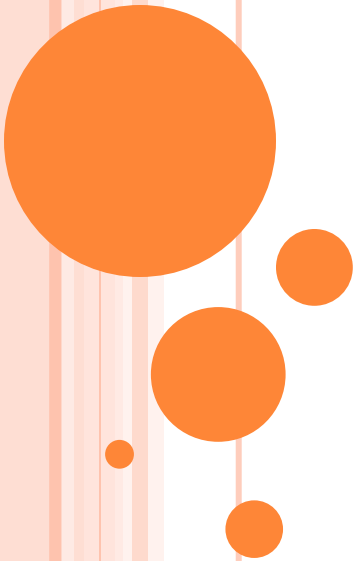


ISTQB Ch. 2 – Part A

SOFTWARE DEVELOPMENT LIFECYCLE

WHERE DOES TESTING - IT LIES IN SDLC

Impact of SDLC in Testing

Various types and Levels of Testing

What is **SDLC** ?

A Framework that describes the activities performed at each stage of a software development project.

Software Development Models

- The development process adopted for a project will depend on the project aims and goals.
- There are numerous development life cycles that have been developed in order to achieve different required objectives.

Software Testing Models

- The life cycle model that is adopted for a project will have a big impact on the testing that is carried out.
- Testing does not exist in isolation.
- **Testing activities are highly related to software development activities.**
- It will define the what, where, and when of our planned testing, influence regression testing, and largely determine which test techniques to use.
- The way testing is organized must fit the development life cycle or it will fail to deliver its benefit.

Waterfall Model

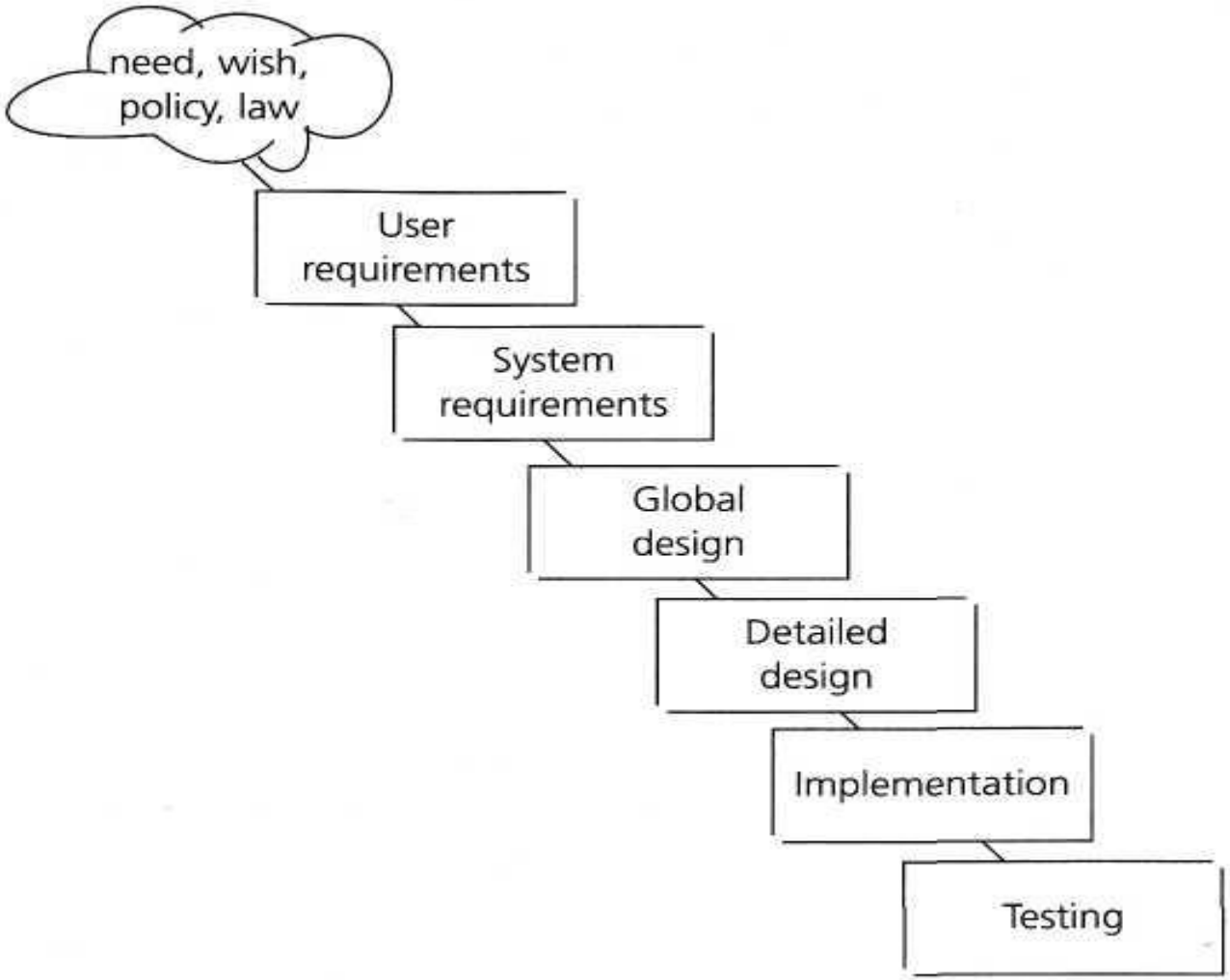


FIGURE 2.1 Waterfall model

Features of a Waterfall Model

- A waterfall model is easy to follow.
- It can be implemented for any size project.
- Every stage has to be done separately at the right time so you cannot jump stages.
- Documentation is produced at every stage of a waterfall model allowing people to understand what has been done.
- Testing is done only at the end.

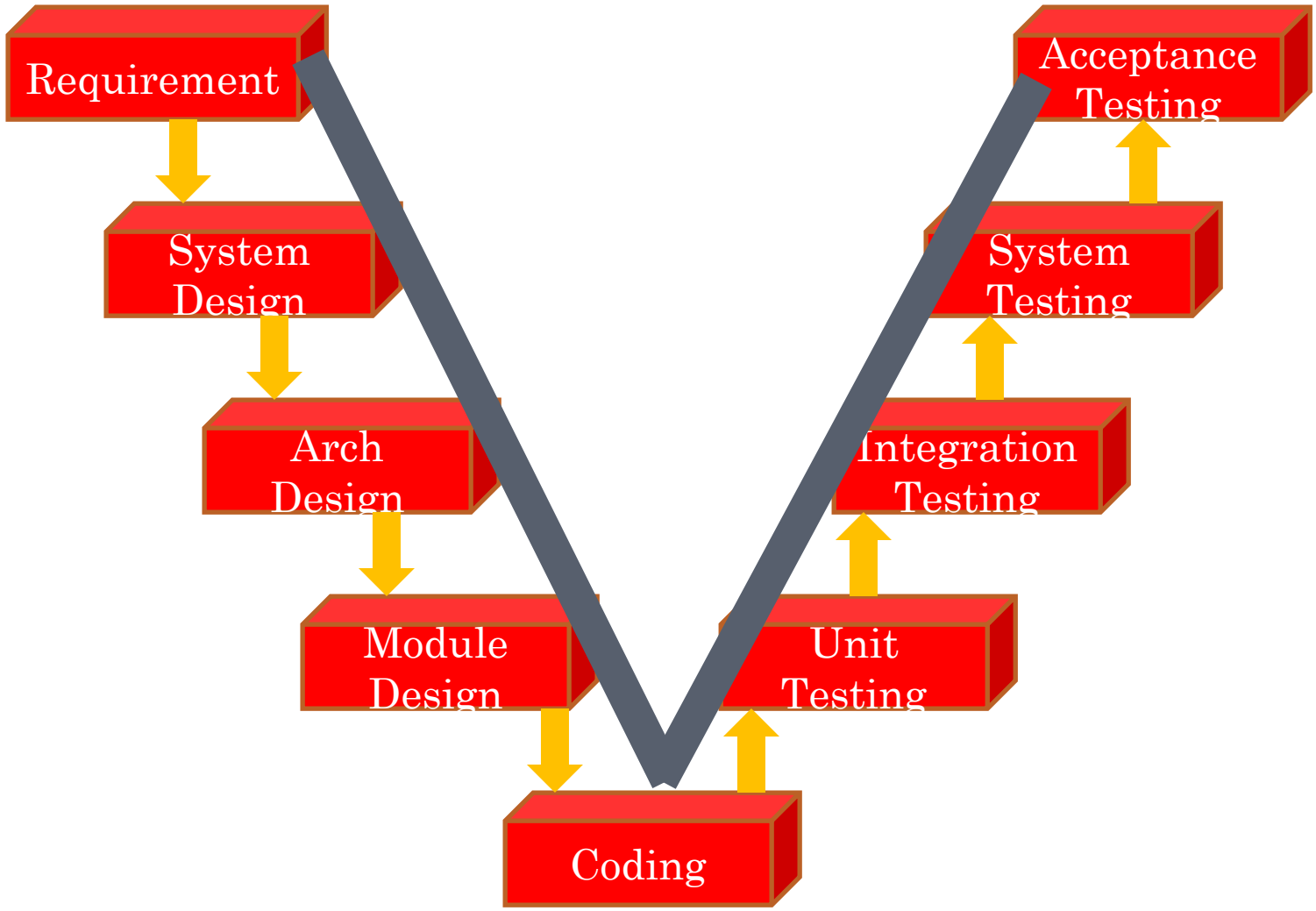
Advantages of a Waterfall Model

- Simple to follow.
- Requirements will be set and these wouldn't be changed.(Advantage for Developer).
- As everything is documented a new team member can easily understand what's to be done.
- Implementers have to follow the design accurately.

Disadvantages of a Waterfall Model

- If requirements change the Waterfall model may not work. (Disadvantage for Customer).
- Many believe it is impossible at one stage to make the projects perfect.
- Difficult to estimate time and cost for each stage of the development process.

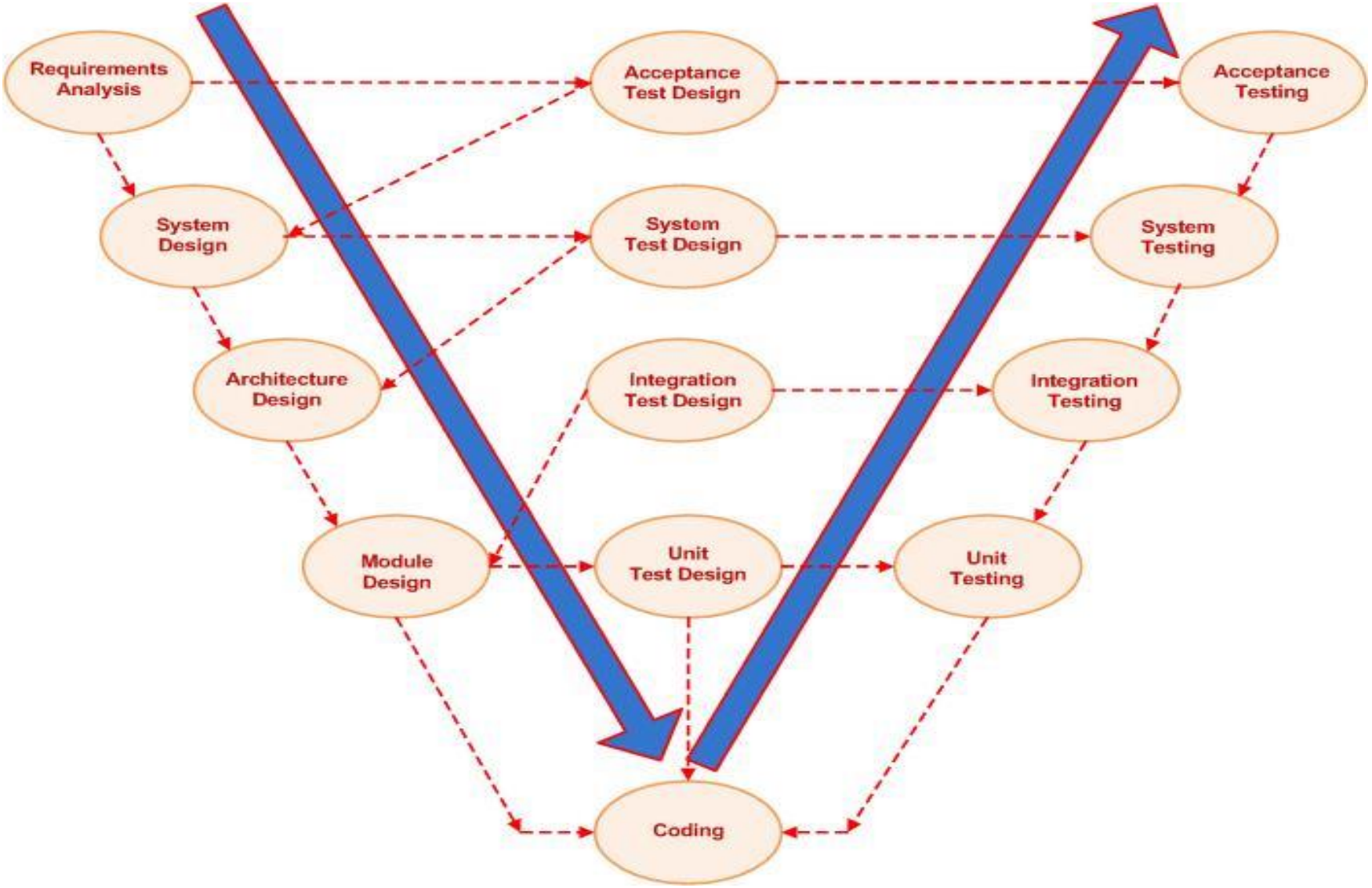
V- MODEL


Requirement
System Design
Arch Design
Module Design
Coding
Unit Testing
Integration Testing
System Testing
Acceptance Testing

The V-Shaped Model

- Testing should not be considered late in project
- **Development and testing go hand in hand**
- When you are developing software, you should perform static testing
  - ✓ Plan for testing
  - ✓ Design test cases
  - ✓ Create test data
- When you finish development, perform dynamic testing
  - ✓Perform testing at various levels
    - Unit testing
    - Integration testing
    - System Testing
    - Acceptance Testing`

Steps in the V-Shaped Model



Quality is guaranteed at each project stage.

Verification and Validation

Verification	Validation
Static	Dynamic
Are we developing product right ?	Are we developing right product ?
Involves checking of documents	Involves execution of code
We get presence and location of defect	We get only presence of defect, not location
Examples – Walkthrough, inspection, technical review	Examples – unit testing, integration testing, system testing, acceptance testing

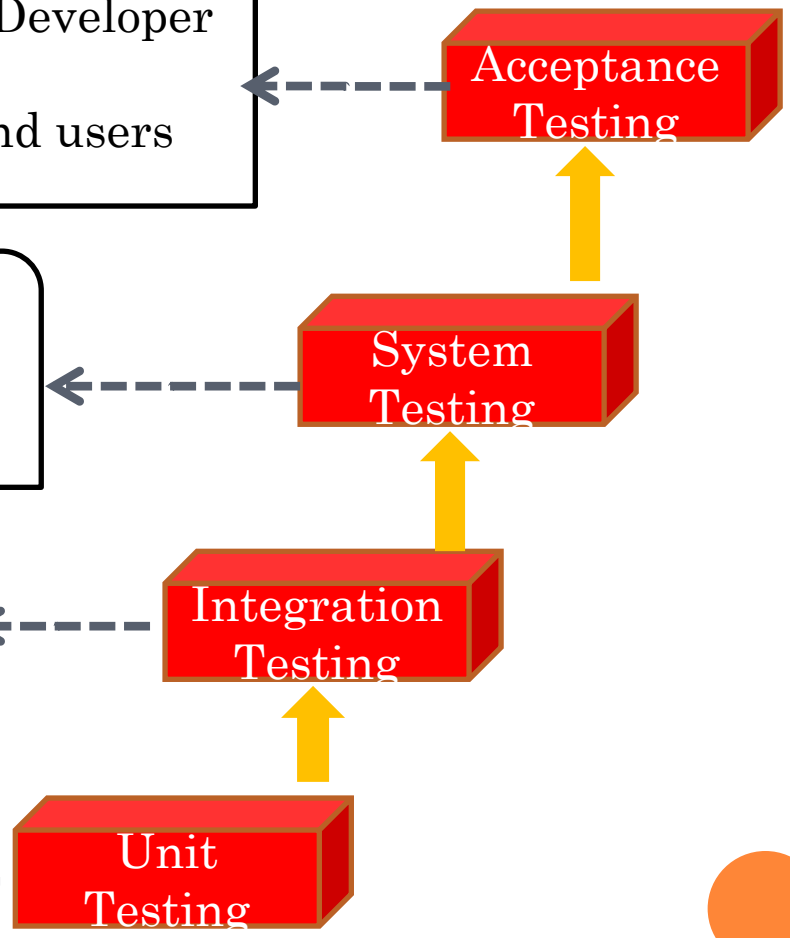
Levels of Testing

Acceptance Testing :
->Alpha Testing:-It is conducted at the Developer sight by end users
->Beta Testing:-It is conducted at the end users site

System Testing :
-> will compare the system specifications against the actual system

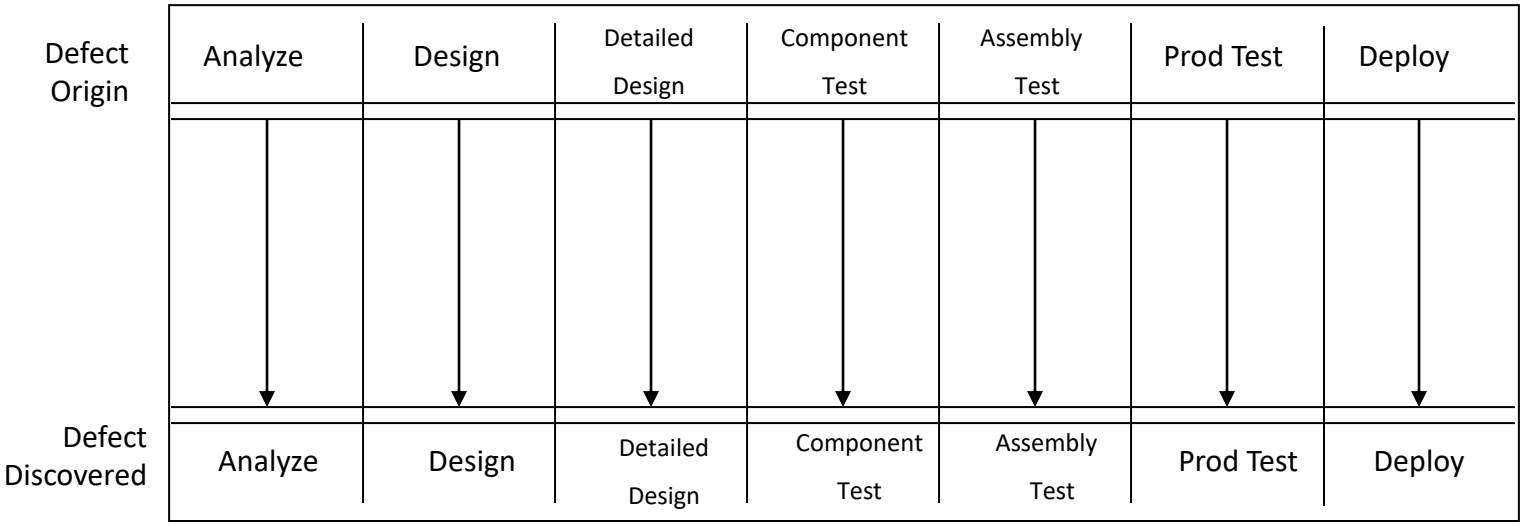
Integration Testing :
-> After combining all the Modules

Unit Testing :
-> White Box Testing
-> Black Box Testing



Stage Containment

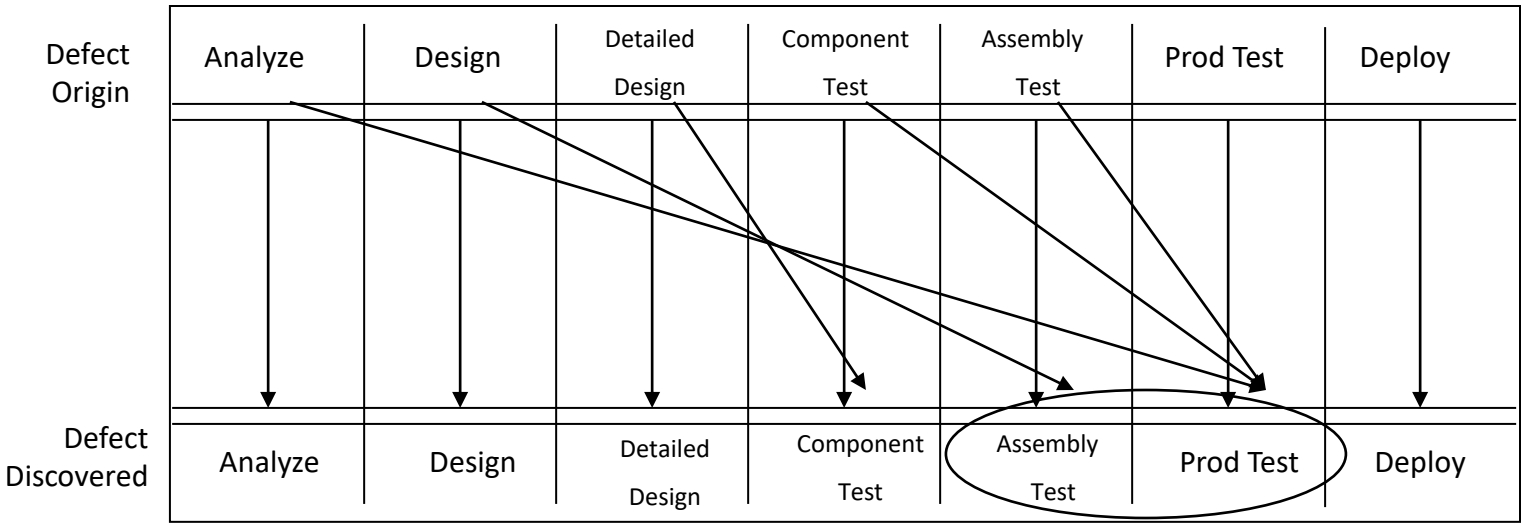
- This term is used to identify problems in existing in the product being developed before proceeding to the following stage.
  - ✓ More errors than defects.
  - ✓ Cost and effort for fixing problems is minimized.



With Stage Containment

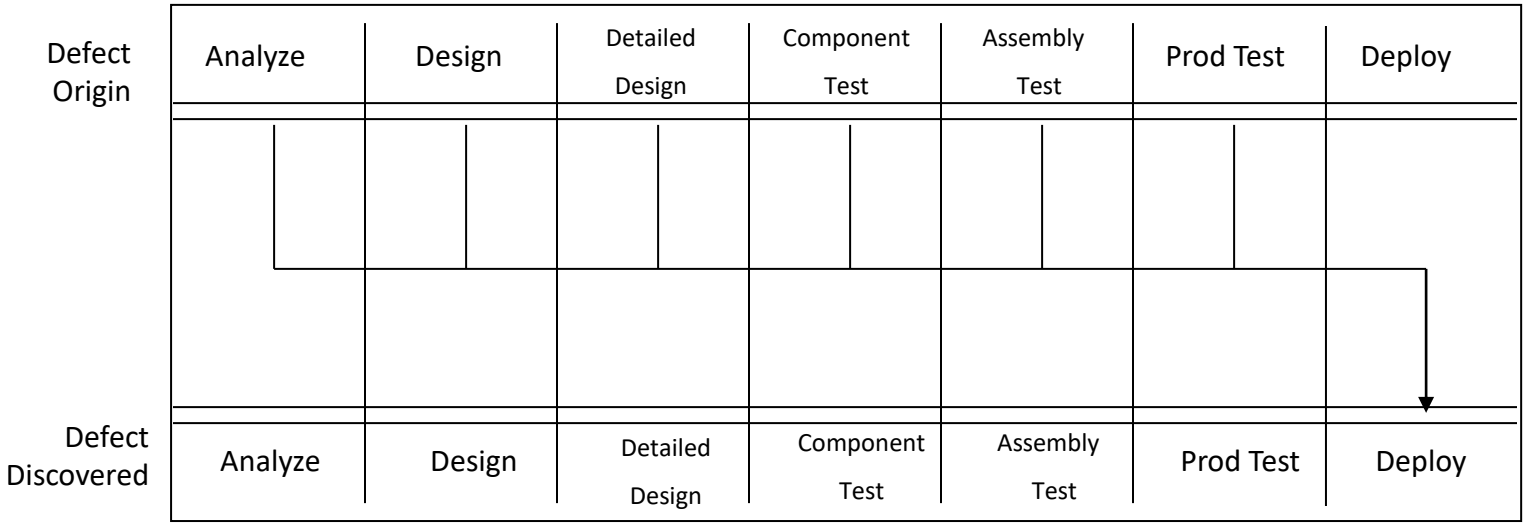
Without Stage Containment

- More defects than errors.
- Fixes become more expensive and difficult.



Without Stage Containment

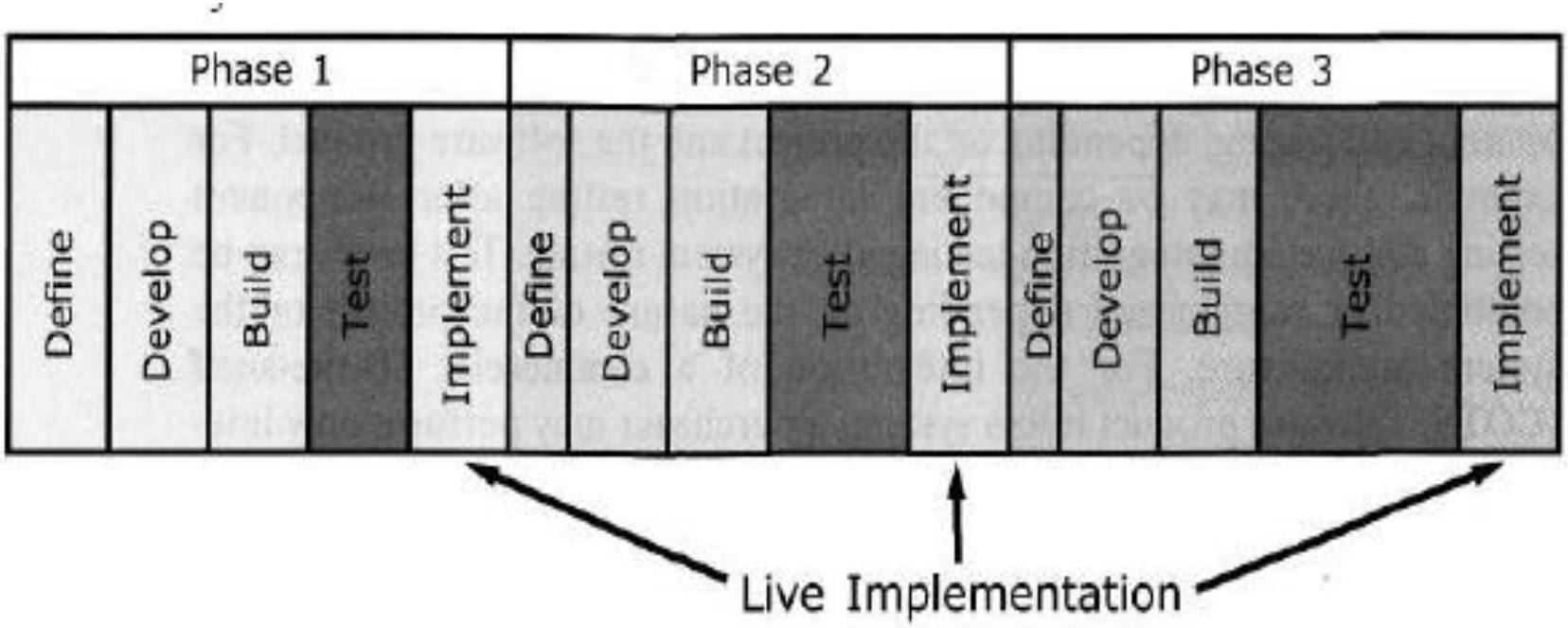
Without Stage Containment



Worst Case!

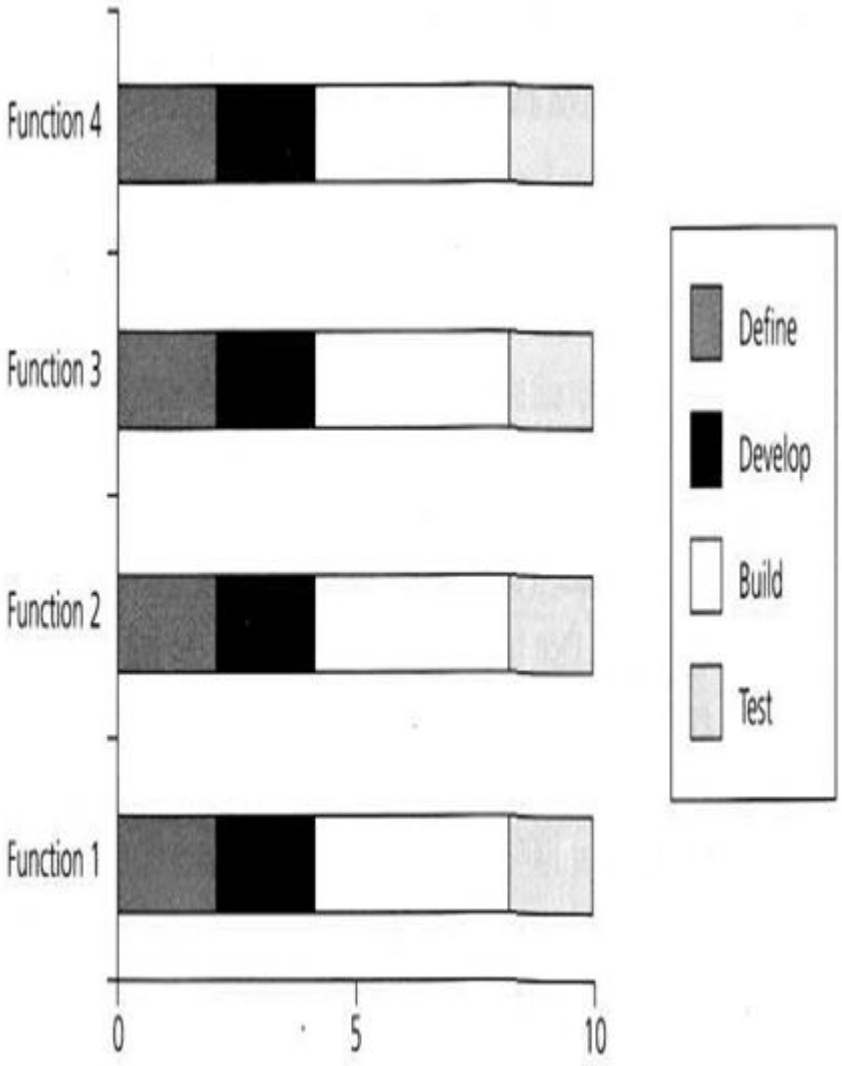
Iterative Life Cycle

- Not all life cycles are sequential.
- There are also iterative or incremental life cycles where, instead of one large development time line from beginning to end, we cycle through a number of smaller self-contained life cycle phases for the same project



Rapid Application Development (RAD)

- Rapid Application Development (RAD) is formally a parallel development of functions and subsequent integration.
- Components/functions are developed in parallel as if they were mini projects,
- The developments are time-boxed, delivered, and then assembled into a working prototype.
- This can very quickly give the customer something to see and use .
- Helps to get feedback regarding the delivery and their requirements.



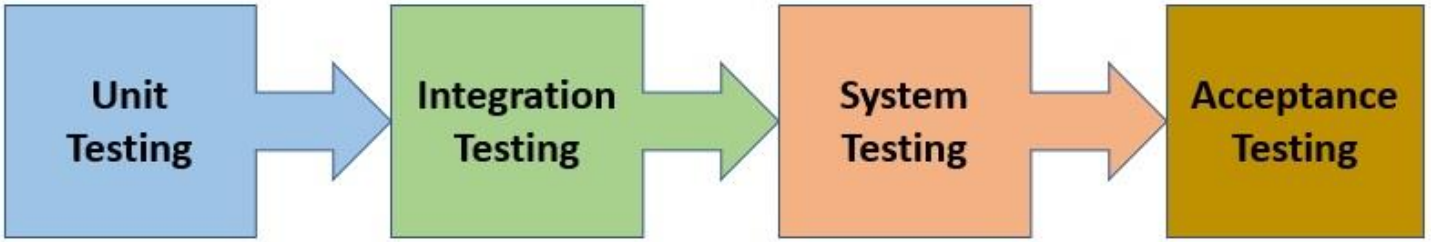
Agile Development

More human friendly than traditional development methodology.

- It promotes the generation of business stories to define the functionality.
- It demands an on-site customer for continual feedback and to define and carry out functional acceptance testing.
- It promotes pair programming and shared code ownership amongst the developers.
- It states that component test scripts shall be written before the code is written and that those tests should be automated.
- It states that integration and testing of the code shall happen several times a day.
- It states that we always implement the simplest solution to meet today's problems.

Validation

- Dynamic testing
- Levels of testing
  - Unit / component testing
  - Integration testing
  - System testing
  - Acceptance testing


Unit Testing
Integration Testing
System Testing
Acceptance Testing

Test Level – Component Testing

- Component testing, also known as unit, module and program testing.
- Searches for defects in, and verifies the functioning of software e.g.
  - modules,
  - programs,
  - objects, classes, etc. that are separately testable.
- Component testing may be done in isolation from the rest of the system.

Integration Testing

- The entire system is viewed as a collection of subsystems (sets of classes) determined during the system and object design
- Goal: Test all interfaces between subsystems and the interaction of subsystems
- The Integration testing strategy determines the order in which the subsystems are selected for testing and integration.

Why do we do integration testing?

- Unit tests only test the unit in isolation
- Many failures result from faults in the interaction of subsystems
- Often many off-the-shelf components are used that cannot be unit tested
- Without integration testing the system test will be very time consuming
- Failures that are not discovered in integration testing will be discovered after the system is deployed and can be very expensive.

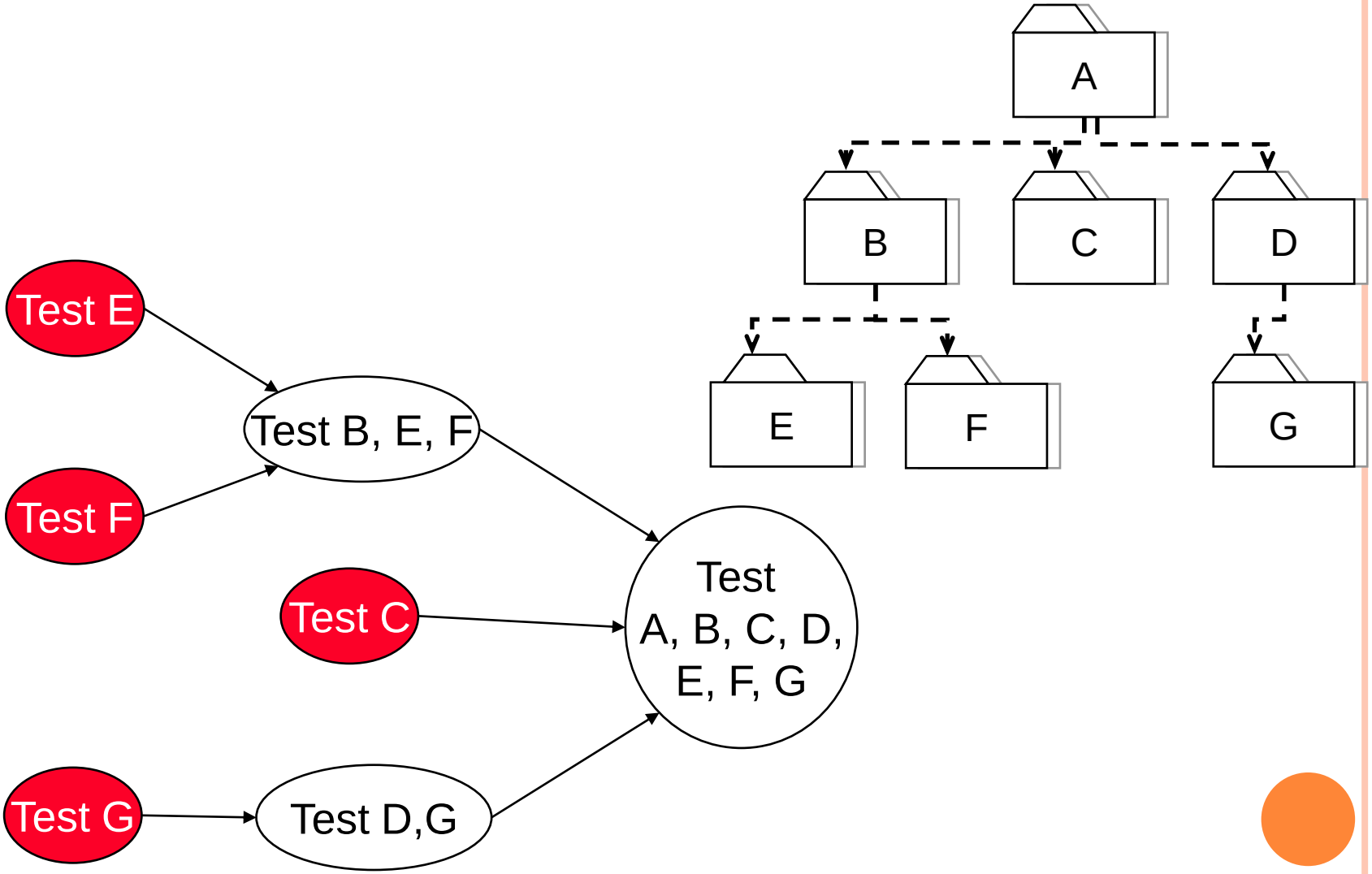
Integration Testing - Methods

- Bottom Up
- Top Down
- Big Bang
- Critical Part First

Bottom-up Testing Strategy

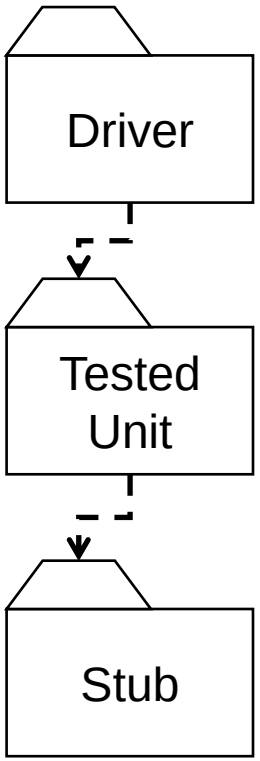
- The subsystems in the lowest layer of the call hierarchy are tested individually
- Then the next subsystems are tested that call the previously tested subsystems
- This is repeated until all subsystems are included
- Drivers are needed.

Bottom-up Integration



Stubs and drivers

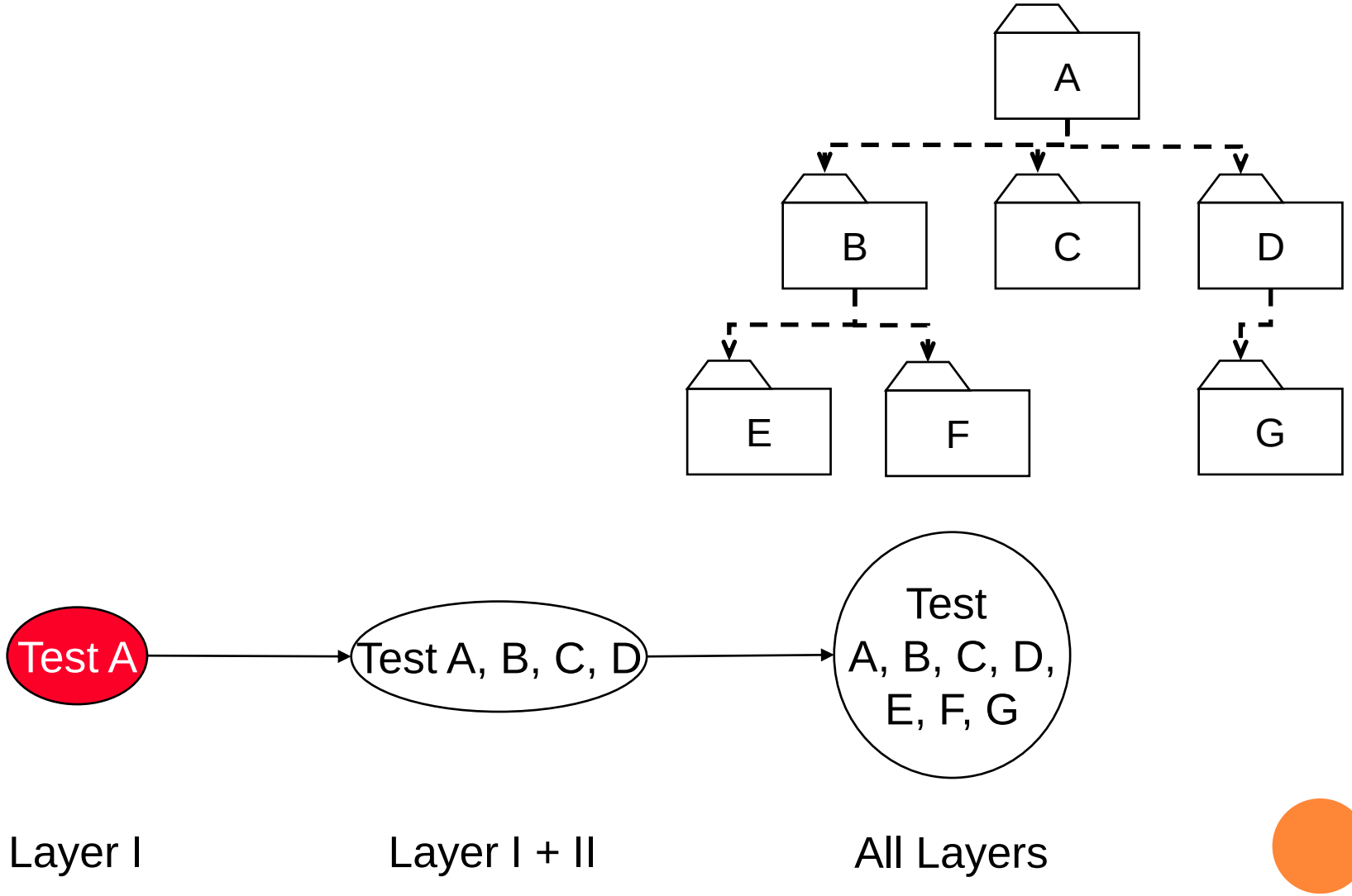
- Driver:
  - A component, that calls the `TestedUnit`
  - Controls the test cases
- Stub:
  - A component, the `TestedUnit` depends on
  - Partial implementation
  - Returns fake values.



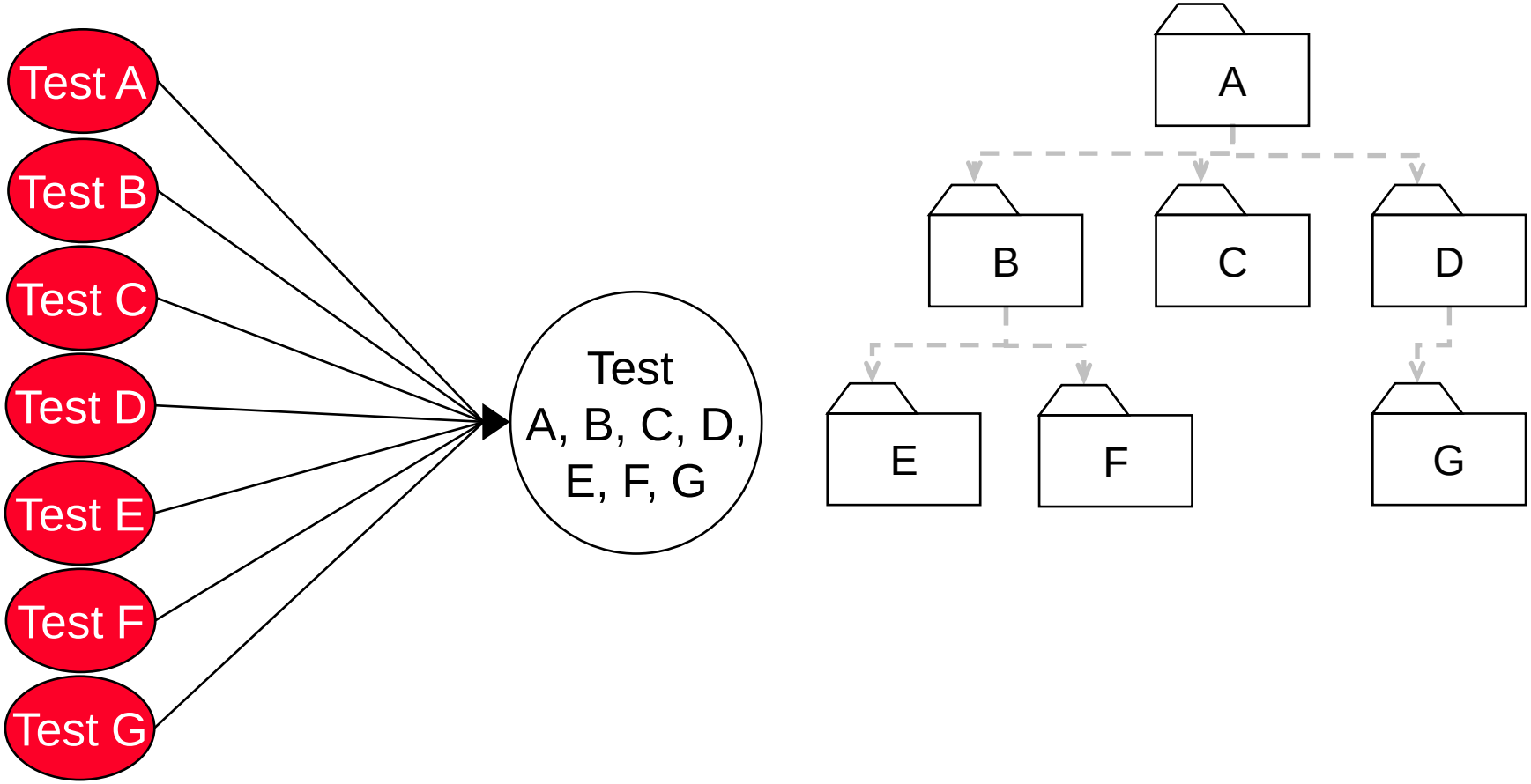
Top-down Testing Strategy

- Test the top layer or the controlling subsystem first
- Then combine all the subsystems and test the resulting collection of subsystems
- Do this until all subsystems are incorporated into the test
- Stubs are needed to do the testing.

Top-down Integration



Big-Bang Approach



Big Bang Integration

- Advantages
  - Convenient for small systems
- Disadvantages
  - Does not need driver and stubs
  - Integration testing can only begin when all modules are ready
  - Fault localization difficult
  - Easy to miss interface faults

Critical Part First

- The entire application is not tested, neither from Top-Down or Bottom-Up
- A part of system is selected for integration testing
- Normally, the critical modules are selected

System Testing

- It includes testing of entire system, consisting of
  - Hardware
  - OS
  - RDBMS
  - Tools. Etc
- Mostly, it is carried out by
  - Specialist testers
  - Independent test team
  - In some organizations system testing is carried out by a third party team or by business analysts.
- System testing should investigate both functional and non-functional requirements of the system. Typical non-functional tests include performance and reliability.

Acceptance Testing

- Acceptance testing is most often the responsibility of the user or customer, although other stakeholders may be involved as well.
- The execution of the acceptance test requires a test environment that is for most aspects, representative of the production environment.
- The goal of acceptance testing is to establish confidence in the system, part of the system or specific non-functional characteristics, e.g. usability, of the system.
- For a Commercial Off The Shelf (COTS) software product acceptance testing may be the only testing when the product is installed or integrated.

Alpha Testing

- This test takes place at the developer's site.
- A cross-section of potential users and members of the developer's organization are invited to use the system.
- Developers observe the users and note problems.
- Alpha testing may also be carried out by an independent test team.

Beta Testing

- Also called field testing.
- System is sent to a cross-section of users who install it and use it under real-world working conditions.
- The users send records of incidents with the system to the development organization where the defects are repaired.