VISVESVARAYA TECHNOLOGICAL UNIVERSITY, JNANA SANGAMA, BELAGAVI - 590 018, KARNATAKA.

AN INTERNSHIP REPORT

ON

"Working on Hadoop Environment and DevOps with A Case Study – Bus Booking Management System"

Submitted in the partial fulfillment of the requirements for the award of Degree

B.E. in Computer Science & Engineering

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CERTIFICATE

This is to certify that **Nikil B S, Sneha Mallappa Kadligondi, Sushma R, Syed Farhan** bearing **4BD20CS062, 4BD20CS094, 4BD20CS102, 4BD20CS104** of Computer Science and Engineering department have satisfactorily submitted the Internship Project Report entitled "Working on Hadoop Environment and DevOps with A Case Study – Bus Booking Management System" in the partial fulfillment of the requirements for the award of Degree of Bachelor of Engineering (B.E.) in Computer Science & Engineering, under the VTU during the academic year 2023-24.

INTERNSHIP GUIDES

Dr. Arun Kumar G Hiremath Ph.D.,	**Mr. Santosh Navale**
Internal Guide	External Guide

Dr. Abdul Razak M S Ph.D.	**Dr. Nirmala C R** Ph.D.	**Dr. H B Aravind** Ph.D.
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External Examination

Name of the Examiners	Signature with Date
1. _____	1. _____
2. _____	2. _____

Bapuji Educational Association (Regd.)

Bapuji Institute of Engineering and Technology, Davangere-577004

Department of Computer Science and Engineering

Vision and Mission of the Department

VISION

To be a center of excellence in imparting state-of-the-art technology in the field of Computer Science and Engineering education enabling the students to become professionally sound and ethically strong.

MISSION

M1	Adapting best teaching and learning techniques that cultivates Questioning and Reasoning culture among the students.
M2	Creating collaborative learning environment that ignites the critical thinking in students and leading to innovation.
M3	Establishing Industry Institute relationship to bridge the skill gap and make them industry ready and relevant.
M4	Mentoring students to be socially responsible by inculcating ethical and moral values.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will be able to

PEO1	To apply the skills acquired in the field of computer science and engineering in solving the societal and industrial problems with technology intervention.
PEO2	To continue their career in industry, academia and to pursue higher studies and research
PEO3	To become successful entrepreneurs, innovators and job creators to design and develop software products and services to meet the societal, technical and business challenges
PEO4	To work in diversified environment by acquiring leadership qualities with strong communication skills along with professional and ethical values

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	Analyze and develop solutions for problems that are complex in nature but applying the knowledge acquired from the core subjects of this program.
PSO2	To develop secure, Scalable, Resilient and distributed applications for industry and societal requirements.
PSO3	To learn and apply the concepts and construct of emerging technologies like Artificial Intelligence, Machine learning, Deep learning, Big Data Analytics, IOT, Cloud Computing, etc for any real time problems.

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ABSTRACT

Agile is a method of software development that aims to deliver functional software consistently through brief iterations. The Bus Booking Management System project is implemented in terms of agile to deliver in sprints. Team has collected requirements and created a product backlog. Sprint planning has been done by team, user stories delivered in sprints. Database size estimations and peak operations size has been identified.

Bus Booking Management System is totally a online software. This system would help clients to book a seat for their journey. Tourists can book the tickets from their home even out of country. It allows customers to search for and book bus trips, as well as manage their accounts and payment options. The system also allows bus companies to monitor their fleet and manage their operations more efficiently. This system provides a better overall experience for both bus companies and customers, allowing for more efficient and cost-effective bus services. It can also improve customer satisfaction by providing better customer service and more convenience.

The project involved the creation of a continuous integration and continuous deployment pipeline for the Bus Booking Management System. The pipeline included various stages such as code compilation, testing, packaging, and deployment. The pipeline was implemented using popular DevOps tools such as Git, Jenkins and cypress. To ensure the quality of the Bus Booking Management System, several automated tests were integrated into the pipeline using cypress. These tests included unit tests, integration tests, and acceptance tests. The pipeline was also configured to trigger automatic builds and deployments whenever changes were made to the source code repository.

As a result of the implementation, The Bus Booking Management System achieved faster and more reliable releases, with reduced deployment time and increased productivity. The project demonstrated the benefits of DevOps practices in improving the software development and deployment.

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 About the Company/ Resource Person

Santosh Navale is an entrepreneur leader with twenty plus years of experience in data analytics, big data, development of innovative products and solutions and traditional databases in Telecom and Financial verticals. He has good knowledge in SDLC, agile & lean methodologies, Continuous Integration and Continuous Delivery and cloud services. He was working with Huawei in a technical architect role. He is one of the co-founders of Fresher Profiles Private Limited; he held director technology strategy position. He holds degrees in BE and MBL (National Law School).

1.2 Agile Methodology

Agile is an iterative approach of project management and software development that helps team members deliver significance to their clients more rapidly and stress-free. An agile team produces work in small, digestible increments as opposed to placing all of their eggs in one massive "big bang" launch. Due to the regular evaluation of needs, plans, and results, teams have a technique for responding quickly to change.

The Manifesto for Agile Software Development: The programmers describe a novel approach to creating software as well as 4 crucial characteristics they believe should take precedence over other factors. As they put it, agile software development teams should value:

1. Individuals and interactions over processes and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan.

1.3 DevOps

A Specific team that works to design, create, and deliver secure software quickly is known as a DevOps team. With automation, teamwork, quick feedback, and iterative improvement, DevOps principles allow software development (dev) and operations (ops) teams to expedite deliveries.

Stemming from an Agile approach to software development, a DevOps process expands on the cross-functional approach of building and shipping applications in a faster and more iterative manner. In adopting a DevOps development process, one can make a decision to improve the flow and value delivery of their application by encouraging a more collaborative environment at all stages of the development cycle.

DevOps represents a change in mindset for IT culture. In building on top of Agile, lean practices, and systems theory, DevOps focuses on incremental development and rapid delivery of software. Success relies on the ability to create a culture of accountability, improved collaboration, empathy, and joint responsibility for business outcomes.

1.4 WinSCP and PuTTY

WinSCP: WinSCP, or Windows Secure Copy, is a popular open-source SFTP (SSH File Transfer Protocol), FTP (File Transfer Protocol), and SCP (Secure Copy Protocol) client for Windows. It allows users to securely transfer files between a local and a remote computer. WinSCP supports both graphical user interface (GUI) and command-line interface (CLI) operations, providing users with flexibility in how they manage file transfers. With its focus on security and ease of use, WinSCP is widely used by system administrators, web developers, and other professionals who need to transfer files over secure protocols.

PuTTY: PuTTY is a free and open-source terminal emulator, serial console, and network file transfer application that supports several network protocols, including SSH, Telnet, rlogin, and raw socket connections. It provides users with a way to access and manage remote systems, such as servers or networking devices, from a Windows environment. PuTTY is known for its lightweight nature and simplicity, making it a popular choice for users who need a basic yet reliable tool for remote access. Its key features include support for SSH keys, session logging, and various configuration options to customize the user experience.

Both WinSCP and PuTTY are commonly used in IT environments for managing and

accessing remote systems and servers. While WinSCP focuses on secure file transfer, PuTTY is more oriented towards terminal access and management of remote systems. Together, these tools provide IT professionals with a comprehensive set of capabilities for remote system administration and file management.

1.5 Hadoop environment:

1. **HDFS:**

   Hadoop Distributed File System (HDFS) is a distributed file system designed to store and manage large volumes of data across a cluster of commodity hardware. It is part of the Apache Hadoop project and is a core component of Hadoop, providing reliable and scalable storage for big data applications. HDFS stores data in a distributed manner, breaking large files into smaller blocks (typically 128 MB or 256 MB) and replicating these blocks across multiple nodes in the cluster to ensure fault tolerance. The default replication factor is usually three, meaning each block is replicated three times across the cluster. HDFS provides high throughput access to data and is optimized for streaming reads and writes, making it suitable for applications that need to process large datasets sequentially. It also supports parallel processing frameworks like MapReduce and Apache Spark, enabling efficient data processing across the cluster. HDFS is designed to be highly fault-tolerant, with mechanisms to detect and recover from hardware failures automatically. It is a key component of the Hadoop ecosystem and is widely used for storing and processing big data in a scalable and reliable manner.

2. **HIVE:**

   Hive is a data warehousing infrastructure built on top of Hadoop that provides tools for easy data summarization, ad-hoc querying, and analysis of large datasets. It allows users to query data using a SQL-like language called HiveQL, making it accessible to users familiar with SQL. Hive stores schema information in a relational database and data in Hadoop's distributed file system (HDFS), organizing data into tables, partitions, and buckets for efficient querying. It supports various data ingestion methods, including loading data from HDFS, inserting data into tables, and external tables that reference data files. Hive is extensible through User-Defined Functions (UDFs) and User-Defined Aggregate Functions (UDAFs) written in Java, Python, or other languages, allowing users to customize its

functionality. It optimizes queries using techniques like predicate pushdown, join optimization, and query pipelining and integrates with other Hadoop ecosystem tools like Spark, Pig, and HBase. Hive provides security features such as authentication, authorization, and encryption to ensure secure data access and processing. Overall, Hive simplifies data analysis and querying for large datasets, making it a valuable tool in the Hadoop ecosystem.

3. Spark

Apache Spark is an open-source distributed computing system that provides an interface for programming entire clusters with implicit data parallelism and fault tolerance. It was developed to address the limitations of MapReduce, offering a faster and more flexible alternative for big data processing. Spark introduces the concept of Resilient Distributed Datasets (RDDs), which are fault-tolerant collections of objects that can be operated on in parallel. RDDs can be created from Hadoop InputFormats (such as HDFS files) or by transforming other RDDs through operations like map, filter, and reduce. Spark's programming model is based on these RDDs, allowing for complex, multi-stage data processing pipelines.

One of Spark's key features is its in-memory computing capabilities, which allows it to perform computations in memory, dramatically speeding up processing times compared to disk-based systems like Hadoop MapReduce. Spark also provides high-level APIs in Scala, Java, Python, and R, making it accessible to a wide audience of developers. Additionally, Spark includes libraries for SQL (Spark SQL), machine learning (MLlib), graph processing (GraphX), and streaming data (Spark Streaming), making it a comprehensive platform for a variety of big data processing tasks. Spark can run on a standalone cluster mode, on Hadoop YARN, or on Apache Mesos, and it integrates with Hadoop ecosystem tools like HDFS, Hive, and HBase, making it a versatile and powerful framework for big data processing.

4. HBase:

Apache HBase is an open-source, distributed, scalable, non-relational database modeled after Google Bigtable and built on top of the Hadoop Distributed File System (HDFS). It is

designed to handle large amounts of sparse data, making it well-suited for use cases that require random, real-time read/write access to Big Data, such as social media analytics, machine learning, and IoT data processing. HBase stores data in tables, with each table consisting of rows and columns. It provides fast lookups and updates for individual rows, making it suitable for applications that require low-latency access to large datasets.

HBase is fault-tolerant and provides automatic sharding and replication of data across nodes in the cluster for scalability and reliability. It supports automatic failover and recovery, ensuring that data remains available even in the event of node failures. HBase is integrated with Apache Hadoop, allowing it to leverage Hadoop's distributed file system and compute capabilities. It also provides APIs for Java, REST, and Thrift, making it accessible from a variety of programming languages and environments.

HBase is part of the Apache Hadoop ecosystem and works well with other Hadoop components such as HDFS, MapReduce, and Spark. It is often used in conjunction with these tools to build robust, scalable, and high-performance big data processing pipelines. Overall, HBase is a powerful database solution for applications that require real-time, random access to large datasets, providing scalability, reliability, and high performance.

1.6 Power BI

Power BI is a business analytics solution by Microsoft that enables organizations to visualize their data and share insights across the organization, or embed them in an app or website. It provides interactive visualizations and business intelligence capabilities with a simple and intuitive user interface, allowing users to create reports and dashboards without the need for extensive technical knowledge. Power BI can connect to a wide range of data sources, including Excel spreadsheets, SQL databases, cloud services, and streaming data, allowing users to easily import and analyze data from multiple sources.

One of the key features of Power BI is its ability to create interactive reports and dashboards that update in real-time, providing users with the most up-to-date information. It also offers natural language querying, which allows users to ask questions about their data in plain

English and receive visualizations as answers. Power BI provides a variety of visualization options, including charts, graphs, maps, and tables, allowing users to choose the best way to represent their data. Additionally, Power BI offers advanced analytics capabilities, such as predictive analytics and data modeling, allowing users to gain deeper insights into their data.

Power BI is available as a desktop application for individual users, as well as a cloud-based service for organizations. It offers a free version with limited features, as well as paid versions with additional features and capabilities. Overall, Power BI is a powerful and user-friendly business intelligence tool that helps organizations make sense of their data and drive better business decisions.

CHAPTER 2

TASK PERFORMED

2.1 Task Performed During Week 1

Learning about waterfall software lifecycle method

- Understood the requirements of the project "Bus Booking Management System" and created a requirement list for waterfall and agile methods

Learning about Agile software lifecycle method

- Understood the requirements of the project "Bus Booking Management System" and created a requirement list for agile methods

Learning about creating product backlog with master requirement list

- Understood the "Bus Booking Management System" requirement and created a product backlog using the template.

Learning about sprint backlog

- Created sprint backlog from product backlog using the same template.

Learning and Normalization and Denormalization.

- Normalizing and Denormalizing the tables of database of Bus Booking Management System.

2.2 Task Performed During Week 2

Preparing the storyboard and Trello

- Created Story board in Trello for sprint handling.

Performing sprint planning meeting exercise

- Conducted sprint planning meeting and picked up the stories for sprint 1.

User Stories

- Created user stories with acceptance criteria.
- Standup meeting exercise.
- Daily Standup Meeting.

Creation of story card in Trello.

- Created story cards in Trello in To Do status

Status of cards

- Moved the cards to Doing, Done based on progress

Calculate DB size

Setup Cloud environment

- Install XAMPP in cloud for production environment

Setup of Local test bench

- Install Cypress in local for system test environment
- Install Jenkins in local

Learned Usage of CI and CD (by the following steps)

- Create a Freestyle Project in Jenkins to prepare database environment
- "Create a Freestyle Project in Jenkins to fetch files from git fetch"
- Create a Freestyle Project in Jenkins to copy files to \htdocs folder
- Create a Freestyle Project in Jenkins run cypress automation script

Learned customer change request to change in title (performed the following steps)

- Change heading in index.php
- Commit and push in Git thru git bash
- Observe the task execution jenkins
- Observe the changed Heading in the portal
- Table size and average row size calculation using Mysql commands

WinSCP and PuTTY

- To instruct WinSCP to perform the transfer on background.
- Connection using PuTTY

  Type the server's IP address to the IP address bar or Host name for connecting to the server and keep the type of connection as SSH and the port as 22. Also, we may store the configuration for future use. Now, the terminal of PuTTY will open and asking for a password and username for connection.

2.3 Task Performed During Week 3

Analyzed Requirements and prepare list

- Understood DevOps requirement flow
- Written a detailed design for all requirements

Understood version control and tool

- Created a github account or use existing

Install GIT

- Download and install TortoiseGIT
- Download https://git-scm.com/downloads"

GIT command execution and understand code commit

- Perform or execute Git bash commands

  Creation of repository in GIT
- Create a new repository in github for "Bus Booking Management System"

  Code add and check in
- Add "Bus Booking Management System" code to repository using Git Bash

Hadoop cluster preparation and HDFS installation

- HDFS read and write operations
- Hive – hive setup and hive command.

2.4 Task Performed During Week 4

System Testing process

- Written system Test cases using test case sheet
- Executed all test cases manually

Learned Automation Testing using Cypress

- Written Automation scripts for all test cases
- Analyzed and Submitted the Test Report
- Learned flow of customer change request and implement
- Provided the requirement analysis and Design

Spark and HBase

- Sparck setup using set of commands
- Spark and HBase command

Power BI

- setup and installation
- Report for DBMS project

CHAPTER 3

SYSTEM REQUIREMENTS

3.1 Tools and Technologies Identified

3.1.1 Hardware Requirements

The hardware required for the development of this project is:

- Processor : Intel 5th generation(i3)
- Processor Speed : 2.4 GHz
- RAM Size : 4GB
- Hard Disk Capacity : 250 GB(min)
- System Type : X64-based Processor

3.1.2 Software Requirements

The software required for the development of this project is:

- Operating System : Windows 10(and any other higher version)

3.1.3 Tools Identified

- Git
- Trello
- VS Code
- Jenkins
- Cypress
- XAMPP
- MySQL
- WinSCP
- PuTTY
- Power BI

CHAPTER 4

SYSTEM DESIGN

4.1 System Topology

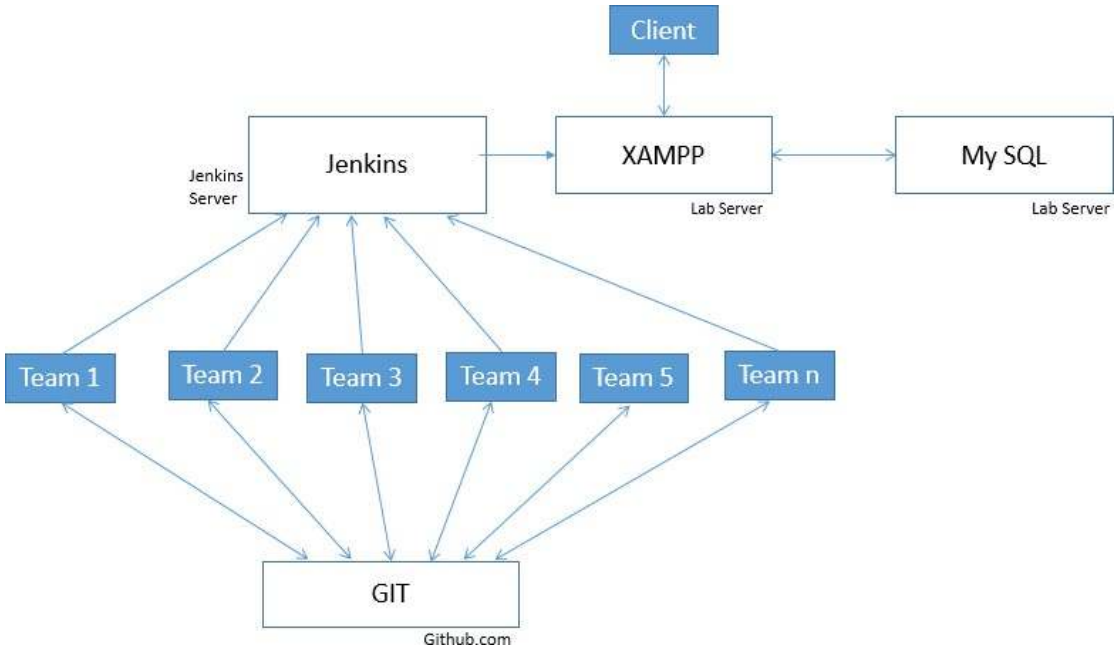

Fig 4.1 System Topology

Figure 4.1 shows the system architecture of the project.

4.2 Flow Diagram

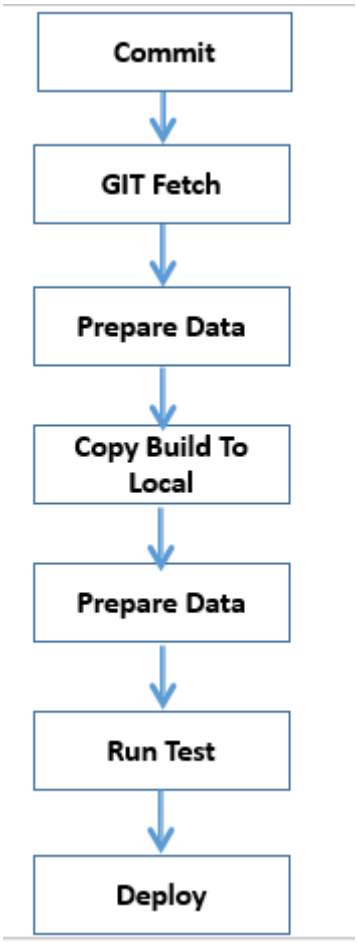

Fig 4.2: Flow diagram

Figure 4.2 describes the process flow of the Project

4.3 Schema Diagram

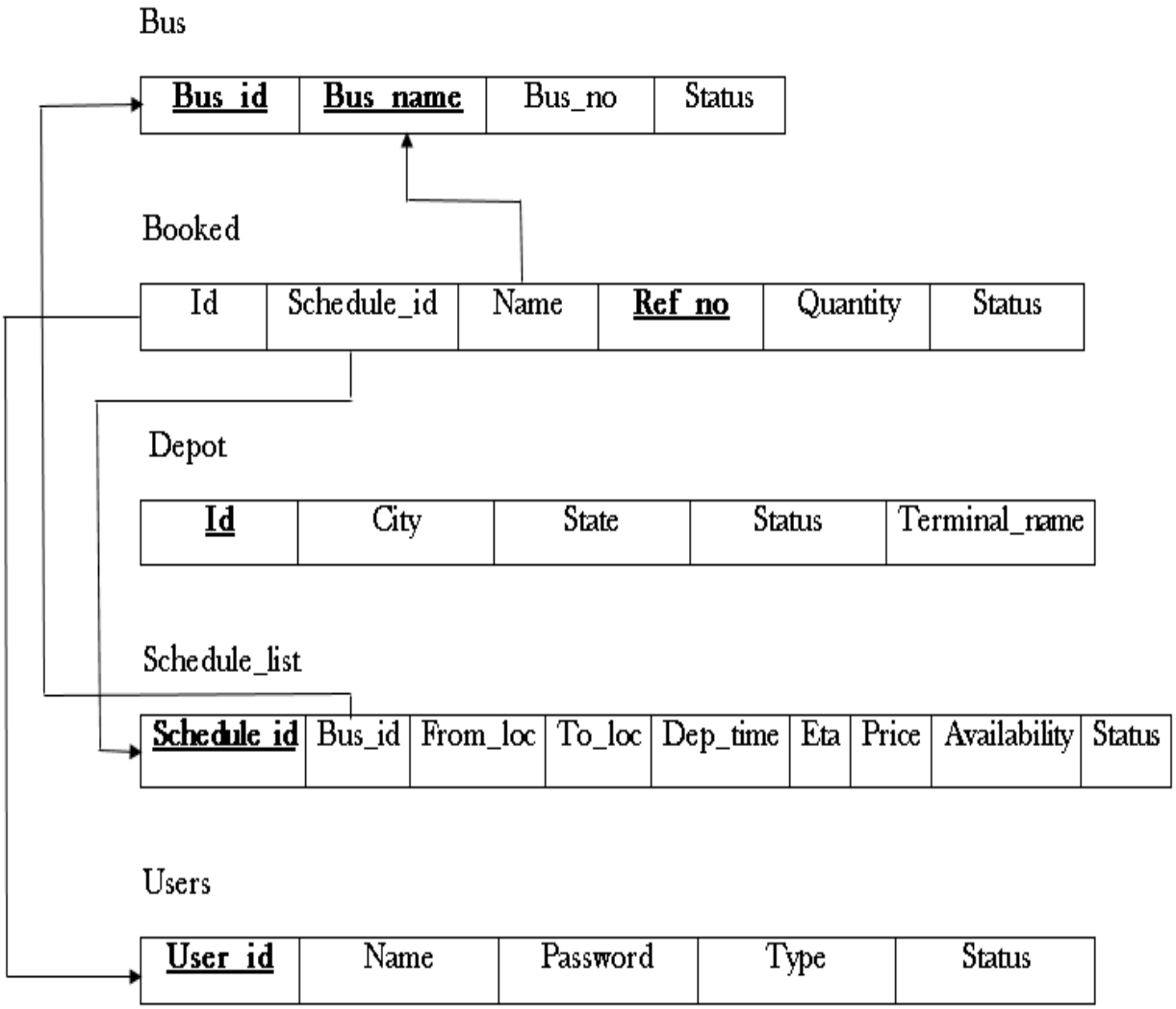

Fig 4.3: Schema diagram

The Figure 4.3 describes the database schema of Bus Booking Management System.

CHAPTER 5

METHODOLOGY

5.1 Description of the Project work

The main objective of the project is to know fundamental concepts and can work on Agile methodology and DevOps frameworks, to gain a broad understanding of build cycles.The project flows as users create multiple projects in Jenkins to fetch the code, build, prepare data in the database, run the automation tests, and deploy the code webserver.To accomplish this, we have worked on the activities and tasks like Requirement analysis, User Story creation, and Story board on Trello, Write automation tests in Cypress, create projects in Jenkins.

5.2 Steps to be followed

The following steps are used for each activity under each method:

Section	Sub Section	Task Description
Waterfall and Agile concepts	Requirement Analysis	Understand the "Team Profile" requirements and create a requirement list for waterfall and agile methods
		Understand the "Team Profile" requirement and create a product backlog using the template
		Create sprint backlog from product backlog using the same template.
		Create Story board in Trello for sprint handling
	Sprint Preparation, Design and Implementation	Conduct sprint planning meeting and pickup the stories for sprint 1
		Create user stories with acceptance criteria
		Daily Standup Meeting
		Create story cards in Trello in To Do status
		Move the cards to Doing, Done based on progress
		Table size and avg row size calculation using Mysql commands
	Plan phase	Analyze Requirements and prepare list
		Write detail design for all requirements
	code Version control and Static Code Check Review	Create a github account or use existing
		Download and install Tortoise GIT Download https://git-scm.com/downloads
		Perform or execute Git bash commands
		Create a new repository in github for "DBMS Project Title"
		Add "DBMS Project Title" code to repository using Git

DevOps Concepts and Implementation		Bash
		Install MYSQL workbench
	Build Setup Dev, Test Environment	Install XAMPP in local for dev and test environments
		Install / Check Mysql or MariaDB
		Create all tables in DB
		Install XAMPP in cloud for production environment
		Install Cypress in local for system test environment
		Install Jenkins in local
	Testing	Write system Test cases using test case sheet
		Execute all test cases manually
		Write Automation scripts for all test cases
		Analyze and Submit the Test Report
	Environment Setup	Create a Freestyle Project in Jenkins to prepare data base environment
	Release	Create a Freestyle Project in Jenkins to fetch files from git fetch
	Deploy	Create a Freestyle Project in Jenkins to copy files to \htdocs folder
	Run Cypress Test	Create a Freestyle Project in Jenkins run cypress automation script
Customer Request	Denormalize the tables used in DBMS projects	Provide the requirement analysis and Design
	Change the title	Change heading in index.php
		Commit and push in Git thru git bash
		Observe the task execution jenkins
		Observe the changed Heading in the portal
HDFS	Hadoop Cluster Preparation HDFS Installation HDFS Read write	Setup all 3 nodes in cluster Install NN, DN,RM,NM Execute HDFS commands and Yarn commands Check the NN and RM url
Hive	Hive Setup Hive Commands	Hive Nodes install
		Create DB and run hive ql commands
		Create DB for DBMS project and insert data related to project
Spark and Hbase	Setup Spark and Hbase Commands	Installation and Command Execution
Power BI	Setup and Installation Reports for DBMS project	Setup and Mysql Driver connection
		HDFS driver connection
		Hive driver connection
Linux	Setup WSL/Linux terminal	Execute Linux commands related to HDFS

Assignments	DevOps Assignment	
	hdfs and hive 100 rows creation	

Table 5.1: Task and activity Table

5.2.1 Waterfall Method

Sl #	Requirements	Description	Requirement Type	Priority	Assumptions/Limitations	Comments
1	Customer	Provide easy booking interface	GUI, Frontend	High	accessibility, customization, and complex booking scenarios.	Easy and edge cases matter.
		Provide list of buses which are ready to trip	GUI, Frontend, DB	Medium	Impossible without knowing origin, destination, time, and data source	Trustworthy info requires specific origin, destination, and time, and privacy concerns may limit data access.
		Provide acknowledgement for the customer who have booked the seats	GUI, Frontend	High	Acknowledging bookings assumes accurate data, delivery method, and understanding of "acknowledgement"	Confirmation
2	Admin	Provide admin to add buses which are ready to trip	DB, Frontend	Medium	Adding "ready to trip" buses assumes accurate data, admin knowledge, and clear definition of "ready"	data accuracy, admin expertise, and "ready" definition (scheduled, boarding, departing?) are crucial.
		Provide admin to update how many seats are available to book the seats of the	DB, Frontend	Medium	Consider accuracy, synchronization, and handling edge cases.	Real-time seat updates are tricky - cancellations

		perticular bus				, bookings, and overbooking loom.
		Provide Admin to remove buses which are not ready to trip	DB, Frontend	Medium	real-time updates, and potential passenger impact	update in real-time, and mind passengers
3	System	intel i3 or higher	Hardware	Medium	It is good to use minimum usabilities	Choosing an Intel i3 processor or higher depends on your specific needs and budget.
		minimum 4GB RAM	Hardware	Medium	It is good to use minimum usabilities	Consider your usage needs for a smoother experience.

5.2.2 Agile Method

Sl no	Requirements	Description	User Stories	Acceptance Criteria	Requirement Type	Priority
1	Admin Login	Provide an interface for the admin to enter user id and password	As an admin I want to login to access and manage the details	Validate the credentials	GUI	High
2	Schedule List	Provide an interface to add Schedule ID	As an admin I need a form which should open to enter the details of Schedule ID	Entered Schedule ID Details should be displayed in the table	GUI	High
		Provide an interface to add Bus ID	As an admin I need a form which should open to enter the details of Buses ID	Entered Bus ID Details should be displayed in the table	GUI	High
		Provide an interface to add From Location	As an admin I need a form which should open to enter the	Entered From location Details should	GUI	High

			details of From location	be displayed in the table		
		Provide an interface to add To Location	As an admin I need a form which should open to enter the details of To location	Entered To location Details should be displayed in the table	GUI	High
		Provide an interface to add Departure time	As an admin I need a form which should open to enter the details of Departure time	Entered Departure time Details should be displayed in the table	GUI	High
		Provide an interface to add Price	As an admin I need a form which should open to enter the details of price	Entered price Details should be displayed in the table	GUI	High
		Provide an interface to add Availability	As an admin I need a form which should open to enter the details of Availability	Entered availability Details should be displayed in the table	GUI	High
3	Add Buses Information	Provide an interface to add Buses ID	I need a button to add the details of the registered Buses	Details should be displayed accurately	GUI	High
		Provide an interface to add Buses Name	As an admin I need a form which should open to enter the details of Buses	Entered Buses Details should be displayed in the table	GUI	High
		Provide an interface to add Bus seat cost	As an admin I need a form which should open to enter the price details	Entered price Details should be displayed in the table	GUI	High

		Provide an interface to Bus Number	As an admin I need a form which should open to enter the Buses number	Entered Buses number should be displayed in the table	GUI	High
4	Add Booked Information	Provide an interface to show details of Booked ID	As an admin I need a form which should open to show the details of Booked ID	It should accept all which are available	GUI	High
		Provide an interface to show details of Schedule ID	As an admin I need a form which should open to show the details of Schedule ID	It should accept all which are available	GUI	High
		Provide an interface to show details of Customer name	As an admin I need a form which should open to show the details of Customer name	It should accept all which are available	GUI	High
		Provide an interface to show details of Ref.no	As an admin I need a form which should open to show the details of Ref.no	It should accept all which are available	GUI	High
		Provide an interface to show details of Quantity of seats booked by customer	As an admin I need a form which should open to show the details of Quantity of seats booked by customer	It should accept all which are available	GUI	High

5	Add Terminal details	Provide an interface to add Terminal ID	As admin I need an interface to add Terminal ID	Accept the entered Terminal ID's	GUI	Medium
		Provide an interface to add Terminal name	As admin I need an interface to add Terminal name	Accept the entered Terminal name	GUI	Medium
		Provide an interface to add city	As admin I need an interface to add city	Accept the entered city	GUI	Medium
		Provide an interface to add state	As admin I need an interface to add state	Accept the entered State	GUI	Medium
		Provide an interface to add status	As admin I need an interface to add status	Accept the entered status	GUI	Medium

5.2.3 Version Control

Sl. No	Requirements	Responsible	Code path
1	Admin Login	Nikil B S	https://github.com/Nikilbs/Test
2	Schedule List	Nikil B S	https://github.com/Nikilbs/Test
3	Add Buses Information	Syed Farhan	https://github.com/4BD20CS104/Test
4	Add Booked Information	Sushma R	https://github.com/SushmaR/Test

5	Add Terminal details	Sneha Mallappa Kadligondi	https://github.com/ SnehaMallappaKadligondi /Test

5.2.4 Cypress Automated Testing

- Create a new spec file inside the e2e folder of Cypress Automation folder.
- Write the test cases in the new spec file.
- Open command prompt and execute “npx cypress open” command.
- Select E2E testing.
- Select the spec file to run the test cases.
- Verify the results.

5.2.5 Jenkins CI/CD Implementation

1. Job to pull code from github:

- Open Jenkins and create a new item with the name “Bus Booking Management System”. Select a free style project.
- Go to Source code management and select git. Specify the url for github repository. Edit the default branch name to “main”.
    - Save the job.

2. Job to Deploy code into apache server:

- Open Jenkins and create a new item with the name “Bus Booking Management System Deploy” . Select a free style project.
- Inside build projects select “Build after other projects are built”.
- For ‘projects to watch’ select ‘Bus Booking Management System’ job.
- Inside ‘Build steps’ select ‘execute windows batch commands’ and add below commands.

```
mkdir C:\xampp\htdocs\files1
Copy C:\ProgramData\Jenkins\.jenkins\workspace\Bus Booking Management System\
C:\xampp\htdocs\files1
```

- Save the job.

3. Job to run Automated Testing:

Open Jenkins and create a new item with the name "Bus Booking Management System Test". Select a free style project.

- Inside build projects select "Build after other projects are built".
- For 'projects to watch' select 'Bus Booking Sales Management System Deploy' job.
- Inside 'Build steps' select 'execute windows batch commands' and add below commands.

```
set
CYPRESS_RUN_BINARY=C:\Users\arunk\AppData\Local\Cypress\Cache\10.9.0\Cy
press\Cypress.exe
cd /d E:\CypressAutomation
npx cypress run  --browser chrome --spec E:\CypressAutomation\cypress\e2e\spec.cy.js
```

- Save the job.

CHAPTER 6

RESULTS AND DISCUSSIONS

6.1 SNAPSHOTS

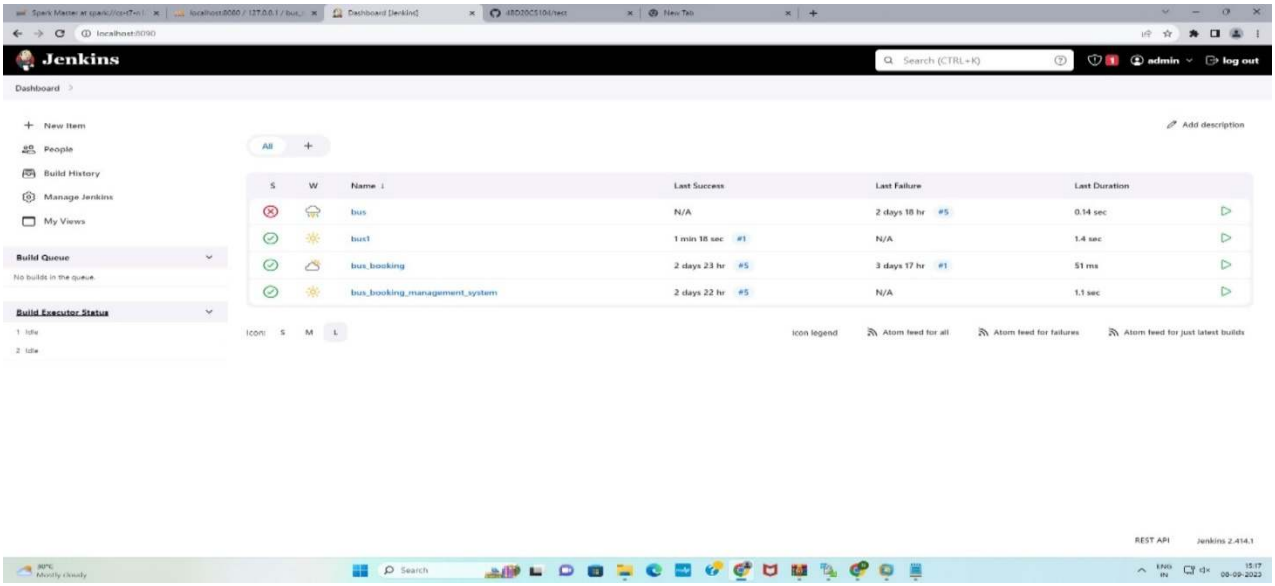

Fig 6.1: Jenkins DashBoard

The Figure 6.1 shows the free style projects executed on Jenkins dashboard.

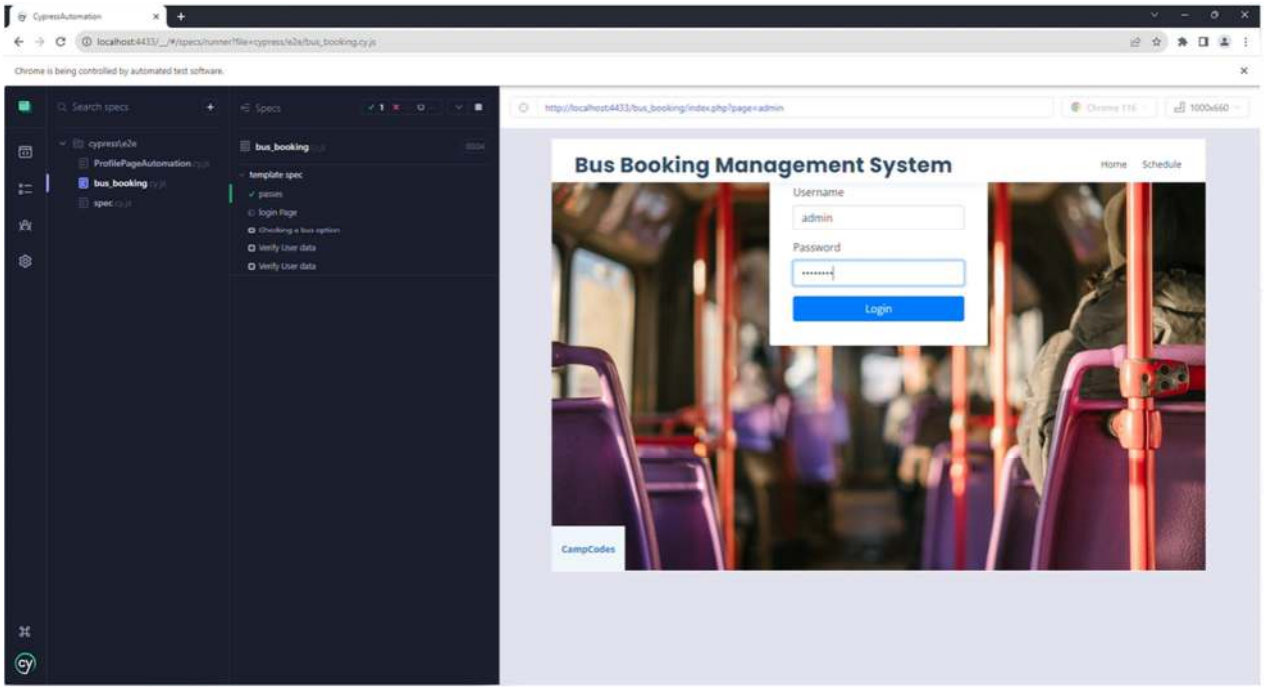

Fig 6.2: Automation test results in Cypress

The Figure 6.2 shows that execution status of cypress test of the project

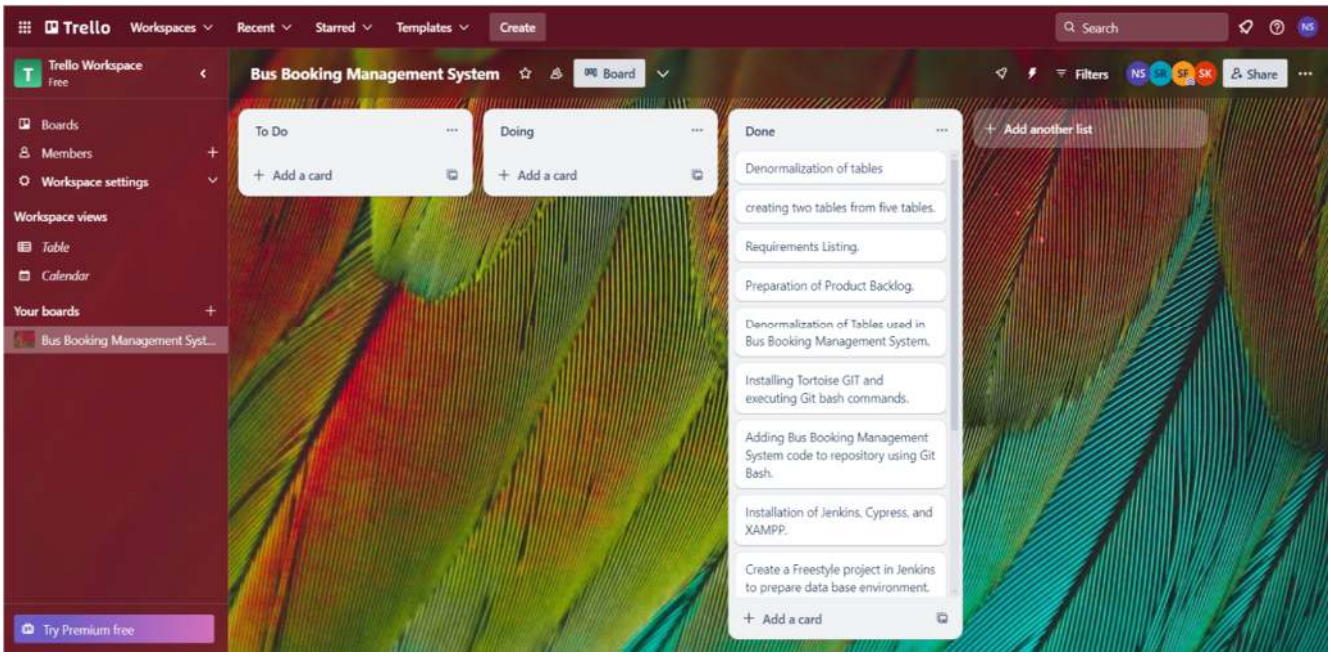

Fig 6.3: Story Board on Trello

The Figure 6.3 shows story board on trello

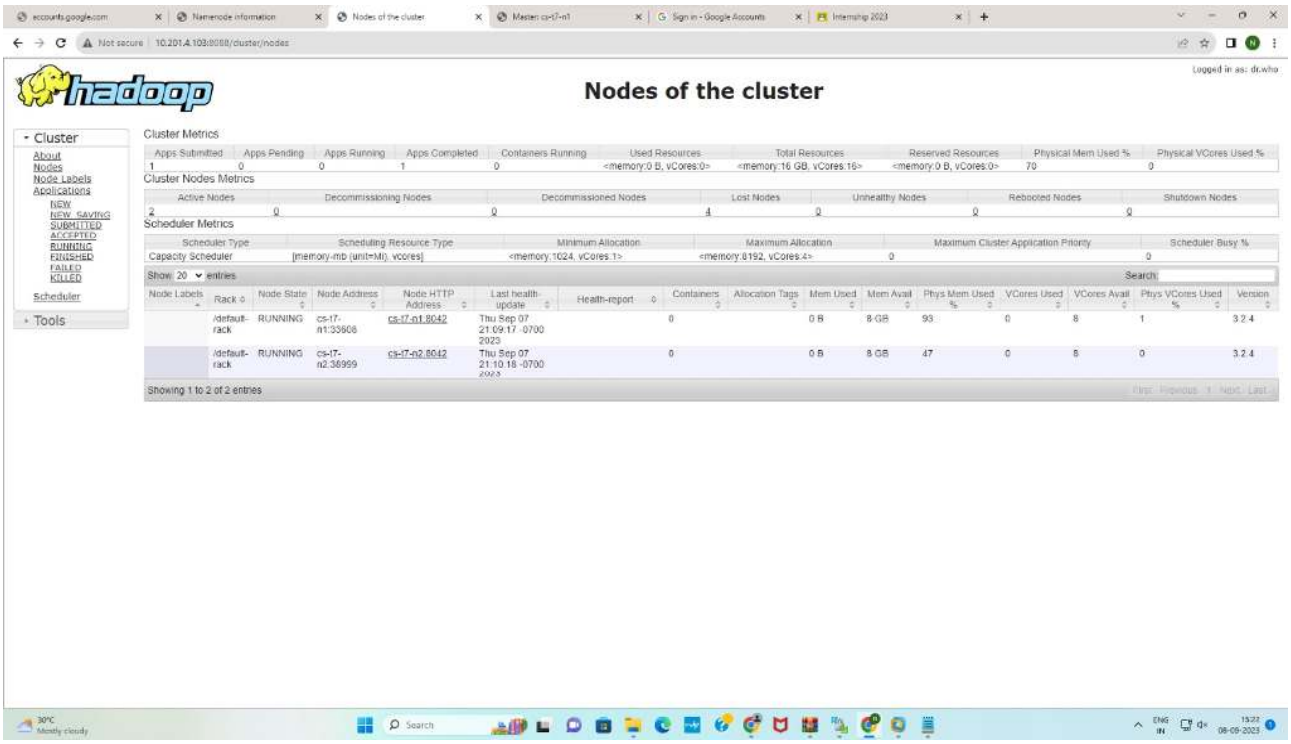

Fig 6.4: Nodes of the cluster

The Figure 6.4 shows Nodes of the cluster

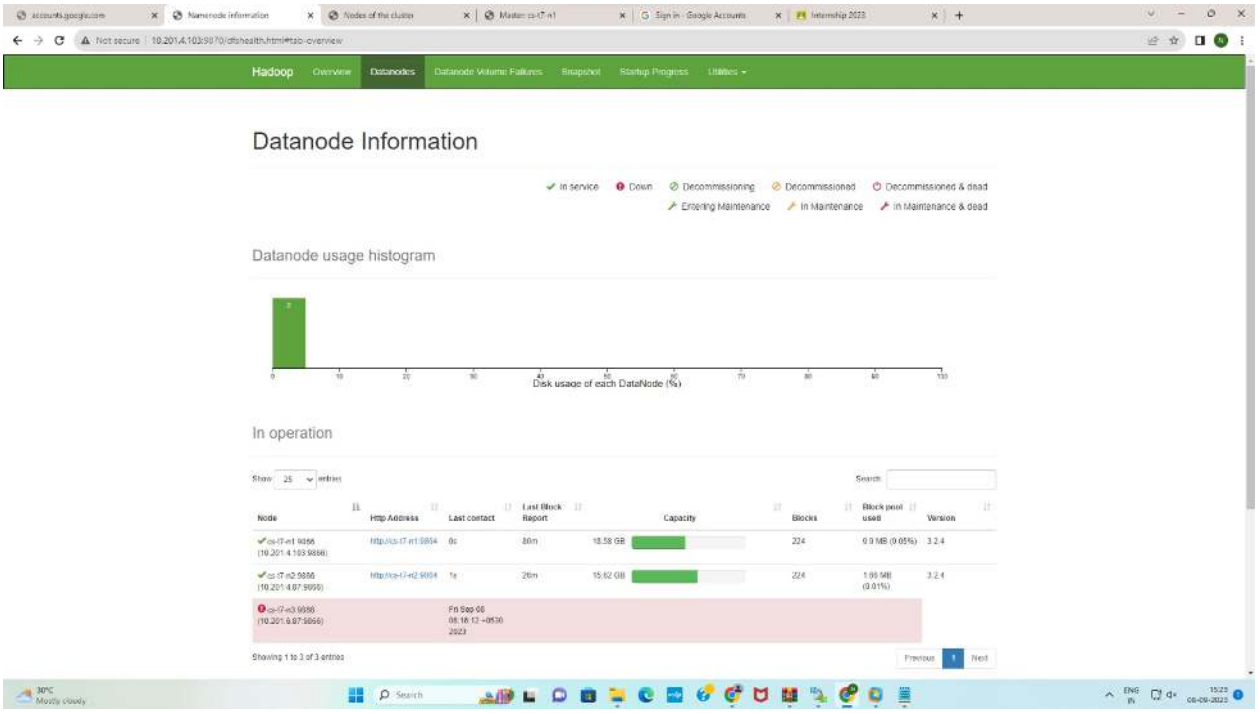

Fig 6.5: Name node and Data node Information

The Figure 6.5 shows Name node and Data node Information

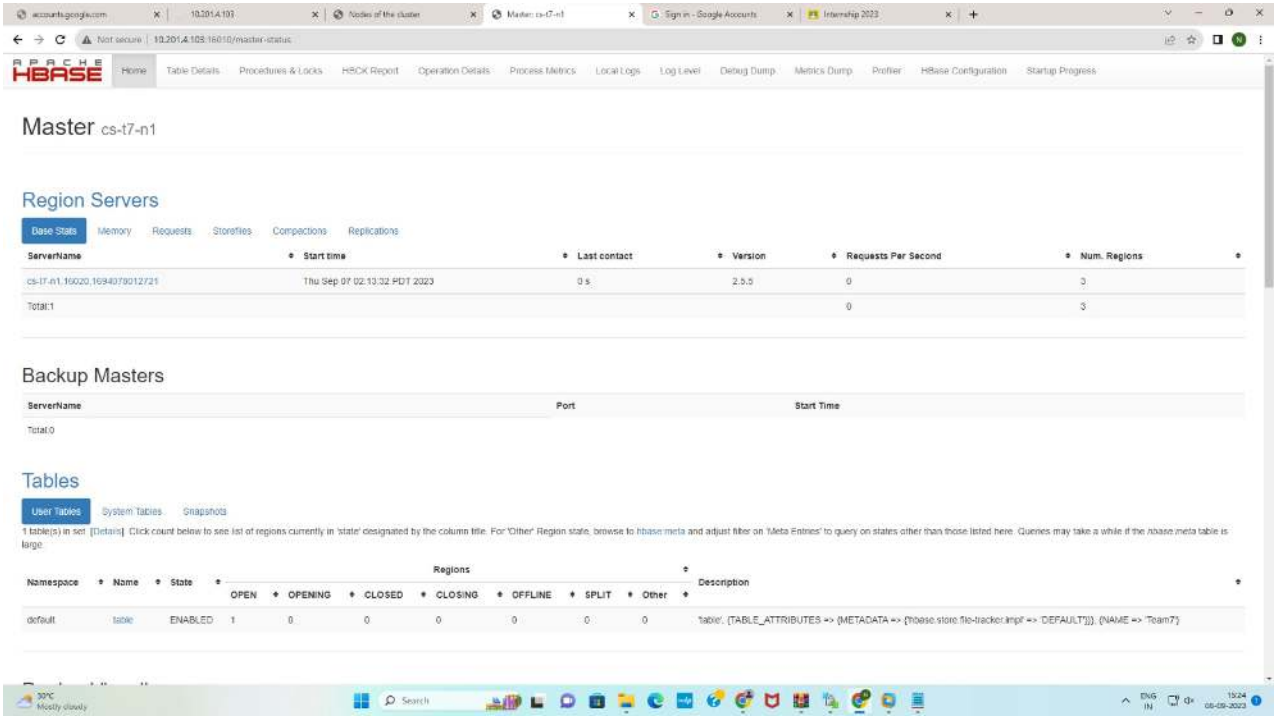

Fig 6.6: Apache HBase

The Figure 6.6 shows Apache HBase

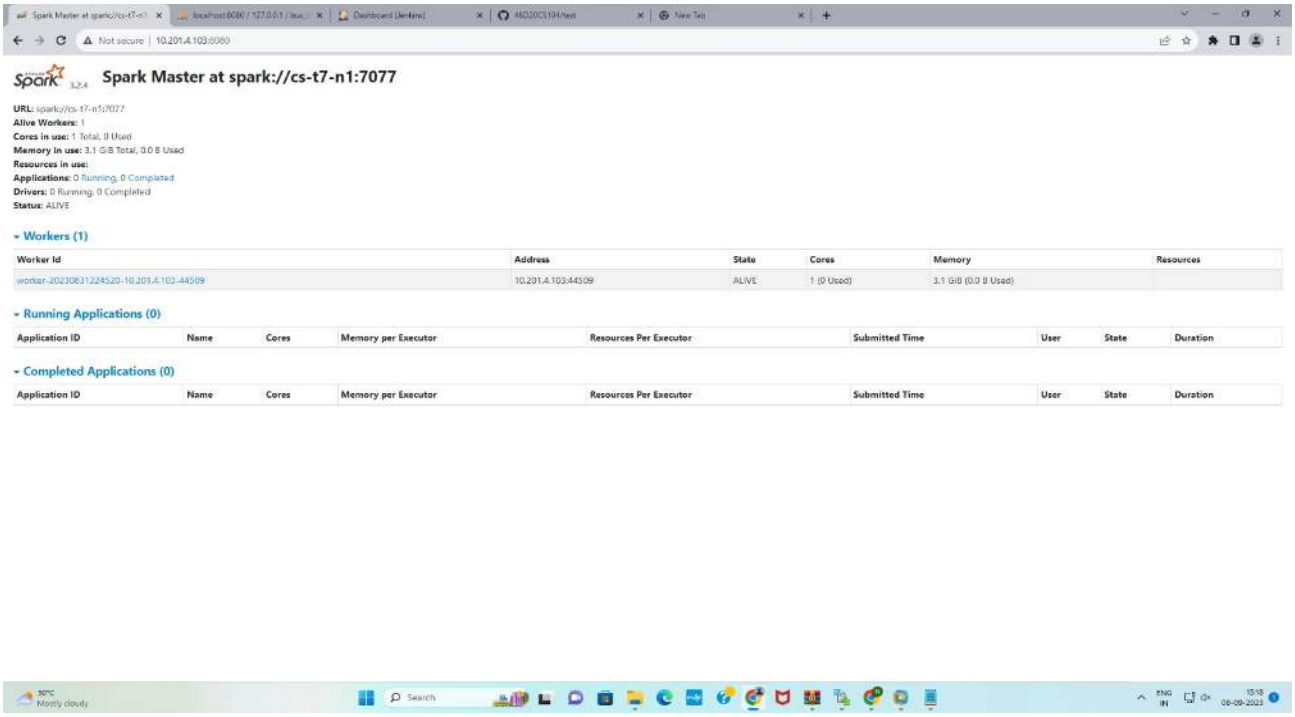

Fig 6.7: Spark master at spark

The Figure 6.7 shows Spark master at spark

Fig 6.8: Apache and MySQL server

The Figure 6.8 showing initialization of apache and mysql server using xampp.

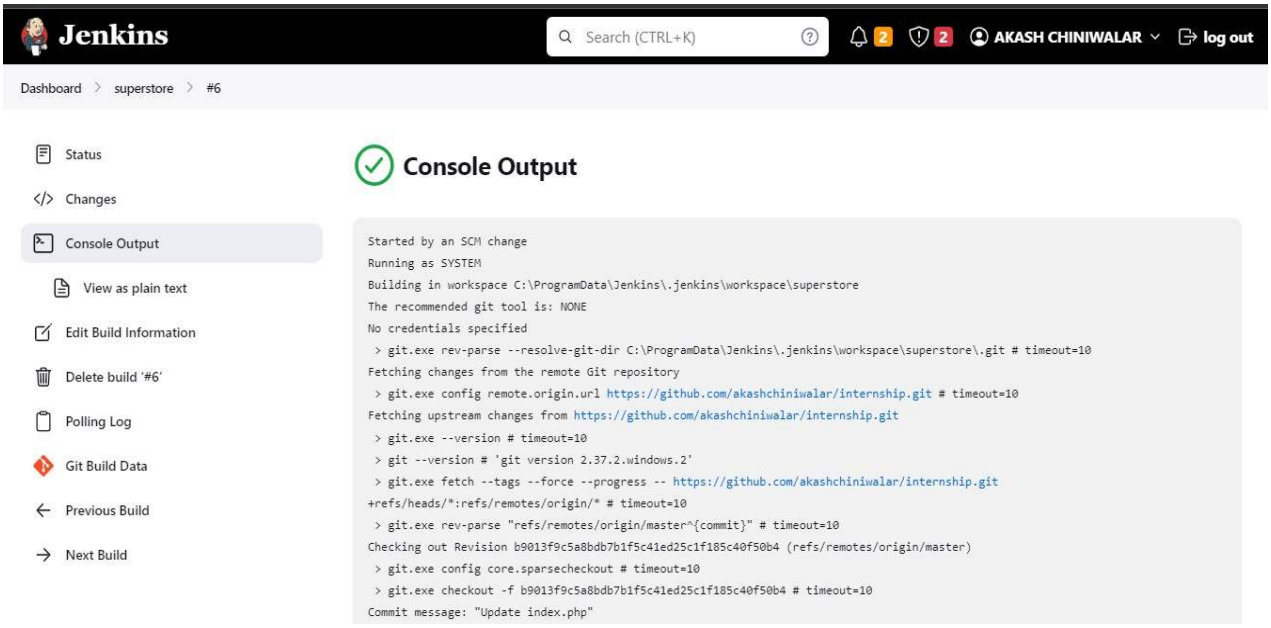

Fig 6.9: Jenkins Bus Booking Management job

The Figure 6.9 showing the output for Jenkins job to pull code from github.

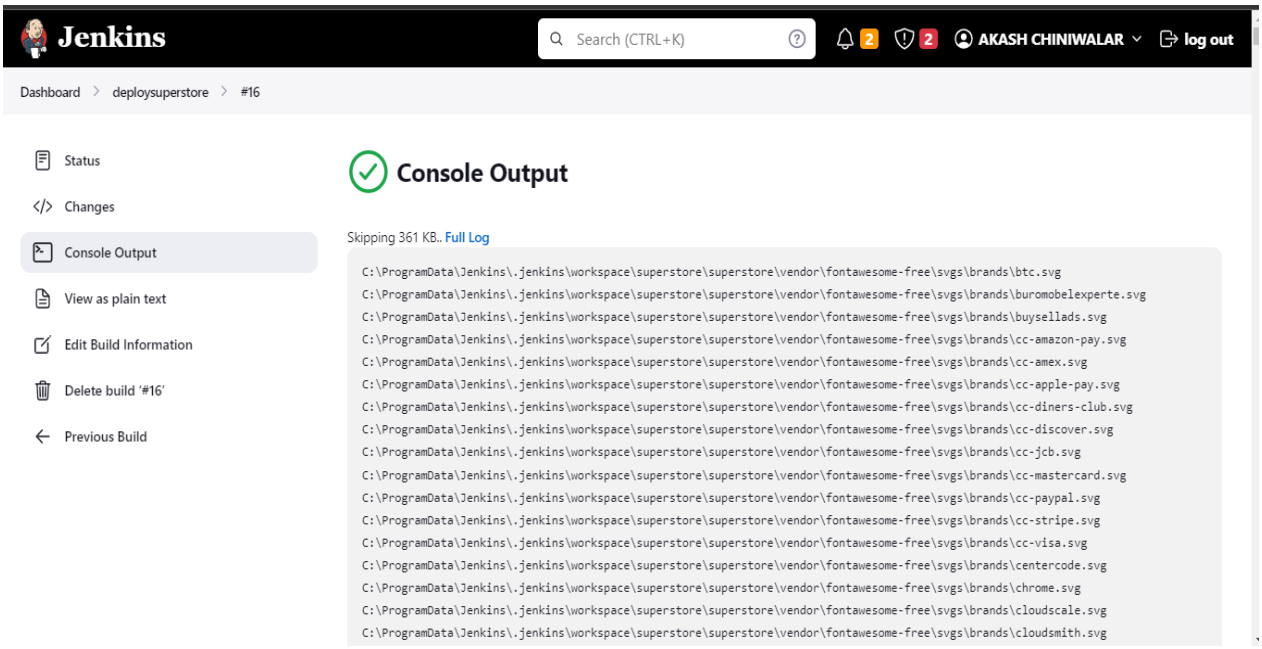

Fig 6.10: Jenkins Bus Booking Management Deploy job

The figure 6.10 shows the output for Jenkins job to put code into xampp-apache server.

CONCLUSION

The activities on Agile methodology, DevOps concepts and cloud computing have been learnt and demonstrated. During this internship period we worked in a specific team that works to design, create, and deliver secure software quickly is known as a DevOps team. With automation, teamwork, quick feedback, and iterative improvement, DevOps principles allow software development operations teams to expedite deliveries. Stemming from an Agile approach to software development, a DevOps process expands on the cross-functional approach of building and shipping applications in a faster and more iterative manner. In adopting a DevOps development process, one can make a decision to improve the flow and value delivery of their application by encouraging a more collaborative environment at all stages of the development cycle. By considering the case study of a DBMS Project the Agile process, DevOps workflow have been implemented. The detailed understanding of CI/CD has been made. The working of cloud concepts has given a deep insight from AWS service perspective. By considering a case study of the Bus Booking Management project, the Agile process, DevOps workflow have been implemented. An online booking system simplifies the booking process for you and your customers by automating such operations as getting customer details, updating booking information, payment, scheduling, and many others. It helps to retain customers on your website since they can see available options and book the one they need without switching between numerous pages and services and without the need to make phone calls. So, if you want to take advantage of the modern way of doing travel and hospitality business, integrating an online booking system with your website is a must..

REFERENCES

Links:

https://www.jenkins.io/doc/book/installing/

https://docs.cypress.io/guides/end-to-end-testing/writing-your-first-end-to-end-test

Text books:

- DevOps for Beginners – Joseph Joyner
- Effective DevOps with AWS: Implement continuous delivery and integration in the AWS environment, 2nd Edition – Yogesh Raheja
- Modern DevOps Practices: Implement and secure DevOps in the public cloud with cutting-edge tools, tips, tricks, and techniques – Gaurav Agarwal.