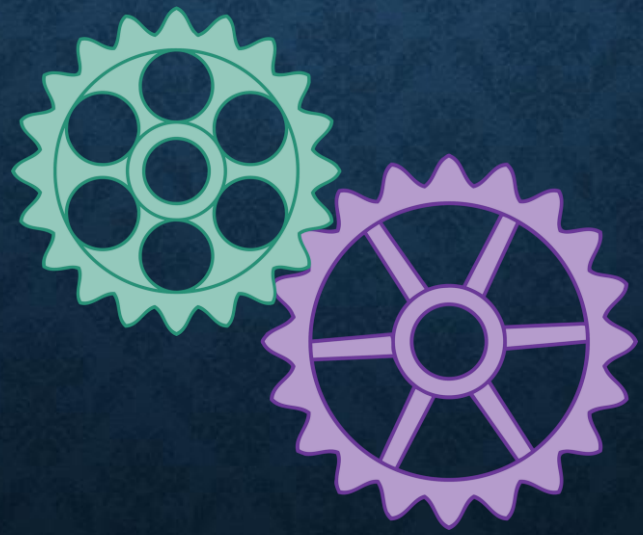
SOFTWARE ENGINEERING

"What one programmer can do in one month, two programmers can do in two months."

– Fred Brooks



WHAT IS SOFTWARE ENGINEERING?

Software engineering is the **process** by which we build software systems…

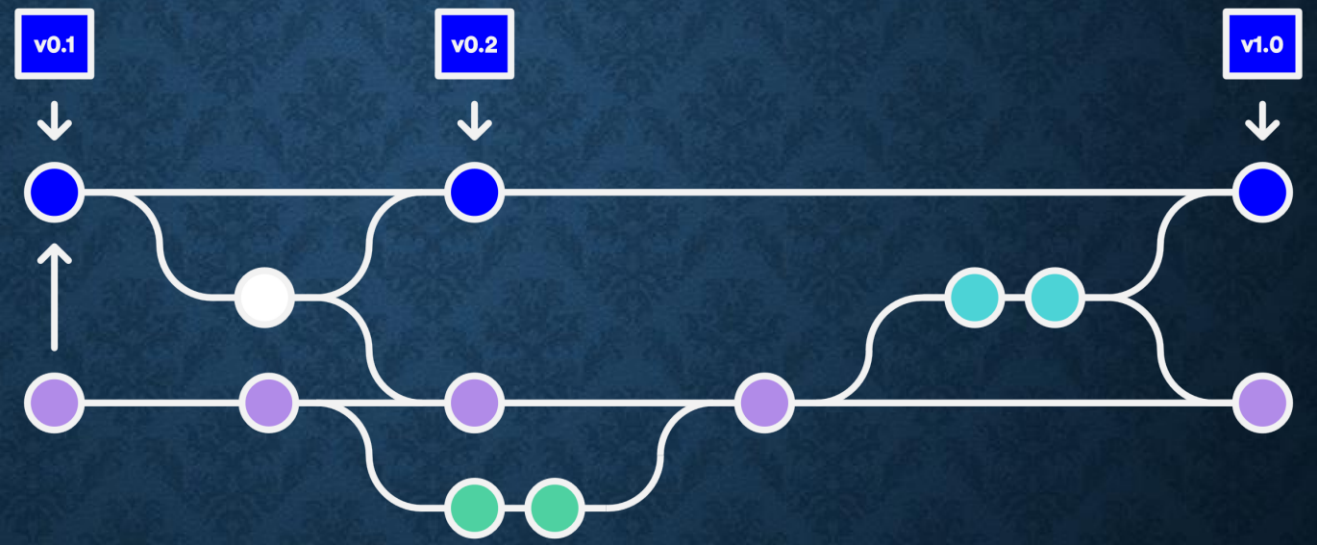
- Social Interaction
- Design
- Development
- Iteration
- Release
- Support
- Maintenance

Software engineering is not just programming; it lasts for the software's lifetime.

VERSION CONTROL: WHY?

Programmers are…

- Awesome, and…
- Brilliant, but…
- Human, and…
- Must work together.

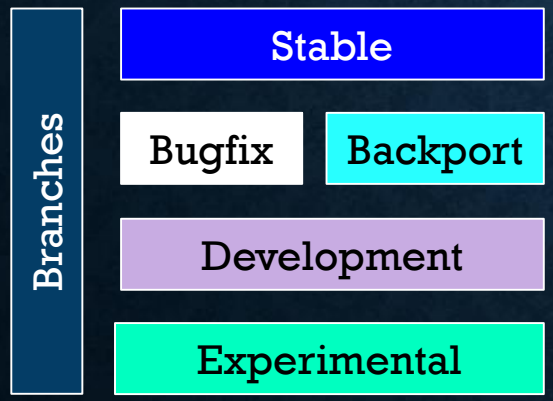


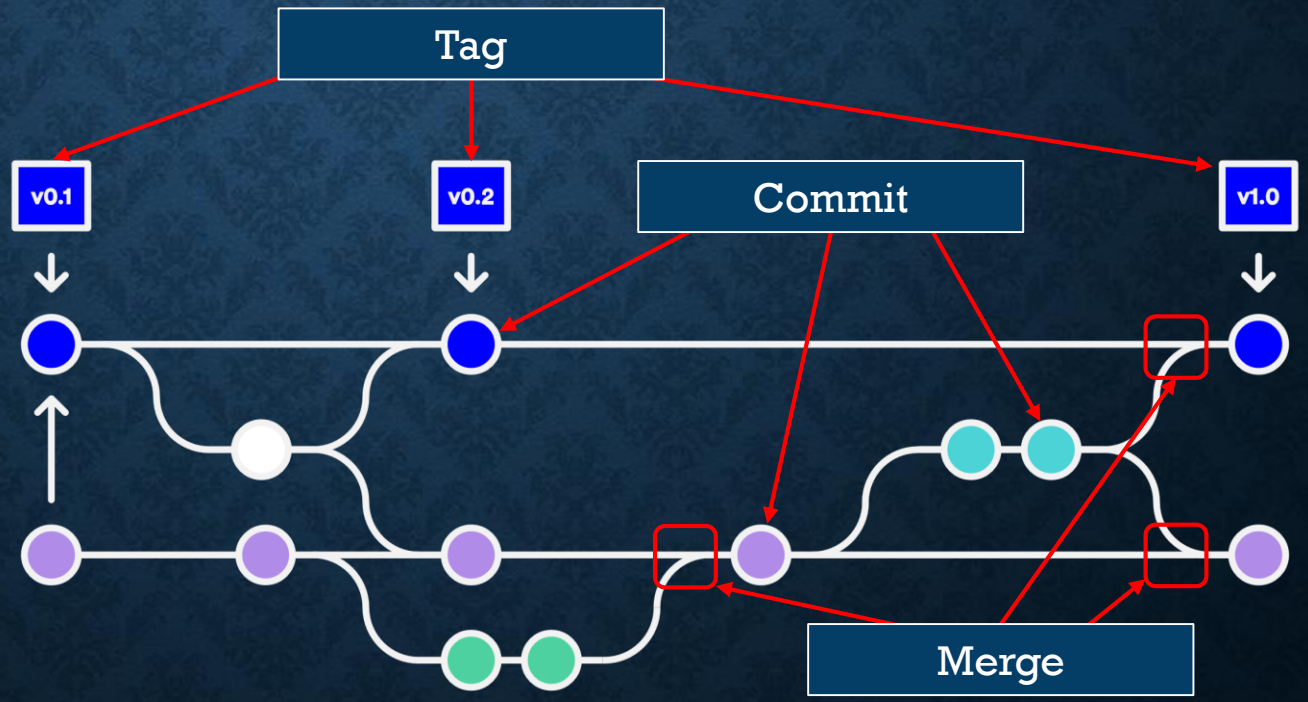
We must plan to fail. **Version control** (**revision control**, **source control**) protects us from our own stupidity and faulty nature by storing changes!

VERSION CONTROL BASICS

Version control…

- Is based on **commits**
- Can have **branches**
- Supports **merging**
- Usually supports **tags**

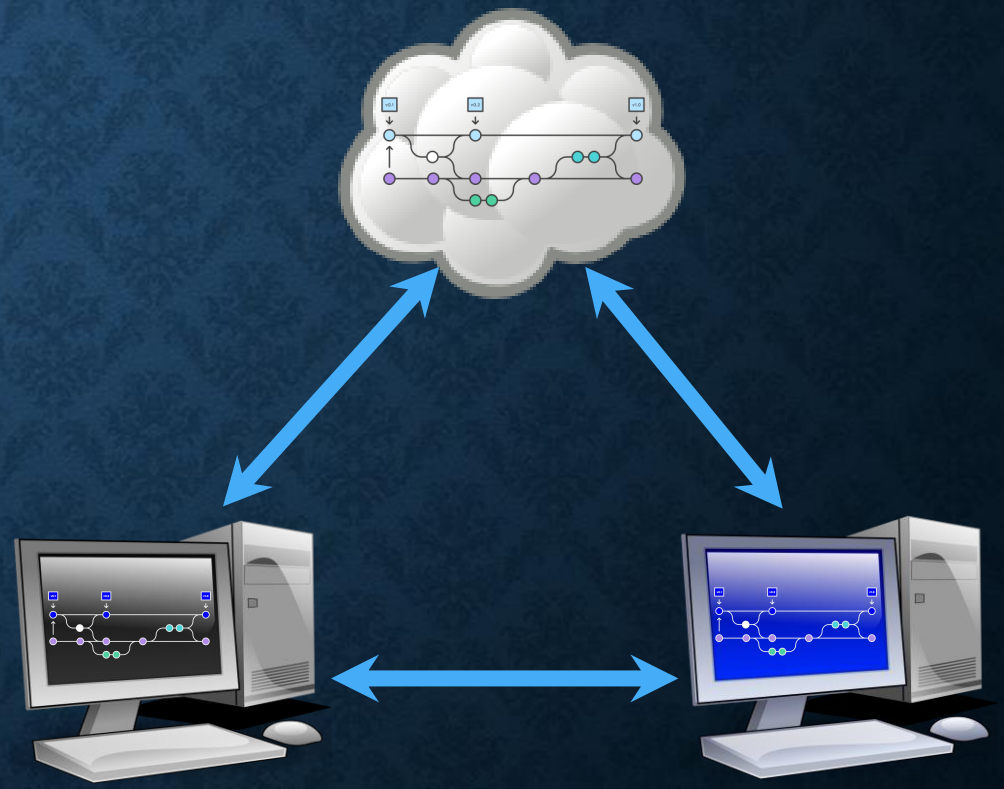




GIT: DISTRIBUTED VERSION CONTROL

Git is a **distributed** version control system.

- Everyone has a copy of the **repository**
- May or may not have central repository
- Commits are **local** until they are **pushed**
- "Commit early and often" (low cost)



AND NOW FOR A DEMONSTRATION…

There are many tools that can be used for Git repositories.

We will support the SourceTree GUI app on Windows and MacOS.

- TortoiseGit is an acceptable alternative for Windows

Recommendations for command line (you'll need one of these):

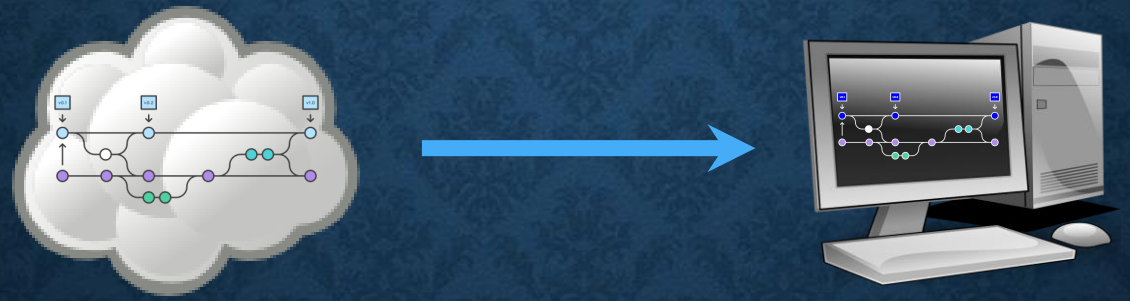
- Windows 10 – Windows Subsystem for Linux (i.e., Ubuntu on Windows)
- Windows 7-8 – MSYS2
- Prev. Win. – …What is wrong with you?
- MacOS – Type 'git' from a terminal.

MERGING AND BRANCHING RESOURCE

- https://confluence.atlassian.com/bitbucket/use-sourcetree-branches-to-merge-an-update-732268925.html

DISTRIBUTED VCS: CLONE

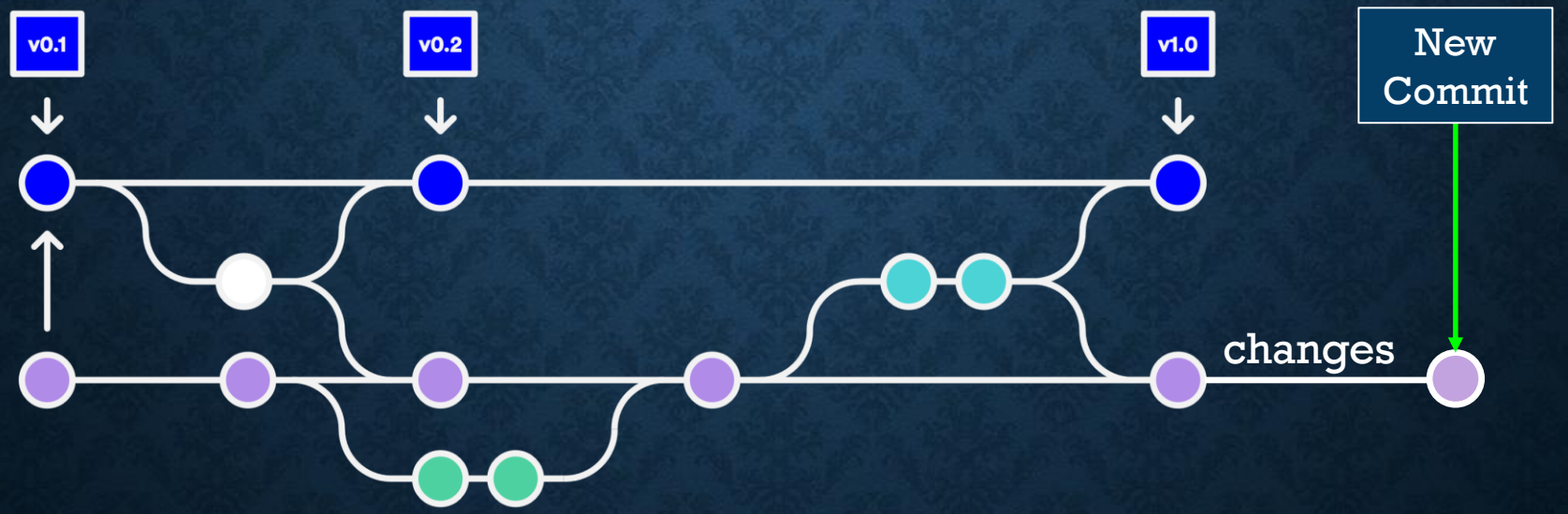
A **clone** operation makes a copy of a repository locally.



Note: a clone does not capture any future commits!

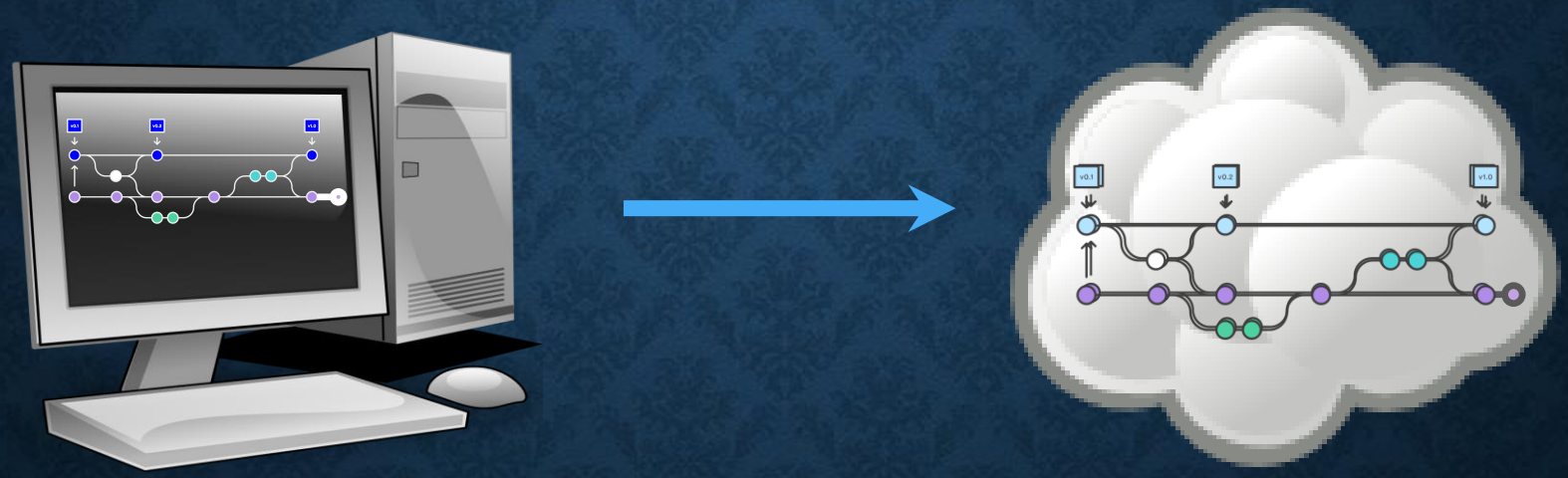
DISTRIBUTED VCS: COMMIT

Performing a **commit** creates a changeset from one version to another.



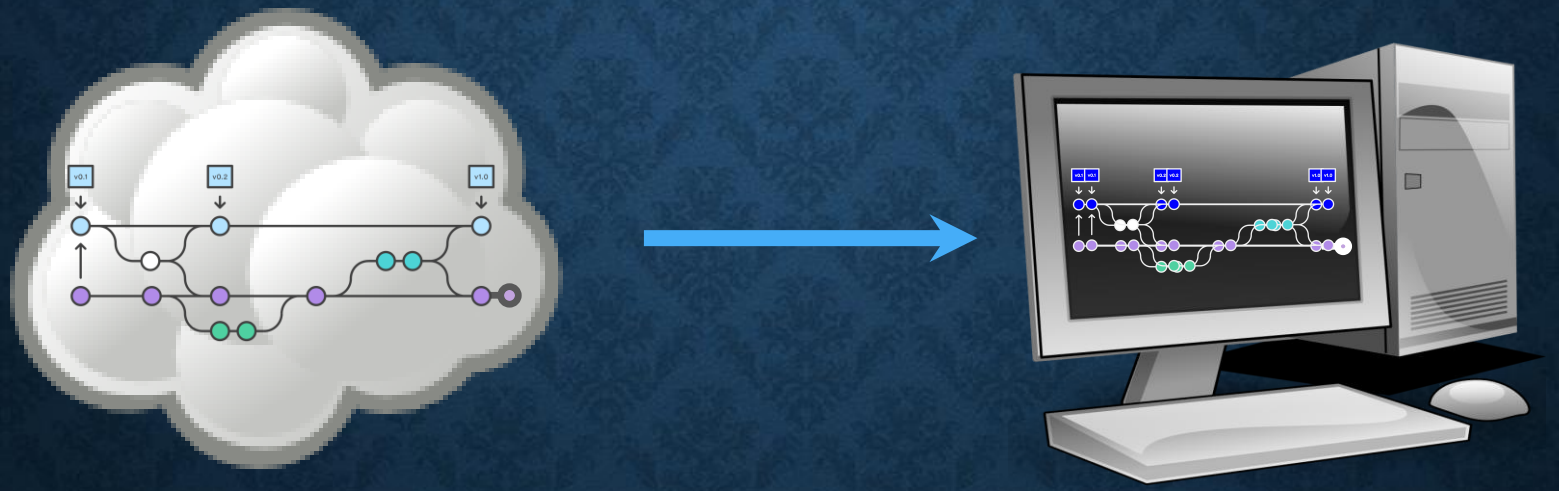
DISTRIBUTED VCS: PUSH

A **push** operation pushes any changes up to a remote repository.



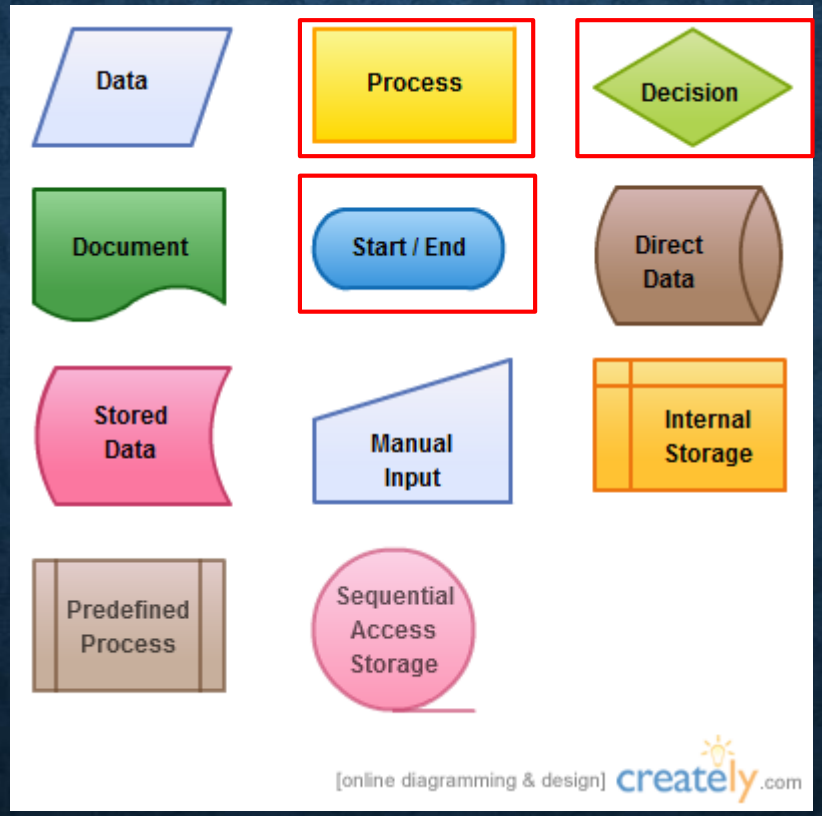
DISTRIBUTED VCS: PULL

A **pull** operation pulls down any changes made to the remote repository.



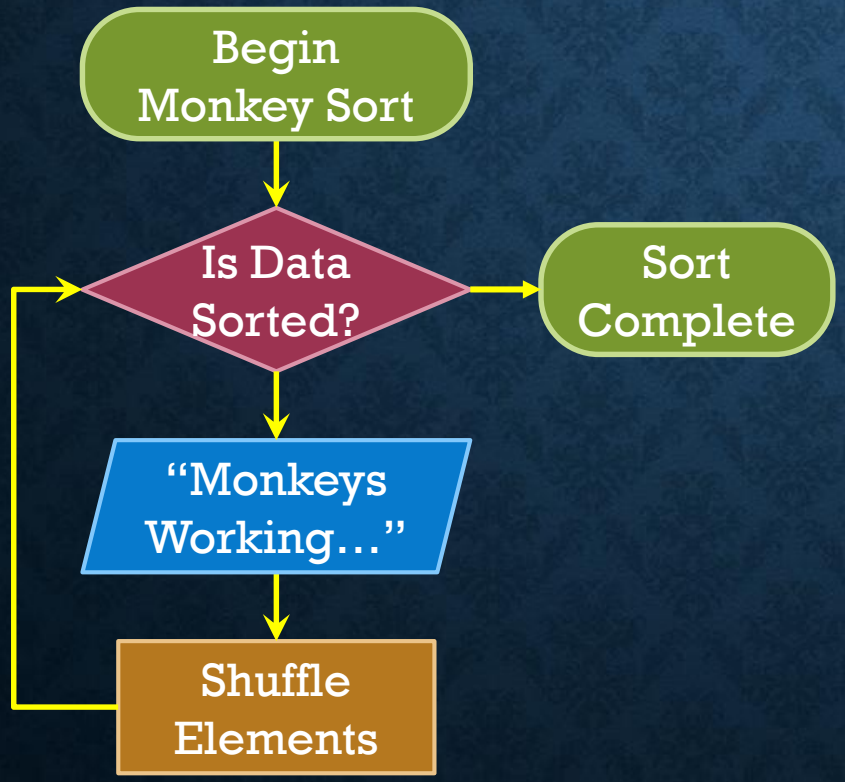
FLOWCHART

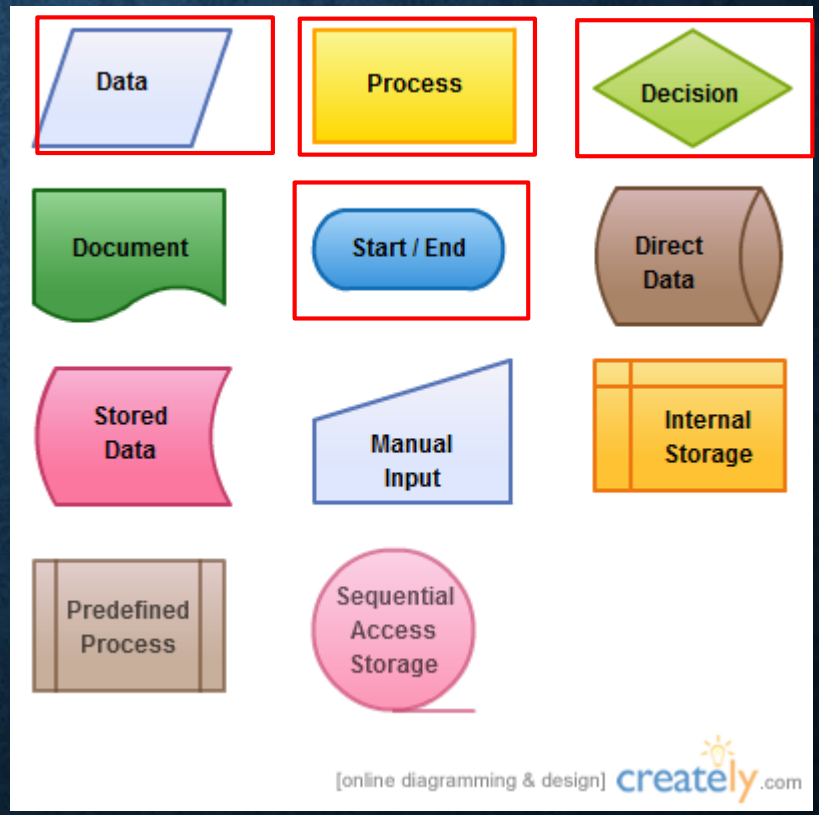
When designing algorithms and systems, we often use a **flow chart** to visualize actions.



FLOWCHART EXAMPLE

When designing algorithms and systems, we often use a **flow chart** to visualize actions.

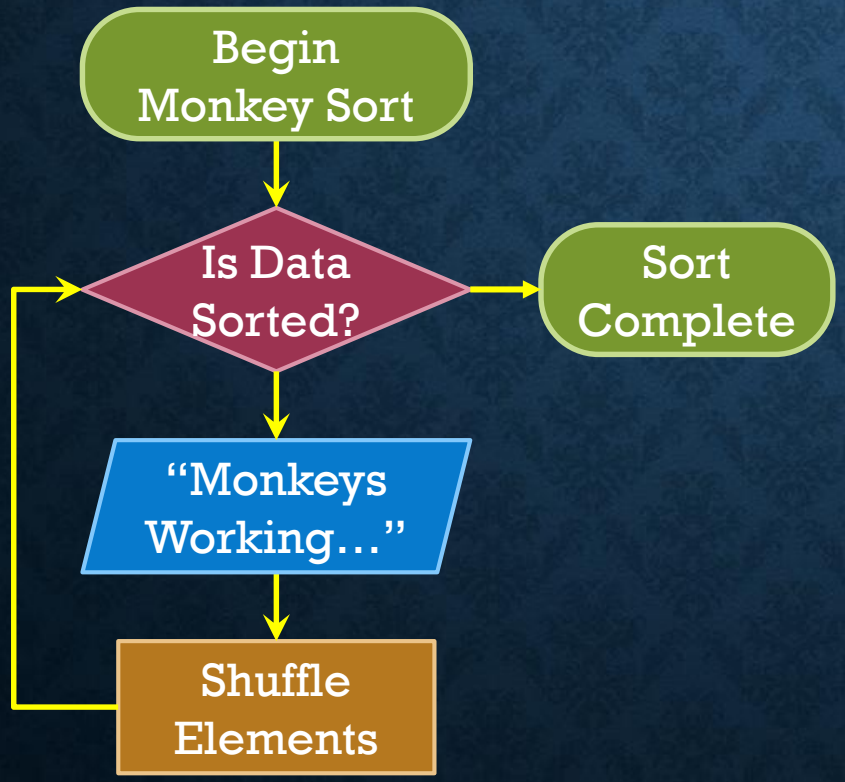




PSUEDOCODE

When designing algorithms and systems, we often use a **flow chart** to visualize actions.

To represent algorithms in text without language-specific limitations, **pseudocode** is often used.




```
bool isSorted(array data) {
    for i from 1 to data.size:
        if data[i-1] > data[i]
            return false;
    return true;
}


void monkeySort(array data){
    while !isSorted(data)
    {
        print "Monkeys Working…";
        shuffle(data);
    }
}
```

UNIT TESTING – DO IT

To find bugs as we write them we can build **unit tests** that we run regularly.

- Test individual methods or groups of methods
- Edge cases and standard cases
- Use assertions or boolean tests
- Often use **annotations** as marking

```
@Test
public static void testCountRuns1()
{
    byte[] testArray = { 0, 0, 2, 2, 2 };
    assert(RleProgram.countRuns(testArray) == 2);
}
```

```
@Test
public static boolean testCountRuns2()
{
    byte[] testArray = { };
    return RleProgram.countRuns(testArray) == 0;
}
```

LABS 5-7

Requires a command line interface

Recommendations for command line (you'll need one of these):

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