# SPECsfs97 Result

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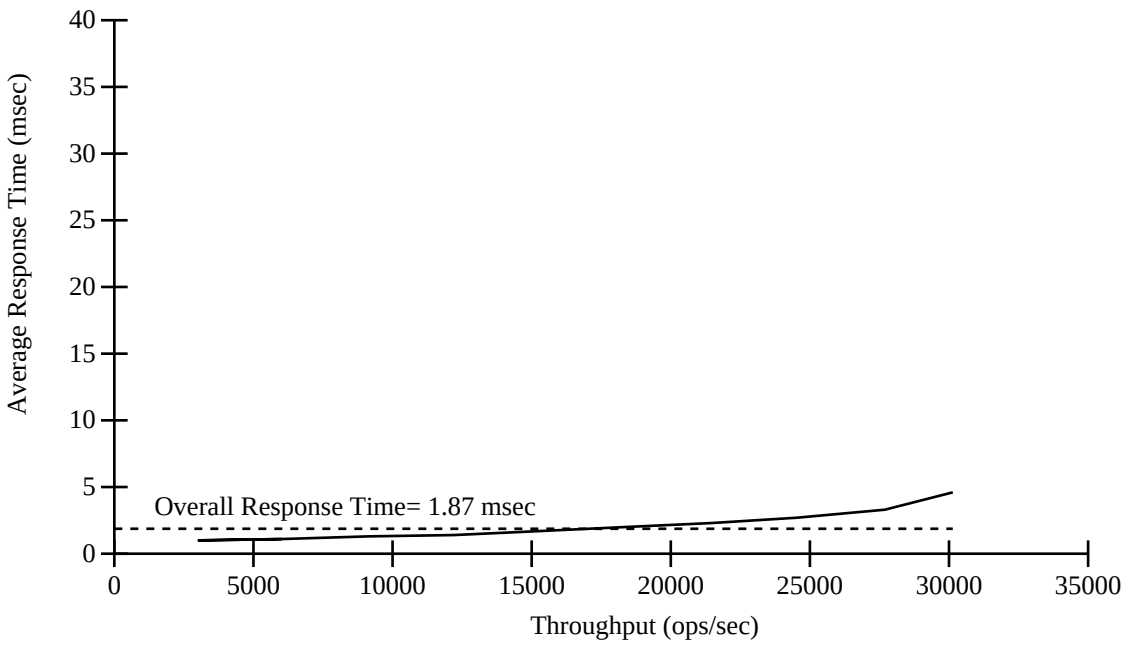
Network Appliance, Inc.
F880c Failover Cluster (UDP, 100x36GB FCAL, 2xGbE)

SPECsfs97_R1.v3 =
**30135 Ops/Sec (Overall Response Time = 1.87 msec)**

| Tested: | September 2001 | By: | Network Appliance, Inc. | License #: | 33 | Hardware Avail: | July 2001 | Software Avail: | July 2001 |
|---|---|---|---|---|---|---|---|---|---|

| Throughput (ops/sec) | Average Response (msec) |
|---|---|
| 3001 | 1.0 |
| 6017 | 1.1 |
| 9141 | 1.3 |
| 12216 | 1.4 |
| 15318 | 1.7 |
| 18360 | 2.0 |
| 21466 | 2.3 |
| 24539 | 2.7 |
| 27694 | 3.3 |
| **30135** | **4.6** |




## CPU, Memory and Power

| | |
|---|---|
| Model Name: | F880c Failover Cluster (UDP, 100x36GB FCAL, 2xGbE) |
| Processor: | 866-MHz Intel Pentium III Coppermine |
| # of Processors: | 4 cores, 4 chips, 1 core/chip (2 per node) |
| Primary Cache: | 16 KB I + 16 KB D |
| Secondary Cache: | 256 KB on-die |
| Other Cache: | N/A |
| UPS: | none |
| Other Hardware: | X1920A cluster adapter card (1 per node - see notes) |
| Memory Size: | 6144 MB (3072 MB per node) |
| NVRAM Size: | 256 MB (128 MB per node) |
| NVRAM Type: | DIMMs on PCI cards |
| NVRAM Description: | 15-day battery-backed shelf-life |

## Server Software

| | |
|---|---|
| OS Name and Version: | Data ONTAP 6.1.1 |
| Other Software: | Cluster Option |
| File System: | WAFL |
| NFS version: | 3 |

## Network Subsystem

| | |
|---|---|
| Network Type: | Gigabit Ethernet |
| Network Controller Desc.: | X1025C PCI adapter card |
| Number Networks: | 1 (N1) |
| Number Network Controllers: | 2 (1 per node) |
| Protocol Type: | UDP |
| Switch Type: | 4 Netgear 518S, 1 Extreme Black Diamond (N1) |
| Bridge Type: | N/A |
| Hub Type: | N/A |
| Other Network Hardware: | N/A |

## Server Tuning

| | |
|---|---|
| Buffer Cache Size: | default |
| # NFS Processes: | N/A |
| Fileset Size: | 291.3 GB |

## Disk Subsystem

| | |
|---|---|
| Number Disk Controllers: | 4 |
| Number of Disks: | 100 |
| Number of Filesystems: | 2 |
| File System Creation Ops: | default |
| File System Config: | 4 RAID-groups of 12 disks each |
| Disk Controller: | X2044A FC-AL adapter card (256 KB RAM standard) |
| # of Controller Type: | 4 |
| Number of Disks: | 25/25/25/25 |
| Disk Type: | X234A 36GB FC-AL |
| File Systems on Disks: | F1/F1/F2/F2 |
| Special Config Notes: | see notes |

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## Load Generator (LG) Configuration

| | |
|---|---|
| Number of Load Generators: | 30 |
| Number of Processes per LG: | 4 |
| Biod Max Read Setting: | 2 |
| Biod Max Write Setting: | 2 |
| LG Type: | LG1 |
| LG Model: | Intel ISP1100 Internet Server Platform |
| Number and Type Processors: | 1x700-MHz Pentium III |
| Memory Size: | 512 MB |
| Operating System: | Linux 2.2.18 (Red Hat 6.2) |
| Compiler: | gcc version egcs-2.91.66 |
| Compiler Options: | -static -O -DNO_T_TYPES -DUSE_INTTYPES |
| Network Type: | integrated Intel Pro/100+ 100BASE-T |

## Testbed Configuration

| LG # | LG Type | Network | Target File Systems | Notes |
|---|---|---|---|---|
| 1/2/../30 | LG1 | N1 | F1,F2 | N/A |

## Notes/Tuning Information

Other Notes
-NetApp's embedded operating system processes NFS requests from the network layer without any NFS daemons, and uses non-volatile memory to improve performance.
-The tested system was a failover cluster comprised of two nodes joined by a cluster interconnect.
-The cluster option was licensed and enabled.
-Each disk controller had two FC-AL loops, one primary and one secondary. Only the primary loops were active.
-Each node was the owner of one filesystem, but the disks were dual-attached so that, in the event of a fault, they could be controlled by the other node via a secondary loop.
-The F1 filesystem was striped across both primary loops of the first node. The F2 filesystem was striped across both primary loops of the second node.
-Each filesystem was composed of four RAID-4 groups; each RAID-group was composed of 11 data disks and 1 parity disk. Four spare disks were present.
-Server tunings:
-options minra 1 -- minimize file read-ahead
-options raid.scrub.enable 0 -- disable periodic RAID scrubs for reproducibility
-Clients were attached in groups of 7 or 8 into the four Netgear switches.
-Each of the Netgear switches was uplinked into the Black Diamond switch.
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