BSF4ooRexx

Parse, Analyze and Process HTML Documents with **jsoup** (a Java DOM Parser)

Business Programming 2

Windows GUIs (AWT)	Sockets SSL/TLS	XML SAX/DOM JSON	Scripting AOO/LO (UNO)	Rexx Script Engine	Portable GUIs (JavaFX)	Java Web Server (Tomcat)	Java Classes written in Rexx style

Markup Language

- Text, marked up in HTML

```
<html>
  <head>
     <title>This is my HTML file</title>
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="a9876">This <span class="verb">is</span> it.
  </body>
</html>
```

Web Browser Output:

Important Heading

This is the first paragraph.

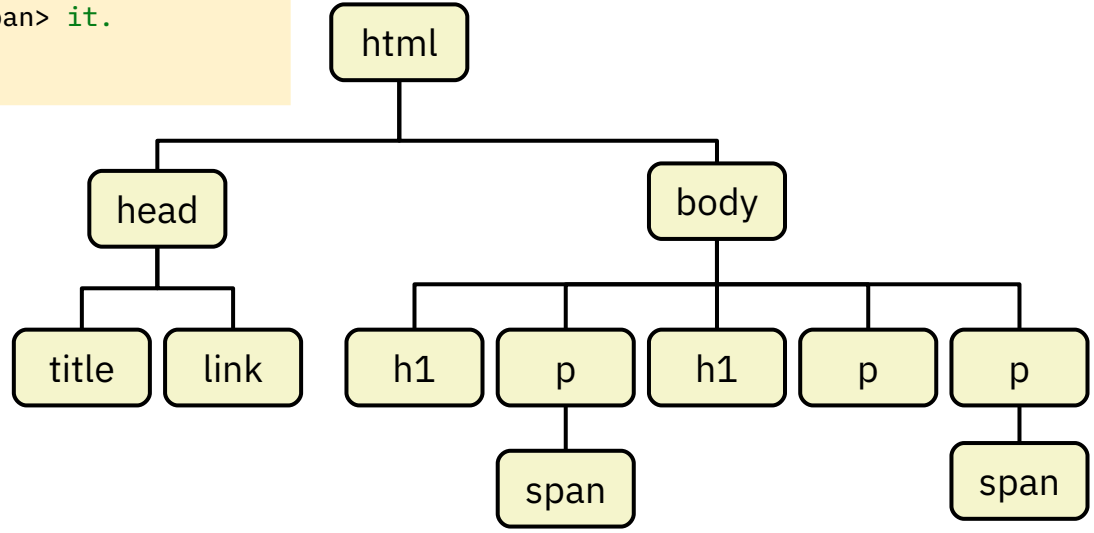
Another Important Heading

Another paragraph.

This is it.

Document Object Model (DOM) – Parse Tree

```
<html>
  <head>
     <title>This is my HTML file</title>
     <link rel="stylesheet" type="text/css" href="example2.css">
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="9876">This <span class="verb">is</span> it.
  </body>
</html>
```



Java jsoup
Brief Overview

- XML-DOM parsers depend on valid marked up XML text
  - No XML tool can be therefore applied to HTML text or "tag soup" HTML text
- "jsoup" – an open-source Java-DOM parser for HTML and XHTML
  - Concepts and acquired skills from XML can be applied, makes it easy to exploit
  - Parses HTML 5
  - Parses "tag soup" HTML, i.e. HTML text with improperly used (at a wrong position) or even undefined tags
  - Can be used to
    - Create proper HTML text from "tag soup" (markup with errors) HTML text
    - Create proper xhtml text from any HTML text
    - Change/rewrite HTML text
    - ... and much more like "web scraping" or "data wrangling"

Java jsoup
How to Get and Setup

- External Java class library/Java archive
  - Homepage: https://jsoup.org
  - Download: https://jsoup.org/download
    - After download make the external Java archive (e.g. 2024-01-12 jsoup-1.17.2.jar) available to Java either by
      - Adding its full path to the CLASSPATH environment variable
      - Easier, if you have BSF4ooRexx850 installed, proceed as follows:
        - in your home directory (%USERPROFILE% on Windows, $HOME on Unix) create the subdirectories exactly spelled out as BSF4ooRexx and therein the subdirectory lib and copy the external Java class library into BSF4ooRexx/lib
        - Alternatively copy the external Java archive into BSF4ooRexx850's installation directory and there into its lib subdirectory, however note:
          - Whenever BSF4ooRexx850 gets uninstalled also all external Java archives will get removed such that you would have to copy them again, after a new version of BSF4ooRexx850 gets installed
  - Jsoup's cookbook: https://jsoup.org/cookbook/

Java jsoup
How To Parse HTML and XML Files, 1

- org.jsoup.Jsoup class has various parse(...) methods
  - Strings with the marked up text
  - java.io.File (local files) and java.net.URL (http and https URLs)
    - Need to create instances from these Java classes to supply as arguments to parse(...)
- Ease debugging of Java exceptions while developing
  - The reported Java exception may be ultimately caused by other Java exceptions
  - BSF4ooRexx850 only shows the reported Java exception
  - To ease debugging
    - Intercept syntax conditions in your programs
    - Use BSF.CLS' public routine ppJavaExceptionChain(condition[,.true])
      - This will show the chain of Java exceptions
      - The second argument if .true will display the Java thread stack of the last Java exception

How To Parse HTML and XML Files, 2

- Jsoup's parse(...) will return the root element as an instance of the org.jsoup.nodes.Document class which is a subclass of
  - org.jsoup.nodes.Element which is a subclass of
    - org.jsoup.nodes.Node
  - Use the JavaDocs to learn about all available methods, e.g. by searching for "javadoc Jsoup" or "javadoc jsoup Document" and the like

Java jsoup
Extract Text from HTML and XML Documents

- Removes all tags and extracts the text of any HTML and XML document
- After parsing the root element can be used to
  - Get the *body* element
  - And fetch its text using one of the org.jsoup.nodes.Element methods *text()*, *wholeText()* or *wholeOwnText()*

Prof. Rony G. Flatscher

Extract Text From Any [X]HTML Document (1/2)

```
/* purpose: demonstrate how to extract the text from a xml file using DOM */
parse arg source      -- can be html, xml; a local file or URL
url? = source ~startsWith("http")   -- do we need to parse a URL?
timeout = 10000             -- when loading URL timeout: 10 sec (10000 msec)
signal on syntax            -- activate syntax condition handling
if url? then src=.bsf~new("java.net.URL",source)    -- create URL object
        else src=.bsf~new("java.io.File",source)    -- create File object

clzJsoup = bsf.importClass("org.jsoup.Jsoup")       -- import Jsoup class
if url? then rootNode = clzJsoup~parse(src,timeout)
        else rootNode = clzJsoup~parse(src)
body = rootNode~body        -- get body element
say "--- body~text:"        -- demonstrate text() method
say pp(body~text)           -- all text normalized (removing whitespace)
say "--- body~wholeText:"   -- demonstrate wholeText() method
say pp(body~wholeText)      -- all text (with whitespace)
say "rootNode~nodeName:" pp(rootNode~nodeName) "body~nodeName:" pp(body~nodeName)
exit
syntax:                     -- label for syntax conditions
  co=condition("object")    -- get directory with condition information
  say ppJavaExceptionChain(co,.true)    -- show Java exception chain
  say "---"
  raise propagate           -- let ooRexx process condition as well

::requires "BSF.CLS"        -- get ooRexx-Java bridge
```

Extract Text From Any [X]HTML Document (2/2)

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "DTD/xhtml1-transitional.dtd">
<html>
  <head>
     <title>This is my HTML file</title>
     <link rel="stylesheet" type="text/css" href="example2.css"/>
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="a9876">This <span class="verb">is</span> it.
  </body>
</html>
```

```
rexx jsoup_01.rxj example2.html
```

Output:

```
--- body~text:
[Important Heading This is the first paragraph. Another Important Heading Another paragraph. This is it.]
--- body~wholeText:
[
     Important Heading
     This is the
        first paragraph.
     Another Important Heading
     Another paragraph.
     This is it.
  ]
rootNode~nodeName: [#document] body~nodeName: [body]
```

List Elements in Document Order

- Using method getAllElements() of org.jsoup.nodes.Element
  - Returns an instance of the org.jsoup.select.Elements which subclasses java.util.ArrayList which implements the java.lang.Iterable interface class
    - BSF4ooRexx supports iterating over Java classes that implement the java.lang.Iterable interface with "do ... over" which simplifies coding in ooRexx
- Using method children() of org.jsoup.nodes.Element
  - Returns an instance of the org.jsoup.select.Elements which subclasses java.util.ArrayList which implements the java.lang.Iterable interface class
    - BSF4ooRexx supports iterating over Java classes that implement the java.lang.Iterable interface with "do ... over" which simplifies coding in ooRexx
- The root element's name in jsoup is: `#document`

List Elements in Document Order (1/2)

```
/* purpose: demonstrate how to list the element names in document order */
parse arg source      -- can be html, xml; a local file or URL
url? = source ~startsWith("http")   -- do we need to parse a URL?
timeout = 10000             -- when loading URL timeout: 10 sec (10000 msec)
if url? then src=.bsf~new("java.net.URL",source)   -- create URL object
        else src=.bsf~new("java.io.File",source)   -- create File object

clzJsoup = bsf.importClass("org.jsoup.Jsoup")      -- import Jsoup class
if url? then rootNode = clzJsoup~parse(src,timeout)
        else rootNode = clzJsoup~parse(src)

do el over rootNode~getAllElements  -- get all Element nodes
   say pp(el~nodeName)
end

::requires "BSF.CLS"        -- get ooRexx-Java bridge
```

List Elements in Document Order (2/2)

```
<!DOCTYPE HTML>
<html>
  <head>
     <title>This is my HTML file</title>
     <link rel="stylesheet" type="text/css" href="example2.css"/>
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="a9876">This <span class="verb">is</span> it.
  </body>
</html>
```

```
rexx jsoup_02.rxj example2.html
```

Output:

```
[#document]
[html]
[head]
[title]
[link]
[body]
[h1]
[p]
[span]
[h1]
[p]
[p]
[span]
```

List Elements Indented in Document Order (1/2)

```
/* purpose: demonstrate how to list the element names in document order */
parse arg source      -- can be html, xml; a local file or URL
url? = source ~startsWith("http")   -- do we need to parse a URL?
timeout = 10000             -- when loading URL timeout: 10 sec (10000 msec)
if url? then src=.bsf~new("java.net.URL",source)   -- create URL object
        else src=.bsf~new("java.io.File",source)   -- create File object

clzJsoup = bsf.importClass("org.jsoup.Jsoup")      -- import Jsoup class
if url? then rootNode = clzJsoup~parse(src,timeout)
        else rootNode = clzJsoup~parse(src)

call followNode rootNode, 0

::requires BSF.CLS   -- get ooRexx-Java bridge

::routine followNode    -- walks the document tree recursively
  use arg node, level
  call processNode node, level      -- process received node
  do childNode over node~children
     call followNode childNode, level+1   -- recurse
  end

::routine processNode   -- processes each node
  use arg node, level
  say "   "~copies(level) || pp(node~nodeName)
```

List Elements Indented in Document Order (2/2)

```
<!DOCTYPE HTML>
<html>
  <head>
     <title>This is my HTML file</title>
     <link rel="stylesheet" type="text/css" href="example2.css"/>
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="a9876">This <span class="verb">is</span> it.
  </body>
</html>
```

```
rexx jsoup_03.rxj example2.html
```

Output:

```
[#document]
   [html]
      [head]
         [title]
         [link]
      [body]
         [h1]
         [p]
            [span]
         [h1]
         [p]
         [p]
            [span]
```

List Elements with Text Indented in Document Order (1/2)

```
/* purpose: demonstrate how to list the element names in document order */
parse arg source      -- can be html, xml; a local file or URL
url? = source ~startsWith("http")   -- do we need to parse a URL?
timeout = 10000             -- when loading URL timeout: 10 sec (10000 msec)
if url? then src=.bsf~new("java.net.URL",source)   -- create URL object
        else src=.bsf~new("java.io.File",source)   -- create File object

clzJsoup = bsf.importClass("org.jsoup.Jsoup")      -- import Jsoup class
if url? then rootNode = clzJsoup~parse(src,timeout)
        else rootNode = clzJsoup~parse(src)

call followNode rootNode, 0

::requires BSF.CLS   -- get ooRexx-Java bridge

::routine followNode    -- walks the document tree recursively
  use arg node, level
  call processNode node, level      -- process received node
  do childNode over node~children
     call followNode childNode, level+1   -- recurse
  end

::routine processNode   -- processes each node
  use arg node, level
  say "   "~copies(level) || pp(node~nodeName)
  if node~hasText then  -- if node has text, show it indented as well
     say "   "~copies(level) || "-->" pp(node~wholeOwnText)
```

List Elements with Text Indented in Document Order (2/2)

```
<!DOCTYPE HTML>
<html>
  <head>
     <title>This is my HTML file</title>
     <link rel="stylesheet" type="text/css" href="example2.css"/>
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="a9876">This <span class="verb">is</span> it.
  </body>
</html>
```

```
rexx jsoup_04.rxj example2.html
```

Output:

```
[#document]
--> [

]
   [html]
   --> [

  ]
      [head]
      --> [


  ]
         [title]
         --> [This is my HTML file]
         [link]
      [body]
      --> [


     ]
         [h1]
         --> [Important Heading]

… continued on the right ...
```

```
          [p]
          --> [This  the
         first paragraph.
      ]
             [span]
             --> [is]
          [h1]
          --> [Another Important Heading]
          [p]
          --> [Another paragraph.
      ]
          [p]
          --> [This  it.

]
             [span]
             --> [is]
```

Get and Show All Links (1/2)

```
/* purpose: demonstrate how to fetch and list all links */
parse arg source      -- can be html, xml; a local file or URL
url? = source ~startsWith("http")   -- do we need to parse a URL?
timeout = 10000             -- when loading URL timeout: 10 sec (10000 msec)
if url? then src=.bsf~new("java.net.URL",source)   -- create URL object
        else src=.bsf~new("java.io.File",source)   -- create File object

clzJsoup = bsf.importClass("org.jsoup.Jsoup")      -- import Jsoup class
if url? then rootNode = clzJsoup~parse(src,timeout)
        else rootNode = clzJsoup~parse(src)

allLinks = rootNode~select("a")  -- get all a-elements
len=length(allLinks~size)
say "there are" pp(allLinks~size) "links"
do counter c link over allLinks
   -- say "#" c~right(len)":" pp(link~absURL('href')) "for" pp(link~text)
   say "#" c~right(len)":" pp(link~attr('href')) "for" pp(link~text)
end

::requires "BSF.CLS"       -- get ooRexx-Java bridge
```

Get and Show All Links (2/2)

```
rexx jsoup_05.rxj http://www.RexxLA.org
```

Output (as of 2023-08-30):

```
there are [32] links
#  1: [/] for []
#  2: [/cookie.srsp] for [Cookie Details]
#  3: [#] for [Accept Cookies]
#  4: [javascript:void(0)] for [╪]
#  5: [/index.srsp] for [RexxLA Home]
#  6: [/rexxla/about.srsp] for [About RexxLA]
#  7: [/rexxlang/index.srsp] for [About Rexx]
#  8: [/community.srsp] for [Community]
#  9: [/members/index.rsp] for [Members]
# 10: [/events/symposium.rsp] for [Symposium]
# 11: [/rexxla/contact.rsp] for [Contact Us]
# 12: [/news/announce-ooRexx-5.0.html] for [Announcement]
# 13: [/rexxla/about.srsp] for [READ MORE]
# 14: [/members/index.rsp?action=join] for [JOIN FOR FREE]
# 15: [https://donorbox.org/donations-to-rexx-language-association] for []
# 16: [/products.srsp] for [About our products]
# 17: [/rexxla/contact.rsp] for [Contact Us]
# 18: [/members/index.rsp?action=login] for [Member Login]
# 19: [/events/symposium.rsp] for [Rexx Symposia]
# 20: [/rexxlang/index.srsp] for [Rexx Language]
# 21: [/rexxlang/history/index.srsp] for [Rexx History]
# 22: [/rexxla/privacy.srsp] for [Privacy Policy]
# 23: [https://sourceforge.net/projects/oorexx/files/] for [Download ooRexx]
# 24: [https://sourceforge.net/projects/regina-rexx/files/] for [Download Regina]
# 25: [http://www.netrexx.org/downloads.nsp] for [Download NetRexx]
# 26: [https://sourceforge.net/projects/bsf4oorexx/files/] for [Download BSF4ooRexx]
# 27: [https://www.rexxla.org/] for [The Rexx Language Association]
# 28: [https://regina-rexx.sourceforge.io/] for [Regina Rexx]
# 29: [https://www.youtube.com/results?search_query=rexx+language%5C] for []
# 30: [https://www.facebook.com/The-Rexx-Language-Association-444234855698010/] for []
# 31: [https://twitter.com/search?q=rexxla&src=typd] for []
# 32: [https://www.facebook.com/ooRexx/] for []
```

Create Proper XHTML File (1/2)

```
/* purpose: demonstrate how to save a file as xhtml   */
parse arg source      -- can be html, xml; a local file or URL
url? = source ~startsWith("http")   -- do we need to parse a URL?
timeout = 10000             -- when loading URL timeout: 10 sec (10000 msec)
if url? then src=.bsf~new("java.net.URL",source)   -- create URL object
        else src=.bsf~new("java.io.File",source)   -- create File object

clzJsoup = bsf.importClass("org.jsoup.Jsoup")      -- import Jsoup class
if url? then rootNode = clzJsoup~parse(src,timeout)
        else rootNode = clzJsoup~parse(src)
    -- set xhtml-mode: restrict entities to xhtml only
outputSettings=rootNode~outputSettings  -- get output settings
    -- make sure xhtml entities only
clzEntities=bsf.loadClass("org.jsoup.nodes.Entities")
outputSettings~escapeMode(clzEntities~EscapeMode~xhtml)
outputSettings~syntax(OutputSettings~Syntax~xml)
if url? then outFilename = "tmpFileForUrl.xhtml"
        else outFilename = source".xhtml"
call charOut outFilename, rootNode~html -- render as xhtml and save

::requires "BSF.CLS"       -- get ooRexx-Java bridge
```

Create Proper XHTML File (2/2)

```
<!DOCTYPE HTML>
<html>
  <head>
     <title>This is my HTML file</title>
     <link rel="stylesheet" type="text/css" href="example2.css"/>
  </head>
  <body>
     <h1>Important Heading</h1>
     <p>This <span class="verb">is</span> the
        first paragraph.
     <h1>Another Important Heading</h1>
     <p id="xyz1">Another paragraph.
     <p id="a9876">This <span class="verb">is</span> it.
  </body>
</html>
```

```
rexx jsoup_06.rxj example2.html
```

Output:

```
<!DOCTYPE html>
<html>
 <head>
  <title>This is my HTML file</title>
  <link rel="stylesheet" type="text/css" href="example2.css" />
 </head>
 <body>
  <h1>Important Heading</h1>
  <p>This <span class="verb">is</span> the first paragraph.</p>
  <h1>Another Important Heading</h1>
  <p id="xyz1">Another paragraph.</p>
  <p id="a9876">This <span class="verb">is</span> it. </p>
 </body>
</html>
```

Roundup

- Parsing any marked up text ([X]HTML) possible
  - jsoup is a powerful Java class library packed as a Java archive ("jar"-file)
    - Versatile, no need for DTD (Document Type Definition)
    - Because of Java, runs on all important operating systems without a change
- Powerful, versatile, still: quite easy to take advantage of
- Can handle "tag soup" marked up text
- Can create proper xhtml renderings from any marked up text!
- Easy to exploit from ooRexx with the ooRexx-Java bridge BSF4ooRexx !

Further Information

- Jsoup
  - jsoup home page: <https://jsoup.org>
- HTML 5 DOM specific URLs (2023-01-26)
  - W3C's HTML 5, DOM: <https://dom.spec.whatwg.org/>
- Wikipedia
  - jsoup: <https://en.wikipedia.org/wiki/Jsoup>
  - Tag soup: <https://en.wikipedia.org/wiki/Tag_soup>
  - Web scraping: <https://en.wikipedia.org/wiki/Web_scraping>
  - Data wrangling: <https://en.wikipedia.org/wiki/Data_wrangling>
- Tutorials, e.g. (2023-01-26)
  - jsoup cookbook: <https://jsoup.org/cookbook/>
  - Tutorialspoint: <https://www.tutorialspoint.com/jsoup/index.htm>
  - "Parsing HTML in Java with Jsoup": <https://www.baeldung.com/java-with-jsoup>
  - "Parsing and Extracting HTML with Jsoup": <https://howtodoinjava.com/java/library/complete-jsoup-tutorial/>