

# Evaluation Data for MoDe4SLA

Lianne Bodenstaff\*, Andreas Wombacher  
University of Twente  
{l.bodenstaff,a.wombacher}@utwente.nl

Manfred Reichert  
University of Ulm  
manfred.reichert@uni-ulm.de

## 1 Transcript

Friday 9 January 2009 the first group of experts evaluated usefulness of MoDe4SLA. It was a try out with only three experts. The complete session was around one hour and 45 minutes which is divided in a *presentation part*, an *explanation part* with two examples, and the actual *evaluation part* with three test cases. A transcript of the exact times is depicted in Table 1.

Although each participant is employed in an information technology environment, not everyone is familiar with service compositions. Therefore, the *presentation* comprises an explanation of the problem and what the exact research gap is. The first part of the presentation discusses the necessity of identifying dependencies between different services in a composition, why identifying these dependencies is not straightforward. The second part of the presentation is on the MoDe4SLA approach in which is explained how we identify these dependencies and solve the problem. Since the first group already participated in previous presentations on MoDe4SLA, the time frame of 15 minutes for the presentation should be considered a minimum.

In the second part is through two examples explained how the survey will be conducted. Both examples have the same structure as the three test cases. The goal of introducing these examples is to allow the participants to get familiar with the MoDe4SLA approach. First, the representation of the service composition and its parameters (e.g., average response times) in the bilateral documents for both the estimations and the realized values is discussed. Second, the analysis done with MoDe4SLA on the realized values of the composition is discussed. Together with a legend the participants discuss how to use both the bilateral and the analysis documents.

The last part is done by the participants separately, without interference of the presenter. First the introductory questions are answered after which the participants go through the three test cases. After the test cases the concluding questions are answered. Interested participants receive an evaluation of the three test cases on how to read the analysis done through MoDe4SLA.

## 2 Hand-out

This Appendix contains the complete hand-out for participants of the evaluation. This starts with a cover sheet and a legend, after which the two examples and three test cases are given. The hand-out concludes with the survey itself and some suggested answers to the presented problems.

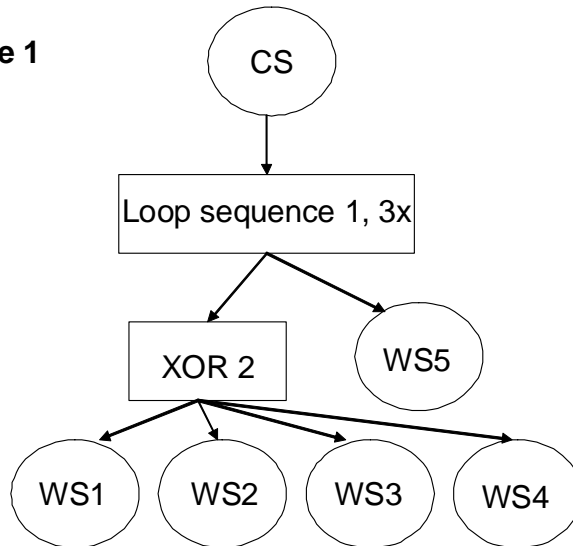
---

\*This research has been supported by the Dutch Organization for Scientific Research (NWO) under contract number 612.063.409

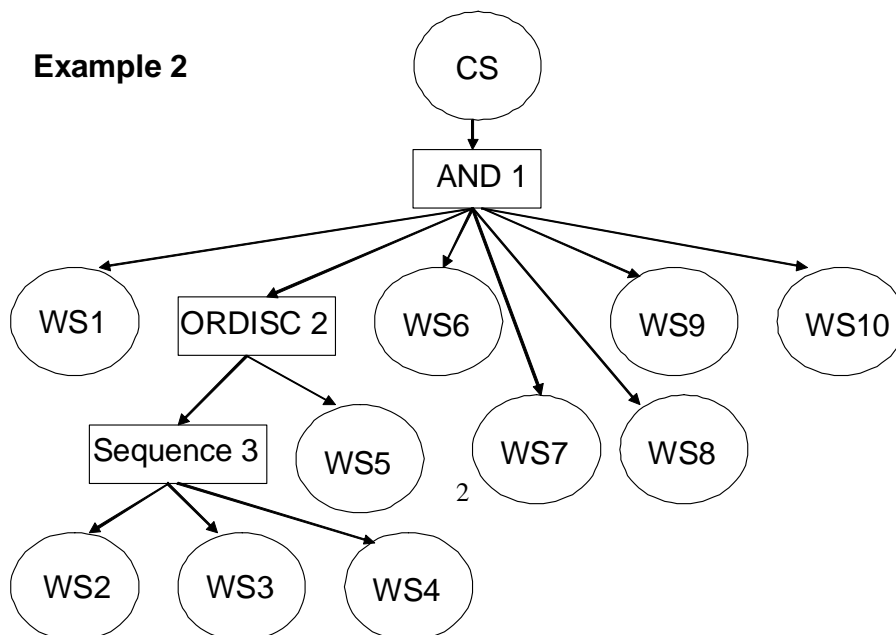
Time	Subject	Minutes
15:09-15:26	Presentation	15
15:27-15:40	Example 1	13
15:40-15:58	Example 2	18
16:00-16:04	Before evaluation: Q1-Q7	4
16:04-16:15	Test Case 1: 5 Services • Q8-Q11 without MoDe4SLA: 4min • Q12-Q18 with MoDe4SLA: 7min	11
16:15-16:28	Test Case 2: 10 Services • Q19-Q22 without MoDe4SLA: 5min • Q23-Q29 with MoDe4SLA: 8min	13
16:28-16:43	Test Case 3: 17 Services • Q30-Q33 without MoDe4SLA: 8min • Q34-Q40 with MoDe4SLA: 7min	15
16:43-16:53	After evaluation: Q41-Q47	10
<b>15:09-16:53</b>	<b>Total time</b>	<b>104</b>

Table 1. Time Transcript

Example 1



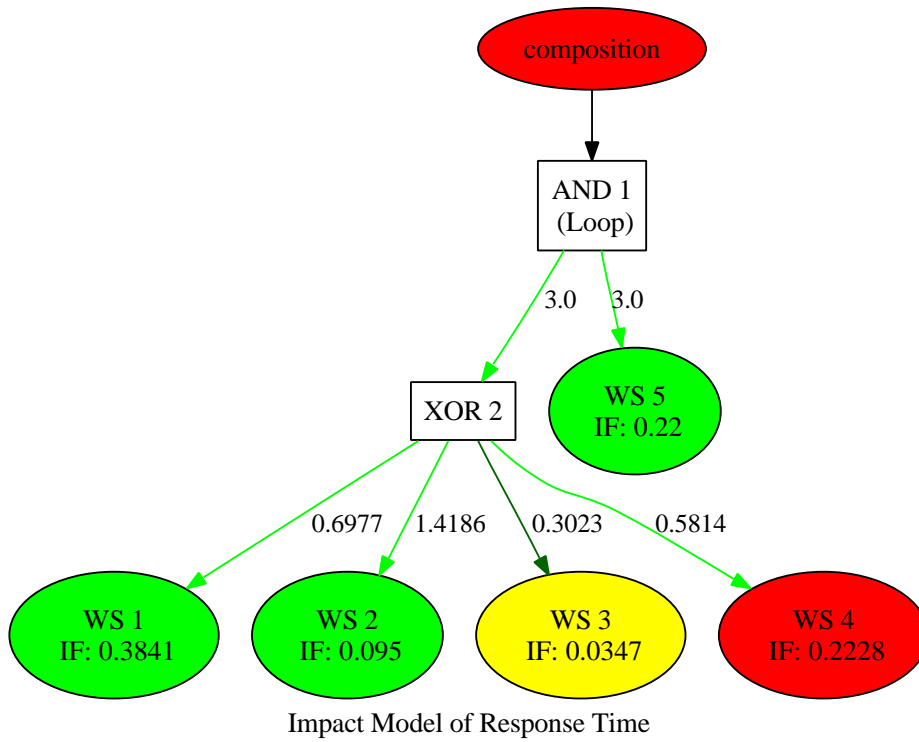
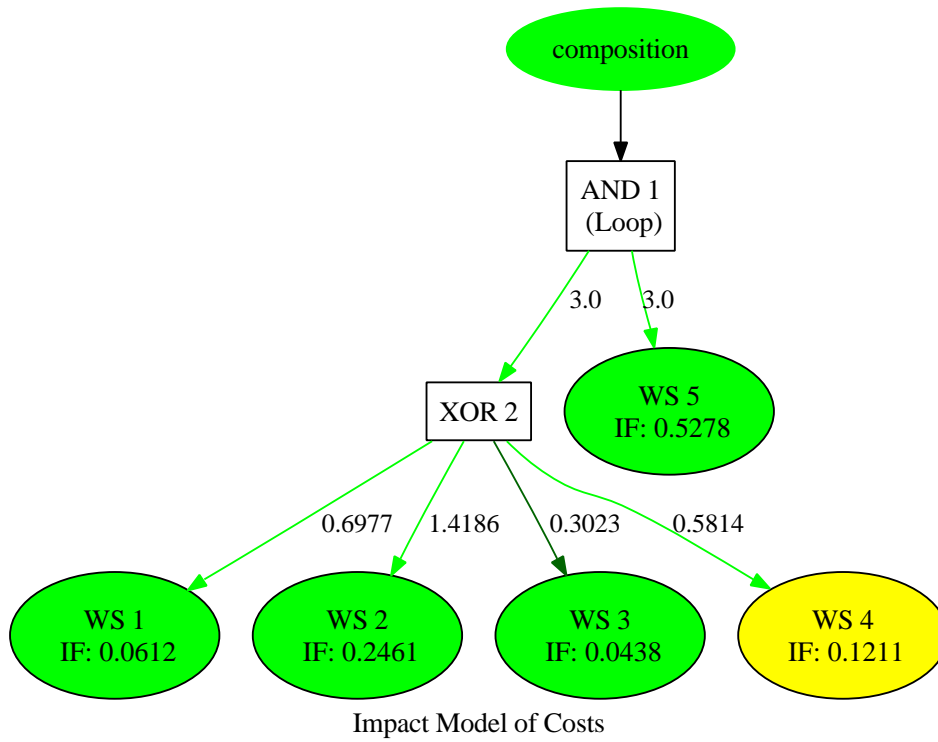
Example 2



```

# -----
#
# date: 2009-01-05
#
# These are the design time estimations of the setup.
#
# -----
Composition has estimations:
  Response Time (min,mean,max): 37.0, 104.65268, 350.0
  Costs (min,mean,max):      1953.8778, 4003.2437, 6294.766
Loop (Estimated: 3 times). 1
  |_Subelement:
  | XOR split and XOR join. 2
  | |_Subelement, [0.23]:
  | | Web Service No 1 with QoS:
  | |   Response Time: ( min, mean, max): 55.0, 64.12, 103.0
  | |   Cost:          ( min, mean, max): 179.98412, 346.907, 446.46692
  | | |_Subelement, [0.47]:
  | | | Web Service No 2 with QoS:
  | | |   Response Time: ( min, mean, max): 6.0, 7.38, 9.0
  | | |   Cost:          ( min, mean, max): 449.4833, 683.2266, 841.07556
  | | | |_Subelement, [0.11]:
  | | | | Web Service No 3 with QoS:
  | | | |   Response Time: ( min, mean, max): 9.0, 12.53, 13.0
  | | | |   Cost:          ( min, mean, max): 306.47635, 575.76666, 1022.1091
  | | | |_Subelement, [0.19]:
  | | | | Web Service No 4 with QoS:
  | | | |   Response Time: ( min, mean, max): 23.0, 37.96, 63.0
  | | | |   Cost:          ( min, mean, max): 652.1204, 795.49695, 1257.2106
  | | |_Subelement:
  | | | Web Service No 5 with QoS:
  | | |   Response Time: ( min, mean, max): 7.0, 8.08, 14.0
  | | |   Cost:          ( min, mean, max): 471.3085, 719.03064, 841.0449
  |
# -----
#
# date: 2009-01-05
#
# These are the realized values of the setup.
#
# -----
Realized values of the composition:
  Response Time (min,mean,max): 10.0, 115.31396, 280.0
  Costs (min,mean,max):      807.55615, 4087.1555, 7654.6367
  Total number of invocations: 86
Loop (Estimated: 3 times). 1
On average 3.0 iterations per invocation, with;
1 iterations minimum
5 iterations maximum
Total # of invocations: 86
Total # of iterations: 258
  |_Subelement:
  | XOR split and XOR join. 2
  | Total # of invocations: 258
  | |_Subelement, [0.23]
  | | Web Service No 1 with QoS:
  | |   Response Time: ( min, mean, max): 5.0, 63.483334, 135.0
  | |   Cost:          ( min, mean, max): 4.4063416, 358.34943, 696.63635
  | |   Total # of invocations: 60
  | | |_Subelement, [0.47]:
  | | | Web Service No 2 with QoS:
  | | |   Response Time: ( min, mean, max): 2.0, 7.7213116, 11.0
  | | |   Cost:          ( min, mean, max): 310.07037, 709.13855, 1258.3787
  | | |   Total # of invocations: 122
  | | | |_Subelement, [0.1]:
  | | | | Web Service No 3 with QoS:
  | | | |   Response Time: ( min, mean, max): 10.0, 13.230769, 17.0
  | | | |   Cost:          ( min, mean, max): 82.50397, 591.9862, 995.69275
  | | | |   Total # of invocations: 26
  | | | |_Subelement, [0.19]:
  | | | | Web Service No 4 with QoS:
  | | | |   Response Time: ( min, mean, max): 7.0, 44.2, 80.0
  | | | |   Cost:          ( min, mean, max): 123.56213, 851.59, 1353.6824
  | | | |   Total # of invocations: 50
  | |_Subelement:
  | | Web Service No 5 with QoS:
  | |   Response Time: ( min, mean, max): 1.0, 8.457364, 19.0
  | |   Cost:          ( min, mean, max): 224.15494, 719.02466, 1178.1434
  | |   Total # of invocations: 258

```



```

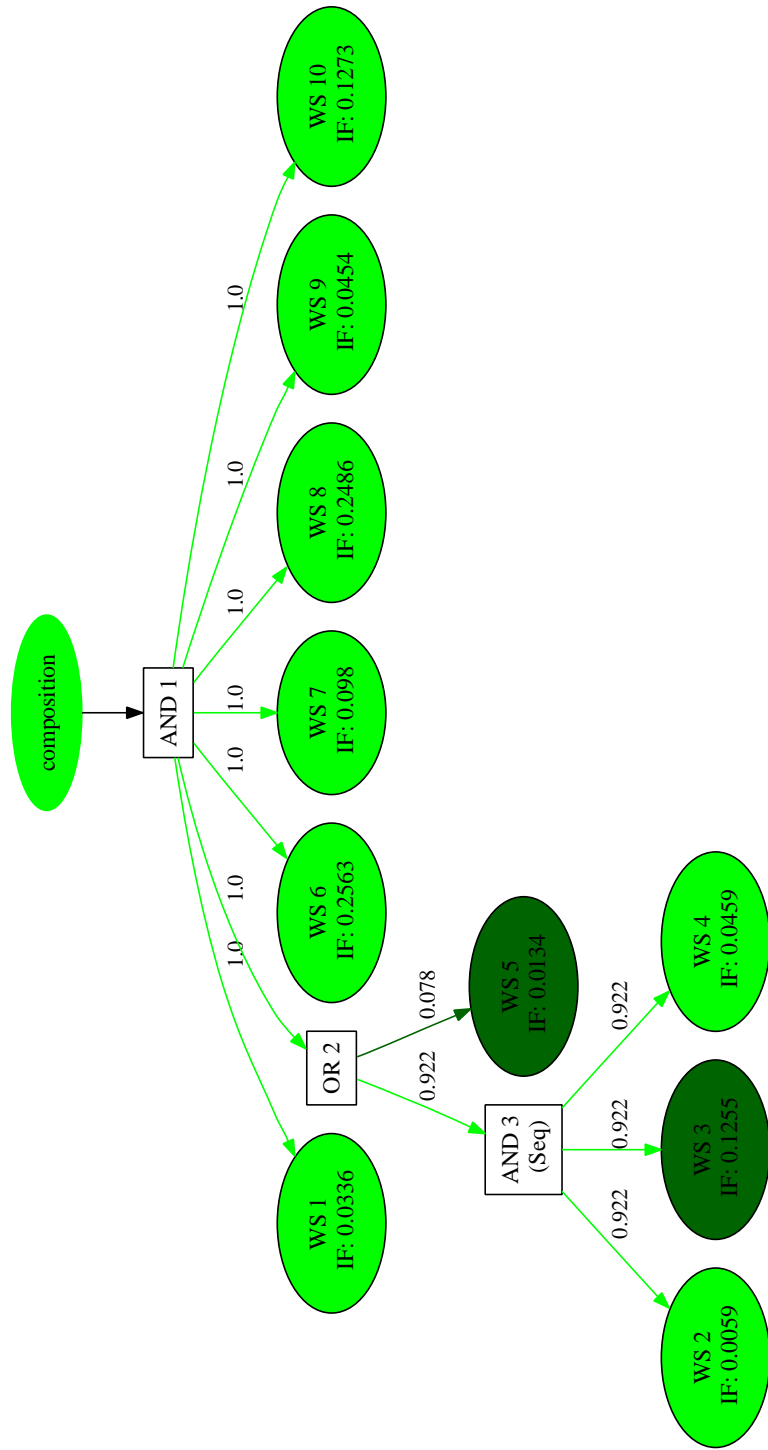
# -----
#
# date: 2009-01-05
#
# These are the design time estimations of the setup.
#
# -----
Composition has estimations:
  Response Time (min,mean,max): 60.0, 60.07926, 87.0
  Costs (min,mean,max):      4478.543, 5904.4717, 7152.936
AND split and join. 1
|_Subelement:
|  Web Service No 1 with QoS:
|    Response Time: ( min, mean, max): 60.0, 60.08, 71.0
|    Cost:         ( min, mean, max): 98.43849, 187.82, 276.05942
|_Subelement:
|  OR split, DISC join, where 1/2 services are started and 1 must finish. 2
|    |_Subelement, [0.91]:
|      Ordered or Unorderd Sequence. 3
|        |_Subelement:
|          Web Service No 2 with QoS:
|            Response Time: ( min, mean, max): 17.0, 17.18, 20.0
|            Cost:         ( min, mean, max): 28.15143, 36.083733, 62.51728
|          |_Subelement:
|            Web Service No 3 with QoS:
|              Response Time: ( min, mean, max): 27.0, 29.12, 39.0
|              Cost:         ( min, mean, max): 844.66565, 849.76044, 1207.5106
|            |_Subelement:
|              Web Service No 4 with QoS:
|                Response Time: ( min, mean, max): 8.0, 8.81, 14.0
|                Cost:         ( min, mean, max): 214.26782, 287.72424, 405.6331
|          |_Subelement, [0.09]:
|            Web Service No 5 with QoS:
|              Response Time: ( min, mean, max): 34.0, 39.99, 65.0
|              Cost:         ( min, mean, max): 917.90076, 1117.3857, 1208.3107
|        |_Subelement:
|          Web Service No 6 with QoS:
|            Response Time: ( min, mean, max): 31.0, 31.92, 59.0
|            Cost:         ( min, mean, max): 1376.125, 1495.7457, 1681.4296
|          |_Subelement:
|            Web Service No 7 with QoS:
|              Response Time: ( min, mean, max): 13.0, 20.83, 24.0
|              Cost:         ( min, mean, max): 509.5893, 567.05164, 768.5949
|            |_Subelement:
|              Web Service No 8 with QoS:
|                Response Time: ( min, mean, max): 19.0, 28.67, 45.0
|                Cost:         ( min, mean, max): 879.7758, 1452.2764, 1639.7931
|              |_Subelement:
|                Web Service No 9 with QoS:
|                  Response Time: ( min, mean, max): 41.0, 51.99, 87.0
|                  Cost:         ( min, mean, max): 224.44736, 271.22287, 344.06854
|                |_Subelement:
|                  Web Service No 10 with QoS:
|                    Response Time: ( min, mean, max): 30.0, 32.78, 44.0
|                    Cost:         ( min, mean, max): 472.2663, 761.843, 767.32996

```

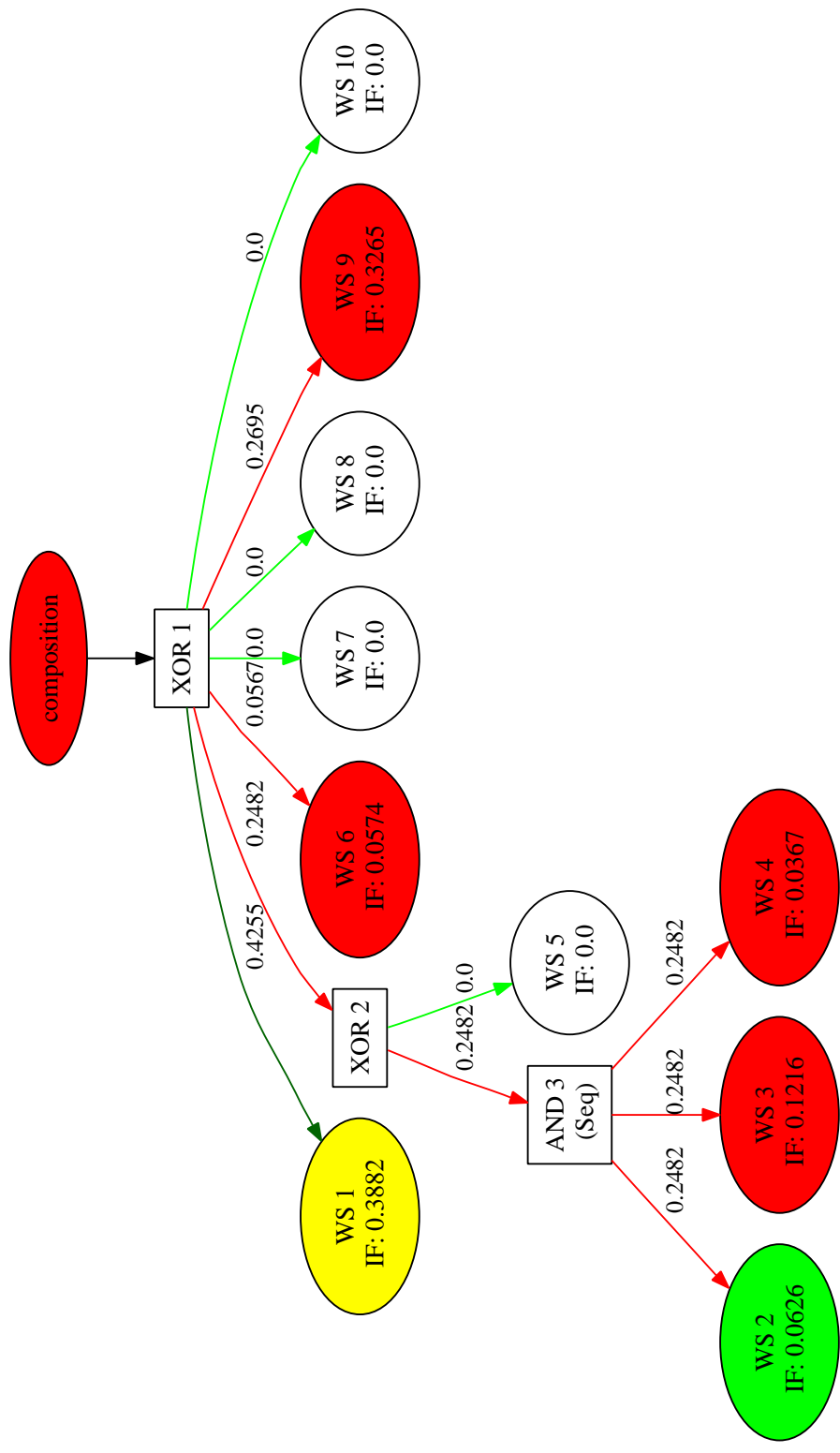
```

# -----
#
# date: 2009-01-05
#
# These are the realized values of the setup.
#
# -----
Realized values of the composition:
Response Time (min,mean,max): 48.0, 69.95744, 118.0
Costs (min,mean,max): 4461.6094, 5837.4336, 7363.0635
Total number of invocations: 141
AND split and join. 1
|_Subelement:
| Web Service No 1 with QoS:
| Response Time: ( min, mean, max): 38.0, 59.737587, 83.0
| Cost: ( min, mean, max): 2.1773071, 196.4023, 506.32004
| Total # of invocations: 141
|_Subelement:
| OR split, DISC join, where 1/2 services are started and 1 must finish. 2
| Total # of invocations: 141
| |_Subelement, [0.92]:
| | Ordered or Unorderd Sequence. 3
| | |_Subelement:
| | | Web Service No 2 with QoS:
| | | Response Time: ( min, mean, max): 13.0, 17.46923, 24.0
| | | Cost: ( min, mean, max): 0.64427567, 37.398582, 75.619675
| | | Total # of invocations: 130
| | |_Subelement:
| | | Web Service No 3 with QoS:
| | | Response Time: ( min, mean, max): 11.0, 29.476923, 46.0
| | | Cost: ( min, mean, max): 221.93439, 794.90106, 1471.3582
| | | Total # of invocations: 130
| | |_Subelement:
| | | Web Service No 4 with QoS:
| | | Response Time: ( min, mean, max): 1.0, 9.2615385, 19.0
| | | Cost: ( min, mean, max): 39.46582, 290.72437, 552.23596
| | | Total # of invocations: 130
| |_Subelement, [0.08]:
| | Web Service No 5 with QoS:
| | Response Time: ( min, mean, max): 14.0, 40.18182, 60.0
| | Cost: ( min, mean, max): 746.75745, 1001.19104, 1312.5217
| | Total # of invocations: 11
|_Subelement:
| Web Service No 6 with QoS:
| Response Time: ( min, mean, max): 1.0, 32.19858, 82.0
| Cost: ( min, mean, max): 1139.2125, 1496.3722, 1959.8899
| Total # of invocations: 141
|_Subelement:
| Web Service No 7 with QoS:
| Response Time: ( min, mean, max): 8.0, 21.021276, 38.0
| Cost: ( min, mean, max): 199.32922, 571.8603, 848.80597
| Total # of invocations: 141
|_Subelement:
| Web Service No 8 with QoS:
| Response Time: ( min, mean, max): 1.0, 28.269503, 61.0
| Cost: ( min, mean, max): 437.3061, 1451.3611, 2627.58
| Total # of invocations: 141
|_Subelement:
| Web Service No 9 with QoS:
| Response Time: ( min, mean, max): 3.0, 52.80142, 118.0
| Cost: ( min, mean, max): 75.968735, 264.92352, 463.69916
| Total # of invocations: 141
|_Subelement:
| Web Service No 10 with QoS:
| Response Time: ( min, mean, max): 10.0, 32.67376, 57.0
| Cost: ( min, mean, max): 171.70697, 742.9943, 1202.0015
| Total # of invocations: 141

```



Impact Model of Costs



Impact Model of Response Time

```

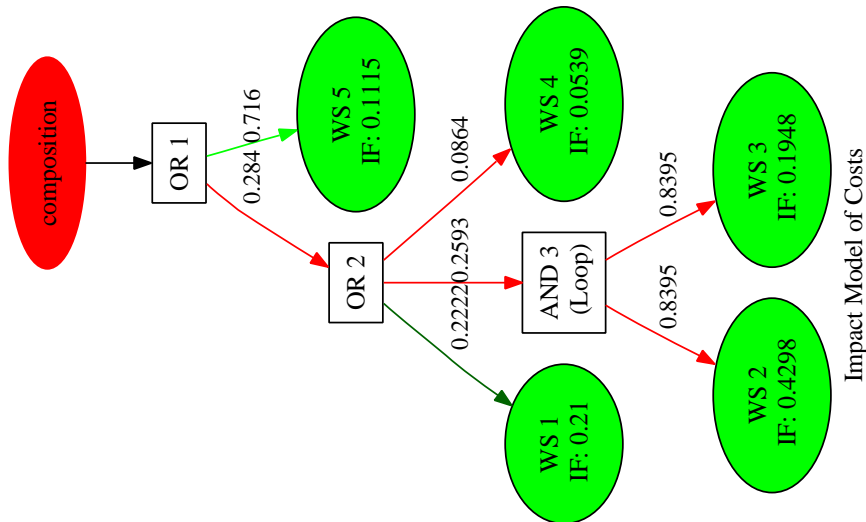
# -----
#
# date: 2009-01-05
#
# These are the design time estimations of the setup.
# -----
Composition has estimations:
  Response Time (min,mean,max): 31.0, 101.255066, 346.0
  Costs (min,mean,max):      156.48984, 1128.1544, 5314.09
OR split, DISC join, where 1/2 services are started and 1 must finish. 1
|_Subelement, [0.25]:
|  OR split, OR join, where 2/3 services are started. 2
|  |_Subelement, [0.13]
|  |  Web Service No 1 with QoS:
|  |  |  Response Time: ( min, mean, max): 37.0, 41.94, 54.0
|  |  |  Cost:          ( min, mean, max): 1016.39996, 1294.8214, 1370.5468
|  |  |_Subelement, [0.1]:
|  |  |  Loop (Estimated: 3 times). 3
|  |  |  |_Subelement:
|  |  |  |  Web Service No 2 with QoS:
|  |  |  |  |  Response Time: ( min, mean, max): 36.0, 43.24, 49.0
|  |  |  |  |  Cost:          ( min, mean, max): 452.08832, 682.67126, 924.9143
|  |  |  |  |_Subelement:
|  |  |  |  |  Web Service No 3 with QoS:
|  |  |  |  |  |  Response Time: ( min, mean, max): 29.0, 53.36, 66.0
|  |  |  |  |  |  Cost:          ( min, mean, max): 229.46642, 328.3388, 389.59998
|  |  |_Subelement, [0.03]:
|  |  |  Web Service No 4 with QoS:
|  |  |  |  Response Time: ( min, mean, max): 71.0, 95.51, 97.0
|  |  |  |  Cost:          ( min, mean, max): 593.22174, 872.5337, 968.7437
|  |_Subelement, [0.75]:
|  |  Web Service No 5 with QoS:
|  |  |  Response Time: ( min, mean, max): 31.0, 49.91, 90.0
|  |  |  Cost:          ( min, mean, max): 156.48984, 205.53635, 284.83356

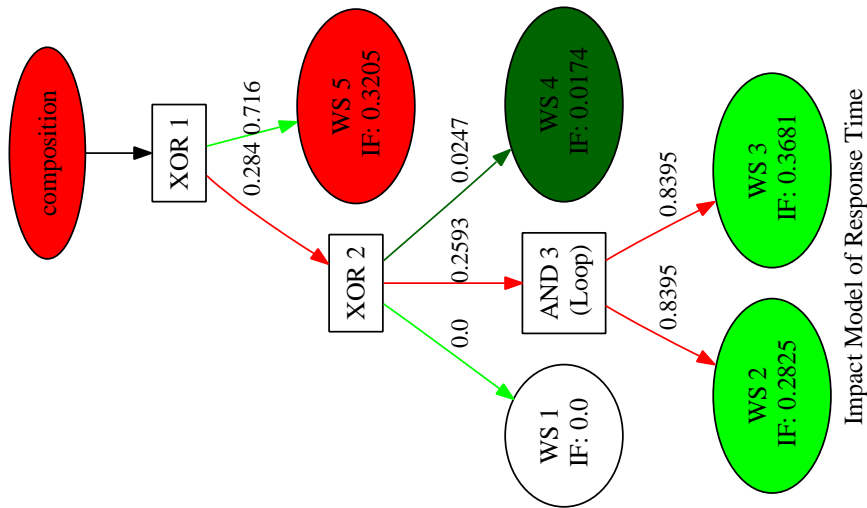
```

```

# -----
#
# date: 2009-01-05
#
# These are the realized values of the setup.
#
# -----
Realized values of the composition:
  Response Time (min,mean,max): 2.0, 124.75309, 552.0
  Costs (min,mean,max): 72.18178, 1367.3472, 6921.927
  Total number of invocations: 81
OR split, DISC join, where 1/2 services are started and 1 must finish. 1
Total # of invocations: 81
  |_Subelement, [0.28]:
  | OR split, OR join, where 2/3 services are started. 2
  | Total # of invocations: 23
  | |_Subelement, [0.39]:
  | | Web Service No 1 with QoS:
  | |   Response Time: ( min, mean, max): 25.0, 44.11111, 59.0
  | |   Cost: ( min, mean, max): 917.0228, 1291.9982, 1716.5248
  | |   Total # of invocations: 18
  | |_Subelement, [0.46]:
  | | Loop (Estimated: 3 times). 3
  | | On average 3.2380953 iterations per invocation, with;
  | | 1 iterations minimum
  | | 5 iterations maximum
  | | Total # of invocations: 21
  | | Total # of iterations: 68
  | | |_Subelement:
  | | | Web Service No 2 with QoS:
  | | |   Response Time: ( min, mean, max): 25.0, 41.985294, 57.0
  | | |   Cost: ( min, mean, max): 148.31451, 700.11615, 1286.4136
  | | |   Total # of invocations: 68
  | | |_Subelement:
  | | | Web Service No 3 with QoS:
  | | |   Response Time: ( min, mean, max): 2.0, 54.705883, 96.0
  | | |   Cost: ( min, mean, max): 133.13046, 317.24414, 494.24457
  | | |   Total # of invocations: 68
  | |_Subelement, [0.15]:
  | | Web Service No 4 with QoS:
  | |   Response Time: ( min, mean, max): 66.0, 86.42857, 102.0
  | |   Cost: ( min, mean, max): 646.3866, 852.32965, 1006.03174
  | |   Total # of invocations: 7
  |_Subelement, [0.72]:
  | Web Service No 5 with QoS:
  |   Response Time: ( min, mean, max): 2.0, 55.844826, 134.0
  |   Cost: ( min, mean, max): 72.18178, 212.97133, 314.7603
  |   Total # of invocations: 58

```





```

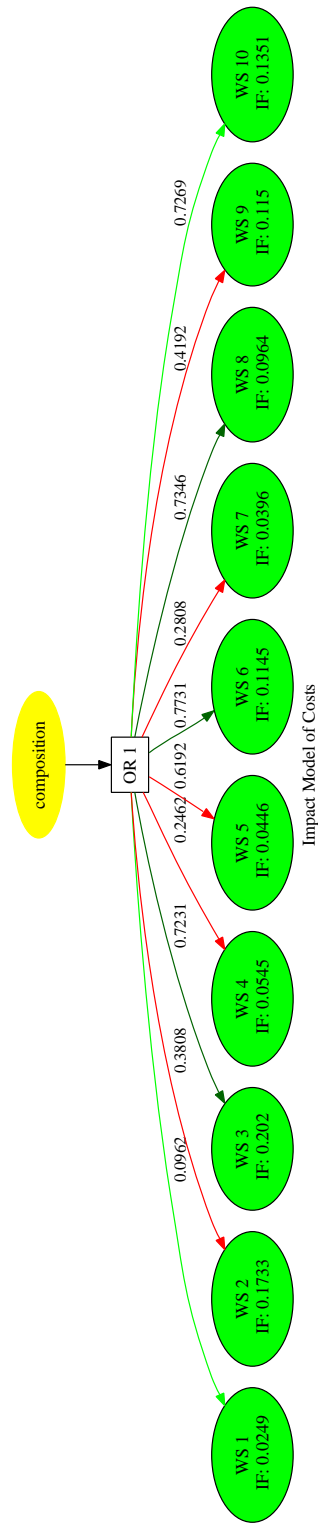
# -----
#
# date: 2009-01-05
#
# These are the design time estimations of the setup.
# -----
Composition has estimations:
  Response Time (min,mean,max): 8.0, 25.232832, 57.0
  Costs (min,mean,max): 1311.291, 2551.4988, 5316.124
OR split, DISC join, where 5/10 services are started and 4 must finish. 1
|_Subelement, [0.02]:
|   Web Service No 1 with QoS:
|     Response Time: ( min, mean, max): 3.0, 5.49, 10.0
|     Cost: ( min, mean, max): 650.1171, 697.0652, 742.9949
|_Subelement, [0.06]:
|   Web Service No 2 with QoS:
|     Response Time: ( min, mean, max): 16.0, 30.5, 34.0
|     Cost: ( min, mean, max): 910.12067, 1248.0664, 1479.9344
|_Subelement, [0.17]:
|   Web Service No 3 with QoS:
|     Response Time: ( min, mean, max): 7.0, 7.4, 13.0
|     Cost: ( min, mean, max): 678.38586, 765.3185, 992.6084
|_Subelement, [0.04]:
|   Web Service No 4 with QoS:
|     Response Time: ( min, mean, max): 7.0, 10.01, 14.0
|     Cost: ( min, mean, max): 340.1327, 616.41974, 820.01715
|_Subelement, [0.11]:
|   Web Service No 5 with QoS:
|     Response Time: ( min, mean, max): 56.0, 70.54, 92.0
|     Cost: ( min, mean, max): 166.74295, 194.34271, 246.28497
|_Subelement, [0.17]:
|   Web Service No 6 with QoS:
|     Response Time: ( min, mean, max): 32.0, 38.66, 57.0
|     Cost: ( min, mean, max): 383.56046, 412.27762, 652.6
|_Subelement, [0.04]:
|   Web Service No 7 with QoS:
|     Response Time: ( min, mean, max): 11.0, 20.22, 31.0
|     Cost: ( min, mean, max): 214.47679, 379.56845, 542.52026
|_Subelement, [0.17]:
|   Web Service No 8 with QoS:
|     Response Time: ( min, mean, max): 30.0, 33.69, 39.0
|     Cost: ( min, mean, max): 206.37807, 344.82913, 683.942
|_Subelement, [0.06]:
|   Web Service No 9 with QoS:
|     Response Time: ( min, mean, max): 20.0, 32.39, 40.0
|     Cost: ( min, mean, max): 664.5739, 756.0107, 1280.5693
|_Subelement, [0.15]:
|   Web Service No 10 with QoS:
|     Response Time: ( min, mean, max): 8.0, 10.01, 15.0
|     Cost: ( min, mean, max): 453.9847, 503.38693, 566.20245

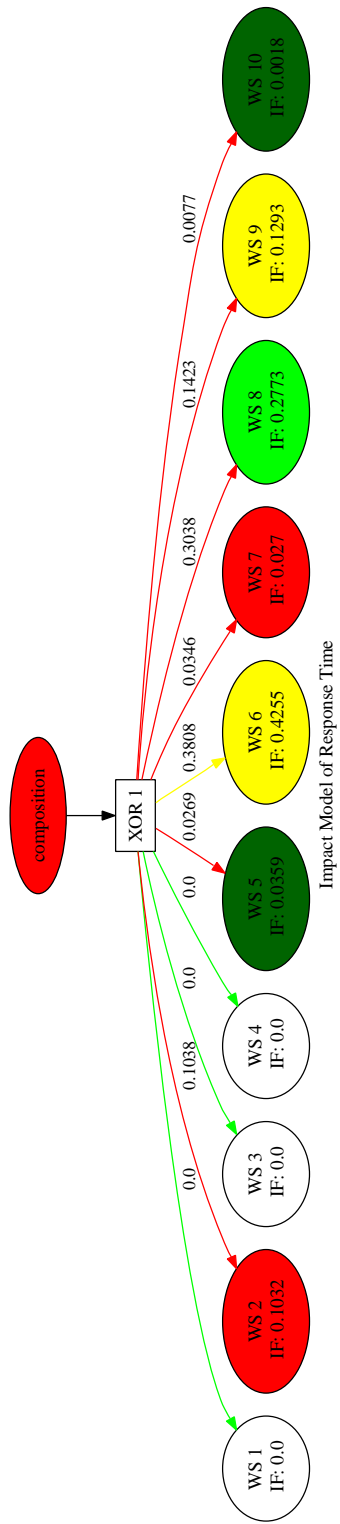
```

```

# -----
#
# date: 2009-01-05
#
# These are the realized values of the setup.
#
# -----
Realized values of the composition:
  Response Time (min,mean,max): 9.0, 37.603848, 77.0
  Costs (min,mean,max):      1385.0469, 2721.055, 4769.6475
  Total number of invocations: 260
OR split, DISC join, where 5/10 services are started and 4 must finish. 1
Total # of invocations: 260
|_Subelement, [0.02]:
| Web Service No 1 with QoS:
|   Response Time: ( min, mean, max): 1.0, 6.64, 15.0
|   Cost:          ( min, mean, max): 638.6256, 705.8908, 822.35046
|   Total # of invocations: 25
|_Subelement, [0.08]:
| Web Service No 2 with QoS:
|   Response Time: ( min, mean, max): 1.0, 29.876404, 53.0
|   Cost:          ( min, mean, max): 464.2979, 1238.5753, 2147.8433
|   Total # of invocations: 99
|_Subelement, [0.14]:
| Web Service No 3 with QoS:
|   Response Time: ( min, mean, max): 1.0, 7.208556, 16.0
|   Cost:          ( min, mean, max): 336.78345, 760.00507, 1241.7505
|   Total # of invocations: 188
|_Subelement, [0.05]:
| Web Service No 4 with QoS:
|   Response Time: ( min, mean, max): 3.0, 10.78125, 16.0
|   Cost:          ( min, mean, max): 120.918, 602.12177, 1098.9824
|   Total # of invocations: 64
|_Subelement, [0.12]:
| Web Service No 5 with QoS:
|   Response Time: ( min, mean, max): 19.0, 45.22222, 66.0
|   Cost:          ( min, mean, max): 76.74548, 196.04285, 284.44122
|   Total # of invocations: 161
|_Subelement, [0.15]:
| Web Service No 6 with QoS:
|   Response Time: ( min, mean, max): 5.0, 35.953335, 77.0
|   Cost:          ( min, mean, max): 21.71933, 402.92, 892.9569
|   Total # of invocations: 201
|_Subelement, [0.06]:
| Web Service No 7 with QoS:
|   Response Time: ( min, mean, max): 1.0, 19.12676, 42.0
|   Cost:          ( min, mean, max): 72.82269, 384.16068, 767.1182
|   Total # of invocations: 73
|_Subelement, [0.15]:
| Web Service No 8 with QoS:
|   Response Time: ( min, mean, max): 21.0, 33.520958, 42.0
|   Cost:          ( min, mean, max): 12.257751, 357.24112, 918.28345
|   Total # of invocations: 191
|_Subelement, [0.08]:
| Web Service No 9 with QoS:
|   Response Time: ( min, mean, max): 3.0, 30.539326, 47.0
|   Cost:          ( min, mean, max): 64.76129, 746.33026, 2026.8804
|   Total # of invocations: 109
|_Subelement, [0.15]:
| Web Service No 10 with QoS:
|   Response Time: ( min, mean, max): 1.0, 10.772487, 21.0
|   Cost:          ( min, mean, max): 357.44855, 505.89777, 668.23944
|   Total # of invocations: 189

```





```

# -----
#
# date: 2009-01-05
#
# These are the design time estimations of the setup.
# -----
Composition has estimations:
  Response Time (min,mean,max): 41.0, 117.02195, 725.0
  Costs (min,mean,max): 4415.4473, 8245.411, 22181.707
AND split and join. 1
  |_Subelement:
  | Web Service No 1 with QoS:
  |   Response Time: ( min, mean, max): 10.0, 11.63, 18.0
  |   Cost: ( min, mean, max): 210.02309, 313.72, 513.5868
  |_Subelement:
  | Web Service No 2 with QoS:
  |   Response Time: ( min, mean, max): 33.0, 37.69, 47.0
  |   Cost: ( min, mean, max): 846.5581, 963.62225, 1339.1849
  |_Subelement:
  | Web Service No 3 with QoS:
  |   Response Time: ( min, mean, max): 22.0, 33.45, 34.0
  |   Cost: ( min, mean, max): 372.75146, 644.95825, 1061.9478
  |_Subelement:
  | Web Service No 4 with QoS:
  |   Response Time: ( min, mean, max): 31.0, 43.39, 60.0
  |   Cost: ( min, mean, max): 736.048, 909.04694, 1338.7078
  |_Subelement:
  | Web Service No 5 with QoS:
  |   Response Time: ( min, mean, max): 7.0, 12.19, 18.0
  |   Cost: ( min, mean, max): 100.35527, 168.35362, 198.89468
  |_Subelement:
  | AND split and join. 2
  | |_Subelement:
  | | Web Service No 6 with QoS:
  | |   Response Time: ( min, mean, max): 41.0, 59.62, 62.0
  | |   Cost: ( min, mean, max): 442.9783, 454.52646, 591.99786
  | |_Subelement:
  | | Web Service No 7 with QoS:
  | |   Response Time: ( min, mean, max): 36.0, 60.51, 61.0
  | |   Cost: ( min, mean, max): 201.85391, 318.47342, 325.6623
  | |_Subelement:
  | | XOR split and XOR join. 3
  | | |_Subelement, [0.72]:
  | | | Web Service No 8 with QoS:
  | | |   Response Time: ( min, mean, max): 32.0, 60.31, 67.0
  | | |   Cost: ( min, mean, max): 525.27045, 618.8252, 664.4616
  | | | |_Subelement, [0.15]:
  | | | | Loop (Estimated: 5 times). 4
  | | | | |_Subelement:
  | | | | | Web Service No 9 with QoS:
  | | | | |   Response Time: ( min, mean, max): 17.0, 31.58, 33.0
  | | | | |   Cost: ( min, mean, max): 804.11975, 1158.6505, 1446.9174
  | | | | | |_Subelement:
  | | | | | Web Service No 10 with QoS:
  | | | | |   Response Time: ( min, mean, max): 16.0, 28.44, 54.0
  | | | | |   Cost: ( min, mean, max): 35.12873, 53.35737, 71.33427

```

```

| | | |__Subelement:
| | | |   Web Service No 11 with QoS:
| | | |     Response Time: ( min, mean, max): 31.0, 36.78, 59.0
| | | |     Cost:          ( min, mean, max): 830.5941, 837.7012, 1149.1959
| | | |__Subelement, [0.13]:
| | | |   Web Service No 12 with QoS:
| | | |     Response Time: ( min, mean, max): 5.0, 7.69, 11.0
| | | |     Cost:          ( min, mean, max): 625.7165, 1118.7761, 1415.0142
| | | |__Subelement:
| | | |   Web Service No 13 with QoS:
| | | |     Response Time: ( min, mean, max): 13.0, 19.05, 32.0
| | | |     Cost:          ( min, mean, max): 694.0153, 1381.3864, 1965.6458
| | | |__Subelement:
| | | |   OR split, DISC join, where 1/2 services are started and 1 must finish. 5
| | | | |__Subelement, [0.89]:
| | | | |   Web Service No 14 with QoS:
| | | | |     Response Time: ( min, mean, max): 20.0, 22.43, 24.0
| | | | |     Cost:          ( min, mean, max): 502.37628, 567.51276, 859.6056
| | | | |__Subelement, [0.11]:
| | | | |   Web Service No 15 with QoS:
| | | | |     Response Time: ( min, mean, max): 26.0, 50.12, 81.0
| | | | |     Cost:          ( min, mean, max): 6.94027, 9.2576885, 13.704545
| | | | |__Subelement:
| | | | |   Web Service No 16 with QoS:
| | | | |     Response Time: ( min, mean, max): 4.0, 8.1, 9.0
| | | | |     Cost:          ( min, mean, max): 156.71298, 285.16486, 325.40204
| | | | |__Subelement:
| | | | |   Web Service No 17 with QoS:
| | | | |     Response Time: ( min, mean, max): 30.0, 42.86, 58.0
| | | | |     Cost:          ( min, mean, max): 121.94054, 171.77739, 323.83493

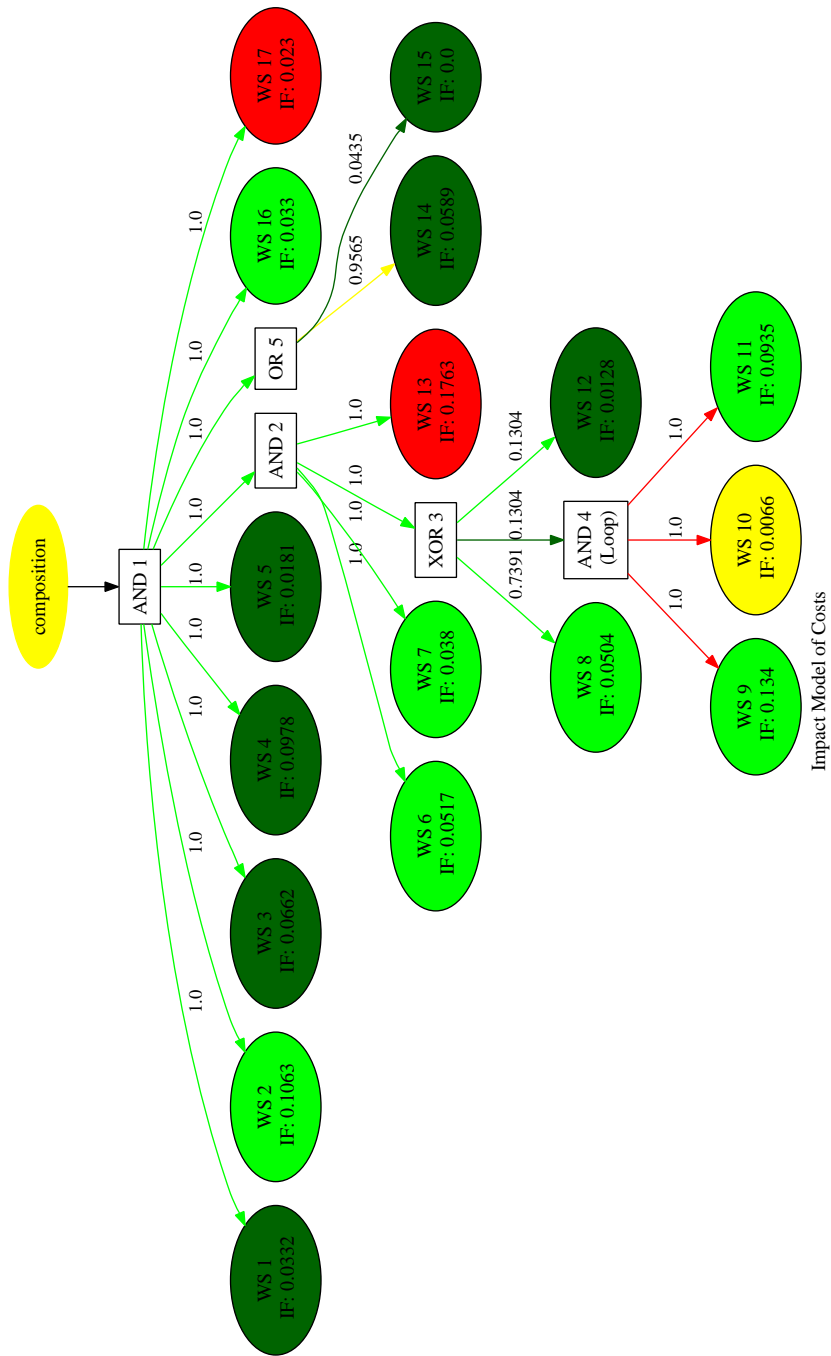
```

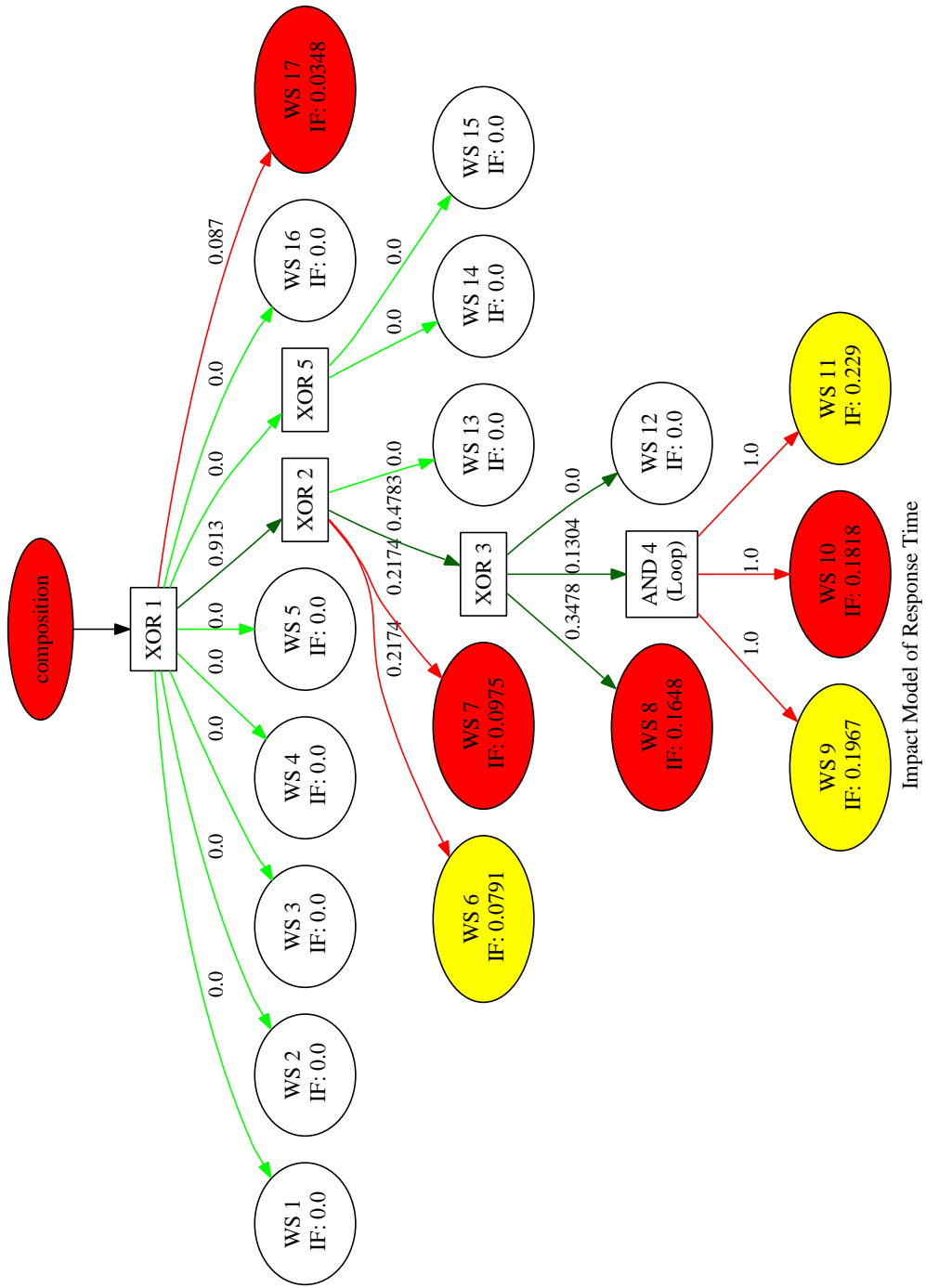
```

# -----
#
# date: 2009-01-05
#
# These are the realized values of the setup.
#
# -----
Realized values of the composition:
  Response Time (min,mean,max): 48.0, 174.86957, 1036.0
  Costs (min,mean,max): 5590.6934, 8678.282, 25450.111
  Total number of invocations: 23
AND split and join. 1
|_Subelement:
| Web Service No 1 with QoS:
|   Response Time: ( min, mean, max): 7.0, 12.565217, 21.0
|   Cost: ( min, mean, max): 39.184357, 288.40488, 607.5144
|   Total # of invocations: 23
|_Subelement:
| Web Service No 2 with QoS:
|   Response Time: ( min, mean, max): 30.0, 40.434784, 63.0
|   Cost: ( min, mean, max): 335.96082, 922.88495, 1502.9639
|   Total # of invocations: 23
|_Subelement:
| Web Service No 3 with QoS:
|   Response Time: ( min, mean, max): 20.0, 37.869564, 54.0
|   Cost: ( min, mean, max): 161.43155, 574.28046, 1251.6294
|   Total # of invocations: 23
|_Subelement:
| Web Service No 4 with QoS:
|   Response Time: ( min, mean, max): 14.0, 40.04348, 69.0
|   Cost: ( min, mean, max): 341.64148, 848.5004, 1338.3586
|   Total # of invocations: 23
|_Subelement:
| Web Service No 5 with QoS:
|   Response Time: ( min, mean, max): 1.0, 13.782609, 21.0
|   Cost: ( min, mean, max): 62.765213, 157.46265, 242.28073
|   Total # of invocations: 23
|_Subelement:
| AND split and join. 2
|_Subelement:
| | Web Service No 6 with QoS:
| |   Response Time: ( min, mean, max): 33.0, 61.608696, 92.0
| |   Cost: ( min, mean, max): 257.6671, 449.0448, 714.92725
| |   Total # of invocations: 23
|_Subelement:
| | Web Service No 7 with QoS:
| |   Response Time: ( min, mean, max): 31.0, 61.304348, 104.0
| |   Cost: ( min, mean, max): 172.90501, 330.1317, 451.6234
| |   Total # of invocations: 23
|_Subelement:
| | XOR split and XOR join. 3
| | Total # of invocations: 23
| | |_Subelement, [0.74]:
| | | Web Service No 8 with QoS:
| | |   Response Time: ( min, mean, max): 33.0, 67.588234, 101.0
| | |   Cost: ( min, mean, max): 456.34702, 591.18994, 754.9042
| | |   Total # of invocations: 17

```







Impact Model of Response Time



**Survey:** Validating Usefulness of MoDe4SLA

**Status:** Launched (survey active)

### 1. Before starting the evaluation

[Copy page](#) • [Delete page](#)

Before starting the evaluation, please answer the following questions.

**1. Do you consider yourself to be from academia or from industry?**

- Industry
- Academia
- Both

**2. Do you have experience using tools to support management of composite services?**

- Yes
- No
- Don't know

**3. How do you currently manage composite services?**

**4. Have you ever developed an approach for managing composite services?**

- Yes
- No

**5. How many years have you worked using composite services?**

- None
- Up to 1 year
- 1-2 years
- 2-3 years
- More than 3 years

**6. My level of expertise concerning management of composite services is high.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**7. I consider research concerning management of composite services as necessary.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**2. Evaluation without MoDe4SLA: 5 S**

Copy page • Delete page •

Evaluation for the composition with **5 services**.  
Answer the following question after seeing only **the structure** (= expected values).

**8. The offered composition appears to be complex.**

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

After seeing runtime results **without MoDe4SLA**, please answer the following questions:

**9. Concerning Costs.**  
**I can easily determine how much impact each service has on the composition.**

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

**10. Concerning Response time.**  
**I can easily determine how much impact each service has on the composition.**

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

**11.**  
Assume only a subset of services can be renegotiated regarding their SLAS.  
I would feel confident in selecting services for renegotiation.

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

**3. Evaluation with MoDe4SLA: 5 Serv**

Copy page • Delete page •

After seeing runtime results **with MoDe4SLA**, please answer the following questions:

**12. After seeing the MoDe4SLA analysis, how is your confidence about the selection of services for renegotiation you made before?**

- Less confident  Equally confident  More confident

**13. Concerning Costs: I need less time to see relations between the different services and the composition.**

- Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

**14. Concerning Response time: I need less time to see relations between the different services and the composition.**

- Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

**15. Concerning Costs: I find it easier to determine the impact each service has on the composition than without the analysis.**

- Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

**16. Concerning Response time: I find it easier to determine the impact each service has on the composition than without the analysis.**

- Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

**17. Assume only a subset of services can be renegotiated regarding their SLAs. I would feel more confident in selecting services for renegotiation than without MoDe4SLA.**

- Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

**18. MoDe4SLA approach is helpful when managing this composition with regard to:**

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Accuracy (accurate depicting of malfunctioning services)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Efficiency (faster depicting of these services)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**4. Evaluation without MoDe4SLA: 10**

Copy page • Delete page •

Evaluation for the composition with **10 services**.Answer the following question after seeing only **the structure** (= expected values).**19. The offered composition appears to be complex.**

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

After seeing runtime results **without MoDe4SLA**, please answer the following questions:**20. Concerning Costs.****I can easily determine how much impact each service has on the composition.**

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**21. Concerning Response time.****I can easily determine how much impact each service has on the composition.**

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**22.**

Assume only a subset of services can be renegotiated regarding their SLAS.

I would feel confident in selecting services for renegotiation.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**5. Evaluation with MoDe4SLA: 10 Ser**

Copy page • Delete page •

After seeing runtime results **with MoDe4SLA**, please answer the following questions:

**23. After seeing the MoDe4SLA analysis, how is your confidence about the selection of services for renegotiation you made before?**

- Less confident  Equally confident  More confident

**24. Concerning Costs.**

**I need less time to see relations between the different services and the composition.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**25. Concerning Response time.**

**I need less time to see relations between the different services and the composition.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**26. Concerning Costs.**

**I find it easier to determine the impact each service has on the composition than without the analysis.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**27. Concerning Response time.**

**I find it easier to determine the impact each service has on the composition than without the analysis.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**28. Assume only a subset of services can be renegotiated regarding their SLAs.**

**I would feel more confident in selecting services for renegotiation than without MoDe4SLA.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**29. MoDe4SLA approach is helpful when managing this composition with regard to:**

- |  | Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
|--|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Accuracy (accurate depicting of malfunctioning services) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |
| Efficiency (faster depicting of these services)          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**6. Evaluation without MoDe4SLA: 17**

Copy page • Delete page •

Evaluation for the composition with **17 services**.Answer the following question after seeing only **the structure** (= expected values).**30. The offered composition appears to be complex.**

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

After seeing runtime results **without MoDe4SLA**, please answer the following questions:**31. Concerning Costs.****I can easily determine how much impact each service has on the composition.**

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**32. Concerning Response time.****I can easily determine how much impact each service has on the composition.**

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**33.**

Assume only a subset of services can be renegotiated regarding their SLAS.

I would feel confident in selecting services for renegotiation.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**7. Evaluation with MoDe4SLA: 17 Ser**

Copy page • Delete page •

After seeing runtime results **with MoDe4SLA**, please answer the following questions:

**34. After seeing the MoDe4SLA analysis, how is your confidence about the selection of services for renegotiation you made before?**

- Less confident  Equally confident  More confident

**35. Concerning Costs.**

**I need less time to see relations between the different services and the composition.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**36. Concerning Response time.**

**I need less time to see relations between the different services and the composition.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**37. Concerning Costs.**

**I find it easier to determine the impact each service has on the composition than without the analysis.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**38. Concerning Response time.**

**I find it easier to determine the impact each service has on the composition than without the analysis.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**39. Assume only a subset of services can be renegotiated regarding their SLAs.**

**I would feel more confident in selecting services for renegotiation than without MoDe4SLA.**

- |                       |                       |                            |                       |                       |
|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**40. MoDe4SLA approach is helpful when managing this composition with regard to:**

- |  | Strongly disagree     | Disagree              | Neither agree nor disagree | Agree                 | Strongly agree        |
|--|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| Accuracy (accurate depicting of malfunctioning services) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |
| Efficiency (faster depicting of these services)          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> |

**8. After all compositions are evaluat**

Copy page • Delete page •

After evaluating all compositions, please answer the following questions.

41. I consider research concerning management of composite services as necessary.

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

42. The presentation before the evaluation was sufficient to properly understand the MoDe4SLA approach.

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

43. MoDe4SLA is helpful for managing service compositions.

Strongly disagree    Disagree    Neither agree nor disagree    Agree    Strongly agree

44. What part of MoDe4SLA do you consider most beneficial?

45. What are the weak points of MoDe4SLA (possible improvements)?

46. Are you aware of any other approaches supporting management of service compositions? If so, what is the name of the approach?

No

Yes

47. MoDe4SLA is more helpful than the above mentioned approaches.

Yes    No    Not applicable

48. Please, fill out your name and email so that we can get back to you if we have some questions and so that we can keep you informed about the results of this evaluation.

Please, note that we will not use your name and email for anything other than above mentioned purposes.

Name:

Email:

### **Test 1**

#### Concerning Costs:

The costs are higher than expected because the expensive loop branch (construct 3) is chosen more often than expected. As a result more services are invoked per composition invocation. Therefore overall costs are higher. Either the structure of the composition should be changed or the SLA of the composition itself has to be reconsidered.

#### Concerning Response Time (RT):

Also the RT is higher than expected because the loop branch is chosen more often than expected. In addition WS 5 has a high impact on the composition (32% of the overall response time is contributed by this service). The service is not chosen more often than expected but is performing bad. So, either the structure has to be improved and/or the SLA of WS 5 concerning RT should be renegotiated.

### **Test 2**

#### Concerning Costs:

Although all services are performing within boundaries, the overall composition is exceeding its costs. Considering red branches in combination with high impact factors, leads to the following conclusion: WS 2 and WS 9 have a high impact and contribute more than expected. They cause a big part of the overall costs. Either the structure should be changed, WS 2 and/or WS 9 should be renegotiated or replaced by cheaper services, or the SLA of the composition should be adapted.

#### Concerning RT:

The composition is performing badly because of several factors. WS 6 is contributing a lot to the overall RT (43%). This is more contribution and more violation than expected. This service should be reconsidered. In addition both WS 2 and WS 9 are contributing more and are not performing well. Also these can be reconsidered. Although WS 7 is not doing well, its impact is relatively low. WS 8 is performing fine but since its impact is high and it is contributing more than expected, it might be worth replacing it with a faster one. Due to the numerous violations no single recommendation can be appointed without considering additional criteria from the application domain, which are not known here.

### **Test 3**

#### Concerning Costs:

The bad performance cost wise is mainly caused by WS 13 and by the loop which is performed more often than expected. Renegotiating WS 13, changing the loop structure, and replacing WS 9 and WS 11 with cheaper services, are good options. The impact of WS 17 and WS 10 are too low to make a real difference when renegotiated and can therefore be neglected.

#### Concerning RT:

The overall bad performance RT wise is due to all red and yellow services. Especially since also all the branches reaching them are red. Therefore choose the ones with the highest impact: WS 11, WS 10, and WS 9 are good option. Also WS 8 might be considered because of the many branches. Since so many branches are red, reconsidering the overall structure is also a good choice.

### 3 Survey results



Online Surveys  
Data Collection  
and Integration

www.s

## Report: Response Summary Report #7

Survey: Validating Usefulness of MoDe4SLA

Compiled: 07/30/2009

1. Do you consider yourself to be from academia or from industry?

#### Summary

Value	Count	Percent %
Industry	2	5.88%
Academia	23	67.65%
Both	9	26.47%

#### Statistics

Choices Selected: 34

Total Responses: 34

2. Do you have experience using tools to support management of composite services?

#### Summary

Value	Count	Percent %
Yes	5	14.71%
No	28	82.35%
Don't know	1	2.94%

#### Statistics

Choices Selected: 34

Total Responses: 34

3. Have you ever developed an approach for managing composite services?

#### Summary

Value	Count	Percent %
-------	-------	-----------

Summary			
Value	Count	Percent	%
Yes	5	14.71%	
No	29	85.29%	

Statistics  
 Choices Selected: 34  
 Total Responses: 34

**4. How many years have you worked using composite services?**

Summary			
Value	Count	Percent	%
None	20	58.82%	
Up to 1 year	4	11.76%	
1-2 years	1	2.94%	
2-3 years	5	14.71%	
More than 3 years	4	11.76%	

Statistics  
 Choices Selected: 34  
 Total Responses: 34

**5. My level of expertise concerning management of composite services is high.**

Summary			
Value	Count	Percent	%
Strongly disagree	10	29.41%	
Disagree	10	29.41%	
Neither agree nor disagree	11	32.35%	
Agree	2	5.88%	
Strongly agree	1	2.94%	

Statistics  
 Choices Selected: 34  
 Total Responses: 34

**6. I consider research concerning management of composite services as necessary.**

Summary

Value	Count	Percent %
Neither agree nor disagree	3	8.82%
Agree	18	52.94%
Strongly agree	13	38.24%

Statistics

Choices Selected: 34  
 Total Responses: 34

7. The offered composition appears to be complex.

Summary

Value	Count	Percent %
Strongly disagree	2	5.88%
Disagree	10	29.41%
Neither agree nor disagree	11	32.35%
Agree	10	29.41%
Strongly agree	1	2.94%

Statistics

Choices Selected: 34  
 Total Responses: 34

8. Concerning Costs.

I can easily determine how much impact each service has on the composition.

Summary

Value	Count	Percent %
Strongly disagree	3	8.82%
Disagree	10	29.41%
Neither agree nor disagree	10	29.41%
Agree	11	32.35%

Statistics

Choices Selected: 34  
 Total Responses: 34

9. Concerning Response time.

I can easily determine how much impact each service has on the composition.

Summary

Value	Count	Percent %
Strongly disagree	4	11.76%
Disagree	14	41.18%
Neither agree nor disagree	8	23.53%
Agree	8	23.53%

Statistics  
 Choices Selected: 34  
 Total Responses: 34

10. Assume only a subset of services can be renegotiated regarding their SLAS. I would feel confident in selecting services for renegotiation.

Summary		
Value	Count	Percent %
Strongly disagree	3	8.82%
Disagree	10	29.41%
Neither agree nor disagree	8	23.53%
Agree	12	35.29%
Strongly agree	1	2.94%

Statistics  
 Choices Selected: 34  
 Total Responses: 34

11. After seeing the MoDe4SLA analysis, how is your confidence about the selection of services for renegotiation you made before?

Summary		
Value	Count	Percent %
Less confident	10	30.30%
Equally confident	7	21.21%
More confident	16	48.48%

Statistics  
 Choices Selected: 33  
 Total Responses: 33

12. Concerning Costs: I need less time to see relations between the different services and the composition.

Summary

Value	Count	Percent %
Disagree	1	2.94%
Agree	19	55.88%
Strongly agree	14	41.18%

Statistics

Choices Selected: 34  
Total Responses: 34

13. Concerning Response time: I need less time to see relations between the different services and the composition.

Summary

Value	Count	Percent %
Disagree	2	5.88%
Agree	17	50.00%
Strongly agree	15	44.12%

Statistics

Choices Selected: 34  
Total Responses: 34  
Report from [www.SurveyGizmo.com](http://www.SurveyGizmo.com)

14. Concerning Costs: I find it easier to determine the impact each service has on the composition than without the analysis.

Summary

Value	Count	Percent %
Disagree	2	5.88%
Neither agree nor disagree	2	5.88%
Agree	18	52.94%
Strongly agree	12	35.29%

Statistics

Choices Selected: 34  
Total Responses: 34

15. Concerning Response time: I find it easier to determine the impact each service has on the composition than without the analysis.

Summary		
Value	Count	Percent %
Neither agree nor disagree	2	5.88%
Agree	17	50.00%
Strongly agree	15	44.12%
Statistics		
Choices Selected:	34	
Total Responses:	34	

16. Assume only a subset of services can be renegotiated regarding their SLAs. I would feel more confident in selecting services for renegotiation than without MoDe4SLA.

Summary		
Value	Count	Percent %
Disagree	1	2.94%
Neither agree nor disagree	2	5.88%
Agree	19	55.88%
Strongly agree	12	35.29%
Statistics		
Choices Selected:	34	
Total Responses:	34	

17. MoDe4SLA approach is helpful when managing this composition with regard to:

Item	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Accuray (accurate depicting of malfunctioning services)	2.9% 1	5.9% 2	11.8% 4	55.9% 19	23.5% 8	34
Efficiency (faster depicting of these services)	-	-	8.8% 3	55.9% 19	35.3% 12	34

Average %: 1.5% 2.9% 10.3% 55.9% 29.4% 68  
Total Responses: 34

### 18. The offered composition appears to be complex.

Summary		
Value	Count	Percent %
Strongly disagree	9	26.47%
Disagree	14	41.18%
Neither agree nor disagree	4	11.76%
Agree	5	14.71%
Strongly agree	2	5.88%

Statistics

Choices Selected: 34  
Total Responses: 34

### 19. Concerning Costs.

I can easily determine how much impact each service has on the composition.

Summary		
Value	Count	Percent %
Strongly disagree	2	5.88%
Disagree	12	35.29%
Neither agree nor disagree	11	32.35%
Agree	8	23.53%
Strongly agree	1	2.94%

Statistics

Choices Selected: 34  
Total Responses: 34  
Report from [www.SurveyGizmo.com](http://www.SurveyGizmo.com)

### 20. Concerning Response time.

I can easily determine how much impact each service has on the composition.

Summary		
Value	Count	Percent %
Strongly disagree	4	11.76%
Disagree	12	35.29%
Neither agree nor disagree	11	32.35%

Summary		
Value	Count	Percent %
Agree	5	14.71%
Strongly agree	2	5.88%
Statistics		
Choices Selected:	34	
Total Responses:	34	

21. Assume only a subset of services can be renegotiated regarding their SLAS.  
I would feel confident in selecting services for renegotiation.

Summary		
Value	Count	Percent %
Strongly disagree	3	8.82%
Disagree	12	35.29%
Neither agree nor disagree	6	17.65%
Agree	13	38.24%
Statistics		
Choices Selected:	34	
Total Responses:	34	

22. After seeing the MoDe4SLA analysis, how is your confidence about the selection of services for renegotiation you made before?

Summary		
Value	Count	Percent %
Less confident	14	41.18%
Equally confident	4	11.76%
More confident	16	47.06%
Statistics		
Choices Selected:	34	
Total Responses:	34	

23. Concerning Costs.  
I need less time to see relations between the different services and the composition.

Summary		
Value	Count	Percent %
Disagree	1	2.94%
Neither agree nor disagree	4	11.76%
Agree	18	52.94%
Strongly agree	11	32.35%

Statistics  
 Choices Selected: 34  
 Total Responses: 34

**24. Concerning Response time.**  
 I need less time to see relations between the different services and the composition.

Summary		
Value	Count	Percent %
Disagree	2	5.88%
Agree	13	38.24%
Strongly agree	19	55.88%

Statistics  
 Choices Selected: 34  
 Total Responses: 34

**25. Concerning Costs.**  
 I find it easier to determine the impact each service has on the composition than without the analysis.

Summary		
Value	Count	Percent %
Disagree	2	5.88%
Neither agree nor disagree	4	11.76%
Agree	16	47.06%
Strongly agree	12	35.29%

Statistics  
 Choices Selected: 34  
 Total Responses: 34

**26. Concerning Response time.**  
 I find it easier to determine the impact each service has on the composition than without the analysis.

Summary		
Value	Count	Percent %
Neither agree nor disagree	1	2.94%
Agree	15	44.12%
Strongly agree	18	52.94%
Statistics		
Choices Selected:	34	
Total Responses:	34	

27. Assume only a subset of services can be renegotiated regarding their SLAs. I would feel more confident in selecting services for renegotiation than without MoDe4SLA.

Summary		
Value	Count	Percent %
Disagree	2	5.88%
Neither agree nor disagree	1	2.94%
Agree	18	52.94%
Strongly agree	13	38.24%
Statistics		
Choices Selected:	34	
Total Responses:	34	

28. MoDe4SLA approach is helpful when managing this composition with regard to:

Item	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Accuracy (accurate depicting of malfunctioning services)	2.9%1	5.9%2	14.7%5	44.1%15	32.4%11	34
Efficiency (faster depicting of these services)	2.9%1	-	5.9%2	52.9%18	38.2%13	34
Average %:	2.9%	2.9%	10.3%	48.5%	35.3%	68
Total Responses:	34					

29. The offered composition appears to be complex.

Summary		
Value	Count	Percent %
Disagree	1	2.94%
Agree	9	26.47%
Strongly agree	24	70.59%
Statistics		
Choices Selected:	34	
Total Responses:	34	

**30. Concerning Costs.**  
 I can easily determine how much impact each service has on the composition.

Summary		
Value	Count	Percent %
Strongly disagree	11	32.35%
Disagree	16	47.06%
Neither agree nor disagree	4	11.76%
Agree	3	8.82%
Statistics		
Choices Selected:	34	
Total Responses:	34	

**31. Concerning Response time.**  
 I can easily determine how much impact each service has on the composition.

Summary		
Value	Count	Percent %
Strongly disagree	13	38.24%
Disagree	14	41.18%
Neither agree nor disagree	4	11.76%
Agree	3	8.82%
Statistics		
Choices Selected:	34	
Total Responses:	34	

**32. Assume only a subset of services can be renegotiated regarding their SLAS.**

I would feel confident in selecting services for renegotiation.

Summary		
Value	Count	Percent %
Strongly disagree	13	38.24%
Disagree	12	35.29%
Neither agree nor disagree	5	14.71%
Agree	4	11.76%

Statistics

Choices Selected: 34  
Total Responses: 34

33. After seeing the MoDe4SLA analysis, how is your confidence about the selection of services for renegotiation you made before?

Summary		
Value	Count	Percent %
Less confident	10	32.26%
Equally confident	5	16.13%
More confident	16	51.61%

Statistics

Choices Selected: 31  
Total Responses: 31

34. Concerning Costs.  
I need less time to see relations between the different services and the composition.

Summary		
Value	Count	Percent %
Neither agree nor disagree	1	2.94%
Agree	16	47.06%
Strongly agree	17	50.00%

Statistics

Choices Selected: 34  
Total Responses: 34

### 35. Concerning Response time.

I need less time to see relations between the different services and the composition.

#### Summary

Value	Count	Percent %
Agree	11	32.35%
Strongly agree	23	67.65%

#### Statistics

Choices Selected: 34

Total Responses: 34

### 36. Concerning Costs.

I find it easier to determine the impact each service has on the composition than without the analysis.

#### Summary

Value	Count	Percent %
Disagree	1	2.94%
Neither agree nor disagree	4	11.76%
Agree	15	44.12%
Strongly agree	14	41.18%

#### Statistics

Choices Selected: 34

Total Responses: 34

### 37. Concerning Response time.

I find it easier to determine the impact each service has on the composition than without the analysis.

#### Summary

Value	Count	Percent %
Strongly disagree	1	2.94%
Neither agree nor disagree	1	2.94%
Agree	14	41.18%
Strongly agree	18	52.94%

#### Statistics

Choices Selected: 34

Total Responses: 34

38. Assume only a subset of services can be renegotiated regarding their SLAs. I would feel more confident in selecting services for renegotiation than without MoDe4SLA.

Summary		
Value	Count	Percent %
Disagree	1	2.94%
Neither agree nor disagree	2	5.88%
Agree	14	41.18%
Strongly agree	17	50.00%
Statistics		
Choices Selected:	34	
Total Responses:	34	

39. MoDe4SLA approach is helpful when managing this composition with regard to:

Item	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Accuray (accurate depicting of malfunctioning services)	2.9%1	2.9%1	8.8%3	50.0%17	35.3%12	34
Efficiency (faster depicting of these services)	-	2.9%1	5.9%2	41.2%14	50.0%17	34
Average %:	1.5%	2.9%	7.4%	45.6%	42.6%	68
Total Responses:	34					

40. I consider research concerning management of composite services as necessary.

Summary		
Value	Count	Percent %
Neither agree nor disagree	1	2.94%
Agree	15	44.12%
Strongly agree	18	52.94%
Statistics		
Choices Selected:	34	

Summary		
Value	Count	Percent %
Total Responses:	34	

41. The presentation before the evaluation was sufficient to properly understand the MoDe4SLA approach.

Summary		
Value	Count	Percent %
Disagree	2	5.88%
Neither agree nor disagree	2	5.88%
Agree	21	61.76%
Strongly agree	9	26.47%
Statistics		
Choices Selected:	34	
Total Responses:	34	

42. MoDe4SLA is helpful for managing service compositions.

Summary		
Value	Count	Percent %
Neither agree nor disagree	2	5.88%
Agree	15	44.12%
Strongly agree	17	50.00%
Statistics		
Choices Selected:	34	
Total Responses:	34	

43. Are you aware of any other approaches supporting management of service compositions? If so, what is the name of the approach?

Summary		
Value	Count	Percent %
No	32	94.12%
Yes	2	5.88%
Other Values: Yes		

Value	Count
Q-WSDL, WSLA	1

work in Leyman group 1

Statistics

Choices Selected:

Total Responses: 34

44. MoDe4SLA is more helpful than the above mentioned approaches.

Summary		
Value	Count	Percent %
Yes	2	6.06%
No	1	3.03%
Not applicable	30	90.91%

Statistics

Choices Selected: 33

Total Responses: 33

Appendix 1:  
How do you currently manage composite services?

Code	Data	Value
19945154	Using workflow engine.	
19945429	Not	
19945595	Not	
23159394	Based on QoS-aspects; "management", i.e., replanning of compositions is automatically done if a SLA-deviation is detected (in fact, it's more self organization than management).	
23159917	With the help of algorithms and heuristics.	
23160289	In theory	
23160947	Operating system does it	
23162141	The thumb rule	
23990507	Process engines and execution logs. For example BPEL engine	
23991571	Ad hoc, look at the end result	

Appendix 2:  
What part of MoDe4SLA do you consider most beneficial?

	Data
Code	Value
19945154	1. It can quickly identify and visualize the problematic parts. 2. The result can work nicely as a starting point for improving service compositions.
19945429	The impact model of response time
19945595	1. With the response time you directly see which services you do not have to look at at all. 2. Makes it much easier and faster to get the relation between the different services 3. Reduces errors from one-by-one comparison of values.
23155349	- the graph visualisation - the colors
23157347	color coding is intuitive; good services (and bad ones respectively) can be recognized very fast.
23157745	visualization
23158420	The coloring of the services is most helpful to see which services should be considered in a more thorough analysis and which can be ignored.
23158789	Coloring information Information on AND Response Time
23159075	The coloring -> you can get the information you need in very short time.
23159394	The more complex a composition gets, the more difficult is it to understand the impact of the different services; here, MoDe4SLA helps a lot
23159917	the color of the services in combination with the impact factor
23160289	- Structure visualization - coloring - impact factors
23160692	coloring
23160947	The graphical part
23161329	the diagrams are after some study easy to understand
23161861	Structured, systematic approach Graphical representation of the results
23162141	Impact Factor
23985138	Drawing the focus of the composition to the important things
23985265	The model concerning response time
23985623	I like the graphical part
23986545	The overview it gives, to see instantly where possible weak links are. Compare with gripcards for business processes of bizz design.
23987219	visualisation of real impact. Incorporates effect of composition structure and relationships.
23988240	Visualisation and "instance" approach are both usefull
23988630	Determining web services that have no impact at all.
23989164	I like the fact that the tool unveil how services interact and how compositions affect the overall efficiency.
23989619	Analysis of response time in complex service composition structured
23989786	Coloring Mentioning of IF
23990027	the time analysis
23990280	To see the impact of each service!
23990507	Intuitive visualization Trouble makers can be easily identified dependencies of the composite service on the used ones becomes more

Code	Data	Value
		obvious more efficient and accurate than manual analysis.
23990868		The approach in general. With all parts like coloured overview.
23991193		Graphical representation instance based evaluation
23991378		Colored representations of relations and services
23991571		Graphical representation

### Appendix 3: What are the weak points of MoDe4SLA (possible improvements)?

Code	Data	Value
19945154		1. legends are needed in the examples to better understand what the numbers, colours, arrows, and their combination would mean. 2. It might be helpful to visualize the service composition structure of the cases.
19945429		Could not find any
19945595		1. provide a legend with explanations of colours. 2. colours might mislead you. E.g. T2 Cost has only green bubbles but yellow composition. The red arrows do not directly "spring out", compared to the bubbles.
23155349		= colors are a little bit together (greens)
23157347		I needed pretty much time to understand the different values annotated in the graphs, ratio of contribution seems to be captured two times with the different perspectives, Remark at 46: 1. is process simulation of block-structured processes related to that? 2. visualisation with the use of feature trees?
23158420		The Impacts of a loop, especially of the iteration count aren't very easy to discover. You still need to have deep look into the data sheets.
23158789		Additional information about delta of estimated (cost/time) at runtime
23159075		Layout of the graph in Test1 after the OR2 : The numbers of the branches are too close together
23159394		The way the deviations are depicted is not that intuitive; these are still 3 attributes (IF, color of the arrow, color of the bubble) and you need to understand the AND/OR/LOOP constructs.
23159917		Interpretation of Impact Factors
23160289		- does it automatically arrange the bubbles? :- ) - colors for arrows vs. colors for bubbles: different meaning but same colors -> maybe choose different colors.
23160692		better explanation of the values
23160947		The calculations of the impact cannot be clearly seen from the graph. Impact = prod of # invocations and agreed cost <- it will be good to include this value in the graph (value of cost)

Data

Code	Value
23161329	I am no expert in the analysis of composite web services but I have the feeling that it would be a good t state the assumptions under which this analysis can be useful and whether they are found in practice. So these service compositions are generated ... for the validation but how do people nowadays construct these services Is it fair to assume that services are independent given network topologies congestion etc. For example: if I download from two providers A and B then the maximum speed/response time is correlated -> should network be modeled as a service?
23161861	Tree structure useful for analysis, perhaps less so for presenting results. Guidelines needed to interpret results.
23162141	There can be situations in which only arrows are the problem -> only the choice of which service to invoke is the problem. The model does not help in this case (not explicitly)
23985138	The name. Aligned to one SLA type. Adaptation probably possible.
23985265	probably mixing the models (cost and response time) to give reader more information in less time, so give an IF regarding two parameters to the manager for easy analysis of renegotiating.
23985623	I found it difficult to understand what the numbers on the arrows mean.
23986545	lack of connection to penalties if services violate their sla. it may even be profitable if an individual service runs bad but doesn't influence the composition outcome.
23987219	impact factor also very important but not visually easy to find high scores.
23988240	more complex cost models more intuitive or clear explanation of depending relationships. Bilateral visualisation comparing to MoDe4SLA might be interesting.
23988630	the absolute numbers (runtime, cost) still need to be obtained from the text file.
23989164	You need to be an expert to use the tool but i guess usability would be hard to improve.
23989619	More clear graphical notation
23989786	Still too complex. It is not explainable in 30 minutes.
23990027	I could not understand the cost models well.
23990280	It's difficult to see the connection between the impact of a service and how good or bad the service is. And it's difficult to see the relation between costs and response time.
23990507	In a tool implementation one can add explanatory components (and also recommendations) on how to adapt a composition (e.g. which services to exchange or even more advanced "how to structurally adapt" the composition? )
23990868	Due to your decision graph-nothing. More look on the nature of the services. I know this is not your focus.
23991193	If possible: can we derive same strategies from the MoDe4SLA models, i.e. if two or more service behave bad. Can we give the user some hint which could be the best improvement?

Data

Code	Value
23991378	Colors shall be determined based on influence overall cost and response time
23991571	colouring of branches (not intention to have same colour as bubbles) if mean something different? Why is the deviation of the branches important? Isn't only the end result for the CS important? Combination of QoS models? With different QoS parameters? Are there more QoS parameters? Get different models? Visualize the SLA (design time) on the structure.

**Monitoring Dependencies for Service Level  
Agreements: MoDe4SLA  
Evaluation**

**Contact:**

**Lianne Bodenstaff**  
University of Twente  
[l.bodenstaff@utwente.nl](mailto:l.bodenstaff@utwente.nl)

**Website:**

<http://www.ewi.utwente.nl/~bodenstaffl/mode4sla>

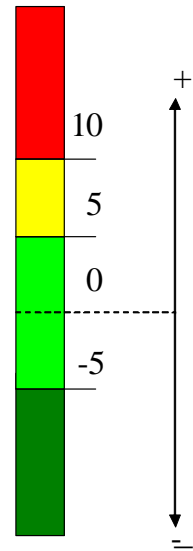
**Estimations:**

[x] = chance to be chosen. All chances within one construct add up to one.

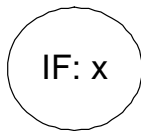
**Realized:**

[x] = ratio a branch was chosen. All chances within one construct add up to one.

Deviation %



**Analysis:**

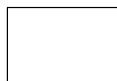


**Red:** costs/response time were higher than agreed upon.

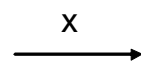
**No color:** did not contribute at all.

Ratio of service contribution  
(= branch value)

$$IF = \frac{X}{\text{Its average costs/response time}}$$



Type of dependency relation



**Red:** branch contributed more often than expected.

**X:** number of times per composition invocation that the branch contributed to the overall costs/response time.