



# **ITMD 536 Software Testing & Maintenance**

## **Chapter 9 and 10 A Focus on Regression Testing & Content Based Annual Release**



## Objectives

- ▶ What is regression test and test baseline?
- ▶ What is revalidation and qualification?
- ▶ What is field testing and releases?
- ▶ What is field support and repairs?
- ▶ What are adaptive, corrective and perfective changes?
- ▶ What changes needs to be included when and why?
- ▶ Why do we focus on quality?
- ▶ What are the distribution controls?



## 9. A Focus on Regression Testing

- ▶ **Regression Testing:** Refers to the testing of software releases to verify that modifications made to them have not caused unintended effects and that the software system and its components still satisfy its specified requirements and perform as intended.



## 9. A Focus on Regression Testing

- ▶ **Regression Testing:** Common methods of regression include rerunning previously executed tests in a specified sequence to check if the system functions the same, performance has degraded, or fixed faults reemerge either as themselves or in other instances.

- ▶ <https://www.youtube.com/watch?v=YwwfipBxE4g>



## 9.1 Regression Tests and Test Baselines:

- **Baseline:** A specification or product that has been reviewed and agreed upon, and thereafter serves as the basis for further development, and that can be changed only through formal change control procedures.



## 9.1 Regression Tests and Test Baselines:

- ▶ Testing is where the action is in software maintenance.
- ▶ IEEE 829 – 1998 specifies a set of documents for use in at least following eight stages of the test process, which are done in total as endorsed by this professional society:



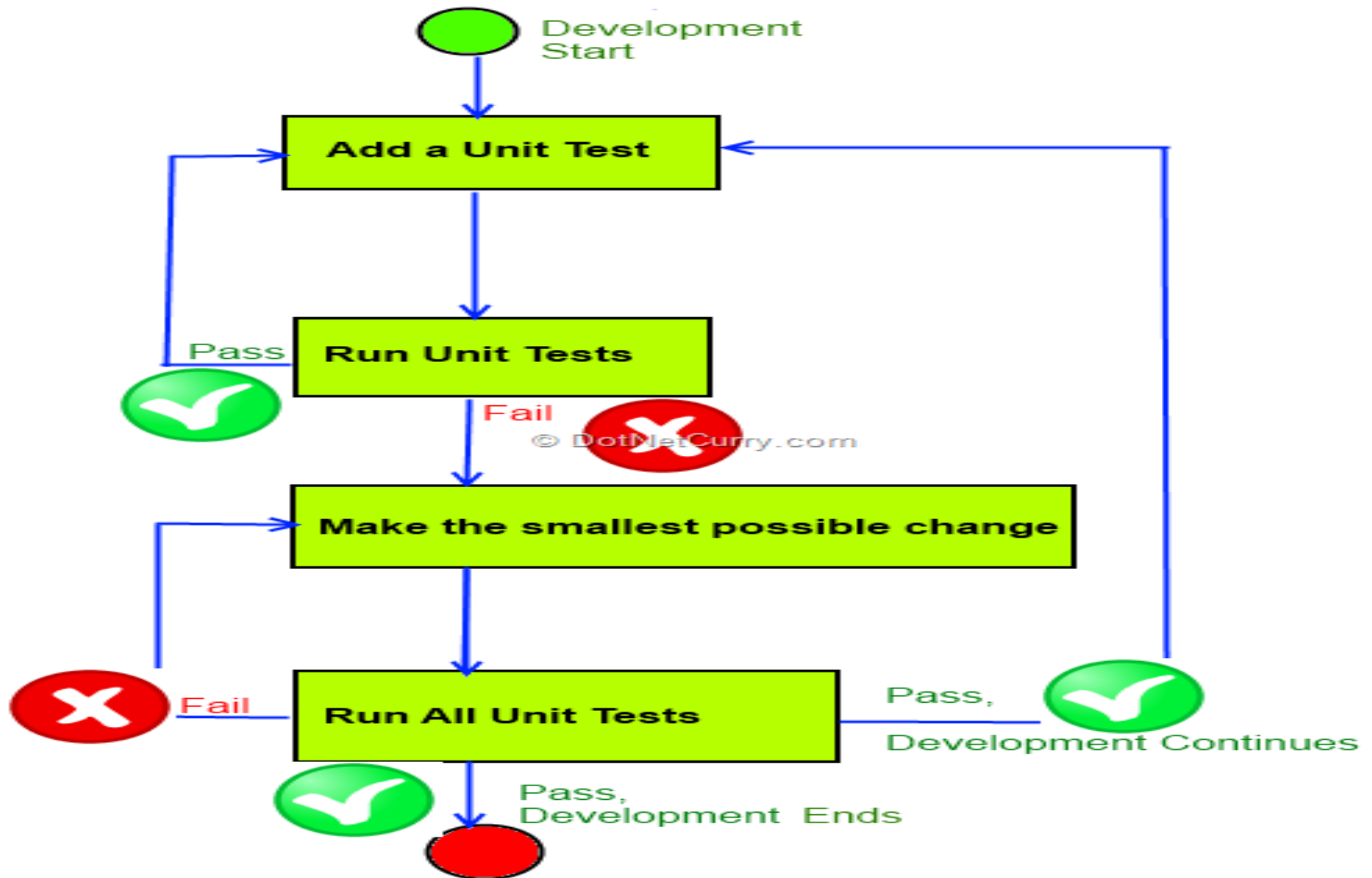
## 9.1 Regression Tests and Test Baselines:

- **Unit Testing:** refers to test run to verify the functionality and correctness of a code module, building block, or class level component of a software build, increment, or program typically performed using white-box methods. Here is where debugging takes place. Where errors are found and fixed.



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## 9.1 Regression Tests & Test Baselines

- ▶ **Integration Testing:** refers to tests conducted to verify the interfaces and interactions between software components as they are integrated together with each other and legacy, library, COTS, and open-source modules in successively larger combinations defined by the software requirements and interface specification, (collections, builds, increments & programs.



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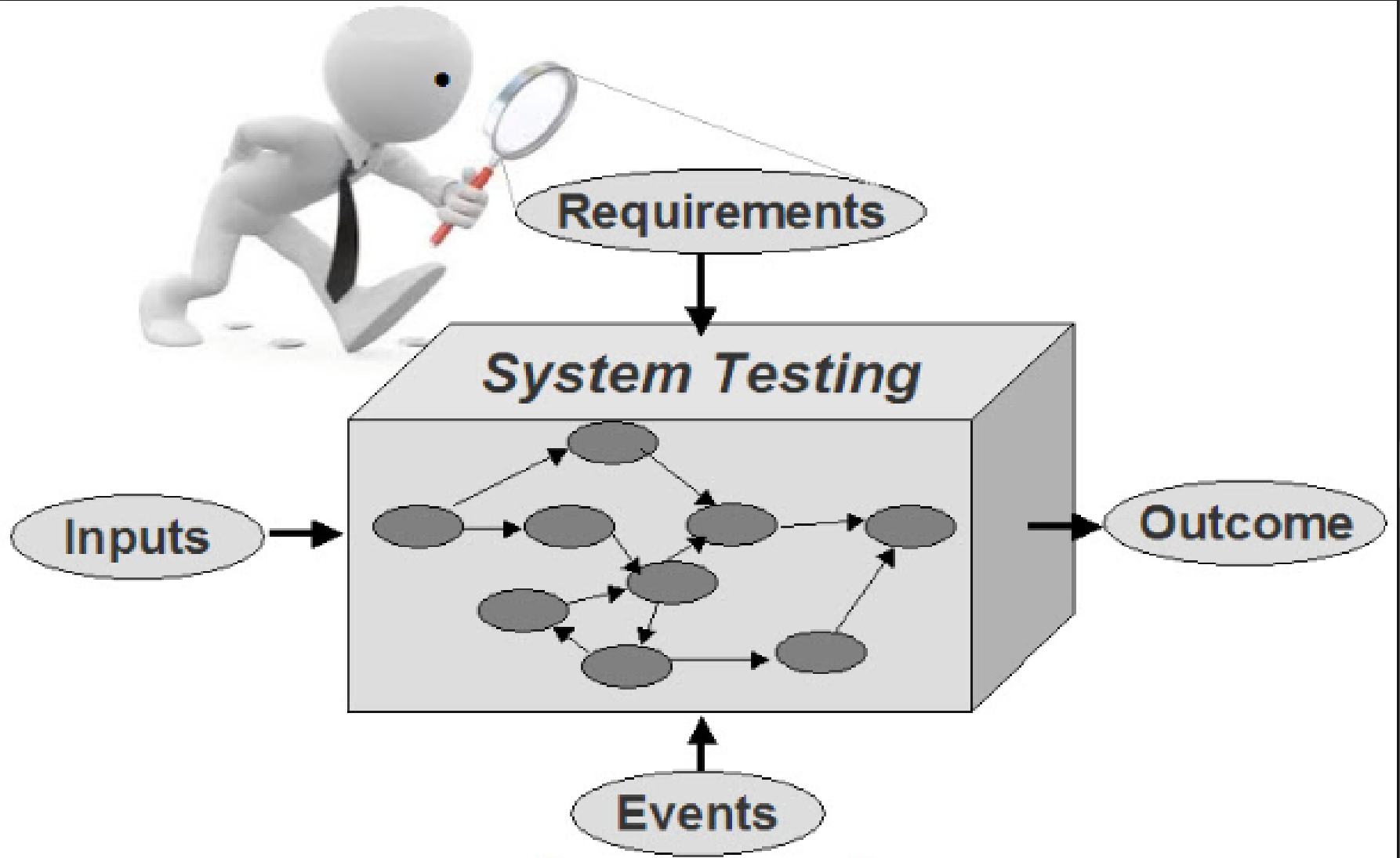


## Integration Testing



## 9.1 Regression Tests and Test Baselines:

- ▶ **System Testing:** Refers to testing the completely integrated system to verify that it satisfies functional, performance, interface, and nonfunctional (availability, reliability, safety, security, etc.) requirements.





## 9.1 Regression Tests and Test Baselines:

- ▶ **System Integration Testing:** refers to tests conducted to verify the interfaces and interactions between components as hardware and software are integrated together with each other and any external or third-party systems defined by the systems requirements into successively larger combinations such as subsystems.



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**Start with Plan**

**Document as You Go**

**Deliver/Release Product**

**Unit Testing**

**Beta Testing**

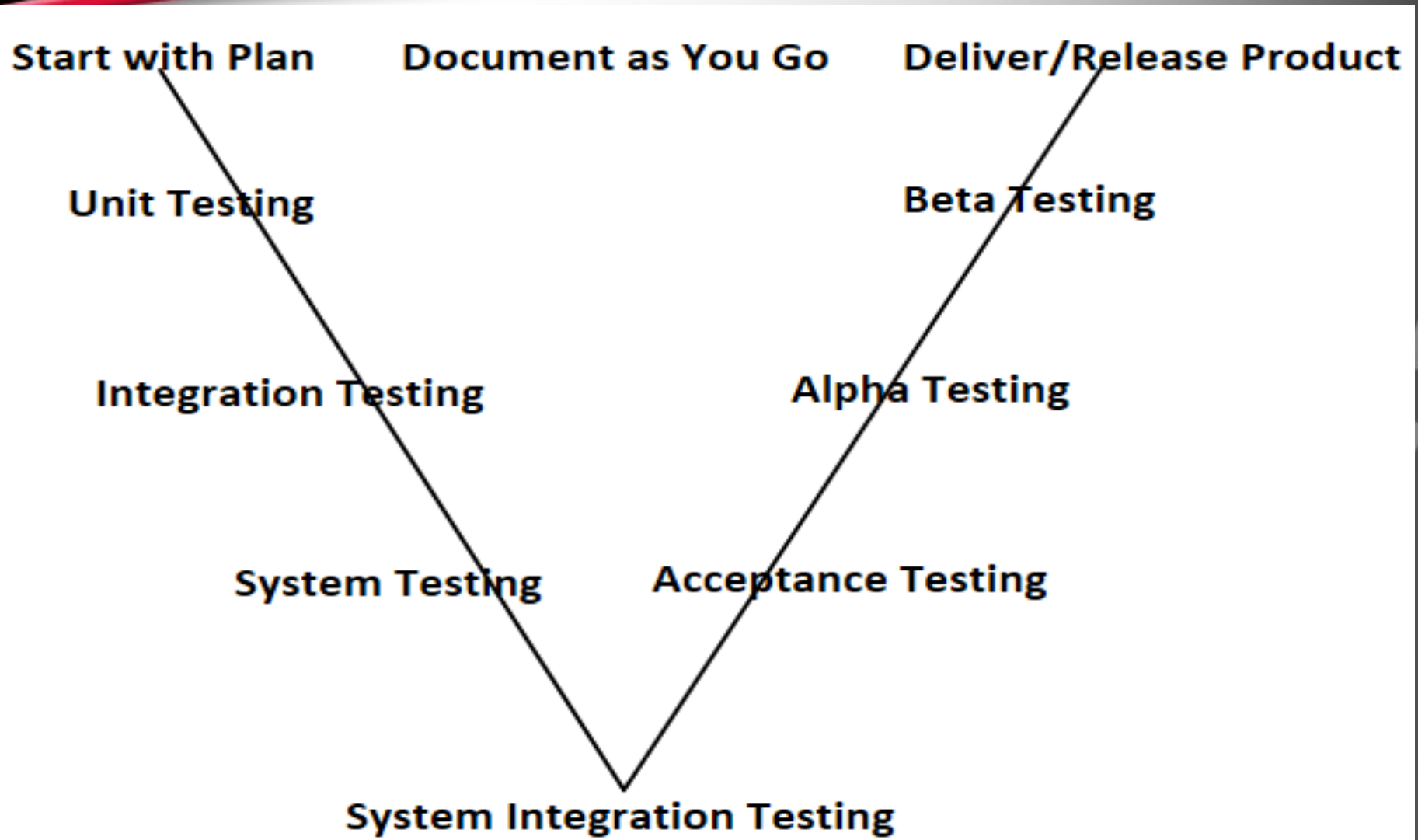
**Integration Testing**

**Alpha Testing**

**System Testing**

**Acceptance Testing**

**System Integration Testing**





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# System Integration Testing





## 9.1 Regression Tests & Test Baselines

- ▶ **Regression Testing:** Refers to test software releases to verify that modifications made to them have not caused any unintended effects. The software system and its components still satisfy its specified requirements and performs as intended. Run previously executed tests in sequence to check the system functions the same.

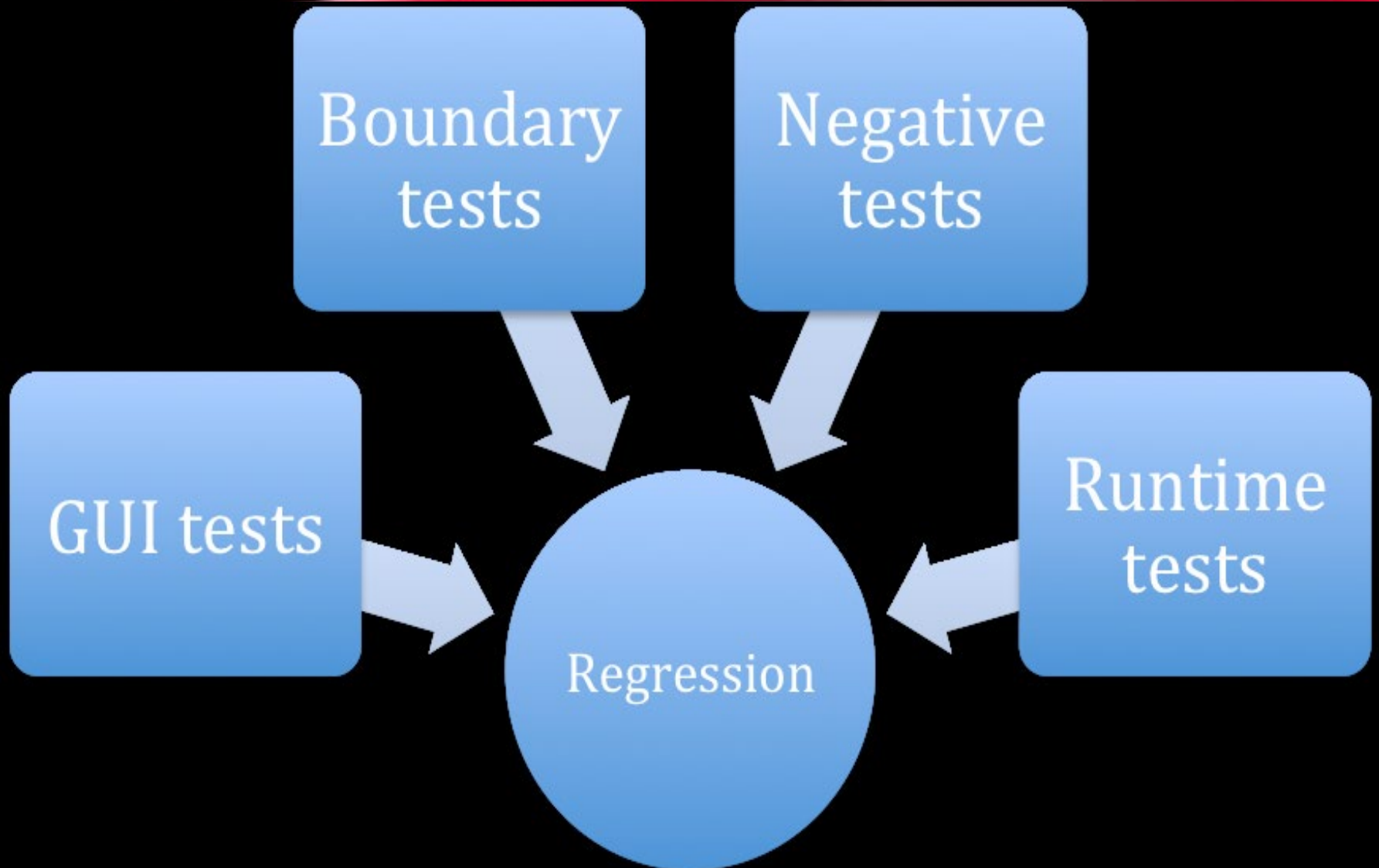




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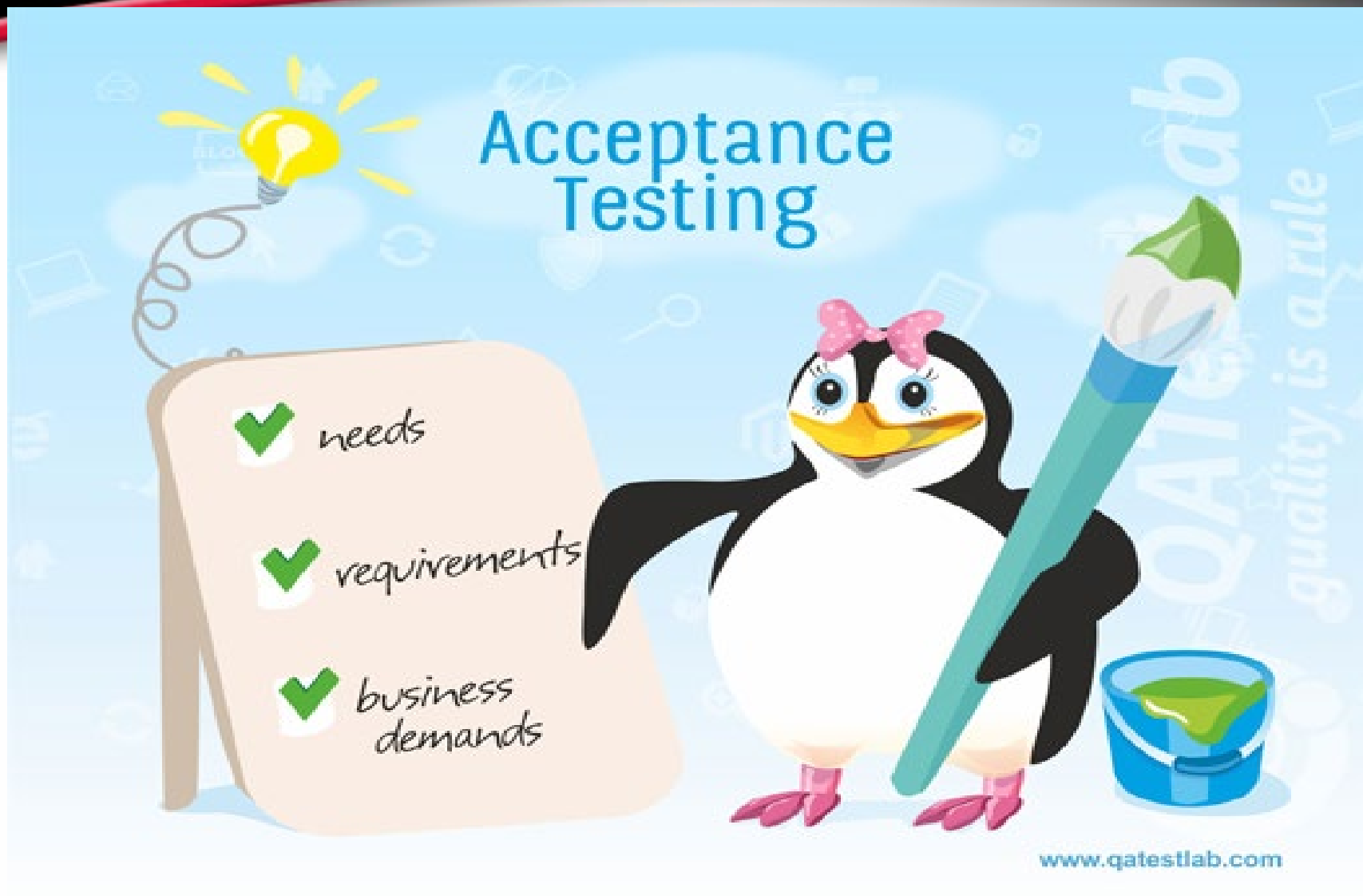
## 9.1 Regression Tests and Test Baselines:

- ▶ **Acceptance Testing:** Refers to black-box testing conducted by the customer on a software system aimed at confirming that it satisfied its specifications and performs as expected on operational hardware prior to accepting transfer of ownership.



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# Acceptance Tests





## 9.1 Regression Tests and Test Baselines:

- ▶ **Alpha Testing:** Refers to testing conducted by an independent team to ensure that the software functions as expected and can be implemented with the same characteristics in its operational environment.



Customer Test



Developer Site

Customer Site

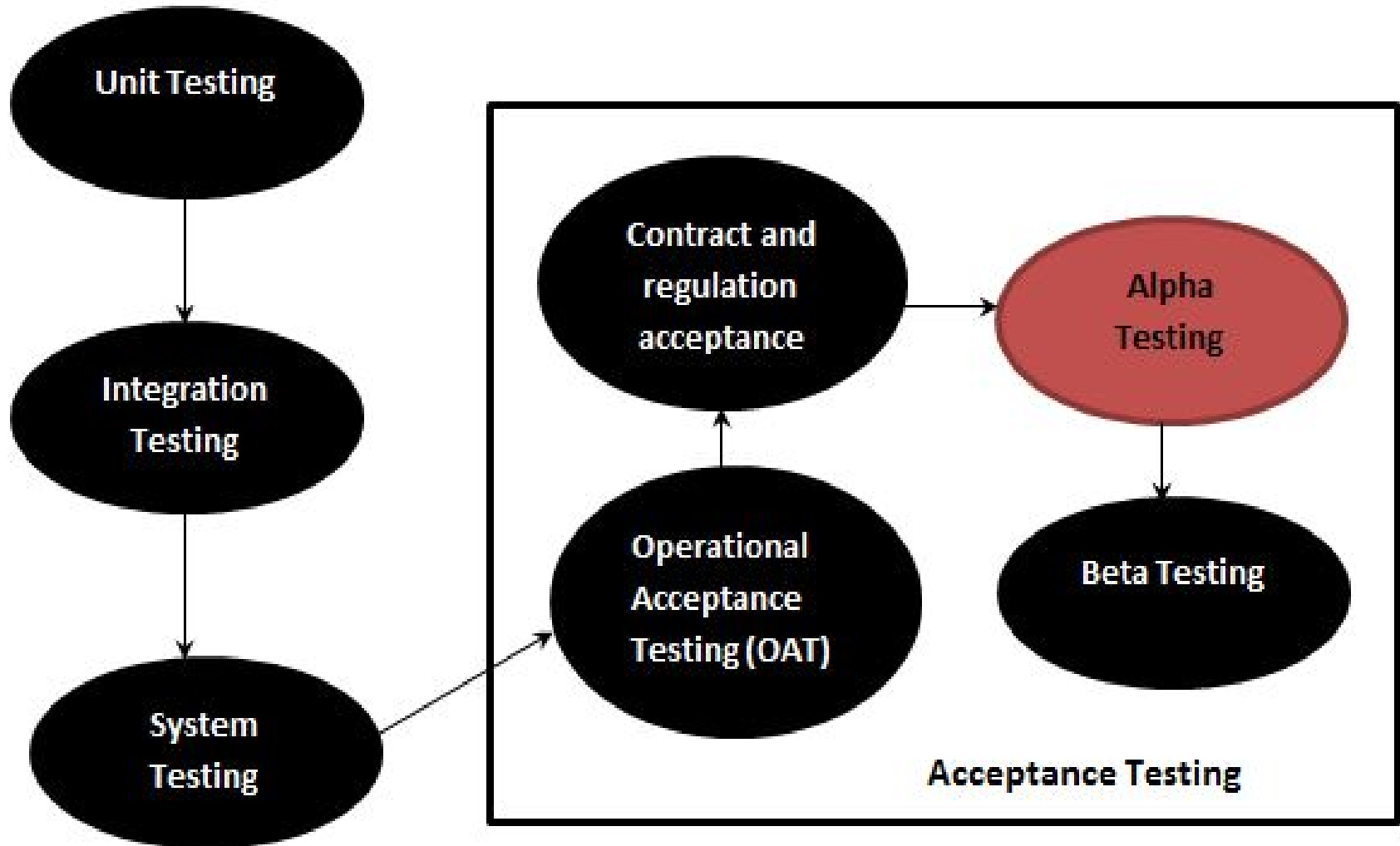
Alpha Testing



## 9.1 Regression Tests and Test Baselines:

- **Beta Testing:** Refers to testing performed by external potential users aimed at ensuring that their needs are met. Typically, an independent group coordinates the tests conducted by outsiders and ensure that recommendations made by them are considered and potentially implemented.







## 9.1 Regression Tests and Test Baselines:

- ▶ Regression tests are run to ensure that the release executes as the users expect on their operational platforms. During these runs, you will need to verify that side effects are not present and operations will not be disturbed by the changes.



## 9.2 Revalidation and Qualification

- ▶ Regression test fulfills a dual purpose. It revalidates the release:
  - 1. will satisfy its requirements including those for external interfaces and any changes included and
  - 2. will perform as intended after repairs have been made as configured/tailored for the user's operation without any side effects.



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Crosscheck Networks - SOAPSonar Enterprise 6

File Mode Tools Library Updates Registration Simulation Agents Help

Project View Run View Report View QA Mode

Drag/Drop Tests to Suite Tree

hide

- Calculator.asmx
  - Configuration
  - WSDL Services
    - Calculator
      - Add
        - Baseline
        - Subtract
        - Multiply
        - Divide

Suite Group

Active Suite: **DefaultSuite**

Test Suite created on April 16, 2014 at 2:27:33 PM

Suite Settings Test Group Settings

Suite Comments:

Suite Pre-Run Task List: **0 Tasks**

Suite Post-Run Task List: **0 Tasks**

**Test Suite Settings:**

result Filename: DefaultSuite\_89.xml

result Directory: C:\Program Files\Crosscheck Networks\SOAPSonar Enterprise 6\log\QA

access Criteria: ☐ Test Case Success Criteria ☒ Regression Baseline Rules

result Logging: Log All Results Task Logging Level: INFO

/ait Time (ms): 200

imeout (sec): 10

**Run Stats**

Log Filename	Duration	Requests	Transfer Errors	Network Errors	HTTP Errors	Min Bytes	Max Bytes	Min Time (ms)	Max Time (ms)	TPS	Error Rate	HTTP Error TPS
DefaultSuite_89.xml	5.652	1	0	0	0	227	227	0	479.4	1.00	0.0%	0.00

(Double-Click on Entry to View Detailed Log and Reports. Right-click to clear entries)



## 9.2 Revalidation and Qualification

- It is highly recommended that regression tests be automated using scripts developed specifically for that purpose. Such scripts should also be designed to automatically compare results to expectations and highlight any differences found. This will simplify the testing process considerably fast, reusable and repeatable.



## 9.2 Revalidation and Qualification

Time to market

95%

earlier on production

Productivity

14

times more effective

Savings

76%

on head count

Savings on investment

83%

equipments and room space

Savings on cost of money

83%

on peripherals

Environment protection

1

more committed to nature



## 9.3 Field Testing and Releases

- Releases to the field are, by design, configured, adapted, and tailored to the needs of the operational facility. Field testing of releases is by its very nature intended to check out operational considerations like setup parameters and power up, boot and shutdown procedures.





## 9.3 Field Testing and Releases

- ▶ Speed and performance of the application (response time, CUPU and memory utilization, etc.)
- ▶ Data population ease (time to populate and verify application databases)





## 9.3 Field Testing and Releases

- ▶ Ease of use (measures include time to launch and complete an application or the steps involved in exercising a feature or function.
- ▶ Ease of learning (measures include time to learn to use features and functionality)



## 9.4 Field Support and Repairs

- ▶ Field support functions that need to be performed by the software maintenance shop besides scheduling and dispatching technical personnel include following:
  - Establish a work order system that defines, tracks, and loses out trouble tickets



## 9.4 Field Support and Repairs

- Creating a Web-based system to provide information to users/customers on field support issues and their resolution (including a frequently asked questions list)
- Creating a customer database that records the history for each site in which the release is installed, including a patch history



## 9.4 Field Support and Repairs

- Establishing a purchase order system and the means to track payments
- Creation of a patch management system to track patches in the field
- ▶ Patches must be approved by management.
- ▶ Must use approved procedures and adequately documented and tested
- ▶ Categorized as priority 1 defect first



# **SLA and Supplier Agreements Management**

- 4.2.12 The SLA indicators are used for billing purposes
- 4.2.13 Raw data describing costs are available for some maintenance resources (personnel, systems, and contracts/licenses). Maintenance billing captures, presents, and explains the most important cost elements



## **10 Content-Based Annual Releases**

- ▶ **10.1 Adaptive, Corrective, and Perfective Changes**
- ▶ Change to existing software releases is precipitated by actions taken to make adaptive (add new functions, address new platform, etc.) updates to the previous software release.



## 10 Content-Based Annual Releases

- ▶ Stakeholders require the maintenance team to provide risk assessment, priorities, cost estimates especially when the changes involves potential commercial off-the-shelf (COTS) hardware and software updates and replacements.



## 10 Content-Based Annual Releases

- ▶ They cannot include everything in the release because of resources limitations (time, money, staff, facility hours etc.)
- ▶ The change control board assumes the stakeholders responsibilities in making content decisions.





## 10 Content-Based Annual Releases

- *Record/Classify*- Stakeholders initiate a software change request (SCR) for changes or repairs. Defects in the field use the software trouble reports which identifies issues. The change control board (CCB) approves the changes.



## 10 Content-Based Annual Releases

- ▶ *Assess* – The CCB tasks a technical team to assess the changes. Request are prioritized based on cost, impact, and implementation risk using the following similar scheme:



## 10 Content-Based Annual Releases

- ▶ *Priority 1 (Urgent)* – must make a change in order to continue operations. Such as emergency repairs.
- ▶ *Priority 2 (Critical)* – The change should be made without delay as it may be associated with a known defect that is seriously degrading system functionality or performance.



## 10 Content-Based Annual Releases

- ▶ *Priority 3 (Major)* – The change should be made, but delays in the repair are tolerable.
- ▶ *Priority 4 (Minor)* – The change should be made when there are time and resources to do it.



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## 10 Content-Based Annual Releases

- ▶ *Plan* – Stakeholders or CCB agrees on the priority of the issue for changes.
- ▶ *Implement* – Stakeholders or CCB agree with the release plan and selected release schedules.
- ▶ *Close / Accept* – Changes implemented should be tested and accepted as part of the release update cycle.



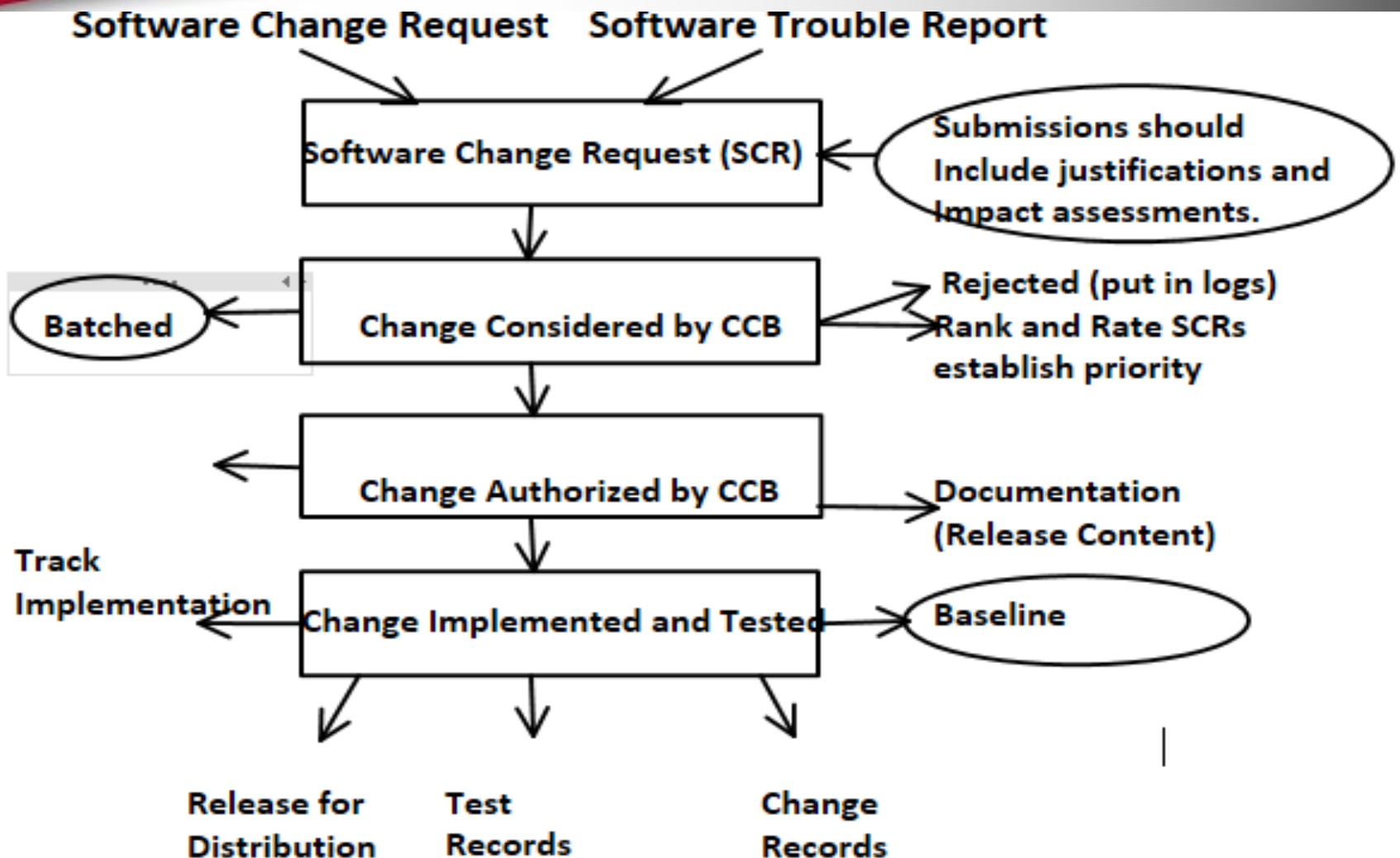
## **10 Content-Based Annual Releases**

- ▶ The normal configuration management process following the steps in Change Control Board (CCB) and process to rate the proposed changes based on an assessment of their impact and assignment priorities.



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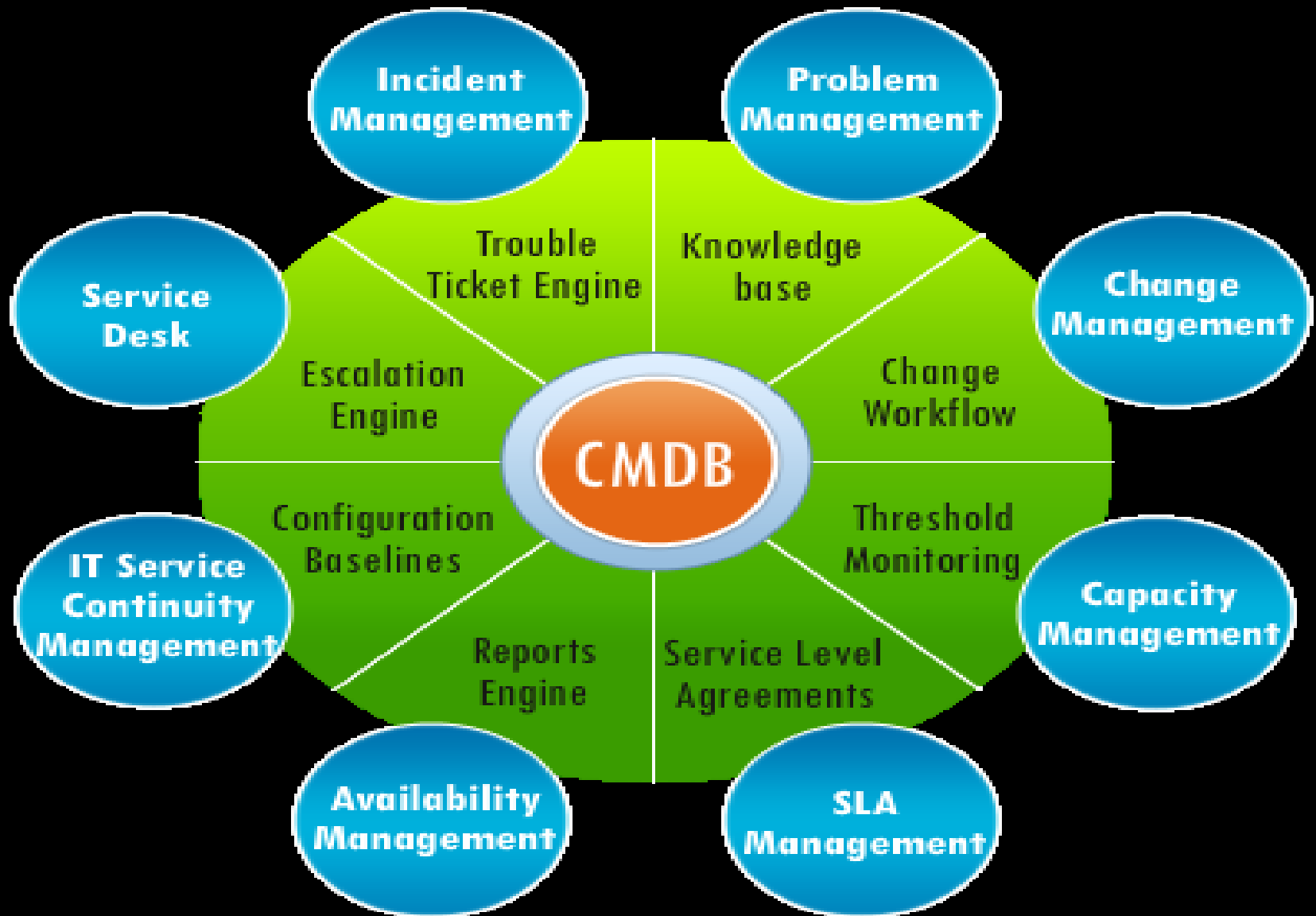
## 10 Content-Based Annual Releases

- ▶ Change control board membership:
  - 1. CCB Chair – Chair of the board
  - 2. CCB – Stakeholders
  - 3. Originator – Software Change Request
  - 4. Evaluator – person or team
  - 5. Implementation team – Project Lead
  - 6. Verifier – Test team representative
  - 7. Recorder – Person who publish minutes



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## 10 Content-Based Annual Releases

- ▶ *Adaptive maintenance*: Modification of a software product performed after delivery to keep computer program usable in a changed or changing environment
- ▶ *Corrective maintenance*: Reactive modification of a software performed after delivery to correct discovered faults.



## 10 Content-Based Annual Releases

- ▶ *Perfective maintenance*: Modification of a software product performed after delivery to improve either its performance or maintainability.
- ▶ *Preventive maintenance*: Modification of a software product after delivery to correct latent defects before they become problem. This often includes redesign, restructuring, or upgrade of the software to make it easier to maintain.



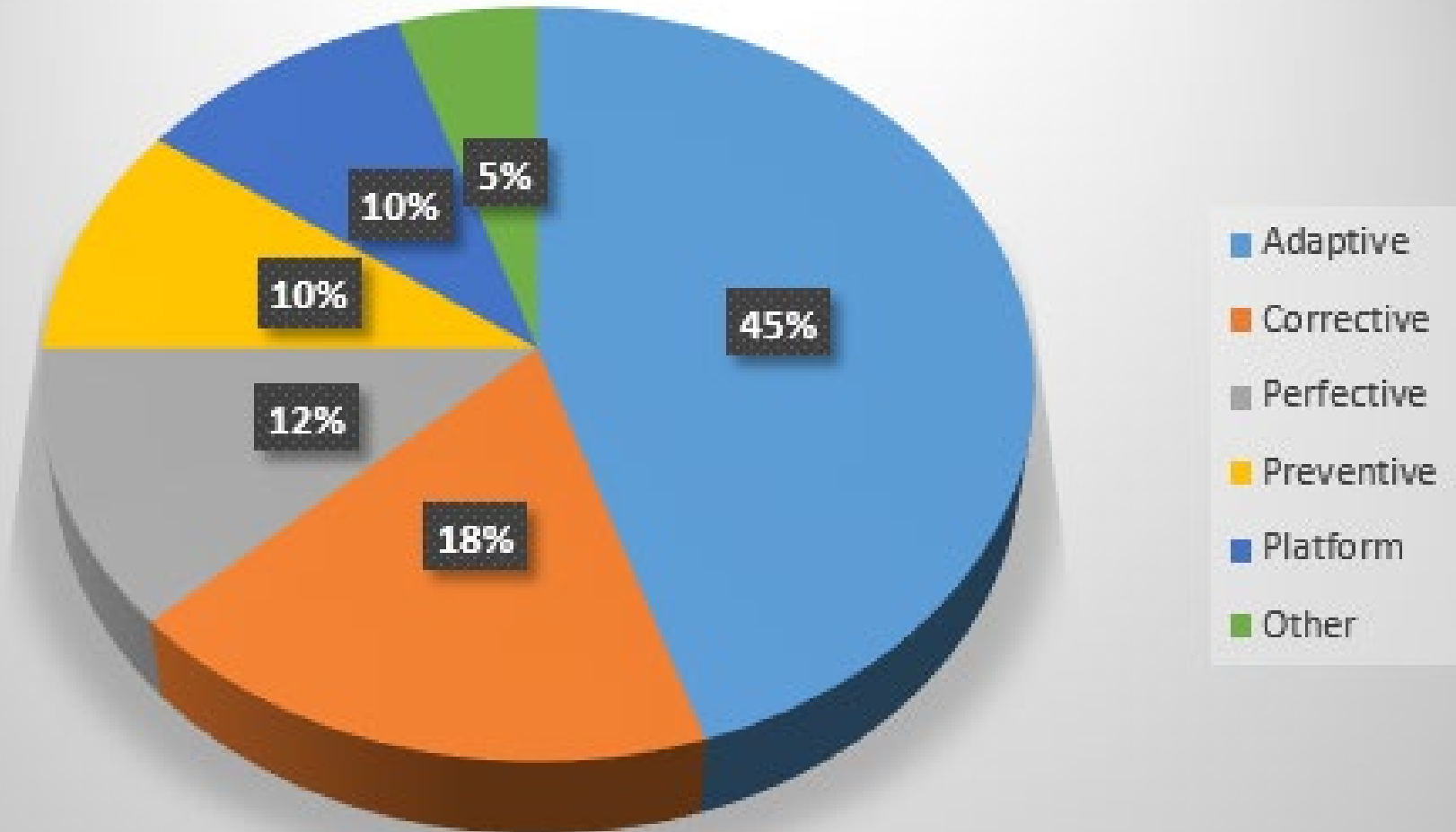
## 10 Content-Based Annual Releases

- *Platform maintenance*: Modification of a software product after delivery to ensure that it runs with platform software (operating systems, database managers, utilities, drivers, etc.) that has been updated to incorporate manufacturer recommended changes.



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## 10 Content-Based Annual Releases

- ▶ **10.2 What Changes to Include, When, and Why**
- ▶ *Starts with the basics* – The basic ingredients revolve around the schedule and budget established for your release the number of SCRs that you have to process, metrics on your past performance and your backlog.



## 10 Content-Based Annual Releases

- ▶ *Add the essential stock* – You need to start prioritizing the work that needs to be done assuming that you have estimated the number of SCRs that you can incorporate into the release.





## 10 Content-Based Annual Releases

- ▶ *Fill the pot* – If you still have resources available in your plan at this point in time, you can add the remaining Priority 2,3 and 4 SCR.s.
- ▶ *Stir as you cook* – Before you start updating the software generate a map that identifies dependencies between modules.



## 10 Content-Based Annual Releases

- ▶ *Sample the results* – The unexpected will occur as the release is being generated. Content will have to be added, deleted, and modified based on events, issues, and user/customer preferences. This approach allows you to set expectations so you can minimize surprises.



## 10 Content-Based Annual Releases

- ▶ **10.3 Focus on Quality**
- ▶ In commercial world, quality is king.
- ▶ Software releases from a historical context, you see what many call the rolling wave model.
- ▶ The number of SCRs lessening over time until the next big upgrade occurs.



## 10 Content-Based Annual Releases

- ▶ There are many practices that can be used during software maintenance to continually improve software quality.
- ▶ Those who work during development like peer reviews and code reading can be applied with minimal modification during maintenance.



## 10 Content-Based Annual Releases

### ► 10.4 Distribution Controls

- Releases have to be configured, customized, and tailored for distribution to more than one site or geographic region.
- For example, financial packages sold worldwide need to be customized to handle different tax laws and restrictions.



## 10 Content-Based Annual Releases

- ▶ The practice of distribution control assume that the release being distributed has been baselined, and a master copy of the release and its associated regression tests and documentation have been placed in a physical repository under configuration control.



## 10 Content-Based Annual Releases

- ▶ Many variations to these distribution practices occur.
- ▶ Specialized install programs may be needed to comply with operating system vendor requirements that call for the established of specialized directories.



**Research Paper Due**

**Research Paper  
due on  
Nov 17<sup>th</sup>**





**Final Exam Group Project**

**Final Exam**

**Group Project**

**Presentation in Class**

**December 1<sup>st</sup> & 8<sup>th</sup>**