

# Kofax Communication Server

TC/Web Performance Test

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The KOFAX logo is displayed in a bold, blue, sans-serif font. The letters are thick and closely spaced, with a consistent weight throughout. The 'K' and 'F' are particularly prominent due to their size and the sharp angles of their strokes.

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## Chapter 1

# Preface

We have measured performance values on a real system and on two virtual systems. Based on the measurements, an administrator can make a rough estimation of the performance on their own hardware or determine what hardware their system will require.

## Performance Considerations

TC/Web is a server application that is accessed by multiple clients at the same time. As more clients access a server, the server uses more of its resources. In situations of maximum load on the system, the server may reach the limits of its resources and may not be able to maintain its performance. The default behavior of TC/Web in this situation is to continue to serve all of the connected clients but to decrease the speed with which it responds to user requests.

Effectively, for every installation of TC/Web there is a maximum number of users that can access the server at the same time and receive acceptable performance.

The goal of this chapter is to provide information about the performance characteristics of TC/Web to guide an administrator through the creation of a server system to meet the demands of their user base.

## TC/Web Metrics

We use the following metric system to describe the characteristics of TC/Web performance: A client is adequately served when the average response time of the requested pages is 5 seconds or less. The performance of a system is the number of clients that can be adequately served at the same time. Another simple useful metric is the average of the number of pages the server delivers per second.

## Metrics Analysis and Recommendations

When considering the necessary hardware for a system, it is important to consider the normal usage patterns of the users. Typically, not all of the registered users of the system are logged in concurrently and use the system heavily. The numbers given above must satisfy the usage demands at peak usage times.

Also, an administrator must determine what is an acceptable speed for the server. If the server should respond faster, the number of users noted in the chart above must be reduced. The server can only respond faster if there are fewer users accessing it at the same time. Alternatively, if it is acceptable for a user to wait longer, the capability of the server increases. See the graphs below for an illustration of the way the server performance changes roughly linearly with the change in the number of users.

Comparing the performance of the different systems, it appears that the speed of the processor has an impact though not as much might be expected. Additional processors improve performance considerably. Multi-processor computers are therefore recommended for serving TC/Web.

## Web Farm

The most effective way to scale performance of TC/Web is to use multiple web server computers in a so-called “web farm” configuration. In a web farm configuration, all outside requests are first received by a “load balancer”, the load balancer then forwards the requests to one of the TC/Web servers. Because TC/Web uses sessions, the load balancer must be configured to always forward requests from an individual user to the same TC/Web server where they first logged in.

A typical configuration for the load balancer would be “round-robin”. Each new user is routed to the next TC/Web web server, so that each web server receives the same number of users. Subsequent requests from already connected users are routed back to the same server that they were first connected to.

Using a web farm, performance scales roughly linearly, each additional server improving the performance by 100% of one server. For example, three servers are roughly three times as fast as just one server.

## Symptoms of Performance Problems

The primary symptom of a performance problem is that the server responds slower to user requests.

If too many users log in to TC/Web at one time, or if users perform commands that tax the server’s resources, IIS can become temporarily unavailable and returns an error message rather than delivering the requested TC/Web page.

The error message varies depending on the version of Windows.

Regardless of the message, the cause is too much load on the system, probably because too many users are trying to access the server at the same time.

## Testing Environment

Basic configuration of all systems:

The TC/Web servers are running Windows Server 2008 R2 SP1 with the default web server: IIS 7.5.

TC/Web version 6.01.23 is used. Systems have different amounts of RAM and different capacity hard disks but these resources are not heavily used by TC/Web. The only resource that must be considered is the CPU speed.

200 users must be created on TCOSS with valid user name and password.

TC/Web version 6.01.23	Number of concurrent clients adequately served (5s)
System 1: 4 x Intel Xeon E5504 2.0 GHz, 8.00 GB RAM Windows 2008 R2 SP1, IIS 7.5	100-120

TC/Web version 6.01.23	Number of concurrent clients adequately served (5s)
System 2: ESX Server VM configuration: 2 CPU, 4.00 GB RAM Windows 2008 R2 SP1, IIS 7.5	100
System 3: ESX Server VM configuration: 4 CPU, 8.00 GB RAM Windows 2012 R2, IIS 8.5	100-120

## Physical Servers Testing Environment

This section describes the physical servers testing environment.

### TC/Web Computer

Name	Description
Operating system	Microsoft Windows Server 2008 R2 SP1 (64 bit)
Processors	4 CPU x 2.0 GHz
Processor type	Intel XEON 5504 2.0 GHz
RAM	8.00 GB
Hard drive	136 GB (72 GB free)

### TCOSS Computer

Name	Description
Operating system	Microsoft Windows Server 2012 R2 (64 bit)
Processors	2 CPU x 2.13 GHz
Processor type	Intel Xeon 5506 2.13 GHz
RAM	4.00 GB
Hard drive	49.6 GB (33.1 free)
C0 channels	30

## ESX Server Testing Environment 1

This section describes the ESX server testing environment 1.

### Virtual Machine 1 (TCOSS)

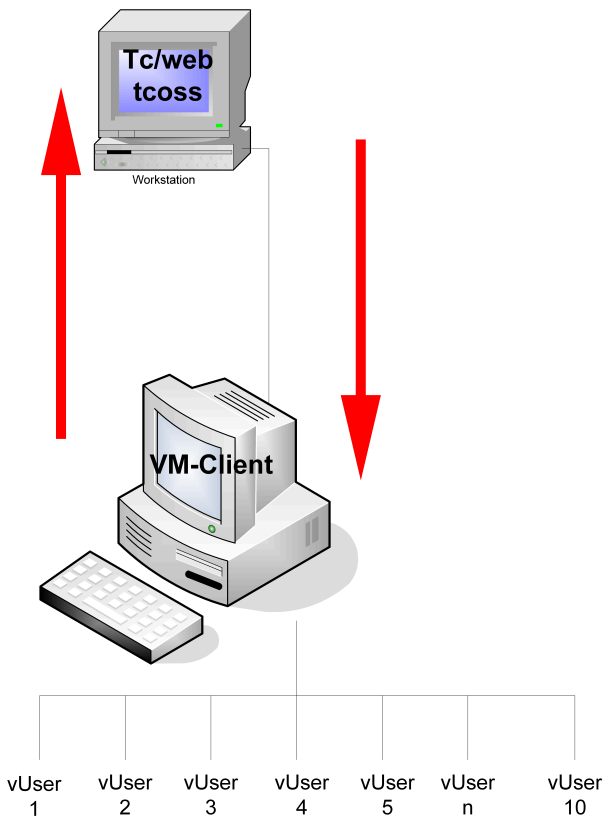
Operating system	Microsoft Windows Server 2008 R2 SP1 (64 bit)
Processor	2 CPU reserved
RAM	4 GB

### Virtual Machine 2 (TC/Web)

Operating system	Microsoft Windows Server 2008 R2 SP1 (64 bit)
Processor	2 CPU reserved
RAM	4 GB

### VM Host

Operating system	VMware ESX Server 5.5.0 1331820
Processor	Intel Xeon 5506 4 x 2.13 GHz
RAM	8 GB



## ESX Server Testing Environment 2

This section describes the ESX server testing environment 2.

### Virtual Machine (TCOSS + TC/Web)

Operating system	Microsoft Windows Server 2008 R2 SP1 (64 bit)
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Processor	4 CPU reserved
RAM	8 GB

### VM Host

Operating system	VMware ESX Server 5.5.0 1331820
Processor	Intel Xeon 5506 4 x 2.13 GHz
RAM	8 GB

## Testing Tool

Tests were done with WAPT Load Testing tool version 8.5.

## Method of Determination of TC/Web Metrics

WAPT 8.5 was used to reproduce the effects of multiple web browsers accessing TC/Web at the same time. The time to deliver the requested page was measured as a function of the number of concurrent users. The resulting values were graphed.

The actions were first recorded with the same tool. For interactive pages, WAPT calculates user think time ranges from the recording session. These times were not modified.

Before each test, the status of the TCOSS machine (VMWare) was restored to the following:

200 users, each with 25 messages in inbox and 25 messages in outbox.  
30 "C0" channels.

### Actions done during each test:

Action
Login
Open Inbox with 25 messages
Open first message in text view
Open image view (PDF)
Close message
Click next button for second page
Create a new message
Send new message (text only, to NULL TUM)
Open Outbox with 25 messages
Click next button for second page



Action
Open recipient tool
Logout

Metrics are measured for the pages with highest response time (typically these are the pages that show data retrieved from TCOS).

Action	Web page file name
Login	/Main.aspx
Inbox	/ViewListData.aspx
Open Message	/OpenMessage.aspx
Open Image	/DownloadDL.aspx
Inbox Next	/ViewListData.aspx
Send Message	/SendMessage.aspx
Outbox	/ViewListData.aspx
Outbox Next	/ViewListData.aspx
Recipients	/ViewListData.aspx

## Chapter 2

# Test Cases

This section describes the test cases.

## Test Case Goal

The goal of this test case is to get the information on how many users can work with TC/Web with a response time equal to or less than 5 seconds. The test case is done using 100 virtual users, with a ramp-up from 10 to 100 users and duration of 20 minutes.

## Chapter 3

# Results

### Summary

Test	Successful Sessions	Failed Sessions	Successful Pages	Failed Pages	Total Bytes Sent	Total Bytes Received	Average Response time (sec)
Physical Server Test	1497	0	82474	0	79160	1372431	0,19
Virtual Machine Test 1	1190	0	66329	0	63662	1102708	0,50
Virtual Machine Test 2	1545	0	85020	0	81616	1413445	0,15

## Performance Graphs with Physical Server

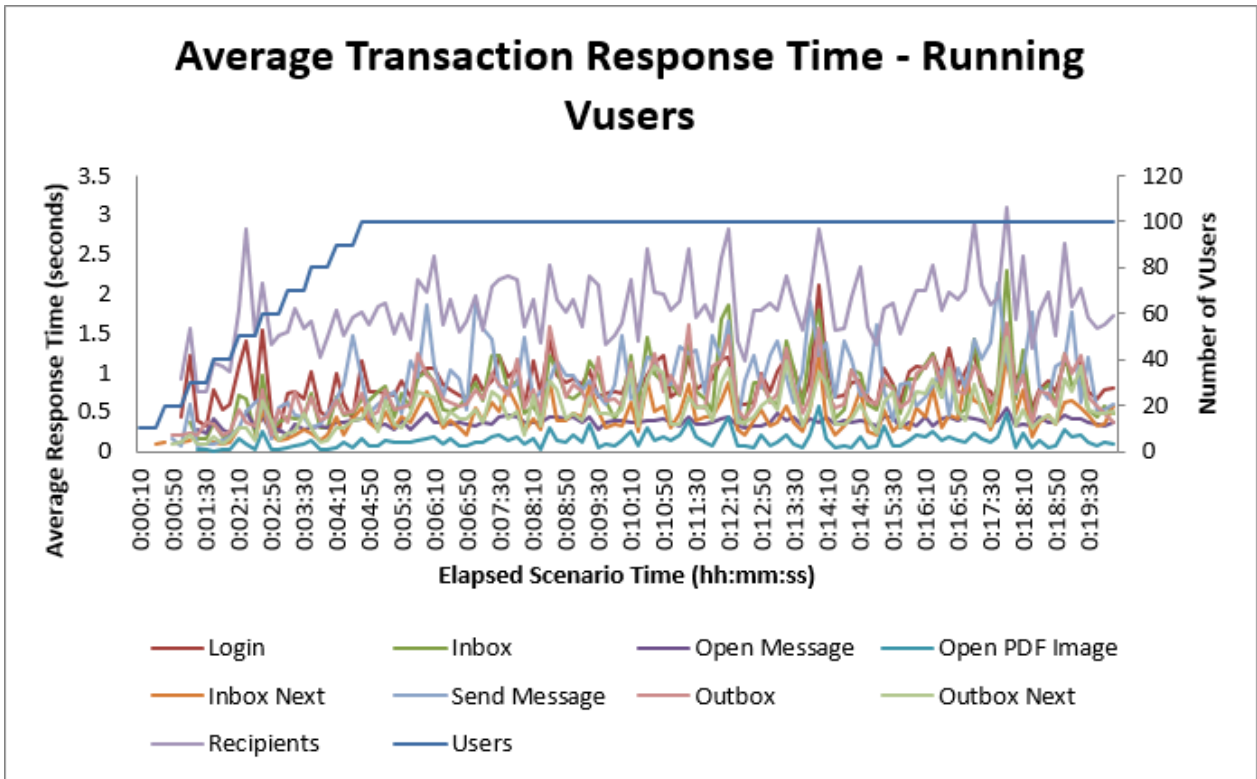
CPU: 4 x Intel Xeon E5504 2.0 GHz

RAM: 8.00 GB RAM

HDD: 136 GB

In the following graph, each line represents the performance of a particular page. Only the pages with highest response time are part of the graph.

Transaction response time

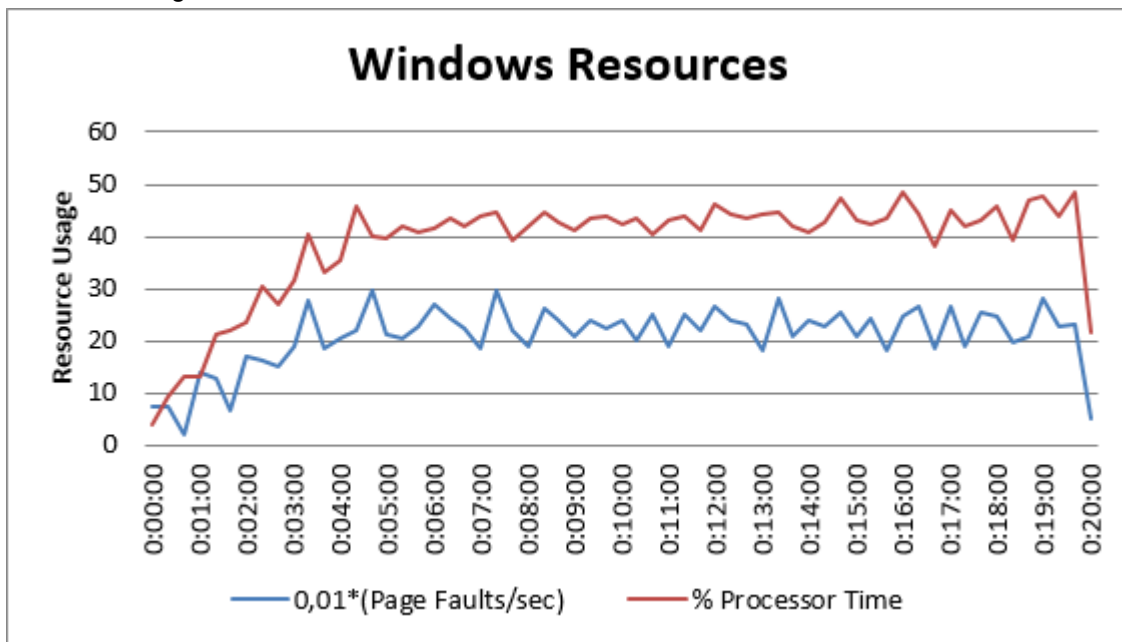


This graph displays the average time taken to perform transactions during each second of the load test. This graph helps determine whether the performance of the server is within acceptable minimum and maximum transaction performance time ranges defined for your system.

Measurement	Graph	Scale	Graph's Min.	Graph's Ave. 100 Users	Graph's Max.	Graph's Median	Graph's SD
Login	Average Transaction Response Time	1	0,26	0,88	2,11	0,85	0,27
Inbox	Average Transaction Response Time	1	0,17	0,76	2,29	0,69	0,37
Open Message	Average Transaction Response Time	1	0,22	0,37	0,55	0,37	0,06
Open PDF Image	Average Transaction Response Time	1	0,01	0,14	0,58	0,12	0,10
Inbox Next	Average Transaction Response Time	1	0,1	0,43	1,24	0,4	0,22

Measurement	Graph	Scale	Graph's Min.	Graph's Ave. 100 Users	Graph's Max.	Graph's Median	Graph's SD
Send Message	Average Transaction Response Time	1	0,06	0,89	2,13	0,83	0,43
Outbox	Average Transaction Response Time	1	02	0,74	1,64	0,70	0,32
Outbox Next	Average Transaction Response Time	1	0,09	0,52	1,44	0,48	0,27
Recipients	Average Transaction Response Time	1	0,76	1,82	3,10	1,80	0,43
Users	Average Transaction Response Time	1	10	88,75	100	100	24,20

Resource usage



Color	Graph	Scale	Measurement	Graph's Min.	Graph's Ave.	Graph's Max.	Graph's Median	Graph's SD
Red	Windows Resources	1	% Processor Time (Processor_Total)	1,78	20,89	29,79	21,99	5,86
Blue	Windows Resources	0,01	Page Faults/sec (Memory)	403,31	3865,91	4855,67	4233,59	992,63

While the tests were run, the Windows Performance Monitoring tool was used to track usage of various resources such as CPU usage and RAM usage. Average processor load was 20-30%.

## Performance Graphs with ESX Server (Test 1)

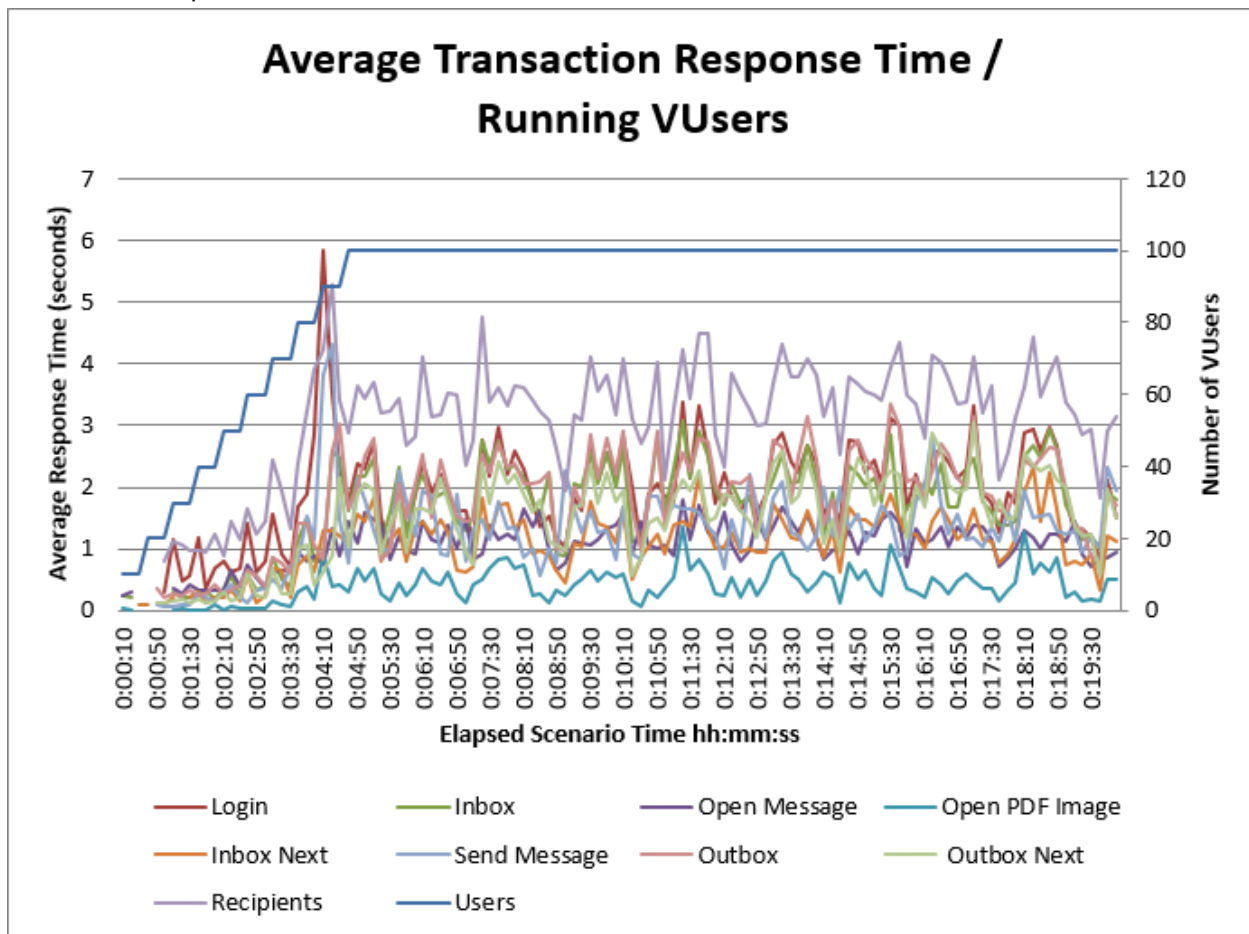
TC/Web virtual machine configuration:

2 CPU reserved











4 GB RAM

In the following graph, each line represents the performance of a particular page. Only the pages with highest response time are part of the graph.

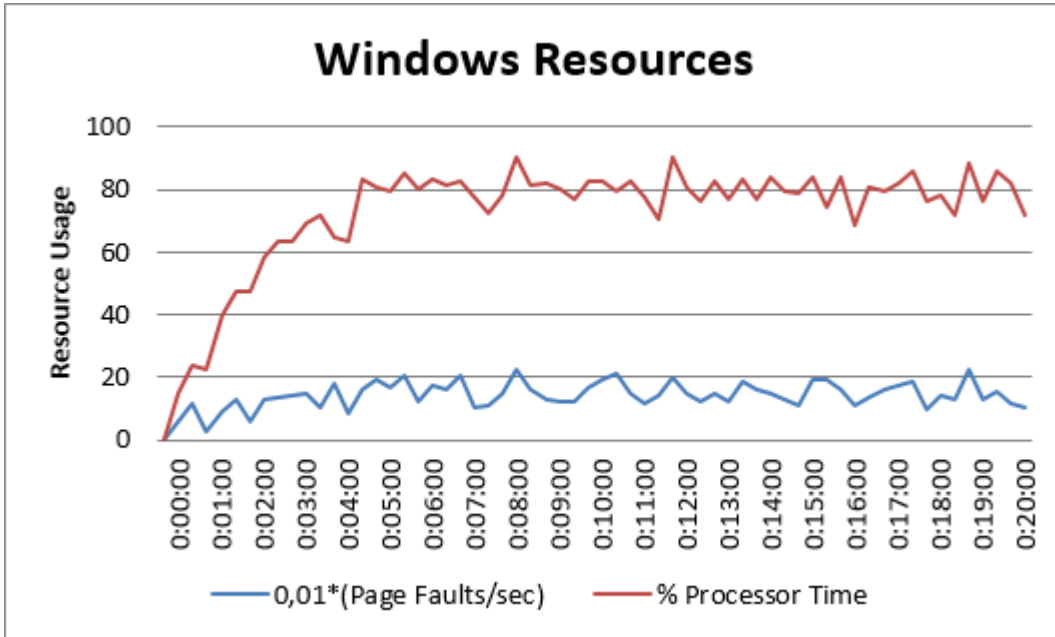
Transaction response time



This graph displays the average time taken to perform transactions during each second of the load test. This graph helps determine whether the performance of the server is within acceptable minimum and maximum transaction performance time ranges defined for your system.

Measurement	Graph	Scale	Graph's Min.	Graph's Ave. 100 Users	Graph's Max.	Graph's Median	Graph's SD
 Login	Average Transaction Response Time	1	0,30	1,94	5,85	1,88	0,81
 Inbox	Average Transaction Response Time	1	0,19	1,69	3,08	1,80	0,76
 Open Message	Average Transaction Response Time	1	0,23	1,06	1,79	1,08	0,36
 Open PDF Image	Average Transaction Response Time	1	0,02	0,41	1,34	0,40	0,27
 Inbox Next	Average Transaction Response Time	1	0,1	1,09	2,31	1,15	0,50
 Send Message	Average Transaction Response Time	1	0,07	1,29	4,31	1,27	0,68
 Outbox	Average Transaction Response Time	1	0,2	1,82	3,35	1,99	0,80
 Outbox Next	Average Transaction Response Time	1	0,12	1,49	3,05	1,67	0,72
 Recipients	Average Transaction Response Time	1	0,81	3,12	5,27	3,31	0,94
 Users	Average Transaction Response Time	1	10	88,75	100	100	24,20

Resource usage



Color	Graph	Scale	Measurer	Graph's Min.	Graph's Ave.	Graph's Max.	Graph's Median	Graph's SD
Red	Windows Resources	1	% Processor Time (Processor_Total)	14,63	73,82	90,28	79,24	15,66
Blue	Windows Resources	0,01	Page Faults/sec (Memory)	244,10	1438,19	2239,86	1442,99	405,00

While the tests were run, the Performance Monitoring tool was used to track usage of various resources such as CPU, RAM. Average processor load inside VM was about 70-85%.

## Performance Graphs with ESX Server (Test 2)

Virtual machine configuration:

4 CPU reserved

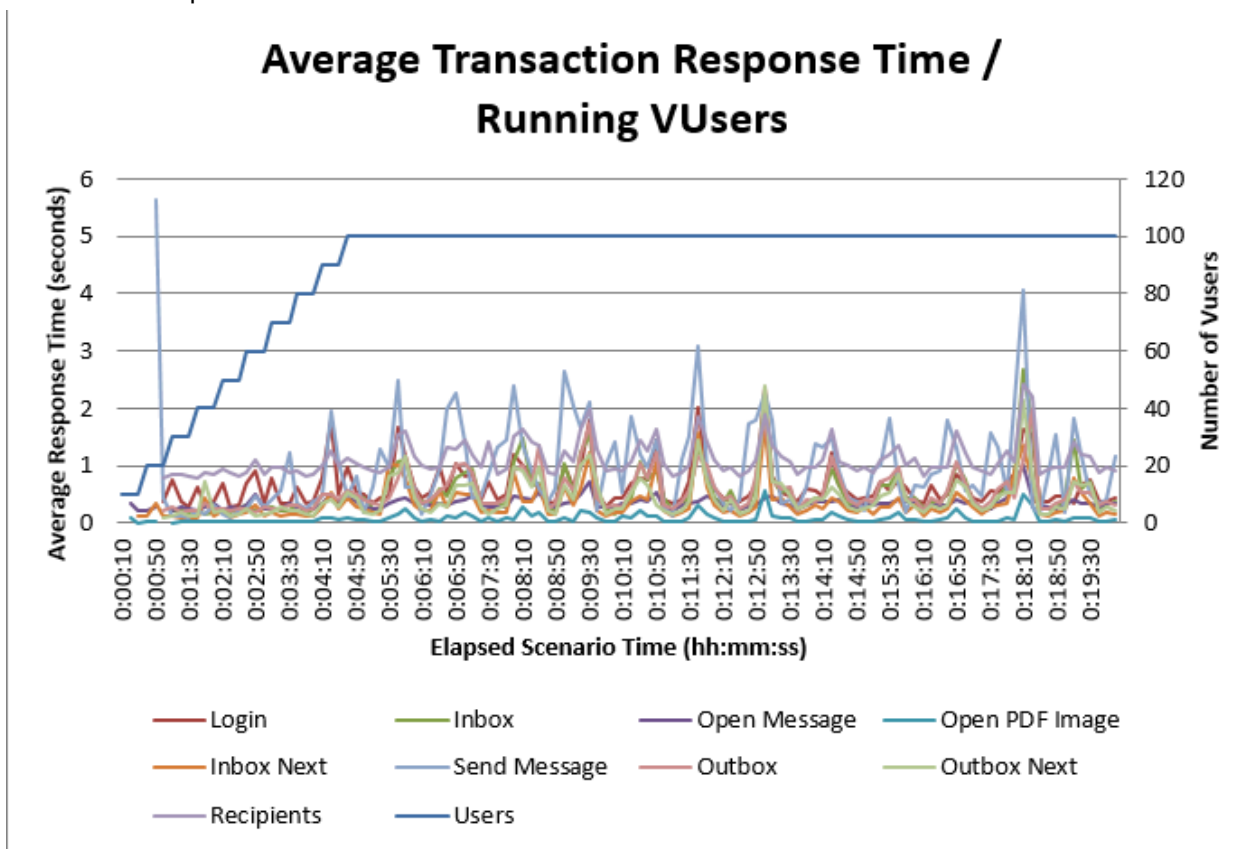
8 GB RAM

The virtual machine hosts TC/Web and TCOSS.

In the following graph, each line represents the performance of a particular page. Only the pages with highest response time are part of the graph.



Transaction response time

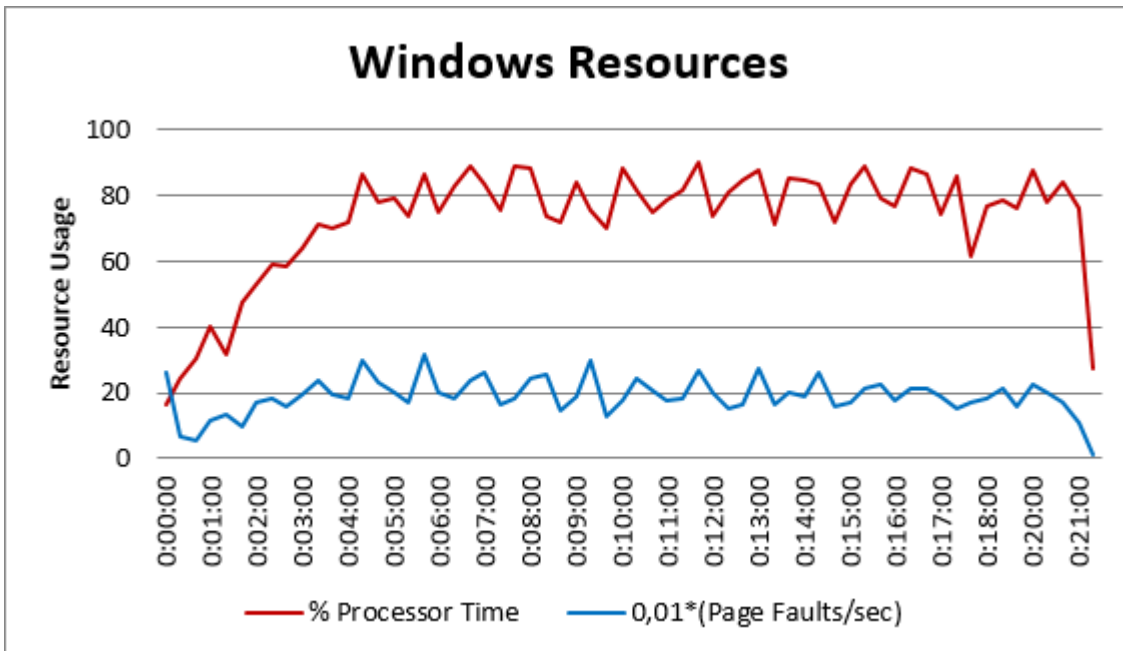




This graph displays the average time taken to perform transactions during each second of the load test. This graph helps determine whether the performance of the server is within acceptable minimum and maximum transaction performance time ranges defined for your system.

Measurement	Graph	Scale	Graph's Min.	Graph's Ave. 100 Users	Graph's Max.	Graph's Median	Graph's SD
Login	Average Transaction Response Time	1	0,29	0,67	2,37	0,55	0,39
Inbox	Average Transaction Response Time	1	0,17	0,55	2,67	0,44	0,40
Open Message	Average Transaction Response Time	1	0,22	0,35	0,99	0,33	0,11
Open PDF Image	Average Transaction Response Time	1	0,01	0,08	0,58	0,05	0,09

Measurement	Graph	Scale	Graph's Min.	Graph's Ave. 100 Users	Graph's Max.	Graph's Median	Graph's SD
Inbox Next	Average Transaction Response Time	1	0,09	0,35	1,73	0,26	0,30
Send Message	Average Transaction Response Time	1	0,08	0,98	5,63	0,67	0,85
Outbox	Average Transaction Response Time	1	0,18	0,55	1,99	0,41	0,35
Outbox Next	Average Transaction Response Time	1	0,1	0,45	2,39	0,32	0,36
Recipients	Average Transaction Response Time	1	0,77	1,11	2,41	0,99	0,30
Users	Average Transaction Response Time	1	10	88,75	100	100	24,21

Resource usage



Color	Graph	Scale	Measurement	Graph's Min.	Graph's Ave.	Graph's Max.	Graph's Median	Graph's SD
	Windows Resources	1	% Processor Time (Processor _Total)	16,26	73,12	90,27	77,26	17,25
	Windows Resources	0,01	Page Faults/sec (Memory)	109,45	1895,59	3165,87	1850,60	558,22

While the tests were run, the Performance Monitoring tool was used to track usage of various resources such as CPU, RAM. Average processor load inside VM was about 70-80%.

## Conclusion

In all three tested environments, the average page response time stays below 5 seconds (for 100 simultaneous user sessions). The smallest CPU time usage was encountered on the physical system.

The overall best performance was encountered in test environment 3, where both TCOSS and TC/Web are installed on a single virtual machine, and all ESX server resources are reserved for this VM.