Coordinated Highways Action Response Team

THE ROAD AHEAD – ADVANCED TRAFFIC MANAGEMENT AND EMERGENCY OPERATIONS IN THE STATE OF MARYLAND

Richard R. Dye
CHART Systems Administrator
Maryland State Highway Administration

INCOSE Dinner – May 18, 2016

MDOT Organization

Maryland Department of Transportation

- Maryland Aviation Administration

- Mass Transit Administration

- Maryland Port Administration

- Motor Vehicle Administration

- State Highway Administration

State Highway Administration

Planning and Engineering | Operations | Administration

Office of Materials Technology

Office of Traffic & Safety

Office of CHART & ITS Development

7 District Offices

Office of Maintenance

Office of Construction

CHART

CHART Focus Areas

- Incident Management
- Traffic Management
- Traffic and Roadway Monitoring
- Traveler Information
- Emergency and Weather Event Operations

Incident Management

- Emergency Response Units (ERU's)
- Approximately 6 - 18 units 24 hours per day
- Close Coordination with State and Local Police
- "Clear the Road Policy"
- 11 Emergency Traffic Patrols (ETP's) 6-9a; 4-7p

CHART

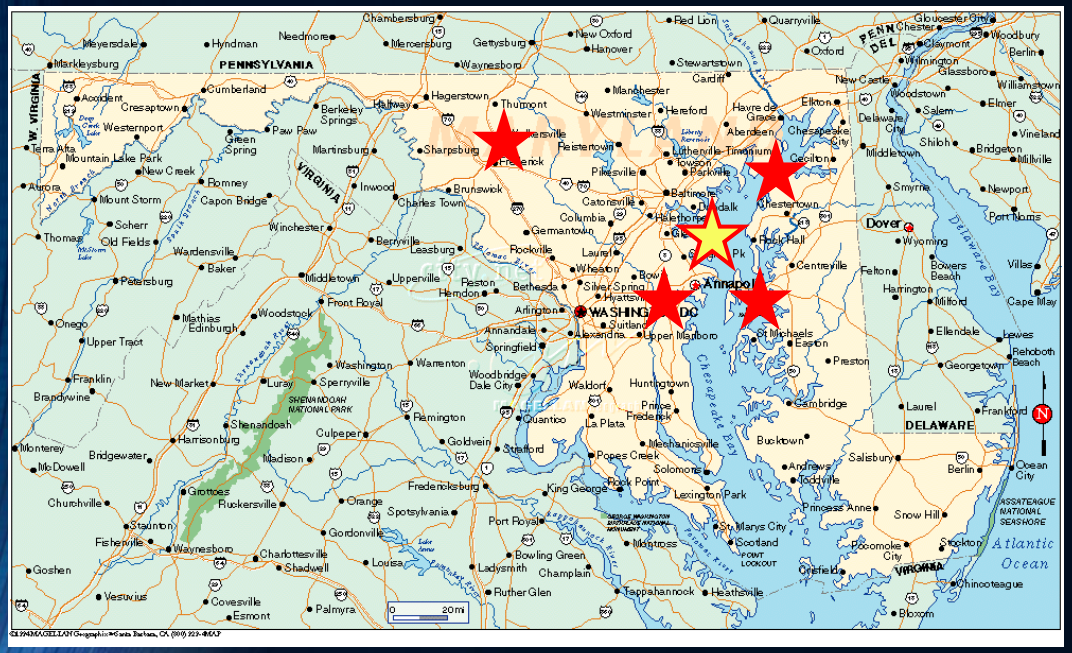
CHART Traffic Management Center Operations

– The Statewide Operations Center (SOC)

- 24 hours-a-day
- 365 days-a-year
- CHART ATMS System
- Maryland State Police (MSP) Liaison: 1
- MSP Officer (peak hours): 5-9a; 3-7p
- Emergency Operations
- "MD First"- 700 MHz Radio Interoperability between various agencies- MSP, MDTA, PG Co, Mont Co.

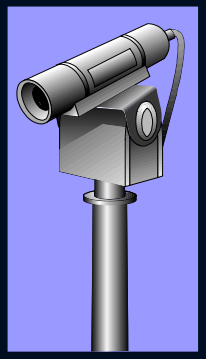
Opened August 30, 1995

CHART TMC Operations –
Satellite Traffic Operations Centers

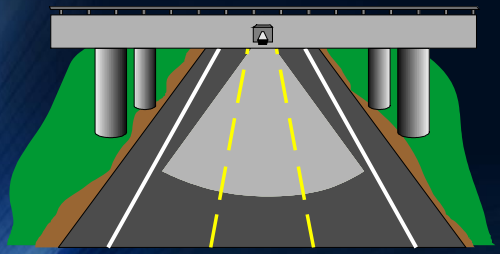


- Washington DC: College Park State Police Barracks
- Baltimore: Golden Ring State Police Barracks
- Frederick: The Frederick Law Enforcement Center (Co-located with MSP and County Sheriff's Office)
- Seasonal: Eastern Shore Traffic Operations (operating out of the SOC)

Traffic and Roadway Monitoring

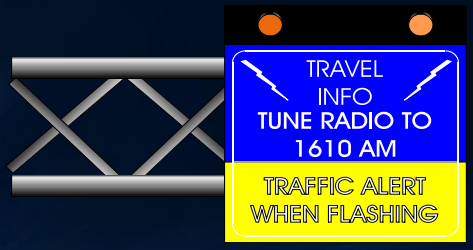


- Cellular Telephone - #77
- Maryland State Police Reports
- SHA Patrol Units
- 100+ speed detection stations statewide
- 700+ Closed Circuit Television Cameras (State and Local)
- Traffic Probe Data



Traveler Information

- 350+ Dynamic Message Signs
- 45+ Traveler's Advisory Radio Stations
- Internet: http://www.traffic.md.gov
- Automated Travel Times
- MD 511



CHART

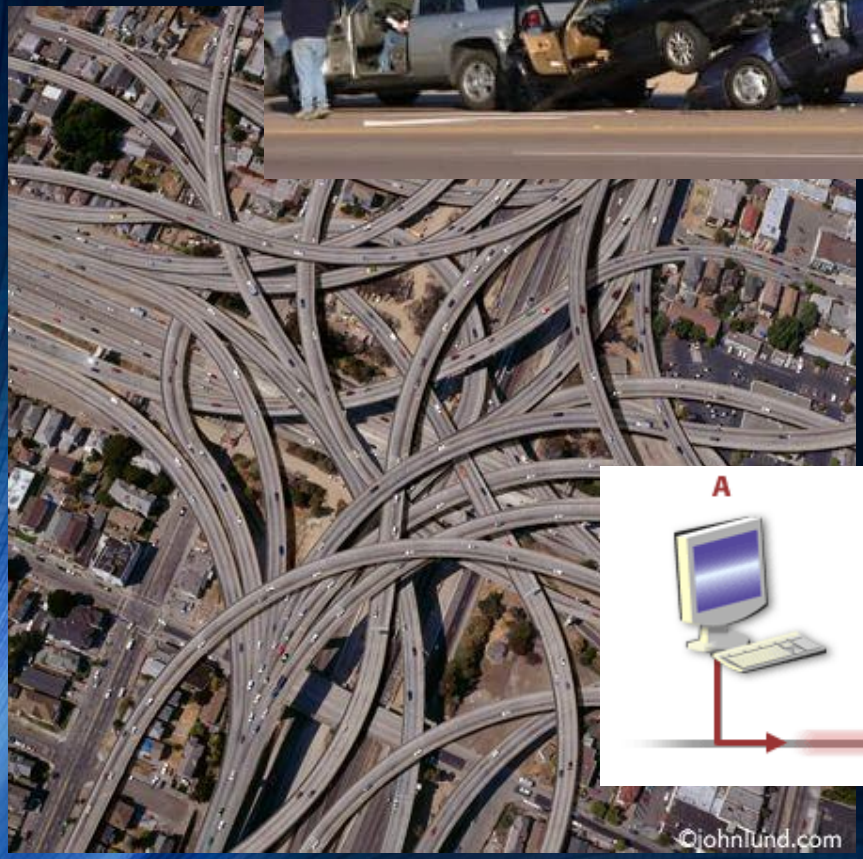
Traffic Management

- Special Events
- Work Zone Management

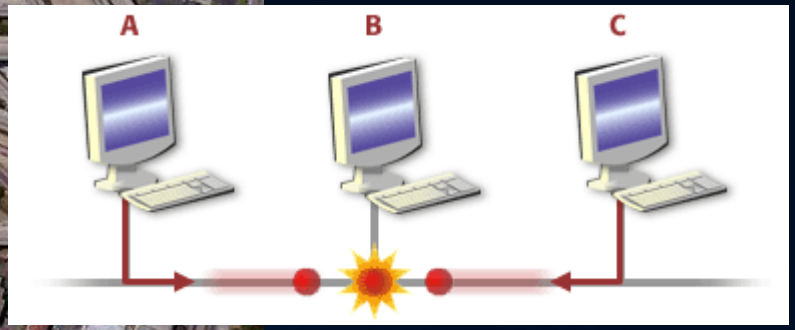
Emergency / Weather Event Operations

- Redundant Communications
- Generator / Battery Back-up
- Decentralized System / Back-up Operations Centers
- 50+ Roadway Weather Stations
- GPS Fleet Management
- Resource Tracking System

Intelligent Vehicle Highway Systems becomes Intelligent Transportation Systems in 1990's



Archived Data Management (AD)



Advanced **T**raffic **M**anagement **S**ystems (ATMS)

Advanced **T**raveler Information **S**ystems (ATIS)

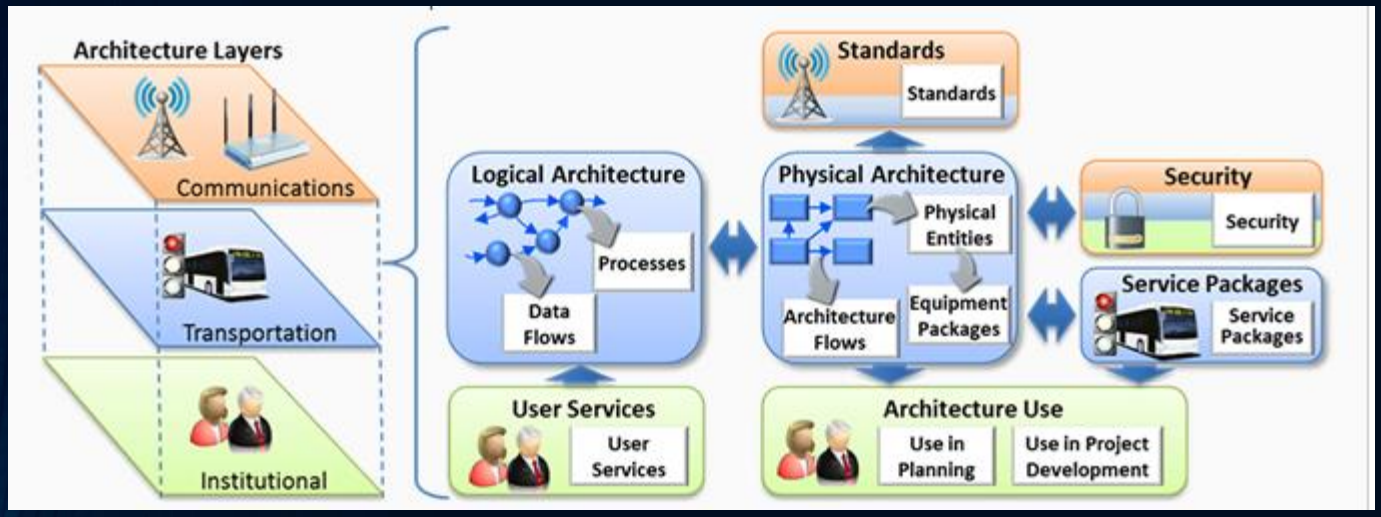
Emergency Management **S**ystems (EMS)

Advanced Public Transportation **S**ystem (APTS)

Commercial Vehicle Operations (CVO)

Maintenance and Construction Management (MC)

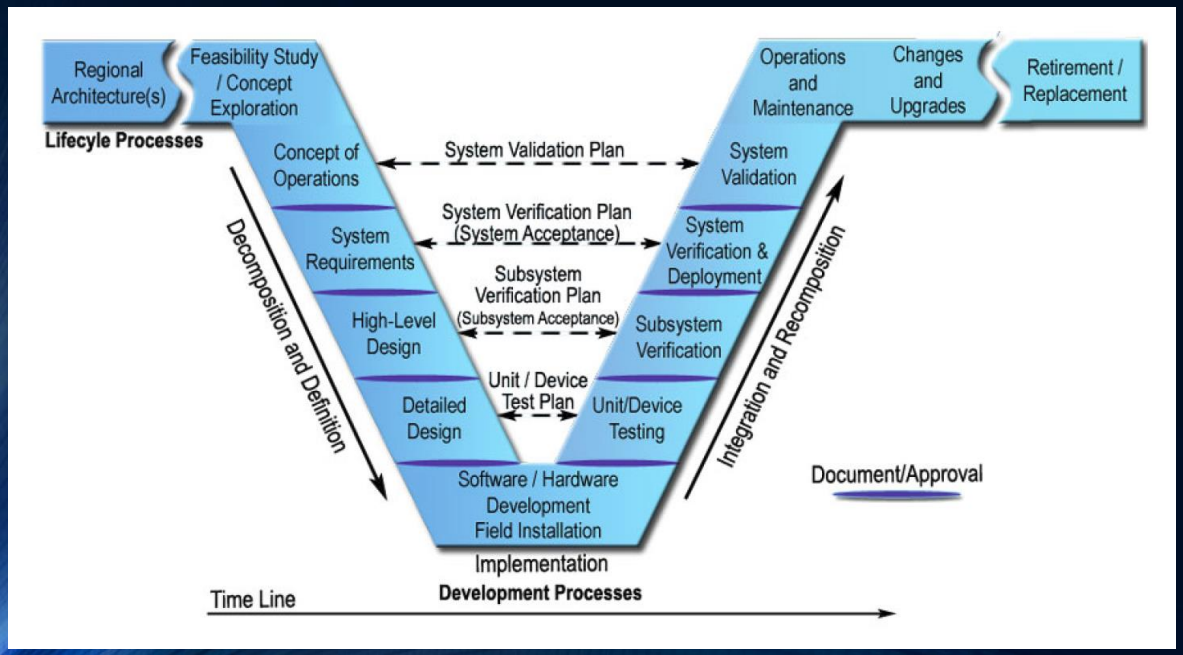
Now, we started applying some words to our vocabulary that you have all heard…



Logical Architecture

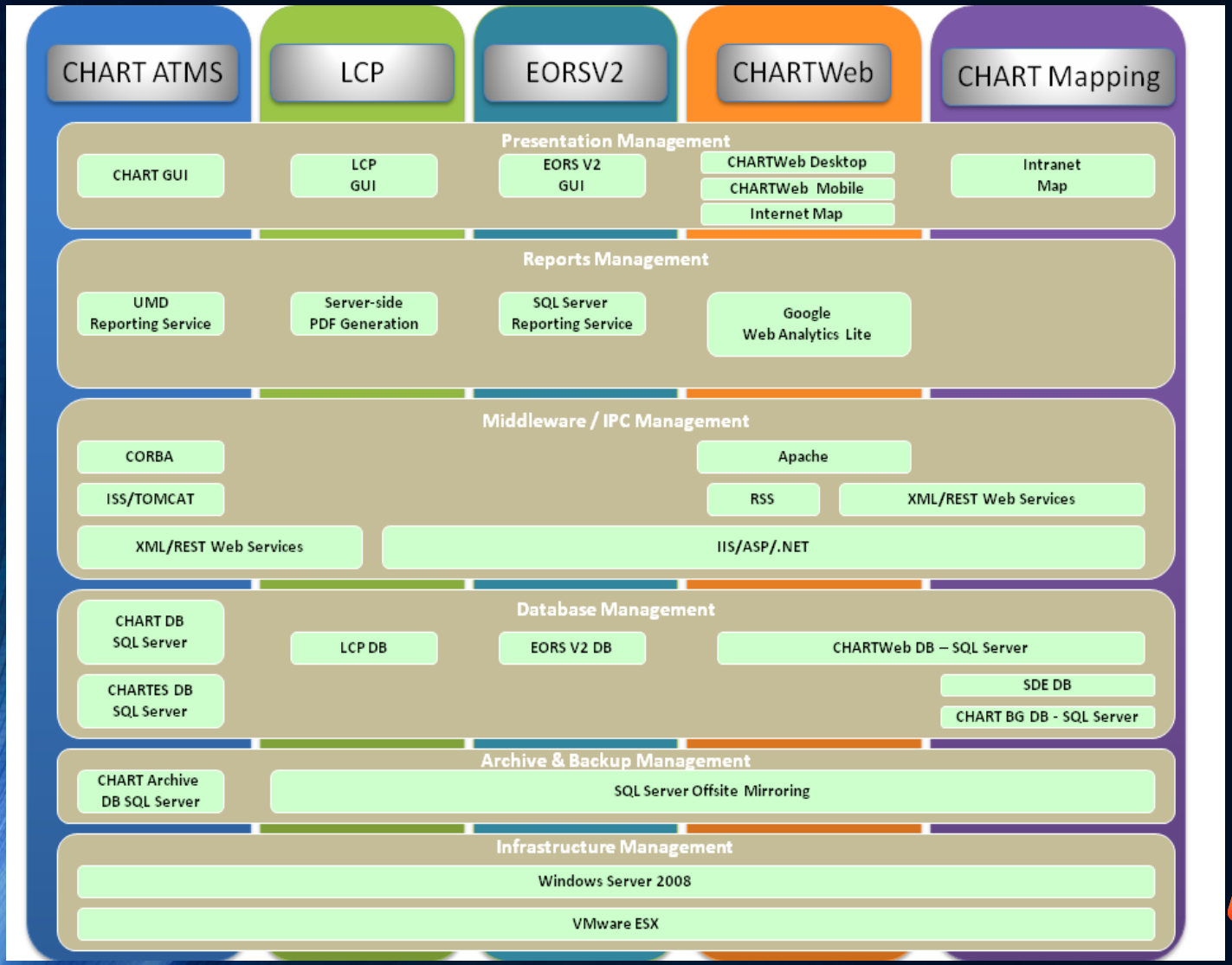
Physical Architecture

Standards



Systems Engineering Methodology

CHART Systems that Serve the Focus Areas



Advanced **T**raffic **M**anagement **S**ystem (ATMS)

Lane **C**losure **P**ermitting System (LCP)

Emergency **O**perations **R**eporting **S**ystem (EORS)

World Wide Web Presence

Integrated GIS Mapping

CHART Suite of Systems

- The CHART ATMS is a set of software programs running on a combination of Windows 2008 Servers, connected to a statewide network of Closed Circuit Television (CCTV) cameras, overhead and portable Dynamic Message Signs (DMSs), Highway Advisory Radios (HARs), Traffic Sensor Systems (TSSs) (microwave traffic flow detectors), remote weather stations, and On/Off devices (electronic relay devices such as for horns and fog beacons).
- It is used identify and track traffic flow disruptions, send responders to correct the disruption and notify the public using the DMS and HAR devices, as well as sending notifications to the media and feeding data to a live traffic web site (http://www.traffic.maryland.gov) and Maryland 511.

CHART Advanced Traffic Management System Software

ATMS

Current Users of CHART
(Over 36 agencies in over 91 operations centers)

Partners

Transportation Management

Law Enforcement

Highway Maintenance

CHART Statewide Operations Center
CHART DC Region Traffic Center
CHART Baltimore Region Traffic Ctr
CHART Annapolis Region Traffic Ctr
Bay Bridge Traffic Operations Center
Authority Operations Center
Montgomery County Traffic Center
Prince George's County Traffic Center
Anne Arundel County Traffic
BWI Airport Operations
Northern Virginia DOT Traffic Center
Washington DC Traffic Mgt Center
Ravens Traffic Operations Center
Redskins Traffic Operations Center
Baltimore City DOT

Baltimore County Police
Maryland State Police Barracks - Annapolis
Maryland State Police Barracks - Rockville
Maryland State Police Barracks - Forestville
Maryland State Police Barracks - Golden Ring
Maryland State Police Barracks - College Park
Maryland State Police Barracks – Waterloo
Maryland State Police Barracks – Glen Burnie
US Park Police (Greenbelt)
Maryland Transportation Authority Police
Baltimore City Police Department

Dayton Shop
Owings Mills Shop
Laurel Shop
Fairland Shop
Annapolis Shop
Gaithersburg Shop
Golden Ring Shop
Upper Marlborough Shop
Harford Shop

CHART Advanced Traffic Management System Software

ATMS

Current Users of CHART
(Over 36 agencies in over 91 operations centers)

Partners (Continued)

Emergency Operations

- SHA Wash DC Region Emergency Operations Center
- SHA Baltimore Region Emergency Operations Center
- SHA Annapolis Region Emergency Operations Center
- Maryland Emergency Management Agency
- Maryland Emergency Medical Services (Ambulance)
- Harford County EOC / 911
- Howard County EOC / 911
- Anne Arundel County Fire Dispatch (Soon EOC)
- Baltimore County EOC (Soon PD/Fire/911)

Information Share / Lab

- University of Maryland Center for Advanced Transportation Technology Lab

Device Maintenance

- Network Operations Center
- Traffic Signal Repair Shop
- Radio and Camera Repair Shop
- Dynamic Message Sign Repair Shop

CHART Advanced Traffic Management System Software

ATMS

Incident Events – Incidents are vehicular crashes, disabled vehicles in the roadway, debris, or any other unplanned case which blocks a lane of travel. All vehicular crashes and vehicle fires are incidents regardless of lane blockage.

Planned Roadway Closure Events – Pre-planned construction activities.

Disabled Vehicle Events – Events that involve a disabled vehicle that does not impede traffic.

Congestion Events – Recurring or non-recurring congestion.

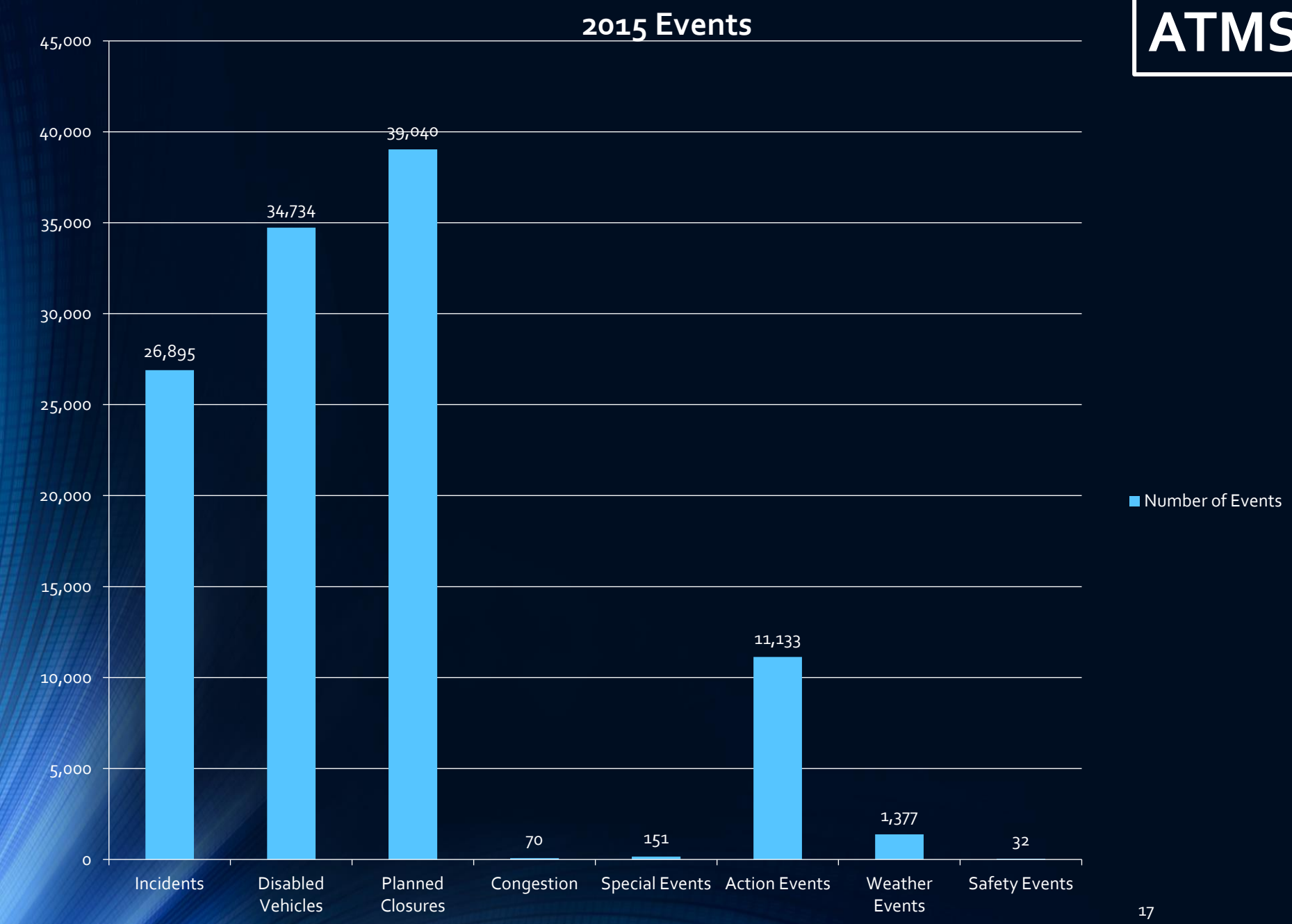
Special Events – Used for sporting and other special events such as air shows, parades, etc.

Action Events – Used whenever a response in the field is required, but no travel lanes are currently impacted. These types of calls include malfunctioning traffic signals or deceased animal carcasses on the shoulder.

Weather Service Events – A weather event that does not close a travel lane, such as reports of icy road conditions requiring salt truck response, but no roadway closures.

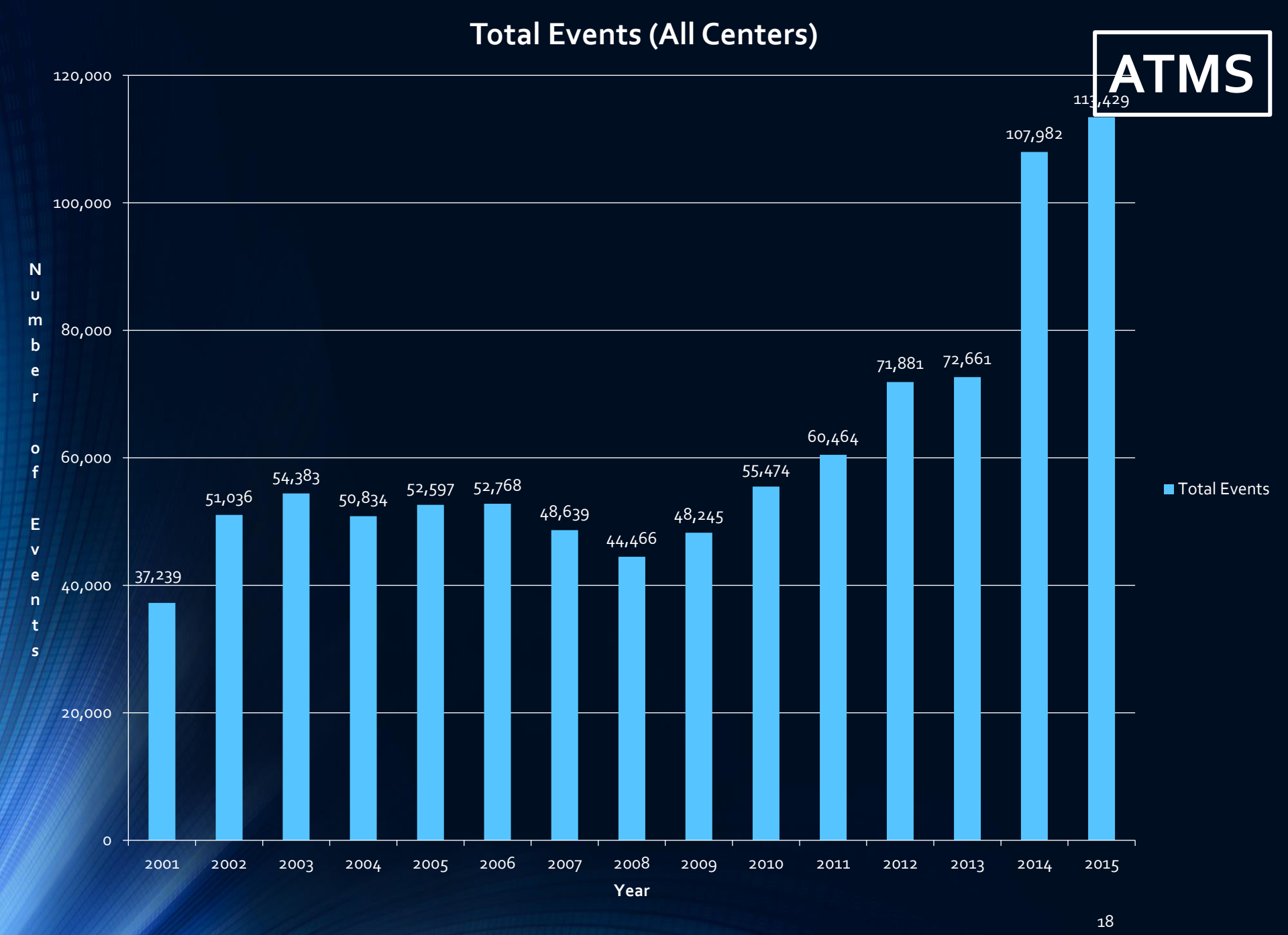
Safety Message Events – Used for safety message campaigns when no other message is displayed, e.g., "Ozone Alert," "Drive Sober," etc.

ATMS


2015 Events
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
26,895
34,734
39,040
70
151
11,133
1,377
32
Incidents
Disabled Vehicles
Planned Closures
Congestion
Special Events
Action Events
Weather Events
Safety Events
Number of Events

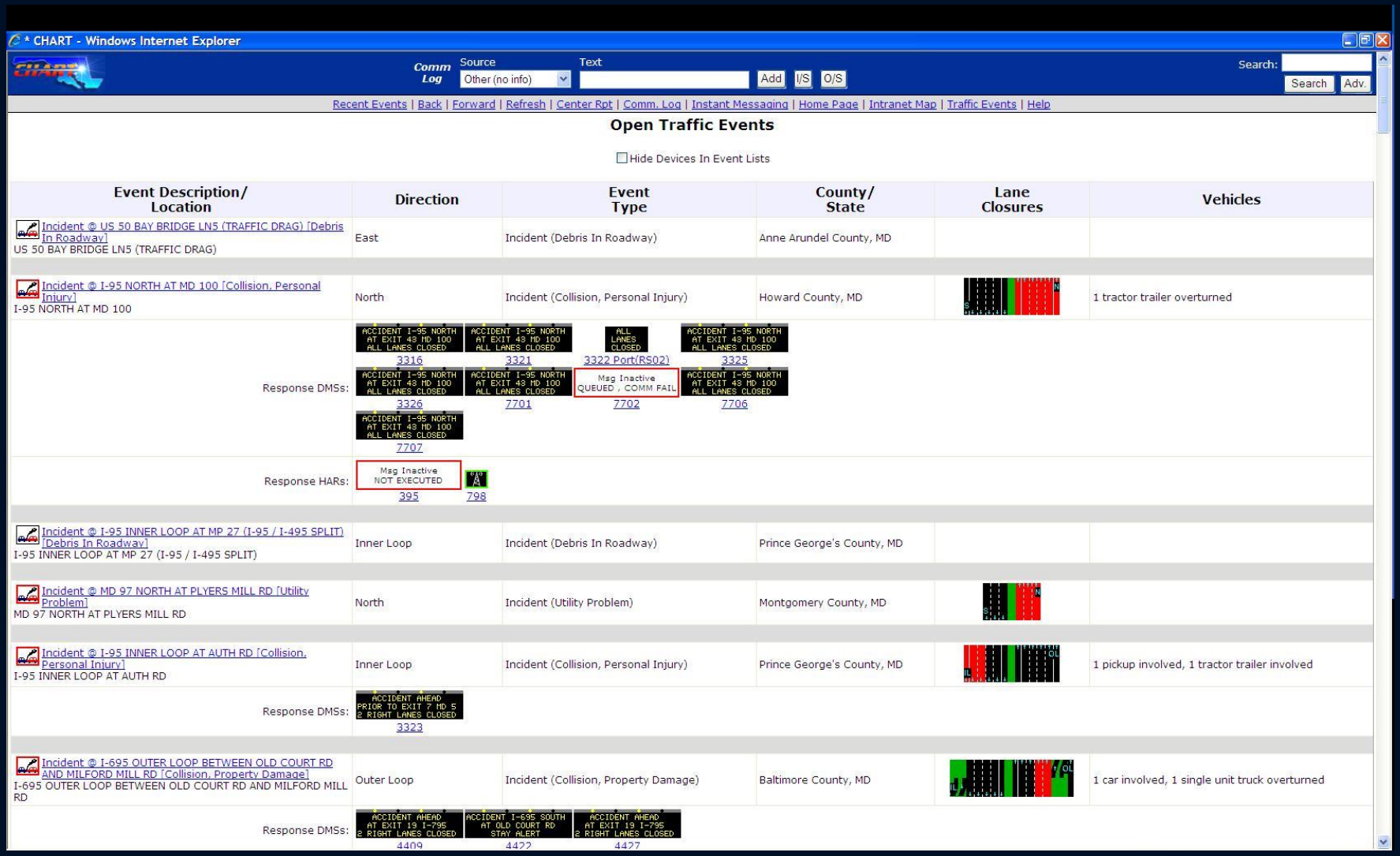
Total Events (All Centers)

ATMS



How does an Operator Use the Software for an Incident?

ATMS



When the Operator 1st logs in he sees all incidents active in his area of responsibility

Clicking on an Incident brings up the details

ATMS

Incident @ MD 295 SOUTH AT MD 100 [Collision, Fatality]

(Event Open; Controlled By TOC4)

General Info | Incident Info | Roadway Conditions | Participation | Response | Notification | Event History | Summary | Associated Events

General Event Information (Edit)

Event Name	Incident @ MD 295 SOUTH AT MD 100 [Collision, Fatality]
Source	State Police (GLEN BURNIE)
Regional	NO (change)
Queue (mi)	3.0
Opened	05:14
Confirmed	05:14
Delay Cleared	No [Delay Cleared]
Scene Cleared	No [Scene Cleared]
Est. Hours To Clear	3.0
Op Center POC	
On Scene POC	9400
Comments	
Open Event Remind Time	10:15 [Edit]
Owning Organization	SHA
Web Alert	ENABLED

Web Alert Text

Location Information (Edit) (Show on Map)

Location Description	MD 295 SOUTH AT MD 100
County	Anne Arundel County
Region	
State	MARYLAND
Route Type	State
Route	MD 295
Direction	South
Point Along Roadway	AT MD 100
Lat/Long	39.170404° N, 76.730832° W (Intersection data - GIS Lookup)
Areas of Responsibility	+NOC County Anne Arundel Maryland Statewide SHA District 5

[Close Event] [False Alarm]

General Info | Incident Info | Roadway Conditions | Participation | Response | Notification | Event History | Summary | Associated Events

What happened? Where did this happen? Who notified us? How far is the queue? What are the SOPs I should follow?

What types of vehicles? What are the roadway conditions?

ATMS

Incident Information

Incident Type: Collision, Fatality **HAZMAT:** NO

Vehicle Count					
	Involved	**Overturned**	**Lost Load**	**Jack-Knifed**	**TOTAL**
Car	1	0			1
Van	1	0			1
Pedestrian	1				1
TOTAL					3

TMDD Vehicle Count: 2 Cars, 1 Other

Edit Incident Info | Close Event | False Alarm

General Info | Incident Info | Roadway Conditions | Participation | Response | Notification | Event History | Summary | Associated Events

Roadway Conditions

Direction: South

Road Surface Condition: Dry

Nearby Wx Station: (Intranet Map)
Location: I-895 / Levering Ave; Distance: 5.9 mi; Surface Condition: DRY; Air Temp: 53 F; Precip Type/Intensity: None/None; Vis: 1.1 mi; Wind: 0 MPH W; System: SCAN; 10/9/2013 5:10:58 AM
show sensors (station details)

Road Configuration Description: 3 Traffic Lanes in each direction, with Shoulders, Right On Ramp, Right Off Ramp, and Median.

Lane Closure Description: 3/3 Southbound-both Shoulders, Right Off Ramp closed

What lanes are closed?

Participation

AVL Auto Detection Enabled (In the table below, 'A' indicates auto detection of on scene arrival/departure and 'M' indicates manual operation.)

Participant	Category	Notified	Arrived / Responded	Departed	Camera	Distance (Miles)
Arrow Board	Resource	05:31	07:02	M		
Arrow Board	Resource	05:31	07:02	M		
CHART Unit 9003	CHART Unit	05:29	M	M	MSP Liaison Display on Monitors / Desktop	
CHART Unit 9400	CHART Unit		05:57	M	CHART-9400 Display on Monitors / Desktop	2.9
CHART Unit 9402	CHART Unit	05:23	05:53	M	CHART-9402 Display on Monitors / Desktop	0.1
CHART Unit 9406	CHART Unit	05:36	05:54	M	CHART-9406 Display on Monitors / Desktop	
CHART Unit 9439	CHART Unit		06:05	M		
CHART Unit 9501	CHART Unit	06:02	06:38	M	CHART-9501 Display on Monitors / Desktop	16.5
CHART Unit 9502	CHART Unit		05:21	M	CHART-9502 Display on Monitors / Desktop	1.3
CHART Unit 9700	CHART Unit		06:52	M	CHART-9700 Display on Monitors / Desktop	
Fireboard	Agency	05:17	05:21	M		
Investigation-accident	Special Needs	05:23	07:35	M		
Medical Examiner	Special Needs		07:35	M		
SHA - OCRI	Agency	05:45	M	M		
SHA Shop Annapolis Call Sign: 5602	Facility	06:32	M	M		
SHA Shop Glen Burnie Call Sign: 5500	Facility	05:50	07:36	M		
Signal Truck 475 VN 80191	Special Needs	07:24	A	A		
State Police						

ATMS

Who is nearby?

Have they been dispatched to the Incident?

Have they arrived?

Do they have mobile camera capability?

What permanent cameras, message signs and radio stations are nearby? Within 3 miles? Within 5 miles?

ATMS

Device(s) Within 3 **Miles (24)** Hide

Select DMSs/HARs/Cameras to add to Response (SHIFT + click to select, CTRL + click to toggle selection).
External Devices are not shown on the map.

DMS **Message Signs (11)** Show

Highway Advisory Radios (1) Show

Detectors (7) Show

Cameras (5) Show

General Info | Incident Info | Roadway Conditions | Participation | Response | Notification | Event History | Summary | Associated Events

ATMS

Target Device	Proposed Message			Status
7 Monitors Hide Monitors SOC Projector 4-4 NOC Monitor 2 SOC Room 122 Monitor 1 SOC Room 124 Monitor 1 Signal Shop 13~ Monitor 1 SHA HQ PAO Monitor 1 MSPP 19~ Monitor 1	**Camera**	**Preset**	**Actions**	Tour entries added to the following monitor(s): SHA HQ PAO Monitor 1, Signal Shop 13~ Monitor 1, SOC Room 122 Monitor 1, NOC Monitor 2, MSPP 19~ Monitor 1, SOC Projector 4-4, SOC Room 124 Monitor 1 Execute Revoke Execution
	CHART-9402 MD	N/A	Display on Desktop	
	MD 295 SB AT MD 175 (502008) MD 295 SB AT MD 175	None	Display on Desktop Request Control	
	MD 295 AT MD 32 (502010) MD 295 AT MD 32	None	Display on Desktop Request Control	
	MD 295 NB AT MD 175 (502007) MD 295 NB AT MD 175	None	Display on Desktop Request Control	
	Edit Tour Display on Desktop			
DMS 4401 Device Details / Device Queue	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED Edit (Auto) Edit (Manual)			Response plan item has been modified Execute Revoke Execution Remove
DMS 4403 Device Details / Device Queue	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED Edit (Auto) Edit (Manual)			Requested message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "4403" Execute Revoke Execution Remove
DMS 4429 Device Details / Device Queue	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED Edit (Auto) Edit (Manual)			Requested message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "4429" Execute Revoke Execution Remove
DMS 5534 FtMd Por Device Details / Device Queue	CRASH AHEAD Edit (Auto) Edit (Manual)			Requested message "CRASH AHEAD ALL LANES BLOCKED" is active on DMS "5534 FtMd Por" Execute Revoke Execution Remove
DMS 8816 Device Details / Device Queue	CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED Edit (Auto) Edit (Manual)			Requested message "CRASH MD 295 SOUTH AT MD 100 ALL LANES BLOCKED" is active on DMS "8816" Execute Revoke Execution Remove

Suggest Message	Edit DMS (Auto)	Edit DMS (Manual)	Execute	Revoke Execution	Remove
All	All Multiple	All Multiple	All Multiple	All Multiple	All Multiple

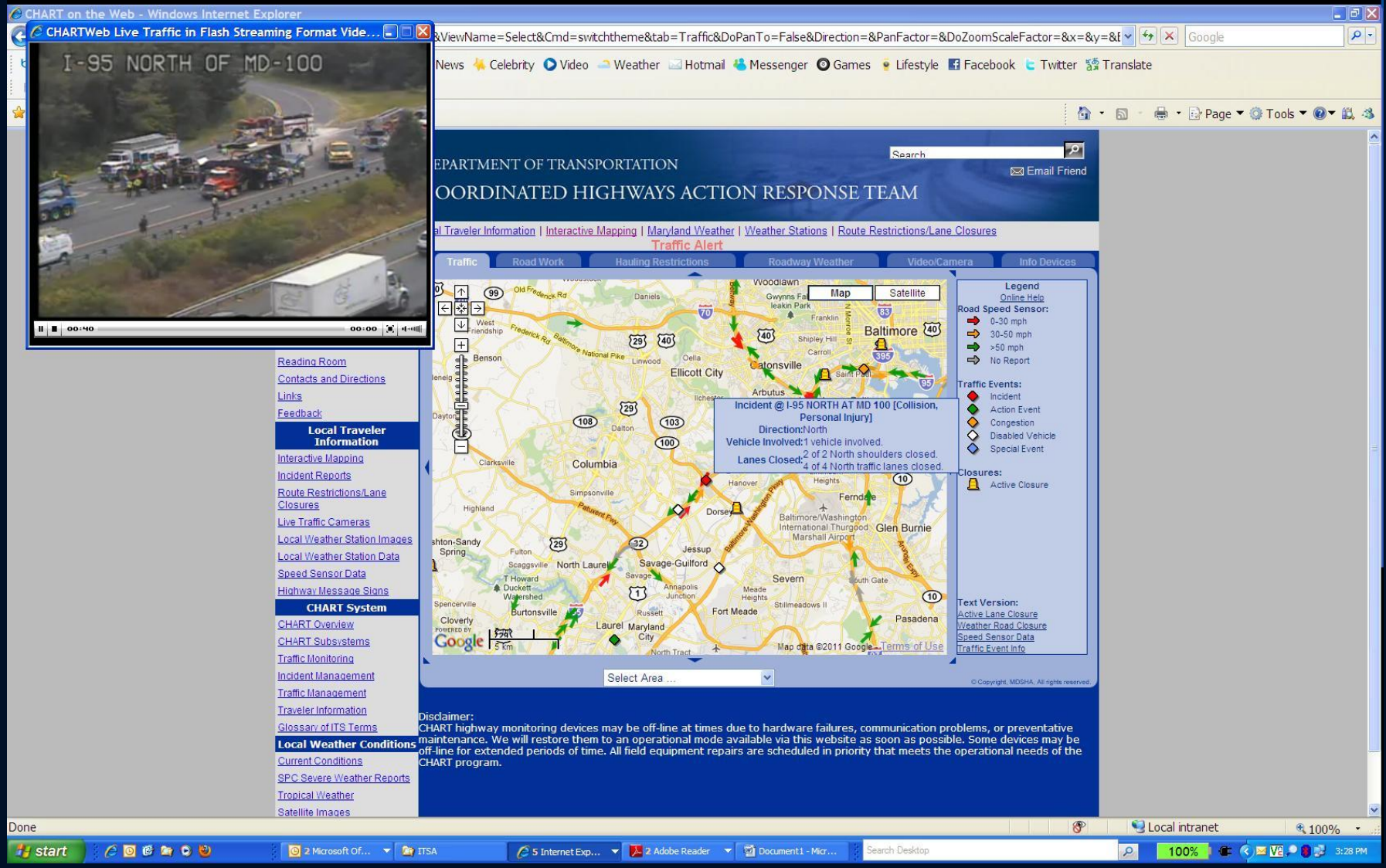
Preview on Map | Refresh | Close Event | False Alarm

Who should be looking at the video from the scene?

What messages should be on the message signs?

The public receives a "real-time" map showing the incidents and streaming video from nearby cameras

ATMS



ATMS

Which groups of responders and managers should be notified?
What should they be told?

Notification

Time Sent	Recipients	Status	Message	Actions
08:06	Anne Arundel County; CHART Major/Executive	106 sent	UPDATE: MD 295 S\B REMAINS BLOCKED AT MD 100. ALL LANES OPEN N\B AT MD 32 /RZ@T 4@08:06	details
06:32	Anne Arundel County; CHART Major/Executive	106 sent	UPDATE:MD 295 S/B REMAINS CLOSED AT MD 100. N/B MD 295 CLOSED AT MD 32 /KL@T 4@06:32	details
06:08	Anne Arundel County; CHART Major/Executive	106 sent	UPDATE:Crash F MD 295 S @ MD 175 ALC. RAMPS FROM E/B & W/B MD 100 TO MD 295 S CLOSED /KL@T 4@06:08	details
05:54	Anne Arundel County; CHART Major/Executive	106 sent	UPDATE:Crash F MD 295 S AT MD 175 ALC. TRAFFIC GETTING OFF ON MD 100. /KL@T 4@05:54	details
05:42	Anne Arundel County; CHART Major/Executive	106 sent	UPDATE: Crash F MD 295 S AT MD 175 ALC /KL@T 4@05:42	details
05:24	Anne Arundel County; CHART Major/Executive	106 sent	Crash PI MD 295 S AT MD 175 ALC /KL@T 4@05:24	details
05:22	Anne Arundel County; CHART Major/Executive	106 sent	Crash F; AA Co MD 295 S AT MD 175; ALC /AM@SOC@05:22	details

Create Notification | Close Event | False Alarm

How can we let these non-CHART responders and managers see what is happening??

ATMS

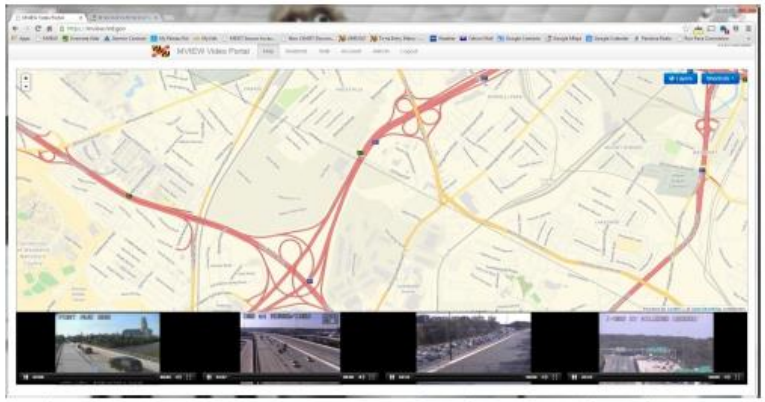
Maryland and National Capital Region Interoperable CCTV Video Portal

The Video Sharing Portal, MView, is designed to be a secure web-based portal for viewing regional 1st responder videos. It is located at https://mview.md.gov.

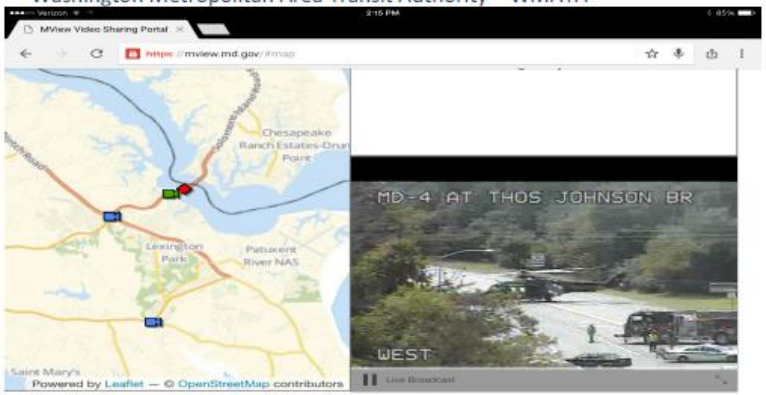
The purpose of this initiative is to create a robust and interconnected closed-circuit television (CCTV) network in and near Maryland and its surrounding regions t secure critical infrastructure and to facilitate real-time monitoring of events via shared cameras from multiple organizations in one interface to assist with even monitoring, evacuation management, and incident response. Camera image sharing is accomplished through translating video signals in real time (or transcoding) to common format and securely sharing video with 1st responders at operations centers, office personal computers, or through handheld phones, tablets, and laptops.

As of October, 2015, video feeds available in this interoperable video solution has increased from 260 in 2007 to more than 5200 representing 40 organizations an include video located on state, county, and city roadways and in-vehicle and helicopter video. There are over 2200 users in MView currently representing over 10 local, state, regional, and federal organizations that can view video. Each user is only allowed to see video that they have been authorized to view.

- Maryland State Highway Administration
- Maryland Transit Administration
- Maryland Stadium Authority
- Maryland State Police
- Department of General Services – MD Capitol Police
- Department of Natural Resources
- Anne Arundel County DPW&T, Police, Fire, and Community College
- Baltimore City Police Department, DOT, and Fire/911/IT
- University of Baltimore
- Gaithersburg City
- Montgomery County DOT, Montgomery County Schools
- Prince George's County DPW&T
- University of Maryland Police at College Park
- Maryland Transportation Authority
- Maryland Port Administration
- Maryland Emergency Management Agency
- Maryland National Capital Park Police – Prince George's Parks and Recs
- Annapolis Police Department
- Baltimore County Police Department
- Harford County DPW&T & EM/911/Public Safety
- Howard County Police Department
- St Mary's County
- Arlington County Virginia
- DC DOT / Homeland Security Emergency Management Agency
- US Park Police
- Virginia Department of Transportation (VDOT)
- Washington Metropolitan Area Transit Authority – WMATA



Desktop: Map-based view-4 concurrent video playing- Presidential Motorcade

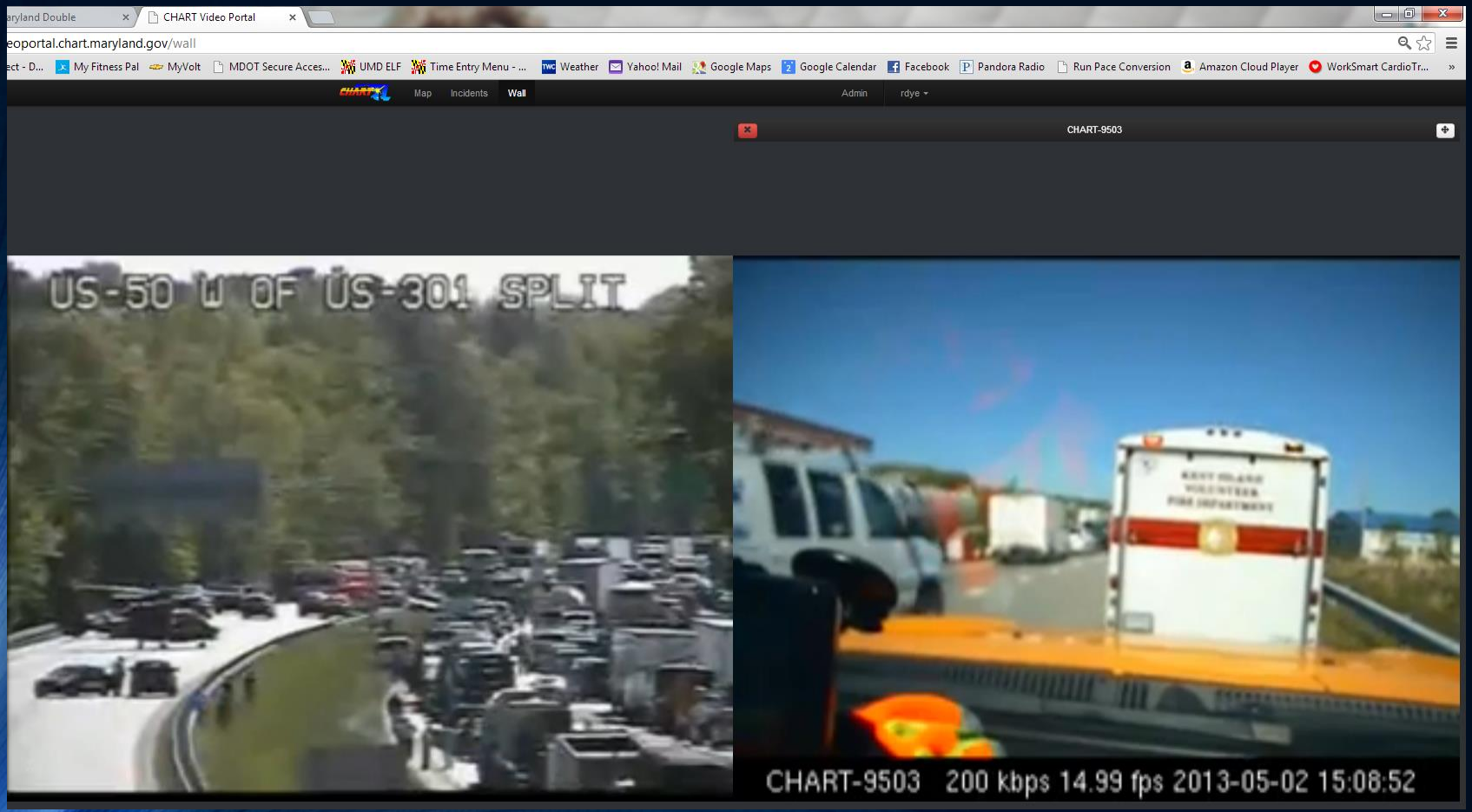


iPad Tablet: Map-based view – State Police Medivac in Southern Maryland

ATMS

We added dash cams in 2011

- Often the thing you wanted to see was not where your ETP / ERU is pointed!



MV-2101 helped fix that

ATMS

- Approximately $17K per camera
- Available on State Contract
- Full Pan – Tilt – Zoom camera controlled by central software at TOC/TMC
- Video rides "secure" APN across AT&T 3G Network

Even when you think you have enough permanent CCTVs…

ATMS

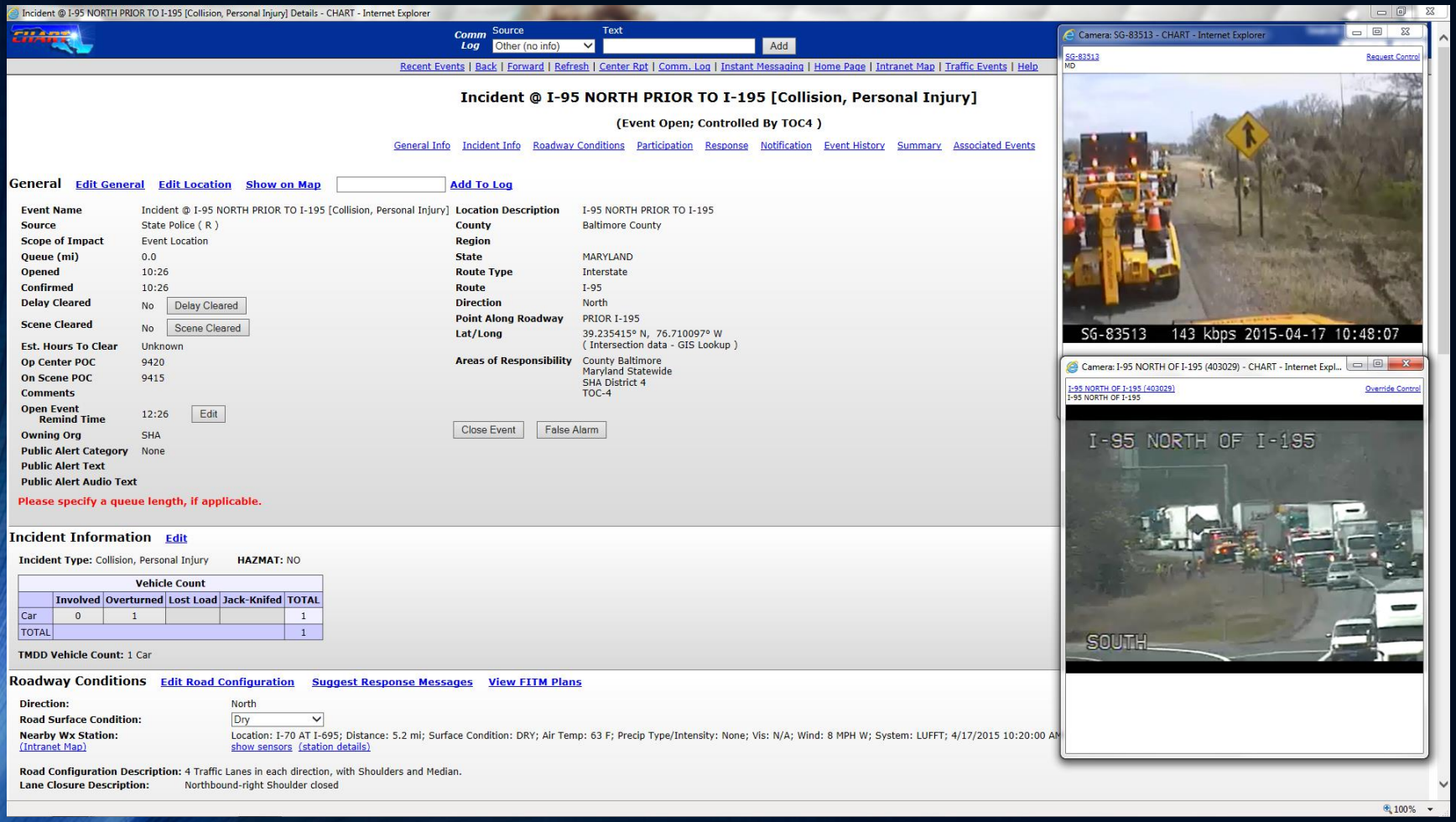


CHART Suite of Systems
EORS

- The EORS application includes:
  - Storm Event Reporting – Provides the ability to manage and report on the utilization of personnel, equipment, materials and conditions for an event.
  - Snow Emergency Plans – Provides the method by which snow emergencies are managed for MD counties.
  - Event Mapping – Provides the ability to specify conditions of predefined roadway segments.
  - Route Restrictions – Provides the ability to manage vehicle restriction information.
  - Post Storm Review & Archive – Provides the ability for a shop to add information about a previous storm event.
  - Situational Awareness Reporting (SARS)/ Archive – Provides the ability to add event data at the district, EOC, CHART and PIO level. Also provides the ability to generate a summary report of the data entered.

CHART Suite of Systems
EORS

- The EORS application includes:
  - Emergency Operations Center (EOC) Plans/Archive – Provides the ability to capture CHART, EOC and district level planned activities data. Also provides the ability to generate a report of the data captured.
  - EORS Rates – Provides the ability to manage rate data for various data types in EORS such as personnel, materials and equipment.
  - Shop RWIS – Provides the ability to assign a primary and secondary RWIS device to each shop for use in gathering weather data in shop reports.
  - Event Reporting Reminder – Provides an alerting/reminder system for shop reporting.
  - CHARTWeb Messages – Provides and interface to manage messages on the CHARTWeb and CHARTWeb Mobile public web sites.

CHART Suite of Systems
EORS

EORS

- The EORS application includes:
  - Hurricane Preparedness – Provides an interface for planning and tracking responses to hurricanes.
  - Reports (34 total)
    - 12 Cost reports – provide costs based upon rates and user provided data
    - 9 OOM Admin reports – provide useful information specifically for the Office of Maintenance management.
    - 12 Storm reports – provide weather operations status reporting
    - EORS Shop Vehicles Report – provides the number and types of certain vehicles deployed for an event
  - Administration Tools – provides standard application administrative tools such as user management and page security

CHART Suite of Systems
LCP

The LCP application includes:

- Permit Management – Provides the capability to add, edit, update and delete lane closure permits.
- List Permits – Provides the capability to list, activate and print lane closure permits
- Permit Workflow – Provides the capability to manage workflow rules for permit states to determine permit approval types
- Permit Reports – Provides capability to generate PDF reports for active and approved permits

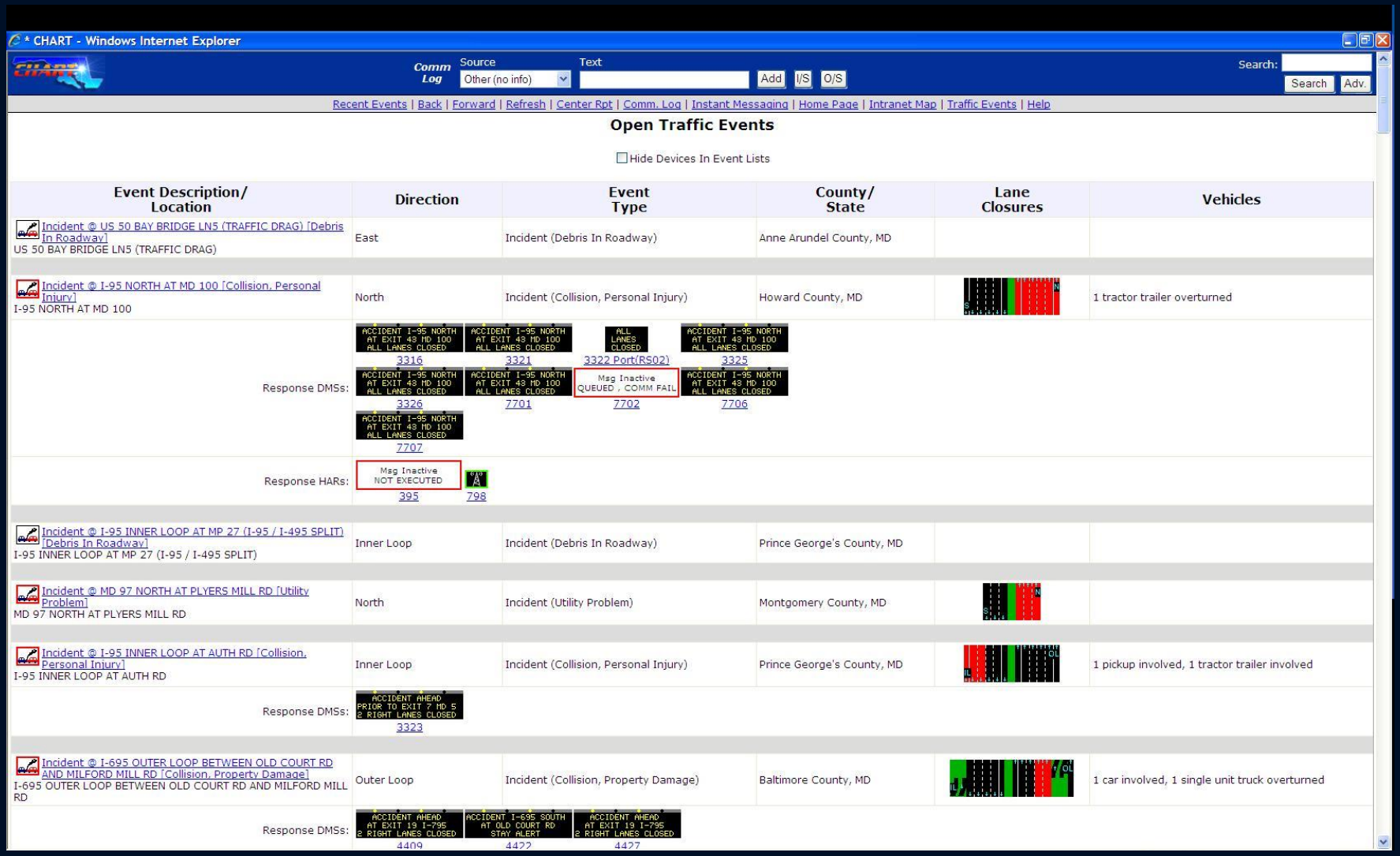
CHART Suite of Systems
LCP

The LCP application includes:

- Permit Mapping – Provides the ability to map the geolocation of a lane closure permit. This functionality is provided by LCP through integration with external web services and a UI interface provided by the CHART Mapping application.
- LCP Data Exporter services – Provides an interface for external applications to get LCP permit data. There are two basic interfaces: CHART Mapping and Public. The Public service resides in the DMZ outside of the MDOT network. The Public interface contains a subset of the data available internally, although the data is much the same.

How does an Operator Use the Advanced Traffic Management System (ATMS) Software for a Workzone?

LCP



When the Operator 1st logs in he sees all incidents active in his area of responsibility.

CHART

How does an Operator Use the Advanced Traffic Management System (ATMS) Software for a Workzone?

LCP

Lane Closure Permits

The Permits section shows any lane closure permits currently active or eligible to be active or queued within the selected time frame, which defaults to the next 2 hours. The permits shown are based on the areas of responsibility assigned to your center and my be further filtered by permit number depending on whether or not any such filters have been defined for your center (see View an Operations Center).

Permits Active Within the Next 2 **Hours (9)** (Hide)

Tracking Number	Lanes	Begin	End	Status --Any--	Days	Route --Any--	Counties (begin/end) --Any--	Actions
SHA-4081962 **Permit:** I-495 East AT EXIT Exit 42 **Event:** I-495 East AT EXIT Exit 42	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	13:00	18:00	Active (Pending Event)	Su M Th F Sa	I-495 East	Frederick	Deactivate Extend View Pending Event
MTA-7138384 **Permit:** I-270 East AT EXIT Exit 30B	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	06:45	13:45	Permitted (No Event)	M Tu W Th F Sa	I-270 East	Frederick	Create Pending Event Activate
MTA-8632540 **Permit:** I-495 East AT EXIT Exit 30A	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	07:45	14:45	Permitted (No Event)	Tu W Th	I-495 East	Howard	Create Pending Event Activate
ABC-3471455 **Permit:** I-170 East AT EXIT Exit 1	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	09:15	17:15	Permitted (No Event)	Su W Th F Sa	I-170 East	Frederick	Create Pending Event Activate
MTA-1792632 **Permit:** I-495 East AT EXIT Exit 30B	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	12:15	16:15	Permitted (No Event)	Su M Th F Sa	I-495 East	Howard	Create Pending Event Activate
SHA-5473456 **Permit:** I-83 East AT EXIT Exit 30A	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	12:45	14:45	Permitted (No Event)	Su Th F	I-83 East	Montgomery	Create Pending Event Activate
MTA-9388374 **Permit:** I-95 East AT EXIT Exit 27	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	14:00	20:00	Future - Queueable (0:46) (No Event)	M W Th Sa	I-95 East	Howard	Create Pending Event Queue
MTA-8101086 **Permit:** I-83 East AT EXIT Exit 30B **Event:** I-83 East AT EXIT Exit 30B	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	14:30	17:30	Queued (Pending Event)	Su W Th	I-83 East	Howard	Dequeue View Pending Event
ABC-7259668 **Permit:** I-83 East AT EXIT Exit 37 **Event:** I-83 NORTH AT EXIT 27 MD 137 MT CARMEL RD (NB)	Lane 1, Lane 2, Shoulders, Ramps, Lane 2 and Ramps permitted between 10 PM and 4 AM only, Lane 1 and Shoulders 10 AM - 3 PM and 10 PM - 4 AM.	06:45	13:45	Active (Open Event)	W Th Sa	I-83 East	Frederick	Deactivate Extend View Open Event

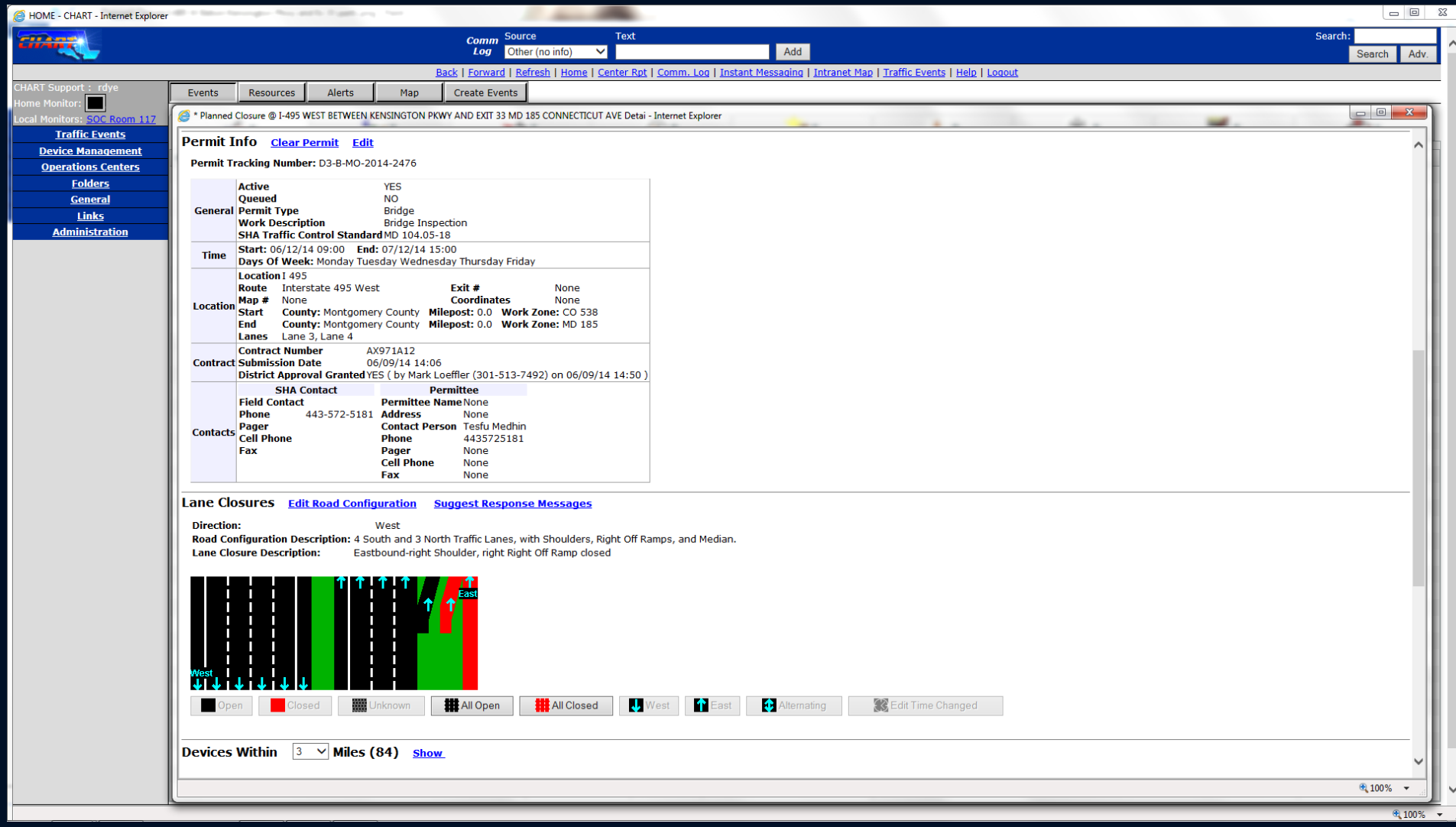
The permit list is sorted with those permits that most likely require action at the top of the list and those least likely to require action at the bottom of the list. For example, a permit that is active but does not have an associated open planned closure event will be at the top of the list, while a permit that is active and does have an open planned roadway closure event will be at the bottom of the list. You may filter the list by status, affected route, or county. You can choose the "look ahead" period using the select list in the section title:

He also sees all permits that are active or "most likely" will be activated in the next 2 hours

CHART

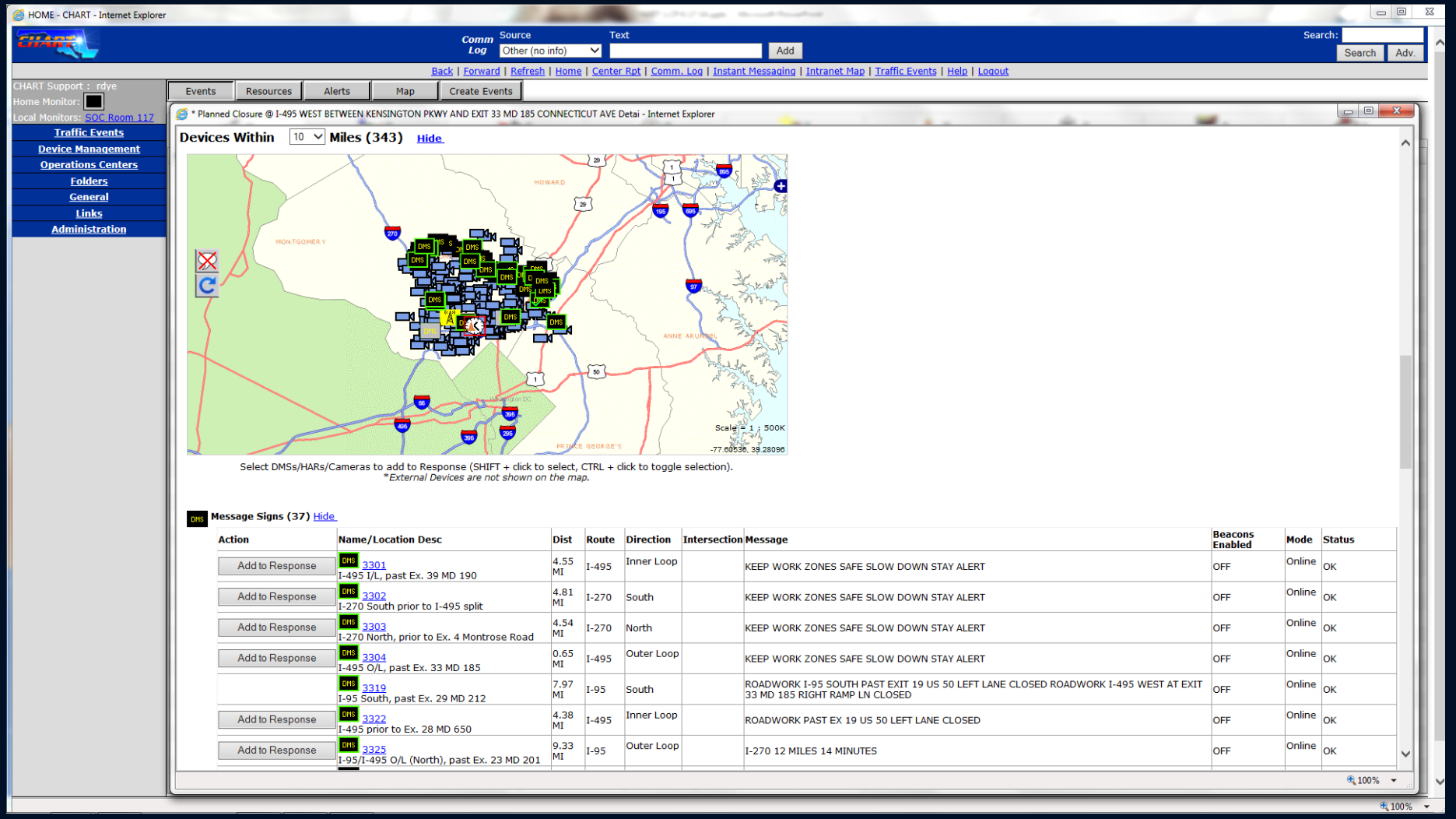
After the ATMS Planned Closure Event is created, the permit information is automatically pulled into the CHART event.

LCP



Now the ATMS suggests appropriate message signs as well as appropriate messages

LCP

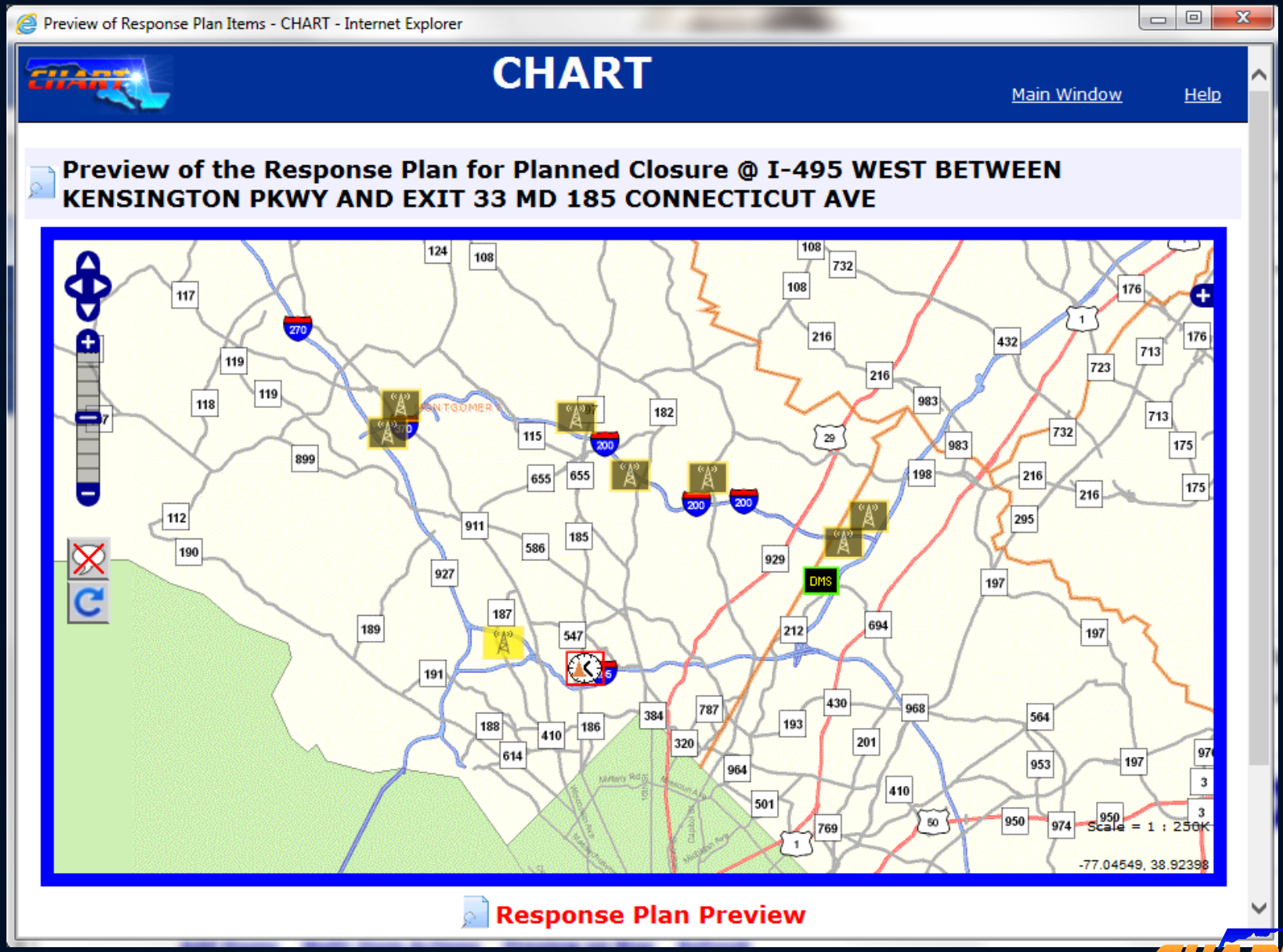


Action	Name/Location Desc	Dist	Route	Direction	Intersection	Message	Beacons Enabled	Mode	Status
Add to Response	DMS 3301 I-495 I/L, past Ex. 39 MD 190	4.55 MI	I-495	Inner Loop		KEEP WORK ZONES SAFE SLOW DOWN STAY ALERT	OFF	Online	OK
Add to Response	DMS 3302 I-270 South prior to I-495 split	4.81 MI	I-270	South		KEEP WORK ZONES SAFE SLOW DOWN STAY ALERT	OFF	Online	OK
Add to Response	DMS 3303 I-270 North, prior to Ex. 4 Montrose Road	4.54 MI	I-270	North		KEEP WORK ZONES SAFE SLOW DOWN STAY ALERT	OFF	Online	OK
Add to Response	DMS 3304 I-495 O/L, past Ex. 33 MD 185	0.65 MI	I-495	Outer Loop		KEEP WORK ZONES SAFE SLOW DOWN STAY ALERT	OFF	Online	OK
	DMS 3319 I-95 South, past Ex. 29 MD 212	7.97 MI	I-95	South		ROADWORK I-95 SOUTH PAST EXIT 19 US 50 LEFT LANE CLOSED ROADWORK I-495 WEST AT EXIT 33 MD 185 RIGHT RAMP LN CLOSED	OFF	Online	OK
Add to Response	DMS 3322 I-495 prior to Ex. 28 MD 650	4.38 MI	I-495	Inner Loop		ROADWORK PAST EX 19 US 50 LEFT LANE CLOSED	OFF	Online	OK
Add to Response	DMS 3325 I-95/I-495 O/L (North), past Ex. 23 MD 201	9.33 MI	I-95	Outer Loop		I-270 12 MILES 14 MINUTES	OFF	Online	OK

CHART

As well as a preview of what the messages would look like and where they would be displayed

LCP

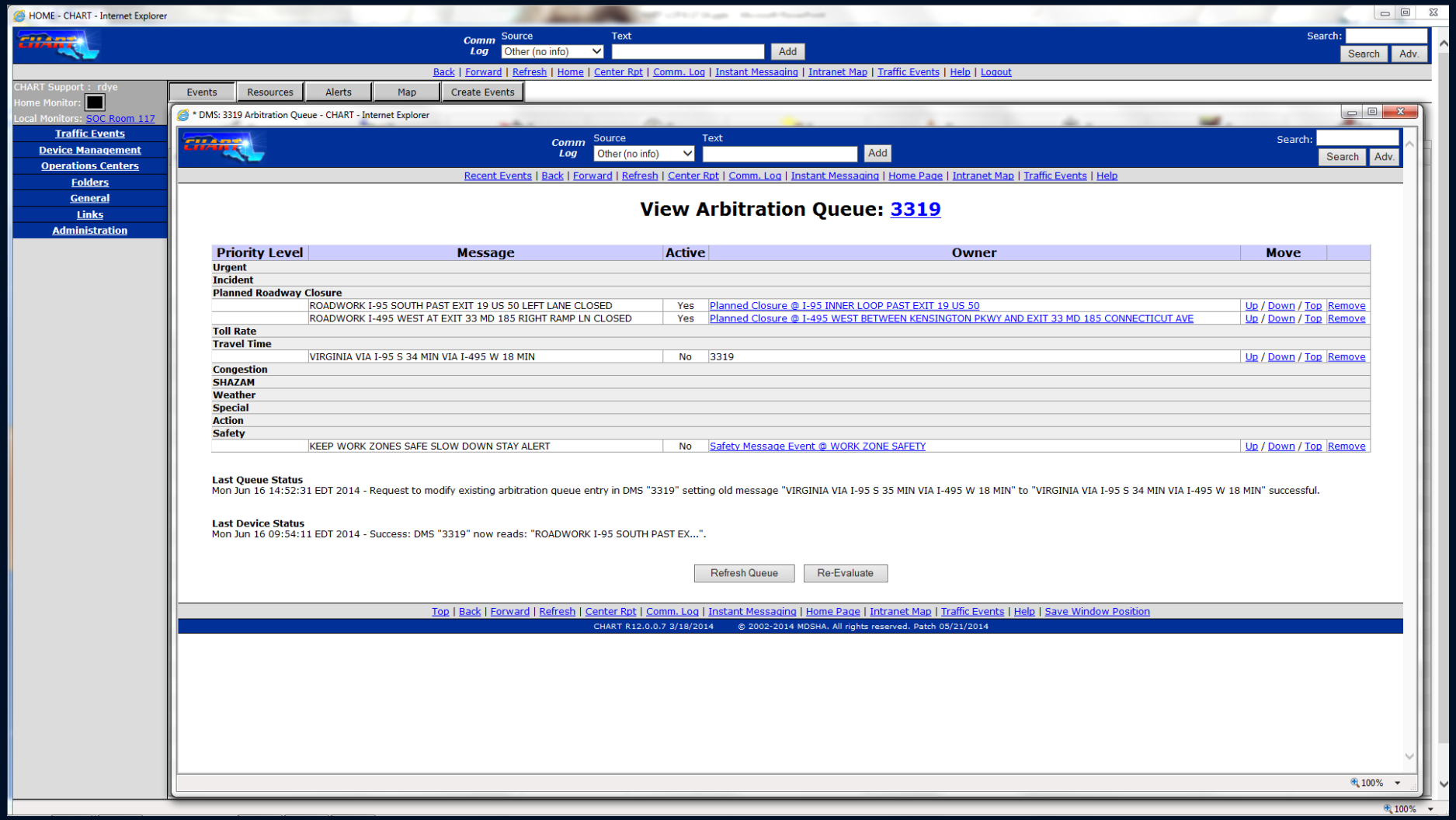


In this case, DMS 3319 is alternating single phase messages for two different planned closures… One on I-495 west and one on I-95 South.

LCP

… but it also wants to display a travel time and a safety message but the rules of the arbitration queue keep the sign from displaying too many phases of dissimilar type messages

LCP



So…. Where are we going?

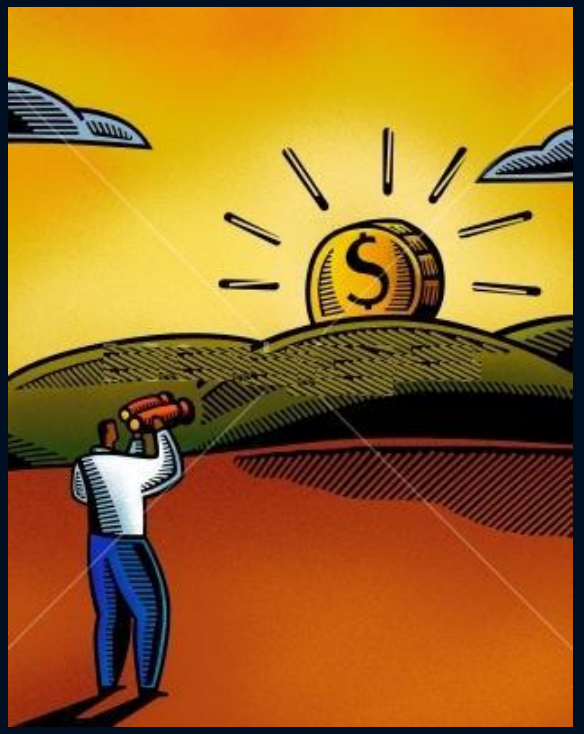
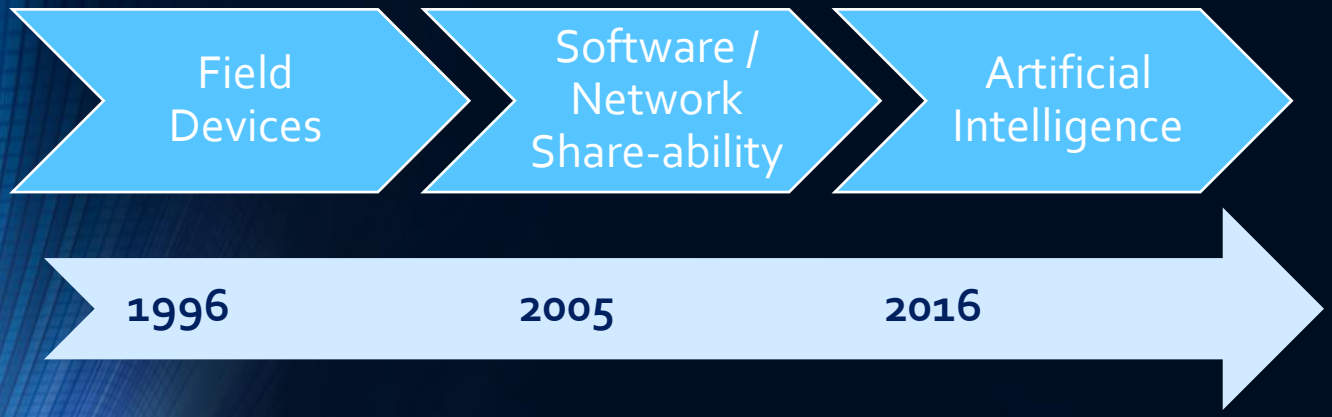
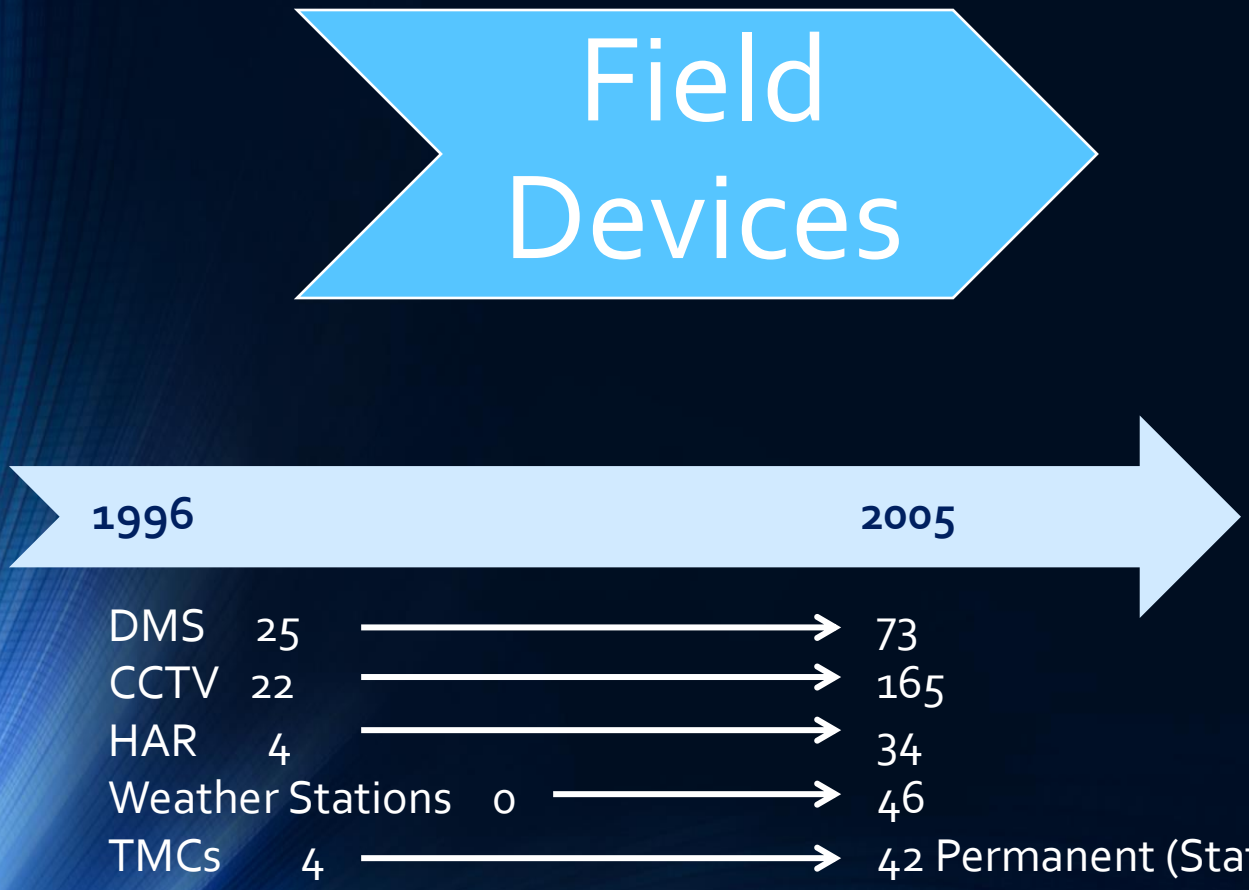


CHART Advanced Traffic Management System Software



- To know where we are going… we have to look at the building blocks of the path that got us here

CHART Advanced Traffic Management System Software



- From 1996 to 2005 (BEFORE MOST OF YOU GUYS) the push was for more permanent Traffic Management Centers and more field devices

CHART Advanced Traffic Management System Software

Software / Network Share-ability

- But more devices allowed more geographically diverse users so from 2005 to 2012 the push was to be able to share the information and control with other 1st responders

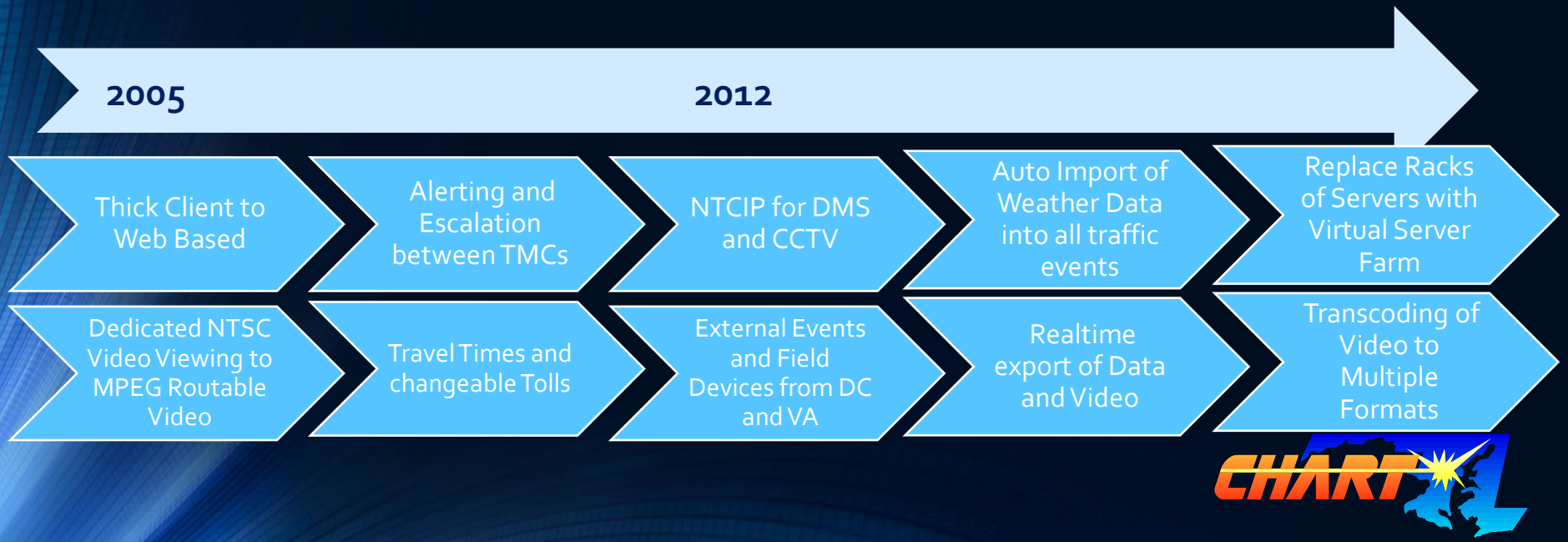
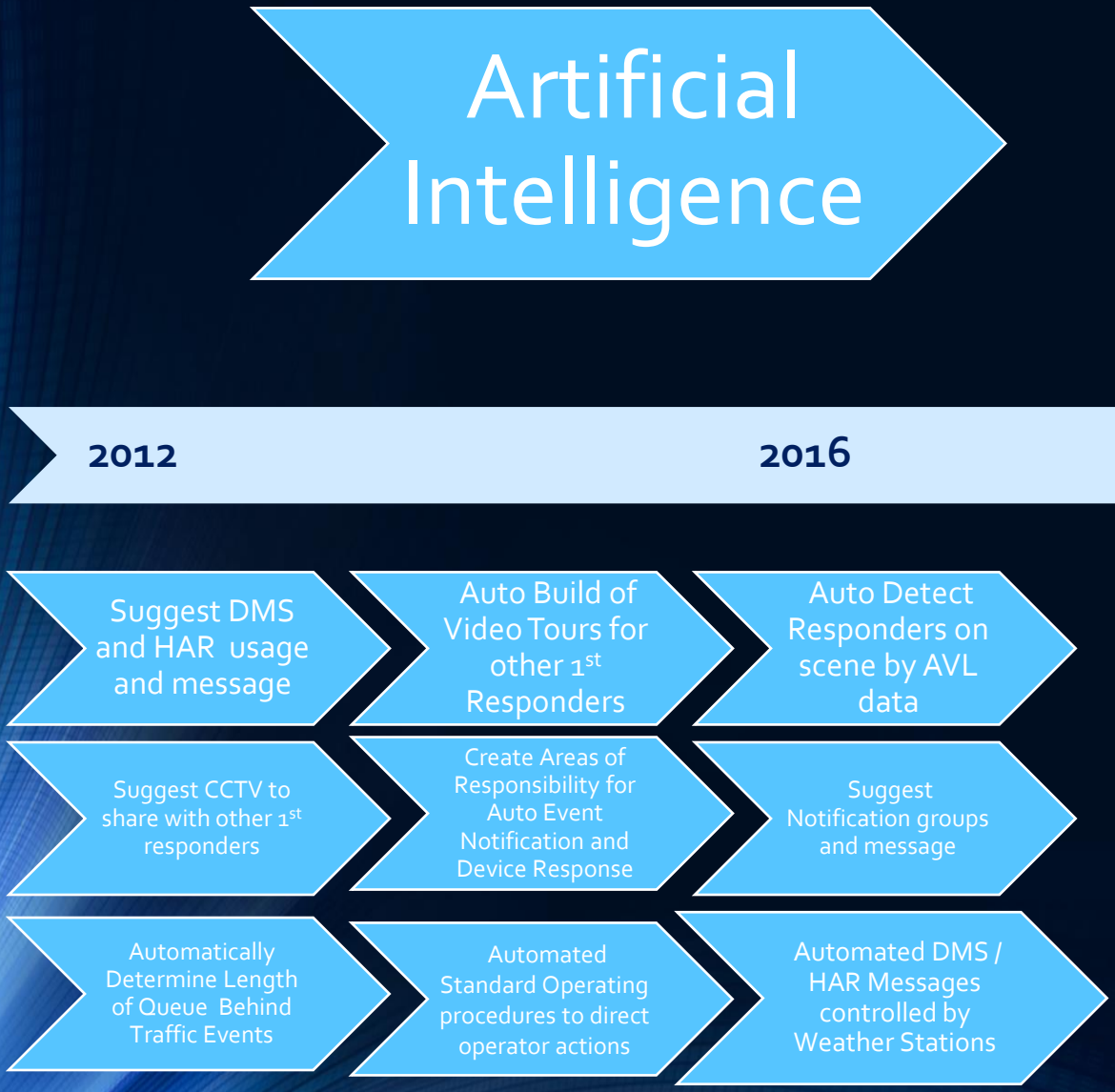


CHART Advanced Traffic Management System Software



- Since 2012 we have been building in more systems intelligence
- Ensures more consistent response to the public
- Allows more junior operators to be allowed to use the system with less direct supervision

CHART Advanced Traffic Management System Software

The FUTURE!

- The push for more users and devices continues

Field Devices

Now → **The Future**

DMS	326	?? (we are building more and getting access to even more from others!)
CCTV	838	?? (we are building more and getting access to even more from others!)
HAR	34	Probably 0 (fewer cars are being built with AM radios)
Weather Stations	66	?? (we are building more and getting access to even more from others!)

TMCs → CHART is now a statewide intranet and secure internet application and has over 381 users spread across 91 multi-jurisdictional sites with complete access to all of the CHART system information and capable of event and device control.

CHART Advanced Traffic Management System Software

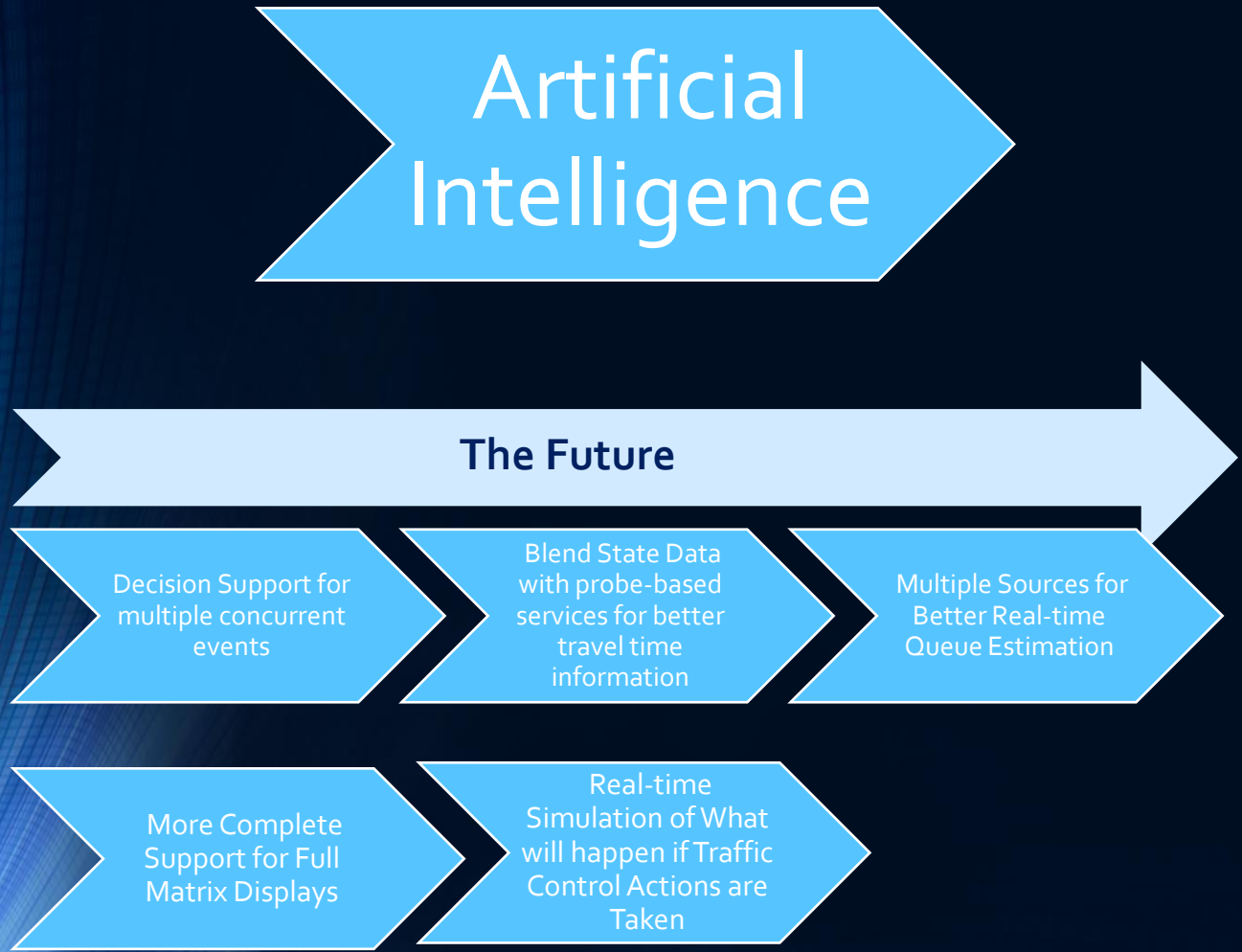
Software / Network Share-ability

- More Flexible Software modules and integrated networks are also necessary to continue the growth of users and subsystems

The Future

- High Speed Connectivity to Real-time backup site
- Complete elimination of Copper Circuits
- Fewer physical devices and more mobile devices and services
- Overlay Transport Virtualization equipment for realtime disaster failover
- Complete Integration of ATMS with Central Authentication
- More direct import and export from neighboring agencies

CHART Advanced Traffic Management System Software



- And to keep up with more traffic and fewer experienced operators the systems will have to get smarter

CHART Advanced Traffic Management System Software

CHART

Lines of code:

•ATMS	2.1 million
•Mapping	285 K
•Web	112 K
•LCP	187 K
•EORS	581 K
Total	3.265 million

Where Does the Money Come From?

Major IT Development projects are funded at MDOT HQ and each project
must be approved and monitored by the State Department of Information Technology

FY 16 MITDP Budget was $5.7M

What is "good" Systems Engineering??

The Feds

And Who Decides?

CHART

What will make the Feds Happy?

Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA–21), Public Law 105–178, 112 Stat. 457, pertaining to conformance with the National Intelligent Transportation Systems Architecture and Standards. 940.11 Project implementation.

(a) All ITS projects funded with highway trust funds shall be based on a systems engineering analysis.

(b) The analysis should be on a scale commensurate with each task scope

(c) The systems engineering analysis shall include, at a minimum:

(1) Identification of portions of the regional ITS architecture being implemented;

(2) Identification of participating agencies roles and responsibilities;

(3) Requirements definitions;

(4) Analysis of alternative system configurations and technology options to meet requirements;

(5) Procurement options;

(6) Identification of applicable ITS standards and testing procedures;

(7) Procedures and resources necessary for operations and management of the system.

At the end of the day, don't forget who you work for…

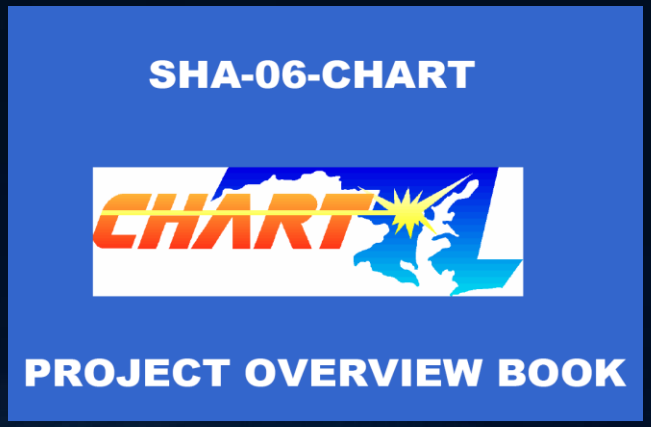
- The Coordinated Highways Action Response Team (CHART) Systems Development project has been identified as a Major Information Technology Development Project as stated in Chapters 467 and 468, Acts of 2002, as mandated by *State Finance and Procurement Title 3 § 3-403*
  - The project Executive Business Sponsor is the SHA Deputy Administrator / Chief Engineer for Operations
  - A full-time Systems Management team is assigned
  - Rigorous Systems Development Life Cycle (SDLC) Methodology are mandated
  - Regular updates to General Assembly through the State Dept of Information Technology are established through an Information Technology Project Request (ITPR)

ITPR Goals & Objectives are tied to SHA Key Performance Areas

- The CHART system, with its ability to identify and confirm traffic events, coordinate and direct first responders and notify the traveling public is the cornerstone of one of SHA's Key Performance Areas, "Mobility/Economy" as identified in SHA's Business Plan (http://www.sha.maryland.gov/oc/shabusinessetnl.pdf)
- Although it has other disaster preparedness and homeland security coordination aspects to it, the CHART software, as planned in the BAA, and as is being built is a direct response to meet the goal "SUPPORT MARYLAND'S ECONOMY AND COMMUNITIES THROUGH ENABLING RELIABLE MOVEMENT OF PEOPLE AND GOODS."
  - Specifically, CHART meets Objective 2.1, Travel Reliability - Achieve an annual user cost savings of at least $1.1 billion as a result of congestion management and Objective 2.3 Traveler Information Dissemination - Provide reliable and accessible real-time modal choice information to travelers and other stakeholders at all times.
  - See Latest Performance Evaluation Report at http://traffic.md.gov/readingroom/readingroom.asp

How extensive is this Business Area Architecture ?

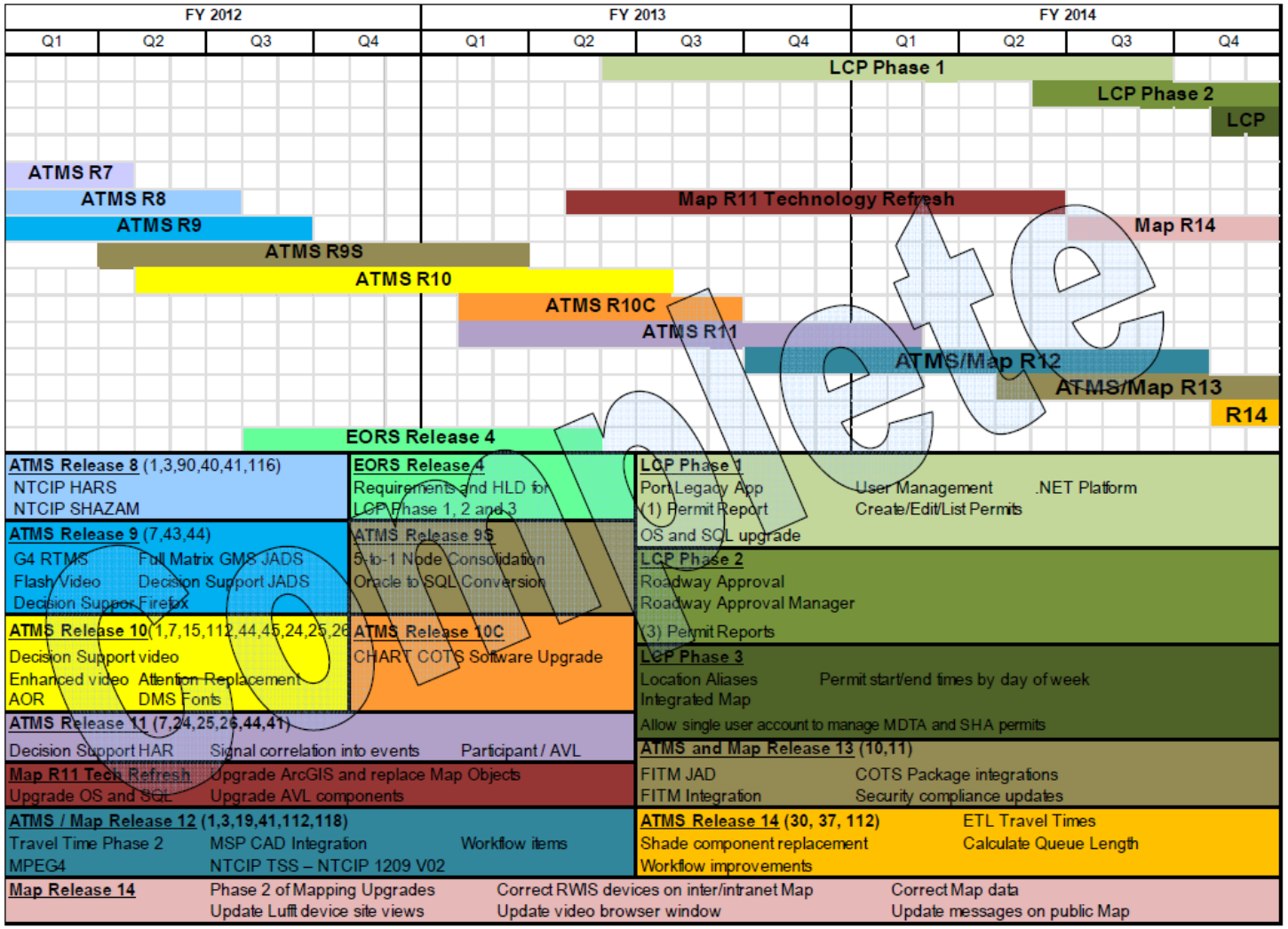
- The original CHART Business Area Architecture (BAA) served as the SDLC Initiation, Concept, Planning and Requirements Analysis phases of the CHART ATMS. Each subsequent release of CHART has then accomplished a requirement validation and continued the design, development, integration/testing, implementation and O&M of the SDLC. (http://traffic.md.gov/readingroom/RR_CurrDocumentation.asp)
- Each follow-on work order will be tracked in a “Blue Books” that includes task schedules, summaries, earned-value charts, budget updates and program schedules



Work is done with multiple work orders using a state mandated Waterfall methodology

Work Orders
As of May 6, 2016 Invoice

CHART Project Overview Book
April 2016



Software development follows a strict development methodology that deploys a new build with more capabilities approximately every 6 months.

The current Waterfall methodology is very Artifact Intensive

Work Orders
As of May 6, 2016 Invoice

CHART Project Overview Book
April 2016

Work Order 49 Title: ITPR-83, ATMS Release 15 / LCP Phase 5

Type: T&M **Term:** 06/01/15-05/17/16

SHA Work Order Manager: Dale Lineweaver

CSC Work Order Manager: Gary Krebs

Statement of Work: This release includes new functionality for CHART ATMS by incorporating new updates for the Audio Recorder, addition on an AVL Layer, Automatic Weather Messages, LCP/ATMS integrations as well as Resource, Participants and Scheduler enhancements

Change Order	Approval Date Total Project Cost Period of Perf.	Comments
NTP	2015-06-01 $1,592,784.10 06/01/15 - 04/15/16	
1	2015-10-27 $1,645,397.83 06/01/15 - 05/17/16	Increase funding by $52,613.73 due to increase in effort for AWM feature and additional scope of IE11 testing. Schedule extended due to additional time for AWM feature.

WO 49	Approved	Actual	ETC	EAC	Var
Previous FYs	$ 145,604.26	$ 145,604.26		$ 145,604.26	$ -
Current FY	$ 1,499,793.72	$ 1,458,572.93	$ -	$ 1,458,572.93	$ (41,220.79)
Next FY		$ -		$ -	$ -
Total	$ 1,645,397.98	$ 1,604,177.19	$ -	$ 1,604,177.19	$ (41,220.79)

Legend	<1.0= Behind Plan	.0 = on pla	>1.0= Ahead of Plan
	0.00 - 0.89	0.90-0.94	0.95-1.10	1.11 +

Performance Index		15-Jun	15-Jul	15-Aug	15-Sep	15-Oct	15-Nov	15-Dec	16-Jan	16-Feb	16-Mar	16-Apr
Cost:	CPI	0.95	0.99	0.98	0.95	1.01	0.96	1	1.02	1.05	1.04	1.04
Schedule:	SPI	0.77	0.98	0.96	0.90	1.01	0.97	1	0.99	1	1	1

Notes:		
15-Jun	SPI	This is beginning of project and minor deviations have major impacts on index.
15-Sep	SPI	The design for the Automated Weather Message feature was delayed because additional JAD sessions were required with users to finalize requirements. While AWM is the second largest feature in the release, it was assumed early in the month that the while the design would be late, the overall effort to implemented could be re-estimated and would not push out the schedule. By the end of September, the confirmed estimates for this feature do not allow the time to be made up and the overall schedule is behind and will be pushed out in planned Change Order 01.

	Deliverables	Planned Start	Actual Start	Planned Finish	Actual Finish
1	Project Plan	05/28/2015	05/28/2015	05/28/2015	05/31/2015
2	Notice to Proceed	06/01/2015	06/01/2015	06/01/2015	06/01/2015
3	Updates Software Requirements	06/05/2015	06/03/2015	07/28/2015	07/28/2015
4	Detailed Design Document	06/17/2015	06/16/2015	09/25/2015	09/25/2015
5	Test Master Plan	09/11/2015	08/20/2015	09/21/2015	08/27/2015
6	Integration Test Procedures	06/30/2015	06/30/2015	11/18/2015	11/19/2015
7	Users Guide	01/11/2016	10/22/2015	02/01/2016	01/29/2016
8	Training Plan	02/03/2016	01/29/2016	02/03/2016	01/29/2016
9	System Test Procedures	08/25/2015	08/31/2015	11/20/2015	11/23/2015
10	System Test Report	02/24/2016	02/24/2016	02/29/2016	02/29/2016
11	Implementation Plan	02/09/2016	02/09/2016	02/29/2016	02/29/2016
12	Operations and Maintence Guide	01/11/2016	01/11/2016	02/23/2016	02/23/2016
13	Update Disaster Recovery Document	01/11/2016	01/11/2016	02/09/2016	02/09/2016
14	Updated System Architecture Document	01/19/2016	01/19/2016	02/11/2016	02/06/2016
15	Operational Readiness Review	03/09/2016	03/09/2016	03/09/2016	03/09/2016
16	Delivery Documents	03/15/2016	03/15/2016	03/15/2016	03/15/2016
17	Updated BAA	08/31/2015	09/01/2015	09/01/2015	09/01/2015
n/a	Deployment Date Target	03/15/2016	03/15/2016	03/15/2016	03/15/2016
n/a	Warranty Period Dates	03/18/2016	03/18/2016	05/17/2016	
n/a	Project Completion	05/17/2016		05/17/2016	

Each month for each project we update…

The current Waterfall methodology is very Artifact Intensive

Work Orders
As of May 6, 2016 Invoice

CHART Project Overview Book
April 2016

T&M WOAs	Title	Current Charges	Cumulative Charges
0049	WO49 - ITPR, CHART ATMS R15/LCP P5	0.00	1,604,177.19

Accomplishments-

- March Indexes:
  - CPI: 1.04
  - SPI: 1.00
- Conducted internal Lessons Learned
- Deployed CHART ES
  - Copy scripts need to be corrected
- Deployed warranty PRs
  - ATMS-1739: Operations Center Report Event List does not include events within center's AOR
  - ATMS-1744: Change Rights To Manage Patrol Areas/Contact for Field Units
  - ATMS-1732: Handle new Traffic Event Source Value 246=LCP in exporter and downstream
  - ATMS-1726: New Planned Closure Event Should Export Pending Transition
  - ATMS-1806: Multiple events created for same permit when user double clicks Activate link
  - ATMS-1777: ATMS Fails to Write Event History When Closing Pending Event
  - ATMS-1828 ATMS GUI Home Page shows Client.CouldNotDecode error message
  - ATMS-1832 Open traffic event does not have controlling op center
  - ATMS-1834 Some events not automatically opened/closed based on queued permit activation/deactivation
  - ATMS-1837 ExportClient Can have pending events in JSON Feed
- Corrected copy scripts for CHART ES
- April Indexes:
  - CPI: 1.04
  - SPI: 1.00

Product Completed-

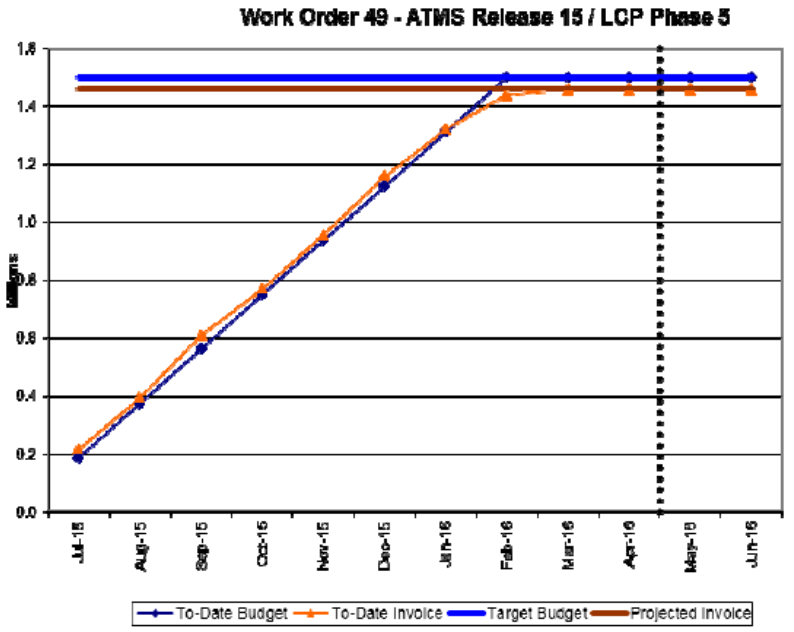
- None

Upcoming Plans -

- Collect Metrics
- Complete warranty 5/17

Issues-

- None



Each month for each project we update…

The current Waterfall methodology is very Artifact Intensive

Work Orders
As of May 6, 2016 Invoice

CHART Project Overview Book
April 2016

Work Order 49 Task Sheet

WO49 ATMS R15 CO 01	PLANNED-CO01			ACTUAL		
	WORK	START	FINISH	Total Work	START	FINISH
	14,169.3	05/28/15	04/21/15	13,637.0	05/28/15	
Initiation	**5.5**	**05/28/15**	**06/03/15**	**5.5**	**05/28/15**	**06/03/15**
Deliverable 1 - Project Plan	0.0	05/28/15	05/28/15	0.0	05/28/15	05/31/15
Deliverable 2 - NTP	0.0	06/01/15	06/01/15	0.0	06/01/15	06/01/15
Kickoff Meeting	5.5	06/03/15	06/03/15	5.5	06/03/15	06/03/15
Requirements	**915.5**	**06/03/15**	**07/29/15**	**915.5**	**06/03/15**	**07/29/15**
LCP/ATMs Integration	173.5	06/04/15	07/16/15	173.5	06/08/15	07/16/15
Audio Recorder	105.5	06/05/15	07/06/15	105.5	06/05/15	07/06/15
AVL Layer	16.5	06/04/15	07/06/15	16.5	06/04/15	07/06/15
Resource and Participant Enhancements	155.0	06/03/15	07/08/15	155.0	06/03/15	07/08/15
Automatic Weather Messages	353.0	06/03/15	07/29/15	353.0	06/03/15	07/29/15
Scheduler Enhancements	106.5	06/04/15	07/14/15	106.5	06/04/15	07/14/15
Deliverable 3 - Software Requirements	5.5	06/05/15	07/28/15	5.5	06/03/15	07/28/15
Detailed Design	**1,245.0**	**06/16/15**	**09/25/15**	**1,245.0**	**06/16/15**	**09/25/15**
LCP/ATMs Integration	329.0	06/16/15	07/23/15	329.0	06/16/15	07/23/15
Audio Recorder	20.0	06/26/15	07/22/15	20.0	06/26/15	07/22/15
AVL Layer	12.0	07/08/15	07/15/15	12.0	07/08/15	08/28/15
Resource and Participant Enhancements	161.0	07/09/15	07/20/15	161.0	07/09/15	08/20/15
Automatic Weather Messages	581.5	07/01/15	09/24/15	581.5	07/10/15	09/24/15
Scheduler Enhancements	130.5	07/09/15	08/24/15	130.5	07/09/15	08/24/15
Deliverable 4 - Detail Design Document	11.0	06/17/15	09/25/15	11.0	06/16/15	09/25/15
Implementation	**3,348.0**	**06/30/15**	**02/05/16**	**3,833.5**	**06/30/15**	**02/05/16**
LCP/ATMs Integration	965.5	06/30/15	10/12/15	965.5	06/30/15	10/12/15
Audio Recorder	38.0	08/03/15	08/07/15	64.0	08/03/15	11/04/15
AVL Layer	42.0	08/06/15	08/14/15	42.0	08/06/15	08/14/15
Resource and Participant Enhancements	323.0	08/05/15	10/05/15	323.0	08/05/15	10/05/15
Automatic Weather Messages	1,361.0	07/30/15	11/09/15	1,381.0	07/30/15	11/13/15
Scheduler Enhancements	159.5	08/12/15	09/22/15	219.5	08/12/15	11/17/15
Peer Reviews	180.0	11/09/15	11/13/15	322.5	10/12/15	11/24/15
Produce Deliverable documentation	81.0	01/11/16	02/05/16	81.0	10/22/15	02/05/16
Unit test	198.0	11/16/15	11/20/15	435.0	10/26/15	11/24/15
Deliverable 5 - Test Master Plan	8.0	09/11/15	08/20/15	0.0	09/21/15	08/27/15
Deliverable 6 - Integration Test Procedures	0.0	06/30/15	11/18/15	0.0	06/30/15	11/18/15

Each month for each project we update…

The current Waterfall methodology is very Artifact Intensive

Work Orders
As of May 6, 2016 Invoice

CHART Project Overview Book
April 2016

Integration Test	**2,067.3**	**11/19/15**	**01/08/16**	**1,627.5**	**11/05/15**	**01/20/16**
Establish IT Environment	0.0	11/19/15	11/19/15	0.0	11/20/15	11/23/15
Conduct ITRR	0.0	11/20/15	11/20/15	0.0	11/24/15	11/24/15
Conduct Integration Test	2,067.3	11/20/15	01/08/16	1,627.5	11/05/15	01/20/16
Support User Training	**0.0**	**01/15/16**	**03/04/16**	0.0	**01/27/16**	**03/04/16**
Machine setup and app config	0.0	01/15/16	01/15/16	0	01/27/16	02/01/16
Setup and support User Training Environment	0.0	02/29/16	03/04/16	0.0	02/29/16	03/04/16
System Test	**3,606.0**	**06/25/15**	**02/05/16**	**3,566.0**	**06/25/15**	**02/29/16**
System Test Procedures	**2,191.5**	06/25/15	01/11/16	**2,214.0**	**06/25/15**	**01/11/16**
Design Review and Planning Meetings	709.8	06/25/15	09/16/15	709.7	06/25/15	08/21/15
Write Test Master Plan	9.0	09/11/15	09/11/15	9.0	08/12/15	08/21/15
Write System Test Procedures	1472.8	09/17/15	01/11/16	1,495.3	08/31/15	01/11/16
Conduct System Test	**1414.5**	**01/11/16**	**02/29/16**	**1,352.0**	**01/11/16**	**02/29/16**
Lab setup and conduct STRR	4.0	01/11/16	01/12/16	4.0	01/11/16	01/11/16
Conduct System Test	472.0	01/12/16	02/29/16	507.5	01/11/16	02/29/16
System Test Support	938.5	01/12/16	02/29/16	840.5	01/11/16	02/29/16
Produce Deliverable documentation	**0.0**	**08/31/15**	**03/15/16**	**0.0**	**08/31/15**	**03/15/16**
Deliverable 7 - Users Guide	0.0	01/11/16	02/01/16	0.0	10/22/15	01/29/16
Deliverable 8 - Training Plan	0.0	02/03/16	02/03/16	0.0	01/29/16	01/29/16
Deliverable 9 - System Test Procedures	0.0	08/25/15	11/20/15	0.0	08/31/15	11/23/15
Deliverable 10 - System Test Report	0.0	02/24/16	02/29/16	0.0	02/26/16	02/29/16
Deliverable 11 - Implementation Plan	0.0	02/09/16	02/29/16	0.0	02/09/16	02/29/16
Deliverable 12 - Operations and Maintenance Guide	0.0	01/11/16	02/23/16	0.0	02/01/16	02/23/16
Deliverable 13 - Updated Application Recovery Document	0.0	01/11/16	02/09/16	0.0	02/09/16	02/09/16
Deliverable 14 - Updated System Architecture Document	0.0	01/19/19	02/06/16	0.0	02/01/16	02/05/16
Deliverable 16 - Delivery Documentation	0.0	03/15/16	03/15/16	0.0	03/15/16	03/15/16
Deliverable 17 - BAA	0.0	08/31/15	09/01/15	0.0	08/31/15	09/01/15
Deployment	**66.0**	**02/09/16**	**03/15/16**	**28.0**	**02/09/16**	**03/22/15**
Pre Deployment activities and documentation	58.0	02/09/16	02/23/16	19.0	02/09/16	03/11/16
Deliverable 15 - Conduct ORR	0.0	03/09/16	03/09/16	0.0	03/09/16	03/09/16
CHART ES Deployment	0.0	TBD	TBD	1.0	03/22/15	03/22/15
Deployment (TBD by Client)	8.0	03/15/16	03/15/16	8.0	03/15/16	03/15/16
Close Out Activites	**10.0**	**03/18/16**	**05/17/16**	**0.0**	**03/18/16**	
Warranty Start	0.0	03/18/16	03/18/16	0.0	03/18/16	03/18/16
Collect Metrics	2.0	05/04/16	05/04/16	0.0	04/29/16	04/29/16
Conduct Lessons Learned	8.0	04/12/16	04/12/16	0.0	03/31/16	03/31/16
Warranty Ends	0.0	05/17/16	05/17/16			
Management & Database Admin	**2,906.0**	06/04/15	05/04/16	**2,416.0**	**06/04/15**	**4/29/16**
Task Lead Management	2,062.0	06/04/15	05/04/16	1,830.0	06/04/15	04/29/16
Database Admin	844.0	06/04/15	03/18/16	586.0	06/09/15	03/18/16

Each month for each project we update…

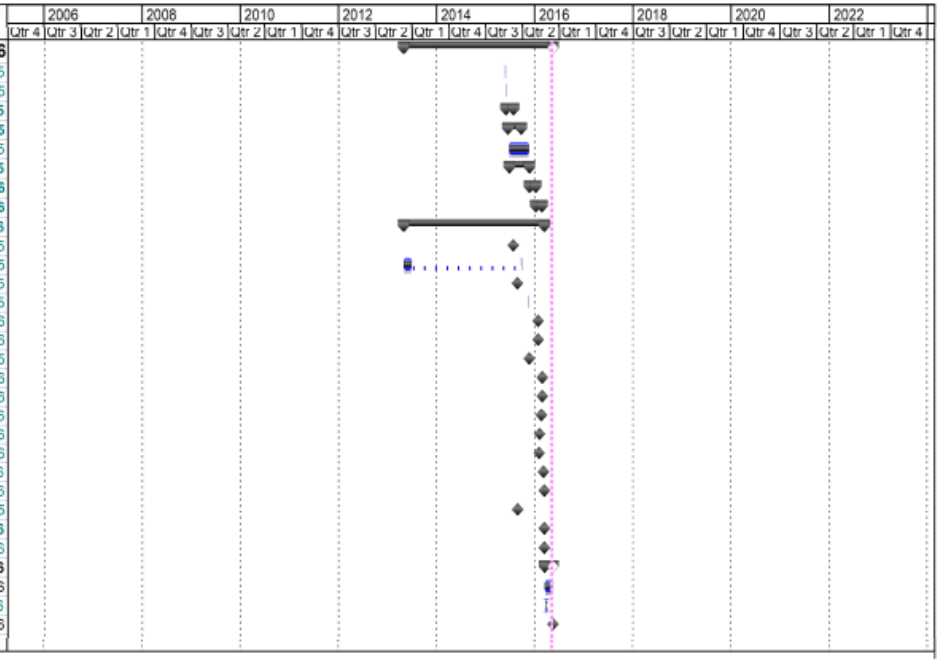
The current Waterfall methodology is very Artifact Intensive

Work Orders
As of May 6, 2016 Invoice

CHART Project Overview Book
April 2016

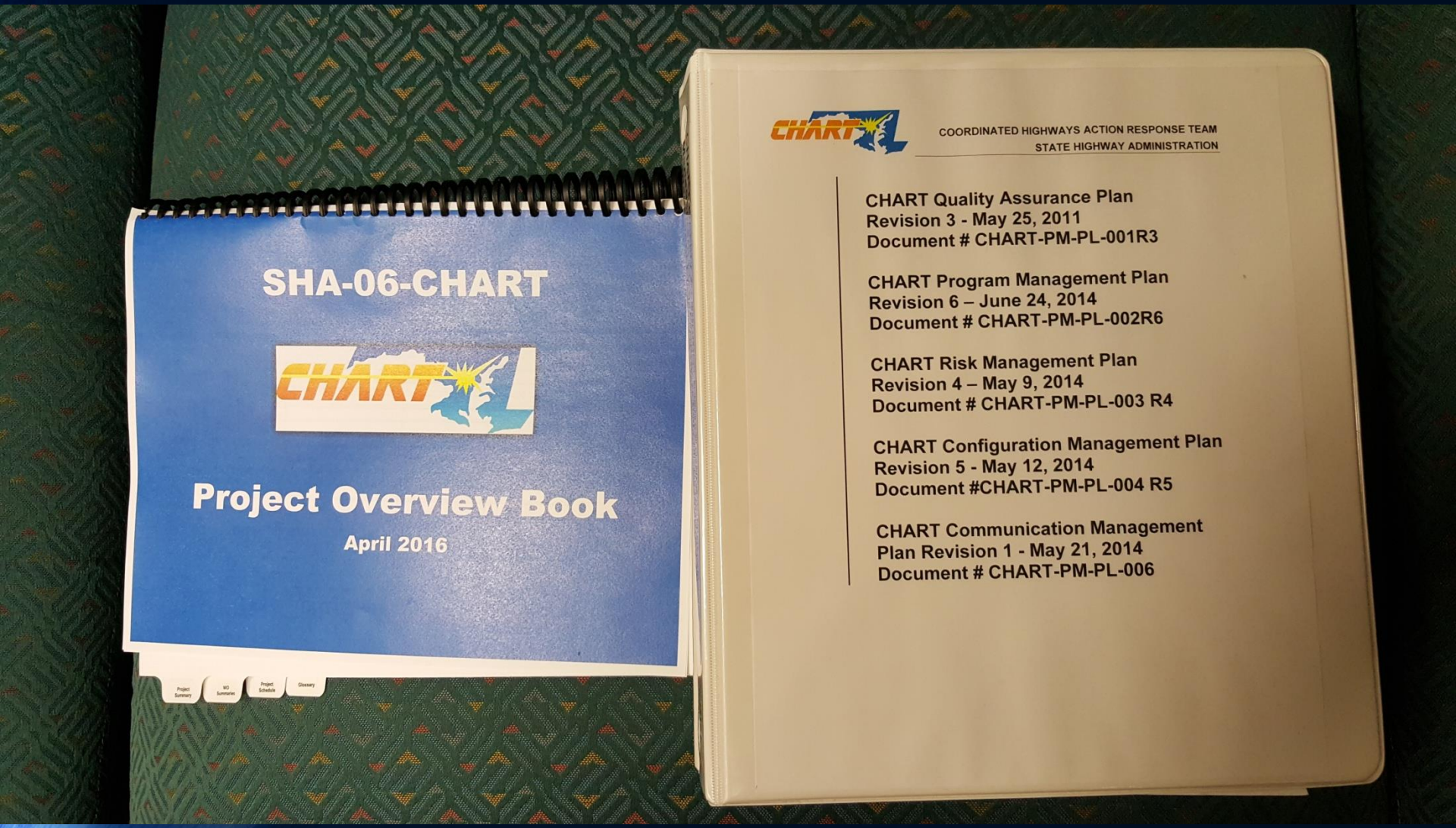
Work Order 49 Schedule

ID	Task Name	% Comp	Start	Finish
2082	**Work Order 49: ATMS R15**	**98%**	**Wed 5/1/13**	**Tue 5/17/16**
2083	Deliverable 1 Project Plan	100%	Thu 5/28/15	Thu 5/28/15
2084	Deliverable 2 Notice to Proceed	100%	Mon 6/1/15	Mon 6/1/15
2085	**Requirements**	**100%**	**Thu 6/4/15**	**Tue 7/28/15**
2087	**System Design**	**100%**	**Wed 6/17/15**	**Fri 9/25/15**
2089	Generate System Test Procedures	100%	Thu 6/25/15	Thu 11/19/15
2090	**Implementation**	**100%**	**Tue 6/30/15**	**Tue 11/24/15**
2092	**Integration Test**	**100%**	**Tue 11/24/15**	**Mon 1/11/16**
2095	**System Test**	**100%**	**Mon 1/11/16**	**Fri 2/26/16**
2098	**Produce Deliverable Documentation**	**100%**	**Wed 5/1/13**	**Tue 3/15/16**
2099	Deliverable 3 Updated Software Requirements	100%	Tue 7/28/15	Tue 7/28/15
2100	Deliverable 4 Detailed Design	100%	Wed 5/1/13	Fri 9/25/15
2101	Deliverable 5 Test Master Plan	100%	Thu 8/27/15	Thu 8/27/15
2102	Deliverable 6 Integration Test Procedures	100%	Wed 11/18/15	Thu 11/19/15
2103	Deliverable 7 Users Guide	100%	Fri 1/29/16	Fri 1/29/16
2104	Deliverable 8 Training Plan	100%	Fri 1/29/16	Fri 1/29/16
2105	Deliverable 9 System Test Procedures	100%	Mon 11/23/15	Mon 11/23/15
2106	Deliverable 10 System Test Report	100%	Mon 2/29/16	Mon 2/29/16
2107	Deliverable 11 Implementation Plan	100%	Mon 2/29/16	Mon 2/29/16
2108	Deliverable 12 Operations and Maintenance Guide	100%	Tue 2/23/16	Tue 2/23/16
2109	Deliverable 13 Updated Application Recovery Documer	100%	Tue 2/9/16	Tue 2/9/16
2110	Deliverable 14 Updated System Architecture Document	100%	Sat 2/6/16	Sat 2/6/16
2111	Deliverable 15 Operational Readiness Review	100%	Wed 3/9/16	Wed 3/9/16
2112	Deliverable 16 Delivery Documentation	100%	Tue 3/15/16	Tue 3/15/16
2113	Deliverable 17 Updated BAA	100%	Mon 8/31/15	Mon 8/31/15
2114	**Deployment**	**100%**	**Tue 3/15/16**	**Tue 3/15/16**
2115	Deployment	100%	Tue 3/15/16	Tue 3/15/16
2116	**Project Close Down/Warranty Period**	**80%**	**Thu 3/17/16**	**Tue 5/17/16**
2117	Warranty Period	78%	Thu 3/17/16	Tue 5/17/16
2118	Lessons Learned	100%	Fri 3/25/16	Wed 3/30/16
2119	Final Acceptance	0%	Tue 5/17/16	Tue 5/17/16
2120				



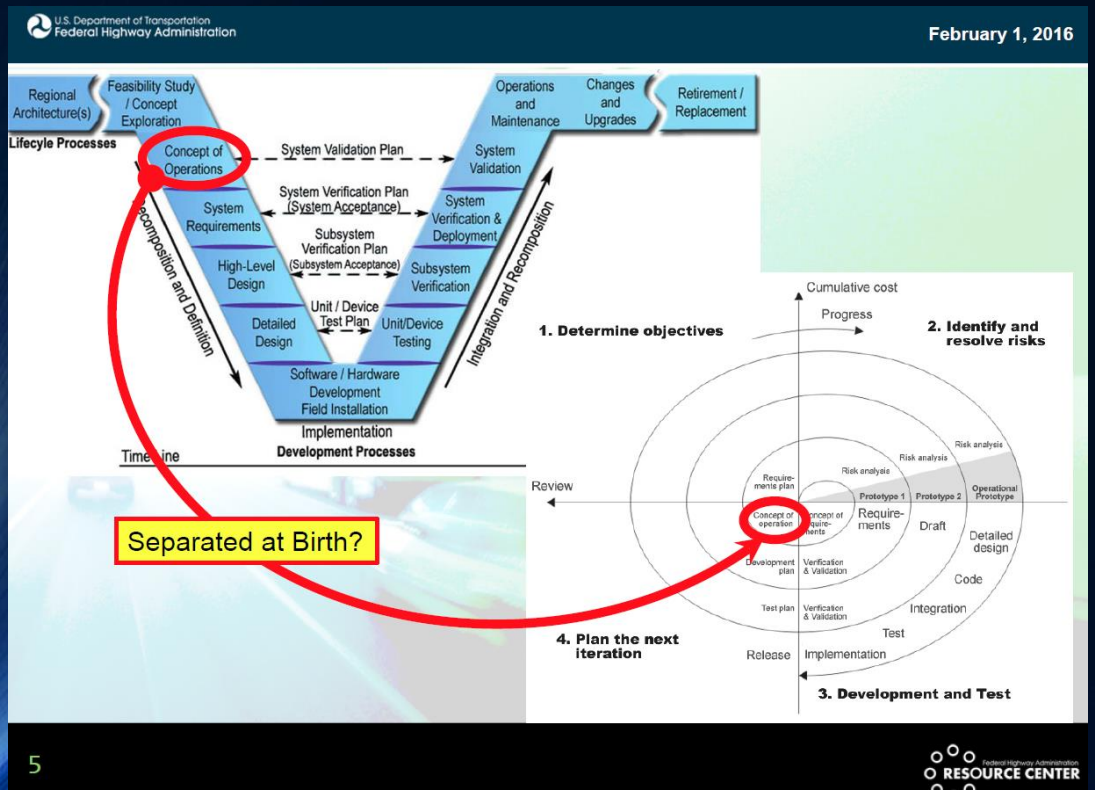
Each month for each project we update…

The current Waterfall methodology is strictly prescribed by management plans



Is Agile next???

- Feb 2016 I attended an FHWA sponsored Webinar:
  - Emerging Role of Agile Software Development for ITS Projects
  - Systems Engineering for Software Intensive Projects Using Agile Methods (much of the content came from INCOSE International Symposium 2014 including content from Gundars Osvalds, Praxis Engrg, Annapolis Junction, MD!)
  - Federal presentations on how Agile Process comply with Federal Aid Oversight (Rule 940.11)
- INCOSE Transportation Working Group is heavily involved (www.incose.org/ChaptersGroups/WorkingGroups/government/transportation)



I think the kids are calling it "spiraling the V!"

Coordinated Highways Action Response Team

Questions?