

Java 9: Make Way for Modules!

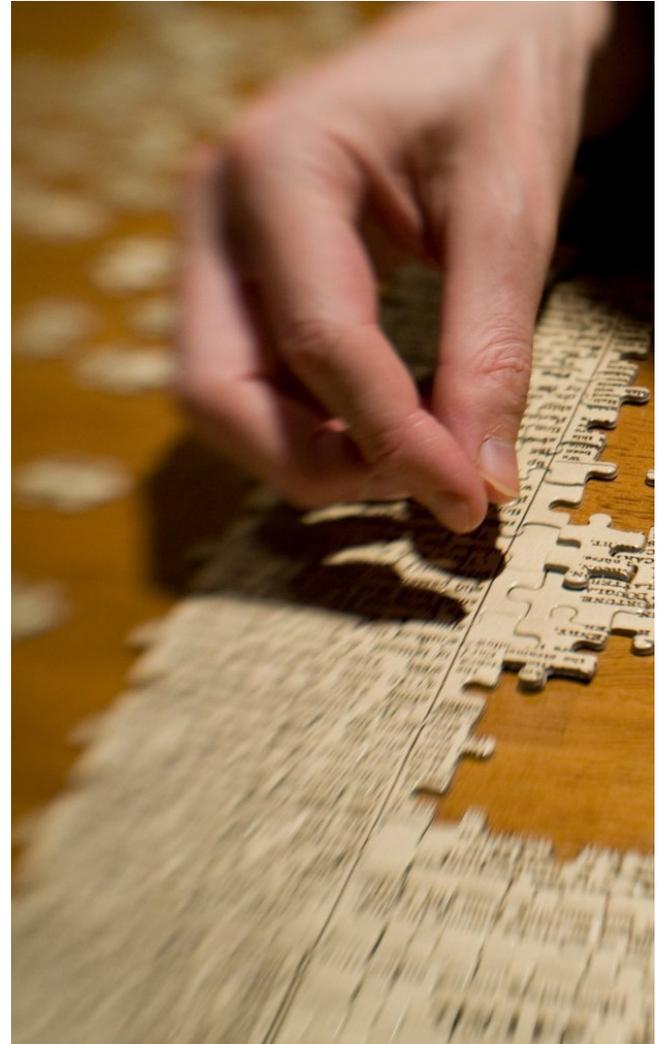
Mark Reinhold (@mreinhold)

Chief Architect, Java Platform Group

Oracle

<http://openjdk.java.net/projects/jigsaw>

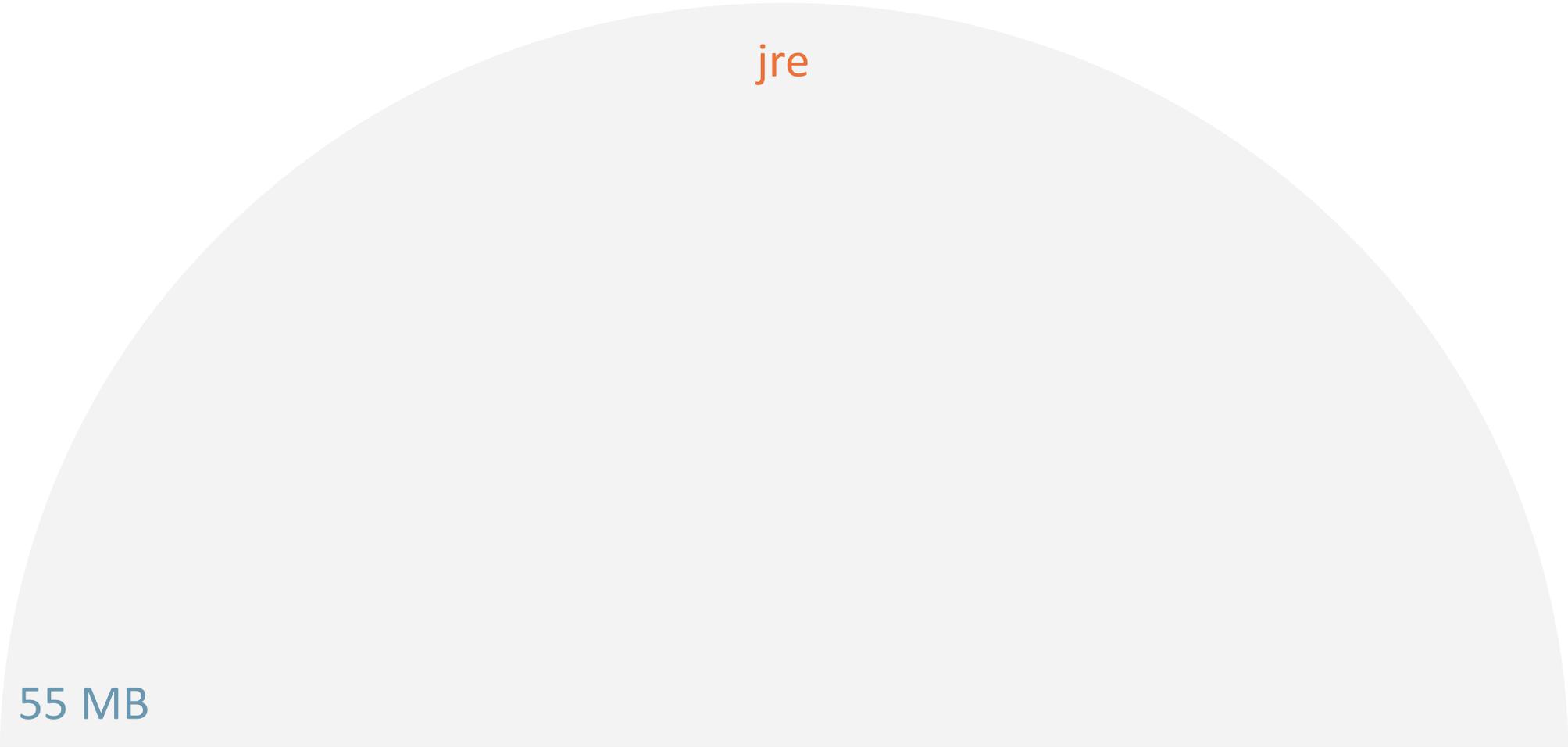
2015/2/3











jre

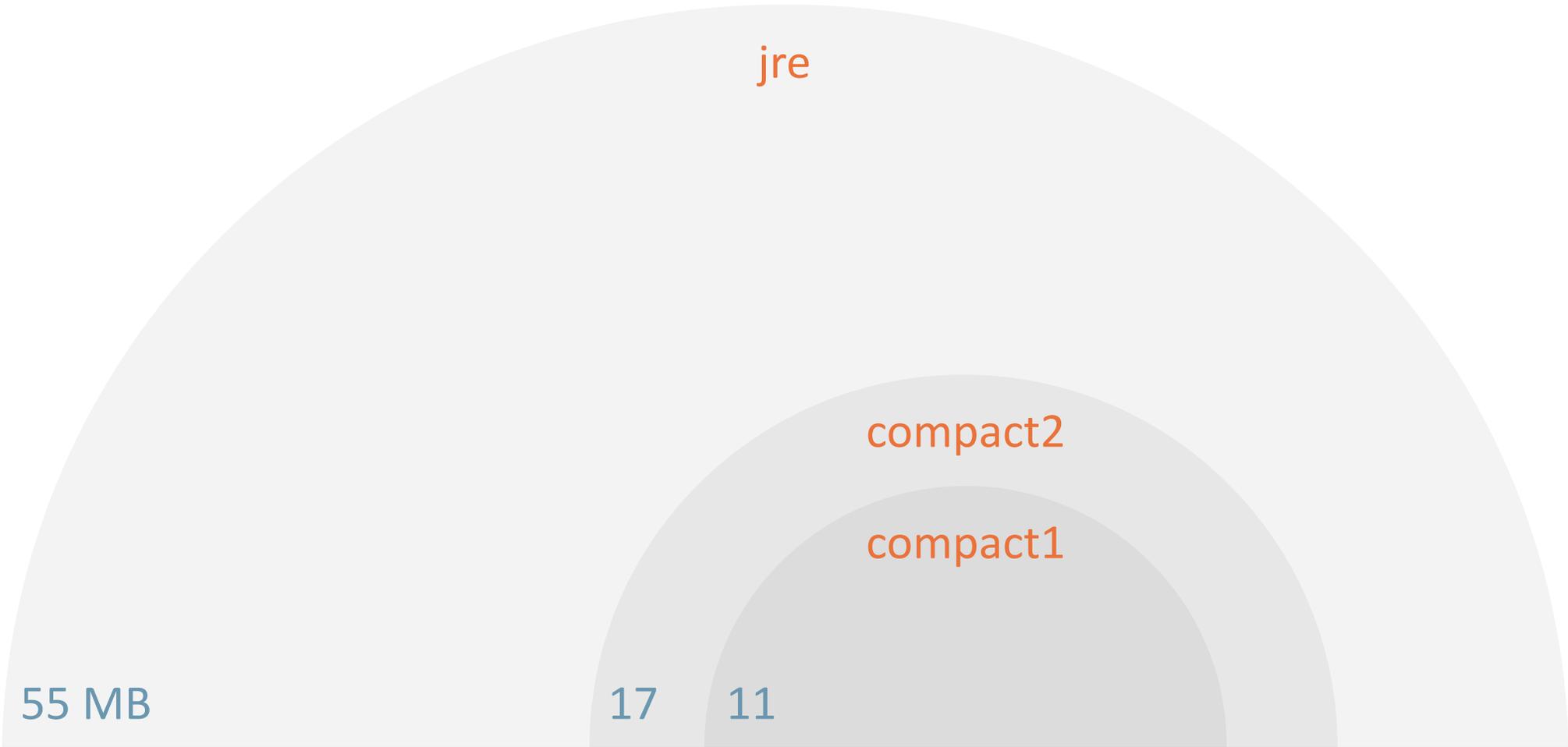
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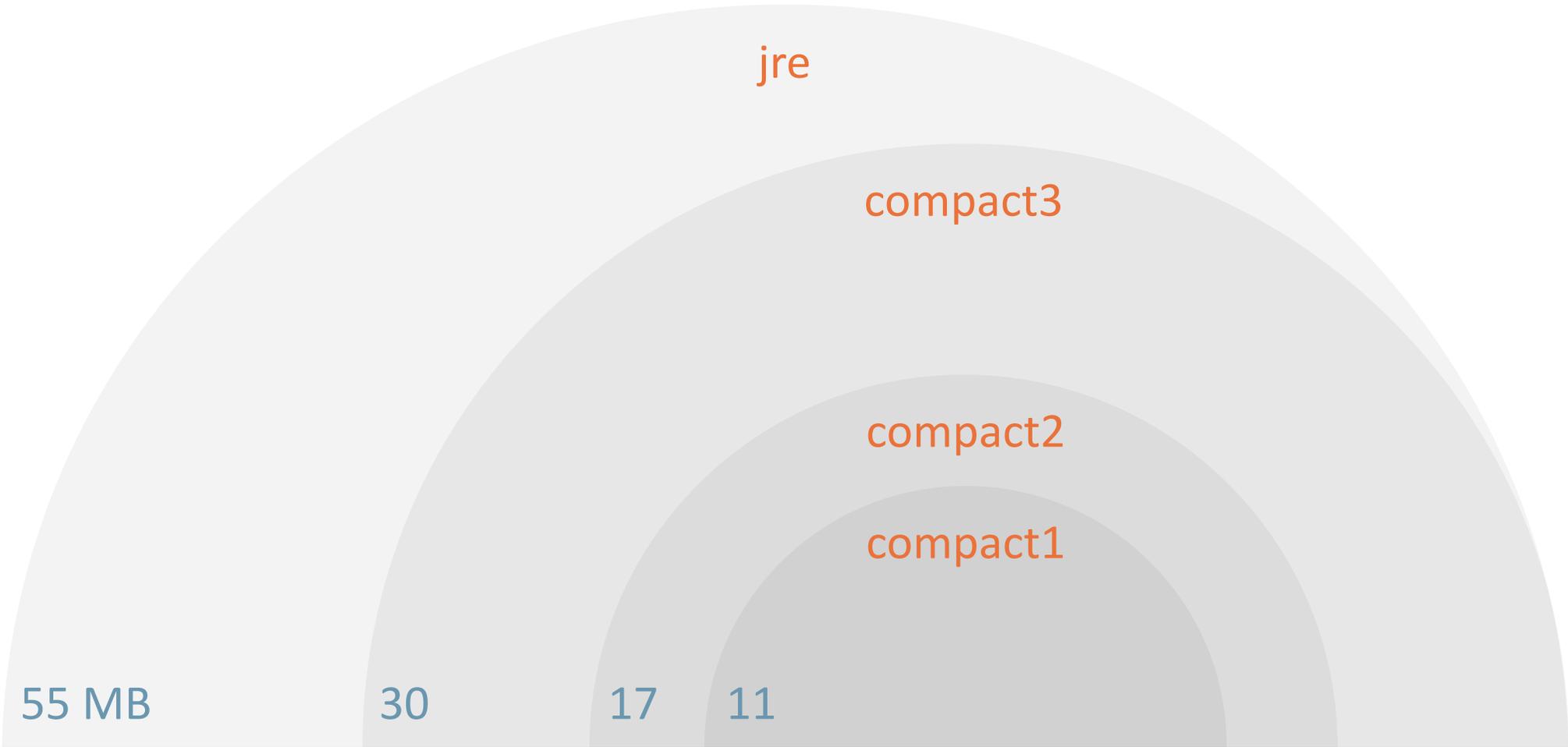
jre

compact1

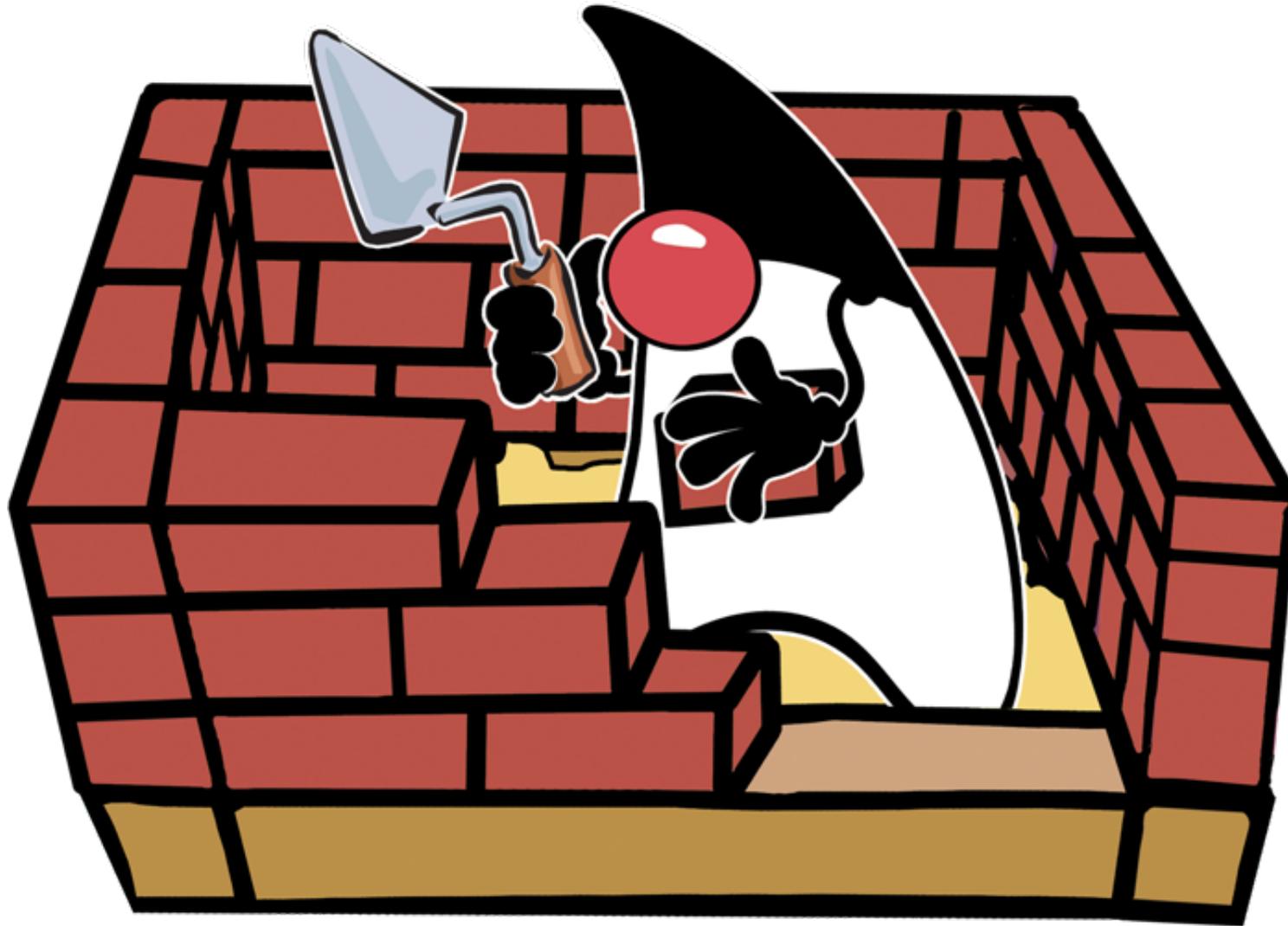
55 MB

11









java.io	java.util.function	sun.misc.resources	sun.security.action
java.lang	java.util.jar	sun.net	sun.security.jca
java.lang.annotation	java.util.regex	sun.net.ftp	sun.security.pkcs
java.lang.invoke	java.util.spi	sun.net.ftp.impl	sun.security.pkcs12
java.lang.ref	java.util.stream	sun.net.idn	sun.security.provider
java.lang.reflect	java.util.zip	sun.net.sdp	sun.security.provider.certpath
java.math	javax.crypto	sun.net.smtp	sun.security.rsa
java.net	javax.crypto.interfaces	sun.net.spi	sun.security.timestamp
java.nio	javax.crypto.spec	sun.net.spi.nameservice	sun.security.util
java.nio.channels	javax.security.auth	sun.net.util	sun.security.validator
java.nio.channels.spi	javax.security.auth.callback	sun.net.www	sun.security.x509
java.nio.charset	javax.security.auth.login	sun.net.www.content.text	sun.text
java.nio.charset.spi	javax.security.auth.spi	sun.net.www.http	sun.text.bidi
java.nio.file	javax.security.auth.x500	sun.net.www.protocol.file	sun.text.normalizer
java.nio.file.attribute	jdk	sun.net.www.protocol.ftp	sun.text.resources
java.nio.file.spi	jdk.internal.org.objectweb.asm	sun.net.www.protocol.http	sun.text.resources.cldr
java.security	jdk.internal.org.xml.sax	sun.net.www.protocol.jar	sun.text.resources.cldr.en
java.security.cert	jdk.internal.util.xml	sun.net.www.protocol.mailto	sun.text.resources.en
java.security.interfaces	jdk.internal.util.xml.impl	sun.net.www.protocol.netdoc	sun.util
java.security.spec	jdk.jigsaw.module	sun.nio	sun.util.calendar
java.text	jdk.jigsaw.tools.jlink	sun.nio.ch	sun.util.cldr
java.text.spi	jdk.joptsimple	sun.nio.cs	sun.util.locale
java.time	jdk.joptsimple.internal	sun.nio.fs	sun.util.locale.provider
java.time.chrono	jdk.joptsimple.util	sun.reflect	sun.util.logging
java.time.format	sun.invoke	sun.reflect.annotation	sun.util.logging.resources
java.time.temporal	sun.invoke.anon	sun.reflect.generics.factory	sun.util.resources
java.time.zone	sun.invoke.empty	sun.reflect.generics.parser	sun.util.resources.cldr
java.util	sun.invoke.util	sun.reflect.generics.scope	sun.util.resources.cldr.en
java.util.concurrent	sun.launcher	sun.reflect.generics.tree	sun.util.resources.en
java.util.concurrent.atomic	sun.launcher.resources	sun.reflect.generics.visitor	sun.util.spi
java.util.concurrent.locks	sun.misc	sun.reflect.misc	



java.io
java.lang
java.lang.annotation
java.lang.invoke
java.lang.ref
java.lang.reflect
java.math
java.net
java.nio
java.nio.channels
java.nio.channels.spi
java.nio.charset
java.nio.charset.spi
java.nio.file
java.nio.file.attribute
java.nio.file.spi
java.security
java.security.cert
java.security.interfaces
java.security.spec
java.text
java.text.spi
java.time
java.time.chrono
java.time.format
java.time.temporal
java.time.zone
java.util
java.util.concurrent
java.util.concurrent.atomic
java.util.concurrent.locks

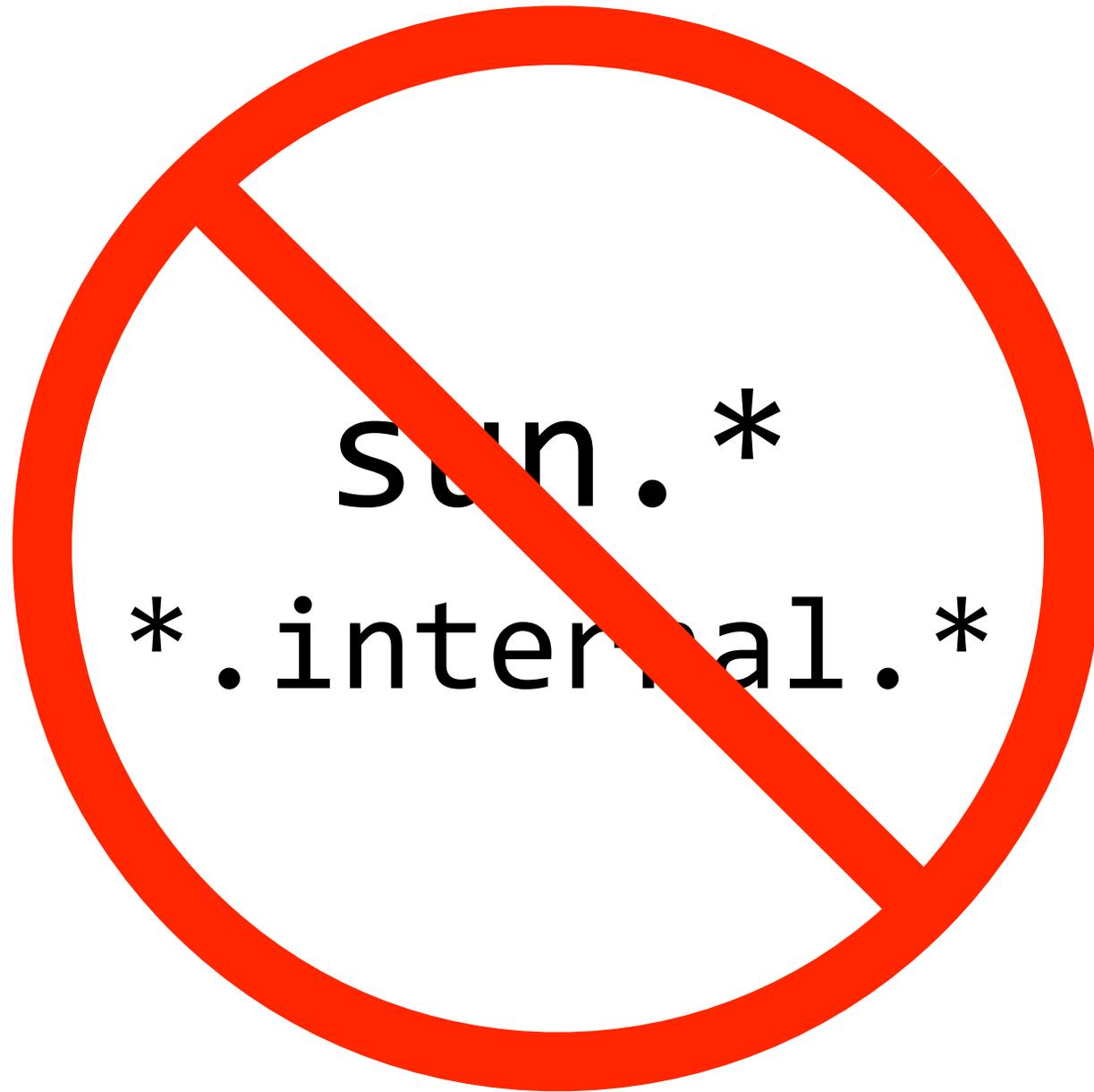
java.util.function
java.util.jar
java.util.regex
java.util.spi
java.util.stream
java.util.zip
javax.crypto
javax.crypto.interfaces
javax.crypto.spec
javax.security.auth
javax.security.auth.callback
javax.security.auth.login
javax.security.auth.spi
javax.security.auth.x500
jdk
jdk.internal.compiler.api
jdk.internal.org.xml.sax
jdk.internal.util.xml
jdk.internal.util.xml.impl
jdk.jigsaw.module
jdk.jigsaw.tools.jlink
jdk.joptsimple
jdk.joptsimple.internal
jdk.joptsimple.util
sun.invoke
sun.invoke.anon
sun.invoke.empty
sun.invoke.util
sun.launcher
sun.launcher.resources
sun.misc

sun.misc.resources
sun.net
sun.net.ftp
sun.net.ftp.impl
sun.net.idn
sun.net.sdp
sun.net.smtp
sun.net.spi
sun.net.spi.nameservice
sun.net.util
sun.net.www
sun.net.www.content.text
sun.net.www.http
sun.net.www.protocol.file
sun.net.www.protocol.ftp
sun.net.www.protocol.http
sun.net.www.protocol.jar
sun.net.www.protocol.mailto
sun.net.www.protocol.netdoc
sun.nio
sun.nio.ch
sun.nio.cs
sun.nio.fs
sun.reflect
sun.reflect.annotation
sun.reflect.generics.factory
sun.reflect.generics.parser
sun.reflect.generics.scope
sun.reflect.generics.tree
sun.reflect.generics.visitor
sun.reflect.misc

sun.security.action
sun.security.jca
sun.security.pkcs
sun.security.pkcs12
sun.security.provider
sun.security.provider.certpath
sun.security.rsa
sun.security.timestamp
sun.security.util
sun.security.validator
sun.security.x509
sun.text
sun.text.bidi
sun.text.normalizer
sun.text.resources
sun.text.resources.cldr
sun.text.resources.cldr.en
sun.text.resources.en
sun.util
sun.util.calendar
sun.util.cldr
sun.util.locale
sun.util.locale.provider
sun.util.logging
sun.util.logging.resources
sun.util.resources
sun.util.resources.cldr
sun.util.resources.cldr.en
sun.util.resources.en
sun.util.spi

java.lang.SecurityManager: checkPackageAccess

sun.*
.internal.



-classpath







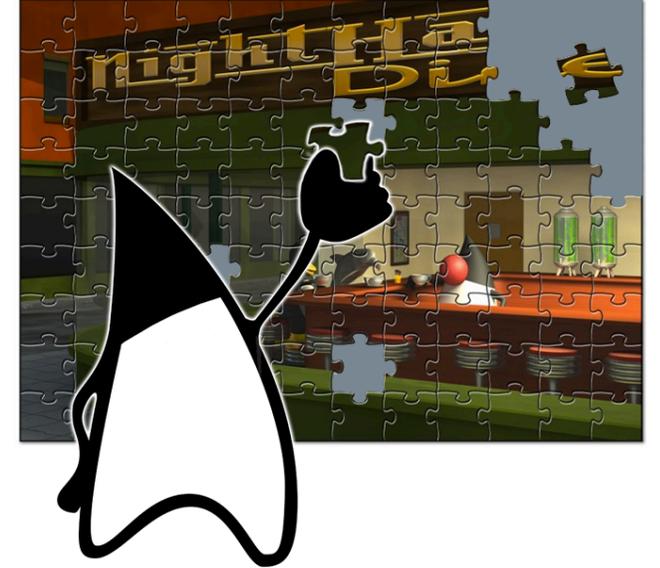
Project Jigsaw

JEP 200: The Modular JDK

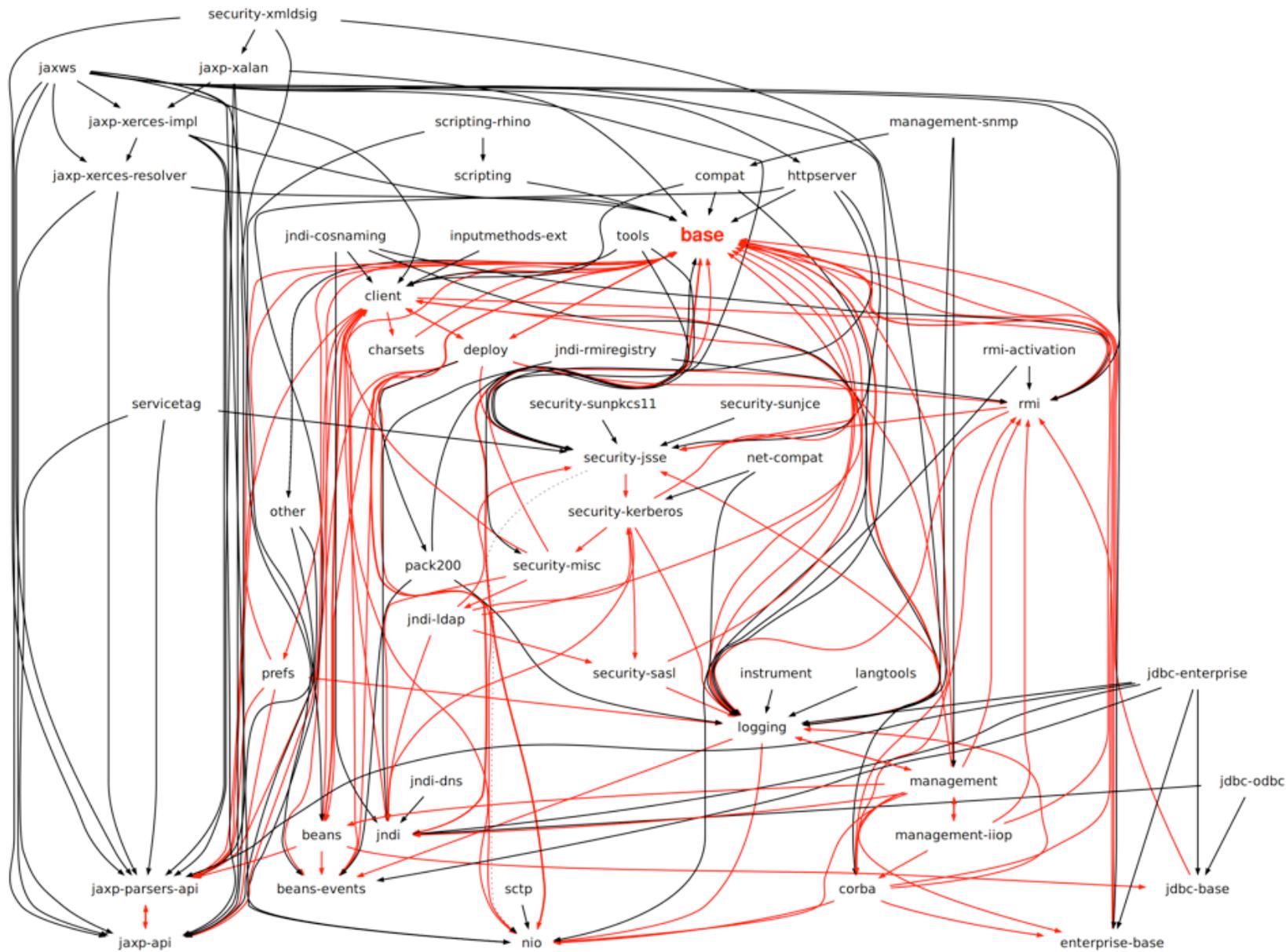
JEP 201: Modular Source Code

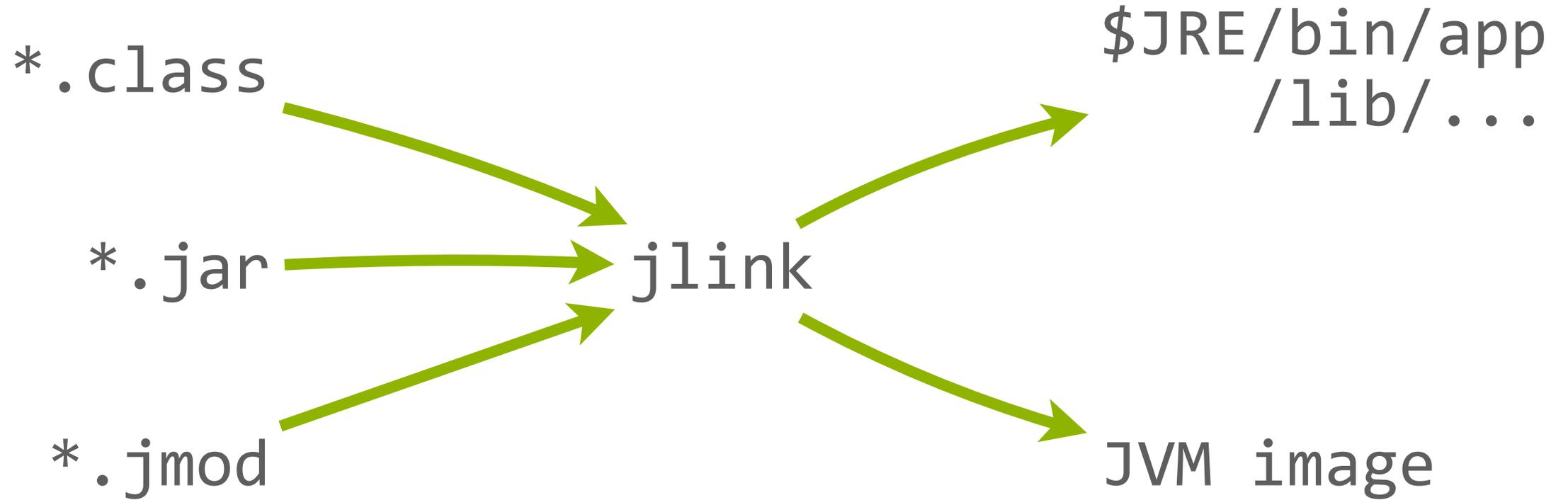
JEP 220: Modular Run-Time Images

JEP TBD / JSR 376: Java Platform Module System



<http://openjdk.java.net/projects/jigsaw>

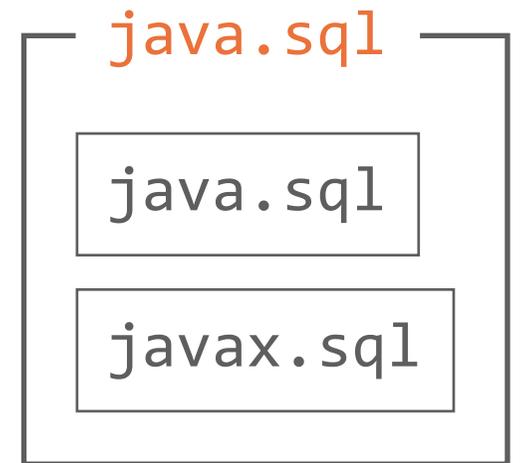


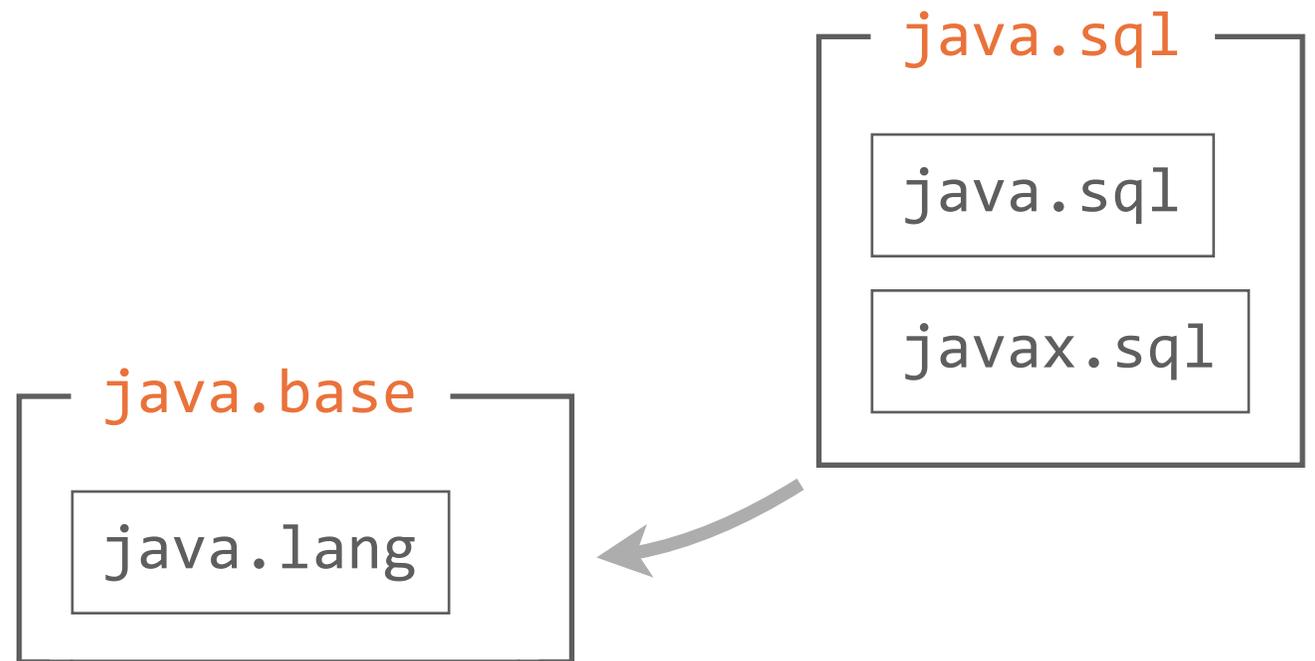


java.base

java.base

java.lang

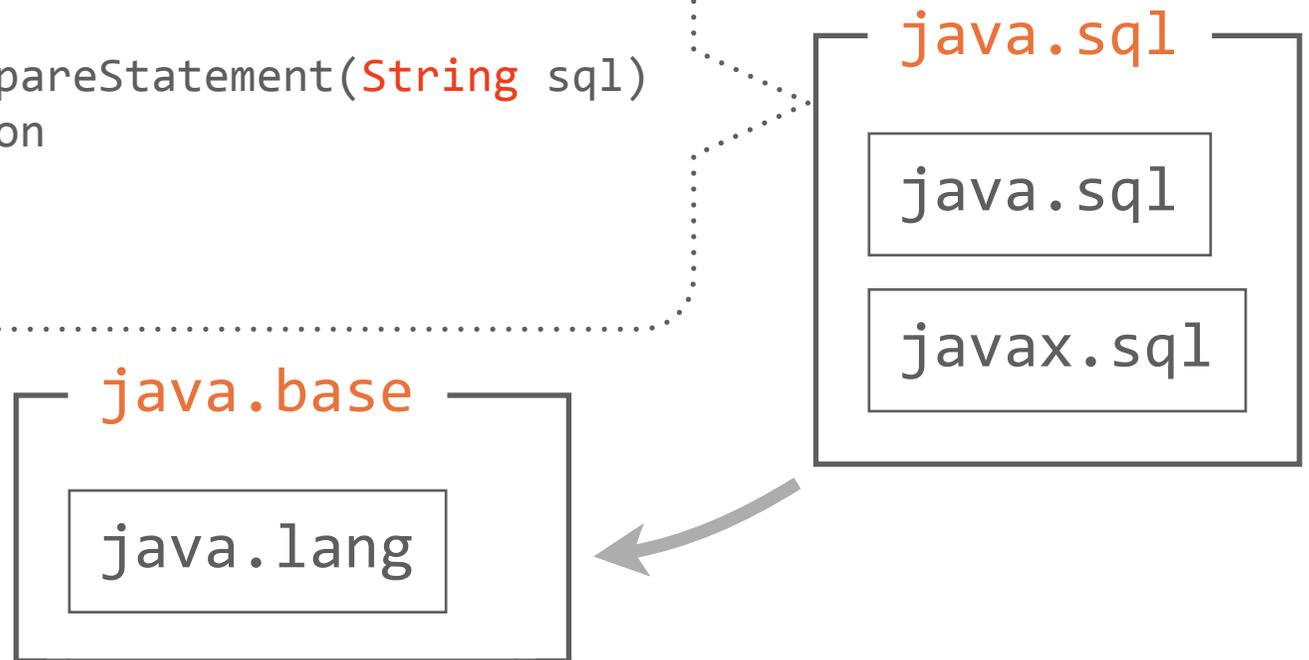




```
package java.sql;

public interface Connection {

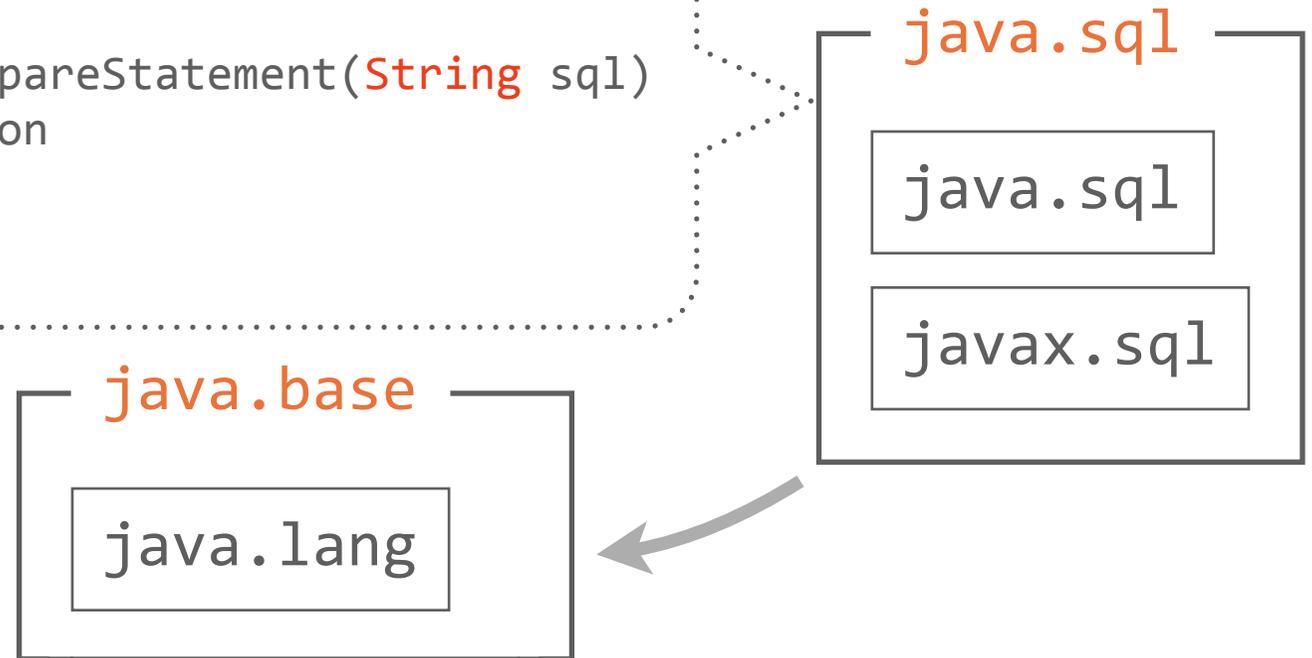
    PreparedStatement prepareStatement(String sql)
        throws SQLException
    {
        ...
    }
}
```



```
package java.sql;

public interface Connection {

    PreparedStatement prepareStatement(String sql)
        throws SQLException
    {
        ...
    }
}
```

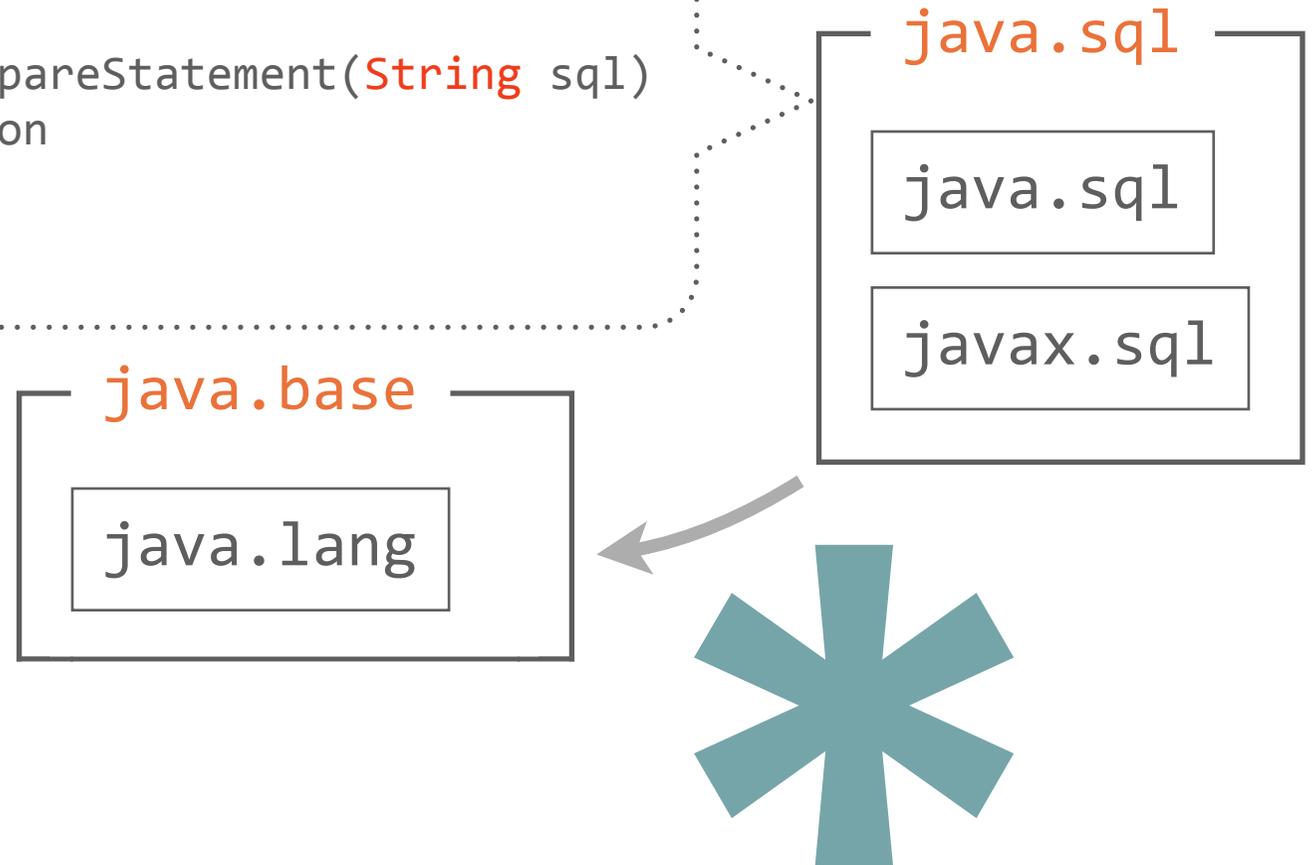


java.lang not exported by java.base

```
package java.sql;

public interface Connection {

    PreparedStatement prepareStatement(String sql)
        throws SQLException
    {
        ...
    }
}
```

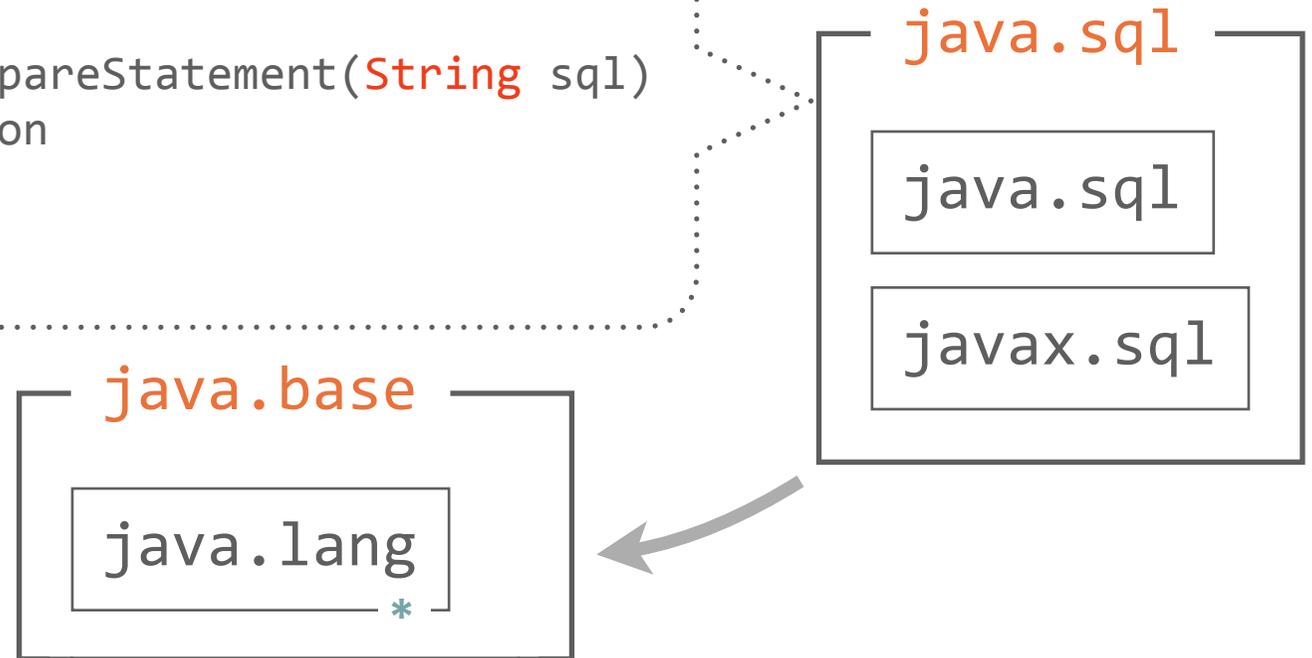


java.lang not exported by java.base

```
package java.sql;

public interface Connection {

    PreparedStatement prepareStatement(String sql)
        throws SQLException
    {
        ...
    }
}
```

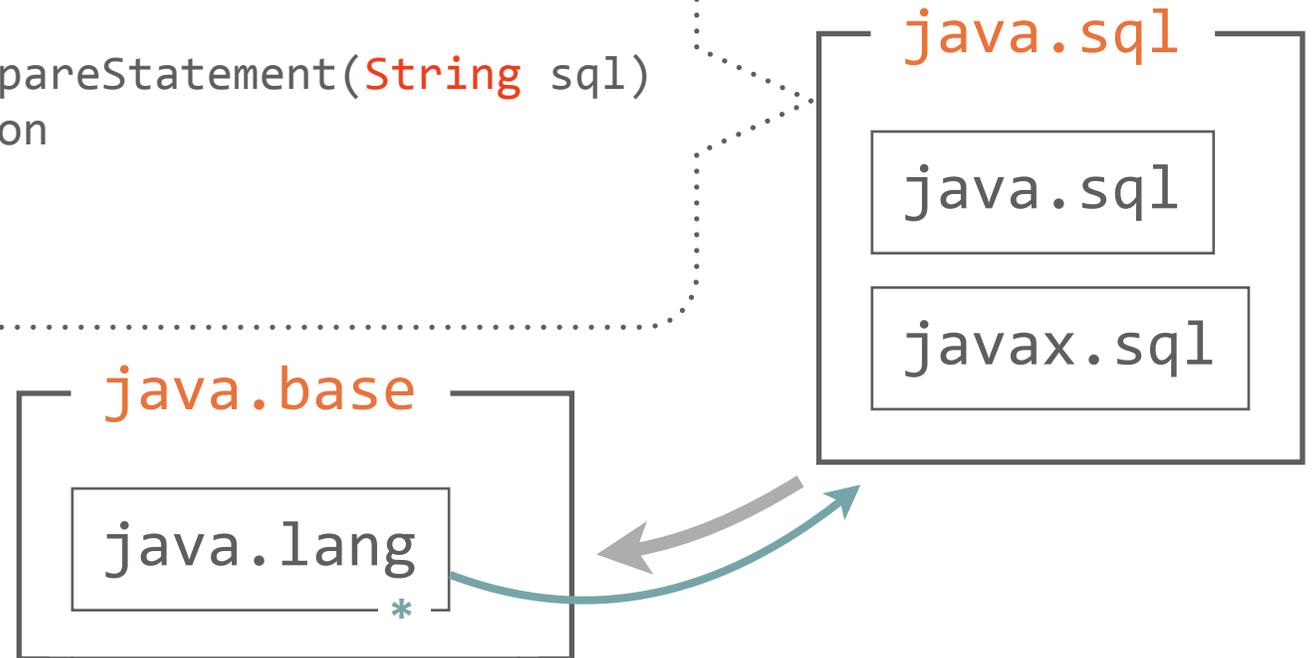


java.lang not exported by java.base

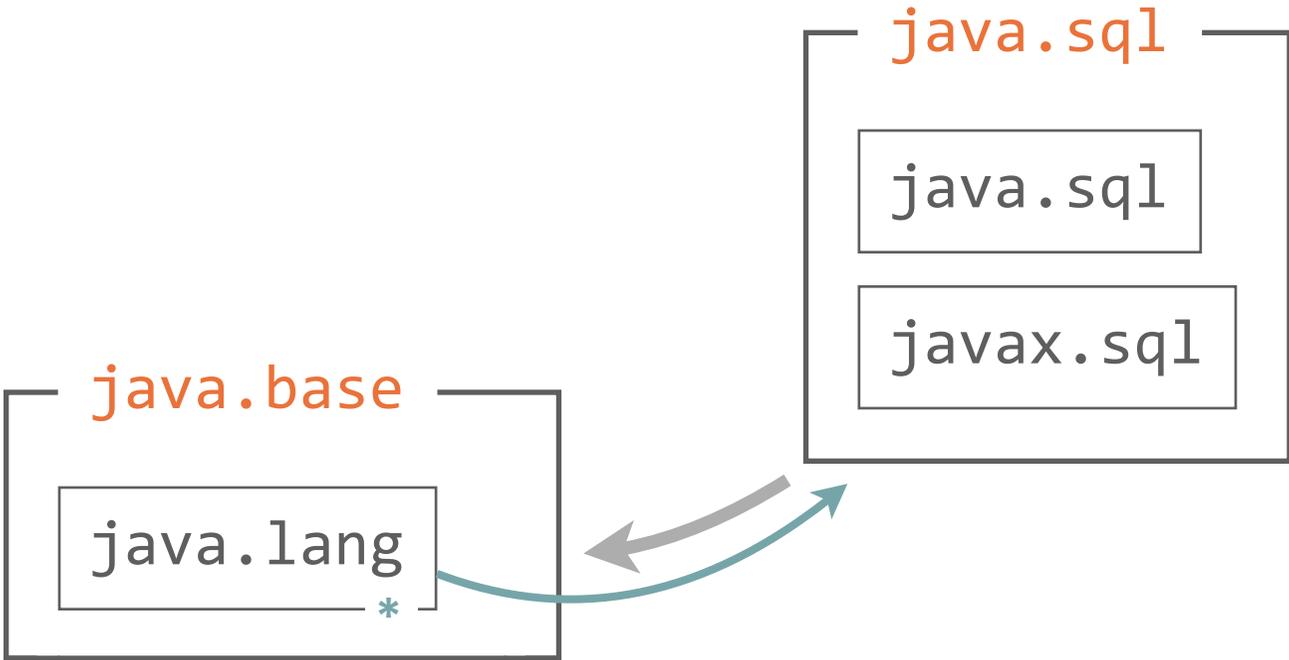
```
package java.sql;

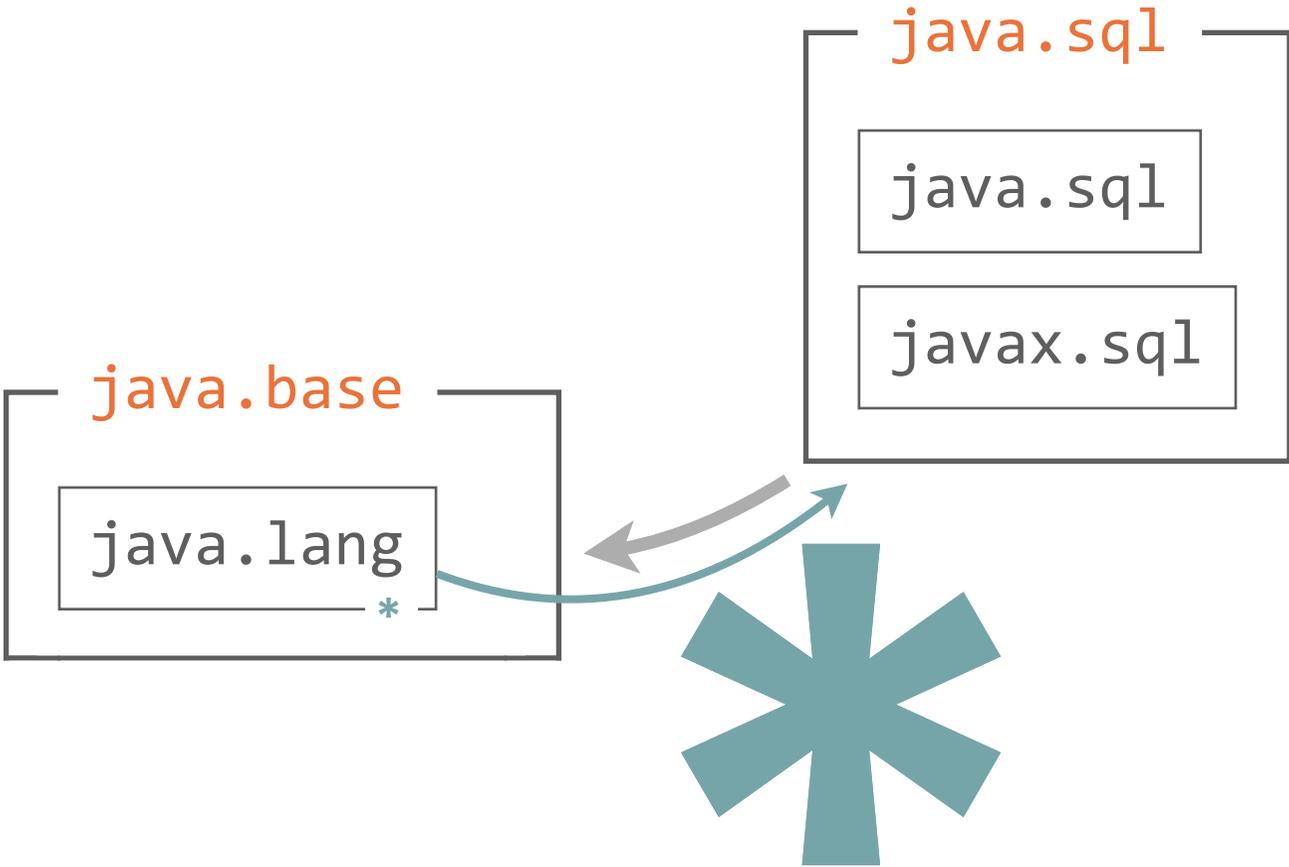
public interface Connection {

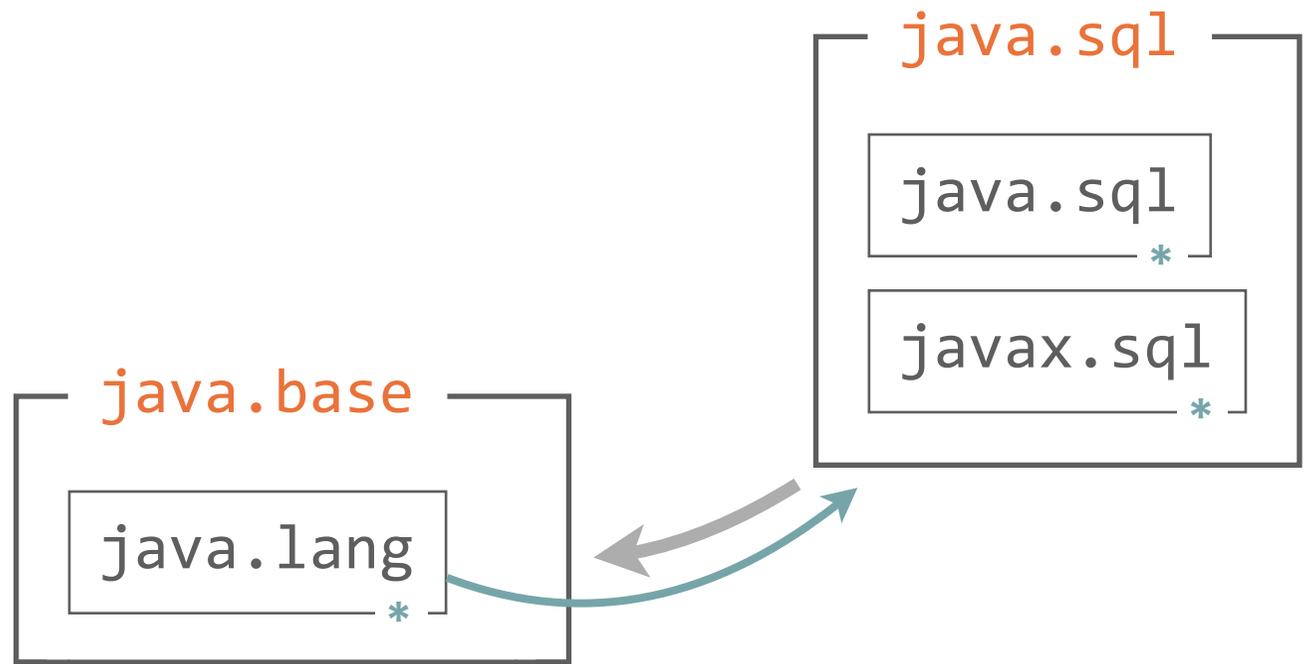
    PreparedStatement prepareStatement(String sql)
        throws SQLException
    {
        ...
    }
}
```



java.lang not exported by java.base



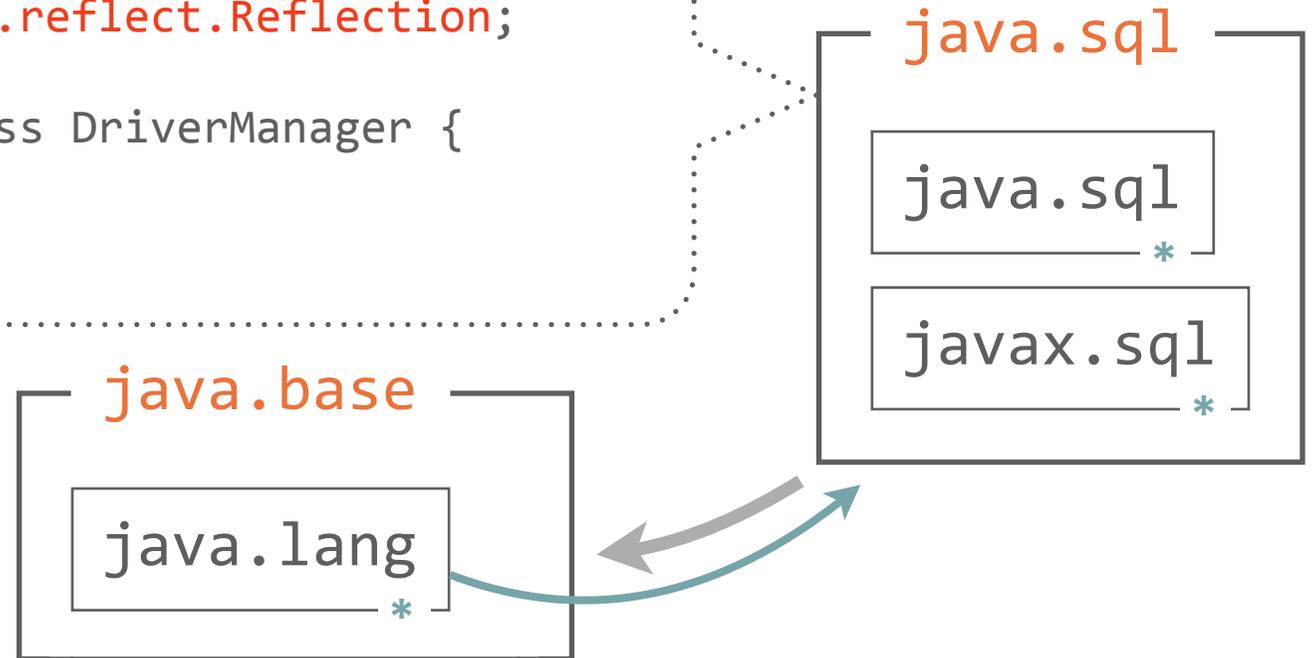




```
package java.sql;

import sun.reflect.CallerSensitive;
import sun.reflect.Reflection;

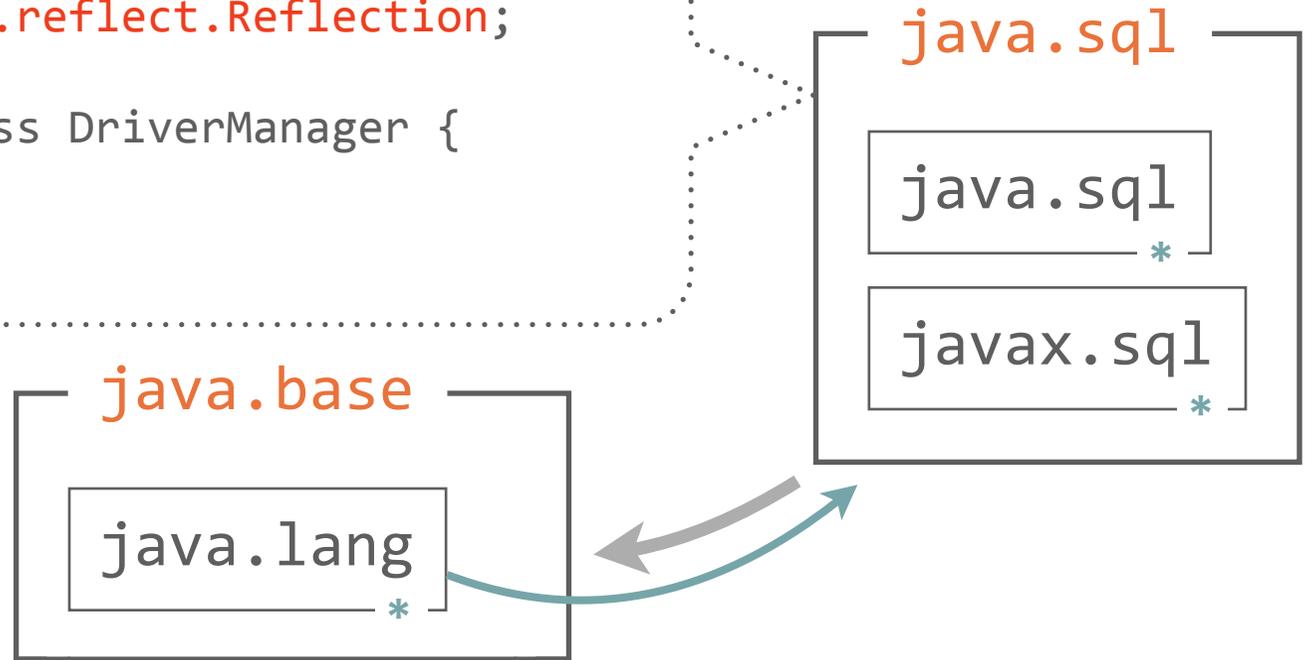
public class DriverManager {
    ...
}
```



```
package java.sql;

import sun.reflect CallerSensitive;
import sun.reflect Reflection;

public class DriverManager {
    ...
}
```

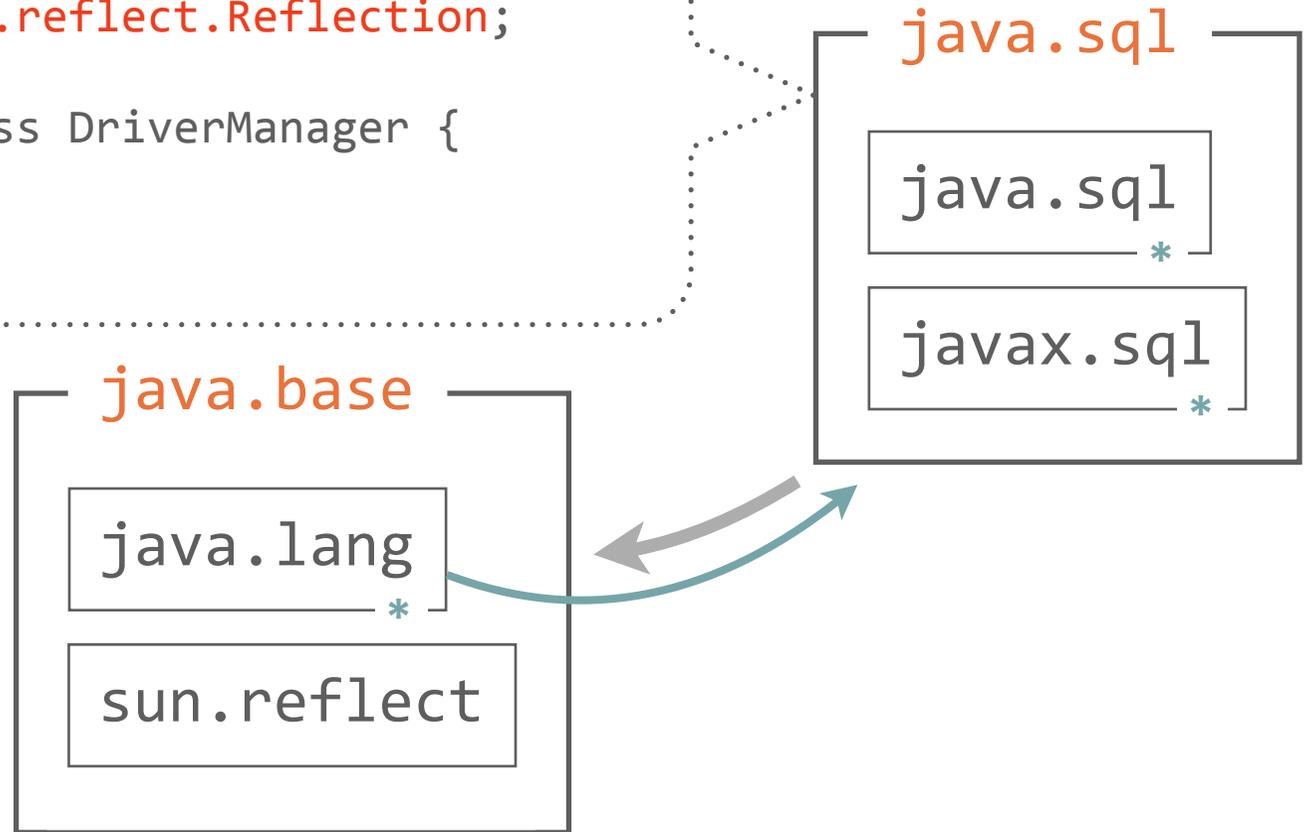


sun.reflect not exported by java.base

```
package java.sql;

import sun.reflect CallerSensitive;
import sun.reflect Reflection;

public class DriverManager {
    ...
}
```

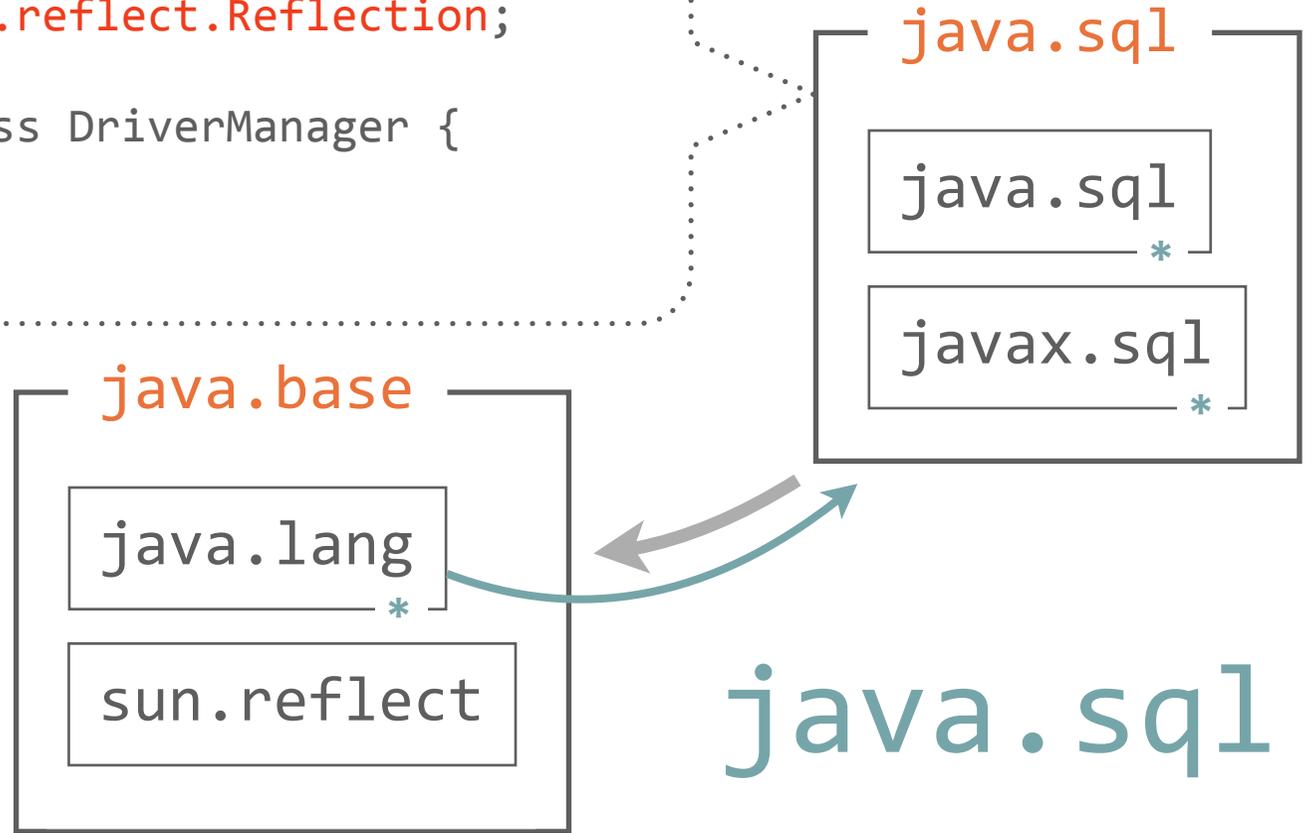


sun.reflect not exported by java.base

```
package java.sql;

import sun.reflect CallerSensitive;
import sun.reflect Reflection;

public class DriverManager {
    ...
}
```



java.sql

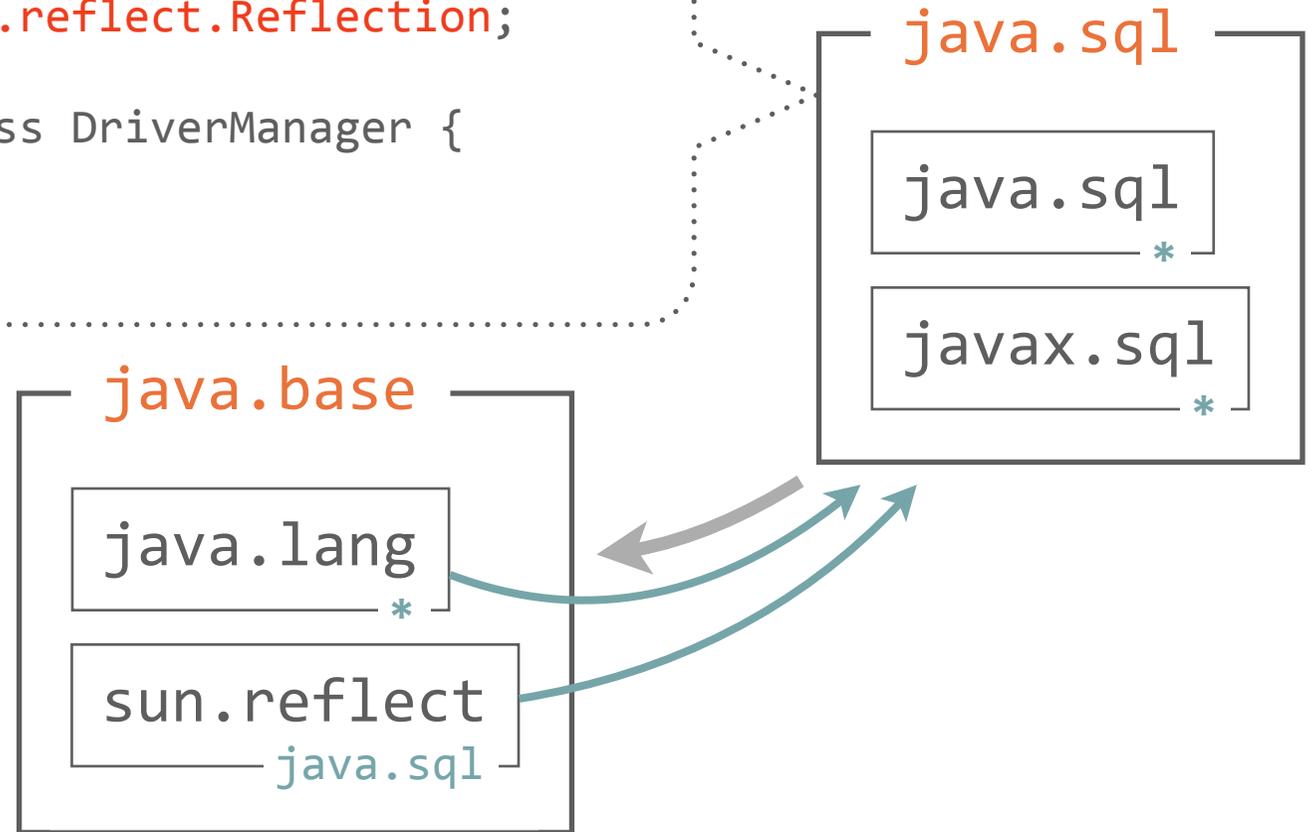


sun.reflect not exported by java.base

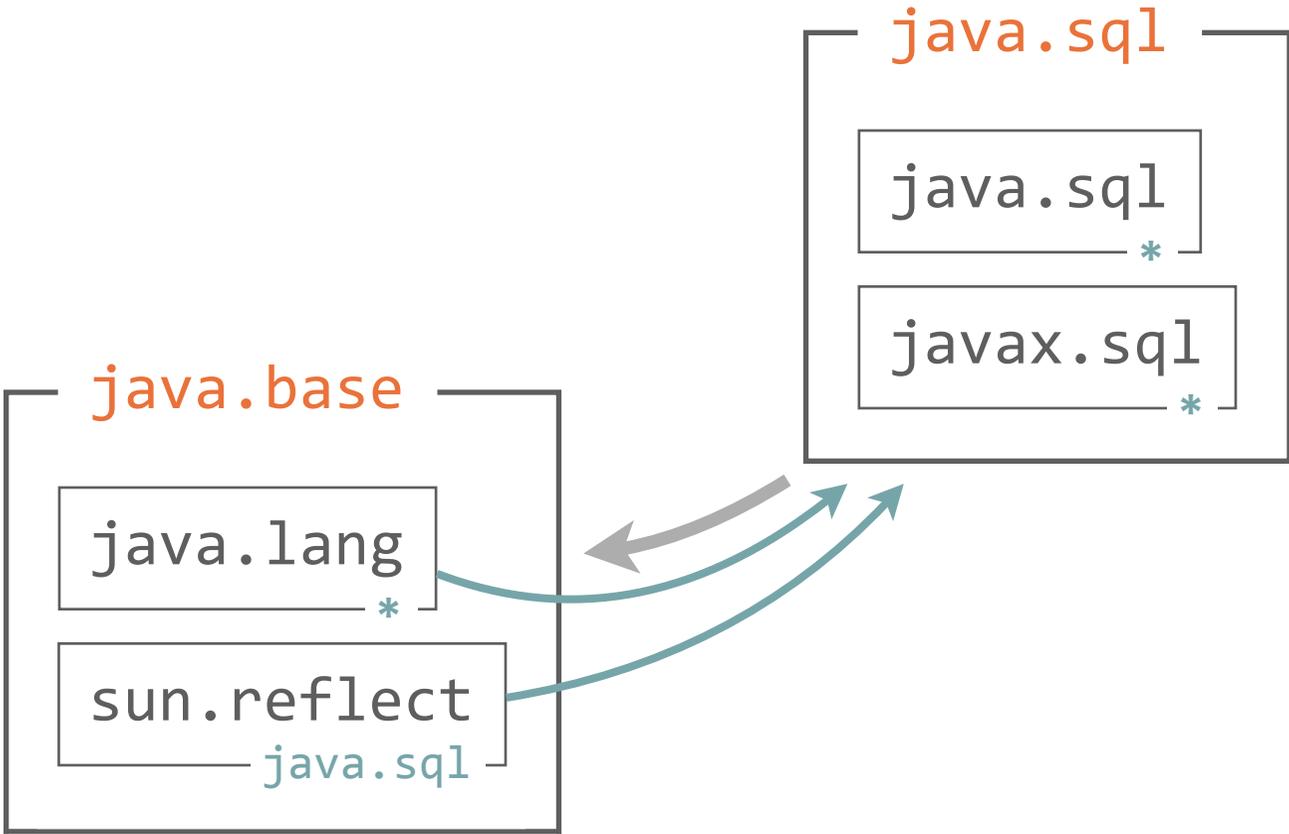
```
package java.sql;

import sun.reflect.CallerSensitive;
import sun.reflect.Reflection;

public class DriverManager {
    ...
}
```



sun.reflect not exported by java.base

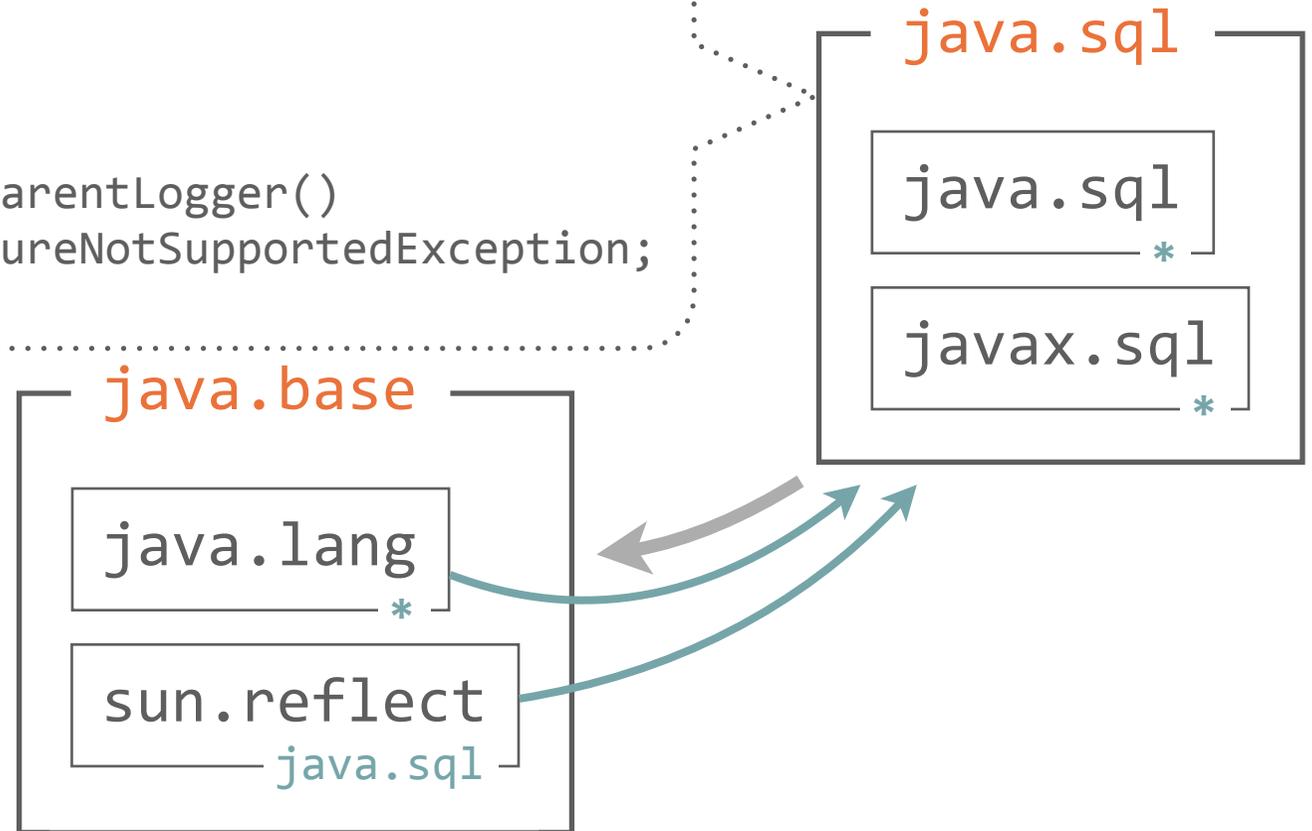


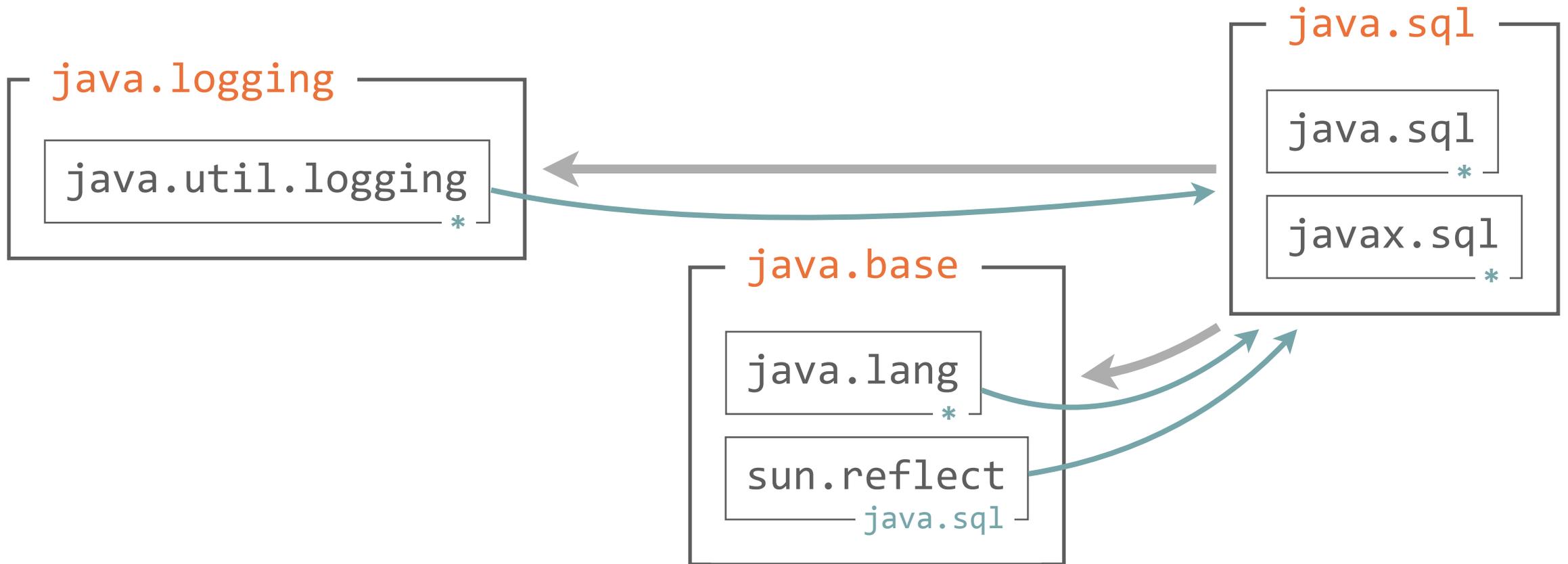
```
package java.sql;

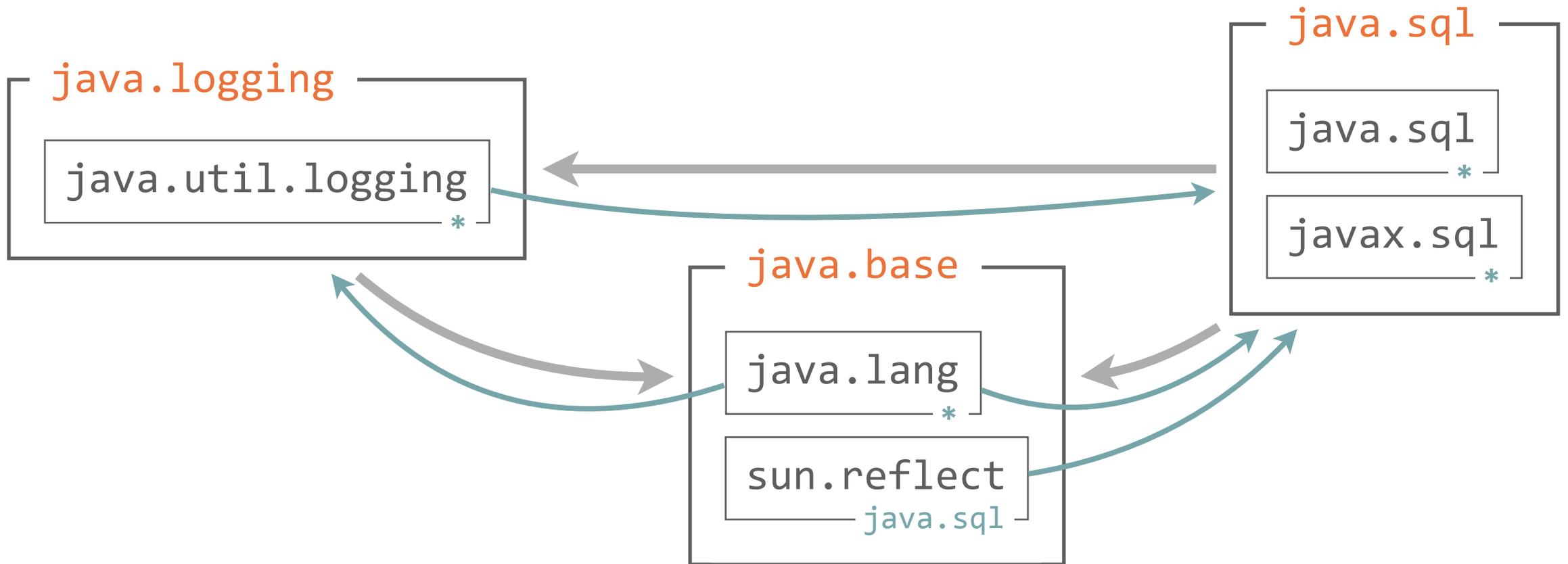
import java.util.logging.Logger;

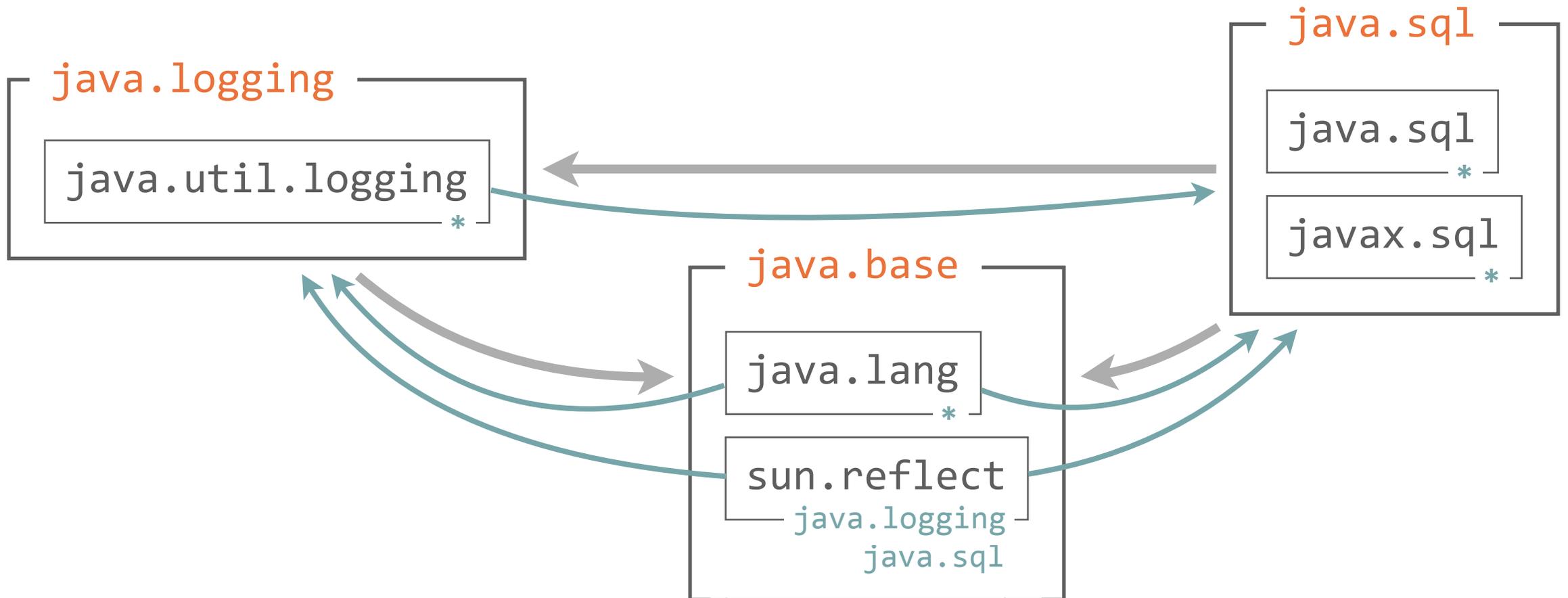
public class Driver {

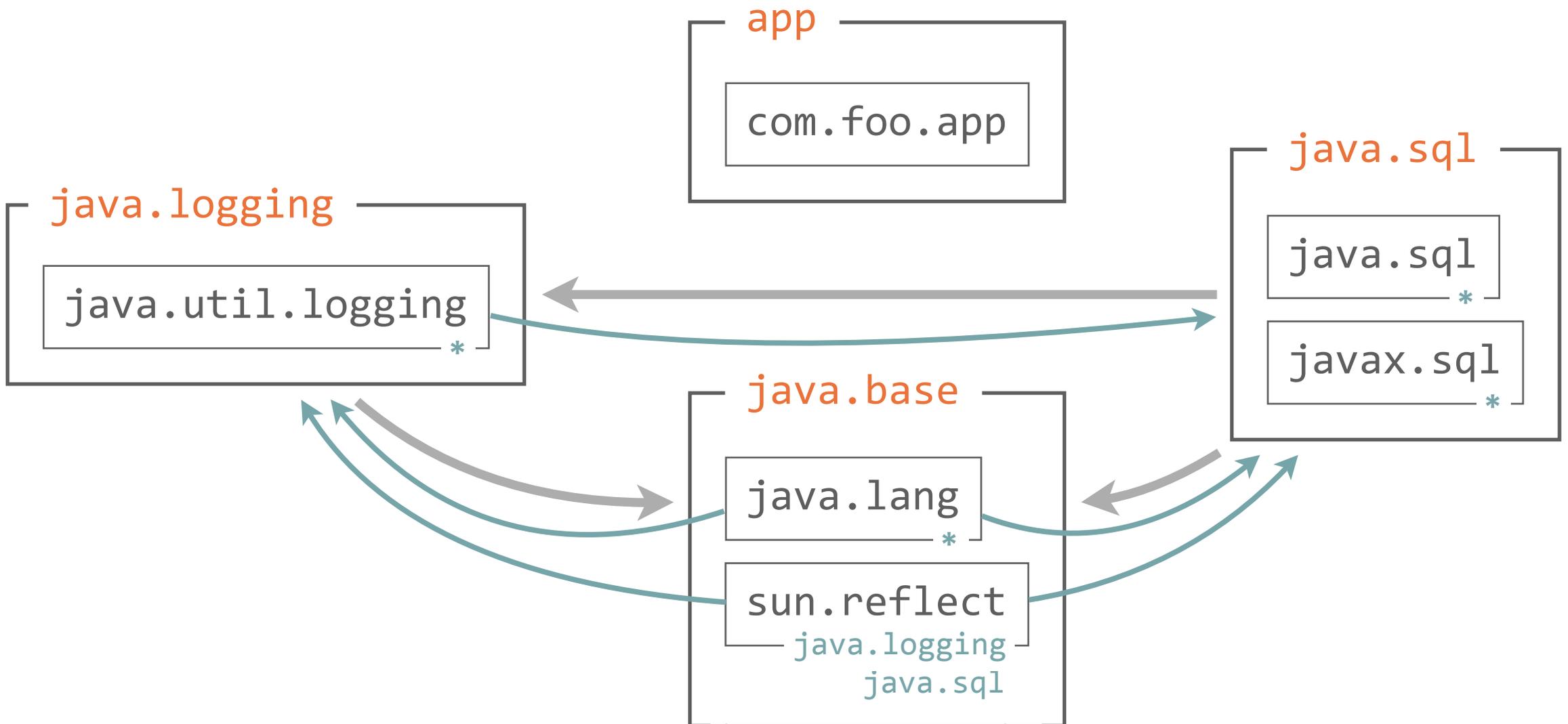
    public Logger getParentLogger()
        throws SQLException;
```

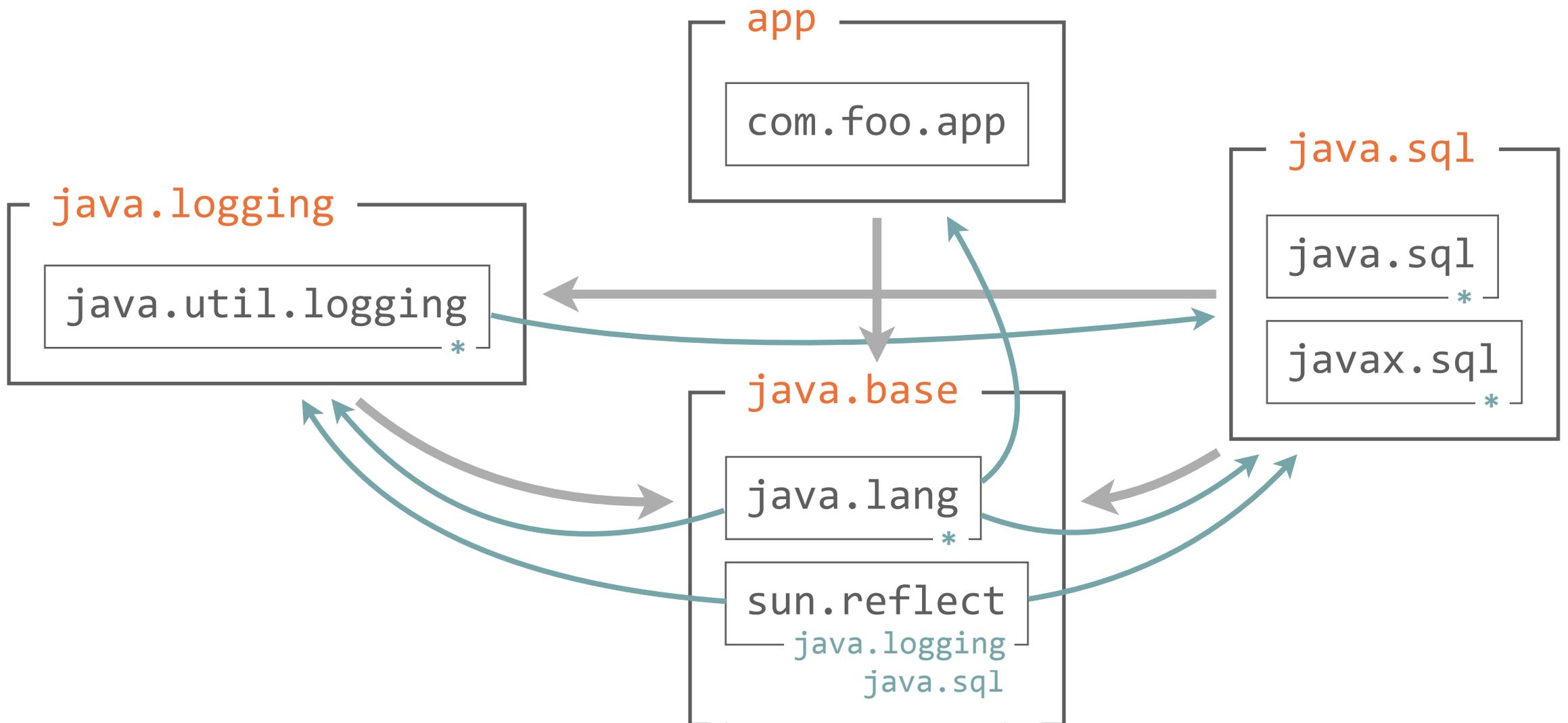


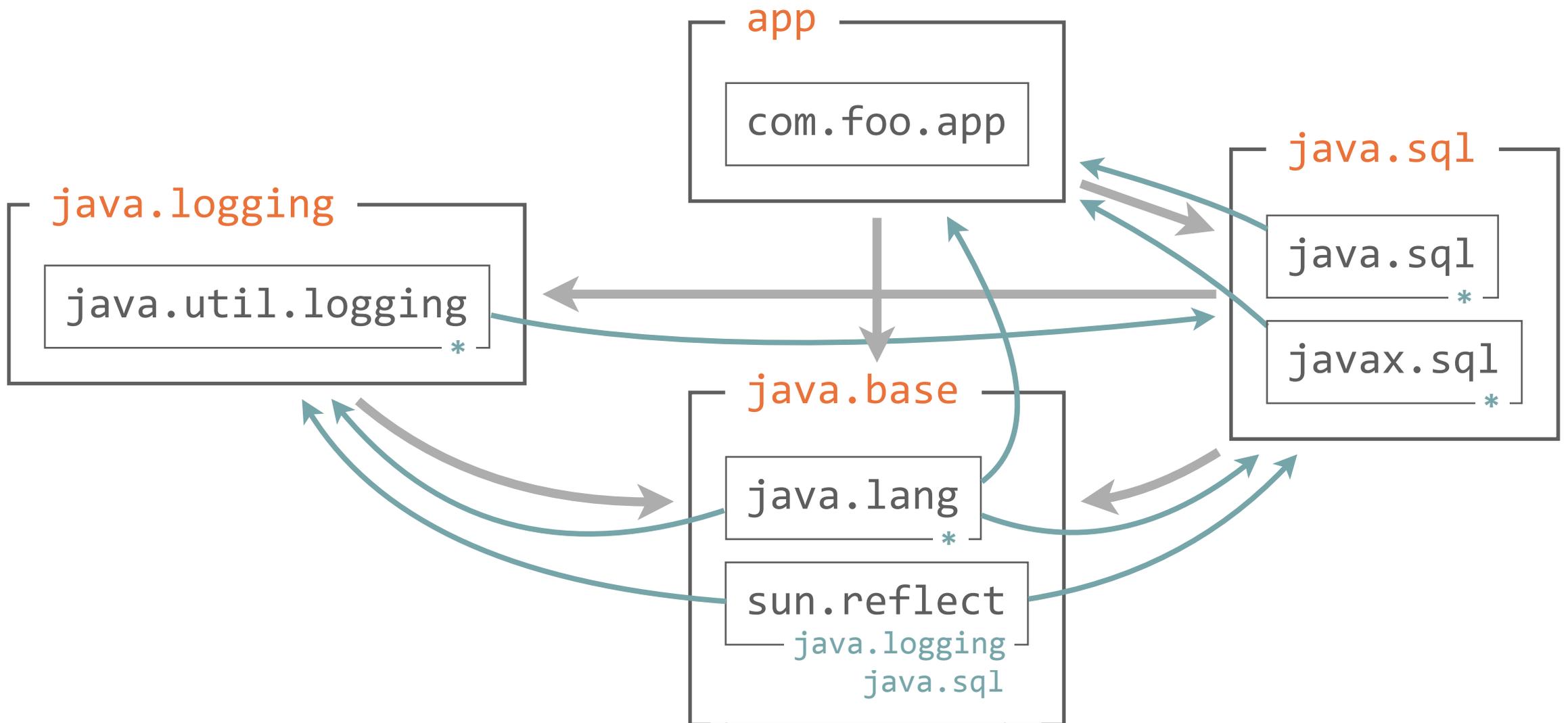


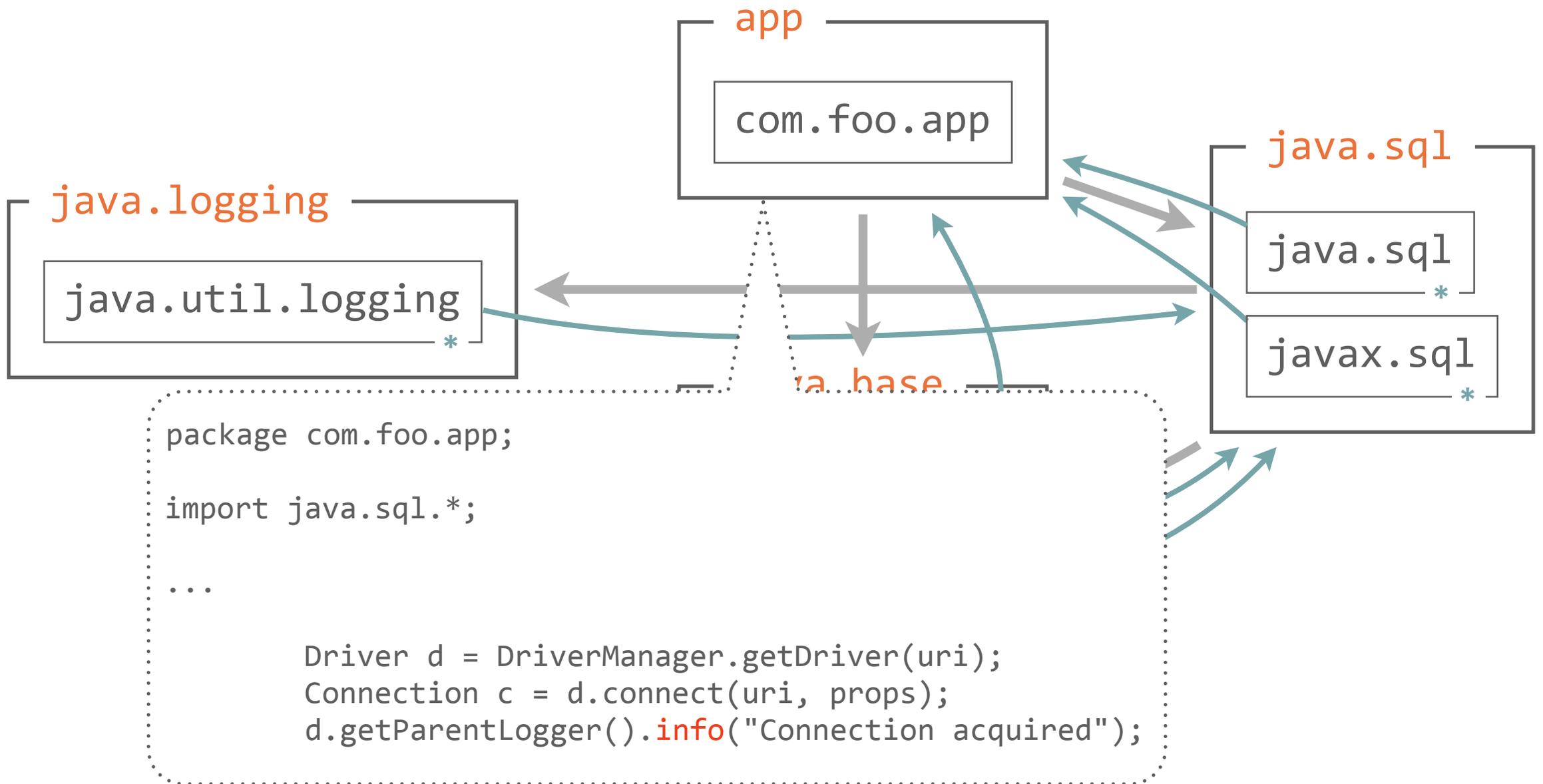


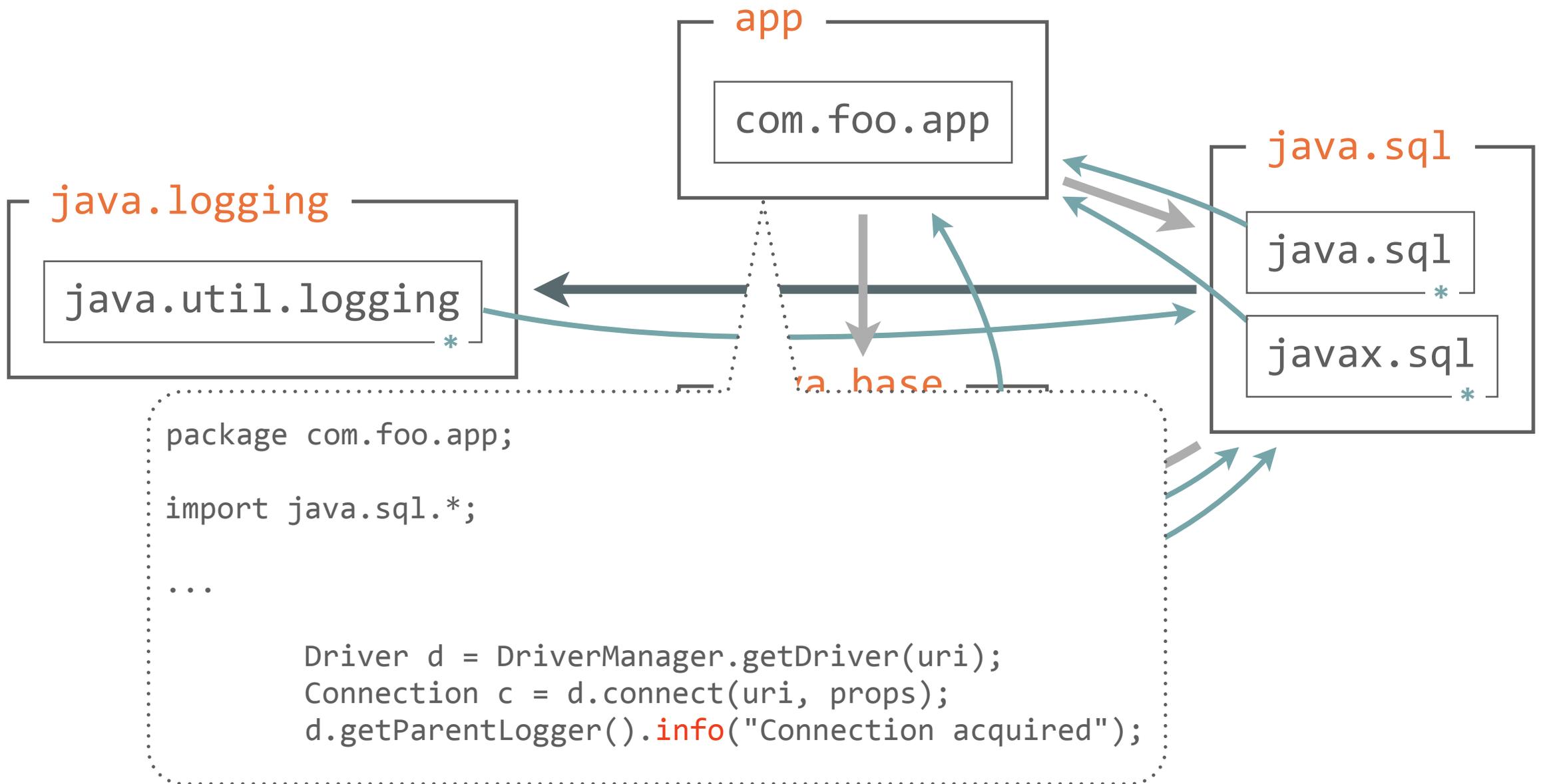


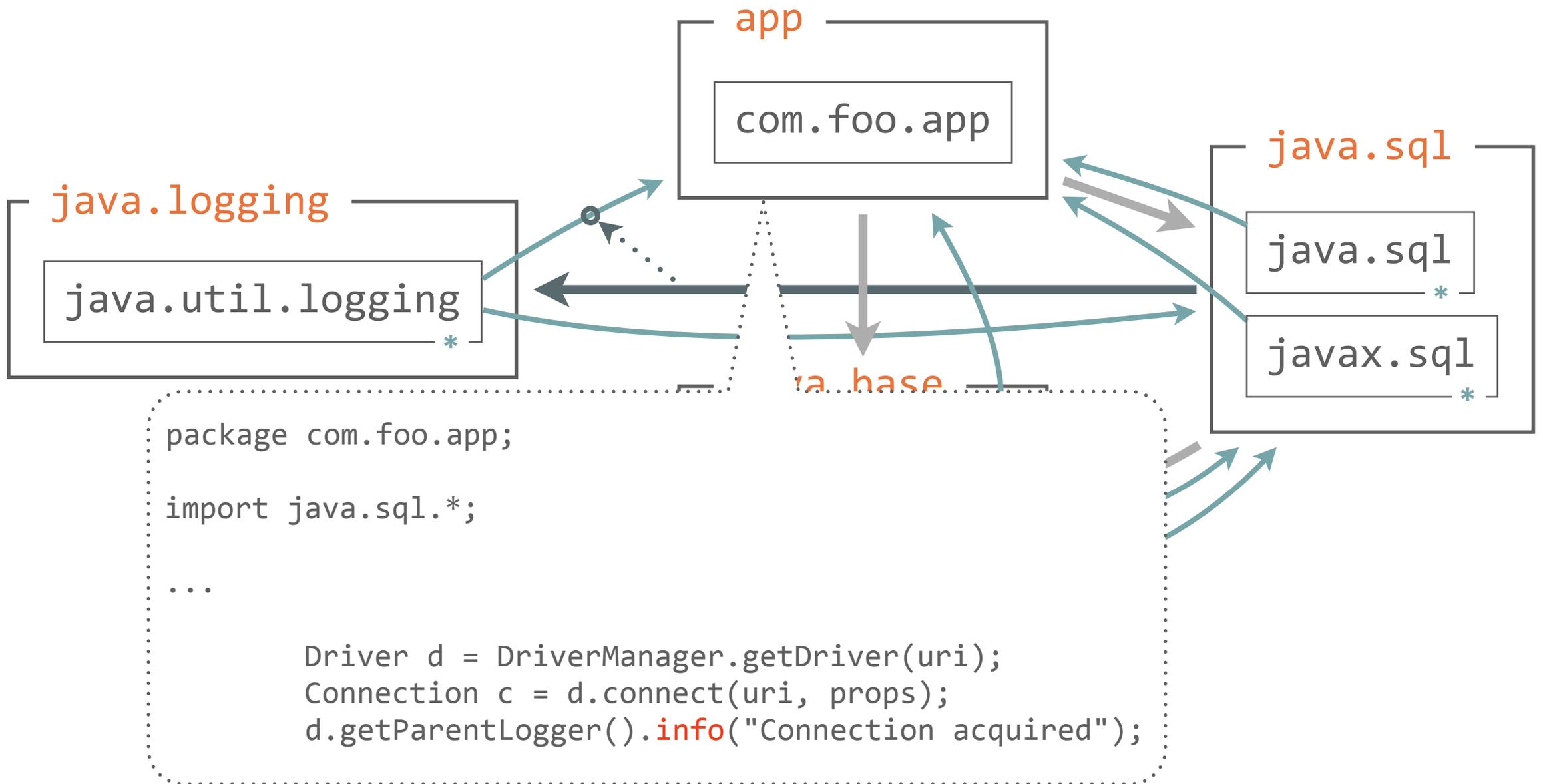


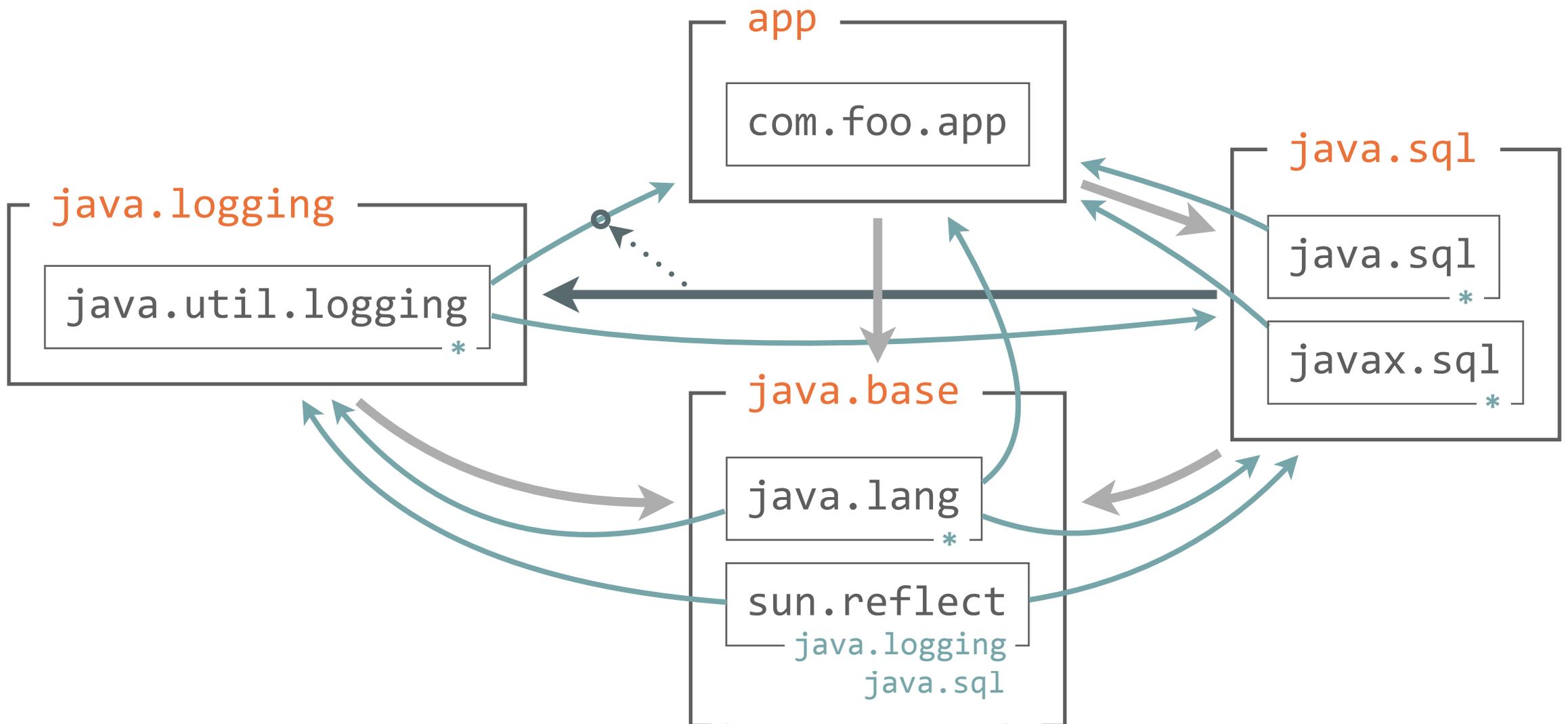


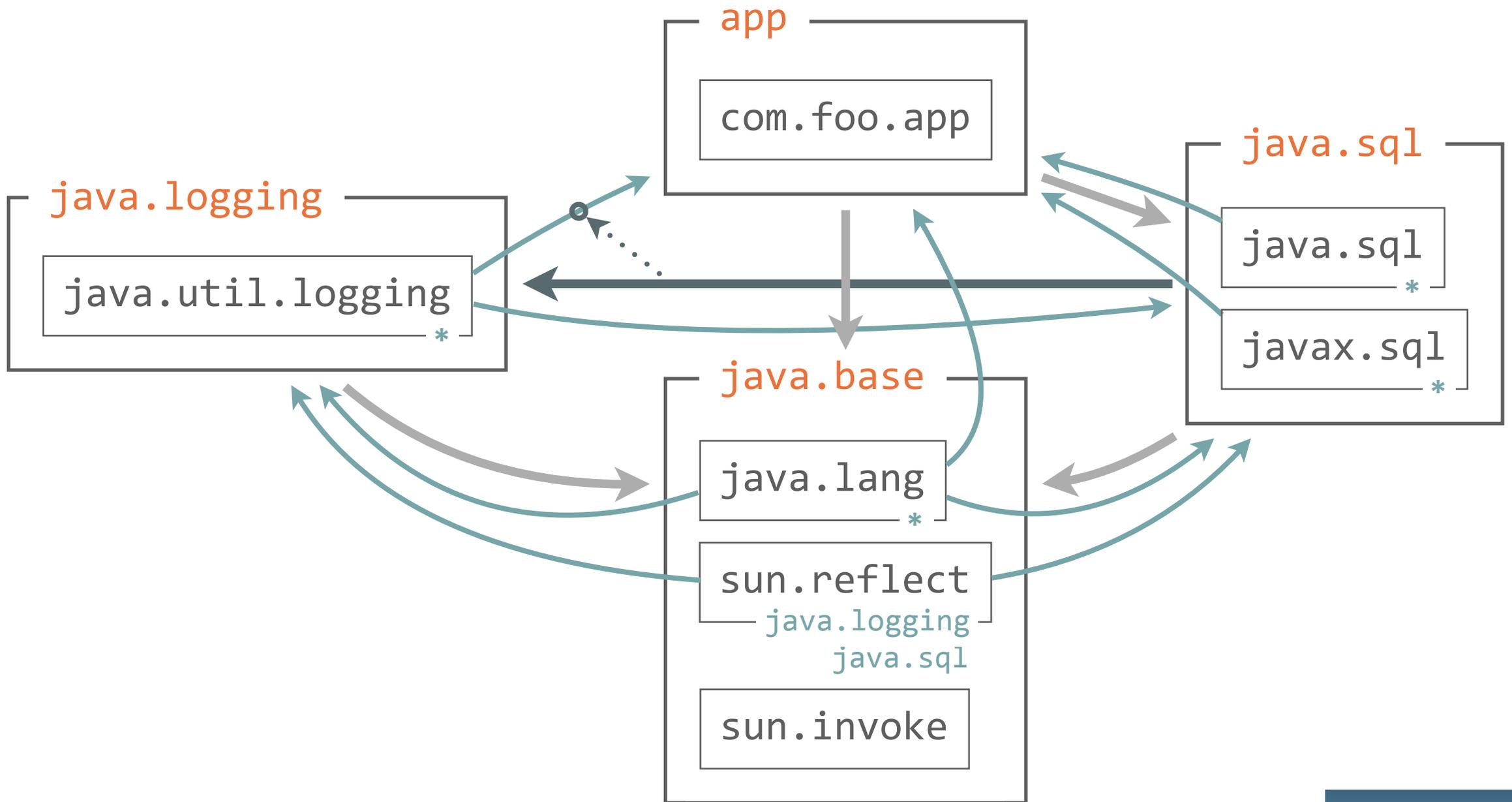














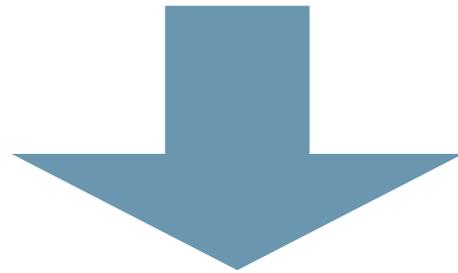
JEP 201: Modular Source Code

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```
src/{share,$OS}/{classes,native}/$PACKAGE/*.{java,c,h,cpp,hpp}
```

JEP 201: Modular Source Code

```
src/{share,$OS}/{classes,native}/$PACKAGE/*.{java,c,h,cpp,hpp}
```



```
src/$MODULE/{share,$OS}/classes/$PACKAGE/*.java  
native/include/*.{h,hpp}  
$LIBRARY/*.{c,cpp}  
conf/*
```

JEP 220: Modular Run-Time Images

JEP 220: Modular Run-Time Images

```
$JRE/bin/  
  /lib/*.{properties,policy}  
  /endorsed  
  /ext  
  /rt.jar  
  /$ARCH/*.so  
    /$VM/*.so  
  /...
```

JEP 220: Modular Run-Time Images

```
$JRE/bin/  
  /lib/*.{properties,policy}  
  /endorsed  
  /ext  
  /rt.jar  
  /$ARCH/*.so  
    /$VM/*.so  
  /...
```



```
$JRE/bin/  
  /conf/*.{properties,policy}  
  /lib/$ARCH/*.so  
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```

JEP 220: Modular Run-Time Images

```
$JRE/bin/  
  /lib/*.{properties,policy}  
  /endorsed  
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  /rt.jar  
  /$ARCH/*.so  
    /$VM/*.so  
  /...
```



```
$JRE/bin/  
  /conf/*.{properties,policy}  
  /lib/$ARCH/*.so  
    /$VM/*.so  
  /...
```

JEP 220: Modular Run-Time Images

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```
ClassLoader.getResource("java/lang/Class.class");
```

JEP 220: Modular Run-Time Images

```
ClassLoader.getResource("java/lang/Class.class");  
=> jar:file:/usr/local/jdk8/jre/lib/rt.jar!/java/lang/Class.class
```

JEP 220: Modular Run-Time Images

```
ClassLoader.getResource("java/lang/Class.class");
```

```
=> jar:file:/usr/local/jdk8/jre/lib/rt.jar!/java/lang/Class.class
```

```
=> jrt:/java.base/java/lang/Class.class
```

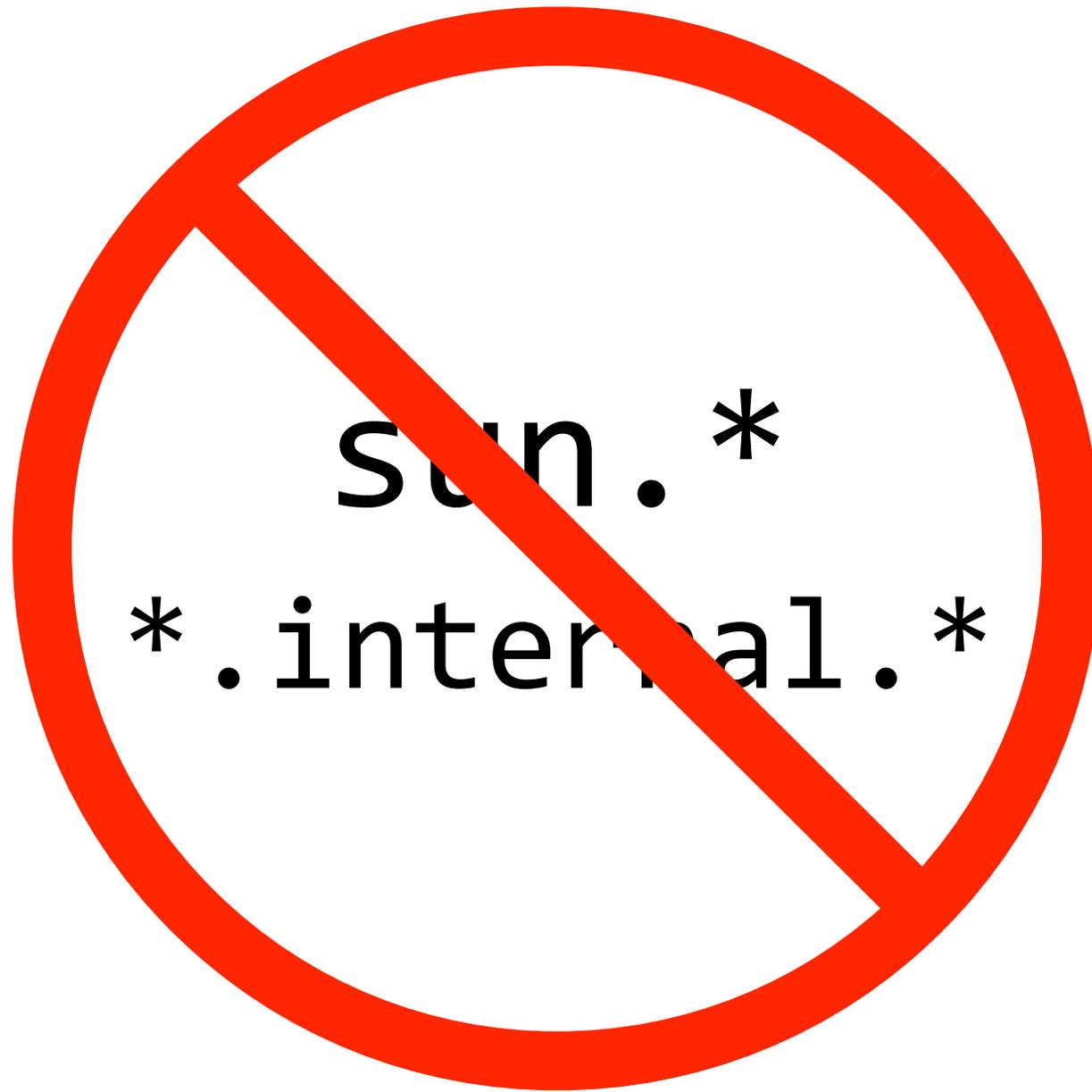
JEP 220: Modular Run-Time Images

```
ClassLoader.getResource("java/lang/Class.class");
```

```
=> jar:file:/usr/local/jdk8/jre/lib/rt.jar!/java/lang/Class.class
```

```
=> jrt:/java.base/java/lang/Class.class
```

```
// NIO filesystem for accessing built-in classes & resources  
FileSystem fs = FileSystems.getFileSystem(URI.create("jrt:/"));  
byte[] jlo = Files.readAllBytes(fs.getPath("/modules/java.base",  
                                           "java/lang/Object.class"));
```




```
$ jdeps app.jar
```

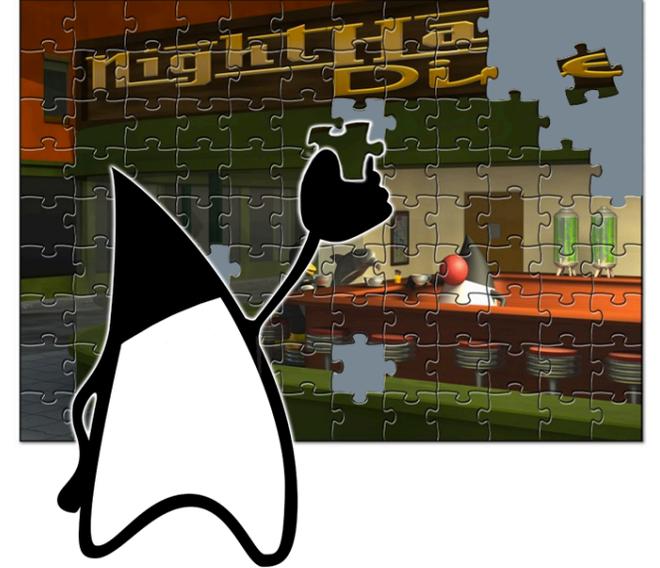
Project Jigsaw

JEP 200: The Modular JDK

JEP 201: Modular Source Code

JEP 220: Modular Run-Time Images

JEP TBD / JSR 376: Java Platform Module System



<http://openjdk.java.net/projects/jigsaw>

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Java 9: Make Way for Modules!

Mark Reinhold (@mreinhold)

Chief Architect, Java Platform Group

Oracle

<http://openjdk.java.net/projects/jigsaw>

2015/2/3

