

A First Look at NetWare for HP-UX 4.1 Performance

Alok Gupta

Hewlett-Packard

19420 Homestead Road, MS 43LF

Cupertino, CA 95014

Phone: (408) 447-2201

Back-ground Information

In today's heterogeneous environment of networked UNIX, Windows and NT systems, HP provides many connectivity solutions, one of which is the high performing and robust NetWare for HP-UX 4.1 product. NetWare for HP-UX or NCPS (Novell's Cross Platform Services) bring one of the most commonly installed Network Operating Systems into the HP-UX world. This allows PC clients (DOS/Windows, including Windows 95 and NT) to use NetWare file and print services on HP-UX and at the same time take advantage of the extensive application environment of HP-UX. HP is the first enterprise RISC vendor to offer NetWare 4.1 service with NDS.

NetWare for HP-UX 4.1 is much more efficient and robust than its predecessors, 3.11 and 3.12. It features Novell's Directory Services (NDS), a global distributed database which provides a single NetWare sign-on. It also provides the reliability of HP-UX and the functionality of a NetWare server. HP has made several proprietary performance enhancements to the vanilla product from Novell. As a result, NetWare for HP-UX 4.1 can now support a greater number of clients than its predecessors. Over and above the testing done by Novell, HP has done its own extensive testing before releasing the product. This has resulted in a very reliable product.

This presentation will focus on the following:

- Features of NetWare for HP-UX 4.1
- Performance differences between NetWare for HP-UX 4.1 and Native NetWare. (Native NetWare is NetWare running in Native mode on Intel Architecture)
- Performance enhancements done by HP
- Performance of NetWare for HP-UX 4.1
- Future directions

A Look at NetWare for HP-UX 4.1

NetWare for HP-UX provides file and print services, transport services, Novell Directory Services (a global distributed directory database of users and resources on the network), and SNMP support. It enables users of different desktop operating systems to share files, print and other services, and to view and use a network as a single enterprise-wide information system.

Performance Differences between NetWare for HP-UX 4.1 and Native NetWare

Native NetWare is optimized for File and Print services at the expense of application environment. All the requests from a client are handled in the "kernel" space. In contrast, NetWare for HP-UX provides the Native NetWare's functionality and the robust UNIX application environment. The Majority of the requests from a client are handled in the user space.

Performance Enhancements

Hewlett-Packard made large improvements in CPU utilization by adding fastpath, fast directory scans and fastlocks to NetWare for HP-UX 4.1.

The I/O performance is vastly improved by providing a fast read path. In the vanilla product, all read requests from a client are processed in the user space. After adding the fast-read and directly manipulating the system buffers, the majority of the read requests are processed in the kernel, thus bypassing switching between kernel and user space. Since the majority of the requests from a client are read requests, this change gives big performance gains.

The directory scan performance is improved by ensuring that all the data structures required to process a directory scan are pre-built in user space and subsequent requests for directory or file information are handled at the kernel level. This again avoids switching between kernel and user space.

The locking mechanisms has been completely rewritten. The deadlock detection and recovery is now much more efficient. The Addition of fastlocks gave a big boost to the performance.

The Client Simulator Benchmark

The client simulator was created by HP as a tool to simulate the behavior of hundreds of NetWare client from a single UNIX system. The client simulator performs the following functions:

- Mixture of NCP requests, based on measurements from real customer sites
- Each simulated client is a real user, with separate connection/login to the server
- NetWare security is applied at the user and group level
- Files accessed are a configurable mixture of private, shared by group, and global(shared by everyone)
- Byte range locking is applied to some of the shared files

Each client simulator workstation (Model 712) can simulate 30 users at roughly 600 NCP requests per client per minute.

Simulated Client Aggregate Throughput

The throughput (solid) lines in the graph indicate the number of NetWare requests serviced per minute. Ideal behavior would be requests serviced increasing proportionally to the number of clients simulated (i.e. we service twice the number of requests for twice the number of clients).

The adjusted throughput (dotted) lines indicate the number of requests that would be serviced if all CPU available were used. This assumes that the server would behave as efficiently at 100 percent CPU utilization. An ideal dotted line would be high on the chart and would be completely horizontal.

The dotted lines tell us several things:

- The closer the dotted lines are to the solid lines, the closer we are to running out of CPU.
- The higher the dotted line, the more efficient the NetWare release
- The high point of the dotted line is where the server is most efficient. Typically efficiency will degrade under heavy load.

Figure 1 shows that 3.11 release actually gets less total work done as more load is added (after 60 users) and it is taking more CPU per request as we add load and we are unable to use all the CPU available.

Release 3.12 throughput increases through 120 users, twice that of 3.11 release.

For release 4.1, both the throughput and efficiency are very close to ideal though 240 users.

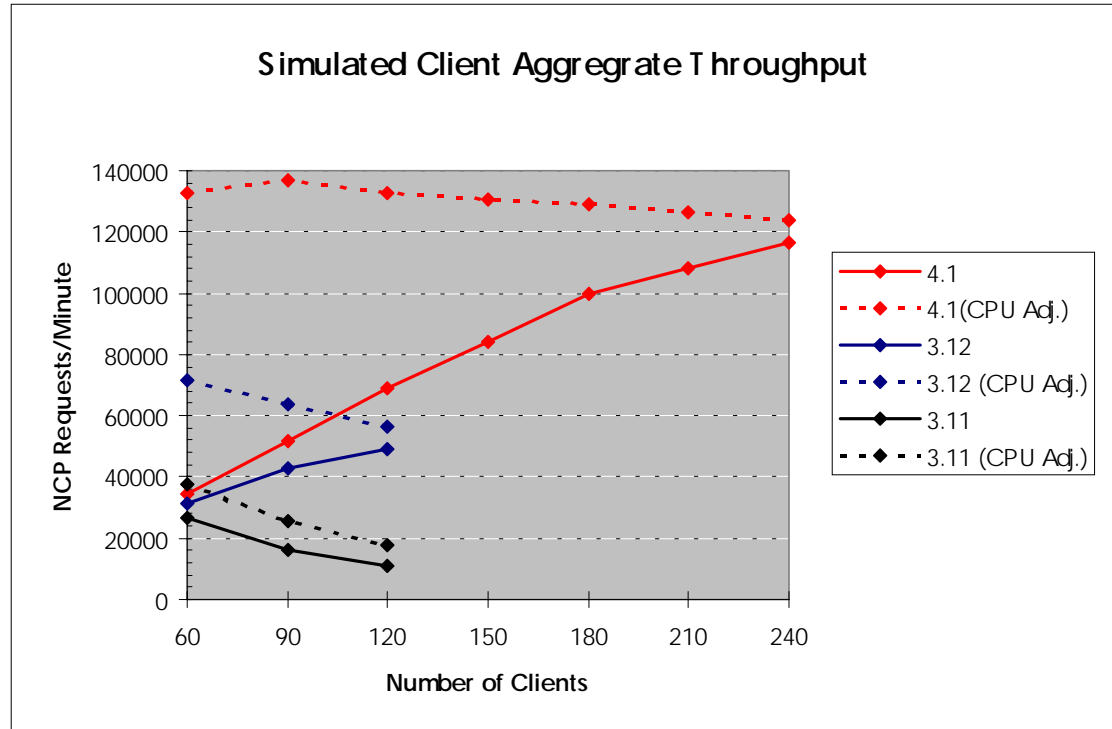


Figure 1. Simulated Client Total Throughput

Throughput per Client

This format makes it easier to see any performance differences at the client level, as well as the point where the server can no longer accept all the load offered.

The ideal behavior here is a horizontal solid line. It means that at this load level, NetWare for HP-UX 4.1 can deliver the same level of service (in this case, approximately 600 NCP requests per minute) to 240 clients. The dotted line indicates how close server is to being unable to service more clients.

The graph more clearly illustrates that 3.11 is already degrading at 60 users and 3.12 has most likely reached its limit at 120 users where as 4.1 can support up to 250 users.

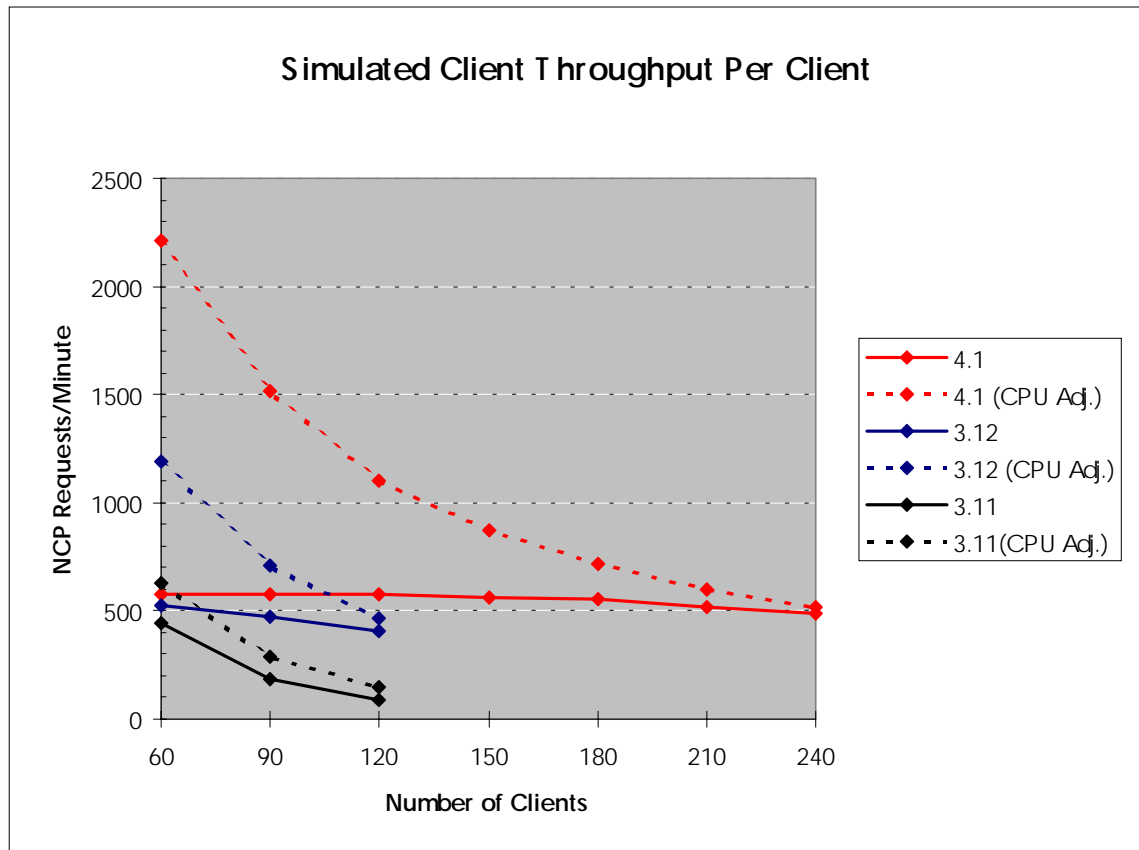


Figure 2. Simulated Client Per-Client Throughput

Future Directions

Hewlett-Packard shall continue to provide NetWare 4.1 services on its RISC server platforms. HP will also provide LDAP (Light Weight Directory Access Protocol) enabled NDS. A single-server version of the directory service, SANDS (Stand Alone NDS) will be available. HP will also provide an add-on directory-to-directory replication and synchronization functionality with SCALE. This functionality will be embedded into the operating system and can be easily enabled through the purchase of a SCALE license. Users shall be able to extend the single-server NDS functionality they receive with their operating system by taking advantage to server-to-server replication and synchronization.

Conclusion

NetWare and HP-UX are complementary operating systems that can be optimized for different purposes. NetWare is a finely tuned network operating system and HP-UX provides a high-performance general purpose application environment. The tight integration of NetWare for HP-UX 4.1 into HP-UX provides a rich set of HP-UX resources to NetWare clients. Together they create an enterprise-wide view of all the networked resources.

Appendix A. System Configuration used in the BenchMarks

This appendix describes the machine configuration used in conducting the benchmarks described in this document:

Configuration	Server	Client
Model	D350 (2-CPU, 100 MHz)	712 (60 MHz)
Memory	128 MB	32 MB
Disk Used	Nike 5 spindle RAID-0	N/A
LAN Card	100VG eisa	built-in LAN
OS Version	hp-ux 10.10	hp-ux 10.10
Client Simulator Version	N/A	b.00