MatrixSSL Getting Started

Version 3.9

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1 OVERVIEW

This Getting Started Guide explains how to quickly compile and test the MatrixSSL package on supported reference platforms. This guide also contains instructions on building and running the client and server applications provided in the package.

1.1 Who is this Document For?

- Software developers working on a supported platform that want to create a development environment for integrating MatrixSSL security into a custom application
- Software developers who want to port MatrixSSL to a new platform
- Anyone wanting to learn more about MatrixSSL

2 COMPILING AND TESTING MATRIXSSL

2.1 POSIX Platforms using Makefiles

The POSIX classification in MatrixSSL encompasses support for several operating system platforms including Mac OSX 10.10 and most UNIX/LINUX varieties. This is the default platform for the Makefile system that is provided in the package and should be the first build option if you are unsure of your platform configuration.

2.1.1 Preparation

The development platform must have the following tools installed:

- The *tar* utility for expanding the package (or other decompression utility supporting *.tgz* files)
- A C source code compiler and linker (*GCC* is the default in the provided Makefile system)
- The *make* tool

2.1.2 Building the Source

1. From the command prompt, unpack the zipped tar image.

```
$ tar -xzvf matrixssl-3-9-0-open.tgz
```

2. Change directory to the root of the package and build the MatrixSSL library

```
$ cd matrixssl-3-9-0-open
$ make
```

3. Confirm there were no compile errors and that the MatrixSSL libraries have been built. A successful build will result in 3 binaries. There should be a shared library for each of the three modules of ./core/libcore_s.a, ./crypto/libcrypt_s.a, and ./matrixssl/libssl_s.a. Applications link and interface with these libraries through the MatrixSSL public API set, which is documented in the MatrixSSL API reference, included in the distribution.

2.1.3 SSL Self-Test Application

Source code for a self-test application to exercise the SSL handshake and data exchange functionality of the MatrixSSL library is provided with the package. The following optional steps will enable the developer to build and run the test application to confirm the SSL protocol is fully functional.

1. Having successfully built the static library from the Building the source steps above, change directories to the test folder where the sslTest.c source is located and compile the application

```
$ cd matrixssl/test
$ make
```

2. Run the `sslTest` application from the command line. This sample output shows a successful run of the test using the default configuration of the open source package.

```
Testing TLS_RSA_WITH_AES_256_CBC_SHA suite
      Standard handshake test
            PASSED: Standard handshake
      Re-handshake test (client-initiated)
            PASSED: Re-handshake
      Resumed handshake test (new connection)
            PASSED: Resumed handshake
```

```
        Re-handshake test (server initiated)
              PASSED: Re-handshake
        Resumed Re-handshake test (client initiated)
              PASSED: Resumed Re-handshake
        Resumed Re-handshake test (server initiated)
              PASSED: Resumed Re-handshake
        Change cert callback Re-handshake test
              PASSED: Upgrade cert callback Re-handshake
        Change keys Re-handshake test
              PASSED: Upgrade keys Re-handshake
        Change cipher suite Re-handshake test
              PASSED: Change cipher suite Re-handshake
  Testing TLS_RSA_WITH_AES_128_CBC_SHA suite
        Standard handshake test
              PASSED: Standard handshake
        Re-handshake test (client-initiated)
              PASSED: Re-handshake
        Resumed handshake test (new connection)
              PASSED: Resumed handshake
        Re-handshake test (server initiated)
              PASSED: Re-handshake
        Resumed Re-handshake test (client initiated)
              PASSED: Resumed Re-handshake
        Resumed Re-handshake test (server initiated)
              PASSED: Resumed Re-handshake
        Change cert callback Re-handshake test
              PASSED: Upgrade cert callback Re-handshake
        Change keys Re-handshake test
              PASSED: Upgrade keys Re-handshake
        Change cipher suite Re-handshake test
              PASSED: Change cipher suite Re-handshake
```

2.1.4 Sockets-Based Client and Server Applications

Source code for TCP/IP sockets-based client and server applications are provided with the MatrixSSL package. The following optional steps will enable the developer to build and run the applications to confirm the development platform is configured for MatrixSSL integration.

1. Having successfully built the library from the **Building the Source** steps above, change directories to the *apps/ssl* folder where the *client.c* and *server.c* source files are located and compile the applications.

   ```
   $ cd apps/ssl
   $ make
   ```

2. Run the *server* application from the command line

   ```
   $ ./server
   Listening on port 4433
   ```

3. In a second shell environment, run the client application using the Bash shell script and verify two connections were made to the running server. Client trace in the successful case:

   ```
   $ ./runClient.sh
    client https://127.0.0.1:4433/ new:1 resumed:1 cipher count:1
    version:3.3
    === 1 new connections ===
    Validated cert for: Sample Matrix RSA-1024 Certificate.
    SEND: [GET / HTTP/1.0
    User-Agent: MatrixSSL/3.9.0-COMM
    Accept: */*
    Content-Length: 0

    ]
   ```

```
RECV PARSED: [HTTP/1.0 200 OK]
RECV PARSED: [Server: MatrixSSL/3.9.0-COMM]
RECV PARSED: [Pragma: no-cache]
RECV PARSED: [Cache-Control: no-cache]
RECV PARSED: [Content-type: text/plain]
RECV PARSED: [Content-length: 9]
RECV COMPLETE HTTP MESSAGE
N
146 bytes received
0 msec (0 avg msec/conn SSL handshake overhead)
0 msec (0 avg msec/conn SSL data overhead)
=== 1 resumed connections ===
SEND: [GET / HTTP/1.0
User-Agent: MatrixSSL/3.9.0-COMM
Accept: */*
Content-Length: 0

]
RECV PARSED: [HTTP/1.0 200 OK]
RECV PARSED: [Server: MatrixSSL/3.9.0-COMM]
RECV PARSED: [Pragma: no-cache]
RECV PARSED: [Cache-Control: no-cache]
RECV PARSED: [Content-type: text/plain]
RECV PARSED: [Content-length: 9]
RECV COMPLETE HTTP MESSAGE
R
146 bytes received
0 msec (0 avg msec/conn SSL handshake overhead)
0 msec (0 avg msec/conn SSL data overhead)
```

2.1.5 Debug Builds vs. Release Builds

The default compiler options in the *Makefile* build system use the *–O3* optimization flag for desktop systems to create a release quality MatrixSSL library. If you wish to create a debug version of the library (and applications) edit the common.mk file at the top of the package directory and change the `BUILD` macro to `debug` rather than the `release` default. To optimize for size, change the flag to –Os

2.2 WIN32 Platforms using Visual Studio Projects

The following steps will enable the user to load the MatrixSSL solution and compile the MatrixSSL library to begin creating custom applications.

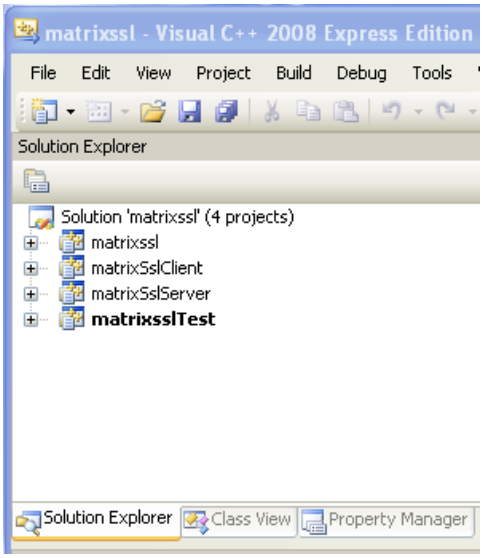
2.2.1 Preparation

The development platform should have one of the following tools installed:

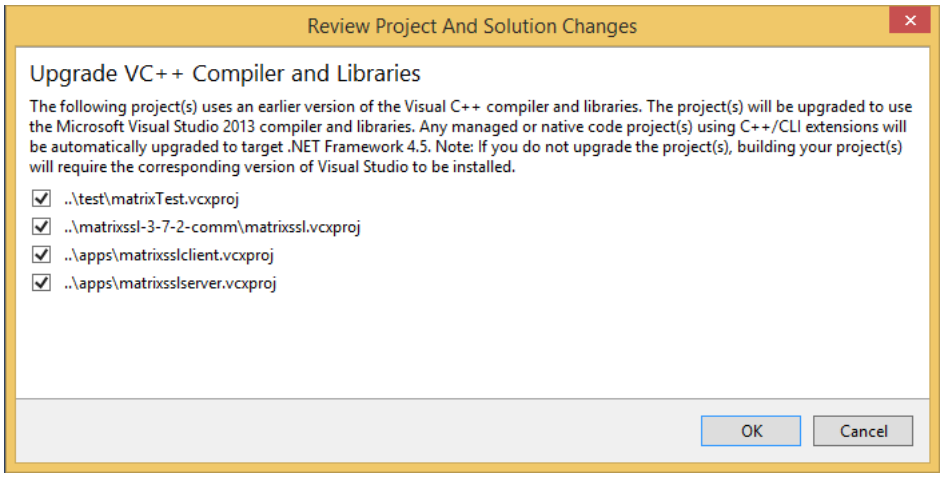
- Microsoft Visual Studio 2013

2.2.2 Building the Source

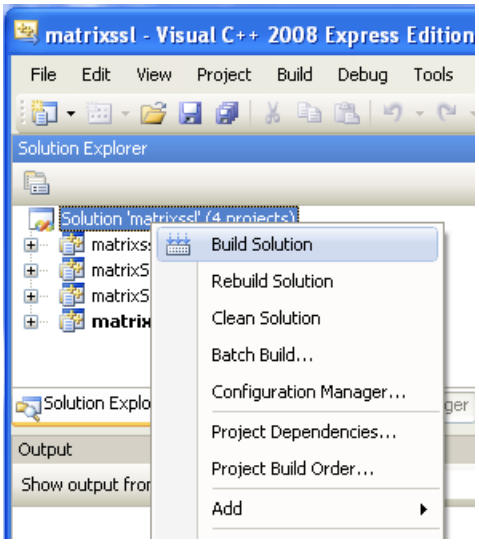
1. Unpack the product image to the directory of your choosing.
2. Open the visualstudio/*matrixssl.sln* file by either double clicking the file or choosing it through the *File -> Open -> Project/Solution* menu option of Visual C++. The result should be a solution with four projects.



3. Visual studio may prompt to update the project to the latest version. Click to agree and continue.



4. Build the package by right clicking the top-level solution and selecting Build Solution.

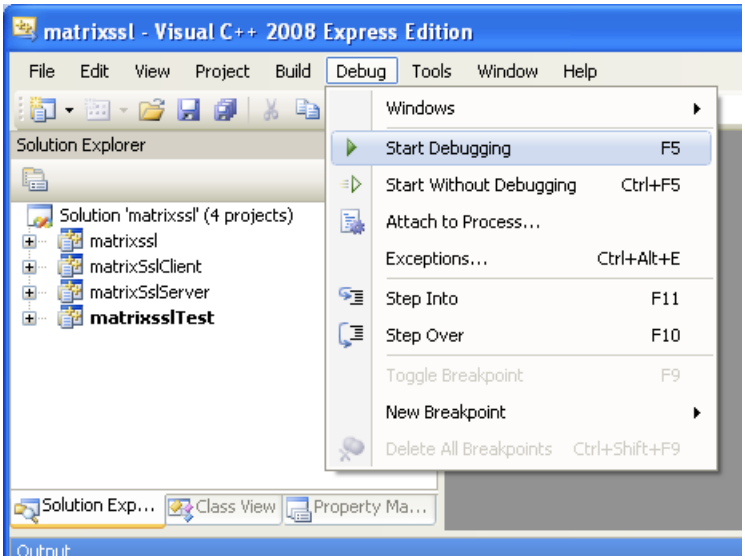


5. Confirm there were no compile errors and that the MatrixSSL library and applications have been built. A successful build will result in a *Debug* (or *Release*) directory being created within the visualstudio directory with the object files, libraries, and executables. A single static library,

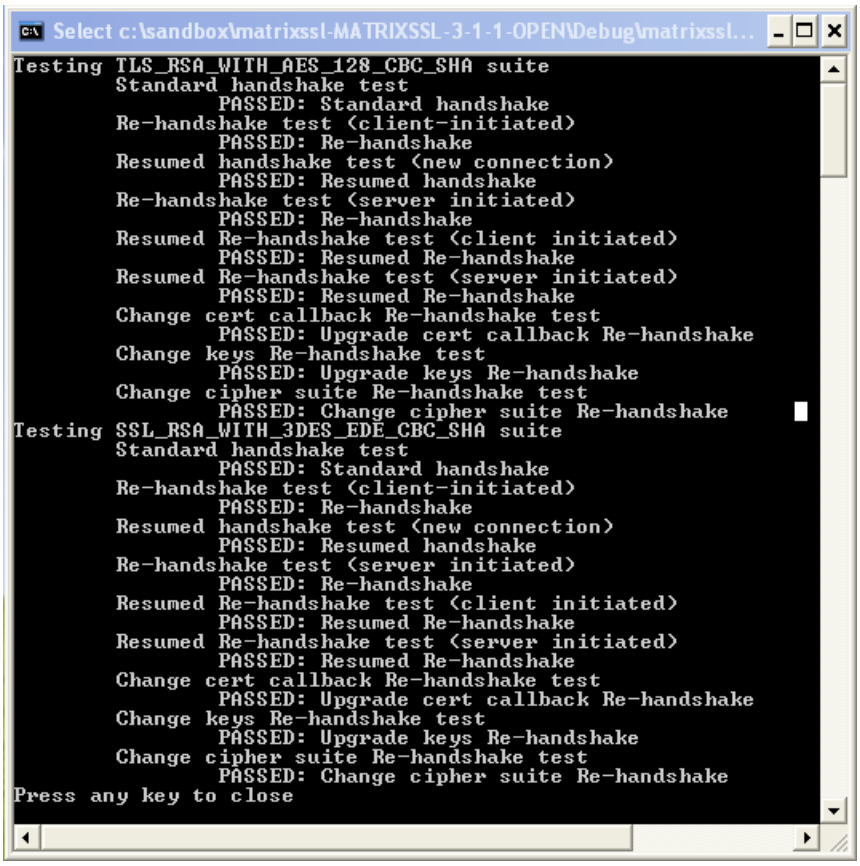
matrixssl.lib, contains the source from core, crypto and matrixssl directories. The *client.exe*, *server.exe*, and *sslTest.exe* are built by statically linking the tests with the static library.

2.2.3 Self-Test Application

The test application will have been built using the above steps. To run the test application, ensure the *sslTest* project appears in bold in the Solution Explorer to indicate it is the StartUp project. Select *Debug -> Start Debugging* from the menu to start the application.



The console output should look like this.

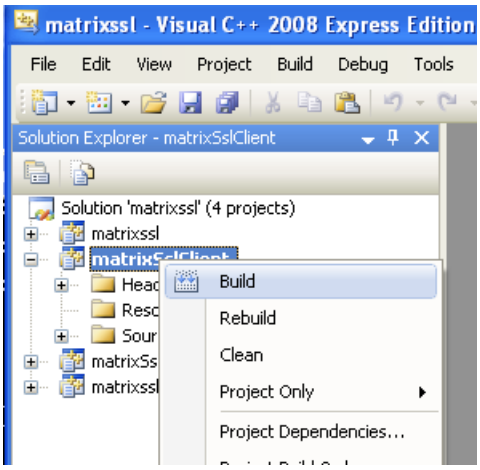


2.2.4 Sockets-Based Client and Server Applications

*** Note: If the client and server projects are not included, use the sslTest project as a model. ***

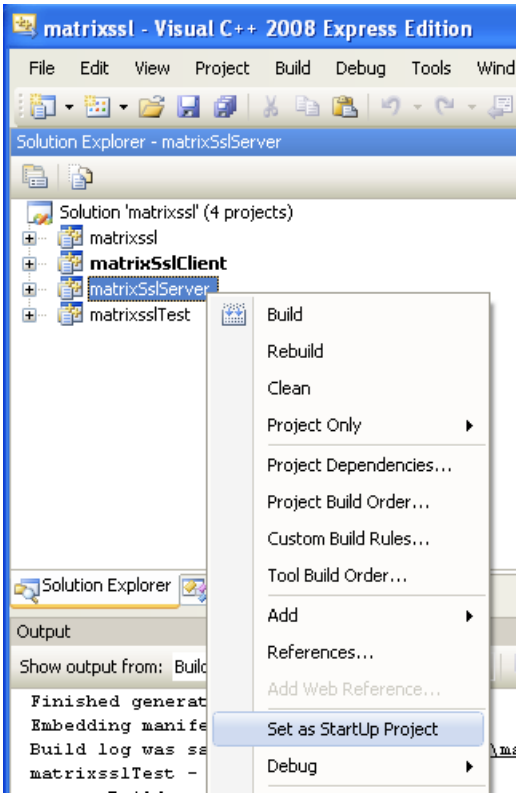
Source code for TCP/IP sockets-based client and server applications are provided with the MatrixSSL package. The client and server applications will have been built when the Solution was built in the above steps.

To individually recompile a project, simply right click the project name and choose Build from the drop down list.

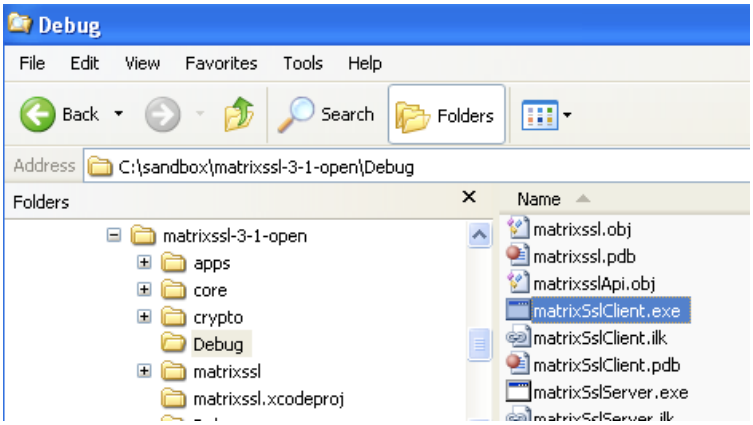


The client application must be given command line options that nominate the server IP address, port, session counts, protocol version, and cipher suites. To set the command line options, select Debugging from the Configuration Properties section of the Property Pages and enter the line in the Command Arguments. See the *./apps/runClient.sh* for the correct command line options to pass to the client example.

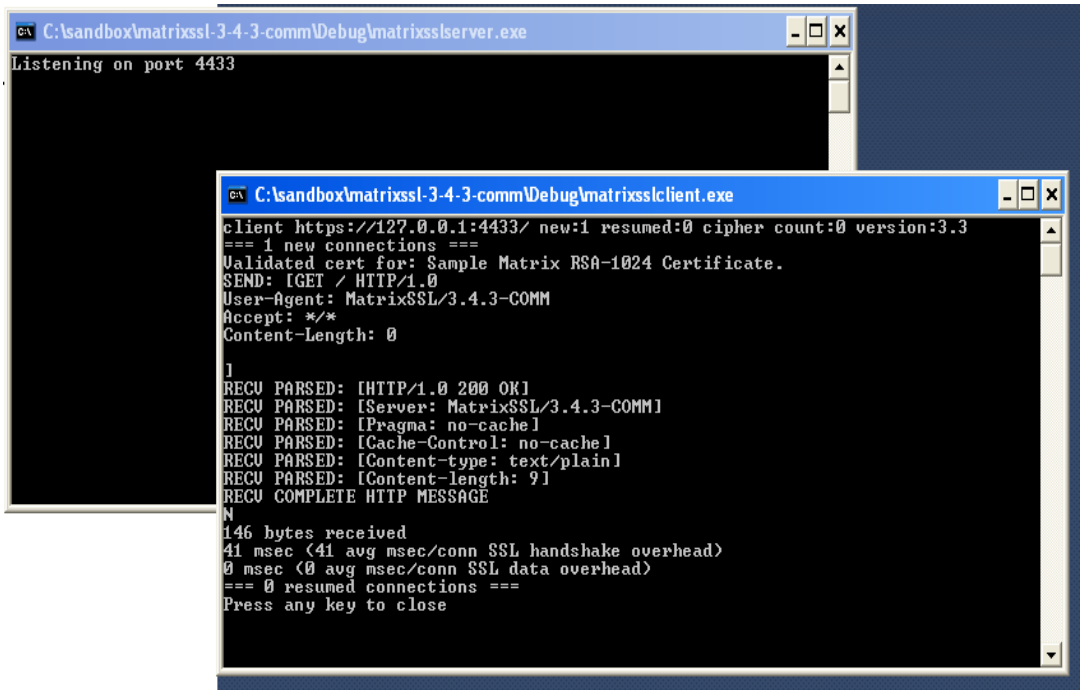
To run the client or server application in the Visual C++ environment, ensure the target project appears in bold in the Solution Explorer to indicate it is the StartUp project. Select *Debug -> Start Debugging* from the menu to start the application.



Only a single project can be executed from within the Visual C++ environment at a time so when testing the server and client applications against each other, at least one of them must be manually run by double clicking the executable file. The server application must be started before the client.

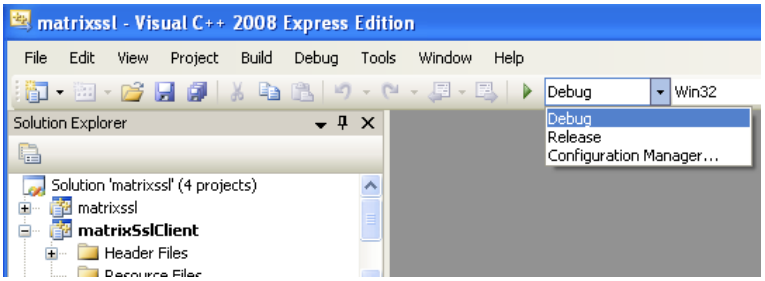


A successful test will result in console output similar to this.



2.2.5 Debug Builds vs. Release Builds

The default build configuration for the provided Visual Studio projects is set to Debug. If you wish to create Release (optimized) versions of the library or applications, simply select the Configuration pull-down list and choose Release as shown below.



By default the output files will be created in a directory under visualstudio/ matching the name of the build (Debug or Release).

2.3 Mac OS X Platforms using Xcode Projects

Xcode projects are included for building the MatrixSSL library, the sslTest application, and the client/server applications. The projects are set up to use an external build tool (make), so they will build output identical to compiling from the command line. The benefits of using Xcode projects is a graphical debug and edit environment.

Open the *xcode/sslTest.xcodeproj* file to open the Xcode development environment. Projects for client and server are also available. Each of these projects includes the sub-projects for core, crypto and matrixssl, which build static libraries for each of the three sub projects respectively.

Xcode schemes for projects are saved to disk on a per-user basis, and does not allow relative paths so the client application scheme will need to be edited to pass the command line options and choose the executable. **By default the scheme will not run the generated executable** - it must be selected in the scheme first. With the matrixSslClient project selected in the workspace, choose “Product – Scheme – Edit Scheme” to bring up the “Arguments Passed On Launch” window. See the *./apps/ssl/runClient.sh* for the correct command line options to pass to the client example.