Native OpenSolaris CIFS Service

Alan Wright
Sun Microsystems, Inc.
cifs-discuss@opensolaris.org

OpenSolaris CIFS Service

- Why a native CIFS service for Solaris
- Features
- Architecture and Implementation
- Authentication and Access Control
- NDR RPC
- Command Line Enhancements
- Installation and Configuration
- Troubleshooting and Diagnostics
- Where To Get More Information

Why a Native CIFS Service for Solaris

- Ubiquitous multi-protocol file sharing in Windows and/or Solaris environments: A storage operating system
- First Class Solaris Citizen
  - Operating system level integration and coordination
  - Single access control model
  - Native command support for ACLs and attributes
  - Common NFS and CIFS sharing and configuration utilities
- Built-in Windows Interoperability
  - Fundamental support for SIDs and identity mapping
  - Windows-style access control and attributes in the file system
  - Case-insensitive file system operations
- Kernel based implementation
  - Better I/O performance

OpenSolaris CIFS Service Features

- File sharing for Windows, Mac OS and other CIFS clients
  - NetBIOS or TCP/IP (NetBIOS-less, SMB-over-TCP) transport
  - Share management and file operations
  - Packet signing and sealing
  - Integrated mandatory locking
  - File Change Notification
  - Open (share/deny) modes (share reservations)
  - Alternate Data Streams
    - Mac OS resource forks, Solaris extended attributes
  - DOS attributes (Hidden, Read-Only, System, Archive)
- Active Directory dynamically publish shares
- Dynamic DNS dynamically publish DNS entries
- SMB Autohome dynamically share home directories

Authentication and Access Control

- SMB Authentication
  - Domain Accounts
  - Local Users
  - Local Windows groups
    - Support for large group membership
- Access Tokens (Windows credentials)
  - SID (GUID) rather than POSIX UID/GID
  - SIDs in access tokens have attributes
  - Groups can have 1000s of members
  - SIDs in groups have attributes
- Security Descriptors (Superset of ACLs)

Domains and Workgroups

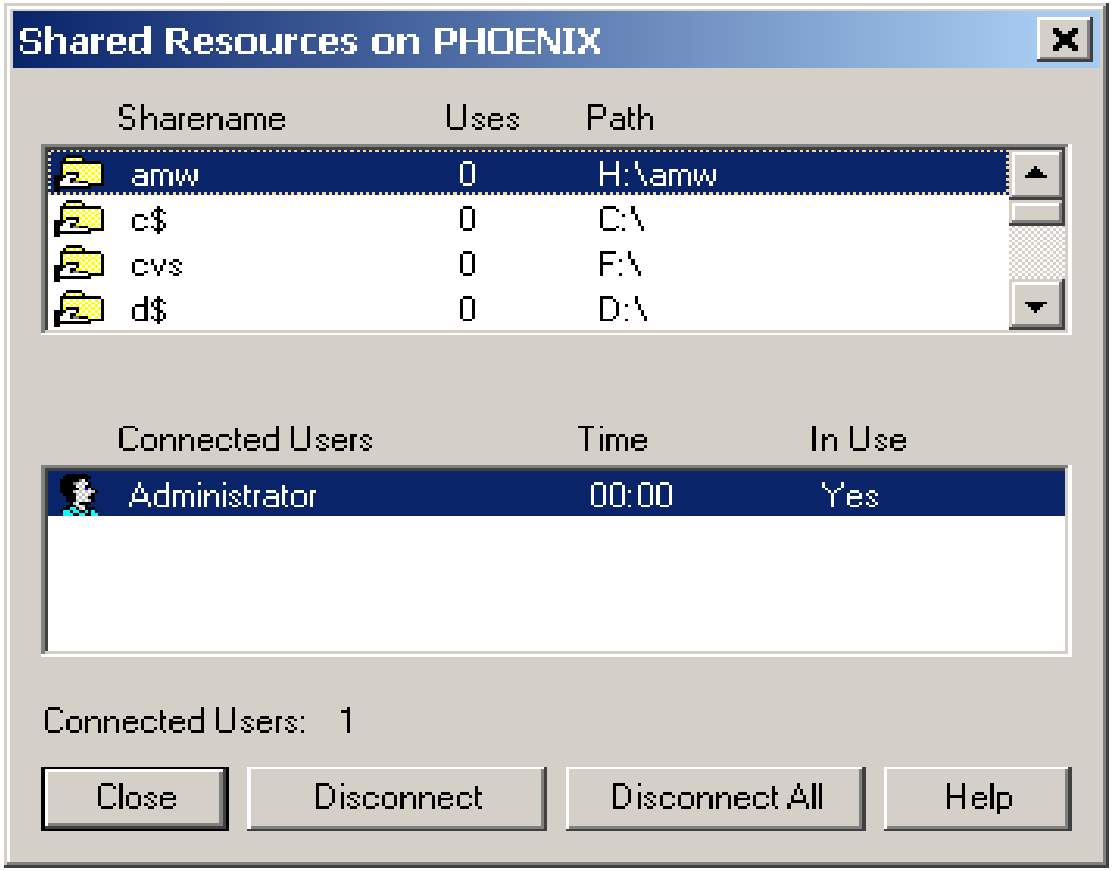
- Windows Domains
  - Centrally administered group of computers and accounts that share a common security and administration policy and database
  - Computer, user and group accounts are centrally managed by domain controllers
  - Computers must join the domain and become domain members
- Windows Workgroups
  - Collection of standalone, independently administered computers
  - Each computer has local user and group accounts, and a security and policy database
  - Computers cooperate through the use of a common workgroup name
  - Peer-to-peer model with no formal membership mechanism

Core MSRPC Services

- Local Security Authority (LSARPC)
  - Remote administration service for policy management of domain, trust, user and group accounts, privileges, and name/SID lookup
- Security Accounts Manager (SAMR)
  - Remote administration service for managing user, group and alias accounts, and name/SID lookup
- NetLogon (NETR)
  - Remote authentication services
  - Authentication with a Domain Controller (DC)
- Workstation Service (WKSSVC)
  - Manages network connections with other computers
- Windows Registry (WINREG)
  - Remote administration interface for the Windows registry

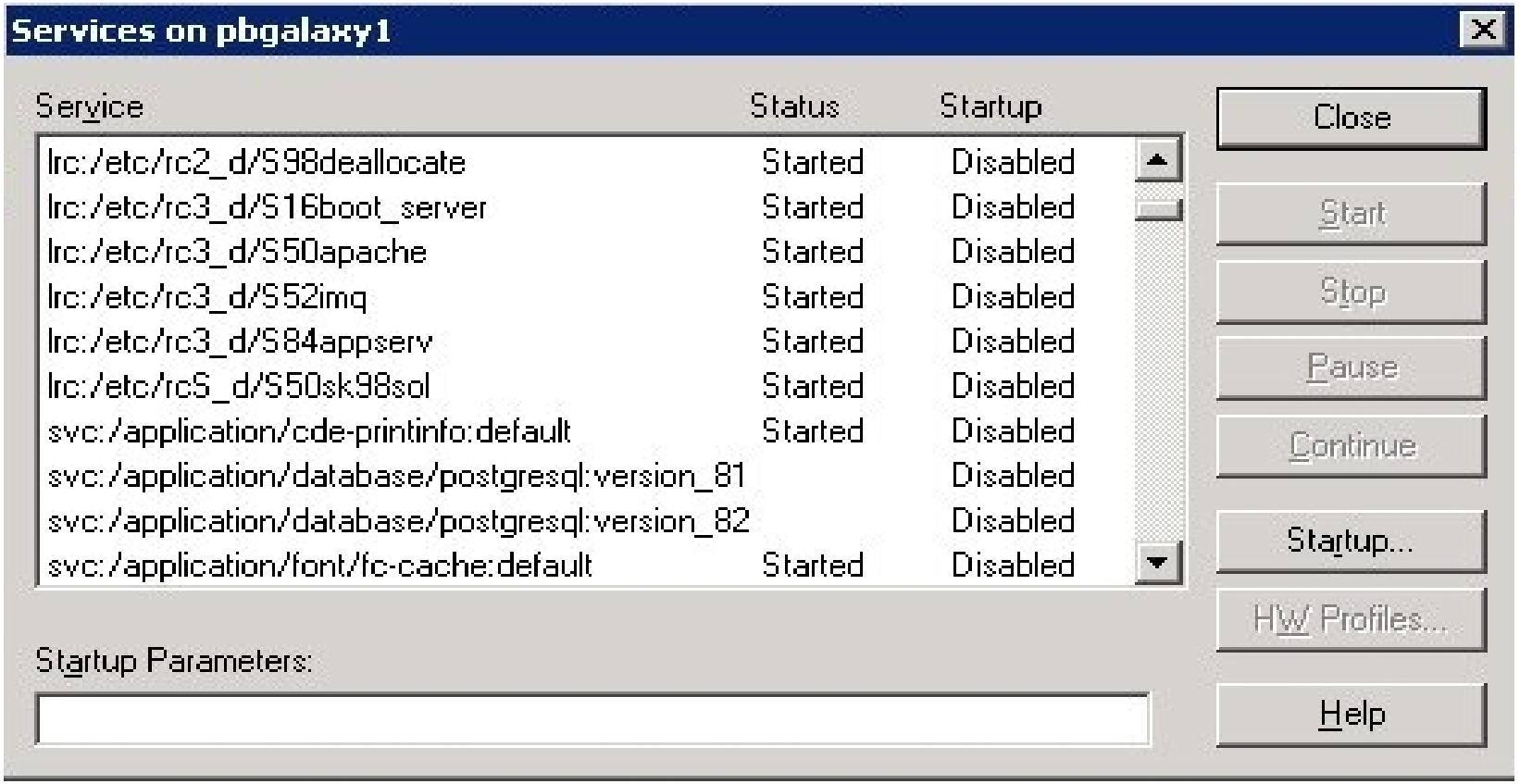
Server Service (SRVSVC)

- Remote administration service for managing servers, sessions, connections, shares, open files etc.

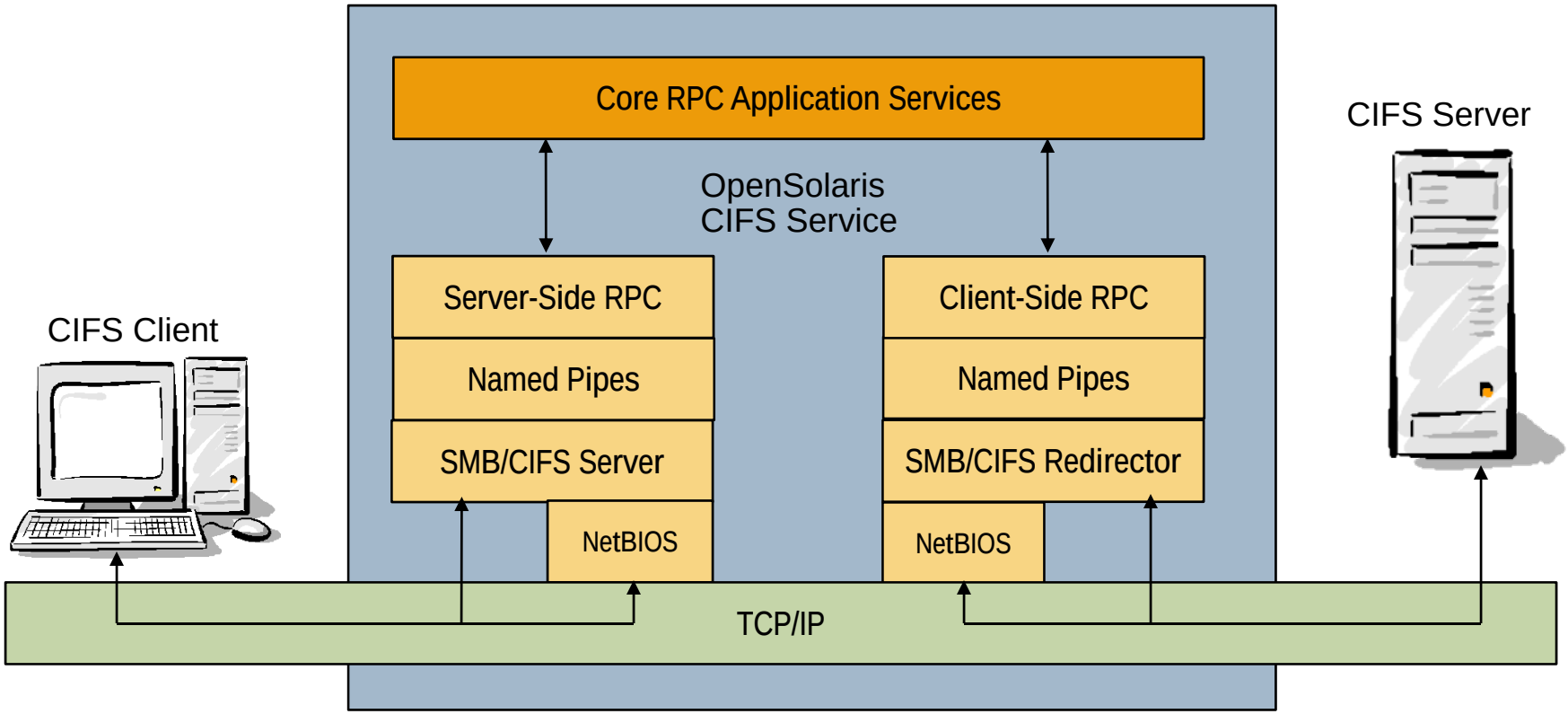


Service Control Service (SVCCTL)

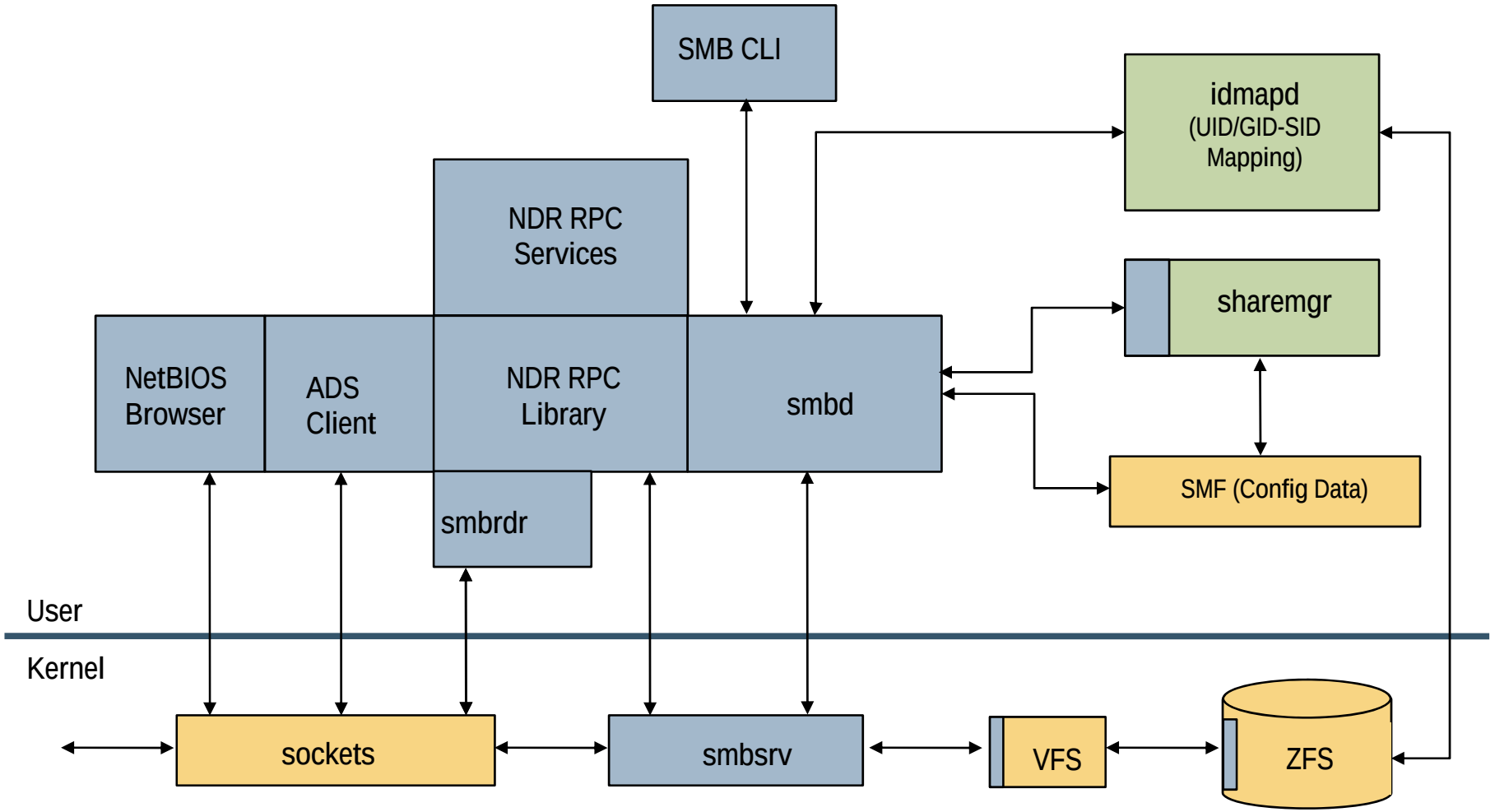
- Remote service management (starting/stopping/configuring services)



OpenSolaris CIFS Service Layers



OpenSolaris CIFS Architecture



Multi-protocol file server features

- Case-sensitive, case-insensitive or mixed datasets
- Unified access control
  - Single ACL model
  - Identity mapping (via Winchester idmapd)
- UTF-8 names on disk
- DOS and system attributes
- Mandatory share reservations (share/deny modes) and range locking
- Client-side caching: CIFS oplock and NFSv4 delegation
- File change notification
- Identity mapping (Winchester idmapd)

Case-Insensitivity

- Required for optimal interoperability with Windows clients
  - Not required by SMB protocol but ...
  - Some Windows applications rely on case-insensitive behavior for correct operation
- ZFS: case-sensitive, case-insensitive and mixed-case modes
  - PSARC 2007/244
  - Default mode is case-sensitive
  - zfs create -o casesensitivity=mixed ...
  - Mixed-mode provides both the expected Windows behavior and compatible (case-sensitive) behavior for local or NFS operations
- UFS only case-sensitive

Case Conflict Resolution

- foo.txt and Foo.txt not distinguishable to CIFS client
  - Case conflicts are flagged by ZFS
  - Name mangling used to resolve conflicts, for example:
    - foo.txt -> FOO~8.txt
    - Foo.txt -> FOO~9.txt
- Client can open original name
  - Returned file will be the first case-insensitive match
- Case conflict mangling is distinct from long name mangling
  - Long name mangling is also supported

Share Reservations
Open (Share/Deny) Modes

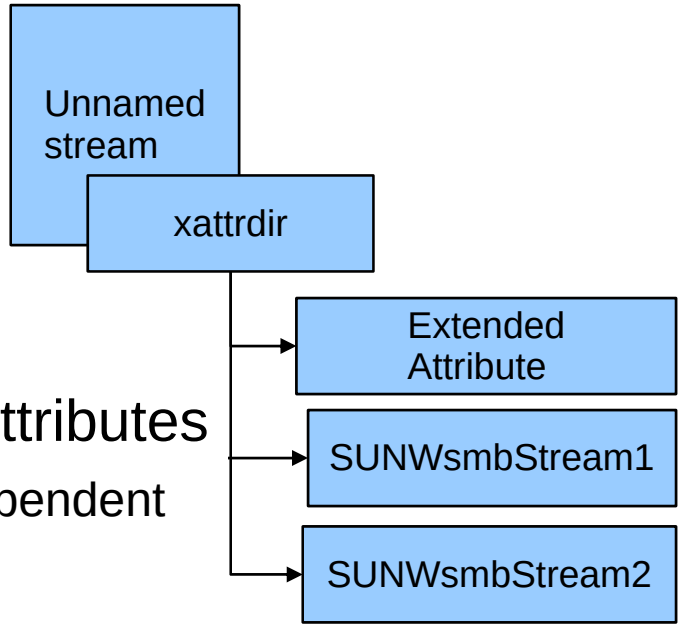
- SMB open can specify restrictions on subsequent attempts to open the same file
  - Allow or deny read/write/delete
  - Rules are described in RFE 6473733
- Requires nbmand for system-wide operation
  - Per file system: mount -o nbmand
  - System-wide byte-range locking
  - System-wide share reservations
  - nbmand is non-POSIX
- PSARC 2000/007, 2007/268, 2007/440

nbmand

- nbmand on
  - System-wide mandatory enforcement
    - CIFS, NFS and local processes
  - Centralized processing in VOP_SHRLOCK()
    - open mode processing
    - open, rename and delete conflict detection
- nbmand off
  - No system-wide enforcement: POSIX mode
  - CIFS service enforces mandatory locking internally
  - VOP_SHRLOCK() still called and nbmand locks still taken
  - VOP_SHRLOCK() processes advisory reservations
    - does not check delete mode

Alternate Data Streams (named streams)

- Associated with a file (or directory)
  - The file is known as the unnamed stream
- Used to store arbitrary data
  - Statistics, notes and history for documents
  - Content information for audio or video files
- Implemented using Solaris extended attributes
  - Windows named streams do not have independent attributes(except for size)
  - CIFS service explicitly assigns mode 0400
  - Unnamed stream UID/GID assigned to stream xattr file
  - SUNWsmb prefix assigned to CIFS stream names
    - SUNWsmb prefix not seen by Windows clients



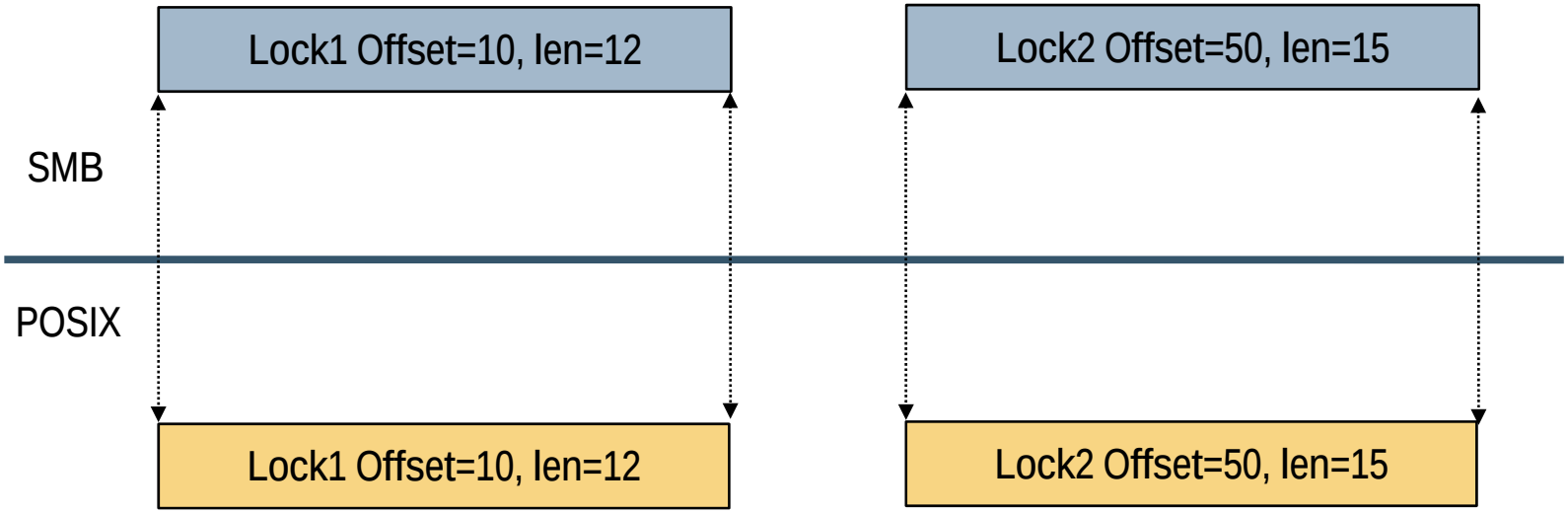
Extensible Attributes

- Introduced with CIFS project
  - PSARC 2007/315 Extensible Attribute Interfaces
  - Not to be confused with extended attributes
- Supports DOS attributes
  - Archive — Indicates when a file has been modified since it was last backed up (set on mtime change)
  - Readonly — File content cannot be modified. Can be set on directories but has no semantic meaning
  - Hidden — Can be set/cleared but it only has meaning in a CIFS context, i.e. no local semantics
  - System — Can be set/cleared but it only has meaning in a CIFS context, i.e. no local semantics

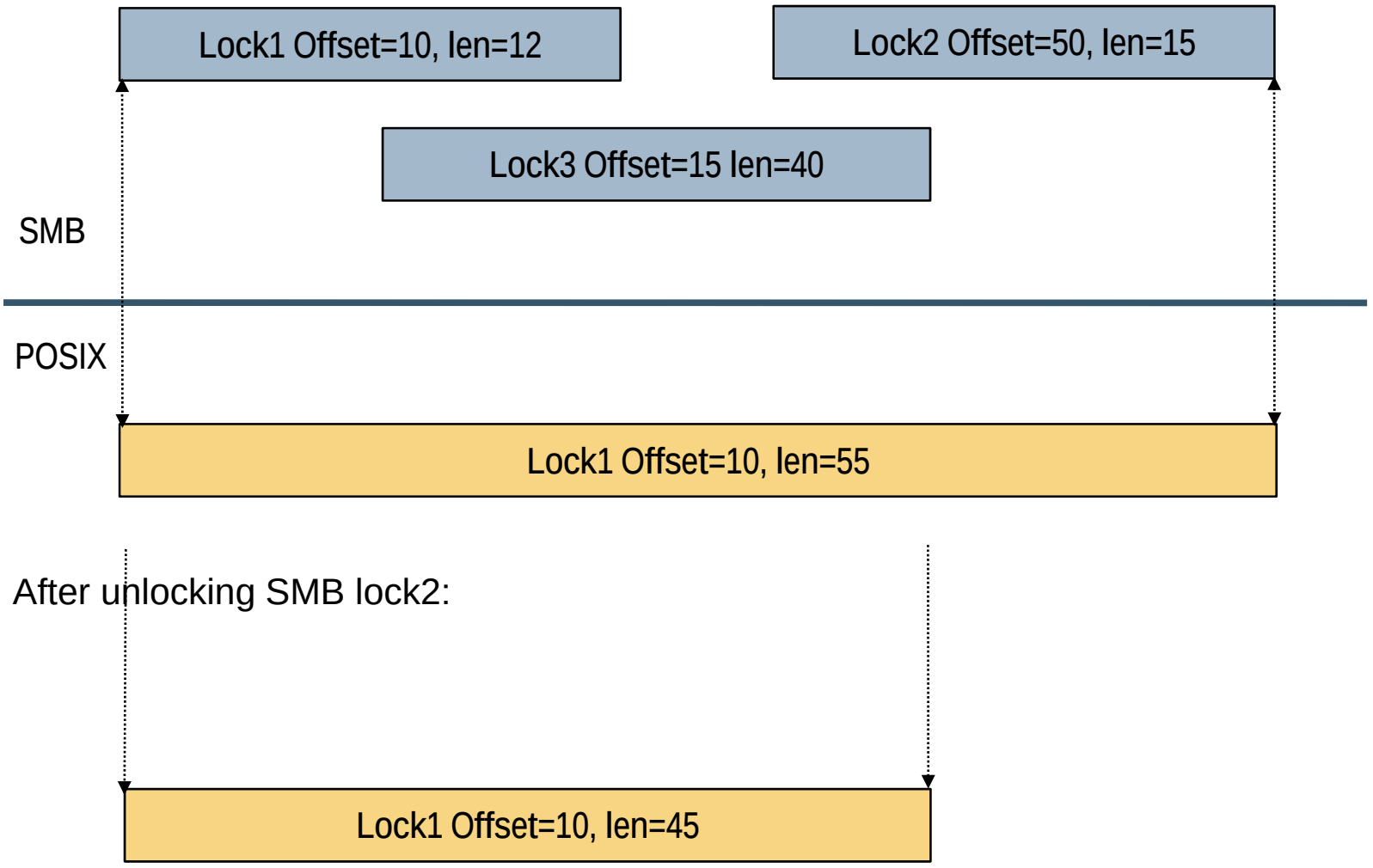
Byte-Range Locking

- SMB and POSIX byte-range locks have different semantics
- SMB byte-range locks
  - Locks are stacked
  - Each locked range represents an independent instance regardless of overlaps
  - Each lock instance must be explicitly unlocked
- POSIX byte-range locks
  - Overlapping locks are merged
  - Any portion of a locked range can be unlocked, which may result in lock splitting
- CIFS service acquires POSIX byte-range locks

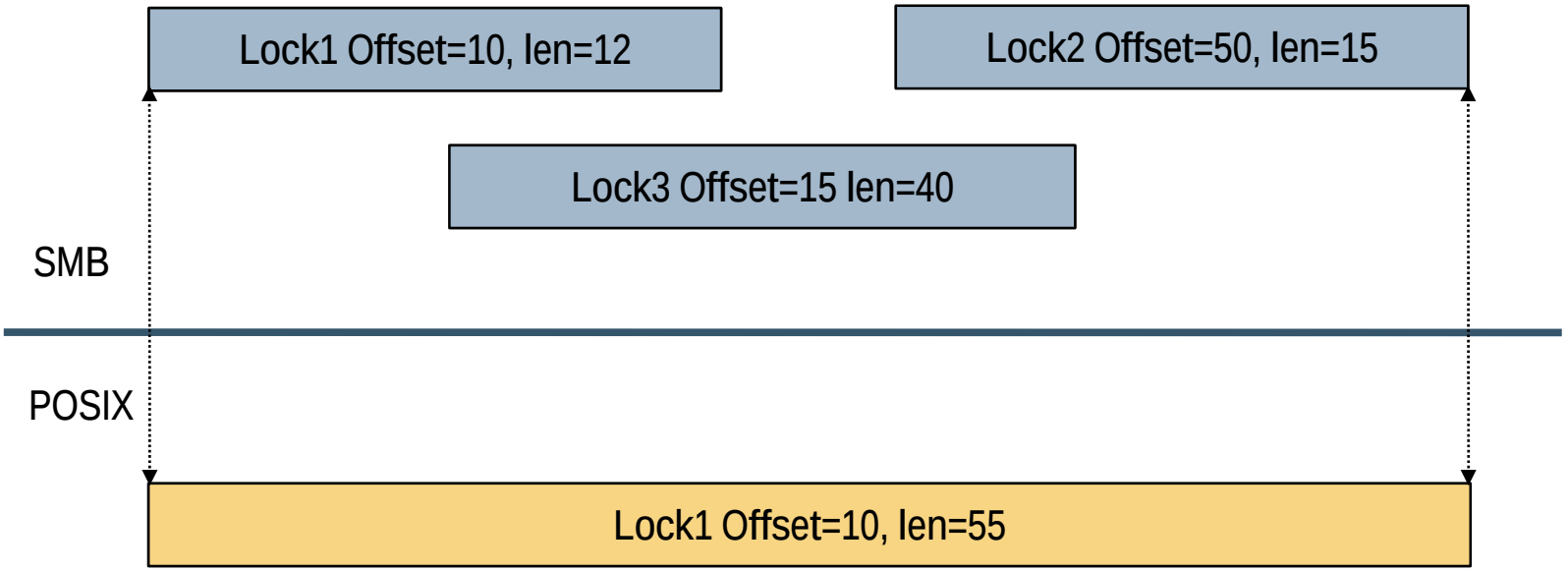
Byte-Range Locking: No overlap



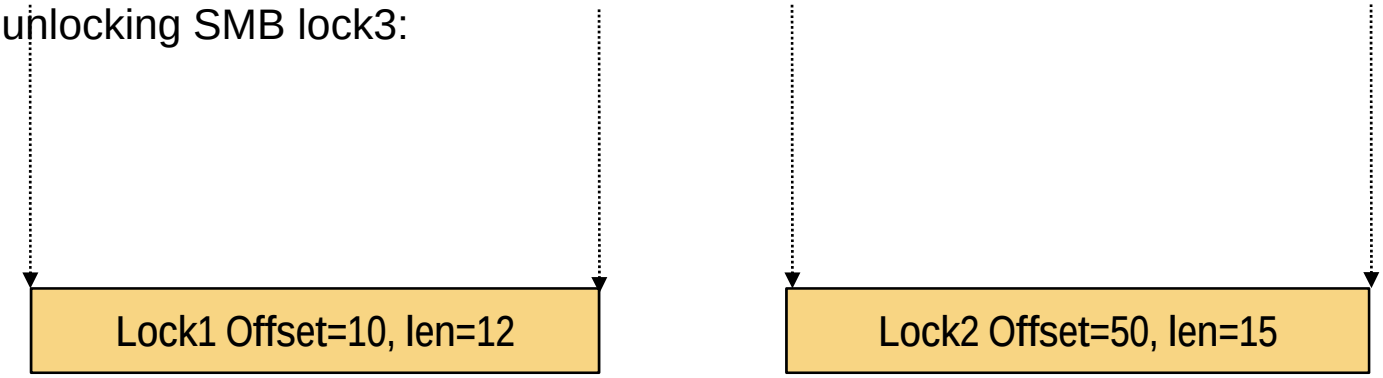
Byte-Range Locking: Overlap



Byte-Range Locking: Splitting



After unlocking SMB lock3:



Authentication and Access Control

- **Authentication**: The process by which the system validates a user's logon information

- **Access Control**: The mechanisms for controlling access to objects or information, or controls based on user identity and membership in various groups

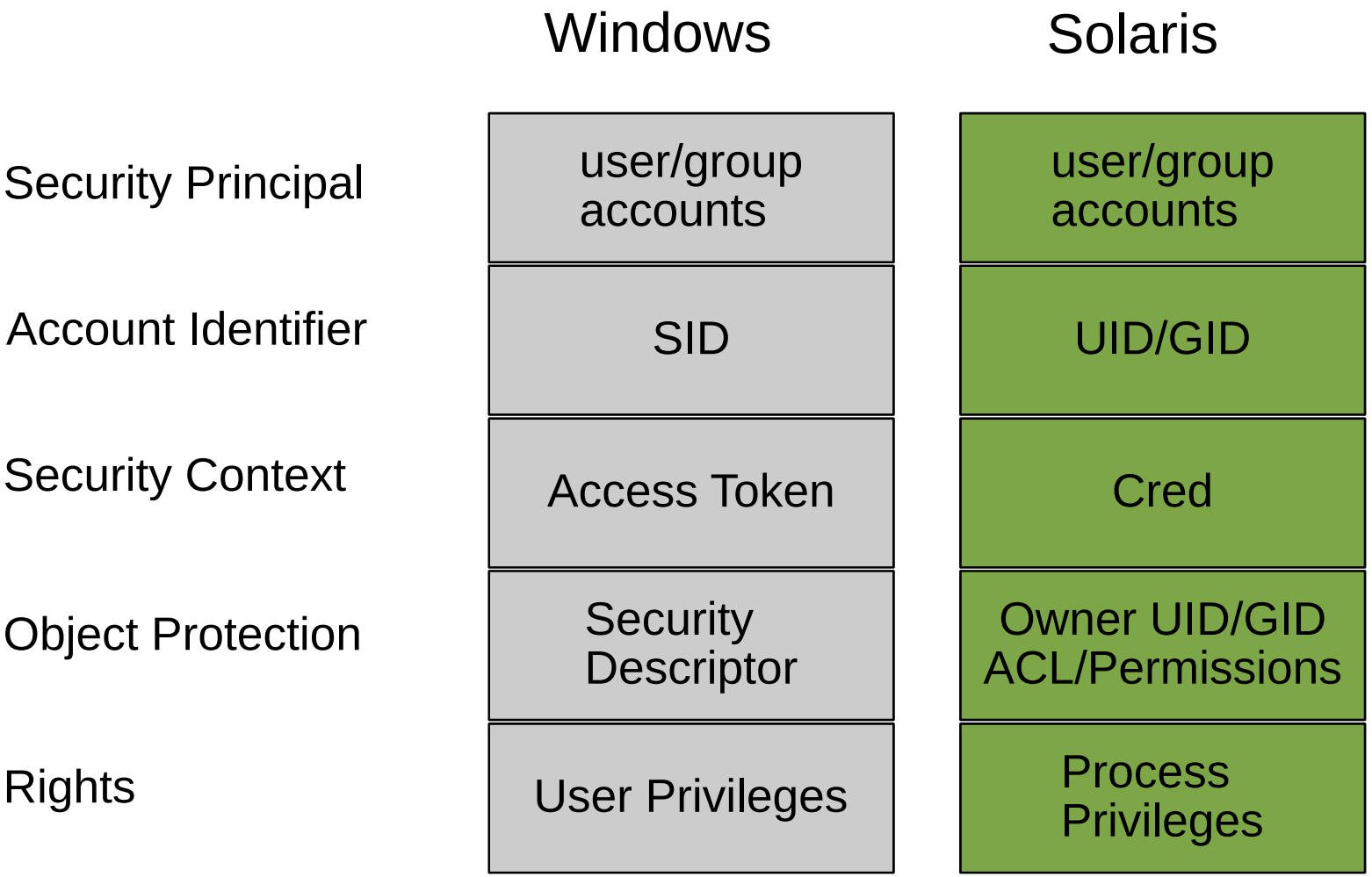
Authentication

- CIFS service operational mode (workgroup or domain) determines user authentication process
- Workgroup Mode
  - CIFS service default mode (Default: WORKGROUP)
  - Don't have to join a workgroup
  - Standalone: No Windows infrastructure required
  - Solaris CIFS service authenticates (local) users
  - PAM configuration required
  - Use passwd(1) to generate CIFS passwords (**`/var/smb/smbpasswd`**)
- Domain Mode
  - Have to join a domain
  - Domain controller (DC) authenticates domain users
  - Solaris CIFS service authenticates local users

Access Control

- Access control is performed by the exported file system
  - Share level access control is not supported yet
    - ... but coming soon
- Access control is identical in workgroup and domain modes
  - CIFS service provides abstraction to CIFS clients

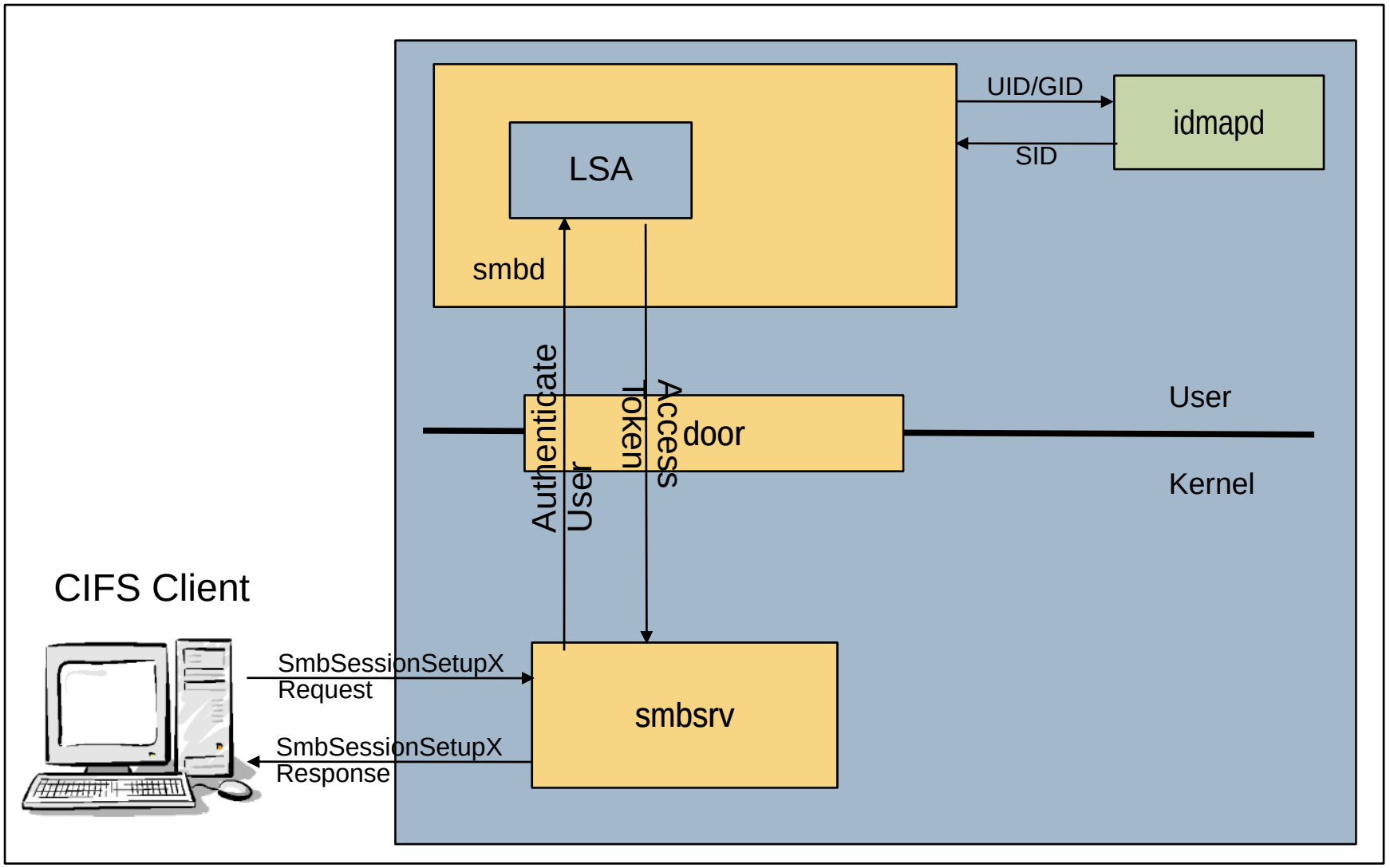
Access Control Components



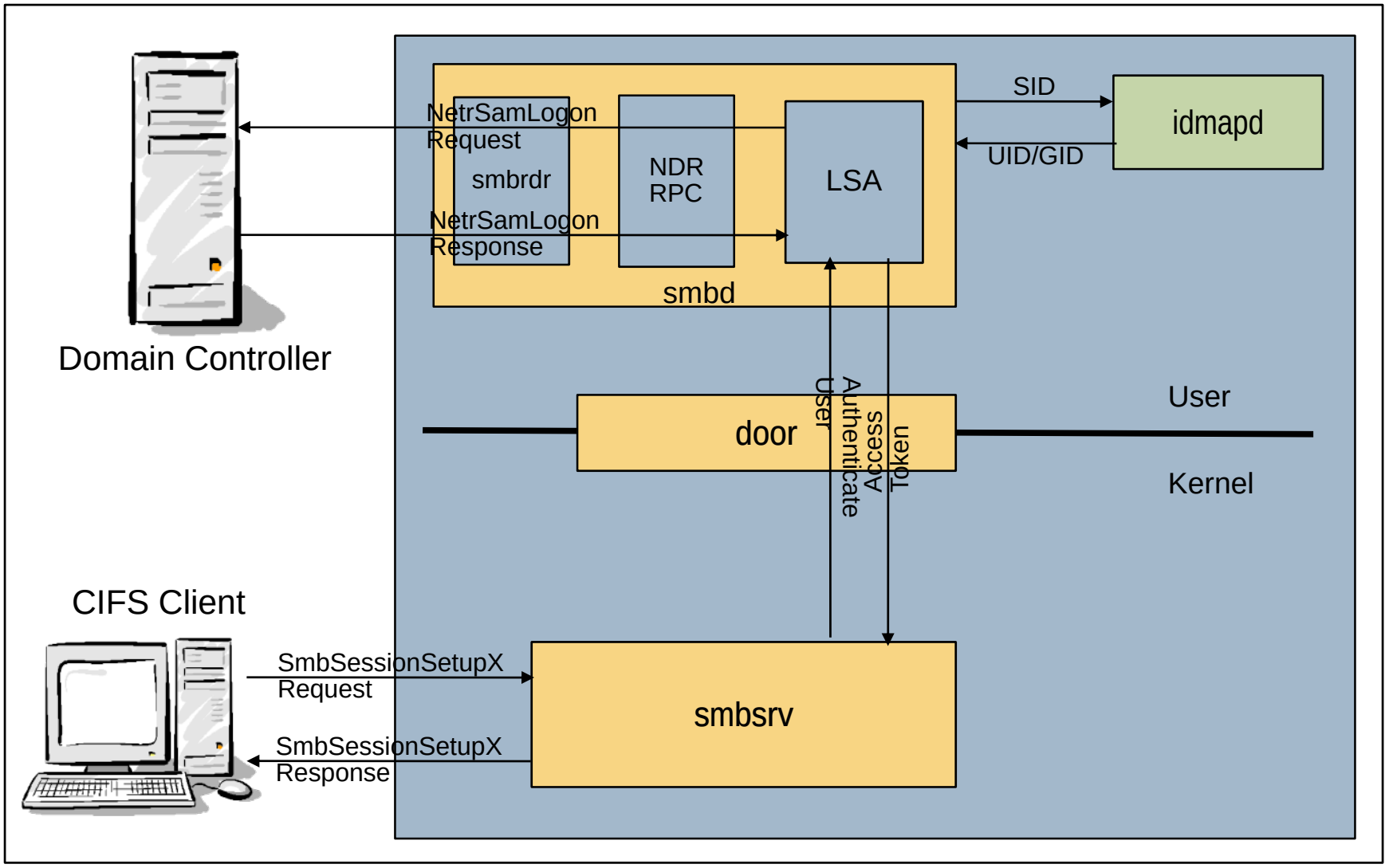
Access Token

- An access token is created when a user is authenticated
  - Contains a security identifier (SID) for the user
  - Contains SIDs for the groups to which the user belongs
  - Contains the user's privileges
- All SIDs are mapped to UIDs/GIDs using idmapd
- Solaris groups are added to the token
- A Solaris cred is created from the token

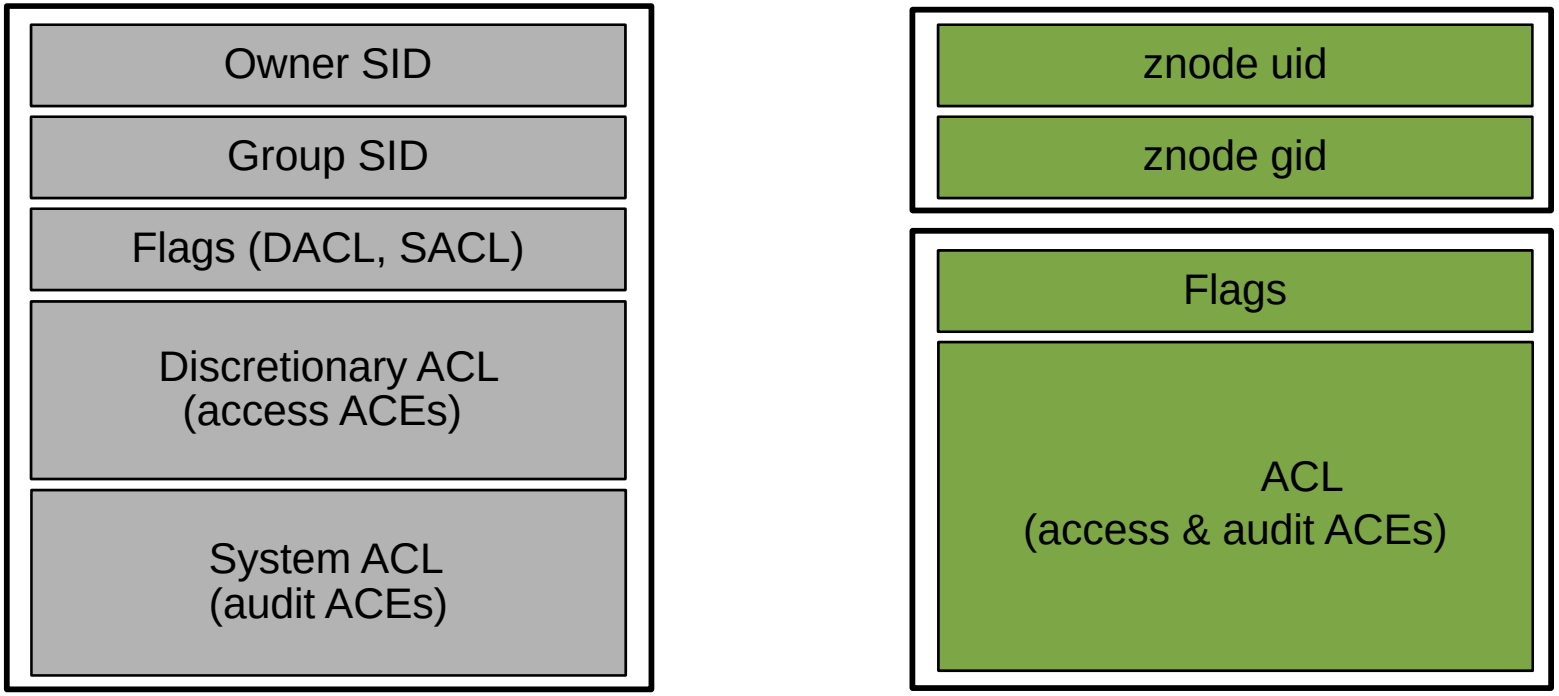
Local Authentication



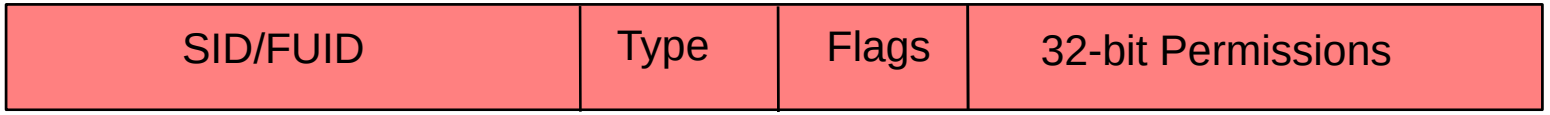
Pass-Through Authentication



Security Descriptor vs. ZFS ACL



Windows/ZFS ACE format



Security descriptor (SD) versus ZFS ACL: Differences

- Different account identifier (SID vs. UID/GID)
  - Unified by introducing FUID (PSARC 2007/064)
- ACL
  - SD has separate lists for access and audit entries
  - ZFS stores all entries in one list
- NULL or Empty DACL
  - NULL DACL: Everyone is granted full access
  - Empty DACL: no access
    - Owner is always granted some permissions regardless of the DACL
  - ZFS ACL always has at least one entry

Security descriptor (SD) versus ZFS ACL: Similarities

- Same ACE types
- Same ACE permission bits
- Same ACE inheritance flags
  - ZFS also has an aclinherit property
- Same access check algorithm

DACL Sort Issue

- Windows GUI needs DACL to be sorted
  - Access denied ACEs should appear before access allowed ACEs
- ZFS trivial ACL represents traditional UNIX permission bits
  - ZFS trivial ACL is not sorted per Windows GUI requirement
- If an ACL is viewed and saved by a Windows client, the ACL will be sorted
  - ... which will change the file's effective permissions

DACL Sort Example


```
$ ls -v file.3
  -rw-r--r--   1 user  staff  0 Oct  9 15:49 file.3
 0: owner@:execute:deny
 1: owner@:read_data/write_data/append_data/write_xattr/
      write_attributes/write_acl/write_owner:allow
 2: group@:write_data/append_data/execute:deny
 3: group@:read_data:allow
 4: everyone@:write_data/append_data/write_xattr/execute/
      write_attributes/write_acl/write_owner:deny
 5: everyone@:read_data/read_xattr/read_attributes/read_acl/
      synchronize:allow
```

After being viewed and saved by Windows client (Note: UNIX permissions have changed):

```
$ ls -v file.3
  -r--r--r--+   1 user  staff  0 Oct  9 15:49 file.3
 0: owner@:execute:deny
 1: group@:write_data/append_data/execute:deny
 2: everyone@:write_data/append_data/write_xattr/execute/
      write_attributes/write_acl/write_owner:deny
 3: owner@:read_data/write_data/append_data/write_xattr/
      write_attributes/write_acl/write_owner:allow
 4: group@:read_data:allow
 5: everyone@:read_data/read_xattr/read_attributes/read_acl/
      synchronize:allow
```

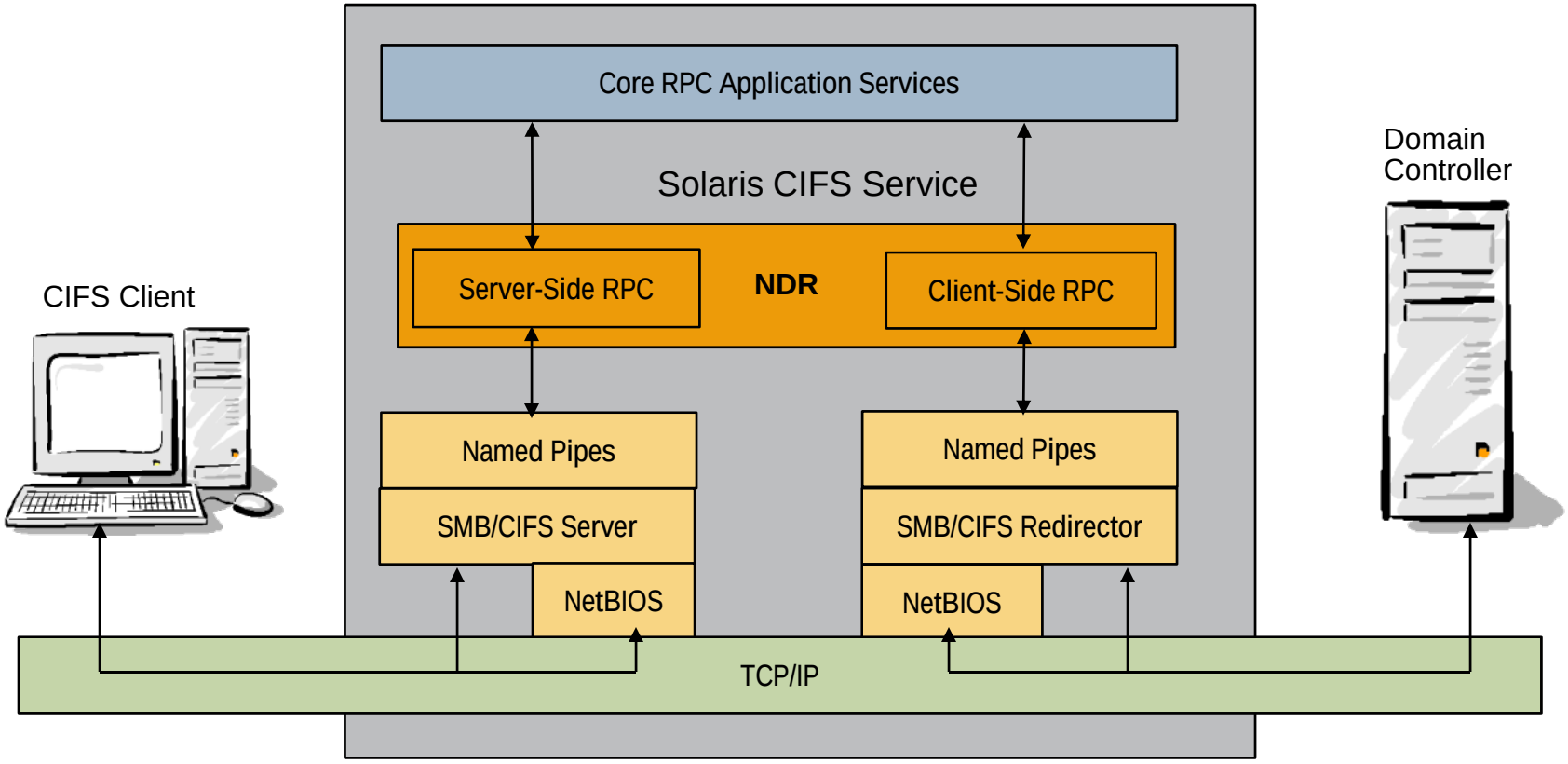
ACL Inheritance

- ZFS ACL inheritance is affected by
  - POSIX inheritance rules
  - aclinherit ZFS property setting
  - ACL inheritance flags
- Default ZFS behavior accommodates POSIX
- CIFS service applies Windows inheritance rules for CIFS operations

NDR RPC

- Independent implementation based on OSF DCE RPC
  - X/Open CAE Specification C706, October 1997
    DCE RPC 1.1
- ndrgen IDL Compiler
  - Supports client-side and server-side RPC operations
  - ndgren generates stubs from NDL RPC interface definitions
- NDR Library
  - Enhanced to interoperate with MSRPC
    - Mainly Unicode string support
  - SMB transport (SMB transactions) only
    - MSRPC supports both SMB and TCP/IP transports

NDR RPC over SMB



ndrgen(1)

- NDL RPC protocol compiler

```
ndrgen [ -Y cpp-path ] file [ file ] ...
```

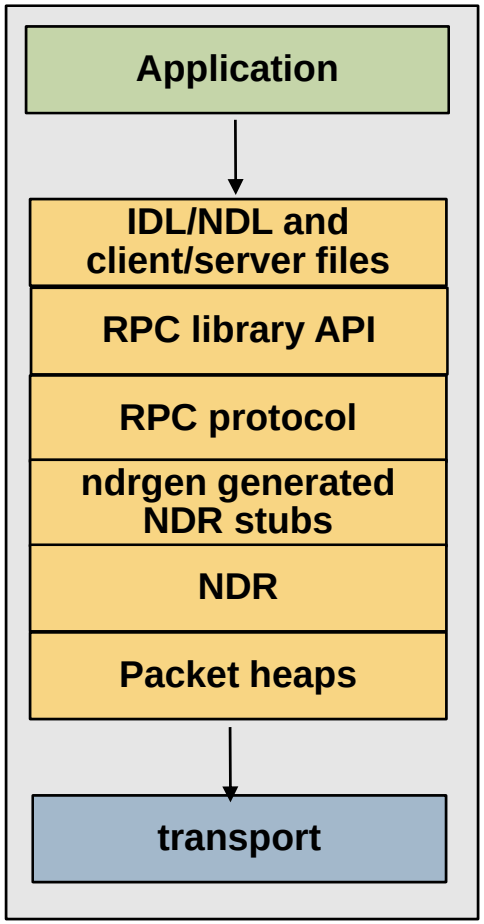
- Generates C code to implement a DCERPC/MSRPC Network Data Representation (NDR) protocol
- Network Data Language (NDL) input language similar to C

```
ndrgen -Y /usr/sfw/bin/cpp proto.ndl
```

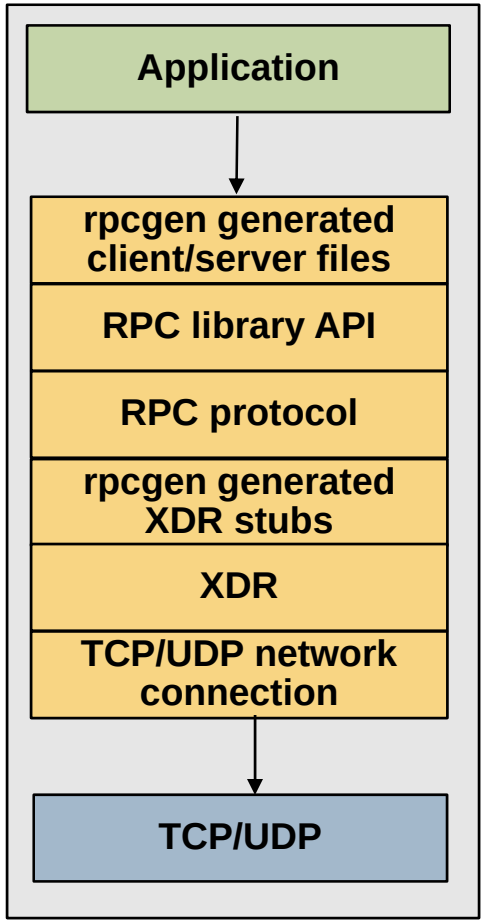
ndrgen will generate **`proto_ndr.c`**

DCE/NDR-ONC RPC Comparison

DCE RPC stack



ONC RPC stack



ls(1) Changes (PSARC/2007/394)

- Two new options to display extended attributes (**`-/ flag`** and **`-% timestamp`**)
- **`ls -/ c test.txt`**

```
-rw-r—r--  1 root  root    0 Jan 14 16:51 test.txt
       {A-RS---m--}
```

- **`ls -/ v test.txt`**

```
-rw-r—r--  1 root  root    0 Jan 14 16:51 test.txt
  {archive,nohidden,readonly,system,noappendonly,nonodump,
    noimmutable,av_modified,noav_quarantined,nonounlink}
```

- **`ls -l -% all file`**

```
-rw-r—r--  1 root  root    0 Jan 14 16:51 test.txt
       timestamp: atime  Jan 14 16:51:16 2008
       timestamp: ctime  Jan 14 16:53:07 2008
       timestamp: mtime  Jan 14 16:51:16 2008
       timestamp: crtime Jan 14 16:51:16 2008
```

chmod(1) Changes (PSARC/2007/410)

- Set the readonly and system attributes of a ZFS file using compact notation

```
chmod S+cRS test.txt
```

- Set the readonly and system attributes of a ZFS file using verbose notation

```
chmod S+v'{readonly,system}' test.txt
ls -/c
-rw-r—r--    1 root  root    0 Jan 14 16:51 test.txt
        {A-RS---m--}
```

- Clear the readonly and system attributes of a ZFS file using compact notation

```
chmod S-cRS test.txt
```

- Clear the readonly and system attributes of a ZFS file using verbose notation

```
chmod S-v'{readonly,system}' test.txt
ls -/c
-rw-r—r--    1 root  root    0 Jan 14 16:51 test.txt
        {A------m--}
```

Installation

- CIFS Service packages: installed by default
  - Except on OpenSolaris 2008.05
    - ...only two IPS packages: **`SUNWsmbskr`** and **`SUNWsmbs`**
- **`SUNWsmbskr`** (Kernel SMB server package)
  - Installs the kernel module & kmdb(1) plugins
- **`SUNWsmbsr`** (Root SMB server package)
- Installs the SMF manifest for the SMB server
- Depends on **`SUNWsmbskr`**
- **`SUNWsmbsu`** (User SMB server package)
- Installs smbd(1M), the SMB command utilities and libraries
- Depends on **`SUNWsmbskr`** and **`SUNWsmbsr`**

OpenSolaris CIFS Service Files

- smbsrv, smbsrv.conf
  - **/kernel/drv, /kernel/drv/amd64, /kernel/drv/sparcv9**
- smbadm, smbstat
  - **/usr/sbin**
- smbd, libraries
  - **/usr/lib/smbsrv**
- smbautohome
  - **/etc**
- smbpasswd, smbgroup.db
  - **/var/smb**
- ccache
  - **/var/run/smb**

The CIFS Service: smb/server

- smbd(1M) is managed as an SMF network service

```
svcadm enable -r smb/server
svcadm disable smb/server
svcadm refresh smb/server
svcs -d smb/server

STATE          STIME    FMRI
online          Mar_06   svc:/milestone/network:default
online          Mar_06   svc:/system/filesystem/local:default
online          Mar_06   svc:/system/idmap:default
```

smbadm(1M)

- Join a domain or workgroup

```
smbadm join -u username domain
smbadm join -w workgroup
smbadm list
```

- SMB local group management

```
smbadm add-member -m member [[-m member] ...] group
smbadm create [-d description] group
smbadm delete group
smbadm get [[-p property] ...] group
smbadm remove-member -m member [[-m member] ...] group
smbadm rename group new-group
smbadm set -p property=value [[-p property=value] ...] group
smbadm show [-m] [-p] [group]
```

sharectl(1M)

- Get/Set CIFS Service Properties

```
sharectl get smb
        system_comment=
        max_workers=64
        netbios_scope=
        lmauth_level=4
        keep_alive=5400
        wins_server_1=192.168.1.7
        wins_server_2=
        wins_exclude=
        signing_enabled=false
        signing_required=false
        restrict_anonymous=false
        pdc=
        ads_site=
        ddns_enable=false
        autohome_map=/etc

sharectl set -p <property_name>=<property_value> smb

sharectl set -p wins_server_1=192.168.1.7 smb
```

sharemgr(1M)

- Share management for NFS and CIFS

```
sharemgr create homegroup
sharemgr add-share -s /export/home -r home homegroup
sharemgr show -vp homegroup

homegroup   nfs=() smb=()
 /export/home
     home=/export/home
```

zfs(1M)

- Sharing using zfs sharesmb
  - zfs(1M) also supports sharenfs and shareiscsi
- `zfs set sharesmb=on homes`

```
sharemgr show -vp zfs
zfs   nfs=()
        homes smb=()
            data_homes=/data/homes
            data_homes_user01=/data/homes/user01
```

- `zfs set sharesmb=name=homes data/homes`

```
sharemgr show -vp zfs
zfs   nfs=()
    data/homes smb=()
        homes=/data/homes
        homes_user01=data//homes/user01
```

pam_smb_passwd (PSARC/2007/544)

- Enhances PAM password management to include Windows style passwords
- Required for standalone mode and/or local authentication
- Manually add line to /etc/pam.conf

```
other   password required       pam_smb_passwd.so.1 nowarn
```

- Hashed passwords stored in /var/smb/smbpasswd

```
passwd newuser
New Password: ********
Re-enter new Password: ********

cat /var/smb/smbpasswd
newuser:1001::9A05AF0B1AEECAD48C1760BC6A211F25
```

- Individual users can be enabled or disabled

```
smbadm disable-user username
smbadm enable-user username
smbadm disable-user root

cat /var/smb/smbpasswd
root:0:*DIS*:*DIS*
newuser:1001::9A05AF0B1AEECAD48C1760BC6A211F25
```

Kerberos Configuration

- Example /etc/krb5/krb5.conf

```
[libdefaults]
    default_realm = ADS.DOMAIN.COM

[realms]
    ADS.DOMAIN.COM = {
        kdc = server.ads.domain.com
        kpasswd_server = server.ads.domain.com
        passwd_protocol = SET_CHANGE
    }

[domain_realm]
    server.ads.domain.com = ADS.DOMAIN.COM
```

Joining a Domain

- Ensure that the domain controller and Solaris system clocks are synchronized (Kerberos requirement)
- Configure **`/etc/resolv.conf`** and **`/etc/krb5/krb5.conf`**
- Start the CIFS Service

```
svcadm enable -r smb/server
```

- Join the domain
  - Domain-user must have appropriate access rights to join a domain

```
smbadm join -u domain-user domain-name
```

Joining a Workgroup

- Start the CIFS Service

```
svcadm enable -r smb/server
```

- Join the workgroup

```
smbadm join -w workgroup-name
```

- Add **pam_smb_passwd.so.1** to **/etc/pam.conf**
- Set passwords for local users to be used with CIFS

```
passwd username
```

Troubleshooting

- OpenSolaris CIFS Project
  - http://www.opensolaris.org/os/project/cifs-server
  - http://opensolaris.org/os/project/cifs-server/docs/
    - Getting Started Guide
    - Administration Guide
    - Troubleshooting Guide
- cifs-chkcfg
  - http://opensolaris.org/os/project/cifs-server/files/cifs-chkcfg
- Bugster Categories
  - solaris->kernel->cifs
    - smbsrv kernel module or CIFS protocol
  - solaris->utility->cifs
    - CIFS utilities, libraries, NDR RPC

Diagnostic Information

- **Use cifs-chkcfg**
- Diagnostic information to gather
  - **Use cifs-gendiag**
    - http://opensolaris.org/os/project/cifs-server/files/cifs-gendiag
    - **`sharemgr show -vp`**
    - **`sharectl get smb`**
    - **`smbadm list`**
    - **`zfs get all`**
    - **`/etc/krb5/krb5.conf`**
    - **`/etc/pam.conf`**
    - **`/etc/resolv.conf`**
  - Network captures (wireshark, netmon)
  - Dtrace output
  - Environment (uname -a, Client OS, version and service packs)

SMB DTrace

- SMB DTrace Provider Coming Soon
  - Provider probes already in place
- Example dtrace scripts: usr/src/cmd/smbsrv/dtrace
- msrpc.d:

```
entry MO 03 ... rpc_vers          put 1@0   =    5 {05}
entry MO 03 ... rpc_vers_minor    put 1@1   =    0 {00}
entry MO 03 ... ptype             put 1@2   =   12 {0c}
entry MO 03 ... pfc_flags         put 1@3   =    3 {03}
entry MO 04 .... intg_char_rep    put 1@4   =   16 {10}
entry MO 04 .... float_rep        put 1@5   =    0 {00}
entry MO 04 .... _spare[0]        put 1@6   =    0 {00}
entry MO 04 .... _spare[1]        put 1@7   =    0 {00}
entry MO 03 ... frag_length       put 2@8   =   68 {44 00} D
entry MO 03 ... auth_length       put 2@10  =    0 {00 00}
entry MO 03 ... call_id           put 4@12  =    1 {01 00 00 00}
entry MO 02 .. max_xmit_frag      put 2@16  = 4280 {b8 10}
entry MO 02 .. max_recv_frag      put 2@18  = 4280 {b8 10}
entry MO 02 .. assoc_group_id     put 4@20  = 1192620711 {a7 f2 15 47}
```

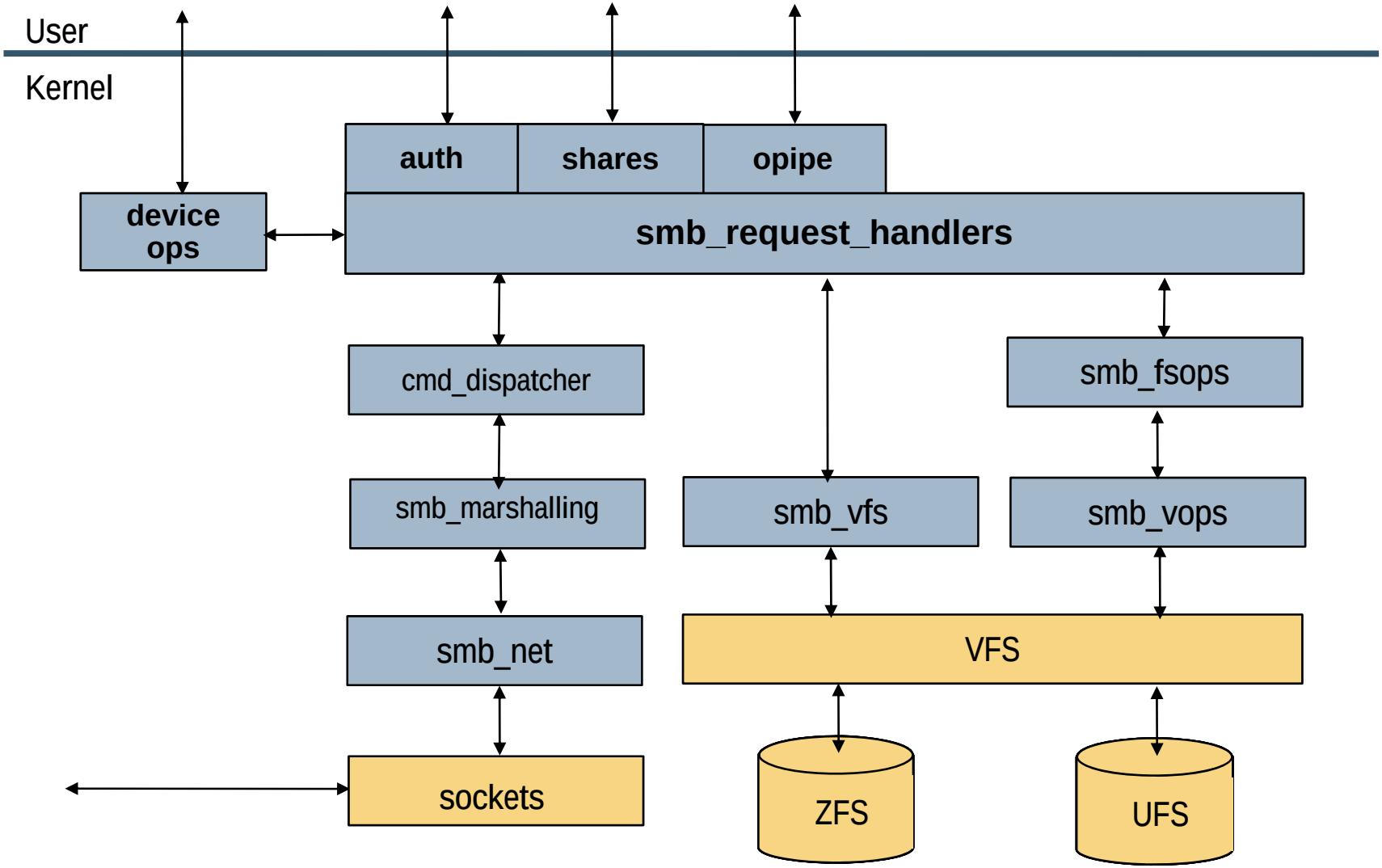
CIFS MDB (debugger) DCMDs

- ::smblist
- ::smbsrv
- ::smbvfs
- ::smbnode
- ::smbsess
- ::smbreq
- ::smblock
- ::smbuser
- ::smbtree
- ::smbodir
- ::smbofile
- ::smbstats
- ::smbace
- ::smbacl
- ::smbsid
- ::smbsd
- ::smbfssd

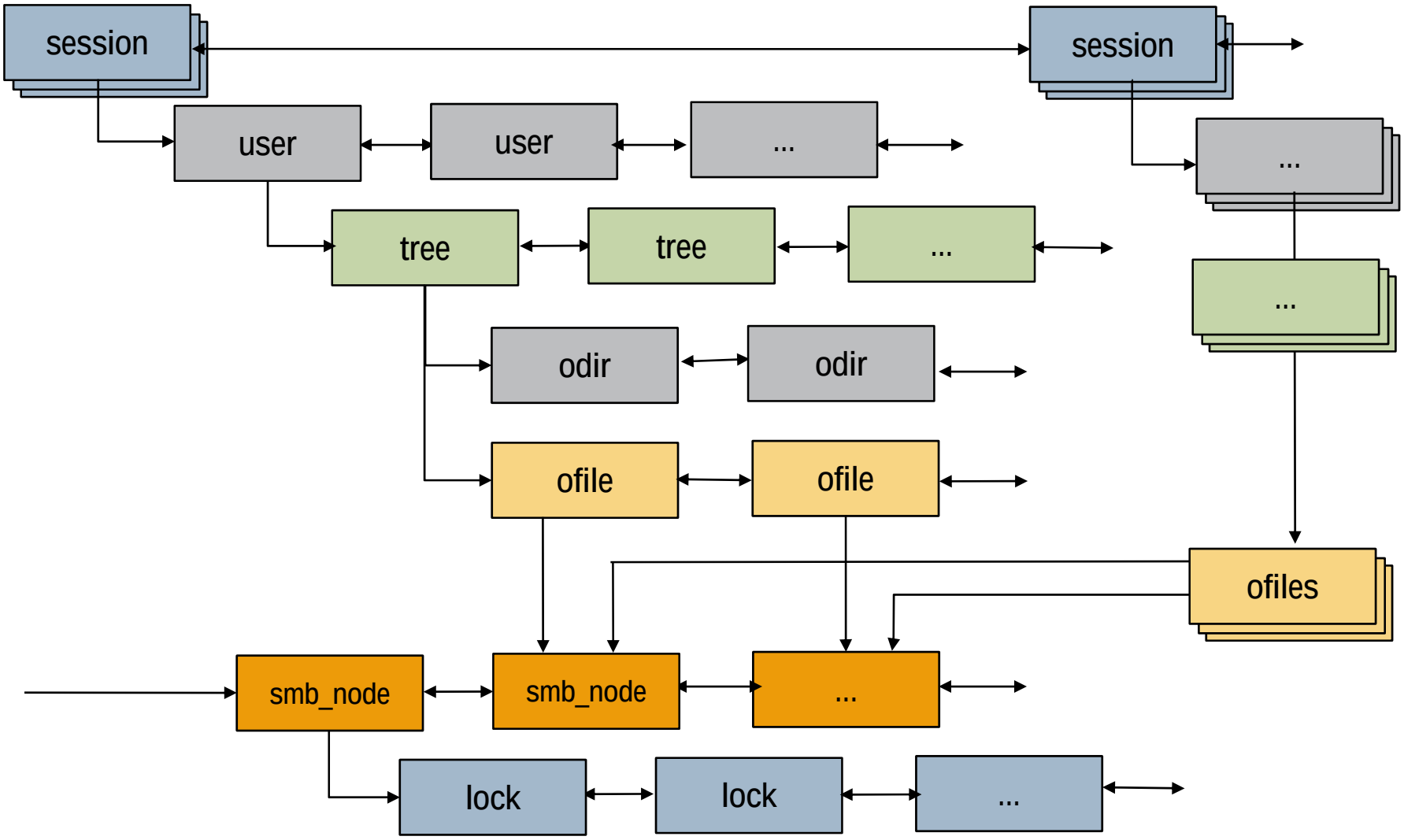
- Each DCMD supports a subset of the following options

-s	Display the list of servers
-m	Display the list of vfs structures
-e	Display the list of sessions
-r	Display the list of requests
-u	Display the list of users
-t	Display the list of trees
-f	Display the list of ofiles
-d	Display the list of odirs
-v	Verbose display

Smbsrv Kernel Module Structure



SMBSRV Object Relationships



::smblist

- Display the object hierarchy

```
[12]> ::smblist
SERVER           ZONE STATE                                  USERS  TREES  FILES
3003ad82bc0      0    RUNNING                                1      2      0
  SESSION        CLIENT_IP_ADDR   LOCAL_IP_ADDR
  3003fb6d528    172.20.24.98     172.20.25.232
    USER         UID   ACCOUNT
    300354d1e00  2     CIFSBRM\jose
      TREE       TID   SHARE NAME      RESOURCE
      300354cf968  2     ipc$            ipc$
      300354cf310  1     jose            /export/home/jose
  SMB_VFS        REFCNT   VFS            VNODE          ROOT
  3003b9aff88    490      3002e68eae8    3003c603d00    /export/home
[12]>
```

::smblist options

- ::smblist -eu
  - Dispay sessions and users (server omitted)

```
[12]> ::smblist -eu
SESSION          CLIENT_IP_ADDR   LOCAL_IP_ADDR
3003fb6d528      172.20.24.98     172.20.25.232
  USER             UID   ACCOUNT
  300354d1e00      2     CIFSBRM\jose
```

- ::smblist -et
  - Dispay sessions and trees (server and user omitted)

```
[12]> ::smblist -et
SESSION          CLIENT_IP_ADDR   LOCAL_IP_ADDR
3003fb6d528      172.20.24.98     172.20.25.232
  TREE             TID   SHARE NAME       RESOURCE
  300354cf968      2     ipc$             ipc$
  300354cf310      1     jose             /export/home/jose
```

::smblist -etv

- -v provides verbose output

```
[12]> ::smblist -etv
SMB session information (3003fb6d528):
Client IP address: 172.20.24.98
Local IP Address: 172.20.25.232
Session KID: 2
Workstation Name:
Session state: 4 (NEGOTIATED)
Number of Users: 1
Number of Trees: 2
Number of Files: 0
Number of Shares: 0
Number of active Transact.: 0

  SMB tree information (300354cf968):

  TID: 0002
  State: 0 (CONNECTED)
  Share name: ipc$
  Resource: ipc$
  Umask: 0000
  Access: 0002
  Flags: 00000000
  SMB Node: 0
  Reference Count: 0

  SMB tree information (300354cf310):

  TID: 0001
  State: 0 (CONNECTED)
  Share name: jose
  Resource: /export/home/jose
  Umask: 0000
  Access: 0002
  Flags: 0000001c
  SMB Node: 300354cb5b8
  Reference Count: 0

[12]>
```

Where To Get More Information

- OpenSolaris CIFS Project Page
  - http://www.opensolaris.org/os/project/cifs-server
  - http://opensolaris.org/os/project/cifs-server/docs/
    - Getting Started Guide
    - Administration Guide
    - Troubleshooting Guide
- Email discussion lists
  - http://www.opensolaris.org/os/project/cifs-server/mailing-lists/
  - cifs-discuss@opensolaris.org
- Related Projects
  - http://www.opensolaris.org/os/community/zfs/
  - http://opensolaris.org/os/project/winchester/
  - http://opensolaris.org/os/project/smbfs

CIFS Related PSARC Cases

- PSARC/2006/715 CIFS Service
  - 2000/007 CIFS Locking and File Sharing
  - 2006/315 Winchester
  - 2007/064 Unified POSIX and Windows Credentials for Solaris
  - 2007/139 Kernel Crypto support for MD4
  - 2007/149 UTF-8 Text Preparation
  - 2007/173 kiconv
  - 2007/177 SMF Sensitive Property Storage
  - 2007/218 VOP Caller Context
  - 2007/227 VFS Feature Registration and ACL-on-Create
  - 2007/244 ZFS Case-Insensitive Support
  - 2007/268 CIFS share reservations
  - 2007/280 CIFS Support for sharemgr
  - 2007/281 NFS share properties for Montana compatibility

CIFS Related PSARC Cases (cont)

- 2007/315 Extensible Attribute Interfaces
- 2007/394 ls(1) '-/' and '-%' options for system attributes
- 2007/403 Modified Access Checks for CIFS
- 2007/410 Add system attribute to chmod
- 2007/432 CIFS system attributes support for cp(1), pack(1), unpack(1), compress(1) and uncompress(1)
- 2007/440 nbmand changes for CIFS Service
- 2007/444 Rescind SETTABLE Attribute
- 2007/458 User land UTF-8 text preparation functions
- 2007/459 CIFS system attributes support for cpio, pax and tar
- 2007/544 pam_smb_passwd
- 2007/546 Update utilities to match CIFS system attributes changes
- 2007/560 ZFS sharesmb property

Native OpenSolaris CIFS Service

Alan Wright
Sun Microsystems, Inc.
cifs-discuss@opensolaris.org