IBM WebSphere Application Server V8.5 lab
Basic Liberty profile administration using the job manager

Scenario

You are a system administrator responsible for managing web application server installations. An application developer has asked you to deploy a Liberty profile installation to two different hosts in a first-level test environment. You decide to use the WebSphere Application Server Network Deployment V8.5 job manager to remotely deploy and administer the Liberty profile installations.

Goals

During this lab, you will do these tasks:

- Use the job manager to remotely deploy and manage a basic Liberty profile installation.
- Use the job manager to generate a merged web server plug-in configuration for multiple Liberty profile servers and set up IBM HTTP Server to use the merged plug-in configuration.

For more information, see the WebSphere Application Server V8.5 information center topic Submitting jobs to manage Liberty profile installations.

This lab is provided **AS-IS**, with no formal IBM support.

Prerequisites

Hosts

The lab instructions assume the use of four hosts; a job manager host, a web server host, and two server hosts; however, a single host can take on two or even all three of these roles. For example, you can place the job manager and the web server on one host, and use the same host as a server host.

- Job manager host
  - Host name: host-1
  - Operating system: Windows, UNIX, or Linux
  - WebSphere Application Server Network Deployment V8.5
    - Installation directory
      Windows: C:\Program Files\IBM\WebSphere\AppServer
      UNIX/Linux: /opt/IBM/WebSphere/AppServer
    - Job manager
      - Profile name: JobMgr01
      - Node name: JobMgr01Node
      - Profile directory
        Windows: C:\Program Files\IBM\WebSphere\AppServer\profiles\JobMgr01
        UNIX/Linux: /opt/IBM/WebSphere/AppServer/profiles/JobMgr01
  - A utility for creating and managing compressed (.zip) files

- Web server host
  - Host name: host-2
  - Operating system: Windows, UNIX, or Linux
  - IBM HTTP Server for WebSphere Application Server V8.5
    - Installation directory
      Windows: C:\was\install01\HTTPServer
      UNIX/Linux: /opt/IBM/HTTPServer
  - Web Server Plugins for WebSphere Application Server V8.5
    - Installation directory
      Windows: C:\Program Files\IBM\WebSphere\Plugins
      UNIX/Linux: /opt/IBM/WebSphere/Plugins
- Server hosts
  - Host names: host-3 and host-4
  - Operating system: Windows, UNIX, or Linux
  - Java 6 installed as the default (system) Java Runtime Environment (JRE). The minimum supported level for the JRE from Oracle is Java 6 update 26. For the Java JRE from IBM, the minimum supported level is 6.0 (J9 2.6) SR 1. Java 7 is supported; however, there are several significant restrictions. For more information, see the WebSphere Application Server V8.5 information center topic Liberty profile: Runtime environment known restrictions.

Materials

This lab requires these materials, all of which must be available on host-1:

- The lab materials file, `WASv85Labs_BasicLibJM.zip`. To download this file, visit the WebSphere Application Server V8.5 area of the IBM Education Assistant site.
- A clean copy of the WebSphere Application Server V8.5 Liberty profile. For more information, see the WebSphere Application Server V8.5 information center topic Installing the Liberty profile.

Procedure

Overview

Assume that an application developer has asked you to deploy a Liberty profile installation to two different hosts in a first-level test environment. You decide to use the WebSphere Application Server Network Deployment V8.5 job manager to remotely deploy and administer the Liberty profile installations.

In part A of this lab, you will complete a few initial setup tasks and then package a Liberty profile installation that includes two embedded servers. In part B, you will use the job manager on host-1 to deploy the Liberty profile installation to host-3 and host-4. In part C, you will configure the IBM HTTP Server on host-2 to forward requests to the Liberty profile servers on host-3 and host-4. The basic topology is outlined below.

- Job manager host (host-1)
  - Job manager
- Web server host (host-2)
  - IBM HTTP Server and web server plug-ins
- Server hosts (host-3 and host-4)
  - Liberty profile installation
    - Server 1
      - Application 1
    - Server 2
      - Application 2

Deployment to server hosts

You will deploy the Liberty profile installation to project directory `selfContained` in the working resources directory on each server host, for example,

Windows: `C:\liberty\working\selfContained`

UNIX/Linux: `/liberty/working/selfContained`

Each server host will ultimately include these directories and files.

```
[-] liberty
      [-] working
            [-] selfContained
                  [-] wlp-85
                        [+] bin
                        [ ] clients
                        [+] dev
                        [ ] lafiles
                        [+] lib
                        [+] templates
                        [-] usr
                              [-] servers
                                    [-] SecuritySample-01.00-01
                                          o bootstrap.properties
                                          o server.xml
                                         [ ] apps
                                               o SecuritySample-01.00.war
                                    [-] ServletSample-01.00-01
                                          o bootstrap.properties
                                          o server.xml
                                         [ ] apps
                                               o ServletSample-01.00.war
```

Part A – Initial setup and packaging

Tasks

1. Working on host-1, extract lab materials file `WASv85Labs_BasicLibJM.zip` into a suitable directory. You can extract this file and any other WebSphere Application Server V8.5 lab materials files into the root directory. For example, on Windows, extracting the file into the `C:\` directory will create lab materials directory `C:\WASv85Labs\BasicLibJM`, and so on. You can also use the same basic approach on UNIX/Linux.

2. Create project directory `WASv85Labs/BasicLibJM/selfContained`

3. Install or copy a completely clean instance of the V8.5 Liberty profile into directory `WASv85Labs/BasicLibJM/selfContained/wlp-85`. For more information, see the WebSphere Application Server V8.5 information center topic Installing the Liberty profile.

4. Delete this directory if it exists: `WASv85Labs/BasicLibJM/selfContained/wlp-85/usr`

5. Copy lab directory `usr` into directory `WASv85Labs/BasicLibJM/selfContained/wlp-85`

   The final directory structure is illustrated below.

```
[-] WASv85Labs
     [-] BasicLibJM
          [-] selfContained
               [-] wlp-85
                    [+] bin
                    [ ] clients
                    [+] dev
                    [ ] lafiles
                    [+] lib
                    [+] templates
                    [-] usr
                         [-] servers
                              [-] SecuritySample-01.00-01
                                   [ ] apps
                              [-] ServletSample-01.00-01
                                   [ ] apps
```

6. Package the Liberty profile resources for deployment to the server hosts.

   Create a compressed (.zip) file that includes directory `selfContained` (and its full contents). Then open the compressed file and verify that `selfContained` is the top-level directory. (This structure will instruct the job manager to deploy the Liberty profile installation into a project directory named `selfContained`.)

Part B – Deployment and basic use

Use the job manager on host-1 to install and start the Liberty profile installation on host-3 and host-4.

Tasks

1. On host-1, use the operating system shell to start the job manager server.

2. Use the operating system shell to launch the administrative console for the job manager. If administrative security is enabled, be sure to log in as a WebSphere user possessing the Administrator role.

3. Use the job manager administrative console to configure the job manager so that it is possible to deploy Liberty profile resources to the server hosts.
    a. Define the WebSphere variable WLP_WORKING_DIR, the base directory for the remote Liberty profile server installations.
        i. Click **Environment > WebSphere variables**.
        ii. Set the scope to the level of the cell.
        iii. Define the variable, for example,
        Windows
        `WLP_WORKING_DIR` with value `C:\liberty\working`
        UNIX/Linux
        `WLP_WORKING_DIR` with value `/liberty/working`
        iv. Click **Save** to save the changes to the master configuration.
    a. Add host-3 and host-4 to the list of job manager targets.
        i. Click **Jobs > Targets**.
        ii. Add host-3 to the list of targets.
            - Host name: host-3
            - Operating system: Operating system of target host
            - Administrative user with installation authority: Operating system user
            - Password authentication: Selected
            - Password: Password of operating system user
            - Confirm password: Password of operating system user
            - Save security information: Checked
        iii. Repeat step ii for host host-4.
    b. Create a new target group containing host-3 and host-4.
        i. Click **Jobs > Target groups**.
        v. Create a new target group with name Server Hosts and members host-3 and host-4.

4. Use the job manager to install the Liberty profile resources package on each server host.
    a. Within the job manager console, click **Jobs > Submit** and do the following:
        i. Select the job type **Install Liberty profile resources** and click **Next**.
        ii. Select the target group **Server Hosts**. (Since you saved the authentication information for each target host in the target group, you do not need to provide it in this step.) Then click **Next**.
        iii. Specify the path to the Liberty profile resources compressed (.zip) file that you created in part A of this lab. (Do not specify any authentication information, as it is only required when specifying a URL path that is secured.) Then click **Next**.
        iv. Accept the default job scheduling settings and click **Next**.
        v. Click **Finish** to submit the job.
    b. In the Job Status window, click the installation job to see the status of the job on each target host. Periodically click the refresh icon in the Status column header. The status should move through these stages over the course of several minutes: Not submitted, In progress, and Succeeded.

5. Use the job manager to verify that the required components are present on each server host.

   Within the job manager console, click **Jobs > Target resources**. You should see a project named *selfContained*, a runtime named *wlp-85*, Liberty servers named *SecuritySample-01.00-01* and *ServletSample-01.00-01*, and application binaries named *SecuritySample-01.00.war* and *ServletSample-01.00.war*.

6. Use the job manager to start the servers on each server host.
    a. Within the job manager console, click **Jobs > Submit** and do the following:
        i. Select the job type **Start Liberty profile server** and click **Next**.
        ii. Select the target group **Server Hosts** and click **Next**.
        iii. Select the server to be started (on each target host).

            Click **Find**. In the Find Target Resources window, click **Find**. Then select server **SecuritySample-01.00-01** and click **OK**.

            Click **Next**.
        iv. Accept the default job scheduling settings and click **Next**.
        v. Click **Finish** to submit the job. Then monitor the job until it is complete. (It may take several minutes for the servers to start.)
    b. Repeat step a for server **ServletSample-01.00-01**.

7. Use the job manager to display the status of each server.

   Within the job manager console, click **Jobs > Target resources**. Then click each server to view its status on each target host.

8. Working on host-1, use a web browser to verify that it is possible to access each application running on each server on host-3 and host-4, for example,

   `http://host-3:9080/ServletSample`

   `http://host-3:9081/SecuritySample` (Specify user name `gkelly` and password `gkelly1`)

Part C – Web server plug-in configuration

Configure the IBM HTTP Server on host-2 to forward requests to the servers on host-3 and host-4.

Tasks

1. Use the job manager on host-1 to generate a merged web server plug-in configuration to enable the IBM HTTP Server on host-2 to forward requests to the Liberty profile servers on host-3 and host-4.

   Note that the Liberty profile servers must be running; otherwise, the associated job will fail. Additionally, each server configuration must include the localConnector feature or the restConnector feature, given that the job uses a JMX connection to request each server to generate plug-in configuration information. Finally, when relying on the restConnector feature, you must specify the user name and password of a WebSphere user with privileges to administer the servers; however, in this lab, the servers include the localConnector feature, so specifying a user name and password is unnecessary.

   Within the job manager console, click **Jobs > Submit** and do the following:

   a. Select the job type **Generate merged plug-in configuration for Liberty profile servers** and click **Next**.
   b. Select the target group **Server Hosts** and click **Next**.
   c. Specify the servers to include in the merged plug-in configuration.

      Click Find. In the Find Target Resources window, click **Find**. Then select server **SecuritySample-01.00-01** and click **OK**.

      Since the merged web server plug-in configuration must include the servers hosting the SecuritySample and ServletSample applications, replace the name of the server with an asterisk (*). The resulting resource path should look like the following:

      ```
      project/selfContained/runtime/wlp-85/liberty_server/*
      ```

      Given that the localConnector feature is included in the configuration of each server, specifying a user ID and password is unnecessary.

      Click **Next**.
   d. Accept the default job scheduling settings and click **Next**.
   e. Click **Finish** to submit the job. Then monitor the job until it is complete.

2. Configure the IBM HTTP Server to use the plug-in for WebSphere Application Server and the newly generated merged web server plug-in configuration.
    a. The merged web server plug-in configuration file, `plugin-cfg.xml`, is located in this directory on host-1:
    app_server_root/profiles/*job_manager_profile*/config/temp/JobManager/*job_ID*/_mergedPluginDir

    Windows example:
    C:\Program Files\IBM\AppServer\profiles\JobMgr01\config\temp\JobManager*job_ID*_mergedPluginDir

    UNIX/Linux example:
    /opt/IBM/WebSphere/AppServer/profiles/JobMgr01/config/temp/JobManager/*job_ID*/_mergedPluginDir

    Copy the merged web server plug-in configuration file to the IBM HTTP Server configuration directory (on host-2), *http_server_root*/conf

    Windows example:
    C:\Program Files\IBM\HTTPServer\conf

    UNIX/Linux example:
    /opt/IBM/HTTPServer/conf

    b. Working on host-2, add these lines to the IBM HTTP Server configuration file, *http_server_root*/conf/httpd.conf, preferably at the end of the Dynamic Shared Object (DSO) Support section:

    ```
    LoadModule was_ap22_module plugins_root/bin/module_file
    WebSpherePluginConfig http_server_root/conf/plugin-cfg.xml
    ```

    Windows example:

    ```
    LoadModule was_ap22_module "C:\Program Files\IBM\WebSphere\Plugins\bin\mod_was_ap22_http.dll"
    WebSpherePluginConfig "C:\Program Files\IBM\HTTPServer\conf\plugin-cfg.xml"
    ```

    UNIX/Linux example:

    ```
    LoadModule was_ap22_module /opt/IBM/WebSphere/Plugins/bin/mod_was_ap22_http.so
    WebSpherePluginConfig /opt/IBM/HTTPServer/conf/plugin-cfg.xml
    ```

3. Working on host-2, use the operating system shell to launch IBM HTTP Server. Alternatively, open a command prompt and change to the IBM HTTP Server bin directory, for example,

   Windows: `C:\Program Files\IBM\HTTPServer\bin`
   UNIX/Linux: `/opt/IBM/HTTPServer/bin`

   Then run this command:

   Windows: `httpd -w -n "IBM HTTP Server V8.5" -k start`
   UNIX/Linux: `./apachectl start`

4. Use a web browser to verify that it is possible to access each application using the IBM HTTP Server, for example,

   `http://host-2/ServletSample`

   `http://host-2/SecuritySample` (Specify user name `gkelly` and password `gkelly1`)

5. Use the operating system shell to stop IBM HTTP Server. Alternatively, run this command from the IBM HTTP Server bin directory:

   Windows: `httpd -w -n "IBM HTTP Server V8.5" -k stop`
   UNIX/Linux: `./apachectl stop`

6. Use the job manager to stop the servers running on each server host.
   a. Within the job manager console, click **Jobs > Submit** and do the following:
      i. Select the job type **Stop Liberty profile server** and click **Next**.
      ii. Select the target group **Server Hosts** and click **Next**.
      iii. Select the server to be stopped (on each target host).

      Click **Find**. In the Find Target Resources window, click **Find**. Then select server **SecuritySample-01.00-01** and click **OK**.

      Click **Next**.
      iv. Accept the default job scheduling settings and click **Next**.
      v. Click **Finish** to submit the job. Then monitor the job until it is complete.
   b. Repeat step a for server **ServletSample-01.00-01**.

7. Use the job manager to uninstall all Liberty profile resources residing on each server host.

   Within the job manager console, click **Jobs > Submit** and do the following:
   a. Select the job type **Uninstall Liberty profile resources** and click **Next**.
   b. Select the target group **Server Hosts** and click **Next**.
   c. Select the project to be uninstalled (from each target host).

      Click the **Find** button for the **Project to uninstall** field. In the Find Target Resources window, click **Find**. Then select the project **selfContained** and click **OK**.

      Click **Next**.
   d. Accept the default job scheduling settings and click **Next**.
   e. Click **Finish** to submit the job. Then monitor the job until it is complete.

8. Log out of the job manager console.

9. Use the operating system shell to stop the job manager server. If you are prompted to authenticate, specify the user name and password of a WebSphere user possessing the Administrator role.