Software Engineering Process

Presented by: Janaki Thapliya
Booz Allen Hamilton

Introduction

What is a Software ?

Software is a collection of executable programming code, associated libraries and documentations.

What is Engineering ?

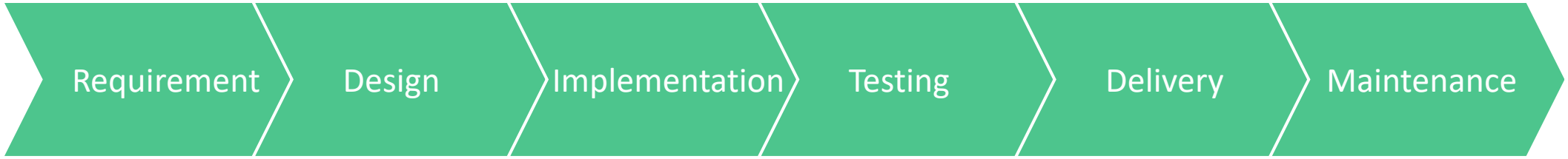
Developing products, using well-defined, scientific principles and methods.

Software Engineering is an engineering branch associated with development of software product using well-defined scientific principles, methods and procedures. The outcome of software engineering is an efficient and reliable software product.

Software Development Life Cycle (SDLC)

- SDLC defines tasks performed at each phase of the software development process

SDLC Phases



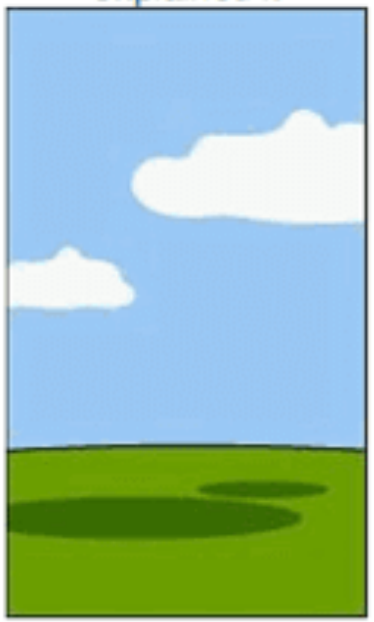
How the customer explained it

How the project leader understood it

How the engineer designed it

How the programmer wrote it

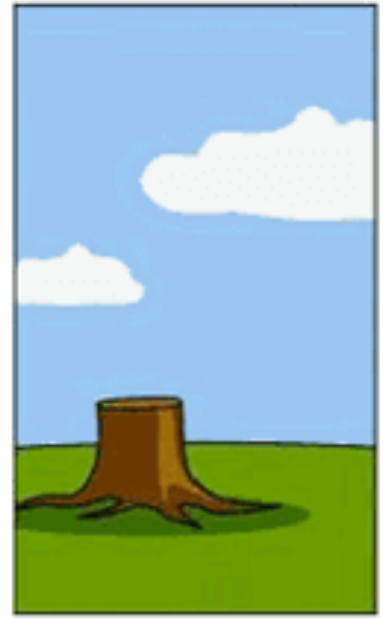
How the sales executive described it



How the project was documented

What operations installed

How the customer was billed



How the helpdesk supported it

What the customer really needed

Requirement Analysis

- Software requirements are description of features and functionalities of the target system.
  - ❖ Example of requirements:
    - The system should let the user login using user id and password
    - The system should handle 5000 users at the same time
    - The user interface should be 508 compliant

Job Description	Job Titles	Background
Talk to the client and come up with requirement statements	Product Owner, Business Analyst, Requirements Engineer/Analyst	All disciplines, Subject matter experts (eg. Scientists, Financial experts etc)

Software Design

- Software design phase includes various activities such as
  - ❖ Detail analysis of requirements
  - ❖ Agree on the development scope
  - ❖ Model the system with architecture and other design diagrams.
  - ❖ Select relevant technology stack to use

Job Description	Job Titles	Background
Talk to requirement analysts and customers. Brainstorm technologies and software system architecture.	Software Architects, Technical Leads, Software Engineers	CS or IT degree or relevant work in the field.

Software Implementation

- During this phase, the software design documents are analyzed and broken down into components
  - ❖ Come up with more models, design documents or prototypes
  - ❖ Write algorithms
  - ❖ Write Code
  - ❖ Write unit tests to test the code written

Job Description	Job Titles	Background
Design software modules or components, write programs using various languages	Software Engineer, Programmer, Application Developer, System Programmer, Database Programmer, Web Developer,	CS degree, All disciplines with programming experience.

Software Testing

- Once the software is written, it will be validated to see if it meets the customer's requirements. There are several types of testing done
  - ❖ Functional testing (manual or automated)
  - ❖ Integration testing
  - ❖ Load testing

Job Description	Job Titles	Background
Write automated test scripts, Perform manual testing	Software Tester, Test Engineer, Quality Assurance Engineer	All disciplines, programming knowledge and experience is very helpful

Software Delivery and Maintenance

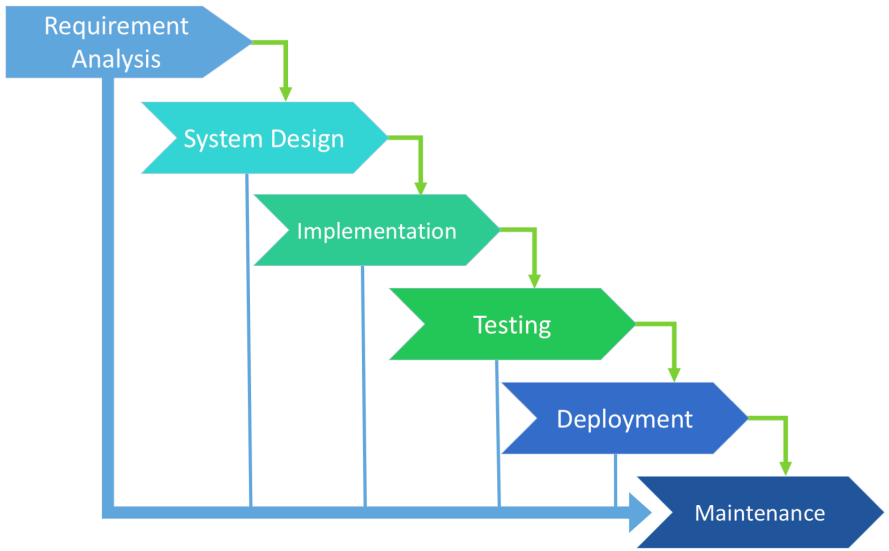
Once the software passes the quality assurance, the system will be deployed in the target environment using Continous Integration and Continous Delivery (CICD) pipelines.

When the system is in production then it needs to be maintained by applying bug fixes, adding new features in newer versions of the software and making sure the system is stable and available to the customers at all times.

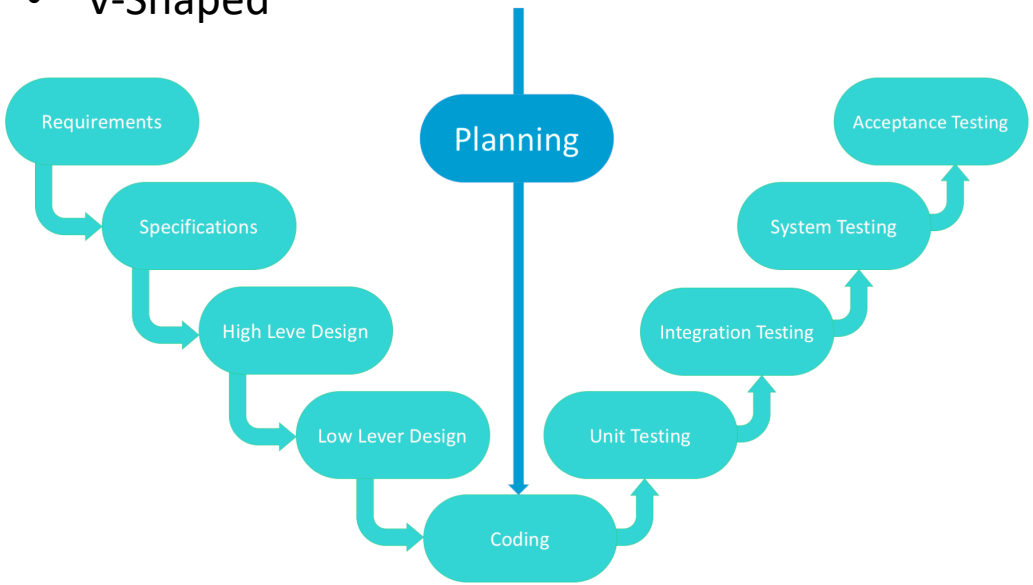
Job Description	Job Titles	Educational Background
Write scripts, monitor system performance and receive alerts when there are problems. Debug problems.	Operations Engineer, Systems Engineer.	CS or Networking or Systems Engineering, Relevant training and experience

SDLC Methods

- Waterfall



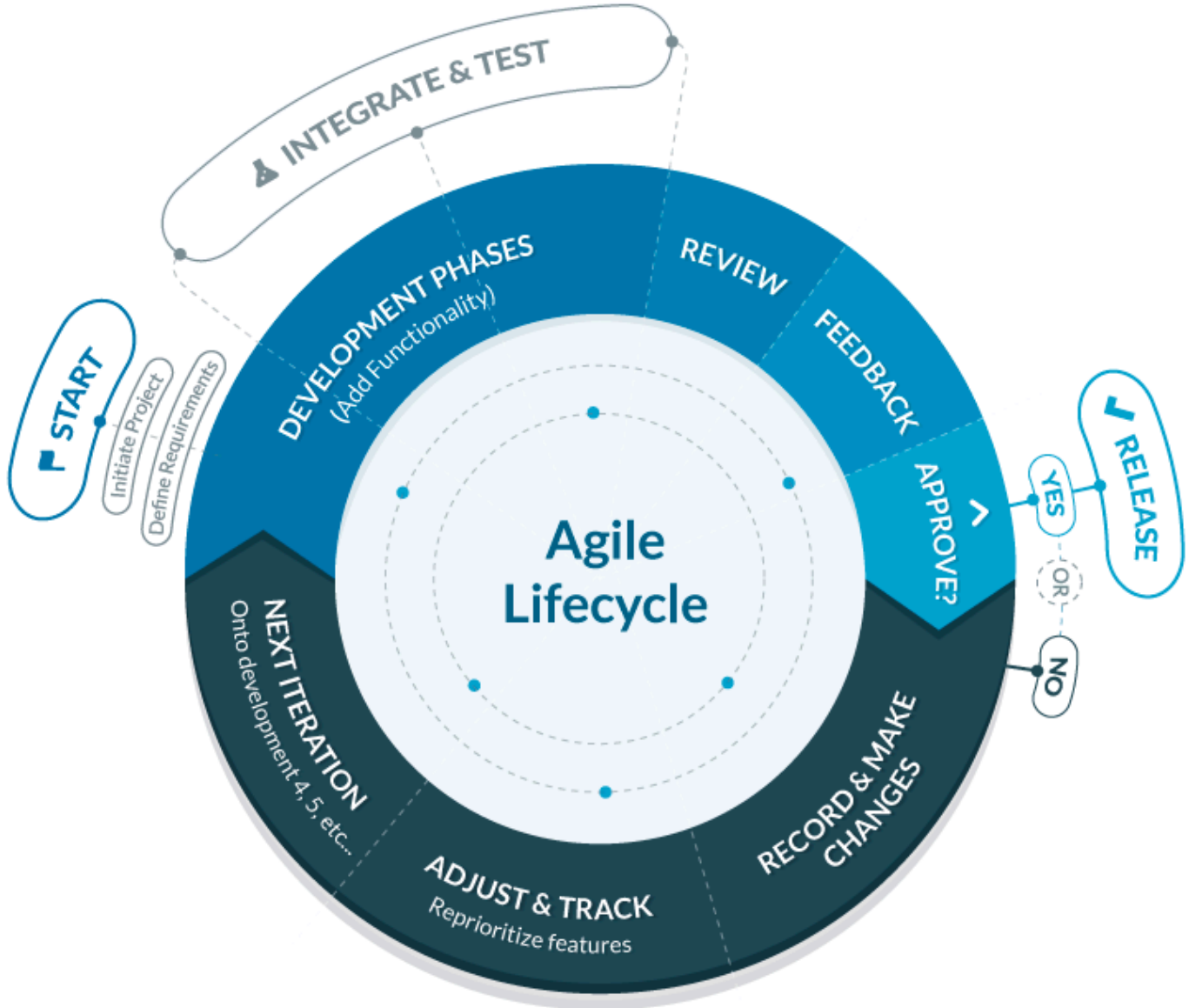
- V-Shaped



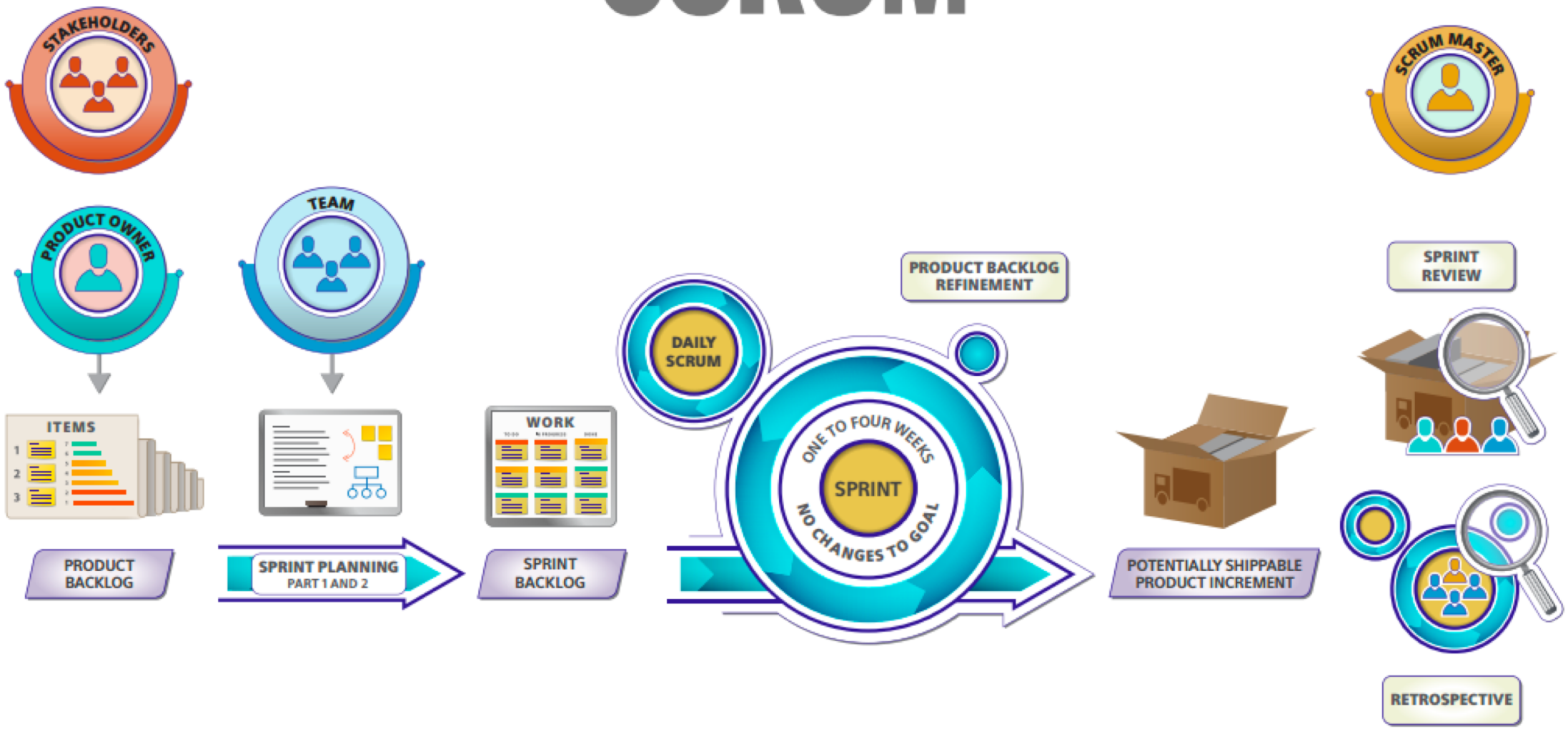
Agile Method

The Agile methodology was designed and created in response to rigid methods like waterfall. Some of the features are:

- Based on the Agile Manifesto https://agilemanifesto.org/principles.html
- Iterative development process
- Constant customer feedback
- Frequent releases
- Collaboration among all parties, can use a variety of tools like
  - Atlassian
  - Zenhub - https://www.zenhub.com/


INTEGRATE & TEST
START
Initiate Project
Define Requirements
DEVELOPMENT PHASES
(Add Functionality)
REVIEW
FEEDBACK
APPROVE?
YES
OR
NO
RELEASE
Agile
Lifecycle
NEXT ITERATION
Onto development 4, 5, etc...
ADJUST & TRACK
Reprioritize features
RECORD & MAKE
CHANGES

SCRUM


STAKEHOLDERS
PRODUCT OWNER
TEAM
SCRUM MASTER
ITEMS
1
2
3
WORK
DAILY SCRUM
PRODUCT BACKLOG REFINEMENT
ONE TO FOUR WEEKS
SPRINT
NO CHANGES TO GOAL
SPRINT REVIEW
PRODUCT BACKLOG
SPRINT PLANNING
PART 1 AND 2
SPRINT BACKLOG
POTENTIALLY SHIPPABLE PRODUCT INCREMENT
RETROSPECTIVE

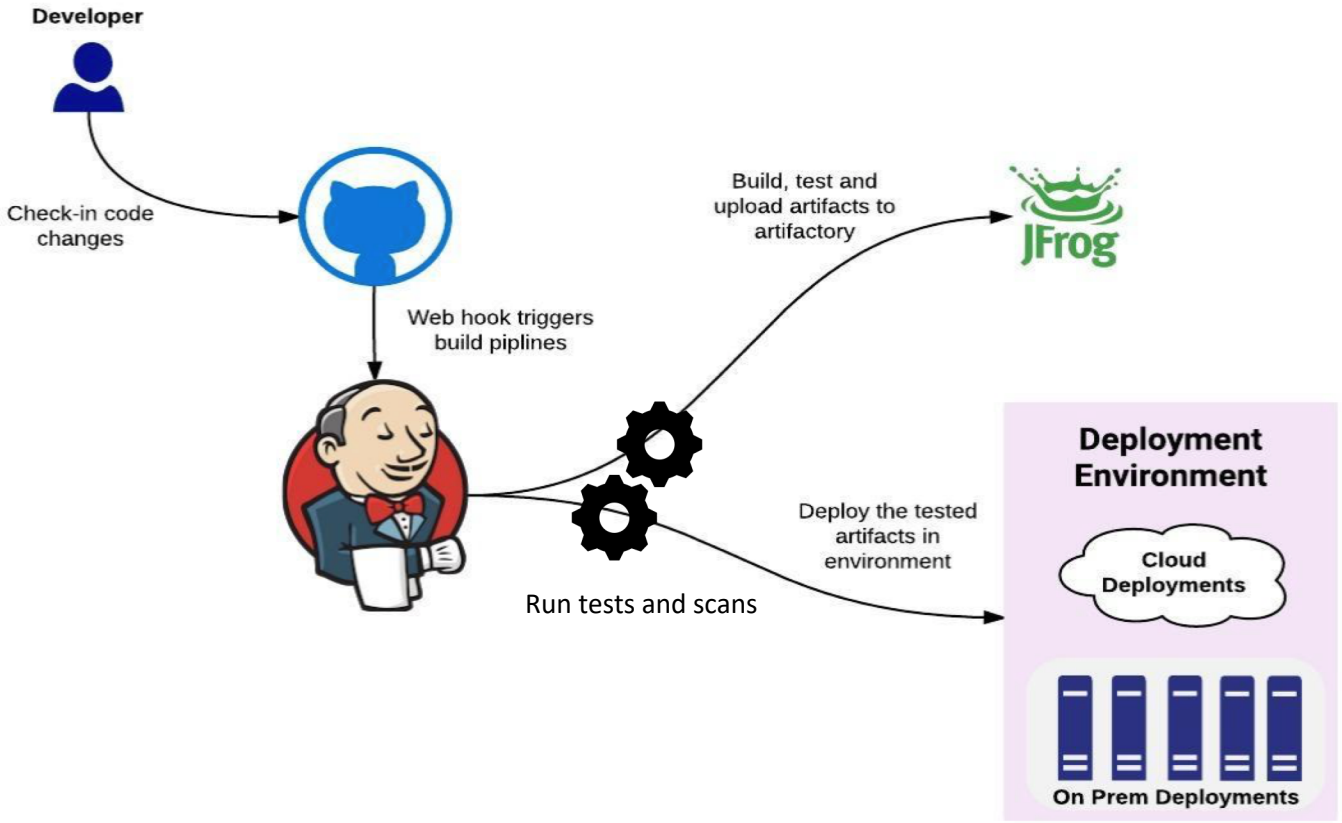
DevOps

DevOps solves some of the real problems in the software development process:

- Developers writing code that are not easy to deploy and maintain
- Operations team configuring and deploying well written applications incorrectly
- Lack of automation in the delivery pipeline

With **DevOpsSec,** Developers, Operations and Security team work together to automate, test and delivery the software to production.

CICD Pipeline



Cloud Deployments

https://www.youtube.com/watch?v=leqUbSY55hY

Resources

https://www.sei.cmu.edu

Agile Manifesto: https://agilemanifesto.org/principles.html

https://www.techopedia.com/

Software Engineering Models: https://existek.com/blog/sdlc-models/

Zenhub: https://www.zenhub.com/