

Multi-device Content Display & Smart Use of Annotation Processing

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Speakers

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- Java developer since 1999
- R&D Team Mentor at



- **Coder, DevOps, Agile Coach**
 - From idea to production
- **eXo Platform**
 - VP Quality

@gdigugli

- Java developer since 1999
- Software architect at



- **ILOG - IBM**
 - ✓ 2D graphic toolkit
 - ✓ Rule engine
- **Prima-Solutions**
 - ✓ Services platform for J2EE
 - ✓ Domain models code generators

Let's talk about visible quality

Effective Content Display

The case

Effective Content Display

- Multi device & languages
 - Labels
 - Layout & images
- Clean code
 - Strong Quality
 - Easy Maintenance

with APT Tooling

- APT Engine
- APT Processors
 - Generate technical code
 - Generate reports
 - Generate Helpers

based on i18n

- @Message
- @MessageBundle

<https://github.com/dbaeli/ez18n>



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Conducteur principal

Sexe :

☒ Homme ☐ Femme

Date de naissance :

/ /

Profession :

-- Sélectionnez --

Situation maritale : ?

-- Sélectionnez --

Date d'obtention du permis de conduire :

Mois Année

Permis obtenu en conduite accompagnée ? ?

☐ Oui ☒ Non



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1 MA DEMANDE

2 MON HISTORIQUE

3 MON VÉHICULE

Conducteur principal

Assuré(e) sans interruption depuis : ?

13 ans ou plus



Résilié(e) par un assureur auto au cours des 3 dernières années :

Non



Bonus-malus actuel : ?

50% de bonus depuis 3 ans



Nombre de sinistres ou incidents déclarés depuis 3 ans : ?

0



[< Étape précédente](#)

CONTINUEZ



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1 MA DEMANDE **2** MON HISTORIQUE **3** MON VÉHICULE

Le véhicule à assurer

Date de 1ère mise en circulation : [Comment la retrouver ?](#)

Janvier 2012 ✓

Date à laquelle le véhicule a été acheté : ?

Janvier 2012 ✓

Marque du véhicule à assurer :

Choisissez votre véhicule

Combien d'années avez-vous conservé votre précédent véhicule ?

Moins d'une année ✓

Lieu ou adresse de stationnement la nuit : ?

rue de l'essai ✓

Carrier 4:10 PM

Retour **Votre voiture**

Assure Mieux VOTRE COMPAREUR D'ASSURANCES

Mon véhicule

Date de 1ère mise en circulation

Janvier 2010

Date d'achat

Janvier 2010

J'indique quel est mon véhicule

PEUGEOT 207 1.6E 16V 120 SPORT PACK
7 cv / Essence / Berline 3 Portes

Choisir un autre véhicule >

Combien d'années ai-je conservé mon précédent véhicule ?

Moins d'une année

Code postal du lieu de stationnement la nuit

How to manage text display ?

Java i18n pattern

- The provided tooling for :
 - Dynamically bind the content
 - Texts, but also CSS and images (urls)
- Tooling :
 - `java.util.ResourceBundle` : for `.properties` reading
 - `java.util.MessageFormat` : tiny templating
 - `.properties` files with naming pattern

java.util.ResourceBundle

- The .properties loader for a given Locale
- Key / Value in .properties
- Naming convention for the storage

Messages_**en_EN**.properties

Langage

Country

```
ResourceBundle myResources =  
    ResourceBundle.getBundle("MyResources", currentLocale);
```

java.util.MessageFormat

At 1:15 on April 13, 1998, we detected 7 spaceships on the planet Mars.

Diagram showing the formatting of the sentence above. The words "1:15", "April 13, 1998", "7", and "Mars" are underlined. Above each underlined word is a label: "Date" for "1:15", "Date" for "April 13, 1998", "Number" for "7", and "String" for "Mars".

```
template = At {2,time,short} on {2,date,long}, \
we detected {1,number,integer} spaceships on \
the planet {0}.
```

```
currentLocale = en_US
At 10:16 AM on July 31, 2009, we detected 7
spaceships on the planet Mars.
currentLocale = de_DE
Um 10:16 am 31. Juli 2009 haben wir 7 Raumschiffe
auf dem Planeten Mars entdeckt.
```

- Tiny templating
- `format("<pattern>", args)`
- Date, numbers are formatted according to the Locale
- Options, conditional values easy to use

.properties issues

- Low quality control
 - Keys are strings in the code
 - Poor IDE support
 - No warning on unused or wrong keys
 - Encoding Hell
 - use \uxxxx or you're in trouble
- Forces you to maintain two files in sync
 - key declaration / value in .properties
 - Key usage in the .java files

Improved i18n

Improved i18n

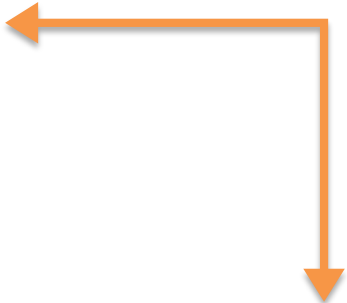
- Interfaces representing each set of .properties
- The methods acts as keys

```
@MessageBundle
public interface Messages {

    @Message(value = "Love Me Tender")
    String loveMeTender();

    @Message("I love {0}")
    String doYouLove(String name);
}
```

Messages.java



```
loveMeTender=Love Me Tender
doYouLove=I love {0}
```

Messages.properties

Annotations and Code generation

- Same pattern as in GWT, but for J2SE
- Annotate your code :
 - @MessageBundle to mark interfaces
 - ➔ represents a ResourceBundle
 - @Message to mark methods
 - ➔ represents a localization key
- Generate :
 - .properties file (for 'default')
 - A ResourceBundle for each .properties
 - Manage other languages out-side your code

Improved i18n benefits

- Now you can
 - Refactor your keys
 - Maintain the 'default' in Java
 - Never change a .properties file for default locale
- And use it with other libs:
 - GWT (done on GitHub)
 - Even JQuery, Dojo, CoffeeScript (planned)

Extend this pattern for Multi-display

Extended to displays

- Add mobile support in @Message declaration

```
@MessageBundle
public interface Messages {

    @Message(value = "Love Me Tender", //
        mobile = "Love Me True")
    String loveMeTender();

    @Message("I love {0}")
    String doYouLove(String name);

}
```

Messages.java

DesktopMessages.properties

```
loveMeTender=Love Me Tender
doYouLove=I love {0}
```

```
loveMeTender=Love Me True
doYouLove=I love {0}
```

MobileMessages.properties



Extended to displays

- One ResourceBundle by kind of display
- All driven by @MessageBundle annotation
- Fallback on the default display
- Keep the plumbing generated

APT to generate .properties and ResourceBundle classes from annotations

Behind the scene

How APT works

APT basics

- APT - Annotation Processing Tool
- Kind of old-school pre-processing
- But not on the file it-self
- No runtime overload
- Based on annotations in source code
- Standard since JDK 1.6 (available in Sun JDK 1.5)

APT annotations

- Use @Retention, @Target

```
@Retention(RetentionPolicy.SOURCE)
@Target(ElementType.TYPE)
public @interface MessageBundle {
```

```
@Retention(RetentionPolicy.SOURCE)
@Target(ElementType.METHOD)
public @interface Message {
```

APT Processors

- `javax.annotation.processing.Processor`
- Code parsing similar to Reflection
 - No need of compiled code
 - Some limitations
- 2 key elements :
 - `@SupportedAnnotationTypes` to declare the matching annotations
 - `FileObject` : the future generated file

Processor code sample

- Processor declaration

```
@SupportedAnnotationTypes(value = "org.ez18n.MessageBundle")
@SupportedSourceVersion(RELEASE_6)
public final class CSVReportProcessor extends AbstractProcessor {

    @Override
    public boolean process(Set<? extends TypeElement> annotations,
                          RoundEnvironment roundEnv) {
```

- Use a FileObject to generate the content

```
final FileObject file = processingEnv.getFile()
    .createResource(SOURCE_OUTPUT, "", "i18n_report.csv");
final Writer writer = file.openWriter();
for (TypeElement bundleType : labelBundles.keySet()) {
    for (LabelTemplateMethod templateMethod : labelBundles.get(bundleType)) {
        writer.write('\n');
        writer.write(bundleType.getQualifiedName().toString());
```

Similarities with `java.lang.reflect`

Java.lang.reflect	Javax.annotation.processing
<code>java.lang.Class</code>	<code>TypeElement</code>
Constructor	<code>ExecutableElement</code>
Field, Parameter	<code>VariableElement</code>
Method	<code>ExecutableElement</code>
<code>java.lang.Package</code>	<code>PackageElement</code>

- NO `Class.newInstance()`
- NO `instanceOf`, NO `isAssignable()`
- NO `getConstructor`, `getMethod`, ...
- Weak inheritance management

APT command line

javac

-cp \$CLASSPATH

-proc:only

-proc:none

-encoding UTF-8

-processor \$PROCESSOR

processors fqcn list

-d \$PROJECT_HOME\target\classes

-s \$PROJECT_HOME\target\generated-sources\apt

-sourcepath \$SOURCE_PATH

-verbose

\$FILES

optional

APT tooling

- Maven integration
 - maven-processor-plugin (google-code)
- Ant integration
 - javac
- IDE integration
 - Extend the JDK compilation options

APT usages

- Generate required repetitive code :
 - Not always possible at runtime
 - Unit tests, JMX declarations
 - Utility code with coverage and debug
- Build your reports on your code
 - Your Metrics without runtime overload
 - Even fail the build if you want !

One or Two phase compilation

- One phase
 - APT runs during the compilation
 - Generated code is directly produced as bytecode (.class)
 - Harder to debug (no .java created)
- Two phases
 - javac with proc:only then with proc:none
 - Creates .java files in the sourcepath
 - Not really supported by IDEs, ok with maven.

Problems with APT

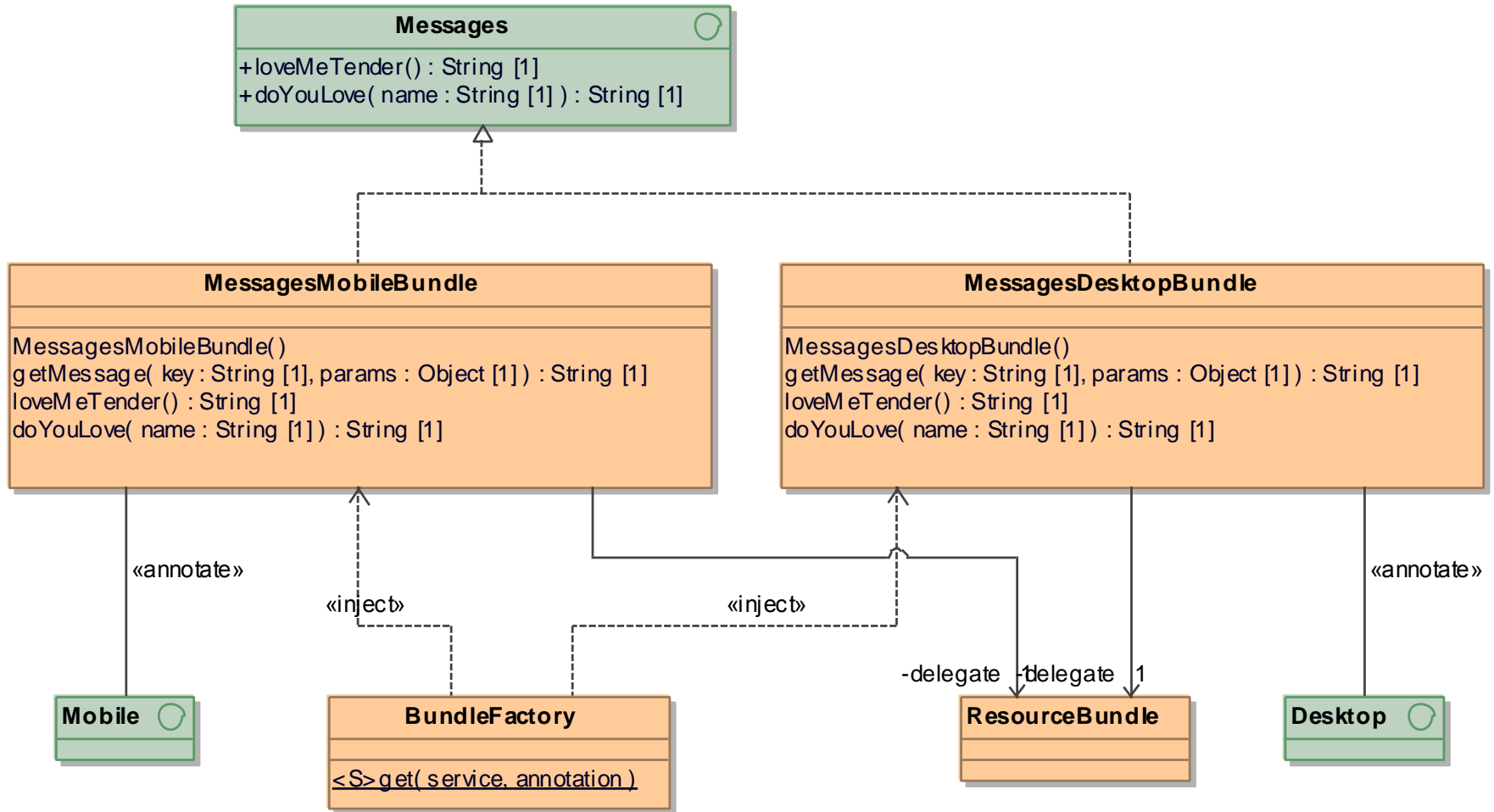
- Beware of the “Generate” golden hammer
 - generate needed code
- APT Processors can be tricky:
 - hard to test / maintain
 - bad error management (hidden errors !)
 - Not really (well) documented
- No built in templating mechanism
- Enforced file path creation
- Beware of maven // builds
 - javac is not thread safe

It's time to convince your team

- APT parses the source code to generate
 - Java Files & .class, Reports (.csv, ...)
 - Build log information or even build failures
- It allows you to have a source level DSL
 - Annotate your code
 - Generate the plumbing
 - Compile / Debug the real code
- APT framework is compact
- Learning curve is low

Go deep in Ez18n

Ez18n - Big picture



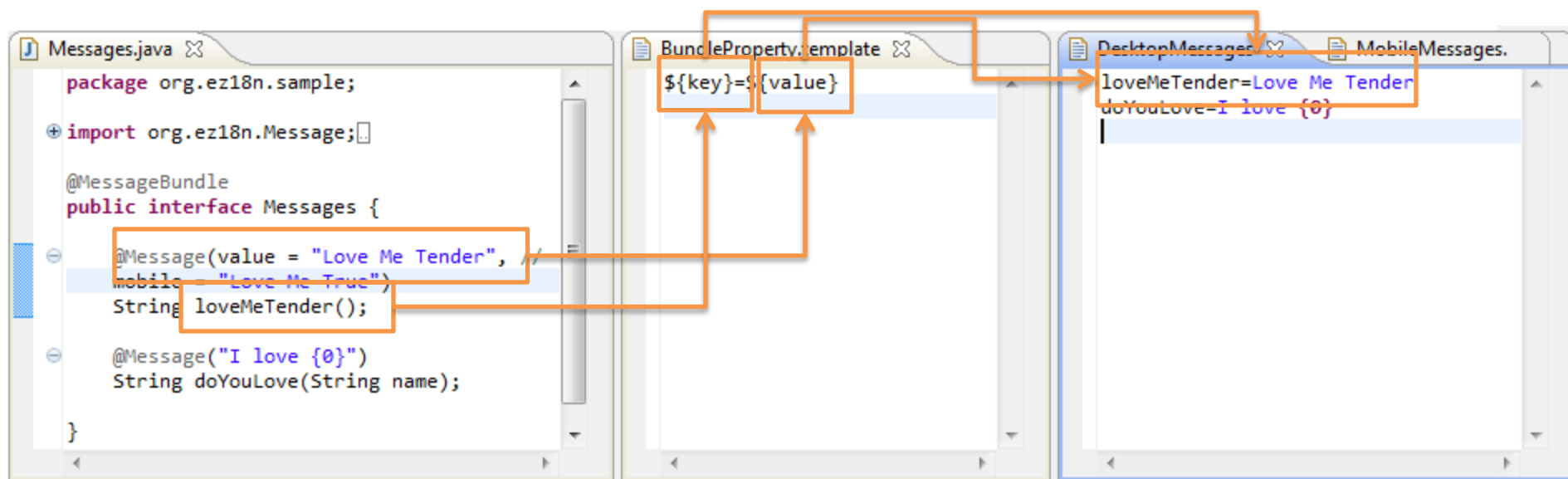
Ez18n - APT chaining

```
<plugin>
  <groupId>org.bsc.maven</groupId>
  <artifactId>maven-processor-plugin</artifactId>
  <executions>
    <execution>
      <id>generate-i18n-source</id>
      <goals>
        <goal>process</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <compilerArguments>-encoding UTF-8</compilerArguments>
        <outputDirectory>${project.build.directory}/generated-sources/apt</outputDirectory>
        <processors>
          <processor>org.ez18n.apr.processor.MobileBundleProcessor</processor>
          <processor>org.ez18n.apr.processor.MobileBundlePropertiesProcessor</processor>
          <processor>org.ez18n.apr.processor.DesktopBundleProcessor</processor>
          <processor>org.ez18n.apr.processor.DesktopBundlePropertiesProcessor</processor>
          <processor>org.ez18n.apr.processor.CSVReportProcessor</processor>
          <processor>org.ez18n.apr.processor.MetaInfServicesProcessor</processor>
        </processors>
      </configuration>
    </execution>
  </executions>
</plugin>
```

- 5 APT processors to obtain the default pattern
- Optional CSV files for analysis/tooling

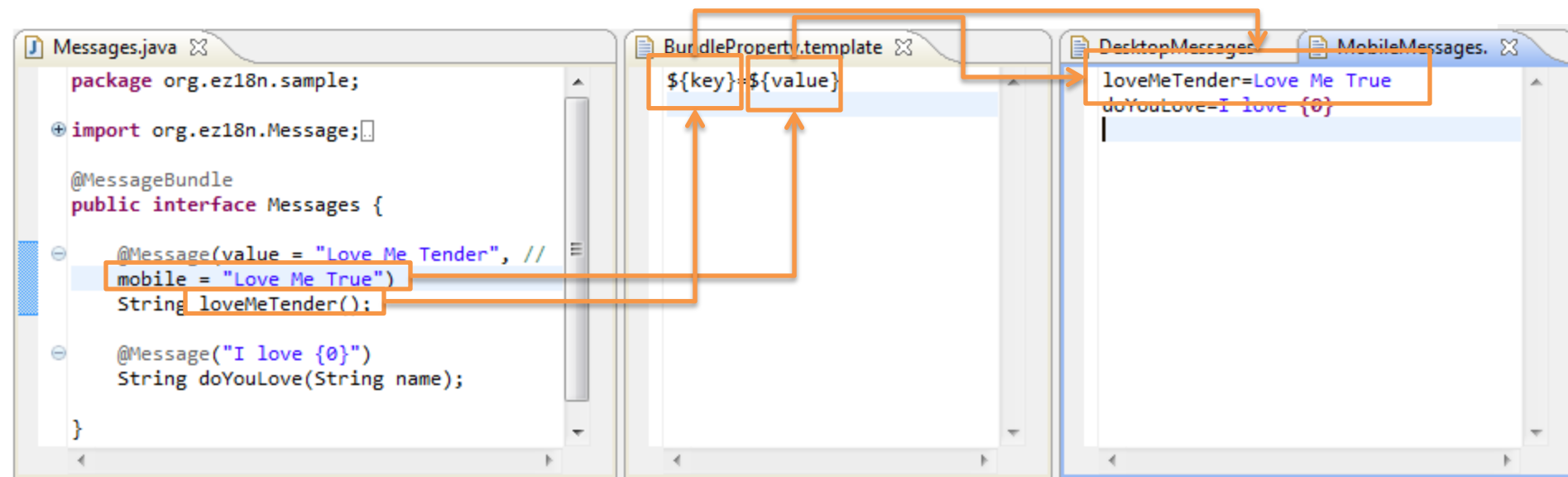
From Messages to DesktopMessages.properties

- One property file per interface with **@MessageBundle**
- One property entry per method with **@Message**



From Messages to MobileMessages.properties

- Another property file is generated for the mobile content
- If **@Message#mobile** is empty, the **@Message#value** is used as fallback



From Messages to MessagesDesktopBundle.java (1/2)

The screenshot displays three Java files in an IDE:

- Messages.java**:
 - Package: `org.ez18n.sample;`
 - Import: `import org.ez18n.Message;`
 - Annotation: `@MessageBundle`
 - Interface: `public interface Messages {`
 - Message 1: `@Message(value = "Love Me Tender", // mobile = "Love Me True") String loveMeTender();`
 - Message 2: `@Message("I love {0}") String doYouLove(String name);`
 - Close: `}`
- DesktopBundle.template**:
 - Package: `package ${package.name};`
 - Imports: `import javax.annotation.Generated;` and `import java.util.ResourceBundle;`
 - Import: `import org.ez18n.runtime.Desktop;`
 - Annotation: `@Desktop`
 - Generated: `@Generated(value = "${process.class}", date = "${process.date}")`
 - Class Declaration: `public final class ${target.class.name} implements ${source.class.name}`
 - Field: `private final ResourceBundle delegate;`
 - Constructor: `public ${target.class.name}() { delegate = ResourceBundle.getBundle("${package.name}.${bundle.pr`
 - Close: `}`
- MessagesDesktopBundle.java**:
 - Class Declaration: `public final class MessagesDesktopBundle implements Messages {`
 - Field: `private final ResourceBundle delegate;`
 - Constructor: `public MessagesDesktopBundle() { delegate = ResourceBundle.getBundle("org.ez18n.sample.DesktopMessages"); }`
 - Annotation: `@SuppressWarnings("all")`
 - Method: `private String getMessage(String key, Object... params) { return java.text.MessageFormat.format(delegate.getString(key), params); }`

An orange box in `Messages.java` highlights the `@MessageBundle` annotation and the `Messages` interface. An orange box in `DesktopBundle.template` highlights the `@Desktop` annotation and the class declaration. An orange box in `MessagesDesktopBundle.java` highlights the class declaration and the constructor. An orange arrow points from the `Messages` interface in `Messages.java` to the `MessagesDesktopBundle` class in `MessagesDesktopBundle.java`.

From Messages to MessagesDesktopBundle.java (2/2)

The screenshot shows three code files in an IDE:

- Messages.java**:

```
package org.ez18n.sample;

import org.ez18n.Message;

@MessageBundle
public interface Messages {

    @Message(value = "Love Me Tender",
             mobile = "Love Me True")
    String loveMeTender();

    @Message("I love {0}")
    String doYouLove(String name);
}
```
- DesktopBundle.templ**:

```
@Override
public ${return.type} ${method.name}(${input.typed.params}) {
    return getMessage("${method.name}", ${input.params});
}
```
- MessagesDesktopBundle.java**:

```
private String getMessage(String key, Object... params) {
    return java.text.MessageFormat.format(delegate.getString(key), params);
}

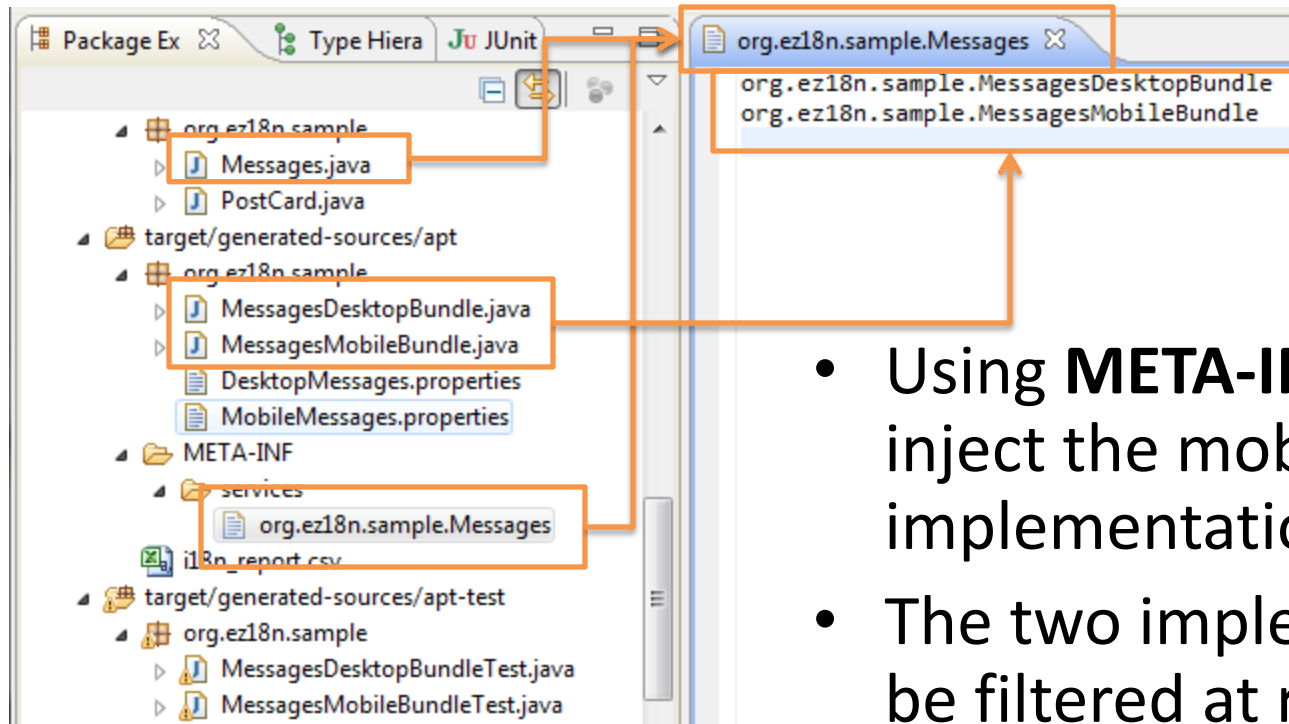
@Override
public String loveMeTender() {
    return getMessage("loveMeTender", new Object[]{});
}

@Override
public String doYouLove(String name) {
    return getMessage("doYouLove", name);
}
```

Orange boxes and arrows illustrate the templating process:

- An arrow points from the `loveMeTender()` method in **Messages.java** to the corresponding `loveMeTender()` method in **MessagesDesktopBundle.java**.
- Another arrow points from the `doYouLove()` method in **Messages.java** to the corresponding `doYouLove()` method in **MessagesDesktopBundle.java**.
- A third arrow points from the `getMessage()` method in **MessagesDesktopBundle.java** to the `getMessage()` method in **DesktopBundle.templ**.

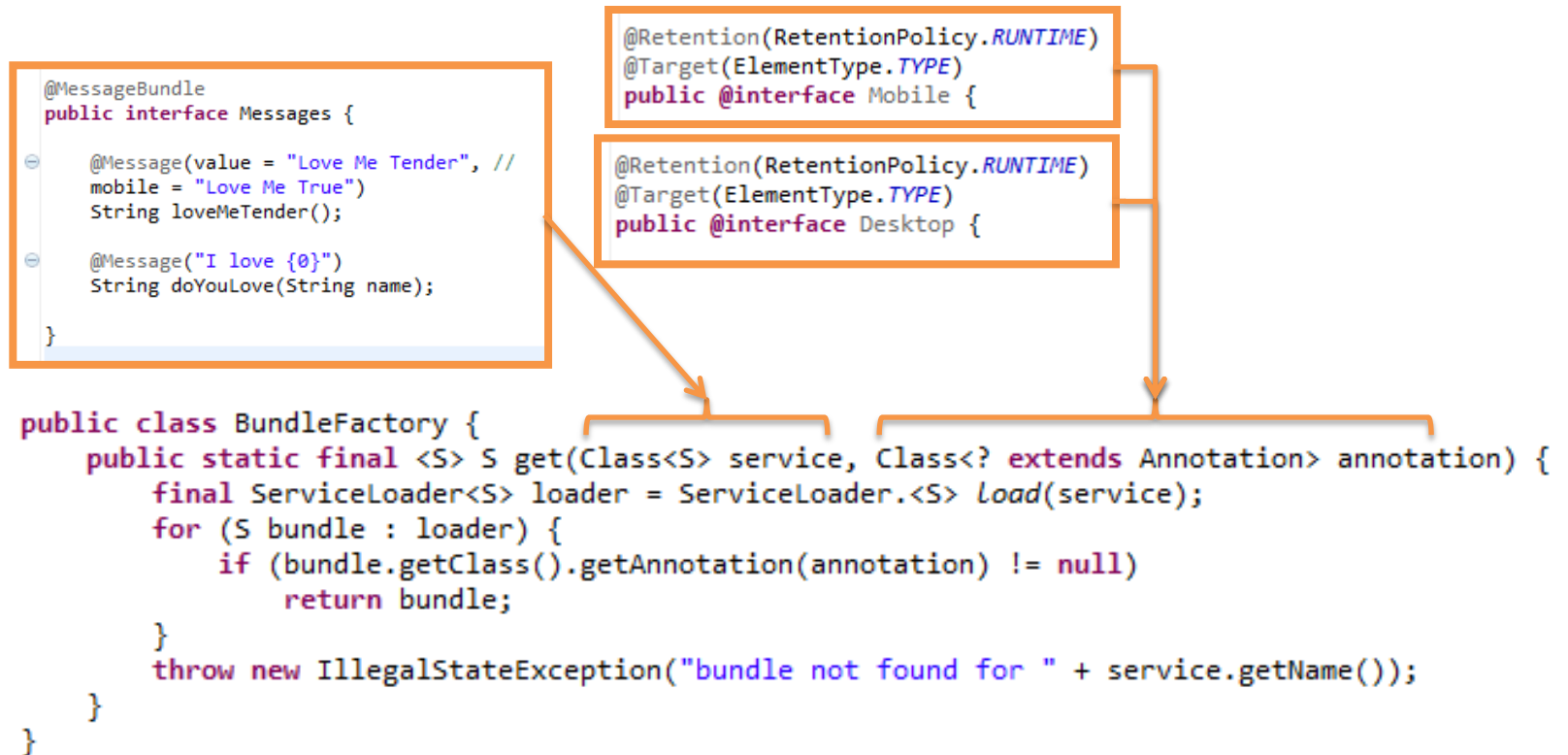
From Messages to META-INF/services/org.ez18n.sample.Messages



- Using **META-INF/services** to inject the mobile & desktop implementation
- The two implementation could be filtered at runtime using **annotations** and **ServiceLoader**
 - **@Mobile**
 - **@Desktop**

A factory for the Messages implementations

- Using `java.util.ServiceLoader` to inject the interface with `@MessageBundle`
- `@Desktop` and `@Mobile` used to filter the injection result



Client code sample with JUnit

- Some basic JUnit test using the API

```
@Generated(value = "org.ez18n.appt.processor.TestDesktopBundleProcessor", date = "9/14/12 7:07 PM")  
public class MessagesDesktopBundleTest {
```

```
    private Messages bundle;  
  
    @org.junit.Before  
    public void setUp() {  
        bundle = BundleFactory.get(Messages.class, Desktop.class);  
    }
```

```
    @org.junit.Test  
    public void loveMeTender() {  
        assertNotNull(bundle.loveMeTender());  
    }  
  
    @org.junit.Test  
    public void doYouLove() {  
        assertNotNull(bundle.doYouLove(null));  
    }
```

The unit tests are generated using APT too ☺

BundleFactory.get(...) usage in the test @Before to retrieve the bundle implementation

Ez18n - Summary

```
@MessageBundle  
public interface Messages
```

```
    @Message(value = "Love Me True")  
    String loveMeTender();  
}
```

```
    @Message("I love {0}")  
    String doYouLove(String name);  
}
```

```
public static final void main(String... args) {  
    final Messages bundle = BundleFactory.get(Messages.class, Desktop.class);  
    System.out.println(bundle.doYouLove("Mum"));  
}
```

**Maven, javac
Injection & APT**

META-INF
services
org.ez18n.sample.Messages

Problems Javadoc Declaration Console
<terminated> PostCard [Java Application] C:\java\jdk1.6.0_35\bin\javaw.exe
I love Mum

**If you think there
is room for a JSR
Please tell us.**



Thank you !

Ez18n is on GitHub. Just fork it !



<https://github.com/dbaeli/ez18n>

