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EUROPE'S LEADING AEM DEVELOPER CONFERENCE

27th – 29th SEPTEMBER 2021

OSGi R8, Felix 7, Atomos and the future of OSGi@Eclipse

Karl Pauls, David Bosschaert – Adobe

Who we are

- David Bosschaert
  - Senior Computer Scientist @ Adobe
  - Member of the Apache Software Foundation
  - Apache Sling, Felix & Aries PMC
  - OSGi Working Group @ Eclipse Member
- Karl Pauls
  - Senior Computer Scientist @ Adobe
  - Member of the Apache Software Foundation
  - Apache Sling & Felix PMC
  - OSGi Working Group @ Eclipse Member

Agenda

- OSGi at Eclipse
- OSGi R8
  - OSGi R8 core
  - OSGi R8 compendium
- OSGi Connect
  - Felix Atomos
- Felix 7
- Demo

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OSGi R8
and the future of OSGi@Eclipse

OSGi at Eclipse

- OSGi is now a project at Eclipse
- Fully Open Source
- Compatible implementations at Eclipse/Apache or elsewhere
- Just join in and contribute!
- Info here: https://projects.eclipse.org/projects/technology.osgi

R8

- OSGi R8 = Core R8 + Compendium R8
- Core R8 Released late 2020
- New specs:
  - 60 – Connect Specification
  - 59 – Condition Service Specification

Condition Service

Core R8

- When is your system fully ready?
- Generally very app-specific
- Sometimes multiple levels
- Introducing:
  `org.osgi.service.condition.Condition`
  service interface

Waiting for a Condition

Core R8

- A client can just listen for a condition:

```
@Reference(
    target="(osgi.condition.id=mycondition)")
Condition ready
```

Compendium R8 Specs coming up

New

- 153 Service Layer for OneM2M (impl at Eclipse)
- 157 Typed Event Service (impl at Apache Aries)
- 159 Feature Service (impl at Apache Felix)

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Typed Event Service

Compendium R8

- Send asynchronous Type-safe Events
- Locally in JVM
- Events are OSGi DTOs
  - Primitive types / wrappers
  - Strings
  - Collections / arrays
  - DTOs

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Typed Event Service

Compendium R8

```
public class ExampleEvent {
    public String message;
    public boolean public;
}
```

Sending:

```
@Reference
TypedEventBus bus;

public void sendEvent() {
    ExampleEvent event = new ExampleEvent();
    event.message = ”Hello there”;

    bus.deliver("org/osgi/example/ExampleEvent", event);
}
```

Receiving:

```
@Component
public class ExampleTypedConsumer implements
TypedEventHandler<ExampleEvent> {
    @Override
    public void notify(String topic, ExampleEvent event) {
        System.out.println("Received event: "
            + event.message);
    }
}
```

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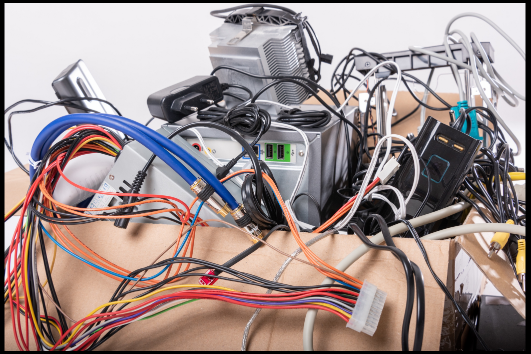
Feature Service

Compendium R8

- Design and work with entities
  - Larger than individual bundles
- Configuration
- Additional metadata
- A design artifact
  - can be mapped to runtime implementations (Sling/Karaf/Eclipse etc…)



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Feature Service

Compendium R8

- Specifies JSON model
- … and API
- Building block
  - Authoring
  - Tooling
  - Launcher

```
{
 "id": "org.acme:acmeapp:1.0.1",

 "name": "The Acme Application",
 "complete": true,

 "bundles": [
  { "id": "org.osgi:org.osgi.util.function:1.1.0" },
  { "id": "org.osgi:org.osgi.util.promise:1.1.1" },
  {
   "id": "org.apache.commons:commons-email:1.5",
  "org.acme.javadoc.link":
    "https://commons.apache.org/.../javadocs/api-1.5"
  },
  { "id": "com.acme:acmelib:1.7.2" }
 ]
```

Compendium R8 Specs coming up

- Final specs aimed for October 2021
- Current drafts at https://osgi.github.io/osgi/cmpn/

OSGi Connect

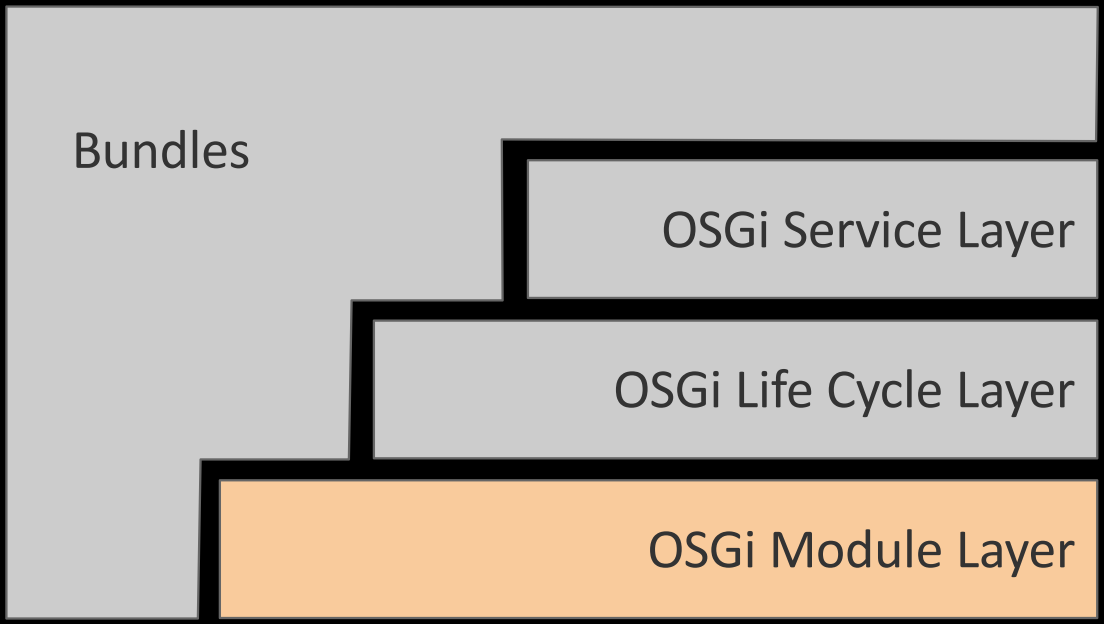
OSGi Connect

Core R8

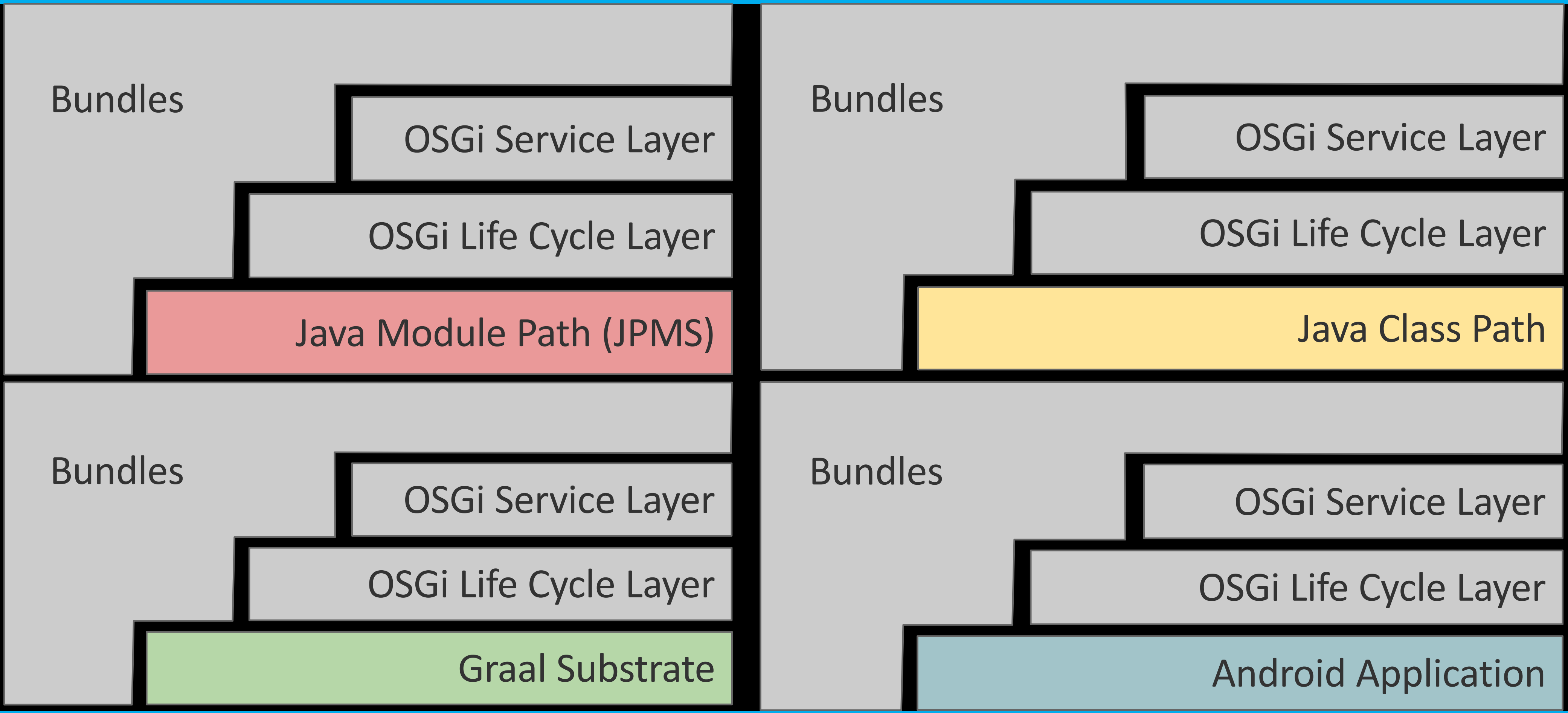
- How can we enable use of OSGi technology in more environments?
  - Integrate with JPMS
  - Native Compilation
  - and more…
- By allowing bundles whose content is not managed by the framework!
  - OSGi Connect
    - Enable content managed outside the Framework to be connected to Bundles installed in the Framework

OSGi

- Module Layer controls class loading
- Life Cycle provides entry point to code through activation
- Service Layer provides powerful programming model for developing components



OSGI Connect



Framework Managed Bundle Content

```
installBundle(String location, InputStream content)
```

Framework Managed Bundle Content

```
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```

Mandatory unique location to bundle, may be in the form of a URL

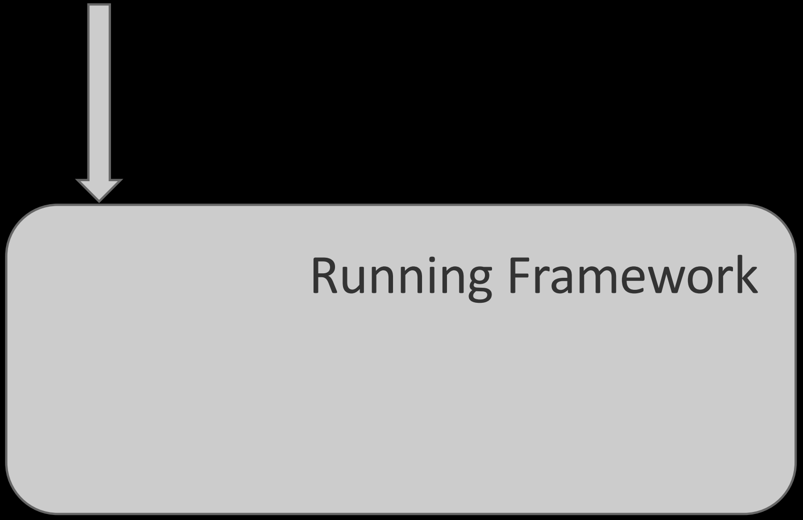
Framework Managed Bundle Content

```
installBundle(String location, InputStream content)
```

Optional content to read the bundle content from

Framework Managed Bundle Content

```
installBundle(String location, InputStream content)
```



Framework Managed Bundle Content

```
installBundle(String location, InputStream content)
```

If content is available: framework persists content to storage

Framework Managed Bundle Content

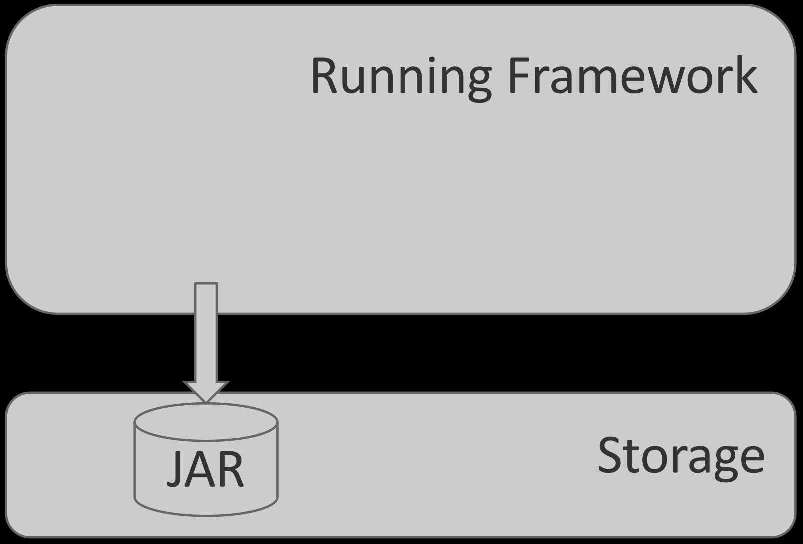
```
installBundle(String location, InputStream content)
```

Otherwise: location string is used to determine content

Running Framework

Framework Managed Bundle Content

```
installBundle(String location, InputStream content)
```



Persist Bundle JAR to Framework Storage

Framework Managed Bundle Content

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installBundle(String location, InputStream content)
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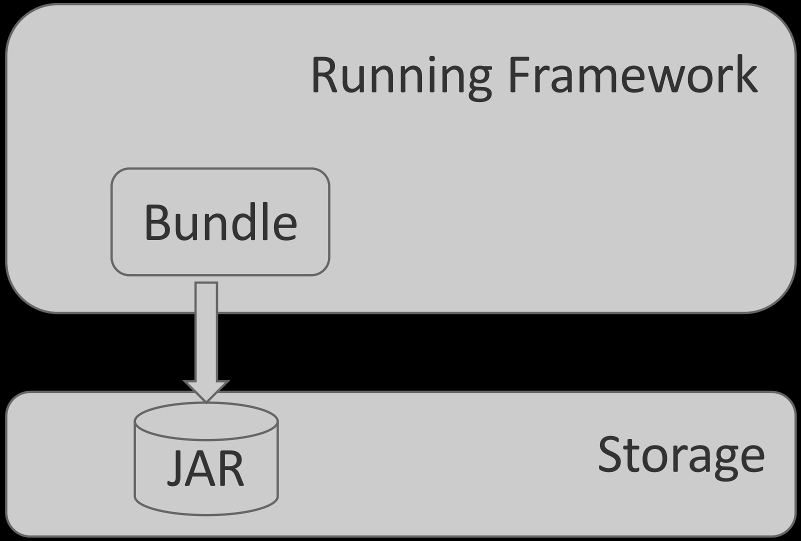

Read bundle manifest; create Bundle object INSTALLED in the Framework

Framework Managed Bundle Content

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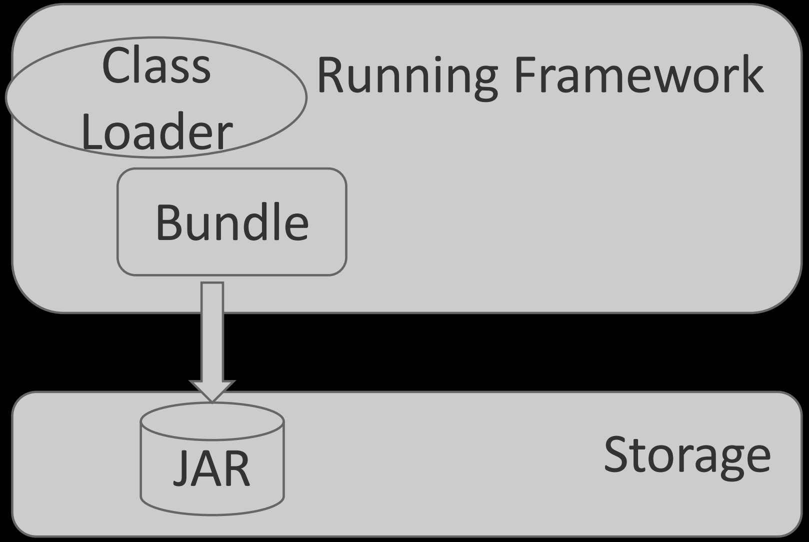
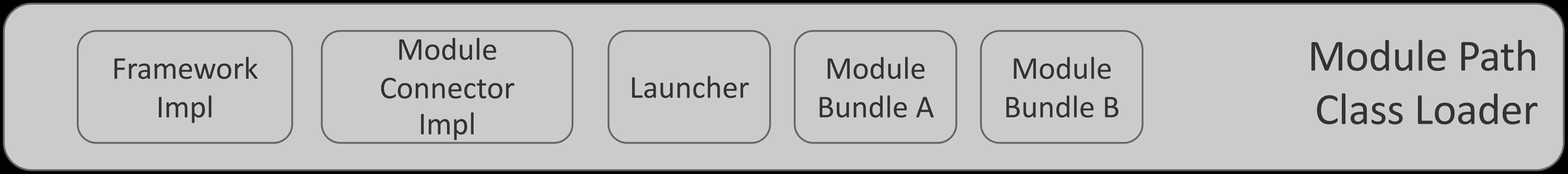


RESOLVED

Framework Managed Bundle Content

```
ConnectFrameworkFactory.newFramework( Map<String,String> configuration,
                                      ModuleConnector moduleConnector )
```



Framework Managed Bundle Content

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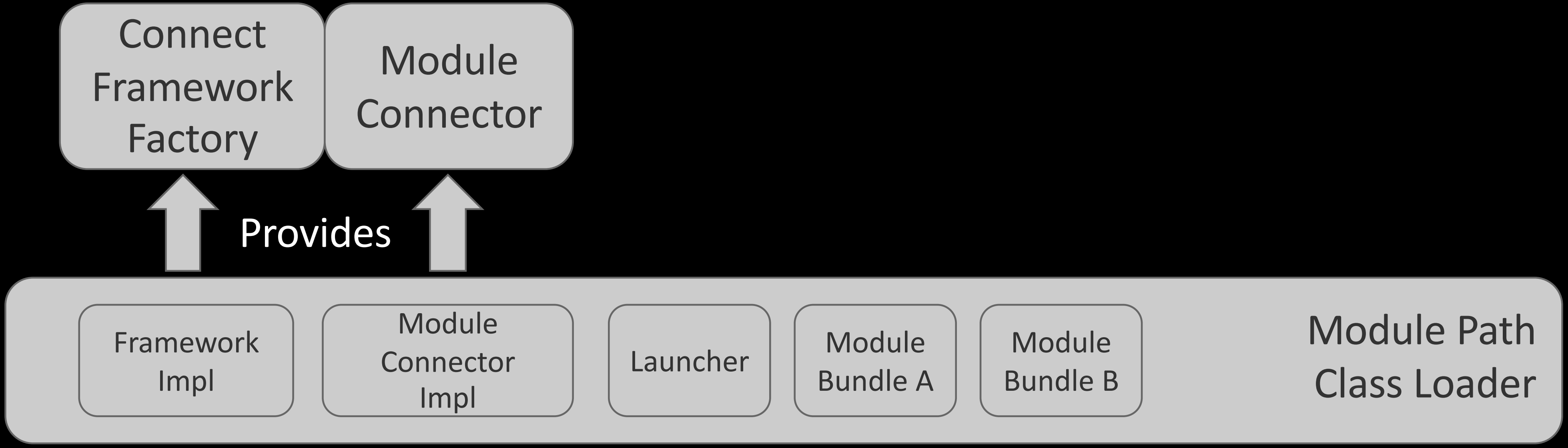

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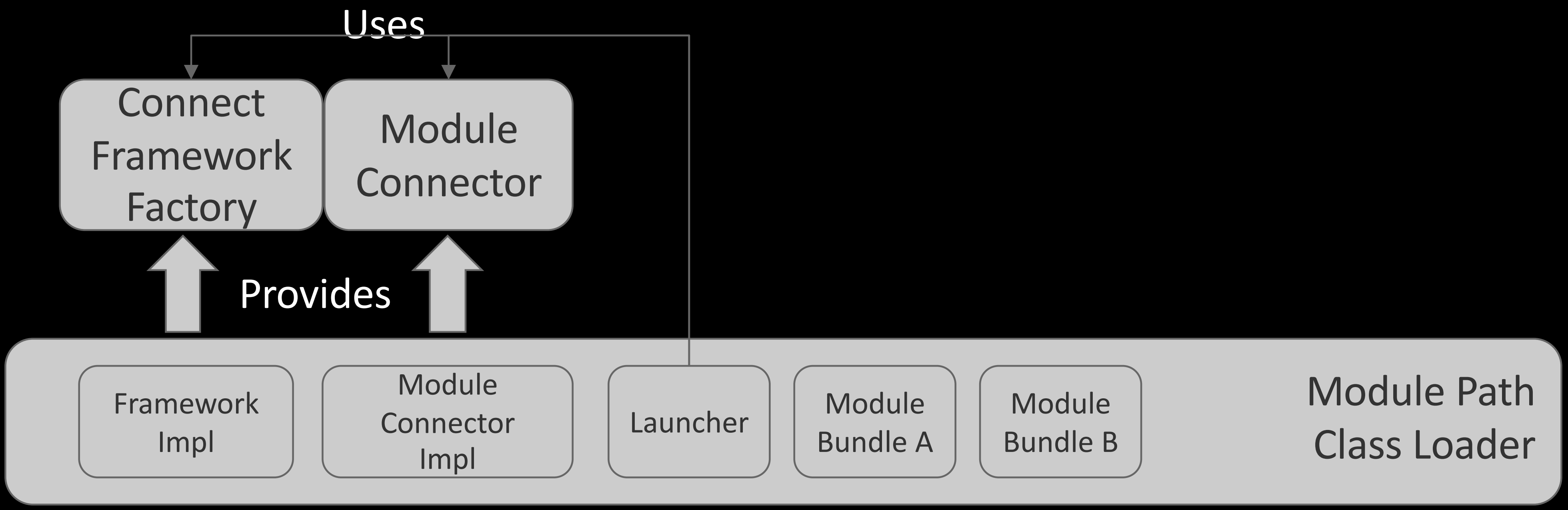

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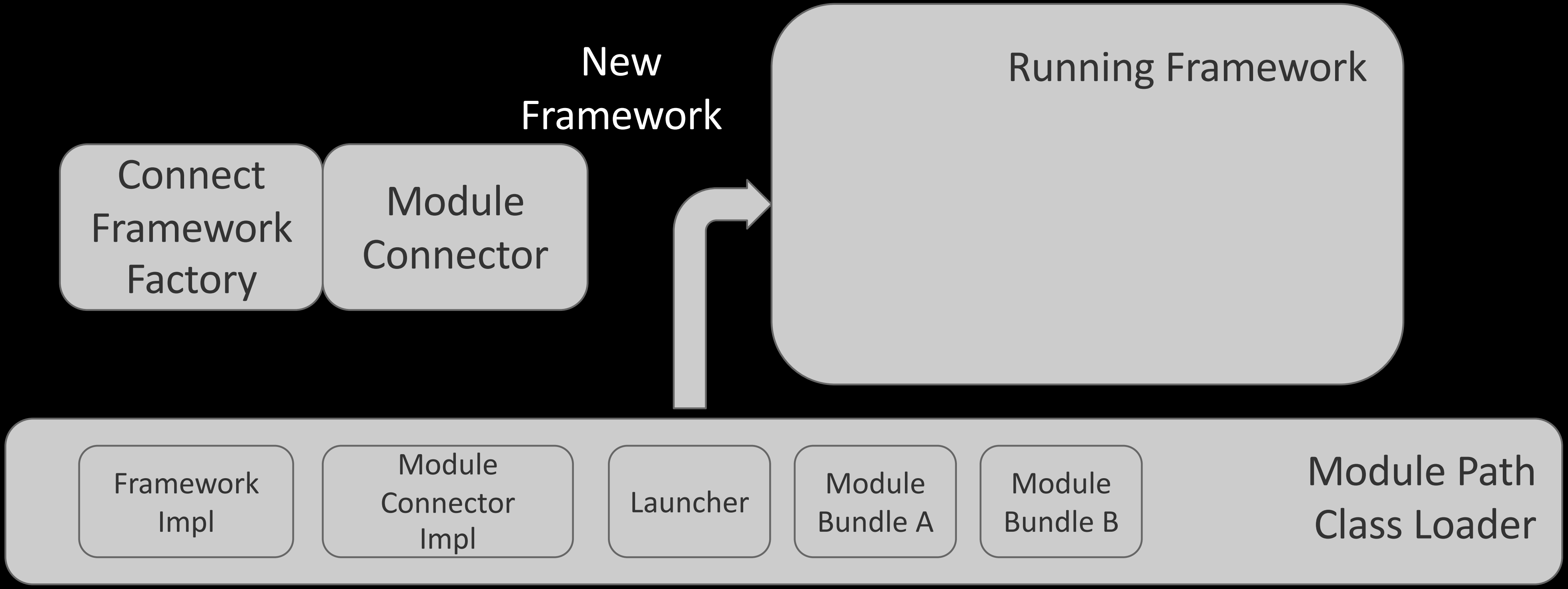

Framework Managed Bundle Content

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installBundle(String loc, InputStream content)
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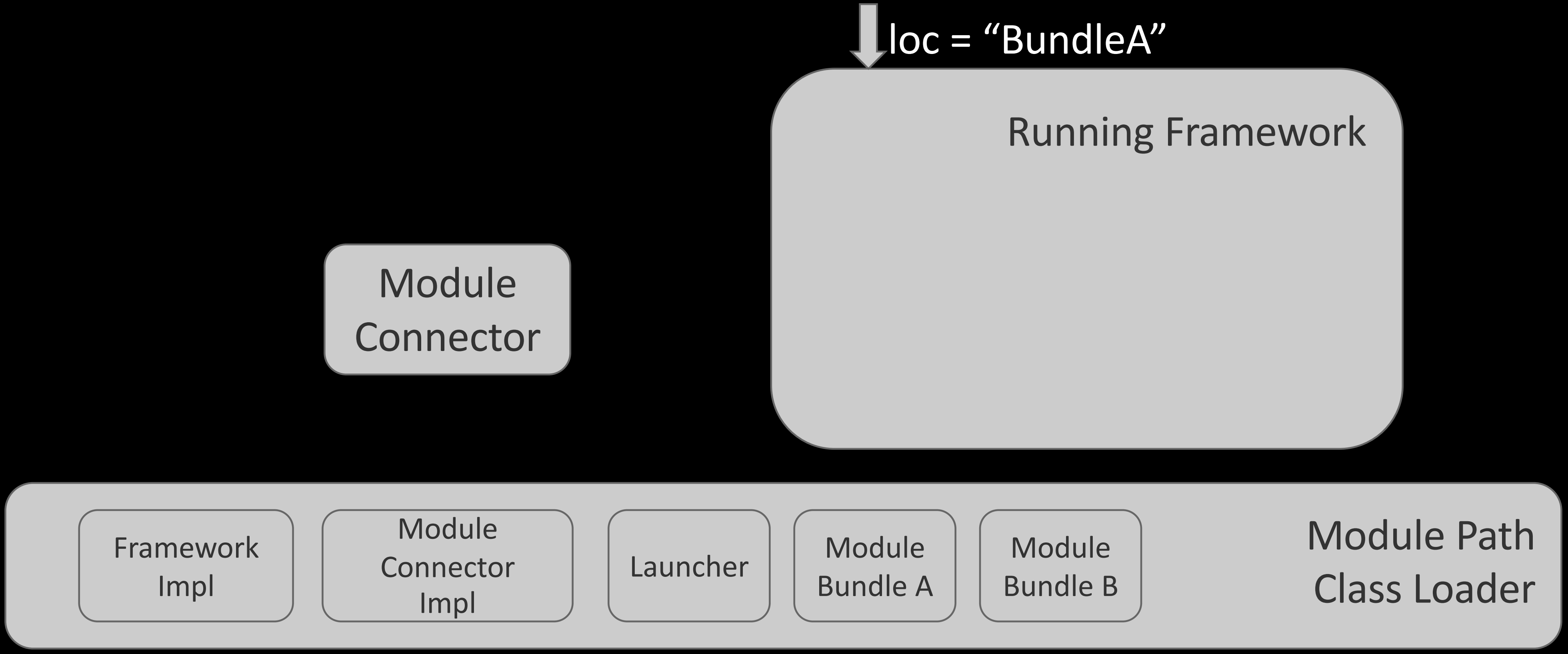

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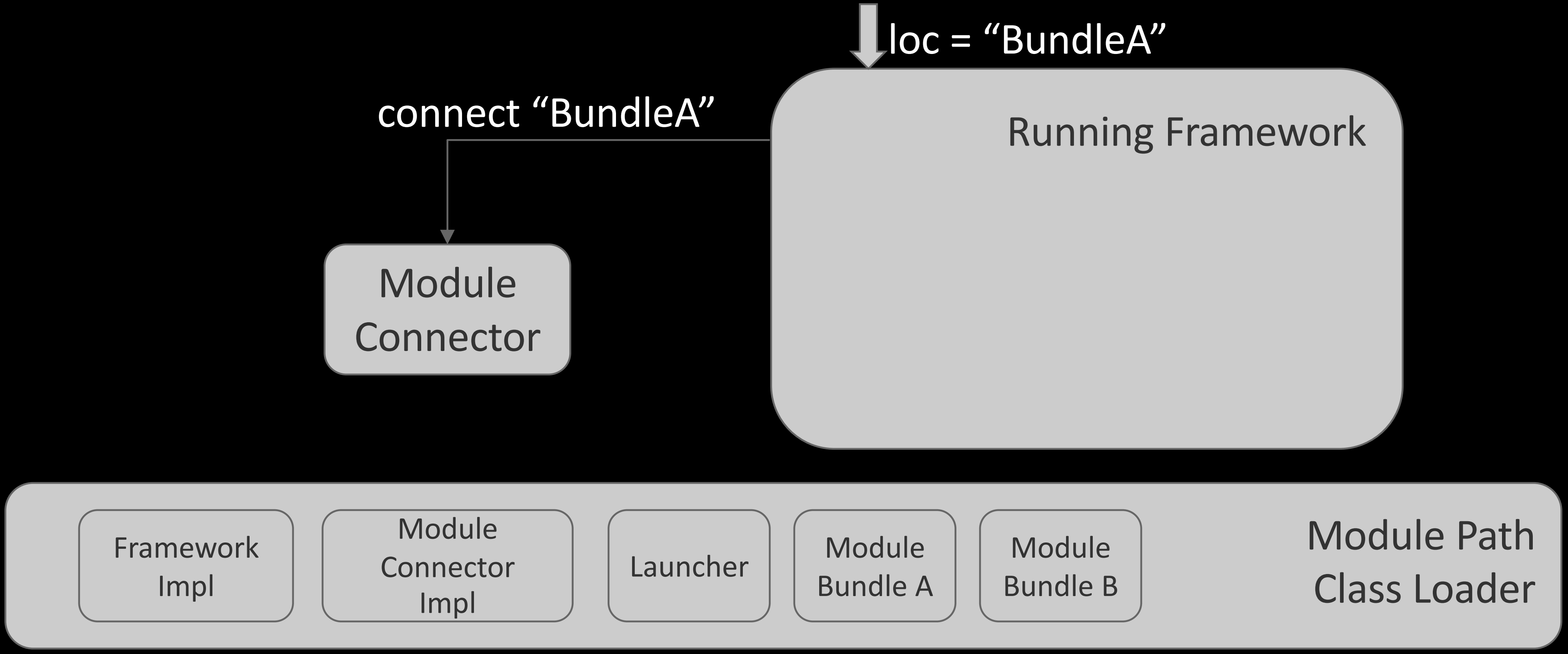

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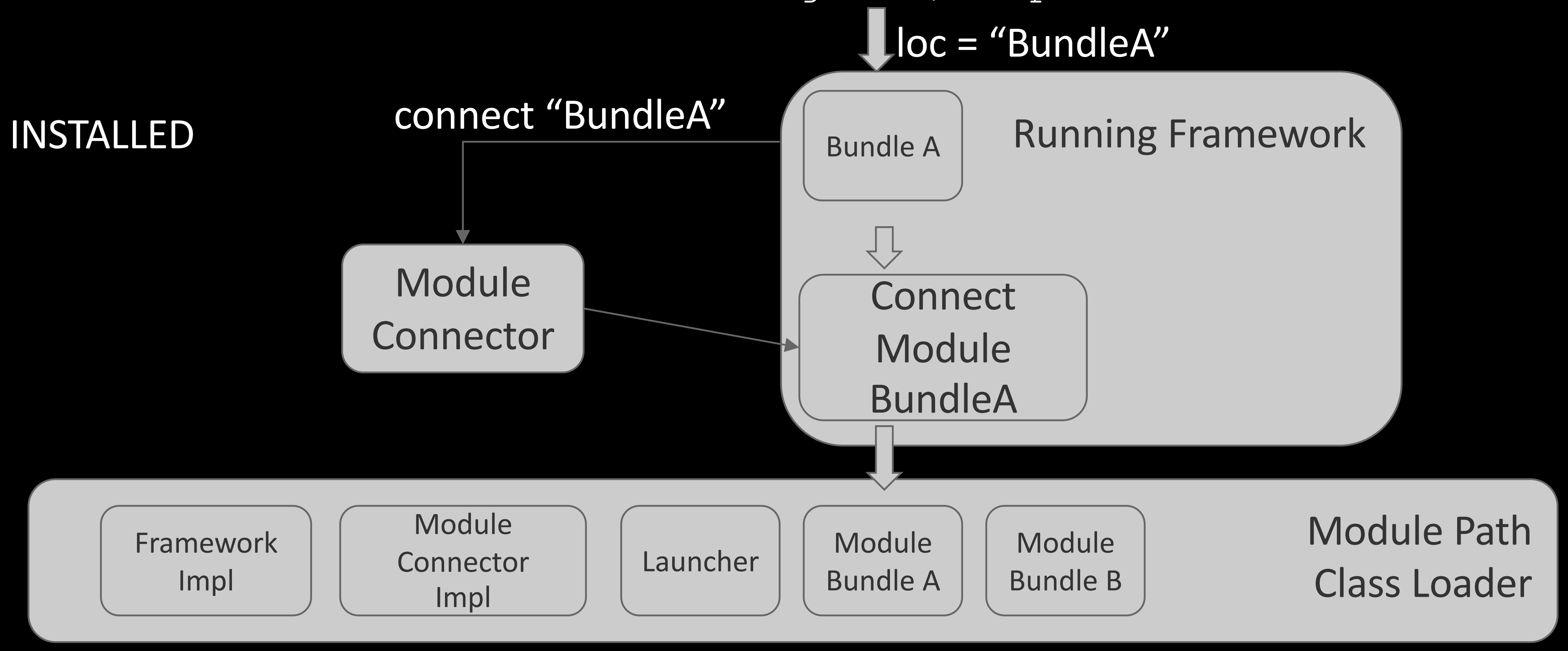

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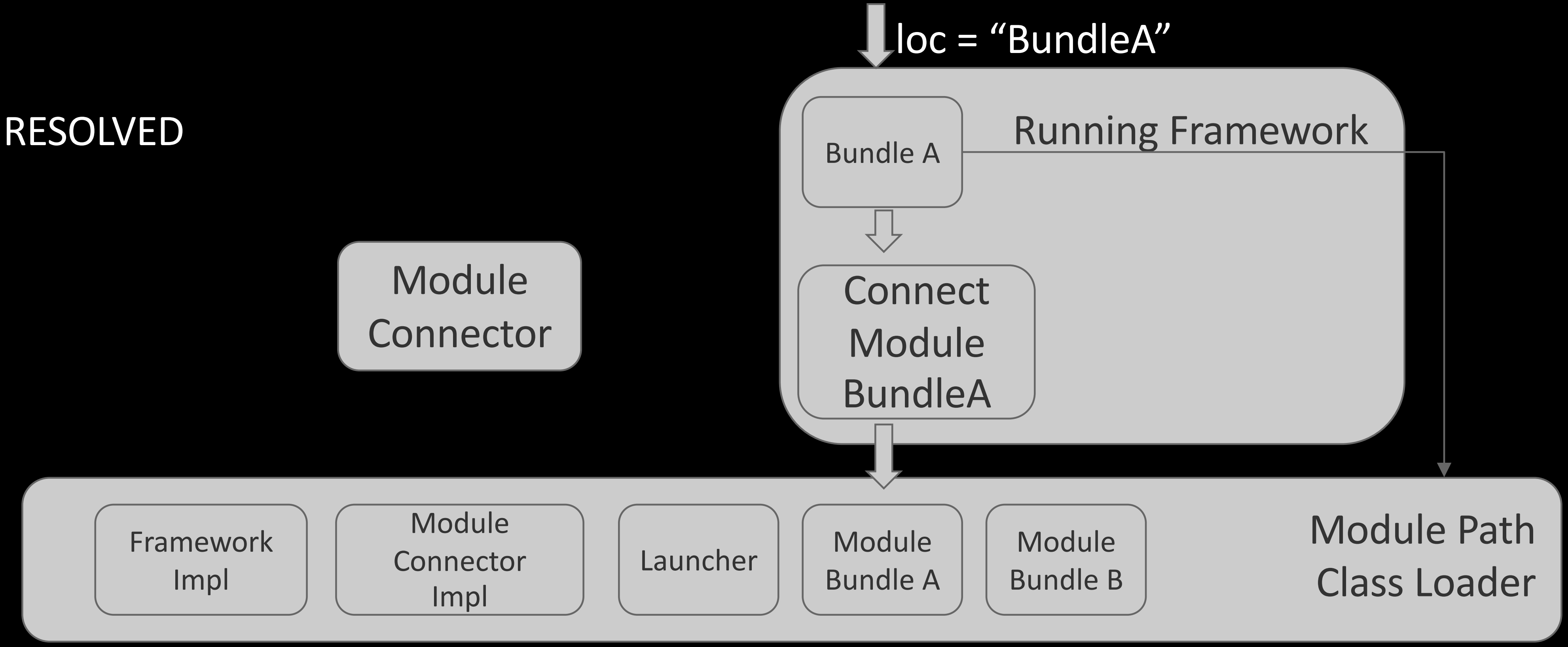
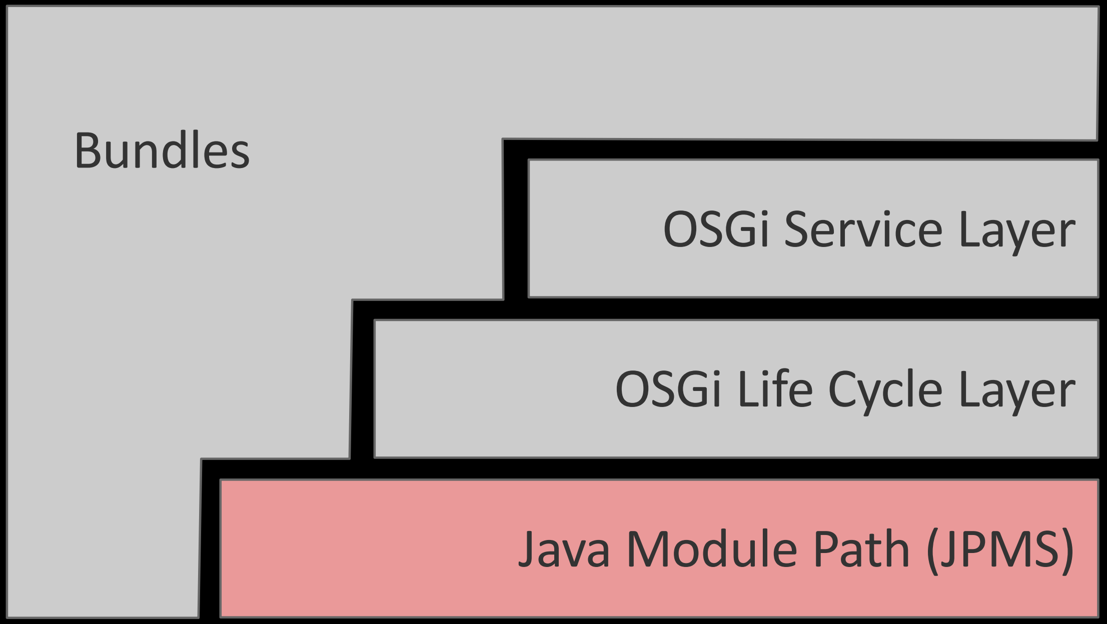


Atomos - Apache Felix Project

https://github.com/apache/felix-atomos

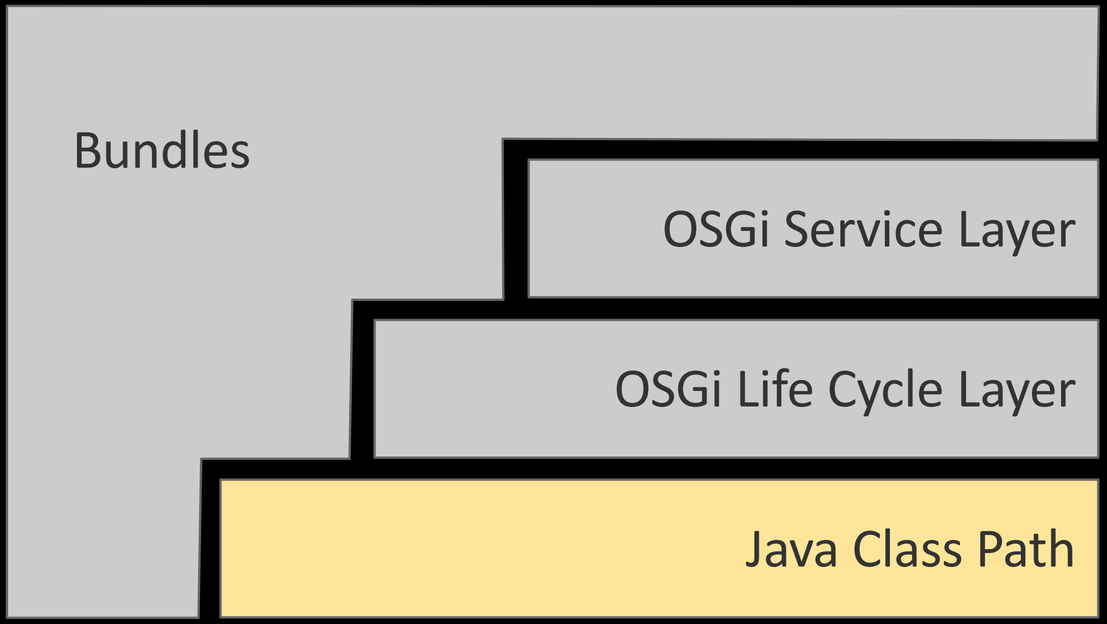
Atomos - OSGi, On JPMS

- JPMS controls the class loader
- Modules and Bundles live together in the same layer
- Generation of OSGi meta-data for Modules
- JRE Boot modules are represented by bundles



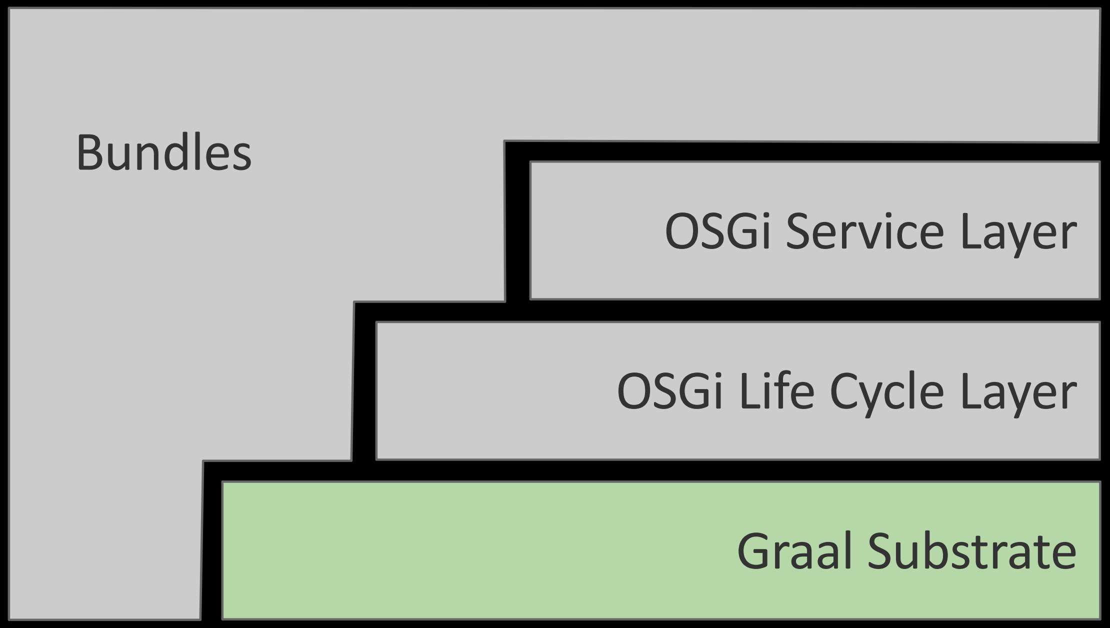
Atomos - OSGi, On the Class Path

- Java Class Path controls the class loader
- Other JARs and Bundles live together in the same class loader
- No isolation provided at the class loader level
- Java 9+ JRE Boot modules are represented by bundles
- Other URL Class Loader like loaders work (e.g. Spring Boot Loader)



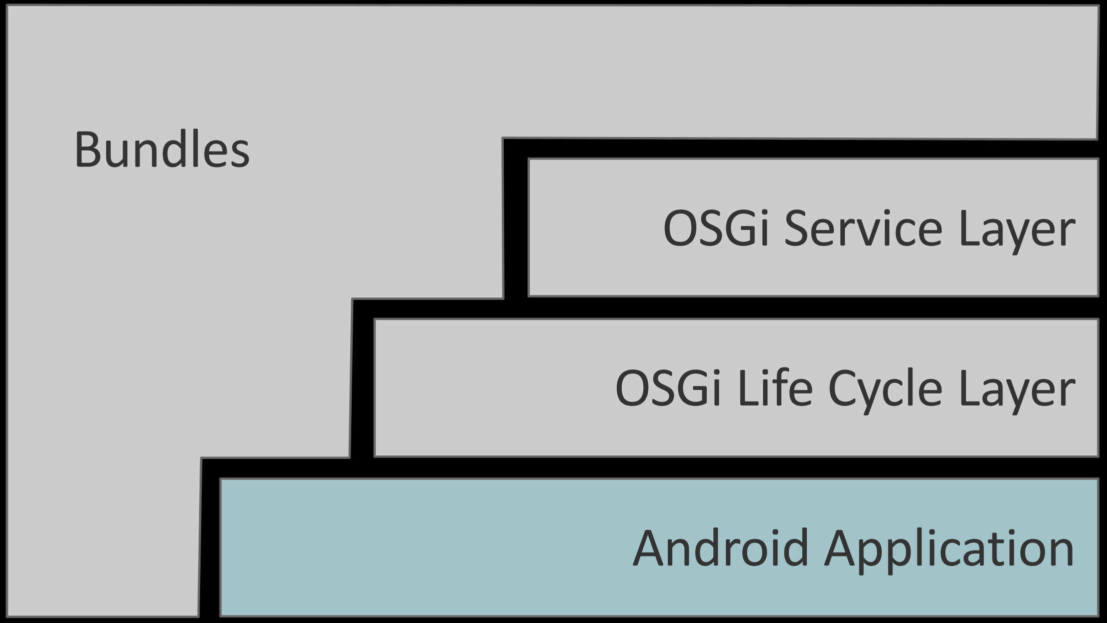
Atomos - OSGi, Native

- Substrate native controls “class loading”
- Atomos indexes resources for each bundle
- Build tools available to configure necessary reflection for OSGi



Atomos - OSGi, Android Application

- Android Runtime controls "class loading"
- Atomos indexes resources for each bundle - similar to Substrate
- Build Android Application from a single "uber" JAR that contains all required bundles



Felix 7

Felix 7

- Latest framework release
  - OSGi R8 core compliant
    - OSGi Connect support
  - Works with java 17 (since 7.0.1)
  - Actually is a JPMS module (can run from the module path)
    - No more –-add-opens required*

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Demo

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Thank you