



# Centracs<sup>®</sup>

Software and System Specifications





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## Glossary

ATMS – Advanced Transportation Management System

COTS – Commercial Off-the-Shelf

CRC – Cyclical Redundancy Check

DCMS – Data Collection and Monitoring System

DMS – Dynamic Message Sign

GIS – Geographic Information System

ITS – Intelligent Transportation System

LAN – Local Area Network

MMS – Maintenance Management System

MOE – Measure of Effectiveness

MULTI – Mark-up Language for Transportation Information

NTCIP – National Transportation Communications for ITS Protocol

PTZ – Pan/Tilt/Zoom

RTMS – Remote Traffic Microwave Sensor

SMS – Short Message Service (text messaging for cellular phones)

TOD/DOW – Time-of-Day/Day-of-Week

TSP – Transit Signal Priority

TWP – Twisted-Wire-Pair copper interconnect

VOS – Volume/Occupancy/Speed

VPN – Virtual Private Network



## 1. Introduction

### 1.1. System Software Overview

- 1.1.1. The system shall be a Commercially-available Off-the-Shelf (COTS), National Transportation Communication for ITS Protocol (NTCIP) compliant, Advanced Transportation Management System (ATMS) software application.
- 1.1.2. The software shall provide, as a base, an intersection control and traffic management software platform, from which additional ITS applications can be integrated.
- 1.1.3. All additional ITS features and functionalities shall be modular and integrated seamlessly into a single user interface.
- 1.1.4. The system shall utilize the following Microsoft® products for each aspect of the system:
  - *Core Database: SQL 2012 or newer*
  - *Server OS: Server 2012 or newer*
  - *Workstation OS: Windows 7 Professional or newer*
  - *Laptop OS: Windows 7 Professional or newer*
- 1.1.5. The ATMS client software shall provide a "Touch Screen" mode for touch screen enabled Windows laptops and Windows tablet computers

### 1.2. System Software Standards

- 1.2.1. NTCIP 1201 and 1202 communications protocol standard shall be implemented in such a manner that the system can adapt to changes in technology and increase functionality over time with minimal impact on individual system components. The system developer and the controller manufacture shall verify that the system and controller firmware are NTCIP compliant and compatible.
- 1.2.2. The primary communications standards shall be NTCIP 1202 and 1202 based for communicating from Center-to-Field (C2F) and the developer shall document the standards to which the systems level of conformity of each standard is developed.

### 1.3. Software Updates

- 1.3.1. The central software shall incorporate a means for client workstations and laptop computers to be automatically updated with new versions that are installed on the server. Upon attempting to login to the server, the client software shall determine if a newer version is available at the server installation. If not, the client software shall complete the login normally. If there is a newer version of software, the user shall be able to have it automatically downloaded, installed, and run with no additional action on the part of the user.

### 1.4. System Device Integration

- 1.4.1. Devices shall be added or deleted from the system by right-clicking on the entity tree and selecting the proper menu item.
- 1.4.2. When adding a device, a dialog box shall be used to enter all the required and optional parameters to allow the device to be integrated into the system.
- 1.4.3. Each device shall be configured to communicate through a device manager service and allowed to be on-line or off-line to reduce failures and alerts for devices not currently connected to the system.





- 1.4.4. Devices shall be added to the system map by clicking and dragging the associated item from the entity tree to its desired location on the map.

## 1.5. System Support and User Management

- 1.5.1. The system shall not limit the number of user accounts that can be defined to allow and grant access
- 1.5.2. The system shall be able to employ Microsoft Active Directory for user management and to manage access to various system functions.
- 1.5.3. Where Active Directory is employed by the system, the ATMS client software shall be able to recognize the user's Windows login credentials when starting the client software. Where the Windows login credentials are used, the user shall be able to open the ATMS client software without providing an additional user name and password.
- 1.5.4. The ATMS administrator shall be able to create and assign user application and jurisdictional permissions based on Active Directory group definitions.

## 2. System Graphical User Interface

### 2.1. General Display Features

- 2.1.1. The main application window shall be divided into multiple rectangular areas or "containers". It shall be possible to drag and drop most status windows into one of these container areas.
  - 2.1.1.1. Upon being dropped, or docked in a container, the window shall automatically resize to fill the area.
  - 2.1.1.2. It shall be possible to click on the title bar of a docked window and drag it out of the container at which point it will become a free-floating window.
  - 2.1.1.3. It shall also be possible to float or to un-dock windows by clicking a button in the window's title bar.
  - 2.1.1.4. When docking a window into a container, the user shall be able to split the container horizontally or vertically and place the either half of the split container
  - 2.1.1.5. It shall be possible to drop multiple windows into any container area. When this occurs, the container area shall provide a tabbed layout for the container with a tab for each contained window such that clicking on a tab will bring the associated window into view in the container.
  - 2.1.1.6. It shall be possible to open multiple application windows, each of which shall include container areas as previously described for the main application window.
  - 2.1.1.7. It shall be possible for the user to select different arrangements or numbers of container areas in the main application windows.
  - 2.1.1.8. It shall be possible to change the size of container areas by clicking and dragging the border between container areas.
- 2.1.2. A user's main window configuration, referred to as a "preference set" shall be restored to its last known state when the user logs into the system. A user may also opt to have the system restore to a default preference set instead of the last known display configuration.
- 2.1.3. The restoration at login, of a user's last known preference set shall be independent of the most recent workstation used by the user.



- 2.1.4. It shall be possible for a user to save and name the current preference set allowing others to open and view the same sets of displays from another workstation
- 2.1.5. When touch-screen functionality is available on the user's computer, a user shall be able to use touch-screen gestures for navigating and manipulating maps and other features of the application software.

## Main Map Display

- 2.1.6. The system shall incorporate an agency-wide map as the major portion of the main graphics display.
  - 2.1.6.1. The main map may be docked in any or all of the available "containers" with any maps docked into multiple containers shall be refreshed simultaneously.
  - 2.1.6.2. The map displays shall have pan and zoom capabilities.
  - 2.1.6.3. Zoom level ranges shall be configurable.
  - 2.1.6.4. Users shall be able to save a map's pan and zoom levels to a named map that may be loaded again at a later time
  - 2.1.6.5. Users shall be able to specify a current map, with its pan and zoom levels as a default map that will be loaded any time a new map is opened for viewing.
  - 2.1.6.6. At each zoom level range, the display of different dynamic status and real-time status data shall be configured.
  - 2.1.6.7. It shall be possible for a user to interactively enable or disable the display of defined map layers.
  - 2.1.6.8. A GIS database shall be used for the purpose of displaying roadway Level of Service (LOS) links and other map elements.
- 2.1.7. The system shall be capable to employing multiple map sources for the base map. These sources shall include, but not limited to:
  - Navtec
  - Bing Maps
  - ESRI shape files
  - WMS Maps
- 2.1.8. The system shall update the status of all devices on all map display at least once per second, with no more than four seconds latency, once data is retrieved from a field device.
- 2.1.9. At a minimum, at all zoom levels the agency-wide map display shall dynamically identify the following status for each traffic signal, in real or near-real time:
  - Free Operation
  - Coordinated Operation
  - Transitioning between Free and Coordinated or from one Coordination pattern to another
  - Flash
  - Preemption
  - Transit Signal Priority (TSP) Service
  - Loss of Communications
- 2.1.10. When zooming in, the main map shall automatically provide a greater level of detailed information, at user-set and configured zoom levels, including, but not limited to:
  - Signal colors or overlaps (green, yellow, red)
  - Active Coordination pattern (if in Coordination Operation)
  - Active Preemption plan (in Preemption only)
  - Signal colors for all pedestrian phases in use
  - Graphical representation of demand on vehicle phases and pedestrian phases



- Graphical representation of active special function outputs
  - Detailed timing and controller information to include (when zoomed to intersection level):
    - Coordination Status
    - Programmed and actual cycle length
    - Programmed and actual offset
    - Programmed and actual phase timings
    - Alarm status
    - Overlap timings and status
    - Phase Next
    - Signal colors or overlaps (green, yellow, red)
- 2.1.11. Maps shall be capable of displaying a variety of device and entity types, including, but not limited to:
- CCTV cameras
  - Travel Time Links
  - Level of Service (LOS) links
  - Vehicle Detectors
  - Asset and maintenance management locations

## 2.2. Manual Commands

2.2.1. Manual commands shall offer the same functionality for initiating or terminating events and functionality as the Scheduler, but with the following exceptions:

- Manual commands shall override any normally scheduled event.
- Manual commands shall be implemented using the following modes:
  - Immediate and full manual
  - Immediate with limited duration
  - Scheduled with limited duration

## 2.3. Scheduler

2.3.1. A means shall be provided by which a user can schedule events and functions to be implemented or terminated by TOD/DOW, and shall include means by which the events can be called with the following frequencies:

- Daily
- Weekly
- Annually
- Seasonally
- Holidays
- Special – an event for any situation not described above (IE. sporting events, concerts, etc.)
- One-Time Event – provide the ability to run an event once and only once.

2.3.2. The scheduler shall provide a means by which alerts can be configured to be delivered to different individuals via email or text (SMS) messages by TOD/DOW.

2.3.3. The system shall provide a calendar-based on-call scheduler to allow a user to schedule when specific users or groups of users will receive system generated text and email notifications.





## 2.4. Additional Displays

- 2.4.1. The system shall allow additional displays, each of which can be opened or closed at any time, and float or be docked into a container. The system shall include the following displays, at a minimum:
- 2.4.2. Entity Tree
- 2.4.2.1. All devices configured in the system shall be displayable on an "entity tree".
  - 2.4.2.2. The entity tree shall allow the user to sort and filter by device type, allowing the user to easily locate any device.
  - 2.4.2.3. The user shall be able to add any device to the entity tree by right-clicking in the window and selecting the appropriate device type to add.
  - 2.4.2.4. The device shall then be added to the main map by clicking on the device in the entity tree and dragging and dropping the device onto the main map display. The device does not have to be placed on the main map to be useable.
  - 2.4.2.5. The Entity Tree shall list all the installed devices on the system, and shall be common across all workstations.
  - 2.4.2.6. The entity tree shall provide a rapid search window to simplify locating a specific entity by its name or description.
  - 2.4.2.7. The entity tree shall provide a filtering mechanism to only display specific types of entities on the tree to reduce clutter.
- 2.4.3. Alerts
- 2.4.3.1. The system shall provide an alert indicator which is always visible on the main window, providing real-time details on the number of open alerts and the criticality of each alert.
  - 2.4.3.2. The system shall provide an alerts window, displaying all alerts from the system or field devices, along with specific details including alert aging.
  - 2.4.3.3. This display shall be updated in real time with the event details, along with a time and date stamp and any acknowledgement information.
  - 2.4.3.4. Alerts shall provide three levels of user-definable criticality:
    - *Critical (highest level)*
    - *Warning (medium level)*
    - *Information (lowest level)*
  - 2.4.3.5. The alert window shall provide a means by which users can acknowledge, un-acknowledge, and close individual critical and warning alerts.
  - 2.4.3.6. All acknowledgements, un-acknowledgements, and closures shall be time and date stamped with the user's credentials upon change of status.
- 2.4.4. Intersection Display
- 2.4.4.1. The system shall provide a display where intersection timings, phase details, and ring information is presented in graphical form.
  - 2.4.4.2. Any intersection display shall easily be accessed by selecting the device on the main map or device tree and double-clicking over the selection. The intersection display shall then float over the containers or be attached to a container by dropping it into the container of the user's choice.
  - 2.4.4.3. The intersection display, when floating, shall be able to be stretched to any size for better visibility, and all components of the display shall resize accordingly without pixilation (shall employ vector drawing).
  - 2.4.4.4. Phase indication arrows shall be programmable for up to 16 phases, including





- protected/permissive movements and overlaps.
- 2.4.4.5. Protected/permissive indications shall be configured as one of the following: MUTCD flashing left turn yellow arrow, 5 section left protected/permissive left turn, or Canadian Fast-Flash left turn
  - 2.4.4.6. All intersection-level graphics shall be placed on a zoomed-in portion of the main map or graphical image of the intersection by selecting the graphic from a menu and dropping it on the intersection.
  - 2.4.4.7. All intersection-level graphics shall be associated with a phase, overlap, or function (preemption, status, alarms, etc.), and shall change color or appearance upon change of status at the intersection.
  - 2.4.4.8. Intersection graphics configurations shall be transferrable from one intersection to another.
  - 2.4.4.9. Animations of some display components shall be provided for better visibility, recognition, and attention.
  - 2.4.4.10. Users shall be able to place a remote vehicle and/or pedestrian call to any enabled phase through controls placed on the Intersection Display Window.
- 2.4.5. Remote Front Panel
- 2.4.5.1. The system shall provide the ability to launch a character-mode controller front panel
  - 2.4.5.2. The remote front panel tool shall provide the same status monitoring displays and configuration screens as found on the traffic signal controller.
  - 2.4.5.3. The remote front panel shall provide the same key-pad interface modeled after the physical key-pad interface of the controller.

## 2.5. Device Grouping

- 2.5.1. All devices shall be added and configured within a common Entity Tree. Any device shall be allowed to be assigned as a stand-alone entity, not associated with any other entity or device, System, Section, Subsection or Group.
- 2.5.2. Any device in the Device Tree, shall be assigned to one of the following static groups:
  - 2.5.2.1. System – associated with an agency or jurisdiction. System events shall have the lowest priority control over all other scheduled events.
  - 2.5.2.2. Section – associated with a portion of a system. Section events shall have higher priority than System Events, but lower priority than events scheduled on Subsections.
  - 2.5.2.3. Subsection – associated with a portion of a Section. Sub-section events have higher priority than events scheduled on Sections, but lower priority than those scheduled for flexible Grouped intersections.
- 2.5.3. Any device in the Device Tree shall also be included into one or more flexible groupings. These Groups shall allow users to associate entities with common requirements for TOD scheduling, action plan control or manual command operation, and placed into their own unique grouping. Group commands override System, Section or Subsection events. Events scheduled on Groups have higher priority than all the groupings in the section above, but lower priority than a Stand-alone device.
- 2.5.4. Devices shall also be capable of being added to the entity tree as a Stand-alone device, not associated with any Static or Flexible Grouping. Scheduled events to these devices have highest priority of all, over all other scheduled events.



- 2.5.5. Devices, Systems, Sections, Subsections and Groups shall also be capable of being dynamically grouped by TOD schedule or by manual commands. Any static group, flexible group, device, or combination thereof shall be configured into a single scheduled event, action plan, or manual command and operate as a single entity.
- 2.5.6. Manual commands shall follow the same prioritization as above for scheduled events with respect to grouping, but they shall override any currently scheduled event for the devices being commanded.

## 3. System Functions

### 3.1. Center-to-Field Communications

- 3.1.1. The system shall communicate to the field devices using Ethernet or serial communications, using the agency's LAN, licensed band or spread-spectrum radios, private twisted-wire-pair copper (TWP), or fiber-optic cabling or Cellular Modems.
- 3.1.2. The system shall communicate with field devices using NTCIP protocols, or established proprietary protocols.
- 3.1.3. The system shall be capable of controlling, receiving status and data from, uploading and downloading field data, and applicable control parameters to and from each device.
- 3.1.4. The system shall maintain a copy of each field device's database of applicable operational parameters.

### 3.2. Database Administration, Security, and System Access

- 3.2.1. The system shall provide, at the top level, the ability to manage the ATMS and all device databases to monitor and control all field devices from one central location and optional remote facilities.
- 3.2.2. Each system client workstation or laptop shall require a username and password for any user, this is assigned by the system administrator. The username and password may be the same as that used by the operating system, but shall be required to be entered for each new system session.
- 3.2.3. The system shall allow for user and group privileges to be defined and assigned by the Administrator.
- 3.2.4. Operating privileges should be available for the following:
  - 3.2.4.1. System Administrator Configuration – full access to all system functions
  - 3.2.4.2. Inter-jurisdictional control – full access, partial access, read-only access to other agencies field devices, status, and logs.
  - 3.2.4.3. User Profile Configuration – full access or read-only access to functions below (at a minimum), regardless of device type:
    - *Device configuration – adding, editing, deleting devices, and properties*
    - *Device control – sending commands and instructions to devices*
    - *Database configuration – access to modifying or editing segments (all or portions) of existing device databases*
    - *Database maintenance – backup, restore, archiving, etc*
    - *Database report creation and generation – includes standard and custom reports*
    - *Map display characteristics– base map controls and intersection display editing*
    - *Communications configurations – modifying communications to the field*

### 3.3. Controller Database Management

- 3.3.1. Traffic Signal Controller Database





- 3.3.1.1. Database management shall allow programming of the intersection controller databases.
- 3.3.1.2. Each device shall have separate database programming pages. These pages shall contain all the programming options unique to each device.
- 3.3.1.3. Programming entries shall primarily consist of numerical or text values, YES/NO or ON/OFF entries, or appropriate values for each type of device. Check boxes shall be used for flags as appropriate. Hexadecimal or binary code shall not be used as entry values unless the data is represented in a similar encoded form on the controller's front panel display.
- 3.3.1.4. During program entry, the new data shall overwrite the old data. If the data entered is out of range, changes shall not be permitted and an error message shall alert the user.
- 3.3.1.5. When a user is editing data for a specific device, that database shall be "locked" and unavailable for edit by other users.
- 3.3.1.6. Standard industry accepted traffic engineering terminology shall be used throughout the programming displays.
- 3.3.1.7. Mnemonic usage shall be minimized and limited to recognized traffic engineering terms.

### 3.4. Controller Database Upload/Download

- 3.4.1. Upload/download shall transfer the programmable database from/to the selected device.
- 3.4.2. All upload/download data shall be verified for integrity using CRC techniques.
- 3.4.3. Following an upload, it shall be possible to compare the controller configuration to the database on file.
- 3.4.4. The system shall provide the ability for users to schedule a database comparison. Based on operator command or TOD/DOW schedule, the system shall automatically upload databases from devices and compare to database versions stored in the central database. The results of this comparison shall be available in a device comparison log. The log shall contain the following information on a per controller basis:
  - *Device number*
  - *Status (upload failed, databases differ, databases match, no upload present)*
  - *Date and time of last database comparison*
- 3.4.5. It shall be possible to switch between the uploaded data and the central data with a simple menu selection. The differences shall be highlighted on the uploaded data.
- 3.4.6. It shall be possible to revert a controller database configuration to any previously saved version for that location.
- 3.4.7. The system's device database management shall provide an operator menu selection interface that is similar to the controller's menu selections.
- 3.4.8. When the operator of the ATMS selects either an upload or a download of a field device database, it shall be possible for the operator to select only the segments of the database to upload or download provided the field device can accept data transfer in this manner.

### 3.5. Alert and Event Notification

- 3.5.1. At a minimum, the system shall be capable of automatically sending alphanumeric messages (SMS – text messaging) to cellular telephones and email addresses upon detecting problems with the system or from any device.



- 3.5.2. Alert notifications shall also appear as a pop-up alarm, or similar notification, on each workstation logged into the system, provided a user has been configured to receive pop-up alarms, and that user is logged onto the system.
- 3.5.3. Alert notifications shall consist of at least three (3), user configurable, priority levels, to include "informational" (low priority), "warning" (medium priority) and "critical" (high priority) alerts.
- 3.5.4. Acknowledgements of incoming alerts shall be required for all medium and high priority on-screen notifications. Low priority alarm notifications shall not require acknowledgements.
- 3.5.5. The system shall be capable of sending alerts via text (SMS) or email and shall be configurable by TOD/DOW, allowing recipients to be selected based upon severity or priority of event and to issue text/email messages sent to multiple devices or addresses.
- 3.5.6. Notifications shall allow a confirmation to assure that the malfunction has been acknowledged.
- 3.5.7. If no acknowledgement is received upon expiration of a user programmable time-out period, subsequent notifications shall be configurable to be sent (or escalated) to alternate devices.
- 3.5.8. The system shall log all malfunction notifications, retries, and acknowledgements with time and date stamps. The first acknowledgement shall be recorded; all others shall be ignored.

### 3.6. System Analysis and Engineering Tools

- 3.6.1. The system shall include engineering and analysis tools, providing users the ability to comparatively evaluate current system and field operation, historical operation, or proposed changes to operation. These tools shall include, but not limited to:
  - *Interface to third party traffic plan optimization software*
  - *Time-space diagrams*
  - *Split monitor displays*
  - *Traffic system and operational analysis reports*
  - *Traffic Responsive Report*
  - *Raw Detector Report*

## 4. Intersection Control Functions

### 4.1. Intersection Controller Access

- 4.1.1. Access to the intersection controllers shall be controlled by privileges associated with system user logon IDs.
- 4.1.2. Any field located intersection controllers, connected to the system shall be capable of being represented by objects on the system map.
- 4.1.3. *The system* shall provide database management with full upload, download and control to Econolite ASC/2, ASC/3 controllers, 2070 controllers running the Econolite ASC/2070, ASC/3 2070 or Eagle EPAC ver. 4.01D or ver. 4.01F controllers using NTCIP 1202 communications protocols, or *Oasis™* firmware, controllers and 170 controllers running Wapiti W4IKS, rev. 55a (6800) or 15 (HC11) using Econolite ACT protocols.



## 4.2. Intersection Control Modes

- 4.2.1. Traffic-Responsive (TR) - A controller shall be considered to be in the TR mode when it is operating on-line under central supervision and responding to system commands for plan selection based on the traffic-responsive algorithm.
- 4.2.2. Time-of-Day (TOD) - A controller shall be considered to be in the TOD mode when the controller is operating in a pre-determined timing plan based on a TOD schedule stored in the central database.
- 4.2.3. Manual - A controller shall be operating under the MAN mode when it is responding to system commands for plan selection issued from central control using manual override. From the perspective of the controller, this mode shall be identical to TR or TOD.
- 4.2.4. Failed - A controller shall be deemed "Failed" when the controller fails one or more monitoring checks. Once failed, a controller shall be in the failed mode until the problem has been corrected and the failure state has been cleared by periodic system retry commands.
- 4.2.5. Local - A controller shall be in the LOCAL mode when the local intersection controller makes the plan selection decision. The central system can command a local intersection to run in LOCAL mode, or LOCAL mode may result from manual command at the intersection. Communication of detector data and other status information shall continue even when in LOCAL mode.
- 4.2.6. Flash - Flash mode status shall be logged for each entry or exit from flash. The system shall have the be capable of detecting and reporting Central Flash, Cabinet Flash and Conflict or MMU Flash events provided the controller is able to discriminate between them and report its mode.

## 5. Traffic Responsive (TR) Control

### 5.1. General Description

- 5.1.1. The system shall utilize a V+kO (volume plus scaled occupancy) algorithm developed by the US Department of Transportation for traffic-responsive operations.
- 5.1.2. System detector data shall provide the basis for all TR plan selections by the system.
- 5.1.3. The system shall utilize a threshold-based algorithm, utilizing computational channels to evaluate system congestion and traffic flows.
- 5.1.4. The TR operation shall automatically select the timing plans for which traffic flow parameters have been defined that exceed the user-defined threshold of traffic. The TR mode shall be selected by a manual user command or on a TOD basis.
- 5.1.5. TR database shall identify the system detectors that are to be used for TR plan selection for each section.
  - 5.1.5.1. The detector data shall have smoothing factors to configure importance of most recent data vs. historical data
  - 5.1.5.2. The detector data shall have scaling factors to accommodate loop placement and redundancy as well as establish ratio of detectors used to establish computational channel. A separate weighting factor is used for each detector but each shares the same "k" value.

### 5.2. Plan Implementation Techniques

- 5.2.1. Plans shall be selected for implementation using the following process sequence:







1. *Process vehicle volumes and occupancies from defined system detectors.*
  2. *Calculate weighted sum of volumes plus a factor of occupancies (V+KO).*
  3. *Compare the V+KO value with the programmed thresholds.*
  4. *Select the plan with the closest match to the calculated value and that satisfies the user configured change threshold.*
  5. *The selected timing plan shall be transmitted to the controllers. The plan will be invoked provided that it is available at each controller in the applicable section or system.*
- 5.2.2. The duration of each TR sampling period shall be operator-selectable.
- 5.2.3. TR operation shall be capable of being overridden by manual selection.
- 5.2.4. TR operation shall be capable of operating in the background without selecting patterns until a user specified level of demand or occupancy is achieved at which point the user selected pattern will be commanded to the intersections and thus overriding the local or system time-of-day patterns.
- 5.2.5. System detectors shall provide volume and occupancy data for archived storage and analysis purposes.
- 5.2.6. Plan changes shall be implemented under TR only if the minimum change threshold has been exceeded.
- 5.2.7. Plan changes shall be implemented under TR only if the user-specified percentage of valid detection is met or exceeded.

## 6. System Analysis and Engineering Tools

### 6.1. Time/Space Diagrams

- 6.1.1. The system shall allow the operator to display time-space diagrams. At a minimum, the operator shall be able perform the following:
- 6.1.1.1. Display time-space diagrams for both programmed, real-time and historical coordination timings.
  - 6.1.1.2. Display sloping progression bands for each direction of travel on the same diagram.
  - 6.1.1.3. Dynamically adjust programmed (not real-time) offsets by "clicking" on an intersection's time bars and "dragging" the bars in either direction.
  - 6.1.1.4. The System shall be able to save time-space diagram offset adjustments to the database and download them to the controller.
  - 6.1.1.5. Display the current offset as a numeric value next to each intersection.
  - 6.1.1.6. Select the phases and/or overlaps for progression phases.
  - 6.1.1.7. Time Space diagrams shall be capable of using GIS data to automatically calculate and display distances between signals.

### 6.2. Split Monitor

- 6.2.1. The system shall include a real-time split monitor that provides, at a minimum, the following functionality:
- 6.2.1.1. It shall be possible to present the operator with an analysis of the splits of an intersection per phase
  - 6.2.1.2. The system user shall be able to view and process both programmed, historical and actual real-time data.
  - 6.2.1.3. Programmed timing data for each phase shall be obtained from the current database of







- controller timings stored in the central system.
- 6.2.1.4. Actual real-time data for each phase shall be obtained by monitoring the controller status on a second-by-second basis.
  - 6.2.1.5. Number of cycles analyzed shall be displayed.
  - 6.2.1.6. It shall be possible to select the period for which the data shall be displayed by start and stop time and date, day of week, the last occurrence of a plan, or the last X minutes (where X is defined by the operator).
  - 6.2.1.7. Actual splits shall be grouped together in “bins” and histograms used to graphically show the distribution of timings over the data collection period.

### 6.3. System and Operational Reports

- 6.3.1. Each report shall allow users to select report parameters and to customize report filtering and data selection.
- 6.3.2. Users shall be able to save report parameter selections to a named report that the user can run again at a later time without re-selecting the parameters.
- 6.3.3. User Reports shall be able to be marked as “private” or “public” thus controlling whether other users are allowed access to run the report.
- 6.3.4. Users shall be able to use the system scheduler or the manual command scheduler to run any user defined reports, as well as system defined reports.
- 6.3.5. Report output formats shall include at a minimum PDF, Microsoft Word and Microsoft Excel formats.
- 6.3.6. The system shall provide a list of reports, providing information compiled from data retrieved from the system and any field device capable of logging data. These reports shall include, but not be limited to the following:
  - *Alerts Log Report*
  - *Raw Detector Reports*
  - *Device Communications Configuration Report*
  - *Scheduler Report*
  - *Signal Changes Report*
  - *Signal Detector Events Report*
  - *Split Monitor Report*
  - *System Events Report*
  - *Upload and Compare Report*
  - *Detector Hourly and Daily VOS Reports*
  - *Detector Multi-date Hourly and Multi-date Daily VOS Reports*

## 7. Optional Modules

The ATMS system shall be capable of supporting any or all of the modules defined in this section as optional additions to the system. Any optional module shall be enabled by a license key and shall provide a seamlessly integrated and common look and feel for the user.

### 7.1. Adaptive Signal Control

- 7.1.1. The system must optionally offer native support for Adaptive Signal Control.





- 7.1.2. The adaptive control algorithms must be an implementation of, or directly derived from the FHWA ACS Lite adaptive control system.
- 7.1.3. The Adaptive Control algorithms shall make adjustments to offsets and splits based on algorithms developed for ACS Lite.
- 7.1.4. The system must allow for definition of multiple adaptive control zones.
- 7.1.5. The Adaptive Control system shall allow users to configure multiple adaptive zones to each manage up to 32 different intersections.
- 7.1.6. Adaptive operation shall be enabled to operate through the ATMS scheduler or by manual command.
- 7.1.7. Adaptive control zones shall be capable of working in conjunction with the system's Traffic Responsive software.
- 7.1.8. Adaptive configuration and status screens shall be seamlessly integrated into the ATMS system.
- 7.1.9. In the event that adaptive operation terminates due to communication failure or in accordance with system schedules, the controllers in the field shall automatically revert to normal or local time-of-day operation.
- 7.1.10. The system shall not make permanent changes to the controller database when making offset or split adjustments at the controller.
- 7.1.11. The Adaptive system shall recognize when any changes are made to the controller database that would affect adaptive operation. Before proceeding with adaptive operation, the system shall automatically upload fresh parameters from the controller without user intervention.
- 7.1.12. The system shall allow users to view historical and real time displays of all adjustments made to offsets or splits by providing a variety of reports including phase utilization, flow reports and detector status reports.
- 7.1.13. Adaptive Signal Control shall operate on the same server hardware and communications channels as the ATMS system and shall not require additional servers or field hardened master computers to implement additional Adaptive zones

## 7.2. Maintenance Management System

### 7.2.1. Module Overview

- 7.2.1.1. The MMS module shall be a Commercially-available Off-the-Shelf (COTS) Product providing tools and capabilities allowing agencies to effectively manage field assets, trouble tickets and preventive maintenance activities.
- 7.2.1.2. The MMS module shall be capable of automatically generating trouble tickets based on alarm and alert conditions originating from field devices or any other alert mechanisms provided by the ATMS.
- 7.2.1.3. The software shall integrate seamlessly with the ATMS system utilizing the same user interfaces, map, entity tree and configuration tools as the ATMS.
- 7.2.1.4. The MMS module shall provide a web server to support web-enabled mobile devices
- 7.2.1.5. The MMS module shall periodically update the status of trouble tickets and supported ITS equipment on all map displays.

### 7.2.2. Entity Tree

- 7.2.2.1. All assets and locations configured in the system shall be displayable on the "entity tree".





- 7.2.2.2. The entity tree shall allow the user to sort and filter by asset type or location, allowing the user to easily locate any location in the tree.
- 7.2.2.3. The user shall be able to add any location to the entity tree by right-clicking in the window and selecting the appropriate device type to add.
- 7.2.2.4. A location may then be added to the main map by clicking on the location in the entity tree and dragging and dropping the location onto the main map display. The location does not have to be placed on the main map to be useable.
- 7.2.2.5. The Entity Tree shall list all the installed locations on the system, and shall be common across all workstations.
- 7.2.3. Tickets and Work Orders
  - 7.2.3.1. The MMS module shall provide a tickets window, displaying all active calls or events resulting in a trouble ticket with information about the nature of the problem, the contact or originator of the call and the current status of the trouble ticket.
  - 7.2.3.2. At a minimum, ticket status shall be indicated by the following colored designations
    - *Red shall indicate a new ticket that has not been acknowledged or accepted*
    - *Yellow shall indicate that a ticket assignment has been accepted by a user*
    - *Green shall indicate that work is underway on the ticket.*
  - 7.2.3.3. This display shall be updated in real time with the event details, along with a time and date stamp and any acknowledgement information.
  - 7.2.3.4. The alert window shall provide a means by which users can acknowledge, un-acknowledge, and close individual critical and warning alerts.
  - 7.2.3.5. All acknowledgements, un-acknowledgements, and closures shall be time and date stamped with the user's credentials upon change of status.
- 7.2.4. On-Call Scheduling
  - 7.2.4.1. The MMS module shall provide a calendar styled scheduler tool for managing the On-Call schedule.
  - 7.2.4.2. The on call scheduler shall provide different views based on individual days, weeks or months. Users shall be able to add on call schedules from the calendar tool, selecting either an individual user or a user group for the schedule.
  - 7.2.4.3. The scheduler shall provide a mechanism allowing the user to select both start and end dates and times as well as a recurrence for a new schedule.
  - 7.2.4.4. Users shall be able to double click on any plan displayed on the calendar and edit or delete the plan.
  - 7.2.4.5. Users shall be able to navigate the calendar, moving both forward and backward through the months.
  - 7.2.4.6. When creating or modifying a schedule, users shall be able to designate an on call plan as either a regular schedule or as an exception.
  - 7.2.4.7. Users viewing the on call calendar shall be able to apply a filter that will show only the regularly scheduled plans, the exception plans or both types of plans.
- 7.2.5. Asset and Inventory Management Tools
  - 7.2.5.1. The MMS module shall provide tools allowing users to define suppliers and manufactures of agency assets
  - 7.2.5.2. The manufacturer information shall be used in Asset definitions and reports provided by the MMS module.
- 7.2.6. Assets



- 7.2.6.1. The MMS module shall provide tools allowing users to create new types of assets.
- 7.2.6.2. The MMS module shall provide an asset-type editor allowing users to assign predefined properties or attributes to user defined asset.
- 7.2.6.3. All new asset-types created by a user shall have a minimum of three attributes which include:
  - *Name*
  - *Service Date*
  - *Manufacturer*
- 7.2.6.4. The MMS module shall provide a set of predefined asset-type attributes that may be used in any asset-type definition. At a minimum, the predefined attributes will include:
  - *Description*
  - *Jurisdiction*
  - *Model No.*
  - *Owner*
  - *Serial No*
  - *Warranty Date*
- 7.2.6.5. An asset-type editor shall allow users to define custom asset attributes and specify validation formatting rules for new asset properties.
- 7.2.6.6. The asset-type editor shall allow users to create shared asset properties that can be used in any asset-type definition..
- 7.2.6.7. Users shall be able to create new assets and associate them with user defined locations.
- 7.2.6.8. The MMS module shall, at a minimum, track the in-service times, failure histories, repair histories, changes to locations, PM activities as well as depreciation and replacement values of individual assets.
- 7.2.7. Preventive Maintenance
  - 7.2.7.1. The MMS module shall provide tools allowing users to define and manage activities associated with Preventive Maintenance
  - 7.2.7.2. The MMS module shall provide a tool allowing users to define all activities associated with Preventive Maintenance.
  - 7.2.7.3. The MMS module shall allow users to organize PM plans and activities by frequency, asset type, location, technician groups or by region.
  - 7.2.7.4. The PM-activities editor shall allow users to define custom PM tasks how activities for a specific task will be documented by the field technician.
  - 7.2.7.5. The MMS module shall provide a means to allow a user to group individual PM tasks into Checklists specific to a type of maintenance activity to be performed.
  - 7.2.7.6. The MMS module shall provide a means to combine tasks and checklists to form more complex PM activities lists.
  - 7.2.7.7. The MMS module shall provide a means to organize, schedule and track PM and determine which assets or locations are due, past due for PM and which groups or individuals are responsible for performing the PM.
  - 7.2.7.8. The MMS module shall provide a calendar styled scheduler tool for managing preventive maintenance plans and schedules.
  - 7.2.7.9. The PM plan scheduler shall provide different views based on individual days, weeks or months. Users shall be able to add PM plans from the calendar tool, designating the type of maintenance, the location or locations to be maintained, the time-period in which the maintenance is to be performed and any recurrence settings associated with the plan.



- 7.2.7.10. Users shall be able to double click on any plan displayed on the calendar and edit the plan or delete the plan.
- 7.2.7.11. Users shall be able to navigate the calendar, moving both forward and backward through the months.
- 7.2.7.12. Users shall be able to check-off PM tasks, provide comments and supply other textual information performed while maintaining a specific asset or location using a web based mobile interface.
- 7.2.7.13. The MMS module shall provide reports documenting all aspects of PM by location, asset, technician group and time periods.
- 7.2.8. Document Management
- 7.2.8.1. The MMS module shall allow users to associate documents, drawings, images or other files with a location or asset type.
- 7.2.8.2. Users shall be able to retrieve and display documents, drawings, images or other types of files using the workstation client software or from the mobile web enabled device.
- 7.2.8.3. The MMS shall not be responsible for providing software for workstation or mobile devices necessary to display files.
- 7.2.9. MMS module and Operational Reports
- 7.2.9.1. The MMS module shall provide a list of reports, providing information compiled from data retrieved from the system. These reports shall include, but not be limited to the following:
- *Asset Aging and Status*
  - *Asset History*
  - *Asset and Inventory Stock Levels*
  - *Project Activity Reports*
  - *Trouble Ticket Status History*
  - *On Call Schedule*
- 7.2.10. Mobile Device Support
- 7.2.10.1. The MMS module shall provide a web service allowing users with mobile devices with web browser support to interface with the system
- 7.2.10.2. The mobile web browser interface shall require a user login and password to access the system
- 7.2.10.3. The mobile web browser interface shall function on hand-held devices with web-browsers including, but not limited to
- *Google Chrome*
  - *Firefox*
  - *Safari*
- 7.2.10.4. Mobile Device Application - The mobile interface shall provide a means for users to view currently open trouble tickets and work orders and scheduled PM.
- 7.2.10.5. Users shall be able to manage their work activities by assigning tasks to themselves from the available list of open tickets, work orders and scheduled PM.
- 7.2.10.6. The mobile interface shall document activities and automatically update the central server when users perform the following activities using the mobile browser application:
- *Movement of assets and inventory between locations such as between warehouses, vehicles and work sites*
  - *Acceptance of trouble tickets or work order assignments*
  - *Arrival at a location to work on a trouble ticket or work order assignment*





- *Tasks performed when working a trouble ticket or work order assignment*
  - *Closing a trouble ticket or work order assignment*
  - *Tasks associated with a preventive maintenance activities at a location*
- 7.2.10.7. Updates from the mobile interface to the application server shall include information about the user, date and time of the activity and the location associated with the activity.
- 7.2.10.8. The MMS module shall provide tools allowing agencies to define their own preventive maintenance plan checklists and activities.
- 7.2.10.9. Preventive maintenance plan checklists and activities shall be automatically incorporated into the mobile interface.
- 7.2.10.10. No special programming by a user shall be required to create and define checklists and PM activities.
- 7.2.10.11. Users shall be able to create new tickets and work orders using the mobile interface.

### **7.3. Data Collection and Monitoring**

- 7.3.1. The system shall optionally support the ability to interface directly with Autoscope and RTMS G4 and X3 detection units for the purpose of collecting and reporting on count station and other data. Supported devices shall include but not be limited to:

- |                                       |                                      |
|---------------------------------------|--------------------------------------|
| • <i>Autoscope Solo Pro</i> ®         | • <i>Autoscope System-16 Terra</i> ™ |
| • <i>Autoscope RackVision</i> ™ Pro   | • <i>Autoscope Encore</i> ™          |
| • <i>Autoscope 2020</i> ™             | • <i>Autoscope Duo</i> ™             |
| • <i>Autoscope Solo Terra</i> ™       | • <i>RTMS G4</i>                     |
| • <i>Autoscope RackVision Terra</i> ™ | • <i>RTMS X3</i>                     |

- 7.3.2. The system shall be capable of automatically identifying devices on the network.

#### **7.3.3. Data Collection Station Status Display**

- 7.3.3.1. The system shall provide a status display where data collections station information is presented in graphical form.
- 7.3.3.2. Any Data Collection Station display shall easily be accessed by selecting the device on the main map or device tree and double-clicking over the selection. The display shall then float over the containers or be attached to a container by dropping it into the container of the user's choice.
- 7.3.3.3. Camera locations be indicated by camera icons placed on an aerial map that will be part of the Data Collection Station display. Video snapshot images shall be also available through the Data Collection Station display, either by double-clicking on the camera icons or by hovering the mouse pointer over the icon.

- 7.3.4. The system shall include a Detector Group Chart that provides, at a minimum, the following functionality:

- 7.3.4.1. It shall be possible to present the operator with multiple graph display options for various types of data.
- 7.3.4.2. Users shall be able to select tabular displays of selected data
- 7.3.4.3. Users shall be able to select a display mode comparing the current day's information with preceding days of collected data





- 7.3.4.4. Users shall be able to select data collection time frames of
  - *Last 24 Hours*
  - *Last Record*
  - *Last Hour*
  - *Current Day*
  - *User Selected Date*
- 7.3.4.5. Users shall be able to select data collection resolution levels of 1-day, 1-hour, 30-minute and 15-minute intervals
- 7.3.4.6. Users shall be able to select from a full range reports and graphical displays on the GUI which shall include but not limited to:
  - *Total Volume*
  - *Average Speed*
  - *Average Time Occupancy*
  - *Space Occupancy Average Time Gap*
- 7.3.4.7. Users shall be able to select from a variety of graph styles to view historical as well as real time data:
  - *Stacked Bar*
  - *Stacked Area*
  - *Line*
  - *Stacked Column*

## 7.4. MOE Reports

- 7.4.1. The system shall optionally support the following graphical Measure of Effectiveness (MOE) monitors or displays. MOE displays or reports shall be based on high density data, collected by the controller at a frequency of 10 times per second.
- 7.4.2. The ATMS shall be able to selectively schedule MOE data collection through the system scheduler.
- 7.4.3. The user shall be able to schedule polling for individual intersections as well as for sections or subsections of intersections.
- 7.4.4. When MOE polling is enabled, the ATMS system shall upload MOE data once per minute.
- 7.4.5. The ATMS shall be capable of producing each MOE report based on a user selectable date for any date for which the system has collected MOE data.
- 7.4.6. MOE reports shall be provided as graphs or data plots over 24 hour periods.
- 7.4.7. The ATMS shall be capable of printing any of the MOE displays.
- 7.4.8. The ATMS shall provide means for archiving, restoring and purging MOE data from the ATMS database.
- 7.4.9. The MOE reports shall include the Purdue Coordination Diagram (PCD)
  - 7.4.9.1. The PCD shall be capable of reporting vehicle arrivals at the time in cycle for each cycle over a 24 hour period.
  - 7.4.9.2. The PCD shall visually map vehicle arrivals against the Green Band, Yellow Band and Red Band portions of the Cycle.
  - 7.4.9.3. The PCD shall visually indicate pattern changes throughout the day
  - 7.4.9.4. The ATMS shall be able to produce a PCD for each phase of a signal.
- 7.4.10. The MOE reports shall include a Cycle Length Report



- 7.4.10.1. The Cycle Length Report shall be capable of reporting cycle lengths for each cycle over a 24 hour period.
- 7.4.10.2. The Cycle Length Report shall be capable of displaying data in a scatter-plot format.
- 7.4.10.3. The Cycle Length Report shall visually indicate pattern changes throughout the day
- 7.4.10.4. The Cycle Length Report shall include a moving-average plot of the Cycle lengths throughout the day.
  
- 7.4.11. The MOE reports shall include a Flow Rate Report
  - 7.4.11.1. The Flow Rate Report shall be capable of reporting vehicle volumes reported for each cycle over a 24 hour period.
  - 7.4.11.2. The Flow Rate Report shall be capable of displaying data in a scatter-plot or line-plot format.
  - 7.4.11.3. The Flow Rate Report shall visually indicate pattern changes throughout the day
  - 7.4.11.4. The Flow Rate Report shall include a moving-average plot of the Volumes throughout the day.
  
- 7.4.12. The MOE reports shall include a Green Times Report
  - 7.4.12.1. The Green Time Report shall be capable of reporting length of green for any phase of a cycle as reported over a 24 hour period.
  - 7.4.12.2. The Green Time Report shall be capable of displaying Green Time data in a scatter-plot or line-plot format.
  - 7.4.12.3. The Green Time Report shall visually indicate pattern changes throughout the day
  - 7.4.12.4. The Green Time Report shall include a moving-average plot of the Green Times throughout the day.
  
- 7.4.13. The MOE reports shall include a Percent Ped Calls Report
  - 7.4.13.1. The Ped Calls Report shall be capable of reporting the percent of cycles affected by pedestrian calls for standard pedestrian phases of a cycle as reported over a 24 hour period.
  
- 7.4.14. The MOE reports shall include a Volume to Capacity Report
  - 7.4.14.1. The Volume to Capacity report shall be capable of reporting vehicle volume to capacity ratio reported for each cycle over a 24 hour period relative to the capacity of the intersection.
  - 7.4.14.2. The Volume to Capacity report shall be capable of displaying data in a scatter-plot or line-plot format.
  - 7.4.14.3. The Volume to Capacity report shall visually indicate pattern changes throughout the day
  - 7.4.14.4. The Volume to Capacity report shall be capable of including a moving-average plot of the data throughout the day.
  
- 7.4.15. The MOE reports shall include a Split Failures Report
  - 7.4.15.1. The Split Failure Report shall be capable of reporting the number split failures that occur as reported over a 24 hour period.
  - 7.4.15.2. The Split Failure Report shall provide graphical display of Split Failures for each phase of the intersection.
  - 7.4.15.3. The Split Failure Report shall display graphs for up to 8 phases.
  - 7.4.15.4. The Split Failure Report shall include a moving-average plot of Split Failures throughout



the day.

- 7.4.15.5. Split Failures shall be defined as occurrences of volume exceeding capacity as defined in the Volume to Capacity Report

## 7.5. Travel Time Module

- 7.5.1. The ATMS software shall support a seamless interface to retrieve real-time travel time information from TrafficCast BlueTOAD servers
- 7.5.2. The ATMS travel-time software module shall not be required to provide support for travel-time or speed for routes or segments where BlueTOAD data is unavailable.
- 7.5.3. ATMS System Map Support
  - 7.5.3.1. Upon establishment of a connection to the TrafficCast BlueTOAD servers, the ATMS software shall automatically configure and render travel time segments that bi-directionally trace actual roadway segments between neighboring BlueTOAD units as configured on the TrafficCast servers.
  - 7.5.3.2. The ATMS system map shall be capable of displaying color coded roadway segments using the underlying GIS database for rendering and reflecting user selectable travel-time or calculated thresholds using no less than three colors to indicate levels of travel time service in the various roadway segments.
  - 7.5.3.3. Users shall be able to easily control whether the travel time segments are displayed on the map or not.
  - 7.5.3.4. Using a mouse gesture, a user shall be able to easily determine the actual current travel time and calculated speed for any given segment.
- 7.5.4. The user shall be able to set the speed or travel-time threshold ranges as percent or later versions ages of the maximum speed associated with specific origin and destination pairs.
- 7.5.5. The Travel Time system shall provide graphical plots of travel times and speeds for selected roadway segments as defined by origin and destination pairs.
- 7.5.6. The ATMS shall be capable of providing pop-up alerts, email notifications and SMS text notifications indicating that speed or travel-time levels have crossed a threshold level of service.
- 7.5.7. Travel Time Reports - The ATMS shall provide reporting capabilities allowing users to see travel times and speed for selected roadway segments where travel time data is available.
  - 7.5.7.1. Travel Time reports shall show data in both graphical and tabular formats and shall be exportable in Microsoft Excel, Microsoft Word, PDF, CSV and other formats.
  - 7.5.7.2. The ATMS shall provide a report for travel time segments over a user selected reporting periods or intervals.
  - 7.5.7.3. The ATMS shall provide a report for travel time segments reported over multiple user selected non-consecutive or non-overlapping time periods over multiple time frames.
- 7.5.8. The Travel Time Module shall be available as an optional component to the ATMS and shall be enabled or disabled with a software license key.

## 7.6. Advanced CCTV Module

- 7.6.1. The ATMS software shall provide an advanced CCTV video monitoring system as an optional module (in addition to the Standard CCTV viewer).
  - 7.6.1.1. The CCTV system shall be IP-based and provide for network-based switching of digitized video streams.



- 7.6.1.2. The CCTV system shall be capable of supporting unicast and multicast video streams depending on the capabilities of the network switches and routers.
- 7.6.1.3. The CCTV system shall support multiple camera types and manufacturers.
- 7.6.1.4. The CCTV system shall support any number of multiple users or clients, based upon number of licenses provided
- 7.6.2. CCTV Cameras and Encoders
  - 7.6.2.1. The system shall support IP cameras that directly generate digital IP video streams.
  - 7.6.2.2. The system shall support analog video cameras attached to video encoders that encode the video into a digital IP video stream.
  - 7.6.2.3. The system shall support configuration of camera or encoder image size, quality, and frame-rate where supported by the hardware.
  - 7.6.2.4. Depending on the capability of the attached cameras or encoders, the system shall support Motion JPEG, MPEG4 Part 2 and MPEG4 Part 10 (H.264).
  - 7.6.2.5. The system shall support both fixed and PTZ cameras.
  - 7.6.2.6. The number of simultaneous video streams shall be limited only by the installed hardware, network bandwidth, and number of licensed cameras.
- 7.6.3. CCTV Clients
  - 7.6.3.1. The system shall support both rich-client and web browser means to view and control the cameras in the advanced CCTV option (i.e. for police or city use).
  - 7.6.3.2. The system shall support multiple, concurrent clients, each capable of opening multiple CCTV video player windows.
  - 7.6.3.3. The CCTV system shall be capable of supplying up to twenty (20) simultaneous video streams.
  - 7.6.3.4. The video player window shall provide mouse gestures to pan, tilt and zoom a PTZ camera. It shall be possible to zoom the camera by using the mouse scroll wheel.
  - 7.6.3.5. CCTV cameras shall be represented as devices on the system map or maps and in the system control tree view.
  - 7.6.3.6. The operator shall be able to double-click on a camera object in a map or tree to open the player window.
  - 7.6.3.7. It shall be possible to drag and drop the camera viewer window into a system container area.
  - 7.6.3.8. The client video player window shall support PTZ presets for cameras that support this feature. The player shall support as many presets as the camera supports up to a maximum of 255 presets.
  - 7.6.3.9. The client video player window shall support tours or timed switching between programmed cameras and presets. The system shall support up to 64 tours and up to 64 camera presets per tour. The dwell time for each camera preset or stop shall be configurable in seconds.
  - 7.6.3.10. The client player window shall provide the ability to stop the video stream and then restart the stream.
  - 7.6.3.11. The client player shall provide the ability to save a "snapshot" of the video image as a jpeg or bmp file.
- 7.6.4. CCTV Wall Monitors
  - 7.6.4.1. The CCTV system shall provide a means to display video images on a wall monitor or video wall.



- 7.6.4.2. It shall be possible to send camera tours (as described under the CCTV clients section above) to the wall.
- 7.6.4.3. A single video signal sent to a wall monitor shall be capable of displaying multiple video streams in tiled windows.

#### 7.6.5. *CCTV Security and Access*

- 7.6.5.1. Access to the CCTV system shall be controlled by privileges associated with user login names and passwords. Privileges shall exist to allow or disallow direct PTZ control of a camera, to allow or disallow playing of a predefined camera tour, and to allow or disallow creation of camera tours.
- 7.6.5.2. Each user shall have a priority setting to control which user has priority if more than one user attempts to access the PTZ control of a camera at the same time. Once a user has taken over the PTZ control of a camera, another user of equal or greater priority shall be able to assume camera control. Users with lower priority will be prevented from taking control of the camera until the current user relinquishes control or until a PTZ inactivity timer has expired (without any PTZ movement) at which point control will be relinquished.

#### 7.6.6. *CCTV Recording (Option)*

- 7.6.6.1. A separate video recording option (not included in the Standard CCTV system or Optional CCTV Module) shall exist to allow recording of video streams.
- 7.6.6.2. It shall be possible to start and stop recording from the client video player window.
- 7.6.6.3. It shall be possible to configure the CCTV system to record video based on a TOD schedule.

### 7.7. Dynamic Message Sign (DMS) Module

- 7.7.1. The vendor's ATMS system shall be capable of communicating with and managing Dynamic Message signs.
- 7.7.2. The ATMS shall provide support NTCIP 1203 objects associated with DMS devices and shall be capable of polling sign status as well as commanding messages to DMS devices.
- 7.7.3. The system shall manage DMS devices from the system entity tree
- 7.7.4. Icons for DMS devices shall be displayed on the system map with the ability to launch a sign status display capable of viewing and modifying the current message on a sign.
- 7.7.5. The system shall provide an editor for defining and storing messages. The editor shall be able to automatically determine the capabilities of the sign and constrain message definitions based on the sign capabilities.
- 7.7.6. The DMS editor shall support MULTI (Mark-Up Language for Transportation Information

### 7.8. Server to Server Module

- 7.8.1. The vendor's ATMS system shall be capable of operating in conjunction with other instances of the vendor's ATMS system owned and operated by neighboring agencies.
- 7.8.2. The Server to Server interface shall allow one agency to remotely command patterns and perform other control level operations on the other ATMS system.
- 7.8.3. One agency using the Server to Server interface shall be able to view another agency's devices on the system map and in the entity tree as if they were part of the home ATMS system.



7.8.4. Using the Server to Server interface, agencies shall be able to share real-time signal status data and detector data.

## 7.9. Synchro Support Module

- 7.9.1. The vendor's ATMS system shall be capable importing and exporting Synchro UTDF timing data.
- 7.9.2. After importing Synchro UTDF files, the vendor's ATMS shall be capable of storing timing and related data to the ATMS master database and shall be capable of downloading the timing data to the local controllers supported by the ATMS.
- 7.9.3. The vendor's ATMS shall support Synchro Version 10 UTDF formats.