

COMP1531

3.5 - SDLC Testing - Code Coverage

How do we know if
our tests are good?

Coverage

- **Test Coverage:** a measure of how much of the feature set is covered with tests
- **Code coverage:** a measure of how much code is executed during testing

Example: Leap years

```
1 def is_leap_year(year):
2     if year % 4 != 0:
3         return False
4     elif year % 100 != 0:
5         return True
6     elif year % 400 != 0:
7         return False
8     else:
9         return True
```

Coverage.py

- Measure code coverage as a percentage of statements (lines) executed
- Can give us a good indication how much of our code is executed by the tests
- ... and most importantly highlight what has **not** been executed.

Example: Year from day

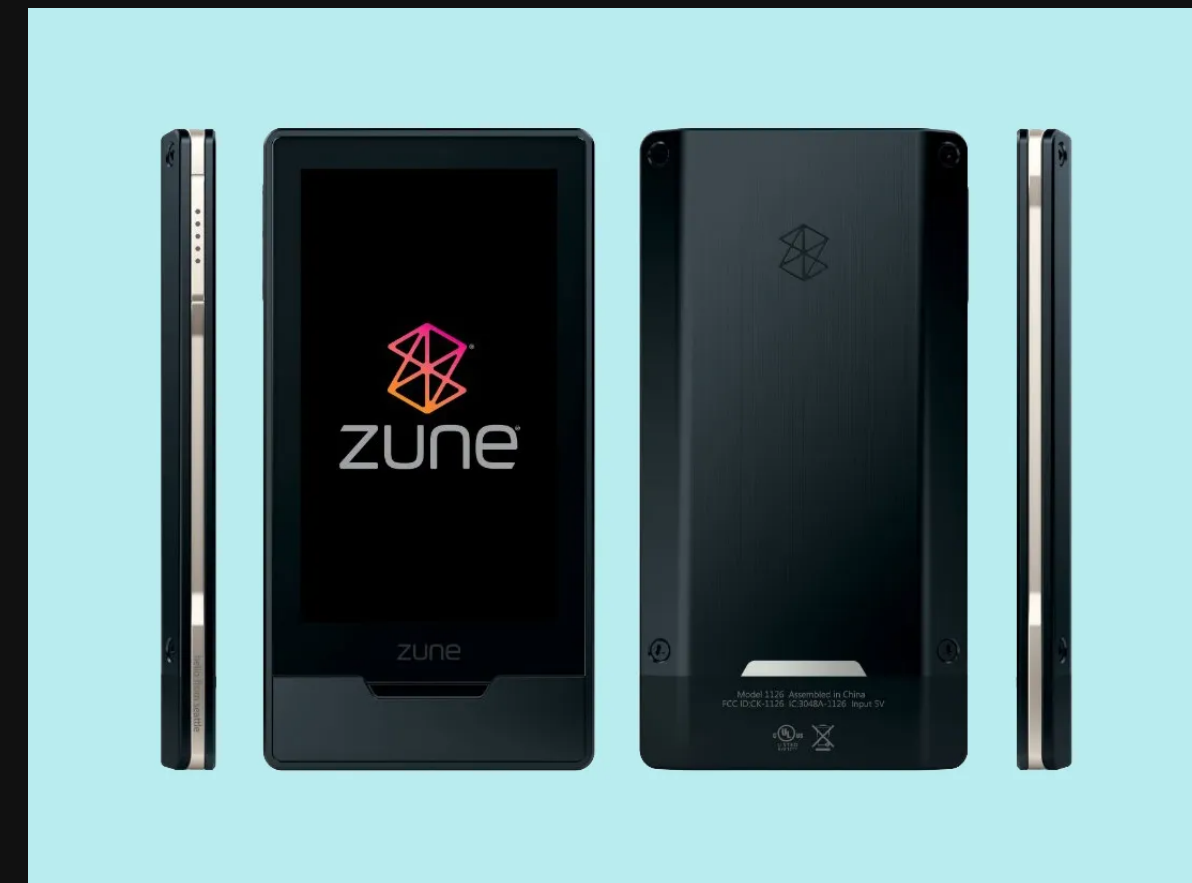
```
1 def day_to_year(days):
2     '''
3     Given a number of days from January 1st 1970, return the year.
4     '''
5     year = 1970
6
7     while days > 365:
8         if is_leap_year(year):
9             if days > 366:
10                days -= 366
11                year += 1
12            else:
13                days -= 365
14                year += 1
15
16     return year
```

Checking code coverage

- Run Coverage.py for your pytests:
`coverage run --source=. -m pytest`
- View the coverage report:
`coverage report`
- Generate HTML to see a breakdown (puts report in htmlcov/)
`coverage html`

Case study: Zune Bug

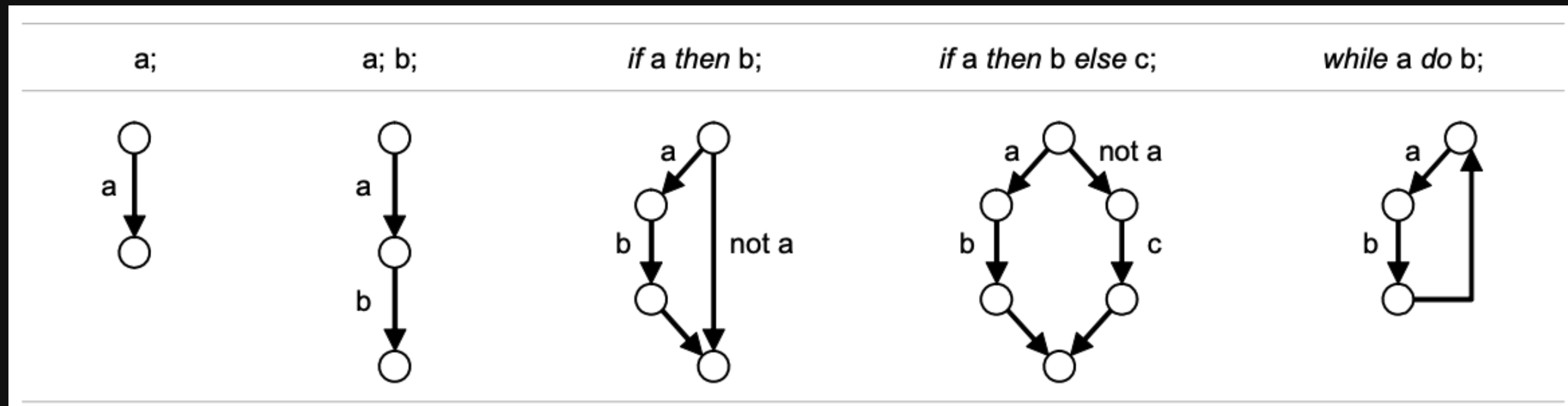
- On December 31st 2008, Microsoft Zunes stopped working for the whole day.
- The bug in the above code caused them to go into an infinite loop
- Hardly catastrophic, but embarrassing for Microsoft



Can we find the Zune bug
with testing?

Branch coverage checking

- For lines that can potentially jump to more than one other line (e.g. if statements), check how many of the possible branches were taken during execution
- Can be done with the `--branch` option in Coverage.py
- Sometimes referred to as edge coverage



Does code coverage imply
test coverage?

What is the right
level of code
coverage?

Summary

- Code coverage is useful
- It's more important to look at what's not covered than the coverage percentage
- Branch coverage is a more accurate measurement so you should use it instead of statement coverage
- Like all measurements, it's important to understand what meaning to attach to it