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# 1. Summary

## 1.1. What is SMB

When discussing SMB, one should distinguish :

- SMB the protocol
- SMB services that run on the protocol NetBIOS
- DCE/RPC services that use SMB as an authenticated Inter-process communication channel (over named pipes)
- “Network Neighborhood” protocols which primarily (but not exclusively) run as datagram services directly on the NetBIOS transport

### 1.1.1. Distributed File Systems

Any computer file system that supports sharing of files and other resources as **persistant storage** over a computer network.

- First file server were developed in the 1970s
  - Network File System (NFS)
    - Created at Sun Microsystems
    - 1985
    - First widely used distributed file system
- Other notable distributed file systems
  - Andrew File System (AFS)
  - Server Message Block SMB
    - AKA CIFS
- **SMB** is a distributed File Systems like **NFS, AFS**

### 1.1.2. Remote file protocol

- Remote (not Local)
  - Access file across the wire (LAN, WAN)
- File (not Block)
  - Different semantics
- Protocol
  - Well-defined and documented
- Examples
  - NFS, SMB2, SMB3, WebDAV

SMB is a session-oriented protocol. Peer SMB applications running on two stations must establish a link with each other prior to exchanging SMB messages. For this reason, SMB traffic is always carried in TCP datagrams.

OSI				TCP/IP	
Application	SMB				Application
Presentation					Application
Session	NetBIOS		NetBIOS	NetBIOS	
Transport		NetBEUI		TCP&UDP	TCP/UDP
Network	IPX <sup>1</sup>		DECnet	IP	IP
Link	802.2, 802.3,802.5	802.2 802.3,802.5	Ethernet V2	Ethernet V2	Ethernet or others
Physical					

### 1.1.3. A brief history

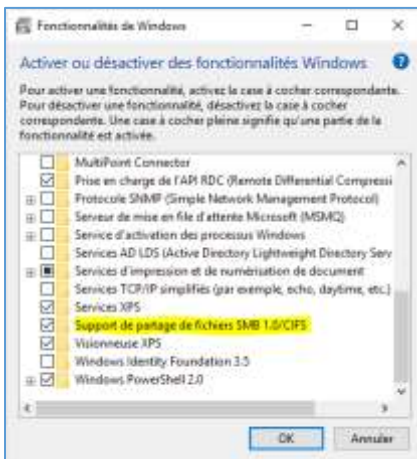


#### SMB

SMB stands for “Server Message Block.” It’s a file sharing protocol that was invented by IBM and has been around since the mid-eighties. It was designed to allow computers to read and write files to a remote host over a local area network (LAN). The directories on the remote hosts made available via SMB are called “shares.”

#### CIFS

CIFS stands for “Common Internet File System.” CIFS is a dialect of SMB. That is, CIFS is a particular implementation of the Server Message Block protocol, created by Microsoft.



#### SAMBA

Samba is an implementation of SMB written for UNIX by a fellow named [Andrew Tridgell](#). Samba was designed to allow Windows clients to access UNIX directories and files via the SMB protocol, just as if they were talking to a Windows server. Samba now runs on multiple platforms and is a mainstay on most Linux distros.

#### NFS

NFS stands for “Networked File System.” It was developed by Sun Microsystems and serves essentially the same purpose as SMB (i.e., to access files systems over a network as if they were local), but is an entirely different protocol. This means that NFS clients can’t speak directly to SMB servers.

## 2. Functional Description of Windows Resource Sharing

### 2.1. The Network Stack

The network stack consists of the following major elements :

- Network applications
  - Wnet
  - Named pipes
  - Mailslots
  - Winsock
- Network providers
  - Windows provider (SMB provider = Microsoft Client)
  - NetWare provider
  - Remote Desktop provider
  - Web Client provider
  - Winsock provider
- Redirectors
  - Windows Redirector  
This driver communicates with Windows servers Using the Server Message Block (SMB) command protocol
  - Netware Redirector
  - RDP Redirector
  - WebDAV Redirector
- Transports
- Network adapter interfaces



### 2.2. Defaults Share Points

An SMB server exposes network resources in the form of share points. A share point can be a folder or a printer. A shared folder is often just called a share.

```
PS C:\Windows\system32> net share
```

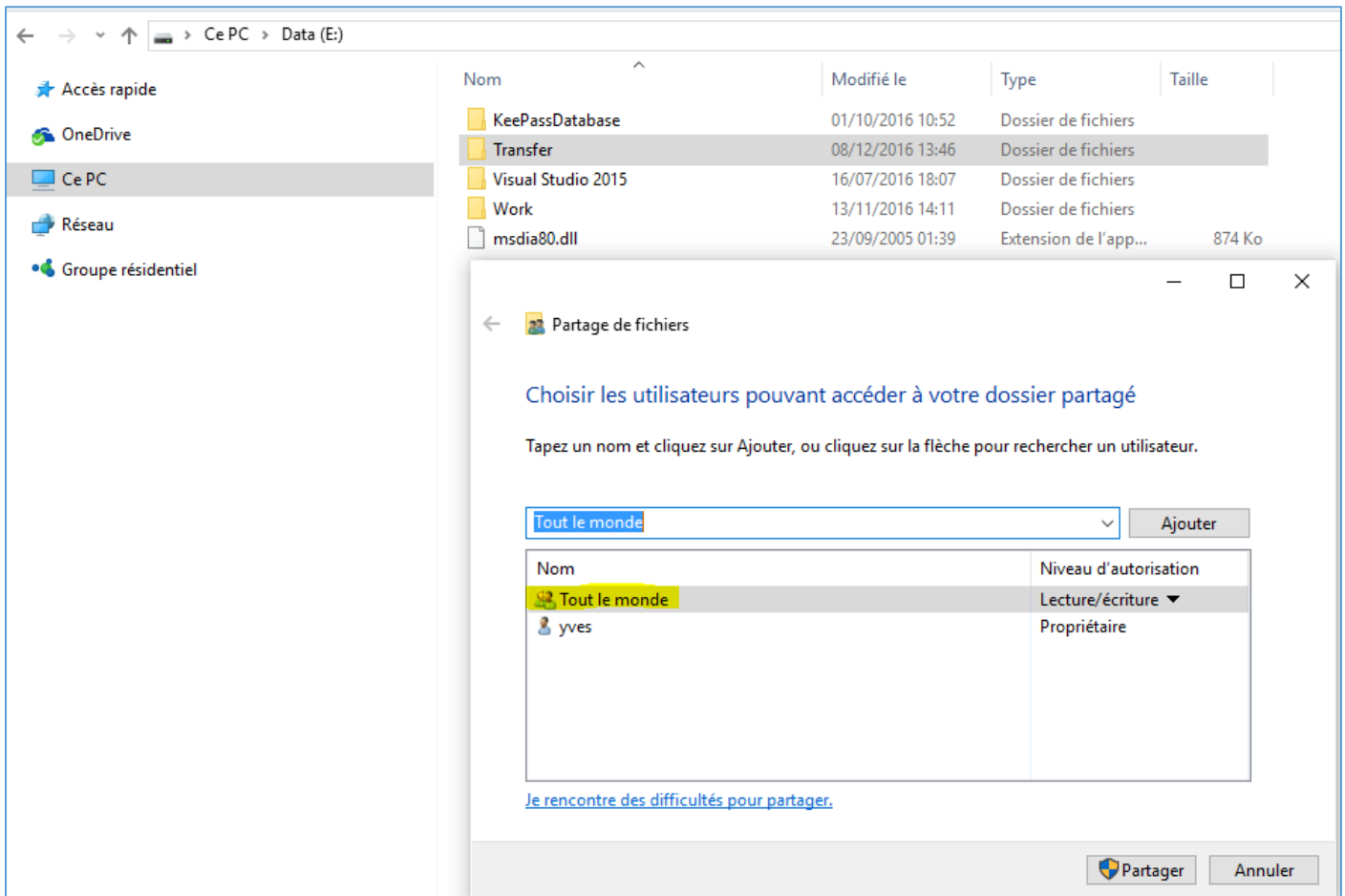
Share name	Resource	Remark
C\$	C:\	Default share
D\$	D:\	Default share
E\$	E:\	Default share
print\$	C:\Windows\system32\spool\drivers	Printer Drivers
IPC\$		Remote IPC
ADMIN\$	C:\Windows	Remote Admin
Users	C:\Users	
HPBBD4C8 <HP Officejet Pro 8600>	WSD-d36222d9-283b-4...	Spooled This is a web services printer

The command completed successfully.

### 2.3. Configuring File Sharing

A share point represents a network path to a local file system. Windows never provides default share points that ordinary users can access. You must create shares at a server before users can map to the server.

### 3. Creating and Sharing a folder on Windows 10 Workstation



#### Net share

```
PS C:\Users\yvesw_000> net share
Nom partage  Ressource                Remarque
-----
C$           C:\                     Partage par défaut
E$           E:\                     Partage par défaut
F$           F:\                     Partage par défaut
IPC$         C:\                     IPC distant
print$       C:\WINDOWS\system32\spool\drivers
             Pilotes d'imprimantes
ADMIN$       C:\WINDOWS              Administration à distance
Transfer     E:\Transfer             Transfer folder for Linux
Users        C:\Users
La commande s'est terminée correctement.
PS C:\Users\yvesw_000>
```

## Get-SmbConnection -ServerName localhost

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32> dir \\localhost\transfer

Répertoire : \\localhost\transfer

Mode                LastWriteTime         Length Name
----                -
-a----            08/12/2016   13:44         64004 Screenshot from 2016-12-08 13-44-04.png

PS C:\WINDOWS\system32> Get-SmbConnection -ServerName localhost

ServerName ShareName Username          Credential          Dialect NumOpens
-----
localhost  transfer YVES-W10-DESK\yves YVES-W10-DESK\yves 3.1.1    0
```

## 4. Connecting to a Windows Shared Drive from Linux SLES using smbclient

Linux machines can also browse and mount SMB shares.

An SMB client program for Linux machines is included with the Samba distribution. It's an FTP-like client to access SMB/CIFS resources on a server.

### 4.1. Smbtree

A text based smb network browser, browse the SMB network

```
linsrv1:~ # smbtree --help
Usage: [OPTION...]
  -b, --broadcast           Use broadcast instead of using the master browser
  -D, --domains             List only domains (workgroups) of tree
  -S, --servers             List domains(workgroups) and servers of tree

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

Common samba options:
  -d, --debuglevel=DEBUGLEVEL  Set debug level
  -s, --configfile=CONFIGFILE  Use alternate configuration file
  -l, --log-basename=LOGFILEBASE  Base name for log files
  -V, --version               Print version
  --option=name=value        Set smb.conf option from command line

Authentication options:
  -U, --user=USERNAME        Set the network username
  -N, --no-pass              Don't ask for a password
  -k, --kerberos              Use kerberos (active directory) authentication
  -A, --authentication-file=FILE  Get the credentials from a file
  -S, --signing=on|off|required  Set the client signing state
  -P, --machine-pass         Use stored machine account password
  -e, --encrypt               Encrypt SMB transport
  -C, --use-ccache           Use the winbind ccache for authentication
  --pw-nt-hash               The supplied password is the NT hash

linsrv1:~ # █
```

```
linsrv1:~ # smbtree -S
Enter root's password:
WORKGROUP
  \\NUMERICABLE DLNA      Numericable DLNA
  \\LG-NAS                 LG-NAS server
TERWAYWRKGRP
  \\YVES-W10-DESK         Yves's principal Workstation
  \\LINSRV1                Samba 4.4.2-29.4-3709-SUSE-SLE_12-x86_64

linsrv1:~ # █
```

## 4.2. smbclient

```
linsrv1:~ # smbclient --help
Usage: smbclient service <password>
-R, --name-resolve=NAME-RESOLVE-ORDER  Use these name resolution services only
-M, --message=HOST                       Send message
-I, --ip-address=IP                     Use this IP to connect to
-E, --stderr                             Write messages to stderr instead of stdout
-L, --list=HOST                          Get a list of shares available on a host
-m, --max-protocol=LEVEL                Set the max protocol level
-T, --tar=c:\x\y\z\q\w\p\o\k\l\j\i\h\g\f\e\  Command line tar
-D, --directory=DIR                     Start from directory
-c, --command=STRING                    Execute semicolon separated commands
-b, --send-buffer=BYTES                  Changes the transmit/send buffer
-t, --timeout=SECONDS                   Changes the per-operation timeout
-p, --port=PORT                          Port to connect to
-g, --grepable                           Produce grepable output
-B, --browse                             Browse SMB servers using DNS

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

Common samba options:
-d, --debuglevel=DEBUGLEVEL             Set debug level
-s, --configfile=CONFIGFILE            Use alternate configuration file
-l, --log-basefile=LOGFILEBASE          Base name for log files
-V, --version                            Print version
--option=name=value                    Set smb.conf option from command line

Connection options:
-O, --socket-options=SOCKETOPTIONS     socket options to use
-h, --netbiosname=NETBIOSNAME           Primary netbios name
-W, --workgroup=WORKGROUPCONF          Set the workgroup name
-i, --scope=SCOPE                       Use this Netbios scope

Authentication options:
-U, --user=USERNAME                     Set the network username
-N, --no-pass                            Don't ask for a password
-k, --kerberos                           Use Kerberos (active directory) authentication
-A, --authentication-file=FILE          Get the credentials from a file
-S, --signing=on/off/required           Set the client signing state
-P, --machine-pass                       Use stored machine account password
-e, --encrypt                             Encrypt SMB transport
-C, --use-cookies                         Use the winbind cookie for authentication
--pw-nt-hash                             The supplied password is the NT hash
```

### 4.2.1. Listing SMB shared folder through command prompt

```
linsrv1:~ # /usr/bin/smbclient -L //YVES-W10-DESK -U root
```

```
linsrv1:~ # /usr/bin/smbclient -L //YVES-W10-DESK -U root
WARNING: The "idmap gid" option is deprecated
WARNING: The "idmap uid" option is deprecated
Enter root's password:
OS=[Windows 10 Pro 10586] Server=[Windows 10 Pro 6.3]

      Sharename      Type      Comment
      -----      -
ADMIN$              Disk      Administration à distance
C$                  Disk      Partage par défaut
E$                  Disk      Partage par défaut
F$                  Disk      Partage par défaut
IPC$                IPC       IPC distant
print$              Disk      Pilotes d'imprimantes
Transfer             Disk      Transfer folder for Linux
Users               Disk

OS=[Windows 10 Pro 10586] Server=[Windows 10 Pro 6.3]

      Server          Comment
      -----
Workgroup           Master
```



#### 4.2.2. Connect to SMB shared folder

```
smbclient \\\machinename\\foldername -U [username] [password]
```

```
linsrv1:~ # /usr/bin/smbclient \\\YVES-W10-DESK\\transfer -U yves password
```

```
linsrv1:~ # smbclient \\\YVES-W10-DESK\\transfer -U yves s1pad$13_1
WARNING: The "idmap gid" option is deprecated
WARNING: The "idmap uid" option is deprecated
Domain=[YVES-W10-DESK] OS=[Windows 10 Pro 10586] Server=[Windows 10 Pro 6.3]
smb: \> █
```

#### 4.2.3. Mounting the SMB shared folder to local folder

##### 4.2.3.1. Creating Mount Directory on Linux

```
linsrv1:/ # mkdir /mnt/transfer
```

##### 4.2.3.2. Mounting Remote SMB Share

```
# mount -t cifs //servername/foldername /localmountpoint -o username=myusername,password=mypassword
```

```
linsrv1:~ #
```

```
mount -t cifs //192.168.0.20/transfer /mnt/transfer -o username=TERWAYWRKGRP/yves,password=s1pad$13_1
```

```
linsrv1:/ # mount -t cifs //192.168.0.20/transfer /mnt/transfer -o username=TERWAYWRKGRP/yves,password=s1pad$13_1
linsrv1:/ # █
```

```
linsrv1:/ # cd /mnt/transfer
linsrv1:/mnt/transfer # ls -la
total 64
drwxr-xr-x 2 root root    0 Dec  8 13:46 .
drwxr-xr-x 1 root root   16 Dec  9 11:59 ..
-rwxr-xr-x 1 root root 64004 Dec  8 13:44 Screenshot from 2016-12-08 13-44-04.png
```

On the Linux Server