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

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Curriculum Path (Testing)

- T101 Introduction to ITS Standards Testing
- T201 How to Write a Test Plan
- T202 Overview of Test Design Specifications, Test Cases, and Test Procedures
- T311 Applying Your Test Plan to the NTCIP 1203 v03 DMS Standard
- T313 Applying Your Test Plan to the NTCIP 1204 v03 ESS Standard
- T3XX Applying Your Test Plan to NTCIP/TMDD/ATC Standards
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
POLLING
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
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
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
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
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
Sample Test Plan

- Please find the sample test plan in your participant supplement
Introduction

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

- Item to be tested
  - Version of the product
  - Specific version of the requirements
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
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
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
Pass/Fail Criteria

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

- Testing takes time
- Where can testing be paused
- What steps must be undertaken to restart testing
Test Deliverables: Preparation

- Requirements
- Test design specification
- Test case specification
- Test procedure specifications
- Test item transmittal report
Test Deliverables: Results

- Test summary
- Test incident reports
- Test logs
Testing Tasks

- Task description
- Predecessors
- Responsible party
- Skills required
- Effort required
ACTIVITY
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
Roles and Responsibilities

• Define each major stakeholder in the test
• Identify responsibilities of each stakeholder
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
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
Approvals

- Approves the plan before testing starts
  - Agency
  - Developer
  - Tester
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**
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Where to Learn More

- Module Supplement
QUESTIONS?