Controlling App Execution & Environment

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Overview

Command-line arguments

Managing app and user properties

Persisting and restoring properties

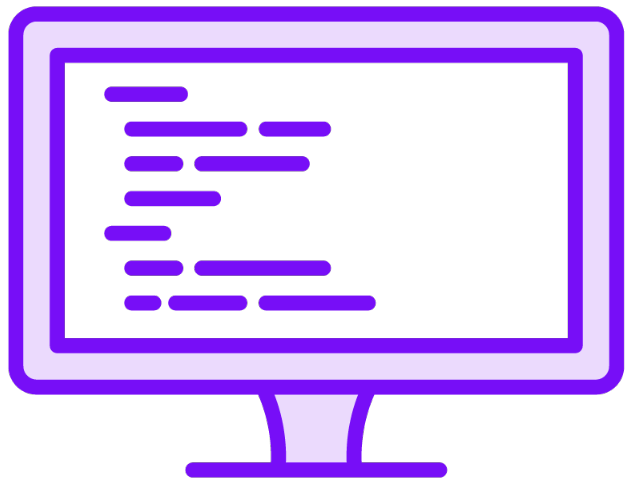
Deploying property defaults in a package

Default class loading behavior

Working with class paths

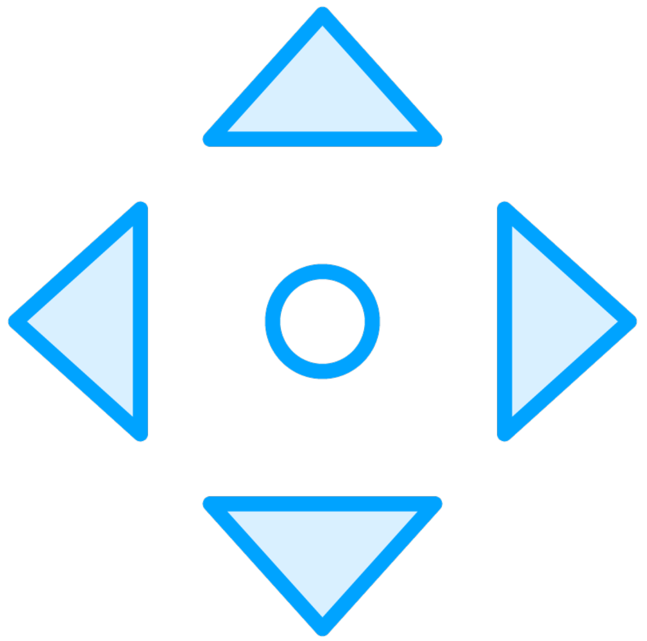
Execution environment information

Factors That Affect App Behavior



Apps require more than just code

Code is just the beginning



Behavior affected by many factors

Startup options

User preferences/actions

Execution environment

Support libraries

Command-line Arguments

Can pass info on command line

Easiest way to pass startup info

Target of app processing

Input/output files, URLs, etc.

Behavior options

[A,B,C]

Arguments passed as a String array

Received by app’s main function

Each argument is a separate element

Separated by OS’s whitespace

Honor’s OS’s value quoting

Simple Command-line Processing

```
java com.jwhh.cmdline.Main
```

Main.java

```
package com.jwhh.cmdline;
class Main {
  public static void main(                ) {
    if(args.length < 1)
      System.out.println("No arguments provided");
    else {
      for(String word:args)
        System.out.println(word);
    }
  }
}
```

```
Hello
there
world
```

IDE’s allow for ease of testing

- Can set command line args
- Will automatically pass when run in IDE

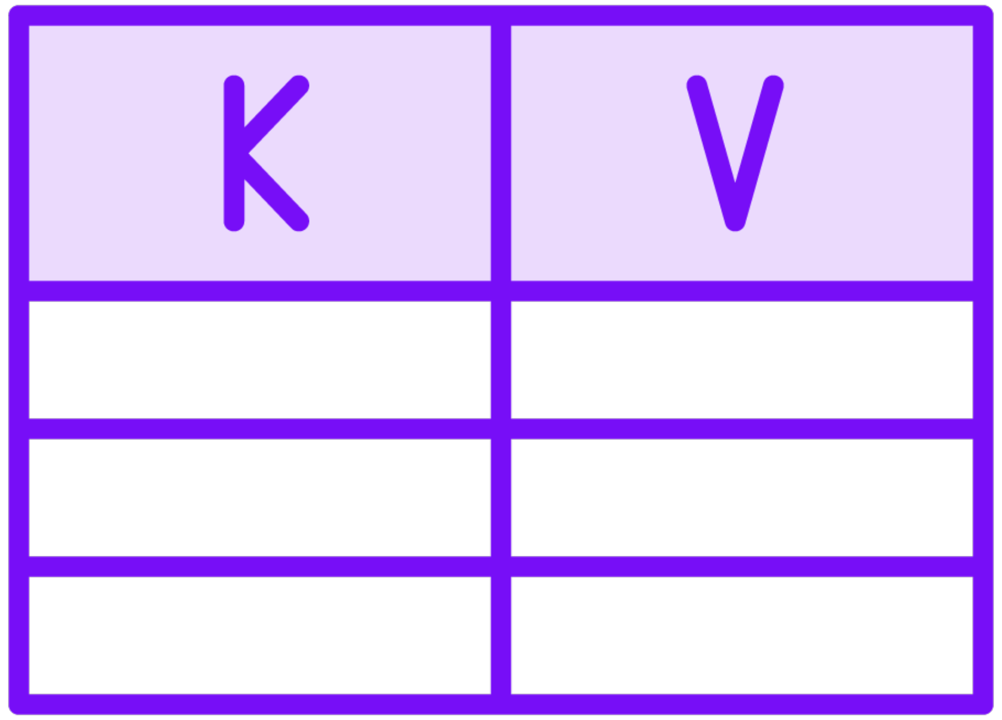
IntelliJ

- http://bit.ly/intellijcmdlineargs

NetBeans

- https://bit.ly/apachenetbeanscmdlineargs

Managing Persistable Key/Value Pairs



Apps often need persistable key/value pairs

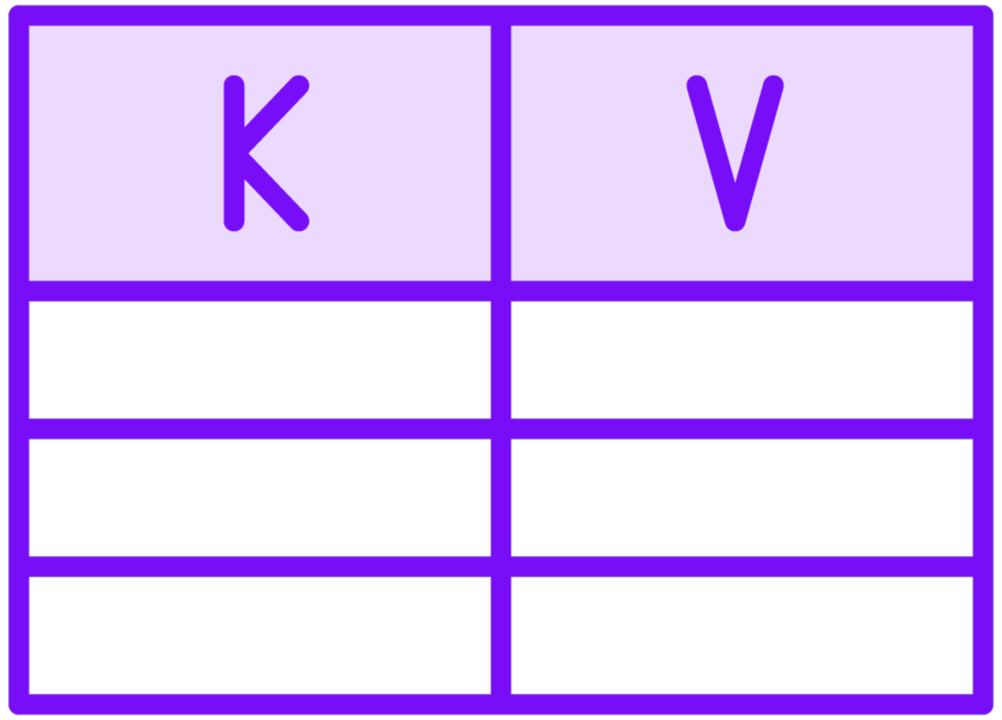
- Store app configuration information
- Track simple aspects of app state
- Track user preferences

Need an easy way to manage key/value pairs

- Set/retrieve value
- Store/load between app executions
- Provide default value when not set

Use the java.util.Properties class

Properties Class



Properties class

- Inherits from HashTable class
- Keys and values are Strings

setProperty method

- Sets the current value for a key
- Creates or updates key as needed

getProperty method

- Returns the current value for the key
- Returns null if not found and no default
- Can optionally provide default value

Setting/Retrieving Properties

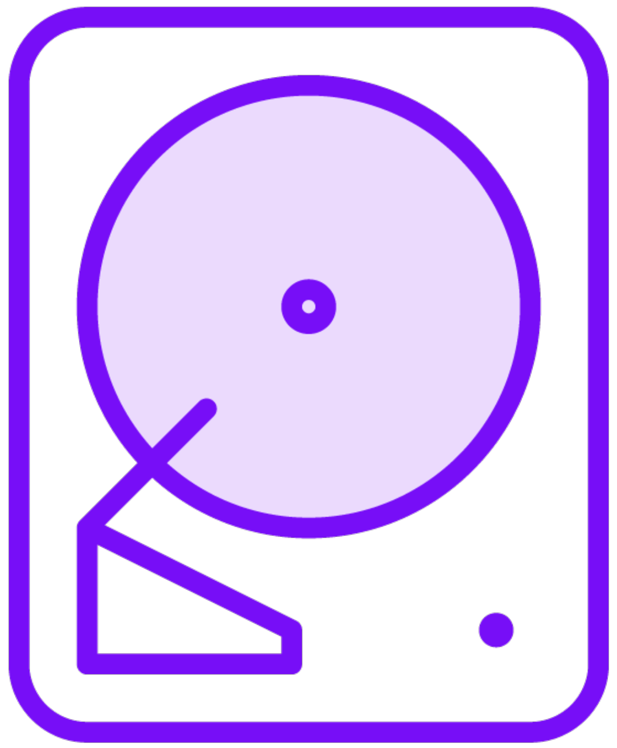
```
Properties props = new Properties();
props.setProperty("displayName", "Jim Wilson");

String name = props.getProperty("displayName");

String acctNum = props.getProperty("accountNumber");

String nextPosition = props.getProperty("position", "1");
```

Store and Load Property Values



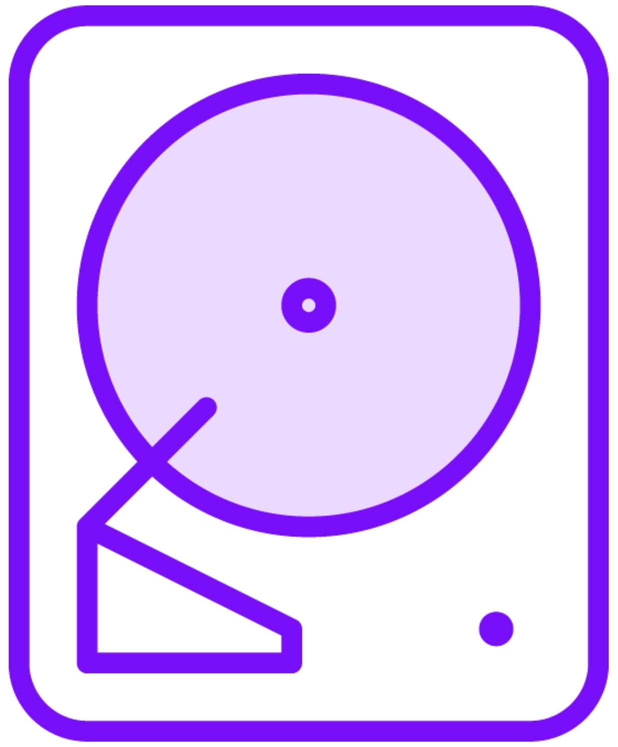
Properties can be persisted

- Can be written to & read from a stream
- Can optionally include comments

Supports 2 formats

- Simple text
- XML

Properties Persisted as Simple Text

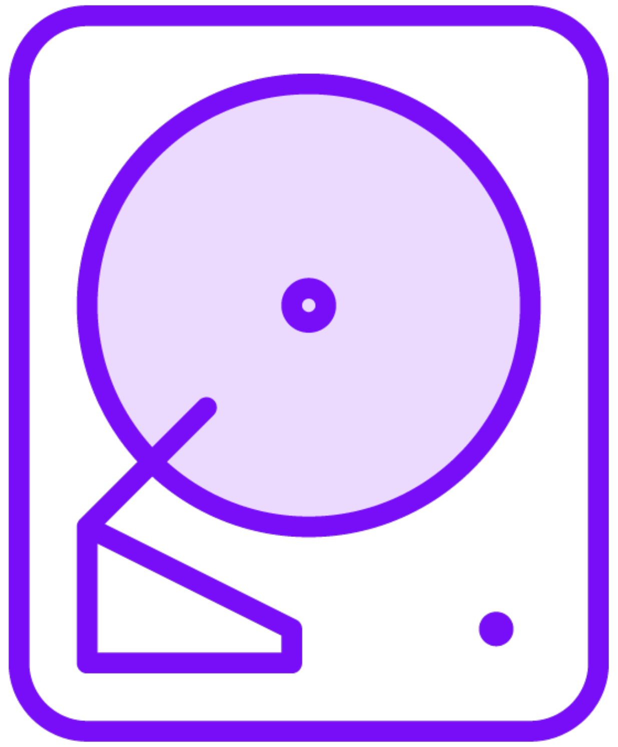


Use store & load methods

- Supports OutputStream/InputStream
- Supports Writer/Reader

Normally name file with .properties suffix

Properties Persisted as Simple Text



One key/value pair written per line

Key/value normally separated by = or :

- Whitespace surrounding =, : ignored
- Whitespace acts as key/value separator if occurs without = or :
- Can escape whitespace, =, or : with \

Start a line with # or ! for comments

Blank lines ignored

Storing Properties as Simple Text

```
Properties props = new Properties();
props.setProperty("displayName", "Jim Wilson");
props.setProperty("accountNumber", "123-45-6789");

try(Writer writer = Files.newBufferedWriter(Paths.get("xyz.properties"))) {
    props.store(writer, "My comment");
}
```

xyz.properties

```
#My comment
#Thu Apr 28 14:45:37 EDT 2025
displayName=Jim Wilson
accountNumber=123-45-6789
```

Loading Properties from Simple Text

```java
Properties props = new Properties();
try(Reader reader = Files.newBufferedReader(Paths.get(“myapp.properties”))) {
    props.load(reader);
}
String val1 = props.getProperty(“val1”);
String val2 = props.getProperty(“val2”);
String val3 = props.getProperty(“val3”);
String val4 = props.getProperty(“val4”);
```

myapp.properties

```
val1=hello world
val2 = goodnight moon
val3:    hi noon
val4 night bobbi sue
```

Properties Persisted as XML

Use storeToXML & loadFromXML methods

- Supports OutputStream/InputStream

Normally name file with .xml suffix

One key/value pair per XML element

Stored as element named entry

- Key stored as key attribute
- Value stored as element value

Use comment element for comments

Storing Properties as XML

```
Properties props = new Properties();
props.setProperty(“displayName”, “Jim Wilson”);
props.setProperty(“accountNumber”, “123-45-6789”);

try(OutputStream out = Files.newOutputStream(Paths.get(“props.xml”))) {
    props.storeToXML(out, “My comment”);
}
```

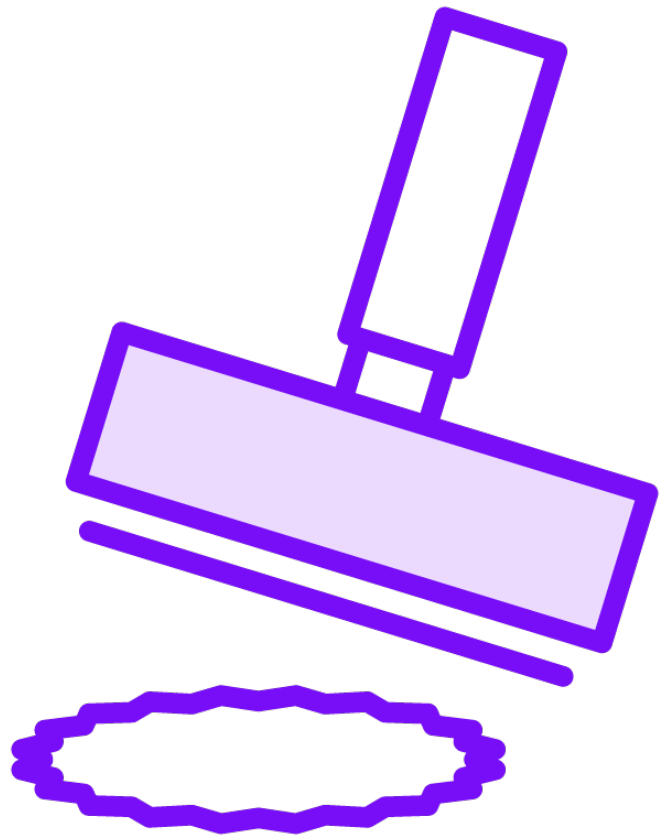
Properties as XML

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
<properties>
  <comment>My comment</comment>
  <entry                 >           </entry>
  <entry                   >            </entry>
</properties>
```

Loading Properties from XML

```
Properties props = new Properties();
try(inputStream in = Files.newInputStream(Paths.get("props.xml"))) {
    props.loadFromXML(in);
}
String val1 = props.getProperty("displayName");
String val2 = props.getProperty("accountNumber");
```

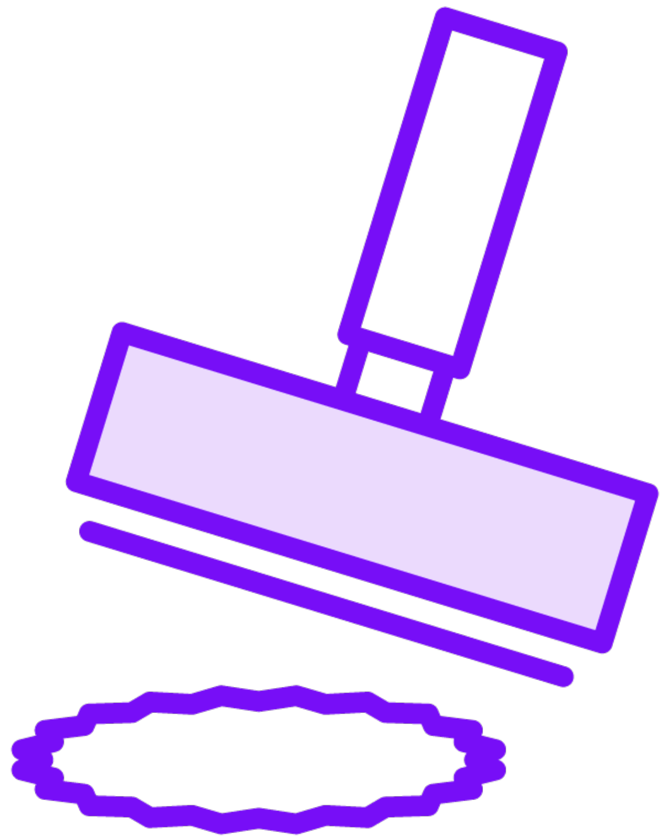
Providing Default Properties



Often useful to provide default values

- Simplifies configuration
- Provide initial values for user preferences
- Cumbersome to explicitly provide defaults for each getProperty call

Providing Default Properties



Can create Properties with defaults

- Pass default Properties to constructor
- Searched if key not found in current Properties instance
- Default properties take precedent over default value passed to getProperty

Using Default Properties

```
Properties defaults = new Properties();
defaults.setProperty(“position”, “1”);

Properties props = new Properties(defaults);
String nextPos = props.getProperty(“position”);
int iPos = Integer.parseInt(nextPos);

// do something with iPos
props.setProperty(“position”, Integer.toString(++iPos));

// do some other work
nextPos = props.getProperty(“position”);
```

Including Default Properties in Package

Default property file can be part of package

- Create .properties file at development time
- Build process includes file in package

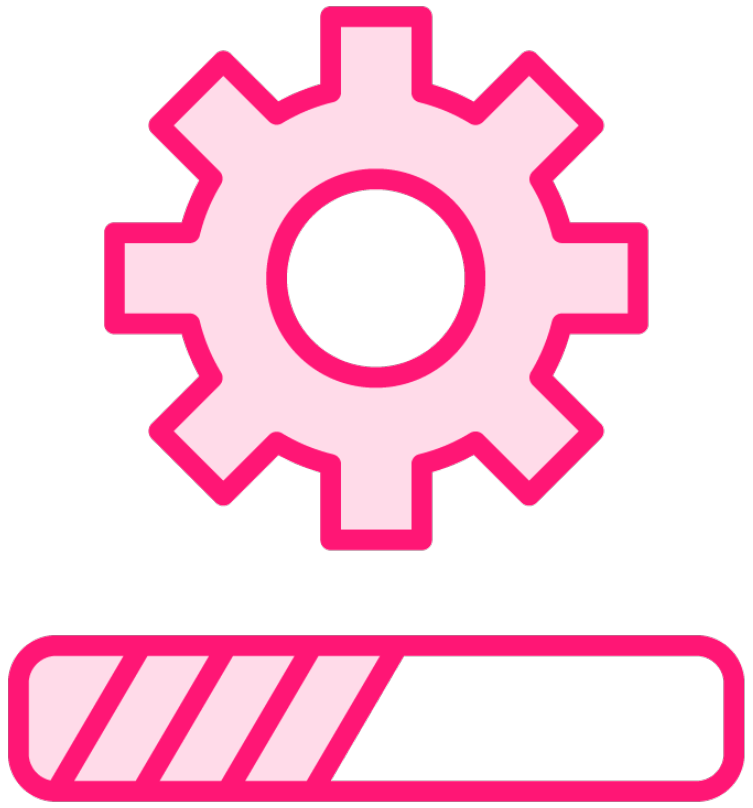
Can load file from package

- Takes advantage of Java resource system

Use getResourceAsStream method

- Accessed through any class in package
- *ClassName*.class
- this.getClass()

Class Loading



Most applications do not stand alone

- Rely on classes in other packages
- JDK packages located automatically
- May need help locating other packages

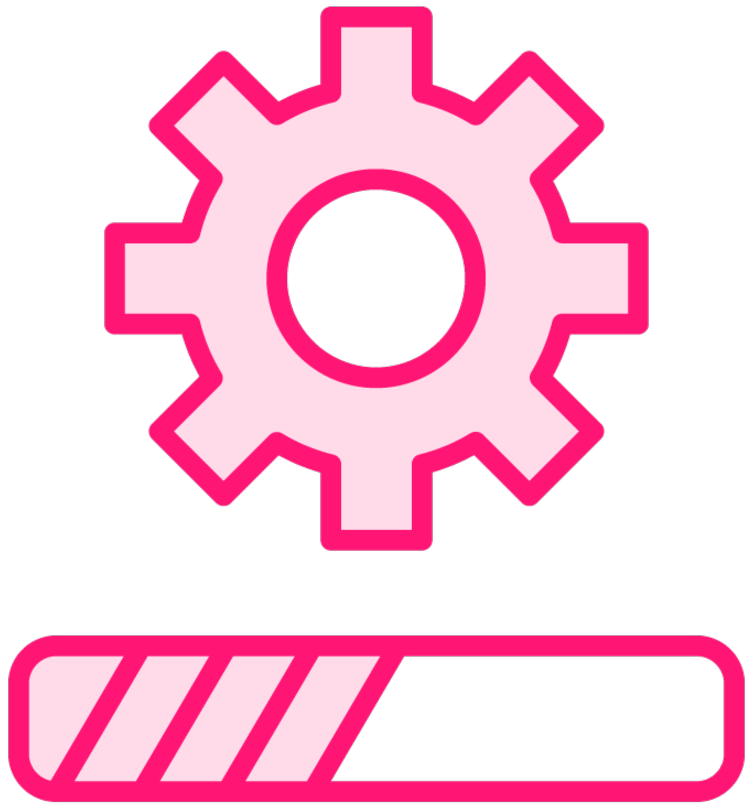
Locating packages at development time

- Specific to each IDE
- IntelliJ: bit.ly/intellijclasspath
- Netbeans: bit.ly/netbeansclasspath

Locating packages at runtime

- Java provides a number of options

Default Class Loading



By default Java searches current directory

- Classes must be in .class files
- Must be under package directories

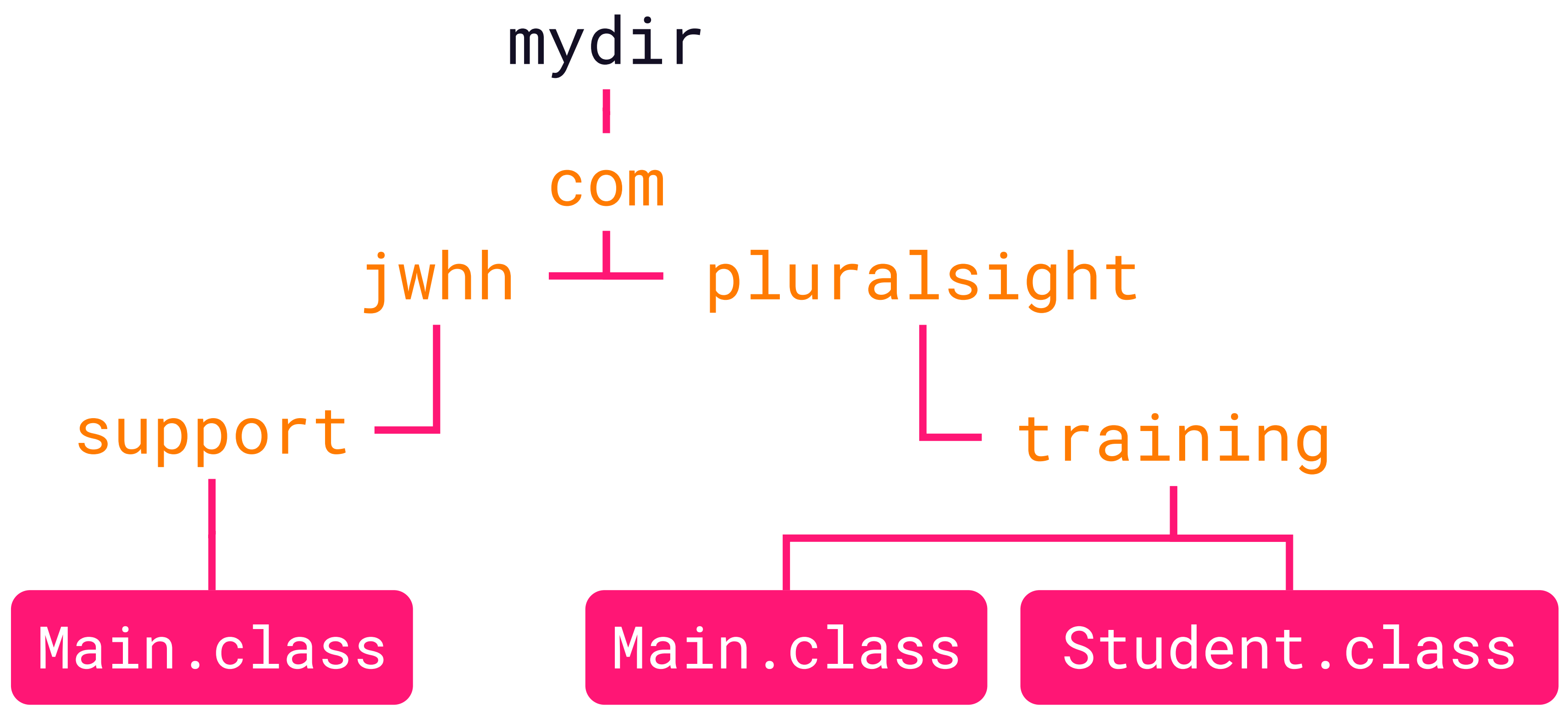
Default Class Loading

```
package com.pluralsight.training;
import com.jwhh.support;
public class Main {
  public static void main {
    Student s = new Student;
    Other o = new Other;
    // do something with s and o
  }
}
```

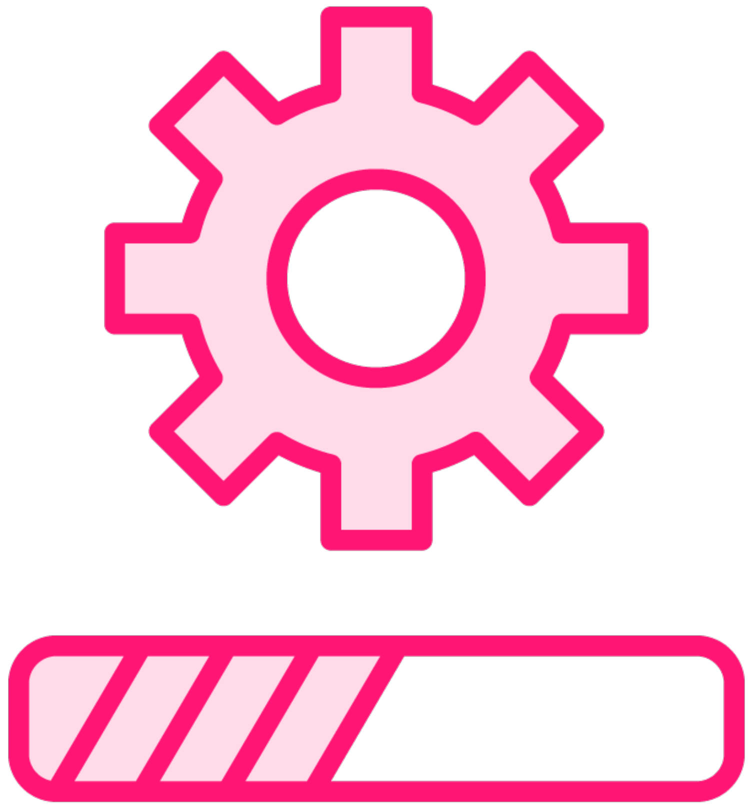
```
package com.pluralsight.training;
public class Student {...}
```

```
package com.jwhh.support;
public class Other {...}
```

```
C:\mydir>
```



Specifying Class Path



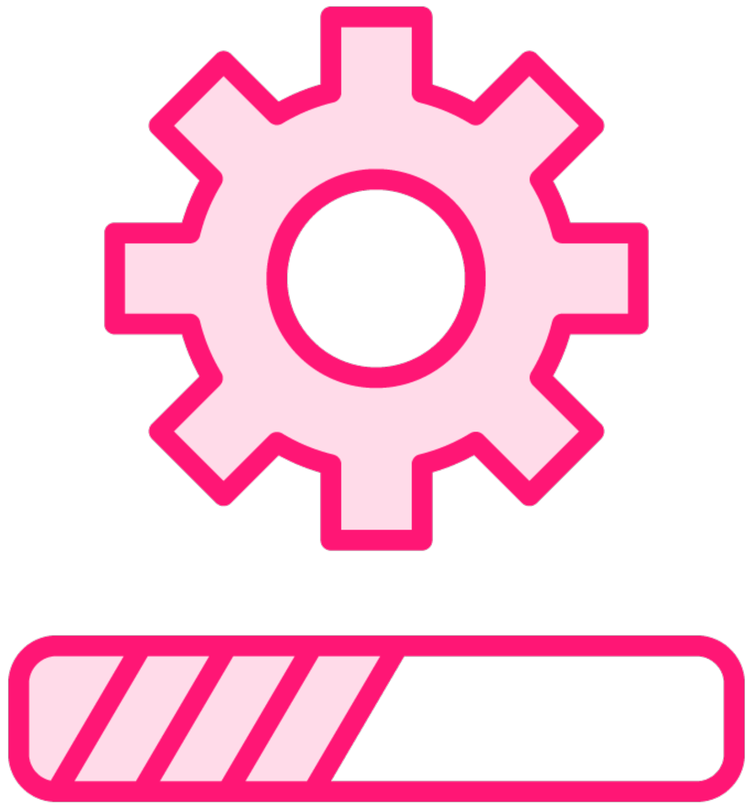
Can provide the list of paths to search

- Searched in the order they appear
- Current directory used only if in list

Two options for specifying class path

- Environment variable
- Java command option

Specifying Class Path as Environment Variable



Can specify as an environment variable

- Variable named CLASSPATH

Becomes default path

- Used by all programs that don’t provide a specific path

Use environment variable with caution

- Changing for one program can break another

Specifying Class Path as Environment Variable

```
C:\mydir>
C:\mydir>
C:\mydir>
```

Classes loaded from \otherdir

Classes loaded from \otherdir

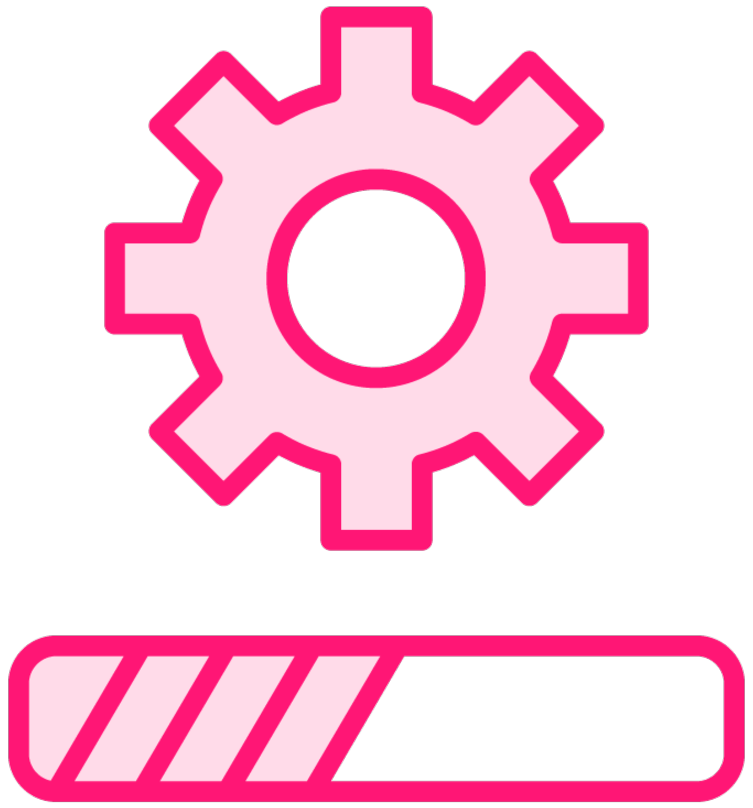
Specifying Class Path as Environment Variable

```
C:\mydir>
C:\mydir> java com.pluralsight.training.Main
C:\mydir> java com.pluralsight.accounting.Main
```

Classes loaded from \diffdir

Classes loaded from \diffdir

Class Path Structure



Paths provided as delimited list

- Windows: separate with ; (semicolon)
- Unix platforms: separate with : (colon)
- Searched in the order they appear

To reference classes in .class files

- Path to folder containing package root

To reference classes in jar files

- Path to the jar file
- Including jar file name

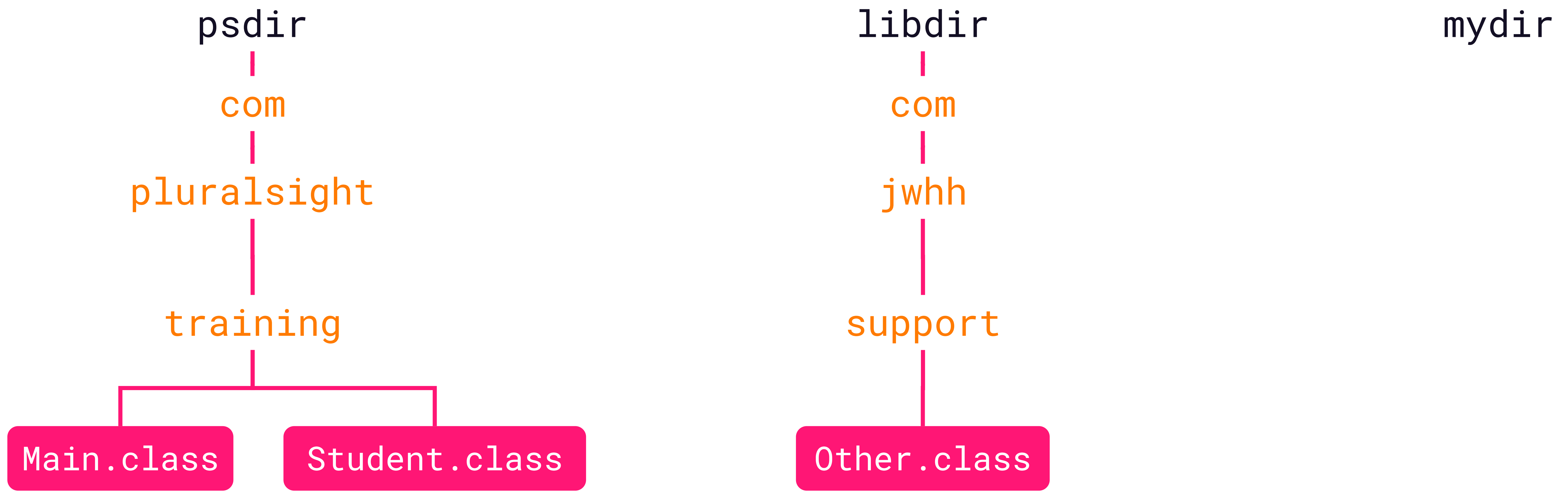
Class Path Structure

Windows

```
java
```

Unix platforms

```
java
```



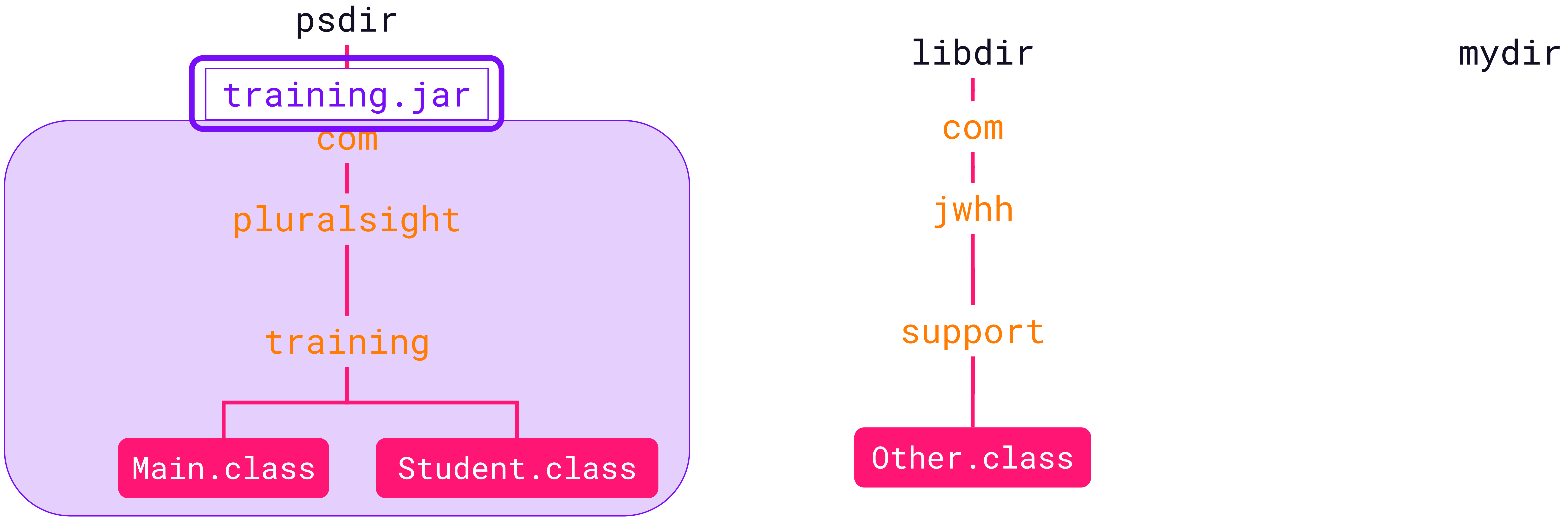
Class Path Structure

Windows

```
java
```

Unix platforms

```
java
```



Class Loading with Java –jar Option

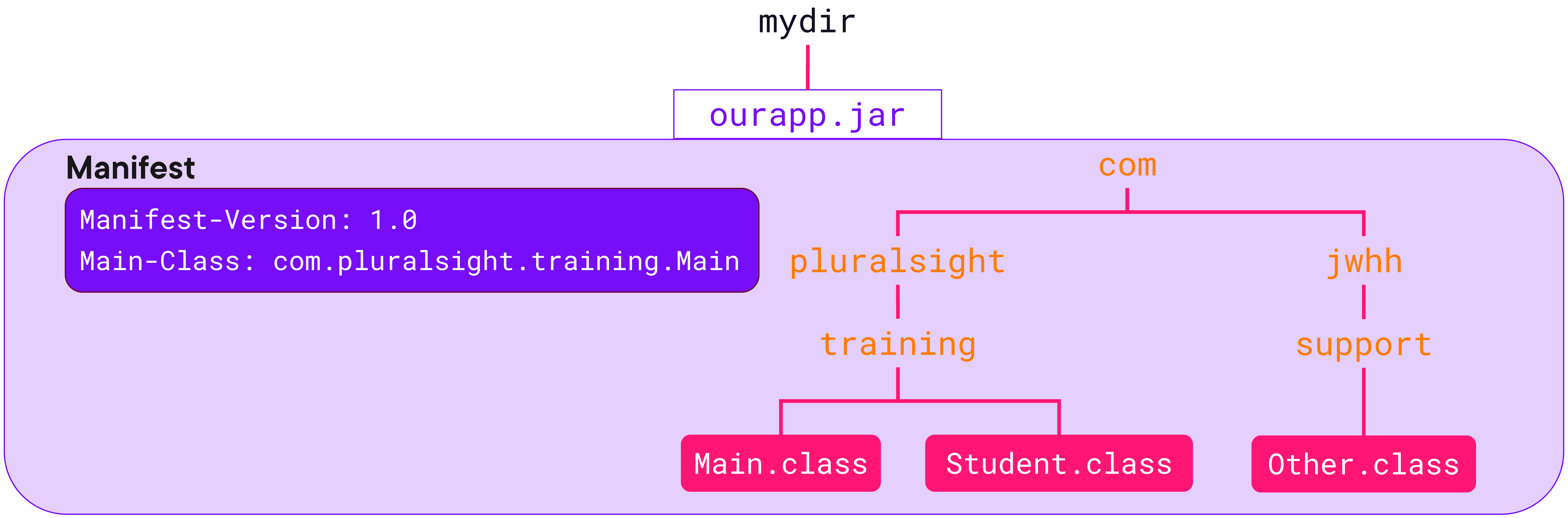
Java –jar option locks down class loading

- Class loading totally controlled by jar file
- No other class loading source is used

Provides tight control over class loading

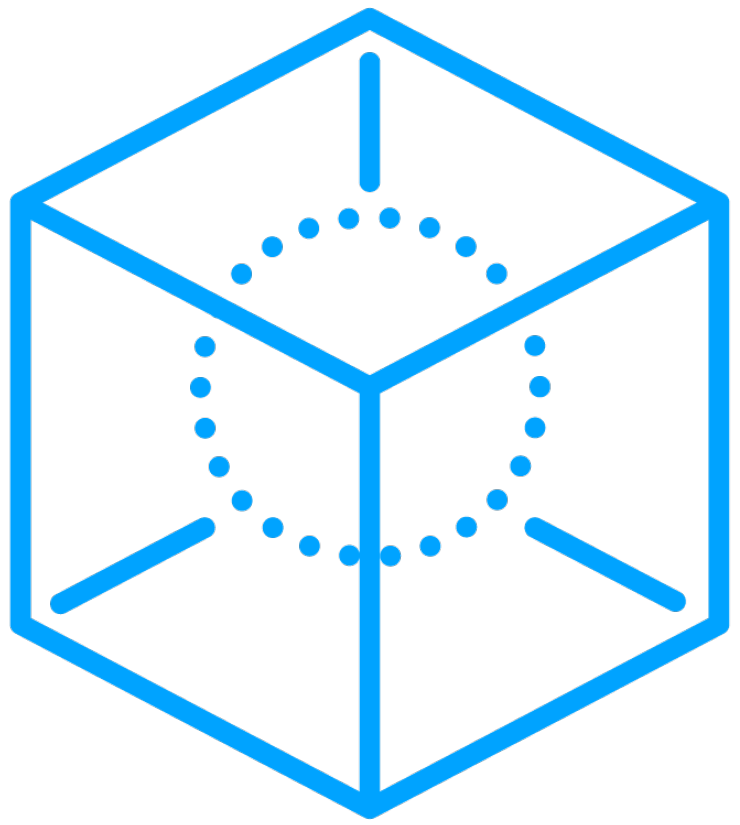
Class Loading with Java –jar Option

```
java
```



```
Manifest-Version: 1.0
Main-Class: com.pluralsight.training.Main
```

Execution Environment Information



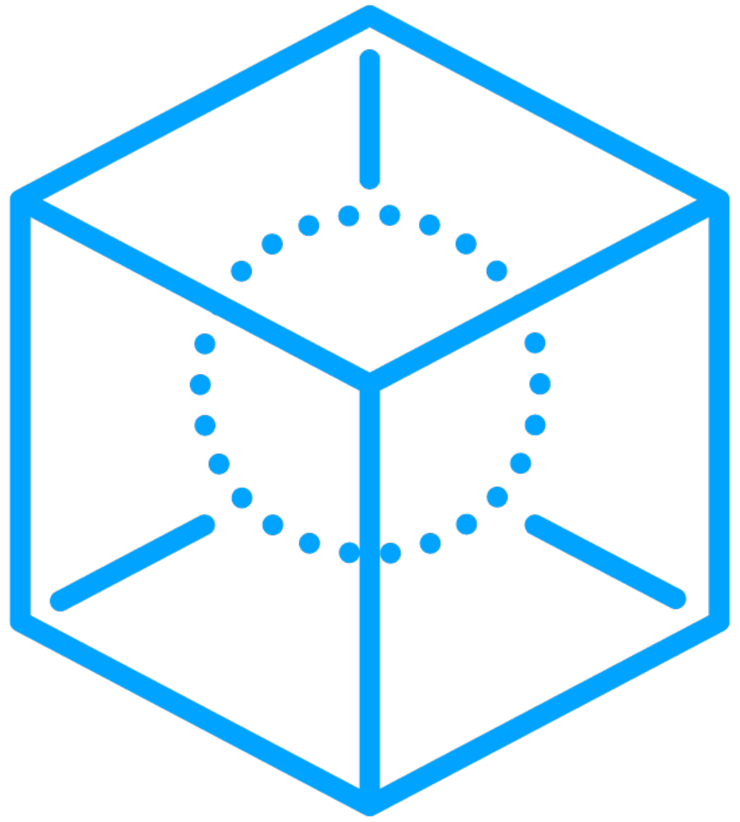
Apps often need environment information

- User information
- System information
- Java configuration information
- Application specific information

Java provides two common solutions

- System properties
- Environment variables

System Properties



Java provides info about environment

- Accessed with System.getProperty

Information includes

- User information
- Java installation information
- OS configuration information

Each value accessed via a string name

- List of commonly used properties:
  - bit.ly/javasystemprops

System Properties

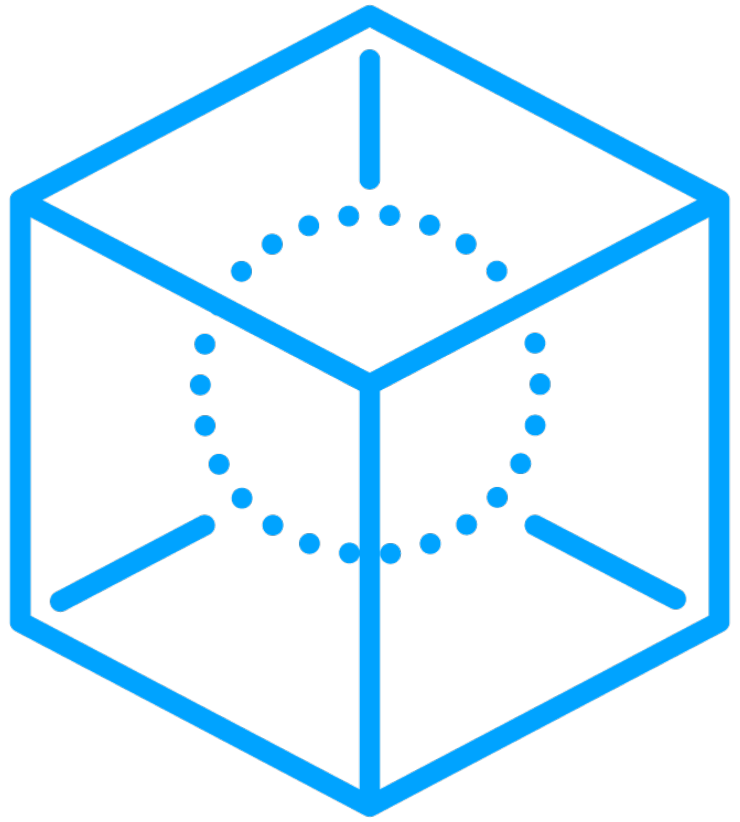
```
String userName = System.getProperty(“user.name”);

String userHome = System.getProperty(“user.home”);

String osArchitecture = System.getProperty(“os.arch”);

String javaVendor = System.getProperty(“java.vendor”);
```

Environment Variables



Most OS's support environment variables

- Provide configuration information
- Many variables are set by OS
- Can provide app-specific variables

Apps can access environment variables

Access all with System.getenv()

- Returns Map<String, String>

Access one with System.getenv(*name*)

- Returns value of specific variable

Environment Variables

Main.java

```
package com.pluralsight.app;
public class Main {
  public static void main {
    String compName = System.getenv(“COMPUTERNAME”);
    String sysRoot = System.getenv(“SystemRoot”);


    System.out.println(compName);
    System.out.println(sysRoot);

  }
}
```

```
>
  JIM_Y50
  C:\windows
```

Environment Variables

Main.java

```
package com.pluralsight.app;
public class Main {
  public static void main {
    String compName = System.getenv(“COMPUTERNAME”);
    String sysRoot = System.getenv(“SystemRoot”);
    String author = System.getEnv(“COURSE_AUTHOR”);

    System.out.println(compName);
    System.out.println(sysRoot);
    System.out.println(author);
  }
}
```

```
>
  JIM_Y50
  C:\windows
  null
```

Environment Variables

Main.java

```
package com.pluralsight.app;
public class Main {
  public static void main {
    String compName = System.getenv(“COMPUTERNAME”);
    String sysRoot = System.getenv(“SystemRoot”);
    String author = System.getEnv(“COURSE_AUTHOR”);

    System.out.println(compName);
    System.out.println(sysRoot);
    System.out.println(author);
  }
}
```

```
>
>
  JIM_Y50
  C:\windows
  Jim Wilson
```

Summary

Apps require more than just code

- Behavior is affected by many factors

Command line arguments

- Received as parameter to main method

Properties class provides name/value pairs

- Can persist across app executions
- Useful for preferences or simple app state
- Supports providing defaults
- Defaults can be included in app package

Summary

Class path controls where classes found

- Can set with CLASSPATH
- Use caution
- Changing for one app can affect others

Better to use Java command –cp option

- Sets path specific to each app

Execution environment info is available

- Java provides info in system properties
- OS environment variables accessible
- Can provide app-specific variables