

RTI Security Plugins

Installation Guide

Version 6.0.1



© 2020 Real-Time Innovations, Inc.
All rights reserved.
Printed in U.S.A. First printing.
March 2020.

Trademarks

RTI, Real-Time Innovations, Connex, NDDS, the RTI logo, 1RTI and the phrase, “Your Systems. Working as one,” are registered trademarks, trademarks or service marks of Real-Time Innovations, Inc. All other trademarks belong to their respective owners.

Copy and Use Restrictions

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form (including electronic, mechanical, photocopy, and facsimile) without the prior written permission of Real-Time Innovations, Inc. The software described in this document is furnished under and subject to the RTI software license agreement. The software may be used or copied only under the terms of the license agreement.

Securing a distributed, embedded system is an exercise in user risk management. RTI expressly disclaims all security guarantees and/or warranties based on the names of its products, including Connex DDS Secure, RTI Security Plugins, and RTI Security Plugins SDK. Visit <https://www.rti.com/terms/> for complete product terms and an exclusive list of product warranties.

This is an independent publication and is neither affiliated with, nor authorized, sponsored, or approved by, Microsoft Corporation.

Technical Support

Real-Time Innovations, Inc.

232 E. Java Drive

Sunnyvale, CA 94089

Phone: (408) 990-7444

Email: support@rti.com

Website: <https://support.rti.com/>

Contents

Chapter 1 Download Instructions	1
Chapter 2 Paths Mentioned in Documentation	3
Chapter 3 Installation Instructions	
3.1 Installing an Evaluation Version	5
3.2 Installing a Non-Evaluation Version	6
3.3 Installing OpenSSL	6
3.3.1 Linux and macOS Systems	7
3.3.2 Windows Systems	8
Chapter 4 License Management	
4.1 Installing the License File	10
4.2 Adding or Removing License Management	12
Chapter 5 Next Steps	13

Chapter 1 Download Instructions

Note: The *Connex DDS* evaluation bundle includes the *Security Plugins* and OpenSSL[®]. If you have the evaluation version of *Connex DDS*, 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 evaluation 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-<version>-host-<host platform>.rtipkg**, includes the OpenSSL distribution files for RTI tools and services.
 - **openssl-<version>-target-<target architecture>.tar.gz** (or **.zip** on Windows systems), includes OpenSSL distribution files to link against your application.

For the currently supported OpenSSL version number, see the *RTI Security Plugins Release Notes*. Architecture names are described in the *RTI Connex DDS Core Libraries Platform Notes*. For example:

- Bundle with distribution files for RTI tools and services:
openssl-1.1.1d-host-x64Win64.rtipkg
- Bundle with distribution files to link against your application:
openssl-1.1.1d-target-x64Win64VS2013.zip

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-6.0.1
- Linux systems, non-*root* user:
/home/<your user name>/rti_connex_dds-6.0.1
- Linux systems, *root* user:
/opt/rti_connex_dds-6.0.1
- Windows® systems, user without Administrator privileges:
<your home directory>\rti_connex_dds-6.0.1
- Windows systems, user with Administrator privileges:
C:\Program Files\rti_connex_dds-6.0.1

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-6.0.1\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/6.0.1/examples**
- Linux systems: **/home/<your user name>/rti_workspace/6.0.1/examples**
- Windows systems: **<your Windows documents folder>\rti_workspace\6.0.1\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* 6.0.1 and OpenSSL 1.1.1d. See the *RTI Security Plugins Release Notes* for the currently supported versions.

Follow the steps in either:

- [3.1 Installing an Evaluation Version below](#)
- [3.2 Installing a Non-Evaluation Version on the next page](#)

3.1 Installing an Evaluation Version

1. Install the *Connex DDS* evaluation bundle as described in the *RTI Connex DDS Installation Guide*.

The evaluation bundle includes *Security Plugins* and OpenSSL. The installer provides a pre-built version of OpenSSL 1.1.1d. If you want to build your own version of OpenSSL 1.1.1d, 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-1.1.1d/<architecture>/release/bin:${PATH}
```

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

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

On Windows systems:

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

3. To verify your installation, enter:

```
> openssl version
```

You should see a response similar to:

```
OpenSSL 1.1.1d
```

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

3.2 Installing a Non-Evaluation 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-6.0.1-host-<host platform>.rtipkg`
 - `rti_security_plugins-6.0.1-target-<target architecture>.rtipkg`

`<host platform>` depends on your host (**i86Linux** or **x64Linux** on Linux systems, **darwin** on macOS systems, **i86Win32** or **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 below](#).
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 evaluation version of *Connex DDS*: OpenSSL is installed automatically with the evaluation bundle. The following instructions are only for non-evaluation users.

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 bundle, 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 Non-Evaluation Version on the previous page](#).
2. Install an OpenSSL host package from RTI: **openssl-1.1.1d-host-<host platform>.rtipkg**. (Use the same process that you used for the **.rtipkg** files in the previous step.)
3. Install an OpenSSL target bundle from RTI: **openssl-1.1.1d-target-<target architecture>.tar.gz**.

- a. Move the downloaded OpenSSL distribution file to a directory of your choice, such as **/local/rti**, and change to that directory. For example:

```
$ cd /local/rti
```

- b. Use **unzip** to uncompress the **openssl-1.1.1d-target-<target architecture>.tar.gz** file. For example (your filename may be different):

```
$ unzip openssl-1.1.1d-target-armv7aQNX6.6.0gcc_cpp4.7.3.tar.gz
```

Note: If **unzip** does not work, you may need GNU's version, **gunzip**.

- c. Use **tar** to extract the distribution from the uncompressed file. For example:

```
$ tar xvf openssl-1.1.1d-target-armv7aQNX6.6.0gcc_cpp4.7.3.tar
```

This will extract files into **/local/rti/openssl-1.1.1d**.

Note: If **unzip** and **tar** do not work on your system, you may need GNU's version, **gunzip** and **gtar** (which handles long file names).

- d. Include the resulting **/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=
/local/rti/openssl-1.1.1d/armv7aQNX6.6.0gcc_cpp4.7.3/release/bin:${PATH}
```

- e. If linking dynamically, include the resulting **/lib** directory in your **LD_LIBRARY_PATH**. 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=
/local/rti/openssl-1.1.1d/armv7aQNX6.6.0qcc_cpp4.7.3/release/lib:$LD_LIBRARY_PATH
```

f. To verify your installation, enter:

```
$ openssl version
```

You should see a response similar to:

```
OpenSSL 1.1.1d
```

If you get a version other than OpenSSL 1.1.1d, your PATH may be pointing with a higher precedence to a different version of OpenSSL. You may need to place version 1.1.1d 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=
/home/<your user name>/rti_workspace/6.0.1/examples/dds_security/cert/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 Non-Evaluation Version on page 6](#).
2. Install an OpenSSL host package from RTI: **openssl-1.1.1d-host-<host platform>.rtipkg**. (Use the same process that you used for the **.rtipkg** files in the previous step.)
3. Install an OpenSSL target bundle from RTI: **openssl-1.1.1d-target-<target architecture>.zip**:
 - a. Right-click the distribution file and extract the contents in a directory of your choice.
 - b. Add the resulting **bin** directory to your **Path** environment variable:

```
c:\rti\openssl-1.1.1d\<target architecture>\release\bin
```

(If you need help with this process, please see *RTI Connex DDS Core Libraries Getting Started Guide*.)

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

```
> openssl version
```

You should see a response similar to:

```
OpenSSL 1.1.1d
```

If you get a version other than OpenSSL 1.1.1d, your PATH may be pointing with a higher

precedence to a different version of OpenSSL. You may need to place version 1.1.1d 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=c:\Users\<your user name>\Documents\rti_  
workspace\6.0.1\examples\dds_security\cert\openssl.cnf
```

Chapter 4 License Management

Most package types (Professional, Secure, Basic, and Evaluation) require a license file in order to run.

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.

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 an evaluation 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 "), apo-

strophes (') (replace with '), greater-than (>) (replace with >), less-than (<) (replace with <), and ampersands (&) (replace with &).

Example XML file:

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

3. A property called **com.rti.serv.secure.license_file**.
4. A property called **dds.license.license_file**. (Only if you have an evaluation 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**:

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