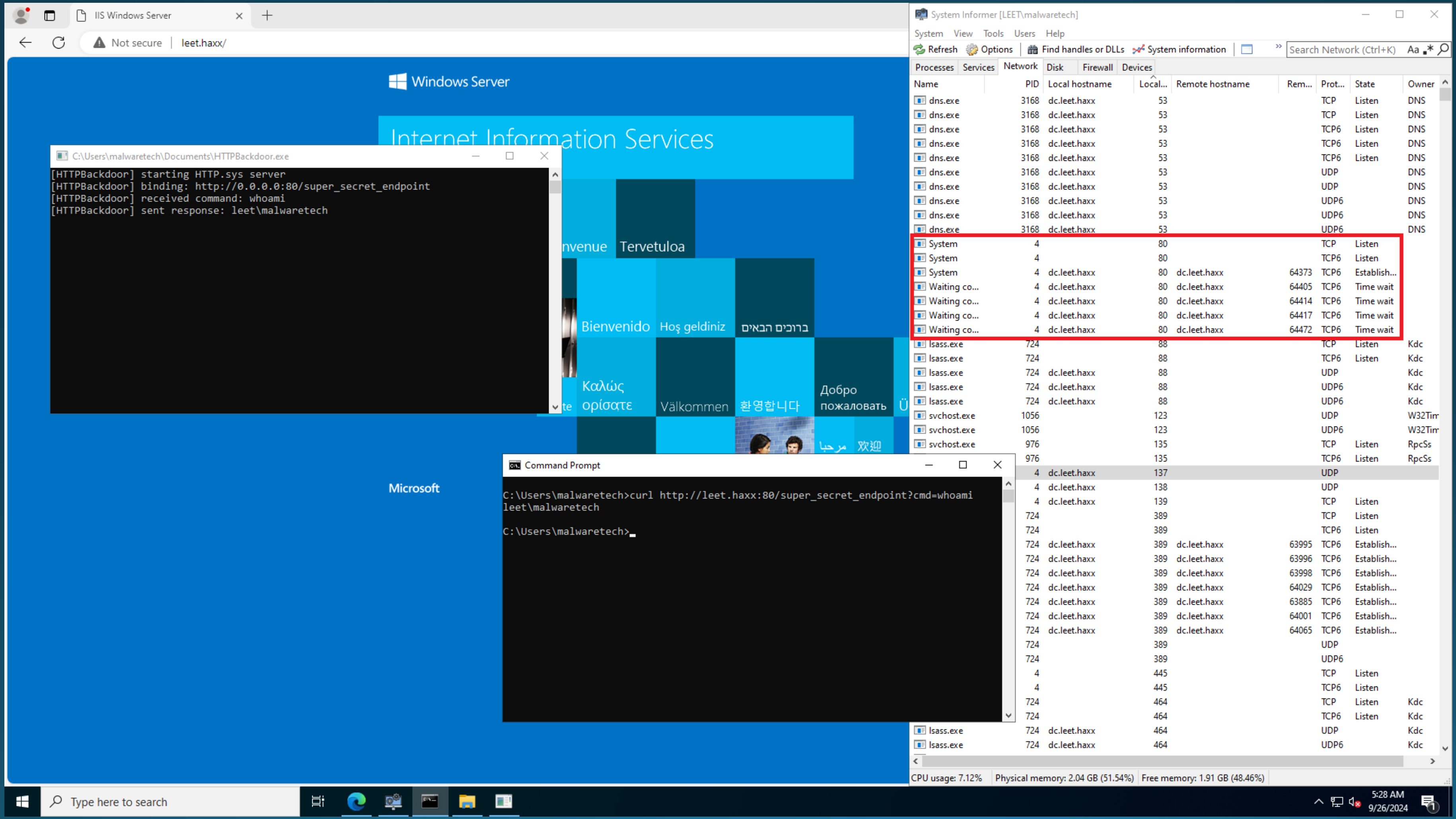
Stealthy User Mode Backdoors Via The HTTP.sys API



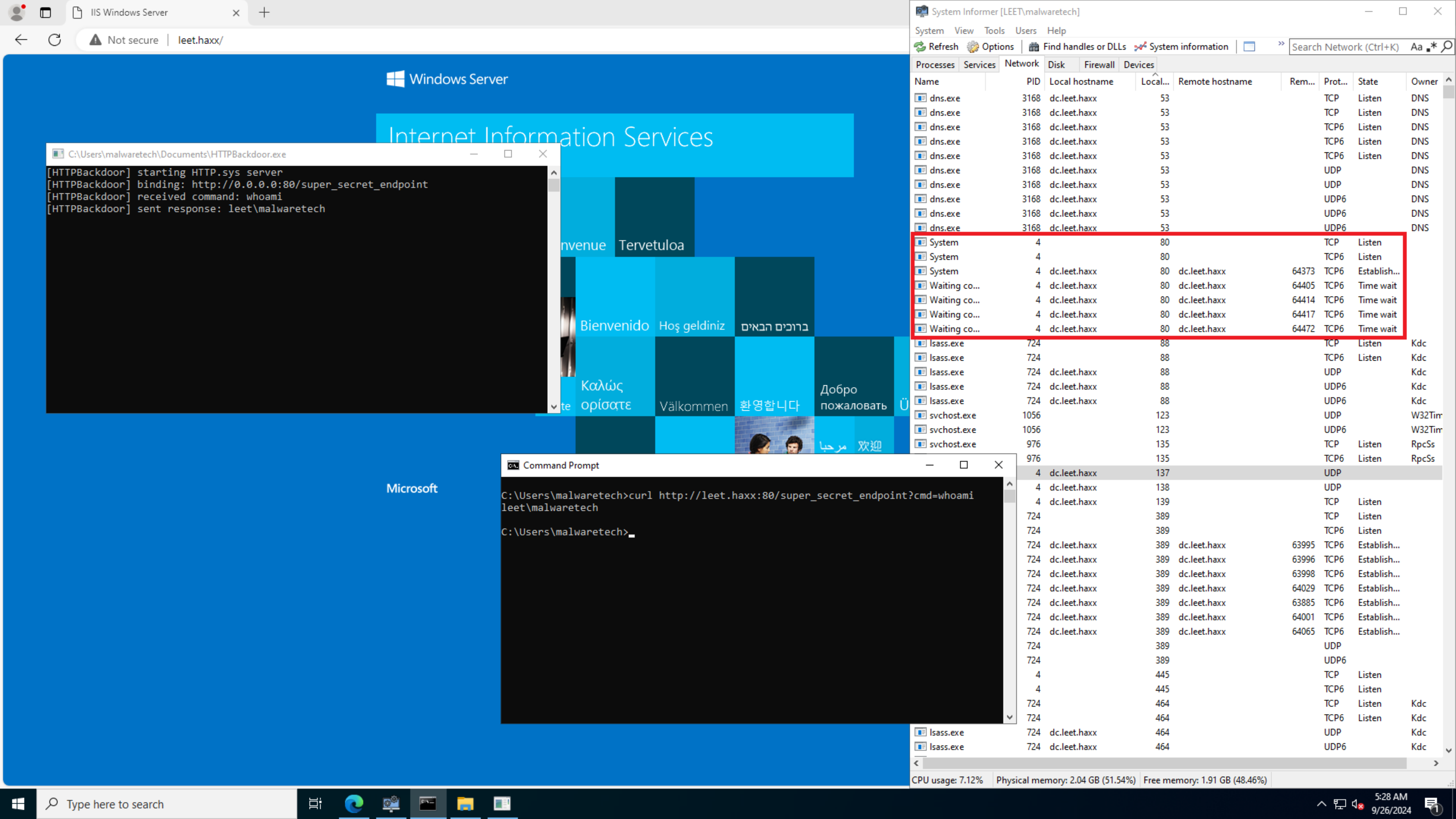
```
[HTTPBackdoor] starting HTTP.sys server
[HTTPBackdoor] binding: http://0.0.0.0:80/super_secret_endpoint
[HTTPBackdoor] received command: whoami
[HTTPBackdoor] sent response: leet\malwaretech
```

```
C:\Users\malwaretech>curl http://leet.haxx:80/super_secret_endpoint?cmd=whoami
leet\malwaretech

C:\Users\malwaretech>_
```

Name	PID	Local hostname	Local...	Remote hostname	Rem...	Prot...	State	Owner
dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
System	4		80			TCP	Listen	
System	4		80			TCP6	Listen	
System	4	dc.leet.haxx	80	dc.leet.haxx	64373	TCP6	Establish...	
Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	64405	TCP6	Time wait	
Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	64414	TCP6	Time wait	
Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	64417	TCP6	Time wait	
Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	64472	TCP6	Time wait	
lsass.exe	724		88			TCP	Listen	Kdc
lsass.exe	724		88			TCP6	Listen	Kdc
lsass.exe	724	dc.leet.haxx	88			UDP		Kdc
lsass.exe	724	dc.leet.haxx	88			UDP6		Kdc
lsass.exe	724	dc.leet.haxx	88			UDP6		Kdc
svchost.exe	1056		123			UDP		W32Tim
svchost.exe	1056		123			UDP6		W32Tim
svchost.exe	976		135			TCP	Listen	RpcSs
	976		135			TCP6	Listen	RpcSs
	4	dc.leet.haxx	137			UDP		
	4	dc.leet.haxx	138			UDP		
	4	dc.leet.haxx	139			TCP	Listen	
	724		389			TCP	Listen	
	724		389			TCP6	Listen	
	724	dc.leet.haxx	389	dc.leet.haxx	63995	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	63996	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	63998	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	64029	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	63885	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	64001	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	64065	TCP6	Establish...	
	724		389			UDP		
	724		389			UDP6		
	4		445			TCP	Listen	
	4		445			TCP6	Listen	
	724		464			TCP	Listen	Kdc
	724		464			TCP6	Listen	Kdc
lsass.exe	724	dc.leet.haxx	464			UDP		Kdc
lsass.exe	724	dc.leet.haxx	464			UDP6		Kdc

CPU usage: 7.12% | Physical memory: 2.04 GB (51.54%) | Free memory: 1.91 GB (48.46%)



C:\Users\malwaretech\Documents\HTTPBackdoor.exe

```
[HTTPBackdoor] starting HTTP.sys server
[HTTPBackdoor] binding: http://0.0.0.0:80/super_secret_endpoint
[HTTPBackdoor] received command: whoami
[HTTPBackdoor] sent response: leet\malwaretech
```

Command Prompt

```
C:\Users\malwaretech>curl http://leet.haxx:80/super_secret_endpoint?cmd=whoami
leet\malwaretech

C:\Users\malwaretech>_
```

System Informer [LEET\malwaretech]

Name	PID	Local hostname	Local...	Remote hostname	Rem...	Prot...	State	Owner
dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
System	4		80			TCP	Listen	
System	4		80			TCP6	Listen	
System	4	dc.leet.haxx	80	dc.leet.haxx	64373	TCP6	Establish...	
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Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	64414	TCP6	Time wait	
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Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	64472	TCP6	Time wait	
lsass.exe	724		88			TCP	Listen	Kdc
lsass.exe	724		88			TCP6	Listen	Kdc
lsass.exe	724	dc.leet.haxx	88			UDP		Kdc
lsass.exe	724	dc.leet.haxx	88			UDP6		Kdc
lsass.exe	724	dc.leet.haxx	88			UDP6		Kdc
svchost.exe	1056		123			UDP		W32Tim
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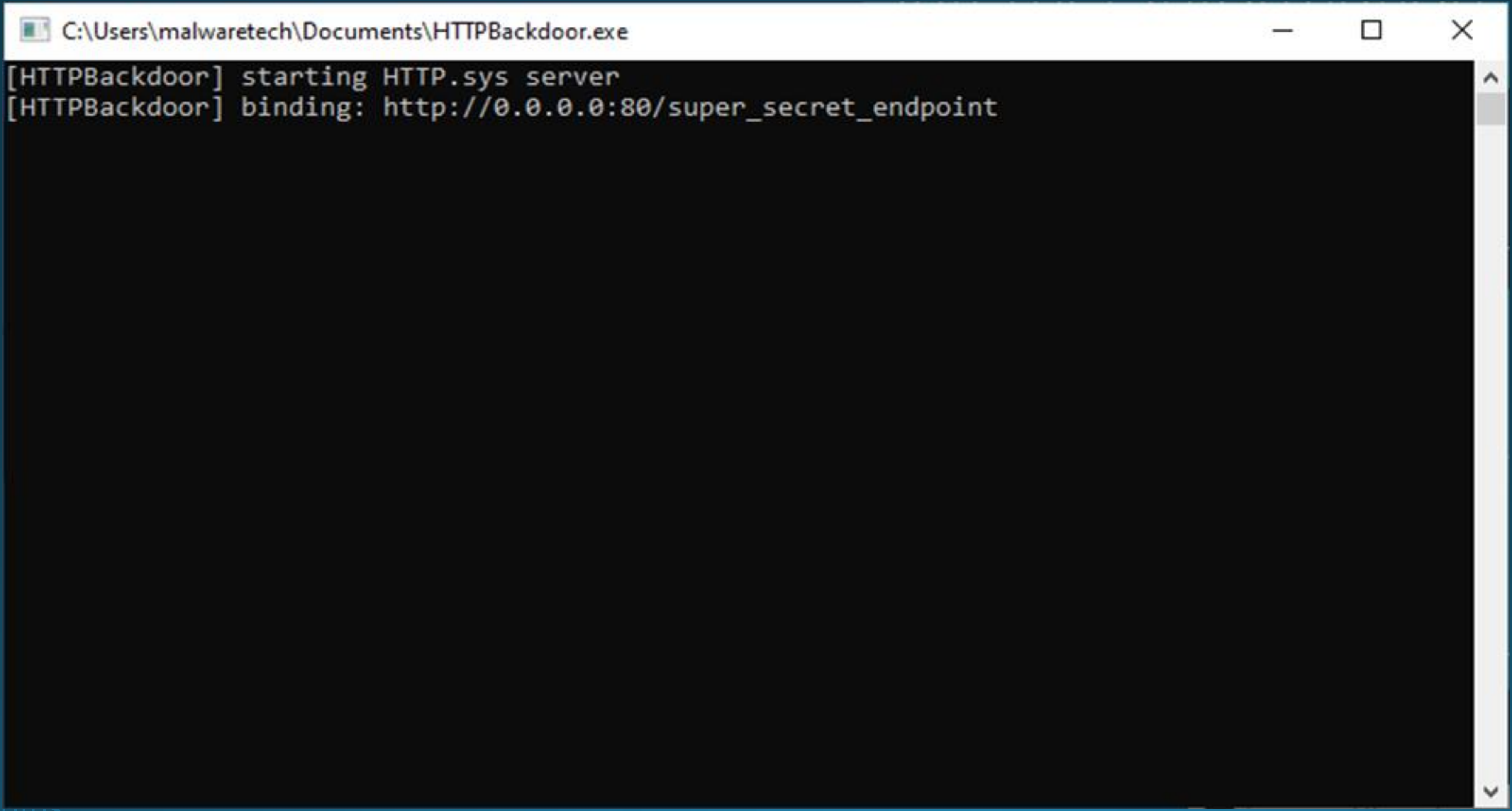
	4	dc.leet.haxx	137			UDP		
	4	dc.leet.haxx	138			UDP		
	4	dc.leet.haxx	139			TCP	Listen	
	724		389			TCP	Listen	
	724		389			TCP6	Listen	
	724	dc.leet.haxx	389	dc.leet.haxx	63995	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	63996	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	63998	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	64029	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	63885	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	64001	TCP6	Establish...	
	724	dc.leet.haxx	389	dc.leet.haxx	64065	TCP6	Establish...	
	724		389			UDP		
	724		389			UDP6		
	4		445			TCP	Listen	
	4		445			TCP6	Listen	
	724		464			TCP	Listen	Kdc
	724		464			TCP6	Listen	Kdc
lsass.exe	724	dc.leet.haxx	464			UDP		Kdc
lsass.exe	724	dc.leet.haxx	464			UDP6		Kdc

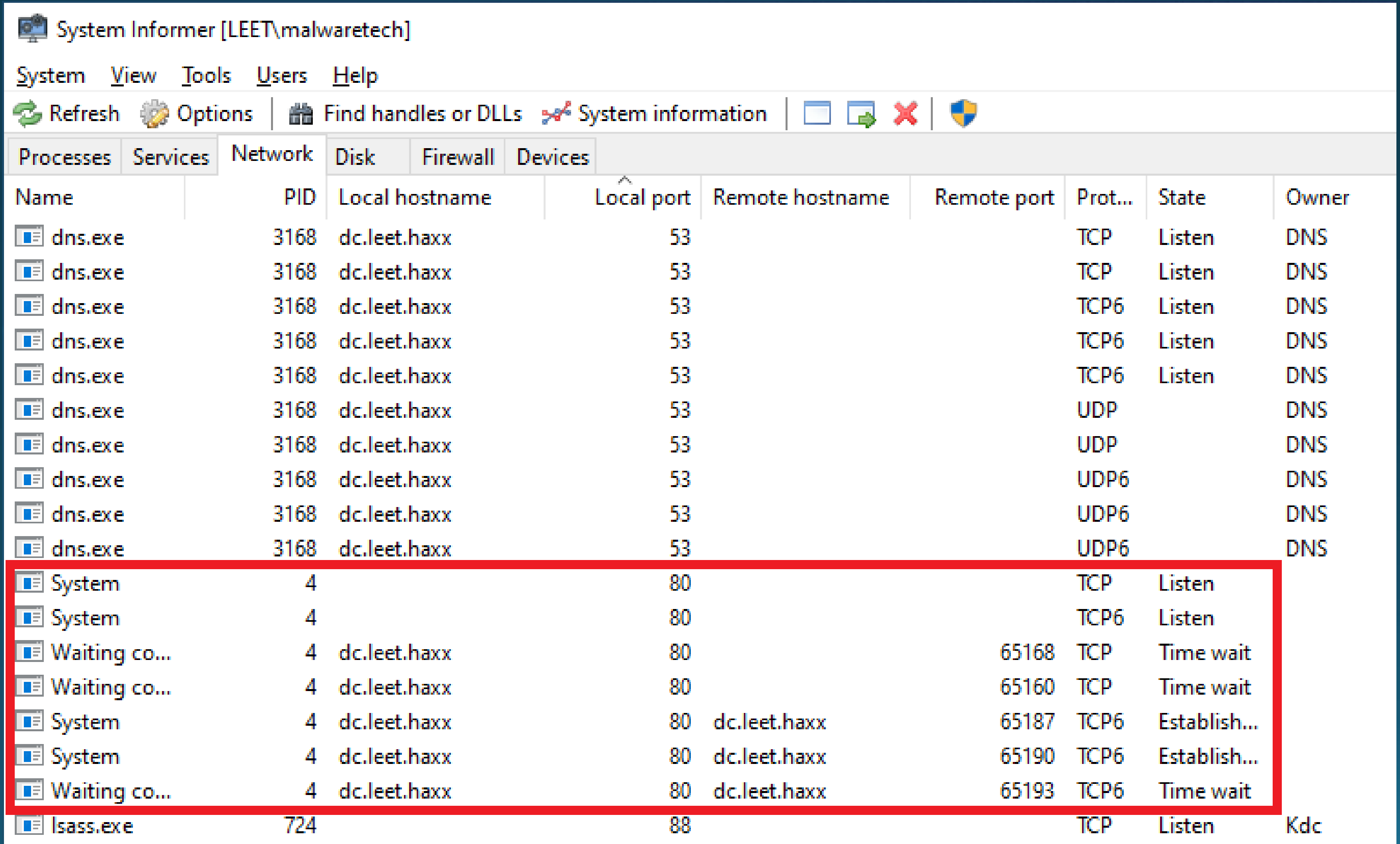
CPU usage: 7.12% | Physical memory: 2.04 GB (51.54%) | Free memory: 1.91 GB (48.46%)

http.sys allows us to launch http servers in the kernel from user mode



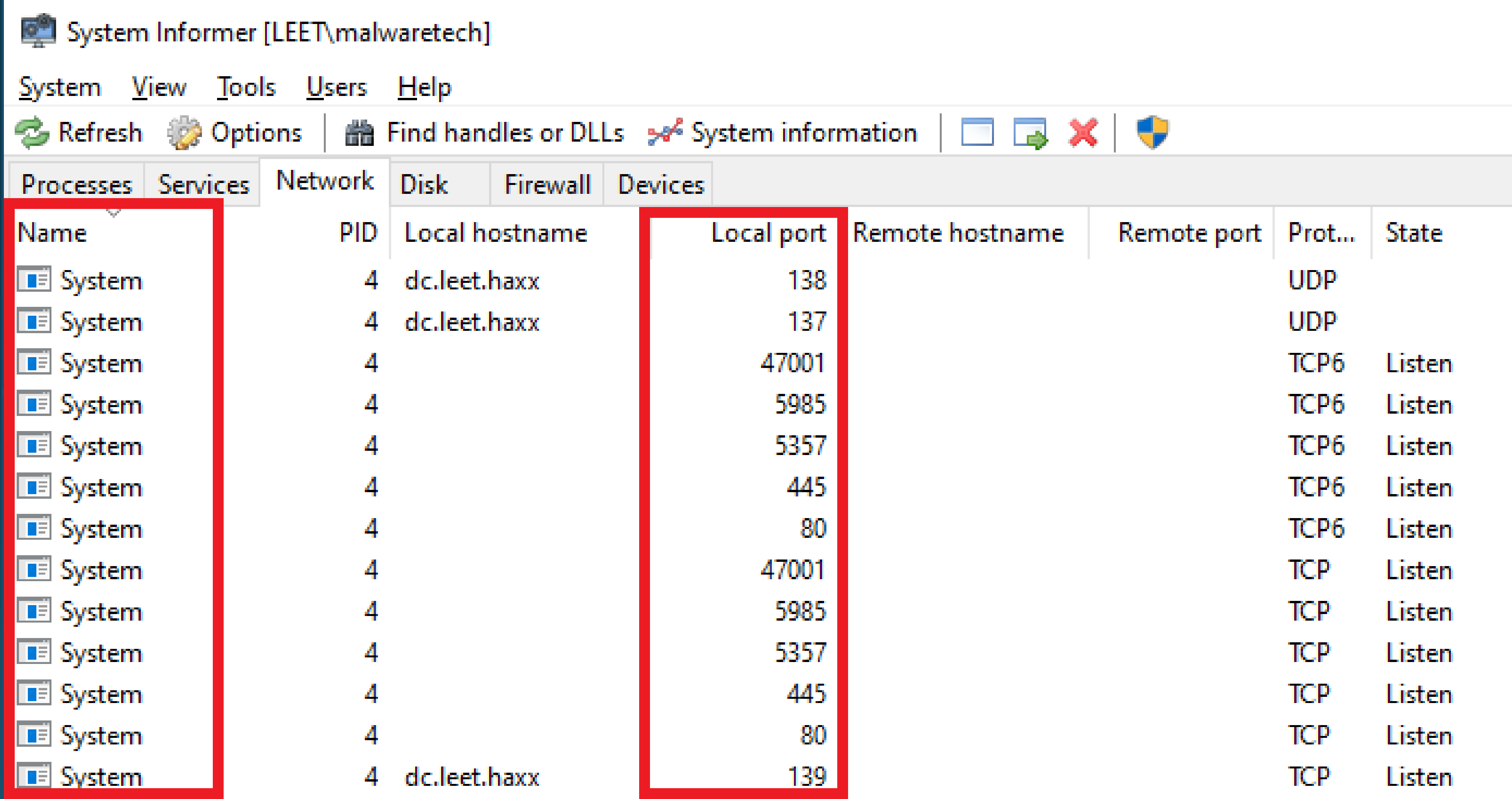
```
[HTTPBackdoor] starting HTTP.sys server
[HTTPBackdoor] binding: http://0.0.0.0:80/super_secret_endpoint
```

The Windows Kernel binds the port for us and handles the http processing



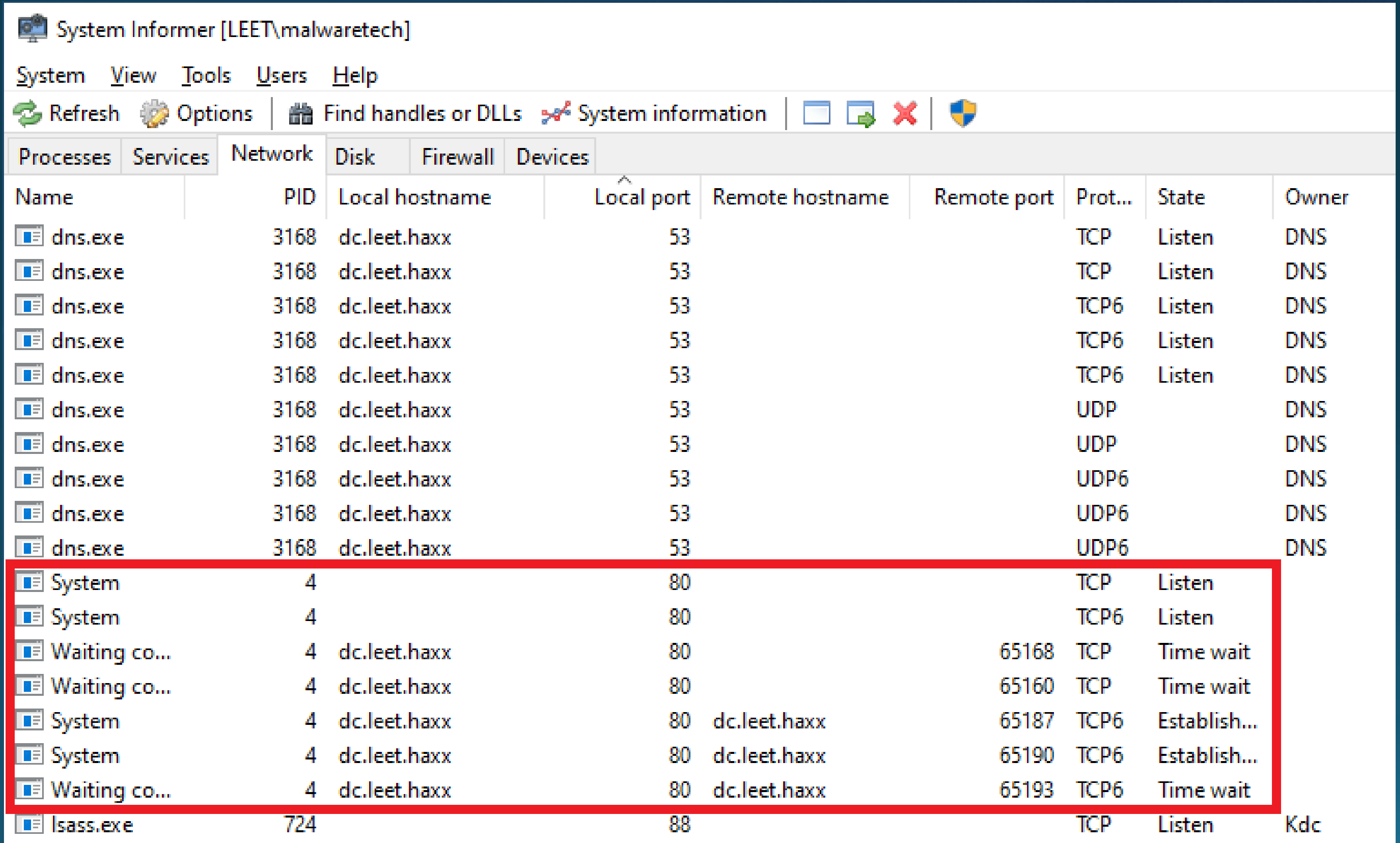
Name	PID	Local hostname	Local port	Remote hostname	Remote port	Prot...	State	Owner
dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
System	4		80			TCP	Listen	
System	4		80			TCP6	Listen	
Waiting co...	4	dc.leet.haxx	80		65168	TCP	Time wait	
Waiting co...	4	dc.leet.haxx	80		65160	TCP	Time wait	
System	4	dc.leet.haxx	80	dc.leet.haxx	65187	TCP6	Establish...	
System	4	dc.leet.haxx	80	dc.leet.haxx	65190	TCP6	Establish...	
Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	65193	TCP6	Time wait	
lsass.exe	724		88			TCP	Listen	Kdc

Since the kernel is responsible for many ports, this isn't unusual



Name	PID	Local hostname	Local port	Remote hostname	Remote port	Prot...	State
System	4	dc.leet.haxx	138			UDP	
System	4	dc.leet.haxx	137			UDP	
System	4		47001			TCP6	Listen
System	4		5985			TCP6	Listen
System	4		5357			TCP6	Listen
System	4		445			TCP6	Listen
System	4		80			TCP6	Listen
System	4		47001			TCP	Listen
System	4		5985			TCP	Listen
System	4		5357			TCP	Listen
System	4		445			TCP	Listen
System	4		80			TCP	Listen
System	4	dc.leet.haxx	139			TCP	Listen

But It makes it hard to figure out who is really using the port :D



Name	PID	Local hostname	Local port	Remote hostname	Remote port	Prot...	State	Owner
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dns.exe	3168	dc.leet.haxx	53			TCP	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			TCP6	Listen	DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
dns.exe	3168	dc.leet.haxx	53			UDP6		DNS
System	4		80			TCP	Listen	
System	4		80			TCP6	Listen	
Waiting co...	4	dc.leet.haxx	80		65168	TCP	Time wait	
Waiting co...	4	dc.leet.haxx	80		65160	TCP	Time wait	
System	4	dc.leet.haxx	80	dc.leet.haxx	65187	TCP6	Establish...	
System	4	dc.leet.haxx	80	dc.leet.haxx	65190	TCP6	Establish...	
Waiting co...	4	dc.leet.haxx	80	dc.leet.haxx	65193	TCP6	Time wait	
lsass.exe	724		88			TCP	Listen	Kdc

We don’t even need to be admin! Some endpoints can be bound by regular users

Usable by any user, even guest accounts:

- http://0.0.0.0:80/Temporary_Listen_Addresses/*

Usable by standard users:

- http://0.0.0.0:5357/*
  http://0.0.0.0:5358/*

Usable by any domain user:

- http://0.0.0.0:10247/apps/*

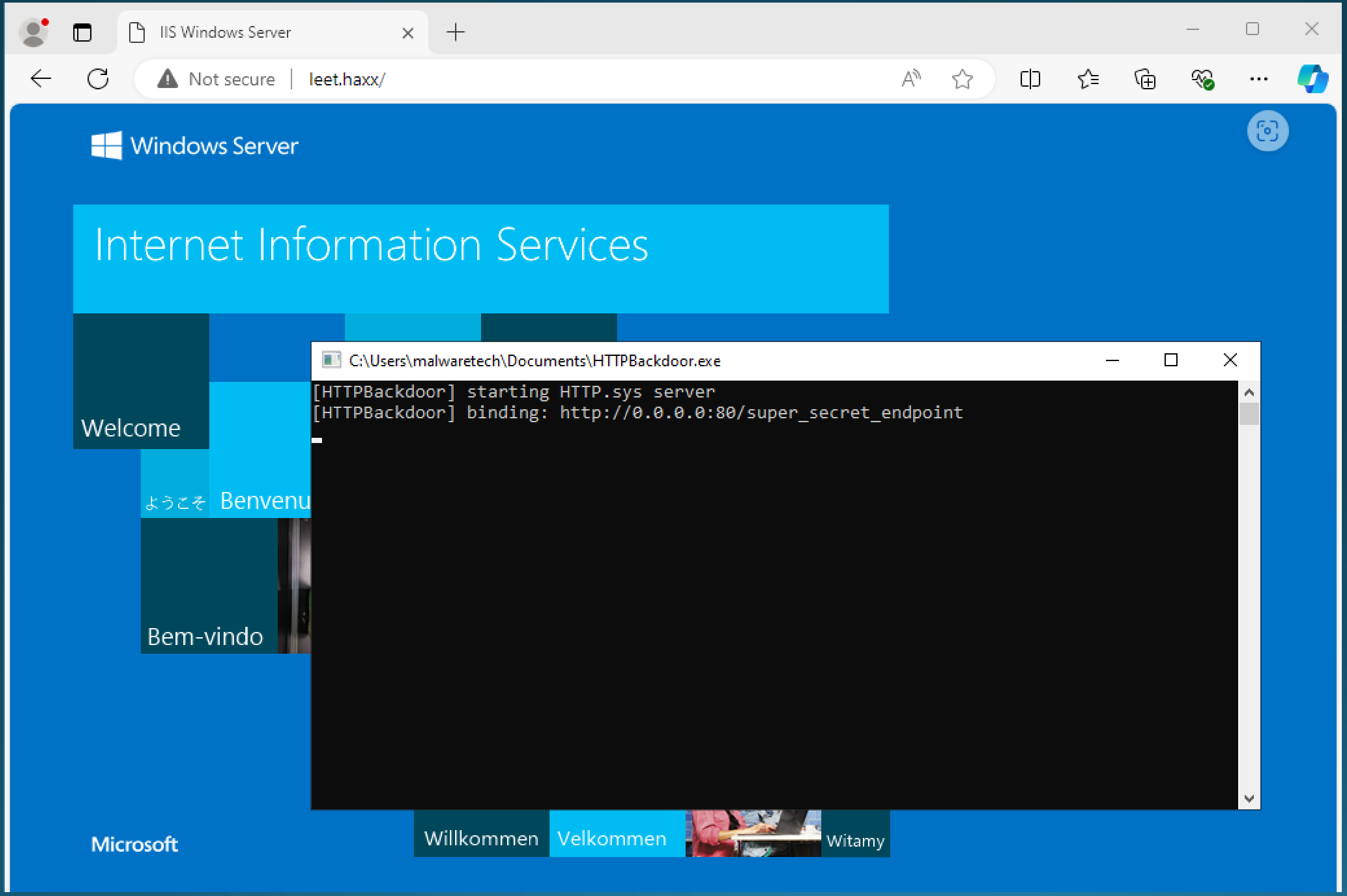
The default domain firewall profile exposes some of the unprivileged ports

- Port 10247 (open to world)
- Port 5357 (open to world if network discovery is enabled)
- Port 5358 (open to world if network discovery is enabled)

With Admin privileges, things get even more fun

- We can bind almost any port we want via the System process
- we can also piggyback on certain ports that are already in use by other apps
- If an app is using http://0.0.0.0:80/app/api, we could bind a different endpoint on the same port if port sharing is enabled.
- The app won’t see any request sent to our endpoint, and we won’t see requests sent to theirs!

IIS uses port sharing, so we can add endpoints to IIS and Outlook Servers



```
[HTTPBackdoor] starting HTTP.sys server
[HTTPBackdoor] binding: http://0.0.0.0:80/super_secret_endpoint
```

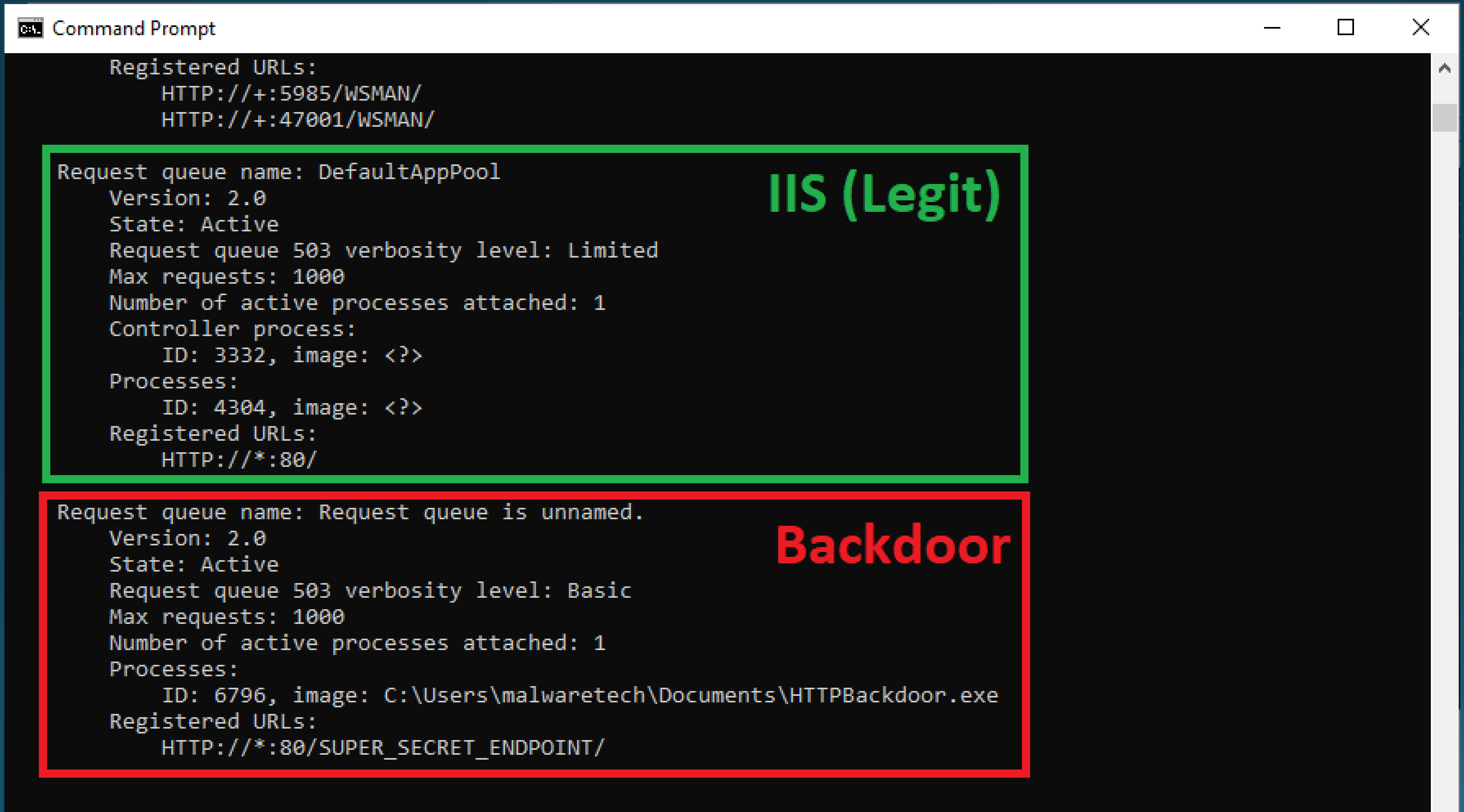
All Communication with http.sys can be done via IOCTL

- No sockets
- No named pipes
- No DLLs
- Just a nice stealthy backdoor

This method is used by several Chinese and Iranian APTs to backdoor servers

- https://securelist.com/operation-shadowhammer-a-high-profile-supply-chain-attack/90380/
- https://cloud.google.com/blog/topics/threat-intelligence/unc1860-iran-middle-eastern-networks

You can investigate endpoints using “netsh http show servicestate"



```
        Registered URLs:
            HTTP://+:5985/WSMAN/
            HTTP://+:47001/WSMAN/

    Request queue name: DefaultAppPool
        Version: 2.0
        State: Active
        Request queue 503 verbosity level: Limited
        Max requests: 1000
        Number of active processes attached: 1
        Controller process:
            ID: 3332, image: <?>
        Processes:
            ID: 4304, image: <?>
        Registered URLs:
            HTTP://*:80/

    Request queue name: Request queue is unnamed.
        Version: 2.0
        State: Active
        Request queue 503 verbosity level: Basic
        Max requests: 1000
        Number of active processes attached: 1
        Processes:
            ID: 6796, image: C:\Users\malwaretech\Documents\HTTPBackdoor.exe
        Registered URLs:
            HTTP://*:80/SUPER_SECRET_ENDPOINT/
```

IIS (Legit)

Backdoor