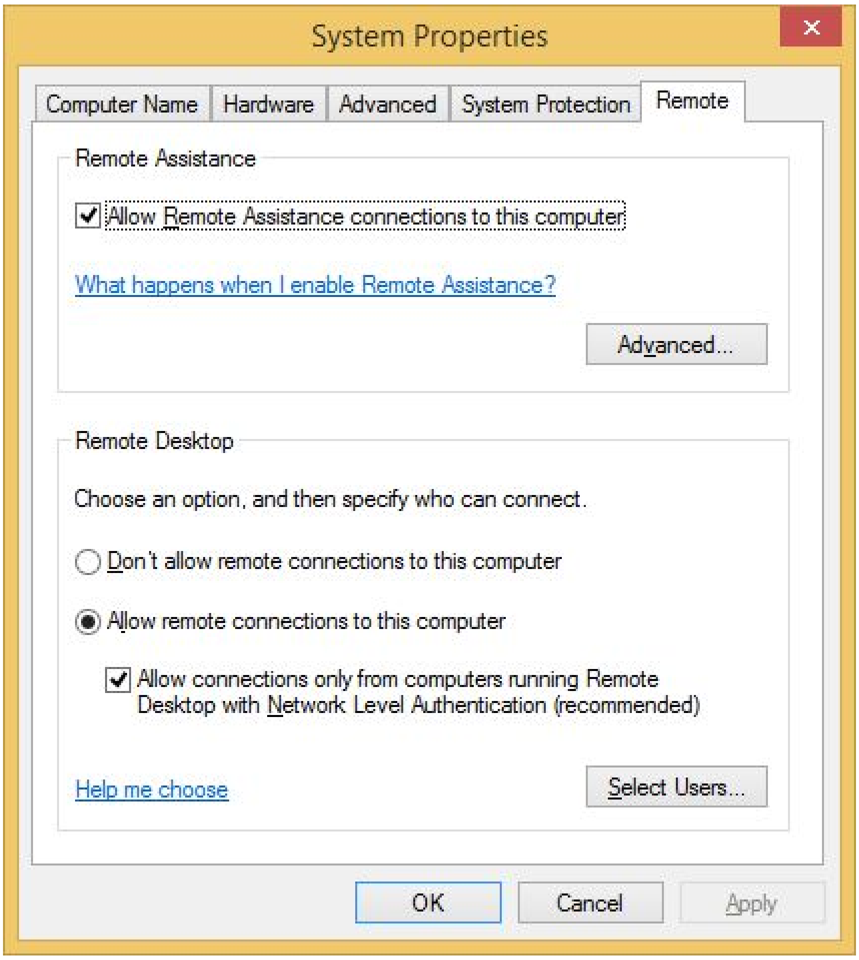
Securing Windows Remote Desktop Access

Usually setting up a basic RDP connection is sufficient enough for most intents and purposes but let's say that we require additional security. Then please allow me to demonstrate how to become proficient at elevating security when allowing Remote Desktop Access.

STEP 1:

First things first - we do need to enable RDP so run sysdm.cpl and click on the Remote tab. Then click on the “Allow remote connections to this computer” radio button and check the “Allow connections only from computers running Remote Desktop with Network Level Authentication.” checkbox. Now select the users that will have access to your computer by clicking Add… When you're done lets go to step 2.

NOTE: By checking the latter you effectively and actively engage suppression of potential Man in the Middle attacks so let's count this one as a first step towards enhanced protection. Also, you might get a warning about Power Options when you enable Remote Desktop so please follow the link provided in the dialog box and configure the Power Plan of your computer as advised by the warning.



Remote Assistance

☑ Allow Remote Assistance connections to this computer

Remote Desktop

Choose an option, and then specify who can connect.

○ Don't allow remote connections to this computer

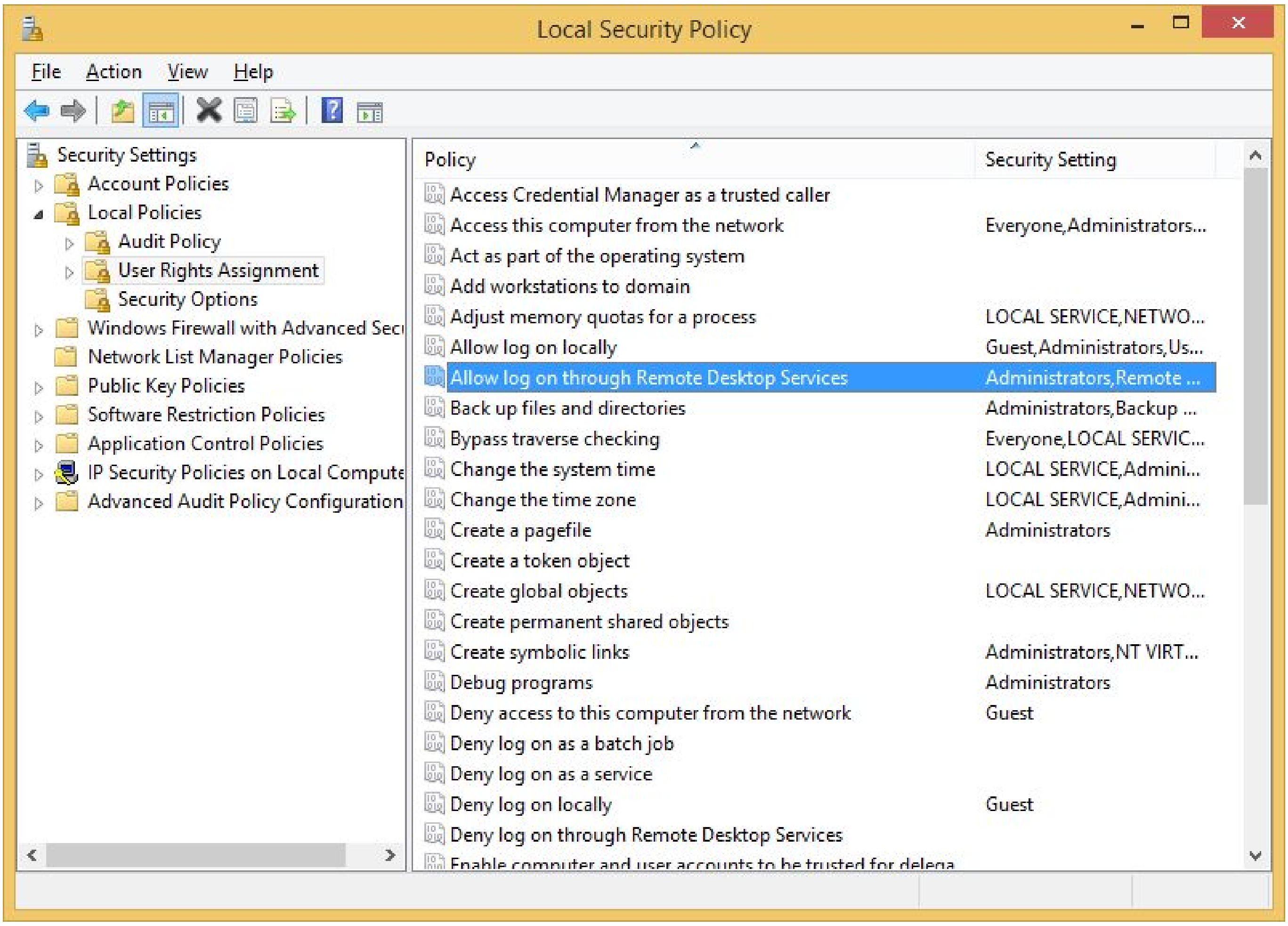
● Allow remote connections to this computer

☑ Allow connections only from computers running Remote Desktop with Network Level Authentication (recommended)

STEP 2:

When we're done handpicking all the folks we want to have access, let's eliminate all of the 'unwanted elements'. First of - we'll have to eliminate default user groups through Local Security Policy so lets run secpol.msc and configure the following: Security Settings → Local Policies → User

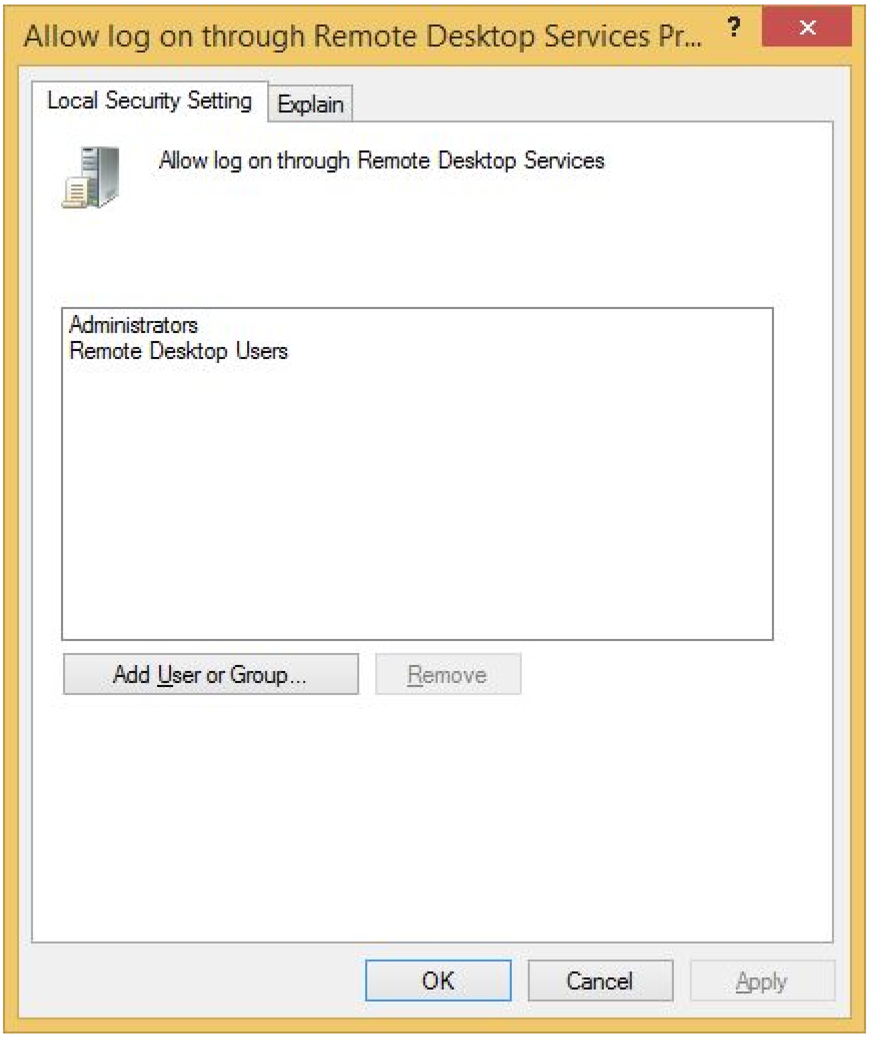
Rights Assignment and double click on “Allow log on through Remote Desktop Services” policy from the list to the right.


Local Security Policy
File
Action
View
Help
Security Settings
Account Policies
Local Policies
Audit Policy
User Rights Assignment
Security Options
Windows Firewall with Advanced Secu
Network List Manager Policies
Public Key Policies
Software Restriction Policies
Application Control Policies
IP Security Policies on Local Compute
Advanced Audit Policy Configuration

Policy	Security Setting
Access Credential Manager as a trusted caller	
Access this computer from the network	Everyone,Administrators...
Act as part of the operating system	
Add workstations to domain	
Adjust memory quotas for a process	LOCAL SERVICE,NETWO...
Allow log on locally	Guest,Administrators,Us...
Allow log on through Remote Desktop Services	Administrators,Remote ...
Back up files and directories	Administrators,Backup ...
Bypass traverse checking	Everyone,LOCAL SERVIC...
Change the system time	LOCAL SERVICE,Admini...
Change the time zone	LOCAL SERVICE,Admini...
Create a pagefile	Administrators
Create a token object	
Create global objects	LOCAL SERVICE,NETWO...
Create permanent shared objects	
Create symbolic links	Administrators,NT VIRT...
Debug programs	Administrators
Deny access to this computer from the network	Guest
Deny log on as a batch job	
Deny log on as a service	
Deny log on locally	Guest
Deny log on through Remote Desktop Services	
Enable computer and user accounts to be trusted for delega	

Now remove both default groups - Administrators and Remote Desktop Users and manually Add User or Group for which you'd like to be able to connect.

NOTE: We eliminate groups because we expect that since we have elevated security for this or that reason, all our users will also use complex passwords, so if we remove the Administrators group completely and latter on create a new admin account with a weak password, we are still preventing attacks since the new account will not have access until we manually add the new account the way we've done it in this step.

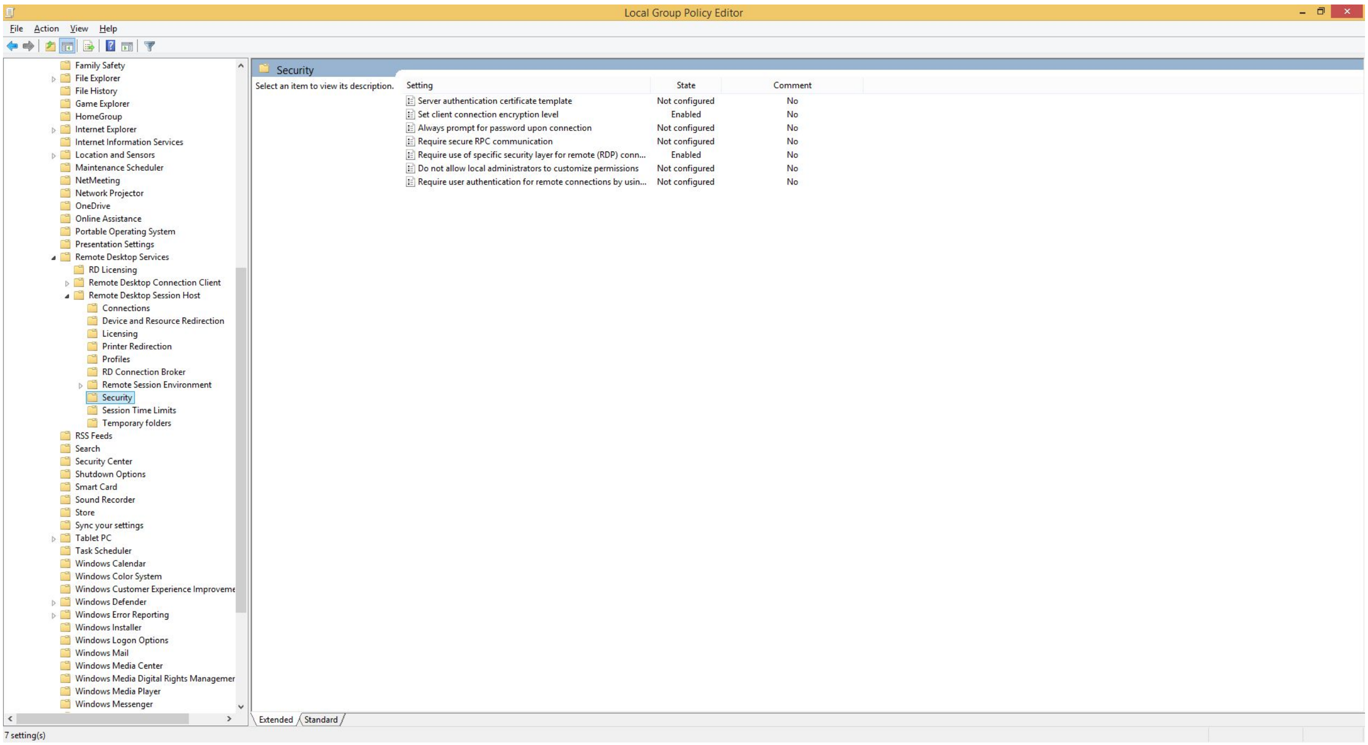


Allow log on through Remote Desktop Services

Administrators
Remote Desktop Users

STEP 3:

So far we've poked around user rights and the likes but now let's really get donw'n'dirty by securing the connection itself with several Local Group Policy mods. That said run the gpedit.msc and go to Local Computer Policy → Computer Configuration → Administrative Templates → Windows Components → Remote Desktop Services → Remote Desktop Session Host → Security.



Security

Select an item to view its description.

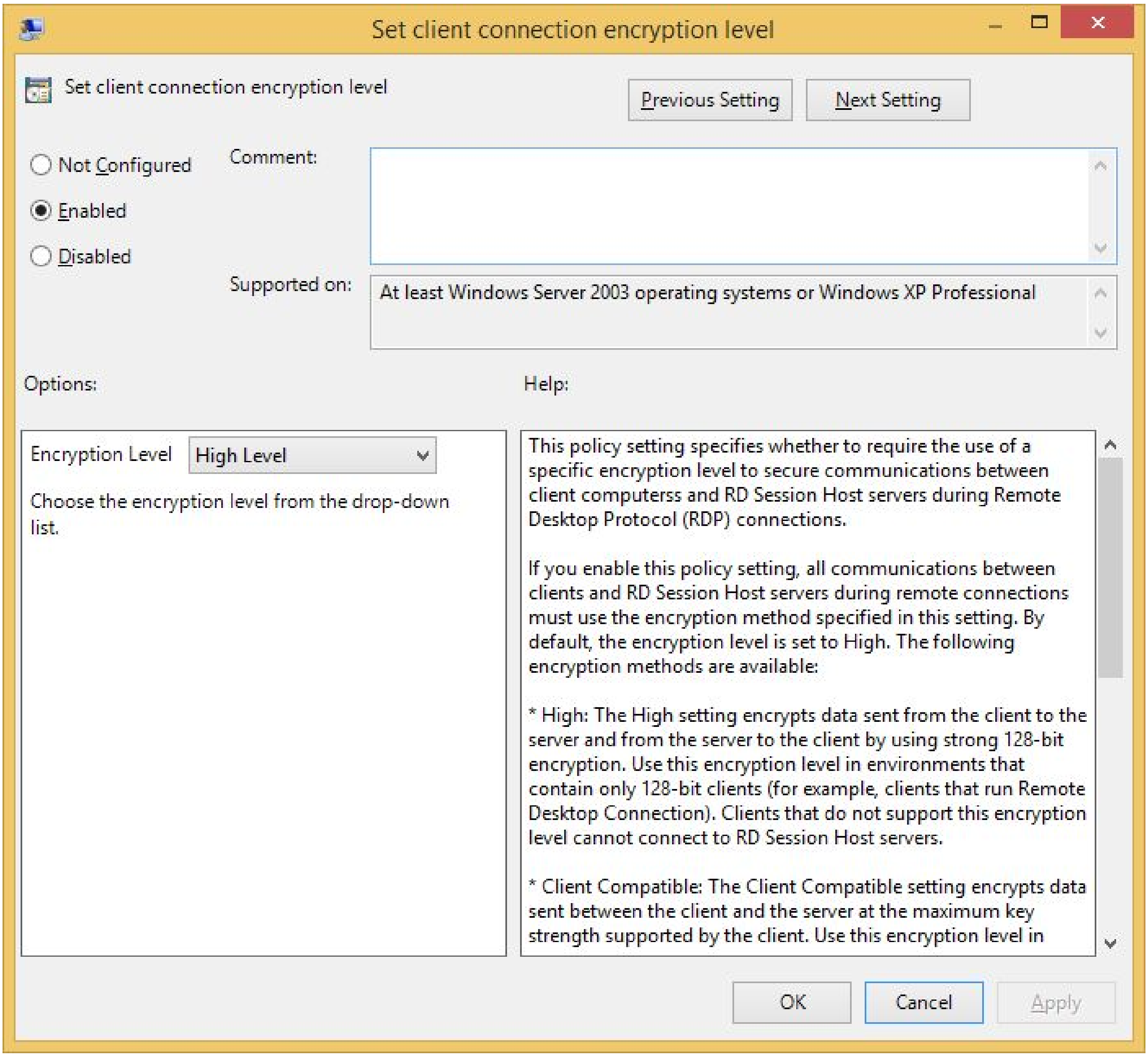
Setting	State	Comment
Server authentication certificate template	Not configured	No
Set client connection encryption level	Enabled	No
Always prompt for password upon connection	Not configured	No
Require secure RPC communication	Not configured	No
Require use of specific security layer for remote (RDP) conn...	Enabled	No
Do not allow local administrators to customize permissions	Not configured	No
Require user authentication for remote connections by usin...	Not configured	No

OK! The first one we need to enable is “Set client connection encryption level” and set its value to “High”. Here's an explanation of what all of the levels do and why:

By default, Remote Desktop connections are encrypted at the highest level of security available (128-bit). However, some older versions of the Remote Desktop Connection client application do not support this high level of encryption. If a high level of encryption is needed to support legacy clients, the encryption level of the connection can be configured to send and receive data at the highest encryption level supported by the client.There are four levels of encryption available:

- Low Data sent from the client to the server is encrypted using 56-bit encryption. Data sent from the server to the client is not encrypted.
- Client Compatible Encrypts client/server communication at the maximum key strength supported by the client. Use this level when the terminal server is running in an environment containing mixed or legacy clients. This is the default encryption level.
- High Encrypts client/server communication using 128-bit encryption. Use this level when the clients accessing the terminal server also support 128-bit encryption. When encryption is set at this level, clients that do not support this level of encryption will not be able to connect.
- FIPS Compliant All client/server communication is encrypted and decrypted with the Federal Information Processing Standards (FIPS) encryption algorithms. FIPS 140-1 (1994) and its successor, FIPS 140-2 (2001), describe U.S. government requirements for encryption.

NOTE: FIPS Compliant option is disabled by default in System Cryptography and just to let you know that the practice of using FIPS became a no-no if latest Microsoft views on security are to be taken into account so we'll leave enabling and using it for a different topic altogether.



Set client connection encryption level

Set client connection encryption level

○ Not Configured
● Enabled
○ Disabled

Comment:

Supported on: At least Windows Server 2003 operating systems or Windows XP Professional

Options:

Encryption Level: High Level

Choose the encryption level from the drop-down list.

Help:

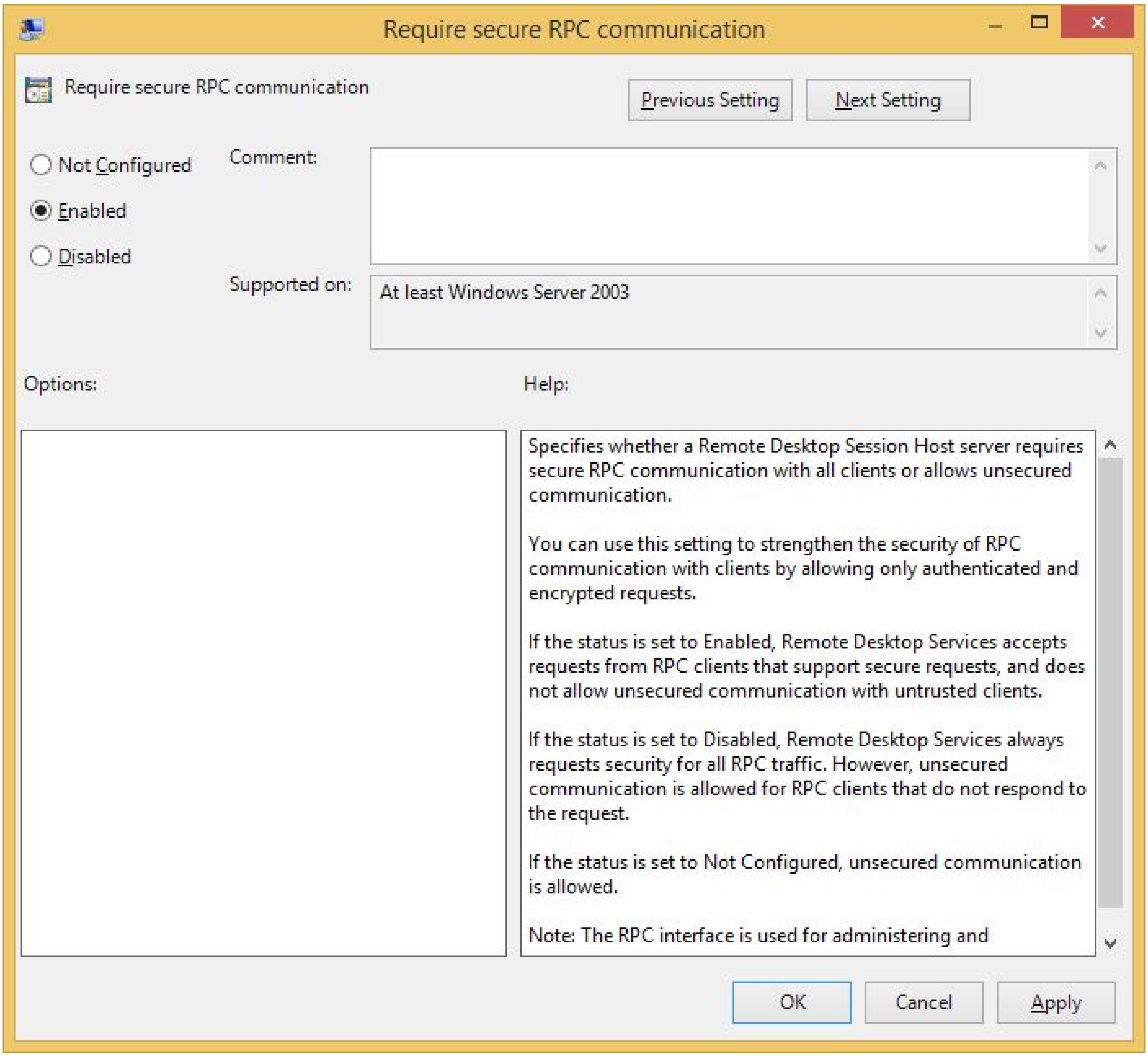
This policy setting specifies whether to require the use of a specific encryption level to secure communications between client computerss and RD Session Host servers during Remote Desktop Protocol (RDP) connections.

If you enable this policy setting, all communications between clients and RD Session Host servers during remote connections must use the encryption method specified in this setting. By default, the encryption level is set to High. The following encryption methods are available:

* High: The High setting encrypts data sent from the client to the server and from the server to the client by using strong 128-bit encryption. Use this encryption level in environments that contain only 128-bit clients (for example, clients that run Remote Desktop Connection). Clients that do not support this encryption level cannot connect to RD Session Host servers.

* Client Compatible: The Client Compatible setting encrypts data sent between the client and the server at the maximum key strength supported by the client. Use this encryption level in

Now then let's Enable the “Require secure RPC communication” policy…



○ Not Configured
● Enabled
○ Disabled

Supported on: At least Windows Server 2003

Specifies whether a Remote Desktop Session Host server requires secure RPC communication with all clients or allows unsecured communication.

You can use this setting to strengthen the security of RPC communication with clients by allowing only authenticated and encrypted requests.

If the status is set to Enabled, Remote Desktop Services accepts requests from RPC clients that support secure requests, and does not allow unsecured communication with untrusted clients.

If the status is set to Disabled, Remote Desktop Services always requests security for all RPC traffic. However, unsecured communication is allowed for RPC clients that do not respond to the request.

If the status is set to Not Configured, unsecured communication is allowed.

Note: The RPC interface is used for administering and

…and by doing so we can now use TLS encryption by setting the “Require use of specific security layer for remote (RDP) connections” policy to Enabled and selecting SSL (TLS 1.0) from the “Security Layer” drop-down list.

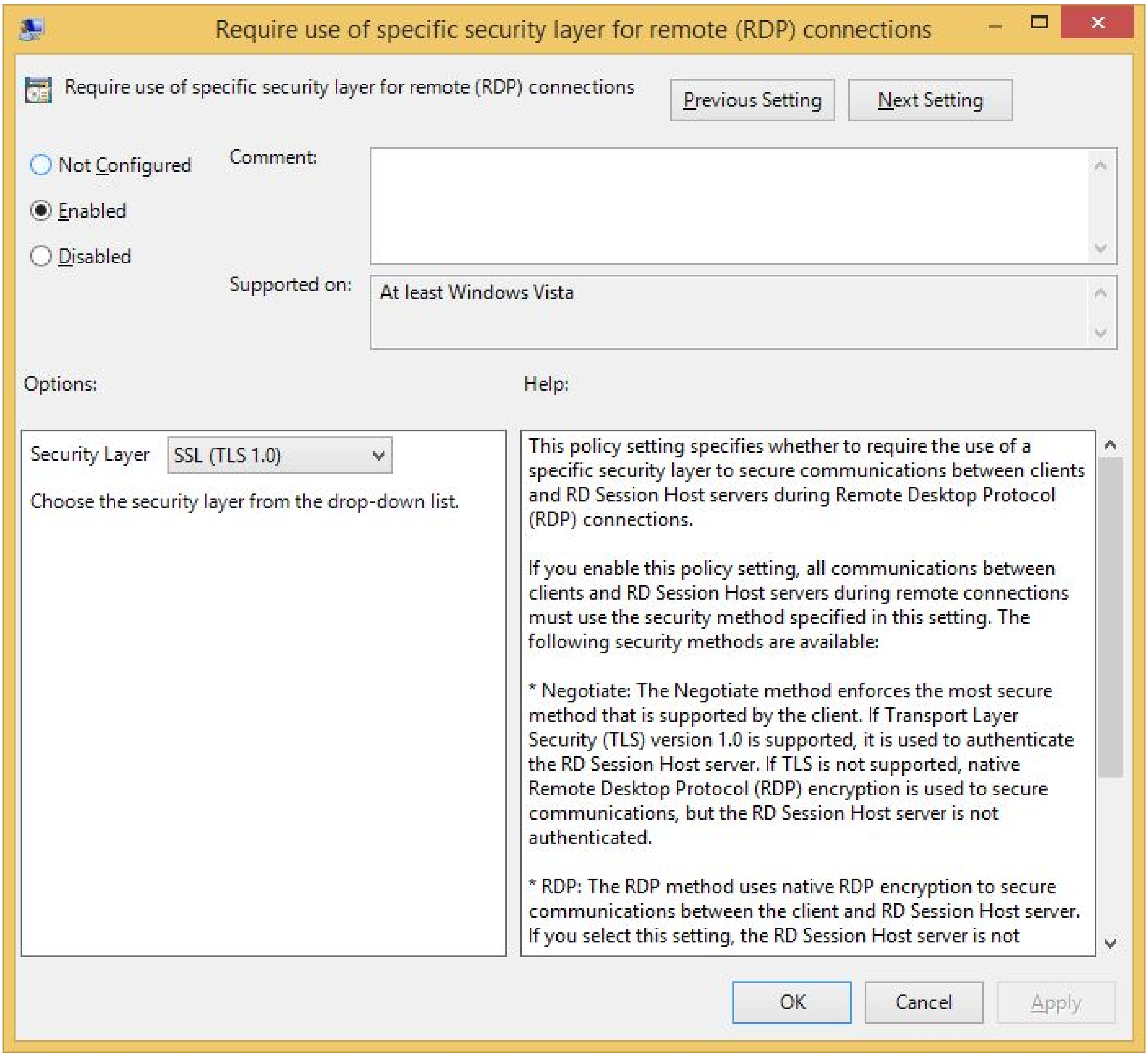
But let's take a moment here and see all our options and why we would want to use anything else:

By default, RD Session Host sessions use native RDP encryption. However, RDP does not provide authentication to verify the identity of an RD Session Host server. You can enhance the security of RD Session Host sessions by using Secure Sockets Layer (SSL) Transport Layer Security (TLS 1.0) for server authentication and to encrypt RD Session Host communications. The RD Session Host server and the client computer must be correctly configured for TLS to provide enhanced security.

The three available security layers are:

- SSL (TLS 1.0) SSL (TLS 1.0) will be used for server authentication and for encrypting all data transferred between the server and the client.
- Negotiate The most secure layer that is supported by the client will be used. If supported, SSL (TLS 1.0) will be used. If the client does not support SSL (TLS 1.0), the RDP Security Layer will be used. This is the default setting.

- RDP Security Layer Communication between the server and the client will use native RDP encryption. If you select RDP Security Layer, you cannot use Network Level Authentication.



Require use of specific security layer for remote (RDP) connections

Require use of specific security layer for remote (RDP) connections

○ Not Configured
● Enabled
○ Disabled

Comment:

Supported on: At least Windows Vista

Options:

Security Layer: SSL (TLS 1.0)

Choose the security layer from the drop-down list.

Help:

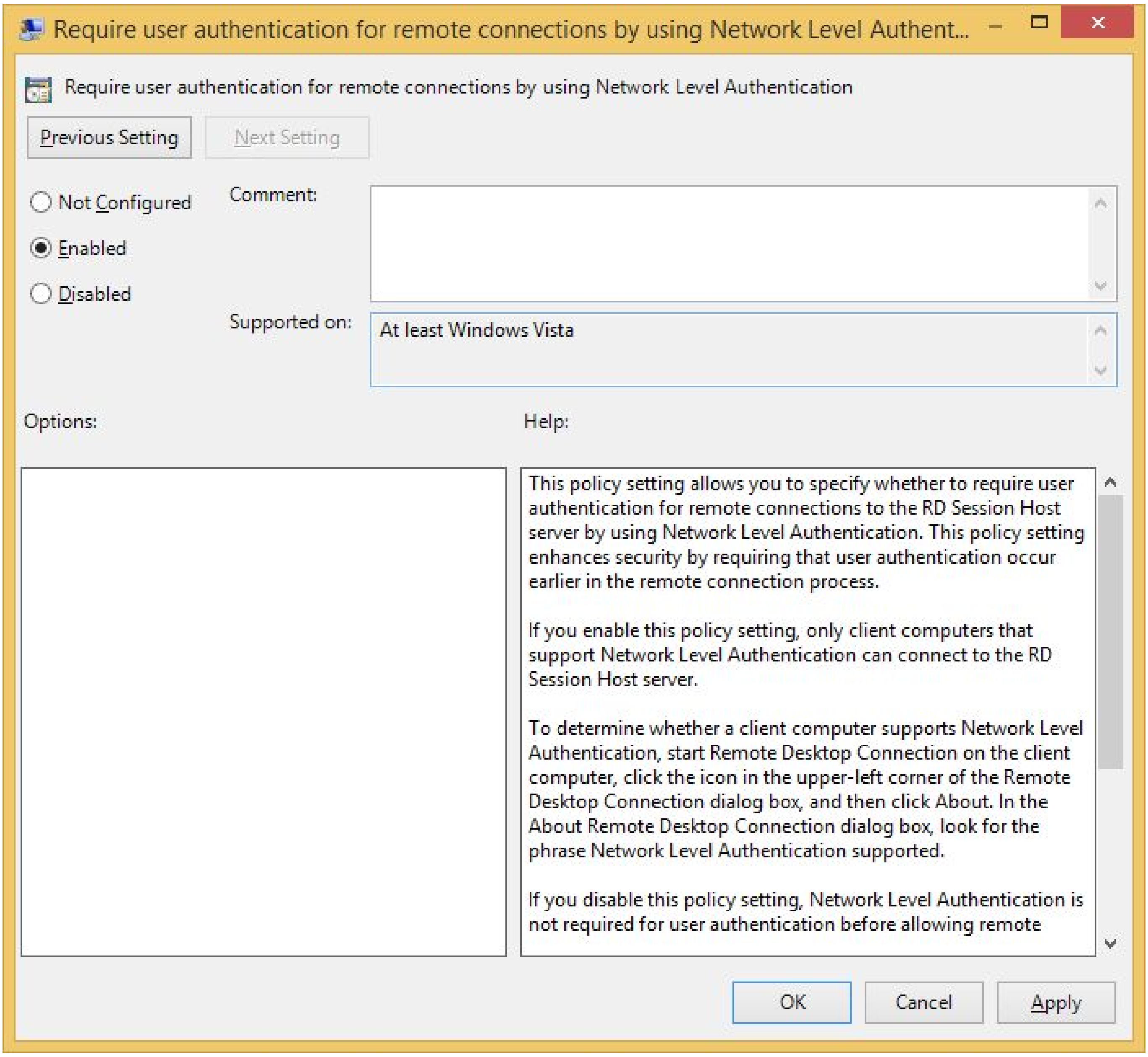
This policy setting specifies whether to require the use of a specific security layer to secure communications between clients and RD Session Host servers during Remote Desktop Protocol (RDP) connections.

If you enable this policy setting, all communications between clients and RD Session Host servers during remote connections must use the security method specified in this setting. The following security methods are available:

* Negotiate: The Negotiate method enforces the most secure method that is supported by the client. If Transport Layer Security (TLS) version 1.0 is supported, it is used to authenticate the RD Session Host server. If TLS is not supported, native Remote Desktop Protocol (RDP) encryption is used to secure communications, but the RD Session Host server is not authenticated.

* RDP: The RDP method uses native RDP encryption to secure communications between the client and RD Session Host server. If you select this setting, the RD Session Host server is not

And finally: Enable the “Require user authentication for remote connections by using Network Level Authentication” policy.



Require user authentication for remote connections by using Network Level Authent...
Previous Setting
Next Setting
OK
Cancel
Apply

Require user authentication for remote connections by using Network Level Authentication

○ Not Configured
● Enabled
○ Disabled

Comment:

Supported on: At least Windows Vista

Options:

Help:

This policy setting allows you to specify whether to require user authentication for remote connections to the RD Session Host server by using Network Level Authentication. This policy setting enhances security by requiring that user authentication occur earlier in the remote connection process.

If you enable this policy setting, only client computers that support Network Level Authentication can connect to the RD Session Host server.

To determine whether a client computer supports Network Level Authentication, start Remote Desktop Connection on the client computer, click the icon in the upper-left corner of the Remote Desktop Connection dialog box, and then click About. In the About Remote Desktop Connection dialog box, look for the phrase Network Level Authentication supported.

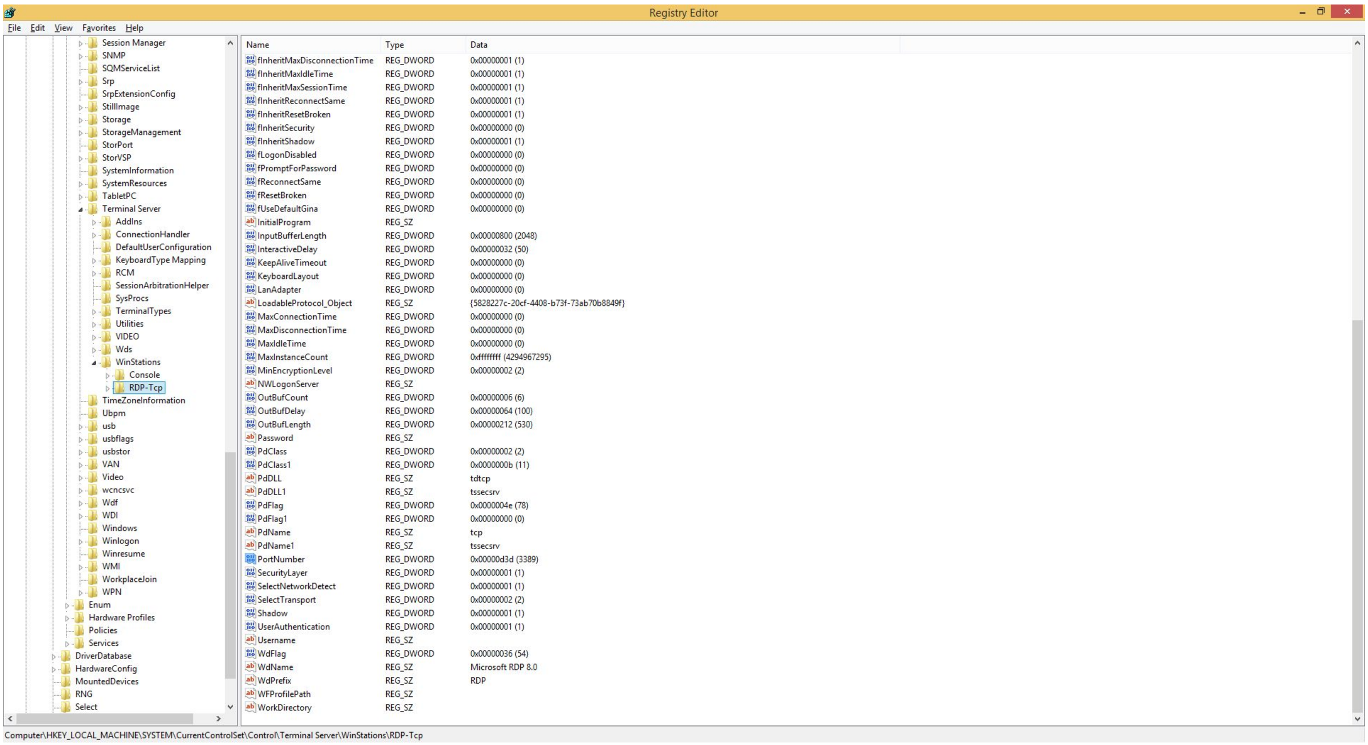
If you disable this policy setting, Network Level Authentication is not required for user authentication before allowing remote

All setup in the Policy department and now we can move on to the final step.

STEP 4:

All of the Windows using world by now knows what a port is, what it's used for and can probably name at least ten basic ports and explain their uses. That said, and given we already went through all this trouble to setup a most secure RDP connection it would so not be a good idea to leave the default 3389 port 'alive' and listening for connection requests so let's obfuscate a little bit.

Open up your Registry by running regedit.exe and find the following HKEY_LOCAL_MACHINE → SYSTEM → CurrentControlSet → Control → Terminal Server → WinStations → RDP-Tcp.



Name	Type	Data
fInheritMaxDisconnectionTime	REG_DWORD	0x00000001 (1)
fInheritMaxIdleTime	REG_DWORD	0x00000001 (1)
fInheritMaxSessionTime	REG_DWORD	0x00000001 (1)
fInheritReconnectSame	REG_DWORD	0x00000001 (1)
fInheritResetBroken	REG_DWORD	0x00000001 (1)
fInheritSecurity	REG_DWORD	0x00000000 (0)
fInheritShadow	REG_DWORD	0x00000001 (1)
fLogonDisabled	REG_DWORD	0x00000000 (0)
fPromptForPassword	REG_DWORD	0x00000000 (0)
fReconnectSame	REG_DWORD	0x00000000 (0)
fResetBroken	REG_DWORD	0x00000000 (0)
fUseDefaultGina	REG_DWORD	0x00000000 (0)
InitialProgram	REG_SZ	
InputBufferLength	REG_DWORD	0x00000800 (2048)
InteractiveDelay	REG_DWORD	0x00000032 (50)
KeepAliveTimeout	REG_DWORD	0x00000000 (0)
KeyboardLayout	REG_DWORD	0x00000000 (0)
LanAdapter	REG_DWORD	0x00000000 (0)
LoadableProtocol_Object	REG_SZ	{5828227c-20cf-4408-b73f-73ab70b8849f}
MaxConnectionTime	REG_DWORD	0x00000000 (0)
MaxDisconnectionTime	REG_DWORD	0x00000000 (0)
MaxIdleTime	REG_DWORD	0x00000000 (0)
MaxInstanceCount	REG_DWORD	0xffffffff (4294967295)
MinEncryptionLevel	REG_DWORD	0x00000002 (2)
NWLogonServer	REG_SZ	
OutBufCount	REG_DWORD	0x00000006 (6)
OutBufDelay	REG_DWORD	0x00000064 (100)
OutBufLength	REG_DWORD	0x00000212 (530)
Password	REG_SZ	
PdClass	REG_DWORD	0x00000002 (2)
PdClass1	REG_DWORD	0x0000000b (11)
PdDLL	REG_SZ	tdtcp
PdDLL1	REG_SZ	tssecsrv
PdFlag	REG_DWORD	0x0000004e (78)
PdFlag1	REG_DWORD	0x00000000 (0)
PdName	REG_SZ	tcp
PdName1	REG_SZ	tssecsrv
PortNumber	REG_DWORD	0x00000d3d (3389)
SecurityLayer	REG_DWORD	0x00000001 (1)
SelectNetworkDetect	REG_DWORD	0x00000001 (1)
SelectTransport	REG_DWORD	0x00000002 (2)
Shadow	REG_DWORD	0x00000001 (1)
UserAuthentication	REG_DWORD	0x00000001 (1)
Username	REG_SZ	
WdFlag	REG_DWORD	0x00000036 (54)
WdName	REG_SZ	Microsoft RDP 8.0
WdPrefix	REG_SZ	RDP
WFProfilePath	REG_SZ	
WorkDirectory	REG_SZ	

Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Terminal Server\WinStations\RDP-Tcp

Now double click the PortNumber DWORD and change it's Decimal value to a five-digit number lower then 65535. I'll pick 38389.

All done so now let's finish this by creating a new Firewall rule for the newly set RDP port. Open Windows Firewall with Advanced Security by running wf.msc and create a New Inbound Rule by right-clicking on Inbound Rules and selecting New Rule… from the dropdown menu. When the “New Inbound Rule Wizard” pops up select “Port” then “TCP” and enter the new port number under the “Specify” field and then just NEXT your way until you get to the last page when a name is required. I'd recommend something like “RDP Port” or if you'd like for no one else to know what's it used for then try something like “Dr. Vlad's security shenanigans” ;)

We're done and by now I reckon you didn't figure it's gonna be that much work just to secure a lil' ole Remote Connection did ya!? Yikes!

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Last update: **2019/10/31 09:06**