WELCOME

RITA Intelligent Transportation Systems
Joint Program Office

Welcome

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T201
How to Write a Test Plan

Target Audience

- Engineering staff
- Operational staff
- Maintenance staff
- Testing staff (testing personnel and systems integrators)

Instructor

Ken Vaughn, P.E.

President

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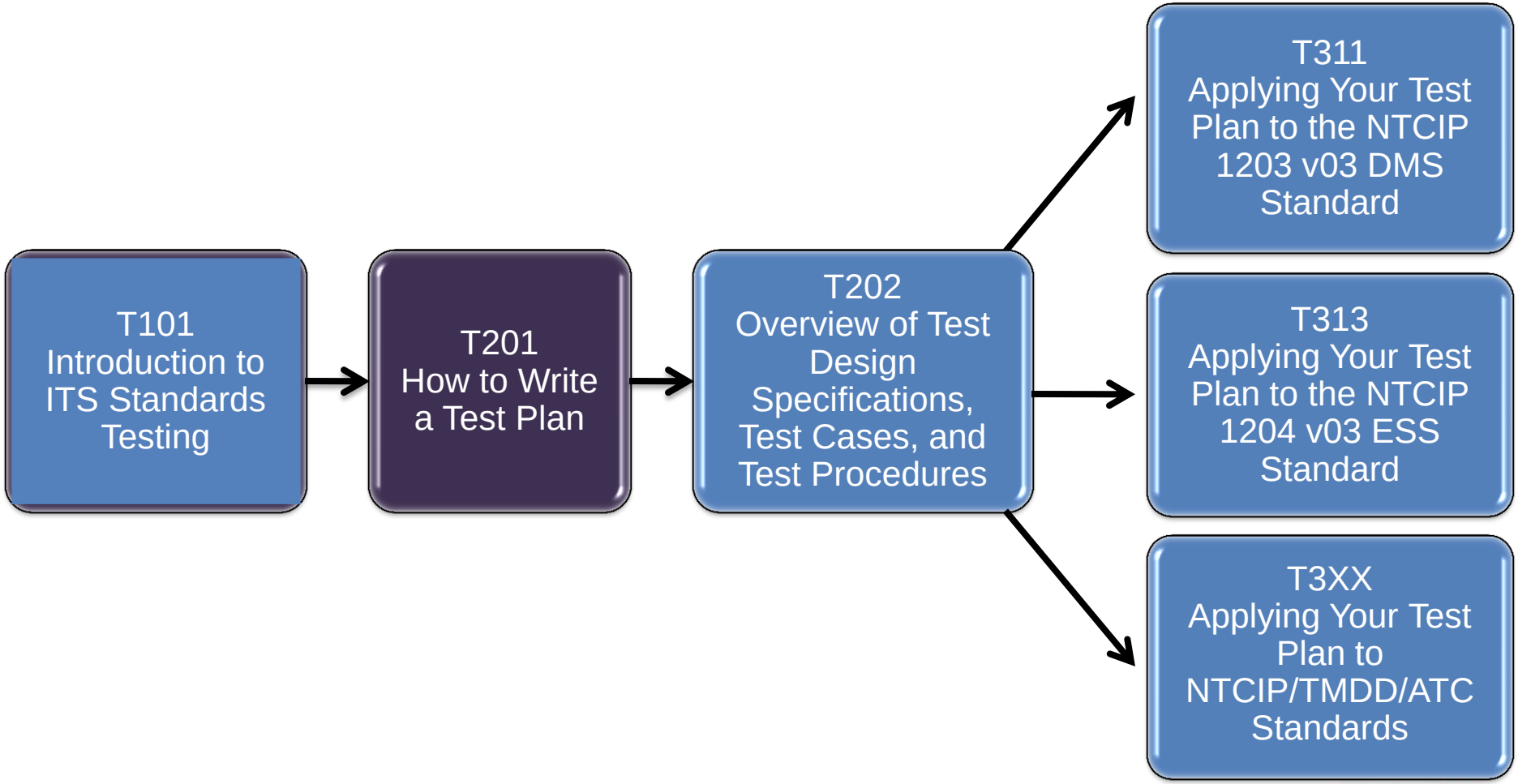
Herndon, VA, USA

Curriculum Path (Testing)



Recommended Prerequisites

- T101: Introduction to ITS Standards Testing
- Helpful to have knowledge of
  - Intelligent Transportation Systems (ITS)
  - Systems engineering process (SEP)
  - Acquisition process for standards-based ITS procurements

Learning Objectives

1. Discuss the role of a test plan within the testing lifecycle and SEP
2. Summarize the characteristics of a good test plan
3. Present the outline of a test plan
4. Describe relationship among test plans and test design specifications

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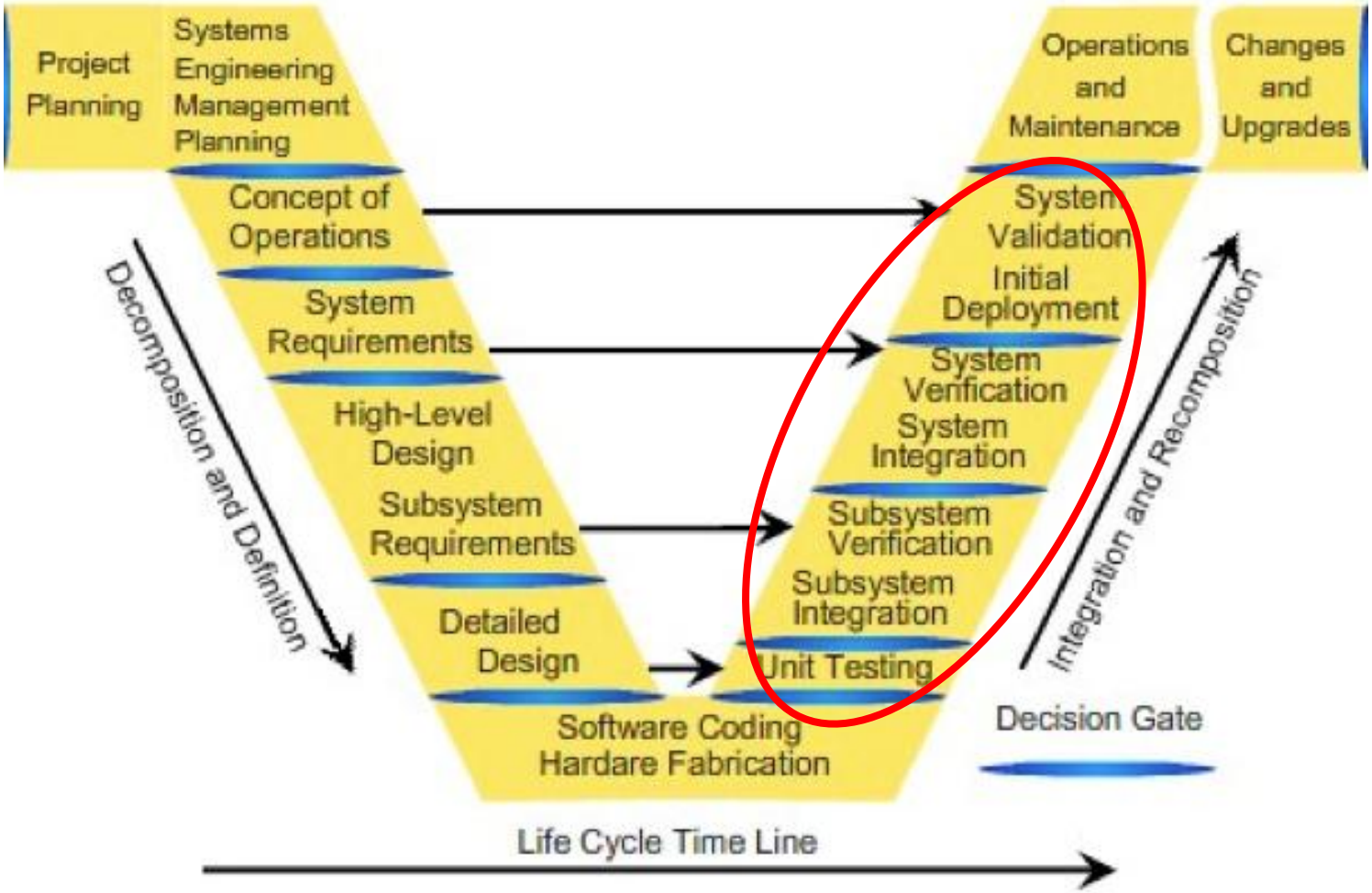
Online Poll

- When should you test?
  1. When there is a prototype
  2. Prior to delivery (e.g., in manufacturer's factory)
  3. Upon installation at the site
  4. All of the above
  5. It depends on the system being acquired

Testing and the Project Lifecycle



When to Test

- It depends on the system being acquired
- Test as needed, which may include:
  - When there is a prototype
  - Once design is complete
  - In manufacturer's factory, prior to delivery
  - Upon delivery
  - Upon installation at the site
  - After all components are integrated together

Types of Testing: Verification

- Ensuring the system is built “right” (according to specifications) through:
  - Inspection
  - Demonstration
  - Analysis
  - Testing

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Online Poll

- Who should perform verification testing on behalf of the client?
  - Development staff
  - Engineering staff
  - Operational staff
  - Testing staff
  - Other (please send chat to explain)

Types of Testing: Validation

- Ensuring the “right” system has been built
  - A system that meets the real user needs

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Online Poll

- Who should perform validation testing on behalf of the client?
  - Development staff
  - Engineering staff
  - Operational staff
  - Testing staff
  - Other (please send chat to explain)

Strategy for Testing

- "V" diagram specifies several testing steps
- Each project must define:
  - When each requirement is tested
  - Where requirement is tested
  - How each requirement is tested
  - Who tests each requirement
- All requirements need to be tested
  - Functional, interface, environmental, etc.

CASE STUDY

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Sample Strategy: New Standard

- VDOT Testing for NTCIP 1203v1 (Version 1 Message Sign)
  - Prototypes were required to pass 85% of NTCIP tests to be pre-qualified to be used on bids
  - Factory acceptance required passing 100% of NTCIP tests (as well as most other tests)
  - Site acceptance required integration with system

Sample Strategy: Stable Standard

- Typical DMS testing today
  - Factory acceptance for hardware requirements
  - Site acceptance testing of initial sign for all NTCIP tests
  - Site acceptance required integration with system

Sample Strategy: Management System

- Testing for an ATMS (i.e., central system)
  - Inspection of test reports from developer
  - Testing of system in agency test lab with sample devices
  - Load testing of system in agency test lab with simulated users and devices
  - Testing of partial deployment
  - Testing of full deployment

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Online Poll

- How many test plans should be developed for a project?
  - One
  - Two
  - One for each test phase
  - Multiple for each test phase
  - It depends

Introduction to IEEE 829

- At least one test plan per testing phase
- May have distinct plans for different categories of testing
  - Functional
  - Interface
  - Environmental
- All test plans are developed after requirements
- Each test plan is developed prior to starting tests

CASE STUDY

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Sample Test Plan

- Please find the sample test plan in your participant supplement

Go to page 6 in the supplement

Introduction

- Test plan identifier
- Objectives
  - Types of requirements
  - Testing phase
- Project Background
- References

Page 6 in the supplement

Identifying the Test Items

- Item to be tested
  - Version of the product
  - Specific version of the requirements

Page 7 in the supplement

Features to be Tested

- Identifies requirements that will be tested
  - Compare to Protocol Requirements List (PRL) contents
  - Listing is as long as necessary
- Identifies requirements that are not tested

Pages 8 and 13-19 in the supplement

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Online Poll

- Where do you find the requirements list when the standard does not include SEP content?
  - Define them in the test plan
  - Refer to project requirements
  - Refer to design specification
  - Refer to user guide

Approach: Standards with Test Cases

- Refer to Requirements to Test Case Traceability Table in standard
  - See Participant Supplement for sample
- Identify activities to be performed
- Identify tools that are needed
- Enough detail to estimate amount of work

Page 8 and 20-21 in the supplement

Approach: Standards without Test Cases

- High-level overview of how item will be tested
- Identify activities to be performed
- Identify tools that are needed
- Enough detail to estimate amount of work

Page 8 in the supplement

Pass/Fail Criteria

- Must clearly specify what constitutes passing
  - Prevents debates later
  - Usually requires 100% success

Page 8 in the supplement

Suspending the Test

- Testing takes time
- Where can testing be paused
- What steps must be undertaken to restart testing

Page 8 in the supplement

Test Deliverables: Preparation

- Requirements
- Test design specification
- Test case specification
- Test procedure specifications
- Test item transmittal report

Page 8 in the supplement

Test Deliverables: Results

- Test summary
- Test incident reports
- Test logs

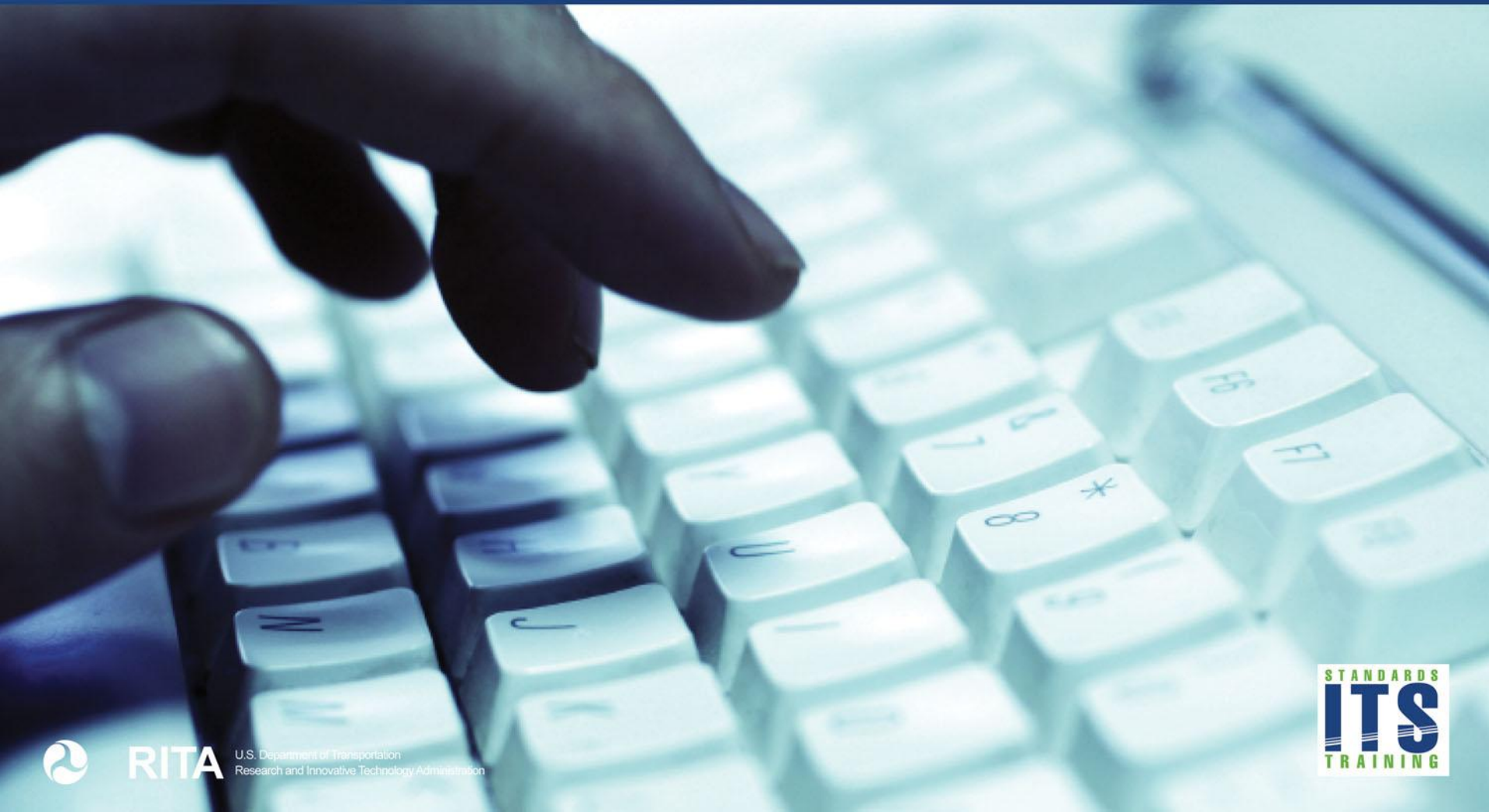
Page 9 in the supplement

Testing Tasks

- Task description
- Predecessors
- Responsible party
- Skills required
- Effort required

Page 9 in the supplement

ACTIVITY



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Tasks Involving Testing

- What are some of the tasks involved in testing?
  - ✓ Developing the test plan, test cases, and procedures
  - ✓ Receiving equipment
  - ✓ Setting up the test environment
  - ✓ Performing the tests
  - ✓ Recording test results
  - ✓ Summarizing test results

Environmental Needs

- Major components and connections
- Testing software used
- Configuration of each piece of equipment
- Practical and logistical needs to perform the test
  - Electrical outlets
  - Tables, chairs, lighting, protection from elements
  - Safety considerations such as safety vests

Page 9 in the supplement

Roles and Responsibilities

- Define each major stakeholder in the test
- Identify responsibilities of each stakeholder

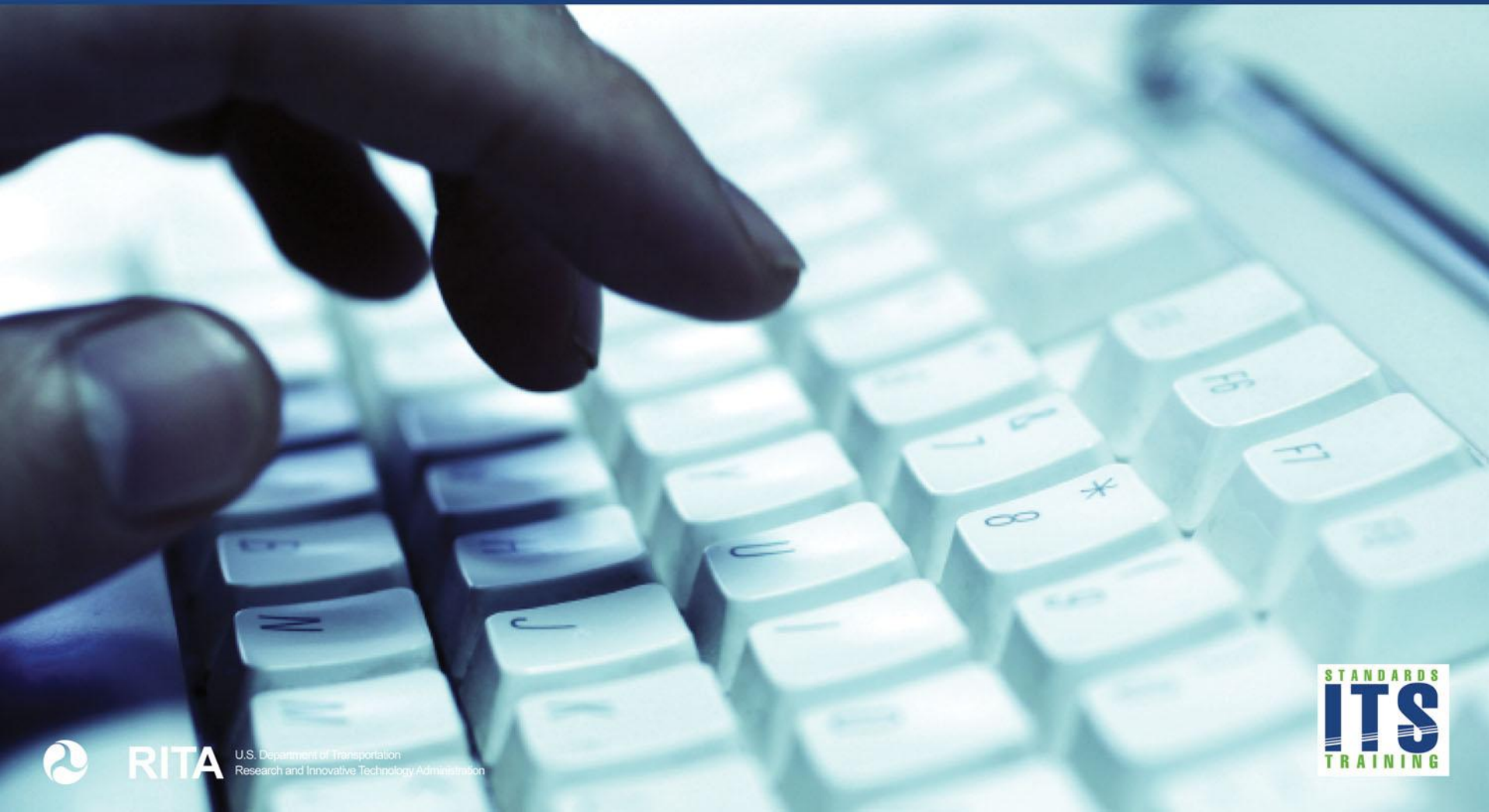
Page 11 in the supplement

Schedule

- Define the expected start and end for each testing task
- Identify dependencies on other project tasks
  - Dependencies within the project
  - Dependencies with other projects
  - Dependencies on resources
- Schedule often shown as weeks from start of testing
- Schedule defines the length of the relevant step in the “V” diagram

Page 12 in the supplement

ACTIVITY



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Discussion

- During testing, what are some of the problems that may arise on a project? Can anyone give concrete examples that may have happened to you or your colleagues?

Risks and Contingencies

- What are the risks?
  - Delay in development
  - Delay in other projects
  - Resources unavailable
  - Defects found during testing
- What happens if delays occur
  - Many times the delay just delays the testing
  - May be constrained by other events
    - System being installed for a special event

Page 12 in the supplement

Approvals

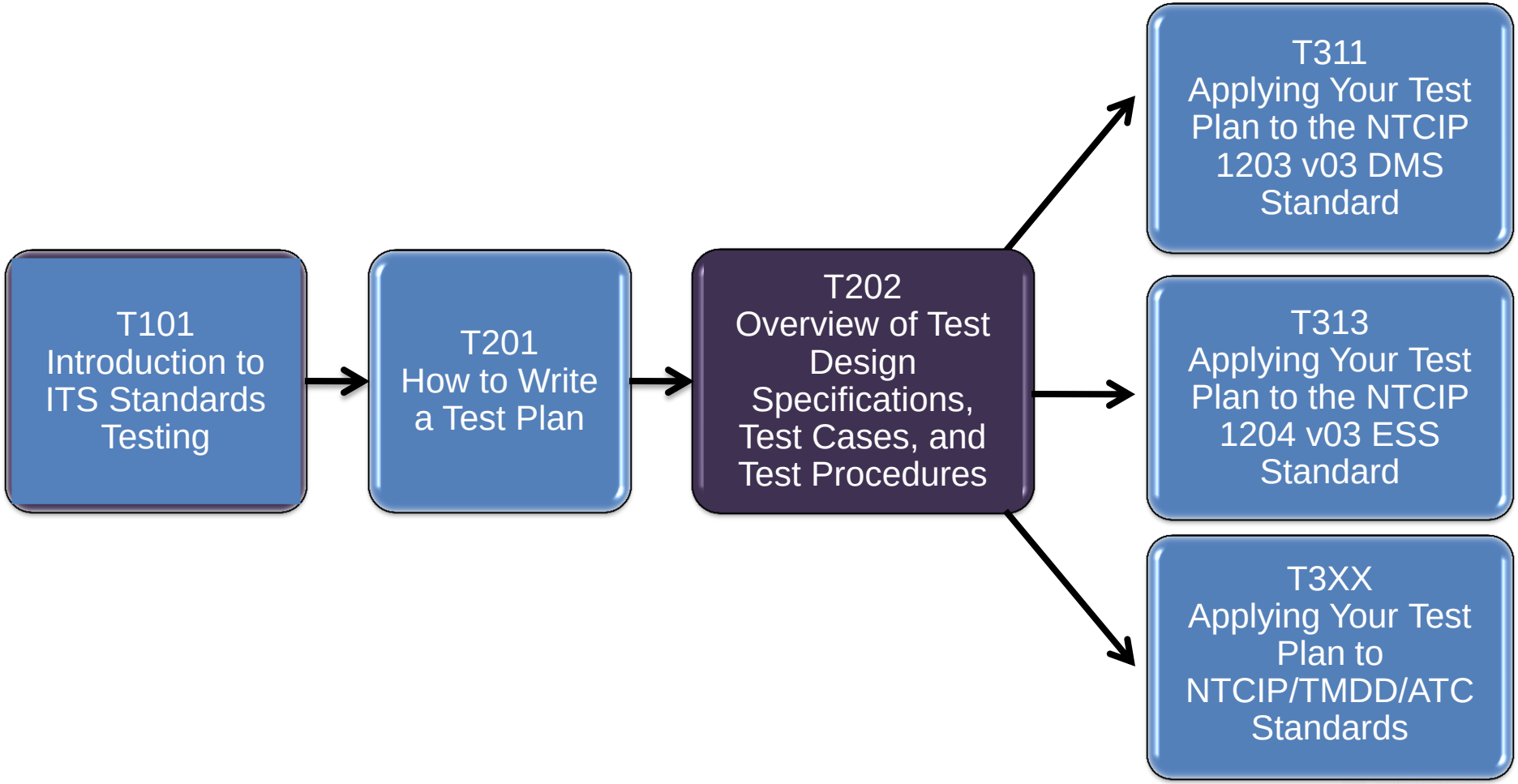
- Approves the plan before testing starts
  - Agency
  - Developer
  - Tester

Page 12 in the supplement

What We Learned

- Testing occurs throughout the Right side of the "V" diagram.
- Testing should follow an overall Strategy.
- Test plans should follow the IEEE 829 outline.
- Test plan is one of several testing Documents.
  - Detailed steps are defined using:
    - Test Design Specifications
    - Test Case Specifications
    - Test Procedure Specifications
  - Results are reported in:
    - Test Summary
    - Incident Reports
    - Test Log

Curriculum Path (Testing)



Where to Learn More

- Module Supplement

QUESTIONS?

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