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Red Hat Enterprise Linux Release 9.2 Manual Pages on 'EVP_PKEY_ASN1_METHOD.3oss1' command

\$ man EVP_PKEY_ASN1_METHOD.3oss1

EVP_PKEY_ASN1_METHOD(3oss1) OpenSSL EVP_PKEY_ASN1_METHOD(3oss1)

NAME

EVP_PKEY_ASN1_METHOD, EVP_PKEY_asn1_new, EVP_PKEY_asn1_copy, EVP_PKEY_asn1_free, EVP_PKEY_asn1_add0, EVP_PKEY_asn1_add_alias, EVP_PKEY_asn1_set_public, EVP_PKEY_asn1_set_private, EVP_PKEY_asn1_set_param, EVP_PKEY_asn1_set_free, EVP_PKEY_asn1_set_ctrl, EVP_PKEY_asn1_set_item, EVP_PKEY_asn1_set_siginf, EVP_PKEY_asn1_set_check, EVP_PKEY_asn1_set_public_check, EVP_PKEY_asn1_set_param_check, EVP_PKEY_asn1_set_security_bits, EVP_PKEY_asn1_set_set_priv_key, EVP_PKEY_asn1_set_set_pub_key, EVP_PKEY_asn1_set_get_priv_key, EVP_PKEY_asn1_set_get_pub_key, EVP_PKEY_get0_asn1 - manipulating and registering EVP_PKEY_ASN1_METHOD structure

SYNOPSIS

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

typedef struct evp_pkey_asn1_method_st EVP_PKEY_ASN1_METHOD;

EVP_PKEY_ASN1_METHOD *EVP_PKEY_asn1_new(int id, int flags,
                                       const char *pem_str,
                                       const char *info);

void EVP_PKEY_asn1_copy(EVP_PKEY_ASN1_METHOD *dst,
                       const EVP_PKEY_ASN1_METHOD *src);

void EVP_PKEY_asn1_free(EVP_PKEY_ASN1_METHOD *ameth);

int EVP_PKEY_asn1_add0(const EVP_PKEY_ASN1_METHOD *ameth);
```

```

int EVP_PKEY_asn1_add_alias(int to, int from);

void EVP_PKEY_asn1_set_public(EVP_PKEY_ASN1_METHOD *ameth,
    int (*pub_decode) (EVP_PKEY *pk,
        const X509_PUBKEY *pub),
    int (*pub_encode) (X509_PUBKEY *pub,
        const EVP_PKEY *pk),
    int (*pub_cmp) (const EVP_PKEY *a,
        const EVP_PKEY *b),
    int (*pub_print) (BIO *out,
        const EVP_PKEY *pkey,
        int indent, ASN1_PCTX *pctx),
    int (*pkey_size) (const EVP_PKEY *pk),
    int (*pkey_bits) (const EVP_PKEY *pk));

void EVP_PKEY_asn1_set_private(EVP_PKEY_ASN1_METHOD *ameth,
    int (*priv_decode) (EVP_PKEY *pk,
        const PKCS8_PRIV_KEY_INFO
        *p8inf),
    int (*priv_encode) (PKCS8_PRIV_KEY_INFO *p8,
        const EVP_PKEY *pk),
    int (*priv_print) (BIO *out,
        const EVP_PKEY *pkey,
        int indent,
        ASN1_PCTX *pctx));

void EVP_PKEY_asn1_set_param(EVP_PKEY_ASN1_METHOD *ameth,
    int (*param_decode) (EVP_PKEY *pkey,
        const unsigned char **pder,
        int derlen),
    int (*param_encode) (const EVP_PKEY *pkey,
        unsigned char **pder),
    int (*param_missing) (const EVP_PKEY *pk),
    int (*param_copy) (EVP_PKEY *to,
        const EVP_PKEY *from),
    int (*param_cmp) (const EVP_PKEY *a,

```

```

        const EVP_PKEY *b),
    int (*param_print) (BIO *out,
        const EVP_PKEY *pkey,
        int indent,
        ASN1_PCTX *pctx));
void EVP_PKEY_asn1_set_free(EVP_PKEY_ASN1_METHOD *ameth,
    void (*pkey_free) (EVP_PKEY *pkey));
void EVP_PKEY_asn1_set_ctrl(EVP_PKEY_ASN1_METHOD *ameth,
    int (*pkey_ctrl) (EVP_PKEY *pkey, int op,
        long arg1, void *arg2));
void EVP_PKEY_asn1_set_item(EVP_PKEY_ASN1_METHOD *ameth,
    int (*item_verify) (EVP_MD_CTX *ctx,
        const ASN1_ITEM *it,
        void *asn,
        X509_ALGOR *a,
        ASN1_BIT_STRING *sig,
        EVP_PKEY *pkey),
    int (*item_sign) (EVP_MD_CTX *ctx,
        const ASN1_ITEM *it,
        void *asn,
        X509_ALGOR *alg1,
        X509_ALGOR *alg2,
        ASN1_BIT_STRING *sig));
void EVP_PKEY_asn1_set_siginf(EVP_PKEY_ASN1_METHOD *ameth,
    int (*siginf_set) (X509_SIG_INFO *siginf,
        const X509_ALGOR *alg,
        const ASN1_STRING *sig));
void EVP_PKEY_asn1_set_check(EVP_PKEY_ASN1_METHOD *ameth,
    int (*pkey_check) (const EVP_PKEY *pk));
void EVP_PKEY_asn1_set_public_check(EVP_PKEY_ASN1_METHOD *ameth,
    int (*pkey_pub_check) (const EVP_PKEY *pk));
void EVP_PKEY_asn1_set_param_check(EVP_PKEY_ASN1_METHOD *ameth,
    int (*pkey_param_check) (const EVP_PKEY *pk));

```

```

void EVP_PKEY_asn1_set_security_bits(EVP_PKEY_ASN1_METHOD *ameth,
                                     int (*pkey_security_bits) (const EVP_PKEY
                                                                *pk));

void EVP_PKEY_asn1_set_set_priv_key(EVP_PKEY_ASN1_METHOD *ameth,
                                     int (*set_priv_key) (EVP_PKEY *pk,
                                                         const unsigned char
                                                                *priv,
                                                         size_t len));

void EVP_PKEY_asn1_set_set_pub_key(EVP_PKEY_ASN1_METHOD *ameth,
                                    int (*set_pub_key) (EVP_PKEY *pk,
                                                         const unsigned char *pub,
                                                         size_t len));

void EVP_PKEY_asn1_set_get_priv_key(EVP_PKEY_ASN1_METHOD *ameth,
                                     int (*get_priv_key) (const EVP_PKEY *pk,
                                                         unsigned char *priv,
                                                         size_t *len));

void EVP_PKEY_asn1_set_get_pub_key(EVP_PKEY_ASN1_METHOD *ameth,
                                    int (*get_pub_key) (const EVP_PKEY *pk,
                                                         unsigned char *pub,
                                                         size_t *len));

const EVP_PKEY_ASN1_METHOD *EVP_PKEY_get0_asn1(const EVP_PKEY *pkey);

```

DESCRIPTION

EVP_PKEY_ASN1_METHOD is a structure which holds a set of ASN.1 conversion, printing and information methods for a specific public key algorithm.

There are two places where the EVP_PKEY_ASN1_METHOD objects are stored:

one is a built-in array representing the standard methods for different algorithms, and the other one is a stack of user-defined application-specific methods, which can be manipulated by using

EVP_PKEY_asn1_add0(3).

Methods

The methods are the underlying implementations of a particular public key algorithm present by the EVP_PKEY object.

```

int (*pub_decode) (EVP_PKEY *pk, const X509_PUBKEY *pub);
int (*pub_encode) (X509_PUBKEY *pub, const EVP_PKEY *pk);
int (*pub_cmp) (const EVP_PKEY *a, const EVP_PKEY *b);
int (*pub_print) (BIO *out, const EVP_PKEY *pkey, int indent,
                 ASN1_PCTX *pctx);

```

The `pub_decode()` and `pub_encode()` methods are called to decode / encode X509_PUBKEY ASN.1 parameters to / from pk. They MUST return 0 on error, 1 on success. They're called by `X509_PUBKEY_get0(3)` and `X509_PUBKEY_set(3)`.

The `pub_cmp()` method is called when two public keys are to be compared. It MUST return 1 when the keys are equal, 0 otherwise. It's called by `EVP_PKEY_eq(3)`.

The `pub_print()` method is called to print a public key in humanly readable text to out, indented indent spaces. It MUST return 0 on error, 1 on success. It's called by `EVP_PKEY_print_public(3)`.

```

int (*priv_decode) (EVP_PKEY *pk, const PKCS8_PRIV_KEY_INFO *p8inf);
int (*priv_encode) (PKCS8_PRIV_KEY_INFO *p8, const EVP_PKEY *pk);
int (*priv_print) (BIO *out, const EVP_PKEY *pkey, int indent,
                 ASN1_PCTX *pctx);

```

The `priv_decode()` and `priv_encode()` methods are called to decode / encode PKCS8_PRIV_KEY_INFO from private key to / from pk. They MUST return 0 on error, 1 on success. They're called by `EVP_PKCS82PKEY(3)` and `EVP_PKEY2PKCS8(3)`.

The `priv_print()` method is called to print a private key in humanly readable text to out, indented indent spaces. It MUST return 0 on error, 1 on success. It's called by `EVP_PKEY_print_private(3)`.

```

int (*pkey_size) (const EVP_PKEY *pk);
int (*pkey_bits) (const EVP_PKEY *pk);
int (*pkey_security_bits) (const EVP_PKEY *pk);

```

The `pkey_size()` method returns the key size in bytes. It's called by `EVP_PKEY_get_size(3)`.

The `pkey_bits()` method returns the key size in bits. It's called by `EVP_PKEY_get_bits(3)`.

```

int (*param_decode) (EVP_PKEY *pkey,
                    const unsigned char **pder, int derlen);
int (*param_encode) (const EVP_PKEY *pkey, unsigned char **pder);
int (*param_missing) (const EVP_PKEY *pk);
int (*param_copy) (EVP_PKEY *to, const EVP_PKEY *from);
int (*param_cmp) (const EVP_PKEY *a, const EVP_PKEY *b);
int (*param_print) (BIO *out, const EVP_PKEY *pkey, int indent,
                   ASN1_PCTX *pctx);

```

The param_decode() and param_encode() methods are called to decode / encode DER formatted parameters to / from pk. They MUST return 0 on error, 1 on success. They're called by PEM_read_bio_Parameters(3) and the file: OSSL_STORE_LOADER(3).

The param_missing() method returns 0 if a key parameter is missing, otherwise 1. It's called by EVP_PKEY_missing_parameters(3).

The param_copy() method copies key parameters from from to to. It MUST return 0 on error, 1 on success. It's called by EVP_PKEY_copy_parameters(3).

The param_cmp() method compares the parameters of keys a and b. It MUST return 1 when the keys are equal, 0 when not equal, or a negative number on error. It's called by EVP_PKEY_parameters_eq(3).

The param_print() method prints the private key parameters in humanly readable text to out, indented indent spaces. It MUST return 0 on error, 1 on success. It's called by EVP_PKEY_print_params(3).

```

int (*sig_print) (BIO *out,
                const X509_ALGOR *sigalg, const ASN1_STRING *sig,
                int indent, ASN1_PCTX *pctx);

```

The sig_print() method prints a signature in humanly readable text to out, indented indent spaces. sigalg contains the exact signature algorithm. If the signature in sig doesn't correspond to what this method expects, X509_signature_dump() must be used as a last resort.

It MUST return 0 on error, 1 on success. It's called by X509_signature_print(3).

```

void (*pkey_free) (EVP_PKEY *pkey);

```

The `pkey_free()` method helps freeing the internals of `pkey`. It's called by `EVP_PKEY_free(3)`, `EVP_PKEY_set_type(3)`, `EVP_PKEY_set_type_str(3)`, and `EVP_PKEY_assign(3)`.

```
int (*pkey_ctrl) (EVP_PKEY *pkey, int op, long arg1, void *arg2);
```

The `pkey_ctrl()` method adds extra algorithm specific control. It's called by `EVP_PKEY_get_default_digest_nid(3)`,

```
EVP_PKEY_set1_encoded_public_key(3),
```

```
EVP_PKEY_get1_encoded_public_key(3), PKCS7_SIGNER_INFO_set(3),
```

```
PKCS7_RECIP_INFO_set(3), ...
```

```
int (*old_priv_decode) (EVP_PKEY *pkey,
```

```
    const unsigned char **pder, int derlen);
```

```
int (*old_priv_encode) (const EVP_PKEY *pkey, unsigned char **pder);
```

The `old_priv_decode()` and `old_priv_encode()` methods decode / encode they private key `pkey` from / to a DER formatted array. These are exclusively used to help decoding / encoding older (pre PKCS#8) PEM formatted encrypted private keys. `old_priv_decode()` MUST return 0 on error, 1 on success. `old_priv_encode()` MUST the return same kind of values as `i2d_PrivateKey()`. They're called by `d2i_PrivateKey(3)` and `i2d_PrivateKey(3)`.

```
int (*item_verify) (EVP_MD_CTX *ctx, const ASN1_ITEM *it, void *asn,
```

```
    X509_ALGOR *a, ASN1_BIT_STRING *sig, EVP_PKEY *pkey);
```

```
int (*item_sign) (EVP_MD_CTX *ctx, const ASN1_ITEM *it, void *asn,
```

```
    X509_ALGOR *alg1, X509_ALGOR *alg2,
```

```
    ASN1_BIT_STRING *sig);
```

The `item_sign()` and `item_verify()` methods make it possible to have algorithm specific signatures and verification of them.

`item_sign()` MUST return one of:

<=0 error

1 `item_sign()` did everything, OpenSSL internals just needs to pass the signature length back.

2 `item_sign()` did nothing, OpenSSL internal standard routines are expected to continue with the default signature production.

3 `item_sign()` set the algorithm identifier `algor1` and `algor2`, OpenSSL

internals should just sign using those algorithms.

item_verify() MUST return one of:

<=0 error

1 item_sign() did everything, OpenSSL internals just needs to pass the signature length back.

2 item_sign() did nothing, OpenSSL internal standard routines are expected to continue with the default signature production.

item_verify() and item_sign() are called by ASN1_item_verify(3) and

ASN1_item_sign(3), and by extension, X509_verify(3),

X509_REQ_verify(3), X509_sign(3), X509_REQ_sign(3), ...

```
int (*siginf_set) (X509_SIG_INFO *siginf, const X509_ALGOR *alg,
                  const ASN1_STRING *sig);
```

The siginf_set() method is used to set custom X509_SIG_INFO parameters.

It MUST return 0 on error, or 1 on success. It's called as part of

X509_check_purpose(3), X509_check_ca(3) and X509_check_issued(3).

```
int (*pkey_check) (const EVP_PKEY *pk);
```

```
int (*pkey_public_check) (const EVP_PKEY *pk);
```

```
int (*pkey_param_check) (const EVP_PKEY *pk);
```

The pkey_check(), pkey_public_check() and pkey_param_check() methods

are used to check the validity of pk for key-pair, public component and

parameters, respectively. They MUST return 0 for an invalid key, or 1

for a valid key. They are called by EVP_PKEY_check(3),

EVP_PKEY_public_check(3) and EVP_PKEY_param_check(3) respectively.

```
int (*set_priv_key) (EVP_PKEY *pk, const unsigned char *priv, size_t len);
```

```
int (*set_pub_key) (EVP_PKEY *pk, const unsigned char *pub, size_t len);
```

The set_priv_key() and set_pub_key() methods are used to set the raw

private and public key data for an EVP_PKEY. They MUST return 0 on

error, or 1 on success. They are called by

EVP_PKEY_new_raw_private_key(3), and EVP_PKEY_new_raw_public_key(3)

respectively.

```
size_t (*dirty) (const EVP_PKEY *pk);
```

```
void (*export_to) (const EVP_PKEY *pk, EVP_KEYMGMT *keymgmt);
```

dirty_cnt() returns the internal key's dirty count. This can be used

to synchronise different copies of the same keys.

The `export_to()` method exports the key material from the given key to a provider, through the `EVP_KEYMGMT(3)` interface, if that provider supports importing key material.

Functions

`EVP_PKEY_asn1_new()` creates and returns a new `EVP_PKEY_ASN1_METHOD` object, and associates the given `id`, `flags`, `pem_str` and `info`. `id` is a NID, `pem_str` is the PEM type string, `info` is a descriptive string. The following flags are supported:

`ASN1_PKEY_SIGPARAM_NULL`

If `ASN1_PKEY_SIGPARAM_NULL` is set, then the signature algorithm parameters are given the type `V_ASN1_NULL` by default, otherwise they will be given the type `V_ASN1_UNDEF` (i.e. the parameter is omitted).

See `X509_ALGOR_set0(3)` for more information.

`EVP_PKEY_asn1_copy()` copies an `EVP_PKEY_ASN1_METHOD` object from `src` to `dst`. This function is not thread safe, it's recommended to only use this when initializing the application.

`EVP_PKEY_asn1_free()` frees an existing `EVP_PKEY_ASN1_METHOD` pointed by `ameth`.

`EVP_PKEY_asn1_add0()` adds `ameth` to the user defined stack of methods unless another `EVP_PKEY_ASN1_METHOD` with the same NID is already there.

This function is not thread safe, it's recommended to only use this when initializing the application.

`EVP_PKEY_asn1_add_alias()` creates an alias with the NID to for the `EVP_PKEY_ASN1_METHOD` with NID from unless another `EVP_PKEY_ASN1_METHOD` with the same NID is already added. This function is not thread safe, it's recommended to only use this when initializing the application.

`EVP_PKEY_asn1_set_public()`, `EVP_PKEY_asn1_set_private()`,

`EVP_PKEY_asn1_set_param()`, `EVP_PKEY_asn1_set_free()`,

`EVP_PKEY_asn1_set_ctrl()`, `EVP_PKEY_asn1_set_item()`,

`EVP_PKEY_asn1_set_siginf()`, `EVP_PKEY_asn1_set_check()`,

`EVP_PKEY_asn1_set_public_check()`, `EVP_PKEY_asn1_set_param_check()`,

`EVP_PKEY_asn1_set_security_bits()`, `EVP_PKEY_asn1_set_set_priv_key()`,

EVP_PKEY_asn1_set_set_pub_key(), EVP_PKEY_asn1_set_get_priv_key() and EVP_PKEY_asn1_set_get_pub_key() set the diverse methods of the given EVP_PKEY_ASN1_METHOD object.
EVP_PKEY_get0_asn1() finds the EVP_PKEY_ASN1_METHOD associated with the key pkey.

RETURN VALUES

EVP_PKEY_asn1_new() returns NULL on error, or a pointer to an EVP_PKEY_ASN1_METHOD object otherwise.
EVP_PKEY_asn1_add0() and EVP_PKEY_asn1_add_alias() return 0 on error, or 1 on success.
EVP_PKEY_get0_asn1() returns NULL on error, or a pointer to a constant EVP_PKEY_ASN1_METHOD object otherwise.

HISTORY

The signature of the pub_decode functional argument of EVP_PKEY_asn1_set_public() has changed in OpenSSL 3.0 so its pub parameter is now constified.

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