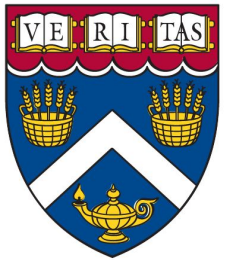


HARVARD
Extension School

Week 10
Jenkins
Build and Configure AWS resources

Jenkins Build and Configure AWS resources

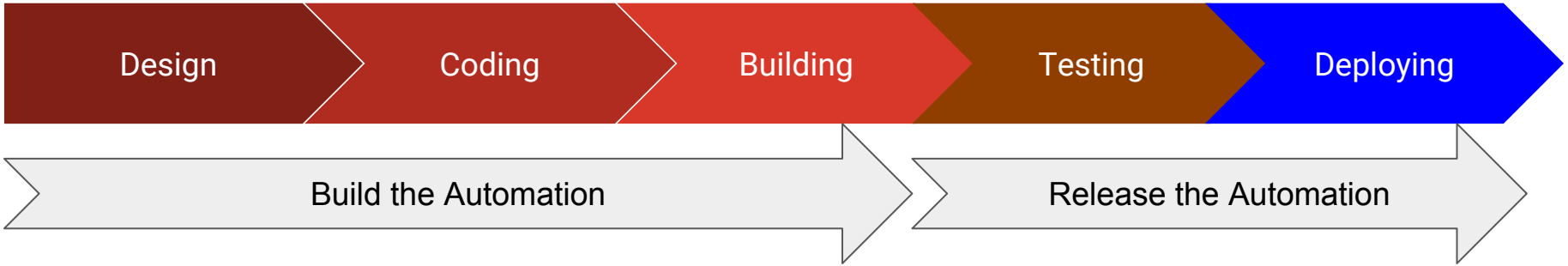
- **Week 10:** Build and configure AWS resources (2/2)

In this lecture a combination of Git, Jenkins, CloudFormation and Boto3 will be used for resource creation and continuous delivery.

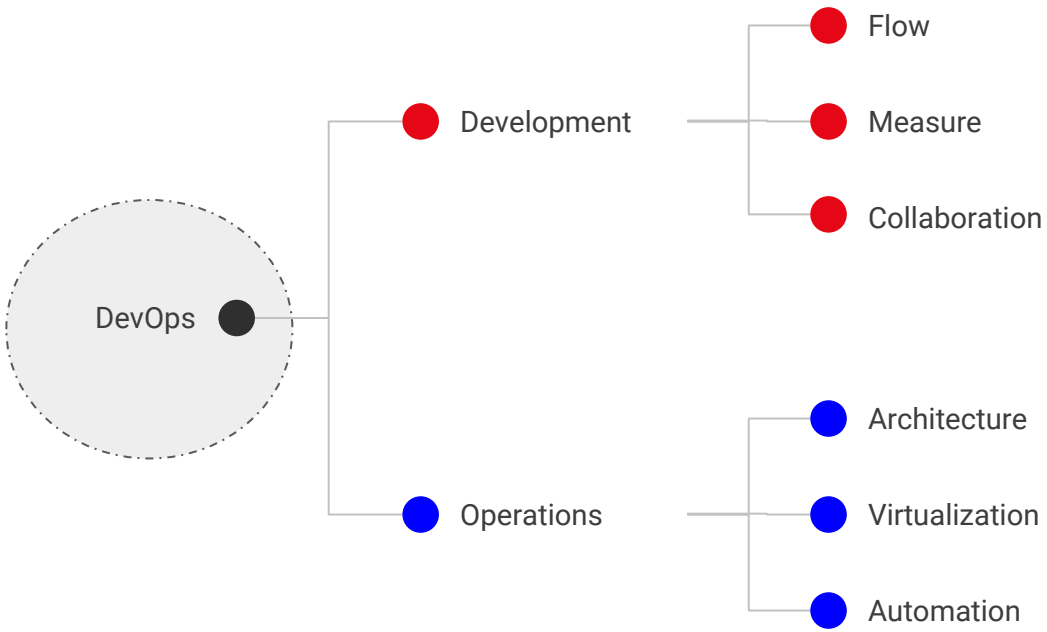
- Triggered by Git commands , build and configure an application environment using CloudFormation templates and configuration management system like puppet.
- Using Python libraries (mainly Boto3 and Fabric) to build and configure a computation cluster of EC2 instances
- More AWS DevOps tools: AWS CodeCommit , AWS CodePipeline, AWS CodeBuild and AWS CodeDeploy

What is Devops?

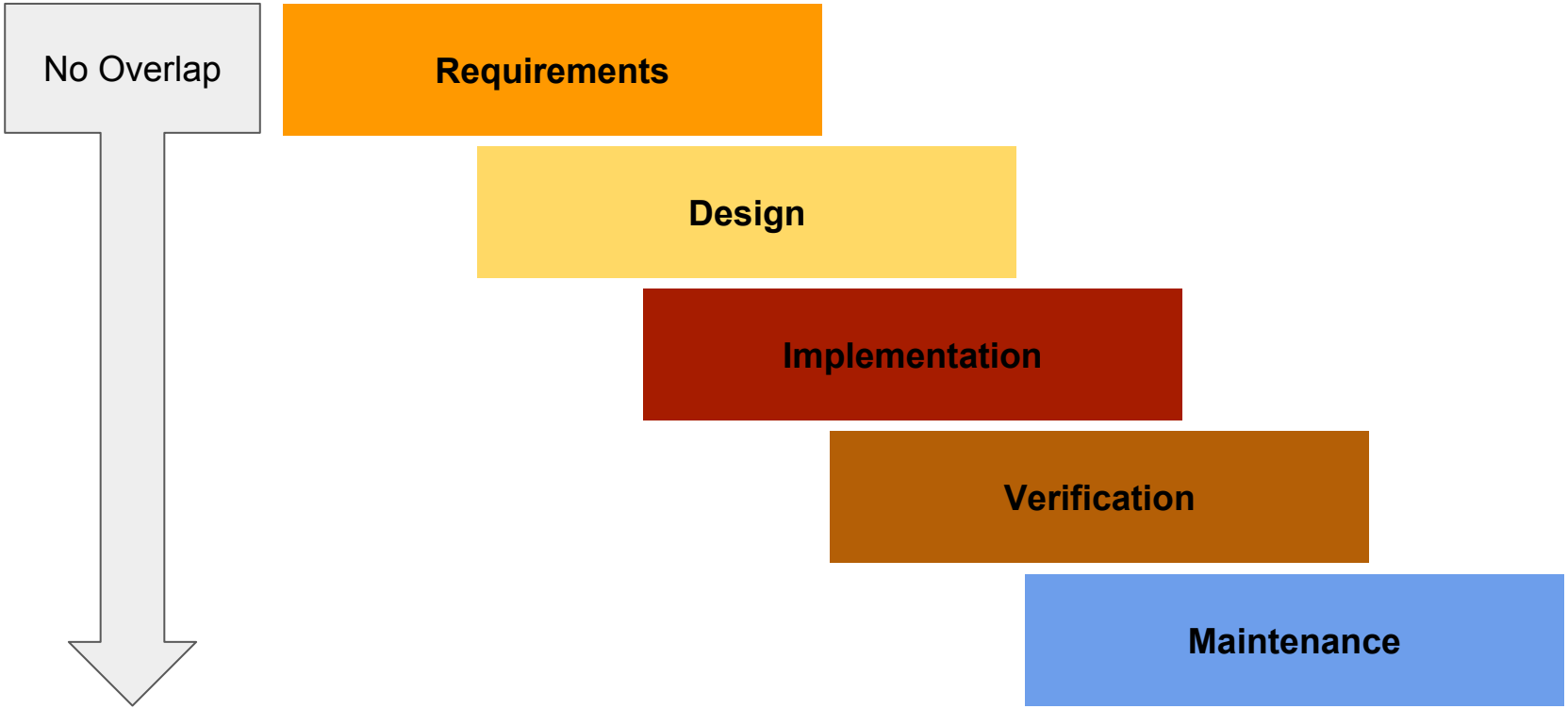
- Develop to automate, automate to develop.
- Develop to automate resources; provisioning and management.
- Automate to enable software development pipeline: develop -> test -> stage and QA -> release
- We develop systems and deploy systems through automation of things we traditionally did manually throughout the SDLC.



Combination of the word DevOps



Waterfall (Plan-Driven) : 1956



Manifesto Agile Software Development: 2001

- Waterfall stands until 2001 when a group of engineer met in Utah and put the manifesto of Agile Software development manifesto.
- Agile Values
  - Individuals and interactions over processes and tools
  - Working software over comprehensive documentation
  - Customer collaboration over contract negotiation
  - Responding to change over following a plan
- http://agilemanifesto.org

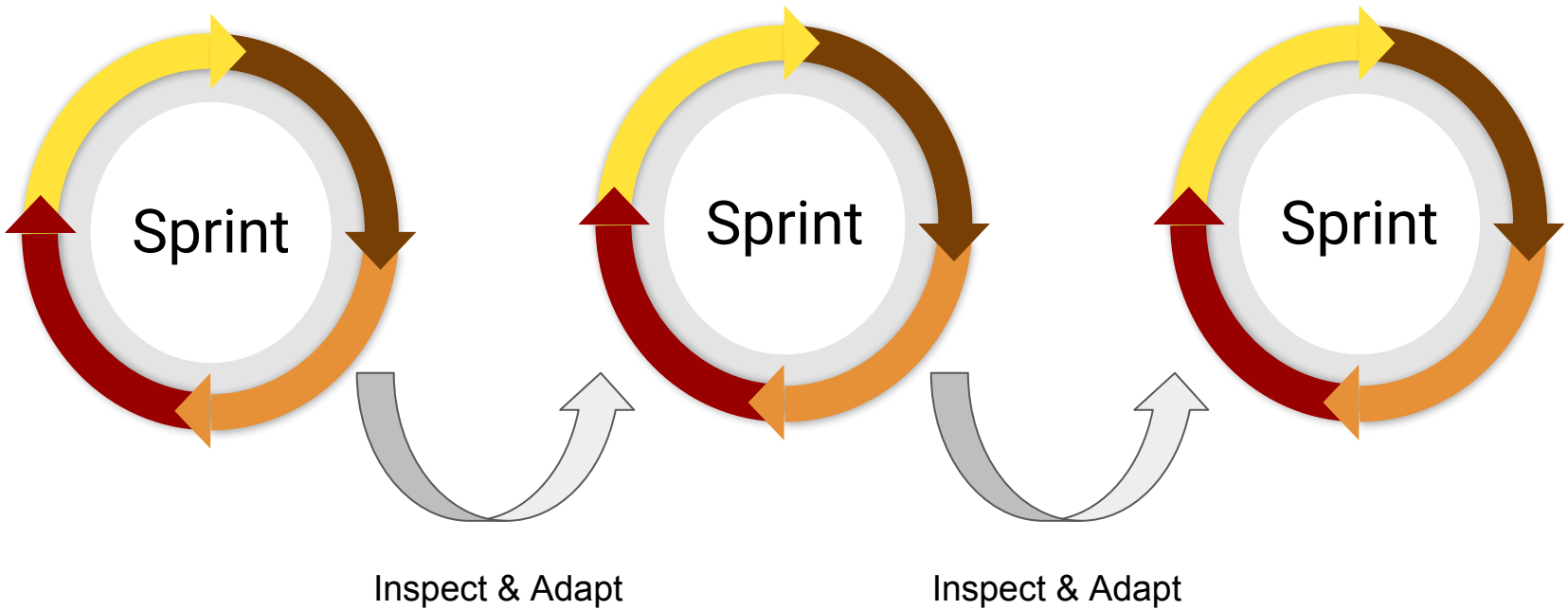
Agile Development methodology

- Scrum - project management methodology
    - Product Owner – Represents Stakeholders
    - Scrum Master – The one responsible for maintaining the processes
    - Team – A cross functional group of about 6-8 people who do actual design, testing, implementation, etc.
    - Sprints (2 to 4 weeks)
    - No change during the sprint period
- Extreme Programming- XP
    - Software development methodology
    - XP does prescribe some engineering practices: Unitest, Pair review, simple clear code, frequent communication with the costumer

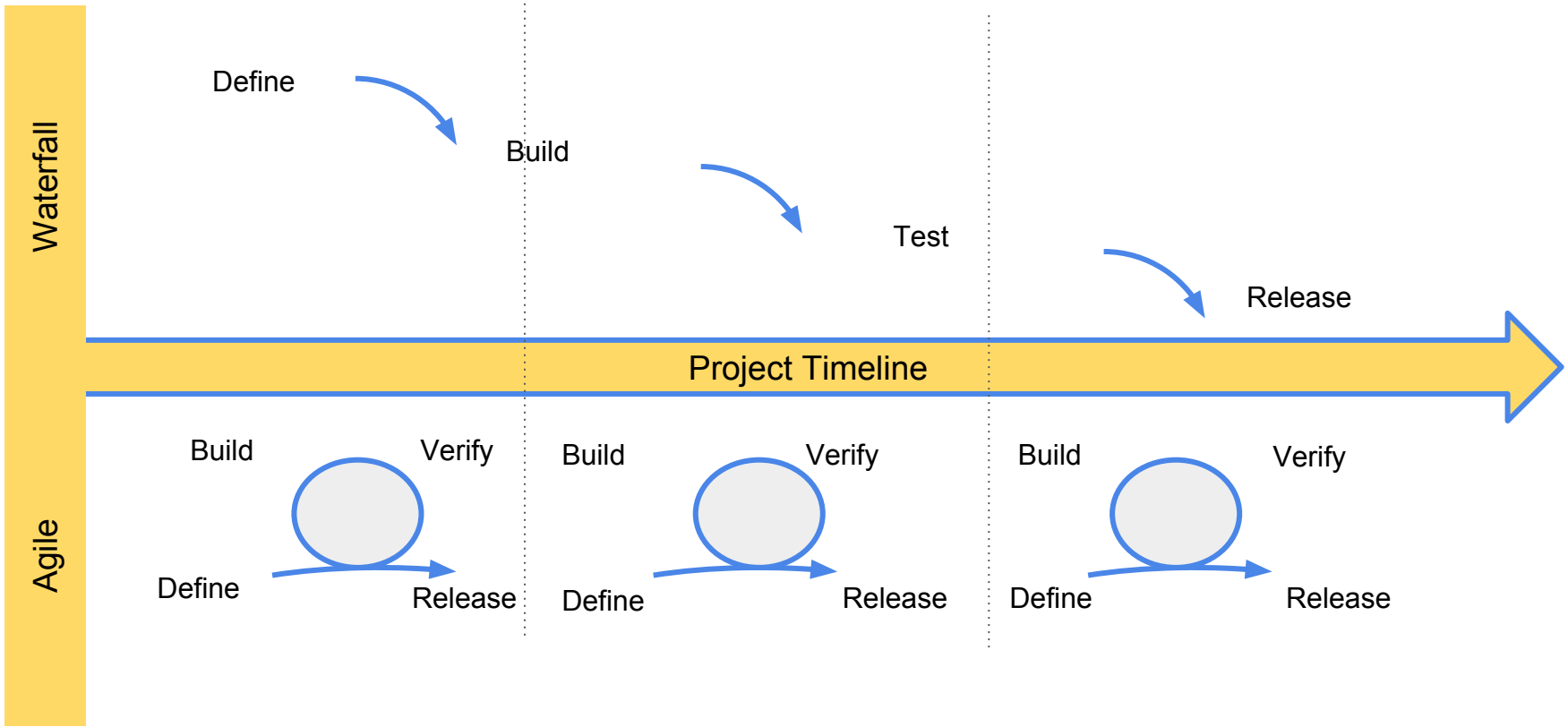
Why agile

- The number one key difference is the **ability to respond to the evolving business needs immediately**.
- Transparency and customer satisfaction - continuous communication with the customer, the customer decide the priority of the features
- Early release - beta and test version in weeks rather than months or years
- Continues delivery - continue to add features
- Adaptation to change
- Rapid sprint from development and testing
- Software agility and Operations
    - Agility for the operations!
    - Automate the operation!
    - Automate the infrastructure!
    - DevOps!

Agile



Waterfall vs Agile



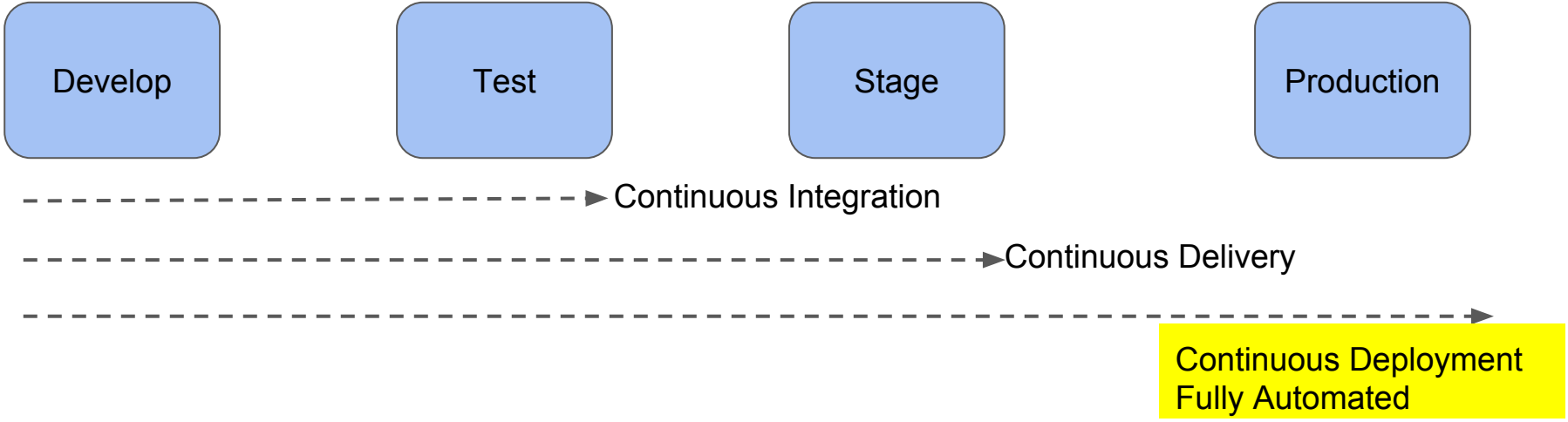
What DevOps Engineers do?

- ★ Write code.
- ★ System Admin skills.
- ★ Infrastructure design.
- ★ Quality assurance (is it testing ? No)
- ★ Automation.
- ★ Building tools.
- ★ Optimization, tuning.
- ★ Cost and scaling.
- ★ Monitoring.
- ★ Virtualization.
- ★ Agile development methodology.
- ★ Security (DevSecOps/SecDevOps).

- ★ Software release cycles and management.
- ★ Designing a branch/release strategy for the provided SCM (git, Mercurial, svn, etc).
- ★ Configuration management. (You've surely heard of Puppet, Chef, Ansible, etc. Yes?)
- ★ Package Management.
- ★ Load balancing / proxying. (Of services, systems, components and processes.) Authentication services.
- ★ Continuous Integration, Continuous Delivery(CI/CD) and Continuous Deployment.

DevOps Tools

- DevOps lifecycle: Each one of these phases needs tools
  - Continuous Development and version control
  - Continuous Testing: Security, performance, integration testing
  - Continuous Integration
  - Continuous Deployment
  - Continuous Monitoring



CI/CD - Continuous Integration and Delivery

CI

- Checkin code
- Review code

CD

- Fast Software release
- Automation

Setting up Jenkins Master in AWS

1. Create a security group: Inbound → ssh, web, secure web
2. Create EC2 instance with auto-assign public IP or create an elastic IP if the configurations rely on the IP address being consistent.
3. Install software:
   Add aptitude key for the Jenkins application to verify packages from the Jenkins repository.

```
wget -q -O - https://pkg.jenkins.io/debian/jenkins-ci.org.key | sudo apt-key add -
sudo sh -c 'echo deb http://pkg.jenkins.io/debian-stable binary/ > /etc/apt/sources.list.d/jenkins.list'
sudo apt-get update
sudo apt-get upgrade
sudo apt-get install openjdk-8-jdk
sudo apt-get install jenkins
systemctl status jenkins
```

Configure Jenkins

1. In the Jenkins server, the file containing the initial admin password is located in Jenkins installation path (usually /var/lib/jenkins/secrets or /opt/jenkins/secrets). Copy the password and open a browser connecting to port 8080 (or ports 80 or 443 if 8080 port is forward to 80 or 443) on the server.
2. Login and select install suggested plugins
3. Create admin user
4. Login into jenkins using the new account
5. Go to Manage Jenkins, Manage Plugins and install the AWS plugin
6. Create an IAM role for Jenkins → EC2 with required policies (If and only if required)

Apache proxy Jenkins port to 443

```
<VirtualHost *:443>
    SSLEngine On
    SSLCertificateFile /etc/pki/tls/certs/jenkins.harvard.edu.crt
    SSLCertificateKeyFile /etc/pki/tls/private/jenkins.harvard.edu.key

    ServerAdmin admin@harvard.edu

    ServerName jenkins.harvard.edu
    DocumentRoot /var/www/html/jenkins/
    ErrorLog /var/www/html/jenkins/logs/error.log
    CustomLog /var/www/html/jenkins/logs/access.log combined

   ProxyPass / http://0.0.0.0:8080/
   ProxyPassReverse / http://0.0.0.0:8080/


</VirtualHost>
```

Please Read

https://www.atlassian.com/continuous-delivery/ci-vs-ci-vs-cd

For Jenkins Doc please follow:

https://jenkins.io/

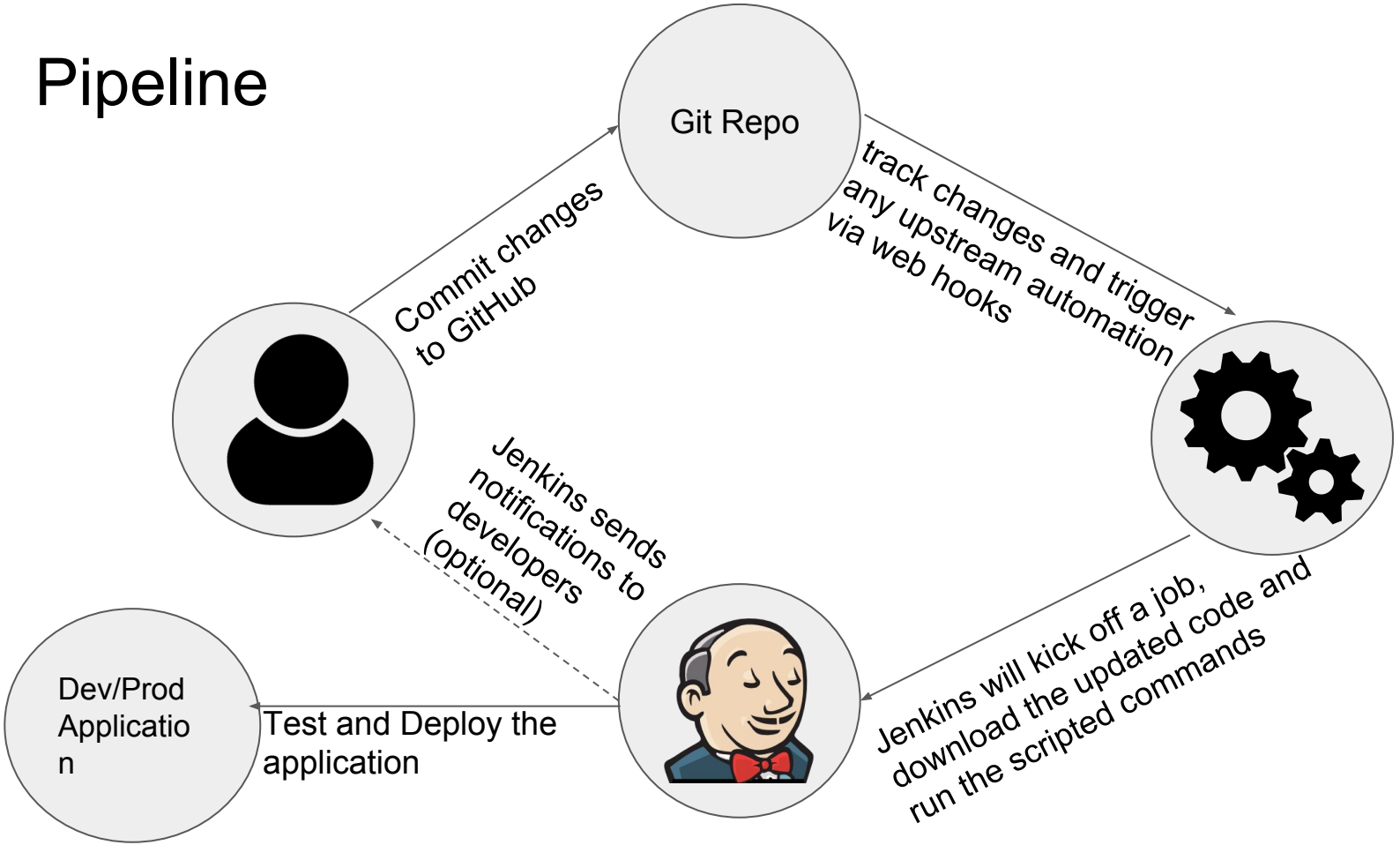
For pipeline:

https://jenkins.io/doc/book/pipeline/jenkinsfile/

Webhook

1. Events created by pushing code to GitHub repository.
2. GitHub stores the code and notifies Jenkins that new code has been committed.
3. The notification gets sent via an HTTP post to the webhook endpoint that Jenkins uses to receive these notifications.
4. Jenkins deploys the code as configured

Pipeline


Git Repo
Commit changes to GitHub
track changes and trigger any upstream automation via web hooks
Jenkins sends notifications to developers (optional)
Jenkins will kick off a job, download the updated code and run the scripted commands
Test and Deploy the application
Dev/Prod Application

Next

1) Logging
    a) CloudTrail
    b) CloudWatch
    c) CloudConfig
2) ElasticSearch and Visualization
3) Serverless
    a) Lambda (Function as a service)
    b) Api Gateway
4) Microservices
5) Docker