SSL Accelerator SAPI
Implementation Agreement

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Revision 1.0

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<td>1.0</td>
<td>8/2/2006</td>
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## 2 Acronyms and Abbreviations

The following acronyms and abbreviations are used in the specifications:

<table>
<thead>
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<th>Acronym</th>
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<tr>
<td>API</td>
<td>Applications Programming Interface</td>
</tr>
<tr>
<td>CP</td>
<td>Control Plane</td>
</tr>
<tr>
<td>FP</td>
<td>Forwarding Plane</td>
</tr>
<tr>
<td>FAPI</td>
<td>NPF Functional API</td>
</tr>
<tr>
<td>IETF</td>
<td>Internet Engineering Task Force</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>IPv4</td>
<td>Internet Protocol version 4</td>
</tr>
<tr>
<td>IPv6</td>
<td>Internet Protocol version 6</td>
</tr>
<tr>
<td>LFB</td>
<td>Logical Functional Block</td>
</tr>
<tr>
<td>NE</td>
<td>Network Element</td>
</tr>
<tr>
<td>NP</td>
<td>Network Processor</td>
</tr>
<tr>
<td>NPE</td>
<td>Network Processing Element</td>
</tr>
<tr>
<td>NPF</td>
<td>Network Processing Forum</td>
</tr>
<tr>
<td>NPU</td>
<td>Network Processing Unit</td>
</tr>
<tr>
<td>openSSL</td>
<td>An open–source implementation of the SSL/TLS protocol. It is based on SSLeay. For more information about OpenSSL, see <a href="http://www.openssl.org/">http://www.openssl.org/</a>. openSSL is used here as an example application throughout the document.</td>
</tr>
<tr>
<td>RFC</td>
<td>Request For Comments (IETF standard)</td>
</tr>
<tr>
<td>SAPI</td>
<td>NPF Service API</td>
</tr>
<tr>
<td>SCTP</td>
<td>Stream Control Transmission Protocol</td>
</tr>
<tr>
<td>IM API</td>
<td>NPF Interface Management API</td>
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4 Introduction
Secure Socket Layer (SSL) has become a widely used mechanism for safeguarding the transmission and reception of Internet data. It is being used to secure online credit card transactions, Web page traffic, file and database information, and even email exchanges. A typical secure network platform will handle hundreds of megabits per second or more of secure packet bandwidth, and establish thousands of new Sessions each second. The computational complexity of such protocols requires that cryptographic hardware acceleration be used on platforms which process a large amount of secure network traffic. This document proposes a set of Services APIs (SAPI) for such hardware that offloads the SSL processing, namely the SSL accelerator.

During the SSL Session negotiation phase a cipher suite is selected and cryptography keys are exchanged. During the bulk data transfer phase the selected cipher suite is used to encrypt/decrypt the data. In addition, a cryptographic hash is used to validate that the data has not been corrupted. The Session negotiation phase uses public key cryptography to pass the keys between the client and server. Both the key exchange and the bulk cryptography are computationally expensive by design. Since most client machines are single user, the computational complexity does not generally represent a problem for the client machine. However, the server machine can easily become overwhelmed by the cryptographic computations because it may have to do these computations for hundreds or thousands of Sessions at a time.

Figure 1: SSL Proxy for Acceleration

A number of acceleration strategies have been observed in the industry. One that is popular is the SSL acceleration proxy. The SSL processing is moved to a separate machine that offloads this processing from the server(s). The hardware platform for the SSL proxy can be optimized specifically for the task, so the cost per computational cycle is lower than for a compute server.
By using cryptographic acceleration operations in the traffic path near wire speed rates can be achieved rather than encrypting records on a general purpose server’s CPU that contains no cryptographic acceleration.

Figure 1 above shows typical architectural blocks used in a SSL accelerator proxy. The side of the SSL Proxy that negotiates with SSL clients in the internet is the “client side”. Similarly, the side of the SSL proxy that sets up connections to the target servers is the “server side”. All bulk data records destined to the SSL accelerator from an external SSL client are termed as inbound records. Similarly all records originating from an OpenSSL\(^1\) based application in the CP or target servers and going out from the interfaces of SSL accelerator are termed as outbound records.

SSL proxies may be hosted on a network element that performs other network or security functions such as load balancing and virus scanning.

The following diagram depicts the typical architecture / relationship between the SSL SAPI and higher / lower layer components, in accordance with the NPF API framework.

---

4.1 SSL Databases
Following SSL accelerator databases are defined for managing the SSL accelerator.

SSL Session Negotiation Database (SND): This database contains the Session negotiation parameters required to negotiate a successful SSL Session with SSL clients. Entries include:

---

\(^1\) An open–source implementation of the SSL/TLS protocol. It is based on SSLeay. For more about OpenSSL, see [http://www.openssl.org/](http://www.openssl.org/). openSSL is used here as an example application.
proxy interface Address, Server Certificate, private key, cipher/digest, initial key, Client CA list etc. This database is looked up via the external proxy interface address.

SSL Session Cache Database (SSCD): This database is used to hold SSL Sessions that have been cached due to inactivity. Included in this database is all of the Session information that has to be retained in order to restore the Session to the SSL Session Database. Connections have their Session information moved from the SSD to the SSCD by using Get, Delete and Add SAPI calls. When decached, the Session information is moved back into the SSD using similar calls.

SSL Session Database (SSD): This database contains the state information associated with each SSL Session and is populated dynamically during the Session negotiation. Also, once the SSL Session is negotiated, a target (server) has to be selected (by querying into the TSD described below), and a connection to the target has to be made; this connection information is also part of this database. There is exactly one entry per client connection. The entries include: a session ID, keying material, bulk cipher used, digest used, client and target server connection identifiers etc. The session ID is assigned per client ↔ server connection. The size changes dynamically, as clients go up & down.

SSL Target Selector Database (TSD): This database is used to determine the target server address for a given Session. Entries include: target address along with the policy information, namely, proxy external address, layer 7 information (URL) or other proprietary classification information etc. The result of query into this database is a target server address to connect to. (Can be exploited for SSL VPN gateway)

Target selection may be performed using a number of different methods and is not the focus of this API. For instance, load balancing, as defined by the SLB SAPI may used as a target selection scheme. The TSD defined herein may be replaced with the SLB or other proprietary target selection methods.

The SSL Service API (SAPI) provides a generic interface for configuring and managing all or a subset of the above databases depending upon the actual distribution model of the SSL (see section 4.2 below). Furthermore, the SSL SAPI allows a client application to receive event notifications indicating packet drops, SSL alerts and other information. In accordance with the NPF framework model, the SSL SAPI is Network Element unaware.

4.2 SSL Distribution Models
SSL protocol comprises Session negotiation and bulk data processing. Depending upon the extent of the SSL functionality offload onto the Forwarding Planes there can be two main offload options: SSL Full offload and SSL Partial offload. The various SSL LFBs referred to in the following sections are as follows:

- SSL Session LFB: Responsible for processing the SSL Session negotiation with the SSL clients.
- SSL Bulk LFB: Responsible for bulk data processing i.e. de-encryption of inbound data and encryption of outbound data.
- SSL Record Layer LFB: Responsible for interacting with the TOE LFBs. It interprets SSL record headers in inbound data, recovers full records from TCP byte stream provided by TOE or other TCP protocol layer, directs records to appropriate LFB for processing,
The SSL LFBs maintain the context of the packet flow via the appropriate shared metadata. For example, the SSL proxy and bulk LFBs can share the session (or socket) identifier to identify a packet flow. Please refer to the SSL FAPI document (a separate NCI document that will capture the FAPI design details) for more details.
4.2.1 SSL Full offload

In this model, both the SSL Session and bulk are offloaded to the forwarding plane as shown in figure below. The SAPIs manage the Session Negotiation and the Target Selector Databases.

Figure 3: SSL Full Offload Model

4.2.1.1 Example packet flow

The Session traffic is handled in the forwarding plane. Typically the bulk data is also handled in the FP as well.
Figure 4: SSL packet flow for full offload model

Figure 4 above shows an example SSL packet flow for the full offload model. The light arrow shows represents the SSL Session records and the dark arrow represents the bulk data records. The SSL Record Layer LFB recovers SSL records from inbound TCP data and routes them to the SSL Bulk or SSL Session LFBs depending on their type. In case of inbound traffic, the records arrive encrypted and are decrypted in the Bulk LFB. The Bulk LFB also sends encrypted Session Records to the SSL Session LFB. (It is possible for the client application to register with the packet handler to receive the inbound bulk data, in which case the bulk data after being processed would be handed to the packet handler LFB).

4.2.2 SSL Partial offload

SSL partial offload model supports SSL Session negotiation in the CP and the SSL Bulk data processing in the FP. The following sub sections briefly outline the several partial offload models supported.

4.2.2.1 openSSL based client application below SAPI layer

In this model, the SSL Session resides in the control plane and bulk is offloaded to the forwarding plane as shown in figure below. As the openSSL based application is below the SAPI layer the SAPIs are exactly same as the SSL full offload. (The openSSL based application reads the Session negotiation information configured via the SAPIs). As the Session negotiation takes place in the CP, the SSD is managed via the FAPIs.
4.2.2.2 openSSL based client application above SAPI layer

As the SSL Session negotiation processing is above the SAPI layer the SND does not need to be configured, however the SSL Session Database (SSD) has to be exposed at the SAPI level. Figure 6 below depicts such a model.

4.2.2.3 Example packet flows

SSL Session records are processed in the CP. The SSL bulk packet flow can take two paths:
1. The bulk records are all processed, in the forwarding plane including encryption/decryption and sending records to/from client side & server side connections. The bulk data processing is similar to that of the full offload model (refer Figure 4). The only difference is that the SSD is managed via the FAPIs in this case during the Session negotiation.

2. All the inbound bulk records, after decrypting, are directed to the client application in the control plane and the client application redirects to the target side connection (or it may consume the records). Outbound bulk records are received by the client application in the CP which then requests the FP for encryption and sending out to the SSL client in the internet. Figure 7 below shows an example SSL packet flow for this partial offload model.

![Diagram of SSL packet flow](image)

**Figure 7: Packet flow for partial offload model with bulk data sent to CP**

The light arrow represents the SSL Session records and the dark arrow represents the bulk data. All the Session traffic flows to the application in the CP. Inbound bulk data is sent to the application in the CP. Packet flow to the CP is achieved via the packet handler (or the remoted TCP infrastructure\(^2\)). The outbound traffic is sent via the `encrypt` SAPI call.

\(^2\) It is possible that the TCP is not offloaded to the FP. In this case, all the records are received by to the application in the CP, which will invoke the SAPIs to get the records encrypted/decrypted.
4.3 Assumptions and External Requirements

- In the scope of this API, the structure and attributes of SSL reflect what is needed by the forwarding plane, not by the application. Applications are expected to maintain their own representation of the SSL databases.
- Memory allocation and usage model for this API implementation will be as dictated by the NPF Software Conventions Implementation Agreement.
- The SSL SAPI is designed in accordance with the NPF framework design principle. Usually control applications need assistance from a number of APIs. In particular the Operational APIs – such as the Interface Management API and the Packet Handler API – are needed by most applications. SSL is no exception. For a usable system, the SSL SAPI is also reliant on the interface management API. Further, for partial offload models the applications will need the TCP APIs.
- SSL runs on top of either TCP or SCTP and the server side connection is TCP (or SCTP)
- There is one set of Session negotiation attributes per proxy (virtual) interface.
- Whenever TOE is assumed on the forwarding plane, it is fully operational including infrastructure to support TOE in the Control Plane. Thus, in case the client application resides in the control plane, (partial offload model), this infrastructure provides TCP packet flow into the control plane from forwarding plane. (In other words, it is assumed that a TCP application running on the CP can fully operate with TOE running on the FP)
- In case of the partial offload model, the application running on the control plane manages TCP connections both passive (client side) and active (server side).
- SSL design could leverage the Server Load Balancing (SLB) functional blocks for the selection of the target server for a particular SSL client request. This is essentially the SLB policy database as described in the SLB SAPI document. A simple case of this SSL target selector database (TSD) is described here for full operation of SSL in absence of SLB. In this case, a more elaborate proprietary target selection mechanism can be used by extending the example TSD.

4.4 Scope

The following are in scope of this document:

1. Complete SSL Services APIs that enable full design and implementation SSL Logical Functional blocks (LFBs). This implies that the packet flow options and the three SSL distribution models are fully supported.
2. The SSL SAPI will conform to the standards / usage as described in the NPF foundations document and hence will provide the NPF method of asynchronous callback completion and event handling.

Following are considered out of scope of this document:

1. SSL VPN gateway, but the overall design of SAPIs tries to accommodate any future VPN gateway efforts
2. Proprietary protocols can exist between the accelerator and the target servers and is considered out of scope of this document.
3. This document is not a design document; for elaborate details of the forwarding plane based LFBs, SSL Accelerator FAPI document needs to be referred (future NCI work).

4.5 Dependencies

The SSL SAPI utilizes conventions from the following NPF documents.

[NPF Lexicon]
[NPF SAPI conv]
[NPF Framework]
[NPF IM API]
[NPF PH API]
[NPF Global]
5 Data Types

5.1 SSL Handle Types

typedef NPF_uint32_t NPF_NCI_SSLSessionNegHandle_t;
This is a 32-bit value that is used to identify an SSL Session Negotiation Database (SND).

typedef NPF_uint32_t NPF_NCI_SSLSessionHandle_t;
This is a 32-bit value that is used to identify an SSL Session Database (SSD).

typedef NPF_uint32_t NPF_NCI_SSLSessionCacheHandle_t;
This is a 32-bit value that is used to identify an SSL Session Cache Database (SSCD).

typedef NPF_uint32_t NPF_NCI_SSLTargetSelHandle_t;
This is a 32-bit value that is used to identify an SSL Target Selector Database (TSD).

typedef NPF_uint32_t NPF_NCI_SSLSessionId_t;
This is a 32-bit value that is used to identify a client Session

typedef NPF_uint32_t NPF_NCI_SSLSessionCacheId_t;
This is a 32-bit value that is used to identify a cached client Session

5.2 SSL Constants

/*Constants that define the SSL Session attributes sizes*/
#define MAX_INITIAL_KEY_SIZE 256
#define MAX_SERVER_CERTIFICATE_SIZE 1024
#define MAX_CLIENT_CA_LIST_SIZE 128

/*Constants that define the bulk data processing information sizes*/
#define MAX_SERVER_CIPHER_KEY_SIZE 4
#define MAX_CLIENT_CIPHER_KEY_SIZE 4
#define MAX_SERVER_MAC_KEY_SIZE 4
#define MAX_CLIENT_MAC_KEY_SIZE 4

/*Size of a url inside the clear data, used to select the target server*/
#define MAX_URL_SIZE 1024

5.3 SSL Generic IP Address

/*
 * Single IP address
 */

typedef union
typedef struct
{
    /* IP Version */
    /* IPv4 = 4, IPv6 = 6 */
    NPF_uint8_t IP_Version;
    union {
        NPF_IPv4Address_t v4;   /* IPv4 address */
        NPF_IPv6Address_t v6;   /* IPv6 address */
    } addr;
    /* Transport Protocol */
    /* TCP =1 or SCTP = 2 */
    NPF_uint8_t L4_Protocol;
    union {
        NPF_uint16_t TCP_Port;
        NPF_uint32_t SCTP_Port;
    } port;
} NPF_NCI_SSLAddressPortInfo_t;

5.4 SSL Cipher and Digests

The NPF_NCI_SSLCipherAndDigest enum defines the various SSL ciphers and digests that can be supported by the SSL accelerator.
NPF_NCI_DHE_DSS_WITH_DES_CBC_SHA,
NPF_NCI_DHE_DSS_WITH_3DES_EDE_CBC_SHA,
NPF_NCI_DHE_RSA_EXPORT_WITH_DES40_CBC_SHA,
NPF_NCI_DHE_RSA_WITH_DES_CBC_SHA,
NPF_NCI_DHE_RSA_WITH_3DES_EDE_CBC_SHA,
NPF_NCI_DH_anon_EXPORT_WITH_RC4_40_MD5,
NPF_NCI_DH_anon_WITH_RC4_128_MD5,
NPF_NCI_DH_anon_EXPORT_WITH_DES40_CBC_SHA,
NPF_NCI_DH_anon_WITH_DES_CBC_SHA,
NPF_NCI_DH_anon_WITH_3DES_EDE_CBC_SHA,
NPF_NCI_RSA_EXPORT1024_WITH_DES_CBC_SHA = 98,
NPF_NCI_DHE_DSS_EXPORT1024_WITH_DES_CBC_SHA,
NPF_NCI_RSA_EXPORT1024_WITH_RC4_56_SHA,
NPF_NCI_DHE_DSS_EXPORT1024_WITH_RC4_56_SHA,
NPF_NCI_DHE_WITH_RC4_128_SHA,

/* Experimental Algorithm Identifiers */
NPF_NCI_START_OF_EXPERIMENTAL_SECTION=500,

/* Proprietary Algorithm Identifiers */
NPF_NCI_START_OF_PROPRIETARY_SECTION=1000
} NPF_NCI_SSLCipherAndDigest;

NOTE: If there are more ciphers/digests they need to be accommodated as well.

5.5 SSL Databases

5.5.1 SSL Session negotiation database (SND)
The SND contains the Session negotiation parameters associated with an SSL proxy (external) interface. These parameters are required to successfully negotiate a Session with an SSL client.

/*The following structure represents an entry in the SSL negotiation Database*/
typedef struct {
    /* Address/Port Info */
    NPF_NCI_SSLAddressPortInfo_t proxyAddress;

    /*cipher/digest supported*/
    NPF_NCI_SSLCipherAndDigest cipher_and_digest;

    /*Suggested Initial key*/
    NPF_uint8_t initialKey[MAX_INITIAL_KEY_SIZE];

    /*Server’s Public Certificate */
    NPF_uint8_t certificate[MAX_SERVER_CERTIFICATE_SIZE];

    /*Server’s Private Key */
    NPF_uint32_t *privateKey;

    /*Comma separated, List of trusted CA’s*/
    NPF_uint8_t clientCAList[MAX_CLIENT_CA_LIST_SIZE];
} NPF_NCI_SSLSessionNegParams_t;
Note: There could be more fields added to the above SND structure as needed.

5.5.1.1 NPF_NCI_SSLSessionNeg_Array_t

typedef struct
{
    NPF_uint32_t nCount;
    NPF_NCI_SSLSessionNegParams_t* sndArray;
} NPF_NCI_SSLSessionNeg_Array_t;

5.5.2 SSL Target Selector Database (TSD)

This database provides the target server address to connect to based on proprietary classification methods. Target selection may be performed using a number of different methods and is not the focus of this API. For instance, load balancing, as defined by the SLB SAPI may used as a target selection scheme. The following database represents an example of a basic target selection scheme. The TSD defined herein may be replaced with the SLB or other proprietary target selection methods.

/*Target selection policy type*/
typedef enum
{
    NPF_NCI_SSL_POLICY_PROXY_ADDR, /*Indicates that the target is selected via the proxy address*/
    NPF_NCI_SSL_POLICY_URL /*Indicates that the target is selected via the url in the data*/
} NPF_NCI_SSLPolicyType_t;

/*Target selection policy. An example of proxy external address and url in the data is shown below*/
typedef struct {
    NPF_NCI_SSLPolicyType_t policy_type; /* policy type*/
    union
    {
        NPF_NCI_SSLIPAddress_t proxyAddress; /*External interface addr*/
        NPF_uint8_t url[MAX_URL_SIZE];/*Url in clear data*/
    } u;
} NPF_NCI_SSLPolicy_t;

typedef struct {
    NPF_uint8_t IP_Version; /* IPv4 = 4, IPv6 = 6 */
    NPF_NCI_SSLIPAddress_t targetAddress; /* Target addr*/
    NPF_NCI_SSLPolicy_t policy;
} NPF_NCI_SSLTargetSelectorParams_t;

This database represents the target selection in the simplest form, namely, one target server per proxy interface address. The policy field can be exploited to support more granular classification, like the url information contained in the decrypted data. Further, more elaborate classification information for supporting the SSL VPN gateway can be also easily supported.
Once the target addressing information is determined, the SSL accelerator can re-route the clear data via a TCP connection for SSL acceleration or any other proprietary mechanism.

5.5.2.1 NPF_NCI_SSLTargetSelector_Array_t

typedef struct {
    NPF_uint32_t nCount;
    NPF_NCI_SSLTargetSelectorParams_t *tsdArray;
} NPF_NCI_SSLTargetSelector_Array_t;

5.5.3 SSL Session Database (SSD)

This database contains per SSL Session information, viz, the encryption/de-cription cipher & digest keys for a Session etc.

The following structure contains the SSL client and the target server connection mapping:

typedef struct {
    NPF_uint32_t clientConnID; /*Identifies the client connection*/
    NPF_uint32_t targetConnID; /*Identifies the target connection*/
} NPF_NCI_SSLConnectionParams_t;

typedef struct {
    NPF_uint32_t serverKeyInfo[MAX_SERVER_CIPHER_KEY_SIZE];
    NPF_uint32_t clientKeyInfo[MAX_CLIENT_CIPHER_KEY_SIZE];
    NPF_uint32_t serverMACKeyInfo[MAX_SERVER_MAC_KEY_SIZE];
    NPF_uint32_t clientMACKeyInfo[MAX_CLIENT_MAC_KEY_SIZE];
    NPF_NCI_SSLCipherAndDigest cipherAndDigest;
    NPF_NCI_SSLConnectionParams_t connectionMapping; /*SSL Client<-->target mapping*/
} NPF_NCI_SSLSessionParams_t;

This database is critical for bulk data processing. It is used by the SSL bulk LFB to select the encryption/decryption information. The entries are populated dynamically during SSL Session negotiation with an SSL client. In bound Records are looked up by the clientConnID for proper decryption, similarly the outbound packets are looked up by the targetConnID for proper encryption. This database has to be managed via SAPIs only for the partial offload case where the openSSL based application is above the SAPI layer (see section 4.2.2.2)

5.5.3.1 NPF_NCI_SSLSession_Array_t

typedef struct {
    NPF_uint32_t nCount;
    NPF_NCI_SSLSessionParams_t *sessionArray;
} NPF_NCI_SSLSession_Array_t;

5.5.4 SSL Session Cache Database (SSCD)

This database contains the SSL Session cache information that is populated as a result of inactivity on an SSL Session.
The following structure contains the SSL client and the target server connection mapping:

```c
typedef struct {
    NPF_uint32_t clientConnID;    /* Identifies the client connection */
    NPF_uint32_t targetConnID;    /* Identifies the target connection */
} NPF_NCI_SSLConnectionParams_t;

typedef struct {
    NPF_uint32_t    serverKeyInfo[MAX_SERVER_CIPHER_KEY_SIZE];
    NPF_uint32_t    clientKeyInfo[MAX_CLIENT_CIPHER_KEY_SIZE];
    NPF_uint32_t    serverMACKeyInfo[MAX_SERVER_MAC_KEY_SIZE];
    NPF_uint32_t    clientMACKeyInfo[MAX_CLIENT_MAC_KEY_SIZE];
    NPF_NCI_SSLCipherAndDigest cipherAndDigest;
    NPF_NCI_SSLConnectionParams_t connectionMapping;    /* SSL Client<-->target mapping */
    NPF_uint32_t    sessionCacheTimeoutValue;    /* in seconds */
} NPF_NCI_SSLSessionCacheParams_t;

5.5.4.1   NPF_NCI_SSLSessionCache_Array_t

typedef struct {
    NPF_uint32_t    nCount;
    NPF_NCI_SSLSessionCacheParams_t    *sessionCacheArray;
} NPF_NCI_SSLSessionCache_Array_t;

5.5.5   NPF_NCI_SSLData_t

This structure contains the SSL bulk data (encrypted/decrypted) information.

```c
typedef struct {
    NPF_uint32_t    data_len;
    NPF_uint8_t    *data;
} NPF_NCI_SSLData_t;
```
5.6 SSL Statistics

Two basic structures provide the SSL statistics as follows:

/*
   Crypto related stats
*/
typedef struct {
   NPF_uint32_t HMAC_Errors;       /* HMAC (hash) errors -inbound only- */
   NPF_uint32_t decryptErrors;     /* Decryption errors -inbound*/
   NPF_uint32_t encryptErrors;     /* Decryption errors -outbound*/
   NPF_uint32_t replayErrors;      /* Replay attacks -inbound only- */
} NPF_NCI_SSLCryptoStats_t;

typedef struct {
   NPF_uint8_t   IP_Version;  /* IPv4 = 4, IPv6 = 6 */
   NPF_NCI_SSLIPAddress_t  clientAddr;
   NPF_NCI_SSLIPAddress_t  proxyAddr;
   NPF_NCI_SSLIPAddress_t  targetAddr;
} NPF_NCI_SSL_ConnectionInfo_t;

/*
   Connection related stats
*/
typedef struct {
   NPF_uint32_t     numSessions;
   NPF_NCI_SSL_ConnectionInfo_t *sslEndpoints;
} NPF_NCI_SSLConnectionStats_t;

5.7 Error Codes

/*
* Asynchronous error codes (returned in function callbacks)
*/

/*
* SSL reserved error codes in relation to other NPF APIs
* Note** The maximum range is 100
*/
#define NPF_NCI_SSL_BASE_ERR 700 /* Base value of 700 wrt other NPF codes */

5.7.1 SSL Error Type : NPF_NCI_SSLErrorType_t

/*
* SSL Error Type
*/
typedef NPF_uint32_t NPF_NCI_SSLErrorType_t;  /* SSL Error Type */

5.7.2 Generic Error Codes

/*
* These are generic error codes, that can be returned in any callback
*/
#define NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT 20 /* Should be enough */
/* The Interface handle provided was not recognized as being valid */
#define NPF_NCI_SSL_E_INVALID_IF_HANDLE 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 1)

/* Already registered */
#define NPF_NCI_SSL_E_ALREADY_REGISTERED 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 2)

/* Optional feature not supported */
#define NPF_NCI_SSL_E_OPTIONAL_FEATURE_NOT_SUPPORTED 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 3)

/* System was unable to allocate sufficient memory to complete operation */
#define NPF_NCI_SSL_E_NOMEMORY 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 4)

5.7.3 Specific Error Codes

/* Invalid SND handle */
#define NPF_NCI_SSL_E_INVALID_SND_HANDLE 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 1)

/* Invalid SSD handle */
#define NPF_NCI_SSL_E_INVALID_SSD_HANDLE 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 2)

/* Invalid TSD handle */
#define NPF_NCI_SSL_E_INVALID_TSD_HANDLE 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 3)

/* Invalid cipher algorithm */
#define NPF_NCI_SSL_E_INVALID_ENC_ALGO 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 4)

/* Invalid cipher algorithm keylen */
#define NPF_SSL_E_INVALID_ENC_ALGO_KEYLEN 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 5)

/* Invalid digest algorithm */
#define NPF_NCI_SSL_E_INVALID_DIGEST_ALGO 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 6)

/* Invalid digest algorithm keylen */
#define NPF_NCI_SSL_E_INVALID_DIGEST_ALGO_KEYLEN 
   ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 
     NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 7)

/* Invalid Initialization vector*/
#define NPF_NCI_SSL_E_INVALID_IV 

\(((\text{NPF} \_\text{NCI} \_\text{SSLErrorType} \_\text{t}) \  \text{NPF} \_\text{NCI} \_\text{SSL} \_\text{BASE} \_\text{ERR} + \ \text{NPF} \_\text{NCI} \_\text{SSL} \_\text{GENERIC} \_\text{ERROR} \_\text{CODE} \_\text{COUNT} + 8)\)
5.8 Data Structures for Completion Callbacks

A completion callback is defined for each of the functions in this API.

5.8.1 Asynchronous Response

This is the asynchronous response structure, which is part of the CallbackData structure that is passed to the caller in the asynchronous response. It contains an error/success code, and a function-specific structure embedded in a union.

```c
typedef struct {
    NPF_NCI_SSLErrorType_t error;
    union {
        NPF_NCI_SSLSessionId_t sslSessionId;
        NPF_NCI_SSLSessionCacheId_t sslSessionCacheId;
        NPF_NCI_SSLSessionNegHandle_t sndHandle;
        NPF_NCI_SSLTargetSelHandle_t tsdHandle;
        NPF_NCI_SSLSessionHandle_t ssdHandle;
        NPF_NCI_SSLSessionCacheHandle_t sscdHandle;
        NPF_NCI_SSLSessionNeg_Array_t sndArray;
        NPF_NCI_SSLTargetSelector_Array_t tddArray;
        NPF_NCI_SSLSession_Array_t ssdArray;
        NPF_NCI_SSLSessionCache_Array_t sscdArray;
        NPF_NCI_SSLConnectionStats_t sslConnStats;
        NPF_NCI_SSLCryptoStats_t sslCryptoStats;
        NPF_NCI_SSLData_t ssl_data;
    } u;
} NPF_NCI_SSLAsyncResponse_t;
```

5.8.2 Callback Type

The callback response contains one of the following codes, indicating the function that was called to cause the callback. This code tells the application how to interpret the data included in the union that is part of the response structure.

```c
/* completion callback types */
typedef enum NPF_NCI_SSLCallbackType {
    NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_CREATE = 1,
    NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_DELETE = 2,
    NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_ADD = 3,
    NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_DELETE = 4,
    NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_PURGE = 5,
    NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_QUERY = 6,
    NPF_NCI_SSL_CONNECTION_STATISTICS_QUERY = 7,
    NPF_NCI_SSL_CRYPTO_STATISTICS_QUERY = 8,
    NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_CREATE = 9,
    NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_DELETE = 10,
    NPF_NCI_SSL_TARGET_SELECTOR_INFO_ADD = 11,
    NPF_NCI_SSL_TARGET_SELECTOR_INFO_DELETE = 12,
    NPF_NCI_SSL_TARGET_SELECTOR_INFO_PURGE = 13,
    NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_QUERY = 14,
    NPF_NCI_SSL_SESSION_DATABASE_CREATE = 15,
    NPF_NCI_SSL_SESSION_DATABASE_DELETE = 16,
    NPF_NCI_SSL_SESSION_INFO_ADD = 17,
}
```
5.8.3 Callback Data

This is the callback response structure, which is passed to the caller in the asynchronous response from a function call. It contains the callback type that identifies the function called, the allOK flag, the number of responses and an array of response structures depending on the call.

```c
typedef struct {
    NPF_NCI_SSLCallbackType_t     type;
    NPF_boolean_t                 allOK;
    NPF_uint32_t                  numResp;
    NPF_NCI_SSLAsyncResponse_t   *resp;
} NPF_NCI_SSLCallbackData_t;
```

5.9 Data Structures for Event Notifications

The following sections detail the information related to SSL events. When an event notification routine is invoked, one of the parameters will be a structure of information related to one or more events.

5.9.1 Event Notification Types

The event type indicates the type of event data in the union of event structures returned in `NPF_NCI_SSLEventData_t`.

```c
/*
 *   SSL Event
 */
typedef enum {
    NPF_NCI_SSL_REPLAY_PACKET     = 1,/* Replay packet caught */
    NPF_NCI_SSL_DECRYPTION_FAILED    = 2,/* SSL decryption failed */
    NPF_NCI_SSL_ENCRYPTION_FAILED    = 3,/* SSL encryption failed */
    NPF_NCI_SSL_NO_TARGET_MAPPING    = 4,/* No target server found*/
    NPF_NCI_SSL_CLIENT_AUTH_FAILED   = 5,/* Client authentication failed*/
    NPF_NCI_SSL_ALERT_RECEIVED    = 6,/* Received an SSL Alert*/
    NPF_NCI_SSL_MEM_FULL      = 7 /*A crypto NPU ran out of memory*/
} NPF_NCI_SSLEvent_t;
```

#define SSL_MAX_EVENT_TYPES 7
Note: More event types can be added in future as needed.

5.9.2 SSL event bitmap : NPF_NCI_SSLEventMask_t
/*
 * SSL event bitmask used in the event registration call.
 */
typedef NPF_uint32_t NPF_NCI_SSLEventMask_t;

/*
 * The following values can be set for the NPF_NCI_SSLEventMask_t
 */
#define NPF_NCI_SSL_EVENT_ALL_DISABLE   (0) /* disable all */
#define NPF_NCI_SSL_REPLAY_PACKET_ENABLE    (1 << 1)
#define NPF_NCI_SSL_DECRYPTION_FAILED_ENABLE     (1 << 2)
#define NPF_NCI_SSL_ENCRYPTION_FAILED_ENABLE     (1 << 3)
#define NPF_NCI_SSL_NO_TARGET_MAPPING_ENABLE      (1 << 4)
#define NPF_NCI_SSL_CLIENT_AUTH_FAILED_ENABLE      (1 << 5)
#define NPF_NCI_SSL_ALERT_RECEIVED_ENABLE      (1 << 6)
#define NPF_NCI_SSL_MEM_FULL_ENABLE       (1 << 7)
#define NPF_SSL_EVENT_ALL_ENABLE    0xFFFFFFFF

5.9.3 Event Notification Structures
This section describes the various events which MAY be implemented.

It is important to note that even if an implementation does not support any of these events, the
implementation still needs to provide the register and deregister event function to enable
interoperability.

This structure defines all the possible event definitions for SSL API. An event type field
indicates which member of the union is relevant in the specific structure.

5.9.3.1 Information on packet of interest: NPF_NCI_SSLPacketInfo_t
/*Problem packet*/
typedef struct
{
    NPF_uint8_t   IP_Version; /* 4 = IPv4, 6 = IPv6 */
    NPF_uint8_t   protocol; /* IP Transport Protocol */
    NPF_NCI_SSLIPAddress_t clientAddr; /*Address on client*/
    NPF_NCI_SSLIPAddress_t proxyAddr;  /*Address on proxy interface*/
    NPF_uint16_t   srcPort; /* IP Source Port */
    NPF_uint16_t alertVal; /* SSL alert value, 200 for others*/
} NPF_NCI_SSLPacketInfo_t;

For each of the events define above, NPF_NCI_SSLPacketDropped_t will be appropriately
populated.
5.9.4 SSL Event Data : NPF_NCI_SSLEventData_t

/*
 * SSL Event Data
 */
typedef struct
{
    NPF_NCI_SSLEvent_t eventType;
    NPF_NCI_SSLPacketInfo_t packet;
} NPF_NCI_SSLEventData_t;

5.9.5 SSL Event Data : NPF_NCI_SSLEvent_Array_t

/*
 * SSL Event Array
 */
typedef struct
{
    NPF_uint16_t n_data; /*Number of events in array*/
    NPF_NCI_SSLEventData_t *eventDataArray; /* Array of event
     notifications */
} NPF_NCI_SSLEventArray_t;
6 Functions

6.1 Completion Callback
This callback function is for the application to register an asynchronous response handling routine to the SSL API implementation.

6.1.1 Completion Callback Function Signature

```c
typedef void (*NPF_NCI_SSLCallbackFunc_t)(
    NPF_IN NPF_userContext_t userContext,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_NCI_SSLCallbackData_t sslCallbackData);
```

Description
This callback function is for the application to register asynchronous response handling routine to the NPF SSL API implementation. This callback function is intended to be implemented by the application, and be registered to the NPF SSL API implementation through `NPF_NCI_sslRegister()` function.

Input Parameters
- **userContext**
  The context item that was supplied by the application when the completion callback function was registered.
- **correlator**
  The correlator item that was supplied by the application when the SSL API function call was made. The correlator is used by the application mainly to distinguish between multiple invocations of the same function.
- **sslCallbackData**
  Response information related to the SSL API function call. Contains information that are common among all functions, as well as information that are specific to a particular function. See `NPF_NCI_SSLCallbackData_t` definition for details.

Output Parameters
None.

Return Value
None.
6.2 Event Notification Function Calls
This event notification function is for the application to register an event handler routine to the
SSL API implementation.

6.2.1 NPF_NCI_SSLEventCallFunc_t

typedef void (*NPF_NCI_SSLEventCallFunc_t) (
   NPF_IN NPF_userContext_t       userContext,
   NPF_IN NPF_NCI_SSLEventArray_t data);

Description
This function is a registered event notification routine for handling SSL API events.

Input Parameters
- userContext - The context item that was supplied by the application when the
  event callback routine was registered.
- data – A structure containing an array of event data structures and a count to
  indicate how many events are present. Each of these NPF_NCI_SSLEventData_t
  members contains event specific information and a type field to identify the
  particular event.

Output Parameters
None

Return Value
None
6.3 **Callback Registration/Deregistration Function Calls**

This section defines the registration and de-registration functions used to install and remove an asynchronous response callback routine.

6.3.1 **Completion Callback Registration Function**

```c
NPF_error_t NPF_NCI_SSLRegister(
    NPF_IN NPF_userContext_t   userContext,
    NPF_IN NPF_NCI_SSLCallbackFunc_t  sslCallbackFunc,
    NPF_OUT NPF_callbackHandle_t  *sslCallbackHandle);
```

**Description**

This function is used by an application to register its completion callback function for receiving asynchronous responses related to NPF SSL API function calls. Application may register multiple callback functions using this function. The callback function is identified by the pair of userContext and sslCallbackFunc, and for each individual pair, a unique `sslCallbackHandle` will be assigned for future reference. Since the callback function is identified by both userContext and sslCallbackFunc, duplicate registration of same callback function with different userContext is allowed. Also, same userContext can be shared among different callback functions. Duplicate registration of the same userContext and sslCallbackFunc pair has no effect, and will output a handle that is already assigned to the pair, and will return `NPF_E_CALLBACK_ALREADY_REGISTERED`.

**Note:** `NPF_NCI_SSLRegister()` is a synchronous function and has no completion callback associated with it.

**Input Parameters**

- **userContext**
  A context item for uniquely identifying the context of the application registering the completion callback function. The exact value will be provided back to the registered completion callback function as its 1st parameter when it is called. Application can assign any value to the userContext and the value is completely opaque to the NPF SSL API implementation.

- **sslCallbackFunc**
  The pointer to the completion callback function to be registered.

**Output Parameters**

- **sslCallbackHandle**
  A unique identifier assigned for the registered `userContext` and `sslCallbackFunc` pair. This handle will be used by the application to specify which callback function to be called when invoking asynchronous NPF SSL API functions. It will also be used when de-registering the `userContext` and `sslCallbackFunc` pair.

**Return Values**

- **NPF_NO_ERROR**
  The registration completed successfully.

- **NPF_E_BAD_CALLBACK_FUNCTION**

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sslCallbackFunc is NULL.

- **NPF_E_CALLBACK_ALREADY_REGISTERED**
  No new registration was made since the userContext and sslCallbackFunc pair was already registered.
  Note: Whether this should be treated as an error or not is dependent on the application.
6.3.2 Completion Callback Deregistration

```
NPF_error_t NPF_NCI_SSLDeregister(
    NPF_IN NPF_callbackHandle_t sslCallbackHandle);
```

**Description**
This function is used by an application to de-register a pair of user context and callback function.
Note: If there are any outstanding calls related to the de-registered callback function, the callback function may be called for those outstanding calls even after de-registration.
Note: `NPF_NCI_sslDeregister()` is a synchronous function and has no completion callback associated with it.

**Input Parameters**
- `sslCallbackHandle`
The unique identifier representing the pair of user context and callback function to be de-registered.

**Output Parameters**
None.

**Return Values**
- `NPF_NO_ERROR`
The de-registration completed successfully.
- `NPF_E_BAD_CALLBACK_HANDLE`
The API implementation does not recognize the callback handle. There is no effect to the registered callback functions.
6.4 Event Registration/Deregistration Function Calls

This section defines the registration and de-registration functions used to install and remove an event handler routine.

6.4.1 NPF_NCI_SSLEventRegister

```c
NPF_error_t NPF_NCI_SSLEventRegister(
    NPF_IN NPF_userContext_t            userContext,
    NPF_IN NPF_NCI_SSLEventCallFunc_t  eventCallFunc,
    NPF_IN NPF_NCI_SSLEventMask_t       eventMask,
    NPF_OUT NPF_callbackHandle_t        *eventCallHandle);
```

Description

This function is used by an application to register its event handling routine for receiving notifications of SSL events. Applications MAY register multiple event handling routines using this function. The event handling routine is identified by the pair of userContext and eventCallFunc, and for each individual pair, a unique eventCallHandle will be assigned for future reference.

Since the event handling routine is identified by both `userContext` and `eventCallFunc`, duplicate registration of the same event handling routine with a different `userContext` is allowed. Also, the same `userContext` can be shared among different event handling routines. Duplicate registration of the same `userContext` and `eventCallFunc` pair has no effect, and will output a handle that is already assigned to the pair, and will return `NPF_E_CALLBACK_ALREADY_REGISTERED`.

Input Parameters

- `userContext` – A context item for uniquely identifying the context of the application registering the event handling routine. The exact value will be provided back to the registered event handling routine as its first parameter when it is called. Applications can assign any value to the `userContext` and the value is completely opaque to the SSL API implementation.
- `eventCallFunc` – The pointer to the event handling routine to be registered.
- `eventMask` – This is a bit mask of the SSL events. It allows the application to register for those selected events.

Output Parameters

- `eventCallHandle` - A unique identifier assigned for the registered `userContext` and `eventCallFunc` pair. This handle will be used when deregistering the `userContext` and `eventCallFunc` pair.

Return Values

- `NPF_NO_ERROR` - The registration completed successfully.
- `NPF_E_BAD_CALLBACK_FUNCTION` – The `eventCallFunc` is NULL, or otherwise invalid.
- `NPF_E_CALLBACK_ALREADY_REGISTERED` – No new registration was made since the `userContext` and `eventCallFunc` pair was already registered.
• NPF_NCI_SSL_E_OPTIONAL_FEATURE_NOT_SUPPORTED – An attempt was made to leverage an optional feature within the API, which is not supported by this implementation. i.e. Some events are optional
6.4.2 NPF_NCI_SSLEventDeregister

NPF_error_t NPF_NCI_SSLEventDeregister(
    NPF_IN NPF_callbackHandle_t eventCallHandle);

Description
This function is used by an application to de-register an event handler routine which was previously registered to receive notifications of SSL events. It represents a unique user context and event handling routine pair.

Input Parameters
- eventCallHandle - The unique identifier returned to the application when the event callback routine was registered.

Output Parameters
None

Return Values
- NPF_NO_ERROR – The de-registration completed successfully.
- NPF_E_BAD_CALLBACK_HANDLE – The de-registration did not complete successfully due to problems with the callback handle provided.
6.5 Event definition signature
NPF SSL implementations can generate the events listed in section 5.9.1, type NPF_NCI_SSLEvent_t.

6.6 Completion Callbacks and Error Returns
Each of the functions defined in the SSL API can return an immediate error, and each makes asynchronous callbacks. The error codes eligible for immediate return are those defined in [API Conventions]. They are:

- NPF_NO_ERROR — This value is returned when a function was successfully invoked.
- NPF_E_UNKNOWN — An unknown error occurred in the implementation such that there is no error code defined that is more appropriate or informative.
- NPF_E_BAD_CALLBACK_HANDLE — A function was invoked with a callback handle that did not correspond to a valid NPF callback handle as returned by a registration function, or a callback handle was registered with a registration function belonging to a different API than the function call where the handle was passed in.

All other error codes must be returned in an asynchronous callback response. They are defined with each function description.
6.7 SSL Service APIs (SSL SAPIs)

The SSL SAPIs defined in the sections below support the three SSL distribution models described earlier in section 4.2:

- SSL SAPIs that manage the SSL Session negotiation database (sections 6.7.2 - 6.7.7) along with the target selector SAPIs (sections 6.7.27 - 6.7.32) are required to manage SSL accelerators based on the SSL full offload model described in section 4.2.1 and SSL partial offloaded model described in section 4.2.2.
- To support the SSL partial offload model described in section 4.2.2.2, a different set of SAPIs are defined (sections 6.7.8 - 6.7.14) that manage the SSL bulk database.

6.7.1 Generic Description of SSL Functions

Syntax

```c
NPF_error_t NPF_NCI_SSL<Noun><verb> (  
    NPF_IN NPF_callbackHandle_t cbHandle,  
    NPF_IN NPF_correlator_t  cbCorrelator,  
    NPF_IN NPF_errorReporting_t errorReporting,  
    <...other function parameters...> );
```

Description

The SSL function definitions follow the NPF framework guidelines.

Input Parameters

- `cbHandle`: the registered callback handle.
- `cbCorrelator`: the application’s context for this call.
- `errorReporting`: the desired level of feedback.
- plus any further parameters.

Output Parameters

Describe the output parameters for each function. In the SSL SAPI there are no output parameters to any function.

Synchronous Return Codes

Only the following error codes are returned on making any function call. All other codes are returned in the asynchronous callback.

- `NPF_NO_ERROR` — The operation is in progress.
- `NPF_E_UNKNOWN` — The operation could not be completed due to problems encountered when handling the input parameters.
- `NPF_E_BAD_CALLBACK_HANDLE` — The callback handle is not valid.
• **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.

• **NPF_NCI_SSL_E_OPTIONAL_FEATURE_NOT_SUPPORTED** – An attempt was made to leverage an optional feature within the API, which is not supported by this implementation. i.e. A given implementation may contain all the defined functional, but may return this error for the ‘optional’ functions.

**Asynchronous response**
Each of the asynchronous return codes are described in the appropriate functional section below, together with any data structures returned by the callback.
6.7.2 NPF_NCI_SSLSessionNegotiationDatabaseCreate()

```c
NPF_error_t NPF_NCI_SSLSessionNegotiationDatabaseCreate(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired);
```

**Description**

This function creates the SSL Session Negotiation Database and returns a handle associated with the SND. The handle is used to perform any subsequent operations on this SND. On success, an implementation provided SND handle is returned via the asynchronous callback.

**Input Parameters**

- **cbHandle**: The callback handle returned by NPF_NCI_SSLRegister() call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**

A callback of type NPF_NCI_SESSION_NEGOTIATION_DATABASE_CREATE is generated in response to this function call. This contains the return codes for any errors encountered. If the call is successful an SND handle is returned. The SND handle should be used in any subsequent interactions with the system. The following codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
6.7.3  NPF_NCI_SSLSessionNegotiationDatabaseDelete()

NPF_error_t NPF_NCI_SSLSessionNegotiationDatabaseDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);

Description
This function administratively destroys the SND, which has been previously created by
the NPF_NCI_SSLSessionNegotiationDatabaseCreate() function. Before destroying
the SND, an implicit SND Flush operation is performed in order to clean the SND.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- sndHandle: The SND handle to be deleted

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_DELETE is generated in
response to this function call. This contains the return codes for any errors encountered. The
following codes may be returned.
- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NO_MEMORY – The system was unable to allocate sufficient memory to
  complete this operation.
- NPF_NCI_SSL_E_INVALID_SND_HANDLE – The Received SND handle was not
  recognized as being valid.
6.7.4 NPF_NCI_SSLSessionNegotiationInfoAdd()

```c
NPF_error_t NPF_NCI_SSLSessionNegotiationInfoAdd(
    NPF_IN NPF_callbackHandle_t cbHandle,  
    NPF_IN NPF_correlator_t correlator,  
    NPF_IN NPF_errorReporting_t cbDesired,  
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle,  
    NPF_IN NPF_uint32_t numEntries,  
    NPF_IN NPF_NCI_SSLSessionNegParams_t *sessionArray);
```

**Description**
This function is used to add an array of Session negotiation parameter entries to the SSL Session negotiation database identified by `sndHandle`.

**Input Parameters**
- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `sndHandle`: Handle to the SND.
- `numEntries`: Number of entries in the `sessionArray`
- `sessionArray`: Array of `NPF_NCI_SSLSessionNegParams_t`

**Output Parameters**
None.

**Synchronous Return Codes**
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**
A callback of type `NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_ADD` is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.
- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_SND_HANDLE` – The Received SND handle was not recognized as being valid.
6.7.5 NPF_NCI_SSLSessionNegotiationInfoDelete()

NPF_error_t NPF_NCI_SSLSessionNegotiationInfoDelete(
    NPF_IN   NPF_callbackHandle_t    cbHandle,
    NPF_IN   NPF_correlator_t       correlator,
    NPF_IN   NPF_errorReporting_t   cbDesired,
    NPF_IN   NPF_NCI_SSLSessionNegHandle_t  sndHandle,
    NPF_IN   NPF_uint32_t           numEntries,
    NPF_IN   NPF_NCI_SSLSessionNegParams_t
        *sessionArray);

Description

This function is used to delete an array of SSL Session negotiation entries in the SSL Session negotiation database identified by the sndHandle. In the case of any existing entry in SND, the Session negotiation parameters are updated with the new ones.

Input Parameters

- cbHandle: The callback handle returned by NPF_NCI_sslRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- sndHandle: The SSL Session negotiation database handle.
- numEntries: Number of entries in the sessionArray
- sessionArray: Array of Session negotiation parameters

Output Parameters

None.

Synchronous Return Codes

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response

A callback of type NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_DELETE is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
- NPF_NCI_SSL_E_INVALID_SND_HANDLE – The Received SND handle was not recognized as being valid.
6.7.6 NPF_NCI_SSLSessionNegotiationInfoPurge()

```c
NPF_error_t NPF_NCI_SSLSessionNegotiationInfoPurge(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);
```

Description

This function is used to purge the SSL Session Negotiation Database identified by the `sndHandle`.

Input Parameters

- `cbHandle`: The callback handle returned by NPF_NCI_SSLRegister() call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `sndHandle`: The handle to SND to be purged.

Output Parameters

None.

Synchronous Return Codes

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response

A callback of type `NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_PURGE` is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_SND_HANDLE` – The Received SND handle was not recognized as being valid.
6.7.7 NPF_NCI_SSLSessionNegotiationDatabaseQuery()

```c
NPF_error_t NPF_NCI_SSLSessionNegotiationDatabaseQuery(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t  correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);
```

Description
This function is used to query the SND identified by the `sndHandle` handle.

Input Parameters
- **cbHandle**: The callback handle returned by NPF_NCI_SSLRegister() call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.
- **sndHandle**: Handle to the SND.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response
A callback of type `NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_QUERY` is generated in response to this function call. A single asynchronous response, `NPF_NCI_SSLAsyncResponse_t`, will be passed to the callback function containing the requested information.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_SND_HANDLE** – The Received SND handle was not recognized as being valid.
6.7.8 NPF_NCI_SSLSessionDatabaseCreate()

```c
NPF_error_t NPF_NCI_SSLSessionDatabaseCreate(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired);
```

**Description**

This function creates the SSL Session database (SSD). The handle is used to perform any subsequent operations on this SSD. On success, an implementation provided SSD handle is returned via the asynchronous callback.

**Input Parameters**

- **cbHandle**: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_SESSION_DATABASE_CREATE` is generated in response to this function call. This contains the return codes for any errors encountered. If the call is successful, then a SSD handle is returned. The SSD handle should be used in any subsequent interactions with the system. The following codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
### 6.7.9 NPF_NCI_SSLSessionDatabaseDelete()

```c
NPF_error_t NPF_NCI_SSLSessionDatabaseDelete(
    NPF_IN NPF_callbackHandle_t   cbHandle,
    NPF_IN NPF_correlator_t    correlator,
    NPF_IN NPF_errorReporting_t   cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle);
```

**Description**

This function administratively destroys the SSD, which have been previously created by the `NPF_NCI_SSLSessionDatabaseCreate()` function. Before destroying the SSD, an implicit SSD Flush operation is performed in order to clean the SSD.

**Input Parameters**

- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `ssdHandle`: The associated SSD handle.

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions](#).

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_SESSION_DATABASE_DELETE` is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_SSD_HANDLE** – The received SSD handle was not recognized as being valid.
6.7.10 NPF_NCI_SSLSessionInfoAdd()

```c
NPF_error_t NPF_NCI_SSLSessionInfoAdd(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_NCI_SSLSessionParams_t *ssdEntry);
```

Description

This function is used to add a Session entry to the SSD identified by `ssdHandle`. This entry is made dynamically during the SSL Session negotiation.

Input Parameters

- **cbHandle**: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.
- **ssdHandle**: Associated handle to the SSD.
- **ssdEntry**: NPF_NCI_SSLSessionParams_t entry.

Output Parameters

None.

Synchronous Return Codes

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response

A callback of type `NPF_NCI_SSL_SESSION_INFO_ADD` is generated in response to this function call. A single asynchronous response, `NPF_NCI_SSLAsyncResponse_t`, will be passed to the callback function containing the Session identifier. The following error codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_SSD_HANDLE** – The received SSD handle was not recognized as being valid.
6.7.11 NPF_NCI_SSLSessionInfoGet()

```c
NPF_error_t NPF_NCI_SSLSessionInfoGet(
  NPF_IN NPF_callbackHandle_t cbHandle,
  NPF_IN NPF_correlator_t correlator,
  NPF_IN NPF_errorReporting_t cbDesired,
  NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
  NPF_IN NPF_NCI_SSLSessionParams_t *ssdEntry,
  NPF_OUT NPF_NCI_SSLSessionParams_t *ssdEntryOutput);
```

**Description**

This function is used to get a Session entry from the SSD identified by `ssdHandle`. This is used to get a session entry to cache in the session cache database.

**Input Parameters**

- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `ssdHandle`: Associated handle to the SSD.
- `ssdEntry`: NPF_NCI_SSLSessionParams_t entry to be output

**Output Parameters**

- `ssdEntryOutput`: NPF_NCI_SSLSessionParams_t entry to be output data

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**

A callback of type NPF_NCI_SSL_SESSION_INFO_GET is generated in response to this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be passed to the callback function containing the Session identifier. The following error codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_SSD_HANDLE** – The received SSD handle was not recognized as being valid.
6.7.12 NPF_NCI_SSLSessionInfoDelete()

NPF_error_t NPF_NCI_SSLSessionInfoDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_uint32_t numEntries,
    NPF_IN NPF_NCI_SSLSessionId_t *ssdArray);

Description
This function is used to delete an array of SSL Session Database entries in the SSD Handle. In the case of any existing entry in SSD, the connection related parameters are updated with the new ones.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_sslRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- ssdHandle: Associated SSD handle.
- numEntries: Number of entries in the ssdArray
- ssdArray: Array of SSL session entries

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response
A callback of type NPF_NCI_SSL SESSION INFO DELETE is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
- NPF_NCI_SSL_E_INVALID_SSD_HANDLE – The received SSD handle was not recognized as being valid.
6.7.13  NPF_NCI_SSLSessionInfoPurge()

NPF_error_t  NPF_NCI_SSLSessionInfoPurge(
    NPF_IN  NPF_callbackHandle_t  cbHandle,
    NPF_IN  NPF_correlator_t  correlator,
    NPF_IN  NPF_errorReporting_t  cbDesired,
    NPF_IN  NPF_NCI_SSLSessionHandle_t  ssdHandle);

Description
This function is used to purge the SSL Session Database identified by the ssdHandle.

Input Parameters
• cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
• correlator: A 32-bit value that will be returned in the callback for this function call.
• cbDesired: The desired level of callback verbosity: always, never, or only upon error.
• ssdHandle: The handle to SSD to be purged.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_SESSION_INFO_PURGE is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.
• NPF_NO_ERROR – The operation was successful.
• NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
• NPF_NCI_SSL_E_INVALID_SSD_HANDLE – The received SSD handle was not recognized as being valid.
6.7.14 NPF_NCI_SSLSessionDatabaseQuery()

NPF_error_t NPF_NCI_SSLSessionDatabaseQuery(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle);

Description
This function is used to query the SSD identified by the ssdHandle.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- ssdHandle: Handle to the SSD.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_SESSION_DATABASE_QUERY is generated in response to this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be passed to the callback function containing the requested information.

- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
- NPF_NCI_SSL_E_INVALID_SSD_HANDLE – The received SSD handle was not recognized as being valid.
### 6.7.15 NPF_NCI_SSLSessionCacheDatabaseCreate()

```c
NPF_error_t NPF_NCI_SSLSessionCacheDatabaseCreate(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired);
```

#### Description

This function creates the SSL Session Cache database (SSCD). The handle is used to perform any subsequent operations on this SSCD. On success, an implementation provided SSCD handle is returned via the asynchronous callback.

#### Input Parameters

- **cbHandle**: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.

#### Output Parameters

None.

#### Synchronous Return Codes

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

#### Asynchronous Callback Response

A callback of type `NPF_NCI_SSL_SESSION_CACHE_DATABASE_CREATE` is generated in response to this function call. This contains the return codes for any errors encountered. If the call is successful, then a SSCD handle is returned. The SSCD handle should be used in any subsequent interactions with the system. The following codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
6.7.16 NPF_NCI_SSLSessionCacheDatabaseDelete()

```c
NPF_error_t NPF_NCI_SSLSessionCacheDatabaseDelete(
    NPF_IN NPF_callbackHandle_t cbHandle, 
    NPF_IN NPF_correlator_t correlator, 
    NPF_IN NPF_errorReporting_t cbDesired, 
    NPF_IN NPF_NCI_SSLSessionCacheHandle_t sscdHandle);
```

**Description**

This function administratively destroys the SSCD, which have been previously created by the
`NPF_NCI_SSLSessionCacheDatabaseCreate()` function. Before destroying the
SSCD, an implicit SSCD Flush operation is performed in order to clean the SSCD.

**Input Parameters**

- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `sscdHandle`: The associated SSCD handle

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_SESSION_CACHE_DATABASE_DELETE` is generated in response to
this function call. This contains the return codes for any errors encountered. The following codes
may be returned.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to
  complete this operation.
- `NPF_NCI_SSL_E_INVALID_SSCD_HANDLE` – The received SSCD handle was not
  recognized as being valid.
6.7.17  NPF_NCI_SSLSessionCacheInfoAdd()

NPF_error_t  NPF_NCI_SSLSessionCacheInfoAdd(
    NPF_IN  NPF_callbackHandle_t   cbHandle,
    NPF_IN  NPF_correlator_t      correlator,
    NPF_IN  NPF_errorReporting_t   cbDesired,
    NPF_IN  NPF_NCI_SSLSessionCacheHandle_t
    sscdHandle,
    NPF_IN  NPF_NCI_SSLSessionCacheParams_t
        *sscdEntry);  

Description

This function is used to add a Session Cache entry to the SSCD identified by sscdHandle. This entry is made dynamically during the SSL Session Cache negotiation.

Input Parameters

• cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
• correlator: A 32-bit value that will be returned in the callback for this function call.
• cbDesired: The desired level of callback verbosity: always, never, or only upon error.
• sscdHandle: Associated handle to the SSCD.
• sscdEntry: NPF_NCI_SSLSessionCacheParams_t entry.

Output Parameters

None.

Synchronous Return Codes

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response

A callback of type NPF_NCI_SSL_SESSION_CACHE_INFO_ADD is generated in response to this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be passed to the callback function containing the Session Cache identifier. The following error codes may be returned.

• NPF_NO_ERROR – The operation was successful.
• NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
• NPF_NCI_SSL_E_INVALID_SSCD_HANDLE – The received SSCD handle was not recognized as being valid.
6.7.18 NPF_NCI_SSLSessionCacheInfoGet()

```c
NPF_error_t NPF_NCI_SSLSessionCacheInfoGet(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionCacheHandle_t sscdHandle,
    NPF_IN NPF_NCI_SSLSessionCacheParams_t *sscdEntry,
    NPF_OUT NPF_NCI_SSLSessionCacheParams_t *sscdEntryOutput);
```

**Description**

This function is used to get a Session Cache entry from the SSCD identified by `sscdHandle`. This is used to get a cached entry to restore to the session database.

**Input Parameters**

- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `sscdHandle`: Associated handle to the SSCD.
- `sscdEntry`: `NPF_NCI_SSLSessionCacheParams_t` entry to be output

**Output Parameters**

- `sscdEntryOutput`: `NPF_NCI_SSLSessionCacheParams_t` entry to be output data

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_SESSION_CACHE_INFO_GET` is generated in response to this function call. A single asynchronous response, `NPF_NCI_SSLAsyncResponse_t`, will be passed to the callback function containing the Session Cache identifier. The following error codes may be returned.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_SSCD_HANDLE` – The received SSCD handle was not recognized as being valid.
6.7.19 NPF_NCI_SSLSessionCacheInfoDelete()

```
NPF_error_t NPF_NCI_SSLSessionCacheInfoDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionCacheHandle_t sscdHandle,
    NPF_IN NPF_uint32_t numEntries,
    NPF_IN NPF_NCI_SSLSessionCacheId_t *sscdArray);
```

**Description**

This function is used to delete an array of SSL Session Cache Database entries in the SSCD Handle. In the case of any existing entry in SSCD, the connection related parameters are updated with the new ones.

**Input Parameters**

- `cbHandle`: The callback handle returned by NPF_NCI_sslRegister() call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `sscdHandle`: Associated SSCD handle.
- `numEntries`: Number of entries in the sscdArray
- `sscdArray`: Array of SSL session entries

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**

A callback of type NPF_NCI_SSL_SESSION_CACHE_INFO_DELETE is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_SSCD_HANDLE** – The received SSCD handle was not recognized as being valid.
6.7.20 NPF_NCI_SSLSessionCacheInfoPurge()

NPF_error_t NPF_NCI_SSLSessionCacheInfoPurge(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionCacheHandle_t sscdHandle);

Description
This function is used to purge the SSL Session Cache Database identified by the sscdHandle.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- sscdHandle: The handle to SSCD to be purged.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_SESSION_CACHE_INFO_PURGE is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
- NPF_NCI_SSL_E_INVALID_SSCD_HANDLE – The received SSCD handle was not recognized as being valid.
6.7.21 NPF_NCI_SSLSessionCacheDatabaseQuery()

```c
NPF_error_t NPF_NCI_SSLSessionCacheDatabaseQuery(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t  correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionCacheHandle_t sscdHandle);
```

**Description**
This function is used to query the SSCD identified by the `sscdHandle`.

**Input Parameters**
- `cbHandle`: The callback handle returned by NPF_NCI_SSLRegister() call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `sscdHandle`: Handle to the SSCD.

**Output Parameters**
None.

**Synchronous Return Codes**
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].

**Asynchronous Callback Response**
A callback of type `NPF_NCI_SSL_SESSION_CACHE_DATABASE_QUERY` is generated in response to this function call. A single asynchronous response, `NPF_NCI_SSLAsyncResponse_t`, will be passed to the callback function containing the requested information.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_SSCD_HANDLE` – The received SSCD handle was not recognized as being valid.
6.7.22 NPF_NCI_SSLConnStatisticsQuery()

NPF_error_t NPF_NCI_SSLConnStatisticsQuery(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);

Description
This function is used query the connection SSL statistics identified by the SND handle.

Input Parameters
• cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
• correlator: A 32-bit value that will be returned in the callback for this function call.
• cbDesired: The desired level of callback verbosity: always, never, or only upon error.
• sndHandle: The handle to SND.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].
Additionally, the following may also be returned.

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_CONNECTION_STATISTICS_QUERY is generated in response to
this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be
passed to the callback function containing the requested information.

• NPF_NO_ERROR – The operation was successful.
• NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to
  complete this operation.
• NPF_NCI_SSL_E_INVALID_SND_HANDLE – The Received SND handle was not recognized
  as being valid.
6.7.23 NPF_NCI_SSLCryptoStatisticsQuery()

NPF_error_t NPF_NCI_SSLCryptoStatisticsQuery (  
NPF_IN NPF_callbackHandle_t cbHandle,  
NPF_IN NPF_correlator_t correlator,  
NPF_IN NPF_errorReporting_t cbDesired,  
NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);

Description
This function is used query the crypto SSL statistics identified by the SND handle.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- sndHandle: The handle to SND.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].
Additionally, the following may also be returned.

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_CRYPTO_STATISTICS_QUERY is generated in response to this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be passed to the callback function containing the requested information.

- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
- NPF_NCI_SSL_E_INVALID_SND_HANDLE – The Received SND handle was not recognized as being valid.
6.7.24 NPF_NCI_SSLBulkEncryptSend()

NPF_error_t NPF_NCI_SSLBulkEncryptSend(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_uint8_t *data,
    NPF_IN NPF_NCI_SSLSessionId_t sslSession
);

Description
This function is used request data to be encrypted and is sent out on flow specified by sslSession.

Input Parameters
- **cbHandle**: The callback handle returned by NPF_NCI_SSLRegister() call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.
- **ssdHandle**: Handle to the SSD.
- **data**: Data to be encrypted
- **sslSession**: Identifies what encryption to be used and the SSL client connection identifier.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].
Additionally, the following may also be returned.

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_BULK_ENCRYPT_SEND is generated in response to this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be passed to the callback function containing the requested information.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_SSD_HANDLE** – The received SSD handle was not recognized as being valid.

Additional Discussion
This API is invoked by the client application only for the outbound traffic to be encrypted before being sent to the SSL client in the internet.
6.7.25 NPF_NCI_SSLBulkEncrypt()

```c
NPF_error_t NPF_NCI_SSLBulkEncrypt(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_uint8_t *data,
    NPF_IN NPF_NCI_SSLSessionId_t sslSession
);
```

**Description**

This function is used request data to be encrypted as specified by `sslSession`.

**Input Parameters**

- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `ssdHandle`: Handle to the SSD.
- `data`: Data to be encrypted
- `sslSession`: Identifies what encryption to be used and the SSL client connection identifier.

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions]. Additionally, the following may also be returned.

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_BULK_ENCRYPT` is generated in response to this function call. A single asynchronous response, `NPF_NCI_SSLAsyncResponse_t`, will be passed to the callback function containing the requested information. The callback will contain the encrypted data information.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_SSD_HANDLE` – The received SSD handle was not recognized as being valid.

**Additional Discussion**

This API can be used by the client application for the non-TOE partial offload model.
6.7.26 NPF_NCI_SSLBulkDecrypt()

NPF_error_t NPF_NCI_SSLBulkDecrypt(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_uint8_t *data,
    NPF_IN NPF_NCI_SSLSessionId_t sslSession
);

Description
This function is used request data to be encrypted as specified by sslSession.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.
- ssdHandle: Handle to the SSD.
- data: Data to be decrypted
- sslSession: Identifies what decryption to be used and the SSL client connection identifier.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions].
Additionally, the following may also be returned.

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_BULK_DECRYPT is generated in response to this function call. A single asynchronous response, NPF_NCI_SSLAsyncResponse_t, will be passed to the callback function containing the requested information. The callback will contain the decrypted data information.

- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
- NPF_NCI_SSL_E_INVALID_SSD_HANDLE – The received SSD handle was not recognized as being valid.

Additional Discussion
This API can be used by the client application for the non-TOE partial offload model.
6.7.27 NPF_NCI_SSLTargetSelectorDatabaseCreate()

NPF_error_t NPF_NCI_SSLTargetSelectorDatabaseCreate(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired
);

Description
This function creates the SSL target selector database (TSD). The handle is used to perform any subsequent operations on this TSD. On success, an implementation provided TSD handle is returned via the asynchronous callback.

Input Parameters
- cbHandle: The callback handle returned by NPF_NCI_SSLRegister() call.
- correlator: A 32-bit value that will be returned in the callback for this function call.
- cbDesired: The desired level of callback verbosity: always, never, or only upon error.

Output Parameters
None.

Synchronous Return Codes
As defined in the Synchronous Return Codes [Generic Description of SSL Functions]. Additionally, the following may also be returned.

Asynchronous Callback Response
A callback of type NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_CREATE is generated in response to this function call. This contains the return codes for any errors encountered. If the call is successful, then a TSD handle is returned. The TSD handle should be used in any subsequent interactions with the system. The following codes may be returned.
- NPF_NO_ERROR – The operation was successful.
- NPF_NCI_SSL_E_NOMEMORY – The system was unable to allocate sufficient memory to complete this operation.
6.7.28 NPF_NCI_SSLTargetSelectorDatabaseDelete()

```c
NPF_error_t NPF_NCI_SSLTargetSelectorDatabaseDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLTargetSelHandle_t tsdHandle);
```

**Description**
This function administratively destroys the TSD, which have been previously created by the `NPF_NCI_SSLTargetSelectorDatabaseCreate()` function. Before destroying the TSD, an implicit TSD Flush operation is performed in order to clean the TSD.

**Input Parameters**
- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `tsdHandle`: The TSDD handle to be deleted

**Output Parameters**
None.

**Synchronous Return Codes**
As defined in the Synchronous Return Codes [Generic Description of SSL Functions]. Additionally, the following may also be returned.

**Asynchronous Callback Response**
A callback of type `NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_DELETE` is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_TSD_HANDLE` – The Received TSD handle was not recognized as being valid.
6.7.29 NPF_NCI_SSLTargetSelectorInfoAdd()

```c
NPF_error_t NPF_NCI_SSLTargetSelectorInfoAdd(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLTargetSelHandle_t tsdHandle,
    NPF_IN NPF_uint32_t numEntries,
    NPF_IN NPF_NCI_SSLTargetSelectorParams_t *tsdArray);
```

**Description**

This function is used to add an array of target selector entries to the TSD identified by `tsdHandle`.

**Input Parameters**

- `cbHandle`: The callback handle returned by `NPF_NCI_SSLRegister()` call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `tsdHandle`: Handle to the TSD.
- `numEntries`: Number of entries in the `tsdArray`
- `tsdArray`: Array of `NPF_NCI_SSLTargetSelectorParams_t`

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions]. Additionally, the following may also be returned.

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_TARGET_SELECTOR_INFO_ADD` is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_TSD_HANDLE` – The received TSD handle was not recognized as being valid.
6.7.30 NPF_NCI_SSLTargetSelectorInfoDelete()

```c
NPF_error_t NPF_NCI_SSLTargetSelectorInfoDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLTargetSelHandle_t tsdHandle,
    NPF_IN NPF_uint32_t numEntries,
    NPF_IN NPF_NCI_SSLTargetSelectorParams_t *tsdArray);
```

**Description**

This function is used to delete an array of SSL target entries in the TSD. In the case of any existing entry in TSD, the target related parameters are updated with the new ones.

**Input Parameters**

- `cbHandle`: The callback handle returned by NPF_NCI_sslRegister() call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `tsdHandle`: The TSD handle.
- `numEntries`: Number of entries in the tsdArray
- `tsdArray`: Array of Target Selector entries

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions]. Additionally, the following may also be returned.

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_TARGET_SELECTOR_INFO_DELETE` is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- `NPF_NO_ERROR` – The operation was successful.
- `NPF_NCI_SSL_E_NOMEMORY` – The system was unable to allocate sufficient memory to complete this operation.
- `NPF_NCI_SSL_E_INVALID_TSD_HANDLE` – The received TSD handle was not recognized as being valid
6.7.31 NPF_NCI_SSLTargetSelectorInfoPurge()

```c
NPF_error_t NPF_NCI_SSLTargetSelectorInfoPurge(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLTargetSelHandle_t tsdHandle);
```

**Description**

This function is used to purge the SSL Target selector Database identified by the `tsdHandle`.

**Input Parameters**

- `cbHandle`: The callback handle returned by NPF_NCI_SSLRegister() call.
- `correlator`: A 32-bit value that will be returned in the callback for this function call.
- `cbDesired`: The desired level of callback verbosity: always, never, or only upon error.
- `tsdHandle`: The handle to TSD to be purged.

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions]. Additionally, the following may also be returned.

**Asynchronous Callback Response**

A callback of type NPF_NCI_SSL_TARGET_SELECTOR_INFO_PURGE is generated in response to this function call. This contains the return codes for any errors encountered. The following codes may be returned.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_TSD_HANDLE** – The received TSD handle was not recognized as being valid
6.7.32 NPF_NCI_SSLTargetSelectorDatabaseQuery()

```c
NPF_error_t NPF_NCI_SSLTargetSelectorDatabaseQuery(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLTargetSelHandle_t tsdHandle);
```

**Description**

This function is used to query the TSD identified by the `tsdHandle`.

**Input Parameters**

- **cbHandle**: The callback handle returned by NPF_NCI_sslRegister() call.
- **correlator**: A 32-bit value that will be returned in the callback for this function call.
- **cbDesired**: The desired level of callback verbosity: always, never, or only upon error.
- **tsdHandle**: Handle to the TSD.

**Output Parameters**

None.

**Synchronous Return Codes**

As defined in the Synchronous Return Codes [Generic Description of SSL Functions](#).

Additionally, the following may also be returned.

**Asynchronous Callback Response**

A callback of type `NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_QUERY` is generated in response to this function call. A single asynchronous response, `NPF_NCI_SSLAsyncResponse_t`, will be passed to the callback function containing the requested information.

- **NPF_NO_ERROR** – The operation was successful.
- **NPF_NCI_SSL_E_NOMEMORY** – The system was unable to allocate sufficient memory to complete this operation.
- **NPF_NCI_SSL_E_INVALID_TSD_HANDLE** – The received TSD handle was not recognized as being valid.
## 7 API Call and Event Capabilities

These tables are included as a summary for informative purposes.

### 7.1 API Functions

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<tr>
<td>NPF_NCI_SSLSessionCacheDatabaseDelete()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLSessionCacheInfoAdd()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLSessionCacheInfoGet()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLSessionCacheInfoDelete()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLSessionCacheInfoPurge()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLConnStatisticsQuery()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLCryptoStatisticsQuery()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLBulkEncryptSend()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLBulkEncrypt()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLBulkDecrypt()</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSLTargetSelectorDatabaseCreate()</td>
<td>Required</td>
</tr>
<tr>
<td>NPF_NCI_SSLTargetSelectorDatabaseDelete()</td>
<td>Required</td>
</tr>
<tr>
<td>NPF_NCI_SSLTargetSelectorInfoAdd()</td>
<td>Required</td>
</tr>
<tr>
<td>NPF_NCI_SSLTargetSelectorInfoDelete()</td>
<td>Required</td>
</tr>
<tr>
<td>NPF_NCI_SSLTargetSelectorInfoPurge()</td>
<td>Required</td>
</tr>
<tr>
<td>NPF_NCI_SSLTargetSelectorDatabaseQuery()</td>
<td>Required</td>
</tr>
</tbody>
</table>
### 7.2 API Events

<table>
<thead>
<tr>
<th>Event Name</th>
<th>Event Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPF_NCI_SSL_REPLAY_PACKET</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSL_DECRYPTION_FAILED</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSL_ENCRYPTION_FAILED</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSL_NO_TARGET_MAPPING</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSL_CLIENT_AUTH_FAILED</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSL_ALERT_RECEIVED</td>
<td>Optional</td>
</tr>
<tr>
<td>NPF_NCI_SSL_MEM_FULL</td>
<td>Optional</td>
</tr>
</tbody>
</table>
Appendix A – npf_nci_ssl.h

/*
 * This header file defines typedefs, constants, and functions
 * for the NP Forum SSL API
 */
#ifndef __NPF_NCI_SSL_H
#define __NPF_NCI_SSL_H

#ifdef __cplusplus
extern "C" {
#endif

/*-----------------------------------------------------------------
* Common Data Types
* *-----------------------------------------------------------------*/
typedef NPF_uint32_t NPF_NCI_SSLSessionNegHandle_t;

/*
 * This is a 32-bit value that is used to identify an SSL Session Negotiation
 * Database (SND).
 */
typedef NPF_uint32_t NPF_NCI_SSLSessionHandle_t;

/*
 * This is a 32-bit value that is used to identify an SSL Session Database
 * (SSD).
 */
typedef NPF_uint32_t NPF_NCI_SSLSessionCacheHandle_t;

/*
 * This is a 32-bit value that is used to identify an SSL Session Cache
 * Database (SSCD).
 */
typedef NPF_uint32_t NPF_NCI_SSLTargetSelHandle_t;

/*
 * This is a 32-bit value that is used to identify an SSL Target Selector
 * Database (TSD).
 */
typedef NPF_uint32_t NPF_NCI_SSLSessionId_t;

/*
 * This is a 32-bit value that is used to identify a client Session
 * (Session).
 */
typedef NPF_uint32_t NPF_NCI_SSLSessionCacheId_t;

/*
 * This is a 32-bit value that is used to identify a cached client Session
 */

/*Constants that define the SSL Session attributes sizes*/
#define MAX_INITIAL_KEY_SIZE 256
#define MAX_SERVER_CERTIFICATE_SIZE 256
#define MAX_CLIENT_CA_LIST_SIZE 128

/*Constants that define the bulk data processing information sizes*/
#define MAX_SERVER_CIPHER_KEY_SIZE 4
#define MAX_CLIENT_CIPHER_KEY_SIZE 4
#define MAX_SERVER_MAC_KEY_SIZE 4
#define MAX_CLIENT_MAC_KEY_SIZE 4
#define MAX_SERVER_IV_KEY_SIZE 4
#define MAX_CLIENT_IV_KEY_SIZE 4

/*Size of a url inside the clear data, used to select the target server*/
#define MAX_URL_SIZE 1024

/
* Single IP address
*/
typedef union
{
    NPF_IPv4Address_t v4;  /* IPv4 address */
    NPF_IPv6Address_t v6;  /* IPv6 address */
} NPF_NCI_SSLIPAddress_t;

/*
 * SSL Proxy Local address and port info
 */
typedef struct
{
    /* IP Version */
    /* IPv4 = 4, IPv6 = 6 */
    NPF_uint8_t  IP_Version;
    union {
        NPF_IPv4Address_t v4;  /* IPv4 address */
        NPF_IPv6Address_t v6;  /* IPv6 address */
    } addr;
    /* Transport Protocol */
    /* TCP =1 or SCTP = 2 */
    NPF_uint8_t  L4_Protocol;
    union {
        NPF_uint16_t TCP_Port;
        NPF_uint32_t SCTP_Port;
    } port;
} NPF_NCI_SSLAddressPortInfo_t;

/*
 * The NPF_NCI_SSLCipherAndDigest enum defines the various SSL ciphers and
 * digests that can be supported by the SSL accelerator.
 */
typedef enum
{
    /* Standard Algorithm Identifiers */
NPF_NCI_RSA_WITH_NULL_MD5 = 1,
NPF_NCI_RSA_WITH_NULL_SHA,
NPF_NCI_RSA_EXPORT_WITH_RC4_40_MD5,
NPF_NCI_RSA_WITH_RC4_128_MD5,
NPF_NCI_RSA_WITH_RC4_128_SHA,
NPF_NCI_RSA_EXPORT WITH RC2_CBC_40_MD5,
NPF_NCI_RSA WITH IDEA_CBC_SHA,
NPF_NCI_RSA_EXPORT WITH DES40_CBC_SHA,
NPF_NCI_RSA WITH DES_CBC_SHA,
NPF_NCI_RSA_WITH_3DES_EDE_CBC_SHA,
NPF_NCI_DH_DSS_EXPORT WITH DES40_CBC_SHA,
NPF_NCI_DH_DSS WITH DES_CBC_SHA,
NPF_NCI_DH_DSS WITH 3DES_EDE_CBC_SHA,
NPF_NCI_DH_RSA_EXPORT WITH DES40_CBC_SHA,
NPF_NCI_DH_RSA WITH DES_CBC_SHA,
NPF_NCI_DH_RSA WITH 3DES_EDE_CBC_SHA,
NPF_NCI_DHE_DSS_EXPORT WITH DES40_CBC_SHA,
NPF_NCI_DHE_DSS WITH DES_CBC_SHA,
NPF_NCI_DHE_DSS WITH 3DES_EDE_CBC_SHA,
NPF_NCI_DHE_RSA_EXPORT WITH DES40_CBC_SHA,
NPF_NCI_DHE_RSA WITH DES_CBC_SHA,
NPF_NCI_DHE_RSA WITH 3DES_EDE_CBC_SHA,
NPF NCI DH anon EXPORT WITH RC4_40_MD5,
NPF NCI DH anon WITH RC4_128 MD5,
NPF_NCI_DH anon EXPORT WITH DES40_CBC_SHA,
NPF_NCI_DH anon WITH DES_CBC_SHA,
NPF_NCI_DH anon WITH 3DES_EDE_CBC_SHA,
NPF_NCI_RSA_EXPORT1024 WITH DES_CBC_SHA,
NPF_NCI_DHE_DSS_EXPORT1024 WITH DES_CBC_SHA,
NPF_NCI_RSA_EXPORT1024 WITH RC4_56_SHA,
NPF_NCI_DHE_DSS_EXPORT1024 WITH RC4_56_SHA,
NPF_NCI_DHE_WITH_RC4_128_SHA,
NPF_NCI_DH_anon_EXPORT WITH RC4_40_MD5,
NPF_NCI_DH_anon_WITH_RC4_128_MD5,
NPF_NCI_DH_anon_EXPORT WITH DES40_CBC_SHA,
NPF_NCI_DH_anon WITH DES_CBC_SHA,
NPF_NCI_DH_anon WITH 3DES_EDE_CBC_SHA,
NPF_NCI_RSA_EXPORT1024 WITH DES_CBC_SHA,
NPF_NCI_DHE_DSS_EXPORT1024 WITH DES_CBC_SHA,
NPF_NCI_RSA_EXPORT1024 WITH RC4_56_SHA,
NPF_NCI_DHE_DSS_EXPORT1024 WITH RC4_56_SHA,
NPF_NCI_DHE_WITH_RC4_128_SHA,

/* Experimental Algorithm Identifiers */
NPF_NCI_START_OF_EXPERIMENTAL_SECTION = 500,

/* Proprietary Algorithm Identifiers */
NPF_NCI_START_OF_PROPRIETARY_SECTION = 1000

typedef struct {
    /* Address/Port Info */
    NPF_NCI_SSLAddressPortInfo_t  proxyAddress;

    /* cipher/digest supported*/
    NPF_NCI_SSLCipherAndDigest cipher_and_digest;

    /*Suggested Initial key*/
    NPF_uint8_t  initialKey[MAX_INITIAL_KEY_SIZE];

/*The following structure represents an entry in the SSL negotiation Database*/

/Server's Public Certificate */
NPF_uint8_t certificate[MAX_SERVER_CERTIFICATE_SIZE];

/*Server's Private Key */
NPF_uint32_t *privateKey;

/*Comma separated, List of trusted CA's*/
NPF_uint8_t clientCAList[MAX_CLIENT_CA_LIST_SIZE];

} NPF_NCI_SSLSessionNegParams_t;

/* SSL negotiation Database array*/
typedef struct {
    NPF_uint32_t nCount;
    NPF_NCI_SSLSessionNegParams_t* sndArray;
} NPF_NCI_SSLSessionNeg_Array_t;

/*Target selection policy type*/
typedef enum {
    NPF_NCI_SSL_POLICY_PROXY_ADDR, /*Indicates that the target is
        selected via the proxy address*/
    NPF_NCI_SSL_POLICY_URL   /*Indicates that the target is
        selected via the url in the data*/
} NPF_NCI_SSLPolicyType_t;

/*Target selection policy. An example of proxy external address and url in
the data is shown below*/
typedef struct {
    NPF_NCI_SSLPolicyType_t policy_type; /* policy type*/
    union {
        NPF_NCI_SSLIPAddress_t proxyAddress; /*External interface addr*/
        NPF_uint8_t url[MAX_URL_SIZE];/*Url in clear data*/
    }u;
} NPF_NCI_SSLPolicy_t;

typedef struct {
    NPF_uint8_t IP_Version;   /* IPv4 = 4, IPv6 = 6 */
    NPF_NCI_SSLIPAddress_t targetAddress; /* Target addr*/
    NPF_NCI_SSLPolicy_t policy;
} NPF_NCI_SSLTargetSelectorParams_t;

/* SSL target selector Database array*/
typedef struct {
    NPF_uint32_t nCount;
    NPF_NCI_SSLTargetSelectorParams_t* tsdArray;
} NPF_NCI_SSLTargetSelector_Array_t;
/* SSL Connection information*/
typedef struct {
    NPF_uint32_t clientConnID; /*Identifies the client connection*/
    NPF_uint32_t targetConnID; /*Identifies the target connection*/
} NPF_NCI_SSLConnectionParams_t;

/* SSL Session Database*/
typedef struct {
    NPF_uint32_t serverKeyInfo[MAX_SERVER_CIPHER_KEY_SIZE];
    NPF_uint32_t clientKeyInfo[MAX_CLIENT_CIPHER_KEY_SIZE];
    NPF_uint32_t serverMACKeyInfo[MAX_SERVER_MAC_KEY_SIZE];
    NPF_uint32_t clientMACKeyInfo[MAX_CLIENT_MAC_KEY_SIZE];
    NPF_uint32_t serverIVInfo[MAX_SERVER_IV_KEY_SIZE];
    NPF_uint32_t clientIVInfo[MAX_CLIENT_IV_KEY_SIZE];
    NPF_NCI_SSLCipherAndDigest cipherAndDigest;
    NPF_NCI_SSLConnectionParams_t connectionMapping; /*SSL Client<-->target mapping*/
} NPF_NCI_SSLSessionParams_t;

typedef struct {
    NPF_uint32_t nCount;
    NPF_NCI_SSLSessionParams_t *sessionArray;
} NPF_NCI_SSLSession_Array_t;

typedef struct {
    NPF_uint32_t serverKeyInfo[MAX_SERVER_CIPHER_KEY_SIZE];
    NPF_uint32_t clientKeyInfo[MAX_CLIENT_CIPHER_KEY_SIZE];
    NPF_uint32_t serverMACKeyInfo[MAX_SERVER_MAC_KEY_SIZE];
    NPF_uint32_t clientMACKeyInfo[MAX_CLIENT_MAC_KEY_SIZE];
    NPF_uint32_t serverIVInfo[MAX_SERVER_IV_KEY_SIZE];
    NPF_uint32_t clientIVInfo[MAX_CLIENT_IV_KEY_SIZE];
    NPF_NCI_SSLCipherAndDigest cipherAndDigest;
    NPF_NCI_SSLConnectionParams_t connectionMapping; /*SSL Client<-->target mapping*/
    NPF_uint32_t sessionCacheTimeoutValue; /* in seconds */
} NPF_NCI_SSLSessionCacheParams_t;

typedef struct {
    NPF_uint32_t nCount;
    NPF_NCI_SSLSessionCacheParams_t *sessionCacheArray;
} NPF_NCI_SSLSessionCache_Array_t;

/* SSL Data – encrypted/de-crypted */
typedef struct {
    NPF_uint32_t data_len;
    NPF_uint8_t *data;
} NPF_NCI_SSLData_t;

/* Crypto related stats */
typedef struct {
    NPF_uint32_t HMAC_Errors; /* HMAC (hash) errors -inbound only- */
    NPF_uint32_t decryptErrors; /* Decryption errors -inbound*/
    NPF_uint32_t encryptErrors; /* Decryption errors -outbound*/
}
typedef struct {
    NPF_uint8_t   IP_Version;  /* IPv4 = 4, IPv6 = 6 */
    NPF_NCI_SSLIPAddress_t  clientAddr;
    NPF_NCI_SSLIPAddress_t  proxyAddr;
    NPF_NCI_SSLIPAddress_t  targetAddr;
} NPF_NCI_SSL_ConnectionInfo_t;

/* Connection related stats */
typedef struct {
    NPF_uint32_t     numSessions;
    NPF_NCI_SSL_ConnectionInfo_t *sslEndpoints;
} NPF_NCI_SSLConnectionStats_t;

/* SSL reserved error codes in relation to other NPF APIs
 * Note** The maximum range is 100 */
#define NPF_NCI_SSL_BASE_ERR 700 /* Base value of 700 wrt other NPF codes */

/* SSL Error Type */
typedef NPF_uint32_t NPF_NCI_SSLErrorType_t;  /* SSL Error Type */

/* These are generic error codes, that can be returned in any callback */
#define NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT 20 /* Should be enough */

/* The Interface handle provided was not recognized as being valid */
#define NPF_NCI_SSL_E_INVALID_IF_HANDLE \((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 1)\n
/* Already registered */
#define NPF_NCI_SSL_E_ALREADY_REGISTERED \((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 2)\n
/* Optional feature not supported */
#define NPF_NCI_SSL_E_OPTIONAL_FEATURE_NOT_SUPPORTED \((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 3)\n
/* System was unable to allocate sufficient memory to complete operation */
#define NPF_NCI_SSL_E_NOMEMORY \((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + 4)\n
/* Invalid SND handle */
#define NPF_NCI_SSL_E_INVALID_SND_HANDLE \((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR + \n
/* Invalid SSD handle */
#define NPF_NCI_SSL_E_INVALID_SSD_HANDLE
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 1)

/* Invalid TSD handle */
#define NPF_NCI_SSL_E_INVALID_TSD_HANDLE
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 2)

/* Invalid cipher algorithm */
#define NPF_NCI_SSL_E_INVALID_ENC_ALGO
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 4)

/* Invalid cipher algorithm keylen */
#define NPF_NCI_SSL_EINVALID_ENC_ALGO_KEYLEN
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 5)

/* Invalid digest algorithm */
#define NPF_NCI_SSL_E_INVALID_DIGEST_ALGO
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 6)

/* Invalid digest algorithm keylen */
#define NPF_NCI_SSL_EINVALID_DIGEST_ALGO_KEYLEN
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 7)

/* Invalid Initialization vector*/
#define NPF_NCI_SSL_EINVALID_IV
  ((NPF_NCI_SSLErrorType_t) NPF_NCI_SSL_BASE_ERR +
   NPF_NCI_SSL_GENERIC_ERROR_CODE_COUNT + 8)

/*Completion Callback Data Types*/

typedef struct {
  NPF_NCI_SSLErrorType_t error;
  union {
    NPF_NCI_SSLSessionId_t sslSessionId;
    NPF_NCI_SSLSessionCacheId_t sslSessionCacheId;
    NPF_NCI_SSLSessionNegHandle_t sndHandle;
    NPF_NCI_SSLTargetSelHandle_t tsdHandle;
    NPF_NCI_SSLSessionHandle_t ssdHandle;
    NPF_NCI_SSLSessionCacheHandle_t sscdHandle;
    NPF_NCI_SSLSessionNeg_Array_t sndArray;
    NPF_NCI_SSLTargetSelector_Array_t tddArray;
  }
} CompletionCallbackData_t;
typedef enum NPF_NCI_SSLCallbackType {
    NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_CREATE = 1,
    NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_DELETE = 2,
    NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_ADD = 3,
    NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_DELETE = 4,
    NPF_NCI_SSL_SESSION_NEGOTIATION_INFO_PURGE = 5,
    NPF_NCI_SSL_SESSION_NEGOTIATION_DATABASE_QUERY = 6,
    NPF_NCI_SSL_CONNECTION_STATISTICS_QUERY = 7,
    NPF_NCI_SSL_CRYPTO_STATISTICS_QUERY = 8,
    NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_CREATE = 9,
    NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_DELETE = 10,
    NPF_NCI_SSL_TARGET_SELECTOR_INFO_ADD = 11,
    NPF_NCI_SSL_TARGET_SELECTOR_INFO_DELETE = 12,
    NPF_NCI_SSL_TARGET_SELECTOR_INFO_PURGE = 13,
    NPF_NCI_SSL_TARGET_SELECTOR_DATABASE_QUERY = 14,
    NPF_NCI_SSL_SESSION_DATABASE_CREATE = 15,
    NPF_NCI_SSL_SESSION_DATABASE_DELETE = 16,
    NPF_NCI_SSL_SESSION_INFO_ADD = 17,
    NPF_NCI_SSL_SESSION_INFO_GET = 18,
    NPF_NCI_SSL_SESSION_INFO_DELETE = 19,
    NPF_NCI_SSL_SESSION_INFO_PURGE = 20,
    NPF_NCI_SSL_SESSION_DATABASE_QUERY = 21,
    NPF_NCI_SSL_SESSION_CACHE_DATABASE_CREATE = 22,
    NPF_NCI_SSL_SESSION_CACHE_DATABASE_DELETE = 23,
    NPF_NCI_SSL_SESSION_CACHE_INFO_ADD = 24,
    NPF_NCI_SSL_SESSION_CACHE_INFO_GET = 25,
    NPF_NCI_SSL_SESSION_CACHE_INFO_DELETE = 26,
    NPF_NCI_SSL_SESSION_CACHE_INFO_PURGE = 27,
    NPF_NCI_SSL_SESSION_CACHE_DATABASE_QUERY = 28,
    NPF_NCI_SSL_BULK_ENCRYPT_SEND = 29,
    NPF_NCI_SSL_BULK_ENCRYPT = 30,
    NPF_NCI_SSL_BULK_DECRYPT = 31
} NPF_NCI_SSLCallbackType_t;

typedef struct {
    NPF_NCI_SSLCallbackType_t     type;
    NPF_boolean_t                 allOK;
    NPF_uint32_t                  numResp;
    NPF_NCI_SSLAsyncResponse_t   *resp;
} NPF_NCI_SSLCallbackData_t;

/* Callback Data*/

typedef struct {  
    NPF_NCI_SSLCallbackType_t   type;
    NPF_boolean_t               allOK;
    NPF_uint32_t                numResp;
    NPF_NCI_SSLAsyncResponse_t  *resp;
} NPF_NCI_SSLCallbackData_t;

/* Event Notification Data Types */
typedef enum
{
    NPF_NCI_SSL_REPLAY_PACKET     = 1,/* Replay packet caught */
    NPF_NCI_SSL_DECRYPTION_FAILED    = 2,/* SSL decryption failed */
    NPF_NCI_SSL_ENCRYPTION_FAILED    = 3,/* SSL encryption failed */
    NPF_NCI_SSL_NO_TARGET_MAPPING    = 4,/* No target server found*/
    NPF_NCI_SSL_CLIENT_AUTH_FAILED   = 5,/* Client authentication failed*/
    NPF_NCI_SSL_ALERT_RECEIVED    = 6,/* Received an SSL Alert*/
    NPF_NCI_SSL_MEM_FULL      = 7 /*A crypto NPU ran out of memory*/
} NPF_NCI_SSLEvent_t;

#define SSL_MAX_EVENT_TYPES 7

typedef NPF_uint32_t NPF_NCI_SSLEventMask_t;

#define NPF_NCI_SSL_EVENT_ALL_DISABLE   (0) /* disable all */
#define NPF_NCI_SSL_REPLAY_PACKET_ENABLE    (1 << 1)
#define NPF_NCI_SSL_DECRYPTION_FAILED_ENABLE     (1 << 2)
#define NPF_NCI_SSL_ENCRYPTION_FAILED_ENABLE     (1 << 3)
#define NPF_NCI_SSL_NO_TARGET_MAPPING_ENABLE      (1 << 4)
#define NPF_NCI_SSL_CLIENT_AUTH_FAILED_ENABLE      (1 << 5)
#define NPF_NCI_SSL_ALERT_RECEIVED_ENABLE      (1 << 6)
#define NPF_NCI_SSL_MEM_FULL_ENABLE       (1 << 7)
#define NPF_SSL_EVENT_ALL_ENABLE    0xFFFFFFFF

typedef struct
{
    NPF_uint8_t   IP_Version; /* 4 = IPv4, 6 = IPv6 */
    NPF_uint8_t   protocol; /* IP Transport Protocol */
    NPF_NCI_SSLIPAddress_t clientAddr; /*Address on client*/
    NPF_NCI_SSLIPAddress_t proxyAddr;  /*Address on proxy interface*/
    NPF_uint16_t   srcPort; /* IP Source Port */
    NPF_uint16_t   alertVal; /* SSL alert value, 200 for others*/
} NPF_NCI_SSLPacketInfo_t;

typedef struct
{
    NPF_NCI_SSLEvent_t eventType;
    NPF_NCI_SSLPacketInfo_t packet;
} NPF_NCI_SSLEventData_t;
/* 
SSL Event Array 
* /
typedef struct
{ 
    NPF_uint16_t  n_data;   /*Number of events in array*/
    NPF_NCI_SSLEventData_t *eventDataArray; /* Array of event 
notifications */
} NPF_NCI_SSLEventArray_t;

/*----------------------------------------------------------------- 
* Function Call Prototypes 
* *-----------------------------------------------------------------*/
typedef void (*NPF_NCI_SSLCallbackFunc_t)(
    NPF_IN NPF_userContext_t  userContext,
    NPF_IN NPF_correlator_t   correlator,
    NPF_IN NPF_NCI_SSLCallbackData_t sslCallbackData);

typedef void (*NPF_NCI_SSLEventCallFunc_t) ( 
    NPF_IN NPF_userContext_t       userContext,
    NPF_IN NPF_NCI_SSLEventArray_t data);

NPF_error_t NPF_NCI_SSLRegister(
    NPF_IN NPF_userContext_t   userContext,
    NPF_IN NPF_NCI_SSLCallbackFunc_t  sslCallbackFunc,
    NPF_OUT NPF_callbackHandle_t  *sslCallbackHandle);

NPF_error_t NPF_NCI_SSLDeregister(
    NPF_IN NPF_callbackHandle_t sslCallbackHandle);

NPF_error_t NPF_NCI_SSLEventRegister(
    NPF_IN NPF_userContext_t            userContext,
    NPF_IN NPF_NCI_SSLEventCallFunc_t  eventCallFunc,
    NPF_IN NPF_NCI_SSLEventMask_t  eventMask,
    NPF_OUT NPF_callbackHandle_t      *eventCallHandle);

NPF_error_t NPF_NCI_SSLEventDeregister(
    NPF_IN NPF_callbackHandle_t eventCallHandle);

NPF_error_t   NPF_NCI_SSLSessionNegotiationDatabaseCreate(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t   correlator,
    NPF_IN NPF_errorReporting_t cbDesired);

NPF_error_t   NPF_NCI_SSLSessionNegotiationDatabaseDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t   correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);

NPF_error_t   NPF_NCI_SSLSessionNegotiationInfoAdd(
    NPF_IN NPF_callbackHandle_t cbHandle,
NPF_IN NPF_correlator_t correlator,
NPF_IN NPF_errorReporting_t cbDesired,
NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle,
NPF_IN NPF_uint32_t numEntries,
NPF_IN NPF_NCI_SSLSessionNegParams_t *sessionArray);

NPF_error_t NPF_NCI_SSLSessionNegotiationInfoDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle,
    NPF_IN NPF_uint32_t numEntries,
    NPF_IN NPF_NCI_SSLSessionNegParams_t *sessionArray);

NPF_error_t NPF_NCI_SSLSessionNegotiationInfoPurge(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);

NPF_error_t NPF_NCI_SSLSessionNegotiationDatabaseQuery(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionNegHandle_t sndHandle);

NPF_error_t NPF_NCI_SSLSessionDatabaseCreate(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired);

NPF_error_t NPF_NCI_SSLSessionDatabaseDelete(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle);

NPF_error_t NPF_NCI_SSLSessionInfoAdd(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_NCI_SSLSessionParams_t *ssdEntry);

NPF_error_t NPF_NCI_SSLSessionInfoGet(
    NPF_IN NPF_callbackHandle_t cbHandle,
    NPF_IN NPF_correlator_t correlator,
    NPF_IN NPF_errorReporting_t cbDesired,
    NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle,
    NPF_IN NPF_NCI_SSLSessionParams_t *ssdEntry,
    NPF_OUT NPF_NCI_SSLSessionParams_t
NPF_error_t NPF_NCI_SSLSessionInfoDelete(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle, NPF_IN NPF_uint32_t numEntries, NPF_IN NPF_NCI_SSLSessionId_t *ssdEntryOutput);

NPF_error_t NPF_NCI_SSLSessionInfoPurge(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle);

NPF_error_t NPF_NCI_SSLSessionDatabaseQuery(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionHandle_t ssdHandle);

NPF_error_t NPF_NCI_SSLSessionCacheDatabaseCreate(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired);

NPF_error_t NPF_NCI_SSLSessionCacheDatabaseDelete(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionCacheHandle_t ssccdHandle);

NPF_error_t NPF_NCI_SSLSessionCacheInfoAdd(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionCacheHandle_t ssccdHandle, NPF_IN NPF_NCI_SSLSessionCacheParams_t *ssccdEntry);

NPF_error_t NPF_NCI_SSLSessionCacheInfoGet(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionCacheHandle_t ssccdHandle, NPF_IN NPF_NCI_SSLSessionCacheParams_t *ssccdEntry, NPF_OUT NPF_NCI_SSLSessionCacheParams_t *ssccdEntryOutput);

NPF_error_t NPF_NCI_SSLSessionCacheInfoDelete(NPF_IN NPF_callbackHandle_t cbHandle, NPF_IN NPF_correlator_t correlator, NPF_IN NPF_errorReporting_t cbDesired, NPF_IN NPF_NCI_SSLSessionCacheHandle_t ssccdHandle, NPF_IN NPF_uint32_t numEntries, NPF_IN NPF_NCI_SSLSessionCacheId_t *ssccdEntryOutput);
NPF_IN  NPF_NCI_SSLSessionCacheHandle_t  sscdHandle,
NPF_IN  NPF_NCI_SSLSessionCacheId_t    *sscdArray);
NPF_error_t NPF_NCI_SSLSessionInfoPurge(
NPF_IN  NPF_callbackHandle_t       cbHandle,
NPF_IN  NPF_correlator_t           correlator,
NPF_IN  NPF_errorReporting_t       cbDesired,
NPF_IN  NPF_NCI_SSLSessionCacheHandle_t  sscdHandle);
NPF_error_t NPF_NCI_SSLSessionCacheDatabaseQuery(
NPF_IN  NPF_callbackHandle_t       cbHandle,
NPF_IN  NPF_correlator_t           correlator,
NPF_IN  NPF_errorReporting_t       cbDesired,
NPF_IN  NPF_NCI_SSLSessionCacheHandle_t  sscdHandle);
NPF_error_t NPF_NCI_SSLSessionTargetSelectorDatabaseCreate(
NPF_IN  NPF_callbackHandle_t       cbHandle,
NPF_IN  NPF_correlator_t           correlator,
NPF_IN  NPF_errorReporting_t       cbDesired
);
NPF_error_t  NPF_NCI_SSLTargetSelectorDatabaseDelete(
    NPF_IN  NPF_callbackHandle_t   cbHandle,
    NPF_IN  NPF_correlator_t      correlator,
    NPF_IN  NPF_errorReporting_t  cbDesired,
    NPF_IN  NPF_NCI_SSLTargetSelHandle_t  
      tsdHandle);

NPF_error_t  NPF_NCI_SSLTargetSelectorInfoAdd(
    NPF_IN  NPF_callbackHandle_t   cbHandle,
    NPF_IN  NPF_correlator_t      correlator,
    NPF_IN  NPF_errorReporting_t  cbDesired,
    NPF_IN  NPF_NCI_SSLTargetSelHandle_t  
      tsdHandle,
    NPF_IN  NPF_uint32_t        numEntries,
    NPF_IN  NPF_NCI_SSLTargetSelectorParams_t *tsdArray);

NPF_error_t  NPF_NCI_SSLTargetSelectorInfoDelete(
    NPF_IN  NPF_callbackHandle_t   cbHandle,
    NPF_IN  NPF_correlator_t      correlator,
    NPF_IN  NPF_errorReporting_t  cbDesired,
    NPF_IN  NPF_NCI_SSLTargetSelHandle_t  
      tsdHandle,
    NPF_IN  NPF_uint32_t        numEntries,
    NPF_IN  NPF_NCI_SSLTargetSelectorParams_t *tsdArray);

NPF_error_t  NPF_NCI_SSLTargetSelectorInfoPurge(
    NPF_IN  NPF_callbackHandle_t   cbHandle,
    NPF_IN  NPF_correlator_t      correlator,
    NPF_IN  NPF_errorReporting_t  cbDesired,
    NPF_IN  NPF_NCI_SSLTargetSelHandle_t 
      tsdHandle);

NPF_error_t  NPF_NCI_SSLTargetSelectorDatabaseQuery(
    NPF_IN  NPF_callbackHandle_t   cbHandle,
    NPF_IN  NPF_correlator_t      correlator,
    NPF_IN  NPF_errorReporting_t  cbDesired,
    NPF_IN  NPF_NCI_SSLTargetSelHandle_t 
      tsdHandle);

#define __cplusplus
}
#endif /* __NPF_NCI_SSL_H */
Appendix B  Acknowledgements

Working Group Chair: Alex Conta, TranSwitch Corporation

Task Group Chair: Keith Williamson, Motorola Corporation

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The list is in alphabetical order of last names:

Suhail Ahmed, Intel
Asher Altman, Intel
Andy Gram, Nortel
Gary Hanson, RadiSys
Bernie Keany, Intel
David Lapp, Seaway
Keith Williamson, Motorola
Appendix C  List of companies belonging to NPF During Approval Process

Agere Systems          Mercury Computer Systems
AMCC                   Nokia
Analog Devices         NTT Electronics
Cypress Semiconductor  PMC Sierra
Enigma Semiconductor   RadiSys
Ericsson               Sensory Networks
Flextronics            Sun Microsystems
Freescale Semiconductor Teja Technologies
HCL Technologies       TranSwitch
Hifn                   U4EA Group
IDT                    Wintegra
Infineon Technologies AG Xelerated
Intel                  Xilinx
IP Fabrics             
IP Infusion            
Motorola               