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# Data ONTAP Server-side-Copy

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# Outline

- We implemented a Server-side-Copy with additions from Space reservation draft in 2010
  - Prototype based on [draft-lentini-nfsv4-server-side-copy-06](#) & [draft-iyer-nfsv4-space-reservation-ops-01](#)
  - Extended NFSv4.1
  - Synthetic client implementation
  - Packet parser extensions
- Basic prototype
  - Limited args handling
  - Only full file copy
  - Basic RPC Auth – NULL & UNIX
  - Copy only within the same cluster



# Server Requirements

- We wanted an architecture that can support NFS, SMB & iSCSI
  - SMB, iSCSI also has Server-side-Copy
  - Support space-reservation semantics
  - Build on the top of Cluster architecture
  - Copy Engines to perform copy – same volume, across volumes, same node, across nodes, etc.
  - Support Intra-cluster copy only



# Server Solution

- Implementation based on the latest draft versions
- Server frontend
  - Server detects the type of Copy
  - Client creates the destination file before triggering copy
    - Copy Engines supporting Protocols without namespace, cannot create files
    - Need Error value to return *“no support for file creation”*
  - Client reserves space
  - Only basic state handling – no preservation of states across data/interface migrations etc.



## Server Solution (contd.)

- Copy Manager
  - Shim Copy Manager for managing copies
  - Support multiple Protocols – different copy models
  - Support multiple Copy Engines
  - Handle Statistics & Flow Control
- Copy Engines
  - Use existing Copy Engines to perform copy for intra-volume, inter-volume, etc.
    - Multiple threads to perform copy in parallel



## Server Solution (contd.)

- Need an option to enforce serial copy so that recovery is easier – just resume Copy again from last-block
- Hole awareness
- Support both Synchronous & Asynchronous copies
- Error handling
  - Any errors during Copy simply implies “***Start Copy Afresh***”



# Client Solution

- Synthetic client to prototype Copy
  - Basic functionality only
  - Creates File before copy
  - Doesn't implement locking/delegation semantics, no delegations taken on source file or destination file
- Wireshark Packet Parser
  - Copy & virtualization XDR incorporated into NFSv4.1



# Example

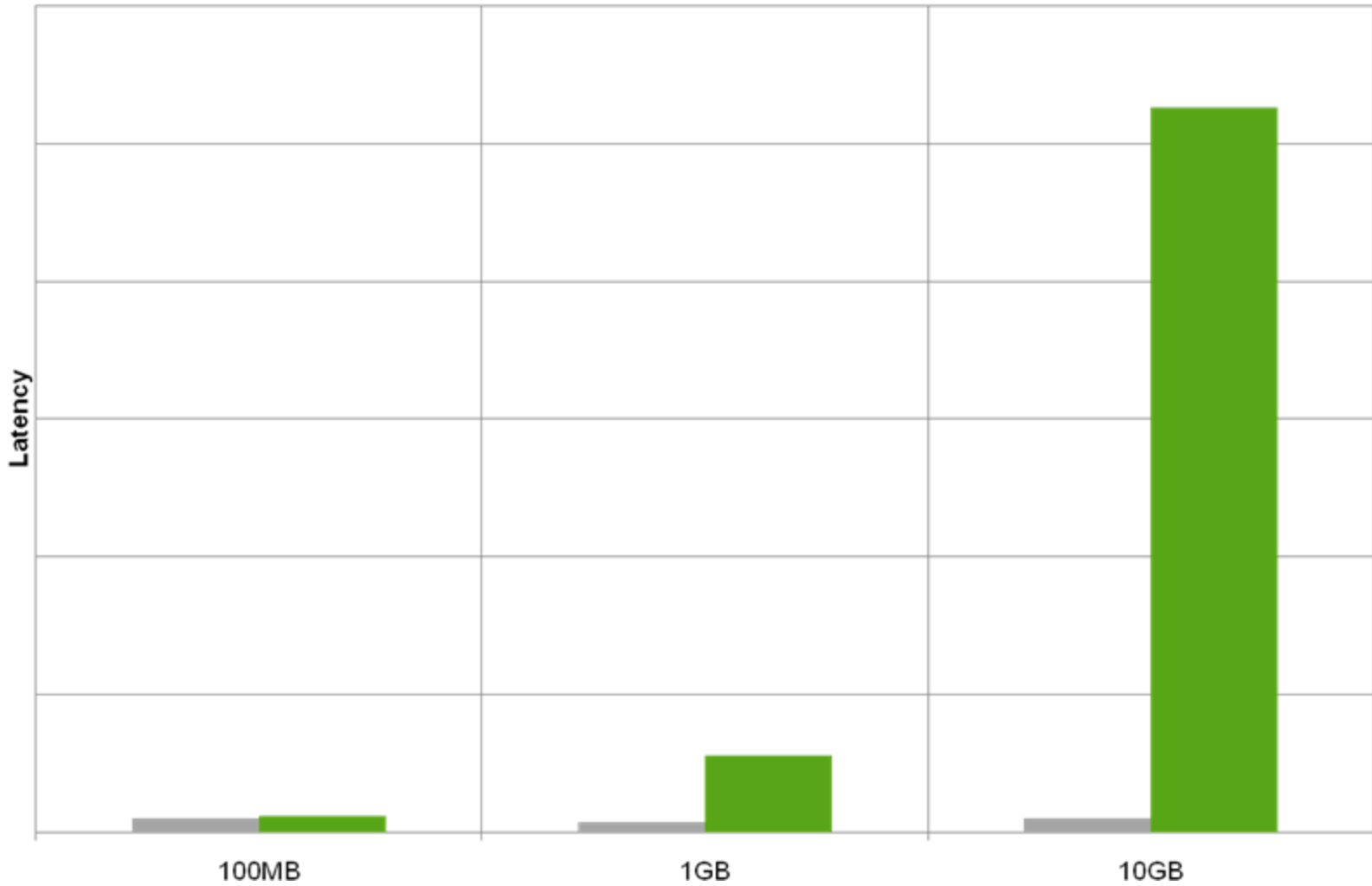
- Demo follows





# Performance (Data ONTAP & Synthetic Client)

■ Server Side Copy (Synchronous)   ■ Traditional Copy (Synchronous)





# Prototype Future

- Implement Sub-file Copy
- Implement Locking/Delegation semantics
- Better Error Handling/Recovery



# Draft Extensions

- Better Argument error handling instead of just NFS4ERR\_INVALID
  - Error codes for handling **netloc4** types
  - Need Error value to return “*no support for file creation*”
- Option to enforce serial copy for easier recovery
- Copying large files in a heterogeneous server environment needs to be considered
  - Consider sub-file delegations
- Attributes to specify Copy functionality

# Questions ?





**Thank you!**