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Hummingbird NFS Maestro = NFSv4

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About Hummingbird Ltd.

- Over fifteen years of experience developing enterprise software solutions
- 75% of F500 & 90% of F100 are customers
- 5.5 million users worldwide
- Sales and support in over 50 countries
- 1400 employees worldwide
- Wide range of connectivity solutions that include NFS Client, Server and Gateway

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What does the NFS protocol offer the Windows world?

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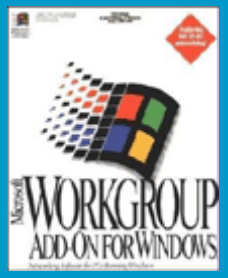
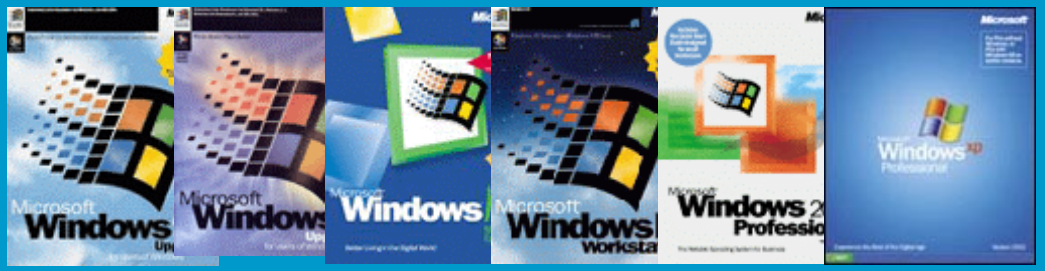
PC evolution

- DOS…
- 16-bit…
- 32-bit…
- 64-bit…





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The History

- History of NFS in PC environment
  - The first PC NFS was released in 1986 by SUN
  - The first Beame & Whiteside NFS implementation for DOS was available in 1989
- NFS has been the de facto protocol for network interoperability for decades

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NFSv3 on Windows

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Integrate NFSv3 into Windows

- PC NFS needs to integrate seamlessly into Windows
- However, NFSv3 was designed for UNIX
- Extra effort is required to implement NFSv3 on Windows

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The Challenges

- File attributes
- User Name Space
- File Locking
- ACLs

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File Attributes

- Limited number of file attributes
  - Windows has
    - Hidden, System, Read-Only, Archive etc.
  - UNIX has
    - Read, Write, Execute, Sticky-bit, Set UID, Set GID.
- The attributes do not match one to one between Windows and UNIX

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User Name Space

- Windows does not have the concept of UID/GID. It uses a different method to uniquely identify a user (SID)
- Windows does not natively have NIS and NIS+. LDAP has just been recently added.

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File Locking

- Not fully compatible with Windows file locking semantics (Mandatory vs. Advisory)
- Mapping NFS file locking attributes to local file system can be problematic

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ACLs

- UNIX had proprietary ACL implementations that were a non-standard add-on to NFSv3
- Windows advanced ACL implementation could not be easily utilized

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Here comes … NFSv4

- NFSv4 fits better with the Windows file system model than the previous versions of NFS
- A more complete, more integrated network file system is now possible!

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NFSv4 on Windows

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NFSv4: The answer to the Challenges

- NFSv4 is designed to be less UNIX-centric than previous versions of NFS
- A "state" protocol provides better integration with Windows

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File Attributes

- Many more file attributes are available to closely match those of Windows
- Named attributes is a feature of native Windows file system

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User Name Space

- NFSv4 uses a much more generic user name space which is friendlier to Windows

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File Locking

- The new locking mechanism is lease-based
- The file sharing and mandatory locking are part of the protocol

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ACLs

- NFSv4 has integrated ACLs
- These can now be mapped directly to Windows ACLs

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New Features of NFSv4

- NFSv4 gives us additional enhancements that we can take advantage of in Windows:
  - Integrated Security
  - Performance
  - Delegation
  - Migration and Replication

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Integrated Security

- RPCSEC_GSS (Kerberos v5) integrated with Microsoft SSPI and Microsoft Active Directory

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Performance

- Aggressive client caching
- **compound** operation

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Delegation

- Ability to implement opportunistic locks features that are native to Windows

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Migration and Replication

- Offer Windows users advanced file system capabilities
  - High-availability
  - Load-balancing

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Our Implementation

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Hummingbird NFS Maestro Family

- NFS Maestro Client™/Solo™
  - NFS Maestro Solo/Client are the first Windows 2000 certified PC NFS solution that provide file and printer accessibility from Windows to NFS servers
- NFS Maestro Server™
  - NFS Maestro Server permits NFS clients to access Windows XP/2000/NT resources across the network
- NFS Maestro Gateway™
  - NFS Maestro Gateway is a proxy between the NFS and SMB networks, it provides centralized and controlled access for occasional NFS users

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What is in NFS Maestro V8.0

- Pseudo File System
- Security (Kerberos v5)
- User Name Space
- ACLs
- Extended and Named Attributes
- Crash Recovery

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Under development

- Delegation
- LIPKEY
- Migration and Replication

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NFSv4 is the Future