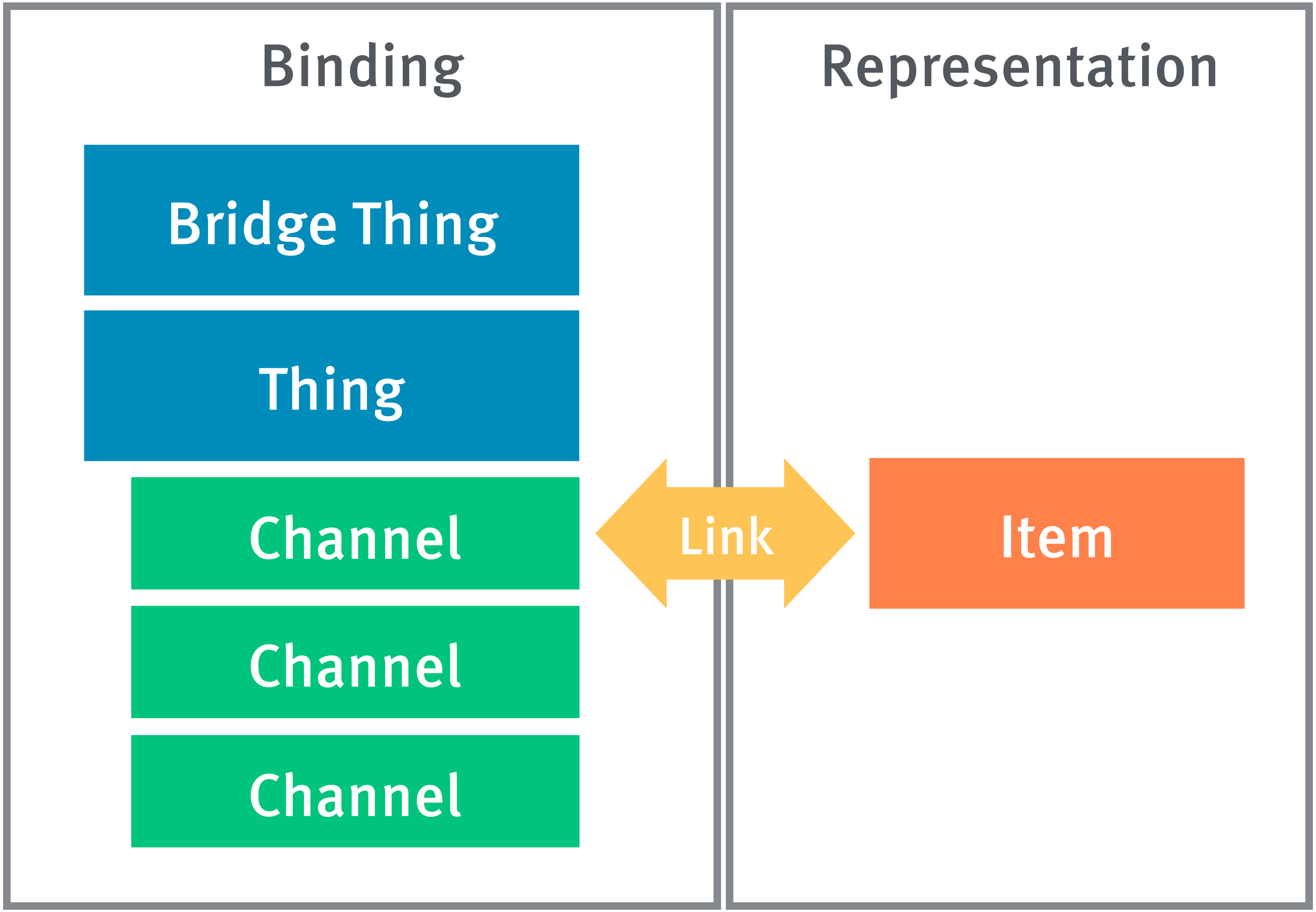
Thing

Item

Type, Name,

Label, Icon, Tags, ...

Item



Binding

Representation

Bridge Thing

Thing

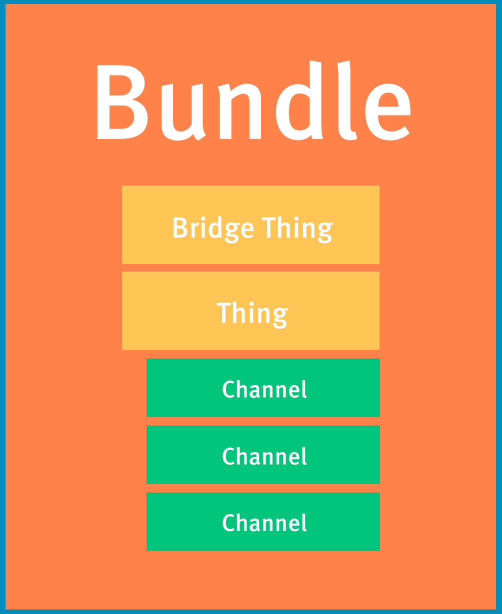
Channel

Channel

Channel

Link

Item



Bundle

Bridge Thing

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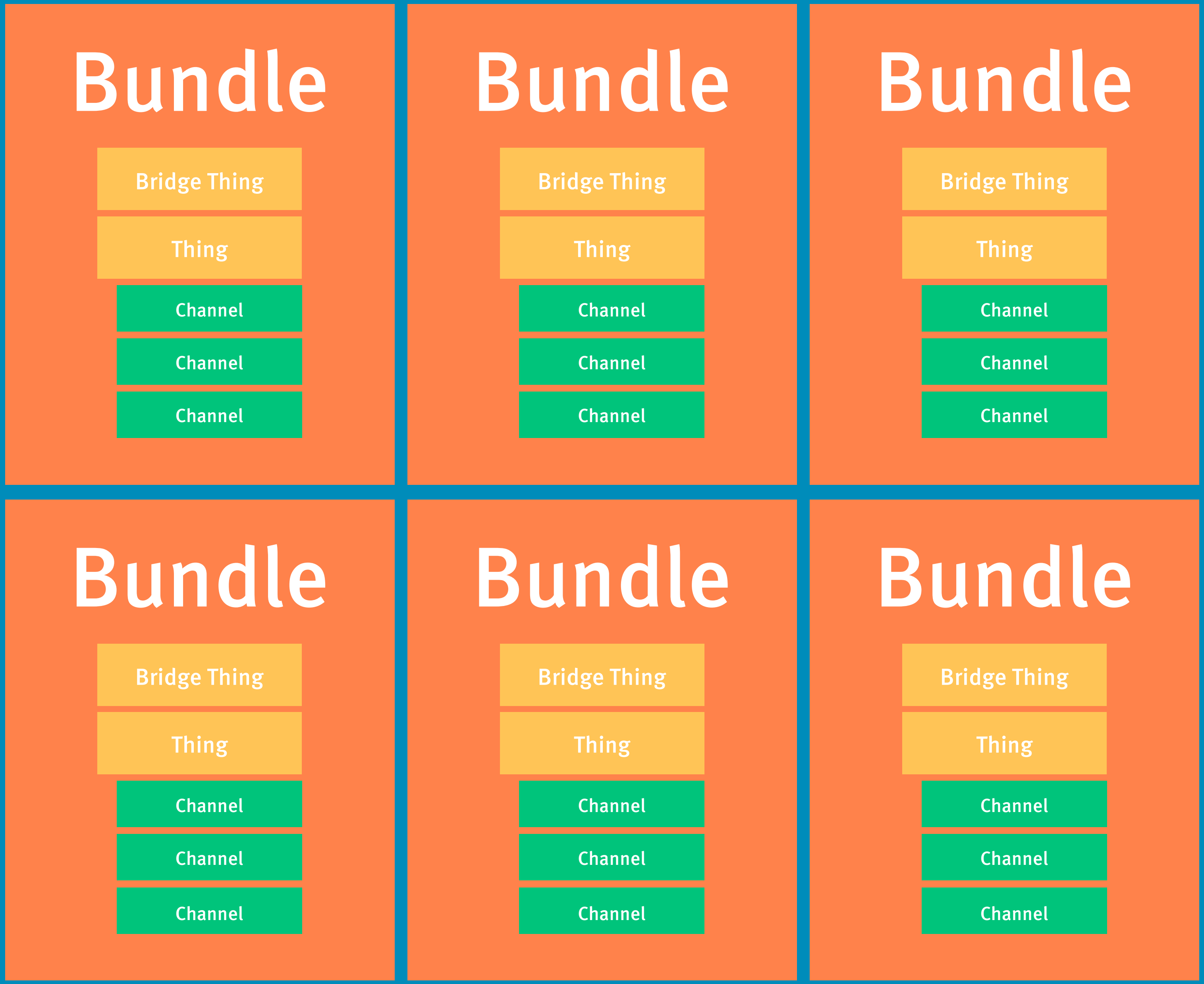
Channel

Channel

Channel

Eclipse SmartHome



Bundle
Bridge Thing
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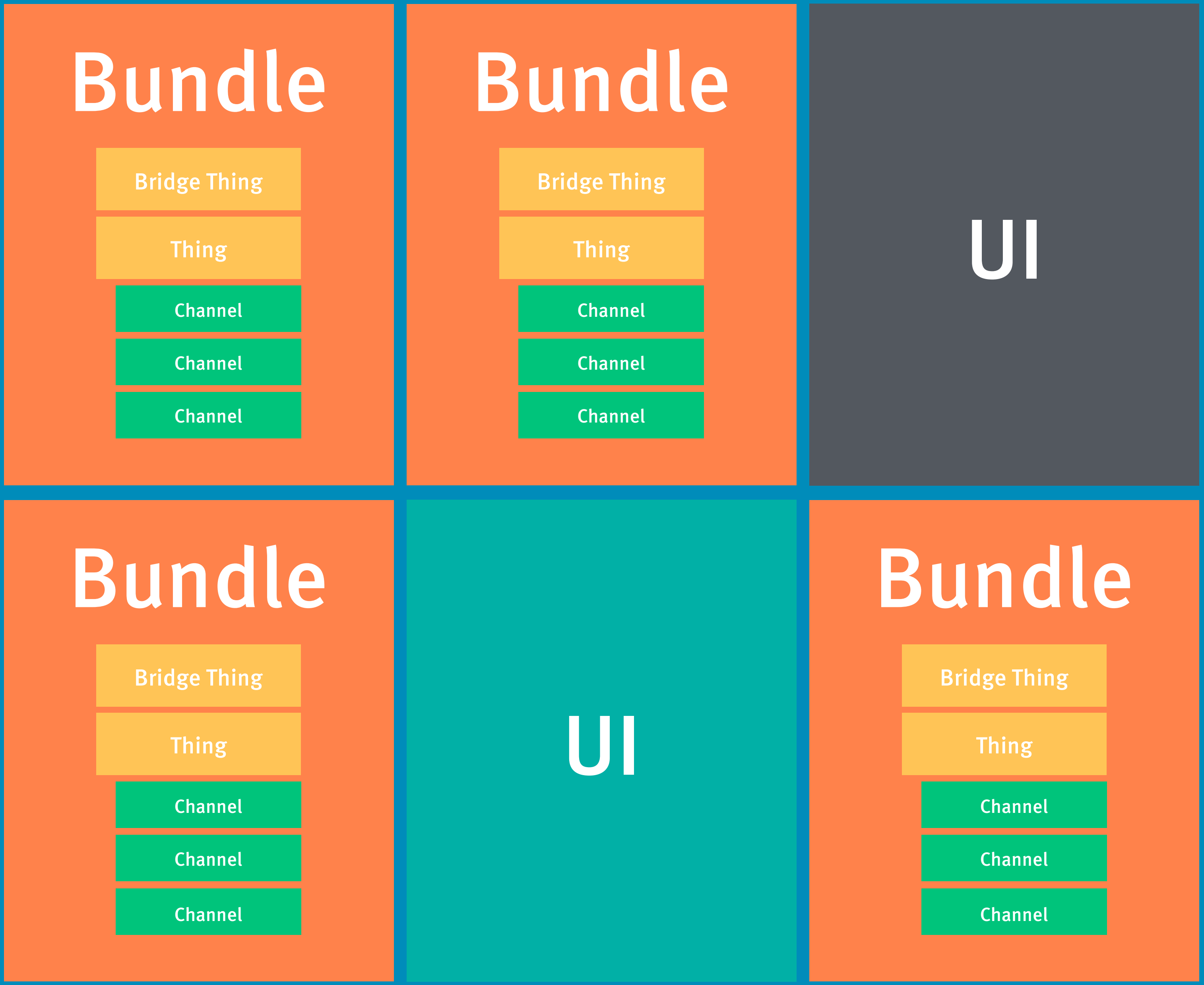
Eclipse SmartHome



Bundle

Bridge Thing

Thing

Channel

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Bundle

Bridge Thing

Thing

Channel

Channel

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UI

Bundle

Bridge Thing

Thing

Channel

Channel

Channel

UI

Bundle

Bridge Thing

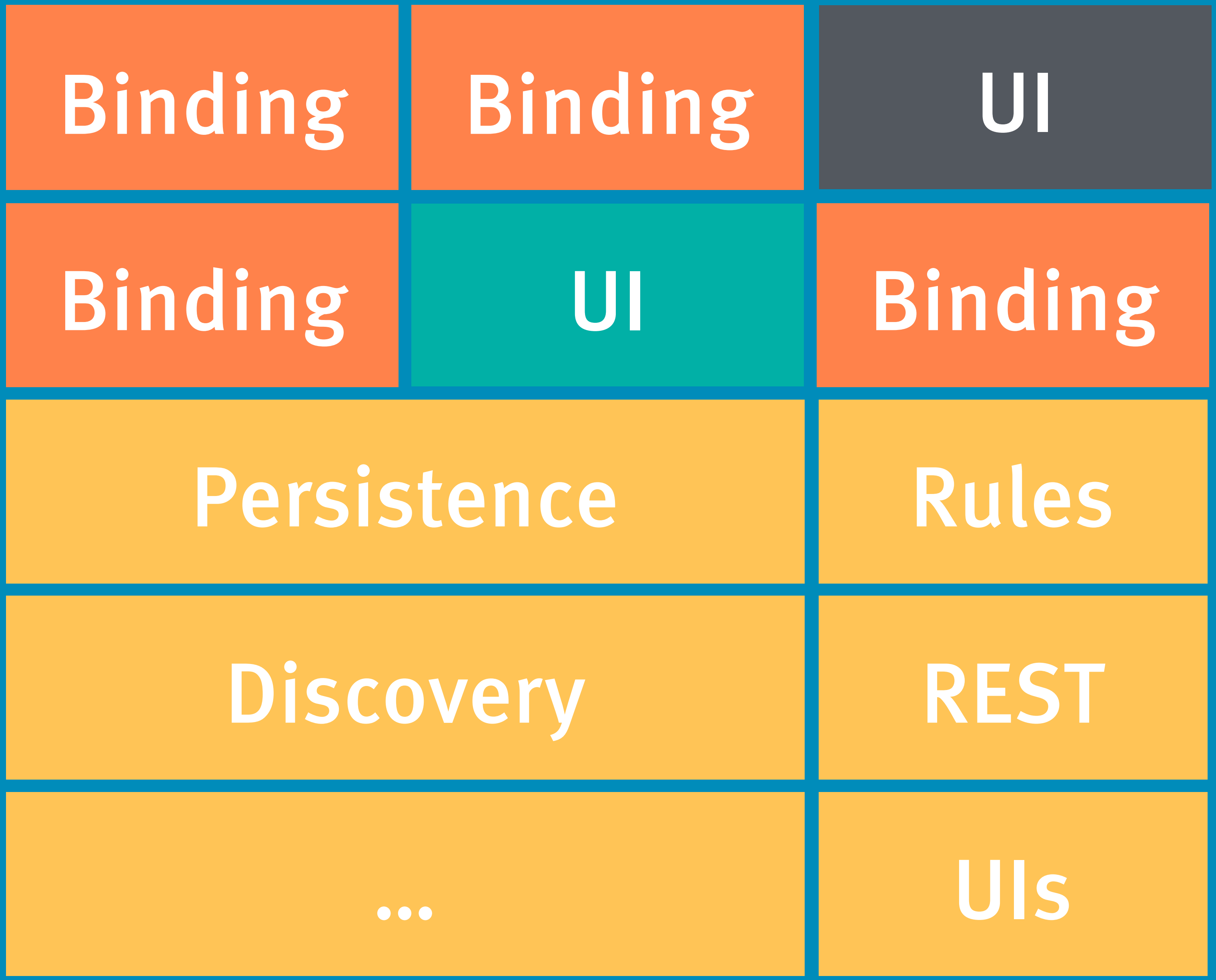
Thing

Channel

Channel

Channel

Eclipse SmartHome



Binding Binding UI

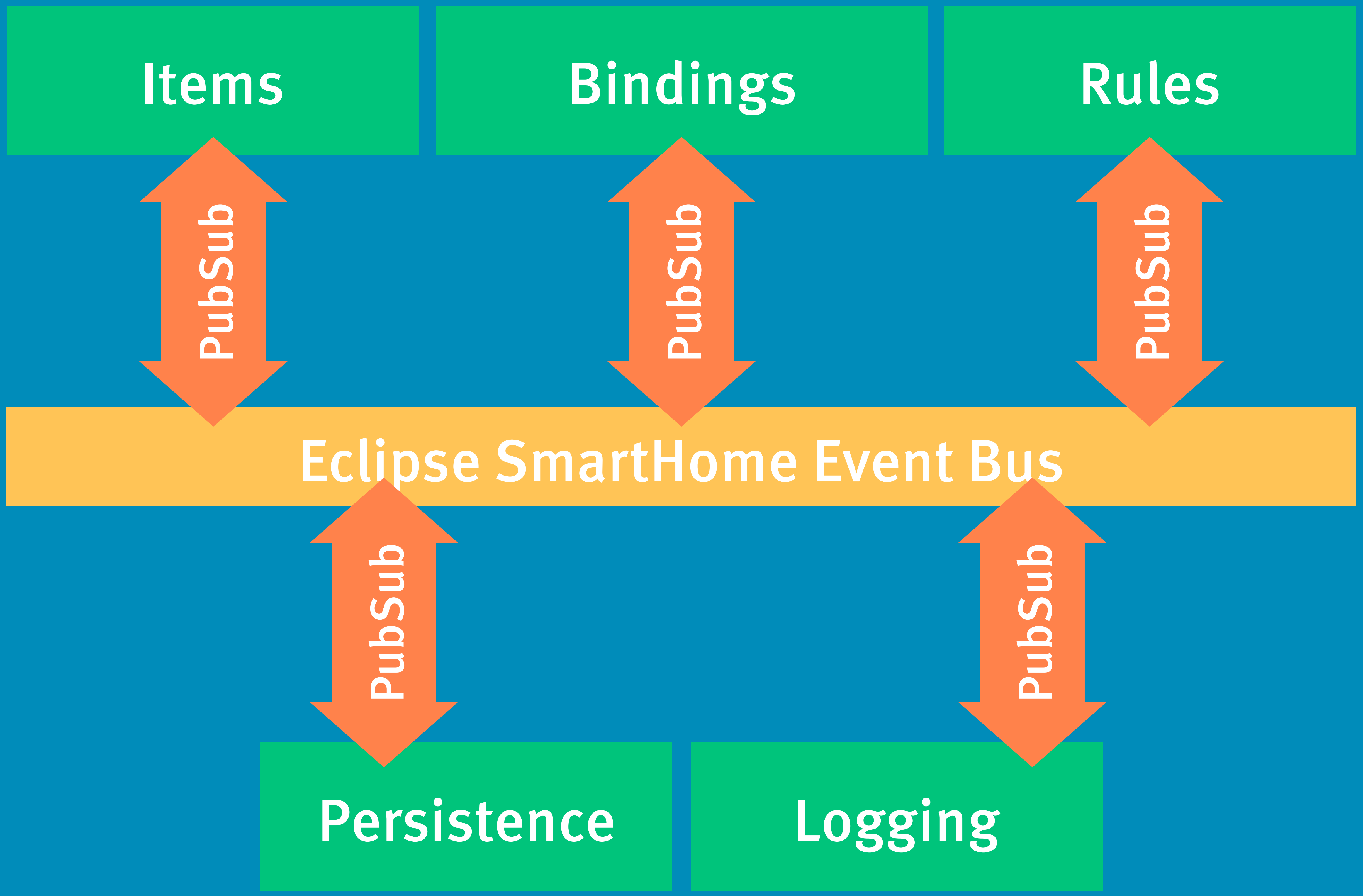
Binding UI Binding

Persistence Rules

Discovery REST

… UIs

Eclipse SmartHome Core



Items

Bindings

Rules

PubSub

PubSub

PubSub

Eclipse SmartHome Event Bus

PubSub

PubSub

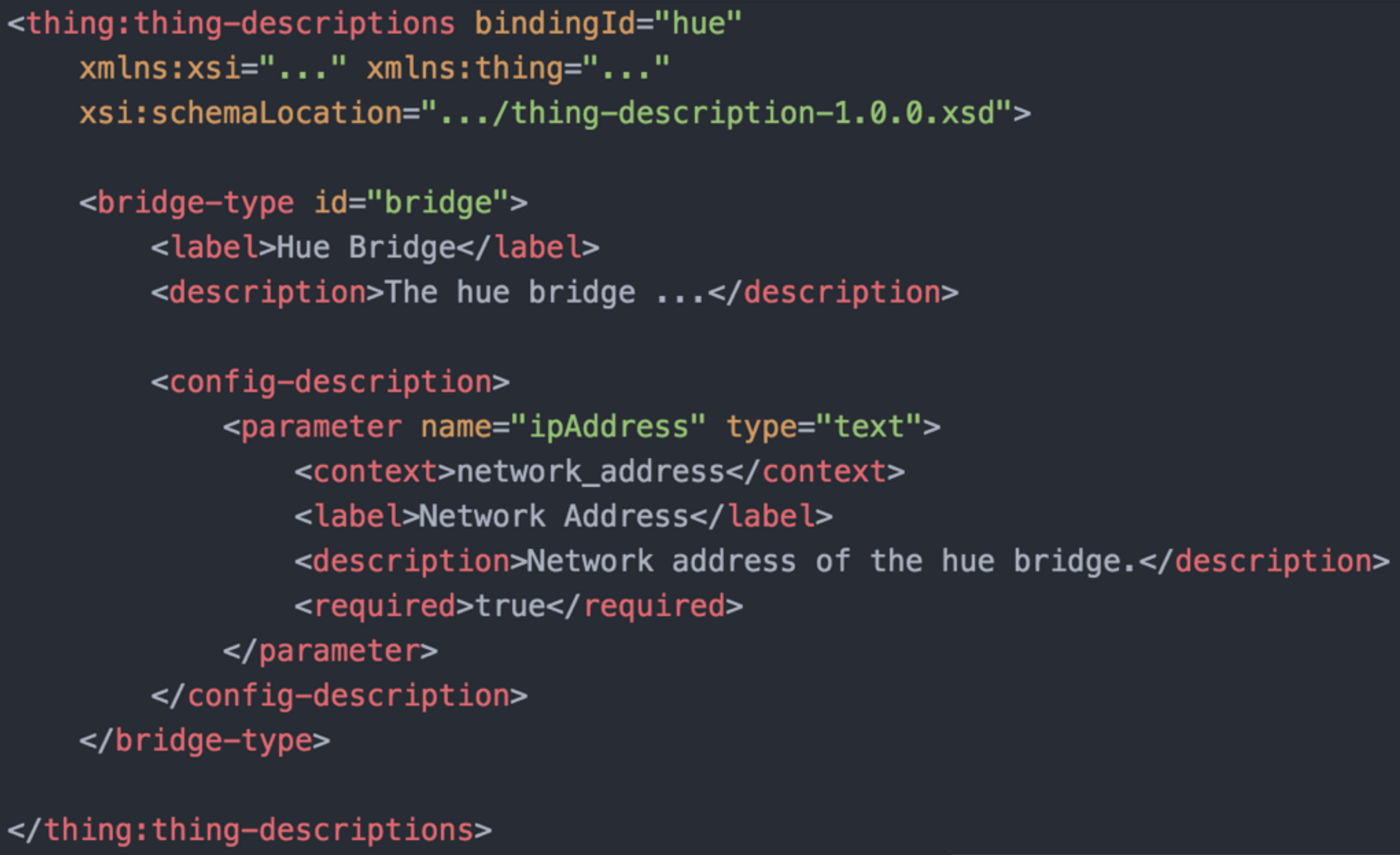
Persistence

Logging

How to

program this?

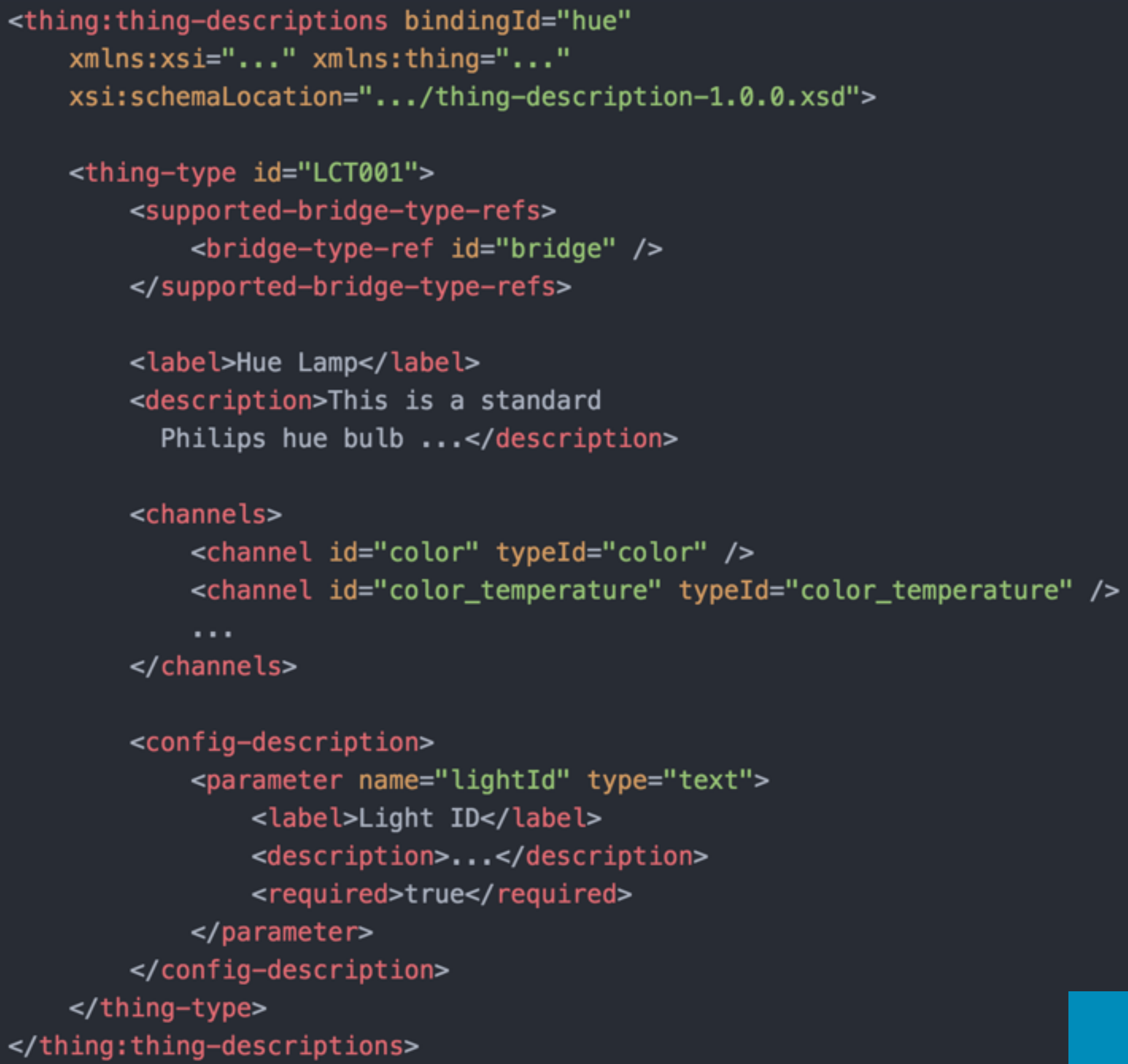
/ESH-INF/thing/bridge.xml



```xml
<thing:thing-descriptions bindingId="hue"
    xmlns:xsi="..." xmlns:thing="..."
    xsi:schemaLocation=".../thing-description-1.0.0.xsd">

    <bridge-type id="bridge">
        <label>Hue Bridge</label>
        <description>The hue bridge ...</description>

        <config-description>
            <parameter name="ipAddress" type="text">
                <context>network_address</context>
                <label>Network Address</label>
                <description>Network address of the hue bridge.</description>
                <required>true</required>
            </parameter>
        </config-description>
    </bridge-type>

</thing:thing-descriptions>
```

Bridge Thing

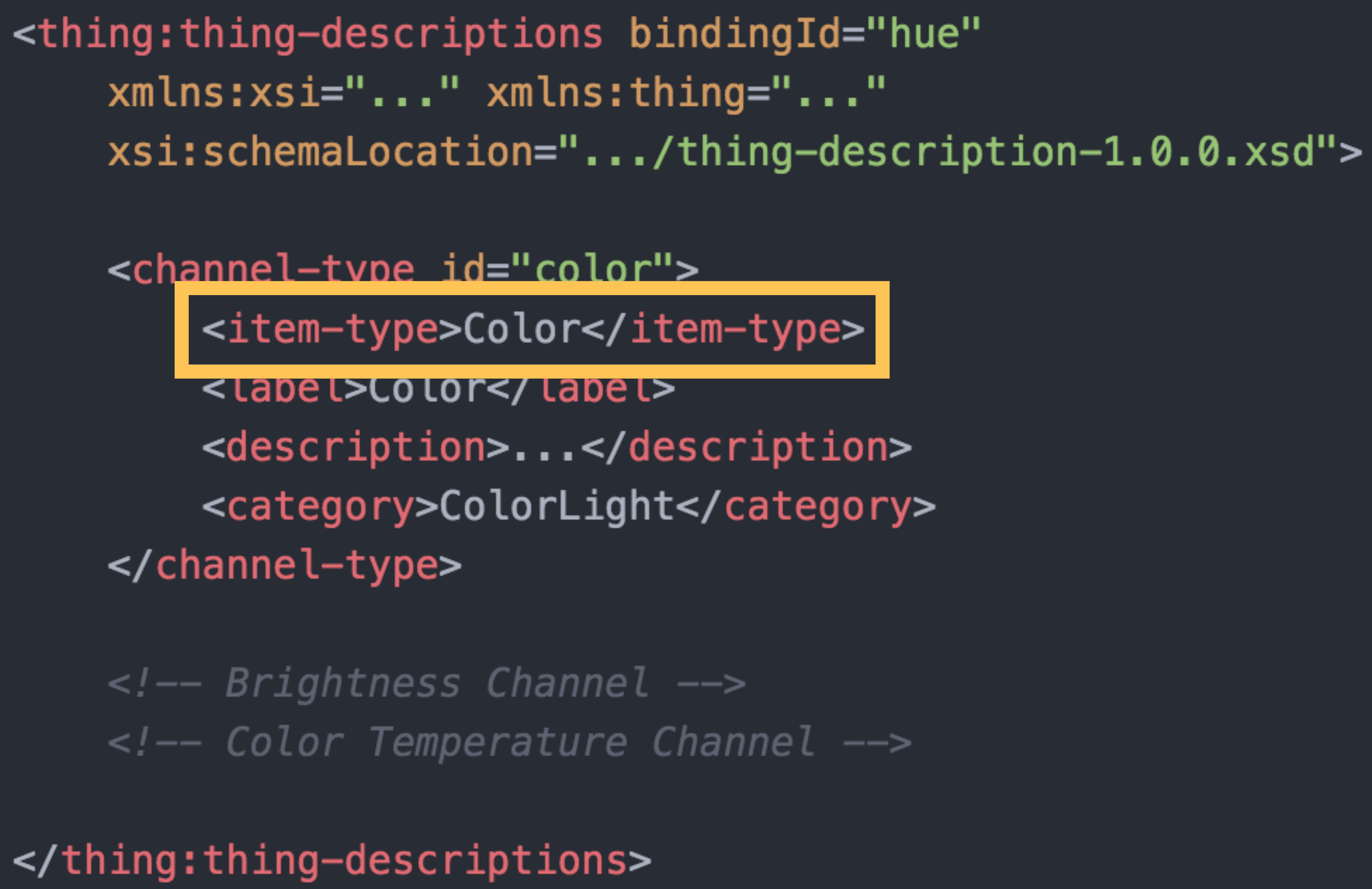
/ESH-INF/thing/LCT001.xml



```xml
<thing:thing-descriptions bindingId="hue"
    xmlns:xsi="..." xmlns:thing="..."
    xsi:schemaLocation=".../thing-description-1.0.0.xsd">

    <thing-type id="LCT001">
        <supported-bridge-type-refs>
            <bridge-type-ref id="bridge" />
        </supported-bridge-type-refs>

        <label>Hue Lamp</label>
        <description>This is a standard
          Philips hue bulb ...</description>

        <channels>
            <channel id="color" typeId="color" />
            <channel id="color_temperature" typeId="color_temperature" />
            ...
        </channels>

        <config-description>
            <parameter name="lightId" type="text">
                <label>Light ID</label>
                <description>...</description>
                <required>true</required>
            </parameter>
        </config-description>
    </thing-type>
</thing:thing-descriptions>
```

Thing

/ESH-INF/thing/channels.xml



```
<thing:thing-descriptions bindingId="hue"
    xmlns:xsi="..." xmlns:thing="..."
    xsi:schemaLocation=".../thing-description-1.0.0.xsd">

    <channel-type id="color">
        <item-type>Color</item-type>
        <label>Color</label>
        <description>...</description>
        <category>ColorLight</category>
    </channel-type>

    <!-- Brightness Channel -->
    <!-- Color Temperature Channel -->

</thing:thing-descriptions>
```

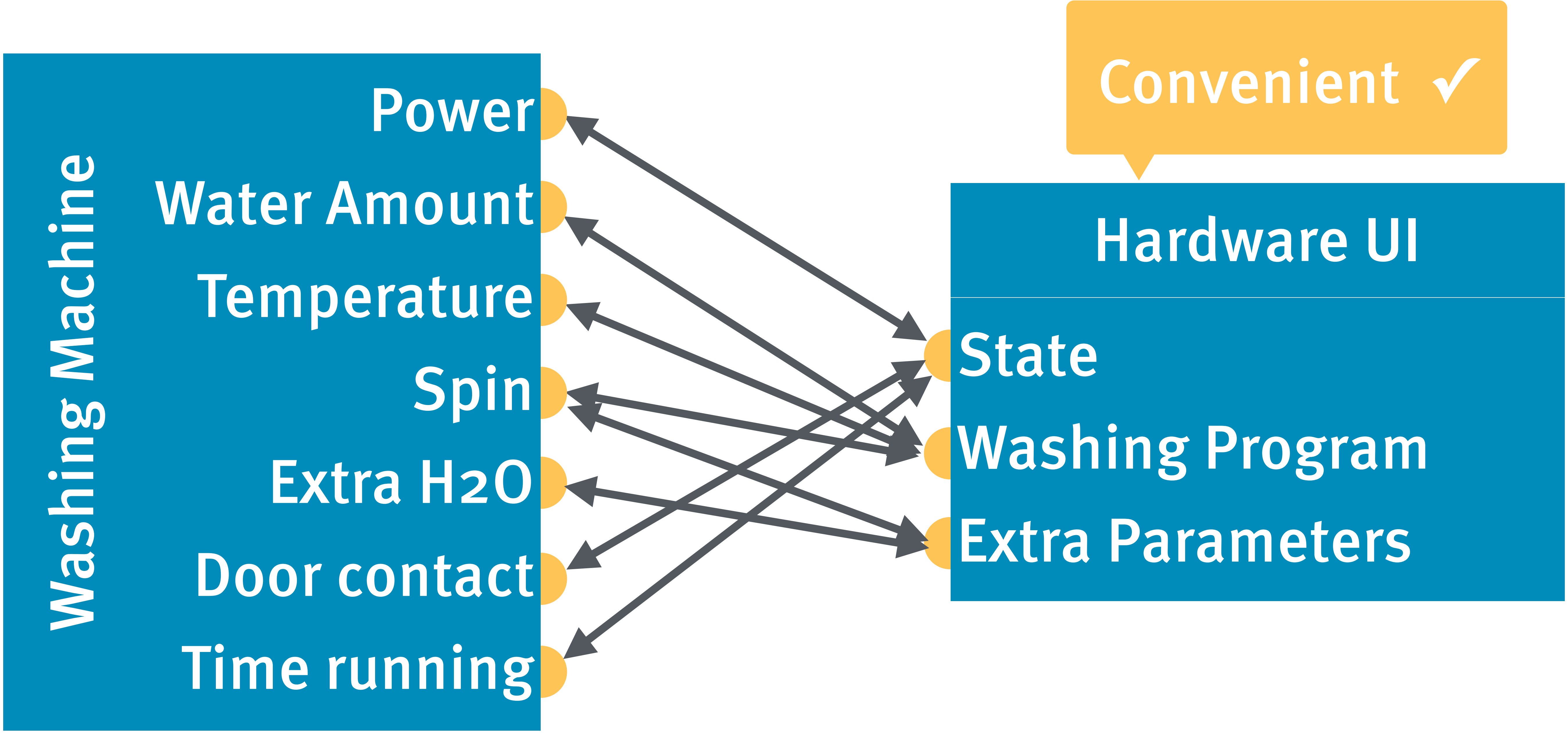
Channel

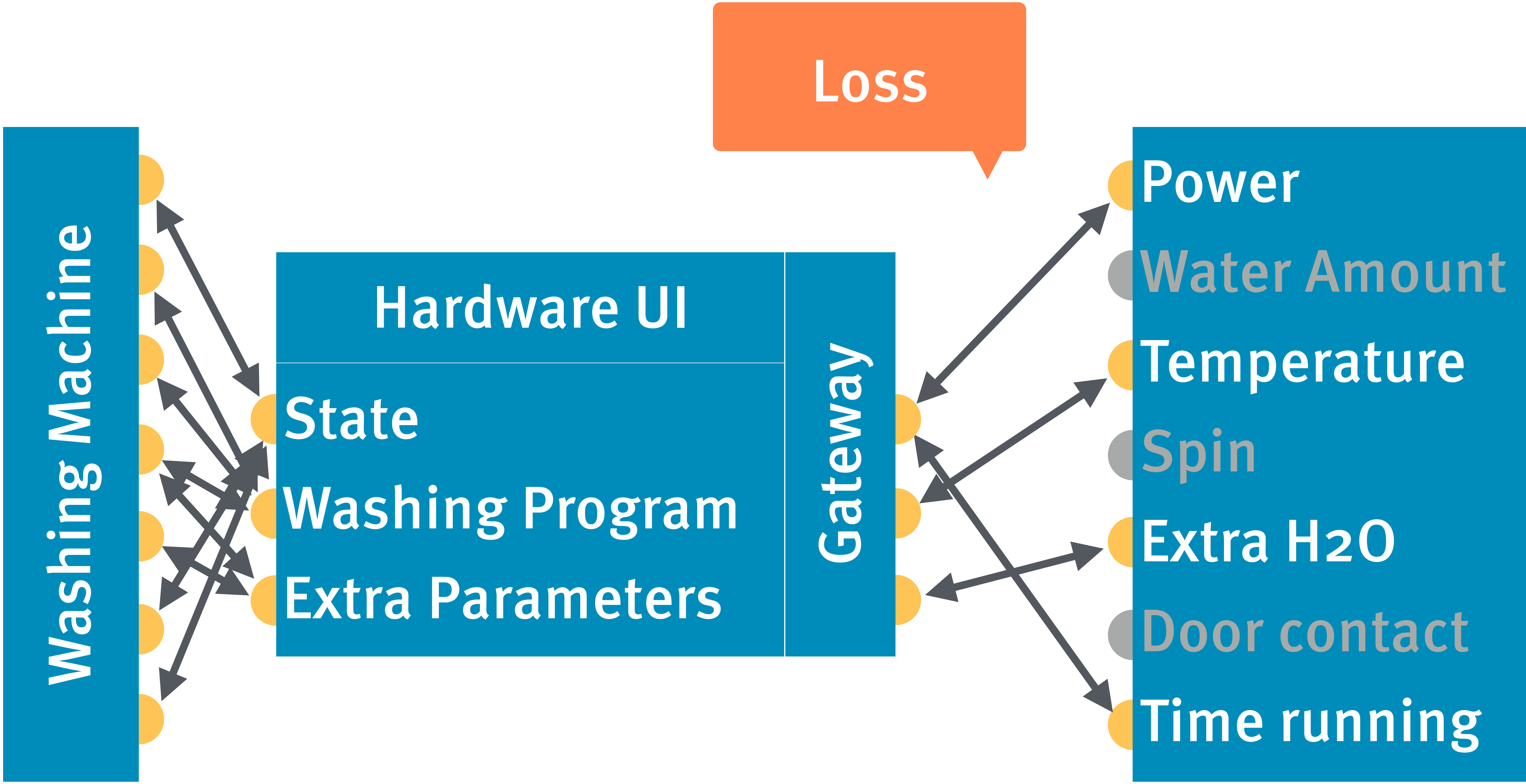
Core ItemTypes

- Color
- Contact
- DateTime
- Dimmer
- Group
- Location
- Number
- Player
- Rollershutter
- String
- Switch

What does **Lost in Abstraction** mean?

Use case:
Wash again, if washing
finished and the door has
not been opened after 16h.


Convenient ✓
Washing Machine
Power
Water Amount
Temperature
Spin
Extra H2O
Door contact
Time running
Hardware UI
State
Washing Program
Extra Parameters



Loss

Washing Machine

Hardware UI

State

Washing Program

Extra Parameters

Gateway

Power

Water Amount

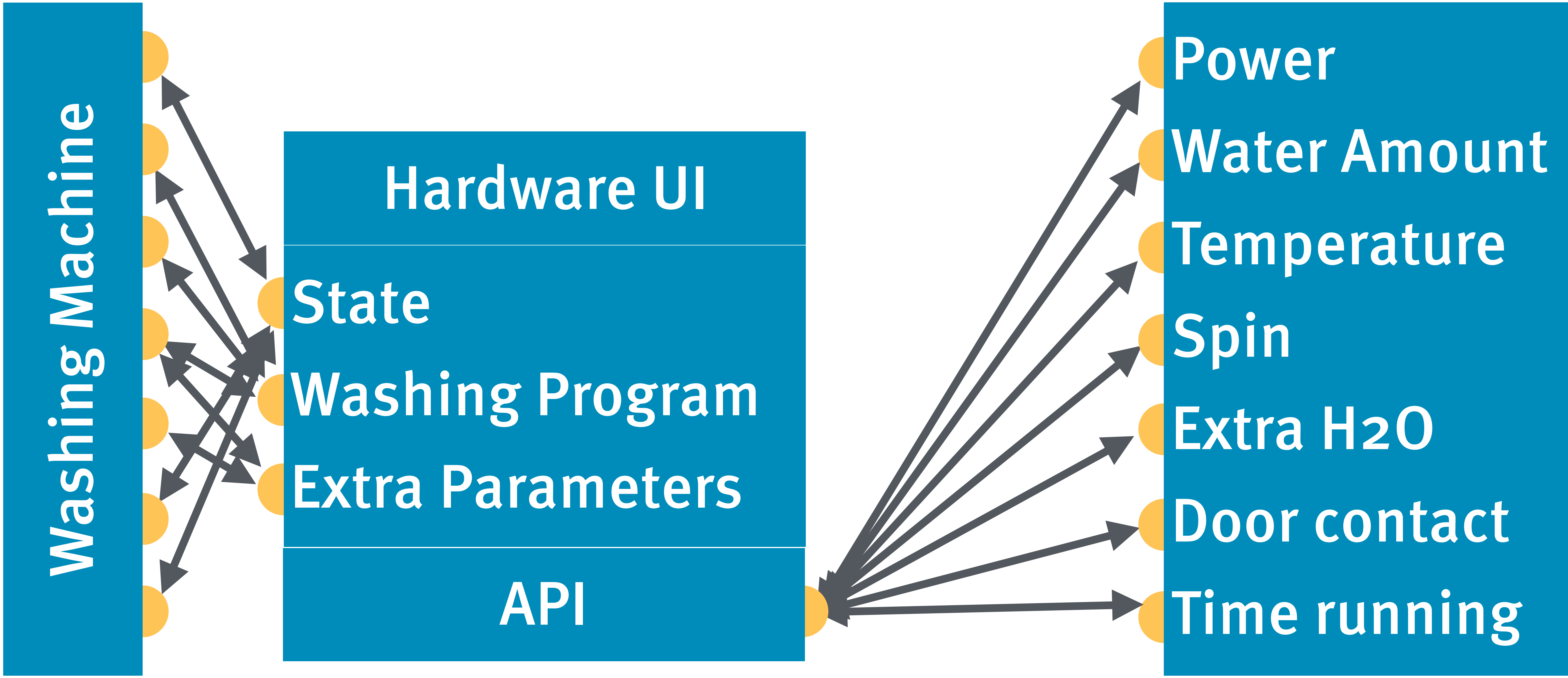
Temperature

Spin

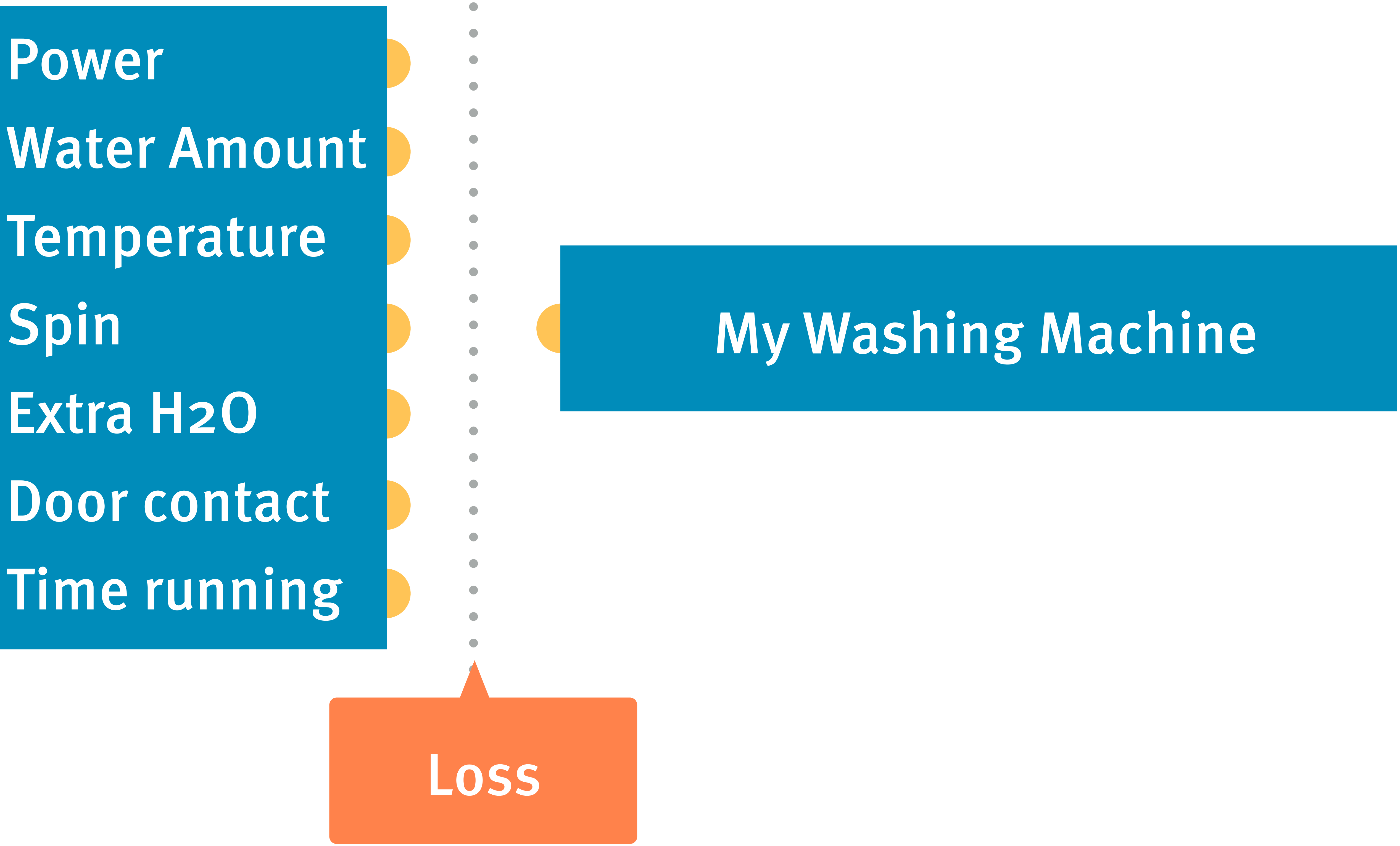
Extra H2O

Door contact

Time running

Washing Machine
Hardware UI
State
Washing Program
Extra Parameters
API
Power
Water Amount
Temperature
Spin
Extra H2O
Door contact
Time running

Own Solution



Power

Water Amount

Temperature

Spin

Extra H2O

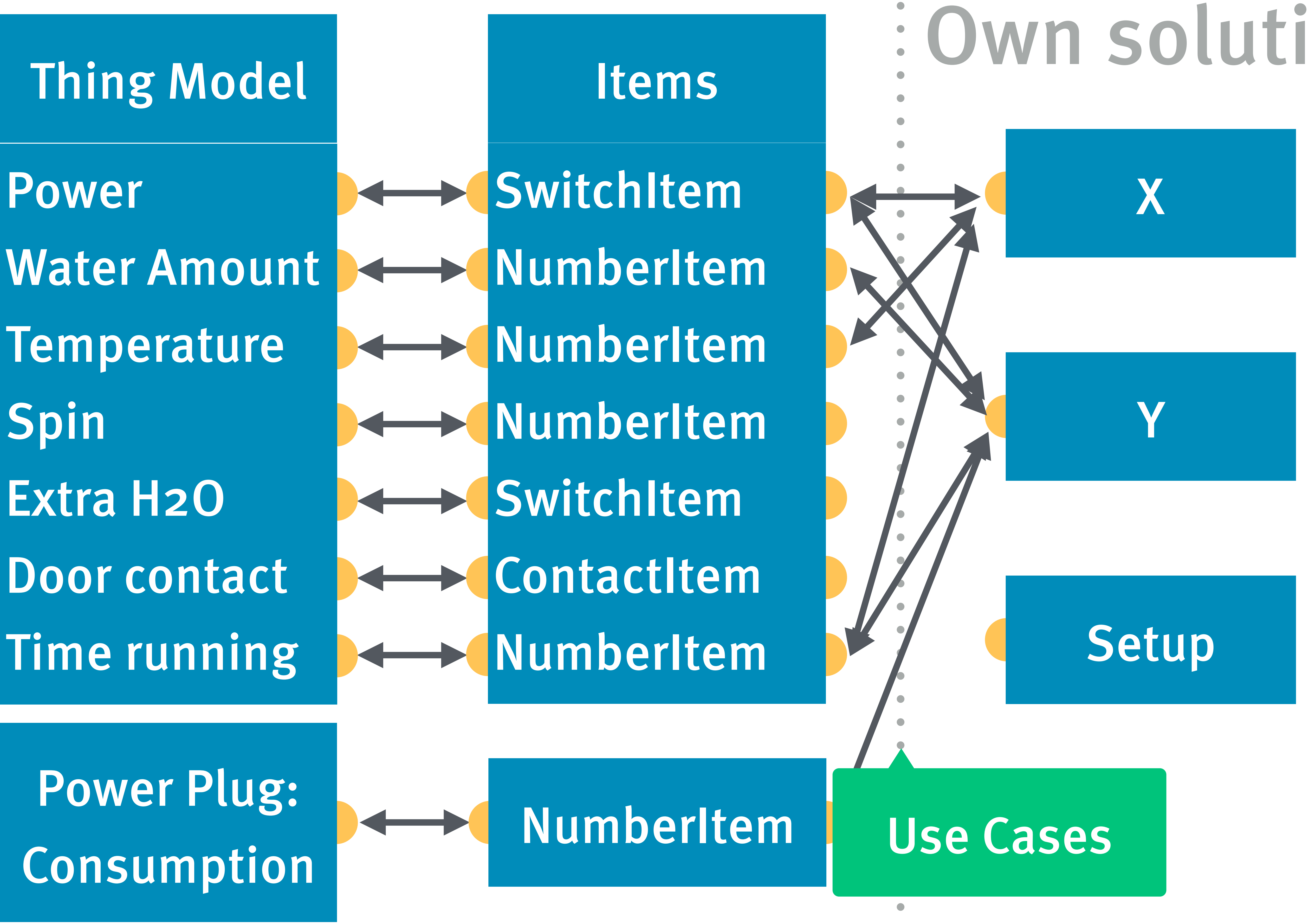
Door contact

Time running

My Washing Machine

Loss

Own soluti



Thing Model

Power

Water Amount

Temperature

Spin

Extra H2O

Door contact

Time running

Power Plug: Consumption

Items

SwitchItem

NumberItem

NumberItem

NumberItem

SwitchItem

ContactItem

NumberItem

NumberItem

X

Y

Setup

Use Cases

Use case: Wash again

```
on wmPower changed to OFF
    timer = startTimer({
        wmPower.state = ON
    }, now + 16h)
end

on wmDoor changed to OPEN
    if timer then timer.cancel()
end
```

Eclipse SmartHome Benefits

- Good framework to implement IoT device lifecycle
- Easy to understand
- Parallel development: UI + Binding
- UI Testing without devices
- Offline, “Intranet of Things”

Thank you!

Questions?

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