

Simulating Queues with Ciw

Geraint Ian Palmer

PyCon Namibia 2016



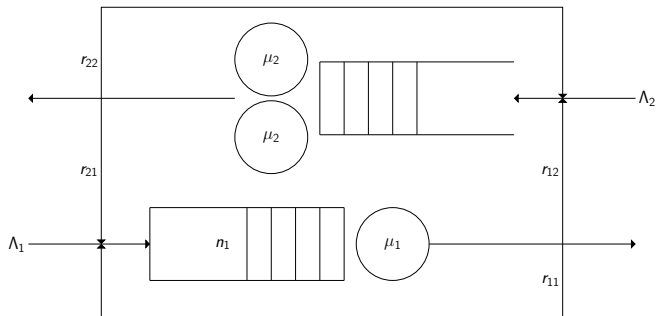




What is a Queue?



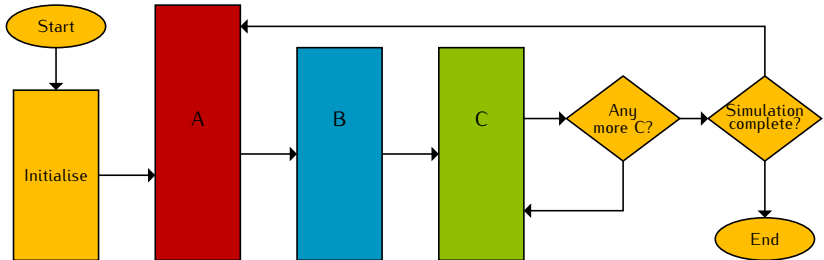
What is a Queue?



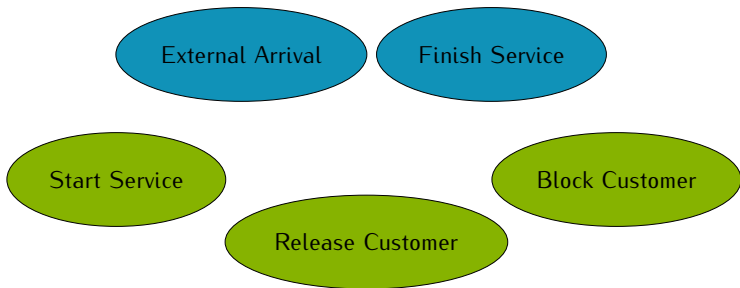
```
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│   ├── arrival_node.py
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│       └── ...
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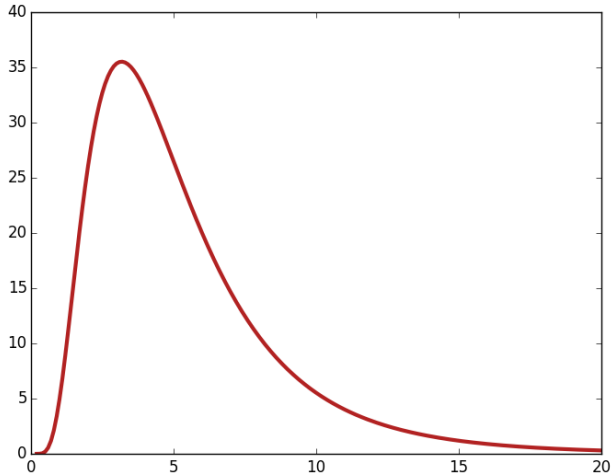
Three-Phase Simulation Approach



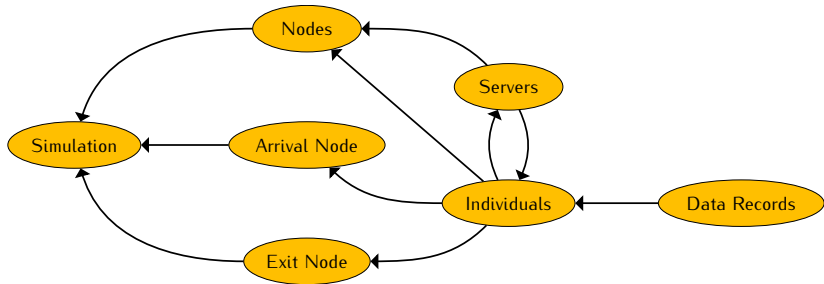
Event Types



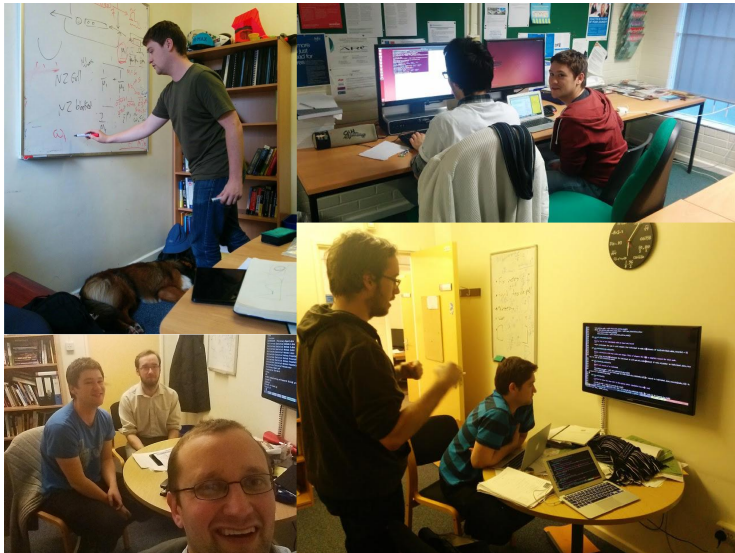
Sampling from a Probability Distribution



Code Structure



Pair Programing / Collaborative Work



Git & GitHub



GitHub Issues

☐ ⓘ **9 Open** ✓ 2 Closed

Author ▾ Labels ▾

☐ ⓘ **Windows slash** **bug** **documentation**
#13 opened 8 minutes ago by geraintpalmer

☐ ⓘ **Documentation on library, not just command line tool** **documentation**
#12 opened 8 minutes ago by geraintpalmer

☐ ⓘ **Sort out script** **help wanted**
#11 opened 9 minutes ago by geraintpalmer

☐ ⓘ **Time dependent servers** **enhancement**
#10 opened 9 minutes ago by geraintpalmer

☐ ⓘ **Script to doc test the docs.** **tests**
#9 opened 9 minutes ago by geraintpalmer

☐ ⓘ **deadlock detection & server schedules not compatible** **bug**
#8 opened 9 minutes ago by geraintpalmer

☐ ⓘ **Include MM1 comparison in docs** **documentation**
#7 opened 9 minutes ago by geraintpalmer

☐ ⓘ **A fancy logo** **documentation** **enhancement**
#5 opened 9 minutes ago by geraintpalmer

☐ ⓘ **Set up travis for continuous integration.** **tests**
#3 opened 10 minutes ago by geraintpalmer

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Doctests

```
def geraints_function(a, b):  
    """  
    Returns the absolute difference between a and b  
  
    >>> geraints_function(7, 9)  
    2  
    >>> round(geraints_function(20.4, 3.1), 1)  
    17.3  
    """  
    return max(b-a, a-b)
```

Unittests

```
import unittest
import geraints_function

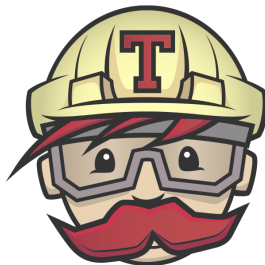
class TestGeraintsFunction(unittest.TestCase):

    def test_geraints_function(self):
        self.assertEqual(geraints_function(7, 9), 2)
        self.assertEqual(geraints_function(20.4, 3.1), abs(20.4-3.1))
```

Travis

build passing

build failing



Coverage

```
$ pip install coverage  
$ coverage run --source=ciw -m unittest discover ciw.tests  
$ coverage report -m
```

Coverage

Name	Stmts	Miss	Cover	Missing

__init__	8	0	100%	
arrival_node	40	2	95%	27, 55
data_record	16	2	88%	12, 15
exit_node	13	0	100%	
import_params	13	2	85%	21-22
individual	16	0	100%	
node	202	7	97%	104, 111, 193, 220, 747, 751-752
server	10	0	100%	
simulation	144	23	84%	50, 53, 56, 59, 62, 65, 68, 71, 86, 96, 98, 100, 107, 182, 199-216
tests/__init__	0	0	100%	
tests/test_arrival_node	71	0	100%	
tests/test_data_record	24	0	100%	
tests/test_exit_node	39	0	100%	
tests/test_individual	26	0	100%	
tests/test_node	60	0	100%	
tests/test_server	18	0	100%	
tests/test_simulation	99	0	100%	

TOTAL	799	36	95%	


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Packaging

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pip install ciw
```

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Documentation



Read the Docs

Academic Uses

Theoretical Work

Investigating deadlock in queueing networks.

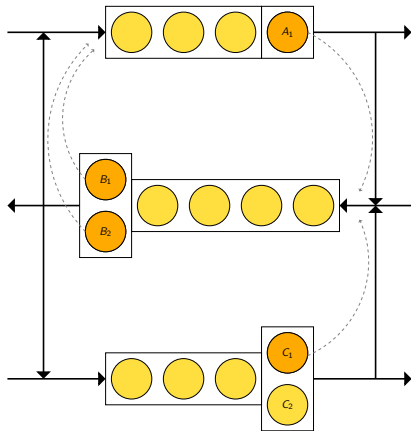
(Geraint Palmer, Prof. Paul Harper, Dr. Vincent Knight)

Practical Work

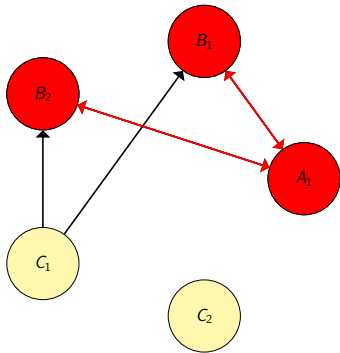
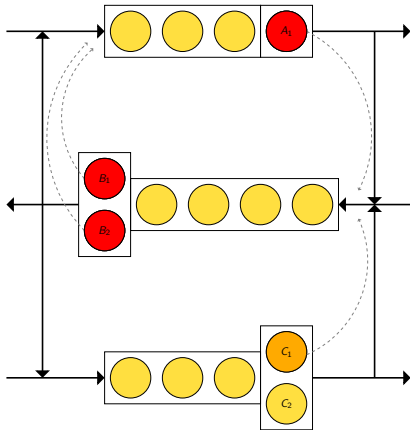
Modelling an ophthalmology clinic to strategise scheduling.

(Lieke Hölscher, Dr. Jennifer Morgan)

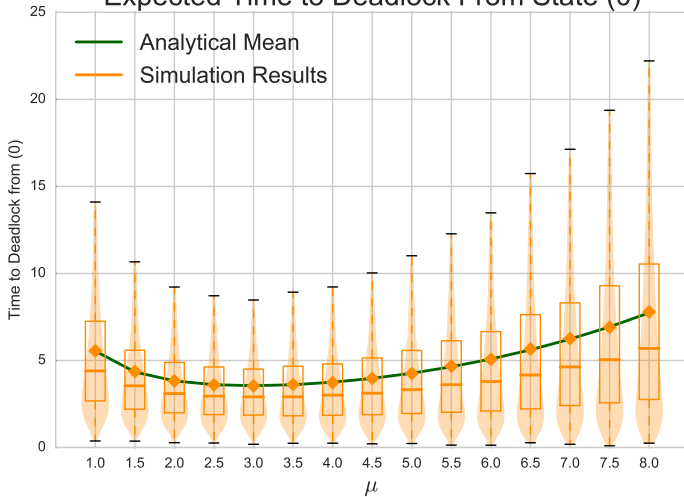
Investigating Deadlock



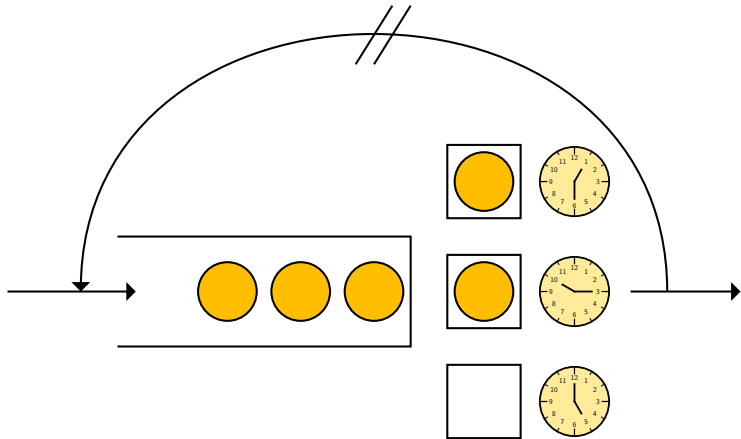
Investigating Deadlock



Expected Time to Deadlock From State (0)



Modelling Ophthalmology Clinic



Thank You!

`palmergi1@cardiff.ac.uk`

`geraintianpalmer.org.uk`

`github.com/geraintpalmer/Ciw`

`ciw.readthedocs.org`

PyYAML

NetworkX

Docopt

Coverage

TravisCI

Sphinx

ReadTheDocs