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

***\$ man EC\_GROUP\_set\_curve.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.

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