SCSI Extensions
for Network Attached Storage

Network Attached Storage

- There are a number of efforts underway to more directly connect storage devices to networks, NASD (Network Attach Secure Devices), SAN (Storage Area Network), etc.
  - Goals include better scalability, sharing data between systems, and support of heterogeneous systems.
- With network attached storage there is a motivation to migrate access of data on storage devices from block level to object level.
  - Object access is closer to file access protocols than block level access and makes the migration for file server easier.
    - Objects are an extent of data identified by an ID with attributes similar to files.
      - The attributes describe the type of data in the object as well as the normal files attributes such as access rights.
    - An object orientated storage device allocates and manages space.

Network Attached Storage

- **Impact on the SCSI architecture**
  - **Extension of the SCSI architecture is a natural choice.**
    - **The storage devices will still have the management requirements such as device id, format, logging, error policy control, etc.**
      - **If a protocol other than SCSI is selected, all the experience in developing these function will be lost or diminished.**
    - **Object access would be an alternative to logical block and streaming modes.**

SCSI Architecture Extensions

- **Object accessing requires more command information be exchanged than in the current CDB length.**
  - **Estimate of up to 80 bytes, but varies by function, i.e., Open, Read, Write, Close.**
    - **Object IDs (names), longer than LBA**
    - **Transfer length in bytes**
    - **Access offset into the object**
    - **Attributes are associated with the objects (read only, write enable, time stamps, video data, etc.).**
    - **Encryption key**
      - **Some of the access information needs to be secure. The object ID, attributes,etc. would need to be secure for privacy, authorized access, and data integrity.**
      - **Data may not have to be secure. One philosophy is sensitive data will be encrypted at the application.**
    - **Checksum for decryption validation**

SCSI Architecture Extensions

- **The implementation of object access to storage devices needs to preserve execution performance.**
  - **Make efficient use of the interface.**
  - **The SCSI queuing model needs to be preserved.**

Options

- **Possible option 1:**
  - **Define a variable length CDB, possibly up to 128 bytes in length.**
    - **An example would be a read object operation with object ID, transfer length, offset into the object, and attributes.**
    - **Advantages**
      - **All the object information may be transferred in one channel transfer.**
      - **The queuing model is preserved.**
    - **Disadvantages**
      - **Requires a mix of non-encrypted and encrypted information.**
      - **Existing devices may not support.**

Options

- **Possible option 2:**
  - **Maintain the current CDB sizes.**
  - **Transfer the addition information required for an object access in a parameter transfer.**
  - **Allow parameter and data transfers in the same command and in opposite directions.**
    - **A read object operation would involve transferring parameter information to the storage device with the read data returned in the opposite direction.**
    - **Advantages**
      - **Preserves present CDB sizes.**
      - **Preserves the queuing model.**
      - **Separates non-encrypted and encrypted information.**
    - **Disadvantages**
      - **Multiple channel operations are necessary to transfer the information.**
      - **Existing devices may not support.**

Options

- **Possible option 3:**
  - **Use linked commands- transfer the object information in one command with a parameter transfer and send a separate execute the operation.**
    - **Advantages**
      - **May work with existing devices.**
      - **Preserves present CDB sizes.**
      - **Preserves data transfer in only one direction per command.**
    - **Disadvantages**
      - **Linked command support is not uniformly implemented.**
      - **Disables the queue model.**
      - **Multiple channel operations are necessary to transfer the information.**

Options

- **Possible option 4:**
  - **Define a new method for associating commands- transfer the object information in one command and send a separate execute instruction**
    - **Advantages**
      - **Would not be burdened by existing Link command implementations.**
      - **Preserves present CDB sizes.**
      - **Preserves the queuing model.**
      - **Preserves data transfer in only one direction per command.**
    - **Disadvantages**
      - **Multiple channel operations are necessary to transfer the information.**
      - **The association reference may have to be encrypted.**

Options

- **Possible option n:**
  - _____
    _____
    - **Advantages**
      - _____
      - _____
    - **Disadvantages**
      - _____
      - _____