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SER506 - Journalisation, Supervision et Clustering

Contenu du Module

Configuration des journaux

java.util.logging

Par défaut, Tomcat utilise le framework **java.util.logging** pour produire ses journaux.

Ce système de journalisation utilise le fichier **$CATALINA_HOME/conf/logging.properties** :

```
[root@centos8 ~]# cat $CATALINA_HOME/conf/logging.properties
# Licensed to the Apache Software Foundation (ASF) under one or more
# contributor license agreements.  See the NOTICE file distributed with
# this work for additional information regarding copyright ownership.
# The ASF licenses this file to You under the Apache License, Version 2.0
# (the "License"); you may not use this file except in compliance with
# the License.  You may obtain a copy of the License at
#
#     http://www.apache.org/licenses/LICENSE-2.0
#
# Unless required by applicable law or agreed to in writing, software
# distributed under the License is distributed on an "AS IS" BASIS,
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
# See the License for the specific language governing permissions and
# limitations under the License.

handlers = 1catalina.org.apache.juli.AsyncFileHandler, 2localhost.org.apache.juli.AsyncFileHandler,
3manager.org.apache.juli.AsyncFileHandler, 4host-manager.org.apache.juli.AsyncFileHandler,
java.util.logging.ConsoleHandler

.handlers = 1catalina.org.apache.juli.AsyncFileHandler, java.util.logging.ConsoleHandler

############################################################
# Handler specific properties.
# Describes specific configuration info for Handlers.
############################################################

1catalina.org.apache.juli.AsyncFileHandler.level = FINE
1catalina.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
1catalina.org.apache.juli.AsyncFileHandler.prefix = catalina.
```

```
1catalina.org.apache.juli.AsyncFileHandler.maxDays = 90
1catalina.org.apache.juli.AsyncFileHandler.encoding = UTF-8

2localhost.org.apache.juli.AsyncFileHandler.level = FINE
2localhost.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
2localhost.org.apache.juli.AsyncFileHandler.prefix = localhost.
2localhost.org.apache.juli.AsyncFileHandler.maxDays = 90
2localhost.org.apache.juli.AsyncFileHandler.encoding = UTF-8

3manager.org.apache.juli.AsyncFileHandler.level = FINE
3manager.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
3manager.org.apache.juli.AsyncFileHandler.prefix = manager.
3manager.org.apache.juli.AsyncFileHandler.maxDays = 90
3manager.org.apache.juli.AsyncFileHandler.encoding = UTF-8

4host-manager.org.apache.juli.AsyncFileHandler.level = FINE
4host-manager.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
4host-manager.org.apache.juli.AsyncFileHandler.prefix = host-manager.
4host-manager.org.apache.juli.AsyncFileHandler.maxDays = 90
4host-manager.org.apache.juli.AsyncFileHandler.encoding = UTF-8

java.util.logging.ConsoleHandler.level = FINE
java.util.logging.ConsoleHandler.formatter = org.apache.juli.OneLineFormatter
java.util.logging.ConsoleHandler.encoding = UTF-8



############################################################
# Facility specific properties.
# Provides extra control for each logger.
############################################################

org.apache.catalina.core.ContainerBase.[Catalina].[localhost].level = INFO
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].handlers =
2localhost.org.apache.juli.AsyncFileHandler
```

```
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/manager].level = INFO
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/manager].handlers =
3manager.org.apache.juli.AsyncFileHandler

org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/host-manager].level = INFO
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/host-manager].handlers = 4host-
manager.org.apache.juli.AsyncFileHandler

# For example, set the org.apache.catalina.util.LifecycleBase logger to log
# each component that extends LifecycleBase changing state:
#org.apache.catalina.util.LifecycleBase.level = FINE

# To see debug messages in TldLocationsCache, uncomment the following line:
#org.apache.jasper.compiler.TldLocationsCache.level = FINE

# To see debug messages for HTTP/2 handling, uncomment the following line:
#org.apache.coyote.http2.level = FINE

# To see debug messages for WebSocket handling, uncomment the following line:
#org.apache.tomcat.websocket.level = FINE
```

Dans ce fichier on constate la directive **handlers** :

```
...
handlers = 1catalina.org.apache.juli.AsyncFileHandler, 2localhost.org.apache.juli.AsyncFileHandler,
3manager.org.apache.juli.AsyncFileHandler, 4host-manager.org.apache.juli.AsyncFileHandler,
java.util.logging.ConsoleHandler
...
```

Il existe deux types de **handlers** :

- **org.apache.juli.AsyncFileHandler** qui écrit dans un fichier texte,
- **java.util.logging.ConsoleHandler** qui écrit sur la sortie standard.

Dans la déclaration des handlers, il faut spécifier un nom. Dans la déclaration ci-dessus, les noms sont :

- 1catalina,
- 2localhost,
- 3manager,
- 4host-manager.

La directive suivante permet de référencer le gestionnaire principal pour le serveur lui-même :

```
...
.handlers = 1catalina.org.apache.juli.AsyncFileHandler, java.util.logging.ConsoleHandler
...
```

Chaque handler doit ensuite être configuré :

```
1catalina.org.apache.juli.AsyncFileHandler.level = FINE
1catalina.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
1catalina.org.apache.juli.AsyncFileHandler.prefix = catalina.
1catalina.org.apache.juli.AsyncFileHandler.maxDays = 90
1catalina.org.apache.juli.AsyncFileHandler.encoding = UTF-8

2localhost.org.apache.juli.AsyncFileHandler.level = FINE
2localhost.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
2localhost.org.apache.juli.AsyncFileHandler.prefix = localhost.
2localhost.org.apache.juli.AsyncFileHandler.maxDays = 90
2localhost.org.apache.juli.AsyncFileHandler.encoding = UTF-8

3manager.org.apache.juli.AsyncFileHandler.level = FINE
3manager.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
3manager.org.apache.juli.AsyncFileHandler.prefix = manager.
3manager.org.apache.juli.AsyncFileHandler.maxDays = 90
3manager.org.apache.juli.AsyncFileHandler.encoding = UTF-8

4host-manager.org.apache.juli.AsyncFileHandler.level = FINE
```

```
4host-manager.org.apache.juli.AsyncFileHandler.directory = ${catalina.base}/logs
4host-manager.org.apache.juli.AsyncFileHandler.prefix = host-manager.
4host-manager.org.apache.juli.AsyncFileHandler.maxDays = 90
4host-manager.org.apache.juli.AsyncFileHandler.encoding = UTF-8

java.util.logging.ConsoleHandler.level = FINE
java.util.logging.ConsoleHandler.formatter = org.apache.juli.OneLineFormatter
java.util.logging.ConsoleHandler.encoding = UTF-8
```

Les attributs communs à la classe org.apache.juli.AsyncFileHandler et java.util.logging.ConsoleHandler sont les suivants :

Attribut	**Description**
level	Spécifie le niveau de journalisation. Les niveaux sont SEVERE, CONFIG, INFO, WARN, FINE, FINEST ou ALL
formatter	Spécifie la classe utilisée pour formater le journal soit par défaut **java.util.logging.SimpleFormatter** soit **java.util.logging.XMLFormatter** pour générer une sortie au format XML

Les attributs spécifiques à la classe org.apache.juli.AsyncFileHandler sont les suivants :

Attribut	**Description**
prefix	Spécifie le nom du fichier
suffix	Spécifie l'extension du fichier
directory	Spécifie le répertoire de stockage des journaux

La rotation des journaux est journalier à 00h00. Le nom du journal aura don la forme suivante : **nom.AAAA.MM.JJ**.

La section suivante du fichier fournit un niveau de contrôle supplémentaire :

```
...
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].level = INFO
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].handlers =
2localhost.org.apache.juli.AsyncFileHandler

org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/manager].level = INFO
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/manager].handlers =
```

```
3manager.org.apache.juli.AsyncFileHandler

org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/host-manager].level = INFO
org.apache.catalina.core.ContainerBase.[Catalina].[localhost].[/host-manager].handlers = 4host-
manager.org.apache.juli.AsyncFileHandler
...
```

Par exemple :

- [Catalina].[localhost] fait référence au hôte localhost,
- [Catalina].[localhost].[/manager] fait référence à l'application manager.

Il est à noter que les configurations spécifiques aux applications peuvent être incluses soit dans le fichier **$CATALINA_HOME/conf/logger.properties** soit dans un fichier logger.properties qui se trouve dans le répertoire **WEB-INF/classes** de l'application concernée.

Important : Pour mettre en place le debugging, utilisez le niveau **FINEST** ou **ALL**. Pour plus d'information concernant la journalisation, consultez le **manuel** de Tomcat 10.

Supervision

JMeter

Ouvrez un terminal dans l'interface graphique de votre VM.

La gestion de la montée en charge de Tomcat peut être faite avec le produit libre **JMeter**. Pour l'obtenir, il convient de le télécharger :

```
[root@centos8 ~]# wget https://archive.apache.org/dist/jmeter/binaries/apache-jmeter-5.6.2.zip
--2023-10-06 05:46:27--  https://archive.apache.org/dist/jmeter/binaries/apache-jmeter-5.6.2.zip
Resolving archive.apache.org (archive.apache.org)... 65.108.204.189, 2a01:4f9:1a:a084::2
```

```
Connecting to archive.apache.org (archive.apache.org)|65.108.204.189|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 94326599 (90M) [application/zip]
Saving to: ‘apache-jmeter-5.6.2.zip’

apache-jmeter-5.6.2.zip     100%[=========================================>]  89.96M  21.6MB/s    in 4.7s

2023-10-06 05:46:33 (19.0 MB/s) - ‘apache-jmeter-5.6.2.zip’ saved [94326599/94326599]
```

Décompressez l'archive dans **$CATALINA_HOME/JMeter** :

```
[root@centos8 ~]# mkdir $CATALINA_HOME/JMeter

[root@centos8 ~]# mv apache-jmeter-5.6.2.zip $CATALINA_HOME/JMeter

[root@centos8 ~]# cd $CATALINA_HOME/JMeter

[root@centos8 JMeter]# unzip apache-jmeter-5.6.2.zip
```

L'arborescence obtenu est :

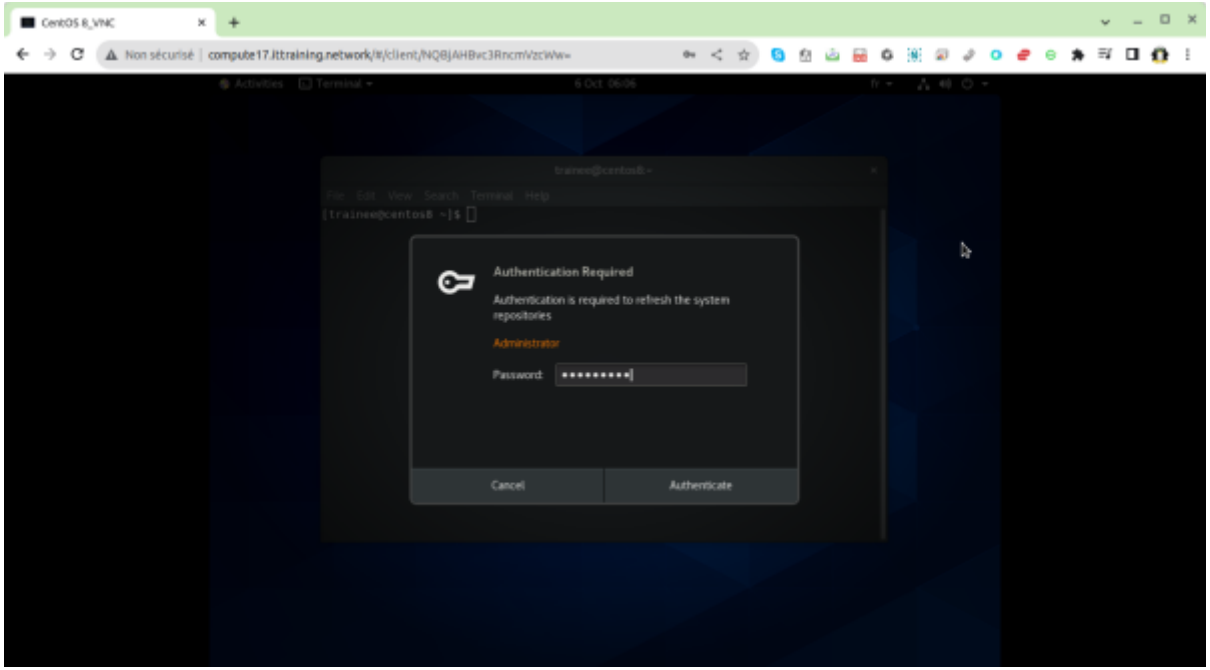
```
[root@centos8 JMeter]# ls
apache-jmeter-5.6.2  apache-jmeter-5.6.2.zip

[root@centos8 JMeter]# cd apache-jmeter-5.6.2/

[root@centos8 apache-jmeter-5.6.2]# ls
bin  docs  extras  lib  LICENSE  licenses  NOTICE  printable_docs  README.md
```

Définissez maintenant la variable **$JMETER_HOME** :

```
[root@centos8 apache-jmeter-5.6.2]# JMETER_HOME=/usr/tomcat10/JMeter/apache-jmeter-5.6.2

[root@centos8 apache-jmeter-5.6.2]# export JMETER_HOME
```

```
[root@centos8 apache-jmeter-5.6.2]# echo $JMETER_HOME
/usr/tomcat10/JMeter/apache-jmeter-5.6.2
```

Connectez-vous à votre VM CentOS 8 en mode graphique en utilisant Guacamole :



Si, et uniquement si, votre VM CentOS 8 n'est pas en mode graphique (erreur de connexion sous Guacamole), modifiez la target par défaut à **graphical target** :

```
[root@centos8 apache-jmeter-5.6.2]# systemctl set-default graphical.target
```

Re-démarrez votre VM CentoS 8 :

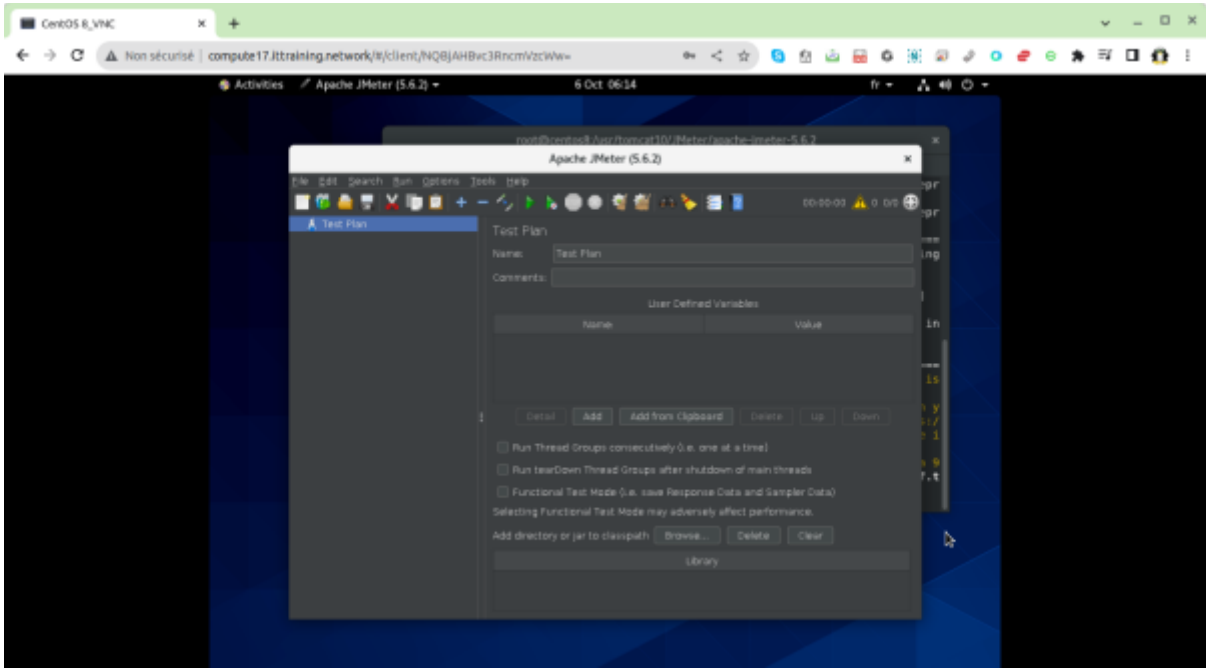
```
[root@centos8 apache-jmeter-5.6.2]# reboot
```

Si votre connexion réussie mais la VM semble être bloquée, retournez dans votre connexion SSH et saisissez la commande suivante :

```
[root@centos8 apache-jmeter-5.6.2]# systemctl restart vncserver@\:1.service
```

Lancez ensuite JMeter dans un terminal graphique de votre VM :

```
[root@centos8 apache-jmeter-5.6.2]# /usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/jmeter
```



Testez cet outil en utilisant les différents fichiers mis-à-disposition lors de l'installation de JMeter :

```
[root@centos8 apache-jmeter-5.6.2]# updatedb
[root@centos8 apache-jmeter-5.6.2]# locate .jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/examples/CSVSample.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/examples/PerformanceTestPlanMemoryThread.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/BeanShellSampler.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/GroovyJSR223Sampler.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/ThinkTime.jmx
```

```
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/build-adv-web-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/build-ftp-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/build-ldap-ext-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/build-ldap-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/build-web-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/build-webservice-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/functional-testing-01-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/jdbc.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/mongodb.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/recording-with-think-time.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/recording.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/bin/templates/simple-http-request-test-plan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/extras/Test.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/AssertionTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/AuthManagerTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/ForEachTest2.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/HeaderManagerTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/InterleaveTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/InterleaveTestPlan2.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/JDBC-Pre-Post-Processor.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/JMSPointToPoint.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/LoopTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/OnceOnlyTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/ProxyServerTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/RegEx-User-Parameters.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/SimpleGraphQLTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/SimpleTestPlan.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/URLRewritingExample.jmx
/usr/tomcat10/JMeter/apache-jmeter-5.6.2/printable_docs/demos/forEachTestPlan.jmx
```

Important : Pour plus d'information concernant l'utilisation de cet outil, consultez la page **https://jmeter.apache.org/usermanual/get-started.html**.

Interface JMX

L'interface JMX est un outil complémentaire à JMeter car il est capable de montrer :

- le comportement interne du serveur,
- le nombre de connexions JDBC disponibles à un instant t,
- le nombre de threads occupés dans un connecteur.

JMX ou *Java Management eXtensions* est un API Java qui extrait des informations des **MBeans**. Les MBeans sont créés dans le fichier $CATALINA_HOME/conf/server.xml en utilisant des éléments <Listener> :

```
...
  <Listener className="org.apache.catalina.startup.VersionLoggerListener" />
  <!-- Security listener. Documentation at /docs/config/listeners.html
  <Listener className="org.apache.catalina.security.SecurityListener" />
  -->
  <!-- APR library loader. Documentation at /docs/apr.html -->
  <Listener className="org.apache.catalina.core.AprLifecycleListener" SSLEngine="on" />
  <!-- Prevent memory leaks due to use of particular java/javax APIs-->
  <Listener className="org.apache.catalina.core.JreMemoryLeakPreventionListener" />
  <Listener className="org.apache.catalina.mbeans.GlobalResourcesLifecycleListener" />
  <Listener className="org.apache.catalina.core.ThreadLocalLeakPreventionListener" />
...
```

Revenez à l'authentification en utilisant le fichier **tomcat-users.xml** en éditant le fichier **$CATALINA_HOME/conf/server.xml** :

```
[root@centos8 apache-jmeter-5.6.2]# vi $CATALINA_HOME/conf/server.xml
[root@centos8 apache-jmeter-5.6.2]# cat $CATALINA_HOME/conf/server.xml
...
      <!-- Use the LockOutRealm to prevent attempts to guess user passwords
           via a brute-force attack -->
      <Realm className="org.apache.catalina.realm.LockOutRealm">
        <!-- This Realm uses the UserDatabase configured in the global JNDI
```

```
             resources under the key "UserDatabase".  Any edits
             that are performed against this UserDatabase are immediately
             available for use by the Realm.  -->
        <Realm className="org.apache.catalina.realm.UserDatabaseRealm"
               resourceName="UserDatabase">
        <CredentialHandler className="org.apache.catalina.realm.MessageDigestCredentialHandler"
algorithm="SHA-256"/>
      </Realm>

      <!--<Realm  className="org.apache.catalina.realm.DataSourceRealm"
         dataSourceName="jdbc/AuthTomcat"
              userTable="users" userNameCol="nom_user" userCredCol="mdp_user"
          userRoleTable="roles" roleNameCol="nom_role" /> -->

      <!-- <Realm  className="org.apache.catalina.realm.JNDIRealm"
          connectionURL="ldap://localhost:389"
         connectionName="cn=Manager,o=ittraining.loc"
     connectionPassword="fenestros"
               roleBase="ou=roles,o=ittraining.loc"
               roleName="cn"
             roleSearch="(uniqueMember={0})"
           userPassword="userPassword"
            userPattern="cn={0},ou=utilisateurs,o=ittraining.loc" /  -->>

      </Realm>
...
```

Éditez ensuite le fichier **$CATALINA_HOME/conf/tomcat-users.xml** :

```
[root@centos8 apache-jmeter-5.6.2]# vi $CATALINA_HOME/conf/tomcat-users.xml
[root@centos8 apache-jmeter-5.6.2]# cat $CATALINA_HOME/conf/tomcat-users.xml
<?xml version='1.0' encoding='utf-8'?>
<tomcat-users xmlns="http://tomcat.apache.org/xml"
              xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
              xsi:schemaLocation="http://tomcat.apache.org/xml tomcat-users.xsd"
              version="1.0">
  <role rolename="tomcat"/>
  <role rolename="role1"/>
  <role rolename="manager-script"/>
  <role rolename="manager-gui"/>
  <role rolename="manager-jmx"/>
  <user username="tomcat" password="tomcat" roles="tomcat"/>
  <user username="both" password="tomcat" roles="tomcat,role1"/>
  <user username="role1" password="tomcat" roles="role1"/>
  <user username="admin"
password="f13c89ed8da3d2674c1937503b73fb15cd061751ddbefdb12c337cf0a67c0b0c$1$ad18b00f8856db9fa0396a5448fa022ed2b7
c367faf113e209bb68e16cbffbce" roles="manager-script,manager-gui,manager-jmx"/>
</tomcat-users>
```

Redémarrez le serveur Tomcat :

```
[root@centos8 apache-jmeter-5.6.2]# systemctl restart tomcat
[root@centos8 apache-jmeter-5.6.2]# systemctl status tomcat
● tomcat.service - Apache Tomcat Web Application Container
   Loaded: loaded (/etc/systemd/system/tomcat.service; disabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 06:25:23 EDT; 7s ago
  Process: 4235 ExecStart=/usr/tomcat10/bin/startup.sh (code=exited, status=0/SUCCESS)
 Main PID: 4245 (java)
    Tasks: 62 (limit: 100949)
   Memory: 351.7M
   CGroup: /system.slice/tomcat.service
           └─4245 /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10//conf/logging.properties -
Djava.util.logging.manager=org.apache.juli.ClassLo>

Oct 06 06:25:23 centos8.ittraining.loc systemd[1]: Starting Apache Tomcat Web Application Container...
Oct 06 06:25:23 centos8.ittraining.loc startup.sh[4235]: Existing PID file found during start.
Oct 06 06:25:23 centos8.ittraining.loc startup.sh[4235]: Removing/clearing stale PID file.
```

```
Oct 06 06:25:23 centos8.ittraining.loc startup.sh[4235]: Tomcat started.
Oct 06 06:25:23 centos8.ittraining.loc systemd[1]: Started Apache Tomcat Web Application Container.
```

Testez que l'authentification fonctionne correctement :

```
[root@centos8 apache-jmeter-5.6.2]# lynx --dump -auth admin:fenestros
"http://www.ittraining.loc:8080/manager/text/serverinfo"
OK - Server info
Tomcat Version: [Apache Tomcat/10.0.27]
OS Name: [Linux]
OS Version: [4.18.0-305.7.1.el8_4.x86_64]
OS Architecture: [amd64]
JVM Version: [1.8.0_312-b07]
JVM Vendor: [Red Hat, Inc.]
```

L'application **manager** propose un client JMX sous la forme d'un proxy JMX, **jmxproxy**.

Saisissez donc la commande suivante :

```
[root@centos8 apache-jmeter-5.6.2]# lynx --dump -auth admin:fenestros
"http://www.ittraining.loc:8080/manager/jmxproxy/?qry=*:*" | more
OK - Number of results: 185

Name: Catalina:type=Service
modelerType: org.apache.catalina.mbeans.ServiceMBean
stateName: STARTED
connectorNames: Array[javax.management.ObjectName] of length 3
        Catalina:type=Connector,port=8080
        Catalina:type=Connector,port=8443
        Catalina:type=Connector,port=8009,address="127.0.0.1"
name: Catalina
managedResource: StandardService[Catalina]

Name: Catalina:j2eeType=Servlet,WebModule=//localhost/examples,name=stock,J2EEAp
```

```
plication=none,J2EEServer=none
modelerType: org.apache.catalina.mbeans.ContainerMBean
maxTime: 0
requestCount: 0
servletClass: async.AsyncStockServlet
countAllocated: 0
available: 0
backgroundProcessorDelay: -1
processingTime: 0
loadOnStartup: -1
loadTime: 0
stateName: STARTED
minTime: 9223372036854775807
classLoadTime: 0
asyncSupported: true
objectName: Catalina:j2eeType=Servlet,WebModule=//localhost/examples,name=stock,
J2EEApplication=none,J2EEServer=none
maxInstances: 20
errorCount: 0

Name: Catalina:type=Valve,host=localhost,context=/,name=NonLoginAuthenticator
modelerType: org.apache.tomcat.util.modeler.BaseModelMBean
cache: true
changeSessionIdOnAuthentication: true
disableProxyCaching: true
stateName: STARTED
className: org.apache.catalina.authenticator.NonLoginAuthenticator
securePagesWithPragma: false

Name: Catalina:j2eeType=Filter,WebModule=//localhost/examples,name=Compression F
ilter,J2EEApplication=none,J2EEServer=none
modelerType: org.apache.tomcat.util.modeler.BaseModelMBean
filterClass: compressionFilters.CompressionFilter
filterName: Compression Filter
```

```
filterInitParameterMap: {debug=0, compressionThreshold=128, compressionBuffer=81
92, compressionMimeTypes=text/html,text/plain,text/xml}

Name: Catalina:j2eeType=Servlet,WebModule=//localhost/examples,name=RequestHeade
rExample,J2EEApplication=none,J2EEServer=none
modelerType: org.apache.catalina.mbeans.ContainerMBean
maxTime: 0
requestCount: 0
servletClass: RequestHeaderExample
countAllocated: 0
available: 0
--More--
```

Saisissez maintenant la commande suivante :

```
[root@centos8 apache-jmeter-5.6.2]# lynx --dump -auth admin:fenestros
"http://www.ittraining.loc:8080/manager/jmxproxy/?qry=Catalina:type=Connector,*" | more
OK - Number of results: 3

Name: Catalina:type=Connector,port=8443
modelerType: org.apache.catalina.mbeans.ConnectorMBean
maxPostSize: 2097152
proxyName: 10.0.2.45
scheme: http
redirectPortWithOffset: 443
acceptCount: 100
secure: false
threadPriority: 5
maxSwallowSize: 2097152
maxSavePostSize: 4096
proxyPort: 443
portWithOffset: 8443
maxParameterCount: 10000
useIPVHosts: false
```

```
stateName: STARTED
redirectPort: 443
allowTrace: false
protocolHandlerClassName: org.apache.coyote.http11.Http11NioProtocol
maxThreads: 200
connectionTimeout: 60000
tcpNoDelay: true
useBodyEncodingForURI: false
connectionLinger: -1
processorCache: 200
keepAliveTimeout: 60000
maxKeepAliveRequests: 100
localPort: 8443
enableLookups: false
URIEncoding: UTF-8
minSpareThreads: 10
executorName: Internal
maxHeaderCount: 100
port: 8443
portOffset: 0
xpoweredBy: false

Name: Catalina:type=Connector,port=8009,address="127.0.0.1"
modelerType: org.apache.catalina.mbeans.ConnectorMBean
maxPostSize: 2097152
scheme: http
redirectPortWithOffset: 8443
acceptCount: 100
secure: false
threadPriority: 5
ajpFlush: true
maxSavePostSize: 4096
proxyPort: 0
portWithOffset: 8009
```

```
protocol: AJP/1.3
maxParameterCount: 10000
useIPVHosts: false
stateName: STARTED
redirectPort: 8443
allowTrace: false
protocolHandlerClassName: org.apache.coyote.ajp.AjpNioProtocol
--More--
```

Saisissez maintenant la commande suivante :

```
[root@centos8 apache-jmeter-5.6.2]# lynx --dump -auth admin:fenestros
"http://www.ittraining.loc:8080/manager/jmxproxy/?qry=Catalina:type=ThreadPool,*"
OK - Number of results: 3

Name: Catalina:type=ThreadPool,name="http-nio-8443"
modelerType: org.apache.catalina.mbeans.ClassNameMBean
currentThreadsBusy: 0
paused: false
selectorTimeout: 1000
connectionCount: 1
acceptCount: 100
threadPriority: 5
executorTerminationTimeoutMillis: 5000
running: true
portWithOffset: 8443
currentThreadCount: 10
sSLEnabled: false
sniParseLimit: 65536
maxThreads: 200
connectionTimeout: 60000
tcpNoDelay: true
maxConnections: 8192
connectionLinger: -1
```

```
keepAliveCount: 0
keepAliveTimeout: 60000
maxKeepAliveRequests: 100
localPort: 8443
useSendfile: true
daemon: true
minSpareThreads: 10
useInheritedChannel: false
alpnSupported: false
acceptorThreadPriority: 5
bindOnInit: true
pollerThreadPriority: 5
port: 8443
portOffset: 0
domain: Catalina
name: http-nio-8443
defaultSSLHostConfigName: _default_

Name: Catalina:type=ThreadPool,name="ajp-nio-127.0.0.1-8009"
modelerType: org.apache.catalina.mbeans.ClassNameMBean
currentThreadsBusy: 0
paused: false
selectorTimeout: 1000
connectionCount: 1
acceptCount: 100
threadPriority: 5
executorTerminationTimeoutMillis: 5000
running: true
portWithOffset: 8009
currentThreadCount: 10
sSLEnabled: false
sniParseLimit: 65536
maxThreads: 200
connectionTimeout: -1
```

```
tcpNoDelay: true
maxConnections: 8192
connectionLinger: -1
keepAliveCount: 0
keepAliveTimeout: -1
maxKeepAliveRequests: 100
localPort: 8009
useSendfile: false
daemon: true
minSpareThreads: 10
useInheritedChannel: false
alpnSupported: false
acceptorThreadPriority: 5
bindOnInit: true
pollerThreadPriority: 5
port: 8009
portOffset: 0
domain: Catalina
name: ajp-nio-127.0.0.1-8009
defaultSSLHostConfigName: _default_

Name: Catalina:type=ThreadPool,name="http-nio-8080"
modelerType: org.apache.catalina.mbeans.ClassNameMBean
currentThreadsBusy: 2
paused: false
selectorTimeout: 1000
connectionCount: 3
acceptCount: 100
threadPriority: 5
executorTerminationTimeoutMillis: 5000
running: true
portWithOffset: 8080
currentThreadCount: 10
sSLEnabled: false
```

```
sniParseLimit: 65536
maxThreads: 200
connectionTimeout: 20000
tcpNoDelay: true
maxConnections: 8192
connectionLinger: -1
keepAliveCount: 1
keepAliveTimeout: 20000
maxKeepAliveRequests: 100
localPort: 8080
useSendfile: true
daemon: true
minSpareThreads: 10
useInheritedChannel: false
alpnSupported: false
acceptorThreadPriority: 5
bindOnInit: true
pollerThreadPriority: 5
port: 8080
portOffset: 0
domain: Catalina
name: http-nio-8080
defaultSSLHostConfigName: _default_
```

Notez la valeur de **maxThreads** dans la section **name="http-nio-8080"** :

```
...
maxThreads: 200
...
```

Pour modifier la valeur de maxThreads, il faut créer le fichier $CATALINA_HOME/bin/setenv.sh :

```
[root@centos8 apache-jmeter-5.6.2]# cd $CATALINA_HOME/bin

```

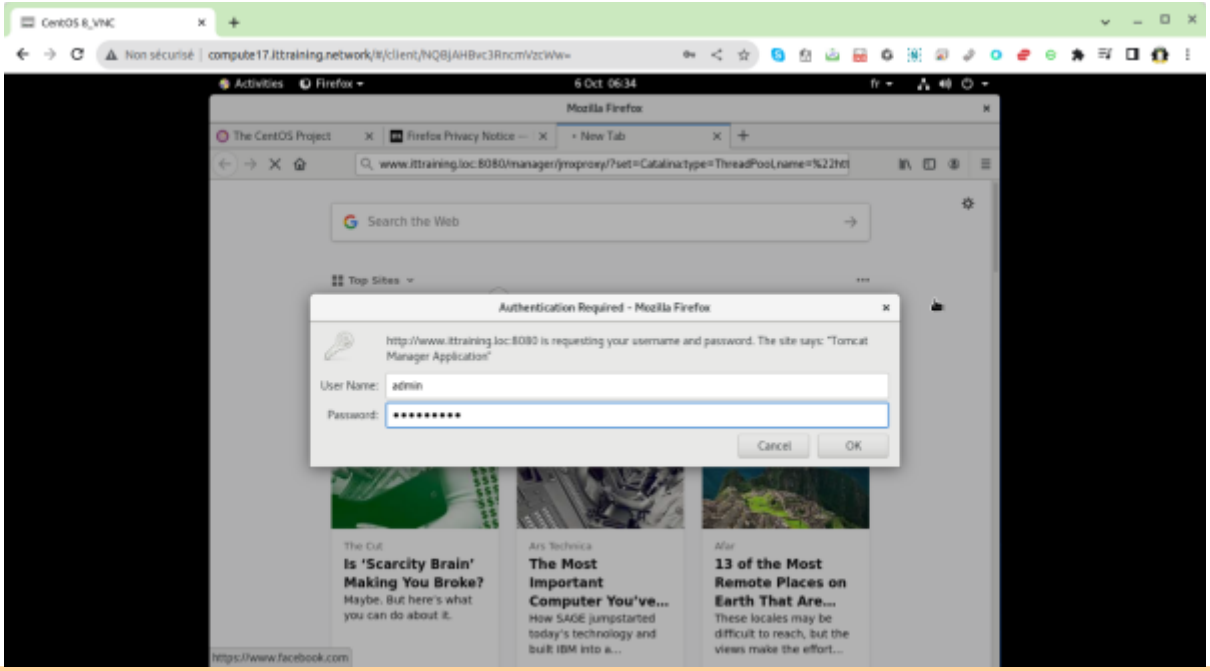
```
[root@centos8 bin]# vi setenv.sh

[root@centos8 bin]# cat setenv.sh
export JAVA_OPTS="-Dcom.sun.management.jmxremote=true -Dcom.sun.management.jmxremote.ssl=false -
Dcom.sun.management.jmxremote.authenticate=false"

[root@centos8 bin]# chmod ugo+x setenv.sh

[root@centos8 bin]# ls -l setenv.sh
-rwxr-xr-x 1 root root 146 Oct  6 06:31 setenv.sh
```

Redémarrez le serveur Tomcat pour une prise en compte du fichier setenv.sh :

```
[root@centos8 bin]# systemctl restart tomcat
[root@centos8 bin]# systemctl status tomcat
● tomcat.service - Apache Tomcat Web Application Container
   Loaded: loaded (/etc/systemd/system/tomcat.service; disabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 06:32:04 EDT; 8s ago
  Process: 4441 ExecStop=/bin/kill -15 $MAINPID (code=exited, status=0/SUCCESS)
  Process: 4450 ExecStart=/usr/tomcat10/bin/startup.sh (code=exited, status=0/SUCCESS)
 Main PID: 4462 (java)
    Tasks: 62 (limit: 100949)
   Memory: 371.2M
   CGroup: /system.slice/tomcat.service
           └─4462 /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10//conf/logging.properties -
Djava.util.logging.manager=org.apache.juli.ClassLo>

Oct 06 06:32:04 centos8.ittraining.loc systemd[1]: Starting Apache Tomcat Web Application Container...
Oct 06 06:32:04 centos8.ittraining.loc startup.sh[4450]: Existing PID file found during start.
Oct 06 06:32:04 centos8.ittraining.loc startup.sh[4450]: Removing/clearing stale PID file.
Oct 06 06:32:04 centos8.ittraining.loc startup.sh[4450]: Tomcat started.
Oct 06 06:32:04 centos8.ittraining.loc systemd[1]: Started Apache Tomcat Web Application Container.
```

Maintenant saisissez l'URL suivant dans un navigateur en mode graphique pour modifier la valeur de MaxThreads :

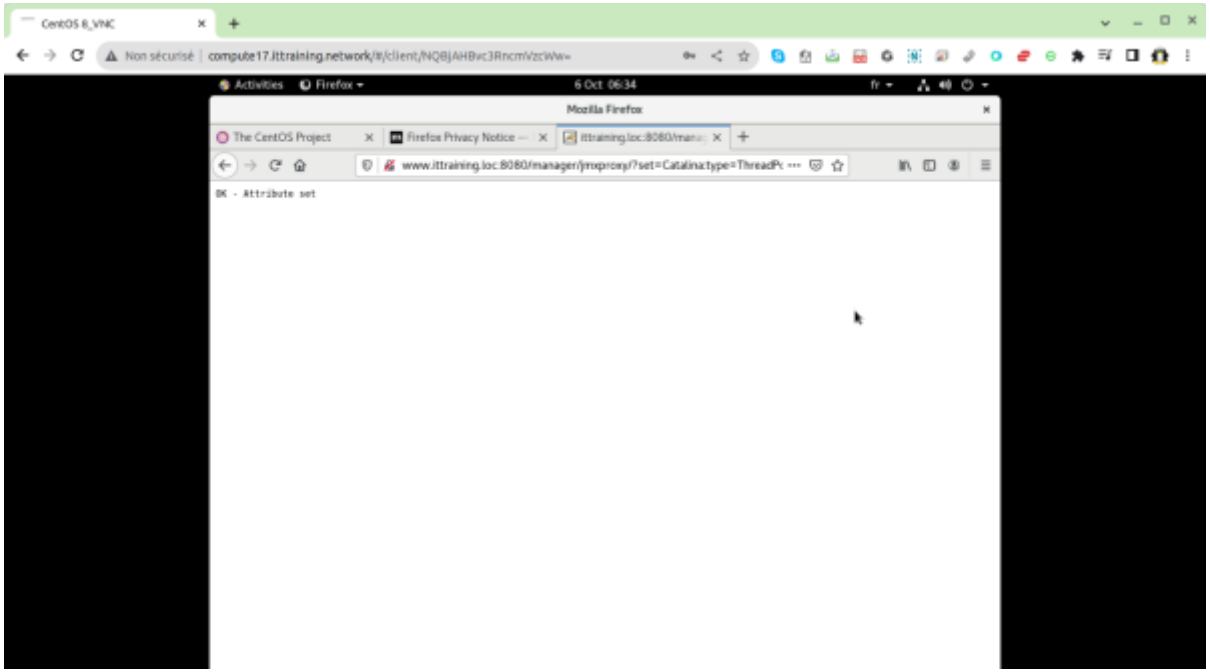
```
http://www.ittraining.loc:8080/manager/jmxproxy/?set=Catalina:type=ThreadPool,name="http-nio-8080"&att=maxThreads&val=300
```



Important : Notez que le navigateur vous demande de renseigner un utilisateur et un mot de passe : **admin/fenestros**.

Vous obtiendrez un résultat similaire à celui-ci :

```
OK - Attribute set
```



Saisissez la commande suivante pour vérifier la prise en compte de la modification :

```
[root@centos8 bin]# lynx --dump -auth admin:fenestros
"http://www.ittraining.loc:8080/manager/jmxproxy/?qry=Catalina:type=ThreadPool,*"
OK - Number of results: 3

...
Name: Catalina:type=ThreadPool,name="http-nio-8080"
modelerType: org.apache.catalina.mbeans.ClassNameMBean
currentThreadsBusy: 2
paused: false
selectorTimeout: 1000
connectionCount: 3
acceptCount: 100
threadPriority: 5
executorTerminationTimeoutMillis: 5000
```

```
running: true
portWithOffset: 8080
currentThreadCount: 10
sSLEnabled: false
sniParseLimit: 65536
maxThreads: 300
connectionTimeout: 20000
tcpNoDelay: true
maxConnections: 8192
connectionLinger: -1
keepAliveCount: 1
keepAliveTimeout: 20000
maxKeepAliveRequests: 100
localPort: 8080
useSendfile: true
daemon: true
minSpareThreads: 10
useInheritedChannel: false
alpnSupported: false
acceptorThreadPriority: 5
bindOnInit: true
pollerThreadPriority: 5
port: 8080
portOffset: 0
domain: Catalina
name: http-nio-8080
defaultSSLHostConfigName: _default_
```

Important : Pour plus d'information concernant jmx, consultez le **manual** de Tomcat.

JConsole

Pour utiliser JConsole, commencez par créer le fichier des utilisateurs et des mots de passe :

```
[root@centos8 bin]# cd ../conf

[root@centos8 conf]# vi jmxremote.access

[root@centos8 conf]# cat jmxremote.access
administrator   readwrite
operator        readonly

[root@centos8 conf]# vi jmxremote.password

[root@centos8 conf]# cat jmxremote.password
administrator   fenestros
operator        tomcat

[root@centos7 conf]# chmod 600 jmxremote.password
```

Modifiez le propriétaire et le groupe des fichiers **jmxremote.access** et **jmxremote.password** :

```
[root@centos8 logs]# chown tomcat:tomcat /usr/tomcat10/conf/jmxremote.access

[root@centos8 logs]# chown tomcat:tomcat /usr/tomcat10/conf/jmxremote.password
```

Dans un premier temps vous allez mettre en place une connexion anonyme à JConsole. Éditez donc votre fichier **$CATALINA_HOME/bin/setenv.sh** :

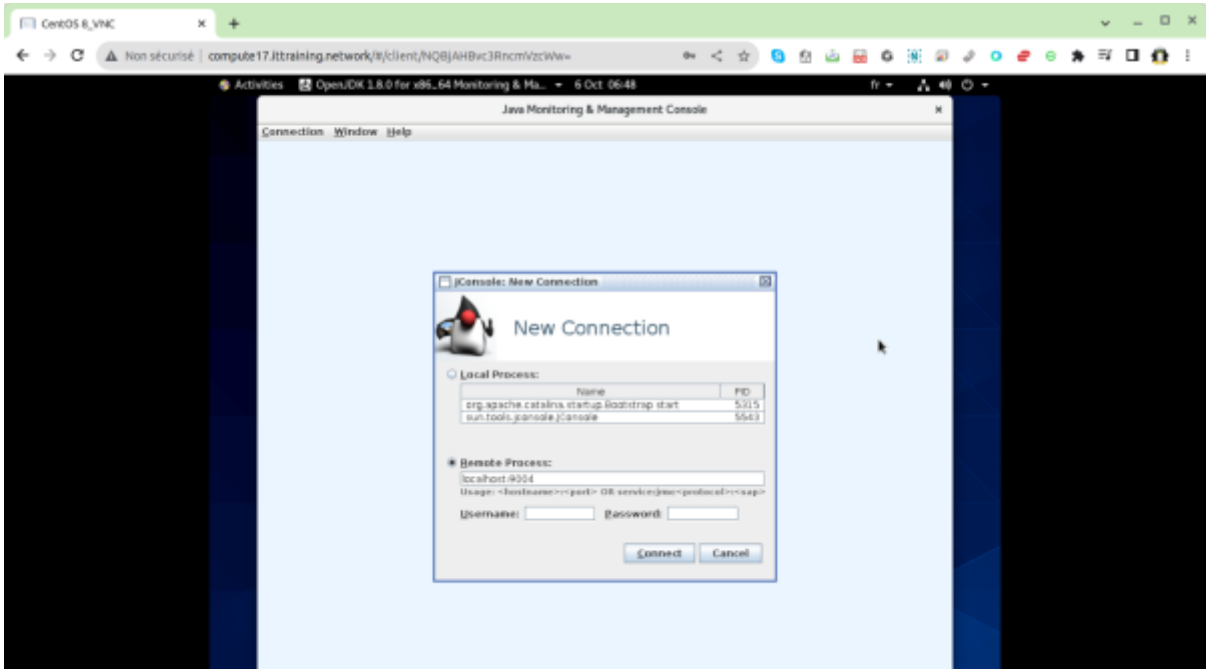
```
[root@centos8 conf]# cd ../bin

[root@centos8 bin]# vi setenv.sh

[root@centos8 bin]# cat setenv.sh
```

```
export JAVA_OPTS="-Dcom.sun.management.jmxremote=true -Dcom.sun.management.jmxremote.ssl=false -
Dcom.sun.management.jmxremote.authenticate=false -Dcom.sun.management.jmxremote.port=9004"
```

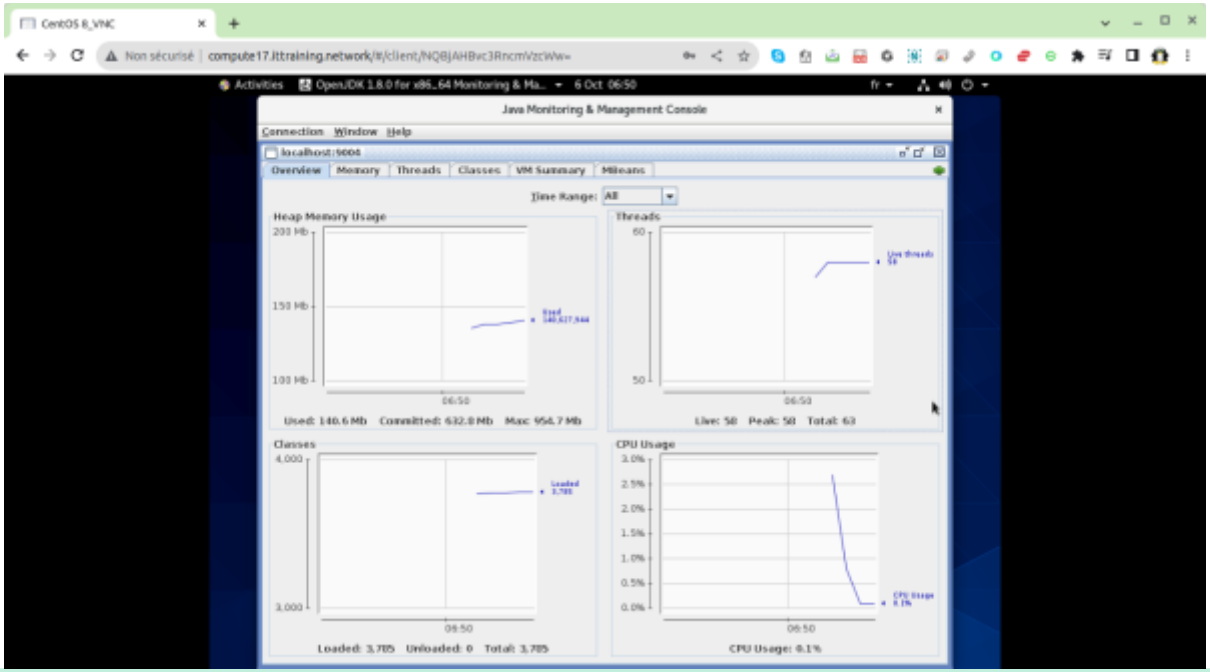
Redémarrez maintenant le serveur Tomcat :

```
[root@centos8 bin]# systemctl restart tomcat
[root@centos8 bin]# systemctl status tomcat
● tomcat.service - Apache Tomcat Web Application Container
   Loaded: loaded (/etc/systemd/system/tomcat.service; disabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 06:45:21 EDT; 7s ago
  Process: 5296 ExecStop=/bin/kill -15 $MAINPID (code=exited, status=0/SUCCESS)
  Process: 5303 ExecStart=/usr/tomcat10/bin/startup.sh (code=exited, status=0/SUCCESS)
 Main PID: 5315 (java)
    Tasks: 65 (limit: 100949)
   Memory: 366.4M
   CGroup: /system.slice/tomcat.service
           └─5315 /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10//conf/logging.properties -
Djava.util.logging.manager=org.apache.juli.ClassLo>

Oct 06 06:45:21 centos8.ittraining.loc systemd[1]: Starting Apache Tomcat Web Application Container...
Oct 06 06:45:21 centos8.ittraining.loc startup.sh[5303]: Existing PID file found during start.
Oct 06 06:45:21 centos8.ittraining.loc startup.sh[5303]: Removing/clearing stale PID file.
Oct 06 06:45:21 centos8.ittraining.loc startup.sh[5303]: Tomcat started.
Oct 06 06:45:21 centos8.ittraining.loc systemd[1]: Started Apache Tomcat Web Application Container.
```

Lancez la commande **jconsole** dans un terminal de l'interface graphique de votre VM. Cochez **Remote Process** et utilisez l'adresse **localhost:9004 sans** stipuler un utilisateur et un mot de passe :



Cliquez ensuite sur **Insecure connection**. Vous obtiendrez :



A Faire : Fermez la fenêtre **jconsole**.

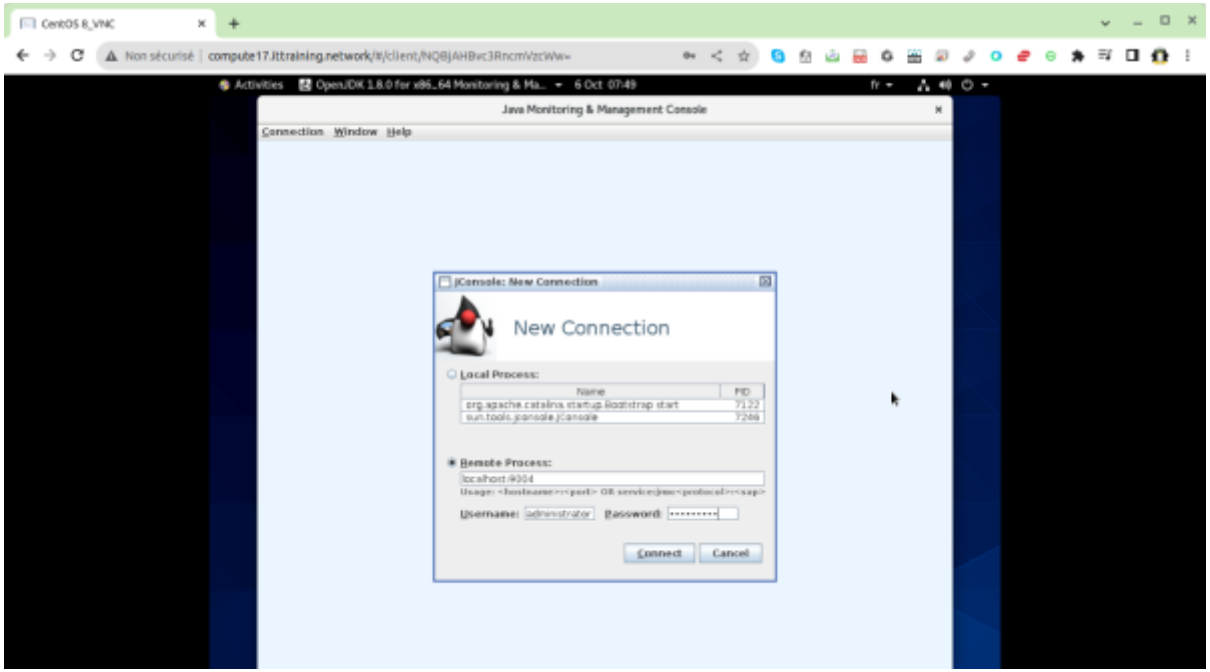
Pour mettre en place une autorisation en utilisant les fichiers **jmxremote.access** et **jmxremote.password**, il convient d'éditer de nouveau le fichier **$CATALINA_HOME/bin/setenv.sh** :

```
[root@centos7 bin]# vi setenv.sh
[root@centos7 bin]# cat setenv.sh
export JAVA_OPTS="-Dcom.sun.management.jmxremote=true -Dcom.sun.management.jmxremote.ssl=false -
Dcom.sun.management.jmxremote.port=9004 -Dcom.sun.management.jmxremote.authenticate=true -
Dcom.sun.management.jmxremote.password.file=$CATALINA_HOME/conf/jmxremote.password -
Dcom.sun.management.jmxremote.access.file=$CATALINA_HOME/conf/jmxremote.access"
```

Redémarrez le serveur Tomcat :

```
[root@centos8 bin]# systemctl restart tomcat
[root@centos8 bin]# systemctl status tomcat
● tomcat.service - Apache Tomcat Web Application Container
   Loaded: loaded (/etc/systemd/system/tomcat.service; disabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 07:47:44 EDT; 4s ago
  Process: 7104 ExecStop=/bin/kill -15 $MAINPID (code=exited, status=0/SUCCESS)
  Process: 7111 ExecStart=/usr/tomcat10/bin/startup.sh (code=exited, status=0/SUCCESS)
 Main PID: 7122 (java)
    Tasks: 65 (limit: 100949)
   Memory: 339.5M
   CGroup: /system.slice/tomcat.service
           └─7122 /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10//conf/logging.properties -
Djava.util.logging.manager=org.apache.juli.ClassLo>

Oct 06 07:47:44 centos8.ittraining.loc systemd[1]: Starting Apache Tomcat Web Application Container...
Oct 06 07:47:44 centos8.ittraining.loc startup.sh[7111]: Existing PID file found during start.
Oct 06 07:47:44 centos8.ittraining.loc startup.sh[7111]: Removing/clearing stale PID file.
Oct 06 07:47:44 centos8.ittraining.loc startup.sh[7111]: Tomcat started.
Oct 06 07:47:44 centos8.ittraining.loc systemd[1]: Started Apache Tomcat Web Application Container.
```

Lancez la commande **jconsole** dans un terminal de l'interface graphique de votre VM. Cochez **Remote Process** et utilisez l'adresse **localhost:9004 en** stipulant un utilisateur et un mot de passe dans les fichiers **jmxremote.access** et **jmxremote.password** respectivement.



Clustering avec Tomcat

Préparation

Arrêtez et désactivez le service Tomcat :

```
[root@centos8 bin]# systemctl stop tomcat

[root@centos8 bin]# systemctl disable tomcat
```

Créez maintenant deux répertoires en dessous de $CATALINA_HOME :

```
[root@centos8 bin]# mkdir $CATALINA_HOME/tomcat1 $CATALINA_HOME/tomcat2
```

Arrêtez le serveur Tomcat et copiez les répertoires $CATALINA_HOME/conf, $CATALINA_HOME/logs, $CATALINA_HOME/temp, $CATALINA_HOME/webapps, $CATALINA_HOME/work dans les répertoires $CATALINA_HOME/tomcat1 et $CATALINA_HOME/tomcat2 :

```
[root@centos8 bin]# cd $CATALINA_HOME
[root@centos8 tomcat10]# cp -rp conf/ tomcat1/
[root@centos8 tomcat10]# cp -rp logs/ tomcat1
[root@centos8 tomcat10]# cp -rp temp/ tomcat1
[root@centos8 tomcat10]# cp -rp webapps/ tomcat1
[root@centos8 tomcat10]# cp -rp work/ tomcat1
[root@centos8 tomcat10]# cp -rp conf/ tomcat2/
[root@centos8 tomcat10]# cp -rp logs/ tomcat2/
[root@centos8 tomcat10]# cp -rp temp/ tomcat2/
[root@centos8 tomcat10]# cp -rp webapps/ tomcat2/
[root@centos8 tomcat10]# cp -rp work/ tomcat2/
```

Supprimez les répertoires $CATALINA_HOME/conf, $CATALINA_HOME/logs, $CATALINA_HOME/temp, $CATALINA_HOME/webapps, $CATALINA_HOME/work :

```
[root@centos8 tomcat10]# rm -rf conf/ logs/ temp/ webapps/ work/
```

Supprimez maintenant le fichier **$CATALINA_HOME/bin/setenv.sh** :

```
[root@centos8 tomcat10]# rm -rf bin/setenv.sh
```

Créez maintenant les scripts de démarrage et d'arrêt de chaque instance de Tomcat :

```
[root@centos8 tomcat10]# cd bin

[[root@centos8 bin]# vi startTomcat1

[root@centos8 bin]# cat startTomcat1
#!/bin/bash
export CATALINA_BASE=/usr/tomcat10/tomcat1
. $CATALINA_HOME/bin/startup.sh
```

```
[root@centos8 bin]# vi startTomcat2

[root@centos8 bin]# cat startTomcat2
export CATALINA_BASE=/usr/tomcat10/tomcat2
. $CATALINA_HOME/bin/startup.sh

[root@centos8 bin]# vi stopTomcat1

[root@centos8 bin]# cat stopTomcat1
#!/bin/bash
export CATALINA_BASE=/usr/tomcat10/tomcat1
. $CATALINA_HOME/bin/shutdown.sh

[root@centos8 bin]# vi stopTomcat2

[root@centos8 bin]# cat stopTomcat2
#!/bin/bash
export CATALINA_BASE=/usr/tomcat10/tomcat2
. $CATALINA_HOME/bin/shutdown.sh
```

Rendez les scripts exécutables :

```
[root@centos8 bin]# chmod a+x startTomcat1
[root@centos8 bin]# chmod a+x startTomcat2
[root@centos8 bin]# chmod a+x stopTomcat1
[root@centos8 bin]# chmod a+x stopTomcat2
[root@centos8 bin]# ls -l | grep startT
-rwxr-xr-x 1 root root       88 Oct  6 10:12 startTomcat1
-rwxr-xr-x 1 root root       76 Oct  6 10:13 startTomcat2
[root@centos8 bin]# ls -l | grep stopT
-rwxr-xr-x 1 root root       89 Oct  6 10:14 stopTomcat1
-rwxr-xr-x 1 root root       88 Oct  6 10:14 stopTomcat2
```

Modifiez les ports dans le fichier server.xml de chaque installation de Tomcat en utilisant VI :

```
[root@centos8 bin]# vi /usr/tomcat10/tomcat1/conf/server.xml
[root@centos8 bin]# vi /usr/tomcat10/tomcat2/conf/server.xml
```

Les commandes VI suivantes peuvent vous aider.

Pour le fichier /usr/tomcat8/tomcat1/conf/server.xml :

```
:g/8080/s//8180/g
:g/8009/s//8109/g
:g/8005/s//8105/g
:g/8443/s//8143/g
```

Pour le fichier /usr/tomcat8/tomcat2/conf/server.xml :

```
:g/8080/s//8280/g
:g/8009/s//8209/g
:g/8005/s//8205/g
:g/8443/s//8243/g
```

Démarrez les deux instances de Tomcat :

```
[root@centos8 bin]# ./startTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.

[root@centos8 bin]# ps aux | grep tomcat
root        9991 85.0  2.0 9705084 337904 pts/0  Sl   10:22   0:11 /usr/lib/jvm/jre-1.8.0-
openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10/tomcat1/conf/logging.properties -
```

```
Djava.util.logging.manager=org.apache.juli.ClassLoaderLogManager -Djdk.tls.ephemeralDHKeySize=2048 -
Djava.protocol.handler.pkgs=org.apache.catalina.webresources -
Dorg.apache.catalina.security.SecurityListener.UMASK=0027 -Dignore.endorsed.dirs= -classpath
/usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar -Dcatalina.base=/usr/tomcat10/tomcat1 -
Dcatalina.home=/usr/tomcat10 -Djava.io.tmpdir=/usr/tomcat10/tomcat1/temp org.apache.catalina.startup.Bootstrap
start
root       10055  0.0  0.0  12136  1136 pts/0    S+   10:22   0:00 grep --color=auto tomcat

[root@centos8 bin]# ./startTomcat2
Using CATALINA_BASE:   /usr/tomcat10/tomcat2
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.

[root@centos8 bin]# ps aux | grep tomcat
root        9991 25.9  1.9 9705084 321360 pts/0  Sl   10:22   0:11 /usr/lib/jvm/jre-1.8.0-
openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10/tomcat1/conf/logging.properties -
Djava.util.logging.manager=org.apache.juli.ClassLoaderLogManager -Djdk.tls.ephemeralDHKeySize=2048 -
Djava.protocol.handler.pkgs=org.apache.catalina.webresources -
Dorg.apache.catalina.security.SecurityListener.UMASK=0027 -Dignore.endorsed.dirs= -classpath
/usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar -Dcatalina.base=/usr/tomcat10/tomcat1 -
Dcatalina.home=/usr/tomcat10 -Djava.io.tmpdir=/usr/tomcat10/tomcat1/temp org.apache.catalina.startup.Bootstrap
start
root       10065 78.4  2.1 9705084 345744 pts/0  Sl   10:22   0:11 /usr/lib/jvm/jre-1.8.0-
openjdk-1.8.0.312.b07-2.el8_5.x86_64/bin/java -
Djava.util.logging.config.file=/usr/tomcat10/tomcat2/conf/logging.properties -
Djava.util.logging.manager=org.apache.juli.ClassLoaderLogManager -Djdk.tls.ephemeralDHKeySize=2048 -
Djava.protocol.handler.pkgs=org.apache.catalina.webresources -
Dorg.apache.catalina.security.SecurityListener.UMASK=0027 -Dignore.endorsed.dirs= -classpath
/usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar -Dcatalina.base=/usr/tomcat10/tomcat2 -
```

```
Dcatalina.home=/usr/tomcat10 -Djava.io.tmpdir=/usr/tomcat10/tomcat2/temp org.apache.catalina.startup.Bootstrap
start
root       10129  0.0  0.0  12136  1068 pts/0    S+   10:23   0:00 grep --color=auto tomcat
```

Vérifiez maintenant que les deux instances peuvent être arrêtés :

```
[root@centos8 bin]# ./stopTomcat2
Using CATALINA_BASE:   /usr/tomcat10/tomcat2
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:

[root@centos8 bin]# ./stopTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:

[root@centos8 bin]# ps aux | grep tomcat
root       10229  0.0  0.0  12136  1152 pts/0    S+   10:24   0:00 grep --color=auto tomcat
```

Le Cluster de Répartition de Charge avec Apache et mod_jk

Modifiez le fichier **/etc/httpd/conf/workers.properties** :

```
[root@centos8 bin]# vi /etc/httpd/conf/workers.properties
[root@centos8 bin]# cat /etc/httpd/conf/workers.properties
worker.list=balancer
```

```
worker.tomcat1.type=ajp13
worker.tomcat1.host=127.0.0.1
worker.tomcat1.port=8109
worker.tomcat1.lbfactor=1

worker.tomcat2.type=ajp13
worker.tomcat2.host=127.0.0.1
worker.tomcat2.port=8209
worker.tomcat2.lbfactor=1

worker.balancer.type=lb
worker.balancer.balance_workers=tomcat1,tomcat2
worker.balancer.sticky_session=1
```

Modifiez la section concernant Tomcat dans le fichier **/etc/httpd/conf/httpd.conf** et commentez la ligne **IncludeOptional conf.d/*.conf** :

```
[root@centos7 bin]# vi /etc/httpd/conf/httpd.conf
[root@centos7 bin]# tail /etc/httpd/conf/httpd.conf
#
# Load config files in the "/etc/httpd/conf.d" directory, if any.
# IncludeOptional conf.d/*.conf

LoadModule  jk_module     modules/mod_jk.so
JkWorkersFile   conf/workers.properties
JkLogFile   logs/mod_jk.log
JkLogLevel  info
JkMount     /docs/*    balancer
JkMount     /docs    balancer
```

Modifiez la section <Engine> du fichier **$CATALINA_HOME/tomcat1/conf/server.xml** :

```
[root@centos8 bin]# vi $CATALINA_HOME/tomcat1/conf/server.xml
...
    <!-- An Engine represents the entry point (within Catalina) that processes
```

```
        every request.  The Engine implementation for Tomcat stand alone
        analyzes the HTTP headers included with the request, and passes them
        on to the appropriate Host (virtual host).
        Documentation at /docs/config/engine.html -->

    <Engine name="Catalina" defaultHost="localhost" jvmRoute="tomcat1">
    <!-- <Engine name="Catalina" defaultHost="localhost"> -->

      <!--For clustering, please take a look at documentation at:
          /docs/cluster-howto.html  (simple how to)
          /docs/config/cluster.html (reference documentation) -->
...
```

Modifiez ensuite la section <Engine> du fichier **$CATALINA_HOME/tomcat2/conf/server.xml** :

```
[root@centos8 bin]# vi $CATALINA_HOME/tomcat2/conf/server.xml
...
    <!-- An Engine represents the entry point (within Catalina) that processes
         every request.  The Engine implementation for Tomcat stand alone
         analyzes the HTTP headers included with the request, and passes them
         on to the appropriate Host (virtual host).
         Documentation at /docs/config/engine.html -->

    <Engine name="Catalina" defaultHost="localhost" jvmRoute="tomcat2">
    <!-- <Engine name="Catalina" defaultHost="localhost"> -->

      <!--For clustering, please take a look at documentation at:
          /docs/cluster-howto.html  (simple how to)
          /docs/config/cluster.html (reference documentation) -->
...
```

Pour pouvoir tester la configuration, remplacer les fichiers index.html de chaque application **docs** afin de pouvoir identifier quelle instance répond à des requêtes :

```
[root@centos8 bin]# mv $CATALINA_HOME/tomcat1/webapps/docs/index.html
$CATALINA_HOME/tomcat1/webapps/docs/index.old

[root@centos8 bin]# vi $CATALINA_HOME/tomcat1/webapps/docs/index.html

[root@centos8 bin]# cat $CATALINA_HOME/tomcat1/webapps/docs/index.html
<html>
<title>Tomcat1</title>
<body>
<center>This is Tomcat1</center>
</body>
</html>

[root@centos8 bin]# mv $CATALINA_HOME/tomcat2/webapps/docs/index.html
$CATALINA_HOME/tomcat2/webapps/docs/index.old

[root@centos8 bin]# vi $CATALINA_HOME/tomcat2/webapps/docs/index.html

[root@centos8 bin]# cat $CATALINA_HOME/tomcat2/webapps/docs/index.html
<html>
<title>Tomcat2</title>
<body>
<center>This is Tomcat2</center>
</body>
</html>
```

Redémarrez le service httpd.service :

```
[root@centos8 bin]# systemctl restart httpd
[root@centos8 bin]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 10:32:26 EDT; 6s ago
     Docs: man:httpd.service(8)
```

```
 Main PID: 10382 (httpd)
   Status: "Started, listening on: port 80"
    Tasks: 213 (limit: 100949)
   Memory: 43.7M
   CGroup: /system.slice/httpd.service
           ├─10382 /usr/sbin/httpd -DFOREGROUND
           ├─10386 /usr/sbin/httpd -DFOREGROUND
           ├─10387 /usr/sbin/httpd -DFOREGROUND
           ├─10388 /usr/sbin/httpd -DFOREGROUND
           └─10389 /usr/sbin/httpd -DFOREGROUND

Oct 06 10:32:26 centos8.ittraining.loc systemd[1]: Starting The Apache HTTP Server...
Oct 06 10:32:26 centos8.ittraining.loc systemd[1]: Started The Apache HTTP Server.
Oct 06 10:32:26 centos8.ittraining.loc httpd[10382]: Server configured, listening on: port 80
```

Démarrez les deux instances de Tomcat :

```
[root@centos8 bin]# ./startTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.

[root@centos8 bin]# ./startTomcat2
Using CATALINA_BASE:   /usr/tomcat10/tomcat2
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
```

```
Tomcat started.
```

Utilisez Lynx pour vous connecter à l'application **docs** :

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat2

[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat2

[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat2
```

Attention : Notez que l'affinité de session est activée par défaut par le module AJP.

Arrêtez maintenant l'instance **tomcat2** :

```
[root@centos7 bin]# ./stopTomcat2
Using CATALINA_BASE:   /usr/tomcat8/tomcat2
Using CATALINA_HOME:   /usr/tomcat8
Using CATALINA_TMPDIR: /usr/tomcat8/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.232.b09-0.el7_7.x86_64
Using CLASSPATH:       /usr/tomcat8/bin/bootstrap.jar:/usr/tomcat8/bin/tomcat-juli.jar
```

Connectez-vous de nouveau à l'application **docs** :

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat1
```

Important - Notez que c'est maintenant l'instance tomcat1 qui répond.

Le Cluster de Répartition de Charge avec Apache et mod_proxy_ajp

Vérifiez que les lignes **LoadModule proxy_ajp_module modules/mod_proxy_ajp.so**, **LoadModule proxy_balancer_module modules/mod_proxy_balancer.so** et **LoadModule proxy_module modules/mod_proxy.so** soient présentes dans le fichier **/etc/httpd/conf.modules.d/00-proxy.conf** :

```
[root@centos8 bin]# cat /etc/httpd/conf.modules.d/00-proxy.conf
# This file configures all the proxy modules:
LoadModule proxy_module modules/mod_proxy.so
LoadModule lbmethod_bybusyness_module modules/mod_lbmethod_bybusyness.so
LoadModule lbmethod_byrequests_module modules/mod_lbmethod_byrequests.so
LoadModule lbmethod_bytraffic_module modules/mod_lbmethod_bytraffic.so
LoadModule lbmethod_heartbeat_module modules/mod_lbmethod_heartbeat.so
LoadModule proxy_ajp_module modules/mod_proxy_ajp.so
LoadModule proxy_balancer_module modules/mod_proxy_balancer.so
LoadModule proxy_connect_module modules/mod_proxy_connect.so
LoadModule proxy_express_module modules/mod_proxy_express.so
LoadModule proxy_fcgi_module modules/mod_proxy_fcgi.so
LoadModule proxy_fdpass_module modules/mod_proxy_fdpass.so
LoadModule proxy_ftp_module modules/mod_proxy_ftp.so
LoadModule proxy_http_module modules/mod_proxy_http.so
LoadModule proxy_hcheck_module modules/mod_proxy_hcheck.so
LoadModule proxy_scgi_module modules/mod_proxy_scgi.so
LoadModule proxy_uwsgi_module modules/mod_proxy_uwsgi.so
LoadModule proxy_wstunnel_module modules/mod_proxy_wstunnel.so
```

Modifiez le fichier **/etc/httpd/conf/httpd.conf** :

```
[root@centos8 bin]# vi /etc/httpd/conf/httpd.conf
```

```
[root@centos8 bin]# cat /etc/httpd/conf/httpd.conf
...
# Supplemental configuration
#
# Load config files in the "/etc/httpd/conf.d" directory, if any.
# IncludeOptional conf.d/*.conf

# LoadModule    jk_module       modules/mod_jk.so
# JkWorkersFile conf/workers.properties
# JkLogFile     logs/mod_jk.log
# JkLogLevel    info
# JkMount               /docs/* balancer
# JkMount               /docs   balancer

ProxyTimeout 300

<Proxy balancer://tomcat10-docs>
        BalancerMember ajp://localhost:8109/docs route=tomcat1
        BalancerMember ajp://localhost:8209/docs route=tomcat2
</Proxy>

ProxyPass               /docs   balancer://tomcat10-docs
ProxyPassReverse        /docs   balancer://tomcat10-docs
```

Redémarrez le serveur httpd :

```
[root@centos8 bin]# systemctl restart httpd
[root@centos8 bin]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 11:03:07 EDT; 9s ago
     Docs: man:httpd.service(8)
 Main PID: 13216 (httpd)
   Status: "Running, listening on: port 80"
```

```
    Tasks: 213 (limit: 100949)
   Memory: 46.8M
   CGroup: /system.slice/httpd.service
           ├─13216 /usr/sbin/httpd -DFOREGROUND
           ├─13219 /usr/sbin/httpd -DFOREGROUND
           ├─13220 /usr/sbin/httpd -DFOREGROUND
           ├─13221 /usr/sbin/httpd -DFOREGROUND
           └─13222 /usr/sbin/httpd -DFOREGROUND

Oct 06 11:03:07 centos8.ittraining.loc systemd[1]: Starting The Apache HTTP Server...
Oct 06 11:03:07 centos8.ittraining.loc systemd[1]: Started The Apache HTTP Server.
Oct 06 11:03:08 centos8.ittraining.loc httpd[13216]: Server configured, listening on: port 80
```

Démarrez l'instance tomcat2 de Tomcat :

```
[root@centos7 bin]# ./startTomcat2
Using CATALINA_BASE:   /usr/tomcat8/tomcat2
Using CATALINA_HOME:   /usr/tomcat8
Using CATALINA_TMPDIR: /usr/tomcat8/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.232.b09-0.el7_7.x86_64
Using CLASSPATH:       /usr/tomcat8/bin/bootstrap.jar:/usr/tomcat8/bin/tomcat-juli.jar
Tomcat started
```

Utilisez Lynx pour vous connecter à l'application **docs** :

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat1

[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat2

[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat1
```

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat2
```

Attention : Notez que l'affinité de session n'est pas activée par défaut par le module proxy.

Afin de mettre en place l'affinité de session, il convient d'utiliser un cookie appelé **ROUTEID**.

Modifiez le fichier **/etc/httdp/conf/httpd.conf** ainsi :

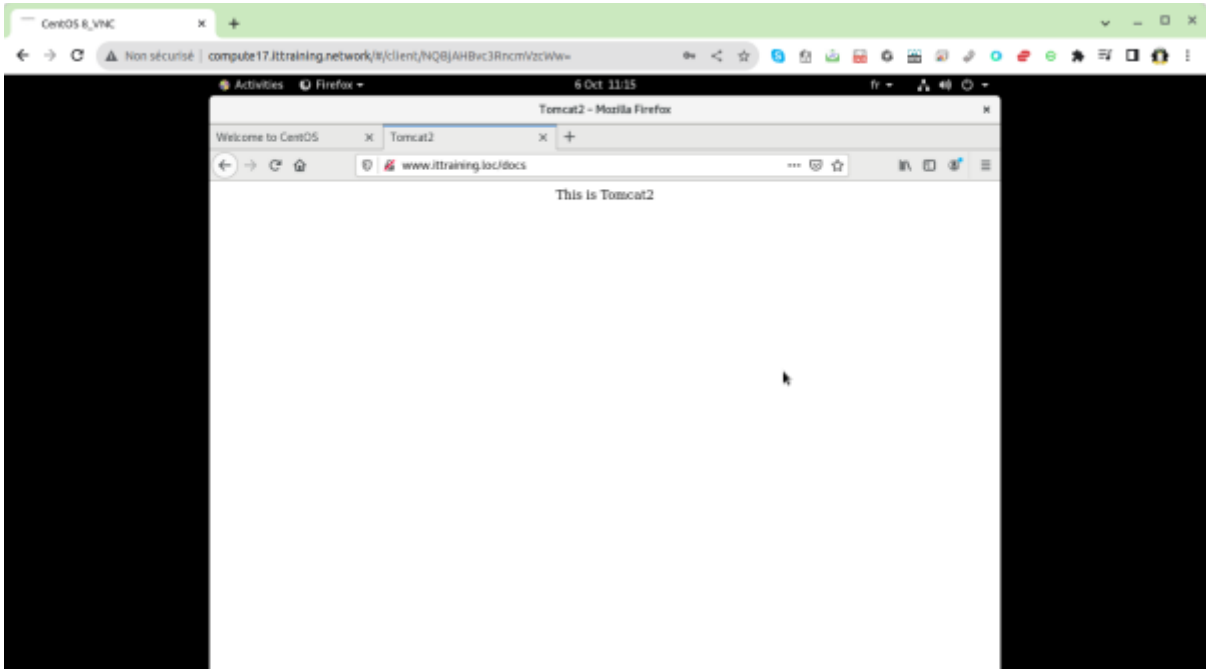
```
[root@centos8 bin]# vi /etc/httpd/conf/httpd.conf
[root@centos8 bin]# cat /etc/httpd/conf/httpd.conf
...
# Supplemental configuration
#
# Load config files in the "/etc/httpd/conf.d" directory, if any.
# IncludeOptional conf.d/*.conf

# LoadModule    jk_module       modules/mod_jk.so
# JkWorkersFile conf/workers.properties
# JkLogFile     logs/mod_jk.log
# JkLogLevel    info
# JkMount               /docs/* balancer
# JkMount               /docs   balancer

ProxyTimeout 300
Header add Set-Cookie "ROUTEID=.%{BALANCER_WORKER_ROUTE}e; path=/" env=BALANCER_ROUTE_CHANGED
<Proxy balancer://tomcat10-docs>
        BalancerMember ajp://localhost:8109/docs route=tomcat1
        BalancerMember ajp://localhost:8209/docs route=tomcat2
        ProxySet stickysession=ROUTEID
```

```
</Proxy>

ProxyPass               /docs   balancer://tomcat10-docs
ProxyPassReverse        /docs   balancer://tomcat10-docs
```

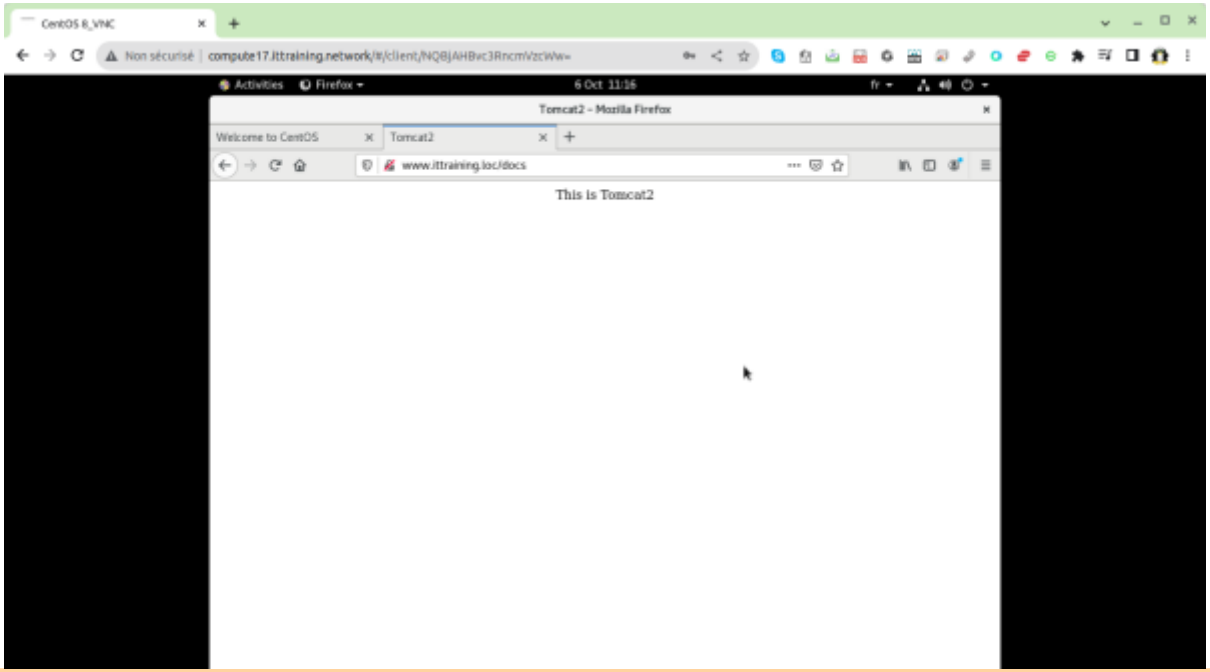
Re-démarrez le serveur httpd :

```
[root@centos8 bin]# systemctl restart httpd
[root@centos8 bin]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 11:13:16 EDT; 16s ago
     Docs: man:httpd.service(8)
 Main PID: 14093 (httpd)
   Status: "Running, listening on: port 80"
    Tasks: 213 (limit: 100949)
   Memory: 42.9M
   CGroup: /system.slice/httpd.service
           ├─14093 /usr/sbin/httpd -DFOREGROUND
           ├─14094 /usr/sbin/httpd -DFOREGROUND
           ├─14095 /usr/sbin/httpd -DFOREGROUND
           ├─14096 /usr/sbin/httpd -DFOREGROUND
           └─14097 /usr/sbin/httpd -DFOREGROUND

Oct 06 11:13:16 centos8.ittraining.loc systemd[1]: Starting The Apache HTTP Server...
Oct 06 11:13:16 centos8.ittraining.loc systemd[1]: Started The Apache HTTP Server.
Oct 06 11:13:16 centos8.ittraining.loc httpd[14093]: Server configured, listening on: port 80
```

Testez ensuite l'affinité de session en utilisant un navigateur graphique.



Rechargez la page :



Attention : Notez que l'affinité de session est activée par le module proxy.

Pour plus d'information concernant l'utilisation de mod_proxy, consultez **cette page**

Le Cluster en mode Maître/Esclave

La configuration en mode **Maître/Esclave** utilise le module **mod_jk**. Editez donc votre fichier **/etc/httpd/conf/httpd.conf** :

```
[root@centos8 bin]# vi /etc/httpd/conf/httpd.conf
[root@centos8 bin]# cat /etc/httpd/conf/httpd.conf
...
# Supplemental configuration
#
```

```
# Load config files in the "/etc/httpd/conf.d" directory, if any.
# IncludeOptional conf.d/*.conf

LoadModule      jk_module       modules/mod_jk.so
JkWorkersFile   conf/workers.properties
JkLogFile       logs/mod_jk.log
JkLogLevel      info
JkMount         /docs/* balancer
JkMount         /docs   balancer
# Header add Set-Cookie "ROUTEID=.%{BALANCER_WORKER_ROUTE}e; path=/" env=BALANCER_ROUTE_CHANGED
# <Proxy balancer://tomcat10-docs>
#       BalancerMember ajp://localhost:8109/docs route=tomcat1
#       BalancerMember ajp://localhost:8209/docs route=tomcat2
#       ProxySet stickysession=ROUTEID
# </Proxy>

# ProxyPass             /docs   balancer://tomcat10-docs
# ProxyPassReverse      /docs   balancer://tomcat10-docs
```

Éditez ensuite le fichier **/etc/httpd/conf/workers.properties** :

```
[root@centos8 bin]# vi /etc/httpd/conf/workers.properties
[root@centos8 bin]# cat /etc/httpd/conf/workers.properties
worker.list=tomcat1,tomcat2,balancer

worker.tomcat1.type=ajp13
worker.tomcat1.host=127.0.0.1
worker.tomcat1.port=8109
# Indique que tomcat2 doit prendre le relais en cas de défaillance de tomcat1
worker.tomcat1.redirect=tomcat2

worker.tomcat2.type=ajp13
worker.tomcat2.host=127.0.0.1
worker.tomcat2.port=8209
```

```
# Indique que l'instance tomcat2 est un escalve
worker.tomcat2.activation=disabled

worker.balancer.type=lb
worker.balancer.balance_workers=tomcat1,tomcat2
```

Redémarrez le serveur httpd :

```
[root@centos8 bin]# systemctl restart httpd
[root@centos8 bin]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2023-10-06 11:22:55 EDT; 8s ago
     Docs: man:httpd.service(8)
 Main PID: 14509 (httpd)
   Status: "Started, listening on: port 80"
    Tasks: 213 (limit: 100949)
   Memory: 48.5M
   CGroup: /system.slice/httpd.service
           ├─14509 /usr/sbin/httpd -DFOREGROUND
           ├─14511 /usr/sbin/httpd -DFOREGROUND
           ├─14512 /usr/sbin/httpd -DFOREGROUND
           ├─14513 /usr/sbin/httpd -DFOREGROUND
           └─14514 /usr/sbin/httpd -DFOREGROUND

Oct 06 11:22:55 centos8.ittraining.loc systemd[1]: Starting The Apache HTTP Server...
Oct 06 11:22:55 centos8.ittraining.loc systemd[1]: Started The Apache HTTP Server.
Oct 06 11:22:55 centos8.ittraining.loc httpd[14509]: Server configured, listening on: port 80
```

Utilisez Lynx pour vous connecter à l'application **docs** :

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat1
```

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat1

[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat1
```

Arrêtez l'instance tomcat1 :

```
[root@centos8 bin]# ./stopTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
```

Utilisez de nouveau Lynx pour vous connecter à l'application **docs** :

```
[root@centos8 bin]# lynx --dump http://www.ittraining.loc/docs
                              This is Tomcat2
```

Attention : Notez que le basculement est automatique en cas de défaillance de l'instance tomcat1.

Maintenir l'Etat des Clients

Préparation

Editez le fichier **web.xml** de l'application **/docs** de chaque instance de Tomcat en incluant la directive **<distributable/>** :

```
[root@centos8 bin]# vi $CATALINA_HOME/tomcat1/webapps/docs/WEB-INF/web.xml

[root@centos8 bin]# cat $CATALINA_HOME/tomcat1/webapps/docs/WEB-INF/web.xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
  Licensed to the Apache Software Foundation (ASF) under one or more
  contributor license agreements.  See the NOTICE file distributed with
  this work for additional information regarding copyright ownership.
  The ASF licenses this file to You under the Apache License, Version 2.0
  (the "License"); you may not use this file except in compliance with
  the License.  You may obtain a copy of the License at

      http://www.apache.org/licenses/LICENSE-2.0

  Unless required by applicable law or agreed to in writing, software
  distributed under the License is distributed on an "AS IS" BASIS,
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
  See the License for the specific language governing permissions and
  limitations under the License.
-->
<web-app xmlns="https://jakarta.ee/xml/ns/jakartaee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="https://jakarta.ee/xml/ns/jakartaee
                      https://jakarta.ee/xml/ns/jakartaee/web-app_5_0.xsd"
  version="5.0"
  metadata-complete="true">

  <display-name>Tomcat Documentation</display-name>
  <description>
     Tomcat Documentation.
  </description>
 <distributable/>
</web-app>
```

```
[root@centos8 bin]# vi $CATALINA_HOME/tomcat2/webapps/docs/WEB-INF/web.xml
[root@centos8 bin]# cat $CATALINA_HOME/tomcat2/webapps/docs/WEB-INF/web.xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
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  contributor license agreements.  See the NOTICE file distributed with
  this work for additional information regarding copyright ownership.
  The ASF licenses this file to You under the Apache License, Version 2.0
  (the "License"); you may not use this file except in compliance with
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  Unless required by applicable law or agreed to in writing, software
  distributed under the License is distributed on an "AS IS" BASIS,
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
  See the License for the specific language governing permissions and
  limitations under the License.
-->
<web-app xmlns="https://jakarta.ee/xml/ns/jakartaee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="https://jakarta.ee/xml/ns/jakartaee
                      https://jakarta.ee/xml/ns/jakartaee/web-app_5_0.xsd"
  version="5.0"
  metadata-complete="true">

  <display-name>Tomcat Documentation</display-name>
  <description>
     Tomcat Documentation.
  </description>
 <distributable/>
</web-app>
```

Créez les fichiers **$CATALINA_HOME/tomcat1/webapps/docs/session.jsp** et **$CATALINA_HOME/tomcat2/webapps/docs/session.jsp** :

```
[root@centos8 bin]# vi $CATALINA_HOME/tomcat1/webapps/docs/session.jsp

[root@centos8 bin]# cat $CATALINA_HOME/tomcat1/webapps/docs/session.jsp
<%@page language="java" %>
<html>
<body>
<h3>
Session : <%= session.getId() %>
</h3>
</body>
</html>

[root@centos8 bin]# vi $CATALINA_HOME/tomcat2/webapps/docs/session.jsp

[root@centos8 bin]# cat $CATALINA_HOME/tomcat2/webapps/docs/session.jsp
<%@page language="java" %>
<html>
<body>
<h3>
Session : <%= session.getId() %>
</h3>
</body>
</html>
```

Dé-commentez la ligne suivante dans les fichiers **server.xml** :

```
[root@centos8 bin]# vi $CATALINA_HOME/tomcat1/conf/server.xml
...
        <Cluster className="org.apache.catalina.ha.tcp.SimpleTcpCluster"/>
...
[root@centos8 bin]# vi $CATALINA_HOME/tomcat2/conf/server.xml
...
        <Cluster className="org.apache.catalina.ha.tcp.SimpleTcpCluster"/>
```

```
...
```

Sessions Persistantes sur Système de Fichiers

Editez maintenant les fichier **$CATALINA_HOME/tomcat1/conf/context.xml** et **$CATALINA_HOME/tomcat2/conf/context.xml** en ajoutant la section suivante :

```
    <Manager className="org.apache.catalina.session.PersistentManager" >
        <Store className="org.apache.catalina.session.FileStore"
        directory="/tmp/sessions/" />
    </Manager>
```

Vous obtiendrez un résultat similaire à celui-ci pour les **deux** instances de Tomcat :

```
[root@centos8 bin]# cat $CATALINA_HOME/tomcat1/conf/context.xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
  Licensed to the Apache Software Foundation (ASF) under one or more
  contributor license agreements.  See the NOTICE file distributed with
  this work for additional information regarding copyright ownership.
  The ASF licenses this file to You under the Apache License, Version 2.0
  (the "License"); you may not use this file except in compliance with
  the License.  You may obtain a copy of the License at

      http://www.apache.org/licenses/LICENSE-2.0

  Unless required by applicable law or agreed to in writing, software
  distributed under the License is distributed on an "AS IS" BASIS,
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
  See the License for the specific language governing permissions and
  limitations under the License.
-->
```

```
<!-- The contents of this file will be loaded for each web application -->
<Context>

    <!-- Default set of monitored resources. If one of these changes, the    -->
    <!-- web application will be reloaded.                                   -->
    <WatchedResource>WEB-INF/web.xml</WatchedResource>
    <WatchedResource>WEB-INF/tomcat-web.xml</WatchedResource>
    <WatchedResource>${catalina.base}/conf/web.xml</WatchedResource>

    <!-- Uncomment this to enable session persistence across Tomcat restarts -->
    <!--
    <Manager pathname="SESSIONS.ser" />
    -->
        <Manager className="org.apache.catalina.session.PersistentManager" >
                <Store className="org.apache.catalina.session.FileStore"
                directory="/tmp/sessions/" />
        </Manager>

</Context>
```

Créez le répertoire **/tmp/sessions** pour contenir les fichiers de sessions :

```
[root@centos8 bin]# mkdir /tmp/sessions
```

Re-démarrez les instances de Tomcat :

```
[root@centos8 bin]# ./stopTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Oct 06, 2023 11:37:50 AM org.apache.catalina.startup.Catalina stopServer
```

```
SEVERE: Could not contact [localhost:8105] (base port [8105] and offset [0]). Tomcat may not be running.
Oct 06, 2023 11:37:50 AM org.apache.catalina.startup.Catalina stopServer
SEVERE: Error stopping Catalina
java.net.ConnectException: Connection refused (Connection refused)
        at java.net.PlainSocketImpl.socketConnect(Native Method)
        at java.net.AbstractPlainSocketImpl.doConnect(AbstractPlainSocketImpl.java:350)
        at java.net.AbstractPlainSocketImpl.connectToAddress(AbstractPlainSocketImpl.java:206)
        at java.net.AbstractPlainSocketImpl.connect(AbstractPlainSocketImpl.java:188)
        at java.net.SocksSocketImpl.connect(SocksSocketImpl.java:392)
        at java.net.Socket.connect(Socket.java:607)
        at java.net.Socket.connect(Socket.java:556)
        at java.net.Socket.<init>(Socket.java:452)
        at java.net.Socket.<init>(Socket.java:229)
        at org.apache.catalina.startup.Catalina.stopServer(Catalina.java:692)
        at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
        at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
        at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
        at java.lang.reflect.Method.invoke(Method.java:498)
        at org.apache.catalina.startup.Bootstrap.stopServer(Bootstrap.java:391)
        at org.apache.catalina.startup.Bootstrap.main(Bootstrap.java:481)

[root@centos8 bin]# ./stopTomcat2
Using CATALINA_BASE:   /usr/tomcat10/tomcat2
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:

[root@centos8 bin]# ./startTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
```

```
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.

[root@centos8 bin]# ./startTomcat2
Using CATALINA_BASE:   /usr/tomcat10/tomcat2
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat2/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
```

Attention : Notez l'exception lors de l'arrêt de **tomcat1** ci-dessus. Cette exception a lieu parce que tomcat1 avait été précédement arrêté. Dans votre cas l'exception pourrait se produire en arrêtant tomcat2 si celui-ci avait déjà été arrêté.

En utilisant votre navigateur graphique, saisissez l'URL suivante :

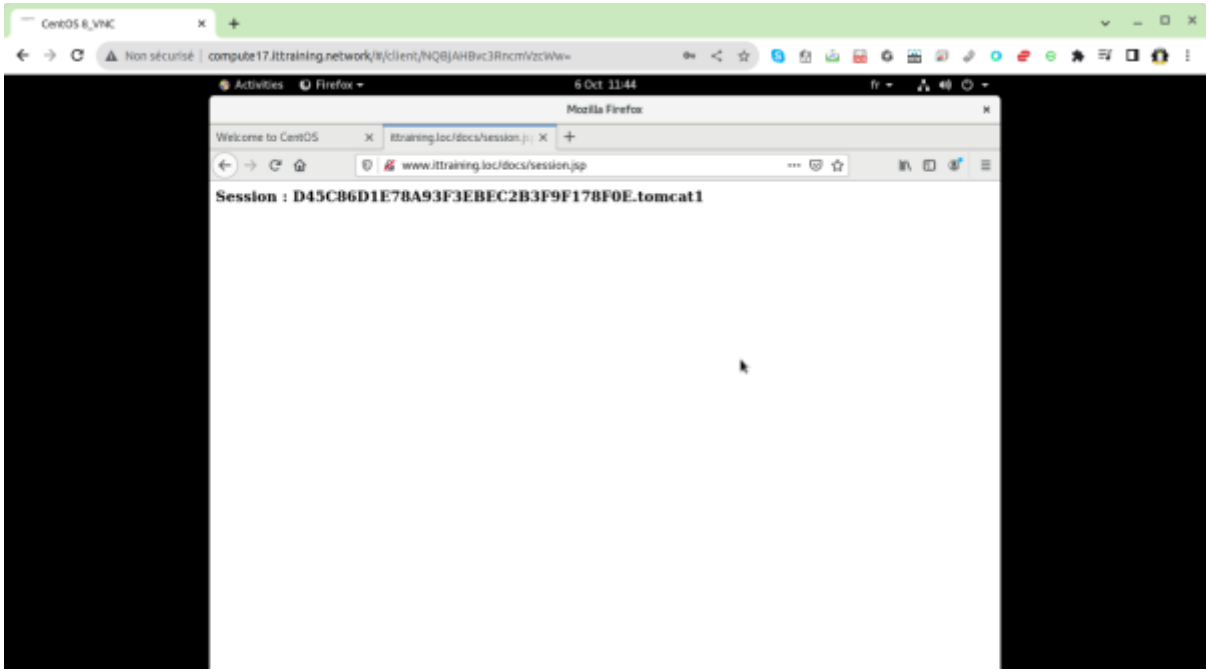
```
http://www.ittraining.loc/docs/session.jsp
```

Vous obtiendrez une résultat similaire à l'exemple suivant :

```
Session : D45C86D1E78A93F3EBEC2B3F9F178F0E.tomcat1
```

ou

```
Session : D45C86D1E78A93F3EBEC2B3F9F178F0E.tomcat2
```



Selon l'instance de Tomcat qui a répondu, arrêtez cette instance :

```
[root@centos8 bin]# ./stopTomcat1
Using CATALINA_BASE:   /usr/tomcat10/tomcat1
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat1/temp
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
```

ou

```
[root@centos8 bin]# ./stopTomcat2
Using CATALINA_BASE:   /usr/tomcat10/tomcat2
Using CATALINA_HOME:   /usr/tomcat10
Using CATALINA_TMPDIR: /usr/tomcat10/tomcat2/temp
```

```
Using JRE_HOME:        /usr/lib/jvm/jre-1.8.0-openjdk-1.8.0.312.b07-2.el8_5.x86_64
Using CLASSPATH:       /usr/tomcat10/bin/bootstrap.jar:/usr/tomcat10/bin/tomcat-juli.jar
Using CATALINA_OPTS:
```

Contrôlez le contenu du répertoire **/tmp/sessions** :

```
[root@centos8 bin]# ls -l /tmp/sessions
total 4
-rw-r----- 1 root root 265 Oct  6 11:45 D45C86D1E78A93F3EBEC2B3F9F178F0E.tomcat1.session
```

Revenez à votre navigateur Web graphique et rafraîchissez la page. Vous obtiendrez un résultat démontrant que la session est resté la même malgré le fait que c'est l'autre instance de Tomcat qui vous a répondu.

```
Session : D45C86D1E78A93F3EBEC2B3F9F178F0E.tomcat1
```

ou

```
Session : D45C86D1E78A93F3EBEC2B3F9F178F0E.tomcat2
```