Jython webapp for DSpace

Basic Jython webapp

1. Create the webapp directory (you may use any name you want):
   ```bash
   mkdir -p [dspace]/webapps-jython/WEB-INF/lib
   ``
   Tip: The jython webapp is just another webapp like the individual DSpace webapps. So while you could put it next to the DSpace webapps into [dspace]/webapps/you should prefer a different location (e.g. [dspace]/webapps-jython/) because the [dspace]/webapps/ directory is replaced every time you run "ant update" (the old webapps directory will not be deleted, it will be renamed to "webapps-[timestamp]").

2. Download the latest Jython installer jar (e.g. jython-installer-2.7.1.jar) from http://www.jython.org/downloads.html (the jython.org website was last updated around 2015 [issue2658]; check Maven Central for latest jython version)
   ```bash
   curl -O -J http://search.maven.org/remotecontent?filepath=org/python/jython-installer/2.7.1/jython-installer-2.7.1.jar
   ``
   Note: Installation location doesn't matter, this is not necessary for DSpace. You can safely delete it after you retrieve jython.jar and Lib

3. Get jython.jar and the Lib directory:
   a. either unzip the installer jar:
      ```bash
      unzip -d [dspace]/lib/ jython-installer-2.7.1.jar jython.jar 'Lib/*'
      unzip -d [dspace]/webapps-jython/WEB-INF/lib/ jython-installer-2.7.1.jar jython.jar 'Lib/*'
      ```
   b. or use it to install Jython:
      ```bash
      java -jar jython-installer-2.7.1.jar --console
      ``

4. Associate .py files with Jython’s PyServlet

   ```xml
   [dspace]/webapps/jython/WEB-INF/web.xml
   <web-app>
     <servlet>
       <servlet-name>PyServlet</servlet-name>
       <servlet-class>org.python.util.PyServlet</servlet-class>
       <load-on-startup>1</load-on-startup>
     </servlet>
     <servlet-mapping>
       <servlet-name>PyServlet</servlet-name>
       <url-pattern>*.py</url-pattern>
     </servlet-mapping>
   </web-app>
   ```

5. Create a Hello World servlet:

   ```python
   [dspace]/webapps/jython/hello.py
   # -*- coding: utf-8 -*-
   from javax.servlet.http import HttpServlet

   class hello(HttpServlet):
     def doGet(self, request, response):
       self.doPost(request, response)

     def doPost(self, request, response):
       response.setContentType("text/html")
       toClient = response.getWriter()
       toClient.println("<h1>Hello World!</h1>")
       toClient.println(u"<p>To make sure that utf-8 works, here's a Czech pangram for you:"")
       toClient.println(u"<p>Píliš žluouký k úpl ábelské ódy.</p>""
   ```

6. Access to DSpace classes from Jython

6. Create a Hello World servlet:

   ```python
   [dspace]/webapps/jython/hello.py
   # -*- coding: utf-8 -*-
   from javax.servlet.http import HttpServlet

   class hello(HttpServlet):
     def doGet(self, request, response):
       self.doPost(request, response)

     def doPost(self, request, response):
       response.setContentType("text/html")
       toClient = response.getWriter()
       toClient.println("<h1>Hello World!</h1>")
       toClient.println(u"<p>To make sure that utf-8 works, here's a Czech pangram for you:"")
   ```

7. Copy DSpace jars to the jython webapp's lib directory:
   ```bash
   cp -r [dspace]/lib/* [dspace]/webapps-jython/WEB-INF/lib/
   ```

7. Start up DSpace kernel on webapp startup and point it to your DSpace configuration:
8. Define the context in Tomcat's configuration. There are several ways how you can do that, so just use the same way you use for configuring DSpace contexts. The recommended one is to use a context fragment:

```
sudo vim /etc/tomcat8/Catalina/localhost/jython.xml
```

```xml
<Context docBase="/dspace/webapps-jython" reloadable="true" />
```

A few seconds after you save the file, Tomcat will notice it and load the “jython” context.

### Adding Java libraries

1. Copy the .jar to `/dspace/webapps-jython/WEB-INF/lib/`
2. Reload the context
   ```bash
   sudo touch /etc/tomcat8/Catalina/localhost/jython.xml
   ```

   Tip: If you forgot which libraries you added (because it’s hard to spot them among dozens of libraries which belong to DSpace), here’s how you can filter out the DSpace libraries, which should leave you only with a list of libraries you added:

   ```bash
   diff -u <(ls -l /dspace/webapps-jython/WEB-INF/lib/) <(ls -l /dspace/lib/) | view -
   ```

### Adding Python libraries

Python libraries can either be added to `/dspace/webapps-jython/WEB-INF/lib/` or to context root (`/dspace/webapps-jython/`).


Read the entire page including notes and warnings, it describes issues you will run into.

```bash
# install pip (do not upgrade pip after installing it):
JYTHON_HOME=[dspace]/webapps-jython/WEB-INF/lib/ java -jar [dspace]/webapps-jython/WEB-INF/lib/jython.jar -m ensurepip
# install a PyPI package (e.g. requests):
JYTHON_HOME=[dspace]/webapps-jython/WEB-INF/lib/ java -jar [dspace]/webapps-jython/WEB-INF/lib/jython.jar -m pip install requests
```

### Creating nice action URLs
You may find a snippet like the one below to set up URL mapping for a Jython servlet. Unfortunately, it's not implemented in PyServlet, as it is more a demo than something to use in production (see this thread). For production deployment, Modjy is recommended.

```xml
<web-app>
  ...
  <servlet-mapping>
    <servlet-name>SherpaRomeo</servlet-name>
    <url-pattern>/SherpaRomeo</url-pattern>
  </servlet-mapping>
</web-app>
```

Example of connection to the DSpace DB via ZxJDBC

An artificial example demonstrating a few techniques that are now possible thanks to the above:

- You can use zxJDBC, a pythonic (DB API 2.0) interface allowing the use of databases accessible via JDBC. The driver (postgresql-*.jar or ojdbc6.jar) used here is available in classpath because we copied it from /dspace/lib/.
- You can use Java libraries, demonstrated here by java.util.Properties used to read dspace.cfg.
- Here we read the database driver, connection string, user and password from dspace.cfg and then pass it to zxJDBC to create a connection.
- We could use DB API 2.0 methods like cursor.fetchall() to get query results. Here I chose to use the Python zip function to return the query results in a custom format.
- You can use a context manager (Python "with" keyword) around a zxJDBC cursor to manage the scope of the DB transaction.
- You can't use the Python "with" keyword around the java.util.Properties as it is a Java class which doesn't implement a Python context manager.
- DB connection here is open in init() and closed in destroy() only to demonstrate the servlet's constructor and destructor. You should not keep a DB connection open for the whole time the servlet is loaded.

```python
def read_dspace_config(self, filename):
    with open(DSPACE_DIR + filename) as f:
        return f.read()
```

```python
from javax.servlet.http import HttpServlet
from com.ziclix.python.sql import zxJDBC
from java.util import Properties

DSPACE_DIR = '/dspace'

class db_example(HttpServlet):
    def doGet(self, request, response):
        self.doPost(request, response)

    def doPost(self, request, response):
        response.setContentType("text/html")
        response.setCharacterEncoding("utf-8")
        toClient = response.getWriter()
        toClient.println("<h1>Example of connection to the DSpace DB via ZxJDBC</h1>")
        rows = self.get_data_from_db()
        toClient.println("<h2>Results</h2>")
        toClient.println("<table>")
        toClient.println("<tr>")
        for column in rows[0]:
            toClient.println("<th>%s</th>" % column)
        toClient.println("</tr>")
        for row in rows:
            toClient.println("<tr>")
            for column in row:
                toClient.println("<td>%s</td>" % row[column])
            toClient.println("</tr>")
        toClient.println("</table>")
```

```python
# -*- coding: utf-8 -*-

from javax.servlet.http import HttpServlet
from com.ziclix.python.sql import zxJDBC
from java.util import Properties

DSPACE_DIR = '/dspace'

class db_example(HttpServlet):
    def doGet(self, request, response):
        self.doPost(request, response)

    def doPost(self, request, response):
        response.setContentType("text/html")
        response.setCharacterEncoding("utf-8")
        toClient = response.getWriter()
        toClient.println("<h1>Example of connection to the DSpace DB via ZxJDBC</h1>")
        rows = self.get_data_from_db()
        toClient.println("<h2>Results</h2>")
        toClient.println("<table>")
        toClient.println("<tr>")
        for column in rows[0]:
            toClient.println("<th>%s</th>" % column)
        toClient.println("</tr>")
        for row in rows:
            toClient.println("<tr>")
            for column in row:
                toClient.println("<td>%s</td>" % row[column])
            toClient.println("</tr>")
        toClient.println("</table>")
```
read dspace.cfg
with open(filename, 'r') as f:
    props = Properties()
    props.load(f)
    return props

def connect_db(self):
    ***
    get DB config from DSpace config, connect in autocommit mode (each
    individual query is commited automatically)
    ***
    self.conn = zxJDBC.connect(
        self.props.getProperty('db.url'),
        self.props.getProperty('db.username'),
        self.props.getProperty('db.password'),
        self.props.getProperty('db.driver'),
    )
    self.conn.autocommit = True

def init(self, config):
    ***
    servlet startup
    ***
    try:
        self.props = self.read_dspace_config(DSPACE_DIR + '/config/local.cfg')
    except IOError:
        self.props = self.read_dspace_config(DSPACE_DIR + '/config/dspace.cfg')
    self.connect_db()

def destroy(self):
    ***
    servlet shutdown: clean up DB connections
    ***
    self.conn.close()

def get_data_from_db(self):
    ***
    Query the DB and return a list of rows
    where each row is a dict of column names and values
    ***
    with self.conn.cursor() as c:
        c.execute("SELECT version, description FROM schema_version ORDER BY version DESC")
        columns = [col[0] for col in c.description]
        rows = []
        for row in c:
            rowdata = dict(zip(columns, row))
            rows.append(rowdata)
        return rows

Error handling
I'm not yet sure why, but some exceptions are neither logged to tomcat, nor to dspace.log, nor to the output HTML.

Example: As mentioned above, the python requests library fails to fetch certain pages with error: java.util.zip.DataFormatException: invalid stored block lengths

Here's a workaround showing how to either log the error or print it in the browser.
class err_example(HttpServlet):
    def doGet(self, request, response):
        response.setContentType("text/plain")
        toClient = response.getWriter()
        toClient.println("BEGIN")
        try:
            r = requests.get('https://demo.dspace.org/xmlui/')  # errors out on certain gzipped pages; see https://github.com/madler/zlib/issues/82
            import sys, traceback
            traceback.print_exc(file=sys.stdout)  # log to catalina.out
            traceback.print_exc(file=toClient)  # log to HTML output
            toClient.println("END")
        except:
            traceback.print_exc(file=sys.stdout)  # log to catalina.out
            traceback.print_exc(file=toClient)  # log to HTML output
            toClient.println("END")

See also

- Curation tasks in Jython