

<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

WSDL - Web Services Description Language

2018

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WSDL - Introduzione

<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

- In **object-oriented** nozione di interfaccia:
Descrizione concreta ed immutabile di come un oggetto appare ad applicazioni esterne che intendano utilizzarne i servizi
- Nell'architettura di **Web services**, la definizione e descrizione di interfaccia prende la forma di un vocabolario XML progettato per descrivere esattamente come i richiedenti possono aver accesso a servizi Web
- Questo vocabolario è chiamato WSDL

WSDL - Cos' è?

```
<?XML?><SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- WSDL Web Services Description Language
- È una specifica W3C (<http://www.w3.org/tr/wsdl20>) per descrivere servizi di rete in XML
- Un documento XML che descrive un servizio fornito da un nodo terminale (end-point):
 - Un servizio è un insieme di operazioni
 - Un end-point è la destinazione dei messaggi
- Descrive principalmente le RPCs

WSDL - Stato

<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

- È uno standard W3C
- <http://www.w3.org/TR/wsdl20/>
Previous V1.2
Mar. 03
- Web Services Description Language (WSDL)
Version 2.0 Part 1: Core Language, W3C
Recommendation 26 June 2007
- Inizialmente creato da Ariba, IBM e Microsoft

WSDL – Un Documento wsdl

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- È un doc. XML che descrive un ws in due parti:
 - una **astratta** e
 - una **concreta**
- Scopo:
 - Riusabilità di descrizione
 - Separare aspetti di progettazione indipendenti

WSDL – Abstract level

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- **Abstract level** descrive un ws in termini di:
 - **Messaggi** inviati e ricevuti, descritti indip. da formato specifico usando un sistema di tipi di dati, e.g. XML Schema
 - **Operazioni** che associano un pattern con uno o più messaggi
 - Un'**interfaccia** che raggruppa operazioni senza vincoli sul trasporto

WSDL – Concrete level

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- **Concrete level** descrive un ws in termini di:
 - Un “**binding**” che specifica dettagli sul trasporto e sul formato per una o più interfacce
 - Un “**endpoint**” che associa un indirizzo di rete a un binding
 - Un “**service**” raggruppa endpoints che implementano la stessa interfaccia

Struttura di un Documento wsdl

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- È un doc. XML che descrive in due parti un ws: una astratta e una concreta.

v.1.1

```
<definitions ... >
  <types ... >
  <message ... >
  <portType ... >
  <binding ... >
  <service ... >
    <port ... >
  </service ... >
</definitions>
```

v.2.0

```
<description
  targetNamespace="xs:anyURI" >
  <documentation />?
  [ <import /> | <include /> ]*
  <types />?
  [ <interface /> | <binding /> | <service /> ]*
</description>
```

xmlns:wsdl="http://www.w3.org/ns/wsdl"

Nota per migration 1.1 a 2.0

- PortType rinominato <interface>
- Port rinominato <endpoint>

WSDL - L' elemento root <definitions>, <description>

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- L' elemento radice di un documento WSDL è
 - In 1.1 <definitions>
 - In 2.0 <description>
- Esempio

```
<definitions name =“AddrBook”  
            targetNamespace = “http://tempuri.org/wsdl/”  
            ...>  
...  
</definitions>
```

```
<description name =“AddrBook”  
            targetNamespace = “http://tempuri.org/wsdl/”  
            ...>  
...  
</description>
```

WSDL 1.1 – Struttura di un Documento WSDL (1.1)

<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

In un documento WSDL ci sono diverse sezioni sottoelementi di <definitions>:

- <types>
descrizione dei tipi complessi
- <message>
descrizione dei messaggi
- <portType>
descrizione delle operazioni
- <binding>
informazioni sul protocollo di trasporto e l' encoding
- <service>
informazioni sull' end-point

WSDL1.1 - I Tipi: <types>

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- I tipi vengono descritti mediante uno Schema XML
- E.g.

```
<types>
  <schema targetNamespace="http://tempuri.org/type"
    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    elementFormDefault="qualified">
    <complexType name="Addr">
      <sequence>
        <element name="name" type="string"/>
        <element name="street" type="string"/>
        <element name="city" type="string"/>
        <element name="phone-number" type="string"/>
      </sequence>
    </complexType>
  </schema>
</types>
```

WSDL 1.1 – I messaggi: <message>

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Un <message> definisce il formato dei dati di ogni singola trasmissione di una comunicazione
- Un messaggio si compone di parti:
Il sottoelemento <part>
- Esempi

```
<message name="AddrBook.GetAddr">  
  <part name="Name" type="xsd:string"/>  
</message>
```

```
<message name="AddrBook.GetAddrResponse">  
  <part name="Result" type="typens:Addr"/>  
</message>
```

WSDL 1.1 – Uso delle parti del messaggio: <part>

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Le parti di un messaggio vengono suddivise secondo una visione logica dei dati
- Nella trasmissione di una chiamata di procedura (RPC) il messaggio viene diviso nelle seguenti parti:
 - nome della procedura e metadati
 - Parametri della procedura

WSDL 1.1 – Le Operazioni: <portType>

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- L' elemento <portType> raggruppa più operazioni logiche (<operation>) con i relativi messaggi di I/O (<input>, <output>)
- Descrive un' operazione associando quali messaggi sono usati per svolgere completamente l' operazione
- Esempio

```
<portType name="AddrBookSoapPortType">
  <operation name="GetAddr" parameterOrder="Name">
    <input message="wsdlIns:AddrBook.GetAddr" />
    <output message="wsdlIns:AddrBook.GetAddrResponse" />
  </operation>
</portType>
```

WSDL 1.1 – Il Binding: <binding>

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Descrive i dettagli sul trasporto e l' encoding di ogni port
- Connette l' operazione descritta astrattamente nel port type ad una descrizione concreta di come viene trasmesso in SOAP
- Esempio

```
<binding name="AddrBookSoapBinding" type="wsdlNs:AddrBookSoapPortType" >
  <soap:binding style="rpc" transport="http://schemas.xmlsoap.org/soap/http" />
  <operation name="GetAddr" >
    <soap:operation soapAction="http://tempuri.org/action/AddrBook.GetAddr" />
    <input>
      <soap:body use="encoded" namespace="http://tempuri.org/message/"
                 encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
    </input>
    <output>
      <soap:body use="encoded" namespace="http://tempuri.org/message/"
                 encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
    </output>
  </operation>
</binding>
```

WSDL 1.1 – Il punto terminale: `<service>`

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- L' elemento `<service>` definisce l' indirizzo fisico di un punto di comunicazione terminale
- Fornisce informazione sui punti terminali (end-points)
- Relaziona il port type ed il binding definiti precedentemente con il servizio
- Fornisce l' URI dello specifico provider del servizio
- Esempio

```
<service name="AddrBook" >
  <port name="AddrBookSoapPort" binding="wsdlNs:AddrBookSoapBinding" >
    <soap:address location="http://SoapServer/AddrBook.asp" />
  </port>
</service>
```

Esempio di documento WSDL 1.1 (1/3)

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Il servizio Stockquote ([Example 1, WSDL](#))
- Questo servizio di quotazione di borsa rende disponibile mediante il protocollo SOAP 1.1 su HTTP una singola operazione chiamata “GetLastTradePrice”
- La richiesta prende un simbolo ticker di tipo string e ritorna il prezzo come float

```
<?xml version="1.0"?>
<definitions name="StockQuote"

targetNamespace="http://example.com/stockquote.wsdl"
    xmlns:tns="http://example.com/stockquote.wsdl"
    xmlns:xsd1="http://example.com/stockquote.xsd"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns="http://schemas.xmlsoap.org/wsdl/">

    ...

```

Esempio di documento WSDL 1.1 (2/3)

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

```
<types>
  <schema targetNamespace="http://example.com/stockquote.xsd" xmlns="http://www.w3.org/2000/10/XMLSchema">
    <element name="TradePriceRequest">
      <complexType>
        <all>
          <element name="tickerSymbol" type="string"/>
        </all>
      </complexType>
    </element>
    <element name="TradePrice">
      <complexType>
        <all>
          <element name="price" type="float"/>
        </all>
      </complexType>
    </element>
  </schema>
</types>
<message name="GetLastTradePriceInput">
  <part name="body" element="xsd1:TradePriceRequest"/>
</message>

<message name="GetLastTradePriceOutput">
  <part name="body" element="xsd1:TradePrice"/>
</message>
```

Esempio di documento WSDL 1.1 (3/3)

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

<portType name="StockQuotePortType">
    <operation name="GetLastTradePrice">
        <input message="tns:GetLastTradePricelInput"/>
        <output message="tns:GetLastTradePriceOutput"/>
    </operation>
</portType>

<binding name="StockQuoteSoapBinding" type="tns:StockQuotePortType">
    <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="GetLastTradePrice">
        <soap:operation soapAction="http://example.com/GetLastTradePrice"/>
        <input>
            <soap:body use="literal"/>
        </input>
        <output>
            <soap:body use="literal"/>
        </output>
    </operation>
</binding>

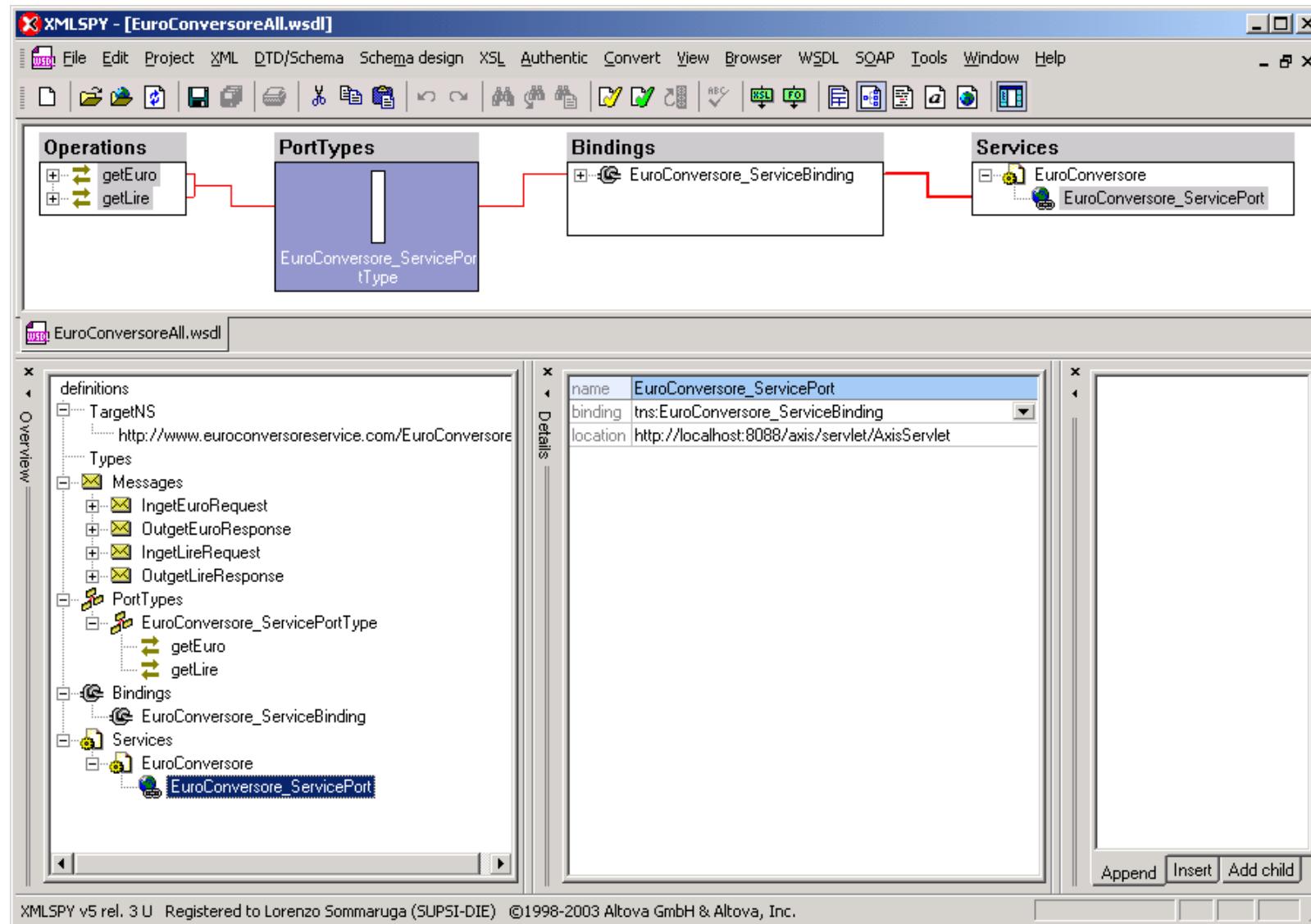
<service name="StockQuoteService">
    <documentation>My first service</documentation>
    <port name="StockQuotePort" binding="tns:StockQuoteBinding">
        <soap:address location="http://example.com/stockquote"/>
    </port>
</service>

</definitions>
```

Editing di un Documento WSDL

Visione grafica con XMLSpy 5

<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">



Esempio documento WSDL 2.0

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

<wsdl:description
    targetNamespace="http://example.org/TicketAgent.wsdl20"
    xmlns:xsTicketAgent="http://example.org/TicketAgent.xsd"
    xmlns:wsdl="http://www.w3.org/ns/wsdl"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.w3.org/2004/08/wsdl wsdl20.xsd">

    <wsdl:types>
        <xs:import schemaLocation="TicketAgent.xsd"
            namespace="http://example.org/TicketAgent.xsd" />
    </wsdl:types>

    <wsdl:interface name="TicketAgent">
        <wsdl:operation name="listFlights" pattern="http://www.w3.org/2004/08/wsdl/in-out">
            <wsdl:input element="xsTicketAgent:listFlightsRequest"/>
            <wsdl:output element="xsTicketAgent:listFlightsResponse"/>
        </wsdl:operation>

        <wsdl:operation name="reserveFlight" pattern="http://www.w3.org/2004/08/wsdl/in-out">
            <wsdl:input element="xsTicketAgent:reserveFlightRequest"/>
            <wsdl:output element="xsTicketAgent:reserveFlightResponse"/>
        </wsdl:operation>
    </wsdl:interface>
    ...
</wsdl:description>
```

Esercizio WSDL

```
<?XML?> <SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Analizzare il file WSDL del servizio SunSetRise
- <http://www.webservicex.net/sunsetriseservice.asmx?WSDL>
- Quali strutture e tipi di dati XML utilizza?

Risposta Esercizio WSDL

```
<?XML?><SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Strutture e tipi di dati def. mediante un XML Schema

```
3   <wsdl:types>
4     <s:schema elementFormDefault="qualified" targetNamespace="http://www.webserviceX.NET/">
5       <s:element name="GetSunSetRiseTime">
6         <s:complexType>
7           <s:sequence>
8             <s:element minOccurs="1" maxOccurs="1" name="L" type="tns:LatLonDate" />
9           </s:sequence>
10          </s:complexType>
11        </s:element>
12        <s:complexType name="LatLonDate">
13          <s:sequence>
14            <s:element minOccurs="1" maxOccurs="1" name="Latitude" type="s:float" />
15            <s:element minOccurs="1" maxOccurs="1" name="Longitude" type="s:float" />
16            <s:element minOccurs="1" maxOccurs="1" name="SunSetTime" type="s:float" />
17            <s:element minOccurs="1" maxOccurs="1" name="SunRiseTime" type="s:float" />
18            <s:element minOccurs="1" maxOccurs="1" name="TimeZone" type="s:int" />
19            <s:element minOccurs="1" maxOccurs="1" name="Day" type="s:int" />
20            <s:element minOccurs="1" maxOccurs="1" name="Month" type="s:int" />
21            <s:element minOccurs="1" maxOccurs="1" name="Year" type="s:int" />
22          </s:sequence>
23        </s:complexType>
24        <s:element name="GetSunSetRiseTimeResponse">
25          <s:complexType>
26            <s:sequence>
27              <s:element minOccurs="1" maxOccurs="1" name="GetSunSetRiseTimeResult" type="tns:LatLonDate" />
28            </s:sequence>
29          </s:complexType>
30        </s:element>
31      </s:schema>
32    </wsdl:types>
```

Risposta Esercizio WSDL

```
<?XML?><SOAP-ENV:Envelope SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

- Corrispondono a struttura/tipi dei dati nei messaggi SOAP



The screenshot shows a software interface for viewing SOAP requests and responses. The title bar says "SO AP Request 1". The left pane contains the SOAP request message:

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope">
  <soap:Header/>
  <soap:Body>
    <web:GetSunSetRiseTime>
      <web:L>
        <web:Latitude>46.0235789</web:Latitude>
        <web:Longitude>8.9165840</web:Longitude>
        <web:SunSetTime>0</web:SunSetTime>
        <web:SunRiseTime>0</web:SunRiseTime>
        <web:TimeZone>1</web:TimeZone>
        <web:Day>15</web:Day>
        <web:Month>3</web:Month>
        <web:Year>2017</web:Year>
      </web:L>
    </web:GetSunSetRiseTime>
  </soap:Body>
</soap:Envelope>
```

The right pane contains the SOAP response message:

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope">
  <soap:Body>
    <GetSunSetRiseTimeResponse xmlns="http://www.webservicex.net/sunsetriseservice.asmx">
      <GetSunSetRiseTimeResult>
        <Latitude>46.02358</Latitude>
        <Longitude>8.916584</Longitude>
        <SunSetTime>16.6665344</SunSetTime>
        <SunRiseTime>8.013386</SunRiseTime>
        <TimeZone>1</TimeZone>
        <Day>15</Day>
        <Month>3</Month>
        <Year>2017</Year>
      </GetSunSetRiseTimeResult>
    </GetSunSetRiseTimeResponse>
  </soap:Body>
</soap:Envelope>
```