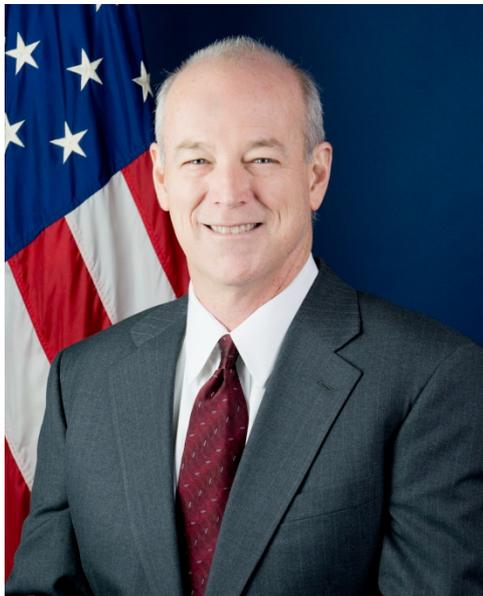




W E L C O M E

**RITA** Intelligent Transportation Systems  
Joint Program Office

# Welcome



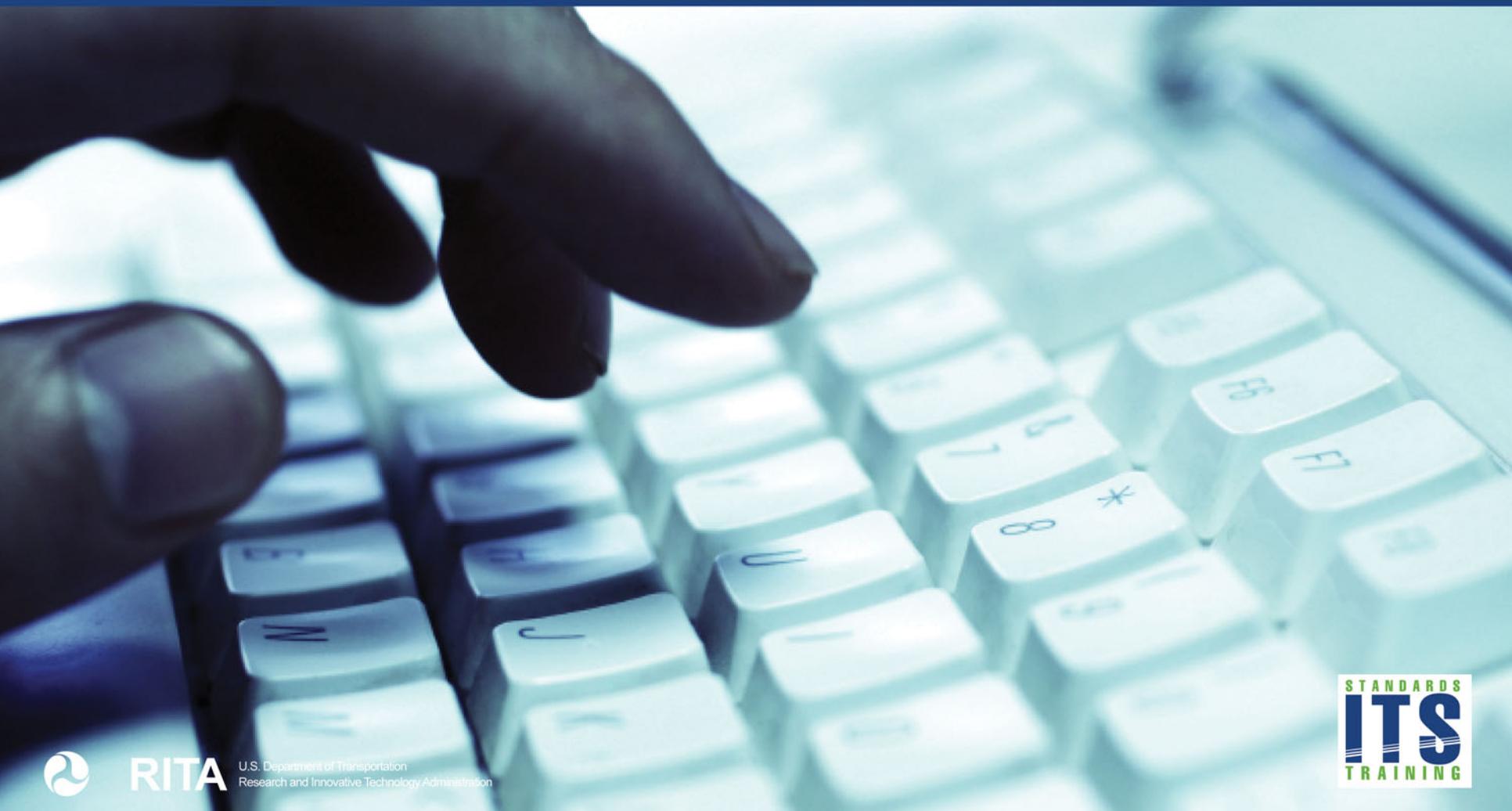
Ken Leonard, Director  
ITS Joint Program Office  
[Ken.Leonard@dot.gov](mailto:Ken.Leonard@dot.gov)

The screenshot shows the RITA website for the ITS Professional Capacity Building Program. The header includes the RITA logo and the text "U.S. Department of Transportation Research and Innovative Technology Administration". Below the header, it says "Intelligent Transportation Systems Joint Program Office" and "ITS Professional Capacity Building Program / Advancing ITS Education". The main content area features a large banner with the text "Welcome to ITS Professional Capacity Building" and "The ITS PCB Program is the U.S. Department of Transportation's leading program for delivering ITS training and learning resources to the nation's ITS workforce." To the right of the banner is a "What's New" section with a list of recent events: "March 18, 2013: Upcoming T3 Webinar: Smart Traffic Management: Lessons from New York City's Midtown in Motion Project (4/18/13)", "Starting February 15, 2013: Several training opportunities are available from the Consortium for ITS Training and Education", and "February 2, 2013: So You Think You Can T3? Send us your T3 Webinar idea!". Below the banner are three main content blocks: "Available E-Training (free)" listing various web courses and blended training options; "Free ITS Training" with a sub-section for "Free ITS Training! Achieve Your ITS Learning Needs" listing web-based and blended courses, standards training, upcoming webinars, and a webinar archive; and "T3 Webinars" with a sub-section for "Free ITS Technical Assistance" open to state and local agencies and FHWA Field Offices, including a peer-to-peer program and a help line.

[www.pcb.its.dot.gov](http://www.pcb.its.dot.gov)



# ACTIVITY



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# **A317b: Understanding Requirements for CCTV Systems Based on NTCIP 1205 Standard**





# Instructor



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# Target Audience

- Engineering staff
- Traffic management center (TMC)/Operations staff
- System developers
- Private and public sector users including manufacturers
- Traveler and other information service providers





# Recommended Prerequisite(s)

- I101 Using ITS Standards: An Overview
- A101 Introduction to Acquiring Standards-based ITS Systems
- A102 Introduction to User Needs Identification
- A103 Introduction to ITS Standards Requirements Development
- A201 Details On Acquiring Standards-based ITS Systems
- A202 Identifying and Writing User Needs When ITS Standards Do Not Have SEP Content
- A203 Writing Requirements When ITS Standards Do Not Have SEP Content

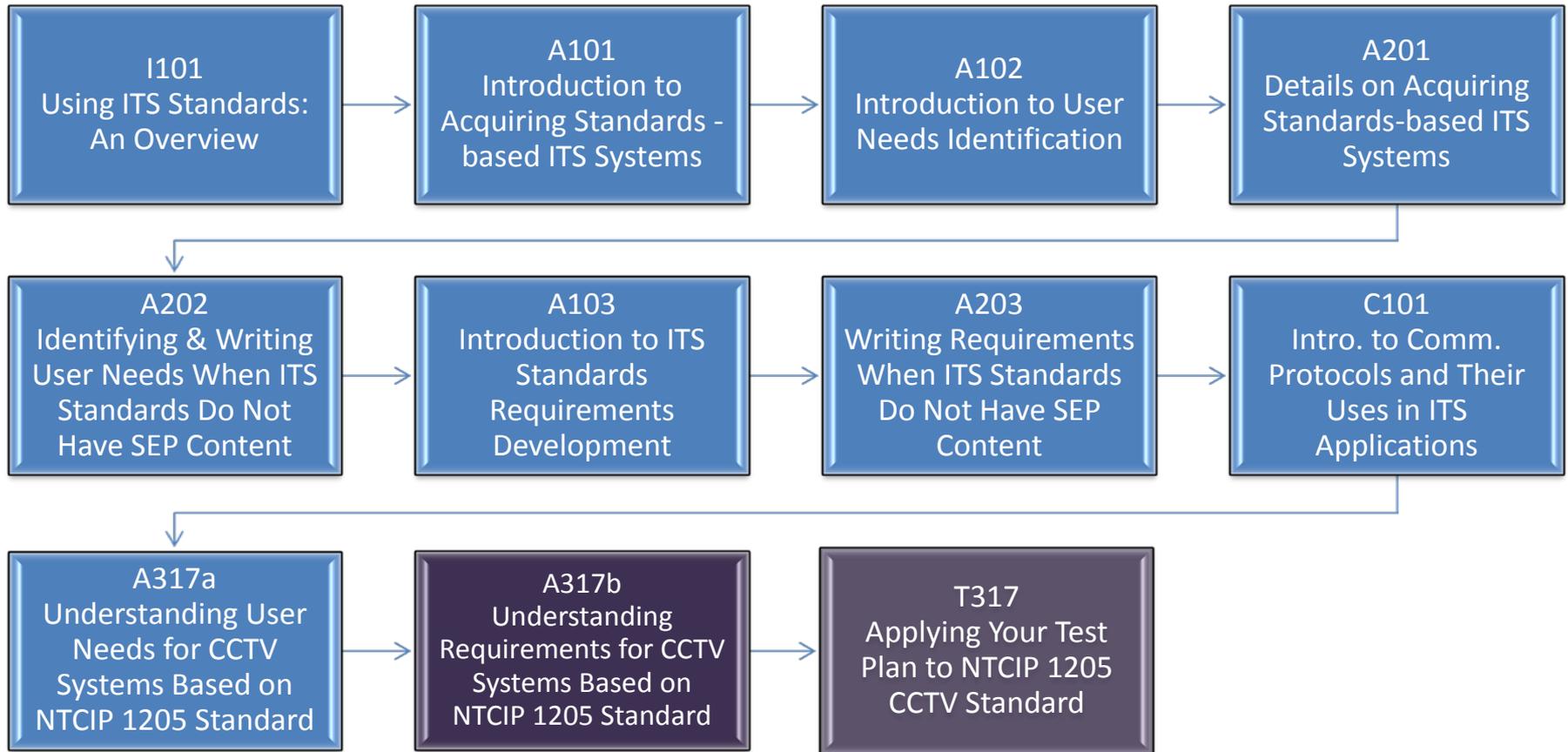


# Recommended Prerequisite(s) (cont.)

- C101 Introduction to the Communications Protocols and Their Uses in ITS Applications
- A317a Understanding User Needs for CCTV Systems Based on NTCIP 1205 Standard



# Curriculum Path (Non-SEP)





# Learning Objectives

1. Learn how to develop requirements using the NTCIP 1205 CCTV standard
2. Achieve interoperability and vendor-independence
3. Understand traceability
4. Incorporate requirements not supported by standardized objects
5. Develop the CCTV system specification





# Learning Objective #1— Develop Requirements Using the NTCIP 1205 CCTV Standard

- Review the structure of NTCIP 1205 standard
- Identify requirements from various sources
  - User needs developed in Module A317a
  - *Configuration-Control and Monitoring* perspectives
  - Content from the SEP-based standards
- Review criteria for well-formed requirements
- Develop sample requirements

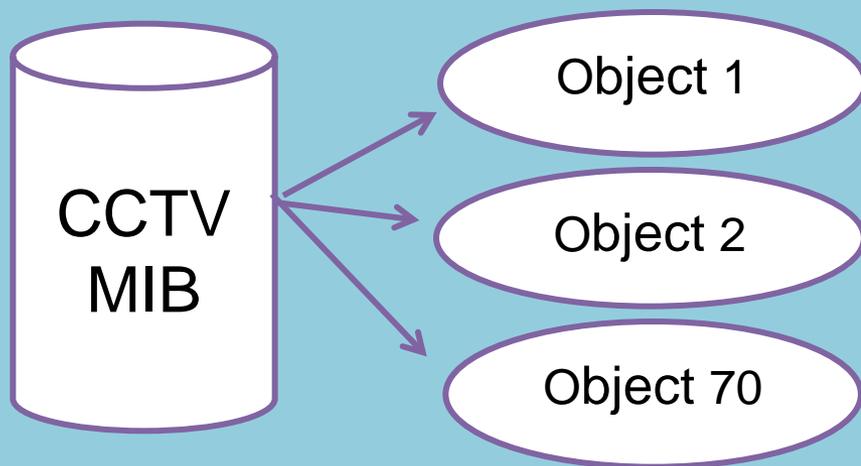
# Review of the NTCIP 1205 v1.08 Structure

Section 1  
CCTV Overview

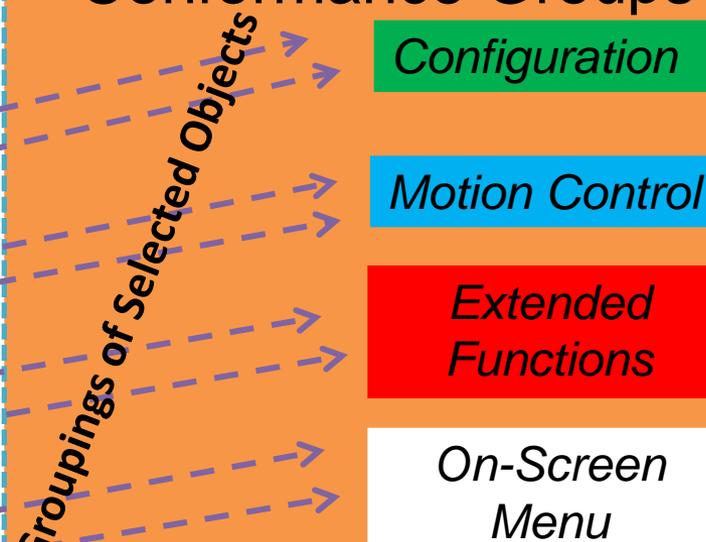
Section 2  
General

Appendix  
Extended Glossary

## Section 3 CCTV MIB (Objects)



## Section 4 Conformance Groups



# CCTV System Terminology



Camera Control



**PTZ  
(Pan-Tilt-Zoom)**



**Focus**

**Presets**

**Iris**

**Labeling**

Source: NYCDOT: TMC CCTV Interface

# Typical Desired Camera Control Functions



Source: NYSDOT

# CCTV Information Required for Specification

1. User Needs

2. Requirements

 **Not Available**

3. Objects (Data)

4. Dialogs (Generic)

 **Available**

5. Protocol Requirements List (PRL)

6. Requirements Traceability Matrix (RTM)

 **Not Available**

# Requirements are a Translation of User Needs

*A translation of needs into a set of individual quantified or descriptive specifications for the characteristics of an entity in order to enable its realization on examination.*

-ISO/IEC Guide 25: 1990

## Example

*“**The CCTV device** shall allow the management station to remotely turn on or off the camera operation.”*

**The burden of design is placed on the device**

# User Needs' Relationship to Requirements

One User Need → Requirement 1

One User Need → Requirement 1  
One User Need → Requirement n

Many User Needs → Requirement 1

# Approach to CCTV Requirements

## Inputs

Utilize User Needs  
From Module A317a

Configuration,  
Monitoring, and  
Control Perspectives

## Apply Two-Steps



## Outputs

Develop  
CCTV  
Requirements

---

Project PRL  
Project RTM

# Review of a Well-Formed Requirement

## Step- 1 Provide Structure of a Requirement

1. **Actor** identifies who does the action.
  2. **Action** identifies what is to happen.
  3. **Target** identifies who or what receives the action.
  4. **Constraint** identifies how to measure success or failure of the requirement.
  5. **Localization** identifies the circumstances under which the requirement applies.
- Not all requirements will have both

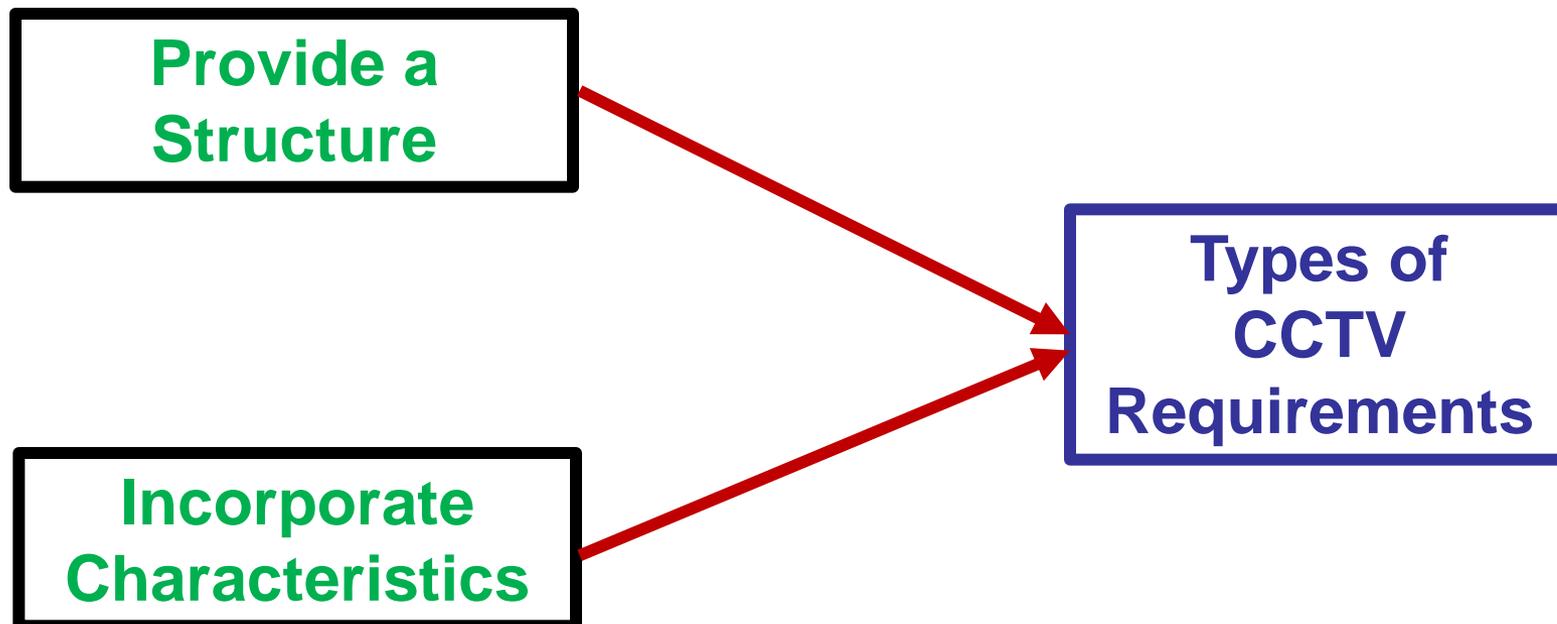
# Review of a Well-Formed Requirement

## Step-2 Include Characteristics of a Requirement

1. **Necessary**: Must be useful and traceable to needs.
2. **Concise**: Minimal, understandable, and expressed as a *shall* statement.
3. **Attainable**: Realistic to achieve within available resources and time.
4. **Standalone**: Stated completely in one place.
5. **Consistent**: Does not contradict itself, nor any other stated requirement.
6. **Unambiguous**: Susceptible to only one interpretation.
7. **Verifiable**: Requirement can be verified through inspection, analysis, demonstration, or test.

# Developing Well-Formed CCTV Requirements

## Applying Two-Steps



# Types of CCTV Requirements

NTCIP Aim is to Achieve Remote Management

## Architectural Requirements

Supports general communication capabilities.

***SNMP Interface***

## Data Exchange Requirements

Supports Device feature-functions.

***Pan-Tilt-Zoom***

## Supplemental Requirements

Not covered above  
Special project need

***Local***

# Organization of Requirements

## SAMPLE CCTV REQUIREMENTS

- 3.1 Background Information**
- 3.2 Architectural Requirements**
  - 3.2.1 Provide Live Data*
  - 3.2.2 Provide Off-Line Logged Data*
- 3.3 Data Exchange Requirements**
  - 3.3.1 Managing Configuration*
  - 3.3.2 Camera Control*
  - 3.3.3 Monitoring Status*
- 3.4 Supplemental Requirements**

**See Student  
Supplement  
for Details**



# Architectural Requirements

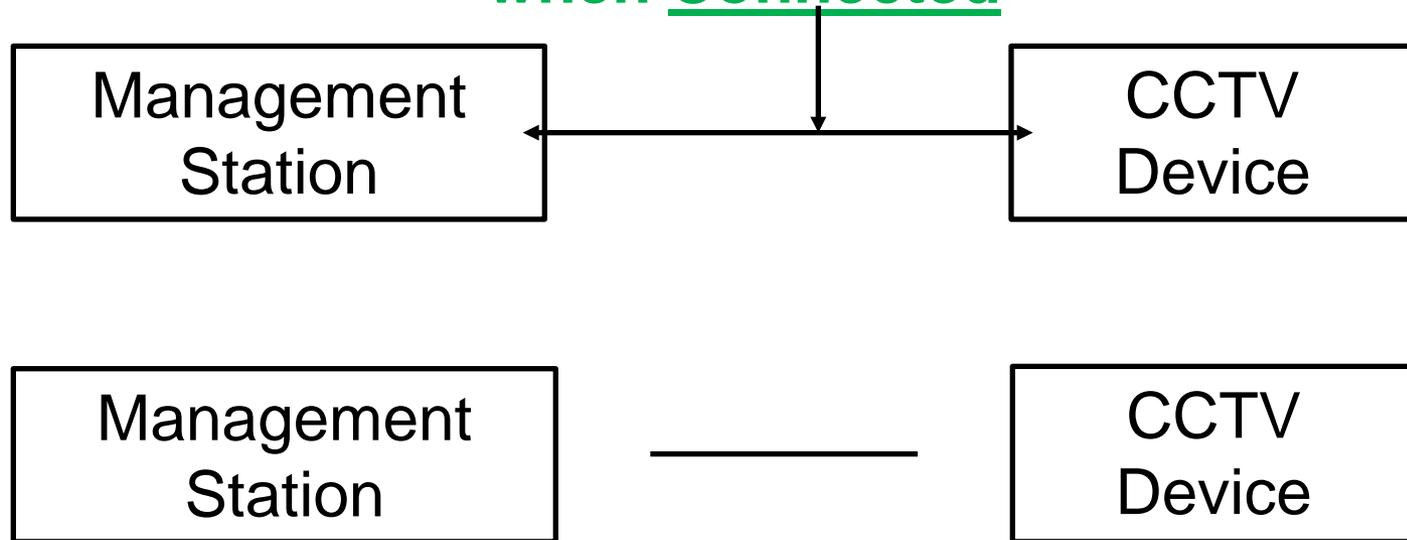
- Requirements related to **communications between** a central Management Station and the CCTV Device

1. Retrieve data from a device
2. Deliver data to a device
3. Explore data in a device
4. Manage access levels to the device



# Architectural Requirements Supported by NTCIP 1205 Standard

**Provide Live Data: Monitor-Control CCTV System when Connected**



**Provide Off-line Log Data: Retrieve Log Data when NOT-Connected (Example: Dial-Up Links)**

# Where do Architectural Requirements Come from?

## Example: Operational User Need: Provide Live Data

### 3.2.1 Provide Live Data [Requirement]

#### 3.2.1.1 Retrieve Data

The CCTV device shall allow the management station **to retrieve data** from the camera control receiver.

#### 3.2.1.2 Deliver Data

The CCTV device shall allow the management station **to deliver data** (e.g. configuration data, commands etc.)

# Where do Architectural Requirements Come from? (cont.)

## Operational User Need: Provide Off-Line Data

### 3.2.2 Provide Off-Line Logged Data [Requirement]

#### 3.2.2.3 Retrieve Logged Data

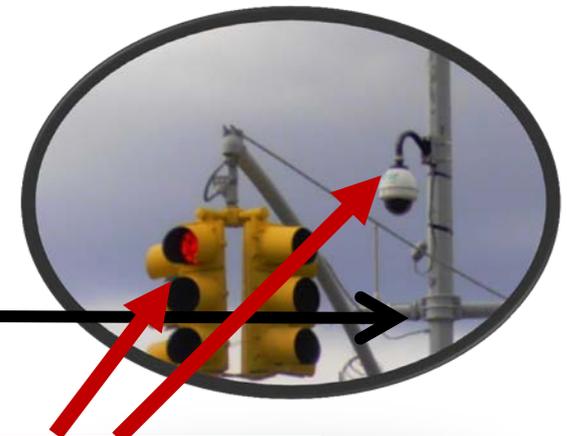
The CCTV device shall allow the management station to retrieve one or more available logged data from the event log.

#### 3.2.2.4 Clear Log

The CCTV device shall allow the management station to clear any or all log entries of a given event class.

# Data Exchange Requirements

- Requirements to:
  - Manage the CCTV Device Configuration
  - Control the CCTV Device
  - Monitor the Status of the CCTV Device



Center-to-Field  
Communications

Source: NYCDOT

Example of Multiple Devices Sharing a Channel

# Where do Data Exchange Requirements Come from?

## CCTV User Needs Dictate Requirement(s)

- We have discussed well-written user needs in Module A317a [Please refer to Module A317a supplement]

- Examples of titles of CCTV User Needs:

*Configure a CCTV Device*

*Move and Control Camera in the Field*

*Set-Up a Camera Tour*

*Set-Up Zones*

*Share Video Images*



# Providing the Structure to a Requirement

**Title of a User Need** “*Configure a CCTV Device*”



**Requirement:** Remotely Configure a CCTV Device

**TARGET**

*The CCTV device shall allow the*

**ACTOR**

*management station to*

**ACTION**

*remotely configure the camera preset positions for a*

*maximum number of 255.*

# Assessing Characteristics of a Requirement

Necessary?

Concise?

Attainable?

Standalone?

## 3.3.1.1 Configure Range Maximum Presets

The CCTV device shall allow the management station to select a preset from the preconfigured range of 1-xx to enable quick monitoring operation for a user defined timeframe.

Consistent?

Unambiguous?

Verifiable?

## 3.3.2.4 Pan Control

### Ensures Structure + Characteristics

The CCTV device shall allow the management station

TARGET

ACTOR

to remotely control a camera position horizontally

ACTION

(Pan- 0° to 360°). This requirement applies to both the

primary management station and a backup TMC facility.

Unambiguous?

Verifiable?

## 3.3.2.5 Tilt Control

### Ensures Structure + Characteristics

The CCTV device shall allow the management station

TARGET

ACTOR

to remotely control a camera Vertically (Tilt-is  $\pm 90^\circ$ ).

ACTION

This requirement applies to both the primary management station and a backup TMC facility.

Unambiguous?

Verifiable?



## 3.3.2.6 Zoom Operation

**TARGET**

The CCTV device shall provide a motorized camera-lens

**ACTOR**

equipped with zoom capability to allow management station

**ACTION**

to remotely adjust lens for a wide and telephoto views.



**Standalone  
Necessary**

**Attainable**



Source: NYCDOT

## 3.3.1.15

# Timeout Limit of a Zoom Operation

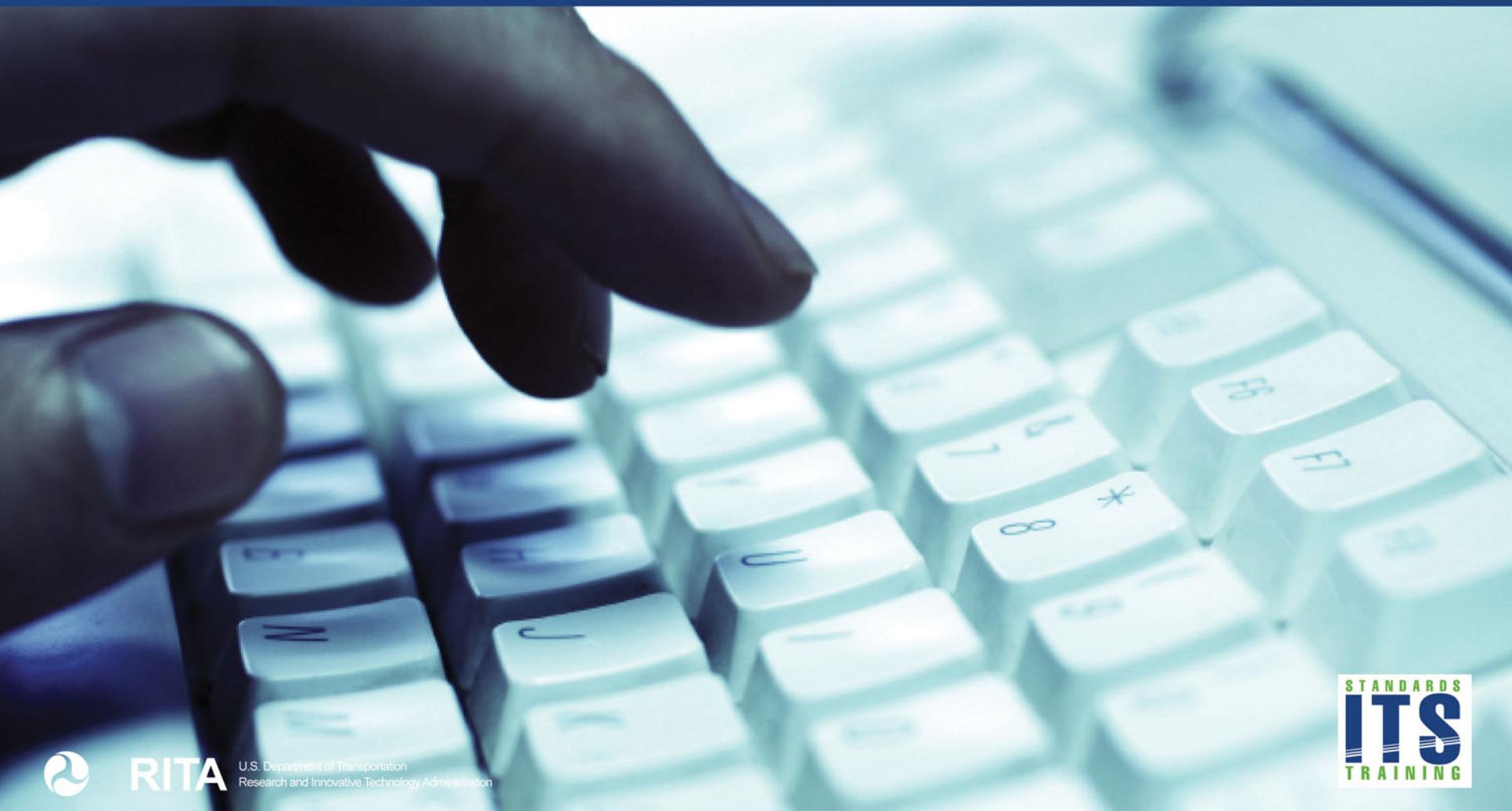
- The CCTV device shall allow the management station to adjust timeout of a zoom motion of the lens to continue for up to 655535 milliseconds without a reissue of a zoom command.

**Ensures Structure + Characteristics**

Zero means timeout feature is not supported



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## Which of the following is a well-formed requirement?

- a) The CCTV device shall allow the management station to retrieve current status of the device features from the camera control receiver.
- b) The camera position must be controllable by the TMC.
- c) Operator needs to monitor current temperature condition inside the camera enclosure.
- d) TMC staff shares camera controls with the maintenance personnel located at another building.

# Review of Answers



- a) The CCTV device shall allow the management station to retrieve current status of the device features from the camera control receiver.

*Correct, because this requirement ensures structure and characteristics.*

**Necessary**

**Concise**

**Attainable**

**Standalone**

**Consistent**

**Unambiguous**

**Verifiable**

# Review of Answers

-  b) The camera position must be controllable by the TMC operator.  
*Incorrect, because this represents a user need.*
-  c) Operator needs to monitor current temperature condition inside the camera enclosure.  
*Incorrect, because this is a user need statement.*
-  d) TMC staff shares camera controls with the maintenance personnel located at another building.  
*Incorrect, because this is a user need statement.*



# Summary of Learning Objective #1

## Develop requirements using the NTCIP 1205 CCTV standard

- Reviewed the structure of the standard
- Learned how to identify types of CCTV requirements from various sources
- Discussed criteria for writing well-formed requirements and developed examples
- Additional examples of requirements are provided in the supplement





# Learning Objective #2 — Achieve Interoperability and Vendor-Independence

- Understand SNMP interface and dialogs
- Understand NTCIP objects
- Develop sample dialogs



# Understanding Interoperability and Vendor-Independence

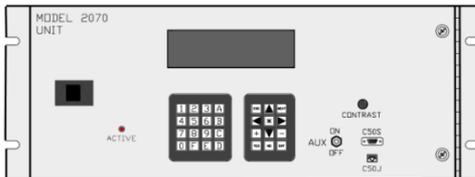
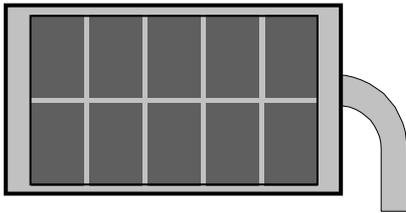


## NTICIP

### Compatibility

### Interoperability

### Interchangeability



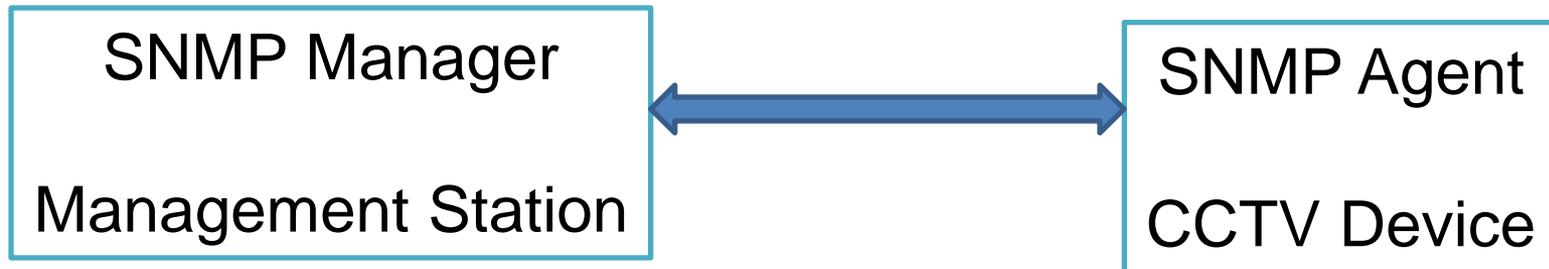
New Camera

Old Camera



# SNMP Interface

- SNMP Interface consists of the **SNMP, dialogs, and messages**



# SNMP Messages

1. **Get** message to read data (retrieve)
2. **GetNext** message to retrieve more data
3. **Set** message to write data (control)

**Each message is a Command and Contains a Protocol Data Unit (PDU)**

[Details Provided in Module C101 and NTCIP Guide]

# Source of PDU Data: Object

- Structure of an Object is Based on Abstract Syntax Notation 1 Language (ASN.1)

Integer is a “value” which is manipulated

1. Object's name	<b>rangeMaximumPresets</b> OBJECT-TYPE
2. Data type value range	<b>SYNTAX INTEGER (0..255)</b>
3. Access limitations	<b>ACCESS</b> read-only
4. Conformance requirement	<b>STATUS</b> mandatory
5. Human readable description, states purpose	<b>DESCRIPTION</b> “A preset is the pre-specified position where a camera is pointed to a fixed point in space.....”
6. Object Identifier (OID)	<b>::={cctvRange1}</b>

# Formation of PDU Data: varBind

## Example

rangeMaximumPresets

SYNTAX INTEGER  
(0..255)

::={CCTVRange1}

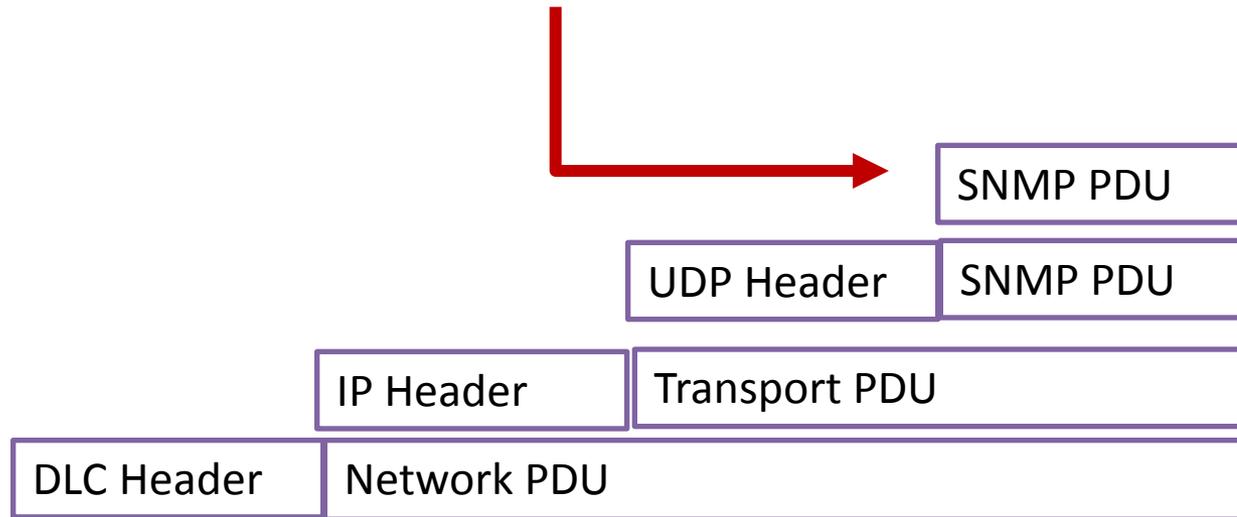
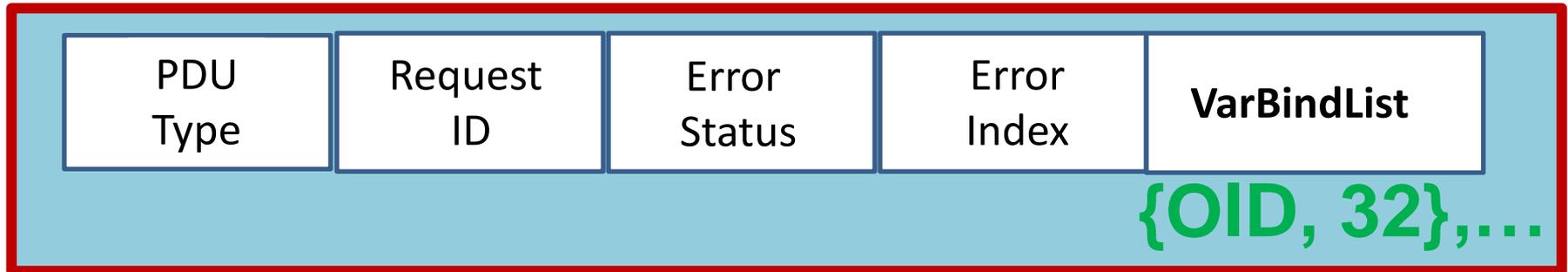


varBind

{  
OID, 32  
}

# Formation of an SNMP Message

## VarBindList Encapsulated in the Message

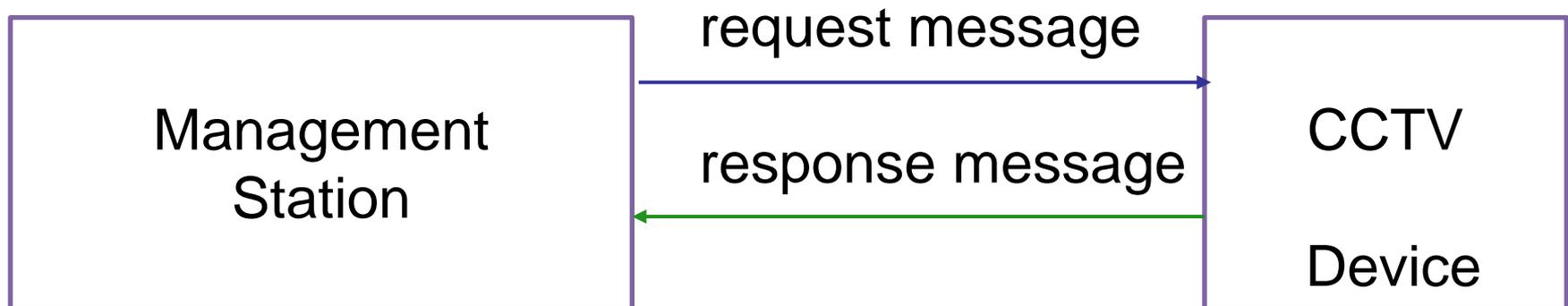


DLC-Data Link Control Layer

See NTCIP Guide for Details

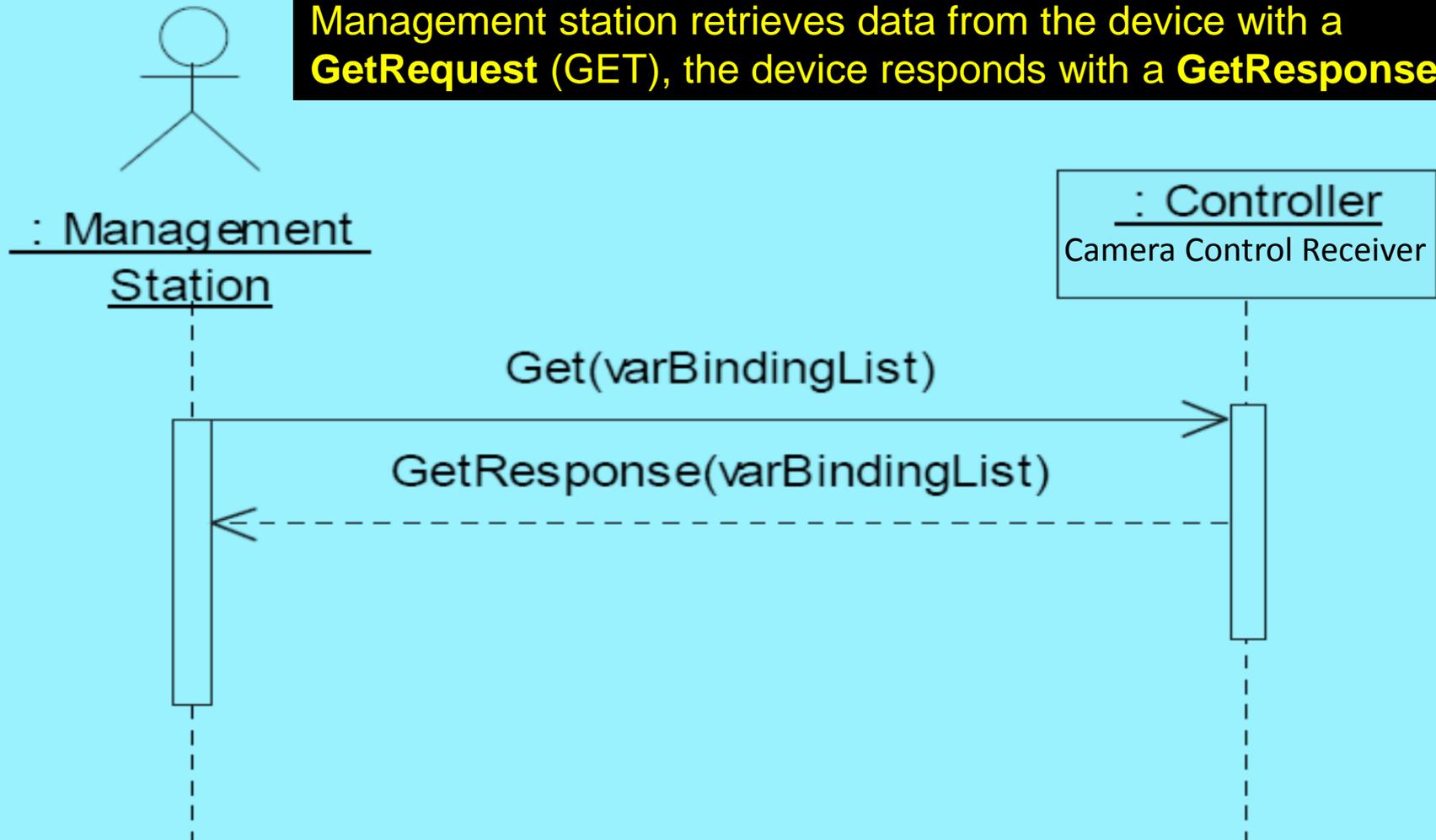
# Generic SNMP Dialogs for Messages

- D.1** SNMP Get Interface Used to Retrieve Data from the Device
- D.2** SNMP Get-Next interface Used to Retrieve More Data
- D.3** SNMP Set Interface Used to Send Data to the Device

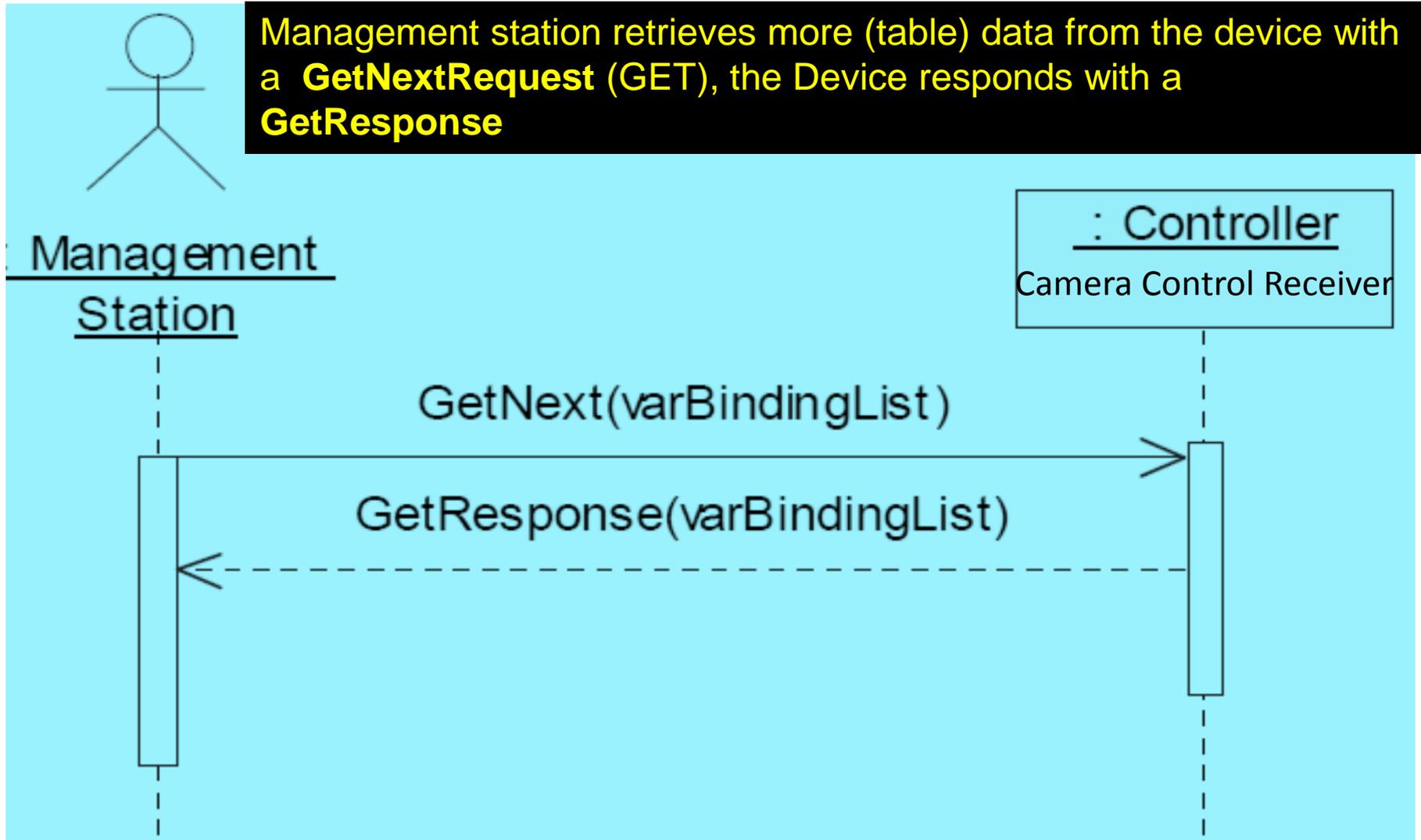


# D.1 Generic SNMP Get Interface Dialog

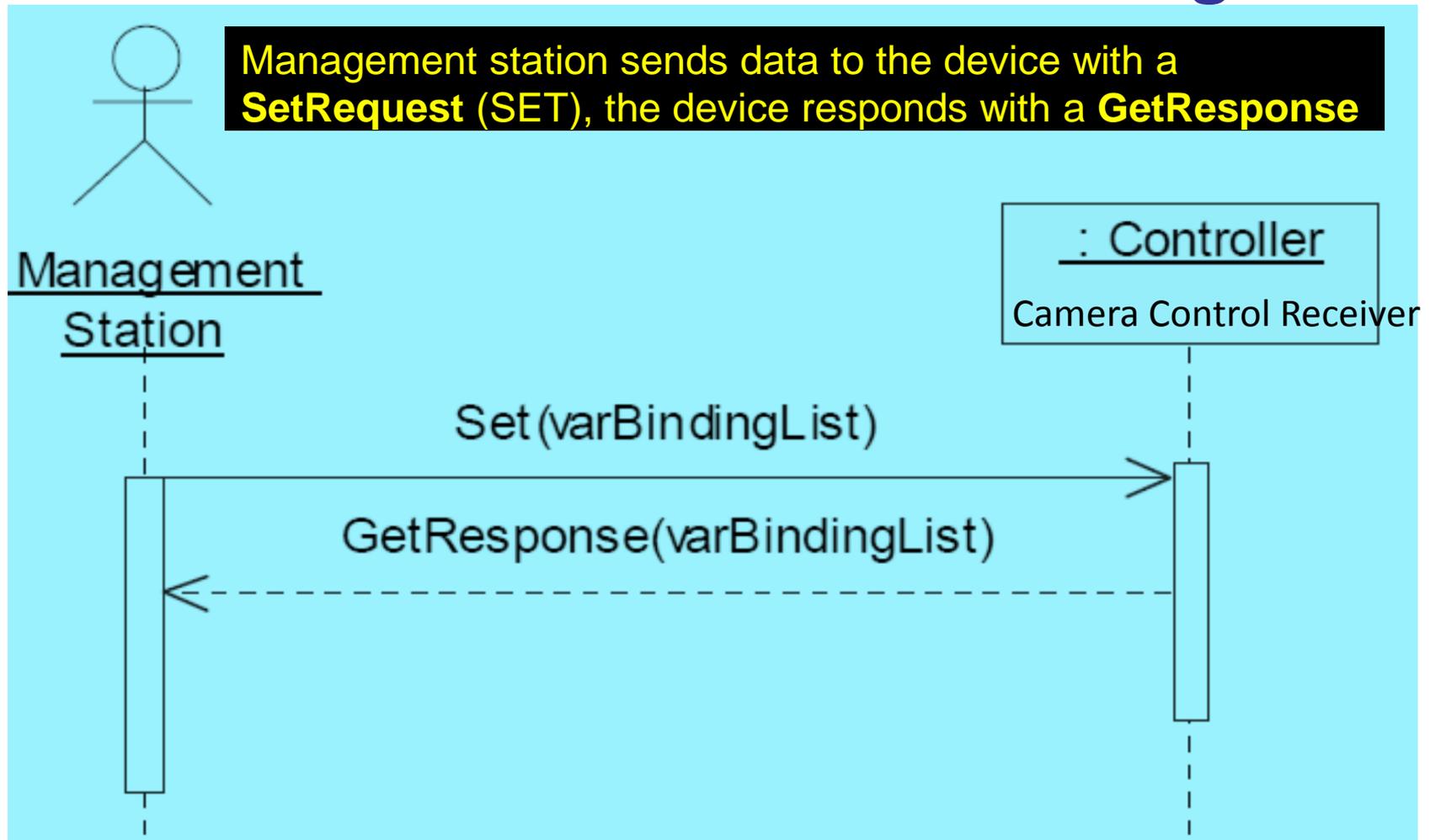
Management station retrieves data from the device with a **GetRequest (GET)**, the device responds with a **GetResponse**



## D.2 Generic SNMP Get-Next Interface Dialog

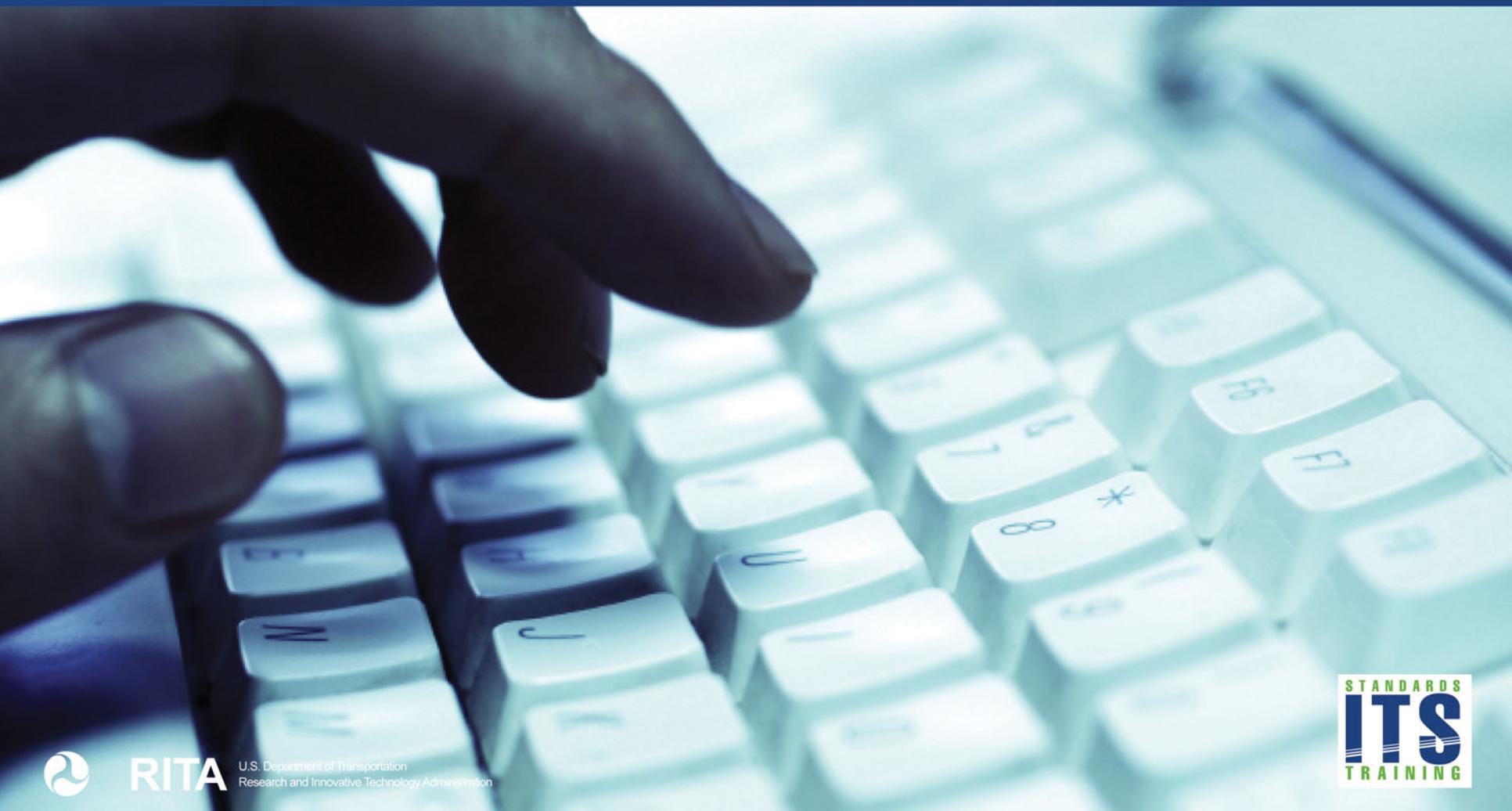


## D.3 Generic SNMP Set Interface Dialog





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**Which Generic SNMP Interfaces will allow the operator to monitor the current temperature within the camera enclosure?**

## Answer Choices

- a) SNMP SET Interface
- b) SNMP Get Interface
- c) SNMP GetNext Interface
- d) Any one of the above

# Review of answers



a) SNMP SET Interface

*Incorrect, because SET operation alters (WRITE) the device behavior, not used for monitoring.*



b) SNMP Get Interface

***Correct, because Get operation retrieves (READ) current data about the current temperature value.***



c) SNMP GetNext Interface

*Incorrect-Perhaps; because for single reading, Get is the appropriate operation, however, GetNext is typically used to read multiple objects in a table.*



d) Any one of the above

*Incorrect, because each interface performs a specific operation. Monitoring requires a Get operation.*

# Ensuring Interoperability

Specification must select the same Objects-Messages-PDUs and Dialogs

**MIB-Objects**

**GetRequest**

**GetNextRequest**  
**SetRequest**

**GetResponse**

**PDU**

**varBindList**

**Dialogs**

**D.1**

**D.2**

**D.3**

**Camera  
Control  
Receiver**

# Example: Requirement for the SET Operation

## D.3.1 Support of SET Operation

**Actor**

**Target**  
*The CCTV device shall allow the management station to*

*perform the SET operation on any supported object*

**Action**

*indicated in in the CCTV specification RTM.*

**Unambiguous-Necessary**

# Example: Requirement for Presets [Slide 30]

*“The CCTV device shall allow the management station to select a preset from the preconfigured range of 1-xx to enable quick monitoring operation for a user defined timeframe.”*

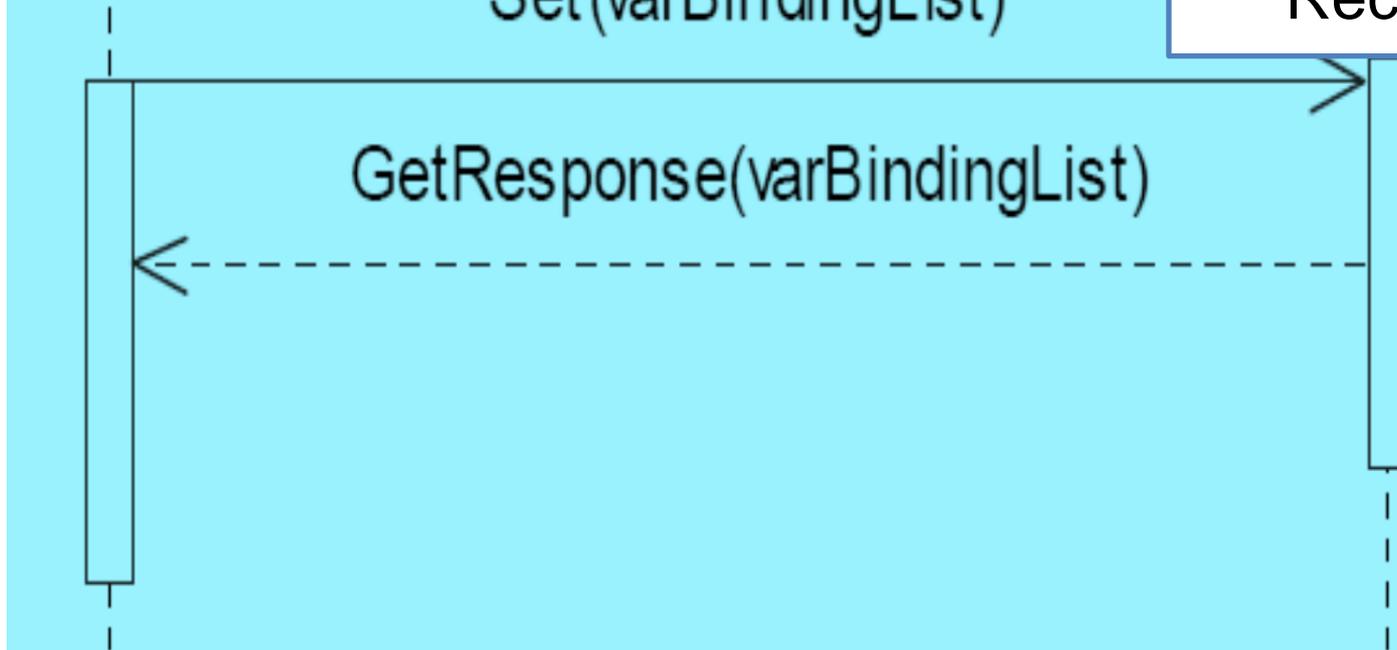
**{ OID, 32 }**

Management  
Station

Camera  
Control  
Receiver

Set(varBindingList)

GetResponse(varBindingList)





# Summary of Learning Objective #2

## Achieve Interoperability and Vendor-Independence

- Discussed SNMP interface and dialogs for communications
- Discussed interoperability and interchangeability
- Reviewed a sample dialog with a message content





# Learning Objective #3 – Understand Traceability

- User needs to requirements traceability
- Requirements to design traceability
- Benefits of documenting a traceability



# What is traceability?

- ***Traceability*** is the ability to follow or study the logical progression among the needs, requirements, and design details in a step-by-step fashion”.

-SEP Based-NTCIP 1204 ESS standard, page 7

- Traceability of requirements to user needs is achieved with a **Protocol Requirements List (PRL)**
- Traceability of design concepts to requirements is achieved with a **Requirements Traceability Matrix (RTM)**

# Traceability Matrix – PRL

- SEP-based NTCIP Standards provides a format to trace requirements to user needs

UN ID	User Need	RQ. ID	Requirement	Additional Specs.
			Each requirement is traced to at least one user need	

A yellow arrow points from the text "Each requirement is traced to at least one user need" in the Requirement column to the User Need column.

- CCTV standard does not provide a PRL

# Preparing a Project Level PRL

	User Need	RQ. ID	Requirement	Additional Specs.
1.0	Configure CCTV Device	3.3.1	Data Exchange Requirements for Managing Configuration	
		3.3.1.1	Configure Range Maximum presets	32 for Dome
		3.3.1.2	Configure Range-Pan Left Limit	
		3.3.1.3	Configure Range-Pan Right Limit	
		3.3.1.4	Configure Range Pan Home Position	
		3.3.1.5	Configure True North Offset	
		3.3.1.6	Configure Range Iris Limit	
		3.3.1.13	Configure Timeout Pan	
		3.3.1.16	Configure Timeout Focus	
		3.3.1.19	Configure Label Table	

# Additional PRL Entries: Camera Control

UN ID	User Need	RQ. ID	Requirement	Additional Specs.
2.0	Remote Camera Control	<b>3.3.2</b>	<b>Camera Control</b>	
		3.3.2.1	Preset Go to Position	
		3.3.2.2	Move Camera to a Stored Position	
		3.3.2.6	Zoom Operation	
		3.3.2.4	Camera Position Horizontally (Pan)	<b>0° to 360°</b>

Additional requirements on camera movements are stated in the last column. More User needs and Requirements can be added as per table format.

# Additional PRL Entries: Monitoring a CCTV Device

UN ID	User Need	RQ. ID	Requirement	Additional Specs.
3.0	Remote Monitoring	3.3.3	Status condition within the device	
		3.3.3.2	Temperature	
		3.3.3.2	Pressure	
		3.3.3.2	Washer fluid	
		3.3.3.3	ID Generator	

Additional requirements on camera movements are stated in the last column. More User needs and Requirements can be added as per table format.

# Benefits of the Project PRL

- PRL shows relationship of user needs (features) to requirements
- As a primary tool for specifying the NTCIP 1205 interface, developers, vendors and users are “connected” to the project’s objectives
- Completed project PRL in the specification becomes a checklist in a validation process: *“Did the CCTV system meet my user needs?”*
- Eliminates “guess-work”

# Preparing a Project Level RTM

RQ. ID	Requirement	Dialog	Object Reference and Title NTCIP 1205 Section 3
3.3.1	Data Exchange Requirements for Managing Configuration	D.3 Generic SNMP SET Interface	
3.3.1.1	Configure Range Maximum presets	3.2.1	rangeMaximumPreset
3.3.1.2	Configure Range-Pan Left Limit	3.2.2	rangePanLeftLimit
3.3.1.3	Configure Range-Pan Right Limit	3.2.3	rangePanrightLimit
3.3.1.4	Configure Range Pan Home Position	3.2.4	rangePanHomePosition
3.3.1.5	Configure True North Offset	3.2.5	rangeTrueNorthOffset
3.3.1.6	Configure Range Iris Limit	3.2.10	ranglirisLimit
3.3.1.13	Configure Timeout Pan	3.3.1	timeOurPan
3.3.1.16	Configure Timeout Focus	3.3.4	timeOutFocus
3.3.1.19	Configure Label Table	3.11.2	labelTable

# Additional RTM Entries: Camera Control

Rq. ID	Requirement	Dialog	Object Reference and Title NTCIP 1205 Section 3
<b>3.3.2</b>	<b>Camera Control</b>		D.3 Generic SNMP SET Interface
3.3.2.1	Preset Go to Position		3.4.1 presetGotoPosition
3.3.2.2	Go to a Stored Position		3.4.2.presetStorePosition
3.3.2.6	Zoom Operation		3.2.8 rangeZoomLimit 3.3.3 timeoutZoom 3.3.3 positionZoomLens
3.3.2.4	Camera Position Horizontally (Pan)		3.2.2 rangePanLeftLimit 3.2.4 rangePanHomePosition 3.2.11 rangeMinimumPanStepAngle 3.3.1 timeoutPan 3.5.1 positionPan 3.2.3 rangePanRightLimit 3.2.4 rangePanHomePosition 3.2.11 rangeMinimumPanStepAngle 3.3.1 timeoutPan 3.5.1 positionPan



# Additional RTM Entries: Monitoring

Rq. ID	Requirement	Dialog	Object Reference and Title NTCIP 1205 Section 3
<b>3.3.3</b>	Status condition within the device	D.1 Generic SNMP GET Interface	
3.3.3.2	Temperature		3.7.5 alarmTemperatureCurrentValue
3.3.3.2	Pressure		3.7.6 alarmPressureHighLowThreshold 3.2.7 alarmPressureCurrentValue
3.3.3.2	Washer fluid		3.7.8 alarmWasherFluidHighLowThreshold 3.2.9 alarmWasherCurrentValue
3.3.3.3	ID Generator		3.11 cctv label Objects

Additional requirements can be added and related objects are collected from the 4 CGs and then go to MIB objects in Section 3 to read each object title

# Benefits of the Project RTM

- RTM shows relationship of requirements to the specific design items of the interface (dialogs and data objects)
- Useful for identifying data objects within standard that may be sub-ranged within the specification
- Helps in system acceptance:

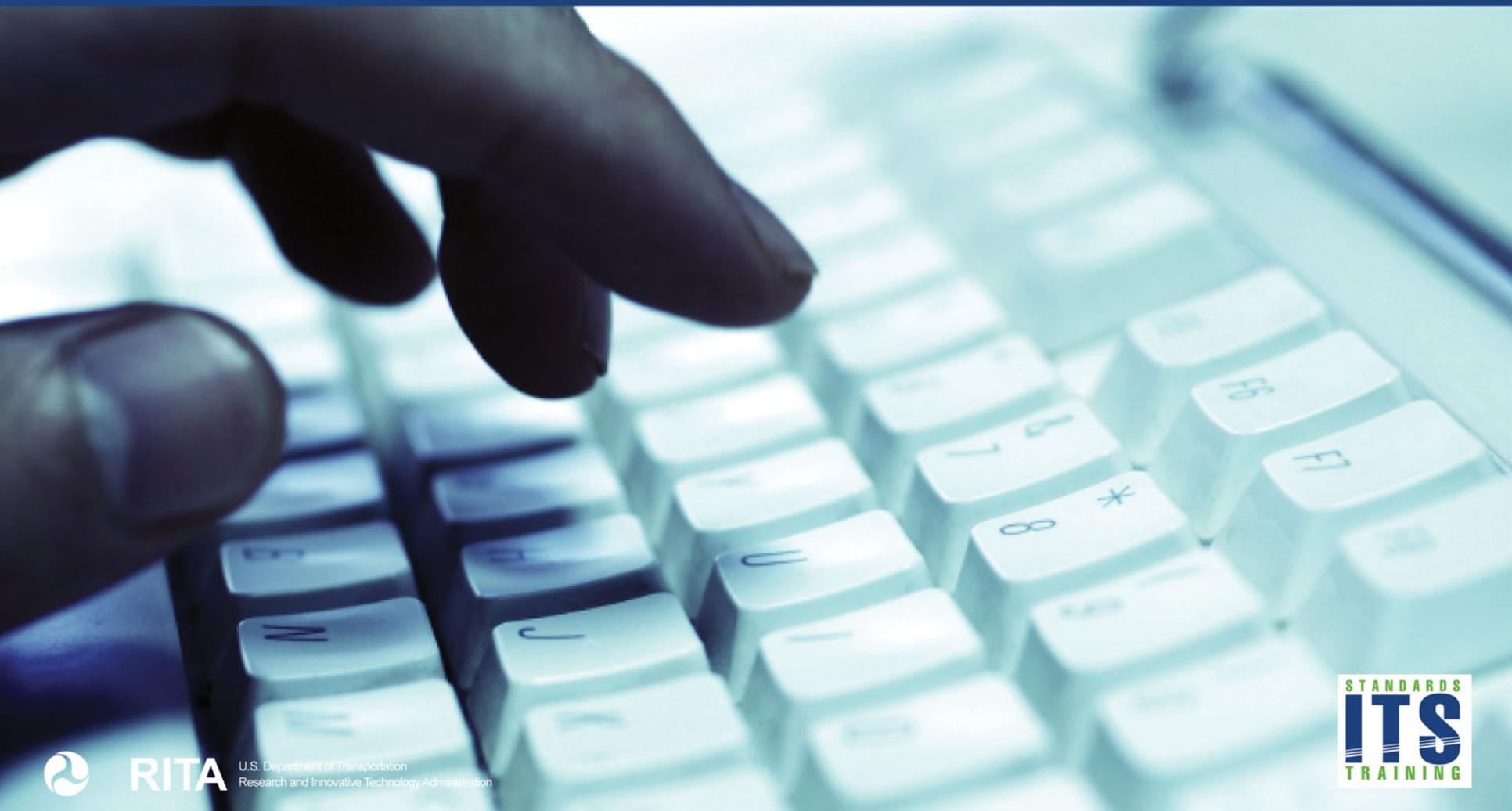
*“Did they build the CCTV system right?”*

*“Does my interface deliver?”*





# ACTIVITY



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Which will ensure the precise objects necessary to fulfill a requirement?

## Answer Choices

- a) The PRL table
- b) The RTM table
- c) SNMP Get Interface
- d) Major Desired Capability (MDC)



# Review of answers

 a) The PRL table  
*Incorrect, because PRL traces user needs to requirements, not objects.*

 b) The RTM table  
***Correct, because RTM it is the only matrix where the precise objects necessary to fulfill a requirement are identified.***

 c) SNMP Get Interface  
*Incorrect, because SNMP Get interface is generic and does not contain objects.*

 d) Major Desired Capability (MDC)  
*Incorrect, because MDC is part of a user need.*



# Summary of Learning Objective #3

## Understand Traceability

- We have discussed how to develop a project PRL to trace User Needs to CCTV requirements
- We have discussed how to develop a project RTM to trace CCTV requirements to dialogs and objects (design)
- We reviewed the benefits of preparing a project level PRL and RTM





# Learning Objective #4 — Incorporate Requirements not Supported by Standardized Objects

- Conditions and context for extending the standard
- Example of extending the standard

# Conditions and Context for Extending the CCTV Standard

- 70 objects based on ASN.1 format are available
- User-developed requirements must trace to NTCIP 1205 data objects and SNMP dialogs to gain interoperability and interchangeability
- Adding new objects to CCTV MIB is possible if it is documented and made available to anyone

# Conditions and Context for Extending the CCTV Standard (cont.)

- Extending or adding objects to the CCTV Standard can make sense to provide for:
  - Control features and requirements that are specific to certain camera systems
  - Objects for IP network cameras are not covered in the standard

# Examples of Objects

## Proposed Amendment to NTCIP 1205 v01 Standard

- **Objects for Query**-position-pan-tilt-Iris-focus-Zoom and preset-position.
  
- **Extensions Conditions:**
  - ASN.1 based Objects must support READ operation for retrieval and WRITE operation for control functions without restrictions
  - Syntax must be a non-negative Integer/Bytes
  - Object must have an OID with MIB node
  - Only SNMP interface will be allowed (as per NTCIP 1103 rules)

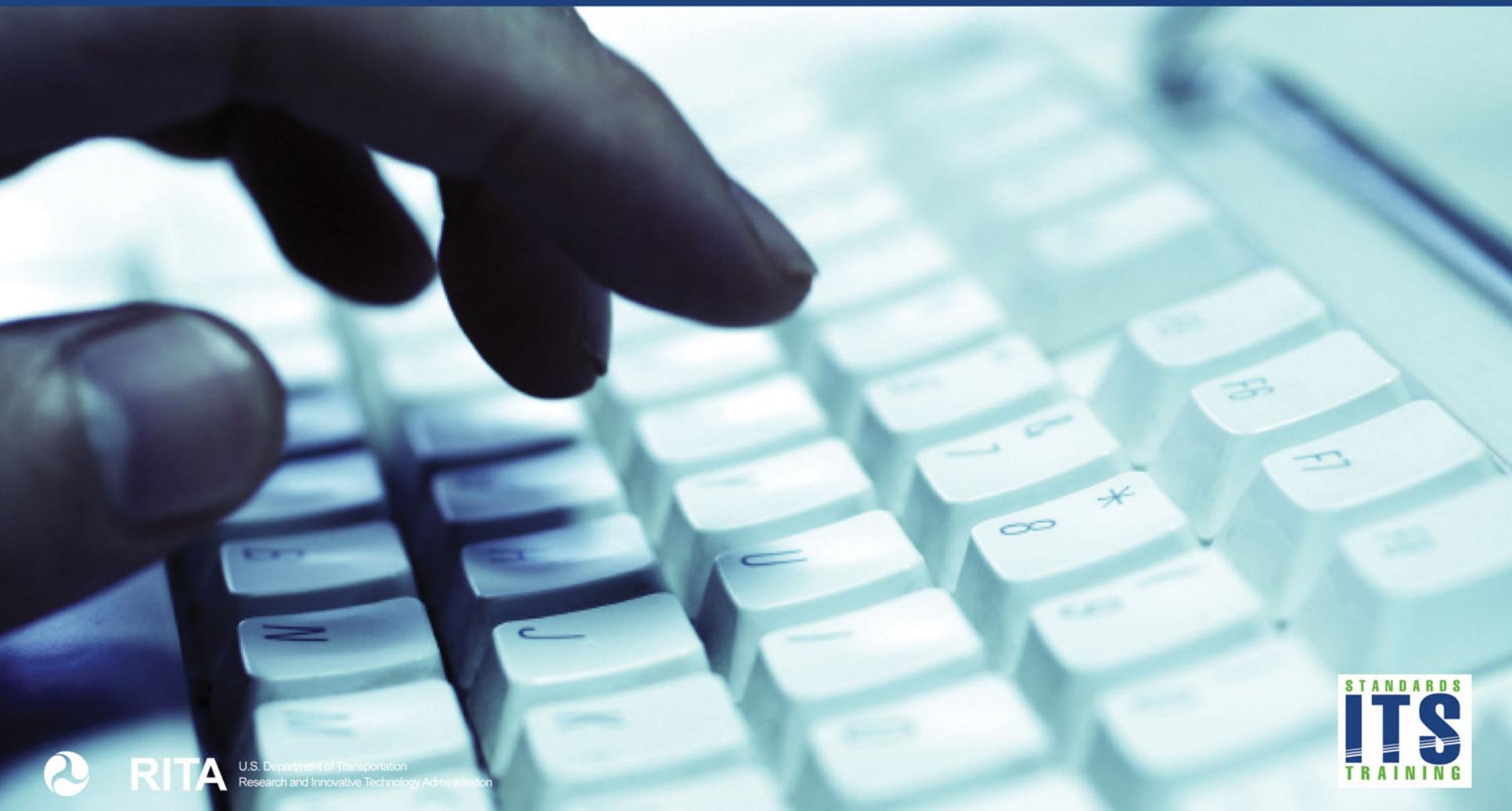
# Extensions - Drawbacks

- Interoperability may be compromised
  - Other management stations that do not support the new objects will be unable to exercise the new capabilities
  - If the agency is not consistent on defining how the requirement is fulfilled, interoperability cannot be achieved without custom integration for each deployment

Example: “Provide remotely selectable **shutter speed**”



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Which of the following is **NOT** applicable to the following extended CCTV requirement?

***“The CCTV device shall allow the management station to remotely control selectable shutter speed of the field camera.”***

## Answer Choices

- a) All **extended** requirements are non-conformant to the standard, and depend on proprietary vendor-specific objects.
- b) The requirement is well-developed and meets criteria.
- c) This requirement will break the interoperability.
- d) The project RTM will ensure interoperability.

# Review of answers

-  a) All **extended** requirements are non-conformant to the standard and depend on proprietary vendor-specific objects.  
*Incorrect, because the statement is true.*
-  b) The requirement is well-developed and meets criteria.  
*Incorrect, because the statement is true.*
-  c) This requirement will break the interoperability  
*Incorrect, because the statement is true.*
-  d) The project RTM will ensure interoperability  
***Correct, because the statement is false; project RTM does not reference a private Object.***



# Summary of Learning Objective #4

## Incorporate requirements not supported by standardized objects

- Reviewed conditions and context for extending the CCTV standard
- Discussed some example of extending the standard
- **Extensions break interoperability and should be avoided**



# Learning Objective #5 — Develop a CCTV System Specification

- How the CCTV specification fits in the specification package
- Checklist of key elements that must be present

# Plans-Specifications and Estimates (PS&E)

Contractual requirements during system development, testing, deployment, integration, and operations/maintenance.

1

Hardware specification  
Functional requirements  
Performance requirement  
Electrical-Mechanical requirements  
Environmental requirement

2

Software specification  
Functional requirements  
Performance requirements

3

**Communication Interface Specifications**  
**Architectural Requirements**  
**Data Exchange Requirements**

# Checklist of Specification Elements

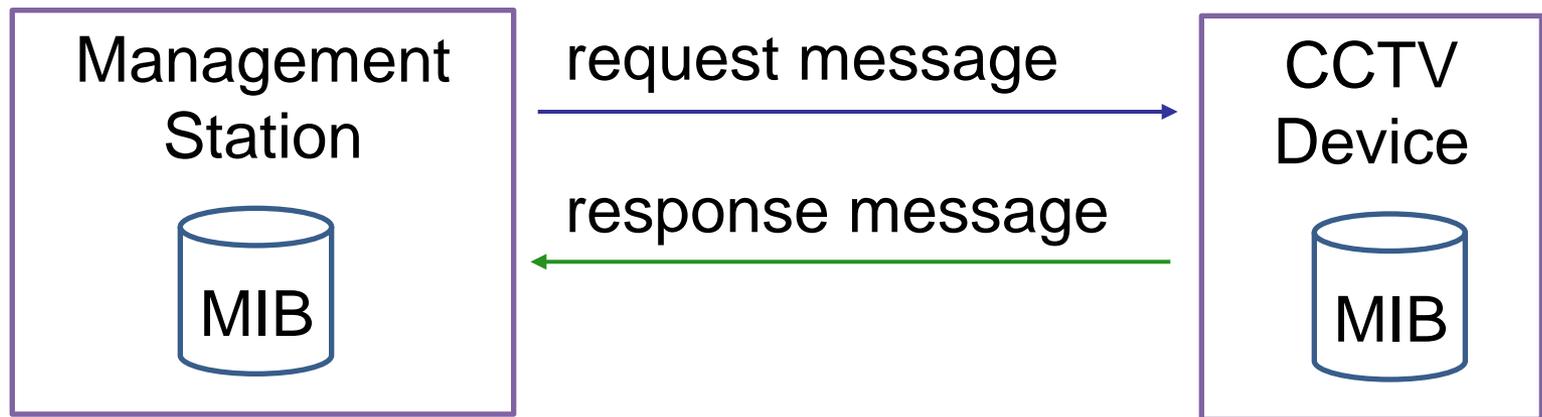
3

## Communication Interface Specifications

- Address Interoperability Issues
- Integrate Project PRL and RTM in the Specification
- Coordination Requirements
- Video formats-standards

# Addressing Interoperability Issues

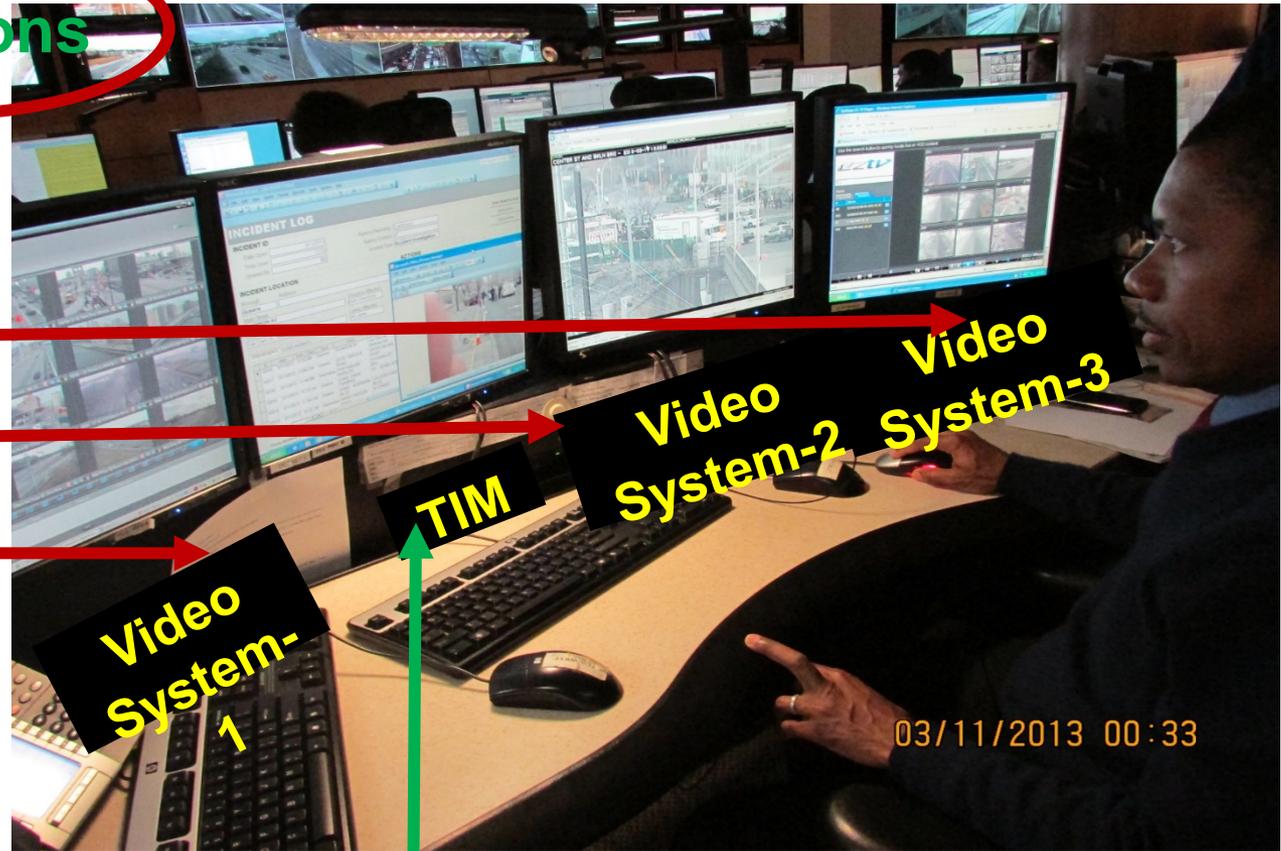
- To achieve interoperability agencies must:
  - Select the same user needs and design solutions
  - Use common protocols



- The management station and cameras must have the same CCTV MIB and use the same dialogs to support the same features.

# Interoperability Issues

Implications



Source: JTMC-NYC Patel

TIM-Traffic Incident Management

# Integrating PRL in the Project Specification

- A project PRL defines data exchange requirements for the communications interface
- Underlying communications standards need to be specified too (protocols at various levels)
- Reference to interface standards must be specific to the version and publication date
- Include the completed PRL with object value ranges for all the objects to clarify parameters



# Coordination of Requirements

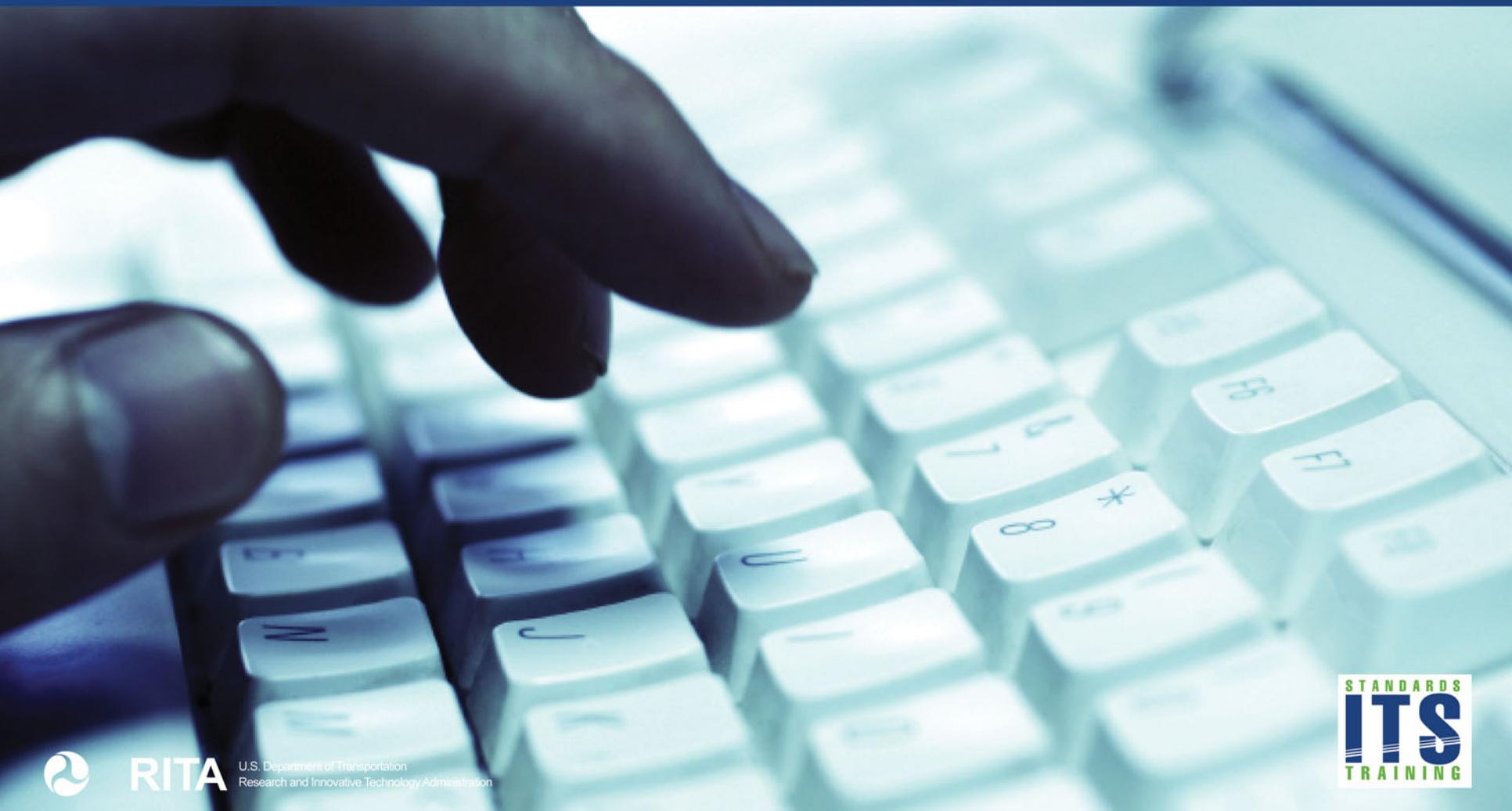
- The requirements for the communications interface must be consistent with the CCTV system specification
- Include statement to use standardized design solutions, as specified in the project RTM
- Include a completed copy of the PRL plus the RTM as a source for the design of the system and the test plan

# CCTV System Video Formats

- Video format standards are outside the scope of the NTCIP 1205
- Video standards support compression, storage, and transmission:
  - H.264 [See supplement]
  - IP Cameras [Open network Video Interface Forum-ONVIF]
- Certain legacy-based implementation may present video format issues and may need a new requirement. (See student supplement for more information)



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# Which of the following statements is false?

## Answer Choices

- a) A CCTV system vendor may support features not selected in the project PRL.
- b) The Project RTM specifies the objects and dialogs.
- c) Analog cameras can be controlled with a common digital camera control interface.
- d) The interface specification must specify SNMP.

# Review of answers



- a) A CCTV system vendor may support features not selected in the project PRL.

*Incorrect, because the statement is true.*



- b) Project RTM specifies the objects and dialogs.

*Incorrect, because the statement is true.*



- c) Analog cameras can be controlled with a common digital cameras control interface.

***Correct, because the statement is false; an analog camera signal must be first converted to a digital signal using an encoder for a common digital camera control interface.***



- d) The interface specification must specify SNMP.

*Incorrect, because the statement is true.*



# Summary of Learning Objective #5

## Develop a CCTV System specification

- Discussed a checklist of key elements including interoperability issues
- Discussed a CCTV system specification fits in the overall project specification package



# What We Have Learned

1. CCTV Standard does not provide requirements and user must develop and write them for project specification.
2. A requirement is a translation of a user need, and has a structure and certain characteristics.
3. Requirements are linked to interoperability and vendor-independence.



# What We Have Learned (cont.)

Specifically at the project level;

4. Each requirement is traced to at least one *user need* in the project *PRL*.

5. Requirements should be traced to *Objects* and *Dialogs* in the project *RTM*.





## What We Have Learned (cont.)

6. To retrieve data (reading operation) from the CCTV device, **SNMP GET** interface is used.
7. To control a CCTV device (writing operation), **SNMP SET** interface is used.
8. To support the same features, the Management station and a CCTV device must have the same **MIB**, and must use the same **Dialogs**.





# Resources

- Student Supplement
- NTCIP Documentation available at [www.ntcip.org](http://www.ntcip.org):
  - NTCIP 1201 v03 Global Object Definitions
  - NTCIP 1205 v01.08 CCTV Camera Control
  - NTCIP 9001: Guide v04
- PCB Training Modules Available at [www.pcb.its.dot.gov/stds\\_training.aspx](http://www.pcb.its.dot.gov/stds_training.aspx)
  - Module A103: Introduction to ITS Standards Requirements Development (to review “well-formed” requirements)
  - Module A203: Writing Requirements When ITS Standards Do Not Have SEP Content

# QUESTIONS?



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# Next Course Module

## T317: Applying Your Test Plan to the NTCIP 1205 CCTV Standard

- Explains how to write a CCTV system Test Plan
- How to test CCTV system requirements

