Status of SMB2 and SMB3 development in Samba

SDC 2012

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Contents

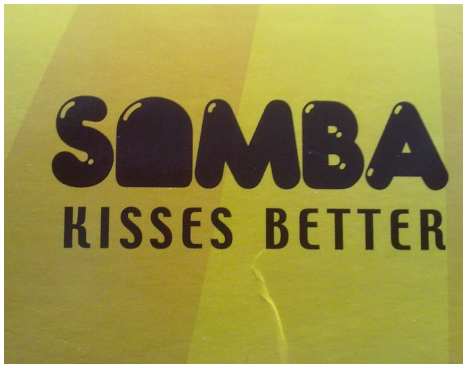
Hi there!

Oh ...

... please interrupt with questions!

Firstly

A couple of introductory words about Samba...

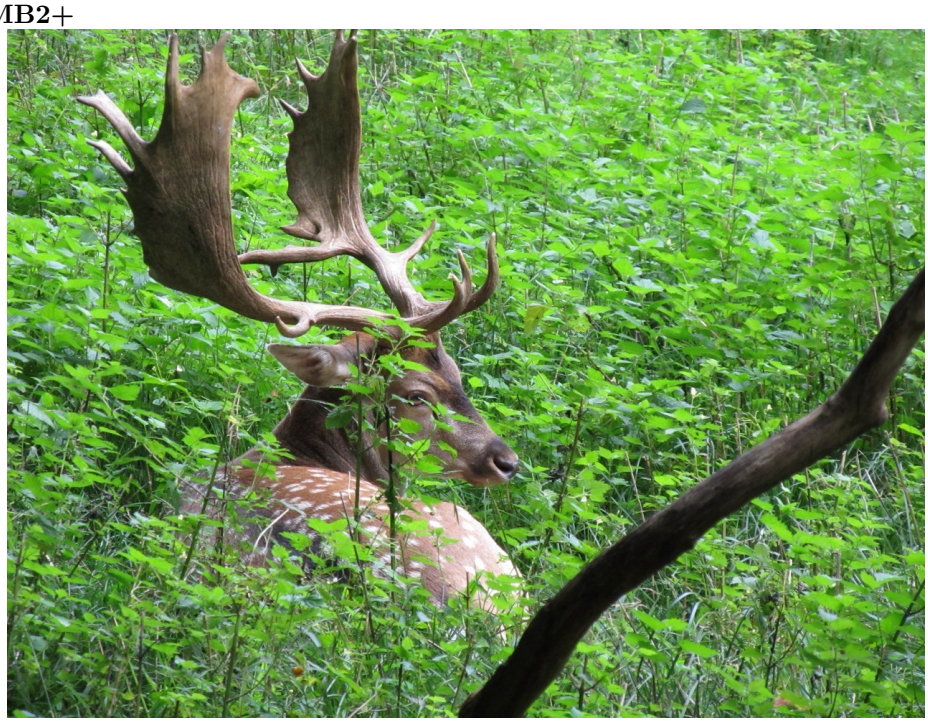


SMB2 in Samba

- Only SMB 2.0 supported in currently released code
- experimental support in version 3.5
- SMB 2.0 officially supported in Samba 3.6

- Missing feature: durable file handles

SMB2+



- SMB 2.0:

  - durable file handles [(almost)DONE]

- SMB 2.1:
  - multi-credit / large mtu [DONE]
  - dynamic reauthentication [DONE]
  - leasing [TODO]
  - resilient file handles [TODO]

- SMB 3.0 (tpfka SMB 2.2):
  - new crypto (sign/encrypt) [DONE]
  - secure negotiation [DONE]
  - durable handles v2 [(almost)DONE]
  - persistent file handles [BEGUN]
  - multi-channel [TODO]
  - SMB direct [TODO]
  - cluster features [TODO]
  - ...

The Construction Squad ...

- Jeremy Allison
- Stefan Metzmacher
- Michael Adam
- Volker Lendecke

- Christian Ambach
- Ira Cooper
- Gregor Beck
- Björn Baumbach
- + ...

Durable Handles


DURABLE
DAS ORIG

- target: short network outages
- client reconnects session (cleanup)
- then reconnects durable handle
- file server keeps disconnected handle open

Durable Handles And Samba


DURABLE
DAS ORIG

- need to find old session by session-ID
- need to find file handle by persistent file ID
- threaded vs. multi-process: keep files open vs. reopen files
- need to **serialize state that had before been in memory only**
- new structures in samba: **separate smb-layer and file system layer**
- ⇒ **foundation for all further SMB2 work**

Preparations: Tests and Client Libraries

- tests to explore protocol details: use client libraries
- *before*: 4 independed client libraries: [smb1, smb2] × [source3, source4] (each incomplete and with its own problems)
- *now*: one low level library for smb1 *and* smb2 (the others are just wrappers now) `libcli/smb/smbXcli_base.h`
- ⇒ we have written a lot of new tests: reauth, multi-credit, multi-channel, durable/persistent handles, ...
- TODO: unify higher level libs to one library used in tests and client

Server: Improve Structures and Protocol Layer Mixup

- Old structures mix SMB1/2/3 layer with filesystem layers. (`[MS-CIFS]` `[MS-SMB]` `[MS-SMB2]`) ↔ `[MS-FSA]` ↔ `SMB_VFS/posix`)

- Problem: structures are used by different layers ⇒ can't be changed easily to fix a problem in just one layer
- plan: split layers:
  - SMB
  - ntfsa vfs layer
  - posix vfs layer as backend

old vs. new structures and dbs

OLD
structures

- `smbd_server_connection`
- `user_struct`
- `connection_struct`
- `files_struct`

databases

- `sessionid.tdb` (smbstatus)
- `connections.tdb` (smbstatus)
- `locking.tdb`
- `brlock.tdb`

NEW
new structures and dbs:

- `smbXsrv_connection`
- `smbXsrv_session smbXsrv_session_global.tdb`
- `smbXsrv_tcon smbXsrv_tcon_global.tdb`
- `smbXsrv_open smbXsrv_open_global.tdb`

moved to VFS:

- connection_struct
- files_struct / locking.tdb

gone:

- sesionid.tdb, connections.tdb

Low Hanging Fruit

LHF1: session reconnect (SMB 2.0)

- when a SMB2 client reconnects to a server (after a network problem) it tries to recreate the user sessions, tree connects and durable open file handles
- SMB2/3 session setup: clients sends **previous_session_id** ⇒ the server closes all opens on the old session in case the server didn't notice the network problem of the client.
- implementation in samba was relatively easy using the new smbXsrv structures and the new helpers

LHF2: dynamic reauthentication (SMB 2.1)

- SMB1 and SMB 2.0: reauthentication was designed to only happen when a kerberos ticket expired ⇒ when the server returns NT_STATUS_USER_SESSION_EXPIRED
- SMB 2.1: clients can reauthentiate a session at anytime ⇒ we *have* to implement it. (The **one** missing mandatory feature for SMB 2.1.)
- implementation was made relatively easy by new gensec-based session setup code and the new smbXsrv structures

LHF3: multi-credit (SMB2.1)

- Reduce number of SMB2 packets by allowing multiple *credits* to be consumed for large reads/writes.
- Implementation was also relatively easy and straight forward with the new smbXsrv architecture.

Durable Handles - smbXsrv extensions

`git show 5e63494508ade5da00ad5ab9db139efe03d39c2e`

```
diff --git a/source3/librpc/idl/smbXsrv.idl b/source3/librpc/idl/smbXsrv.idl
index 90572e5..2a6d7b3 100644
--- a/source3/librpc/idl/smbXsrv.idl
+++ b/source3/librpc/idl/smbXsrv.idl
@@ -267,12 +268,19 @@ interface smbXsrv
                hyper                   open_volatile_id;
                dom_sid                 open_owner;
                NTTIME                  open_time;
+               GUID                    create_guid;
+               GUID                    client_guid;
+               GUID                    app_instance_id;
                /* ... */
+               NTTIME                  disconnect_time;
+               uint32                  durable_timeout_msec;
+               boolean8                durable;
+               DATA_BLOB               backend_cookie;
        } smbXsrv_open_global0;
```

Durable Handles - VFS interface

New VFS operations for durable handles

- `SMB_VFS_DURABLE_COOKIE()` called from the DHnQ / DH2Q create call
- `SMB_VFS_DURABLE_DISCONNECT()` called when a client is disconnected ("shutdown close")
- `SMB_VFS_DURABLE_RECONNECT()` called from the durable reconnect call (DHnC / DH2C create)

Durable Handles - VFS default implementation

from `source3/librpc/idl/open_files.idl`**:**

```
typedef [public] struct {
      [value(VFS_DEFAULT_DURABLE_COOKIE_MAGIC),charset(DOS)] \
              uint8 magic[0x30];
      [value(VFS_DEFAULT_DURABLE_COOKIE_VERSION)] uint32 version;
      boolean8 allow_reconnect;
      file_id id;
      [string,charset(UTF8)] char servicepath;
      [string,charset(UTF8)] char base_name;
      hyper initial_allocation_size;
      hyper position_information;
} vfs_default_durable_cookie;
```

Durable Handles - Where are we?


DURABLE
DAS ORIG

- DONE (Samba 4.0.0rc1):
  - basic smbXsrv infrastructure
  - session reconnect
  - durable open: v1 and v2
  - durable reconnect: v1 and v2 with reopening files
- LIMITATIONS:
  - no interop yet:
  - ⇒ disabled when "posix locking = yes"
  - ⇒ disabled when "kernel oplocks = yes"
  - ⇒ disabled when "kernel share modes = yes"
  - no reconnect for delete-on-close

Durable Handles - TODOs


DURABLE
DAS ORIG

- fully implement scavenger mechanism
- delete on close handling
- keep track of write time
- interoperability:
  - keep handle open, use fd-passing
  - create Linux kernel interface for cookie/disconnect/reconnect
- cluster improvements ...

SMB3 - Clustering

- SMB 3.0 / Windows 8:
  - client is fully aware of clustering
  - scale out (SO) shares
  - continuously available (CA) shares
- Samba:
  - CTDB all-active clustering
  - Windows client is unaware of clustering
- TODOs (durable/persistent):
  - node failure/smbd crash?
  - replay/retry
  - channel sequence number
  - application instance ID

SMB3 - Persistent Handles

we got:

- Hacked/faked proof of concept

we need:

- really implement CA share ($\leftrightarrow$ ctdb)
- implement server side of replay/retry
- provide guarantees associated with persistence, e.g.
- store more info, *persistently*, to survive server reboot
- *need* kernel interface (cookie) to keep files open

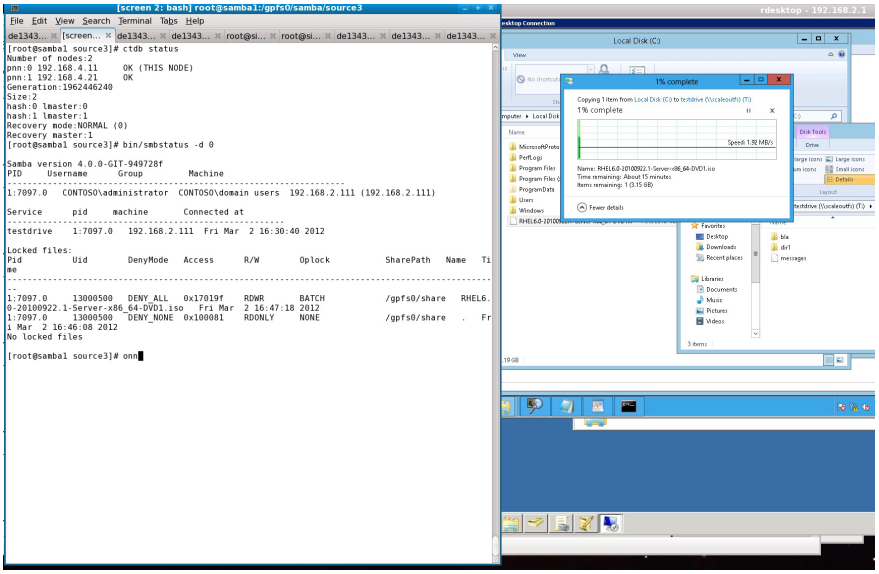
SMB3 - Multi Channel

- foundation laid in the smbXsrv structures
- will *need* kernel (cookie) interface to reopen file
- need to implement interface discovery

SMB3 - SMB direct (RDMA)

- Research using iwarp started (Metze)

What is already working? - DEMO



Summary for Samba 4.0

- Samba 4.0.0rc1 released on 2012-09-13
- Samba 4.0.0 late this year (?!)
- SMB 3.0 as default
- basic durable handle support
- multi credit
- reauthentication
- SMB3 signing/encryption

Questions?