



Centracs[®]

MMS



Introduction

1.1. System Software Overview

- 1.1.1. The system shall be a Commercially-available Off-the-Shelf (COTS) Product
- 1.1.2. The software shall provide, as a base, management data collection, monitoring and reporting software platform, onto which additional ITS applications can be integrated.
- 1.1.3. Any 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 2008 or newer
 - Server OS: Server 2008 or newer
 - Workstation OS: Vista or Windows 7 Professional or newer
 - Laptop OS: Vista or Windows 7 Professional or newer
- 1.1.5. The system shall provide a web server to support web-enabled mobile devices

1.2. System Software Architecture

- 1.2.1. The system shall use client/server architecture and distributed processing.
- 1.2.2. System Modularity shall provide the user the capability to add or modify functionality with little or no impact on currently installed modules or functionality.

1.3. System Software Updates

- 1.3.1. The central software shall incorporate a means for client workstations 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.

2. System Functionality

2.1. Asset and Inventory Management Tools

- 2.1.1. The system shall provide tools allowing users to create new types of assets.
 - 2.1.1.1. The system shall provide an asset-type editor allowing users to assign predefined properties or attributes to user defined asset.
 - 2.1.1.2. All new asset-types created by a user shall have a minimum of three attributes which include:
 - **Name**
 - **Service Date**
 - **Manufacturer**



- 2.1.1.3. The system 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**
- 2.1.1.4. The asset-type editor shall allow users to define custom asset attributes and specify validation formatting rules for new asset properties
- 2.1.1.5. At a minimum, users shall be able to create their own asset type attributes using:
- **Pull-down lists**
 - **Checkboxes**
 - **User definable text**
 - **Date-Time fields**
 - **Currency fields**
 - **Decimal fields**
 - **Integer fields**
 - **Downloadable files**
- 2.1.1.6. A set of predefined asset and location attributes can include, but are not limited to:
- **Manufacturer**
 - **Description**
 - **Model Number**
 - **Name**
 - **Owner**
 - **Serial Number**
 - **Warranty Date**
- 2.1.1.7. The asset-type editor shall allow users to create shared asset properties that can be used in any asset-type definition.
- 2.1.2. Users shall be able to create new assets and associate them with system and user defined locations.
- 2.1.3. The system shall support a variety of location types including:
- **Signalized intersections**
 - **Non-signalized intersections**
 - **CCTV locations**
 - **DMS locations**
 - **HAR locations**
 - **RWIS locations**
 - **Ramp Meter locations**
 - **Count Station locations**
 - **Warehouses**
 - **Vehicles**
 - **Manufacturers**
 - **Repair Depots**



- 2.1.4. The system shall provide a master inventory tool.
 - 2.1.4.1. The Master Inventory tool shall allow users to create and manage assets and inventory items.
 - 2.1.4.2. The Master Inventory tool shall allow users to move assets between locations using simple mouse controls to “drag” individual assets between locations.
 - 2.1.4.3. Movements of assets and inventory items shall be logged in the system database.
 - 2.1.4.4. The Master Inventory tool shall allow users to search for assets based on any user or system defined asset attributes.
- 2.1.5. The system 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.
- 2.1.6. The system shall allow users to define a straight-line depreciation schedule for specific types of assets and shall provide a report indicating both the investment in assets by locations and also the depreciated value of those assets.
- 2.1.7. The system shall provide a report indicating the total number of asset and inventory items
- 2.1.8. The system shall provide tools allowing users to define suppliers and manufactures of agency assets
- 2.1.9. The manufacturer information shall be used in Asset definitions and reports provided by the system.
- 2.1.10. The system shall provide a mobile interface allowing field technicians to move assets and inventory items between locations.

2.2. *Preventative Maintenance Tools*

- 2.2.1. The system shall provide tools allowing users to define and manage activities associated with Preventive Maintenance
 - 2.2.1.1. The system shall allow users to organize PM plans and activities by frequency, asset type, location, technician groups or by region.
 - 2.2.1.2. 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.
 - 2.2.1.3. Data entry documenting individual PM activities shall be accomplished using user defined and labeled check-boxes, pull-down lists, single-line comment fields and multi-line comment fields.
 - 2.2.1.4. The system 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.
 - 2.2.1.5. The system shall provide a means to combine tasks and checklists to form more complex PM activities lists.
- 2.2.2. The system 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.
 - 2.2.2.1. The system shall provide a calendar styled scheduler tool for managing preventive maintenance plans and schedules.
 - 2.2.2.2. 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.
 - 2.2.2.3. Users shall be able to double click on any plan displayed on the calendar and edit the plan or delete the plan.
 - 2.2.2.4. Users shall be able to navigate the calendar, moving both forward and backward through the months.
- 2.2.3. 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.



- 2.2.4. The system shall provide an integrated tool that will allow a user to see what PM activities, if any have been accomplished at a given location. This tool shall be accessible by mouse clicks associated with an asset location indicated by an icon on the map
- 2.2.5. In the event that a PM is started, but not completed, the system shall log the tasks that have been completed or not and will allow users doing follow-up to avoid repeating tasks already performed.
- 2.2.6. The system shall provide reports documenting all aspects of PM by location, asset, technician group and time periods
 - 2.2.6.1. Reports shall be provided to indicate PM tasks that are coming due or that are past due.
 - 2.2.6.2. A report shall be provided to indicate what PM tasks have been performed, when the task was started and completed and by whom the task was accomplished
- 2.2.7. The system shall provide a mobile interface allowing field technicians to document all PM activities performed in the field.

2.3. Call Ticket Support

- 2.3.1. The system shall provide a tickets window, displaying all active calls or events resulting in a call-ticket or work-order with information about the nature of the problem, the contact or originator of the call and the current status of the call-ticket.
- 2.3.2. Ticket status on the system map and in other tools shall be indicated using a flag icon having the following colored designations
 - Red shall indicate a new ticket that has been created and assigned to a technician or group but has not been acknowledged or accepted
 - Yellow shall indicate that a ticket assignment has been accepted by a user
 - Purple shall indicate that the ticket or work order has been started but the technician is not yet on site.
 - Green shall indicate that the technician is on site and work is underway on the ticket.
 - Blue shall indicate that the work order or call-ticket is completed, but follow-up work is needed.
- 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.
- 2.3.4. The alert window shall provide a means by which users can acknowledge, un-acknowledge, and close individual critical and warning alerts.
- 2.3.5. All acknowledgements, un-acknowledgements, and closures shall be time and date stamped with the user's credentials upon change of status.
- 2.3.6. The system shall allow the creation of "user groups" for the purpose of assigning responsibilities for call-tickets, work-orders and PM tasks for specific locations or assets.
- 2.3.7. The system shall be able to automatically assign a new call-ticket to a specific user within user group. A user with supervisory access shall be able to reassign a ticket to a user different from the originally assigned user.
- 2.3.8. The system shall allow tickets to be prioritized as "High", "Normal" or "Low".
- 2.3.9. The system shall provide automated ticket notifications.
 - 2.3.9.1. The system shall be capable of sending an SMS text message and/or emails to individuals or groups of individuals, informing them that a new call-ticket or work-order has been created and assigned to them.
 - 2.3.9.2. Users shall be able to acknowledge a ticket that has been assigned to them.
 - 2.3.9.3. The system shall provide an escalation mechanism whereby tickets that are not acknowledged within a user specified timeframe will be pushed to additional users in order to make sure problems receive the desired attention.



When the MMS system is also integrated with an ATMS system, the MMS system shall also be capable of generating call tickets using alarm notifications originating with the ATMS. These alarm conditions may include: Flash, communications failures, detector failures and other notifications as provided through the ATMS.

2.4. Mobile Device Support

- 2.4.1. The system shall provide a web service allowing users with mobile devices with web browser support to interface with the system
- 2.4.2. The mobile web browser interface shall require a user login and password to access the system
- 2.4.3. The mobile web browser interface shall function on hand-held devices with web-browsers including, but not limited to
 - Google Chrome
 - Firefox
 - Internet Explorer
- 2.4.4. Users shall be required to login to the mobile device with a user name and password.
- 2.4.5. The mobile interface shall provide a means for users to view currently open trouble tickets and work orders and scheduled PM.
 - 2.4.5.1. 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.
 - 2.4.5.2. 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
 - Reassignment of a trouble ticket or work order to another technician
- 2.4.6. 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.
- 2.4.7. The system shall provide tools allowing agencies to define their own preventive maintenance plan checklists and activities.
 - 2.4.7.1. Preventive maintenance plan checklists and activities shall be automatically incorporated into the mobile interface.
 - 2.4.7.2. No special programming by a user shall be required to create and define checklists and PM activities.
- 2.4.8. Users shall be able to download electronic files, such as drawings, images or user documentation associated with specific locations or assets.
- 2.4.9. Users shall be able to create new tickets and work orders using the mobile interface.

3. User Software Interface

3.1. General Display Features

- 3.1.1. 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.





- 3.1.1.1. Upon being dropped, or docked in a container, the window shall automatically resize to fill the area.
 - 3.1.1.2. 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.
 - 3.1.1.3. It shall also be possible to float or to un-dock windows by clicking a button in the window's title bar.
 - 3.1.1.4. 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.
 - 3.1.1.5. It shall be possible to open multiple application windows, each of which shall include container areas as previously described for the main application window.
 - 3.1.1.6. It shall be possible for the user to select different arrangements or numbers of container areas in the main application windows.
 - 3.1.1.7. It shall be possible to change the size of container areas by clicking and dragging the border between container areas.
- 3.1.2. 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.
- 3.1.3. The restoration at login, of a user's last known preference set shall be independent of the most recent workstation used by the user.
- 3.1.4. 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

3.2. Main Map Display

- 3.2.1. The system shall incorporate an agency-wide map as a component of the main graphics display.
- 3.2.1.1. Maps may be docked in any or all of the available "containers".
 - 3.2.1.2. Any maps docked into multiple containers shall be refreshed simultaneously.
 - 3.2.1.3. The map displays shall have pan and zoom capabilities.
 - 3.2.1.4. Zoom level ranges shall be configurable.
 - 3.2.1.5. 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
 - 3.2.1.6. 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.
 - 3.2.1.7. At each zoom level range, the display of different dynamic status and real-time status data shall be configured.
 - 3.2.1.8. It shall be possible for a user to interactively enable or disable the display of defined map layers.
- 3.2.2. The system shall be capable to employing multiple map sources for the base map. These sources shall include, but not limited to:
- Navtec
 - ESRI shape files
 - Bing Maps
 - WMS Maps
- 3.2.3. An integrated map editing tool shall be provided to allow users to place icons and symbols on the map to represent various types of ITS and other locations on the map for the purposes of monitoring and accessing information about the locations and any assets and call-ticket status information related to the location.
- 3.2.3.1. The system editor tool shall allow a user to place a special icon on the map that will be used by the system to indicate that a service call ticket is currently active at a specific location
 - 3.2.3.2. The system shall support a variety of locations and provide icons related to the different types of



locations. At a minimum, location types shall include:

- Signalized intersections
- Non-signalized intersections
- CCTV locations
- DMS locations
- HAR locations
- RWIS locations
- Ramp Meter locations
- Count Station locations
- Warehouses
- Vehicles
- Manufacturers
- Repair Depots

3.2.3.3. The system shall periodically update the status of service-call tickets and supported ITS equipment on all map display. Ticket status shall be indicated by a color coded flag using 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.

3.3. *Schedulers*

3.3.1. 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

3.3.2. The system shall provide a calendar styled scheduler tool for managing the On-Call schedule.

- 3.3.2.1. 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.
- 3.3.2.2. 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.
- 3.3.2.3. Users shall be able to double click on any plan displayed on the calendar and edit or delete the plan.
- 3.3.2.4. Users shall be able to navigate the calendar, moving both forward and backward through the months.
- 3.3.2.5. 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.
- 3.3.2.6. 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.

3.4. *Additional Displays*

3.4.1. 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:

3.4.2. Entity Tree

- 3.4.2.1. All assets and locations configured in the system shall be displayable on an “entity tree”.
- 3.4.2.2. 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.
- 3.4.2.3. The user shall be able to add any device or location to the entity tree by right-clicking in the window and selecting the appropriate device type to add.
 - 3.4.2.4. The location shall 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.
 - 3.4.2.5. The Entity Tree shall list all the installed locations on the system, and shall be common across all workstations.

3.4.3. Alerts

- 3.4.3.1. 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.
 - 3.4.3.2. The system shall provide an alerts window, displaying all alerts from the system or field devices, along with specific details including alert aging.
 - 3.4.3.3. This display shall be updated in real time with the event details, along with a time and date stamp and any acknowledgement information.
 - 3.4.3.4. Alerts shall provide three levels of user-definable criticality:
 - Critical (highest level)
 - Warning (medium level)
 - Information (lowest level)
- 3.4.4. The alert window shall provide a means by which users can acknowledge, un-acknowledge, and close individual critical and warning alerts.
- 3.4.5. All acknowledgements, un-acknowledgements, and closures shall be time and date stamped with the user's credentials upon change of status.

3.5. System and Operational Reports

- 3.5.1. The system 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 and Inventory Counts
 - Asset History
 - Inventory Stock Levels
 - Trouble Ticket Status History
 - On Call Schedule
- 3.5.2. Each report shall allow users to select report parameters and to customize report filtering and data selection.
- 3.5.3. 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.
- 3.5.4. User Reports shall be able to be marked as "private" or "public" thus controlling whether other users are allowed access to run the report.
- 3.5.5. 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.
- 3.5.6. Report output formats shall include at a minimum PDF, Microsoft Word and Microsoft Excel formats.

3.6. Database Administration, Security, and System Access

- 3.6.1. The system shall provide, at the top level, the ability to manage the MMS system and all tickets, work orders, preventive maintenance and on-call schedules, assets, user login credentials, system maps and configuration parameters from one central location.



- 3.6.2. Each system client workstation, laptop or mobile device shall require a username and password for any user as 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.
- 3.6.3. The system shall allow for user and group privileges to be defined and assigned by the Administrator.
- 3.6.4. Operating privileges should be available for the following:
- 3.6.4.1. System Administrator Configuration – full access to all system functions
 - 3.6.4.2. Inter-jurisdictional control – full access, partial access, read-only access to other agencies field locations, status, and logs.
 - 3.6.4.3. User Profile Configuration – full access or read-only access to functions below (at a minimum), regardless of device type:
 - 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
 - GUI settings and editing – modifying desktop settings
 - Communications configurations – modifying communications to the field

4. Optional Modules

4.1. Signal Control and Management Module

- 4.1.1. The MMS shall be capable of seamlessly integrating with a full featured, commercial off the shelf Advanced Transportation Management System (ATMS).
- 4.1.1.1. The ATMS shall utilize the same map interface, entity tree and other components as the MMS
 - 4.1.1.2. Icons representing signal controllers shall be displayable on the map and shall provide a color-coded status indications for flash, free, coordination, communications failures, off-line, transition, traffic responsive control and manual command control.
 - 4.1.1.3. The ATMS functionality shall be capable of real-time (at least once per second) polling communication with traffic signal controllers, bringing back signal phase status, alarm status and other information using NTCIP.
 - 4.1.1.4. The ATMS shall be capable of providing a variety of intersection control modes including:
 - *Traffic Responsive (TR)*
 - *Traffic Adaptive*
 - *Manual*
 - *Time of Day*
 - *Local*
 - *Flash*
 - 4.1.1.5. The ATMS module shall be capable of automatically creating and dispatching trouble tickets through the MMS when alarm conditions, such as signal flash, communication failures, detector faults and coordination failures are detected.
 - 4.1.1.6. The ATMS module shall support the following signal controller equipment:
 - *Econolite ASC/3 NEMA, 2070, ASC/3 Rack Mount*
 - *Econolite ASC/2s NEMA*
 - *Econolite Cobalt*
 - *Econolite Oasis*
 - *Wapiti 170 controllers W4IKS*
 - *Siemens SEPAC controllers running software version 4.01d and 4.01f*
 - 4.1.1.7. 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*

4.2. Dynamic Message Sign Module

- 4.2.1. As an optional module, the vendor's MMS system shall be capable of communicating with and managing Dynamic Message signs.
- 4.2.2. The MMS 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.
- 4.2.3. The system shall manage DMS devices from the system entity tree
- 4.2.4. 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.
- 4.2.5. 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.
- 4.2.6. The DMS editor shall support MULTI (Mark-Up Language for Transportation Information)

4.3. Advanced CCTV Module

- 4.3.1. The CCTV module software shall seamlessly integrate as an optional module with the MMS system allowing users to add new CCTV cameras to the entity tree and the map.
- 4.3.2. The CCTV video monitoring system shall utilize Ethernet communications and support both unicast and multicast video streaming depending on the capabilities of the devices and the network switches and routers.
- 4.3.3. Users shall be able to pan, tilt and zoom CCTV cameras using mouse gestures for cameras having PTZ capabilities.
- 4.3.4. The CCTV system shall support multiple camera types, video encoders and decoders from multiple manufacturers.
- 4.3.5. The system shall support up to twenty (20) simultaneous video streams may be possible depending on the installed hardware, network bandwidth, frame rates, video quality and number of licensed cameras.
- 4.3.6. CCTV Security and Access
 - 4.3.6.1. 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.
 - 4.3.6.2. 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, that user shall maintain control of the camera from any equal or lower priority user until a PTZ inactivity timer has expired (without any PTZ movement) at which point control will be relinquished.