redhat

Joining a domain the windows way

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Joining before Samba 3.2

- `net rpc join` and `net ads join` implement all join code in the “net” binary monolithically
- Configuration must always have been set appropriately before the join
- 3rd party applications could just do upcalls to the “net” binary, and in case of error, parse stdout return
- We wanted to change this and provide something better

New Joining methods in Samba 3.2

- Support for joining Windows 2008
- Internal library libnetjoin
- Shared library offering a "`NetJoinDomain`" call
- Ability to join with an empty configuration file
- Ability to join remotely
- Ability to be joined remotely
- Example gtk GUI for joining

Joining with an (almost) empty smb.conf

- Samba 3.2 has a new `libsmbconf` internal interface
- Provides read/write access for storing Samba configuration in the local samba registry
- Frontend Samba: `net conf`
- Frontend Windows: `regedit.exe`
- Based on this `libsmbconf`, libnetjoin can join a client with a minimal smb.conf file:

```
[global]
        config backend = registry
```

Live Demo

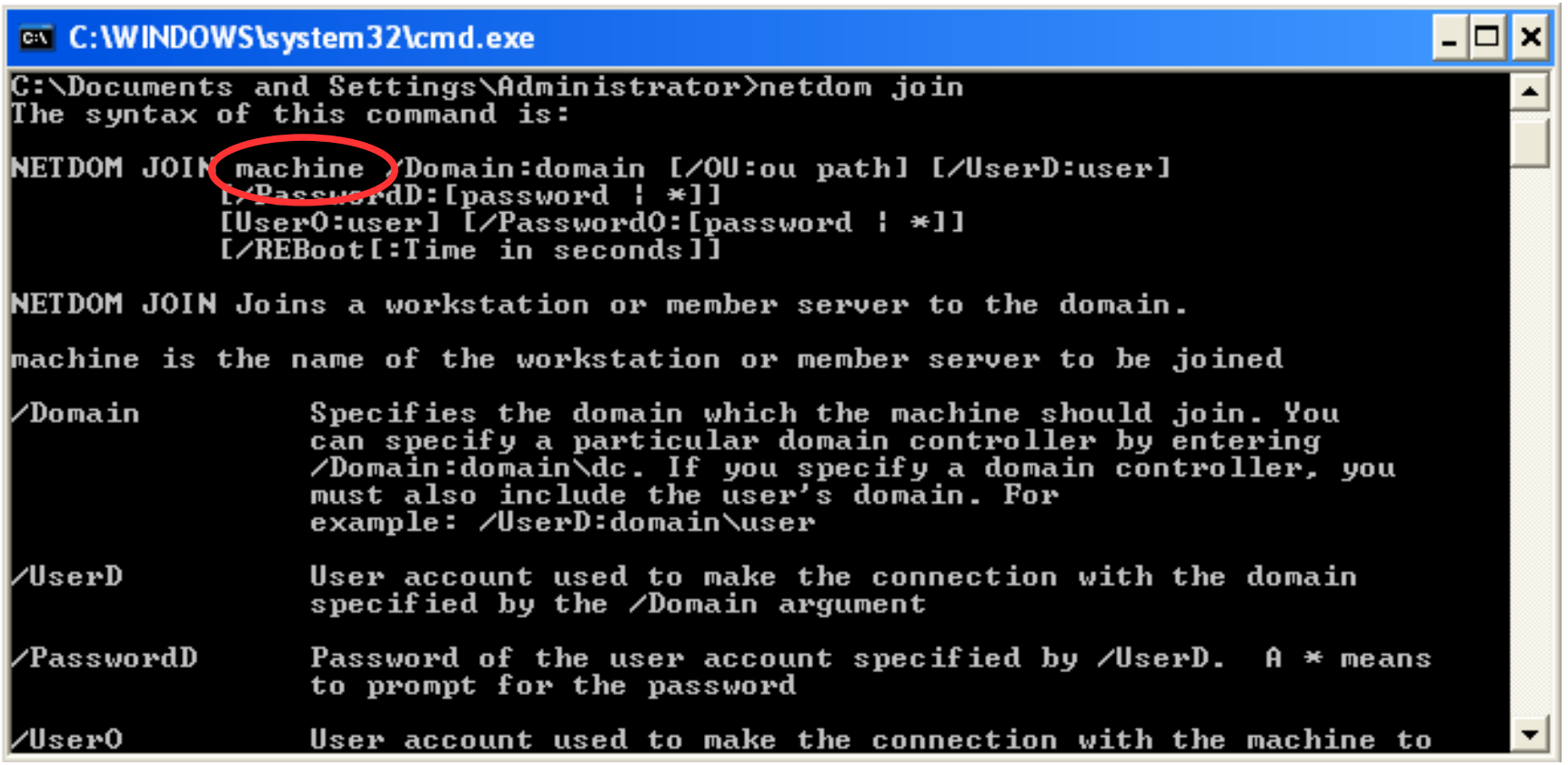
net ads join
&
“config backend = registry”

Joining and Unjoining on Windows ?

- Joining using the gui
- Joining using the command line “netdom join”

Windows netdom join tool

- Windows can join the local or a ***remote*** host to a domain



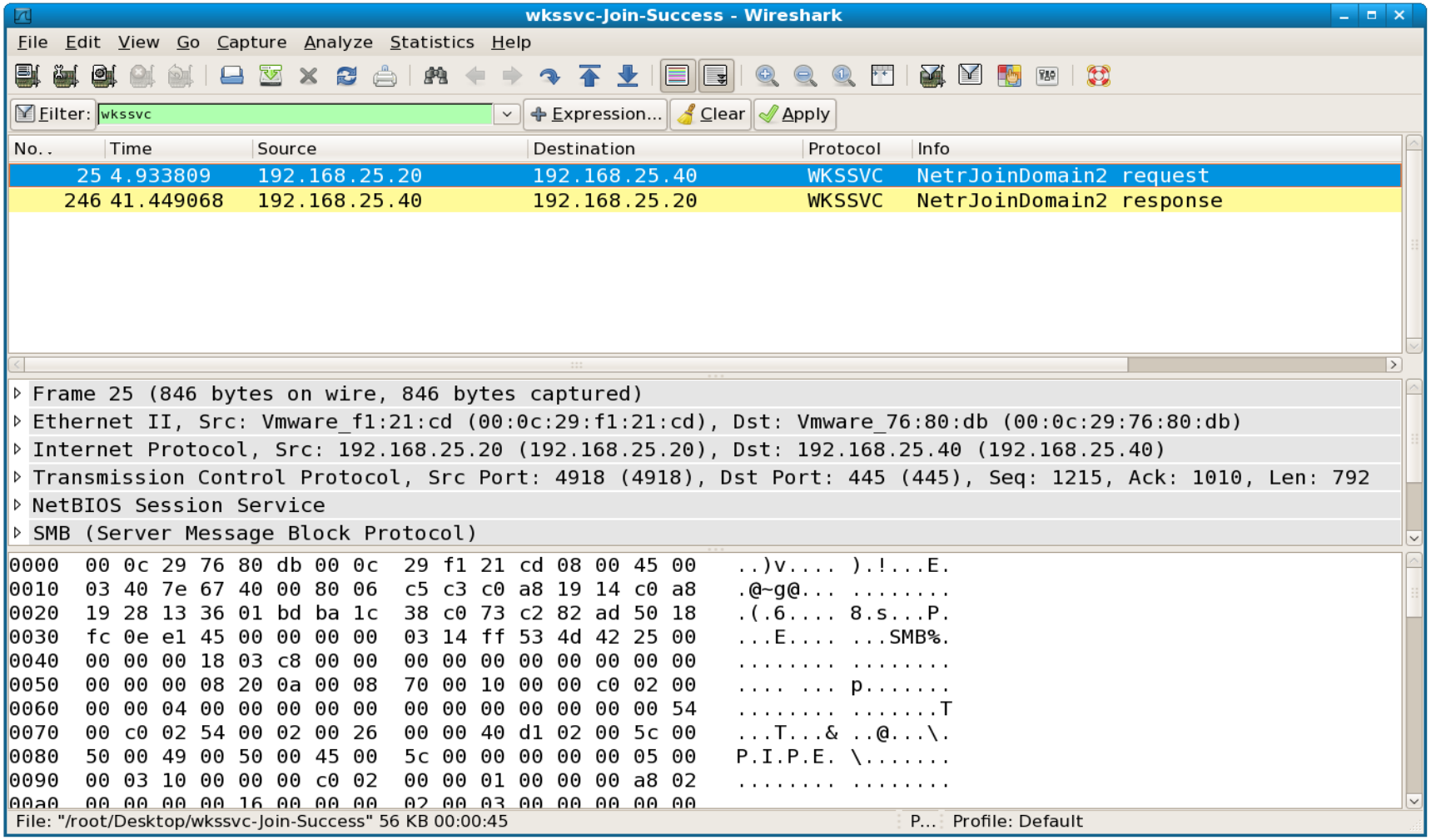
Windows netdom join tool

- At that time there was no documentation available
- We wanted to know:
- How does this actually work?
- How are admin credentials transfered to the remote computer?
- What crypto is being used for this?
- What does that command trigger on the remote computer ?
- And once we have all these answers: can we do this as well ?

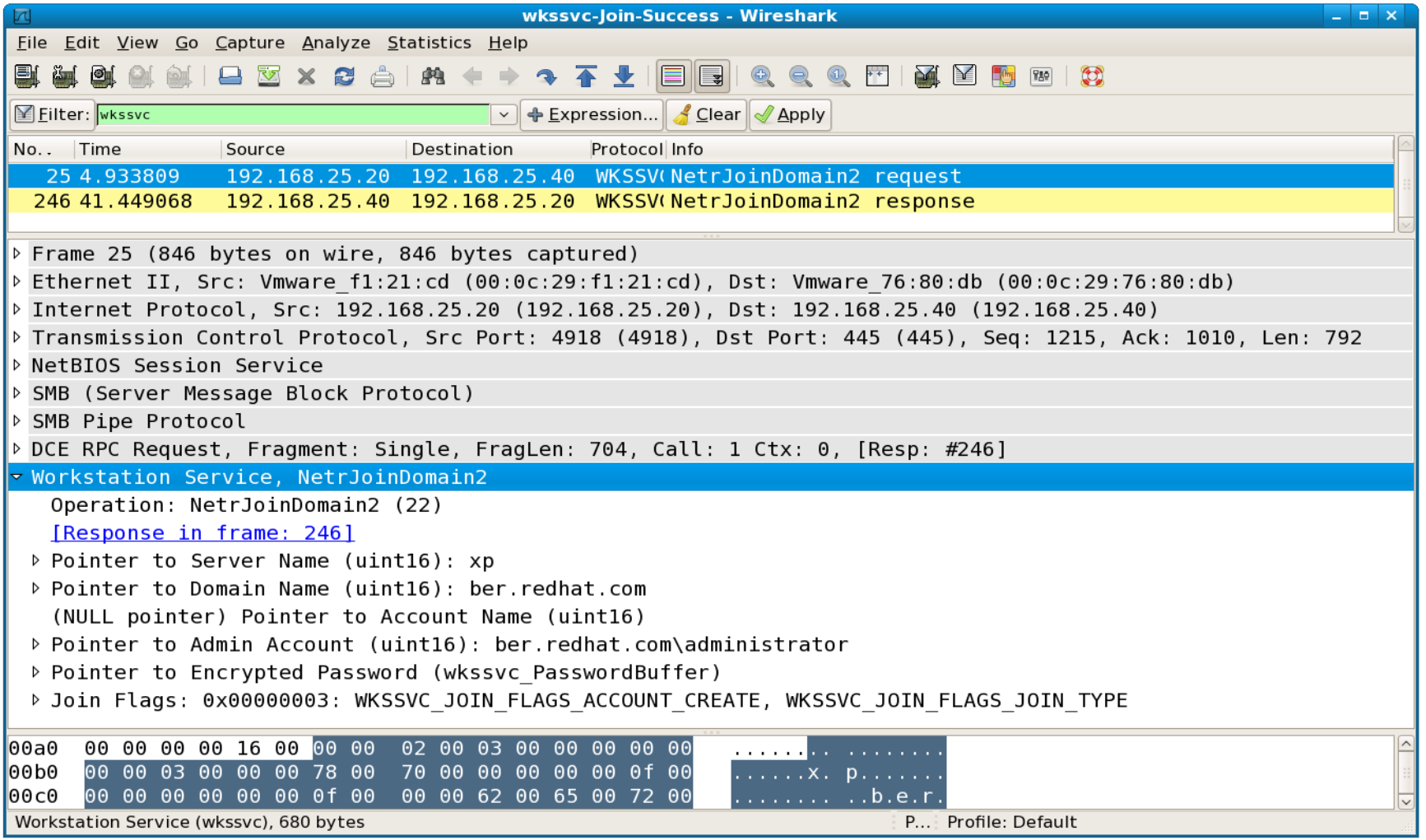
Windows netdom join tool

- Connects to remote computer using current or given credentials
- Opens the remote Workstation Service Named Pipe (`WKSSVC`)
- Calls `NetrJoinDomain2` which transports another set of domain credentials which are used by the remote computer to join the domain
- Also allows to specify Account OU to be joined to
- Once the remote computer receives this request, it gets very active

What NetrJoinDomain2 triggers...



... the mysterious encrypted password



An undocumented 524 byte buffer

- What is the algorithm? Tried all kinds of known and possible combinations using samba4 smbtorture tests
- After some weeks, got WERR_BAD_PASSWORD instead of WERR_LOGON_FAILURE so found the first part of the puzzle
- Final result:
- Cleartext admin password encoded in a 516 byte buffer (like `samr_CryptPassword`)
- 8 byte confounder in front of the 516 byte buffer
- MD5Update *first* called with session_key, *then* with confounder
- Finally encrypted with RC4 using confounded session key

Finding a home for remote domain join

- Samba4 `smbtorture` became able to remotely join clients in a domain
- Long term `smbtorture` was surely not the best place for such a feature
- On Windows NetApi32.lib provides a `NetJoinDomain` call
- The `NetJoinDomain` call looks very similar to `wkssvc_NetrJoinDomain2` as seen on the wire (except the password buffer)
- Started very basic `libnetapi.so` trying to implement this call

`libnetapi` – An API for network management

- Offer similar interface as on windows
- Initially only to support join related calls
- Extended `pidl` version to autogenerate libnetapi based on IDL
- Most calls wrap around rpc call sequences
- Example: `NetUserAdd` on windows calls:
  - `samr_Connect5,`
    `samr_EnumDomains,`
    `samr_LookupDomain,`
    `samr_OpenDomain,`
    `samr_CreateUser2,`
    `samr_QueryUserInfo,`
    `samr_GetUserPwInfo,`
    `samr_SetUserInfo2`

`libnetapi.so` – RPC client library

- Samba 4 IDL based auto-generated rpc client code everywhere
- WKSSVC and WINREG was already done
- migration of LSARPC, SAMR, NETLOGON, DSSETUP and SRVSVC to Samba4 IDL was missing
- Initially only pidl generated *client* was planned but server code needed to be migrated at the same time
- That took some time
- Now fixing or adding new features / infolevels to Samba RPC client or server is much easier

`libnetapi.so` - local vs. remote

- In Windows each Net* call has a `server_name` field as the first argument
- `server_name` is used to distinguish local or remote processing most of the time
- In Samba, local processing could use `LIBSMB_PROG` to talk to the local RPC server.

Implemented calls in libnetapi

- NetJoinDomain
- NetUnjoinDomain
- NetGetJoinInformation
- NetGetJoinableOUs
- NetServerGetInfo
- NetServerSetInfo
- NetGetDCName
- NetGetAnyDCName
- DsGetDcName
- NetUserAdd
- NetUserDel, NetUserEnum, NetQueryDisplayInformation, etc., etc.

NetJoinDomain in netapi.h

- Defined in `netapi.h`
- Very simple call, hides all complexity from the caller
- Does anything required to join the local or a remote computer into a domain
- Admin credentials are given in clear, `NetJoinDomain` takes care of encryption details
- Header:

```
NET_API_STATUS NetJoinDomain(const char * server /* [in] */,
                             const char * domain /* [in] [ref] */,
                             const char * account_ou /* [in] */,
                             const char * account /* [in] */,
                             const char * password /* [in] */,
                             uint32_t join_flags /* [in] */);
```

NetJoinDomain example binaries

- **`netdomjoin` in lib/netapi/examples directory**

```
Usage: netdomjoin hostname
     --ou=ACCOUNT_OU                 Account ou
     --domain=DOMAIN                 Domain name (required)
     --userd=USERNAME                Domain admin account
     --passwordd=PASSWORD            Domain admin password

Help options:
     -?, --help                      Show this help message
     --usage                         Display brief usage message

Common samba netapi example options:
     -U, --user=USERNAME             Username used for connection
     -p, --password=PASSWORD         Password used for connection
     -d, --debuglevel=DEBUGLEVEL     Debuglevel
     -k, --kerberos                  Use Kerberos
```

NetJoinDomain example binaries

- **`net dom join` as a sub command of `net`**

```
usage: net dom join <domain=DOMAIN> <ou=OU> <account=ACCOUNT>
<password=PASSWORD> <reboot>
```

NetJoinDomain locally - libnetjoin

- Needed to abstract all join calls of “net ads join” to make them available outside of the net binary
- Started internal library libnetjoin
- NetJoinDomain calls libnetjoin when server_name is NULL.
- libnetjoin uses IDL for the join and unjoin context

Libnetjoin - input

```
libnet_JoinCtx: struct libnet_JoinCtx
        in: struct libnet_JoinCtx
             dc_name                  : 'w2k3dc-rhber'
             machine_name             : 'MTHELENA'
             domain_name              : *
                  domain_name             : 'BER.REDHAT.COM'
             account_ou               : NULL
             admin_account            : 'administrator'
             admin_password           : 'password'
             machine_password         : NULL
             join_flags               : 0x00000023 (35)
                  0: WKSSVC_JOIN_FLAGS_JOIN_WITH_NEW_NAME
                  0: WKSSVC_JOIN_FLAGS_JOIN_DC_ACCOUNT
                  0: WKSSVC_JOIN_FLAGS_DEFER_SPN
                  0: WKSSVC_JOIN_FLAGS_MACHINE_PWD_PASSED
                  0: WKSSVC_JOIN_FLAGS_JOIN_UNSECURE
                  1: WKSSVC_JOIN_FLAGS_DOMAIN_JOIN_IF_JOINED
                  0: WKSSVC_JOIN_FLAGS_WIN9X_UPGRADE
                  0: WKSSVC_JOIN_FLAGS_ACCOUNT_DELETE
                  1: WKSSVC_JOIN_FLAGS_ACCOUNT_CREATE
                  1: WKSSVC_JOIN_FLAGS_JOIN_TYPE
             os_version               : NULL
             os_name                  : NULL
             create_upn               : 0x00 (0)
             upn                      : NULL
             modify_config            : 0x00 (0)
             ads                      : NULL
             debug                    : 0x01 (1)
             secure_channel_type      : SEC_CHAN_WKSTA (2)
```

Libnetjoin - output

```
libnet_JoinCtx: struct libnet_JoinCtx
        out: struct libnet_JoinCtx
             account_name             : NULL
             netbios_domain_name      : 'BER'
             dns_domain_name          : 'ber.redhat.com'
             dn                       :
                  'CN=mthelena,CN=Computers,DC=ber,DC=redhat,DC=com'
             domain_sid               : *
                  domain_sid              : S-1-5-21-1800104011-1129049609-1243822444
             modified_config          : 0x00 (0)
             error_string             : NULL
             domain_is_ad             : 0x01 (1)
             result                   : WERR_OK
```

Samba 3.2 NetrJoinDomain2 server-side

- Samba 3.2 has also support for remote join and unjoin server side
- Admin credentials need to be provided
- Only members of the Domain Admin and Local Administrators group can call this
- Needs to handle more post-processing
  (local modification, group policy)
- Needs be transaction based

Live Demo

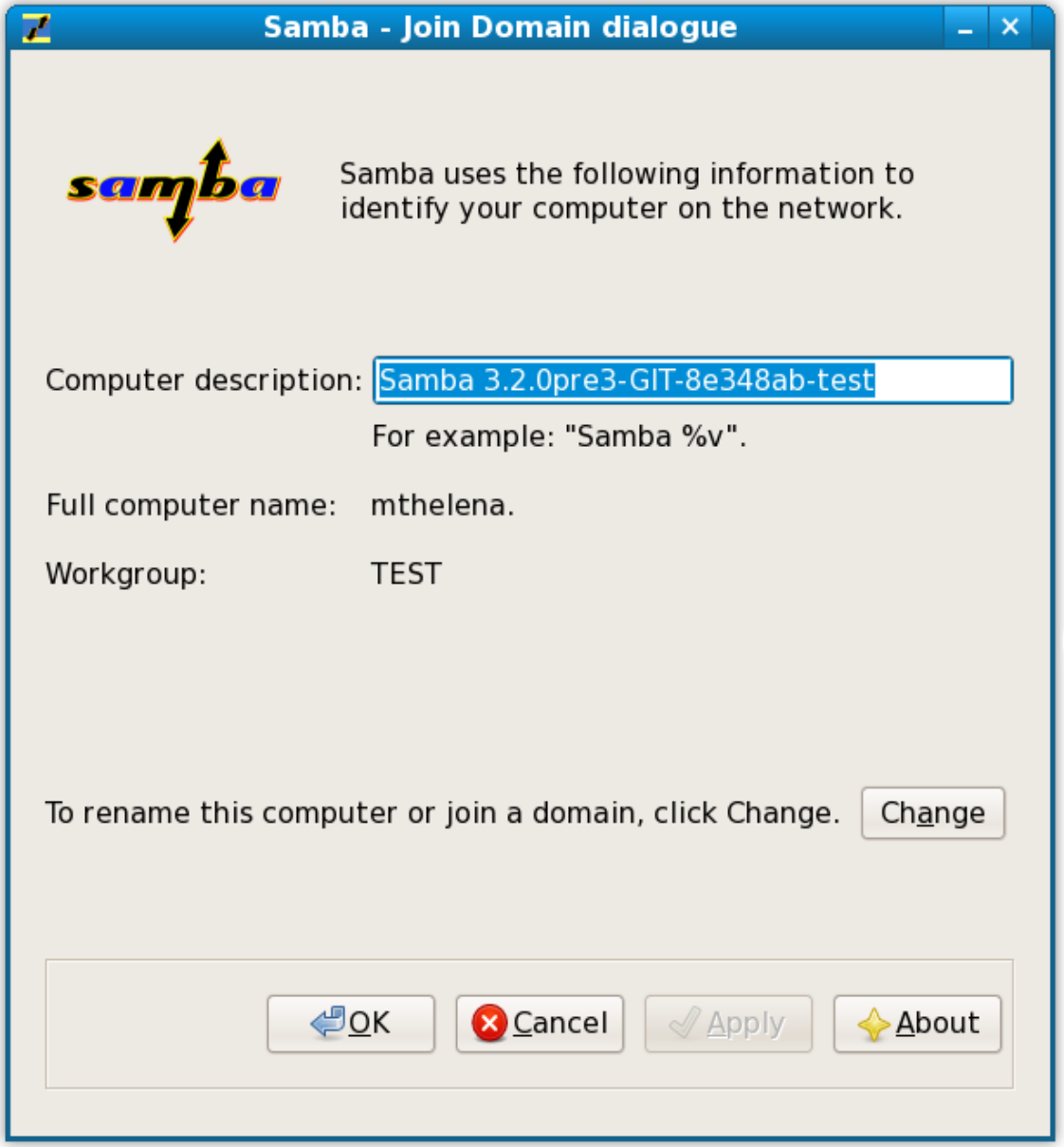
Samba joins XP to W2K3
XP joins Samba to W2K3

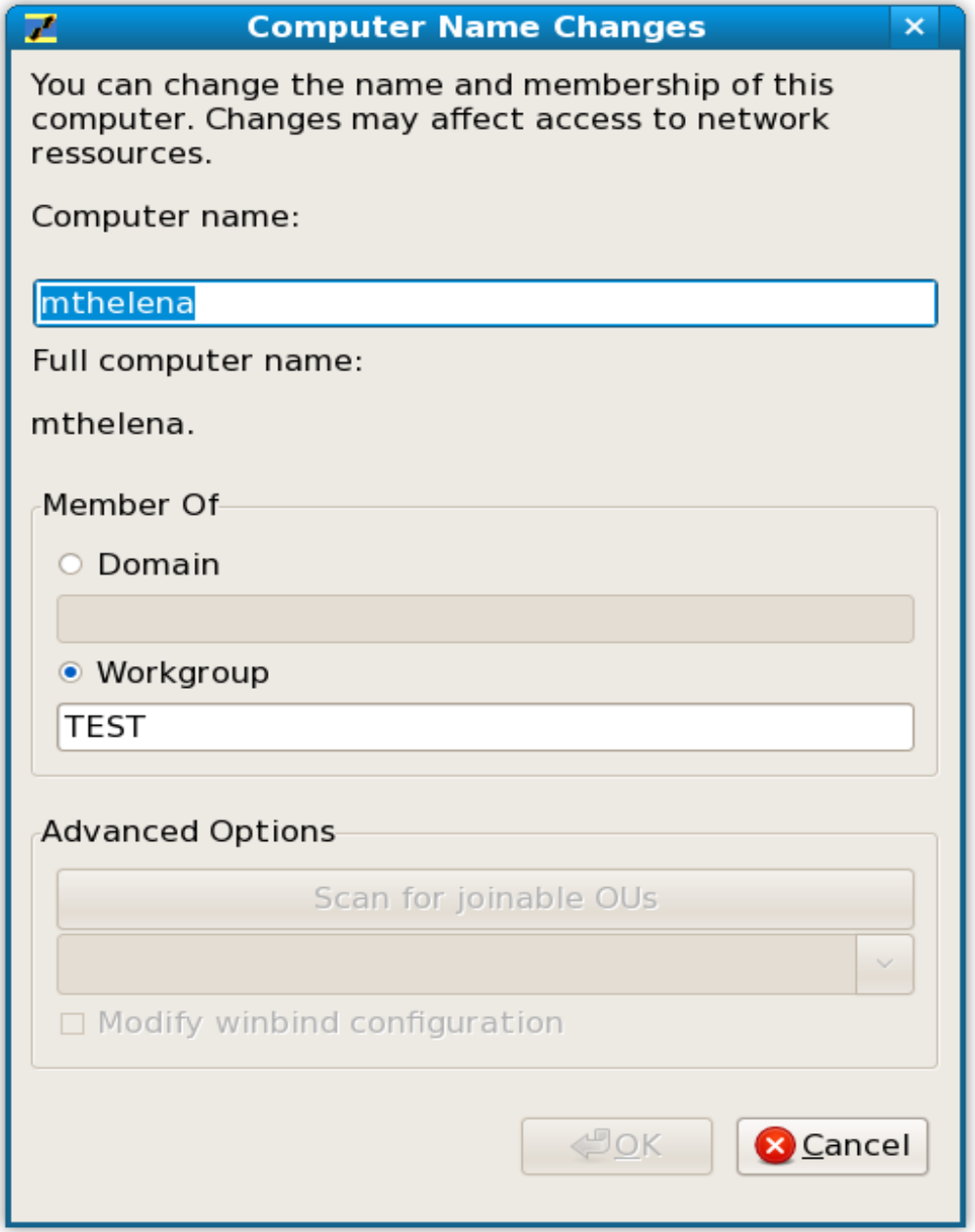
Grow your own...

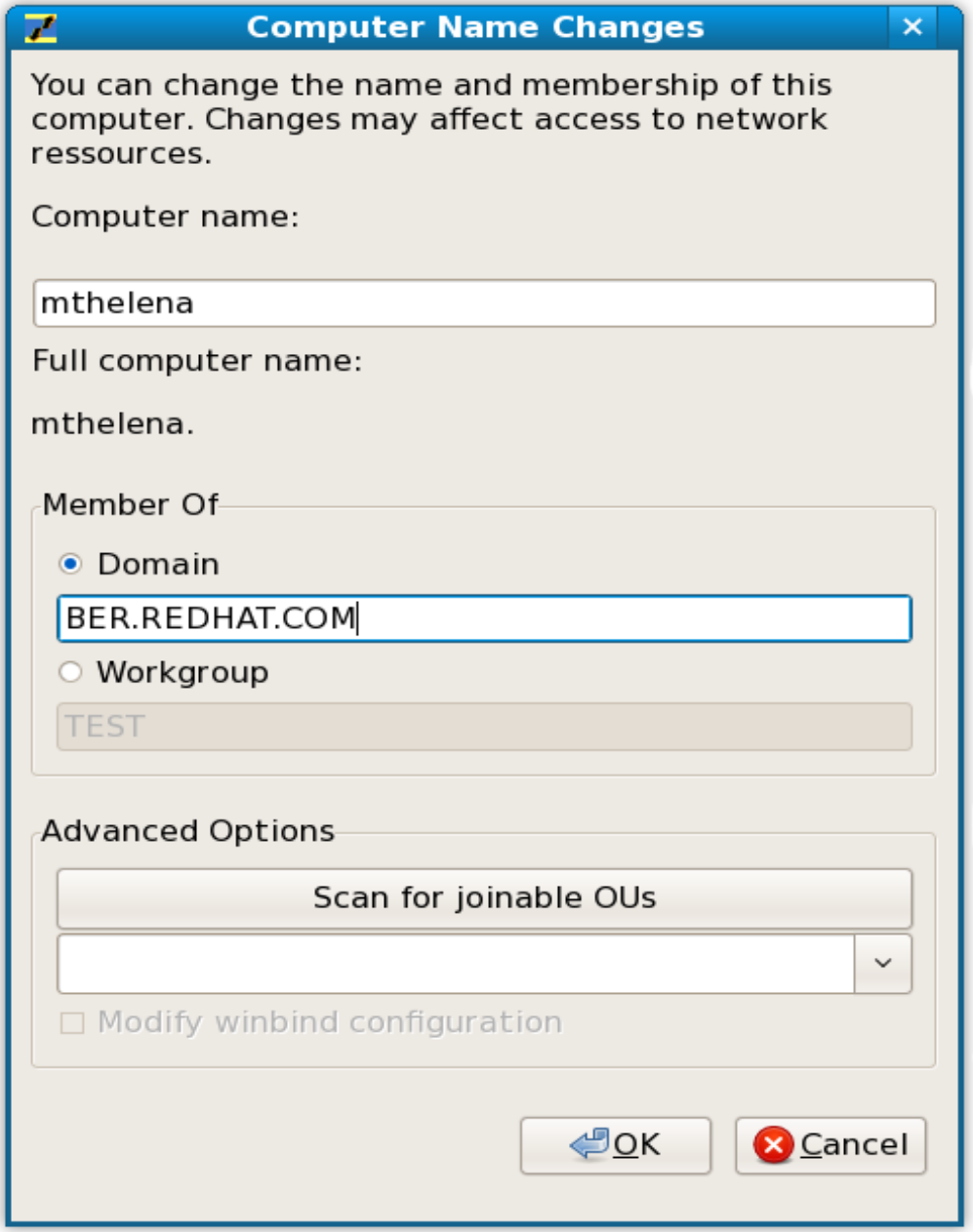
- Now that we had the abstraction in libnetjoin, as well as the abstraction in libnetapi, all kinds of new applications can be written
- One experiment was to offer a Windows-like interface for joining a workstation into a domain
- gtk domainjoin gui in lib/netapi/examples

Live Demo

netdomjoin-gui


Samba - Join Domain dialogue
Samba uses the following information to identify your computer on the network.
Computer description:
Samba 3.2.0pre3-GIT-8e348ab-test
For example: "Samba %v".
Full computer name:
mthelena.
Workgroup:
TEST
To rename this computer or join a domain, click Change.
Change
OK
Cancel
Apply
About


Computer Name Changes
You can change the name and membership of this computer. Changes may affect access to network ressources.
Computer name:
mthelena
Full computer name:
mthelena.
Member Of
Domain
Workgroup
TEST
Advanced Options
Scan for joinable OUs
Modify winbind configuration
OK
Cancel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Advanced Options
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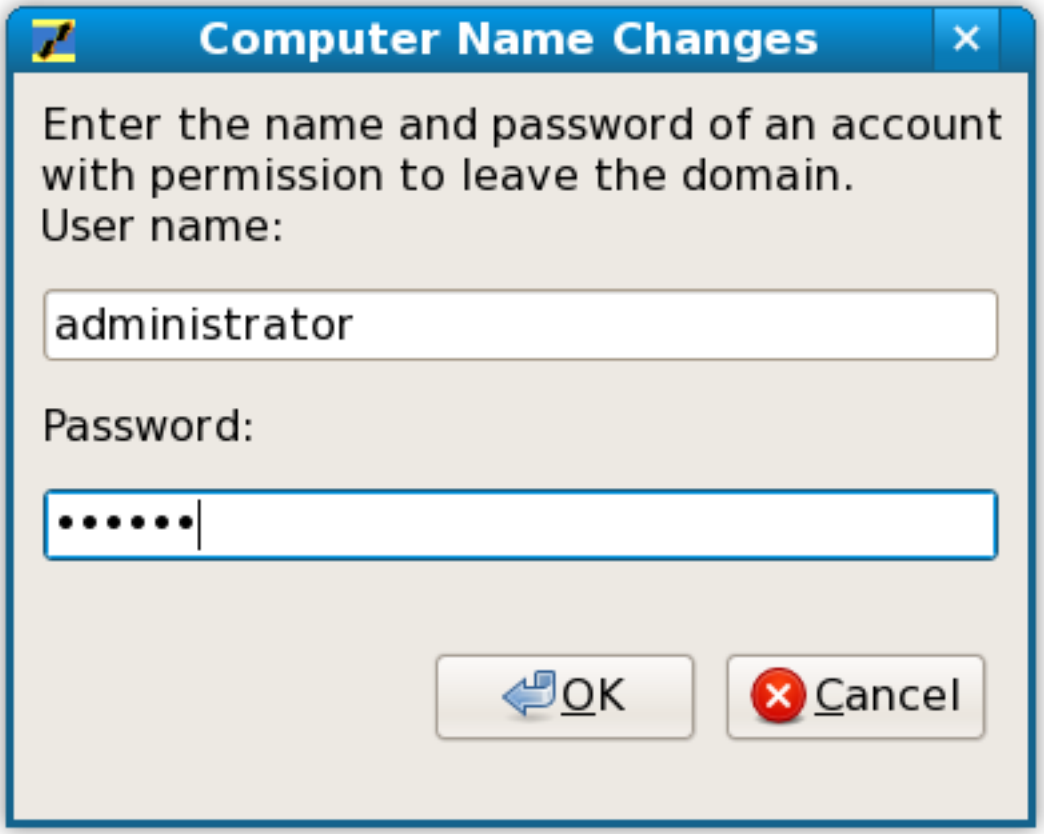
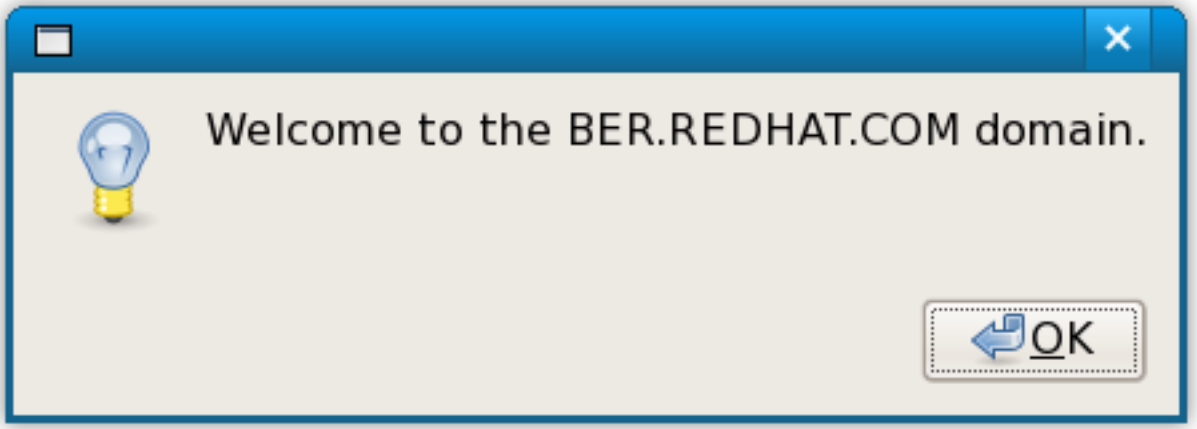
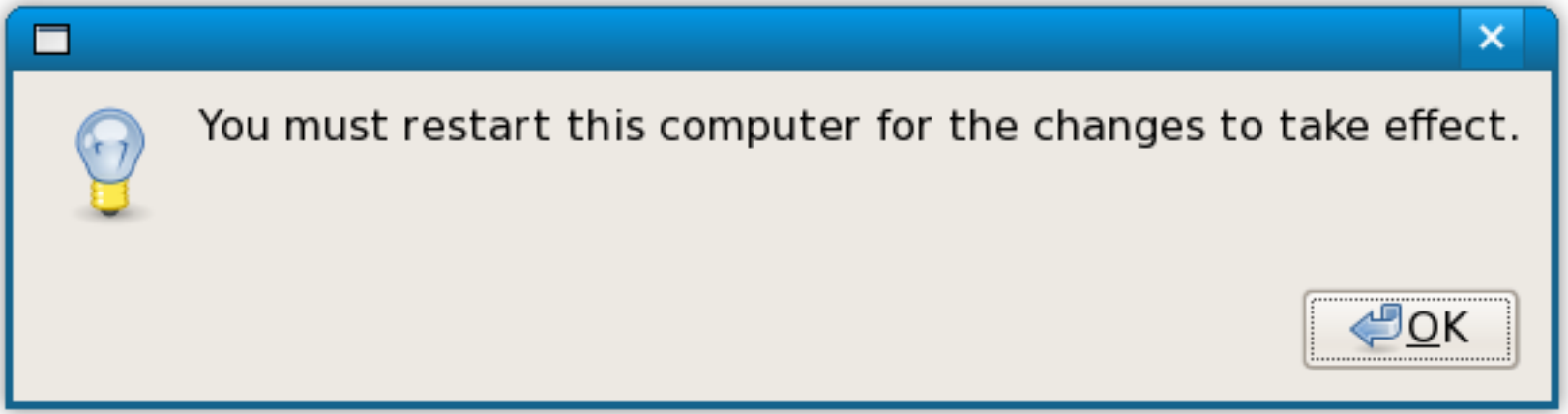

Computer Name Changes
Enter the name and password of an account with permission to leave the domain.
User name:
administrator
Password:
OK
Cancel


Welcome to the BER.REDHAT.COM domain.
OK


You must restart this computer for the changes to take effect.
OK

What's next:

- libnetjoin:
  - joining using vendor extensions (script plugin that vendors use to integrate with local system management frameworks)
  - Set hostname, krb5, ntp, winbind/idmap, nsswitch, pam configuration
  - remote “unsecure” join
- libsmbconf:
  - write support for smb.conf backend in libsmbconf
- libnetapi:
  - make the library less heavyweight
  - python bindings
- start an internal libnet

Thank you for your attention!