Component 3: Exercise Debrief

FEBRUARY 25, 2017
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

<table>
<thead>
<tr>
<th>Stakeholder</th>
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</thead>
<tbody>
<tr>
<td>City Department of Transportation/TMC Operators</td>
</tr>
<tr>
<td>City Police Department</td>
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<tr>
<td>State Department of Transportation</td>
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<tr>
<td>City Transit Department/Authority</td>
</tr>
<tr>
<td>City Parking Department/City Parking Operators</td>
</tr>
<tr>
<td>University Department of Transportation</td>
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<tr>
<td>University Parking Department</td>
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<tr>
<td>University Police Department</td>
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<tr>
<td>Travelers</td>
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</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Related ITS Systems</th>
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</thead>
<tbody>
<tr>
<td>City Department of Transportation/TMC Operators</td>
<td>City Traffic Management Center</td>
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<tr>
<td></td>
<td>City Cameras</td>
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<td></td>
<td>City Dynamic Message Signs</td>
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<td></td>
<td>City Vehicle Detectors</td>
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<td>City Police Department</td>
<td>City 911 Call Center</td>
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<td></td>
<td>City Police Vehicles</td>
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<tr>
<td>State Department of Transportation</td>
<td>Freeway Traffic Management Center</td>
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<td></td>
<td>Freeway Cameras</td>
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<td></td>
<td>Freeway Dynamic Message Signs</td>
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<td></td>
<td>Freeway Vehicle Detectors</td>
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<tr>
<td>City Transit Department/Authority</td>
<td>City Transit Management Center</td>
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<tr>
<td></td>
<td>City Transit Vehicles</td>
</tr>
<tr>
<td>City Parking Department/City Parking Operators</td>
<td>City Parking Occupancy Detectors</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>Related ITS Systems</td>
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<td>-----------------------------------------------</td>
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<tr>
<td>University Department of Transportation</td>
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<td>University Police Vehicles</td>
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<tr>
<td>Travelers</td>
<td>Smart Phones/Devices</td>
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</table>
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

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

Uniquely Identifiable

Major Desired Capability

Rationale

Solution-Free

Note that this user need does not specify how this will be accomplished, it only specifies the need.
Task 3: Your Turn

UN 3.7 Provide Traffic Condition Information to Travelers

Travelers need traffic conditions in the vicinity of the stadium in order to allow travelers to make informed decisions.

Note that this user need does not specify how this will be accomplished, it only specifies the need.
Task 3: Your Turn

UN 3.12 Monitor Transit Vehicles

The Transit Management Center Operator needs to monitor its Transit Vehicles in order to better manage the transit network and provide transit vehicle information to travelers.

*Note that this user need does not specify how this will be accomplished, it only specifies the need.*
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 in order to provide better traffic coordination around the stadium.

Major Desired Capability

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**

The City TMC Operator needs to remotely retrieve freeway and arterial roadway traffic conditions by controlling cameras in order to obtain current roadway operational conditions.

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

• United States Department of Transportation (USDOT) Intelligent Transportation Systems (ITS) Joint Program Office (JPO) - [http://www.its.dot.gov/index.htm](http://www.its.dot.gov/index.htm)

• USDOT ITS JPO Professional Capacity Building (PCB) - [https://www.pcb.its.dot.gov/](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](https://www.nhi.fhwa.dot.gov/home.aspx)