SOAP for VSE

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Agenda

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What is SOAP?

- Simple Object Access Protocol
- SOAP provides an implementation of Services Oriented Architecture (SOA)
- A communications protocol
  - Built on HTTP
  - SMTP and FTP can also be used
  - The VSE implementation uses HTTP
  - Also called Services Oriented Architecture Protocol

What is SOAP?

- Services Oriented Architecture
  - Implements business processes as callable services
    - Simple or complex
    - Amount of processing done by a service is unimportant
  - SOAP is one of many ways to accomplish an SOA
    - CICS Transaction Gateway
    - MQ Series
    - Websphere/Java

What is SOAP?

- Cross system program to program communications (RPC)
  - From any operating system
  - From any programming language
  - To any operating system
  - To any programming language
- Initiated by a program on one system communicating to a program on the same or another system

What is SOAP?

- Provider
  - The system that makes available the SOAP Service
  - The 'server'
- Consumer
  - That which uses the SOAP Service
  - The 'client'

What is SOAP?

- SOAP envelope is the basic method of information exchange
- Envelope is an XML document
  - wrapped in an HTTP request or response
- Conversion to/from XML is handled by the implementation
  - Programmer does not need to know XML
  - Does not hurt to have some basic knowledge

General information

- SOA and Web Services
  http://www-130.ibm.com/developerworks/webservices/
- New to SOA and Web Services
  http://www-128.ibm.com/developerworks/webservices/newto/
- SOA and Web Services White Papers
  http://www.systinet.com/resources/white_papers
- SOAP Tutorial
  http://www.w3schools.com/soap/default.asp
- Web Services Architect
  http://www-106.ibm.com/developerworks/webservices/library/ws-arc1/
- What is Services Oriented Architecture?
  http://webservices.xml.com/pub/a/ws/2003/09/30/soa.html

SOAP for VSE

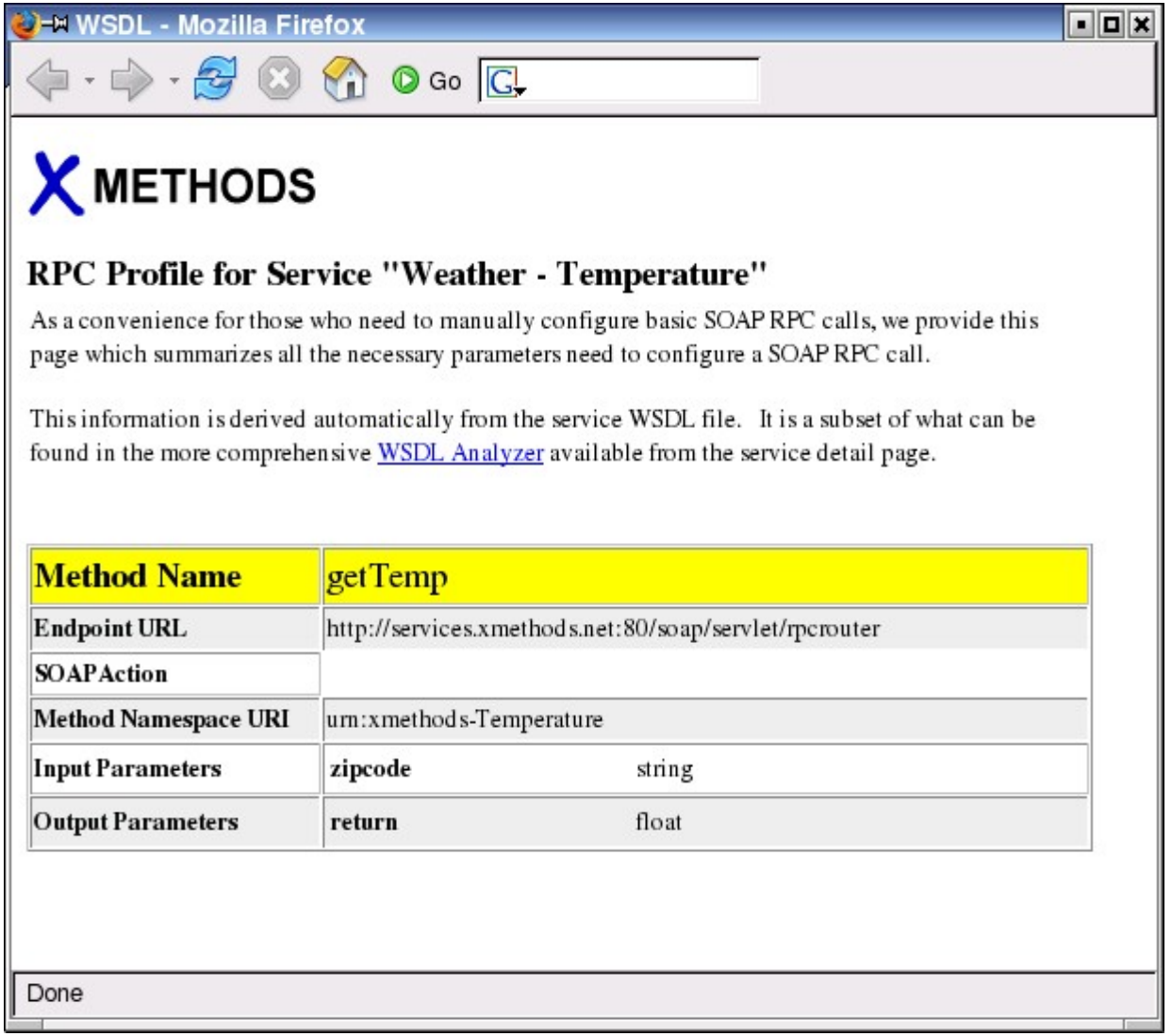
- Available with VSE/ESA 2.6 +PQ78973, VSE/ESA 2.7 and z/VSE 3.1
- Implemented as an extension of CICS Web Support
- Runs under CICS Transaction Server
- HTTP Client and XML Parser available for batch

Information about SOAP for VSE

- eBusiness Connectors Users Guide
  - SC33-8231 – Chapter 24
- VSE Connector Client
  - Soap Examples
  - Web Pages

Using the SOAP Client

- Get the parameters of the SOAP service to be called



Using the SOAP Client

- This web service takes a single parameter, a US zipcode
- The server is called with:
  - `http://64.124.140.30/soap/service/rpcrouter`
- The method name is **getTemp**
- A single floating point value is returned

Using the SOAP Client

- Data Areas
- SOAP_PARAM_HDR
  - In and Out parameters
  - Read from/Written to temporary storage
- SOAP_DEC_PARAM
  - COMMAREA for calling the encoder (IESSOAPE)

Using the SOAP Client

```
01 SOAP-PARAM-HDR.
   05  NAME      PIC X(16).
   05  TYPENAME  PIC X(16).
   05  LENGTH    PIC 9(4)  COMP.
   05  TYPE      PIC 9(4)  COMP.
   05  PARAMETER PIC X(260).
```

- Name of parameter
- Name of parameter field type
- Length of parameter
- Field type code
- Parameter value

Using the SOAP Client

- Field type codes

```
UNSPECIFIED 0   // unknown/unspecified type
PRIVATE     1   // private type
STRUCT      2   // hirarchical structure
STRING      10  // String
INTEGER     11  // Integer (4 bytes)
SHORT       12  // Short (2 bytes)
BYTE        13  // Byte (1 byte)
BOOLEAN     14  // Boolean (1 byte)
BINARY      15  // Binary (XML Base64)
```

Using the SOAP Client

- Each parameter passed to the SOAP Server is written out to a temporary storage queue
- The queue name convention is the current task number with 'I' or 'O' appended to it
  - eg: 0000078I
  - eg: 0000078O
- The direction (input or output) is relative to the encoder

Using the SOAP Client

- Set up the queue name data areas

```
05  OUTQUEUE.
    10 CICS-TASKNUM-O PIC 9(7).
    10 FILLER         PIC X VALUE 'O'.
05  INQUEUE.
    10 CICS-TASKNUM-I PIC 9(7).
    10 FILLER         PIC X VALUE 'I'.
```

- Move the appropriate values

```
MOVE EIBTASKN TO CICS-TASKNUM-O,
                 CICS-TASKNUM-I.
```

Using the SOAP Client

- Move the parameter to the queue data area

```
MOVE 'zipcode' TO NAME.
MOVE 'string' TO TYPENAME.
MOVE 45 TO LENGTH.
MOVE 10 TO TYPE.
```

- Write the parameter to the queue

```
EXEC CICS WRITEQ TS QUEUE(INQUEUE)
    FROM(SOAP-PARAM-HDR)
    LENGTH(TS-QUEUE-LENGTH-IN)
    RESP(COMMAND-RESPONSE)
    END-EXEC.
```

Using the SOAP Client

- Move the encoder parameters to the COMMAREA

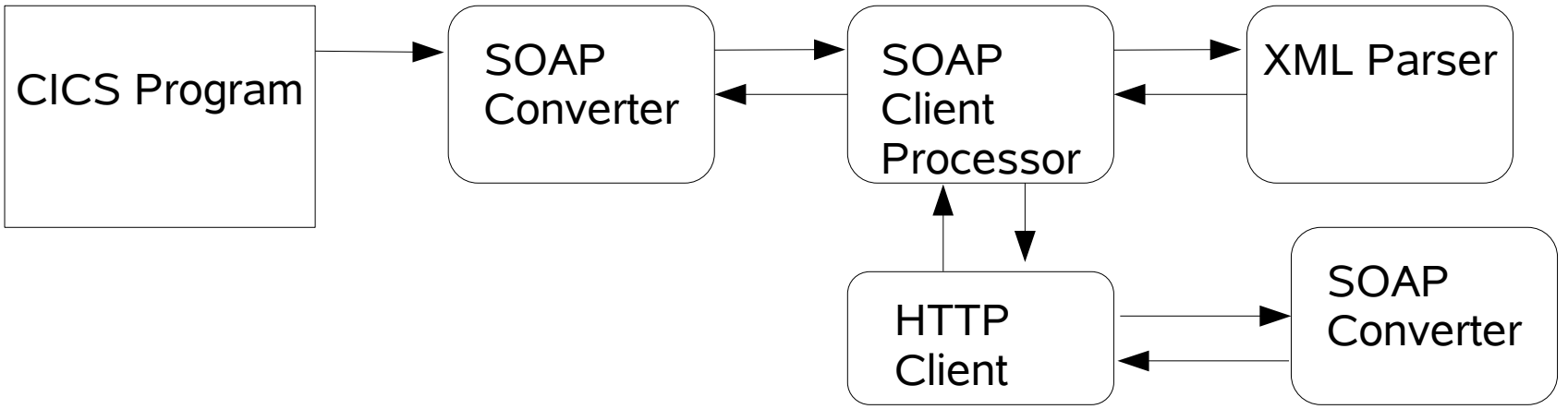
```
MOVE 'http://64.124.140.30/soap/service/rpcrouter' TO URL.
MOVE 'getTemp' TO METHOD.
MOVE 'urn:xmethods-Temperature' TO URN.
```

- Call the encoder

```
EXEC LINK PROGRAM('IESSOAPE')
    LENGTH(ENC-DEC-COMMAREA-LENGTH)
    COMMAREA(SOAP-DEC-PARAM)
    RESP(COMMAND-RESPONSE)
    RESP2(COMMAND-RESPONSE2).
```

Using the SOAP Client

- The encoder calls the SOAP client processor
- ...the XML processor
- ...the HTTP client
- Envelope is sent to the remote web service
- The response takes the reverse path

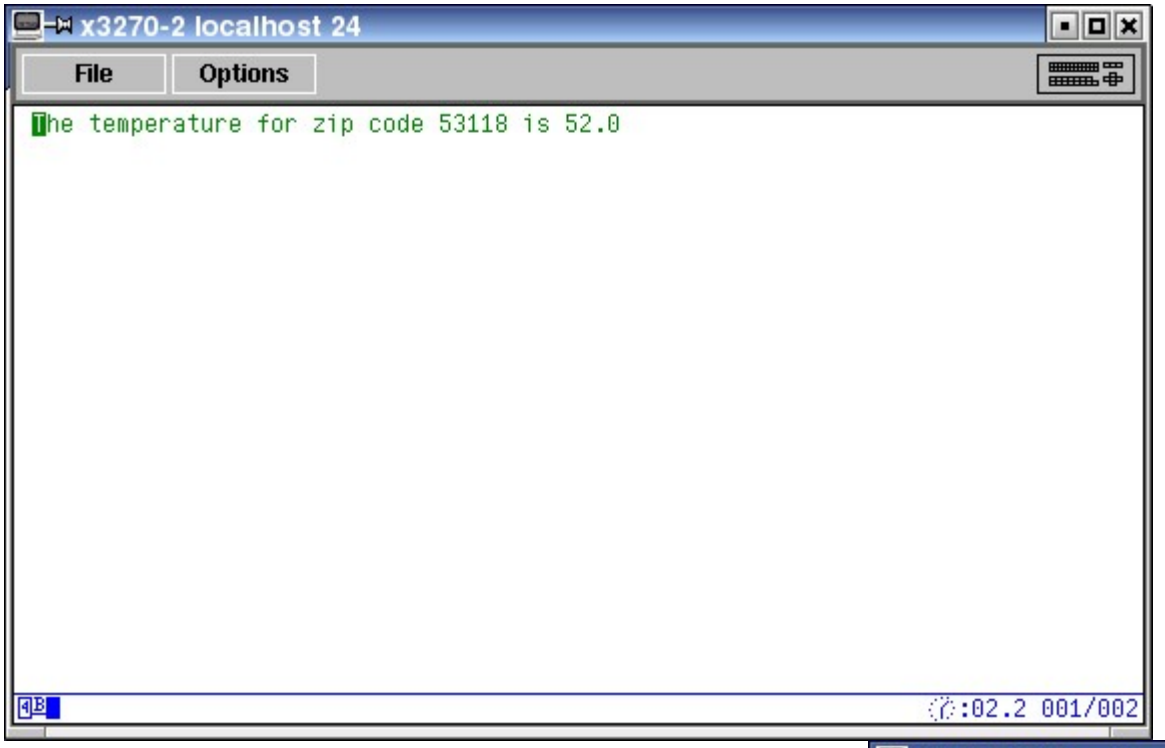


Using the SOAP Client

- When control returns – read the responses from temporary storage

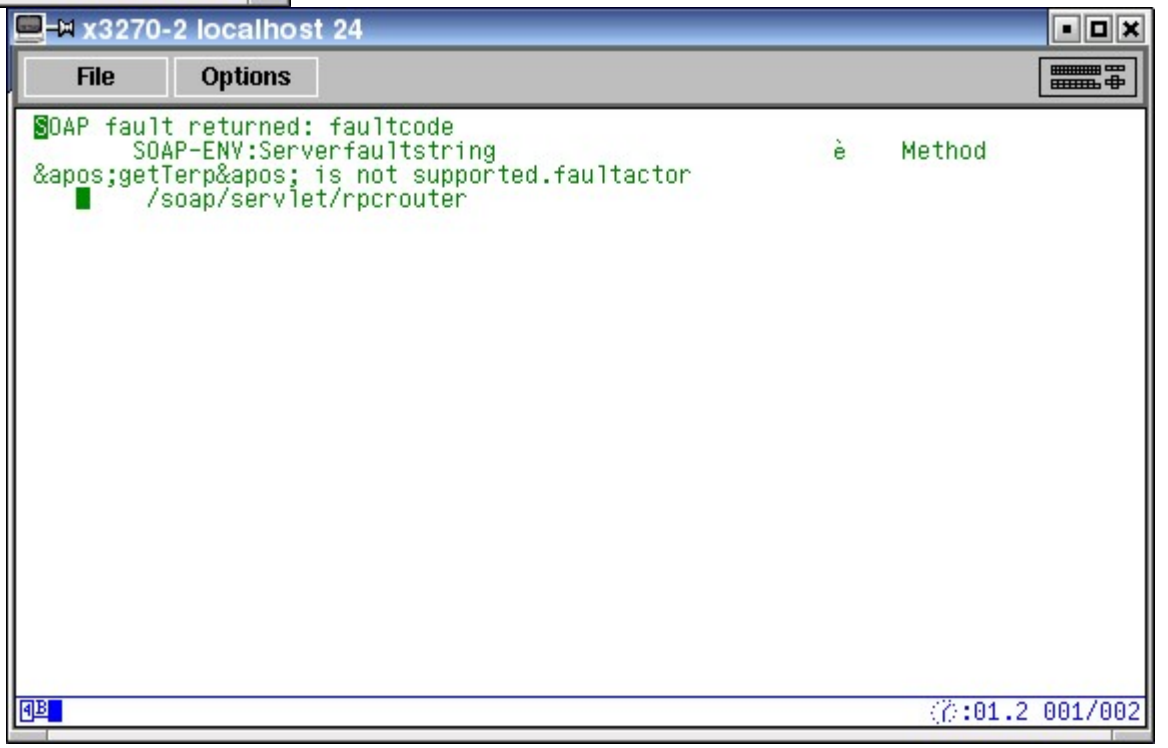
```
EXEC CICS READQ TS QUEUE(OUTQUEUE)
     FROM(SOAP-PARAM-HDR)
     LENGTH(TS-QUEUE-LENGTH-OUT)
     RESP(COMMAND-RESPONSE)
     END-EXEC.
```

- Check response for 'fault'
- Otherwise process returned data



Enter zipcode,
temperature is returned

An example of using an
invalid method name



Configuring CICS to be a SOAP Server

- SOAP is based on HTTP
- CICS provides an HTTP Server
  - For CICS Web Support
- SOAP Server for VSE is an extension of CWS
- CICS configuration as a SOAP Server is exactly the same
  - TCP/IP support must be on in the SIT (TCPIP=YES)
  - A TCP/IP Service must be defined

Configuring CICS to be a SOAP Server

```
CEDA  View TCpipservice( HTTPNSSL )
 TCpipservice   : HTTPNSSL
 Group          : TCPSVC
 Description    : CICS Web TCPIPSERVICE

 Urm            : DFHWBADX
 Portnumber     : 01080                 1-65535
 Certificate    :

 STatus         : Open                  Open | Closed
 SSl            : No                    Yes | No |
Clientauth
 Attachsec      : Verify                Local | Verify
 TRansaction    : CWXN
 Backlog        : 00005                 0-32767
 TSqprefix      :
 Ipaddress      :
 SOcketclose    : No                    No | 0-240000
```

Demo SOAP Service on VSE

- COBOL Application to do state lookup
  - Enter US state code
  - VSAM lookup
  - Display state name
- Two programs
  - Program 1 invoked by transaction
    - Handles screen I/O
  - Program 2 called by program 1
    - Handles VSAM I/O

Application considerations

- To be a Web Service
  - A CICS program needs to be called with EXEC CICS LINK
  - Read parameters from TS, write responses to TS
- Not always desirable to change an existing program
  - A wrapper is used to intercept the SOAP call
  - Read the parameters from TS
  - EXEC CICS LINK to the Web Service passing a properly formed COMMAREA
  - Write responses back to TS

SOAP Wrapper

- Written in COBOL (originally assembler)
- Called by CICS SOAP Server (IESSOAPD)
- Passed a COMMAREA

```
01  DFHCOMMAREA.
     05  METHOD        PIC X(16).
     05  INQUEUE       PIC X(8).
     05  OUTQUEUE      PIC X(8).
     05  FILLER        PIC X(128).
     05  RET-CODE      PIC 9(8) COMP.
```

- Reads SOAP parameters from inqueue
- Formats COMMAREA, calls program in METHOD field
- Writes responses to outqueue

SOAP Client options

- SOAP is operating system and programming language agnostic
- Pick (almost) any combination
  - ✔ Windows
  - ✔ Linux
  - ✔ AIX
  - ✔ z/VSE
  - ✔ z/OS
  - ✔ Java
  - ✔ PHP
  - ✔ COBOL
  - ✔ Visual Basic/C/C++
  - ✔ .Net

SOAP Client setup

- Example will use Java on Linux
- Download and install
  - Java SDK
  - Apache SOAP
  - Sun Java Mail and JavaBeans Activation Framework
- Only three Java classes are required
  - soap.jar
  - mail.jar
  - activation.jar

SOAP Client setup

```
-rw-r--r--    1 rks0     users       54829 2004-08-23 16:10 activation.jar
drwxrwxr-x    4 rks0     users        4096 2004-05-11 12:54 jaf-1.0.2
drwxrwxr-x    5 rks0     users        4096 2004-05-11 08:36 javamail-1.3.1
-rw-r--r--    1 rks0     users      327603 2004-08-23 16:10 mail.jar
drwxr-xr-x    6 rks0     users        4096 2002-06-10 01:13 soap-2_3_1
-rw-r--r--    1 rks0     users      232498 2004-08-23 16:09 soap.jar
```

SOAP Client

- Our Java program will use Web Services to call 'program 2' running under CICS
- It will pass a single parameter
  - two character state code

```
if (args.length != 2) {
  System.err.println ("Usage: java " + getstate.class.getName () +
                      " SOAP-router-URL statecode");
  System.exit (1);
}
// Process the arguments.
String encodingStyleURI = Constants.NS_URI_SOAP_ENC;
URL url = new URL (args[0]);
String statecode = args[1];
```

SOAP Client

- Set up the SOAP call

```
call.setTargetObjectURI ("urn:iessoapd:soapwrap");
call.setMethodName ("liststad");
```

- Use a vector to hold the parameters

```
Vector params = new Vector ();
params.addElement (new Parameter("statecode", String.class,
     statecode, null));
call.setParams (params);
```

- Make the call

```
Response resp = call.invoke (url, "" );
```

SOAP Client

- After we're done

```
if (resp.generatedFault ()) {
  Fault fault = resp.getFault ();
  System.err.println("Generated fault: " + fault);
} else {
  Parameter result = resp.getReturnValue ();
  System.out.println ("Response: " + result.getValue ());
}
```

SOAP Client

- Set the classpath

```
export CLASSPATH=.:soap.jar:mail.jar:activation.jar
```

- Compile the java source

```
javac getstate.java
```

- Run the code

```
java getstate http://192.168.200.3:1080/cics/CWBA/IESSOAPS WI
```

- Expected response

```
Response: WIWisconsin
```

- Passing an invalid state code

```
Response: 99STATE CODE NOT FOUND
```

Conclusion

- The COBOL code used here is available at

  `ftp://ftp.software.ibm.com/eserver/zseries/zos/vse/download/xmps/soap_cobol_rsmrcina.zip`

- COBOL and Java programs available at

  `http://www.vmassist.com/rs_samples`

Questions

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