z/TPF V1.1

TPF Users Group Spring 2009

Accessing Web Services From Your z/TPF System

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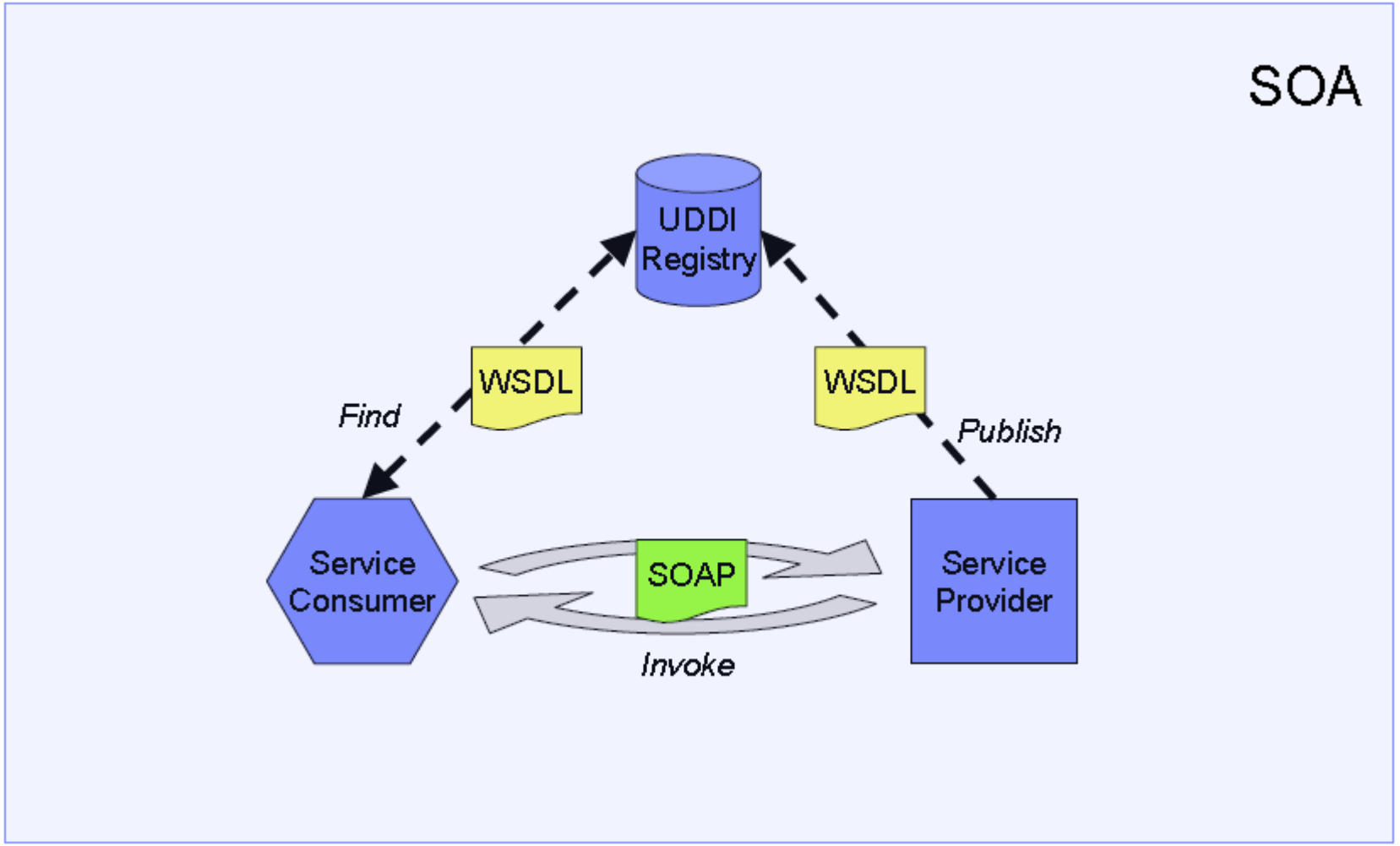
Venue: Ongoing TPF Education

AIM Enterprise Platform Software
IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

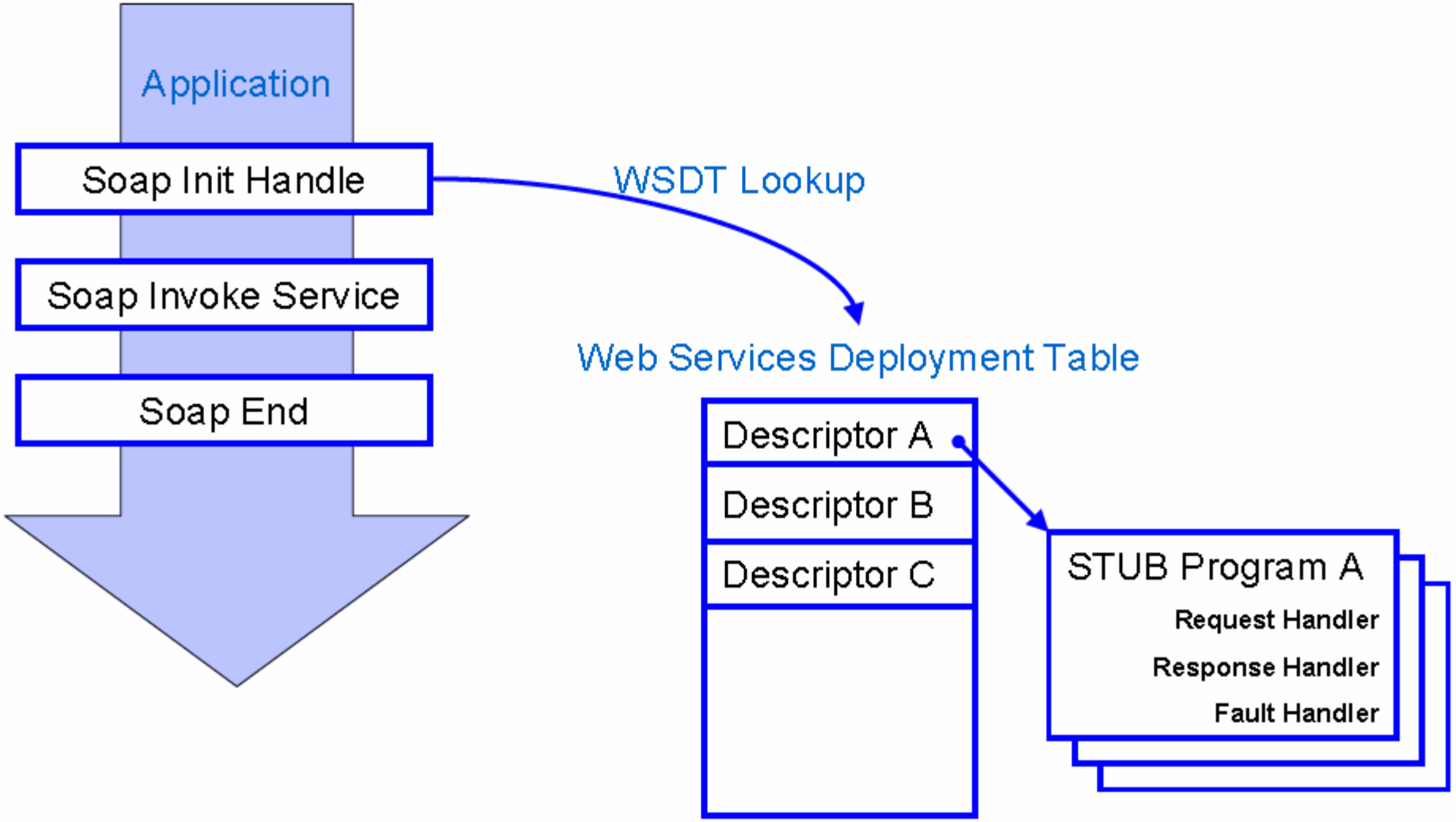
Contents

- **Web Services**
- **Soap Consumer Flow**
- **Accessing a Web Service from your z/TPF application**

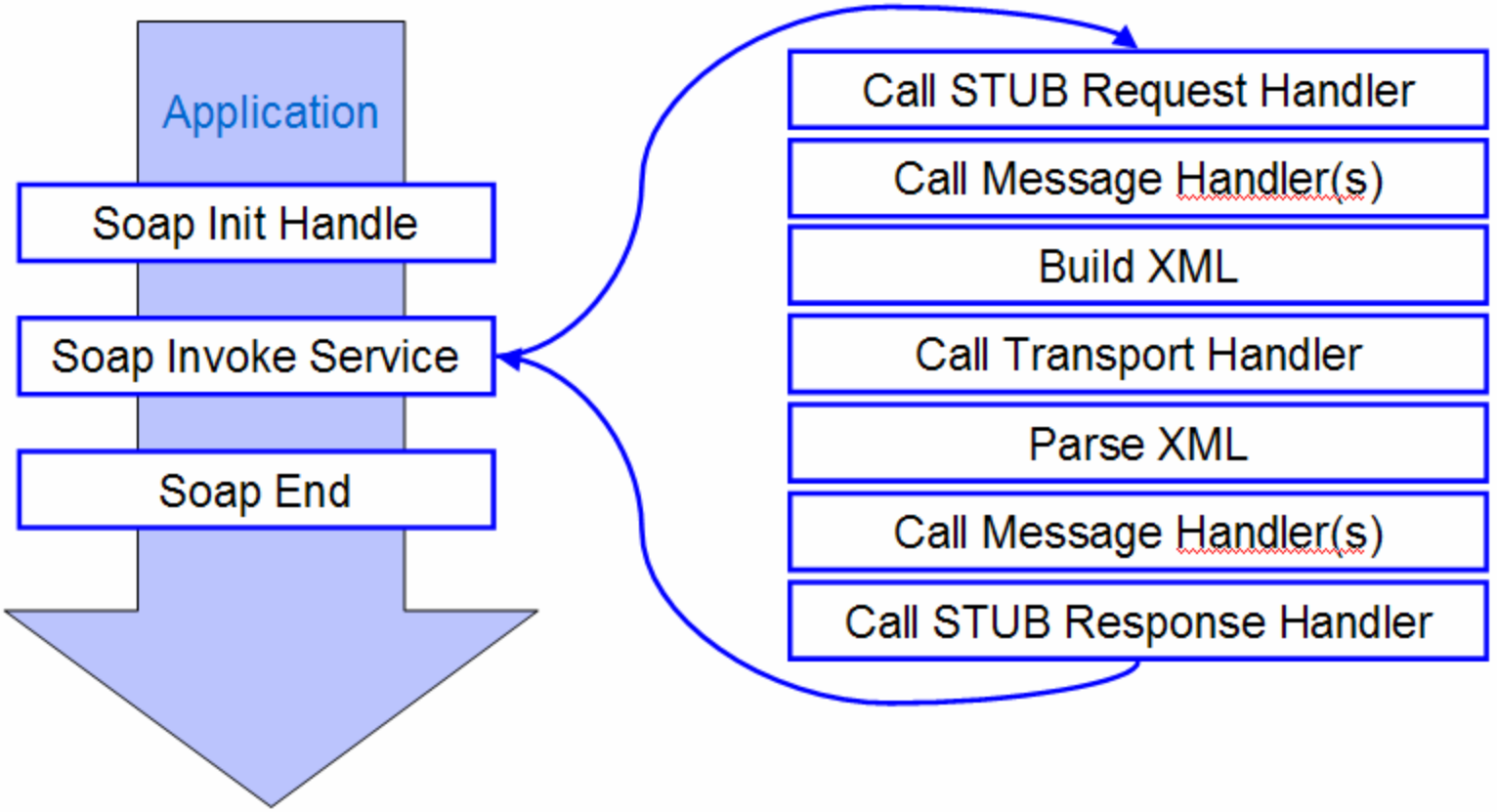
Web Services



Soap Consumer Flow



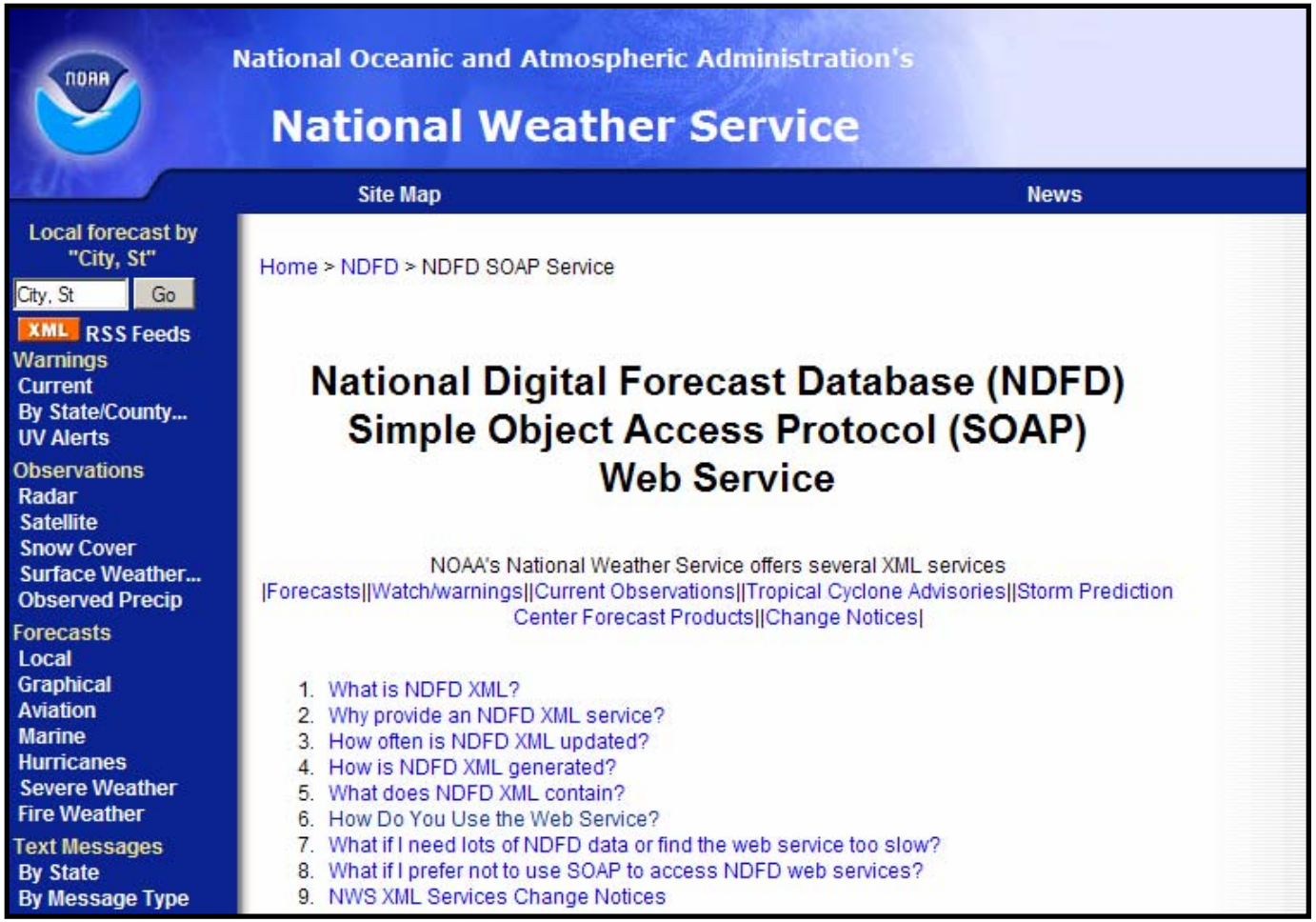
Soap Consumer Flow



Summary

- **Get the Service's WSDL**
- **Create a Deployment Descriptor**
- **Create STUB code**
- **Deploy the Descriptor**
- **Invoke the Web Service**

What We Will Consume



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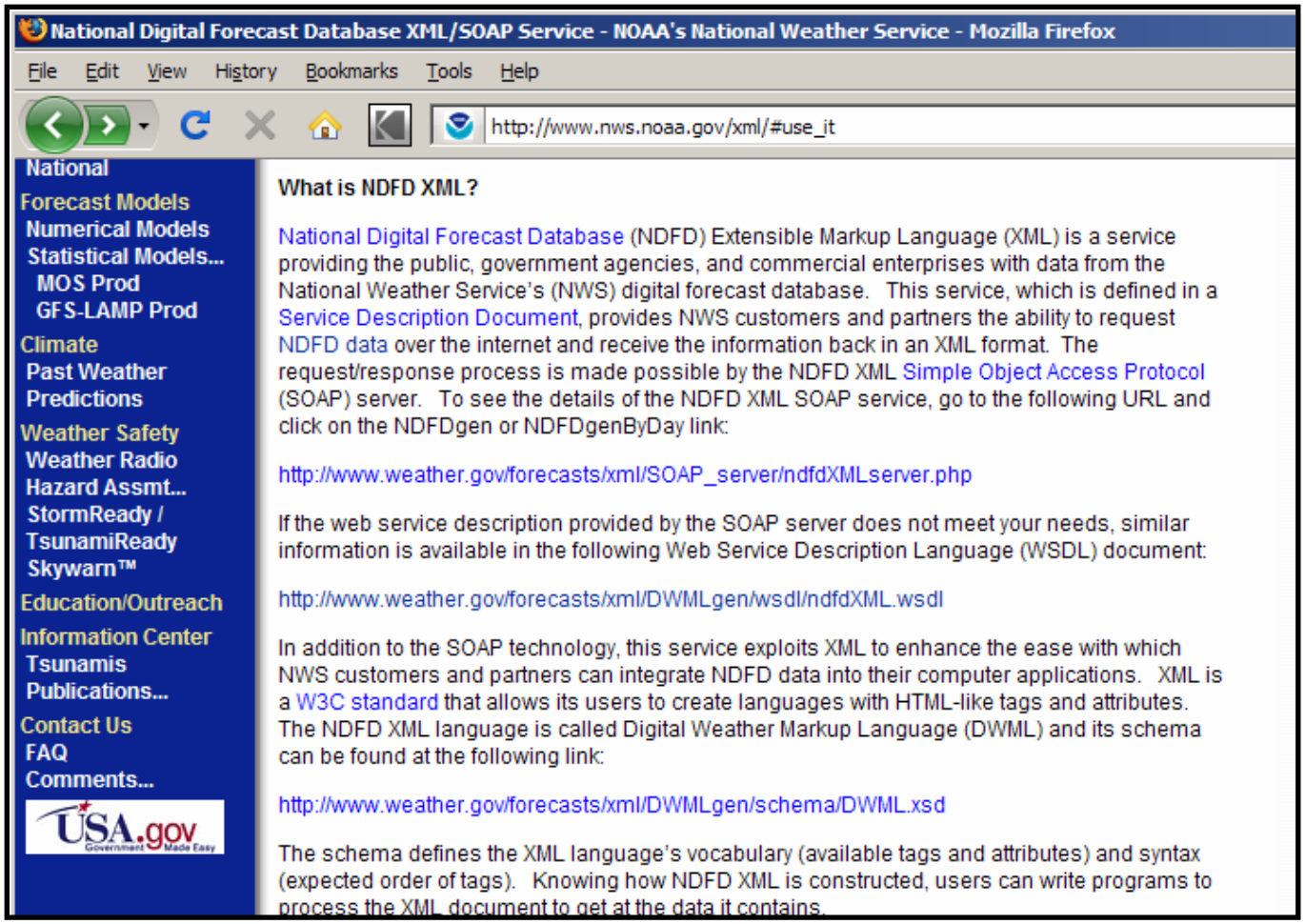
Download the WSDL



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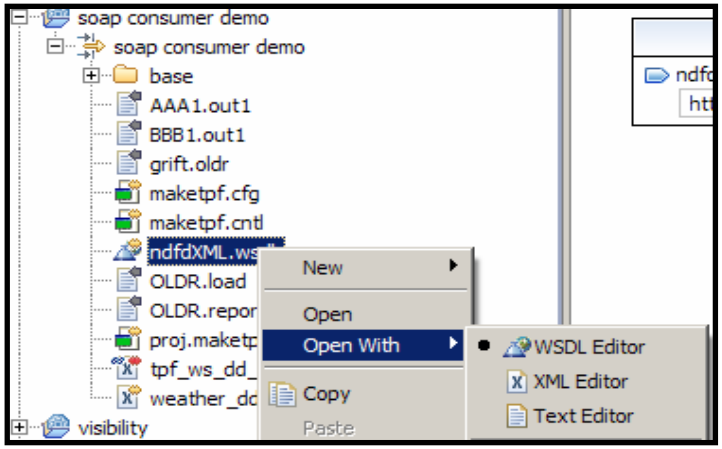
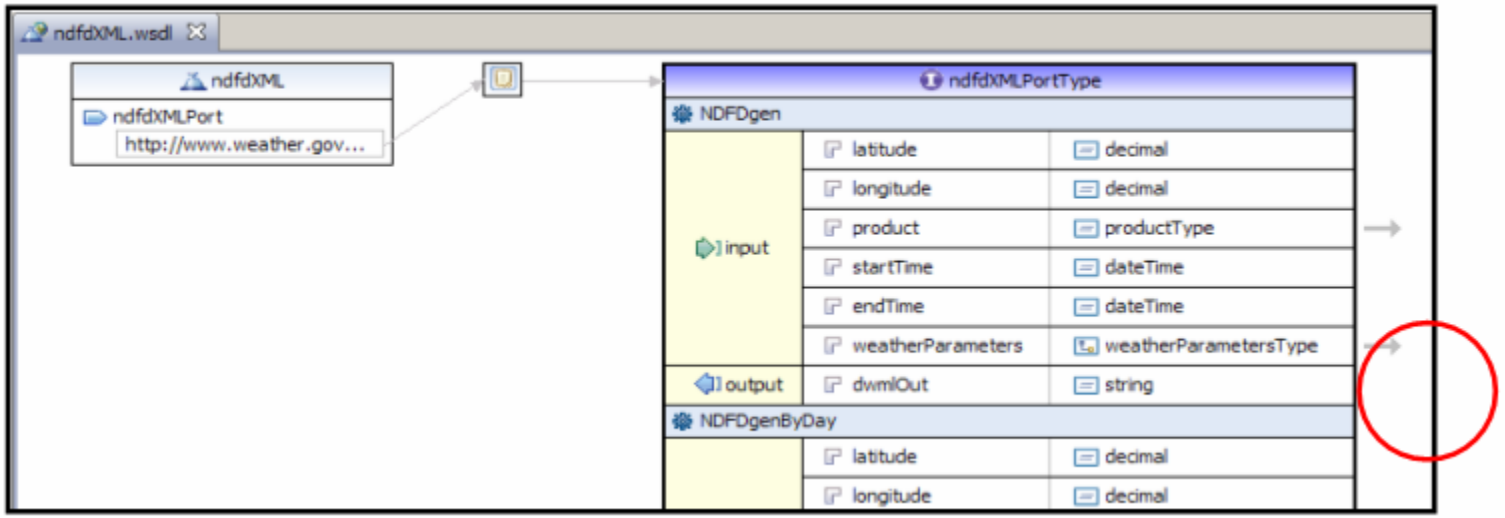
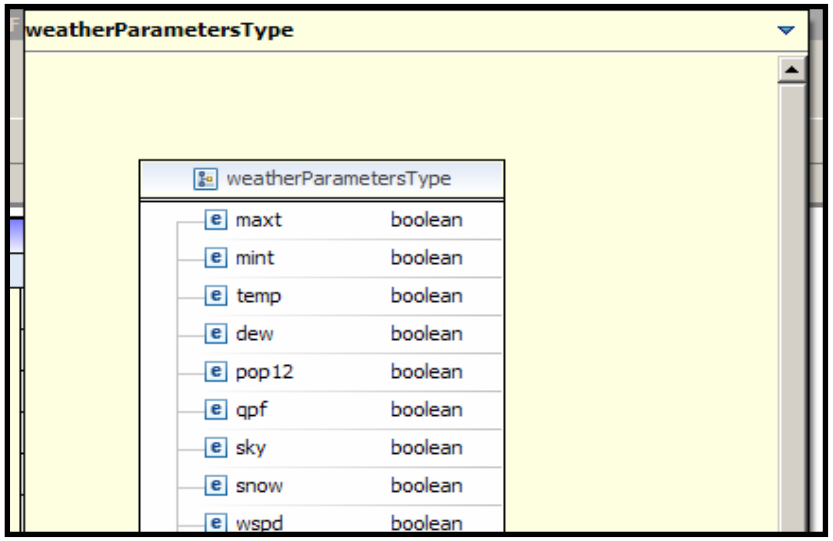
WSDL Management



WSDL Editor



WSDL Editor



Summary

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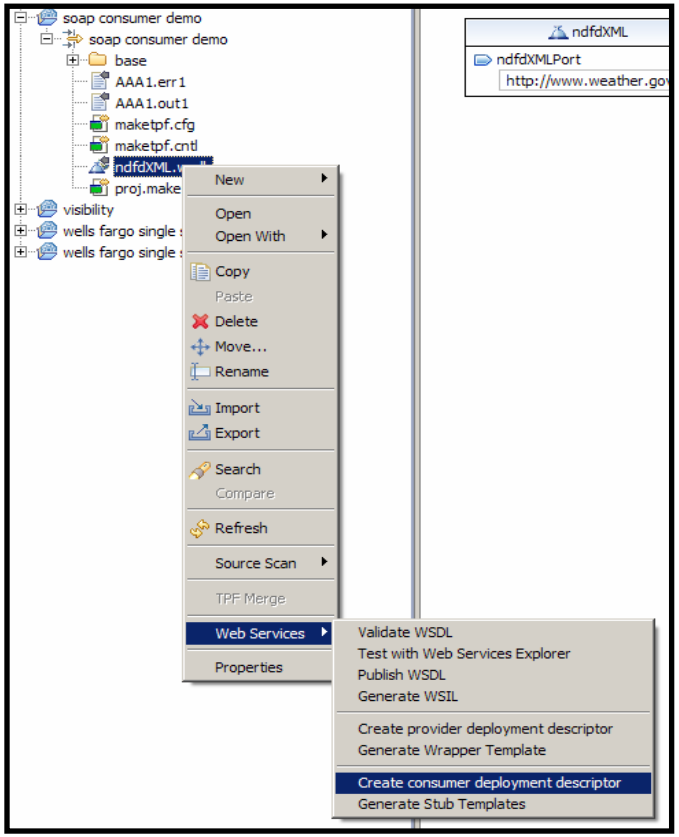
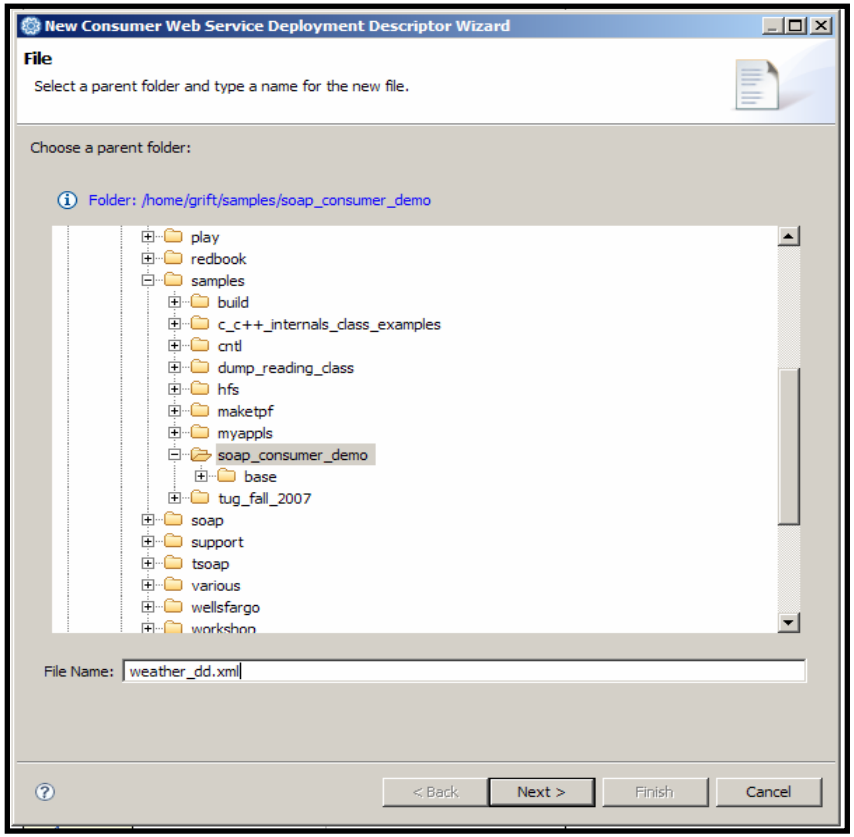
- **Create a Deployment Descriptor**
- **Create STUB code**
- **Deploy the Descriptor**
- **Invoke the Web Service**

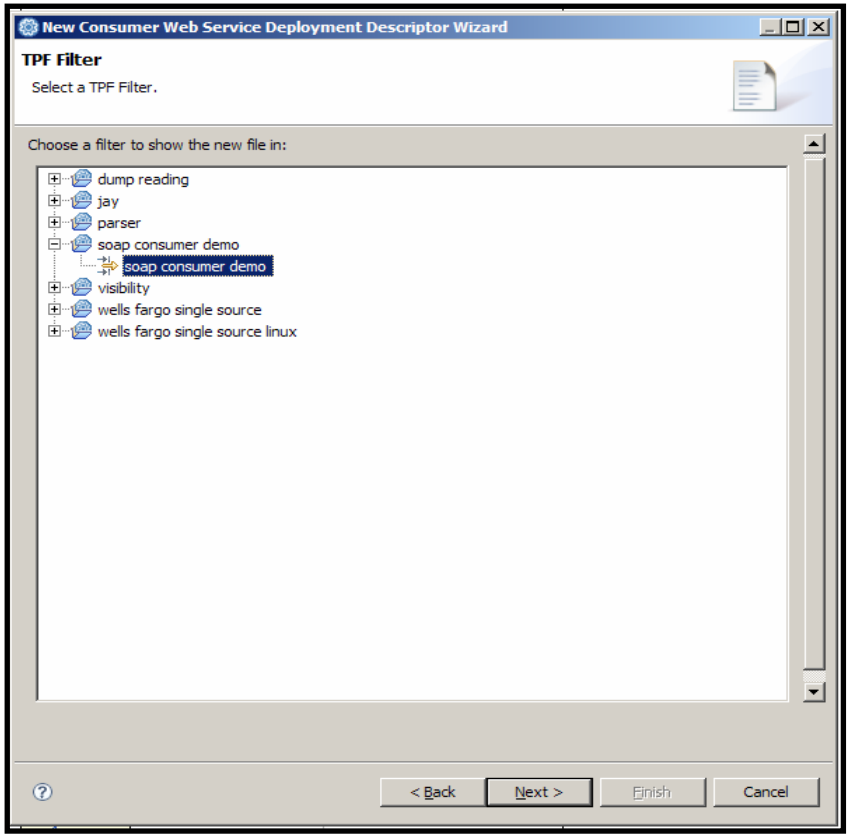
Create Consumer Deployment Descriptor



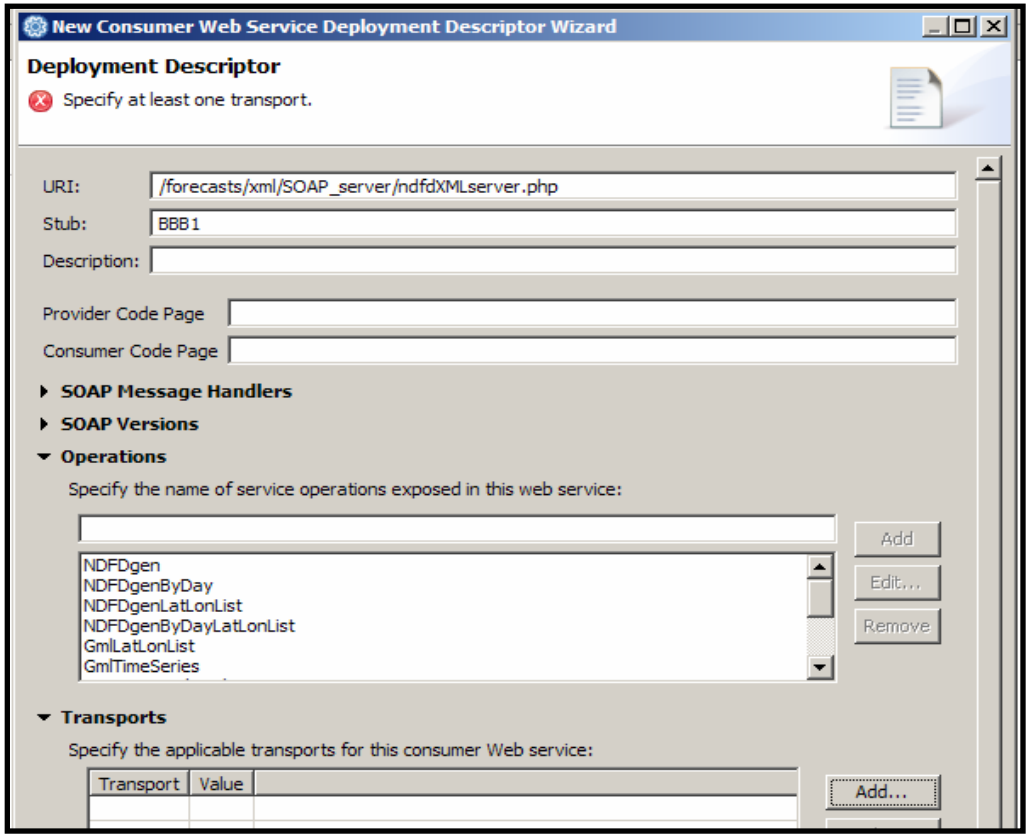
Name the Deployment Descriptor



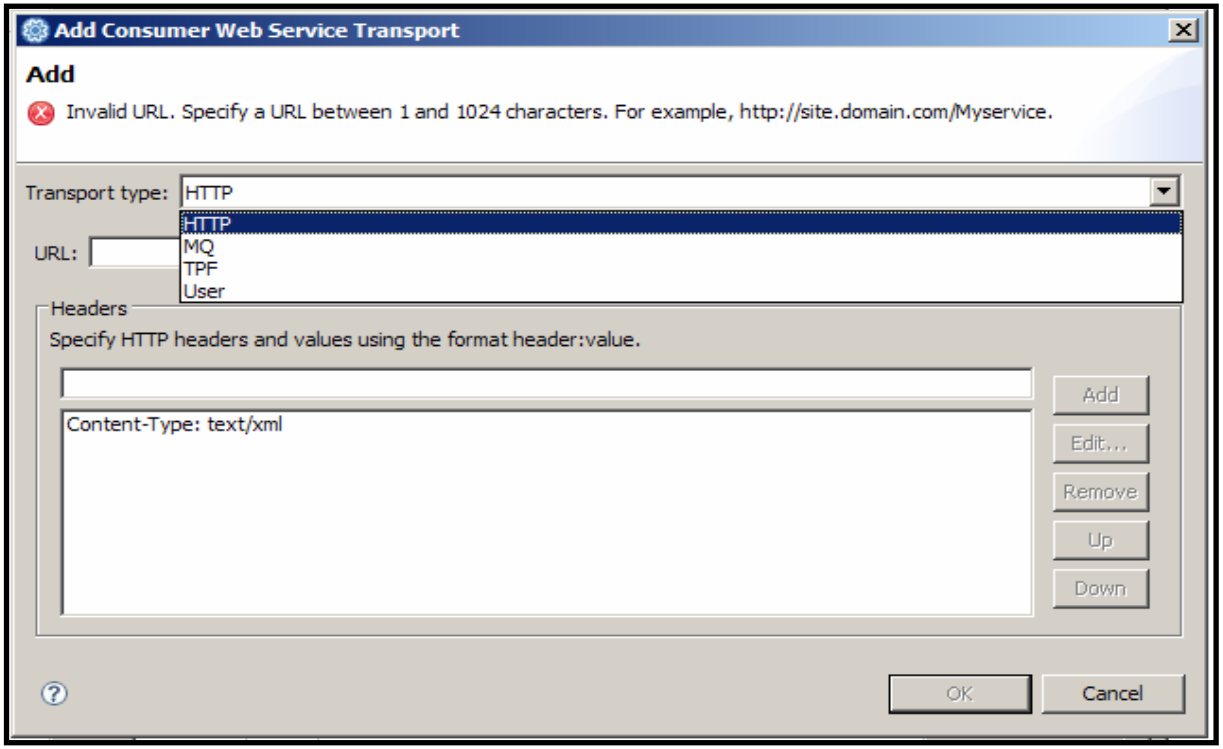
Select a TPF Filter



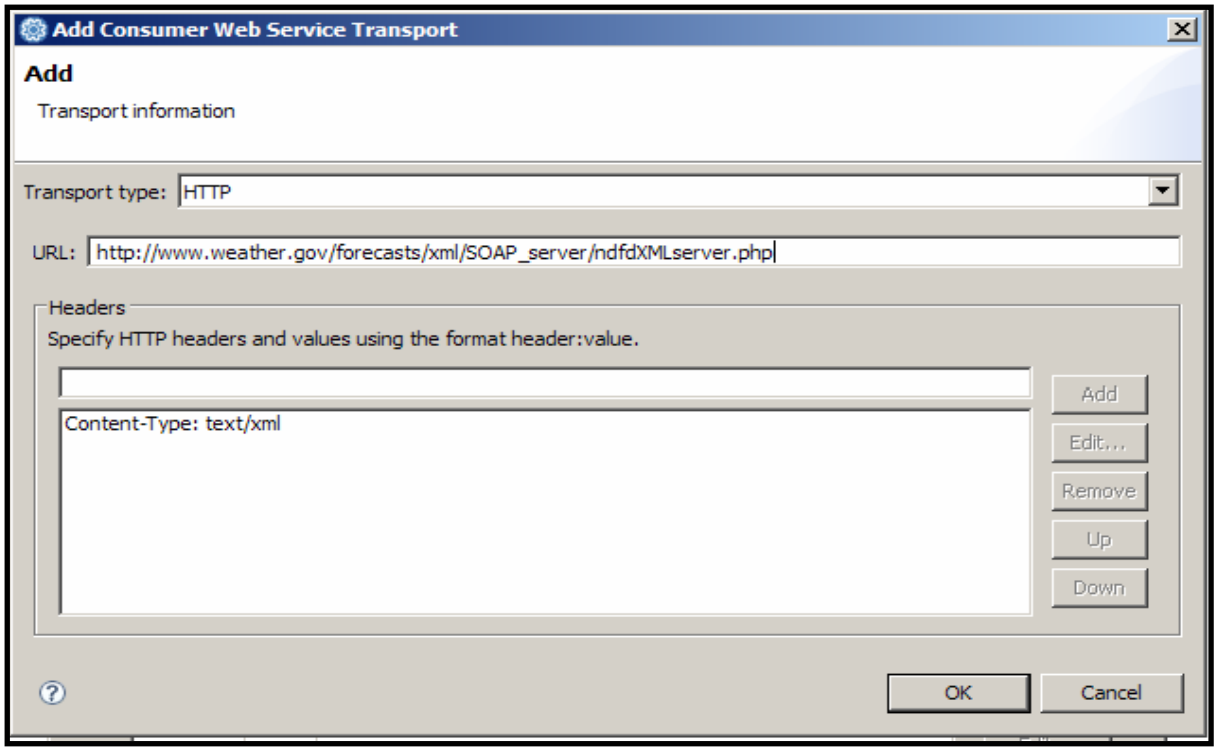
Specify the STUB Name



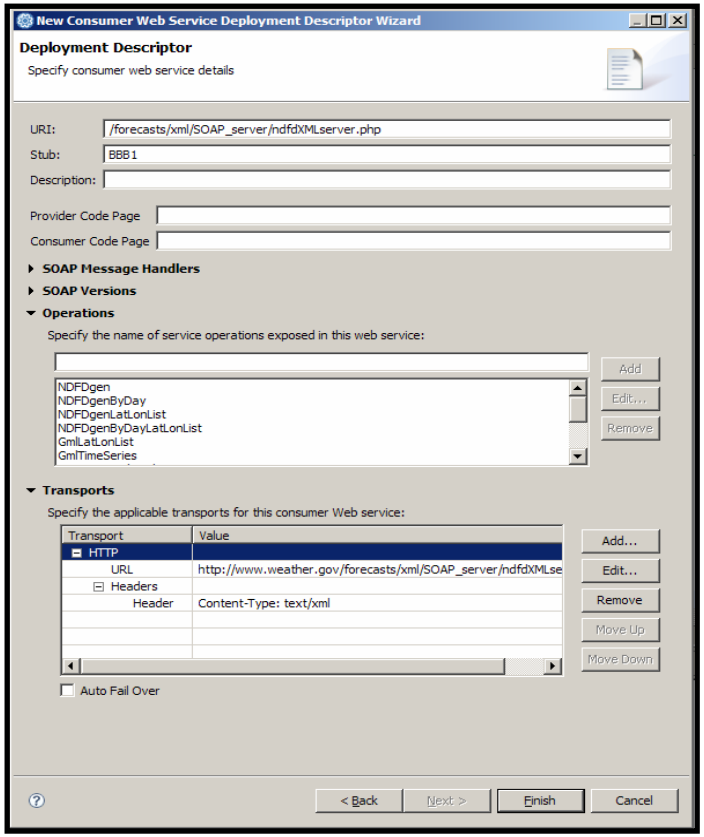
Add a Transport



Add a Transport



Finish the Descriptor Wizard

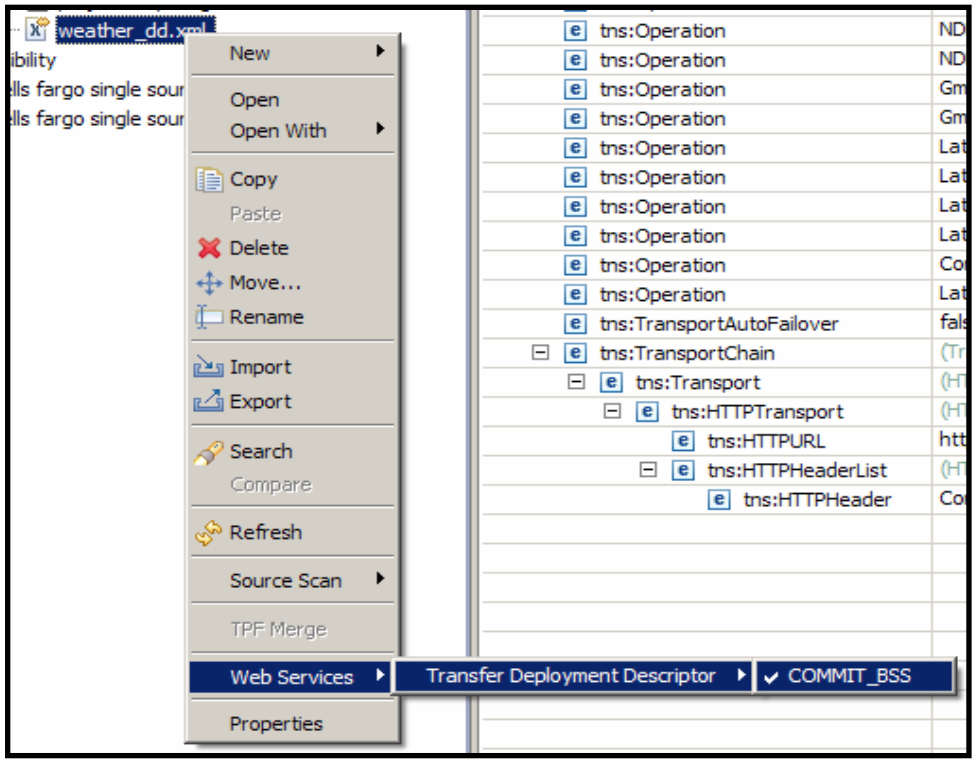


The Deployment Descriptor

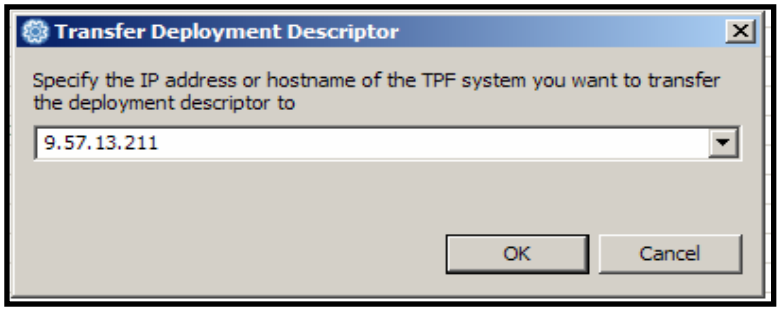
aaa1.cpp | bbb1_request.c | bbb1_response.c | weather_dd.xml | weather_dd.xml

xml	version="1.0" encoding="UTF-8"
tns:ConsumerDeploymentDescriptor	(ServiceURI, Stub, SOAPProcessing, Operation*, Description?, TransportAutoFailover, Co
xmlns:tns	http://www.ibm.com/xmlns/prod/ztpf/soap
xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance
xsi:schemaLocation	http://www.ibm.com/xmlns/prod/ztpf/soap file:/etc/tpf-ws/schema/tpf_ws_dd_v2.xsd
tns:ServiceURI	/forecasts/xml/SOAP_server/ndfdXMLserver.php
tns:Stub	BBB1
tns:SOAPProcessing	(SOAPMessageHandlerChain*, VerifySOAPHeaders, SOAPVersion*)
tns:VerifySOAPHeaders	false
tns:SOAPVersion	SOAP1.1
tns:Operation	NDFDgen
tns:Operation	NDFDgenByDay
tns:Operation	NDFDgenLatLonList
tns:Operation	NDFDgenByDayLatLonList
tns:Operation	GmlLatLonList
tns:Operation	GmlTimeSeries
tns:Operation	LatLonListSubgrid
tns:Operation	LatLonListLine
tns:Operation	LatLonListZipCode
tns:Operation	LatLonListSquare
tns:Operation	CornerPoints
tns:Operation	LatLonListCityNames
tns:TransportAutoFailover	false
tns:TransportChain	(Transport+)
tns:Transport	(HTTPTransport | MQTransport | TPFTransport | UserTransport)
tns:HTTPTransport	(HTTPURL, HTTPHeaderList?)
tns:HTTPURL	http://www.weather.gov/forecasts/xml/SOAP_server/ndfdXMLserver.php
tns:HTTPHeaderList	(HTTPHeader+)
tns:HTTPHeader	Content-Type: text/xml

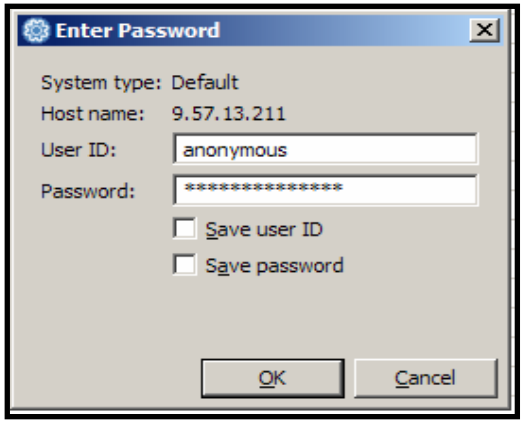
Transfer the Deployment Descriptor



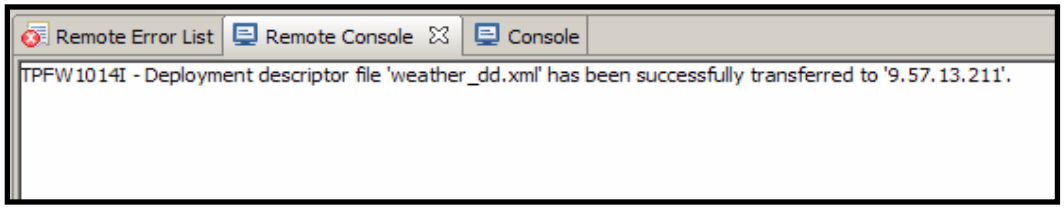
Specify the TPF System's Address



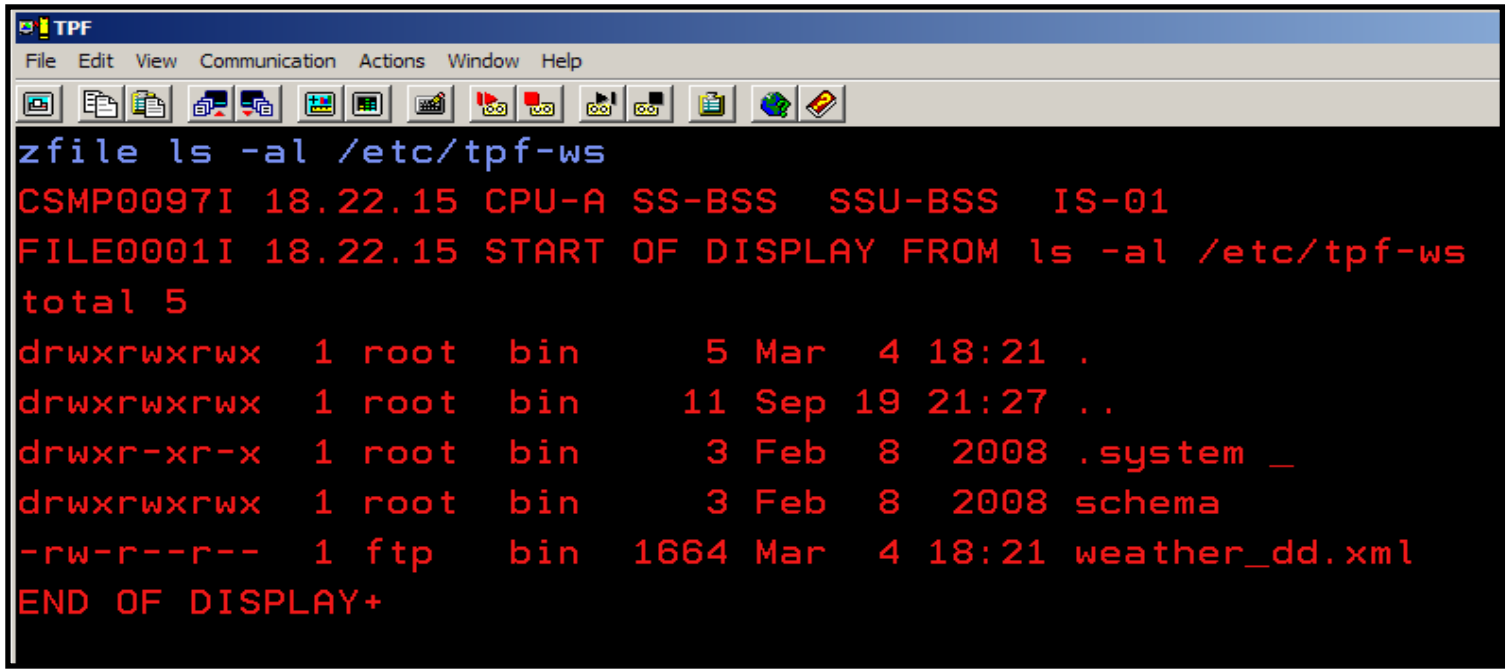
Authenticate with FTP



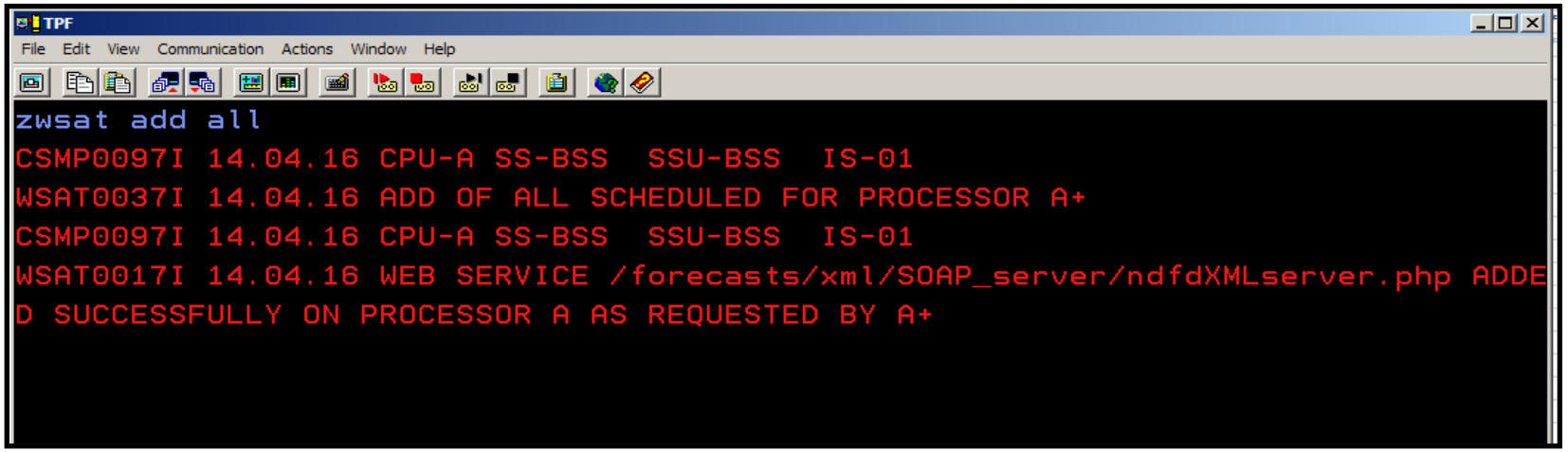
FTP Results



The Descriptor on TPF



Add the Descriptor



Summary

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The STUB

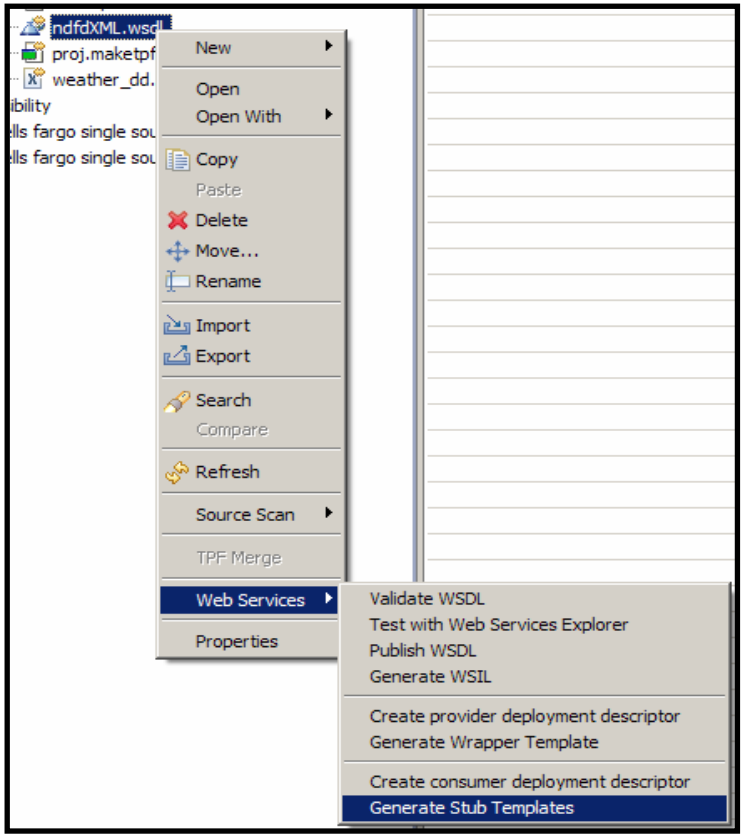
- **An isolation point for the portion of code that:**
  - Serializes the operation and parameter data into the body portion of the SOAP request.
  - Deserializes the return from the service provider from the parsed SOAP response.

- **This hides the following details from the application:**
  - Message formats
  - Service locations
  - Communication protocol information

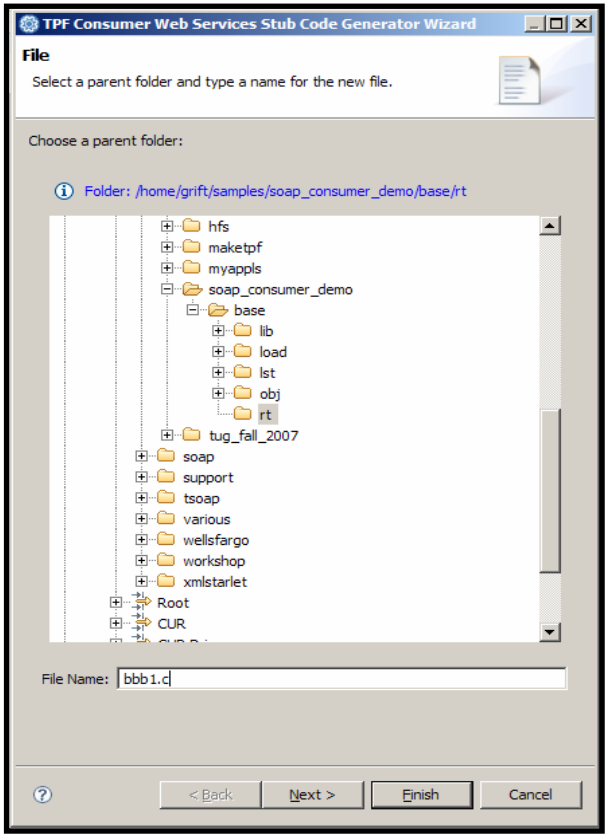
The STUB

- **Uses TPF_CALL_BY_NAME to call the Web service stub program name**
- **Processing is implemented in C shared objects**

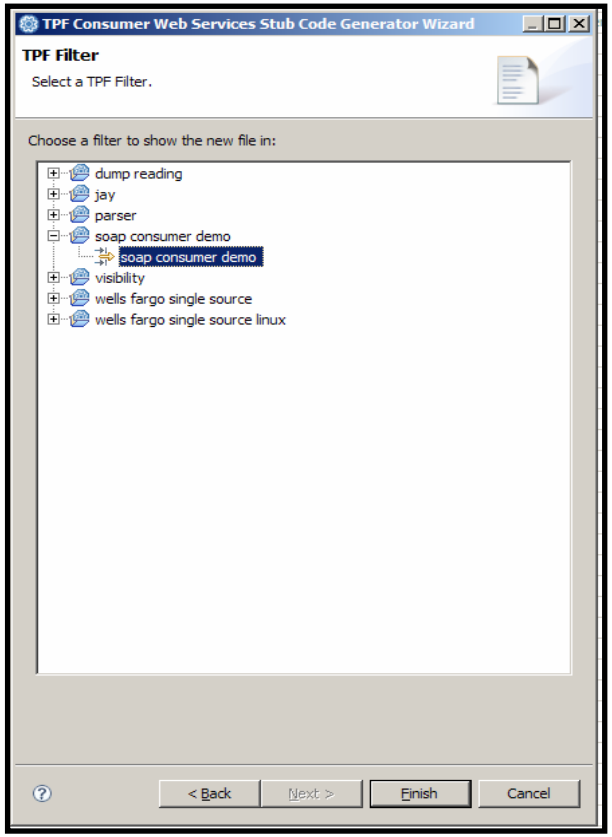
Generate STUB Templates



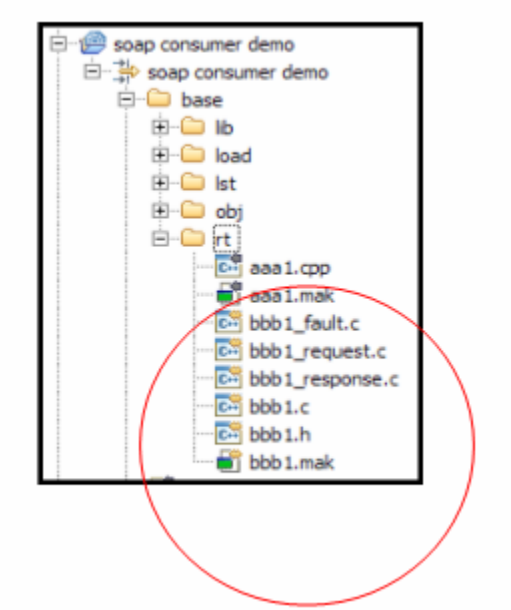
Specify STUB Location & Name



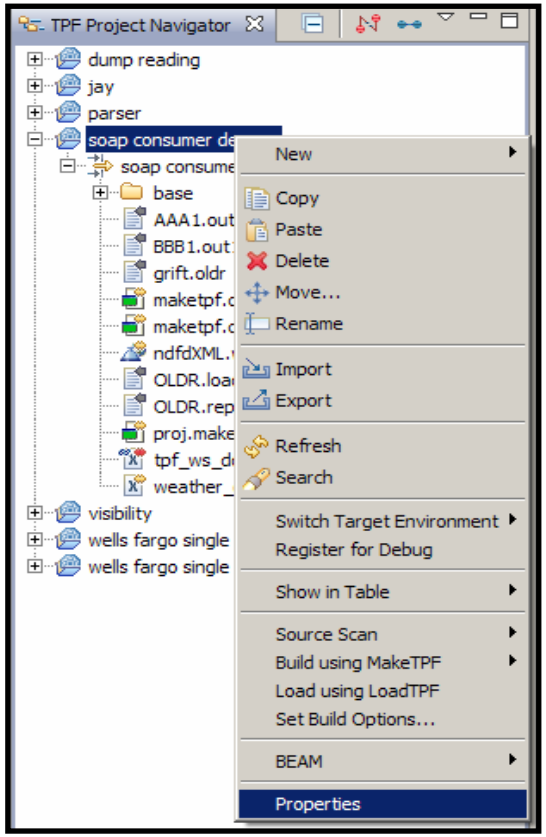
Specify a Filter



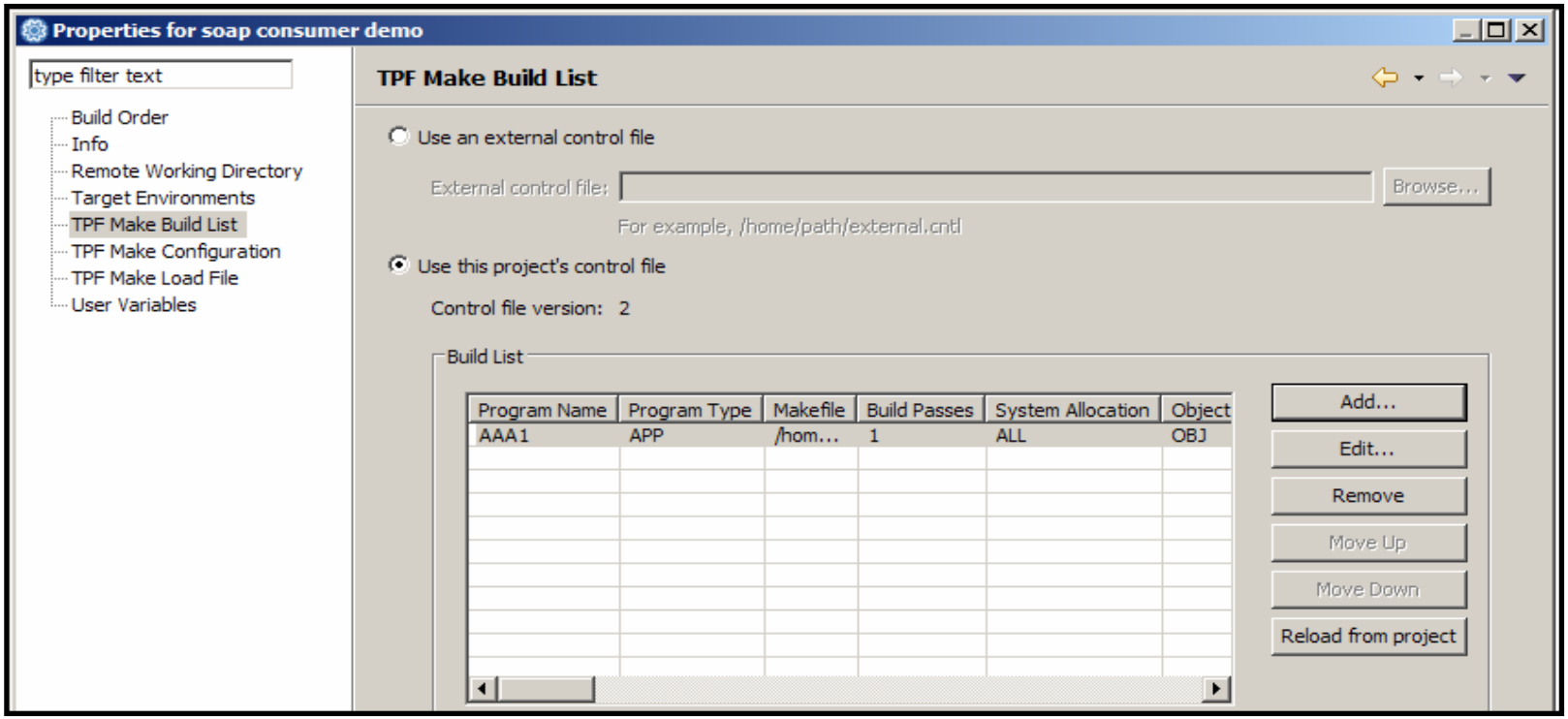
Generated Template Segments



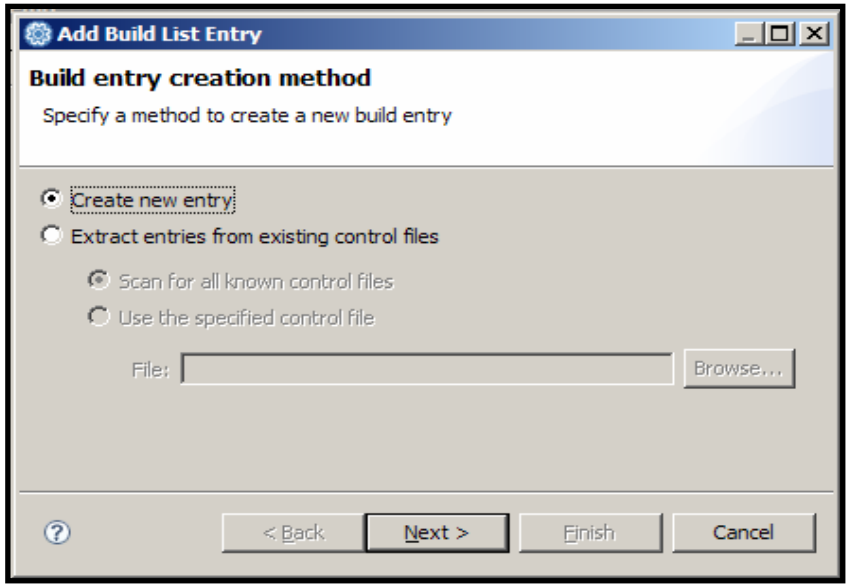
Add the STUB to the Project



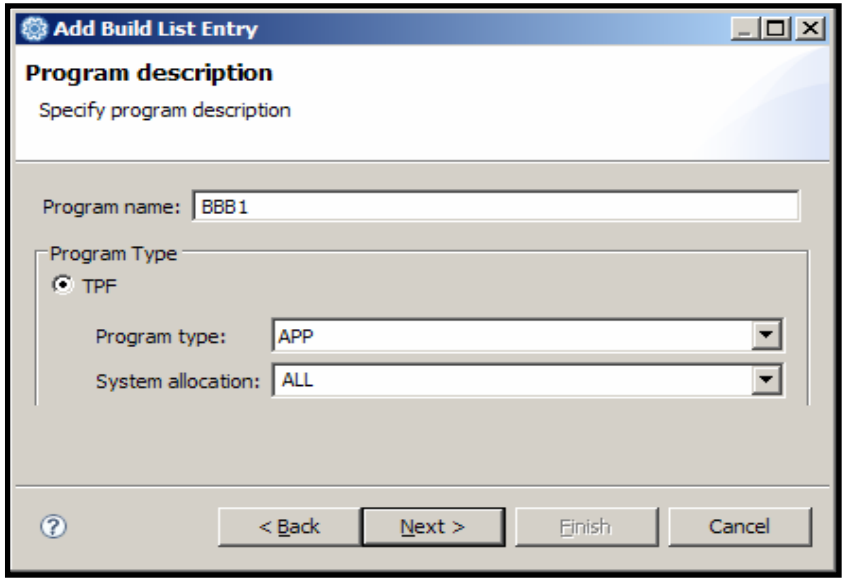
Add the STUB to the Build List



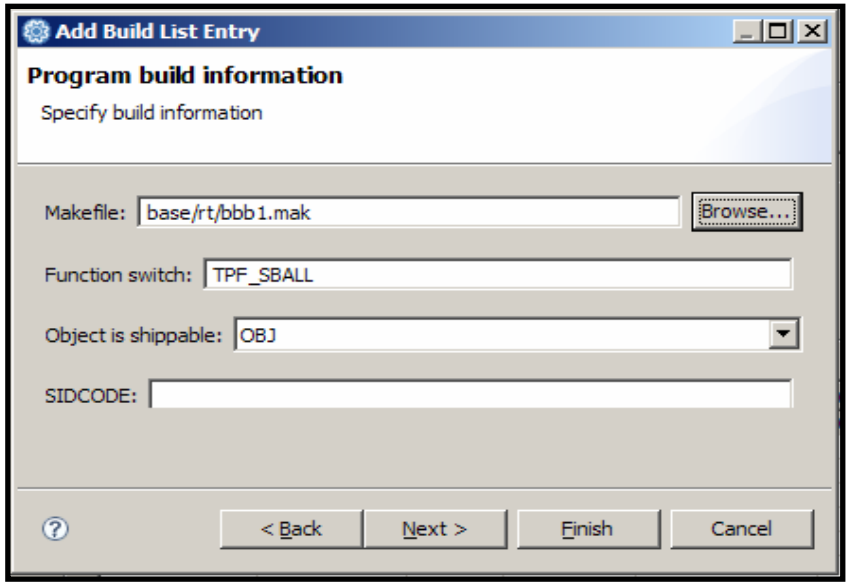
Create a New Build List Entry



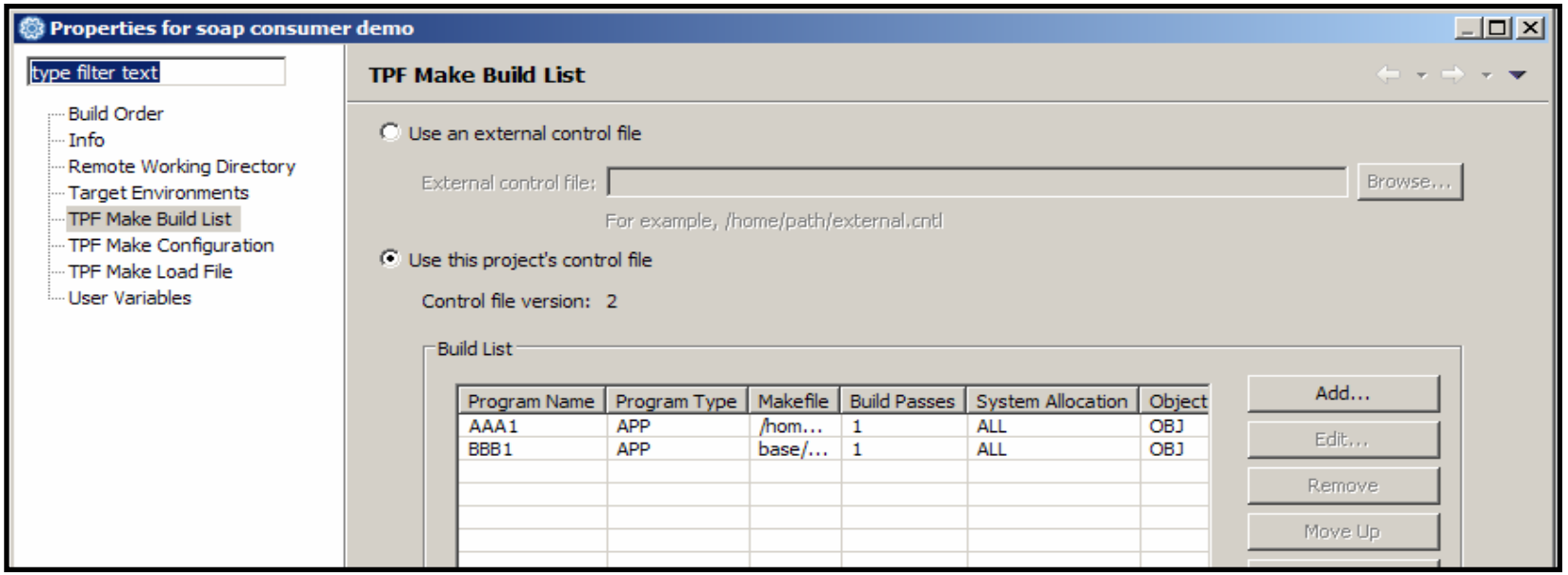
Specify the STUB Program Name



Specify the STUB Make File



Add the STUB to the Control File



Request Message

```
<Body>
   <NDFDGen>
      <latitude>41.90</latitude>
      <longitude>-87.65</longitude>
      <product>glance</product>
      <startTime>2009-03-10T12:00</startTime>
      <endTime>2009-03-10T12:00</endTime>
      <weatherParameters>maxt=TRUE</weatherParameters>
   </NDFDGen>
</Body>
```

Response Message

```
<Body>
   <NDFDGen>
      <dwmlOut>

         ...

         <parameters applicable-location="point1">
            <temperature type="maximum" units="Fahrenheit" time-layout="k-p24h-n1-1">
               <name>Daily Maximum Temperature</name>
               <value>51</value>
            </temperature>
         </parameters>

         ...

      </dwmlOut>
   </NDFDGen>
</Body>
```

Generated Request Handler

```
int bbb1_NDFDgen_request (t_soapHandle soapHandle, XMLHandle requestMsg,
                          t_soapParms *parmsArray, void **returnValue)
{
          int rc = WSSTUB_RET_CONT;
          /* Function return code      */

          /*************************************************************/
          /* ADD YOUR CODE HERE TO APPEND THE NECESSARY ELEMENTS UNDER  */
          /* THE "BODY" ELEMENT TO BUILD A VALID SOAP REQUEST MESSAGE   */
          /* FOR THIS OPERATION.                                        */
          /*************************************************************/

          /*************************************************************/
          /* Return to tpf_soapInvokeService processing.                */
          /*************************************************************/
          return (rc);

} /* end of function bbb1_NDFDgen_request ( )            */
```

Code the Request Handler 1/2

```
int bbb1_NDFDgen_request (t_soapHandle soapHandle, XMLHandle requestMsg,
                          t_soapParms *parmsArray, void **returnValue)
{
   int rc = WSSTUB_RET_CONT;
   int xmlRC = 0;
   xmlRC = tpf_xml_appendElement(requestMsg, "Body", "NDFDgen",
                                 NULL, BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
   if(xmlRC == TPF_SOAP_ERROR) {
      // Error handling
   }
   xmlRC = tpf_xml_appendElement(requestMsg, "NDFDgen", "latitude",
                                 parmsArray->parmArray[0].parmPtr,
                                 BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
   if(xmlRC == TPF_SOAP_ERROR) {
      // Error handling
   }
   xmlRC = tpf_xml_appendElement(requestMsg, "NDFDgen", "longitude",
                                 parmsArray->parmArray[1].parmPtr,
                                 BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
   if(xmlRC == TPF_SOAP_ERROR) {
      // Error handling
   }
```

Code the Request Handler 2/2

```
    xmlRC = tpf_xml_appendElement(requestMsg, "NDFDgen", "product",
                                  parmsArray->parmArray[2].parmPtr,
                                  BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
    if(xmlRC == TPF_SOAP_ERROR) {
       // Error handling
    }
    xmlRC = tpf_xml_appendElement(requestMsg, "NDFDgen", "startTime",
                                  parmsArray->parmArray[3].parmPtr,
                                  BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
    if(xmlRC == TPF_SOAP_ERROR) {
       // Error handling
    }
    xmlRC = tpf_xml_appendElement(requestMsg, "NDFDgen", "endTime",
                                  parmsArray->parmArray[4].parmPtr,
                                  BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
    if(xmlRC == TPF_SOAP_ERROR) {
       // Error handling
    }
    xmlRC = tpf_xml_appendElement(requestMsg, "NDFDgen", "weatherParameters",
                                  parmsArray->parmArray[5].parmPtr,
                                  BBB1_NAMESPACE_PREFIX, BBB1_NAMESPACE, 0);
    if(xmlRC == TPF_SOAP_ERROR) {
       // Error handling
    }
    return (rc);
}
```

Generated Response Handler

```
int bbb1_NDFDgen_response (t_soapHandle soapHandle, XMLHandle responseMsg,
                           void **returnValue)
{
          int            rc = WSSTUB_RET_SUCCESS;
          /* Function return code      */

          /*************************************************************/
          /* ADD YOUR CODE HERE TO EXTRACT THE NECESSARY DATA FROM THE    */
          /* SOAP RESPONSE MESSAGE AND CREATE THE REQUIRED INFORMATION    */
          /* TO BE PASSED BACK TO THE ORIGINAL CALLING APPLICATION.       */
          /*************************************************************/

          /*************************************************************/
          /* Return to tpf_soapInvokeService processing.                  */
          /*************************************************************/
          return (rc);

} /* end of function bbb1_NDFDgen_response ( )          */
```

Code the Response Handler 1/2

```
int bbb1_NDFDgen_response (t_soapHandle soapHandle, XMLHandle responseMsg,
                           void **returnValue)
{
   int rc = WSSTUB_RET_SUCCESS;
   xmlNodesArray* xptr = NULL;
   xmlNodesArray* wptr = NULL;
   int wRc;
   int parserRc;
   XMLHandle w;

   xptr = tpf_xml_getElementsByTagName (responseMsg, TYPE_TEXT, "dwmlOut");
   if(xptr == NULL) || (xptr->nodesArraySize == 0) {
      // Error handling
   }
```

Code the Response Handler 2/2

```
   wRc = tpf_xml_initialize_handle(&w, B2B_XML_SCANNER, NULL);
   if((wRc != 0) || (w == 0)) {
      // Error handling
   }

   wRc = tpf_xml_parseDocument(w, xptr->nodesArray[0].nodeValueStr,
                               TPF_CCSID_IBM1047,
                               strlen(xptr->nodesArray[0].nodeValueStr),
                               &parserRc, 0);
   if(wRc != 0) {
      // Error Handling
   }

   wptr = tpf_xml_getElementsByTagName (w, TYPE_INT, "value");
   if((wptr == NULL) || (wptr->nodesArraySize == 0)){
      // Error handling
   }

   *returnValue = malloc(sizeof(int));
   *(int*)*returnValue = wptr->nodesArray[0].nodeValueDataType.nodeValueInt;
   return (rc);
}
```

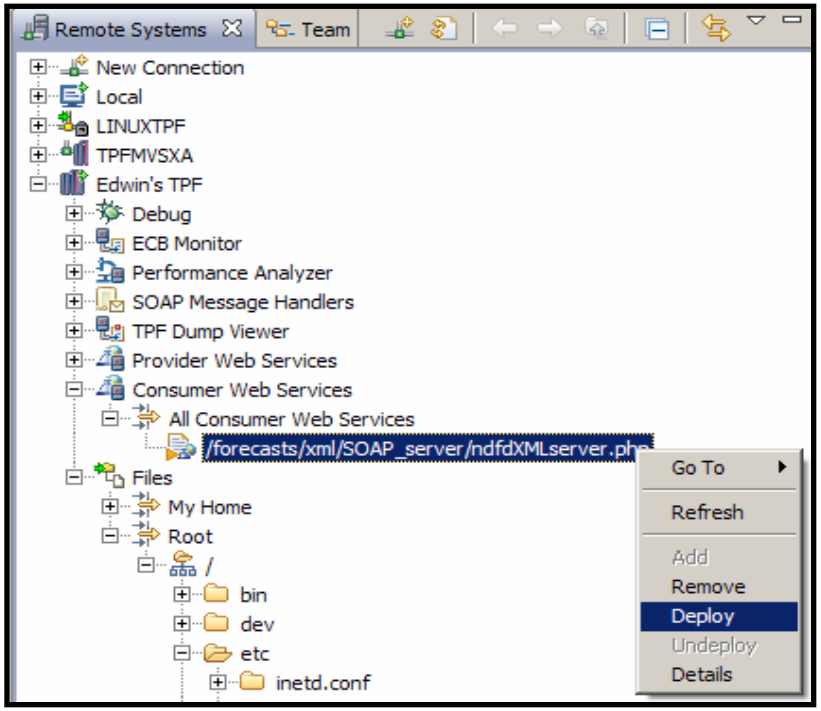
Code the Fault Handler

```
#include <tpf/tpfapi.h>                                          /* edwin */


int bbb1_NDFDgen_fault (t_soapHandle soapHandle, XMLHandle faultMsg, void **returnValue)
{
   int rc = WSSTUB_RET_CONT; /* Function return code      */

   /*************************************************************/
   /* ADD YOUR CODE HERE TO EXTRACT THE NECESSARY DATA FROM THE    */
   /* SOAP FAULT MESSAGE AND CREATE THE REQUIRED INFORMATION TO BE */
   /* PASSED BACK TO THE ORIGINAL CALLING APPLICATION.             */
   /*************************************************************/

   wtopc("bbb1 NFDgen fault", WTOPC_EBROUT + WTOPC_PRC, NULL, NULL); /* edwin */

   /*************************************************************/
   /* Return to tpf_soapInvokeService processing.                  */
   /*************************************************************/
   return (rc);
}/* end of function bbb1_NDFDgen_fault ( )              */
```

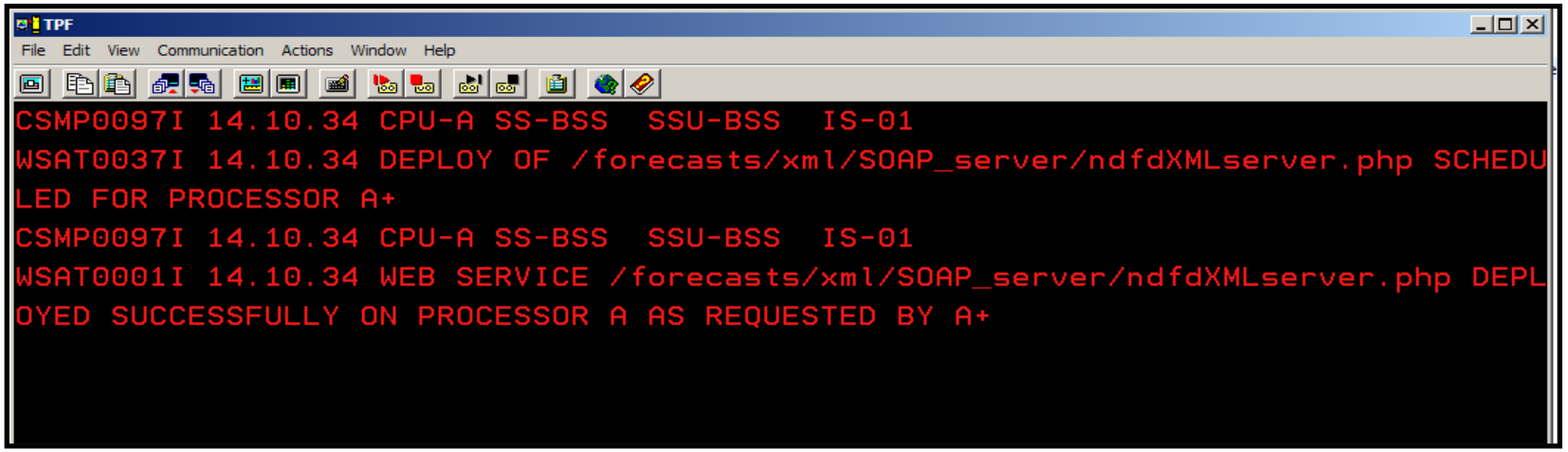
Summary

- **Get the Service's WSDL**
- **Create a Deployment Descriptor**
- **Create STUB code**
- **Deploy the Descriptor**
- **Invoke the Web Service**

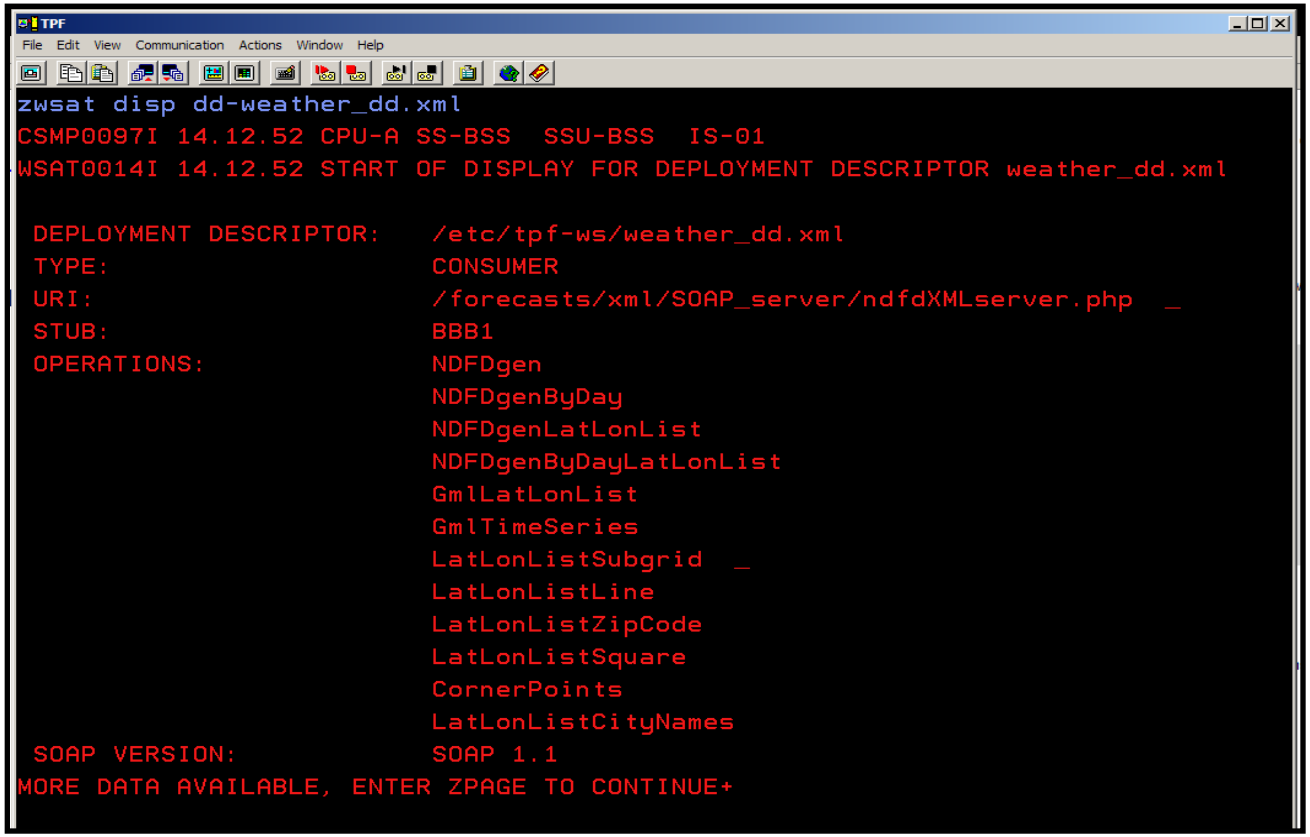
Deploy the Web Service



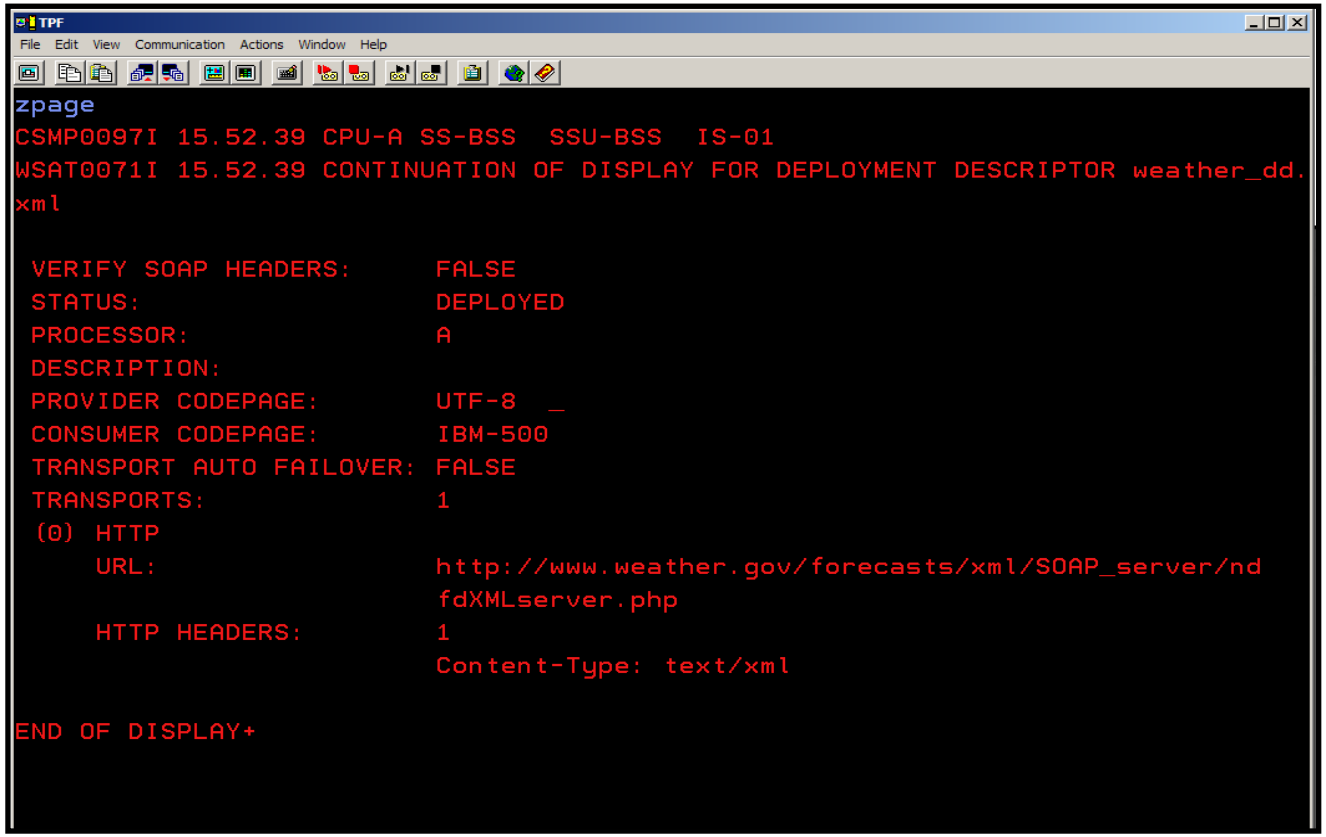
Deploy the Web Service



Display the Web Service



Display the Web Service



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- **Get the Service's WSDL**
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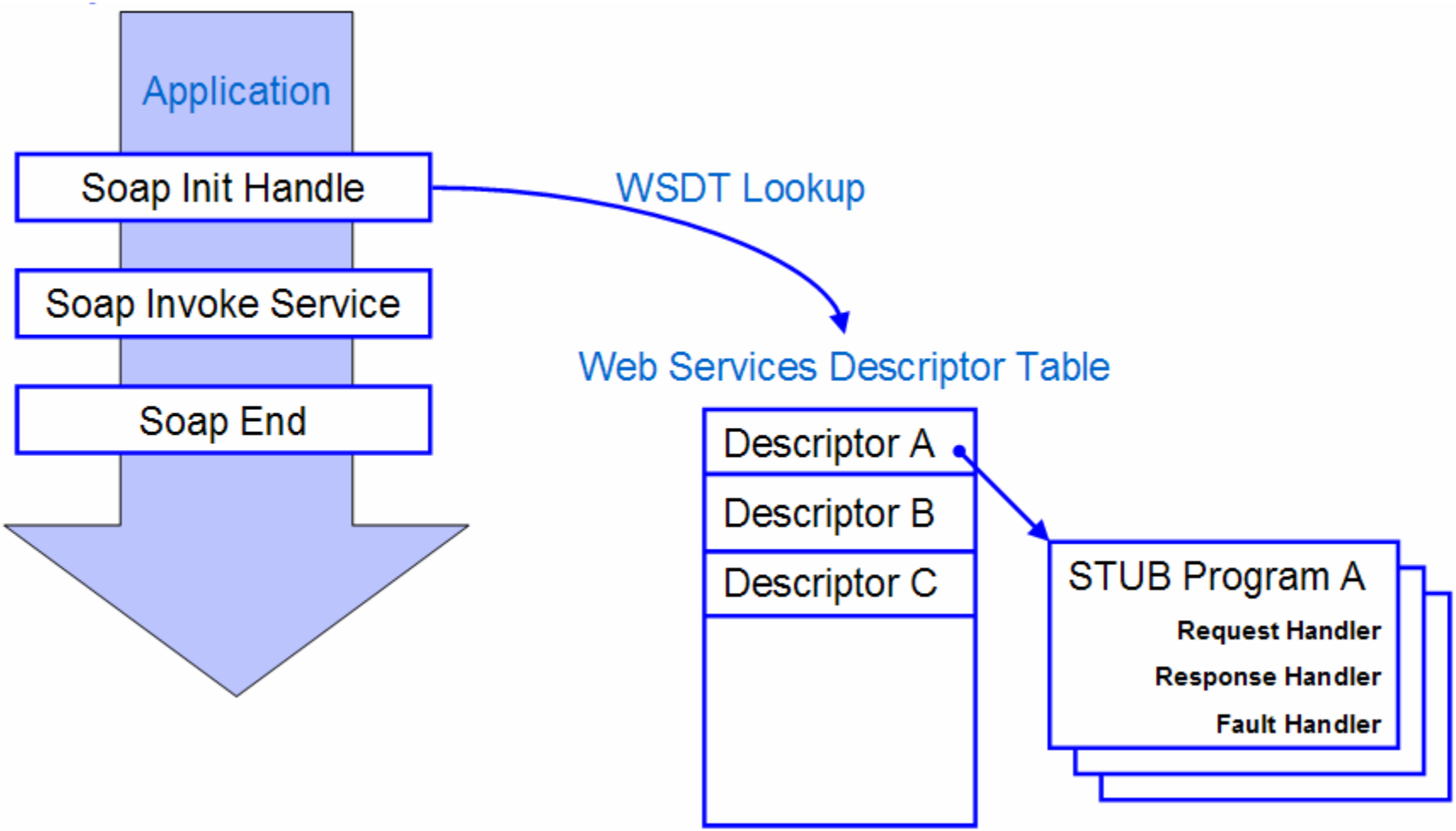
Start Using the Web Service

- **Shared object AAA1**
- **One C++ program aaa1.cpp**
- **To be invoked using ZFMSG**

aaa1.mak

```
##############################################################################
# Define shared object name
##############################################################################
APP := AAA1
APP_EXPORT := ENTRY
APP_ENTRY := AAA1

##############################################################################
# Environments needed for build
##############################################################################
maketpf_env := base_rt
maketpf_env += system

LIBS += CWSA

##############################################################################
# CPP segments
##############################################################################
CXX_SRC := aaa1.cpp

##############################################################################
# Include maketpf build rules
##############################################################################
include maketpf.rules
```

Soap Consumer Flow



Initialize a Soap Consumer Handle

```
LIBS := CWSA
#include  <tpf/c_soap.h>
t_soapHandle tpf_soapInitHandle (char *serviceName);
```

serviceName

A null-terminated string that represents the name of the Web service.

Normal return

A SOAP handle (t_soapHandle) is returned; this represents the SOAP consumer session handle. You must provide this handle for any following SOAP consumer function calls that will use the same session.

Call a Web Service

```
LIBS := CWSA
#include  <tpf/c_soap.h>
int tpf_soapInvokeService (t_soapHandle soapHandle, t_soapInv *invocationParms,
                           void **soapResponse);
```

soapHandle

The SOAP consumer session handle to perform the request for.

invocationParms

A pointer to a fully initialized t_soapInv structure.

soapResponse

A pointer to the SOAP response that will point to different values depending on the dataFormat field.

Normal return

When the SOAP_CONSUMER_SYNC MEP is used, a return of TPF_SOAP_SUCCESS indicates that the tpf_soapInvokeService call was successful.

End Web Service Session

```
LIBS := CWSA
#include  <tpf/c_soap.h>
int tpf_soapEnd (t_soapHandle soapHandle);
```

```
soapHandle

   The SOAP consumer session handle to end.

Normal return

   TPF_SOAP_SUCCESS indicates that the specified consumer Web service session ended.
```

aaa1.cpp 1/4

```
#include <tpf/c_soapc.h>
#include <stdio.h>
#include <stdlib.h>

extern "C" int AAA1() {

   char* date = "2009-03-10T12:00";

   t_soapHandle h = tpf_soapInitHandle("/forecasts/xml/SOAP_server/ndfdXMLserver.php");

   if(h == TPF_SOAP_ERROR) {

      // Error handling
      printf("Soap init handle error\n");
      exit(0);

   } else {
```

aaa1.cpp 2/4

```
t_soapInv parameters;

strcpy(parameters.operation, "NDFDgen");

parameters.timeout = 5;

parameters.messageExchangePattern = SOAP_CONSUMER_SYNC;

parameters.invocParmsVersion = SOAPC_VERSION_1;

parameters.dataFormat = SOAP_PARMS;

t_soapParms* parameterData = (t_soapParms*)calloc(1,
                          (sizeof(t_soapParms) + (sizeof(t_soapParmValues)*6)));

if(parameterData == 0) {
   // Error handling
   printf("Memory allocation failed\n");
   exit(0);
}
```

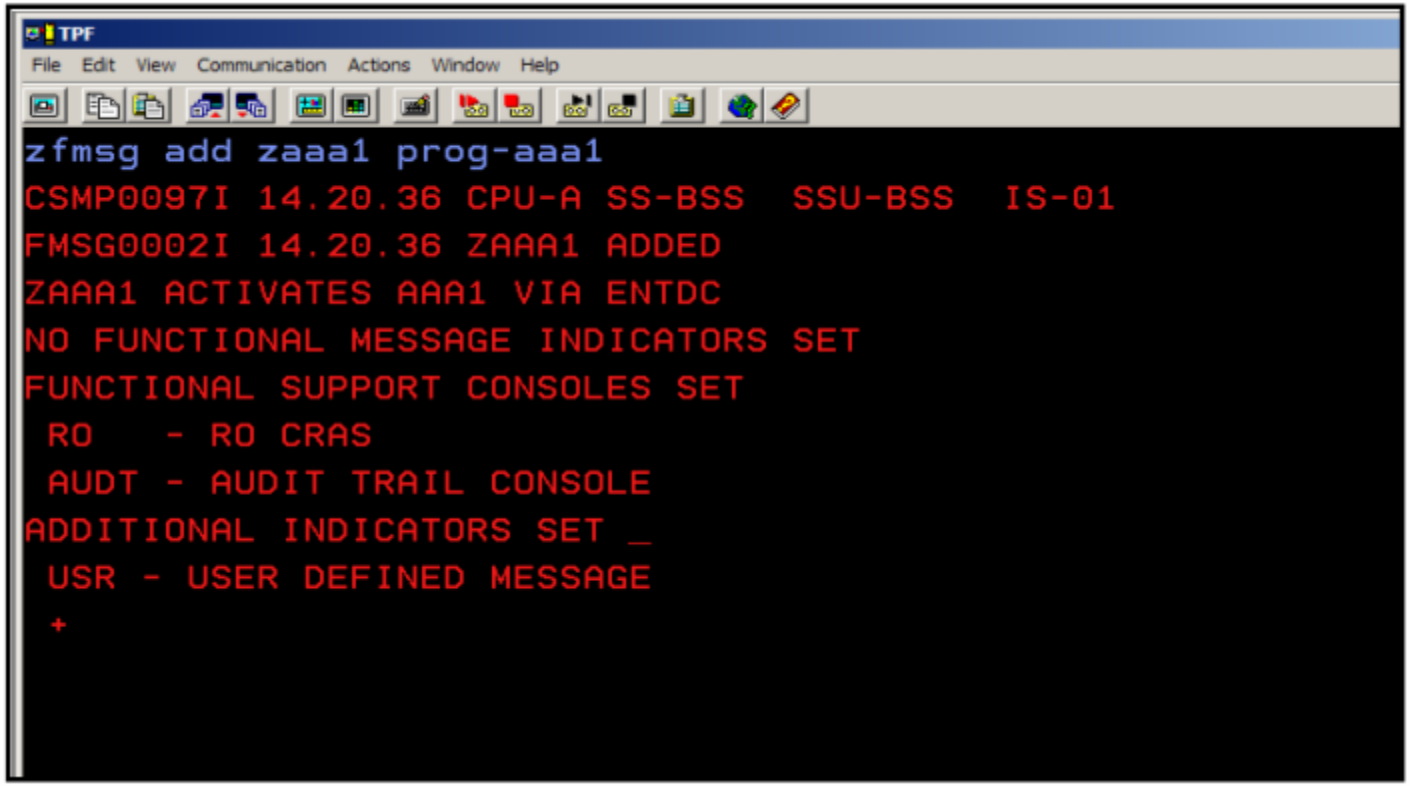
aaa1.cpp 3/4

```
parameterData->numParms = 6;

parameterData->parmArray[0].parmLength = 5;
parameterData->parmArray[0].parmPtr = (void*)"41.90";     // latitude of Chicago, IL
parameterData->parmArray[1].parmLength = 6;
parameterData->parmArray[1].parmPtr = (void*)"-87.65";    // longitude of Chicago, IL
parameterData->parmArray[2].parmLength = 6;
parameterData->parmArray[2].parmPtr = (void*)"glance";    // product
parameterData->parmArray[3].parmLength = 16;
parameterData->parmArray[3].parmPtr = (void*)date;        // startTime
parameterData->parmArray[4].parmLength = 16;
parameterData->parmArray[4].parmPtr = (void*)date;        // endTime
parameterData->parmArray[5].parmLength = 9;
parameterData->parmArray[5].parmPtr = (void*)"maxt=TRUE"; // weatherParameters

parameters.data = parameterData;
```

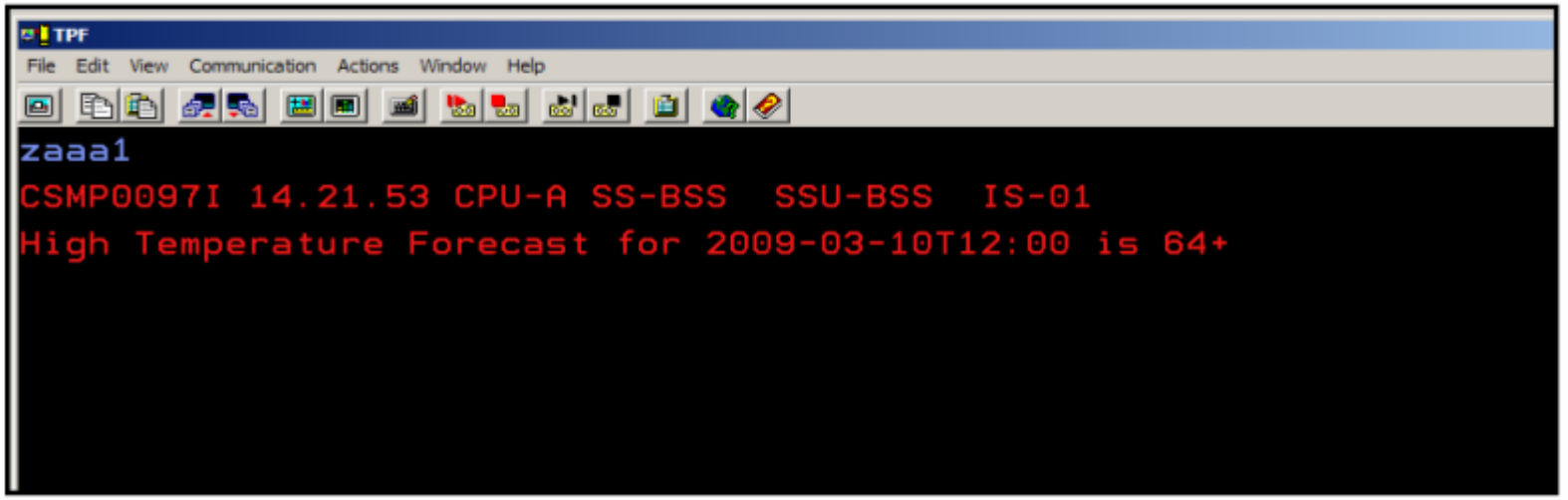
aaa1.cpp 4/4

```
      void* response;
      if(tpf_soapInvokeService(h, &parameters, &response) != TPF_SOAP_SUCCESS) {

         // Error handling
         tpf_soapEnd(h);
         printf("Soap invoke service error - %s\n", strerror(errno));
         exit(0);

      }

      free(parameterData);
      printf("High Temperature Forecast for %s is %d\n", date, *(int*)response);
      free(response);
      tpf_soapEnd(h);

   }

   return 0;
}
```

ZAAA1



ZAAA1



Summary

- **Get a Web service's WSDL**
- **Create a Deployment Descriptor**
- **Create STUB code**
- **Deploy the Descriptor**

Travel Home Safely!

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