

# MatrixSSL Readme

## ***Description***

Most of the currently existing SSL packages are too large or too complex for use in an embedded project. MatrixSSL is an embedded, open source SSL implementation designed for small footprint applications and devices. It is designed to reduce the complexity of integrating SSL into an embedded project. With a simple API and security layer, users are able to easily integrate MatrixSSL with their applications. MatrixSSL uses industry standard cryptographic algorithms and protocols to ensure users are getting a strong and reliable security solution in an open-source package that is under 50K compiled.

MatrixSSL was designed to allow users to easily add support for new operating systems, crypto providers, and cipher suites. The package comes with built in support for Windows and Linux and cipher suites defined in the PeerSec embedded cryptography implementation.

## ***Overview***

A functional SSL implementation consists of two primary components: A handshake protocol between a client and server to securely negotiate a communication session over which secure messages will be transported, and a set of cryptographic algorithms used to secure the messages sent and received over that negotiated session.

MatrixSSL's handshake protocol supports the client and server side SSLv3 standard. This standard protocol is compatible with any client software that supports SSL such as Web browsers, Web servers and email clients.

MatrixSSL current supports the standard SSL\_RSA\_WITH\_RC4\_128\_MD5, SSL\_RSA\_WITH\_RC4\_128\_SHA and SSL\_RSA\_WITH\_3DES\_EDE\_CBC\_SHA cipher suites. RSA is used as the public key encryption mechanism for key exchange. RSA keys are stored on disk in the PEM format. 3DES encrypted private RSA key files are supported as well. Message authentication codes are either MD5 or SHA1. 3DES or arc4 are used for encryption and decryption of messages.

PeerSec Networks has included an implementation of these cryptographic algorithms as part of the MatrixSSL distribution. MatrixSSL has been designed to allow users to easily add or replace cipher suites, add or replace individual cryptographic algorithms, and allows easy integration of any crypto provider.

Support for Transport Layer Security (TLS), AES and other specific requirements are available as part of our commercial license.

## ***Installing***

The MatrixSSL package is a single downloadable archive file that includes the source code and compilation environments to generate the MatrixSSL library as well as example application source code. Simply extract the archive to a dedicated directory to install the package. For detailed information on package contents and compiling MatrixSSL consult the *Building MatrixSSL* document.

## ***Building MatrixSSL***

This section explains how to build the MatrixSSL shared library and example httpsReflector server application. For development information on application integration, porting, implementing new cipher suites, and other compile-time configurations see the [MatrixSSL Developers Guide](#).

## ***Quick Start for Windows***

These steps will enable a user to build the MatrixSSL library and an example server application very quickly. These steps assume a Windows box that has been configured with Visual Studio .NET.

1. Extract the MatrixSSL distribution package to a dedicated directory.
2. Open the httpsReflector.sln solution file located in the examples directory. This solution contains two projects: matrixssl, the project that builds the MatrixSSL library and httpsReflector, which builds an example application that uses MatrixSSL.
3. Make sure the httpsReflector project is the default project by right clicking the project name and selecting 'Set As StartUp Project'.
4. Build the solution through the 'Build' menu. You can specify Release or Debug targets through the Visual Studio configuration manager.
5. You can now run the httpsReflector.exe through the debugger or by double clicking the executable file. The httpsReflector application is a simple server application that accepts an HTTPS connection and echoes the data back to the client.
6. Open a web browser and connect to the server at <https://localhost:4433/>

## ***Quick Start for Linux***

These steps will enable a user to create the MatrixSSL library and example server application very quickly. These steps assume a Linux box that has been configured with standard development tools (gcc compiler and *make*).

1. Extract the MatrixSSL distribution package to a dedicated directory:  
gunzip matrixssl\*.gz  
tar -xvf matrixssl\*.tar
2. Type 'make' from the src directory to build the MatrixSSL library.
3. Type 'make' from the examples directory to build the example server.

4. Run the example server application by typing './httpsReflector'. The httpsReflector application is a simple server application that accepts an HTTPS connection and echoes the data back to the client.
5. Open a web browser and connect to the server at <https://localhost:4433>

## **MatrixSSL Directory structure**

The top level directories in the full MatrixSSL distribution are *src*, *doc*, *interfaces* and *examples*. In addition, the public header for the library is located at the top level (*matrixSsl.h*).

The *src* directory (with the addition of the public header file) contains all the of the source code necessary to build the MatrixSSL library. The C code and header files at the top level of *src* are the core files of the product and should always be included when compiling.

The *os* and *crypto* subdirectories contain the 'pluggable' portions of MatrixSSL that may vary depending on the specific operating system and crypto provider being used. The provided default crypto provider in the *crypto* directory is *peersec* (the company that wrote MatrixSSL). Normally the built-in PeerSec crypto provider is sufficient, but if you need specific hardware implementations please contact PeerSec Networks for an easy to use OpenSSL crypto wrapper.

The supported operating systems supplied by default in the *os* directory are Windows and Linux (*win* and *linux*). Additional OS ports can be added at this level.

The *examples* directory contains reference applications that use the MatrixSSL library. The *httpsReflector* example is a server that simply echoes a HTTPS request back to a client such as a Web browser. The *httpsClient* example implements client side HTTPS functionality, and can interact securely with *httpsReflector* or another secure server such as Apache with OpenSSL.

The *interfaces* directory contains source code interfaces that have been written to integrate MatrixSSL into existing third-party software packages, such as the Mbedthis AppWeb embedded Web server. Look to this example for a sample C++ implementation of MatrixSSL.

The *doc* directory contains all the documentation for the MatrixSSL product.

## **1.0 Release Notes**

- Functional changes from Beta release
  - Optimized RSA private keys (faster public key encryption)
  - Client can set multiple CA certificates for server validation
  - Client can register callback routine to perform custom validation checks on server certificates
  - A memory buffer based version of *matrixSslReadKeys* for environments where certificate information is not stored on disk.

- API changes from Beta release
  - Added APIs
    - `matrixSslSetCertValidator`
  - Modified APIs – All functions now return integers for success and failure status
    - `matrixSslReadKeys`
    - `matrixSslNewSession`
    - `matrixSslGetSessionId`
- The examples *httpsReflector* and *httpsClient* now use a common sample socket layer.
- MatrixSSL has been designed as a small embeddable SSL library and does not generate key files or certificates. Detailed information on how to generate your own key files and certificates is contained in the *Working with Certificate Files in MatrixSSL* document.
- The OpenSSL crypto provider hooks have been removed from the distribution for clarity. Please contact PeerSec Networks if your project requires crypto support from OpenSSL.
- For a full list of release notes and issues, see <http://www.matrixssl.org>

## **Support**

Full email support is available during the beta period. Email questions or support issues to: [support@matrixssl.org](mailto:support@matrixssl.org)

## **Documentation**

The latest versions of all MatrixSSL documentation, including security advisories is available at <http://www.matrixssl.org/docs.html>.