CS314 Software Engineering
Test Driven Development

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- Two kinds of tests
  - tests that find defects after they occur (a waste of time)
  - tests to prevent defects (the only kind to create)

Agile Testing Principles

- All code is tested code!
  - Teams get no credit for delivering functionality that has been coded but not tested.
- Tests are written before, or concurrently with, the code itself.
- Testing is a team effort. All developers write tests.
- Automation the the rule, not the exception.

Dean Leffingwell, Scaling Software Agility, 2007

Agile Testing Strategy

Unit Test	Developers write unit tests for every class and method.	Each unit test returns a "pass" or "fail" against the developers build.	All unit tests must pass before code can be checked in.	*Automated* unit tests are run frequently (or *continuously*) against an integrated build of the system.
Acceptance Test	Testers / product owners write functional or acceptance tests for each new user story.	Acceptance tests are elaborated and written during the iteration planning and execution.	Acceptance tests are run during the iteration and serve as acceptance checkpoints for the iteration's stories.	Acceptance tests are automated whenever possible and are added to the regression test suite at each iteration.

Dean Leffingwell, Scaling Software Agility, 2007

Test Driven Development

- Write a test - RED
  - fails because the code doesn't yet exist
- Make it run - GREEN
  - quickly do the clean, simple, obvious solution
  - something that works
- Make it right - GREEN
  - refactor to something you can live with
  - clean code

Kent Beck, Test Driven Development: By Example, 2003

Test Driven Development - Step 1

```
public void testGreatCircleDistance() {
  assertEquals(466, greatCircleDistance( 37, -102, 41, -109 ));

  assertEquals(466, greatCircleDistance( 37, -109, 41, -102 ));
}



int greatCircleDistance( double lat1, double lon1, double lat2, double lon2 ) {
  return 466;
}
```


Kent Beck, Test Driven Development: By Example, 2003

Test Driven Development - Step 2

```
public void testGreatCircleDistance() {
  assertEquals(466, greatCircleDistance( 37, -102, 41, -109 ));
  assertEquals(466, greatCircleDistance( 37, -109, 41, -102 ));
  …
}

int greatCircleDistance( double lat1, double lon1, double lat2, double lon2 ) {
  double distance;
  … // code to compute in miles
  return Math.round(distance);
}
```


Kent Beck, Test Driven Development: By Example, 2003

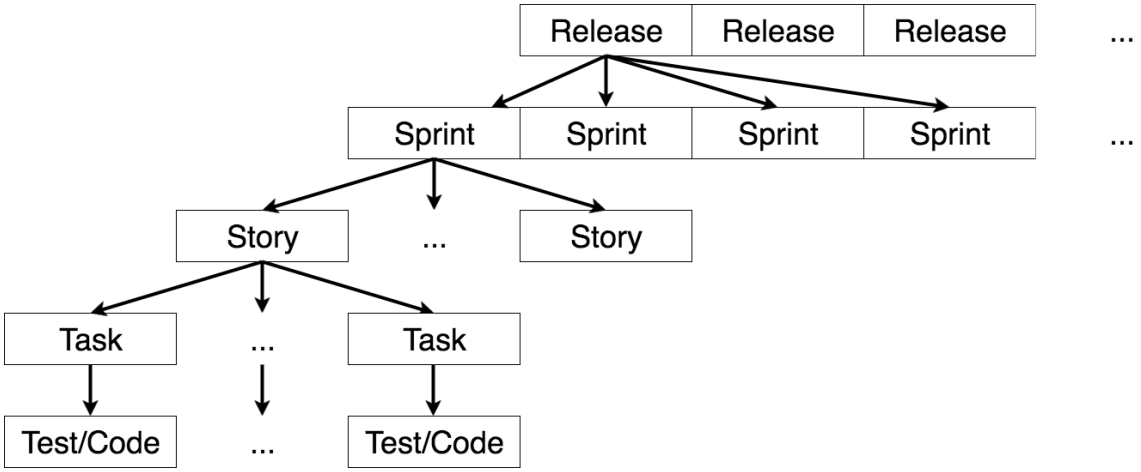
Test Driven Development - Step 3

```
public void testGreatCircleDistance() {
  // test in miles
  …
  assertEquals(466, greatCircleDistance( 37, -102, 41, -109 ));
  assertEquals(466, greatCircleDistance( 37, -109, 41, -102 ));
  …
  // test in km
  …
  assertEquals(750, greatCircleDistance( 37, -102, 41, -109 ));
  assertEquals(750, greatCircleDistance( 37, -109, 41, -102 ));
  …
}

int greatCircleDistance( double lat1, double lon1, double lat2, double lon2 ) {
  double distance;
  … // code to compute in miles or km
  return Math.round(distance);
}
```


Kent Beck, Test Driven Development: By Example, 2003

Test Driven Development in Scrum



cs314 - Test Driven Development

- First we figure out what it should do
  - Write declarations / signatures
  - Write Javadoc for them
  - Write tests that describe correct behavior
- Now we know what it should do
  - Write empty definition, run tests, FAIL
  - Write simplest code to make it work, run tests, PASS
  - Refactor / Clean the code, run tests, PASS