

# Component 3: Exercise Debrief

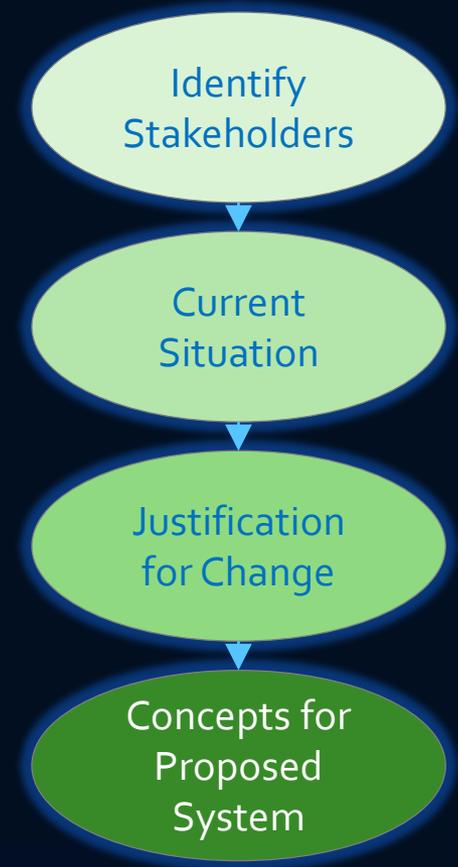
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# Purpose of the SE ConOps Exercise

- Introduce Systems Engineering
- Perform ConOps Development Activities
- Goal: Develop sections of a ConOps to describe the an ITS project for a major university trip generator  
– football game

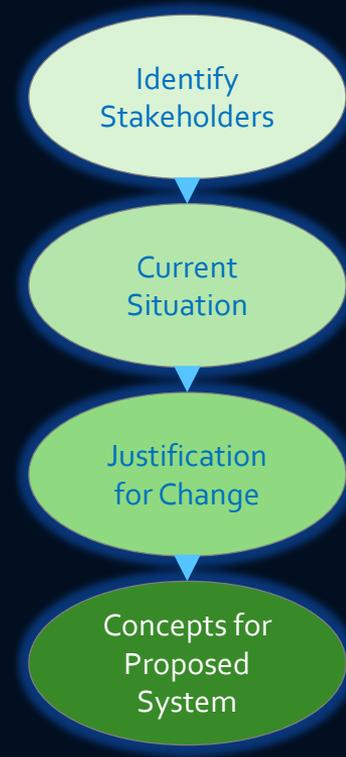
# Exercise Activities

- Task 1: Identify Stakeholders
  - Determine who is involved
  - Roles and Responsibilities
- Task 2: Current Situation
  - Operations
  - System Elements and Connections
- Task 3: Justification for Change
  - User needs
  - Description of Desired Changes
- Task 4: Concepts for Proposed System
  - Policies and constraints impacting the system
  - Description of the proposed system



# Task 1: Identify Stakeholders

- The first step in developing a ConOps is identifying the stakeholders
- This task requires you to read the project introduction and determine the possible stakeholders for the project



# Task 1: Identify Stakeholders

List of Stakeholders
City Department of Transportation/TMC Operators
City Police Department
State Department of Transportation
City Transit Department/Authority
City Parking Department/City Parking Operators
University Department of Transportation
University Parking Department
University Police Department
Travelers

# Task 1: Questions

- Who is the stakeholder that is most central to the project?

*This may be obvious but it is important to identify the stakeholder that is central to the project, in this case the City DOT. Most successful projects have a champion stakeholder who has the overall responsibility for the project.*

- Why could the State DOT be involved?

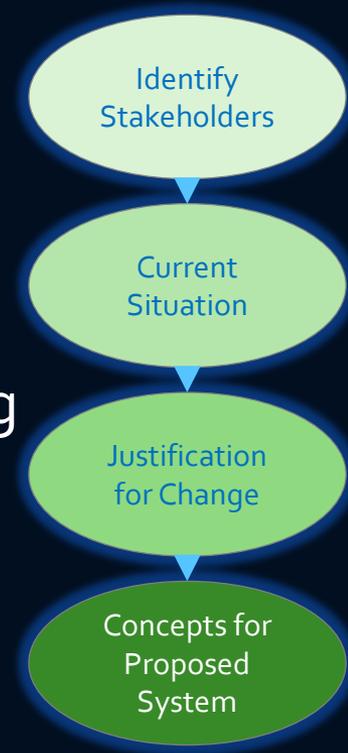
*The State DOT usually is responsible for the freeways; since this project could impact the freeways and could provide additional field equipment in the vicinity of the freeway it is important to involve the State DOT.*

- Is it a good idea to include transit stakeholders? Why or why not?

*Although it appears that this project is not primarily a transit project, the addition of field devices and an improved Traffic Management Center will benefit the City transit operations. Potentially sharing traffic conditions and camera images would enhance the overall traffic management around the stadium including transit.*

# Task 2: Current Situation

- The ConOps provides a common understanding of the environment that the project will be dealing with
- The ConOps defines the scope of the project
- Your task was to relate each stakeholder in Task 1 with their existing systems (center, traveler device, vehicle and/or a field device)



# Task 2: Current Situation

Stakeholder	Related ITS Systems
<b>City Department of Transportation/TMC Operators</b>	<b>City Traffic Management Center                      City Cameras                      City Dynamic Message Signs                      City Vehicle Detectors</b>
<b>City Police Department</b>	<b>City 911 Call Center                      City Police Vehicles</b>
<b>State Department of Transportation</b>	<b>Freeway Traffic Management Center                      Freeway Cameras                      Freeway Dynamic Message Signs                      Freeway Vehicle Detectors</b>
<b>City Transit Department/Authority</b>	<b>City Transit Management Center                      City Transit Vehicles</b>
<b>City Parking Department/City Parking Operators</b>	<b>City Parking Occupancy Detectors</b>

# Task 2: Current Situation (cont.)

Stakeholder	Related ITS Systems
University Department of Transportation	University Traffic Management Center University Cameras University Dynamic Message Signs University Vehicle Detectors
University Parking Department	University Parking Occupancy Detectors
City Transit Department/Authority	City Transit Management Center City Transit Vehicles
University Police Department	University Police Vehicles
Travelers	Smart Phones/Devices

# Task 3: Justification for Change

- One of the most important parts of a ConOps is to capture the user (stakeholder) needs
- User needs as well as the ConOps document must be written in the stakeholder's language so it is easy for the users of the proposed system to understand
- Remember to capture the User Needs, not the System Needs – System Requirements will be defined in the next systems Engineering step



# Task 3: Justification for Change

- Recall the Criteria for Writing a “Well-Written” User Need:
- When documenting a user need, one must remember that it addresses an operational problem, and “describe” it using the following recommended criteria:
  - Provide a structure by assigning a unique number and title to make it uniquely identifiable
  - Identify a major desired capability (Including functions or features you desire from the device/system)
  - Capture the rationale by stating why it is needed by the user
  - Keep it solution-free: don’t get into how to meet it (design)

# Applying the Criteria: Transit AVL Example

## **UN 3.10 Configure Transit Vehicle Tracking System**

**Uniquely Identifiable**

*The Transit Operator needs to enter the bus route information into the transit vehicle including the driver*

**Major Desired Capability**

*in order for the transit vehicle to track its status against the route schedule and provide bus stop announcements.*

**Rationale**

*Note that this user need does not specify how this will be accomplished, it only specifies the user need.*

**Solution-Free**

# Monitor Traffic Conditions Example

## UN 3.4 Monitor Traffic Conditions

Uniquely Identifiable

The Traffic Management Center Operator needs to monitor and verify the traffic conditions around the stadium for both the freeway and arterial roadways

Major Desired Capability

in order to better manage the traffic around the stadium.

Rationale

*Note that this user need does not specify how this will be accomplished, it only specifies the need.*

Solution-Free

# Task 3: Your Turn

## **UN 3.7 Provide Traffic Condition Information to Travelers** **Uniquely Identifiable**

**Travelers need traffic conditions in the vicinity of the stadium**  
**Major Desired Capability**

**in order to allow travelers to make informed decisions.**  
**Rationale**

*Note that this user need does not specify how this will be accomplished, it only specifies the need.*  
**Solution-Free**

# Task 3: Your Turn

## UN 3.12 Monitor Transit Vehicles

Uniquely Identifiable

The Transit Management Center Operator needs to monitor its Transit Vehicles

Major Desired Capability

in order to better manage the transit network and provide transit vehicle information to travelers.

Rationale

*Note that this user need does not specify how this will be accomplished, it only specifies the need.*

Solution-Free

# Task 3: Your Turn

## **UN 3.19 Exchange Traffic Condition Information between the Traffic Management and Transit Management Centers**

**Uniquely Identifiable**

The Traffic Management Center Operator and Transit Management Center Operator need to share their traffic condition information with each other

**Major Desired Capability**

in order to provide better traffic coordination around the stadium.

**Rationale**

*Note that this user need does not specify how this will be accomplished, it only specifies the need.*

**Solution-Free**

# Task 3: Your Turn

- What is wrong with the following user need?

## ***UN 3.4.1 Retrieve Remote Traffic Conditions using Cameras*** **Uniquely Identifiable**

*The City TMC Operator needs to remotely retrieve freeway and arterial roadway traffic conditions by controlling cameras*

**Major Desired Capability**

*in order to obtain current roadway operational conditions.*

**Rationale**

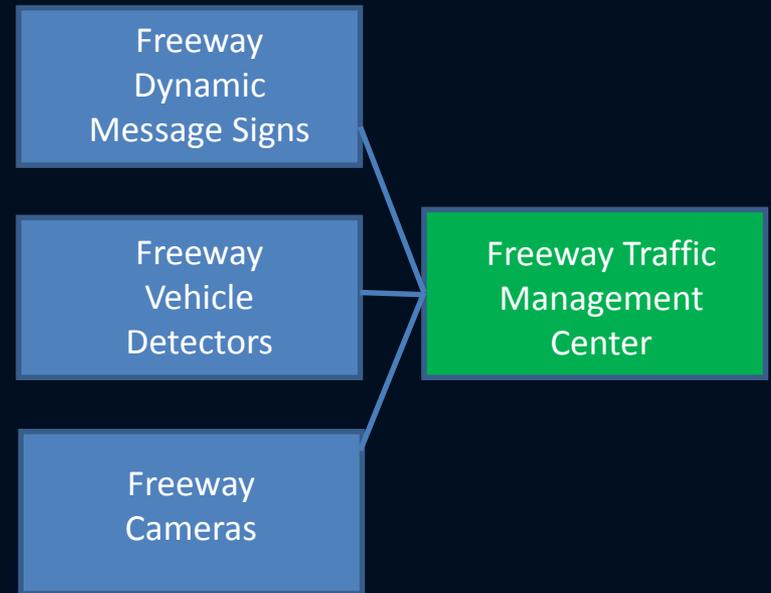
*Note that this user need does not specify how this will be accomplished, it only specifies the need.*

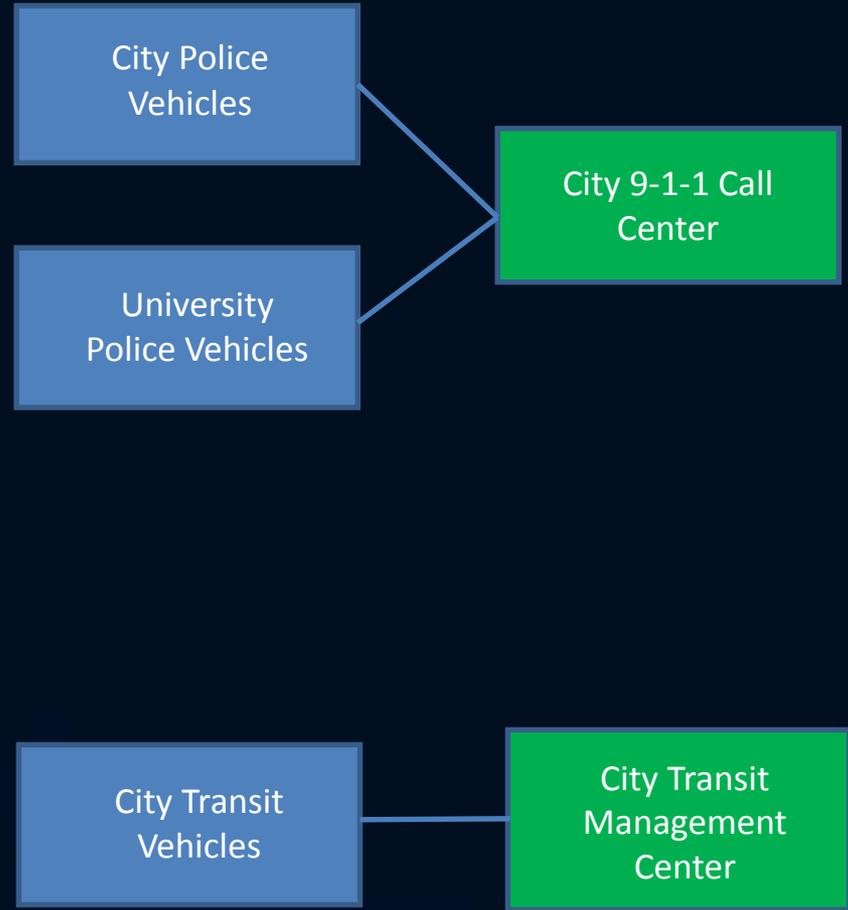
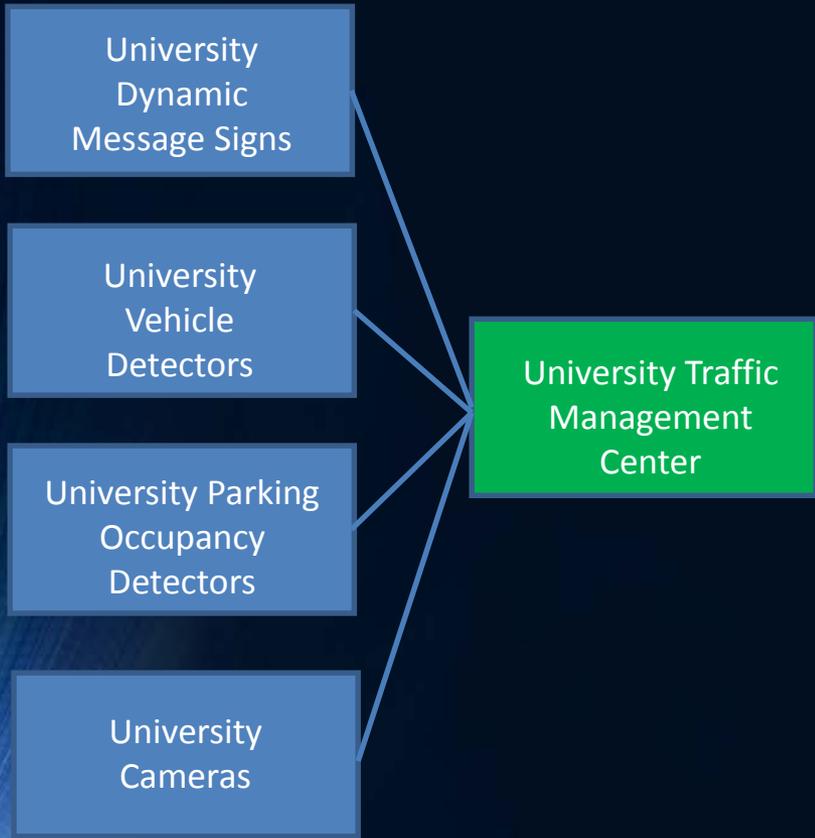
**Solution-Free???**

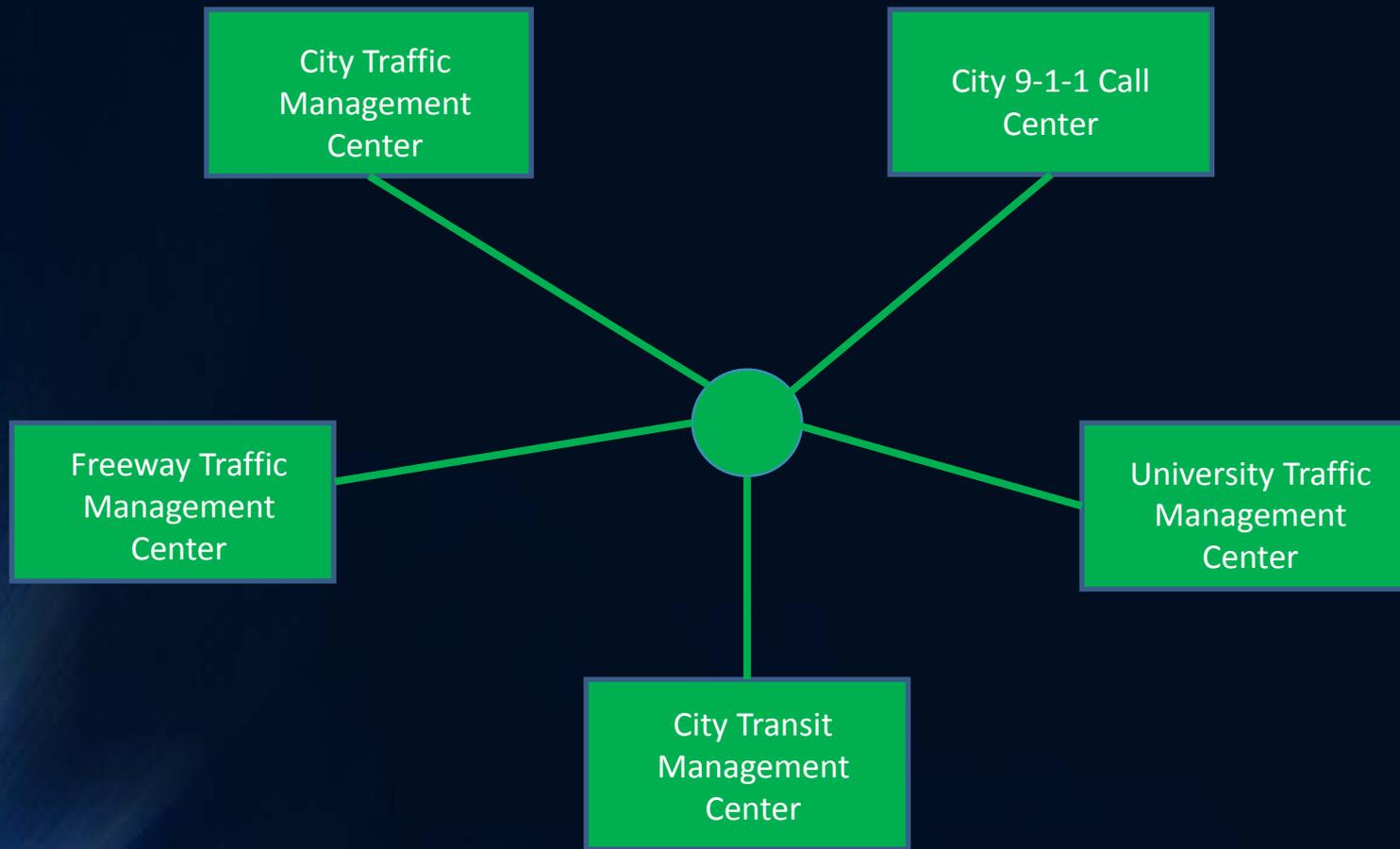
# Task 4: Concepts for Proposed System

- A high-level block diagram of the proposed system components helps to define the scope of the project.
- Based on your understanding of the proposed project, sketch a rough block diagram of the major systems and the information they communicate with each other.
- Make sure you label your system blocks as well as connecting the blocks where there is information communications between them.









# Case Study Purpose

- Provide understanding of systems engineering
- Gain experience in beginning development of a systems project with a Concept of Operations
- Explore balancing priorities in establishing project scope



# References

- International Council on Systems Engineering (INCOSE) - <http://www.incose.org/>
- Systems Engineering for Intelligent Transportation Systems Handbook - <https://ops.fhwa.dot.gov/publications/seitsguide/>
- Systems Engineering Guidebook for Intelligent Transportation Systems (ITS) - <https://www.fhwa.dot.gov/cadiv/segb/>

# References

- United States Department of Transportation (USDOT) Intelligent Transportation Systems (ITS) Joint Program Office (JPO) - <http://www.its.dot.gov/index.htm>
- USDOT ITS JPO Professional Capacity Building (PCB) - <https://www.pcb.its.dot.gov/>
  - Case Studies including this one can be found under “ITS in Academics”
- National Highway Institute (NHI) - <https://www.nhi.fhwa.dot.gov/home.aspx>