



Verticross India Pvt. Ltd.

Basic Computer Software



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INTRODUCTION

vSmart BCS (vSmart360⁰) is a tool used to read meters of single phase/three phase type, process the data and display the parameters in textual and graphical reports. Tool will have the user privileges to control the access based on the requirement.

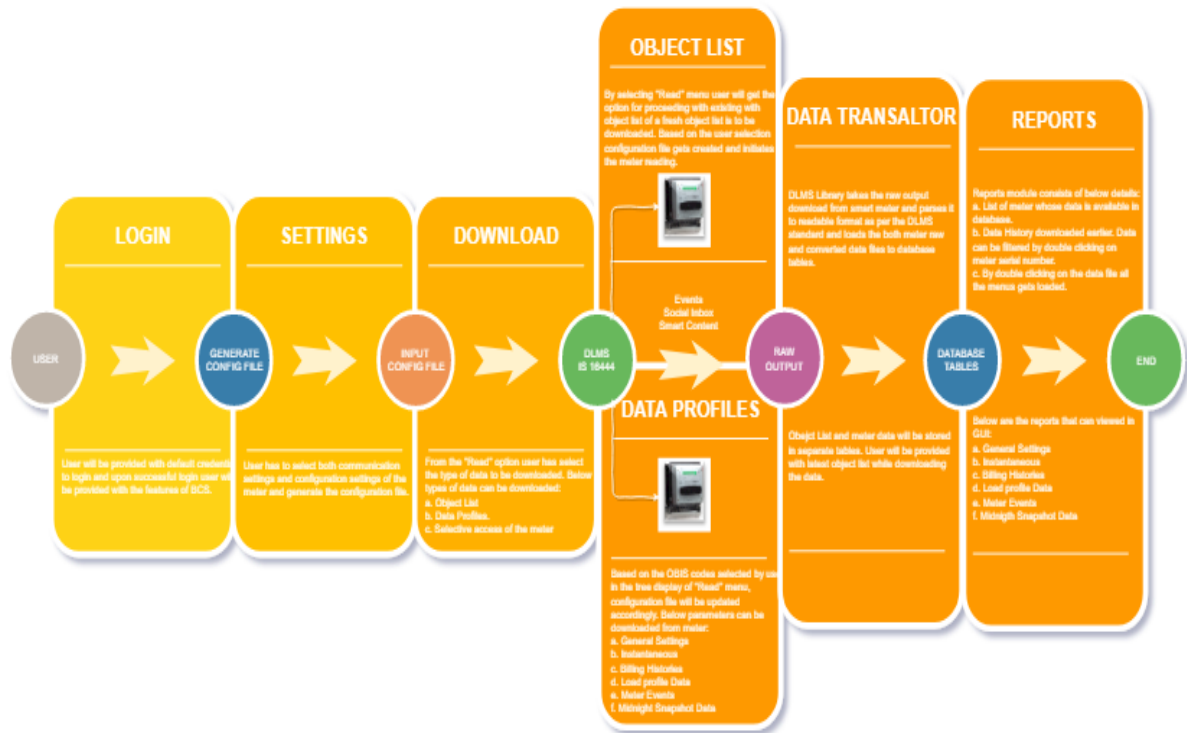
Tool supports the facility of downloading meter data both locally and remotely. Local reading will be done using the serial port communication and remote reading will be done using IPV4 or IPV6 communication on TCP/IP.

This tool is a standalone application which can be deployed on any of the PC/laptop having JRE (Java Runtime Environment) installed. This tool can be deployed and used only in Windows operating system. Upload of meter data from CMRI and assigning of jobs to CMRI shall be supported. Jobs shall include reading and setting of parameters and data.

This document details the software requirements for developing **vSmart BCS (vSmart360⁰)**. This document is prepared as part of the initial release of the software. The primary objective of the VSmart BCS (vSmart360⁰) is to download/import data from meter/CMRI and represent the data in textual and graphical reports to the user. **vSmart BCS (vSmart360⁰)** is developed as a standalone to automate the process of downloading meter data from meters.



ARCHITECTURE

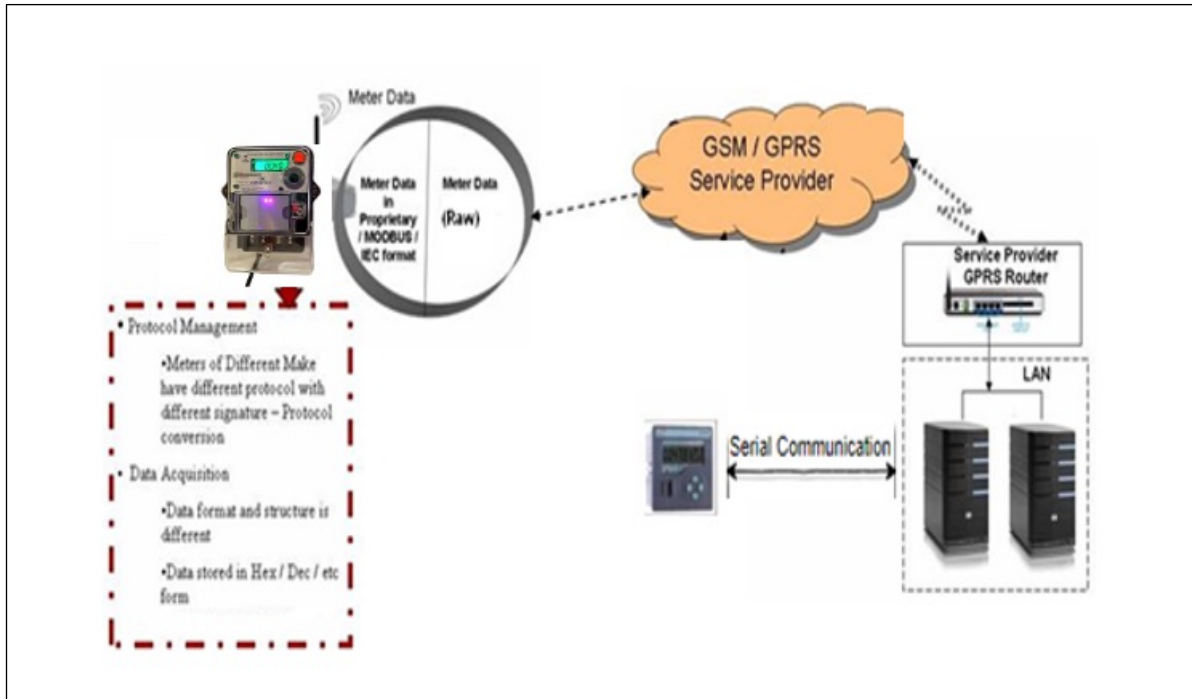


The software design process is a sequence of steps that enable the designer to describe all aspects of the software to be built.

Design Objectives

- Data Accuracy
- Data Security
- Data Accessibility
- User Friendly
- Quick Response
- Handling Huge data volume

The higher-level sequence of work flow of the application is as described in the following diagram.



The application is planned to be developed using Java and embedded C. Embedded C is used for invoking meter protocol command, for which other alternatives are not currently identified. Therefore, the application can be executed only on Windows OS. Workstation required with windows 7 or later and minimum 4 GB RAM

Assumptions and Dependencies

- Availability of meters for integration and testing
- Application can be used only with meters complied with DLMS IS 16444 Standard
- Workstation required with windows 7 or later and minimum 4 GB RAM
- Authentication keys shared by the meter manufacturer are valid.
- All the parameters stored by the meter are valid with zero errors.
- Meter Communication Port follows IEC Standard.

Application can also be developed using Microsoft platform (.net). This is not recommended due to platform dependencies.

Major design decisions

- The application is planned to be developed using Java and embedded C. Embedded C is used for invoking meter protocol command
- Development using Net beans, JavaFX, JDBC, Embedded C, MySQL database.
- Data Encryption for data security.



Classes or Components

- Login
- Settings
- Download
- Object List
- Data Profiles
- Data Translator
- Reports

Reusable component is used for invoking meter protocol command. Protocol is IS16444 and Algorithm for cyphering and deciphering is AES128 bit. Base Computer Software (BCS) must integrate with Smart meter and download meter data. Both BCS and Smart meter will be interfaced with a communication port. Protocol gets initiated from BCS to Smart Meter and upon receiving the response meter BCS initiates next command. BCS creates a raw meter data file from all the DLMS command and response frames.

BCS uses two libraries for accomplishing of reading and translation activities. For reading of Smart meter BCS uses DLMS Part-2 library and for translation of meter raw data to readable format it uses DLMS Part-2 Translator library.

MySQL Database is used for storing of the meter raw data file and translated file whose content will be displayed in BCS through various reports. BCS and Smart Meters are the components which are to be integrated using DLMS IS 16444 standards through serial communication.

User Classes and Characteristics:

#	Stakeholders	Priority	Pertinent Characteristics
1	Admin User	High	Admin User will have full control over all the modules. Admin User will have the privileges to add the new use and assign access rights to him.
2.	Normal User	Low	Based on the access rights provided to the user will be able to perform the activities. By default, all users will be able to view the data which is authorized to them.

Test Data

Test data for unit testing to be set up by the individual responsible for executing the tests. System test data will be prepared in similar lines as the production data. Sample data or Meta



data will be provided by the BCS business unit for this purpose. System testing team will set up the data in test environment. Data for all roles will be configured and verified for appropriate user accesses and authorization

Test Phases

Sl. No.	Test Types	Build Acceptance Criteria	# of Cycles
1	Unit Testing	Development of the feature tested completed. Integrated build not mandatory for Unit Testing.	As required
2	System Testing	- Unit Test Logs - Release Notes Approved by PM	2, Can be completed in one cycle if exit criteria is met.
3	User Demonstration	- Approved System Test Report - Release Notes Approved by PM - Zero high severity/show stopper defects pending to be resolved from system testing. - Not more than three medium severity defects pending to be resolved from system testing. - Not more than 10 low severity defects pending to be resolved from system testing.	2, Can be completed in one cycle if exit criteria is met.

Test Case Execution

As part of the test execution process, the test team would carry out the following steps:

- Ensure that the release of the executables/builds have associated review reports
Note: Furnish the location of the review report or other details of the review conducted, along with the release note/the go-ahead instruction to the tester. This is to ensure that the source code is reviewed before it is delivered for independent testing.
- Execute the test cases and observe the output
- A Pass/Fail criterion is determined by comparing the actual results against the expected results



- A test case is said to be passed when the most recent test run is successful
- Whenever a test case fails, record the results and report the defect in the defect tracking tools with appropriate explanation of the defect

Defect Tracking and Reporting

The Project Manager will receive a report of the list of unresolved defects prior to the final delivery. This list will be appended to the Release Notes. It will be the sole responsibility of the Project Manager with respect to the delivery of the build considering the defects identified by the Test Team.

A defect has one of the possible states:

- A newly logged defect will have “Open” and it will be assigned to a developer.
- After fixing the defect, the developer sets it to “Resolved” state and provides the description of the resolution.
- A Test Team member then validates the resolved defect and changes the state accordingly (Re-Open/Close)
- The project manager will be responsible for reviewing all the (Open/ Closed / Re-Open/ Duplicate) defects with the development and test teams
- Defects will be prioritized by the project manager. The priority levels are established as part of the defect review process by the PM. The levels of priority are mentioned below:
 - High Priority
 - Medium Priority
 - Low Priority
- Severity measures the actual impact on the user’s operation environment. The severity of a defect depends on the probability of the occurrence of the problem and the impact of the defect on the application.

The levels of severity are as follows:

High Severity	All users or a group of users not able to use the application as a whole or a business critical feature of the application. Defects having monitory impact e.g: Error in calculations, reports.
Medium Severity	Defects impacting usability of the software. Defects exists however software can be used with work around.



	Calculation errors having no monetary impact to business. A problem causing system failure frequently
Low Severity	An operation does function as specified but with no business impact. Cosmetic errors, alignment, formatting errors etc.

Test case will be executed with test data and expected results. A test case is considered as fail if the expected results are not achieved during test.

System testing may be suspended under following scenarios:

- Abnormal number of High or Medium Severity defects identified during initial stages of testing.
- Frequent system failures impacting continuance of the testing process
- Major errors identified in test data

Approval from Verticross India Private Limited operations head to be obtained for suspending System testing

System testing can be resumed on confirmation from the project manager that the issues that caused suspension of tests are resolved. Root cause analysis reports to be submitted along with request for resumption of the tests.

Approval from Verticross India Private Limited Operations Head is to be obtained for resumption of System tests once the tests are suspended.

Approval from BCS Business Unit Head is to be obtained for resumption of tests once the tests are suspended.

The following conditions are to be satisfied for approval of test reports.

- All identified test cases must be executed
- All defects are captured and severity identified



Test Deliverables

The following are the deliverables by the test team for System testing and User Demonstration:

- Test plan (this document)
- Test Cases
- Test Results
- Defect Reports

FEATURES & FUNCTIONALITIES

Following are the key features for **vSmart BCS (vSmart360⁰)** project:

- Login module
- User Management
- Hierarchy Management (Import/Export)
- Data Acquisition
 - Local download of meter
 - Remote download of meter
 - FTP Download
 - Import data from CMRI
- Firmware upgrade for Meter and Modem
- Export of data for various integrations.
- Generate textual/graphical reports.
- Tool Version and License.

The details requirements to be implemented are as described.

REQ No	Requirement Description
REQ 1	Login Module After successful installation of the tool activation is to be done in one of the below scenarios: a) Online: If installed PC/laptop is having internet facility then tool license can be activated online by asking email-id of the client. Credentials of admin user will be informed through email. b) Offline: User must send an email for getting activation key and credentials.
REQ 2	User Management



REQ No	Requirement Description
	After successful login to the BCS application, admin user can perform below activities regarding user accounts: - Create - Update - Delete - Assign user role i.e., user is of type administrator or normal user.
REQ 3	Hierarchy Management (Import/Export) After successful login, admin user can upload master data through import facility. Sample excel file can be downloaded from the tool having different levels of hierarchy as below: - Utility - Zone - Circle - Division - Subdivision - Substation - Feeder - Transformer - HT/LT Consumer User must fill the downloaded sample file in the prescribed format and upload through bulk upload option. Summary of the bulk upload will be displayed on the user interface. Failure records can be exported for further verification. Master Data available in the database can be exported by the admin user based on the Utility selection.
REQ 4	Data Acquisition Data acquisition can be done using below scenarios: - Local download of meter using serial port as per the IS16444: - Remote download of meter through TCP/IP as per IS16444: - Download of meter data files from MRI. - Shall be capable of assigning jobs to CMRI and clear the job status when the job is completed by CMRI - Reading and writing of parameters such as RTC, TOD, push address, MD IP, Load survey IP, Data push time interval, etc as required by IS16444 - Reading and writing of proprietary OBIS codes as required locally as well as through CMRI - Download of meter data files from FTP.



REQ No	Requirement Description
	Progress of download will be notified in the application.
REQ 5	Meter shall be capable of upgrading meter and modem firmware as per the procedure defined in IS 15959 part 2 & part 3.
REQ 6	Report Data downloaded through acquisition module can be viewed through graphical and textual reports. Below is the procedure to view the reports. - List of files downloaded and their source of reading. - By clicking on the above individual file reports related to below reports gets generated. - Meter Information - Instantaneous - Billing Histories / Energy Readings - Load Profile Data - Meter Events - Midnight snapshot data
REQ 7	Export of data in various formats : All the textual and graphical reports generated in the report's module can be exported to below formats: - Excel - CSV - PDF - MIOS
REQ 8	Help Desk Feature : - After successful login, manual regarding the tool can be downloaded. - Support feature to be added in login screen. - Contact information will be provided in this menu so that the end user of the tool can contact team regarding support.
REQ 9	Tool Version and License: Tool will have an option for viewing the license, copy rights and validity/expiry date.

Head End System

Following key features for **Head End System** project includes the following.

- Head End System using IS 16444 DLMS Standard for downloading data from smart meters.
- The Objective of the HES is to acquire meter data from smart meters automatically from remote avoiding any human intervention, monitor important distribution parameters, providing the meter data for accurate billing, auditing, and power quality supply analysis purposes.



- As per the schedule of the respective meter, Head End System takes the decision to download meter data.
- Head End System initiates command set based on the configuration file of the meter.
- The configuration file can be generated using GUI which contains settings as communication port of smart meter, IP address, baud rate, list of OBIS Codes to be downloaded from meter.
- On Successful download of meter data HES generates raw file which contains encrypted data.
- Raw Data file gets translated to the readable/integration format by the translator module. General integration formats are MIOS, csv etc.
- HES maintain the readings of all the smart meters which helps in monitoring of violations.
- While translating smart meter data HES performs Active Energy violation and takes the decision to disconnect if required.

Mobile Application as per the tender requirement:

- Application to aid in installation of modem, in carrying out diagnostics in the field as and when required etc.
- Should work on all current prevalent versions of Android and is to be updated with future releases of Android as and when they become prevalent covering the 5-year AMC period.
- Signal strength
- Network connectivity status
- IP Address assigned to Modem
- Server connectivity status
- Meter connectivity status – if meter is not communicating – whether no response, authentication failure, etc.
- Meter nameplate information (meter serial number, meter date time, meter firmware version, CT & PT ratio, etc)
- Modem date-time
- Commands that can be initiated from the app:
- View signal profile (over the last 24 hrs)
- View network connectivity status (over the last 24 hrs)



- Get meter nameplate info
- Get meter instantaneous values
- Send Health check message (to DATA ACQUISITION SOFTWARE)
- Send Instantaneous data message (to DATA ACQUISITION SOFTWARE)
- Issue modem reset command to reset modem.
- All login / logout of modem's web service by mobile application is to be captured and logged at server end as events with appropriate tagging in the database for easy retrieval of such events.

The core of **vSmart BCS (vSmart360⁰)** will be a standalone application which can be deployed across windows and Linux environments. Z-Smart BCS will have user privileges module using which access to the modules can be restricted based on the business requirements.

The **vSmart BCS (vSmart360⁰)** will be used by the utility teams for downloading/importing of meter data and perform analytics on the data displayed to him.

vSmart BCS (vSmart360⁰) application can be used in PCs or laptops with Windows or Linux operating systems. Executables will be shared with the user along with user manual to facilitate his installation.

SPECIFICATIONS:

Usability is the key for the **vSmart BCS (vSmart360⁰)** and users should revert with the errors/suggestions / enhancements to the application.

The BCS software must support for meters as per IS 16444 part 1&2.

Nonfunctional Requirements

Performance Requirements

- Textual and Graphical reports should get generated in less than 20 seconds.
- Tool should not get hang indefinitely. In case meter is not responding with response tool must respond with error messages to user for taking the necessary action.
- In case COM port gets hanged then tool should release the port after few retry counts.
- In case of concurrent users on shared database, tool should not take more than 30 seconds to display the reports.
- Selections of the user interface should be in quick response mode.



Software Quality Attributes

- i. Data Collection and its validness is very critical and hence accuracy of this data entry need to be validated.

Business Rules

- Report View- MIS report should be visible to all users as per their hierarchy in mobile app and dashboard.
- Download Report- Download option should be present in dashboard for report for hierarchy wise user.

BENEFITS

Tool will have the provision for downloading of meter data by below scenarios:

1. MRI Download
2. Local Serial Port Download
3. Remote Download
4. FTP Download

Tool will have the conversion API module to process the files to specific standard like MIOS. MIOS standard file gets parsed and loaded to database by parser module of the tool

Safety Requirements

- i. Forgot Password: In case of forgot password, user must approach admin to reset the password.
In case admin user forgets the password, he will be taken through sequences of questions for activation.

Security Requirements

- i. Database backup is to be taken on weekly basis for easy recovery of data in case of database crash/failure.