From monolith to single-source to single-deployment

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Speaker

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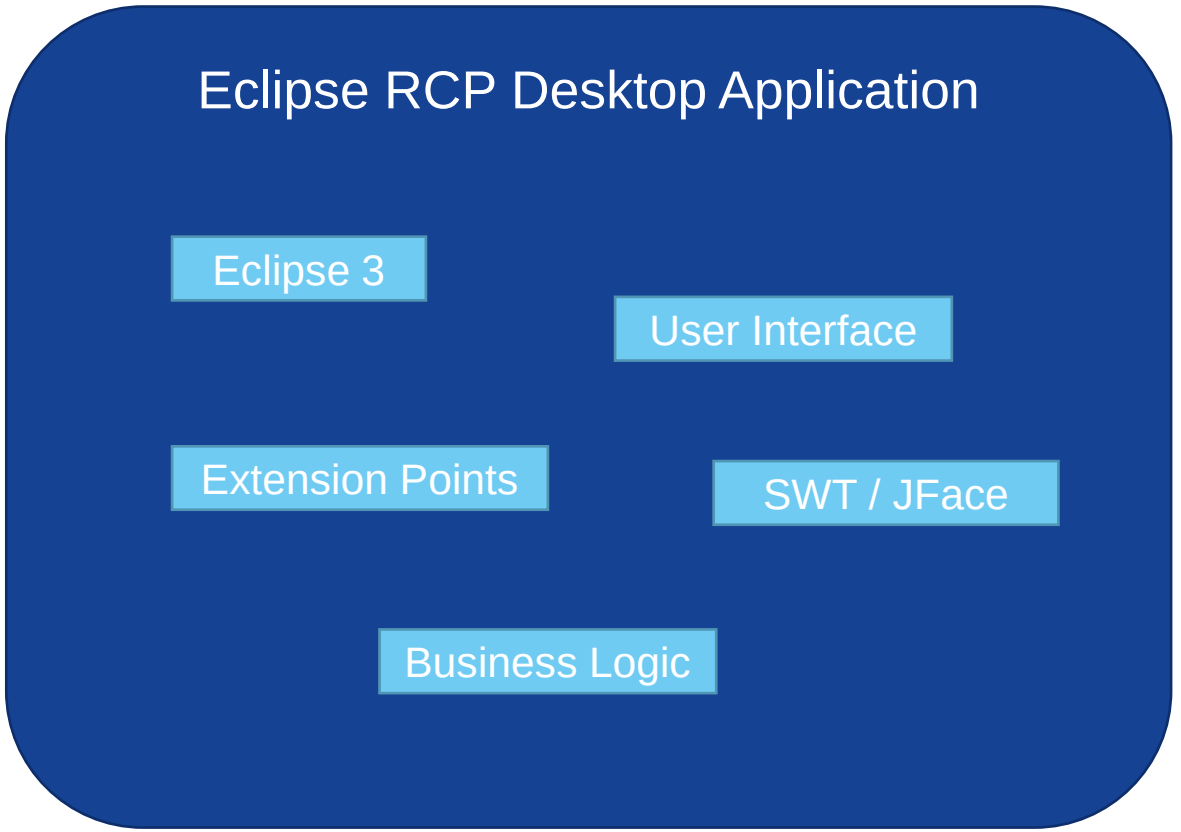
From monolith to single-source to single-deployment

Overview

1. **The Monolith**
2. **The Modulith**
3. **Single Source**
4. **Single Deployment**
5. **Conclusion**

The Monolith

The Monolith

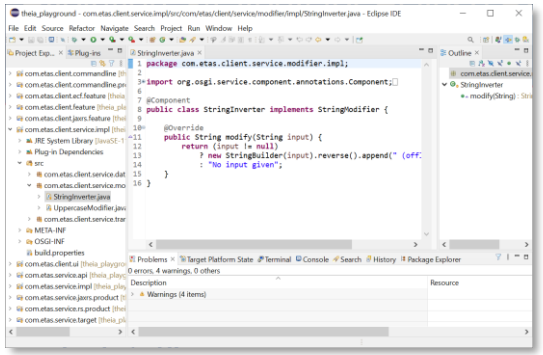


- Deployment monolith
- User interface and business logic not clearly separated
- Usage of “old” Eclipse 3.x Platform
  - Platform Singletons
  - Extension Points
  - Abstract Superclasses
- Tooling limited to Eclipse PDE

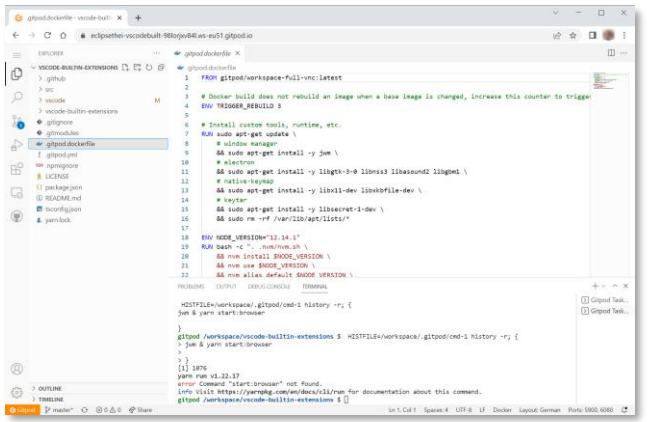
The Monolith

Problems

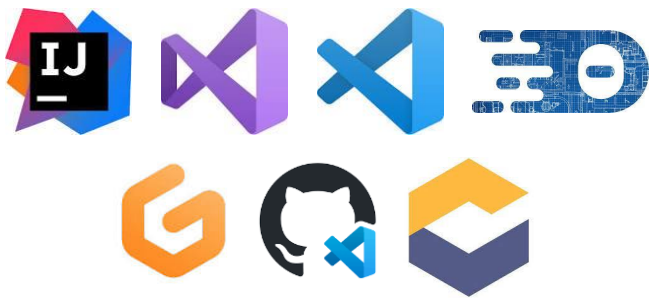
Eclipse RCP Application



DevOps



Web-/Cloud-based Tooling



From monolith to single-source to single-deployment

Questions

- **New customer requirements**
  - DevOps
  - Web-/Cloud-based Tooling
  - Tools should be available faster and process faster

- **New developer requirements**
  - Freedom of choice regarding the IDE
  - Tools should be available faster and process faster

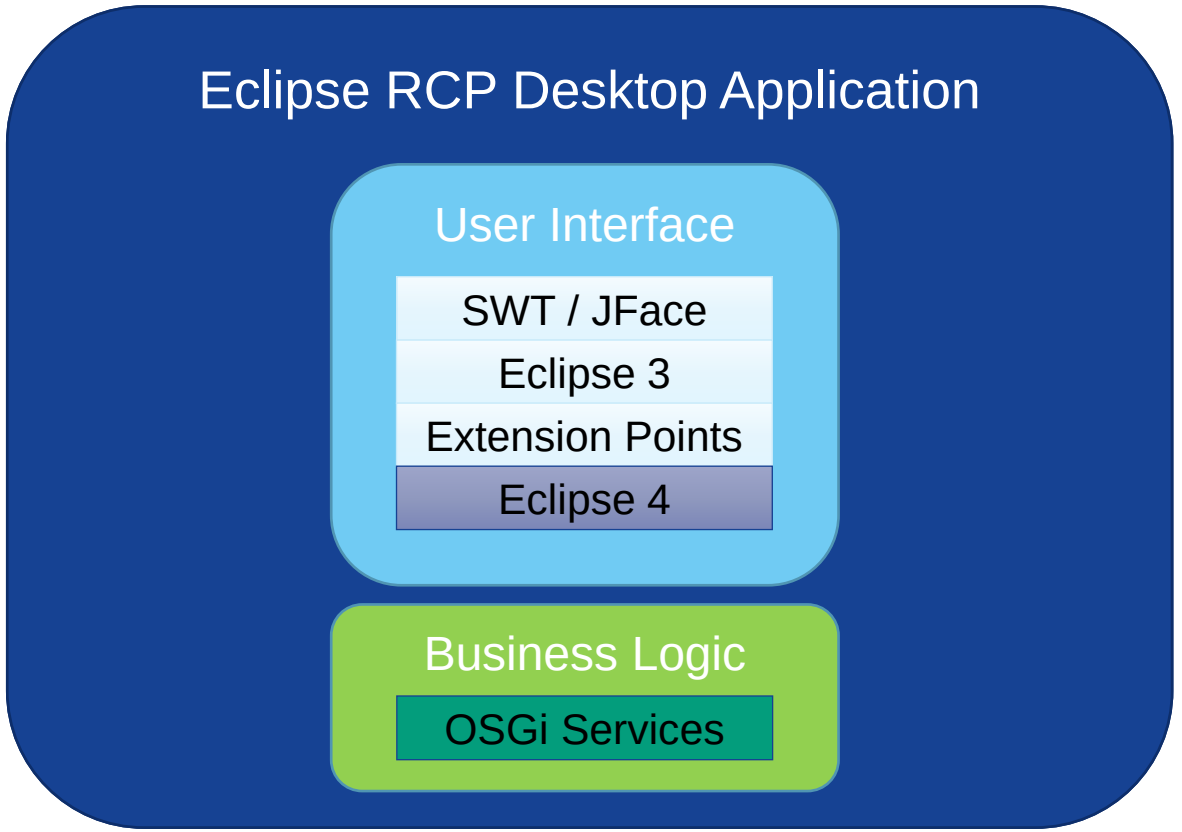
How to support new requirements by keeping the existing applications alive?

How to reuse existing functionality in different scenarios?

How can OSGi help in answering those questions?

The Modulith

The Modulith



- Deployment monolith
- Clearly defined and isolated modules
  - User Interface vs. Business Logic
- Eclipse 3.x for editors with navigator support
- Eclipse 4.x for business logic integration
- Business Logic encapsulated in OSGi Services

The Modulith

Refactoring

- **Extract business logic and provide it as OSGi Services**
  - Use OSGi Declarative Services
  - Access Services via Eclipse 4 Injection
- **Use plain Java/Maven or Java/Gradle project layout with bnd plugins**
  - Make development IDE agnostic
  - Add resulting bundles to Eclipse PDE Target Definition via ***m2e PDE Integration***

Mind the bundle activation policy!

A: Add the bundle to the auto-start configuration of the Eclipse launch configuration

B: Add the necessary header in the bundle via `@Header` annotation

```
@Header(name="Bundle-ActivationPolicy", value="lazy")
```

Note:

As a migration path you can also start with a PDE project layout and switch later.
Since 4.28 PDE supports project layouts with automatic manifest generation.
Remember that you are forced to use Eclipse as your IDE in that case.

The Modulith

OSGi Declarative Services & Eclipse 4 Service Injection

Service Interface

```
public interface StringModifier {
    String modify(String input);
}
```

Service Implementation

```
@Component
public class StringInverter implements StringModifier {

    @Override
    public String modify(String input) {
        return new StringBuilder(input)
            .reverse().toString();
    }
}
```

Field injection in Eclipse 4

```
@Inject
@Service
StringModifier modifier;
```

The Modulith

Why OSGi Declarative Services and Eclipse 4

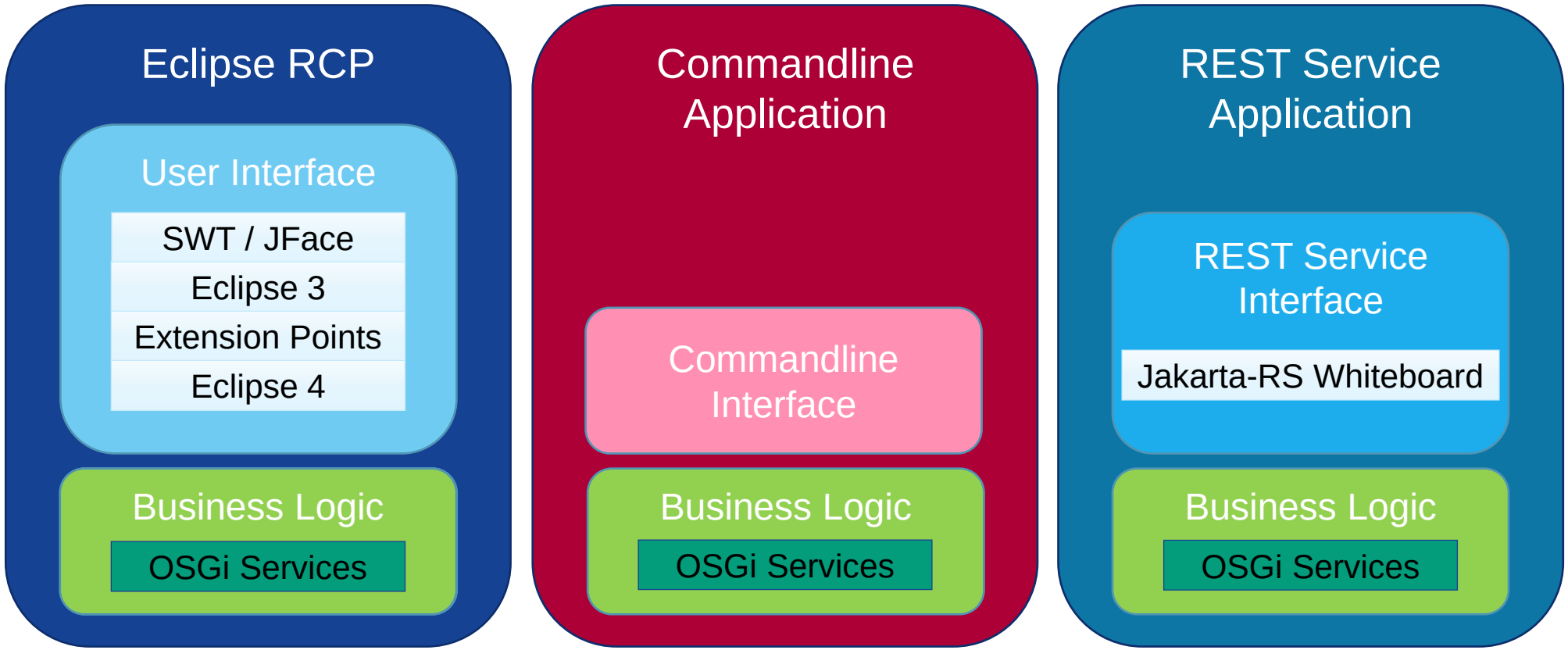
- OSGi Declarative Services
  - Service oriented architecture
  - “state-of-the-art” programming model (dependency injection, annotation based)
  - No additional dependency (OSGi is the core of the Eclipse Platform)
  - Pre-requisite for further steps

- Eclipse 4
  - “state-of-the-art” programming model (dependency injection, annotation based, POJOs)
  - Access OSGi Services via injection not via low-level OSGi API

→It is still Eclipse RCP with Eclipse SWT UI
→It is still a deployment monolith

Single Source

Single Source



Single Source

Multiple Applications from Single Source

- **Create new application types out of the existing services**

- **Minimal effort required**
  - Starter
  - Component Configuration
  - Mainly application setup with required dependencies

- **Used OSGi Specification Implementations**
  - Declarative Services
  - Whiteboard Specification for Jakarta™ RESTful Web Services

Single Source

Commandline Application – Starter Component

```
@Component(immediate = true)
public class BndStarter {
    String[] launcherArgs;

    @Reference(target = "(launcher.arguments=*)")
    void setLauncherArguments(Object object, Map<String, Object> map) {
        this.launcherArgs = (String[]) map.get("launcher.arguments");
    }

    @Reference
    StringModifier modifier;

    @Activate
    void activate() {
        // 1. inspect the cmd line args
        // 2. execute the logic
        // 3. shutdown
    }
}
```

Single Source

Service Implementation with Jakarta-RS annotations and Jakarta-RS Whiteboard configuration

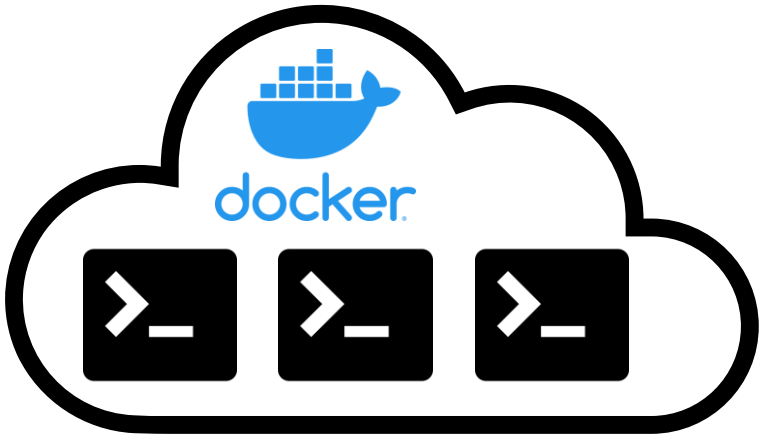
```
@Path("/inverter")
@Component(
   property = { "osgi.jakartars.resource=true" } )
public class StringInverter implements StringModifier {

    @GET
    @Produces(MediaType.TEXT_PLAIN)
    @Path("/{value}")
    @Override
    public String modify(@PathParam("value") String input) {
        return (input != null)
          ? new StringBuilder(input).reverse().toString()
          : "No input given";
    }
}
```

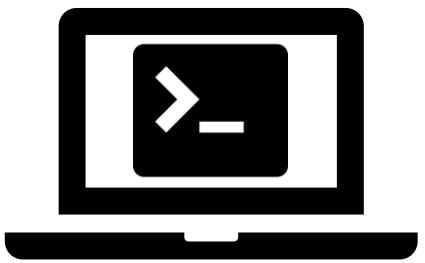
Single Source

Use Cases - DevOps

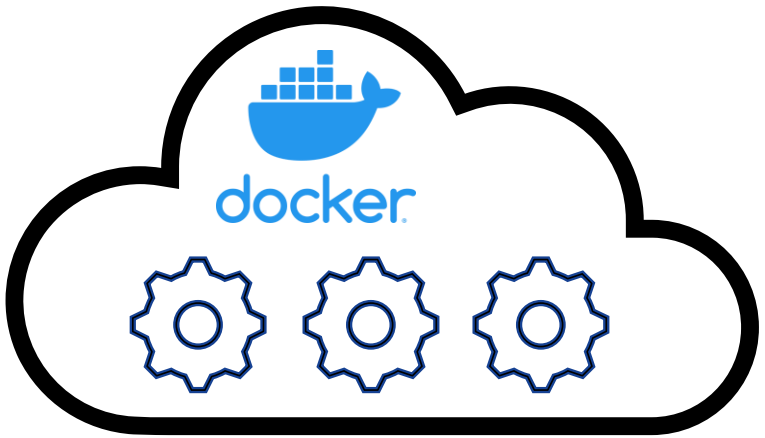
Local Rich Client



Commandline based Pipeline



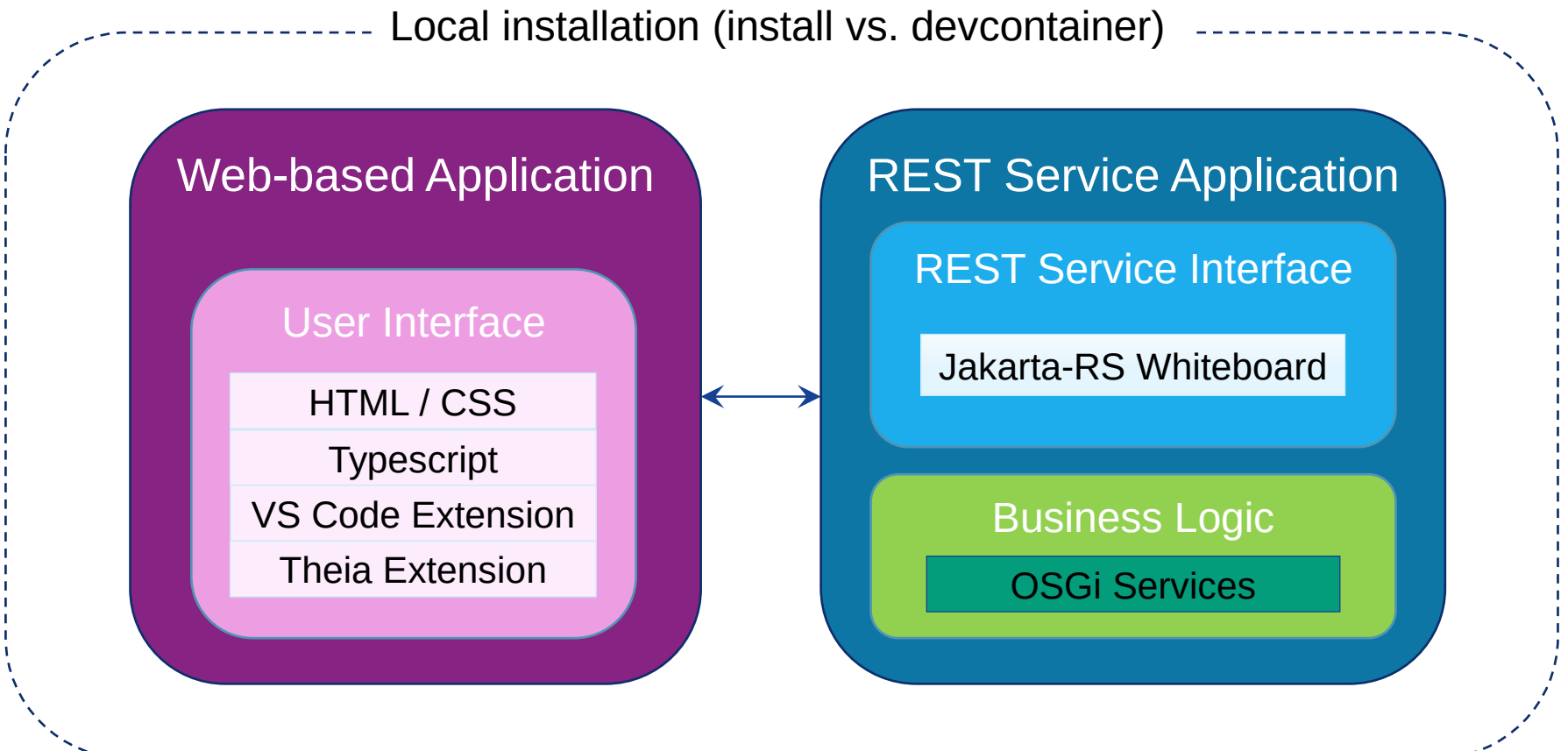
Local Commandline



REST API based Pipeline

Single Source

Web-based Application

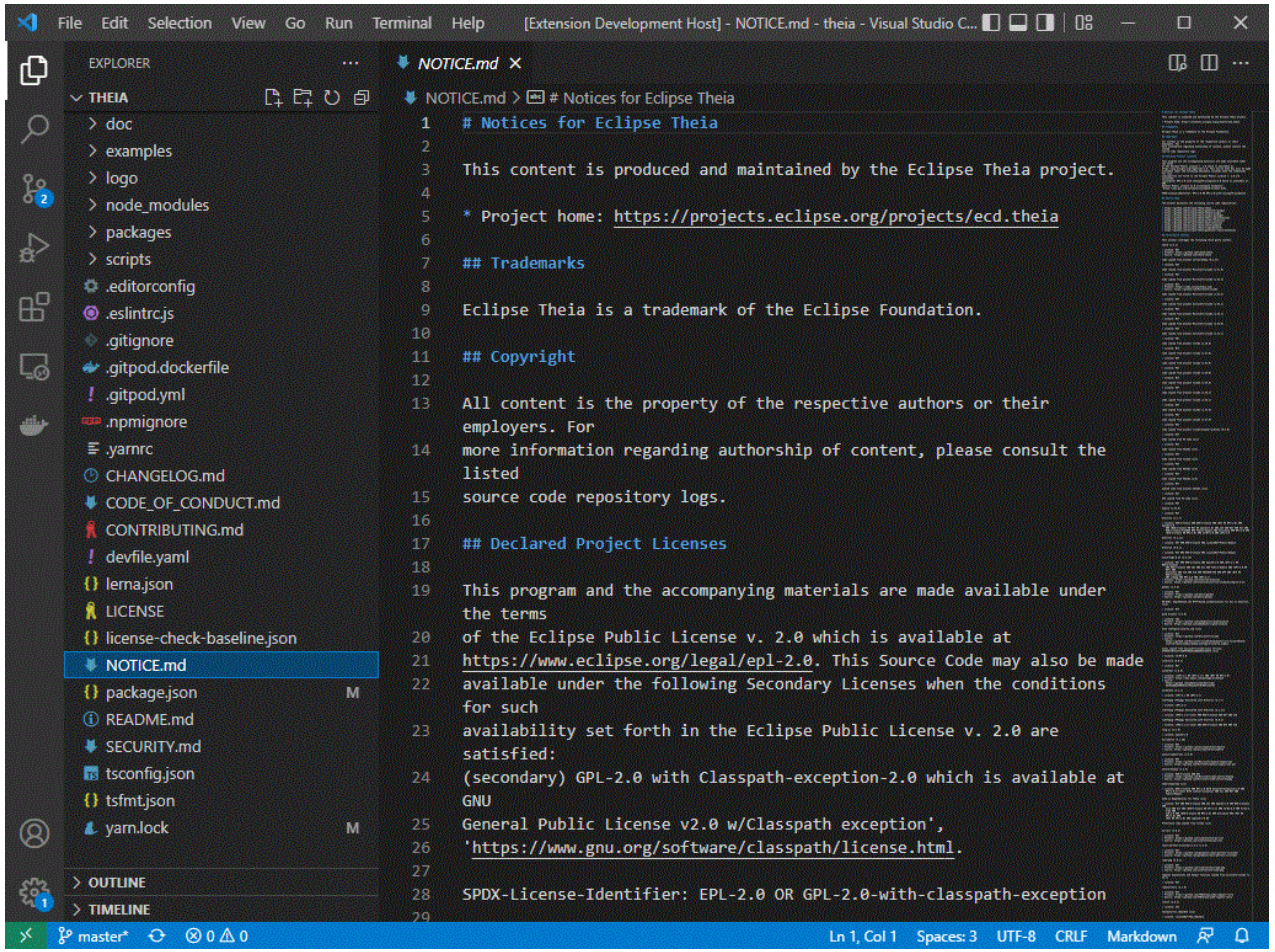


Single Source

Visual Studio Code Extension

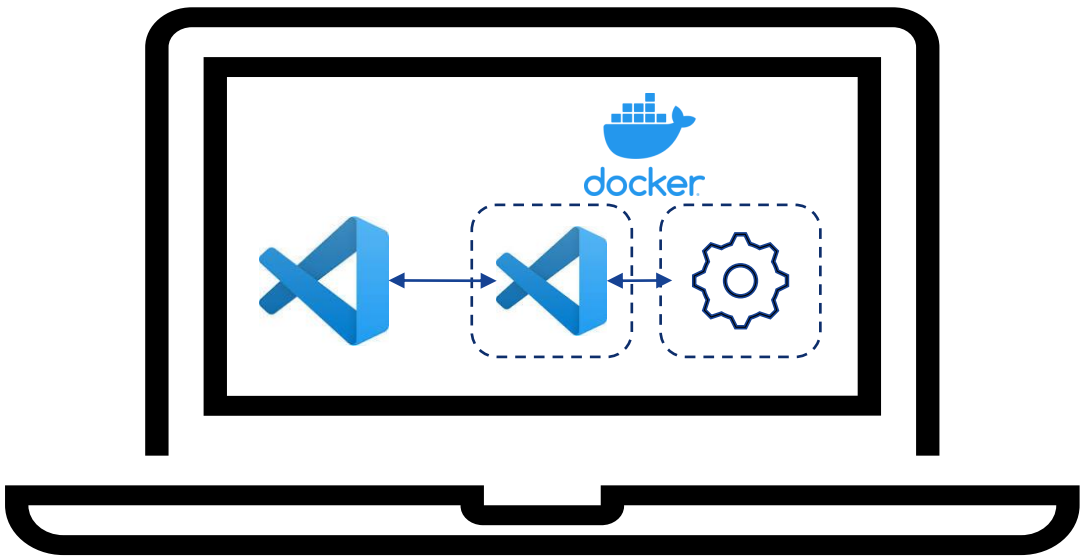
```
import fetch from 'cross-fetch';

async function modifyREST(input:string) {
  const response = await fetch (
    'http://localhost:8282/'
    + 'uppercase/'
    + input);
  const data = await response.text();
  return data;
}
```



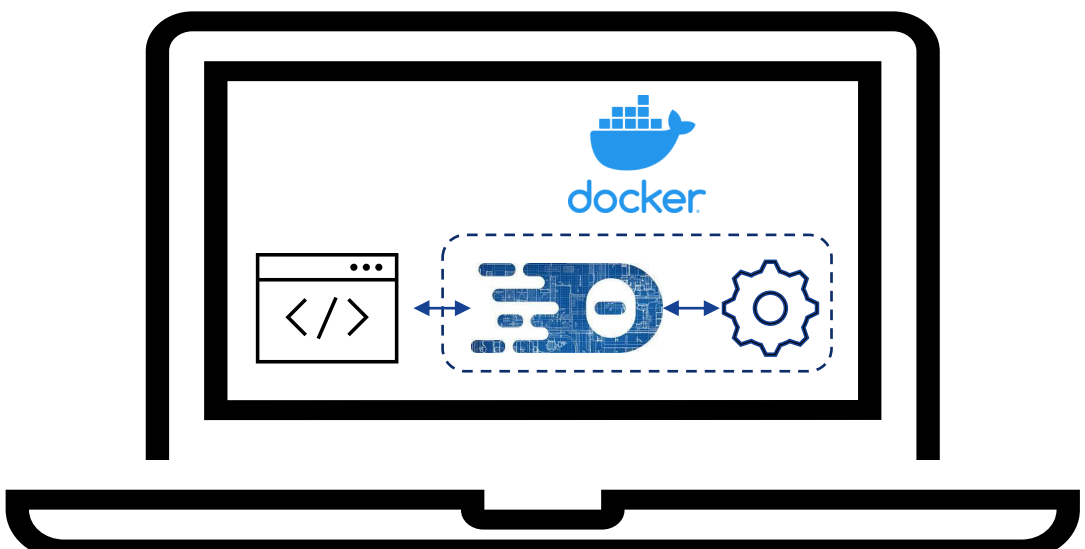
Single Source

Use Cases – Development Container



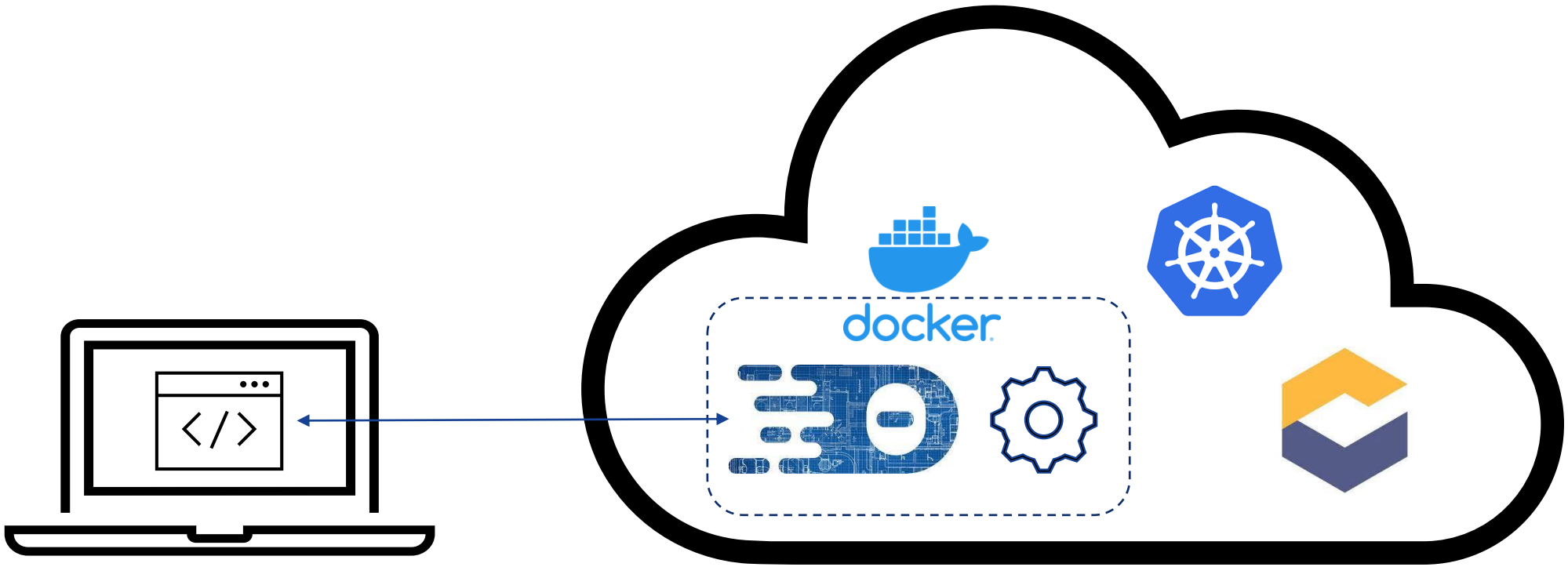
- VS Code
- Docker Compose
  - VS Code Remote Container
  - Service Container

- Browser
- Docker Container
  - Theia Application + Services



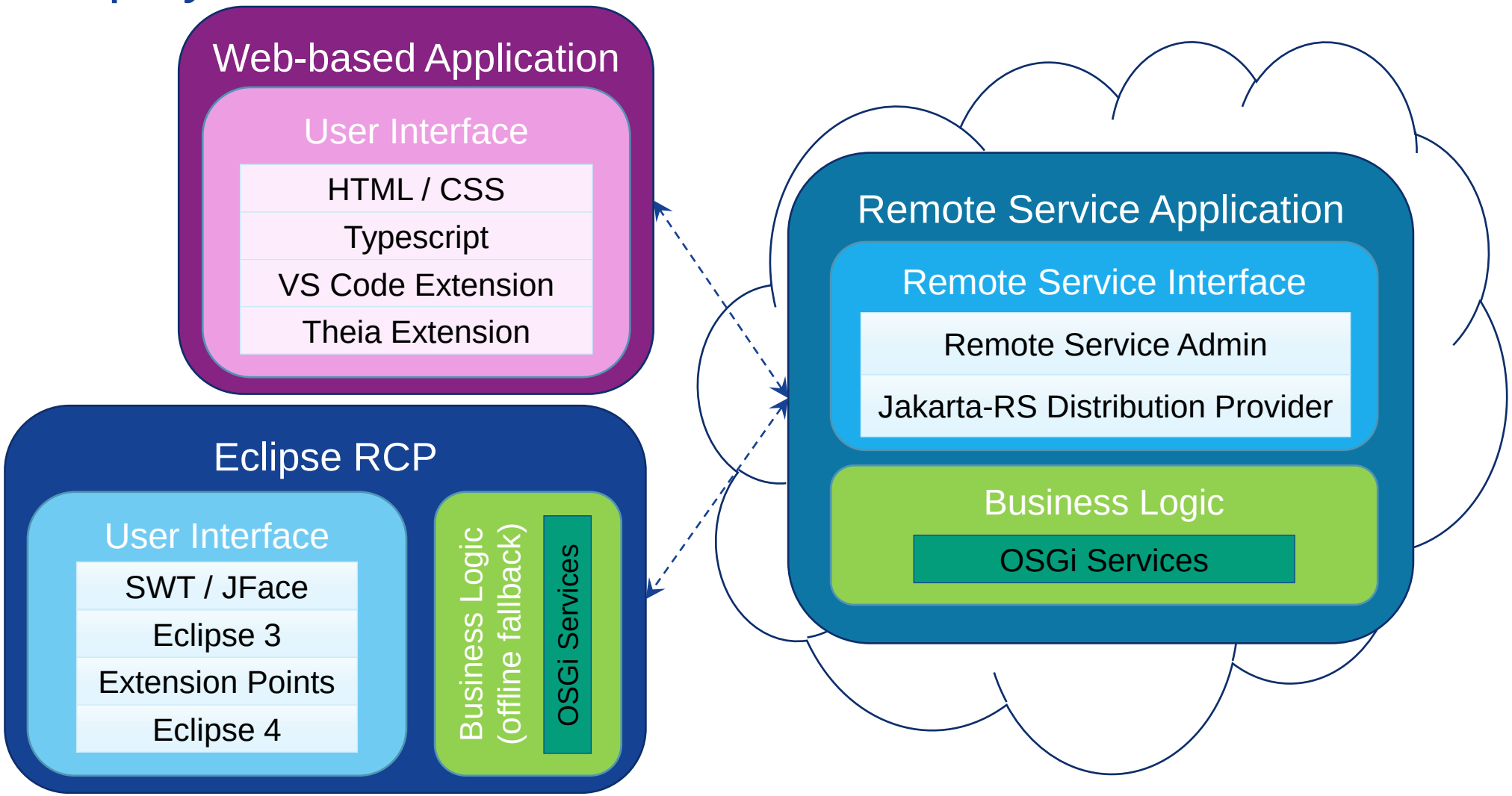
Single Source

Use Case – Cloud IDE



Single Deployment

Single Deployment



Single Deployment

- **Create new application that provides services in different ways at the same time**
  - OSGi Remote Service
  - REST Service
- **Effort required**
  - Provider: Component Configuration and application setup
  - Consumer: Add required dependencies
- **Used OSGi Specification Implementations**
  - Declarative Services
  - Remote Services
  - Remote Service Admin
  - Jakarta-RS Whiteboard

ECF Jakarta-RS Distribution Provider is currently an unpublished PoC
A reference implementation in the Eclipse namespace is “work in progress”

Single Deployment

Service Implementation with Jakarta-RS annotations and Remote Service configuration properties

```
@Path("/inverter")
@Component(
    property = {
        "service.exported.interfaces=*",
        "service.exported.intents=jakartars",
        "osgi.jakartars.resource=true"})
public class StringInverter implements StringModifier {

    @GET
    @Produces(MediaType.TEXT_PLAIN)
    @Path("/{value}")
    @Override
    public String modify(@PathParam("value") String input) {
        return (input != null)
            ? new StringBuilder(input).reverse().toString()
            : "No input given";
    }
}
```

Single Deployment

ECF Jakarta-RS Distribution Provider Issues

ECF Jakarta-RS Remote Service

Jakarta-RS Whiteboard Service

```
@Path("/inverter")
@Component(
    property = {
        "service.exported.interfaces=*",
        "service.exported.intents=jakartars",
        "osgi.jakartars.resource=true"})
public class StringInverter implements StringModifier {
```

Jakarta-RS Annotations

Needed on methods in **interface and impl** so the client can create the proxy.

→ API bundles have dependencies to Jakarta-RS

Maven Build

ECF Jakarta-RS Distribution Provider not available in Maven Central

→ Additional work needed on build setup

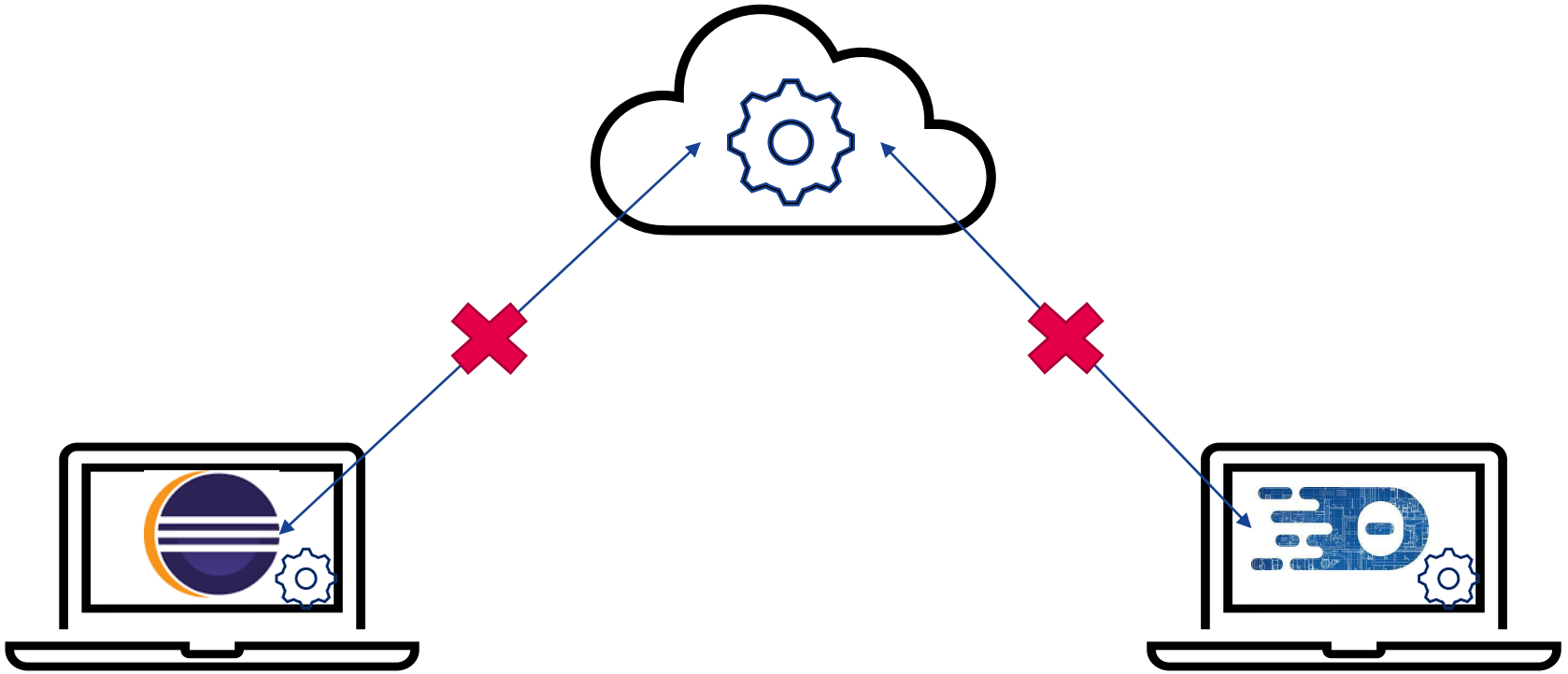
Runtime

1. Bundle startup order issues
2. Configuration of `jakarta.ws.rs` SPI

→ Additional work needed on runtime configuration

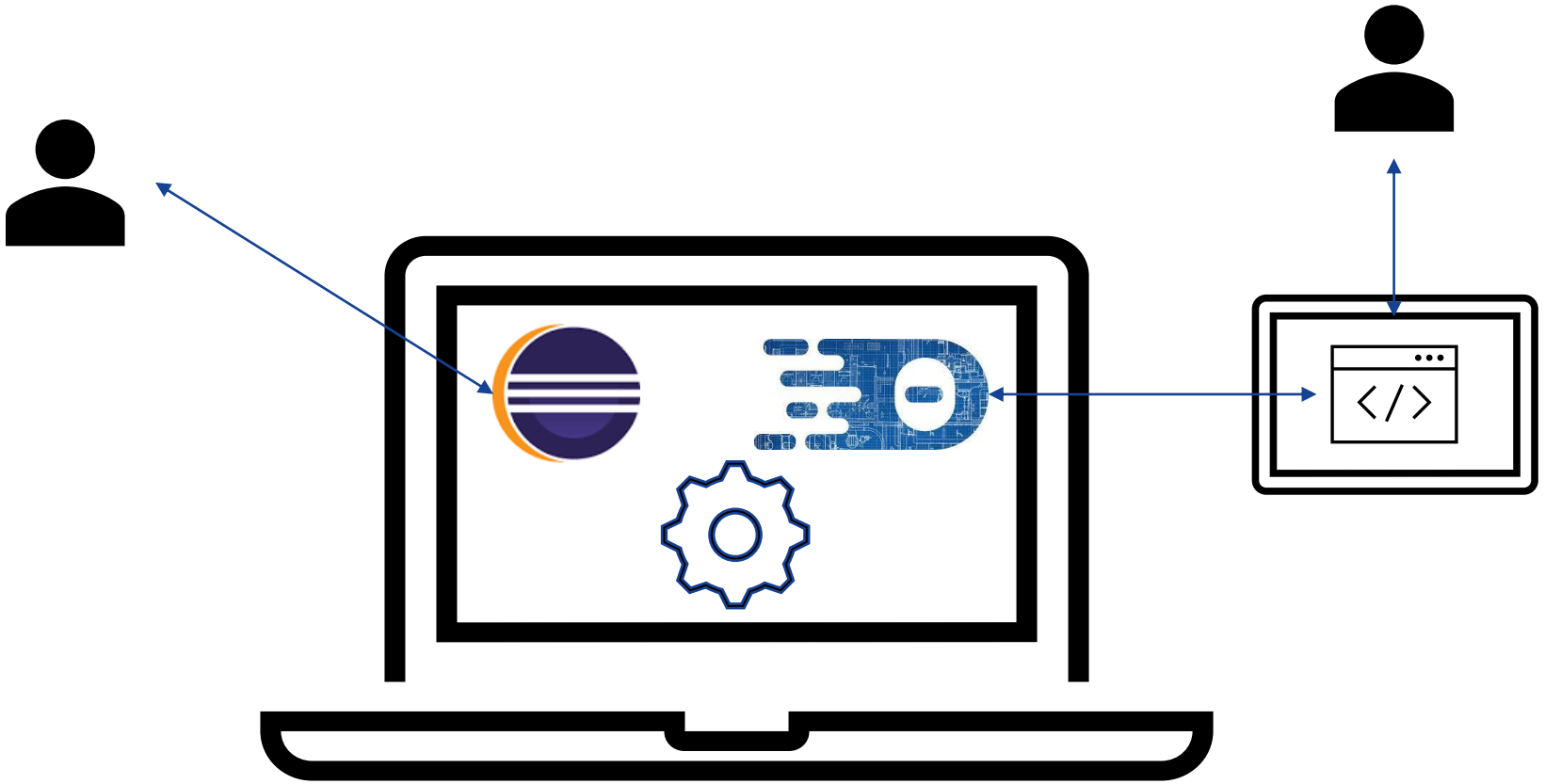
Single Deployment

Use Case – Cloud Service Deployment



Single Deployment

Use Case – Local Deployment with Remote Access



Conclusion

Conclusion

How to reuse existing functionality in different scenarios?

- **Extract business logic to services**

How to support new requirements by keeping the existing applications alive?

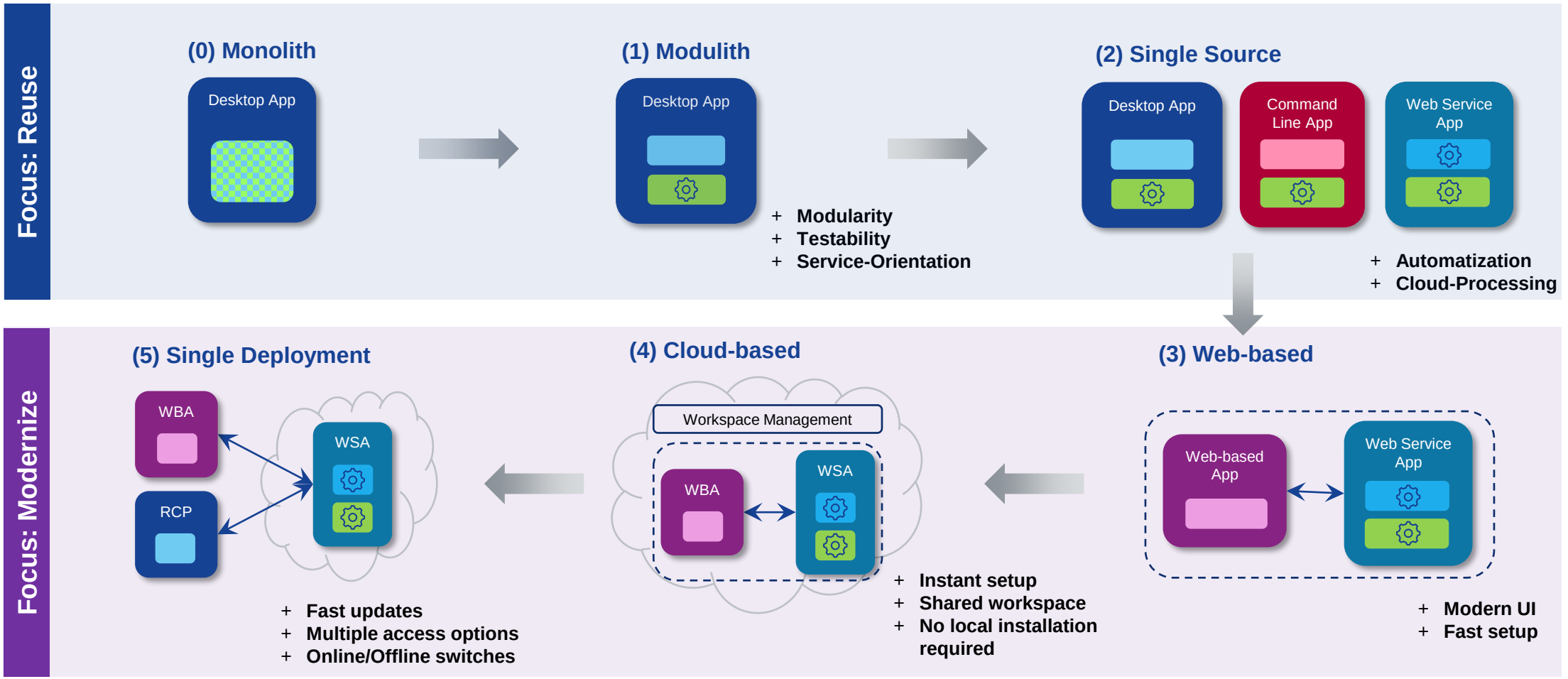
- **DevOps & Web-/Cloud-based tooling**
  - Build different applications using the same services
- **Freedom of choice regarding the IDE for developers**
  - Change the project layout

How can OSGi help in answering those questions?

- **Use OSGi Specifications and Implementations**
  - Declarative Services
  - Jakarta-RS Whiteboard
  - Remote Services
  - Remote Service Admin

From monolith to single-source to single-deployment

Migration Path



Further Information

- **Blog Posts**
  - Getting Started with OSGi Declarative Services
    https://vogella.com/blog/getting-started-with-osgi-declarative-services/
  - Building a “headless RCP” application with Tycho
    https://vogella.com/blog/building-a-headless-rcp-application-with-tycho/
  - Getting Started with OSGi Remote Services
    https://vogella.com/blog/getting-started-with-osgi-remote-services-enroute-maven-archetype-edition/
  - Build REST services with the OSGi Whiteboard Specification for Jakarta™ RESTful Web Services
    https://vogella.com/blog/build-rest-services-with-osgi-jakarta-rs-whiteboard/

- **Example**
  https://github.com/fipro78/monolith-single_deployment

Thank you

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