

FORTRA



Globalscape
Recommendations for High
Performance

FORTRA

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PURPOSE

The purpose of this document is to identify a baseline to successfully design an infrastructure where EFT is configured for optimal performance based on server load expectation.

LIMITATIONS

Various limitations are outside of EFT's control that can affect performance within your environment. The information within is a guide and baseline to help identify any potential bottlenecks that could cause a heavy load on an EFT server.

Network

Several issues within your network can impose some limitations in your infrastructure. Two of those limitations are bandwidth and throughput. Throughput¹ is used to measure how much data can be transferred from the source to its destination within a given timeframe. Bandwidth¹ is used to measure the maximum transfer capacity of a network. Please consider these two limitations when performing load testing within your infrastructure and configure your environment accordingly.

Latency

High latency can cause multiple issues when transmitting data to any destination and is no different when using EFT, such as slow upload speeds or potential upload failures (if the latency is too high). Optimal latency is anything less than 20ms; however, this is not always achieved. As a result, consider how much latency exists between your client and source and account for this accordingly.

No Latency

To achieve "real world" testing scenarios, your infrastructure should mimic a type of network environment that matches the expected deployment. There are various third-party tools that can inject artificial latency and can limit network bandwidth to achieve an expected network environment. GlobalSCAPE uses WANem² to inject this latency and limit bandwidth during testing.

Saturation

When performing a load test, consider where the infrastructure resides. If all of your virtual images reside on the same server, it is possible that network saturation may be exhibited. As a result, avoid having the client and server on the same server to avoid saturating your network between the images, because they all share the same resources.

¹ Throughput vs Bandwidth: Understanding the Difference Plus Tools
<https://www.comparitech.com/net-admin/throughput-vs-bandwidth/>

² Installing and Configuring Wanem Virtual Appliance – Vninja.net
<https://vninja.net/virtualization/installing-and-configuring-wanem-virtual-appliance/>

Hyper-V and VMWare settings

Having multiple virtual images within the same server (Hyper-V or VMWare) will share resources among the virtual images. Therefore, verify within the test environment that settings related to networking can be enabled on each image to maximize its network bandwidth such that you can allow the image to use the full network card configuration. Hyper-V has the Bandwidth Management feature that allows you to enable and configure this option³.

HA Shared Configuration

Another system that could affect performance is an EFT HA (High Availability) shared configuration location GlobalSCAPE recommends that if an HA share (or use of Folder Monitor Rules) resides on a Unix Samba share⁴, the Samba share is running version 3.x or later. Additionally, when selecting a network share, consider a location that has little to no latency so that each node can successfully write to the EFT configuration and/or internal database files and avoid out of sync errors. Furthermore, if the EFT site(s) are configured on the HA share, all file transfers (uploads/downloads) will be hosted on the share and the server must be able to keep up with the multiple file requests. Therefore, a high CPU/Memory configured server is recommended.

GlobalSCAPE has tested shared configurations such as SMB/CIFS on FreeNAS⁵ and Windows File Share (Server 2016 and 2019). In our testing for high load, our FreeNAS was configured with **96GB of RAM** and **16 CPU cores**. Please note, your configuration may be different based on expected EFT load.

Disk I/O

Your infrastructure is only as fast as the data can be read and written. Disk I/O⁶ can affect performance tests in your environment. GlobalSCAPE recommends, when dealing with a lot of traffic and disk I/O, that an SSD (Solid State Drive) be used in your configuration to produce higher write transfer rates⁷.

Memory

EFT is efficient at memory management; a minimum recommended amount of RAM is 2GB. However, since this is enterprise software, your server should be configured accordingly to properly manage EFT along with any Windows service(s) that will be running on this server. Additionally, if performance tests are executed using EFT's AS2 protocol or AWE, additional memory configuration is recommended⁸.

³ Set bandwidth limits for Hyper-V VMS with Windows Server 2012

Rick Vanover - <https://www.techrepublic.com/blog/data-center/set-bandwidth-limits-for-hyper-v-vms-with-windows-server-2012/>

⁴ GlobalSCAPE HA FAQ: <https://help.globalscape.com/help/eft8-0/mergedProjects/HA/HAFAQ.htm>

⁵ How to Configure Windows Share (SMB/CIFS) on FreeNAS

Ashok Kalakoti - <https://www.techinformant.in/how-to-configure-windows-share-smbcifs-configuration-on-freenas/>

⁶ Understanding Disk I/O – When Should You Be Worried?

Derek Haynes - <https://scoutapm.com/blog/understanding-disk-i-o-when-should-you-be-worried>

⁷ Ssd Vs Hdd Speed and Comparison (updated 2019)

Gaurav P - <https://wintechlab.com/ssd-vs-hdd-which-is-better-for-you/>

⁸ EFT 8.0 System Requirements: https://help.globalscape.com/help/eft8-0/System_Requirements_for_Server.htm

During GlobalSCAPE's performance testing, the HTTPs protocol using WTC (Web Transfer Client) and Workspaces was under heavily load. During various tests, the EFT service process would use less than 4GB of memory. Therefore, when exercising load tests consider the EFT memory usage plus any other roles that may reside on the same server, such as a mail server, DHCP, AD, etc.

CPU

CPU usage is taxed when a server is processing a large sum of data or multiple amounts of data. During load testing, the CPU could be a bottleneck, because it is too busy, and it is unable to respond to further requests. Similar to memory usage, the server should be properly configured with adequate CPU configurations to properly manage EFT and any additional Server roles that reside on the server. Estimated CPU usage is difficult to gauge since various factors affect the server. Microsoft has provided an article on how to recognize a processor bottleneck⁹.

Antivirus

Antivirus software is always encouraged to be configured in a production environment. EFT has multiple tools to monitor data/traffic that enters and exits an EFT server such as DLP (Data Loss Prevention) via the ICAP protocol. However, if an antivirus resides on the Server itself, various steps need to be taken to reduce the additional overhead that may be experienced by high CPU usage from the antivirus software.

Therefore, ensure the antivirus software ignores the target upload folders and EFT's program data folder. The rationale for this is to eliminate scanners as a potential performance bottleneck. Scanning can be resumed later after the performance test has been completed.

Windows Updates

By default, Windows Updates are enabled to be downloaded and installed based on the administrator's approval. GlobalSCAPE recommends that while you perform tests you disable Windows Updates and installs. Doing so will ensure that the EFT server is not rebooted during a performance load test.

INFRASTRUCTURE DIAGRAM

As listed above, we recommend that the resources used for performance testing are adequately distributed to avoid network saturation. Therefore, in GlobalSCAPE's test infrastructure the environment was spread across four (4) different Hyper-V servers and one (1) ESXi server.

Figure 1 provides an overview of the ESXi and Hyper-V server that hosted the Visual Studio Test Controller and Agents as well as WANem.

This ESXi server has two of the Visual Studio Agents and the Hyper-V server has the remaining two Visual Studio Agents that generate the load to the EFT server. These agents are controlled by the Visual Studio Load Test Controller, which triggers the web load tests and records the test results.

⁹ Recognizing a Processor Bottleneck
Archivedocs - [https://docs.microsoft.com/en-us/previous-versions/windows/it-pro/windows-2000-server/cc938609\(v=technet.10\)?redirectedfrom=MSDN](https://docs.microsoft.com/en-us/previous-versions/windows/it-pro/windows-2000-server/cc938609(v=technet.10)?redirectedfrom=MSDN)

Additionally, as mentioned in the *No Latency* section; in our performance test we injected artificial latency to the EFT Cluster by using WANem which introduced ~10ms (milliseconds) between the agents and the EFT Cluster. When configuring latency, consider limiting high latency values since you will be experiencing high latency under heavy load.

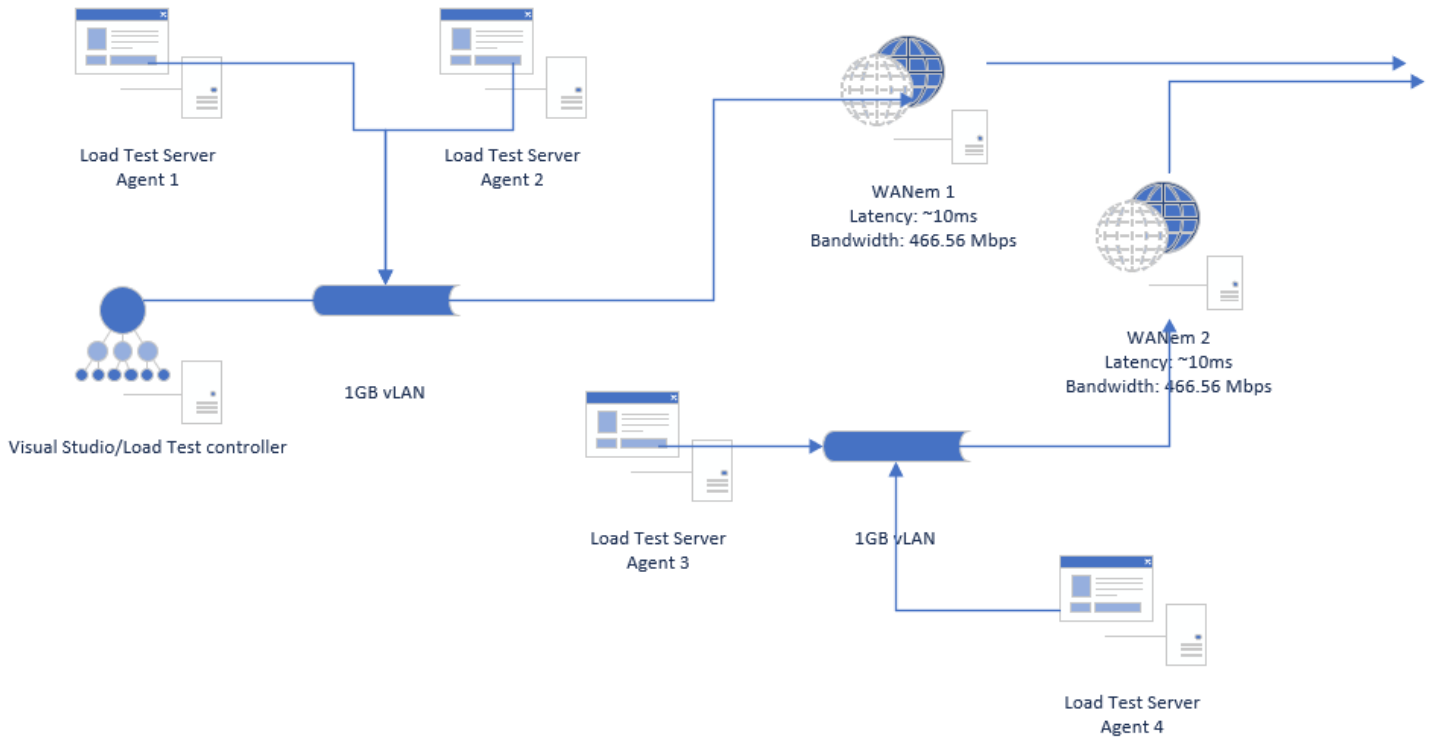


Figure 1 - ESXi/Hyper-V Server Infrastructure

Figure 2 provides an overview of the Hyper-V server that host both EFT Nodes. Details on the load balancer are covered in *System Specifications*.

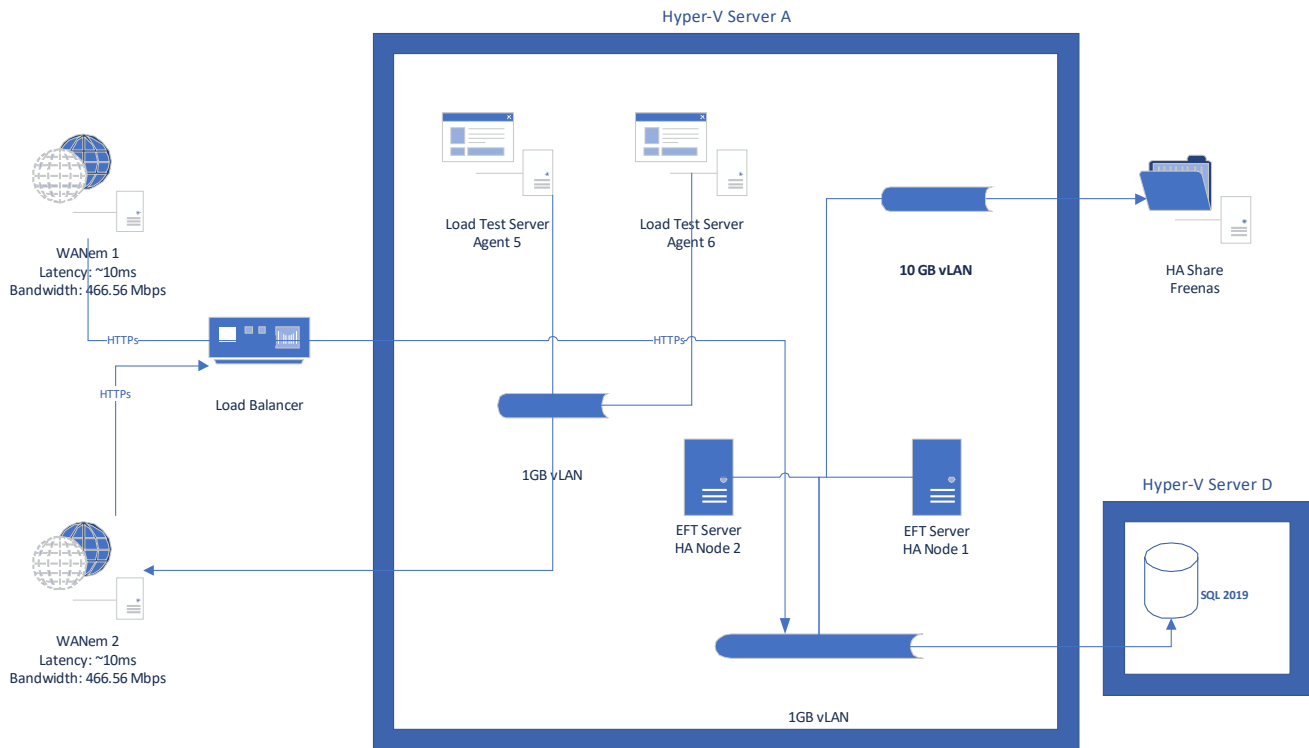


Figure 2 – Hyper-V Server with the EFT Cluster

Each EFT node is residing on a different Hyper-V server to help offset network saturation, which helps maximize the available network to handle all the incoming traffic from the Agents as described in [Figure 1](#).

Figure 3 is the third Hyper-V server that hosts the SQL Database that is used by Visual Studio (VS) to record all the testing results for later use.

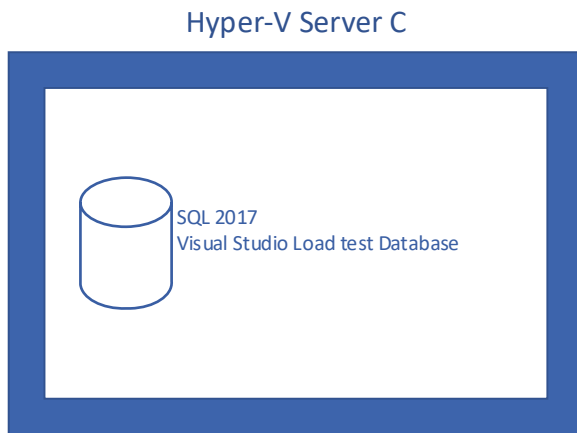


Figure 3 – Hyper-V Server with the SQL for VS

Finally, the last Hyper-V server hosts the SQL server that is used by the EFT Cluster. **Figure 4** also displays the FreeNAS server that provides the network share used by the cluster.

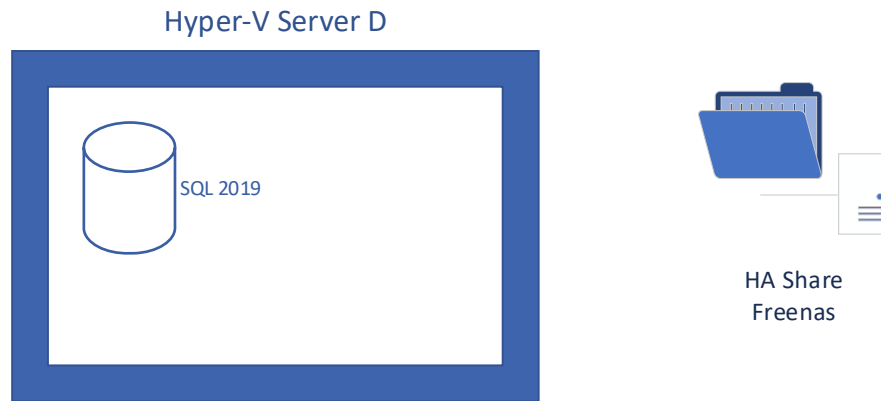


Figure 4 – Hyper-V Server with the SQL for EFT and the FreeNAS network share

Unlike the database from [Figure 3](#), this database is used heavily by EFT to track all changes/transfers incoming/outgoing from both EFT nodes. GlobalSCAPE recommends that little to no latency exists between your EFT nodes and your database to avoid disconnects to the database and cause the EFT node to log entries to a local file¹⁰.

The complete diagram has been provided at the end of this document, see [Figure 5](#).

System Specifications

ESXi Server A

The details herein are related to the overall ESXi server, which may or may not contain additional virtual images.

OS	N/A
CPU	16 CPUs x Xeon® E5-2660 @ 2.2Ghz
Memory	184GB
HDD	11TB
Network	3 x 1Gb

¹⁰ GlobalSCAPE Auditing Database Errors and Logging: https://hstechdocs.helpsystems.com/manuals/globalscape/ef8-1/mergedprojects/arm/auditing_database_errors_and_logging.htm

Hyper-V Server A

The details herein are related to the overall Hyper-V server, which may or may not contain additional virtual images.

OS	Windows Server 2019
CPU	48 CPUs x Xeon® E5-2670 v3 @ 2.30Ghz
Memory	384 GB
HDD	5.23 TB
Network	3 x 1GB, 1 x 10GB

Hyper-V Server B

The details herein are related to the overall Hyper-V server, which may or may not contain additional virtual images.

OS	Windows Server 2019
CPU	24 CPUs x Xeon® L7555 @ 1.86Ghz
Memory	256 GB
HDD	2.72 TB
Network	3 x 1GB, 1 x 10GB

Hyper-V Server C

The details herein are related to the overall Hyper-V server, which may or may not contain additional virtual images.

OS	Windows Server 2019
CPU	32 CPUs x Xeon® x7560 @ 2.26Ghz
Memory	288 GB
HDD	3.63 TB
Network	3 x 1GB, 1 x 10GB

Hyper-V Server D

The details herein are related to the overall Hyper-V server, which may or may not contain additional virtual images.

OS	Windows Server 2019
CPU	24 CPUs x Xeon® x5660 @ 2.79Ghz
Memory	144 GB
HDD	4.54 TB
Network	3 x 1GB, 1 x 10GB

FreeNAS

OS	FreeNAS-11.3-U1
CPU	16 CPUs x Xeon® E5630 @ 2.53Ghz
Memory	96 GB
HDD	12 TB
Network	4 x 1GB, 1 x 10GB

Visual Load Test Agents

The visual studio agents are used to mimic users connecting to the EFT server via the WTC page. There were 6 Agents configured in the GlobalSCAPE infrastructure in order to properly balance the performance load.

OS	Windows Server 2016 and 2019
CPU	8 CPUs
Memory	16 GB
HDD	150 GB
Network	1 x 1GB

Visual Load Test Controller

OS	Windows Server 2016
CPU	8 CPUs
Memory	16 GB
HDD	150 GB
Network	1 x 1GB

Visual Studio Load Test Controller SQL Server

OS	Windows Server 2016/2019
CPU	4 CPUs
Memory	16 GB
HDD	2 x 100 GB
Network	1 x 1GB

WANem

OS	Linux Bootable ISO drive
CPU	2 CPUs
Memory	2 GB
HDD	16 GB
Network	1 x 1GB

EFT SQL Server

OS	Windows Server 2019
CPU	4 CPUs
Memory	16 GB
HDD	1 x 125 GB, 1 x 350 GB
Network	1 x 1GB

EFT HA Node 1

OS	Windows Server 2019
CPU	16 CPUs
Memory	8 GB
HDD	1 x 150 GB
Network	1 x 1GB

EFT HA Node 2

OS	Windows Server 2019
CPU	16 CPUs
Memory	8 GB
HDD	1 x 150 GB
Network	1 x 1GB

Load Balancer

The Load Balancer was configured using a linux based load balancer. In our testing GlobalSCAPE used a HA-Proxy version 2.0.13-2ubuntu and its balancing algorithm was set to “balance Round Robin” with the two (2) EFT HA Nodes. All connections were configured to use the https protocol.

HA Configuration

The EFT performance HA (High Availability) server (behind a load balancer) was configured with 8GB of RAM (each EFT server node) and using a network share in a FreeNAS server. The EFT server and FreeNAS had little to no latency. Additionally, this environment was configured with Unicast configuration and default EFT settings.

If testing with one single server, a configuration of 8GB of RAM and 16 CPU cores is recommend to manage the OS and EFT performance load.

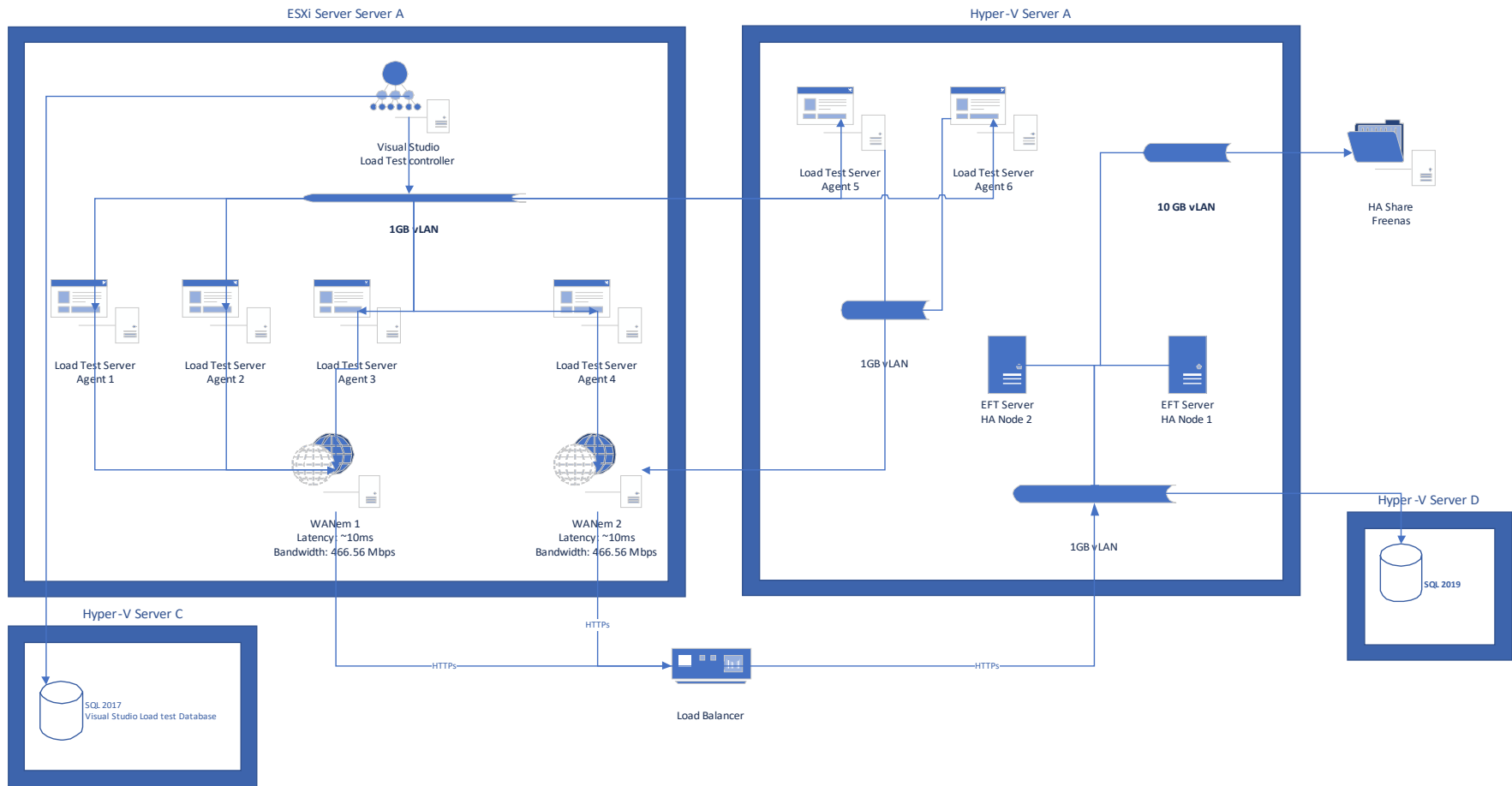


Figure 5 – Full diagram view of GlobalSCAPE's Infrastructure

EFT CONFIGURATION

Globalscape recommends the following benchmark to successfully load test the EFT server between 300 to 600 concurrent users. Please note, your results may vary based on the limitations outlined above. Additionally, latency between the Visual Studio controller and agent can greatly affect your test results.

300 User Load

EFT Requirements:

Minimum: 8GB* RAM/ 8 CPU Cores and one EFT server (Non-HA or HA)

Recommended: 8GB* RAM / 16 CPU Cores and one EFT server (Non-HA or HA)

Visual Studio Agent Requirements used to mimic the simulated load:

Minimum: 16GB RAM/4 CPU Cores with 4 Visual Studio agents

Recommended: 16GB RAM/8 CPU Cores with 4 Visual Studio agents

*This recommendation is based on using the Windows server to host EFT service only and no additional server roles are enabled on the server (i.e., AD, SMTP, etc.).

600 User Load

EFT Requirements:

Minimum: 8GB* RAM/ 8 CPU Cores and two EFT server nodes in an HA configuration behind a load balancer.

Recommended: 8GB* RAM / 16 CPU Cores and two EFT server nodes in an HA configuration behind a load balancer.

Visual Studio Agent Requirements used to mimic the simulated load:

Minimum: 16GB RAM/4 CPU Cores with 6 Visual Studio agents

Recommended: 16GB RAM/8 CPU Cores with 6 Visual Studio agents

*This recommendation is based on using the Windows server to host EFT service only and no additional server roles are enabled on the server (i.e., AD, SMTP, etc.).

600 or more User Load

During testing, the Visual Studio agents have a difficult time managing tests with 1000 or more concurrent connections. This is due to various factors such as high CPU usage, socket exceptions errors, and network disconnects from the controller. Therefore, Globalscape does not recommend using this tool with high concurrent connections. This may be achievable if your configuration is using a 10gb network adapter.

The following recommendations are for tests with equal to or less than 1000 users load test.

EFT Requirements:

Minimum: 8GB* RAM/ 16 CPU Cores and three EFT server nodes in an HA configuration behind a load balancer.

Recommended: 8GB* RAM / 32 CPU Cores and three EFT server nodes in an HA configuration behind a load balancer.

Visual Studio Agent Requirements:

Minimum: 16GB RAM/4 CPU Cores with 6 Visual Studio agents

Recommended: 16GB RAM/8 CPU Cores with 8 Visual Studio agents

*This recommendation is based on using the Windows server to host EFT service only and no additional server roles are enabled on the server (i.e., AD, SMTP, etc.).

TESTS

Concurrent Sessions and Transfers

The tests consisted of numerous unique users concurrently connecting to EFT via our Web Transfer Client endpoint (WTC) and uploading files of varying sizes, 10MB, 25MB, 50MB, 100MB. In a typical test, an EFT server could have up to 500 users connected to the server of which 200 are actively uploading a file.

Additionally, the Send portal was exercised by sending an uploaded file to various email addresses.

As previously mentioned, the Visual Studio Agents are the clients that generate the user traffic, such as login and upload requests to the EFT server. To effectively distribute the network bandwidth and CPU, this load was distributed across six (6) agents that are managed by the Visual Studio Controller.

Tested Protocols

For this test, only the HTTPs WTC (Web Transfer Client) was used for testing. In future releases further protocols may be tested such as FTP, SFTP and FTPs.

Test Results

As of EFT 8.1 release the user count was increased from 300 to 600. **600**-user load test across two EFT HA nodes produces few errors and reasonable page response times as seen in **Figure 6** and **Figure 7**:

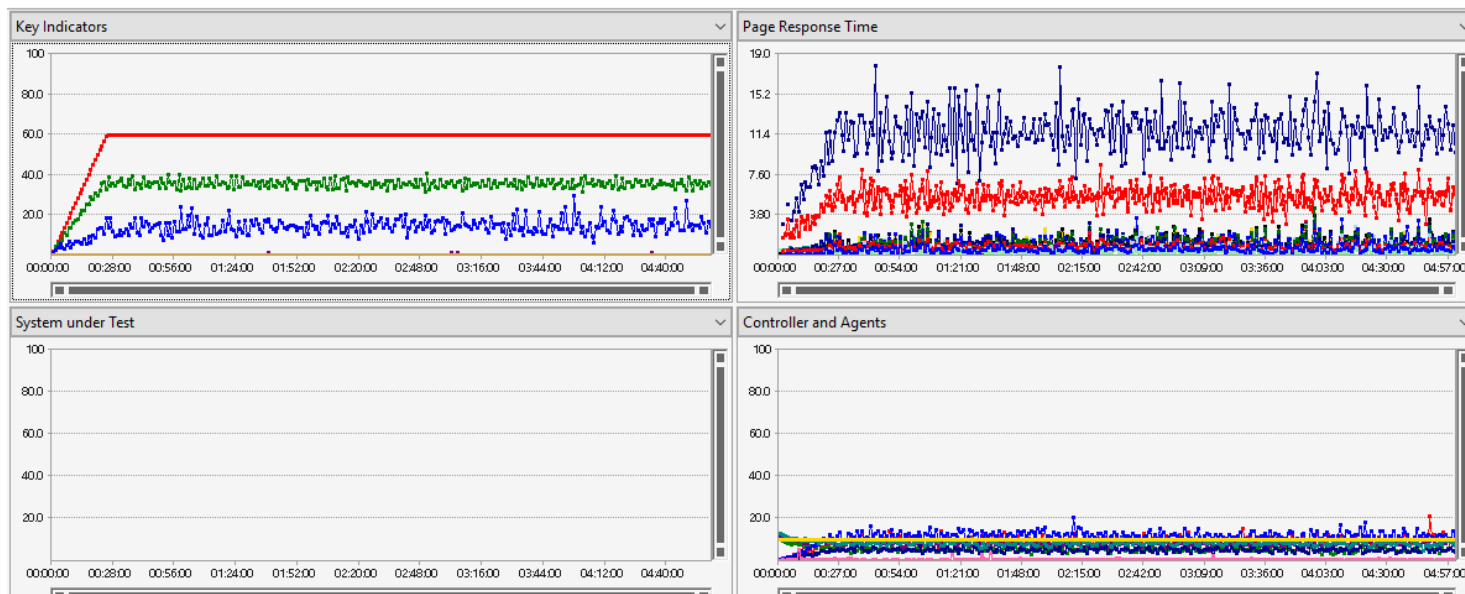


Figure 6 – Visual Studio Graphs results

Tests							
Test	Scenario	Total	Passed	Failed	Tests/Sec	Test Time	95% Test Time
01_UploadFile_100MB - EFTv8	UploadFile	1,174	1,174	0	0.066	163	214
01_UploadFile_10MB - EFTv8	UploadFile	12,067	12,065	2.00	0.67	118	132
01_UploadFile_25MB - EFTv8	UploadFile	6,113	6,111	2.00	0.34	131	152
01_UploadFile_50MB - EFTv8	UploadFile	3,223	3,223	0	0.18	142	173
02_EmailFileSecurely_100MB - EFTv8	UploadFile	824	824	0	0.046	240	293
02_EmailFileSecurely_10MB - EFTv8	UploadFile	7,748	7,748	0	0.43	189	210
02_EmailFileSecurely_25MB - EFTv8	UploadFile	4,016	4,016	0	0.22	208	231
02_EmailFileSecurely_50MB - EFTv8	UploadFile	2,181	2,181	0	0.12	219	252

Errors			
Type	Subtype	Count	Last Message
Total		8	
Excepti...	SocketException	4	An existing connection was forcibly closed by the remote host
Excepti...	LoadTestCounterCategoryNotFoundExcept...	3	The performance counter category 'Memory' cannot be accessed on computer '58_PERF_AGENT' (Access is denie...
Excepti...	LoadTestRequestUrlsExceededException	1	The maximum number of unique Web test request URLs to report on has been exceeded; performance data for ot...

Figure 7 – Visual Studio Tables

Figure 8, provides the overall test results:

Overall Results	
Max User Load	600
Tests/Sec	2.07
Tests Failed	4
Avg. Test Time (sec)	157
Transactions/Sec	41.2
Avg. Transaction Time (sec)	13.8
Pages/Sec	34.6
Avg. Page Time (sec)	1.45
Requests/Sec	53.3
Requests Failed	4
Requests Cached Percentage	0
Avg. Response Time (sec)	1.07
Avg. Content Length (bytes)	1,152,410

Figure 8 – Visual Studio Overall Results

TROUBLESHOOTING

My Agents are reporting a lot of failures

During Globalscape performance load tests, the Visual Studio Agents are susceptible to memory leaks as they can quickly consume all the memory that is available to them. This becomes even more apparent when there is high latency between the Visual Studio Controller and Visual Studio Agent. Globalscape recommends that these two systems should have as little latency as possible; at a minimum, it should be no more than 15ms.

Additionally, we recommended that after a completed run (successful or failure) that all Visual Studio agents are restarted to ensure they are running in a proper state.

I abruptly stopped a test during its allocated test run, what now?

The Visual Studio Controller does not gracefully handle cancel test requests when they have not completed. As a result, some of the Visual Studio agents will continue to run even though it should have stopped. Therefore, we recommended that all the Visual Studio agents be restarted and any Web Test Results temporary files (in the temp directory) be deleted at the Agent.

I'm using IE11 and as client browser in my load test, but the test isn't working?

Microsoft does not officially support IE11 for load test using Visual Studio. It might not be officially supported in Visual Studio 2017; therefore, make sure your "Browser mix" is set to IE9 and not IE11.