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Working through Modularity

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Java Your Next (Cloud)

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Agenda of the day …

1. What JIGSAW brings to the system
2. Change in accessibility and Readability
3. Types of Module brings the Migration Plan
4. Final Thoughts

What is Modularity ?

- Degree to which a system's component can be separated or can be recombined.
- Success story of modularity exists in every part of your life.
- What a good module will look like
  - Hidden implementation details (encapsulation)
  - Understandable interface
  - Autonomous unit of deployment (loose coupling)
  - Requirements can be easily discoverable

So Java Modularity for ?

- Strong encapsulation
- As-per-required binaries
- Small devices
- Compile time resolution

- and many more …

JIGSAW JEP's in a nutshell.

- JEP 200 : The modular JDK
- JEP 261 : Module System
- JEP 220 : Modular run-time images
- JEP 260: Encapsulate Most Internal API's
- JEP 282: jlink: The java linker

- and many more …

Change in accessibility and Readability

Accessibility in Java < Java 9

- public
- protected
- <package>
- private

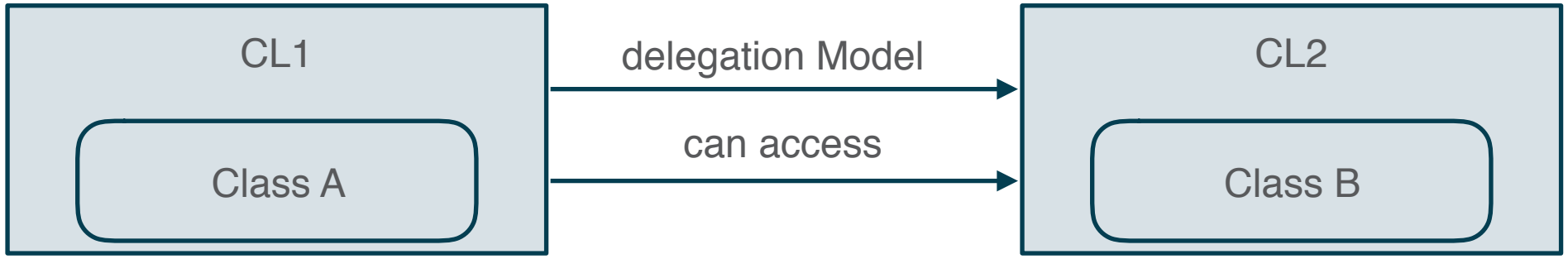
Accessibility in Java >= Java 9

- **public to everyone**
- **public but only to specific module**
- **public within a module**
- protected
- <package>
- private

```
public is no longer means accessible
```

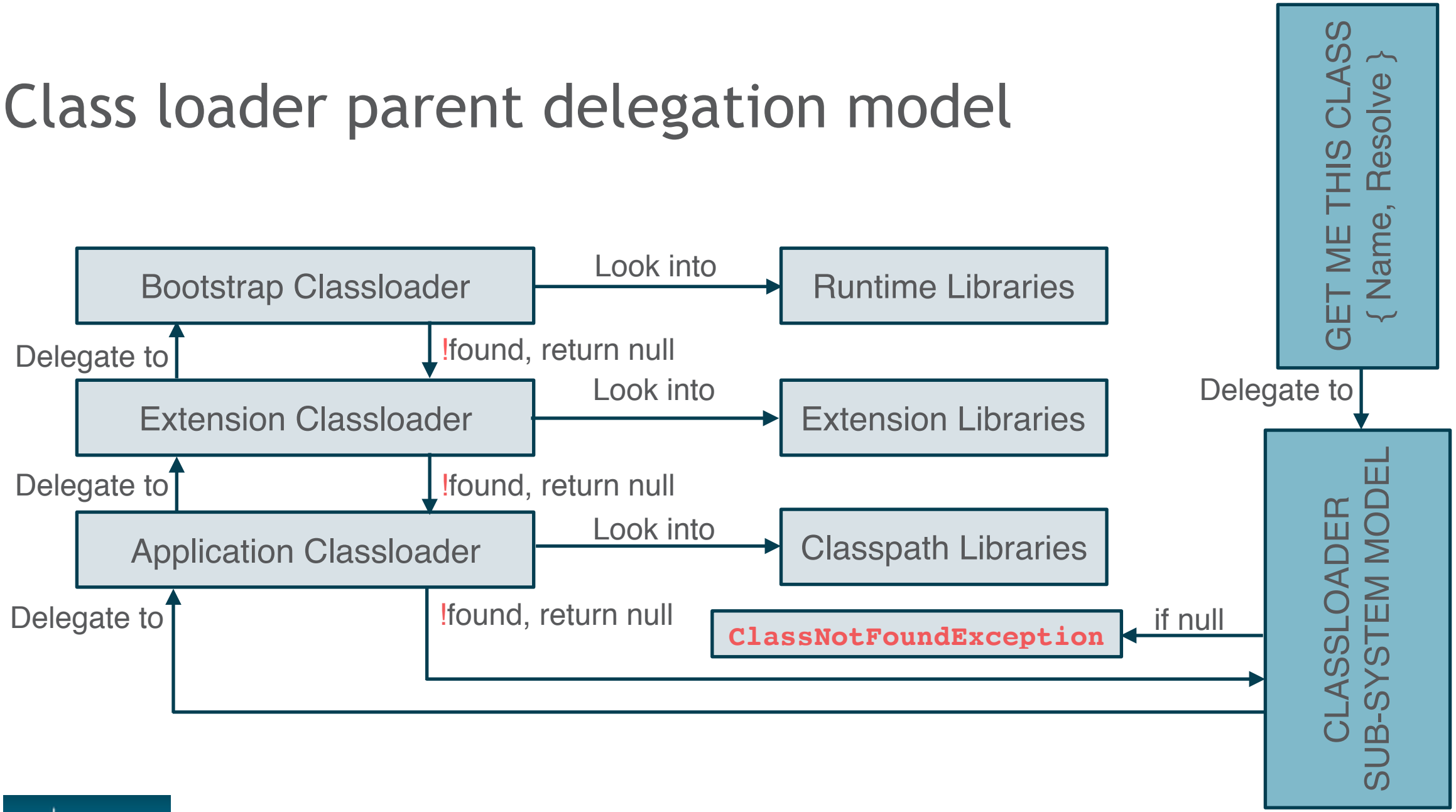
Accessibility in Java - Classloader view

- **Same class concept**
  - (C1, P1, K1) != (C1, P1, K2)



- **Ideally a class loader can set the accessibility in Java.**
- **No enforcement, too many classloader, boot loader.**

Class loader parent delegation model

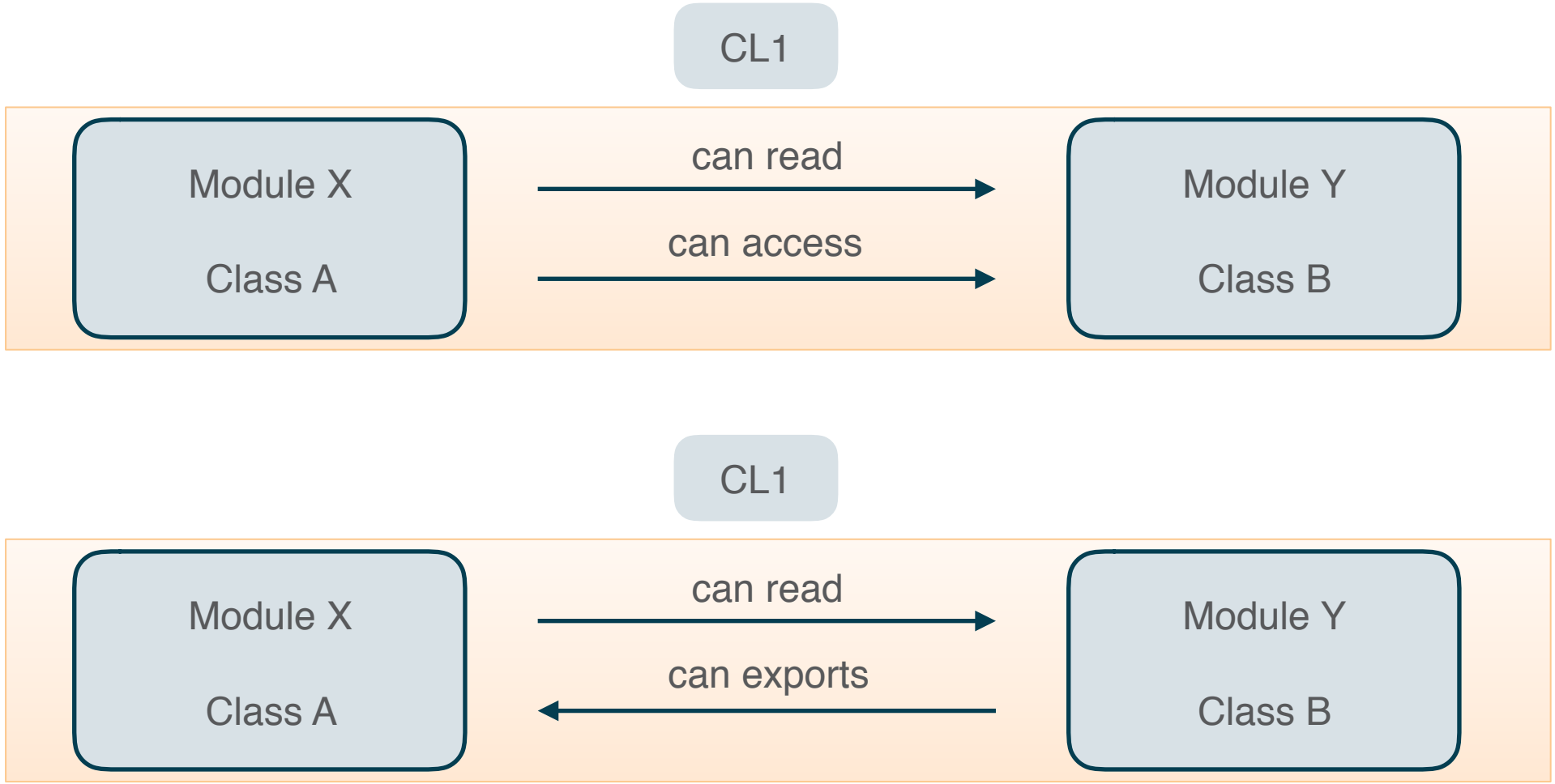


In short, this is how it works

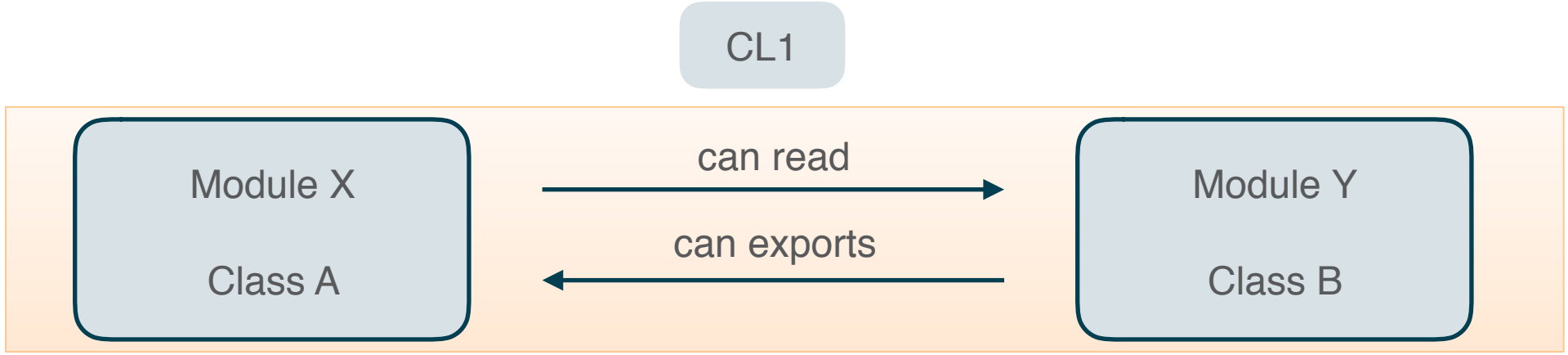
```
protected synchronized Class<?> loadClass
    (String name, boolean resolved)
    throws ClassNotFoundException {

    // First check if the class is already loaded
    Class c = findLoadedClass(name);
    if (c == null) {
        try {
            if (parent != null) {
                c = parent.loadClass(name, false);  // parent delegation
            } else {
                    c = findBootstrapClass0(name);
            }
        } catch (ClassNotFoundException e) {
            c = findClass(name);                    // if still not found, invoke findClass
        }
    }
    if(resolved) {
           resolveClass(c);
    }
    return c;
}
```

Accessibility in Java - Role of Readability



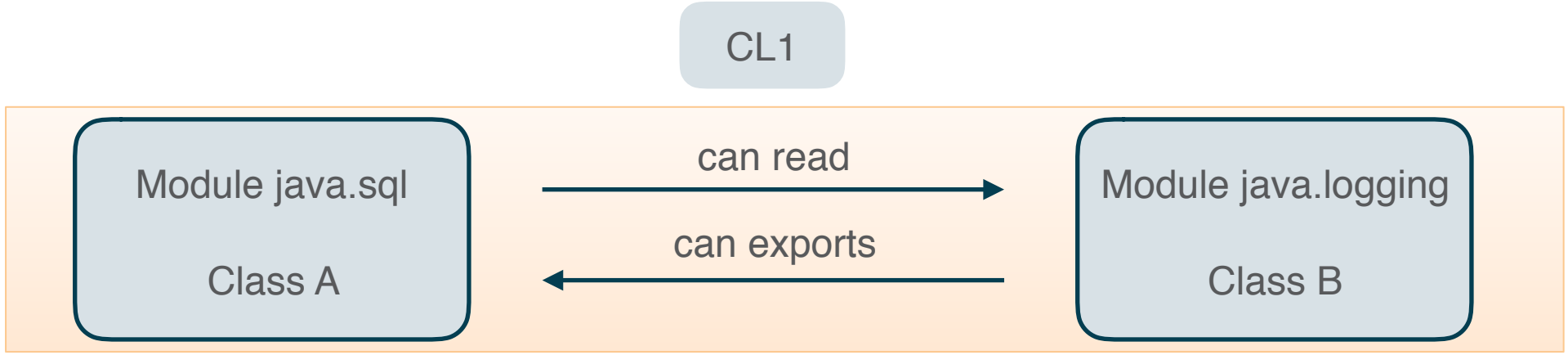
Accessibility in Java - Role of Readability




```
module X {
    requires Y;
}
```

```
module Y {
    exports P;
}
```

Readability in the SE dependency graph




```
module java.sql {
    requires java.logging;
    exports  java.sql;
}
```

```
module java.logging {
    exports java.util.logging;
}
```

Core reflection + Internal API’s

- At runtime, we need to respect accessibility and readability.
- For example : setAccessible(true) - No more a good choice

- JDK internal API’s are meant to use internally.
- A major portion of that will not be accessible now.
  - some are accessible
  - some tells the replacement
  - some are not

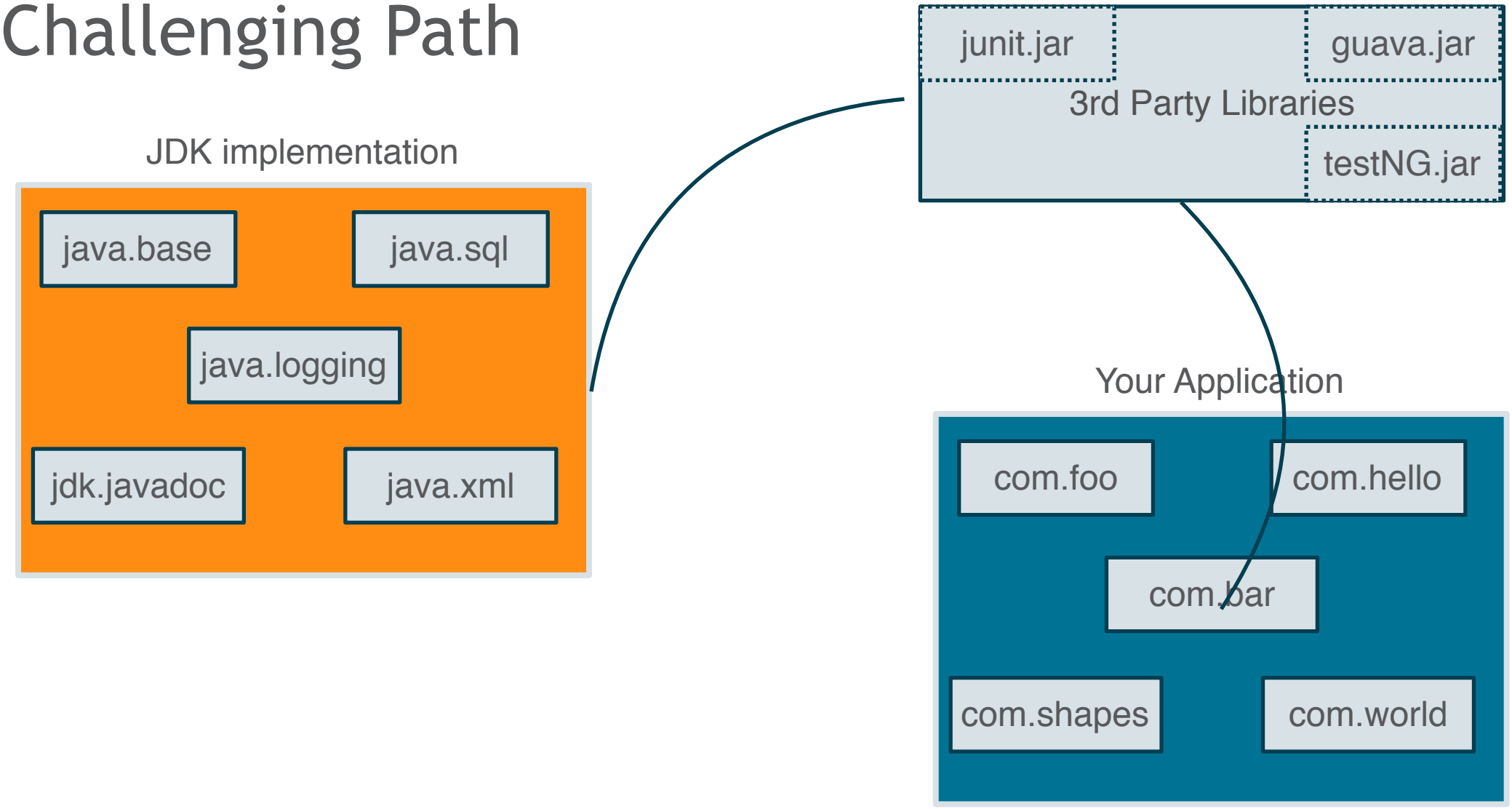
Summary

- Accessibility is “enforced” by the module system
- Like all module system, dependency discover at compile-time
- module-info.java manages exports, requires and many more
- Readability can be direct or can be implied.

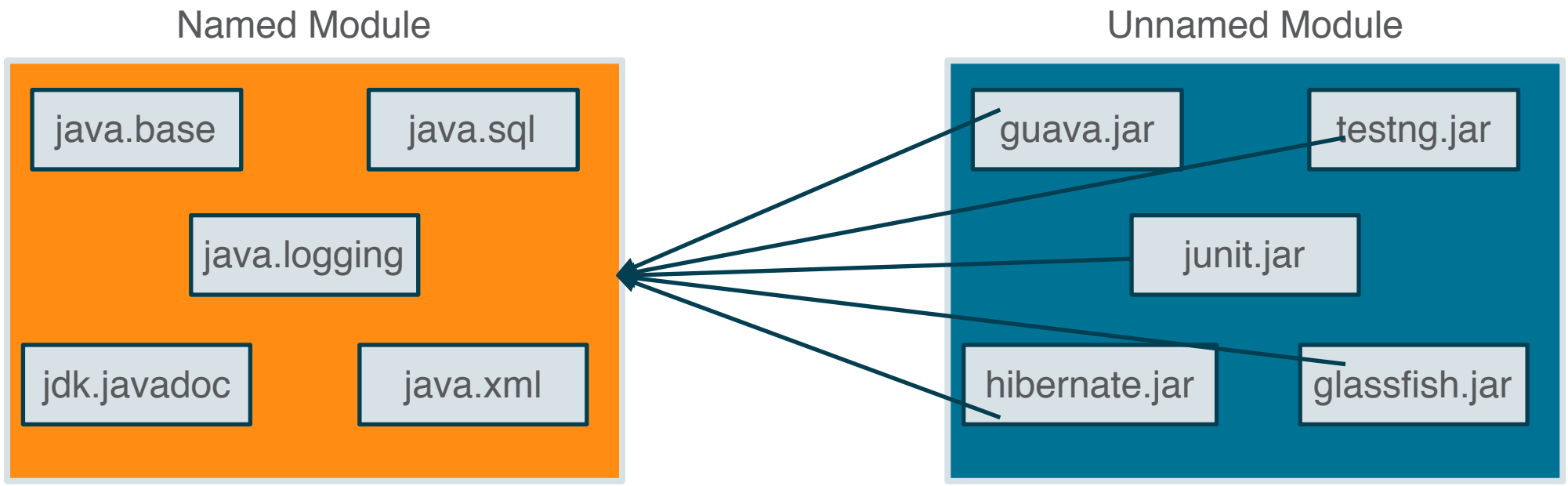
- Core reflection needs to respect accessibility and readability.
- Be aware of internal API’s usages

Types of Modules

Challenging Path

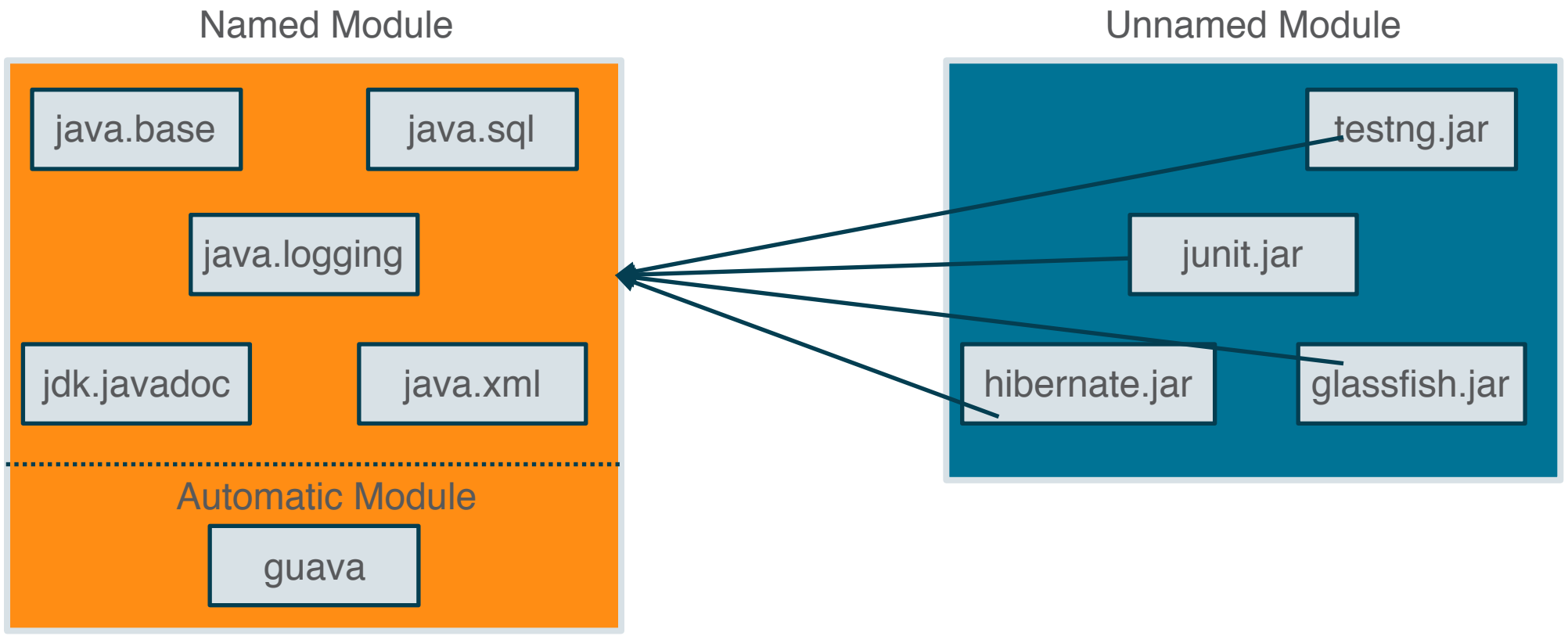


What if not a “Named Module”



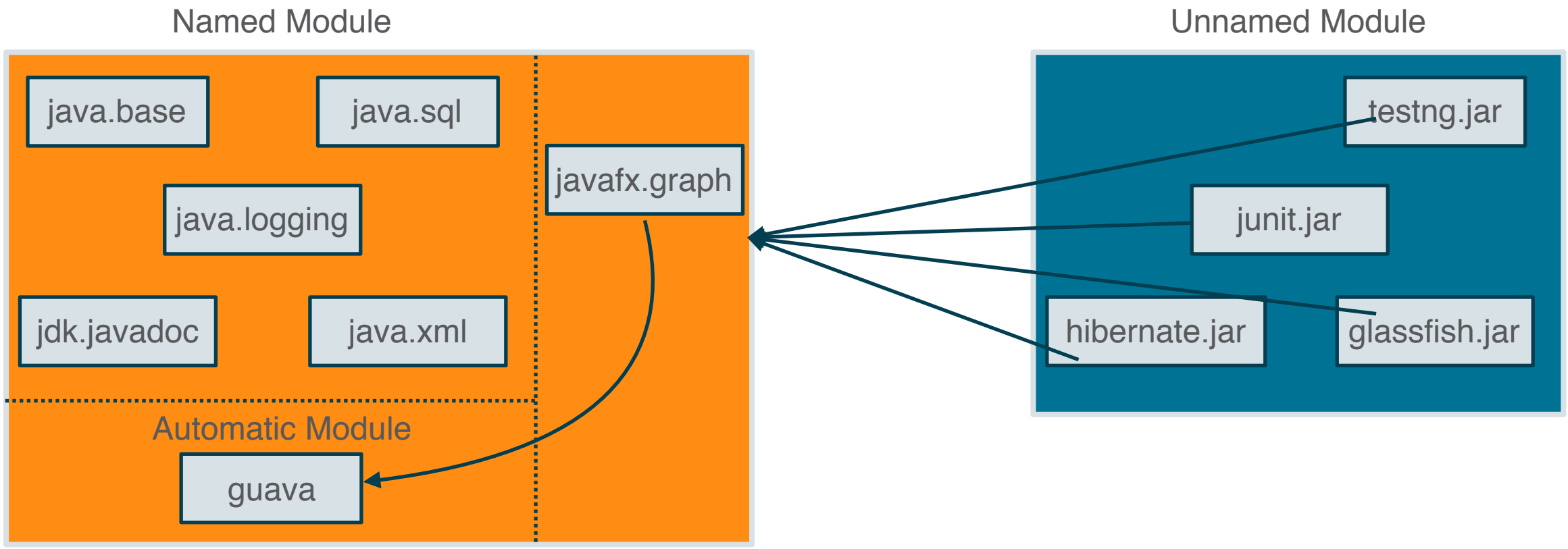
- Ideally unnamed module gives everything
- But is it a good idea for the named module to read everything of unnamed module ? (Something like reads class-path or reads “unnamed”)

Welcome to “Automatic Module”



- change from class-path to module-path will do the magic

Welcome to “Automatic Module”



- requires guava (or can say requires **public** guava)

Summary

- Named Module - is the new way to go
- Automatic Module - will help in migration
- Unnamed module - will live a old life in class-path

- “Migration can be done as lot of readability is FREE”

What we can see

- Demo
  - Create some modules
  - Add some dependency, understand the simple dependencies
  - See the dependency graph
  - Create your own binary
  - Check out the size of your binary
  - Further compression with the binary, if possible.

Important References

- State of Module - http://openjdk.java.net/projects/jigsaw/spec/sotms/
- Mark Reinhold Talk - https://www.youtube.com/watch?v=UKC0uC7QUkI
- Project Penrose - http://openjdk.java.net/projects/penrose/
- Project Jigsaw - http://openjdk.java.net/projects/jigsaw/

Thank you

For any query :-

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