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Performance White Paper

XenApp 5.0

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U.S. Patent Numbers: 5,600,784; 5,615,403; 5,787,485; 5,790,397; 5,896,523; 5,956,474; 5,983,371; 6,038,685; 6,205,565; 6,279,119; 6,473,869; 6,728,898, 7,373,545.

European Patent Numbers: EP0731945; EP0986784; EP0993633; EP1000397; EP1029267; EP0974 912; GB2392536; Japanese Patent Numbers: 3679412; 4166939; other patents pending.

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SOFTWARE REVISION

The revision of the software that this document supports is Release 4.1.

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XenApp 5.0

Use this document to understand the performance implications for running XenApp 5.0 with everRun.

PROJECT SUMMARY

This project was designed to validate XenApp 5.0 operating on XenServer 5.0 and protected by everRun level-2 availability. In order to test this solution we ran an "application silo" of 40 users across a single XenApp server.

To prove this configuration, three test cases were utilized. Test #1 was a baseline of an unprotected workload and a protected workload. This will give us an idea of the amount of overhead everRun adds to the workload. Test #2 is based on a protected workload with performance monitoring during a network failure and recovery. Test #3 is also based on a protected workload with performance monitoring during a storage failure and recovery.

PROJECT DESCRIPTION

ARCHITECTURE – HARDWARE

- Citrix XenApp 5.0 Hardware

  Two Dell PowerEdge 1900 servers; (2) 2.33GHz-quad-core- E7310 Xeon CPUs, 20 Gb RAM

- Citrix EdgeSight Load Testing Launcher Server

  Dell Poweredge 1950; 2.33 Ghz quad-core CPU, 16Gb RAM

- Domain Controller

  (1) Dell Poweredge 1950; 2.33Ghz CPU, 2Gb RAM

- Storage

  Local SCSI 320 Ultra 10k drives

ARCHITECTURE – SOFTWARE

- Citrix XenServer Enterprise 5.0 HF1

- XenApp 5.0 64 bit Roll up 3
- MS Windows Server 2003, R2 SP2 Enterprise Ed. 64-bit
- Marathon everRun VM 4.1
- Edgesight for Load Testing Build 3.0.61.0
- Microsoft Office 2003 service pack 3
- UPH Clean

TOOLS

- Load Generation Software:

  Citrix EdgeSight for load testing allows you to run predefined scripts with a defined user count over a time period.

- Citrix Edge Sight for Load testing Configuration:

  40 Concurrent users

  Microsoft Word 2003 used with data and graphic input

  Load was ramped up from 1 user to 40 over 10min period

  Load of 40 users ran for 3 hours

  Performance counters we tracked and stored on the ESLT controller

- We used the following performance counters to measure performance:

  % CPU Utilization - Average: The CPU utilization metrics in each XenServer workload are collected by Windows Server PerfMon and are displayed in terms of the average CPU utilization rate (max of 100%) for the server over the term of the test period.

  % Page File Usage: The amount of the Page File instance in use in percent

  % Total Disk Time: % Disk Time is the percentage of elapsed time that the selected disk drive was busy servicing read or write requests.

  Avg. Disk Write Queue Length: Avg. Disk Write Queue Length is the average number of write requests that were queued for the selected disk during the sample interval.

  Avg. Disk Queue Length: Avg. Disk Queue Length is the average number of both read and write requests that were queued for the selected disk during the sample interval.

Due to characteristics of ESLT which cause abnormally high processor utilization at the start of the load operation, results were collected following the initial 10 minute stabilization period for each test.

METHODOLOGIES

XenApp Farm Design and Build

In order to keep the XenApp farm as close to a production environment as possible we created the following farm. On a pair of servers we created a protected workload for our data store and license server to reside on a single workload as well as two protected XenApp workloads. We created a single Domain Controller living on a separate host. One XenApp server was the data collector the other was serving users. This allowed us to have a dedicated data collector running in our farm. We also installed UPH Clean as you would in a production environment.

Registry Keys

The following registry keys were change in the farm:

Setting
Set NIC Settings Set the media type, duplex setting, and the speed that the NIC is required to use within the environment. Verify that the switch or managed switch is configured to the preferred setting. Never allow the NIC to "Auto detect" the network settings
Set Static Pagefile Set the pagefile to a static size. Microsoft recommends moving the pagefile to a separate hard drive.
Increase Event Viewer Log Size to prevent errors when Event Logs fill IntraSystems recommends a minimum Event Viewer Size of 16384 KB The following settings were set on and Event Viewer Log Log Overwrite Size Application Log as needed 16384 KB Security Log as needed 16384 KB System Log as needed 16384 KB
Increase the registry size. IntraSystems recommends setting the maximum registry size to at least 100 MB
Disable Dr. Watson popup More information is available from Microsoft Article: **Q229012** [HKLM/System\CurrentControlSet\Control\Windows] "ErrorMode"="2"
I/O Page Lock Limit More information is available from Microsoft Articles: Q102985 Specifies the number of bytes that can be locked for I/O operations. System default if 512K. On systems with more than 1 GB of RAM 64MB is recommended. [HKLM\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management] "IOPageLockLimit"=dword:00010000(65536)
Disable Roaming Profile Cache [HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon] "DeleteRoamingCache"=dword:00000001
Disable the printer beep. Disable printer beep to reduce bandwidth/increase performance. [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Print\] "BeepEnabled"=dword:00000000

Setting
Disable print events from the Event Log [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Print\Providers] For no printer logging set "EventLog"=dword:00000000 To log errors only, set "EventLog"=dword:00000001
Set IgnoreLinkResolver entry to fix shortcuts resolving to UNC paths issue. [HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer] "LinkResolveIgnoreLinkInfo"=dword:00000001
Changes the name of the My Computer icon to the logged on user and the machine name This is an optional setting that helps identify the logged on server and user [HKEY_CLASSES_ROOT\CLSID\{20D04FE0-3AEA-1069-A2D8-08002B30309D}] @="My Computer" "InfoTip"="Displays the files and folders on your computer" "LocalizedString"=hex(2):25,00,55,00,53,00,45,00,52,00,4e,00,41,00,4d,00,45,00,\ 25,00,20,00,6f,00,6e,00,20,00,25,00,43,00,4f,00,4d,00,50,00,55,00,54,00,45,\ 00,52,00,4e,00,41,00,4d,00,45,00,25,00,00,00
Disable Active Desktop in Terminal Services Configuration Utility
Display Logoff option on the start menu This setting reduces the chance of an administrator accidentally restarting a server Run gpedit.msc to open Group Policy snap-in Under “Local Computer Policy” go to User Configuration – Administrative Templates – Start Menu & Task Bar Double Click on “Add logoff to the Start Menu” Choose “Enabled”
Set Windows 2003 time source
Stop extra/unnecessary processes from running in each session. Remove all unnecessary processes from running in each session. Remove entries from the following regkey. [HKLM\Software\Microsoft\Windows\Current Version\Run]
Services Settings The following settings should be set to automatically restart a stopped Citrix service. Citrix XML Services Recovery First Failure: Restart the Service Second Failure: Restart the Service Subsequent Failures: Restart the Service Reset failed count after: 0 days Restart service after: 1 minute Independent Management Architecture Recovery First Failure: Restart the Service Second Failure: Restart the Service Subsequent Failures: Restart the Service Reset failed count after: 0 days Restart service after: 1 minute

Logical Farm

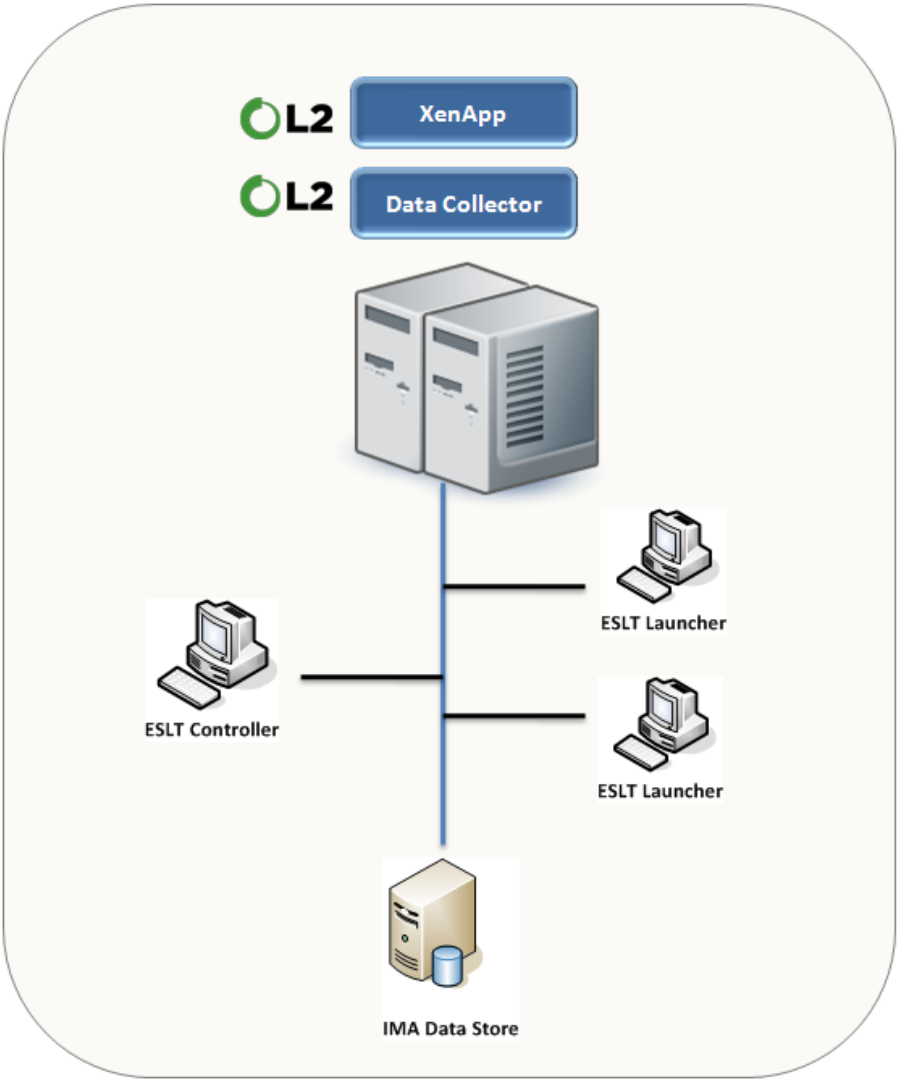

Figure 1 – Farm Overview

Network Configuration

The basic configuration utilizes two servers direct-connected by 2 1Gb Ethernet links (Availability Links). These links are used by everRun to mirroring all storage and data. Storage, management, and production LANs are also configured, resulting in 5 network adapters on each server.

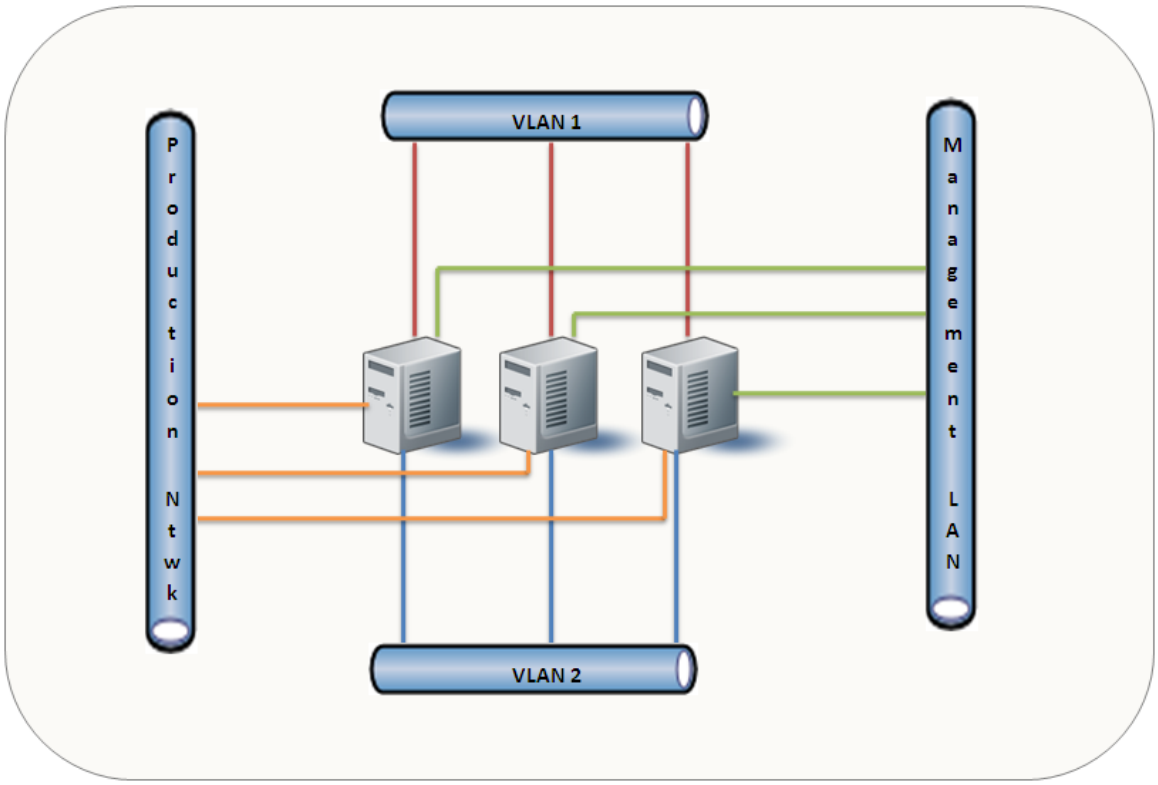

Figure 2 – Host Network Settings

TEST SCENARIOS

TEST #1: BASELINE WORKLOADS

In test 1 we ran two tests for a baseline comparison between a workload and a protected workload. For this test we used an application silo of 40 users connecting to a single XenApp-hosted application. In this case the application was Microsoft Office 2003.

The test and workload configuration is shown below:

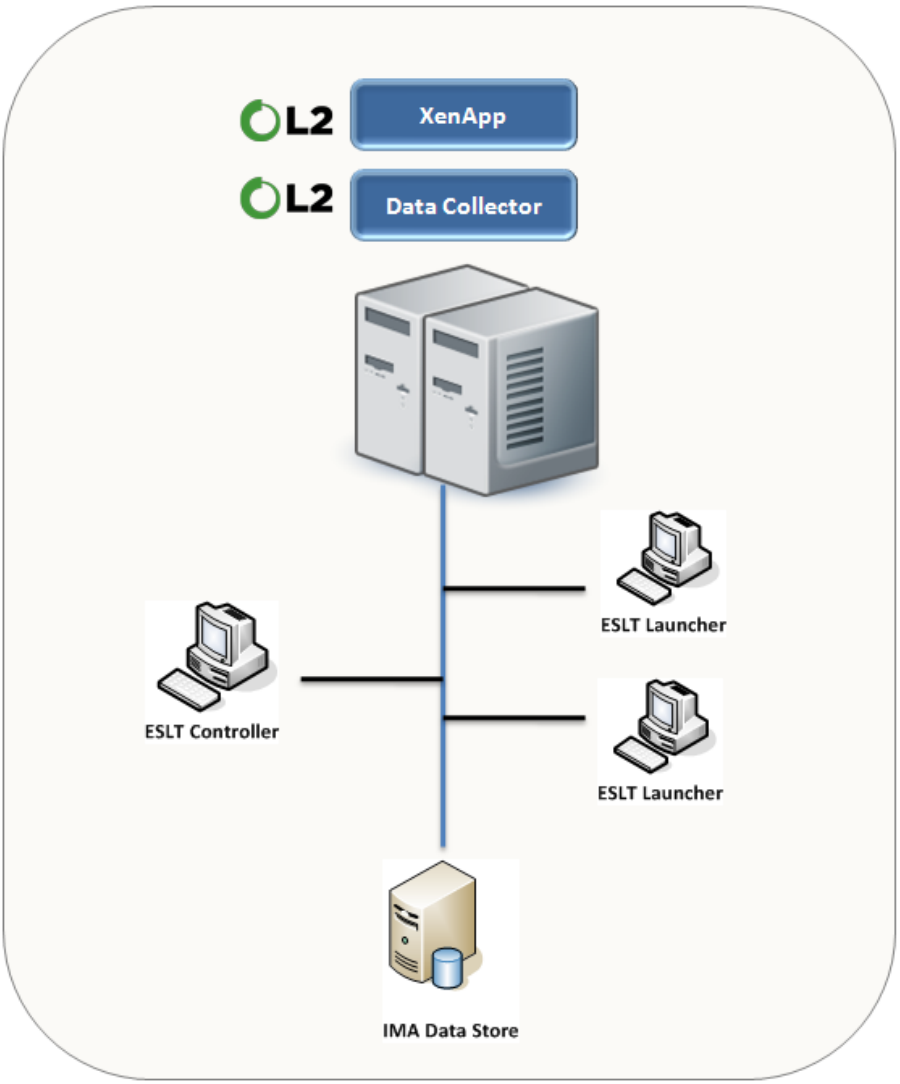

Figure 3 – Baseline Test

The methodology for running the baseline test involved the following steps:

- We setup ESLT to run a script that ran different Microsoft Office Applications including Microsoft Excel, Microsoft Word and Microsoft PowerPoint.
- We ran a total of 40 virtual users connecting directly to the XenApp server from 2 separate virtual Microsoft Windows XP hosts.
- We let the script run for 3 hours 32 minutes. We collected data for 3 hours once the 40 users were all logged and the system had settled down from thrashing due to the instant load of users.
- Once we ran the test with an unprotected workload we ran the same test with a protected workload. The same workload was used for both tests on the same server. A reboot to the workload was done between tests.

TEST #2: NETWORK FAILURE AND RECOVERY

In test 2 we allowed 40 users to log onto the server and then pulled the production LAN network cable that was assigned to the workload. This allowed us to test performance impact during a network component failure and I/O redirection as well as during the repair and recover of that failed device.

The methodology for running the baseline test involved the following steps:

- We setup ESLT to run a script that ran different Microsoft Office Applications including Microsoft Excel, Microsoft Word and Microsoft PowerPoint.
- We ran a total of 40 virtual users connecting directly to the server from 2 separate virtual Microsoft Windows XP hosts.
- We let the script run for 3 hours 32 minutes. We collected data for 3 hours once the 40 users were all logged and the system had settled down from thrashing due to the instant load of users.
- We captured performance data when everything was in a steady state. Then we pulled the network cable, monitored performance during the following states:

  Transition to redirecting I/O to the secondary host network interface

  Running while using the network interface on the secondary host

  Repair of failed device and transition back to primary servers network interface

The test and workload configuration is shown below:

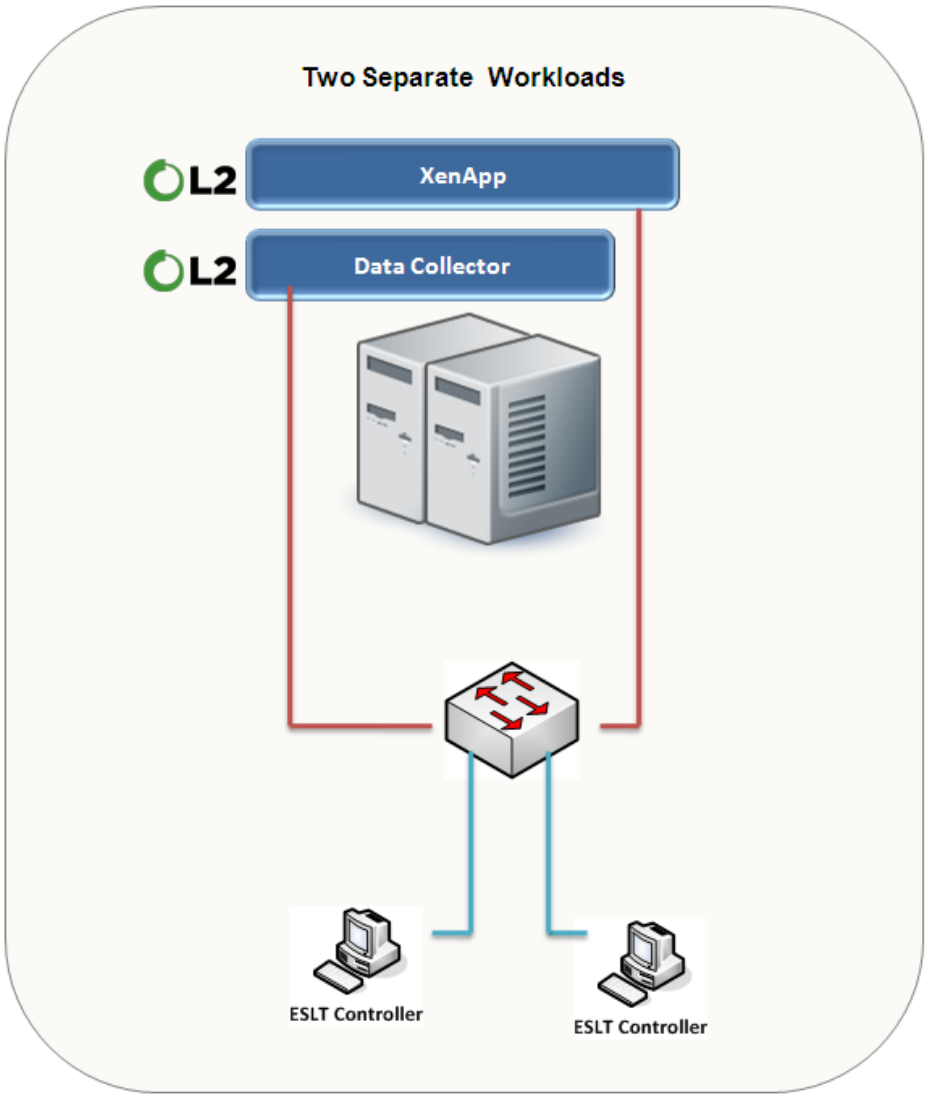

Figure 4 – Network Failure Test

With ESLT running, the test sequence for test #2 will be as follows:

- Once 40 users have been loaded onto the server for a 1 hour period, pull the production network cable from the active host.
- Allow the failure to run for 1 hour period with 40 users to simulate the time needed to troubleshoot the network issue and repair plan
- Plug the cable back into the active production network and allow the test to run for one more hour of 40 users

TEST #3: STORAGE FAILURE AND RECOVERY

In test 3 we took the same ESLT load of 40 users and ran our script for 3 hours. During the second hour we disabled the local disks on our active everRun host. This allowed us

to create a storage sub-system failure. Once we let the failed disk run for an hour we then recovered the disk and let it run for the last hour.

The methodology for running the baseline test involved the following steps:

- We setup ESLT to run a script that ran different Microsoft Office Applications including Microsoft Excel, Microsoft Word and Microsoft PowerPoint.
- We ran a total of 40 virtual users connecting directly to the server from 2 separate virtual Microsoft Windows XP hosts.
- We let the script run for 3 hours 32 minutes. We collected data for 3 hours once the 40 users were all logged and the system had settled down from thrashing due to the instant load of users.
- We captured performance data when everything was in a steady state. Then we disabled a disk drive on the active host and monitored performance during the following states:

  Transition to redirecting I/O to the secondary host storage device

  Running while using just the storage device on the secondary host

  Repair of failed device and transition back to primary servers storage device

  Re-mirror of data to synchronize the two systems

The test and workload configuration is shown below:

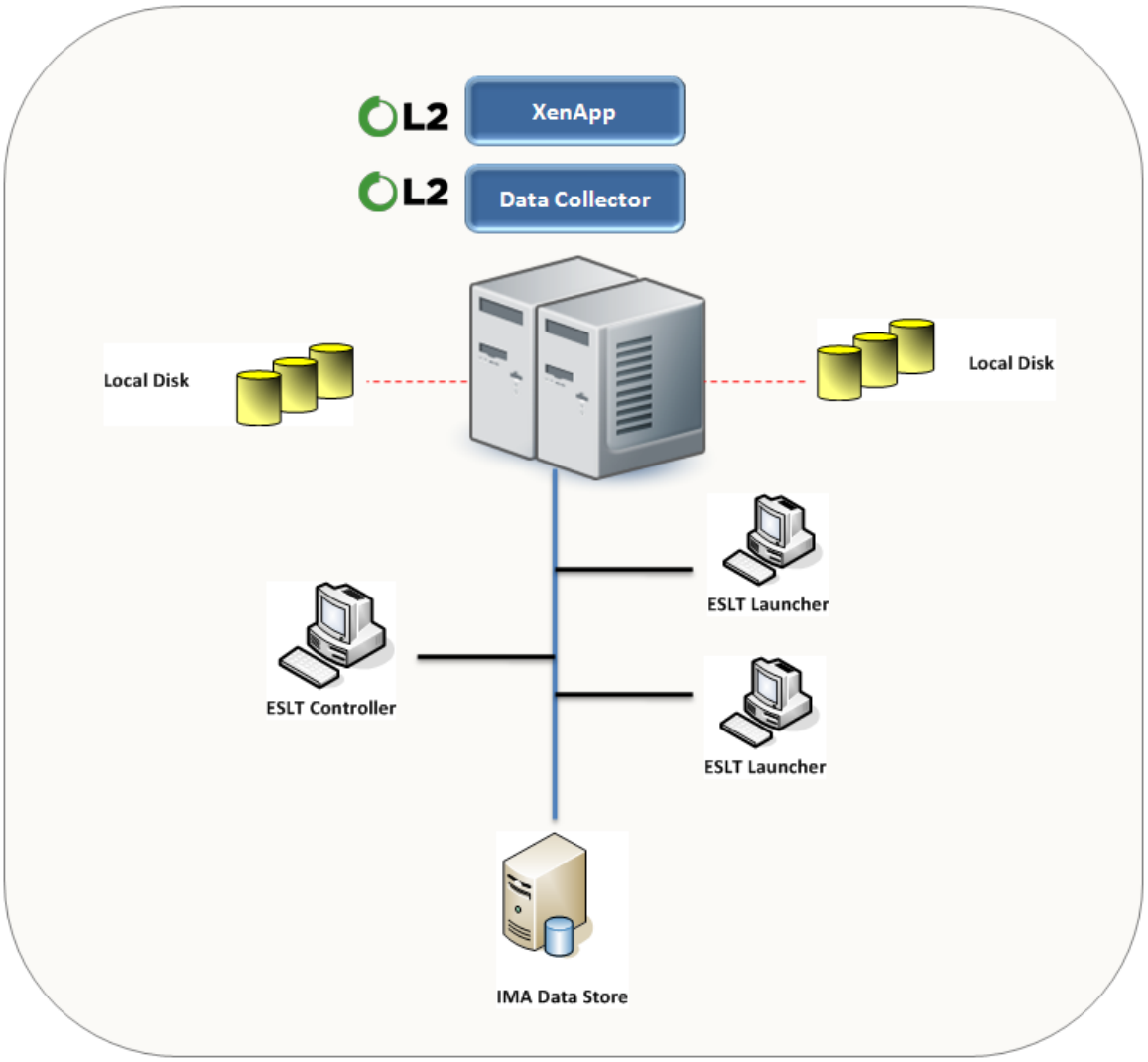

Figure 5 – Storage Failure Test

With ESLT running, the test sequence for test #3 will be as follows:

- Once 40 users have been loaded onto the server for a 1 hour period, disable the local disk from the active host.
- Allow the failure to run for 1 hour period with 40 users to simulate the time needed to troubleshoot the storage issue and repair plan
- Enable the disk on the active host and allow the test to run for one more hour of 40 users

RESULTS & RECOMMENDATIONS

RESULTS TEST #1 BASELINE

- Results:

  everRun adds about 14% of average CPU overhead per workload

  everRun performance averaged only about 50% of the maximum CPU utilization recommended by Citrix for XenApp workloads

- Conclusions:

  everRun performed very well on a protected workload. everRun level 2 protection does not have a large amount of overhead therefore should not impact the amount of users per workload

  XenApp running on an everRun protected environment is well below recommended CPU utilization guidelines published by Citrix

Test#	#Test Name	# vCPU Cores/ workload	Users/ Core	Total # Users	% Paging Files Used	RAM/workload (Gb)	Total RAM (Gb)	% Total Processor Average (<80%)	CPU Usage, Max	Physical Disk % Time	Memory Pages per Second
1.1	Unprotected	2	20	40	3.11	4	24	24.80%	63.4%	1.72	116.43
1.1	Protected	2	20	40	2.77	4	24	39.00%	87.9%	11.11	132.94

RESULTS TEST #2 NETWORK FAILURE AND RECOVERY

- Results:

  No packets were lost during the network cable pull.

  There was no user impact when a network component failed

- Conclusions:

  everRun is a great way to protect a workload running XenApp from network component failure. There was no user impact or downtime.

Test#	#Test Name	# CPU Cores/ Server	Users/ Core	Total # Users	% Paging Files Used	RAM/server (Gb)	Total RAM (Gb)	% Total Processor Average (<80%)	CPU Usage, Max	Physical Disk % Time	Memory Pages per Second
2.1	Pre-Failure	2	20	40	2.87	4	24	41.78	63.4%	10.8%	120.50
2.2	Failure	2	20	40	3.11	4	24	46.96	58.5%	12.7%	161.56
2.3	Post Failure	2	20	40	3.07	4	24	41.91	58.9%	13.00%	150.04

RESULTS TEST #3 STORAGE FAILURE AND RECOVERY

- Results:

  No data was lost during the storage failure due to everRuns disk mirroring capability

  There was no user impact when a storage component failed

- Conclusions:

  everRun is a great way to protect a workload running XenApp from storage component failure. There was no user impact or downtime.

  everRun synchronized the data upon recovery with no user impact

Test#	#Test Name	# CPU Cores/ Server	Users/ Core	Total # Users	% Paging Files Used	RAM/server (Gb)	Total RAM (Gb)	% Total Processor Average (<80%)	CPU Usage, Max	Physical Disk % Time	Memory Pages per Second
3.1	Pre-Failure	2	20	40	2.7	4	24	42.30%	88.50%	12.00%	141.6
3.2	Failure	2	20	40	3	4	24	61.20%	93.20%	13.80%	192.1
3.3	Post Failure	2	20	40	3.1	4	24	48.50%	83.50%	13.20%	142.6

ANALYSIS

After running XenApp in a Marathon everRun environment we were able to see how everRun can effectively protect XenApp workloads with limited overhead. In a XenApp farm everRun can be used to protect your data store, license server and application silos as designed.