*\*\**

 *\* \file des.h*

 *\**

 *\* \brief DES block cipher*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

*/\**

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 *\**

 *\* This file is part of mbed TLS (*[https://tls.mbed.org](https://tls.mbed.org/)*)*

 *\**

 *\*/*

**#ifndef** MBEDTLS\_DES\_H

**#define** MBEDTLS\_DES\_H

**#if** !**defined**(MBEDTLS\_CONFIG\_FILE)

**#include** "config.h"

**#else**

**#include** MBEDTLS\_CONFIG\_FILE

**#endif**

**#include** <stddef.h>

**#include** <stdint.h>

**#define** MBEDTLS\_DES\_ENCRYPT 1

**#define** MBEDTLS\_DES\_DECRYPT 0

**#define** MBEDTLS\_ERR\_DES\_INVALID\_INPUT\_LENGTH -0x0032 */\*\*< The data input has an invalid length. \*/*

*/\* MBEDTLS\_ERR\_DES\_HW\_ACCEL\_FAILED is deprecated and should not be used. \*/*

**#define** MBEDTLS\_ERR\_DES\_HW\_ACCEL\_FAILED -0x0033 */\*\*< DES hardware accelerator failed. \*/*

**#define** MBEDTLS\_DES\_KEY\_SIZE 8

**#ifdef** \_\_cplusplus

**extern** "C" {

**#endif**

**#if** !**defined**(MBEDTLS\_DES\_ALT)

*// Regular implementation*

*//*

*/\*\**

 *\* \brief DES context structure*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

**typedef** **struct** mbedtls\_des\_context

{

 uint32\_t sk[32]; */\*!< DES subkeys \*/*

}

mbedtls\_des\_context;

*/\*\**

 *\* \brief Triple-DES context structure*

 *\*/*

**typedef** **struct** mbedtls\_des3\_context

{

 uint32\_t sk[96]; */\*!< 3DES subkeys \*/*

}

mbedtls\_des3\_context;

**#else** */\* MBEDTLS\_DES\_ALT \*/*

**#include** "des\_alt.h"

**#endif** */\* MBEDTLS\_DES\_ALT \*/*

*/\*\**

 *\* \brief Initialize DES context*

 *\**

 *\* \param ctx DES context to be initialized*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

void **mbedtls\_des\_init**( mbedtls\_des\_context \*ctx );

*/\*\**

 *\* \brief Clear DES context*

 *\**

 *\* \param ctx DES context to be cleared*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

void **mbedtls\_des\_free**( mbedtls\_des\_context \*ctx );

*/\*\**

 *\* \brief Initialize Triple-DES context*

 *\**

 *\* \param ctx DES3 context to be initialized*

 *\*/*

void **mbedtls\_des3\_init**( mbedtls\_des3\_context \*ctx );

*/\*\**

 *\* \brief Clear Triple-DES context*

 *\**

 *\* \param ctx DES3 context to be cleared*

 *\*/*

void **mbedtls\_des3\_free**( mbedtls\_des3\_context \*ctx );

*/\*\**

 *\* \brief Set key parity on the given key to odd.*

 *\**

 *\* DES keys are 56 bits long, but each byte is padded with*

 *\* a parity bit to allow verification.*

 *\**

 *\* \param key 8-byte secret key*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

void **mbedtls\_des\_key\_set\_parity**( unsigned char key[MBEDTLS\_DES\_KEY\_SIZE] );

*/\*\**

 *\* \brief Check that key parity on the given key is odd.*

 *\**

 *\* DES keys are 56 bits long, but each byte is padded with*

 *\* a parity bit to allow verification.*

 *\**

 *\* \param key 8-byte secret key*

 *\**

 *\* \return 0 is parity was ok, 1 if parity was not correct.*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

int **mbedtls\_des\_key\_check\_key\_parity**( **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE] );

*/\*\**

 *\* \brief Check that key is not a weak or semi-weak DES key*

 *\**

 *\* \param key 8-byte secret key*

 *\**

 *\* \return 0 if no weak key was found, 1 if a weak key was identified.*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

int **mbedtls\_des\_key\_check\_weak**( **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE] );

*/\*\**

 *\* \brief DES key schedule (56-bit, encryption)*

 *\**

 *\* \param ctx DES context to be initialized*

 *\* \param key 8-byte secret key*

 *\**

 *\* \return 0*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

int **mbedtls\_des\_setkey\_enc**( mbedtls\_des\_context \*ctx, **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE] );

*/\*\**

 *\* \brief DES key schedule (56-bit, decryption)*

 *\**

 *\* \param ctx DES context to be initialized*

 *\* \param key 8-byte secret key*

 *\**

 *\* \return 0*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

int **mbedtls\_des\_setkey\_dec**( mbedtls\_des\_context \*ctx, **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE] );

*/\*\**

 *\* \brief Triple-DES key schedule (112-bit, encryption)*

 *\**

 *\* \param ctx 3DES context to be initialized*

 *\* \param key 16-byte secret key*

 *\**

 *\* \return 0*

 *\*/*

int **mbedtls\_des3\_set2key\_enc**( mbedtls\_des3\_context \*ctx,

 **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE \* 2] );

*/\*\**

 *\* \brief Triple-DES key schedule (112-bit, decryption)*

 *\**

 *\* \param ctx 3DES context to be initialized*

 *\* \param key 16-byte secret key*

 *\**

 *\* \return 0*

 *\*/*

int **mbedtls\_des3\_set2key\_dec**( mbedtls\_des3\_context \*ctx,

 **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE \* 2] );

*/\*\**

 *\* \brief Triple-DES key schedule (168-bit, encryption)*

 *\**

 *\* \param ctx 3DES context to be initialized*

 *\* \param key 24-byte secret key*

 *\**

 *\* \return 0*

 *\*/*

int **mbedtls\_des3\_set3key\_enc**( mbedtls\_des3\_context \*ctx,

 **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE \* 3] );

*/\*\**

 *\* \brief Triple-DES key schedule (168-bit, decryption)*

 *\**

 *\* \param ctx 3DES context to be initialized*

 *\* \param key 24-byte secret key*

 *\**

 *\* \return 0*

 *\*/*

int **mbedtls\_des3\_set3key\_dec**( mbedtls\_des3\_context \*ctx,

 **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE \* 3] );

*/\*\**

 *\* \brief DES-ECB block encryption/decryption*

 *\**

 *\* \param ctx DES context*

 *\* \param input 64-bit input block*

 *\* \param output 64-bit output block*

 *\**

 *\* \return 0 if successful*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

int **mbedtls\_des\_crypt\_ecb**( mbedtls\_des\_context \*ctx,

 **const** unsigned char input[8],

 unsigned char output[8] );

**#if** **defined**(MBEDTLS\_CIPHER\_MODE\_CBC)

*/\*\**

 *\* \brief DES-CBC buffer encryption/decryption*

 *\**

 *\* \note Upon exit, the content of the IV is updated so that you can*

 *\* call the function same function again on the following*

 *\* block(s) of data and get the same result as if it was*

 *\* encrypted in one call. This allows a "streaming" usage.*

 *\* If on the other hand you need to retain the contents of the*

 *\* IV, you should either save it manually or use the cipher*

 *\* module instead.*

 *\**

 *\* \param ctx DES context*

 *\* \param mode MBEDTLS\_DES\_ENCRYPT or MBEDTLS\_DES\_DECRYPT*

 *\* \param length length of the input data*

 *\* \param iv initialization vector (updated after use)*

 *\* \param input buffer holding the input data*

 *\* \param output buffer holding the output data*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

int **mbedtls\_des\_crypt\_cbc**( mbedtls\_des\_context \*ctx,

 int mode,

 size\_t length,

 unsigned char iv[8],

 **const** unsigned char \*input,

 unsigned char \*output );

**#endif** */\* MBEDTLS\_CIPHER\_MODE\_CBC \*/*

*/\*\**

 *\* \brief 3DES-ECB block encryption/decryption*

 *\**

 *\* \param ctx 3DES context*

 *\* \param input 64-bit input block*

 *\* \param output 64-bit output block*

 *\**

 *\* \return 0 if successful*

 *\*/*

int **mbedtls\_des3\_crypt\_ecb**( mbedtls\_des3\_context \*ctx,

 **const** unsigned char input[8],

 unsigned char output[8] );

**#if** **defined**(MBEDTLS\_CIPHER\_MODE\_CBC)

*/\*\**

 *\* \brief 3DES-CBC buffer encryption/decryption*

 *\**

 *\* \note Upon exit, the content of the IV is updated so that you can*

 *\* call the function same function again on the following*

 *\* block(s) of data and get the same result as if it was*

 *\* encrypted in one call. This allows a "streaming" usage.*

 *\* If on the other hand you need to retain the contents of the*

 *\* IV, you should either save it manually or use the cipher*

 *\* module instead.*

 *\**

 *\* \param ctx 3DES context*

 *\* \param mode MBEDTLS\_DES\_ENCRYPT or MBEDTLS\_DES\_DECRYPT*

 *\* \param length length of the input data*

 *\* \param iv initialization vector (updated after use)*

 *\* \param input buffer holding the input data*

 *\* \param output buffer holding the output data*

 *\**

 *\* \return 0 if successful, or MBEDTLS\_ERR\_DES\_INVALID\_INPUT\_LENGTH*

 *\*/*

int **mbedtls\_des3\_crypt\_cbc**( mbedtls\_des3\_context \*ctx,

 int mode,

 size\_t length,

 unsigned char iv[8],

 **const** unsigned char \*input,

 unsigned char \*output );

**#endif** */\* MBEDTLS\_CIPHER\_MODE\_CBC \*/*

*/\*\**

 *\* \brief Internal function for key expansion.*

 *\* (Only exposed to allow overriding it,*

 *\* see MBEDTLS\_DES\_SETKEY\_ALT)*

 *\**

 *\* \param SK Round keys*

 *\* \param key Base key*

 *\**

 *\* \warning DES is considered a weak cipher and its use constitutes a*

 *\* security risk. We recommend considering stronger ciphers*

 *\* instead.*

 *\*/*

void **mbedtls\_des\_setkey**( uint32\_t SK[32],

 **const** unsigned char key[MBEDTLS\_DES\_KEY\_SIZE] );

*/\*\**

 *\* \brief Checkup routine*

 *\**

 *\* \return 0 if successful, or 1 if the test failed*

 *\*/*

int **mbedtls\_des\_self\_test**( int verbose );

**#ifdef** \_\_cplusplus

}

**#endif**

**#endif** */\* des.h \*/*