How to use Approval Tests for C++ Effectively

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23 June 2020

CppEurope

About Me

- **C++** and **Qt** developer since 1999
- **My mission: Sustainable and efficient testing and refactoring of legacy code**
  - Co-author of **"Approval Tests for C++"**
- **Consulting & training**
  - https://claremacrae.co.uk

- **All links from this talk via:**
  - github.com/claremacrae/talks

Llewellyn Falco
@LlewellynFalco

As part of expanding my c++ I was thinking of improving #ApprovalTests and making it work with GoogleTest. Anyone interested in pairing on that?

12:52 PM - 26 Nov 2017

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Replying to @LlewellynFalco

Would be interested in hearing more.

2:46 PM - 26 Nov 2017

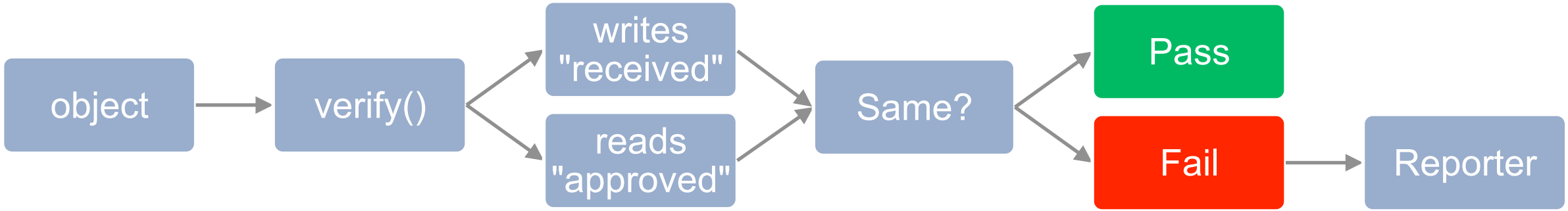
“**Approval Tests** allow you to
verify a chunk of output (such as a file)
in one operation
as opposed to
writing test assertions for each element”

Demo 1:
Hello Approvals

Main Methods

- `Approvals::verify(std::string, Options)`
  - 2 other overloads take template types
- `Approvals::verifyAll()`
  - For use with containers
  - Writes one element at a time
- All are in namespace `ApprovalTests`

Stages of Approvals::verify()



Easy to:

- … Add tests quickly
- … Visualise differences
- … Update output
- Convenience
  - Separates **test data** from **test code**
  - Ignore end-of-line differences

Easy setup

- Single header
  - https://github.com/approvals/ApprovalTests.cpp/releases
- Finds diff tool automatically
- Sensible filenames automatically
  - `source_directory/test_filename.test_name.approved.txt`
- “It just works”

Separation

- Separates **test data** from **test code**

Supported Test Frameworks

- Lots to choose from:

[Boost].UT / µt

- Get to know chosen one well!

Demo 2:
Legacy Code: Gilded Rose

Approvals and Legacy Code

- Before you start refactoring…
- Achieve good coverage
- verifyAllCombinations()
  - Not just for legacy code

Lots of String Conversion Options

- String Conversions
  - Pass in a `std::string`
  - Use `Approvals::verify( object, lambda )`
  - Write custom `operator<<( std::ostream, … )`
  - Specialize `ApprovalTests::StringMaker::toString( … )`
  - Use `TApprovals<YourStringConvertingClass>`
- How to Use the Fmt Library To Print Objects
  - Use {fmt} library via `FmtApprovals::verify()`

String Design Guidelines

- Objects print their **relevant** data
- The data is consistent between runs
  - (no times, pointers, random)
- The data is easy to read, at a glance:

```
[0] = [x: 4 y: 50 width: 100 height: 61]
[1] = [x: 50 y: 5200 width: 400 height: 62]
[2] = [x: 60 y: 3 width: 7 height: 63]
```

```
(x,y,width,height) = (4,50,100,61)
(x,y,width,height) = (50,5200,400,62)
(x,y,width,height) = (60,3,7,63)
```

- Advice: Tips for Designing Strings

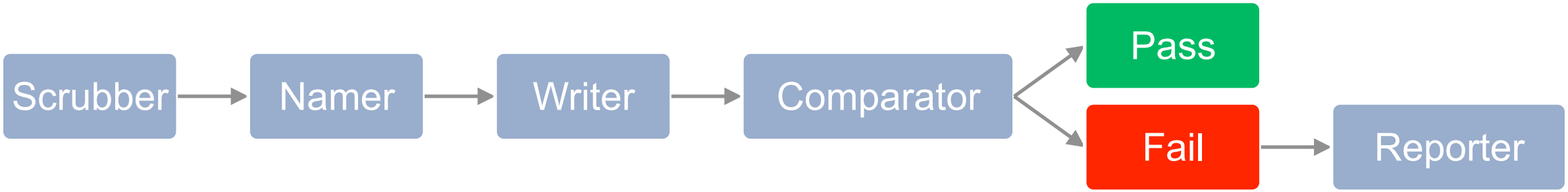
Demo 3:
Log Files

Key Points

- Approvals::verifyExistingFile()
  - For when the file is already written
- Scrubbers for non-deterministic output
  - More scrubber options coming soon…

Customisation Points Overview

Stages of Approvals::verify()



Everything is customisable

- We take great pride in the docs
- All examples generated from compiled, tested code

github.com/approvals/ApprovalTests.cpp/blob/master/doc/

Customising Behaviour

- **Principles**: Options | Disposable Objects
- **Customisation points**: Reporters | Comparators | Writers | Namers | Scrubbers | Configuring Approval Tests
- **Summary**: All Customizations of Approval Tests

approvaltestscpp.readthedocs.io/en/latest/

Customising Behaviour

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Demo 4:
SVG Files

Key Points

- Custom Reporters can help understand failures
- Make it easy to visualise differences
- No need to version control .png files

Common Challenges

External Resources

- I/O, Networking, System API calls…
- Be creative!
- Can you intercept and log calls?
  - And save them as “approved” results?
  - Then intercept again during later runs, and compare results?
- You can even use this data as inputs to later tests!
- Excellent example from Angie Jones:
  - https://angiejones.tech/verifying-entire-api-responses/

Embedded Systems

- Separate as much logic as possible
- Test the logic on desktop machines and CI
- Then if you get a failure on device, you've got less to test

- It may become possible to run Approval Tests from cross-built code

Output is OS-specific

- Include the OS in the file-names
- So verify() compares against output from same platform
- For example
  - TestQtDialog.loginScreen.on**MacOSX**.approved.png
  - TestQtDialog.loginScreen.on**Windows**.approved.png
  - TestQtDialog.loginScreen.on**Linux**.approved.png
- See Multiple output files per test

Approving is fiddly or takes too long

- Approving images?
- Approving hundreds of files?
- Try one of:
  - AutoApproveIfMissingReporter
  - AutoApproveReporter (and compare the diffs in version control!)

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- **Any Questions?**