Annexure-I

Specifications of Report Generation Builder

Energy Management System(EMS) (in which Report Generation Builder is a part) is used to acquire data from energy metres using a Serial device servers, which are connected to other systems and MaxDCS on the Ethernet . The Max DCS consists of various components i.e. Virtual DPU, Software Back plane (SBP), OPC Server, HMI, and Historian. All the tags in the EMS system are configured in the Virtual DPU. The data values of all the configured tags can be read from the SBP. Data can be sourced to other non-max system using OPC Server. The HMI is used to display all the tag values and the Historian is the database of MAX System, which logs all configured values.

Data available on Max DCS, can be tapped from the SBP and MaxOPC Server. This data has to be presented in the form of user specific reports using the Report generation Builder.

Report Generation Builder shall consists of the two modules

A1. Module wise Breakup

Configuration Module
Report Generation Module

A1. Configuration Module

Configuration module shall consist of a GUI for configuring tags with attributes, connecting the tag with sources and configuring trigger attributes for the tags for generation of reports.

A1- 1) Connectivity and Data Acquisition

The configuration module shall deal with selecting the source of data. The data can be sourced from all of the following. Provision has to be provided, where in the user selects the source of data.

a) **OPC Server**

In this case, the configuration module should have single/multiple OPC Client, built into the software, that shall connect with the available OPC servers (Multiple Server or Single OPC server) .All the required tags along with their attributes should be allowed to be configured in the configuration module of the Reporting Software. All the tags along with their attributes should be read from the OPC Server. The required tags and their attributes shall be configured in the reporting software so as to be presented in the required format in the reporting software . All the tags should be populated in the Configuration module of Reporting Software in Tree Format. As per the user requirement, the user can select the required tags from the list. Facility to search for required tags should be provided.

b) **Software Back plane(SBP)**

All the tags used in MaxDNA DCS are configured and available in Virtual DPU. SBP is the software back plane mechanism used in MaxDNA DCS for data transport, making the data available at multiple nodes over MaxDNA DCS network. The tag data is available on the SBP and can be tapped using Max DCS dlls. The reporting software should also have the ability to reads all the configured tags either from Microsoft Access (97/ 2003 format), CSV, xls, XML or text files. The reporting software should present the tags in a tree structure form. Facility to search for required tags should be provided. Once the tags have been configured, these tags should be subscribed to the SBP and the data values will be read from the SBP , by the report generation module software and stored in the database for the purpose of generating reports.

c) Shared Memory

The Configuration module shall have the capability to configure tags read from other applications using Shared memory data transport mechanism. To that effect suitable application calls with handles should be provided both in the configuration and report generation module to read and exchange data.

d) MODBUS Serial master/MOBBUS Ethernet.

Reporting software should have the ability to read data from the available serial devices.

A1-2) Tag customization

On selecting the tags the following features should be provided

1) Creation of a Derived Tag

1-1 .Provision for

a) Applying Tag statistics (such as sample, Average, Maximum, Minimum, Time integration) on the tag.
b) Selecting the time period over which the function should be applied from the following options (15 min, 30 min, 1hour, 1 day, 1 week,1 month, 1 year, Shift wise and custom time duration).
c) Multiplication factor (If any).
d) Naming the tags(Derived) on application of this features

1-2. On creation of derived tags, provision for grouping of the above tags should be allowed. This feature enables the user to select a group of tags at once when generating the report.

2) Performing mathematical functions on the tags.

Provision to perform mathematical operations on the tags should be provided. A derived tag can be created which stores the output of the tag after the mathematical operations have been performed. The mathematical operations that can be performed are addition, multiplication, division, subtraction. These operations can be carried out in

between tags values or with numeric constants .The resultant value can be used in reports.

3) Provision to select different date-Time formats should be provided.

4) Configure shift timings
Provision to enter Shift details should be provided. This includes No of Shifts, Start and end time of shifts along with general shift timings. This data enables the user to create reports shift wise.

5) Configuring Events
It should also be possible to generate reports based on events. The Hi and low limit of a tags can be defined or read from SBP or OPC Server or any other data sources. When the actual value of tag crosses the permissible limit, a report can be generated. Details can be worked out in due course of development.

All the tags that that have been configured in the configuration module should be stored in the database for continuous logging , to be retrieved when ever required.

A1-3) Supported data types

Provision for the following data types

1) Signed Integer, signed float/real, text and Boolean

A2. <u>Report Generation Module</u>

All the tags have to be configured in the Configuration module , so as to be used in the Report generation module of the reporting software. The tags and their corresponding data values, that have been configured in the configuration module , should be stored in the backend database i.e. MySQL , SQL SERVER,ORACLE 9X or above version. The databases to be used should be free versions .

A2-1) Types of Report

Provision to create 4 types of Reports should be provided. They are as follows

1. Trend Report
2. Summary Report
3. Trip Report
4. Shift Report

Trend Report

It is the most basic type of Report covering the trending data over specified intervals of time such as day, hour, shift, week, and month.

Summary Report

A summary report is similar to a trend Report only that it provides a aggregate statistics at the end of the column. The supported statistics are average, maximum, minimum, No of Summary, and Total.

Trip Report

This report is generated in response to an event. The event can be a condition as specified in the software. The condition can be the change of state of a tag from 0 to 1 or vice versa.

Shift report

Shift related data is entered as a part of Configuration. This includes no of shifts in a day, the start time of the shift, the start day of the week and the start day of the Month. This data should be used to generate reports shift wise. The report should also show hourly time intervals of data and tag statistics at the end of every shift.

A2-2) Displays

1. **Report Format**

The selected tags to be displayed in the reports should be displayed in tabular format. A configurable reporting system with provisions to configure Header, Footer details with provisions to alter text and cell attributes to be provided. For all the different types of reports, provision should be provided to create templates. The user should be able to select (from among the created templates) the required template and generate reports.

2. Provision to display variety of charts :
    a) Bar charts (2D &3D)
    b) Pie Charts (2D &3D)
    c) Histograms
    d) Line plots
    e) Scatter plots
3. The reporting software should be Web based supporting the following Browsers
    a) Microsoft Windows Internet Browser 7.0 or above.
    b) Google Chrome
    c) Mozilla FireFox

A2-3) Posts processing of Reports

1. Print and Emailing
   Provision to print the generated report should be provided. Auto print option with emailing facility also to be provided.
2. Export
   Provision to Export the generated report in Microsoft Excel, CSV, Microsoft Word and PDF formats have to be provided.
3. Automatic report saving in PDF and HTML formats to be provided.
4. Security
   Facility for viewing the report to be allowed only to certain users only.
5. Provision for manual entry of value for the tag value should be provided in the event of retrieval failure of value. This should be password protected.

A2-4) Report generation

A2-4.1) Auto Generation

Provision to configure reports (in advance) should be provided. While configuring the report, the following selection options to be provided.

a) The type of report.
b) The tags to be displayed in the report. The tags that have been configured in the configuration module can be displayed in the form of a list, for the user to select.
c) The scheduling details of the report i.e. the whether the report is to be generated once in every hour, every day, every week, every month, every shift .
d) Configurable the row interval of each entry.
e) Option to be provided to auto save the report in a specific location, auto print the report and auto Export to PDF, HTML, Microsoft Excel formats.

A2-4.2) Manual Generation

Provision should be provided for the user to generate reports as and when required.

a) The tags that are configured in the configuration module should be provided as list so that the user can select the required tags , whose values can be displayed in the reports.
b) The user should be provided a choice of the previously created report templates(Sec A2-2 ,pt 1)
c) Provision to print the report to be provided.
d) Provision to save the report to be provided.

B. Software requirements

B1. Platform Requirements

1. The Reporting software should be a web based solution so as to enable access the software from any Workstation in the intranet. It should have rich graphics to display the reports in an attractive manner.
2. The development platform has to be Microsoft Visual Studio 2008/2010 (C#NET 3.5 or above).
3. An Interface Application is also to be developed to acquire data from Max SBP. This data can be got using a API . This SBP dll has already been developed in VC++ and so proper typecast has to be done for interfacing it with .Net application.
4. The software should run on any PC running Windows XP (SP2), Windows 7 and above.
5. The database shall reside in the same PC as the reporting software.

B2. Connectivity and data integration Capabilities

1. The Reporting Software should support OPC Connectivity with OPC Server complaint with the OPCDA specification 2.05a or above with tag browsing capabilities. Connectivity shall be established with the network having firewalls. The application software shall have the capability to access remote server without any additional software.
2. It should also provide drivers for Modbus serial master and MOBUS Ethernet (ASCII & RTU).
3. It should be able to read data from CSV,XML and Microsoft Access (97/ 2003 format) formats.
4. Where possible, drivers to have options of acquiring from secondary source i.e. one level source redundancy.
5. Data can be acquired by using multiple drivers (OPC Client drivers, SBP Drivers, Modbus Client drivers) simultaneously.
6. Provision for driver diagnostics to be provided.
7. Reading specific tags from specific databases as well as writing specific tags to specific formats.

B3. Data storage

1. Allow computation before data storage.
2. Provision to handle a total of up to 10000 tags or more.
3. Configurable database storage size with a duration of 1 year storage.
4. Automatic backup facility. The duration of automatic backup should be configurable by the user.
5. Facility to be provided to restore the backup and generate reports. While restoring the backup, the data available in the existing database should be protected. The user should be given a provision of selecting the elapsed time period for which he wants to generate reports. The reporting tool should pick up appropriate backup file automatically and provide interface to generate report.
6. If Time stamp is available at the data source level , that time stamp should be used as the Time stamp for reporting. In case the time stamp is unavailable ta data source level, the time stamp of the local machine shall be used in the reporting software for generating reports.

B4. User Management

1. Provision to configure user levels for accessing specific reports.

C. General Specifications.

C1. Documentation:

Detailed design documents, test Criteria, Software source code , User Manual shall be supplied along with the Software (in the form of CD).

C2. Deliverables

1. Software design Documentation
2. Software source code.
3. Deployable package.

C3. Accepting criteria

The minimum accepting criteria shall be

Step1 : Creation of Tag and Connectivity the below mentioned data sources.

a) Third party OPC Server i.e. Softings ,Matrikon and any other servers of Vendors Choice
b) Max SBP
c) Modbus serial/Ethernet devices

Step 2: Data acquisition and storing the acquired data in MySQL, SQL SERVER and Oracle 9X or above databases.

Step 3: Generating various reports from the acquired/stored data

Step 4: Viewing the generated report on the intranet.

Step 5 : Storage and Backup of the database. Retrieval of backup data and generate reports.

Detailed accepting criteria will be made during project execution.