

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. $a \cdot R$. 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

COPYRIGHT

Copyright 2000-2020 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>.