



# **Connected Vehicle Architecture Workshop**

## SET-IT Use Example

June 16, 2016

# Workshop Agenda

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- Introduction 9:00 AM
- CVRIA Overview 9:20 AM
- CVRIA Website Tour 9:50 AM
- National ITS Architecture / CVRIA Integration 10:20 AM
- Break 10:35 AM
- Attendee Feedback on CVRIA 10:50 AM
- SET-IT Software Tour 11:20 AM
- SET-IT Use Example 11:50 AM
- Wrap-up 12:20 PM
- Adjourn 12:30 PM

# Project Architecture Process using SET-IT

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- Start a new project
- Include application(s) in the project
- Tailor the physical view of each application (on a diagram and in the definitions)
- Tailor the enterprise view of the application
- Setup the communications view
- Create outputs

# Start a New Project

The screenshot displays the SET-IT software interface. The title bar reads "SET-IT - C:\Work Zone Alert Project\Work Zone Alert Project.setit". The main menu includes "Project", "Home", "Review", and "Output". A search bar is present with the text "Search all diagrams..." and a "Search" button. The ribbon contains several groups: "Diagram" (with a "New" button), "Enterprise", "Physical" (highlighted in orange), "Comm", and "Synchronize". The "Physical" group includes a "Views" section. On the left, an "Overview" sidebar contains buttons for "Project", "Applications", "Dashboard", and "Change Log". Below these are "Overview", "Diagrams", and "Definitions" sections. The main workspace is titled "Project Information" and contains the following fields:

- Name: Work Zone Alert Project
- Description: (empty text area)
- Start Date: (calendar icon)
- End Date: (calendar icon)
- Geographical Scope: (empty text area)
- Service Scope: (empty text area)
- Developer: (text input)
- Maintainer: (text input)
- Initials: (text input)
- Origin Location: United States (dropdown menu)
- Version: (text input)
- Timestamp: 8/31/2015 5:56:10 PM (calendar icon)

At the bottom left, the word "Physical" is displayed. At the bottom right, there is a navigation bar with a series of red arrows and a plus sign.

# Provide Project Information

The screenshot shows the SET-IT software interface. The title bar reads "SET-IT - C:\Work Zone Alert Project\Work Zone Alert Project.setit". The ribbon includes "Project", "Home", "Review", and "Output". The "Physical" view is selected. The left sidebar shows "Overview" as the active view. The main area displays the "Project Information" form with the following fields:

Name:	Work Zone Alert Project		
Description:	Connected Vehicle project deploying warnings about hazards in work zones and warnings of upcoming work zones to approaching vehicles.		
Start Date:	10/1/2015	End Date:	4/1/2016
Geographical Scope:	City of Mobility, USA, Highway 7 eastbound, starting at MM 27.1 and ending at MM 33.2.		
Service Scope:	Provide warnings to maintenance personnel within a work zone about potential hazards within the work zone. For example, vehicles moving at high speed near the work zone or entering the work zone. Provide warnings of upcoming work zones to approaching vehicles.		
Developer:	Joe Safety	Maintainer:	Joe Safety
Initials:	JS	Origin Location:	United States
Version:	1.0		8/31/2015 5:56:10 PM

# Select Application(s)

The screenshot displays the SET-IT software interface for a project titled "SET-IT - C:\Work Zone Example Project\Work Zone Project\Work Zone Project.setit". The interface includes a navigation pane on the left with options like "Project", "Applications", "Dashboard", and "Change Log". The main area is divided into two sections: a table of applications and a diagram.

Include	Type	Group	In Project	Application
<input type="checkbox"/>	Mobility	Public Safety	0	Incident Scene Pre-Arrival Staging Guid
<input type="checkbox"/>	Mobility	Public Safety	0	Incident Scene Work Zone Alerts for D
<input type="checkbox"/>	Safety	V2I Safety	0	In-Vehicle Signage
<input type="checkbox"/>	Safety	V2I Safety	0	Reduced Speed Zone Warning
<input checked="" type="checkbox"/>	Safety	V2I Safety	0	Warnings about Hazards in a Work Zo
<input checked="" type="checkbox"/>	Safety	V2I Safety	0	Warnings about Upcoming Work Zone

The diagram below the table illustrates the system architecture for "Warnings about Upcoming Work Zone". It shows various components and their interactions:

- (Traffic Management Center):** TMC Work Zone Traffic Management, TMC in-Vehicle Signage Management.
- (Mobile and Control Center Personnel):** Mobile and Control Center Personnel.
- (Mobile and Control Management Center):** Mobile and Control Management Center.
- (Transmission Information Center):** TMC Transceiver Information/Broadcast.
- (Roadway Equipment):** Roadway Traffic Information/Communications, Roadside Work Zone Traffic Control.
- (Roadside Equipment):** Roadside Equipment.
- (Mobile and Control Vehicle OBE):** Mobile and Control Vehicle OBE, MCV Work Zone Support.
- (Driver):** Driver.
- (Vehicle OBE):** Vehicle OBE, Vehicle-to-Vehicle Information/Communication, Vehicle-to-Infrastructure Information/Communication.

Interactions are shown with data flows (solid lines) and control flows (dashed lines). A blue arrow points to the "Include" button at the bottom of the table, and another blue arrow points to the "work zone" text in the search field.

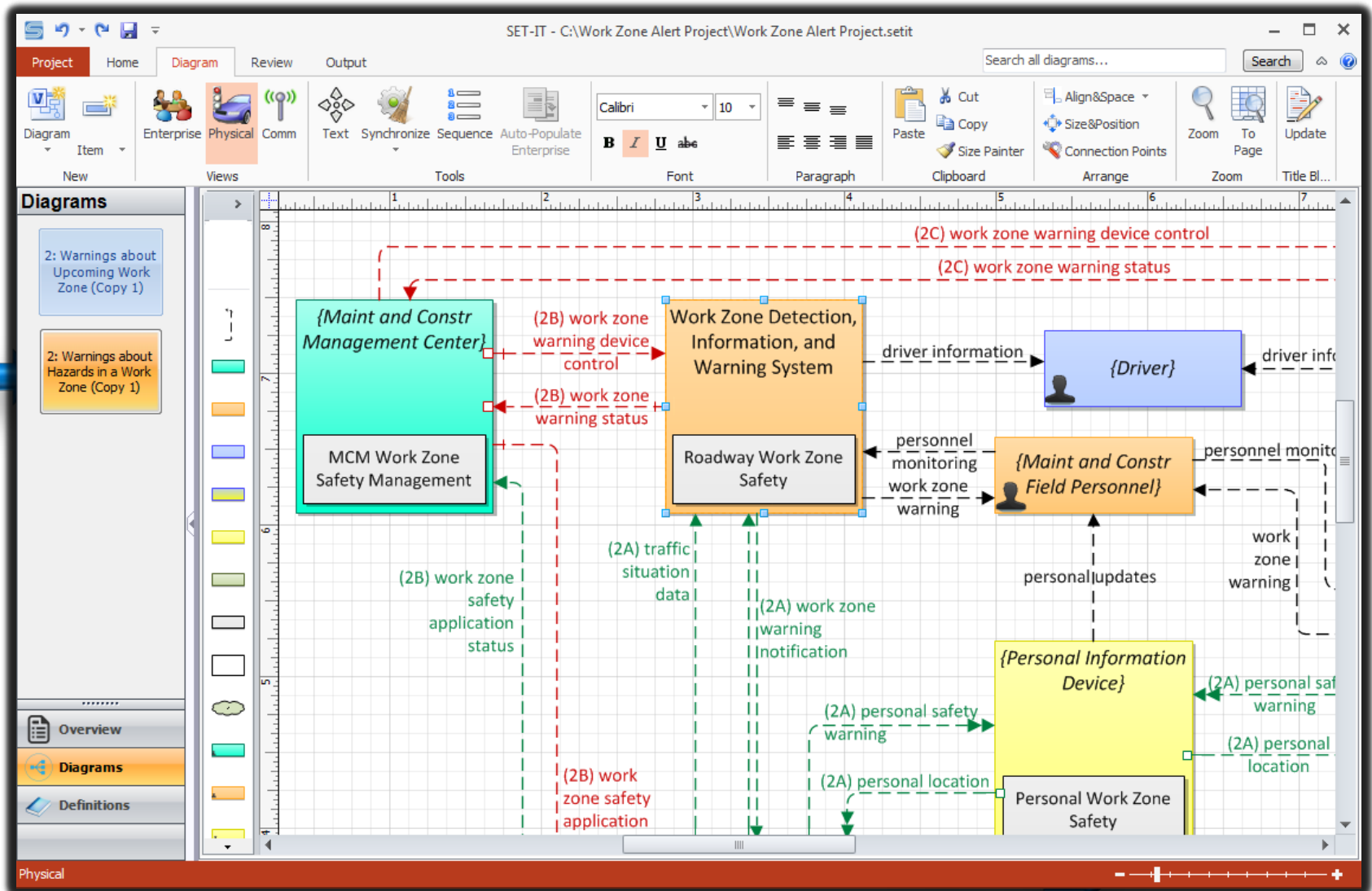
# Needs Identification

The screenshot shows the SET-IT software interface. The title bar indicates the file path: C:\Work Zone Alert Project\Work Zone Alert Project.setit. The interface includes a ribbon with 'Project', 'Home', 'Review', and 'Output' tabs. Below the ribbon are icons for 'Diagram', 'Item', 'Enterprise', 'Physical', 'Comm', and 'Synchronize'. A search bar is located in the top right corner.

The main area displays a table titled 'Needs' with the following columns: Area, Number, Need, and Comment. The 'Needs' section is highlighted in the left sidebar. The table contains the following data:

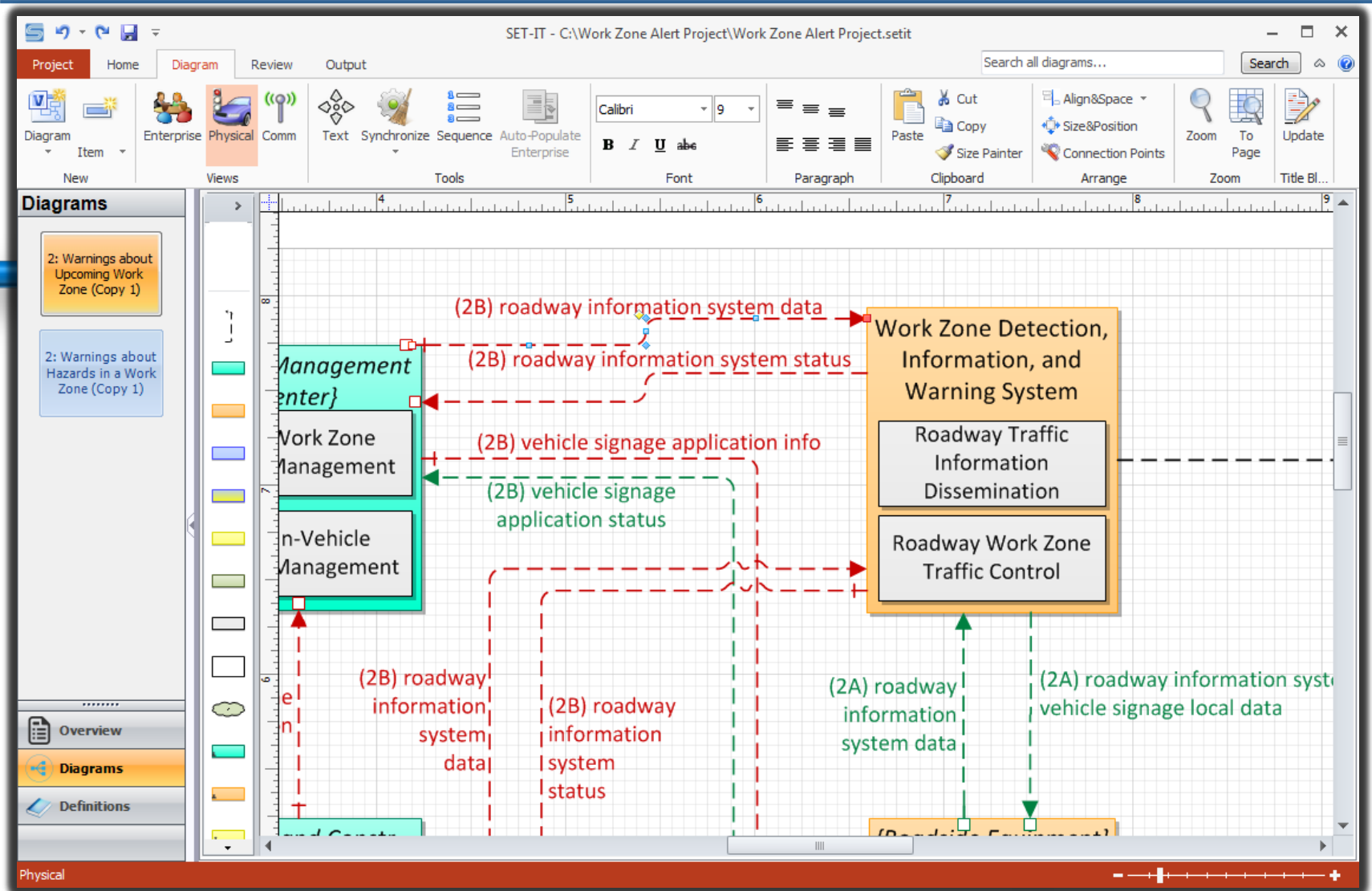
Area	Number	Need	Comment
General Safety Needs	1	Pedestrian in Signalized Crosswalk Warning needs to warn the pedestrians about crossing status or potential vehicle infrin	
General Safety Needs	2	Vehicle to Infrastructure (V2I) Safety applications need to assess their own performance, to determine errors and avoid	
General Safety Needs	3	failures when critical components fail.	
General Safety Needs	4	V2I Safety applications need to have a common time source so that location and projected positions may be synchronized	
General Safety Needs	5	V2I Safety applications need to have positioning accurate enough to create alerts and/or warnings when warranted.	
General Safety Needs	6	V2I Safety applications need to have positioning accurate enough to avoid false positive alerts and/or warnings.	
General Safety Needs	7	Vehicle to Vehicle (V2V) Safety applications need to assess their own performance, to determine errors and properly ente	
General Safety Needs	8	V2V Safety applications need to broadcast the performance of their vehicle in the transportation environment, to enable V	
General Safety Needs	9	V2V Safety applications need to have a common time source so that location and projected positions may be synchroniz	
Warnings about Hazards in a Work Zone (Copy 1)	1	Warnings about Hazards in a Work Zone (WHWZ) needs to provide warnings about hazards in the work zone to maintena	
Warnings about Hazards in a Work Zone (Copy 1)	2	WHWZ needs to know about hazards in the work zone.	
Warnings about Upcoming Work Zone (Copy 1)	1	Warnings about Upcoming Work Zone (WUWZ) needs to provide information describing upcoming work zones to vehicles.	
Warnings about Upcoming Work Zone (Copy 1)	2	WUWZ needs to inform the Driver of upcoming work zones.	

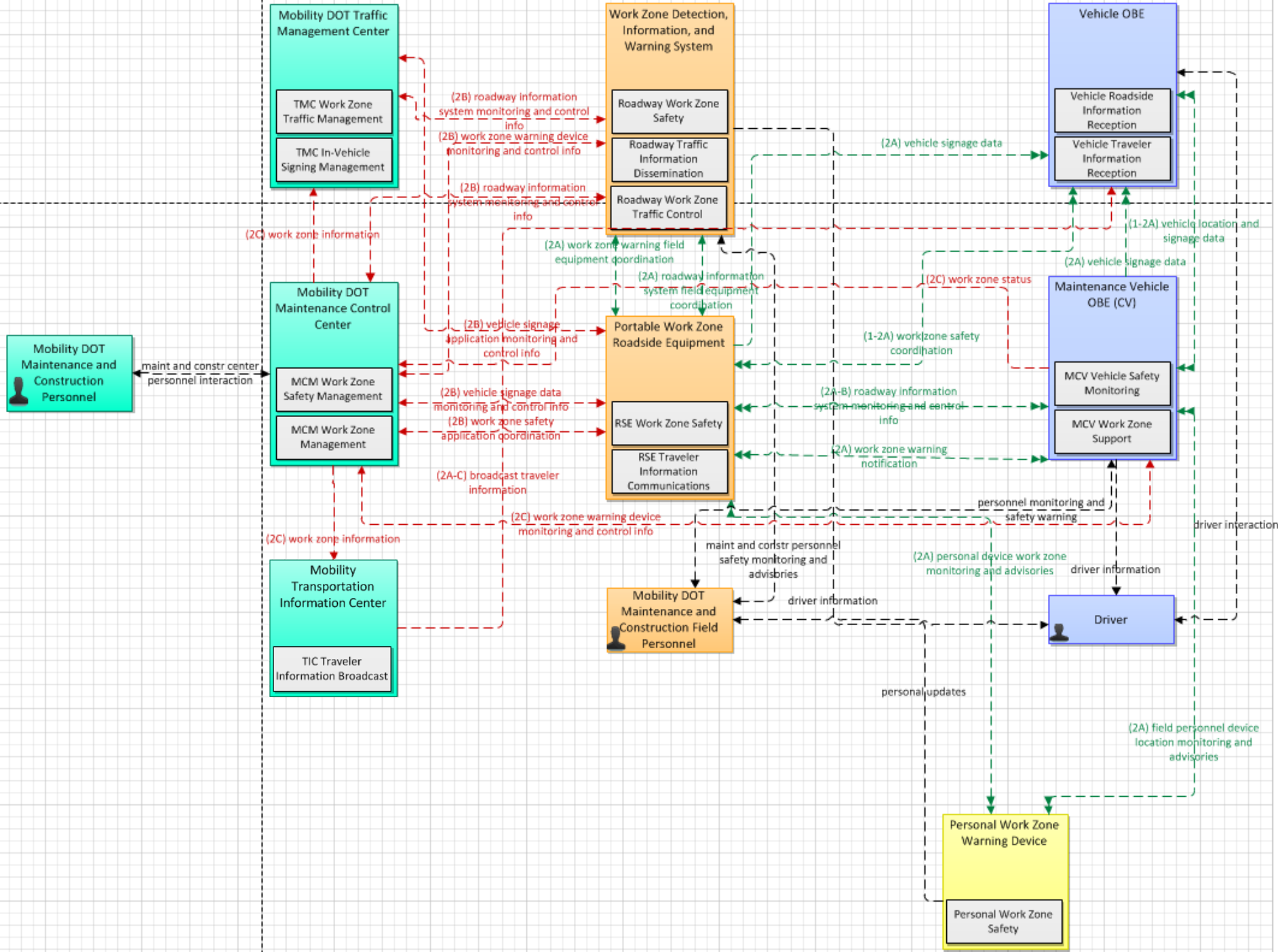
# Tailor Applications – Physical Object Definition



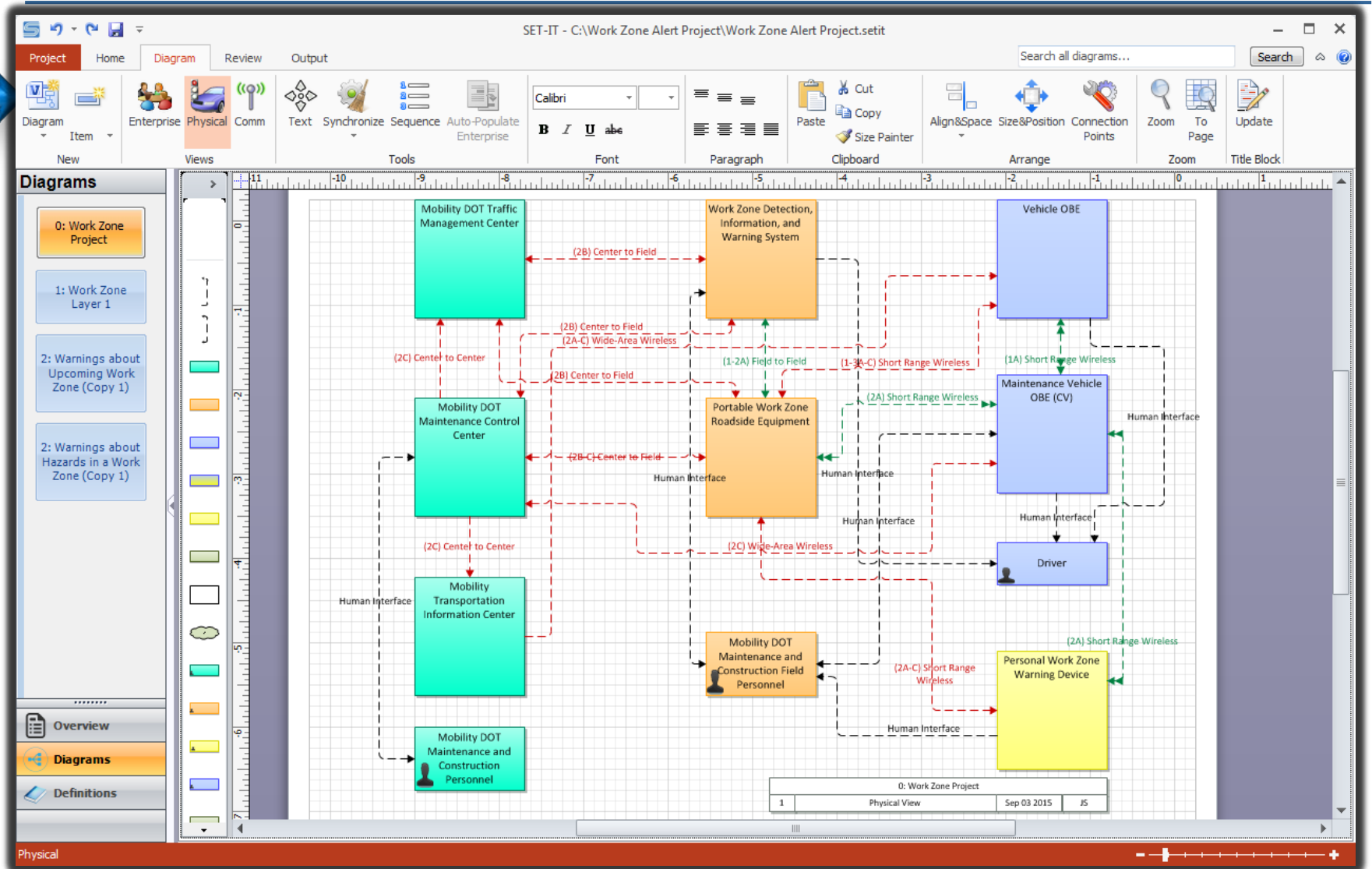


# Tailor Applications – Next Application

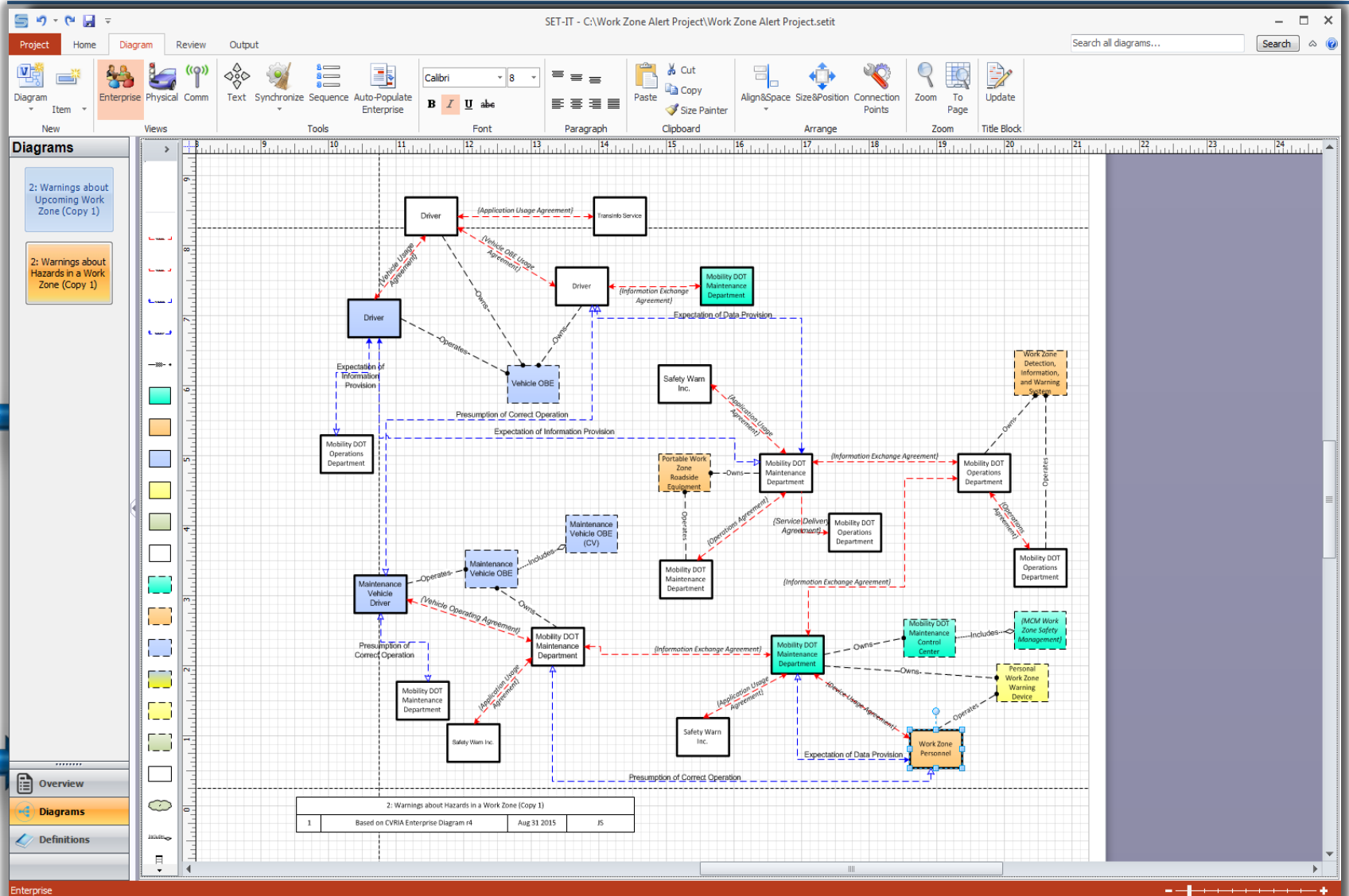




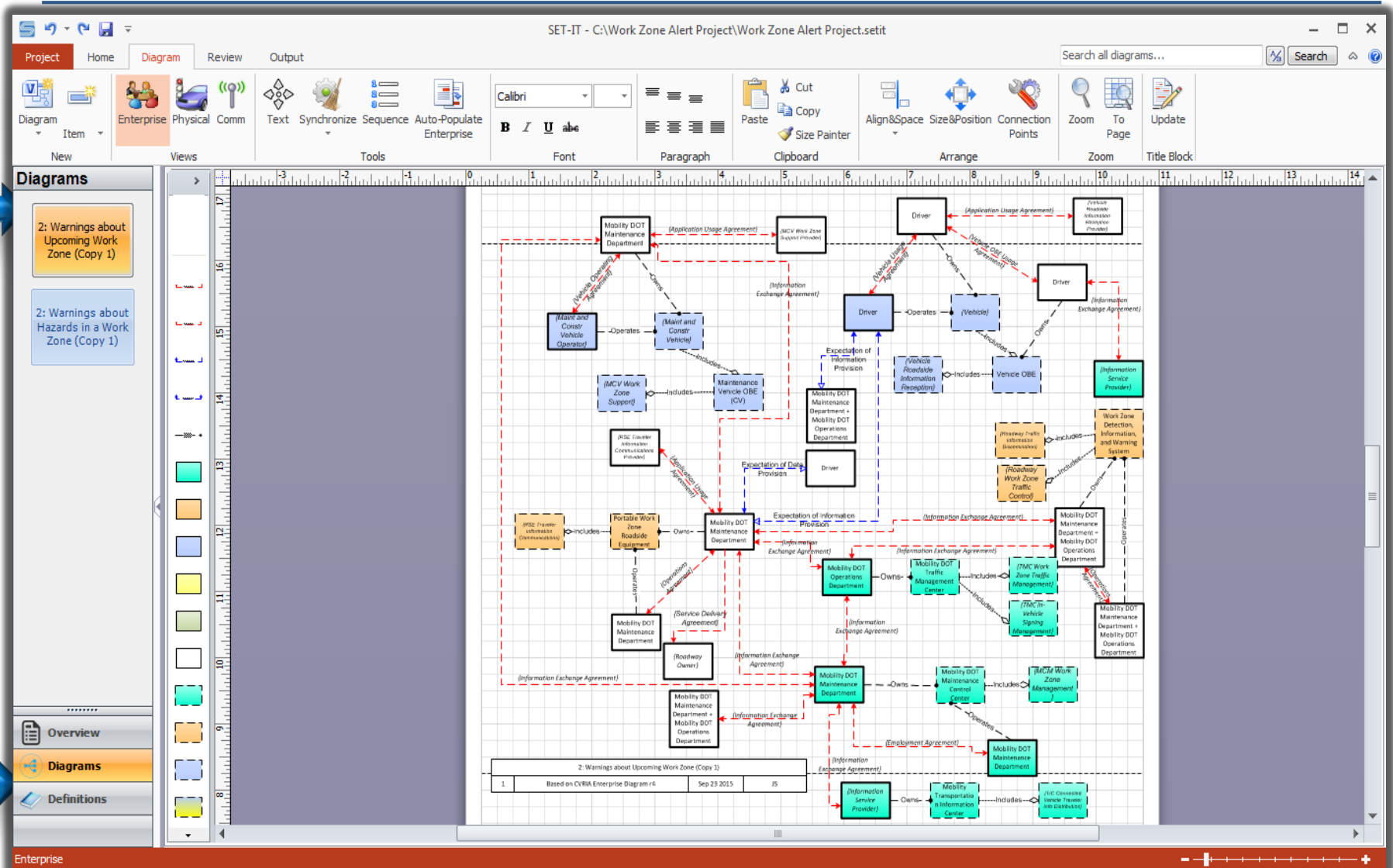
# Physical Layer 0 Diagram



# Tailor Enterprise Diagrams



# Tailor Enterprise Diagrams – Auto-Populate



# Enterprise Layer 0

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- Summarizes the Stakeholders and their Roles and Responsibilities for the entire project
- Create this after you have created a Physical Layer 0 drawing
- Will draw each of the Stakeholders (aka Enterprise Objects)
  - Relationships (agreements, coordination, etc.) with each other
  - Relationships with the Resources/Elements they own and/or operate



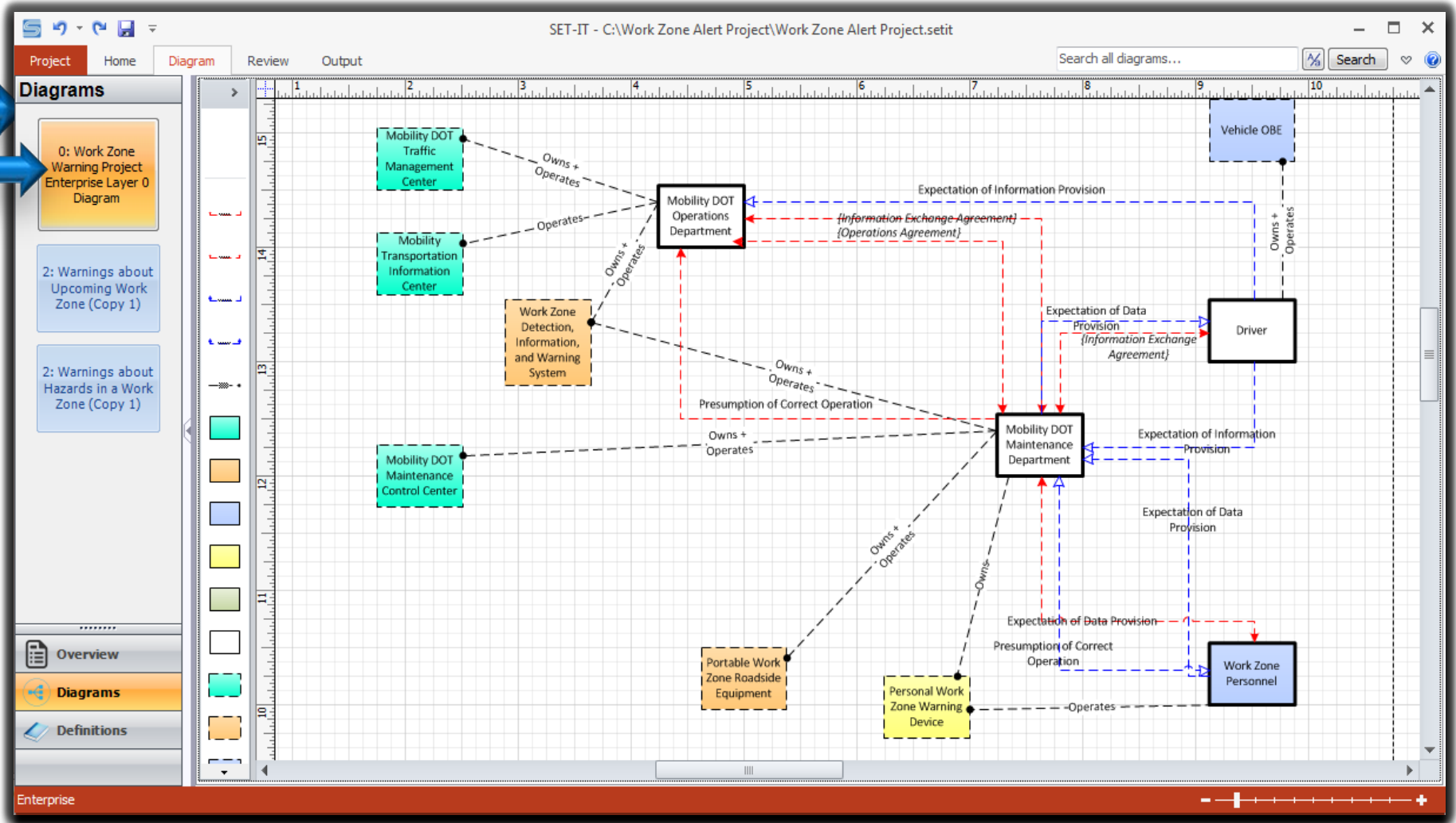
# Enterprise Layer 0 (cont)

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- You will need to edit the drawing just as with Physical Layer 0
- Used as part of the Concept of Operations



# Enterprise Layer 0 Diagram





# Communications Diagrams

SET-IT - C:\Work Zone Alert Project\Work Zone Alert Project.setit

Project Home Diagram Review Output

Diagram Enterprise Physical Comm Text Synchronize Sequence Auto-Populate Enterprise

Calibri B I U abc Paste

Font Paragraph

Templates

- DSRC-5.9-GHz-UDP
- C2V-RSEGateway
- C2V-WAW
- DSRC2Traveler
- C2C-DATEX
- C2C-XML**
- RSE2ITSRoadway
- C2F-SNMP
- V2C-RSEGateway
- V2C-WAW

Overview Templates Definitions

Center to Center

FLOWS-SOURCE

**P-OBJECT-SOURCE**

Process Information Layer

INFORMATION-LAYER-STANDARD

Facility Layer  
NTCIP 2306, IETF HTTP, IETF FTP

Presentation Layer  
NTCIP 2306, W3C XML, IETF GZIP

Session Layer  
IETF TLS

Transport and Network Layer  
IETF TCP, IETF IPv6

**Link Layer**  
IEEE 802.2, IEEE 802 MAC

Physical Layer  
Backhaul PHY\*

Security Plane  
IEEE 1609.2, HTTPS, HTTP Auth, FTPS, FTP Auth

Shape Properties

Link Layer  
IEEE 802.2, IEEE 802 MAC

Layer

Standard

- IEEE 802.2
- IEEE 802 MAC
- IEEE 1609.4
- NTCIP 2101-PMPP / V Series Modem
- NTCIP 2102-PMPP / FSK Modem
- NTCIP 2103-PPP
- NTCIP 2104-Ethernet
- Various

Layer

Process Information

Shape Properties

\* Mechanism for transmitting raw bits over a physical layer specification or SONET/SDH, IEEE 802.3, IEEE 802.11 or any other viable physical layer specification or

Communications

# Tailoring Communications View Templates - Definitions

SET-IT - C:\Work Zone Alert Project\Work Zone Alert Project.setit

Search all diagrams... Search

Project Home Review Output

Diagram Enterprise Physical Comm Synchronize

New Views Tools

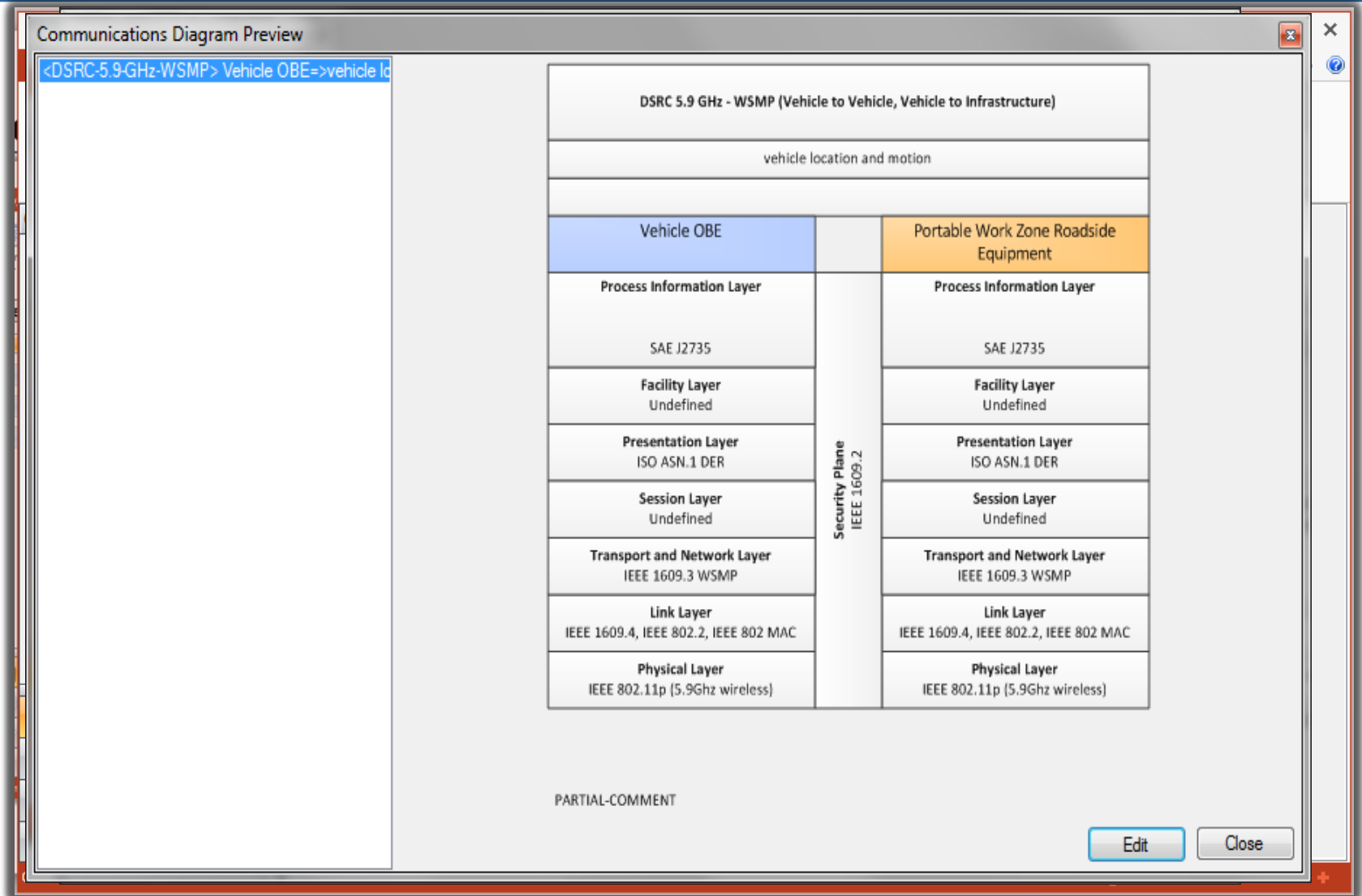
### Definitions

- Diagram Information
- P-Interconnects
- Layers
- Profiles
- Standards
- Standards to Layers
- Profiles to Standards
- Flow Triples to Profiles/Standards
- Overview
- Templates
- Definitions

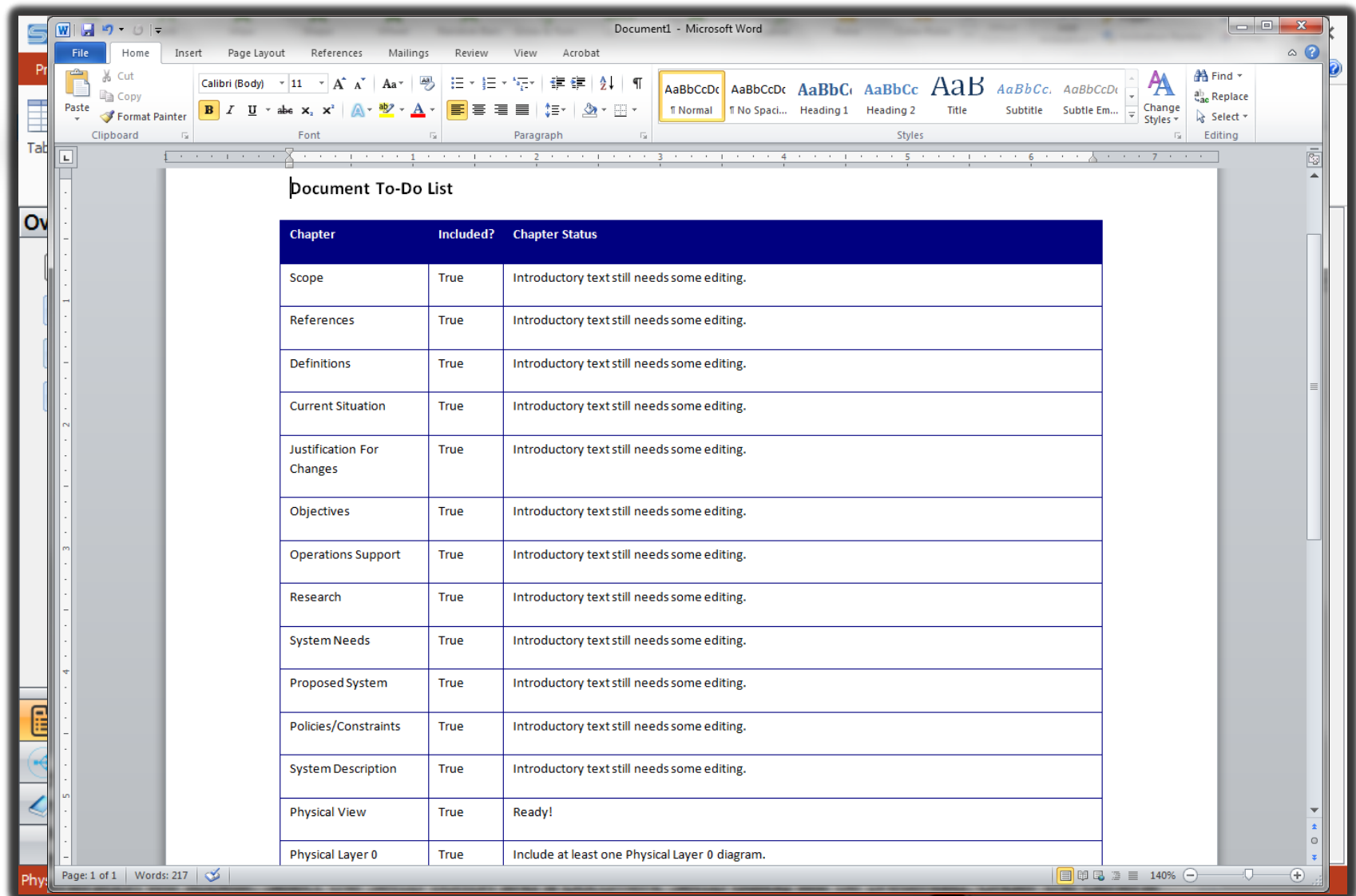
Name	Source	Destination	Profile	Information Layer Standard	User Defined
broadcast traveler information	Mobility Transportation	Vehicle OBE	C2V-RSEGateway	SAE J2735	<input type="checkbox"/>
broadcast traveler information	Mobility Transportation	Vehicle OBE	C2V-WAW	SAE J2735	<input type="checkbox"/>
personal location	Personal Work Zone Wa	Maintenance Vehicle OB	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
personal location	Personal Work Zone Wa	Portable Work Zone Ro	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
personal safety warning	Maintenance Vehicle OB	Personal Work Zone Wa	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
personal safety warning	Portable Work Zone Ro	Personal Work Zone Wa	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
roadway information system data	Maintenance Vehicle OB	Portable Work Zone Ro	DSRC-5.9-GHz-WSMP	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system data	Mobility DOT Maintenanc	Work Zone Detection, I	C2F-SNMP	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system data	Mobility DOT Traffic Ma	Work Zone Detection, I	C2F-SNMP	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system data	Portable Work Zone Ro	Work Zone Detection, I	RSE2ITSRoadway	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system status	Portable Work Zone Ro	Maintenance Vehicle OB	DSRC-5.9-GHz-WSMP	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system status	Work Zone Detection, I	Mobility DOT Maintenanc	C2F-SNMP	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system status	Work Zone Detection, I	Mobility DOT Traffic Ma	C2F-SNMP	NTCIP 1203-DMS	<input type="checkbox"/>
roadway information system status	Work Zone Detection, I	Portable Work Zone Ro	RSE2ITSRoadway	NTCIP 1203-DMS	<input type="checkbox"/>
traffic situation data	Portable Work Zone Ro	Work Zone Detection, I	RSE2ITSRoadway	NTCIP 1209-TSS	<input type="checkbox"/>
vehicle location and motion	Vehicle OBE	Maintenance Vehicle OB	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
vehicle location and motion	Vehicle OBE	Portable Work Zone Ro	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
vehicle signage application info	Mobility DOT Maintenanc	Portable Work Zone Ro	C2F-RSE	(Unspecified)	<input type="checkbox"/>
vehicle signage application info	Mobility DOT Traffic Ma	Portable Work Zone Ro	C2F-RSE	(Unspecified)	<input type="checkbox"/>
vehicle signage application status	Portable Work Zone Ro	Mobility DOT Maintenanc	C2F-RSE	(Unspecified)	<input type="checkbox"/>
vehicle signage application status	Portable Work Zone Ro	Mobility DOT Traffic Ma	C2F-RSE	(Unspecified)	<input type="checkbox"/>
vehicle signage data	Maintenance Vehicle OB	Vehicle OBE	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
vehicle signage data	Portable Work Zone Ro	Vehicle OBE	DSRC-5.9-GHz-WSMP	SAE J2735	<input type="checkbox"/>
vehicle signage local data	Work Zone Detection, I	Portable Work Zone Ro	RSE2ITSRoadway	(Unspecified)	<input type="checkbox"/>
work zone information	Mobility DOT Maintenanc	Mobility DOT Traffic Ma	C2C-DATEX	ITE TMDD	<input type="checkbox"/>
work zone information	Mobility DOT Maintenanc	Mobility DOT Traffic Ma	C2C-XML	ITE TMDD	<input type="checkbox"/>
work zone information	Mobility DOT Maintenanc	Mobility Transportation	C2C-DATEX	ITE TMDD	<input type="checkbox"/>
work zone information	Mobility DOT Maintenanc	Mobility Transportation	C2C-XML	ITE TMDD	<input type="checkbox"/>
work zone safety application info	Mobility DOT Maintenanc	Portable Work Zone Ro	C2F-RSE	(Unspecified)	<input type="checkbox"/>
work zone safety application status	Portable Work Zone Ro	Mobility DOT Maintenanc	C2F-RSE	(Unspecified)	<input type="checkbox"/>
work zone status	Maintenance Vehicle OB	Mobility DOT Maintenanc	V2C-WAW	SAE J2735	<input type="checkbox"/>
work zone status	Maintenance Vehicle OB	Mobility DOT Maintenanc	V2C-RSEGateway	SAE J2735	<input type="checkbox"/>
work zone warning device control	Mobility DOT Maintenanc	Maintenance Vehicle OB	C2V-RSEGateway	NTCIP 1205-CCTV	<input type="checkbox"/>

Communications

# Generating Communications View Diagrams



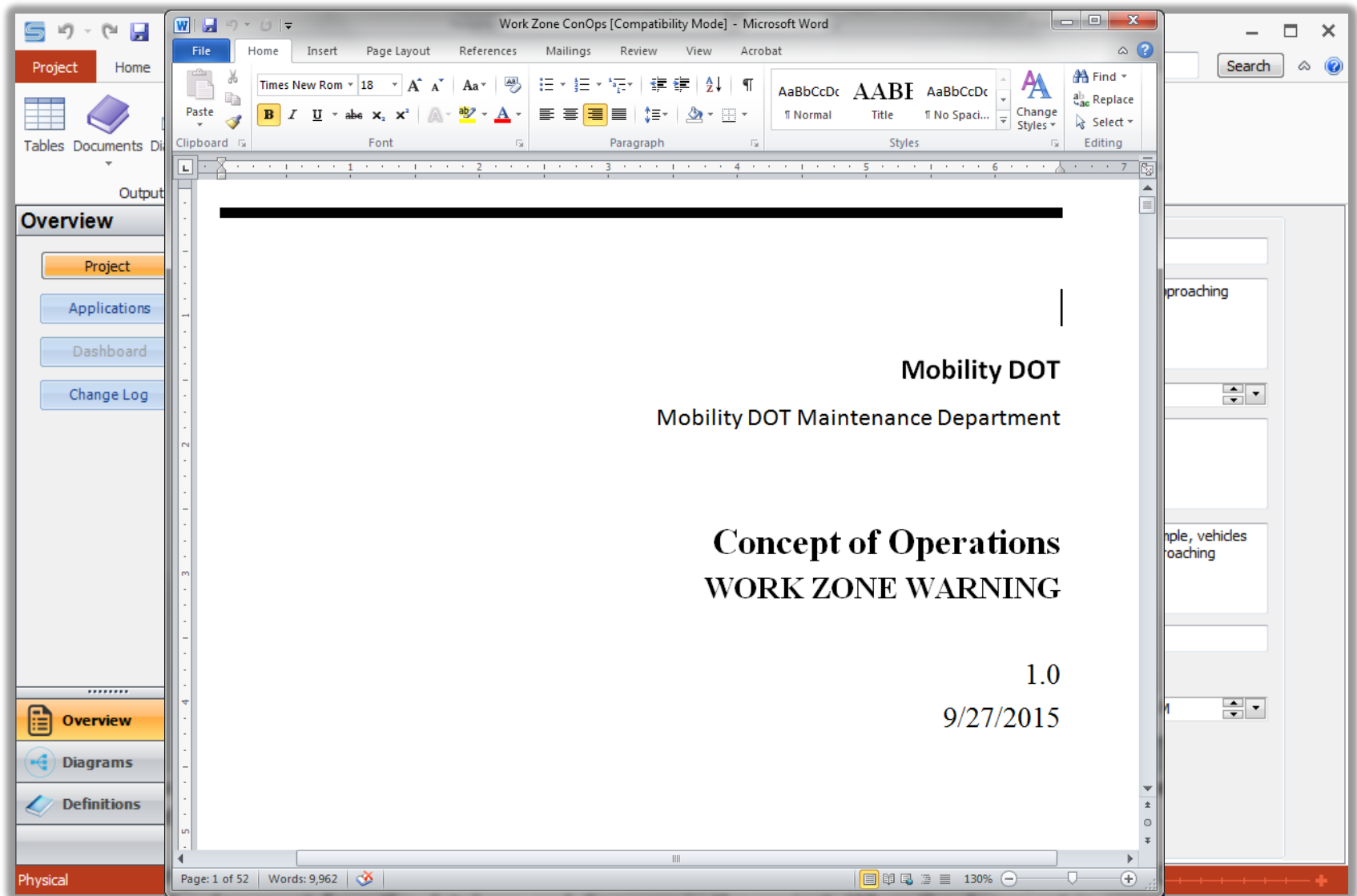
# Outputs – Concept of Operations (ConOps)



The screenshot shows a Microsoft Word document titled "Document To-Do List". The document contains a table with three columns: "Chapter", "Included?", and "Chapter Status". The table lists various chapters and their current status, with most chapters marked as "Included" and needing editing, while "Physical View" is marked as "Ready!".

Chapter	Included?	Chapter Status
Scope	True	Introductory text still needs some editing.
References	True	Introductory text still needs some editing.
Definitions	True	Introductory text still needs some editing.
Current Situation	True	Introductory text still needs some editing.
Justification For Changes	True	Introductory text still needs some editing.
Objectives	True	Introductory text still needs some editing.
Operations Support	True	Introductory text still needs some editing.
Research	True	Introductory text still needs some editing.
System Needs	True	Introductory text still needs some editing.
Proposed System	True	Introductory text still needs some editing.
Policies/Constraints	True	Introductory text still needs some editing.
System Description	True	Introductory text still needs some editing.
Physical View	True	Ready!
Physical Layer 0	True	Include at least one Physical Layer 0 diagram.

# ConOps Document Content Setup



# Editing Document Templates

ConOpsTemplate [Read-Only] [Compatibility Mode] - Microsoft Word

File Home Insert Page Layout References Mailings Review View Acrobat

Clipboard Font Paragraph Styles Editing

## 3 Definitions

The following table defines selected project specific terms used throughout this Concept of Operations document.

```
{**Your document should include a table or Glossary of terms used in your document as well as a list of acronyms and abbreviations. The current version of SET-IT provides no automated content in this chapter. **}
```

Table 2 – Glossary of Terms

Term	Definition

<Insert Acronym List Here>

Table 3 – Acronym List

Acronym/Abbreviation	Definition

Page: 7 of 21 Words: 36/3,537 130%

Physical

# Concept of Operations - Needs

**5.4.1 General Safety Needs**

Connected vehicle safety applications can increase situational awareness and reduce or eliminate crashes through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. V2V and V2I applications enable vehicles to inform drivers of roadway hazards and dangerous situations that they can't see through driver advisories, driver warnings, and vehicle and/or infrastructure controls.

**Table 4: General Safety Needs**

Number	Need
1	Pedestrian in Signalized Crosswalk Warning needs to warn the pedestrians about crossing status or potential vehicle infringement into the crosswalk.
2	Vehicle to Infrastructure (V2I) Safety applications need to assess their own performance, to determine errors and avoid failures when critical components fail.
3	V2I Safety applications need to broadcast the performance of their host vehicle, to enable V2I applications that rely on knowing the location and/or trajectories of other vehicles.
4	V2I Safety applications need to have a common time source so that location and projected positions may be synchronized.
5	V2I Safety applications need to have positioning accurate enough to create alerts and/or warnings when warranted.
6	V2I Safety applications need to have positioning accurate enough to avoid false positive alerts and/or warnings.
7	Vehicle to Vehicle (V2V) Safety applications need to assess their own performance, to determine errors and properly enter fail-safe mode when critical components fail.
8	V2V Safety applications need to broadcast the performance of their vehicle in the transportation environment, to enable V2V applications that rely on knowing the location and/or trajectories of other vehicles.
9	V2V Safety applications need to have a common time source so that location and projected positions may be synchronized.

# Concept of Operations – Physical Layer 0

Work Zone ConOps [Compatibility Mode] - Microsoft Word

File Home Insert Page Layout References Mailings Review View Acrobat

Clipboard Font Paragraph Styles Editing

Calibri 11 A Aa

Normal Title No Spaci...

Find Replace Select

Concept of Operations

The table below includes the definitions of the physical interconnects, the lines between the elements, shown in the Layer 0 diagram (above).

Table 9 – Architecture Layer 0 – Physical Interconnect

p-Interconnect Name	Description	Source	Destination	Encryption	Authenticability	Cardinality	Bidirectional	Status
Center to Center	A communications link that provides communications between centers. It may be implemented using a variety of public or private communication networks and technologies.	Mobility DOT Maintenance Control Center	Mobility DOT Traffic Management Center	True	True	Unicast	False	Project
Center to Center	A communications link that provides communications between centers. It may be implemented using a variety of public or private communication networks and technologies.	Mobility DOT Maintenance Control Center	Mobility Transportation Information Center	True	True	Unicast	False	Project
Center to Field	A communications link that provides communications between centers and field devices. It may be implemented using a variety of public or private communication networks and technologies.	Mobility DOT Maintenance Control Center	Portable Work Zone Roadside Equipment	True	True	Unicast	True	Project
Center to Field	A communications link that provides communications between centers and field devices. It may be implemented using a variety of public or private communication networks and technologies.	Mobility DOT Maintenance Control Center	Work Zone Detection, Information, and Warning System	True	True	Unicast	True	Project
Center to Field	A communications link that provides communications between centers and field devices. It may be implemented using a variety of public or private communication networks and technologies.	Mobility DOT Traffic Management Center	Portable Work Zone Roadside Equipment	True	True	Unicast	True	Project

1.0 Page: 14 9/27/2015

Page: 19 of 52 Words: 9,962 90%



# Concept of Operations – Physical Layer 1

The table below includes the definitions of all of the Layer 1 Application Objects shown in the Layer 1 Diagram(s). The Elements are defined in Table 5 found in Section 6.2.1.1 above. Many of these application objects are identical or related to CVRIA objects; project unique or user defined application objects are marked so the relationship is shown.

**Table 10 – Architecture Layer 1 – Application Objects**

Element	Application Object	Description	Project Unique	Status
Maintenance Vehicle OBE (CV)	MCV Vehicle Safety Monitoring	'MCV Vehicle Safety Monitoring' detects vehicle intrusions in the vicinity of the vehicle and warns crew workers and drivers of imminent encroachment. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone. It can be used for stationary work zones or in mobile applications where a safe zone is maintained around the moving vehicle.	False	Project
Maintenance Vehicle OBE (CV)	MCV Work Zone Support	'MCV Work Zone Support' provides communications and support for local management of a work zone. It supports communications between field personnel and the managing center to keep the center apprised of current work zone status. It controls vehicle-mounted driver information systems (e.g., dynamic message signs) and uses short range communications to monitor and control other fixed or portable driver information systems in the work zone.	False	Project
Mobility DOT Maintenance Control Center	MCM Work Zone Management	'MCM Work Zone Management' remotely monitors and supports work zone activities, controlling traffic through dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers, and informing other groups of activity (e.g., traveler information, traffic management, other maintenance and construction centers) for better coordination management. Work zone speeds, and delays, and closures are provided to the motorist prior to the work zones. This application provides control of field equipment in all maintenance areas, including fixed and portable field equipment supporting both stationary and mobile work zones.	False	Project
Mobility DOT Maintenance Control Center	MCM Work Zone Safety Management	'MCM Work Zone Safety Management' remotely monitors work zone safety systems that detect vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone.	False	Project
Mobility DOT Traffic Management Center	TMC In-Vehicle Signing Management	'TMC In-Vehicle Signing Management' controls and monitors RSEs that support in-vehicle signing. Sign information that may include static regulatory, service, and directional sign information as well as variable information such as traffic and road conditions can be provided to the RSE, which uses short range communications to send the information to in-vehicle equipment. Information that is currently being communicated to passing vehicles and the operational status of the field equipment is monitored by this application. The operational status of the field equipment is reported to operations personnel.	False	Project

1.0 Page: 22 9/27/2015

Page: 27 of 52 Words: 9,962 90%

# Concept of Operations – Enterprise Layer 0

The table below describes each of the stakeholders illustrated in the diagram above and the roles they play with respect to the elements in the physical view.

[Table 14. Stakeholders and Roles](#)

Stakeholder	Description	Role	Element	Status
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.		Mobility DOT Maintenance Department	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Owns	Work Zone Detection, Information, and Warning System	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Owns	Portable Work Zone Roadside Equipment	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Owns	Maintenance Vehicle OBE	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Owns	Mobility DOT Maintenance Control Center	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Owns	Personal Work Zone Warning Device	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Operates	Work Zone Detection, Information, and Warning System	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Operates	Portable Work Zone Roadside Equipment	Project
Mobility DOT Maintenance Department	Mobility DOT Maintenance Department is responsible for roadway facility maintenance and construction.	Operates	Mobility DOT Maintenance Control Center	Project
Driver			Driver	Project

1.0 Page: 39 9/27/2015

Page: 44 of 52 Words: 9,962 100%

# Concept of Operations – Application Scenarios

**7 Operational Scenarios**

This section is intended to provide an overview of the major operational uses for the Work Zone Alert Project. These scenarios are arranged based on the applications that make up the Work Zone Alert Project. Each scenario begins with a brief description followed by one or more diagrams that define different sequences of actions that occur in the scenario. Following each diagram, each sequence is described in terms of the overall flow of the application – what happens first, what information is shared, what activities are required in order for the application to succeed, what other factors need to be considered?

{\*\* The detailed content in this section is provided by SET-IT. Update the above introductory text as desired. SET-IT will replace the <SET-IT Inserts Scenarios Here> placeholder with a series of subsections for each application that the project includes. Each subsection includes a diagram followed by a scenario description. \*\*}

**7.1 Roadway Information System**

**7.1.1 Warnings about Upcoming Work Zone (Copy 1)**

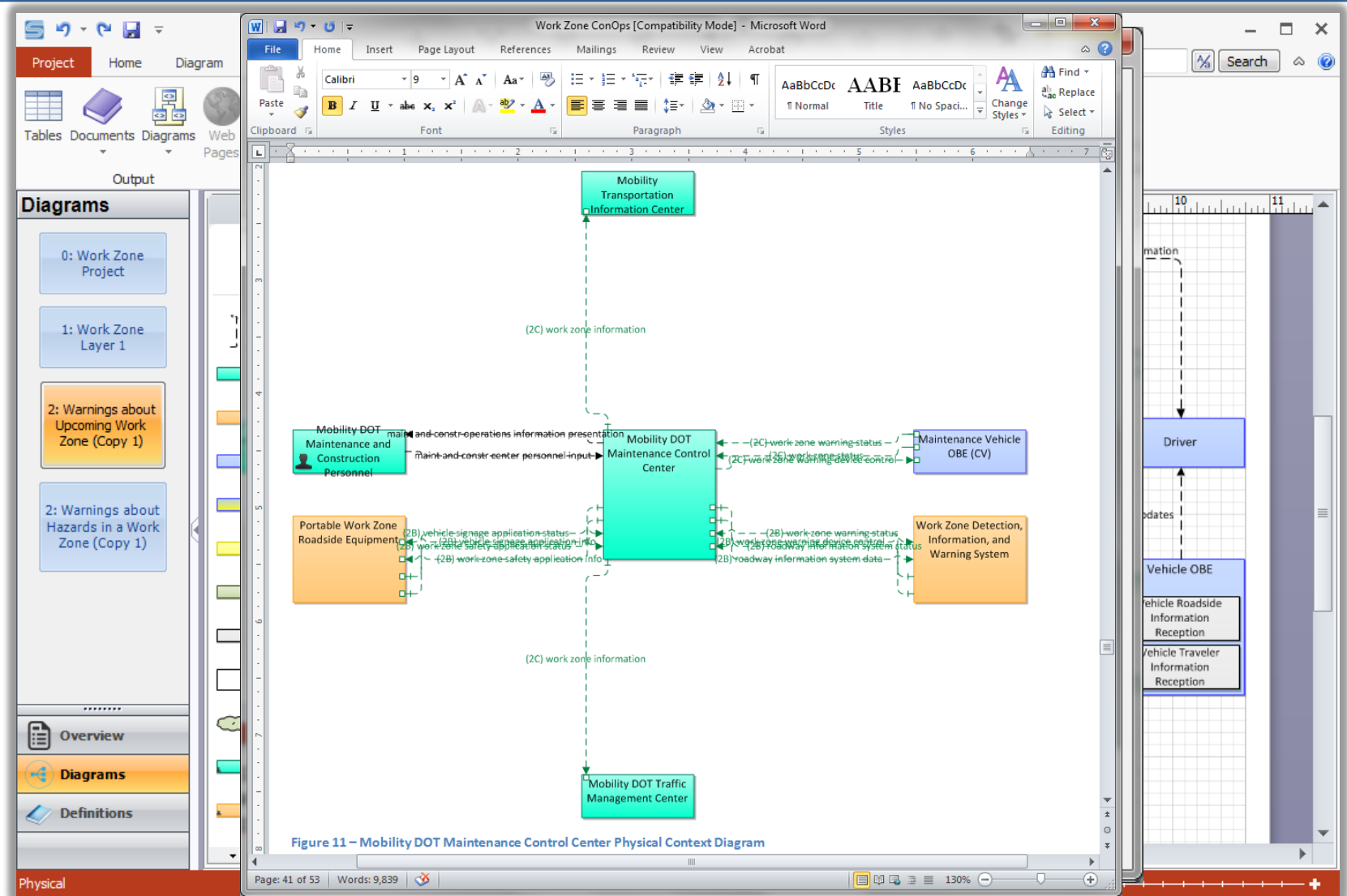
The diagram illustrates the data flow for warnings about upcoming work zones. It shows the following components and their interactions:

- Mobility DOT Traffic Management Center (TMC):** Includes TMC Work Zone Traffic Management and TMC In-Vehicle Signaling Management.
- Mobility DOT Maintenance and Construction Control Center (MCM):** Includes MCM Work Zone Management.
- Work Zone Detection, Information, and Warning System:** Includes Roadway Traffic Information Dissemination and Roadway Work Zone Traffic Control.
- Portable Work Zone Roadside Equipment (RSE):** Includes RSE Traveler Information Communications.
- Vehicle OBE (On-Board Electronics):** Includes Vehicle Roadside Information Reception and Vehicle Traveler Information Reception.
- Driver:** Receives driver updates and driver information.

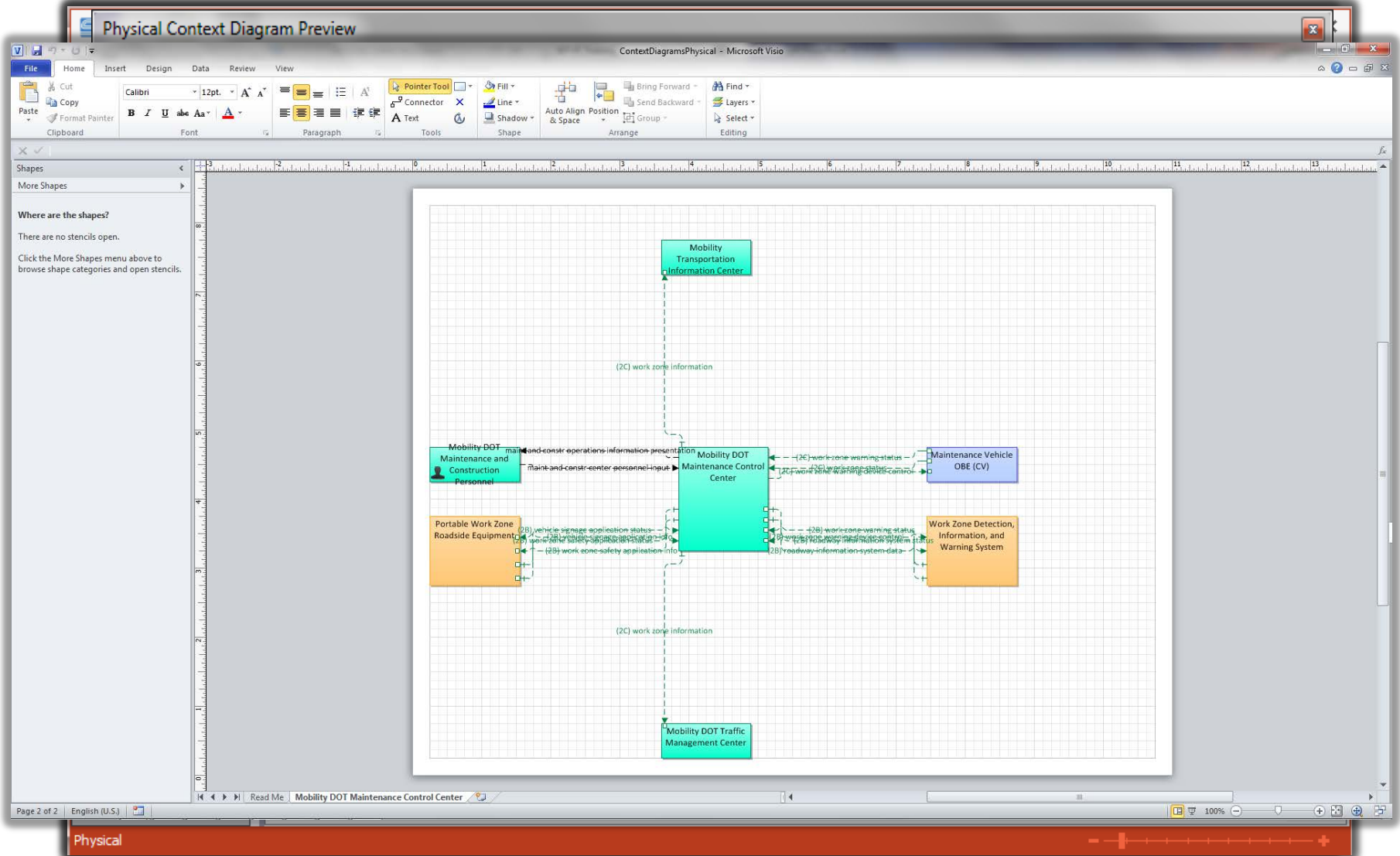
Key data flows include:

- (2C) work zone information from MCM to TMC.
- (2B) roadway information system data and (2B) roadway information system status from TMC to the Work Zone Detection system.
- (2B) vehicle signage application info and (2B) vehicle signage application status from TMC to the Work Zone Detection system.
- (2A) roadway information system data and (2A) roadway information system status + vehicle signage local data from the Work Zone Detection system to the Portable Work Zone Roadside Equipment.
- (2A) vehicle signage data from the Portable Work Zone Roadside Equipment to the Vehicle OBE.
- (2B) roadway information system data and (2A) roadway information system status from the Portable Work Zone Roadside Equipment to the Vehicle OBE.
- (2A) vehicle signage data from the Portable Work Zone Roadside Equipment to the Driver.
- driver updates from the Driver to the Vehicle OBE.
- driver information from the Work Zone Detection system to the Driver.


# Concept of Operations – Context Diagrams



# Options for Modifying Context Diagrams



# Further Training is Available

**CONNECTED VEHICLE REFERENCE  
IMPLEMENTATION ARCHITECTURE**

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## Training

In order to better understand the architecture and the software tool that makes use of the architecture, online or web-based training material has been developed.

Each course is modular in nature allowing you to take the training at your own pace. Each course is presented in a web-based format using Adobe Presenter with narration by instructors from the National ITS Architecture team.

- [CVRIA Training](#) — provides an introduction to the Connected Vehicle Reference Implementation Architecture (CVRIA) to acquaint students with the background, structure, and use of the architecture. They will be able to effectively navigate the website to find the CVRIA content they need for their connected vehicle project definition.
- [SET-IT Training](#) — provides an introduction and overview of the Systems Engineering Tool for Intelligent Transportation (SET-IT) software. The modules cover the basic layout of the tool, how to navigate the tool, and the basic steps to create a connected vehicle project architecture that is based on CVRIA.



**Web-Based Training**