Kerberos/Authentication Updates in Samba

Status Update within Samba 4.16

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Topics

- ► SambaXP 2020
- Security updates
- Testing improvements
- MIT KDC improvements
- Updated Heimdal snapshot
- Pending Heimdal based Fixes
- Future Updates
- How you can reliable change a machine password
- Questions? Feedback!



SambaXP 2020

- Also see my SambaXP 2020 Talk
- https://samba.org/~metze/presentations/2020/SambaXP/
- ▶ It explains/shows a lot of details of how Kerberos works



Security updates

- ▶ In November 2021 we fixed a lot security problems
 - ► Mostly related to name based races
- ► See Andrew's SambaXP 2022 Talk which explains the details



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Testing improvements

- ▶ In 2020 we introduced python based protocol tests for krb5
 - ▶ We're able to generate any possible request PDU
 - and verify all fields of the response PDU of the KDC
 - ▶ The initial infrastructure consisted of 3498 lines
 - (including autogenerated as code)
- Now in 2022 these tests have been expanded a lot
 - ► We're now at ~ 21k lines!
 - These new tests helped a lot exploring and fixing the security problems
- Catching regressions is important when changing the KDC code
 - The amount of tests should be able to prevent major regressions
 - However there's still a lot of potential for new/additional tests



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MIT KDC improvements

- ▶ The MIT-KDC code for the active directory dc got support for:
 - PKINIT (certificate/smartcard authentication)
 - S4U2Self (enable an application service to obtain a Kerberos service ticket on behalf of a named user)
 - ► S4U2Proxy (including resource based constrained delegation RBCD)
 - ▶ Propagation of Asserted Identity SIDS: S-1-18-1 vs. S-1-18-2
- We still hide the MIT-KDC feature behind '-with-experimental-mit-ad-dc'
 - ► The Heimdal based KDC is still the preferred choice
 - ► The new features require MIT krb5 1.20, which got released on 2022-05-26
 - But the python tests give us an overview what's still missing (and it's getting less and less)



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 - ▶ We still have custom patches, but rebased
 - We try to create upstream pull requests before we integrate patches
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- The new Heimdal internal APIs are much more flexible:
 - It's much easier to hook our AD KDC logic into the core code
 - ▶ Hopefully we require less custom changes for future features



(7/15)

Updated Heimdal snapshot (Part 2)

- Support for Kerberos FAST was added:
 - This brings Kerberos request armoring
 - It can tunnel ticket requests and replies that might be encrypted with a weak password inside a wrapper built with a stronger password, say from a machine account.
 - ► We don't support Compound Identity with FAST yet
- FAST is used by Heimdal and MIT by default if possible
 - But not for Authetication Ticket requests (AS-REQ/REP)
 - ► Pre-Authentication with weak passwords is not protected
 - Only for Service-Tickets requests (TGS-REQ/REP)
- Windows clients do not use FAST by default
 - Windows (at least) 2012 DCs, as well as explicit GPO settings, are required
 - ► We announce ourself only as Windows 2008R2



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Pending Heimdal based Fixes (Part 1)

- Usage of previous passwords should not update badPwdCount
 - It happens when working on multiple hosts with cached passwords
 - ► It's already fixed for NTLM authentication
 - But Kerberos Pre-Authentication results in ACCOUNT_LOCKED_OUT
 - https://bugzilla.samba.org/show_bug.cgi?id=14054
 - ► This merge request has fixes for the problem
 - https://gitlab.com/samba-team/samba/-/merge_requests/664
- There are important S4U2Proxy fixes for Windows consumers
 - We need to use the correct decryption key for enc-authorization-data
 - https://bugzilla.samba.org/show_bug.cgi?id=13131
 - We need to use the correct authtime for the PAC
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Pending Heimdal based Fixes (Part 2)

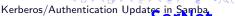
- We should announce PA-SUPPORTED-ETYPES like windows:
 - We should announce strong encryption types, even if no related key is stored
 - It means a ticket can have a stronger session key type than decryption key type
 - https://bugzilla.samba.org/show_bug.cgi?id=13135
 - ► This merge request has fixes for the problem
 - https://gitlab.com/samba-team/samba/-/merge_requests/2459



Future Changes

- Compound Identity Support together with Claims Support
 - ▶ The new Heimdal KDC APIs will make it easy to add new PAC buffers
 - ▶ It's also easy to check with PA-Data elements are used by the client
- Given the client support for FAST in Heimdal and MIT
 - winbindd could be changed to use armoring krb5 auth for pam_winbind
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- First we tried completely random passwords:
 - ▶ The length is random between 128 and 255 characters
 - ► Each character is a random 32-bit codepoints
 - >https://bugzilla.samba.org/show_bug.cgi?id=12262
 - After a password change Kerberos may no longer works
 - ► The conversation of passwords was wrong depending on 'unix charset'
 - As Heimdal/MIT libraries don't support compound UTF-16
- ► Then we limited the characters to 16-bit codepoints
 - This avoids compound UTF-16 characters
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- We tried to store the new password locally first
 - In the past we had problems with ctdb failing to store the password after the remote change
 - =>https://bugzilla.samba.org/show_bug.cgi?id=12782
 - ► There are DCs with RefusePasswordChange=1 returning WRONG_PASSWORD
 - That way we destroyed the join
- ► We now store 3 or 4 password generations
 - older, old, current and optionally next
 - Before trying a remote change we store the 'next_change' password (if not already existing)
 - Then we check which password the remote DC currently holds



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 - We try the remote change and store the result

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 - Changing the password via an RODC we likely destroy the join
 - ▶ RODC/RWDC PasswordUpdateForward handling via NetrLogonSendToSam ignores errors
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- We now finally match Windows
 - ▶ We're using a fixed length of 120 characters
 - ▶ It means password changes work against RODCs now
- It is so important to match Windows as close as possible
 - ► This is just one example
 - But we had a lot of similar cases in the last 20 years
 - ▶ It's really important otherwise we're constantly hitting untested code
 - ► In Windows itself
 - Other vendors are only testing against Windows



Questions? Feedback!

- ► Stefan Metzmacher, metze@samba.org
- ► https://www.sernet.com
- https://samba.plus

Slides: https://samba.org/~metze/presentations/2022/SDC-EMEA/

