Android and OSGi: Can they Work Together?

BJ Hargrave
Senior Technical Staff Member, IBM Lotus

Neil Bartlett
Java Developer and Consultant
Yes!
Any Questions?
Motivation
Different Models

OSGi

Android
Benefits of OSGi
Cheap
Possible
Benefits of Android
Safe
Finding the right granularity
Prior work
Felix on Android

Marcel Offermans (Luminis)

Karl Pauls (Luminis)
http://blog.luminis.nl/luminis/entry/osgi_on_google_android_using

(repeated on last slide)
Our Goal

**Equinox**

**Concierge**
1. Concierge
First step: Start Framework
“Dexification”
dx --dex --output=classes.dex foo.jar
aapt add foo.jar classes.dex
Code changes Required
hargrave@bjhargrave ~

$ adb shell /data/concierge/cf.sh

Concierge OSGi 1.0_RC1 on Linux 2.6.23-g0774dffb starting ...

restoring profile default
Profile default not found, performing clean start ...

Framework started in 0.01 seconds.
Next Step: Adding a Bundle
ClassLoader.defineClass() does not work
Use android.dalvik.DexFile
private final DexFile df;

DexHelper(File file) throws Exception {
    df = new DexFile(file);
}

Class defineClass(ClassLoader cl, String name) {
    String dexName = name.replace('.', '/');
    try {

        Class c = df.loadClass(dexName, cl);
        return c;

    } catch (Exception e) {
        // log error
        return null;
    }
}

Patch Limitations

- Simple bundle classpath only, i.e. Bundle-ClassPath: .
- No nested JARs
- No directory bundles
Android doesn’t like this:

- `ClassLoader.loadClass(clazz, true)`
- ‘true’ triggers `ClassLoader.resolveClass()`, which fails
- `=>` call `ClassLoader.loadClass(clazz)`
- ‘false’ is the default
Success!
DEMO
2. Equinox
First Step: Start Framework
- Equinox uses CodeSource to configure some properties
- On Android, ProtectionDomain is null so no CodeSource
- => Supply properties explicitly
-Dosgi.framework=file:/data/equinox
org.eclipse.osgi_3.4.0.jar

-Dosgi.install.area=file:/data/equinox
- ClassLoader.getResource() is used to return list of Hook configuration property files
- Android always return an empty enum
- => Manually list hooks in config.ini
Strange VerifyError on a framework internal class

=> Turn off the verifier

Is this a dexifier bug?
$ adh shell
# /data/equinox/eq.sh
/data/equinox/eq.sh
Debug options:
    file:/data/equinox/.options loaded
rm /data/equinox/configuration/org.eclipse.osgi/.manager/.fileTable.2
rm /data/equinox/configuration/org.eclipse.osgi/.manager/.fileTable.1
rm /data/equinox/configuration/org.eclipse.osgi/.manager/.tmp27461.instance
rm /data/equinox/configuration/org.eclipse.osgi/.manager/.fileTableLock
rmdir /data/equinox/configuration/org.eclipse.osgi/.manager
rmdir /data/equinox/configuration/org.eclipse.osgi
Skipping osgi.properties: osgi.properties
Initialize the framework: 1463
Trying to launch framework
osgi> ss
ss

Framework is launched.

   id  State     Bundle
    0  ACTIVE     org.eclipse.osgi_3.4.0

osgi>
Next Step: Adding a Bundle
Same need for DexHelper
Same Limitations
Cannot find java.lang.Object!
-Dosgi.parentClassloader=ext
Success!
Possible Next Steps

- A proper hook for dex file loading
- Full Bundle-ClassPath support
- JIT dexification of JARs in the hook?
- Equinox incubator?
Getting Started

- All changes available as patches against Concierge, Equinox
- Subversion repository:
http://www.adon-line.de/kunden/prosystBlog/?p=24
Links

- Felix on Android
  
  http://blog.luminis.nl/luminis/entry/osgi_on_google_android_using

- Our Repository:
  

- ProSyst Announcement:
  
  http://www.adon-line.de/kunden/prosystBlog/?p=24
Legal Notices

- IBM and the IBM logo are trademarks or registered trademarks of IBM Corporation, in the United States, other countries or both.

- Java and all Java-based marks, among others, are trademarks or registered trademarks of Sun Microsystems in the United States, other countries or both.

- Eclipse and the Eclipse logo are trademarks of Eclipse Foundation, Inc.

- Other company, product and service names may be trademarks or service marks of others.

- THE INFORMATION DISCUSSED IN THIS PRESENTATION IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. WHILE EFFORTS WERE MADE TO VERIFY THE COMPLETENESS AND ACCURACY OF THE INFORMATION, IT IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, AND IBM SHALL NOT BE RESPONSIBLE FOR ANY DAMAGES ARISING OUT OF THE USE OF, OR OTHERWISE RELATED TO, SUCH INFORMATION. ANY INFORMATION CONCERNING IBM'S PRODUCT PLANS OR STRATEGY IS SUBJECT TO CHANGE BY IBM WITHOUT NOTICE.