

## ANNEXURE I

### Software requirement specifications for Implementation of IEC60870-5-104 and DNP3 on Remote Terminal Unit (RTU) for SCADA

#### **1.0 Introduction**

This document describes the software requirement specifications for the development of Remote Terminal Unit (RTU) to implement the IEC 60870-5-104 over TCP/IP and DNP 3.0 over TCP/IP as well as Serial as a Client and Server for SCADA. The application shall be based on the IEC 60870-5-104 and DNP 3.0 Source code library. The application runtime environment will be QNX 6.5 Operating System over x86 hardware platform.

#### **2.0 Scope:**

The scope of the work includes:

- 2.1 Submitting the detailed design document in line with the requirement specifications
- 2.2 Developing the software as per the approved design document.
- 2.3 Demonstration of the software features at vendor premises
- 2.4 A. Supply of Source Code Libraries along with user's manual and documentation.  
B. Supply of the software – source code of application and executables, along with the software documentation including data diagrams, flow charts, user's manuals etc.
- 2.5 Installing the software at BHEL R&D in their hardware and testing.
- 2.6 Training on the development and configuration of the software.
- 2.7 Support during / for the successful third party test certification at a reputed test lab.
- 2.8 Maintenance and Warranty for a period of one year after successful installation / third party test certification (whichever is later).

#### **3.0 Deliverables**

The deliverables will include:

- 3.1 Source code Libraries of IEC 60870-5-104 - Server & Client and DNP 3.0 - Master & Outstation.
- 3.2 IEC 60870-5-104 - Server & Client and DNP 3.0 - Master & Outstation software integrated with BHEL application software.
- 3.3 Utility software/tool for easy mapping between user data and 60870-5-104 variables and DNP 3.0 variables.
- 3.4 Design documentation and user manual of both Source code Libraries and Implementation software.
- 3.5 Training on Source code Libraries and implementation of software.

#### **4.0 Detailed functional requirements of the software (Scope as defined in IEC60870-5-104 standard & DNP 3.0 Protocol)**

- 4.1 The software implementation should cover IEC 60870-5-104 Client software for controlling station functionality and IEC 60870-5-104, Server for controlled station functionality as specified in the IEC60870-5-104 protocol over TCP/IP. The software should also support interoperability specified in the IEC60870-5-104 protocol. Some of the basic supported features would be:
  1. Simultaneous and independent communication with several control stations through the same port.
  2. Cyclic Data Transmission

3. Spontaneous transmission in both directions, this means that indications, measured values, commands etc. can be transmitted in both directions – from control station (master) to slave and vice versa.
3. Double transmission of information objects with cause of transmission spontaneous
4. Station interrogation
5. Clock synchronization
6. Command transmission, support “select before operate” or “direct execute” command execution modes
7. File transfer

4.2 The implemented software for DNP 3.0 should be suitable for one or more master stations, one or more outstations and peer to peer communication over TCP/IP and serial. The software should also support interoperability specified in the DNP 3.0 protocol. Some of the basic supported features would be:

1. Map local physical I/O data to DNP points.
2. Define local DNP points as Class 1, Class 2 or Class 3 data types.
3. 16-bit and 32-bit variations of analog inputs are transmitted through DNP3 as signed numbers.
4. Poll DNP outstations for static (Class 0) data and Class 1, 2 and 3 event data.
5. Accept unsolicited response messages from polled outstations.
6. Map Outstation DNP data to local DNP points. This data can then be used in application programs executing in the local controller or made available to other DNP master station(s) that poll this local controller.
7. Command handling, support “select/operate pairs” or “direct operate” command execution modes
8. Time Synchronization
9. Event Reporting

The scope includes building of 60870-5-104 server & client and DNP 3.0 Master & Outstation for transmit of user data as per configuration file. It can be assumed that the data of the input signals is transferred via IPC (Inter process communication) from the BHEL’s software.

## 5.0 General

5.1 The application shall be developed based on the latest IEC60870-5-104 and DNP 3.0 source code libraries.

5.2 The vendor should have the development environment and all the software and hardware components to carry out the development. The vendor should substantiate the same in the offer.

5.3 A. The offer should contain the technical documentation of Source code Libraries for technical evaluation.

B. The offer should specify the development environment and the same has to be included in the Technical Proposal.

5.4 The successful bidder shall submit a design document within 2 weeks time from the date of Purchase Order.

1. After the design is approved by BHEL R&D, vendor shall take up the implementation.
2. BHEL R&D shall review the work at suitable stages of then development.
3. The functioning of the software shall be inspected periodically.

4. Vendor shall install the software at BHEL R&D, on the target hardware platform provided by BHEL.
  5. Testing shall be conducted as per mutually agreed Acceptance criteria. This shall include modifications on the source code, compiling in the development environment and porting on to the runtime platform at BHEL R&D
- 5.5 The source code is deliverable to BHEL; the source code should be compiled and executed in the presence of BHEL in their in-house development environment for demonstration.
- 5.6 The application and configuration software modules for server are the sole property of BHEL R&D and should not be used for any other purpose by the vendor.