

Next Generation COMPASS Lite

*Proven software solutions to
military, governmental and
scientific organizations worldwide*



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What is it?

COMPASS gathers information about traffic flow and then uses that data to display real-time traffic information such as vehicle speed and density.

Using dynamic message signs (DMS), MTO operators then inform drivers of impending traffic congestion as well as managing the dispatch of emergency services to incident sites.

COMPASS Lite is a lightweight system for traffic management for smaller cities and rural areas

History

COMPASS was initially deployed in Mississauga (1985) and Burlington (1986), while Toronto received its first COMPASS system in 1990.

The development of the Next Generation COMPASS System (NGCS) began in 2005, and since 2010 and has been operating continuously in the Toronto and Burlington Traffic Operation Centres (TOCs)

COMPASS works well for central (Toronto), what about Eastern/Western/Northern Ontario regions?

Next Generation COMPASS Lite

The screenshot displays the COMPASS Lite web application interface. The top navigation bar includes: Map View, Device View, Event View, Alarm View, CommLog, Admin, Event Mgmt, Map, Settings, and Help. The left sidebar contains a tree view of the road network, including options for Google Traffic Data, Crossings, Events, Segment, DMSMessage, CCTV, and DMS. The main map area shows a 3D view of a highway with a DMS (Dynamic Message Sign) overlay. A detailed popup window for DMS ID: 400VN0020VSS provides the following information:

DMS Information - ID: 400VN0020VSS	
ID:	400VN0020VSS
Description:	400 Southbound South of Rutherford
Latitude:	43°49' 29.04"
Longitude:	-80°27' 13.32"
Highway:	400
Direction:	1
Domain:	1
Adjacent Domain:	2
Collector / Express:	0
Site Number:	DTOC-42
DMS Type:	1

The popup also shows a 'Current Message' section with a yellow sign reading 'PLEASE GIVE MOTORCYCLES SPACE FOR SLIPY'. Below the map, a status bar indicates: Communication with server (idle), Rendering of layers (idle), and Rendering of tree (idle). A 'Dismiss DMS Response' button is visible at the bottom of the popup.

Needed a 'light weight' simple browser based system that can better focus on the rest of Ontario, for example:

- Boarder advisory service
- Queue warning
- No Ontario Road Network mapping
- No Collector / Express

The NGCS-lite Architecture

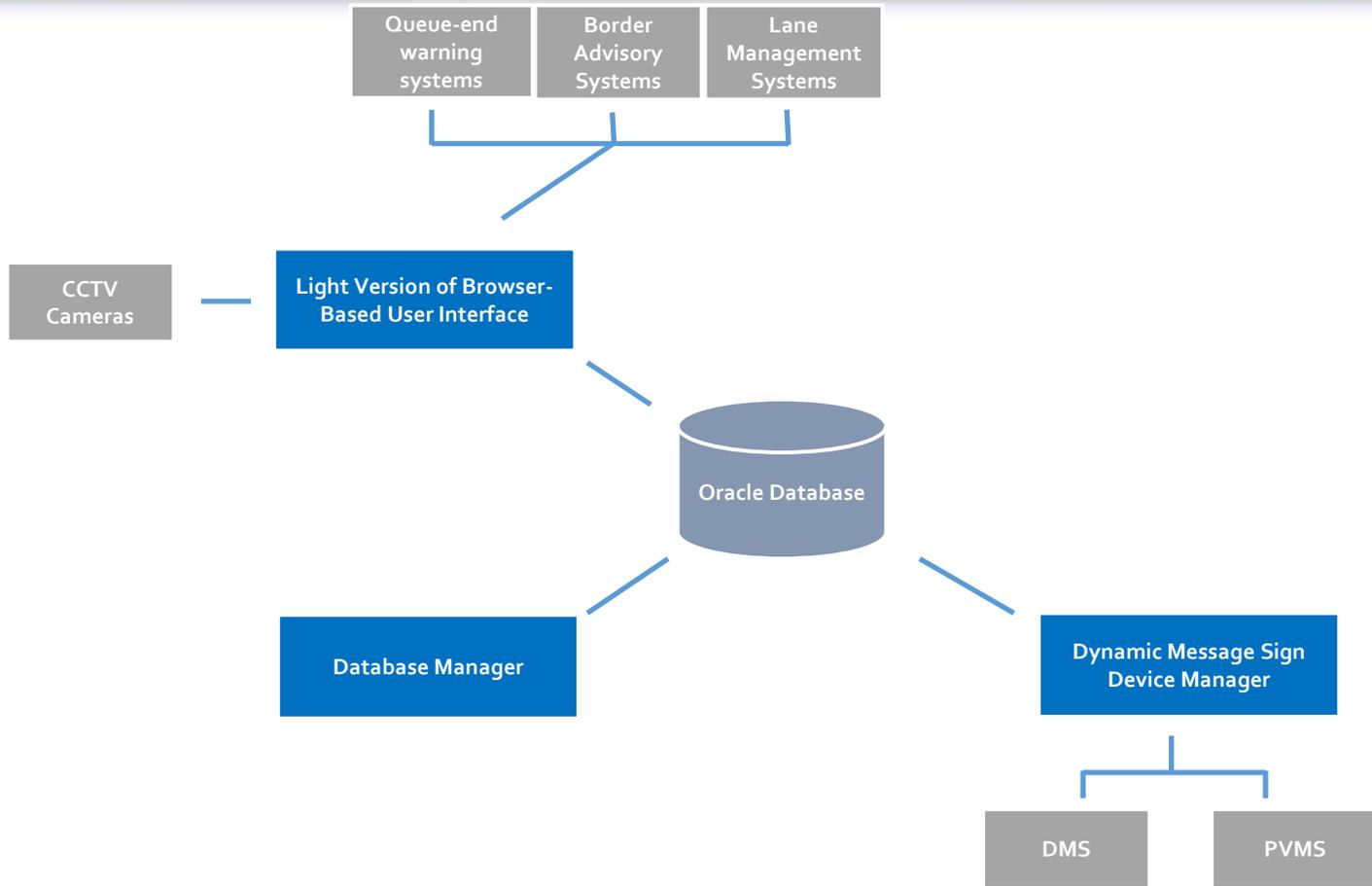


Figure 2: Components of the Light Version of Next Generation Compass System (NGCS-Lite)

Key Features

CCTV Information - ID: 401TE0330TEC

ID: 401TE0330TEC
Description: Highway 401 near Kingston Road
Latitude: 43°47' 41.49"
Longitude: -80°50' 50.68"
Highway: HWY 401
Direction: 3
Domain: 1
Adjacent Domain: 2
Camera Code:



Real-time monitoring of current traffic congestion.

Real-time (automatic) selection and updating of upstream and proximal DMS and PVMS.

Web based interface allows access to real-time data to *remote* responders.

Google Maps used for GIS data (could also use Bing or OpenStreetMap).

All device polling, monitoring, and management is through SNMP. GUI makes it easy to add new devices.

Incident Alarm Management

Data Archival Management

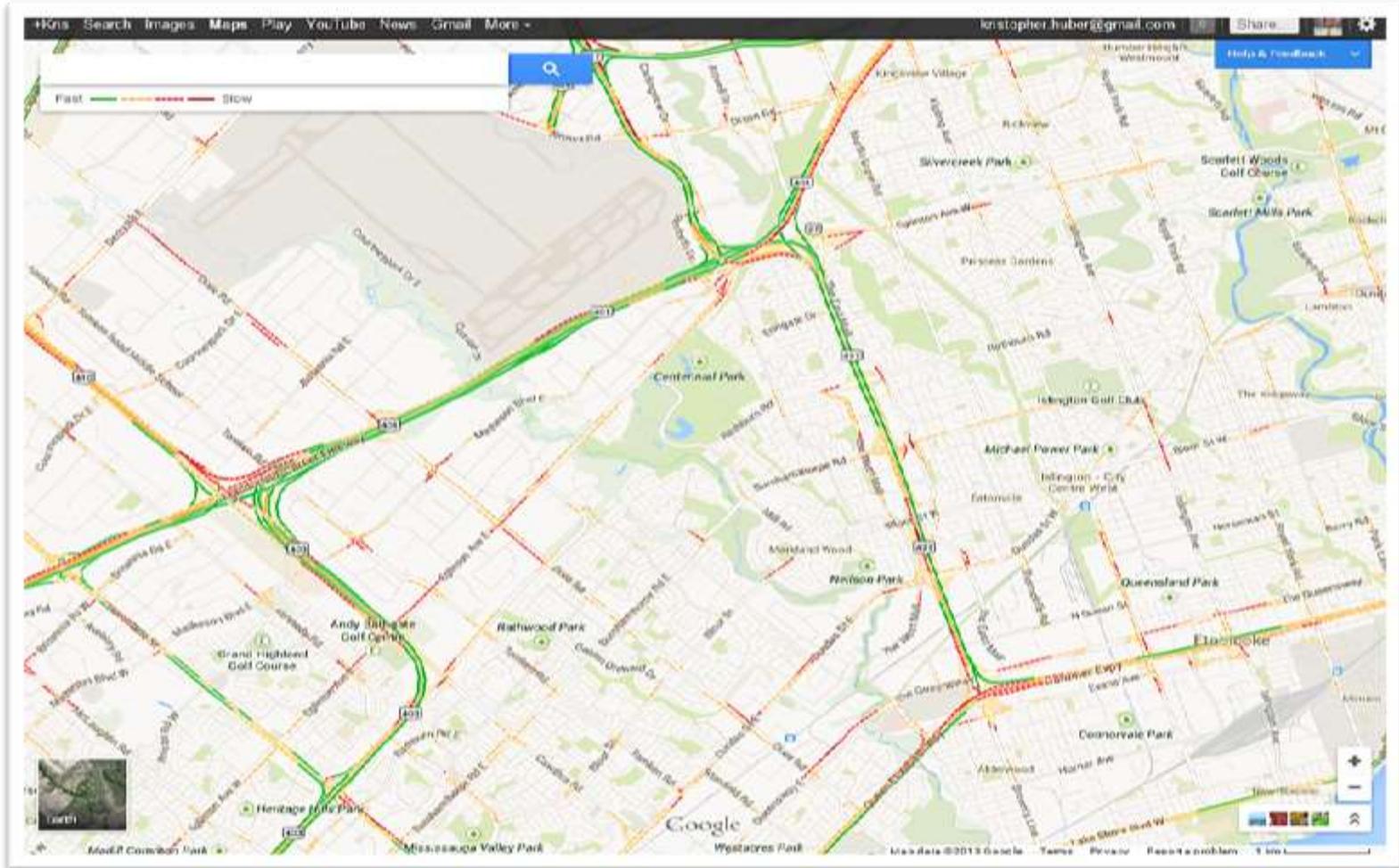
Scheduled Reporting and Report Generation

Border Advisory System (BAS)

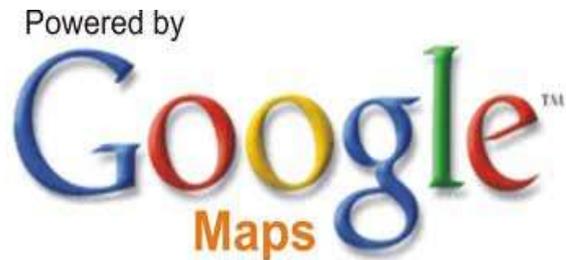
Queue Warning System (QWS)

Lane Management System (LMS)

Lightweight Portable Architecture



Lightweight Portable Architecture



Only the browser need be installed on remote systems

Makes supporting the system more straightforward, since most IT infrastructure and staffing is available in Central Region.

This allows trusted organizations with access to see the same real-time information that the traffic control center operators do - We can control what information is visible to each user according to region or role, so it is possible to share information with first responders (for example) without giving them full TOC operator privileges

Application server physically resident at user's Traffic Operations Center.

Benefits of Google Maps

Sophisticated functions like **Traffic Layer**, **Construction**, **Satellite** and **Streetview** are available

Use of Google Maps means that maintenance of the map is Google's responsibility rather than the Ministry's. – i.e. Google provides regular map updates.

Removes the need of the user to provide their own Ontario Road Network (ORN) database for spatial information.

ORN data is often variable between jurisdictions, this makes management of border crossings more challenging. Removes the issues of multiple road names between jurisdictions.

In the event that outside connectivity (Google Maps) is unavailable, **all functions are available from textual GUIs without any dependence on Google services.**

Extending Layers in Google Maps View

COMPASS lite embeds Google Maps and extends it with dedicated layers for:

Events

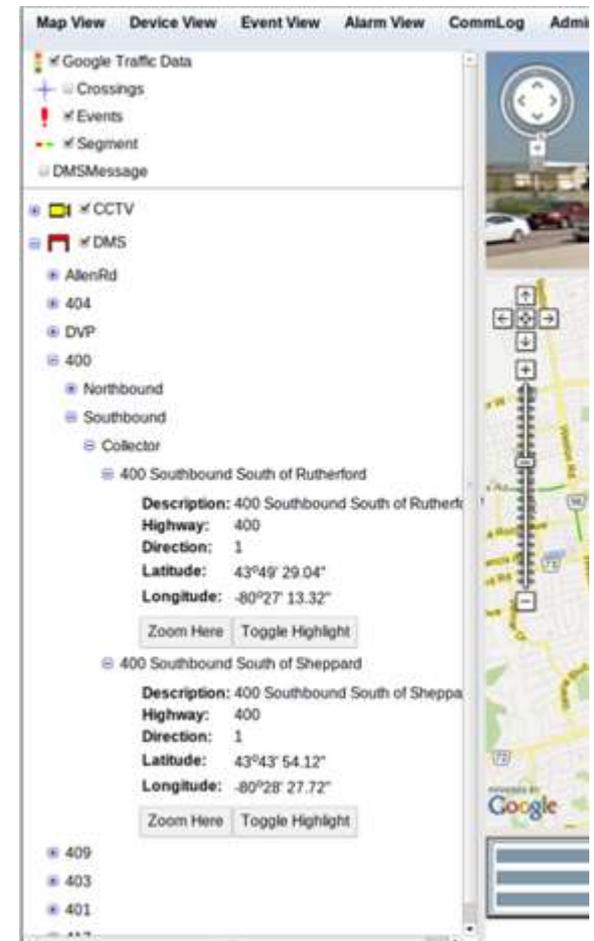
Devices

- CCTV
- DMS / PVMS

Subsystems

- Queue Warning Systems
- Boarder Advisory system
- Lane Management Systems

Zone congestion levels (realtime traffic)



Event Management on CAT



Traffic Events – defined by crossings

- Incident
- Roadwork
- Flooding etc.

Area Events – apply to one or more 'Jurisdictional Areas'

- Amber Alert
- Civic Event (sports stadium)
- Adverse Weather

Event & Traffic Layer

Event & Traffic shows layers for:

- Google Traffic
- Active Event
- Roadwork Notifications
- NGCS Traffic Flow

Selecting an incident brings up a dialogue box providing additional information.

The screenshot shows a web-based traffic management interface. At the top is a navigation menu with options like 'Map View', 'Comm Log', 'Active Events', 'Roadwork Notification', 'Devices', 'Other Systems', 'Alarms', 'Admin', 'Log Out', 'Map Options', and 'Help'. On the left, there are several control panels:

- Events & Traffic Layer:** Includes checkboxes for 'Google Traffic', 'Active Events' (checked), 'Roadwork Notifications', and 'NGCS Traffic Flow'.
- DEVICES:** A section for managing various devices.
- Other Subsystems:** Includes 'Border Advisory System (BAS)', 'Lane Management System (LMS)', and 'Queue Warning System (QWS)', each with sub-options for signs and ATC.

The main map area shows a satellite view of the Detroit region. A yellow warning icon is placed on a road near the city. A pop-up window is open over this icon, displaying the following information:

HWY 402 Westbound [CHRISTINA ST N UP IC-2-SARNIA -] right lane blocked - Disable Vehicle

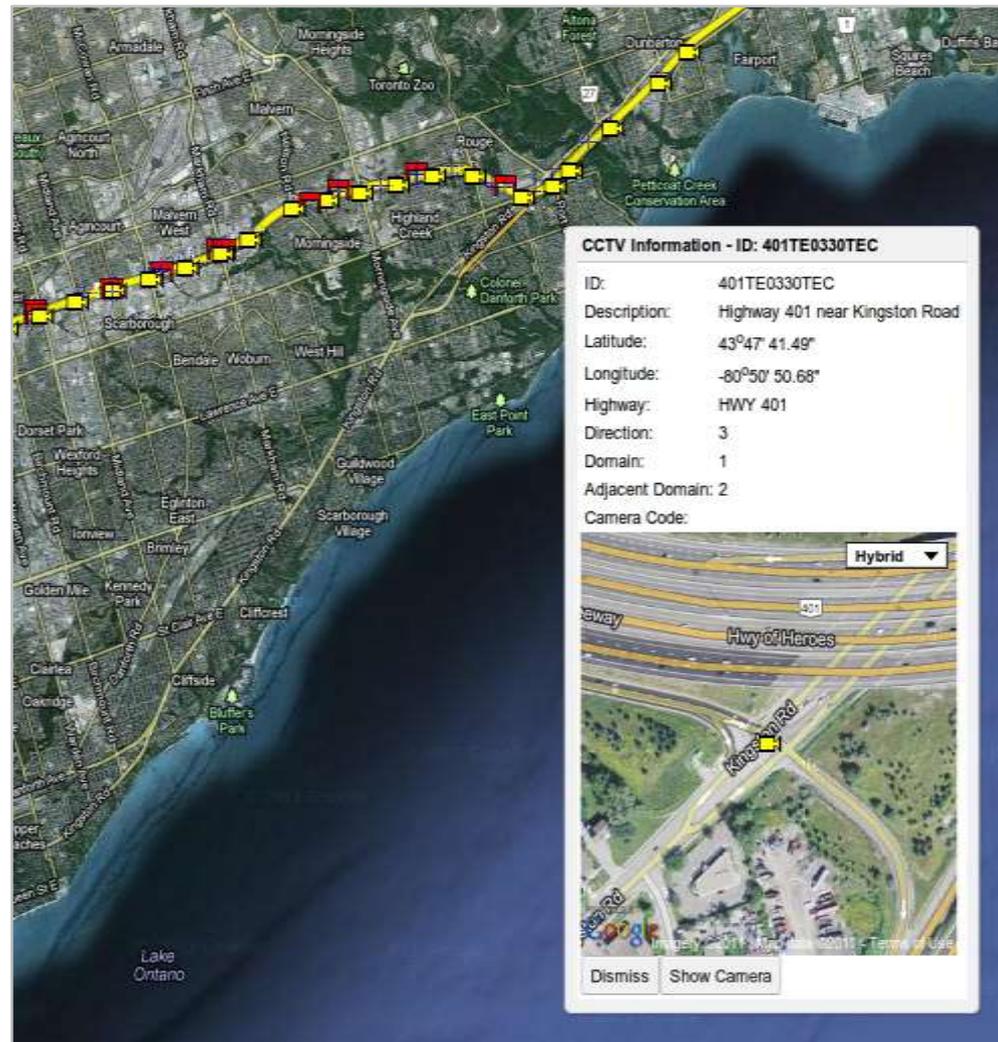
ID	374790
Description	HWY 402 Westbound [CHRISTINA ST N UP IC-2-SARNIA -] right lane blocked - Disable Vehicle
Latitude	42.9880753
Longitude	-82.3981898
Event Type	Incident
Event Start	2013-04-16 13:11
Public Comment	
Domain	London Traffic Operations Centre (LTOC)
Last Updated	Updated 2013-05-27 10:32

At the bottom of the pop-up window are 'Close' and 'Update' buttons.

CCTV Devices

COMPASS lite provides functions for viewing of CCTV camera footage in a pop-up window and for controlling CCTV cameras:

- Camera selection
- Pan, tilt, zoom
- Iris
- Focus



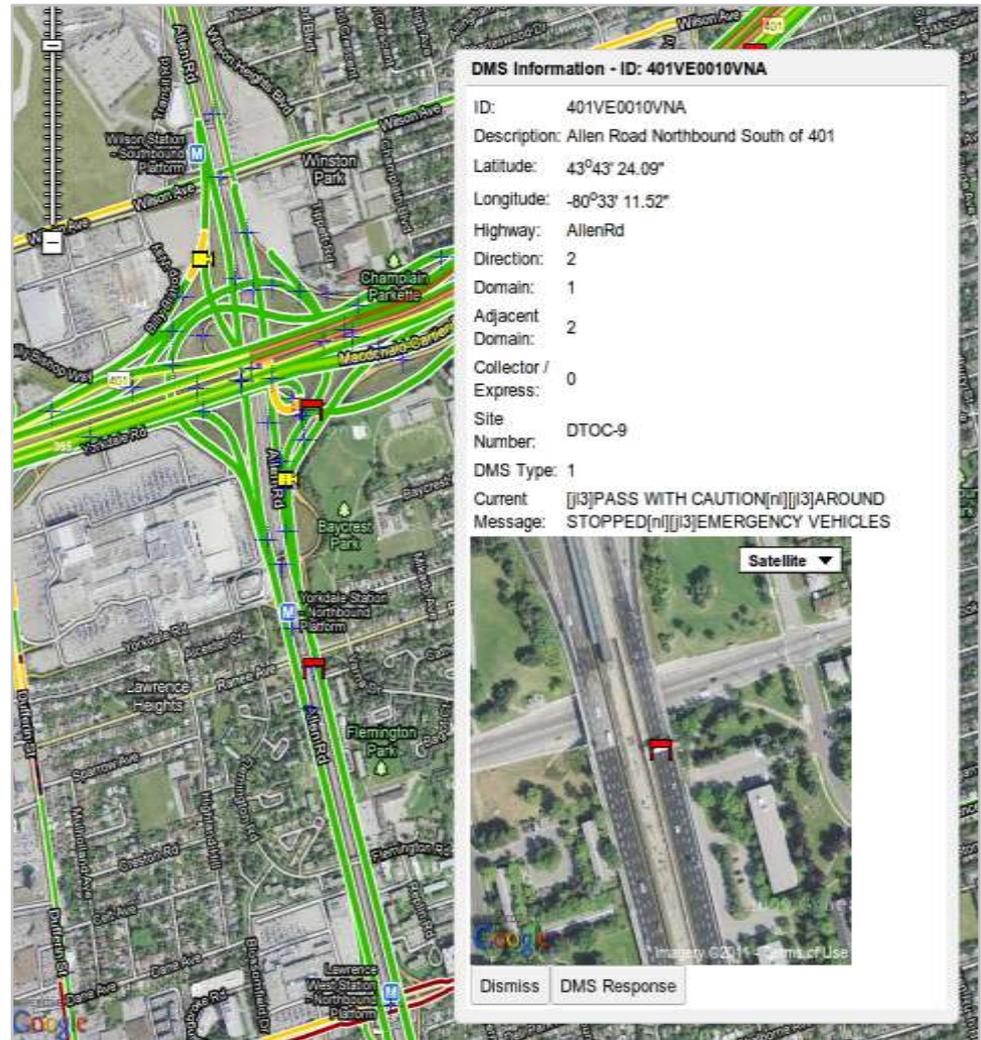
DMS / PVMS Devices

COMPASS lite provides functions for monitoring the status of DMS signs and for commanding messaging:

- Automatically suggest response to an event
- Operator initiated manual messaging

Functions will be provided for:

- Monitoring currently displayed message
- Obtaining PVMS lat / long position from GPS.



The screenshot displays a map of an urban area with a road highlighted in green. A data panel on the right provides the following information:

DMS Information - ID: 401VE0010VNA	
ID:	401VE0010VNA
Description:	Allen Road Northbound South of 401
Latitude:	43°43' 24.09"
Longitude:	-80°33' 11.52"
Highway:	AllenRd
Direction:	2
Domain:	1
Adjacent Domain:	2
Collector / Express:	0
Site Number:	DTOC-9
DMS Type:	1
Current Message:	[[i3]PASS WITH CAUTION[n]]i3]AROUND
Message:	STOPPED[n]]i3]EMERGENCY VEHICLES

Below the data panel is a satellite view of the road with a red marker indicating the DMS location. At the bottom of the panel are buttons for "Dismiss" and "DMS Response".

Event Management

EVENT DECLARATION

	<input type="text" value="401"/>
Highway:	<div style="border: 1px solid gray; padding: 2px;"><div style="background-color: #e0e0e0; padding: 2px;">HWY 401</div><div style="padding: 2px;">ALLEN ROAD</div><div style="padding: 2px;">BURLINGTON STREET</div><div style="padding: 2px;">EAST MAIN ST WELLAND</div></div>
Direction:	<input type="text" value="Westbound"/>
Roadway:	<input type="text" value="Single Roadway"/>
From:	<input type="text" value="keele"/> <input type="text" value="At"/> <input type="text" value="KEELE ST"/>
To:	<input type="text"/> <input type="text" value="Beyond"/> <input type="text" value="(WE01H) 401 W. EXP BEYOND KEELE BEFORE BASKET WEAVE"/>
Blockage Pattern:	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Comment:	<div style="border: 1px solid gray; padding: 5px; min-height: 30px;">Debris in left hand lanes.</div>

An event declaration is performed using the operators database of crossing information.

Fields are selected sequentially and are filtered in real-time allowing rapid data entry.

DMS / PVMS Sign Selection

For Incidents / Roadworks:

Compute 'Upstream List' - the DMS signs on the same highway, in same direction of travel, upstream of the event, within some parameterized distance along the highway. (Selected by default)

Compute 'Adjacent List' – '**Area of Influence**'. DMS signs not on the same highway but within a parameterized radius of the event. (Shown in list but not selected by default)



For Area Events:

Compute list of all signs designated for that type of event, and in the appropriate area

For Border Crossing Events:

Compute list of all signs designated for that type of event, and in the appropriate border crossing

Automated DMS Response

DMS ID	Current Message	Preview	Proposed Message	Preview
<input type="checkbox"/> 401VE0060VSF	[[3]DONT DRINK AND DRIVE[[3]POLICE PATROLLED	DON	[[3]401 WESTBOUND SINGLE ROADWAY[[3]3 LEFT LANES B	11111111111111111111 L2LHS c RHS Test 3
<input checked="" type="checkbox"/> 401VE0070VNF	[[3]PASS WITH CAUTION[[3]AROUND STOPPED[[3]EMERK	PASS WITH CAUTION AROUND STOPPED EMERGENCY VEHICLES	[[3]401 WESTBOUND SINGLE ROADWAY[[3]3 LEFT LANES B	11111111111111111111 L2LHS c RHS Test 3
<input checked="" type="checkbox"/> 401VE0030VEC	[[3]PUT SAFETY FIRST[[3]DONT DRINK AND DRIVE	PUT SAFETY FIRST DON	[[3]SINGLE ROADWAY 3 LEFT LANES BLOCKED[[3]AT VMS V	11111111111111111111 L2LHS c RHS Test 3
<input type="checkbox"/> 401VE0040VEE			[[3]SINGLE ROADWAY 3 LEFT LANES BLOCKED[[3]AT VMS V	11111111111111111111 L2LHS c RHS Test 3
<input type="checkbox"/> 401VE0040VWE	[[3]CHECK YOUR MIRRORS[[3]FOR MOTORCYCLES	CHECK YOUR MIRRORS FOR MOTORCYCLES	[[3]SINGLE ROADWAY 3 LEFT LANES BLOCKED[[3]AT VMS V	11111111111111111111 L2LHS c RHS Test 3

The CAT System is able to automatically propose DMS/PVMS messaging in response to events.

Message composition is based on library of template messages (French and English).

All proposed signing is subject to operator review prior to dispatch.

Operator can manually adjust message if necessary.

Communications Log

CommLog Edit

Log ID: 2011100311053300

Category: Road Work

Roadname: QEW

Direction: Fort Erie Bound

Roadtype: Ramp

From: Gardiner west

To: Thompson

Subject: long term ramp closure until November

Status: ongoing

CommLog Detail History

Log Date	Category	From Location	To Location	Callback No.	Details
18-AUG-11	ROADWORK	Direct Traffic - Kettle	ETOC	Direct Traffic - Kettle	closing the ramp until

Linked Events

LINK ACTIVE EVENTS

Event ID	Event Type	Roadname/News	Direction	Road Type	From Location	To Location
LINK6	>Controlling	Incident	QEW	Fort Erie Bound	Ramp	8

Linked Major Incident Report

[Add NEW MIRC](#) [LINK MIRC](#)

Report ID	Report Name	Highway	Location	Report Status
No items to show				

Linked CommLog

[LINK Other CommLog](#)

CommLog ID	Category	Subject	Location/Description	Termination
LINK6	20111003110546291	Road Work	long term ramp closure until November	P
LINK6	20111003110505105	Road Work	right lane closure until MPT 8:00C	P

SAVE DETAILS CLEAR EXIT

Logging of all telephone, radio, email, and in-person communications into or out of the TOC.

Agency specific report generation

COMMLIST

[ADD NEW](#) [REPORT](#) [EXIT](#)

User: in

ID	Log Date	Category	Roadname	Direction	Roadtype	From	To	Subject	Status	VLog	Fatality
2011100309540322	03-OCT-11	Road Work	HWY 12	Southbound	Ramp	Talbot		ramp closure until October 9	ongoing	NO	NO
2011100310485796	03-OCT-11	Road Work	HWY 400	Northbound	Single Roadway	beyond HWY 11		left lane closure until October 9	ongoing	NO	NO
2011100310510571	03-OCT-11	Road Work	HWY 400	Northbound	Single Roadway	Forbes	Horseshoe Valley Rd	right lane closure until October 9	ongoing	NO	NO
2011100310545843	02-OCT-11	Road Work	HWY 12	BOTH	Single Roadway	Wye Marsh Rd	Old Fort Rd	left lane closure	ongoing	NO	NO
2011100310594662	23-AUG-11	Road Work	HWY 427	Northbound	Ramp	Eglinton East/b		long term ramp closure until November	ongoing	NO	NO
2011100311053300	18-AUG-11	Road Work	QEW	Fort Erie Bound	Ramp	Gardiner west		long term ramp closure until November	ongoing	NO	NO
2011100311195415	03-AUG-11	Road Work	HWY 427	Southbound	On Ramp	Eva Rd		long term ramp closure until November	ongoing	NO	NO
2011100311233276	27-JUN-11	Road Work	QEW	Toronto bound	Single Roadway	Central Ave	Gilmore	long term closure - 2 right lanes	ongoing	NO	NO
2011100311305907	23-JUN-11	Road Work	QEW	Fort Erie Bound	Single Roadway	Gilmore	Thompson	long term lane closure	ongoing	NO	NO

[ONGOING CommLog List](#)

Summary Benefits of COMPASS lite

Comprehensive event management system, for traffic and various types of events

Complement to COMPASS to provide real-time monitoring and management of current traffic events outside of Central Region.

Doesn't require Ontario Road Network but instead uses open source mapping software

Provides additional features such as:

- Queue Warning System
- Lane Management System
- Boarder Advisory Service

GUI makes it easy to add new devices

Going Forward

In discussions:

Traffic signal layer, perhaps with a link to their traffic system for online, offline, fault, in flash, etc. status information

Map layer for tracking transit vehicle location, with data from their AVL system

Communication node (i.e. E-switch) status information in the past

Asset management data collection and logging functions

Mobile applications and access into the NGCS system

Offering State-of-the-Art Signal Processing Solutions from Satellites to Submarines

