

NAME

d2i_DSAPrivateKey, d2i_DSAPrivateKey_bio, d2i_DSAPrivateKey_fp, d2i_DSAPublicKey, d2i_DSA_PUBKEY, d2i_DSA_PUBKEY_bio, d2i_DSA_PUBKEY_fp, d2i_DSAParams, d2i_RSAPrivateKey, d2i_RSAPrivateKey_bio, d2i_RSAPrivateKey_fp, d2i_RSAPublicKey, d2i_RSAPublicKey_bio, d2i_RSAPublicKey_fp, d2i_RSA_PUBKEY, d2i_RSA_PUBKEY_bio, d2i_RSA_PUBKEY_fp, d2i_DHparams, d2i_DHparams_bio, d2i_DHparams_fp, d2i_ECParameters, d2i_ECPrivateKey, d2i_ECPrivateKey_bio, d2i_ECPrivateKey_fp, d2i_EC_PUBKEY, d2i_EC_PUBKEY_bio, d2i_EC_PUBKEY_fp, i2d_RSAPrivateKey, i2d_RSAPrivateKey_bio, i2d_RSAPrivateKey_fp, i2d_RSAPublicKey, i2d_RSAPublicKey_bio, i2d_RSAPublicKey_fp, i2d_RSA_PUBKEY, i2d_RSA_PUBKEY_bio, i2d_RSA_PUBKEY_fp, i2d_DHparams, i2d_DHparams_bio, i2d_DHparams_fp, i2d_DSAPrivateKey, i2d_DSAPrivateKey_bio, i2d_DSAPrivateKey_fp, i2d_DSAPublicKey, i2d_DSA_PUBKEY, i2d_DSA_PUBKEY_bio, i2d_DSA_PUBKEY_fp, i2d_DSAParams, i2d_ECParameters, i2d_ECPrivateKey, i2d_ECPrivateKey_bio, i2d_ECPrivateKey_fp, i2d_EC_PUBKEY, i2d_EC_PUBKEY_bio, i2d_EC_PUBKEY_fp - DEPRECATED

SYNOPSIS

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)**:

```
TYPE *d2i_TYPEPrivateKey(TYPE **a, const unsigned char **ppin, long length);
TYPE *d2i_TYPEPrivateKey_bio(BIO *bp, TYPE **a);
TYPE *d2i_TYPEPrivateKey_fp(FILE *fp, TYPE **a);
TYPE *d2i_TYPEPublicKey(TYPE **a, const unsigned char **ppin, long length);
TYPE *d2i_TYPEPublicKey_bio(BIO *bp, TYPE **a);
TYPE *d2i_TYPEPublicKey_fp(FILE *fp, TYPE **a);
TYPE *d2i_TYPEparams(TYPE **a, const unsigned char **ppin, long length);
TYPE *d2i_TYPEparams_bio(BIO *bp, TYPE **a);
TYPE *d2i_TYPEparams_fp(FILE *fp, TYPE **a);
TYPE *d2i_TYPE_PUBKEY(TYPE **a, const unsigned char **ppin, long length);
TYPE *d2i_TYPE_PUBKEY_bio(BIO *bp, TYPE **a);
TYPE *d2i_TYPE_PUBKEY_fp(FILE *fp, TYPE **a);
```

```
int i2d_TYPEPrivateKey(const TYPE *a, unsigned char **ppout);
int i2d_TYPEPrivateKey(TYPE *a, unsigned char **ppout);
int i2d_TYPEPrivateKey_fp(FILE *fp, const TYPE *a);
int i2d_TYPEPrivateKey_fp(FILE *fp, TYPE *a);
int i2d_TYPEPrivateKey_bio(BIO *bp, const TYPE *a);
int i2d_TYPEPrivateKey_bio(BIO *bp, TYPE *a);
int i2d_TYPEPublicKey(const TYPE *a, unsigned char **ppout);
```

```

int i2d_TYPEPublicKey(TYPE *a, unsigned char **ppout);
int i2d_TYPEPublicKey_fp(FILE *fp, const TYPE *a);
int i2d_TYPEPublicKey_bio(BIO *bp, const TYPE *a);
int i2d_TYPEparams(const TYPE *a, unsigned char **ppout);
int i2d_TYPEparams(TYPE *a, unsigned char **ppout);
int i2d_TYPEparams_fp(FILE *fp, const TYPE *a);
int i2d_TYPEparams_bio(BIO *bp, const TYPE *a);
int i2d_TYPE_PUBKEY(const TYPE *a, unsigned char **ppout);
int i2d_TYPE_PUBKEY(TYPE *a, unsigned char **ppout);
int i2d_TYPE_PUBKEY_fp(FILE *fp, const TYPE *a);
int i2d_TYPE_PUBKEY_bio(BIO *bp, const TYPE *a);
int i2d_TYPE_PUBKEY_bio(BIO *bp, TYPE *a);

```

DESCRIPTION

All functions described here are deprecated. Please use **OSSL_DECODER(3)** instead of the **d2i** functions and **OSSL_ENCODER(3)** instead of the **i2d** functions. See "Migration" below.

In the description here, **TYPE** is used a placeholder for any of the OpenSSL datatypes, such as **RSA**. The function parameters *ppin* and *ppout* are generally either both named *pp* in the headers, or *in* and *out*.

All the functions here behave the way that's described in **d2i_X509(3)**.

Please note that not all functions in the synopsis are available for all key types. For example, there are no **d2i_RSAParams()** or **i2d_RSAParams()**, because the PKCS#1 **RSA** structure doesn't include any key parameters.

d2i_TYPEPrivateKey() and derivatives thereof decode DER encoded **TYPE** private key data organized in a type specific structure.

d2i_TYPEPublicKey() and derivatives thereof decode DER encoded **TYPE** public key data organized in a type specific structure.

d2i_TYPEparams() and derivatives thereof decode DER encoded **TYPE** key parameters organized in a type specific structure.

d2i_TYPE_PUBKEY() and derivatives thereof decode DER encoded *TYPE* public key data organized in a **SubjectPublicKeyInfo** structure.

i2d_TYPEPrivateKey() and derivatives thereof encode the private key *TYPE* data into a type specific DER encoded structure.

i2d_TYPEPublicKey() and derivatives thereof encode the public key *TYPE* data into a type specific DER encoded structure.

i2d_TYPEparams() and derivatives thereof encode the *TYPE* key parameters data into a type specific DER encoded structure.

i2d_TYPE_PUBKEY() and derivatives thereof encode the public key *TYPE* data into a DER encoded **SubjectPublicKeyInfo** structure.

For example, **d2i_RSAPrivateKey()** and **d2i_RSAPublicKey()** expects the structure defined by PKCS#1. Similarly, **i2d_RSAPrivateKey()** and **i2d_RSAPublicKey()** produce DER encoded string organized according to PKCS#1.

Migration

Migration from the diverse *TYPE*s requires using corresponding new OpenSSL types. For all *TYPE*s described here, the corresponding new type is **EVP_PKEY**. The rest of this section assumes that this has been done, exactly how to do that is described elsewhere.

There are two migration paths:

- ⊕ Replace `b<d2i_TYPEPrivateKey()>` with `d2i_PrivateKey(3)`, `b<d2i_TYPEPublicKey()>` with `d2i_PublicKey(3)`, `b<d2i_TYPEparams()>` with `d2i_KeyParams(3)`, `b<d2i_TYPE_PUBKEY()>` with `d2i_PUBKEY(3)`, `b<i2d_TYPEPrivateKey()>` with `i2d_PrivateKey(3)`, `b<i2d_TYPEPublicKey()>` with `i2d_PublicKey(3)`, `b<i2d_TYPEparams()>` with `i2d_KeyParams(3)`, `b<i2d_TYPE_PUBKEY()>` with `i2d_PUBKEY(3)`. A caveat is that `i2d_PrivateKey(3)` may output a DER encoded PKCS#8 outermost structure instead of the type specific structure, and that `d2i_PrivateKey(3)` recognises and unpacks a PKCS#8 structures.
- ⊕ Use `OSSL_DECODER(3)` and `OSSL_ENCODER(3)`. How to migrate is described below. All those descriptions assume that the key to be encoded is in the variable *pkey*.

Migrating i2d functions to OSSL_ENCODER

The exact `OSSL_ENCODER(3)` output is driven by arguments rather than by function names. The

sample code to get DER encoded output in a type specific structure is uniform, the only things that vary are the selection of what part of the **EVP_PKEY** should be output, and the structure. The **i2d** functions names can therefore be translated into two variables, *selection* and *structure* as follows:

i2d_TYPEPrivateKey() translates into:

```
int selection = EVP_PKEY_KEYPAIR;
const char *structure = "type-specific";
```

i2d_TYPEPublicKey() translates into:

```
int selection = EVP_PKEY_PUBLIC_KEY;
const char *structure = "type-specific";
```

i2d_TYPEparams() translates into:

```
int selection = EVP_PKEY_PARAMETERS;
const char *structure = "type-specific";
```

i2d_TYPE_PUBKEY() translates into:

```
int selection = EVP_PKEY_PUBLIC_KEY;
const char *structure = "SubjectPublicKeyInfo";
```

The following sample code does the rest of the work:

```
unsigned char *p = buffer; /* |buffer| is supplied by the caller */
size_t len = buffer_size; /* assumed be the size of |buffer| */
OSSL_ENCODER_CTX *ctx =
    OSSL_ENCODER_CTX_new_for_pkey(pkey, selection, "DER", structure,
        NULL, NULL);
if (ctx == NULL) {
    /* fatal error handling */
}
if (OSSL_ENCODER_CTX_get_num_encoders(ctx) == 0) {
    OSSL_ENCODER_CTX_free(ctx);
    /* non-fatal error handling */
}
if (!OSSL_ENCODER_to_data(ctx, &p, &len)) {
    OSSL_ENCODER_CTX_free(ctx);
    /* error handling */
}
OSSL_ENCODER_CTX_free(ctx);
```

NOTES

The letters **i** and **d** in **i2d_TYPE()** stand for "internal" (that is, an internal C structure) and "DER" respectively. So **i2d_TYPE()** converts from internal to DER.

The functions can also understand **BER** forms.

The actual **TYPE** structure passed to **i2d_TYPE()** must be a valid populated **TYPE** structure -- it **cannot** simply be fed with an empty structure such as that returned by **TYPE_new()**.

The encoded data is in binary form and may contain embedded zeros. Therefore, any **FILE** pointers or **BIOs** should be opened in binary mode. Functions such as **strlen()** will **not** return the correct length of the encoded structure.

The ways that **ppin* and **ppout* are incremented after the operation can trap the unwary. See the **WARNINGS** section in **d2i_X509(3)** for some common errors. The reason for this-auto increment behaviour is to reflect a typical usage of ASN1 functions: after one structure is encoded or decoded another will be processed after it.

The following points about the data types might be useful:

DSA_PUBKEY

Represents a DSA public key using a **SubjectPublicKeyInfo** structure.

DSAPublicKey, DSAPrivateKey

Use a non-standard OpenSSL format and should be avoided; use **DSA_PUBKEY**, **PEM_write_PrivateKey(3)**, or similar instead.

RETURN VALUES

d2i_TYPE(), **d2i_TYPE_bio()** and **d2i_TYPE_fp()** return a valid **TYPE** structure or **NULL** if an error occurs. If the "reuse" capability has been used with a valid structure being passed in via *a*, then the object is freed in the event of error and **a* is set to **NULL**.

i2d_TYPE() returns the number of bytes successfully encoded or a negative value if an error occurs.

i2d_TYPE_bio() and **i2d_TYPE_fp()** return 1 for success and 0 if an error occurs.

SEE ALSO

OSSL_ENCODER(3), **OSSL_DECODER(3)**, **d2i_PrivateKey(3)**, **d2i_PublicKey(3)**, **d2i_KeyParams(3)**, **d2i_PUBKEY(3)**, **i2d_PrivateKey(3)**, **i2d_PublicKey(3)**, **i2d_KeyParams(3)**, **i2d_PUBKEY(3)**

COPYRIGHT

Copyright 2020-2023 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>.