Basic Python Programs, Software Engineering Tools

Rose-Hulman Institute of Technology

Computer Science and Software Engineering

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Announcements

- Homework timing:

Day assigned	Reading quizzes due (next class)	Other parts of assignments due (at least 48 hours)
Tuesday	Thursday	Thursday
Thursday	Friday	Monday
Friday	Tuesday	Tuesday

Q1

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Who wants to share?

Sample Animations

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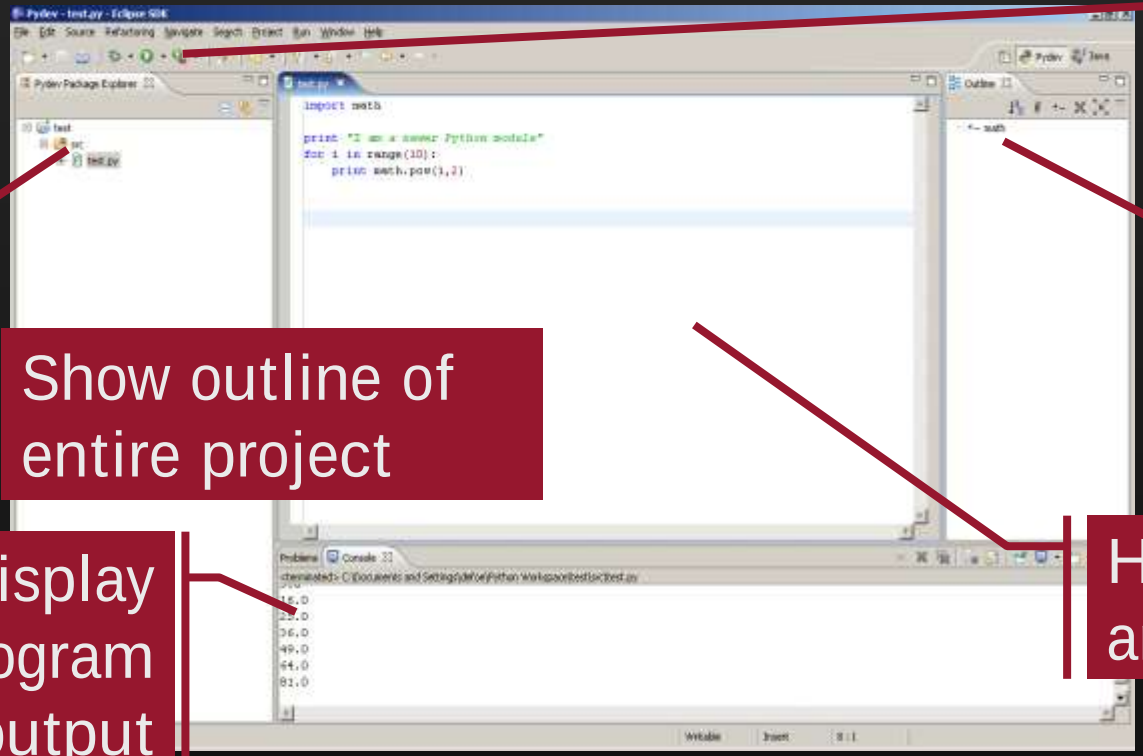
Outline

- Goals for today:
  - Get started with Eclipse and Subversion
  - Learn and practice writing small programs
    - Functions
    - The main function
    - The input-compute-output pattern
    - Examples: chaos, temperature, kph

Integrated Development Environments

- What do they do?
- Why use one?
- Our IDE – Eclipse

IDEs – What do they do?



Let us compile, run, and debug

Show an outline of our module (file)

Show outline of entire project

Display program output

Help us enter and edit code

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IDEs – Why use one?

- Harness the power of the computer to make us more productive!

IDEs – Why Eclipse?

- Powerful
- Easy to use
- Free and open-source
- An IDE for any language, not just Python

Basic concepts in Eclipse

- *Workspace* – where your projects are stored on your computer
- *Project* – a collection of files, organized in folders, that includes:
  - Source code
  - Compiled code
  - Design documents
  - Documentation
  - Tests
  - And more…

Setting up Eclipse

- Just need to do this the first time!
- Follow along with me
  - We will:
    - Open Eclipse
    - Set the workspace
    - Switch to the Pydev perspective
  - If your setup is different, see
    - http://www.rose-hulman.edu/class/csse/resources/Eclipse/installation.htm

Follow Along…

1. *File ➢ New ➢ Pydev Project*
2. *File ➢ New ➢ Pydev Module*
3. Type `print("hello world")`
4. Run the program
5. Type a few more *print* statements, including one that is wrong.
   - See where the error message appears and how clicking on it brings you to the offending line.

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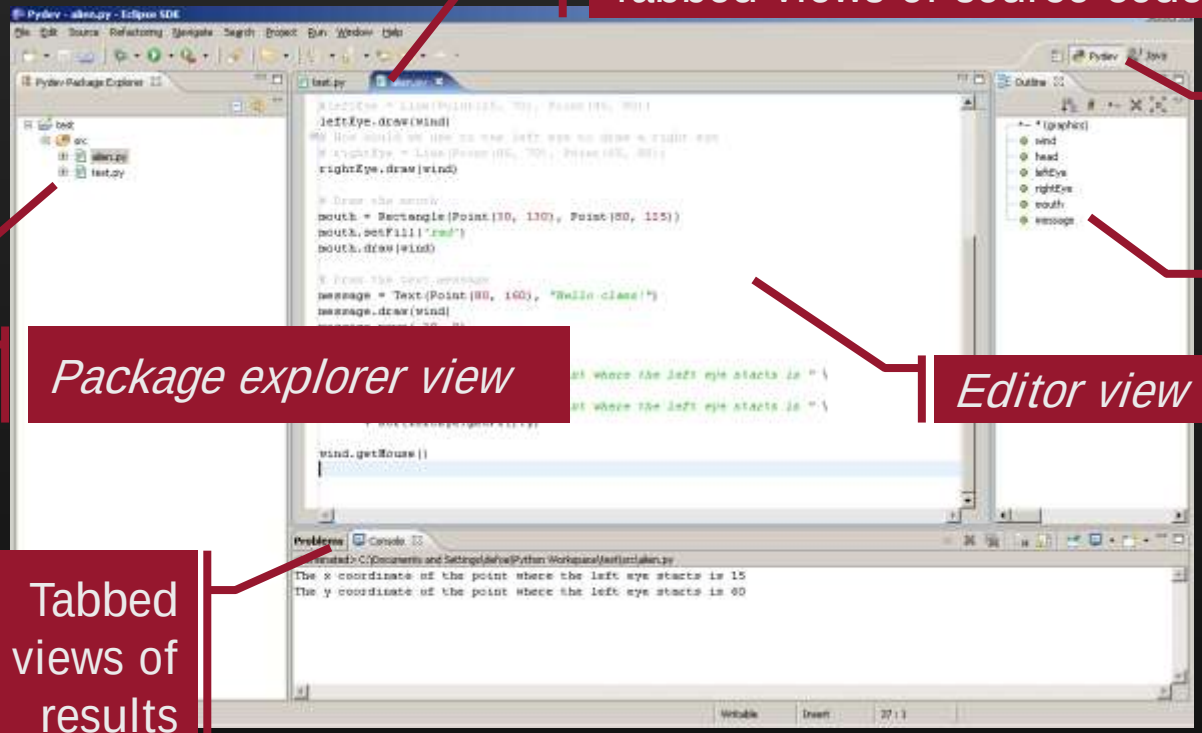
Views, Editors, PyDev Perspectives



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Eclipse in a Nutshell

- *Workspace* – where your *projects* are stored on your computer
- *Project* – a collection of files, organized in folders, that includes:
  - *Source code* and *Compiled code* and more
- *Workbench* – the tool in which to work
  - It has *perspectives* which organize the *views* and *editors* that you use
- *View* – a "window within the window"
  - displays code, output, project contents, debugging info, etc.

Eclipse in a Nutshell

- *Workspace* – where your projects are stored on your computer
- *Project* – a collection of files, organized in folders
- *Perspective* – a set of views and editors
- *View* – an area of a window showing focused information (code, outline, results, etc.)

Software Engineering Tools

- IDEs, like Eclipse and IDLE
- Version Control Systems, like Subversion
- Testing frameworks, like JUnit
- Diagramming applications, like UMLet, Violet and Visio
- Modeling languages, like Alloy, Z, and JML
- Task management trackers like TRAC

Version Control Systems

Store “snapshots” of all the changes to a project over time

Version Control Systems

- Benefits for individual work:
  - Logging and Backups
  - Act as a “global undo” to whatever version you want to go back to
  - Maintain a log of the changes made
  - Can simplify debugging

Version Control Systems

- Benefits for group work:
  - Multiple users can share work on a project
  - Record who made what changes to a project
  - Provide help in resolving conflicts between what the multiple users do
  - Maintain multiple different versions of a project simultaneously

Version Control Systems

- Benefits for course work:
  - Three click turn in for programming projects
  - Get back comments from the grader right in the code
  - No more ANGEL drop boxes!

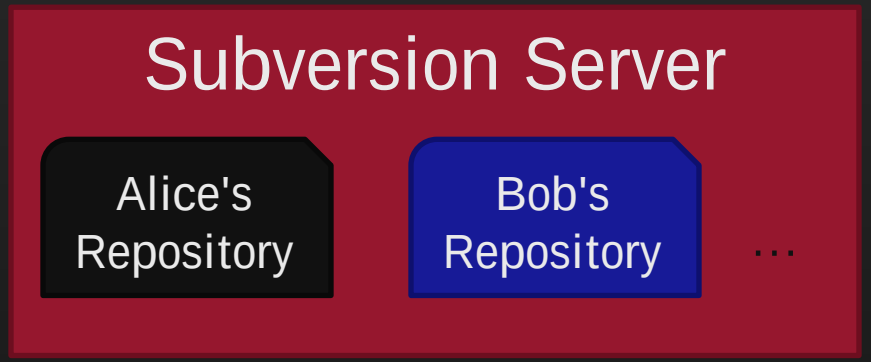
Our Version Control System

- Subversion, sometimes called SVN
- A free, open-source application
- Lots of tool support available
  - Works on all major computing platforms
  - *TortoiseSVN* for version control in Windows Explorer
  - *Subclipse* for version control inside Eclipse

Q2a

Version Control Terms

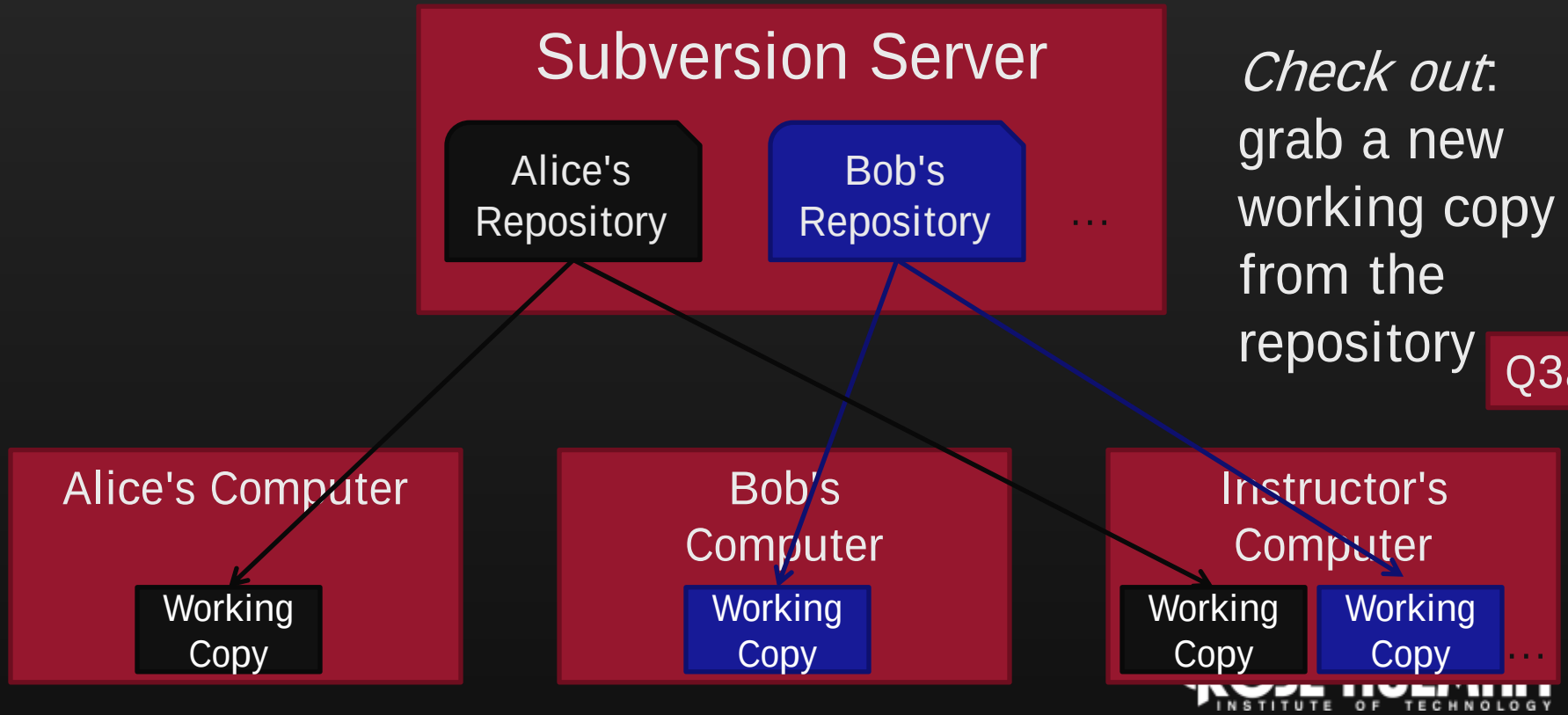
Repository: the copy of your data on the server, includes all past versions



Working copy: the current version of your data on your computer

Q2b

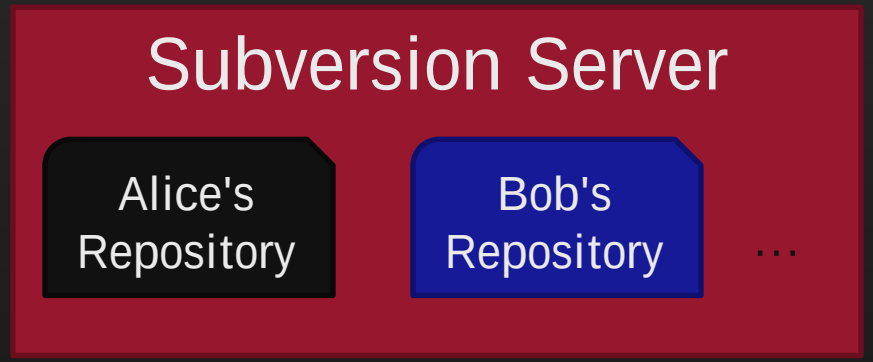
Version Control Steps—Check Out



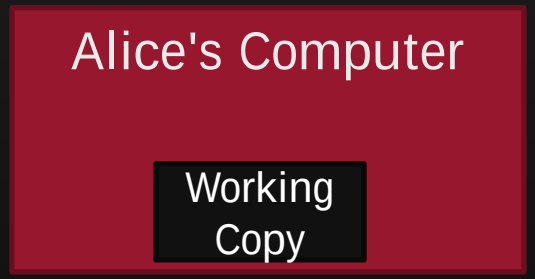
Check out: grab a new working copy from the repository

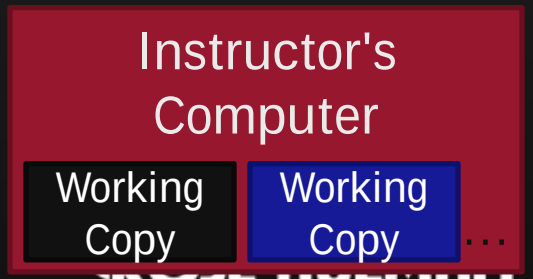
Q3a

Version Control Steps—Edit

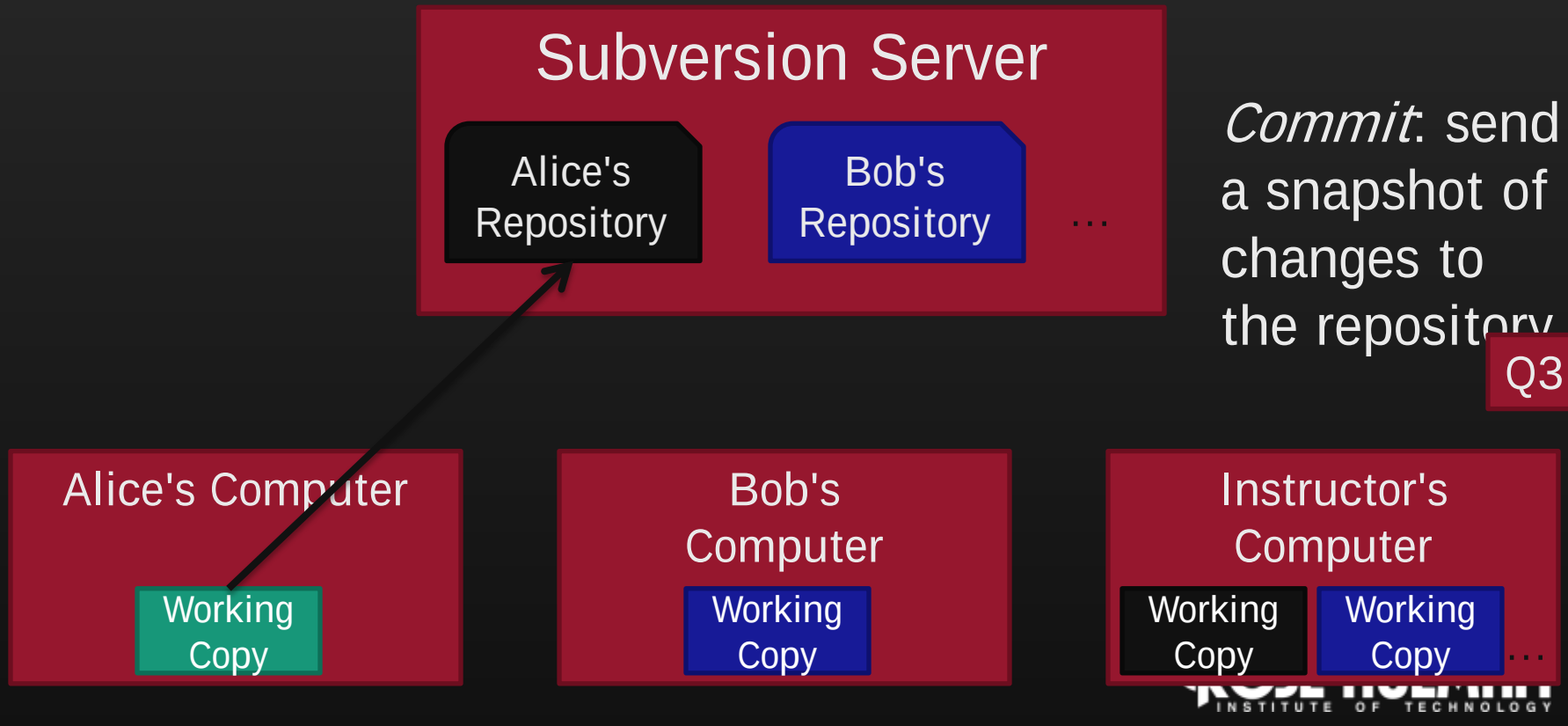


Edit: make *independent* changes to a working copy





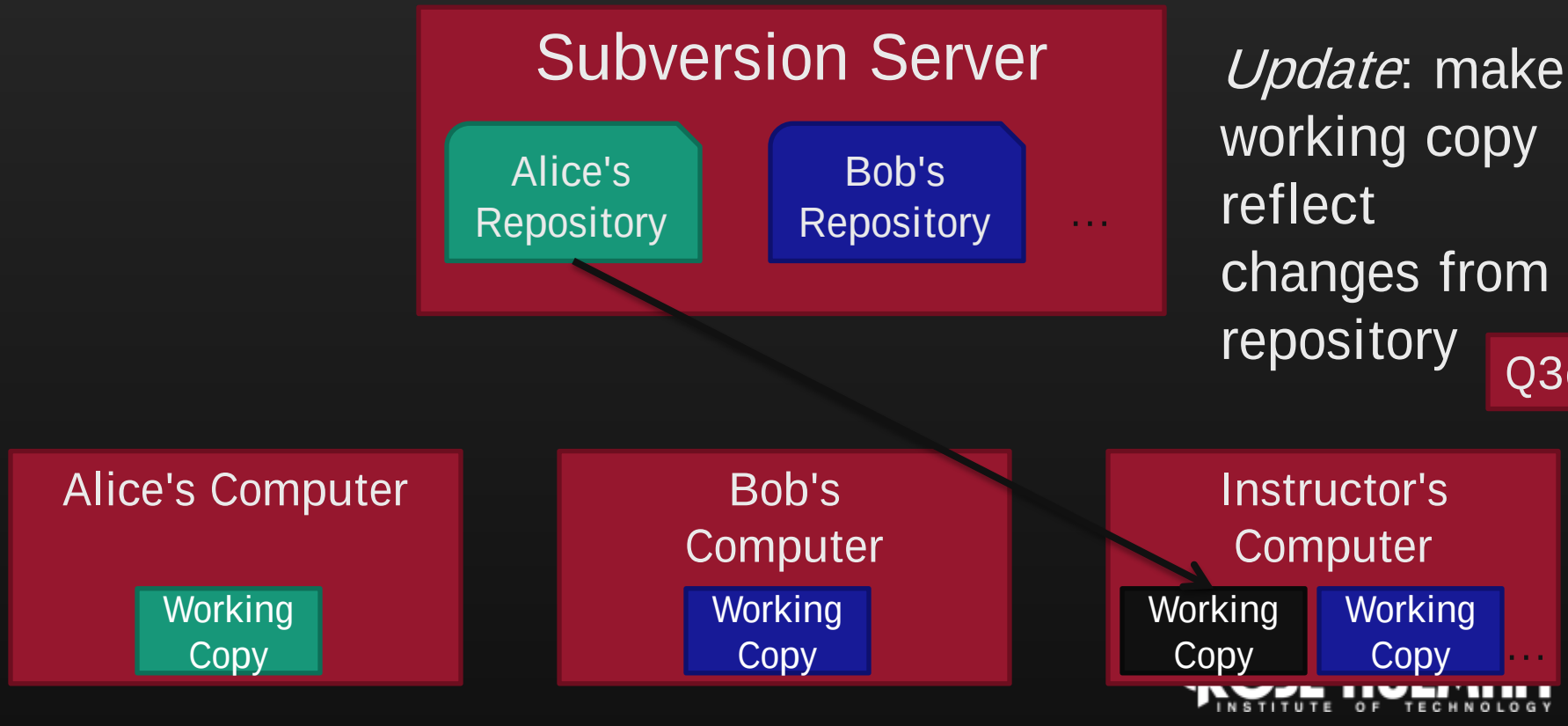
Version Control Steps—Commit



Commit: send a snapshot of changes to the repository

Q3b

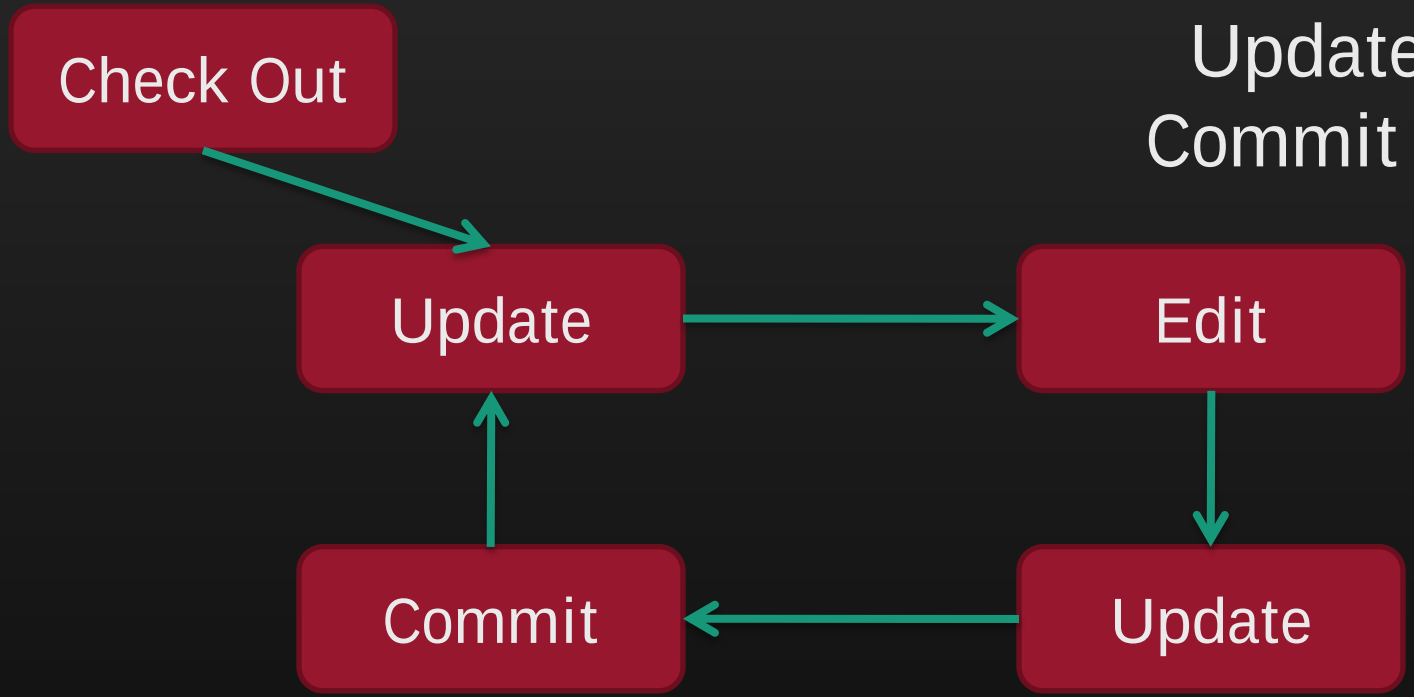
Version Control Steps—Update



Update: make working copy reflect changes from repository

Q3c

The Version Control Cycle



Check out today's exercise

- Follow along
- You'll need:
  - Subversion URL from Homework 2
  - SVN password sent in an email recently

Functions

- Examine your hello.py module in your Eclipse project.
- *Functions*
  - Named sequences of statements
  - Can *invoke* them—make them run
  - Can take *parameters*—*changeable* parts

Parts of a Function Definition

Defining a function called “hello”

```
>>> def hello():
        print("Hello")
        print("I'd like to complain about this parrot")
```

Indenting tells interpreter that these lines are part of the hello function

Entering a blank line tells interpreter that we’re done defining the hello function

Defining vs. Invoking

- *Defining* a function says what it should do
- *Invoking* (calling) a function makes that happen
  - Parentheses tell the interpreter to invoke the function

```
>>> hello()
Hello
I'd like to complain about this parrot
```

  - Later we'll define functions with *parameters*

Q4

Identifiers: Names in Programs

- Uses of identifiers so far…
  - Modules
  - Functions
  - Variables
- Rules for identifiers in Python
  - Start with a letter or _ (the “underscore character”)
  - Followed by any sequence of letters, numbers, or _
- Case matters! **spam** ≠ **Spam** ≠ sPam ≠ **SPAM**
- Choose descriptive names!

Q5a

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Reserved Words

- Built-in names, can't be used as identifiers
- Python reserved words:

and	del	for	is	raise
assert	elif	from	lambda	return
break	else	global	not	try
class	except	if	or	while
continue	exec	import	pass	with
def	finally	in	print	yield

Q5b

Don’t redefine function names!

- Examples that trip me up:
  - *len* – used to find the length of a list
  - *max*
  - *min*

Expressions

- Fragments of code that produce or calculate new data values
- Examples
  - *Literals*: indicate a specific value
  - *Identifiers*: evaluate to their assigned value
  - *Compound expressions* contain other expressions:
    - E.g., 3 + 4 * 2
- Can use parentheses to group

Q6,7

Recall…

- Programming languages have precise rules for:
  - Syntax (form)
  - Semantics (meaning)
- Computer scientists use *meta-languages* to describe these rules
- Example…

Output Statements

- Syntax:
  - print()
  - print(<expr>)
  - print(<expr>, ...)
  - print(<expr>, ..., **end=**<str>)
- Are these allowed?
  - print("The answer is:", 7 * 3 * 2)
  - print(3, 5, 7, end="")
- Semantics?

A “slot” to be filled with any expression

Repeat indefinitely as many times as desired, zero or more

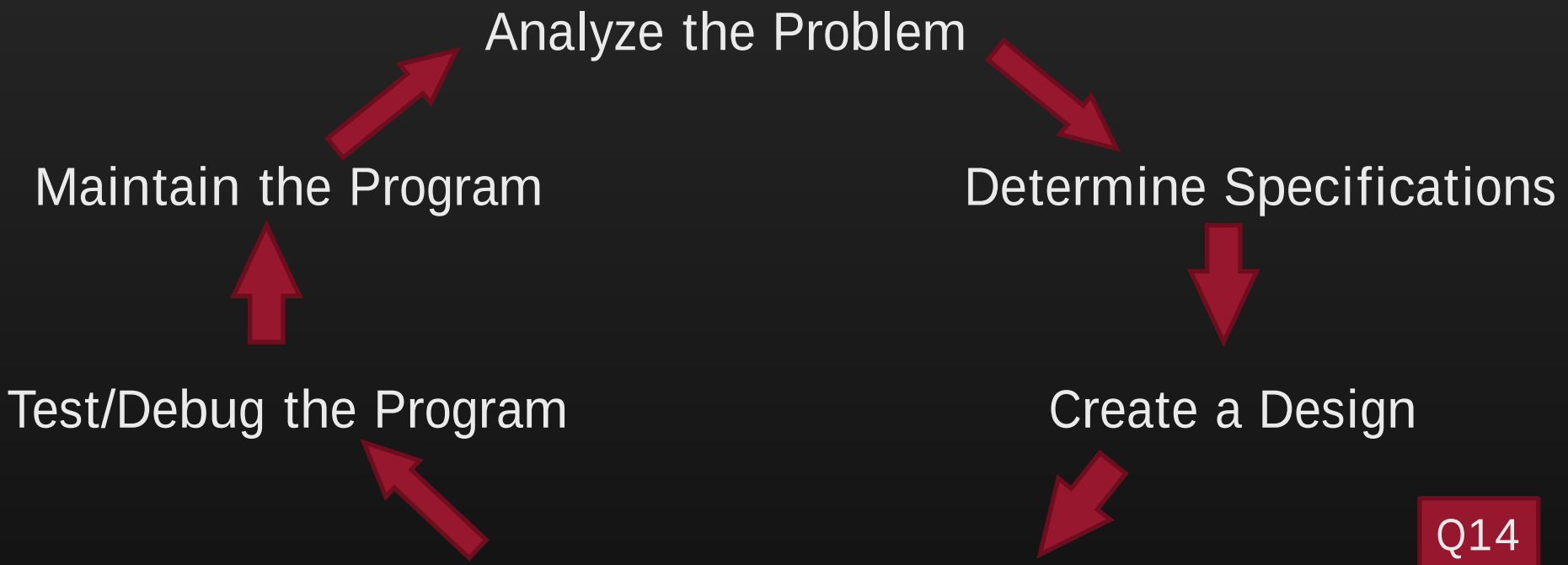
Q8

The *input-compute-output* pattern

- Examine the chaos.py module in your Eclipse project.
- Do the TODOs in it.
  - I'll demo some of them with you.

Q9-13

The Software Development Process



Q14

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More input-compute-output practice

- Examine the temperature.py module in your Eclipse project
- Do the TODOs in it

Homework

- Hand in quiz
- Begin homework
  - Find it from the Schedule page
  - Reading and ANGEL quiz due Friday.
  - Rest (programming part) due Monday at the time of your regular class session.