Dominik Stein

Wrapping the XML-parser 'expat' in Rexx/ObjectRexx.

RexxExpat

- An Introduction -

Table of Contents

Overview

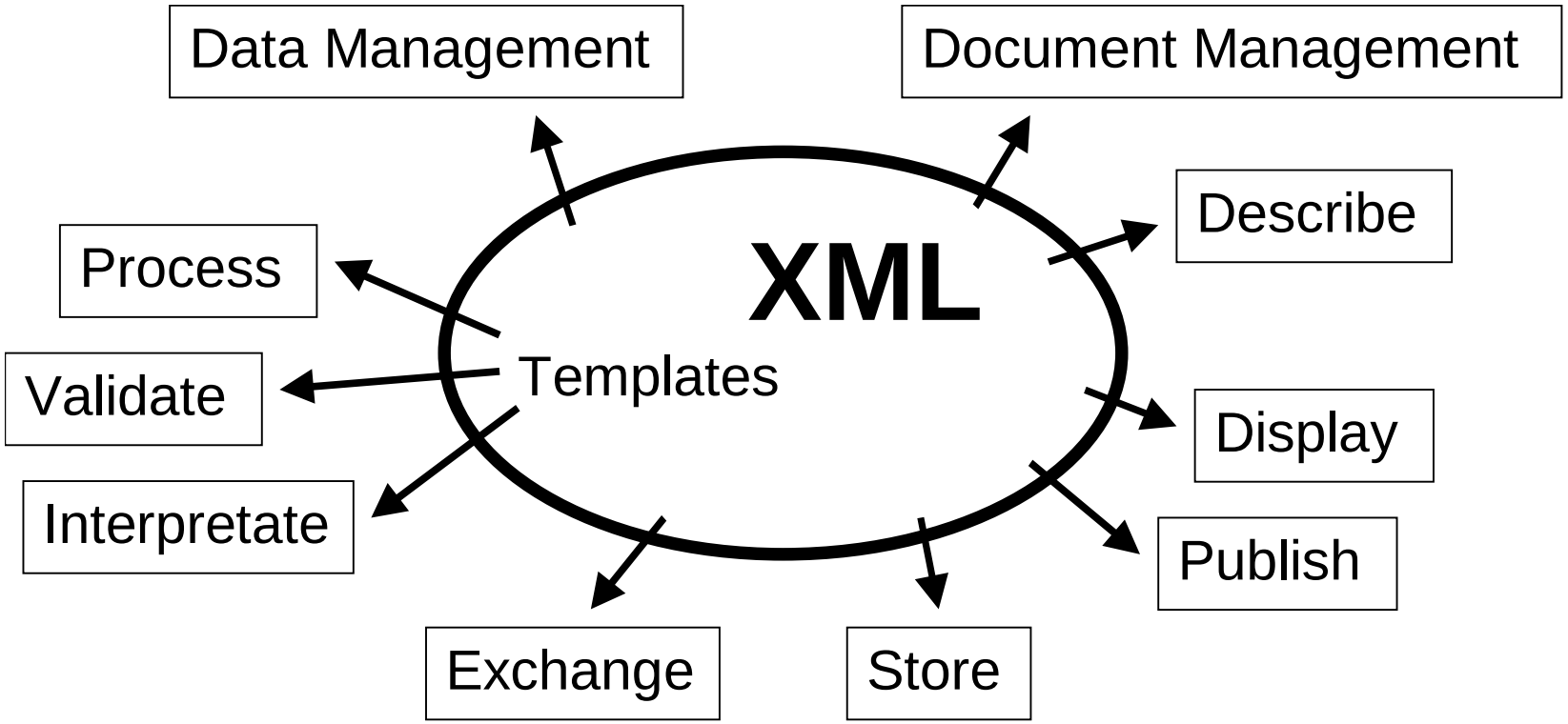
XML (eXtended Markup Language)

- standardized meta language to define individual document types
- allows automated processing and easy exchange of data

expat

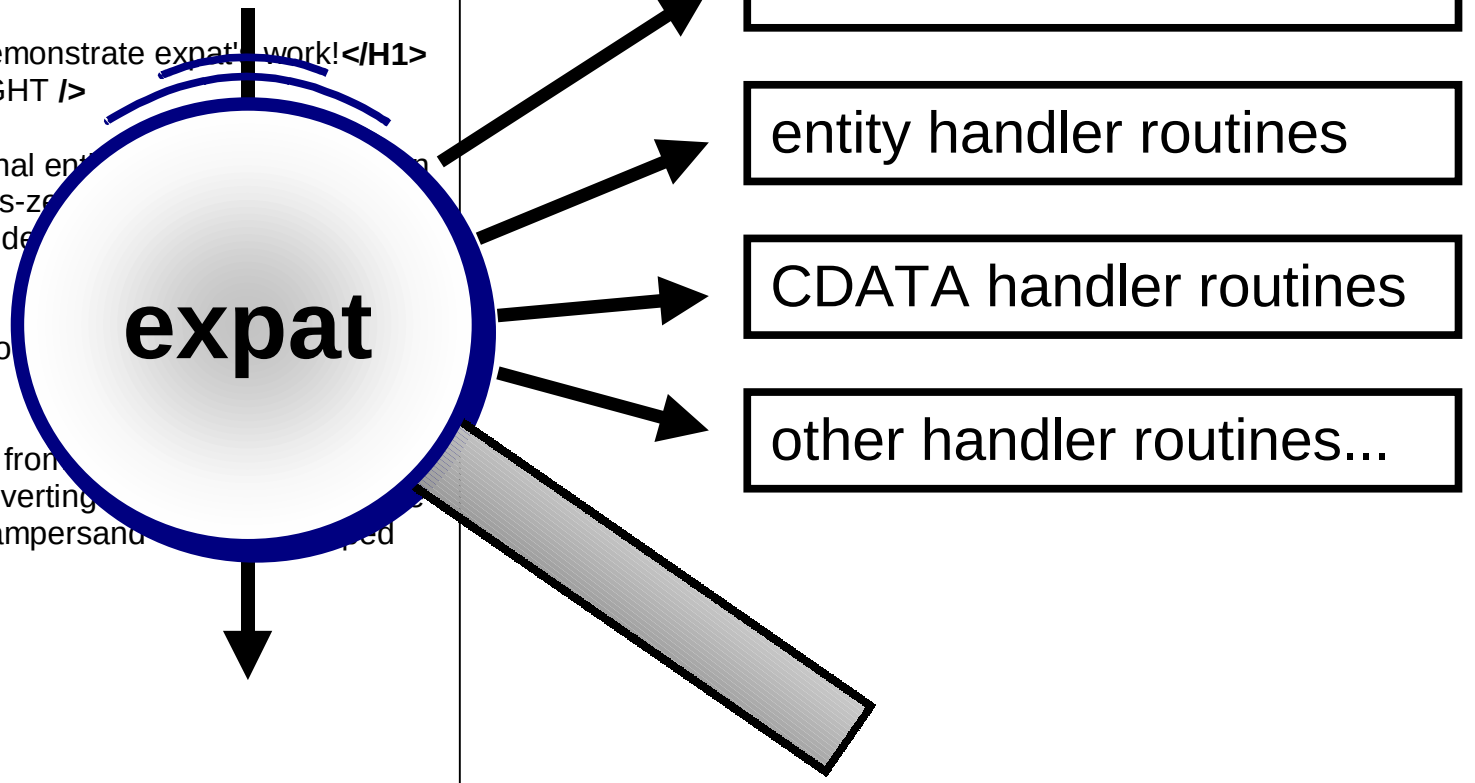
- conforming, non-validating XML-parser
- in C implemented
- supports individual encodings, namespace processing and external entity parsing

Using XML


Data Management
Document Management
Describe
Process
XML
Templates
Validate
Display
Interpretate
Publish
Exchange
Store

expat in Action

```
<?xml version="1.0" standalone='no' encoding='NativeAustrian' ?>

<!DOCTYPE HTML
        PUBLIC      "-//W3C//DTD HTML 4.0 Transitional//EN"
        SYSTEM      "http://www.w3.org/TR/REC-html40/loose.dtd">

<HTML> <BODY>
        <H1>This is a document to demonstrate expat's work!</H1>
        <IMG SRC='logo' ALIGN=RIGHT />

        Well, an example for an external en
        Umlaut 'ü' and the German ess-z
        &uuml; and &szlig;. They are de
        (aren't they?).

        <?php echo("To serve XML do

        <![CDATA[
        >>> This text could be copied fro
        as CDATA frees you from converting
        left sharp bracket '<' and the ampersand
        form ("&lt;" and "&amp;")! <<<
        ]]>

        Author &author;

</BODY> </HTML>
```



Example: expat parsing XML

```
<?xml version="1.0" standalone='no' encoding='NativeAustrian' ?>

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN"
              SYSTEM "http://www.w3.org/TR/REC-html40/loose.dtd">

<!-- XML declarations -->

<!NOTATION php SYSTEM "http://www.php.net/onlineservices/php.exe">

<!NOTATION gif SYSTEM "http://www.dot.com/viewers/gifviewer.exe">

<!ENTITY logo SYSTEM "/bilder/RexxExpat.gif" NDATA gif>

<!ENTITY copyright SYSTEM "copyright.html">

<!ENTITY author "Dominik Stein">
```

<HTML> **<BODY>**

<H1>This is a little document to demonstrate RexxExpat's work!**</H1>**

<IMG **SRC**='logo' **ALIGN**=RIGHT **/>**

Well, an example for an external entity might be the German Umlaut 'ü' and the German ess-zett 'ß' in their escaped form: **&**uuml**;** and **&**szlig**;.** They are declared in the HTML-DTD (aren't they?).

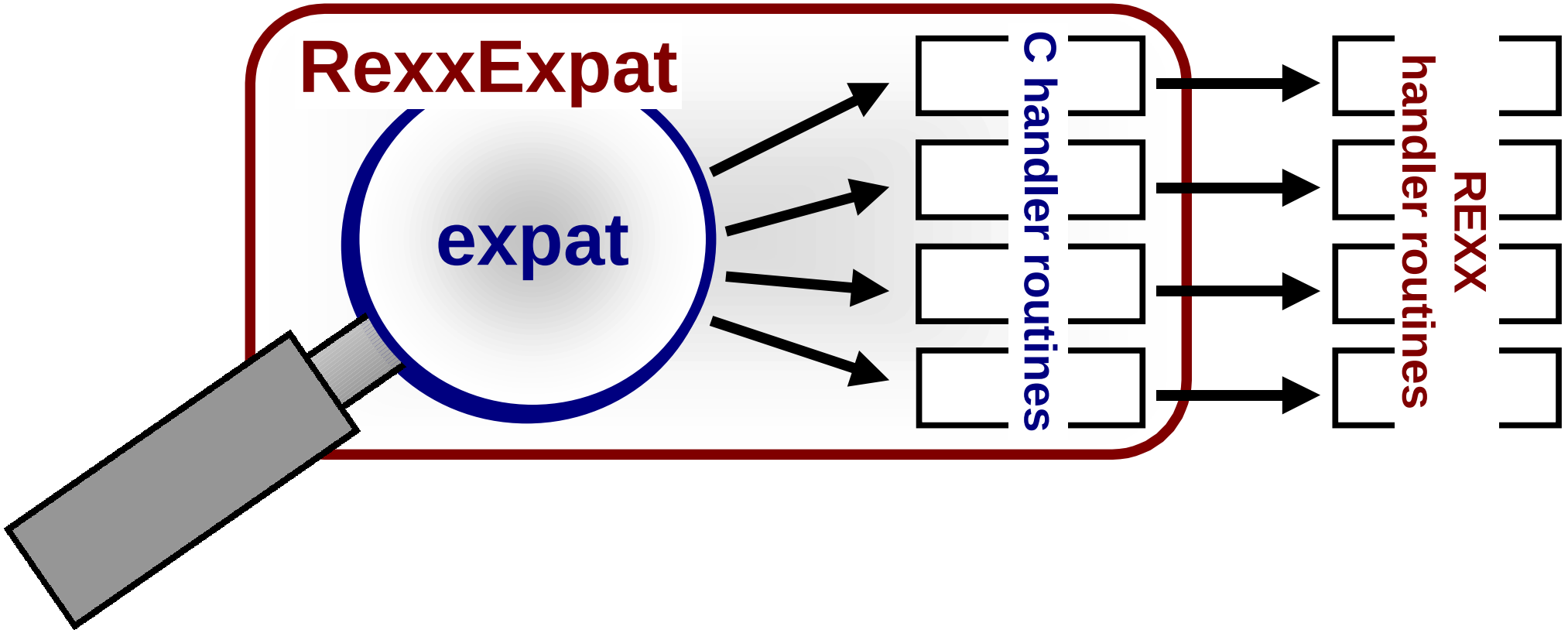
<?php echo("To serve XML documents, do like this\n"); **?>**

<![CDATA[
>>> This text could be copied from some file ;-). Declaring it as CDATA frees you from converting key characters like the left sharp bracket '<' and the ampersand '&' to its escaped form ("<" and "&")! <<<
]]>

Author **&**author**;**

</BODY> **</HTML>**

RexxExpat wrapping expat



Calling expat = Calling RexxExpat

1. **create** parser

```
Parser = ExpatParserCreate();
```

2. **initialize** callback routines

```
Call ExpatSetElementHandler(Parser,
     "Say 'StartElement <'ARG(2)'>'", "", 1,
     "EndElementExternFunc.cmd", EnvName, 0);
```

3. **parse** and process document (via callback routines)

```
Call ExpatParse(Parser, Puffer, isfinal)
```

4. **free** parser

```
Call ExpatParserFree(Parser);
```

Handler setting

Each handler is defined by three parameters **`ProcName`**, **`EnvName`**, **`Instore`** according to the following pseudo code:

```
if (ISNULLSTR(Instore) || ISZEROLENSTR(Instore) || Instore == 0)
    { ProcName is a file name of a Rexx procedure }
else if (Instore = “macro” || Instore = “MACRO”)
    { ProcName is a macro loaded into the macrospace }
else
    { ProcName contains pure Rexx code }
```

Handler invocation

- all wrapper functions **match** the corresponding expat functions
- handler functions **pass through** all arguments from C to Rexx
- callback routines do not **return codes** (few exceptions)

```
RexxStart (   ArgCount,
              ArgList,
              userData->Handler[HandlerType]->ProcName,
              userData->Handler[HandlerType]->Instore,
              userData->Handler[HandlerType]->EnvName,
              RXSUBROUTINE,
              NULL,                    /* no system exits for dll's available */
              &result_int,
              &result_str);
```

RexxExpat: Special Issues

UnknownEncodingHandler's return code defines **individual encodings**:

```
/*set XML_Encoding structure*/
currIndex = result_str.strptr;
for (i=0; currIndex && i<ENCODINGMAPSIZE
     && currIndex<=(result_str.strptr+result_str.strlength);
     i++, currIndex++) {
   if (isdigit((unsigned char)*currIndex)) /*byte defined*/
      info->map[i] = strtol(currIndex, &currIndex, 0);
   else                                    /*byte left out*/
      info->map[i] = i;
}
/*fill up bytes*/
for (; i<ENCODINGMAPSIZE; i++) info->map[i] = i;
```

RexxExpat: Special Issues

Problem: Separate environments in main program and callback routines

main program (Rexx) ➔ RexxExpat (C) ➔ handler routines (Rexx)

RexxExpat: Special Issues

Variable pool functions to exchange data between main program and callback routines:

```
numeric ExpatSetVariablePool(  numeric parser,
                               alphanumeric varnames, ...);

numeric ExpatGetVariablePool(  numeric parser);

numeric ExpatFreeVariablePool(numeric parser);
```

Possible obstacle: insufficient memory due to duplication of variable pool

Outlook

- implementation of an object ‘expat’ in ObjectRexx
- Rexx procedure which creates an object model from a given XML-file

- all current expat functions are wrapped
- future extensions to expat can be easily appended

References

- W3C, Extensible Markup Language (XML) 1.0 (Second Edition), Oct. 6, 2000 (http://www.w3.org/TR/REC-xml)
- Kuno Dünhölter, Extensible Markup Language (XML), version 2.0, Sept. 1, 1998 (http://members.aol.com/xmldoku)
- xmlparse.h, version 1.2, Thai Open Source Software Center
- Clark Cooper, Using Expat, Sept. 1, 1999, XML.com, O'Reilly & Associates (http://www.xml.com/pub/1999/09/expat/reference.html)
- rexxsaa.h, version 1.5, Anders Christensen (/Mark Hessling), The Regina Rexx Interpreter
- Anders Christensen (/Mark Hessling), The Regina Rexx Interpreter, Aug. 14, 2000, (ftp://ftp.lightlink.com/pub/hessling/Regina/reginapdf22.zip)
- IBM, Object REXX for Windows NT and Windows95 Programming Guide (Version 1.03), third edition, May 1999 (ftp://service.boulder.ibm.com/ps/products/ad/obj-xx/rexxpg.zip)

RexxExpat – Example (1)

RexxExpatExample.rexx

```
Call    RxFuncAdd 'ExpatLoadFuncs', 'RexxExpat.dll',
              'ExpatLoadFuncs';
Call    ExpatLoadFuncs();
Parser  = ExpatParserCreate();
Call    ExpatSetElementHandler(Parser,
              "StartElement.rexx", "", 0,
              "EndElement.rexx", "", 0);
pad     = 5; i = 0;
myfile  = "Interface.xml"; mypos = 0;
Do while lines(myfile)<>0
   nextline = linein(myfile)
   mypos   = STREAM(myfile, 'Command',
                 'Query Position Read');
   Call    ExpatFreeVariablePool(Parser);
   Call    ExpatSetVariablePool(Parser, "i", "pad");
   retstr  = ExpatParse(Parser, nextline,
                 lines(myfile))
   Call    ExpatGetVariablePool(Parser);
   If retstr == 0 then say "### ERROR ###"
   Call    STREAM(myfile, 'Command',
                 'Position ='mypos Read);
End
Call    ExpatParserFree(Parser);
Call    ExpatDropFuncs();
```

RexxExpat – Example (2)

StartElement.rexx

```
Parse Arg Parser, Name
Call    RxFuncAdd 'ExpatSetVariablePool',
        'RexxExpat.dll', 'ExpatSetVariablePool';
Call    RxFuncAdd 'ExpatGetVariablePool',
        'RexxExpat.dll', 'ExpatGetVariablePool';
Call    ExpatGetVariablePool(Parser);
Say     Insert(Name, "End", i*padding+6);
i       = i + 1;
Call    ExpatSetVariablePool(Parser, "i");
Call    RxFuncDrop 'ExpatSetVariablePool'
Call    RxFuncDrop 'ExpatGetVariablePool'
Exit
```

EndElement.rexx

```
Parse Arg Parser, Name
Call    RxFuncAdd 'ExpatSetVariablePool',
        'RexxExpat.dll', 'ExpatSetVariablePool';
Call    RxFuncAdd 'ExpatGetVariablePool',
        'RexxExpat.dll', 'ExpatGetVariablePool';
Call    ExpatGetVariablePool(Parser);
i       = i - 1;
Say     Insert("/"Name, "End", i*padding+6);
Call    ExpatSetVariablePool(Parser, "i");
Call    RxFuncDrop 'ExpatSetVariablePool'
Call    RxFuncDrop 'ExpatGetVariablePool'
Exit
```

RexxExpat – Data structures

```
/* ExpatHandlers - how many are there? */
enum EXPATHANDLERTYPES {
                OnStartElement,
                OnEndElement,
                OnCharacterData,
                [...]
                NumberOfHandlers};

/* ExpatHandler - data storage */
typedef struct TypeDefExpatHandler {
   PSZ          ProcName;
   PSZ          EnvName;
   PRXSTRING    Instore;    /* pointer to array[2] */
} *EXPATHANDLER;

/* RexxExpatData - to make it thread-safe */
typedef struct TypeDefRexxExpatData {
   /* Expat-Data */
   XML_Parser      Parser;              /* parser   */
   XML_Encoding    Encoding;            /* encoding */
   EXPATHANDLER    Handler[NumberOfHandlers];
                                        /* handler  */
   /* Rexx-Data */
   PSHVBLOCK       shvfirst; /* rexx variable pool */
} *RexxExpatData;
```