

Continuous integration pipeline implementation for Tech11 software

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Overview

- 1 INTRODUCTION
- 2 PROPOSED SYSTEM
- 3 MODULES
- 4 IMPLEMENTATION
- 5 CONCLUSION

(Common) Scenario

- **Developers working on a project.**
 - They each implement a few class.
 - Code them.
 - Ensure well tested.
 - When they're done, They *integrate* them.
 - Every thing breaks.

Integration Hell

**That awkward moment near the end of the project
when everyone realizes that none of their classes
interoperate correctly.**

Integration Hell (cont..)

Integration hell is extremely risk for a project.

- **Difficult to determine how long it will take to resolve the integration process.**
 - May (vastly) exceed our budget.
 - May (vastly)exceed our schedule.

Continues Integration

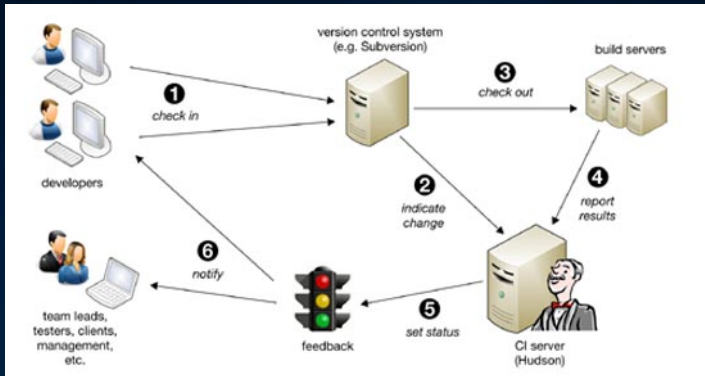
- **Originated from eXtreme Programing (XP).**
- **Mitigates risk associated with integrating Software.**
- **Avoids integration hell.**
- **Integrate early and integrate often.**
 - *ie, on every change.*

Evolution of software delivery

- Waterfall
- Agile
- Continuous Delivery
 - Another subset of agile which in which the team keeps its software ready for release at all times during development. It is different from traditional agile in that it does not involve stopping and making a special effort to create a releasable build.

Continues Integration

Automates the process of building,testing,reporting.



Benefits of CI server

- **Developer might forget to run the test.**
 - *Don't break the build.*
- **It may take too long to run the tests.**
- **We might need to test the code in various environments.**
 - Different architectures (32-bit,64-bit,ARM,PowerPC).
 - Different platforms (Windows,Linux,Mac,Solaris).

Benefits of CI server (cont..)

- **Reports provide useful insights to team.**
 - Can track metrics like line coverage.
 - Percentage of line executed by a program's test.
 - Can run all sorts of utilities on our code.
 - *CheckStyle, Findbugs, ..*
- **Can deploy automatically.**
 - Deploy a web project to a staging server.
 - Deploy latest stable build of a desktop application.

Modules

- Version Control
- Artifact Manager
- Continuous Integration Handler
- Test Automator

Modules

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- Test Automator

Version Control

- This practice advocates the use of a revision control system for the projects source code.
- 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.

Version Control

- Here we use Git-Hub for version controlling.
- 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 functionality of Git as well as adding its own features.



Modules

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Modules

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Artifact Manager

- Artifact repositories are great at managing multilevel dependencies, much better than the old text file with a list that developers update and maintain.
- Critical for reducing errors and ensuring the right pieces make it with each build/deployment/release, especially in large-scale business applications.

Modules

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Modules

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Continuous Integration Handler

- 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.

Modules

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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 is critical for continuous delivery and continuous testing.
 - Graphical user interface testing.
 - API driven testing.

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.

Data Flow Diagram

- level 0



Figure : level 0 dfd

Data Flow Diagram

- level 1

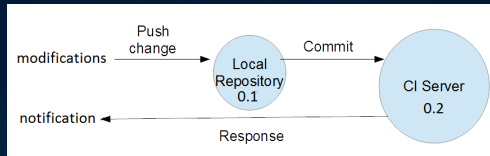


Figure : level 1 dfd

Data Flow Diagram

- level 2

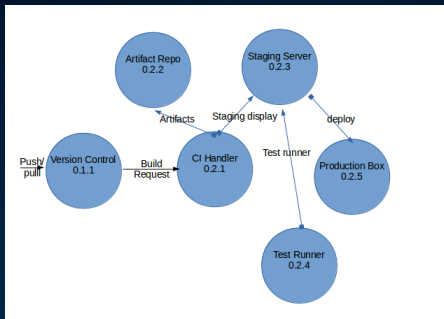


Figure : level 2 dfd

Flow Diagram

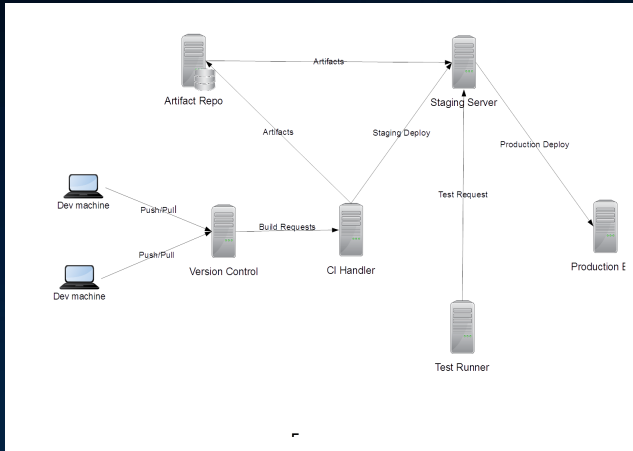


Figure : Flow Diagram

CI Pipeline Diagram

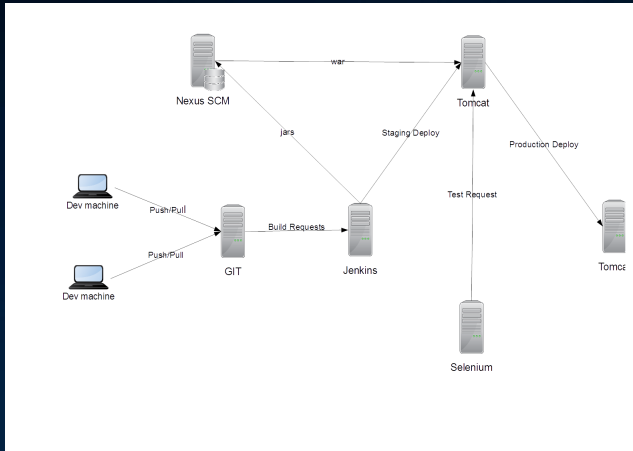


Figure : CI Pipeline

Sequence Diagram

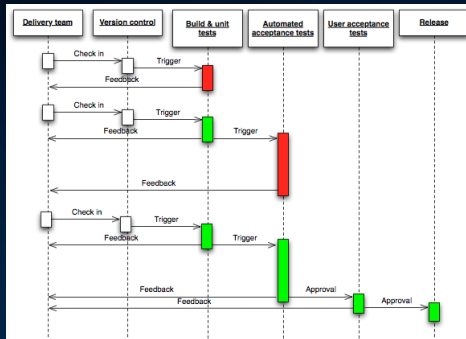


Figure : Sequence Diagram

Implementation

- For demonstration to the Tech 11 Software Team, We decided to implement a Calculator application (using Java, javaScript, NodeJs, Angularjs)
- We divided the work
 - Addition Module - Vishnu Bose
 - Subtraction Module - Nitin Suresh
 - Multiplication Module - Aswin G Sugu
 - Division Module - Jeffin Jacob
 - View - All

Implementation

For Version Control

- Created a Repository named LogicBaker in Git-Hub and cloned to individual systems.
- Created modules given to each member in java
- After Coding the individual modules the team members commit to Git-Hub, irrespective on the platform which each one has build.

Implementation

The screenshot shows the GitHub interface for the repository 'girishngopal / LogicBaker'. At the top, there are buttons for 'Unwatch' (5), 'Star' (0), and 'Fork' (4). Below these are navigation tabs: 'Code', 'Issues' (0), 'Pull requests' (1), 'Projects' (0), 'Wiki', 'Pulse', and 'Graphs'. The main content area shows the 'app' directory on the 'master' branch. A table lists the files and their commit history:

girishngopal pom commit		Latest commit 734d3b3 12 hours ago
..		
CalculatorApp	VB	22 days ago
CalculatorAppMaven/com.logicbaker.mathutil	pom commit	12 hours ago
.project	undo	2 months ago

Implementation

Artifact Repository

- An artifact repository is akin to what Subversion is to source code, i.e. it is a way of versifying code binary artifacts. In the Java world these artifacts could be jars, wars, ears, fully fledged applications, libraries or a collections of libraries that are packaged.

Implementation

Artifact Repository

- The Difficulty in integrating the individual modules due to the syntax mis-matching is overcome by Mavenising the individual modules.

Implementation

Artifact Repository

- Maven was originally started as an attempt to simplify the build processes in the Jakarta Turbine project. There were several projects each with their own Ant build files that were all slightly different and JARs were checked into CVS. We wanted a standard way to build the projects, a clear definition of what the project consisted of, an easy way to publish project information and a way to share JARs across several projects.

Implementation

Artifact Repository

- The Same Calculator Test application code is mavenised by each team member and again pushed to the local repository.
- The whole application can be integrated and build in each team members local system much easier.
- With listed dependencies docs.

Implementation

Continous Integration Handler

- To review intermediately the generated code, Understanding what or How it looks like when Deployed?
- Thats the idea behind Continuous Integration, We provide a Automation platform where all team members and the project manager can VIEW the application and discuss.

Implementation

Continuous Integration Handler

- For Automation we use Jenkins.
- Jenkins is an open source automation server written in Java. The project was forked from Hudson after a dispute with Oracle. It is a server-based system running in a servlet container such as Apache Tomcat.

Implementation

Test Automator

- The test Automation plugin is added to Jenkins depending upon the nature of the development process dealing with.
- Which involve programming framework, language etc.
- Since we use Java , we use find-bugs and Check style in Jenkins..
- Also added Jacoco , For code coverage.

Implementation

The screenshot displays the Jenkins web interface in a browser. The address bar shows the URL: 35.154.108.194/job/LogicBakerBuild/com.logicbaker.mathutil.web\$com.logicbaker.mathutil.web/64/. The Jenkins header includes the logo, a red notification badge with the number '1', a search bar, and the user 'jeffin jacob' with a 'log out' link. The breadcrumb trail is: Jenkins > LogicBakerBuild > com.logicbaker.mathutil.web > #64. On the left sidebar, there are links for 'Back to Project', 'Status', 'Changes', 'Console Output', 'Edit Build Information', 'Executed Mojos', and 'Previous Build'. The main content area features a large blue sphere icon next to the title 'Build #64 (Mar 6, 2017 2:07:48 AM)'. Below this, a progress bar is shown with the text 'Progress:'. To the right, it says 'Started 13 sec ago' and 'Build has been executing for 13 sec'. There is a link to 'add description'. Below the progress bar, a document icon with a pencil indicates 'No changes'. At the bottom, an orange diamond icon indicates 'Started by user jeffin jacob'. The footer of the page states: 'Page generated: Mar 6, 2017 2:08:04 AM UTC REST API Jenkins ver. 2.39'.

35.154.108.194/job/LogicBakerBuild/com.logicbaker.mathutil.web\$com.logicbaker.mathutil.web/64/

Apps For quick access, place your bookmarks here on the bookmarks bar, [Import bookmarks now...](#)

Jenkins 1 search jeffin jacob | log out

Jenkins > LogicBakerBuild > com.logicbaker.mathutil.web > #64 [ENABLE AUTO REFRESH](#)

[Back to Project](#)

[Status](#)

[Changes](#)

[Console Output](#)

[Edit Build Information](#)

[Executed Mojos](#)

[Previous Build](#)

Build #64 (Mar 6, 2017 2:07:48 AM)

Progress: Started 13 sec ago
Build has been executing for 13 sec

[add description](#)

No changes.

Started by user [jeffin jacob](#)

Page generated: Mar 6, 2017 2:08:04 AM UTC [REST API](#) [Jenkins ver. 2.39](#)

Implementation

Arithmetic LogicBaker Testing app

6	+	2	Result	8
	-		Result	
5	*	8	Result	40
20	/	8	Result	2

Implementation

Heroku

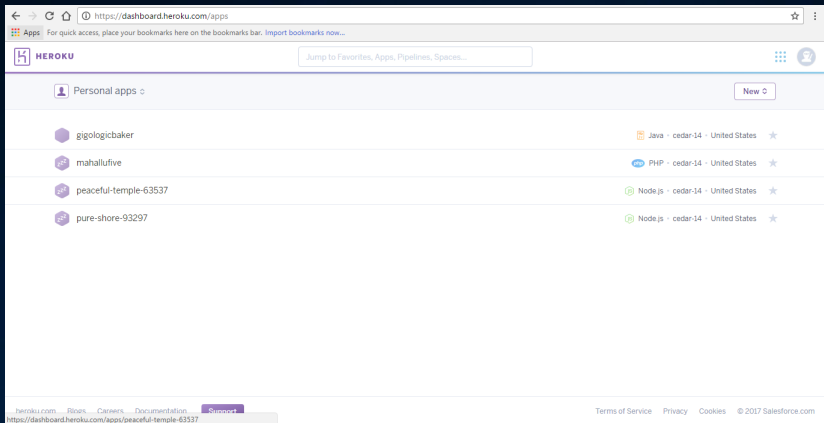
- Heroku is a cloud Platform-as-a-Service (PaaS) supporting several programming languages that is used as a web application deployment model. Heroku, one of the first cloud platforms

Implementation

Heroku

- The same mavenised java application is pushed to heroku Git hub.
- Also code the same application in Node.js for efficient viweing, and deployed

Implementation



The screenshot shows the Heroku dashboard at the URL <https://dashboard.heroku.com/apps>. The page features a navigation bar with the Heroku logo, a search bar, and a user profile icon. Below the navigation bar, there is a section for "Personal apps" with a "New" button. A list of four apps is displayed, each with its name, icon, technology stack, region, and a star icon.

App Name	Technology Stack	Region
gigologicbaker	Java · cedar-14	United States
mahallutiv	PHP · cedar-14	United States
peaceful-temple-63537	Node.js · cedar-14	United States
pure-shore-93297	Node.js · cedar-14	United States

At the bottom of the page, there is a footer with links to [heroku.com](#), [Blog](#), [Careers](#), [Documentation](#), and [Privacy](#), along with the text "Terms of Service", "Privacy", "Cookies", and "© 2017 Salesforce.com".

Implementation

← → × ⌂ ⓘ https://peaceful-temple-63537.herokuapp.com ☆ ⋮

Apps For quick access, place your bookmarks here on the bookmarks bar. [Import bookmarks now...](#)

Arithmetic LogicBaker Testing app

<input type="text"/>	+	<input type="text"/>	Result	<input type="text"/>
<input type="text"/>	-	<input type="text"/>	Result	<input type="text"/>
<input type="text"/>	*	<input type="text"/>	Result	<input type="text"/>
<input type="text"/>	/	<input type="text"/>	Result	<input type="text"/>

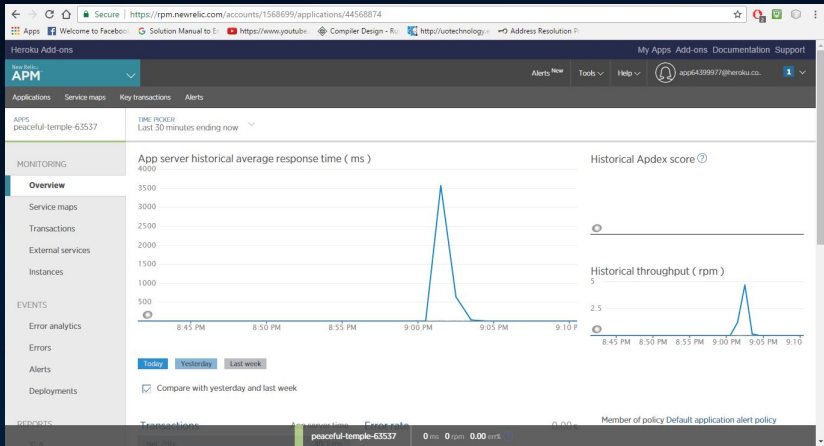
Waiting for payments.google.com...

Implementation

Heroku

- New Relic plugin is added to the Calc Application(Node.js).
- Its an application performance manager.
- It tracks real time response time and throughput.

Implementation



CONCLUSION

- **Continually integrate and test to reduce risk.**
- **Detect problems early.**
- **Always have a deployable build.**
- **Generate metrics to guide project management.**
- **Continuous Integration is:**
 - *A good practice in any software development method.*
 - *Vital for agile development.*