Connected Vehicle Architecture Workshop

SET-IT Use Example

June 16, 2016

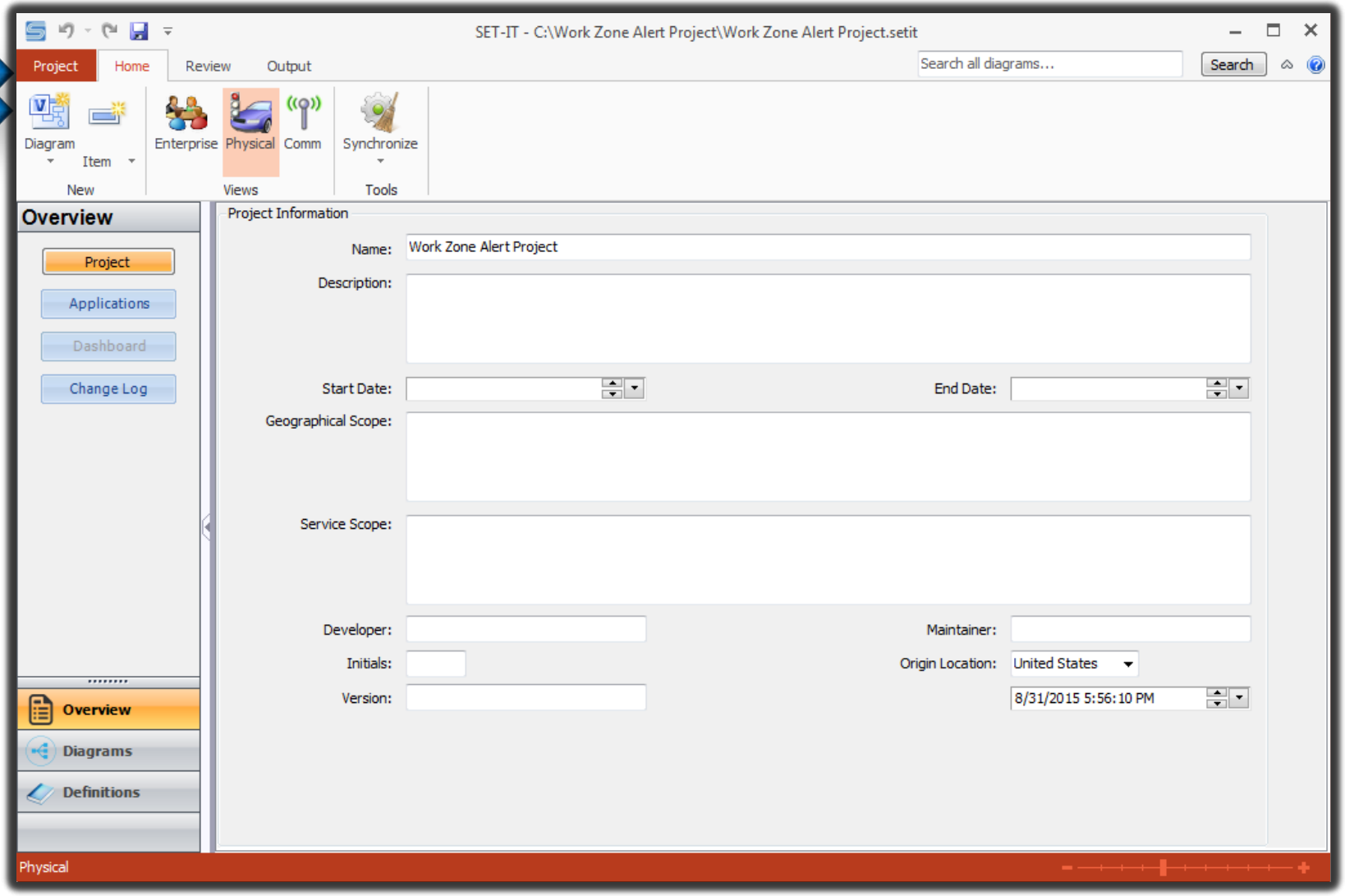
Workshop Agenda

▪ 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

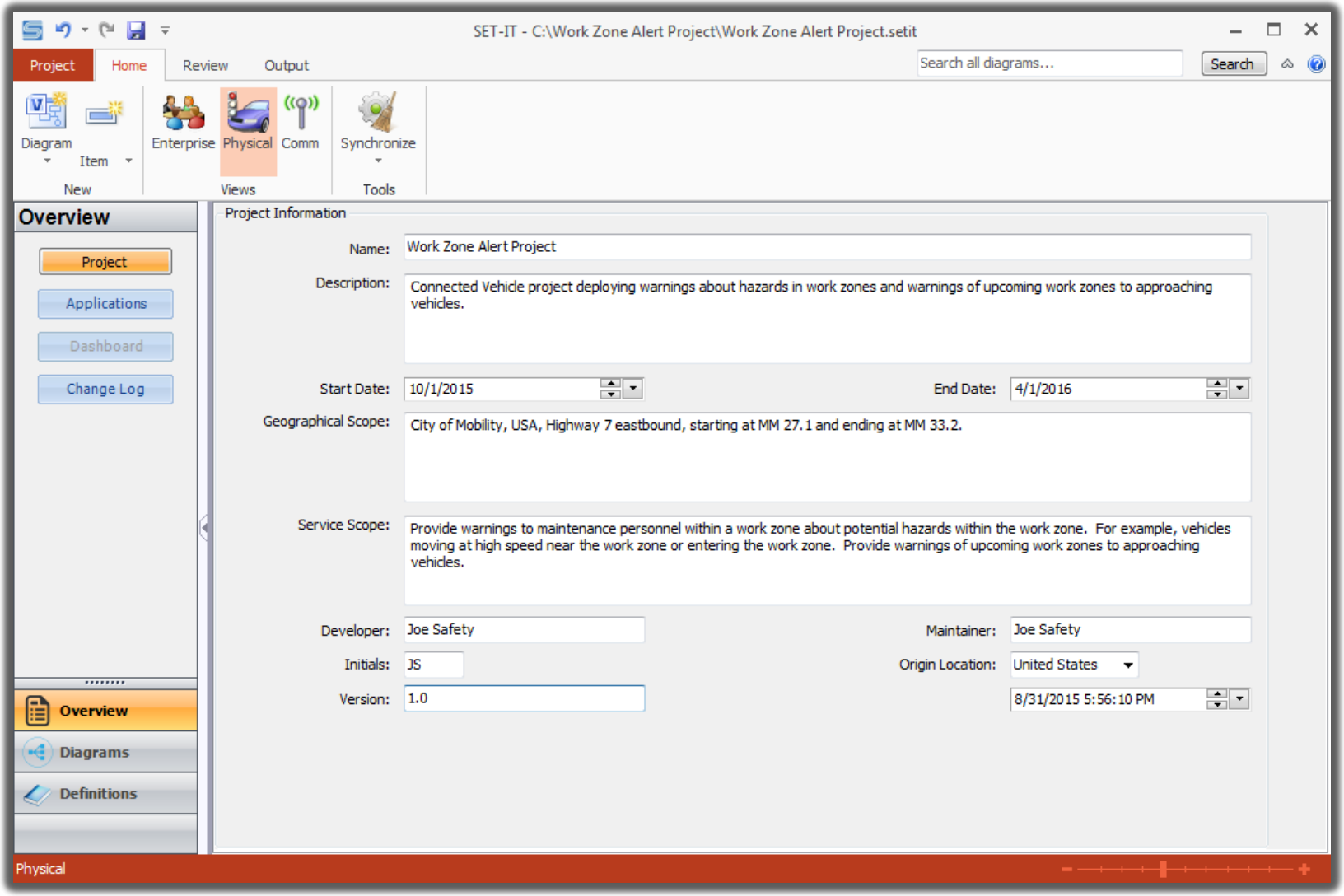
Project Architecture Process using SET-IT

- 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

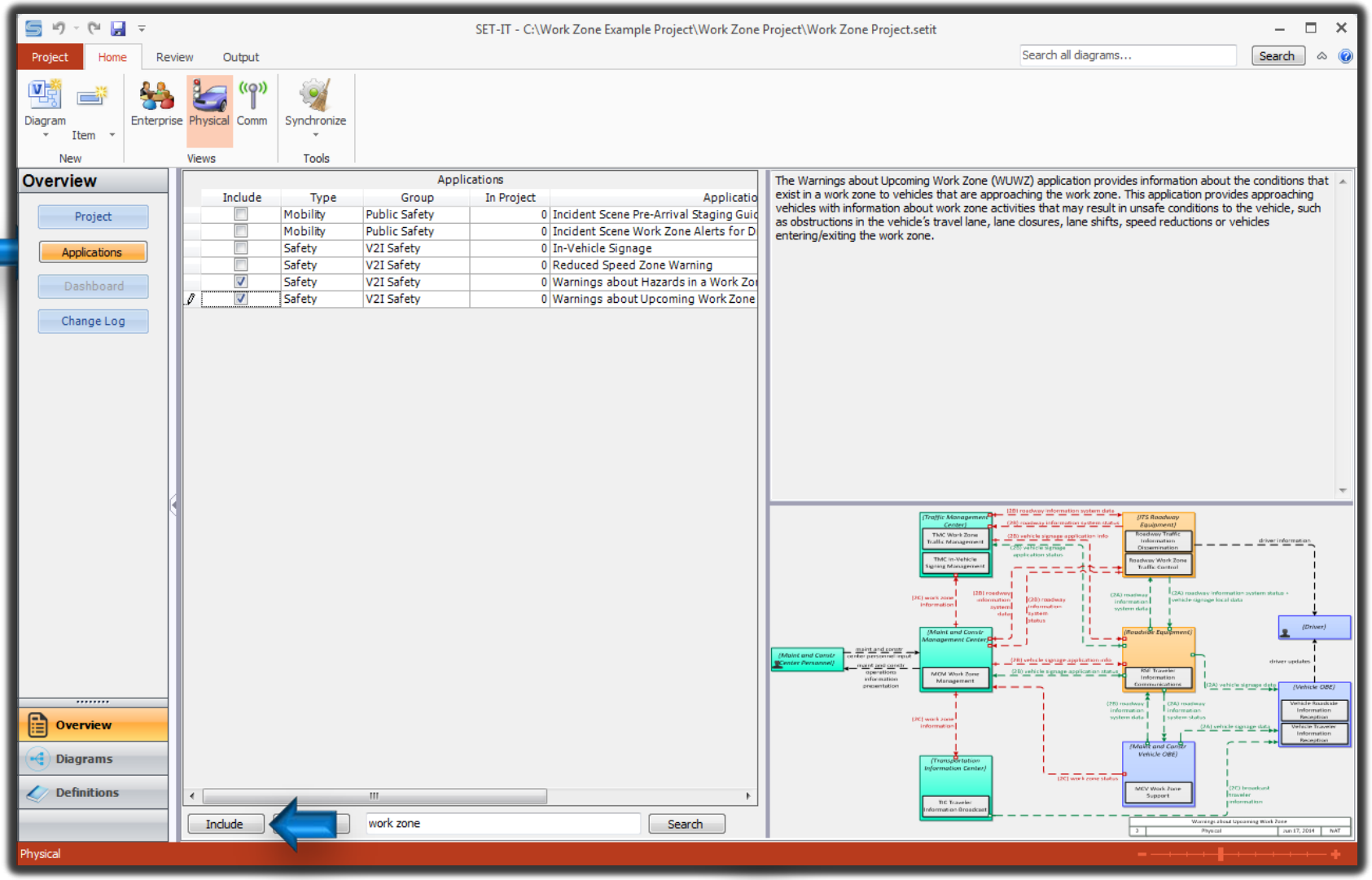
Start a New Project



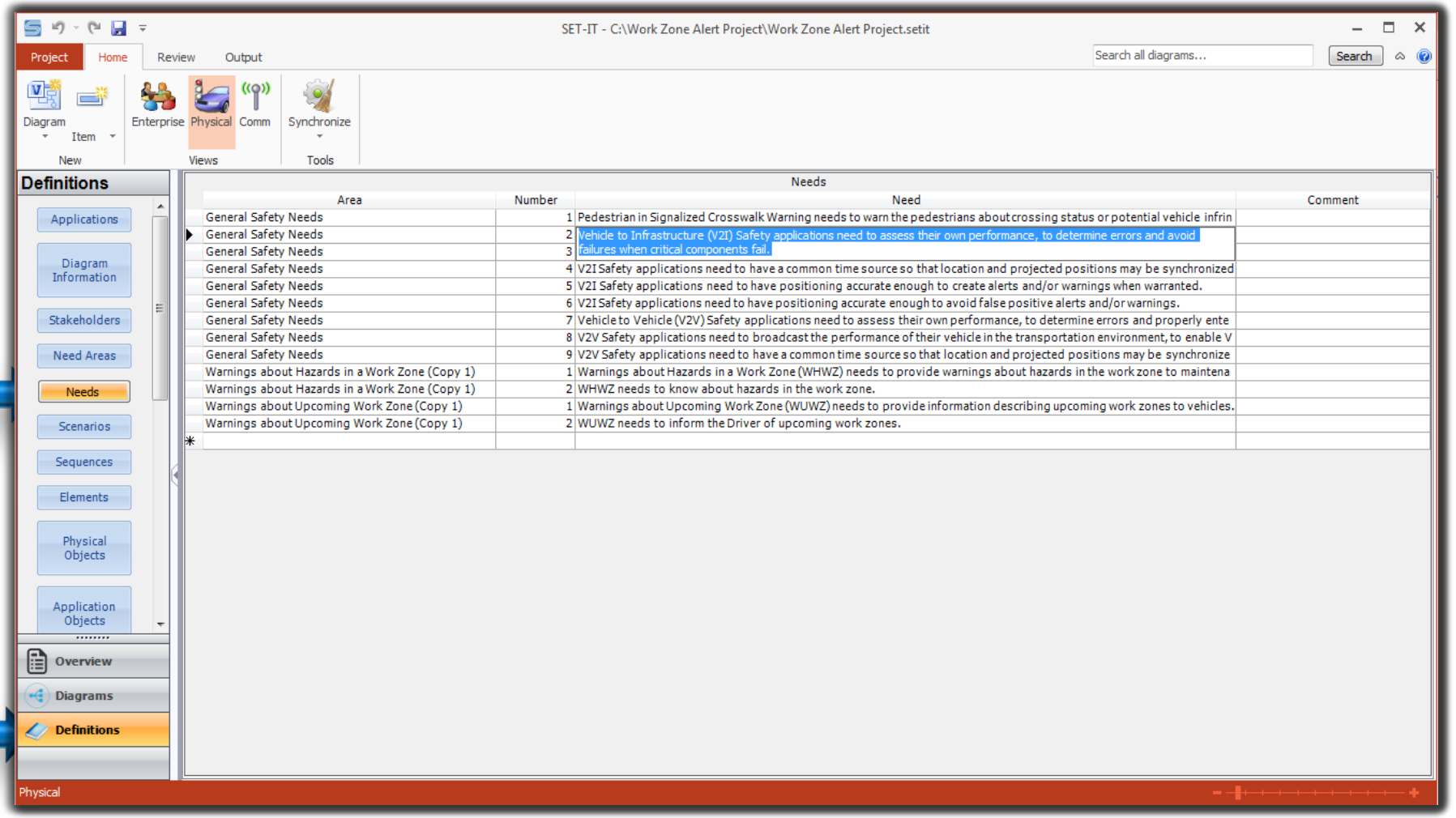
Provide Project Information



Select Application(s)



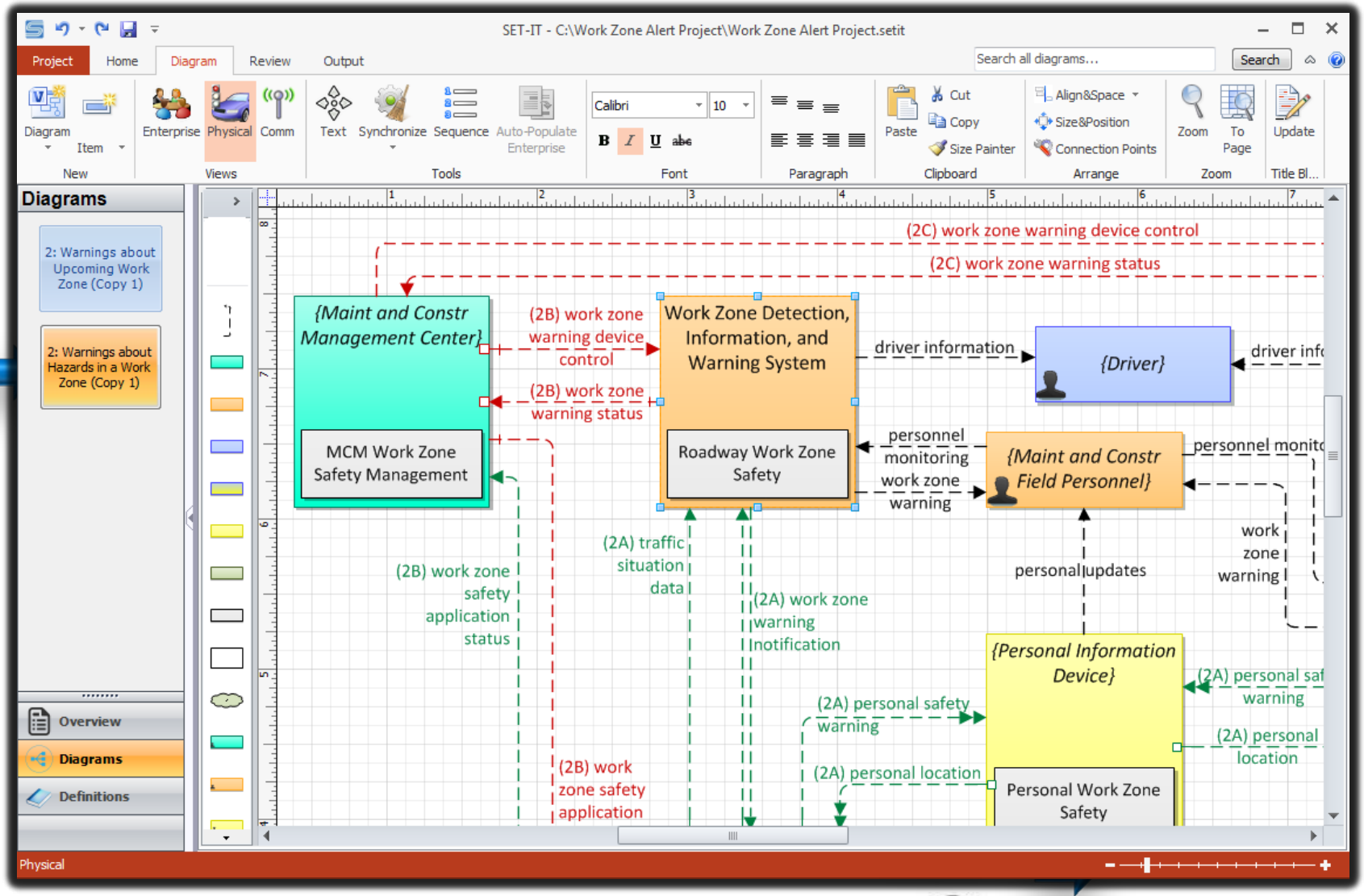
Needs Identification



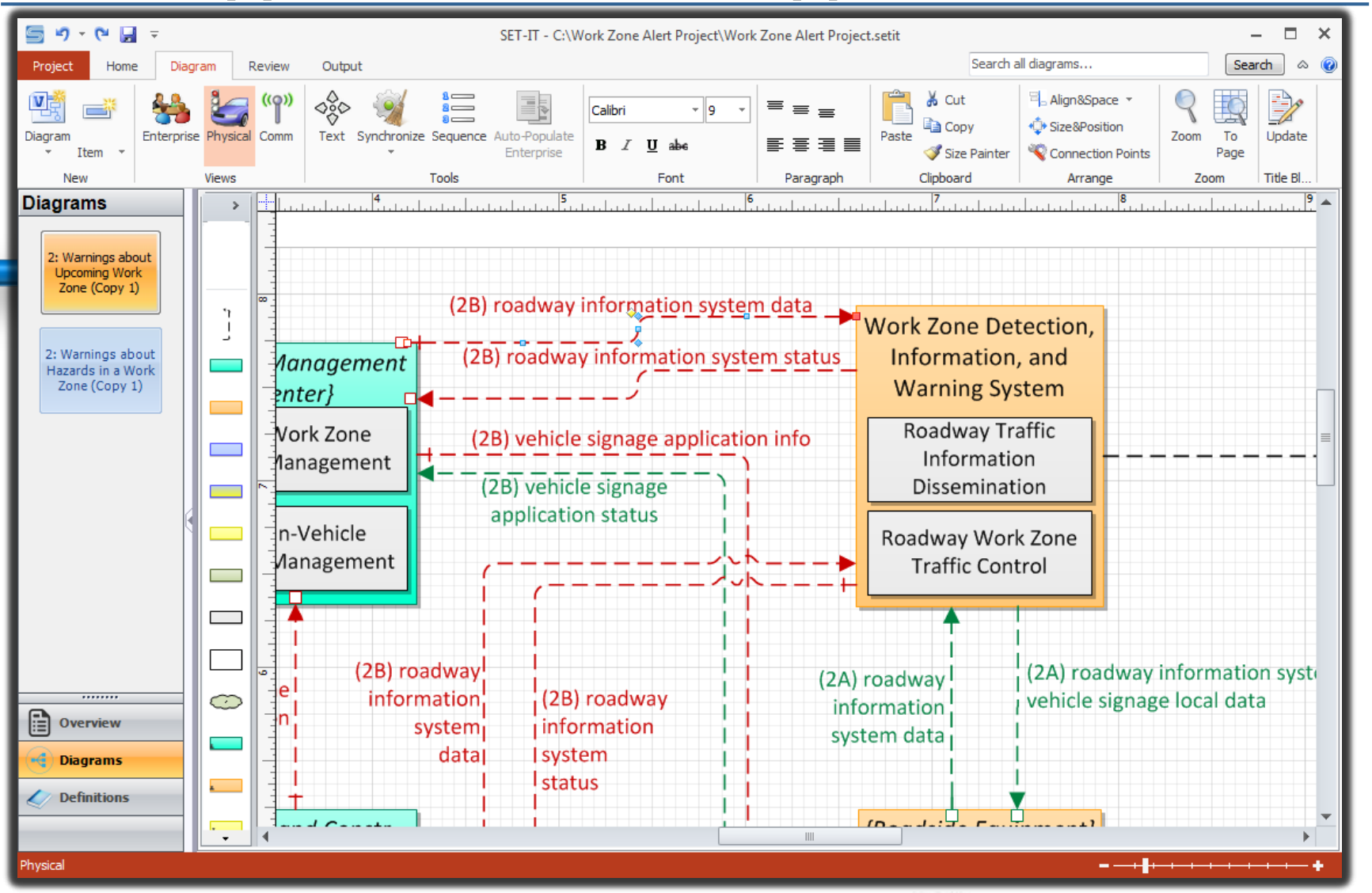
Needs

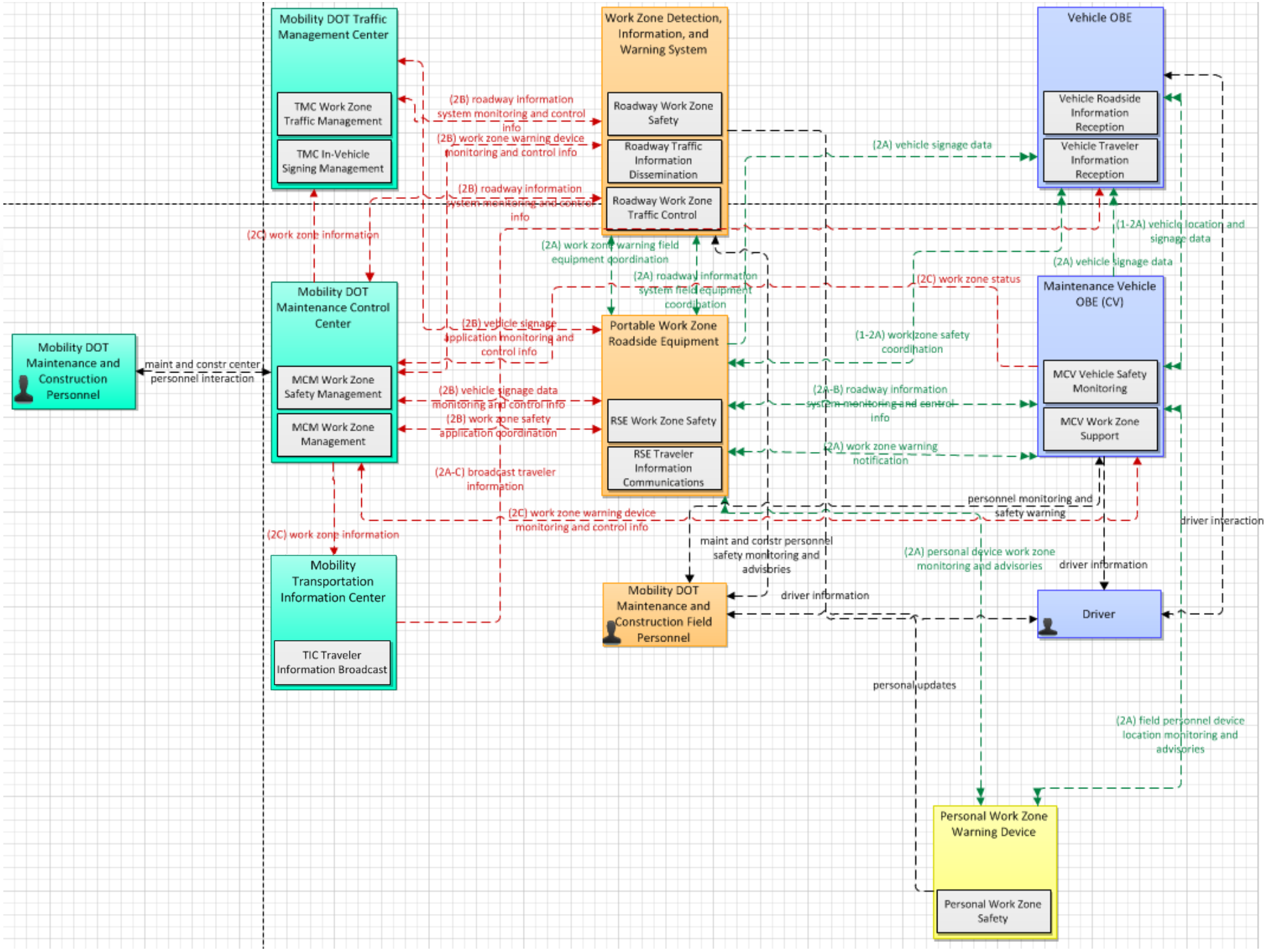
Area	Number	Need	Comment
General Safety Needs	1	Pedestrian in Signalized Crosswalk Warning needs to warn the pedestrians about crossing status or potential vehicle infrin	
General Safety Needs	2	Vehicle to Infrastructure (V2I) Safety applications need to assess their own performance, to determine errors and avoid failures when critical components fail.	
General Safety Needs	3		
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 synchronize	
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

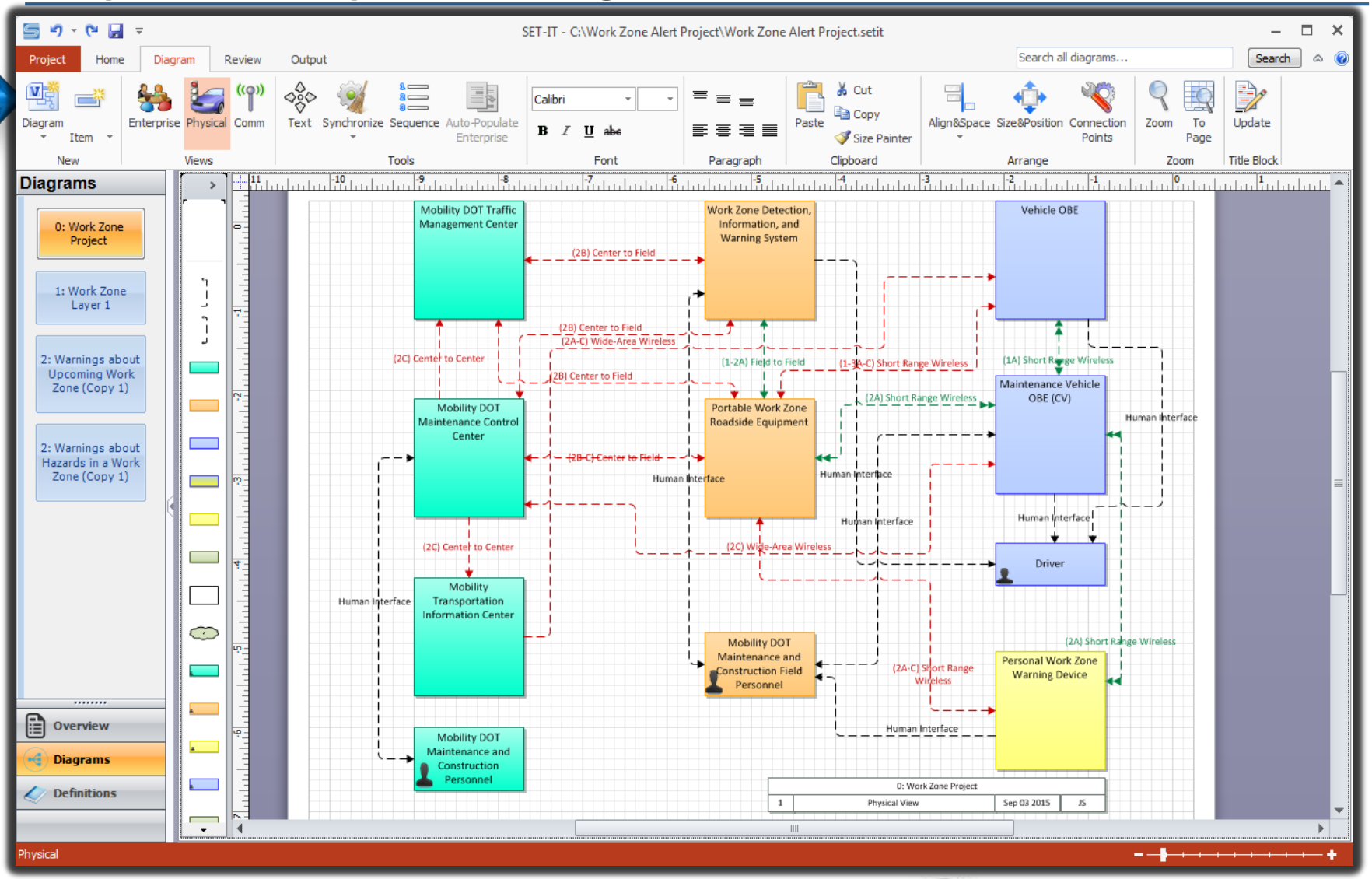


Tailor Applications – Next Application

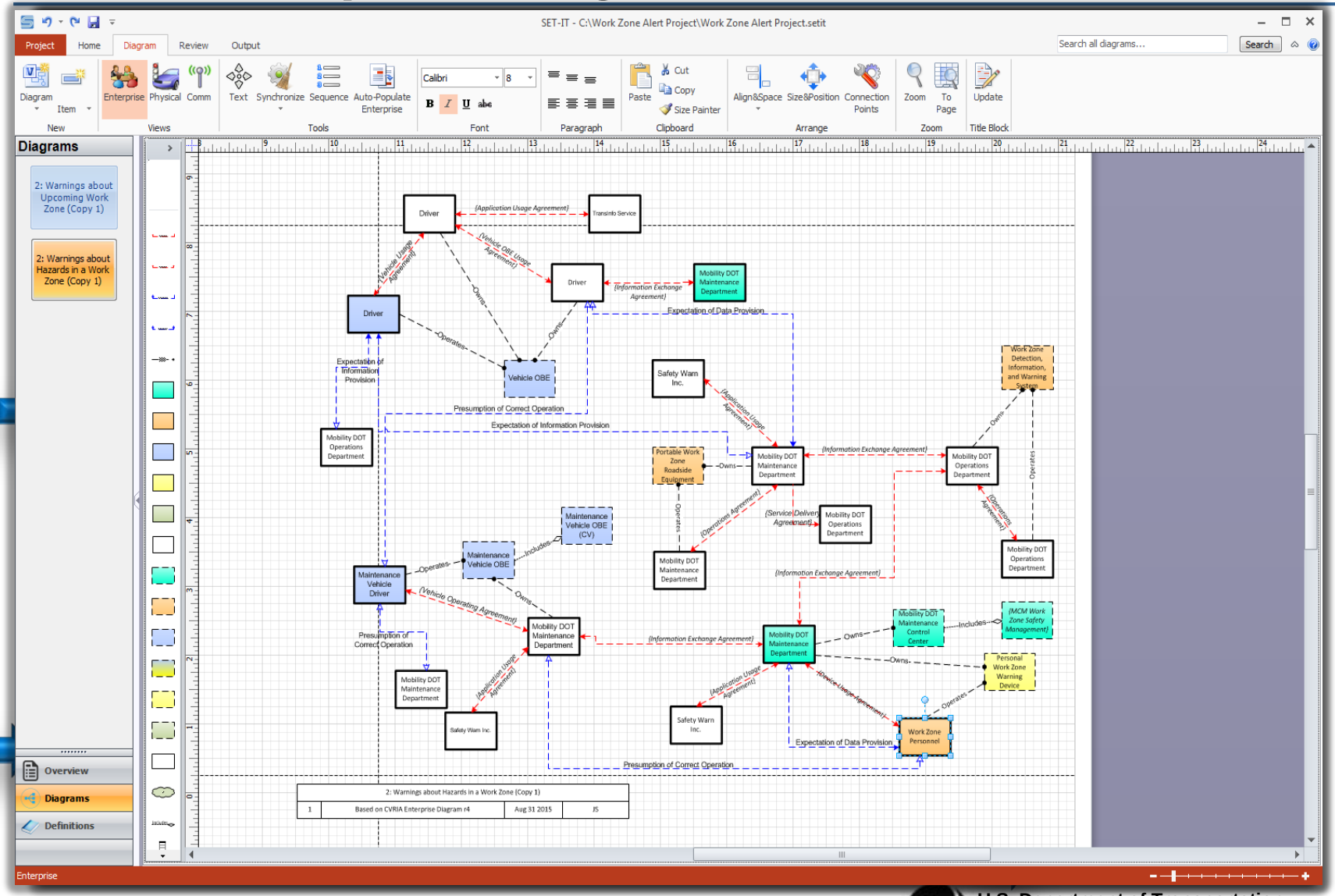



Mobility DOT Traffic Management Center
TMC Work Zone Traffic Management
TMC In-Vehicle Signing Management
Work Zone Detection, Information, and Warning System
Roadway Work Zone Safety
Roadway Traffic Information Dissemination
Roadway Work Zone Traffic Control
Vehicle OBE
Vehicle Roadside Information Reception
Vehicle Traveler Information Reception
(2B) roadway information system monitoring and control info
(2B) work zone warning device monitoring and control info
(2B) roadway information system monitoring and control info
(2A) vehicle signage data
(2C) work zone information
(2A) work zone warning field equipment coordination
(2A) roadway information system field equipment coordination
(2C) work zone status
(1-2A) vehicle location and signage data
(2A) vehicle signage data
Mobility DOT Maintenance Control Center
Mobility DOT Maintenance and Construction Personnel
maint and constr center personnel interaction
MCM Work Zone Safety Management
MCM Work Zone Management
(2B) vehicle signage application monitoring and control info
(2B) vehicle signage data monitoring and control info
(2B) work zone safety application coordination
Portable Work Zone Roadside Equipment
RSE Work Zone Safety
RSE Traveler Information Communications
(1-2A) workzone safety coordination
(2A-B) roadway information system monitoring and control info
(2A) work zone warning notification
Maintenance Vehicle OBE (CV)
MCV Vehicle Safety Monitoring
MCV Work Zone Support
(2A-C) broadcast traveler information
(2C) work zone warning device monitoring and control info
personnel monitoring and safety warning
driver interaction
(2C) work zone information
Mobility Transportation Information Center
TIC Traveler Information Broadcast
maint and constr personnel safety monitoring and advisories
(2A) personal device work zone monitoring and advisories
driver information
Mobility DOT Maintenance and Construction Field Personnel
driver information
Driver
personal updates
(2A) field personnel device location monitoring and advisories
Personal Work Zone Warning Device
Personal Work Zone Safety

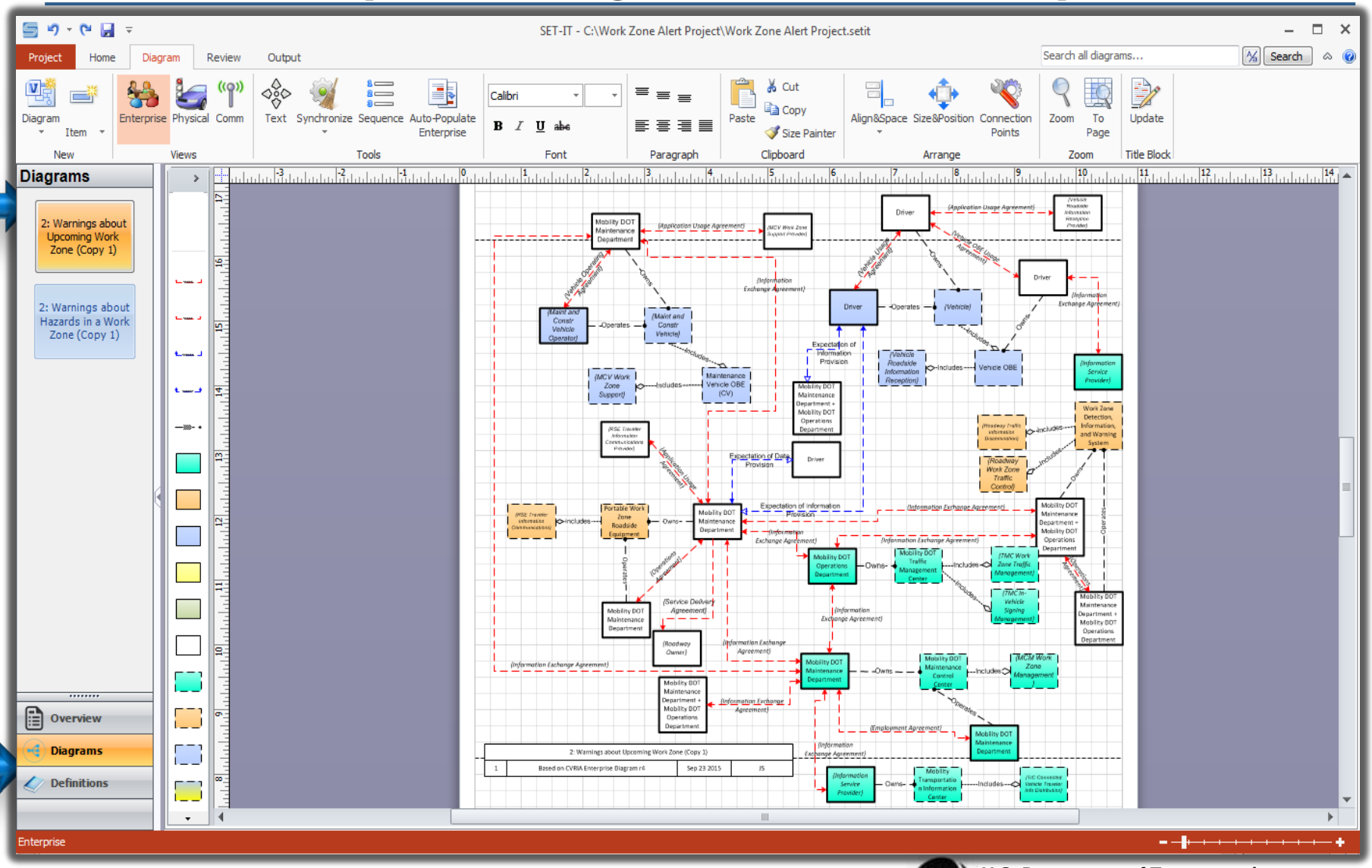
Physical Layer 0 Diagram



Tailor Enterprise Diagrams



Tailor Enterprise Diagrams – Auto-Populate



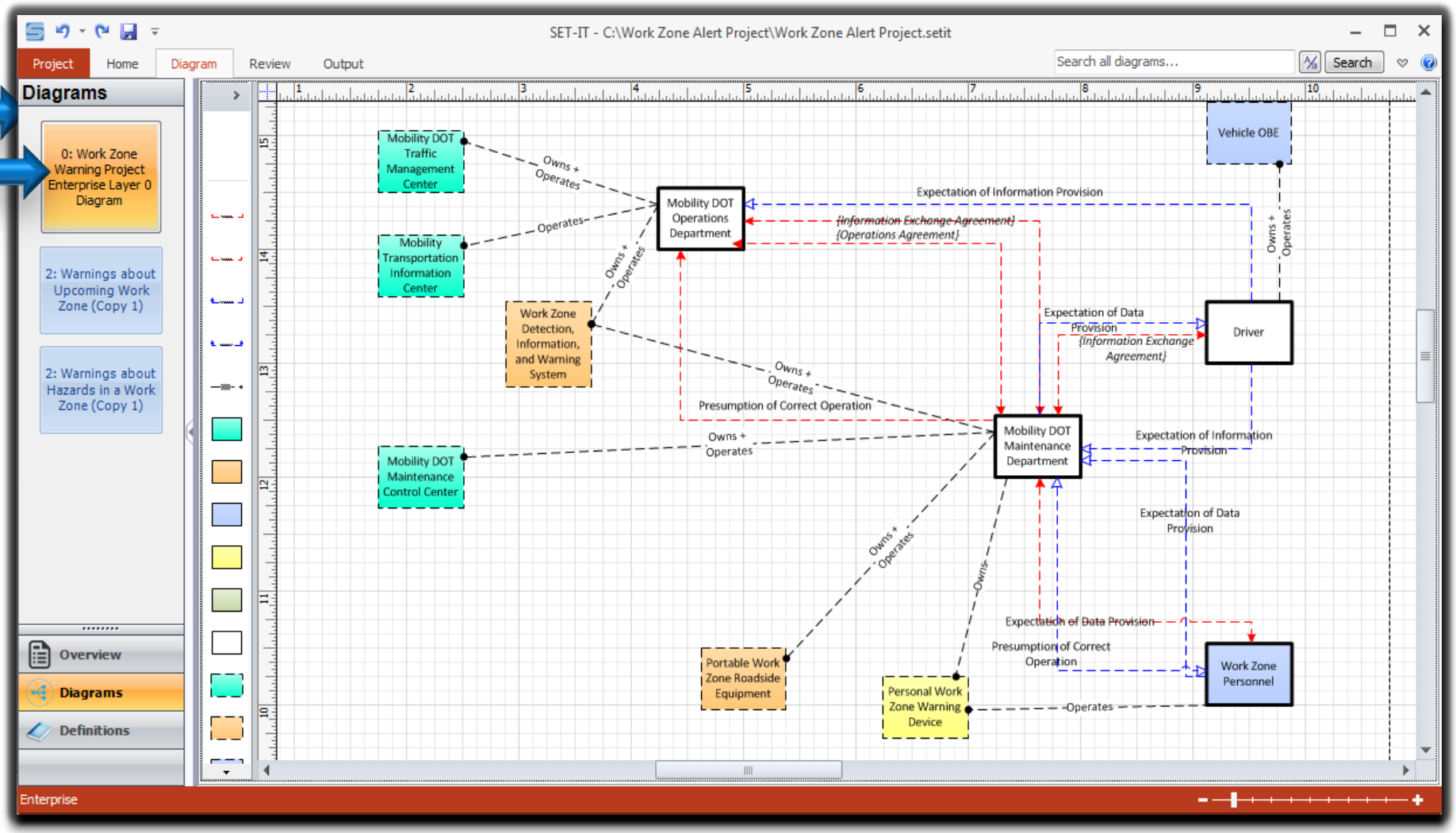
Enterprise Layer 0

- 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

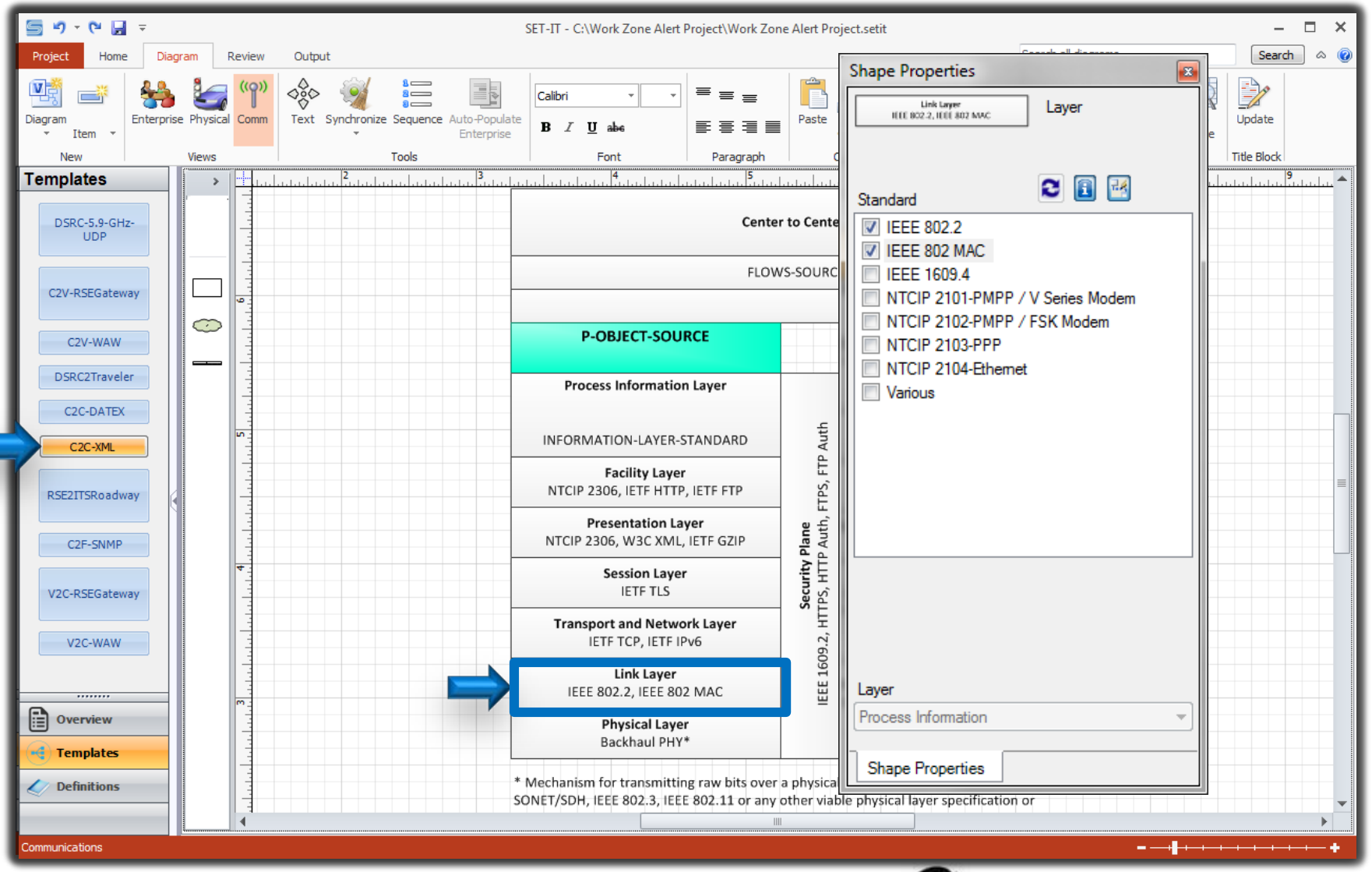
Enterprise Layer 0 (cont)

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

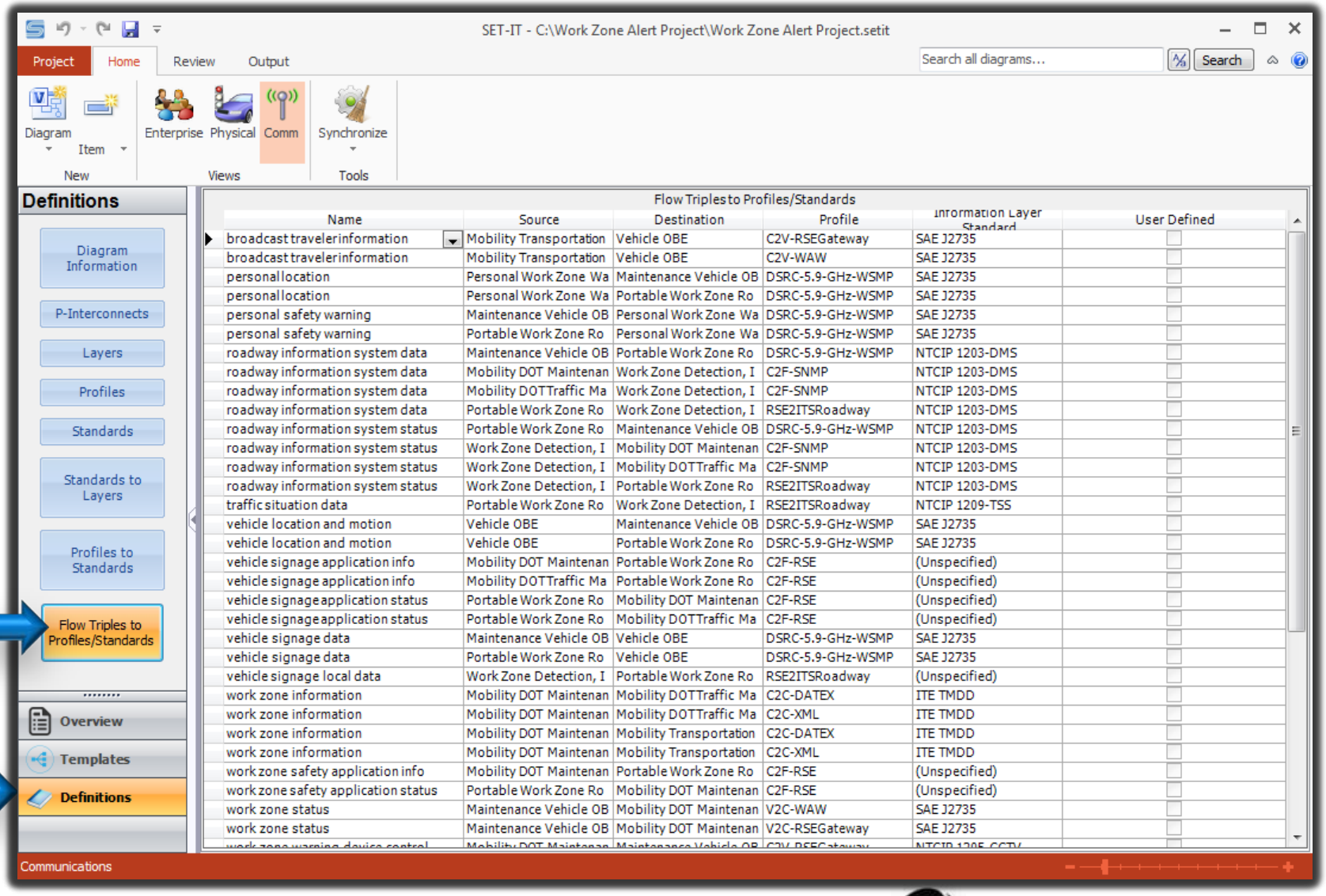
Enterprise Layer 0 Diagram



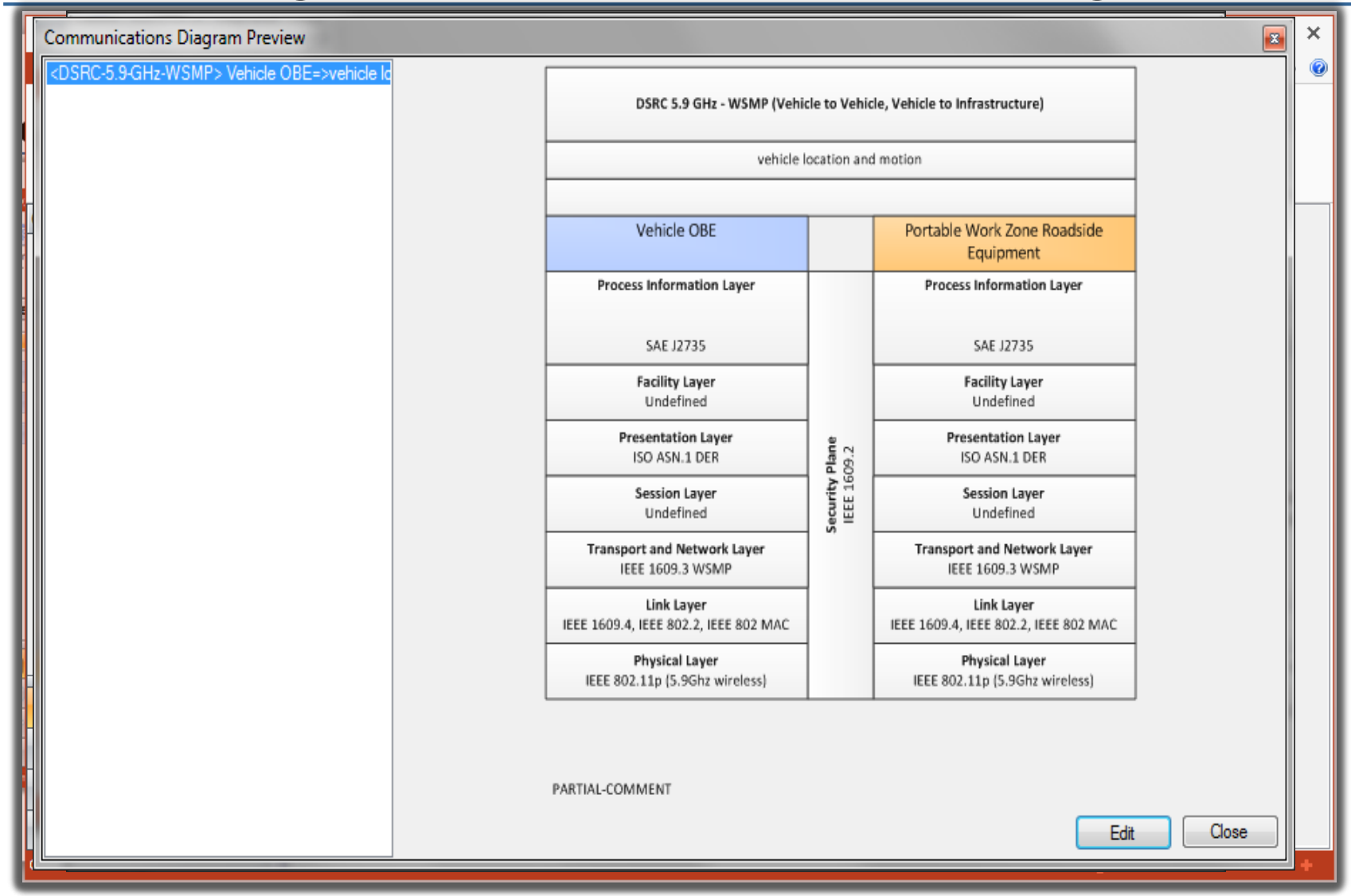
Communications Diagrams



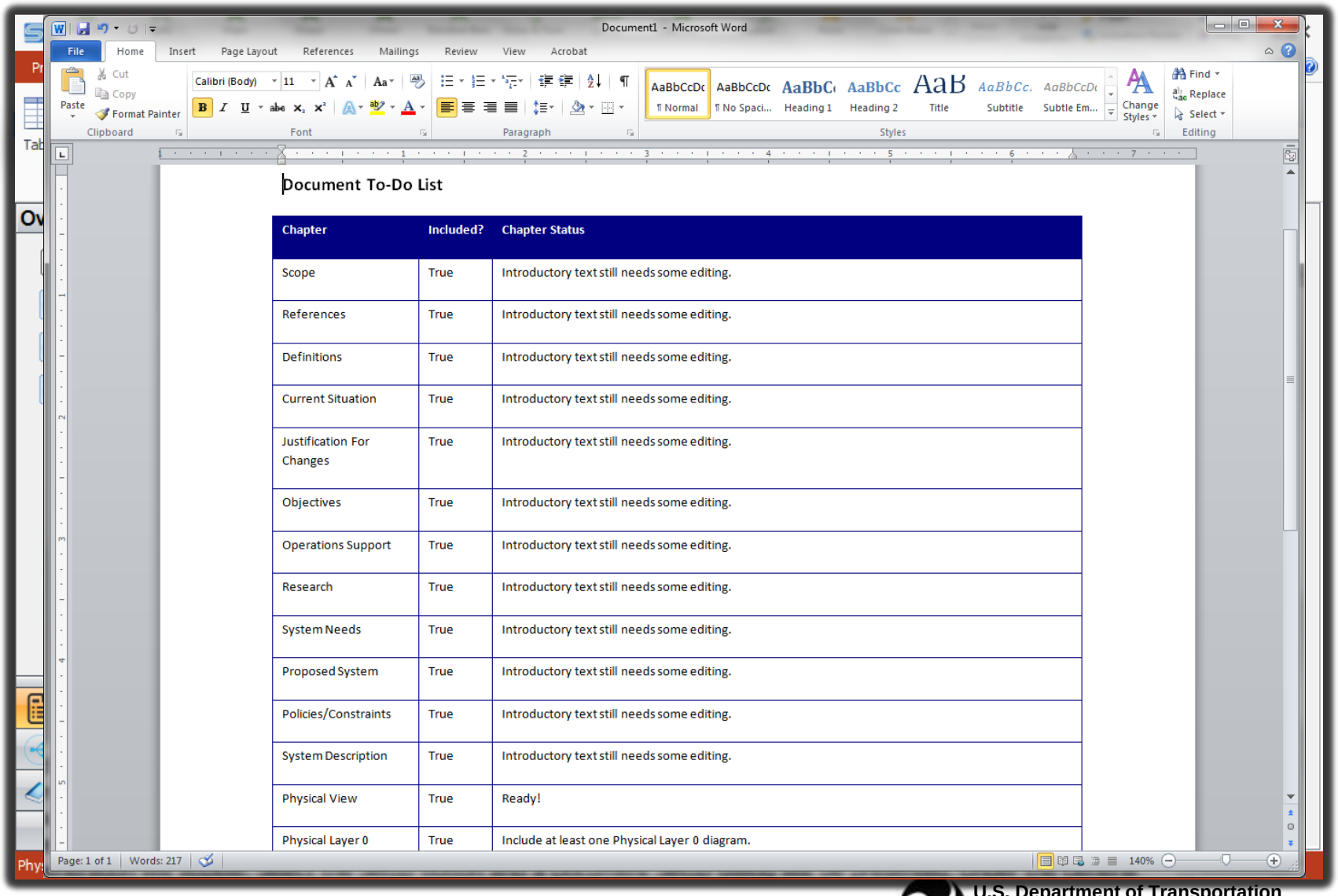
Tailoring Communications View Templates - Definitions



Generating Communications View Diagrams



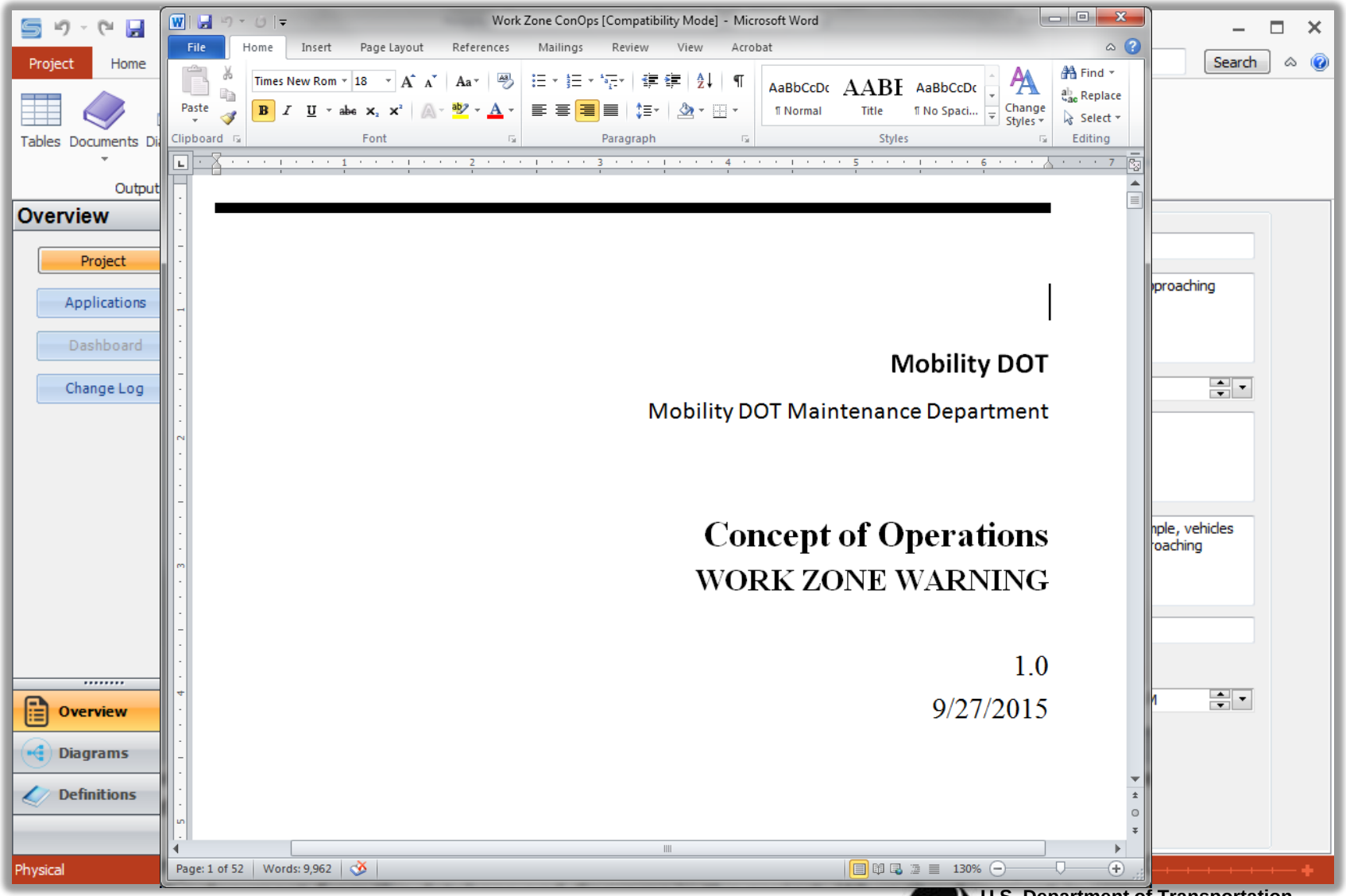
Outputs – Concept of Operations (ConOps)



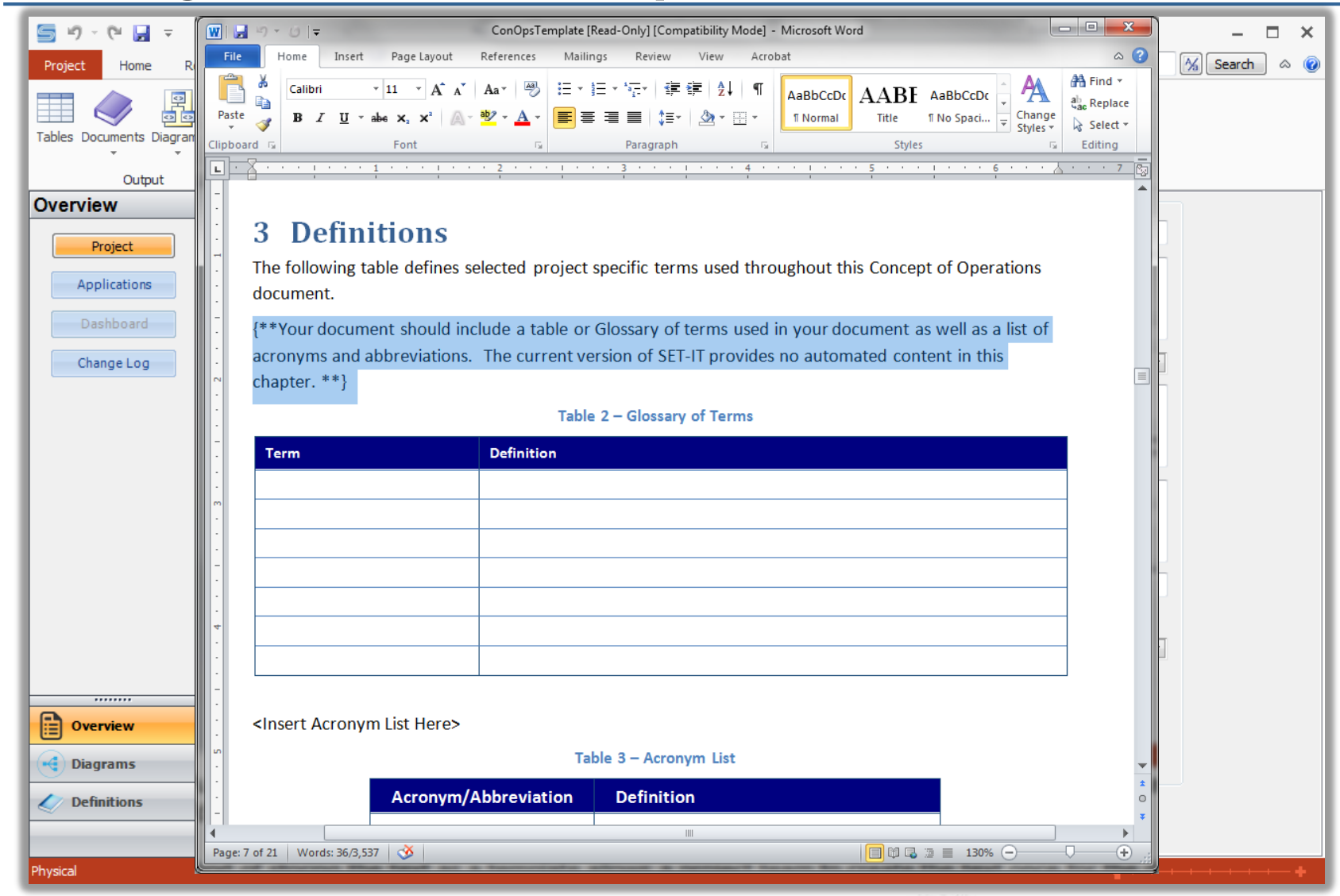
Document To-Do List

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.

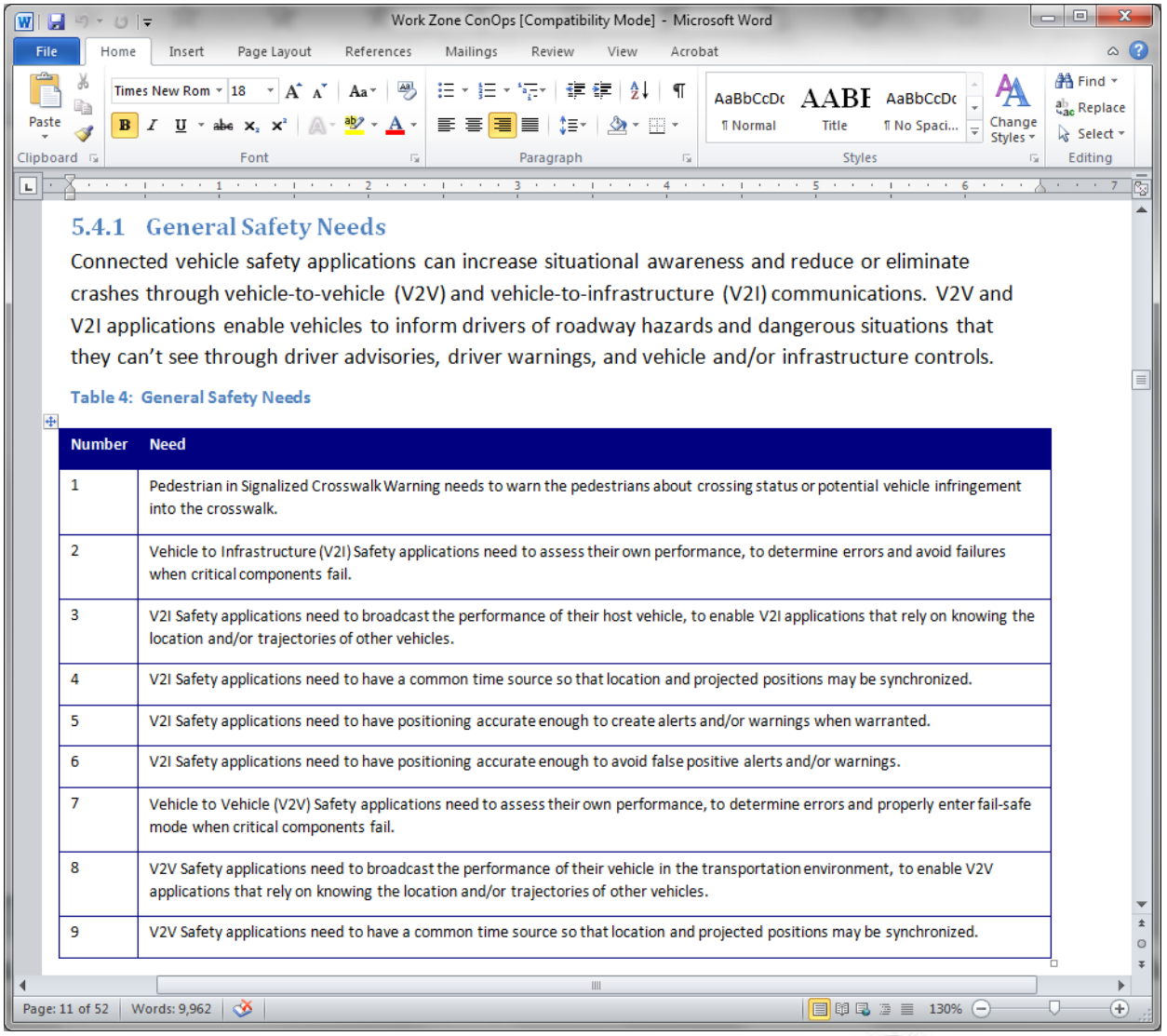
ConOps Document Content Setup



Editing Document Templates



Concept of Operations - Needs



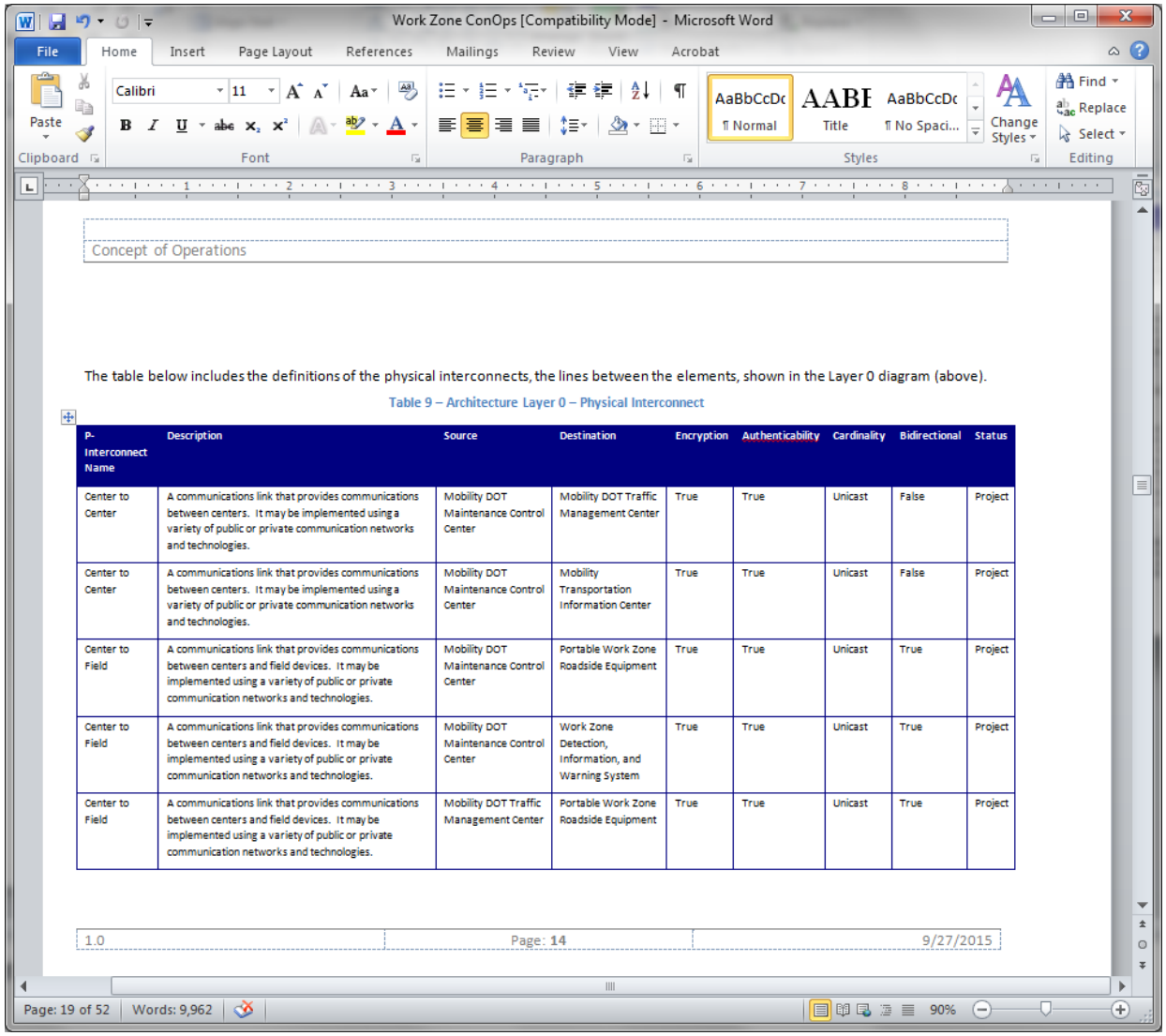
5.4.1 General Safety Needs

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

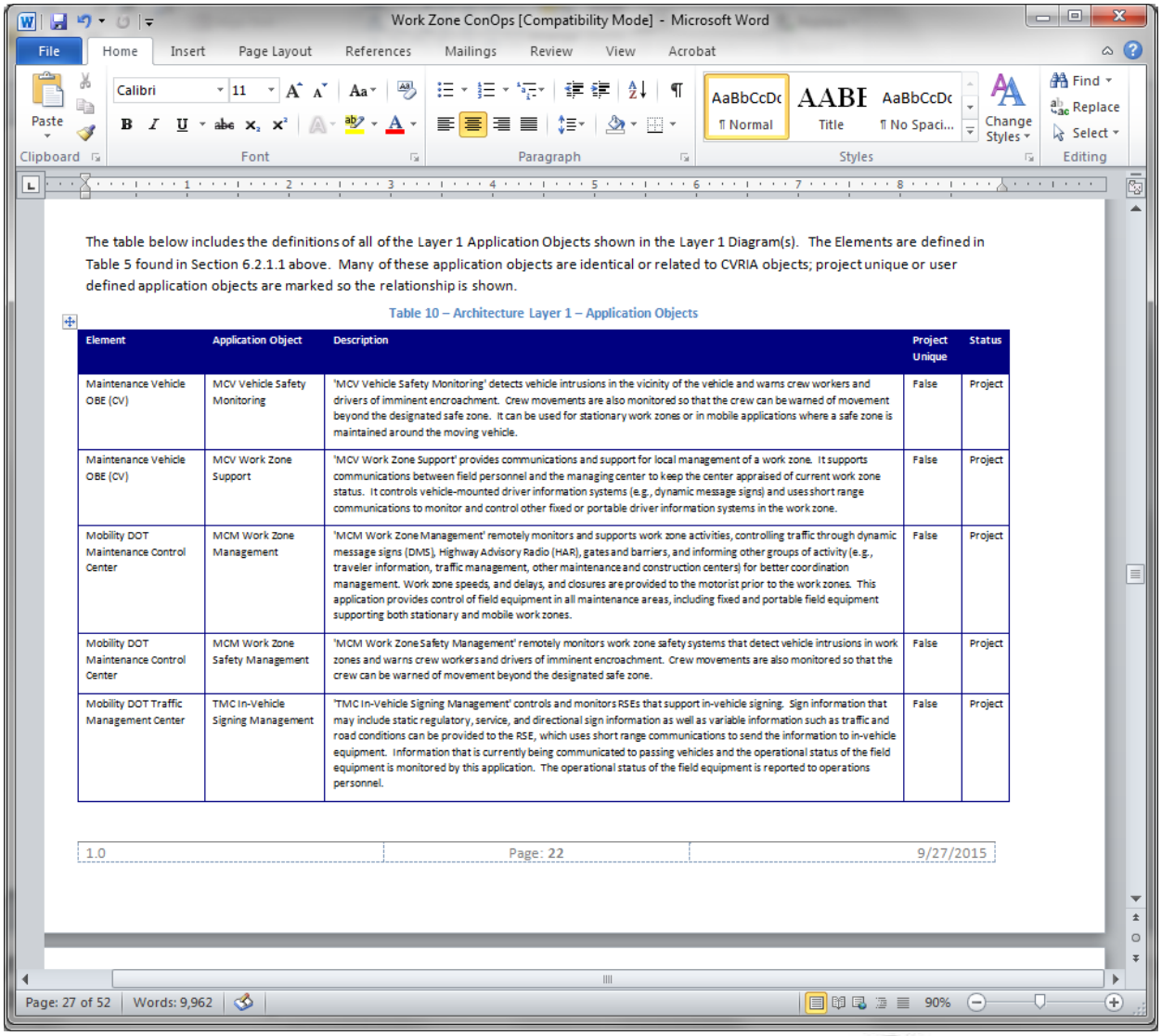
Number	Need
1	Pedestrian in Signalized Crosswalk Warning needs to warn the pedestrians about crossing status or potential vehicle infringement into the crosswalk.
2	Vehicle to Infrastructure (V2I) Safety applications need to assess their own performance, to determine errors and avoid failures when critical 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

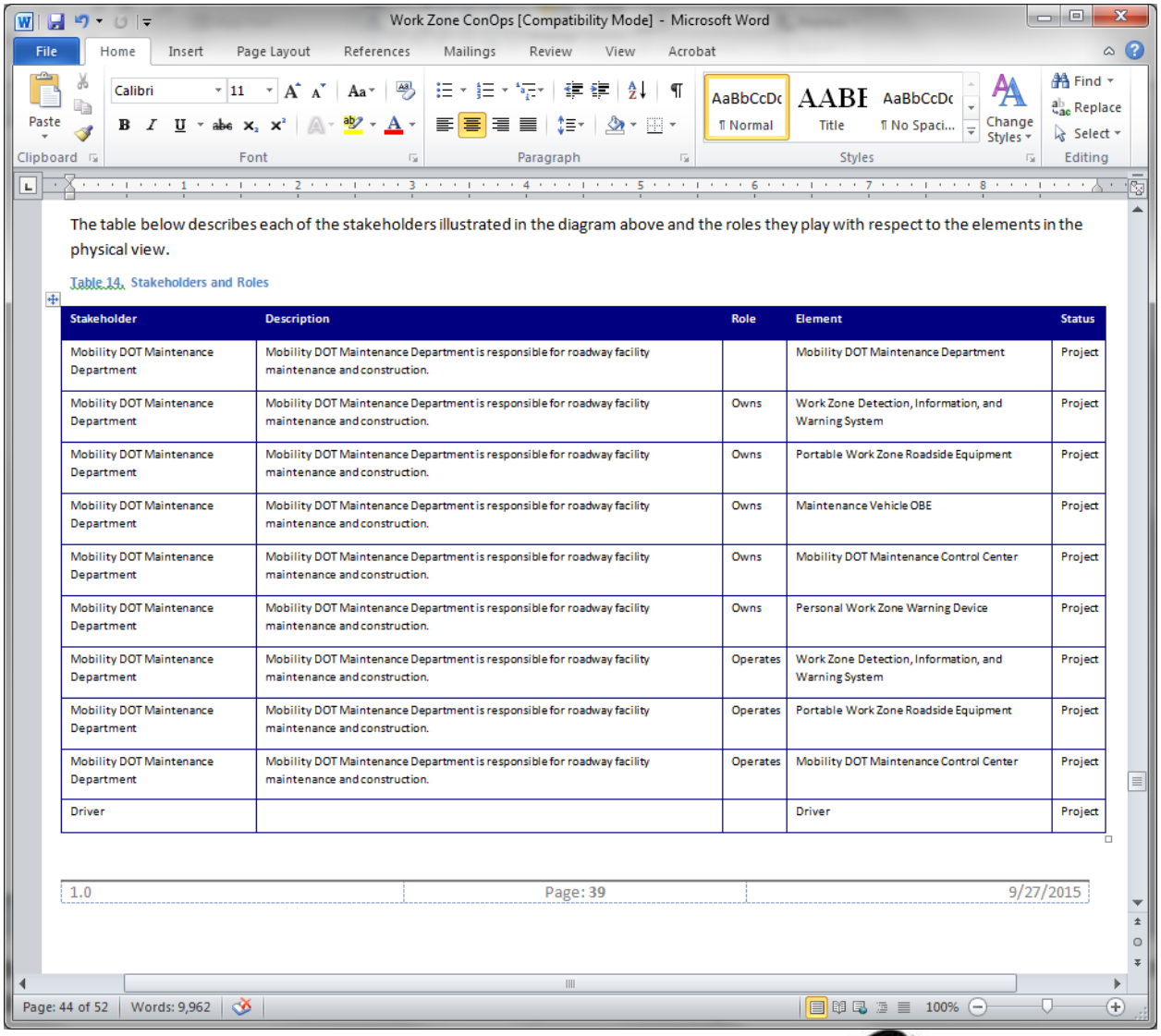


P-Interconnect Name	Description	Source	Destination	Encryption	Authenticability	Cardinality	Bidirectional	Status
Center to Center	A communications link that provides communications between centers. It may be implemented using a variety of public or private communication networks and technologies.	Mobility 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

Concept of Operations – Physical Layer 1



Concept of Operations – Enterprise Layer 0

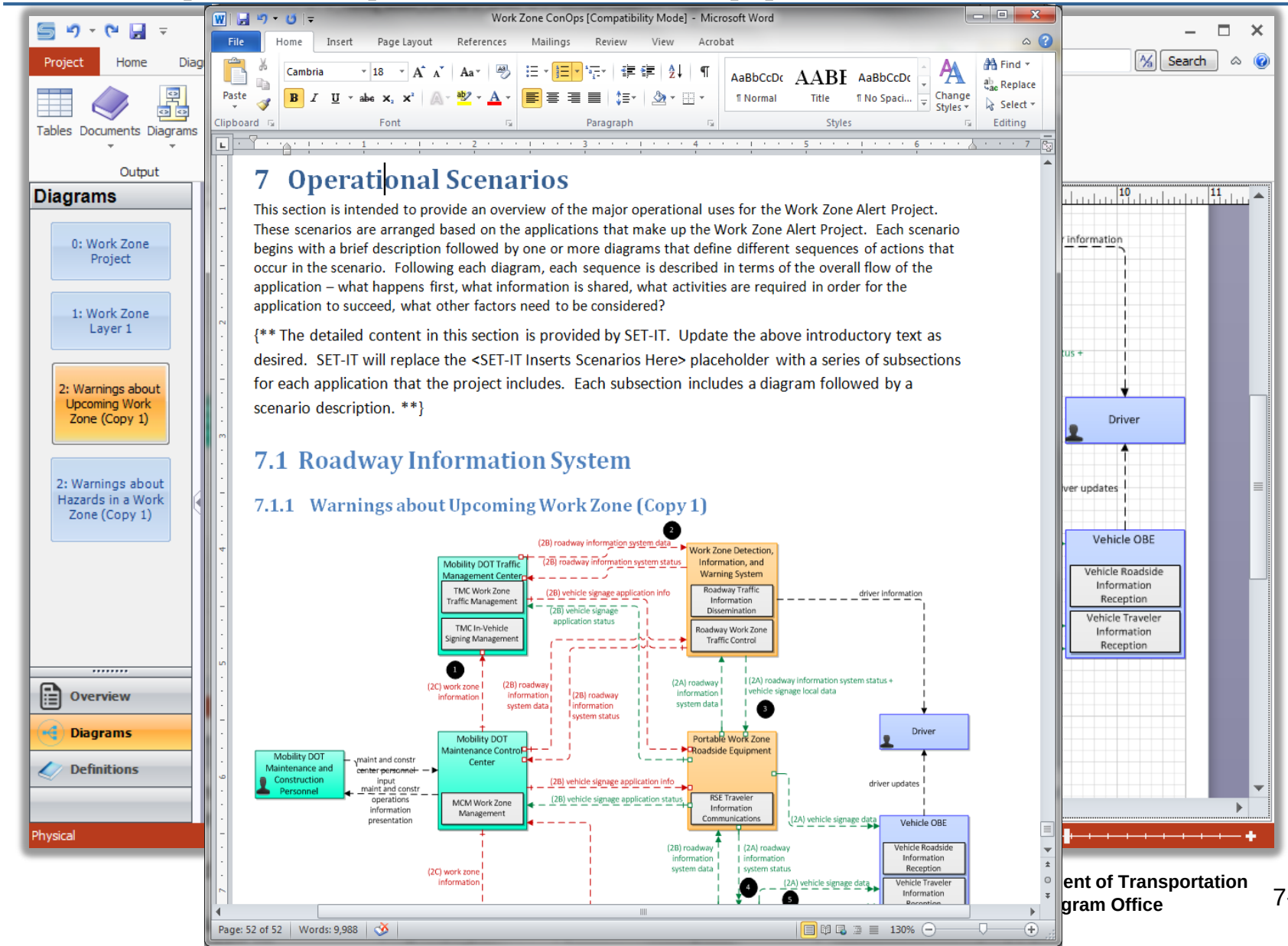


The table below describes each of the stakeholders illustrated in the diagram above and the roles they play with respect to the elements in the physical view.

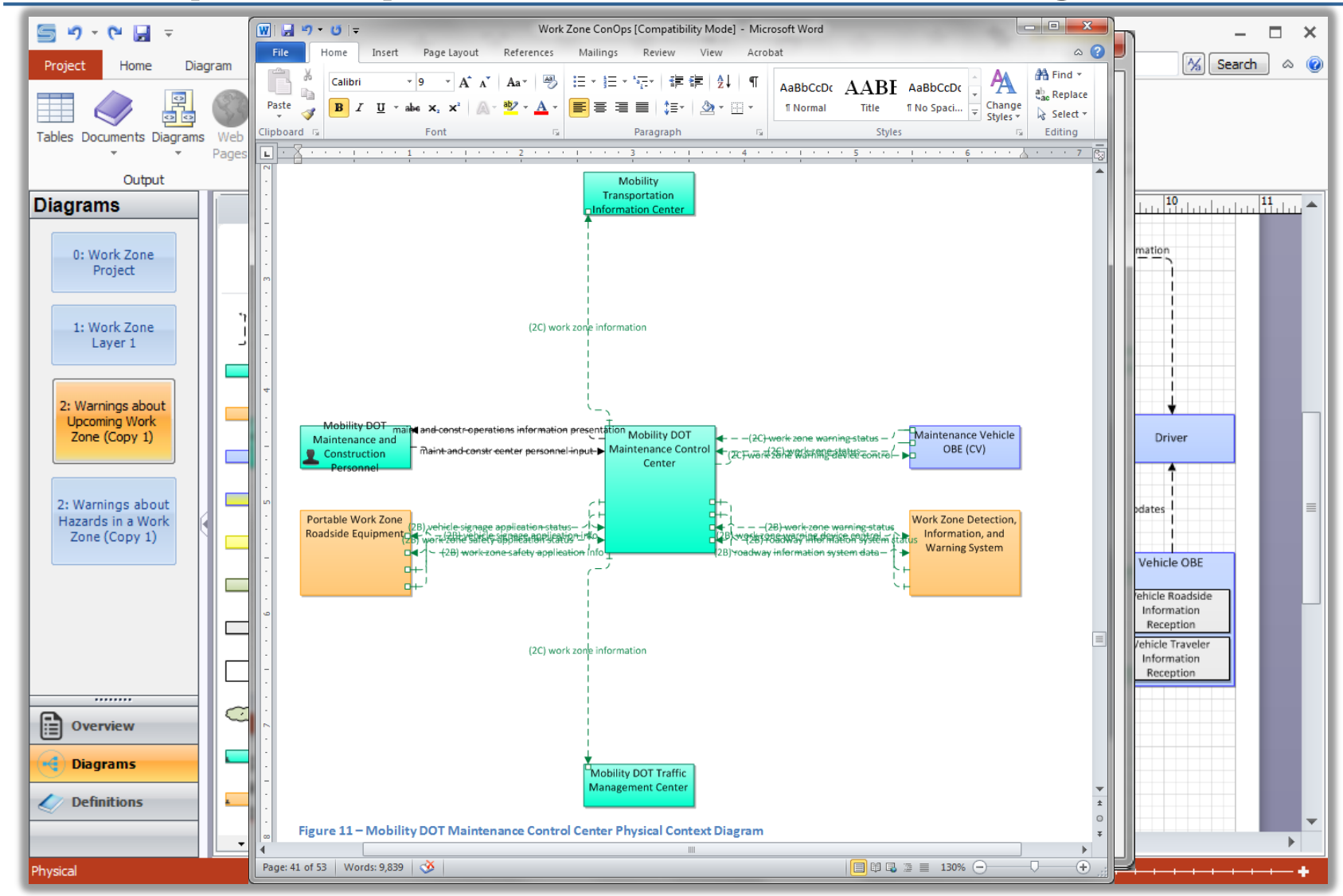
Table 14. Stakeholders and Roles

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

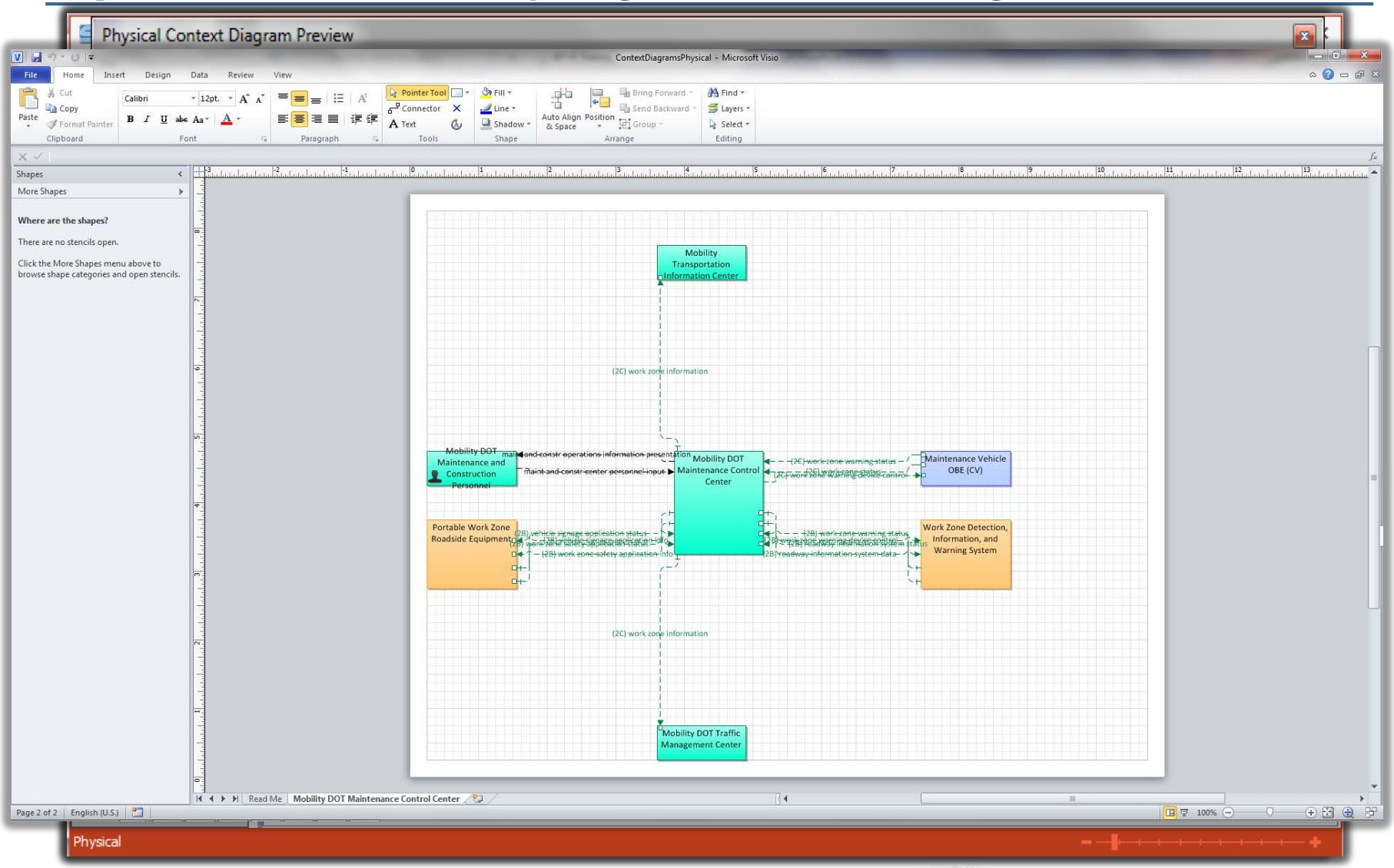
Concept of Operations – Application Scenarios



Concept of Operations – Context Diagrams



Options for Modifying Context Diagrams



Further Training is Available

CVRIA CONNECTED VEHICLE REFERENCE IMPLEMENTATION ARCHITECTURE

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Home > Resources > Training

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.

Web-Based Training

- 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.