
International Conference on
QA
TEST
Embedded Software Testing
TESTING FUNDAMENTALS
What is testing and how you can implement it

ABOUT ME

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Working at SQS as testing engineer.
Worked in projects for critical sectors like health or railway.
Unit testing, testing automation, risk and requirements definition & validation.

OBJECTIVES OF THE TRAINING

- What is testing? Why is it necessary? And what types of testing are there?
- What kind of testing suits your project? How and when implement it?
- How is the full process of testing? from the definition to the reports.

QUESTION

What is the level of knowledge you have about testing?

A. No knowledge neither experience
B. I have studied some testing procedures but never worked on it.
C. I have worked on testing.
D. I am a certified tester.

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GLOSSARY OF TERMS

Test case & Test Data

TEST CASE

- Succession of instructions required to test a feature, requirement or security aspect of the system under validation.
- Each test case is focused on validating just one aspect of the system.

TEST DATA

- Data used for the testing process.
- This data is used in every test case that needs an input of any kind of data.
- Used to replicate the real data as close as possible to the data that the system will work with.

GLOSSARY OF TERMS

TEST SUITE

- Collection of test cases and test data used to validate a set of behaviors of the program.
- Generally used to group similar test cases together.
- They can identify gaps in the testing procedure where the successful completion of one test case must occur before you begin the next test case.

GLOSSARY OF TERMS

Defect Error & Failure

ERROR

- Human mistake.
- Generally created in coding but can be in other aspects of the project.

DEFECT

- Error found by the tester when the test doesn't output the expected.
- When the error is accepted by development then is called a bug.

FAILURE

- Failure is a consequence of a defect.
- Observable incorrect behavior of the system.

GLOSSARY OF TERMS

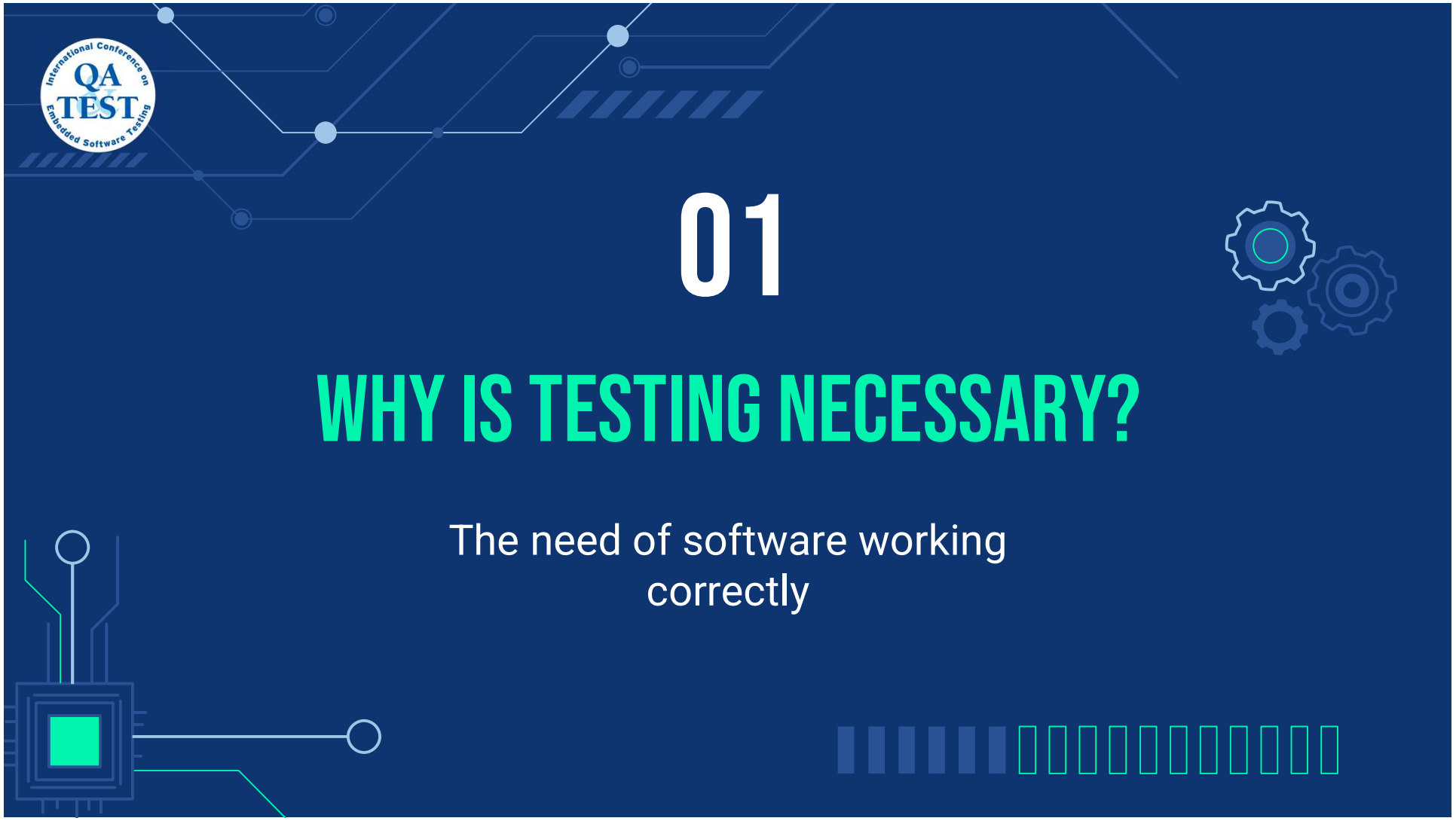
HOW TO CATEGORIZE AN ERROR

There are lots of ways to categorize an error.
Most important category is the severity of the error.

- The levels of severity and what kind of errors enters in those categories are different between projects.

Other ways of categorizing an error can be its source.

- Depending on where the error is held it can be categorized in documental, code, requirement, etc.
- Important categorization as it helps focusing on the source of the error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01
WHY IS TESTING NECESSARY?
The need of software working
correctly

WHEN SOFTWARE DOESN'T WORK AS WISHED

- Wrong results
- Not the functionality wanted
- Crashing
- Slow response
- Difficult to use

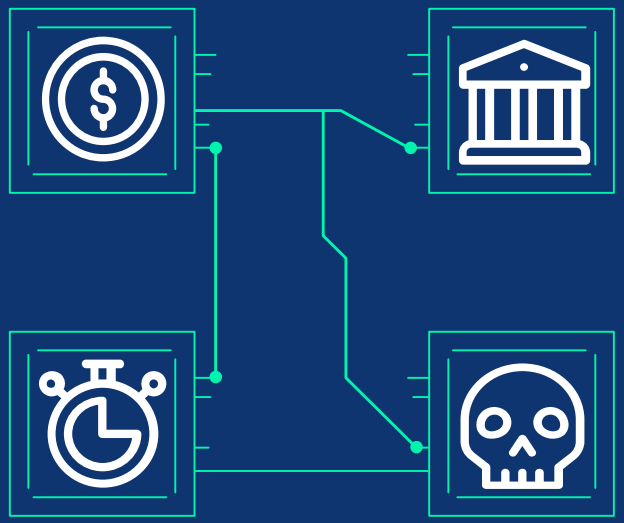
RISKS OF SOFTWARE FAILURE

MONEY

A software failure can recall in a loss of money

TIME

A failure of software needs time for it to be fixed

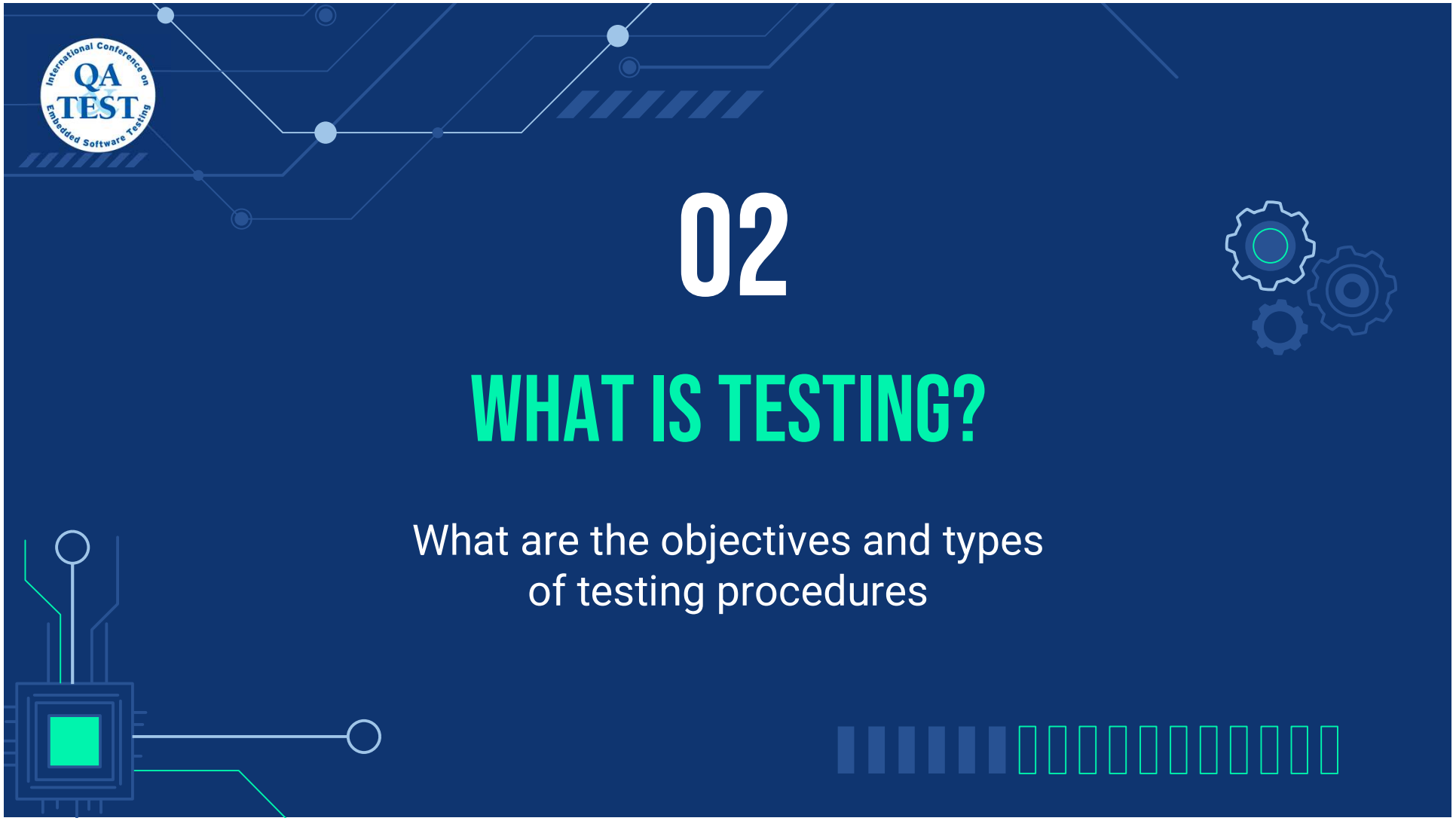


REPUTATION

A software error can make your company's image to drop

DEATH

If a critical software fails, it can produce risk of death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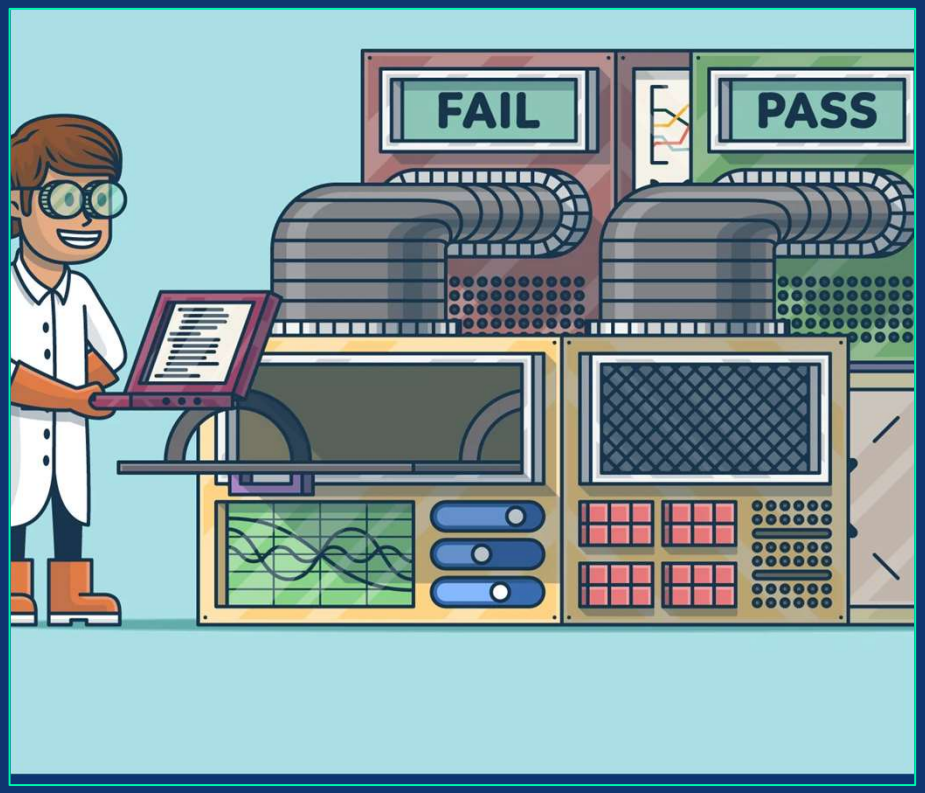
02
WHAT IS TESTING?
What are the objectives and types
of testing procedures

WHAT IS TESTING?

Testing is a method to check whether the actual product matches the expected requirements and to reduce its defects to a coherent rate. The purpose of software testing is to identify errors, gaps or missing requirements in contrast to actual requirements.



TEST OBJECTIVES

FIND DEFECTS

GAIN CONFIDENCE ON LEVEL OF QUALITY OF THE PRODUCT

PREVENT SYSTEMATIC FAILURES

ENSURE THE PRODUCT OPERATES IN LINE WITH REQUIREMENTS

REDUCE COST OF ERRORS

MINIMIZE SCOPE OF ERRORS

TYPES OF TESTING

If the software is running

STATIC TESTING

- The program is not running when testing.
- Used to avoid errors in an early stage of development.
- Find weak areas of the code, in instance, dead code
- Find of complexity, standard compliance, etc.

DYNAMIC TESTING

- The program is running when testing
- Used to test the behavior with dynamic variables.

TYPES OF TESTING

Based on the execution process of the tests

MANUAL TESTING

- The tester must introduce the data and analyze the output of the tests.
- Best option for programs not yet fully defined with changing requirements.
- Easy to modify test cases with low cost.

AUTOMATIC TESTING

- Full test cases launched automatically in a test suite.
- Recommendable process when the program has a level of stability.
- Significant cost in implementation and maintenance.
- Higher level of coverage with less effort and cost.
- Regression testing

TYPES OF TESTING

Based on the accesibility to the program

BLACK BOX TESTING

- The tester doesn't have access to the source code, just the data accessible to the end user.
- Test with the interfaces offered by the product
- Dynamic testing.

WHITE BOX TESTING

- The tester has full access to the source code and development process.
- Can operate with internal variables of the system under test.
- More in-depth potential than a black box testing procedure.

TEST CASES DEFINITION
BLACK BOX TESTING

- Equivalence partitioning
- Boundary value analysis
- Decision table testing
- State transition testing
- Use case testing

QUESTION

Black box testing

All figures will be to the closest euro. Select only 1 answer per question.

The first 1,500 € per annum	0%
The next 2,500 €	10%
The next 23,000 €	23%
Thereafter	40%

What are the correct input values for valid and invalid Equivalence Partitioning tests for the 10% tax band?

A. 2,750 €
B. 750 €
C. 1,501 €, 4,001 €
D. 1,500 €, 2,750 €, 4,001 €

QUESTION

Black box testing

All figures will be to the closest euro. Select only 1 answer per question.

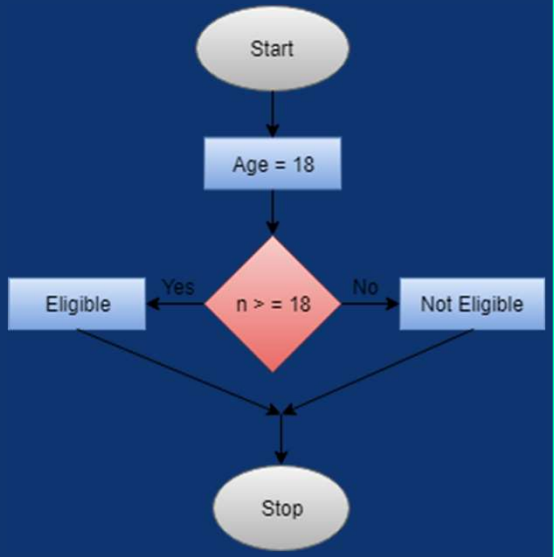
The first 1,500 € per annum	0%
The next 2,500 €	10%
The next 23,000 €	23%
Thereafter	40%

What are the valid Boundary Value analysis input value(s) to check the tax bands charged are correct for a client in the 23% band?

A. 4,000 €, 4,001 €, 4,002 €, 26,999 €, 27,000 €, 27.001 €
B. 4,001 €, 4,002 €, 27,000 €, 27.001 €
C. 2,500 €, 2,501 €, 22,999 €, 23,000 €
D. 4,001 €, 4,002 €, 26,999 €, 27,000 €

TEST CASES DEFINITION
WHITE BOX TESTING

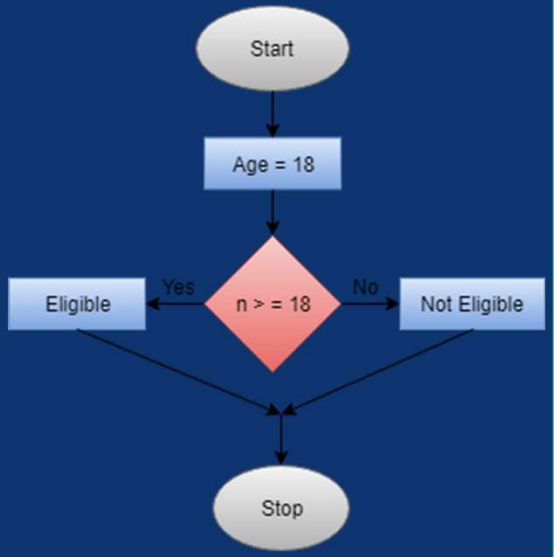
- Control flow
- Data flow
- Path testing



TEST CASES DEFINITION
WHITE BOX TESTING COVERAGE

- Branch coverage
- Statement coverage
- Modified condition/

  decision coverage



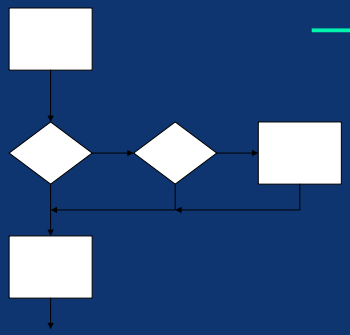
QUESTION

White box testing coverage

Identify the number of tests required to achieve:

1. 100% statement coverage.
2. 100% branch coverage.

```
READ AGE
IF AGE>0 THEN
        IF AGE=21 THEN
                PRINT “21st”
        END IF
END IF
PRINT AGE
```



Statement Coverage: _____
Branch Coverage: _____

QUESTION

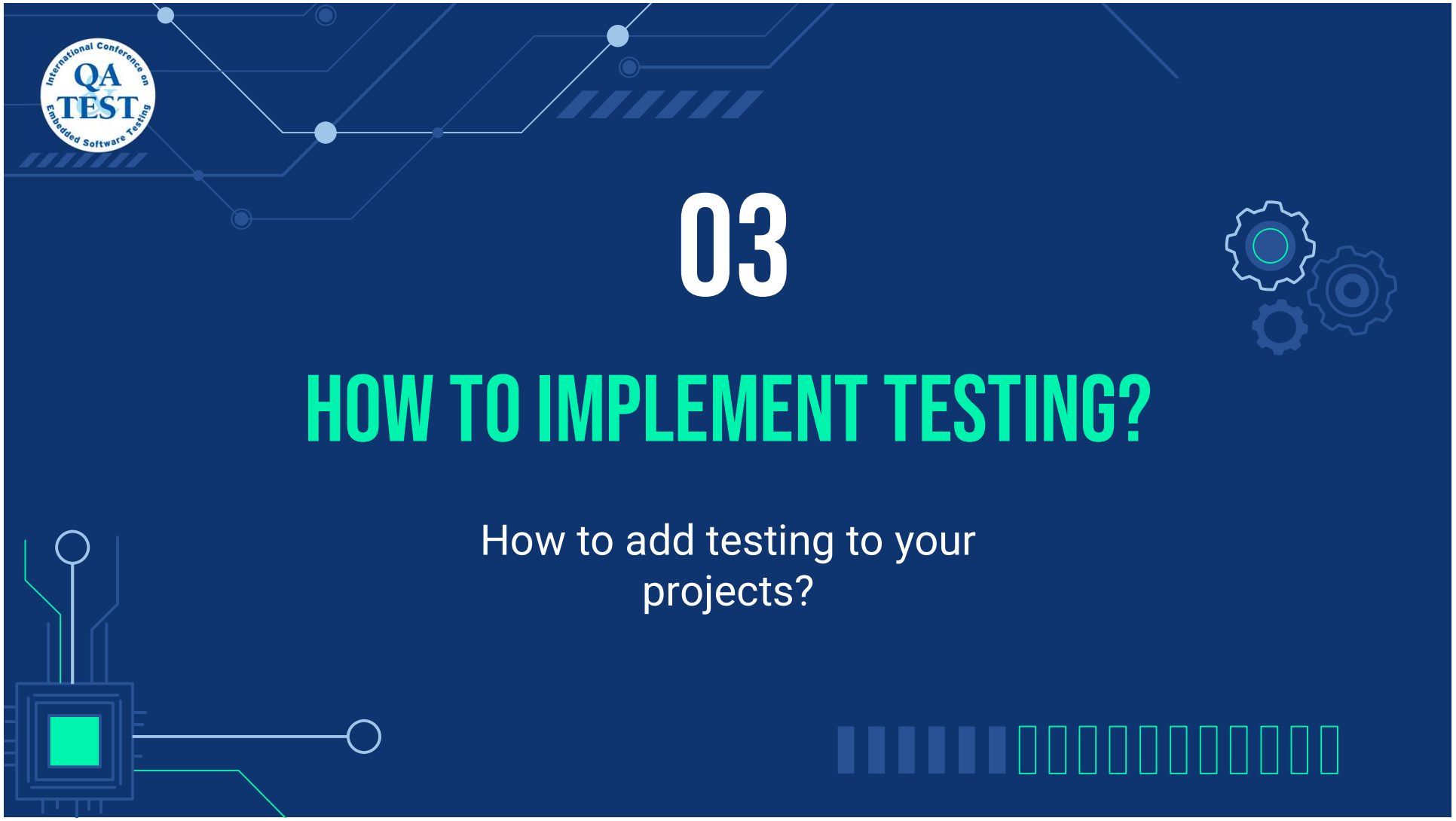
White box testing coverage

Identify the number of tests required to achieve:

1. 100% statement coverage.
2. 100% branch coverage.

```
READ HUSBANDAGE
READ WIFEAGE
IF HUSBANDAGE>65
        PRINT “Husband retired”
END IF
IF WIFEAGE>65
        PRINT “Wife retired”
END IF
```

Statement Coverage: _____
Branch Coverage: _____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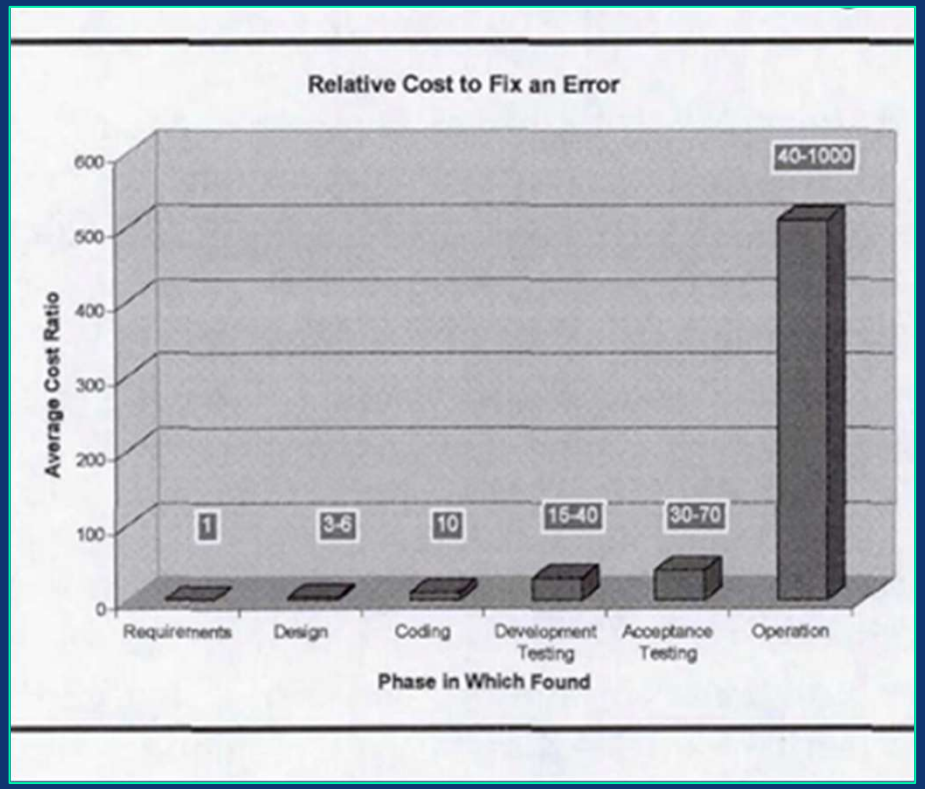
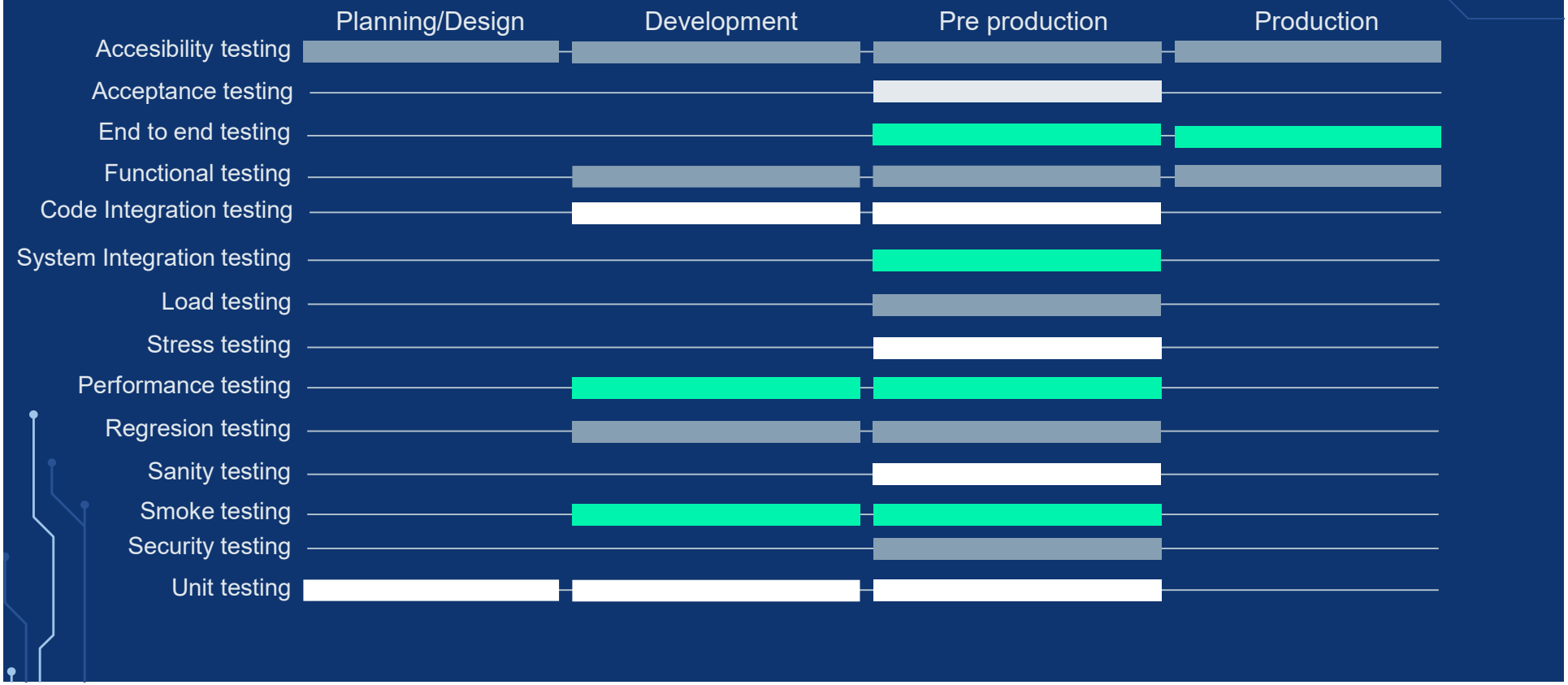
03
HOW TO IMPLEMENT TESTING?
How to add testing to your
projects?

EARLY TESTING IS KEY

The sooner the testing starts, the earlier the deffects are found.
The earlier the deffects are fixed, the cheaper it is.



TYPES OF TESTING DURING THE PROJECT



QUESTION

Selecting Testing types for a project

The program that manages the registering process for a 2-day workshop. After the workshop, the tool will be discontinued and not used again.

Select the testing procedure that fit best the project's needs:

A. End to end testing
B. Unit testing
C. Load/stress testing
D. Regression testing

QUESTION

Selecting Testing types for a project

The program that manages the alarms triggered in a train. This program will be installed on the train and must be working correctly for the full train's working life, with the same functionalities through all of it.

Select the testing procedure that fit best the project's needs:

A. End to end testing
B. Unit testing
C. Load/stress testing
D. Regression testing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IT IS NOT POSSIBLE TO
MAKE AN EXHAUSTIVE TEST

IF YOU ARE GOING TO TEST, DO IT RIGHT

DEFINE THE RISKS AND PRIORITIES OF THE PROJECT

- The context on which the product will operate changes the focus in the testing procedure
- It's important to focus the effort on the project.
- Make a risk analysis and define requirements based on it.

DEFINE THE REQUIREMENTS OF THE SYSTEM

- Develop requirements that cover both functional and nonfunctional.
- Test cases to review requirements.
- Review requirements to achieve a complete and coherent set of them.

04

FUNDAMENTAL TEST PROCESS

What are the different parts of a testing process?

TEST PLANNING

- Define the objective of testing
- Specify the test ativity for a project
- Determine the scope, risks and objectives of testing
- Determine exit criteria

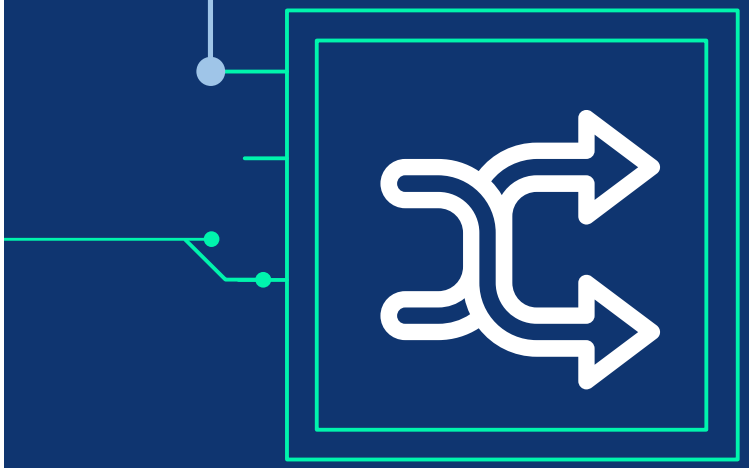
TEST CONTROL

- Compare actual progress against the plan and report the status
- Take actions necessary to meet the mission and objectives of the project
- Measure and analyze results
- Monitor and document progress, test coverage and exit criteria
- Make decisions to release the software or to retain it for further work

TEST ANALYSIS & DESIGN

- Transform test objectives into tangible test conditions and test designs.
- Designing the tests
- Evaluate testable requirements and system
- Design the test environment set-up and identify required infrastructure and tools

TEST IMPLEMENTATION & EXECUTION

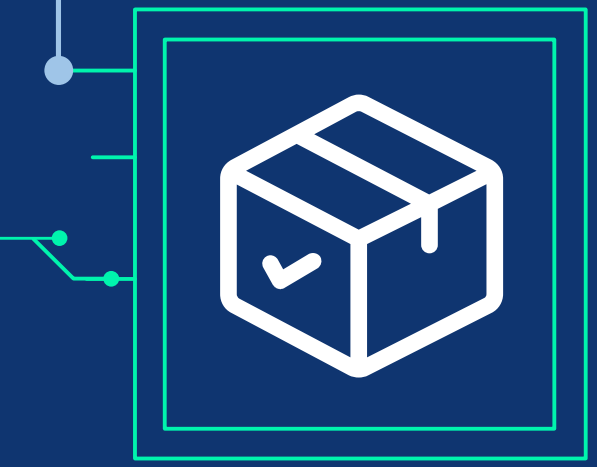


- Develop and prioritize test cases, create test data, write test procedures and optionally prepare automated test scripts
- Execute test cases according to the planned sequence
- Log the outcome of test execution
- Compare actual results with expected results
- Record discrepancies as incidents and analyze them to establish the reason of the defect

EXIT CRITERIA EVALUATION & REPORTING

- Check test logs against the exit coverage criteria specified in test planning
- Check incident reports against exit quality criteria
- Assessing if more tests are needed
- Assessing if the exit criteria specified should be changed
- Write test summary for stakeholders

TEST CLOSURE



- Documentation of the acceptance of the system
- Finalize and archive testware, the test environment and test infrastructure for later reuse
- Handover of testware to the maintenance organization
- Retain audit trail, make sure we don’t delete things we will want to use again.
- Learn from mistakes made this time for our next project.

THANKS!

Do you have any questions?

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NEXT TRAINING SESSION

Unit testing
20/10/2021 14:30
With Javier Martínez