Testing Engineering Fundamentals

Software Engineering Seminar

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Outline

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Software Engineering

- **Software engineering** is the application of engineering principles to the design, development, and maintenance of software systems.
- It involves the use of systematic methods and tools to ensure that software is of high quality, reliable, and meets the needs of its users.
- The main goal of software engineering is to produce software that is cost-effective, efficient, and maintainable.
- It encompasses a wide range of activities, including requirements analysis, design, implementation, **testing**, and maintenance.
- Software engineering is a collaborative discipline that involves collaboration between developers.

Software Testing

- **Software testing** is the process of evaluating a `software system` or `its components` to determine whether it **satisfies** the specified **requirements** and to identify any defects.
- It involves `executing` the software under controlled conditions and evaluating the **results against expected outcomes**.
- The *main goal* of **software testing** is to ensure that the software is of high quality, reliable, and meets the needs of its users.
- It is an essential part of the **software development process** and is typically performed by independent testers or quality assurance teams.

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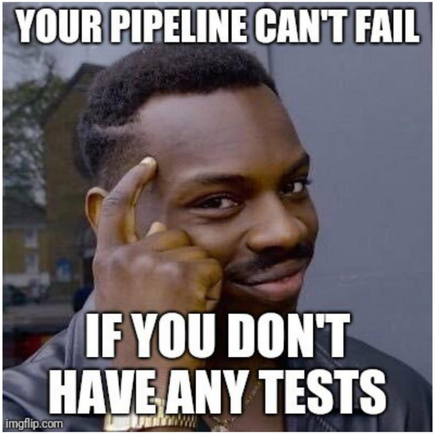
Classical Philosophy

"If you don't have time to do it right, when will you have time to do it over?"



Software Quality

- **Software quality** is the `degree` to which a software system meets the specified requirements and satisfies the needs of its users.
- It is a critical aspect of `software development` and is typically measured by a set of **quality attributes**, such as reliability, performance, usability, and maintainability.
- **Software quality** is typically assessed through a combination of static analysis, dynamic analysis, and testing techniques.

Quality is a Key Factor

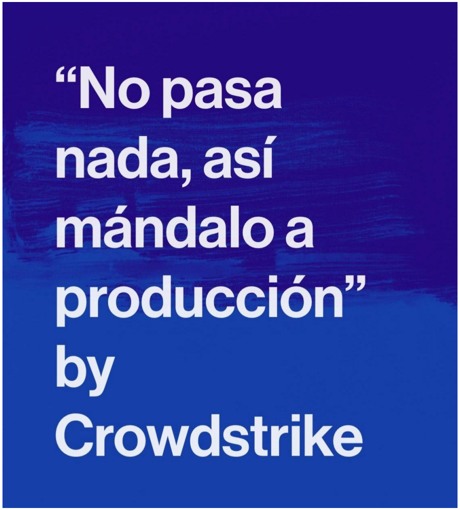

“No pasa nada, así mándalo a producción” by Crowdstrike

Figure: Microsoft Style!

Testing Engineering

- **Testing engineering** is the application of `engineering principles` to the design, development, and execution of **tests** for software systems.
- It involves the use of systematic methods and tools to ensure that software is of high quality, reliable, and meets the needs of its users.
- The main goal of testing engineering is to produce software that is cost-effective, efficient, and maintainable through the use of **automated testing** and **test-driven development** (`TDD`) practices.
- It encompasses a wide range of activities, including test design, test execution, and test analysis.
- **Testing engineering** is a *collaborative* discipline that involves *collaboration* between developers and testers to ensure that software is of high quality and meets the needs of its users.

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Test-Driven Development (TDD)

- **Test-Driven Development** (`TDD`) is a *software development methodology* that emphasizes the use of automated tests to drive the design and development of software.
- It involves writing a test for a specific piece of functionality **before** writing the code to implement that functionality.
- The `main goal` of `TDD` is to produce software that is of high quality, reliable, and meets the needs of its users through the use of **automated testing** and **test-driven development** practices.
- `TDD` is typically used in *conjunction* with other software development methodologies, such as *Agile* or *Scrum*, to ensure that software is developed in a collaborative and iterative manner.

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- It involves writing a test for a specific piece of functionality **before** writing the code to implement that functionality.
- The main goal of TDD is to produce software that is of high quality, reliable, and meets the needs of its users through the use of **automated testing** and **test-driven development** practices.
- TDD is typically used in *conjunction* with other software development methodologies, such as *Agile* or *Scrum*, to ensure that software is developed in a collaborative and iterative manner.

Quality Guidelines

- **Quality guidelines** are *principles* that *guide* the design of a system to *ensure* that it meets the needs of its users.
- They include reliability, scalability, maintainability, and usability guidelines.
- They are *important* for *ensuring* that a **system** is robust, efficient, and effective.

Reliability Guidelines

- **Reliability guidelines** are *principles* that *guide* the design of a system to *ensure* that it is reliable and dependable.
- They include fault-tolerance, redundancy, and error-handling guidelines.
- They are *important* for *ensuring* that a system is robust and resilient to failures.

Scalability Guidelines

- **Scalability guidelines** are *principles* that *guide* the design of a system to *ensure* that it is scalable and flexible.
- They include modularity, extensibility, and performance guidelines.
- They are *important* for *ensuring* that a system can grow and adapt to changing requirements.

Maintainability Guidelines

- **Maintainability guidelines** are *principles* that *guide* the design of a system to *ensure* that it is easy to maintain and update.
- They include modularity, documentation, and versioning guidelines.
- They are *important* for *ensuring* that a system can be easily maintained and updated by its developers.

Quality Standards

- **Quality standards** are benchmarks that *define* the level of quality that a system must meet.
- They include ISO 9000, CMMI, and Six Sigma standards.

ISO 9000

- **ISO 9000** is a `quality standard` that *defines* the **requirements** for a quality management system.
- It is *designed* to help organizations `ensure` that they meet the needs of their customers and stakeholders.
- It is *based* on a `number` of `quality management principles`, including customer focus, leadership, and continuous improvement.

ISO 27001

- **ISO 27001** is a `quality standard` that *defines* the **requirements** for an information security management system.
- It is *designed* to help organizations `protect` their information and ensure that it is secure and confidential.
- It is *based* on a `number` of `information security management principles`, including risk assessment, security policies, and incident response.

CMMI

- **CMMI** is a `quality standard` that *defines* the **requirements** for a mature software development process.
- It is *designed* to help organizations `improve` their software development processes and deliver high-quality products to their customers.
- It is *based* on a `number` of `best practices` for `software development`, including requirements management, project planning, and process monitoring.

Six Sigma

- **Six Sigma** is a `quality standard` that *defines* the **requirements** for a process that is *capable* of producing high-quality products.
- It is *designed* to help organizations `improve` their processes and reduce defects in their products and services.
- It is *based* on a `number` of `quality management principles`, including data-driven decision-making, process improvement, and customer focus.

Outline

Testing Levels

- **Testing levels** refer to the different stages of testing that a software system goes through during its development lifecycle.
- **Each level** of testing has its own set of objectives, techniques, and tools.
- The **main goal** of testing levels is to ensure that the software is of `high quality`, `reliable`, and `meets the needs of its users`.
- The most **common testing levels** include unit testing, integration testing, system testing, and acceptance testing.

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Base Code Quality & Good Practices

- **Base code quality** refers to the fundamental principles and practices that ensure that the **code** is of `high quality`, `maintainable`, and `efficient`.
- It includes **practices** such as code reviews, code refactoring, and code documentation.
- **Good practices** in software development include following coding standards, using version control systems, and writing unit tests. These practices help to ensure that the **code** is of `high quality`, `maintainable`, and `efficient`, and `that it meets the needs of its users`.

Demo Time!

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Static Analysis

- **Static analysis** is a *software testing technique* that involves analyzing the source code of a software system without executing it.
- The **main goal** of static analysis is to identify potential defects, vulnerabilities, and code quality issues in the `source code`.
- **Static analysis tools** can automatically analyze the source code and provide `feedback` on potential issues, such as coding standards violations, security vulnerabilities, and performance issues.
- *Static analysis* is typically performed early in the software development process.

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Unit Testing

- **Unit testing** is a *software testing technique* that involves testing individual units or components of a software system in isolation.
- The **main goal** of unit testing is to identify defects and issues in the `source code` at an early stage of the software development process.
- **Unit tests** are typically written by developers and are executed automatically as part of the software development process.
- **Unit testing** is typically performed after the code has been written and before the code is integrated into the larger software system.
- **Unit testing** is an essential part of the software development process and is typically performed using unit testing frameworks such as JUnit, NUnit, or pytest.

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Integration Testing

- **Integration testing** is a *software testing technique* that involves testing the interactions between different components or units of a software system.
- The **main goal** of integration testing is to identify defects and issues in the interactions between different components or units of the software system.
- **Integration testing** is typically performed after unit testing and before system testing.
- It can be performed using a variety of techniques, including top-down, bottom-up, and big bang integration testing.
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Integration Testing Techniques

- **Top-down integration testing** is a technique that involves testing the higher-level components of a software system first, and then gradually integrating and testing the lower-level components.
- **Bottom-up integration testing** is a technique that involves testing the lower-level components of a software system first, and then gradually integrating and testing the higher-level components.
- **Big bang integration testing** is a technique that involves integrating and testing all components of a software system at once, without any prior integration testing.

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API Testing

- **API testing** is a *software testing technique* that involves testing the application programming interfaces (APIs) of a software system.
- The **main goal** of API testing is to identify defects and issues in the APIs of the software system, including their functionality, performance, and usability.
- **API testing** is typically performed `after` integration testing and `before` system testing.
- It can be performed using a variety of **techniques**, including functional, non-functional, and regression testing.
- **API testing** is an essential part of the software development process and is typically performed using API testing frameworks such as Postman, SoapUI, or RestAssured.

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- **Non-functional testing** is a technique that involves testing the non-functional aspects of a software system, such as its performance, usability, and security.
- **Regression testing** is a technique that involves retesting a software system after changes have been made to ensure that the changes `have not introduced any new defects.`

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Stress Testing

- **Stress testing** is a *software testing technique* that involves testing the software system under extreme conditions to determine its stability and performance.
- The **main goal** of stress testing is to identify defects and issues in the software system when it is subjected to high loads or stressful conditions.
- **Stress testing** is typically performed `after` system testing and `before` acceptance testing.
- It can be performed using a variety of **techniques**, including load testing, performance testing, and scalability testing.
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Acceptance Testing

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- The **main goal** of acceptance testing is to identify defects and issues in the software system from the perspective of the end user.
- **Acceptance testing** is typically performed after system testing and *before deployment*.
- It can be performed using a variety of **techniques**, including user acceptance, alpha, and beta testing.
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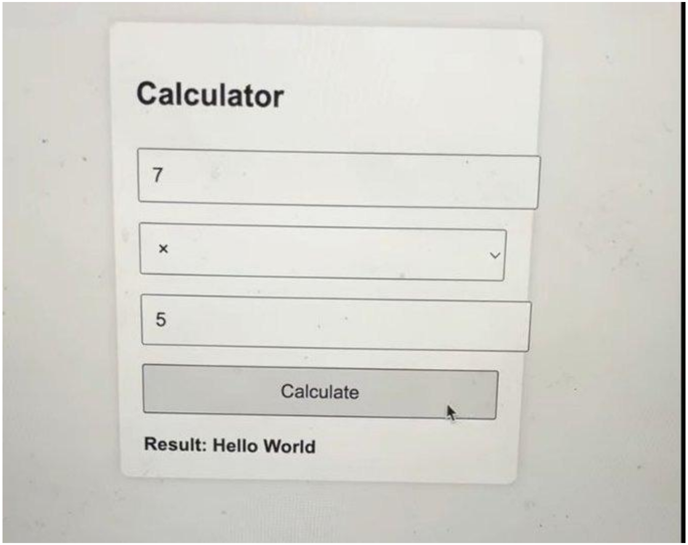
Feature Error



Result: Hello World

Outline

Thanks!

Questions?

Repo: *www.github.com/EngAndres/ud-public/tree/main/courses/software_engineering_seminar*