



# Cloud Digital Repository Automation

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# Outline

- Continuous Integration and Continuous Deployment Overview
- Tools Used
- Completed Pipeline
- Analyzing Our Cost
- Final Thoughts
- Final Work before Submission to VTechWorks

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# CI/CD

- Continuous Integration and Continuous Deployment
- Software engineering practice
- Used in Agile environments
- One of the main, and most difficult components of the DevOps process





# Fedora4

- Our Task: CICD for Fedora4
- Any Development Change prompts a build/test/deployment
- Manage bugs and feature changes more efficiently
- Always has a updated and working version of the application
- Overhead for deployment and manual unit testing becomes automated
- Helps the Fedora Dev team



## Our AWS Stack

- CodePipeline
- CodeBuild
- Simple Cloud Storage Service (S3)
- Elastic Beanstalk
- CloudWatch



AWS CodePipeline



AWS CodeBuild



Amazon S3



AWS Elastic Beanstalk

# Finished Pipeline

## Final View:

- Awaiting Review
- No Deployment
- Email based Approval
- Email subscription can be setup/modified easily

## Trial-6 [View pipeline history](#)

View progress and manage your pipeline.

Edit

Release change

### Source

Source

GitHub

✓ Succeeded 15 min ago  
d0afc9f

Source: added buildspec....

### Build

CodeBuild

AWS CodeBuild

✓ Succeeded 6 min ago  
Details

MavenTesting

AWS CodeBuild

✓ Succeeded 2 min ago  
Details

Source: added buildspec.yml for AWS codebuild integration

### TestingAndApproval

ManualTestCheck

Manual approval

⚠ Waiting for approval 3 min ago

Review

Source: added buildspec....

### Staging

Trial6-env

AWS Elastic Beanstalk

No executions yet

Source: added buildspec....

# Finished Pipeline

The screenshot displays a CI/CD pipeline interface with the following stages and components:

- Source:** A single step using GitHub, which has **Succeeded** 16 min ago. The commit ID is `d0afcf9f`. The step description is "Source: added buildspec...".
- Build:** A stage containing two parallel steps: **CodeBuild** (AWS CodeBuild) and **MavenTesting** (AWS CodeBuild). Both have **Succeeded** (6 min ago and 3 min ago respectively). The step description is "Source: added buildspec.yml for AWS codebuild integration".
- TestingAndApproval:** A stage containing a **ManualTestCheck** step (Manual approval) which is **Waiting for approval** (3 min ago). A **Review** button is visible below the step.
- Staging:** The final stage in the pipeline, currently empty.

At the top of the interface, there are buttons for **Edit** and **Release change**.

Overlaid on the right side is a modal window titled "Approve or reject the revision" with a close button (X). It contains a **Comments** section with a text input field containing the placeholder text "Summarize the reason for your approval or rejection." At the bottom of the modal are three buttons: **Cancel**, **Approve**, and **Reject**.

# Finished Pipeline

## Final View:

- Finished and all Green
- Each Stage Completed
  - Pipeline triggered from source change

## Trial-6 [View pipeline history](#)

View progress and manage your pipeline.

Edit

Release change

### Source

Source

GitHub

✔ Succeeded 21 min ago  
d0afc9f

Source: added buildspec....

### Build

CodeBuild

AWS CodeBuild

✔ Succeeded 12 min ago  
Details

MavenTesting

AWS CodeBuild

✔ Succeeded 8 min ago  
Details

Source: added buildspec.yml for AWS codebuild integration

### TestingAndApproval

ManualTestCheck

Manual approval

✔ Approved 3 min ago  
Details

Source: added buildspec....

### Staging

Trial6-env

AWS Elastic Beanstalk

✔ Succeeded 2 min ago

Source: added buildspec....



# Total Costs from the Pipeline



## Minimal Costs

- Amazon S3
  - \$0.023 per first 50 TB
- CloudWatch
  - Free / Logging Service

## Possible Larger Costs

- CodeBuild
  - Build Minute Based
- Elastic Beanstalk (ie EC2)

# Total Costs

EC2 instance At 100% utilization  
Hosting Opt 1  
**\$35 a month**

Upfront cost for a dedicated server  
Hosting Opt 2  
**\$103 per year**

CodeBuild daily builds  
**\$21.90 per year**

CodePipeline pipeline  
**\$1.00 per pipeline**

*Roughly*  
**\$126 to host and build per year**

FREE USAGE TIER: New Customers get free usage tier for first 12 months

**Services** Estimate of your Monthly Bill (\$ 0.00)

Choose region: US East (N. Virginia) Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per month

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make it easy to scale computing easier for developers. Amazon Elastic Block Store (EBS) provides persistent storage to Amazon EC2 instances.

FREE TIER: For ALB 10 free rules will be applicable.

**Compute: Amazon EC2 Instances:**

Description	Instances	Usage	Type	Billing Option
Web Server	1	100% Utilized/Mo	Linux on t1.micro	On-Demand (No C
+ Add New Row				

**Compute: Amazon EC2 Dedicated Hosts:**

Description	Number of Hosts	Usage	Type	Billing Option
+ Add New Row				

**Storage: Amazon EBS Volumes:**

Description	Volumes	Volume Type	Storage	IOPS	Baseline Throughput	Snapshot Storage
+ Add New Row						

**Elastic IP:**

Number of Additional Elastic IPs:

Elastic IP Non-attached Time:  Hours/Month

Number of Elastic IP Remaps:  Per Month

**Data Transfer:**

Inter-Region Data Transfer Out:  GB/Month

Data Transfer Out:  GB/Month

Data Transfer In:  GB/Month

VPC Peering Data Transfer:  GB/Month

Intra-Region Data Transfer:  GB/Month

Public IP/Elastic IP Data Transfer:  GB/Month

**Classic Load Balancing:**

Number of Classic LBs:

Total Data Processed per CLB:  GB/Month

**Application Load Balancing:**

Number of Application LBs:



# Final Thoughts

- Groundwork Pipeline
  - Minimal changes needed to handoff permissions and access to the Pipeline with transitioning to client
  - Room for more stages, configurations, and plug-ins
- Providing an AWS starting point for the Fedora4 team
- Modest cost for an automatic process



## Finishing Touches

- Document of AWS roles/users so that Fedora devs can follow and modify the Pipeline
- Cleaning up unused AWS resources (Storage/Invalid Builds)
- Screenshots/Commenting our Configs
- Finalizing a cost spreadsheet
- Synthesizing our Final Report
  - Including Cost spreadsheet, AWS accounts, permissions, and screenshots we have been using for the AWS stack



# Acknowledgements

Client: Yinlin Chen [ylchen@vt.edu](mailto:ylchen@vt.edu) (540-231-0271)



Fedora4 Development Team and DuraSpace Organization



**Fedora™**

# References



AWS CodePipeline/CodeBuild/CodeDeploy/ElasticBeanstalk :

<https://docs.aws.amazon.com/codepipeline/latest/userguide/codepipeline-user.pdf>  
<https://aws.amazon.com/documentation/elastic-beanstalk/>  
<https://aws.amazon.com/documentation/codebuild/>  
<https://aws.amazon.com/documentation/s3/>  
<https://aws.amazon.com/codebuild/pricing/>  
<https://aws.amazon.com/ec2/pricing/>

Monthly Calculator:

<https://calculator.s3.amazonaws.com/index.html>

Images (in order):

<https://loadimpact.com/integrations/performance-testing-aws-codepipeline>  
<https://docs.aws.amazon.com/codepipeline/latest/userguide/welcome.html>  
<https://aws.amazon.com/blogs/security/how-to-audit-cross-account-roles-using-aws-cloudtrail-and-amazon-cloudwatch-events/>  
<https://www.flickr.com/photos/pictures-of-money/17309480255>  
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