eSign Remote API Specifications

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1. Introduction

The Government introduced enabling law in the second schedule of IT Act, in 2015 , known as “e-authentication technique using Aadhaar and other e-KYC services”. eSign API 2.x and eSign API 3.x are based on the above-mentioned notification. In the year 2020, the IT Act Gazette notification titled “e-authentication technique and procedure for creating and accessing subscriber's signature key facilitated by trusted third party” was published to enable subscribers to store their private key in a remote HSM managed by CA. This eSign Remote API is addressing the functions relating to remote key storage, authentication to HSM and signature functions. The pre-requisite for this API will be the operational eKYC account created using eSign API 3.x

In this model, key pair is stored in remote HSM managed by Certifying Authorities. As in the case of token, subscribers generate the key-pair and obtain Digital Signature certificate from CA once and the same key will be used subsequently after authentication to HSM. The key-pair generation and subsequent usage of private key for the signature will be under the sole activation control of the subscriber though HSM may be under the physical custody or managed by CA.

1.1. Target Audience

This technical document is targeted to CA, who implement the infrastructure for remote key storage and Application Service Providers who require signing of digital document(s) in their application.

1.2. Objective of the document

This document provides eSign Remote Service API specification for remote key management and authentication functions. This includes necessary API Data format, protocol and other related specifications.

1.3. Terminology

SAM

Subscriber Authentication Module (SAM) is software which shall reside in the FIPS boundary of HSM. SAM shall utilize the secure channel establishment function of the HSM to securely communicate (through eSign Service providers) with the subscribers, including during the subscriber authentication.

" eSign" or “eSign Service” is an online Electronic Signature Service in which the key pair generation, certification of the public key by the CA and digital signature creation for electronic document are facilitated by the eSign online Electronic Signature Service provider instantaneously within a single online service based on successful authentication of individual using e-KYC services. If the remote key storage by CA is enabled for subscriber, the eSign service will be based on authentication of subscriber’s key and corresponding certificate.

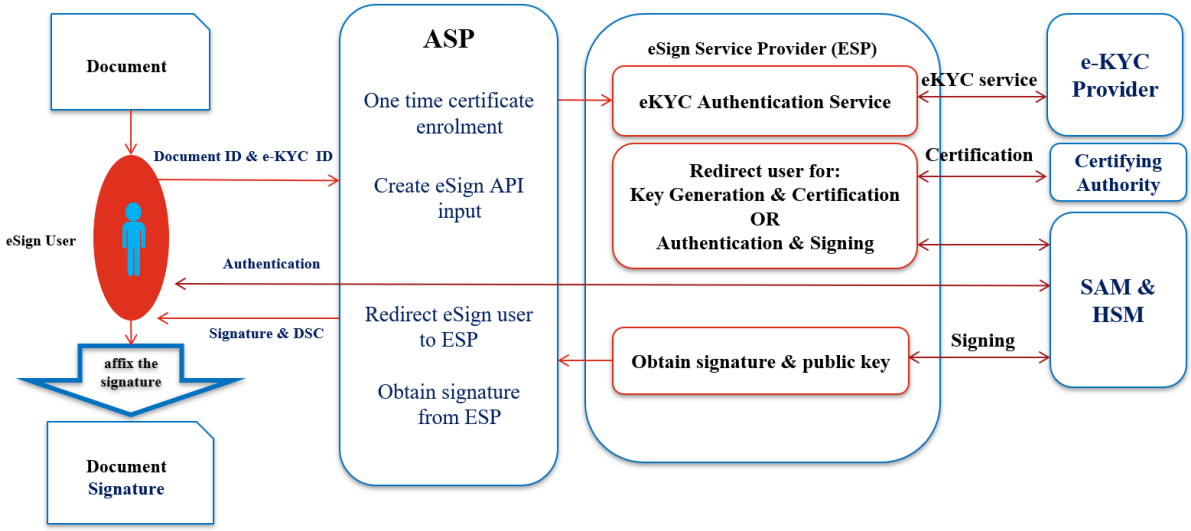
1.4. Legal Framework

eSign service based on remote key-storage will operate under the provisions of the Second Schedule of Information Technology Act, 2000 (“e-authentication technique and procedure for creating and accessing subscriber's signature key facilitated by trusted third party”).

2. Understanding eSign Remote Service

This chapter describes eSign Service based on remote key-storage, the remote key management and authentication follow in subsequent chapters.

2.1. eSign Remote Service at a glance



2.2. Participants

The various participants involved in the framework of eSign Remote are described as under.

eSign User: eSign user is the Subscriber for Digital Signature Keys as defined under the Act. eSign user is required to have enrolled successfully with the Certifying Authority under the eKYC requirements, and thus have the corresponding eKYC account functional. eSign User shall meet the verification requirements for KYC account as per Identity Verification Guidelines of CCA.

Application Service Provider (ASP): ASP is the front ending application to the eSign User, necessarily a software application, facilitating digital signing to the eSign user. This application is required to comply with the on-boarding requirements laid down by CCA.

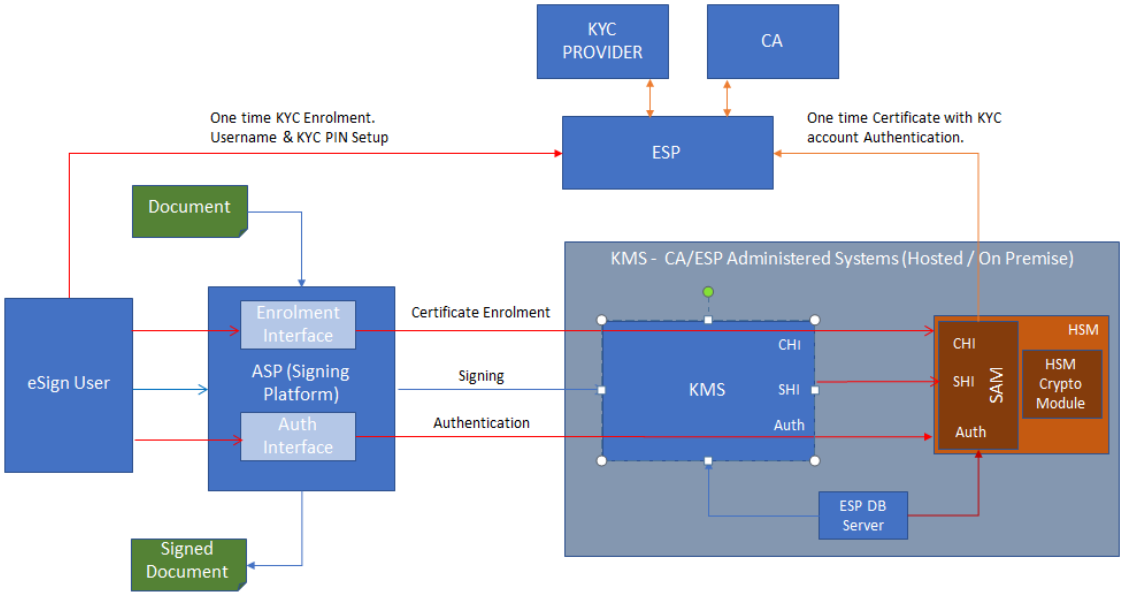
eSign Service Provider (ESP): ESP is the empanelled/licensed entity by CCA to act as an eSign Service Provider.

Certifying Authority: Certifying Authority is the entity empanelled/licensed by CCA to perform the duties of Certifying Authority under the provisions of the Act.

2.3. Detailed Framework

This chapter describes the eSign Remote API framework.

2.3.1. Architecture Diagram



2.3.2. eSign User

This framework expects that the user has eKYC account and successfully authenticated to eKYC account for the purposes of Certificate Enrolment in HSM. The enrolment to eKYC account needs to be carried out independent of this document.

2.3.3. SAM & HSM

Subscriber Authentication Module (SAM) and Hardware Security Module (HSM) are the hardware/software components residing in the Hardware device located at ESP or a Trusted Third Party (TTP), and are administered solely by ESP for the purposes of this service. This shall meet the requirements laid down under e-Authentication guidelines of CCA. Key Management Servers (KMS) interface with SAM and HSM for executing the functions.

HSM shall be FIPS 140-2 Level 3 certified, and shall secure the signing keys of the eSign Users through this protection. HSM shall also host one or more Encryption keys, which will be solely used by SAM for the protection of authentication credentials of the eSign Users. The access to the keys in HSM, including all the signing and encryption keys mentioned here, shall be limited to the SAM. It shall not be accessible to any other external component which may have administrative or overriding privileges.

SAM Component shall reside in the HSM towards fulfilling the security requirements of this framework. This shall have access to the signing keys of the eSign Users, and also the Encryption keys, used for the protection of authentication credentials of the eSign Users. SAM component shall have access to the database, which will be used for managing the eSign Users, their certificate Identifiers (Cert ID) / Key Identifiers (Key ID), encrypted credentials, etc. The encrypted values shall always include the Key Identifier along with the PIN, in order to prevent value-replacement attacks in the database. SAM shall not log the decrypted credentials for whatsoever reasons. SAM shall not provide the decrypted credentials outside SAM. The credentials shall be decrypted and consumed only within SAM layer.

The SAM and HSM shall never be exposed to Public Internet, and shall attend incoming requests only through Key Management Server.

2.3.4. Key Protocols

The framework implements secure protocols through defined interfaces for interaction between HSM/SAM and the eSign User/ASP through Key Management Server (KMS)

The core layer of these interfaces resides in SAM, and a corresponding part for each interface resides in KMS to interact with SAM. All communication these interfaces shall be signed & encrypted through secure channel. The transport layer shall always be secured using secure version of TLS protocol.

Auth Interface (AI): This interface interacts between eSign user & the HSM for the Authentication functions. During this process, it interacts with eSign User to capture the Authentication Credentials, Hash the secret/PIN at entry level (using the nonce), Encrypt the packet with HSM's Encryption key, and perform the authentication of the User securely within the SAM. The interface also extends through KMS to directly interact with the eSign user in ASP application. Before the Authentication process, this interface generates a unique random nonce and provides to the user's interface to perform entry level hashing. On successful authentication, this interface will generate a unique session-token to enable the signing operation.

CA HSM Interface (CHI): This interface interacts between ESP, CA & the HSM for the Certificate Enrolment functions. During this process, it interacts with eSign User to capture certificate enrolment related information, eKYC Account Authentication, Key Generation/Management, Certificate Generation (from CA), Auth PIN enrolment, Auth PIN reset functions. The interface also extends through KMS to directly interact with the eSign user in ASP application.

Signing HSM Interface (SHI): This interface interacts between ESP & the HSM for the Signature functions. During this process, it interacts with eSign User to eKYC Account Authentication, Interact with HSM for authentication and signature creation

2.3.5. Key Management Server (KMS)

ESP shall provide a Key Management Server (KMS) to expose the protocol interfaces on necessary manner, to fulfil the requirements of eSign Remote API to the ASPs. This KMS shall prevent directly exposing SAM & HSM to public internet. For this purpose, the HTTP interface exposed by this KMS will be the only channel for interaction with the ASP / eSign User.

While this KMS frontends for Enrolment/Authentication of eSign User, it shall implement all necessary security requirements towards Encryption of credentials using SAM's Public Key Certificate. During the authentication of the eSign user, this shall implement entry-level hashing of the PIN. This KMS Application shall never store or log the PIN/Secret of the user for whatsoever reasons, and shall ensure that such PIN/Secret is always travelled out in the encrypted format.

2.3.6. ESP Database Server

ESP shall facilitate a Database Server to store / manage the eSign Users by SAM. The database shall store the eSign User's credentials only in encrypted format through a key residing in HSM and protected by SAM. The database can reside either in the HSM boundary or in the KMS.

3. eSign Remote Service Implementation Scenarios

This chapter describes the eSign Remote Service implementation scenarios & the process flow.

3.1. Implementation Scenarios

The eSign Remote Service acts as an extension to eSign Service API 3.x in case of key management related functions and can work independently at CA premises or TTP location for key authentication and signature creation. The API is common to both scenarios; however, the parameter values that will vary for each ESP/TTP are 'eSign Service URL' and 'CERT ID' (Unique CERT ID issued by the CA/ESP).

3.1.1. Remote key-storage hosted at CA

In this case, the access to key for signature and authentication will be carried by after authentication of subscriber to eKYC account. The key-management function will also be carried out after authentication of subscriber to eKYC account. The key storage and second factor authentications are at ESP level thereby the software interfaces of CHI, SHI and AI contained in SAM are hosted at ESP location.

3.1.2. Remote key-storage hosted at TTP

In this case, the access to key for signature and authentication will be carried by after authentication of subscriber to ASP application. In such ASP application-level authentication, at least one of them should be the second factor authentication specified in the eSign Service API 3.X. The key-management function will be carried out after authentication of subscriber to eKYC account maintained at CA level. The key storage and second factor authentications are at ASP (TTP) level there by the software interfaces of CHI, SHI and AI contained in SAM are hosted at TTP location.

3.2. Process Flow

The process flow consists of two stages, that is, Certificate Enrolment process by the eSign User (usually a one-time process per certificate) and Authentication & Signing process.

3.2.1. Certificate Enrolment process

During this process:

1. Prerequisite:
    a. User shall have a valid eKYC Account with the ESP/CA.
2. User visits ESP / ASPs application and initiates enrolment.
3. User is redirected to KMS interface for Certificate Enrolment.
    a. User performs the KYC Account authentication (2-factor) through KMS interface.
        i. KMS communicates with KYC Provider to authenticate.
        ii. KMS Receives eKYC Response.
    b. KMS invokes CHI based user enrolment and requests for new Certificate Auth PIN.
        i. CHI provides the Encryption Public Key of the SAM to KMS .
        ii. KMS uses the Encryption Public Key to encrypt Auth PIN.
    c. CHI captures the KYC User ID & Certificate Auth PIN, optionally key algorithm & validity(default sha256/ECC & 2 years)
    d. CHI generates new Key Pair and CSR
    e. KMS communicates with CA for the certificate with given CSR and eKYC response.
    f. CA generates the certificate for desired validity.
    g. User Accepts the Certificate.
    h. CHI completes the Certificate enrolment with corresponding key. The Authentication Credentials for the Certificate are successfully registered by SAM.
4. User is redirected back to ESP/ASP's application.

3.2.2. Authentication & Signing process

During this process:

1. Prerequisite:
    a. User shall have a valid eKYC Account with the ESP/CA.
    b. User shall have a valid Certificate Enrolment in the HSM.
2. User visits ASP's application and initiates Signature.
3. User shall perform initial authentication in ASP's application prior to or after initiating signature. User shall be in a valid authenticated session before the next step.
4. ASP shall initiate an eSign Transaction with Document hash, Unique Transaction ID, and optional KYC Username.
5. User is redirected to KMS interface for Signing with the Transaction ID.
    a. User performs the Certificate Authentication (KYC Username & Certificate Auth PIN).
        i. At this stage, KMS requests and initializes the authentication with SAM before capturing the details.
        ii. SAM provides back a unique random nonce and Encryption Public Key of the SAM to KMS .
        iii. KMS hashes the PIN along with the nonce, and then encrypts the data with Encryption Public Key of the SAM
    b. SAM receives the authentication data, and authenticates.
        i. SAM decrypts the authentication data.
        ii. SAM gets the authentication data from database and decrypts it.
        iii. SAM applies nonce on Auth PIN from database, and hashes it.
        iv. SAM compares the authentication data match.
        v. Once Success, SAM generates a unique session-token and responds to KMS .
    c. KMS send the Document Hash to SHI along with session-token and gets the Signature.
        i. SHI validates the session-token and gains access to the corresponding key protected by SAM.
        ii. SHI performs signature on given Document Hash by consuming corresponding signing key.
    d. KMS responds the Signature (and Corresponding Certificate) back to ASP.
6. User is redirected back to ASP's application.
    a. ASP attaches the Signature to the original document and provides it to the user.

4. eSign Remote API for ASPs

This chapter describes the eSign Remote Service API in detail including the communication protocol, and data formats to be used by ASPs.

Following are the APIs exposed by KMS Application to ASP.

1. Certificate Enrolment: HTTPS Redirection
2. Initiate eSign: HTTPS API
3. eSign Authentication: HTTPS Redirection
4. Check Signing Status: HTTPS API

4.1. Certificate Enrolment

ASP shall initiate the Certificate Enrolment with a unique transaction ID. ESP shall receive such enrolment request for the transaction ID and facilitate Certificate Enrolment with HTTPS Redirection. At this stage, ASP is expected to guide the user with proper information before redirecting the user to the Certificate Enrolment page of the ESP.

ESP shall expose a redirection URL with following specifications.

Request:

API URL	ESP shall expose URL as HTTPS redirection page.
Protocol	HTTPS
Method	POST
Content-Type	application/x-www-form-urlencoded
Parameter name	txnreq
Parameter Value	Concatenated transaction ID and Redirection URL (separated with a pipe character) in base 64 encoding.
Example format	txnreq=Base64(transaction ID + "|" + Redirection URL)
Data validation	Transaction ID: This shall be an alphanumeric string not exceeding 50 characters. Shall be unique for a given date ASP combination. Redirection URL: This shall be a valid HTTP(S) URL of the ASP, to which ESP shall redirect the user after enrolment steps.

ESP shall redirect back the user to ASP's interface with a appropriate response.

Response:

API URL	ASP shall expose URL as HTTP(S) redirection page.
Protocol	HTTP(S)
Method	POST
Content-Type	application/x-www-form-urlencoded
Parameter name	txnresp
Parameter Value	Concatenated transaction ID, Status, and Data (separated with a pipe character) in base 64 encoding.
Example format	txnresp=Base64(transaction ID + "|" + Status + "|" + Data)
Data validation	Transaction ID: This shall be the original transaction ID given by ASP. Status: This shall be 0 in case of failure. 1 in case of Success. Data: This shall contain the username of the user, in case of Success. Else, in case of Failure, this shall contain a Custom Error Message by ESP.

4.2. Initiate eSign

eSign Remote service is exposed as stateless service over HTTPS. Usage of open data format in XML and widely used protocol such as HTTPS allows easy adoption and deployment of this service. To support strong end to end security and avoid request tampering and man-in-the-middle attacks, it is essential that the requests and responses are digitally signed.

ESP shall provision a valid digital signature certificate of ASP application against the ASP account, in order to validate the requests.

The usage of HTTPS shall ensure transport layer encryption, while digital signing of XML shall ensure integrity & authenticity of data.

Following is the URL format and the parameters for eSign service:

API URL	ESP shall expose URL as HTTPS endpoint
Protocol	HTTPS
Method	POST
Content-Type	application/xml
Post data	A well-formed XML, as per the specifications provided in this document.

ASP is required to collect the necessary API URL from the respective ESP.

4.2.1. eSign API: Input Data Format - eSign Service

eSign Service uses XML as the data format for input and output.

4.2.1.1. eSign XML structure

Following is the XML data format for eSign XML.

```
<Esign ver="" signerid="" ts="" txn="" maxWaitPeriod="" aspId="" responseUrl="" redirectUrl="" >
        <Docs>
                <InputHash id="" hashAlgorithm="" docInfo="" docUrl=""
                responseSigType="">Document Hash in Hex</InputHash>
        </Docs>
        <Signature>Digital signature of ASP</Signature>
</Esign>
```

Element Details:

Element Name: Esign

- Description: Root element of the eSign xml
- Requirement of tag: Mandatory
- Value: Sub-elements
- Attributes: Table below

Sl No	Attribute	Required?	Value
1.	Ver	Mandatory	eSign version (mandatory). ESP may host multiple versions for supporting gradual migration. As of this specification, API Version is “1.0”.
2.	username	Optional	ASP collects the username of the signer. If username is not present, ESP may facilitate the new Certificate Enrolment, however KYC authentication of user should be carried out before Enrolment.
3.	ts	Mandatory	Request timestamp in ISO format. The value should be in Indian Standard Time (IST), and should be within the range of maximum 30 minutes deviation to support out of sync server clocks.
4.	txn	Mandatory	Transaction ID of the ASP calling the API, this is logged and returned in the output for correlation. Should be unique for the given ASP-ESP combination for that calendar day.
5.	maxWaitPeriod	Mandatory	Expiry time in minutes. This is maximum wait time for the ESP to allow Signer to complete the signing. In case the user does not sign within ASP’s expected duration, ESP should mark the transaction as error ‘User timeout’ error code. Default = 1440 minutes

6.	aspId	Mandatory	Organization ID of ASP allocated by ESP.
7.	responseUrl	Mandatory	ASP URL to receive the response from ESP. This should be a valid URI accessible from ESP system to make a call and submit the response XML packet using HTTP(S)-POST with Content-Type as application/xml. On success or failure including cancellation by user, ESP shall perform a background call to this response URL with 'eSign Response Format' which contains the status success/failure (status = 1/0).
8.	redirectUrl	Optional	ASP URL to redirect the user after completion of transaction. This is supported only in case where ASP uses redirection to ESP authentication page. If present, ESP shall redirect the user back to ASP's designated URL. Such redirection shall have a HTTP(S)-POST and Content-Type of 'application/x-www-form-urlencoded' with parameter of 'txnref' containing concatenated transaction ID and responseCode (separated with a pipe character) in base 64 encoding. txnref=Base64(transaction ID + "|" + responseCode)

Element Name: Docs

- Description: Contains one sub-element with Document Hash
- Requirement of tag: Mandatory
- Value: Sub-elements
- Attributes: Not applicable

Element Name: InputHash

- Description: Contains the value of Document Hash, which has to be signed.
- Requirement of tag: Mandatory
- Value: SHA256 hash value of the document in Hex format
- Attributes: Table below

Sl No	Attribute	Required?	Value
1.	id	Mandatory	The index number of the document. Should start with one. Maximum 5. Should be sequential. Shall not repeat.
2.	hashAlgorithm	Mandatory	Should be fixed to "SHA256"
3.	docInfo	Mandatory	Description for the respective document being signed, not more than 50 characters. docInfo should be strictly adhere to the content of document. Multiple documents of same type or different types should not be included in a single file.

			ESP shall display this information against docUrl, so that user can identify the same.
4.	docUrl	Mandatory	URL of the document. Should be a HTTP / HTTPS URL for the document, accessible by the signer during the transaction permitted duration (maxUserWait Time). ESP shall display this URL with hyperlink, so that user can access the document to view.
5.	responseSigType	Mandatory	This value represents the response signature type, where ASP can request for a specific type of signature from one of the following Allowed Values are: 1. raw 2. PKCS7(with only the signer certificate in the certificate section and no revocation information) 3. PKCS7pdf(all issuer certificates up to and including root CA certificate and CRLs/OCSP responses of each issuer certificates should be included in the response. In case, the number CRL entries are more than 5, only OCSP responses are allowed. The revocation information should be included as a signed attribute under pdfRevocationInfoArchival (1.2.840.113583.1.1.8). The signature may also be optionally time stamped using the time stamping services of CA. 4. PKCS7complete(All issuer certificates & its revocation information in unsigned info)

Element Name: Signature

- Description: Contains the signature of ASP.
- Requirement of tag: Mandatory
- Value:
    - Signed value of Input XML, as per the W3C recommendation on XML Signature Syntax and Processing (Second Edition)
    - Refer http://www.w3.org/TR/xmldsig-core/ for more information
- Attributes: Not applicable

4.3. eSign: User Authentication Page

Once ASP submits the Request XML, ESP provides a 'pending for completion' (status=2) response which will contain the response code (as an acknowledgement). At this stage, ASP is expected to guide the user with proper to redirect the user to the authentication page of the ESP.

ESP shall expose a redirection URL with following specifications.

API URL	ESP shall expose URL as HTTPS redirection page.
Protocol	HTTPS

Method	POST
Content-Type	application/x-www-form-urlencoded
Parameter name	txnref
Parameter Value	Concatenated transaction ID and responseCode (separated with a pipe character) in base 64 encoding.
Example format	txnref=Base64(transaction ID + "|" + responseCode)

4.4. eSign API: Response Data Format - eSign Service

Below is the response format of eSign Service API. This response shall be used in following situations:

1. Once the subscriber authorizes (or cancels or expire), ESP shall provide a completed response to the ASP on the responseUrl (status = 1/0).
2. ESP shall also respond to 'Check Signing Status' API call with this response format including 'pending for completion' statuses.

Note that, the API does not give any identity related data of the eSign user.

```
<EsignResp ver="" status="" ts="" txn="" resCode=" " error="">
        <UserX509Certificate>base64 value of eSign user certificate (.cer)</UserX509Certificate>
        <Signatures>
                <DocSignature id="" sigHashAlgorithm="SHA256" error="">
                Signature data in raw (PKCS#1) or raw (ECDSA) or PKCS7 (CMS) signature as
                requested
                </DocSignature>
        </Signatures>
        <Signature>Signature of ESP</Signature>
</EsignResp>
```

4.4.1. Element Details

Element Name: EsignResp

- Description: This element is the root element of the response and contains the meta values.
- Value: Sub-elements
- Attributes: Table below

Sl No	Attribute	Presence	Value
1.	ver	Mandatory	Should be set to 3.3
2.	status	Mandatory	In case of success, it will be "1" In case of failure, it will be "0" In case of pending for completion, it will be "2"
3.	ts	Mandatory	Will contain the response timestamp in ISO format.
4.	txn	Mandatory	The Transaction ID provided by ASP in the request.
5.	resCode	Mandatory	A unique response code provided by ESP. This is a unique id for the transaction (eSign user authentication & eSign request) provided by ESP. It

			shall make the transaction traceable, and ASP is expected to store this code in their audit log. The response code shall be maintained same for particular transaction. Being asynchronous, there may be need for providing the response multiple times including the acknowledgement stage and final response stage. All the responses shall carry same response code for the particular transaction.
6.	error	Optional	In case of failure, this will contain an error code. OR blank, in case of success.

Element Name: UserX509Certificate

- Description: This element will contain the Base 64 value of the Certificate. No private key information is shared. For manual verification, this value can be copied and saved as .cer file (With begin and end statements - PEM Format).
- Presence: Mandatory, if success.
- Value: Base 64 value of eSign user certificate (public).
- Attributes: Not Applicable

Element Name: Signatures

- Description: This element contains the sub-elements of signatures corresponding to InputHash.
- Presence: Mandatory, if success.
- Value: Sub-elements.
- Attributes: Not Applicable

Element Name: DocSignature

- Description: This element will contain the signed value which will be verifiable against original document.
- Presence: Mandatory
- Value: Signed value in raw (PKCS#1) or raw (ECDSA) or PKCS7 (CMS) signature format as per the request XML.
- Attributes: Table Below

Sl No	Attribute	Presence	Value
1.	Id	Mandatory	Contains the corresponding ID to the Input Hash received
2.	sigHashAlgorithm	Mandatory	Should be fixed to “SHA256”
3.	error	Optional	In case of failure, this will contain an error code. OR blank, in case of success. ESP shall provide necessary option for signer to uncheck any document hash. Such unchecked document hash shall not be signed and shall be returned with an error called “User Rejected”.

Element Name: Signature

- Description: This element will contain the signature of ESP, which can be used for verification by ASP and protect the response from any kind of tamper.
- Value:
    - Signed value of response XML, as per the W3C recommendation on XML Signature Syntax and Processing (Second Edition)
    - Refer http://www.w3.org/TR/xmldsig-core/ for more information
- Attributes: Not Applicable

4.5. eSign API: Check Signing Status - Request

This is an additional option for ASP to check the status of the transaction, in case necessary.

On a successful & timely flow, ESP will automatically call back the ASP's responseUrl with necessary eSign response. However, in case of any need, ASP can call the signing status API and receive the response again.

ESP shall provide this service for minimum of 30 days from the date of transaction, for the ASP.

4.5.1. Request XML format

```
<EsignStatus ver="" ts="" txn="" aspId="" >
        <Signature>Digital signature of ASP</Signature>
</EsignStatus>
```

4.5.1.1. Element Details

Element Name: Esign

- Description: Root element of the eSign xml
- Requirement of tag: Mandatory
- Value: Sub-elements
- Attributes: Table below

	Attribute	Required?	Value
1.	ver	Mandatory	Should be set to 3.3
2.	ts	Mandatory	Request timestamp in ISO format. The value should be in Indian Standard Time (IST), and should be within the range of maximum 30 minutes deviation to support out of sync server clocks.
3.	txn	Mandatory	Transaction ID of the ASP provided in original request.
4.	aspId	Mandatory	Organization ID of the ASP

Element Name: Signature

- Description: Contains the signature of ASP.
- Requirement of tag: Mandatory
- Value:

    - Signed value of Input XML, as per the W3C recommendation on XML Signature Syntax and Processing (Second Edition)
    - Refer http://www.w3.org/TR/xmldsig-core/ for more information
- Attributes: Not applicable

This will respond with an eSign response data as defined in this document. The status attribute of the response will indicate the success or pending for completion.

5. eSign Remote API for ESPs

This chapter describes the eSign Remote Service API in detail including the communication protocol, and data requirements to be used by ESPs.

Following are the APIs exposed by SAM / KYC Provider / CA to ESP.

1. KYC Account: Initiate Authentication (HTTPS API)
2. KYC Account: Authenticate (HTTPS API)
3. CA: Generate Certificate (HTTPS API)
4. SAM: Initiate Enrolment (CHI protocol)
5. SAM: Enrol Certificate (CHI protocol)
6. SAM: Initiate Signing (SHI protocol)
7. SAM: Authenticate user (AI protocol)
8. SAM: Perform Signing (SHI protocol)

For security reasons, these APIs is not detailed with data formats, but given with data requirements. The implementation shall ensure that, it is using a secure transport layer. The APIs shall also include authentication with secure access secrets implementing transaction wise hashing to prevent replay attacks.

5.1. KYC Account: Initiate Authentication

Protocol	**HTTPS API**
Request Fields	• Unique Access Credentials for each deployment • Unique Transaction ID • Time Stamp • KYC Username
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • KYC Username • Unique Nonce (128 bits or longer in accordance with RFC 2104) • Error (if any)

5.2. KYC Account: Authenticate (HTTPS API)

Protocol	**HTTPS API**
Request Fields	• Unique Access Credentials for each deployment • Transaction ID corelating to Initialization • Time Stamp • KYC Username • PIN hashed along with Nonce with minimum of SHA256. • Second Factor data
Response Fields	• Corresponding Transaction ID • Response Time Stamp

	• Status • KYC Username • KYC Information • Error (if any)

5.3. CA: Generate Certificate (HTTPS API)

Protocol	**HTTPS API**
Request Fields	• Unique Access Credentials for each deployment • Unique Transaction ID • Time Stamp • KYC Username • KYC information • CSR for the Certificate
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • KYC Username • Certificate Data • Error (if any)

5.4. SAM: Initiate Enrolment (CHI protocol)

Protocol	**Custom Protocol**
Request Fields	• Unique Transaction ID • Time Stamp • KYC Username
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • Unique Nonce • CSR • Key ID • Public Key of Encryption Certificate • Error (if any)

5.5. SAM: Enrol Certificate (CHI protocol)

Protocol	**Custom Protocol**
Request Fields	• Transaction ID correlating to Initialization • Time Stamp • KYC Username • Encrypted Authentication PIN • Certificate Data • Key ID
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • KYC Username • Certificate ID • Error (if any)

5.6. SAM: Initiate Signing (SHI protocol)

Protocol	Custom Protocol
Request Fields	• Unique Transaction ID • Time Stamp • KYC Username • Certificate ID
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • Unique Nonce • Public Key of Encryption Certificate • Error (if any)

5.7. SAM: Authenticate user (AI protocol)

Protocol	Custom Protocol
Request Fields	• Transaction ID correlating to Initialization • Time Stamp • KYC Username • Certificate ID • Encrypted Authentication Data
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • KYC Username • Certificate ID • Session Token • Error (if any)

5.8. SAM: Perform Signing (SHI protocol)

Protocol	Custom Protocol
Request Fields	• Unique Transaction ID • Time Stamp • KYC Username • Certificate ID • Session Token • Document Hash(es)
Response Fields	• Corresponding Transaction ID • Response Time Stamp • Status • KYC Username • Signature(s) • User Certificate(s) • Error (if any)

6. Change History
