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## **Red Hat Enterprise Linux Release 9.2 Manual Pages on 'SSL\_set\_alpn\_protos.3ossl' command**

**\$ man SSL\_set\_alpn\_protos.3ossl**

SSL\_CTX\_SET\_ALPN\_SELECT\_CB(3ossl) OpenSSL SSL\_CTX\_SET\_ALPN\_SELECT\_CB(3ossl)

### NAME

SSL\_CTX\_set\_alpn\_protos, SSL\_set\_alpn\_protos,  
SSL\_CTX\_set\_alpn\_select\_cb, SSL\_CTX\_set\_next\_proto\_select\_cb,  
SSL\_CTX\_set\_next\_protos\_advertised\_cb, SSL\_select\_next\_proto,  
SSL\_get0\_alpn\_selected, SSL\_get0\_next\_proto\_negotiated - handle  
application layer protocol negotiation (ALPN)

### SYNOPSIS

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

int SSL_CTX_set_alpn_protos(SSL_CTX *ctx, const unsigned char *protos,
                           unsigned int protos_len);

int SSL_set_alpn_protos(SSL *ssl, const unsigned char *protos,
                       unsigned int protos_len);

void SSL_CTX_set_alpn_select_cb(SSL_CTX *ctx,
                               int (*cb) (SSL *ssl,
                                           const unsigned char **out,
                                           unsigned char *outlen,
                                           const unsigned char *in,
                                           unsigned int inlen,
                                           void *arg), void *arg);
```

```
void SSL_get0_alpn_selected(const SSL *ssl, const unsigned char **data,  
                           unsigned int *len);
```

```
void SSL_CTX_set_next_protos_advertised_cb(SSL_CTX *ctx,  
                                           int (*cb)(SSL *ssl,  
                                                    const unsigned char **out,  
                                                    unsigned int *outlen,  
                                                    void *arg),  
                                           void *arg);
```

```
void SSL_CTX_set_next_proto_select_cb(SSL_CTX *ctx,  
                                      int (*cb)(SSL *s,  
                                                unsigned char **out,  
                                                unsigned char *outlen,  
                                                const unsigned char *in,  
                                                unsigned int inlen,  
                                                void *arg),  
                                      void *arg);
```

```
int SSL_select_next_proto(unsigned char **out, unsigned char *outlen,  
                          const unsigned char *server,  
                          unsigned int server_len,  
                          const unsigned char *client,  
                          unsigned int client_len);
```

```
void SSL_get0_next_proto_negotiated(const SSL *s, const unsigned char **data,  
                                    unsigned *len);
```

## DESCRIPTION

SSL\_CTX\_set\_alpn\_protos() and SSL\_set\_alpn\_protos() are used by the client to set the list of protocols available to be negotiated. The protos must be in protocol-list format, described below. The length of protos is specified in protos\_len.

SSL\_CTX\_set\_alpn\_select\_cb() sets the application callback cb used by a server to select which protocol to use for the incoming connection.

When `cb` is `NULL`, ALPN is not used. The `arg` value is a pointer which is passed to the application callback.

`cb` is the application defined callback. The `in`, `inlen` parameters are a vector in protocol-list format. The value of the `out`, `outlen` vector should be set to the value of a single protocol selected from the `in`, `inlen` vector. The `out` buffer may point directly into `in`, or to a buffer that outlives the handshake. The `arg` parameter is the pointer set via `SSL_CTX_set_alpn_select_cb()`.

`SSL_select_next_proto()` is a helper function used to select protocols. It implements the standard protocol selection. It is expected that this function is called from the application callback `cb`. The protocol data in `server`, `server_len` and `client`, `client_len` must be in the protocol-list format described below. The first item in the `server`, `server_len` list that matches an item in the `client`, `client_len` list is selected, and returned in `out`, `outlen`. The `out` value will point into either `server` or `client`, so it should be copied immediately. If no match is found, the first item in `client`, `client_len` is returned in `out`, `outlen`. This function can also be used in the NPN callback.

`SSL_CTX_set_next_proto_select_cb()` sets a callback `cb` that is called when a client needs to select a protocol from the server's provided list, and a user-defined pointer argument `arg` which will be passed to this callback. For the callback itself, `out` must be set to point to the selected protocol (which may be within `in`). The length of the protocol name must be written into `outlen`. The server's advertised protocols are provided in `in` and `inlen`. The callback can assume that `in` is syntactically valid. The client must select a protocol. It is fatal to the connection if this callback returns a value other than `SSL_TLSEXT_ERR_OK`. The `arg` parameter is the pointer set via `SSL_CTX_set_next_proto_select_cb()`.

SSL\_CTX\_set\_next\_protos\_advertised\_cb() sets a callback cb that is called when a TLS server needs a list of supported protocols for Next Protocol Negotiation. The returned list must be in protocol-list format, described below. The list is returned by setting out to point to it and outlen to its length. This memory will not be modified, but the SSL does keep a reference to it. The callback should return SSL\_TLSEXT\_ERR\_OK if it wishes to advertise. Otherwise, no such extension will be included in the ServerHello.

SSL\_get0\_alpn\_selected() returns a pointer to the selected protocol in data with length len. It is not NUL-terminated. data is set to NULL and len is set to 0 if no protocol has been selected. data must not be freed.

SSL\_get0\_next\_proto\_negotiated() sets data and len to point to the client's requested protocol for this connection. If the client did not request any protocol or NPN is not enabled, then data is set to NULL and len to 0. Note that the client can request any protocol it chooses. The value returned from this function need not be a member of the list of supported protocols provided by the callback.

## NOTES

The protocol-lists must be in wire-format, which is defined as a vector of nonempty, 8-bit length-prefixed, byte strings. The length-prefix byte is not included in the length. Each string is limited to 255 bytes. A byte-string length of 0 is invalid. A truncated byte-string is invalid. The length of the vector is not in the vector itself, but in a separate variable.

Example:

```
unsigned char vector[] = {  
    6, 's', 'p', 'd', 'y', '/', '1',
```

```
8, 'h', 't', 't', 'p', '/', '1', '.', '1'  
};  
unsigned int length = sizeof(vector);
```

The ALPN callback is executed after theservername callback; as thatservername callback may update the SSL\_CTX, and subsequently, the ALPN callback.

If there is no ALPN proposed in the ClientHello, the ALPN callback is not invoked.

## RETURN VALUES

SSL\_CTX\_set\_alpn\_protos() and SSL\_set\_alpn\_protos() return 0 on success, and non-0 on failure. WARNING: these functions reverse the return value convention.

SSL\_select\_next\_proto() returns one of the following:

### OPENSSL\_NPN\_NEGOTIATED

A match was found and is returned in out, outlen.

### OPENSSL\_NPN\_NO\_OVERLAP

No match was found. The first item in client, client\_len is returned in out, outlen.

The ALPN select callback cb, must return one of the following:

### SSL\_TLSEXT\_ERR\_OK

ALPN protocol selected.

### SSL\_TLSEXT\_ERR\_ALERT\_FATAL

There was no overlap between the client's supplied list and the server configuration.

## SSL\_TLSEXT\_ERR\_NOACK

ALPN protocol not selected, e.g., because no ALPN protocols are configured for this connection.

The callback set using `SSL_CTX_set_next_proto_select_cb()` should return `SSL_TLSEXT_ERR_OK` if successful. Any other value is fatal to the connection.

The callback set using `SSL_CTX_set_next_protos_advertised_cb()` should return `SSL_TLSEXT_ERR_OK` if it wishes to advertise. Otherwise, no such extension will be included in the `ServerHello`.

## SEE ALSO

`ssl(7)`, `SSL_CTX_set_tlsext_servername_callback(3)`,  
`SSL_CTX_set_tlsext_servername_arg(3)`

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