

@WebService OUT params via  
javax.xml.ws.Holder

Example webservice-holder can be browsed at <https://github.com/apache/tomee/tree/master/examples/webservice-holder>

With SOAP it is possible to return multiple values in a single request. This is impossible in Java as a method can only return one object.

JAX-WS solves this problem with the concept of Holders. A `javax.xml.ws.Holder` is a simple wrapper object that can be passed into the `@WebService` method as a parameter. The application sets the value of the holder during the request and the server will send the value back as an OUT parameter.

## Using @WebParam and javax.xml.ws.Holder

The `@WebParam` annotation allows us to declare the `sum` and `multiply` Holders as `WebParam.Mode.OUT` parameters. As mentioned, these holders are simply empty buckets the application can fill in with data to have sent to the client. The server will pass them in uninitialized.

```
@Stateless
@WebService(
    portName = "CalculatorPort",
    serviceName = "CalculatorService",
    targetNamespace = "http://superbiz.org/wSDL",
    endpointInterface = "org.superbiz.ws.out.CalculatorWs")
public class Calculator implements CalculatorWs {

    public void sumAndMultiply(int a, int b,
                               @WebParam(name = "sum", mode = WebParam.Mode.OUT)
Holder<Integer> sum,
                               @WebParam(name = "multiply", mode = WebParam.Mode.OUT)
Holder<Integer> multiply) {
        sum.value = a + b;
        multiply.value = a * b;
    }
}
```

If the Holders were specified as `WebParam.Mode.INOUT` params, then the client could use them to send data and the application as well. The `Holder` instances would then be initialized with the data from the client request. The application could check the data before eventually overwriting it with the response values.

## The WSDL

The above JAX-WS `@WebService` component results in the following WSDL that will be created automatically. Note the `sumAndMultiplyResponse` complex type returns two elements. These match the `@WebParam` declarations and our two `Holder<Integer>` params.

```

<?xml version="1.0" encoding="UTF-8"?>
<wsdl:definitions xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    name="CalculatorService"
    targetNamespace="http://superbiz.org/wsdl"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:tns="http://superbiz.org/wsdl"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <wsdl:types>
    <xsd:schema attributeFormDefault="unqualified" elementFormDefault="unqualified"
        targetNamespace="http://superbiz.org/wsdl"
        xmlns:tns="http://superbiz.org/wsdl"
        xmlns:xsd="http://www.w3.org/2001/XMLSchema">
      <xsd:element name="sumAndMultiply" type="tns:sumAndMultiply"/>
      <xsd:complexType name="sumAndMultiply">
        <xsd:sequence>
          <xsd:element name="arg0" type="xsd:int"/>
          <xsd:element name="arg1" type="xsd:int"/>
        </xsd:sequence>
      </xsd:complexType>
      <xsd:element name="sumAndMultiplyResponse" type="tns:sumAndMultiplyResponse"/>
      <xsd:complexType name="sumAndMultiplyResponse">
        <xsd:sequence>
          <xsd:element minOccurs="0" name="sum" type="xsd:int"/>
          <xsd:element minOccurs="0" name="multiply" type="xsd:int"/>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:schema>
  </wsdl:types>
  <wsdl:message name="sumAndMultiplyResponse">
    <wsdl:part element="tns:sumAndMultiplyResponse" name="parameters"/>
  </wsdl:message>
  <wsdl:message name="sumAndMultiply">
    <wsdl:part element="tns:sumAndMultiply" name="parameters"/>
  </wsdl:message>
  <wsdl:portType name="CalculatorWs">
    <wsdl:operation name="sumAndMultiply">
      <wsdl:input message="tns:sumAndMultiply" name="sumAndMultiply"/>
      <wsdl:output message="tns:sumAndMultiplyResponse" name="sumAndMultiplyResponse"
"/>
    </wsdl:operation>
  </wsdl:portType>
  <wsdl:binding name="CalculatorServiceSoapBinding" type="tns:CalculatorWs">
    <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <wsdl:operation name="sumAndMultiply">
      <soap:operation soapAction="" style="document"/>
      <wsdl:input name="sumAndMultiply">
        <soap:body use="literal"/>
      </wsdl:input>
      <wsdl:output name="sumAndMultiplyResponse">
        <soap:body use="literal"/>
      </wsdl:output>
    </wsdl:operation>
  </wsdl:binding>
</wsdl:definitions>

```

```
</wsdl:output>
</wsdl:operation>
</wsdl:binding>
<wsdl:service name="CalculatorService">
  <wsdl:port binding="tns:CalculatorServiceSoapBinding" name="CalculatorPort">
    <soap:address location="http://127.0.0.1:4204/Calculator?wsdl"/>
  </wsdl:port>
</wsdl:service>
</wsdl:definitions>
```

## Testing the OUT params

Here we see a JAX-WS client executing the `sumAndMultiply` operation. Two empty `Holder` instances are created and passed in as parameters. The data from the `sumAndMultiplyResponse` is placed in the `Holder` instances and is then available to the client after the operation completes.

The holders themselves are not actually sent in the request unless they are configured as INOUT params via `WebParam.Mode.INOUT` on `@WebParam`

```

import org.junit.BeforeClass;
import org.junit.Test;

import javax.ejb.embeddable.EJBContainer;
import javax.xml.namespace.QName;
import javax.xml.ws.Holder;
import javax.xml.ws.Service;
import java.net.URL;
import java.util.Properties;

import static org.junit.Assert.assertEquals;
import static org.junit.Assert.assertNotNull;

public class CalculatorTest {

    @BeforeClass
    public static void setUp() throws Exception {
        Properties properties = new Properties();
        properties.setProperty("openejb.embedded.remotable", "true");
        //properties.setProperty("httpjbd.print", "true");
        //properties.setProperty("httpjbd.indent.xml", "true");
        EJBContainer.createEJBContainer(properties);
    }

    @Test
    public void outParams() throws Exception {
        final Service calculatorService = Service.create(
            new URL("http://127.0.0.1:4204/Calculator?wsdl"),
            new QName("http://superbiz.org/wsdl", "CalculatorService"));

        assertNotNull(calculatorService);

        final CalculatorWs calculator = calculatorService.getPort(CalculatorWs.class);

        final Holder<Integer> sum = new Holder<Integer>();
        final Holder<Integer> multiply = new Holder<Integer>();

        calculator.sumAndMultiply(4, 6, sum, multiply);

        assertEquals(10, (int) sum.value);
        assertEquals(24, (int) multiply.value);
    }
}

```

## Inspecting the messages

The above execution results in the following SOAP message.

## SOAP sumAndMultiply <small>client request</small>

```
<?xml version="1.0" encoding="UTF-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <soap:Body>
    <ns1:sumAndMultiply xmlns:ns1="http://superbiz.org/wsdl">
      <arg0>4</arg0>
      <arg1>6</arg1>
    </ns1:sumAndMultiply>
  </soap:Body>
</soap:Envelope>
```

## SOAP sumAndMultiplyResponse <small>server response</small>

```
<?xml version="1.0" encoding="UTF-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <soap:Body>
    <ns1:sumAndMultiplyResponse xmlns:ns1="http://superbiz.org/wsdl">
      <sum>10</sum>
      <multiply>24</multiply>
    </ns1:sumAndMultiplyResponse>
  </soap:Body>
</soap:Envelope>
```