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***Rocky Enterprise Linux 9.2 Manual Pages on command 'BN\_mod\_mul\_montgomery.3ossl'***

***\$ man BN\_mod\_mul\_montgomery.3ossl***

BN\_MOD\_MUL\_MONTGOMERY(3ossl)    OpenSSL    BN\_MOD\_MUL\_MONTGOMERY(3ossl)

**NAME**

BN\_mod\_mul\_montgomery, BN\_MONT\_CTX\_new, BN\_MONT\_CTX\_free,  
BN\_MONT\_CTX\_set, BN\_MONT\_CTX\_copy, BN\_from\_montgomery, BN\_to\_montgomery  
- Montgomery multiplication

**SYNOPSIS**

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

```
BN_MONT_CTX *BN_MONT_CTX_new(void);
```

```
void BN_MONT_CTX_free(BN_MONT_CTX *mont);
```

```
int BN_MONT_CTX_set(BN_MONT_CTX *mont, const BIGNUM *m, BN_CTX *ctx);
```

```
BN_MONT_CTX *BN_MONT_CTX_copy(BN_MONT_CTX *to, BN_MONT_CTX *from);
```

```
int BN_mod_mul_montgomery(BIGNUM *r, BIGNUM *a, BIGNUM *b,
```

```
BN_MONT_CTX *mont, BN_CTX *ctx);
```

```
int BN_from_montgomery(BIGNUM *r, BIGNUM *a, BN_MONT_CTX *mont,  
    BN_CTX *ctx);
```

```
int BN_to_montgomery(BIGNUM *r, BIGNUM *a, BN_MONT_CTX *mont,  
    BN_CTX *ctx);
```

## DESCRIPTION

These functions implement Montgomery multiplication. They are used automatically when `BN_mod_exp(3)` is called with suitable input, but they may be useful when several operations are to be performed using the same modulus.

`BN_MONT_CTX_new()` allocates and initializes a `BN_MONT_CTX` structure.

`BN_MONT_CTX_set()` sets up the mont structure from the modulus `m` by precomputing its inverse and a value `R`.

`BN_MONT_CTX_copy()` copies the `BN_MONT_CTX` from to to.

`BN_MONT_CTX_free()` frees the components of the `BN_MONT_CTX`, and, if it was created by `BN_MONT_CTX_new()`, also the structure itself. If `mont` is `NULL`, nothing is done.

`BN_mod_mul_montgomery()` computes  $\text{Mont}(a,b) := a * b * R^{-1}$  and places the result in `r`.

`BN_from_montgomery()` performs the Montgomery reduction  $r = a * R^{-1}$ .

`BN_to_montgomery()` computes  $\text{Mont}(a, R^2)$ , i.e.  $a * R$ . Note that `a` must be nonnegative and smaller than the modulus.

For all functions, `ctx` is a previously allocated `BN_CTX` used for

temporary variables.

## RETURN VALUES

`BN_MONT_CTX_new()` returns the newly allocated `BN_MONT_CTX`, and `NULL` on error.

`BN_MONT_CTX_free()` has no return value.

For the other functions, 1 is returned for success, 0 on error. The error codes can be obtained by `ERR_get_error(3)`.

## WARNINGS

The inputs must be reduced modulo `m`, otherwise the result will be outside the expected range.

## SEE ALSO

`ERR_get_error(3)`, `BN_add(3)`, `BN_CTX_new(3)`

## HISTORY

`BN_MONT_CTX_init()` was removed in OpenSSL 1.1.0

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