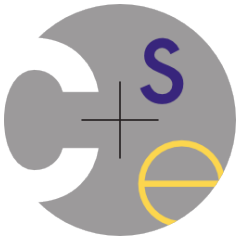
CSE332: Data Abstractions
Section 1



Nicholas Shahan

Winter 2015

Adapted from slides by Hye In Kim

Today

- Announcements
- Introductions
- Questions?
- Generics
- Project 1: Sound Blaster!
- Bugs & Testing
- Eclipse Tutorial

Announcements

- Project 1 is out
  - Phase A: Due Monday Jan 12th 11pm
  - Phase B: Due Thursday Jan 15th 11pm
- Written HW 1 is out
  - Due Friday Jan 16th

Introductions
Your TAs & Office Hours

- Nicholas Shahan: Mon at 10:30 in CSE 218
- Jack Warren: Tues at 3:30pm in CSE 220
- Conrad Nied: Wed at 10:30 in CSE 218
- Daphna Khen: Wed at 3:30 in CSE 218
- Matthew Gillette: Thurs at 3:30 in CSE 220
- Ian Turner: Fri at 2:30 in CSE 218
- cse332-staff@cs.washington.edu

Introductions – Now You

- Name
- Year
- What is a movie that stands out in your mind? (for any reason good or bad)

Questions

Any questions about the class so far?

Generics

- Technique of writing Class/Interface without specifying type of data it uses
- The data types will be specified when the Class/Interface is used
- Idea: class/interface can have type parameter
  - Typically denoted as T or E

Generics Example

- Want a Bag class to store items

```
public class Bag {  // Stores a String
    private String item;
    public void setItem(String x) { item = x; }
    public String getItem( ) { return item; }
}

public class Bag { // Stores a Book
    private Book  item;
    public void setItem(Book x) { item = x; }
    public Book getItem( ) { return item; }
}
```

- What is the problem here?

Generics Example

- Should not create a Bag class for every type
- Pre Java 5: Objects – DO NOT USE

```
public class Bag {
    private Object item;
    public void setItem(Object x ) { item = x; }
    public Object getItem() { return item; }
}

Bag b = new Bag();
b.setItem("String in the bag.");
String contents = (String) b.getItem();
```

- What is the problem here?

Generics Example

- Pre Java 5: Objects – DO NOT USE

```
Bag b = new Bag();                                  // Object Bag
b.setItem("String in the bag.");

String contents = (String) b.getItem();             // Ok
double contents = (double) b.getItem();             // Error (Runtime)
```

- Error appears at runtime
- Likely to crash ☹

Generics Example

- Should not create a Bag class for every type
- Using Java Generics

```
public class Bag<E> {
private E item;
public void setItem(E x) {  item = x; }
public E getItem( ) { return item; }
}

Bag<String> b = new Bag<String>();
b.setItem ("String in the bag.");
String contents = b.getItem();
```

- Why is this better?

Generics Example

- Should not create a Bag class for every type
- Using Java Generics

```
Bag<String> b = new Bag<String>();          // Generic Bag
b.setItem("String in the bag.");

String contents = (String) b.getItem();   // Ok
double contents = (double) b.getItem();   // Error (Compile time)
```

- Error appears at compile time ☺

Generics

- Why Generics?
  - Type Safe Containers
  - Compile-time type checking
  - No need to cast or manually check the type
- **Important:** Cannot create a generic array!

```
E[] myArray = new E[INITIAL_SIZE];                  // Error

@SuppressWarnings("unchecked")
E[] myArray = (E[]) new Object[INITIAL_SIZE];   // Ok
```

Project 1: Sound Blaster!

- Phase A
  - Implement Stack ADT: Stores double
    - Implement Dstack
    - Using Array (ArrayStack)
    - Using Linked List (ListStack)
- Phase B
  - Implement Stack ADT: Use generic
    - Implement GStack
    - Using Array (GArrayStack)
    - Using Linked List (GListStack)

Project 1: Sound Blaster!

- Reverse.java
  - Handles all music stuff
  - No need to edit for part A
  - Reverses in.dat file and writes it to out.dat
  - Accepts 4 command line arguments
    - Stack Implementation: array or list
    - Content type: double or generic
    - Input file name: (example) in.dat
    - Output file name: (example) out.dat
- Eclipse: Run with Command line arguments

Project 1: Sound Blaster!

- Sound Exchange (SOX)
  - Converts .wav file to .dat file & vice versa
    - Reverse.java needs .dat file
    - You need .wav file to play sound
  - Installed on lab machines
  - Use in terminal or command prompt
- Example Usage:

```
$> sox secret.wav secret.dat
```

Style Guide

- Style Points are up to 1/3 of your grade!!
  - Grade breakdown "roughly":
    - 1/3 correctness
    - 1/3 write up
    - 1/3 style
- Make sure you read style guides
  - 142/143 Style tips: http://courses.cs.washington.edu/courses/cse332/15wi/projects/style.pdf
  - 142/143 Unofficial Style Guide: http://courses.cs.washington.edu/courses/cse332/15wi/projects/style-guide.pdf
  - CSE 142/143 Unofficial commenting guide: http://courses.cs.washington.edu/courses/cse332/15wi/projects/commenting-guide.pdf
- We DO take points off for style!

Style Guide

- Make sure your code compiles without warnings
  - No correctness points if your code doesn't compile!!
  - Use default package or remove package statement
- Comment your code
- Follow Java convention: `this.isEmpty()` `//☹`
- Use descriptive variable and method names
  - If variable points to beginning of queue, name it something like 'front' or 'start', not 'w' or 'g'
- Use visibility specifiers (private/public etc.)
  - On every classes, methods, fields. Do not omit these!

Style Guide

- Initialize all non-static fields in constructor
- Make your code as concise and clear
- Use **`@Override`** when overriding
- Do not leave any warning-generating code
  - Suppress warnings only when you know exactly why it is there and why it is unavoidable
  - Suppress warnings on method/variable, but not on whole class

Style Guide

- Use constants instead of “magic numbers”
- Practice the art of “Boolean Zen”
- Maximize code reuse to minimize redundancy
  - For example: Re-use methods like `isEmpty()` instead of directly testing
  - also improves readability
- Note: a good compiler/run-time will in-line short methods so there is no loss in efficiency in doing this and it makes the code more readable.
- If any of these don’t make sense please ask!

Bugs & Testing

- Why Testing?
- Bugs can be costly
  - Cost points in homework
  - Can cost $$$ and even life (Therac-25)
- Interesting Bug References
  - List of bugs
    http://en.wikipedia.org/wiki/List_of_software_bugs
  - History's worst
    http://archive.wired.com/software/coolapps/news/2005/11/69355?currentPage=all
  - Bugs of the month
    http://www.gimpel.com/html/bugs.htm

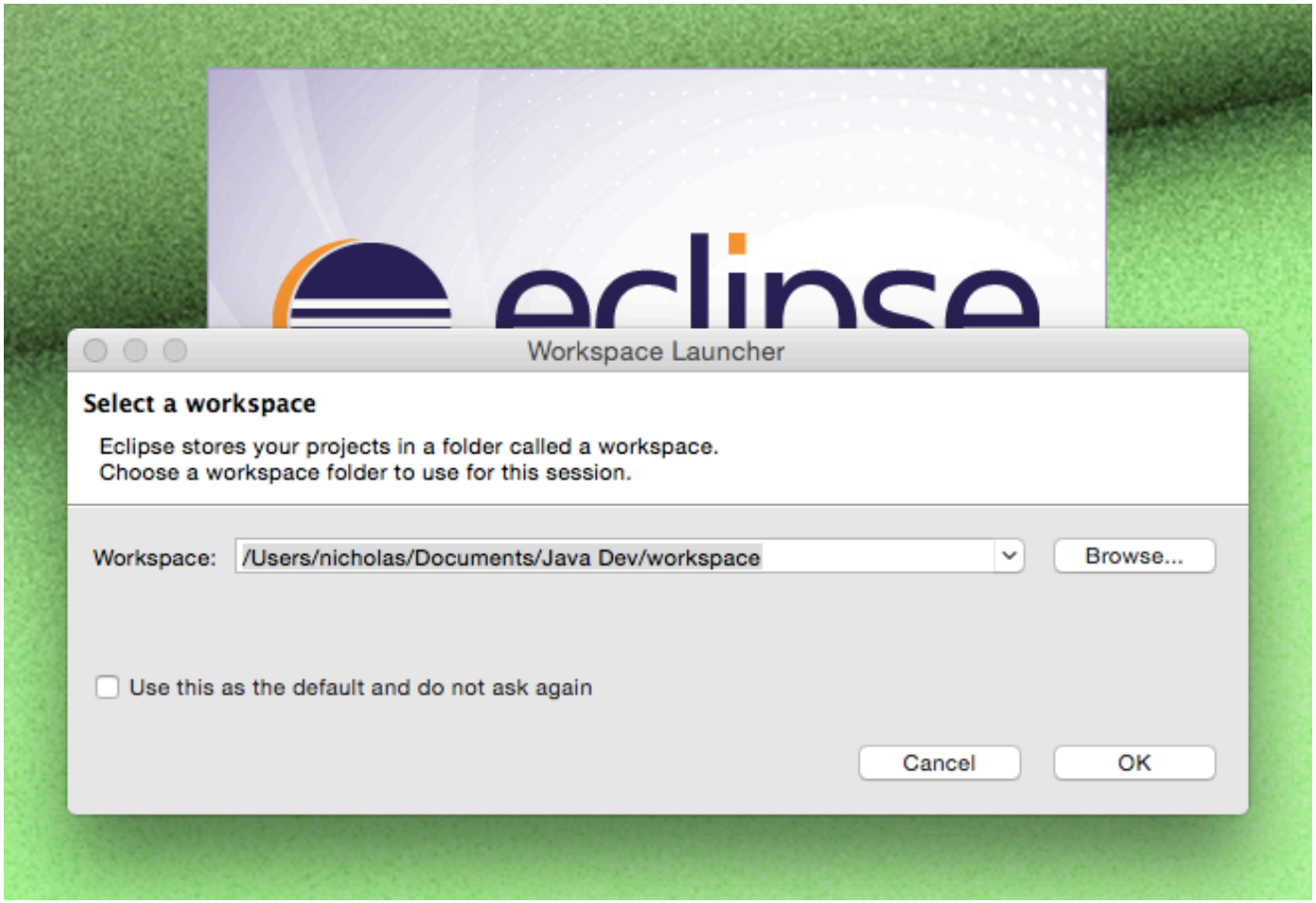
Bugs & Testing

- Tips for Testing
  - Make sure program meets the spec
  - Test if each method works independently
  - Test if methods work together
  - Test for edge cases
    - Empty stack
    - Push after resizing
    - Anything else?
  - Check against Java's Stack

Bugs & Testing

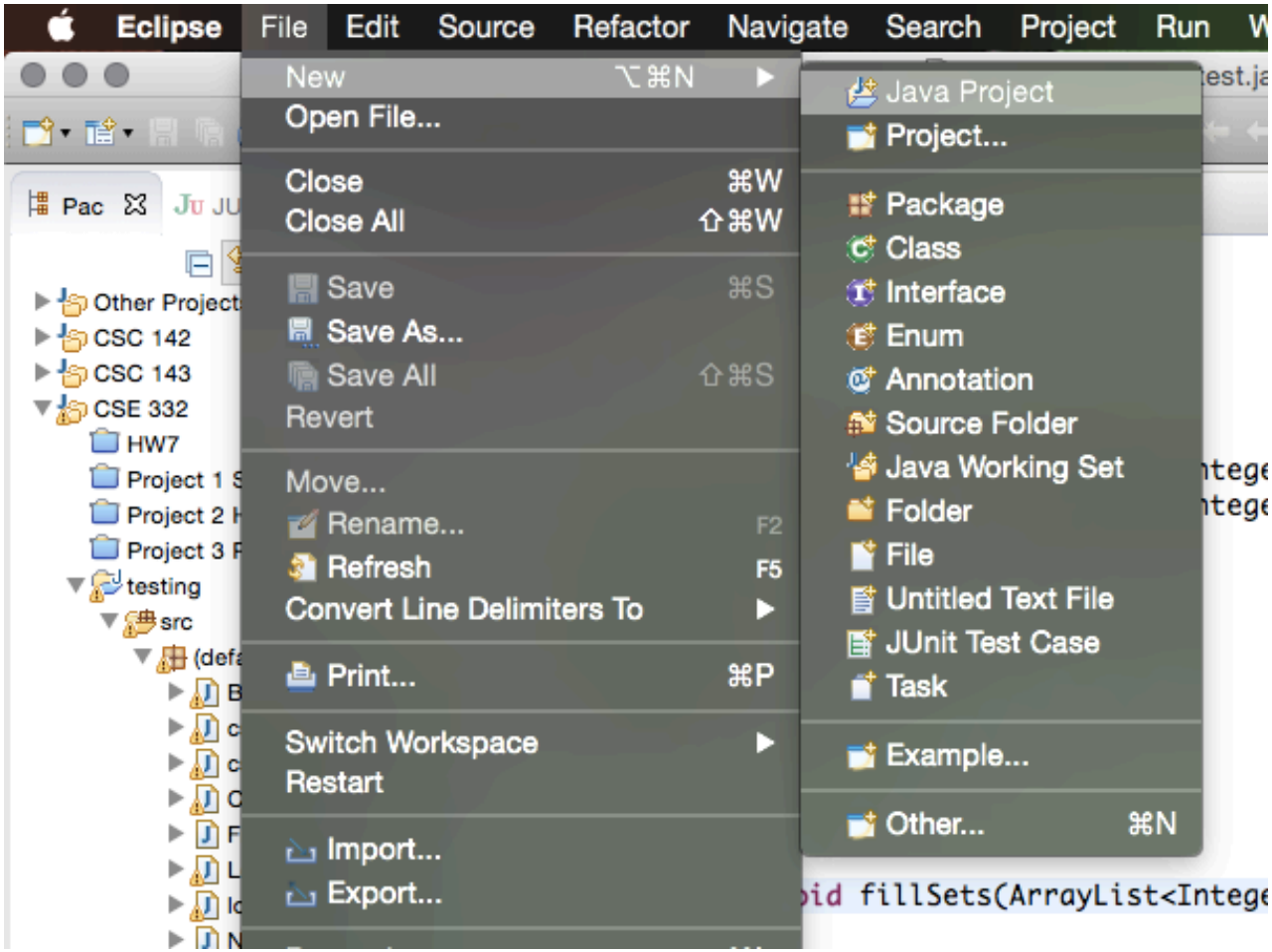
- Testing tools: JUnit Testing
  - Not required for Project 1
  - Required for Project 2
- Covered in a later section
  - If you are curious now, lets talk during office hours

Eclipse Tutorial



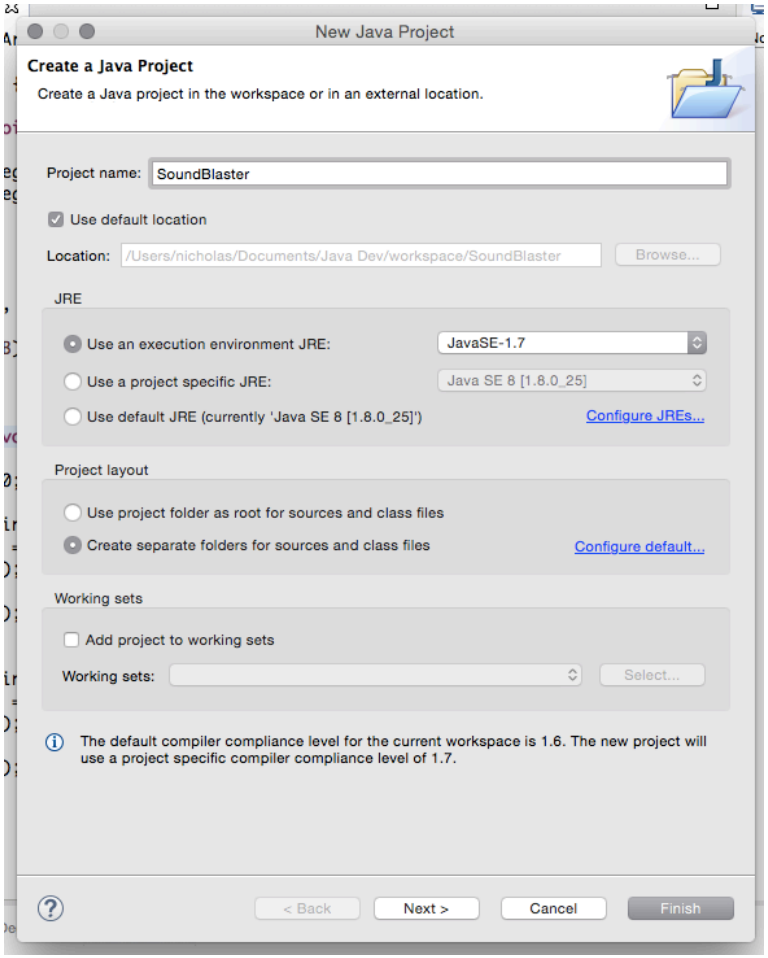
Select a workspace

Eclipse Tutorial



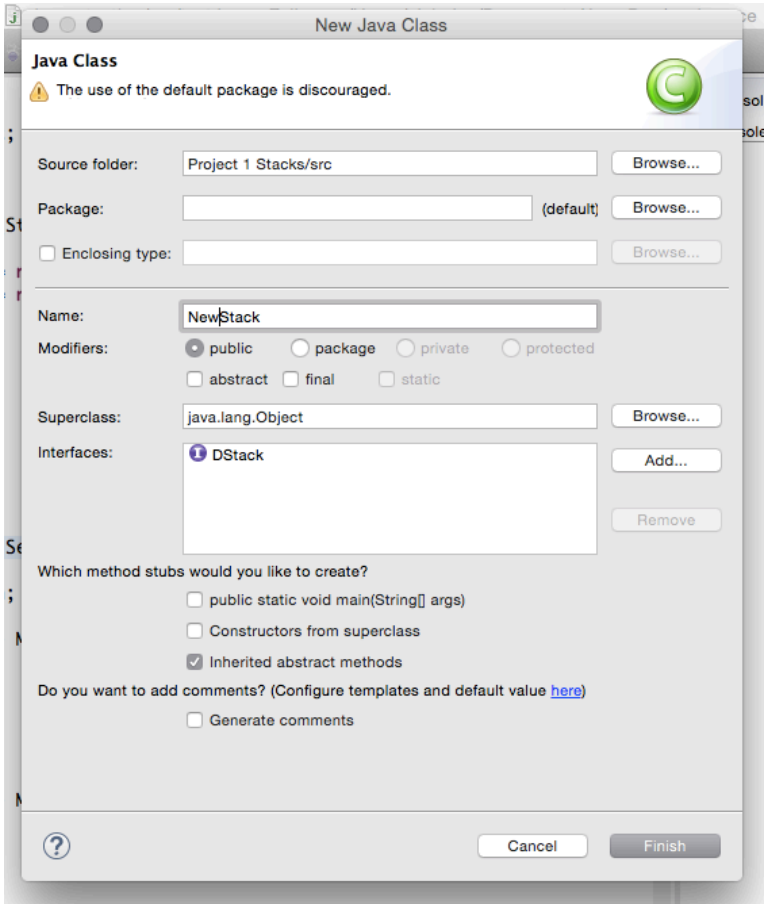
Create a new project

Eclipse Tutorial



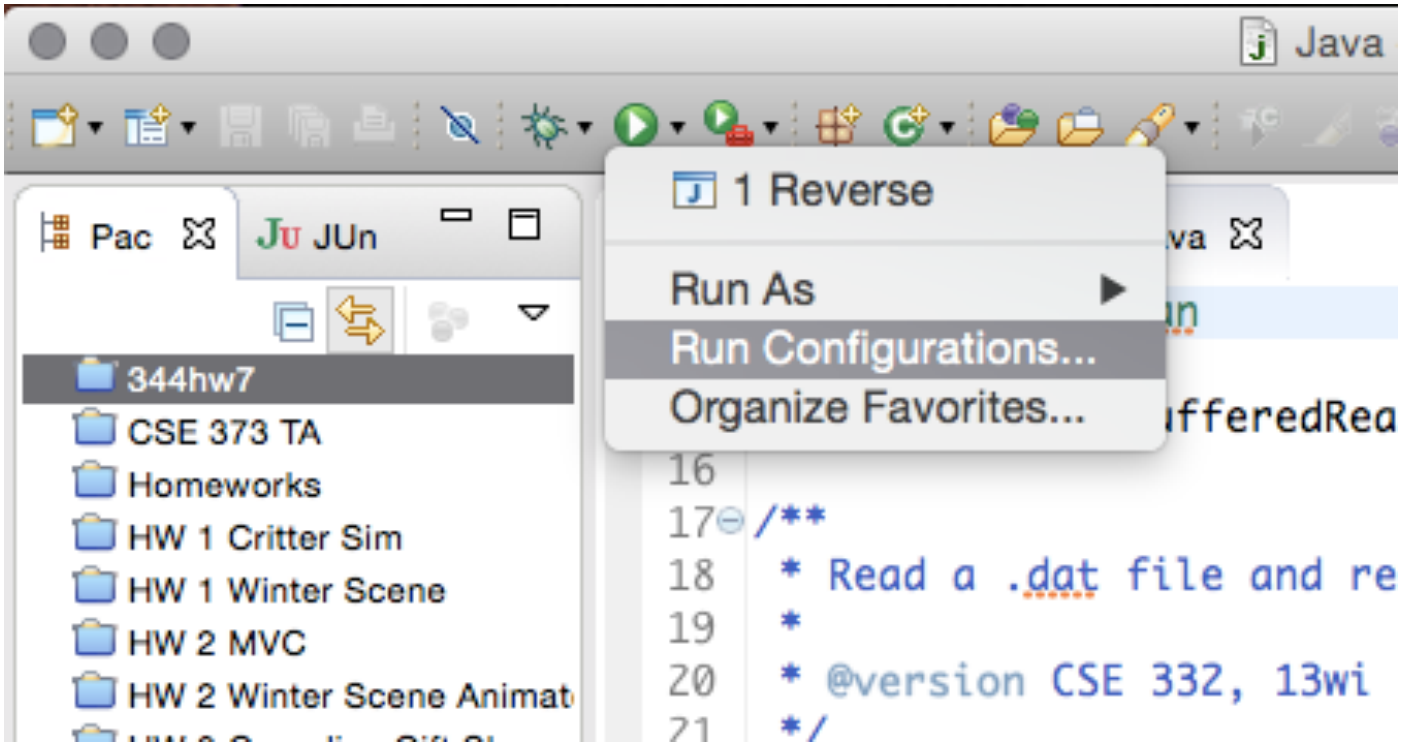
Select the new project options

Eclipse Tutorial



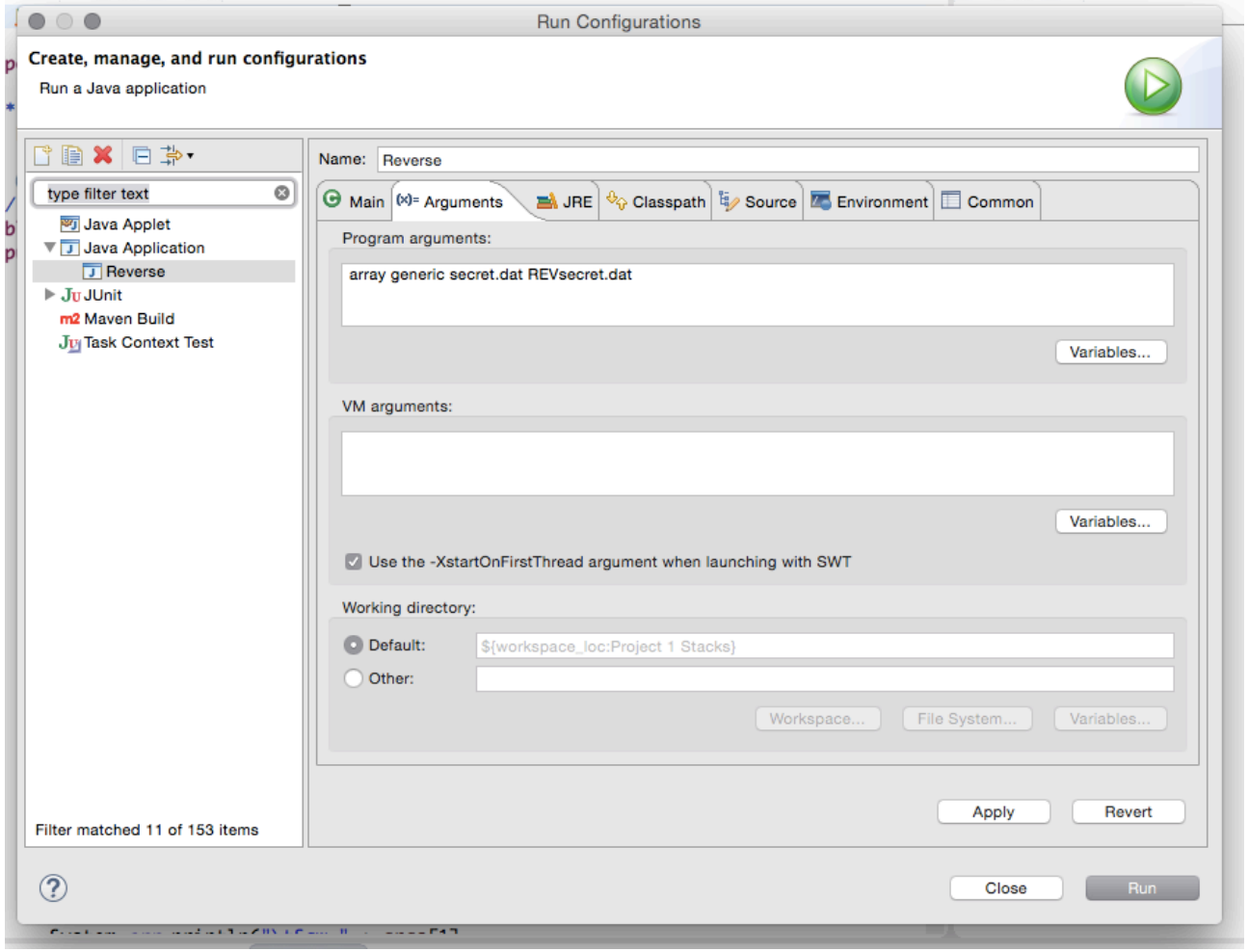
Create a new class

Eclipse Tutorial



Run Configurations (command line arguments)

Eclipse Tutorial



Run Configurations (command line arguments)

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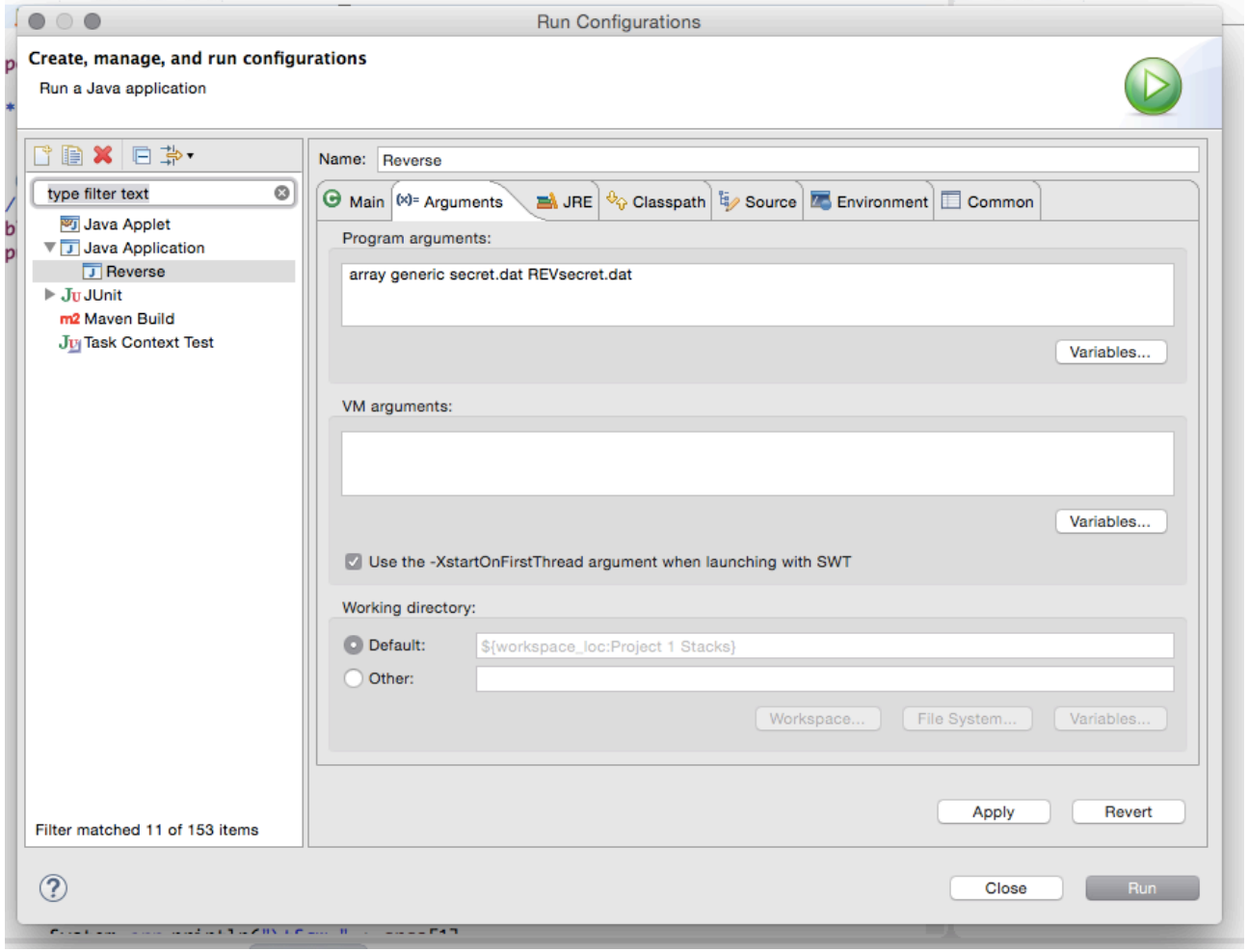

Run Configurations (command line arguments)

Eclipse Tutorial

- More Tutorials
  - Written Tutorial
    http://www.vogella.com/articles/Eclipse/article.html
  - Video Tutorial
    http://eclipsetutorial.sourceforge.net/totalbeginner.html
  - Eclipse Shortcut Keys
    http://www.rossenstoyanchev.org/write/prog/eclipse/eclipse3.html