|  |  |  |
| --- | --- | --- |
| **Title:** | **Software Subsystem Design Description <ServicePort Subsystem>** | |
| **Distribution** |  | |
| **Author** | Ganapathi R.  Hao Wu | Date: 2012-11-30 |
| **Review** | Paul Li  Xiaojin Kuang | see Specification Review |
| **Approved** | Rock-Rendong Li | 2012-12-03 |
| **Remarks** | | |

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# Context

This document is a representation of analysis, planning, implementation and decision-making for the 2Wire Common Topworks project’s “ServicePort” subsystem on Communication Board.

## Overview

This document describes the functional design specification for the “ServicePort Subsystem” of 2Wire Common Topworks project. This document covers the design of “ServicePort Subsystem” on the Communication Board only.

Service port helps in fast configuration of the device. The protocol followed by the service port is same as that of HART, as defined by HCF. Service port supports only following HART commands.

Table 1: CMD Supported by Service Port

|  |  |  |
| --- | --- | --- |
| **Command** | **Description** | **Destination** |
| 1 | Read Object | CB or FE |
| 2 | Write Object |
| 3 | Read Memory |
| 4 | Write Memory |

## Use Case Diagram

The following Use Case diagram illustrates the top-level uses derived in the *SSRS\_Software Subsystem Requirement Specification ServicePort.docx[*[*1*](#Ref1)*]*).



Figure 1: Service Port Use Case

Service port is auto-enabled when HMI is unplugged. Service port is disabled and HMI functionality is restored when HMI is plugged back to the HMI port.

Service port subsystem shall provide a method for coordinator to scan the HMI presence pin. Service port is enabled if the HMI presence pin is read low.

## Subsystem Definitions

|  |  |
| --- | --- |
| Coordinatore Subsystem | 2wire subsystem providing initialization and scheduling |
| HART Subsystem | 2wire subsystem for interfacing to HART (Highway Addressable Remote Transducer) protocol communications. |
| HMI Subsystem | 2wire subsystem providing Human Machine Interface for local user access via display and key input |

## Acronyms and Abbreviations

|  |  |
| --- | --- |
| 2wire platform | Based on 266 design, improve the re-use of previous common components to build a new platform for ABB 2wire devices. |
| HART | Highway Addressable Remote Transducer |
| HCF | Hart Communication Foundation |
| HMI | Human Machine Interface |
| N/A | Not Applicable |
| TBD | To Be Determined |
| FE | Front-end Board |
| CB | Communication Board |

# Data Sheet

This chapter gives an overview about all important facts of the subsystem. It can be used by a developer who would like to reuse this subsystem.

|  |  |  |
| --- | --- | --- |
| *Category* | *Item* | *Description* |
| Development | Version / Status | Version 1.2.3 |
| Known Bugs | Not known |
| Planned Improvements | None |
| HW-Platform | Type | M16C63 |
| Clocking | Oscillation clocking 3.6864MHz  CPU clocking 1.8432MHz |
| SW-Development Environment | Compiler | IAR M16C 3.40 |
| Operating System | None |
| Case / Code-Generation Tool | EntryTool 1.1.3 |
| Required Resources | Operating System | None |
| HW | UART1:  ServicePort use UART1 to receive and transmit data.  I/O Port6\_5:  ServicePort use I/O Port6\_5 to test whether HMI is plugged or not  I/O Port4\_1:  ServicePort use I/O Port6\_5 to control power supply for HMI and itself |
| RAM | 1 Byte |
| NVRAM | None |
| ROM | None |
| Execution Time | None |
| Special HW | None |
| Subsystems | 1. HMI 2. Coordinator |
| Data Objects | TCHAR  For detail, Please refer *3.4 Data Object Description* |
| Safety | NA |
| Standards | Other | None |
| Requirements / Use Cases | Please refer to *1.2 Use Case Diagram* |
| Documentation | Public Interface Description | Refer *3.3 Application Interface* |
| Test Specification | Refer [TP020] Software Subsystem Test Plan ServicePort. |

# Detailed Description

## Static Modelling

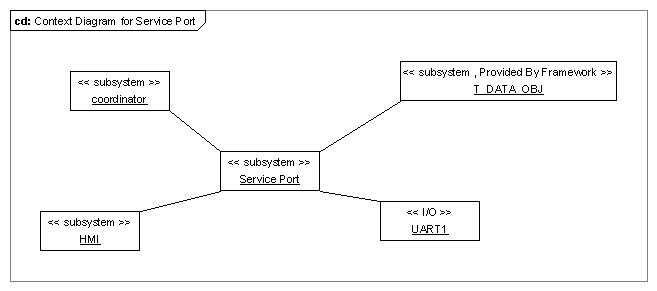


Figure 2: Static Modelling

* All service port functionalities are initiated and called by coordinator subsystem.
* Service port subsystem continuously scans the HMI presence pin. If HMI is unplugged, service-port is auto enabled on UART1. Similarly, if HMI is plugged, HMI is auto enabled on UART1.
* Service port subsystem uses Get and Put methods provided by T\_DATA\_OBJ to write and read objects from other subsystems.

## Dynamic Modelling

### Sequence Diagram

Following diagram shows the flow sequence between the subsystems, with HMI unplugged.



Figure 3: Sequence Diagram with HMI Unplugged

Following diagram shows the flow sequence between the subsystems, with HMI plugged.



Figure 4: Sequence Diagram with HMI plugged

## Application Interface

Service port subsystem shall provide the coordinator with following services/ methods.

Table 2: Services Provides to Coordinator

|  |  |  |  |
| --- | --- | --- | --- |
| **Methods/ Services** | **Parameters** | | **Description** |
| **Input** | **Output** |
| ServPortCommandInterpreterEXE | None | None | * Checks if a proper frame has arrived. * Checks if a valid command has arrived. * Interprets the command. |
| ServPortUpdateActivationStatusSRV | None | None | * Updates the activation status of the service port depending on the status of HMI presence pin. |
| ServPortGetActivationStatusSRV | None | Returns activation status | * Returns the activation status of the service port. |

The functionality of the command “ServPortCommandInterpreterEXE” method is shown in the activity diagram below.



**Figure 5:Activity Diagram of ServPortCommandInterpreterEXE**

The functionality of the service “ServPortUpdateActivationStatusSRV” is shown below in the activity diagram.



**Figure 6:Activity Diagram of ServPortUpdateActivationStatusSRV**

## Data Object Description

Provide a detailed description of all Data Objects.

Table 3: Data Objects

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Object name** | **T\_DATA\_OBJ** | **Data Class** | **Storage** | **Description** |
| activationStatus | SIMPLE\_CHAR | DYNAMIC | RAM | ServicePort status |

## Miscellaneous

**Pin Disturbance:** While HMI is plugged and unplugged, disturbance will be there on HMI presence pin. The value read on HMI presence pin shall not be stable at this time. Therefore, it has to be taken care to implement a mechanism to enable or disable service-port, only when voltage on HMI presence pin stabilizes.

*typedef struct*

*{*

*TUSIGN16 baud;*

*TUSIGN8 parity;*

*TUSIGN8 stop;*

*TUSIGN8 source;*

*void (\*ReceiveIrqService)(void);*

*void (\*TransmitIrqService)(void);*

*} T\_SERVICEPORT\_UART\_PARAM;*

**Interrupts:** Service port shall use 2 interrupts, UART1 receive and transmit interrupts. Both these interrupts are shared with HMI.

*UART1 receive interrupt*: In the receive interrupt, receive state machine shall be implemented to build receive frame. Reception is always enabled.

*UART1 transmit interrupt:* In the transmit interrupt, transmit state machine shall be implemented to build transmit frame. Transmission is enabled only when, there is a valid frame. After the transmission of complete frame, UART1 transmission is disabled.

References

|  |  |
| --- | --- |
| **Ref.** | **Document** |
| [1] | [RS019]Software Subsystem Requirement Specification ServicePort |

Revision Chart

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev.** | **Description of Version/Changes** | **Primary Authors** | **Date** |
| 00 | First Release | Ganapathi R | 2010-01-13 |
| 01 | Second Release;  Revise HMI condition for Figure 1, Revise first response=64 for invalid CMD for Figure 5  Revise HMI Presence Pin Status for Figure 3, Figure 4 and Figure 6. | Hao Wu | 2012-11-30 |

Review

**First Review**

|  |  |
| --- | --- |
| **Document Revision:** | 00 |
| **Review Date:** | 2010-01-13 |

**Second Review**

|  |  |
| --- | --- |
| **Document Revision:** | 01 |
| **Review Date:** | 2012-11-30 |

**Review-Participant:**

|  |  |  |
| --- | --- | --- |
| *Dept.* | *Name* | *Date* |
| R&D Lenno | Roberto Colombo | 2010-01-13 rev.00 |
| R&D Bangalore | Ashwin Herur R  Ganapathi R |

|  |  |  |
| --- | --- | --- |
| *Dept.* | *Name* | *Date* |
| R&D ShangHai | Paul Li  Xiaojin Kuang | 2012-11-30 rev.01 |

**Decision of the Review:**

|  |  |  |
| --- | --- | --- |
|  | *Decision* | *next steps* |
| **x** | Inspection passed ***without restrictions*** | Phase finished |
|  | Inspection passed ***with restrictions*** | some changes must be done |
|  | Inspection ***not*** passed | Inspection must be repeated |

**Changes Are Proved:**

The Reviewer confirms that all changes are done:

|  |  |  |
| --- | --- | --- |
| proved Rev: | Date: | Reviewer: |
| 00 | 2010-01-13 | Ashwin Herur R  Ganapathi R  Roberto Colombo |

|  |  |  |
| --- | --- | --- |
| proved Rev: | Date: | Reviewer: |
| 01 | 2012-11-30 | Paul Li  Xiaojin Kuang |

**Check List**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Yes | No |
| 1. | Is the software architecture distinct and documented? | **X** |  |
| 2. | Fit the modules together? | **X** |  |
| 3. | Are complex algorithms/procedures explained? | **X** |  |
| 4. | Is a strategy for error handling designated? | **X** |  |
| 5. | Is the configuration management system well prepared? | **X** |  |
| 6. | Are all open issues transferred to the defects table? | **X** |  |

**Remarks:**

**Defect**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Checkpoint | Description | Major Defect | Done Date |
| 1 |  | Revision needs to be updated in the page headers. | N | **2009-10-07** |
| 2 |  | CODE/PRODUCT SERIES – ACTIVITY is mentioned as 2600T Series Pressure Transmitter instead of MiLe2(266) | N | **2009-10-07** |
| 3 |  | Add servicePort as actor in use-cases diagram. | N | **No Action** |
| 4 |  | In context diagram Sensor Interface can also be added as a subsystem | N | **No Action** |
| 5 |  | Add transmit/receive state machine description/diagram.  **Answer: already explained in the activity diagram.** | N | **No Action** |