Advanced SQL (PROG3070)

Assignment #1

- Work in groups of 1 or 2

Introduction

EMCA Corporation consumes about 1,000,000 KWH of electricity on a normal day of production. The corporation is investing in an energy management program and needs a simple system to monitor and track consumption.

Existing Infrastructure

1. There are three hydro meters measuring plant electrical consumption.

2. Each hydro meter is monitored by a Programmable Logic Controller (PLC). A pulse is sent to the PLC for each KWH consumed.

3. The PLC keeps a running count of the pulses until the PLC value is read, at which point, the count is set back to 0.

4. The PLC is on an Ethernet network and the values can be read/reset using an OPC Server.

5. A service is already running on a computer that is connected to the all three PLCs. This service can be accessed via TCP/IP. The IP address and port number is configurable.

6. In providing the response to a request, the service returns a fault (instead of a value) about 1% of the time.

7. The following is the protocol for the commands to the monitoring service: [Command][Delimiter][Parameter][CR][LF]

8. The following is the protocol for the response to the commands: [Status][optional Delimiter][optional Response][CR][LF]

9. The only command to the service at the present time is “R” (for “Read”). The delimiter is the vertical pipe (|). The parameter is the PLC number – either 1, 2 or 3.

10. The only responses are:

    a. “R” (for “result”), with parameter 1 being the PLC number and parameter 2 being the number of pulses since the last read.

    b. “F” (for “fault”), where an error of any sort may have been encountered. It is not providing an error code at the moment.

System Requirements

1. Since the development team cannot use the existing PLCs and the connected computer, a simulator must be developed to provide the exact same functionality as the service outlined in “Existing Infrastructure”. This simulator may be written a language of your choice, and must provide responses as if it was connected to 3 PLCs.
2. The user requires an application that provides the following functions:
    a. Provide a report with the total electrical consumption given a specific date/time range (user selectable).
    b. Provide a report with the electrical consumption given a specific date/time range (user selectable), and selectable as hourly, daily or weekly totals.
    c. Enter a target value for hourly consumption. If the hourly rate has been surpassed in the most recent last hour, an email will be sent to a user configurable email or text message recipient.
3. The application may be a web app, or a desktop app.
4. The data read from the PLC polling service must be written to a database.
5. The user application must read the data from the database.

Hand In:

1. A diagram showing the system components.
2. All the source code with appropriate comments.
3. Installation instructions. Bear in mind this needs to be deployable to the instructor’s environment for evaluation and testing purposes.

Demonstration:

The solution must run on at least 2 computers:
Computer 1: The PLC service simulator
Computer 2: The database
Computer 3: The client computer running the browser or desktop application

Marking Guide

Use the advice below to guide your work and preparations for this assignment:

Item	'OK' Grade	'Good' Grade	'Excellent' Grade	Weight
Diagram – System Components	Basic information provided.	Basic information with additional, relevant details; easy to read.	All details and easy to read; before/after versions; full color etc.	10 points
Source Code	Compiles, runs and supports the required functionality.	In addition, the code is documented, and constructed with best practices in mind.	Exemplary code. Well documented; modular; easy to review and extend; errors handled, etc.	20 points
Installation & Deployment	Full walkthrough. Deployment is successful	Scripting or other automation is used to ease some parts of the installation/deployment.	Entire assignment is automated for deployment and testing purposes.	10 points
Functionality	Core functionality supported with no unhandled errors in basic testing.	Extended testing survives surprise scenarios with handled errors;	You extend the requested functionality with your own, successful feature implementation.	20 points
Communication Skill	Conforms to the required formatting, spelling, and grammar rules.	Also provides additional resource information (e.g. links or suggested reading)	This document would help win new business or exceed a customer's expectations.	10 points
TOTAL				**70 points**

Note: The guidelines above are provided as recommendations for students to adequately prepare their environment, demonstration and deliverables to maximize their success.

- In general, the guidelines above are cumulative from OK, to Good, to Excellent
- In general, some guidelines can be useful to other areas of the assignment
- The Instructor reserves the right to interpret the guidelines above on an as needed basis. 'They be more like guidelines than actual rules.' – Captain Barbossa, Pirate.