This text helps you to deploy e-learning portal with Sakai (https://sakaiproject.org/)

Assumption:

Deployer has experiences to setup CentOS, configure Apache and Tomcat

Target

Deploy Sakai and MySQL on a same server.
User can explore directy the Sakai from the Tomcat URL http://<server>:8080/portal

#	Main sheets	Description
1	Linux	Install common tools on CentOS 7: Java, Tomcat
2	Sakai	Install Sakai from binary package
3	Exercise01_CreateCourseSite	Guideline to Create a training course siite
4	Exercise02_CreateQuestionBank	Guideline to create question bank for the e-learning system
5	Exercise03_CreateAccount	Create local users in Sakai
6	Exercise04_CreateTestSession	Create exam

This text helps you install required tools for Sakai on CentOS 7 x64

To be installed:
Java 8
Tomcat 7 (use version **7.0.65**)
(Tomcat 7.0.67 does not work with Sakai 10.6)

Note:
This guide is performed with root permission.

1) Preparation

```
# yum install mc yum-utils nano net-tools telnet
```

2) Setup Java Development Kit (JDK)

a) Download and Install JDK
Download "jdk-8u60-linux-x64.gz" into the local path (ex: /root/soft/)

Change the current directory into /opt. The JDK will be installed into this directory /opt
Extract file jdk-…gz into /opt by executing command

```
# tar -xvzf ~/soft/jdk-8u60-linux-x64.gz -C /opt
```

b) Configure the PATH environment for JDK
Create file /etc/profile.d/jdk.sh with below content

```
# Setting JAVA_HOME
export JAVA_HOME=/opt/jdk1.8.0_60
export PATH=$JAVA_HOME/bin:$PATH
```

(Refer script at "Scripts/jdk.sh")

Review file after created or copied. Maker owner and mod are similar as below

```
# ls -l /etc/profile.d/jdk.sh
-rw-r--r--. 1 root root 88 Oct 23 16:28 /etc/profile.d/jdk.sh
```

Apply those configuration by executing the command

```
# source /etc/profile.d/jdk.sh
```

Now, you can check the installed java by run command

```
# java -version
java version "1.8.0_60"
Java(TM) SE Runtime Environment (build 1.8.0_60-b27)
Java HotSpot(TM) 64-Bit Server VM (build 25.60-b23, mixed mode)
```

3) Install apache tomcat

a) Download and install apache tomcat
1. Download "apache-tomcat-7.0.65.tar.gz" into "/root/soft/apache-tomcat-7.0.65.tar.gz"
2. Extract the package of apache tomcat into /opt by executing below command

```
# tar -xvzf ~/soft/apache-tomcat-7.0.65.tar.gz -C /opt/
```

3. Create a link folder "tomcat" to the folder "/opt/apache-tomcat-7.0.65"

```
# cd /opt
# ln -nsf apache-tomcat-7.0.65 tomcat
# chown tomcat.tomcat -R /opt/apache-tomcat-7.0.65
```

b) Install service for the tomcat

1. Add user "tomcat" with no login shell by excuting below command:

```
# useradd tomcat
```

2. Create script "/etc/rc.d/init.d/tomcat"
   Refer content of this script "tomcat" in sheet "_tomcat-service"

3. Add executable attribute for this script

```
# chmod +x /etc/init.d/tomcat
```

4. Add service tomcat into the system by executing below command:

```
# chkconfig --add tomcat
```

5. Check the configuration of service tomcat

```
# chkconfig --list tomcat
tomcat          0:off   1:on    2:on    3:on    4:off   5:on    6:off
```

6. Now, you can start the tomcat service by executing below command:

```
# service tomcat start
```

Monitor the log file /opt/tomcat/logs/catalina.out, you will found this information:

```
...
INFO: The APR based Apache Tomcat Native library which allows optimal performance in production
environments was not found on the java.library.path:
/usr/java/packages/lib/amd64:/usr/lib64:/lib64:/lib:/usr/lib
...
```

It not a problem. Go to step 7.

7. Install the APR to use Apache Tomcat Native library
   View sheet "_APR"

8. Copy script "Scripts/setenv.sh" into "/opt/tomcat/bin"
   Or create file /opt/tomcat/bin/setenv.sh following:

```
# nano /opt/tomcat/bin/setenv.sh
```

   In the editor of nano, copy content from sheet "setenv.sh" into the file.
   Sheet "_setenv.sh"
   Please check to adjust the configuration memory to match with your requirement.

   Press Ctrl-O, Enter, Ctrl-X to finish creating file setenv.sh.

```
# chown tomcat:tomcat /opt/tomcat/bin/setenv.sh && chmod +x /opt/tomcat/bin/setenv.sh
```

9. Now you can clear the tomcat log, then restart the tomcat

```
# service tomcat stop
```

Clear logs of the tomcat

```
# rm -f /opt/tomcat/logs/*
```

Check to make sure no java process is running

```
# ps aux | grep java
```

Re-start the tomcat

```
# service tomcat start
```

Monitor the log file /opt/tomcat/logs/catalina.out, you will found this information:

```
INFO: Loaded APR based Apache Tomcat Native library 1.1.33 using APR version 1.4.8.
Oct 23, 2015 5:18:31 PM org.apache.catalina.core.AprLifecycleListener lifecycleEvent
INFO: APR capabilities: IPv6 [true], sendfile [true], accept filters [false], random [true].
Oct 23, 2015 5:18:31 PM org.apache.catalina.core.AprLifecycleListener initializeSSL
INFO: OpenSSL successfully initialized (OpenSSL 1.0.1e 11 Feb 2013)
```

10. Remove unnecessary web applications from the tomcat by delete them from the ../webapps

    docs examples host-manager manager ROOT

```
# rm -fr /opt/tomcat/webapps/*
```

11. Configure log4j for Tomcat
    Refer: https://tomcat.apache.org/tomcat-7.0-doc/logging.html

4) Open port

firewall-cmd --zone=public --add-port=8009/tcp --permanent
firewall-cmd --zone=public --add-port=8080/tcp --permanent

Use nmap to check port on a server. Ex:
nmap -PN -p 8009 <server>

This text helps you to install Sakai on CentOS 7.

Prerequisites:

Java 8
Tomcat 7
MySQL (Refer sheet "MySQL")

To be installed:

Sakai 10.6 from binary package
(http://source.sakaiproject.org/release/10.6/artifacts/sakai-bin-10.6.tar.gz)

Note:

This guide is performed with root permission.

1) Download and install Sakai

a) Download and Install Sakai into Tomcat

Download the binay sakai package into folder /root/soft

```
# mkdir ~/soft
# cd ~/solf
# wget http://source.sakaiproject.org/release/10.6/artifacts/sakai-bin-10.6.tar.gz
```

b) Extract file binary sakai package into Tomcat:

```
# tar -xvzf ~/soft/sakai-bin-10.6.tar.gz -C /opt/tomcat
```

c) Download MySQL J Connector

Download and extract the mysql-connector-java

```
# wget http://dev.mysql.com/get/Downloads/Connector-J/mysql-connector-java-5.1.38.tar.gz
# tar -xvzf mysql-connector-java-5.1.38.tar.gz
```

d) Copy the mysql connector .jar file into Tomcat

```
# cd ~/soft
# cp ./mysql-connector-java-5.1.38/mysql-connector-java-5.1.38-bin.jar /opt/tomcat/shared/lib/
```

2) Configure Tomcat and Sakai

a) Modify conf/server.xml of Tomcat for international character support

```
# nano /opt/tomcat/conf/server.xml
```

Add URIEncoding="UTF-8" to the Connector element

```
<Connector port="8080" protocol="HTTP/1.1" URIEncoding="UTF-8"
           connectionTimeout="20000"
           redirectPort="8443" />
```

(In nano editor, press Ctrl+O, Enter, Ctrl+X to save and exit it)

Add ,${catalina.base}/common/lib/*.jar into the common.loader

```
# nano /opt/tomcat/conf/catalina.properties
```

```
common.loader=${catalina.base}/lib,${catalina.base}/lib/*.jar,${catalina.home}/lib,${catalina.home}/lib/*.jar,${
catalina.base}/common/lib/*.jar


shared.loader=${catalina.base}/shared/lib/*.jar
```

b) Configure sakai.properties

Download the default sakai properties file of sakai 10.x

```
# wget https://source.sakaiproject.org/svn/config/branches/sakai-
  10.x/configuration/bundles/src/bundle/org/sakaiproject/config/bundle/default.sakai.properties
```

Prepare folder for sakai configuration

```
# mkdir /opt/tomcat/sakai
```

Copy default sakai.properties into the sakai

```
# cp ~/soft/default.sakai.properties /opt/tomcat/sakai/sakai.properties
```

Setting database connection to MySQL

```
# nano /opt/tomcat/sakai/sakai.properties
```

Insert below lines into the sakai.properties afer line "## MySQL settings" (without double-quotes)

```
# Inserted by Thach.START
## MySQL settings
vendor@org.sakaiproject.db.api.SqlService=mysql
driverClassName@javax.sql.BaseDataSource=com.mysql.jdbc.Driver
hibernate.dialect=org.hibernate.dialect.MySQL5InnoDBDialect
url@javax.sql.BaseDataSource=jdbc:mysql://10.88.16.135:3306/sakai106?useUnicode=true&characterEncoding=UTF-8
username@javax.sql.BaseDataSource=sakai_admin
password@javax.sql.BaseDataSource=sakai_admin
validationQuery@javax.sql.BaseDataSource=select 1 from DUAL
defaultTransactionIsolationString@javax.sql.BaseDataSource=TRANSACTION_READ_COMMITTED
# Insert by Thach.END
```

Now you can start the sakai

```
# service tomcat start
```

Trouble shooting

Monitor the logging file /opt/tomcat/logs/catalina.out, if you found exception is similar as:

```
com.mysql.jdbc.exceptions.jdbc4.MySQLSyntaxErrorException: Table 'sakai106.SAKAI_SESSION'
doesn't exist
```

Please consider to create table SAKAI_SESSION manually

(Refer sheet "MySQL)

c) Create "Academic term"

Excute below command to login to mysql

```
# mysql -h localhost -u sakai_admin -p sakai106
```

(Refer mysql script in sheet "MySQL")

Now, you can explore the Sakai with URL http://<your server name or ip>:8080/portal

1. Install required packages by executing below command:

```
# yum install gcc apr-devel openssl openssl-devel
```

(For CentOS 6: yum install gcc apr-devel open-ssl open-ssl-devel)

2.

```
# cd /opt/tomcat/bin/
```

```
# tar xvzf tomcat-native.tar.gz
```

```
# cd tomcat-native-1.1.33-src/jni/native
```

```
# ./configure  --with-apr=/usr/bin/apr-1-config --with-ssl=yes && make && make install
```

```
Libraries have been installed in:
   /usr/local/apr/lib

If you ever happen to want to link against installed libraries
in a given directory, LIBDIR, you must either use libtool, and
specify the full pathname of the library, or use the `-LLIBDIR'
flag during linking and do at least one of the following:
   - add LIBDIR to the `LD_LIBRARY_PATH' environment variable
     during execution
   - add LIBDIR to the `LD_RUN_PATH' environment variable
     during linking
   - use the `-Wl,-rpath -Wl,LIBDIR' linker flag
   - have your system administrator add LIBDIR to `/etc/ld.so.conf'

See any operating system documentation about shared libraries for
more information, such as the ld(1) and ld.so(8) manual pages.
----------------------------------------------------------------------
```

```
#! /bin/sh

export JAVA_OPTS="-Djsse.enableSNIExtension=false"

# http://wiki.apache.org/tomcat/FAQ/Memory
export CATALINA_OPTS="-server -XX:+UseParallelGC -Xms512m -Xmx4096m -
XX:MaxNewSize=256m  -Dsun.lang.ClassLoader.allowArraySyntax=true -Djava.awt.headless=true -
Dorg.apache.jasper.compiler.Parser.STRICT_QUOTE_ESCAPING=false"

# Optimize performace for APR
export LD_LIBRARY_PATH=/usr/local/apr/lib:$LD_LIBRARY_PATH
```

`

```
#!/bin/sh
#
# Startup script for Tomcat Servlet Engine
#
# chkconfig: 1235 99 1
# description: Tomcat Servlet Engine
# processname: tomcat
# pidfile: $TOMCAT_HOME/bin/tomcat.pid
#

# User under which tomcat will run
TOMCAT_USER=tomcat
TOMCAT_HOME=/opt/tomcat

RETVAL=0

# start, debug, stop, and status functions
start() {
   # Start tomcat in normal mode
   SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
   if [ $SHUTDOWN_PORT -ne 0 ]; then
      echo "tomcat already started"
   else
      echo "Starting tomcat..."
      chown -R $TOMCAT_USER:$TOMCAT_USER $TOMCAT_HOME

      echo "Invoke script to start tomcat"
      su -l $TOMCAT_USER -c $TOMCAT_HOME/bin/startup.sh

     SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
      while [ $SHUTDOWN_PORT -eq 0 ]; do
         sleep 1
         SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
      done
      RETVAL=$?
      echo "tomcat started in normal mode"
      [ $RETVAL=0 ] && touch /var/lock/subsys/tomcat
   fi
}

debug() {
   # Start tomcat in debug mode
   SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
   if [ $SHUTDOWN_PORT -ne 0 ]; then
      echo "tomcat already started"
   else
      echo "Starting tomcat in debug mode..."
      chown -R $TOMCAT_USER:$TOMCAT_USER $TOMCAT_HOME
      chown -R $TOMCAT_USER:$TOMCAT_USER /home/tomcat
      su -l $TOMCAT_USER -c $TOMCAT_HOME/bin/catalina.sh jpda start
     SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
      while [ $SHUTDOWN_PORT -eq 0 ]; do
         sleep 1
         SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
      done
      RETVAL=$?
      echo "tomcat started in debug mode"
      [ $RETVAL=0 ] && touch /var/lock/subsys/tomcat
```

```
    fi
}

stop() {
    SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
    #  SHUTDOWN_PORT=`ps aux | grep tomcat | grep tomcat | wc -l`
    if [ $SHUTDOWN_PORT -eq 0 ]; then
        echo "tomcat already stopped"
    else
           chown -R $TOMCAT_USER:$TOMCAT_USER $TOMCAT_HOME
        echo "Stopping tomcat..."
        su -l $TOMCAT_USER -c $TOMCAT_HOME/bin/shutdown.sh
       SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
        while [ $SHUTDOWN_PORT -ne 0 ]; do
            sleep 1
            SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
        done
       RETVAL=$?
        echo "tomcat stopped"
        [ $RETVAL=0 ] && rm -f /var/lock/subsys/tomcat $TOMCAT_HOME/bin/tomcat.pid
    fi
}

status() {
    SHUTDOWN_PORT=`netstat -vatn|grep LISTEN|grep 8005|wc -l`
    if [ $SHUTDOWN_PORT -eq 0 ]; then
        echo "tomcat stopped"
    else
        MODE="normal"
        JPDA_PORT=`netstat -vatn|grep LISTEN|grep 8080|wc -l`
        if [ $JPDA_PORT -ne 0 ]; then
            MODE="debug"
        fi
       echo "tomcat running in $MODE mode"
    fi
}

case "$1" in
  start)
        start
        ;;
  debug)
        debug
        ;;
  stop)
        stop
        ;;
  restart)
        stop
        start
        ;;
  redebug)
        stop
        debug
        ;;
  status)
       status
       ;;
  *)
```

```
        echo "Usage: $0 {start|debug|stop|restart|redebug|status}"
        exit 1
    esac

    exit $RETVAL
```

This text provide you some common mysql scripts or configurations for Sakai.

A. MySQL Server

Change the configuration (recommended)

Modify file my.ini

[mysqld]

max_allowed_packet=20M

B. Scripts to create database sakai106 and set permission

Create database for sakai 10.6

```
Create database sakai106 default character set utf8;
GRANT ALL ON sakai106.* TO sakai_admin@'%.%.%.%' IDENTIFIED BY 'sakai_admin';
GRANT ALL ON sakai106.* TO sakai_admin@'localhost' IDENTIFIED BY 'sakai_admin';
```

C. Create table SAKAI_SESSION manually

```
CREATE TABLE `SAKAI_SESSION` (
 `SESSION_ID` varchar(36) DEFAULT NULL,
 `SESSION_SERVER` varchar(64) DEFAULT NULL,
 `SESSION_USER` varchar(99) DEFAULT NULL,
 `SESSION_IP` varchar(128) DEFAULT NULL,
 `SESSION_HOSTNAME` varchar(255) DEFAULT NULL,
 `SESSION_USER_AGENT` varchar(255) DEFAULT NULL,
 `SESSION_START` datetime DEFAULT NULL,
 `SESSION_END` datetime DEFAULT NULL,
 `SESSION_ACTIVE` tinyint(1) DEFAULT NULL,
 UNIQUE KEY `SAKAI_SESSION_INDEX` (`SESSION_ID`),
 KEY `SAKAI_SESSION_SERVER_INDEX` (`SESSION_SERVER`),
 KEY `SAKAI_SESSION_START_END_IE`
(`SESSION_START`,`SESSION_END`,`SESSION_ID`),
 KEY `SESSION_ACTIVE_IE` (`SESSION_ACTIVE`)
);
```

D. Create Academic term

```
INSERT INTO CM_ACADEMIC_SESSION_T
(ACADEMIC_SESSION_ID,VERSION,LAST_MODIFIED_BY,LAST_MODIFIED_DATE,
CREATED_BY,CREATED_DATE,ENTERPRISE_ID,TITLE,DESCRIPTION,START_DA
TE,END_DATE,IS_CURRENT) VALUES (0 ,0 ,'s',{d '2016-01-20'},'s',{d '2016-01-
20'},'MyAcademic' ,'MyAcademic' ,'Internal e-learning system' ,{d '2016-01-01'},{d '2030-
12-31'},1);
```