

**NAME**

openssl-enc, enc – symmetric cipher routines

**SYNOPSIS**

**openssl enc** *-cipher* [**-help**] [**-list**] [**-ciphers**] [**-in filename**] [**-out filename**] [**-pass arg**] [**-e**] [**-d**] [**-a**] [**-base64**] [**-A**] [**-k password**] [**-kfile filename**] [**-K key**] [**-iv IV**] [**-S salt**] [**-salt**] [**-nosalt**] [**-z**] [**-md digest**] [**-iter count**] [**-pbkdf2**] [**-p**] [**-P**] [**-bufsize number**] [**-nopad**] [**-debug**] [**-none**] [**-rand file...**] [**-writerand file**] [**-engine id**]

**openssl** [*cipher*] [...]

**DESCRIPTION**

The symmetric cipher commands allow data to be encrypted or decrypted using various block and stream ciphers using keys based on passwords or explicitly provided. Base64 encoding or decoding can also be performed either by itself or in addition to the encryption or decryption.

**OPTIONS****-help**

Print out a usage message.

**-list**

List all supported ciphers.

**-ciphers**

Alias of **-list** to display all supported ciphers.

**-in filename**

The input filename, standard input by default.

**-out filename**

The output filename, standard output by default.

**-pass arg**

The password source. For more information about the format of **arg** see “Pass Phrase Options” in **openssl** (1).

**-e** Encrypt the input data: this is the default.**-d** Decrypt the input data.**-a** Base64 process the data. This means that if encryption is taking place the data is base64 encoded after encryption. If decryption is set then the input data is base64 decoded before being decrypted.**-base64**

Same as **-a**

**-A** If the **-a** option is set then base64 process the data on one line.**-k password**

The password to derive the key from. This is for compatibility with previous versions of OpenSSL. Superseded by the **-pass** argument.

**-kfile filename**

Read the password to derive the key from the first line of **filename**. This is for compatibility with previous versions of OpenSSL. Superseded by the **-pass** argument.

**-md digest**

Use the specified digest to create the key from the passphrase. The default algorithm is sha-256.

**-iter count**

Use a given number of iterations on the password in deriving the encryption key. High values increase the time required to brute-force the resulting file. This option enables the use of PBKDF2 algorithm to derive the key.

**-pbkdf2**

Use PBKDF2 algorithm with default iteration count unless otherwise specified.

**-nosalt**

Don't use a salt in the key derivation routines. This option **SHOULD NOT** be used except for test purposes or compatibility with ancient versions of OpenSSL.

**-salt**

Use salt (randomly generated or provide with **-S** option) when encrypting, this is the default.

**-S salt**

The actual salt to use: this must be represented as a string of hex digits.

**-K key**

The actual key to use: this must be represented as a string comprised only of hex digits. If only the key is specified, the IV must additionally specified using the **-iv** option. When both a key and a password are specified, the key given with the **-K** option will be used and the IV generated from the password will be taken. It does not make much sense to specify both key and password.

**-iv IV**

The actual IV to use: this must be represented as a string comprised only of hex digits. When only the key is specified using the **-K** option, the IV must explicitly be defined. When a password is being specified using one of the other options, the IV is generated from this password.

**-p** Print out the key and IV used.

**-P** Print out the key and IV used then immediately exit: don't do any encryption or decryption.

**-bufsize number**

Set the buffer size for I/O.

**-nopad**

Disable standard block padding.

**-debug**

Debug the BIOs used for I/O.

**-z** Compress or decompress encrypted data using zlib after encryption or before decryption. This option exists only if OpenSSL was compiled with the zlib or zlib-dynamic option.

**-none**

Use NULL cipher (no encryption or decryption of input).

**-rand file...**

A file or files containing random data used to seed the random number generator. Multiple files can be specified separated by an OS-dependent character. The separator is ; for MS-W indows, , for OpenVMS, and : for all others.

**[-writerand file]**

Writes random data to the specified *file* upon exit. This can be used with a subsequent **-rand** flag.

**NOTES**

The program can be called either as **openssl cipher** or **openssl enc -cipher**. The first form doesn't work with engine-provided ciphers, because this form is processed before the configuration file is read and any **ENGINEs** loaded. Use the **list** command to get a list of supported ciphers.

Engines which provide entirely new encryption algorithms (such as the ccgost engine which provides gost89 algorithm) should be configured in the configuration file. Engines specified on the command line using **-engine** options can only be used for hardware-assisted implementations of ciphers which are supported by the OpenSSL core or another engine specified in the configuration file.

When the enc command lists supported ciphers, ciphers provided by engines, specified in the configuration files are listed too.

A password will be prompted for to derive the key and IV if necessary.

The **-salt** option should **ALWAYS** be used if the key is being derived from a password unless you want compatibility with previous versions of OpenSSL.

Without the **-salt** option it is possible to perform efficient dictionary attacks on the password and to attack stream cipher encrypted data. The reason for this is that without the salt the same password always generates the same encryption key. When the salt is being used the first eight bytes of the encrypted data are reserved for the salt: it is generated at random when encrypting a file and read from the encrypted file when it is decrypted.

Some of the ciphers do not have large keys and others have security implications if not used correctly. A beginner is advised to just use a strong block cipher, such as AES, in CBC mode.

All the block ciphers normally use PKCS#5 padding, also known as standard block padding. This allows a rudimentary integrity or password check to be performed. However, since the chance of random data passing the test is better than 1 in 256 it isn't a very good test.

If padding is disabled then the input data must be a multiple of the cipher block length.

All RC2 ciphers have the same key and effective key length.

Blowfish and RC5 algorithms use a 128 bit key.

## SUPPORTED CIPHERS

Note that some of these ciphers can be disabled at compile time and some are available only if an appropriate engine is configured in the configuration file. The output of the **enc** command run with the **-ciphers** option (that is **openssl enc -ciphers**) produces a list of ciphers, supported by your version of OpenSSL, including ones provided by configured engines.

The **enc** program does not support authenticated encryption modes like CCM and GCM, and will not support such modes in the future. The **enc** interface by necessity must begin streaming output (e.g., to standard output when **-out** is not used) before the authentication tag could be validated, leading to the usage of **enc** in pipelines that begin processing untrusted data and are not capable of rolling back upon authentication failure. The AEAD modes currently in common use also suffer from catastrophic failure of confidentiality and/or integrity upon reuse of key/iv/nonce, and since **enc** places the entire burden of key/iv/nonce management upon the user, the risk of exposing AEAD modes is too great to allow. These key/iv/nonce management issues also affect other modes currently exposed in **enc**, but the failure modes are less extreme in these cases, and the functionality cannot be removed with a stable release branch. For bulk encryption of data, whether using authenticated encryption modes or other modes, **cms(1)** is recommended, as it provides a standard data format and performs the needed key/iv/nonce management.

|           |                      |
|-----------|----------------------|
| base64    | Base 64              |
| bf-cbc    | Blowfish in CBC mode |
| bf        | Alias for bf-cbc     |
| blowfish  | Alias for bf-cbc     |
| bf-cfb    | Blowfish in CFB mode |
| bf-ecb    | Blowfish in ECB mode |
| bf-ofb    | Blowfish in OFB mode |
| cast-cbc  | CAST in CBC mode     |
| cast      | Alias for cast-cbc   |
| cast5-cbc | CAST5 in CBC mode    |
| cast5-cfb | CAST5 in CFB mode    |
| cast5-ecb | CAST5 in ECB mode    |
| cast5-ofb | CAST5 in OFB mode    |
| chacha20  | ChaCha20 algorithm   |
| des-cbc   | DES in CBC mode      |
| des       | Alias for des-cbc    |

|              |   |
|--------------|---|
| des-cfb      | DES in CFB mode                                       |
| des-ofb      | DES in OFB mode                                       |
| des-ecb      | DES in ECB mode                                       |
| des-ede-cbc  | Two key triple DES EDE in CBC mode                    |
| des-ede      | Two key triple DES EDE in ECB mode                    |
| des-ede-cfb  | Two key triple DES EDE in CFB mode                    |
| des-ede-ofb  | Two key triple DES EDE in OFB mode                    |
| des-ede3-cbc | Three key triple DES EDE in CBC mode                  |
| des-ede3     | Three key triple DES EDE in ECB mode                  |
| des3         | Alias for des-ede3-cbc                                |
| des-ede3-cfb | Three key triple DES EDE CFB mode                     |
| des-ede3-ofb | Three key triple DES EDE in OFB mode                  |
| desx         | DESX algorithm.                                       |
| gost89       | GOST 28147-89 in CFB mode (provided by ccgost engine) |
| gost89-cnt   | GOST 28147-89 in CNT mode (provided by ccgost engine) |
| idea-cbc     | IDEA algorithm in CBC mode                            |
| idea         | same as idea-cbc                                      |
| idea-cfb     | IDEA in CFB mode                                      |
| idea-ecb     | IDEA in ECB mode                                      |
| idea-ofb     | IDEA in OFB mode                                      |
| rc2-cbc      | 128 bit RC2 in CBC mode                               |
| rc2          | Alias for rc2-cbc                                     |
| rc2-cfb      | 128 bit RC2 in CFB mode                               |
| rc2-ecb      | 128 bit RC2 in ECB mode                               |
| rc2-ofb      | 128 bit RC2 in OFB mode                               |
| rc2-64-cbc   | 64 bit RC2 in CBC mode                                |
| rc2-40-cbc   | 40 bit RC2 in CBC mode                                |
| rc4          | 128 bit RC4   |
| rc4-64       | 64 bit RC4  |
| rc4-40       | 40 bit RC4  |
| rc5-cbc      | RC5 cipher in CBC mode                                |
| rc5          | Alias for rc5-cbc                                     |
| rc5-cfb      | RC5 cipher in CFB mode                                |
| rc5-ecb      | RC5 cipher in ECB mode                                |
| rc5-ofb      | RC5 cipher in OFB mode                                |
| seed-cbc     | SEED cipher in CBC mode                               |
| seed         | Alias for seed-cbc                                    |
| seed-cfb     | SEED cipher in CFB mode                               |
| seed-ecb     | SEED cipher in ECB mode                               |
| seed-ofb     | SEED cipher in OFB mode                               |
| sm4-cbc      | SM4 cipher in CBC mode                                |
| sm4          | Alias for sm4-cbc                                     |
| sm4-cfb      | SM4 cipher in CFB mode                                |
| sm4-ctr      | SM4 cipher in CTR mode                                |

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sm4-ecb          SM4 cipher in ECB mode
sm4-ofb          SM4 cipher in OFB mode

aes-[128|192|256]-cbc 128/192/256 bit AES in CBC mode
aes[128|192|256]      Alias for aes-[128|192|256]-cbc
aes-[128|192|256]-cfb 128/192/256 bit AES in 128 bit CFB mode
aes-[128|192|256]-cfb1 128/192/256 bit AES in 1 bit CFB mode
aes-[128|192|256]-cfb8 128/192/256 bit AES in 8 bit CFB mode
aes-[128|192|256]-ctr 128/192/256 bit AES in CTR mode
aes-[128|192|256]-ecb 128/192/256 bit AES in ECB mode
aes-[128|192|256]-ofb 128/192/256 bit AES in OFB mode

aria-[128|192|256]-cbc 128/192/256 bit ARIA in CBC mode
aria[128|192|256]      Alias for aria-[128|192|256]-cbc
aria-[128|192|256]-cfb 128/192/256 bit ARIA in 128 bit CFB mode
aria-[128|192|256]-cfb1 128/192/256 bit ARIA in 1 bit CFB mode
aria-[128|192|256]-cfb8 128/192/256 bit ARIA in 8 bit CFB mode
aria-[128|192|256]-ctr 128/192/256 bit ARIA in CTR mode
aria-[128|192|256]-ecb 128/192/256 bit ARIA in ECB mode
aria-[128|192|256]-ofb 128/192/256 bit ARIA in OFB mode

camellia-[128|192|256]-cbc 128/192/256 bit Camellia in CBC mode
camellia[128|192|256]      Alias for camellia-[128|192|256]-cbc
camellia-[128|192|256]-cfb 128/192/256 bit Camellia in 128 bit CFB mode
camellia-[128|192|256]-cfb1 128/192/256 bit Camellia in 1 bit CFB mode
camellia-[128|192|256]-cfb8 128/192/256 bit Camellia in 8 bit CFB mode
camellia-[128|192|256]-ctr 128/192/256 bit Camellia in CTR mode
camellia-[128|192|256]-ecb 128/192/256 bit Camellia in ECB mode
camellia-[128|192|256]-ofb 128/192/256 bit Camellia in OFB mode

```

## EXAMPLES

Just base64 encode a binary file:

```
openssl base64 -in file.bin -out file.b64
```

Decode the same file

```
openssl base64 -d -in file.b64 -out file.bin
```

Encrypt a file using AES-128 using a prompted password and PBKDF2 key derivation:

```
openssl enc -aes128 -pbkdf2 -in file.txt -out file.aes128
```

Decrypt a file using a supplied password:

```
openssl enc -aes128 -pbkdf2 -d -in file.aes128 -out file.txt \
-pass pass:<password>
```

Encrypt a file then base64 encode it (so it can be sent via mail for example) using AES-256 in CTR mode and PBKDF2 key derivation:

```
openssl enc -aes-256-ctr -pbkdf2 -a -in file.txt -out file.aes256
```

Base64 decode a file then decrypt it using a password supplied in a file:

```
openssl enc -aes-256-ctr -pbkdf2 -d -a -in file.aes256 -out file.txt \
-pass file:<passfile>
```

## BUGS

The **-A** option when used with large files doesn't work properly.

The **enc** program only supports a fixed number of algorithms with certain parameters. So if, for example, you want to use RC2 with a 76 bit key or RC4 with an 84 bit key you can't use this program.

**HISTORY**

The default digest was changed from MD5 to SHA256 in OpenSSL 1.1.0.

The **-list** option was added in OpenSSL 1.1.1e.

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