Samba 2020: Why are we stuck in the 1980's

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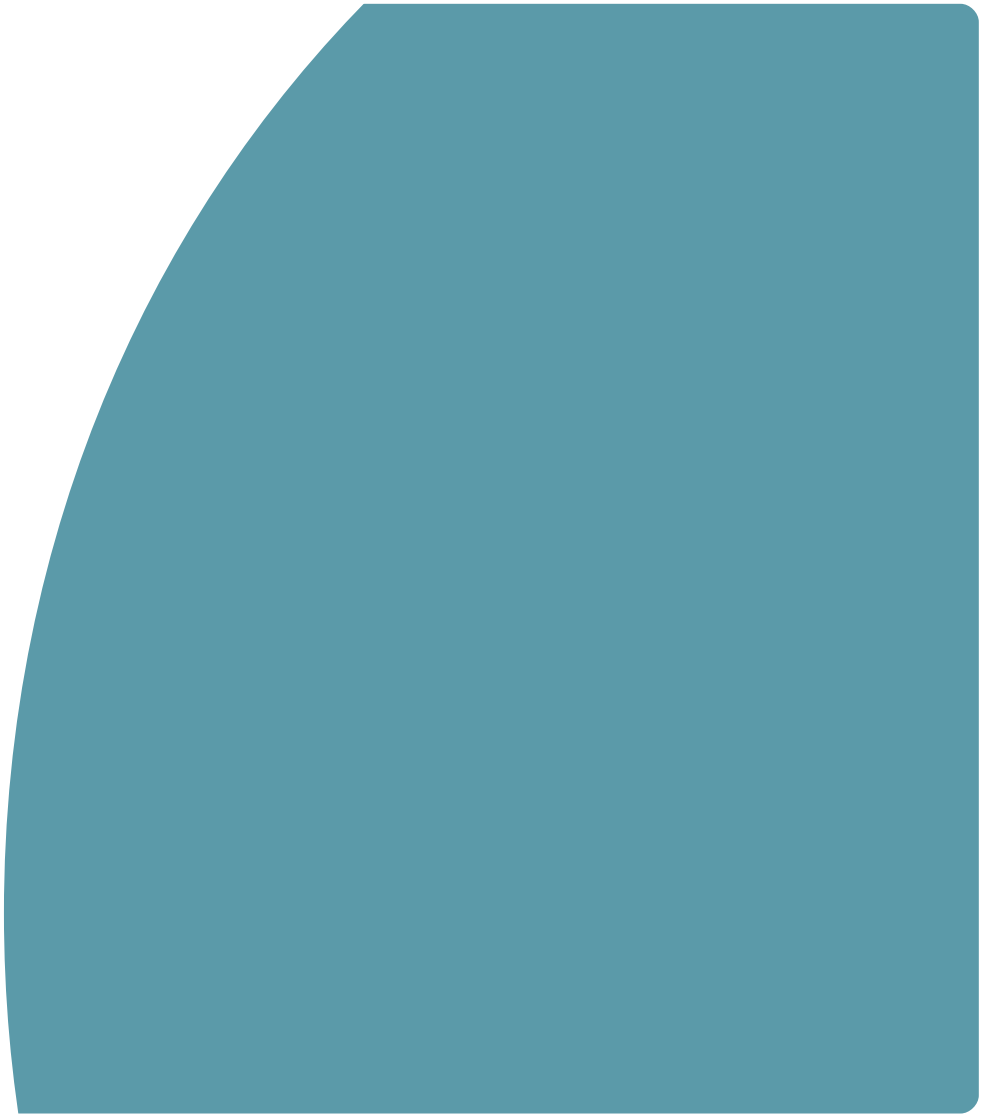
SAMBA

Samba in 2020

A status update



Samba 4.11 released

First Samba AD released for the 300,000 user scale

GnuTLS used for cryptography (new to the fileserver)

SMB1 Disabled by default

LanMan and plaintext authentication deprecated

Python 3.4 required at runtime

Python 2.7 still supported for the build (only)

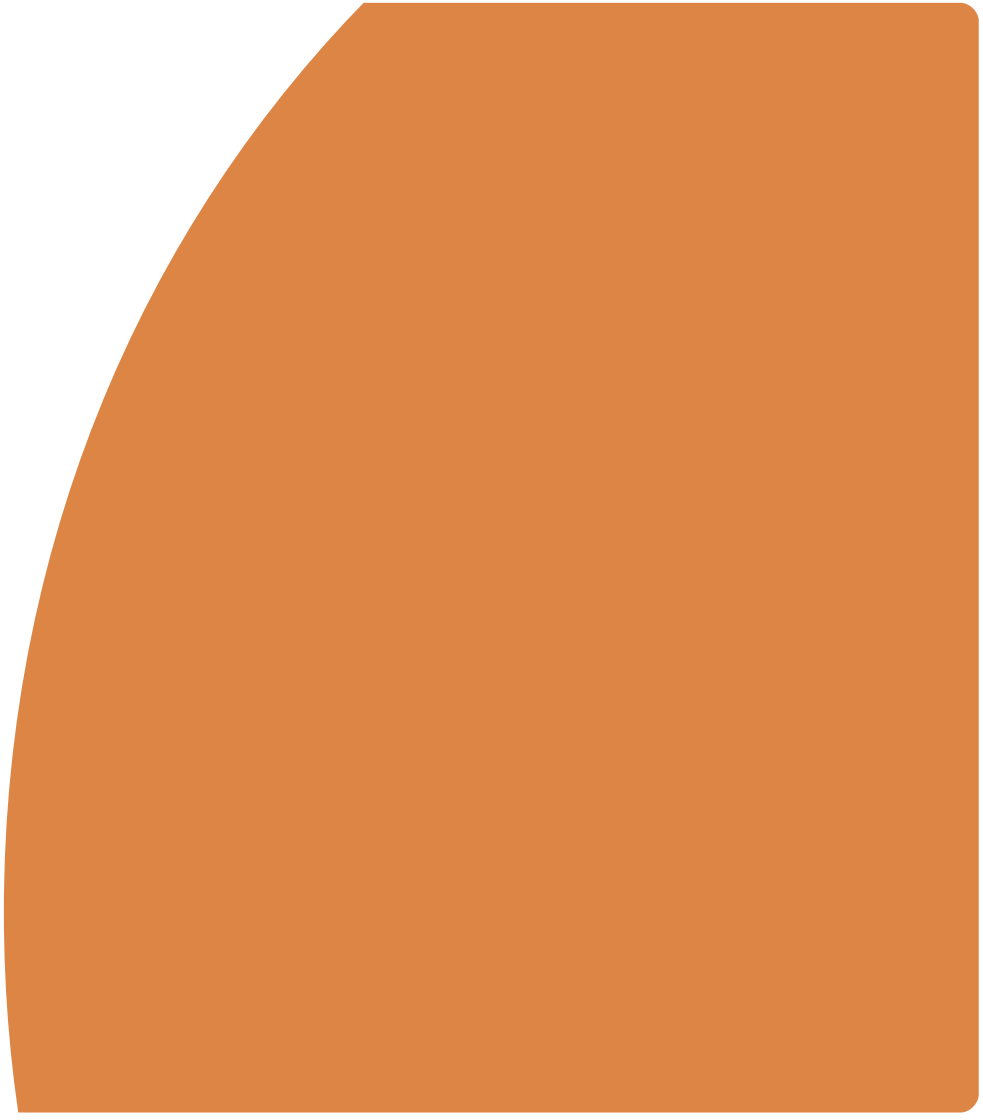
CI tested on OpenSUSE, Fedora, RHEL, Debian, Ubuntu

Samba 4.12 frozen

- More in-tree cryptography replaced (DES, AES)
- DES Kerberos keys no longer supported
- More robust NDR parser due to fuzz testing
- Python 3.5 required at runtime
  - Python 2.7 still supported for the build (only)

1980s authentication?

Just say no to NTLM?



LanMan Authentcation

SMB started with DES back in 1982

Challenge/response was a great improvement at the time

DES(chal, uppercase(password[:7]).DES(chal, uppercase(password[7:])

Attack each end of the password separately

Needed for DOS and Win9X client

To be clear, LanMan authtication is disabled by default

NTLM authentication

Unicode password support added for Windows NT in 1990s

Still quite weak:

DES(chal, MD4(UTF-16LE(password))[:7]).

DES(chal, MD4(UTF-16LE(password))[7:14]).

DES(chal, MD4(UTF-16LE(password))[14:].[0][0][0][0][0][0])

Those zeros and the splitting is not good!

Still used extensively by MS-CHAPv2

Typically over TLS, but did you check the certificate?

NTLMv2 authentication

HMAC-MD5 based

Primary risk is offline brute force attacks

Can include provision for channel binding (for use under TLS)

TLS is not used in SMB and Samba doesn’t implement this so far

The default for all modern clients and Servers

Still requires storage of unsalted MD4-based password hash

Even HMAC-MD5 is a 1997 specification

Kerberos to the rescue

Yet another 1980s protocol

- Kerberos is old
  - Kerberos first deployed in 1986!
  - Kerberos v5 is 1993
- Suffers from a number of 1980s design decisions (ASN.1)
- The solution to every problem
  - Except for the complexity of Kerberos

Kerberos should solve the issues

De-couples login (getting a ticket) from submitting that ticket

Provides Smart card support

So why so little innovation / nothing better?

No client UI control (unlike the web)

Hashed password methods (so poor OTP options)

Kerberos is a poor match without a full domain

Smart cards only work as part of a domain

Clients speak Kerberos or NTLM, but nothing else

KDC on every device?

- Apple has a mode where Kerberos, not NTLM is used in a workgroup
  - The fileserver is a KDC for itself only
  - Avoids the need to find the KDC
- No support on Windows or Samba clients
- Essentially a way of using the Kerberos key exchange in place of NTLM

Little interest from Microsoft

A better NTLM is not considered a priority

Focus is on Windows Hello and Hello for Business

Windows Hello

So what is this Hello thing anyway

Log into your windows computer directly to the cloud

Competing with Chromebooks and apple cloud-based login

Unlock the device with a per-device PIN

Hard to actually set up local accounts on new windows installs!

Hello for business

Essentially makes your PC the smart card

Unlock your PC and you have unlocked your smart card

Enrolment procedure into AD via Active Directory Federation Services

So not an easy add-on for Samba

What can we do?

Smart Cards could be easier

- Smart cards (eg the Yubikey 5) are still a pain to set up
- Typical enrolment involves a full CA infrastructure
  - Samba supports this but certificate revocation support is not great
- Alternative is to record each key in the directory entry for the user
  - But not supported in Samba / Heimdal yet.

SSH Wrapping?

SSH keys have become the standard way to authenticate on Linux

Could we somehow forward over SSH **and** inherit the authentication?

Or add the SSHv2 protocol as an additional mechanism in SPNEGO (eg using libssh)

NT hash-free Samba AD?

Should we just remove all MD4 hashes?

We could go pure kerberos, no fallback!

Quite a few bits of Samba's protocols use the MD4 hash

- Password history
- Password change over SAMR
- Plaintext passwords internally

These need to be re-implemented in terms of eg crypt()

A new or safer NTLM for Samba?

Difficult to negotiate new NTLM versions

Could allow NTLMv2 but not store the raw NT hash?

(salt it with username/domain)

Would require that the “domain” part be given correctly to Samba

Perhaps support some kind of predictable OTP or hardware response?

Something that can cope with being hashed like TOTP

Perhaps put a 2nd factor in the NTLMv2 response, encrypt with password?

What about U2F (eg Yubikey)?

Can Samba somehow make the jump into web security?

U2F is the only physical two-factor system that is simple to set up

Could we give Samba ‘API Keys’ as passwords, configured from the web?

Can we somehow do U2F without the web, like pam-u2f?

Are we headed to a pure-web world?

Does this matter anyway?

Our protocols are on-LAN and the real threats on the big bad web right?

The SAML gateway / IDP can handle all this proper security stuff?

Leave Samba to just check simple passwords?

I think we should do better, but how is not entirely clear

A recognised paring with Samba filling the ADFS niche would be a good start

So what should we do?

We need to innovate, not just follow

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SAMBA

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