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REPORT:

TermAppISONFT: Orchestra Cross Test Resource Usage  
Summary

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```
## Loading required package: lattice
##
## Attaching package: 'BSDA'
##
## The following object is masked from 'package:datasets':
##
##   Orange
##
##   : starts:   Mon Jul 15 22:48:00 2024
##
## The following files in ../Test_Summary_Comparisons/csv match pattern "Resource_S
##   File = Test_Resource_Summary_D20231011.csv
##   File = Test_Resource_Summary_D20231012.csv
##   File = Test_Resource_Summary_D20240320.csv
##   File = Test_Resource_Summary_D20240715.csv
##   File = Test_Resource_Summary_D20231011.csv with 18 rows added to total making
##   File = Test_Resource_Summary_D20231012.csv with 18 rows added to total making
##   File = Test_Resource_Summary_D20240320.csv with 14 rows added to total making
##   File = Test_Resource_Summary_D20240715.csv with 26 rows added to total making
```

## 1 Introduction

There are two elements to this cross test resource usage comparison report. The first compares the current test sessions test(s) estimate of resource and measure for each server group to the corresponding pooled estimates of the resource and measure for that group. The second compares each of the tests current and earlier tests individually for each resource and measure for each server group.

For the pooled comparison, the resource usage data for each resource type and measure of each server group (as grouped by the corresponding server classification file) for the current test(s) (the last set of tests by date) are isolated as individual tests and compared to the corresponding pooled resource usage distribution using a Welch modified two-sample t-test (`tsum.test`) based on the distribution parameters. Each resource type and measure, the estimation of the background usage (*Bias*, or load independent resource usage), for that resource and measure for the current test(s) are compared to the estimated pooled background usage of that resource type and measure. In a similar way, the estimation of the usage rate (*Rate*, or load dependant resource usage, the measure of the cost in terms of the corresponding resource for a rate of one customer arrival per second). For the pooling, the previous test results are filtered so that only the tests for which there is some confidence in the corresponding coefficient estimate are included in the pool statistics. A set resource usage coefficient estimate is included in the pooling of the corresponding  $p$ -value does not exceed  $\alpha = 0.05$  (so that there is some confidence in the pooled coefficients). The *Bias* and *Rate* together with the actual customer arrival rate (*ArrivalRate*) give an estimation of the cost in terms of the resource being considered as  $TotalCost = Bias + ArrivalRate * Rate$ .

For each of the resource types and measures (Percent CPU Utilisation) and for each of the coefficient estimates (*Bias* and *Rate*), three `tsum.test`s are performed: One two-sided test to for differences in the corresponding distributions, and two one-sided tests, one to test for increases in the resource usage, and one to test for decreases in resource usage (of each of the current tests over pooled prior tests). These comparisons of the tests are ranked by the corresponding  $p$ -values. The items for which the  $p$ -value does not exceed the cut-off  $\alpha$  value (0.05) are high-lighted by reporting them in a ranked table.

are included in the corresponding comparison table. Up to the first 15 are included in an accompanying box-plot as well.

This high-lighting is intended to quickly bring outliers or significant changes in resource usage to the readers attention, but the second part of the report includes a full cross test comparison of current and earlier tests each server group, resource and measure, for both *Bias* and *Rate*.

These summary results have been taken from the analysis sections of the individual NFT sessions. For the *Rate* coefficient, only those results which are considered significant in the response of the resource usage to the applied load are included. The *Bias* parameter is included wherever there was some significance in the estimated intercept value.

The coefficients are determined from linear models regressing the resource usage onto the throughput observed. A model is generated for each server class in the server classification list for the specific project's server landscape. In each case, the resource usage is a measure of the resource usage, and these metrics are added up for all servers in the class. In addition, for the z/OS workload, the RMF measured CPU for each address space of interest is totalled and used as resource measure to regress onto the throughput observed (field R791TCPU of RMF record type 79 subtype one is used for this). A class is simply a group of servers intended to deliver the function to the application. The class name is intended to indicate the function provided (for example, `TFIM_CLIENT`). For each linear model, two coefficients are estimated. The Bias/Intercept is an estimate of the background resource usage, which is independent of the load applied. This load could be unrelated or overhead workload on a shared server or overhead workload on dedicated servers. For dedicated servers, this value is expected to be reasonably small as it should only reflect the overhead in managing and monitoring the workload. For shared servers, the value should ideally be reasonably low, and where this is the case, this indicates a reasonably controlled test environment (making the shared server behave like a dedicated server for the test duration). Where there is workload on a shared server/servers unrelated to the system under test during a test, the additional workload may confound the estimation of the Rate coefficient, making the required resource usage over or understated.

The *Rate* is the coefficient on the achieved load. This is usually the session rate or customer arrival rate, measure in customer arrivals per second. Depending on the NFT setup, a session would do either a chain of application functions on behalf of a single business/user-level function or may do a single function or operation. This distinction usually correlates to simulating end-users (multiple calls/operations within a session) or single function/call/operation within a session (system to system or device to device calls). In either case, the Rate coefficient is the session arrival rate achieved.

The interpretation of the *Rate* coefficient is that it is the resource cost in (one of) the appropriate metric for the server type, and hence is the estimated cost in terms that metric of a single session per second (or customer arrival per second).

Coef	Description
Rate	Resource usage per customer arrival per second.
Bias	Load independent resource usage or background load

## 2 Server classification from application landscape

```
## The following files in landscape match pattern "Server_Classification.*csv":
##   File = CMLEcoSystem_Server_Classification.csv
```

## File = CMLEcoSystem\_Server\_Classification.csv with 10 rows added to total mal

Classification	Server	IP_Address	OSType	Description	Hardware_Support	Support_Supplier	Application_Support	SOURCE_FILE
LOAD	LOAD0	176.67.166.86	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
LOAD	LOAD0_SNTM	176.67.166.86	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
LOAD	LOAD1	176.67.166.89	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
LOAD	LOAD1_SNTM	176.67.166.89	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
MODEL	MODELAPP	176.67.166.120	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
MODEL	MODELAPP6_SNTM	176.67.166.120	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
MODEL	MODELAPP7	176.67.166.121	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
MODEL	MODELAPP6_SNTM	176.67.166.121	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
NETWORK	NETWORK0	109.123.111.1	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv
NETWORK	NETWORK0_SNTM	109.123.111.1	Linux	CML EcoSystem	Patrick Hayward	Patrick Hayward	Patrick Hayward	CMLEcoSystem_Server_Classification.csv

### 3 Comparison of current tests to pooled earlier tests

The last test date in the summary data is used to delimit the prior tests from the tests in the last test session. This section compares the resource usage for each resource type and measure for each server group to the corresponding pooled resource usage and measure for the server group. The current test(s) are the tests performed on 2024-07-15. Resource usage metrics are pooled only where the corresponding  $p$ -value is demonstrates some confidence in the estimated coefficient.

#### 3.1 Differences in resource usage

The following show the comparisons of the tests performed on 2024-07-15 as compared to the tests performed before this date. The tables are ranked in increasing order of the  $p$ -values from the corresponding Welch Modified Two-Sample t-Test (two.sided), starting from server group where the resource usage distribution differences are the greatest. Results are only shown for which the  $p$ -value is less than or equal to the cutoff value ( $\alpha = 0.05$ ).

##### 3.1.1 Test 1 - TermAppISO

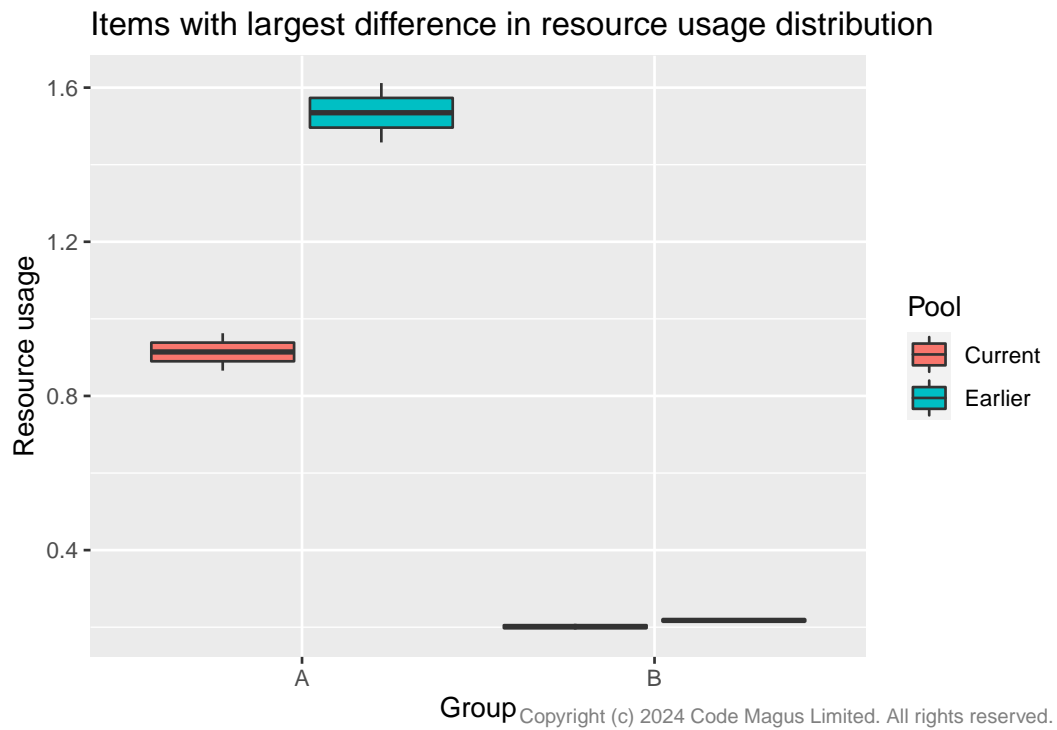
###### 3.1.1.1 Resource class: CPU

3.1.1.1.1

The following compares the Rate coefficient for the CPU resource usage differences from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.d
MODERate	69	cpu.cpu.system.us	Percent single processor		0.914	0.024	210	1.535	0.039	0
LOADRate	69	cpu.cpu.system.us	Percent single processor		0.201	0.004	210	0.218	0.003	0

## Loading required package: grid



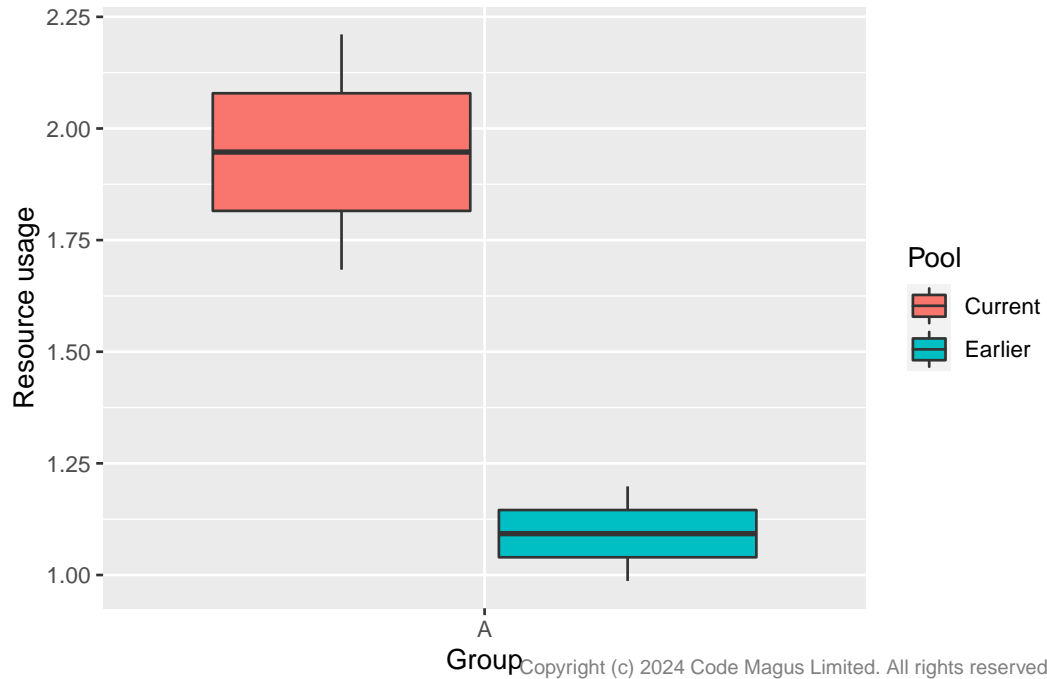
Key	Group
A	MODEL Rate Percent single processor CPU Usage
B	LOAD Rate Percent single processor CPU Usage

3.1.1.1.2

The following compares the Bias coefficient for the CPU resource usage differences from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.d
LOAD Bias	69		cpu.cpu.system.us	Percent single processor	1.947	0.132	210	1.093	0.053	0

Items with largest difference in resource usage distribution



Key	Group
A	LOAD Bias Percent single processor CPU Usage

**3.1.1.2 Resource class: Network**

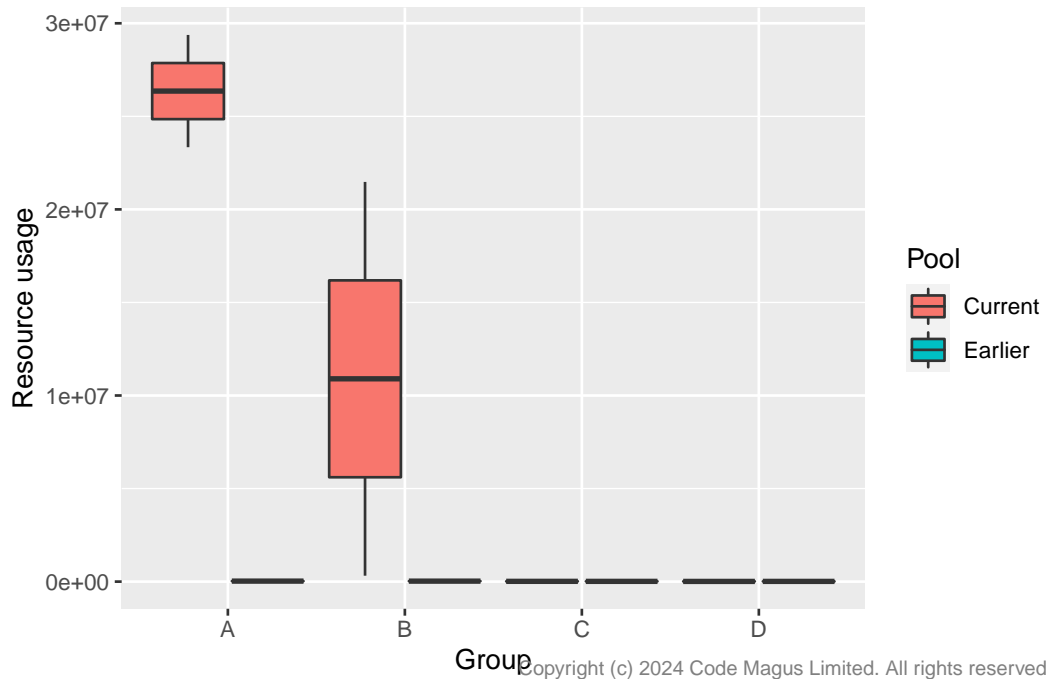
**3.1.1.2.1**

The following compares the Rate coefficient for the Network resource usage differences from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.d
MODEIRate	69	sent	bits per second		26358059.741507804.613		210	27030.93	376.708	0.000
MODEIRate	69	recv	bits per second		10898109.775289668.924		210	26554.58	206.210	0.000
MODEIRate	69	sent	bits per second		28279.64	841.872	210	27030.93	376.708	0.000

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.d
LOAD	Rate	69	sent	bits per second	14832.64	378.347	173	14398.51	89.881	0.000
LOAD	Rate	69	recv	bits per second	11491.42	669.800	210	12146.60	130.318	0.000
MODEL	Rate	69	recv	bits per second	26727.79	399.463	210	26554.58	206.210	0.001

Items with largest difference in resource usage distribution



Key	Group
A	MODEL Rate bits per second Network Usage sent
B	MODEL Rate bits per second Network Usage recv
C	LOAD Rate bits per second Network Usage sent
D	LOAD Rate bits per second Network Usage recv

3.1.1.2.2

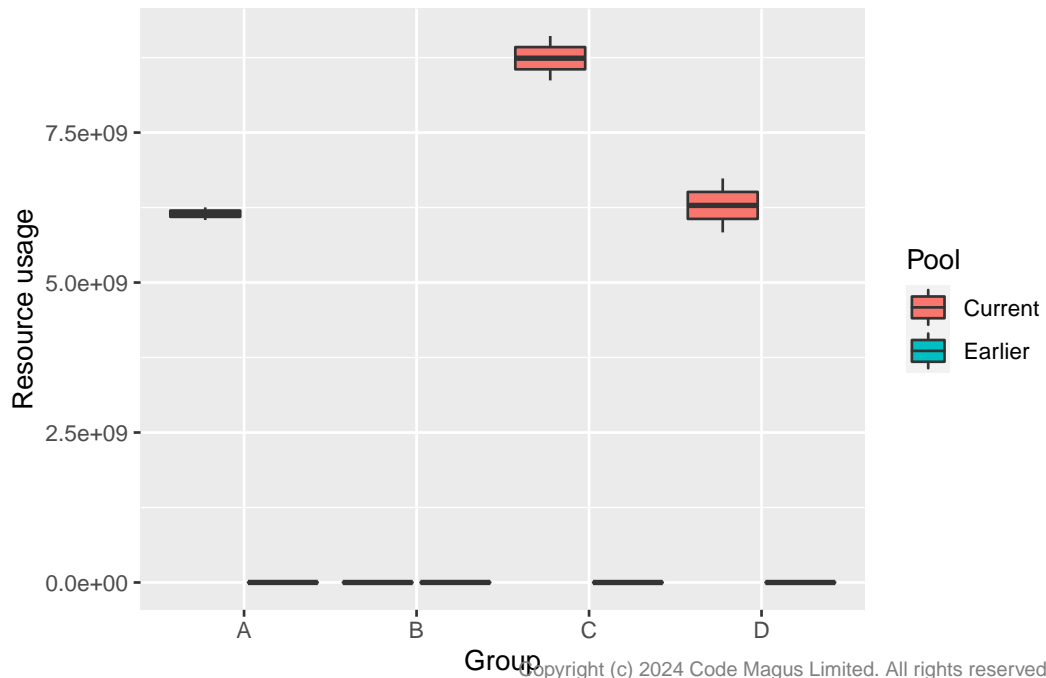
The following compares the Bias coefficient for the Network resource usage differences from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.d
MODEL	Bias	69	sent	bits per second	6147403086.7	2760755.89	210	371328.5	9764.734	0



Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.d
LOAD	Bias	69	sent	bits per second	105448.7	13239.03	210	297395.8	50783.534	0
MODEL	Bias	69	recv	bits per second	8739590008.7	185094891.27	210	196291.9	4527.647	0
LOAD	Bias	69	sent	bits per second	5338140626.8	69818825.32	210	297395.8	50783.534	0
LOAD	Bias	69	recv	bits per second	6285561870.2	24823568.97	210	173729.7	3236.294	0
MODEL	Bias	69	recv	bits per second	240350.4	13977.93	210	196291.9	4527.647	0
LOAD	Bias	69	recv	bits per second	235273.0	23437.48	210	173729.7	3236.294	0
MODEL	Bias	69	sent	bits per second	386815.2	29458.58	210	371328.5	9764.734	0

Items with largest difference in resource usage distribution



Key	Group
A	MODEL Bias bits per second Network Usage sent
B	LOAD Bias bits per second Network Usage sent
C	MODEL Bias bits per second Network Usage recv
D	LOAD Bias bits per second Network Usage recv

## 3.2 Increases in resource usage

The following show the comparisons of the tests performed on 2024-07-15 as compared to the tests performed before this date. The tables are ranked in increasing order of the  $p$ -values from the corresponding Welch Modified Two-Sample t-Test (greater), starting from server group where the resource usage distribution increases are the greatest. Results are only shown for which the  $p$ -value is less than or equal to the cutoff value ( $\alpha = 0.05$ ).

### 3.2.1 Test 1 - TermAppISO

#### 3.2.1.1 Resource class: CPU

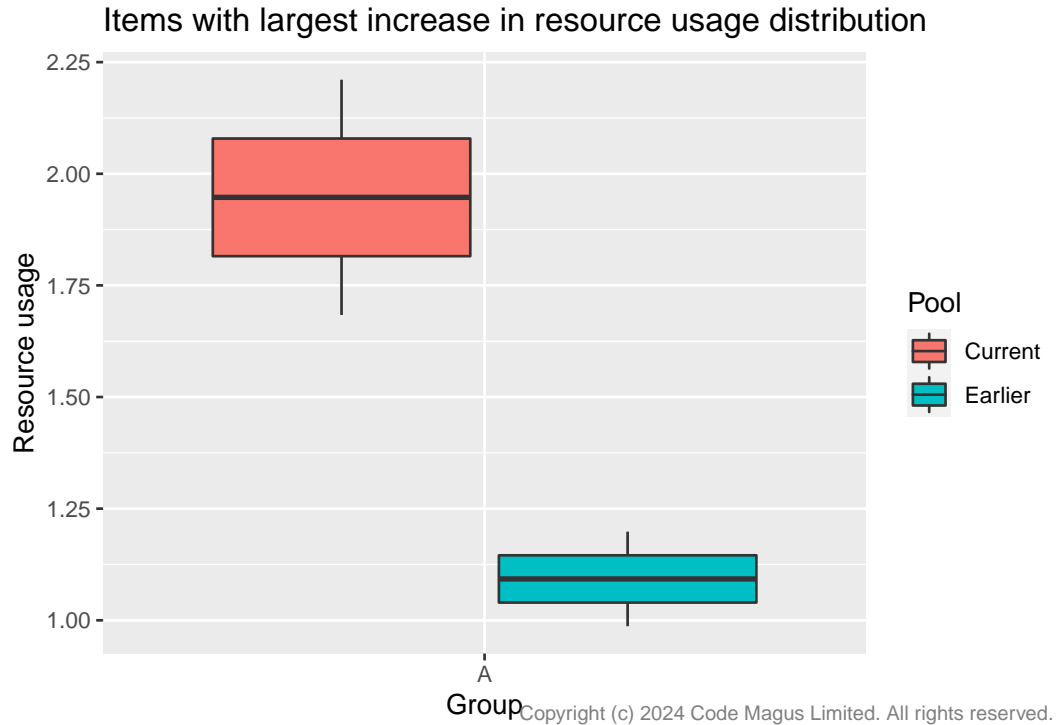
##### 3.2.1.1.1

There are no significant increases for the Rate coefficient for the test that started at CPU when compared to the 2024-07-15 15:36:01 resource usage from previous pooled test results.

##### 3.2.1.1.2

The following compares the Bias coefficient for the CPU resource usage increases from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.g
LOAD	Bias	69	cpu.cpu.system.us	Percent single processor	1.947	0.132	210	1.093	0.053	0



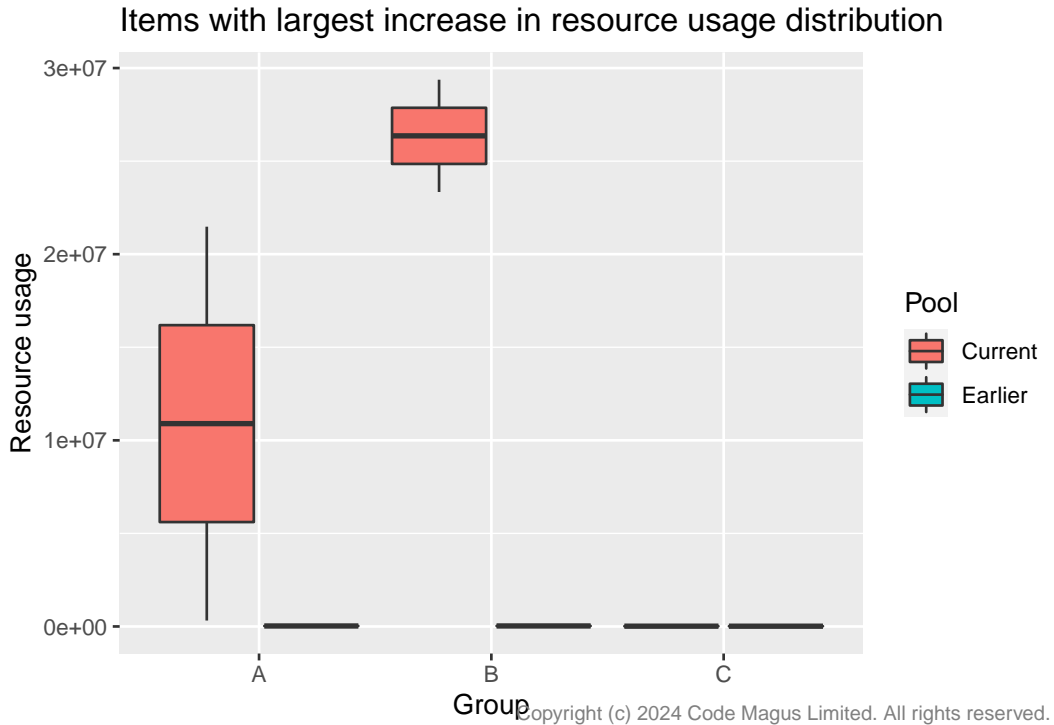
Key	Group
A	LOAD Bias Percent single processor CPU Usage

### 3.2.1.2 Resource class: Network

#### 3.2.1.2.1

The following compares the Rate coefficient for the Network resource usage increases from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.g
MODEIRate	69	recv	bits per second		10898109.77	5289668.924	210	26554.58	206.210	0
MODEIRate	69	sent	bits per second		26358059.74	1507804.613	210	27030.93	376.708	0
MODEIRate	69	sent	bits per second		28279.64	841.872	210	27030.93	376.708	0
LOAD Rate	69	sent	bits per second		14832.64	378.347	173	14398.51	89.881	0
MODEIRate	69	recv	bits per second		26727.79	399.463	210	26554.58	206.210	0



Key	Group
A	MODEL Rate bits per second Network Usage recv
B	MODEL Rate bits per second Network Usage sent
C	LOAD Rate bits per second Network Usage sent

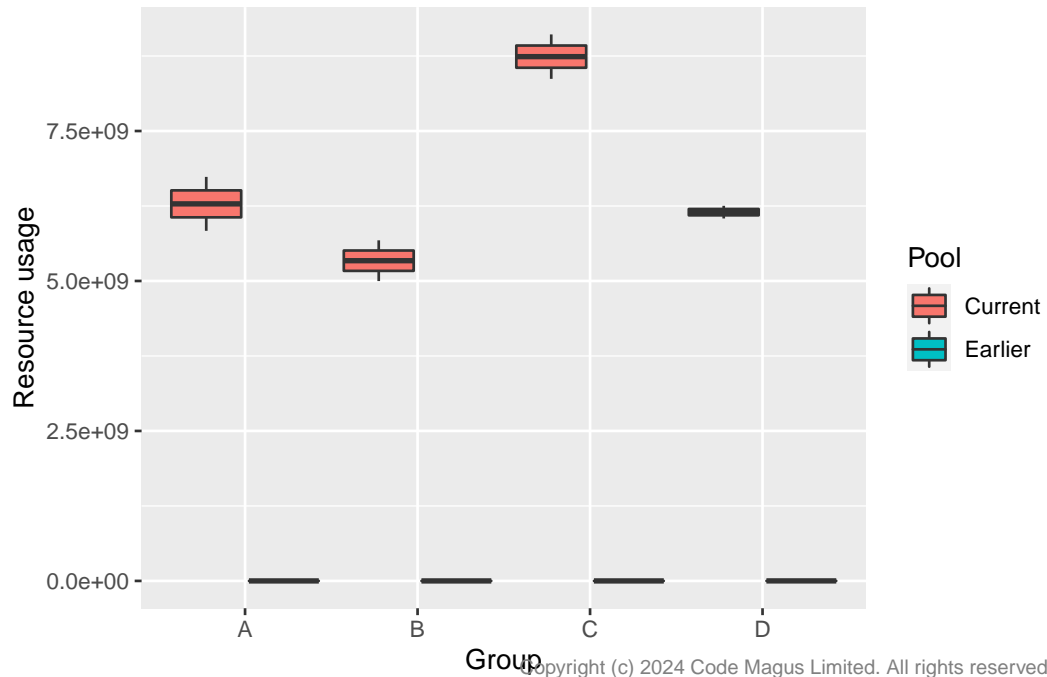
### 3.2.1.2.2

The following compares the Bias coefficient for the Network resource usage increases from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.g
LOAD	Bias	69	recv	bits per second	6285561870.2	24823568.97	210	173729.7	3236.294	0
LOAD	Bias	69	sent	bits per second	5338140626.8	69818825.32	210	297395.8	50783.534	0
MODEL	Bias	69	recv	bits per second	8739590008.7	85094891.27	210	196291.9	4527.647	0
MODEL	Bias	69	sent	bits per second	6147403086.3	2760755.89	210	371328.5	9764.734	0
LOAD	Bias	69	recv	bits per second	235273.0	23437.48	210	173729.7	3236.294	0
MODEL	Bias	69	recv	bits per second	240350.4	13977.93	210	196291.9	4527.647	0

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.g
MODEL	Bias	69	sent	bits per second	386815.2	29458.58	210	371328.5	9764.734	0

Items with largest increase in resource usage distribution



Key	Group
A	LOAD Bias bits per second Network Usage recv
B	LOAD Bias bits per second Network Usage sent
C	MODEL Bias bits per second Network Usage recv
D	MODEL Bias bits per second Network Usage sent

### 3.3 Decreases in resource usage

The following show the comparisons of the tests performed on 2024-07-15 as compared to the tests performed before this date. The tables are ranked in increasing order of the  $p$ -values from the corresponding Welch Modified Two-Sample t-Test (less), starting from server group where the resource usage distribution decreases are the greatest. Results are only shown for which the  $p$ -value is less than or equal to the cutoff value ( $\alpha = 0.05$ ).

#### 3.3.1 Test 1 - TermAppISO

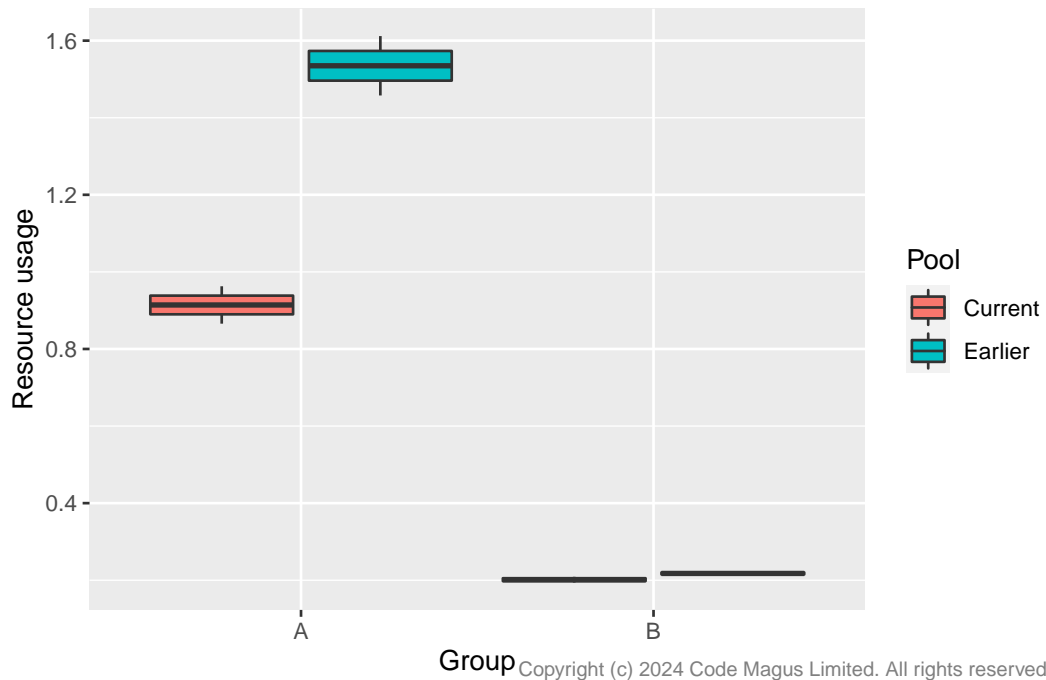
##### 3.3.1.1 Resource class: CPU

**3.3.1.1.1**

The following compares the Rate coefficient for the CPU resource usage decreases from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSE	pvalue.1
MODERate	69	cpu.cpu.system.us	Percent single processor		0.914	0.024	210	1.535	0.039	0
LOAD Rate	69	cpu.cpu.system.us	Percent single processor		0.201	0.004	210	0.218	0.003	0

Items with largest decrease in resource usage distribution



Key	Group
A	MODEL Rate Percent single processor CPU Usage
B	LOAD Rate Percent single processor CPU Usage

**3.3.1.1.2**

There are no significant decreases for the Bias coefficient for the test that started at CPU when compared to the 2024-07-15 15:36:01 resource usage from previous pooled test results.

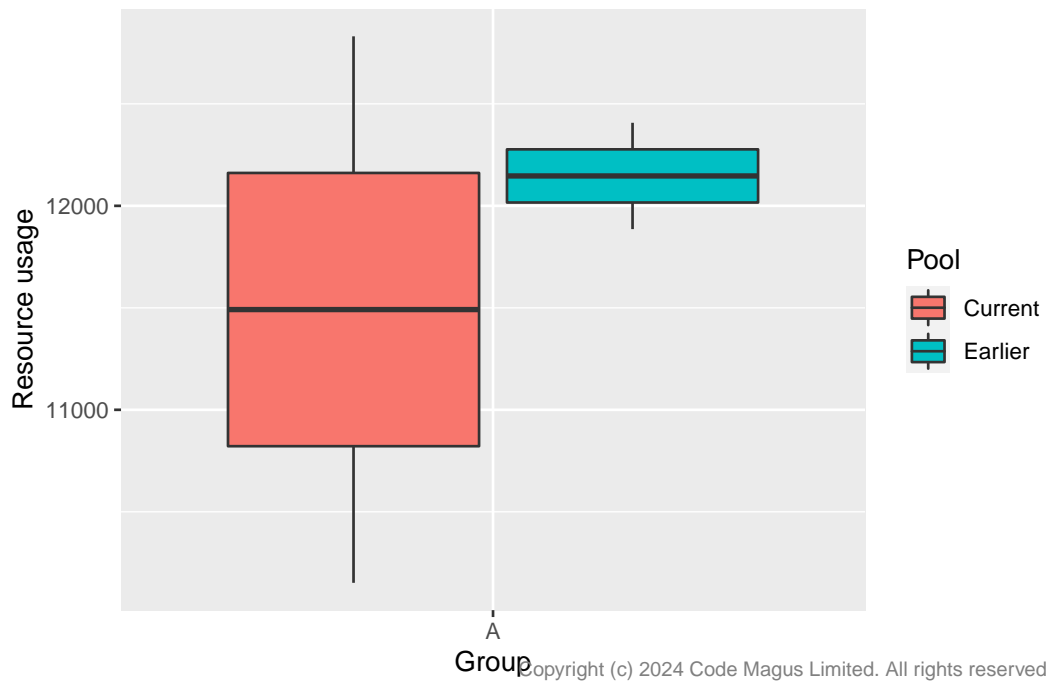
**3.3.1.2 Resource class: Network**

### 3.3.1.2.1

The following compares the Rate coefficient for the Network resource usage decreases from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.l
LOAD	Rate	69	recv	bits per second	11491.42	669.8	210	12146.6	130.318	0

Items with largest decrease in resource usage distribution

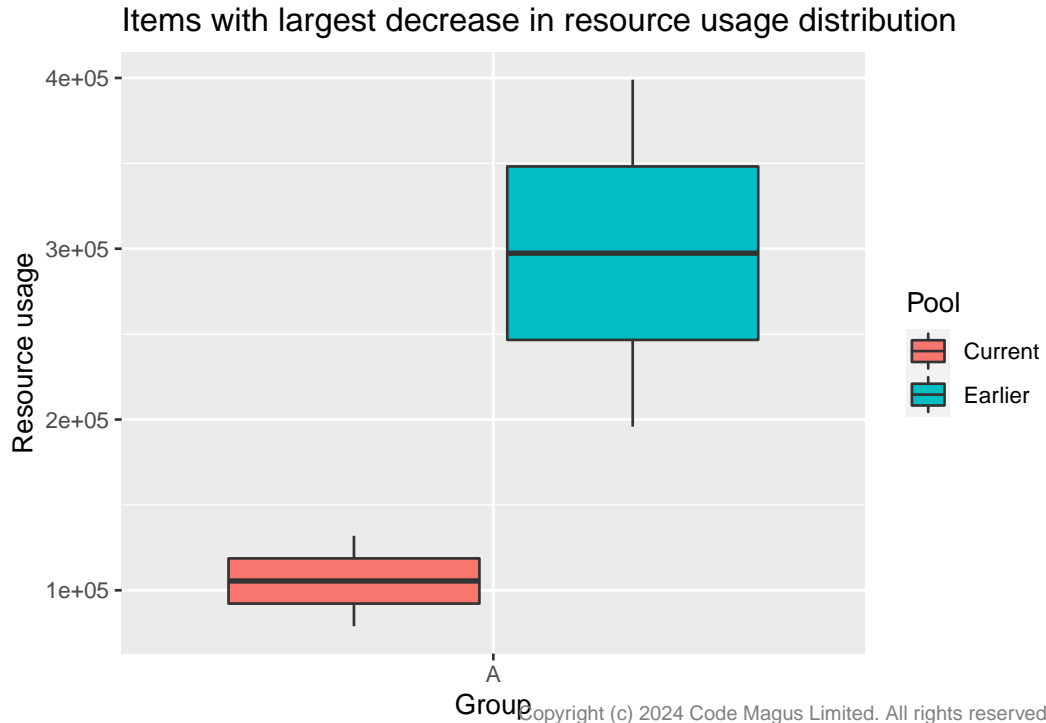


Key	Group
A	LOAD Rate bits per second Network Usage recv

### 3.3.1.2.2

The following compares the Bias coefficient for the Network resource usage decreases from the test started at 2024-07-15 15:36:01 to the tests from previous test sessions.

Class	Coef	Count	Metric	Units	Estimate	Std..Error	PrevCount	PrevEst	PrevSEM	pvalue.l
LOAD	Bias	69	sent	bits per second	105448.7	13239.03	210	297395.8	50783.53	0



Key	Group
A	LOAD Bias bits per second Network Usage sent

## 4 Comparison of resource usage across tests

This section compares the resource usage between the NFT tests to date for each of the groups/servers in the classification list for which data has been collected.

In the box-plots that follow, in each case, the centre is the estimated value of the coefficient calculated for the particular test. The lower edge of the box is the corresponding estimated value less the standard error, and the upper edge of the box is the corresponding estimated value plus the standard error. The minimum and maximum values are calculated by taking two times the standard error values in a similar manner.

### 4.1 CPU Resource usage for LOAD by CPU Usage using `cpu.cpu.system.user` in Percent single processor

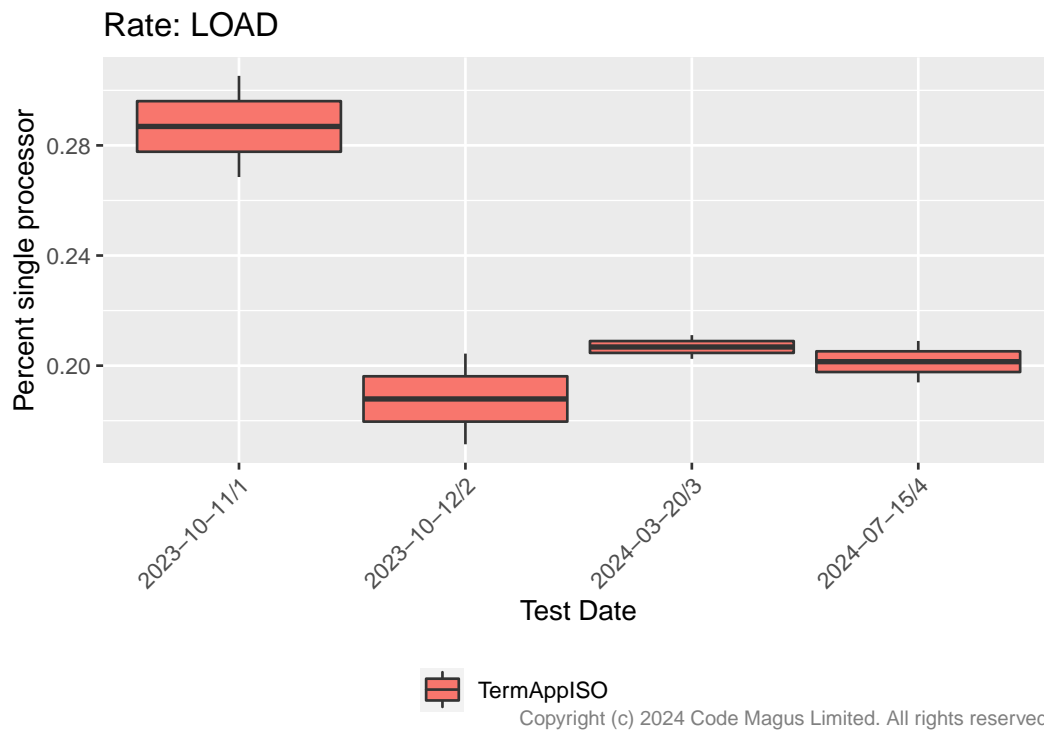
Server	OSType	Description
LOAD0	Linux	CML EcoSystem
LOAD0_SNMP	LinuxSNMP	CML EcoSystem
LOAD1	Linux	CML EcoSystem



Server	OSType	Description
LOAD1_SNMP	LinuxSNMP	CML EcoSystem

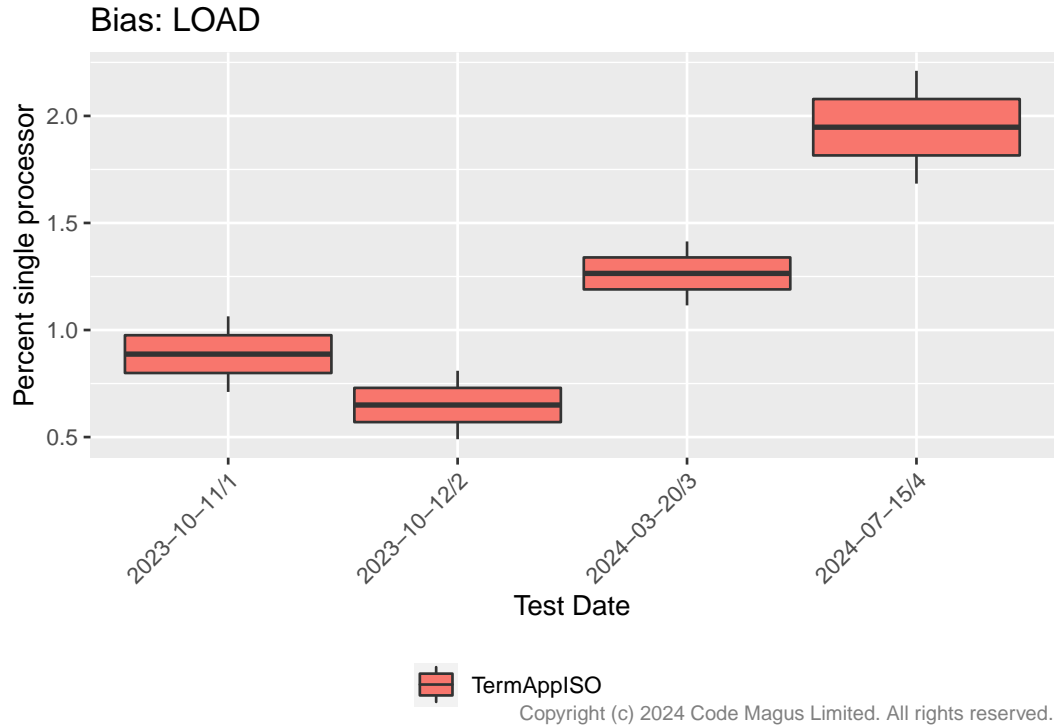
The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: Percent single processor.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Rate	0.287	0.009	31.225	0	TermAppISO
2023-10-12	Rate	0.188	0.008	22.821	0	TermAppISO
2024-03-20	Rate	0.207	0.002	96.018	0	TermAppISO
2024-07-15	Rate	0.201	0.004	53.513	0	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: Percent single processor.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	0.887	0.088	10.056	0	TermAppISO
2023-10-12	Bias	0.650	0.080	8.127	0	TermAppISO
2024-03-20	Bias	1.264	0.075	16.936	0	TermAppISO
2024-07-15	Bias	1.947	0.132	14.783	0	TermAppISO

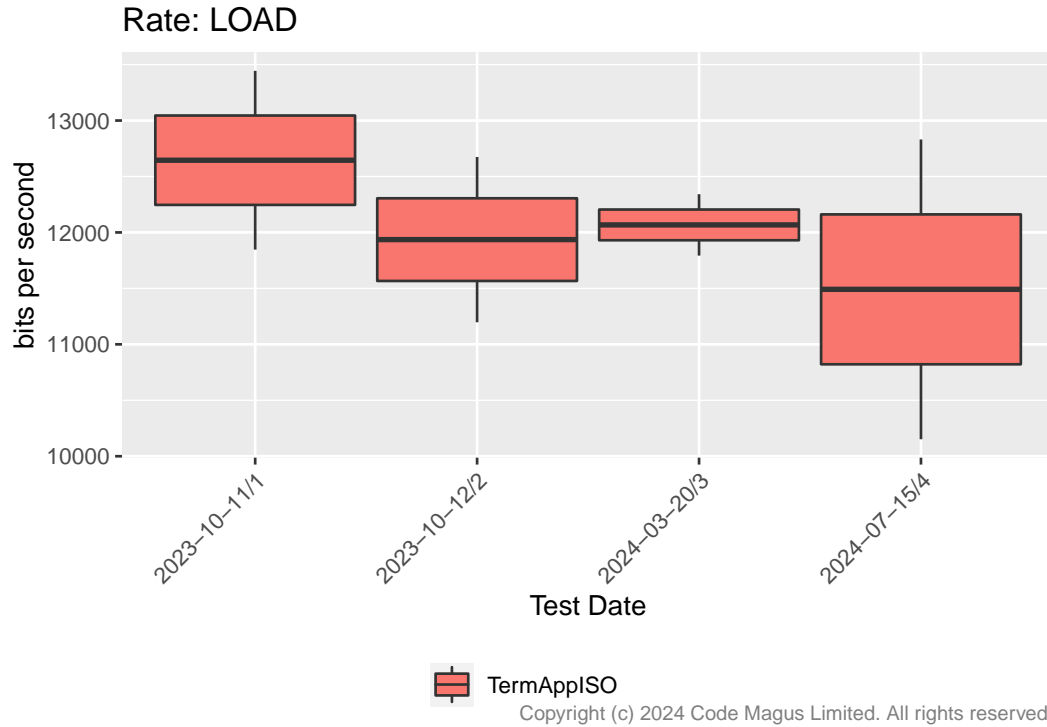


#### 4.2 Network Resource usage for LOAD by Network Usage recv using recv in bits per second

Server	OSType	Description
LOAD0	Linux	CML EcoSystem
LOAD0_SNMP	LinuxSNMP	CML EcoSystem
LOAD1	Linux	CML EcoSystem
LOAD1_SNMP	LinuxSNMP	CML EcoSystem

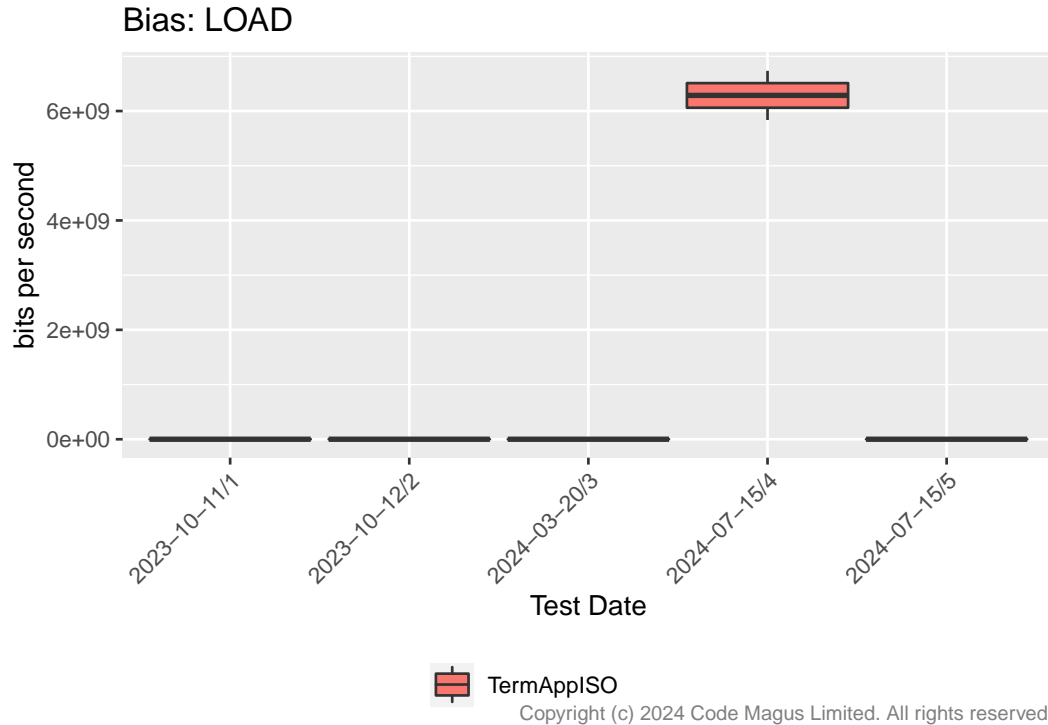
The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Rate	12645.34	399.450	31.657	0	TermAppISO
2023-10-12	Rate	11935.78	369.366	32.314	0	TermAppISO
2024-03-20	Rate	12067.31	137.274	87.906	0	TermAppISO
2024-07-15	Rate	11491.42	669.800	17.157	0	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	171587.3	3.836638e+03	44.723	0	TermAppISO
2023-10-12	Bias	172577.1	3.586502e+03	48.119	0	TermAppISO
2024-03-20	Bias	174611.2	4.758899e+03	36.692	0	TermAppISO
2024-07-15	Bias	6285561870.9	2.248236e+08	27.958	0	TermAppISO
2024-07-15	Bias	235273.0	2.343748e+04	10.038	0	TermAppISO

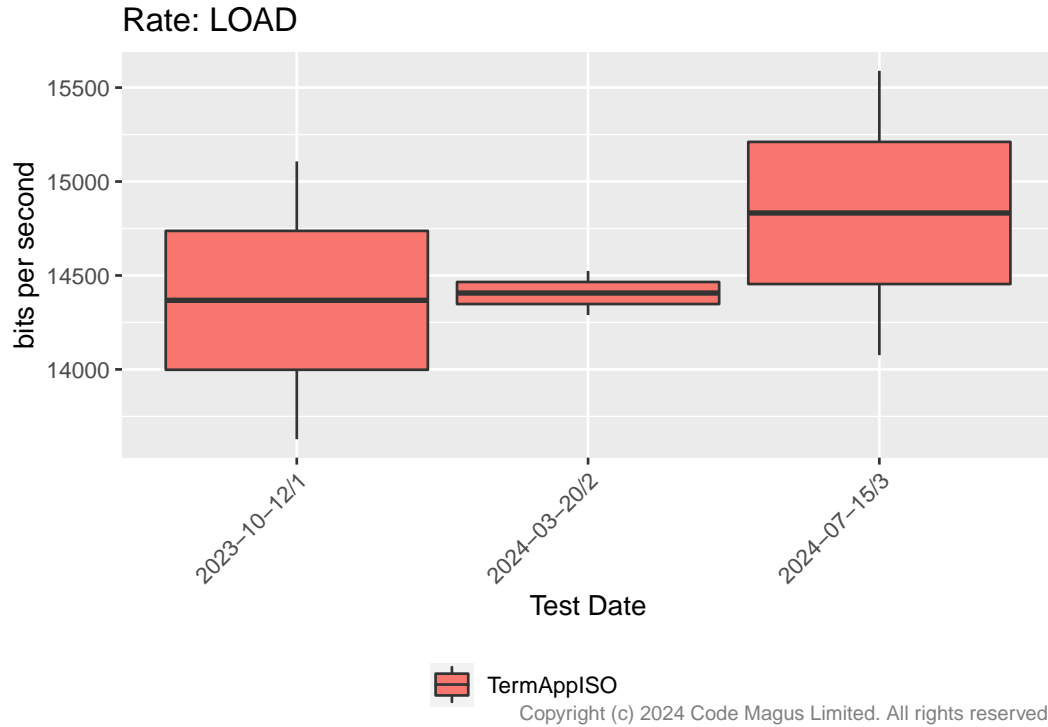


#### 4.3 Network Resource usage for LOAD by Network Usage sent using sent in bits per second

Server	OSType	Description
LOAD0	Linux	CML EcoSystem
LOAD0_SNMP	LinuxSNMP	CML EcoSystem
LOAD1	Linux	CML EcoSystem
LOAD1_SNMP	LinuxSNMP	CML EcoSystem

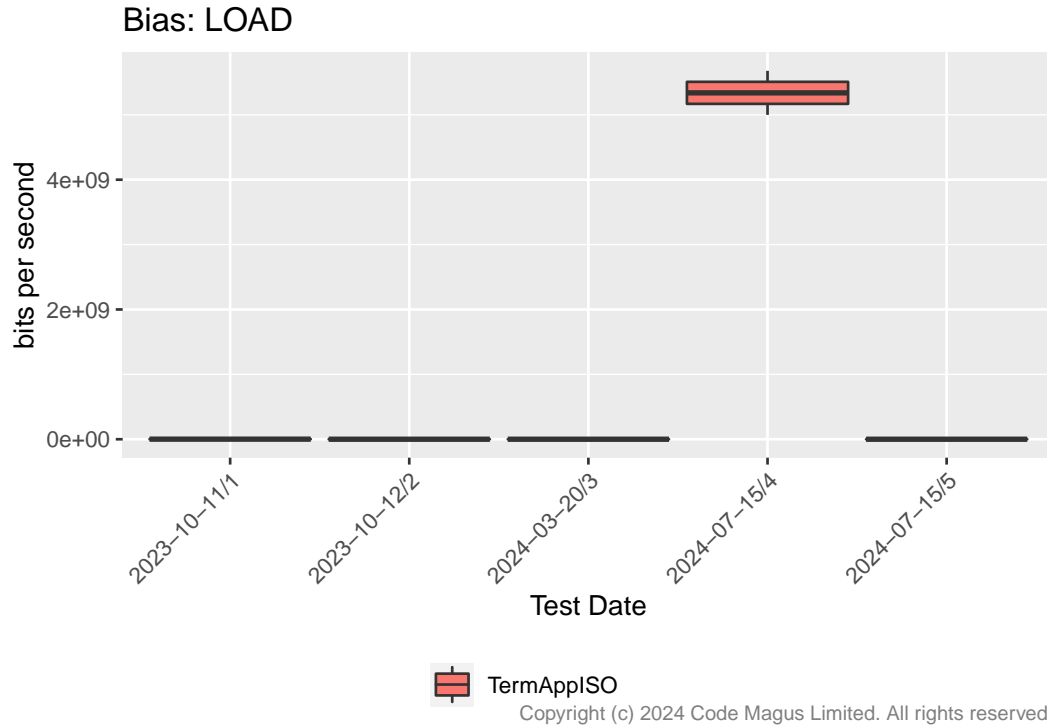
The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-12	Rate	14367.67	369.686	38.865	0	TermAppISO
2024-03-20	Rate	14406.62	58.695	245.448	0	TermAppISO
2024-07-15	Rate	14832.64	378.347	39.204	0	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	1.359858e+06	2.881112e+05	4.720	0	TermAppISO
2023-10-12	Bias	6.425911e+04	3.589609e+03	17.901	0	TermAppISO
2024-03-20	Bias	7.171554e+04	2.034788e+03	35.245	0	TermAppISO
2024-07-15	Bias	5.338141e+09	1.698188e+08	31.434	0	TermAppISO
2024-07-15	Bias	1.054487e+05	1.323903e+04	7.965	0	TermAppISO

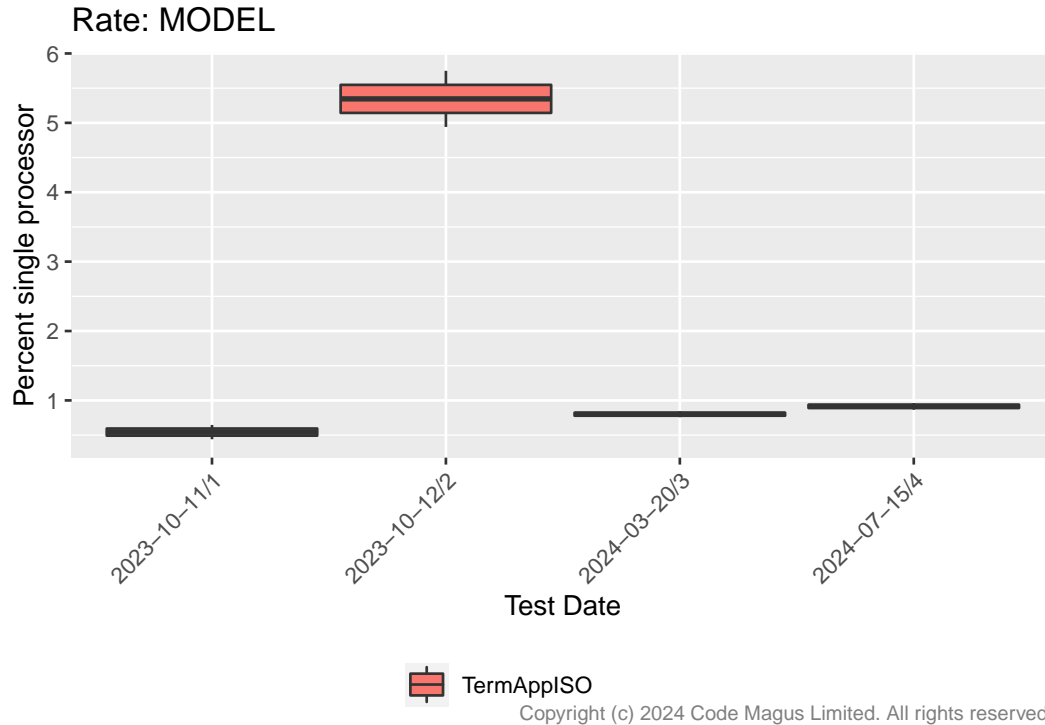


#### 4.4 CPU Resource usage for MODEL by CPU Usage using `cpu.cpu.system.user` in Percent single processor

Server	OSType	Description
MODELAPP0	Linux	CML EcoSystem
MODELAPP0_SNMP	LinuxSNMP	CML EcoSystem
MODELAPP1	Linux	CML EcoSystem
MODELAPP1_SNMP	LinuxSNMP	CML EcoSystem

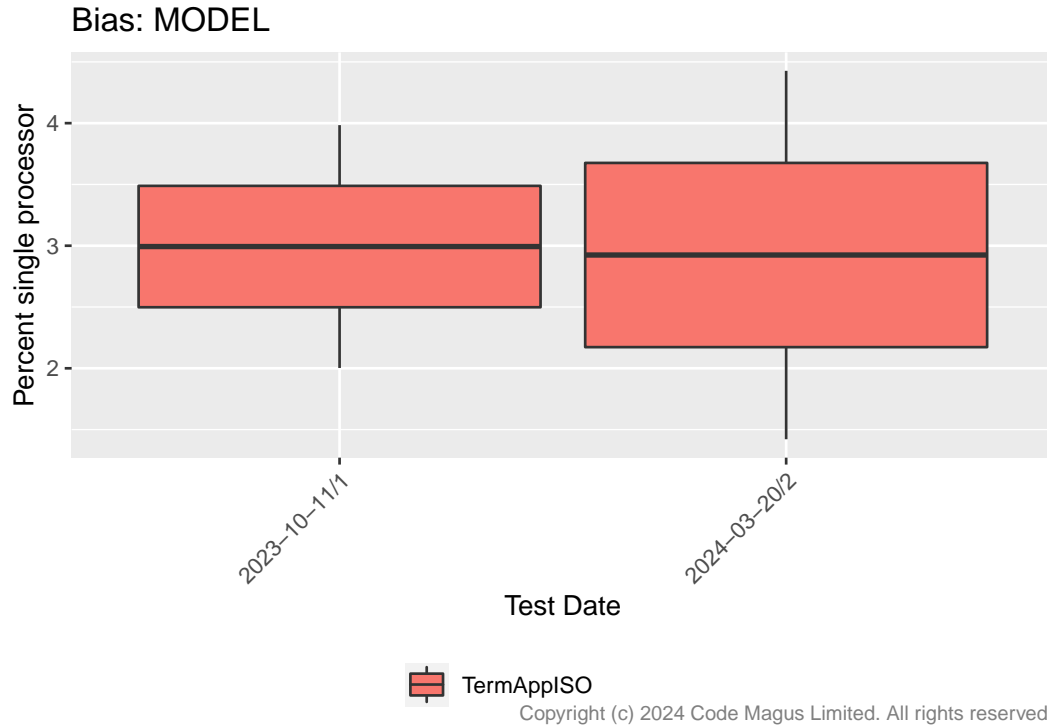
The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: Percent single processor.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Rate	0.543	0.052	10.537	0	TermAppISO
2023-10-12	Rate	5.346	0.202	26.444	0	TermAppISO
2024-03-20	Rate	0.801	0.022	36.955	0	TermAppISO
2024-07-15	Rate	0.914	0.024	37.696	0	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: Percent single processor.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	2.993	0.495	6.043	0	TermAppISO
2024-03-20	Bias	2.924	0.752	3.891	0	TermAppISO



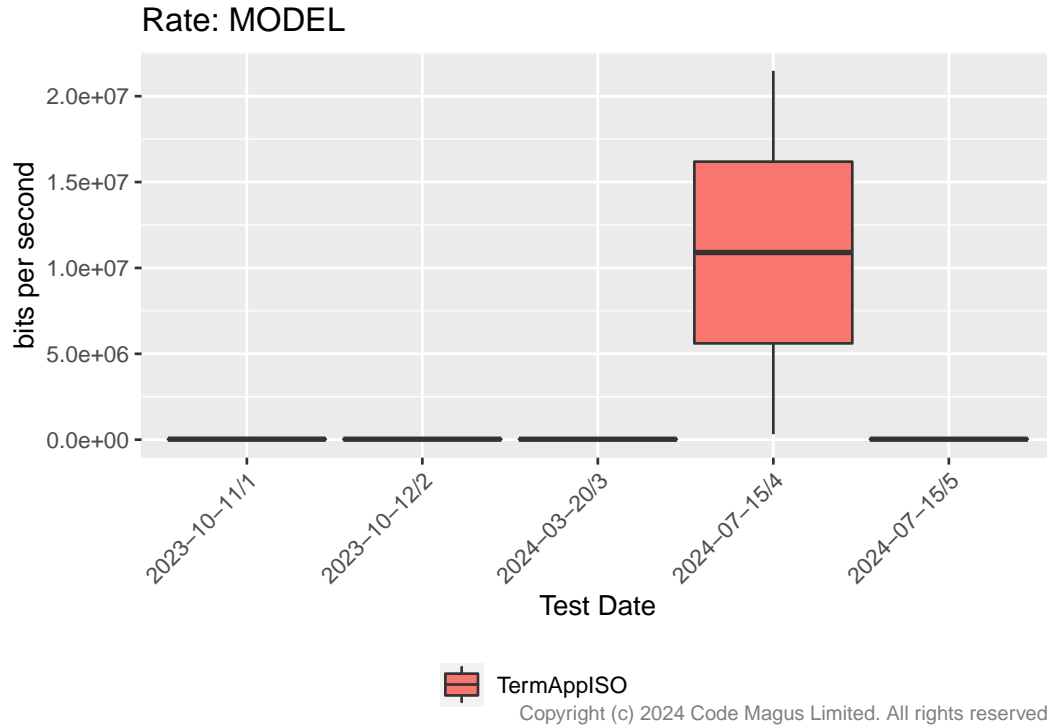
#### 4.5 Network Resource usage for MODEL by Network Usage recv using recv in bits per second

Server	OSType	Description
MODELAPP0	Linux	CML EcoSystem
MODELAPP0_SNMP	LinuxSNMP	CML EcoSystem
MODELAPP1	Linux	CML EcoSystem
MODELAPP1_SNMP	LinuxSNMP	CML EcoSystem

The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

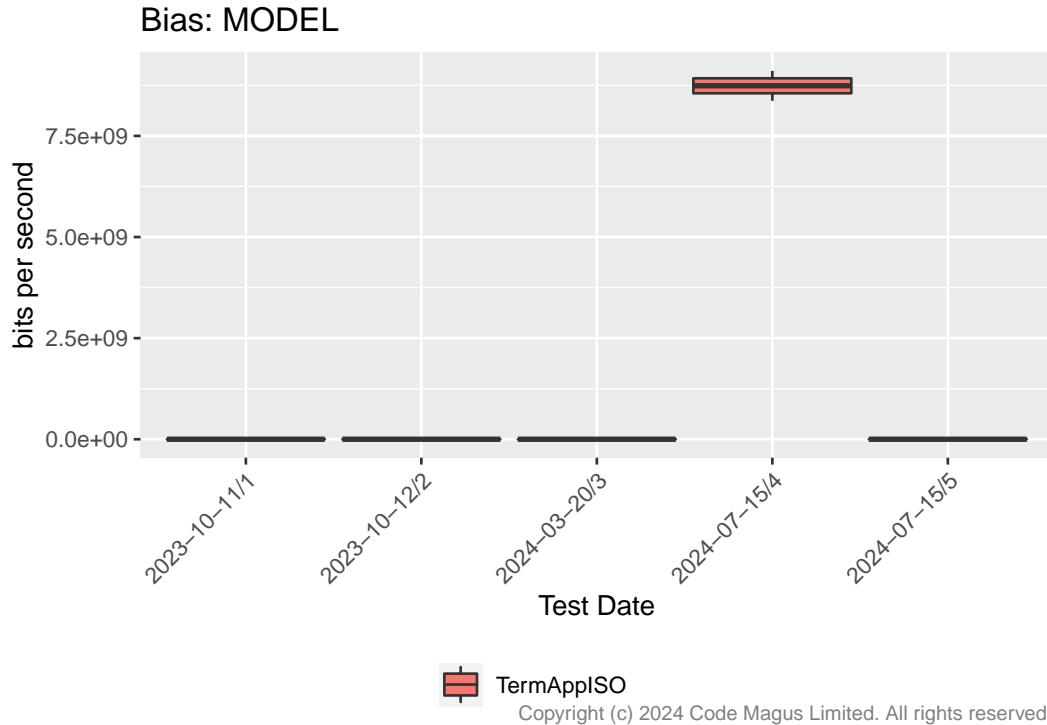
TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Rate	28037.96	599.560	46.764	0.000	TermAppISO
2023-10-12	Rate	26715.93	748.249	35.705	0.000	TermAppISO
2024-03-20	Rate	26111.56	187.170	139.507	0.000	TermAppISO
2024-07-15	Rate	10898109.77	5289668.924	2.060	0.043	TermAppISO
2024-07-15	Rate	26727.79	399.463	66.909	0.000	TermAppISO





The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	181549.1	5.758658e+03	31.526	0	TermAppISO
2023-10-12	Bias	194463.1	7.265410e+03	26.766	0	TermAppISO
2024-03-20	Bias	200754.1	6.488644e+03	30.939	0	TermAppISO
2024-07-15	Bias	8739590008.7	1.850949e+08	47.217	0	TermAppISO
2024-07-15	Bias	240350.4	1.397793e+04	17.195	0	TermAppISO

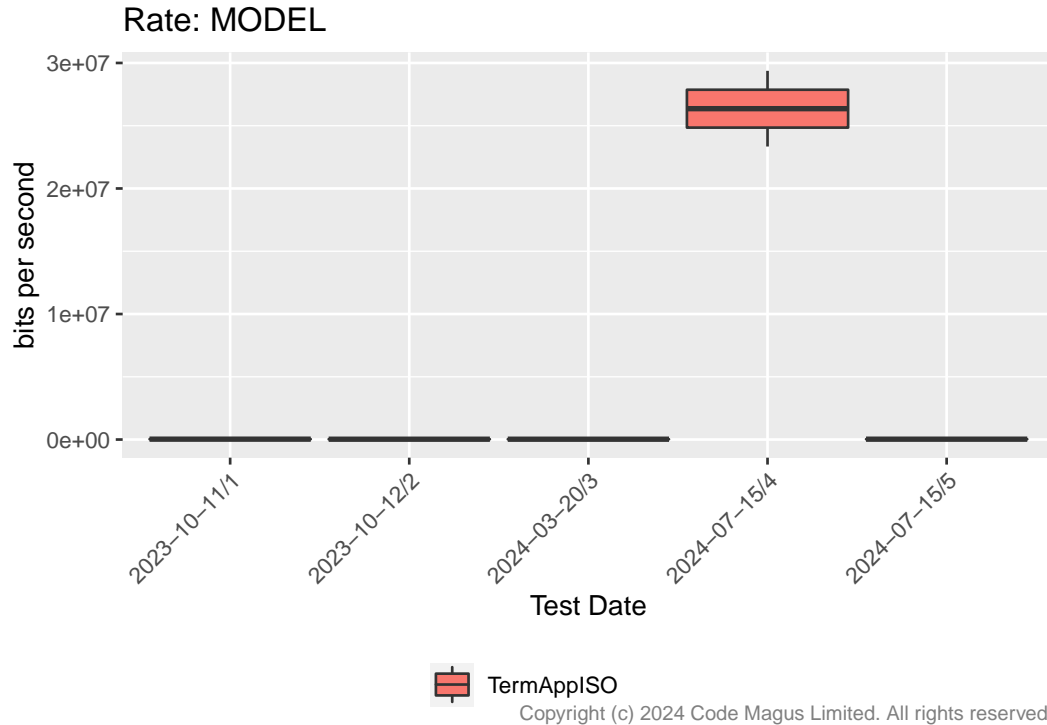


#### 4.6 Network Resource usage for MODEL by Network Usage sent using sent in bits per second

Server	OSType	Description
MODELAPP0	Linux	CML EcoSystem
MODELAPP0_SNMP	LinuxSNMP	CML EcoSystem
MODELAPP1	Linux	CML EcoSystem
MODELAPP1_SNMP	LinuxSNMP	CML EcoSystem

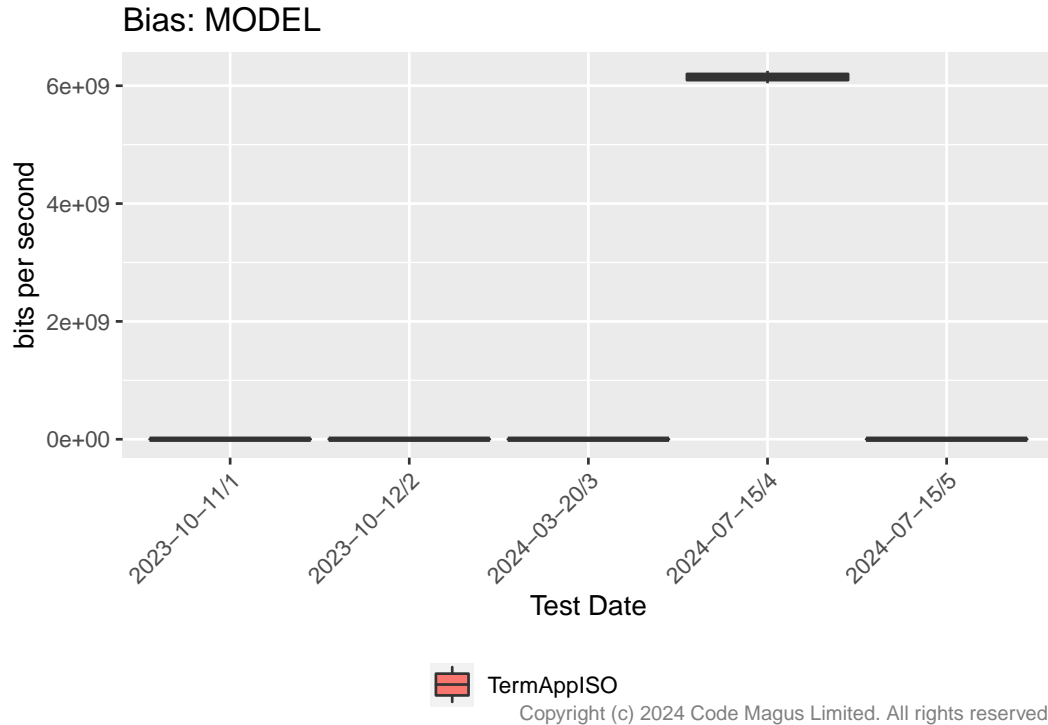
The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Rate	31570.63	765.171	41.260	0	TermAppISO
2023-10-12	Rate	26997.60	1300.297	20.763	0	TermAppISO
2024-03-20	Rate	25813.64	417.109	61.887	0	TermAppISO
2024-07-15	Rate	26358059.74	1507804.613	17.481	0	TermAppISO
2024-07-15	Rate	28279.64	841.872	33.591	0	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	322200.7	7349.323	43.841	0	TermAppISO
2023-10-12	Bias	399853.6	12625.744	31.670	0	TermAppISO
2024-03-20	Bias	377100.9	14459.923	26.079	0	TermAppISO
2024-07-15	Bias	6147403086.7	52760755.889	116.515	0	TermAppISO
2024-07-15	Bias	386815.2	29458.585	13.131	0	TermAppISO

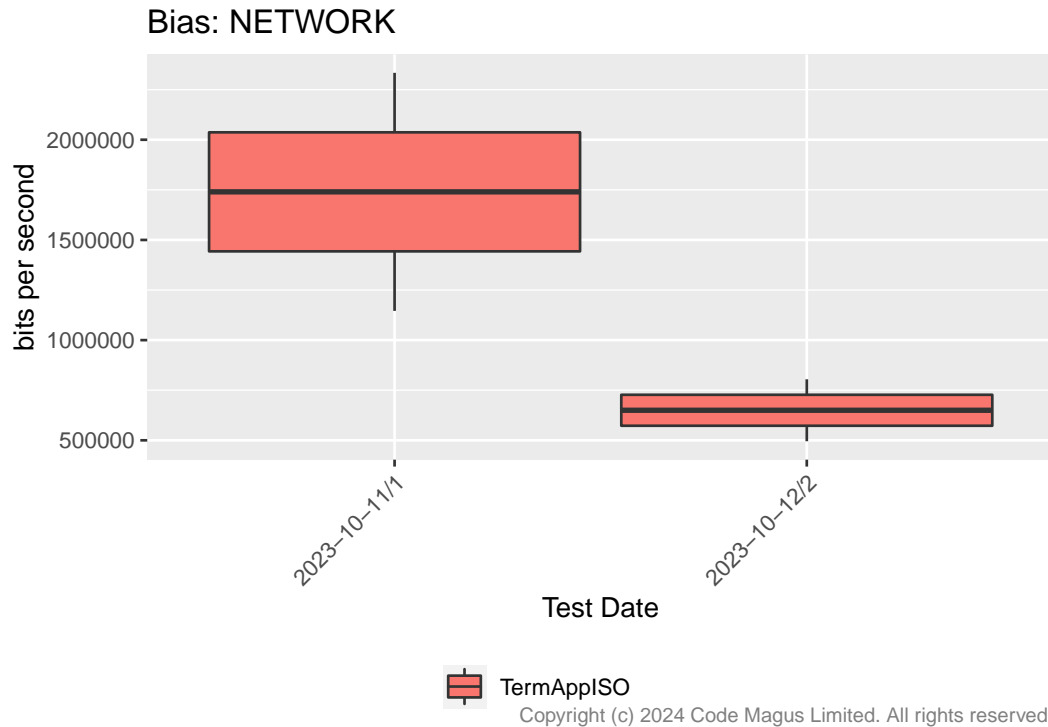


#### 4.7 Network Resource usage for NETWORK by Network Usage recv using recv in bits per second

Server	OSType	Description
NETWORK	Linux	CML EcoSystem
NETWORK_SNMP	LinuxSNMP	CML EcoSystem

The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	1739981.7	297019.61	5.858	0	TermAppISO
2023-10-12	Bias	649969.9	77316.29	8.407	0	TermAppISO

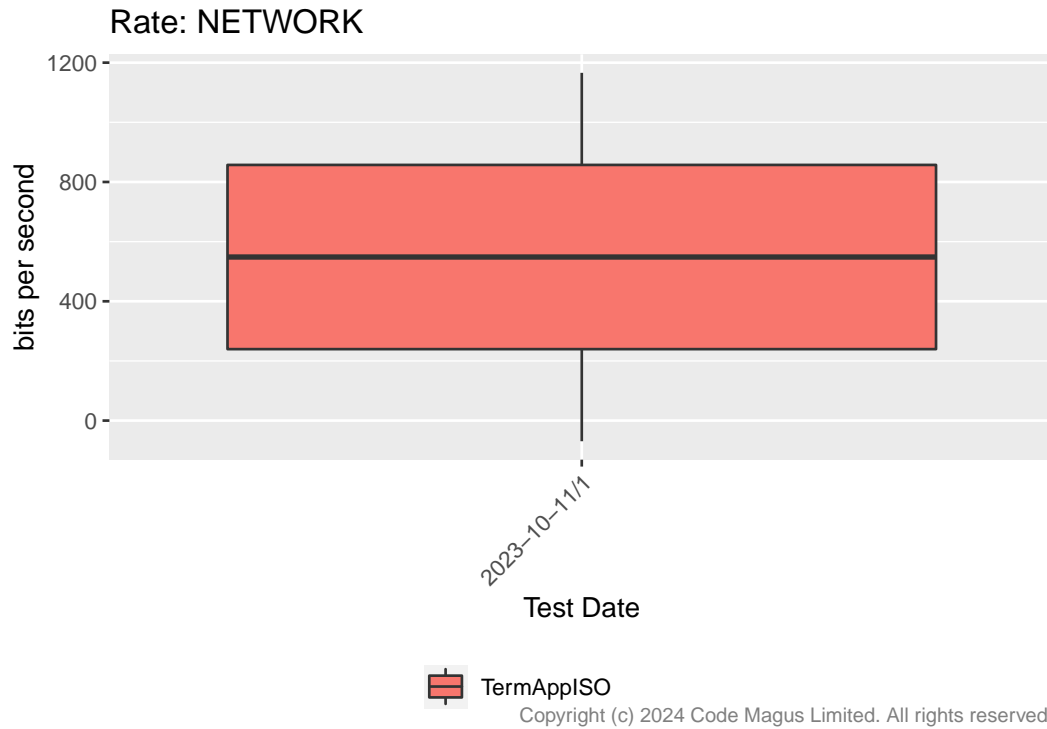


#### 4.8 Network Resource usage for NETWORK by Network Usage sent using sent in bits per second

Server	OSType	Description
NETWORK	Linux	CML EcoSystem
NETWORK_SNMP	LinuxSNMP	CML EcoSystem

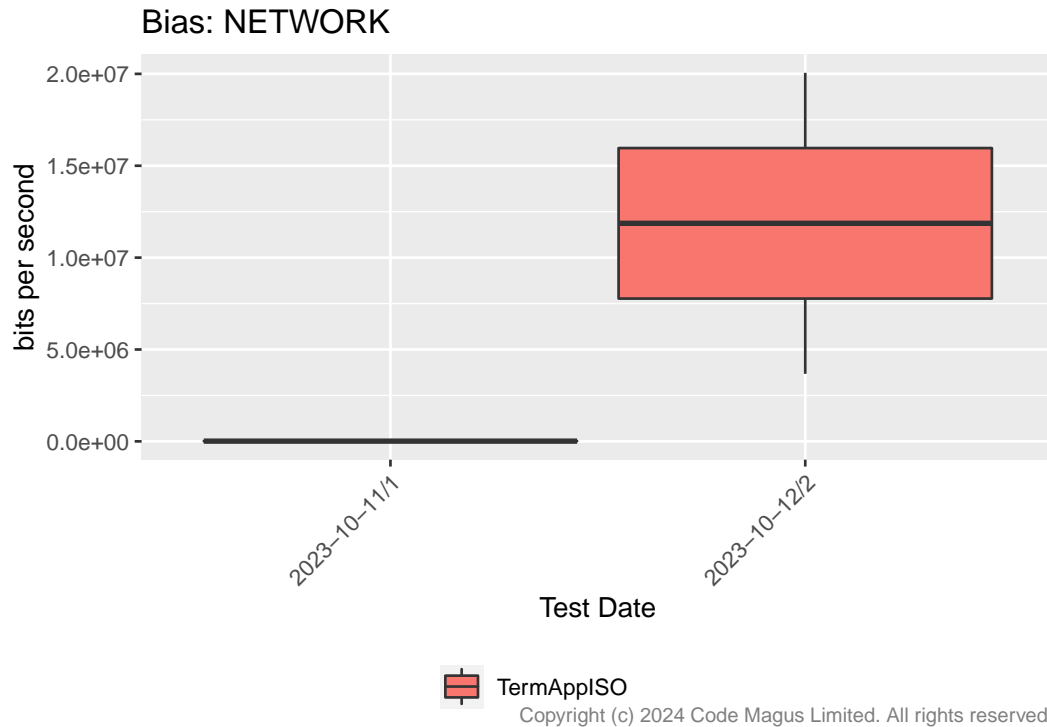
The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Rate	548.35	308.792	1.776	0.084	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: bits per second.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	11959.77	2965.893	4.032	0.000	TermAppISO
2023-10-12	Bias	11867150.94	4095643.993	2.898	0.007	TermAppISO

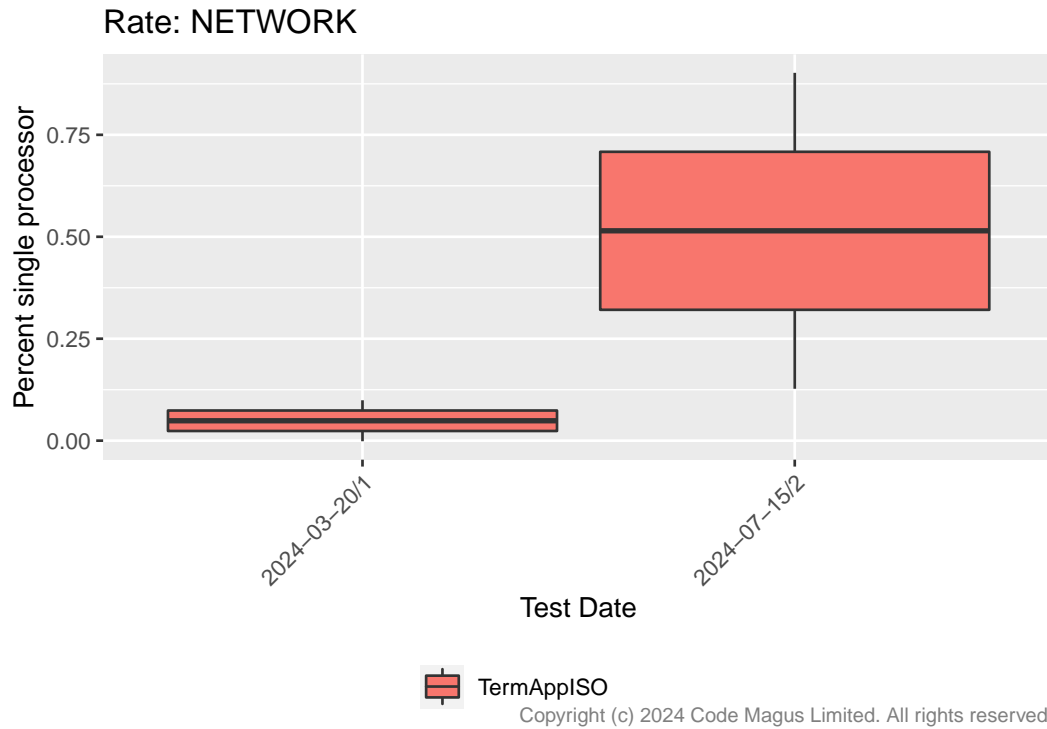


#### 4.9 CPU Resource usage for NETWORK by CPU Usage using `cpu.cpu.system.user` in Percent single processor

Server	OSType	Description
NETWORK	Linux	CML EcoSystem
NETWORK_SNMP	LinuxSNMP	CML EcoSystem

The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: Percent single processor.

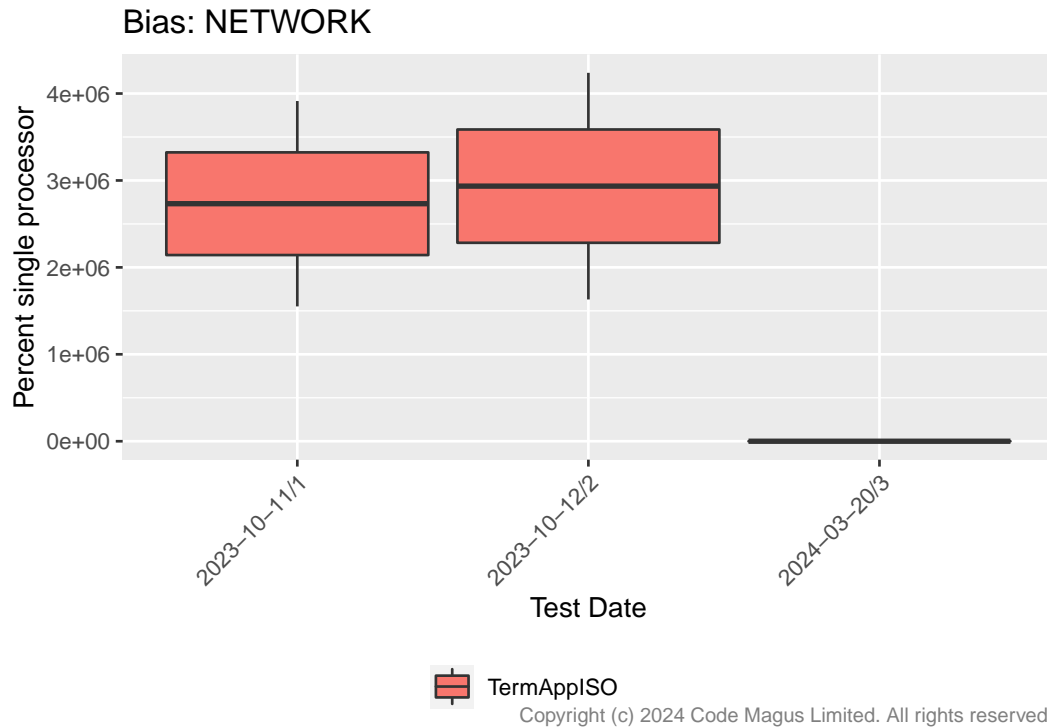
TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2024-03-20	Rate	0.049	0.025	1.944	0.054	TermAppISO
2024-07-15	Rate	0.515	0.194	2.657	0.010	TermAppISO



The following table shows the Bias coefficient values over the various tests performed. In this table the units of estimate are: Percent single processor.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2023-10-11	Bias	2732466.466	590654.360	4.626	0	TermAppISO
2023-10-12	Bias	2934722.884	651780.421	4.503	0	TermAppISO
2024-03-20	Bias	11.806	0.871	13.557	0	TermAppISO



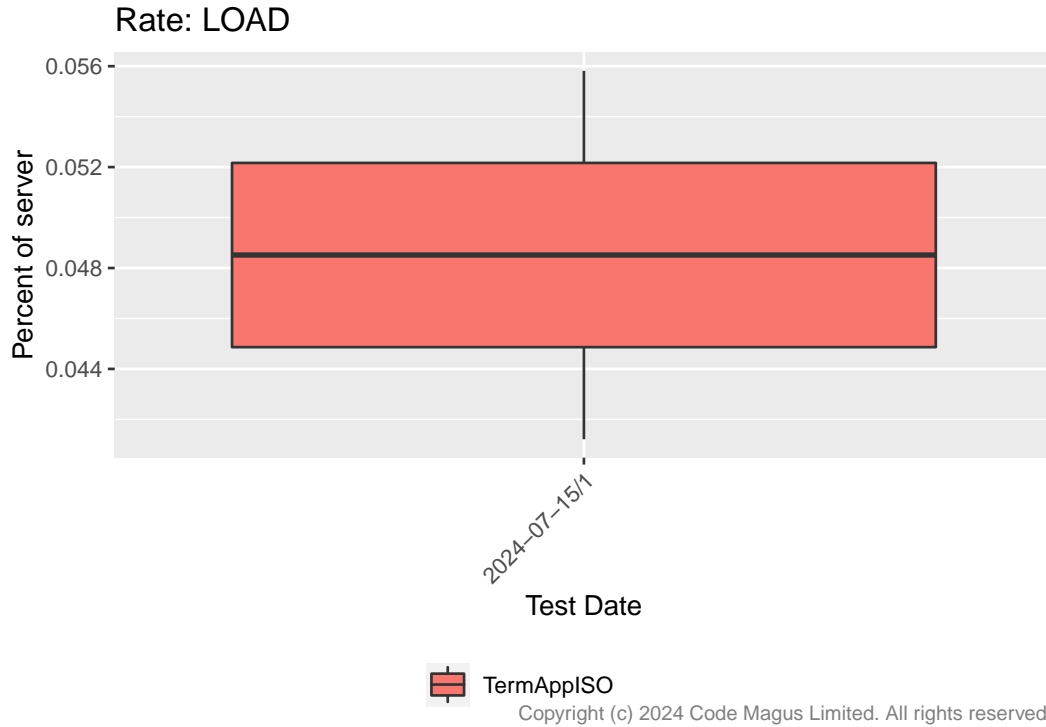


#### 4.10 CPU Resource usage for LOAD by CPU Usage using ssCPUSystemUser in Percent of server

Server	OSType	Description
LOAD0	Linux	CML EcoSystem
LOAD0_SNMP	LinuxSNMP	CML EcoSystem
LOAD1	Linux	CML EcoSystem
LOAD1_SNMP	LinuxSNMP	CML EcoSystem

The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: Percent of server.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2024-07-15	Rate	0.049	0.004	13.288	0	TermAppISO

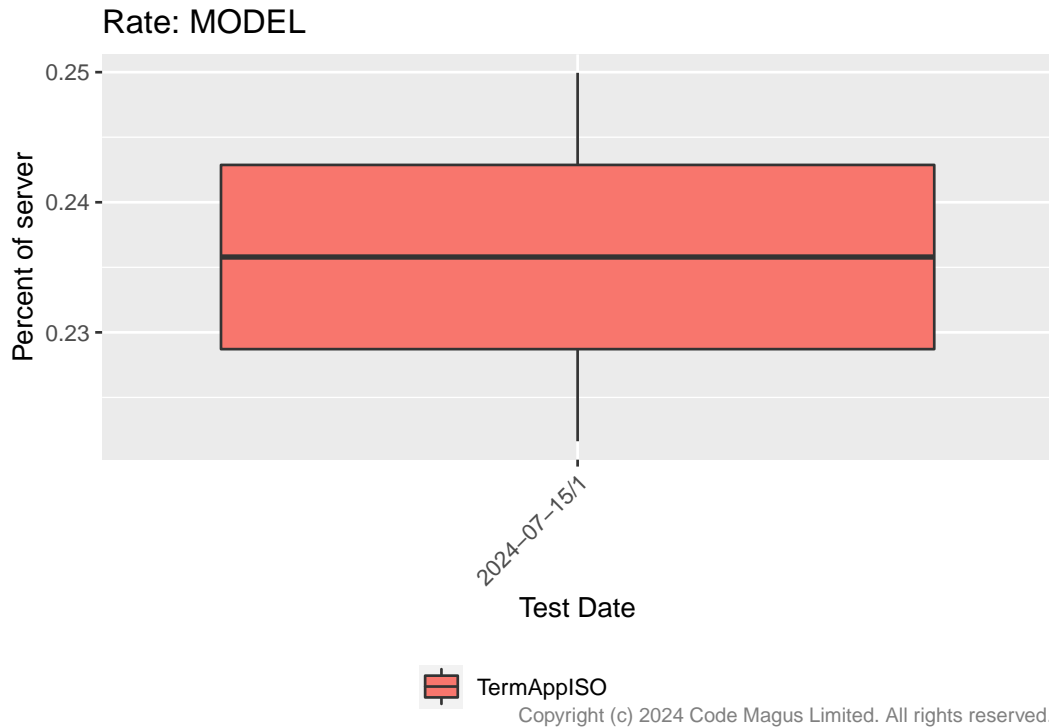


#### 4.11 CPU Resource usage for MODEL by CPU Usage using ssCPUSystemUser in Percent of server

Server	OSType	Description
MODELAPP0	Linux	CML EcoSystem
MODELAPP0_SNMP	LinuxSNMP	CML EcoSystem
MODELAPP1	Linux	CML EcoSystem
MODELAPP1_SNMP	LinuxSNMP	CML EcoSystem

The following table shows the Rate coefficient values over the various tests performed. In this table the units of estimate are: Percent of server.

TestDate	Coef	Estimate	Std..Error	t.value	p.value	Test
2024-07-15	Rate	0.236	0.007	33.305	0	TermAppISO



## 5 Session details

```
sessionInfo();
```

```
## R version 3.6.0 (2019-04-26)
## Platform: x86_64-redhat-linux-gnu (64-bit)
## Running under: CentOS Linux 7 (Core)
##
## Matrix products: default
## BLAS/LAPACK: /usr/lib64/R/lib/libRblas.so
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8      LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8  LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8    LC_NAME=C
##  [9] LC_ADDRESS=C             LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] grid      stats    graphics grDevices utils    datasets methods
## [8] base
##
```

```
## other attached packages:
## [1] pander_0.6.3      doBy_4.6.7        cmlrutils_1.19   XML_3.98-1.20
## [5] scales_1.1.1      ggplot2_3.3.2     BSDA_1.2.0       lattice_0.20-38
##
## loaded via a namespace (and not attached):
## [1] Rcpp_1.0.7         highr_0.8         pillar_1.4.6     compiler_3.6.0
## [5] class_7.3-15      tools_3.6.0       digest_0.6.25    evaluate_0.14
## [9] lifecycle_0.2.0  tibble_3.0.3     gtable_0.3.0     pkgconfig_2.0.3
## [13] rlang_0.4.7       Matrix_1.2-17    yaml_2.2.1       xfun_0.17
## [17] e1071_1.7-4       withr_2.2.0       stringr_1.4.0    dplyr_1.0.2
## [21] knitr_1.30        generics_0.0.2   vctrs_0.3.2      tidyselect_1.1.0
## [25] glue_1.4.1        R6_2.4.1         rmarkdown_2.6    farver_2.0.3
## [29] tidyr_1.1.2       purrr_0.3.4      cmlbrandr_3.0    magrittr_1.5
## [33] backports_1.1.8   ellipsis_0.3.1   htmltools_0.5.0  MASS_7.3-51.4
## [37] colorspace_1.4-1 Deriv_4.0.1       labeling_0.3     stringi_1.5.3
## [41] munsell_0.5.0     broom_0.7.0      crayon_1.3.4
```