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A Comparison of CIFS and NFS Protocols

Tom Spuhler

Solutions Specialist

Hewlett Packard

3000 Minuteman rd

Andover MA 01810

tom_spuhler@hp.com

978-659-4828 FAX: 978-659-3908



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Network Evaluation Criteria

- Price
- Performance
- Functionality
- Availability
- Reliability
- Security
- Vendor quality & stability
- Standardization
- Corporate direction



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Realistic Network Evaluation Criteria

• Corporate Direction

- Price
- Performance
- Functionality
- Availability
- Reliability
- Security
- Vendor quality & stability
- Standardization



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Remote File Access Method

- By far the largest consumer of most Technical network resources
- Usually, by far, the most important



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Remote File Access Method Evaluation Criteria

- Price
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Network Performance

- Latency
- Throughput



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Latency

- System speed
- routers
- switches
- length



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Throughput

- Overall capacity of a link
- may be very wide but slow (sneakernet)



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Protocol impacts on network/application performance

- Latency
 - Inherent request/response protocol
 - minimize the required requests
 - minimize dependencies on timely responses
 - Throughput



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Protocol impacts on network/application performance

- Throughput
 - Minimize information transferred
 - ask for only what you need
 - remember what you get



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What do we look for in a well performing protocol?

- Avoids re-transmission of information using local caching
 - Local caching can save 75% network throughput
- Minimum dependency on previous transaction completion before the next one can begin
- Minimum of required transactions to perform common operations (includes large data size)
- Maximum parallelism (Files, sessions, threads)
- Minimum protocol overhead
- minimum negative impact on lower layers
- Simple, efficient implementation possible



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A Quick Note on Workloads

- **The Workload, the type and amount of work being done, is the primary metric required to evaluate the appropriateness of any protocol.**
 - Technical environments, although usually considered large sequential read/write intensive, do a surprising amount of file name activity.
- **The correct answer is always “It Depends”**



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CIFS/SMB and NFS: an Evaluation opportunity

- CIFS and NFS are available as both client and server with 11.0 on HP9000 computers
- CIFS is available on most Microsoft offerings. NFS is available via 3rd parties
- NFS is available on most non-Microsoft Operating systems natively



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CIFS/SMB and NFS: an Evaluation opportunity (Cont.)

- CIFS/SMB and NFS protocols have some significant differences in how they will impact network resources and deliver reliable, correct data to the user application.



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NFS - Network File System

- From Sun Microsystems
- Sun held control of protocol until version 4 (underway) and transferred the control to IETF
- Version 2 the old standby, version 3 widely used.
- Numerous add-ons. AutoFS, CacheFS, NIS etc
- Operates over a variety of transports, a reliable transport is NOT required



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NFS - Network File System - cont

- Largely Stateless
- 17 unique calls
- Asynchronous writes only with version 3 (except for -async option on some vendors server implementations)
- Poor support for client caching
- Locking is a separate protocol



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NFS - Network File System - cont

- Some piggybacking of calls and status return
- Negotiates v2 or V3 protocol at mount



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CIFS - Common Internet File System

- From Microsoft
- Formerly known as SMB (System Message Block)
- Microsoft claims it's a multi-vendor standard, and submitted it to IETF - where it has disappeared
- Numerous versions and dialects
- Protocol "richer" than NFS



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CIFS - Common Internet File System - continued

- A reliable connection is required. No error checking or retransmission is supported.
- Version and dialect is negotiated upon initiation
- Between 28-65 calls depending upon version and dialect
- Calls can be of considerable complexity



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CIFS - Common Internet File System - continued

- File and data region locking is part of the protocol
- Opportunistic locks, called OPLOCKS, facilitate locking and client caching
 - Exclusive OPLOCKS
 - Batch OPLOCKS
 - Level II OPLOCKS
- AndX - allows chaining multiple calls into 1 transmission
- File change notification



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Implementation

- The actual implementation will have a significant impact on how a protocol performs
 - Especially true on the client!
 - CIFS server implementation can have dramatic impact (eg refuse oblocks)
 - 3rd party implementers indicate some difficulty implementing from available documentation



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Implementation

- No feature, no matter how powerful, is of any use if not implemented!
- Completeness of implementation is often a reflection of the implementers resources



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Conclusions

- NFS offers a relatively simple to implement protocol which works well over a variety of transports especially in a local LAN environment
 - Works well with
 - Large, sequential files
 - files that do not change a lot
- Stay Tuned for Version 4



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Conclusions - Continued

- CIFS/SMB has the potential be very effective in a variety of environments where the implementations are sufficient to take advantage of it's more advanced features.
 - Works especially well
 - high latency environments
 - situations where the sensitivity to file change is high



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