Paper 2 – A Mini-Systems Engineering Project

You have been assigned as the systems engineer for the development of a new traffic control system for the city of Littlecity, USA. The city currently has 24 standard traffic lights that guide traffic through the city center. The signals all operate independently and are all of the traditional variety that do not have any sensors. Their current programming is to operate purely on a timer. They do have built-in functionality to be remotely controlled to adjust their timing pattern, but it is currently unused because there are currently are no connections to them.

During rush hour, the traffic lights slow traffic since they are not coordinated. To help ease traffic congestion, the city has hired your company to develop a system that will be able to sense traffic flow, integrate the traffic lights together so they can react to the traffic pattern to improve traffic flow, and provide a way for the traffic light system to be monitored and controlled.

The operational requirements for the new traffic control system are as follows:

1) The traffic control system shall sense traffic in the city center.
2) The traffic control system shall connect to each of the traffic signals.
3) The traffic control system shall change timing on the traffic signals to maximize traffic flow through the city.
4) The traffic control system shall provide a way to monitor the status of the traffic in the city.
5) The traffic control system shall provide a way for a user to manually control traffic light settings throughout the city.
6) The traffic control system shall be highly reliable.
7) The traffic control system shall be easy to maintain.
8) The traffic control system shall be cost effective to operate.
9) The traffic control system shall be easy to use.
10) The traffic control system shall use common products and standard products to the maximum extent possible.

The customer has stated that the functional requirements are more important than the non-functional requirements.

[Yes, there are some vague words used in the above requirements. These requirements are more at the user needs level and the specific numbers are not important to the assignment.]

Given the above provide a “paper” that addresses the following:

a) Draw a context diagram of the system.
   [Hint – the context diagram should not include all the internal subsystems detail and the interactions between them]
b) Write a short Concept of Operations (CONOPS) of how the new traffic control should work (1/2 page)

c) Describe at least 2 different conceptual solutions that you would believe could be a candidate solution (minimum 1 paragraph each)
    i. supplemental drawings depicting your concept, block diagrams, lists of subsystems, etc. to clarify your concept (e.g., the conceptual subsystems, physical architecture, etc.) are optional if you think it will help to clarify your concept

d) Given that you are going do a trade study to choose a concept (assume that there more than the two that you have described):
    a. Describe what you would use as selection criteria for choosing the one approach go forward with and why you chose those criteria.
    b. What you would use as weights on the criteria and why. (summary table is okay)

e) Assume you are at the start of the advance development phase and you are the systems engineer. The city wants to have confidence that the proposed system will work before committing the money to build the entire system.
    a. Choose one of your proposed solutions from c) above and write a 1/2 page on what you would do in the advance development effort to demonstrate that your system concept is a valid approach and you are ready to go to full scale development.
        i. This must include what you would want to prove in this phase, what you would develop in this phase and how you would test it.
    b. List 10 risks (include both programmatic and technical) for the effort associated with your advance development phase described above.
        i. Rank your risks – which are the most important ones
        ii. Briefly state what you would do to mitigate them.