Interfacing Sensirion Sht75 Temperature/Humidity sensor on Meshbean platform

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Platform

Meshbean platform refers to the WSN motes developed by *MeshNetics*, who offers a variety of boards and development kits. This white paper refers to the *Zigbit Amp Development Kit 1.0*. See: http://www.meshnetics.com/dev-tools/. Latter board runs on ATM1281 microprocessor.

Meshbean with TinyOS

Meshbean (2.4 GHz) and Meshbean900 (900 Mhz) platforms are rather recent introductions to the TOS tree. Therefore, the addition of sensor support for these platforms in *tinyos-2.x-contrib* is in slow progress. However, there is ample amount of code already developed for Atm128 chip; it resembles Atm1281 in functionality. Therefore, the generic components of Atm128 can also be used with Atm1281. This paper assumes the Meshbean platform is already installed on your TOS tree. If not, follow the instructions in the README file in http://tinyos.cvs.sourceforge.net/viewvc/tinyos/tinyos-2.x-contrib/ethz/meshbean900/.

Using SPI and I2C

This is possible, and the authors have tested these buses successfully. However, keeping in mind the future tasks at hand, *bit-banging* process was favored to interface the Sht75 sensor. *TelosA* platform uses bit-banging to interface its Sensirion sensor Sht11, which is identical in operation to Sht75, except for the latter has better calibration.

Porting Telos code to Meshbean

The platform specific code for Sht11 on TelosA required porting in to Meshbean before usage. The porting process required a few changes on one component file and pin configurations. Required changes are as follows:

1. Copy the *sht11* folder in *$TOSROOT/tos/platforms/telosa/chips* to *$TOSROOT/tos/platforms/meshbean/chips*.
2. Rename *sht11* as *sht75* (for better recognition).
3. Add *%T/platforms/meshbean/chips/sht75*

and *%T/chips/sht75* to the *.platform* file in *$TOSROOT/tos/platforms/meshbean*.

4. Change *HplSensirionSht11C.nc* in *$TOSROOT/tos/platforms/meshbean/chips/sht75* (see Appendix).
5. See README file in the same folder above how to use the correct pins for SCK, Vdd, DATA, and GND of the sensor (also see: http://www.sensirion.com/en/pdf/product_information/Datasheet-humidity-sensor-SHT7x.pdf).

Required hardware changes

A 10k pull up resistor is required between the DATA and VDD pin of the Sht75 sensor (see: pg. 4/11 of the Sht7x datasheet). The pin connection is detailed in the README file in the Appendix.

Acknowledgments

Many thanks to Philipp Sommers <sommer@tik.ee.ethz.ch> for his code contribution.

Appendix

HplSensirionSht11C.nc

```
// License information and author details are left out

configuration HplSensirionSht11C
{
  provides interface Resource[ uint8_t id ];
  provides interface GeneralIO as DATA;
  provides interface GeneralIO as SCK;
  provides interface GpioInterrupt as InterruptDATA;
}

implementation
{
  components HplAtm128GeneralIOC;
  DATA = HplAtm128GeneralIOC.PortE7;
  SCK = HplAtm128GeneralIOC.PortD6;

  //unnecessary abstraction layer has been removed here, ie MSP430GpioC.nc

  components HplSensirionSht11P;
  HplSensirionSht11P.PWR -> HplAtm128GeneralIOC.PortD7;        // Power
  HplSensirionSht11P.DATA -> HplAtm128GeneralIOC.PortE7;       // Data
  HplSensirionSht11P.SCK -> HplAtm128GeneralIOC.PortD6;        // clock

  components new TimerMilliC();
  HplSensirionSht11P.Timer -> TimerMilliC;

  //small changes here to suit the atm128 interrupt component

  components HplAtm128InterruptC, new Atm128GpioInterruptC();
  Atm128GpioInterruptC.Atm128Interrupt -> HplAtm128InterruptC.Int7; // Data interrupt, PortE7
  InterruptDATA = Atm128GpioInterruptC.Interrupt;

  components new FcfsArbiterC( "Sht11.Resource" ) as Arbiter;
  Resource = Arbiter;

  components new SplitControlPowerManagerC();
  SplitControlPowerManagerC.SplitControl -> HplSensirionSht11P;
  SplitControlPowerManagerC.ArbiterInfo -> Arbiter.ArbiterInfo;
  SplitControlPowerManagerC.ResourceDefaultOwner -> Arbiter.ResourceDefaultOwner;
}
```

README.txt

// Author details are left out

```
============================================================
 SHT11 Humidity/Temperature Sensor on pixie/meshbean-P1/meshbean 900 platforms
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```

SHT 11	Pixie	Atmega1281(ZigBit900)	Zigbit Amp
SCK (1)	GPIO8 (P10.7)	PE3 (48)	GPIO6,PD6 (17)
VDD (2)	GPIO_1WR (P10.2)	PG5 (36)	GPIO7,PD7 (18)
GND (3)	DGND (P10.10)	any	any
DATA (4)	IRQ_7 (P10.8)	PE7 (42)	IRQ_7,KE2 (42)

Notes:

1. Meshbean (Development kit on P1 board): PE3, PG5, and PE7 are used for battery monitor, UID (for unique MAC addresses), and SW2 (user input switch 2). So, new pins had to be used.

2. Pin 17 and 18 are not connected on the Meshbean P1 board. So, they present no issue! If one need not use SW2 on the board, then Pin 42 can be used, too.

3. The pin configurations may differ for different boards: P1, A2, E1, Amp, and 900. Main requirement is to have two **GPIO** pins and an **Interrupt** pin.

4. On Meshbean platform, the Sensirion 1x and 7x series sensors can be used likewise with the code provided. Only the pins need to be adapted accordingly.