Multi-protocol (SMB-NFS) Access Test Suite

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Why an Multi-protocol Access Test Suite

- **Data Lake – Data integrity is sacrosanct**
  - While each protocol in itself tries to address this they cannot address this mechanism globally.
  - Each protocol has different caching and locking semantics.
  - FS lock manager has to be exercised for all possible scenarios, especially in a multi-node cluster
Requirements

- Extensible framework
  - At least cover SMB2, 2.1, NFSv3 and NFSv4.
  - Extend to HDFS, NDMP, SFTP, ssh, etc.
- Needs an implementation of the above protocols
Test Combinations

- Obvious combinations:
  - Oplock break scenarios
  - Oplock vs Leases and vice versa
  - Oplock vs NFS4 leases and vice versa
  - Oplock vs NFS4 delegation and vice versa
  - SMB Lease vs NFS4 leases and vice versa
  - SMB Lease vs NFS4 delegation and vice versa
Test Combinations

- Less obvious combinations:
  - Oplock vs NFSv4 Open and vice versa.
  - SMB Lease vs NFS4 open and vice versa
  - NFSv3 Read/Write/Access with Oplocks
  - NFSv3 Read/Write/Access with Leases
  - V3 Accesses/Read/Write vs V4 open
Test Combinations

- Additional combinations:
  - SMB3 share access vs NFSv3 read/write
  - SMB3 share access modes vs NFS4 open allow and deny modes and vice versa.
Notable Observations

- Large number of combinations overall
- More possibilities for extension:
  - U-g-o vs ACL
  - File deletion, creation
  - Directory ops
  - Attribute updates/changes
Design Considerations

- The framework contains protocol knowledge
- Assumes resource availability
- Distributed execution
Multi-Protocol Test Suite Architecture
Synchronizer

- Controls the flow between the protocol framework and test xml
- Basic operations:
  - Receive XML input
  - Extract the client information from XML
  - Extract commands from XML
  - Call appropriate interface located at different locations on the network
  - Pass the corresponding XML to the Interface depending upon the Test Case
  - Log the result of each test case
- Calls from Synchronizer to Interface are made through socket communication
XML Parser

- XML input contains the actual SMB/NFS commands that are executed by the client
- Commands are grouped in sets
- Can be extended to contain other protocol commands
- The XML tags have the instructions about which command is to be passed to which client
Interface

- Responsible for:
  - Wrapping protocol client implementation
  - Fetching the result and sending back response to the Synchronizer
  - Sending asynchronous notifications to the synchronizer (required for validation in lock/lease breaking cases)
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<TCS>
  <TC>
    <Desc></Desc>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2Negotiate>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2SessionSetup>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2TreeConnect>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2Create>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="NFS3" server_ip="172.17.54.28" id="2">
      <NFS3Mount>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="NFS3" server_ip="172.17.54.28" id="2">
      <NFS3Access>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="NFS3" server_ip="172.17.54.28" id="2">
      <NFS3Unmount>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2Close>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2TreeDisconnect>
    </CLIENT>
  </TC>
  <TC>
    <CLIENT ip="192.168.205.55" port="5010" protocol="SMB" server_ip="172.17.54.28" id="1">
      <SMB2LOGOFF>
    </CLIENT>
  </TC>
</TCS>
Multi-protocol Test Suite

Questions?