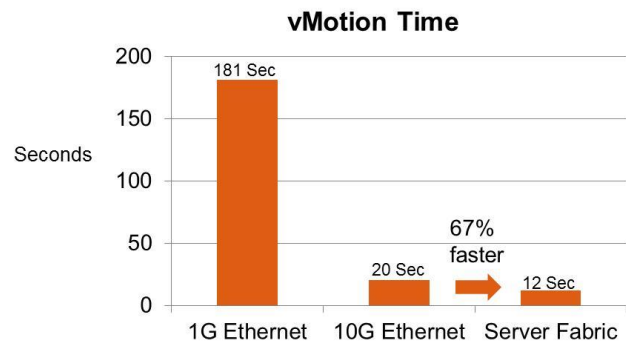
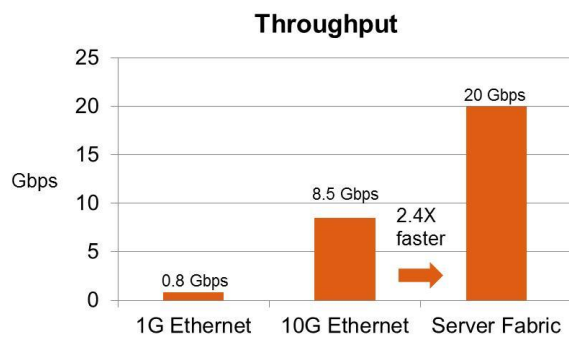


Xsigo Server Fabric Performance Benchmark Report

Executive Summary

In performance benchmark testing, the Xsigo Server Fabric demonstrated significantly higher network device throughput as compared to 1G Ethernet and 10G Ethernet server connections. In this testing, the Xsigo Server Fabric was shown to deliver:

- 2.4X the Ethernet traffic of a 10G Ethernet connection (throughput to a single virtual machine)
- 20Gbps throughput measured to a single NIC on a single virtual machine
- 15X faster vMotion than 1G Ethernet
- 67% faster vMotion than 10G Ethernet



Test Bed Overview

The performance test bed environment consisted of the following:

- 2 Xsigo VP-780 QDR I/O Directors
- 2 Dual Port ConnectX-2 QDR Infiniband PCI Cards
- 4 Fujitsu Primergy RX200-S6 Servers
 - 8 Cores 3.6Ghz Intel Xeon X5687 CPUs [2-Quad Core CPUs]
 - 48GB of RAM
- EMC Clariion Shared FC Storage [VMFS3]

- Typical VM Configuration: Redhat Enterprise Linux 5
 - 64 Bit OS
 - vmxnet3 drivers [paravirtualized]

Tests Performed

Three scenarios were tested.

Test #1

Measure the speed between two Redhat Linux VMs on ESXi-5.0 servers.

Result:

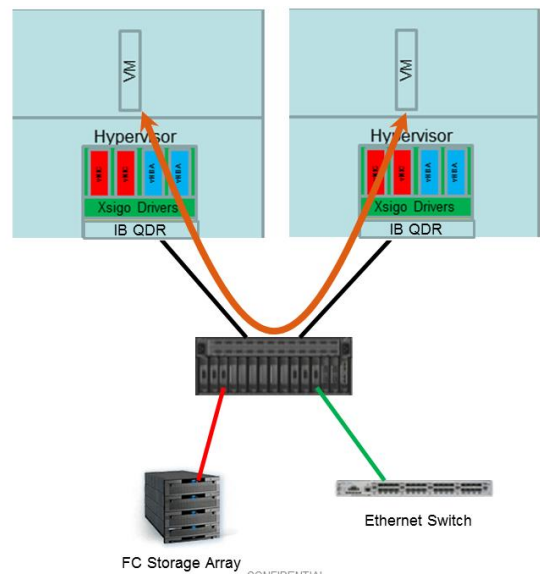
The iperf test measured a sustained a 16.9 Gbit/sec data rate (shown by the orange path).

```

fu50-vm1 on fu50sub6.xsigo.com
File View 324
Kernel 2.6.18-194.el5 on an x86_64
fu50-vm1 login: root
Password:
root login: Tue Jan 17 20:01:40 on tty1
[root@fu50-vm1 ~]# ifconfig eth1 172.16.249.10
[root@fu50-vm1 ~]# ifconfig eth1 172.16.249.10 netmask 255.255.255.0
[root@fu50-vm1 ~]# ifconfig eth1 mtu 9000
[root@fu50-vm1 ~]# ethtool -K eth1 gso on
[root@fu50-vm1 ~]# iperf -s
-----
Server listening on TCP port 5801
TCP window size: 85.3 KByte (default)
[ 4] local 172.16.249.10 port 5801 connected with 172.16.249.12 port 33869
[ ID] Interval      Transfer      Bandwidth
[ 4] 0.0-10.0 sec  19.5 GBytes  16.8 Gbits/sec
[ 5] local 172.16.249.10 port 5801 connected with 172.16.249.12 port 36129
[ ID] Interval      Transfer      Bandwidth
[ 5] 0.0-10.0 sec  19.4 GBytes  16.7 Gbits/sec
[ 4] local 172.16.249.10 port 5801 connected with 172.16.249.12 port 36130
[ ID] Interval      Transfer      Bandwidth
[ 4] 0.0-10.0 sec  19.7 GBytes  16.9 Gbits/sec
[root@fu50-vm1 ~]#
[root@fu50-vm1 ~]#

```

**Bandwidth
16.9 Gbits/sec**

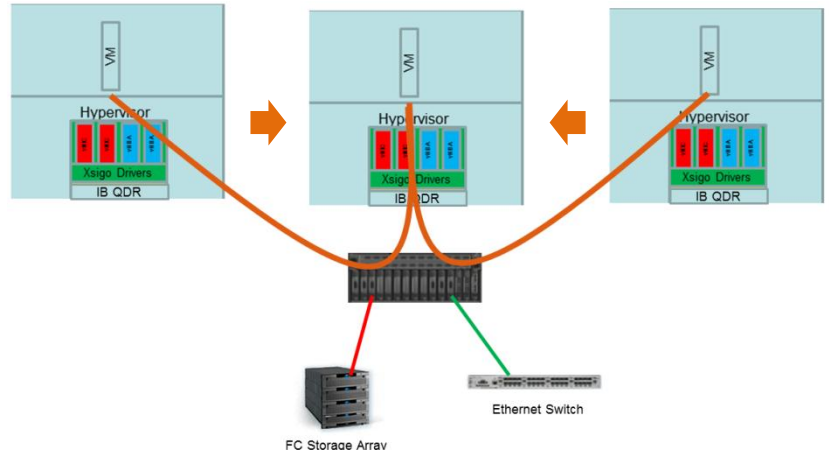


Test #2

Measure the performance of 2 VMs inputting traffic to a single application server.

Result

The application VM was able to receive traffic at over 20Gbits/sec.



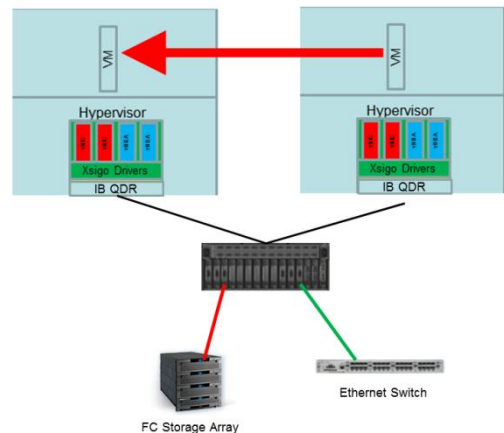
Test #3

Measure the speed of vMotion over the Xsigo Server Fabric vs. 10G and 1G Ethernet, using a 20GB VM with shared FC storage.

Result

The VM was consistently able to complete vMotion on a loaded ESX server 67% faster than with 10G Ethernet. The single VM vMotion times were:

- Xsigo Server Fabric: 12 seconds
- 10G Ethernet: 20 seconds
- 1G Ethernet: 181 seconds



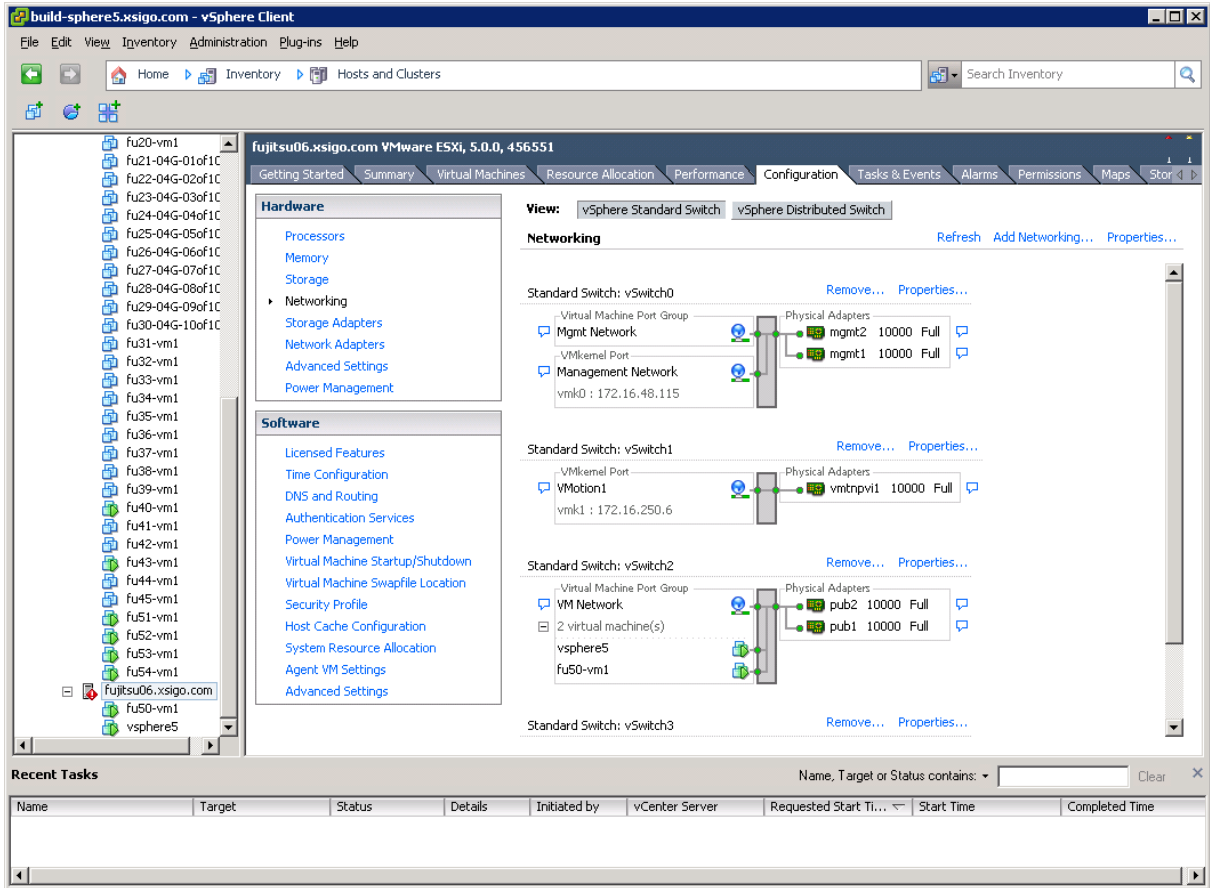
Appendix A: Details and Screenshots of the Setup

The screenshot displays the vSphere Client interface for a host named 'fujitsu01.xsigo.com VMware ESXi, 5.0.0, 456551'. The left sidebar shows a tree view of the inventory, including 'Fujitsu Test Servers' and a 'Cluster1' containing various VMs (fu01-vm1 to fu26-vm1). The main pane shows the 'Summary' tab with the following details:

| General | |
|---------------------------------|---|
| Manufacturer: | FUJITSU |
| Model: | PRIMERGY RX200 S6 |
| CPU Cores: | 8 CPUs x 3.6 GHz |
| Processor Type: | Intel(R) Xeon(R) CPU X5687 @ 3.60GHz |
| License: | VMware vSphere 5 Enterprise Plus - Licensed for 2 physic... |
| Processor Sockets: | 2 |
| Cores per Socket: | 4 |
| Logical Processors: | 16 |
| Hyperthreading: | Active |
| Number of NICs: | 12 |
| State: | Connected |
| Virtual Machines and Templates: | 3 |
| vMotion Enabled: | Yes |
| VMware EVC Mode: | Disabled |
| vSphere HA State: | N/A |
| Host Configured for FT: | No |
| Active Tasks: | |
| Host Profile: | |
| Image Profile: | (Updated) ESXi-5.0.0-4565... |
| Profile Compliance: | N/A |
| DirectPath I/O: | Supported |

| Resources | | |
|---------------------------------|-----------------------|------------|
| CPU usage: 439 MHz | Capacity: 8 x 3.6 GHz | |
| Memory usage: 7745.00 MB | Capacity: 49142.23 MB | |
| Storage | | |
| Storage | Status | Drive Type |
| datastore1 | ✓ Normal | Non-SSD |
| fc-storage01 | ✓ Normal | Non-SSD |
| Network | | |
| Network | Type | Sta |
| Mgmt Network | Standard port group | ✓ |
| PVI Network 1 | Standard port group | ✓ |
| VM Network | Standard port group | ✓ |
| Fault Tolerance | | |
| Fault Tolerance Version: | 2.0.1-3.0.0-3.0.0 | |
| Total Primary VMs: | 0 | |
| Powered On Primary VMs: | 0 | |
| Total Secondary VMs: | 0 | |
| Powered On Secondary VMs: | 0 | |

Server Summary Details: Fujitsu Primergy Class Server running ESX-5.0 Build 456551 [GA]



ESX Network Summary Details: Basic VMware vSwitch [VSS] with non-redundant uplinks for simplicity

build-sphere5.xsigo.com - vSphere Client

File Edit View Inventory Administration Plug-ins Help

Home Inventory Hosts and Clusters Search Inventory

fujitsu06.xsigo.com VMware ESXi, 5.0.0, 456551

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Tasks & Events Alarms Permissions Maps Storage

Hardware

- Processors
- Memory
- Storage
- Networking
- Storage Adapters
- Network Adapters
- Advanced Settings
- Power Management

Software

- Licensed Features
- Time Configuration
- DNS and Routing
- Authentication Services
- Power Management
- Virtual Machine Startup/Shutdown
- Virtual Machine Swapfile Location
- Security Profile
- Host Cache Configuration
- System Resource Allocation
- Agent VM Settings
- Advanced Settings

Storage Adapters Add... Remove Refresh Rescan All...

| Device | Type | WWN |
|---|---------------|---|
| MT26428 [ConnectX VPI - 10GigE / IB QDR, PCIe 2.0 5GT/s] | | |
| vhba6 | Fibre Channel | 50:01:39:71:00:13:51:19 50:01:39:70:00:13:51:19 |
| vhba14 | Fibre Channel | 50:01:39:71:00:13:51:1f 50:01:39:70:00:13:51:1f |
| ICH10 2 port SATA IDE Controller | | |
| vmhba1 | Block SCSI | |
| vmhba33 | Block SCSI | |
| ICH10 4 port SATA IDE Controller | | |
| vmhba0 | Block SCSI | |
| vmhba32 | Block SCSI | |
| MegaRAID SAS GEN2 Controller | | |
| vmhba2 | SCSI | |

Details

vhba14

Model: MT26428 [ConnectX VPI - 10GigE / IB QDR, PCIe 2.0 5GT/s]
 WWN: 50:01:39:71:00:13:51:1f 50:01:39:70:00:13:51:1f
 Targets: 1 Devices: 1 Paths: 1

View: Devices Paths

| Name | Runtime Name | Operational State | LUN | Type |
|-------------------------------------|-----------------|-------------------|-----|------|
| DGC Fibre Channel Disk (naa.6006... | vhba14:C0:T0:L1 | Mounted | 1 | disk |

Recent Tasks

Name, Target or Status contains: Clear X

| Name | Target | Status | Details | Initiated by | vCenter Server | Requested Start Ti... | Start Time | Completed Time |
|------|--------|--------|---------|--------------|----------------|-----------------------|------------|----------------|
|------|--------|--------|---------|--------------|----------------|-----------------------|------------|----------------|

Mid-Teir Shared FC Storage: EMC Clariion Storage.

Typical Virtual Machine Configuration Details: vmxnet3 paravirtualized drivers attached to Private Virtual Network (PVI) Portgroup. That was toggled between networks of XS

