Paremus

# OSGi Architecture and IoT

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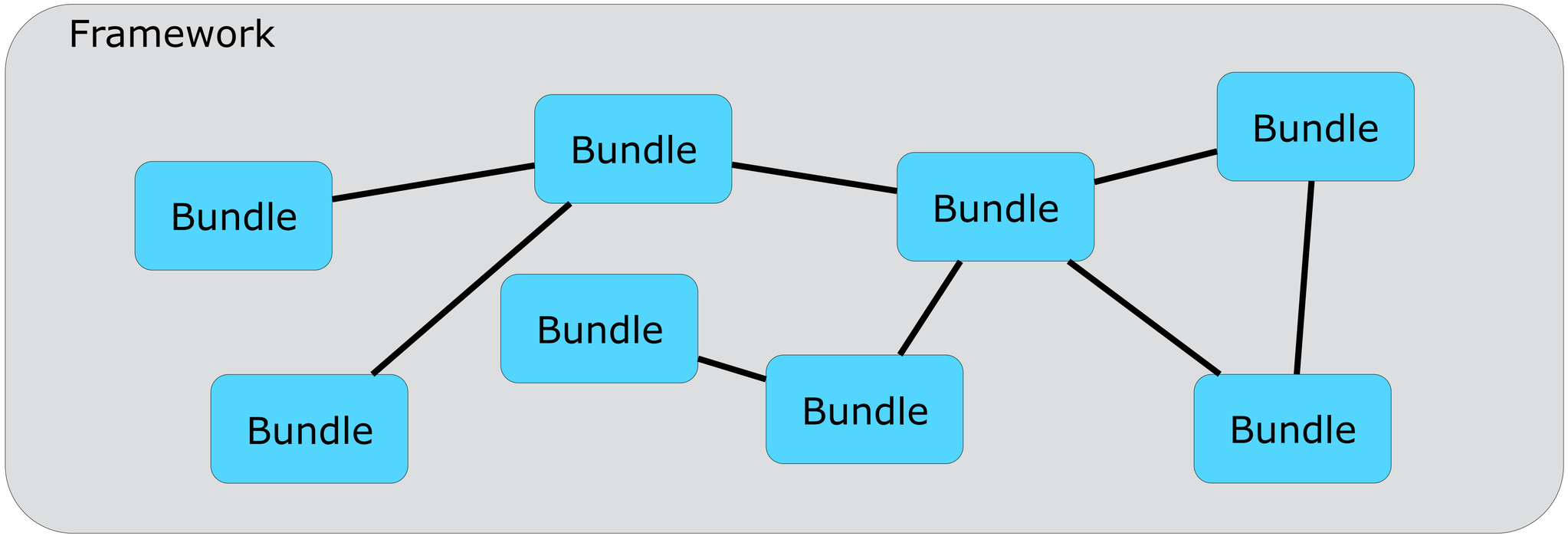
# OSGi Architecture - the basics

## OSGi is built around modules called bundles

### A bundle runs inside an OSGi runtime called a framework



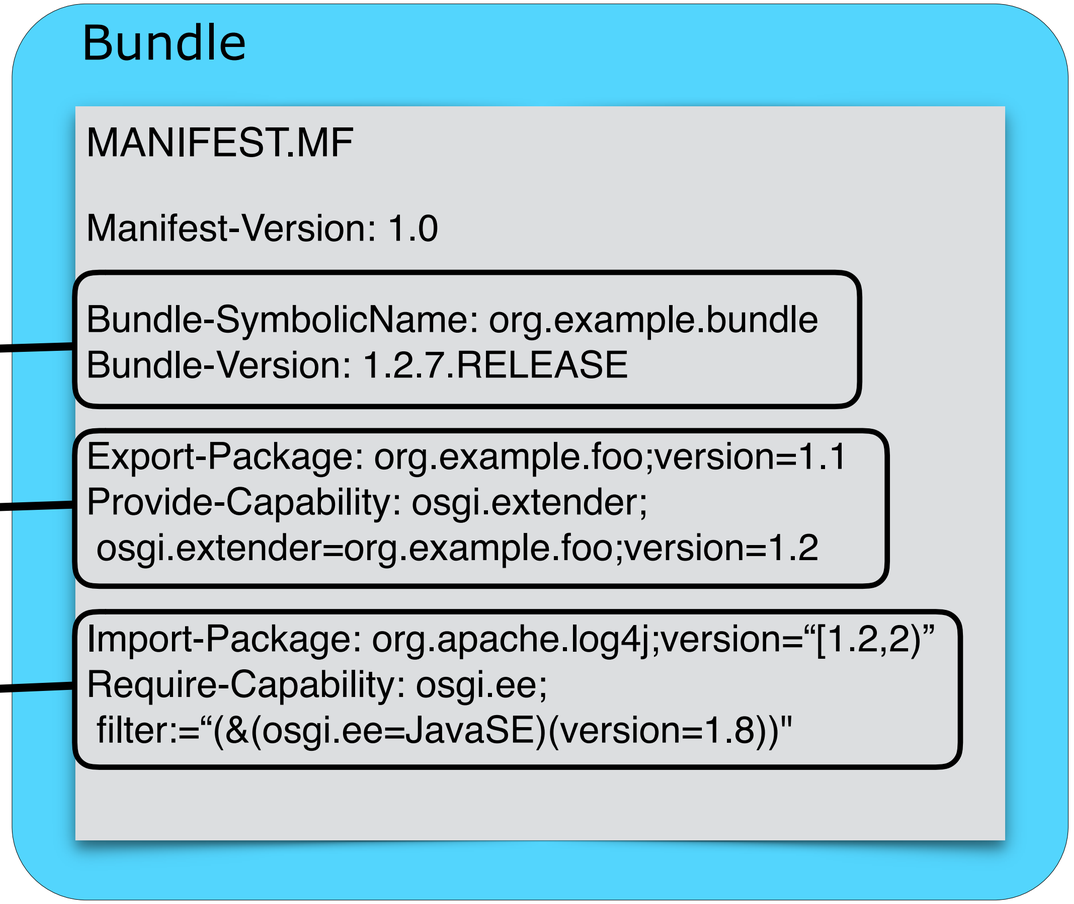
# OSGi Architecture - the basics

## Bundles are JAR files with metadata

### The metadata lives in MANIFEST.MF

## The metadata defines:

- The bundle identity
- The bundle contracts
- The bundle requirements



# So why is this good for IoT?

## Modularity is great for heterogenous systems

- Need to add a device using a new standard?

## Modulararity makes it easy to add features and fix bugs

- Need to add a new metrics reporting transport?
- Want to update a driver without disrupting everyone else?

## Modularity makes it easy to control what you run

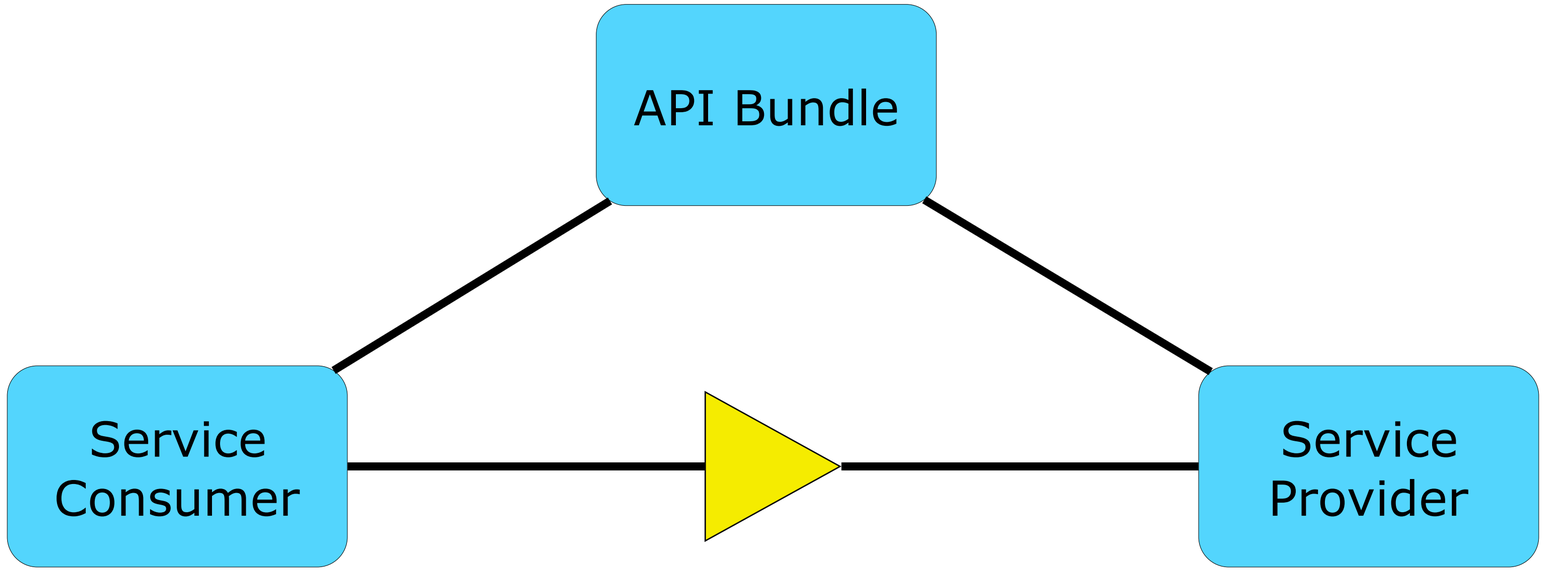
- Are we using this version of library X that has a security vulnerability?

# OSGi Services

## Truly decoupled modules must share objects by interface

### How do you get an object when you can only see its interface?

## The OSGi Service Registry enables sharing these objects



# OSGi Services

## Using services is a powerful way for bundles to collaborate

## Services advertise their public interfaces

- This provides a type-safe way to identify what a service does

## Services can be registered and unregistered dynamically

- Clients can be notified of these changes

## Services have properties for information and filtering

- Useful for identifying sub-categories or specific services

# So why is this good for IoT?

## Using services makes it easier to replace implementations

- Switching from oneM2M to Web of Things?

## Services give a common discovery pattern

- However something is connected you communicate in the same way
- Using ten things is no different from using one

## Services are dynamic, just like things are

- Services register when new things are detected
- Services unregister when things run out of battery/go out of range

# So why is this good for IoT?

## OSGi implementations can be very lightweight

- Many frameworks are only a few hundred kilobytes

## OSGi is an excellent technology to deploy at the edge

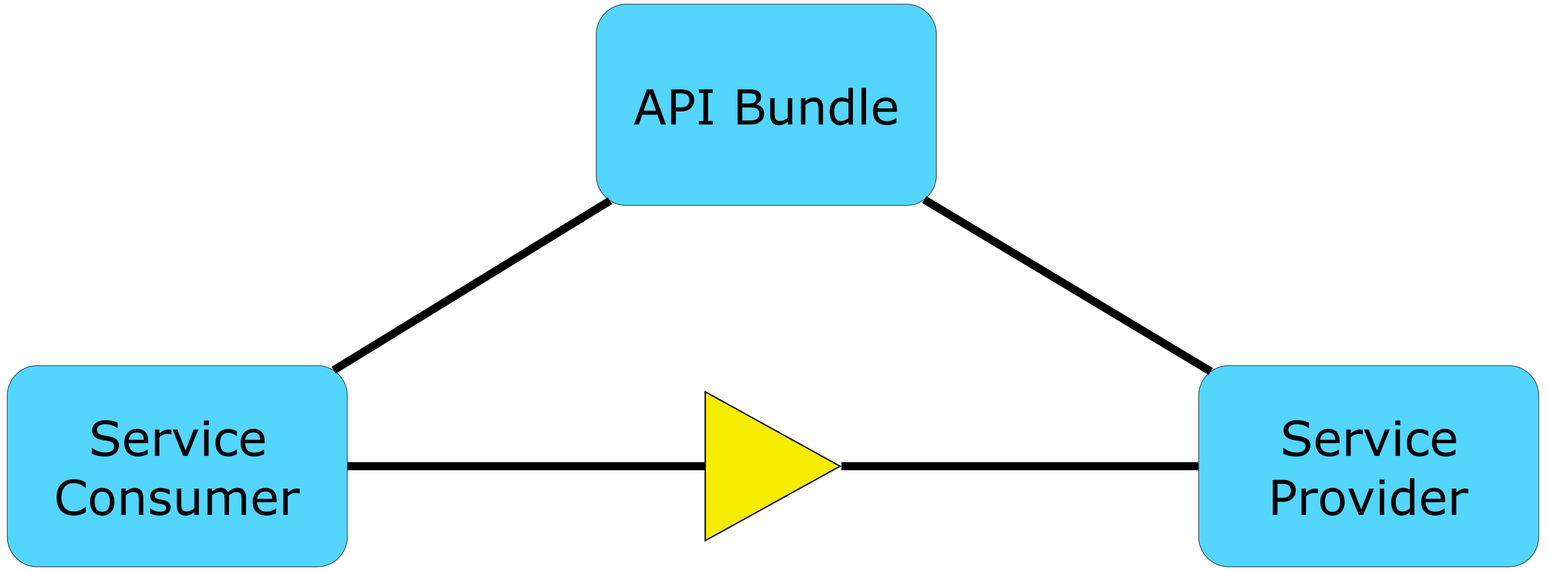
- Remotely manageable and updatable
- Good for connecting to different things locally

## But what about elsewhere?

- Does OSGi only make sense at the edge…

# OSGi Services (recap)

## Truly decoupled modules must share objects by interface

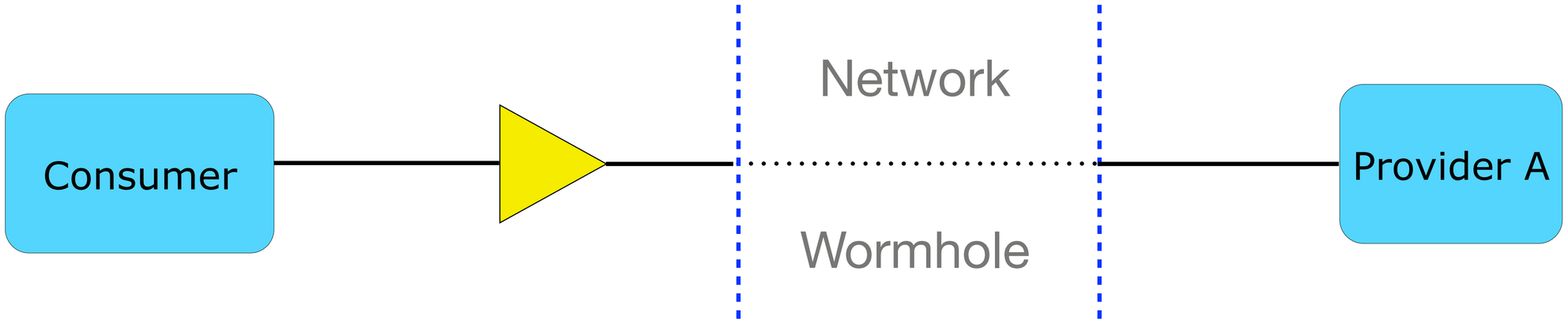



## If you're truly decoupled does it matter who the provider is?

# OSGi Remote Services

## OSGi services can come from anywhere!

- Any service can be transparently remoted *
- Service properties are made available remotely too

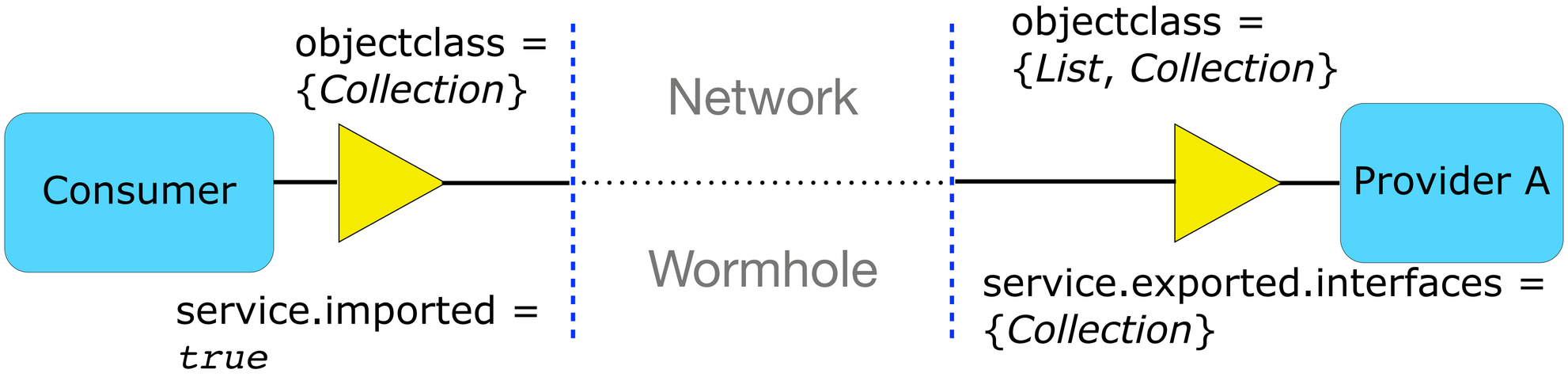



* Make sure your service is actually suitable for remoting!

# OSGi Remote Services

## Exposing a remote service is not transparent

- Services opt-in using the `service.exported.interfaces` property
- Imported services are marked with a `service.imported = true`



# So why is this good for IoT?

## Remote Services provide transparent remoting

- Function can be provided centrally or pushed out to the edge

## Transports and discovery technologies are pluggable

- Different implementations possible for different layers of the system

## Native support for Asynchronous remoting

- A rich API possible using Promises

## OSGi provides a simple path from edge to fog to cloud

# IoT specific activities in the OSGi Alliance

## The OSGi Alliance has several Expert Groups

- The IoT Expert Group focuses on IoT relevant use cases

## Current RFCs include

- The oneM2M Interworking Service
- The oneM2M Service Layer API
- MQTT Protocol adapter

## OSGi Requirements Documents are publicly visible

- https://github.com/osgi/design

# Interacting with oneM2M

## Integration is about being part of oneM2M networks

- How does my OSGi bundle register as a oneM2M device?
- How does it receive notifications when a Content Instance changes?

## The Service Layer is for interacting with oneM2M devices

- What devices are available?
- What actions does that device have?
- Change that device from “OFF” to “ON”

## These specifications are deliberately separated

- It’s rare to be a device and a management agent at the same time!

# Working with MQTT

## MQTT is a lightweight asynchronous messaging standard

### Many Smart devices communicate using MQTT

## OSGi supports asynchronous actions and event streams

## This RFC investigates ways to bridge these areas

# Summary

OSGi is a powerful technology used across many sectors

Modularity is a powerful advantage at the edge

The OSGi service model is a great abstraction for IoT

OSGi solutions are in place right now

And it’s time for you to hear about some of them!