CSE 4317 – Architectural Design Exercise

Problem: A customer has approached your employer, a mobile app and cloud service development company, for help designing a new product. Your employer has tasked you with creating a system architecture for the project, which the customer must approve before development funds are made available. The customer has provided a preliminary product concept that must be reflected in your system architecture.

Product Concept: The customer, an electric wheelchair manufacturer, wishes to develop a web-based system for monitoring usage information from all wheelchairs in the field. Each wheelchair is currently equipped with Platform Measurement Module (PMM) that records wheel speeds, battery life, user commands, etc. The PMM includes a Bluetooth interface and communication API that you will use to retrieve all necessary data streams from the wheelchair platform.

The customer wants a mobile app developed that will run on the user's tablet or phone, collect information that the PMM periodically publishes, perform some filtering of the PMM data, and publish the filtered data to a cloud service. The cloud service will maintain PMM data for all wheelchairs in a database, which may then be accessed at a later date by the original user's mobile device or by the wheelchair manufacture's Fleet Management System (FMS).

The mobile application will provide high-level usage statistics to the wheelchair user on request, such as the total miles traveled, average miles traveled per battery charge, etc. These queries will be performed and displayed via the GUI menu.

The FMS will allow real-time monitoring of individual wheelchairs in the system, fleet-wide statistics (battery mean time to failure, average distance traveled per day, geolocation data, etc.), and data archiving. The FMS reports will be accessed by the manufacturer support staff through a web browser, and archived data may be used for future machine learning or data mining purposes.

Design Guidelines: Your architecture must meet, at a minimum, the following guidelines

- A minimum of 3 top-level systems must be used
- Each system must include at least 2 subsystems
- All subsystems must have at least 1 source or sink represented as a dataflow line
- All systems and subsystems must be named
- All dataflow connection lines must include arrows on one or both ends to denote directionality
- All dataflow connection lines must be numbered
- At least one database must be used and represented with the proper cylinder symbol

Deliverables: Your submission will consist of a coversheet, dataflow diagram, connection table, and writeup. For the dataflow diagram, use appropriate diagramming software (MS Visio, OpenOffice Draw, etc.) and follow the design guidelines above. For the connection table, list each numbered dataflow connection line and provide a high-level description of what type of information is being exchanged.

For the writeup page, consider the relevance of each of the following factors to this project:

- public health
- safety & welfare
- global
- cultural

- social
- environmental
- economic

Address how each factor applies to the design, implementation, testing, and/or adoption of this project. Each factor should be individually discussed in a short paragraph. Your final submission should be exported as a single, 4-6 page PDF file (1 page coversheet, 1 page diagram, 1 page table, 1-3 page writeup).