The Need For Speed

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Overview

- What is:
  - Investigation of our NFS solution performance in real-world work environment
  - An indication of how our NFS stacks up with other NFS solutions, SMB and local file system
- What is not:
  - An academic study of NFS performance
  - A competitive comparison between different NFS solutions
  - A competitive comparison between NFS and SMB
  - To explore the limits of NFS in general or our NFS solution in specific

Introduction

- What is Hummingbird
  - A leading Enterprise software solution company that provide:
    - Connectivity, and
    - Enterprise Content Management Solutions
  - A leading PC NFS vendor (amongst many other things)
  - Supplies NFS Client, Server and Gateway to 32-bit and 64-bit Windows platforms

Performance is the key

- File level vs. block level access
- Competition:
  - NFS
  - SMB
  - Local FS
- Objective:

  To make NFS as fast as Windows local file system in order to compete

The Test

- Three test suites are used:
  - ***Connectathon***
    - Only a sample of the Basic tests are used
  - ***Copy***
    - Copy files of predefined sized to and from Remote hosts
  - ***fileperf***
    - Created by Jim Howard of Intel Application Solution Center

fileperf

- Measures server file system performance from client's point of view
  - Creating files at the given location
  - Sequential write
  - Read, seek, skip
- Performance measured in Operations per second

fileperf

- Mixture of operations are chosen to mimic file system operations
  - lookup 50%
  - read 30%
  - getattr 5%
  - write 3%
  - create 1%

  Source: Sun Microsystem technical paper on their NFS design, given at USENIX Summer 1985

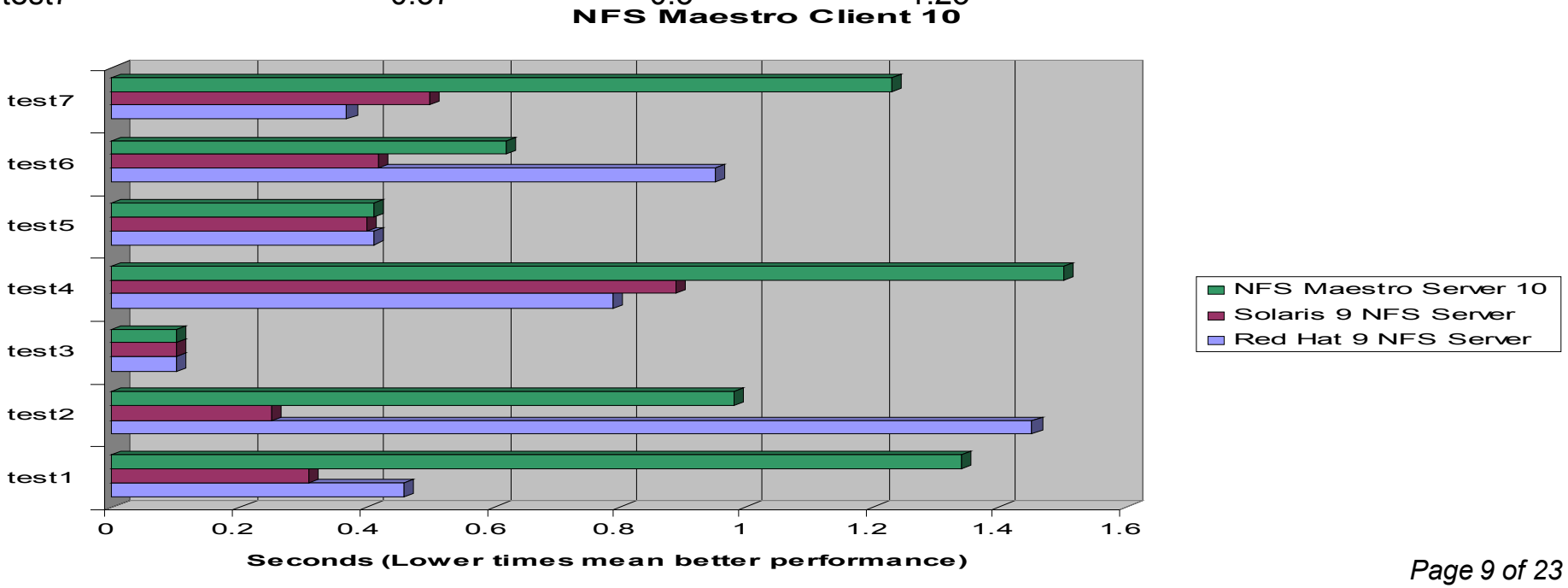
The Test Bed

- Hardware spec:
  - Intel Pentium 4 2.8 GHz
  - 512 MB SDRAM
  - 80 GB 8MB Cache Western Digital HD
- Operating Systems:
  - Windows XP Professional with SP2
  - Red Hat 9.0 with the latest patches
    - SMB v3.0.7
    - NFS from Kernel 20.4.20-8
  - Sun Solaris 9 with the latest x86 recommended patches
    - SMB v3.0.7
- Network
  - SMC 5612DS 100Mbps Hub

Connectathon Basic Tests

- Using NFS Maestro Client 10

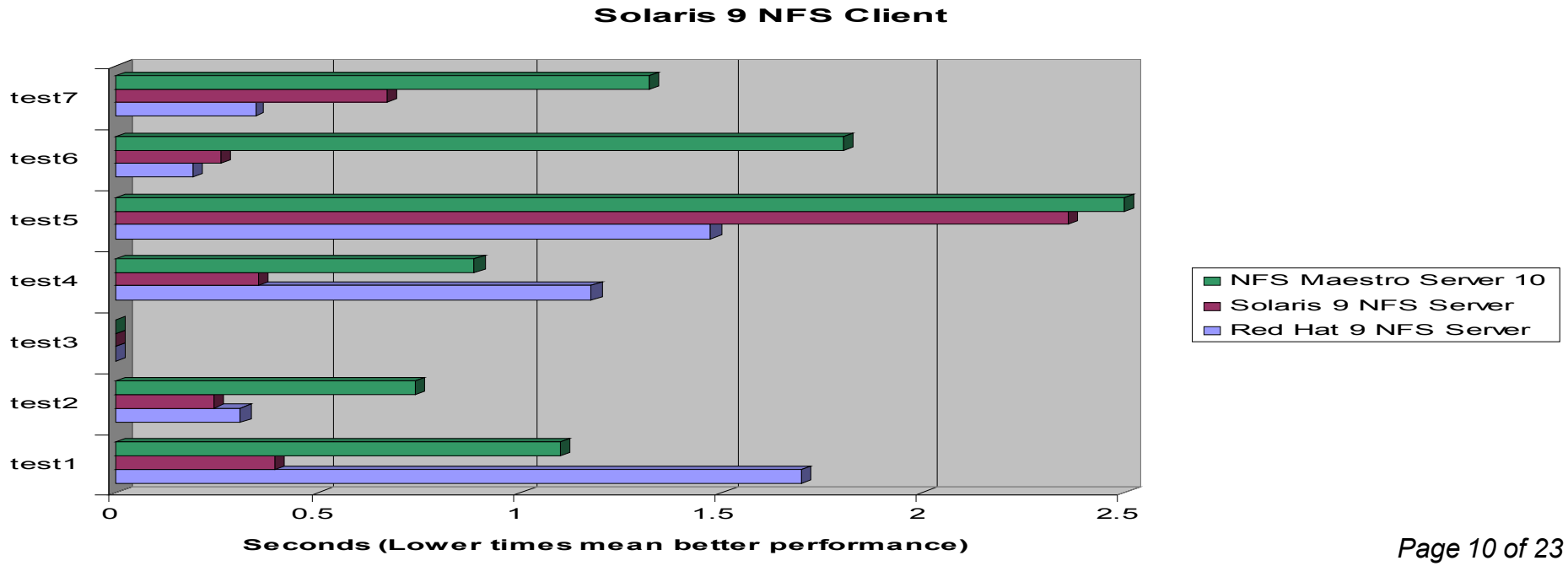
	Red Hat 9 NFS Server	Solaris 9 NFS Server	NFS Maestro Server 10
test1	0.46	0.31	1.34
test2	1.45	0.25	0.98
test3	0.1	0.1	0.1
test4	0.79	0.89	1.5
test5	0.41	0.4	0.41
test6	0.95	0.42	0.62
test7	0.37	0.5	1.23



Connectathon Basic Tests

- Using Sun Solaris 9 NFS client

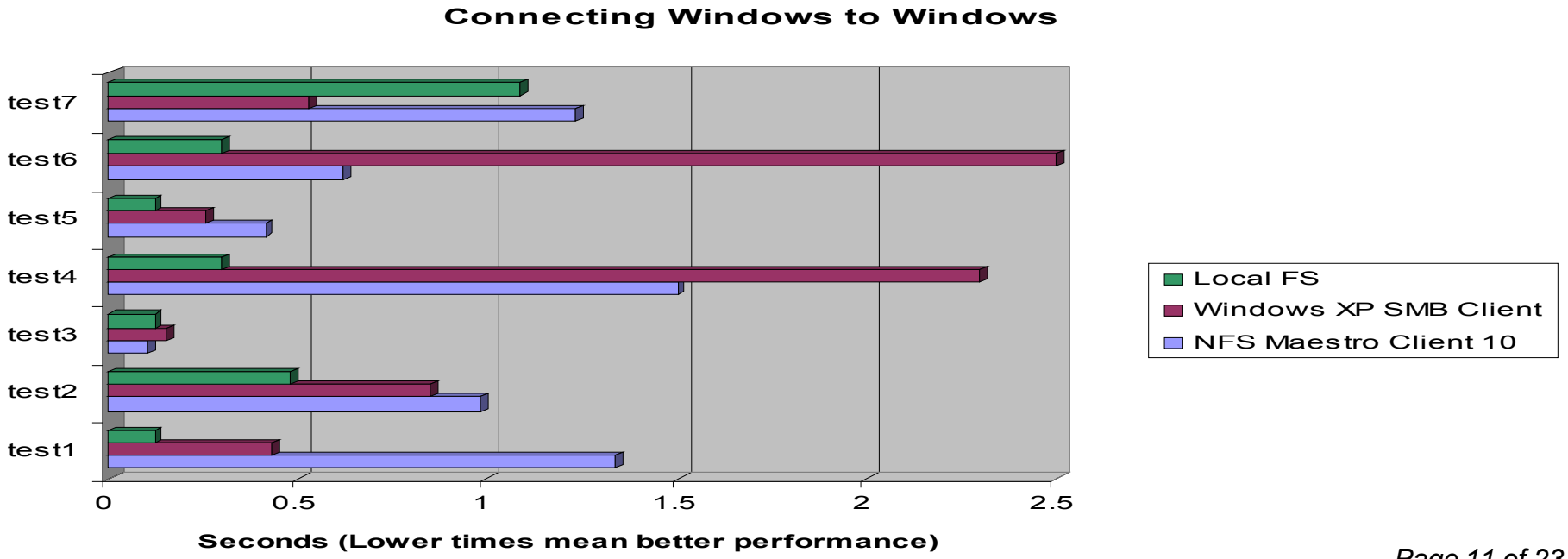
	Red Hat 9 NFS Server	Solaris 9 NFS Server	NFS Maestro Server 10
test1	1.7	0.39	1.1
test2	0.31	0.24	0.74
test3	0	0	0
test4	1.18	0.35	0.89
test5	1.477	2.36	4
test6	0.19	0.26	1.8
test7	0.34	0.67	1.32



Connectathon Basic Tests

- On Windows platforms

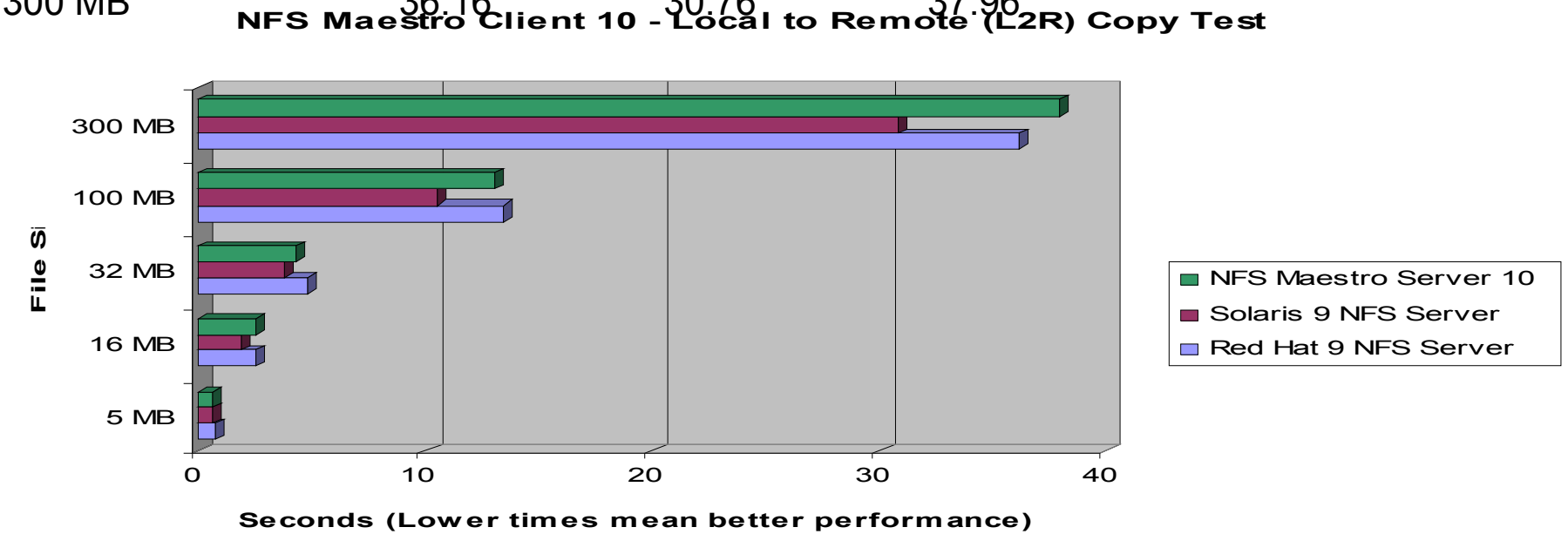
	NFS Maestro Client 10	Windows XP SMB Client	Local FS
test1	1.34	0.43	0.12
test2	0.98	0.85	0.48
test3	0.1	0.15	0.12
test4	1.5	2.3	0.3
test5	0.41	0.26	0.12
test6	0.62	93.53	0.3
test7	1.23	0.53	1.08



Copy Test – NFS Maestro Client 10

Local to Remote (L2R)

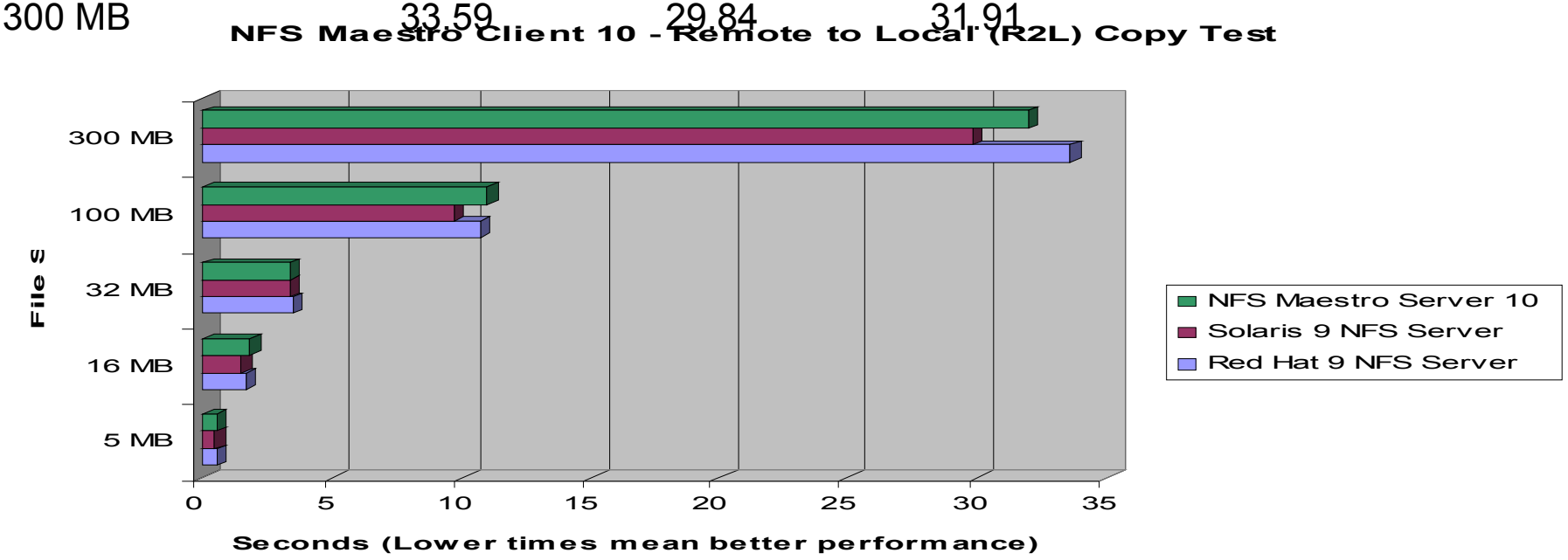
File Size	Red Hat 9 NFS Server	Solaris 9 NFS Server	NFS Maestro Server 10
5 MB	0.75	0.64	0.69
16 MB	2.56	1.95	2.54
32 MB	4.73	3.7	4.3
100 MB	13.48	10.47	13.08
300 MB	36.16	30.76	37.96



Copy Test – NFS Maestro Client 10

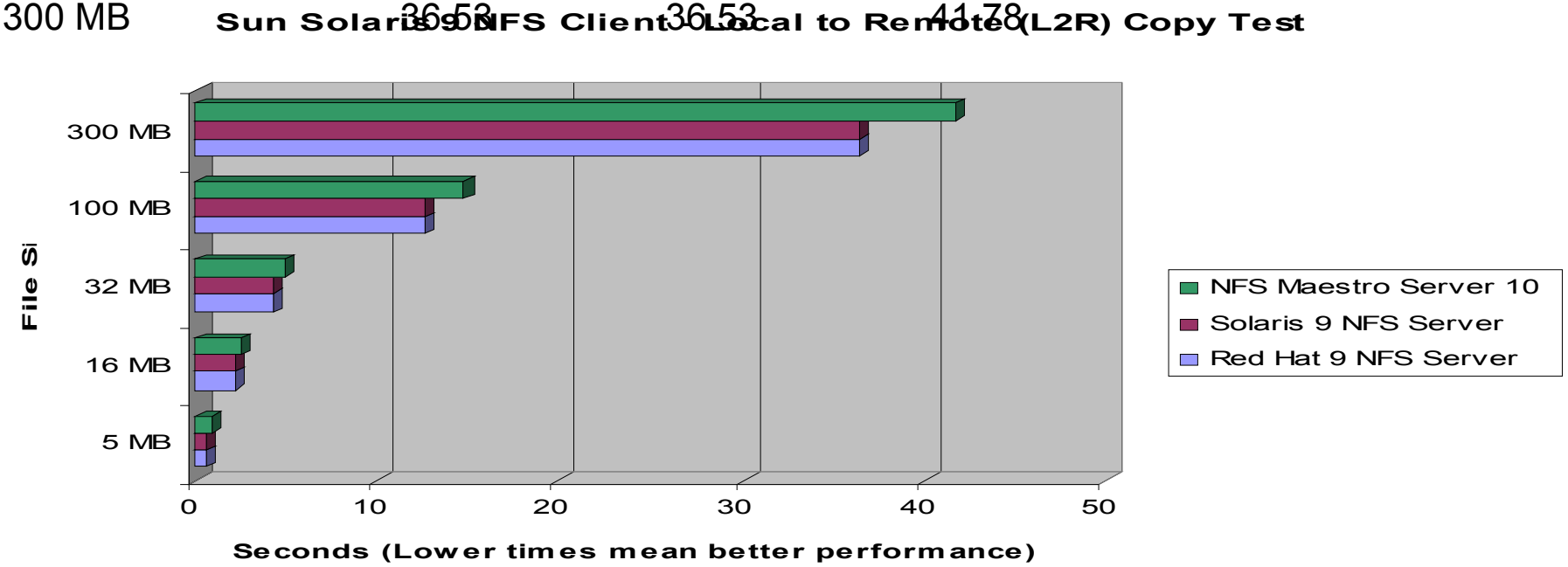
Remote to Local (R2L)

File Size	Red Hat 9 NFS Server	Solaris 9 NFS Server	NFS Maestro Server 10
5 MB	0.53	0.48	0.53
16 MB	1.7	1.54	1.86
32 MB	3.41	3.3	3.34
100 MB	10.7	9.71	11.03
300 MB	33.59	29.84	31.91



Copy Test – Sun Solaris 9 NFS Client
Local to Remote (L2R)

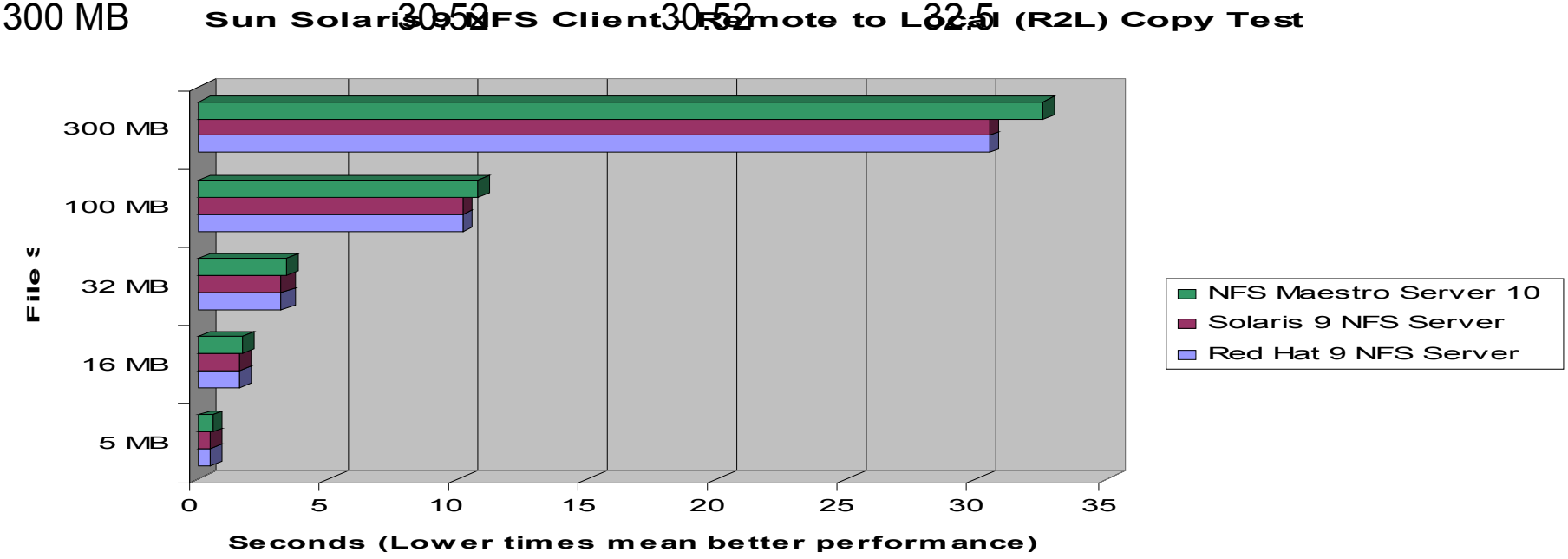
File Size	Red Hat 9 NFS Server	Solaris 9 NFS Server	NFS Maestro Server 10
5 MB	0.63	0.63	0.84
16 MB	2.23	2.23	2.52
32 MB	4.37	4.37	4.99
100 MB	12.73	12.73	14.72
300 MB	36.53	36.53	41.78



Copy Test – Sun Solaris 9 NFS Client

Remote to Local (R2L)

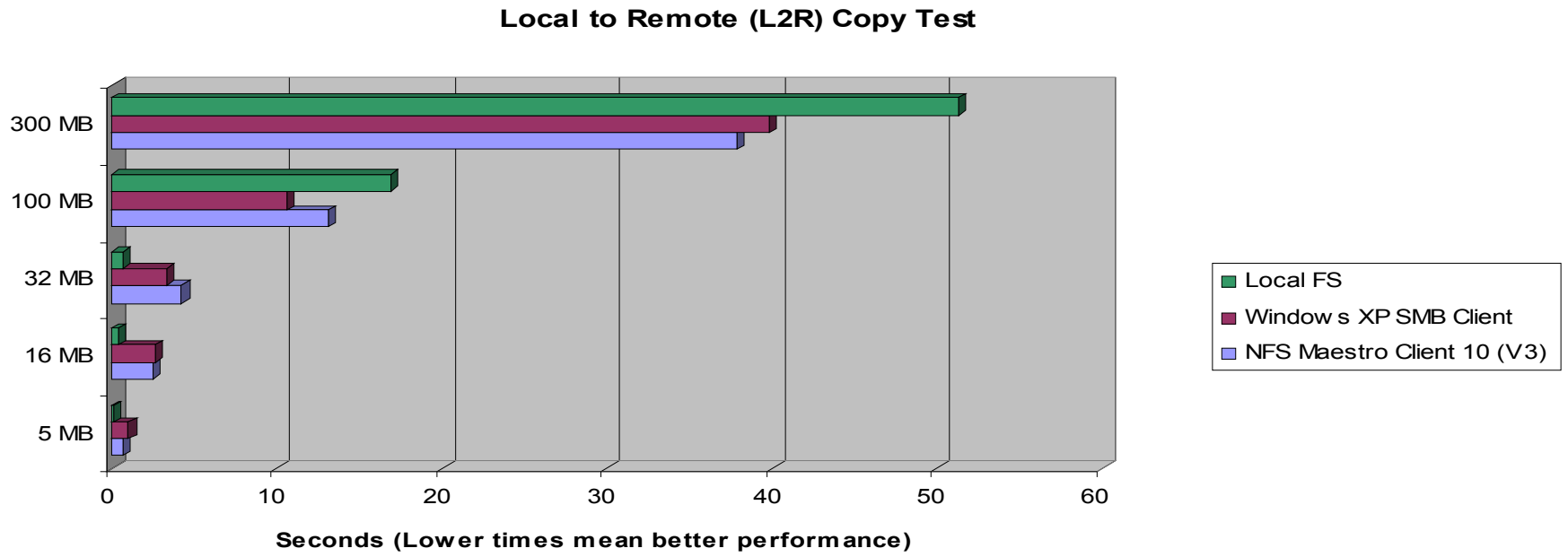
File Size	Red Hat 9 NFS Server	Solaris 9 NFS Server	NFS Maestro Server 10
5 MB	0.53	0.53	0.56
16 MB	1.63	1.63	1.74
32 MB	3.25	3.25	3.46
100 MB	10.17	10.17	10.81
300 MB	30.52	30.52	32.5



Copy Test – All Windows platforms

Local to Remote (L2R)

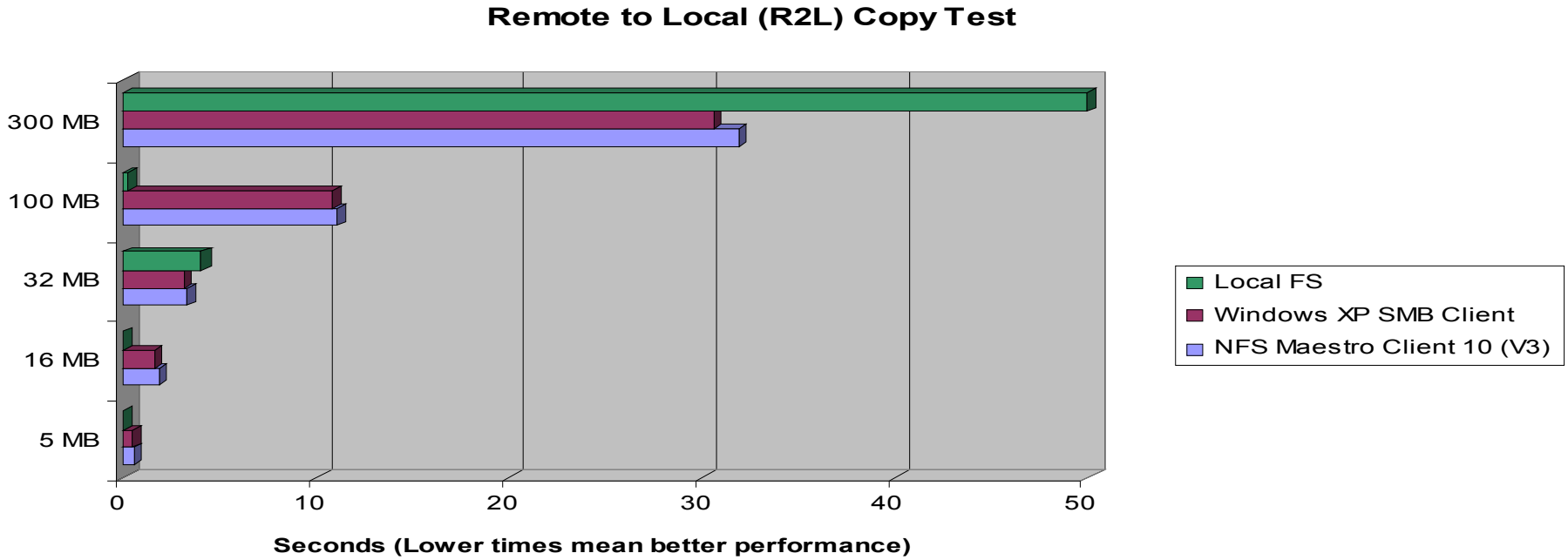
File Size	NFS Maestro Client 10	Windows XP SMB Client	Local FS
5 MB	0.69	1.03	0.17
16 MB	2.54	2.62	0.36
32 MB	4.3	3.4	0.67
100 MB	13.08	10.61	16.94
300 MB	37.96	39.81	51.38



Copy Test – All Windows platforms

Remote to Local (R2L)

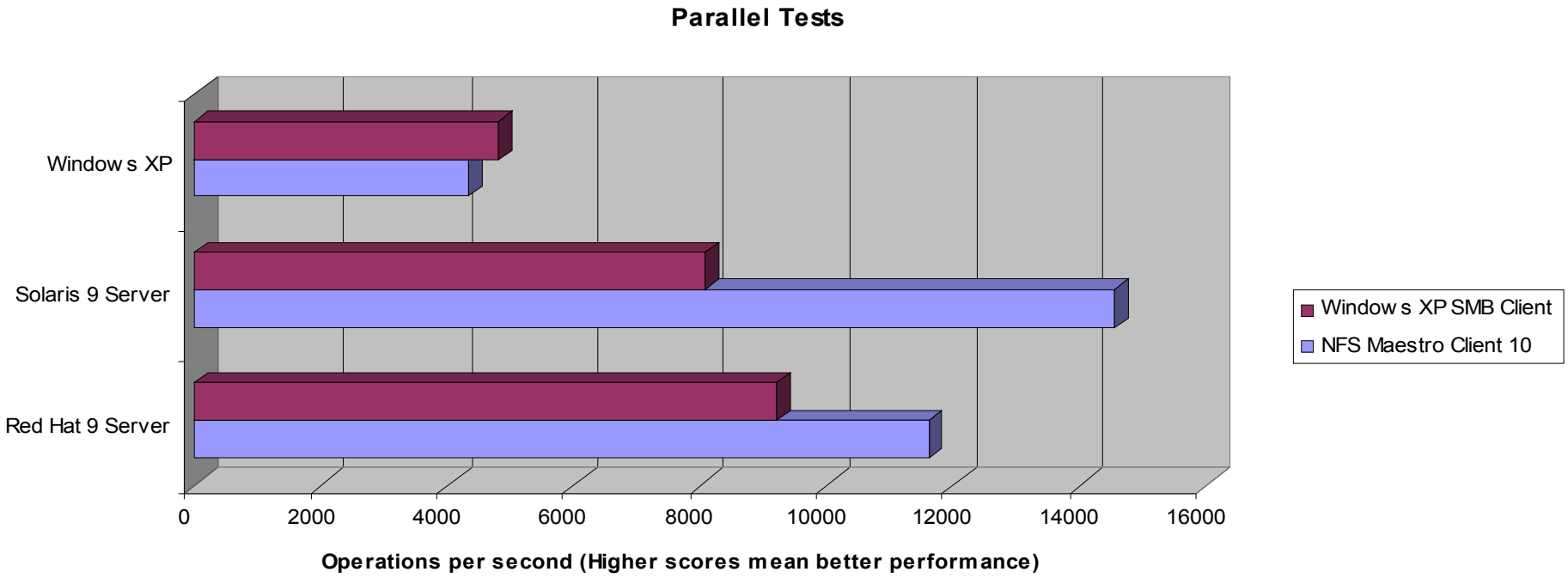
File Size	NFS Maestro Client 10	Windows XP SMB Client	Local FS
5 MB	0.53	0.51	0.02
16 MB	1.86	1.61	0.04
32 MB	3.34	3.17	4.08
100 MB	11.03	10.79	0.23
300 MB	31.91	30.61	50



fileperf

- Parallel Tests

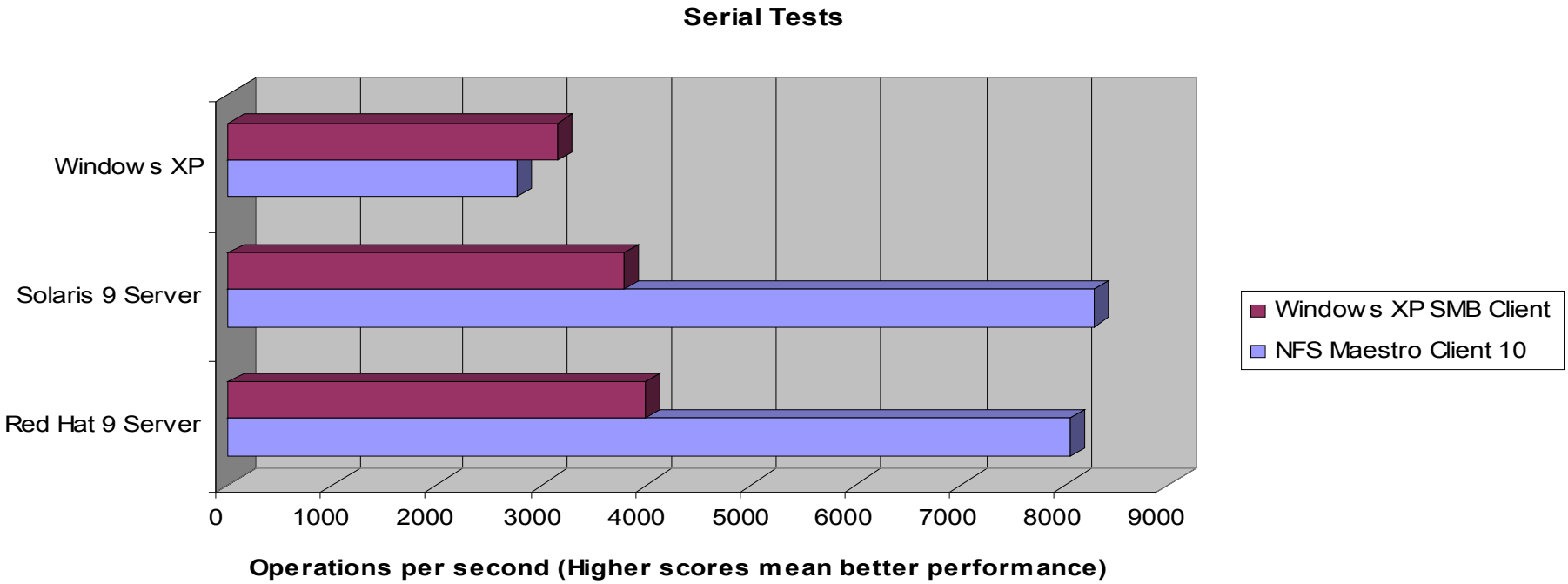
	NFS Maestro Client 10	Windows XP SMB Client
Red Hat 9 Server	11625.038	9201.1692
Solaris 9 Server	14573.014	8078.939
Windows XP	4344.879	4811.627



fileperf

- Serial Tests

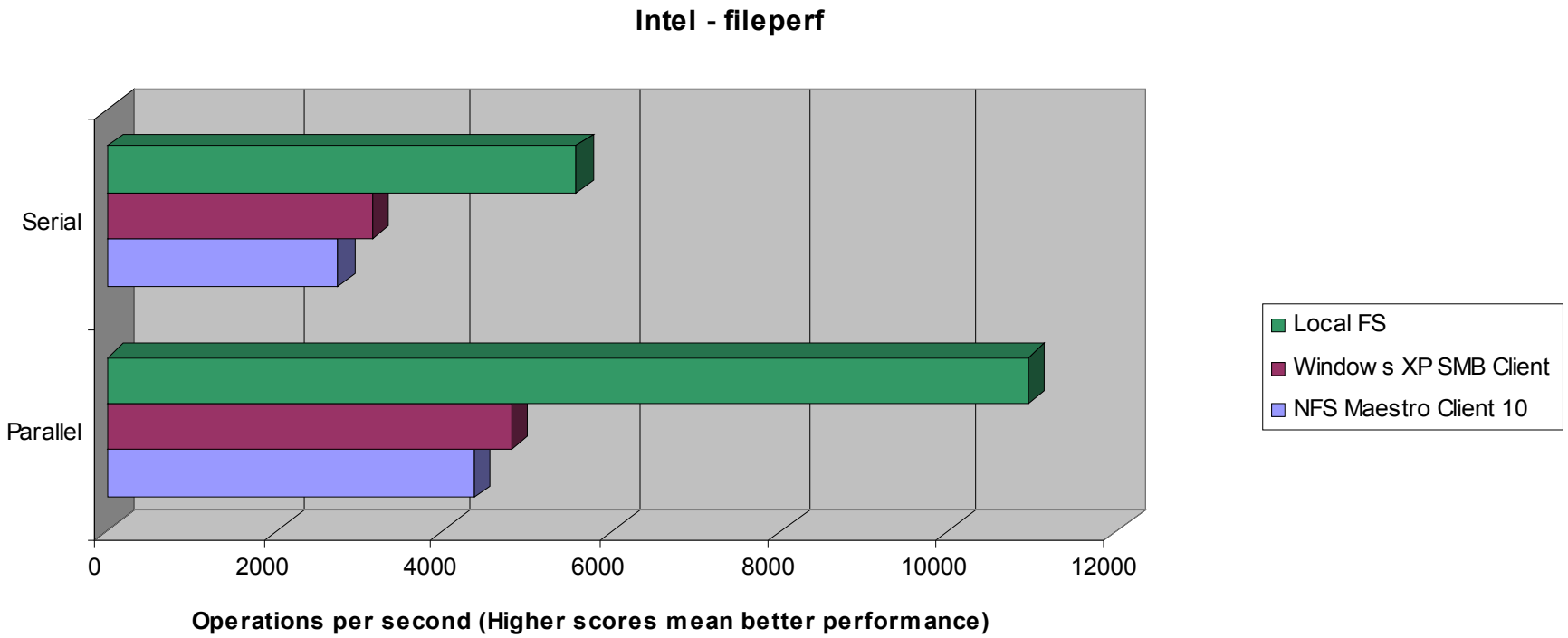
	NFS Maestro Client 10	Windows XP SMB Client
Red Hat 9 Server	8039.346	3982.892
Solaris 9 Server	8279.652	3780.288
Windows XP	2754.893	3150.891



fileperf

- All Windows platforms

	NFS Maestro Client 10	Windows XP SMB Client	Local FS
Parallel	4344.879	4811.627	10955.971
Serial	2754.893	3150.891	5590.664



What have we done?

- Enhanced data caching
- Improved Directory Listing caching
- Other fine tunings
- Tight collaboration with other NFS vendors

What can we do?

- NFS Maestro Server:
  - Add Kernel level implementation
  - Create filter drivers on top of NTFS
- NFS Maestro Client:
  - Enhance performance tuning per operation

Conclusion

- No solution is an absolute winner
- The QUEST for SPEED continues
- Our ultimate goals
  - NFS Maestro performance be consistently faster than other NFS and SMB solutions
  - Close the performance gaps between NFS and local file system