Configuring Software for Use with the CAC

Revision History	
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Overview

Smart Cards are used to provide security for many different transactions. They are used to send signed email, encrypted email, accessing PKI enabled websites, and in our case can be used to get a *Kerberos* Ticket Granting Ticket (TGT).

To communicate with the certificate on the CAC, an application like Firefox or *PKINIT* Kerberos will use a crypto library. The crypto library uses the pkcs#11 standard. There are many pkcs#11 packages which could be used. Various OS's, such as MAC OSX, include a pkcs#11 package with the system. There is also a freely available package called CoolKey that runs on many different platform that will provide all the functions needed to communicate to the CAC.

The pkcs#11 library communicates with the CAC through a driver to the SmartCard reader. the driver is not only hardware specific, but also depends on how the reader is hooked up to the system (USB, serial port, PCMCIA slot).

The card driver accesses the Smartcard. The Smartcard we use is the CAC (Common Access Card). The CAC contains several java applets based on Sun Microsystems's Java Card Technology. These Java applets include a PIN Management Applet, multiple Public Key Infrastructure (PKI) applets and general container applets for specific use by the various branches of the military. One of the applets does the cryptographic functions and forwards the response back through the layers.

Systems that Can Use Commercial CAC software

There are some systems that can use commercially available software to get the capability to run applications that use the CAC.

Users that are part of an HPCMO project should, depending on the military branch they are contracted to, be able to acquire a licensed copy of ActiveGold or Active Client from one of the following resources:

Air Force

The Air Force provides information and training regarding Public Key Infrastructure (PKI), including CAC at:

Air Force Public Key Infrastructure (PKI) Systems Program Office (SPO) site [https://afpki.lackland.af.mil/html]

The middleware client is available from the My AF portal via the following URL:

https://www.my.af.mil/gcss-af/USAF [https://www.my.af.mil/gcss-af/USAF/ep/contentView.do?contentType=EDITORIAL&contentId=c6925EC192DEA0FB5E044080020E329A9&programId=t6925EC2DA47C0FB5E

Note

Make sure you download and follow the 64 bit instructions if you are using a Windows 64 version.

Army

The Army provides it's users an extensive knowledge base, similar to the Air Force's site, along with middleware downloads at:

Army AKO/DKO site [http://www.us.army.mil]

Users allowed AKO (Army Knowledge Online) access include:

- Active Army
- Army Reserve
- National Guard
- DA Civilian
- Retired Army
- Army Guests

After logging into the AKO site, go to the following area to get the CAC information:

AKO Login > Quick Links > CAC > CAC Resource Center

Users allowed DKO (Defense Knowledge Online) access include:

- DoD Military CAC holders
- DoD Civilian CAC holders
- Sponsored Contractors

For more Information about who is eligible for a DKO account go to:

https://help.us.army.mil [https://help.us.army.mil/cgi-bin/akohd.cfg/php/enduser/std_adp.php?p_faqid=108]

After logging into the DKO site, go to the following area to get the CAC information:

DKO Login > Quick Links > CAC > CAC Resource Center

Navy

In order to get the CAC card reader and software for home use the customer will need to contact their local CTR. The CTR's can order CAC readers and the Active Client software to be installed on a users home computer. If these users require assistance in locating their CTR please refer to the link provided below:

https://www.homeport.navy.mil/training/ctr/contact-database/

Marines

In order to get the CAC card reader and software for home use the customer will need to contact their local CTR. The CTR's can order CAC readers and the Active Client software to be installed on a users home computer. If these users require assistance in locating their CTR please refer to the link provided below.

https://www.homeport.navy.mil/training/ctr/contact-database/

Configuring Windows Systems

In this section we will go over installing the ActivClient or ActivCard Gold 3.0 packages on a Windows system. These two commercial middleware packages are available from ActivIdentity. ActivClient is the latest version of the middleware, but since some sites may be using the older ActivCard Gold middleware, we will also cover the installation for that software.

Driver Installation

The first thing that will need to be done on the Windows system is to ensure the Card Reader is recognized and the drivers are properly installed.

1. Shut down the Windows operating system and turn off your computer.

2. Depending on the type of reader you have purchased, attach your reader to an available serial or USB port or insert the PC card reader into an available PCMCIA slot.

   ### Note

   If your serial reader has a supplementary PS/2 cable/connector, attach your keyboard or mouse connector to it, and plug it into your computer's keyboard or mouse port.

3. Boot the Windows system and log on as a user with administrative privileges.

4. If the device driver for the smartcard reader is available as part of the Windows system you are on, follow the prompts to install the driver.

5. If the device driver for the smart card reader is not available on Windows, locate the drivers for your model of CAC reader.

Note

This can typically be found on the manufacturers site.

6. Double Click on the driver package icon and follow the instructions on the software to finish loading the Card Reader drivers.

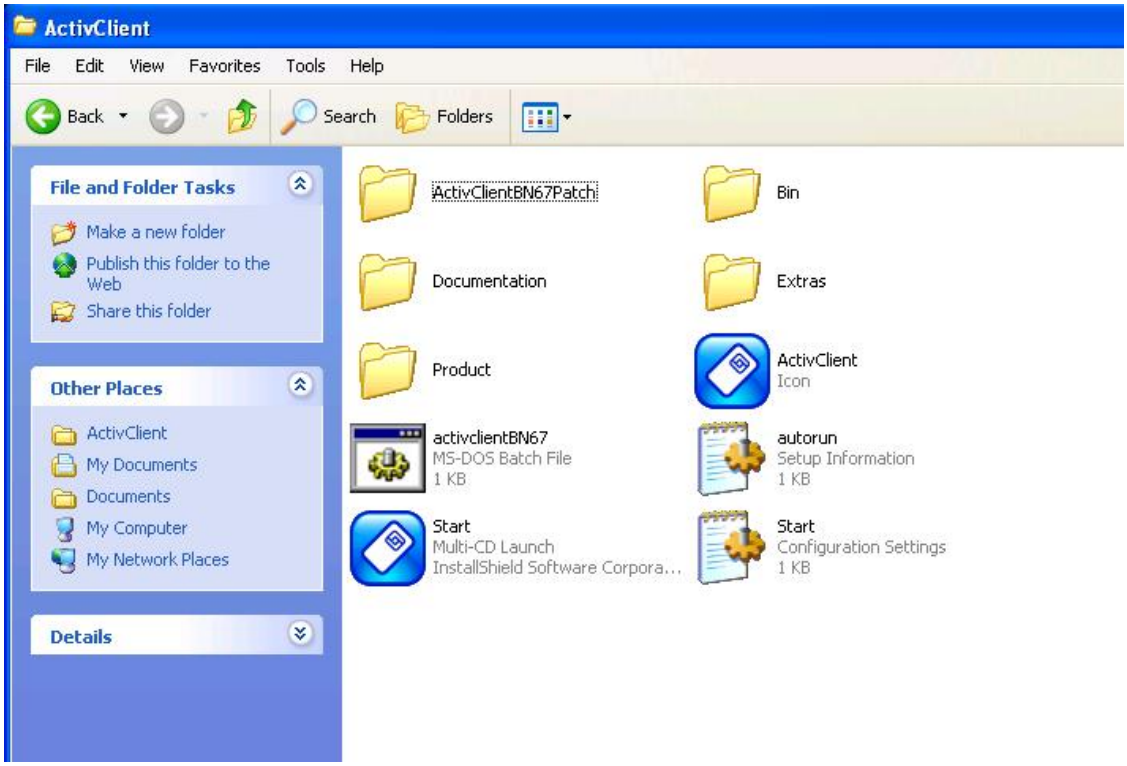
Installing ActivClient on a Windows system

1. Download a copy of ActivClient or insert the ActivClient CD.

Note

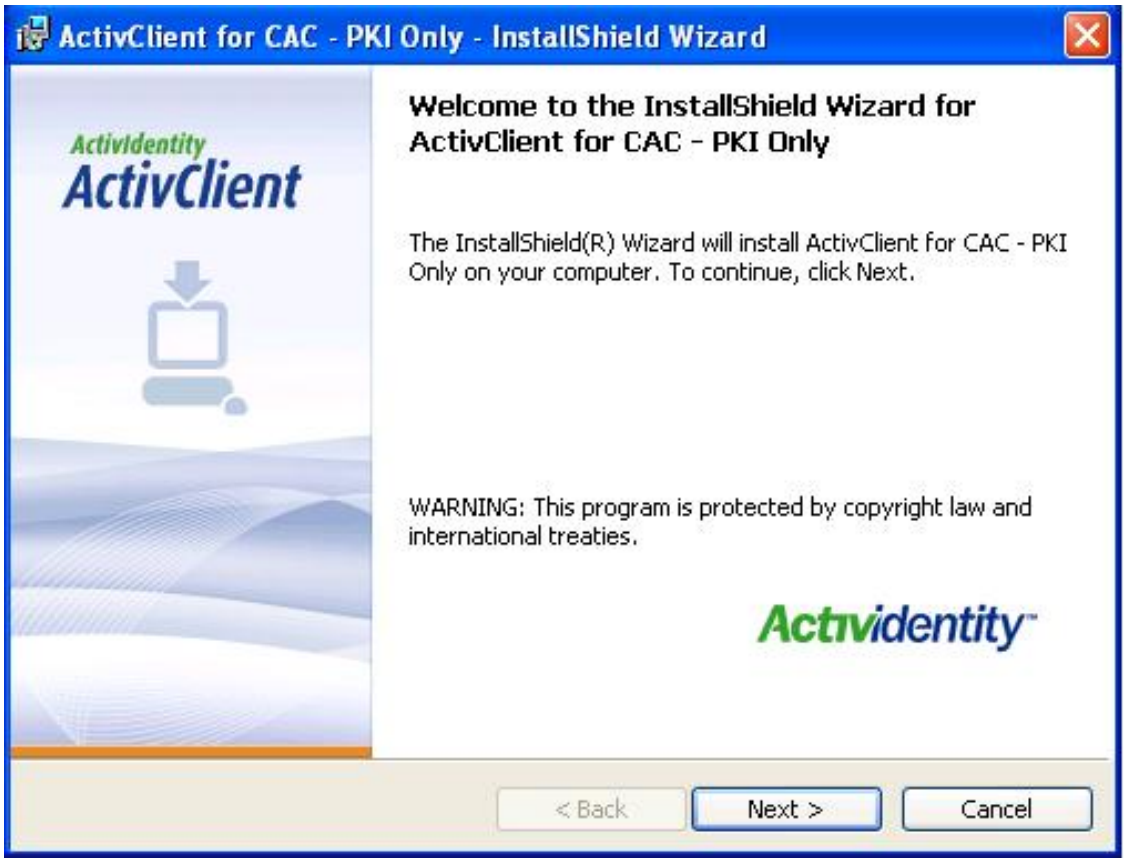
If you download ActivClient, you will need to unzip the files to a temporary directory.

2. Go to the directory the files were unzipped to, or to the location on the CD where the files reside.



3. Double click the start icon. The ActivClient CAC window will come up. Click on the Install button.

4. The next Window gives you the option of reading the 'Installation Guide' and 'Release Notes'. Click on the 'Install / Upgrade Now' icon on the bottom of the screen. The Welcome screen of the InstallShield Wizard will come up.

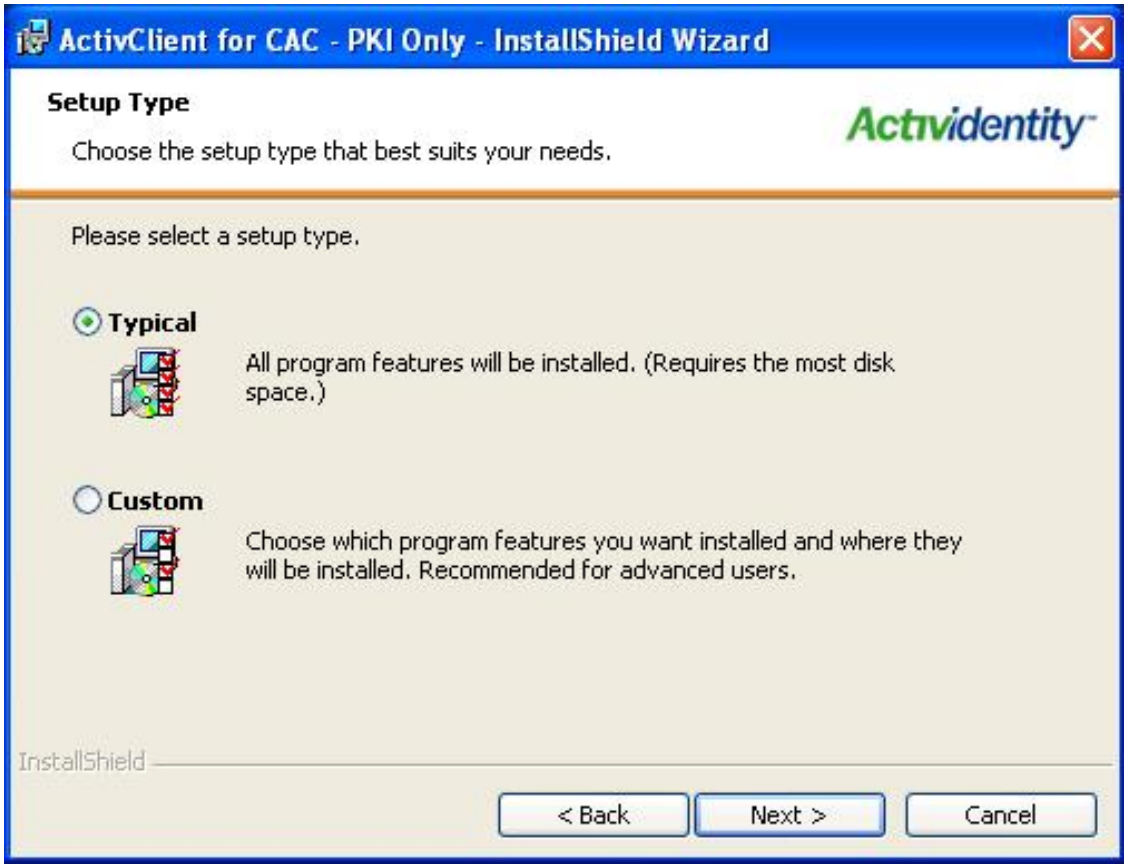


5. After clicking the next button you will be presented with the license agreement. Choose 'I accept the terms in the license agreement' and click the next button again.

6. Next the install program will ask you what type of install you would like. The default is 'Typical', which is the way you should leave it.

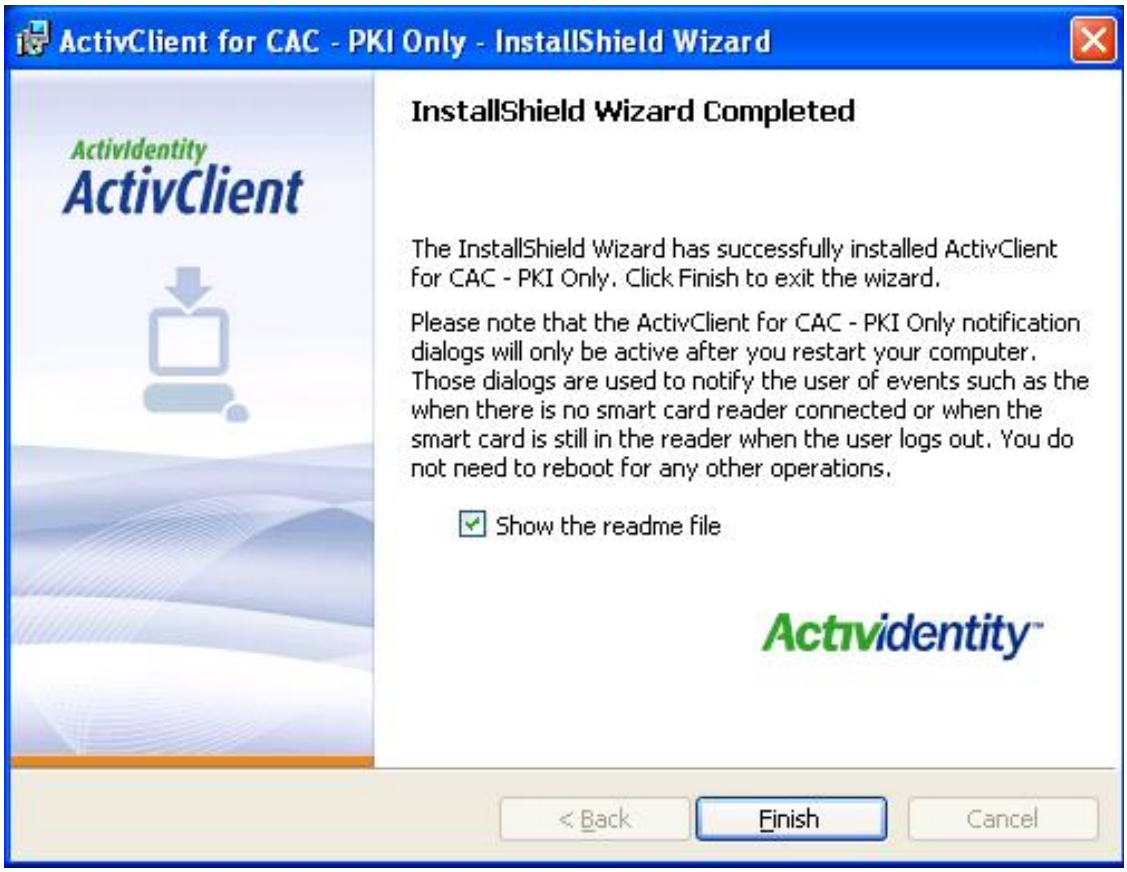
Note

If you are upgrading from an older version of ActivClient or ActivCard, the previous version will be uninstalled before installation begins. The installer will use the setup type from the previous version of the software.

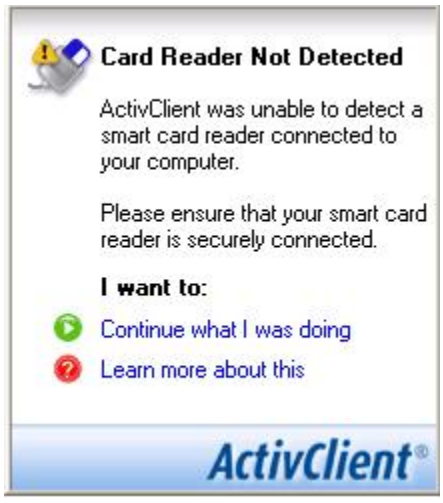


7. Finally the install screen will be presented. Click on the install button.

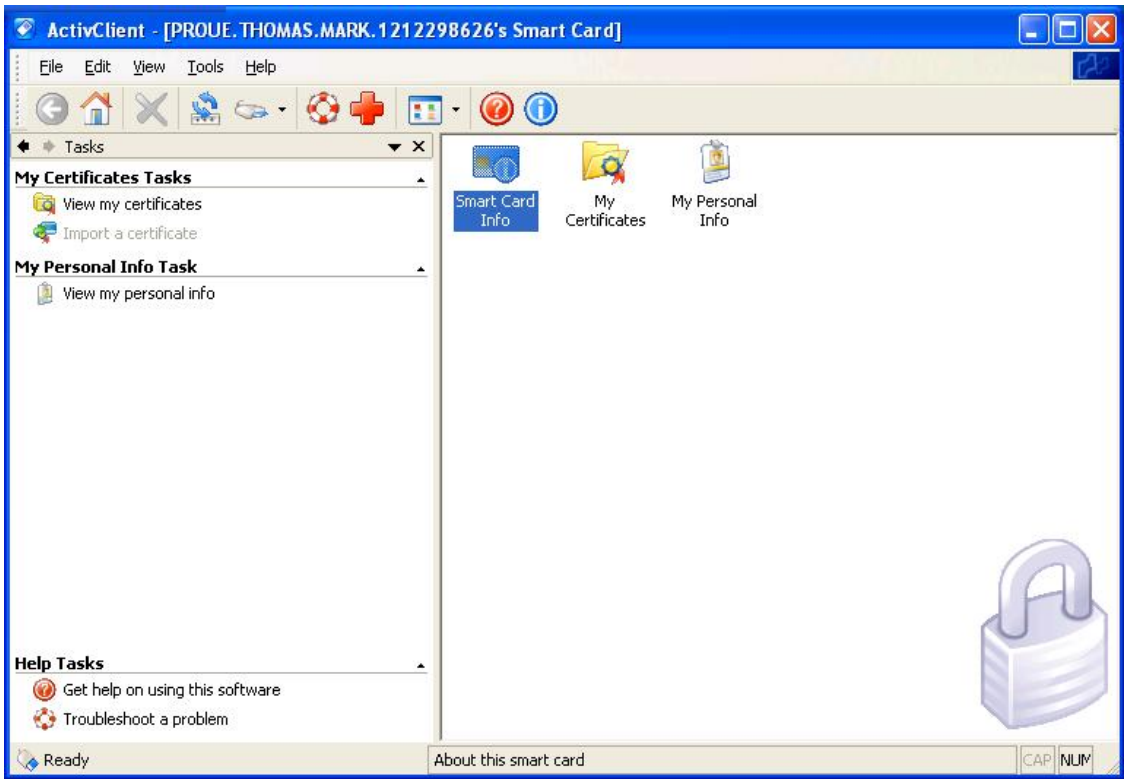
8. After a few minutes a screen should come up telling you that the install was successful. At this point you can open up the README file or uncheck the 'view README file' button and choose OK. Even though the program does not ask you to restart your system, it would be a good idea to reboot at this time. Before doing that you should quit out of the 'ActivClient CAC screen' by click on the x in the upper right corner.



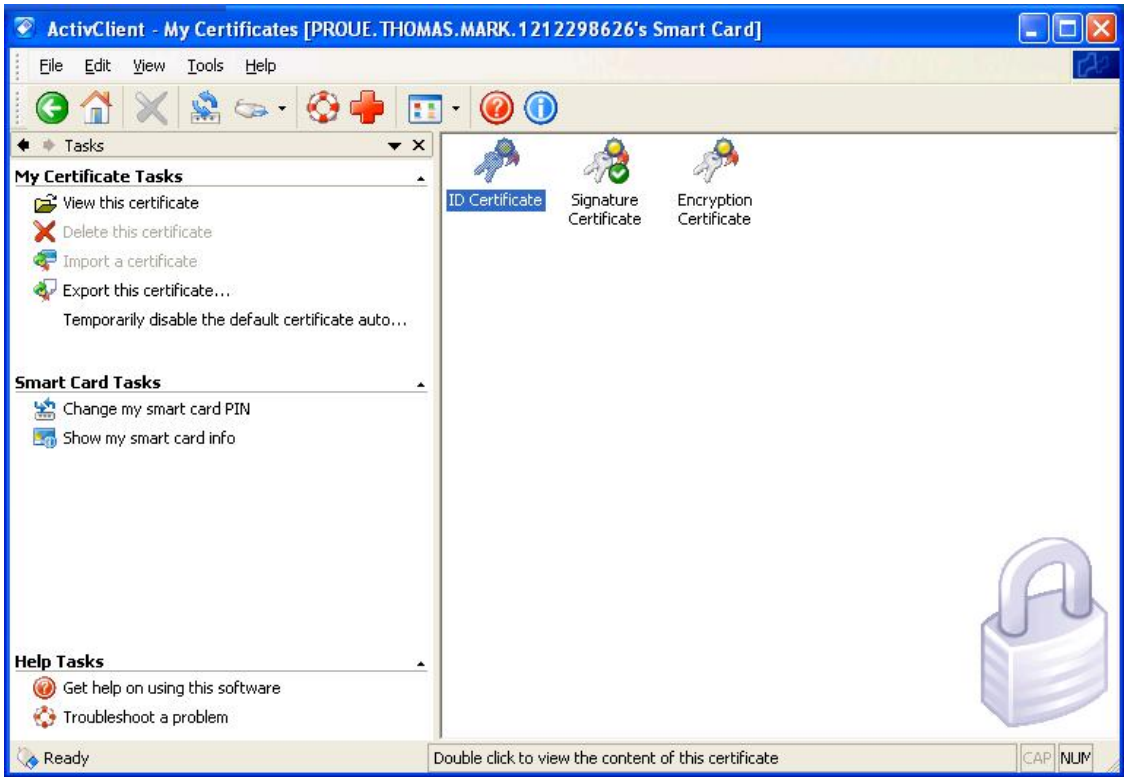
9. After the system has rebooted you should see an icon a smartcard reader with a red X over it in taskbar. After putting your CAC into the reader the X will go away indicating a card has been inserted. A message may also show up after a system boot telling you a Card is not inserted in the reader. After putting the smartcard into the reader the message will go away.



10. Double click on the reader icon to bring up the ActivClient Utilities screen. Verify the card is being read properly by clicking on the 'View my certificates' link on the left sidebar. You should be able to see the three certificates from the CAC. You can also click on the 'View my personal info' link and see various information about the owner of the card. By clicking this link it will ask you to type in your PIN.



11.To register your CAC certificates with the Windows applications,on the ActivClient toolbar select Tools->Advanced>Make Certificates Available to Windows...



12.Once certificates are made available to Windows application a confirmation box will appear. Click the OK button.

13.At this point you can set up any CAC required application on your Windows system (Browser, email, pkinit kerberos, etc).

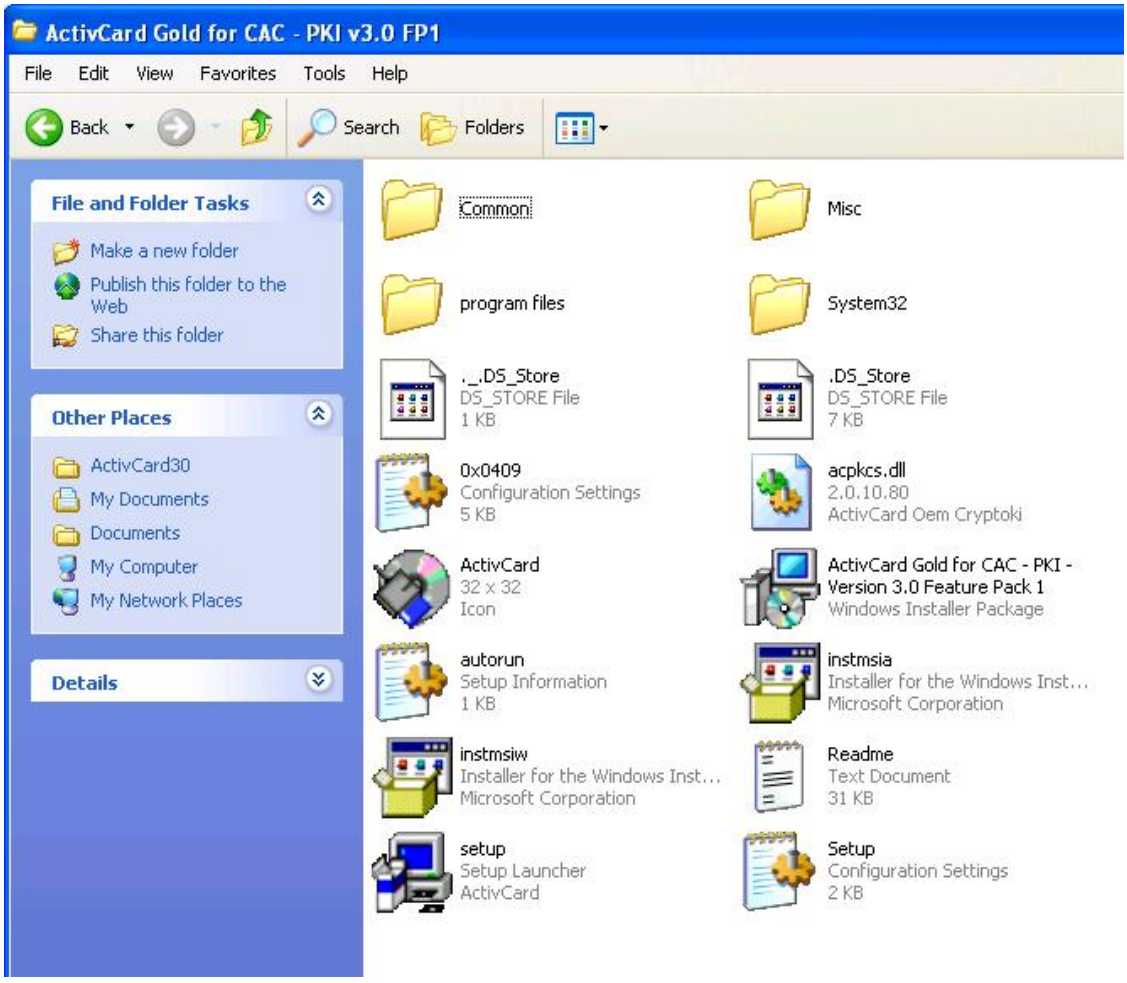
Installing ActiveCard Gold on a Windows system

1. Download a copy of ActivCard Gold or insert the ActivCard Gold CD.

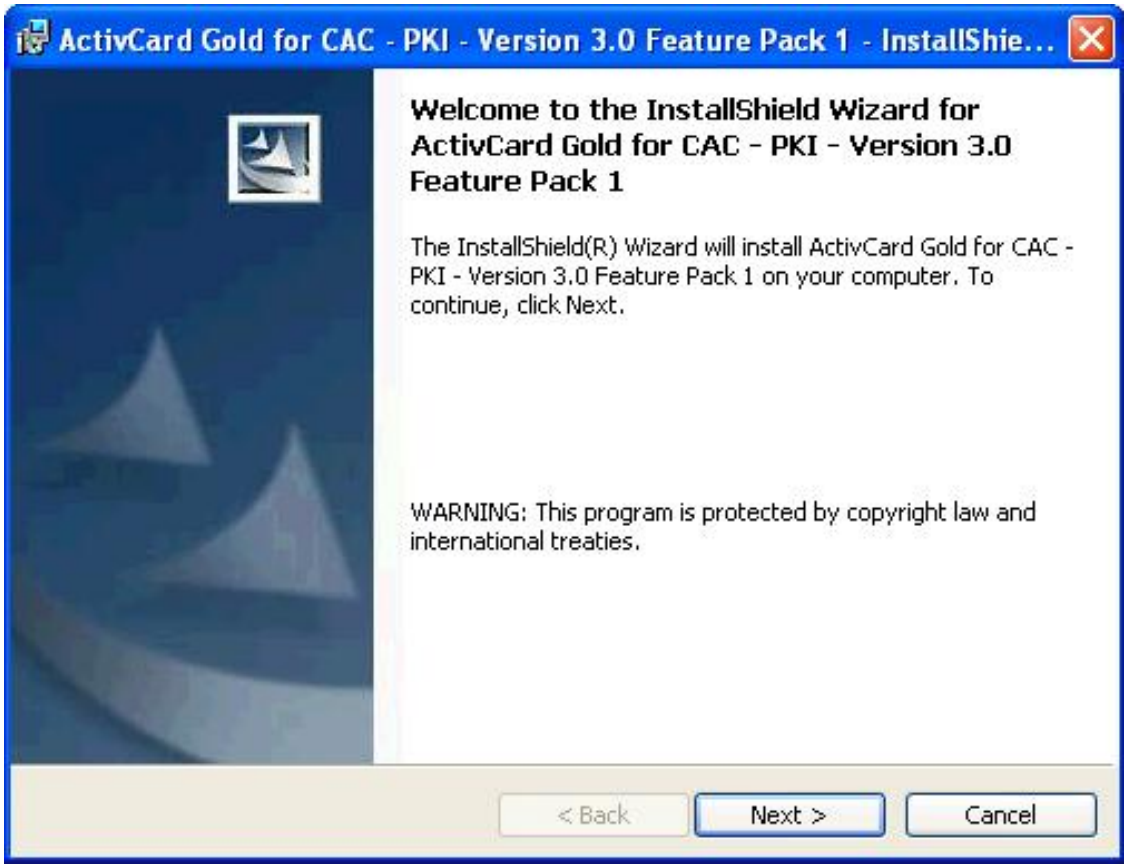
Note

If you download ActivCard Gold, you will need to unzip the files to a temporary directory.

2. Go to the directory the files were unzipped to, or to the location on the CD where the files reside.



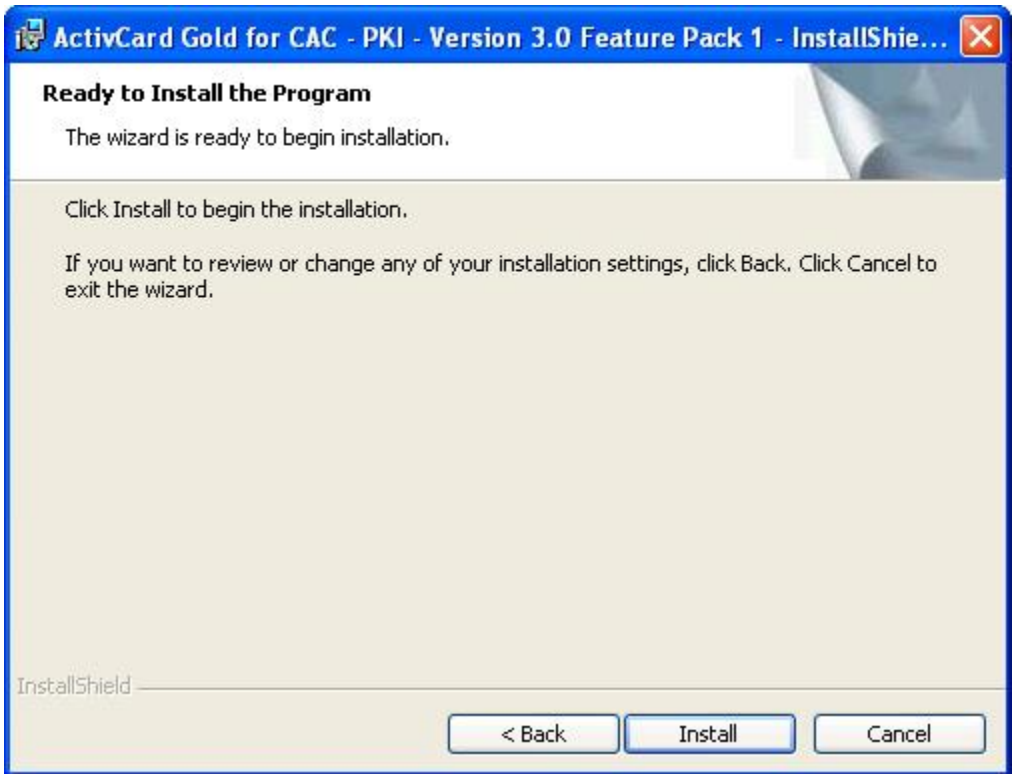
3. After Double clicking the setup icon, the Install screen will come up.



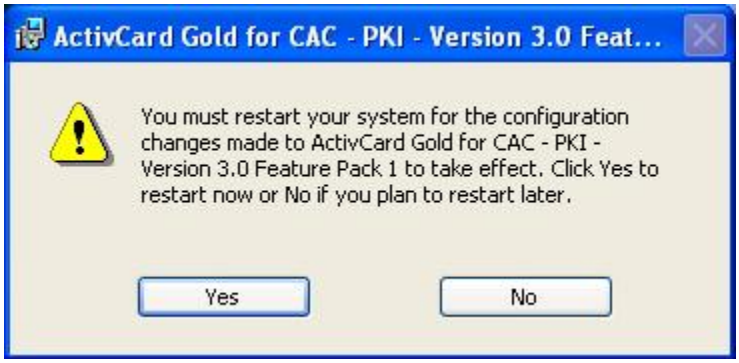
4. At the Install screen click on the next button. You will then be presented with the license agreement. Choose 'I accept the terms in the license agreement' and click the next button again.

5. Next the install program will ask you what type of install you would like. The default is 'Typical', which is the way you should leave it.

6. Finally the install screen will be presented. Click on the install button.

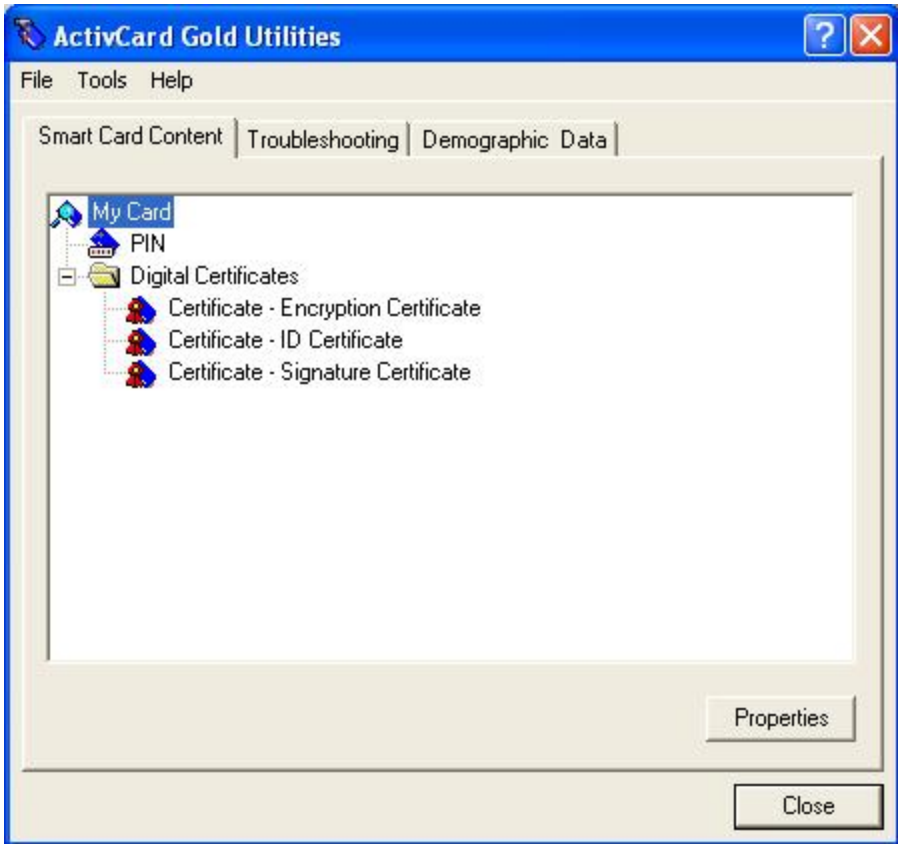


7. After a few minutes a screen should come up telling you that the install was successful. At this point you can open up the README file or uncheck the 'view README file' button and choose OK. It will then ask you to restart the system, which you should do.



8. After the system has rebooted you should see an icon of the smartcard reader with a red X over it on the lower left part of the screen. After putting your CAC into the reader the X will go away indicating a card has been inserted.

9. Double click on the smartcard reader icon to bring up the ActivCard Gold Utilities screen. Verify the card is being read properly by clicking on the 'Smart Card Content' tab. You should be able to see the three certificates from the CAC. You can also click on the 'Demographic Data' tab and see various information about the owner of the card. By clicking this tab it will ask you to type in your PIN.



10.To register your CAC certificates with the Windows applications,on the ActivClient toolbar select Tools->Advanced>Make Certificates Available to Windows...

11.A confirmation dialog box up will appear. Select YES to continue.

12.Once certificates are registered another dialog box will appear confirming that certificates from your CAC were successfully installed. Click the OK button.

13.At this point you can set up any CAC required application on your Windows system (Browser, email, pkinit kerberos, etc).

UNIX Systems Preconfigured for use with CAC

Several systems now come with CAC support built-in. This allows the user simply to plug in a card reader, insert their CAC and start running CAC enabled applications. These applications include mail, web browsers, screen locking, and login services. This also allows the user to easily set up the PKINIT Kerberos application.

The following systems have CAC support built in at some level, and can use the PKINIT Kerberos application with minimal changes.

1. RedHat EL 5
2. CentOS 5.X
3. Linux Fedora Core 9, 10, & 11
4. Linux OpenSuSE 10.x, & 11.x

5. MAC OS X 10.4.X, & 10.5.x

Components on UNIX Style Systems

libusb A library for use by user level applications to access USB devices on UNIX style systems. NOTE: Not needed under MAC OS X if you use the vendor pkcs11 lib.

pcsc-lite Provide a Windows(R) SCard interface in a very small form factor for communicating to smartcards and readers. The PC/SC Lite library is used to connect to the PC/SC daemon from a client application and provide access to the desired reader.

ccid A driver used for UNIX systems for USB smart card readers based on the CCID (Chip/Smart Card Interface Devices) protocol. NOTE: Windows needs a driver for the specific card reader you have, most are available via Windows Update.

CoolKey PKCS #11 module The CoolKey PKCS #11 module provides the basic driver for CoolKey tokens. Applications that use PKCS #11 (which includes all NSS applications such as Firefox, Evolution, Thunderbird, and pam_pkcs11) are able to use the CoolKey PKCS #11 module to access CoolKey Tokens. The CoolKey PKCS #11 provides the access to the CAC.

The following systems are currently supported with updates as of 01 August 2009 and have been tested with the CAC:

1. Red Hat Enterprise Linux 3 (Taroon)

   Latest update 9, 15 June 2007

2. Red Hat Enterprise Linux 4 (Nahant)

   Latest update 4.8, also known as Update 8, 18 May 2009

3. Red Hat Enterprise Linux 5 (Tikanga)

   - Update 5.1, 07 November 2007
   - Update 5.2, 21 May 2008
   - Update 5.3, 19 January 2009

4. Fedora 9 (Sulphur)
5. Fedora 10 (Cambridge)
6. Fedora 11 (Leonidas)
7. CentOS 5.x
8. SUSE Linux Enterprise Desktop 10
9. SUSE Linux Enterprise Server 10
10. SUSE Linux Enterprise Desktop 11
11. SUSE Linux Enterprise Server 11
12. openSuSE version 10.3
13. openSuSE version 11.0

14.openSUSE version 11.1

15.Debian GNU/Linux 4.0 (etch)

16.Debian GNU/Linux 5.0 (lenny)

17.Ubuntu 6.06.2 LTS (Dapper Drake)

Note

LTS stands for Long Term Support; these versions of Ubuntu are supported for longer than usual - 3 years on the desktop and 5 years on the server.

18.Ubuntu 6.10 (Edgy Eft)

19.Ubuntu 7.04 (Feisty Fawn)

20.Ubuntu 7.10 (Gutsy Gibbon)

21.Ubuntu 8.04.2 LTS (Hardy Heron)

22.Ubuntu 8.10 (Intrepid Ibex)

23.Ubuntu 9.04 (Jaunty Jackalope)

UNIX Systems that use Pre-built Packages

A number of systems do not have smart card capabilities added during the install as the default, however there are packages available for various OS's that can be added to allow the system to use smart cards.

To check for RedHat Enterprise packages, you need to have a registered system. Go to:

http://www.redhat.com

To check for RedHat style packages go to the following URL:

http://rpm.pbone.net/

To check for Debian packages got to the following URL:

http://www.debian.org/distrib/packages

To check for SUN packages go to the following URL:

http://www.sun.com/software/solaris/freeware/

libusb The libusb rpm package or libusb debian package is available for the following systems:

- RedHat EL 3
- RedHat EL 4
- RedHat EL 5
- Fedora 9
- Fedora 10
- Fedora 11
- CentOS 5.x

- SuSE 10.x
- SuSE 11.x
- OpenSuSE 10.x
- OpenSuSE 11.x
- Debian
- Ubuntu

Note

A libusb package is included with Solaris 10 11/06 and 05/09 OS Sun supported software.

A pre-built libusb package is not available for the following systems:

- Solaris 9.x

pcsc

The pcsc-lite rpm package or pcscd debian package is available for the following Systems:

- RedHat EL 3
- RedHat EL 4
- RedHat EL 5
- Fedora 9
- Fedora 10
- Fedora 11
- SuSE 10.x
- SuSE 11.x
- OpenSuSE 10.x
- OpenSuSE 11.x
- Debian
- Ubuntu 7.10 and above

A pre-built pcsc package is not available for the following systems:

- Ubuntu 7.04 and below
- Solaris 10.x
- Solaris 9.x

ccid

The ccid rpm package or libccid debian package is available for the following Systems:

- RedHat EL 3

- RedHat EL 4
- RedHat EL 5
- Fedora 9
- Fedora 10
- Fedora 11
- SuSE 10.x
- SuSE 11.x
- OpenSuSE 10.x
- OpenSuSE 10.x
- Debian
- Ubuntu 7.10 and above

A pre-built ccid package is not available for the following systems:

- Ubuntu 7.04 and below
- Solaris 10.x
- Solaris 9.x

CoolKey The packaged coolkey rpm or deb is available for the following Systems:

- RedHat EL 4
- RedHat EL 5
- Fedora 9
- Fedora 10
- Fedora 11
- SuSE 11.x
- OpenSUSE 10.x
- OpenSUSE 11.x
- Ubuntu 7.10 and above

A pre-built CoolKey package is not available for the following systems:

- RedHat EL 3
- SuSE 10.X
- Debian
- Ubuntu 7.04 and below
- Solaris 10.x
- Solaris 9.x

Getting the packages installed from your distribution CD is usually easier than having to download files from a remote web site, but they usually don't stay up to date for very long. It may be better to go to the vendor site and download the required packages.

The table below lists the location of several popular vendors that files could be downloaded from.

Table 1. Popular Package Download Sites

Distribution	Location
RedHat	http://www.redhat.com/ http://www.rpmfind.net/
Fedora	http://download.fedora.redhat.com/pub/fedora/linux/core/ http://www.rpmfind.net/
Debian	http://packages.debian.org
Ubuntu	http://packages.ubuntu.com
SuSE	http://software.opensuse.org/search

Installing the packages

RedHat Style Installs

Either download the RPMs into a temporary directory such as /tmp, or if using the install CD/DVD, after mounting the CD/DVD, go to the directory that contains the package.

The next step is to issue the rpm -Uvh command to install the package. The -U qualifier is used for updating an RPM to the latest version, the -h qualifier gives a list of hash # characters during the installation and the -v qualifier prints verbose status messages while the command is run. Here is an example of a typical RPM installation command to install the libusb package:

```
# cd /tmp

# pwd

/tmp

# rpm -Uvh libusb-0.1.12-5.0.99.el4.at.x86_64.rpm

Preparing... ########################## [100%]

1:libusb ########################## [100%]

#
```

Note

When installing the packages there may be dependency issues. Error messages will be outputted and the install of the package will stop.

There are other ways to install the RedHat style packages on the various Linux distributions. The table below lists the tools that can be used to install the packages and helps with the resolution of dependency issues.

Table 2. Package Install Methods

Distribution	Install tool	Documentation
RedHat	up2date	http://kbase.redhat.com/faq/FAQ_80_7749.shtm
Fedora	yum	http://docs.fedoraproject.org/yum/
SuSE	yast	http://developer.novell.com/wiki/index.php/YaST

Note

You have to register your machine via Red Hat Network (RHN) to use up2date to install a new package that is available in Red Hat Network (RHN).

Debian Style Installs

Either download the Debian packages (.deb files) into a temporary directory, such as /tmp, or if using the install CD/DVD after mounting the CD/DVD, go to the directory that contains the package.

The next step is to issue the dpkg -i command to install the package.

```
#cd /tmp

# pwd

/tmp

#dpkg –-i libusb-0.1-4_0.1.12-7_i386.deb

#
```

Similar to the RPM packages there may be dependency issues when installing the package. Error messages will be outputted and the install of the package will stop. Another method of installing Debian packages is using apt-get. If dependencies occur, apt-get will give you the choice of installing additional packages.

For more information on installing Debian packages, go to:

http://www.debian.org/doc

CAC Software Built From Source

For systems that are not pre-built with smartcard support, and do not have pre-built packages available to install, you will need to build the binaries from source.

The following procedures will show how to build each set of binaries using publicly available source.

Prerequisites

- zlib-devel
- glibc
- gcc
- autoconf

- automake

Pcsc-lite

Get the source from:

https://alioth.debian.org/projects/pcsclite/

Unpack and build pcsc lite.

```
$ gunzip < pcsc-lite-1.4.4.tar.gz | tar xvf –

$ cd pcsc-lite-1.4.4

$ ./configure

$ make

$ sudo -s

# make install
```

You now should have installed pcsc in /usr/local/pcsc

As the pcsc library is installed to /usr/local/lib, you may have to configure your system so other builds will look in this directory for the library.

Ccid

Get the source from:

https://alioth.debian.org/projects/pcsclite/

Unpack and build ccid.

```
$ gunzip < ccid-1.3.0.tar.gz | tar xvf –
$ ./configure
$ make
$ sudo -s
# make install
```

You should now have the ccid driver in /usr/local/pcsc/drivers/ifd-ccid.bundle

CoolKey

Get the source from:

http://directory.fedoraproject.org/wiki/CoolKey

Unpack and build CoolKey.

```
$ gunzip < coolkey-1.1.0.tar.gz | tar xvf –
$ autoconf
$ ./configure
$ make
$ sudo -s
# make install
```

```
    or
# make install DEST=/my/destination/tree
```

Note

There is an NRL site which has some good information on building CAC software. The URL is:

https://airborne.nrl.navy.mil/PKI/ [https://airborne.nrl.navy.mil/PKI/]

Troubleshooting CAC Problems

Common Questions Asked About the CAC

1. What do I do if I am locked out of my CAC?

   SOLUTION: If you have been locked out your CAC PIN (after three incorrect tries) you should contact your local help desk to determine the location of the nearest CAC PIN Reset (CPR) station. You should go to an ID Card Issuance Facility (your central processing/badge office or Local Registration Authority) to have your PIN reset only if a CPR station is unavailable.

2. When attempting to access the 'Kerberos & Information Center' web site, you receive a message indicating “client certificate rejected” or “No User Certificate”.

   SOLUTION: Check to ensure that you have imported your DoD certificate into your browser, or your CAC is not in your reader.

3. When using your CAC to access a CAC enable website you receive a message that indiactes “Your certificate is expired” .

   SOLUTION: Your DoD PKI certificate has expired. View the certificates on your CAC to verify the expiration date.

4. When using your CAC you receive a message that says “Your certificate has been revoked.”

   SOLUTION: The certificates on your CAC may have been revoked for some reason, or there is a problem with the CAC. Contact the help desk to verify the status of your CAC.

5. What should I do if my CAC is lost?

   SOLUTION: You should report the loss of your CAC to the help desk and the nearest RAPIDS issuance station. The issue station will request revocation of the digital certificates and issue new certificates.

6. In Firefox, the user receives this message while logging in to a CAC supported web page:

   ```
   www.hpcmo.hpc.mil has received an incorrect or unexpected message.
   Error Code: -12227
   ```

   SOLUTION: Make sure the correct Security Module is loaded into Firefox. After bringing up the Firefox program use the following procedures to check for the correct Security Module:

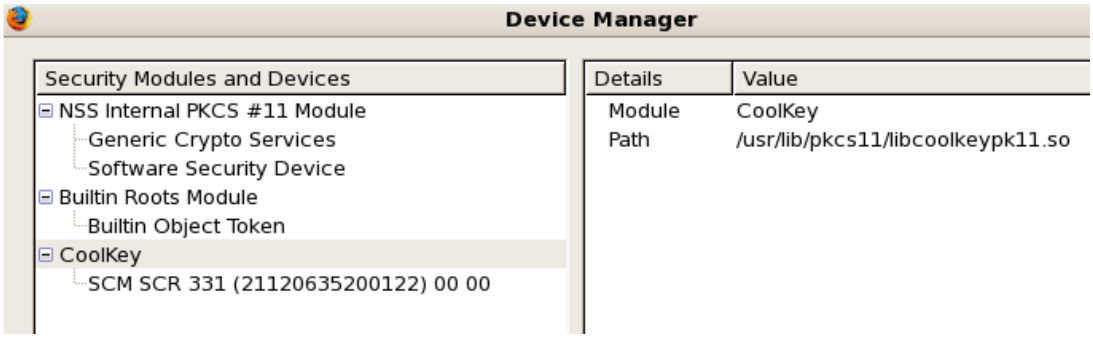
   On Firefox under Windows:

   Click on the Tools # Options...button

   On Firefox under Linux:

   Click on the Edit # Preferencesbutton

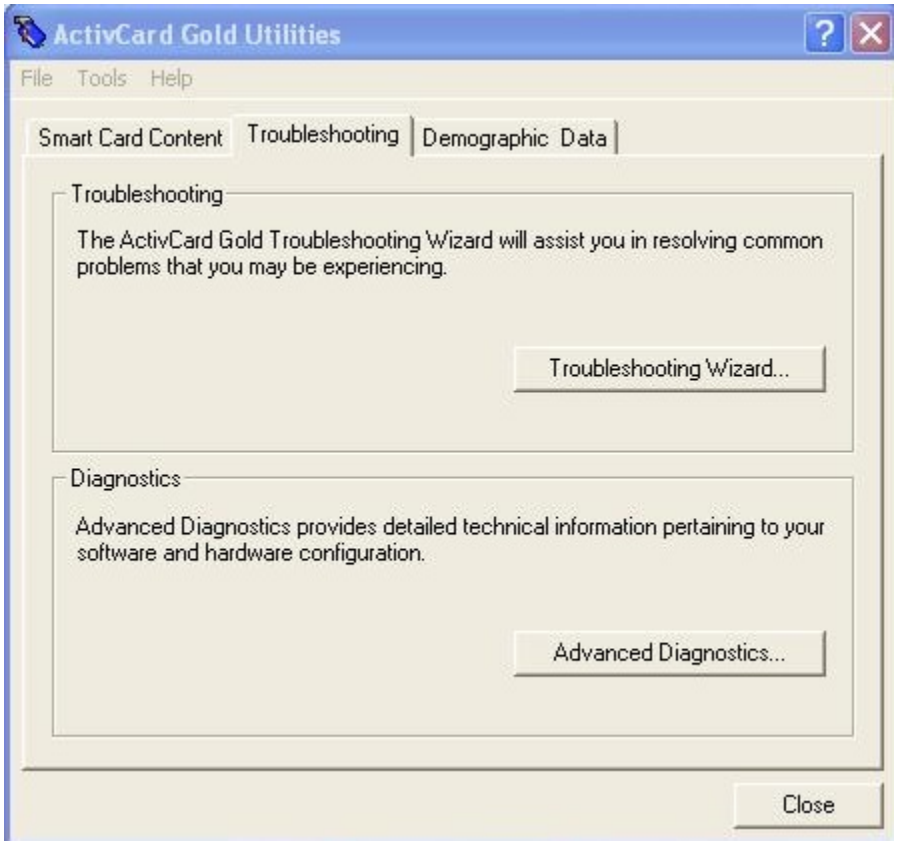
Once the window comes up, click on the 'Advanced' icon, then click on the 'Security Devices' button. Make sure a module has not been loaded for using the CAC. If the module is not loaded, you need to load it (typically libcoolkeypk11.so for Linux and acpkcs.dll or acpkcs211.dll for Windows).



Windows Troubleshooting Tools

Both ActivClient for CAC and ActivCard Gold for CAC contain an 'Advanced Diagnostics' option that will generate comprehensive information about your Operating System, Card Reader, and CAC. This information can be used to diagnose the problem you may be having with your CAC. The information can also be sent to the help desk for further analysis. The figure below shows a screen snap of the ActivCard Gold Utilities Windows. Simply click on the 'Advanced diagnostics...' button and you will be presented with a information window explaining what the diagnostics report will contain. After pressing the 'Next >' button the diagnostics will run.

Figure 1. ActivCard Gold Advanced Diagnostics



After running the advanced diagnostics, information similar to what is displayed below will be generated.

Note

Only information about the Reader and the CAC are shown. There is additional information on applets, the OS, registry settings, functions, DLLs, and the browser.

```
=== This is the ActivCard Gold diagnostics information generated
on Fri Nov 30 15:29:15 2007 on the machine 'BLUEJAY'. ===


-- HARDWARE INFORMATION --

- Readers:

Found '1' readers

Reader #1:

Reader Name = SCM Microsystems Inc. SCR33x USB Smart Card Reader 0
Channel Type = 0x20
Channel ID = 0x00
Characteristics = 0
Default Clock Rate = '4000' kHz
Default Data Rate = '10753' bps
Friendly Name = 'SCM Microsystems Inc. SCR33x USB Smart Card Reader 0'
System Name = 'SCM Microsystems Inc. SCR33x USB Smart Card Reader 0'
Device Unit = '0'
ICCInterfaceStatus = 'FF'
ICCPresence = '02'
Max Clock Rate = '8000'
Max Data Rate = '344105'
Max IFSD = '254'
Power Mgmt Support = '0'
Protocol Types = '3'
Vendor IFD Type = 'SCR33x USB Smart Card Reader'
Vendor IFD Version = '5.34.0'
Vendor Name = 'SCM Microsystems Inc.'



-- SMART CARD INFORMATION --

- Scanning reader SCM Microsystems Inc. SCR33x USB Smart Card Reader 0

Card inserted = YES
Pin checked = NO
Pin tries left = 3
Card State = OK
Card ATR = 3b db 96 00 80 1f 03 00 31 c0 64 77 e3 03 00 82 90 00 c1
  (unknown card)
Card CUID = 20 50 50 00 10 28 00 55 08 83

Card Manager:
```

```
ID = a0 00 00 00 03 00 00

Applet PIN:
Keyset Version = 0
Keyset Index = 0
Applet Version = 01 00 00 0e
Applet ID = a0 00 00 00 79 03 00
Min PIN length = 6
Max PIN length = 8
Weak PIN flag = 0
Change PIN AfterFirstUse flag = 0
Effective PIN length = 8
```

There is also a 'Troubleshooting Wizard...' button available to help diagnose problems with the CAC. The figure below shows the results after running the troubleshooting wizard.

Figure 2. Results After Running the Troubleshooting Wizard

Linux Troubleshooting Tools

A package called pcsc-tools is available with the RedHat and Debian style Linux distributions. These tools are used to test a PC/SC driver, card or reader and display the output in text format. The following programs are available in the pcsc-tools package.

- pcsc_scan(1) scans available smart card readers and print detected events: card insertion with ATR, card removal.
- ATR_analysis(1) analyses a smart card ATR (Answer To Reset).
- scriptor(1) Perl script to send commands to a smart card using a batch file or stdin.
- gscriptor(1) the same idea as scriptor.pl(1) but with Perl-Gtk GUI.

After running the pcsc_scan command, information will be displayed to the screen as shown below.

```
$ pcsc_scan
PC/SC device scanner
V 1.4.9 (c) 2001-2006, Ludovic Rousseau <ludovic.rousseau@free.fr>
Compiled with PC/SC lite version: 1.4.2
Scanning present readers
0: SCM SCR 331 (50107A05) 00 00

Fri Nov 30 16:24:11 2007
 Reader 0: SCM SCR 331 (50107A05) 00 00
  Card state: Card removed,

Fri Nov 30 16:24:21 2007
 Reader 0: SCM SCR 331 (50107A05) 00 00
  Card state: Card inserted,
  ATR: 3B DB 96 00 80 1F 03 00 31 C0 64 77 E3 03 00 82 90 00 C1
```

Definitions

These are to get references right in the glossary API Cryptoki PKCS RSA

dummy	This is a placeholder because a glossary can't be empty. It will be filled in from glossary.collection parameter