

GCI Impact Simulated

David Ferreira Quaresma (david.quaresma@ccc.ufcg.edu.br)

october, 2019

Simulation results: GCI vs NOGCI

```
## Warning: package 'dplyr' was built under R version 3.6.1
```

```
## Warning: package 'ggplot2' was built under R version 3.6.1
```

ECDF for response time of 1^o simulation

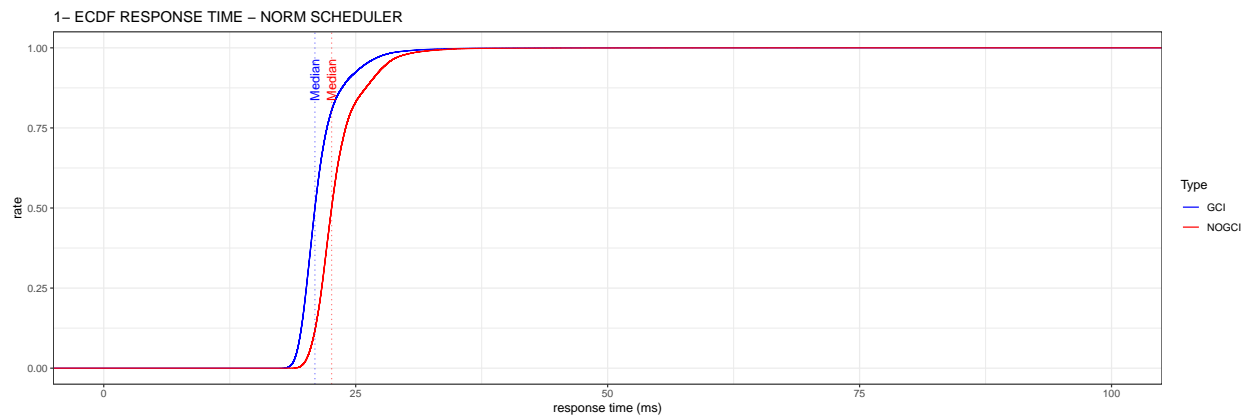
```
## Warning: Removed 305 rows containing non-finite values (stat_ecdf).
```

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

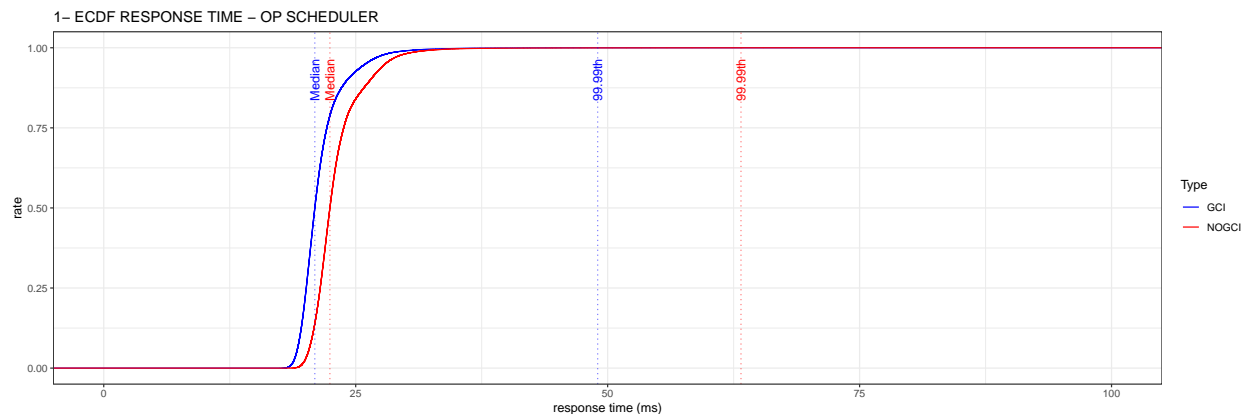
```
## Warning: Removed 1 rows containing missing values (geom_vline).
```

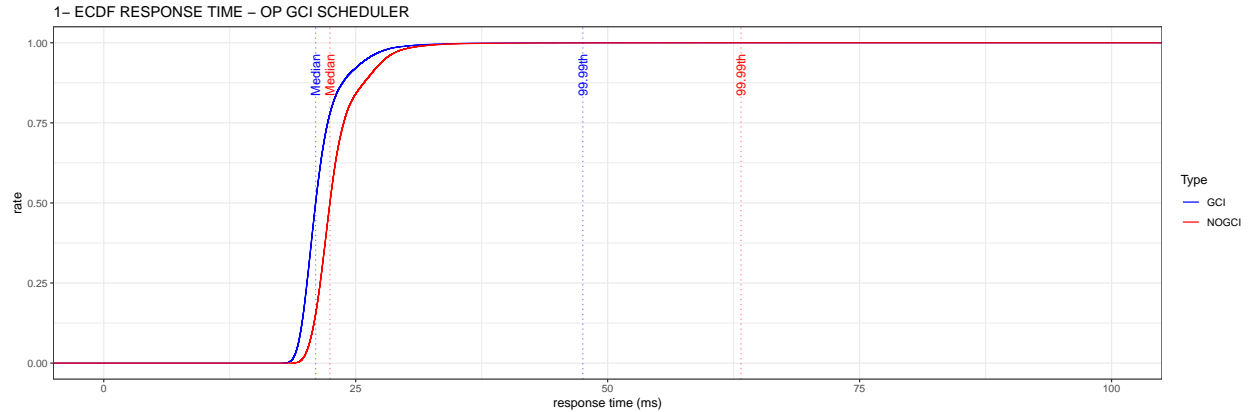
```
## Warning: Removed 1 rows containing missing values (geom_text).
```

```
## Warning: Removed 1 rows containing missing values (geom_vline).
```



```
## Warning: Removed 8 rows containing non-finite values (stat_ecdf).
```





summary table of confidence interval for response time, both in milliseconds, of 1^o simulation

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	23.00	24.00	24.00
## 2	p50	20.95	20.96	22.60	22.62
## 3	p95	26.01	26.07	28.08	28.12
## 4	p99	29.92	30.11	32.00	32.14
## 5	p999	39.53	40.69	43.93	45.32
## 6	p9999	2969.00	3030.00	2979.00	2994.00
## 7	p99999	3034.00	3034.00	3493.00	3493.00
## 8	dist	3013.00	3013.00	3470.00	3470.00

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	22.00	23.00	23.00
## 2	p50	20.94	20.95	22.43	22.44
## 3	p95	25.96	26.01	27.93	27.97
## 4	p99	29.71	29.87	31.53	31.71
## 5	p999	37.71	38.59	40.52	41.65
## 6	p9999	47.32	51.66	61.71	63.44
## 7	p99999	75.96	3033.00	68.21	68.25
## 8	dist	55.02	3012.00	45.77	45.80

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	22.00	23.00	23.00
## 2	p50	21.02	21.03	22.43	22.44
## 3	p95	26.13	26.19	27.93	27.97
## 4	p99	30.05	30.22	31.53	31.71
## 5	p999	37.96	38.86	40.52	41.65
## 6	p9999	47.12	49.44	61.71	63.44
## 7	p99999	54.26	71.41	68.21	68.25
## 8	dist	33.24	50.38	45.77	45.80

ECDF for response time of 2^o simulation

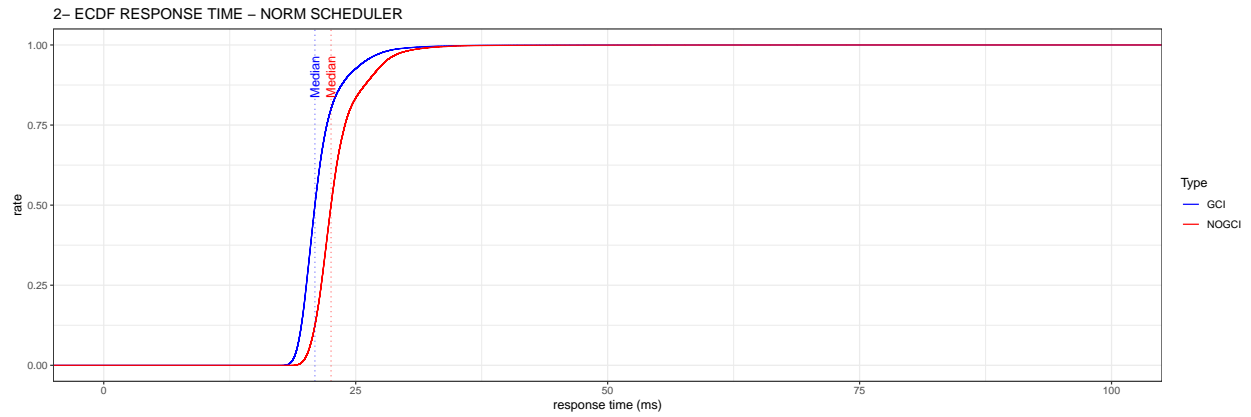
Warning: Removed 310 rows containing non-finite values (stat_ecdf).

Warning: Removed 1 rows containing missing values (geom_text).

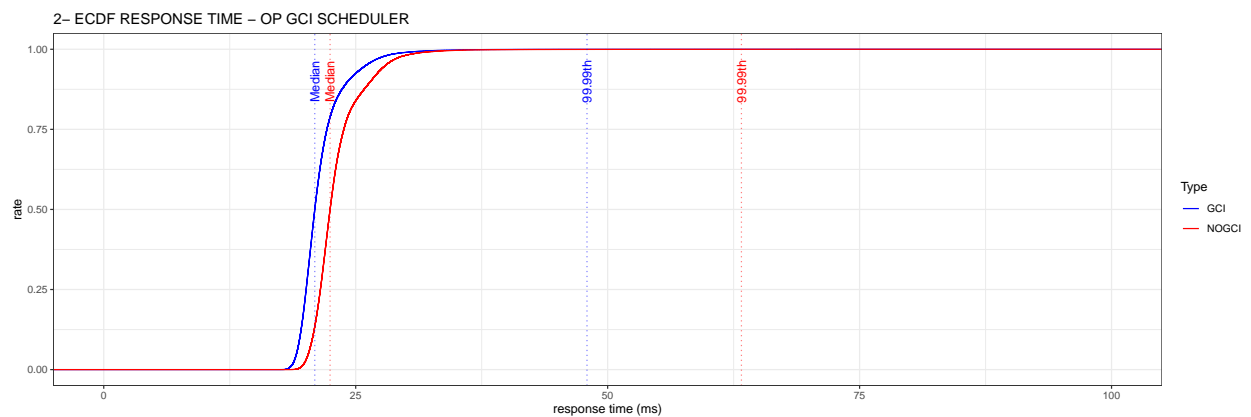
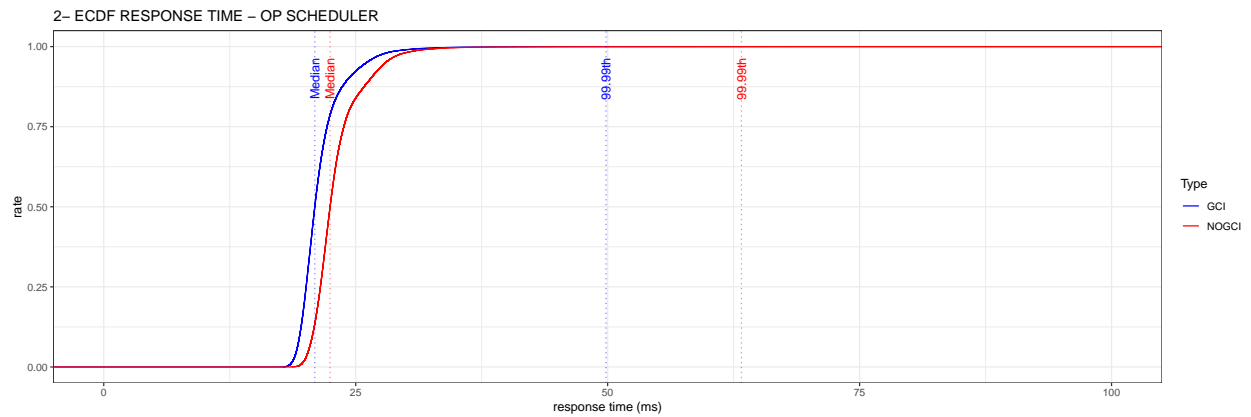
Warning: Removed 1 rows containing missing values (geom_vline).

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

```
## Warning: Removed 1 rows containing missing values (geom_vline).
```



```
## Warning: Removed 10 rows containing non-finite values (stat_ecdf).
```



```
#### summary table of confidence interval for response time, both in milliseconds, of 2o simulation
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1    avg   22.00  23.00   24.00   24.00
## 2    p50   20.95  20.96   22.55   22.56
## 3    p95   25.94  26.01   28.02   28.06
```

```
## 4    p99    29.87    30.06    31.84    32.00
## 5    p999   39.78    40.73    43.63    45.32
## 6    p9999 2981.00 3030.00 2979.00 2994.00
## 7    p99999 3034.00 3034.00 3493.00 3493.00
## 8    dist 3013.00 3013.00 3470.00 3470.00
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg   22.00   22.00    23.00    23.00
## 2      p50   20.93   20.94    22.45    22.46
## 3      p95   26.04   26.09    27.94    27.99
## 4      p99   29.84   30.01    31.52    31.69
## 5      p999   37.42   38.19    40.40    41.59
## 6      p9999  47.32   54.16    62.32    63.69
## 7      p99999 2936.00 3036.00    68.21    73.70
## 8      dist 2915.00 3015.00    45.75    51.23
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg   21.00   21.00    23.00    23.00
## 2      p50   20.93   20.94    22.45    22.46
## 3      p95   25.99   26.05    27.94    27.99
## 4      p99   29.79   29.95    31.52    31.69
## 5      p999   37.40   38.14    40.40    41.59
## 6      p9999  47.12   49.84    62.32    63.69
## 7      p99999 57.98   71.73    68.21    73.70
## 8      dist  37.05   50.79    45.75    51.23
```

ECDF for response time of 3^o simulation

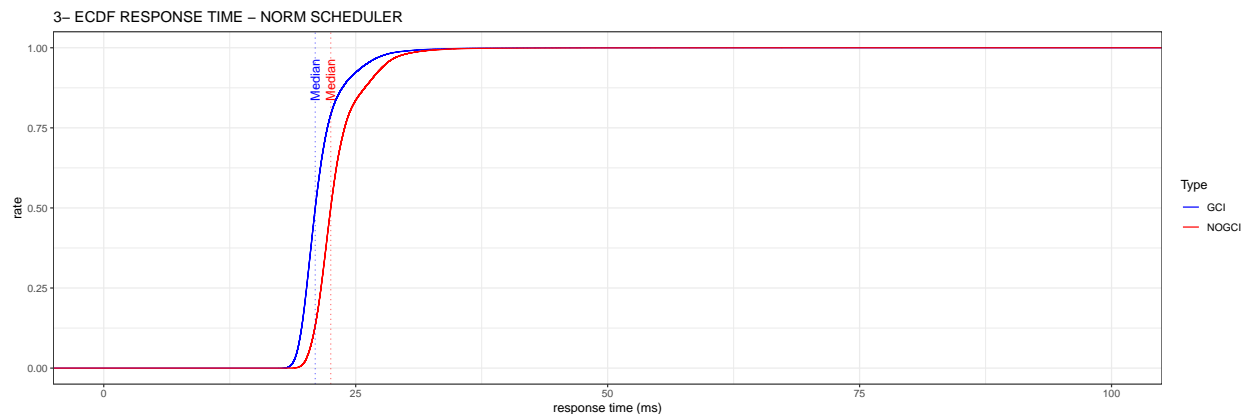
```
## Warning: Removed 306 rows containing non-finite values (stat_ecdf).
```

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

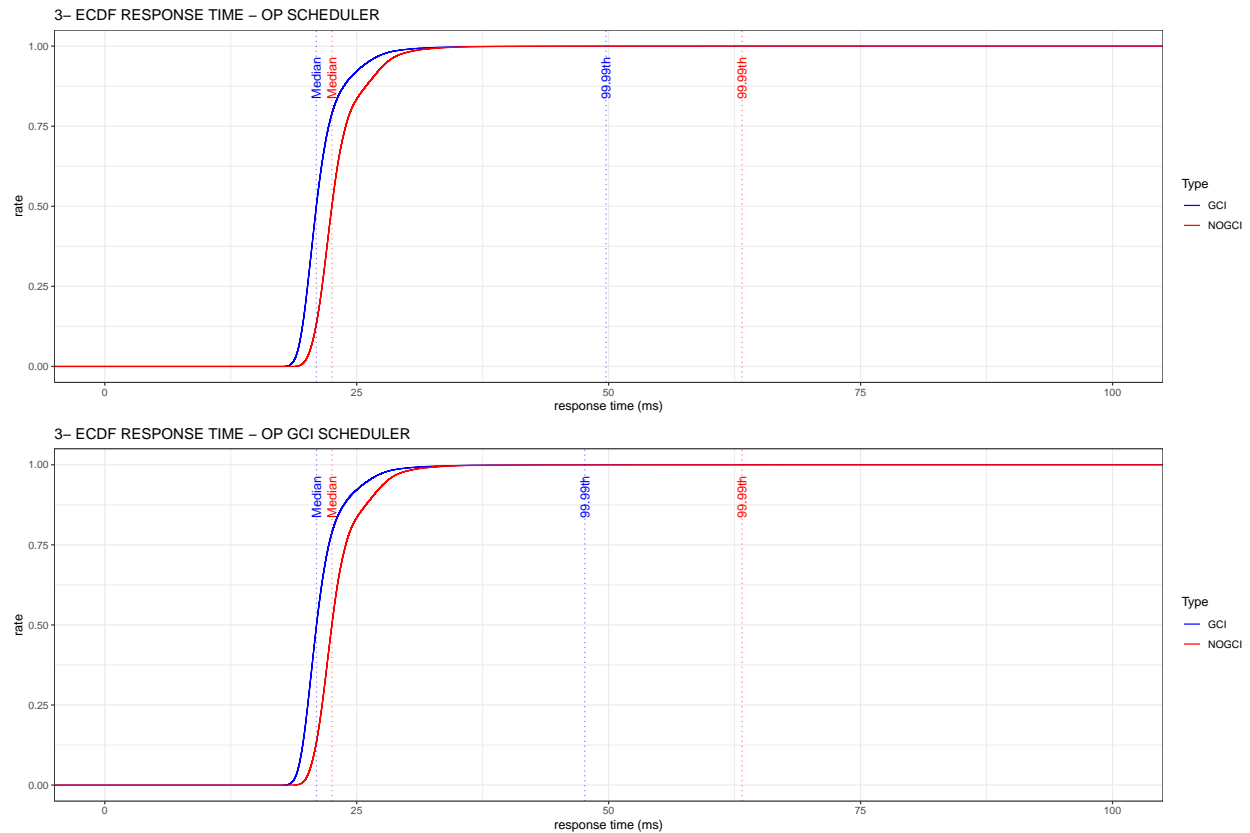
```
## Warning: Removed 1 rows containing missing values (geom_vline).
```

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

```
## Warning: Removed 1 rows containing missing values (geom_vline).
```



```
## Warning: Removed 11 rows containing non-finite values (stat_ecdf).
```



```
##### summary table of confidence interval for response time, both in milliseconds, of 3o simulation
```

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	23.00	24.00	24.00
## 2	p50	20.98	20.99	22.52	22.53
## 3	p95	26.08	26.15	28.00	28.05
## 4	p99	30.04	30.23	31.79	31.95
## 5	p999	39.54	40.69	43.73	45.75
## 6	p9999	2981.00	3030.00	2979.00	2994.00
## 7	p99999	3034.00	3034.00	3493.00	3493.00
## 8	dist	3013.00	3013.00	3470.00	3470.00

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	22.00	23.00	23.00
## 2	p50	20.99	21.00	22.53	22.54
## 3	p95	26.09	26.16	28.00	28.04
## 4	p99	29.93	30.10	31.57	31.80
## 5	p999	37.68	38.54	39.85	41.27
## 6	p9999	47.63	54.16	61.78	63.45
## 7	p99999	2956.00	3035.00	67.76	73.70
## 8	dist	2935.00	3014.00	45.23	51.15

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	22.00	23.00	23.00
## 2	p50	21.01	21.02	22.53	22.54

## 3	p95	26.11	26.17	28.00	28.04
## 4	p99	29.94	30.13	31.57	31.80
## 5	p999	37.50	38.40	39.85	41.27
## 6	p9999	47.10	49.75	61.78	63.45
## 7	p99999	60.92	75.96	67.76	73.70
## 8	dist	39.91	54.94	45.23	51.15

ECDF for response time of 4^o simulation

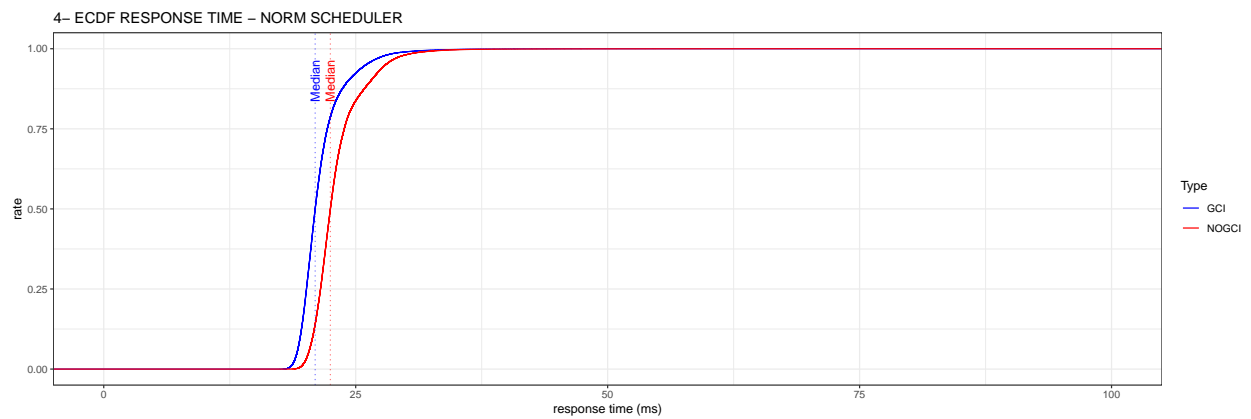
Warning: Removed 309 rows containing non-finite values (stat_ecdf).

Warning: Removed 1 rows containing missing values (geom_text).

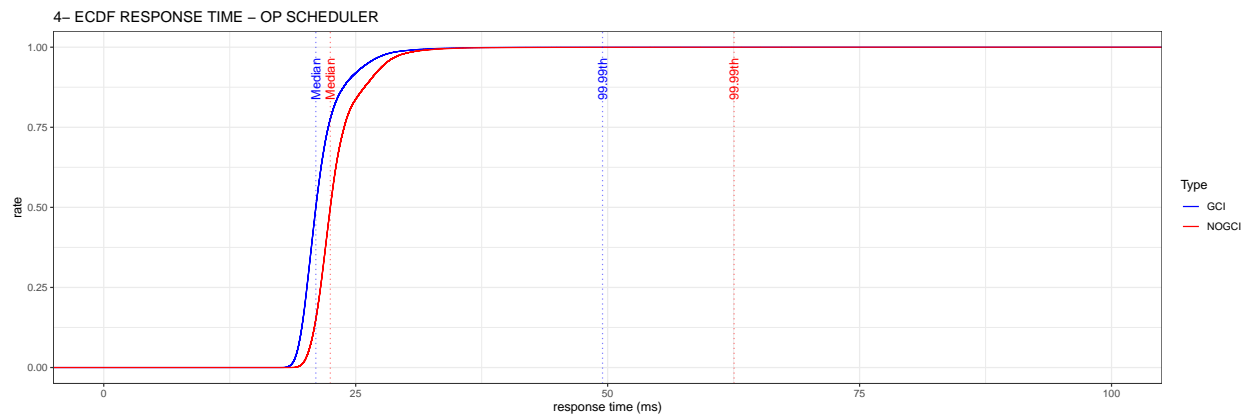
Warning: Removed 1 rows containing missing values (geom_vline).

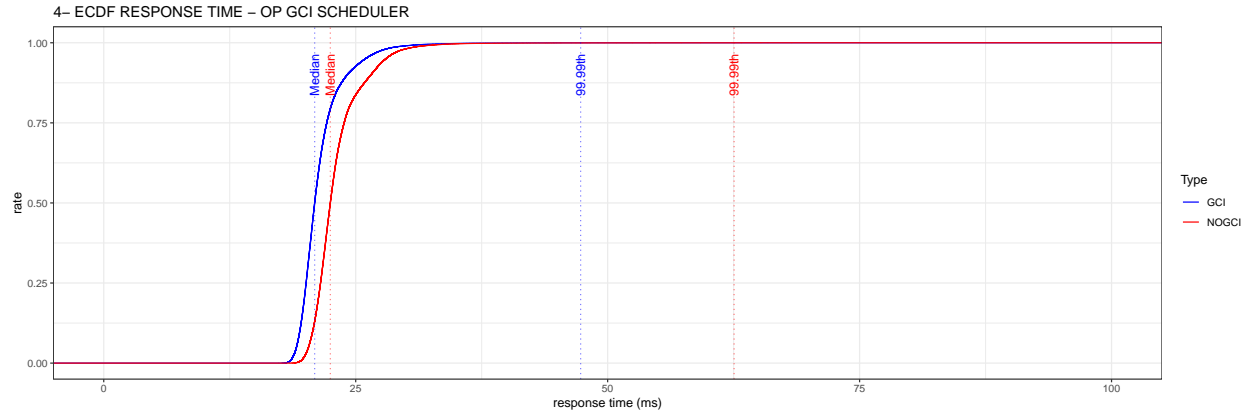
Warning: Removed 1 rows containing missing values (geom_text).

Warning: Removed 1 rows containing missing values (geom_vline).



Warning: Removed 12 rows containing non-finite values (stat_ecdf).





summary table of confidence interval for response time, both in milliseconds, of 4^o simulation

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	23.00	24.00	24.00
## 2	p50	20.97	20.98	22.48	22.50
## 3	p95	26.01	26.07	27.96	28.00
## 4	p99	29.90	30.08	31.61	31.82
## 5	p999	39.14	40.38	42.48	44.37
## 6	p9999	2982.00	3030.00	2979.00	2994.00
## 7	p99999	3034.00	3034.00	3493.00	3493.00
## 8	dist	3013.00	3013.00	3470.00	3470.00

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	22.00	22.00	23.00	23.00
## 2	p50	21.04	21.05	22.48	22.49
## 3	p95	26.19	26.25	27.96	28.01
## 4	p99	30.08	30.27	31.54	31.72
## 5	p999	37.68	38.51	39.99	41.43
## 6	p9999	47.92	54.23	60.36	63.40
## 7	p99999	2946.00	3033.00	67.76	73.70
## 8	dist	2925.00	3012.00	45.28	51.21

##	stats	gci.cii	gci.cis	nogci.cii	nogci.cis
## 1	avg	21.00	21.00	23.00	23.00
## 2	p50	20.92	20.93	22.48	22.49
## 3	p95	25.92	25.99	27.96	28.01
## 4	p99	29.69	29.88	31.54	31.72
## 5	p999	37.42	38.46	39.99	41.43
## 6	p9999	47.10	51.03	60.36	63.40
## 7	p99999	55.59	70.44	67.76	73.70
## 8	dist	34.67	49.51	45.28	51.21

ECDF for response time of 5^o simulation

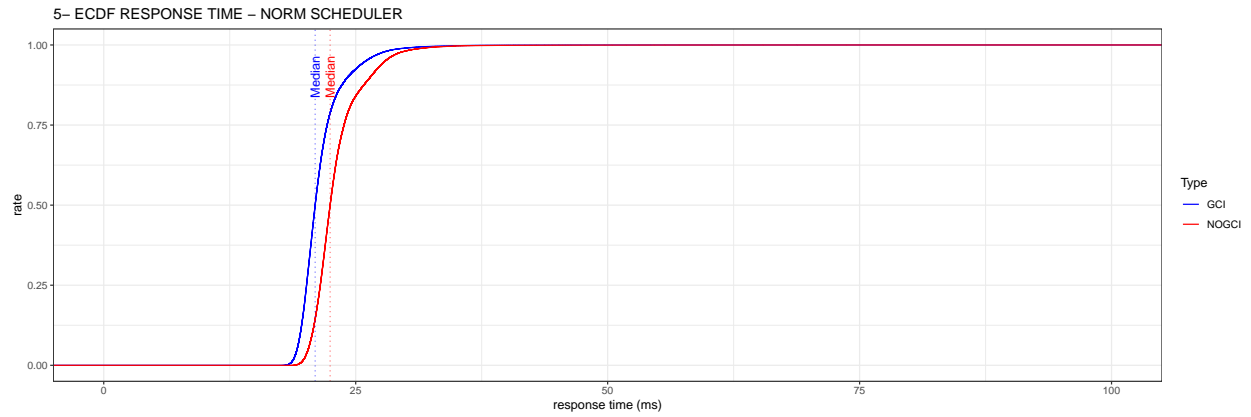
Warning: Removed 304 rows containing non-finite values (stat_ecdf).

Warning: Removed 1 rows containing missing values (geom_text).

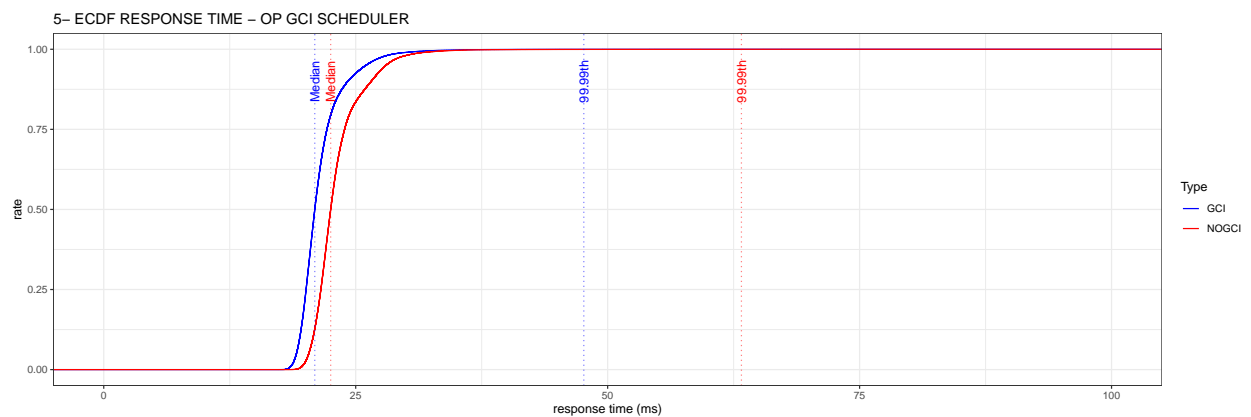
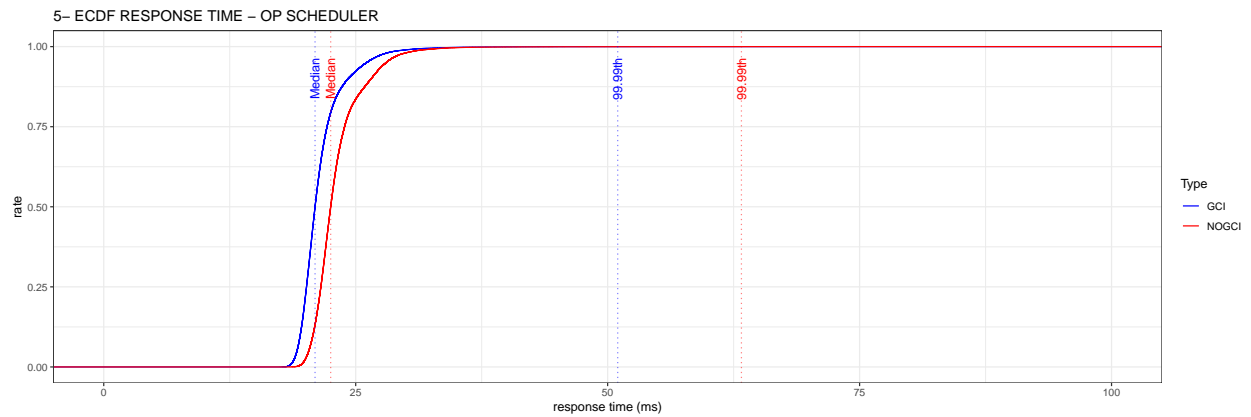
Warning: Removed 1 rows containing missing values (geom_vline).

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

```
## Warning: Removed 1 rows containing missing values (geom_vline).
```



```
## Warning: Removed 9 rows containing non-finite values (stat_ecdf).
```



```
#### summary table of confidence interval for response time, both in milliseconds, of 5o simulation
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1    avg   22.00  23.00   24.00   24.00
## 2    p50   20.97  20.98   22.46   22.47
## 3    p95   25.98  26.05   27.93   27.97
```



```
## 4    p99    29.87    30.05    31.70    31.86
## 5    p999   39.33   40.51   43.27   45.29
## 6    p9999 2970.00 3030.00 2979.00 2994.00
## 7    p99999 3034.00 3034.00 3493.00 3493.00
## 8    dist 3013.00 3013.00 3470.00 3470.00
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg    22.00    22.00    23.00    23.00
## 2      p50    20.96    20.97    22.51    22.52
## 3      p95    26.05    26.10    27.99    28.03
## 4      p99    29.91    30.08    31.61    31.84
## 5      p999   37.96    38.86    40.07    41.36
## 6      p9999  48.02    54.23    62.32    63.74
## 7      p99999 1535.00 3002.00    68.21    73.70
## 8      dist 1514.00 2981.00    45.69    51.17
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg    21.00    21.00    23.00    23.00
## 2      p50    20.93    20.94    22.51    22.52
## 3      p95    25.98    26.05    27.99    28.03
## 4      p99    29.83    30.01    31.61    31.84
## 5      p999   37.18    37.91    40.07    41.36
## 6      p9999  47.24    49.76    62.32    63.74
## 7      p99999  57.98    68.79    68.21    73.70
## 8      dist   37.05    47.85    45.69    51.17
```

Joining all results into one data frame

ECDF for response time of all simulation

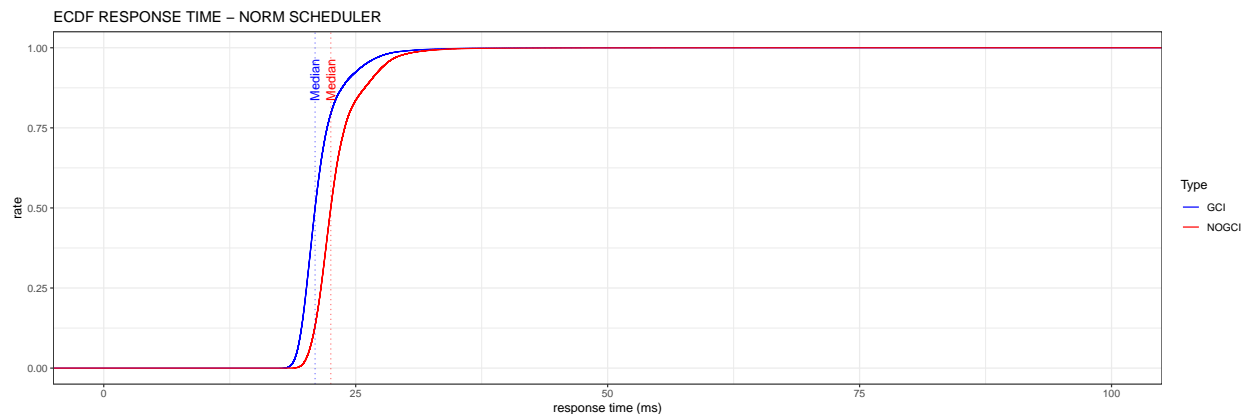
```
## Warning: Removed 1534 rows containing non-finite values (stat_ecdf).
```

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

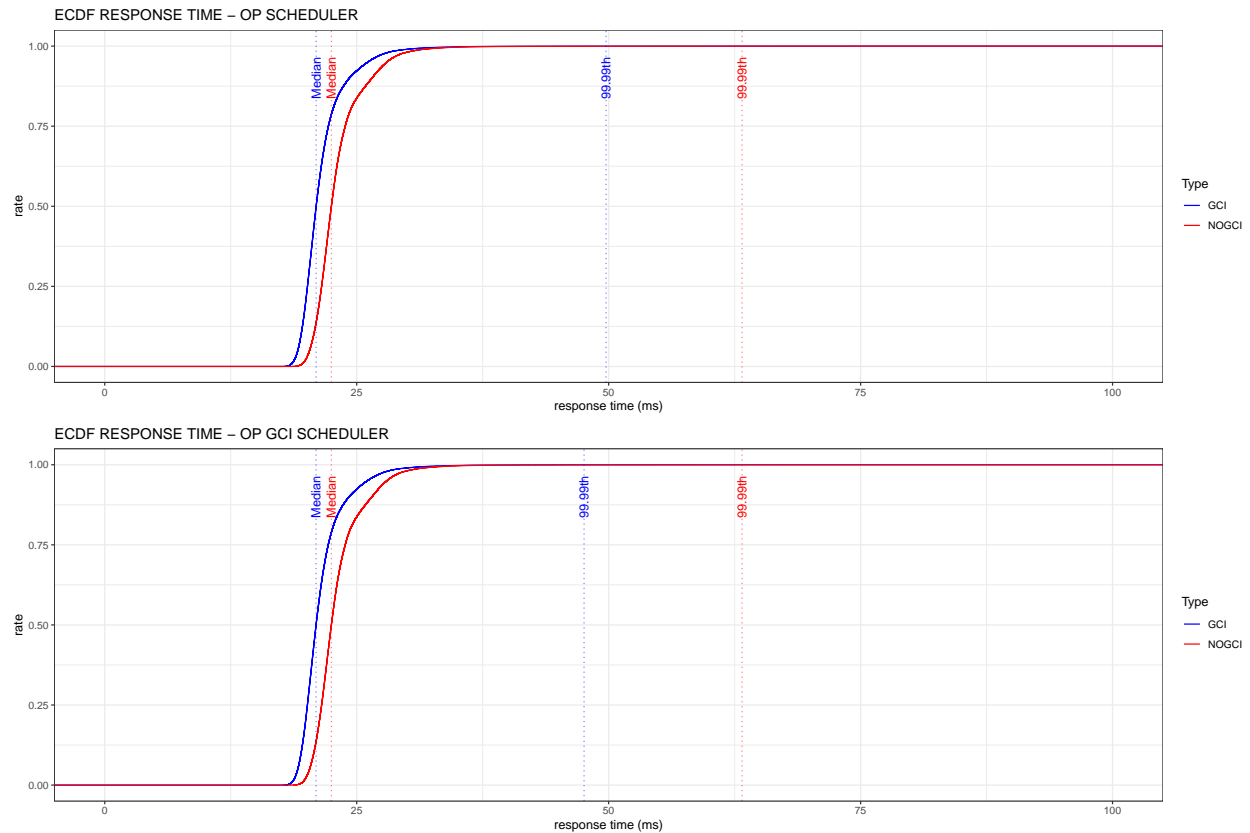
```
## Warning: Removed 1 rows containing missing values (geom_vline).
```

```
## Warning: Removed 1 rows containing missing values (geom_text).
```

```
## Warning: Removed 1 rows containing missing values (geom_vline).
```



```
## Warning: Removed 50 rows containing non-finite values (stat_ecdf).
```



```
#### summary table of confidence interval for response time, both in milliseconds, of all simulation
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg   22.00  23.00    24.00    24.00
## 2      p50   20.97  20.97    22.52    22.53
## 3      p95   26.03  26.05    28.01    28.03
## 4      p99   29.96  30.05    31.84    31.90
## 5     p999   39.80  40.24    43.93    44.63
## 6    p9999  2982.00 3030.00   2989.00   2989.00
## 7   p99999 3034.00 3034.00   3493.00   3493.00
## 8     dist 3013.00 3013.00   3470.00   3470.00
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg   22.00  22.00    23.00    23.00
## 2      p50   20.98  20.98    22.48    22.49
## 3      p95   26.08  26.10    27.98    28.00
## 4      p99   29.94  30.03    31.59    31.69
## 5     p999   37.94  38.29    40.56    41.14
## 6    p9999   49.02  51.26    62.54    63.40
## 7   p99999 2964.00 2983.00    68.21    68.25
## 8     dist 2943.00 2962.00    45.72    45.76
```

```
##      stats gci.cii gci.cis nogci.cii nogci.cis
## 1      avg   22.00  22.00    23.00    23.00
## 2      p50   20.97  20.97    22.48    22.49
```

## 3	p95	26.05	26.07	27.98	28.00
## 4	p99	29.91	29.99	31.59	31.69
## 5	p999	37.71	38.03	40.56	41.14
## 6	p9999	47.29	48.15	62.54	63.40
## 7	p99999	59.66	67.25	68.21	68.25
## 8	dist	38.70	46.28	45.72	45.76

Visualizing metrics

##	scenario	scheduler_name	throughput	instances_cost
## 1	pp-gci1	-normscheduler	49.97244	73804.87
## 2	pp-gci1	-opgcischeduler	50.01344	32105.54
## 3	pp-gci1	-opscheduler	50.01622	29329.74
## 4	pp-nogci1	-normscheduler	50.00022	71569.78
## 5	pp-nogci1	-opscheduler	50.01178	27598.90
## 6	pp-gci2	-normscheduler	49.98378	74121.81
## 7	pp-gci2	-opgcischeduler	50.00456	31579.35
## 8	pp-gci2	-opscheduler	50.00122	30585.21
## 9	pp-nogci2	-normscheduler	50.01000	72395.49
## 10	pp-nogci2	-opscheduler	50.00733	27291.99
## 11	pp-gci3	-normscheduler	49.99656	75334.31
## 12	pp-gci3	-opgcischeduler	50.01633	30803.45
## 13	pp-gci3	-opscheduler	50.01422	30925.18
## 14	pp-nogci3	-normscheduler	50.00733	71231.51
## 15	pp-nogci3	-opscheduler	49.98622	27599.22
## 16	pp-gci4	-normscheduler	50.00456	74726.22
## 17	pp-gci4	-opgcischeduler	49.98878	31267.64
## 18	pp-gci4	-opscheduler	50.01211	32820.64
## 19	pp-nogci4	-normscheduler	50.01244	71533.79
## 20	pp-nogci4	-opscheduler	49.99733	27590.42
## 21	pp-gci5	-normscheduler	50.00822	73667.23
## 22	pp-gci5	-opgcischeduler	50.00700	29914.21
## 23	pp-gci5	-opscheduler	49.98089	31059.65
## 24	pp-nogci5	-normscheduler	50.00589	71834.96
## 25	pp-nogci5	-opscheduler	50.01511	27598.45
##	instances_efficiency	simulation_exec_time		
## 1	0.03316579		8	
## 2	0.28790037		4	
## 3	0.28851775		4	
## 4	0.02467734		8	
## 5	0.35558055		4	
## 6	0.02892223		9	
## 7	0.27594743		4	
## 8	0.24240071		4	
## 9	0.03047020		9	
## 10	0.37548173		4	
## 11	0.03012551		8	
## 12	0.27569262		4	
## 13	0.29272286		4	
## 14	0.02633598		8	
## 15	0.37872777		4	
## 16	0.02773661		8	
## 17	0.24620733		4	

## 18	0.27879058	4
## 19	0.02389440	7
## 20	0.37098539	4
## 21	0.03007710	7
## 22	0.29786229	4
## 23	0.27686908	4
## 24	0.02583279	8
## 25	0.38446936	4