z/TPF V1.1

TPF Users Group Spring 2008

SOAP Message Handlers:
Extending the basic SOAP protocol

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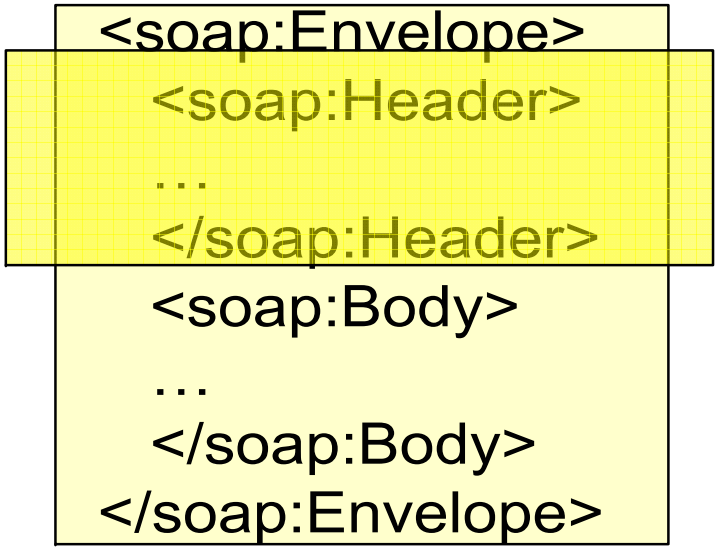
IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

Extending the basic Web services support

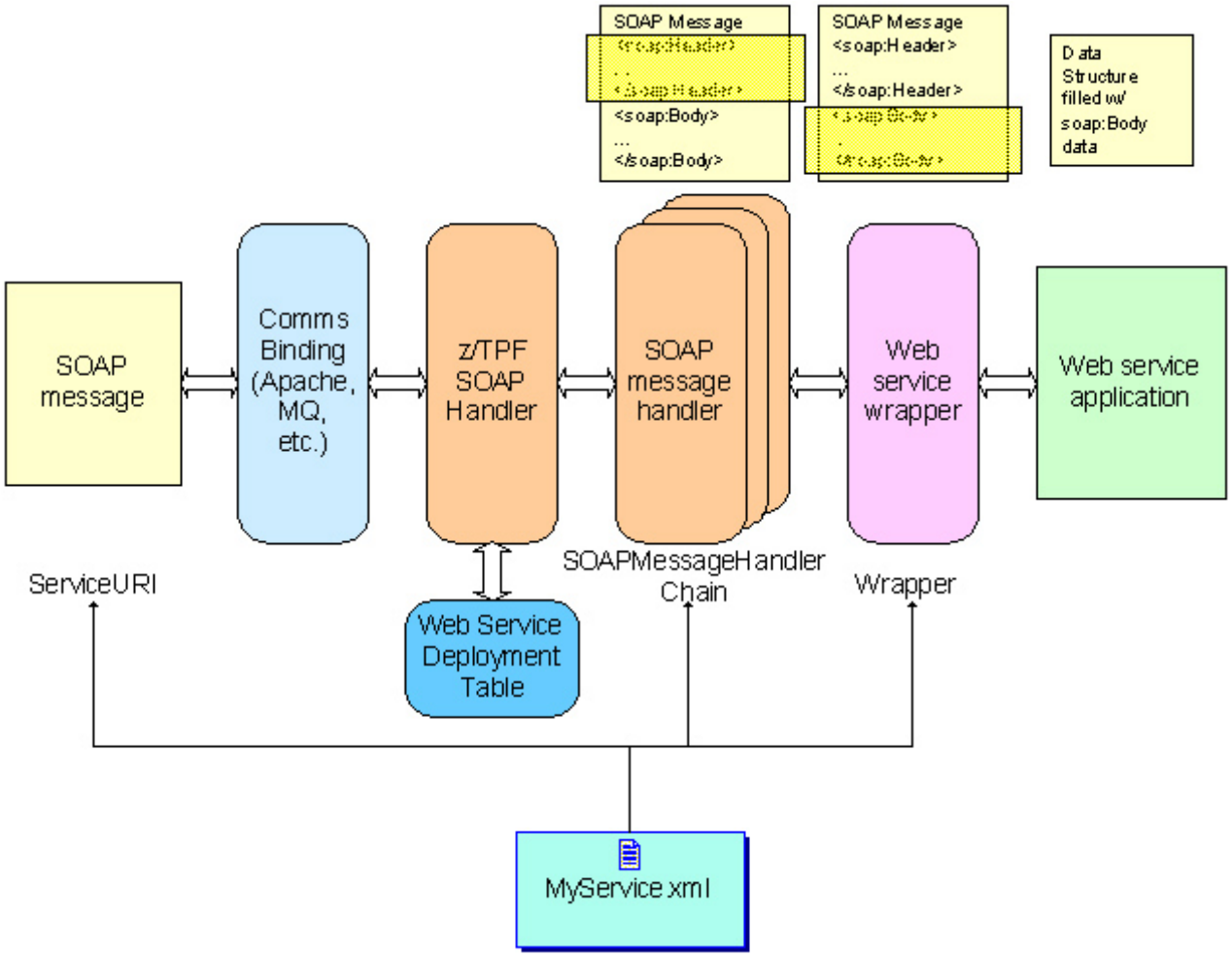
- The SOAP specifications allow for a great deal of extensibility by using the “Header” section of SOAP messages
- A large number of secondary specifications have evolved for solving common business problems; collectively, these are known as ***SOAP features*** or ***WS-****
  - WS-Security
  - WS-Addressing
  - WS-Reliable Messaging
- As of z/TPF PUT 4 (PJ32215), you can easily create reusable Web service extensions, known on z/TPF as ***SOAP message handlers***



Taking advantage of SOAP message handlers

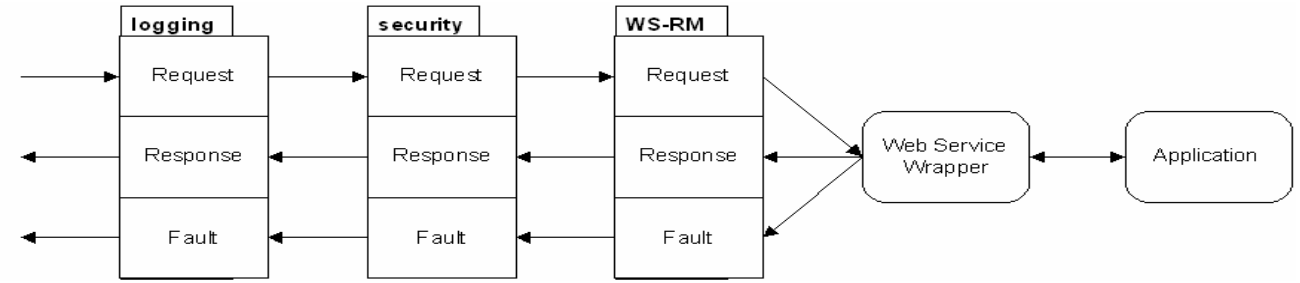
- SOAP message handlers provide a single, reusable interface for extending one or more provider Web services
  - Standard SOAP features: WS-Security, WS-Addressing, WS-*
  - User-specific functionality: request/response logging, etc.
- Creating SOAP message handlers for use on z/TPF requires 2 artifacts:
  - ***SOAP message handler deployment descriptor:*** defines the runtime characteristics of the SOAP message handler
  - ***SOAP message handler program:*** performs necessary processing using the inbound SOAP request and the outbound SOAP response
- Each provider Web service that requires a SOAP message handler to be called must include the message handler's name in the SOAPMessageHandlerChain element of its own deployment descriptor

Logical processing flow of a SOAP request



Implementing a SOAP message handler program

- SOAP message handlers are invoked by the z/TPF SOAP handler in each of the following situations:
  - **SOAP request:** called in the order they are listed in the Web service's SOAP message handler chain before calling the Web service wrapper
  - **SOAP response:** called in the reverse order they are listed in the Web service's SOAP message handler chain after calling the Web service wrapper
  - **SOAP fault:** called in the reverse order they are listed in the Web service's SOAP message handler chain



SOAP message handler interface

```
typedef enum SOAP_MSGHDLR_RET(*intfn)(enum SOAP_MSGHDLR_ACT,
                                      tpfSoapMsgCtx*);
```

- **Parameter #1:** Specifies reason for invoking SOAP message handler (received request, sending response, sending SOAP fault)
- **Parameter #2:** SOAP message context structure (defined in `<tpf/c_soapctx.h>`
  - Contains XML API handles for the SOAP request and response
  - Contains a complete copy of the Web service deployment table (WSDT) entry for the intended Web service
  - Macros available to get information about this SOAP message handler from the SOAP message context. For example:
    - `TPF_SOAP_MSGCTX_GET_HDLR_WRKAREA`
    - `TPF_SOAP_MSGCTX_SET_HDLR_WRKAREA`

Example uses for SOAP message handlers

- **logging**: Log information about SOAP requests/responses to the syslog facility
- **SNMP_alert:** Send an SNMP alert when a SOAP fault is generated in response to a SOAP request
- **msg_expiration:** Validate the WS-Security expiration timeout value before processing SOAP request and before sending SOAP response

Example #1: *logging*

- Request Flow: MSGHDLR_ACT_REQ

```
openlog ("WSLOG", LOG_PID, LOG_USER);

syslog (LOG_INFO, "Request logged for service %.32s, operation: %.32s",
        ctx->wsdt_ent.key, xptr->nodesArray[0].nodeName);

closelog ();
```

- Response Flow: MSGHDLR_ACT_RESP

```
openlog ("WSLOG", LOG_PID, LOG_USER);

syslog (LOG_INFO, "Response logged for service %.32s, operation: %.32s",
        ctx->wsdt_ent.key, xptr->nodesArray[0].nodeName);

closelog ();
```

- Fault Flow: MSGHDLR_ACT_FAULT

```
openlog ("WSLOG", LOG_PID, LOG_USER);

syslog (LOG_NOTICE, "Fault logged for service %.32s, operation: %.32s",
        ctx->wsdt_ent.key, xptr->nodesArray[0].nodeName);

closelog ();
```

Note: Complete sample is available for download at http://www-306.ibm.com/software/htp/tpf/download/ztpfsoap.htm

Example #2: *SNMP_alert*

- Request Flow: MSGHDLR_ACT_REQ
  - Do nothing
- Response Flow: MSGHDLR_ACT_RESP
  - Do nothing
- Fault Flow: MSGHDLR_ACT_FAULT
  - Setup: you will need to define your own Enterprise-specific management information base (MIB) variable that represents the particular service

```
tpf_snmp_BER_encode ();  /* BER encode the ObjectID,
                            value, binding*/

tpf_itrpc ():            /* Send the Trap to the
                            remote SNMP destination
                            managers defined in
                           /etc/snmp.cfg */
```

Example #3: *msg_expiration*

- Using a feature of WS-Security specification, validate that a SOAP request has not expired, as specified by the consumer, before processing the SOAP request or sending back the SOAP response

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="..." xmlns:wsse="..." xmlns:wsu="...">
   <SOAP-ENV:Header>
      <wsse:Security SOAP-ENV:mustUnderstand="true">
         <wsu:Timestamp wsu:Id="timestamp">
           <wsu:Created>2008-03-10T01:56:02Z</wsu:Created>
           <wsu:Expires>2008-03-10T01:56:03Z</wsu:Expires>
         </wsu:Timestamp>
      </wsse:Security>
   </SOAP-ENV:Header>
   ...
</SOAP-ENV:Envelope>
```

Example #3: *msg_expiration* (continued)

- Request Flow: `MSGHDLR_ACT_REQ`
  - Inspect the `Expires` timestamp and ensure that the message hasn't expired upon receipt

```
time_t curTime;
time_t *expireTime = (time_t *)malloc(sizeof time_t);
/* Get current time */
curTime = time(NULL);
/* Compare it with <wsu:Expires> */
nodeArray = tpf_xml_getNextElementByTagName
              (xmlPtr, TYPE_DATETIME, "Expires");
*expireTime =
  mktime(nodeArray->nodesArray[0].nodeValueDataType.nodeValueDateTime;
/* If message has expired, return fault, else save expiration in work area */
if (*expireTime < curTime)
  tpf_soap_build_fault_ext (soapFaultPtr, &faultHandle);
else
  TPF_SOAP_MSGCTX_SET_HDLR_WRKAREA (ctx, expireTime);
```

Example #3: *msg_expiration* (continued)

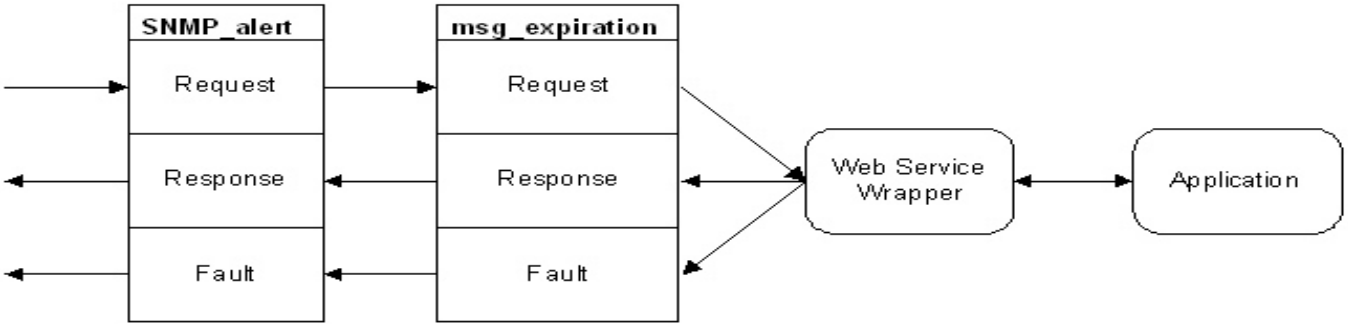
- Response Flow: MSGHDLR_ACT_RESP
  - Check the current time against the previously saved expiration time and ensure that the message hasn't expired just prior to sending the response

```
time_t curTime;
time_t *expireTime;
/* Get current time */
curTime = time(NULL);
/* Compare it with the expiration time */
expireTime = (time_t *)TPF_SOAP_MSGCTX_GET_HDLR_WRKAREA (ctx);
/* If message has expired, return fault and activate transaction rollback */
if (*expireTime < curTime) {
  tpf_soap_build_fault_ext (soapFaultPtr, &faultHandle);
  if (((pid = fork()) != -1) && (pid))
    execl ("/test.sh", lniata, NULL);  }
```

- Fault Flow: MSGHDLR_ACT_FAULT
  - Do nothing

Combining the message handlers

- **Problem:**
  - msg_expiration SOAP message handler only informs the SOAP consumer in the case of an expired message
  - Your SNMP management console must be notified of this event as well
- **Solution:** Include both message handlers in your message handler chain for the particular Web service



Even more uses for SOAP message handlers

- *billing* SOAP message handler
  - Capture system utilization statistics from ECB when request is received just before handing it off to wrapper
  - Compare with system utilization statistics from ECB after response is built
  - Update billing information based on actual system resources used to satisfy the consumer request
- Extensibility options are limitless!

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