Welcome

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A311a: Understanding User Needs for DMS Systems based on NTCIP 1203 Standard v03
Instructor

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Learning Objectives

- Review the **structure** of the DMS standard
- **Identify** specific DMS operational needs
- Describe the **purpose** of the Protocol Requirements List (PRL) matrix and benefits
- Discuss how to **prepare a project level PRL** with user needs and their associated requirements
Learning Objective 1

Review the **structure** of the DMS standard
What Is a Dynamic Message Sign?

Dynamic Message Sign (DMS) is any sign system that can change the message presented to the viewer. --NTCIP 1203 v03 Standard
Major Components of a DMS System

- Sign Housing
- Sign Face
- Cabinet (Located close to the sign)
- Controller
How This Standard Fits into the Family of NTCIP Standards

NTCIP Framework

Information Level
- C2C Data Dictionaries (TMDD, ATIS, TCIP, IM)
  - Functional Area Data Dictionaries
    - NTCIP 1203/NTCIP 1201
    - NTCIP Data Dictionaries (1200 Series)
  - C2C Messages
  - Files
  - Data Objects
  - Dynamic Objects

Application Level
- C2C XML (2306)
- DATEX (2304)
- FTP (2303)
- TFTP (2302)
- SNMP (2301)
- STMP (2301)

Transport Level
- TCP/IP (2202)
- UDP/IP (2202)
- T2/NULL (2201)

Subnetwork Level
- PPP (2103)
- Ethernet (2104)
- PMPP (2101 & 2102)

Plant Level
- Dial-Up Telco
- Fiber
- Coax
- Wireless
- Twisted Pair
- Leased Line
Types of DMS and Technologies

DMS Characteristics Supported by the Standard

<table>
<thead>
<tr>
<th>DMS Types</th>
<th>Capabilities</th>
<th>The DMS offers for handling messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMS Technology</td>
<td>The technology</td>
<td>that is used in the sign</td>
</tr>
<tr>
<td>DMS Display Matrix Configuration</td>
<td>The type of display layout</td>
<td>employed by the sign</td>
</tr>
</tbody>
</table>
Types of DMS and Technologies Examples

Blank-out Sign (BOS)
One Message/Nothing

Changeable Message Sign (CMS),
Predefined Messages

Variable Message Sign (VMS)
Real-time Messages

Sources:
- ITE OET DMS-Patel
- MNDOT
DMS Display Technologies

- Fiber Optic
- Light Emitting Diode (LED)
- Flip Disk or Shutter
- Lamp Matrix
- Drum (rotating, multifaceted cylinder)

Standard Supports all Display Technologies and Types-Matrix
Types of DMS and Technologies Examples

Display Surface Matrix Configurations

- **Full matrix**
- **Line matrix**
- **Character matrix**

Source: ITE OET DMS
Source: WSDOT DMS Manual
Types of DMS and Technologies

How Messages are Organized and Displayed

First Line Identifies **Problem**

Second Line Identifies **Location**

Third Line Identifies **Action**

Source: WSDOT

Warnings on VMS boards gave drivers a chance to use alternate routes, helping to minimize the backup on northbound I-5.
Types of DMS and Technologies

For Longer Messages, a Page is Added

A page is defined as the information that can fit on a sign at one time, together with its message attributes.
How a Message “Appears” on the Surface

Markup Language for Transportation Information (MULTI) is similar to HTML where text is transmitted,

and [tags define how the text appears-displayed]
Structure of Standard (Sections)

Reference Architecture for DMS

Comm Line between Sign Controller and Sign Housing (NOT covered by NTCIP)

Management Station

Subject of NTCIP

DMS Sign Controller

Local Computer

Sign Housing
Structure of Standard (Sections)

NTCIP 1203 v03 Documentation Organization (Part 1)

- Section 1: General
- Section 2: Concept of Operations-User Needs
- Section 3: Functional Requirements (Includes Protocol Requirements List-PRL)
- Section 4: Dialogs
- Section 5: Management Information Base (MIB)
- Section 6: Markup Language for Transportation Information-MULTI
### NTCIP 1203 v03 Documentation Organization (cont.)

#### Part 1
- **Annex A**: Requirements Traceability Matrix (RTM)
- **Annex B**: Object Tree
- **Annex D**: Documentation of Revisions
- **Annex E**: Frequently Asked Questions
- **Annex F**: ASCII Table and Description
- **Annex G**: Simple Network Management Protocol (SNMP) Interface

#### Part 2
- **Annex C**: Test Procedures
What Is New in NTCIP 1203 v03 DMS Standard?

v01 was published in 1997
Amended in 2001, Non-SEP based

v02 was published in 2007
Added new functionality, SEP-based

v03.03 was published in 2011
Annexes A, B, D-H Information Data
Annex C: Added Test Procedures
Structure of Standard (Sections)

What Is New in v03

- v03 added Test Procedures (Annex C)
- Made minor corrections (see Annex D)
- Published in Two Parts

Both versions are SEP based; provide User Needs/Requirements/Dialogs and PRL/RTM.
What are user Needs?

- Standardized statements that describe what a DMS should do—features/functions

- Every user need has an **Unique ID**, provides a Major Desired Capability (**MDC**), has a **rationale** and it is **solution-free**
2.5.2.3.4 Blank a Sign

This feature enables the operator (or logic within the management station) to **remove any messages** displayed on a sign (causing the sign to appear blank).

Source: Caltrans
## 2.4 Architectural Needs

- **2.4.1** Fundamental Needs
- **2.4.2** Operational Environment
  - **2.4.2.1** Live Data Exchange
  - **2.4.2.2** Logged Data Exchange

## 2.5 User Needs/Features

- **2.5.1** Manage the DMS Configuration
- **2.5.2** Control the DMS
- **2.5.3** Monitor the Status of the DMS

Source: FDOT Dist. 6
Which of the following is a **FALSE** statement?

**Answer Choices**

a) DMS Standard Contains SNMP Interface
b) DMS Standard Lacks Testing Documentation
c) DMS Standard Supports all Types of DMSs and Technologies
d) DMS Standard Includes Protocol Requirements List (PRL)
Review of Answers

a) DMS Standard Contains SNMP interface

*True statement. v03 provides SNMP interface in Annex G.*

b) DMS Standard Lacks Testing Documentation

*False statement. v03 provides test procedures in Annex C.*

c) DMS Standard Supports all Types of DMSs and Technologies

*True statement. Standard is independent of types of signs and technologies. It supports all.*

d) DMS Standard Includes Protocol Requirements List (PRL)

*True statement. v03 includes PRL in Section 3.*
Learning Objectives

Review the **structure** of the DMS standard

**Identify** specific DMS operational needs
Learning Objective 2

Identify specific DMS operational needs
What Are You Trying to Do with a DMS System?

Concept of Operations (ConOPs)

- Communicates user needs and expectations for the proposed DMS system
- Provides an operational context of a DMS system

Fundamental Needs Driving DMS Deployment

“The provision of **timely and reliable information** to the traveling public improves **public safety and convenience** by providing advance notification of items that may be of interest (e.g., downstream **road conditions** or the **arrival of a transit vehicle**). DMS are typically dispersed along interstate highways, arterial roadways, and at transit stops.”

-NTCIP 1203 v03
“DMS provides dynamic operational information to motorists, including incident, traffic, and road condition information, emergency alerts, travel time information, and other advisories.”

“Motorists can use this information to select an alternate route or divert, delay, or even cancel their trip to avoid traffic delays.”

Source: https://secure.in.gov/indot/3251.htm
What Are You Trying to Do with a DMS System?

Who Benefits from the Use of DMSs

**Public Sector**
- Achieve ITS objectives
- Safe and Efficient Mobility-Capacity
- Real-time Messages to Public

**Road Users**
- Obtain Visual Traffic Information
- Make Informed decisions

**Private Sector**
- Larger DMS Installed-base
What Are You Trying to Do with a DMS System?

Operations Staff Use DMS System to Improve Operations

TMC Provides Real-time Traffic Information

Traveling Public Makes Decisions Based on Real-time Information

- Advisory Information
- Regulatory Information
- Special Events Information

Resulting in Improved:
- Traffic Flow
- Road Safety
- Environment
- Mobility Management

Source: Courtesy Munjal Joshi: NYCDOT TMC
What Are You Trying to Do with a DMS System?

Convey Advisory Information to the Traveling Public

Road Closures

Traffic Condition

Source: www.dot.ny.gov

Source: IN DOT
What Are You Trying to Do with a DMS System?

Convey Advisory Information to the Traveling Public

Weather Warnings

Curve Warning

Safety Benefits

Source: ntl.bts.gov

Source: ODOT
What Are You Trying to Do with a DMS System?

Convey Advisory Information to the Traveling Public:

Estimated Travel Times

Source: NYSDOT
What Are You Trying to Do with a DMS System?

Convey Advisory Information to the Traveling Public:

Transit Vehicle Arrival Times

Source: ntl.bts.gov

Source: FHWA-PCB
What Are You Trying to Do with a DMS System?

Convey Advisory Information to the Traveling Public:

HOV Lane Access Requirements

Source: mtc.ca@gov
What Are You Trying to Do with a DMS System?

Convey Regulatory Information to the Traveling Public

- Mandatory detour information/evacuation
- Speed limits
- Variable Speed

Source: FHWA
Source: WSDOT ATDM
Source: FDOT
Source: FHWA
What Are You Trying to Do with a DMS System?

Convey Special Event Information to the Traveling Public

- High Value Information
- Require Urgent Attention
What Are You Trying to Do with a DMS System?

Activate a Flashing Beacon to Draw Attention of Motorists

- Traffic Alert-Message Activation
- Change in Condition

Source: Iowa DOT

Source: WSDOT

Source: ITE

Source: ops.fhwa.dot.gov
What Are You Trying to Do with a DMS System?

Manage Information from Multiple Facilities, Owning Centers

- Traffic Management Centers; Roadside, Moveable or Vehicle-based
- Transit platforms: Train Stations, Bus Depots
- Parking facility

Source: FHWA
Support for Configuring/Monitoring and Controlling a Sign

Support Operational Environment with Communications Interface

DMS Operation (Features):
- Configure
- Control
- Monitor

Management Station

Architectural (Communications) Needs

Sign Controller

Source: NYCDOT
Connection Always ON:

Need to allow a management station to issue request for status and issue control commands to a DMS.

Support for Configuring/Monitoring and Controlling a Sign

Support Operational Environment with Live Data Exchange

Request for Status Information → Response

Control Command → Response

What Message Currently is Displayed:

NEW MESSAGE
EXIT 42
CLOSED TILL 6 PM

Source: NYCDOT
Support for Configuring/Monitoring and Controlling a Sign

Support Operational Environment with Logged-Data

When Connection is Broken or Using Dial-UP Connection:
Logged-Data is retrieved at later time when a broken connection is restored.

- Controller door was opened at 2 am
- Power on at 3:15 am

Source: NYCDOT

Source: ITE OET DMS
Support for Configuring/Monitoring and Controlling a Sign

Summary of Operational Needs Supported by the Standard?

1. Manage the DMS Configuration
2. Control the DMS
3. Monitor the Status of the DMS
4. Perform Diagnostics to the DMS System such as pixel testing
### Managing the DMS Configuration

**Determine the DMS Identity**

<table>
<thead>
<tr>
<th>DMS Type</th>
<th>Make</th>
<th>Location</th>
<th>Id</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telespot</td>
<td>Max IV</td>
<td>Telegra</td>
<td>Sylvia</td>
</tr>
<tr>
<td>Daktronics</td>
<td>Imago</td>
<td>Skyline</td>
<td></td>
</tr>
</tbody>
</table>

Source: WSDOT
Managing the DMS Configuration (cont.)

- Manage Graphics
- Manage Fonts (color, height, width)
- Manage Brightness-LED (changing lighting conditions)
- Determine Sign Display Capabilities
Support for Configuring/Monitoring and Controlling a Sign

Controlling the DMS

- Control the Sign Face
- Control External Devices
- Control the Brightness Outputs
- Remotely Reset the Sign Controller
- DMS Control by Multiple Locations Centers

How centers share field devices?

Source: PCB-Patel
Support for Configuring/Monitoring and Controlling a Sign

Monitoring the Status of the DMS

TMC Work Station Display Confirms the Message

Source: NYCDOT

Source Credit: Skyline
Support for Configuring/Monitoring and Controlling a Sign

Performing Diagnostics to the DMS System

Test the Operational Status of System Components

- Determine Sign Error Conditions (High-Level Diagnostics)
- Monitor Message Errors
- Monitor Sign Environment

Source: WSDOT
Performing Diagnostics to the DMS System (cont.)

Test the operational status of system components

- Monitor Door Status
- Monitor Controller Software Operations
- Monitor Power Source
- Monitor Power Voltage
- Pixel Status
Support for Configuring/Monitoring and Controlling a Sign

What if a User Need is NOT Found in NTCIP 1203 v03?

- The standard allows for extensions
- Proprietary extensions are not desired
- Interoperability rests on standardized user needs; may be broken if a proprietary solution is imposed

Caution! Certain Automatic Actions are NOT supported
Examples of DMS Operational Uses

Transportation Operations that Use DMSs

- Freeway Management
- Travel Information
- Incident Management
- Work Zone Management
- Traffic Control
- Parking Management

Source: www.roadtraffic-technology.com
Examples of DMS Operational Uses

Transportation Operations that Use DMS (cont.)

- Route Diversion
- Evacuation
- Public Service & Safety
- Road Weather Information System

Source: WSDOT TMC

Warnings on VMS boards gave drivers a chance to use alternate routes, helping to minimize the backup on northbound I-5.

Source: WSDOT TMC
Examples of DMS Operational Uses

Key Outcomes from ITS Deployments (DMS)

- Improved Traffic Flow
- Coordinated Incident Management
- Reduced Travel Time
- Work Zones-Safety
- Speed Limits Enforcement

Source: City of Scottsdale

Source: FHWA OP
Question

Which of the following is **NOT** a DMS operational need?

**Answer Choices**

a) Management station remotely configures a DMS sign

b) Management station monitors and controls a DMS sign

c) Management station activates the beacon during an incident

d) Management requests current traffic flow data from the DMS controller
Review of Answers

a) Management station remotely configures a DMS sign

   True. This is a major DMS operational need. Management station configures a sign-type, location, direction, manufacture etc.

b) Management station monitors and controls a DMS sign

   True. Management station remotely manages messages in real-time.

c) Management station activates the beacon during an incident

   True. A beacon is activated to flash mode to make motorists aware of the current, perhaps urgent, message.

d) Management requests current traffic flow data from the DMS controller

   False. DMS is a display device; it does not collect data such as traffic flow data.
Learning Objectives

Review the **structure** of the DMS standard

Identify specific DMS operational needs

Describe the **purpose** of the Protocol Requirements List (PRL) matrix and benefits
Learning Objective 3

Describe the purpose of the Protocol Requirements List (PRL) matrix and benefits
What Is a PRL?

Protocol Requirements List (PRL) is a Table, a Matrix

- Provides the standardized **relationship** between user needs and their requirements
- As a **template** with fixed columns and multiple rows it guides users and DMS manufacturers/suppliers
What Is a PRL?

Standardized Relationship Provided by the Standard

Agency selects

- One User Need → Requirement 1
  - Minimum
- One User Need → Requirement 1
- Many User Needs → Requirement 1

Templates Links to Associated Requirements
What Is a PRL?

Provides Guidance

- PRL template *guides agency* to select project user needs
- PRL then presents associated requirements to fulfill user needs

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
<th>USER NEED</th>
<th>FR SECTION NUMBER</th>
<th>FUNCTIONAL REQUIREMENT</th>
<th>CONFORMANCE</th>
<th>SUPPORT/PROJECT REQUIREMENT</th>
<th>ADDITIONAL PROJECT REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>Features</td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Agency completes the *rows* by entering selected user needs with associated requirements.
### User Need

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
<th>USER NEED</th>
<th>FR SECTION NUMBER</th>
<th>FUNCTIONAL REQUIREMENT</th>
<th>CONFORMANCE</th>
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<th>ADDITIONAL PROJECT REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.1.2</td>
<td>Determine Sign Display Capabilities</td>
<td></td>
<td></td>
<td>0</td>
<td>Yes / No</td>
<td></td>
</tr>
</tbody>
</table>

1st line is the headings of the PRL Table *(We cannot Modify Columns)*

2nd line, an example of a user need, with section number-2.5.1.2 and its title

Section number 2.5.1.2, (page 25), find the user need; and determine if it is desired for your project implementation
Determine if a User Need is Required

2.5.1.2 Determine Sign Display Capabilities
This feature allows the operator to retrieve the necessary information to produce a rendering of a suggested or active message. This feature also allows the system to ensure that a message can be displayed on the DMS. The feature allows the operator to determine the detailed physical limitations of the DMS as well as details regarding the current fonts and any graphics that are stored.

May be desired to provide a graphical rendering of how a DMS sign face may look like

May not be desired if a blank out sign (BOS) is procured
### Completing a Project PRL-Functional Requirements

<table>
<thead>
<tr>
<th>UN Section Number</th>
<th>User Need (UN)</th>
<th>FR Section Number</th>
<th>Functional Requirement (FR)</th>
<th>Conformance</th>
<th>Support / Project Requirement</th>
<th>Additional Project Requirements</th>
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</thead>
<tbody>
<tr>
<td>2.5.2.3.1</td>
<td>Activate and Display a Message</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5.2.3.1</td>
<td>Activate a Message</td>
<td>M</td>
<td>Yes</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>3.5.2.3.3.5</td>
<td>Retrieve Message</td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5.2.3.6</td>
<td>Activate a Message with Status</td>
<td>Drum: M</td>
<td>Yes / NA</td>
<td></td>
</tr>
</tbody>
</table>

- Third/Fourth columns lists FR section number and title as described in Section 3.5 of the standard
Identifies if the user need (or requirement) is Mandatory (M) or Optional (O)

Certain basic user needs are considered Mandatory by the standard that must be selected YES

Example: DMS Matrix Configuration, must be selected (M)
The designation **O.2 (1)** means:

- This user need is optional (indicated by the ‘O’)

- The user need is one of several under the higher-level User Need (2.3.2.3 – DMS Display Matrix Configuration) (indicated by group ‘.2’)

- One of the user needs selected under the higher-level user need must be selected (indicated by the (1)
### Conformance Column (cont.)

See page 32 of Standard for details

<table>
<thead>
<tr>
<th>UN Section Number</th>
<th>User Need (UN)</th>
<th>FR Section Number</th>
<th>Functional Requirement (FR)</th>
<th>Conformance</th>
<th>Support / Project Requirement</th>
<th>Additional Project Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.1.3 (Fonts)</td>
<td>Manage Fonts</td>
<td></td>
<td>VMS:O</td>
<td></td>
<td>Yes / No / NA</td>
<td></td>
</tr>
</tbody>
</table>

Predicate - <predicate>: Indicates whether this user need is mandatory, optional or applicable, and is dependent **on a condition or another feature is supported**

- E.g., for **Manage Fonts**, VMS:O indicates if the DMS is a variable message sign, the user need is optional
- Other conditions or features include type of DMS (**BOS**, **CMS**; requires no font management)-**NA**
Support/Project Requirement Column

Agency/Specifier circles Yes, No or NA to indicate the agency’s user needs for the proposed implementation.

- If the Conformance statement for the User Need is Mandatory, you must circle Yes.

- If the Conformance statement is not applicable for your implementation, circle (write) NA.
### Additional Project Requirements-Last Column

- Provides additional notes or requirements (implementation)

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.2.1</td>
<td></td>
<td>Determine Device Component Information</td>
<td>M</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.2.4</td>
<td></td>
<td>Determine Supported Standards</td>
<td>M</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5.1.2</td>
<td></td>
<td>Determine Sign Display Capabilities</td>
<td>O</td>
<td>Yes / No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5.1.2.1.1</td>
<td></td>
<td>Determine the Size of the Sign Face</td>
<td>M</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>3.5.1.2.3.1</td>
<td></td>
<td>Determine Maximum Number of Pages</td>
<td>VMS:M</td>
<td>Yes / NA</td>
<td>The DMS shall support at least (1,255) pages for a single message.</td>
<td></td>
</tr>
</tbody>
</table>

#### 3.5.1.2.3.1 Determine Maximum Number of Pages

The DMS shall allow a management station to determine the maximum number of pages that can be included in a single message.

- How many pages? 1 or 2
- Do you really need 3? Costs
Agency Prepares a Customized Project PRL by selecting YES for Support

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
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</thead>
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<tr>
<td>2.5</td>
<td>Features</td>
<td></td>
<td></td>
<td>M</td>
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<td></td>
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<tr>
<td>2.5.1</td>
<td>Manage the DMS Configuration</td>
<td></td>
<td></td>
<td>M</td>
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<td></td>
</tr>
<tr>
<td>2.5.1.1</td>
<td>Determine the DMS Identity</td>
<td></td>
<td></td>
<td>M</td>
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<td></td>
</tr>
<tr>
<td>3.5.1.1.1</td>
<td>Determine Sign Type and Technology</td>
<td></td>
<td></td>
<td>M</td>
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<td></td>
</tr>
<tr>
<td>H.2.1</td>
<td>Determine Device Component Information</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>H.2.4</td>
<td>Determine Supported Standards</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
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<tr>
<td>2.5.2.2</td>
<td>Determine Sign Display Capabilities</td>
<td></td>
<td>3.5.1.2</td>
<td>O</td>
<td>Yes / No</td>
<td></td>
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<tr>
<td>3.5.1.2.1.1</td>
<td>Determine the Size of the Sign</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2.5.3.1.5</td>
<td>Monitor Sign Environment</td>
<td></td>
<td></td>
<td>O</td>
<td>Yes / No</td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.7</td>
<td>Monitor Sign Housing Temperatures</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.8</td>
<td>Monitor Sign Housing Humidity</td>
<td></td>
<td></td>
<td>O</td>
<td>Yes / No</td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.9</td>
<td>Monitor Control Cabinet Temperatures</td>
<td></td>
<td></td>
<td>O</td>
<td>Yes / No</td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.10</td>
<td>Monitor Control Cabinet Humidity</td>
<td></td>
<td></td>
<td>O</td>
<td>Yes / No</td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.7</td>
<td>Monitor Ambient Environment</td>
<td></td>
<td>3.5.3.1</td>
<td>Temp:M</td>
<td>Yes / NA</td>
<td></td>
</tr>
</tbody>
</table>
Agency Perspective (Project PRL)

- "Communicates" the scope of the desired DMS communication interface
- Makes it easier to specify what the interface is to do (customize)
- "Spells out" conformance requirements
- Acts as a "checklist" to validate the built system
- Aids in achieving interoperability

Did they build RIGHT system?
Benefits of PRL to Stakeholders

Vendors/System Developers Perspective

- Everyone is “connected” on the same page
- Eliminates “ambiguity” - reduces risks
- Vendors “confirms” DMS functionality + offer optional features

With a completed PRL, your agency, your vendors, system developers, all parties know what is expected from the DMS implementation.
ACTIVITY
Which of the following is **NOT** a correct statement?

**Answer Choices**

a) PRL is used to ensure conformance to the standard
b) PRL only identifies mandatory user needs/requirements
c) PRL is used as a validation checklist
d) PRL may be used to provide additional notes
Review of Answers

a) PRL is used to ensure conformance to the standard

*True. The statement is valid; we do use PRL to ensure Conformance to the standard.*

b) PRL only identifies Mandatory user needs/requirements

*False. The statement is invalid; PRL also allows agency to select optional user needs and associated requirements, in addition to mandatory ones.*

c) PRL is used as a validation checklist

*True. PRL helps in validating user needs-Right system being built.*

d) PRL may be used to provide additional notes

*True, Last column of a PRL allows users to make special comments if required.*
Learning Objectives

- Review the **structure** of the DMS standard
- Identify specific DMS operational needs
- Describe the **purpose** of the Protocol Requirements List (PRL) matrix and benefits
- Discuss how to prepare a **project level PRL** with user needs and their associated requirements
Discuss how to prepare a project level PRL with user needs and their associated requirements
How PRL Fits into the DMS Specification

Procurement Contract Specifications

1. Hardware Specifications
   - Functional Req.
   - Performance Req.
   - Structural Req.
   - Mechanical Req.
   - Electrical Req.
   - Environmental Req.

2. Software Specifications
   - Functional Req.
   - Performance Req.

3. Communications Interface Specifications
   - User Needs
   - Functional Req.
   - Project PRL, RTM
   - Testing Documentation

Contractual requirements during:
- System development
- Testing
- Deployment/integration
- Operations/maintenance
- Project management
Review Steps (Tailoring) to Select User Needs and Associated Requirements

Key Points for Completing a Project PRL

- Your DMS Specification Must have a fully completed PRL

PRL must be consistent with the hardware specification

Example: Temperature gauge, LED or Fiber Optic signs

- PRL must be based on the NTCIP 1203 v03 with SNMP Interface

Include Need-based specific DMS parameters—NOT All YOU Can GET! Not a Wish list
Conformance Versus Compliance

- **Conformance**: Meets a specified standard
  - To claim "Conformance" to NTCIP 1203 v03, the vendor shall minimally satisfy the mandatory requirements selected (YES)
  - Vendors that provide additional features beyond the completed PRL are still conformant as long as they conform with the requirements of NTCIP 1203 v03 and its normative references

- **Compliance**: Meets an agency specification
### Fill-in PRL with User Needs/Requirements

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
<th>USER NEED</th>
<th>FR SECTION NUMBER</th>
<th>FUNCTIONAL REQUIREMENT</th>
<th>CONFORMANCE</th>
<th>SUPPORT / PROJECT REQUIREMENT</th>
<th>ADDITIONAL PROJECT REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.3.1.5 (Environment)</td>
<td>Monitor Sign Environment</td>
<td></td>
<td>O</td>
<td>Yes / No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.7</td>
<td>Monitor Sign Housing Temperatures</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.8</td>
<td>Monitor Sign Housing Humidity</td>
<td>O</td>
<td></td>
<td>Yes / No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.9</td>
<td>Monitor Control Cabinet Temperatures</td>
<td>O</td>
<td></td>
<td>Yes / No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.4.10</td>
<td>Monitor Control Cabinet Humidity</td>
<td>O</td>
<td></td>
<td>Yes / No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5.3.1.7</td>
<td>Monitor Ambient Environment</td>
<td>Temp:M</td>
<td></td>
<td>Yes / NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Use the Support/Project Requirement column to indicate if the user need is required for the implementation.
- If the YES is selected, the requirements associated with that user need are also selected.
Commonly Used DMS User Needs in PRL

Fill-in PRL with User Needs/Requirements

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
<th>USER NEED</th>
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<th>FUNCTIONAL REQUIREMENT</th>
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<th>ADDITIONAL PROJECT REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.2</td>
<td>Operational Environment</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2.4.2.1</td>
<td>Live Data Exchange</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4.1.1</td>
<td>Retrieve Data</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4.1.2</td>
<td>Deliver Data</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4.1.3</td>
<td>Explore Data</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4.4.1</td>
<td>Determine Current Access Settings</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4.4.2</td>
<td>Configure Access</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td>The DMS shall support at least ____ access levels in addition to the administrator.</td>
</tr>
</tbody>
</table>

DMS Specification **MUST Select** [YES] these User Needs and associated Requirements; **First Step to Achieving Interoperability.**

<table>
<thead>
<tr>
<th>2.5</th>
<th>Features</th>
<th></th>
<th></th>
<th>M</th>
<th>Yes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.1</td>
<td>Manage the DMS Configuration</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2.5.1.1</td>
<td>Determine the DMS Identity</td>
<td></td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.5.1.1.1</td>
<td>Determine Sign Type and Technology</td>
<td>M</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
Commonly Used DMS User Needs in PRL

Fill-in PRL with User Needs/Requirements

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>2.5.2.3</td>
<td>Control the Sign Face</td>
<td>M</td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2.5.2.3.1</td>
<td>Activate and Display a Message</td>
<td>M</td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>3.5.2.3.1</td>
<td>Activate a Message</td>
<td>M</td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>3.5.2.3.3.5</td>
<td>Retrieve Message</td>
<td>M</td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

**Specification Must selects YES.**

<table>
<thead>
<tr>
<th>USER NEED SECTION NUMBER</th>
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<th>ADDITIONAL PROJECT REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.3.1.8 (Door)</td>
<td>Monitor Door Status</td>
<td>O</td>
<td></td>
<td>O</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>3.5.3.1.3.10</td>
<td>Monitor Door Status</td>
<td>M</td>
<td></td>
<td>M</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
2.5.2.1 Control a DMS from More than One Location

This feature addresses the need for DMS to be controlled both remotely (e.g., from one or more central computers) and locally (e.g., from the controller directly or from a laptop computer connected to the controller).

In summary, PRL has all your user needs and associated requirements—all in **ONE place-together with solid relationship**.
Which of the following is a **FALSE** statement related to a DMS specification?

**Answer Choices**

a) DMS specification includes a PRL
b) Conformance requires only meeting mandatory user needs
c) Compliance requires only mandatory user needs
d) Vendor must use the project PRL
a) DMS specification includes a PRL

*True. The statement is true; PRL must be in every DMS specification.*

b) Conformance requires only mandatory user needs

*True. The statement is true; only Mandatory user needs must be met to conform to the DMS standard.*

c) Compliance requires only meeting mandatory user needs

*False. The vendor must meet mandatory and selected optional user needs for compliance to specification.*

d) Vendor must use the project PRL

*True. The statement is true; the vendor must use agency PRL.*
Module Summary

- Review the **structure** of the DMS standard
- **Identify** specific DMS operational needs
- Describe the **purpose** of the Protocol Requirements List (PRL) matrix and benefits
- Discuss how to **prepare a project level PRL** with user needs and their associated requirements
We Have Now Completed A311a in the DMS Curriculum

**Module A311a**: Understanding User Needs for DMS Systems based on NTCIP 1203 Standard v03

**Module A311b**: Specifying Requirements for DMS Systems based on NTCIP 1203 Standard v03

**Module T311**: Applying Your Test Plan to the NTCIP 1203 v03 DMS Standard
Next Course Module

Module A311b: Specifying Requirements for NTCIP 1203 v03 DMS Standard

Concepts taught in next module (Learning Objectives):

1) Briefly review the structure of the DMS Standard
2) Explain the purpose of requirements traceability matrix (RTM) and its benefits
3) Prepare a project-level RTM with standard supplied requirements and design content (concepts)
4) Prepare a DMS specification (check list)
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!