WELCOME
Welcome

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ACTIVITY
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)

101 Using ITS Standards: An Overview

A101 Introduction to Acquiring Standards-based ITS Systems

A102 Introduction to User Needs Identification

A201 Details on Acquiring Standards-based ITS Systems

A202 Identifying & Writing User Needs When ITS Standards Do Not Have SEP Content

A103 Introduction to ITS Standards Requirements Development

A203 Writing Requirements When ITS Standards Do Not Have SEP Content

A317a Understanding User Needs for CCTV Systems Based on NTCIP 1205 Standard

A317b Understanding Requirements for CCTV Systems Based on NTCIP 1205 Standard

C101 Intro. to Comm. Protocols and Their Uses in ITS Applications

T317 Applying Your Test Plan to NTCIP 1205 CCTV Standard
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)

CCTV MIB

Object 1

Object 2

Object 70

Section 4
Conformance Groups

Configuration

Motion Control

Extended Functions

On-Screen Menu

Learning Objective #1

CCTV System Terminology

Focus

Iris

Presets

Labeling

PTZ (Pan-Tilt-Zoom)

Source: NYCDOT: TMC CCTV Interface
Typical Desired Camera Control Functions

Source: NYSDOT
CCTV Information Required for Specification

1. User Needs
   - Not Available
2. Requirements
3. Objects (Data)
   - Available
4. Dialogs (Generic)
5. Protocol Requirements List (PRL)
   - Not Available
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.


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

Learning Objective #1

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

- Provide a Structure
- Incorporate Characteristics

Types of CCTV Requirements
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

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
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<tbody>
<tr>
<td>3.1</td>
<td>Background Information</td>
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<tr>
<td>3.2</td>
<td>Architectural Requirements</td>
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<td>3.3.3</td>
<td>Monitoring Status</td>
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<tr>
<td>3.4</td>
<td>Supplemental Requirements</td>
</tr>
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</table>

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

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

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

Example of Multiple Devices Sharing a Channel

Source: NYCDOT
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

- **ACTOR** management station
- **TARGET** The CCTV device
- **ACTION** remotely configure the camera preset positions for a maximum number or 255.
Assessing Characteristics of a Requirement

Learning Objective #1

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 to remotely control a camera position horizontally

(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

ACTOR: The CCTV device

TARGET: shall allow the management station to remotely control a camera Vertically (Tilt-is ±90º).

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

Unambiguous? Verifiable?
3.3.2.6 Zoom Operation

The CCTV device shall provide a motorized camera-lens equipped with zoom capability to allow management station to remotely adjust lens for a **wide** and **telephoto** views.

**Learning Objective #1**

**ACTOR**

**TARGET**

**ACTION**

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 the **timeout of a zoom motion** of the lens to continue for up to 65535 milliseconds without a reissue of a zoom command.

Ensures Structure + Characteristics

Zero means timeout feature is not supported
ACTIVITY
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.**

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<thead>
<tr>
<th>Necessary</th>
<th>Standalone</th>
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</thead>
<tbody>
<tr>
<td>Concise</td>
<td>Consistent</td>
</tr>
<tr>
<td>Attainable</td>
<td>Unambiguous</td>
</tr>
<tr>
<td></td>
<td>Verifiable</td>
</tr>
</tbody>
</table>
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

Learning Objective #2

Compatibility
Interoperability
Interchangeability

NTCIP

New Camera
Old Camera
SNMP Interface

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

SNMP Manager

Management Station

SNMP Agent

CCTV Device
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)

1. Object’s name
2. Data type value range
3. Aces limitations
4. Conformance requirement
5. Human readable description, states purpose
6. Object Identifier (OID)

- **rangeMaximumPresets** OBJECT-TYPE
  - **SYNTAX** INTEGER (0..255)
  - **ACCESS** read-only
  - **STATUS** mandatory
  - **DESCRIPTION** “A preset is the pre-specified position where a camera is pointed to a fixed point in space……”

::={cctvRange1}
Formation of PDU Data: varBind

Example

rangeMaximumPresets

SYNTAX INTEGER

(O..255)

::{CCTVRange1}

varBind

{ OID, 32 }
Formation of an SNMP Message

VarBindList Encapsulated in the Message

<table>
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<tr>
<th>PDU Type</th>
<th>Request ID</th>
<th>Error Status</th>
<th>Error Index</th>
<th>VarBindList</th>
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</table>

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
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

Management station retrieves more (table) data from the device with a **GetNextRequest** (GET), the Device responds with a **GetResponse**
D.3 Generic SNMP Set Interface Dialog

Management station sends data to the device with a **SetRequest** (SET), the device responds with a **GetResponse**.
ACTIVITY
Learning Objective #2

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:
The CCTV device shall allow the management station to perform the SET operation on any supported object indicated in the CCTV specification RTM.

Target:
The CCTV device shall allow the management station to perform the SET operation on any supported object indicated in the CCTV specification RTM.

Action:

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.”
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

<table>
<thead>
<tr>
<th>UN ID</th>
<th>User Need</th>
<th>RQ. ID</th>
<th>Requirement</th>
<th>Additional Specs.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Each requirement is traced to at least one user need</td>
<td></td>
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- CCTV standard does not provide a PRL
## Preparing a Project Level PRL

### Learning Objective #3

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<td>Data Exchange Requirements for Managing Configuration</td>
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<td>3.3.1.1</td>
<td>Configure Range Maximum presets</td>
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<td></td>
<td>3.3.1.2</td>
<td>Configure Range-Pan Left Limit</td>
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<td></td>
<td>3.3.1.3</td>
<td>Configure Range-Pan Right Limit</td>
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<td></td>
<td>3.3.1.4</td>
<td>Configure Range Pan Home Position</td>
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<td>3.3.1.5</td>
<td>Configure True North Offset</td>
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<td>3.3.1.6</td>
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<td>3.3.1.13</td>
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<td>Configure Label Table</td>
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</table>
Learning Objective #3

Additional PRL Entries: Camera Control

<table>
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<th>User Need</th>
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<th>Additional Specs.</th>
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<td>Camera Control</td>
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<td>Preset Go to Position</td>
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<td>Move Camera to a Stored Position</td>
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<td>Zoom Operation</td>
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<td></td>
<td></td>
<td>3.3.2.4</td>
<td>Camera Position Horizontally (Pan)</td>
<td>0º to 360º</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
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</table>

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

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<thead>
<tr>
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<td>D.3 Generic SNMP SET Interface</td>
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## Additional RTM Entries: Camera Control

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<td></td>
<td>3.5.1 positionPan</td>
</tr>
</tbody>
</table>
### Additional RTM Entries: Monitoring

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

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?"
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 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”
ACTIVITY
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

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

TIM-Traffic Incident Management

Source: JTMC-NYC Patel
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-ONVF]
- Certain legacy-based implementation may present video format issues and may need a new requirement. (See student supplement for more information)
ACTIVITY
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, \textit{SNMP GET} interface is used.

7. To control a CCTV device (writing operation), \textit{SNMP SET} interface is used.

8. To support the same features, the Management station and a CCTV device must have the same \textit{MIB}, and must use the same \textit{Dialogs}.
Resources

- Student Supplement

- NTCIP Documentation available at 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/standards_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
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