QA Testing Boot Camp

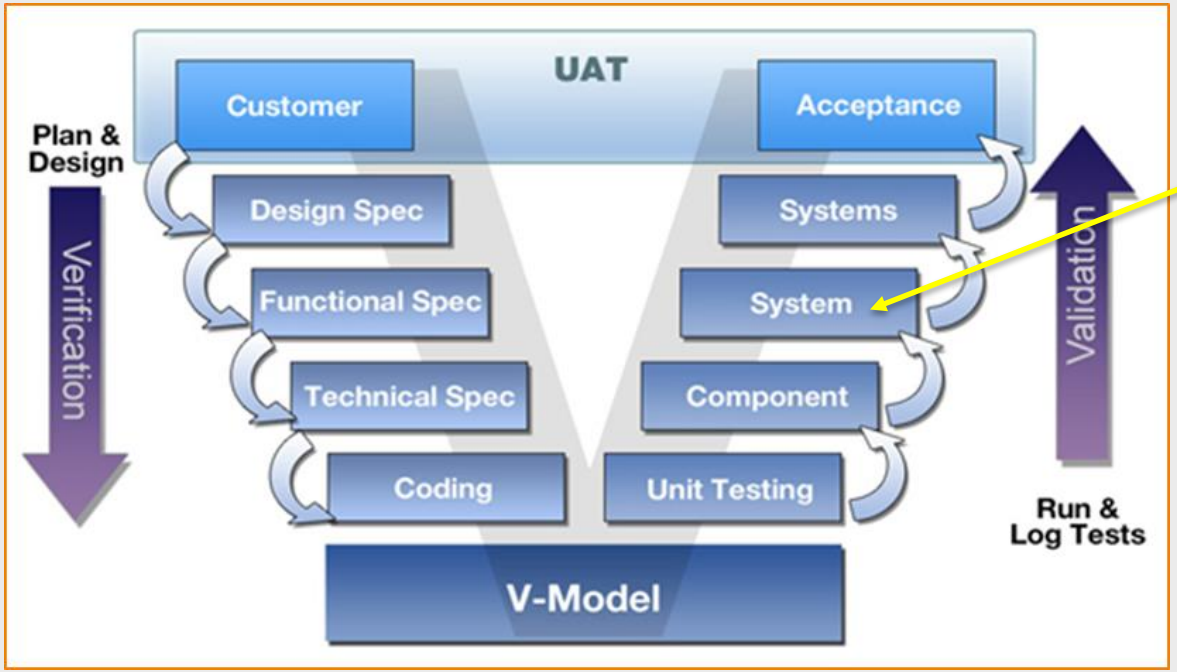
Chapter 9 – The Levels of Testing

Learning Outcomes

- Understand the levels of testing
- Understand where in the SDLC the levels are applied
- How the levels related to V&V

The Levels of Testing

There is a 5th level – Post Production Testing – Ensures that all components were moved to the production region and are functional.



1st System Test is known as Integration Testing.

In 2015 due to the security issues, penetration testing is now included in the model.

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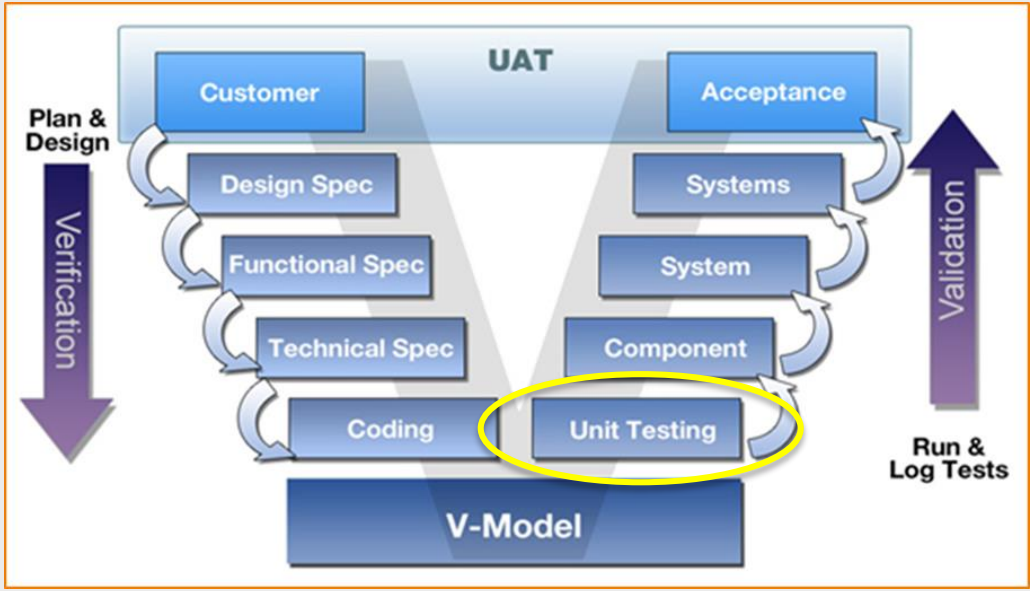
Unit Testing

- Performed by developers during the development cycles
- Ensures that the components are working to the best of their knowledge
- Tests code during development
- Classes, Functions, Interfaces and Procedures



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Unit Testing (2)

Unit – Smallest testable part of the application (functions, classes, etc.)

- Goal is to test individual parts of the code
- Software should function as expected
  - Handle results correctly
  - Fail gracefully
- Uses White Box Testing Methods
  (Chapter 13)

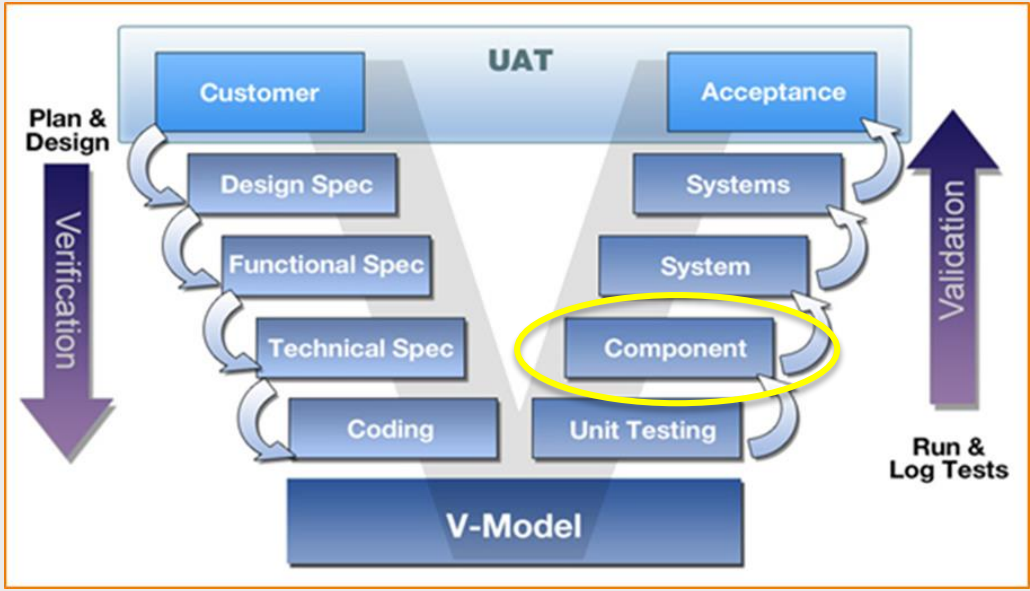
Unit Testing (3)

Advantages:

- Defects discovered early
- Isolated from other parts of the system
- Reduces the cost of defect removal
- Simplifies defect detection in later stages

Component Testing

- Cross between Unit and Integration Testing
- Modules work together but are coded/tested independently
- Example: Save and Upload Functions



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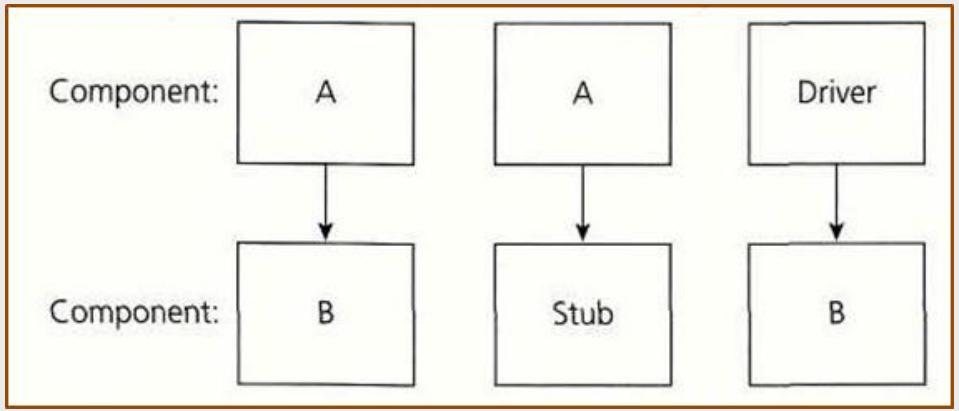
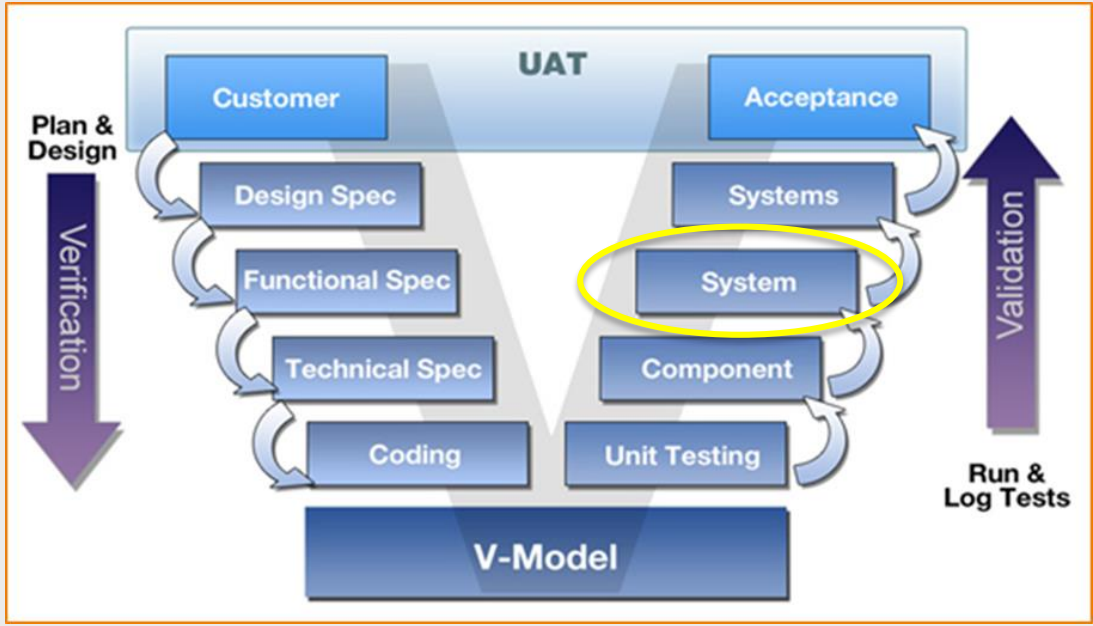
Component Testing (2)

- Each component is tested separately
- Known as module or program testing
- Completed by testers – First look at software
- May be done in isolation depending on the SDLC model used
- Missing modules are stubbed and drivers are used
  - Stubs – pre-coded entry/exit points
  - Driver – empty calls to other modules



System Integration Testing

- Performed when 2 or more modules work together to achieve a goal
- Tests behavior and functionality
- Types: Big Bang, Top Down, Bottom Up, Functional Incremental, Component Integration, System Integration



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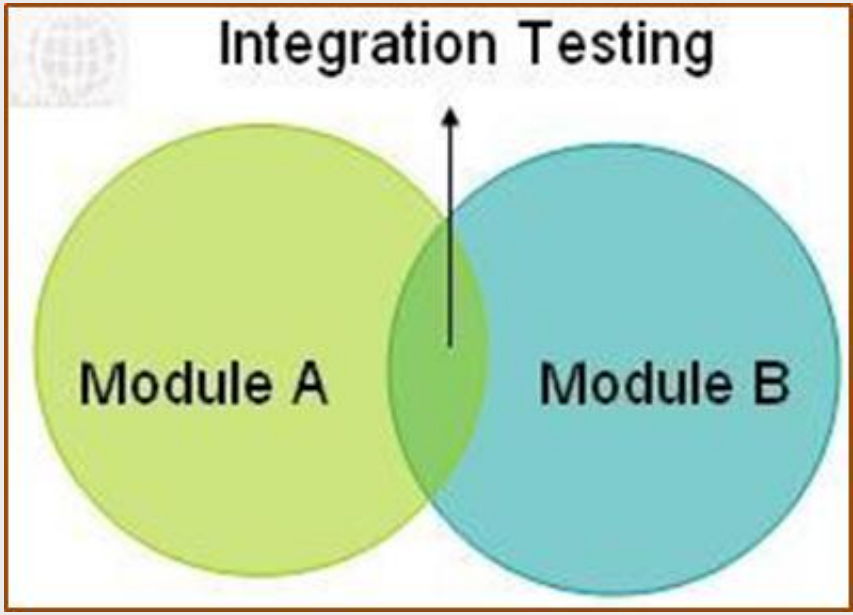
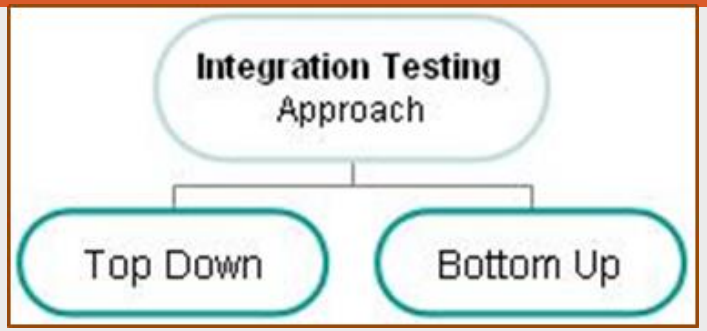
System Integration Testing (2)

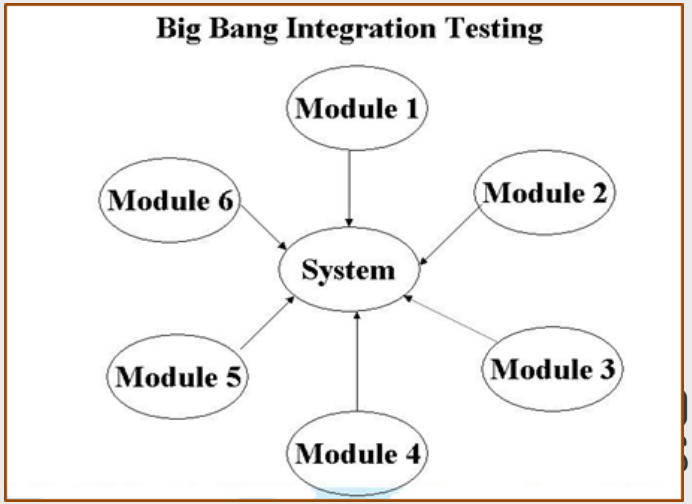
- Tests the integration and/or the interfaces between the components
  - Interactions with the O/S, other systems, the file system, the hardware
- Ensures data flow between components
- First time the entire system is interacting as a complete unit of software



System Integration Testing (3)

- Two Common Approaches
  - Top-Down – Testing begins at the upper most entry point (e.g. login screen) of the software
  - Bottom-Up – Starts with the lowest level component and works backwards to the upper most bound
- Big Bang Approach – Everything is tested all at once

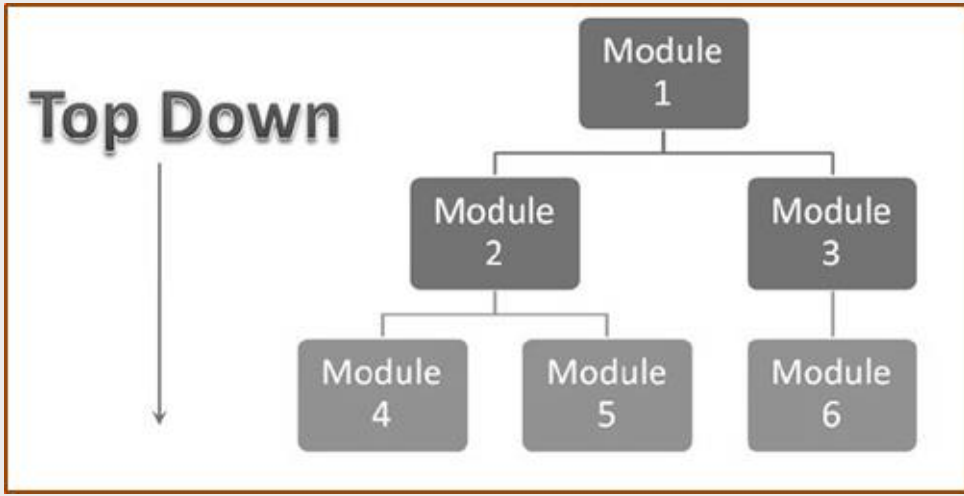




System Integration Testing (4)

Top- Down Approach

- Follows Control Flow Graph
- Starts with upper most module – usually a GUI or main screen
- Stubs are used as in component testing
- Environment is similar to the final destination
- Issues: basic functionality tested later in the process



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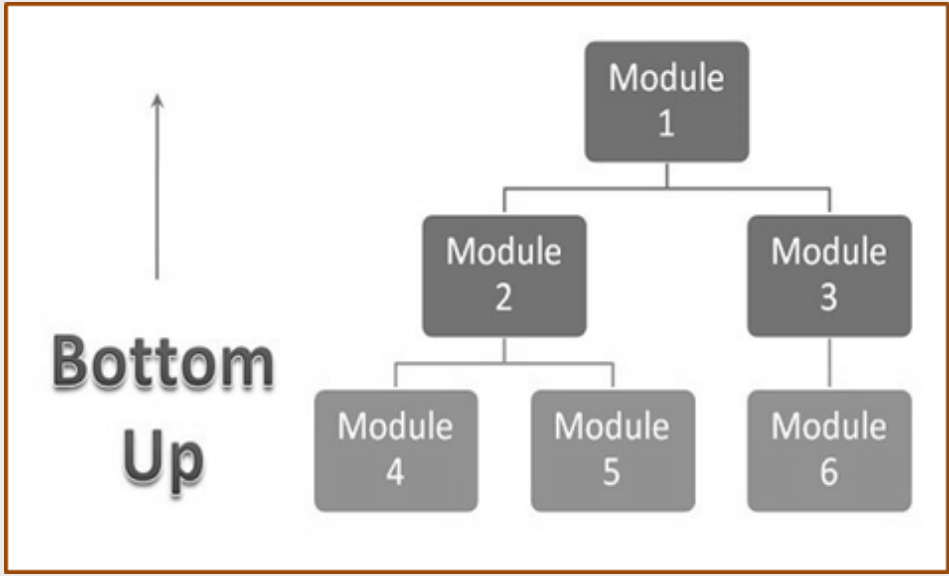
System Integration Testing (5)

Bottom Up Approach

- Follows Control Flow Graph in bottom to top fashion
- Drivers are used as in component testing
- Development/Testing done together
- Early defect discovery
- Issues: Drivers must be created at all levels

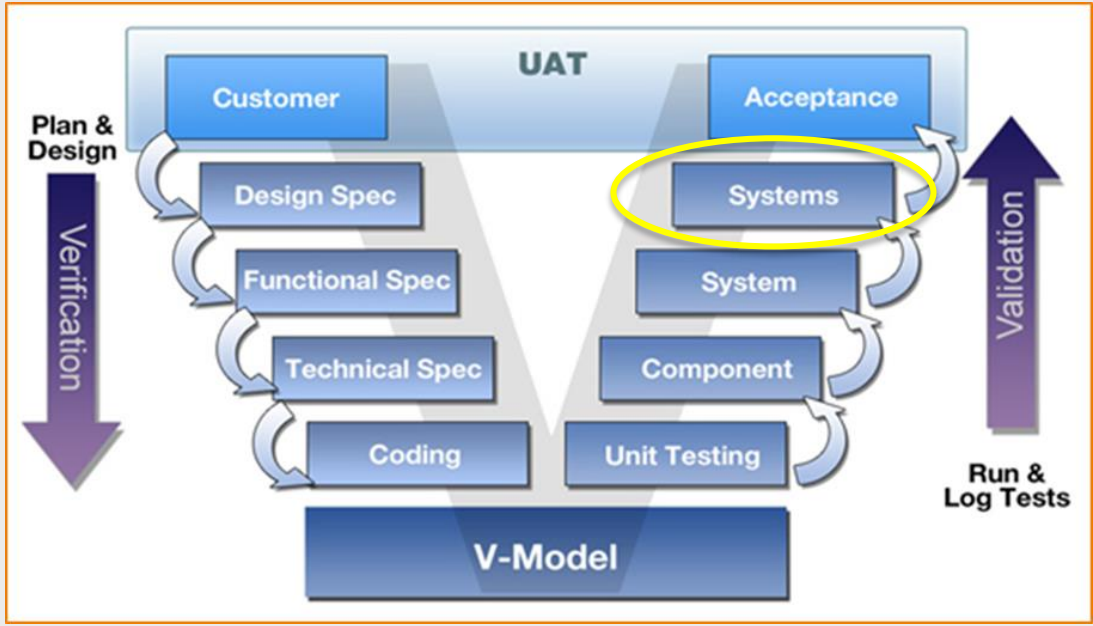


System Integration Testing (6)

- Additional Approaches
  - Incremental Integration – Extreme Programming (XP) testing methodology
    - Integrate each module one by one, testing after each step
    - Functional Integration (FI) - Based of the functions and functionalities
    - Component Integration Testing (CIT) - Tests the interactions between software components
    - System Integration Testing (SIT) - Tests the interactions between different systems

Systems Testing

- The compatibility of the entire application is tested
- Functional and Non-Functional Requirements are addressed
- Most often Black Box Testing Methodologies are used (Chapter 12)
- Can be the final level of testing
- Testers perform these tests



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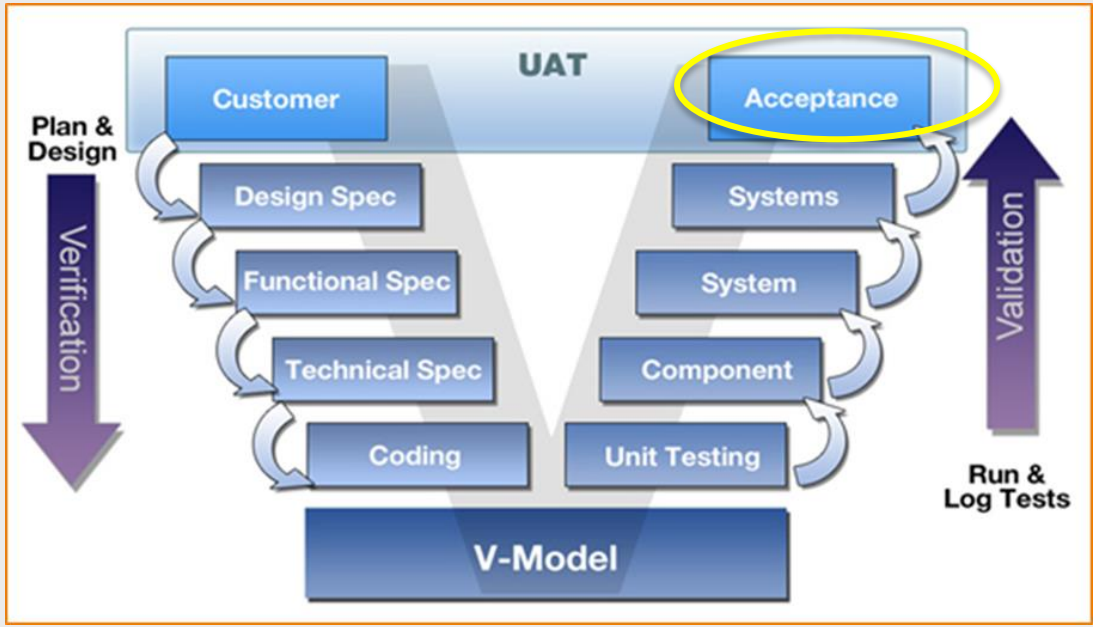
Acceptance Testing

- Measures the software to the requirements to ensure we built the right software (Validation)
- Most defects have been found by now
- **Business stakeholders** perform this test
- Uses the system as they will once delivered
- Goal is to establish confidence in the system



Acceptance Testing (2)

- Types:
  - User Acceptance Testing (UAT) – Focus on functionality
  - Operational Acceptance Testing (OAT) also known as Production Testing - Validates whether the system meets the requirements for operation
  - Contract Acceptance Testing (CAT) - Performed against the contract's acceptance criteria for producing custom developed software
  - Compliance (Regulation) Acceptance Testing - Performed against the regulations which must be adhered to

Alpha and Beta Testing

Commercial software application testing:

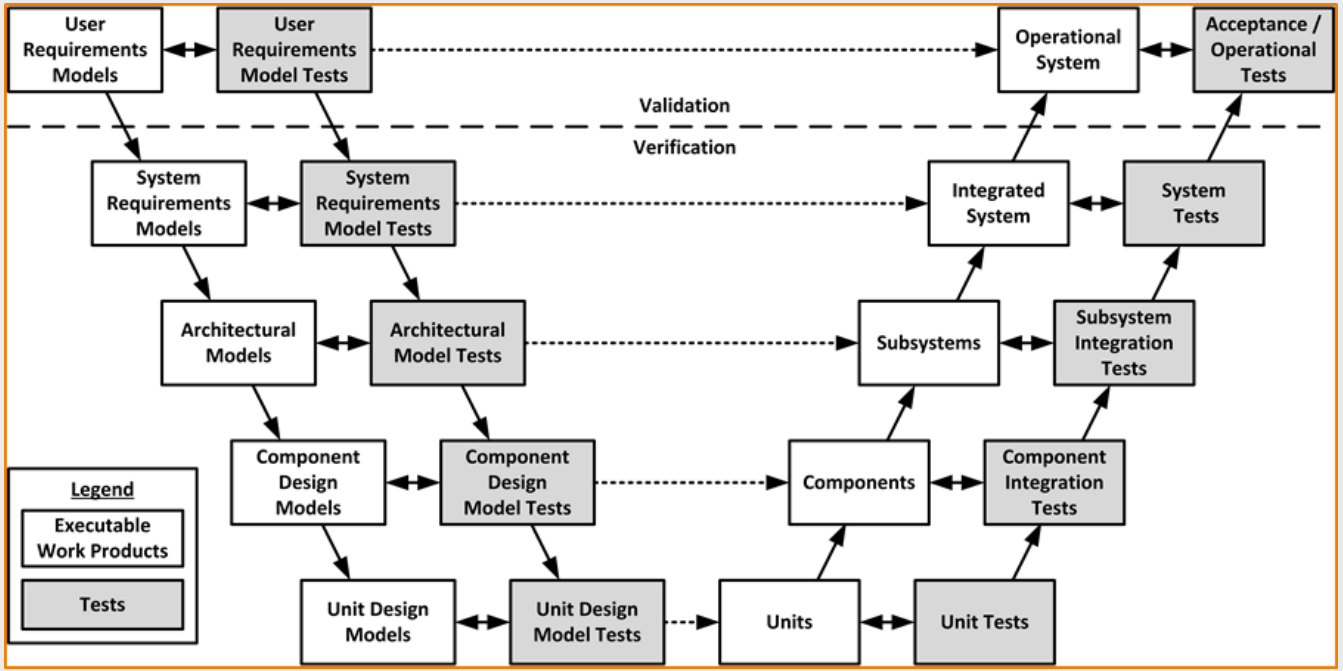
- Alpha Tests - Testing at the Developer's location
  - Done at the end of the development cycle

- Beta (Field) Tests – Testing at the Customer's location
  - Done just before the launch of the software
  - Pre-release Testing
  - Common in the gaming community
  - Open Beta – Released to a large group
  - Closed Beta – Select group of individuals

Testing with Continuous V&V

Continuous V&V

This is how it is integrated into the testing cycles



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Summary

- Unit Testing – Code/test cycles by developers
- Component – The testers first look at the software
- Integration – Testing all components together
- System – Testing the whole system as a complete unit
- Alpha – Commercial software; testing done at developer's site
- Beta – Commercial software; testing done by customer; common in gaming community

Chapter Assessment

1. What are alpha and beta testing?

2. Explain when you would use unit testing.

3. What does it mean to apply testing to the Continuous V&V Model?

4. Explain the difference between bottom-up and top-down integration testing.

5. Define the four types of Integration testing.

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