Managed Service Accounts Redux

SCAN ME

Unveiling Best Practices And Security Measures To Reduce Risk And Impact

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—CONNECT—

Introducing Me, Myself & I!

MC2MC CONNECT

semperis

Microsoft MVP Most Valuable Professional SINCE 2006

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- *Technology Focus*: Identity, Security And Recovery
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- *Work*: Architecting, designing, implementing and maintaining secure identity solutions… and recovery
- *Writer Of Scripts*: "KRBTGT Pwd Reset", "AD Convergence", "SYSVOL Convergence" (Feedback WELCOME!)

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MC2

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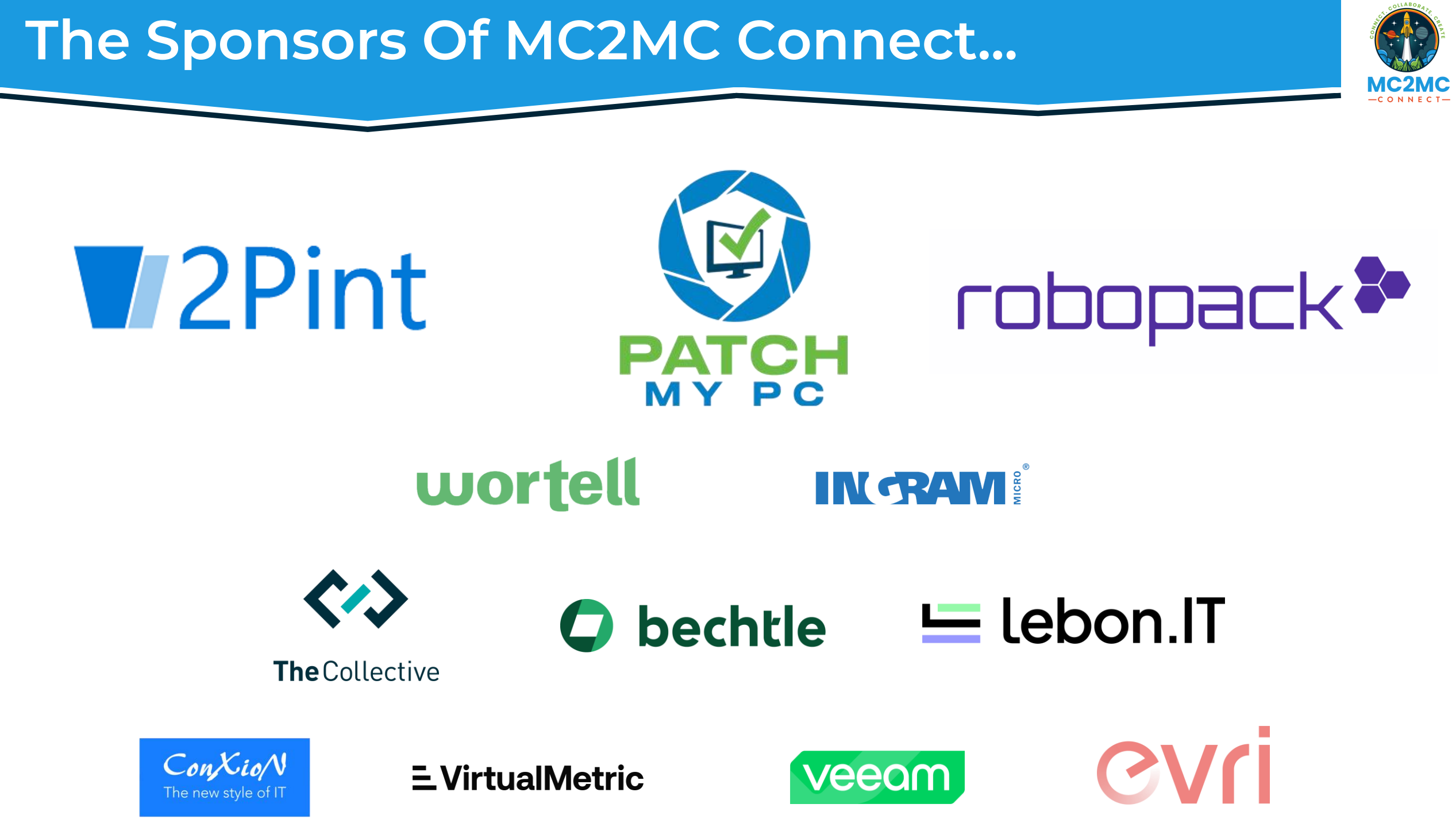


Evolution Of Service Accounts

LEGACY

NT3.5 NT4 → 2000 → 2003 (R2) → 2008 → 2008 R2 → 2012 → 2025

WINDOWS SERVER 2012:
Group Managed Service Accounts
(msDS-GroupManagedServiceAccount)
(gMSA)

WINDOWS SERVER 2008R2:
Stand-Alone Managed Service Accounts
(msDS-ManagedServiceAccount)
(sMSA)

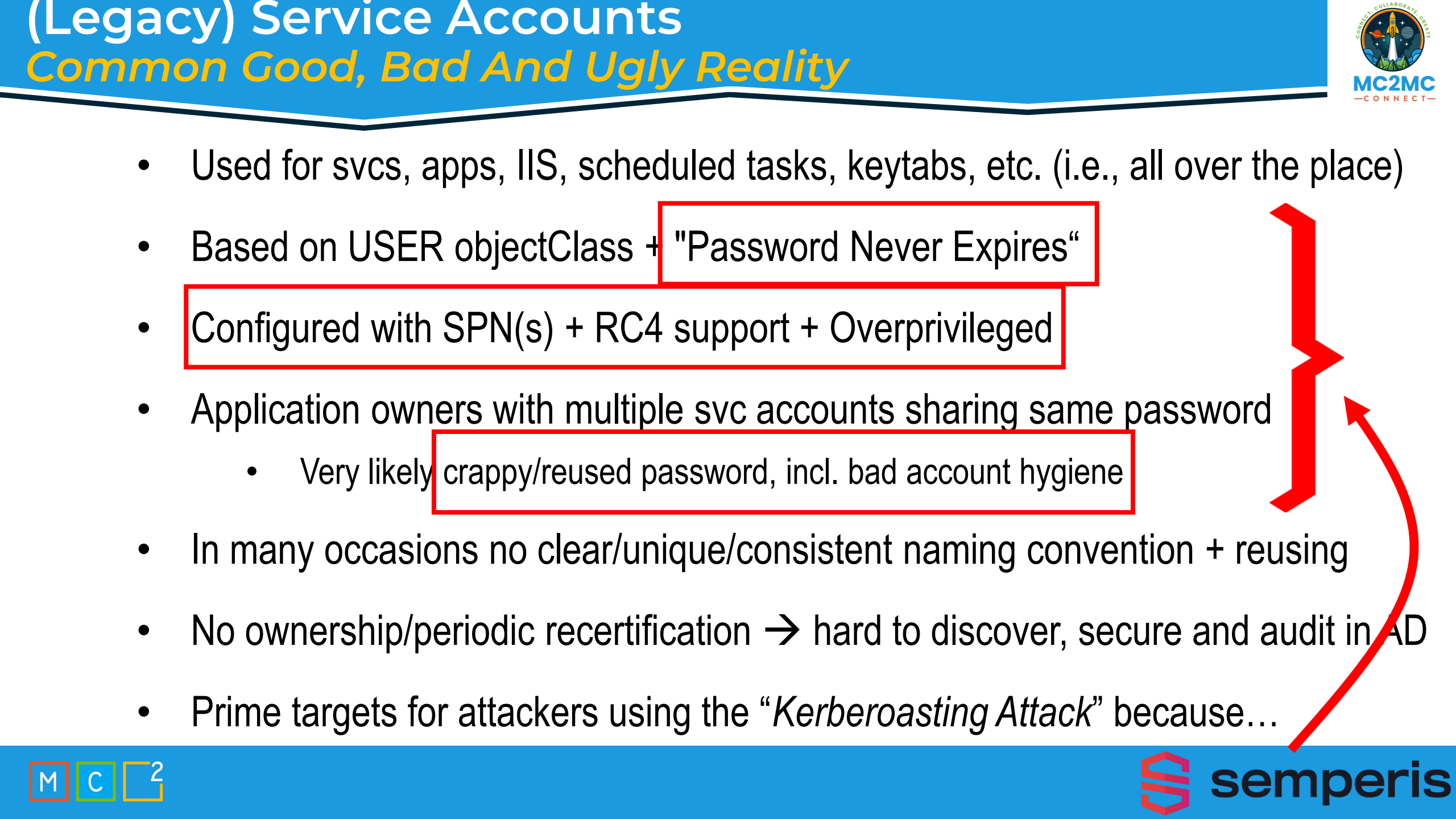
WINDOWS SERVER 2025:
Delegated Managed Service Accounts
(msDS-DelegatedManagedServiceAccount)
(dMSA)

PS: Throughout presentation you may see “xMSA”, which means “sMSA, gMSA and/or dMSA”

(Legacy) Service Accounts

Common Good, Bad And Ugly Reality

- Used for svcs, apps, IIS, scheduled tasks, keytabs, etc. (i.e., all over the place)
- Based on USER objectClass + "Password Never Expires“
- Configured with SPN(s) + RC4 support + Overprivileged
- Application owners with multiple svc accounts sharing same password
  - Very likely crappy/reused password, incl. bad account hygiene
- In many occasions no clear/unique/consistent naming convention + reusing
- No ownership/periodic recertification → hard to discover, secure and audit in AD
- Prime targets for attackers using the “*Kerberoasting Attack*” because…



(Legacy) Service Accounts vs xMSAs

Main benefits of sMSAs/gMSAs/dMSAs over (legacy) service accounts?

- Automatic, better & stronger credential management

RETRY…
What happens when you ask AI: “Kerberoasting Being History!”

The following still applies for sMSAs/gMSAs/dMSAs

- Clear and unique naming convention
- Ownership and recertification
- Least privilege
- Protecting access to, usage of account and its credentials (incl. server it runs on)

Managed Service Accounts
Stand-Alone (sMSA)

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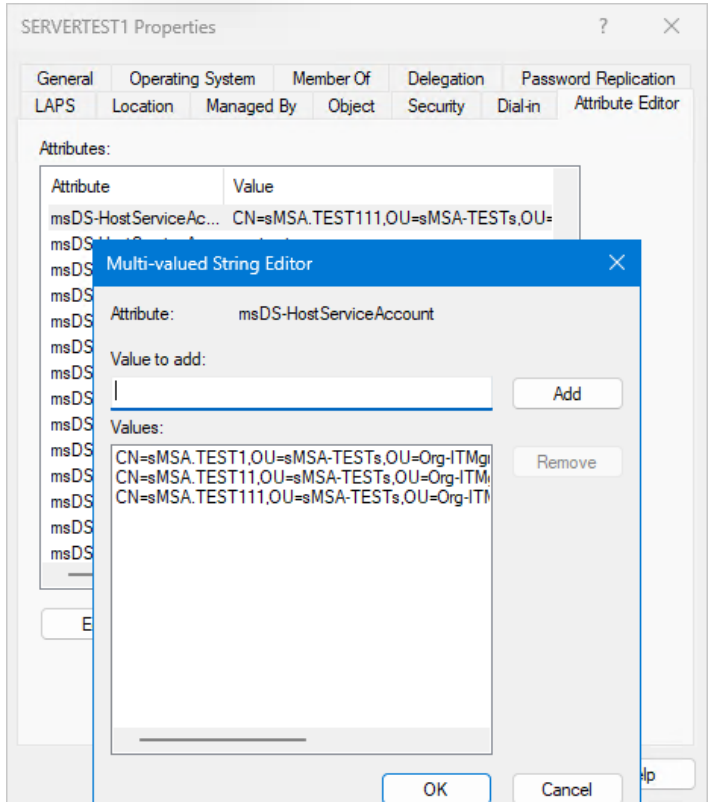
2008 R2

- sMSAs → objectClass = msDS-ManagedServiceAccount
- sMSA is <u>linked to 1 specific computer</u>
  - Forward Link "*msDS-HostServiceAccount*" on computer
  - Back link "*msDS-HostServiceAccountBL*" on sMSA
- sMSA can be transferred to another computer (relink + reinstall)



Managed Service Accounts
Stand-Alone (sMSA)

- Auto password/SPN management by computer (No KDS Root Key Required)
  - Initial password generated and set when installing the sMSA on computer (Possible to reset password: *Reset-ADServiceAccountPassword -Identity <sMSA>*)
  - sMSA uses the exact same logic/behavior and password update interval as the computer it is being used on
- Like for computers, following policy settings also impact management of sMSAs
  - Security Option "*Domain member: Disable machine account password changes*“ (Not Configured = Default = DO Change Password)
  - Security Option "*Domain member: Maximum machine account password age*“ (Not Configured = Default = 30 Days)
  - Security Option "*Domain controller: Refuse machine account password changes*“ (Not Configured = Default = DO NOT Refuse Password Changes)

Managed Service Accounts
Stand-Alone (sMSA)

- Get relevant data from all sMSAs (Stand-Alone Managed Service Accounts) in AD Domain (https://gist.github.com/zjorz/1d454aaa7c8fb7f0a696092b332af49b)
  - Password Change Interval: Very likely the default of 30 days…. But…

sMSAs In The AD Domain 'ADTEC.NET' (SID: S-1-5-21-274783270-2712129839-3354909249) (2025-05-27 20:56:09)

Filter

Add criteria

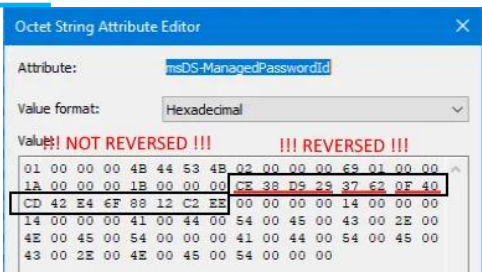
DistinguishedName	SamAccountName	RID	Type	description	Enabled	KerbEncryptType	WhenCreated	WhenChanged	PasswordLastSetSmsa	PasswordLastSetHost	msDS-HostServiceA...	MemberOf
CN=sMSA.TEST2,OU=sMSA-TESTs,...	sMSA.TEST2$	12804	sMSA	sMSA For TEST SERVER 2	True	RC4, AES128, AES256	2025-05-02 23:23:35	2025-05-17 14:16:29	2025-05-16 20:50:18	2025-05-16 06:50:16	{CN=SERVERTEST2,...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
CN=sMSA.TEST3,OU=sMSA-TESTs,...	sMSA.TEST3$	12868	sMSA	sMSA For TEST SERVER 3	True	RC4, AES128, AES256	2025-05-03 23:27:31	2025-05-17 14:16:29	2025-05-15 06:54:00	2025-05-14 20:28:58	{CN=SERVERTEST3,...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
CN=sMSA.TEST1,OU=sMSA-TESTs,...	sMSA.TEST1$	12803	sMSA	sMSA For TEST SERVER 1	True	RC4, AES128, AES256	2025-05-02 23:23:34	2025-05-17 14:16:29	2025-05-16 00:35:16	2025-05-16 00:35:16	{CN=SERVERTEST1,...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
CN=sMSA.TEST9,OU=sMSA-TESTs,...	sMSA.TEST9$	12817	sMSA	sMSA For TEST SERVER 9	True	RC4, AES128, AES256	2025-05-02 23:23:39	2025-05-17 14:16:29	2025-05-05 01:43:30	2025-05-02 23:23:39	{CN=SERVERTEST9,...	{}
CN=sMSA.RODC,OU=sMSA-TESTs,...	sMSA.RODC$	12884	sMSA	sMSA For TEST SERVER 3	True	RC4, AES128, AES256	2025-05-09 12:53:18	2025-05-17 14:16:29	2025-05-15 14:06:56	2025-05-14 20:28:58	{CN=SERVERTEST3,...	{CN=GRP_R0_ALLOWCache-R0FSRODC1,OU=Grou...
CN=sMSA.TEST4,OU=sMSA-TESTs,...	sMSA.TEST4$	12807	sMSA	sMSA For TEST SERVER 4	True	RC4, AES128, AES256	2025-05-02 23:23:36	2025-05-17 14:16:29	2025-05-02 23:23:36	2025-05-02 23:23:36	{CN=SERVERTEST4,...	{}
CN=sMSA.TEST5,OU=sMSA-TESTs,...	sMSA.TEST5$	12809	sMSA	sMSA For TEST SERVER 5	True	RC4, AES128, AES256	2025-05-02 23:23:37	2025-05-17 14:16:29	2025-05-02 23:23:37	2025-05-02 23:23:36	{CN=SERVERTEST5,...	{}
CN=sMSA.TEST6,OU=sMSA-TESTs,...	sMSA.TEST6$	12811	sMSA	sMSA For TEST SERVER 6	True	RC4, AES128, AES256	2025-05-02 23:23:37	2025-05-17 14:16:29	2025-05-02 23:23:37	2025-05-02 23:23:37	{CN=SERVERTEST6,...	{}
CN=sMSA.TEST7,OU=sMSA-TESTs,...	sMSA.TEST7$	12813	sMSA	sMSA For TEST SERVER 7	True	RC4, AES128, AES256	2025-05-02 23:23:38	2025-05-17 14:16:29	2025-05-02 23:23:38	2025-05-02 23:23:38	{CN=SERVERTEST7,...	{}
CN=sMSA.TEST8,OU=sMSA-TESTs,...	sMSA.TEST8$	12815	sMSA	sMSA For TEST SERVER 8	True	RC4, AES128, AES256	2025-05-02 23:23:39	2025-05-17 14:16:29	2025-05-02 23:23:39	2025-05-02 23:23:38	{CN=SERVERTEST8,...	{}
CN=sMSA.TEST22,OU=sMSA-TESTs...	sMSA.TEST22$	12873	sMSA	sMSA For TEST SERVER 2	True	RC4, AES128, AES256	2025-05-04 22:41:20	2025-05-17 14:16:29	2025-05-04 22:41:20	2025-05-16 06:50:16	{CN=SERVERTEST2,...	{}
CN=sMSA.TEST11,OU=sMSA-TESTs...	sMSA.TEST11$	12872	sMSA	sMSA For TEST SERVER 1	True	RC4, AES128, AES256	2025-05-04 22:41:19	2025-05-17 14:16:29	2025-05-15 13:37:48	2025-05-16 00:35:16	{CN=SERVERTEST1,...	{}
CN=sMSA.TEST111,OU=sMSA-TES...	sMSA.TEST111$	12883	sMSA	sMSA For TEST SERVER 1	True	RC4, AES128, AES256	2025-05-08 18:01:07	2025-05-17 14:16:29	2025-05-16 00:20:16	2025-05-16 00:35:16	{CN=SERVERTEST1,...	{}
CN=sMSA.TEST33,OU=sMSA-TESTs...	sMSA.TEST33$	12871	sMSA	sMSA For TEST SERVER 3	True	RC4, AES128, AES256	2025-05-04 21:51:52	2025-05-17 14:16:29	2025-05-16 04:40:05	2025-05-14 20:28:58	{CN=SERVERTEST3,...	{}

Managed Service Accounts
Group (gMSA)

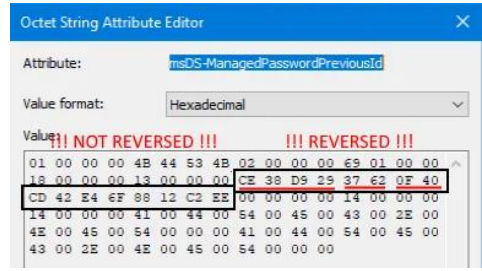
- gMSAs → objectClass = msDS-GroupManagedServiceAccount
- Centralized password management → KDS Root Key (at least 1) in AD Forest
  - KDS Root Keys are stored in AD in container: "*CN=Master Root Keys,CN=Group Key Distribution Service,CN=Services,CN=Configuration,DC=<forest name>*"
  - *name* (KeyId) → identifier of KDS Root Key object referenced by gMSAs in attributes "*msDS-ManagedPasswordId*" and "*msDS-ManagedPasswordPreviousId*"
  - "*msKds-CreateTime*" (CreationTime) → time KDS Root Key object was created in AD
  - "*msKds-UseStartTime*" (EffectiveTime) → time any RWDC can start using KDS Root Key Object for gMSAs
    - For subsequent KDS Root Keys: Create KDS Root Key + Force AD Repl + Restart KDSSVC
- gMSA can be shared by multiple computers or be restricted to just 1 (flexibility!)

Managed Service Accounts
Group (gMSA)

- The inner guts of a gMSA
  - *"msDS-ManagedPasswordInterval"*: password rotation interval in days, set at creation ONLY. Default of 30 days = too long. Thoughts/suggestion: set it to 3-5 days. Depends on AD Replication Convergence!. Measure AD Replication Convergence for Configuration NC through → https://github.com/zjorz/Public-AD-Scripts/blob/master/Check-AD-Replication-Latency-Convergence.md
  - *"msDS-ManagedPasswordId"*: references keyID of KDS Root Key currently being used (N).

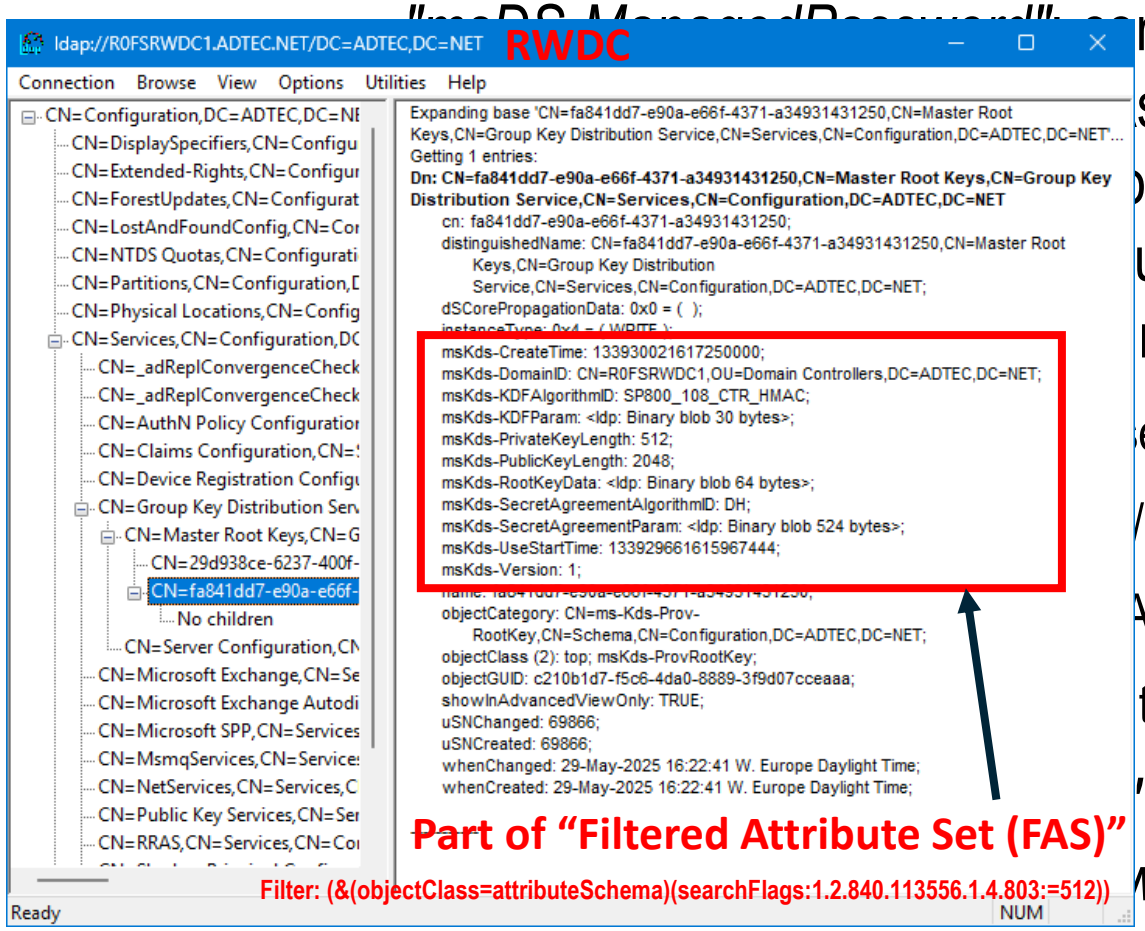


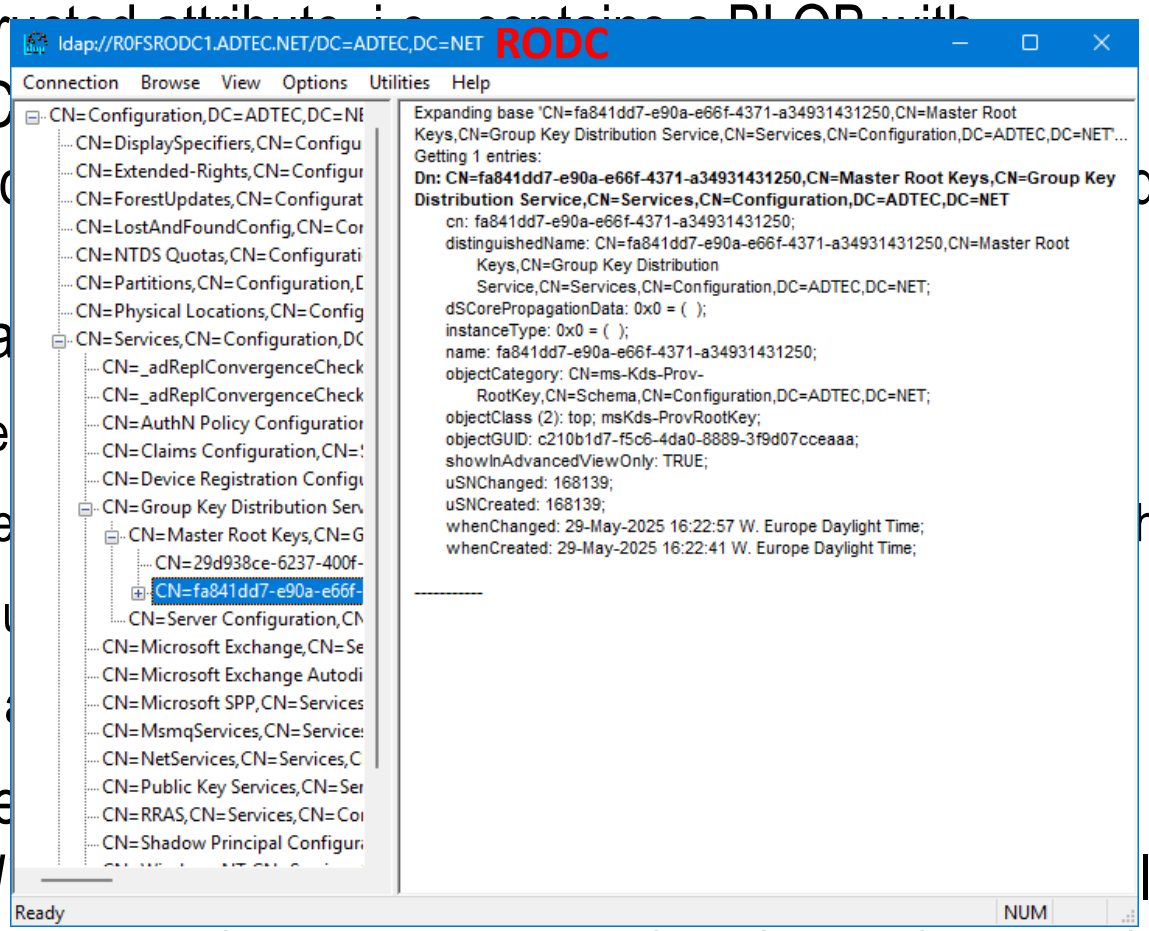
  - *"ms-DS-ManagedPasswordPreviousId"*: references keyID of KDS Root Key previously being used (N-1).



Managed Service Accounts
Group (gMSA)

- The inner guts of a gMSA (Continued…)





can be **groups**, computers, users, other gMSAs, and even dMSAs (Audit Changes!)

Managed Service Accounts

Group (gMSA)

 # Retrieving 'msDS-ManagedPassword' Using LDAP Query When Allowed ONLY Works With gMSA, As For dMSA A TGS Request Is Needed

```
$gMSASamAccountName = 'GMSA_1DAY_001$'
$gMSA = Get-ADServiceAccount -Identity $gMSASamAccountName -Properties 'msDS-ManagedPassword',PasswordLastSet,PrincipalsAllowedToRetrieveManagedPassword -Server $((Get-ADDomain -Current LocalComputer).PDCEmulator)
$gMSA
$managedGmsaPwd = $gMSA.'msDS-ManagedPassword'
ConvertFrom-ADManagedPasswordBlob $managedGmsaPwd
Write-Host "CURRENT NTHASH...: $(ConvertTo-NTHash -Password $((ConvertFrom-ADManagedPasswordBlob $managedGmsaPwd).SecureCurrentPassword))"
Write-Host "PREVIOUS NTHASH..: $(ConvertTo-NTHash -Password $((ConvertFrom-ADManagedPasswordBlob $managedGmsaPwd).SecurePreviousPassword))"
```

Administrator: Windows Powe

AD PoSH

```
DistinguishedName                          : CN=GMSA_1DAY_001,OU=TEST,DC=ADTEC,DC=NET
Enabled                                    : True
msDS-ManagedPassword                       : {1, 0, 0, 0...}
Name                                       : GMSA_1DAY_001
ObjectClass                                : msDS-GroupManagedServiceAccount
ObjectGUID                                 : 2da6a432-8b44-4db7-b2fd-7f2dcd1dec31
PasswordLastSet                            : 29-May-2025 12:30:30
PrincipalsAllowedToRetrieveManagedPassword : {CN=GroupGMSA_1DAY_001,OU=TEST,DC=ADTEC,DC=NET}
SamAccountName                             : GMSA_1DAY_001$
SID                                        : S-1-5-21-274783270-2712129839-3354909249-10026
UserPrincipalName                          :

Version                   : 1
CurrentPassword           : [illegible]
SecureCurrentPassword     : System.Security.SecureString
PreviousPassword          : [illegible]
SecurePreviousPassword    : System.Security.SecureString
QueryPasswordInterval     : 14:32:51.4560834
UnchangedPasswordInterval : 14:27:51.4560834

CURRENT NTHASH...: 63b36db40c5cc43c86306e839f7a1c76
PREVIOUS NTHASH..: f75c692672e5a1821b45c5073c5cec13
```

DS Internals

 # Works With BOTH gMSA And dMSA

```
$gMSASamAccountName = 'GMSA_1DAY_001$'
$adAccount = Get-ADReplAccount -SamAccountName $gMSASamAccountName -Server $((Get-ADDomain -Current LocalComputer).PDCEmulator)
$adAccount
```

Administrator: Windows Powe

DS Internals

```
DistinguishedName: CN=GMSA_1DAY_001,OU=TEST,DC=ADTEC,DC=NET
SamAccountName: GMSA_1DAY_001$
Enabled: True
Deleted: False
Sid: S-1-5-21-274783270-2712129839-3354909249-10026
Guid: 2da6a432-8b44-4db7-b2fd-7f2dcd1dec31
SamAccountType: Computer
UserAccountControl: WorkstationAccount
DNSHostName: 1DAY_001.ADTEC.NET
OperatingSystem:
OperatingSystemVersion:
Description: gMSA With 1 Day Password Interval
PrimaryGroupId: 515
SidHistory:
SupportedEncryptionTypes: RC4_HMAC, AES128_CTS_HMAC_SHA1_96, AES256_CTS_HMAC_SHA1_96
ServicePrincipalName:
LastLogonDate:
PasswordLastSet: 29-May-2025 12:30:30
SecurityDescriptor: DiscretionaryAclPresent, SystemAclPresent, DiscretionaryAclAutoInherited, SystemAclAutoInherited, SelfRelative
LAPS
Key Credentials
Secrets
  NTHash: 63b36db40c5cc43c86306e839f7a1c76
  LMHash:
  NTHashHistory:
    Hash 01: 63b36db40c5cc43c86306e839f7a1c76
    Hash 02: f75c692672e5a1821b45c5073c5cec13
    Hash 03: c44a021ed38efa132b28f7b9dcac8eda
```

Managed Service Accounts
Group (gMSA)

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- Get relevant data from all gMSAs (Group Managed Service Accounts) in AD Domain (https://gist.github.com/zjorz/d1906ac04964a29d87bd377e0298eb21)

gMSAs In The AD Domain 'ADTEC.NET' (SID: S-1-5-21-274783270-2712129839-3354909249) (2025-06-10 20:33:01)

Filter

Add criteria

DistinguishedName	SamAccountName	RID	Type	dNSH...	description	Enabled	KerbEncryptType	WhenCreated	WhenChanged	PasswordLastSetGmsa	PwdInt	PSHC	DUEX	CurKDSRootKeyGuid(+KeyCreation)	CurKDSRootKeyOrgRWDCDateTim
CN=gMSA.TEST,O...	gMSA.TEST$	12828	gM...	gMSA....	gMSA For...	True	RC4, AES128, AES256	2025-05-02 23:25:36	2025-06-10 20:07:45	2025-06-10 20:07:30	1	NO	0.982	be3cf336-9db8-ef50-1efd-a28b0ac2d297 (2025-06-09 13:46:52)	DTCNTR01\R0FSRWDC2 (2025-06-
CN=gMSA.TEST3,...	gMSA.TEST3$	12831	gM...	gMSA....	gMSA For...	True	RC4, AES128, AES256	2025-05-02 23:25:37	2025-06-10 12:45:21	2025-06-10 12:42:38	4	NO	3.673	be3cf336-9db8-ef50-1efd-a28b0ac2d297 (2025-06-09 13:46:52)	DTCNTR01\R0FSRWDC3 (2025-06-
CN=gMSA.TEST1,...	gMSA.TEST1$	12829	gM...	gMSA....	gMSA For...	True	RC4, AES128, AES256	2025-05-02 23:25:36	2025-06-10 12:09:54	2025-06-10 00:17:45	2	NO	1.156	be3cf336-9db8-ef50-1efd-a28b0ac2d297 (2025-06-09 13:46:52)	DTCNTR01\R0FSRWDC3 (2025-06-
CN=gMSA.TEST2,...	gMSA.TEST2$	12830	gM...	gMSA....	gMSA For...	True	RC4, AES128, AES256	2025-05-02 23:25:37	2025-06-10 12:41:05	2025-06-10 12:40:47	3	NO	2.672	be3cf336-9db8-ef50-1efd-a28b0ac2d297 (2025-06-09 13:46:52)	DTCNTR01\R0FSRWDC1 (2025-06-
CN=provAgentgM...	pGMSA_fa76e09...	1602	gM...	ADTEC....	Azure AD...	True	RC4, AES128, AES256	2023-02-24 14:00:50	2025-06-06 00:17:08	2023-04-06 09:45:52	30	YES	-76...	29d938ce-6237-400f-cd42-e46f8812c2ee (2023-02-24 12:20:55)	46bb96e5-6a0d-408a-82b1-742dd
CN=gMSA AAD Cl...	gmsa.t0.AADCldS$	2632	gM...	R0FSM...	Tier0 | gM...	True	RC4, AES128, AES256	2023-04-06 10:32:32	2025-06-10 12:51:43	2025-06-10 12:51:24	30	NO	29.6...	29d938ce-6237-400f-cd42-e46f8812c2ee (2023-02-24 12:20:55)	DTCNTR01\R0FSRWDC2 (2025-06-
CN=gMSA.RODC,...	gMSA.RODC$	12885	gM...		gMSA For...	True	RC4, AES128, AES256	2025-05-09 12:54:48	2025-06-10 12:02:15	2025-06-10 11:57:25	1	NO	0.642	be3cf336-9db8-ef50-1efd-a28b0ac2d297 (2025-06-09 13:46:52)	DTCNTR01\R0FSRWDC3 (2025-06-
CN=gMSA_R0_AA...	gMSA_R0_AADC$	1607	gM...	R0FSM...	gMSA Us...	True	AES128, AES256	2023-02-24 19:09:53	2025-05-17 14:16:28	2023-04-06 09:43:52	30	YES	-76...	29d938ce-6237-400f-cd42-e46f8812c2ee (2023-02-24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-04-
CN=gMSA SQL (Ti...	gmsa.t0.SQL$	2633	gM...	SQL.AD...	Tier0 | gM...	True	RC4, AES128, AES256	2023-04-06 10:32:32	2025-05-17 14:16:28	2023-04-06 10:32:32	30	YES	-76...	29d938ce-6237-400f-cd42-e46f8812c2ee (2023-02-24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-04-
CN=GMSA35B18E...	GMSA35B18EF67...	2915	gM...	35B18E...	GMSA WI...	True	RC4, AES128, AES256	2023-06-12 20:31:23	2025-05-17 14:16:28	2023-06-12 20:31:23	30	YES	-69...	29d938ce-6237-400f-cd42-e46f8812c2ee (2023-02-24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-06-

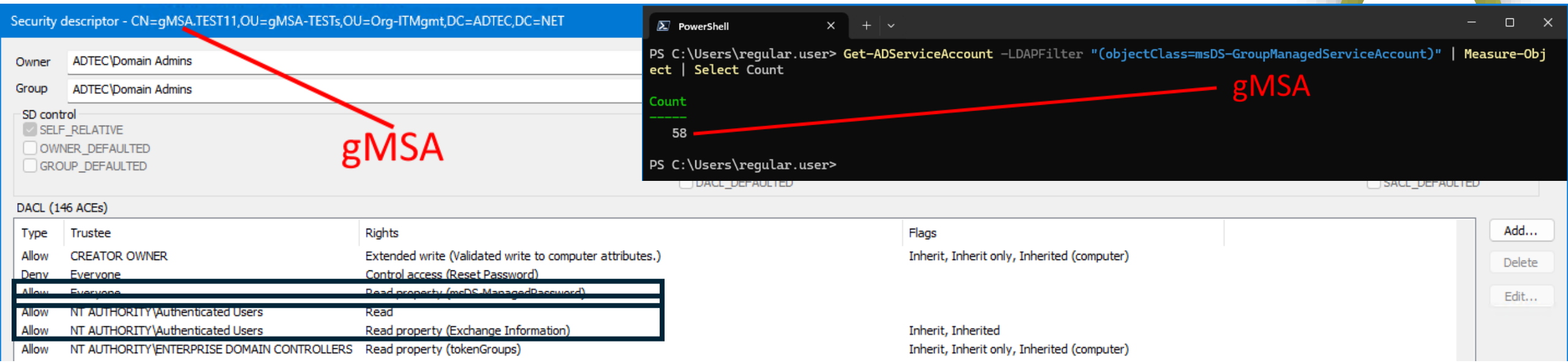
gMSAs In The AD Domain 'ADTEC.NET' (SID: S-1-5-21-274783270-2712129839-3354909249) (2025-06-10 20:33:01)

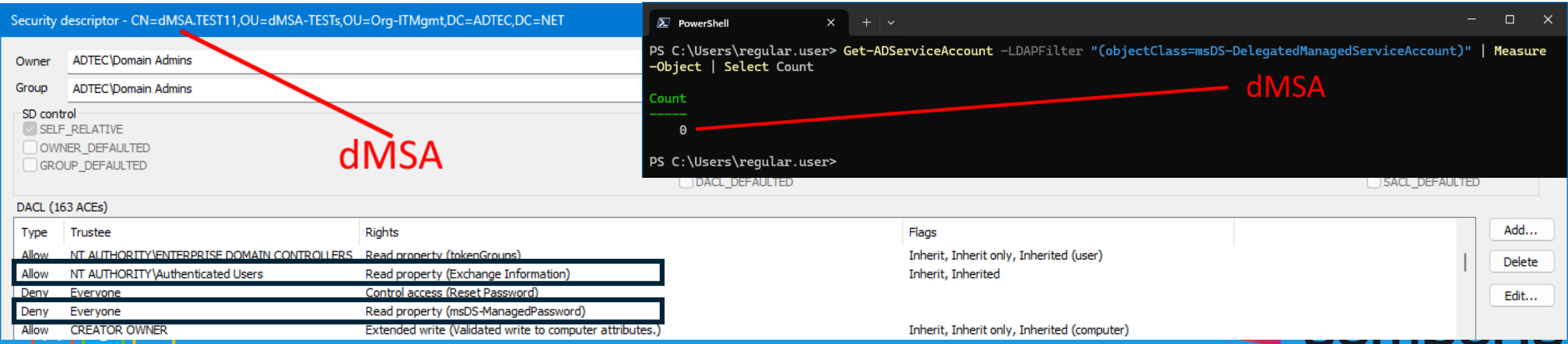
Filter

Add criteria

	CurKDSRootKeyOrgRWDCDateTime	PrevKDSRootKeyGuid(+KeyCre...	PrevKDSRootKeyOrgRWD...	PrincipalsAllowedToRetrieveManagedPasswordCONFIGURED	PrincipalsAllowedToRetrieveManagedPasswordEFFECTIVE	MemberOf
09 13:46:52)	DTCNTR01\R0FSRWDC2 (2025-06-10 20:07:30)	be3cf336-9db8-ef50-1efd-a28...	DTCNTR01\R0FSRWDC2 (2...	CN=grp.gs.Retrieve-Pwd-For-gMSA.TEST,OU=Groups,OU=...	{SERVERTEST3$ (S-1-5-21-274783270-2712129839-3354909249-1...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
09 13:46:52)	DTCNTR01\R0FSRWDC3 (2025-06-10 12:42:38)	8f1ff2ec-6515-6624-ea89-44cb...	DTCNTR01\R0FSRWDC3 (2...	CN=grp.gs.Retrieve-Pwd-For-gMSA.TEST3,OU=Groups,OU...	{SERVERTEST3$ (S-1-5-21-274783270-2712129839-3354909249-1...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
09 13:46:52)	DTCNTR01\R0FSRWDC3 (2025-06-10 00:17:45)	8f1ff2ec-6515-6624-ea89-44cb...	DTCNTR01\R0FSRWDC3 (2...	CN=grp.gs.Retrieve-Pwd-For-gMSA.TEST1,OU=Groups,OU...	{SERVERTEST1$ (S-1-5-21-274783270-2712129839-3354909249-1...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
09 13:46:52)	DTCNTR01\R0FSRWDC1 (2025-06-10 12:40:47)	8f1ff2ec-6515-6624-ea89-44cb...	DTCNTR01\R0FSRWDC1 (2...	CN=grp.gs.Retrieve-Pwd-For-gMSA.TEST2,OU=Groups,OU...	{SERVERTEST2$ (S-1-5-21-274783270-2712129839-3354909249-1...	{CN=Domain Admins,CN=Users,DC=ADTEC,DC=NET}
24 12:20:55)	46bb96e5-6a0d-408a-82b1-742ddf1e3359 (...	29d938ce-6237-400f-cd42-e46...	46bb96e5-6a0d-408a-82b...	CN=R0FSMBSV3,OU=Servers,OU=Org-ITMgmt,DC=ADTEC,...	R0FSMBSV3$ (S-1-5-21-274783270-2712129839-3354909249-16...	{CN=Performance Log Users,CN=Builtin,DC=ADTEC...
24 12:20:55)	DTCNTR01\R0FSRWDC2 (2025-06-10 12:51:25)	29d938ce-6237-400f-cd42-e46...	DTCNTR01\R0FSRWDC2 (2...	CN=grp.gs.Tier0-Retrieve-Password-For-gmsa.t0.AADCldS,...	R0FSMBSV3$ (S-1-5-21-274783270-2712129839-3354909249-16...	{CN=GRP_R0_AADWriteBack-Attributes,OU=Group...
09 13:46:52)	DTCNTR01\R0FSRWDC3 (2025-06-10 11:57:25)	be3cf336-9db8-ef50-1efd-a28...	DTCNTR01\R0FSRWDC3 (2...	CN=grp.gs.Retrieve-Pwd-For-gMSA.RODC,OU=Groups,OU...	SERVERTEST3$ (S-1-5-21-274783270-2712129839-3354909249-1...	{CN=GRP_R0_ALLOWCache-R0FSRODC1,OU=Grou...
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-04-06 09:43:52)	29d938ce-6237-400f-cd42-e46...	DTCNTR01\R0FSRWDC1 (2...	CN=GRP_R0_Servers-AADConnect,OU=Groups,OU=Org-IT...	R0FSMBSV3$ (S-1-5-21-274783270-2712129839-3354909249-16...	{}
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-04-06 10:32:32)			CN=grp.gs.Tier0-Retrieve-Password-For-gmsa.t0.SQL,OU=G...		{}
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-06-12 20:31:23)			CN=GroupGMSA35B18EF6732,OU=TEST,DC=ADTEC,DC=NET		{}
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-06-12 20:31:24)			CN=GroupGMSA35B18EF6742,OU=TEST,DC=ADTEC,DC=NET		{}
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-06-12 20:31:25)			CN=GroupGMSA35B18EF6752,OU=TEST,DC=ADTEC,DC=NET		{}
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-06-12 20:31:26)			CN=GroupGMSA35B18EF6767,OU=TEST,DC=ADTEC,DC=NET		{}
24 12:20:55)	DTCNTR01\R0FSRWDC1 (2023-06-12 20:31:28)			CN=GroupGMSA35B18EF6771,OU=TEST,DC=ADTEC,DC=NET		{}

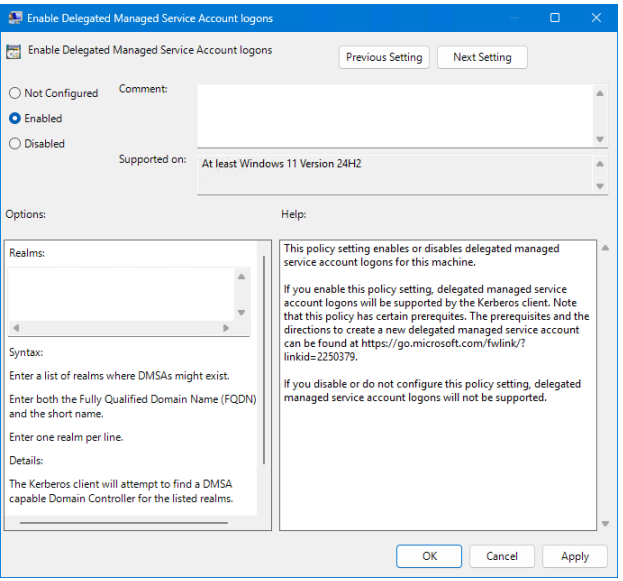
Managed Service Accounts
Delegated (dMSA)





Managed Service Accounts
Delegated (dMSA)

- dMSA = gMSA with more steroids and more requirements! Key differences are:
  - Unlike gMSA, with regards to a dMSA:



- dMSA support NOT enabled by default
  - Not enabling support? → dMSA authN fails with username/password incorrect, logon failure, etc
  - Enable support through registry or GPO + realms (=optimize lookup of domains with W2K25 RWDCs)
- It supports native use and migration from legacy service account (last is main use case!)
  - NATIVE dMSA use supports services, IIS App Pools but NOT Scheduled Tasks
  - MIGRATION dMSA supports ANY (legacy) service account!
- NOTE: dMSA creation and management is to be considered as Tier 0!

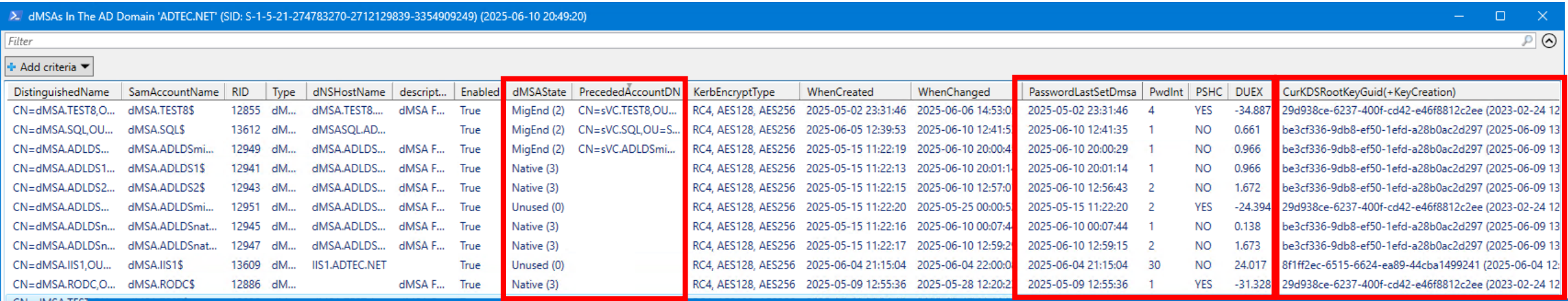
Managed Service Accounts
Delegated (dMSA)

- The inner guts of a dMSA / Superseded Account
  - *"msDS-DelegatedMSAState"*: state of dMSA and how it is being used if applicable
    - 0 = Unused (Default)
    - 1 = Migration Start | 2 = Migration End (Migration of legacy service account to dMSA!)
    - 3 = Native Use
  - *"msDS-SupersededServiceAccountState"*: state of superseded account
    - Empty = Not superseded (Default)
    - 1 = Migration Start | 2 = Migration End (Migration of legacy service account to dMSA!)
  - *"msDS-ManagedAccountPrecededByLink":* DN of legacy service account (a.k.a. account being superseded) (AT LEAST: how it is intended! ;-))
  - *"msDS-SupersededManagedAccountLink"*: DN of dMSA (a.k.a. account superseding)
  - adminSDHolder DOES NOT follow link!

Managed Service Accounts
Delegated (dMSA)

MC2MC CONNECT

- Get relevant data from all dMSAs (Deleg. Managed Service Accounts) in AD Domain (https://gist.github.com/zjorz/62de8c4b5c8d10f7b3c1934c4332dfb8)



Migrating Service Accounts
Legacy → dMSA (Good Successor!)

MC2MC CONNECT

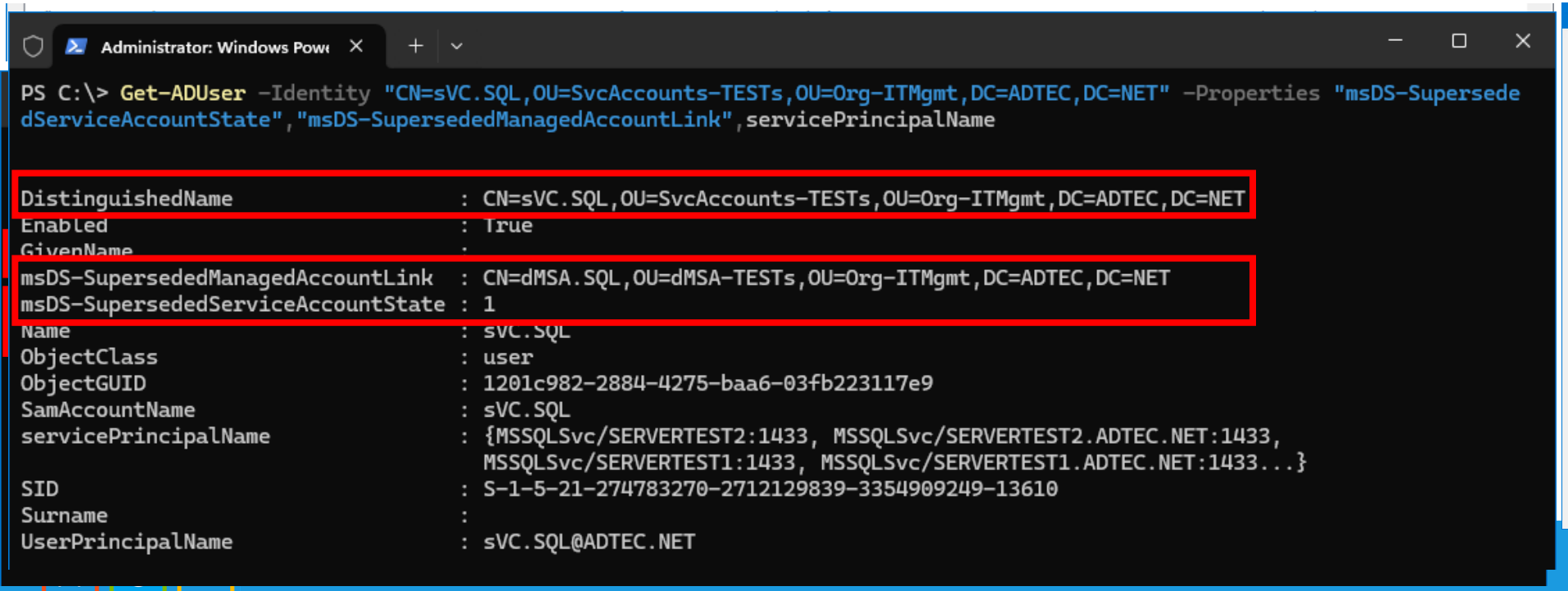
INITIATING MIGRATION through PoSH CMDlet (Domain Admin only!):

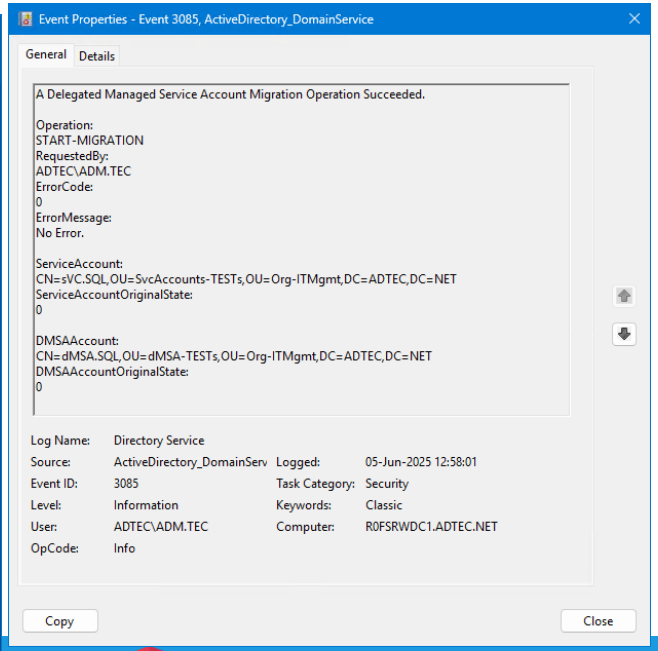
 # Starting Migration Of Svc Account To dMSA

Start-ADServiceAccountMigration -Identity "**<dMSA>**" -SupersededAccount "**<DN of Legacy Svc Account>**"

 # Starting Migration Of Svc Account To dMSA (Under The Hood)

$rootDSE = [ADSI]"LDAP://**<RWDC FQDN>**/RootDSE“
$rootDSE.Put("migrateADServiceAccount", "**<DN of dMSA>**:**<DN of Legacy Svc Account>**:1")
$rootDSE.SetInfo()





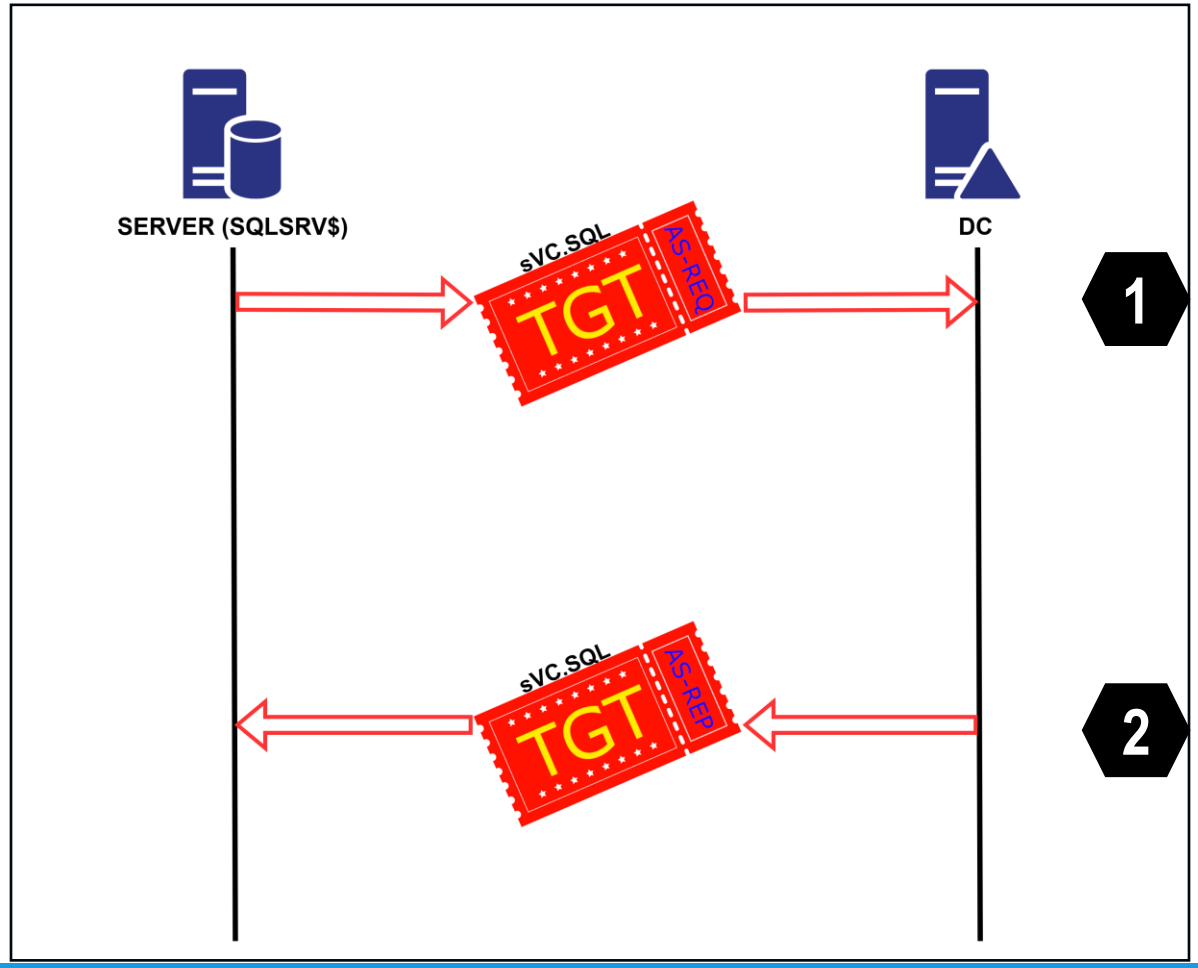
semperis

Migrating Service Accounts

Legacy → dMSA (Good Successor!)

MC2MC CONNECT

Authentication BEFORE Migration State



SOURCE: https://www.akamai.com/blog/security-research/abusing-dmsa-for-privilege-escalation-in-active-directory

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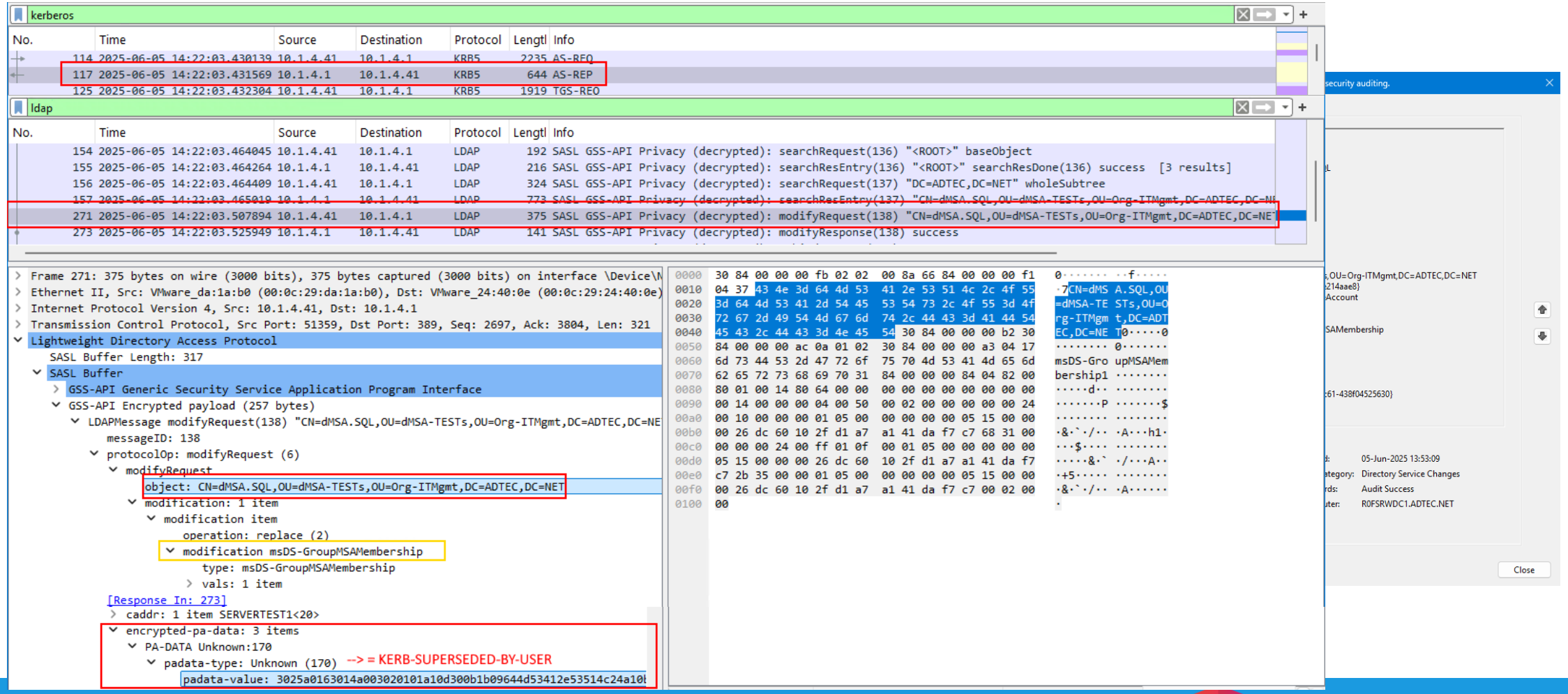
Migrating Service Accounts

Legacy → dMSA (Good Successor!)

MC2MC CONNECT

Authentication DURING Migration State (either force or take enough time!)



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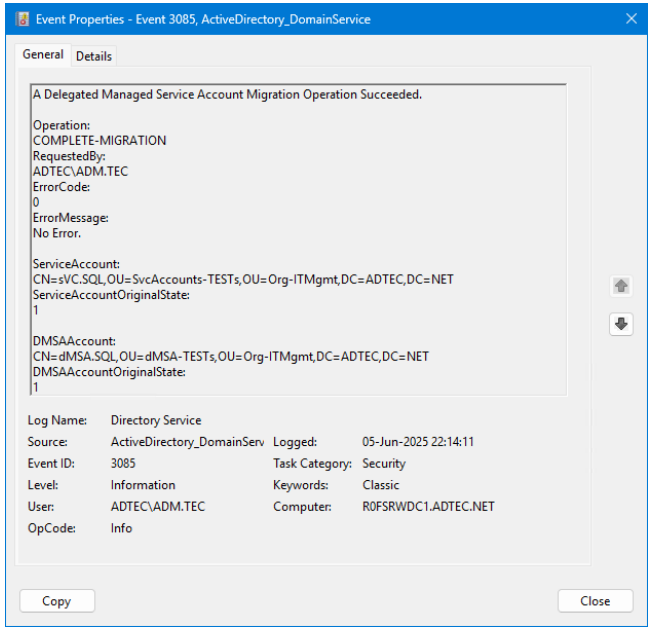
Migrating Service Accounts
Legacy → dMSA (Good Successor!)

MC2MC CONNECT

COMPLETING MIGRATION through PoSH CMDlet (Domain Admin only!):

 # Completing Migration Of Svc Account To dMSA

Complete-ADServiceAccountMigration -Identity "**<dMSA>**" -SupersededAccount "**<DN of Legacy Svc Account>**"



 # Completing Migration Of Svc Account To dMSA (Under The Hood)

$rootDSE = [ADSI]"LDAP://**<RWDC FQDN>**/RootDSE“

$rootDSE.Put("migrateADServiceAccount", "**<DN of dMSA>**:**<DN of Legacy Svc Account>**:2")

$rootDSE.SetInfo()

Allow	ADTEC\gVC.SQL	Write property (msDS-GroupMSAMembership)	Object inherit
Allow	ADTEC\gVC.SQL	Read	

MC2

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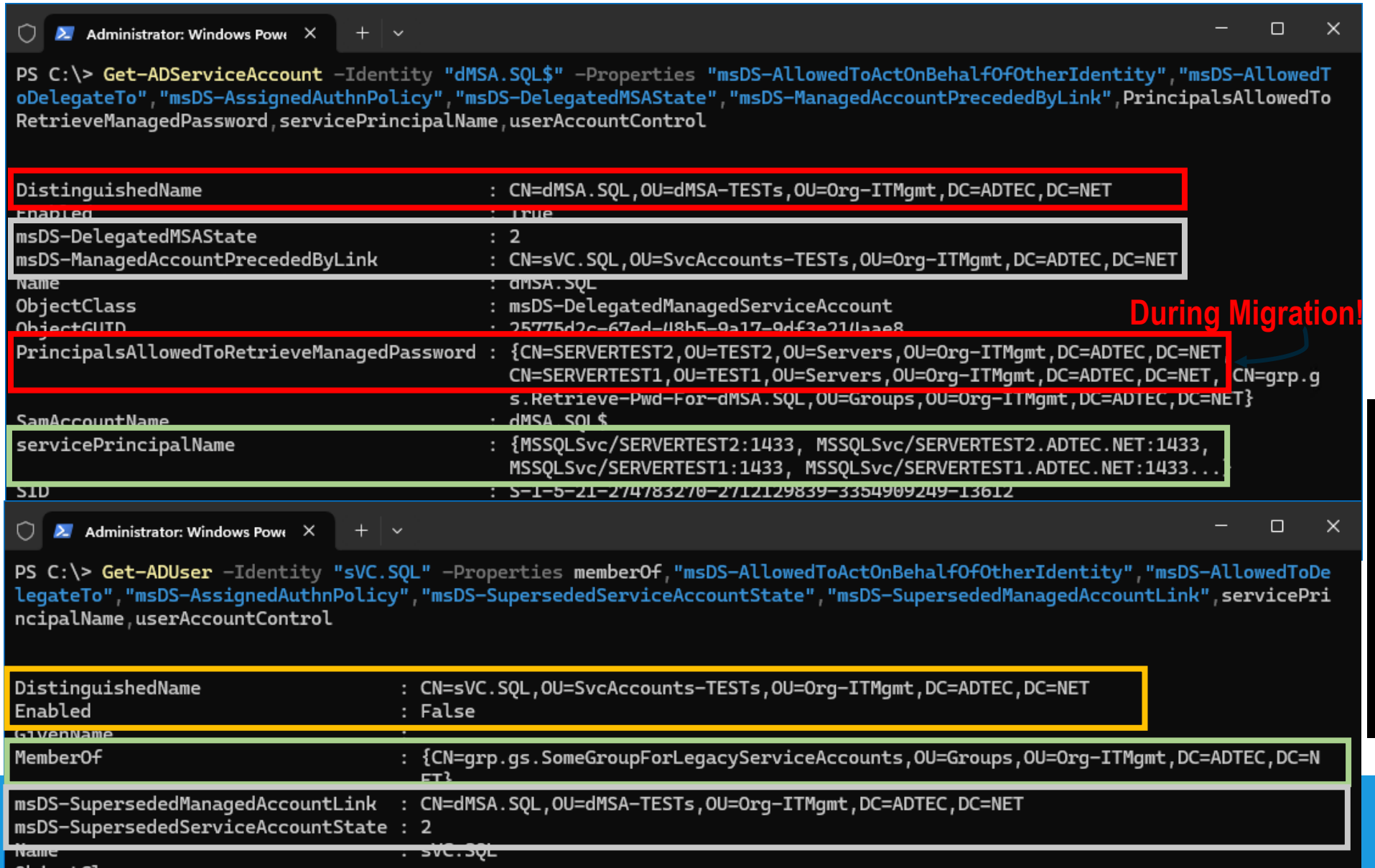
Migrating Service Accounts

Legacy → dMSA (Good Successor!)

MC2MC CONNECT



COMPLETING MIGRATION through PoSH CMDlet (Domain Admin only!):

Config Migration Legacy Svc Acc 2 dMSA

- Service Principal Names (SPNs)
- Allowed To Delegate To List
- Resource Based Constrained Delegation
- Assigned Authentication Policy
- Assigned Authentication Silo
- Trusted AuthN For Delegation UAC Bit

REQUIRES Attention if applicable!:

- Allow/Denied To Cache" List of RODC(s)

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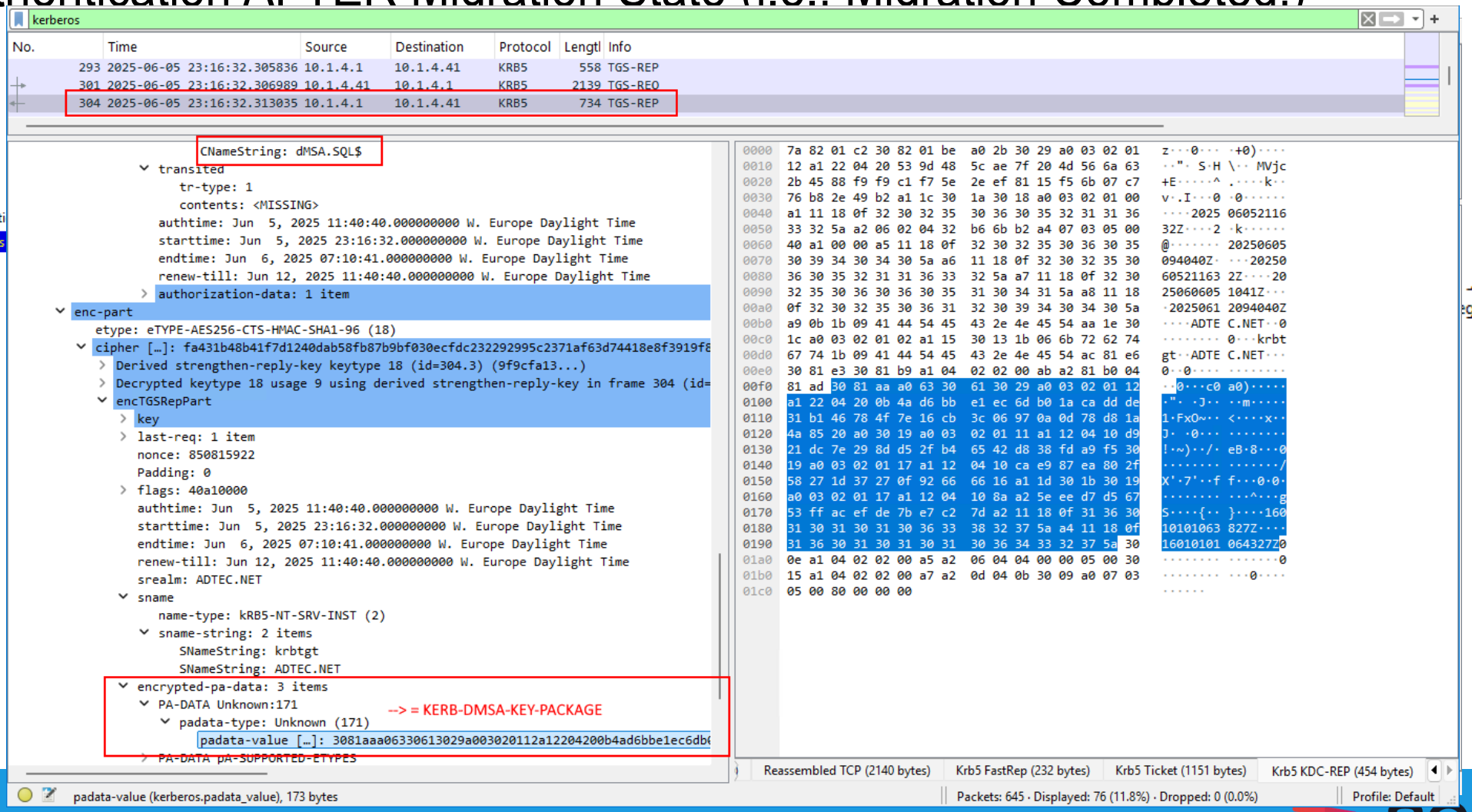
Migrating Service Accounts

Legacy → dMSA (Good Successor!)

MC2MC CONNECT

Authentication AFTER Migration State (i.e., Migration Completed!)



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Migrating Service Accounts

Legacy → dMSA (Good Successor!)

MC2MC CONNECT

WARNING: Some applications/services may still require attention!!! → e.g., ADFS

BEFORE Start

```
AllowedOnBehalfOfCallers SID
S-1-5-21-274783270-2712129839-3354909249-13636

AuthorizationPolicy
@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/
29839-3354909249-13636"])
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/perm

@RuleName = "Permit Local Administrators"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/perm

AuthorizationPolicyReadOnly
@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/
29839-3354909249-13636"])
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/perm

@RuleName = "Permit Local Administrators"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/perm

PS C:\>
```

AFTER Starting Mig
BEFORE Completin

```
AllowedOnBehalfOfCallers SID
S-1-5-21-274783270-2712129839-3354909249-13636

AuthorizationPolicy
@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/primarys
29839-3354909249-13636"])
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", Value

@RuleName = "Permit Local Administrators"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/groupsid"
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", Value
@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/primarys
29839-3354909249-13637"])
=> issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", value

AuthorizationPolicyReadOnly
@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/primarys
29839-3354909249-13636"])
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", Value

@RuleName = "Permit Local Administrators"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/groupsid"
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", Value
@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/primarysid",
29839-3354909249-13637"])
=> issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", value =
```

AFTER Completing Migration

```
AllowedOnBehalfOfCallers SID
S-1-5-21-274783270-2712129839-3354909249-13636

AuthorizationPolicy
@RuleName = "Permit Local Administrators"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/groupsid", Value == "S-1-5-32-544"])
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", Value = "true");

@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/primarysid", Value == "S-1-5-21-274783270-27121
29839-3354909249-13637"])
=> issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", value = "true");

AuthorizationPolicyReadOnly
@RuleName = "Permit Local Administrators"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/groupsid", Value == "S-1-5-32-544"])
 => issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", Value = "true");

@RuleName = "Permit Service Account"
exists([Type == "http://schemas.microsoft.com/ws/2008/06/identity/claims/primarysid", Value == "S-1-5-21-274783270-27121
29839-3354909249-13637"])
=> issue(Type = "http://schemas.microsoft.com/authorization/claims/permit", value = "true");

PS C:\>
```

New Service Account

New Service Account

```
Microsoft.IdentityServer.PolicyModel.Client.StorageAuthorizationException: ADMIN0120: The client is not authorized to access the endpoint net.tcp://localhost:1500/policy. The client process must be run with service administrative privileges.
   at Microsoft.IdentityServer.PolicyModel.Client.PolicyStoreClientManager.SearchWorker(Filter filter, Int32 maxObjects, String[] propertyNames, Boolean firstTry, PropertyFactoryBase propertyFactory)
   at Microsoft.IdentityServer.PolicyModel.Client.PolicyManagerBase.Search[T](Filter filter, Int32
```

Log Name: AD FS/Admin
Source: AD FS
Event ID: 102
Level: Error
User: ADTEC\dMSA.ADFS$
OpCode: Info
Logged: 01-Jul
Task Category: None
Keywords: AD FS
Computer: SERVE

Copy

Close

Event Properties - Event 143, AD FS

General Details

User: ADTEC\dMSA.ADFS$
OpCode: Info
Computer: SERVERTEST1.ADTEC.NET

Copy

Close

 # Adding NEW Service Account To AuthZ Rules

https://github.com/microsoft/adfsToolbox/tree/master/s

Add-AdfsServiceAccountRule -ServiceAccount "<New dMSA Account>" [-SecondaryServers "<List Of Secondary Servers>"]

 # Removing OLD Service Account From AuthZ Rules

https://github.com/microsoft/adfsToolbox/tree/master/serviceAccountModule

Remove-AdfsServiceAccountRule -ServiceAccount "<Old Legacy Account>" [-SecondaryServers "<List Of Secondary Servers>"]

Migrating Service Accounts

Legacy → dMSA (Bad Successor!)

- Bad Successor = **WITHOUT PATCH** Aug 12, 2025 - KB5063878 - W2K25 DCs
  - Merging PAC (= Privilege Attribute Certificate) and getting hashes/keys of supported encryption types from targeted account, under the following minimal conditions
    - dMSA attribute "*msDS-DelegatedMSAState*" = 2
    - dMSA attribute "*msDS-ManagedAccountPrecededByLink*" = "<*DN of some account, user/computer/sMSA/gMSA/dMSA*>" (anything that can authenticate!)
      Major Problem → Accounts with well-known DNs (default domain admin + KRBTGT)
  - Listed attributes ARE NOT protected from regular LDAP writes!
- Wow! That's a LOT of EASY power! What could go wrong? 

Migrating Service Accounts

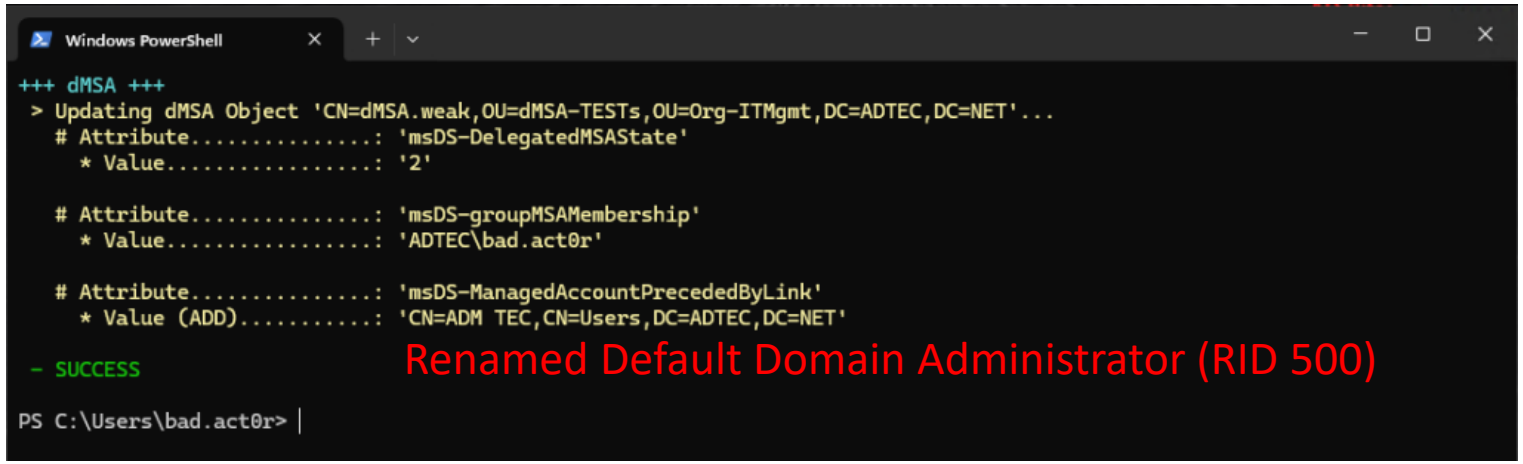
Legacy → dMSA (Bad Successor!)

- Therefore, anyone controlling ANY dMSA through….:
  - Create Child (Specific to dMSA or generic)
  - Full Control (e.g., Account Operators)
  - Write DACL
  - Write Owner
  - Write Property

[Bad-Successor-WRITE-DATA-v2.ps1]

[Bad-Successor-VIEW-DATA-v2.ps1]

```
# WRITE DATA INTO ATTRIBUTES "msDS-groupMSAMembership", "msDS-DelegatedMSAState", "msDS-ManagedAccountPrecededByLink" OF THE dMSA
$dMSADN = "CN=dMSA.weak,OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET“
$objectState = 2
$accDN = "CN=ADM TEC,CN=Users,DC=ADTEC,DC=NET“ # = Renamed Default Domain Admin
$accAllowGetPwd = "ADTEC\bad.act0r“
$badSuccessorPatchInstalled = $false
```



Migrating Service Accounts

Legacy → dMSA (Bad Successor!)

MC2MC CONNECT

the
MSA

Migrating Service Accounts

Legacy → dMSA (Patched Successor!)

- Patched Successor = **WITH PATCH** Aug12, 2025 - KB5063878 - W2K25 DCs
  - Merging PAC (= Privilege Attribute Certificate) and getting hashes/keys of supported encryption types from targeted account, under the following minimal conditions
    - dMSA attribute "*msDS-DelegatedMSAState*" = 2
    - dMSA attribute "*msDS-ManagedAccountPrecededByLink*" = "<*DN of some account, user/computer/sMSA/gMSA/~~dMSA~~*>" (anything that can authenticate, except dMSAs!)
    - (legacy service) account attribute "*msDS-SupersededServiceAccountState*" = 2
    - (legacy service) account attribute "*msDS-SupersededManagedAccountLink*" = <DN of dMSA referencing the (legacy service) account>
  - Listed attributes ARE STILL NOT protected from regular LDAP writes!
  - In addition to controlling dMSA, control is also needed on target/referenced account!
  - Protected Accounts (secured by adminSDHolder) are now exempt from this attack. But... what about over-permissioned non-protected accounts as the backdoor?

Migrating Service Accounts

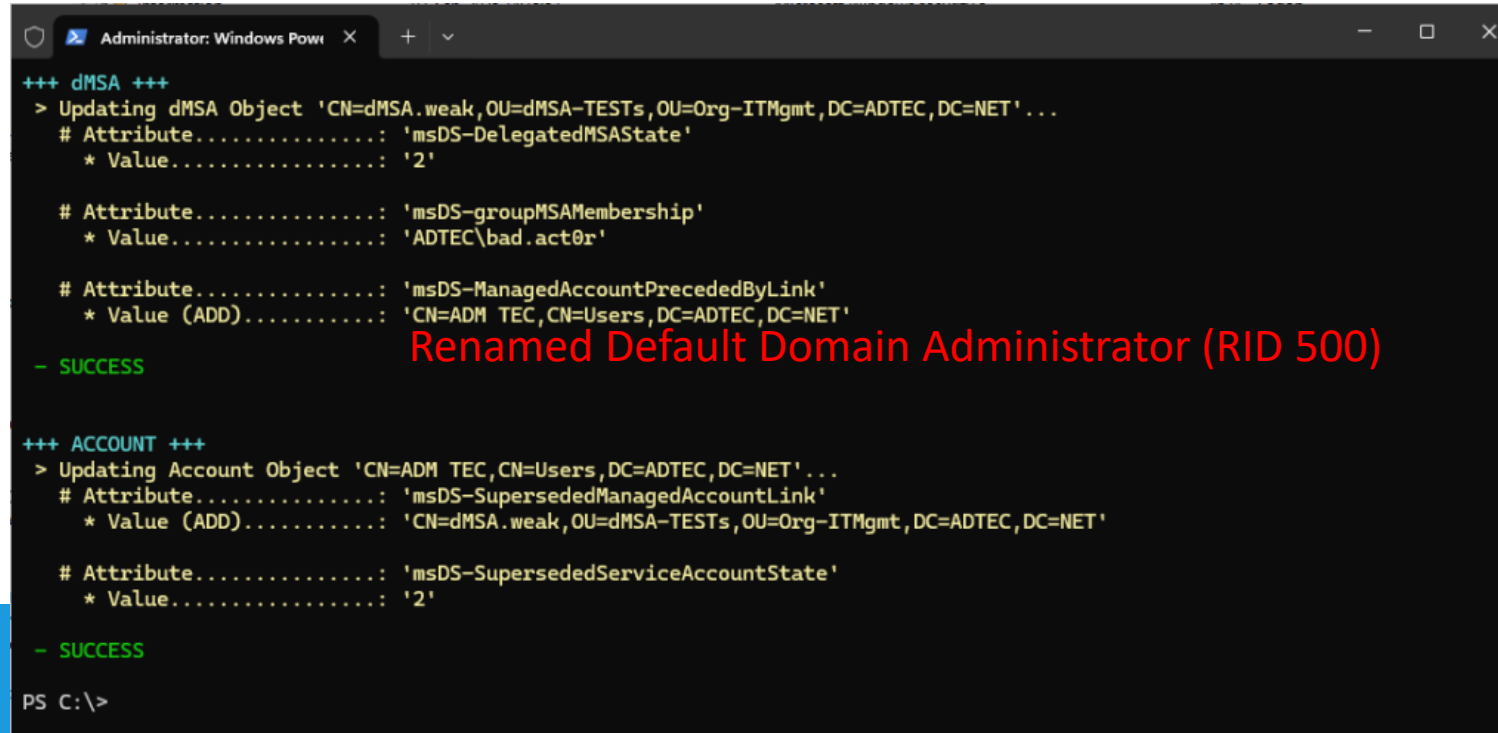
Legacy → dMSA (Patched Successor!)

- Therefore, anyone controlling ANY Account + dMSA through:
  - Create Child (Specific to dMSA or generic)
  - Full Control (e.g., Account Operators)
  - Write DACL
  - Write Owner
  - Write Property
- Attack technique still valid!

Bad-Successor-WRITE-DATA-v2.ps1

Bad-Successor-VIEW-DATA-v2.ps1

```
# WRITE DATA INTO ATTRIBUTES "msDS-groupMSAMembership", "msDS-DelegatedMSAState", "msDS-ManagedAccountPrecededByLink" OF THE dMSA
# WRITE DATA INTO ATTRIBUTES "msDS-SupersededServiceAccountState", "msDS-SupersededManagedAccountLink" OF THE (LEGACY SERVICE) ACCOUNT
$dMSADN = "CN=dMSA.weak,OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET“
$objectState = 2
$accDN = "CN=ADM TEC,CN=Users,DC=ADTEC,DC=NET“ # = Renamed Default Domain Admin
$accAllowGetPwd = "ADTEC\bad.act0r“
$badSuccessorPatchInstalled = $true
```

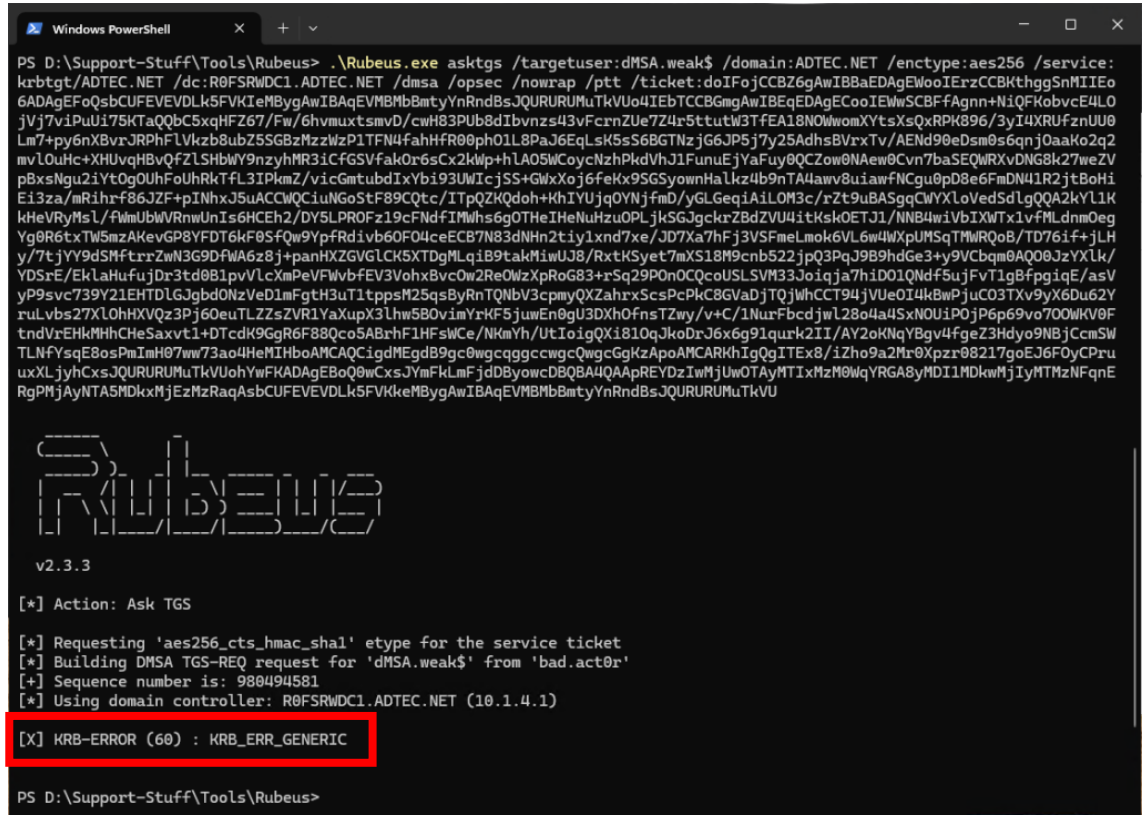


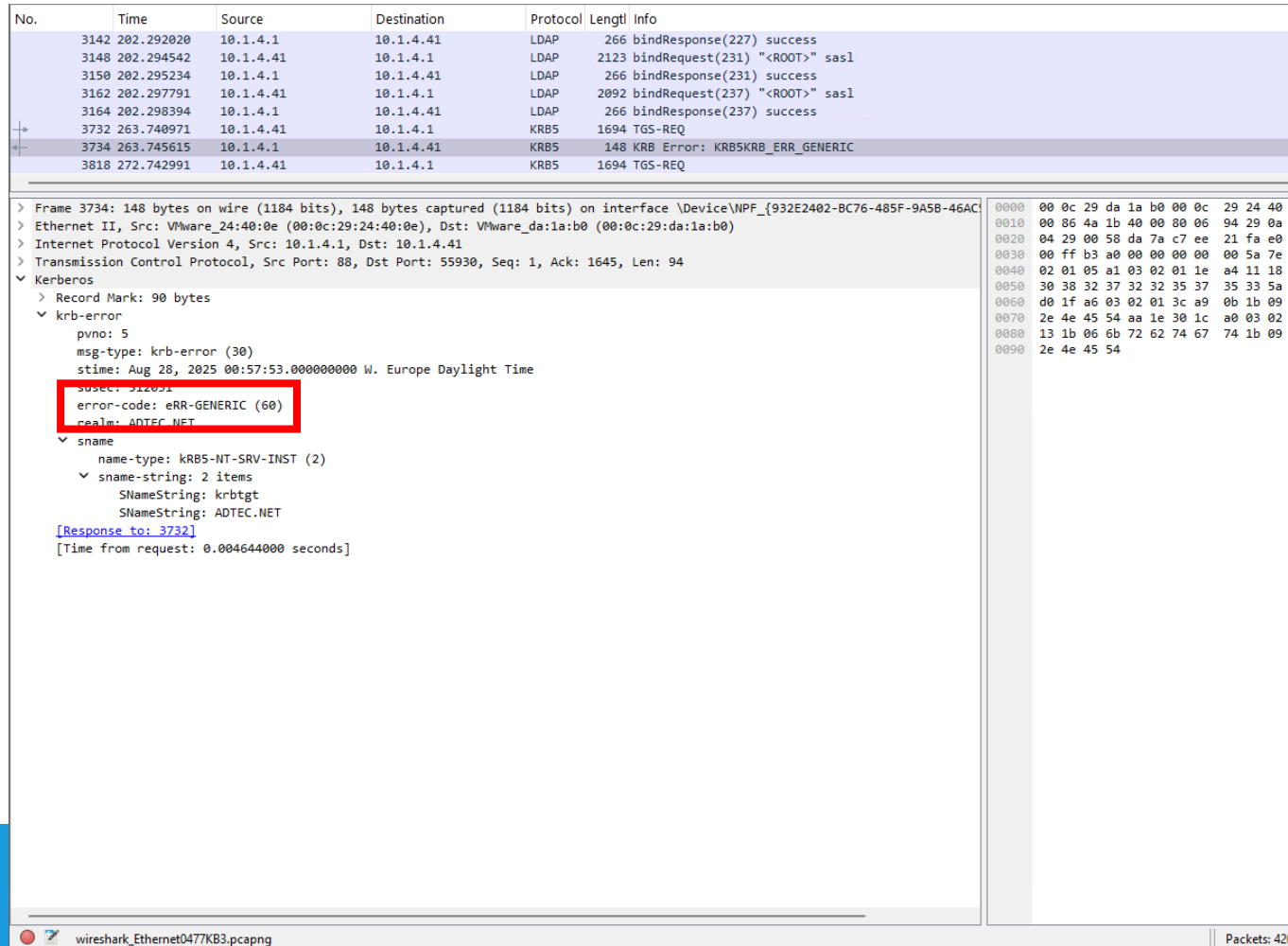
Migrating Service Accounts

Legacy → dMSA (Patched Successor!)

MC2MC CONNECT

- Following only the conditions for Bad Successor while patch is installed, results in Kerberos Error when requesting the TGS for the dMSA!





Migrating Service Accounts

Legacy → dMSA (Protections!)

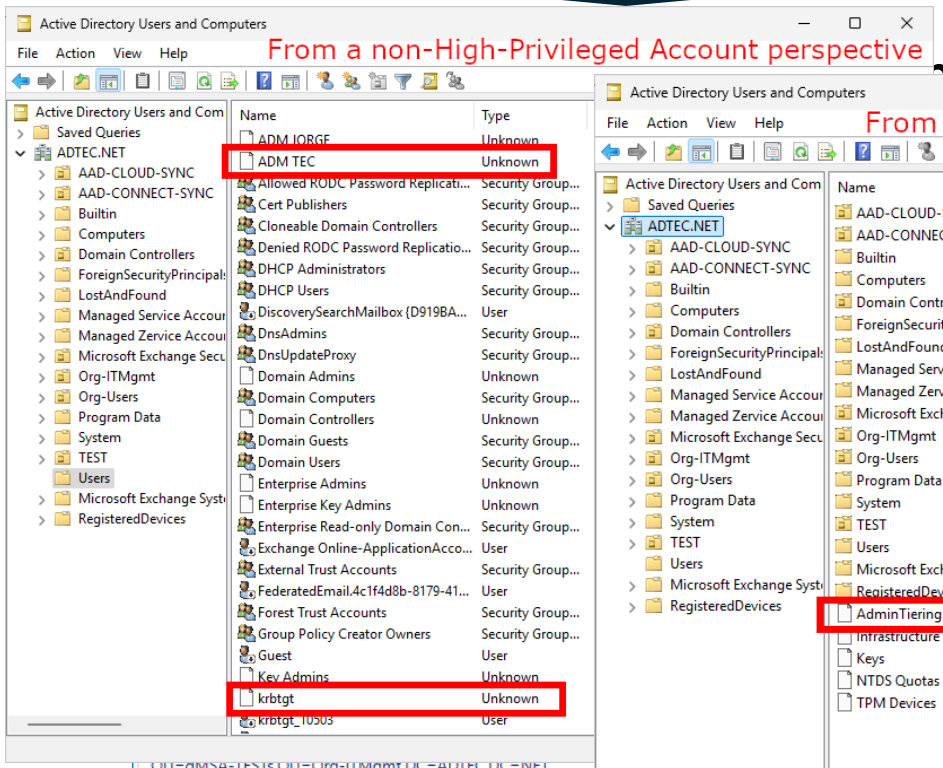
- **REMEMBER**: dMSA creation and management is Tier0!
- Auditing
  - Event ID 5137 - dMSA creation
  - Event ID 5136 - writes to "*msDS-groupMSAMembership*" on dMSA object
  - Applicable For BadSuccessor → Event ID 5136 - writes to "*msDS-DelegatedMSAState*" with value of "2“ (not coming from 1) in combination with writes to "*msDS-ManagedAccountPrecededByLink*" on dMSA object (+not being DN of disabled user object), while also NOT writing anything to "*msDS-SupersededServiceAccountState*" and to "*msDS-SupersededManagedServiceAccountLink*" on the referenced account

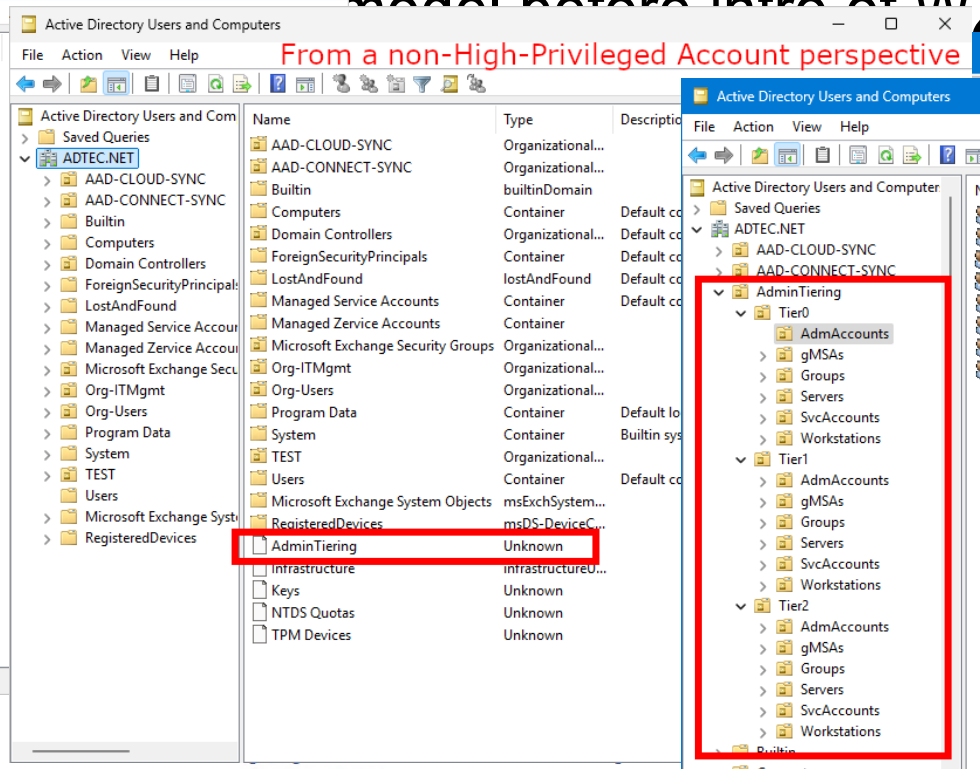
Migrating Service Accounts
Legacy → dMSA (Protections!)

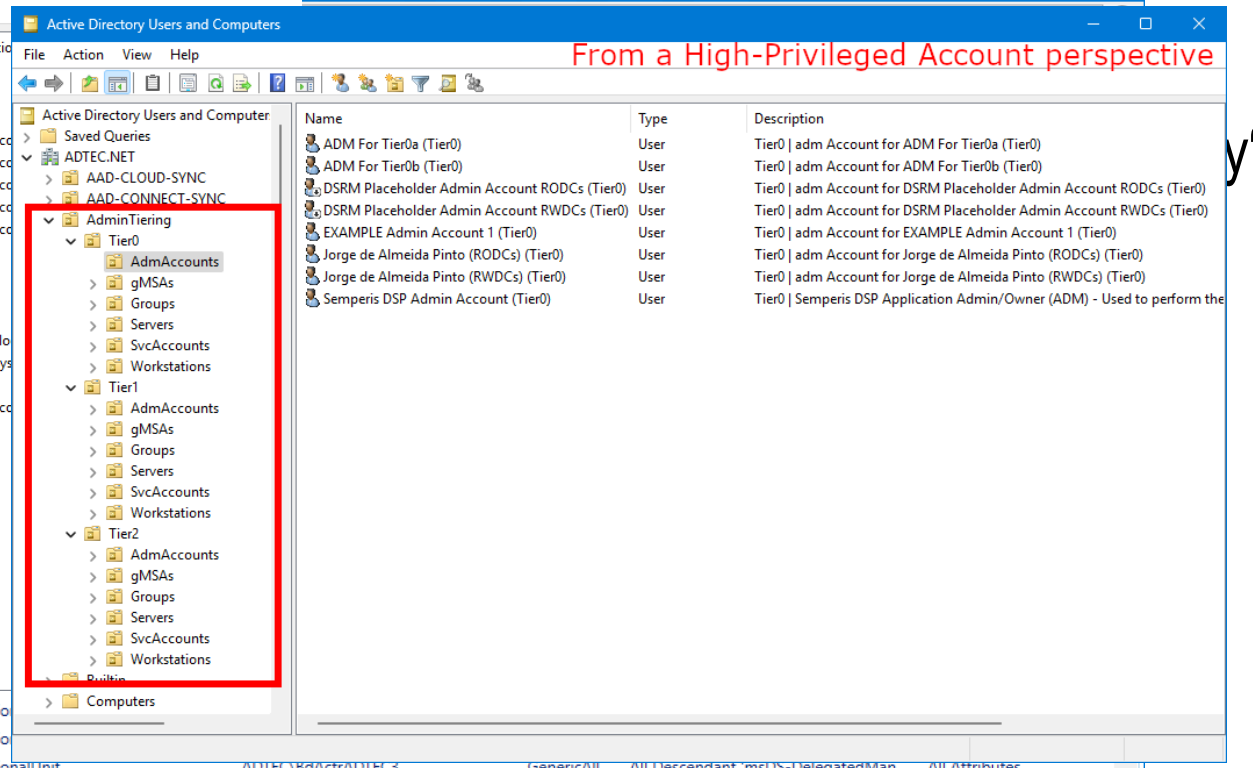
- Auditing (Continued)
  - Applicable For PatchedSuccessor → Event ID 5136 - writes to "*msDS-DelegatedMSAState*" with value of "2“ (not coming from 1) in combination with writes to "*msDS-ManagedAccountPrecededByLink*" on dMSA object (+not being DN of disabled user object), while also writing “2” (not coming from 1) to "*msDS-SupersededServiceAccountState*" and to "*msDS-SupersededManagedServiceAccountLink*" on the referenced account
  - Event ID 2946 - Audit fetching passwords of dMSAs (unusual)
  - Event ID 4768 - Audit Success Of Kerberos Tickets Operations (*TGT Request by Account*) followed by Event ID 4769 - Audit Failure Of Kerberos Tickets Operations (*TGS Request by same Account*)
    (When patched IS installed and BadSuccessor method, 2 attributes only, is used)

Migrating Service Accounts
Legacy → dMSA (Protections!)

MC2MC CONNECT







model before intro of W2K25 DCs and enhance security

y"

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OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC3	GenericAll	All Descendant 'msDS-DelegatedMan...	All Attributes
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC10	WriteDacl	This Object Only	Not Applicable
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC11	WriteDacl	This Object And All Descendant Objects	Not Applicable
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC12	WriteDacl	All Descendant Objects	Not Applicable
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC2	GenericAll	All Descendant Objects	All Attributes
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC60	Owner Of...	Not Applicable	Not Applicable
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC0	GenericAll	This Object Only	All Attributes
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC1	GenericAll	This Object And All Descendant Objects	All Attributes
OU=dMSA-TESTs,OU=Org-ITMgmt,DC=ADTEC,DC=NET	ADTEC.NET/Org-ITMgmt/dMSA-TESTs	organizationalUnit	ADTEC\BdActrADTEC40	CreateChild	This Object Only (All Object Types)	All Attributes

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Migrating Service Accounts

Legacy → dMSA (The Ultimate Block!)

- Block writing values into
  - "*msDS-ManagedAccountPrecededByLink*"
  - "*msDS-SupersededManagedServiceAccountLink*"
- Impacts regular LDAP writes & unfortunately also writes through PoSH CMDlets

Link Attribute on a dMSA

Link Attribute on any account

Migrating Service Accounts

Legacy → dMSA (More Information)

- Further Reading
  - BadSuccessor: Abusing dMSA to Escalate Privileges in Active Directory
  - BadSuccessor: How to Detect and Mitigate dMSA Privilege Escalation
  - (2025-05-25) Reviewing Your Delegation Model Before Introducing W2K25 DCs And Enhancing Security (Due To “BadSuccessor”)
  - Understanding & Mitigating BadSuccessor
  - (2025-07-11) How to Block BadSuccessor: The Good, Bad, and Ugly of dMSA Migration
  - (2025-09-02) From BadSuccessor To PatchedSuccessor





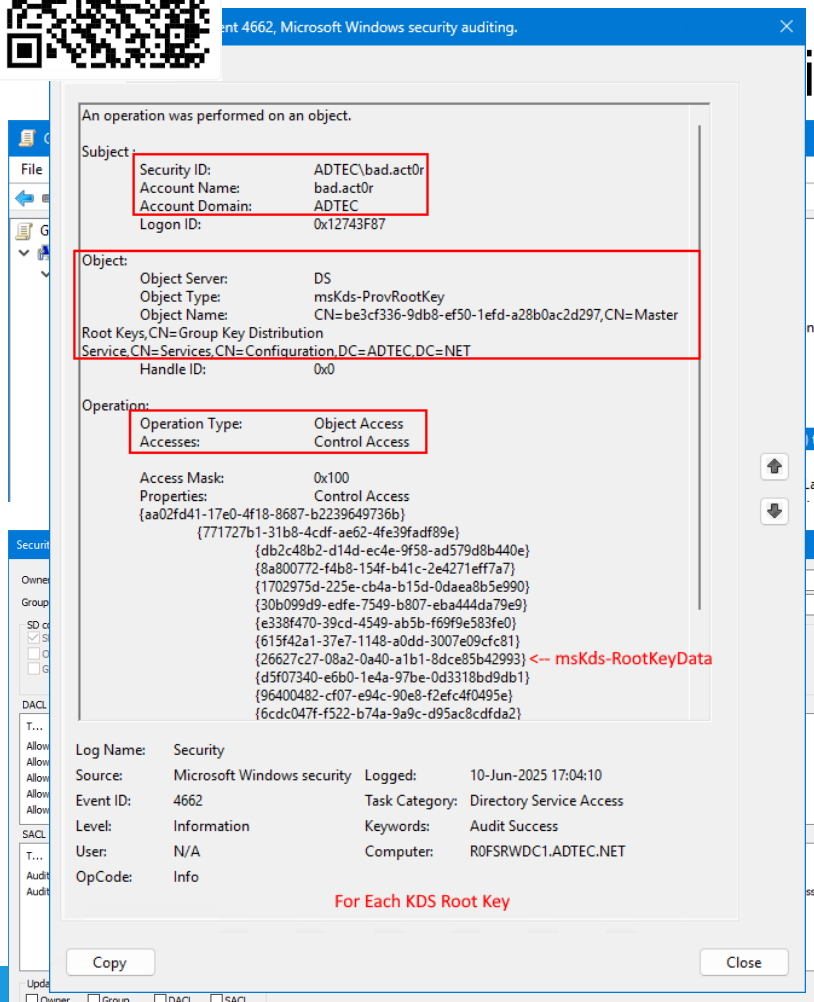

Auditing KDS Root Key Access

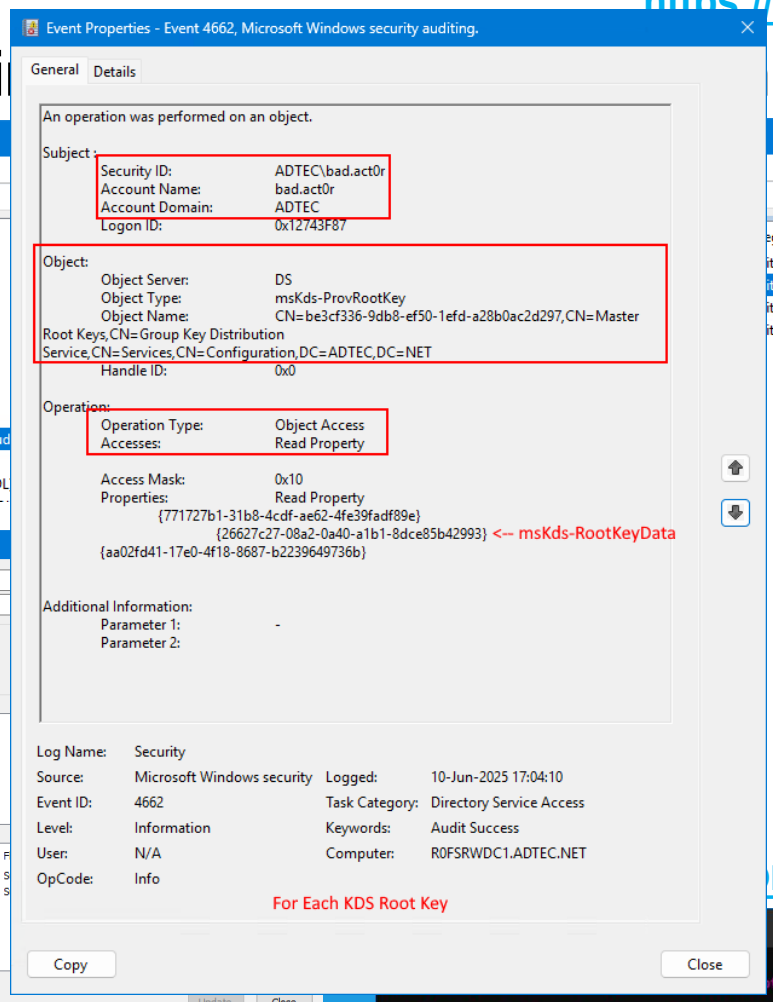
Detecting Golden gMSA/dMSA Attacks

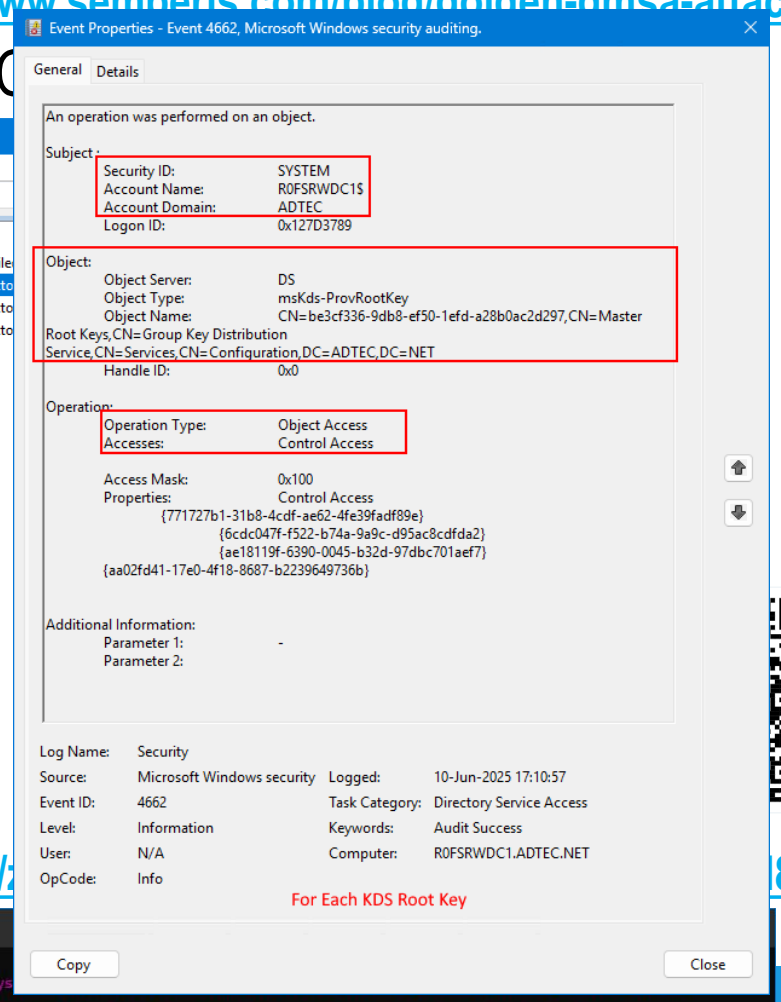
MC2MC CONNECT

Access of any KDS Root Key by anyone is NOT audited in any way by default!

https://www.semperis.com/blog/golden-gmsa-attack/







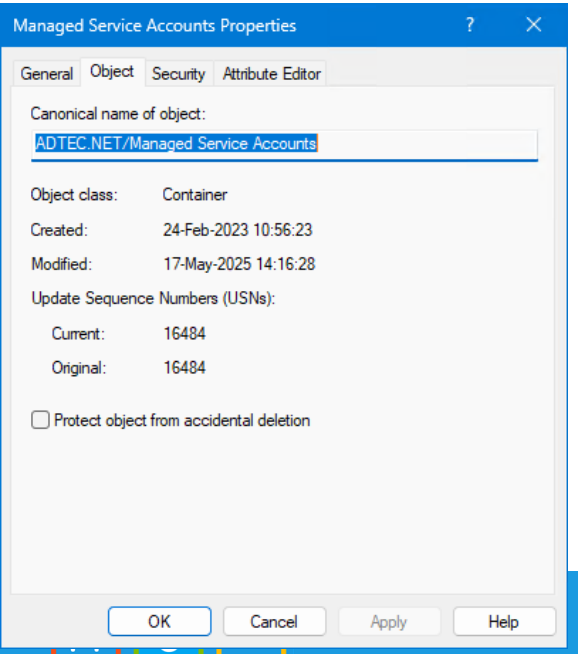
> Adding Audit Entry For Success ReadProperty, ExtendedRight By 'NT AUTHORITY\Authenticated Users' On 'msKds-RootKeyData'

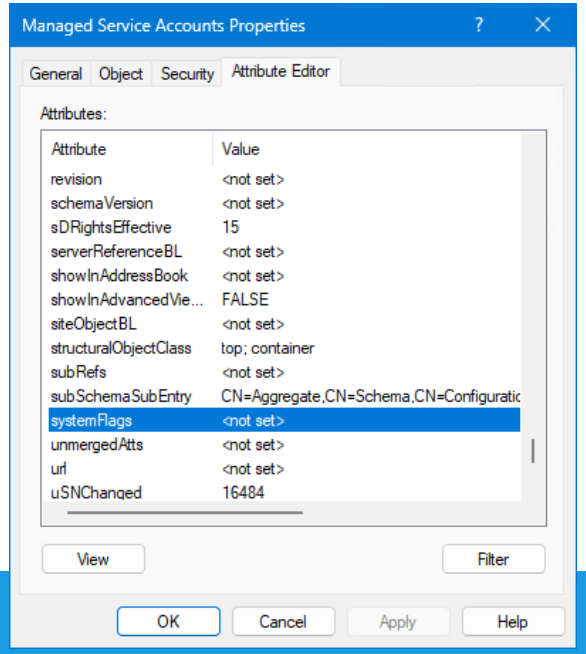
Managed Service Accounts
Container For sMSA/gMSA/dMSA

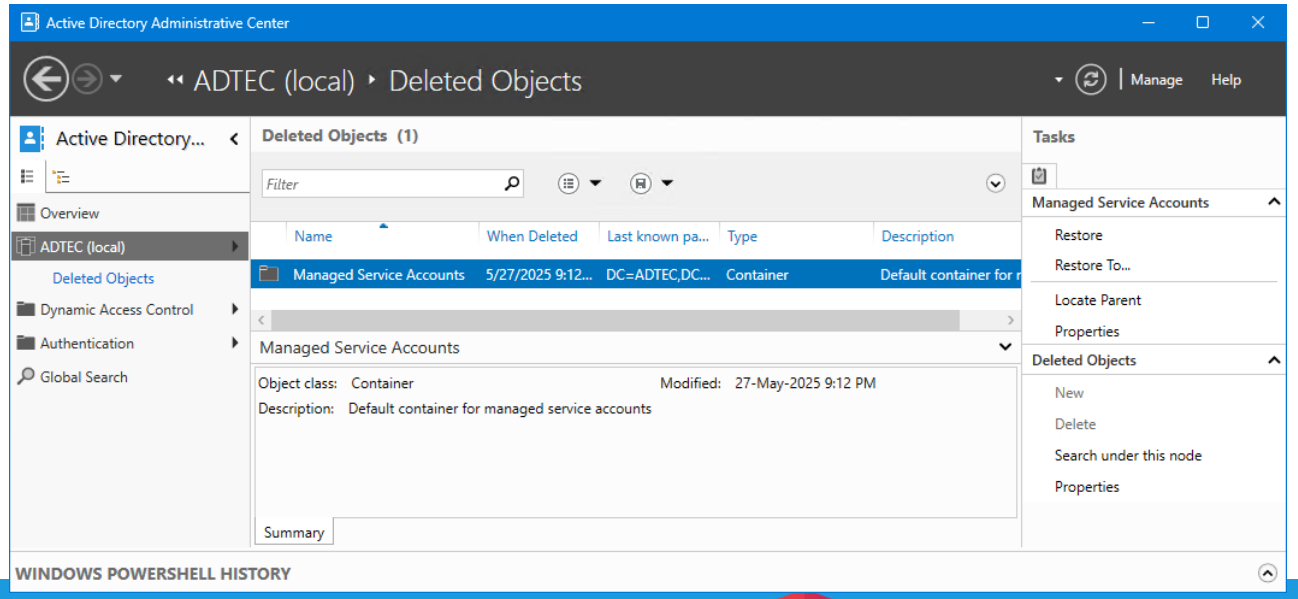
MC2MC CONNECT

- Default Container in AD for sMSAs/gMSAs/dMSAs:
  "*CN=Managed Service Accounts,DC=<DOMAIN>,DC=<TLD>*"
  (sMSAs/gMSAs/dMSAs can live in ANY other container or OU!)
  - NOT protected, can be deleted!
  - It can be protected from deletion!

https://jorgequestforknowledge.wordpress.com/2025/06/27/well-known-containers-in-an-ad-domain-how-to-restore-and-or-repair-as-needed/





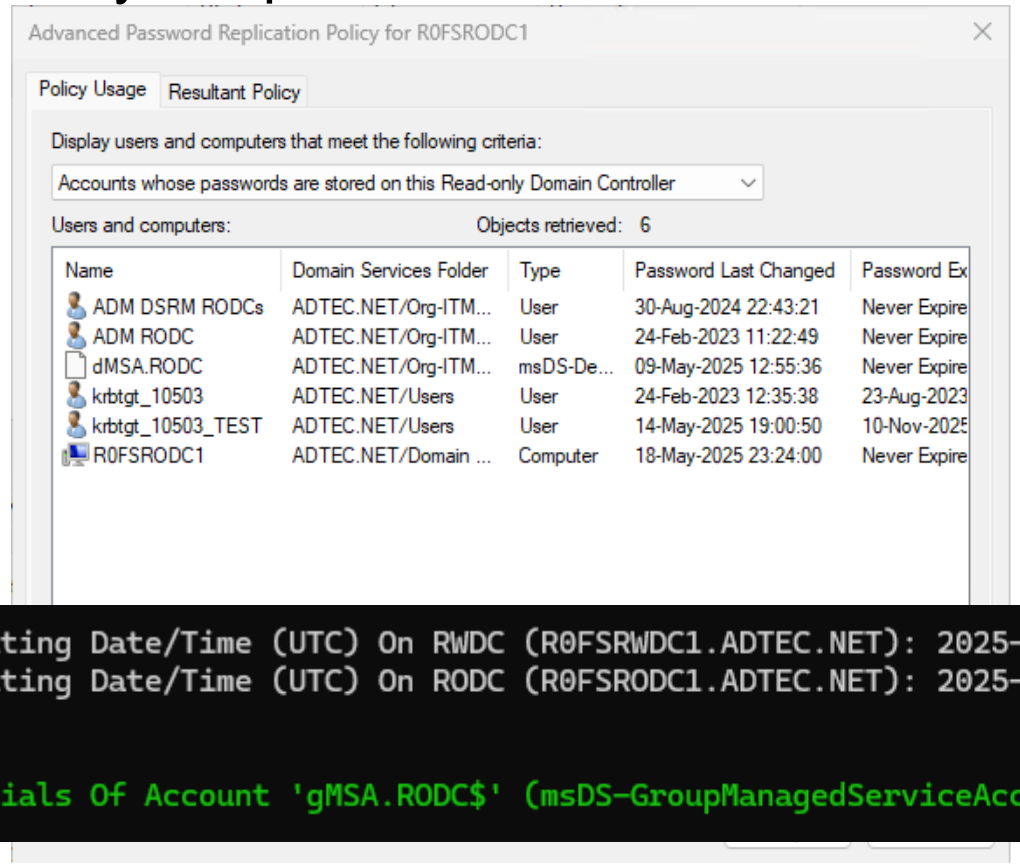


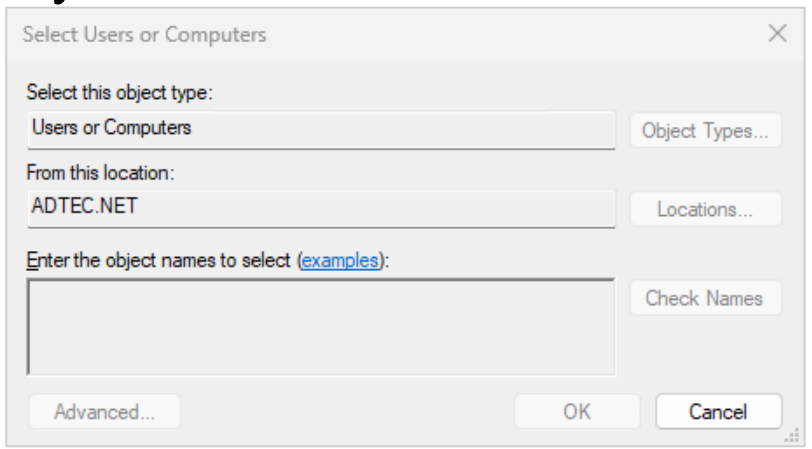
semperis

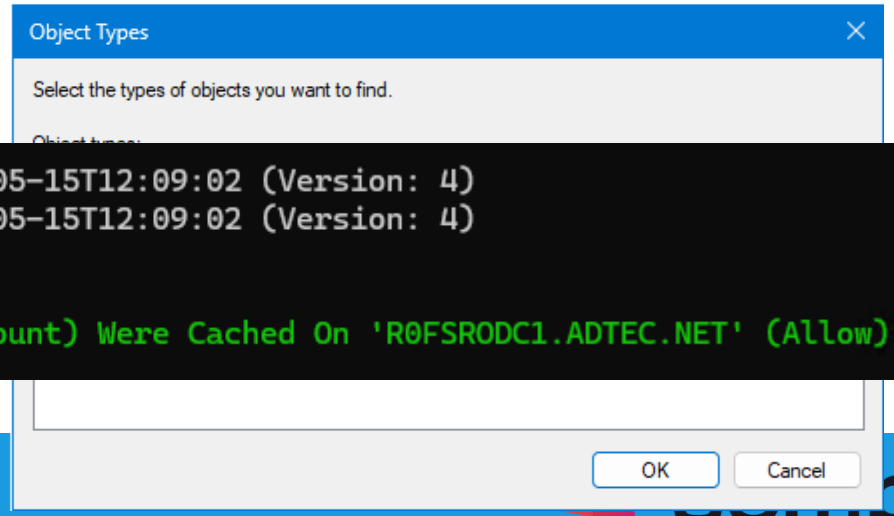
RODCs And sMSA/gMSA/dMSA

Caching Account Creds On RODC

Attributes “unicodePwd”, “supplementalCredentials”, etc contain current values for respectively the password and the Kerberos keys. Can be cached on an RODC.







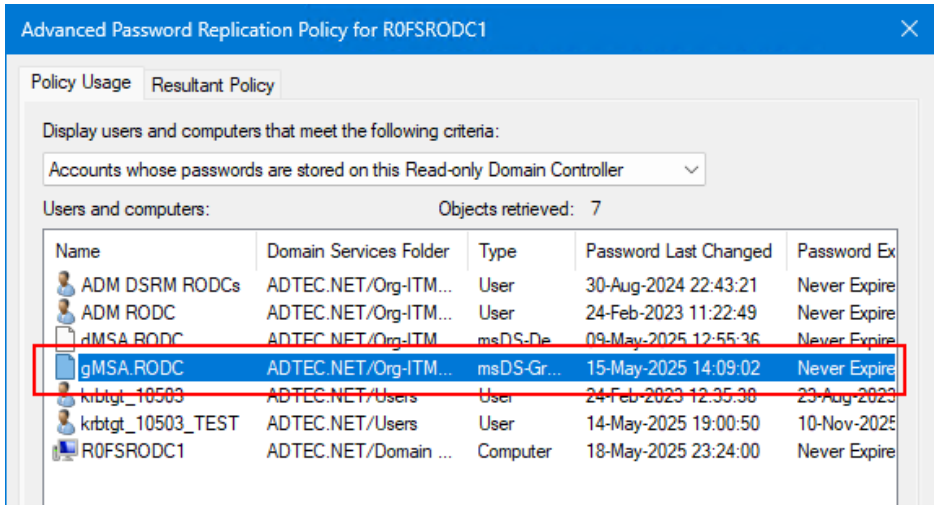

```
Originating Date/Time (UTC) On RWDC (R0FSRWDC1.ADTEC.NET): 2025-05-15T12:09:02 (Version: 4)
Originating Date/Time (UTC) On RODC (R0FSRODC1.ADTEC.NET): 2025-05-15T12:09:02 (Version: 4)


Credentials Of Account 'gMSA.RODC$' (msDS-GroupManagedServiceAccount) Were Cached On 'R0FSRODC1.ADTEC.NET' (Allow)...
```

https://gist.github.com/zjorz/aecdb9aacdcdf5fe37c1d7c42ef9ec60

RODCs And sMSA/gMSA/dMSA

Removing Account Creds From RODC (A.k.a. Purging)

- The Secure Way:
  - Remove account from “Allowed To Cache” list
  - Reset the password of the account (or wait in case of gMSA/dMSA)



- The Less Impactful Way (Also Less Secure):
  - Use PowerShell and the operational attribute “rODCPurgeAccount” against the RODC

```
Originating Date/Time (UTC) On RWDC (R0FSRWDC1.ADTEC.NET): 2025-05-15T12:09:02 (Version: 4)
Originating Date/Time (UTC) On RODC (R0FSRODC1.ADTEC.NET): 1601-01-01T00:00:00 (Version: 4)

Credentials Of Account 'gMSA.RODC$' (msDS-GroupManagedServiceAccount) Have Been Purged From 'R0FSRODC1.ADTEC.NET'...
WARNING:
 > Credentials Of The Account Are Still Allowed To Be Cached On 'R0FSRODC1.ADTEC.NET'...
 > Make Sure To Remove The Account From The ALLOWED To Be Cached List Of The RODC 'R0FSRODC1.ADTEC.NET'
```

https://gist.github.com/zjorz/a6b819047638a4103c37ee087e688c57


ANY
QUESTIONS
?

Please Fill In Feedback Form

Session feedback available in home feed of the app after the session

semperis

THANK YOU!

MC2MC

CONNECT

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LinkedIn	http://tiny.cc/JorgeLinkedIn
Blog	http://tiny.cc/JQFKblog
Twitter	http://tiny.cc/JQFKtwitter
Github	http://tiny.cc/JQFKgithub
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