SMB2 and SMB3 in Samba: Durable File Handles and Beyond

sambaXP 2012

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Samba Team / SerNet

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Hi there!

Hey, who are you?...

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Oh, and ...

please interrupt with questions!

SMB2+

- SMB 2.0:
  - durable file handles
- SMB 2.1:
  - multi-credit / large mtu
  - dynamic reauthentication
  - leasing
  - resilient file handles
- SMB 2.2^H^H^H3.0:
  - persistent file handles
  - multi-channel
  - SMB direct (SMB over RDMA)
  - cluster features

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Durable Handles And Samba

- target: short network outages
- client reconnects session (cleanup)
  $\Rightarrow$ need to find old session by session_id
- then reconnects durable handle
  $\Rightarrow$ needs to find file handle by persistent file ID
- multi-process vs threaded: keep files open vs reopen files
- need to serialze state that had been on memory only needs to be serialized
- new structures in samba: smb(2)-layer vs file system (fsa) layer
- Clustering! (ctdb vs SO and CA)

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The Construction Squad ...

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- Stefan Metzmacher
- Michael Adam
- Volker Lendecke
- Christian Ambach
- Gregor Beck
- Björn Baumbach
- + ...

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- mix of SMB and File System (FSA)/POSIX
- proposal:
  - SMB
  - ntfsa vfs layer
  - posix vfs layer as backend
- untangle create call

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writing tests and client libraries

- tests to explore protocol details: use client libraries
- the existing client libraries had a limited functionality and it wasn't possible to test all protocol aspects
- we had 4 completely independed client libraries [smb1, smb2] x [source3, source4] (each with its own problems)
- the solution was to create just one low level library which is able to handle everything (the others are just wrappers now) ⇒ `libcli/smb/smbXcli_base.h`
- we now have a lot of new tests (reauth, multi-credit, multi-channel, durable/persistent handles)
- the tests still use the old interfaces ⇒ TODO: write a higher level protocol independed library for usage in generic tests and client tools

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the current structures in `smbd` (all in memory)

- `struct smbd_server_connection`
  ⇒ transport connection (one process per connection)
- `struct user_struct`
  ⇒ user session (multiple per connection)
- `struct connection_struct`
  ⇒ tree connect (multiple per connection)
- `struct files_struct`
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  ⇒ mostly only for debugging (smbstatus)
- `connections.tdb`
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problems with the current design regarding new features

- The current structures mix the SMB1/2/3 server layer with the filesystem layers
  $\Rightarrow$ `[MS-CIFS], [MS-SMB] and [MS-SMB2]`
  vs.
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cleanup work (gensec)

- backport the gensec code
  (as abstraction layer, but with the old code as implementation)
  ⇒ this makes it possible to use the same authentiation code
  in all places (SMB, RPC, LDAP and other servers)
  (with the help of Andrew Bartlett)
- The SMB1/2 code was simplified a lot
  ⇒ v3-6 vs. master

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new smbXsrv structures and databases

Structures for the SMB1/2/3 server layer are the first step

- `struct smbXsrv_connection` (per transport connection/in memory)
- `struct smbXsrv_session` (per user session/in memory)
  - `struct smbXsrv_session_global` (in `smbXsrv_session_global.tdb` with 32bit index key)
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- `struct smbXsrv_version_global` (smbXsrv_version_global.tdb just one record)
  $\Rightarrow$ an array with version information per node
  $\Rightarrow$ maybe allows rolling code upgrades later

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- dbwrap_record_watch_send()/dbwrap_record_watch_recv() (by Volker Lendecke) ⇒ an easy way to get notified when a tdb record changed
- msg_channel_init(), msg_read_send()/msg_read_recv() (by Volker Lendecke) ⇒ a tevent_req based infrastructure to receive samba internal messages

(Maybe) in future:

- (re)write and unify the source3 and source4 `struct messaging_context` subsystems to have a way all samba components are able to talk to each other
- make IRPC (currently only in source4) available for the whole code base
- make it possible to do `fd passing` via IRPC

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- (re)write and unify the source3 and source4 `struct messaging_context` subsystems to have a way all samba components are able to talk to each other
- make IRPC (currently only in source4) available for the whole code base
- make it possible to do `fd passing` via IRPC

dynamic reauthentication

- with SMB1 and SMB 2.0 reauthentication was designed to only happen when a kerberos ticket expired
  $\Rightarrow$ when the server returns NT_STATUS_USER_SESSION_EXPIRED
- with SMB 2.1 clients, clients can reauthentiate a session at anytime
  $\Rightarrow$ which means we have to implement it.
- implementing dynamic reauth is much eachier using gensec and the new smbXsrv structures
- but it's still not that easy as there might be code that relies on pointers to the previous 'struct auth_session_info' in memory during async operations.

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session reconnect (handling previous_session_id)

- when a client reconnects to a server (after a network problem) it tries to recreate the user sessions, tree connects and (durable) open file handles
- on the SMB2/3 session setup the clients sends the previous_session_id $\Rightarrow$ the server closes all opens on the old session in case the server doesn't noticed the network problem of the client.
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What is already working?

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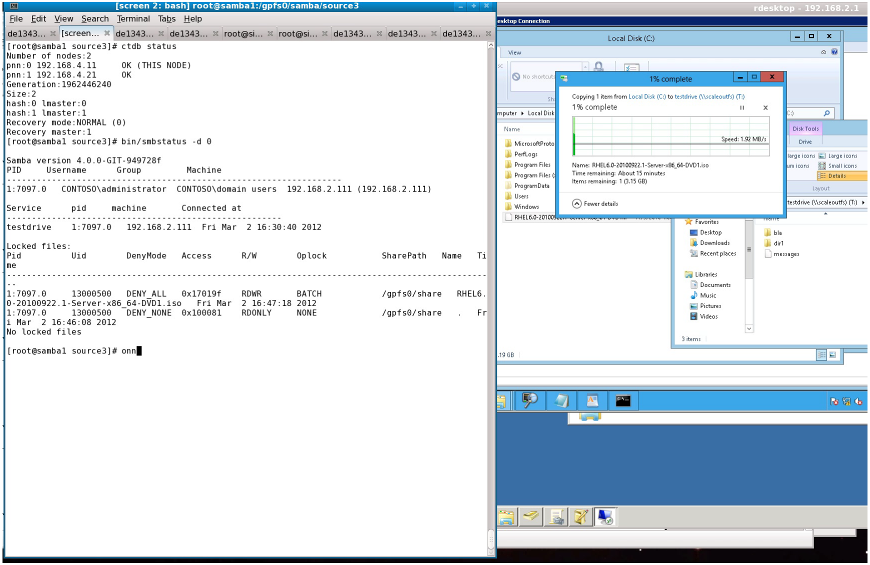

```
[root@sambal source3]# ctdb status
Number of nodes:2
pnn:0 192.168.4.11     OK (THIS NODE)
pnn:1 192.168.4.21     OK
Generation:1962446240
Size:2
hash:0 lmaster:0
hash:1 lmaster:1
Recovery mode:NORMAL (0)
Recovery master:1
[root@sambal source3]# bin/smbstatus -d 0

Samba version 4.0.0-GIT-949728f
PID     Username      Group         Machine
-------------------------------------------------------------------
1:7097.0   CONTOSO\administrator  CONTOSO\domain users  192.168.2.111 (192.168.2.111)

Service      pid     machine       Connected at
-------------------------------------------------------
testdrive    1:7097.0    192.168.2.111  Fri Mar  2 16:30:40 2012

Locked files:
Pid          Uid        DenyMode   Access      R/W        Oplock           SharePath   Name   Ti
me
------------------------------------------------------------------------------------------------
--
1:7097.0     13000500   DENY_ALL   0x17019f    RDWR       BATCH            /gpfs0/share   RHEL6.
0-20100922.1-Server-x86_64-DVD1.iso    Fri Mar  2 16:47:18 2012
1:7097.0     13000500   DENY_NONE  0x100081    RDONLY     NONE             /gpfs0/share   .    Fr
i Mar  2 16:46:08 2012
No locked files

[root@sambal source3]# onn
```

1% complete

Copying 1 item from Local Disk (C:) to testdrive (\\scaleoutfs) (T:)

1% complete

Speed: 1.92 MB/s

Name: RHEL6.0-20100922.1-Server-x86_64-DVD1.iso
Time remaining: About 15 minutes
Items remaining: 1 (3.15 GB)

When will we get it???

When will we get it???

Questions?

`https://wiki.samba.org/index.php/Samba3/SMB2`