

SIEMENS

Intelligent Transportation Systems

NTCIP – “What it is and how it effects Signal Systems”

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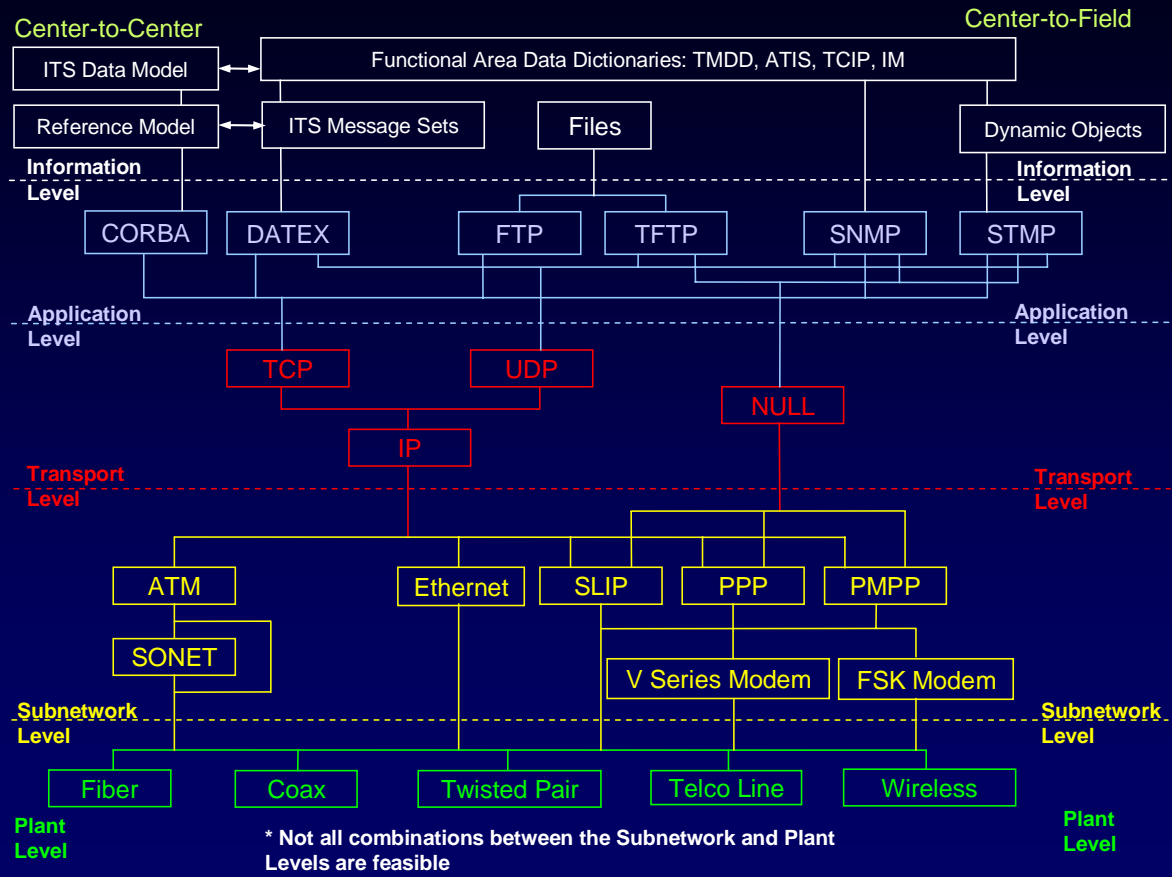
Presentation Outline

- NTCIP – What is it and why is it important
- Center-to-field overview
- Relevant Traffic Signal Controller standards
- NTCIP Implementation
- Summary

NTCIP – What is it?

- National Transportation Communications for ITS Protocol (AASHTO, ITE, NEMA)
- Defines a collection of standards-based communication protocols and data profiles used in the transportation industry for center-roadside, center-center, and vehicle-roadside communications
- NTCIP-based software devices and hardware can help achieve interoperability and interchangeability
- NTCIP Guide – www.ntcip.org

ITS / NTCIP Framework



Source: NTCIP Guide

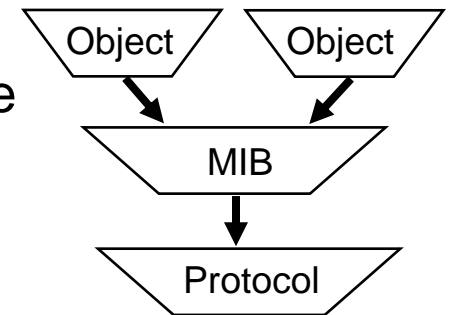


NTCIP – Why is it important?

- Defines an open and standard communications protocol between ATMS software and traffic signal hardware allowing vendor interoperability and neutrality
- Supports integration of different vendor products
- Federally – funded ITS projects must conform to the Regional ITS Architecture (2005) and NTCIP

Center to Field Standard - Overview

- Defines the data exchange between field devices and management stations
- Management Information Base (MIB) module defines a collection of application specific objects
 - Mandatory, optional (open standard)
 - Manufacturer specific (Intellectual property rights)
- Data Element (Objects) + Protocol = Standard



Center to Field Standard - Overview

Data Elements called "Objects"

phaseMinimumGreen OBJECT-TYPE

SYNTAX INTEGER (0..255)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Phase Minimum Green Parameter in seconds (NEMA TS 2 range: 1-255 sec). The first timed portion of the Green interval which may be set in consideration of the storage of vehicles between the zone of detection for the approach vehicle detector(s) and the stop line."

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Center to Field Standard - Overview

- Protocol
 - SNMP (Simple Network Management Protocol)
 - Rules for reading/writing objects to devices (Get, Set, Get-Next, Trap)
 - Mechanism for status reporting, control, upload/download and time broadcast
 - STMP (Simple Transportation Management Protocol)
 - Bandwidth and processing efficient alternative to SNMP for status reporting
 - Uses dynamic objects to concatenate objects

Relevant Standards

- NTCIP 1201 – Global Objects
 - Common data elements for all field devices
 - Configuration, time management, DB management, scheduled events, logging, reports, Aux I/O
 - v02.31 approved March 2005

Relevant Standards

- NTCIP 1202 – Actuated Traffic Signal Controllers (ASC)
 - Data elements for controlling, managing, and monitoring actuated traffic signal controller units
 - Phases, Rings and Sequence; Detectors; Special Functions; Coordination; Time Base Control; Preemption; Overlaps; and Upload and Download
 - Mature standard – V02.18 approved Dec 2004 includes block object support

Relevant Standards

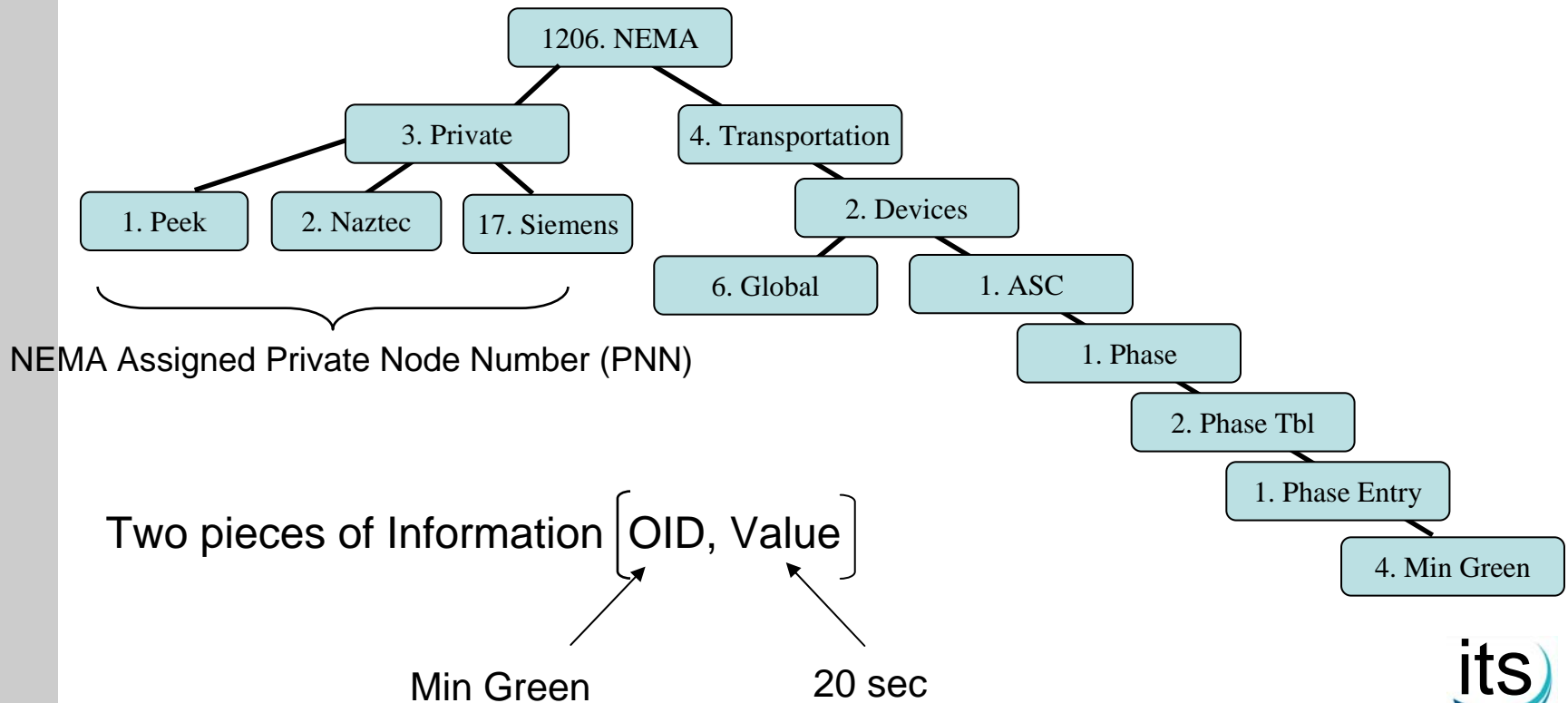
- NTCIP 1210 Field Management Station (Signal System Master) standard v01 expected February 2006
- NTCIP 1211 Signal Control Priority - a jointly-approved standard (v01.36) is expected end of 2005

Traffic Signals – NTCIP 1202 (ASC)

- Basic Function Support Includes
 - Status Reporting - Phase, Overlaps, Peds, Detectors, Unit Status, Preempts, Alarms, Special Functions
 - Control – Pattern, Actions
 - Upload / Download – Configuration, Event Logs
- About 220 Std ASC Objects

Traffic Signals – NTCIP 1202 (ASC)

OID Structure – Example 1.3.6.1.4.1.1206.4.2.1.1.2.1.4 (Min Green)



Traffic Signals – NTCIP 1202 (ASC)

- Dynamic Objects
 - Used to retrieve groups of status objects with single request
 - Dynamically configured between central (management station) and controller (agent)
- Block Objects
 - Used to group related objects for upload and download operations (i.e. phase, detector, overlap, preempt, pattern, and split)

NTCIP Implementation

- Standard objects ensure higher level of interoperability
 - Use standard objects to support most functions
 - Compliant devices will at least communicate at this level
 - Standard maintained by standards body with process for review, approval, updates, arbitration

NTCIP Implementation

- Manufacturer specific objects
 - Implement non-standard features (i.e. remote download)
 - Custom software to decode and process objects (Hidden costs & risks)
 - Increase complexity in system integration
 - Higher maintenance cost for proprietary features

NTCIP Implementation

- Conformance Groups
 - Specify a collection of related objects that defines a certain functionality - basic unit of conformity
 - Covers all MIB sources (NTCIP, RFC)
 - Mandatory or Optional Support

NTCIP Implementation

- Protocol Implementation Conformance Statement (PICS)
- Controller & Central
 - Defines what objects are supported, value range, and enumerations for standard and manufacturer objects
- Licensing and access rights to manufacturer specific objects
- MIB documentation
 - Includes Standard (mandatory, optional) and Manufacturer specific objects
 - Supplied as an electronic ASCII encoded file in ASN.1 standardized format

NTCIP Implementation

- Verify platform support for NTCIP
 - ATC/2070
 - Most current model NEMA TS1/TS2
 - Older controllers (Type 170) with device Interface
- Communications Performance
 - Not as efficient as some proprietary protocols
 - Upload/Download times and channel loading to support 1/sec status polling

NTCIP Implementation

- Independent Compliance Testing – Lots of tools
 - MIB Compiler
 - Protocol Analyzers
 - Frontline Test Equipment
 - Intelligent Devices, Inc (Device Tester)
 - NCTIP Exerciser

Summary

- Traffic signal controller standards are mature – all vendors now supporting some level of support
- Initial deployments with limited functionality with more recent deployments supporting more data elements
- NTCIP is ready for deployment