Automating your Tomcat with Ansible

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What will be covered

- Who am i?
- Brief Overview of Ansible
- Problem
- Solution
- Demo
- Potential improvements
- Thoughts and/or Questions?
- Thanks!

Who am i?

- Coty Sutherland
- Software Engineering Manager @ Red Hat
- Java Developer
- Tomcat committer since 2016
- Fedora tomcat package maintainer since 2015
- Husband and father of three
- East Coast, USA

Brief Overview of Ansible

“Ansible is a suite of software tools that enables infrastructure as code. It is open-source and the suite includes software provisioning, configuration management, and application deployment functionality.” - Wikipedia

It uses no agents and no additional custom security infrastructure, so it's easy to deploy - and most importantly, it uses a very simple language (YAML, in the form of Ansible Playbooks) that allow you to describe your automation jobs in a way that approaches plain English.

Why Ansible?

We're not pushing this because it's our product, we acquired Ansible because we think its the best automation solution on the market.

We like drinking our own champagne...and better product integration.

Ansible is outside of the JVM (unlike ant or maven) and provides a more standardized solution that that can be applied across multiple applications.

JBoss Web Server aka JWS

Throughout this presentation, I'll mention JWS, which is the product containing the Red Hat build of Apache Tomcat.

Product name could be better, but here we are :)

- Apache Tomcat is the main component
- Vault Extension for Tomcat
- Mod_cluster
- Other small components extending and supporting Apache Tomcat

Problem

- Managing lots of instances of Tomcat is difficult and costly.
  - Defining and verifying deployment strategies
  - Technical debt incurred by rolling your own solution
- A specific issue I'll focus on here is about how testing new Apache Tomcat releases is difficult and costly too.
  - Manual
  - Scripted/some automation solution

Solution

Solution, cont'd.

Automation with Ansible makes things easier!

Define and verify deployment strategies with Ansible's declarative syntax (playbooks).

Repeatable state/status synchronization.

Testing your application on new Apache Tomcat releases is faster, easier, and repeatable using Ansible.

Introducing the JWS Ansible Collection...

Main JWS collection features

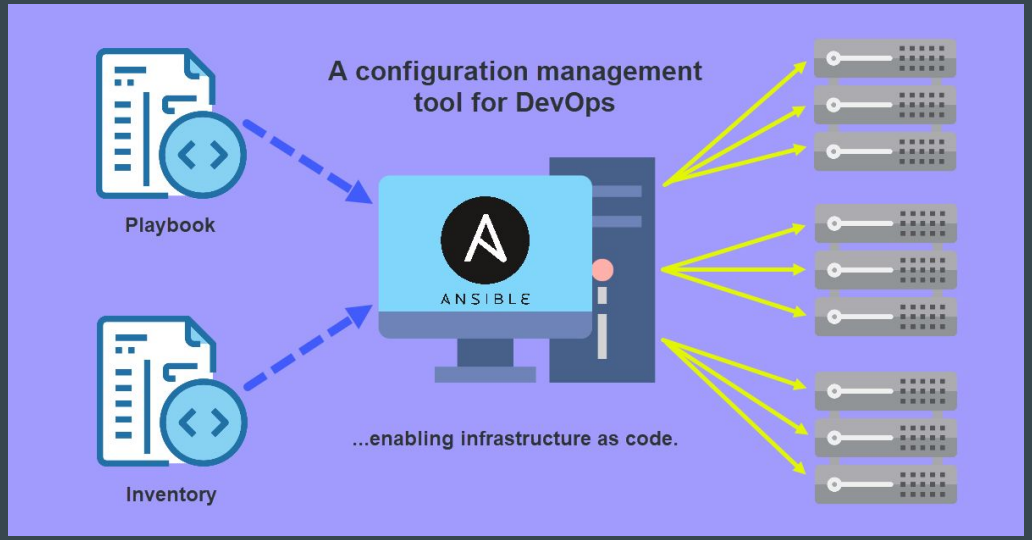
Easily install and configure JWS instances

Automatically configure product features, like mod_cluster

Uniform deployment strategies

Collection owner/maintainer is responsible for automation management rather than doing it yourself

By default, running the playbook will setup a basic Tomcat installation running on port 8080 with no applications deployed.



Overview

The template for the server.xml.j2 (and other conf files) covers the most basic use case of the server.

You can use your own template files if what we provided doesn't work for you.

Full table table of options is documented within the role's readme: https://github.com/ansible-middleware/jws/tree/main/roles/jws

Service configuration

Variable	Description	Default
`jws_apps_to_remove`	Comma separated list of apps to undeploy	`docs,ROOT,examples`
`jws_catalina_base`	Tomcat catalina base env variable	`{{ lookup('env','CATALINA_BASE') }}`
`jws_conf_properties`	Path for tomcat configuration	`./conf/catalina.properties`
`jws_conf_policy`	Path for tomcat policy configuration	`./conf/catalina.policy`
`jws_conf_loggging`	Path for logging configuration	`./conf/logging.properties`
`jws_conf_context`	Relative path to context.xml	`./conf/context.xml`
`jws_conf_server`	Relative path to server.xml	`./conf/server.xml`
`jws_conf_web`	Relative path to web.xml	`./conf/web.xml`
`jws_conf_templates_context`	Template to use for context.xml	`templates/context.xml.j2`
`jws_conf_templates_server`	Template to use for server.xml	`templates/server.xml.j2`
`jws_conf_templates_web`	Template to use for web.xml	`templates/web.xml.j2`

server.xml template syntax

The templates are Jinja2 syntax.

Here is an example of the configuration template for the server.xml portion that sets up the HTTPS connector for Tomcat.

```
{% if jws.listen.https.enabled is defined and jws.listen.https.enabled %}
    <Connector port="{{ jws.listen.https.port }}"
               protocol="org.apache.coyote.http11.Http11NioProtocol"
{% if jws.listen.https.bind_address is defined %}              address="{{ jws.listen.https.bind_address }}"
{% endif %}
               maxThreads="{{ jws.listen.https.threads.max }}"
               SSLEnabled="true"
          allowTrace="false"
          scheme="https"
               secure="true"
               xpoweredBy="false"
               server="{{ jws.listen.https.servername }}"
               connectionTimeout="{{ jws.listen.https.connection.timeout }}"
               maxHttpHeaderSize="{{ jws.listen.https.headers.max_size }}">
        <SSLHostConfig sslProtocol="TLS"
                       certificateVerification="{{ jws.listen.https.client.auth }}">
           <Certificate certificateKeystoreFile="{{ jws.listen.https.keystore.file }}"
                        certificateKeystorePassword="{{ jws.listen.https.keystore.password }}"
                        type="RSA" />
        </SSLHostConfig>
    </Connector>
{% endif %}
```

Example use case: testing tomcat releases

Four main parts to this playbook:

- Get sources and run unit tests
- Download binary distro
- Configure and start Tomcat
- Deploy and test application

```yaml
---
- name: "Test Apache Tomcat Release In Progress"
  hosts: localhost
  connection: local
  become: true
  vars:
    # variables used by the role for configuration
    - tomcat_version: 9.0.67
    - jws_install_dir: /opt
    - jws_home: "{{ jws_install_dir }}/apache-tomcat-{{ tomcat_version }}"
    - jws_systemd_enabled: True
    # custom variables for use in this playbook
    - tomcat_src_zip_filename: "apache-tomcat-{{ tomcat_version }}-src.zip"
    - tomcat_src_download_url: "https://dist.apache.org/repos/dist/dev/tomcat/tomcat-{{ tomcat_v
    - tomcat_bin_download_url: "https://dist.apache.org/repos/dist/dev/tomcat/tomcat-{{ tomcat_v
    - tomcat_source_home: "{{ jws_install_dir }}/apache-tomcat-{{ tomcat_version }}-src"
    - run_unit_tests: True
  collections:
    - middleware_automation.jws
```

```yaml
pre_tasks:
  - name: "Download Apache Tomcat sources and run the unit test suite"
    block:
      - name: "Install required dependencies"
        include_tasks: fastpackage.yml
        vars:
          package_name: "{{ item }}"
        loop:
          - zip
          - unzip
          - ant

      - name: "Download source zip from: {{ tomcat_src_download_url }}"
        ansible.builtin.get_url:
          url: "{{ tomcat_src_download_url }}"
          dest: "{{ jws_install_dir }}"
          validate_certs: no

      - name: "Unzip source zip in {{ jws_install_dir }}"
        ansible.builtin.unarchive:
          remote_src: yes
          src: "{{ jws_install_dir }}/{{ tomcat_src_zip_filename }}"
          dest: "{{ jws_install_dir }}"
          creates: "{{ tomcat_source_home }}"

      - name: "Run unit tests"
        ansible.builtin.shell:
          ## exclude tests that depend on openssl version a lot and only check nio
          cmd: "ant -Dexecute.test.apr=false -Dexecute.test.nio2=false -Dtest.exclude=\"**/TestCipher.java,**/TestOpenSSLCipherConfigurationParser.java\" test > build.log 2>&1"
          chdir: "{{ tomcat_source_home }}"
        ignore_errors: True
        register: test_output

      - name: "Output failed tests"
        block:
          - name: "grep FAILED from logs"
            ansible.builtin.shell:
              cmd: "grep -ar FAILED {{ tomcat_source_home }}/output/build/logs | grep -oe TEST-.*\\.txt"
            register: grep_output

          # We can change this to a fail if you want the playbook to stop execution when any tests fail
          - name: "Print grep output"
            ansible.builtin.debug:
              msg: "Check the following logs for failures: {{ grep_output.stdout_lines | join(', ') }}"
        when: test_output.rc != 0
    when: run_unit_tests

  # Since the binary doesn't exist on the CDN yet, we must manually download from the staging area
  - name: "Download binary zip from: {{ tomcat_bin_download_url }}"
    ansible.builtin.get_url:
      url: "{{ tomcat_bin_download_url }}"
      dest: "{{ jws_install_dir }}"
      validate_certs: no
```

```yaml
tasks:
  - name: "Include role to unzip and configure Apache Tomcat, then smoke test (validate)"
    ansible.builtin.include_role:
      name: jws

  - name: "Deploy test application and make some requests"
    block:
    - name: "Deploy test webapp"
      ansible.builtin.copy:
        src: "testapp"
        dest: "{{ jws_home }}/webapps/"
        mode: 0644

    # This will cause systemd to start Tomcat
    - name: "Force all notified handlers to run at this point, not waiting for normal sync points"
      ansible.builtin.meta: flush_handlers

    - name: "Wait for Tomcat HTTP port to be available"
      ansible.builtin.wait_for:
        port: 8080

    - name: "Verify webapp is responding as expected"
      ansible.builtin.uri:
        url: "http://localhost:8080/testapp"
        return_content: yes
      register: this
      failed_when: "'Hello!' not in this.content"
      until: this.status == 200
      retries: 3
      delay: 5
```

Demo!

```
[csutherl@EVE tomcat-release-test-playbook]$ # check to ensure /opt is empty
[csutherl@EVE tomcat-release-test-playbook]$ ll /opt/apache-tomcat* -d
drwxr-xr-x. 1 root root 12 Sep 26 15:22 /opt/apache-tomcat-9.0.65-src
[csutherl@EVE tomcat-release-test-playbook]$ ll /opt/apache-tomcat-9.0.65-src/output/build/
total 4
lrwxrwxrwx. 1 root root 67 Sep 26 15:22 logs -> /home/csutherl/Downloads/apache-tomcat-9.0.65-src/output/build/logs
[csutherl@EVE tomcat-release-test-playbook]$ # verify that tomcat isn't running
[csutherl@EVE tomcat-release-test-playbook]$ ps aux | grep tomcat
csutherl 1147833  0.0  0.0 222168  2236 pts/11   S+   15:24   0:00 grep --color=auto tomcat
[csutherl@EVE tomcat-release-test-playbook]$ # execute the playbook
[csutherl@EVE tomcat-release-test-playbook]$ ansible-playbook playbook.yml
[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all'

PLAY [Test Apache Tomcat Release In Progress] **********************************************************************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************************************************************************
ok: [localhost]

TASK [Install required dependencies] *******************************************************************************************************************************************************
included: /home/csutherl/source/tomcat-release-test-playbook/fastpackage.yml for localhost => (item=zip)
included: /home/csutherl/source/tomcat-release-test-playbook/fastpackage.yml for localhost => (item=unzip)
included: /home/csutherl/source/tomcat-release-test-playbook/fastpackage.yml for localhost => (item=ant)

TASK [Check arguments] *********************************************************************************************************************************************************************
ok: [localhost]

TASK [Test if package zip is already installed] ********************************************************************************************************************************************
ok: [localhost]

TASK [Check arguments] *********************************************************************************************************************************************************************
ok: [localhost]

TASK [Test if package unzip is already installed] ******************************************************************************************************************************************
ok: [localhost]

TASK [Check arguments] *********************************************************************************************************************************************************************
ok: [localhost]

TASK [Test if package ant is already installed] ********************************************************************************************************************************************
ok: [localhost]

TASK [Download source zip from: https://dist.apache.org/repos/dist/dev/tomcat/tomcat-9/v9.0.65/src/apache-tomcat-9.0.65-src.zip] ********************************************************
```

Potential Improvements

- Provide a major version and automatically pull and test available releases for that major version
- Add logic to role in collection rather than a unique playbook
- Add property to check for development releases (after we include the logic into the role)
- Startup with startup.sh rather than requiring systemd
- Do something with the test output!
- Check file hashes and keys after downloading
- Fail if a test in the test suite fails
- Set variables to skip tests, etc
- Add a small cluster to test on in our validation logic

What do you think? Interested in using or contributing?

For using: https://galaxy.ansible.com/middleware_automation/jws

For contributing: https://github.com/ansible-middleware/jws

Issues tracked on GitHub!

Questions?

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Thanks!