MAJOR PROJECT REPORT ON

Continuous Integration Pipeline Implementation for Tech11Software

Submitted By

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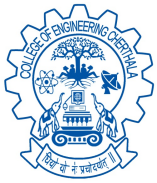

MARCH 2017

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In partial fulfilment of the requirements for the award of the degree
of
Bachelor of Technology
in
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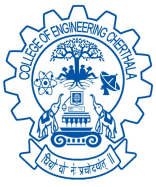

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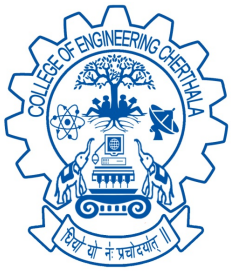

C E R T I F I C A T E

This is to certify that, the major project report submitted by

Name: Date:08/03/2017

Reg.No:

On ***Continuous Integration Pipeline Implementation for Tech11Software*** in partial fulfillment of the requirements for the award of the degree, **B. Tech. Computer Science & Engineering** of **Cochin University of Science & Technology**.

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ABSTRACT

Software development, as we know it today, is a demanding area of business with it's fast-changing customer requirements, pressures of an ever shorter time to-market, and unpredictability of market. With the shift towards modern continuous deployment pipelines, releasing new software versions early and often has become a concrete option also for an ever growing number of practitioners.

Continuous delivery is a software development practice where new features are made available to end users as soon as they have been implemented and tested. In such a setting, a key technical piece of infrastructure is the development pipeline that consists of various tools and databases, where features are made available from development to deployment and then further to use.

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Chapter 1

INTRODUCTION

Continuous integration is the practice where members of a development team integrate their work frequently. Usually each of them integrates at least daily, which leads to multiple integrations per day. To detect errors, each integration is verified by an automated build and test. This approach is generally found to lead to a significant reduction of integration problems, which in turn allows teams to develop cohesive software even in a limited time frame.

1.1 PURPOSE

The objective of the project is to put in place a Continuous Integration framework for product development activities of Tech11 Softwares. This would enable the Tech11 team to rapidly bring a product change or feature to production gaining market advantage.

This activities of this project will involve accessing different CI integration approaches and solutions available, identify the feasibility of those solution by doing POCs and demos, fine tune the final solution and set up the CI infrastructures, educate the developers on CI culture.

1.2 PRODUCT SCOPE

The scope of the system is to help software developers to ensure new features are made available as soon as the program has been implemented and tested. This product also helps in reducing the time needed to develop a software and also acts a guideline for future software developments

Chapter 2

OVERALL DESCRIPTION

2.1 PRODUCT PERSPECTIVE

Continuous Integration is based on continuous performance of acts of integration of source code, testing, building and deployment in response to each change to the source code of the project submitted by the developer and for the use of tools for support of the development and testing by compliance with the established procedure automatically. The proposed system directs the user (developers) for time and cost effective production and solves majority of the Integration hell problem.

Integration Hell refers to the point in production when members on a delivery team integrate their individual code. In traditional software development environments, this integration process is rarely smooth and seamless, instead resulting in hours or perhaps days of fixing the code so that it can finally integrate. Continuous Integration (CI) aims to avoid this completely by enabling and encouraging team members to integrate frequently (e.g., hourly, or at least daily).

2.1.1 Proposed System

The Proposed system is to help software developers to ensure new features are made available as soon as the program has been implemented and tested. This product also helps in reducing the time needed to develop a software and also acts a guideline for future software developments.

2.2 SOLUTION FUNCTION

Continuous integration the practice of frequently integrating one's new or changed code with the existing code repository. Integration should occur frequently enough that no intervening window remains between commit and build, and such that no errors can arise without developers noticing them and correcting them immediately. Normal practice is to trigger these builds by every commit to a repository, rather than a periodically scheduled build. The practicalities of doing this in a multi-developer environment of rapid commits are such that it is usual to trigger a short time after each commit, then to start a build when either this timer expires, or after a rather longer interval since the last build. Many automated tools offer this scheduling automatically.

- **Version Control**

  This practice advocates the use of a revision control system for the project's source code. All artifacts required to build the project should be placed in the repository. In this practice and in the revision control community, the convention is that the system should be buildable from a fresh checkout and not require additional dependencies. Extreme Programming mentions that where branching is supported by tools, its use should be minimised. Instead, it is preferred for changes to be integrated rather than for multiple versions of the software to be maintained simultaneously.

- **Artifact Manager**

  While many developers have adopted Maven as a build tool, most have yet to understand the importance of maintaining a repository manager both to proxy remote repositories and to manage and distribute software artifacts. A repository stores two types of artifacts: releases and snapshots. Release repositories are for stable, static release artifacts and snapshot repositories are frequently updated repositories that store binary software artifacts from projects under constant development. While it is possible to create a repository which serves both release and snapshot artifacts, repositories are usually segmented into release or snapshot repositories serving different consumers and maintaining differ-

ent standards and procedures for deploying artifacts. Much like the difference between a production network and a staging network, a release repository is considered a production network and a snapshot repository is more like a development or a testing network. While there is a higher level of procedure and ceremony associated with deploying to a release repository. Snapshot artifacts can be deployed and changed frequently without regard for stability and repeatability concerns.

- **Continuous Integration Handler**

  While there are many tools, we focus on one of the most popular, Jenkins CI. This is one of the more popular (open source) tools available. Jenkins CI (the continuation of a product formerly called Hudson) allows continuous integration builds in the following ways:

  - It integrates with popular build tools (ant, maven, make) so that it can run the appropriate build scripts to compile, test and package within an environment that closely matches what will be the production environment
  - It integrates with version control tools, including Subversion, so that different projects can be set up depending on projection location within the trunk.
  - It can be configured to trigger builds automatically by time and/or changeset. (i.e., if a new changeset is detected in the Subversion repository for the project, a new build is triggered.)
  - It reports on build status. If the build is broken, it can be configured to alert individuals by email.

- **Test Automator**

  In software testing, test automation is the use of special software (separate from the software being tested) to control the execution of tests and the comparison of actual outcomes with predicted outcomes. Test automation can automate some repetitive but necessary tasks in a formalized testing process already in place, or perform additional testing that would be difficult to do manually. Test automation is critical for continuous

delivery and continuous testing. There are many approaches to test automation, however below are the general approaches used widely:

- Graphical user interface testing. A testing framework that generates user interface events such as keystrokes and mouse clicks, and observes the changes that result in the user interface, to validate that the observable behavior of the program is correct.
- API driven testing. A testing framework that uses a programming interface to the application to validate the behaviour under test. Typically API driven testing bypasses application user interface altogether. It can also be testing public (usually) interfaces to classes, modules or libraries are tested with a variety of input arguments to validate that the results that are returned are correct.

- **Continouos Deployment**

  Continuous deployment is the next step of continuous delivery: Every change that passes the automated tests is deployed to production automatically. Continuous deployment should be the goal of most companies that are not constrained by regulatory or other requirements.

2.3 OPERATING ENVIRONMENT

The system is expected to be operated in Linux as well as in windows with the support of respective JRE (Java Runtime Environment). This system based project is completely platform independent. The most important requirement is the Internet connection. This tool is coded using JDK 1.6.

2.4 GANTT CHART

Gantt chart is a graphical representation of allocation of resources to the activities. Here our resource is time. A Gantt chart is a type of bar chart that illustrates a project schedule. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements

of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Some Gantt charts also show the dependency (i.e., precedence network) relationships between activities.

Gantt charts have become a common technique for representing the phases and activities of a project work breakdown structure (WBS), so they can be understood by a wide audience. Although a Gantt chart is useful and valuable for small projects that fit on a single sheet or screen, they can become quite unwieldy for projects with more than about 30 activities. Larger Gantt charts may not be suitable for most computer displays. A related criticism is that Gantt charts communicate relatively little information per unit area of display. That is, projects are often considerably more complex than can be communicated effectively with a Gantt chart. Although project management software can show schedule dependencies as lines between activities, displaying a large number of dependencies may result in a cluttered or unreadable chart.

Because the horizontal bars of a Gantt chart have a fixed height, they can misrepresent the time-phased workload (resource requirements) of a project, which may cause confusion especially in large projects. A related criticism is that all activities of a Gantt chart show planned workload as constant. In practice, many activities (especially summary elements) have front loaded or back-loaded work plans, so a Gantt chart with percent-complete shading actually may lead to mis-communications on the true schedule performance status.

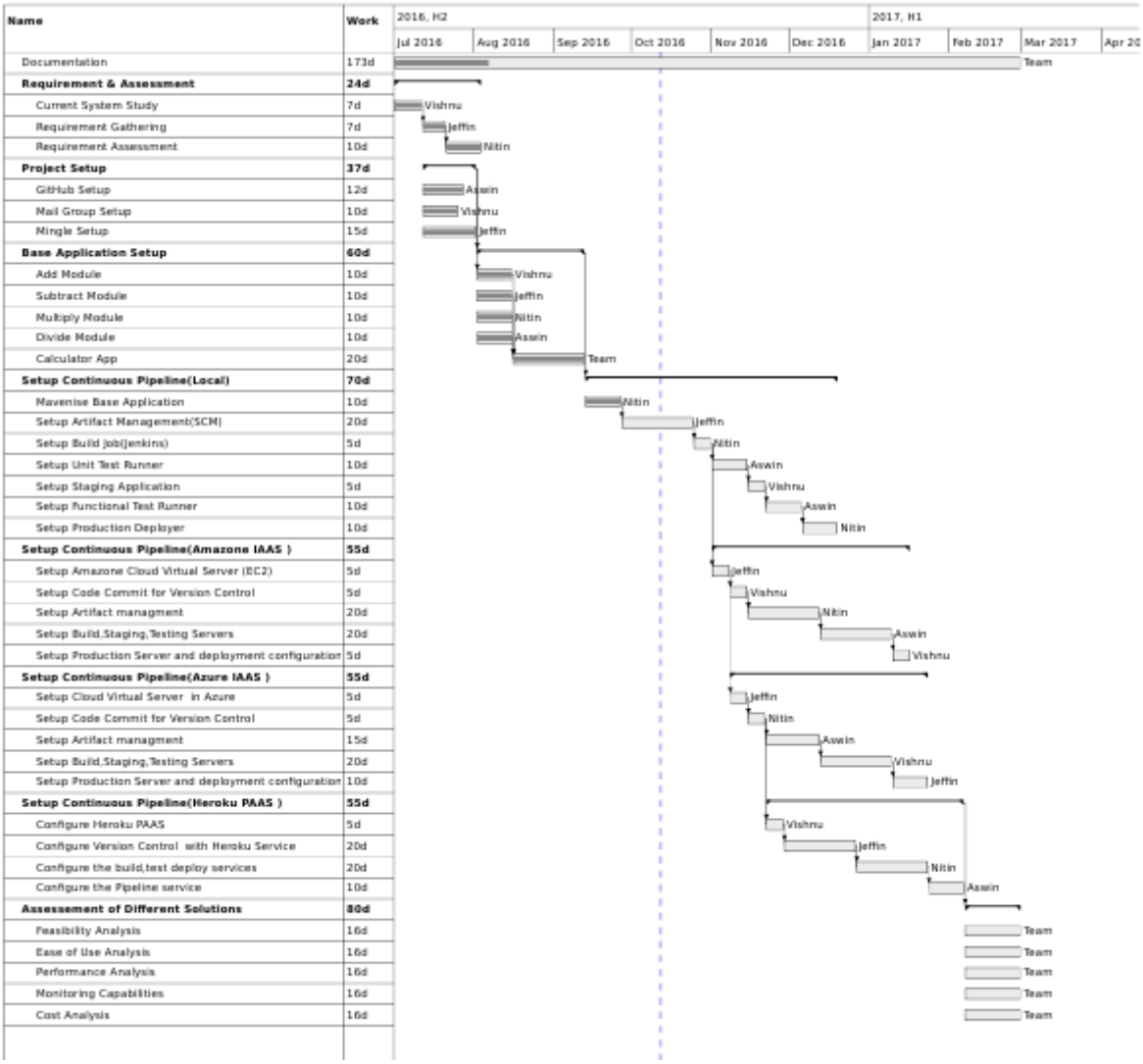

Figure 2.1: Gantt chart

2.5 COST ESTIMATION

Basic COCOMO computes software development effort (and cost) as a function of program size. Program size is expressed in estimated thousands of lines of code (KLOC).

COCOMO applies to three classes of software projects:

- Organic projects - small teams with good experience working with less than rigid requirements.
- Semi-detached - medium teams with mixed experience working with a mix of rigid and less than rigid requirements
- Embedded projects - developed within a set of tight constraints (hardware, software, operational ...)

The basic COCOMO equations take the form:
Effort Applied = a(KLOC)ˆb [person-months]
Development Time = c(Effort Applied)ˆd [months]
People required = Effort Applied / Development Time [count]
The coefficients a, b, c and d are given in the following table.

Software project	a	b	c	d
Organic	2.4	1.05	2.5	0.38
Semi-detached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Figure 2.2: COCOMO Model Coefficients

2.6 EXTERNAL INTERFACE REQUIREMENTS

This system based software can be used in any operating system such as Microsoft Windows, Linux or any kind of user application interface, since it is platform independent.

2.6.1 User Interface

Interface hardware shall be encapsulated in a set of classes that isolate hardware specifications from the rest of the software. In particular, interfaces for specific hardware boards shall be implemented as derived classes of an abstract class.

2.6.2 Network Requirements

- Systems need minimum speed internet connection.

2.6.3 Software Requirements

- Git
- Jenkins
- Checkstyle
- Findbugs
- Heroku

Chapter 3

SYSTEM DESIGN

3.1 MODULES

3.1.1 Version Control

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3.2 DATA FLOW DIAGRAMS

3.2.1 Purpose

The data ow diagram(DFD)is used for classifying system requirements to major transformation that will be come programs in system design. This is starting point of the design phase that functionally decomposes the required specifications down to the lower level of details. It consists of a series of bubbles joint together by lines. Bubbles: Represent the data transformations. Lines: Represent the logic ow of data. Data can trigger events and can be processed to useful information. Systems analysis recognizes the central goal of data in organizations. This data flow analysis tells a great deal about how organization objectives are accomplished.

3.2.2 Description

- Process : Describes how each input data is converted to output data.
- Data Store : Describes the repositories of data in a system.
- Data Flow : Describes the data owing between Processes, Data stores, Entities.
- Entity : An external entity causing the origin of data.

Figure 3.1: Notations used in DFD

3.2.3 Level 0 DFD

Level 0 DFD gives a simple information about the overall structure.

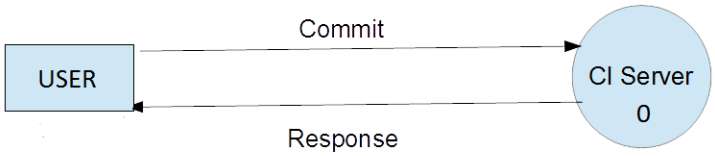

Figure 3.2: Level 0 DFD

3.2.4 Level 1 DFD

The level 1 DFD gives a basic structure of the project indicating the five modules needed to execute the project.

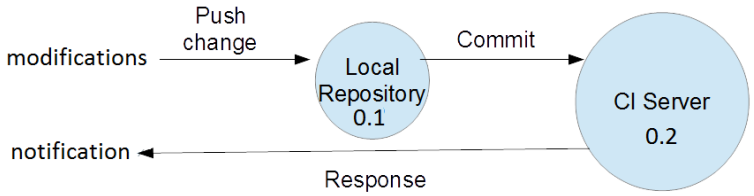

Figure 3.3: Level 1.1 DFD

3.2.5 Level 2 DFD

The level 2 DFD gives a much more advanced idea about the execution. Each of these sections perform unique functions and these are combined together to yield the final product.

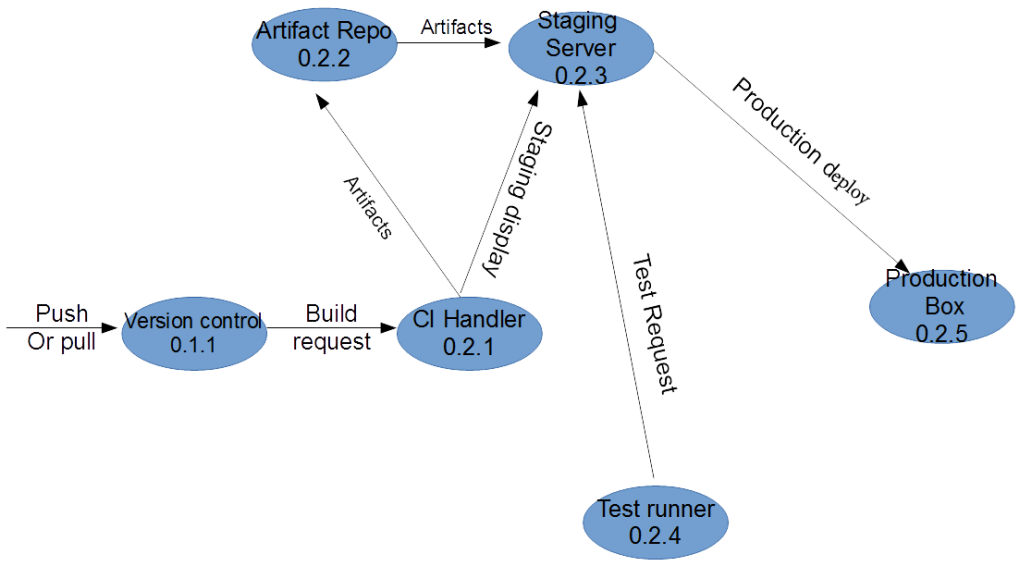

Figure 3.4: Level 2.1.1 DFD

3.3 FLOW DIAGRAM

Flow diagram is a collective term for a diagram representing a flow or set of dynamic relationships in a system. The term flow diagram is also used as a synonym for flowchart, and sometimes as a counterpart of the flowchart.

Flow diagrams are used to structure and order a complex system, or to reveal the underlying structure of the elements and their interaction.

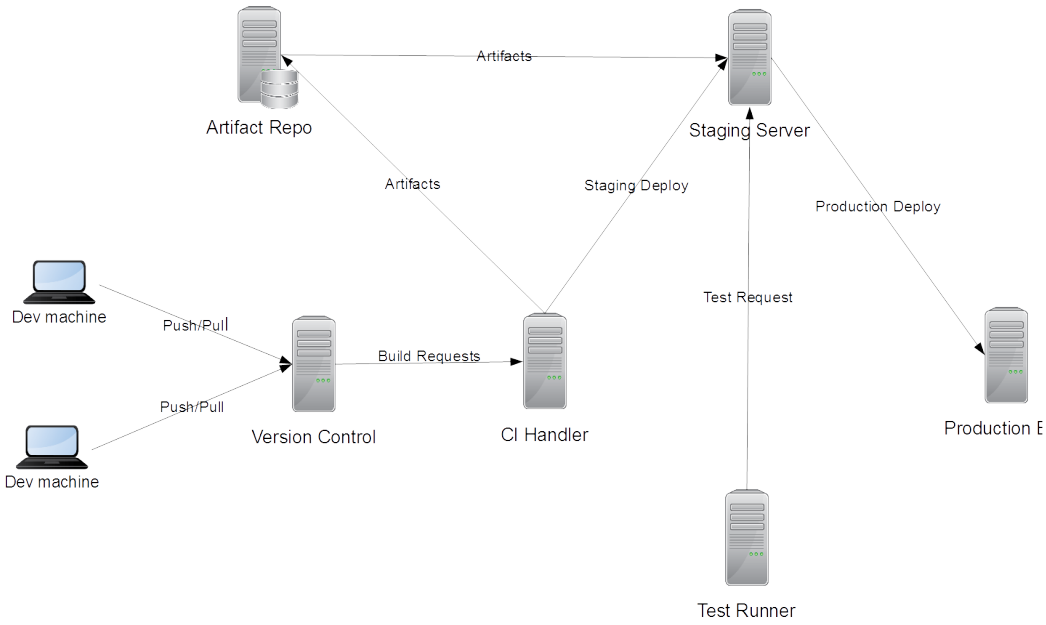

Figure 3.5: Flow diagram

3.4 C.I PIPELINE DIAGRAM

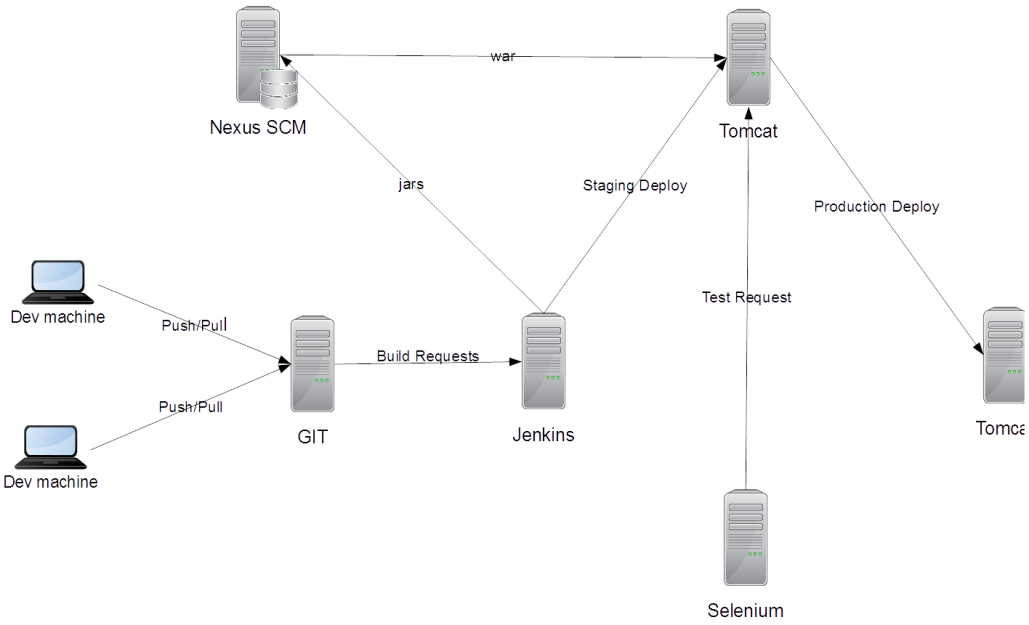

Figure 3.6: C.I Pipeline

3.5 SEQUENCE DIAGRAM

A Sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

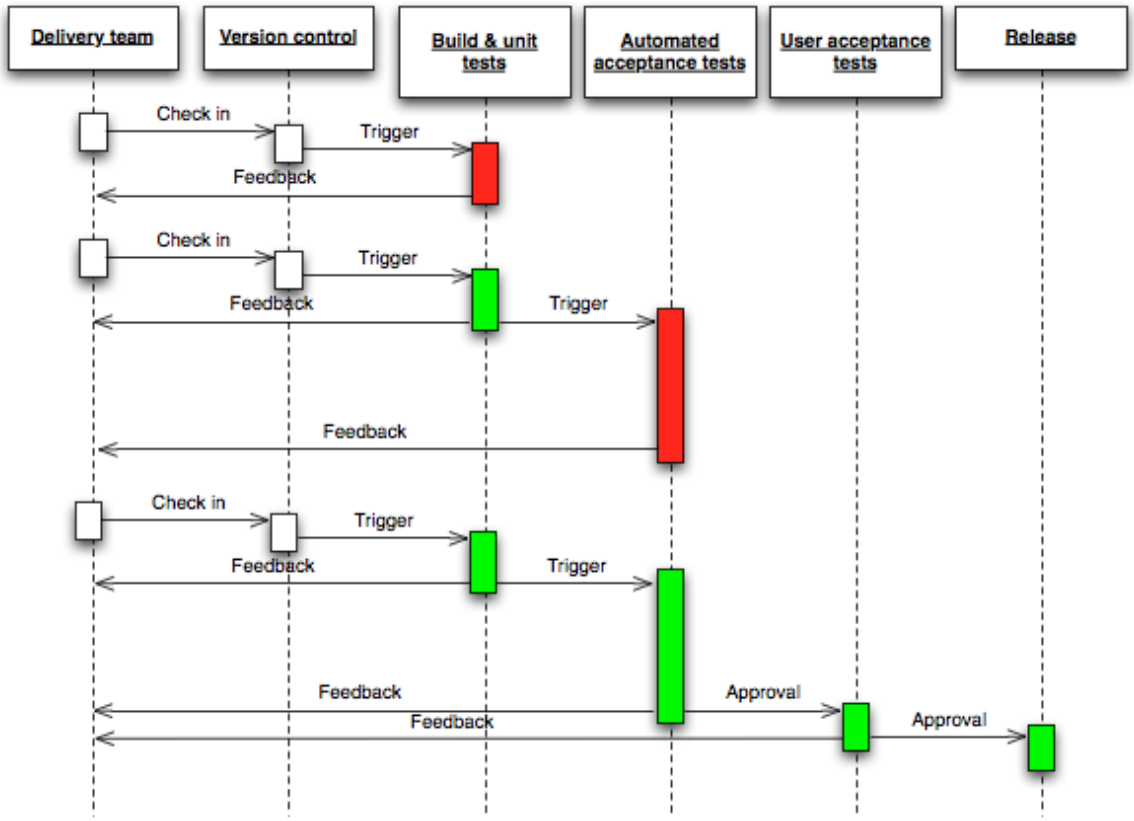

Figure 3.7: sequence

The input to the pipeline is a particular revision in version control. Every change creates a build that will, rather like some mythical hero, pass through a sequence of tests of, and challenges to, its viability as a production release. This process of a sequence of test stages, each evaluating the build from a different perspective, is begun with every commit to the version control system, in the same way as the initiation of a continuous integration process.

As the build passes each test of its fitness, confidence in it increases. Therefore, the resources that we are willing to expend on it increase, which means that the environments the build passes through become progressively more production-like. The objective is to eliminate unfit release candidates as early in the process as we can and get feedback on the root cause of failure to the team as rapidly as possible. To this end, any build that fails a stage in the process will not generally be promoted to the next.

Chapter 4

IMPLEMENTATION

Implementation is the stage in the project where the theoretical design is turned into a working system and is giving confidence about the new system to users that it will work effectively. It involves careful planning, investigation of the current system and it constraints on implementation, design of achieve the changeover, an evolution of change over method.

4.1 LANGUAGES AND PLATFORM USED

Continuous integration (CI) is an integral part of an agile software development setup. Sprint after sprint, teams strive to ”not break the build” while delivering incremental features. But when developers focus completely on adding features, code errors can sometimes creep in and render the software unusable. To stop such errors from being integrated into the software configuration management (SCM), a CI server is the gatekeeper that helps keep a tab on code quality. Even if the code is integrated to SCM, a CI server can quickly tell you what went wrong

The platforms and softwares that are used in the continuous integration pipeline implementation is mentioned below

4.1.1 GitHub

GitHub is a web-based Git or version control repository and Internet hosting service. It offers all of the distributed version control and source code management (SCM) functionality

of Git as well as adding its own features. It provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project.

GitHub offers both plans for private and free repositories on the same account which are commonly used to host open-source software projects.

4.1.2 Amazon Web Services (AWS)

Amazon Web Services (AWS), a subsidiary of Amazon.com, offers a suite of cloud-computing services that make up an on-demand computing platform. These services operate from 16 geographical regions across the world. They include Amazon Elastic Compute Cloud, also known as ”EC2”, and Amazon Simple Storage Service, also known as ”S3”. As of 2016 AWS has more than 70 services, spanning a wide range, including compute, storage, networking, database, analytics, application services, deployment, management, mobile, developer tools and tools for the Internet of things. Amazon markets AWS as a service to provide large computing capacity quicker and cheaper than a client company building an actual physical server farm.

4.1.3 Jenkins

Jenkins helps to automate the non-human part of the whole software development process, with now common things like continuous integration, but by further empowering teams to implement the technical part of a Continuous Delivery. It is a server-based system running in a servlet container such as Apache Tomcat. It supports SCM tools including AccuRev, CVS, Subversion, Git, Mercurial, Perforce, Clearcase and RTC, and can execute Apache Ant, Apache Maven and sbt based projects as well as arbitrary shell scripts and Windows batch commands. The creator of Jenkins is Kohsuke Kawaguchi. Released under the MIT License, Jenkins is free software.

Builds can be triggered by various means, for example by commit in a version control system, by scheduling via a cron-like mechanism and by requesting a specific build URL. It can also be triggered after the other builds in the queue have completed.

Jenkins functionality can be extended with plugins.

4.1.4 Apache Maven

Maven is a build automation tool used primarily for Java projects. The word maven means ”accumulator of knowledge” in Yiddish.

Maven addresses two aspects of building software: first, it describes how software is built, and second, it describes its dependencies. Contrary to preceding tools like Apache Ant, it uses conventions for the build procedure, and only exceptions need to be written down. An XML file describes the software project being built, its dependencies on other external modules and components, the build order, directories, and required plug-ins. It comes with pre-defined targets for performing certain well-defined tasks such as compilation of code and its packaging.

Maven dynamically downloads Java libraries and Maven plug-ins from one or more repositories such as the Maven 2 Central Repository, and stores them in a local cache.This local cache of downloaded artifacts can also be updated with artifacts created by local projects. Public repositories can also be updated.

Maven can also be used to build and manage projects written in C#, Ruby, Scala, and other languages. The Maven project is hosted by the Apache Software Foundation, where it was formerly part of the Jakarta Project.

4.1.5 FindBugs

FindBugs is an open source static code analyser created by Bill Pugh and David Hovemeyer which detects possible bugs in Java programs. Potential errors are classified in four ranks: (i) scariest, (ii) scary, (iii) troubling and (iv) of concern. This is a hint to the developer about their possible impact or severity.FindBugs operates on Java bytecode, rather than source code. The software is distributed as a stand-alone GUI application

4.1.6 Jacoco

Jacoco is a free code coverage library for Java. I use it because it is very simple to add to all types of build including ANT and Maven, and it is also very simple to add to Java containers or a standalone JVM.

4.1.7 Apache Tomcat

Apache Tomcat, often referred to as Tomcat Server, is an open-source Java Servlet Container developed by the Apache Software Foundation (ASF). Tomcat implements several Java EE specifications including Java Servlet, JavaServer Pages (JSP), Java EL, and WebSocket, and provides a ”pure Java” HTTP web server environment in which Java code can run.

Tomcat is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation, released under the Apache License 2.0 license, and is open-source software.

4.1.8 Heroku

Heroku is a cloud Platform-as-a-Service (PaaS) supporting several programming languages that is used as a web application deployment model. Heroku, one of the first cloud platforms, has been in development since June 2007, when it supported only the Ruby programming language, but now supports Java, Node.js, Scala, Clojure, Python, PHP, and Go. For this reason, Heroku is said to be a polyglot platform as it lets the developer build, run and scale applications in a similar manner across all the languages. Heroku was acquired by Salesforce.com in 2010.

4.1.9 New Relic APM

Lew Cirne founded New Relic in 2008 with a revolutionary vision: To deliver application performance monitoring (APM) as a purely SaaS product. By embracing the power and accessibility of the cloud, New Relic grew rapidly and quickly became an integral tool for developers, IT ops teams, and executives around the world.

4.1.10 Node.js

Node.js is an open-source, cross-platform JavaScript runtime environment for developing a diverse variety of server tools and applications. Although Node.js is not a JavaScript framework,many of its basic modules are written in JavaScript, and developers can write new modules in JavaScript. The runtime environment interprets JavaScript using Google's V8 JavaScript engine.

Node.js has an event-driven architecture capable of asynchronous I/O. These design choices aim to optimize throughput and scalability in Web applications with many input/output operations, as well as for real-time Web applications.

4.1.11 AngularJS

Node.js is an open-source, cross-platform JavaScript runtime environment for developing a diverse variety of server tools and applications. Although Node.js is not a JavaScript framework,many of its basic modules are written in JavaScript, and developers can write new modules in JavaScript. The runtime environment interprets JavaScript using Google's V8 JavaScript engine.

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4.2 SCREEN SHOTS

4.2.1 GitHub

- A developer can change the program files locally and commit the changes to the remote GitHub repository using this GitHub desktop application. The changes will be automatically send to the CI server.

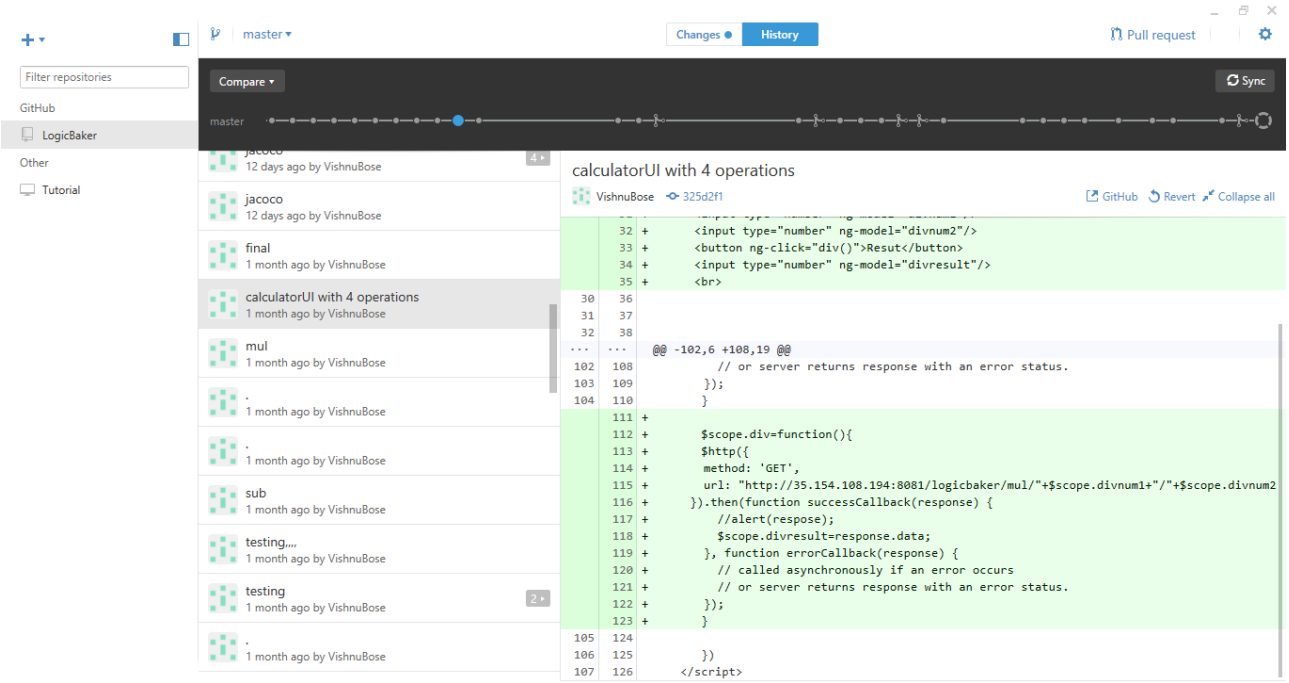

Figure 4.1: GitHub GUI in windows

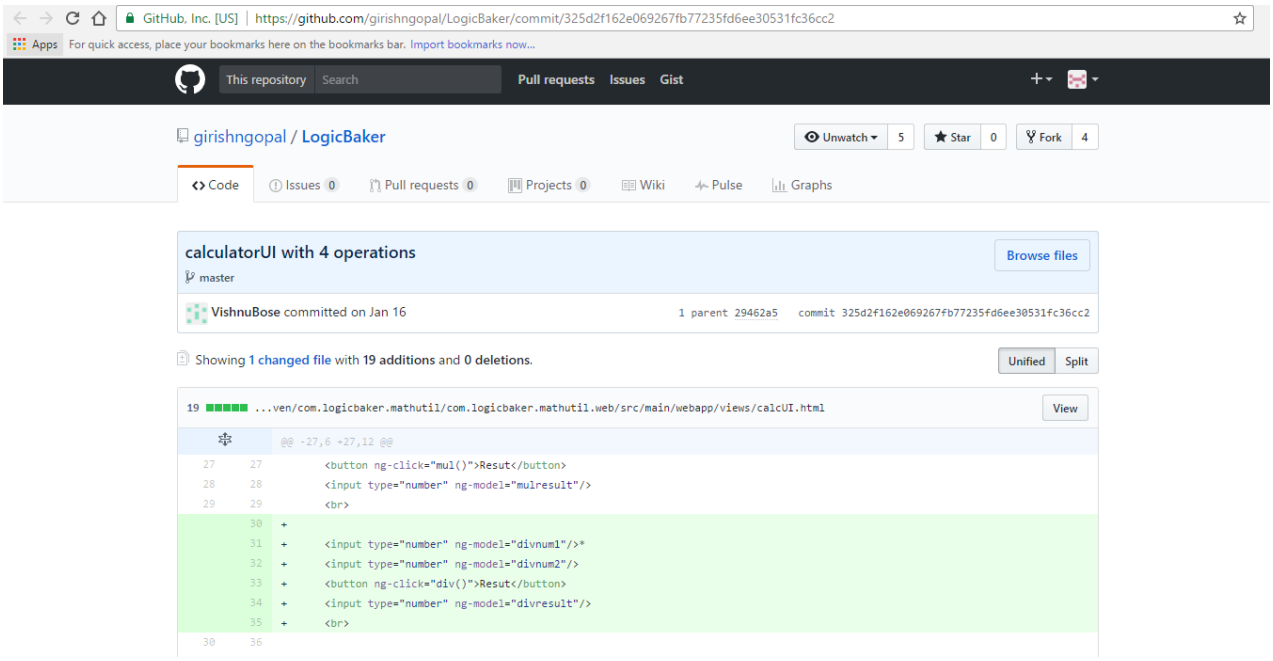

Figure 4.2: GitHub remote repository

4.2.2 Amazon Web Services (AWS)

- AWS is a IaaS (Infrastructure as a Service). Here Jenkins is Working on Ubuntu installed in aws

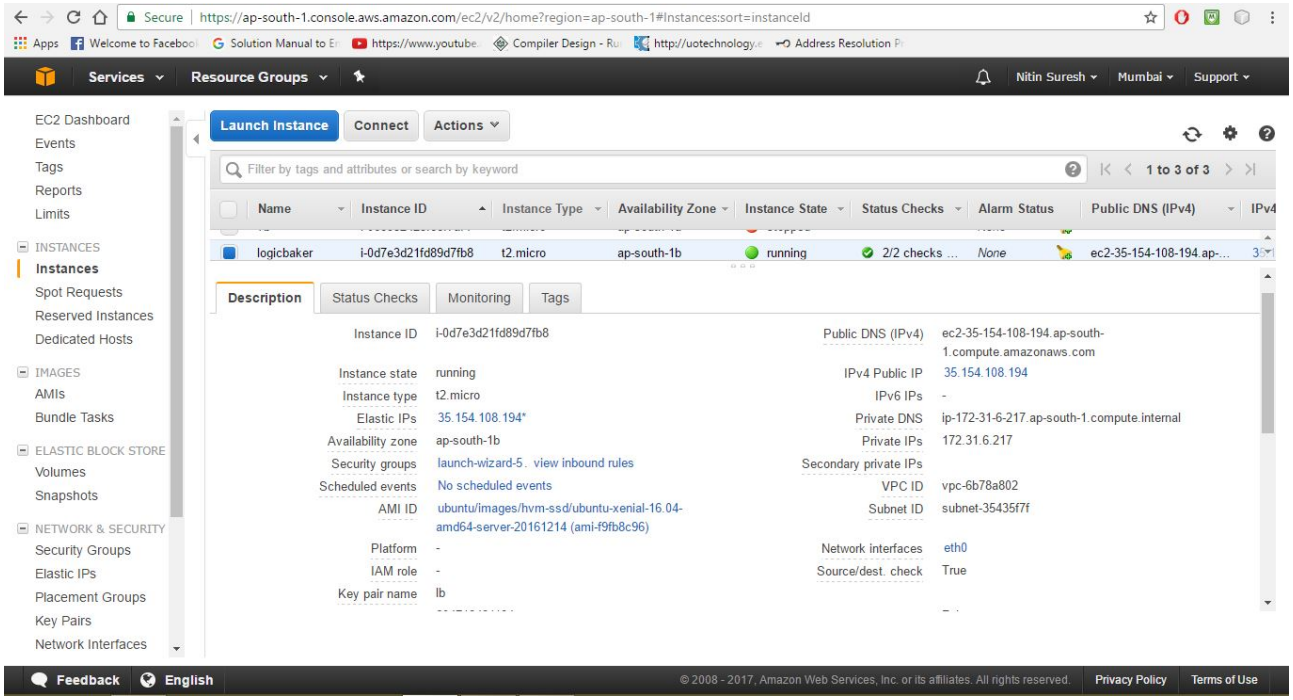

Figure 4.3: Amazon Web Services Dashboard

4.2.3 Jenkins

- Whenever a change occurred in the GitHub the change will be automatically push into the ci server ie, Jenkins.It is then builded and ready to deploy

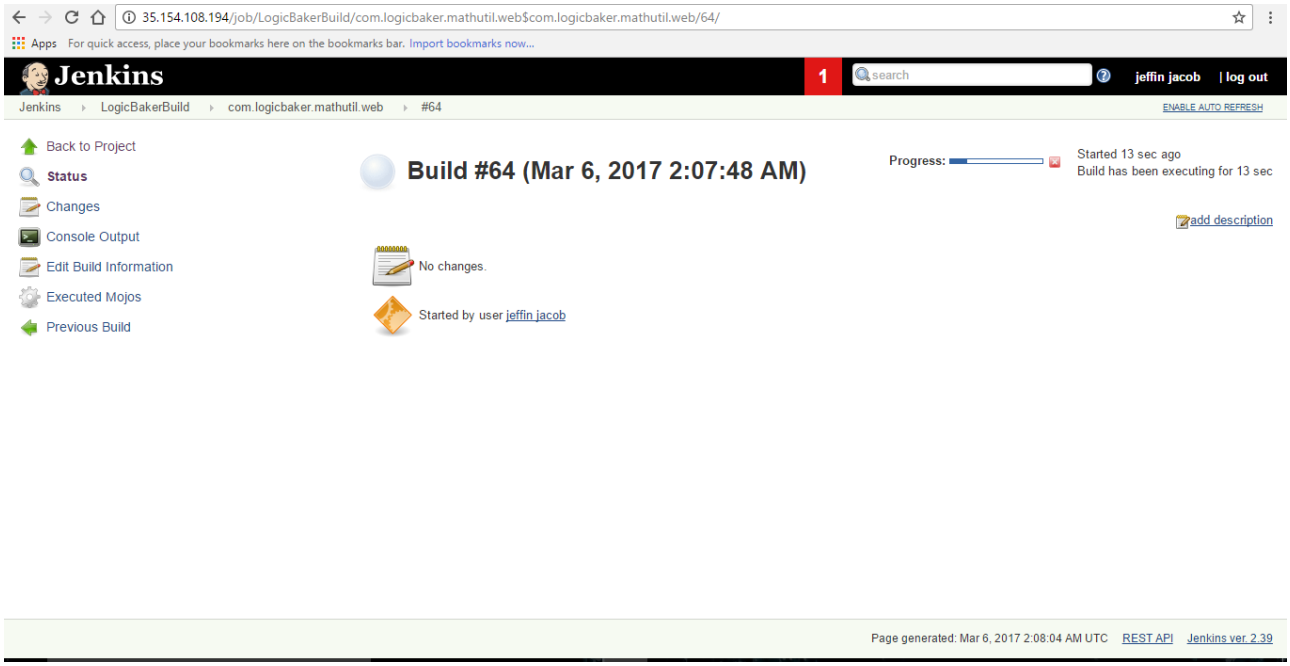

Figure 4.4: Jenkins dashboard building calculator app

- We can configure the deployment with FindBugs or Jacoco as per the requirement

4.2.4 Calculator app in Jenkins

- Calculator application deployed automatically by Jenkins

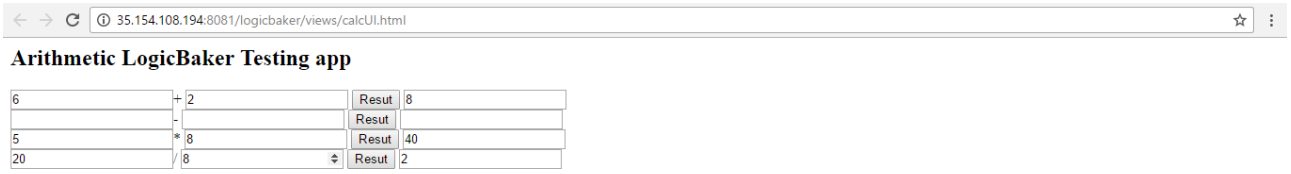

Figure 4.5: Calculator app in Jenkins

4.2.5 Heroku

- The same application is deployed using another pipeline Heroku. Heroku is a PaaS (Platform as a Service) here platforms for each language is available,complexity of an IaaS is reduced in Heroku

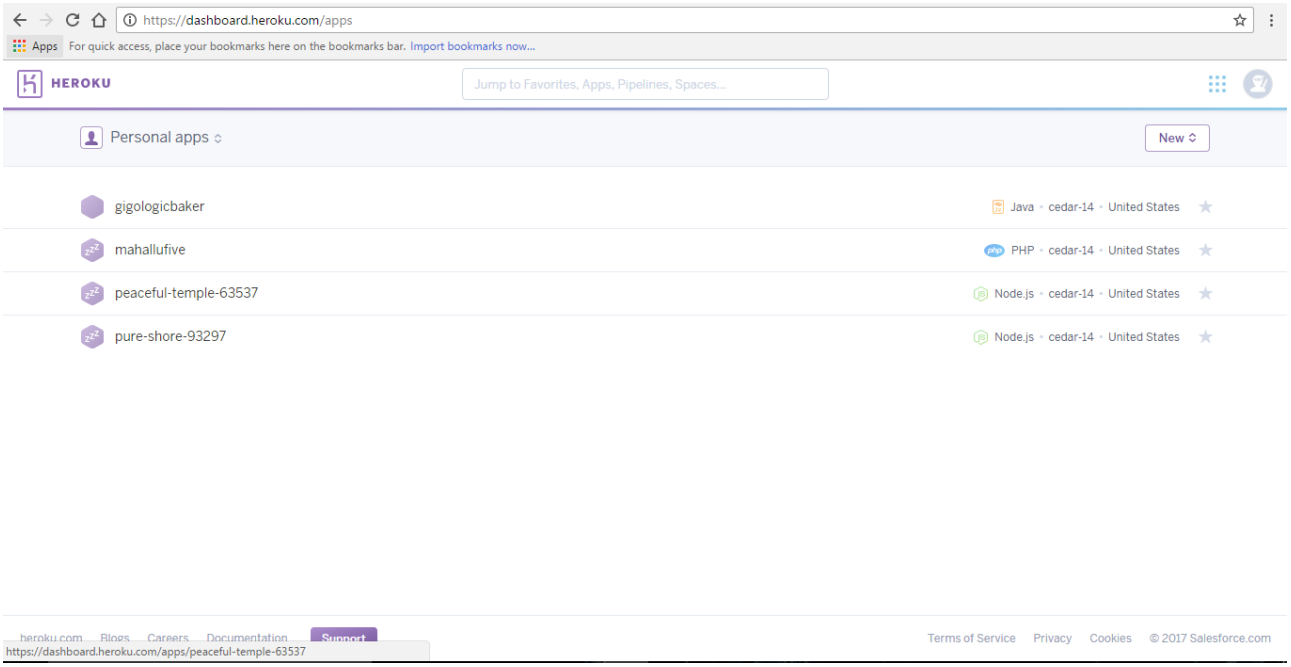

Figure 4.6: Heroku Dashboard

4.2.6 Calculator app in Heroku

- Calculator application deployed automatically by Heroku

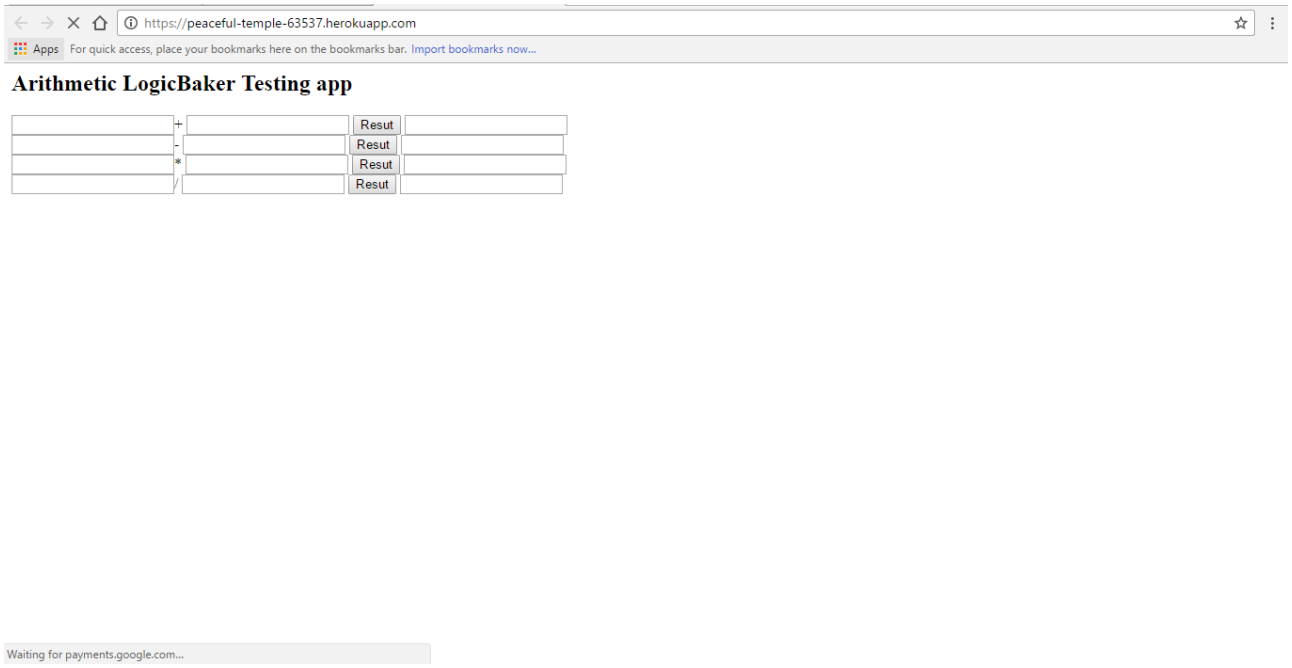

Figure 4.7: Calculator app in Heroku

4.2.7 New Relic Monitoring

- The deployed app can be monitored using the new Relic APM.

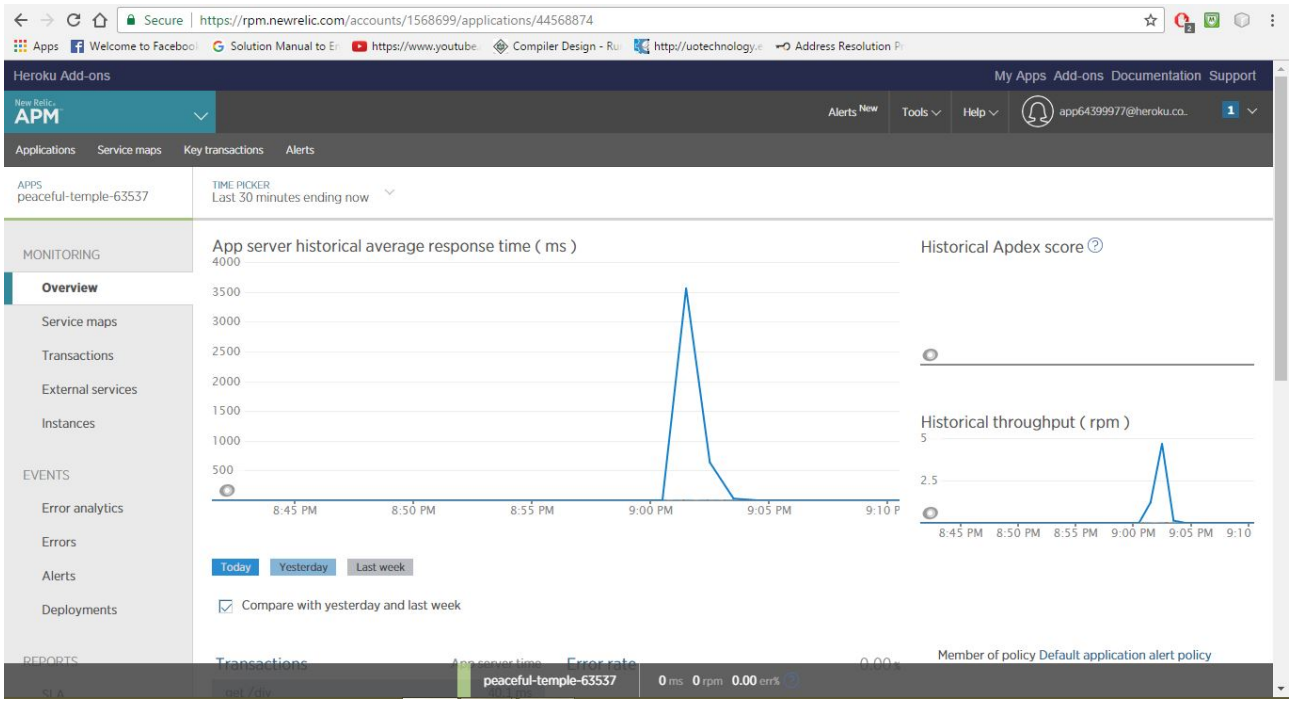

Figure 4.8: New Relic APM monitoring

Chapter 5

TESTING

When a system is developed, it is hoped that it performs properly. In practice, however some errors always occur. The main purpose of testing an information system is to find the error and correct them. A successful test is one that finds an error. System testing is a critical aspect of Software Quality Assurance and represents the ultimate review of specification, design and coding. Testing is the process of executing a program with the intent of finding an as yet undiscovered error. Nothing is complete without testing. Testing is vital to the success of the system.

The main objectives of the system testing are:

- To ensure during operation the system will perform as per specification.
- To make sure that the system meets user requirements during operation.
- To verify that the controls incorporated in the system function as intended.

If the testing conducted successfully, it will uncover errors in the software. As a secondary benefit, testing demonstrates that the software functions appear to be working according to specification and that performance requirements appear to have been satisfied.

The system Save Me is tested in such a way that almost all errors that may occur are found and corrected. The test process carried out in this system includes the following:

5.1 CODE TESTING

In code testing the logic of the developed system is tested. For this every module of the program is executed to find any error. To perform specification test, the examination of the specifications stating what the program should do and how it should perform under various conditions.This testing was done side by side with coding. This examines the logic of the program. In Java special test cases are used for testing the code. Every part of the program was tested in this phase.

5.2 UNIT TESTING

Unit testing is undertaken after a module has been coded and reviewed. Before carrying this testing, the unit test cases have to be designed and the test environment for the unit under test has to be developed. The various test cases are driver and stub modules. The main objective is to determine the correct working of the individual modules. During the testing each module is isolated from other modules and individually unit tested. It involves a precise definition of the test cases, testing criteria, and management of test cases. The modules that are tested include Android module, Server module and Sensing module.

5.3 INTEGRATION TESTING

System testing does not test the software as a whole, but rather than integration of each module in the system. The primary concern is the compatibility of individual modules. One has to find areas where modules have been designed with different specifications of data lengths, type and data element name. Testing and validation are the most important steps after the implementation of the developed system. The system testing is performed to ensure that there are no errors in the implemented system. The software must be executed several times in order to find out the errors in the different modules of the system. Each of the modules were integrated together and subjected to testing.

5.4 VALIDATION TESTING

Validation refers to the process of using the new software for the developed system in a live environment i.e., new software inside the organization, in order to find out the errors. The validation phase reveals the failures and the bugs in the developed system. It will come to know about the practical difficulties the system faces when operated in the true environment. Validation test was performed in the Login section. By testing the code of the implemented software, the logic of the program can be examined. A specification test is performed to check whether the specifications stating the program are performing under various conditions. Apart from these tests, there are some special tests conducted which are given below:

- Peak load test This determines whether the new system will handle the volume of activities when the system is at the peak of its processing demand. The test has revealed that the new system is capable of handling the demands at the peak time.
- Storage testing This determines the capacity of the new system to store transaction data on a disk or on other files. The proposed software has the required storage space available.
- Performance time testing This test determines the length of the time used by the system to process transaction data.

5.5 SYSTEM TESTING

After all units of a program have been integrated together and tested, system testing is taken up. It is same for both procedural and object oriented programming. System tests are designed to validate a fully developed system to assure that it meets its requirements. The system test cases can be classified into performance and functionality test cases. The functionality test cases are designed to check whether the software satisfies the functional requirements as documented in the SRS document. The performance tests on the other hand test the conformance of the system with non-functional requirements of the system.

5.6 OUTPUT TESTING

After the performance of unit testing, the next step is output testing. No system would be useful if it does not produce the required output in the specific format, thus output format on the screen is found to be correct when the format was designed in the system phase according to the user need.

The maintenance of software is the time period in which software product performs useful works. Maintenance activities involve making enhancement to software product, adapting product to new environment and correcting problems. It includes both the improvement of the system function.

It may involve the continuing involvement of a large proportion of computer department resources. The main task may be to adapt existing system in a changing environment. System should not be changed casually following informal requests. To avoid unauthorized amendments, all requests for change should be channeled to a person nominated by management. The nominated person has sufficient knowledge of the organizations computer based systems to be able to judge the relevance of each proposed change.

No annual costs for support or maintenance are required. Of course, the individual system components come with limited warranty from the manufacturers, eg:, the PC, mobile phones, etc.

There is no obligation to purchase or pay for any extended maintenance or support.

5.7 GOAL OF TESTING

Many users may use our project. So the project designer must test all the modules of the project. The main goal of our project is, whenever user uses our project, it should run without any error.

5.8 PASS/FAIL CRITERIA

The pass/fail criteria specifies a set of constraints whose satisfaction leads to approval or disapproval of the proper functioning of the system .

5.9 PASS CRITERIA

The system must meet all the functional and non-functional requirements. Pass all the test cases, get the expected response, and get acceptable performance to be tested pass.

- Developer can commit and push.
- Successful build
- Positive feedback

5.10 FAIL CRITERIA

If one of the following situations happens, the system is considered to fail:

- Conflict
- build failure
- Negative feedback

5.11 TEST REPORTS

The detailed test reports prepared for each function. A sample test report is given below:

Test case preparation helps the user and the developer to find and fix the errors easily and in advance. Save Me is well tested with the proper test cases and thus passed a better unit test. Elaborated test cases also prepared subjected the system for thorough testing. The test cases prepared are in the above format.

Table 5.1: Test Report

Name	Continuous Integration Pipeline Implementation for Tech11Software
Version	1.0
Author	Aswin G Sugunan, Jeffin Jacob, Nitin Suresh,Vishnu Bose.
Approved By	Self
Date	08/03/2017
Role	Developer can operate the system.
Prerequisite	The Developer is logged into the system by the repository administrator
Developer/Actor	System Response
Run Applications	Developer can continuously integrate the and there always a ready-to deploy bu
Handle developer Data	The server can handle various developer data
The test project was successfully saved	

Chapter 6

FUTURE SCOPE

CI was created with the goal of eliminating the old big bang integration practices in which software modules are developed in isolation and integration is postponed until the end of the project - and quite frequently the timing and project cost of the final integration work is deeply underestimated. In order to eradicate this hindrance, many agile development experts have now converted integration into a continuous process. When integrations are performed on a daily basis, the final, uncontrolled big-bang integration will vanish from the modern development process.

The CI process is now a daily practice of software developers worldwide, and an important reason why other best practices such us automated testing have become mainstream throughout the software industry.

Chapter 7

CONCLUSION

Putting software into production is slow and risky. Optimizing this process has the potential to make software development overall more effective and efficient. Continuous Delivery might therefore be one of the best options to improve software projects.

Moving to Continuous Deployment will change the development dramatically. It will make the development more productive and lead to a more stable and better product.

Continuous Delivery aims at regular, reproducible processes to deliver software much like Continuous Integration does to integrate all changes. While Continuous Delivery seems like a great option to decrease time to market it actually has much more to offer: It is an approach to minimizing risk in a software development project because it ensures that software can actually be deployed and run in production. So any project can gain some advantage even if it is not in a very competitive market where time to market is not that important after all.

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GLOSSARY

DFD : Data Flow Diagram

CI : Continuous Integration

AWS : Amazon Web Services

APM : Application Performance Monitoring

SCM : Software configuration Management

IaaS : Infrastructure as a Service

PaaS : Platform as a Service

JVM : Java Virtual Machine

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