



*Full credit is given to the above companies including the OS that this PDF file was generated!*

### ***Rocky Enterprise Linux 9.2 Manual Pages on command 'EC\_GROUP\_set\_curve\_GFp.3ossl'***

***\$ man EC\_GROUP\_set\_curve\_GFp.3ossl***

EC\_GROUP\_NEW(3ossl)            OpenSSL            EC\_GROUP\_NEW(3ossl)

#### NAME

EC\_GROUP\_get\_ecparameters, EC\_GROUP\_get\_ecpkparameters,  
EC\_GROUP\_new\_from\_params, EC\_GROUP\_new\_from\_ecparameters,  
EC\_GROUP\_new\_from\_ecpkparameters, EC\_GROUP\_new, EC\_GROUP\_free,  
EC\_GROUP\_clear\_free, EC\_GROUP\_new\_curve\_GFp, EC\_GROUP\_new\_curve\_GF2m,  
EC\_GROUP\_new\_by\_curve\_name\_ex, EC\_GROUP\_new\_by\_curve\_name,  
EC\_GROUP\_set\_curve, EC\_GROUP\_get\_curve, EC\_GROUP\_set\_curve\_GFp,  
EC\_GROUP\_get\_curve\_GFp, EC\_GROUP\_set\_curve\_GF2m,  
EC\_GROUP\_get\_curve\_GF2m, EC\_get\_builtin\_curves, OSSL\_EC\_curve\_nid2name  
- Functions for creating and destroying EC\_GROUP objects

#### SYNOPSIS

```
#include <openssl/ec.h>

EC_GROUP *EC_GROUP_new_from_params(const OSSL_PARAM params[],
                                   OSSL_LIB_CTX *libctx, const char *propq);

EC_GROUP *EC_GROUP_new_from_ecparameters(const ECPARAMETERS *params);
EC_GROUP *EC_GROUP_new_from_ecpkparameters(const ECPKPARAMETERS *params);

void EC_GROUP_free(EC_GROUP *group);
```

```

EC_GROUP *EC_GROUP_new_curve_GFp(const BIGNUM *p, const BIGNUM *a,
    const BIGNUM *b, BN_CTX *ctx);
EC_GROUP *EC_GROUP_new_curve_GF2m(const BIGNUM *p, const BIGNUM *a,
    const BIGNUM *b, BN_CTX *ctx);
EC_GROUP *EC_GROUP_new_by_curve_name_ex(OSSL_LIB_CTX *libctx, const char *propq,
    int nid);
EC_GROUP *EC_GROUP_new_by_curve_name(int nid);
int EC_GROUP_set_curve(EC_GROUP *group, const BIGNUM *p, const BIGNUM *a,
    const BIGNUM *b, BN_CTX *ctx);
int EC_GROUP_get_curve(const EC_GROUP *group, BIGNUM *p, BIGNUM *a, BIGNUM *b,
    BN_CTX *ctx);
ECPARAMETERS *EC_GROUP_get_ecparameters(const EC_GROUP *group,
    ECPARAMETERS *params);
ECPKPARAMETERS *EC_GROUP_get_ecpkparameters(const EC_GROUP *group,
    ECPKPARAMETERS *params);
size_t EC_get_builtin_curves(EC_builtin_curve *r, size_t nitems);
const char *OSSL_EC_curve_nid2name(int nid);

```

The following functions have been deprecated since OpenSSL 3.0, and can be hidden entirely by defining `OPENSSL_API_COMPAT` with a suitable version value, see `openssl_user_macros(7)`:

```

EC_GROUP *EC_GROUP_new(const EC_METHOD *meth);
void EC_GROUP_clear_free(EC_GROUP *group);
int EC_GROUP_set_curve_GFp(EC_GROUP *group, const BIGNUM *p,
    const BIGNUM *a, const BIGNUM *b, BN_CTX *ctx);
int EC_GROUP_get_curve_GFp(const EC_GROUP *group, BIGNUM *p,
    BIGNUM *a, BIGNUM *b, BN_CTX *ctx);
int EC_GROUP_set_curve_GF2m(EC_GROUP *group, const BIGNUM *p,
    const BIGNUM *a, const BIGNUM *b, BN_CTX *ctx);
int EC_GROUP_get_curve_GF2m(const EC_GROUP *group, BIGNUM *p,
    BIGNUM *a, BIGNUM *b, BN_CTX *ctx);

```

## DESCRIPTION

Within the library there are two forms of elliptic curve that are of interest. The first form is those defined over the prime field  $F_p$ . The

elements of  $F_p$  are the integers 0 to  $p-1$ , where  $p$  is a prime number.

This gives us a revised elliptic curve equation as follows:

$$y^2 \bmod p = x^3 + ax + b \bmod p$$

The second form is those defined over a binary field  $F_2^m$  where the

elements of the field are integers of length at most  $m$  bits. For this

form the elliptic curve equation is modified to:

$$y^2 + xy = x^3 + ax^2 + b \text{ (where } b \neq 0\text{)}$$

Operations in a binary field are performed relative to an irreducible

polynomial. All such curves with OpenSSL use a trinomial or a

pentanomial for this parameter.

Although deprecated since OpenSSL 3.0 and should no longer be used, a

new curve can be constructed by calling `EC_GROUP_new()`, using the

implementation provided by `meth` (see `EC_GFp_simple_method(3)`) and

associated with the library context `ctx` (see `OSSL_LIB_CTX(3)`). The `ctx`

parameter may be `NULL` in which case the default library context is

used. It is then necessary to call `EC_GROUP_set_curve()` to set the

curve parameters. Applications should instead use one of the other

`EC_GROUP_new_*` constructors.

`EC_GROUP_new_from_params()` creates a group with parameters specified by

`params`. The library context `libctx` (see `OSSL_LIB_CTX(3)`) and property

query string `propq` are used to fetch algorithms from providers. `params`

may be either a list of explicit params or a named group, The values

for `ctx` and `propq` may be `NULL`. The params that can be used are

described in `EVP_PKEY-EC(7)`.

`EC_GROUP_new_from_ecparameters()` will create a group from the specified

params and `EC_GROUP_new_from_ecpkparameters()` will create a group from

the specific PK params.

`EC_GROUP_set_curve()` sets the curve parameters  $p$ ,  $a$  and  $b$ . For a curve

over  $F_p$   $p$  is the prime for the field. For a curve over  $F_2^m$   $p$

represents the irreducible polynomial - each bit represents a term in

the polynomial. Therefore, there will either be three or five bits set

dependent on whether the polynomial is a trinomial or a pentanomial.

In either case,  $a$  and  $b$  represents the coefficients  $a$  and  $b$  from the

relevant equation introduced above.

`EC_group_get_curve()` obtains the previously set curve parameters.

`EC_GROUP_set_curve_GFp()` and `EC_GROUP_set_curve_GF2m()` are synonyms for `EC_GROUP_set_curve()`. They are defined for backwards compatibility only and should not be used.

`EC_GROUP_get_curve_GFp()` and `EC_GROUP_get_curve_GF2m()` are synonyms for `EC_GROUP_get_curve()`. They are defined for backwards compatibility only and should not be used.

The functions `EC_GROUP_new_curve_GFp()` and `EC_GROUP_new_curve_GF2m()` are shortcuts for calling `EC_GROUP_new()` and then the `EC_GROUP_set_curve()` function. An appropriate default implementation method will be used.

Whilst the library can be used to create any curve using the functions described above, there are also a number of predefined curves that are available. In order to obtain a list of all of the predefined curves, call the function `EC_get_builtin_curves()`. The parameter `r` should be an array of `EC_builtin_curve` structures of size `nitems`. The function will populate the `r` array with information about the built-in curves. If `nitems` is less than the total number of curves available, then the first `nitems` curves will be returned. Otherwise the total number of curves will be provided. The return value is the total number of curves available (whether that number has been populated in `r` or not). Passing a `NULL` `r`, or setting `nitems` to 0 will do nothing other than return the total number of curves available. The `EC_builtin_curve` structure is defined as follows:

```
typedef struct {  
    int nid;  
    const char *comment;  
} EC_builtin_curve;
```

Each `EC_builtin_curve` item has a unique integer id (`nid`), and a human readable comment string describing the curve.

In order to construct a built-in curve use the function

`EC_GROUP_new_by_curve_name_ex()` and provide the `nid` of the curve to be

constructed, the associated library context to be used in `ctx` (see `OSSL_LIB_CTX(3)`) and any property query string in `propq`. The `ctx` value may be `NULL` in which case the default library context is used. The `propq` value may also be `NULL`.

`EC_GROUP_new_by_curve_name()` is the same as `EC_GROUP_new_by_curve_name_ex()` except that the default library context is always used along with a `NULL` property query string.

`EC_GROUP_free()` frees the memory associated with the `EC_GROUP`. If `group` is `NULL` nothing is done.

`EC_GROUP_clear_free()` is deprecated: it was meant to destroy any sensitive data held within the `EC_GROUP` and then free its memory, but since all the data stored in the `EC_GROUP` is public anyway, this function is unnecessary. Its use can be safely replaced with `EC_GROUP_free()`. If `group` is `NULL` nothing is done.

`OSSL_EC_curve_nid2name()` converts a curve `nid` into the corresponding name.

## RETURN VALUES

All `EC_GROUP_new*` functions return a pointer to the newly constructed group, or `NULL` on error.

`EC_get_builtin_curves()` returns the number of built-in curves that are available.

`EC_GROUP_set_curve_GFp()`, `EC_GROUP_get_curve_GFp()`, `EC_GROUP_set_curve_GF2m()`, `EC_GROUP_get_curve_GF2m()` return 1 on success or 0 on error.

`OSSL_EC_curve_nid2name()` returns a character string constant, or `NULL` on error.

## SEE ALSO

`crypto(7)`, `EC_GROUP_copy(3)`, `EC_POINT_new(3)`, `EC_POINT_add(3)`, `EC_KEY_new(3)`, `EC_GFp_simple_method(3)`, `d2i_ECPKParameters(3)`, `OSSL_LIB_CTX(3)`, `EVP_PKEY-EC(7)`

## HISTORY

? `EC_GROUP_new()` was deprecated in OpenSSL 3.0.

`EC_GROUP_new_by_curve_name_ex()` and `EC_GROUP_new_from_params()` were

added in OpenSSL 3.0.

? EC\_GROUP\_clear\_free() was deprecated in OpenSSL 3.0; use EC\_GROUP\_free() instead.

?

EC\_GROUP\_set\_curve\_GFp(), EC\_GROUP\_get\_curve\_GFp(), EC\_GROUP\_set\_curve\_GF2m() and EC\_GROUP\_get\_curve\_GF2m() were deprecated in OpenSSL 3.0; use EC\_GROUP\_set\_curve() and EC\_GROUP\_get\_curve() instead.

## COPYRIGHT

Copyright 2013-2021 The OpenSSL Project Authors. All Rights Reserved.

Licensed under the Apache License 2.0 (the "License"). You may not use

this file except in compliance with the License. You can obtain a copy

in the file LICENSE in the source distribution or at

<<https://www.openssl.org/source/license.html>>.

3.0.7                    2023-07-13                    EC\_GROUP\_NEW(3ossl)