Teradici PCoIP Remote Workstation Card Agent for Windows Documentation

This documentation is intended for administrators who are installing the **Remote Workstation Card Agent for Windows** as part of a Teradici Remote Workstation Card system. It assumes thorough knowledge of conventions and networking concepts, including firewall configuration.

Although many agent features and settings can be configured using the Windows user interface, some administrative tasks require use of Windows command line tools. Users should be familiar with both *cmd* and *PowerShell*.

About the PCoIP Remote Workstation Card Agent for Windows

The PCoIP Remote Workstation Card Agent for Windows introduces Teradici brokering to a Teradici Remote Workstation Card deployment, allowing the desktop to be managed by Teradici Cloud Access Manager or by third-party brokers that support the PCoIP Broker protocol.

A complete PCoIP Remote Workstation Card deployment includes these components:

- **A physical host machine**, which provides the desktop to remote clients. See System Requirements for more information.
- A PCoIP Remote Workstation Card installed on the host machine.
- The PCoIP Remote Workstation Card software for Windows installed on the host machine.
- The Remote Workstation Card Agent for Windows installed on the host machine.

About PCoIP Licensing

When the Remote Workstation Card Agent for Windows is installed, the Remote Workstation Card can be licensed using a Remote Workstation Card license. With this flexibility, you can conveniently move to Remote Workstation Card and virtual solutions when you are ready, and without changing licenses.

What's New in This Release

Release 22.04 of the Remote Workstation Card Agent for Windows includes:

- This release maintains version parity with other products.

System Requirements

The Remote Workstation Card Agent for Windows depends on the following system capacities and capabilities:

Supported Instance Types

The Remote Workstation Card Agent for Windows requires a physical machine with a PCoIP Remote Workstation Card installed.

Host Instance Requirements

Global instance requirements	
Operating Systems	• Windows 10 21H1, 21H2 (64-bit Professional and Enterprise) • Windows Server 2016, 2019 (single-user only) • Windows 11 *(Technology preview; not for production use)*
Remote Host Memory	At least ***2GB*** of RAM is required on the host desktop. The agent should have at least ***512MB*** of available memory.
Remote Host CPUs	At least 2 CPUs are required on the host desktop. Processors must support Streaming SIMD Extensions (SSE) 4.2.
Network Ports	The following ports must be open on the host desktop: • TCP 443 • TCP 4172 • UDP 4172 • TCP 60443 Collaboration sessions require an open UDP port (default 64172)

Global instance requirements	
Storage	At least 100MB for installation and 100MB for logging are recommended.

PCoIP Remote Workstation Card Agent for Windows Installation Guide

Before you proceed with installation, a few prerequisites must be met.

Prerequisites

These instructions assume you have already built the remote desktop machine, and that the machine meets the agent's requirements.

A few other things to confirm before proceeding:

- You should have already installed the Remote Workstation Card Software for Windows on the desktop machine.
- The desktop machine requires the following ports to be open: TCP 443, TCP 60443, TCP 4172, and UDP 4172.
- You should be able to run applications as an administrator.
- The PCoIP Agent must be able to execute PowerShell scripts. If your PowerShell execution policy set to ***Restricted***, the execution policy will be automatically changed so installation can proceed. ***If the agent cannot execute PowerShell scripts or change the execution policy, the installation will fail***.
- If you are using a PCoIP Local License Server, you'll need to know it's URL and port numbers.

Installation Overview

Once your prerequisites are in place, you can proceed with installation. Here's a brief overview of the process:

1. Temporarily connect a physical display, mouse, and keyboard to the machine for installation.
2. Download or transfer the PCoIP Remote Workstation Card Agent for Windows installer to the system.

3. Install the PCoIP Agent using one of these methods:
    - Using the installer's setup wizard for a guided, interface-driven process, or
    - Silently using a script
4. If required, configure the agent software.
5. Disconnect physical display, mouse, and keyboard.
6. Connect to the desktop using a PCoIP client.

If you're ready to start, proceed to installation.

Installing the PCoIP Remote Workstation Card Agent for Windows

Download the Remote Workstation Card Agent for Windows Installer

The Remote Workstation Card Agent for Windows installs at the system level and is available to all users. You must have administrator privileges to install it. You can download the installer directly onto the machine, or download it separately and transfer it yourself.

The installer can be downloaded here.

Install or Update the Remote Workstation Card Agent for Windows

Once the installer is present on the desktop, you can run the setup wizard or install it silently using a script. The procedure is the same for new installations and system upgrades.

Installing the Remote Workstation Card Agent for Windows using the Wizard

If you're installing the Remote Workstation Card Agent for Windows via the Windows interface and would prefer to use a graphical interface and guided setup, use the Remote Workstation Card Agent for Windows setup wizard.

> **Important: Required ports will be automatically opened**
>
> The Remote Workstation Card Agent for Windows installer will add firewall exceptions for the following required PCoIP ports during installation: TCP 443, TCP 4172, UDP 4172, and TCP 60443.

To install the Remote Workstation Card Agent for Windows using the setup wizard:

1. Temporarily connect a physical display, mouse, and keyboard to the machine for installation.

2. Navigate to the Remote Workstation Card Agent for Windows installer file and launch it. The setup wizard will appear.
3. Select an installer language and click **OK**.
4. Click **Next** at the welcome screen.
5. Review and accept the license agreement by clicking **I agree**.
6. Specify an installation directory and click **Install**.

   By default, the software will be installed in the `C:\Program Files (x86)\Teradici\Remote Workstation Card Agent for Windows` directory.
7. Provide your licensing information on the License Registration screen.

   Type or paste a registration code in the ***Registration code*** field and click **Next** for the proxy settings screen.

   > **Important: Local license server users**
   >
   > If you are using a local PCoIP License Server, do not enter a registration code here. Select **Not now** and then click **Next** instead. You will configure your license server information later.

   - If you use a proxy server to access the internet, select **Use a proxy server for Internet connection** and specify the address and port numbers of the proxy server, then click **Next** to register the license.
   - If your system does ***not*** use a proxy server, leave this screen unchanged and click **Next** to register the license.
8. The Windows desktop must be rebooted to complete installation; you can choose to do that now, or do it yourself later. Some features may not work until the system is restarted.
9. Click **Finish** to exit the installer.
10. If you skipped license registration, complete registration by following one of the procedures listed here.
11. Disconnect the monitor, keyboard, and mouse.

Once the Remote Workstation Card Agent for Windows is installed and licensed, you can configure it or connect to it with a PCoIP client.

Scripted Installations

The Remote Workstation Card Agent for Windows can be installed on the desktop programmatically, without using a graphical interface. The installation will proceed silently and the system will reboot when finished.

Scripted installation requires access to the Windows Command Prompt or PowerShell.

> **Important: Required ports will be automatically opened**
>
> The Remote Workstation Card Agent for Windows installer will add firewall exceptions for the following required PCoIP ports during installation: TCP 443, TCP 4172, UDP 4172, and TCP 60443.

To install the Remote Workstation Card Agent for Windows via a script:

1. Temporarily connect a physical display, mouse, and keyboard to the machine for installation.
2. Copy the agent installer file to the desktop.
3. Run the agent installer using one of the following methods:
   - Windows BAT: Open a Windows command line tool and enter the following:

     ```
     start /WAIT <path_to_installer> /S /NoPostReboot
     echo %ERRORLEVEL%
     ```

     ...where `<path_to_installer>` is the system filepath of the installer file.
   - Windows PowerShell: Open a PowerShell window and enter the following:

     ```
     $process = Start-Process -FilePath <path_to_installer> -ArgumentList
"/S /NoPostReboot _?<path_to_installer>" -Wait -PassThru
$process.ExitCode
     ```

     ...where `<path_to_installer>` is the system filepath of the installer file. Note that this argument is used twice!

   Both methods will return one of these process return codes:

code	description
0	success
1	installation aborted by user (user cancel)
2	installation aborted due to error
1641	success, reboot required

4. If you are using Cloud Licensing, register the Remote Workstation Card Agent for Windows's license by running the **`pcoip-register-host.ps1`** script:

```
    C:\Program Files (x86)\Teradici\Remote Workstation Card Agent for
Windows\pcoip-register-host.ps1 [-ProxyServer <String>] [-ProxyPort <String>]
-RegistrationCode <String> [<CommonParameters>]
```

   Where:

   - `-RegistrationCode` sets the registration code to use.
   - `-ProxyServer` sets the address of your proxy server, if you have one.
   - `-ProxyPort` sets the port number of your proxy server, if you have one.

> **Important: PowerShell execution policy**
>
> PowerShell scripts must be permitted to run on your machine. If your execution policy prevents pcoip-register-host.ps1 from running, you can temporarily enable PowerShell script execution with the following command:
>
> ```
>     powershell.exe -InputFormat None -ExecutionPolicy Bypass -Command .\pcoip-register-
> host.ps1
> ```

Once the Remote Workstation Card Agent for Windows is installed and licensed, you can configure it or connect to it with a PCoIP client.

Register a License After Installation

In most cases, a PCoIP license is registered during installation. If you are using a local license server, or if you skipped registration during installation, you can register your agent using the methods described next.

- **Registering with Teradici Cloud Licensing**: If you are using Teradici's Cloud Licensing service (most systems use this method), you can register the agent using the PCoIP control panel or via a PowerShell script.
- **Registering with a Local License Server**: If you are serving licenses with your own license server, your registration method depends on your brokering environment. For complete information and instructions, see Licensing Remote Workstation Card Agent for Windowss with a Local License Server.

Licensing The Remote Workstation Card Agent for Windows

The Remote Workstation Card Agent for Windows must be assigned a valid PCoIP session license before it will work. Until you've registered it, you can't connect to the desktop using a PCoIP client.

You receive a registration code when you purchase a pool of licenses from Teradici. Each registration code can be used multiple times; each use consumes one license in its pool.

> **Note: Registration code format**
>
> Registration codes look like this: `ABCDEFGH12@AB12-C345-D67E-89FG`

PCoIP agent license registrations are managed automatically by Teradici's Cloud Licensing service. If necessary, you can manage them yourself, using your own locally-installed PCoIP license server instead.

If you need to purchase Cloud Access licenses, contact Teradici.

Troubleshooting Licensing Issues

If you're encountering problems with Teradici licensing, refer to Troubleshooting License Issues.

Using Teradici Cloud Licensing

To use Cloud Licensing, all you need to do is provide a registration code for each Remote Workstation Card Agent for Windows in your deployment (the same registration code can be used multiple times).

Whitelist network blocks for Teradici Cloud Licensing

If you are using Teradici Cloud Licensing, you will need to whitelist the following:

- teradici.flexnetoperations.com
- teradici.compliance.flexnetoperations.com

Alternatively, you can also ensure the following network blocks are whitelisted:

- **Production**: 64.14.29.0/24
- **Disaster Recovery**: 64.27.162.0/24

The following network blocks are not currently in use, but may also be used in the future:

- **Production**: 162.244.220.0/24
- **Disaster Recovery**: 162.244.222.0/24

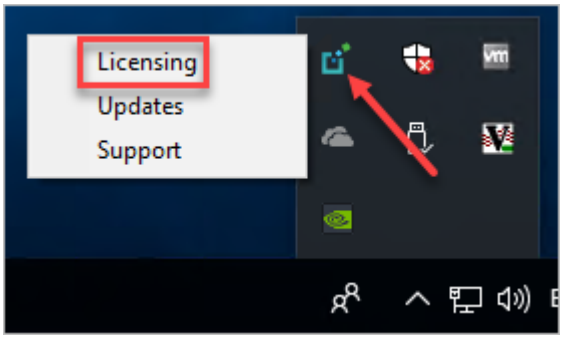
The Windows setup wizard collects this registration code during installation. If you're already registered your PCoIP agents, there's nothing more to do here. If you've already installed the PCoIP agent software but ***have not*** registered it yet, you can register post-installation using the PCoIP Control panel or via a PowerShell Script.

Register or Renew a PCoIP License With the PCoIP Control Panel

Use this method to register or renew an installed PCoIP agent using the Windows user interface.

To provide the registration code via the PCoIP Control Panel:

1. Connect to the desktop using a physical keyboard, mouse, and display (if you're renewing a license that is still active, you can use a PCoIP session to do this instead).
2. Open the ***PCoIP control panel*** by clicking  in the system tray and select **Licensing** from the pop-up menu:



The PCoIP Control panel appears with the licensing tab enabled.

3. Provide the registration code in the registration code field.

Register or Renew a PCoIP License With PowerShell

Use this method to register a PCoIP agent using Windows PowerShell. You can do this during a scripted installation, or at any time after installation.

To provide the registration code via the Windows PowerShell script:

1. Connect to your dekstop using a physical keyboard, mouse, and display.
2. Run the `pcoip-register-host.ps1` script:

```
    "C:\Program Files\Teradici\PCoIP Agent\pcoip-register-host.ps1" [-
ProxyServer <String>] [-ProxyPort <String>] -RegistrationCode <String>
[<CommonParameters>]
```

Where:

- `-RegistrationCode` sets the registration code to use.
- `-ProxyServer` sets the address of your proxy server, if you have one.
- `-ProxyPort` sets the port number of your proxy server, if you have one.

Important: PowerShell execution policy

PowerShell scripts must be permitted to run on your machine. If your execution policy prevents pcoip-register-host.ps1 from running, you can temporarily enable PowerShell script execution with the following command:

```
    powershell.exe -InputFormat None -ExecutionPolicy Bypass -Command .\pcoip-register-
host.ps1
```

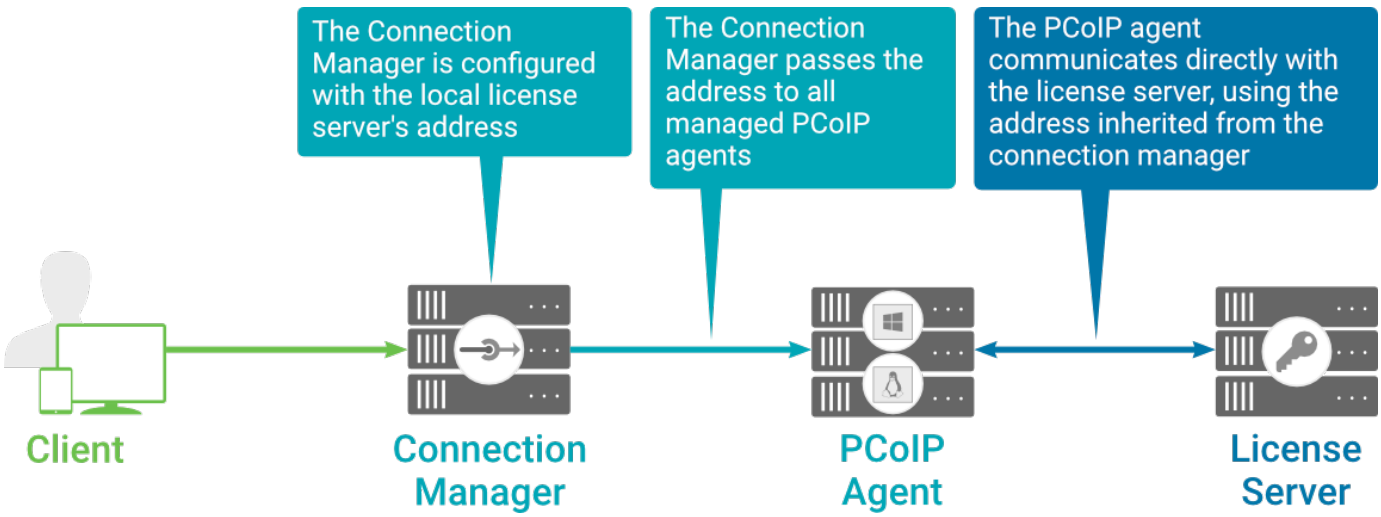
Licensing PCoIP Agents With a Local License Server

In deployments where PCoIP agents cannot access the internet, or where cloud-based licensing is not permitted or desired, a local PCoIP License Server can be used instead. The PCoIP License Server manages PCoIP session licenses within your private environment.

Configuring PCoIP agents to use a local license server is done in one of two ways, depending on whether your deployment uses a PCoIP Connection Manager, or whether your PCoIP clients connect directly to PCoIP agents.

Brokered Environment Licensing

In ***brokered*** deployments, the license server address is configured in the Connection Manager, which passes it through to its managed PCoIP agents.



When using a Connection Manager, the license server address is only configured once no matter how many PCoIP agents are behind the Connection Manager.

To set the License Server URL in the Connection Manager:

1. On the Connection Manager machine, use a text editor to open /etc/ConnectionManager.conf.
2. Set the `LicenseServerAddress` parameter with the address of your local license server:
   - `http://{license-server-address}:{port}/request`
3. Save and close the configuration file.

4. Restart the Connection Manager.

Verifying Your Brokered Licensing Configuration

To verify your system's licensing configuration, run the `pcoip-validate-license.ps1` PowerShell script on the PCoIP Agent machine. The script will ping the license server and attempt to retrieve information on an available license:

```
    "C:\Program Files\Teradici\PCoIP Agent\pcoip-validate-license.ps1" -
LicenseServerUrl <license-server-address> [-ThroughProxyServer <proxy-server-
address>] [-ProxyPort <proxy port>]
```

Where `<license-server-address>` is the address of the license server to ping, formatted as `http://{license-server-address}:{port}/request`

If the license server is behind a proxy server, provide the proxy information via the `-ThroughProxyServer` and `-ProxyPort` parameters.

If successful, the response will show that a valid license was found on the license server, and its expiration date.

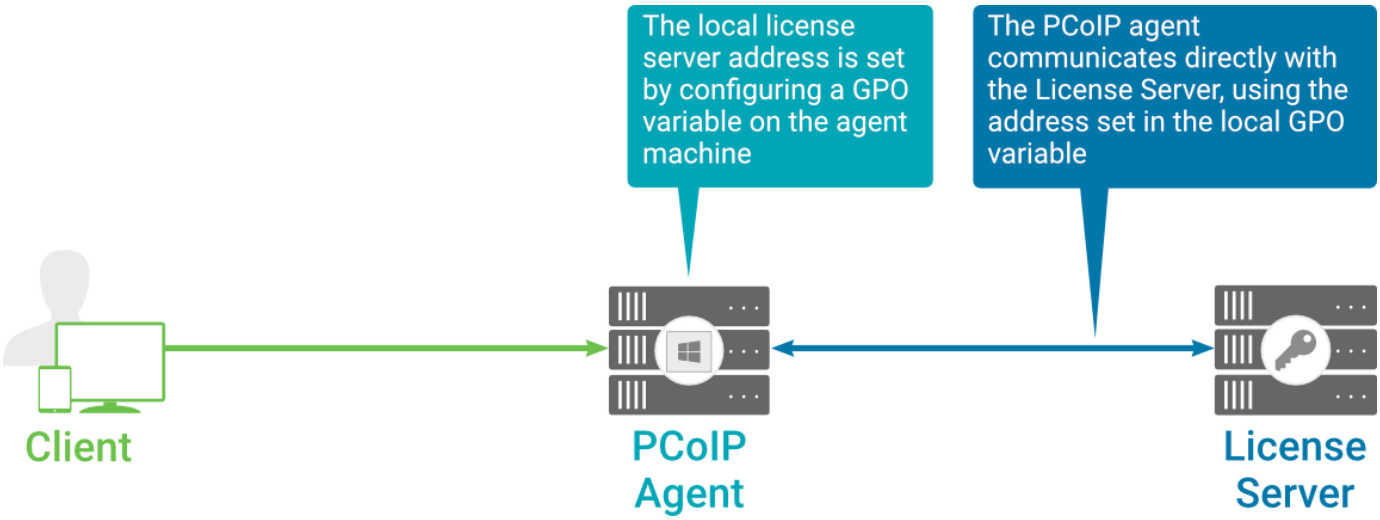
If the connection is unsuccessful, investigate the following possibilities:

- The license server address is incorrect, or formatted incorrectly.
- The license server is inaccessible.
- There are no available licenses on the license server. `pcoip-validate-license.ps1` will only return a positive response if there is at least one available session license.
- If you have only one license on the license server and run `pcoip-validate-license.ps1` from a PCoIP session, the command will fail because you are currently using the single license. In this scenario, disconnect your PCoIP session and try again from an RDP session instead.

Unbrokered Environment Licensing

In direct, or unbrokered, deployments, each Remote Workstation Card Agent for Windows is configured with the license server address via a GPO variable. When a client initiates a new

PCoIP session, the Remote Workstation Card Agent for Windows uses its local configuration to communicate with the license server.



Local license validation using a PCoIP Windows agent and a direct (unbrokered) connection

Each Remote Workstation Card Agent for Windows in your environment must be individually configured with the license server's URL.

To configure the License Server URL on the PCoIP Agent machine:

1. Open the Local Group Policy Editor on the agent machine:
   a. Press + `r` to open the run dialog
   b. type `gpedit.msc` and press `Enter`.
2. Navigate to *Computer Configuration* > *Administrative Templates* > *PCoIP Session Variables* > *Overridable Administrative Defaults*.

   The list of configurable PCoIP settings will appear in the right panel.
3. Open the **Configure the license server URL** variable.
4. Select the **Enabled** option.
5. Enter the License Server URL in the option field and click **OK**. The URL format is `http://{license-server-address}:{port}/request`.

Verifying Your Unbrokered Licensing Configuration

To verify your system's licensing configuration, run the `pcoip-validate-license.ps1` PowerShell script. The script will ping the license server using the local GPO configuration and attempt to retrieve information on an available license:

```
"C:\Program Files\Teradici\PCoIP Agent\pcoip-validate-license.ps1"
```

If successful, the response will show that a valid license was found on the license server, and its expiration date.

If the connection is unsuccessful, investigate the following possibilities:

- The license server address is incorrect, or formatted incorrectly.
- The license server is inaccessible.
- There are no available licenses on the license server. `pcoip-validate-license.ps1` will only return a positive response if there is at least one available session license.
- If you have only one license on the license server and run `pcoip-validate-license.ps1` from a PCoIP session, the command will fail because you are currently using the single license. In this scenario, disconnect your PCoIP session and try again from an RDP session instead.

Updating the Remote Workstation Card Agent for Windows

To install an update:

To update the Remote Workstation Card Agent for Windows, copy the new installer file onto the host machine and run it in place, either via the installation wizard or silently via command line.

Unisntalling the Remote Workstation Card Agent for Windows

The Remote Workstation Card Agent for Windows can be uninstalled using the Windows Control panel, or by running the uninstall utility provided in the agent's installation directory.

In either case, you should disconnect any active PCoIP sessions and then connect to the machine *as an administrator* with a physical keyboard, mouse, and display.

- To uninstall using the Windows Control Panel: Open the Windows Control Panel, navigate to *Programs* > *Uninstall a program*, select the Remote Workstation Card Agent for Windows from the list, and click uninstall.
- To uninstall using the provided utility: Run the executable found at `C:\Program Files (x86)\Teradici\PCoIP Agent\uninst.exe`,

Security Certificates in PCoIP Agents

PCoIP requires a certificate to establish a session. By default, PCoIP agents generate a self-signed certificate that secures the PCoIP session. Each component in the PCoIP system can generate these self-signed certificates, which will automatically work together without requiring any configuration.

You can, if needed, create and deploy your own custom certificates instead of relying on Teradici's self-signed certificates. This section explains how to create and implement custom certificates.

Using Custom Security Certificates

You can use OpenSSL, Microsoft Certification Authority, or a public certificate authority (CA) of your choice to create your certificates. If you are not using OpenSSL, consult your certificate authority's documentation for instructions on creating certificates in a Windows Certificate Store-compatible format.

The procedures is this section use OpenSSL to generate certificates that will satisfy most security scanner tools when the root signing certificate is known to them.

> **Caution: Certificates are stored in the Windows Certificate Store**
>
> Certificates are stored in the Windows certificate store. If you have old certificates that are stored on the host, they should be deleted to avoid conflicts or confusion.

Custom Certificate Guidelines

If you choose to use your own certificates, follow these general guidelines:

- Save your root CA signing certificate in a safe place for deployment to clients.
- Back up private and public keys to secure locations.
- Never store files created when generating keys or certificates on network drives without password protection.

- Once certificates have been deployed to the Windows certificate store, the files they came from are no longer needed and can be deleted.
- Standard automatic tools, such as Automatic Certificate Enrollment and Group Policy, can be used for deploying automatically generated certificates. Both Automatic Certificate Enrollment and Group Policies are implemented through Active Directory. See MSDN Active Directory documentation for more information.

Pre-session Encryption Algorithms

Connections are negotiated using the following supported RSA cipher suites:

- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_RSA_WITH_AES_256_GCM_SHA384
- TLS_RSA_WITH_AES_128_GCM_SHA256
- TLS_RSA_WITH_AES_256_CBC_SHA256
- TLS_RSA_WITH_AES_128_CBC_SHA256
- TLS_RSA_WITH_AES_256_CBC_SHA
- TLS_RSA_WITH_AES_128_CBC_SHA

Note: Minimum SSL version

These Max Compatibility security level cipher suites have a minimum required SSL version of TLS 1.2.

Creating And Installing Custom Certificates

This section describes how to replace Teradici's default certificates with your own custom certificates.

> **Note: These procedures use OpenSSL**
>
> The procedures in this section use OpenSSL to create private keys, certificate signing requests, and certificates. To use OpenSSL, install Visual C++ 2008 Restributables and Win32 OpenSSL Light v1.0.2g+.
>
> For detailed information about OpenSSL, refer to OpenSSL documentation.

To replace Teradici's default certificates with custom certificates:

1. Install required OpenSSL components on your system.
2. Create the internal root CA certificate.
3. Create a private key and certificate pair for the PCoIP Agent.
4. Configure the certificate mode for each desktop.
5. Install the internal root CA in your PCoIP clients.

Installing OpenSSL Requirements

Install the following components on your Windows machine:

- Visual C++ 2008 Redistributables
- Win32 OpenSSL v1.0.2g Light (or later).

  When prompted during OpenSSL installation, copy the OpenSSL DLLs to the OpenSSL binaries directory; for example, C:\OpenSSL-Win32\bin.

> **Note: Examples use the default installation directory**
>
> The following examples assume the default OpenSSL installation directory: `C:\OpenSSL-Win32`.

Creating the Internal Root CA Certificate

This section shows how to create a root CA private key, how to use this key to self-sign and generate an internal root CA certificate, and how to add X.509 v3 extensions to a certificate that restrict how the certificate can be used.

Creating a Root CA Private Key

To create a root CA private key in RSA format:

1. Open a command prompt and navigate to the OpenSSL binaries directory (`c:\OpenSSL-Win32\bin`).
2. Type `openssl` and press `Enter` to launch OpenSSL.

   > **Note: OpenSSL may need help finding the .cfg file**
   >
   > If you see the following error, you will need to set the OPENSSL_CONF variable before proceeding.
   >
   > ```
   > WARNING: can't open config file: /usr/local/ssl/openssl.cnf
   > ```

3. To create 3072-bit root RSA key named ***rootCA.key***, use one of the following commands:
   - For an ***unsecured*** key, type:

     ```
     genrsa -out rootCA.key 3072
     ```

   - For a ***password-protected*** key, add the -des3 argument:

     ```
     genrsa -out rootCA.key -des3 3072
     ```

   Password-protected keys require the password to be entered each time they are used.

> **Caution: Store your private root key in a safe location**
>
> Anyone with access to your private root key can use it to generate certificates that your PCoIP clients will accept.

Setting the OPENSSL_CONF variable

If OpenSSL is unable to find its configuration file, you may need to set the OPENSSL_CONF variable.

To set the OPENSSL_CONF variable:

1. Exit OpenSSL.
2. Type the following command:

```
set OPENSSL_CONF=C:\OpenSSL-Win32\bin\openssl.cfg
```

3. Type `ssl` and press `Enter` to continue with the step you were performing when you saw the error.

Self-signing and Creating the Internal Root CA Certificate

Now that we have our private key, we will use it to generate a self-signed X.509 root CA certificate called **rootCA.pem** that is valid for 1095 days (1095 days is three years, ignoring leap days).

To create the root CA certificate:

1. Type the following command. This example creates a certificate that is valid for 3 years (1095 days). Change the `-days` parameter to customize the certificate lifetime:

```
req -x509 -new -nodes -key rootCA.key -days 1095 -out rootCA.pem
```

   An interactive script will run, which prompts you to enter values for several fields.

2. Follow the prompts to enter field values:

Field	Notes
Country Name	Optional. Use one of the ISO 3166-1 alpha-2 country codes.
State or Province Name	Optional

Field	Notes
Locality name	Optional
Organization Name	Optional
Common name	**Required**. Enter a name for your root CA (for example, certificates.mycompany.com)
Email address	Optional. Enter an administrative alias email if you use this field.

Note: Field values can be templatized

If you will be creating a lot of certificates, consider using a configuration file that contains global field values. See http://www.openssl.org/docs for more information.

Creating a Private Key and Certificate for the PCoIP Agent

For each PCoIP Agent instance, you will create three items:

- A private key file
- A certificate signing request (CSR)
- A certificate

You will also need an X.509 v3 extension file, which is used as an input when generating the workstation certificate.

Note: There are two different private keys

The private key you create here is used by the PCoIP Agent to decrypt data. It is different from the internal root CA private key.

Creating an X.509 Version 3 Extension File

X.509 Version 3 extensions restrict how certificates can be used.

To create the X.509 v3 extension file:

1. Using a text editor, open a new file and paste the following text into it:

```
authorityKeyIdentifier=keyid,issuer
basicConstraints=CA:TRUE
keyUsage=digitalSignature, nonRepudiation, keyEncipherment, dataEncipherment
subjectAltName=email:test@mycompany.com
```

2. Save the file with an **.ext** extension (for example, `v3.ext`).
3. Store the file in the `C:\OpenSSL-Win32\bin directory`.

> **Note: More about X.509 v3 extensions**
>
> For more information about X.509 v3 certificate extensions, see https://www.openssl.org/docs/apps/x509v3_config.html.

Creating the Private Key and Certificate

To create the PCoIP Agent's private key, certificate signing request, and certificate:

1. Launch **openssl** from the `C:\OpenSSL-Win32\bin` directory.
2. Create a *3072-bit private key* in RSA format:

```
genrsa -out pcoipprivate.pem 3072
```

   This command creates a pcoipprivate.pem file in the current directory.

3. Create a *certificate signing request*:

```
req -new -key pcoipprivate.pem -out pcoip_req.csr
```

   This command initiates an interactive script that prompts you to enter certificate metadata.

   You may be prompted for a challenge password and company name.

   The **Common Name** field must be the fully-qualified domain name (FQDN) of the desktop where the PCoIP agent is installed for example, `mypcname.mydomain.local`. If you want to

use the same certificate on multiple machines in the same domain, use a wild card for all but the last two segments of the FQDN: `*.mydomain.local`.

When finished, this command creates a `pcoipprivate.pem` file in the current directory.

4. Sign and create an ***X.509 v3 certificate***. This example creates a certificate valid for one year (365 days). To customize the certificate lifetime, change the `-days` parameter:

```
x509 -req -outform PEM -in pcoip_req.csr -extfile v3.ext -CA rootCA.pem -
CAkey rootCA.key -CAcreateserial -sha256 -out pcoipcert.pem -days 365
```

This command creates a *poipcert.pem* file in the current directory.

> **Caution: Use Secure Hash Algorithms**
>
> Windows Certificate Manager has deprecated the use some older hash algorithms such as MD4, MD5, and SHA1. Use SHA-384 or SHA-256 when creating your certificates.

5. Create a ***PKCS#12 file*** to import into a Windows certificate store. Replace `<password>` with your password:

```
pkcs12 -export -in pcoipcert.pem -inkey pcoipprivate.pem -name PCoIP -out
pcoipagent.p12 -password pass:<password>
```

This command creates a `pcoipagent.p12` file in the current directory.

> **Note: The -name parameter must be 'PCoIP'**
>
> You must specify `PCoIP` as the `-name` parameter value. This value sets the certificate's friendly name.

6. Place the `pcoipagent.p12` and `rootCA.pem` files where administrative users of the PCoIP Agent can access them, such as on network storage or on a USB key.

Installing the Private Key and Certificate on the PCoIP Agent Desktop

The agent certificate and signing certificate must be installed on each desktop running a PCoIP Agent.

To install the agent certificate and signing certificate:

1. Open the Microsoft Management Console on the agent machine:
    a. Press + `r` to open the run dialog
    b. type `mmc` and press `Enter`.
2. Add the Certificates snap-in:
    a. Select **File** > **Add/Remove Snap-in**.
    b. Select **Certificates** from the Available snap-ins list and click **Add**.
    c. Select **Computer account** and click **Next**.
    d. Select **Local computer** and click **Finish**.
    e. Click **OK**.
3. Add `rootCA.pem` to the 's Trusted Root Certification Authorities list:
    a. Expand **Certificates (Local Computer)**.
    b. Right-click **Trusted Root Certification Authorities**, select **All Tasks** > **Import from the context menu**, and click **Next**.
    c. Use the Browse button to navigate to the directory where the `rootCA.pem` file is located.
    d. Select **All Files (*.*)** from the File name drop-down list, and select the `rootCA.pem` file.
    e. Click **Open**, **Next** (twice), and **Finish**.
    f. Click **OK** to close the *The import was successful* message.
4. Add `pcoipagent.p12` to the Personal store of the agent's computer account:
    a. Expand **Certificates (Local Computer)**.
    b. Right-click **Personal**, select **All Tasks** > **Import** from the context menu, and click **Next**.

c. Select **Personal Information Exchange (*.pfx;*.p12)** from the File name drop-down list, and select the `pcoipagent.p12` file.

d. Click **Open** and **Next**.

e. Type the certificate password.

f. Ensure these settings are correct:

- **Mark this key as exportable...** is enabled
- **Include all extended properties** is enabled

g. Click **Next** twice and **Finish**.

h. Click **OK** to close the The import was successful message.

5. Restart the PCoIP Agent service on the workstation:

a. Open Control Panel and select **Administrative Tools**.

b. Double-click **Services**.

c. Select your PCoIP Agent service in the Services list.

d. Click **Restart the service**.

Installing the Internal Root CA Certificate in a PCoIP Client

Your root CA certificate must be installed in any PCoIP client that will be used to connect to the PCoIP Agent.

Installing Root CA Certificates on a Zero Client

Zero clients are managed via an Administrative Web Interface (AWI) and accessed using a web browser. Supported browsers are:

- Firefox 86
- Chrome 60
- Internet Explorer 11
- Microsoft Edge 25

> **Note: Browser must support TLS**
>
> Web browsers must support TLS 1.2 or later to connect to the zero client's Administrative Web Interface.

To upload the root CA certificate to a zero client:

1. From a supported browser, enter the IP address of the zero client and log in to its Administrative Web Interface.
2. Select the **Upload** > **Certificate** menu to display the ***Certificate Upload*** page.
3. In the ***Certificate filename*** field, click **Browse**, and then navigate to the directory that contains your root CA certificate.
4. Select your root CA certificate (`*.pem`) and then click **Open**.
5. Click **Upload** and then **OK**.
6. Click **Continue**.

If the certificate uploads successfully, it will appear in the Uploaded Certificates section on this page.

Installing Root CA Certificates on a Mobile Client

Before you can install the root CA certificate in a PCoIP Mobile Client, you must change the file extension from `.pem` to `.crt`.

The `.pem` extension is used for different types of X509 v3 files that contain ASCII Armor (Base64) data prefixed with a "-----BEGIN" line. The `.crt` extension is used for certificates that may be encoded either in binary DER format or ASCII PEM format.

Installing Root CA Certificates in the PCoIP Software Client for macOS

> **Important: Root CA Certificate must have a .crt extension**
>
> You must change the root CA certificate's extension from `.pem` to `.crt` before installing it on a PCoIP Software Client.

In macOS, certificates are stored in the Keychain Access application.

To import your root CA certificate in the PCoIP Software Client for macOS:

1. Copy your root CA certificate file (*.crt) to the Mac client desktop.
2. Double-click **Applications** > **Utilities Keychain Access.app** to open Keychain Access.
3. Select **File** > **Import Items**.
4. Navigate to the desktop and then select your root CA certificate.
5. In the Destination Keychain drop-down menu, select **System**, and then click **Open**.
6. If prompted, enter your Keychain Access password and then click **Modify Keychain**.
7. At the next screen, click **Always Trust** when asked whether you want your computer to trust certificates signed by this certificate.
8. If prompted, enter your Keychain Access password and then click **Update Settings**.

After the certificate installs successfully, it appears in the *System* > *Certificates* list.

Installing Root CA Certificates in the PCoIP Software Client for Windows

Important: Root CA Certificate must have a .crt extension

You must change the root CA certificate's extension from `.pem` to `.crt` before installing it on a PCoIP Software Client.

Note: Windows must trust your root certification authority

When you use your own private key and certificate, you must add your internal root CA certificate to the Windows Trusted Root Certification Authorities certificate store on the client computer.

Users without a trusted root CA will receive an Unable to get local issuer certificate error and fail to connect.

Note: Active Directory group policies

For information on using Active Directory Group Policy to distribute certificates to client computers, see http://technet.microsoft.com/en-us/library/cc772491.aspx.

To import the root CA certificate for the PCoIP Software Client for Windows:

1. Copy your root CA certificate file (*.crt) to a directory reachable by your Windows client.
2. Open the Microsoft Management Console on the agent machine:
    a. Press + `r` to open the run dialog
    b. type **`mmc`** and press `Enter`.
3. Add the Certificates snap-in:
    a. Select **File** > **Add/Remove Snap-in**.
    b. Select **Certificates** from the Available snap-ins list and then click **Add**.
    c. Select **My user account** and then click **Finish**.
    d. Click **OK**.
4. Import the root CA certificate:
    a. Expand **Certificates - Current User**.

b. Right-click on **Trusted Root Certification Authorities**, select **All Tasks** > **Import** from the context menu, and then click **Next**.

c. Use the Browse button to navigate to the directory where your root CA certificate is located and select your root CA certificate.

d. Click **Open** and then **Next**.

e. Select the option to place all certificates in the Trusted Root Certification Authorities certificate store.

f. Click **Next** and then **Finish**.

g. At the security warning, click **Yes**.

After the certificate installs successfully, it appears in the Trusted Root Certification Authorities > Certificates list.

Installing in a PCoIP Mobile Client

To install your internal root CA certificate on an iOS, Android, or ChromeOS device, consult the documentation for your device. The PCoIP Mobile Client software does not implement certificate installation.

Verifying Certificate Formats

If you have OpenSSL installed on your system, you can use it to verify that your root CA certificate is in ASCII PEM format.

To verify that the root CA certificate is in ASCII PEM format:

1. Launch **openssl** from the **`C:\OpenSSL-Win32\bin`** directory.
2. Type the following command:

```
x509 -in rootCA.pem -text -noout
```

If your certificate contents successfully display on the screen, it is encoded correctly as a PEM file.

Configuring the Agent Certificate Mode

The PCoIP Agent chooses a certificate based on the parameters set in the ***Configure PCoIP Security Certificate Settings*** GPO variable.

Since PCoIP agents automatically generate and use self-signed certificates by default, you only need to configure the Configure PCoIP Security Certificate Settings GPO variable if you are deploying your own custom certificates.

You can configure PCoIP Agents to handle certificates in the following ways:

- Always use self-signed certificates (default)
- Always use local custom certificates
- Attempt to use a local certificate, and revert to self-signed if not found

> **Note: Import the administrative template file before configuring**
>
> The Configure License Server Path GPO variable only appears in the GPO editor after you import the administrative template file.

The example in this section configures the agent to look for the certificate only in the remote workstation's Windows certificate store. The example also gives the store the friendly name of "PCoIP". These settings are mandatory when you deploy your own custom certificates.

To configure the Configure PCoIP Security Certificate Settings GPO variable with a custom certificate:

1. Open the Local Group Policy Editor on the agent machine:
   a. Press + `r` to open the run dialog
   b. type `gpedit.msc` and press `Enter`.
2. Navigate to *Local Computer Policy* > *Computer Configuration* > *Administrative Templates* > *PCoIP Session Variables* > *Not Overridable Administrator Defaults*
3. Double-click **Configure PCoIP Security Certificate Settings** to open the variable's dialog.
4. Select **Enabled** to enable the setting.

5. In the *How the PCoIP agent chooses the certificate...* drop-down list, select From the Certificate Store. A search field will appear next, labelled *Name of the Certificate Store to search for CA-signed certificates*.
6. In the search field, enter the name for the certificate in the Windows Cert store. This should be the *friendly name* of the CA signed cert which appears in the store.
7. In *The minimum key length...* drop-down list, select the desired minimum key length (in bits). If you're unsure, specify the actual length of the cert you're using.
8. Click OK.
9. Close the Local Group Policy Editor and reboot the desktop to apply your settings.
10. After the PCoIP agent restarts, you can verify that it is using your custom certificate by checking the agent's level 2 log files.

Supported Installer Languages

The Remote Workstation Card Agent for Windows installer supports the following languages:

- French
- German
- Spanish
- Simplified Chinese
- Traditional Chinese
- Japanese
- Portuguese
- Italian
- Korean
- Russian
- Turkish

Contacting Support

If you encounter any problems installing, configuring, or running the Graphics Agent, you can create a support ticket with Teradici.

Before creating a ticket, be prepared with the following:

- A detailed description of the problem
- Your agent version number (how do I find my version number?)
- A prepared support file

The Teradici Community Forum

The PCoIP Community Forum enables users to have conversations with other IT professionals to learn how they resolved issues, find answers to common questions, have peer group discussions on various topics, and access the Teradici PCoIP Technical Support Service team. Teradici staff are heavily involved in the forums.

To visit the Teradici community, go to https://communities.teradici.com.

Finding the Agent Version Number

You can find your PCoIP Agent's version number using the Windows Control Panel.

To find your agent's version number:

1. Open the Windows Control Panel, and navigate to **Uninstall a program**.
2. Find the PCoIP agent type and version number in the program list.

Creating a Technical Support File

Teradici may request a support file from your system in order to troubleshoot and diagnose PCoIP issues. The support file is an archive containing PCoIP Remote Workstation Card Agent for Windows logs and other diagnostic data that can help support diagnose your problem.

You can create a support file using the PCoIP control panel. If the PCoIP control panel is disabled, you can also run the bundling application directly using Windows Explorer or from the command line.

Both methods place a support bundle in the Teradici Support folder, located at `C:\ProgramData\Teradici\Support`.

To create a support file with the PCoIP Control Panel:

1. Open the PCoIP Control Panel  in the system tray.
2. Select the *Support* tab and then click the **Create Support File** button.
3. When the zipped support file is ready, an Explorer window opens and displays your Teradici Support folder. The generated file is selected.

To create a support file with the bundling application:

1. Using Windows Explorer or a command line tool, navigate to `C:\Program Files\Teradici\PCoIP Agent`.
2. Run `SupportBundler.exe`.
3. When the zipped support file is ready, an Explorer window opens and displays your Teradici Support folder. The generated file is selected.

Performing Diagnostics

Each PCoIP component creates and updates a log file which records its activity as the system is used. Most troubleshooting within a PCoIP system begins by examining these log files and looking for error conditions or other indications that may explain why the system is not operating as expected.

Log files for the and other Teradici PCoIP components are saved to log directories.

The Windows Event Viewer also contains PCoIP event logs for high-level events.

> **Note: Bundling log files for support**
>
> When investigating issues with Teradici support, you may need to provide a support file which includes system log files. Instructions are provided here.

Locating Agent Log Files

Log files for the PCoIP agent are located in the following directories by default. If you changed your agent's location during installation, the log files will be in your custom location instead.

Component	Log file location
Remote Workstation Card Agent for Windows	`%programdata%\Teradici\PCoIPAgent\logs`
PCoIP Server	`PCoIP Server%programdata%\Teradici\PCoIPAgent\logs`

Note: Bundling log files for support

When investigating issues with Teradici support, you may need to provide a support file which includes system log files. Instructions are provided here.

Setting the Remote Workstation Card Agent Log Level

Each PCoIP component is configured to log events. The amount of information captured can be configured by setting the log verbosity on a scale from 0 (least verbose) to 3 (most verbose). **By default, the Remote Workstation Card Agent for Windows records log events at level 2**.

When troubleshooting a particular problem, Teradici Support Services may recommend adjusting the log level for specific components to obtain more information from certain parts of the system.

To change the agent's log level:

1. Open the registry editor on the agent machine:
   a. Press + `r` to open the run dialog
   b. type `regedit.exe` and press `Enter`.
2. Navigate to the *HKEY_LOCAL_MACHINE* > *SOFTWARE* > *Teradici* > *PCoIP* > *pcoip_admin* directory. The configured DWORDs are shown in the right pane.
3. If the `pcoip.event_filter_mode` DWORD does not exist, create it: Right-click the *pcoip_admin* folder and select **New > DWORD (32-bit) Value**. Name the new entry `pcoip.event_filter_mode`.
4. Right-click *pcoip.event_filter_mode* and select **Modify**.
5. In the *Edit DWORD Value* dialog box, revise the number in the **Value data** field:
   - Valid values are `0`, `1`, `2`, and `3`, ranging from least to most verbose.
   - For normal operation, `2` is recommended (and is the default setting).
   - For debugging and support, `3` should be used.
6. Click **OK**.

Session Log IDs

At the start of each PCoIP session, a unique session ID is generated by the PCoIP Client and passed to all connected PCoIP components (including the agent). Log messages generated by the agent are prefixed with this session ID, making it easy to identify All log messages generated during a single session, by any PCoIP component, will be prefixed with the same session log ID in RFC-4122 format:

```
yyyy-mm-ddThh:mm:ss.ffffffZ xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx > …
```

For example:

```
2015-11-06T08:01:18.688879Z 4208fb66-e22a-11d1-a7d7-00a0c982c00d > …
```

Log messages that do not pertain to a specific session will show a string of zeroes in place of the session log ID number.

If a PCoIP component does not receive a session log ID from the PCoIP client, or receives an invalid value, it will generate a new session log ID and distribute it to the other components in the system.

Viewing Windows Event Viewer PCoIP Agent Logs

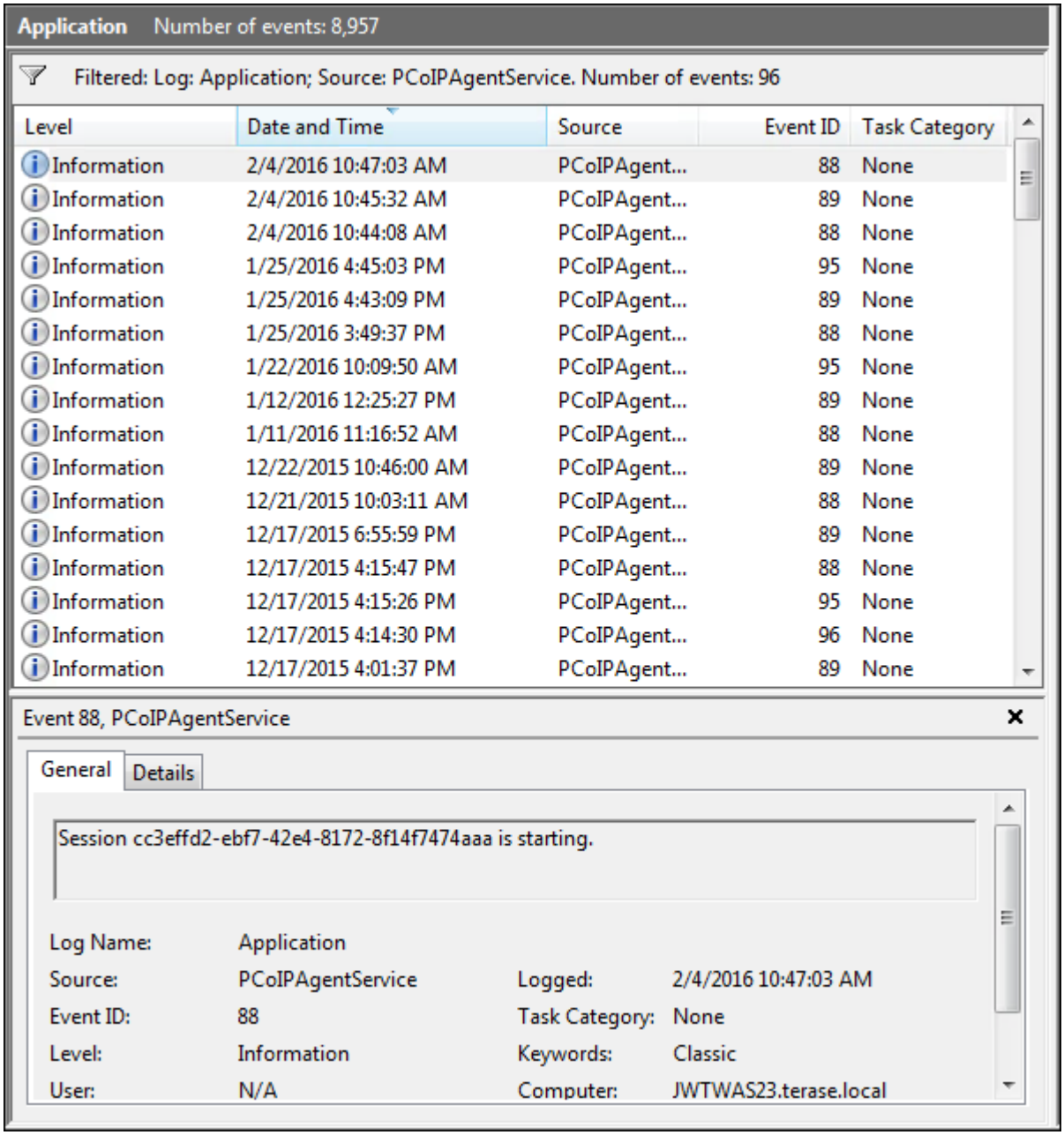
You can view high-level session and connection events generated by the PCoIP agent and Cloud Access Manager in the Windows Event Viewer.

PCoIP Agent Events

To view events using the Windows Event Viewer:

1. Navigate to *Start* > *Control Panel* > *System and Security* > *Administrative Tools* and double-click Event Viewer.
2. Navigate to *Event Viewer (Local)* > *Windows Logs*, right-click Application, and select Filter Current Log.
3. In the *Event sources* drop-down list, select PCoIPAgentService and click OK.
4. Select an event to view its details.

The next example shows typical PCoIP agent session and connection events that you can view in the Windows Event Viewer.



Key events to watch for in the event viewer logs:

Event ID	Key	Notes
88	SESSION_START	
89	SESSION_END	
90	LAUNCHER_EXIT	

Event ID	Key	Notes
91	CONNECTION_TIMEOUT	
92	CONNECTION_FAILURE	
93	SESSION_REDIRECTION	
94	SESSION_INTERRUPTION	
95	SERVICE_STARTING PCoIP	Agent service starting.
96	SERVICE_STOPPING PCoIP	Agent service stopping.
97	SESSION_RESUMING	
98	VIDEO_DRIVER_REPAIR_ERROR	
99	FLEXERA_SERVICE_ERROR	
100	VCHAN_LOADER_EXCEPTION	An exception was thrown in a PCoIP virtual channel plugin.
101	NO_AGENT_ERROR	The PCoIP agent process could not be detected.
102	VCHAN_LOADER_INTERNAL_ERROR	An internal error has occured.
103	VCHAN_LOADER_BAD_INVOCATION_ERROR	The PCoIP virtual channel loader utility was invoked incorrectly.
104	AGENT_PROCESS_TERMINATED_ERROR	The PCoIP Agent process was terminated.
105	SSO_PIPE_CREATION_ERROR	The Single Sign On framework was unable to establish a secure connection with the Teradici Agent.
112	SERVICE_START_ERROR PCoIP	Agent service cannot be started.
113	SERVICE_INTERNAL_ERROR	

Event ID	Key	Notes
114	SERVICE_ADMINISTRATIVE_MESSAGE	

Cloud Access Manager Events

If you are using Cloud Access Manager to start and stop your host machines, the CAMIdleShutdown process will log events as well. Follow the same procedure

Event ID	Description
95	CAM Idle Machine Shutdown service starting
96	CAM Idle Machine Shutdown service stopping
114	Machine will be checked for idle state.
115	Shutting down idle machine.

Troubleshooting License Issues

Teradici includes license troubleshooting utilities with the Remote Workstation Card Agent for Windows. These utilities allow you to validate your licenses and list license entitlements.

Validate Licenses

`pcoip-validate-license` scans your local system and any connected physical or cloud-based license servers for active licenses, and lets you know when your license subscription expires. For more information, see Welcome to Cloud Licensing.

To run the license validation tool, open a PowerShell window, navigate to the PCoIP Agent directory, and type:

```
./pcoip-validate-license.ps1
```

For more detailed instructions, open a PowerShell window and type:

```
get-help ./pcoip-validate-license.ps1
```

List License

`pcoip-list-licenses` retrieves and displays all license entitlements on a connected physical or cloud-based PCoIP license server.

To run the license list tool, open a PowerShell window, navigate to the PCoIP Agent directory, and type:

```
./pcoip-list-licenses.ps1
```

For more detailed instructions, open a PowerShell window and type:

```
get-help ./pcoip-list-licenses.ps1
```

Tracking Usage Over Time

Teradici Local License Server users can use our open-source script, which displays the maximum Cloud Access Software license concurrent usage for a license server over time. For more information, refer to our Github page.

Teradici Cloud Licensing users can write a short script that runs `pcoip-list-licenses` periodically (for example, every 60 minutes) on any PCoIP agent machine to track license usage.

Managing Session Licenses Using the PCoIP Control Panel

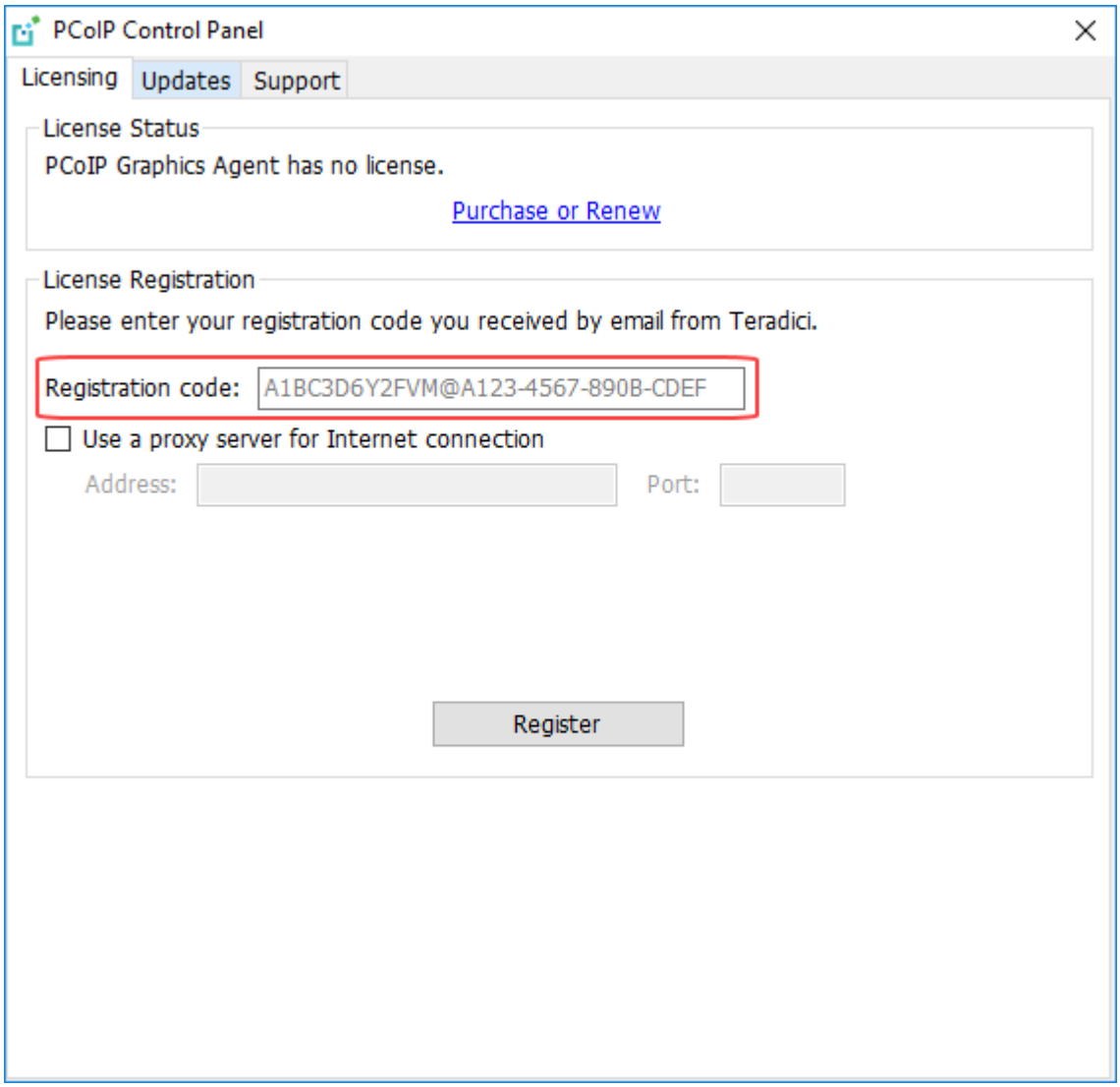
You can use the PCoIP Control Panel to register a license, check the status of a license, and renew a license.

The PCoIP Control Panel can be opened using either of these methods:

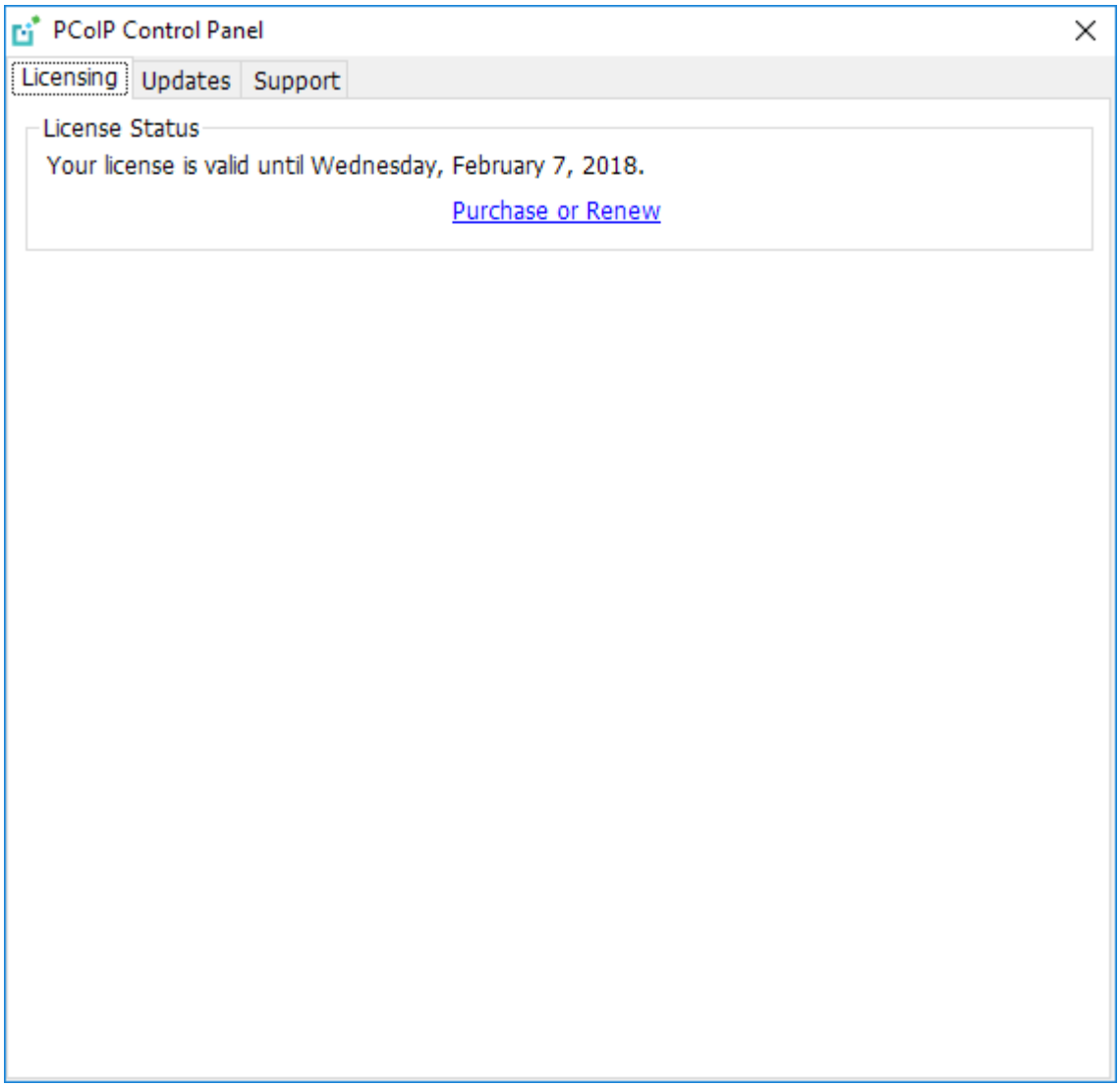
- Click  in the Windows system tray
- Open a command line tool and run

```
C:\Program Files (x86)\Teradici\PCoIP Agent\bin\pcoip_control_panel.exe
```

If you have not registered your license already, select the **Licensing** tab and enter your registration code, as shown next.



Once you are licensed, the tab will show your license subscription expiry information, and enables you to renew the license.



Frequently Asked Questions

Can I use a screensaver?

Yes. However, a blank, static screensaver will provide the most efficient CPU ane network bandwidth usage.

How quickly does a PCoIP agent complete a connection?

PCoIP agents can usually achieve a connection in 15 to 30 seconds. Teradici uses the statistical value Top Percentile (TP) to measure the time to establish a session:

- TP99: Ninety-nine percent of connections complete in under 30 seconds.
- TP50: Fifty percent of connections complete in under 15 seconds.

What do I need to know about power management?

Hosts with Windows power management enabled may drop PCoIP connections when turning off displays or going to sleep. If this behavior is undesirable, these Windows power management features should be turned off.

To disable Windows power management features:

1. From the Windows Control Panel, open **Power Options**.
2. Click **Change plan settings** next to the enabled power plan.
3. Select **Never** from the drop-down list for ***Turn off the display***
4. Select **Never** in the drop-down list for ***Put the computer to sleep***.
5. Click **Save changes**.

Why is my application not sending audio?

The PCoIP agent delivers audio over PCoIP connections by reassigning the system's default audio device. Only applications that use the system default audio device will send or receive audio over

PCoIP; applications that are configured to use non-default devices will not work. If you don't hear audio from your application, make sure it is configured to use the system default audio device.

I'm using Teradici Cloud Licensing. What network blocks should I leave open?

If you are using Teradici Cloud Licensing, you will need to whitelist the following:

- teradici.flexnetoperations.com
- teradici.compliance.flexnetoperations.com

Alternatively, you can also ensure the following network blocks are whitelisted:

- Production: 64.14.29.0/24
- Disaster Recovery: 64.27.162.0/24

The following network blocks are not currently in use, but may also be used in the future:

- Production: 162.244.220.0/24
- Disaster Recovery: 162.244.222.0/24