e-Motions
re-implementation of Palladio
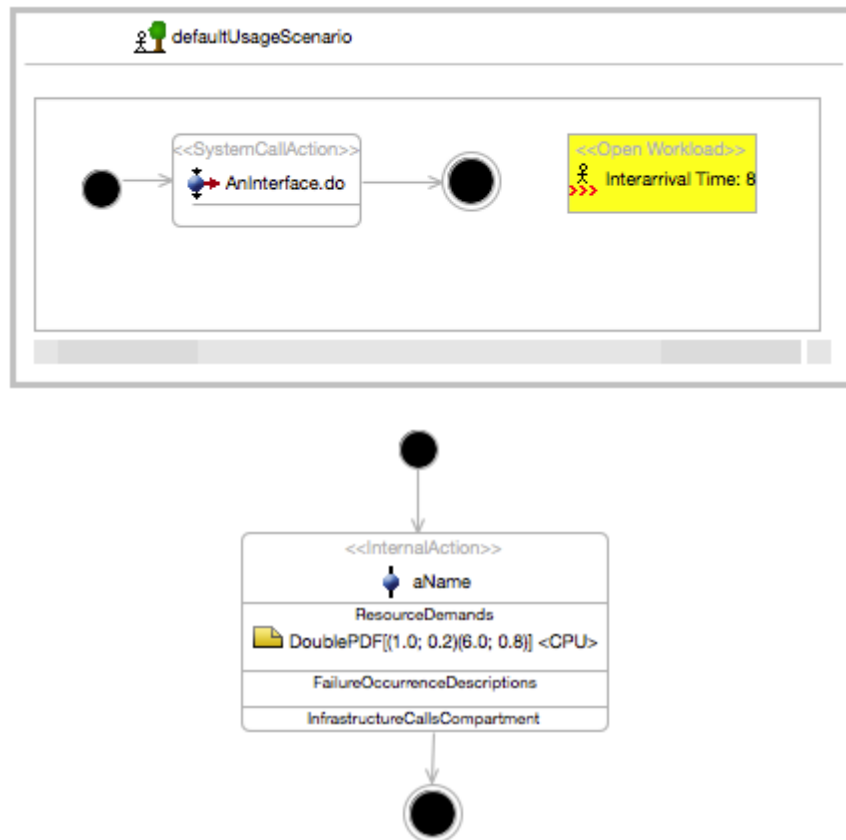
-- *Evaluation* --

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TestDoublePDF

The TestDoublePDF example checks whether the e-Motions implementation of such expression matches the Palladio's one.

The very simple examples is like this:

And with the following results to the non-saturation executions:

```
*******
**** For OpenWorkload = 8.0 (without saturation) || 1000 t.u.
*******

size of the sample
  # size:    125
e-Motions data analysis:
  # mean:    2.81968
  # st dev:  1.77487746693
PCM data analysis:
  # mean:    2.93838888067
  # st dev:  1.75988927067
(0.096000000000000002, 0.59062258362582365)


*******
**** For OpenWorkload = 8.0 (without saturation) || 5000 t.u.
*******

size of the sample
  # size:    625
e-Motions data analysis:
  # mean:    2.872916
  # st dev:  1.7683200338
```
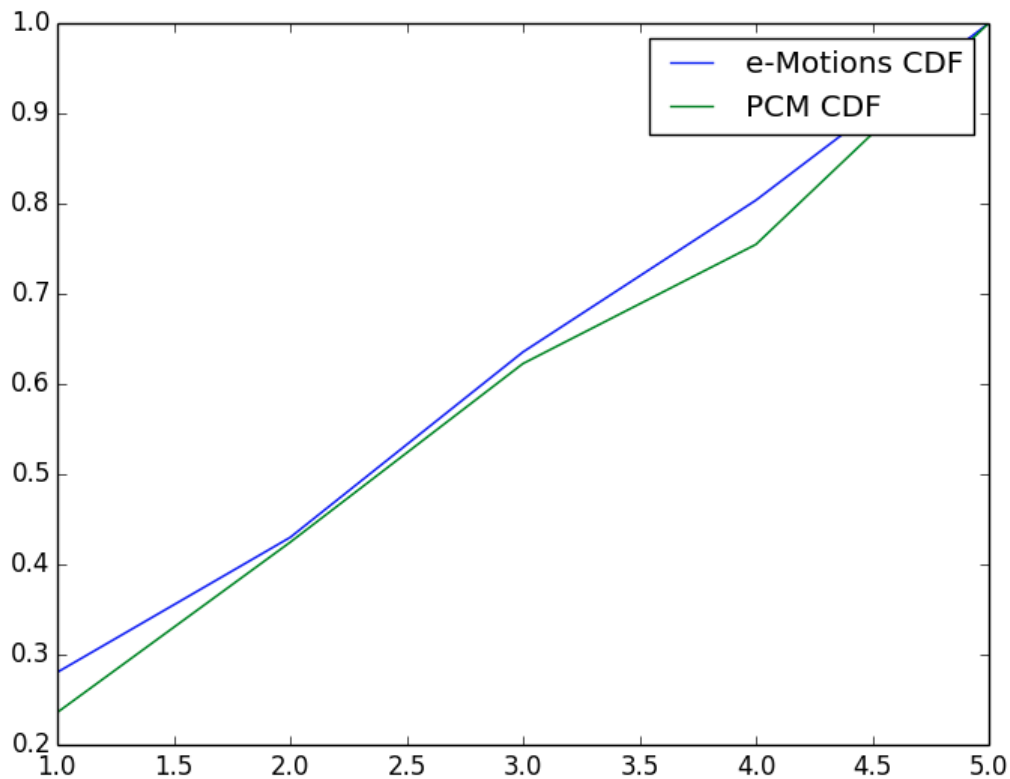
```
PCM data analysis:
  # mean:    2.92404422275
  # st dev:  1.77434520731
(0.036799999999999944, 0.78394110735867217)
```

And with CDF plot:

With saturation (i.e. with OpenWorkload rate = 4.0) the results do not match with small samples (although there are not results here) since it depends on the seed the expression starts of.
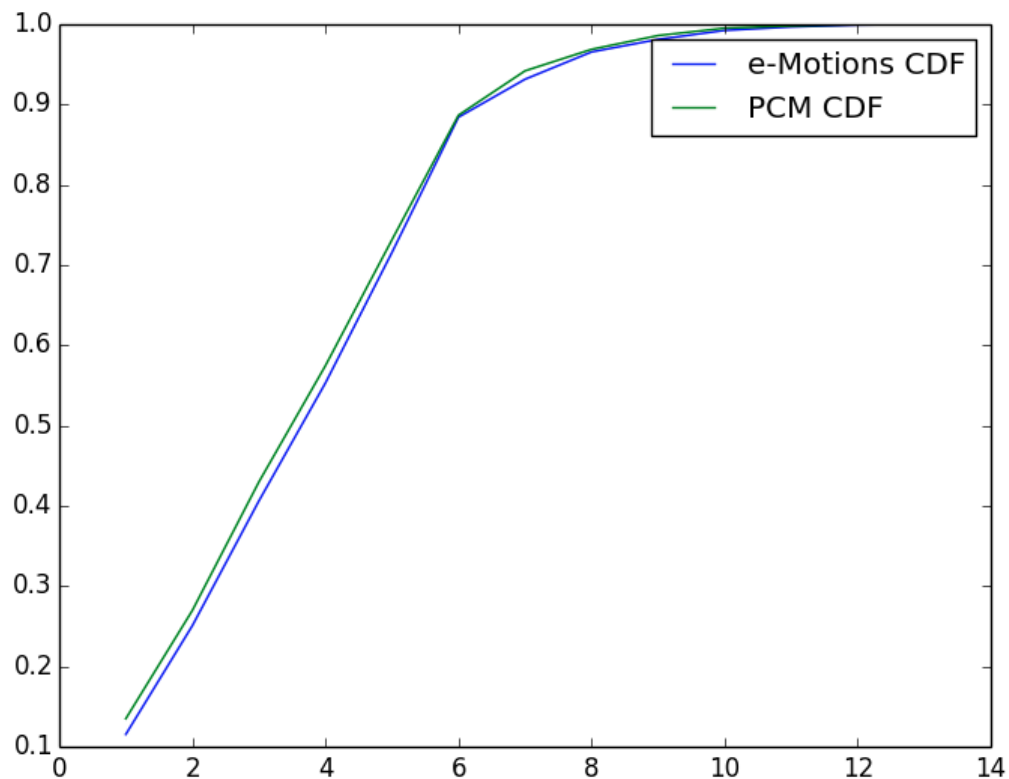
```
*******
**** For OpenWorkload = 4.0 (with saturation) || 5000 t.u.
*******

size of the sample
  # size:    1250
e-Motions data analysis:
  # mean:    3.717344
  # st dev:  2.31083617727
PCM data analysis:
  # mean:    3.52905363673
  # st dev:  2.03468469053
(0.039964131305044059, 0.26586909604235259)

*******
**** For OpenWorkload = 4.0 (with saturation) || 10000 t.u.
*******
```
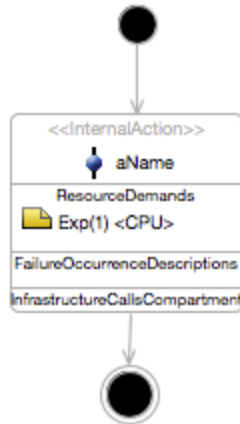
```
size of the sample
  # size:    2499
e-Motions data analysis:
  # mean:     3.71636254502
  # st dev:  2.19386857325
PCM data analysis:
  # mean:     3.5933788337
  # st dev:  2.16758758454
(0.031019927971188466, 0.17738346650037451)
```

And with CDF plot (for the 10000 t.u. sample) is:

TestExp

This test is the same as the shown above but with an Exponential expression.

<<InternalAction>>

aName

ResourceDemands

Exp(1) <CPU>

FailureOccurrenceDescriptions

InfrastructureCallsCompartment

This time the execution has been executed with no queue saturation, achieving the following results:

```
with 1000 time units:
size of the sample
  # size:    500
e-Motions data analysis:
  # mean:    1.22000049577
  # st dev:  1.11065834158
PCM data analysis:
  # mean:    1.63956626649
  # st dev:  1.60928267189
(0.11599999999999999, 0.0021477573158074762)

with 5000 time units:
size of the sample
  # size:    2499
e-Motions data analysis:
  # mean:    1.2723948134
  # st dev:  1.30866483322
PCM data analysis:
  # mean:    1.24962940838
  # st dev:  1.22373003424
(0.02273213285314124, 0.53373247433364968)

with 10000 time units:
size of the sample
  # size:    5000
e-Motions data analysis:
  # mean:    1.23595389561
  # st dev:  1.28575057028
PCM data analysis:
  # mean:    1.25584261577
  # st dev:  1.24140976488
(0.024097019403880759, 0.10814736345015447)
```
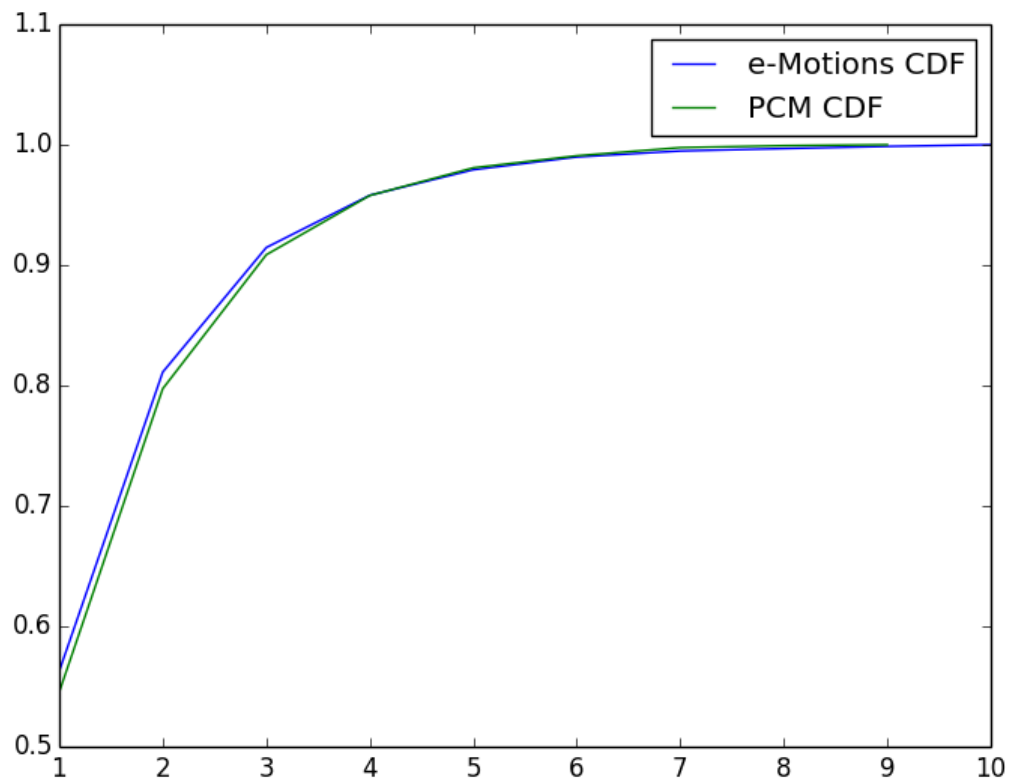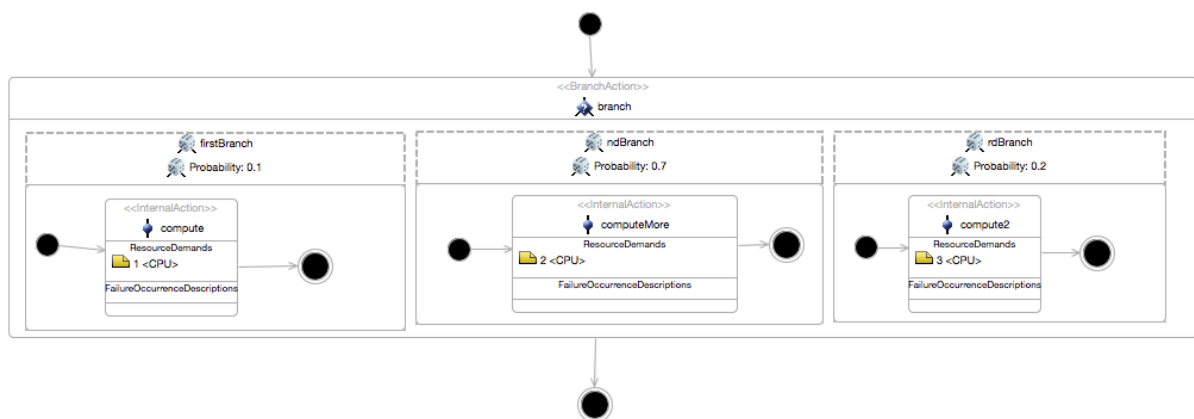
This is the CDF for the 10000 t.u. sample.

BranchTest

This test is the same, but with branches. This is because I was wondering if the algorithm we did to handle branches was working properly. So the example is shown below:

And the results are excelents:

```
--> Reading file  MaudeResults/result_10000tu.txt
--> Reading file  PalladioResults/result_10000tu.csv
size of the sample
  # size:    2000
e-Motions data analysis:
  # mean:    2.0925
```

```
  # st dev:  0.53380122705
PCM data analysis:
  # mean:    2.1105
  # st dev:  0.527531752599
(0.010500000000000009, 0.99988671512839344)
```

Minimum Example

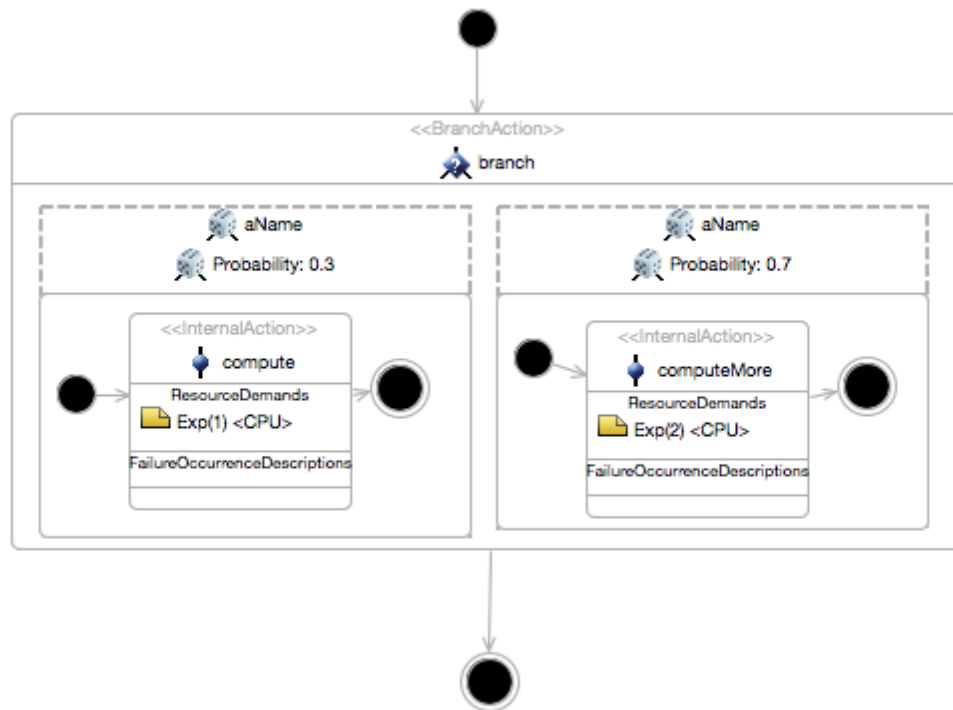The MinimumExample case study has been inspired by the one offered by the Palladio Team in the example workspace.

Fig. 1: ComponentA of the MinimumExample with exponential exps.

MinimumExample with Exponentials. OpenWorkload with rate : 3.0 t.u.
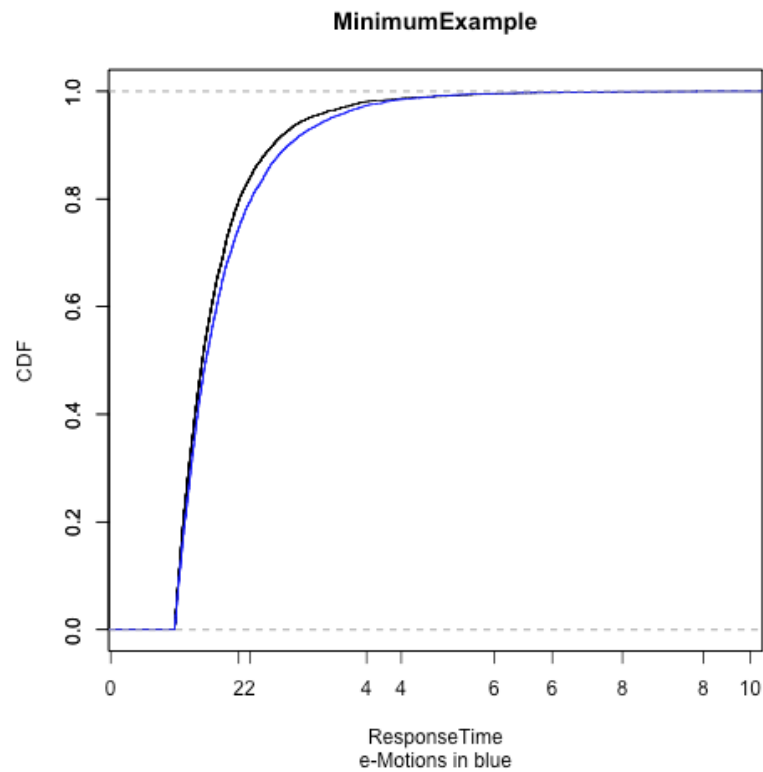
Execution through 16000 t.u.
        p-value: 0.2525

Fig. 2: CDF MinimumExample Exp. OpenWorkload 3.0

MinimumExample with Exponentials. OpenWorkload with rate : 1.0 t.u.

Execution through 2000 t.u.
        p-value: 9.243e-11
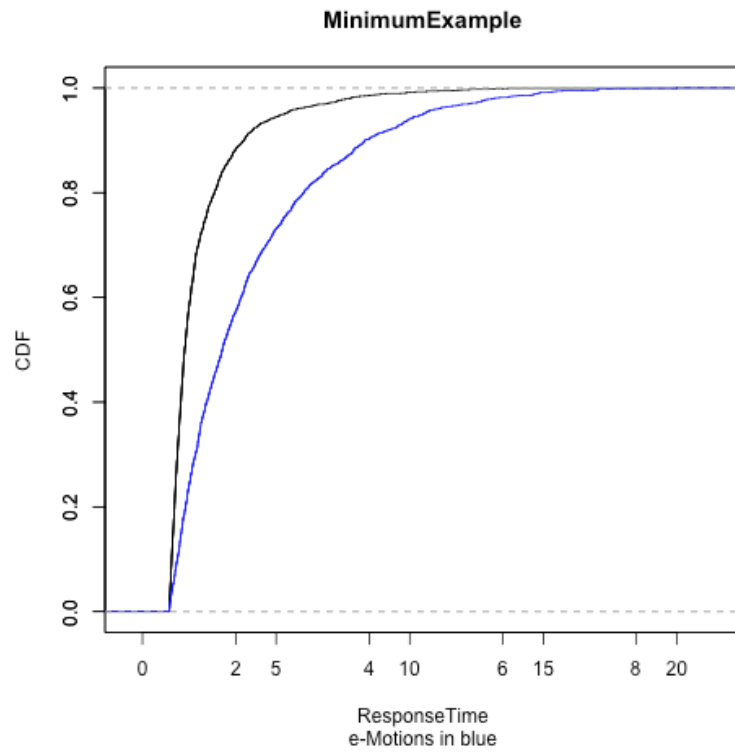*Notes: This example has queues saturation.*

Fig. 3: CDF MinimumExample Exp. OpenWorkload 1.0

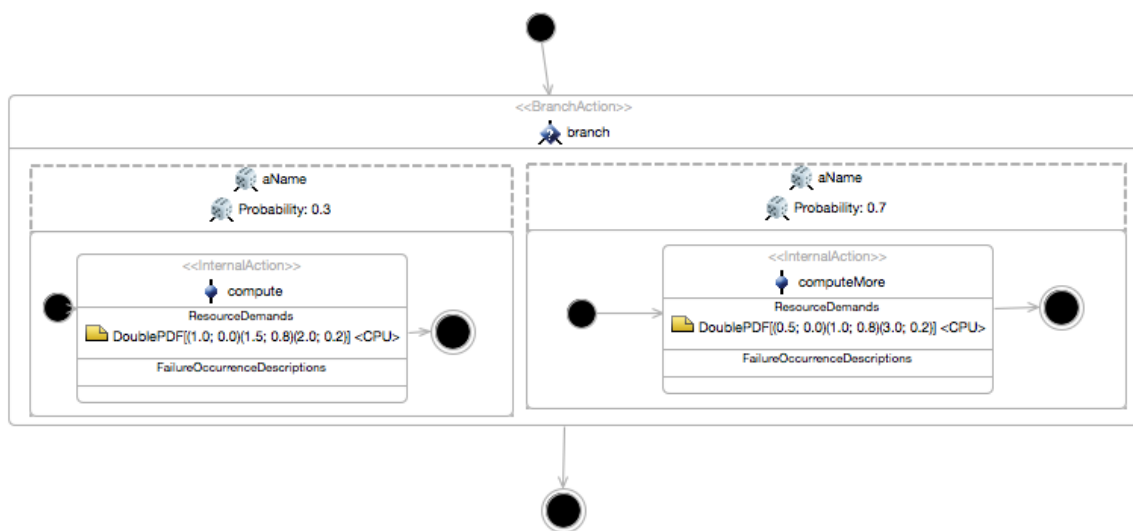**MinimumExample with DoublePDF. OpenWorkload with rate : 2.0 t.u.**

Fig. 4: ComponentA of the MinimumExample with DoublePDF exps.
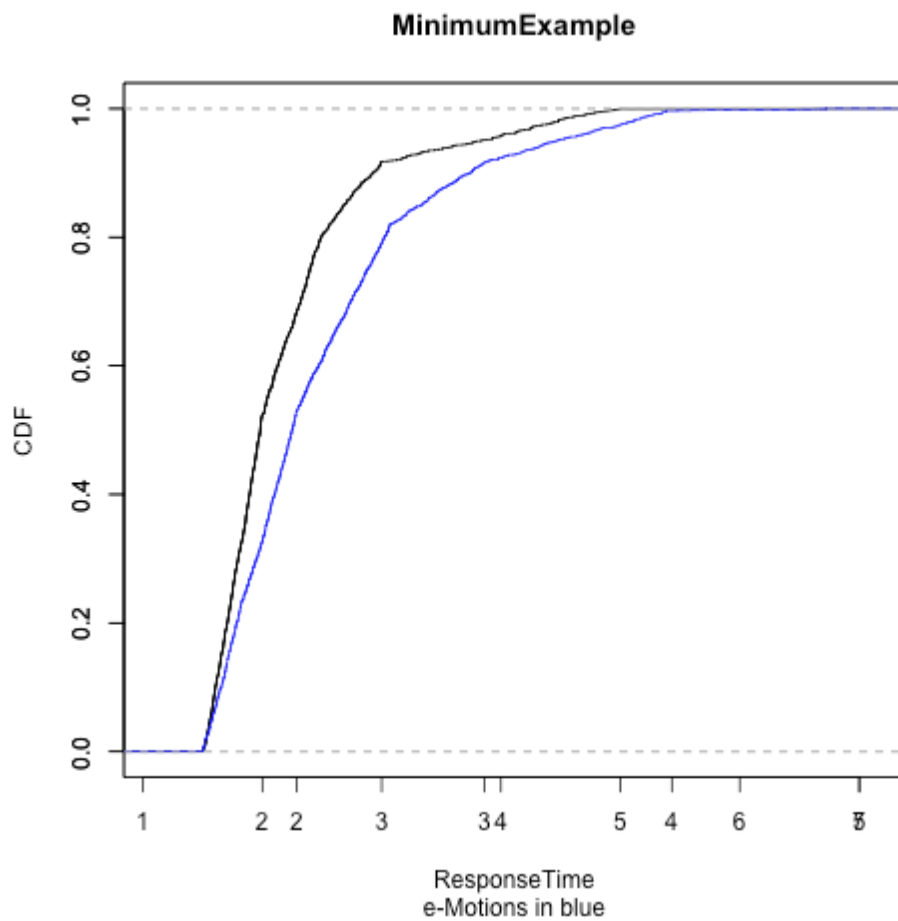
Execution through 4000 t.u.
　　　p-value: 0.07501

MinimumExample

ResponseTime
e-Motions in blue

Fig. 5: CDF MinimumExample DoublePDF OpenWorkload 2.0

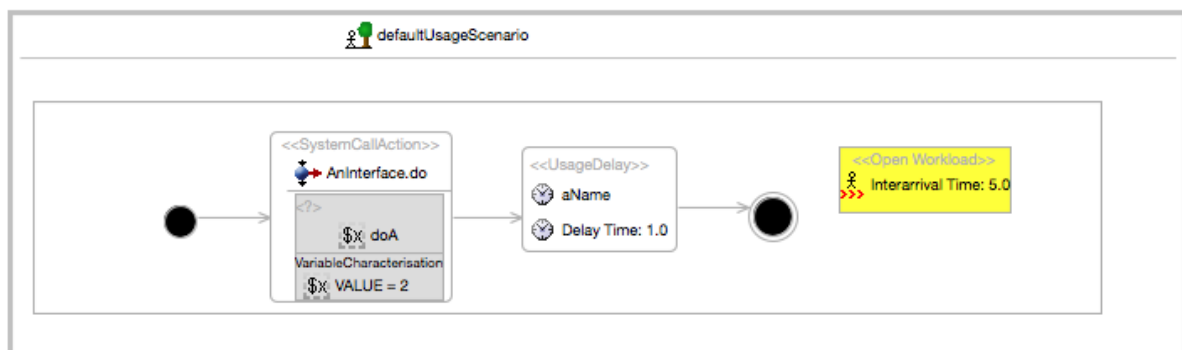## MinimumExample Extended

Executed through 8000t.u.
  p-value: 0.8629
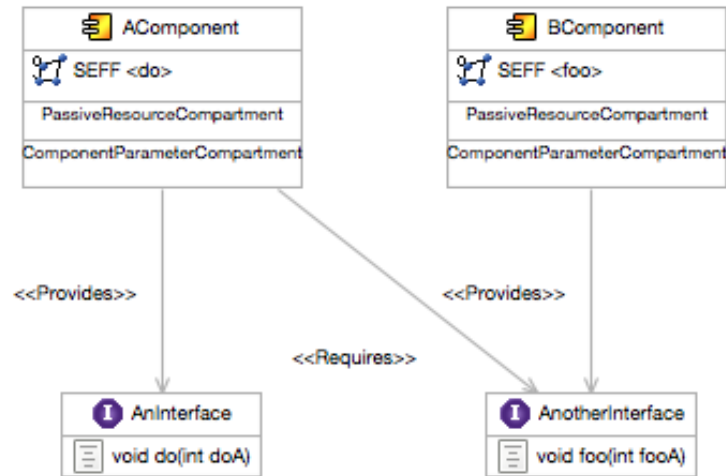

Fig. 6: MinimumExampleExtended Usage Model.

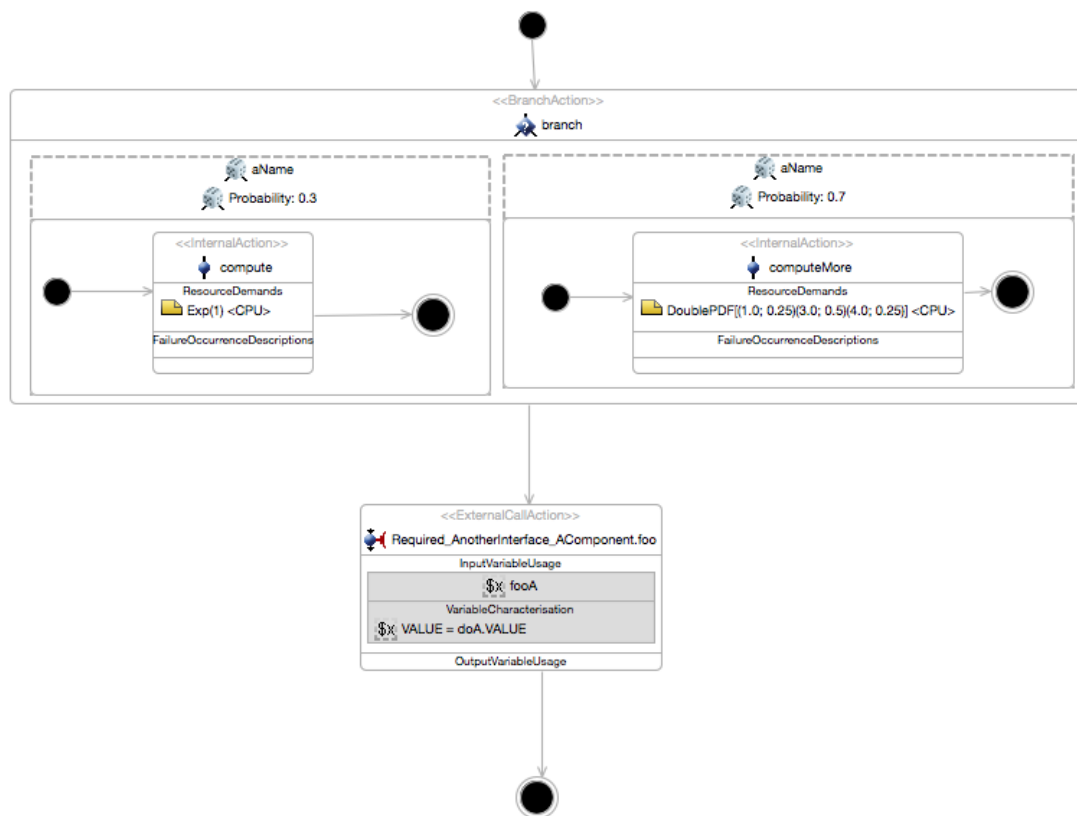Fig. 7: MinimumExampleExtended repository.

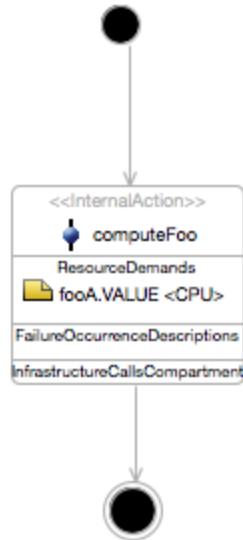Fig. 8: MinimumExampleExtended ComponentA.
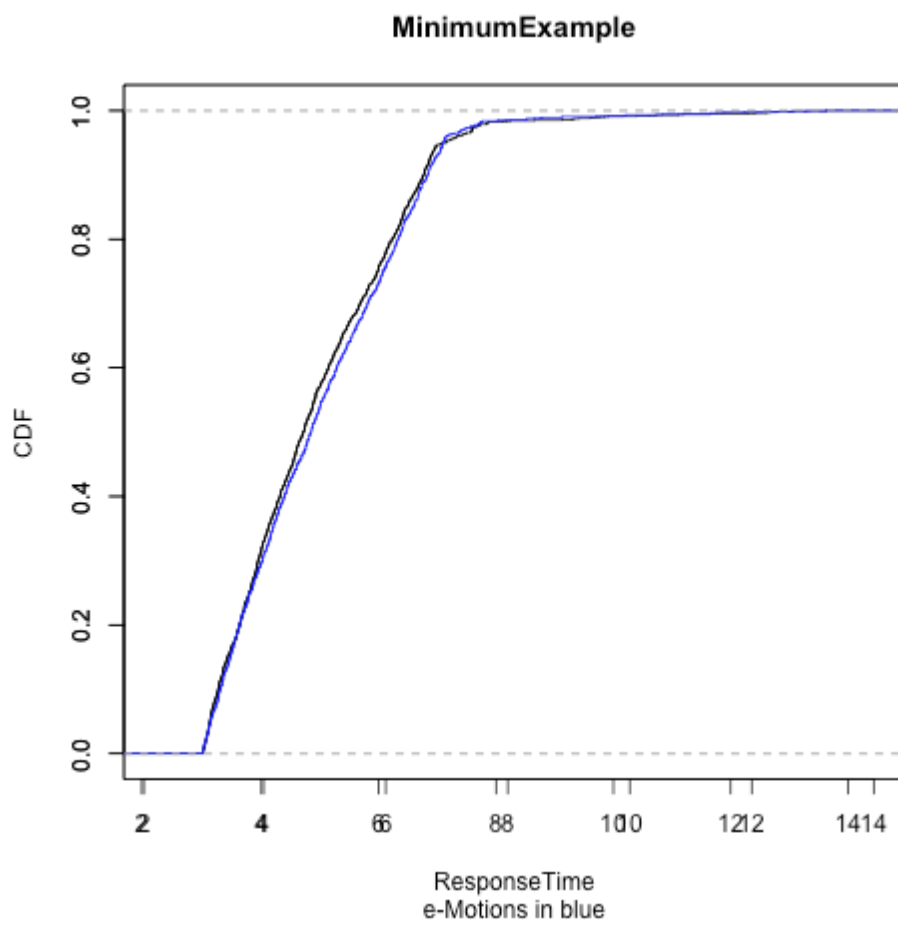
Fig. 9: MinimumExampleExtended ComponentB.

Fig. 10: CDF MinimumExampleExtended.

ECMFA Example

Fixed: The example had an error, so it has been fixed and we have new results.

16000 time units.

old results - p-value = 2.331e-15

new results

```
--> Reading file  MaudeResults/result_8000tu.txt
--> Reading file  PalladioResults/result_8000.csv
size of the sample
  # size:    2782
e-Motions data analysis:
  # mean:    9.35857370823
  # st dev:  3.58469426452
PCM data analysis:
  # mean:    9.45590077037
  # st dev:  3.44516385917
(0.033538216224135553, 0.087626712139278362)


--> Reading file  MaudeResults/result_16000tu.txt
--> Reading file  PalladioResults/result_16000.csv
size of the sample
  # size:    5530
e-Motions data analysis:
  # mean:    9.65688938222
  # st dev:  3.85153212218
PCM data analysis:
  # mean:    10.0259210033
  # st dev:  5.55929853988
(0.09020394256055736, 7.21265765267507e-20)
```
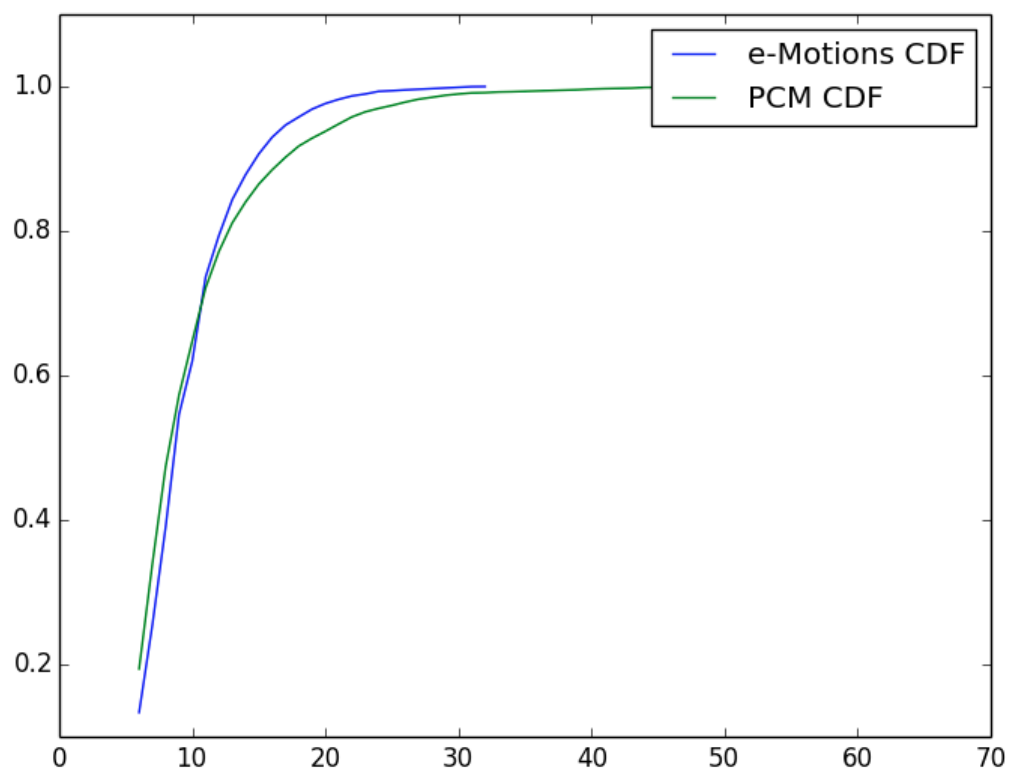
Fig. 11: CDF ECMFA Example.

BranchesUMParameters

16000 time units.

  p-value = 0.792

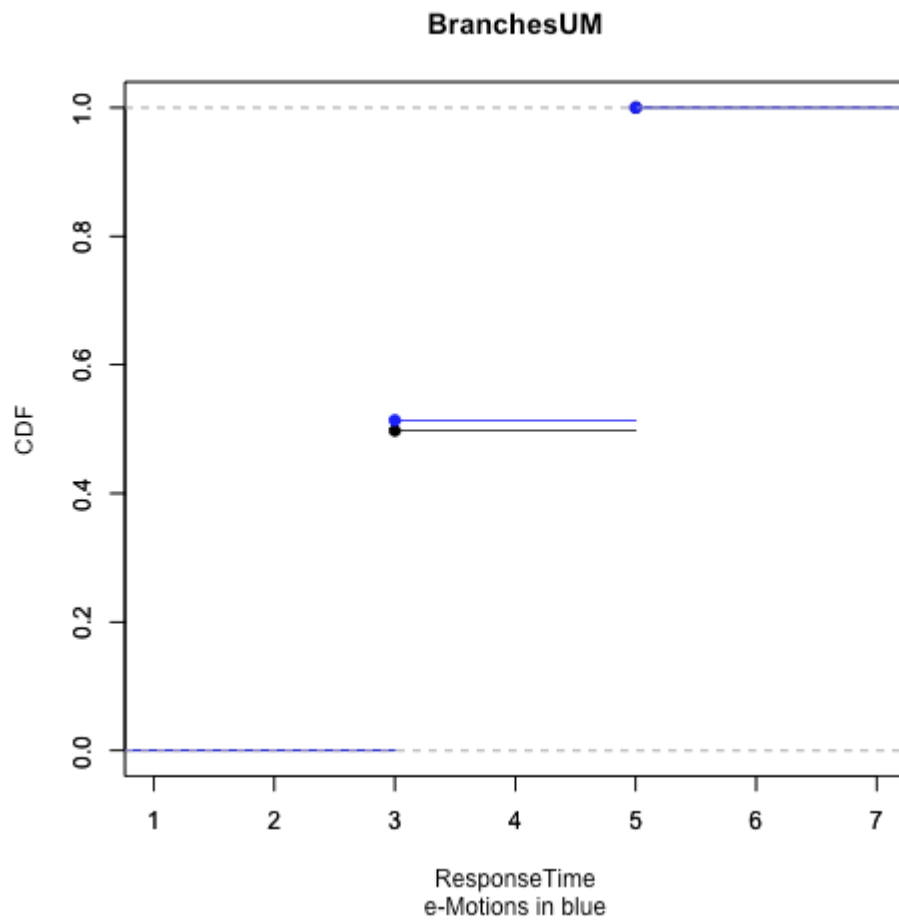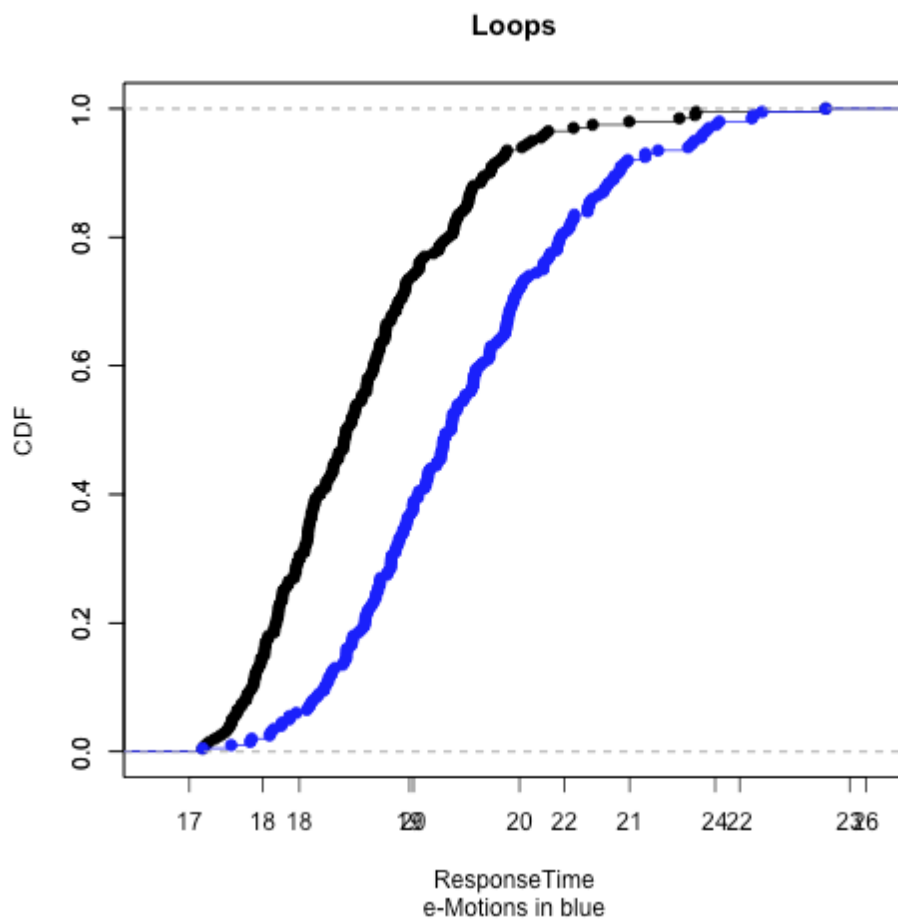Fig. 12: CDF BranchesUMParameters Example.

Loops

4000 time units.

    p-value = 0.01638

Fig. 12: CDF Loops Example.