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### ***Rocky Enterprise Linux 9.2 Manual Pages on command 'EC\_POINT\_mul.3ossl'***

***\$ man EC\_POINT\_mul.3ossl***

EC\_POINT\_ADD(3ossl)            OpenSSL            EC\_POINT\_ADD(3ossl)

#### NAME

EC\_POINT\_add, EC\_POINT\_dbl, EC\_POINT\_invert, EC\_POINT\_is\_at\_infinity,  
EC\_POINT\_is\_on\_curve, EC\_POINT\_cmp, EC\_POINT\_make\_affine,  
EC\_POINTs\_make\_affine, EC\_POINTs\_mul, EC\_POINT\_mul,  
EC\_GROUP\_precompute\_mult, EC\_GROUP\_have\_precompute\_mult - Functions for  
performing mathematical operations and tests on EC\_POINT objects

#### SYNOPSIS

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

```
int EC_POINT_add(const EC_GROUP *group, EC_POINT *r, const EC_POINT *a,  
                  const EC_POINT *b, BN_CTX *ctx);
```

```
int EC_POINT_dbl(const EC_GROUP *group, EC_POINT *r, const EC_POINT *a, BN_CTX *ctx);
```

```
int EC_POINT_invert(const EC_GROUP *group, EC_POINT *a, BN_CTX *ctx);
```

```
int EC_POINT_is_at_infinity(const EC_GROUP *group, const EC_POINT *p);
```

```
int EC_POINT_is_on_curve(const EC_GROUP *group, const EC_POINT *point, BN_CTX *ctx);
```

```
int EC_POINT_cmp(const EC_GROUP *group, const EC_POINT *a, const EC_POINT *b, BN_CTX *ctx);
int EC_POINT_mul(const EC_GROUP *group, EC_POINT *r, const BIGNUM *n,
                 const EC_POINT *q, const BIGNUM *m, BN_CTX *ctx);
```

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)`:

```
int EC_POINT_make_affine(const EC_GROUP *group, EC_POINT *point, BN_CTX *ctx);
int EC_POINTs_make_affine(const EC_GROUP *group, size_t num,
                          EC_POINT *points[], BN_CTX *ctx);
int EC_POINTs_mul(const EC_GROUP *group, EC_POINT *r, const BIGNUM *n, size_t num,
                 const EC_POINT *p[], const BIGNUM *m[], BN_CTX *ctx);
int EC_GROUP_precompute_mult(EC_GROUP *group, BN_CTX *ctx);
int EC_GROUP_have_precompute_mult(const EC_GROUP *group);
```

## DESCRIPTION

`EC_POINT_add` adds the two points `a` and `b` and places the result in `r`.

Similarly `EC_POINT_dbl` doubles the point `a` and places the result in `r`.

In both cases it is valid for `r` to be one of `a` or `b`.

`EC_POINT_invert` calculates the inverse of the supplied point `a`. The result is placed back in `a`.

The function `EC_POINT_is_at_infinity` tests whether the supplied point is at infinity or not.

`EC_POINT_is_on_curve` tests whether the supplied point is on the curve or not.

`EC_POINT_cmp` compares the two supplied points and tests whether or not they are equal.

The functions `EC_POINT_make_affine` and `EC_POINTs_make_affine` force the internal representation of the `EC_POINT(s)` into the affine co-ordinate system. In the case of `EC_POINTs_make_affine` the value `num` provides the number of points in the array `points` to be forced. These functions were deprecated in OpenSSL 3.0 and should no longer be used. Modern versions automatically perform this conversion when needed.

`EC_POINT_mul` calculates the value  $\text{generator} * n + q * m$  and stores the result in `r`. The value `n` may be `NULL` in which case the result is just  $q * m$  (variable point multiplication). Alternatively, both `q` and `m` may be `NULL`, and `n` non-`NULL`, in which case the result is just  $\text{generator} * n$  (fixed point multiplication). When performing a single fixed or variable point multiplication, the underlying implementation uses a constant time algorithm, when the input scalar (either `n` or `m`) is in the range  $[0, \text{ec\_group\_order})$ .

Although deprecated in OpenSSL 3.0 and should no longer be used, `EC_POINTs_mul` calculates the value  $\text{generator} * n + q[0] * m[0] + \dots + q[\text{num}-1] * m[\text{num}-1]$ . As for `EC_POINT_mul` the value `n` may be `NULL` or `num` may be zero. When performing a fixed point multiplication (`n` is non-`NULL` and `num` is 0) or a variable point multiplication (`n` is `NULL` and `num` is 1), the underlying implementation uses a constant time algorithm, when the input scalar (either `n` or `m[0]`) is in the range  $[0, \text{ec\_group\_order})$ . Modern versions should instead use `EC_POINT_mul()`, combined (if needed) with `EC_POINT_add()` in such rare circumstances.

The function `EC_GROUP_precompute_mult` stores multiples of the generator for faster point multiplication, whilst `EC_GROUP_have_precompute_mult` tests whether precomputation has already been done. See `EC_GROUP_copy(3)` for information about the generator. Precomputation functionality was deprecated in OpenSSL 3.0. Users of `EC_GROUP_precompute_mult()` and `EC_GROUP_have_precompute_mult()` should switch to named curves which OpenSSL has hardcoded lookup tables for.

## RETURN VALUES

The following functions return 1 on success or 0 on error:

`EC_POINT_add`, `EC_POINT_dbl`, `EC_POINT_invert`, `EC_POINT_make_affine`,  
`EC_POINTs_make_affine`, `EC_POINTs_make_affine`, `EC_POINT_mul`,  
`EC_POINTs_mul` and `EC_GROUP_precompute_mult`.

`EC_POINT_is_at_infinity` returns 1 if the point is at infinity, or 0 otherwise.

`EC_POINT_is_on_curve` returns 1 if the point is on the curve, 0 if not, or -1 on error.

`EC_POINT_cmp` returns 1 if the points are not equal, 0 if they are, or -1 on error.

`EC_GROUP_have_precompute_mult` return 1 if a precomputation has been done, or 0 if not.

## SEE ALSO

`crypto(7)`, `EC_GROUP_new(3)`, `EC_GROUP_copy(3)`, `EC_POINT_new(3)`,  
`EC_KEY_new(3)`, `EC_GFp_simple_method(3)`, `d2i_ECPKParameters(3)`

## HISTORY

`EC_POINT_make_affine()`, `EC_POINTs_make_affine()`, `EC_POINTs_mul()`,  
`EC_GROUP_precompute_mult()`, and `EC_GROUP_have_precompute_mult()` were deprecated in OpenSSL 3.0.

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