HUB Web Service API

IPPC ePhyto HUB

v1.8

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Document Roadmap

Following is the planned enhancements to this document

Feature
-- no roadmap features are planned at this stage --

1. Introduction

1.1 Purpose

This document describes the IPPC HUB Web Service. It should be used as guideline to implement the required client software components needed to connect to the HUB.

Note: This document is an early release and may be updated during the pilot phase of the HUB project. Updates will be released following the standard Change Management process. The latest version will be available in the document repository at https://www.ippc.int/en/ephyto/ephyto-technical-information/

1.2 Intended Audience and Reading Suggestions

The audience for this document are developers and system architects of NPPOs who will evaluate and release the components for connecting to the HUB. It will also be used for developing the interface between the IPPC HUB and the IPPC Generic National System (GeNS), as well as serve as prototype documentation of the HUB implementation. This document should be read in parallel with the ePhyto HUB Software Requirements Specification and it is totally related to the hub web services operations and usage.

1.3 References

- ePhyto HUB Software Requirements Specification
- https://www.ippc.int/en/ephyto/
- https://www.ippc.int/en/ephyto/ephyto-technical-information/

2. HUB On-Boarding

- The first step in this process is to send a Registration request to the NPPO using https://www.ephytoexchange.org/onboard
- After due validation and confirmation from the IPPC official contact point of the indicated country, the user account is automatically created (using the indicated contact email) and credentials are sent.
- After obtaining access to the admin console the HUB Administrator will contact the focal point sending the latest version of this document and supporting the NPPO for the initial setup of the UAT site, where the implementation can be tested and validate before the final release to production.

3. Technical Support

Issues encountered during the testing phase or other technical queries related to the testing of the HUB can be raised using the Hub portal - https://www.ephytoexchange.org/support *(Registered users only)*

We also encourage using the collaboration tool to get quick answers and share experiences. *(Registered users only)*

For general queries on the HUB please go to https://www.ephytoexchange.org/support

If you encounter issues while testing the implementation of the components needed to connect to the HUB you can raise a technical support request from within the Administration Console (https://hub.ephytoexchange.org/AdminConsole) following the link available in the menu after the successful login.

The system will send a mail to the technical team that will respond to the query.

We suggest to look first at the collaboration area of the admin console as possible source of information.

4. HUB Web Service Systems

4.1 Testing Environment (UAT)

The testing environment (UAT) is a live system with the latest release of the system that is constantly available to test the implementation of the client application connection to the HUB.

Self-Signed certificates and ad-hoc credentials can be provided in order to facilitate the activities.

4.1.1 URL for Testing

HUB UAT/Test environment can be accessed from the following URLs:

https://uat-hub.ephytoexchange.org/hub/DeliveryService?wsdl (web service WSDL)

https://uat-hub.ephytoexchange.org/hub/DeliveryService (web service end point will accept only certificate authentication)

https://uat-hub.ephytoexchange.org/AdminConsole (Admin interface)

Log in credentials to the console are provided separately in the process of NPPO on-boarding.

4.1.2 Certificates for Web Service client authentication

During the testing phase, web services client authentication will use self-signed certificates. NPPOs can issue their certificates with the "keytool" command found in the Java Development Kit (JDK) or they can request that UNICC provide a sample certificate for the NPPO that they can use.

With the March 2018 release the NPPO administrator can access the HUB Admin Console and update the public certificates that will be used to authenticate the NPPO client application when using the services

4.1.2.1 Requesting a test certificate from UNICC

The NPPO needs to provide the information needed to create the *X.500 Distinguished Name* for the certificate:

- Common Name
- Organization Unit
- Organization Name
- Locality Name (city)
- State Name
- Two-letter country code

UNICC will send a key store file in the PKCS12 format with the certificate, and upload the public key from the HUB Admin Console in the NPPO profile.

4.1.2.2 Generating a self-signed test certificate

Certificates can be generated with the "keytool" command provided by the JDK. Once the NPPO has generated the certificate, it has to send the public key to UNICC so that it can be added to the server's *truststore*.

Example of certificate generation for a NPPO entity located in London, UK with a validity of 10 years:

```
C:\certificates>keytool -genkey -alias nppo1 -keyalg RSA -keysize 1024 -keystore nppo.keystore -validity 3650 -keypass nppo1pass -storepass nppoStore1pass
What is your first and last name?
  [Unknown]:  www.nppo.mycountry
What is the name of your organizational unit?
  [Unknown]:  NPPO
What is the name of your organization?
  [Unknown]:  NPPO-MyCountry
What is the name of your City or Locality?
  [Unknown]:  Capital
What is the name of your State or Province?
  [Unknown]:
What is the two-letter country code for this unit?
  [Unknown]:  MC
Is CN=www.nppo.mycountry, OU=NPPO, O=NPPO-MyCountry, L=Capital, ST=Unknown, C=MC correct?
  [no]:  yes
```

Example of public key export from the key store:

```
C:\certificates>keytool -export -keystore nppo.keystore -alias nppo1 -file nppo1.cer -keypass nppo1pass -storepass nppoStore1pass
```

Once generated, the NPPO will send the nppo1.cer file to UNICC in order to be imported into the *truststore*. The certificate fingerprint is also required for validation purposes.

4.2 Production Environment

HUB Production environment can be accessed from the following URLs:

https://hub.ephytoexchange.org/hub/DeliveryService?wsdl (web service WSDL)

https://hub.ephytoexchange.org/hub/DeliveryService (web service end point will accept only certificate authentication)

https://www.ephytoexchange.org/AdminConsole (Admin interface)

4.3 Authentication

Authentication to the web service supports TLS 1.1 and TLS 1.2 client certificates that are associated to each country accessing the HUB. X509 certificates are the client credentials. Each connected application will have a defined certificate, issued by a recognized Certificate Authority that will authenticate the client application to the HUB on HTTPS protocol. Details of the Security implementation are outside the scope of this document but contained in the referenced HUB requirements document specification.

The HUB will only accept 'envelopes' where the 'From' field (described below) matches the TLS Certificate of the connecting NPPO.

5. HUB XML Schemas

5.1 Schema

The HUB will accept an envelope that will comprise of the following two elements:

1) Envelope Header
2) Envelope Content

The WSDL defined in this document (Section 6 of this document) has 5 operations; supported by the following entities:

a. Envelope Header
b. Envelope= header + content
c. Array of Envelope Header
d. Array of Envelope
e. HUBTrackingInfo

5.1.1 Envelope Header

The envelope header element is used to exchange information on the ePhyto certificates without viewing/processing the content of the actual certificate.

The HUB will be instrumented to verify the correct use of such codes and raise communication errors when such attributes are not complying with the standards. This will be a feature of the HUB software.

During interaction with the HUB, it is not mandatory to set all the elements within the header. However, some identified elements are required at the minimum.

The Envelope header has the following elements:

- **From:** ISO 3166-1 alpha 2 letter Country Code of the exporting country
- **To:** ISO 3166-1 alpha 2 letter Country Code of the importing country
- **CertificateType:** This is the UNECE code for certificate types. For the IPPC implementation, the HUB will check that the type code corresponds to the following two numbers only.
  - 851 for Phyto

- 657 for Re-Export Phyto

- **CertificateStatus:** This is the UNECE code for the status of the certificate. For the IPPC implementation, the HUB will check that the status code corresponds to one of the following numbers:
  - 70:Issued
  - 39:Approved
  - 40:Withdrawn
  - 41:Rejected
- **NPPOCertificateNumber:** For its own reference, the **exporting** NPPO can insert the certificate number of the ePhyto contained within the envelope, in this field. It will allow the NPPO national system to match a certificate against the HubTrackingNumber in its own national system. Furthermore, the HUB user-interface will also display this number along with the delivery status. This element is multi-lingual; allowing the exporting NPPO to use any language of their choice. This is limited to a 1000 characters.
- **HUBTrackingNumber:** This is unique identifier that will be assigned by the HUB for each envelope when it receives the envelope for the first time. The NPPO system can subsequently query the HUB against this identifier; to get delivery information on any particular certificate identified by the HUBTrackingNumber. This element size can grow up to 50 characters long.
- **HUBTrackingInfo:** This element has one of the following four status codes; indicating the delivery status of the envelope within the HUB:
  - **PendingDelivery**: implies that the envelope is still held within the HUB and has not been delivered. Also, the queue expiry period is not over; thus, the HUB still has the envelope.
  - **Delivered**: The envelope was successfully delivered by the HUB and has been deleted after delivery
  - **FailedDelivery**: The HUB has not been able to deliver the envelope and the Queue expiry period set by the exporting NPPO was reached. Thus, the envelope was deleted from the HUB queue.
  - **EnvelopeNotExists**: For the given Tracking Number, the HUB does not have any information.
  - **DeliveredWithWarnings:** introduced with March 2018 release will be used to mark envelopes that are acknowledge from the importing country with some schema non-compliancy warnings text that can be read and used from the exporting country to fine tune the generation of the most globally standardized XML

- **HUBErrorMessage:** This element will have messages for different errors that may occur during interaction with the HUB. Most of the error messages are related to Queue retention time expiration. From March 2018 release the importing country can set the warning messages related to the AdvancedAcknowledge (see operations below) indicating elements to be improved in the ePhyto XML they have received.

5.1.2 Envelope Content

The envelope type *inherits* the envelope header and extends it with the “Content” element that can be any type of string/xml.

The electronic phytosanitary certificate will be created by exporting NPPO client application, serialized into XML and sent to the HUB using the Content attribute of the envelope.

The HUB will not perform the validation of the certificate content and its adherence to the ISPM 12 schema. The importing NPPO client application will be responsible for opening the certificate content and ensuring it adheres to the applicable standard. At the receipt of the Envelope the importing NPPO Client Application has to acknowledge the successful receipt of the message, regardless of the certificate validation that will be performed with a separate business process.

The following reference library contains all the documents and guidelines in how to prepare and compile a valid ePhyto document to send via the HUB, including overall business information, the ePhyto schema, global codes and the mapping in the ePhyto schema.

https://www.ippc.int/en/ephyto/ephyto-technical-information/

5.1.3 Array of EnvelopeHeader

This element is used to exchange a number of envelope headers grouped together. The operation 'GetUnderDeliveryEnvelope' uses this as described below.

5.1.4 Array of Envelope

This element contains a list of envelope. Each envelope contains – one header and one ePhyto certificate. This entity is used in the operation 'PULLImportEnvelope' described in details below.

6. Operations

6.1 Connect to the hub

Connecting to the HUB is not an operation exposed by the web service, but the internal call needed before any invoke of the remote web service operations.

In this section we show the generic code needed to open a client connection with the HUB using C# and the .Net Framework 4.6.1 and also Java 1.8 and the Apache Axis 1 framework for generating the client code from the WSDL definition.

The code will create the new client, add the certificate and the URL (depending on the environment) to be used in all the subsequent calls to the web service.

C#

```
    private static DeliveryService getClientConnection()
    {
        // the following code is use to prevent security protocol
exceptions
        // raised by using self-signed certificates (test environment)
        ServicePointManager.SecurityProtocol = SecurityProtocolType.Tls11;
        System.Net.ServicePointManager.ServerCertificateValidationCallback
= delegate (
        Object obj, X509Certificate certificate, X509Chain chain,
        SslPolicyErrors errors)
```

```
        {
            return (true);
        };

        //This is the actual implementation of the generated proxy
        //from the given or downloaded WSDL
        DeliveryService client = new DeliveryService();

        //setting the test environment URL
        client.Url = "https://uat.ippchub.unicc.org/hub/DeliveryService";

        //adding the certificate
        X509Certificate2 cert = new
X509Certificate2("/Users/luca/repos/IPPCHubDev/certificates/nppo-it.p12",
"nppoITp12");
        client.ClientCertificates.Add(cert);

        //returning the client object
        return client;
    }
```

Java

```
  private static final String KEYSTORE_TRUSTED =
"G:\\certificates\\trustedStore";
  private static final String KEYSTORE_TRUSTED_PASSWORD = "changeit";

  private static final String KEYSTORE_SERVER =
"G:\\certificates\\privateStore";
  private static final String KEYSTORE_SERVER_PASSWORD = "changeit";

  private static IDeliveryServiceProxy getClientConnection() {
    // Configure the stores with certificates
    System.setProperty("sun.security.ssl.allowUnsafeRenegotiation",
"true");  // true for self-signed certificates, false in production

    // Trusted certificates, IPPC HUB certificate should be here
    System.setProperty("javax.net.ssl.trustStore", KEYSTORE_TRUSTED);
    System.setProperty("javax.net.ssl.trustStorePassword",
KEYSTORE_TRUSTED_PASSWORD);

    // Private Key store, with NPPO certificate
    System.setProperty("javax.net.ssl.keyStore", KEYSTORE_SERVER);
    System.setProperty("javax.net.ssl.keyStorePassword",
KEYSTORE_SERVER_PASSWORD);

    // Uncomment next line to have handshake debug information
    // System.setProperty("javax.net.debug", "ssl");

    // Getting the proxy to the appropriate URL
    IDeliveryServiceProxy proxy = new IDeliveryServiceProxy("https://uat-
hub.ephytoexchange.org/hub/DeliveryService");

    return proxy;
  }
```

6.2 DeliverEnvelope

The exporting NPPO will use this operation to send the envelope to the HUB. The Header must be filled with the following required minimum attributes:

- From,
- To,
- CertificateType,
- CertificateStatus
- NPPO Certiticate Number (is not mandatory but we suggest to use the field to be able to easily reference each transmission with the original certificate in the exporter system)
- and the 'Content' attribute is populated with the actual certificate; to complete the envelope with the XML serialized version of the generated ePhyto.

The HUB responds back with the EnvelopeHeader – which contains all the attributes populated by the exporting NPPO client application as well as the HUBTrackingNumber and the HUBTrackingInfo attributes are added by the HUB application.

In the case of 'Transit', when the certificate has to be distributed to transit countries too, the client application should send the envelope to all involved countries as separate message and each of the transmission will be tracked separately.

Client sample implementation in C# generated as .Net 2.0 standard web service client:

https://docs.microsoft.com/en-us/dotnet/framework/wcf/feature-details/transport-security-with-certificate-authentication

C#

```
            // initialize the client
             DeliveryService client = getClientConnection();

             // simulating an Issue certificate from Italy to United States
             Envelope env = new Envelope()
             {
                 From = "IT",
                 To = "US",
                 CertificateType = 851,
                 CertificateStatus = 70,
                 NPPOCertificateNumber = "Internal NPPO Certificate Number"

             };

             //load the actual electronic certificate XML
             var ePhyto = new System.Xml.XmlDocument();
             ePhyto.LoadXml("<?xml version=\"1.0\" encoding=\"UTF-
8\"?><ephyto><contents/></ephyto>");

             //set the XML to the content element of the message
             env.Content = ePhyto.InnerXml;

             try
             {
                 // send the message to the hub and get back the header
                 EnvelopeHeader header = client.DeliverEnvelope(env);

                 //handle internal issues
```

```
                if (header.HUBTrackingInfo == "FailedDelivery")
                {
                    //manage the exception and provide errors to the client
                    //in this case the error is due to one of the following
                    //Header Validation error (certificate, destination
country not boarded...)
                    //Internal error of the system

                    //get the error message
                    string error = header.hubDeliveryErrorMessage;
                    System.Console.WriteLine("Message failed delivery,
"+error);
                }
                else
                {
                    //get the hub tracking number...
                    string hubTrackingNumber = header.hubDeliveryNumber;
                    System.Console.Write("header delivered with tracking
number : " + hubTrackingNumber);

                    //persist the header details to record that the message
is under delivery
                }

            }catch(Exception ex){
                //manage the exception and provide errors to the client
                //in this case the error is due to one of the following
                //Header Validation error (certificate, destination country
not boarded...)
                //network
                //unavailability of the remote system
                Console.WriteLine("Failed to deiver the message to the HUB"
+ ex.Message);
            }
```

Java

```
  private static EnvelopeHeader DeliverEnvelope() throws HubClientException
{
    IDeliveryServiceProxy proxy = getClientConnection();

    DocumentBuilderFactory dbFactory =
DocumentBuilderFactory.newInstance();

    // Envelope creation, from Italy to United States
    Envelope envelope = new Envelope();
    envelope.setFrom("IT");
    envelope.setTo("US");
    envelope.setCertificateType(851);
    envelope.setCertificateStatus(70);
    envelope.setNPPOCertificateNumber("EPHYTO-IT-2017-0010277");

    try {
      DocumentBuilder dBuilder = dbFactory.newDocumentBuilder();
      Document doc = dBuilder.parse("<?xml version=\"1.0\" encoding=\"UTF-
8\"?><ephyto><contents/></ephyto>");
```

```
      DOMSource domSource = new DOMSource(doc);
      StringWriter writer = new StringWriter();
      StreamResult result = new StreamResult(writer);
      TransformerFactory tf = TransformerFactory.newInstance();
      Transformer transformer = tf.newTransformer();
      transformer.transform(domSource, result);
      envelope.setContent(writer.toString());
    } catch (SAXException | IOException | ParserConfigurationException |
TransformerException e1) {
      //manage the exception and provide errors to the client
      //in this case the error is due to one of the following
      //The XML string could not be parsed
      System.out.println("Failed to load certificateinto XML document.");
      throw new HubClientException(e1); // Without certificate we cannot
continue
    }

    try {
      // send the message to the hub and get back the header
      EnvelopeHeader header = proxy.deliverEnvelope(envelope);

      // Handle internal issues
      if (header.getHUBTrackingInfo().equals("FailedDelivery")) {
        //manage the exception and provide errors to the client
        //in this case the error is due to one of the following
        //Header validation error
        String error = header.getHubDeliveryErrorMessage();
        System.out.println(String.format("Message failed delivery. %s",
error));
      } else {
        //get the hub tracking number...
        String hubTrackingNumber = header.getHubDeliveryNumber();
        System.out.println(String.format("Header delivered with tracking
number: %s", hubTrackingNumber));
      }
      return header;
    } catch (RemoteException e) {
      //manage the exception and provide errors to the client
      //in this case the error is due to one of the following
      // network
      // unavailability of the remote system
      System.out.println(String.format("Failed to deliver the message to
the HUB. ", e.getMessage()));
      throw new HubClientException(e);
    }
  }
```

If any error occurs, the HUBTrackingInfo is set to “FailedDelivery” and the details will be found in the hubDeliveryErrorMessage element of the Envelope Header returned. Possible errors detected include:

- The NPPO sending the envelope is not from the country in the “From” field
- There is no NPPO in the system for the country in the “To” field
- Invalid certificate type
- Invalid certificate status

Connectivity issues such as network outages or unavailability of the system will be reported as standard HTTP protocol errors, as they are not generated by the remote application.

6.3 PULLImportEnvelope, AcknowledgeEnvelopeReceipt, AdvancedAcknowledgeEnvelopeReceipt

The importing NPPO configured for PULL operation will use this operation to retrieve all the envelopes that are destined for them. The authenticated client is representing the importing country and it will receive all of the envelopes (*array of envelope*) that are in the HUB's queue with the importing country in the To field. For each of these envelopes, the importing country should message back on the operation AckknowledgeEnvelopeReceipt the successful receipt of each envelope; with the HUBTrackingNumber. Acknowledged messages will be removed from the queue and the next pull operation will fetch the remaining messages until the result is empty.

The NPPO configuration will allow for reducing the batch of the messages of each pull in order to fine tune the communication with office using a poor connection.

From March 2018 release the system support to communicate a text message related to the acknowledge operation that will set the tracking info to DeliveredWithWarnings and provide in the error message the details of the issues found during the receiving and opening of the XML. See sample below, such messages can be extracted from a schema validation action and reported back to the exported to leverage the XML harmonization.

Client sample implementation:

C#

```
    // initialize the client
    DeliveryService client = getClientConnection();

    //get all the envelopes pending delivery
    Envelope[] envelopesToImport = client.PULLImportEnvelope();

    foreach(Envelope env in envelopesToImport)
    {
        System.Console.WriteLine("Processing hub delivery number : "
+env.hubDeliveryNumber);

        try
        {
            //get the content containing the certificate XML
            String xmlContent = env.Content;

            //verifications in xml
            var ePhyto = new System.Xml.XmlDocument();
            ePhyto.LoadXml(xmlContent);

            //save the ePhyto to the client application
            //acknowledge the receipt back to the server (this could be
done as separate action based on user validation ??)
            client.AcknowledgeEnvelopeReceipt(env.hubDeliveryNumber);

            //perform schema/xml checks
```

```
            client.AdvancedAcknowledgeEnvelopeReceipt(env.hubDeliveryNumber,
"please indicate the date elements without milliseconds");
        }
        catch(Exception ex)
        {
            //handle the content parsing error
            System.Console.WriteLine(String.Format("error when parsing
content of {0} {1}", env.hubDeliveryNumber,ex.Message));
        }
    }
```

Java

```
  private static void pullAcknowledge() throws HubClientException {
    IDeliveryServiceProxy proxy = getClientConnection();

    try {
      // get all the envelopes pending delivery
      Envelope[] envelopesToImport = proxy.PULLImportEnvelope();

      for (Envelope envelope : envelopesToImport) {
        System.out.println(String.format("Processing hub delivery number:
%s", envelope.getHubDeliveryNumber()));

        // get the content containing the certificate XML
        String xmlContent = envelope.getContent();

        // verifications in XML
        DocumentBuilderFactory dbFactory =
DocumentBuilderFactory.newInstance();
        DocumentBuilder dBuilder;
        try {
          dBuilder = dbFactory.newDocumentBuilder();
          InputStream content = new
ByteArrayInputStream(envelope.getContent().getBytes(StandardCharsets.UTF_8.
name()));
          Document doc = dBuilder.parse(content);
        } catch (ParserConfigurationException | SAXException | IOException
e) {
          // The content of the envelope is not a proper XML file
          System.out.println(String.format("Error parsing content of %1$s
%2$s", envelope.getHubDeliveryNumber(), e.getMessage()));

          // This envelope won't be acknowledged

proxy.advancedAcknowledgeEnvelopeReceipt(envelope.getHubDeliveryNumber(),
"error while parsing the XML");
          continue;
        }

        //acknowledge the receipt back to the server (this could be done as
a separate action based on user validation)
        proxy.acknowledgeEnvelopeReceipt(envelope.getHubDeliveryNumber());
      }
    } catch (RemoteException e) {
      //manage the exception and provide errors to the client
      //in this case the error is due to one of the following
      // network
```

```
        // unavailability of the remote system
        System.out.println(String.format("Failed to deliver the message to
the HUB. ", e.getMessage()));
        throw new HubClientException(e);
      }
    }
```

If an error occurs in the processing of PullImportEnvelope, AckowledgeEnvelopeReceipt or AdvancedAckowledgeEnvelopeReceipt, a standard SOAP Fault element will be sent describing the error. Errors detected in these services include:

- The NPPO making the request is not in the system
- The acknowledge of receipt requester NPPO isn't from the country in the "To" field of the acknowledged header
- Envelope not found, as above related to acknowledge request. When the sent number is not found in the HUB.

6.4 GetUnderDeliveryEnvelope

The operation allows the exporting NPPO to get a list of all the envelope headers that are in the delivery process (i.e. with HUBDeliveryStatus as PendingDelivery). The authenticated client represents the exporting country. The HUB will return the list of all the envelopes that are pending delivery (array of EnvelopeHeader).

The client application can use the HUBTrackingNumber from the returned envelope headers and updates the system.

Client sample implementation.

C#

```
        DeliveryService client = getClientConnection();
        try
        {
              //get the envelopes under delivery (received by the HUB and
queued to be delivered to the destination)
              EnvelopeHeader[] headers = client.GetUnderDeliveryEnvelope();

              //cicles the records to update the client system
              foreach (var head in headers)
              {
                  //updates the client records
System.Console.WriteLine("Env:"+head.hubDeliveryNumber+",Tracking
Info:"+head.HUBTrackingInfo);
              }
        }
        catch (Exception ex)
        {
              System.Console.WriteLine(ex.Message);
        }
```

Java

```
  private static void getUnderDeliveryEnvelope() throws HubClientException
{
    IDeliveryServiceProxy proxy = getClientConnection();

    try {

      // get the envelopes under delivery
      EnvelopeHeader[] headers = proxy.getUnderDeliveryEnvelope();

      //clicles the records to update the client system
      for(EnvelopeHeader header : headers) {
        // updates client records
        System.out.println(String.format("Envelope: %1$s - Tracking info:
%2$s", header.getHubDeliveryNumber(), header.getHUBTrackingInfo()));
      }
    } catch (RemoteException e) {
      //manage the exception and provide errors to the client
      //in this case the error is due to one of the following
      // network
      // unavailability of the remote system
      System.out.println(String.format("Failed to deliver the message to
the HUB. ", e.getMessage()));
      throw new HubClientException(e);
    }
  }
```

If an error occurs in the processing of GetUnderDeliveryEnvelope a standard SOAP Fault element will be sent describing the error. Errors detected in this service include:

- The NPPO making the request is not in the system

6.5 GetImportEnvelopeHeaders & PULLSingleImportEnvelope

Similarly to the previous this operation allows the importing NPPO to get a list of all the envelope headers that are in the delivery process. The authenticated client represents the importing country. The HUB will return the list of all the envelopes that are pending delivery (array of EnvelopeHeader).

The client application can use the HUBTrackingNumber from the returned envelope headers and pull each of them one by one. This will allow the importing country to work on the entire subset of messages to be delivered, rather than having to pull them in batches

Client sample implementation.

C#

```
      DeliveryService client = getClientConnection();
      try
      {
            //get the envelopes under delivery (received by the HUB and
queued to be delivered to the destination)
            EnvelopeHeader[] headers = client.GetImportEnvelopeHeaders();

            //cicles the records to update the client system
            foreach (var head in headers)
            {
```

```
                Envelope env =
client.PULLSingleImportEnvelope(head.hubDeliveryNumber);
                //get the content containing the certificate XML
                String xmlContent = env.Content;

                //verifications in xml
                var ePhyto = new System.Xml.XmlDocument();
                ePhyto.LoadXml(xmlContent);


                //save the ePhyto to the client application
                //acknowledge the receipt back to the server (this could be
done as separate action based on user validation ??)
                client.AcknowledgeEnvelopeReceipt(env.hubDeliveryNumber);


               //perform schema/xml checks

client.AdvancedAcknowledgeEnvelopeReceipt(env.hubDeliveryNumber, "please
indicate the date elements without milliseconds");



            }
      }
      catch (Exception ex)
      {
            System.Console.WriteLine(ex.Message);
      }
```

Java

```
  private static void getImportEnvelopeHeaders() throws HubClientException
{
    IDeliveryServiceProxy proxy = getClientConnection();

    try {

      // get the envelopes under delivery
      EnvelopeHeader[] headers = proxy.getUnderDeliveryEnvelope();

      //clicles the records to update the client system
      for(EnvelopeHeader header : headers) {

         // get the envelope
         Envelope env = proxy.PULLSingleImportEnvelope(header.
getHubDeliveryNumber());

        // get the content containing the certificate XML
        String xmlContent = env.getContent();

        // verifications in XML
        DocumentBuilderFactory dbFactory =
DocumentBuilderFactory.newInstance();
        DocumentBuilder dBuilder;
        try {
          dBuilder = dbFactory.newDocumentBuilder();
```

```
            InputStream content = new
ByteArrayInputStream(env.getContent().getBytes(StandardCharsets.UTF_8.name(
)));
            Document doc = dBuilder.parse(content);
          } catch (ParserConfigurationException | SAXException | IOException
e) {
            // The content of the envelope is not a proper XML file
            System.out.println(String.format("Error parsing content of %1$s
%2$s", env.getHubDeliveryNumber(), e.getMessage()));

            // This envelope won't be acknowledged

proxy.advancedAcknowledgeEnvelopeReceipt(env.getHubDeliveryNumber(), "error
while parsing the XML");
            continue;
          }

          //acknowledge the receipt back to the server (this could be done as
a separate action based on user validation)
          proxy.acknowledgeEnvelopeReceipt(env.getHubDeliveryNumber());
        }
      } catch (RemoteException e) {
        //manage the exception and provide errors to the client
        //in this case the error is due to one of the following
        // network
        // unavailability of the remote system
        System.out.println(String.format("Failed to pull envelopes from the
HUB. ", e.getMessage()));
        throw new HubClientException(e);
      }
    }
```

If an error occurs in the processing of GetImportEnvelopeHeader, AcknowledgeEnvelopeReceipt and AdvanvcedAcknowledgeEnvelopeReceipt a standard SOAP Fault element will be sent describing the error. Errors detected in this service include:

- The NPPO making the request is not in the system

6.6 GetEnvelopeTrackingInfo

This operation provides the HUBTrackingInfo for a given HUBTrackingNumber;none envelope at a time. The idea is that if the client application has sent the envelope and the envelope header is not listed in the pending delivery, then the system should query the hub to understand if it was delivered successfully and/or at which stage it is. Reference of the tracking info is done above and commented in the code example below.

C#

```
      DeliveryService client = getClientConnection();
            try
            {
                  EnvelopeHeader head= client.GetEnvelopeTrackingInfo(num);

               System.Console.WriteLine(string.Format("The envelope {0}
```

```
tracking info is {1}",head.hubDeliveryNumber,head.HUBTrackingInfo ));

                switch(head.HUBTrackingInfo){
                    case "Delivered":
                        //perform client updates to mark the envelope
delivered
                        break;
                    case "DeliveredWithWarnings":
                        //perform client updates to mark the envelope
delivered, capture the text and send the information to technical people
                        break;
                    case "FailedDelivery":
                        string error = head.hubDeliveryErrorMessage;
                        //update the client state with the informational
error message
                        break;
                    case "EnvelopeNotExists":
                        //the message was received by the hub but not yet
added to the queue or the number is not correct
                        //resending of the original can be applied
                        break;
                    case "PendingDelivery":
                        //still in the queue on the hub, waiting to be
pulled or pushed
                        break;
                }
            }
            catch (Exception ex)
            {
                  System.Console.WriteLine(ex.Message);
            }
```

Java

```
  private static void getEnvelopeTrackingInfo(String hubTrackingNumber)
throws HubClientException {
    IDeliveryServiceProxy proxy = getClientConnection();

    try {
      EnvelopeHeader header =
proxy.getEnvelopeTrackingInfo(hubTrackingNumber);
      System.out.println(String.format("The envelope %1$s tracking info is
%2$s", header.getHubDeliveryNumber(), header.getHUBTrackingInfo()));

      switch (header.getHUBTrackingInfo()) {
        case "Delivered":
          // perform client updates to mark the envelope as delivered
          break;
        case "DeliveredWithWarnings":
          // perform client updates to mark the envelope as delivered,
capture the error message and send it to the technical people
          break;
        case "FailedDelivery":
          String errorMessage = header.getHubDeliveryErrorMessage();
          // update the client state with the informational error message
          break;
```

```
        case "EnvelopeNotExists":
          //the message was received by the hub but not yet added to the
queue or the number is not correct
          //resending of the original can be applied
          break;
        case "PendingDelivery":
          //still in the queue on the hub, waiting to be pulled or pushed
          break;
      }
    } catch (RemoteException e) {
      //manage the exception and provide errors to the client
      //in this case the error is due to one of the following
      // network
      // unavailability of the remote system
      System.out.println(String.format("Failed to deliver the message to
the HUB. ", e.getMessage()));
      throw new HubClientException(e);
    }
  }
```

If an error occurs, the error will be returned as SOAP exception. Possible errors detected include:

- The NPPO making the request is not in the system
- Requester NPPO isn't from the country in the "From" field

6.7 GetActiveNppos

This operation is a simple query action that return all the active NPPO of the HUB, with only the Country code, the Send and Receive flags. Such flags may be used by a client application to automate the sending or receiving from the relevant country depending on their status on the HUB.

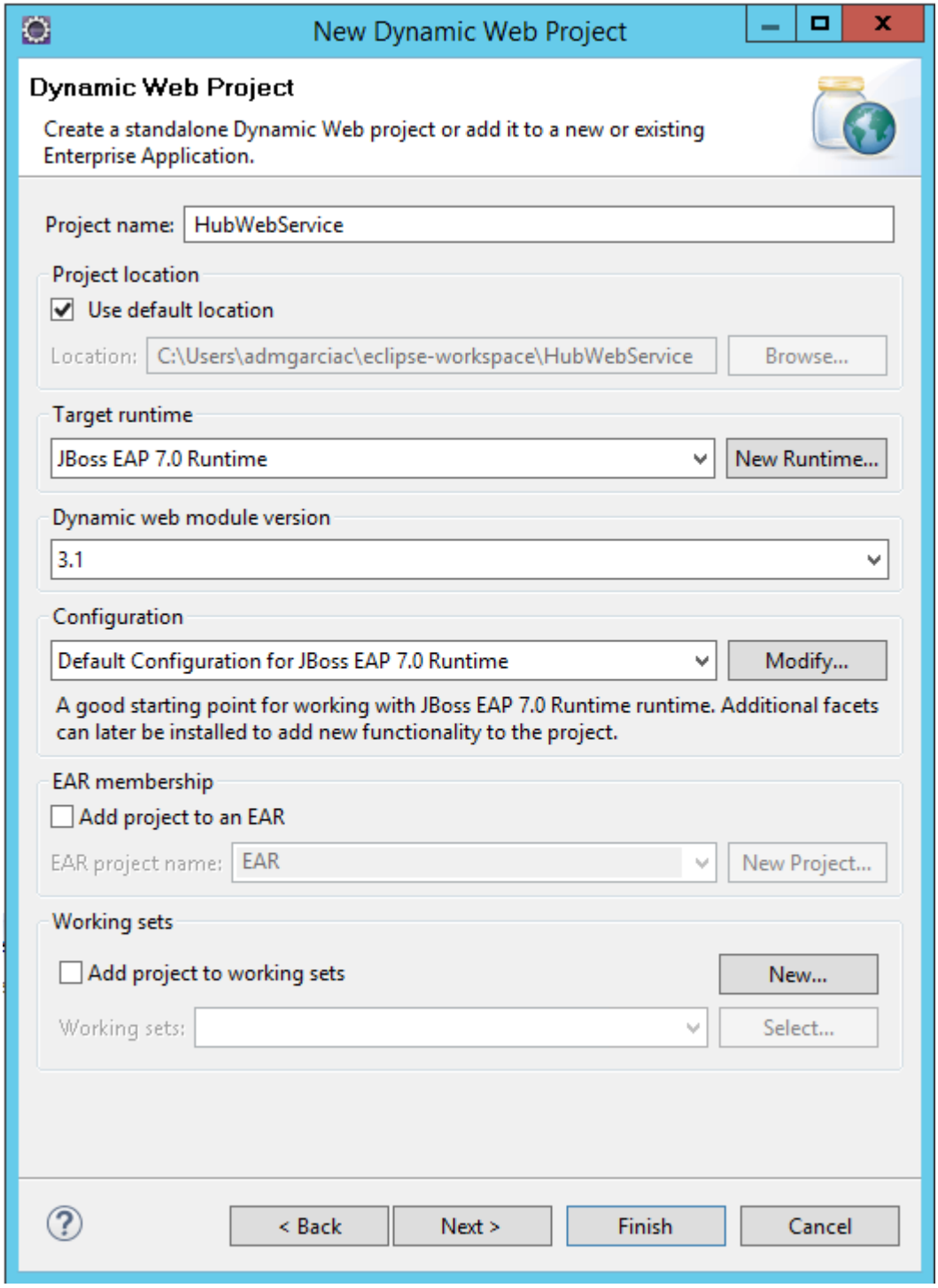
6.8 Receiving a PUSH delivery

In order to receive a PUSH delivery the importer NPPO must have an endpoint ready for the HUB to connect.

The NPPO can use the HUB WSDL file in order to generate the needed sources.

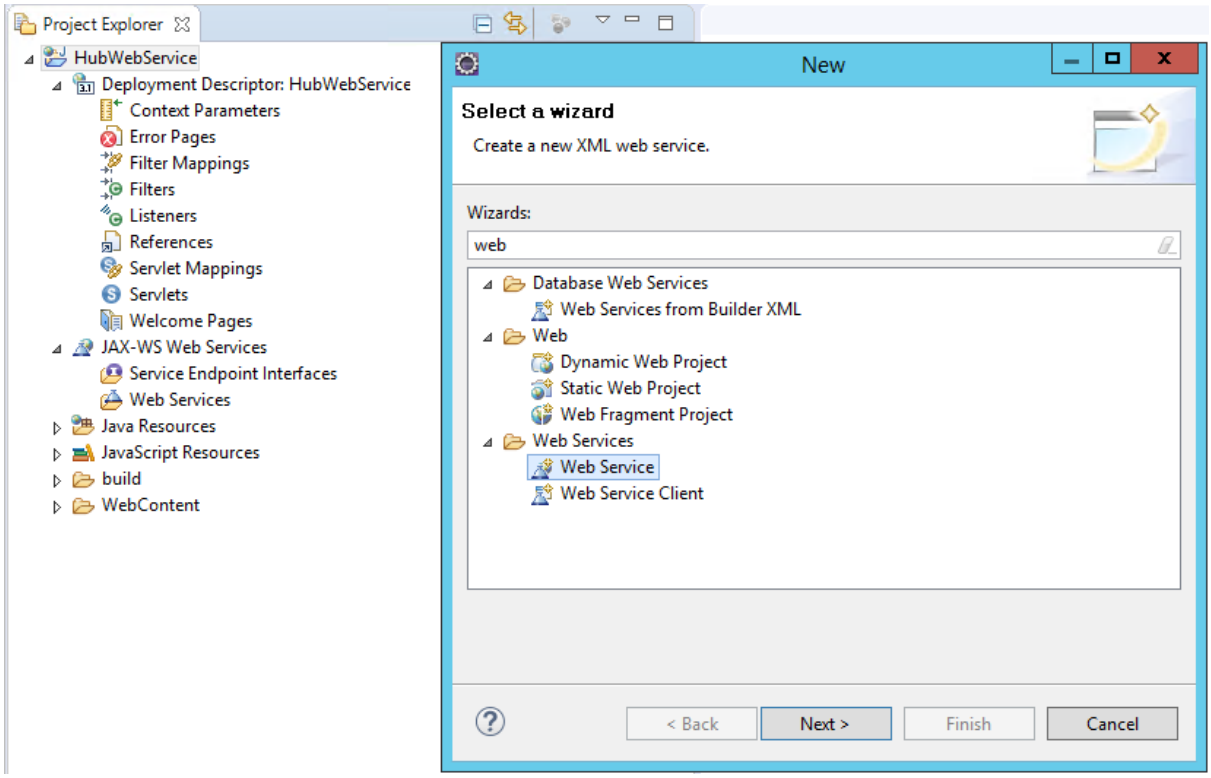
Here below a sample on how to create a basic endpoint using Eclipse and Apache Axis.

First, create a new Dynamic Web project in Eclipse (here we use JBoss as target runtime, please use the runtime that best suit your needs)

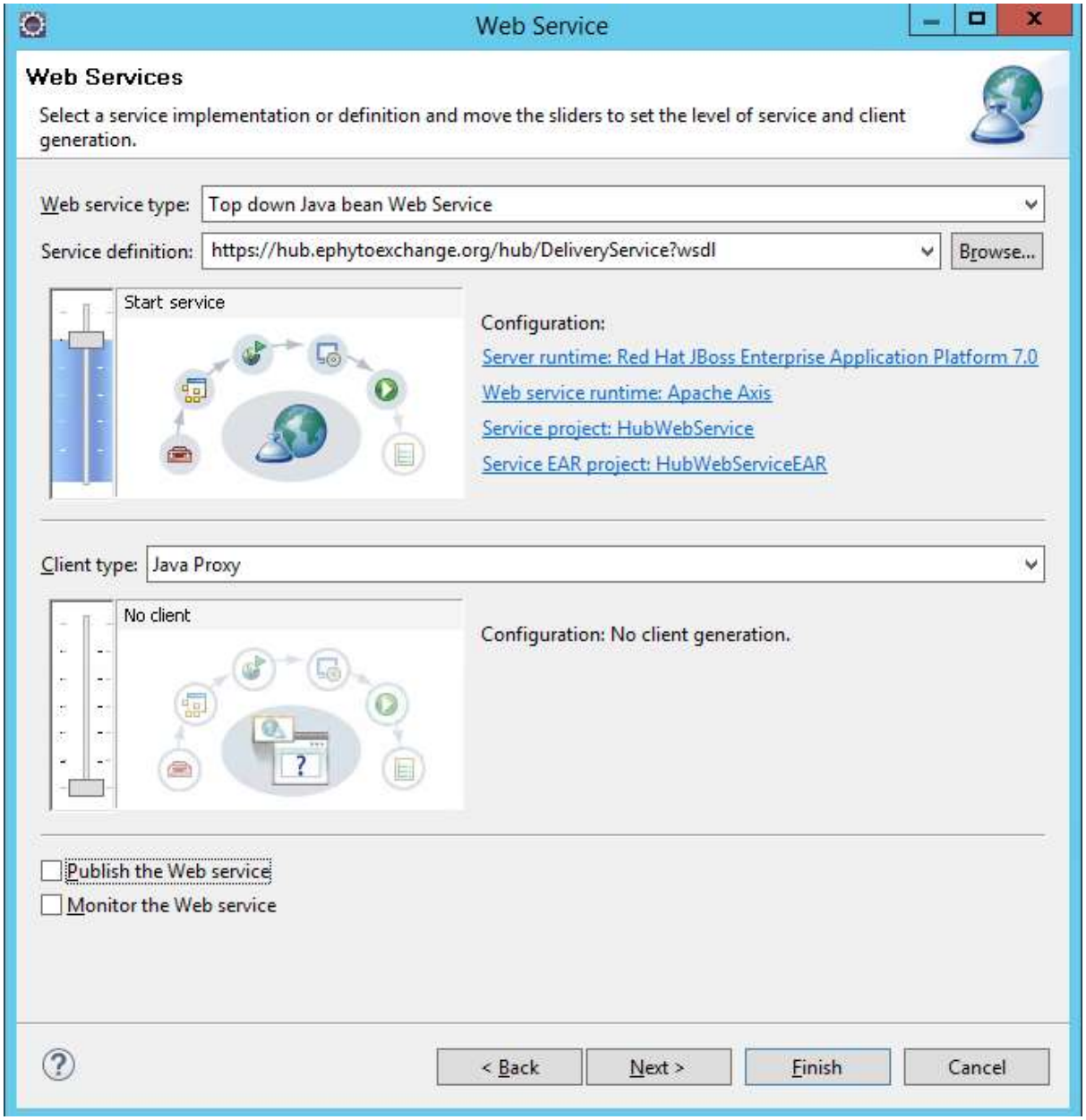


You can click “Finish” in this dialog.

Once the project is there (skip the project creation if you want to implement the service into an existing project), you will need to create the classes implementing the web service interface. For this, we will add a new Web Service to the project by right clicking the project name and then “new” and “Other…”



Select “Web Service” and click “Next”



As we already have the WSDL file, select "Top down Java bean Web Service"

After that enter the Hub WSDL URL address in the service definition:

https://hub.ephytoexchange.org/hub/DeliveryService?wsdl

We will use "Apache Axis" and JBoss as our server for the deployment. If you have a different Application Server, just select it by clicking in the "Server runtime" link. Make sure that the Application Server is running and click "Finish".

When the process finishes, Eclipse will open the file: DeliveryServiceSoapBindingImpl.java this is where the code has to be completed. In this case, we only need to implement the "deliverEnvelope" method, which is the one that will be called by the PUSH service in the HUB.

Java

```
    public _int.ippc.ephyto.HUB_Entities.EnvelopeHeader
deliverEnvelope(_int.ippc.ephyto.HUB_Entities.Envelope env) throws
java.rmi.RemoteException, _int.ippc.ephyto.HubWebException {
        saveEnvelope(env);
        return env;
    }

    private void saveEnvelope(_int.ippc.ephyto.HUB_Entities.Envelope env) {
      // do checks and store the envelope in the suitable place

      // acknowledge the reception
      HubClient.acknowledge(env);
    }
```

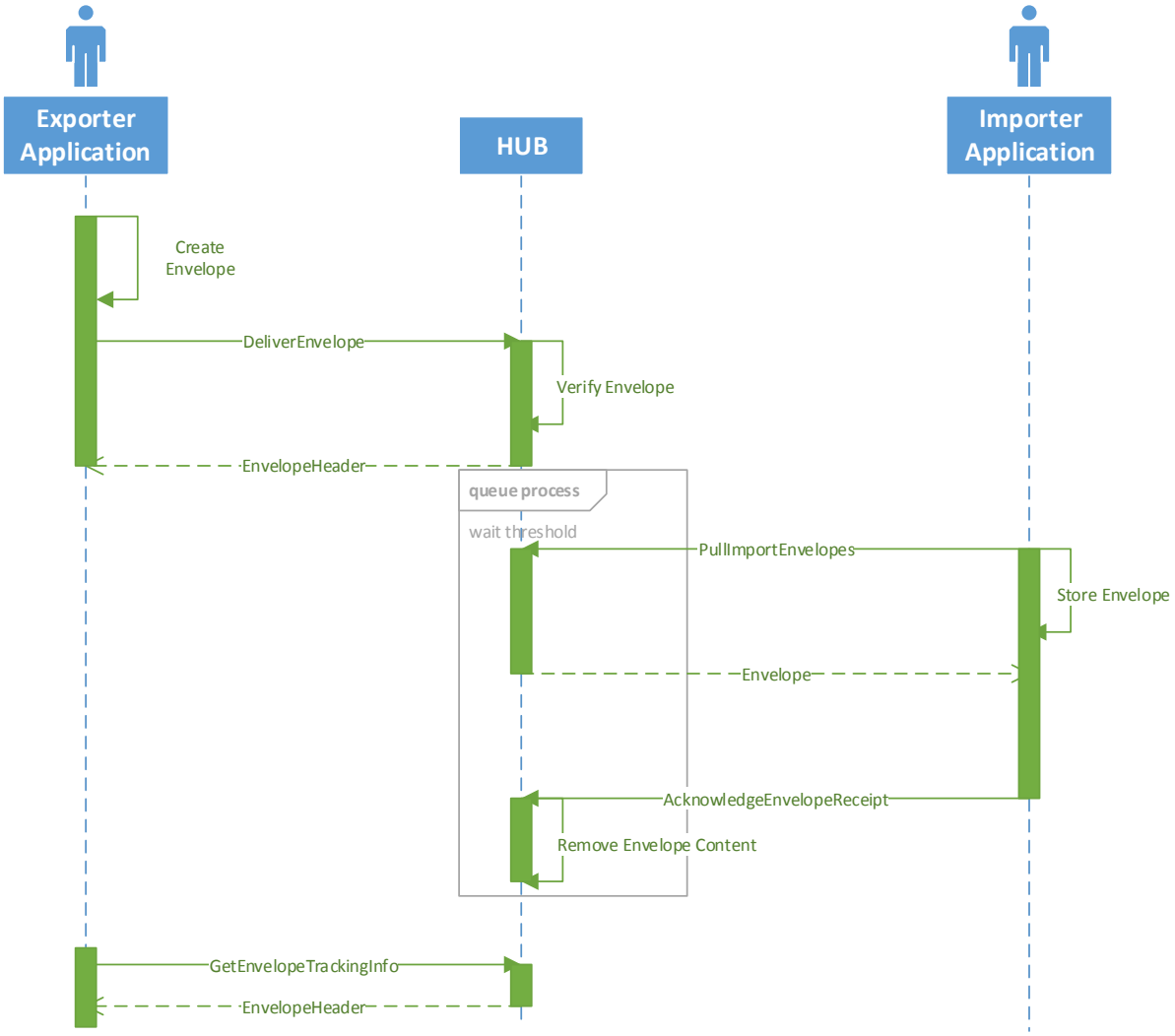
Save the envelope and then acknowledge the reception of the envelope to the HUB so it can be marked as delivered.

Note that the HubClient is referring to the object implementing the connection to the HUB web services.

In the example above we do not provide guidelines on how to setup the client certificate authentication as it may vary considerably depending on the underlying platform and infrastructure. To implement the push endpoint the NPPO application should accept the HUB public certificate for the client authentication.

7. Sequence Diagram

Following a sequence diagram defining the optimal envelope delivery process interaction between the NPPO client applications and the HUB.



8. Testing with Soap UI

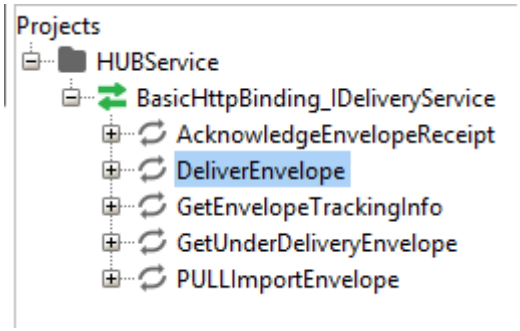
Note: Each time that SOAP UI is started, steps 9 to 15 have to be done again.

Please follow the next steps in order to test with SOAPUI:

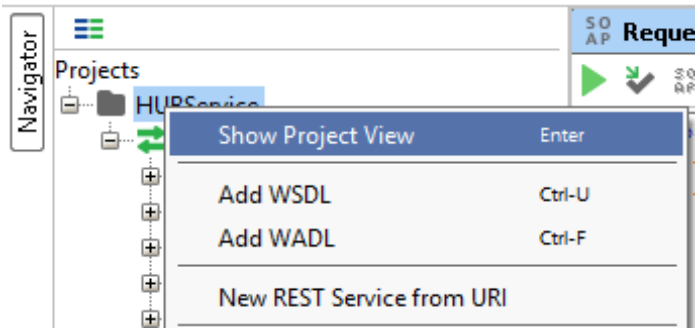
1. Download and installs SOAP UI. We are using version 5.3
2. Go to the Installation folder bin directory and open the file SOAPUI-5.3.0.vmoptions. On windows machines, the file is located in "C:\Program Files\SmartBear\SoapUI-5.3.0\bin", on Mac is under the /Applications/SoapUI-5.3.0.app/Contents/vmoptions.txt. You have to edit this file with Administrator rights.
3. Include this line at the end of the file (the hub web service accepts only TLSv1.1 and TLSv1.2):

-Dsoapui.https.protocols=TLSv1.1,TLSv1.2

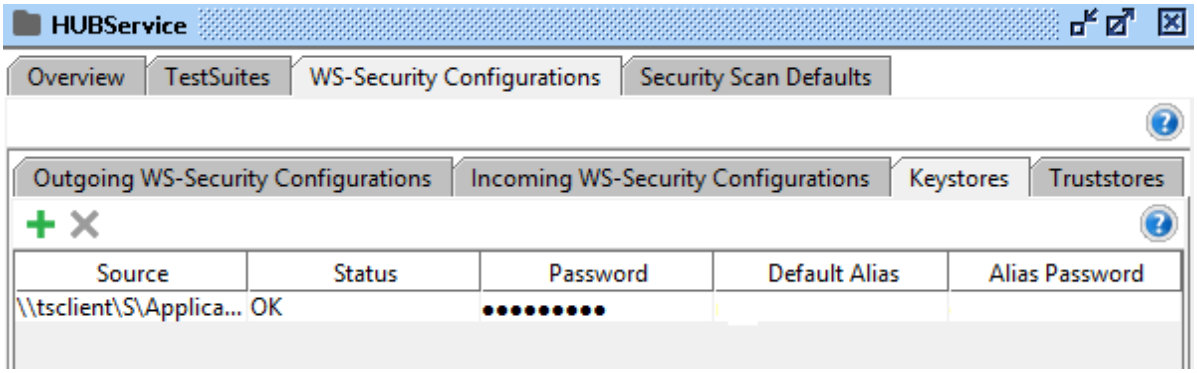
4. Save the file and open or reopen SOAP UI.
5. Go to File New SOAP Project.
6. In “Project Name” field, choose a descriptive project name.
7. In “Initial WSDL” field, choose the provided URL for the endpoint (this URL should finish in “?wsdl”), or choose the wsdl file, if you received the file or you saved the wsdl file in your computer.
8. After clicking OK, SOAP UI will generate some templates with the operation requests. Here you can see an example of this generated template requests:



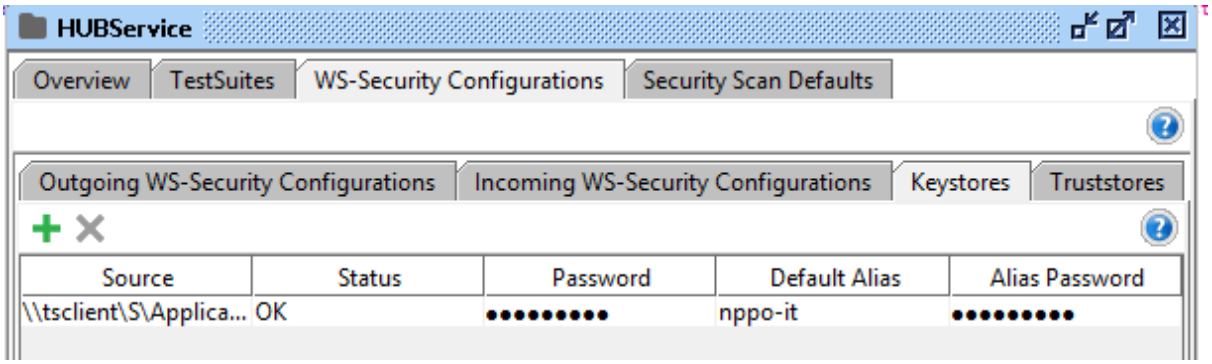
9. Right click in the project name, in our case “HUBService”. And choose the option “Show Project View”.



10. In the new dialog go to “WS-Security Configurations” tab and inside this tab, go to the “Keystores” tab.
11. Click on the green plus symbol button in order to add your client certificate. This green plus symbol button is at the top left hand side corner of the window.
12. In the bowser window, choose your certificate keystore with P12 extension and format.
13. Write the keystore password in the prompt windows.
14. A new keystore rows appears in the window with Status OK.

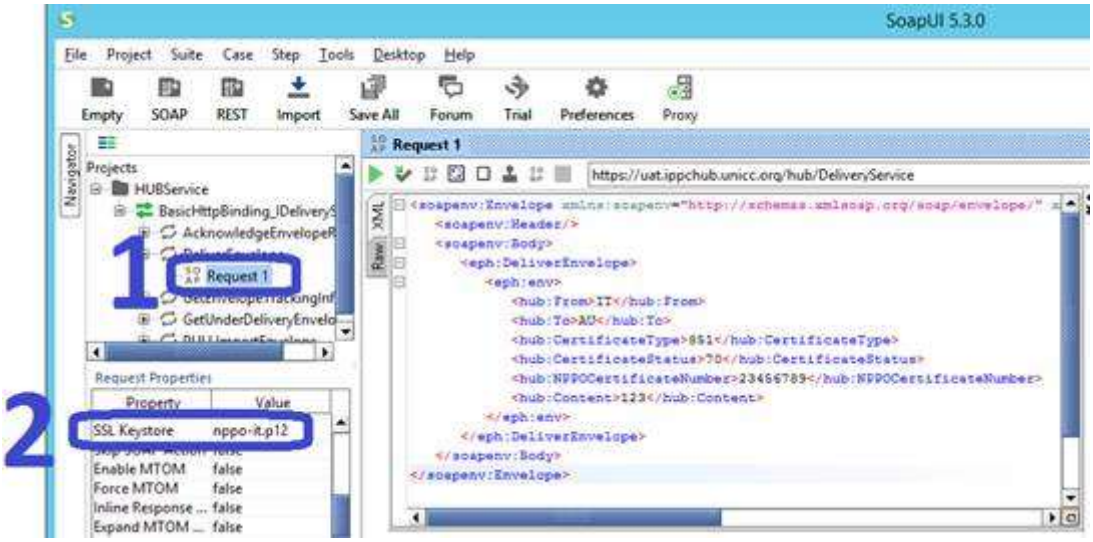


15. Add you certificate alias and password, in our case the certificate alias is “nppo-it”

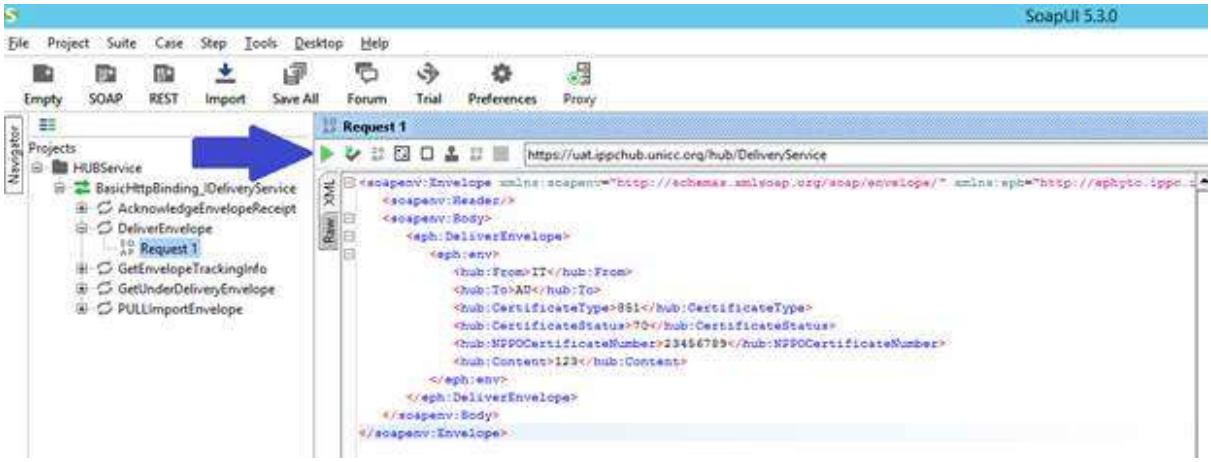


16. Close this windows and click in DeliveryEnvelope request (the following procedure is valid for every request). A Request template appears:

17. Include your certificate in the request, in the filed SSL Keystore (do the same for the rest of the requests that you want to test):



18. Fill the template with valid data like in the example, and click in RUN (remember “hub:From” in the code of your country and should be the same as your certificate country code):



19. You receive the response:

20. If you save the project and close SOAP UI, you need to repeat steps 9 to 15 when you open SOAP UI again.