

i2d_ECParameters, 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_fp(FILE *fp, TYPE *a);
```

```
int i2d_TYPEPublicKey_bio(BIO *bp, const TYPE *a);
```

```

int i2d_TYPEPublicKey_bio(BIO *bp, 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_fp(FILE *fp, TYPE *a);
int i2d_TYPEparams_bio(BIO *bp, const TYPE *a);
int i2d_TYPEparams_bio(BIO *bp, 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_fp(FILE *fp, 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 TYPEs requires using corresponding new OpenSSL types. For all TYPEs 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_PRIVATE_KEY;  
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)

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