

INTRODUCTION TO BIMServer and CASSANDRA DATABASE

LEARNING OUTCOMES:

The architecture, engineering and construction (AEC) industry lacks a framework for capturing, managing, and exchanging project, product, and social information over the lifecycle of a building. The current tools have various limitations, such as lack of interoperability, slow to transfer huge building model files, and possibility of data inconsistency

Introduction to BIMServer:

The Social BIMCloud framework helps to develop and exchange BIM models, which are rich in project information such as social interactions, cost, and energy analyses. This framework improves the communication efficiency between project participants, leading to better designs and less rework. The information captured by this framework could also be useful to determine important metrics such as industry trends, relationships among project participants, and user requirements.

BIMServer is Building Information Model server open source platform.

Introduction to Cassandra Database:

Apache Cassandra is a free and open-source distributed database management system designed to handle large amounts of data across many commodity servers, providing high availability with no single point of failure.

Cassandra provides a number of key features and benefits for those looking to use it as the underlying database for modern online applications:

- Massively scalable architecture – a masterless design where all nodes are the same, which provides operational simplicity and easy scale-out.
- Active everywhere design – all nodes may be written to and read from.
- Linear scale performance – the ability to add nodes without going down produces predictable increases in performance.
- Continuous availability – offers redundancy of both data and node function, which eliminate single points of failure and provide constant uptime.
- Transparent fault detection and recovery – nodes that fail can easily be restored or replaced.
- Flexible and dynamic data model – supports modern data types with fast writes and reads.
- Strong data protection – a commit log design ensures no data loss and built in security with backup/restore keeps data protected and safe.
- Tunable data consistency – support for strong or eventual data consistency across a widely distributed cluster.
- Multi-data center replication – cross data center (in multiple geographies) and multi-cloud availability zone support for writes/reads.
- Data compression – data compressed up to 80% without performance overhead.

- CQL (Cassandra Query Language) – an SQL-like language that makes moving from a relational database very easy.

Task 01: Setup Ubuntu 16.04

- Install Ubuntu 16.04 Version
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Task 02: Setup Apache Tomcat 7

- Followed the steps from the below link to setup BIMserver
<https://github.com/opensourceBIM/BIMserver/wiki/Install-on-Ubuntu>
 In step Restart Tomcat: service tomcat7 restart
 - **Error:** The webpage was unable to connect.
 Solution: Removed all the files which i installed in the above steps.
- Downloaded tomcat7 from <https://tomcat.apache.org/download-70.cgi> tar.gz file.
Error: Could not extract the files.

Solution: Therefore, tried downloading apache tomcat 7 tar.gz file from another mirror

i.e,

<https://tomcat.apache.org/download-70.cgi?Preferred=http%3A%2F%2Fapache.cs.utah.edu%2F>

E . Extract the files.

- Placed the apache tomcat 7 folder in /opt.
 - Ran opt/tomcat/bin/startup.sh to start Tomcat 7. Now, I see Apache Tomcat7 page working.
 - Apache Tomcat 7 is installed.
 - It works!
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Task 03: Setup the BIM server

- Deploy BIM Server WAR file in Apache tomcat 7

In order to deploy the WAR file on Apache Tomcat 7, we need to set the tomcat users. In /opt/apache tomcat7/conf/ tomcat-users.xml file,

```
<?xml version='1.0' encoding='utf-8'?>
```

```
<tomcat-users>
```

```
    <role rolename="manager-gui"/>
```

```
    <role rolename="manager-script"/>
```

```
    <role rolename="manager-jmx"/>
```

```
    <role rolename="manager-status"/>
```

```
    <role rolename="admin"/>
```

```
    <user username="admin" password="admin"
```

```
        roles="admin,manager-gui,manager-script"/>
```

```
</tomcat-users>
```

- Go to Tomcat first page , click on manager app. Login with the same details as in tomcat-users xml file.
- Go to section Deploy a file, browse the WAR file and deploy it.
- Click on the deployed WAR file link which has the display name as BIM server.

Error: Couldn't deploy

Solution: Tomcat 7 allows maximum of 50MB file. Therefore, go to /opt/apache tomcat7/webapps/manager/WEB-INF/web.xml.

Change the maximum file size it has to deployed on apache,

```
<multipart-config>
```

```
    <max-file-size>165000000</max-file-size>
```

```
    <max-request-size>165000000</max-request-size>
```

```
    <file-size-threshold>0</file-size-threshold>
```

```
</multipart-config>
```

- Deploy the WAR file again. Click on the BIM server link.
 - BIM server is successfully installed on Apache tomcat 7.
 - Create Administrator Username , email and password. Sign in.
 - Create new project -> subproject -> upload the BIM model files .rvt files
- Error:** cannot find IFC headers.
- Solution: Download a sample IFC file and upload to the BIM Server.
- It works!

Task 04: Setup Cassandra Database:

- Install Docker from the latest release
- Pull the cassandra database from the docker registry
- Run cqlsh
- Sample CQL query to create a table and retrieve the details from the table.
 - It works!

Task 05: Find a compatible viewer with BIM Server

After extensive research, i realized that BIM Server 1.4 version has an inbuilt viewer

Bimvie.ws. Below is the referenced link,

<http://forum.freecadweb.org/viewtopic.php?t=14187>

As a rule of thumb, set the heap size according to: 15MB per 1MB of IFC file, e.g. for 30MB of IFC file, the heap size should be at least 5GB

Task 06: Find the plugin for clash detection

Java based clash detection service

<https://github.com/opensourceBIM/BIMserver/issues/347#issuecomment-223224338>

This plugin does the basic clash detection.

Task 07: Run the Clash detection plugin on the BIMServer

Uploaded the IFC file 20160613office_model_CV2b_fordesign.ifc from the IFC file folder shared on google drive. Downloaded the clash detection plugin from the GitHub. Compressed the clash detection plugin file to .jar file and put that in the plugin folder in the BIM server WAR file.

Deployed the BIM server WAR file again on Apache Tomcat 7. BIM server works well.

Error: Clash Detection plugin is not seen in the plugins tab in the BIM server.

May be the IFC file does not have any clashes.

Developer's suggestion: clash detection plugin works with BIM1.5.

Solution : Upgrade it to BIM1.5

- Task 7.01: Upgrade to BIM1.5

Deployed the BIM 1.5.51 WAR file on Tomcat 7.

Able to view and set up BIMserver

Error: Websocket error while logging in to BIMvie.ws viewer. Not able to log-in.

Solution: if you are using Tomcat 7, there is a special WAR build that uses an older API for supporting Websockets. For Tomcat 8 and other application containers you can use the normal WAR file (which uses JSR-356 for Websockets).

- Task 7.02: Upgrade Tomcat 7 to Tomcat 8
- Task 7.03: Deploy BIM Server 1.5.51 on Tomcat 8.
- Task 7.04: Install the Clash detection plugin and Merger plugin
 - Run the Clash detection plugin on the BIMServer
- Task 7.05: Create a project in BIM 1.5 named Test01 which has two subprojects subproject 1 and subproject 2.
- Add the first IFC file in the subproject 01 and second IFC in the sub project 02.
- The model files in subproject 1 and subproject 2 merge and can view it by clicking on the eye button next to Test01 project label.
- Now, go to Test01 dropdown arrow and add clash detection service.

Error: No notification or logs seen.

Solution: Tried IFC viewer in BIMserver 1.5.

Error: BIM server does not deploy.

Solution: Add a clash detection tool that can access data from the BIM server and perform clash detection. To build clash into the server, the server needs a method to get access only to the geometry. Therefore Citygml plugin uses this functionality to create other formats. So, we can use the same methods to get geometry.

Error: CityGML does not work at this moment.

<https://github.com/opensourceBIM/CityGML>

Solution: Add the clash detection service even before add the subprojects to the project.

Error: Missing notification Url

Task 8: Read and write from the Cassandra Database

- Install Docker
- Check the following
 - \$ sudo docker version
 - \$ sudo docker ps
 - \$ sudo docker ps -a
- Install Cassandra in Docker
 - Launch a container running cassandra called cass1
 - sudo docker run --detach --name cass1 poklet/cassandra
 - Connect to it using cqlsh
 - Sudo docker run -it --rm --net container:cass1 poklet/cassandra cqlsh

- You should see something like this:
[cqlsh 5.0.1 | Cassandra 2.2.0 | CQL spec 3.3.0 | Native protocol v4]
Use HELP for help.
cqlsh> quit
 - Try some sql:
CREATE KEYSPACE test_keyspace WITH REPLICATION =
{'class': 'SimpleStrategy', 'replication_factor': 1};
USE test_keyspace;
CREATE TABLE test_table (
id text,
test_value text,
PRIMARY KEY (id)
);
INSERT INTO test_table (id, test_value) VALUES ('1', 'one');
INSERT INTO test_table (id, test_value) VALUES ('2', 'two');
INSERT INTO test_table (id, test_value) VALUES ('3', 'three');
SELECT * FROM test_table;
- If that worked, you should see:
- | id | test_value |
|----|------------|
| 3 | three |
| 2 | two |
| 1 | one |
- (3 rows)
- It works!
 - Able to read and write into a cluster.

Task 09: Analysis of BIMSERVER 1.5.51 source code

- Downloaded Eclipse kepler
- Uploaded the Bimserver 1.5.51 source code file
- Let the Build paths for JRE
 - Go to properties -> Java Build path -> library -> select JRE System Library[java-8-oracle]
 - Go to properties-> Java Build path -> Projects tab -> add the dependency projects.
 - Go -> properties -> Java Compiler -> Uncheck use default compliance settings and set those to 1.7
- Lot of errors, Fix them
 - **Error 1:** '<>' operator is not allowed for source level below 1.7
Solution: 50 down vote accepted

In your project's preferences, you must set the compiler --source option to 1.7 and --target option to 1.7 also. There are dedicated option boxes for that. Right-click on the project. Choose *Properties*. Choose *Java Compiler* on the left. Choose 1.7 for the *Compiler Compliance level*. If the 2 drop-downs below that aren't 1.7, uncheck *Use default compliance settings* and set those to 1.7.

- **Error 2:** AbstractEList cannot be resolved to a type
Solution: You can press Shift+Ctrl+O for auto importing.
- **Error 3:** unbound classpath container error in eclipse?
Solution: An unbound classpath container for an Eclipse project implies that the JRE associated with the project is not available in the list of JREs available in the workspace. You will need to modify your Java build path (accessible via Project Preferences), to use a JRE definition that is valid in your workspace. You can choose your workspace default JRE or an alternate JRE, or even a JRE that matches an execution environment (like Java 5 or Java 6)
- **Error 4 :** '<>' operator is not allowed for source level below 1.7
- Upload the project as a maven project and then build.
 - In your project's preferences, you must set the compiler --source option to 1.7 and --target option to 1.7 also. There are dedicated option boxes for that. Right-click on the project. Choose *Properties*. Choose *Java Compiler* on the left. Choose 1.7 for the *Compiler Compliance level*. If the 2 drop-downs below that aren't 1.7, uncheck *Use default compliance settings* and set those to 1.7.
 - Include maven dependency part of code in pom.xml
 - No errors.

Editing the Berkeley part of code in BIMServer to Cassandra and changing to the equivalent functions from the java client driver of the Cassandra.

After editing the part of code, Zip to a WAR file and deployed.

When i deploy the edited BIM server WAR file, I get this error on the Tomcat page,

FAIL - Application at context path /myBim01 could not be started

localhost:8080/manager/html/start?path=/myBim01&org.apache.catalina.filters.CSRF_NONCE=39B6D6F12ED323041D890A8B9171E641

The Apache Software Foundation
http://www.apache.org/

Tomcat Web Application Manager

Message: FAIL - Application at context path /myBim01 could not be started

Manager

List Applications HTML Manager Help Manager Help Server Status

Applications

| Path | Version | Display Name | Running | Sessions | Commands |
|---------------|----------------|---------------------------------|---------|----------|--|
| / | None specified | BIMserver | false | 0 | Start Stop Reload Undeploy |
| /docs | None specified | Tomcat Documentation | true | 0 | Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes |
| /examples | None specified | Servlet and JSP Examples | true | 0 | Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes |
| /host-manager | None specified | Tomcat Host Manager Application | true | 0 | Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes |
| /manager | None specified | Tomcat Manager Application | true | 1 | Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes |
| /myBim01 | None specified | BIMserver | false | 0 | Start Stop Reload Undeploy |

When i checked in the logs of the webapps folder,

2016-08-16 15:34:37,542 INFO [http-nio-8080-exec-11] o.b.BimServer [BimServer.java:213]

Starting BIMserver

2016-08-16 15:34:37,577 INFO [http-nio-8080-exec-11] o.b.BimServer [BimServer.java:215]

Using "/opt/apache-tomcat-8.0.36/webapps/myBim01/WEB-INF" as homedir

2016-08-16 15:34:41,938 ERROR [http-nio-8080-exec-11] o.b.BimServer [BimServer.java:268]

java.lang.NoClassDefFoundError: org/bimserver/client/json/JsonSocketReflectorFactory
at org.bimserver.BimServer.<init>(BimServer.java:223) ~[bimserver-1.5.51.jar:na]