



https://wiki.samba.org/index.php/DCERPC\_Hardening

Stefan Metzmacher <metze@samba.org>

Samba Team / SerNet

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https://samba.org/~metze/presentations/2016/SDC/



- ▶ The badlock related bugs
- ► Scope of the urgent changes
- ▶ What is DCERPC?
- ► Existing Hardening
- ► Remaining Problems
- ► Proposed Solutions
- Summary/Status
- Questions?



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#### SambaXP Talk

- ▶ I gave a talk about Badlock and the related bugs at SambaXP 2016
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- ▶ I found new problems day after day
- About 20 problem classes (mostly denial of service and man in the middle)
- ▶ Distributed over 4 DCERPC implementations (2 servers, 2 clients)
- ▶ I analysed these problems deeply together with Günther Deschner
- ▶ At the end I had 94 patches including an almost complete DCERPC protocol verification testsuite



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- ▶ I guess it's really not that unlikely that someone might find exploits for an unpatched router firmware



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- ► Some application layer protocols (e.g. DRSUAPI) only allow secure connections using integrity or privacy protection
- Samba was missing most of these checks which were already available on Windows



# CVE-2016-2110: NTLMSSP problems

- ▶ While working on CVE-2015-5370 and CVE-2016-2118 I thought a complete audit of all protocols was required
- ► After a while I found that NTLMSSP flags, e.g. NTLMSSP\_SIGN/SEAL can be removed by a man in the middle without noticing
- ► This has implications on encrypted LDAP traffic
- A bit of research revealed that Microsoft already implemented downgrade detection into NTLMSSP when using NTLMv2
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- ► The problem with this was that any domain member was able to ask the domain controller for NTLM session keys of authentication sessions of all other domain members.
- ► The protection mechanism relies on NTLMv2 being used only via NTLMSSP
- ▶ During the research it turned out that the problems in Samba were even worse
- Anonymous attackers could ask for the session keys
- ► raw NTLMv2 was allowed without NTLMSSP wrapping, which allowed downgrade attacks





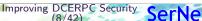
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- ▶ It was required to fix these things in the LDAP server as well as in our two LDAP client libraries
- At the same time we improved the consistency of behaviors especially regarding the usage of configuration options
- ▶ The default behavior of the LDAP server is much stricter than before





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- ► This applies to all TLS based protocols like ldaps:// and ncacn\_http with https://
- ► For Idaps:// it only applies to tools like samba-tool, Idbsearch, Idbedit and other Idb tools
- ▶ Typically, these protocols are not used, but if someone does use them they are expected to be protected
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- ► As all unprotected DCERPC transports are vulnerable to man in the middle attacks it was clear that SMB signing is important
- ► It turned out that we didn't require SMB signing even if we are configured with mandatory signing
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- ► As the Samba Team we only have resources to provide security fixes for 3 maintained branches (at the time 4.4, 4.3 and 4.2)
  - 4.4.2 had 323 patches on top of 4.4.0 (note that 4.4.1 had a regression and was superseeded by 4.4.2)
  - ► samba-4.4.0-security-2016-04-12-final.patch 227 files changed, 14582 insertions(+), 5037 deletions(-)
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  - ▶ It is an infrastructure to call a function on a remote server
  - ▶ "remote" is connected via some kind of socket (tcp/ip, named pipes, ...)
- As development environment
  - Function stubs are typically autogenerated from an Interface Definition Language (IDL)
- As network protocol defines how:
  - marshalling of payloads work transfer syntax (NDR/NDR64)
  - marshalling of PDUs
  - PDUs are ordered
  - authentication and encryption works
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- ▶ Distributed Computing Environment / Remote Procedure Calls
  - ▶ It is an infrastructure to call a function on a remote server
  - "remote" is connected via some kind of socket (tcp/ip, named pipes, ...)
- As development environment
  - ► Function stubs are typically autogenerated from an Interface Definition Language (IDL)
- As network protocol defines how:
  - marshalling of payloads work transfer syntax (NDR/NDR64)
  - marshalling of PDUs
  - PDUs are ordered
  - authentication and encryption works
- ▶ My talk from 2014 has much more details
  - https://samba.org/~metze/presentations/2014/



## Wireshark DCERPC (BIND)

```
▼ Distributed Computing Environment / Remote Procedure Call (DCE/RPC) Bind, Fragment:
   Version: 5
   Version (minor): 0
   Packet type: Bind (11)
 ▶ Packet Flags: 0x07
 ▶ Data Representation: 10000000 (Order: Little-endian, Char: ASCII, Float: IEEE)
   Frag Length: 198
   Auth Lenath: 74
   Call ID: 1
   Max Xmit Frag: 5840
   Max Recv Frag: 5840
   Assoc Group: 0x00000000
   Num Ctx Items: 2
 ▶ Ctx Item[1]: Context ID:0, LSARPC, 32bit NDR
 ▶ Ctx Item[2]: Context ID:1, LSARPC, Bind Time Feature Negotiation
 ▼ Auth Info: SPNEGO, Packet integrity, AuthContextId(1)
    Auth type: SPNEGO (9)
    Auth level: Packet integrity (5)
    Auth pad len: 0
    Auth Rsrvd: 0
    Auth Context ID: 1
   ▶ GSS-API Generic Security Service Application Program Interface
```



# Existing DCERPC Hardening (PFC\_SUPPORT\_HEADER\_SIGN)

- GSS-API based authentication is used
  - NTLMSSP, KRB5, SPNEGO
  - ► A custom security provider for the NETLOGON service
  - gss\_wrap\_iov() is required to support header signing





# Existing DCERPC Hardening (PFC\_SUPPORT\_HEADER\_SIGN)

- GSS-API based authentication is used
  - NTLMSSP, KRB5, SPNEGO
  - ► A custom security provider for the NETLOGON service
  - gss\_wrap\_iov() is required to support header signing
- MS-RPCE 2.2.2.3 PFC\_SUPPORT\_HEADER\_SIGN Flag.
  - Same value as PEC PENDING CANCEL
  - ▶ This flag can be negotiated in the Bind/BindAck exchange
  - On Windows and modern Samba installations all security providers support it.
  - ▶ It protects the header fields of DCERPC Request/Response PDUs incl. the sec trailer.





#### Wireshark DCERPC PFC\_SUPPORT HEADER SIGN

```
Version: 5
 Version (minor): 0
 Packet type: Bind (11)
▼ Packet Flags: 0x07
    0... .... = Object: Not set
    .0.. .... = Maybe: Not set
    ..0. .... = Did Not Execute: Not set
    ...0 .... = Multiplex: Not set
    .... 0... = Reserved: Not set
    ..... 1.. = Cancel Pending: Set PFC SUPPORT HEADER SIGN
    .... ..1. = Last Frag: Set
    .... 1 = First Frag: Set
▶ Data Representation: 10000000 (Order: Little-endian, Char: ASCII, Float: IEEE)
  Frag Length: 198
 Auth Length: 74
 Call ID: 1
 Max Xmit Frag: 5840
 Max Recv Frag: 5840
 Assoc Group: 0x00000c58
 Num Ctx Items: 2
▶ Ctx Item[1]: Context ID:0, LSARPC, 32bit NDR
▶ Ctx Item[2]: Context ID:1, LSARPC, Bind Time Feature Negotiation
```



## Existing DCERPC hardening (Verification Trailer)

- ▶ MS-RPCE 2.2.2.13 Verification Trailer
  - A hidden structure injected at the end of the DCERPC Request stub data
  - Identified by a 8 byte magic value (0x8a, 0xe3, 0x13, 0x71, 0x02, 0xf4, 0x36, 0x71)
  - It contains an array of optional command structures
- rpc\_sec\_vt\_bitmask protects the PFC\_SUPPORT\_HEADER\_SIGN negotiation
- rpc\_sec\_vt\_header2 protects the header fields if PFC\_SUPPORT\_HEADER\_SIGN is not available
- rpc\_sec\_vt\_pcontext protects the negotiation of the presentation context (InterfaceId/TransferSyntax)





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- rpc\_sec\_vt\_pcontext protects the negotiation of the presentation context (InterfaceId/TransferSyntax)





#### Wireshark DCERPC Request PDU

```
▼ Distributed Computing Environment / Remote Procedure Call (DCE/RPC) Request, Fragment:
   Version: 5
   Version (minor): 0
   Packet type: Request (0)
 ▶ Packet Flags: 0x03
 ▶ Data Representation: 10000000 (Order: Little-endian, Char: ASCII, Float: IEEE)
   Frag Length: 240
   Auth Length: 16
   Call ID: 2
   Alloc hint: 188
   Context ID: 0
   Opnum: 6
   [Response in frame: 66]
 ▼ Complete stub data (188 bytes)
    Pavload stub data (44 bytes)
   ▶ Verification Trailer
 ▶ Auth Info: SPNEGO, Packet integrity, AuthContextId(1)
▶ Local Security Authority, lsa OpenPolicy
```





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#### Wireshark DCERPC Verification Trailer

#### ▼ Complete stub data (104 bytes)

Payload stub data (44 bytes)

▼ Verification Trailer

SEC\_VT\_SIGNATURE: 8ae3137102f43671

▼ Command: BITMASK\_1

► Command: 0x0001, Cmd: BITMASK\_1

Length: 4

▶ rpc\_sec\_vt\_bitmask: 0x00000001, CLIENT\_SUPPORT\_HEADER\_SIGNING

▼ Command: PCONTEXT, END

► Command: 0x4002, Cmd: PCONTEXT, SEC\_VT\_COMMAND\_END

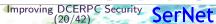
Length: 40

**▼** pcontext

Abstract Syntax: LSARPC Version: 0x00000000

Transfer Syntax: 32bit NDR

Version: 0x00000002



## Existing DCERPC hardening (Bind Time Features)

- ► MS-RPCE 2.2.2.14 BindTimeFeatureNegotiationBitmask
  - ► A way to negotiate new features
- Current defined features:
  - SecurityContextMultiplexingSupported
  - ► KeepConnectionOnOrphanSupported





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- Current defined features:
  - SecurityContextMultiplexingSupported
  - KeepConnectionOnOrphanSupported

## Wireshark DCERPC Bind Time Features (BIND)

- ► Ctx Item[1]: Context ID:0. LSARPC. 32bit NDR
- f f Ctx Item[2]: Context ID:1, LSARPC, Bind Time Feature Negotiation

Context ID: 1

Num Trans Items: 1

- ▶ Abstract Syntax: LSARPC V0.0
- lacktriangledown Transfer Syntax[1]: Bind Time Feature Negotiation V1

Transfer Syntax: Bind Time Feature Negotiation UUID:6cb71c2c-9812-4540-0300-00000000000

▶ Bind Time Features: 0x0003, Security Context Multiplexing Supported, Keep Connection On Orphan Supported ver: 1





## Wireshark DCERPC Bind Time Features (BIND ACK)

- ▼ Ctx Item[1]: Acceptance, 32bit NDR Ack result: Acceptance (0) Transfer Syntax: 32bit NDR Syntax ver: 2
- ▼ Ctx Item[2]: Negotiate ACK, NULL Ack result: Negotiate ACK (3)
  - ▶ Bind Time Features: 0x0003, Security Context Multiplexing Supported, Keep Connection On Orphan Supported Transfer Syntax: NULL

Syntax ver: 0



- ► DCERPC Fault, Cancel and Orphan PDUs don't include any integrity nor privacy protection.
- ► DCERPC\_NCA\_S\_OP\_RNG\_ERROR is typically used to indicate that a specific opnum is not implemented by the server
- DCERPC\_NCA\_S\_FAULT\_INVALID\_TAG is typically used to indicate that a specific information level is not supported
- ▶ There are higher level protection against downgrades required.
- ▶ The most important protocols don't have known downgrade problems
- ▶ But it would be good to have real protection at the DCERPC layer.





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#### **Proposed Solutions**

- ► SMB 3.x has support for generic encryption and downgrade detection
  - ▶ It wrapps SMB 2/3 PDUs inside an SMB2 TRANSFORM\_HEADER PDU.
  - ► FSCTL\_VALIDATE\_NEGOTIATE\_INFO was a nice try, but does not protect everything.





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- ► SMB 3.1.1 has finally a working downgrade protection
  - A SHA512 preauth hash is calculated over the Negotiate and SessionSetup PDUs.
- BindTimeFeatureNegotiation and Verification Trailer should be able to build a backward compatible solution for DCERPC.
  - DCERPC\_BIND\_TIME\_SUPPORT\_PREAUTH
  - DCERPC\_BIND\_TIME\_PROTECT\_ALL\_PDUS
  - DCERPC\_BIND\_TIME\_SUPPORT\_WRAP





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#### DCERPC\_BIND\_TIME\_SUPPORT\_PREAUTH

- ► DCERPC\_BIND\_TIME\_SUPPORT\_PREAUTH is negotiated in the Bind/BindAck exchange.
  - ► The DCERPC\_BIND\_ACK\_RESULT\_NEGOTIATE\_ACK element is filled with a random transfer\_syntax value as salt (16 bytes).
- ► All DCERPC Bind, BindAck, AlterContext, AlterContextResp and Auth3 PDUs update a rolling preauth hash.
  - These are triggered by the client and are strictly ordered.
  - Client and Server start with a zero preauth hash.
  - The preauth hash is updated when sending or receiving an unprotected PDU.
  - ► PREAUTH\_SHA512 = SHA512(PREAUTH\_SHA512, PDU).
- ► DCERPC\_SEC\_VT\_COMMAND\_PREAUTH is added to the verification trailer of the first request.
  - DCERPC\_SEC\_VT\_COMMAND\_PREAUTH contains a 16 byte SALT
  - ▶ It also contains the result of SHA512(PREAUTH\_SHA512 + SALT)



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  - ▶ It also contains the result of SHA512(PREAUTH\_SHA512 + SALT).





# Wireshark DCERPC Bind Time Features (PREAUTH Bind)

## Wireshark DCERPC Bind Time Features (PREAUTH Ack

```
Num results: 2
▼ Ctx Item[1]: Acceptance, 32bit NDR
   Ack result: Acceptance (0)
   Transfer Syntax: 32bit NDR
   Syntax ver: 2
▼ Ctx Item[2]: Negotiate ACK, ad6a9956-cce7-45d2-801a-ca2d0d3c4216
   Ack result: Negotiate ACK (3)
 ▼ Bind Time Features: 0x0004, Support SHA512 PREAUTH Verification
    .... .... 0 = Security Context Multiplexing Supported: False
    .... .... ..0. = Keep Connection On Orphan Supported: False
    .... .... .1.. = Support SHA512 PREAUTH Verification: True
    .... o... = Support protection of all PDUs: False
   Transfer Syntax: ad6a9956-cce7-45d2-801a-ca2d0d3c4216
   Syntax ver: 0
```

▶ Auth Info: SPNEGO, Packet integrity, AuthContextId(1)

## Wireshark DCERPC Verification Trailer (PREAUTH)

- ▼ Complete stub data (188 bytes) Payload stub data (44 bytes)
  - ▼ Verification Trailer

SEC\_VT\_SIGNATURE: 8ae3137102f43671

- ▶ Command: BITMASK\_1
  ▶ Command: PCONTEXT
  ▼ Command: PREAUTH, END
  - ▶ Command: 0x4004, Cmd: PREAUTH, SEC\_VT\_COMMAND\_END
    - Length: 80
  - ▼ preauth

Salt: 5cf16b4a22602a6c10fd7678de2c235f

SHA512 Hash: 96a9bd8be3572ade794b5cad6e4371dc23d87296f1f5c2c9...





## Wireshark DCERPC Bind Time Features (PROTECT\_ALL\_PDUs Bind)

```
Num Ctx Ttems: 2
▶ Ctx Item[1]: Context ID:0, LSARPC, 32bit NDR
▼ Ctx Item[2]: Context ID:1, LSARPC, Bind Time Feature Negotiation
   Context ID: 1
   Num Trans Items: 1
 ▶ Abstract Syntax: LSARPC V0.0
 ▼ Transfer Syntax[1]: Bind Time Feature Negotiation V1
    Transfer Syntax: Bind Time Feature Negotiation UUID:6cb71c2c-9812-4540-0f00-000000000000
  ▼ Bind Time Features: 0x000f.
      .... .... 1 = Security Context Multiplexing Supported: True
      .... .... .... ..... Keep Connection On Orphan Supported: True
      .... .... .1.. = Support SHA512 PREAUTH Verification: True
      .... 1... = Support protection of all PDUs: True
    ver: 1
▶ Auth Info: SPNEGO, Packet integrity, AuthContextId(1)
```



## Wireshark DCERPC Bind Time Features (PROTECT\_ALL\_PDUs Ack)

```
Num results: 2
▼ Ctx Item[1]: Acceptance. 32bit NDR
   Ack result: Acceptance (0)
   Transfer Syntax: 32bit NDR
   Syntax ver: 2
▼ Ctx Item[2]: Negotiate ACK, d38da7fa-a8a8-4ee8-9069-f840f6752401
   Ack result: Negotiate ACK (3)
 ▼ Bind Time Features: 0x000c, Support SHA512 PREAUTH Verification, Support protection of all PDUs
    .... .... ...0 = Security Context Multiplexing Supported: False
     .... .... ... ... ... ... Keep Connection On Orphan Supported: False
    .... .... .1.. = Support SHA512 PREAUTH Verification: True
    .... 1... = Support protection of all PDUs: True
   Transfer Syntax: d38da7fa-a8a8-4ee8-9069-f840f6752401
   Syntax ver: 0
▶ Auth Info: SPNEGO, Packet integrity, AuthContextId(1)
```



#### Wireshark DCERPC Fault PDU-

```
▼ Distributed Computing Environment / Remote Procedure Call (DCE/RPC) Fault, Fragment:
   Version: 5
   Version (minor): 0
   Packet type: Fault (3)
 ▶ Packet Flags: 0x03
 ▶ Data Representation: 10000000 (Order: Little-endian, Char: ASCII, Float: IEEE)
   Frag Length: 32
   Auth Length: 0
   Call ID: 2
   Alloc hint: 32
   Context ID: 0
   Cancel count: 0
 ▶ Fault flags: 0x00
 ▶ Status: nca s fault access denied (0x00000005)
   Reserved: 00000000
   [Opnum: 6]
   [Request in frame: 65]
   [Time from request: 0.000296000 seconds]
   Fault stub data (0 bytes)
```



## Wireshark DCERPC Fault PDU (Protected)

#### ullet Distributed Computing Environment / Remote Procedure Call (DCE/RPC) Fault, Fragment:

```
Version: 5

Version (minor): 0

Packet type: Fault (3)

▶ Packet Flags: 0x03

▶ Data Representation: 10000000 (Order: Little-endian, Char: ASCII, Float: IEEE)

Frag Length: 68

Auth Length: 28

Call ID: 2

Alloc hint: 24

Context ID: 0

Cancel count: 0

▶ Fault flags: 0x00

▶ Status: nca_s_fault_access_denied (0x00000005)

Reserved: 000000000
```

[Opnum: 45]

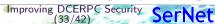
[Request in frame: 55]

[Time from request: 0.002011000 seconds]

Fault stub data (0 bytes)

▶ Auth Info: SPNEGO, Packet integrity, AuthContextId(1)





## IDL definition the DCERPC (ncacn) PDU

#### The ncacn pdu IDL description in Samba:

```
typedef [public] struct {
    uint8 rpc_vers;
                                /* RPC version */
    uint8 rpc_vers_minor;
                                /* Minor version */
    dcerpc_pkt_type ptype;
                                /* Packet type */
    dcerpc_pfc_flags pfc_flags; /* Fragmentation flags */
    uint8 drep[4];
                                /* NDR data representation */
                               /* Total length of fragment */
    uint16 frag_length;
                               /* authenticator length */
    uint16 auth_length;
    uint32 call_id;
                                /* Call identifier */
    [switch_is(ptype)] dcerpc_payload u;
} ncacn_packet;
```

#### IDL definiation of the Payload union

The neacn payload destription union:

```
typedef [nodiscriminant] union {
    [case(DCERPC PKT REQUEST)]
                                   dcerpc request
                                                     request;
    [case(DCERPC_PKT_RESPONSE)]
                                   dcerpc_response
                                                     response;
    [case(DCERPC_PKT_FAULT)]
                                   dcerpc_fault
                                                     fault;
    [case(DCERPC PKT BIND)]
                                   dcerpc_bind
                                                     bind:
    [case(DCERPC PKT BIND ACK)]
                                   dcerpc_bind_ack
                                                     bind ack:
    [case(DCERPC_PKT_BIND_NAK)]
                                   dcerpc_bind_nak
                                                      bind_nak;
    [case(DCERPC PKT ALTER)]
                                   dcerpc bind
                                                      alter:
    [case(DCERPC PKT ALTER RESP)]
                                   dcerpc bind ack
                                                      alter resp:
    [case(DCERPC_PKT_SHUTDOWN)]
                                   dcerpc_shutdown
                                                      shutdown:
    [case(DCERPC_PKT_CO_CANCEL)]
                                   dcerpc_co_cancel
                                                     co_cancel;
    [case(DCERPC PKT ORPHANED)]
                                   dcerpc_orphaned
                                                     orphaned;
    [case(DCERPC_PKT_AUTH3)]
                                   dcerpc_auth3
                                                     auth3;
    [case(DCERPC_PKT_RTS)]
                                   dcerpc_rts
                                                     rts;
    /* WRAP packets used to improve privacy */
    [case(DCERPC_PKT_WRAP)]
                                   dcerpc wrap
                                                      wrap:
} dcerpc_payload;
```

## dcerpc\_wrap (work in progress) definition

The IDL function definition (in Samba):

```
typedef [public] struct {
   //TODO/DISCUSS:
   // - add random confounder at the beginning
       - add explicit verification traller
   // - allow extra preauth hash check PDU
   // - callid random?
   // - flags?
   // - How to detect downgrades on the client
   //
         without breaking against old servers
   /* this contains the real ncacn_packet blob and the auth verifier */
   [flag(NDR REMAINING)] DATA BLOB pdu and verifier:
} dcerpc_wrap;
```

- The specific numbers for flags and types need to agreed on
  - ▶ It would be good if Microsoft could assign them in MS-RPCE
  - ▶ Are other vendors also interested to implement (at least parts of) this?





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- Bind Time Features:
  - ▶ DCERPC\_BIND\_TIME\_SUPPORT\_PREAUTH = 0x0004
  - ► DCERPC\_BIND\_TIME\_PROTECT\_ALL\_PDUS = 0x0008
  - ► DCERPC\_BIND\_TIME\_SUPPORT\_WRAP = 0x0010
- Verification Trailer Command:
  - ► DCERPC\_SEC\_VT\_COMMAND\_PREAUTH = 0x0004
- ▶ PDU Type:
  - ▶ DCERPC\_PKT\_WRAP = 21





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- Bind Time Features:
  - ▶ DCERPC\_BIND\_TIME\_SUPPORT\_PREAUTH = 0x0004
  - ► DCERPC\_BIND\_TIME\_PROTECT\_ALL\_PDUS = 0x0008
  - ► DCERPC\_BIND\_TIME\_SUPPORT\_WRAP = 0x0010
- Verification Trailer Command:
  - DCERPC\_SEC\_VT\_COMMAND\_PREAUTH = 0x0004
- PDU Type:
  - ▶ DCERPC\_PKT\_WRAP = 21





- The specific numbers for flags and types need to agreed on
  - ▶ It would be good if Microsoft could assign them in MS-RPCE
  - Are other vendors also interested to implement (at least parts of) this?
- Bind Time Features:
  - DCFRPC BIND TIME SUPPORT PREAUTH = 0x0004
  - DCERPC\_BIND\_TIME\_PROTECT\_ALL\_PDUS = 0x0008
  - ► DCERPC BIND TIME SUPPORT WRAP = 0x0010
- Verification Trailer Command:
  - DCFRPC SFC VT COMMAND PRFAUTH = 0x0004
- ► PDU Type:
  - DCERPC PKT WRAP = 21





#### New DCERPC testing infrastructure

- Low-level protocol testing
  - python/samba/tests/dcerpc/raw\_protocol.py
  - ▶ This uses our python bindings to marshall PDUs and use raw sockets
  - ▶ This becomes a full DCERPC testsuite exploring almost each bit in the protocol
  - Windows 2012R2 is the current reference implementation
  - Samba as AD DC also passes
  - Currently 75 tests in master and 50 more waiting for review





#### New DCERPC testing infrastructure

- Low-level protocol testing
  - python/samba/tests/dcerpc/raw\_protocol.py
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  - ▶ This becomes a full DCERPC testsuite exploring almost each bit in the protocol
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Calling the raw protocol testsuite (in a Samba source tree):

```
$ export SMB_CONF_PATH=/dev/null
 export SERVER=w2012r2-188.w2012r2-16.base
 export USERNAME = administrator
 export PASSWORD=A1b2C3d4
$ python/samba/tests/dcerpc/raw_protocol.py -v -f TestDCERPC_BIND
```

## Application level problems (LSA and SAMR)

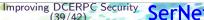
- ▶ Some LSA and SAMR functions use an SMB application session key
  - ► This implies that they only work on ncacn\_np
  - ► They can't use DCERPC level authentication (integrity/privacy)
  - ► They rely on SMB signing/encryption
- ► There're used to be a wellknown transport session key for authenticated DCERPC
  - It was the constant "SystemLibraryDTC"
  - All recent versions of Samba and Windows return NT\_STATUS\_NO\_USER\_SESSION\_KEY instead
  - DCERPC\_AUTH\_LEVEL\_CONNECT is not supported anymore
- samr\_Connect5() and Isa\_OpenPolicy2() can be used to negotiate a new behaviour
  - It's possible to avoid application level encryption
  - ▶ It could rely on DCERPC\_AUTH\_LEVEL\_PRIVACY
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## https://wiki.samba.org/index.php/DCERPC\_Hardening

- ▶ Please contact me if you're a vendor and are interested in implementing this in your product.
- Stefan Metzmacher, metze@samba.org
- http://www.sernet.com

→ SerNet sponsor booth