

Android and OSGi: Can they Work Together?

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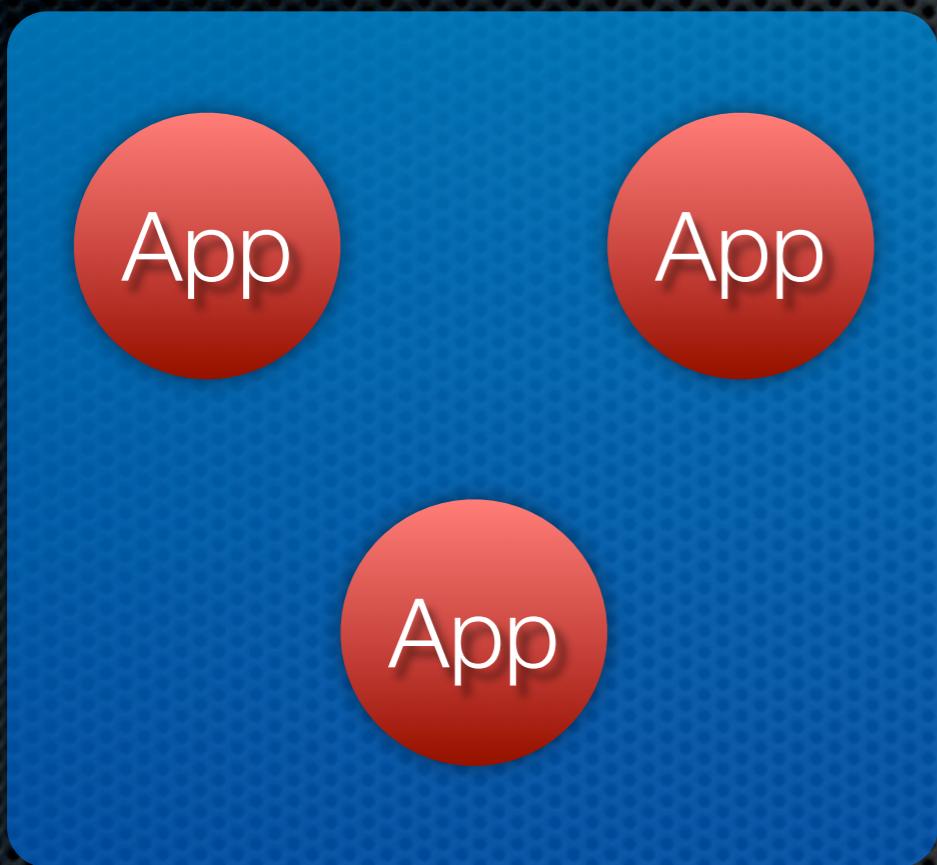
Yes!

Any Questions?

Motivation

Different Models

JVM



OSGi

DVM



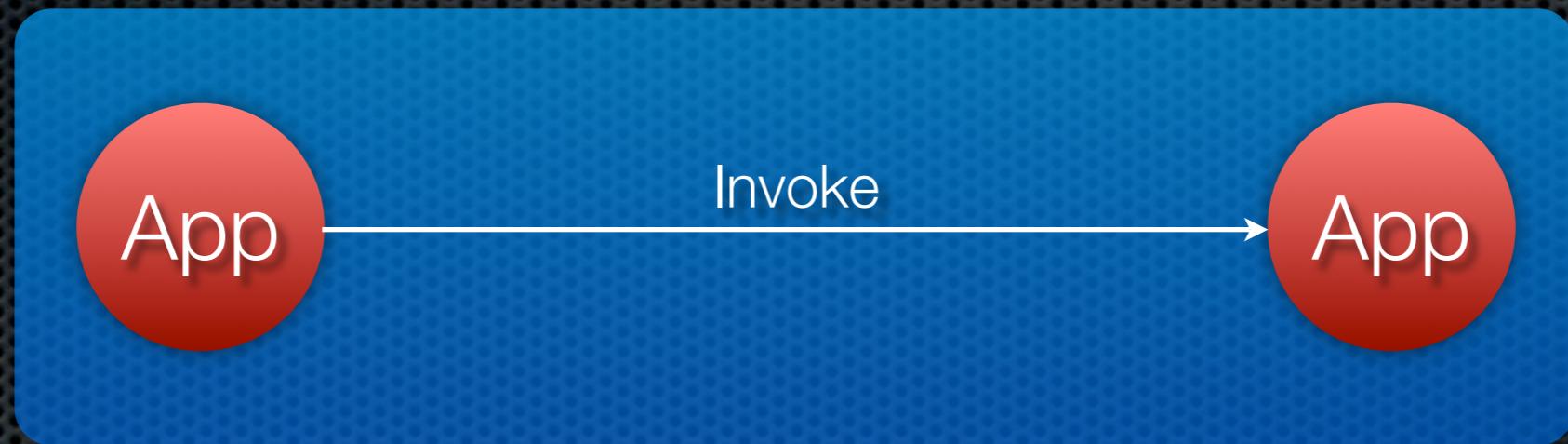
DVM

DVM

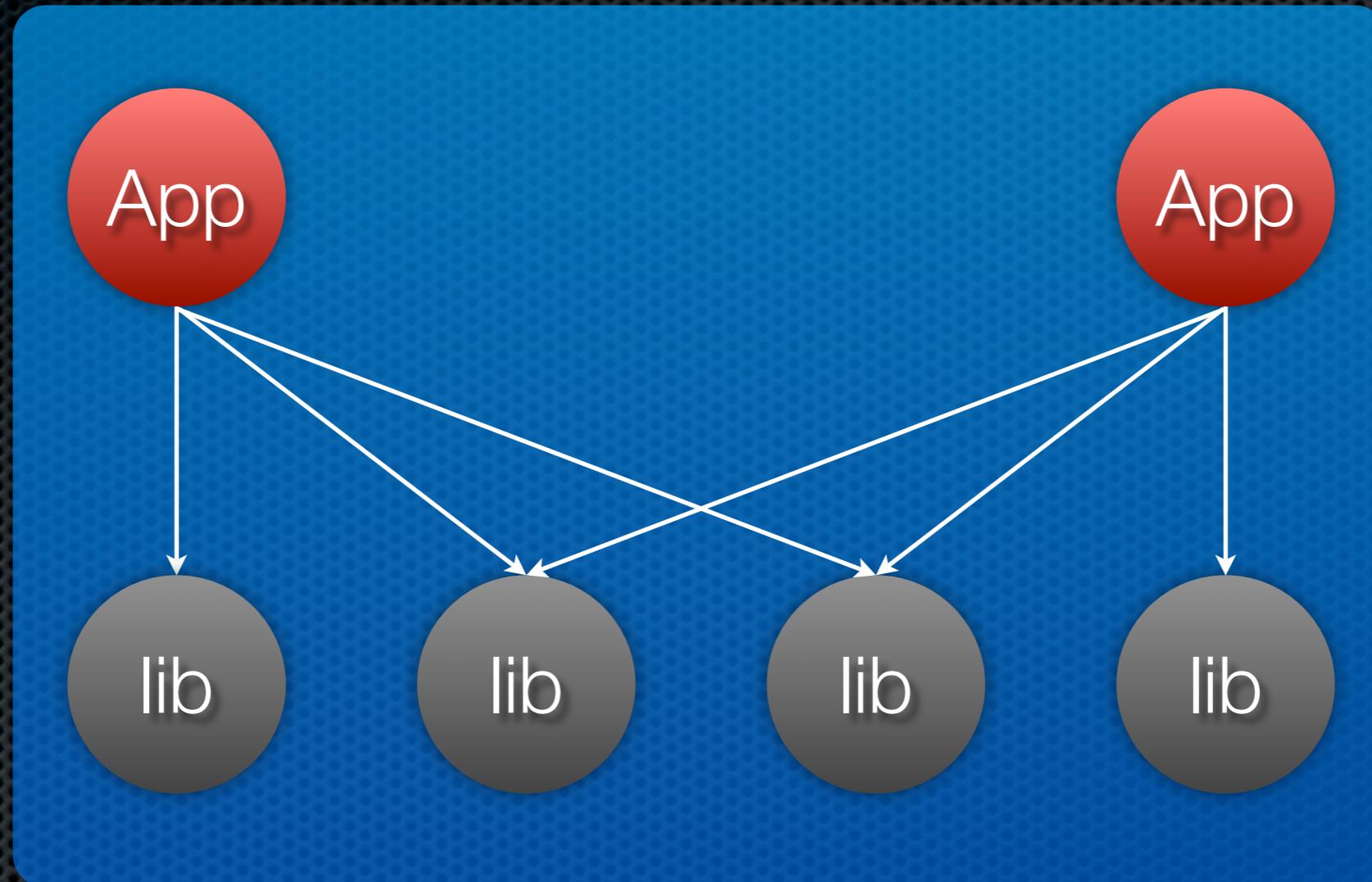


Android

Benefits of OSGi



Cheap



Possible

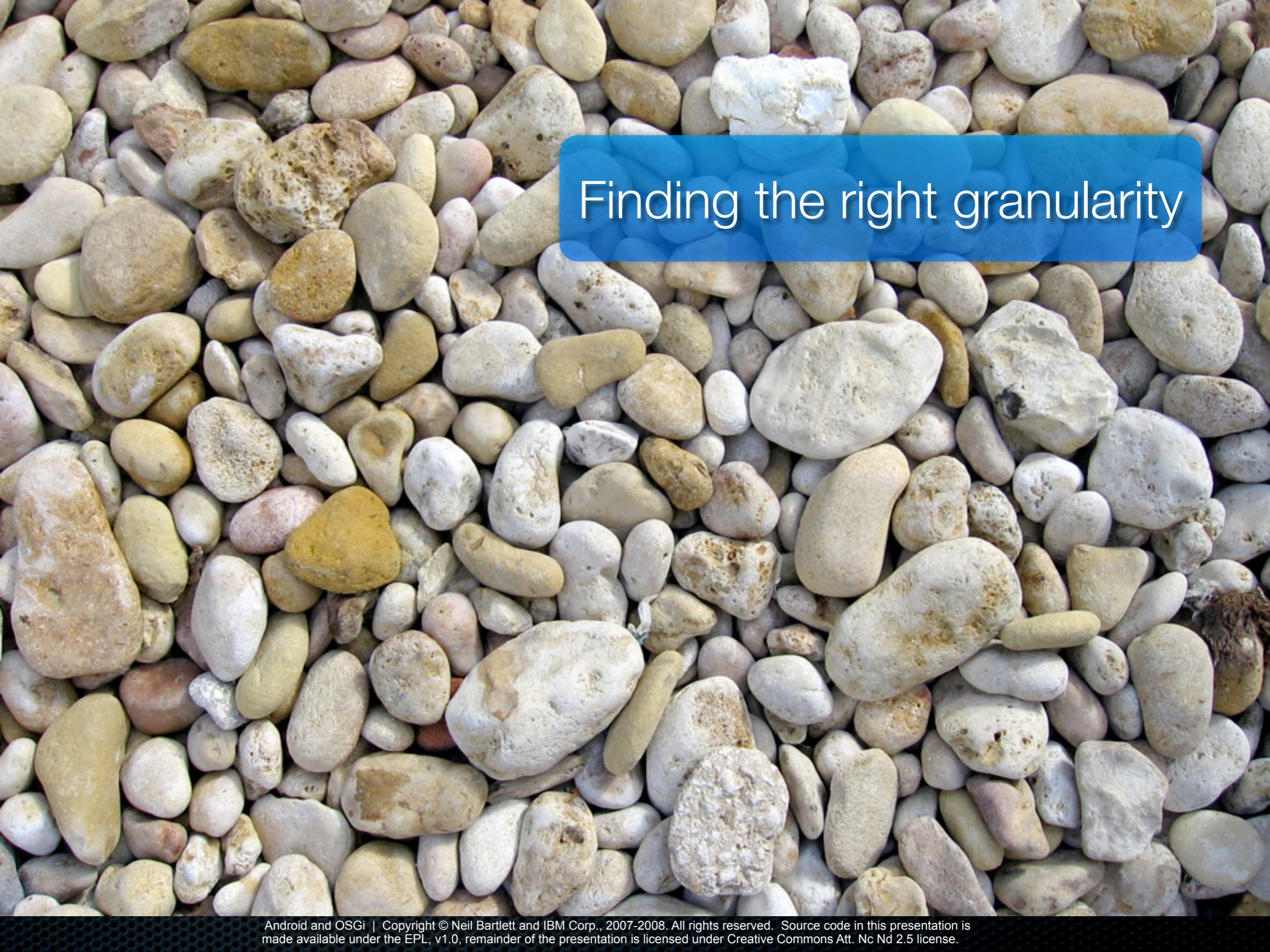
Benefits of Android



Safe



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](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

Somewhat Harder

- 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

```
osgi.hook.configurators=org.eclipse.osgi.  
internal.baseadaptor.BaseHookConfigurator  
,org.eclipse.core.runtime.internal.adaptor.  
EclipseLogHook,org.eclipse.core.runtime  
.internal.adaptor.EclipseLazyStarter,org.  
eclipse.core.runtime.internal.adaptor.Ecl  
ipseStorageHook
```

- Strange VerifyError on a framework internal class
- => Turn off the verifier
- Is this a dexifier bug?

```
hargrave@bjhargrave ~
$ adb 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.

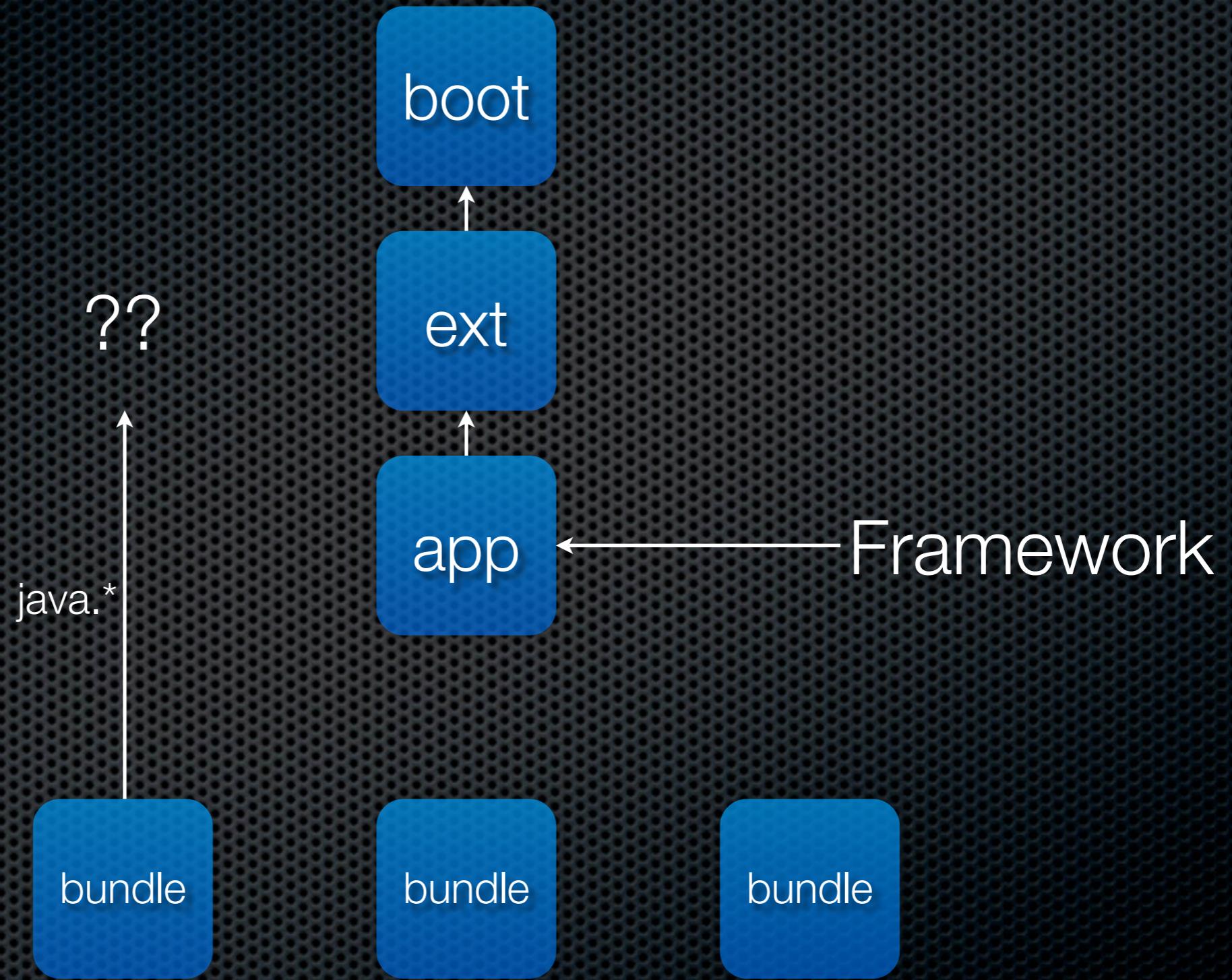
  id  State  Bundle
  0  ACTIVE  org.eclipse.osgi_3.4.0

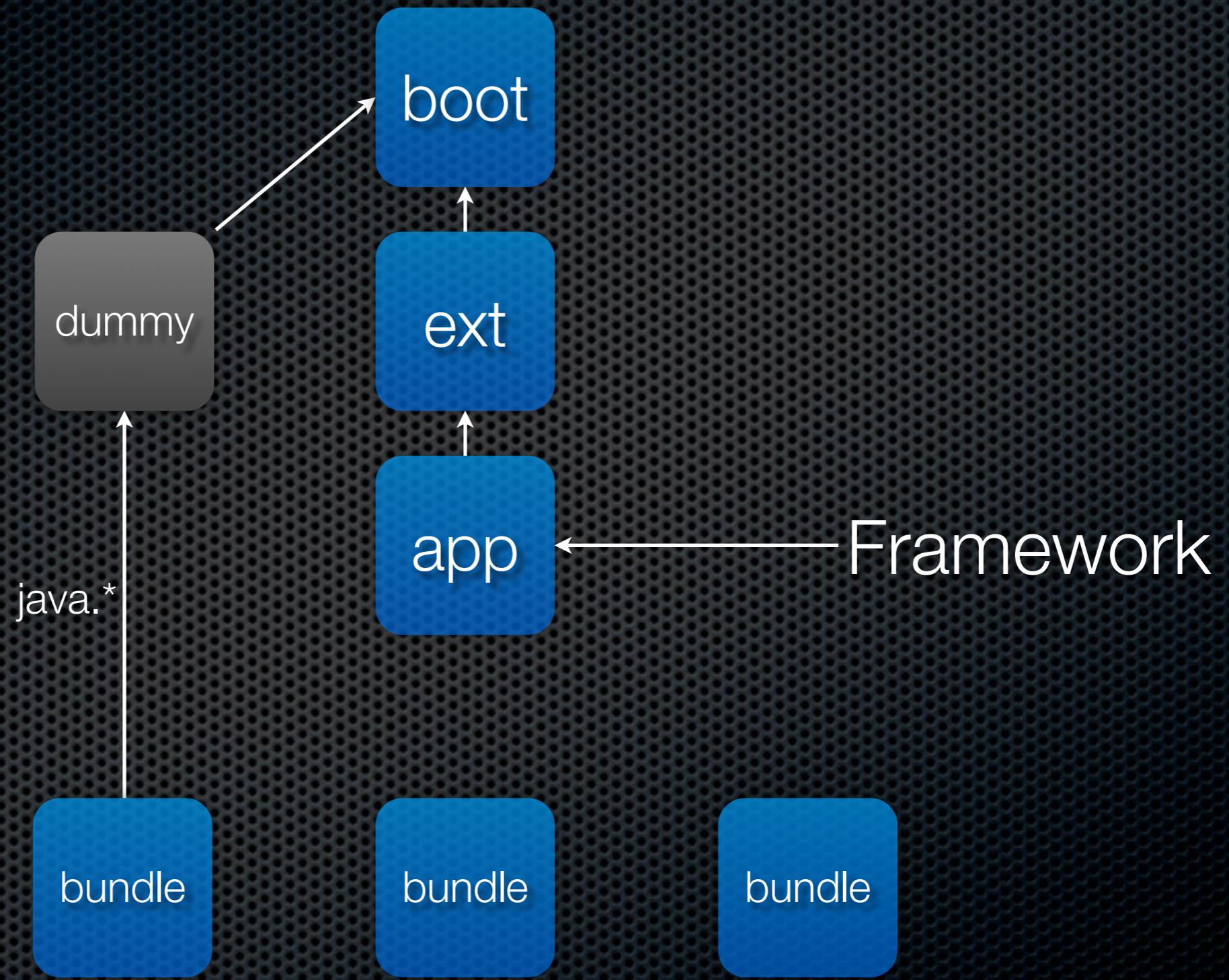
osgi>
```

Next Step: Adding a Bundle

Same need for DexHelper

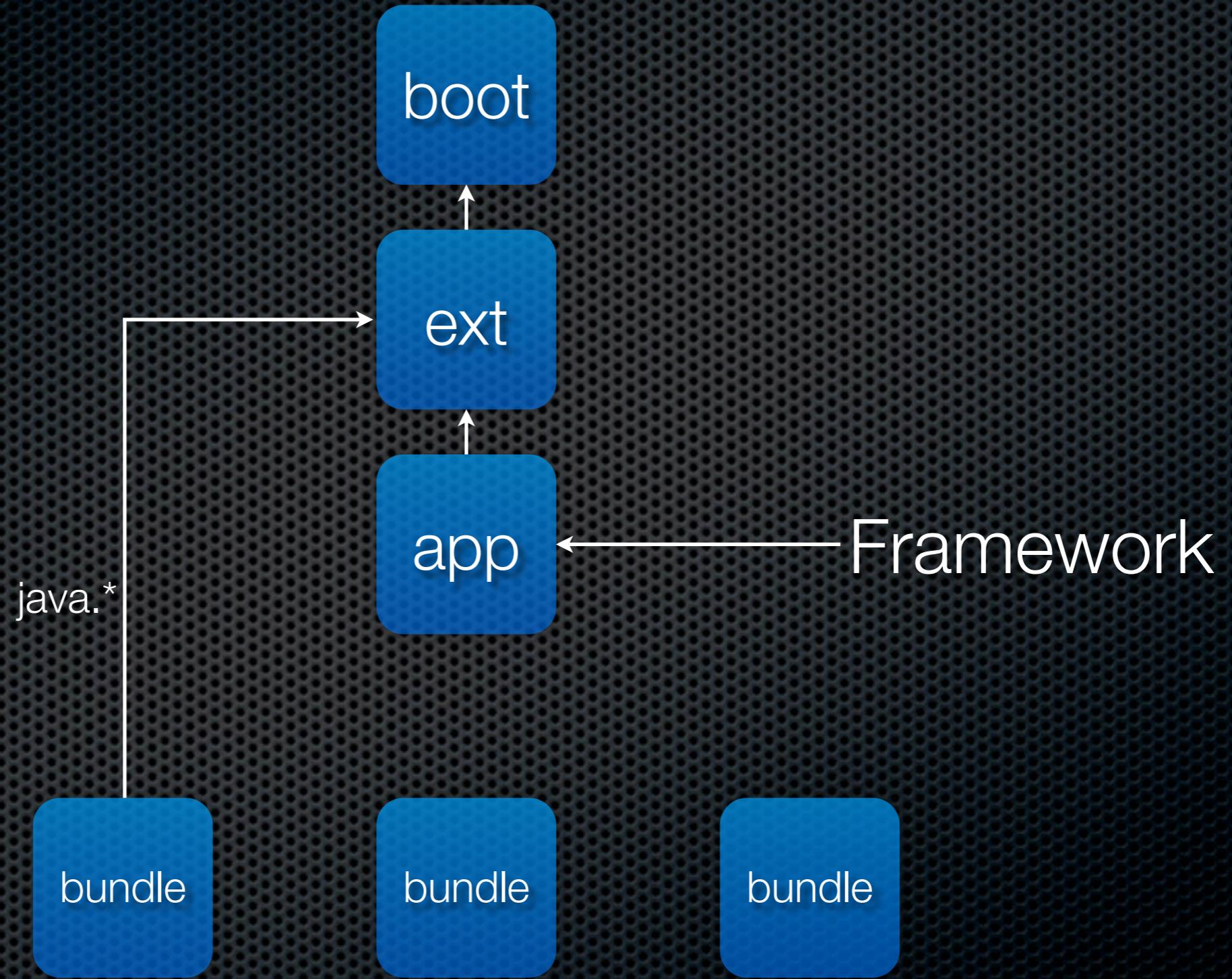
Same Limitations





Cannot find java.lang.Object!

-Dosgi.parentClassloader=ext



Success!



DEMO

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

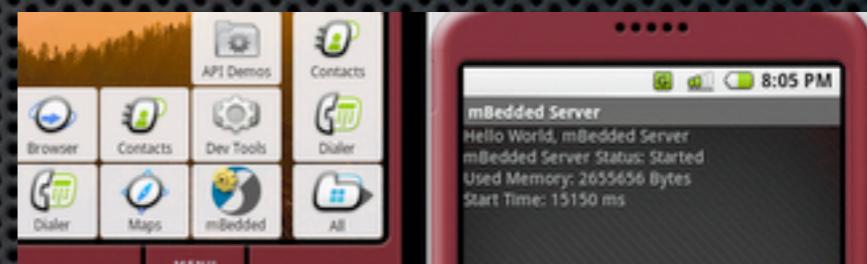
- All changes available as patches against Concierge, Equinox
- Subversion repository:
- <http://www.osgi.org/svn/public/trunk/eclipsecon/2008/androidosgi>

ProSyst



```
telnet localhost
mBedded Server
Framework Version:1.3
Vendor:ProSyst
OS Name:linux
OS Version:2.6.23-g0774dffb
Processor:os_arch

Login: admin
Password:
fw>ls
ID  State      Jar Name
0  ACTIVE     System Bundle
1  ACTIVE     javax.servlet
2  ACTIVE     osgilib
3  ACTIVE     putil
4  ACTIVE     db
5  ACTIVE     metatype
6  ACTIVE     config
7  ACTIVE     log
8  ACTIVE     http
9  ACTIVE     useradm
10  ACTIVE    usradmex
11  ACTIVE     devicem
12  ACTIVE     connector
13  ACTIVE     prvagent
14  ACTIVE     kitman
15  ACTIVE     console
16  ACTIVE     telnet
17  ACTIVE     socketconn
18  ACTIVE     pnp
fw>ls
```



<http://www.adon-line.de/kunden/prosystBlog/?p=24>

Links

- Felix on Android
- [http://blog.luminis.nl/luminis/entry/osgi on google android using](http://blog.luminis.nl/luminis/entry/osgi_on_google_android_using)
- Our Repository:
<http://www.osgi.org/svn/public/trunk/eclipsecon/2008/androidosgi>
- ProSyst Announcement:
<http://www.adon-line.de/kunden/prosystBlog/?p=24>

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