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How to secure WebDAV with SSL and Two-Factor AuthenticationBenefits of Using WebDAV

Web-based distributed authoring and versioning or WebDAV is the protocol that is creating the "read-write" web. It is facilitating collaboration in many ways across the internet, replacing proprietary protocols (FrontPage, e.g.) or superseding less functional open protocols ((FTP, SFTP). The primary drivers for the adoption of WebDAV include:

- WebDAV resources can be set up like local drives allowing you to work with remote files as if they were on your machine.
- It allows for "locking" of files so multiple users can work with a file at the same time, but only one at a time can make changes.
- It is more efficient than FTP or SFTP.. You can pipeline multiple transfers through a single TCP connection.
- It is an extension of HTTP and uses the same ports - 80 or 443, avoiding potential firewall issues.
- Support for WebDAV is available across multiple platforms creating a cross-platform solution.

However, as with all things Internet-related, security is an issue, particularly if you are dealing with confidential information. Yet companies always need to share information and work with outside personnel. It can be very tricky to collaborate with third-parties, yet still be able to authenticate users. How do you know that users aren't sharing a password? Yet, you don't want to provide a hardware token to a non-employee particularly for a short project, as you will more than likely never get it back.

A scenario where combining two-factor authentication with WebDAV might be for a public company that collaborates with an outside PR firm for financial releases. Knowledge of pending merger announcements or financial results is highly confidential corporate information and using two-factor authentication greatly reduces the risks of sharing static passwords. Many firms might also need to replace less-secure FTP services due to new compliance regulations.

For our purposes, a key benefit is that we can use the security tools available to protect HTTP services to protect WebDAV. In this how-to, we will create a secure WebDAV resource using Apache, Radius, SSL and two-factor authentication from WiKID Systems to set up secured remote drives on Windows, Mac and Linux machines. **DAV Commands**

It is a good idea to get familiar with WebDAV. Here are the new methods WebDAV adds to HTTP 1.1, according to **Wikipedia:**

- PROPFIND: Used to retrieve properties, persisted as XML, from a resource. It is also overloaded to allow one to retrieve the collection structure (a.k.a. directory hierarchy) of a remote system.

- PROPPATCH: Used to change and delete multiple properties on a resource in a single atomic act.
- MKCOL: Used to create collections (a.k.a. directory).
- COPY: Used to copy a resource from one URI to another.
- MOVE: Used to move a resource from one URI to another.
- LOCK: Used to put a lock on a resource. WebDAV supports both shared and exclusive locks.
- UNLOCK: To remove a lock from a resource.

Configuring the Server

For any service to be secure, the underlying server also needs to be secure. Be sure that your server is locked down tight and always up-to-date. Please note that I used Apache version 2.2.2-1.2 installed via RPM on a Fedora Core 5 System. I was not able to get mod_auth working on httpd-2.2.3-5 and have heard the same of 2.4.

Create WebDAV directories

Create some directories for your user's files. You may even want to create individual directories:

```
mkdir /var/www/webdav/
```

```
mkdir /var/www/webdav/USERNAME
```

```
chown -R root:apache /var/www/webdav
```

```
chmod -R 750 /var/www/webdav
```

Note that the Apache user is the owner of these directories.

Configuring WiKID

The WiKID Strong Authentication System is a commercial/open source two-factor authentication solution. Unlike most offerings which use shared-secrets, it uses public key cryptography to securely transmit PINs and one-time passcodes between the server and software tokens. With WiKID the two-factors are possession of the private key and knowledge of the PIN. Because we are testing across Windows, Mac and Linux, the screenshots here are of the open-source J2SE WiKID token. The token client uses port 80, so again, there are no firewall concerns. More information on WiKID's technology can be found **here.**

Here's how it will work, when the user wants access to the WebDAV resource, they will be prompted for a username and password. The user generates the one-time passcode on their WiKID token and enters it into the password prompt. Apache will route the username and one-time password to the WiKID server via pam_auth_xradius. If the username and one-time password match what WiKID expects, the server will tell Apache to grant access. First, we add Apache to the WiKID Strong Authentication Server as a network client, then add radius to Apache. I assume you already have a WiKID domain and users setup - more information on how to install and confgure WiKID can be **found here**.

Start by adding a new Radius network client to the WiKID server for your web server:

- Log into WiKID server web interface (http://yourwikidserver/WiKIDAdim).
- Select **Network Clients** tab.
- Click on **Create New Network Client"**
- Fill in the requested information.

- For the IP Address, use the web server IP address
- For Protocol, select Radius
- Hit the Add button, and on the next page, enter a shared secret
- Do not enter anything into the Return Attribute box
- From the terminal or via ssh, run 'stop' and then 'start' to load the network client into the built-in WiKID radius server

That is it for the WiKID server. Now on to Apache.

Configure Apache

If you are using a binary version of Apache, you will only need to load the modules in httpd.conf. If you are compiling yourself, use the --with-dav option at compile time, and add support for the file system backend with the --enable-dav-fs option. Obviously, it is critical that Apache be configured for SSL to encrypt the data in transfer. If you do not have SSL keys, you will need to generate them:

```
openssl genrsa -out webdav.mydomain.com.key 1024
```

```
openssl req -new -key webdav.mydomain.com.key -out webdav.mydomain.com.csr
```

```
openssl x509 -in webdav.mydomain.com.csr -out webdav.mydomain.com.crt -req -signkey webdav.mydomain.com.key -days 365
```

```
cp webdav.mydomain.com.key /etc/httpd/conf/
```

```
cp webdav.mydomain.crt /etc/httpd/conf/
```

Now, you can edit your httpd.conf file. First, validate that the DAV modules are loaded:

```
LoadModule dav_module modules/mod_dav.so
LoadModule dav_fs_module modules/mod_dav_fs.so
```

Load the mod_auth_xradius modules and set the time-out, in this case 1 hour. :

```
LoadModule auth_xradius_module modules/mod_auth_xradius.so
AuthXRadiusCache dbm conf/authxcache
AuthXRadiusCacheTimeout 3600
```

And, create a locking database for WebDAV:

```
<IfModule mod_dav_fs.c="">
# Location of the WebDAV lock database.
DAVLockDB /var/lib/dav/lockdb
</IfModule>
```

Make sure that Apache can handle various WebDAV clients:

```
BrowserMatch "Microsoft Data Access Internet Publishing Provider" redirect-carefully
BrowserMatch "MS FrontPage" redirect-carefully
BrowserMatch "^WebDrive" redirect-carefully
BrowserMatch "^WebDAVFS/1.[0123]" redirect-carefully
BrowserMatch "^gnome-vfs/1.0" redirect-carefully
BrowserMatch "^XML Spy" redirect-carefully
BrowserMatch "^Dreamweaver-WebDAV-SCM1" redirect-carefully
```

Then, add a virtual host for SSL:

```
NameVirtualHost *:443
<VirtualHost webdav.mydomain.com:443="">
ServerName webdav.mydomain.com
DocumentRoot /var/www/html
SSLEngine on
SSLProxyEngine on
SSLCertificateFile conf/webdav.mydomain.com.crt
SSLCertificateKeyFile conf/webdav.mydomain.com.key
  Alias /webdav/ "/var/www/webdav/"
  <Directory /var/www/webdav>
```

```
    DAV on
    <Limit GET PROPFIND POST OPTIONS MKCOL PUT DELETE LOCK UNLOCK COPY MOVE PROPPATCH>
    AuthTypSe Basic
    AuthName "You must be authenticated by WiKID to Enter!"
    AuthXRadiusAddServer "wikid_server_ip:1812" "webdav_shared_secret"
    AuthXRadiusTimeout 7
    AuthXRadiusRetries 2
    require valid-user
    </Limit>
  </Directory>
</VirtualHost>
```

A couple of notes: Depending on your setup, you might also need to add the location of your SSL cert and key to your ssl.conf file. I am using an alias here because I have the document root set to publish public facing webpages. I also am using the Limit command as defined in the **Apache Documentation**:

> The purpose of the Limit directive is to restrict the effect of the access controls to the nominated HTTP methods. For all other methods, the access restrictions that are enclosed in the Limit bracket will have no effect. The following example applies the access control only to the methods POST, PUT, and DELETE, leaving all other methods unprotected.

You can set the AuthXRadiusCacheTimeout for whatever time you think is appropriate depending upon your needs and what you think the client environment is like. The more open the access, the more frequently your users should have to re-authenticate. Making it too short, however can cause problems with large file transfers, so if you are looking for a secure replacement to FTP, think about typical file sizes and transfer times.

Each sub-directory listed in the httpd.conf file inherits the security of it's parent, so if you want to further restrict access you can. For example, this virtual host add subdirectories that are limited to specific users:

```
NameVirtualHost *:443
<VirtualHost webdav.mydomain.com:443="">
```

```
ServerName webdav.mydomain.com
DocumentRoot /var/www/html
SSLEngine on
SSLProxyEngine on
SSLCertificateFile conf/webdav.mydomain.com.crt
SSLCertificateKeyFile conf/webdav.mydomain.com.key
  Alias /webdav/ "/var/www/webdav/"
 <Directory /var/www/webdav>
     DAV on
     <Limit GET PROPFIND POST OPTIONS MKCOL PUT DELETE LOCK UNLOCK COPY MOVE PROPPATCH>
     AuthType Basic
     AuthName "You must be authenticated by WiKID to Enter!"
     AuthXRadiusAddServer "wikid_server_ip:1812" "webdav_shared_secret"
     AuthXRadiusTimeout 7
     AuthXRadiusRetries 2
     require valid-user
     </Limit>
   </Directory>
   <Directory /var/www/webdav/PCIdata>
     require user bob ted alice
   </Directory>
</VirtualHost>
```

You could also have a top-level directory that was read-only and sub-directories that were write-able by certain users.

N.B.: I was getting a 412 Error when trying to use Cadaver on linux. Checking the audit.log showed that mod-security was blocking it. I had to comment out this line in mod-security:

```
# SecFilterSelective HTTP_Content-Type "!(^$|^application/x-www-form-urlencoded$|^multipart/form-data)"
```

Setting up clients Linux

On linux, I used a package called **Cadaver**, which could not have been easier:

```
cadaver https://webdav.mydomain.com/webdav/
```

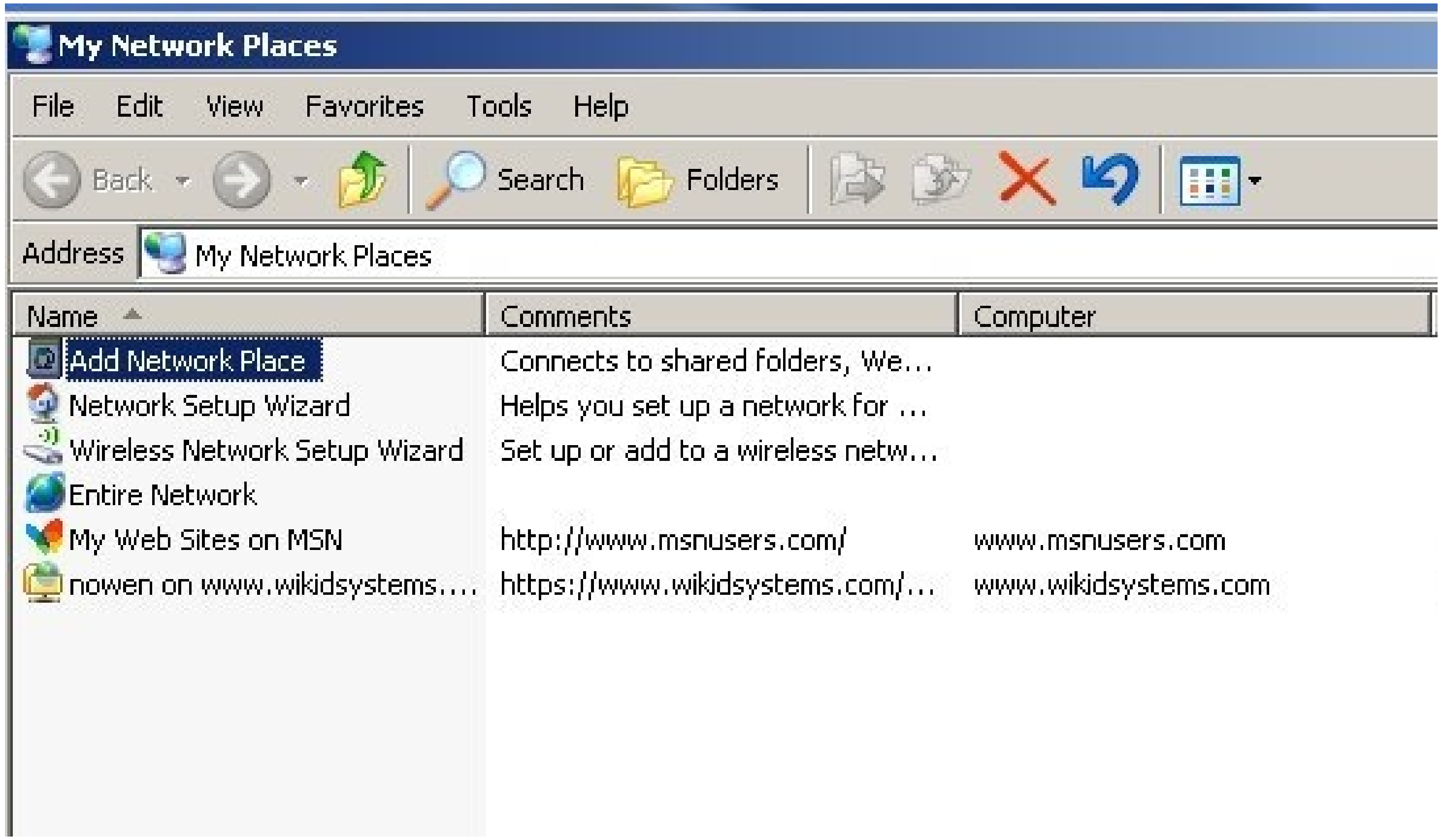
You will be prompted for your username and password, and then you have commandline access. Type 'help' to see a list of commands. **Windows**

Setting up WebDAV on Windows was somewhat confusing as there seem to be a few ways to do it. However, there was only one way that seemed to consistently work. First you must enable basic authentication in the Windows registry. I opened a command prompt and typed regedit. I browsed to

```
HKEY_LOCAL_MACHINESYSTEMCurrentControlSetServices WebClientParameters
```

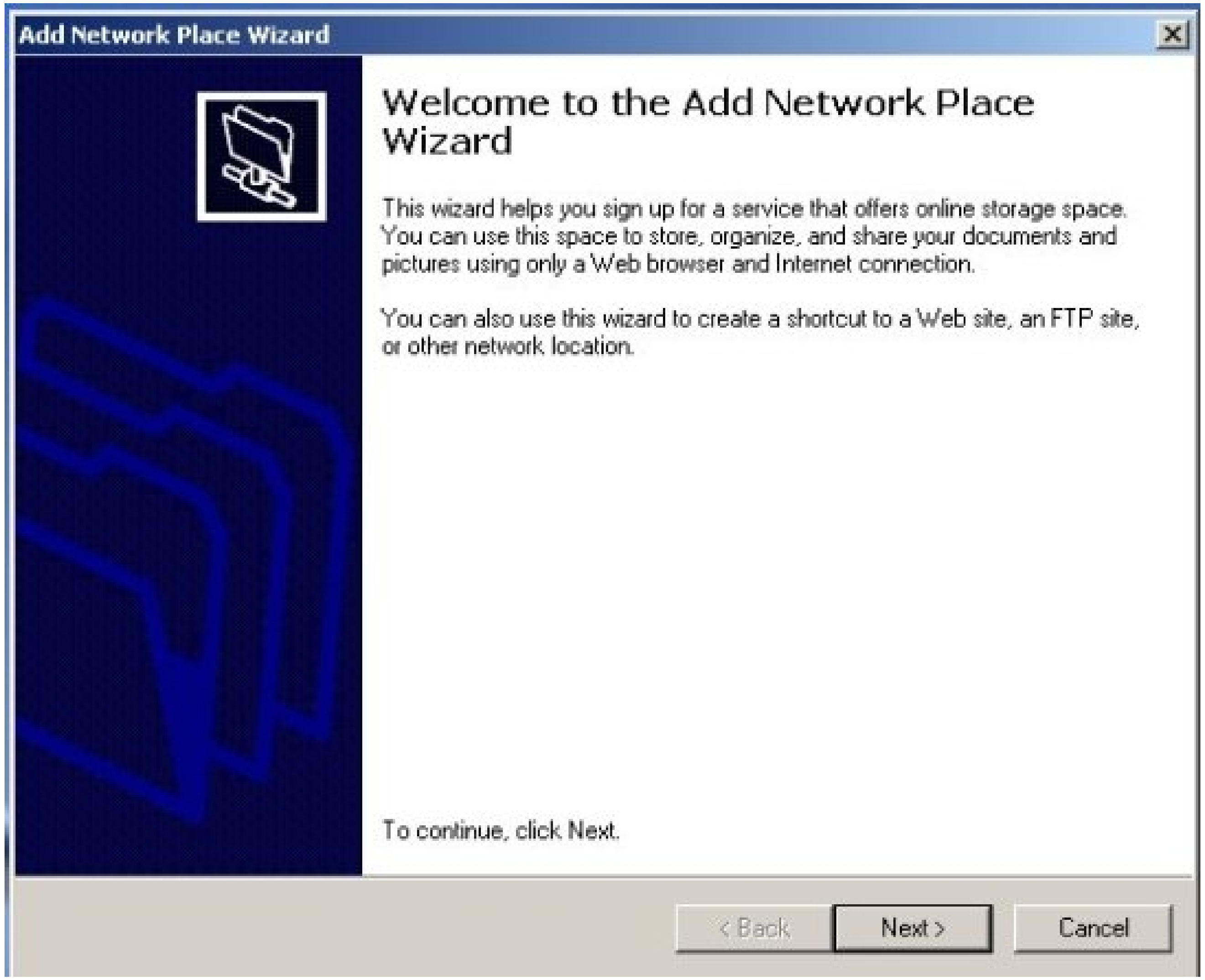
And right-clicked on Parameters, Add New, Selected DWORD and created "UseBasicAuth". Set the value to 1 to enable basic authentication. You can change it to 0 to turn it off again. Basic authentication sends the password in the clear so it is disabled, but we are using SSL and one-time passcodes, so it is not an issue here. I was able to add drag-and-drop access by adding the WebDAV address as a Network Place.

Start by clicking on the **My Network Places** icon on your desktop - Select Add Network Place:


My Network Places
File Edit View Favorites Tools Help
Back
Search
Folders
Address My Network Places

Name	Comments	Computer
Add Network Place	Connects to shared folders, We...	
Network Setup Wizard	Helps you set up a network for ...	
Wireless Network Setup Wizard	Set up or add to a wireless netw...	
Entire Network		
My Web Sites on MSN	http://www.msnusers.com/	www.msnusers.com
nowen on www.wikidsystems....	https://www.wikidsystems.com/...	www.wikidsystems.com

This starts the wizard:



Add Network Place Wizard

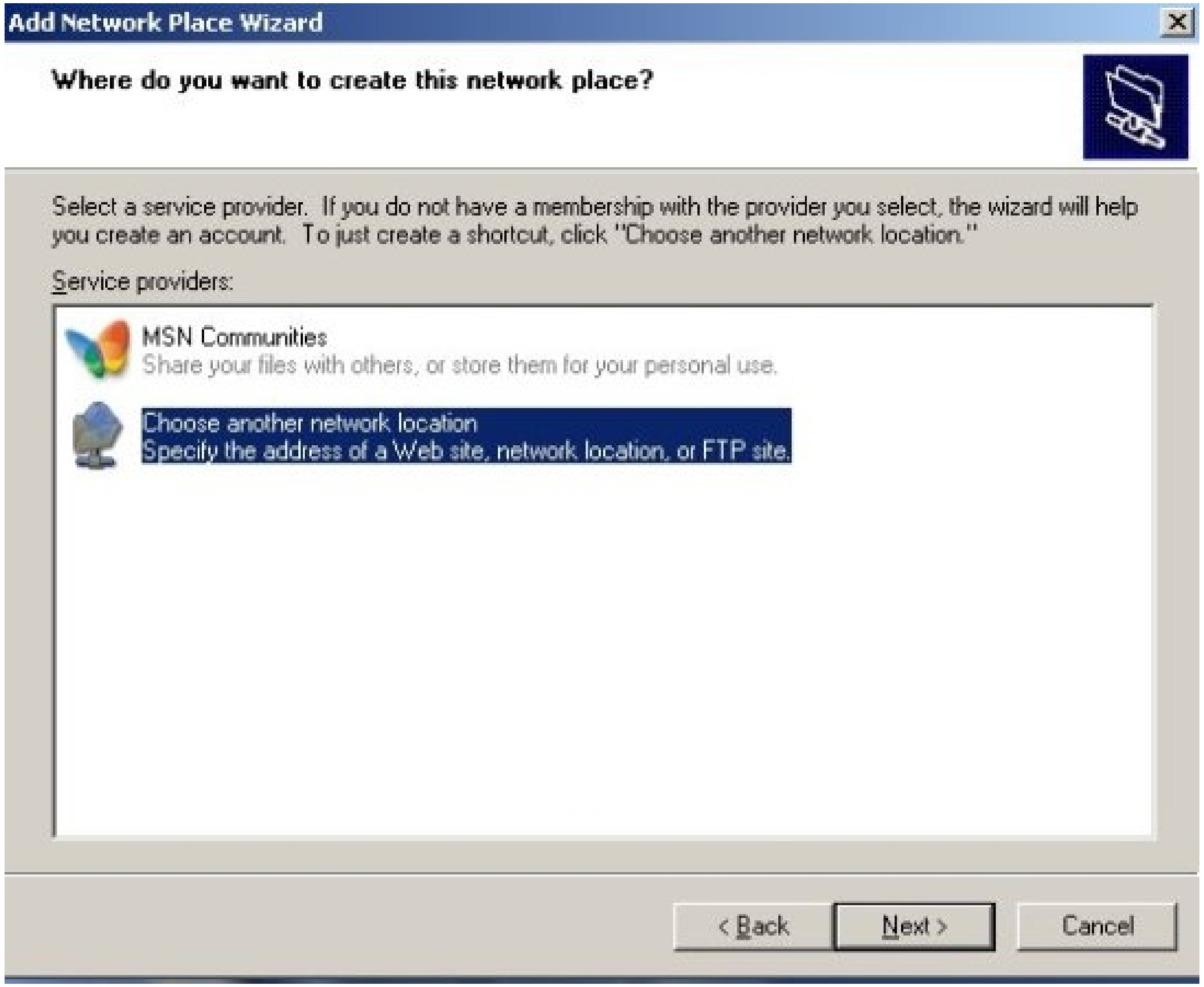
Welcome to the Add Network Place Wizard

This wizard helps you sign up for a service that offers online storage space. You can use this space to store, organize, and share your documents and pictures using only a Web browser and Internet connection.

You can also use this wizard to create a shortcut to a Web site, an FTP site, or other network location.

To continue, click Next.

Select the bottom option, "Choose another network location":



Add Network Place Wizard

Where do you want to create this network place?

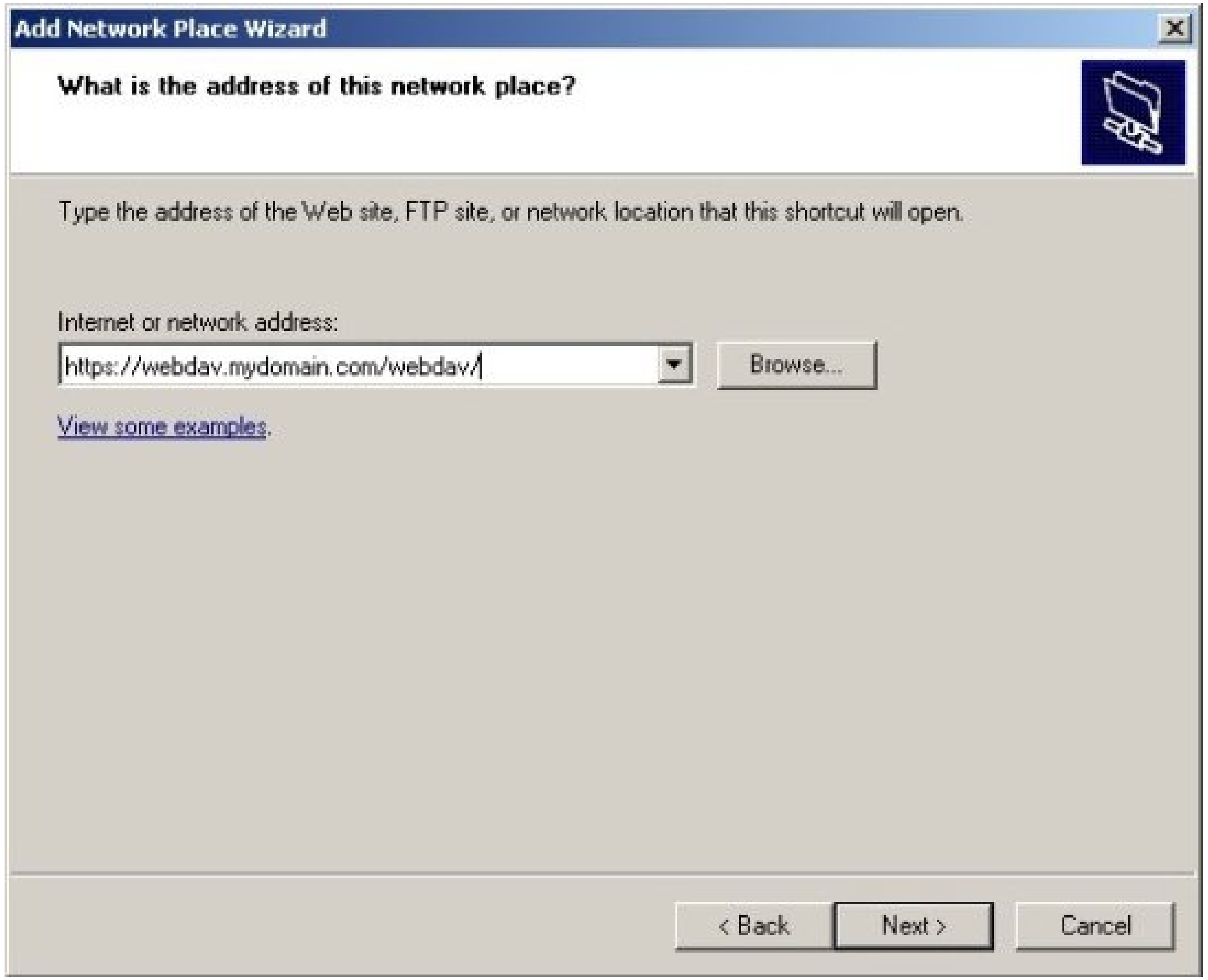
Select a service provider. If you do not have a membership with the provider you select, the wizard will help you create an account. To just create a shortcut, click "Choose another network location."

Service providers:

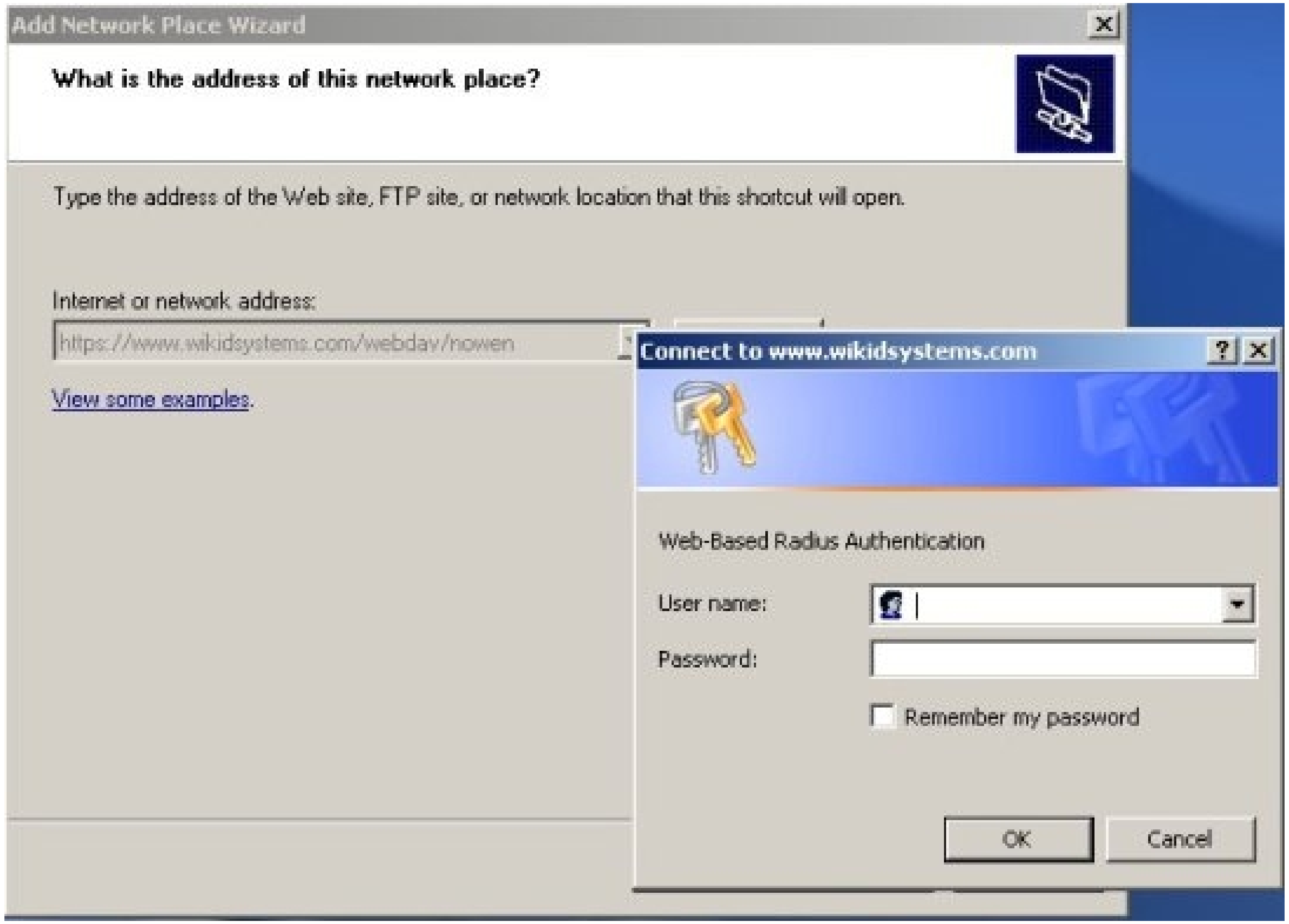
MSN Communities
Share your files with others, or store them for your personal use.

Choose another network location
Specify the address of a Web site, network location, or FTP site.

Enter the URL of your WebDAV folder:


Add Network Place Wizard
What is the address of this network place?
Type the address of the Web site, FTP site, or network location that this shortcut will open.
Internet or network address:
https://webdav.mydomain.com/webdav/
Browse...
View some examples.
< Back
Next >
Cancel

When prompted to enter your username and the WiKID one-time passcode:


Add Network Place Wizard

What is the address of this network place?

Type the address of the Web site, FTP site, or network location that this shortcut will open.

Internet or network address:

https://www.wikidsystems.com/webdav/nowen

View some examples.

Connect to www.wikidsystems.com

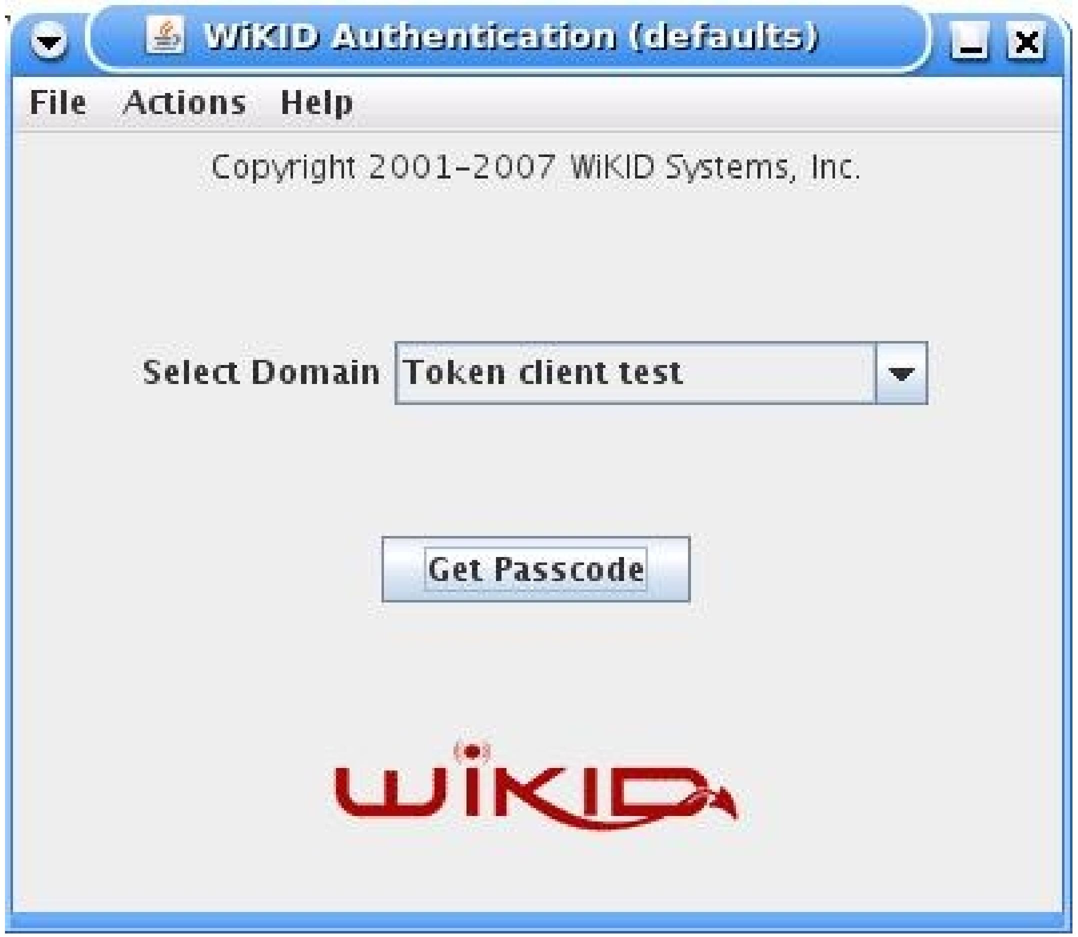
Web-Based Radius Authentication

User name:

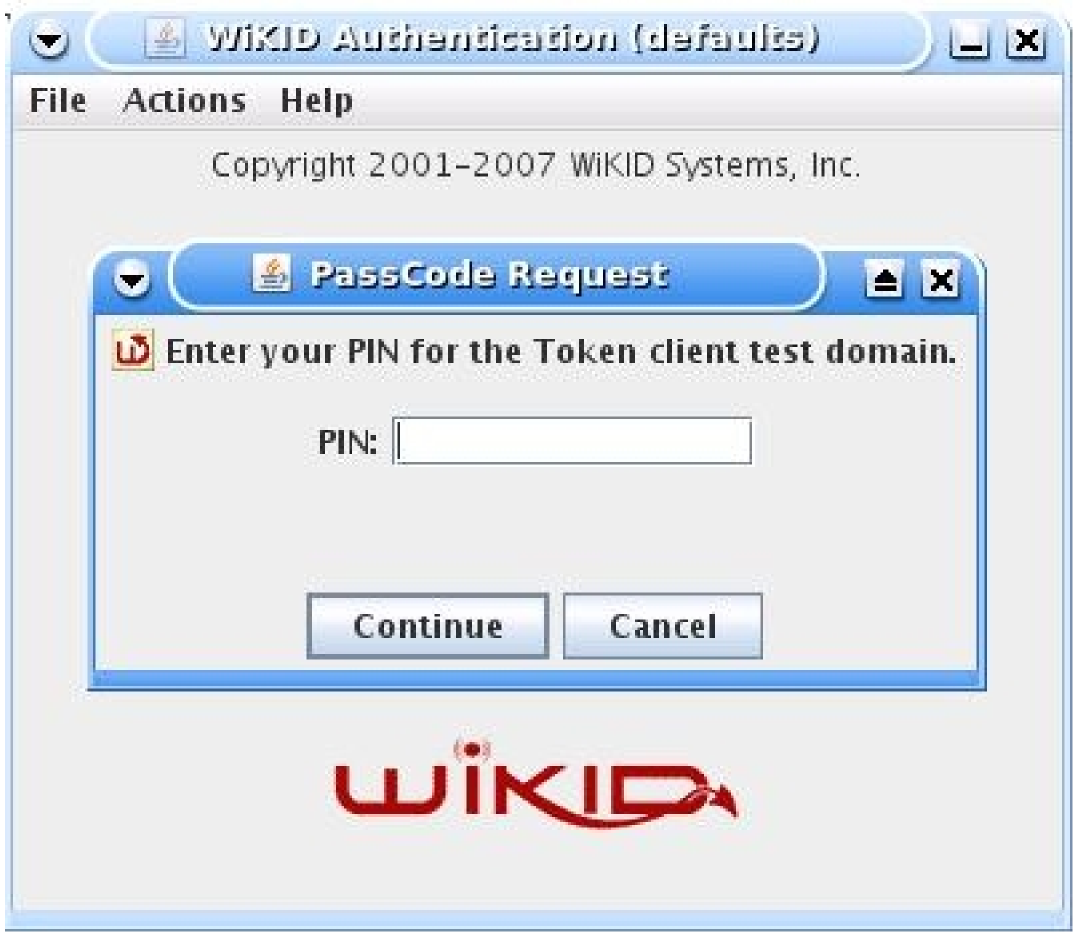
Password:

Remember my password

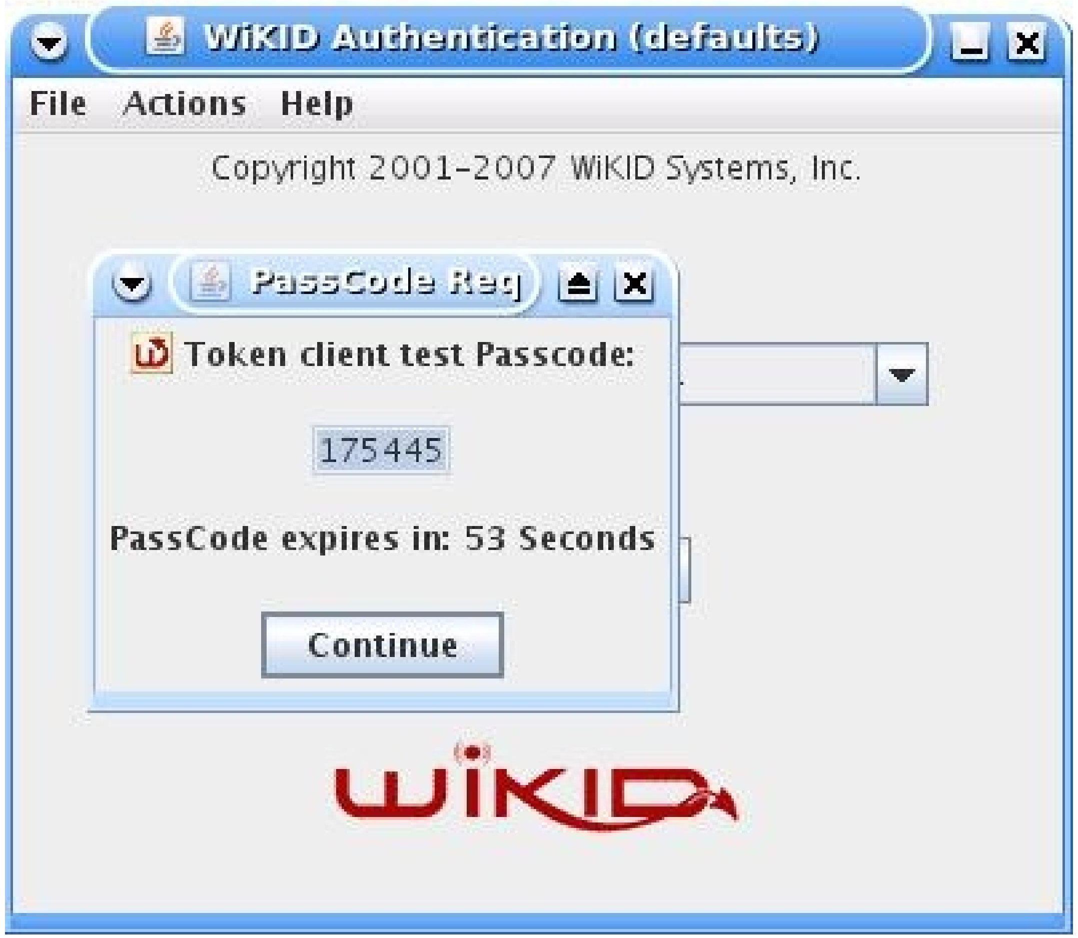
Start the WiKID token and select the Domain associated with the WebDAV resource:


WiKID Authentication (defaults)
File
Actions
Help
Copyright 2001-2007 WiKID Systems, Inc.
Select Domain
Token client test
Get Passcode
WiKID

Enter the PIN:


WiKID Authentication (defaults)
File
Actions
Help
Copyright 2001-2007 WiKID Systems, Inc.
PassCode Request
Enter your PIN for the Token client test domain.
PIN:
Continue
Cancel
WiKID

And you will get back the one-time passcode. The OTP is time-bounded, but the time can be set on the WiKID server to whatever you want:

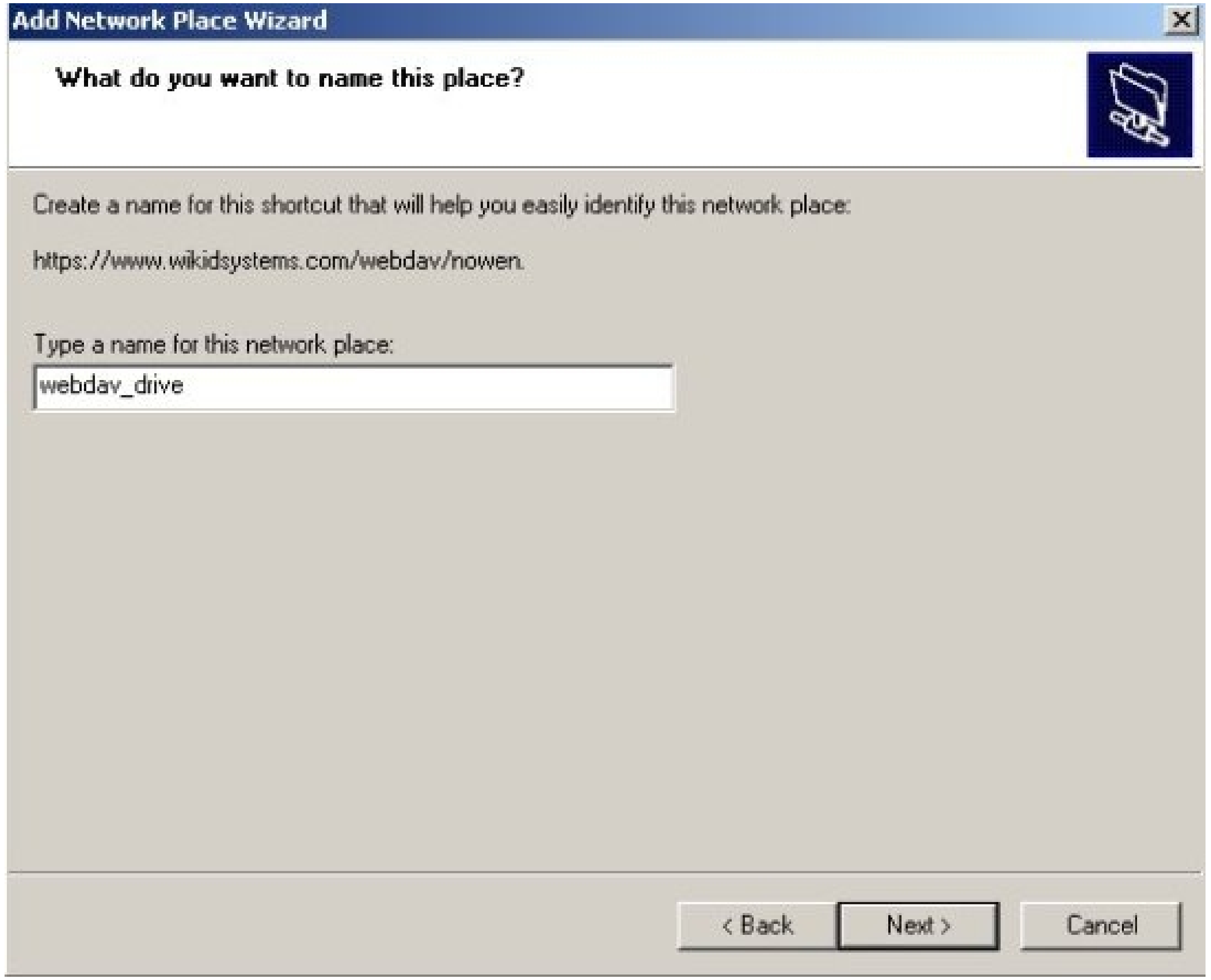

WiKID Authentication (defaults)
File
Actions
Help
Copyright 2001-2007 WiKID Systems, Inc.
PassCode Req
Continue

Token client test Passcode:

175445

PassCode expires in: 53 Seconds

You will be asked to give the location a name:



Add Network Place Wizard

What do you want to name this place?

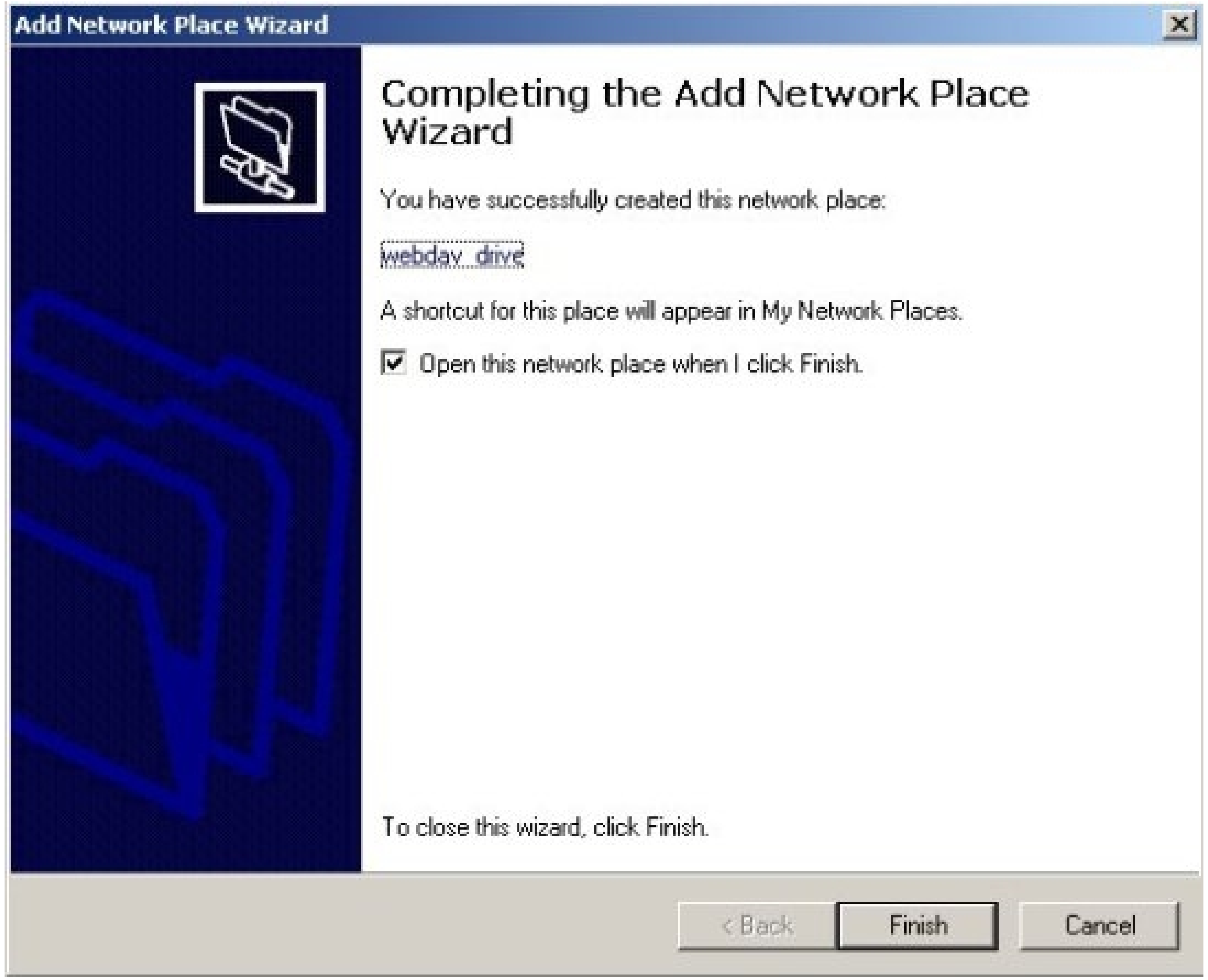
Create a name for this shortcut that will help you easily identify this network place:

https://www.wikidsystems.com/webdav/nowen.

Type a name for this network place:

webdav_drive

That should be it, click Finish:


Add Network Place Wizard

Completing the Add Network Place Wizard

You have successfully created this network place:

webdav_drive

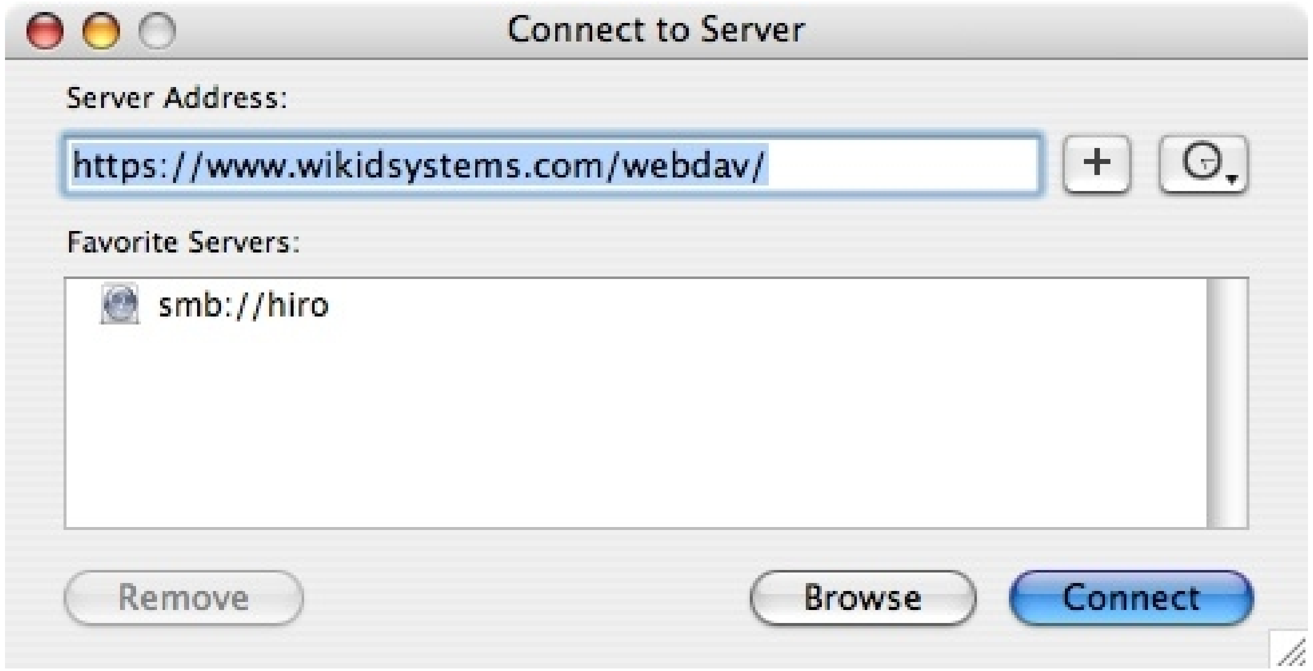
A shortcut for this place will appear in My Network Places.

☑ Open this network place when I click Finish.

To close this wizard, click Finish.

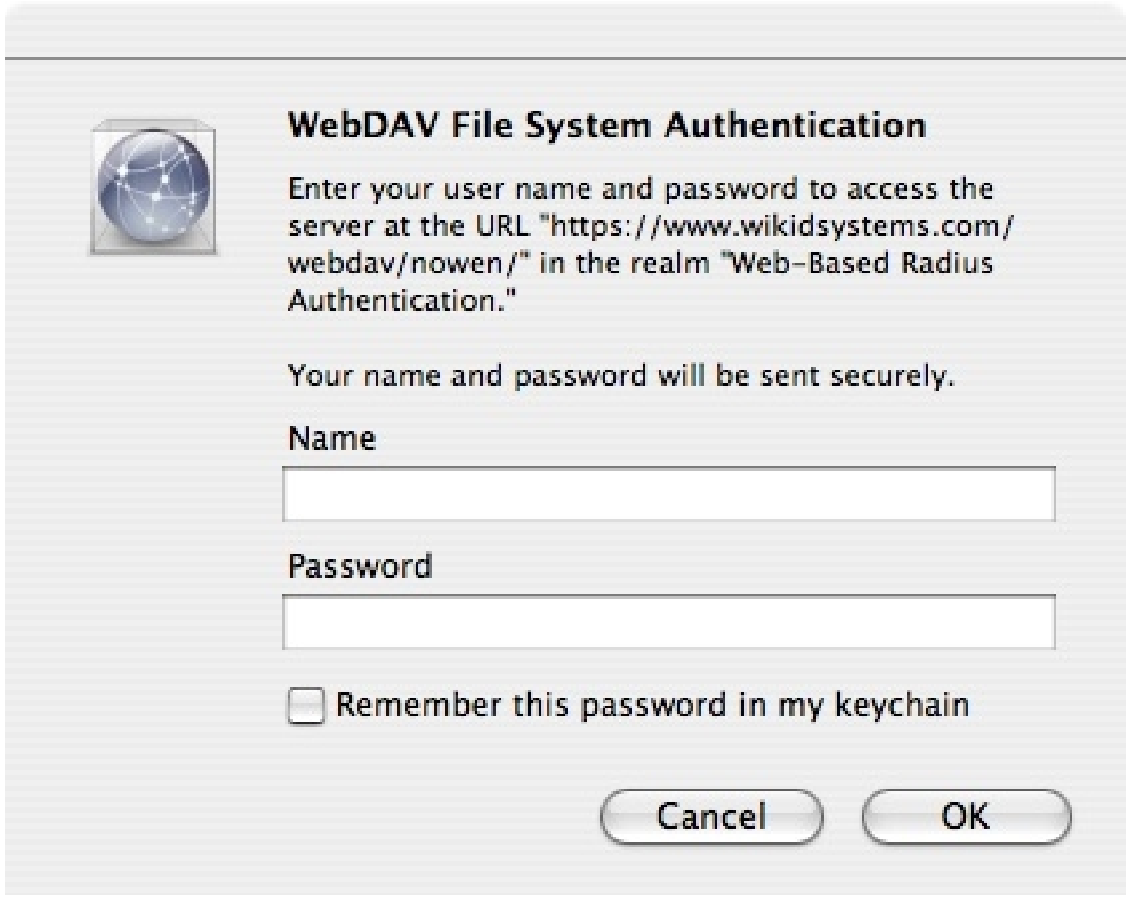
The location should open and you should be able to drag and drop a file from Explorer into this location. I was unable to map the WebDAV location to a driver letter. The directory listing entered an infinite loop.**MacIntosh OSX**

Setting up a WebDAV location on the Mac was a bit easier. Start in the Finder, selecting Go, Connect to Server. A dialog box will open.



Server Address: https://www.wikidsystems.com/webdav/

Enter your username and password:


WebDAV File System Authentication

Enter your user name and password to access the server at the URL "https://www.wikidsystems.com/webdav/nowen/" in the realm "Web-Based Radius Authentication."

Your name and password will be sent securely.

Name

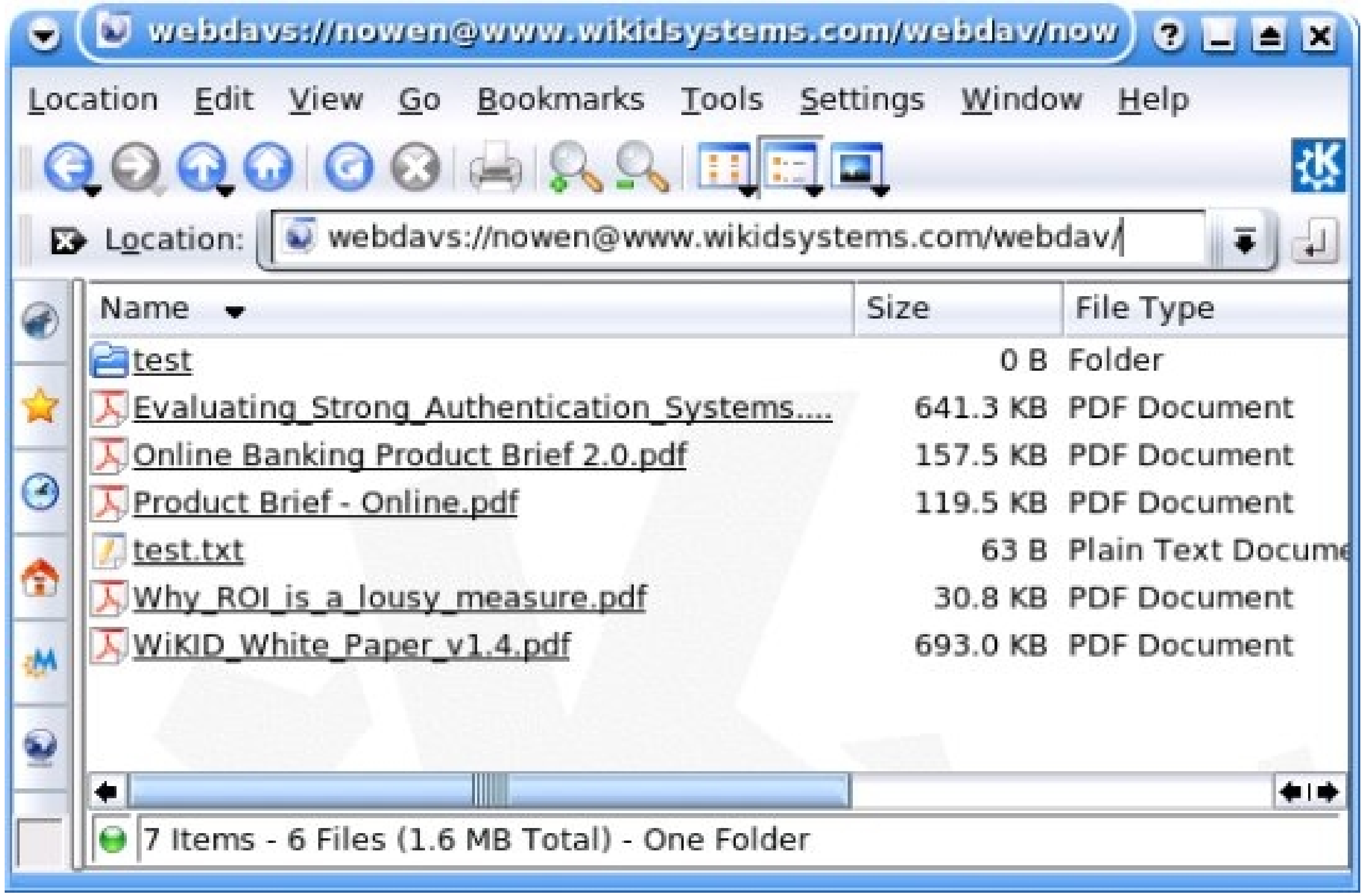
Password

☐ Remember this password in my keychain

And that is it. You can drag and drop files to this location.

Linux

Getting WebDAV to work on Linux is also simple. The trick is to use webdavs as the protocol. In your Konquerer, for example, you can enter: "webdavs://webdav.mydomain.com/webdav/". Additionally, if you would like to not enter the username each time, you can enter "webdavs://username@webdav.mydomain.com/webdav/". You can then bookmark that URL:


webdavs://nowen@www.wikidsystems.com/webdav/now
Location Edit View Go Bookmarks Tools Settings Window Help
Location: webdavs://nowen@www.wikidsystems.com/webdav/

Name	Size	File Type
test	0 B	Folder
Evaluating_Strong_Authentication_Systems....	641.3 KB	PDF Document
Online Banking Product Brief 2.0.pdf	157.5 KB	PDF Document
Product Brief - Online.pdf	119.5 KB	PDF Document
test.txt	63 B	Plain Text Docume
Why_ROI_is_a_lousy_measure.pdf	30.8 KB	PDF Document
WiKID_White_Paper_v1.4.pdf	693.0 KB	PDF Document

7 Items - 6 Files (1.6 MB Total) - One Folder

In Gnome, the process is the same, but the URL would be "davs://username@webdav.mydomain.com/webdav/"

Conclusion

Combining WebDAV and Apache provides a great deal of flexibility. With flexibility often comes insecurity. However, by locking down your server, encrypting data in transit with SSL and using two-factor authentication, you can create a system that offers maximum ease of use without sacrificing security. Apache controls access and provides encryption in transit via SSL; Mod_auth_Xradius provides the credential caching and WiKID strongly authenticates the user.

Links of Interest

- **WebDAV**
- **Apache**
- **WiKID Systems**