

RTI Security Plugins

Installation Guide

Version 6.1.0



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The security features of this product include software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>). This product includes cryptographic software written by Eric Young (eay@cryptsoft.com). This product includes software written by Tim Hudson (tjh@cryptsoft.com).

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Chapter 1 Download Instructions

Note: The *Connex DDS* LM bundle includes the *Security Plugins* and OpenSSL[®]. If you have the LM version of *Connex DDS* (with "lm" in its package name), you can skip to the next chapter.

Download *Security Plugins* from the RTI Support Portal, accessible from <https://support.rti.com/>.

Security Plugins also require OpenSSL, which is available from RTI's Support Portal, or you may obtain it from another source.

You will need your username and password to log into the portal; these are included in the letter confirming your purchase or LM copy. If you do not have this letter, please contact license@rti.com

If you need help with the download process, contact support@rti.com.

Once you have logged into the portal, select the **Downloads** link, then select the appropriate version of *Security Plugins* and OpenSSL for your platform.

- For *Security Plugins*, download both:
 - **rti_security_plugins-<version>-host-<host platform>.rtipkg**, includes the compiler-independent *Security Plugins* dependencies (documentation, headers, and the libraries used by RTI tools and services) for the host platform.
 - **rti_security_plugins-<version>-target-<target architecture>.rtipkg**, contains the *Security Plugins* libraries you will link against for your target architecture.
- For OpenSSL, download both:
 - **openssl-1.1.1k-6.1.0-host-<host platform>.rtipkg**, includes the OpenSSL distribution files for RTI tools and services.
 - **openssl-1.1.1k-6.1.0-target-<target architecture>.rtipkg**, includes OpenSSL distribution files to link against your application.

Architecture names are described in the *RTI Connex DDS Core Libraries Platform Notes*.

Chapter 2 Paths Mentioned in Documentation

The documentation refers to:

- **<NDDSHOME>**

This refers to the installation directory for *RTI® Connex® DDS*. The default installation paths are:

- macOS® systems:
/Applications/rti_connex_dds-6.1.0
- Linux systems, non-*root* user:
/home/<your user name>/rti_connex_dds-6.1.0
- Linux systems, *root* user:
/opt/rti_connex_dds-6.1.0
- Windows® systems, user without Administrator privileges:
<your home directory>\rti_connex_dds-6.1.0
- Windows systems, user with Administrator privileges:
C:\Program Files\rti_connex_dds-6.1.0

You may also see **\$NDDSHOME** or **%NDDSHOME%**, which refers to an environment variable set to the installation path.

Wherever you see **<NDDSHOME>** used in a path, replace it with your installation path.

Note for Windows Users: When using a command prompt to enter a command that includes the path **C:\Program Files** (or any directory name that has a space), enclose the path in quotation marks. For example:

```
"C:\Program Files\rti_connex_dds-6.1.0\bin\rtiddsgen"
```

Or if you have defined the **NDDSHOME** environment variable:

```
"%NDDSHOME%\bin\rtiddsgen"
```

- *<path to examples>*

By default, examples are copied into your home directory the first time you run *RTI Launcher* or any script in **<NDDSHOME>/bin**. This document refers to the location of the copied examples as *<path to examples>*.

Wherever you see *<path to examples>*, replace it with the appropriate path.

Default path to the examples:

- macOS systems: **/Users/<your user name>/rti_workspace/6.1.0/examples**
- Linux systems: **/home/<your user name>/rti_workspace/6.1.0/examples**
- Windows systems: **<your Windows documents folder>\rti_workspace\6.1.0\examples**

Where 'your Windows documents folder' depends on your version of Windows. For example, on Windows 10, the folder is **C:\Users\<your user name>\Documents**.

Note: You can specify a different location for **rti_workspace**. You can also specify that you do not want the examples copied to the workspace. For details, see *Controlling Location for RTI Workspace and Copying of Examples* in the *RTI Connex DDS Installation Guide*.

Chapter 3 Installation Instructions

You do not need administrator privileges. All directory locations are meant as examples only; adjust them to suit your site.

These instructions assume you are installing *Security Plugins* 6.1.0 and OpenSSL 1.1.1k. See the *RTI Security Plugins Release Notes* for the currently supported versions.

Follow the steps in either:

- [3.1 Installing a License-Managed \(LM\) Version below](#)
- [3.2 Installing a Regular Version on the next page](#)

3.1 Installing a License-Managed (LM) Version

1. Install the *Connex* DDS license-managed ("lm") bundle as described in the *RTI Connex DDS Installation Guide*.

The "lm" bundle includes *Security Plugins* and OpenSSL. The installer provides a pre-built version of OpenSSL 1.1.1k. If you want to build your own version of OpenSSL 1.1.1k, you can find the source code here: <https://www.openssl.org/source/>.

After installation, the *Security Plugins* header files and libraries will be in **<install dir>/include/ndds/security** and **<install dir>/lib/<target architecture>**, respectively. OpenSSL will be under **<install dir>/third_party**.

2. Add OpenSSL's **/bin** directory to your PATH.

For example, assuming you want to use the *release* version of the OpenSSL libraries, enter the following command (all on one line). Adjust the path to match your installation directory and use your own architecture string.

On Linux and macOS systems:

```
> export PATH=
<install dir>/third_party/openssl-1.1.1k/<architecture>/release/bin:${PATH}
```

If linking dynamically, also add OpenSSL's `/lib` directory in your `LD_LIBRARY_PATH`. For example:

```
> export LD_LIBRARY_PATH=
<installdir>/third_party/openssl-1.1.1k/<architecture>/release/lib:$LD_LIBRARY_PATH
```

On Windows systems:

```
> set PATH=
<install dir>\third_party\openssl-1.1.1k\<architecture>\release\bin;%PATH%
```

3. To verify your installation, enter:

```
> openssl version
```

You should see a response similar to:

```
OpenSSL 1.1.1k
```

4. Your *Security Plugins* distribution may require a license. See [Chapter 4 License Management on page 10](#).

3.2 Installing a Regular Version

1. Install the *Connex DDS* host and target bundles as described in the *RTI Connex DDS Installation Guide*.
2. Install the *Security Plugins* host and target packages:
 - `rti_security_plugins-6.1.0-host-<host platform>.rtipkg`
 - `rti_security_plugins-6.1.0-target-<target architecture>.rtipkg`

`<host platform>` depends on your host (**x64Linux** on Linux systems, **darwin** on macOS systems, **x64Win64** on Windows systems).

`<target architecture>` is one of the supported platforms, see the *RTI Security Plugins Release Notes*.

After installation, the *Security Plugins* header files and libraries will be in `<install dir>/include/ndds/security` and `<install dir>/lib/<target architecture>`, respectively.

3. Install OpenSSL as described in [3.3 Installing OpenSSL on the next page](#).
4. Your *Security Plugins* distribution may require a license. See [Chapter 4 License Management on page 10](#).

3.3 Installing OpenSSL

If you have the license-managed (LM) version of *Connex DDS* (with "lm" in the package file name): OpenSSL is installed automatically with the LM bundle. The following instructions are only for regular installations.

RTI provides:

- An OpenSSL host package, which enables OpenSSL for RTI's applications such as *RTI Admin Console*, *RTI Routing Service*, *rtiddsspy*, etc.
- An OpenSSL target package, which provides OpenSSL libraries that can be used to secure your applications.

3.3.1 Linux and macOS Systems

1. Make sure you've installed host and target *Security Plugins* packages as described in [3.2 Installing a Regular Version on the previous page](#).
2. Install an OpenSSL host package from RTI: **openssl-1.1.1k-host-<host platform>.rtipkg**. (Use the same process that you used for the **.rtipkg** files in the previous step.)
3. Install an OpenSSL target package from RTI: **openssl-1.1.1k-6.1.0-target-<target architecture>.rtipkg**. (Use the same process that you used for the **.rtipkg** files in the previous step.)
4. Include the resulting OpenSSL **bin** directory in your PATH. For example, assuming you want to use the "release" version of the OpenSSL libraries (enter the command all on one line):

```
export PATH=
<NDDSHOME>/third_party/openssl-1.1.1k/<architecture>/release/bin:${PATH}
```

5. If you will be using the dynamic libraries, include the resulting OpenSSL **lib** directory in your LD_LIBRARY_PATH (on Linux systems) or DYLD_LIBRARY_PATH (on macOS systems). For example, assuming you want to use the *release* version of the OpenSSL libraries (enter the command all on one line):

```
export LD_LIBRARY_PATH=
<NDDSHOME>/third_party/openssl-1.1.1k/<architecture>/release/lib:$LD_LIBRARY_PATH
```

6. To verify your installation, enter:

```
openssl version
```

You should see a response similar to:

```
OpenSSL 1.1.1k
```

If you get a version other than OpenSSL 1.1.1k, your PATH may be pointing with a higher precedence to a different version of OpenSSL. You may need to place version 1.1.1k first or earlier in

your PATH.

Note: When running the `openssl version` command, you may run into this OpenSSL warning:

```
WARNING: can't open config file: [default openssl built-in path]/openssl.cnf
```

To resolve this issue, set the environment variable `OPENSSL_CONF` to the path to the `openssl.cnf` file you are using. For example (enter this all on one line):

```
export OPENSSL_CONF=
<NDDSHOME>/third_party/openssl-1.1.1k/<architecture>/release/ssl/openssl.cnf
```

3.3.2 Windows Systems

1. Make sure you've installed host and target *Security Plugins* packages as described in [3.2 Installing a Regular Version on page 6](#).
2. Install an OpenSSL host package from RTI: `openssl-1.1.1k-host-<host platform>.rtipkg`. (Use the same process that you used for the `.rtipkg` files in the previous step.)
3. Install an OpenSSL target package from RTI: `openssl-1.1.1k-6.1.0-target-<target architecture>.rtipkg`. (Use the same process that you used for the `.rtipkg` file in the previous step.)
4. Add the resulting OpenSSL `bin` directory to your Path environment variable. For example (enter the command all on one line):

```
set PATH=
<NDDSHOME>\third_party\openssl-1.1.1k\<architecture>\release\bin;%PATH%
```

5. If you will be using the dynamic libraries, add the resulting OpenSSL `lib` directory to your `Path`. For example, assuming you want to use the *release* version of the OpenSSL libraries (enter the command all on one line):

```
set PATH=
<NDDSHOME>\third_party\openssl-1.1.1k\<architecture>\release\lib;%PATH%
```

6. To verify your installation, open a command prompt and enter:

```
openssl version
```

You should see a response similar to:

```
OpenSSL 1.1.1k
```

If you get a version other than OpenSSL 1.1.1k, your PATH may be pointing with a higher precedence to a different version of OpenSSL. You may need to place version 1.1.1k first or earlier in your path.

Note: When running the above command, you may run into this OpenSSL warning:

```
WARNING: can't open config file: [default openssl built-in path]/openssl.cnf
```

To resolve this issue, set the environment variable `OPENSSL_CONF` to the path to the `openssl.cnf`

file you are using. For example (enter this all on one line):

```
set OPENSSL_CONF=  
<NDDSHOME>\third_party\openssl-1.1.1k\<architecture>\release\ssl\openssl.cnf
```

Chapter 4 License Management

Tools like *RTI Admin Console*, which are included in the Professional package, require a license *file* in order to run. A license *file* is never required to deploy your system in production. LM (license-managed) bundles are not for production. If your distribution requires a license file, you will receive one from RTI via email.

If you have more than one license file from RTI, you can concatenate them into one file. (If you need help with this, please contact support@rti.com.)

A single license file can be used to run on any architecture and is not node-locked. You are not required to run a license server.

4.1 Installing the License File

Save the license file in any location of your choice; the locations checked by the plugin are listed below. You can also specify the location of your license file in *RTI Launcher's* **Configuration** tab. Then *Launcher* can copy the license file to the installation directory or to the user workspace.

Each time your application starts, it will look for the license file in the following locations until it finds a valid license. (The properties are in the PropertyQosPolicy of the *DomainParticipant*.)

1. A property called **com.rti.serv.secure.license_string**. The value for this property can be set to the content of a license file. (This may be necessary if a file system is not supported on your platform.)
2. A property called **dds.license.license_string**. (Only if you have a license-managed, or "lm," version of *Connex DDS Professional*.)

The above two **license_string** properties can be set to the content of a license file. (This may be necessary if a file system is not supported on your platform.) You can set the property either in source code or in an XML file.

If the content of the license file is in XML, special characters for XML need to be escaped in the license string. Special characters include: quotation marks (") (replace with "), apostrophes (') (replace with '), greater-than (>) (replace with >), less-than (<) (replace with <), and ampersands (&) (replace with &).

Example XML file:

```
<domain_participant_qos>
  <property>
    <value>
      <element>
        <name>dds.license.license_string</name>
        <value>contents of license file</value>
      </element>
    </value>
  </property>
</domain_participant_qos>
```

3. A property called **com.rti.serv.secure.license_file**.
4. A property called **dds.license.license_file**. (Only if you have a license-managed, or "lm," version of *Connex DDS Professional*.)

The above two **license_file** properties can be set to the location (full path and filename) of a license file. (This may be necessary if a default license location is not feasible and environment variables are not supported.) You can set the property either in source code or in an XML file.

Example XML to set **dds.license.license_file**:

```
<domain_participant_qos>
  <property>
    <value>
      <element>
        <name>dds.license.license_file</name>
        <value>path to license file</value>
      </element>
    </value>
  </property>
</domain_participant_qos>
```

5. In the location specified in the environment variable `RTI_LICENSE_FILE`, which you may set to point to the full path of the license file, including the filename.

Note: When you run any of the scripts in the `<NDDSHOME>/bin` directory, this automatically sets the `RTI_LICENSE_FILE` environment variable (if it isn't already set) prior to calling the executable. It looks for the license file in two places: your `rti_workspace` directory and the installation directory (`NDDSHOME`). (See [Chapter 2 Paths Mentioned in Documentation on page 3](#).)

6. If you are running any of the tools/services as executables via `NDDSHOME/bin/<executable script>` or through *Launcher*:

- a. In your **rti_workspace**/*<version>* directory, in a file called **rti_license.dat**.
 - b. In your **rti_workspace** directory, in a file called **rti_license.dat**.
 - c. In **<NDDSHOME>** (the *Connex DDS* installation directory), in a file called **rti_license.dat**.
7. If you are running your own application linked with *Connex DDS* libraries:
- a. In your current working directory, in a file called **rti_license.dat**.
 - b. In **<NDDSHOME>** (the *Connex DDS* installation directory), in a file called **rti_license.dat**.

As *Connex DDS* attempts to locate and read your license file, you may (depending on the terms of the license) see a message with details about your license.

If the license file cannot be found or the license has expired, your application may be unable to initialize, depending on the terms of the license. If that is the case, your application's call to **DomainParticipantFactory.create_participant()** will return null, preventing communication.

If you have any problems with your license file, please email support@rti.com.

4.2 Adding or Removing License Management

If your license file changes—for example, you receive a new license for a longer term than your original license—you do not need to reinstall.

However, if you switch from a license-managed distribution of *Connex DDS* to one of the same version that does not require license management, or vice versa, RTI recommends that you first uninstall your original distribution before installing your new distribution. Doing so will prevent you from inadvertently using a mixture of libraries from multiple installations.

Chapter 5 Next Steps

See the *RTI Security Plugins Getting Started Guide* and *User's Manual* for further information on setting up and using *Security Plugins*. The *Getting Started Guide* introduces important concepts and includes hands-on exercises. In the *User's Manual*, make sure to read these chapters in particular:

- Libraries Required for Using RTI Security Plugins
- Restrictions when Using RTI Security Plugins

For descriptions and examples of the security configuration in this release, please consult the **hello_security** examples under the `rti_workspace/<version>/examples/connex_dds/[c, c++, java, cs]` directory.

Security Plugins documentation and examples will be updated online between releases. Please see the RTI Community website (<https://community.rti.com>) for the most up-to-date documentation.