# International Institute of Information Technology, Bangalore

## Software Production Engineering Mini Project

# Custom-eBooks


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# Abstract

Custom Ebooks is a project aimed to provide an application that enables users to compose ebooks as per their preferences. Ebooks give us a lot of flexibility in terms of what their contents can be unlike paperbacks where the content is fixed and we aim to make use of this flexibility and provide users with tools to take advantage of this. We use DevOps tools and approaches to develop the said application and we have summarised the tools we have used, problems we faced and the development process in this report along with details regarding the design and features of our application.

# Introduction

## Importance of the problem

This project sets out to solve the problem of generating e-books based on preferences associated with the user. More and more people are preferring ebooks to a hard copy. But the trend has been towards treating them like normal books in terms of their contents (fixed content). The idea is that unlike with hard copies, we can have a lot of flexibility with ebooks. One such ability is to customize them the way we want. This is similar to taking selected pages from different hardcover books and binding them together. To be more precise, we can have the ability to create ebooks that are composable with smaller components, and the ability to select and assemble parts of many books to create them. The aim of our project is to create an application to make this possible.

## Work plan

The plan is to create a simple application that is easy to use where a user can upload pdf (we refer to them as chapters i.e. each unit is a chapter) and combine them as required to create custom books. The content management framework which handles storing the ebooks and enables search through stored books is available so we plan to build on it to create a frontend for users to utilize these services. The proposed solution includes two interfaces for publishers and customers. The publisher interface will allow

them to upload books. The customer view allows the customer to define a structure to the book, search for various topics and create a custom book. The books will be stored in a native XML database. Representing data using XML conforms to the way books are structured using hierarchies as chapters and sections. Hence, using XML as a primary storage mechanism makes it easier to work with and to avoid mapping.  At the time of checkout, we assemble all the different topics that are selected and arrange them in a user-defined order and let the customer define the structure.

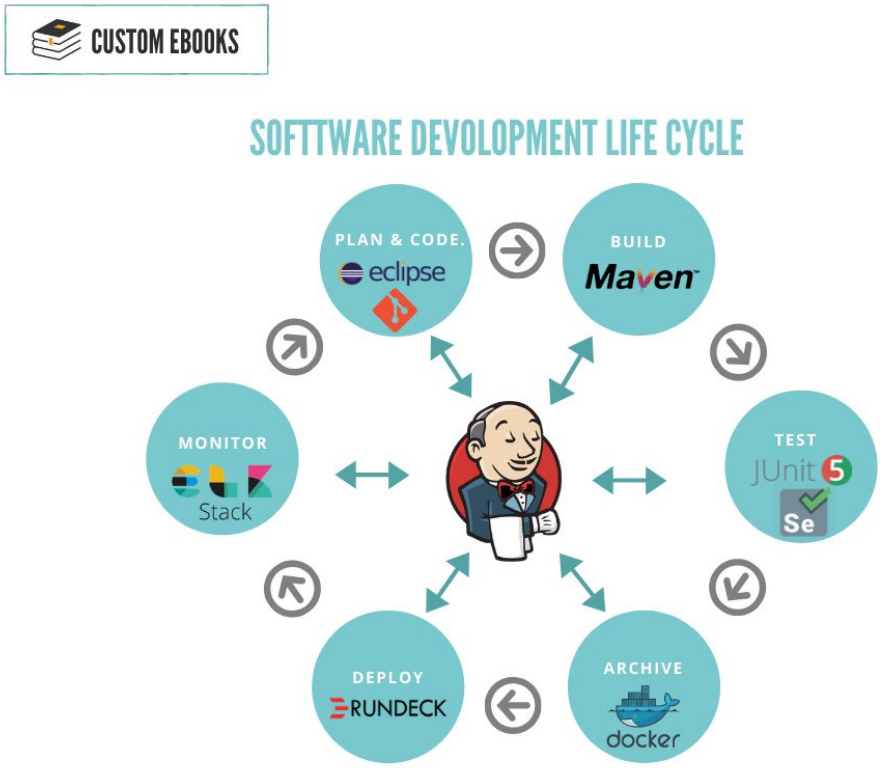
### Why DevOps?

We plan to build this project in an incremental manner. The design consists of views and services which function fairly independently. Given the complexity of the project, it's not feasible for one of us to build and test all the code manually every time we make a small change. Also since there are four of us working from different locations, an automated pipeline will not only make our work easier, it also makes it more efficient. The amount of communication that has to happen between us will reduce. DevOps enables us to focus on important aspects of the project, improves efficiency, stability and security. There's less scope for manual errors. Also since we plan to ship this product at some point, continuous delivery makes it easy. Also, monitoring allows us to understand the usage better and helps us improve the application.

## System Configuration

| NAME | SPECS |
|---|---|
| OS - Ubuntu | 16.04 LTS |
| CPU | Intel Core I5 (8 cores) |
| RAM | 8GB |
| Kernel version | Linux 4.15.0-101 generic |
| Languages used | Java, JSP, HTML, CSS, javascript and XML |
| Others | eXist-DB and tomcat server |

# Software Development Life Cycle (SDLC)




## Source Code Management ( SCM ) :

A source code manager is a software tool used by teams of programmers to manage source code. SCMs are used to track revisions in software. Each revision is given a timestamp and includes the name of the person who is responsible for the change. Various revisions may be compared, stored, and merged with other revisions.

We used Git as SCM for this project.

Why Git?

- A distributed version control system.
- Easy to use and merge.
- Easy to track changes in any file of the project.
- It allows us to revert the code files back to their previous state.

The list of commands used for code management are:

```
$  git init
$  git add -all
$  git commit -m  "commit message"
$  git push
```

## Build :

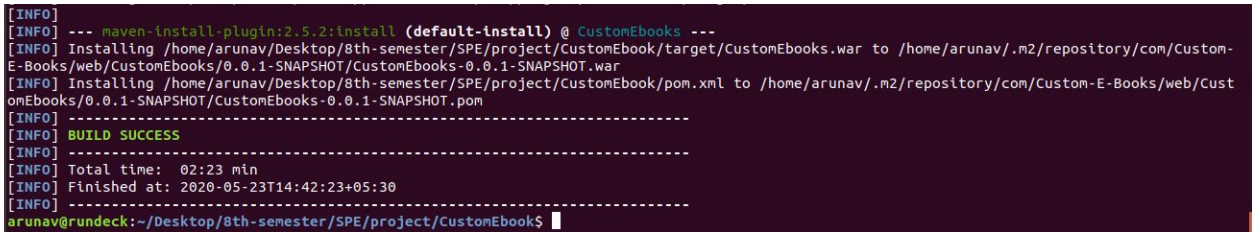
We used Maven is a build automation tool used primarily for Java projects. Itis a software project management and comprehension tool. Based on the concept of a project object model (POM), Maven can manage a project's build, reporting, and documentation from a central piece of information.

Maven uses Convention over Configuration, which means developers are not required to create the build process themselves. Maven project structure and contents are declared in an XML file, pom.xml, referred to as Project Object Model (POM), which is the fundamental unit of the entire Maven system.

We used the following command to build the maven project by skipping the test cases:

```
$ mvn install -DskipTests
```

**Build Result:**




A war file is created upon the successful build. Now to run the test cases, move the created war file to web apps folder in tomcat then start the tomcat server and run the following command:

```
$ mvn test
```

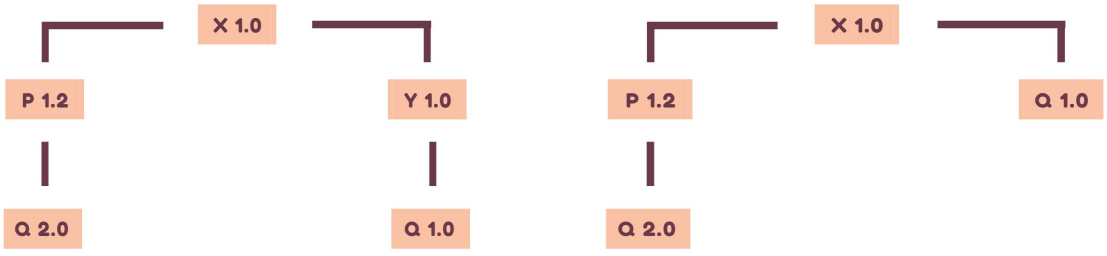
**Test Result :**

```
[INFO] -------------------------------------------------------
[INFO]  T E S T S
[INFO] -------------------------------------------------------
[INFO] Running Tests
ERROR StatusLogger No Log4j 2 configuration file found. Using default configuration (logging only errors to the console), or user programmatic
ally provided configurations. Set system property 'log4j2.debug' to show Log4j 2 internal initialization logging. See https://logging.apache.o
rg/log4j/2.x/manual/configuration.html for instructions on how to configure Log4j 2
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 3.994 s - in Tests
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  12.121 s
[INFO] Finished at: 2020-05-23T15:09:42+05:30
[INFO] ------------------------------------------------------------------------
arunav@rundeck:~/Desktop/8th-semester/SPE/project/CustomEbook$
```

## Issues faced while building our project:

### Dependency conflict :

Dependencies can be linked to other dependencies with different versions that can produce conflicts.Suppose the  dependency tree scheme for our project X looks something like this:




From the tree scheme, our project X will use all the libraries (Y, P, and Q) even if we didn't specify them explicitly in the POM. in this case, maven dependency mechanism imports the library's version whose node is nearest to the root (project X) in the dependency tree. However, if there are several versions of the same library whose nodes are on the same level in the tree, the first library version found is used.

To tackle this conflict, we can either add the latest version of the dependency directly to the POM file or we can exclude the specific dependency using the following command:

```
<!-- https://mvnrepository.com/artifact/xalan/serializer -->
      <dependency>
          <groupId>xalan</groupId>
          <artifactId>serializer</artifactId>
          <version>2.7.2</version>

           <exclusions>
             <exclusion>
                 <groupId>xerces</groupId>
                 <artifactId>xercesImpl</artifactId>
             </exclusion>
             <exclusion>
                 <groupId>xml-apis</groupId>
                 <artifactId>xml-apis</artifactId>
             </exclusion>
          </exclusions>

      </dependency>
```

## Test :

Testing is done using JUnit and selenium.

**Junit**

It is an open-source framework, which is used for writing and running tests. Provides annotations to identify test methods, assertions for testing expected results, etc.

**Selenium**

It is an open-source tool that is used for automating the tests carried out on web browsers (Web applications are tested using any web browser).

**Test Example**

```
@Before
public void setUp() {
  // Create a new instance of the html unit driver
  driver = new HtmlUnitDriver();

  //Navigate to desired web page
  driver.get("http://localhost:8080/Custom-eBooks");
}

@After
public void cleanUp() {
  driver.close();
}

@Test
public void WebsiteUpTest() {

  String expectedTitle = "Custom-eBooks";

  String actualTitle = driver.getTitle();
  Assert.assertEquals(expectedTitle, actualTitle);

}

@Test
public void ConsumerTest() {
  driver.manage().timeouts().implicitlyWait(30, TimeUnit.SECONDS);
  String expectedTitle = "Consumer Page";

  WebElement element = driver.findElement(By.id("consumer"));
  element.click();
```

## Archive :

Archiving is the process by which inactive information, in any format, is securely stored for long periods of time. A war file is generated after the project code successfully builds and passes all the test cases.

Then a docker image is built which contains a tomcat server and the war file generated from building the project will be copied to the same image. A dockerfile is written to perform this task, It contains the following commands.

```
FROM tomcat:8.5.55-jdk8-openjdk
COPY ./target/CustomEbooks.war /usr/local/tomcat/webapps/
```

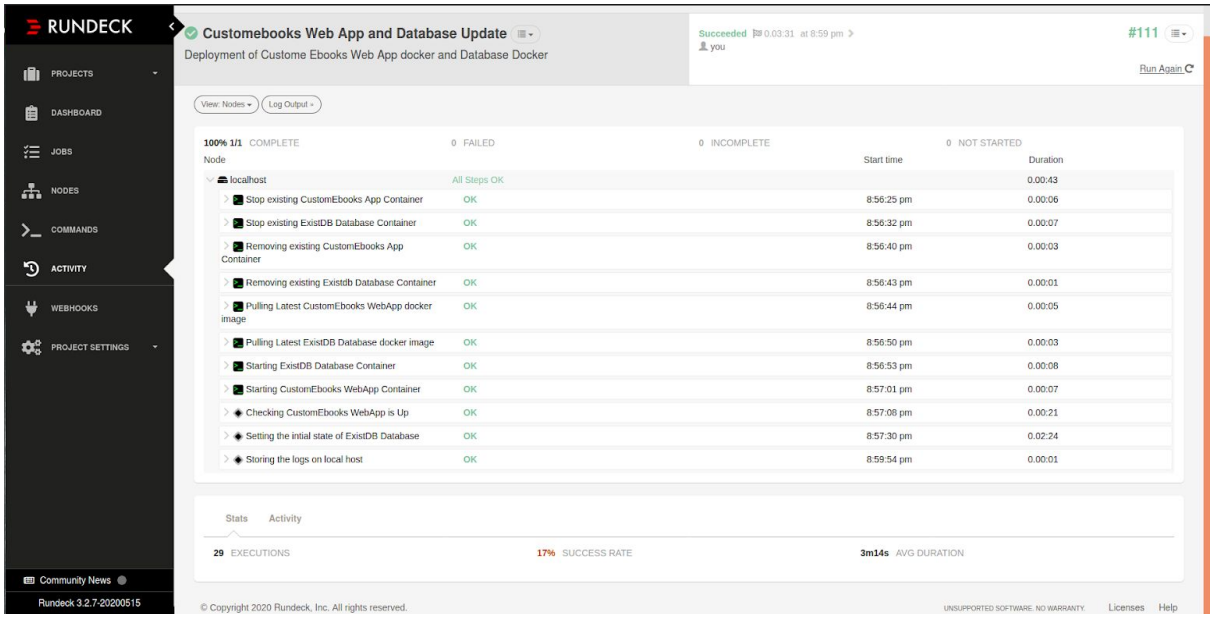
We create a docker image and push this image to the docker hub repository. The image contains the latest version of the source code which can be built successfully to see all the features that have been implemented so far.

## Deployment :

We have used Rundeck for the deployment of the application. It is an open-source software operation management platform.

Rundeck provides a number of features that will alleviate time-consuming grunt work and make it easy for you to scale up your automation efforts and create self-service for others.

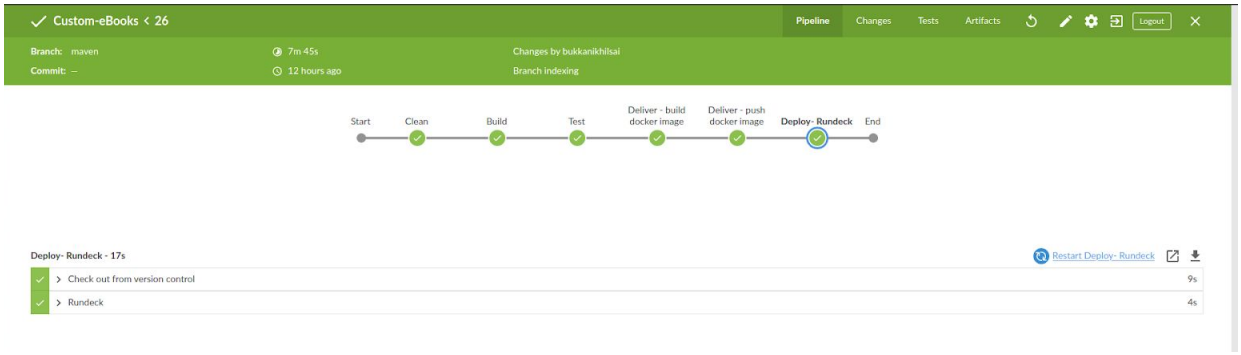
Rundeck allows us to run tasks on any number of nodes from a web-based interface.



## Continuous Integration - Jenkins.

We created a pipeline using Jenkins. Each job in the pipeline initiates the downstream job on successful execution except for the last job which has no downstream job (Build pipeline plugin used).

With the Pipeline plugin, we can implement a project's entire pipeline in a Jenkinsfile and store that alongside their code, treating their pipeline as another piece of code checked into source control. The pipeline was created with the GUI based Jenkins plugin Blue Ocean. It asks us to connect our github repository which should contain the Jenkinsfile file in the root folder.




## Builds - Jenkins.

| STATUS | RUN | COMMIT | BRANCH | MESSAGE | DURATION | COMPLETED |
|---|---|---|---|---|---|---|
| ✓ | 26 | e53df24 | maven | updated Jenkins File | 7m 45s | 12 hours ago |
| ✓ | 25 | 6f2661e | maven | Started by user Nikhil Sai Bukka | 7m 19s | a day ago |
| ✓ | 22 | 6f2661e | maven | changed jenkins file | 18m 19s | a day ago |
| ✗ | 21 | 70821d7 | maven | Restarted from build #19, stage Testing | 1m 30s | a day ago |
| – | 20 | 70821d7 | maven | Restarted from build #19, stage Testing | 24s | a day ago |
| ✗ | 19 | 70821d7 | maven | Started by user Nikhil Sai Bukka | 6m 35s | a day ago |
| ✓ | 18 | 70821d7 | maven | removed password for database | 4m 36s | 2 days ago |
| ✓ | 17 | e25b3cd | maven | Started by user Nikhil Sai Bukka | 6m 37s | 2 days ago |

# Installation Procedure

## SCM - git.

We should start out by running general OS and package updates. On Ubuntu we'll do this by running:

```
$ sudo apt-get update
```

After you have run the general updates on the server you can get started with installing Git.

1. Install Git using the following command :

```
$ sudo apt-get install git-core
```

2. You may be asked to confirm the download and installation; simply enter **y** to confirm. It's that simple, Git should be installed and ready to use!

3. Confirm Git the installation
   With the main installation done, first check to ensure the executable file is set up and accessible. The best way to do this is simply to run Git with the version command.

```
$ git --version
```

## Build - maven.

**Prerequisites:**

Maven 3.3+ requires JDK 1.7 or above to be installed. We'll install OpenJDK, which is the default Java development and runtime in Ubuntu.

Start by updating the package index and install the OpenJDK package by using :

```
$ sudo apt update
$ sudo apt install default-jdk
```

Verify the installation by running the following command:

```
$ java -version
```

Install Maven by typing the following commands:

```
$ sudo apt install maven
```

Verify the installation by running the maven version command:

```
$ mvn -version
```

The output should look something like this:

```
arunav@rundeck:~$ mvn -version
Apache Maven 3.6.0
Maven home: /usr/share/maven
Java version: 11.0.7, vendor: Ubuntu, runtime: /usr/lib/jvm/java-11-openjdk-amd64
Default locale: en_IN, platform encoding: UTF-8
OS name: "linux", version: "5.3.0-51-generic", arch: "amd64", family: "unix"
arunav@rundeck:~$
```

## Test -selenium/JUnit.

No separate installation needed. Here are the maven dependencies:

```
<dependencies>
  <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>4.8.1</version>
      <scope>test</scope>
  </dependency>

    <dependency>
            <groupId>org.seleniumhq.selenium</groupId>
            <artifactId>selenium-java</artifactId>
            <version>3.4.0</version>
    </dependency>
  </dependencies>
```

## Artifact - Docker.

Docker is an application that makes packaging and running an application process easy. It provides OS-level virtualization to deliver the software in a package called the container.

There are two methods to install Docker.

1. Installing it on an existing operating system (Ubuntu 16.04).
2. Using a tool called Docker Machine.

We are going to follow the first method. You can find the second method here.

**Prerequisites:**

- Laptop with Ubuntu 16.04 installed in it
- Docker Hub account to create and push your own images to the docker hub.

**Installing Docker**

The docker installation package available on Ubuntu 16.04 repo may not be the latest version. We need to download and install the latest version from the official docker repository.

First, in order to ensure the downloads are valid, add the GPG key for the official Docker repository to your system

```
$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key
add -
```

Add the Docker repository to APT sources to your system

```
$ sudo add-apt-repository "deb [arch=amd64]
https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
```

Update the Ubuntu package Database

```
$ sudo apt-get update
```

To make sure we are installing from official docker repository  run the following command :

```
$ apt-cache policy docker-ce
```

The output would look like this :

```
Installed: (none)
  Candidate: 5:19.03.9-3-0-ubuntu-xenial
  Version table:
     5:19.03.9-3-0-ubuntu-xenial 500
     500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packag
```

Finally Install docker

```
$ sudo apt-get install -y docker-ce
```

Docker should be installed now. Checking that it's running

```
$ sudo systemctl status docker
```

The output should look like :

```
● docker.service - Docker Application Container Engine
   Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset
enabled)
   Active: active (running) since Mon 2020-05-25 20:36:12 IST; 1h 42min ago
     Docs: https://docs.docker.com
  Main PID: 2435 (dockerd)
     Tasks: 30
    Memory: 40.7M
       CPU: 11.075s
    CGroup: /system.slice/docker.service
            ├─ 2435 /usr/bin/dockerd -H fd://
--containerd=/run/containerd/containerd.sock
            └─15162 /usr/bin/docker-proxy -proto tcp -host-ip 0.0.0.0
-host-port 8081 -container-ip 172.17.0.2 -container-port 8080
```

If the status of the docker is off. You can start the docker using the command

```
$ sudo systemctl start docker
```

**Executing the docker without sudo command**

By default running the docker commands required root privileges (prefix **sudo** to commands). A **docker group** is created by default. All the users in the docker group can run the docker commands without root privileges. If the user is not added to the docker group and tries to run the docker commands the output would look like this

```
Output
docker: Cannot connect to the Docker daemon. Is the docker daemon running
on this host?.
See 'docker run --help'.
```

To avoid typing sudo, add your username to the docker group

```
$ sudo usermod -aG docker ${USER}
```

For the new group membership to apply you need to logout and login or restart.
If you want to add another user who is logged in you can use the following command.

```
$ sudo usermod -aG docker username
```

You can get the documentation on all the docker commands here. or run **docker** in command prompt. Tutorials on how to work with docker images and containers are available here.

To Deploy our Web application we are using the Tomcat web server and ExistDB as the database.

## Deploy - rundeck.

Rundeck is used to automate the ad-hoc and routine procedures in the data center or cloud environments.

**Installation procedure for rundeck**

Minimum Requirements

- Java version 1.8

**Installing Rundeck**

To install the Rundeck run the following commands.

```
$ echo "deb https://rundeck.bintray.com/rundeck-deb /" | sudo tee -a /etc/apt/sources.list.d/rundeck.list

$ curl 'https://bintray.com/user/downloadSubjectPublicKey?username=bintray' | sudo apt-key add -

$ sudo apt-get update

$ sudo apt-get install rundeck
```

Rundeck service can be started using the command

```
$ sudo service rundeckd start
```

And you can check the status of Rundeck using the command

```
$ sudo service rundeckd status
```

**Logging in for the first time**

1. Navigate to http://localhost:4440/ in a browser.
1. Log in with the username **admin** and password **admin**

Rundeck is now up and running!

Tutorials on how to use rundeck can be found here.

## Monitor - ELK.

ELK stands for three tools namely elastic search, logstash, and kibana. We have installed these three tools in Ubuntu 16.04 using exe available in elastic.co website.

https://www.elastic.co/ . First update your system using: *sudo apt-get update*

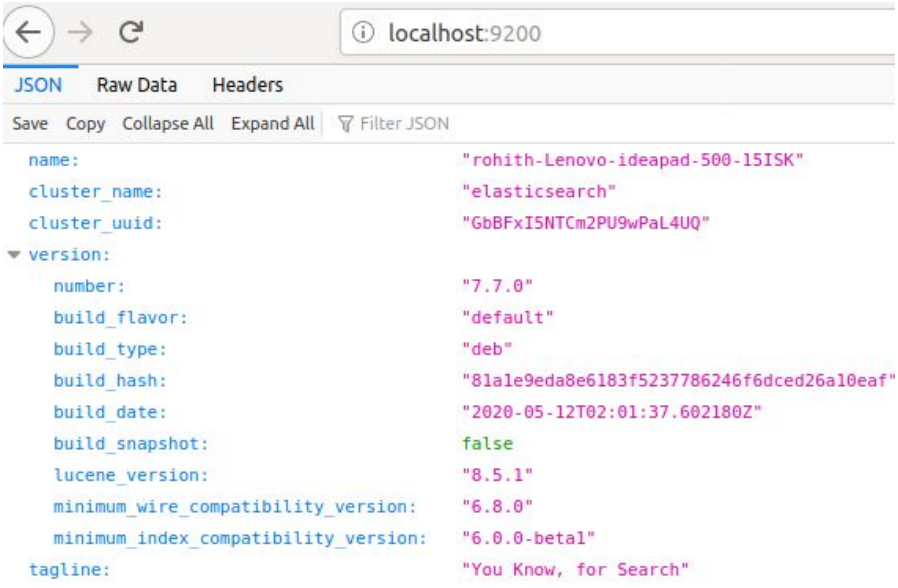
### Installing Elasticsearch

Elasticsearch is a text search and analytics engine. It provides the ability to store, search and analyze huge amounts of data in real-time. And the best part of these tools is they are all open-source software.

For Ubuntu 16.04 bit install using :

```
$  echo "deb https://artifacts.elastic.co/packages/7.x/apt stable main" |
sudo tee -a /etc/apt/sources.list.d/elastic-7.x.list
$  sudo apt-get install elasticsearch
$  sudo systemctl start elasticsearch
$  sudo systemctl enable elasticsearch
```

### elasticsearch running in localhost:9200




### Installing Filebeat

File Beats are lightweight agents that help us to collect different types of logs so that we can forward into the logstash or elasticsearch.
For Installing File beat we run

```
$  sudo apt-get install filebeat
$  sudo systemctl start filebeat
$  sudo systemctl enable filebeat
```

```
root@rohith-Lenovo-ideapad-500-15ISK:~# sudo apt-get install filebeat
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  filebeat
0 upgraded, 1 newly installed, 0 to remove and 20 not upgraded.
Need to get 28.1 MB of archives.
After this operation, 91.2 MB of additional disk space will be used.
Get:1 https://artifacts.elastic.co/packages/7.x/apt stable/main amd64 filebeat amd64 7.7.0 [28.1 MB
Fetched 28.1 MB in 29s (966 kB/s)
Selecting previously unselected package filebeat.
(Reading database ... 284054 files and directories currently installed.)
Preparing to unpack .../filebeat_7.7.0_amd64.deb ...
Unpacking filebeat (7.7.0) ...
Processing triggers for systemd (229-4ubuntu21.28) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
ureadahead will be reprofiled on next reboot
Setting up filebeat (7.7.0) ...
Processing triggers for systemd (229-4ubuntu21.28) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
root@rohith-Lenovo-ideapad-500-15ISK:~# subl /etc/filebeat/filebeat.yml
```

Now the next step is to configure Filebeat to collect the Tomcat access log file and forward it to Logstash for processing.

```
filebeat.inputs:

# Each - is an input. Most options can be set at the input level, so
# you can use different inputs for various configurations.
# Below are the input specific configurations.

- type: log

  # Change to true to enable this input configuration.
  enabled: true

  # Paths that should be crawled and fetched. Glob based paths.
  paths:
    - /opt/tomcat/logs/localhost_access_log.*.txt
    #- c:\programdata\elasticsearch\logs\*
```

```
#------------------------------ Logstash output -------------------------------
output.logstash:
  # The Logstash hosts
  hosts: ["localhost:5044"]
```

Enable all the filebeat modules by using *sudo filebeat modules enable system*

Now all the tomcat paths are correct and the outputs are also redirected to the correct path.

### Installing Logstash

Logstash is essentially a log aggregator that collects data from various input sources, like servers, applications, docker containers etc and performs various transformations and pushes it into elasticsearch.

Again for Ubuntu 16.04 bit install using :

```
$  sudo apt-get install kibana
$  sudo systemctl start kibana
```

After that run these commands :

```
root@rohith-Lenovo-ideapad-500-15ISK:~# subl /etc/logstash/conf.d/tomcat.conf
root@rohith-Lenovo-ideapad-500-15ISK:~# sudo service logstash start
root@rohith-Lenovo-ideapad-500-15ISK:~# sudo service filebeat start
```

We can write the tomcat config file to send the output to elasticsearch as below. In this file tomcat.conf, we used the beats input plugin, a number of filter plugins these are optional, and the Elasticsearch output plugin. All the output is redirected to elasticsearch.

```
1  input {
2    beats {
3      port => 5044
4   }
5  }
6
7  filter {
8      grok {
9        match => { "message" => "%{COMBINEDAPACHELOG}" }
10     }
11
12     date {
13       match => [ "timestamp" , "dd/MMM/yyyy:HH:mm:ss Z" ]
14     }
15     geoip {
16       source => "clientip"
17     }
18 }
19
20 output {
21   elasticsearch {
22     hosts => ["localhost:9200"]
23     }
24 }
25
```

Here we can check if the output is redirected correctly to localhost:9200 - elasticsearch.

```
root@rohith-Lenovo-ideapad-500-15ISK:~# sudo service filebeat start
root@rohith-Lenovo-ideapad-500-15ISK:~# sudo service logstash start
root@rohith-Lenovo-ideapad-500-15ISK:~# curl -X GET "localhost:9200/_cat/indices?v"
health status index                            uuid                   pri rep docs.count docs.deleted store.size pri.store.size
yellow open   logstash-2020.05.23-000001        TjL93pMQSB-oSQbwVTAhog   1   1      20242            0      5.5mb          5.5mb
green  open   .apm-custom-link                 6CmJSoG9QY61xx-U01Ln_g   1   0          0            0       208b           208b
green  open   .kibana_task_manager_1           Wj_mg4IDS3K_QclX4-JD_g   1   0          5            0     31.9kb         31.9kb
green  open   .apm-agent-configuration         PE_flE3aQSuqqT781xiAww   1   0          0            0       208b           208b
green  open   .kibana_1                        WrlrgxemSbiOniFgyCHC8Q   1   0       1438           50    752.4kb        752.4kb
yellow open   filebeat-7.7.0-2020.05.23-000001 zIuQ92nNT920RsZ3JTp37g   1   1          0            0       208b           208b
root@rohith-Lenovo-ideapad-500-15ISK:~#
```

### Installing Kibana

Kibana is used for visualization and it works on top of Elasticsearch. It also provides us with the ability to analyze or query the data. These visualizations could be in the form of tables, plots, charts etc.

Again for Ubuntu 16.04 bit install using :

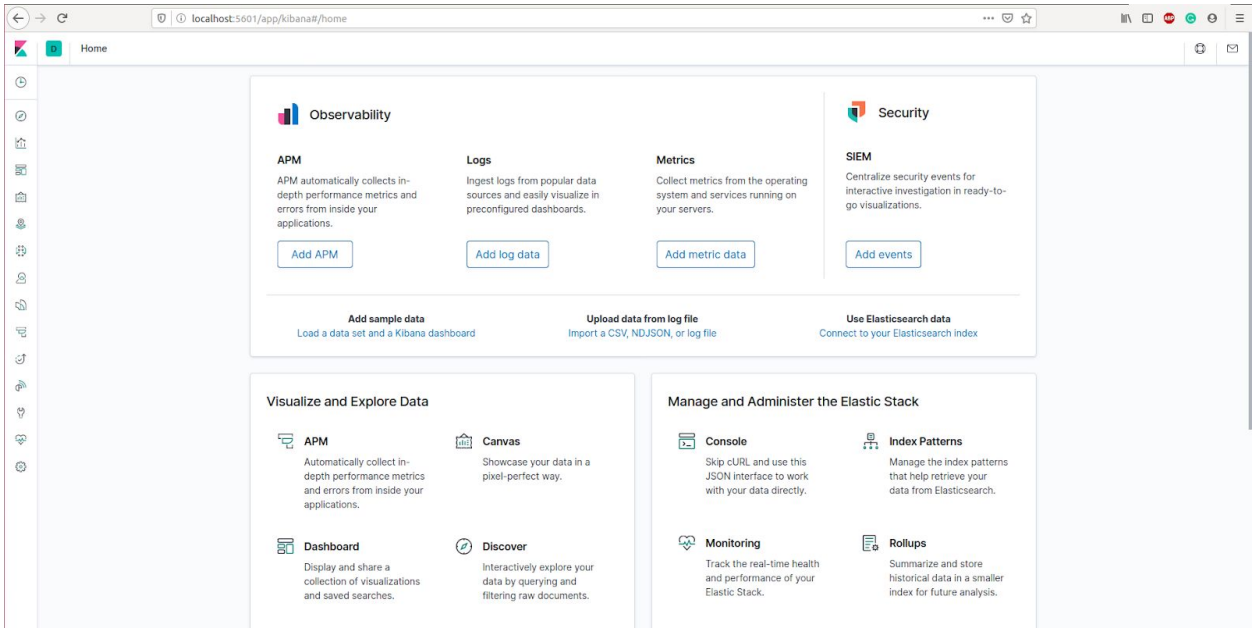
- *sudo apt-get install kibana*

I have faced this error while running this command

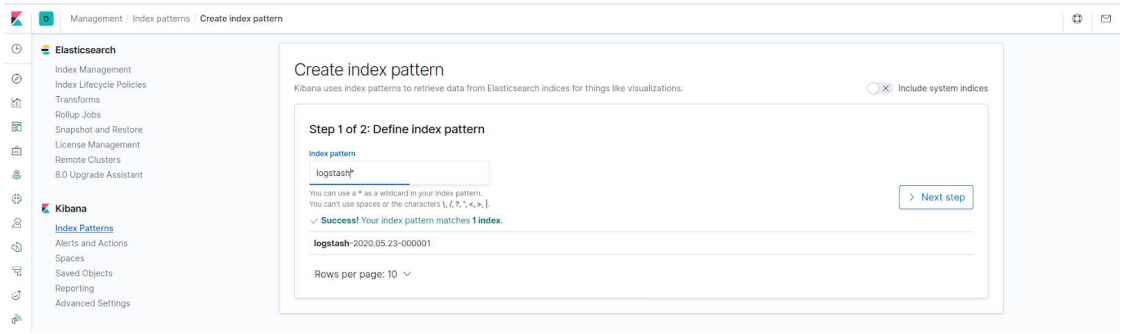
```
rohith@rohith-Lenovo-ideapad-500-15ISK:~$ sudo apt-get install kibana
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  kibana
0 upgraded, 1 newly installed, 0 to remove and 20 not upgraded.
Need to get 289 MB of archives.
After this operation, 918 MB of additional disk space will be used.
Get:1 https://artifacts.elastic.co/packages/7.x/apt stable/main amd64 kibana amd64 7.7.0 [289 MB]
Err:1 https://artifacts.elastic.co/packages/7.x/apt stable/main amd64 kibana amd64 7.7.0
  GnuTLS recv error (-54): Error in the pull function.
E: Failed to fetch https://artifacts.elastic.co/packages/7.x/apt/pool/main/k/kibana/kibana-7.7.0-amd64.deb  GnuTLS recv error (-54): Error
in the pull function.

E: Unable to fetch some archives, maybe run apt-get update or try with --fix-missing?
rohith@rohith-Lenovo-ideapad-500-15ISK:~$ sudo apt-get update
```

Which was solved by running *sudo apt-get update* before installing it again.

**kibana running in localhost:5601**

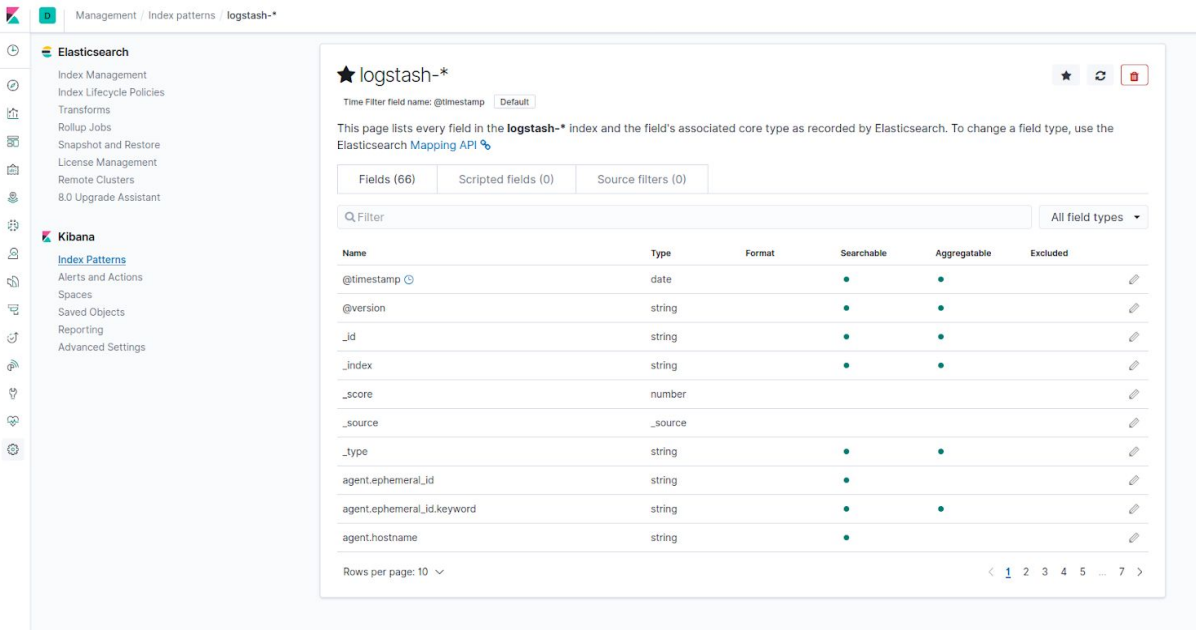



**Finally in Kibana: Management > Index Pattern (** Create Index Pattern **) - logstash-***

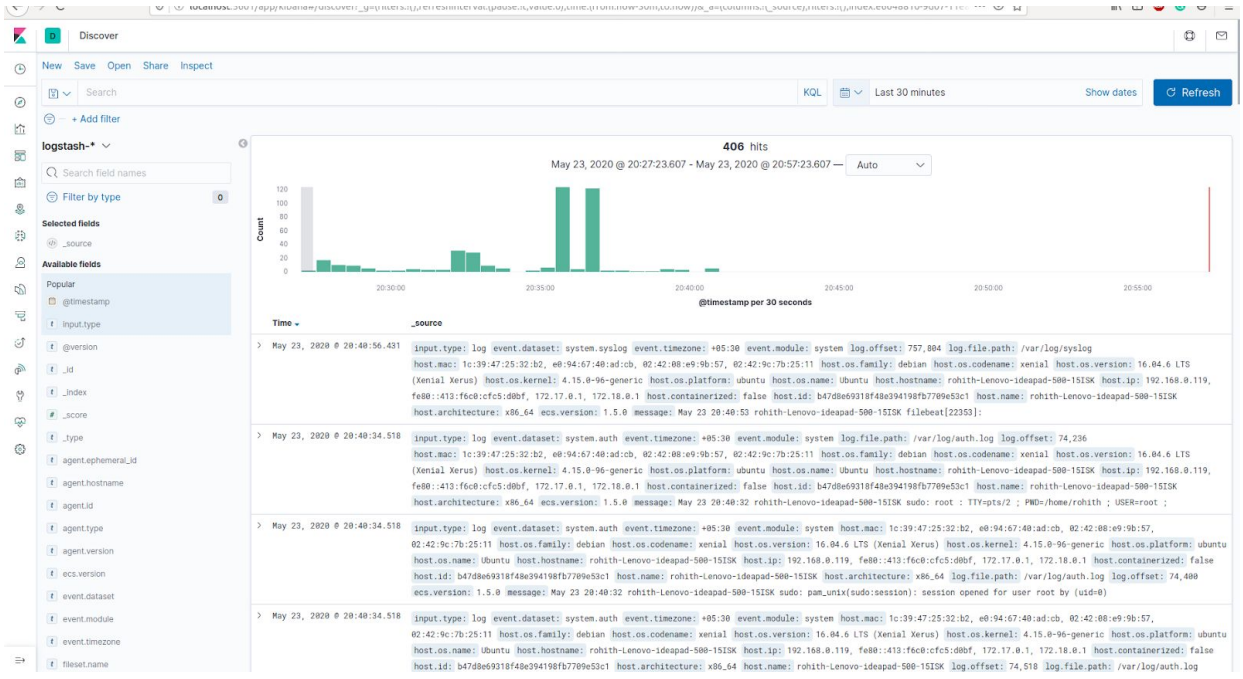



We can find the indices that are loaded in elasticsearch in kibana index patterns and load them for visualizing.

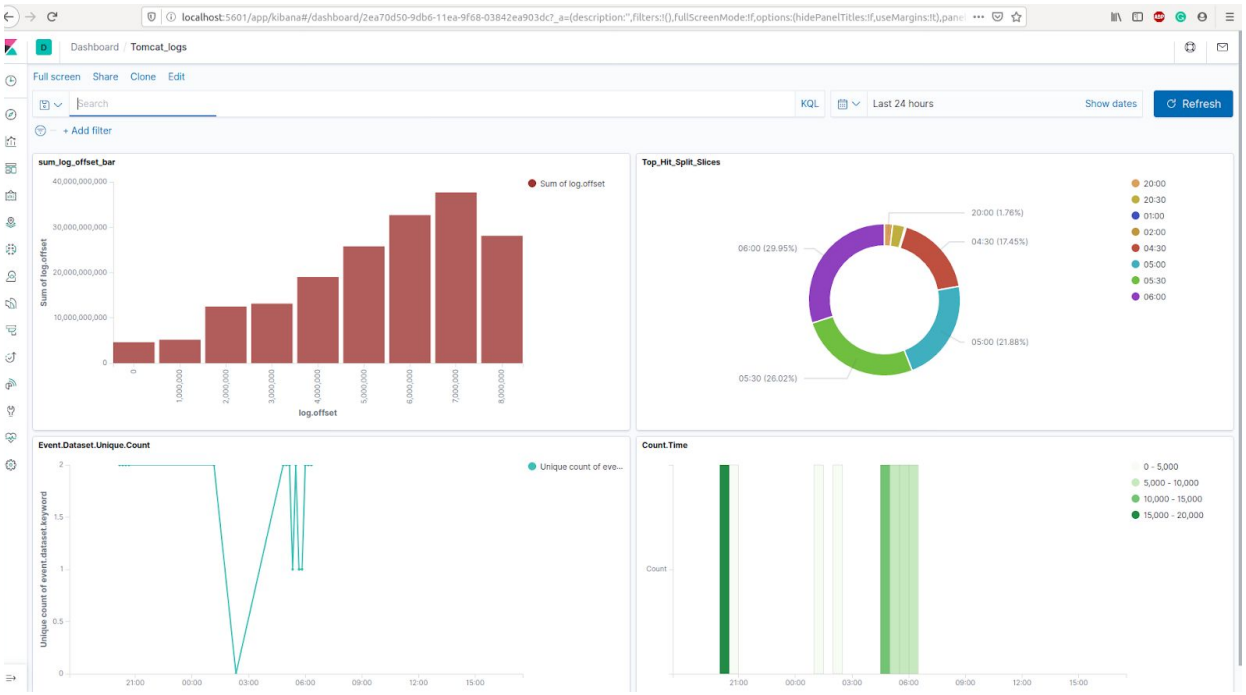
**Click on Next Step > logstash-* :**

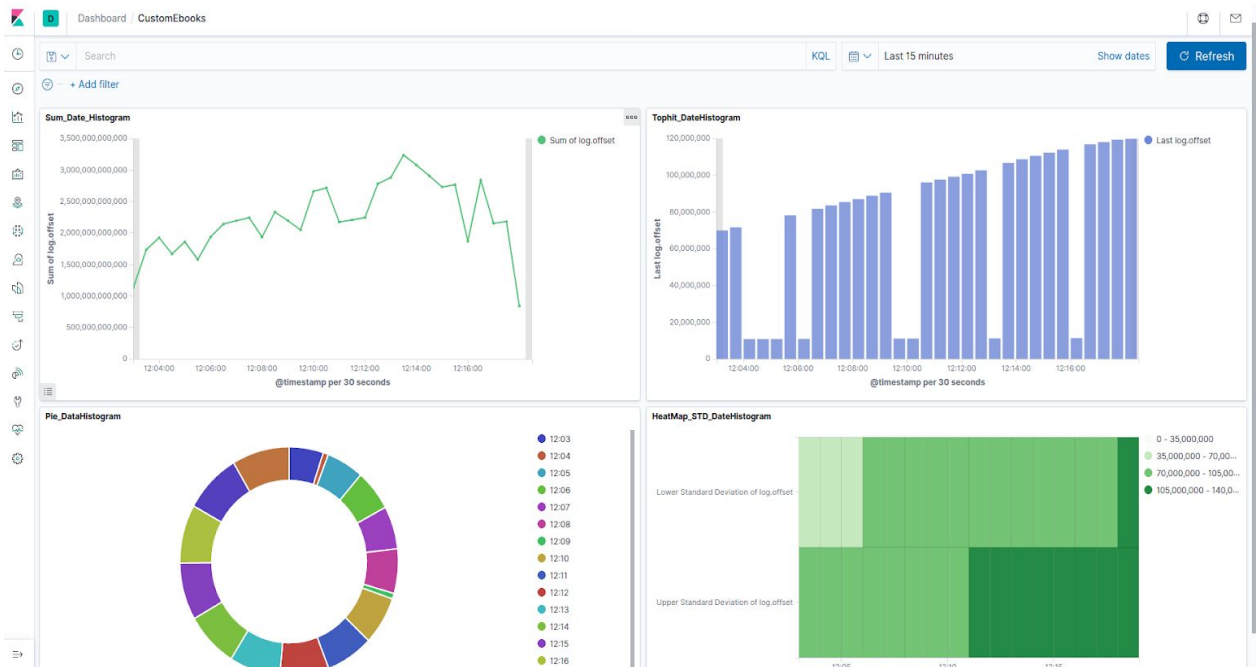



**Go to Discover > logstash-*:**



## Kibana Dashboard :



## Continuous Integration - jenkins.

**Prerequisites :**

Jenkins is a Java application, the first step is to install Java. Update the package index and install the Java 8 OpenJDK package with the following commands :

```
$ sudo apt update
$ sudo apt install openjdk-8-jdk
```

To add the Jenkins Debian repository. Import the GPG keys of the Jenkins repository using the following wget command :

```
$ wget -q -O - https://pkg.jenkins.io/debian/jenkins.io.key | sudo
apt-key add -
```

The command above should output OK which means that the key has been successfully imported and packages from this repository will be considered trusted.

Next, add the Jenkins repository to the system with :

```
$ sudo sh -c 'echo deb http://pkg.jenkins.io/debian-stable binary/ >
/etc/apt/sources.list.d/jenkins.list'
```

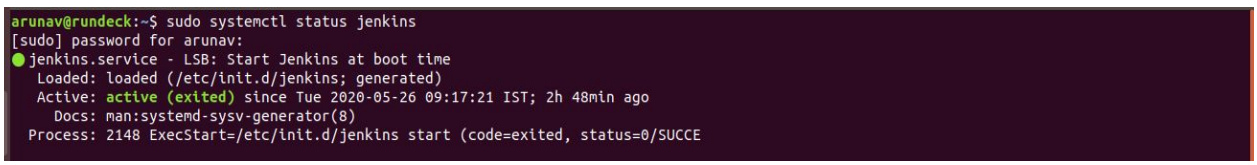
Once the jenkins repository is enabled , update the apt package list and install jenkins using following commands :

```
$ sudo apt update
$ sudo apt install jenkins
```

Jenkins service will automatically start after the installation process is complete. You can verify it by printing the service status :

```
$ systemctl status jenkins
```

Output should look similar to this :



**Git in jenkins :**

Click on the Manage Jenkins button on your Jenkins dashboard and open manage plugins, search for GIT Plugin and choose install without restart . Installation might take some time to download all the dependencies,restart the jenkins after installation successfully finished.


**Maven in Jenkins :**

Maven Integration plugin helps us to build projects that use Apache Maven in Jenkins.Go to Manage Jenkins, select Manage Plugins, select the Available tab, then find the Maven Integration plugin,install it and restart the jenkins.

**Docker in Jenkins :**

To add docker to the jenkins pipeline, first we have to install Docker  plugin in jenkins. Add jenkins in the docker group to execute docker commands from jenkins.

```
$ sudo usermod -aG docker jenkins
```

Then add docker hub credentials in the credentials section in jenkins. Restart Jenkins after doing this. Jenkinsfile can now be edited to add the docker build and push stages.

**Rundeck in jenkins :**

Install Rundeck plugin in Jenkins. In  Manage Jenkins > Configure System > Rundeck , fill the required details and do Test Connection . If it is working, it shows a successful message. If not, execute command

```
$ service rundeckd restart
```

then open *http://localhost:4440/* to verify if Rundeck is working.

# Experimental Setup

## Functional Requirements

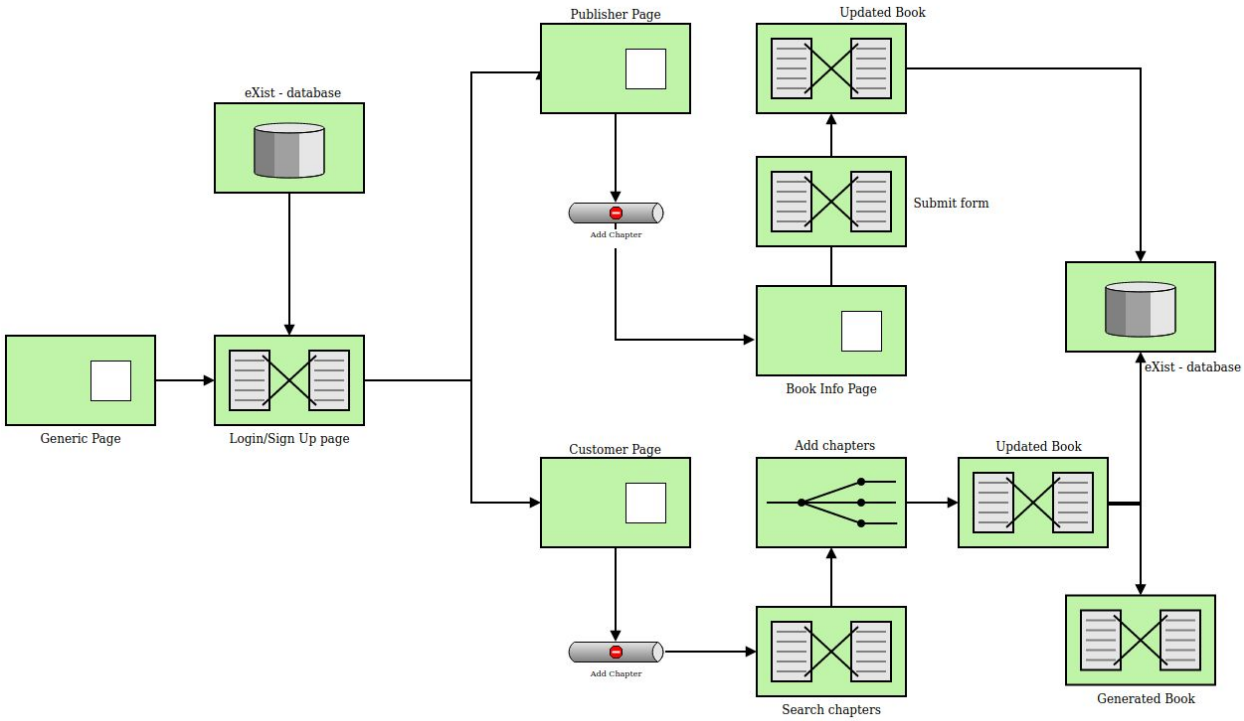
Two kinds of users : publishers and consumer

- Ability for publishers to post books (in pieces) and for customers to accumulate these pieces to create a custom book.
- Publishers should be able to upload chapters (in the form of pdf). Publishers will also provide the name and keywords associated with the chapter.
- The publisher should be able to review and delete items before publishing.
- The consumer should be able to build a book from scratch combining the chapters uploaded by different publishers.
- Consumers should be able to search for chapters based on keywords and chapter names.
- Consumers should be able to preview the chapter before adding it to the book.
- Consumers should be able to review the book structure and delete things before generating the book.

## Non - Functional Requirements

- Given the model of having books made up of smaller units each with their own metadata, storing and retrieving might cause bottlenecks.
- The data storing and retrieval should not cause bottlenecks so requires an efficient content management framework.
- The search should be fast. This means we should be able to parse through the whole database in very less time.
- The user will be able to preview the documents. This should be efficient.

## Architecture and Design




## Code Walkthrough

## Servlets

### Add Book Servlet:

Adds a book to the exist database.

```
public class AddBookServelt extends HttpServlet {

  public void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    String id = request.getParameter("name");
    PrintWriter out = response.getWriter();
    HttpSession session = request.getSession();
    ExistSearchUtil ex = (ExistSearchUtil)session.getAttribute("ex");
    CustomEbookBuilder cb = (CustomEbookBuilder)session.getAttribute("cb");

    Element chapter = ex.ChapterAtIndex(Integer.parseInt(id));
    cb.addChapter(chapter);

    session.setAttribute("cb",cb);
    session.setAttribute("ex",ex);
  }
}
```

**Upload servlet :**

Gets the uploaded PDF and stores it.

```
int book_id = ex.noOfBooks();

cb.setBookId(String.valueOf(book_id));

String appPath = request.getServletContext().getRealPath("");
String savePath = appPath + File.separator + "uploads";

// creates the save directory if it does not exists
File fileSaveDir = new File(savePath);
if (!fileSaveDir.exists()) {
    fileSaveDir.mkdir();
}

File file = new File(savePath+File.separator+"example.xml");
if(file.delete()){
      System.out.println("File deleted");
  }else System.out.println("File doesn't exist");

cb.saveAsXML(savePath+File.separator+"example.xml");
ex.StoreIntoCollection(savePath+File.separator+"example.xml",null);

cb = new CustomEbookBuilder("Database Systems");
session.setAttribute("cb",cb);
session.setAttribute("ex",ex);
```

**Download Servlet :**

Downloads the user defined book in the form of a PDF.

```
    ServletContext context = getServletContext();

    // gets MIME type of the file
    String mimeType = context.getMimeType(filePath);
    if (mimeType == null) {
        // set to binary type if MIME mapping not found
        mimeType = "application/octet-stream";
    }
    System.out.println("MIME type: " + mimeType);

    // modifies response
    response.setContentType(mimeType);
    response.setContentLength((int) downloadFile.length());

    // forces download
    String headerKey = "Content-Disposition";
    String headerValue = String.format("attachment; filename=\"%s\"", downloadFile.getName());
    response.setHeader(headerKey, headerValue);

    // obtains response's output stream
    OutputStream outStream = response.getOutputStream();

    byte[] buffer = new byte[4096];
    int bytesRead = -1;

    while ((bytesRead = inStream.read(buffer)) != -1) {
        outStream.write(buffer, 0, bytesRead);
    }

    inStream.close();
    outStream.close();
```

**Get Book Servlet :**

Data api call to get the details of a book. Used in results display and book creation.

```
public class GetBookSrcServlet extends HttpServlet {

  public void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    String id = request.getParameter("name");
    PrintWriter out = response.getWriter();
    HttpSession session = request.getSession();
    ExistSearchUtil ex = (ExistSearchUtil)session.getAttribute("ex");
    CustomEbookBuilder cb = (CustomEbookBuilder)session.getAttribute("cb");
    String ret = ex.PdfLocationAtIndex(Integer.parseInt(id));
    String absPath = "./../uploads/";
    Path path = Paths.get(ret);
    ret = path.getFileName().toString();

    // get source of pdf into ret
    out.println(absPath + ret);
    session.setAttribute("ex",ex);
  }
}
```

### Search Results Servlet :

Data api call for results of a search keyword.

```
public class GetSearchResults extends HttpServlet {
  public void doGet(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    doPost(request, response);
  }

  public void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    String keywords = request.getParameter("search_text");
    PrintWriter out = response.getWriter();
    HttpSession session = request.getSession();
    session.setAttribute("chapter_search_keywords", keywords);
  }
}
```

### Remove chapter :

Removes a chapter from the book that the customer is putting together. (Note: not for deleting a book in the database, just provides the customer with a functionality of deleting certain added parts of the book while putting things together.

```
public class RemoveChapterServlet extends HttpServlet {

  public void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    String id = request.getParameter("name");
    PrintWriter out = response.getWriter();
    HttpSession session = request.getSession();
    CustomEbookBuilder cb = (CustomEbookBuilder) session.getAttribute("cb");

    cb.removeChapter(Integer.parseInt(id));

    session.setAttribute("cb",cb);
  }
}
```

### Upload ChapterServlet :

Stores a chapter into the database.

```
String chapter_path = savePath + File.separator + randomString() + "_" + fileName ;
filePart.write(chapter_path);

try{

      HttpSession session = request.getSession();
      int id;
      if(session.getAttribute("id")!=null)
        id = (int) session.getAttribute("id")+1;
      else
        id = 1;
      String chapter_id = String.valueOf(id);


      CustomEbookBuilder cb = (CustomEbookBuilder)session.getAttribute("cb");
      Element chap = cb.createChapter(chapter_name,chapter_id,chapter_tags,chapter_path);


      if(!chapter_name.trim().isEmpty()  && !chapter_tags.trim().isEmpty() && !fileName.trim().isEmpty()){
              cb.addChapter(chap);
              session.setAttribute("id",id);
              session.setAttribute("cb",cb);
        }

      response.sendRedirect("./../index.jsp");


  }catch (Exception e) {
    System.out.println("DEBUG : Unable to create builder instance");
    e.printStackTrace();
```

**User Login Servlet :**

```
public class UserLoginServlet extends HttpServlet {
  public void doGet(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    doPost(request, response);
  }

  public void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException,
    String id = request.getParameter("name");
    PrintWriter out = response.getWriter();
    HttpSession session = request.getSession();
    session.setAttribute("type",id);
  }
}
```

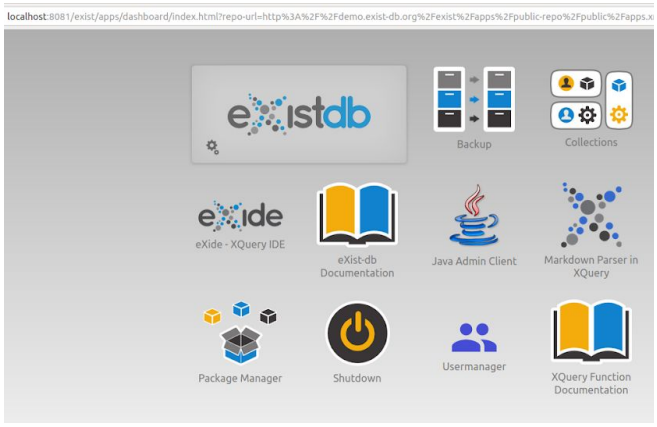
**Front end :**

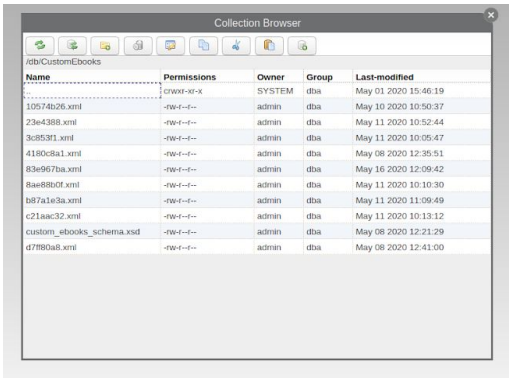
We won't include the html, JS and Jsp code here for brevity.

# Results

## Database - eXist-DB

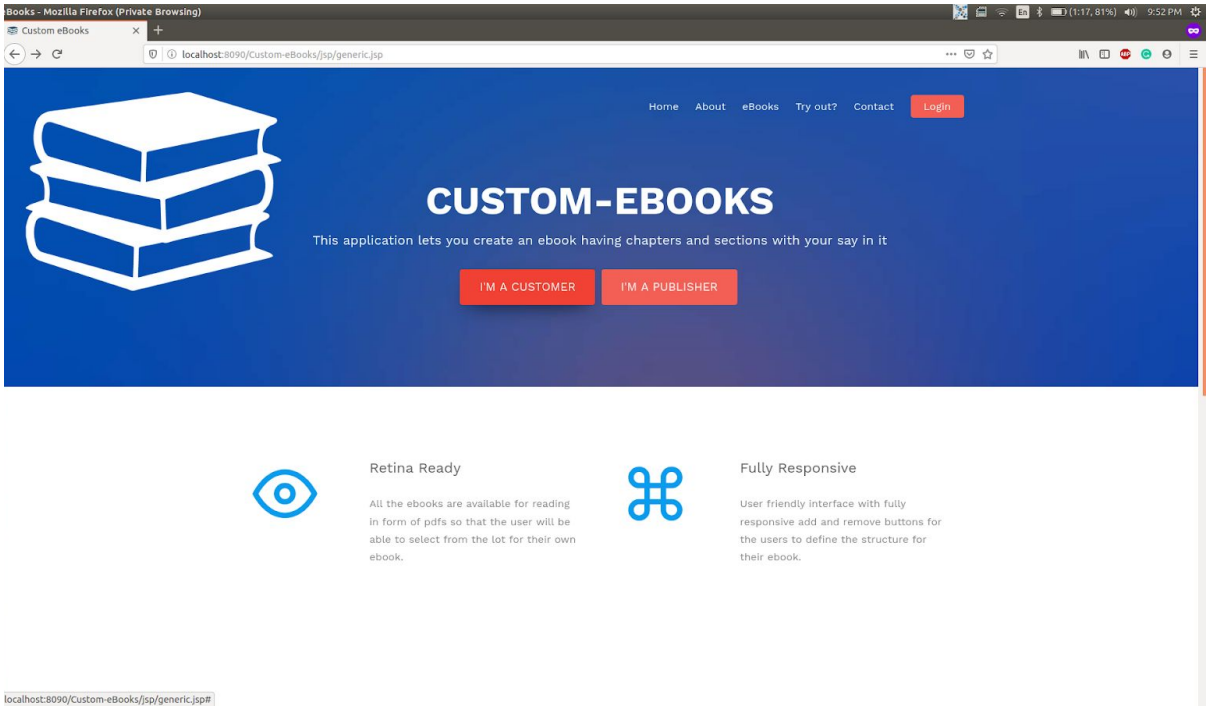
### eXist-db running on localhost:8081 :



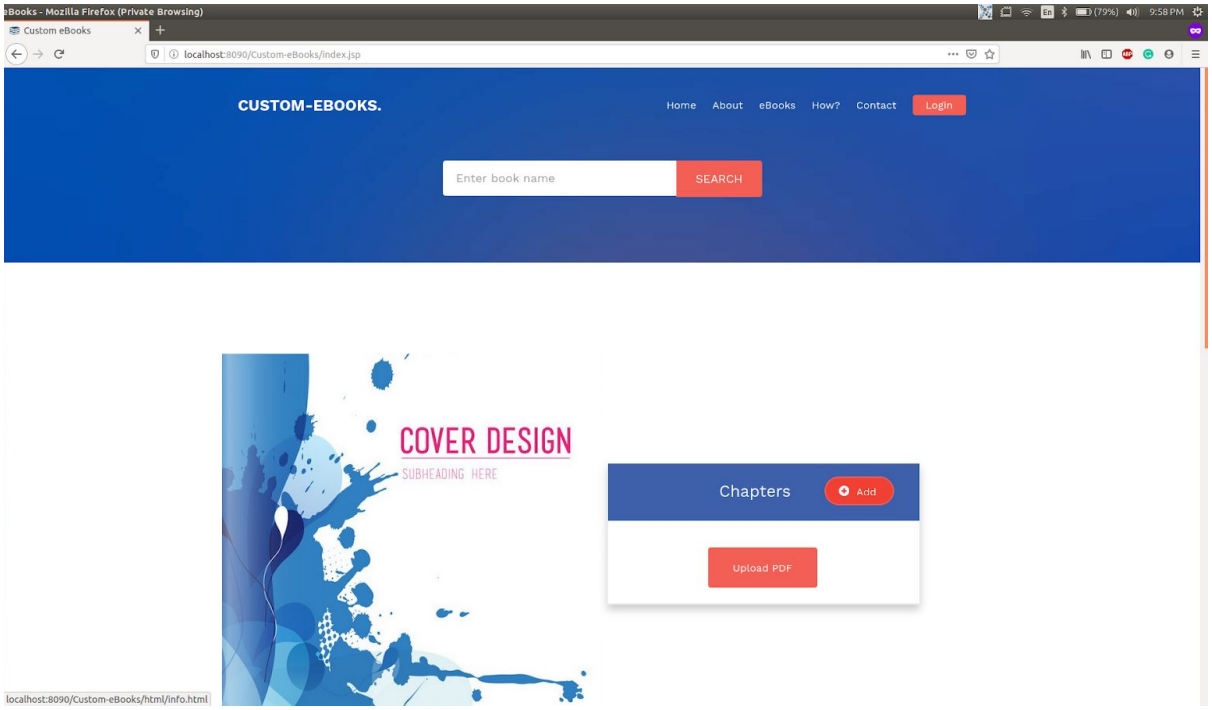




## Website - Custom-eBooks

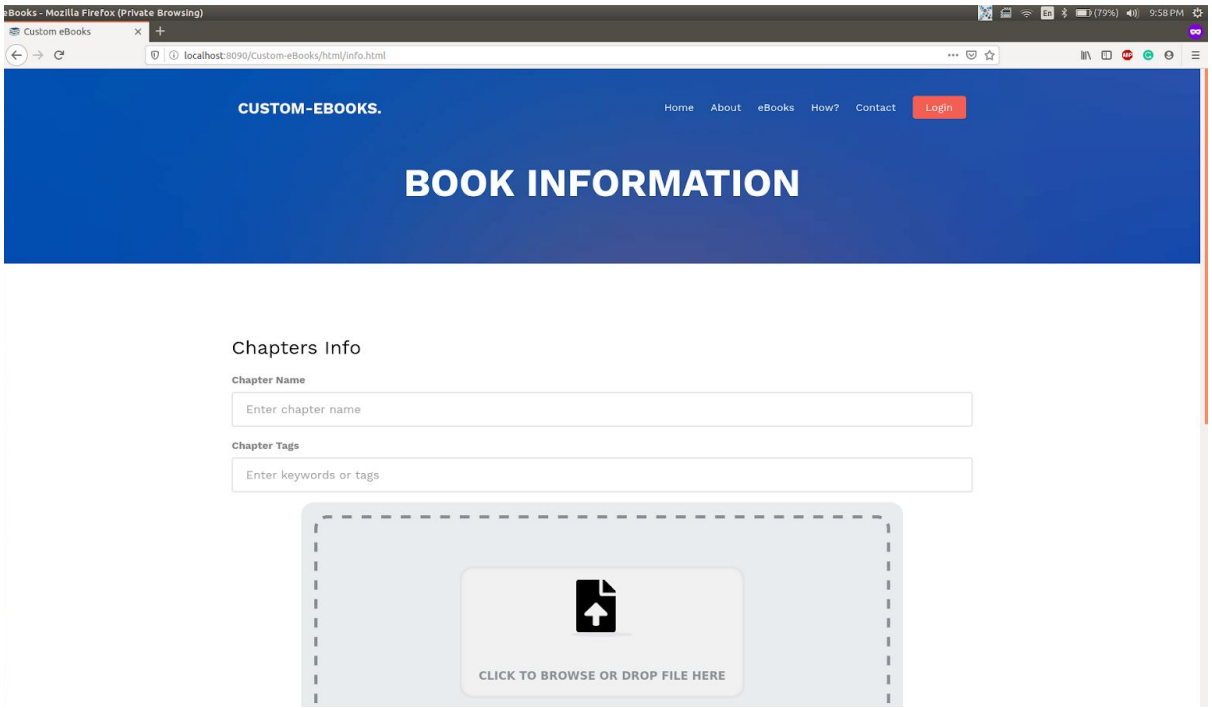
### Generic page :



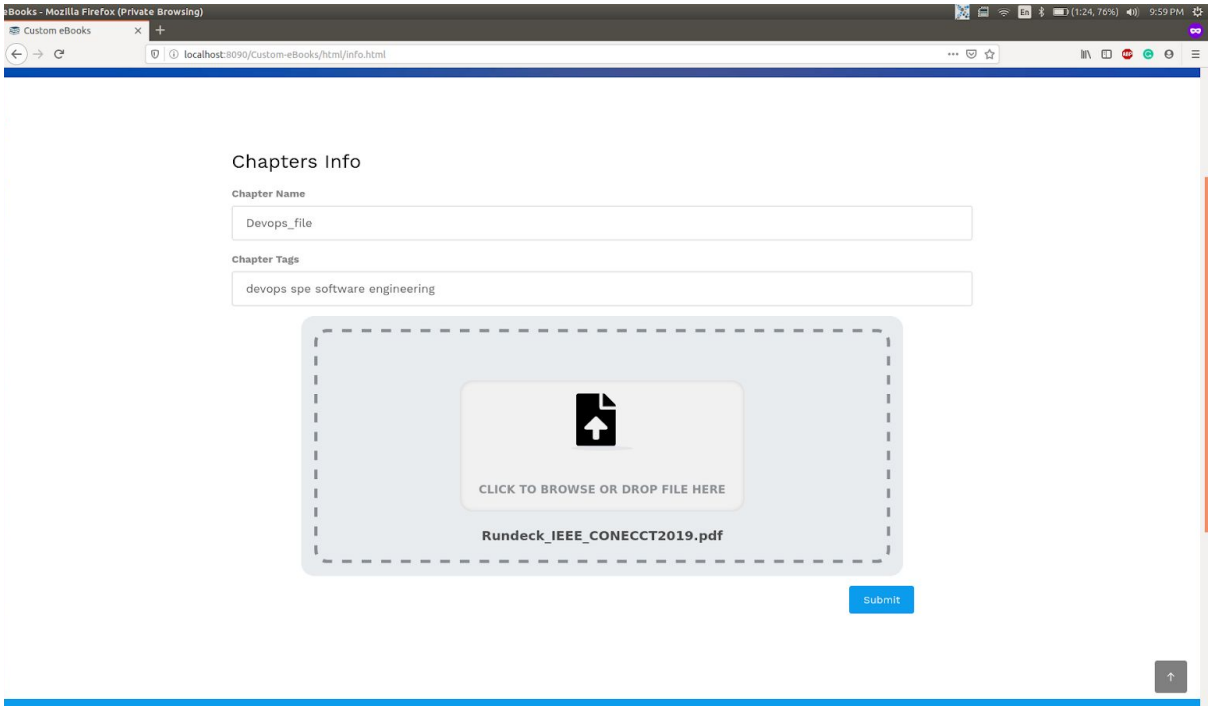
## Publisher page :



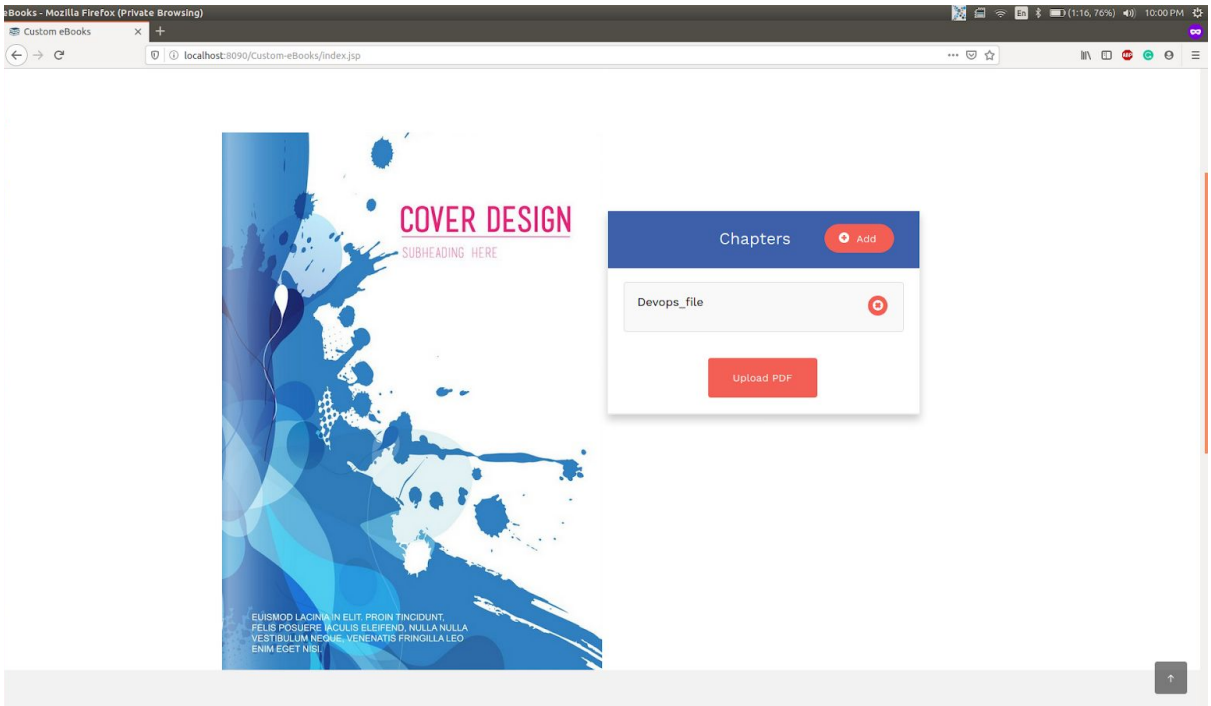

## Book info page :



## Upload Chapter :

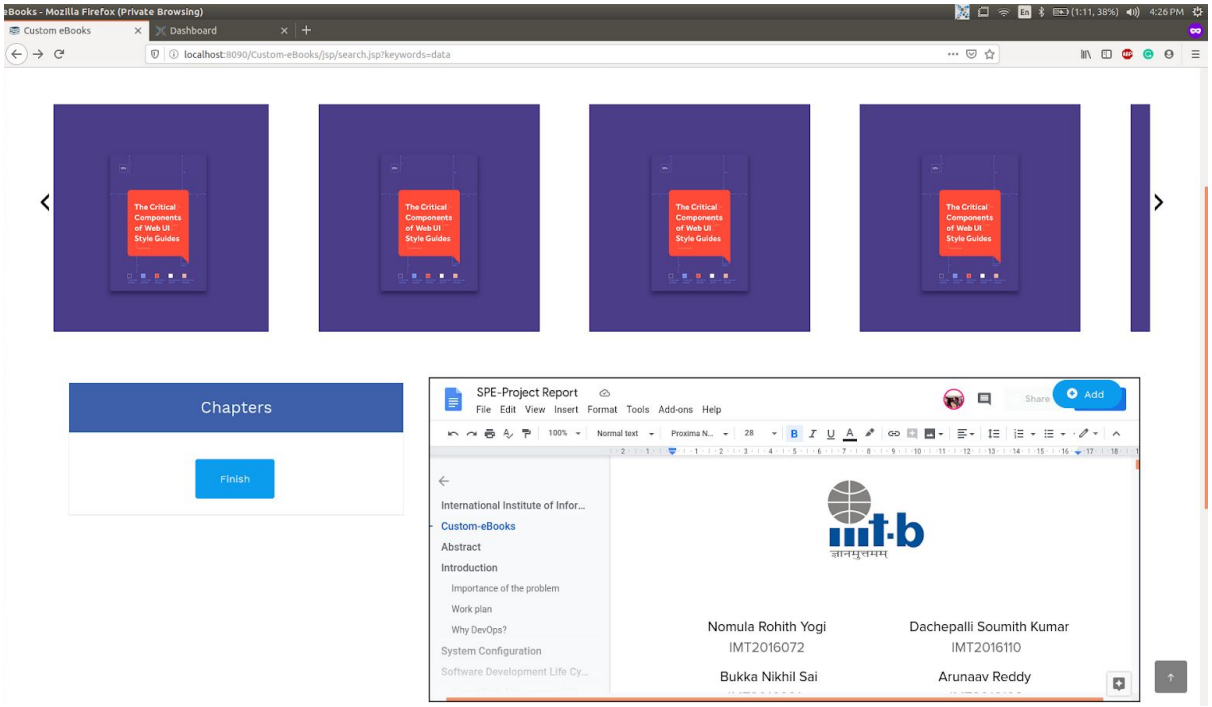


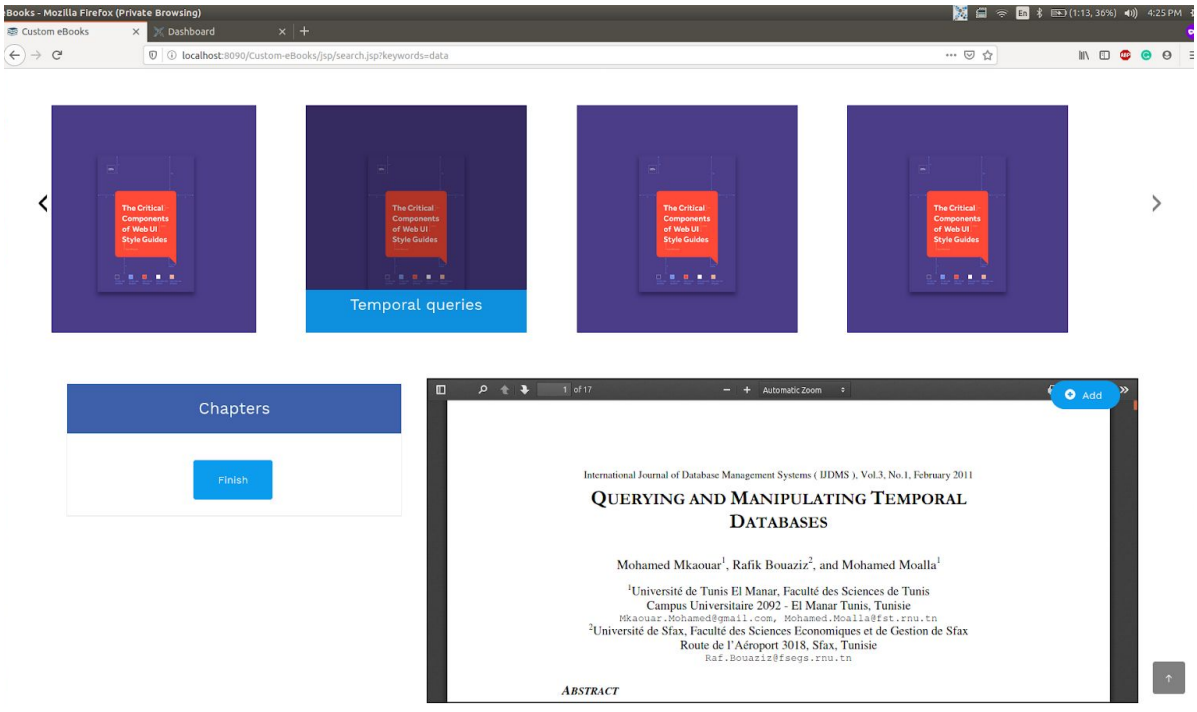

## Chapter Uploaded successfully :

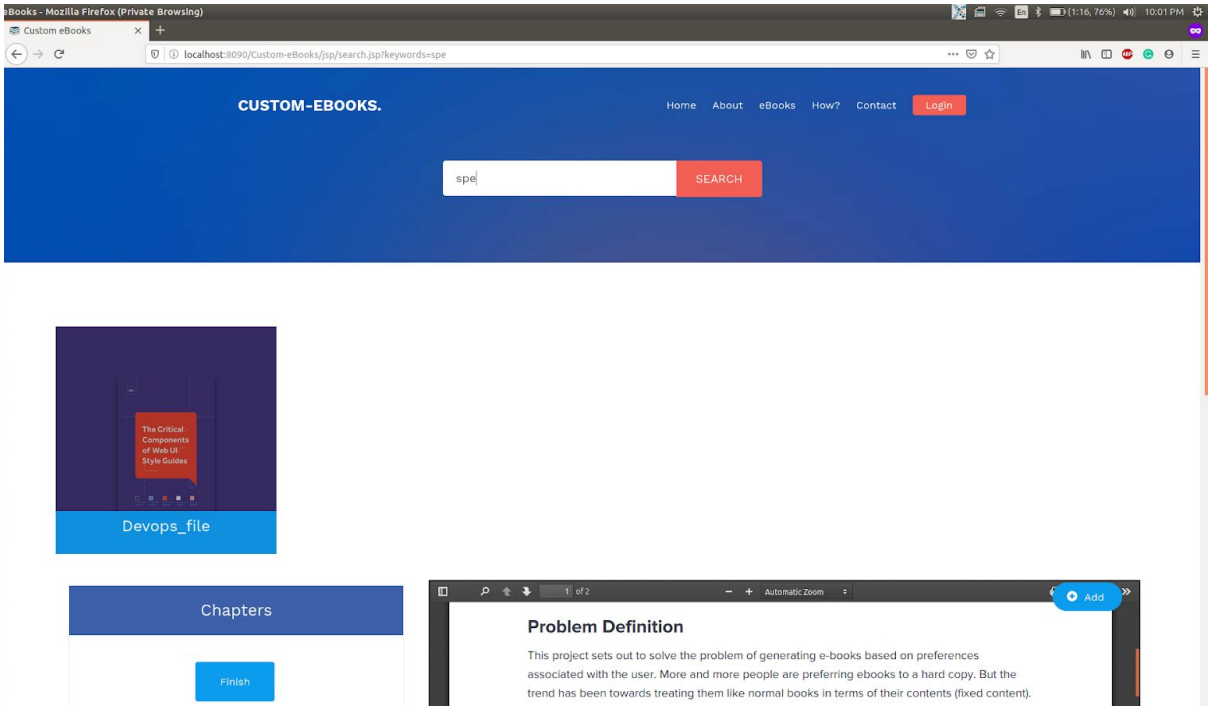


## Customer page :

Click on any chapter to view

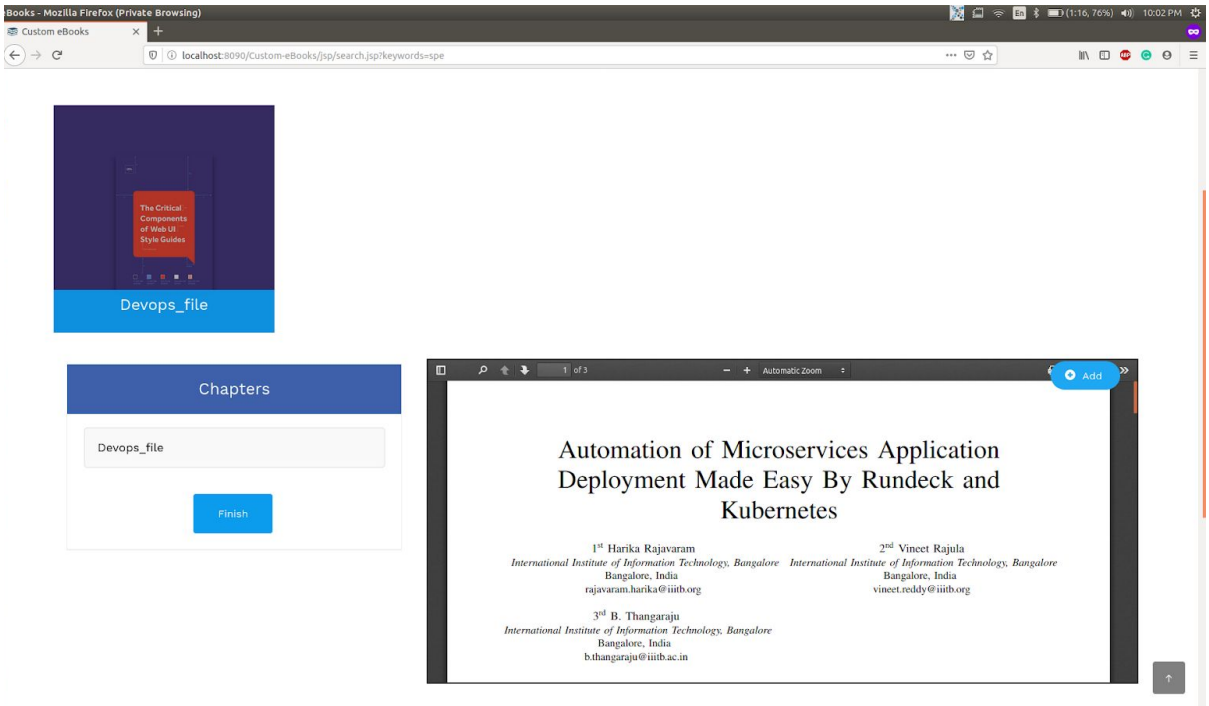




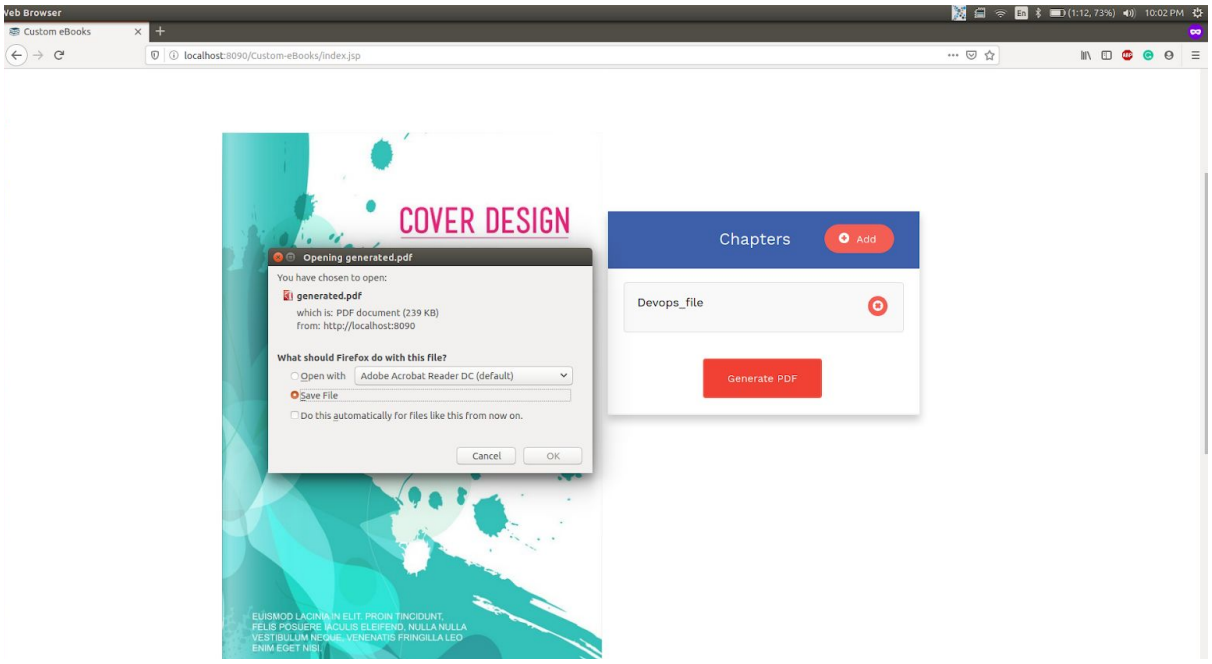

## Chapter Added :

Click on add button to add the chapter to the book.



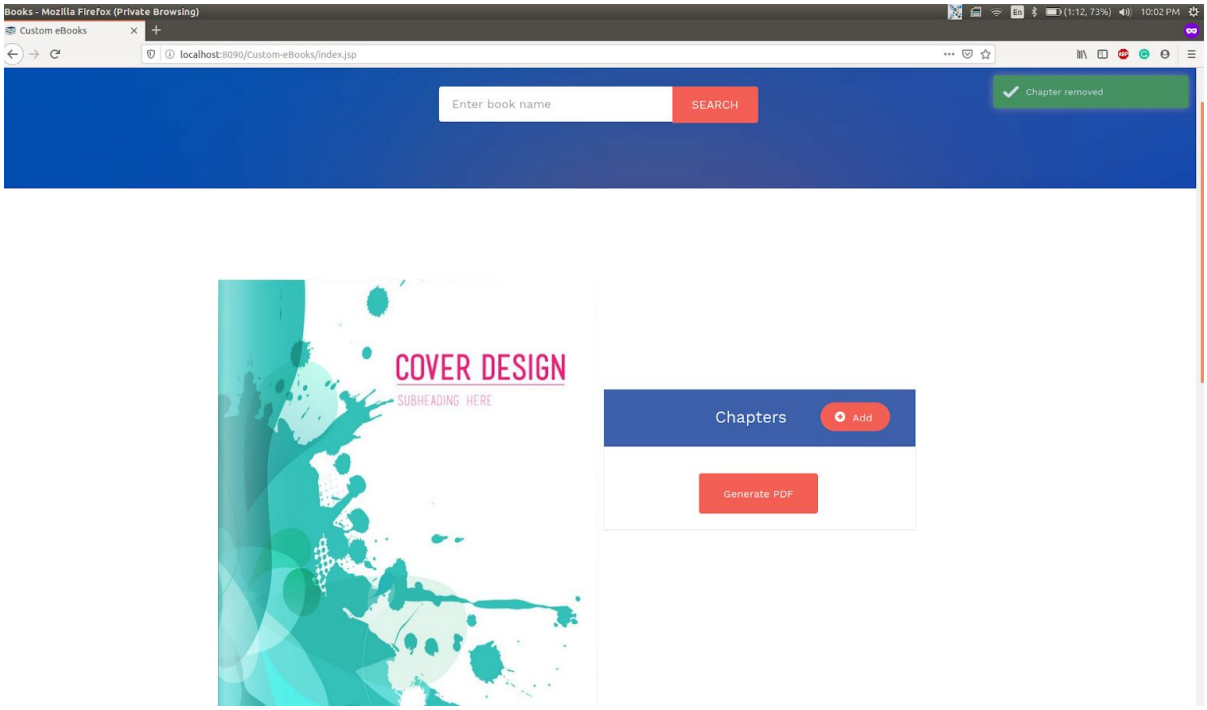
## Book Generated :

Your custom-eBook is generated

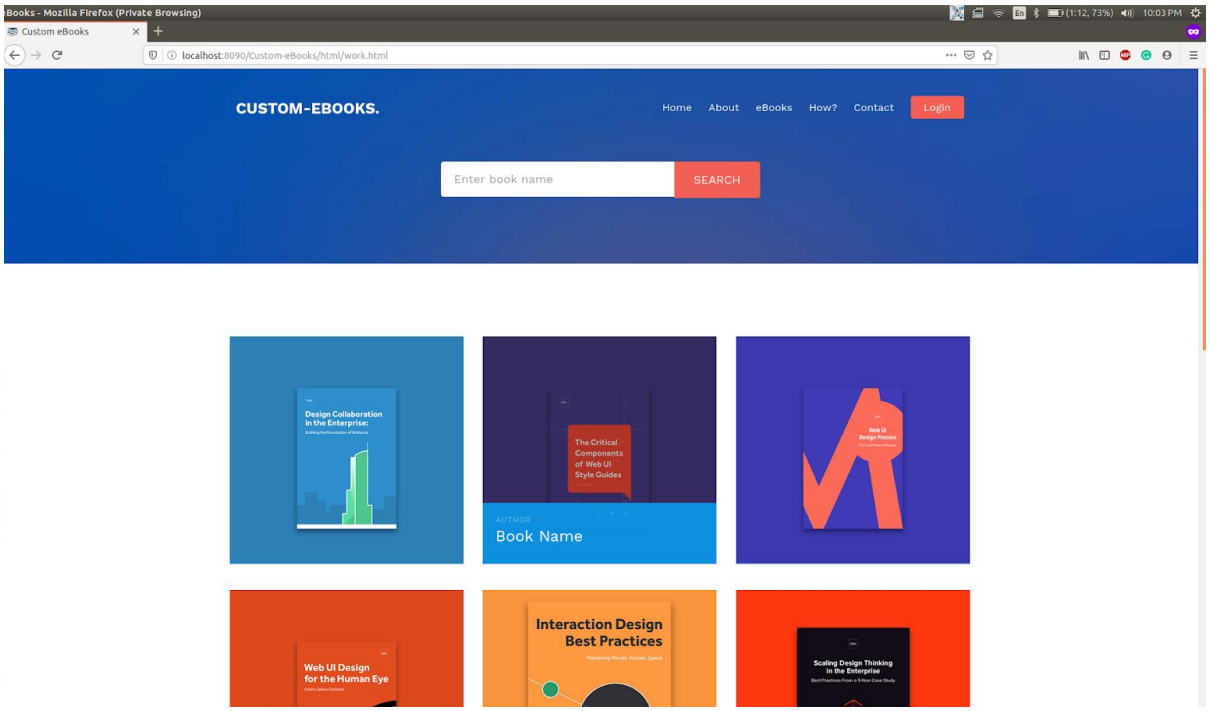



## Additional functionalities :

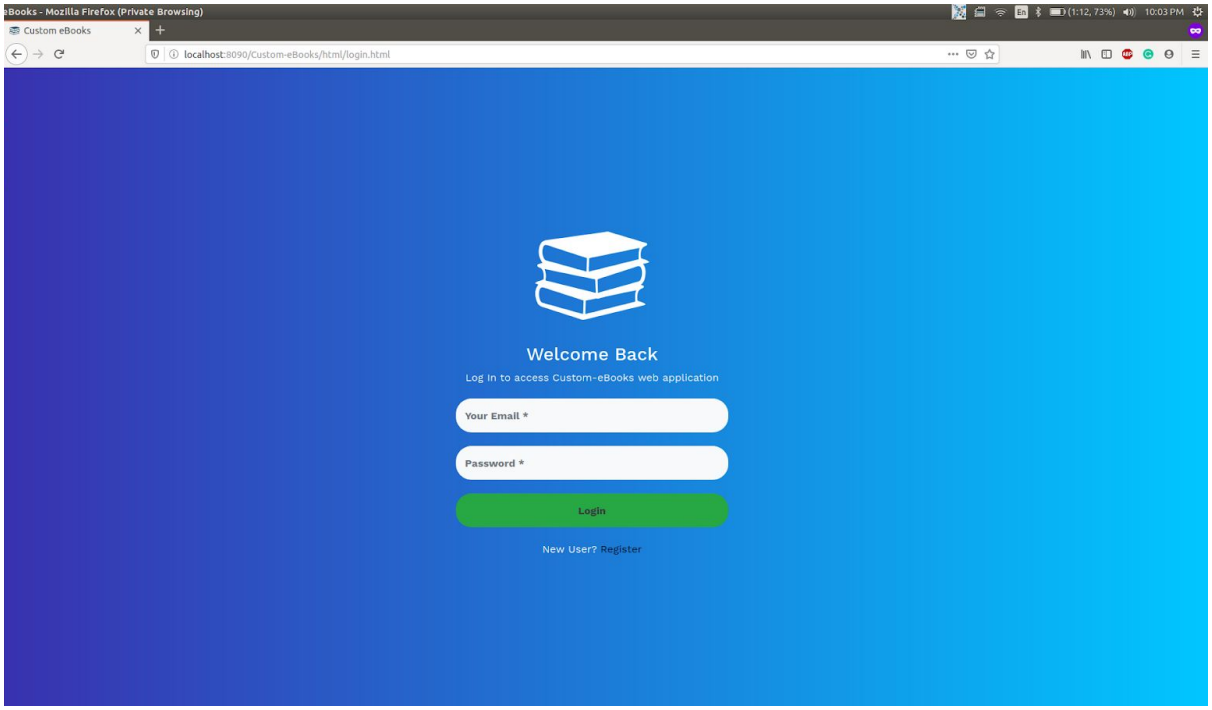
Customer can remove a added Chapter



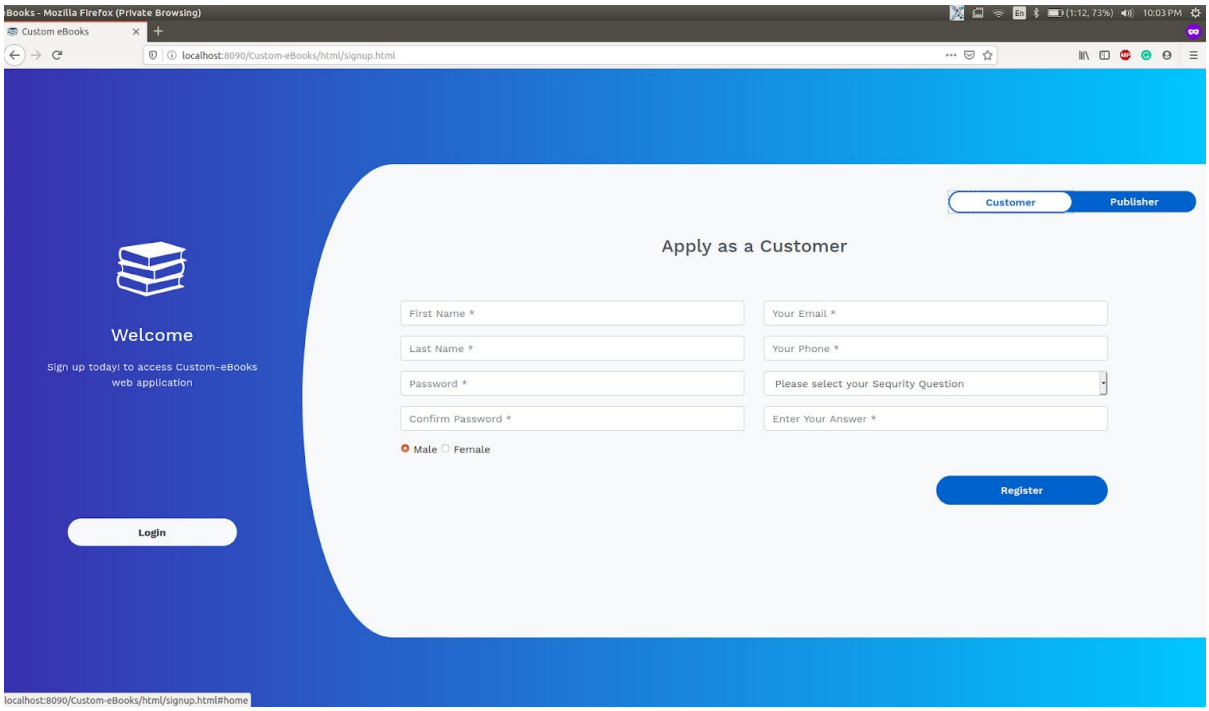
Generated Books are stored in eBooks page



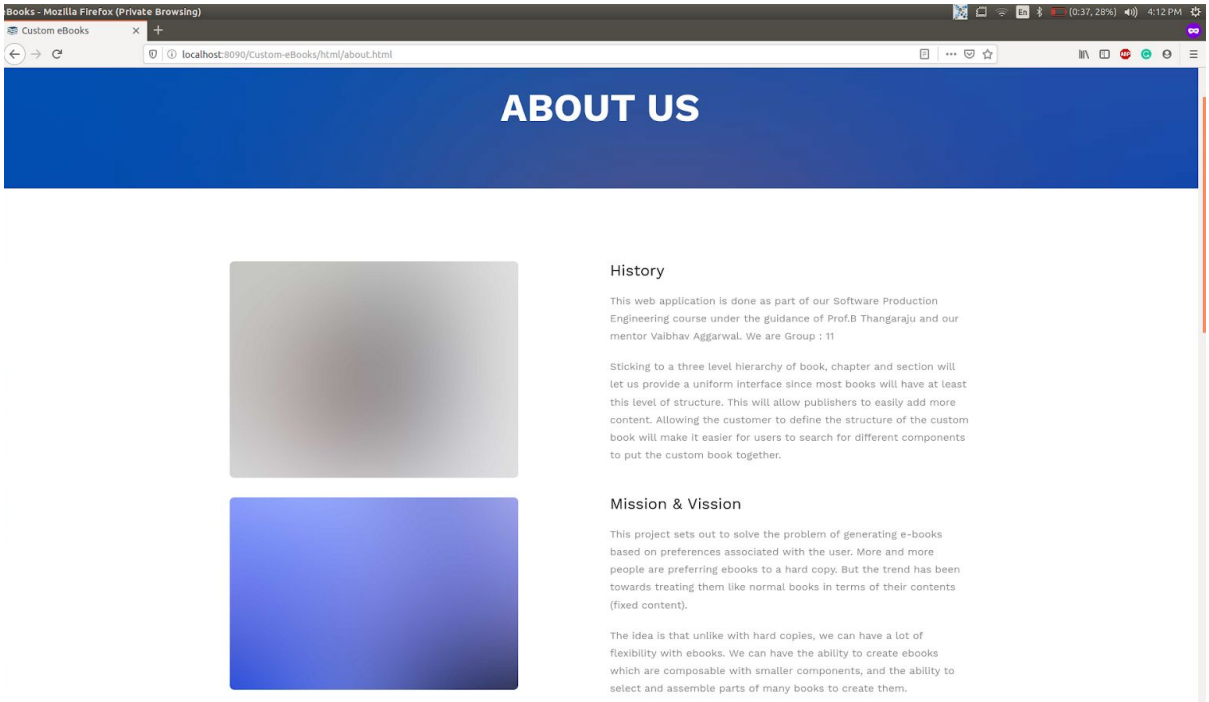

Login Page :



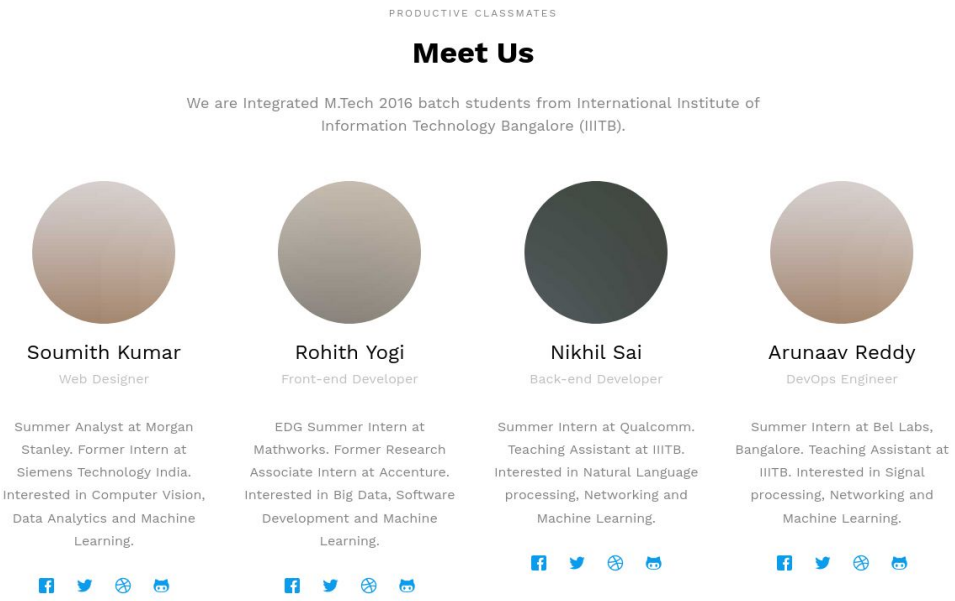
## Sign Up Page :




## About Page :



## Our Team :




## GitHub :

https://github.com/RohithYogi/Custom-eBooks/

## Docker Hub :

https://hub.docker.com/repository/docker/bukkanikhilsai/tomex/general

# Future Work and Conclusion

Taking this application to production will include hosting this on the cloud and putting some security protocols in place. In terms of features, this can be treated as a complete product and there's scope for improvement and addition in many areas. Some of them include personal user space where a user can view the books he/she have uploaded and put together. Also there can be more lower levels of hierarchy (in our case it's a chapter) making things more flexible. The idea of custom assembled books changes the notion of how we look at books. This gives users a lot of flexibility in terms of being able to choose what should be in the custom book they are creating. This will enable us to make the most of flexibility ebooks provide in terms of not having a fixed content.

# References


https://www.elastic.co/
https://github.com/Alakazam03/ELK-Tutorial
https://www.digitalocean.com/community/tutorials/how-to-install-elasticsearch-logstash-and-kibana-elastic-stack-on-ubuntu-16-04
https://www.jenkins.io/doc/tutorials/build-a-java-app-with-maven/
https://logz.io/blog/apache-tomcat-monitoring/
https://logz.io/learn/complete-guide-elk-stack/
https://www.codeproject.com/articles/143430/test-your-web-application-s-ui-with-junit-and-sele
https://www.selenium.dev/maven/
https://www.selenium.dev/selenium/docs/api/java/overview-summary.html
https://junit.org/junit5/docs/current/user-guide/
https://www.digitalocean.com/community/tutorials/how-to-install-and-use-docker-on-ubuntu-16-04