Software Re-Engineering

Lecture: 01

Dr. Imran Ali
School of Computing- Software Engineering
FAST-National University of Computer &
Emerging Sciences, Karachi

SDLC (Software Development Life Cycle)

- The SDLC is a process that development teams use to create quality and cost-effective software.
- The main goal is to ensure the software meets the customer's expectations during and after production.
- This process is about creating a detailed plan to guide development of the product and then breaking down the development process into smaller modules that can be assigned, completed, and measured to make the whole thing more manageable.

Why to use SDLC ?

- Increased visibility of the development process for all stakeholders involved
- More efficient estimation, planning, and scheduling
- Improved risk management and cost estimation
- A systematic approach to delivering software that meets customer expectations and improves satisfaction

Models of SDLC

- Agile
- Iterative
- Waterfall
- Spiral
- V-model
- Lean
- Prototyping
- DevOps
- Big-Bang model
- Incremental model

Phases of SDLC

- The SDLC process will look a little different for every team and product. However, the stages that most SDLC frameworks have in common are:
    - Planning and Analysis
    - Define Requirements
    - Design
    - Development
    - Testing
    - Deployment
    - Maintenance

Planning and Analysis

- This phase is when feasibility of creating the product is evaluated, revenue potential, the cost of production, the needs of the end-users, etc.
- To properly decide what to make, what not to make, and what to make first, a feature prioritization framework is used that takes into account the value of the software/update, cost, the time it takes to build.

Define Requirements

- This phase is critical for converting the information gathered during the planning and analysis phase into clear requirements for the development team.
- This process guides the development of several important documents:
    - Software requirement specification (SRS) or product specification
    - Use Case document: How the users will interact with the system.
    - Requirement Traceability Matrix document: Demonstrates the relationship between requirements and test cases. It's used to prove that requirements have been fulfilled.

Design

- The original plan and vision are elaborated into a software design document (SDD) that includes the system design, programming language, templates, platform to use, and application security measures.
- This is also where flowchart is defined that how the software responds to user actions.
- In most cases, the design phase will include development of a prototype model.
- Creating a pre-production version of the product can give team the opportunity to visualize what product will look like and make changes.

Development

- The actual development phase is where the development team members turn the software requirements into code that makes the product.
- This SDLC phase can take quite a lot of time and specialized development tools.
- It is important to have a set timeline and milestones so the software developers understand the expectations and you can keep track of the progress in this stage.
- In some cases, the development stage can also merge with the testing stage where certain tests are run to ensure there are no critical bugs.

Testing

- It’s important to have quality assurance team to perform validation testing to make sure it is functioning properly and does what it’s meant to do.
- The testing process can also help hash out any major user experience issues and security issues.
- In some cases, software testing can be done in a simulated environment. Other simpler tests can also be automated.
- The types of testing to do in this phase:
  - Performance testing
  - Functional testing
  - Security testing
  - Unit-testing
  - Usability testing
  - Acceptance testing

Deployment

- Software deployment is the process of making software available to be used on a system by intended users and other programs.
- Software may be deployed to create a backup copy of the software or to move the software to another system.
- The software release life cycle (SRLC) is a set of milestones that describe the various stages in software’s life cycle or sequential release timeline, from its conception to its eventual fully-baked release.
- The stages in SRLC include:
  - Pre-Alpha Version
  - Alpha Version
  - Beta Version
  - Release Candidate
  - General Availability
  - Production Release

Maintenance

- The maintenance phase is the final stage of the SDLC.
- The industry is moving towards a more agile software development approach where maintenance is only a stage for further improvement.
- In the maintenance stage, users may find bugs and errors that were missed in the earlier testing phase. These bugs need to be fixed for better user experience and retention.
- In some cases, these can lead to going back to the first step of the software development life cycle.
- The SDLC phases can also restart for any new features you may want to add in your next release/update.

Requirement Elicitation

- The process of investigating and learning about a system’s requirements from users, clients, and other stakeholders is known as requirements elicitation.
- Requirements elicitation in software engineering is perhaps the most difficult, most error-prone, and most communication-intensive software development.
- There are several requirements elicitation methods:
    - Interviews
    - Questionnaires
    - Brain storming
    - Use Case Approach

Integration of Security in SDLC

- SDLC integrates security via DevSecOps, which is not an isolated stage but a continuous process.
- DevSecOps, an extension of DevOps, incorporates security checks at every SDLC phase.
- Activities include code review, architecture analysis, penetration testing, and automated detection.