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WELCOME

U.S. Department of Transportation

Office of the Assistant Secretary for
Research and Technology

Welcome

Ken Leonard, Director
ITS Joint Program Office
Ken.Leonard@dot.gov

www.pcb.its.dot.gov

T306:
Applying Your Test Plan to the Electrical and Lighting Management Systems Based on NTCIP 1213 ELMS Standard v03

Instructor

James J. Frazer

President

Gridaptive Technologies

Pompano Beach, FL, USA

Learning Objectives

Describe **ELMS Testing**

Describe **ELMS Test Plan Application**

Identify **Relevant Elements** of an ELMS Test Plan

Describe **Adaptation** of a Test Plan

Learning Objective 1

Describe **ELMS Testing**

Describe ELMS Testing

The testing life cycle, the role of test plans, and the testing to be undertaken for Electrical and Lighting Management Systems (ELMS)

- Why We Test ELMS
- Purpose of an ELMS Test Plan
- Components of an ELMS Test Plan
  - Test Design Specification
  - Test Case Specification
  - Test Procedure Specification

Why We Test

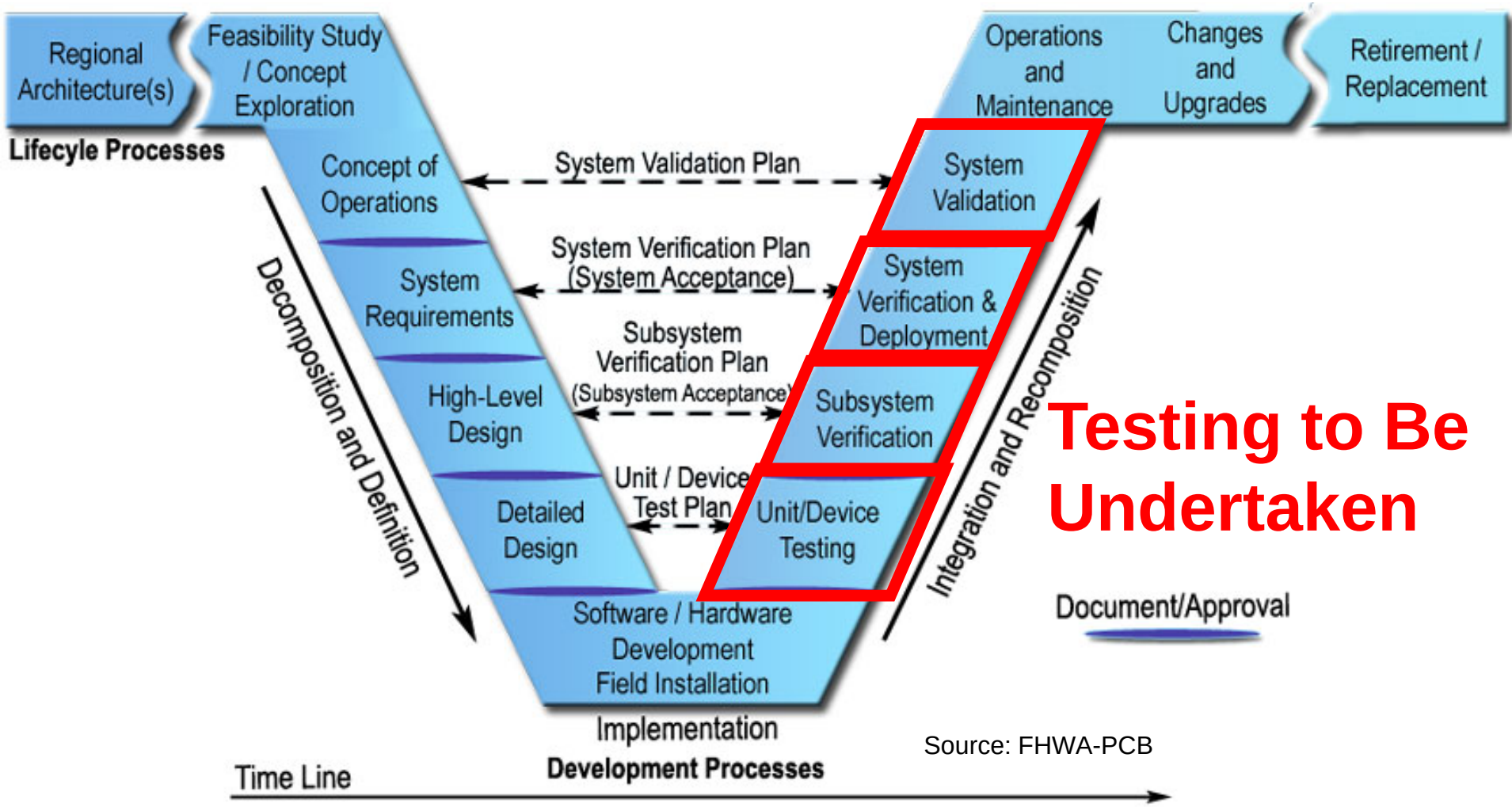
To confirm that an ELMS will work as intended

The testing process provides objective evidence that the system:

- Satisfies the system requirements
- Solves the right problem
- Satisfies the user needs

Why We Test

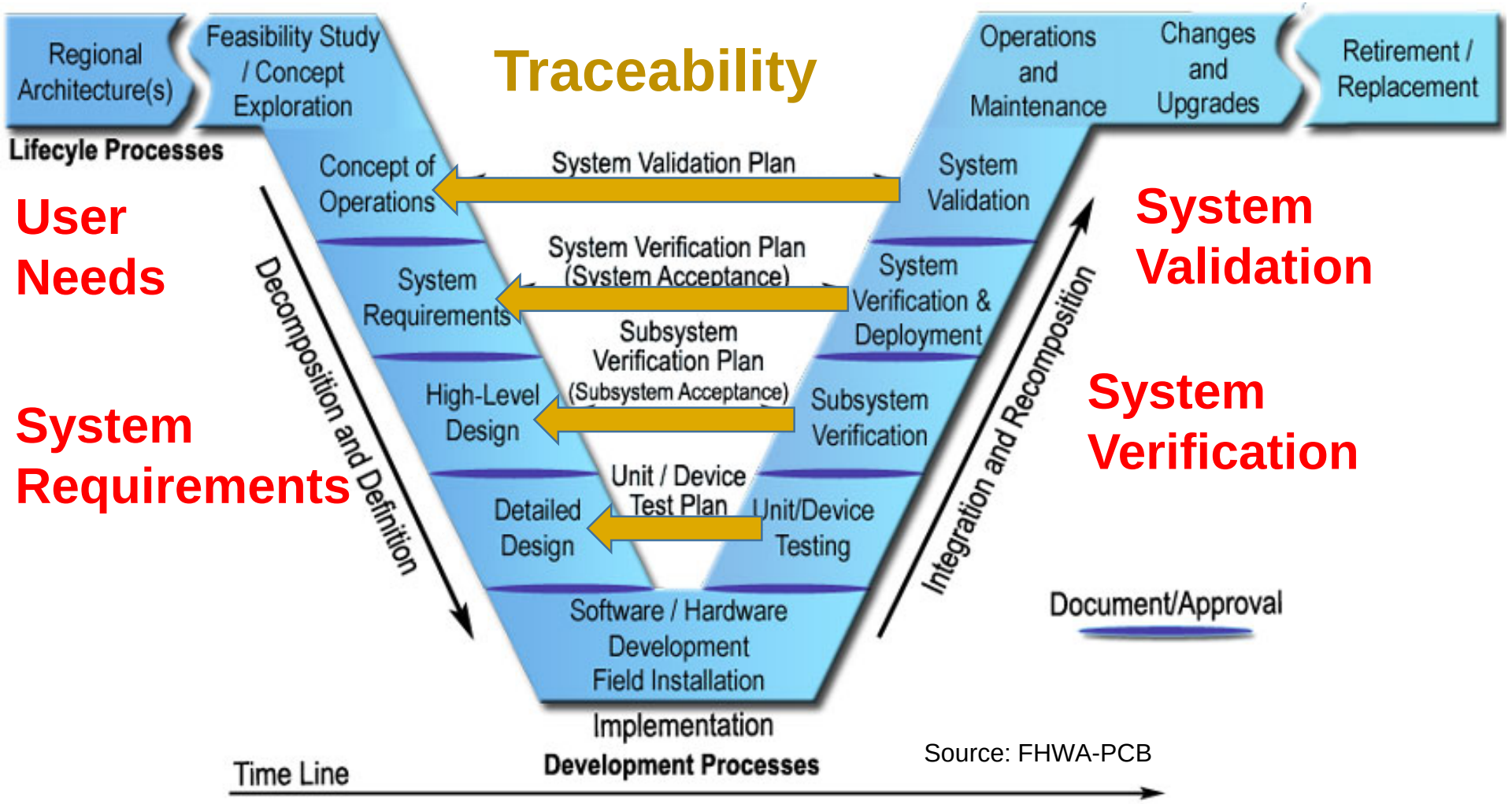
Testing and the Systems Life Cycle



Source: FHWA-PCB

Why We Test

To confirm that an ELMS system will work as intended



Source: FHWA-PCB

Purpose of a Test Plan

Does the system conform to the requirements

- A test plan is a document describing:
  - Scope (technical management)
  - Approach
  - Resources needed
  - Schedule to complete
- A test plan identifies:
  - Test items
  - Features to be tested
  - Testing tasks
  - Risks requiring contingency plan

Testing determines whether the system conforms to the requirements and whether it satisfies its intended use and user needs (IEEE-829-2008).

Components of a Test Plan

Relationship between Components

- Test Plan Specification
- Test Design Specification
- Test Case Specification
- Test Procedure Specification

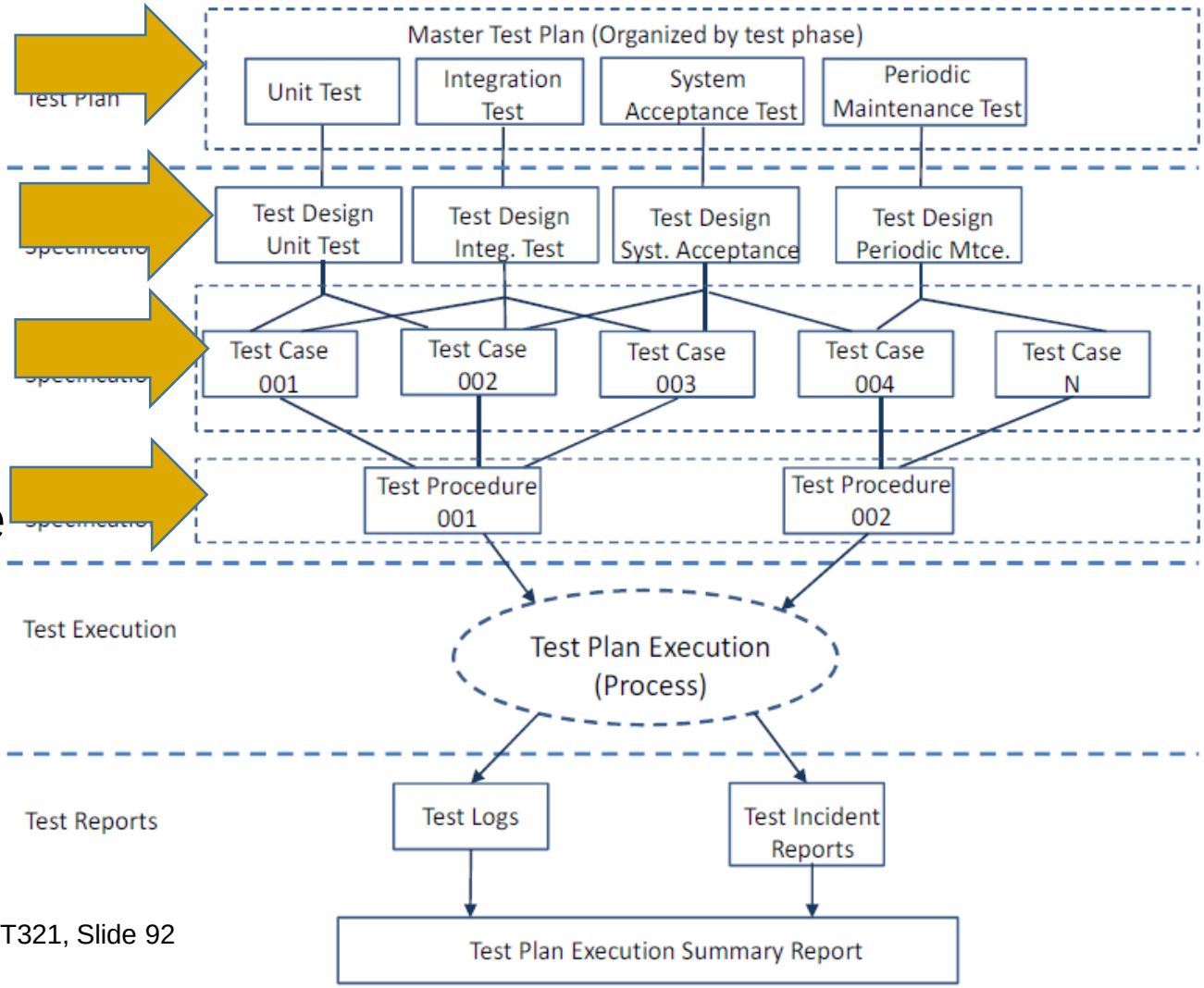


Image Courtesy of ITS PCB Course T321, Slide 92

Components of a Test Plan

Test Plan Specification

- Test plan specifications detail objectives, target market, internal beta team, and processes for a specific test for a software or hardware product

- Test plan specifications contain a detailed understanding of the comprehensive workflow

Components of a Test Plan

Test Design Specification

- Test design specifications result in a collection of test cases that are intended to be used to test a specified set (test suite) of behavior

- A test suite contains detailed instructions or goals for each collection of test cases and information on the system configuration to be used during testing

Components of a Test Plan

Test Case Specification (TCS)

A test case specification is a set of conditions under which a tester will determine whether the system is working as it was originally intended to do

Components of a Test Plan

Test Procedure Specification

- Test procedure specification defines a process that produces a test result

- It is a technical operation that consists of determining the characteristics of a given product, process, or service according to a specified procedure

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Question

Which is not a component of an ELMS test plan?

Answer Choices

a) Test Facilitation

b) Test Design Specification

c) Test Case Specification

d) Test Procedure Specification

Review of Answers

a) Test Facilitation

Correct! Test facilitation is not part of an ELMS test plan.

b) Test Design Specification

Incorrect. Test Design Specification is part of an ELMS test plan.

c) Test Case Specification

Incorrect. Test Case Specification is part of an ELMS test plan.

d) Test Procedure Specification

Incorrect. Test Procedure Specification is part of an ELMS test plan.

Learning Objectives

Describe **ELMS Testing**

Describe **ELMS Test Plan Application**

Learning Objective 2

Describe **ELMS Test Plan Application**

ELMS Test Plan Application

Steps in Developing an ELMS Test Plan

- Identify requirements to be tested/not to be tested for each testing phase
- Identify test methodology
- Introduce and describe the Requirements to Test Case Traceability Matrix (RTCTM)
- Plan logistics of testing
- Estimate level of effort for testing
- Evaluate risks
- Plan project closeout

ELMS Test Plan Application

Develop a Sample Test Plan

Identify Requirements to Test:

- Requirements are found in the Protocol Requirements List (PRL)
- Module A306b identified how to define ELMS requirements
  - See Participant Student Supplement for list of sample requirements
- Every requirement should be tested:
  - During at least one test phase
  - Using at least one method
  - By at least one party
- Extent of agency testing is a risk management issue

ELMS Test Plan Application

Develop a Sample Test Plan

Identify Test Plan Level

- Each test level will have its own test plan
  - Prototype
  - Design Approval
  - Factory Acceptance
  - Incoming Device
  - Site Acceptance
  - Burn-in
- Often further divided
  - NTCIP testing
  - Hardware testing
  - Etc.

SUPPLEMENT

ELMS Test Plan Application

Develop a Sample Test Plan Approach

- Identify Test Methodology
- Inspection
- Analysis
- Demonstration
- Formal testing
- Consider testing scenarios
  - Positive test(s)
  - Negative test(s)
  - Boundary test(s)

SUPPLEMENT

ELMS Test Plan Application

Develop a Sample Test Plan

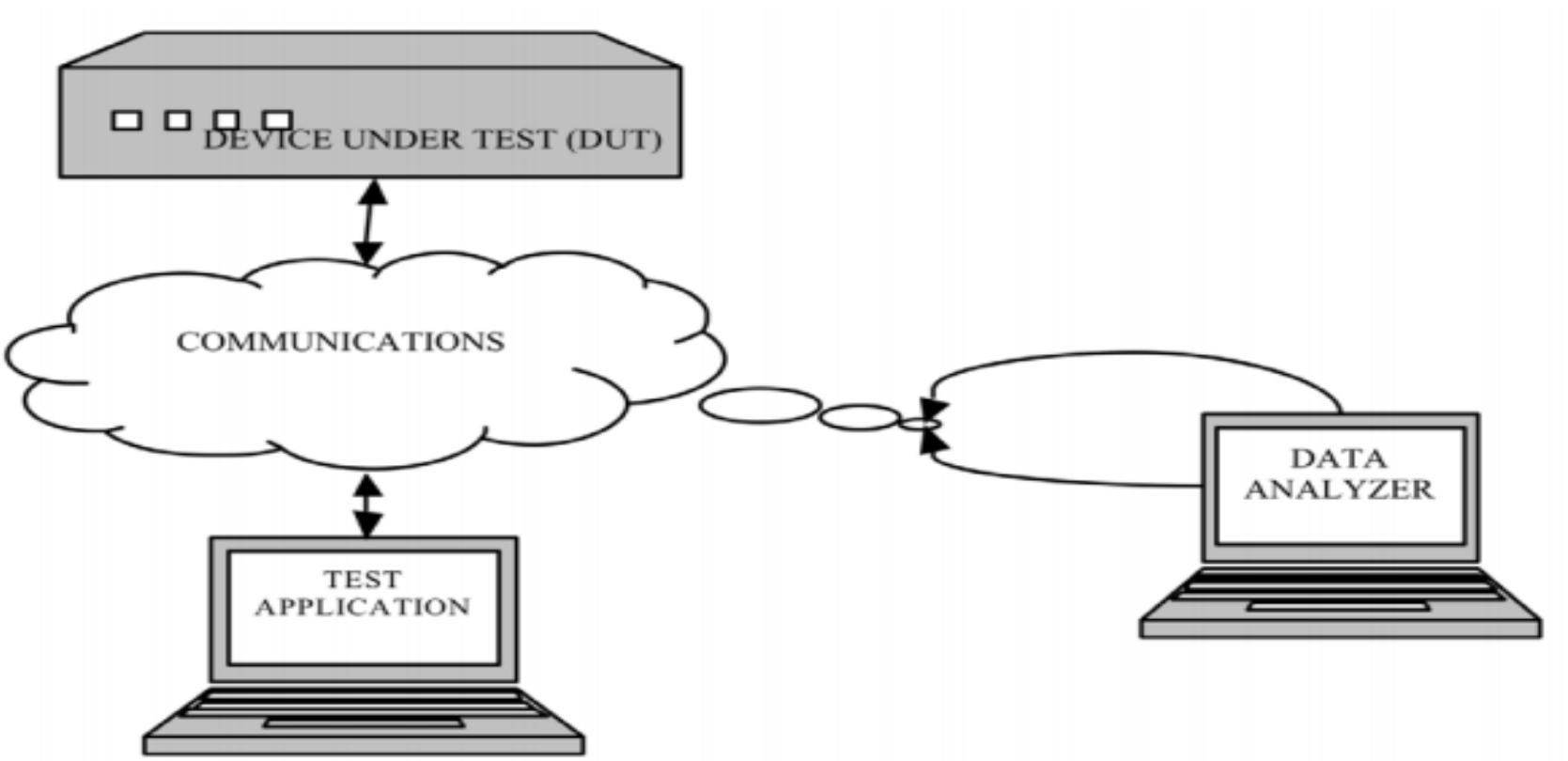
Requirements to Test Case Traceability Matrix (RTCTM)

Requirement ID	Requirement	Test Case ID	Test Case
3.5.4.1.1.1	Retrieve Luminaire Pole Identifier	3.5.4.1.1	Retrieve Luminaire Pole Identifier
3.5.4.1.1.2	Retrieve Luminaire Location	3.5.4.1.1.2	Retrieve Luminaire Location
3.5.4.1.3	Configure Luminaire Mode	3.5.4.1.3.1	Configure Luminaire Mode
		3.5.4.1.3.2	Incorrectly Configure Luminaire Mode
3.5.4.1.4.1	Configure Luminaire Color Temperature	3.5.4.1.4.1.1	Configure Luminaire Color Temperature
		3.5.4.1.4.1.2	Incorrectly Configure Luminaire Color Temperature

ELMS Test Plan Application

Develop a Sample Test Plan

Identify the Test Environment



Source: NTCIP 8007, page 13

ELMS Test Plan Application

Develop a Sample Test Plan

Plan Logistics of Testing

- Where will tests be performed?
  - Safety during on-site testing
- Who is responsible for what?
  - Power
  - Tools
  - Tables
  - Protection from elements
  - Local assistance for remote testing
- What happens if testing is suspended?

ELMS Test Plan Application

Develop a Sample Test Plan

Estimate effort, schedule, and budget for:

- Preparing test plan
- Preparing test cases
- Preparing test procedures
- Performing multiple rounds of testing
  - Performing tests
  - Investigating problems
  - Preparing test documentation

ELMS Test Plan Application

Develop a Sample Test Plan

Understanding the Impact of a Failure

Requirement ID	Requirement	Test Case ID	Test Case
3.5.4.1.1.1	Retrieve Luminaire Pole Identifier	3.5.4.1.1	Retrieve Luminaire Pole Identifier
3.5.4.1.1.2	Retrieve Luminaire Location	3.5.4.1.1.2	Retrieve Luminaire Location
3.5.4.1.3	Configure Luminaire Mode	3.5.4.1.3.1	Configure Luminaire Mode
		3.5.4.1.3.2	Incorrectly Configure Luminaire Mode
3.5.4.1.4.1	Configure Luminaire Color Temperature	3.5.4.1.4.1.1	Configure Luminaire Color Temperature
		3.5.4.1.4.1.2	Incorrectly Configure Luminaire Color Temperature

EXAMPLE

ELMS Test Plan Application

Develop a Sample Test Plan

Understanding the Impact of a Failure

User Need ID	User Need	Requirement ID	Requirement
2.5.2.1.1.1	Retrieve Luminaire Information		
		3.5.4.1.1.1	Retrieve Luminaire Pole Identifier
		3.5.4.1.1.2	Retrieve Luminaire Location
		3.5.4.1.1.3	Retrieve Luminaire Mode
		3.5.4.1.1.4	Retrieve Luminaire Zone
		3.5.4.1.1.5	Retrieve Luminaire Vendor Information
		3.5.4.1.1.6	Retrieve Luminaire Light Source Type
		3.5.4.1.1.7	Retrieve Luminaire Wattage
		3.5.4.1.1.8	Retrieve Luminaire Voltage

EXAMPLE

ELMS Test Plan Application

Develop a Sample Test Plan

Plan Project Closeout

- Have a plan
- Understand the impacts of accepting a failure

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Question

Which of the following ELMS statements is false?

Answer Choices

a) Every ELMS requirement should be tested

b) You should only need to perform your ELMS test plan once

c) Some ELMS testing may be performed by the manufacturer

d) ELMS traceability tables can help you assess the impact of a test failure

Review of Answers

a) Every ELMS requirement should be tested

True. Every requirement should be tested.

b) You should only need to perform your ELMS test plan once

False (correct). This statement is not true. Testing will often reveal problems; these should be fixed and the device retested.

c) Some testing may be performed by the manufacturer

True. Testing may be performed by the agency, the manufacturer, or a third party.

d) ELMS traceability tables can help you assess the impact of a test failure

True. Traceability tables allow you to identify the user needs that will not be completely fulfilled.

Learning Objectives

Describe **ELMS Testing**

Describe **ELMS Test Plan Application**

Identify **Relevant Elements** of an ELMS Test Plan

Learning Objective 3

Identify **Relevant Elements** of an ELMS Test Plan

What Is Being Tested?

Only Project-Specific Requirements Are Tested

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Support	Additional Specifications
2.5.2.2.2	Control Electrical Service			O	Yes / No	
		3.5.5.2.1	Control Electrical Service by Permanent/Continuous Override	M	Yes	
		3.5.5.2.2	Control Electrical Service by Transitory Override	O	Yes / No	
		3.5.5.2.3	Control Electrical Service by Timed Override	O	Yes / No	
		3.5.5.2.4	Control Electrical Service in Stagger Mode	O	Yes / No	
		3.5.5.2.5	Control Electrical Service by Photocell	O	Yes / No	
		3.5.5.2.6	Control Electrical Service by Adaptive Means	O	Yes / No	

Test Design, Test Cases, and Test Procedures

Designing Test Case Specifications and Procedures

- Review guidance from IEEE 829-2008 and NTCIP 8007
- Apply guidance to sample dialog
- Key Differences Between the Two Approaches
  - IEEE standard approach is applicable to all ITS standards including C2C and C2F
  - IEEE standard approach separates test cases from test procedures, while previous efforts combined both, such as per NTCIP 8007 information report
  - IEEE standard approach allows reuse of test procedures, where agencies typically place more efforts
  - IEEE standard approach includes a test plan and method to split testing into test designs, and includes test reports

Test Design, Test Cases, and Test Procedures

Designing Test Case Specifications and Procedures

What Does IEEE 829-2008 Provide?

- Test Plan
- Test Design Specification
- Test Case Specification
- Test Procedure Specification
- Test Reports
  - Test Logs
  - Test Anomaly Report
  - Test Report
- Testing professionals across ITS are familiar with these definitions/formats

Test Design, Test Cases, and Test Procedures

Designing Test Case Specifications and Procedures

NTCIP 8007 Components

- NTCIP 8007 describes how these can be combined for NTCIP testing
  - Test case identifier
  - Purpose
  - Inputs
  - Pass/Fail criteria
  - Procedure steps
    - Can reference other often used procedures
    - Expected outputs
    - Features tested
- Defines terms that can be used in test steps for NTCIP testing

Test Design, Test Cases, and Test Procedures

Designing Test Case Specifications and Procedures

Sample Basic Dialog: Set Time Dialog

Test Design, Test Cases, and Test Procedures

Designing Test Case Specifications and Procedures

- Specify Test Case First
  - “What You Are Testing”
- Then Specify Test Procedure
  - “How You Run The Test”

Test Design, Test Cases, and Test Procedures

Designing Test Case Specifications

Specify Each Test Case

Requirement ID	Requirement	Test Case ID	Test Case
2.2.1	Set Time	2.2.1	Set Time

Test Case		
Test Case 2.2.1	Test Case Name	Set Time
	Description	This test case verifies that the ELMS properly tracks time. It advances the clock by a user-defined amount, waits a few seconds, retrieves the time, and verifies it indicates an appropriate value.
	Variable	GlobalTime as defined in NTCIP 1213 V3.0
	Pass/Fail Criteria	The DUT shall pass every verification step included within the Test Case to pass the Test Case.

Test Design, Test Cases, and Test Procedures

Designing Test Case Procedures

- Data exchanges should follow defined **dialogs**
- Return the device to its original state (generally)
- Verification steps should cite the **relevant requirement**
  - A test case typically tests multiple requirements
- NTCIP 8007 precisely defines standardized step types
- A “SET” operation includes **nine specific verification checks** related to the Simple Network Management Protocol (SNMP) response packet

Test Design, Test Cases, and Test Procedures

Designing Test Case Procedures

Steps of a Sample Procedure

Step Number	Test Procedure	Results
1	CONFIGURE: Determine the number of seconds to advance the clock in the ELMS	
2	GET the following object(s): globalTime.0	Pass/Fail
3	RECORD the RESPONSE VALUE for globalTime.0 as Start_Time	
4	SET the following object(s): globalTime.0 = Start_Time + Time_Offset	Pass/Fail
5	DELAY for 15 seconds	
6	GET the following object(s): globalTime.0	Pass/Fail
7	VERIFY that the RESPONSE VALUE for globalTime.0 is roughly equal to Start_Time + Time_Offset + 15	Pass/Fail

Adapting the Test Plan

The process of adapting the test plan based on selected user needs and requirements

- We have described the components of a **test plan**
- We have examined the major components of **test cases** and **test procedures** in detail
- Next we will create a **project-specific ELMS test plan**

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Question

Where can you find definitions for terms that can be used in NTCIP test steps?

Answer Choices

a) IEEE 829

b) NTCIP 8007

c) ISO 9001

d) Student Supplement

Review of Answers

a) IEEE 829

Incorrect. IEEE 829 defines sample outlines for test documentation, but does not define steps for NTCIP.

b) NTCIP 8007

Correct! NTCIP 8007 defines a number of terms that can be used in test steps for NTCIP testing.

c) ISO 9001

Incorrect. ISO 9001 deals with quality management, but does not deal directly with NTCIP testing.

d) Student Supplement

Incorrect. The student supplement provides samples of test procedures, but it does not define the test terms.

Learning Objectives

Describe **ELMS Testing**

Describe **ELMS Test Plan Application**

Identify **Relevant Elements** of an ELMS Test Plan

Describe **Adaptation** of a Test Plan

Learning Objective 4

Describe **Adaptation** of a Test Plan

Develop an NTCIP 1213 v03 Test Design Specification

Background

Information Sources:

NTCIP 1213 v03 – National Transportation Communications for ITS Protocol Object Definitions for Electrical and Lighting Management Systems

- Protocol Requirements List (PRL)
- Requirements Traceability Matrix (RTM)
- Testing documentation
  - Required but not supplied in standard
  - Must be created

Develop an NTCIP 1213 v03 Test Design Specification

Background

Characteristics of the NTCIP 1213 v3.0 (ELMS) Standard

- ELMS is a Center-to-Field Communications Standard
- ELMS contains System Engineering (SE) content (the standard has a PRL and an RTM)
- ELMS does not contain Test Procedures

Develop an NTCIP 1213 v03 Test Design Specification

Background

Protocol Requirements List (PRL)

- Contains user needs
- Contains functional requirements
- Describes relationship between needs and requirements
- **Project-specific** requirements are identified by project-level Protocol Requirements List (PRL)

Develop an NTCIP 1213 v03 Test Design Specification

Background

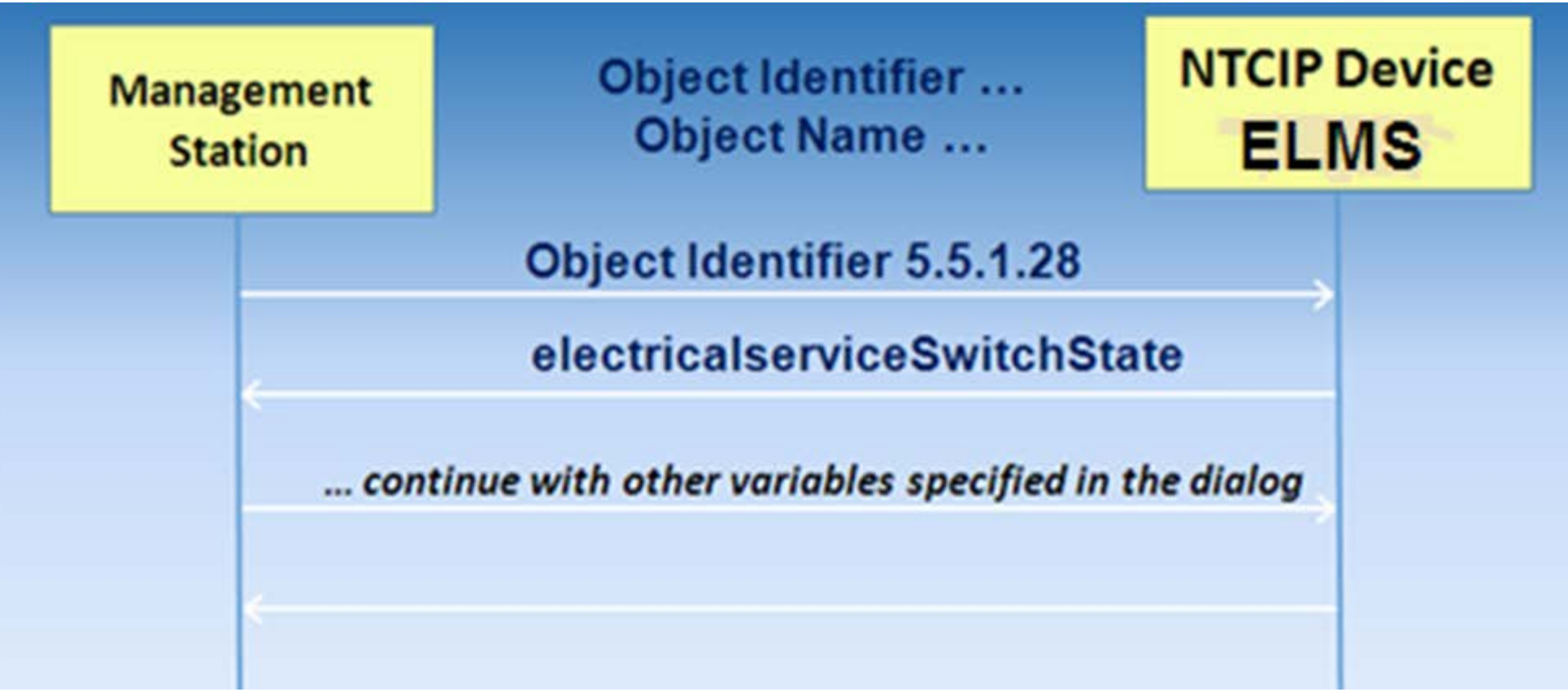
Requirements Traceability Matrix (RTM)

- Contains functional requirements
- Contains object dialogs
- Describes relationship between requirements and object dialogs
- A **project-specific** Requirements Traceability Matrix (RTM) references relevant design content needed to define the inputs and outputs for the test case specification

Develop an NTCIP 1213 v03 Test Design Specification

Background

Context Diagram



NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 1: Select Your User Needs in the PRL

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Support	Additional Specifications
2.5.2.2.2	Control Electrical Service			O	Yes / No	
		3.5.5.2.1	Control Electrical Service by Permanent/Continuous Override	M	Yes	
		3.5.5.2.2	Control Electrical Service by Transitory Override	O	Yes / No	
		3.5.5.2.3	Control Electrical Service by Timed Override	O	Yes No	
		3.5.5.2.4	Control Electrical Service in Stagger Mode	O	Yes / No	
		3.5.5.2.5	Control Electrical Service by Photocell	O	Yes No	
		3.5.5.2.6	Control Electrical Service by Adaptive Means	O	Yes / No	

NTCIP 1213 v03 Test Design Specification

Testing Documentation

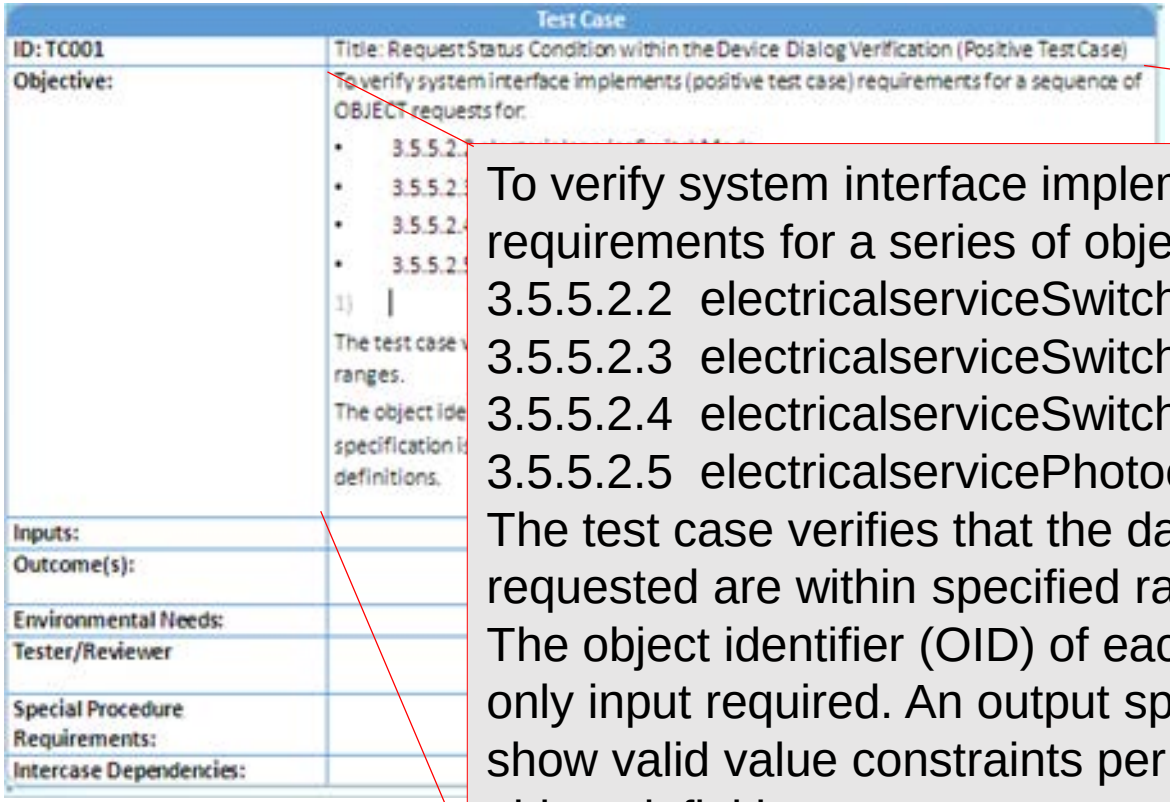
Step 2: Use Project RTM to Identify Objects and Dialogs to Be Tested

Requirements Traceability Matrix (RTM)					
FR ID	Functional Requirement	Dialog ID	Object ID	Object Name	Additional Specifications
3.5.5.2.2	Control Electrical Service by Transitory Override	G.3			
			5.5.1.6	electricalserviceSwitchMode	
3.5.5.2.3	Control Electrical Service by Timed Override	4.2.13			
			5.5.1.6	electricalserviceSwitchMode	
			5.5.1.7	electricalserviceSwitchModeTime	
3.5.5.2.4	Control Electrical Service in Stagger Mode	G.3			
			5.5.1.28	electricalserviceSwitchState	
3.5.5.2.5	Control Electrical Service by Photocell	G.3			
			5.5.1.29	electricalservicePhotocellIndex	
3.5.5.2.6	Control Electrical Service by Adaptive Means	G.3			
			5.5.1.6	electricalserviceSwitchMode	

NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 3: Develop Test Case Objective



Test Case	
ID: TC001	Title: Request Status Condition within the Device Dialog Verification (Positive Test Case)
Objective:	To verify system interface implements (positive test case) requirements for a sequence of OBJECT requests for: • 3.5.5.2. • 3.5.5.2. • 3.5.5.2. • 3.5.5.2. 1) The test case v ranges. The object ide specification i definitions.
Inputs:	
Outcome(s):	
Environmental Needs:	
Tester/Reviewer	
Special Procedure Requirements:	
Intercase Dependencies:	

To verify system interface implements (positive test case) requirements for a series of object requests for:
3.5.5.2.2 electricalserviceSwitchMode
3.5.5.2.3 electricalserviceSwitchModeTime
3.5.5.2.4 electricalserviceSwitchState
3.5.5.2.5 electricalservicePhotocellIndex
The test case verifies that the data value of the OBJECTS requested are within specified ranges.
The object identifier (OID) of each object requested is the only input required. An output specification is provided to show valid value constraints per the NTCIP 1205 v01 object definitions.

EXAMPLE

NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 3: Develop Test Case Objective (continued)

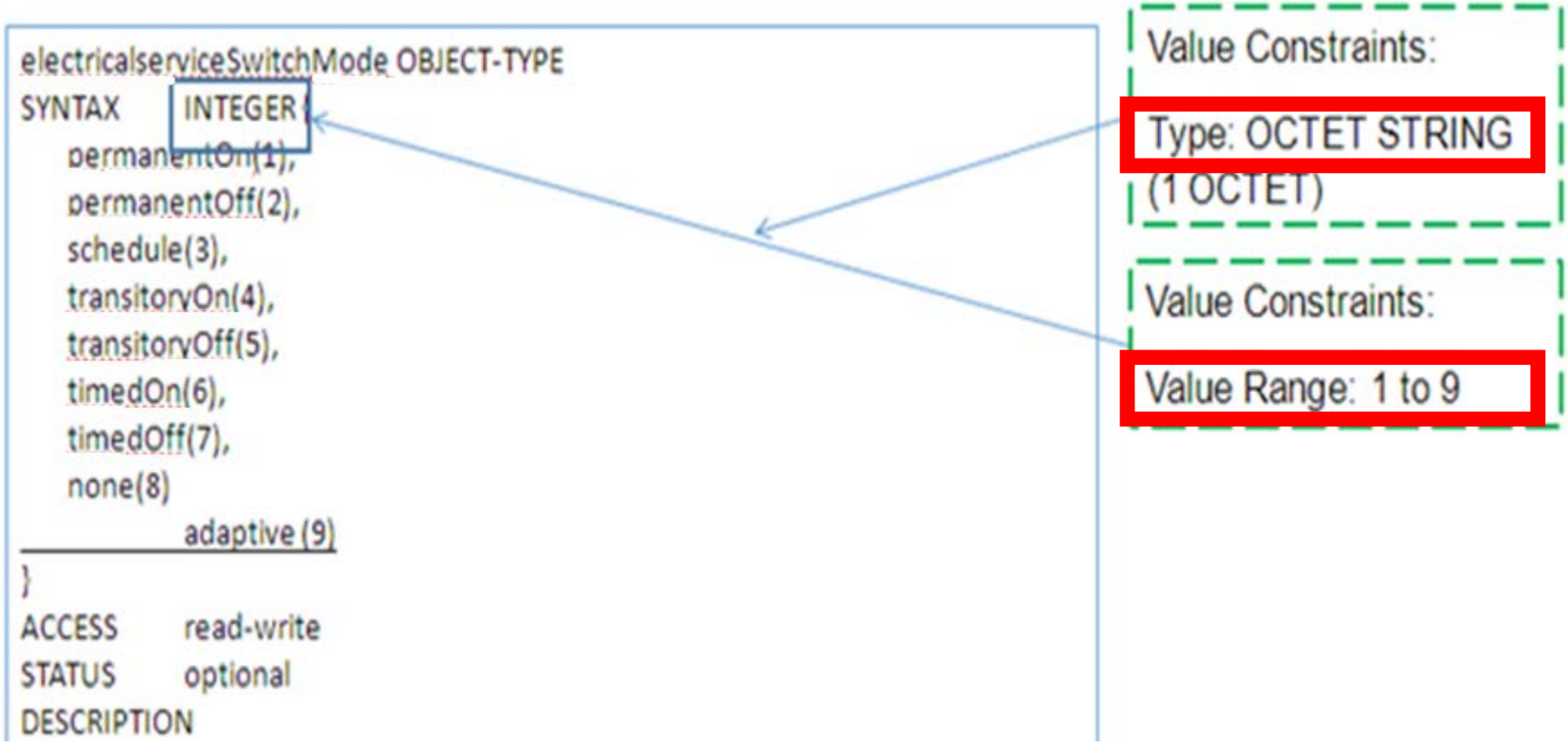
Test Case Output Specification			
ID: TCOS001		Title: Status Condition within the Device	
Data Concept ID	Data Concept Name (Variable)	Data Concept Type	Value Constraints
3.5.5.2.2	electrcialserviceSwitchMode	Data Element	
3.5.5.2.3	electrcialserviceSwitchModeTime	Data Element	
3.5.5.2.4	electrcialserviceSwitchModeState	Data Element	
3.5.5.2.5	electrcialservicePhotocellIndex	Data Element	

EXAMPLE

NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 4: Identify Dialogs, Inputs, Outputs

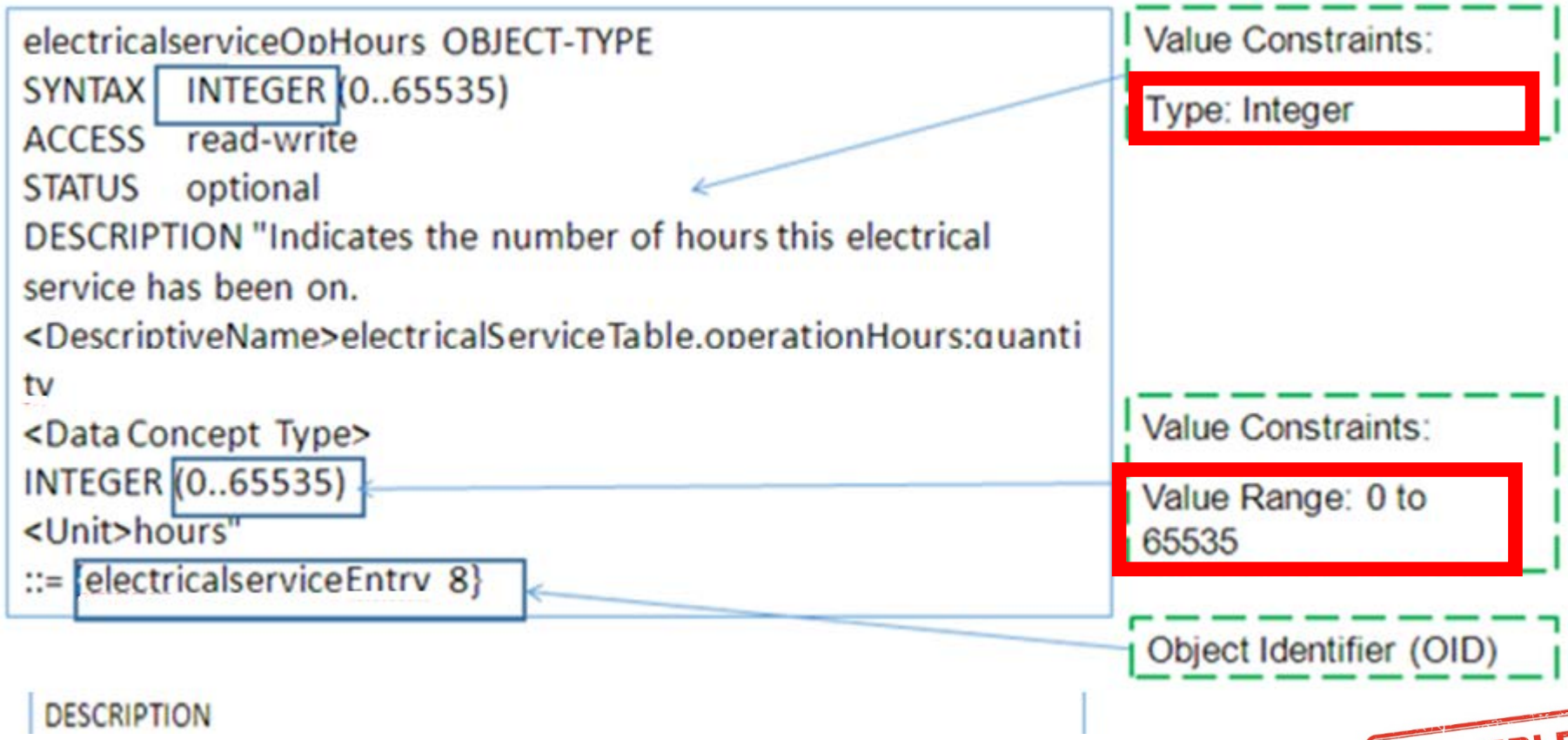


EXAMPLE

NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 4: Identify Dialogs, Inputs, Outputs (continued)



NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 5: Document Value Constraints for Inputs

Test Case Input Specification			
ID TCI201		Title: Input Specification for electricalserviceSwitchMode (Positive test case)	
Data Concept ID	Data Concept Name (Variable)	Data Concept Type	Value Constraints
3.5.5.52.2	electricalserviceSwitchMode	Data Element	1 = "permanentOn" 2 = "permanentOff" 3 = "schedule" 4 = "transitoryOn" 5 = "transitoryOff" 6 = "timedOn" 7 = "timedOff" 8 = "none" 9 = "adaptive"

EXAMPLE

NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 5: Document Value Constraints for Outputs

Test Case Output Specification			
ID TCI201		Title: Output Specification for electricalserviceSwitchMode (Positive test case)	
Data Concept ID	Data Concept Name (Variable)	Data Concept Type	Value Constraints
3.5.5.52.2	electricalserviceSwitchMode	Data Element	1 = "permanentOn" 2 = "permanentOff" 3 = "schedule" 4 = "transitoryOn" 5 = "transitoryOff" 6 = "timedOn" 7 = "timedOff" 8 = "none" 9 = "adaptive"

EXAMPLE

NTCIP 1213 v03 Test Design Specification

Testing Documentation

Step 6: Complete Test Case

Test Case	
ID TCI201	Title: electricalserviceSwitchMode Dialog Verification (Positive Test Case)
Objective	To verify system interface implements(positive test case) requirements for object: electricalserviceSwitchMode
Inputs	Use valid inputs as defined by test case input specification
Outcomes	All data are returned and verified as correct: correct sequence of message exchanges, structure of data, and valid value of data content. See Test Case Output Specification for details.
Environmental Needs:	No additional needs outside of those specified in the test plan.
Tester/Reviewer	JF
Special Procedure Requirements	None
Intercase Dependencies	None

Developing Test Cases and Procedures for Extensions

Supporting Objects Not in the Standard

Extending the Standard complicates interoperability and interchangeability

- Not achievable unless all design details are known
- Extensions are relatively custom solutions, resulting in:
  - Increased specification costs
  - Increased development costs
  - Increased testing costs
  - Increased integration costs
  - Longer deployment timeframe
  - Increased maintenance costs

Developing Test Cases and Procedures for Extensions

Supporting Objects Not in the Standard

Extensions should only be considered when:

- NTCIP features are inadequate to meet needs
- Benefits of extension outweigh added costs

Developing Test Cases and Procedures for Extensions

Supporting Objects Not in the Standard

Extended equipment should be designed to:

- Appropriately integrate with NTCIP-only deployments
- Minimize added complexity

Developing Test Cases and Procedures for Extensions

If You Do Choose to Test Objects Not in the Standard

- Adhere to the relationships between the PRL, RTM, and RTCTM, as well as the underlying user needs and measurable functional requirements
- The main purpose of Test Design is to identify the features to be tested by a particular level test (e.g., unit test)
- The features to be tested are included in the RTCTM
  - Based on a Requirements Traceability Matrix (RTM)

Test Procedure Generator Tool (TPG)

Introduction to the Test Procedure Generator

- What is the TPG?
- Why is the TPG important?
- What are the benefits?
- How do you use the TPG?
- How does it fit into testing for NTCIP Standards?
- Where does a user obtain the TPG?

Test Procedure Generator Tool (TPG)

What Is the TPG and How Does It Work?

- USDOT has released the version 2.1 of the TPG tool for the ITS Standards communities
- TPG v2.1 supports development and deployment NTCIP Center-to-Field (C2F) Device Interface Standards with Systems Engineering Content
- TPG is a Windows-based software tool that uses Microsoft Word to input the NTCIP Standards and output Test Procedures
- TPG supports ITS Standard developers as well as deployers (local and state agencies) of NTCIP C2F Standards

Test Procedure Generator Tool (TPG)

What Is the TPG and How Does It Work?

- For deployers and local agencies, the TPG guides the development of test procedures by: Loading and processing the standard to be implemented including the requirements, dialogs, and objects

- Basing the Test Procedures on the user-selected requirements in NTCIP C2F Standard

Test Procedure Generator Tool (TPG)

What Is the TPG and How Does It Work?

- Uses standardized and consistent language for Test Procedures development, including:
  - Standard keywords, variables, and object names imported directly from the standard
- Outputs an XML file that can be consistently interpreted by vendors and testing staff for their test suites
- Standards Deployers can use the TPG to create consistent Test Procedures
- ***Remember: The TPG is not a testing tool!***

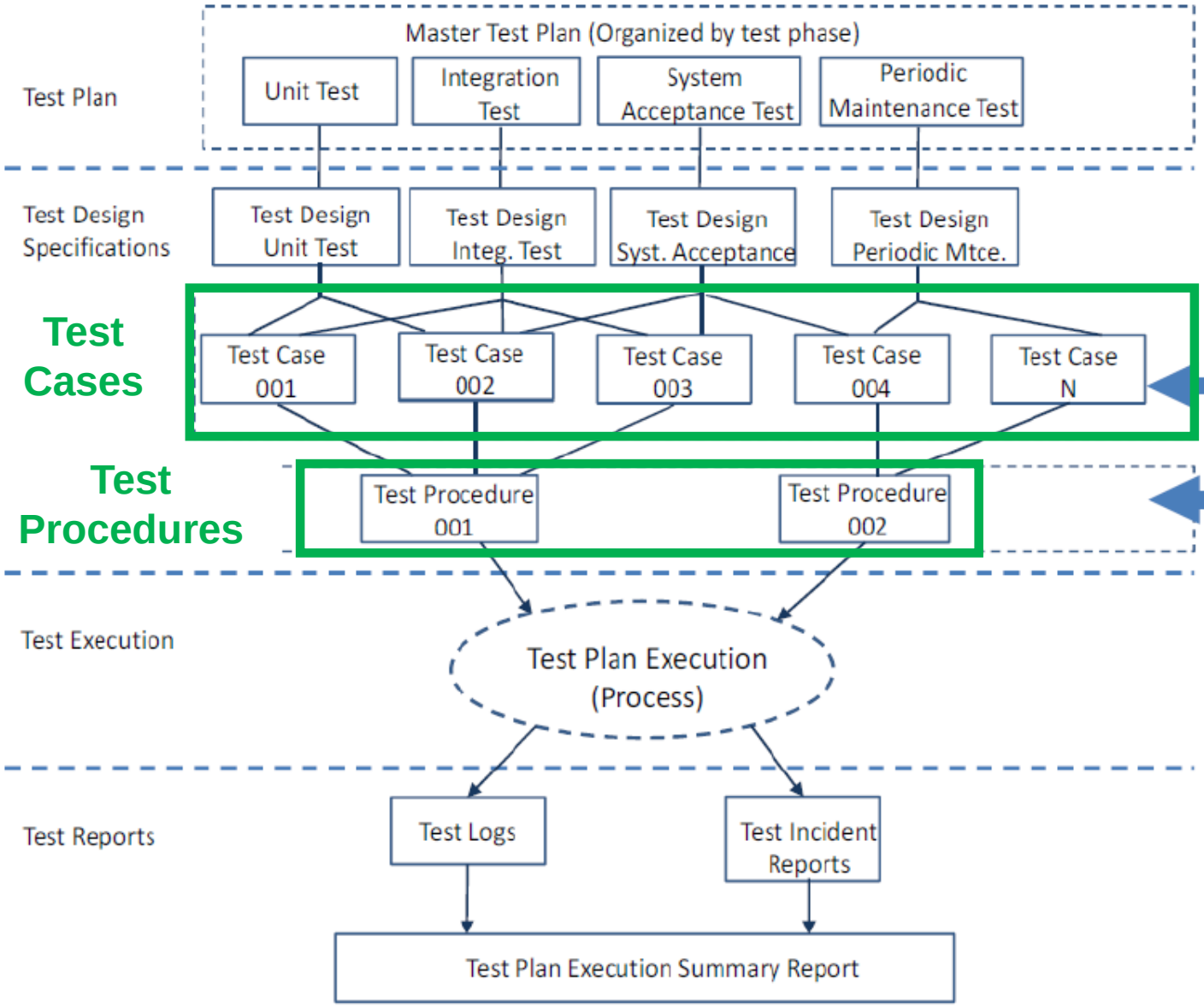
Test Procedure Generator Tool (TPG)

Benefits of the TPG

- Agencies can use the TPG to develop consistent test procedures for verifying conformance and compliance

- Using the TPG tool will reduce developmental risks, effort, and the cost of developing standards and test procedures

Test Procedure Generator Tool (TPG)



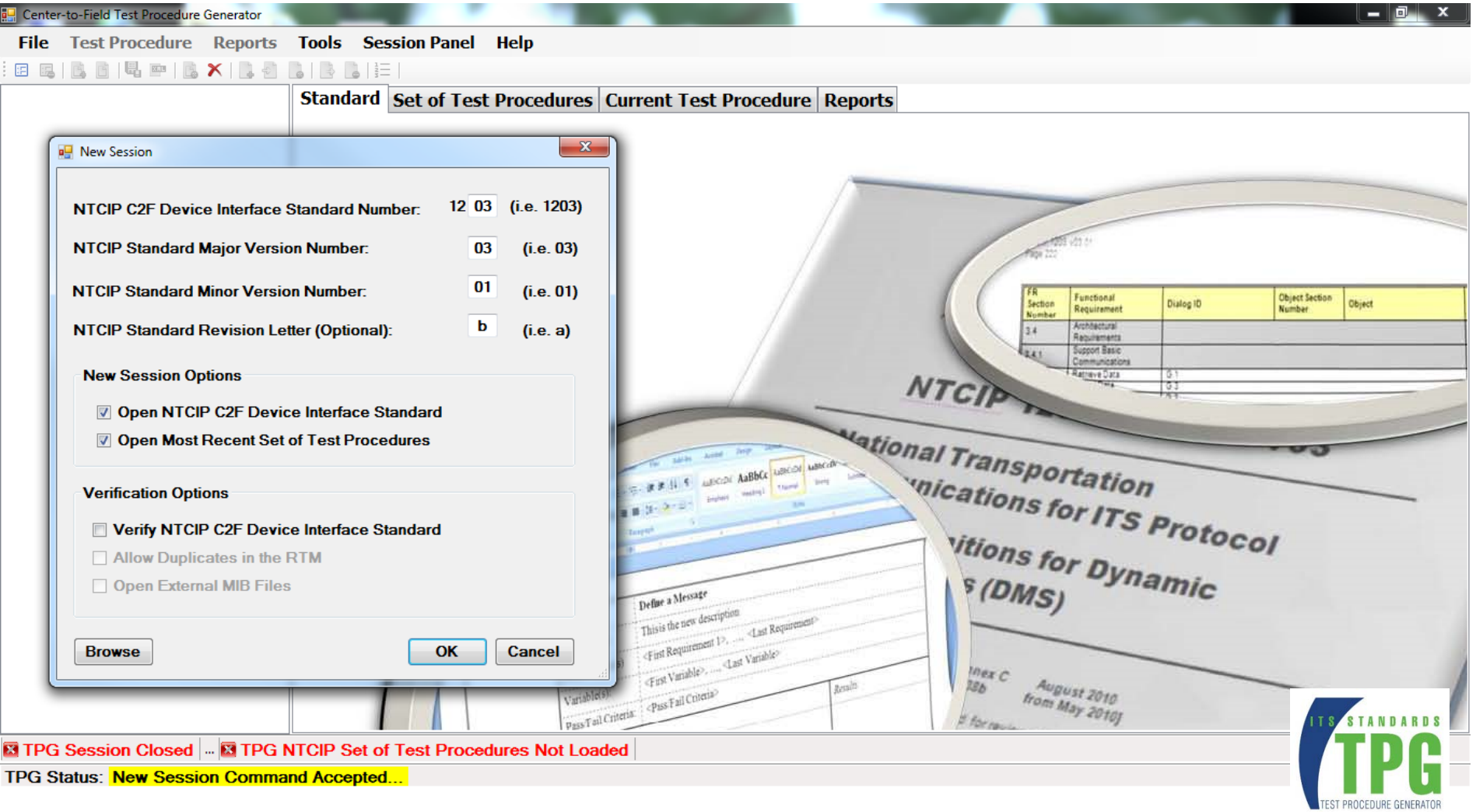
Test Procedure Generator Tool (TPG)

Role of the TPG in Testing

- Supports off-the-shelf interoperability
- Promotes the systems engineering process by giving users support in creating test procedures
- Standardized and easily available Test Procedures that are conformant to the standard help to eliminate the proprietary system elements

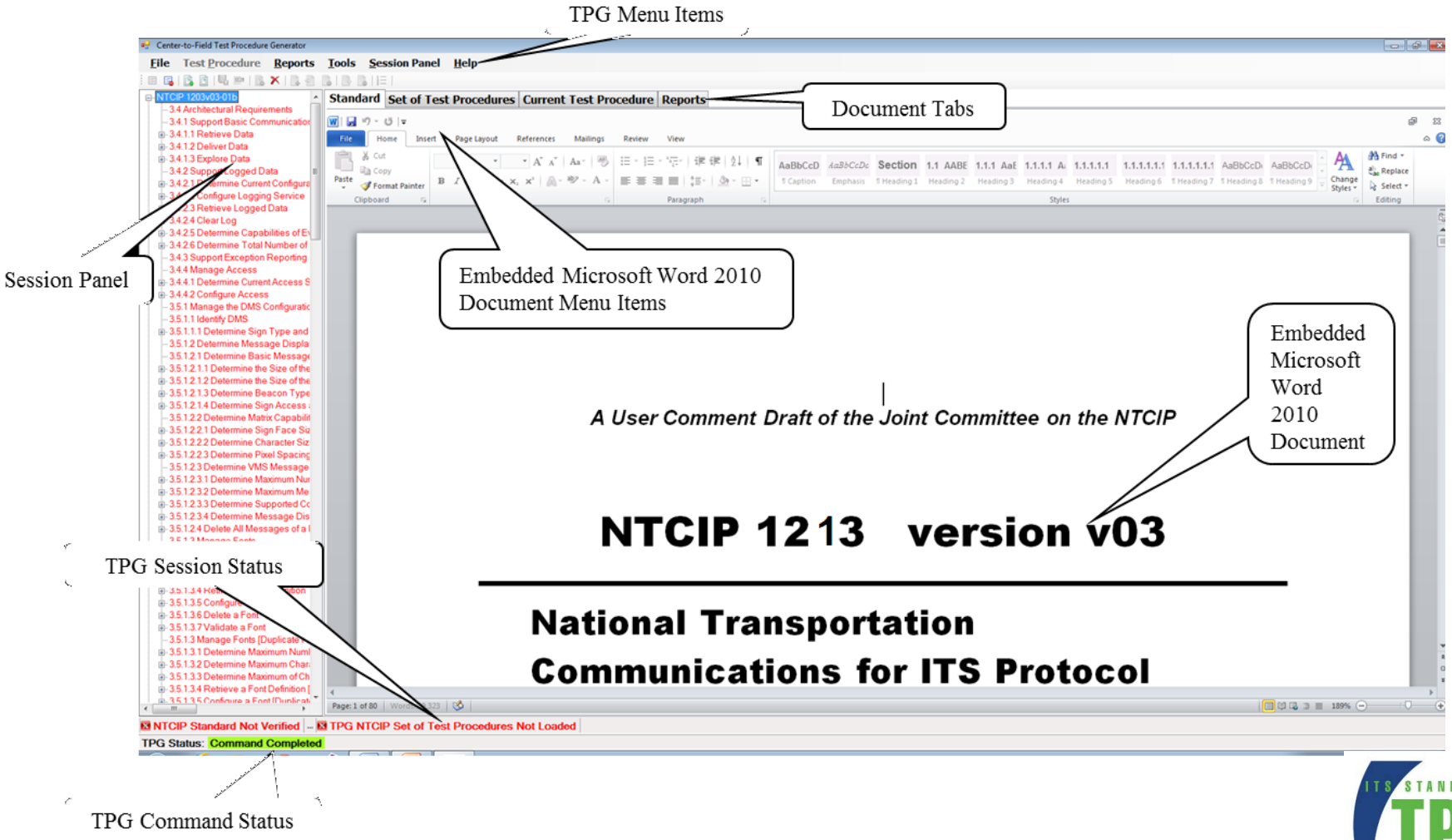
Test Procedure Generator Tool (TPG)

Using the TPG – Start a New Session



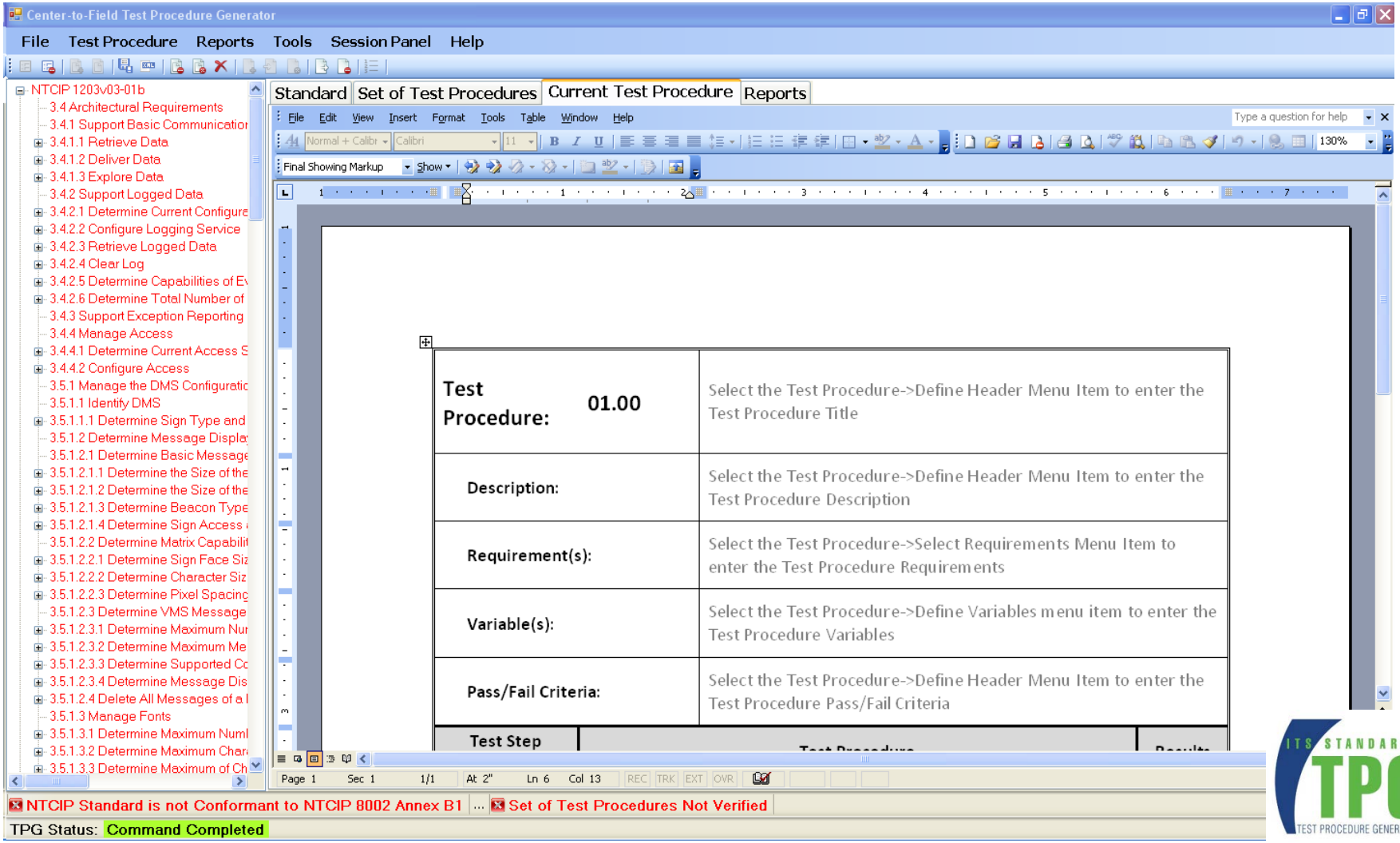
Test Procedure Generator Tool (TPG)

Using the TPG – The Graphical User Interface



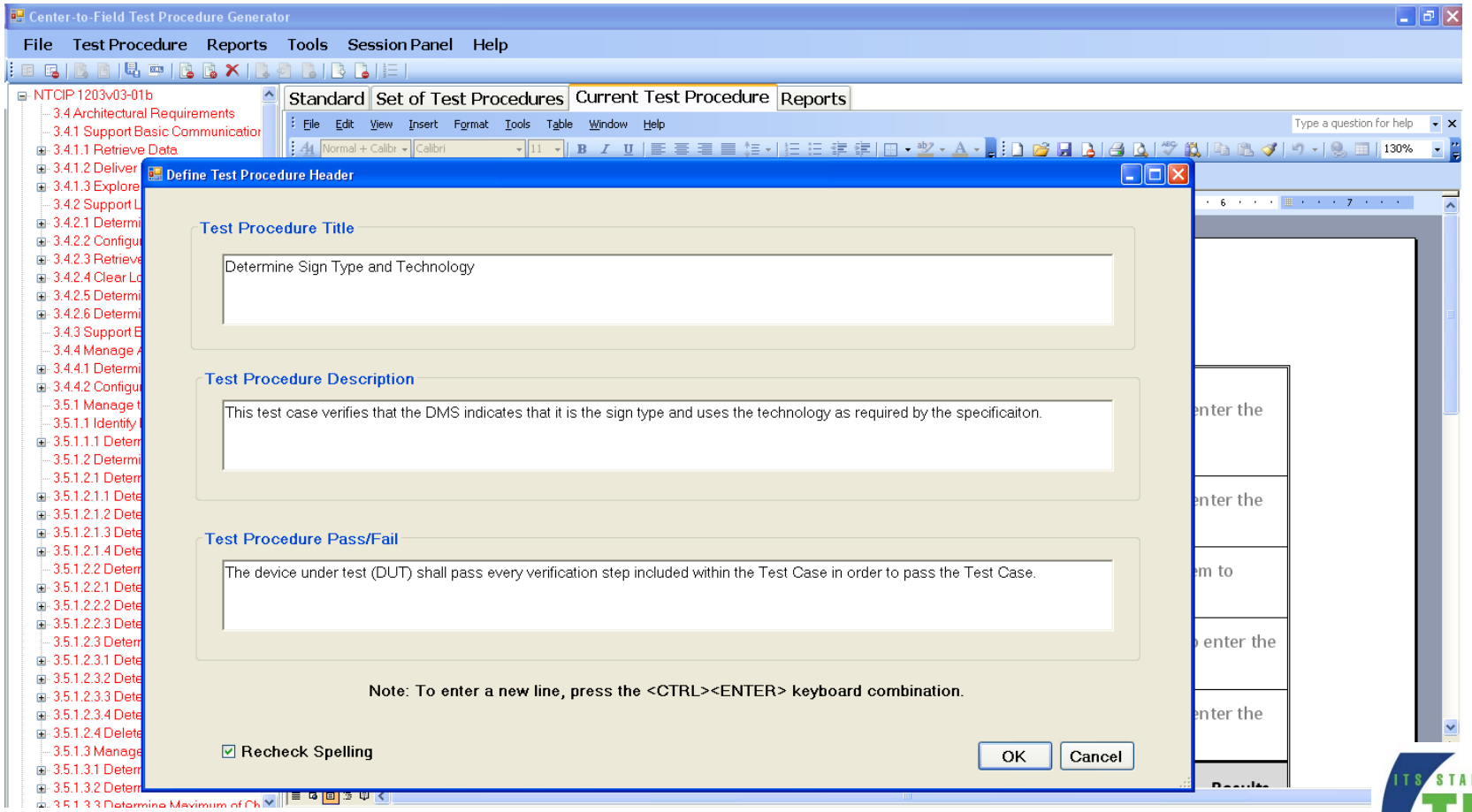
Test Procedure Generator Tool (TPG)

Using the TPG – Create a New Test Procedure



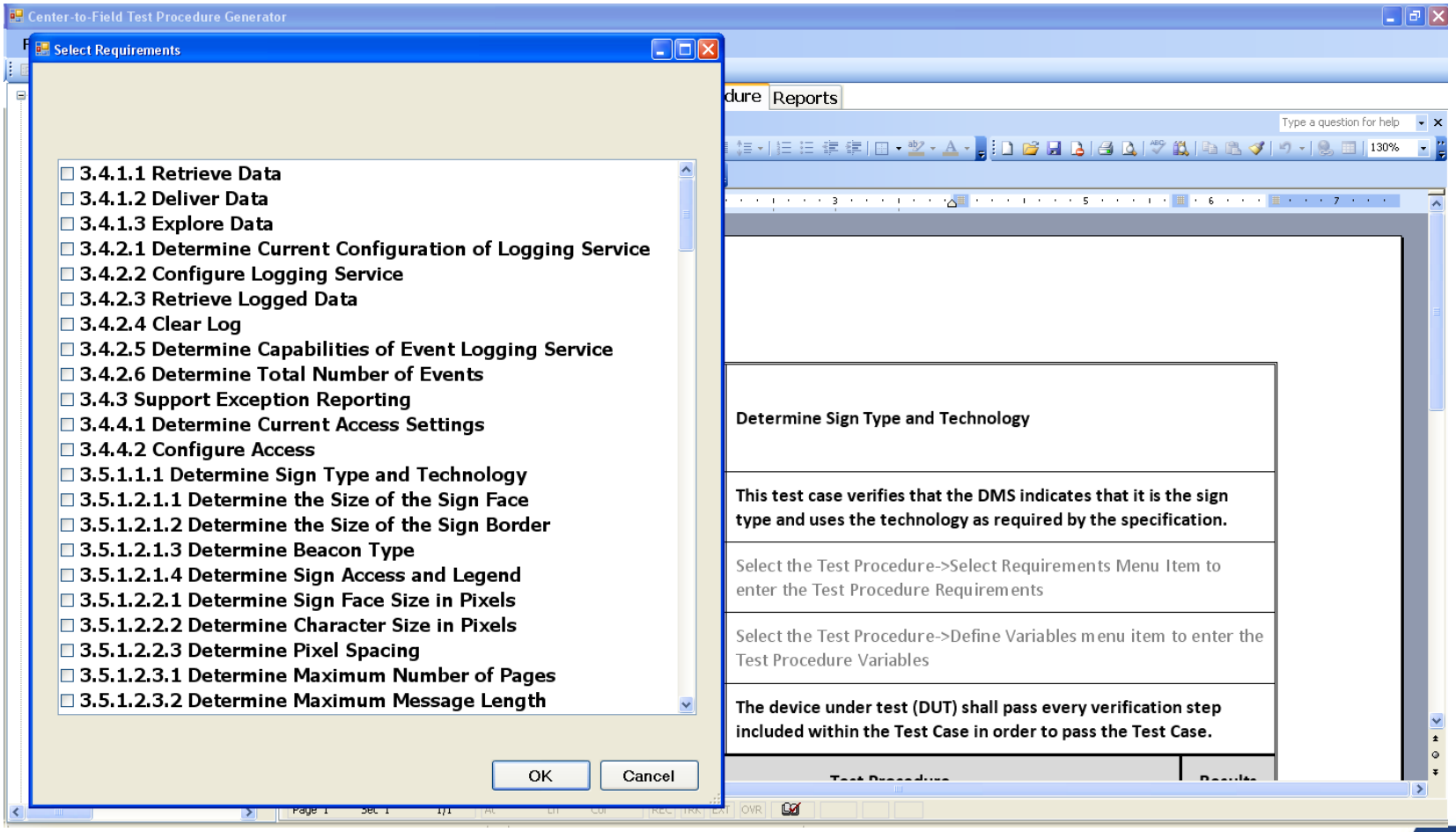
Test Procedure Generator Tool (TPG)

Using the TPG – Create a New Test Procedure



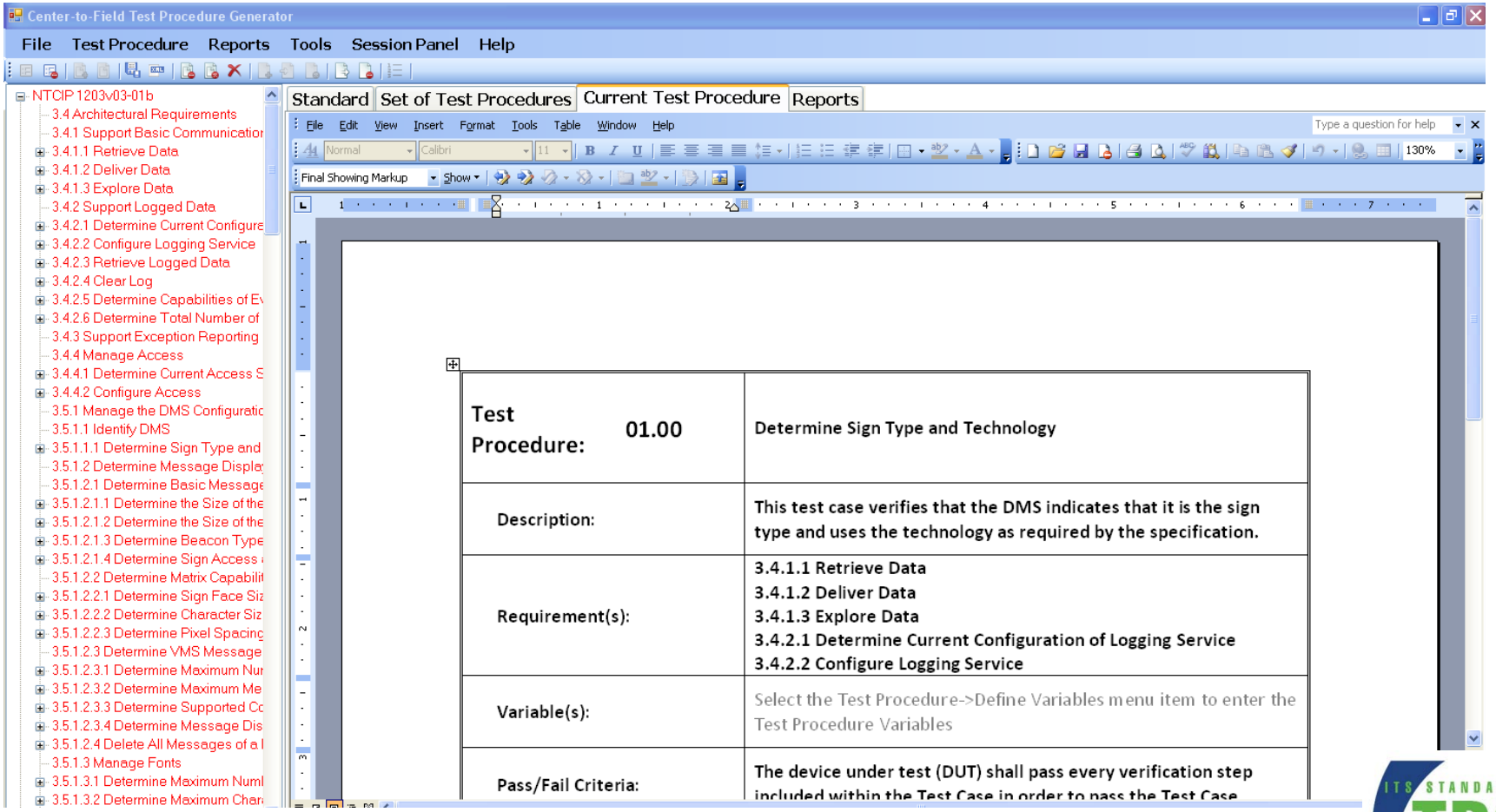
Test Procedure Generator Tool (TPG)

Using the TPG – Select Your Requirements



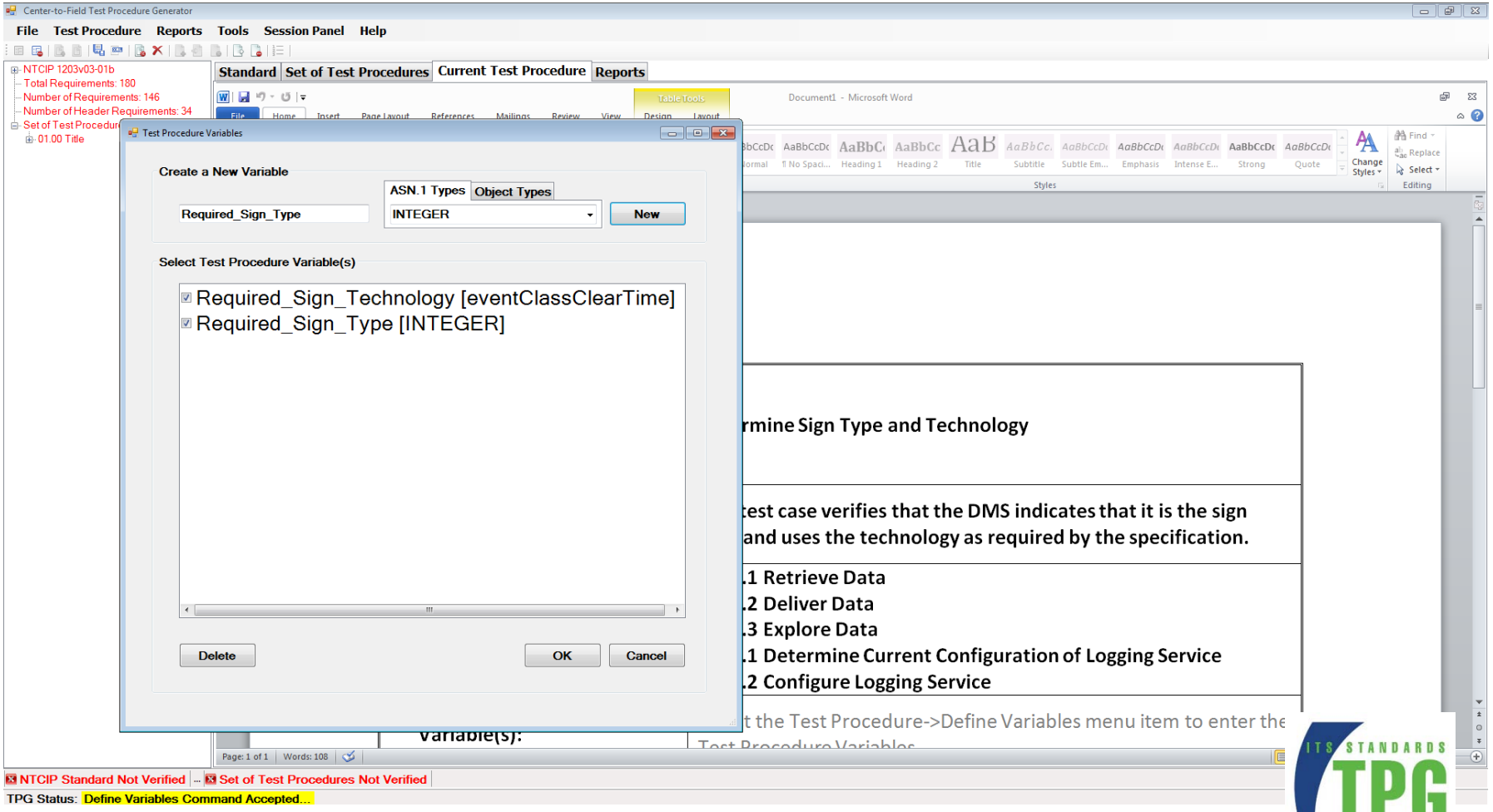
Test Procedure Generator Tool (TPG)

Using the TPG – The Test Procedure



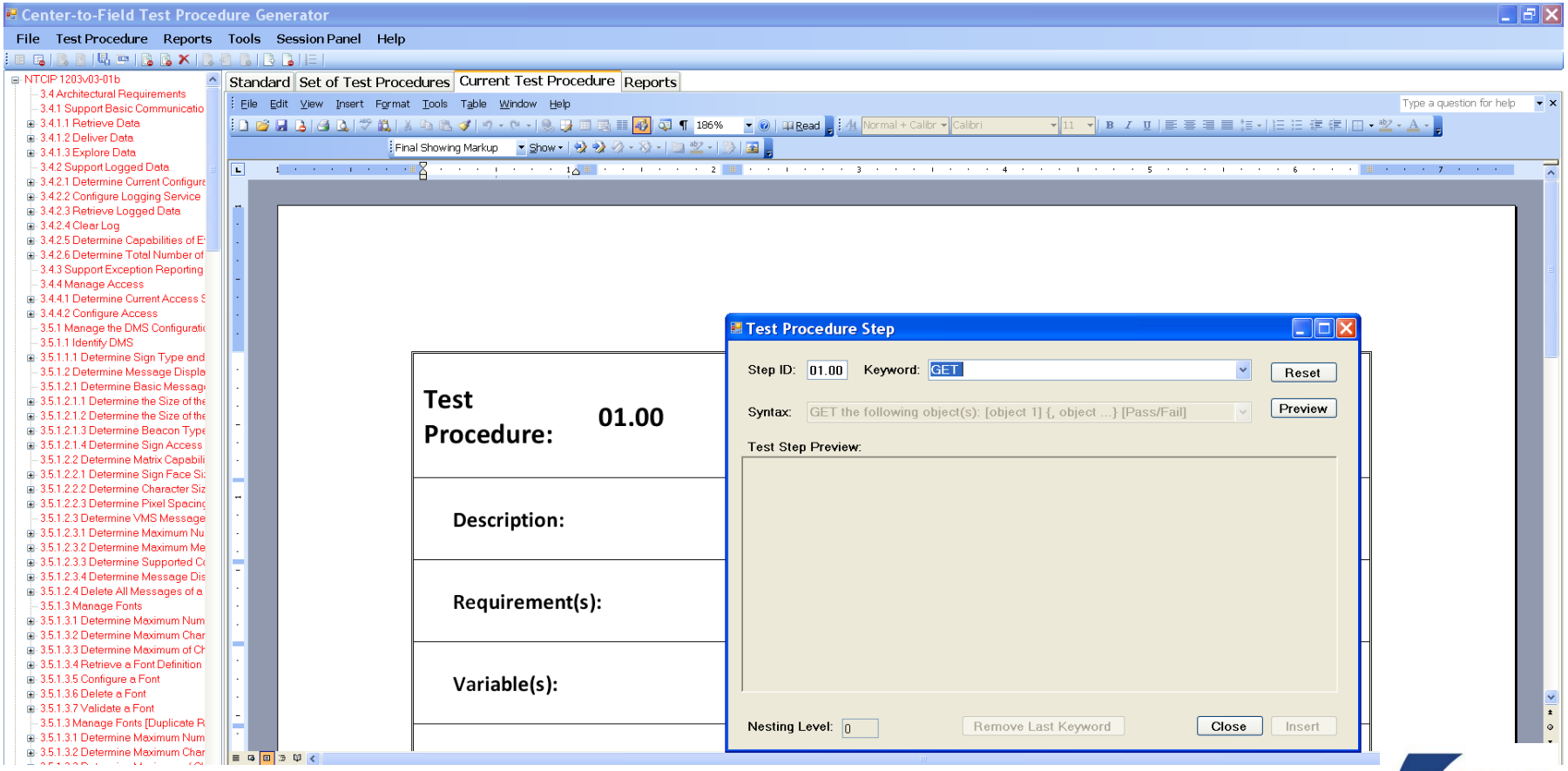
Test Procedure Generator Tool (TPG)

Using the TPG – Create Your Variables



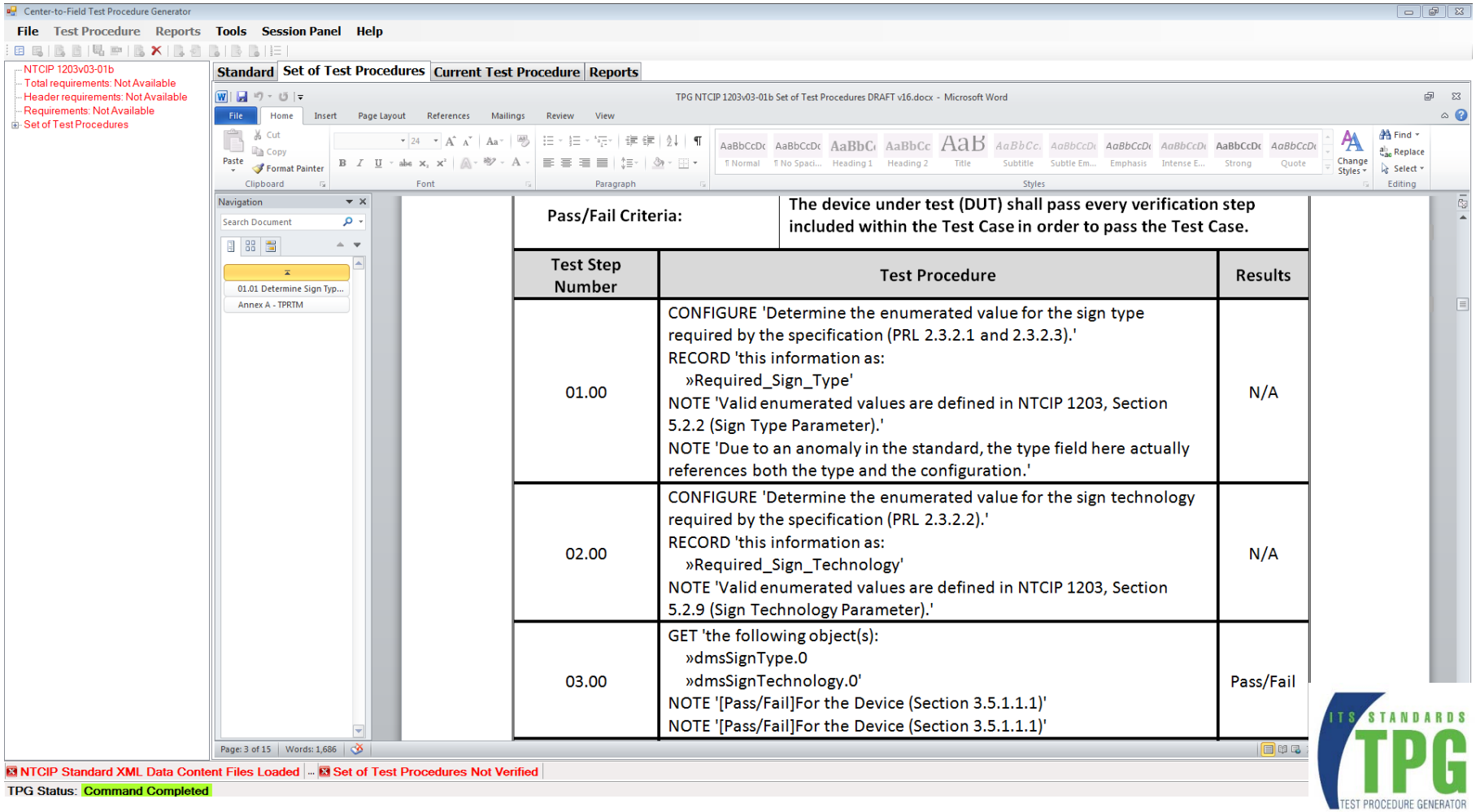
Test Procedure Generator Tool (TPG)

Using the TPG – Create Your Test Procedure Step



Test Procedure Generator Tool (TPG)

Using the TPG – Test Procedure Results



Test Procedure Generator Tool (TPG)

How to Obtain the TPG

- TPG v2.1 updates include: Compatibility with Windows 7 Professional
- Compatibility with Microsoft Office 2010
- For more information and to acquire the TPG, please visit: https://www.standards.its.dot.gov/DeploymentResources/Tools
- The free download package includes:
  - TPG v2.1 Installation file
  - TPG User Manual
- TPGSupport@noblis.org

ACTIVITY

STANDARDS ITS TRAINING

U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

Question

Which of the following statements is false?

Answer Choices

a) TPG v2.1 supports development and deployment NTCIP Center-to-Field (C2F) Device Interface Standards with Systems Engineering Content

b) TPG is a testing tool

c) TPG is a Windows-based software tool that uses Microsoft Word to input the NTCIP Standards and output Test Procedures

d) TPG supports ITS Standard developers as well as deployers (local and state agencies) of NTCIP C2F Standards

Review of Answers

a) TPG v2.1 supports development and deployment NTCIP Center-to-Field (C2F)Device Interface Standards with Systems Engineering Content

Incorrect. TPG does support development and deployment NTCIP Center-to-Field (C2F)Device Interface.

b) TPG is a testing tool

Correct! False, TPG is not a testing tool.

c) TPG is a Windows-based software tool that uses Microsoft Word to input the NTCIP Standards and output Test Procedures

Incorrect. TPG is a Windows-based software tool.

d) TPG supports ITS Standard developers as well as deployers (local and state agencies) of NTCIP C2F Standards.

Incorrect. TPG supports ITS Standard developers as well as deployers.

Module Summary

Describe **ELMS Testing**

Describe **ELMS Test Plan Application**

Identify **Relevant Elements** of an ELMS Test Plan

Describe **Adaptation** of a Test Plan

We Have Now Completed the ELMS Curriculum

Module A306a: Understanding **user needs** for Electrical and Lighting Management Systems Based on NTCIP 1213 v03

Module A306b: Specifying **requirements** for Electrical and Lighting Management Systems Based on NTCIP 1213 v03

Module T306: Applying Your **Test Plan** to the Electrical and Lighting Management Systems Based on NTCIP 1213 v03

Thank you for completing this module.

Feedback

Please use the Feedback link below to provide us with your thoughts and comments about the value of the training.

Thank you!