Smart Green House

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Agenda

- Motivation
- Functional Description
- Hardware Components
- Software Components
- Roadmap

Motivation

You live far away from home and no one is there to take care about your plants?

You are a busy student and you don’t have enough time to pour your plants?

A wireless sensor network can help you!

Motivation

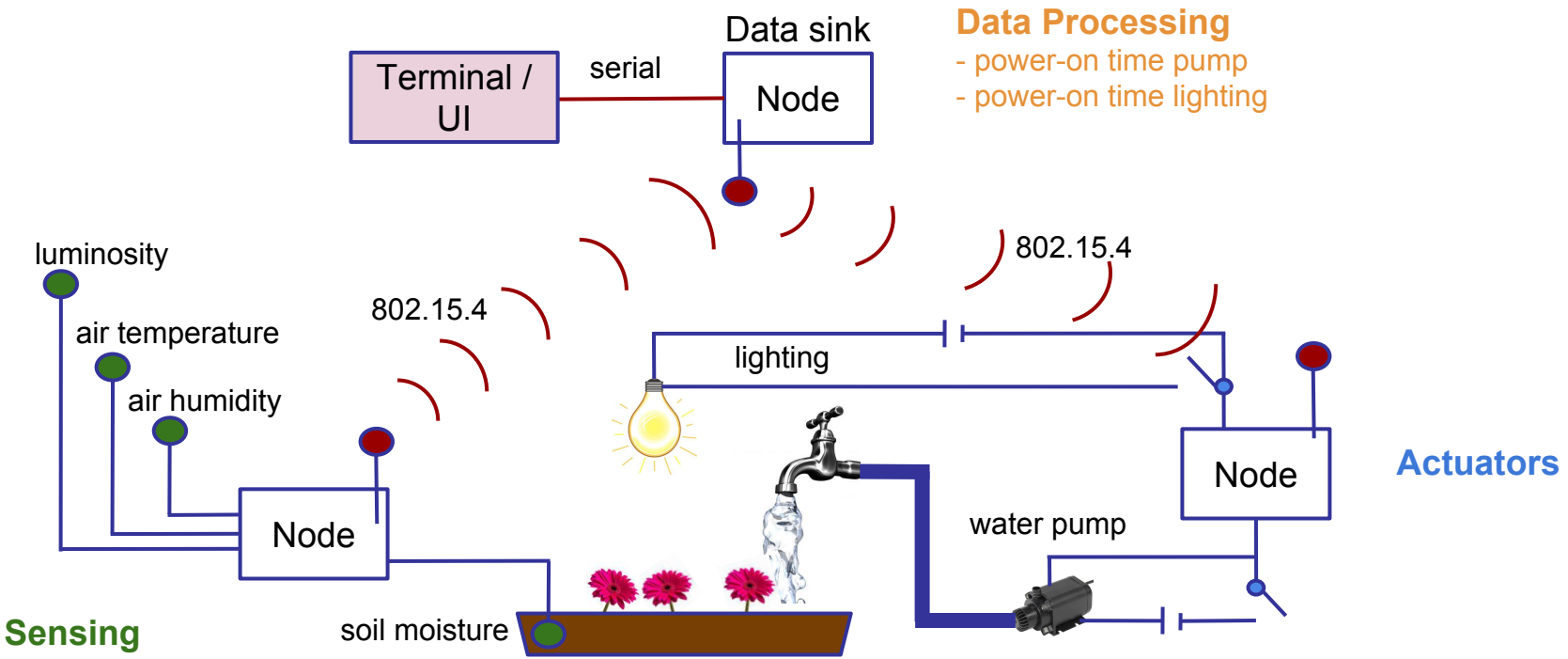
The Smart green house …

- is able to pour several plants automatically
- controls perfect illumination
- is scalable for a lot of plants
- user can interact with the system

Functional description

- **3 Sensors**:
  - Air temperature & humidity
  - Soil moisture
  - Luminosity
- **2 Actuators**:
  - Water pump
  - Flower lighting
- **Data processing**:
  - Power-on time pump (duration of pouring the plants)
  - Power-on time light (duration of additional lighting time)

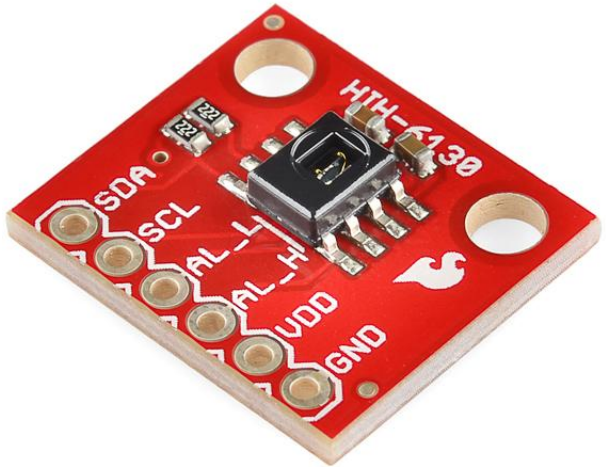
Scenario


Data sink
Terminal / UI
serial
Node
Data Processing
- power-on time pump
- power-on time lighting
luminosity
air temperature
air humidity
802.15.4
802.15.4
lighting
Node
Node
Actuators
water pump
Sensing
soil moisture

Air temperature & Humidity

HIH6130 Breakout

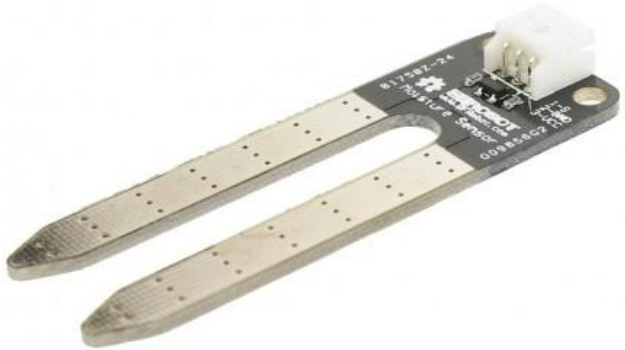
- Seller: Sparkfun
- Operating Voltage: 2.3-5.5V
- Digital Sensor
- Compensated humidity range: 10-90% RH
- Compensated temp. range 5-50°C
- Easy to connect with Waspmote
  via I2C protocol to read digital values



Soil Moisture

Analog soil moisture sensor

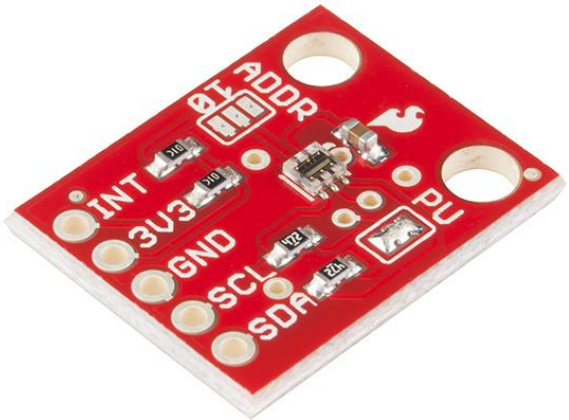
- Seller: DFRobot
- Operating voltage: 3.3V or 5V
- Analog sensor:
  Resistance changes with moisture:
  More water-> less resistance-> higher V
- Use Waspmote analog-in to get value
- 10-Bit ADC resolution (0-1023)



Luminosity

TSL2561 Breakout

- Seller: Sparkfun
- Operating Voltage: 2.7 - 3.6V
- Digital Sensor
- Light range: 0.1 - 40k Lux
- Easy to connect with Waspmote via I2C protocol to read digital values

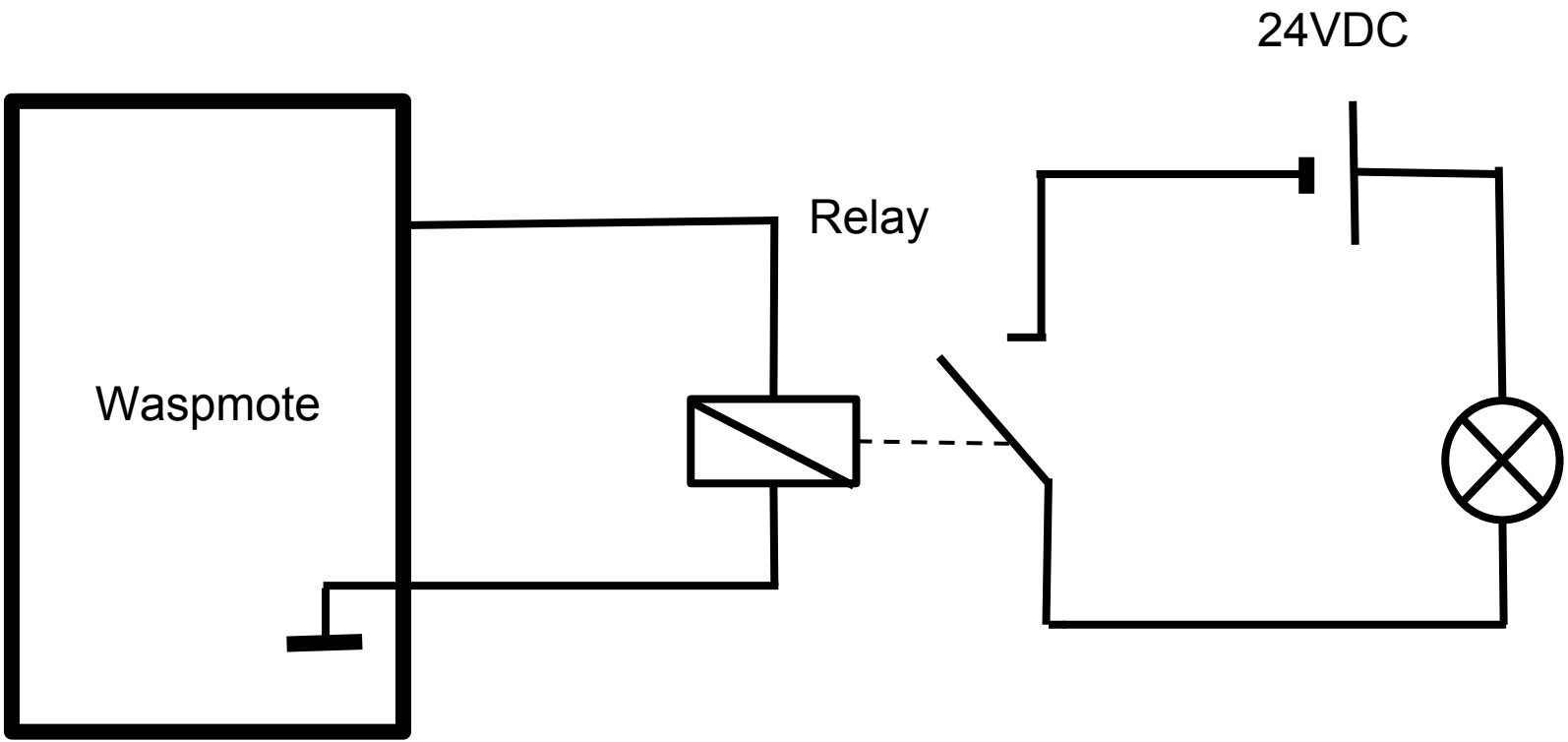


Actuators - Water supply

Liquid Pump ROB-10455

- Seller: Sparkfun
- Operating voltage: 12V
- Current consumption: 1.5A
- Bilge principle: works under water until water reservoir is empty
- Waspmote can use relay shield to control power supply

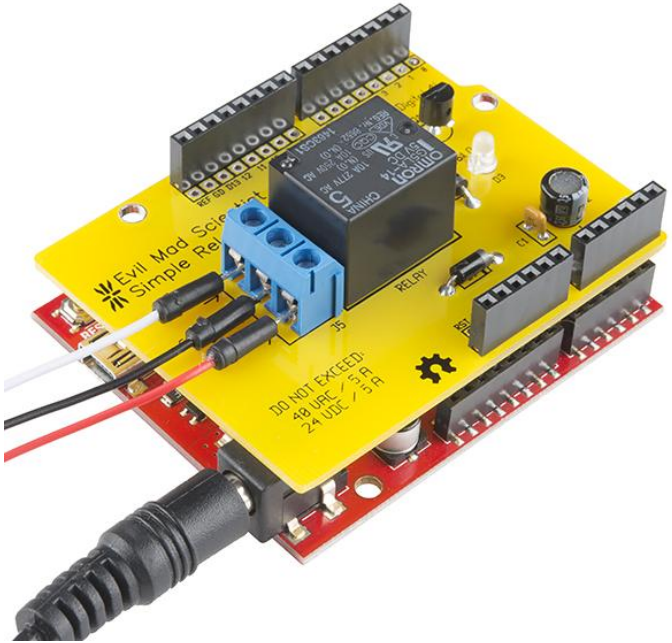
Actuators - Controlling



Actuators - Relay Shield

Relay Shield DEV-12093

- Seller: Sparkfun
- Switching load: up to 24VDC
- Current load: up to 5A
- Compatible with Arduino: Waspmote can connect with extension board

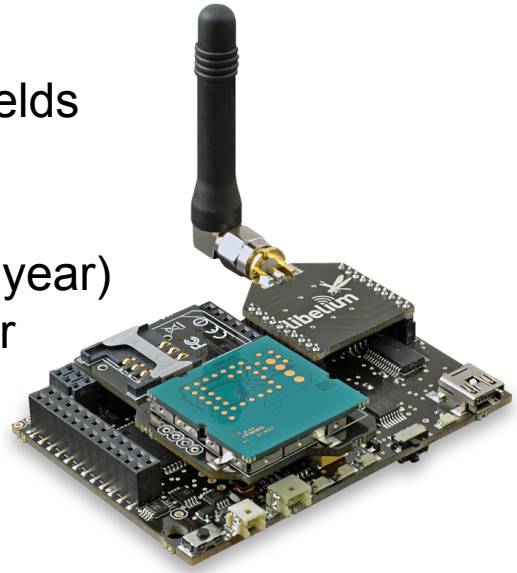


Platform Waspmote

We want to use Waspmote as Sensor node, Actuator node and Control Center.

Waspmote offers:

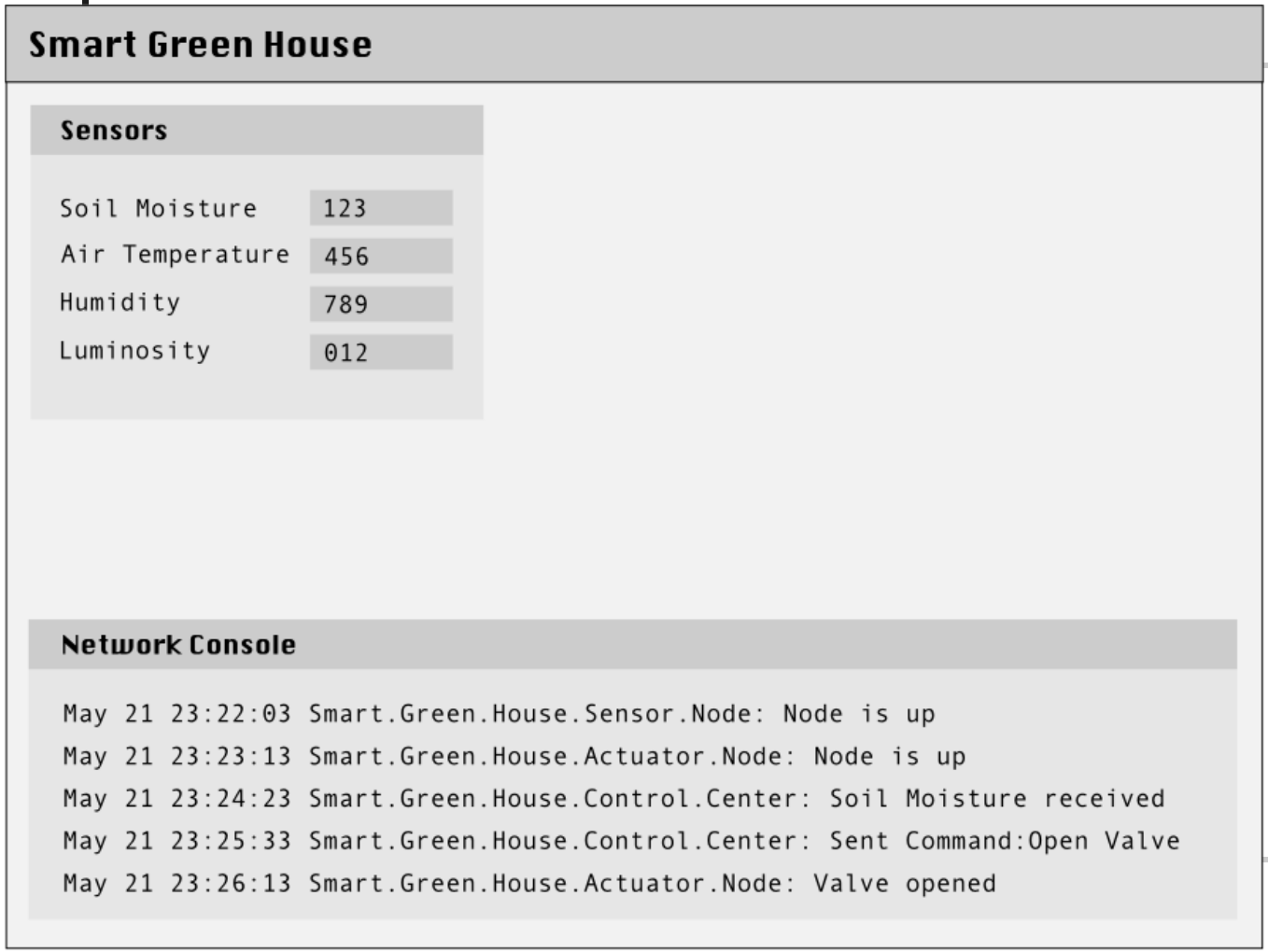
- Several communication protocols with different shields
- We plan to use IEEE 802.15.4
- Analog, Digital GPIO and I2C
- Less power consuming (battery life of more than a year)
- Programmed using Open Source API and Compiler
- Supports Extension boards



Software Components

- **Control Center**
  - It is the brain of Smart Green House that coordinates the functions between Sensors and Actuators.
  - Waspmote with Coordinator communication module will act as a Control Center.
  - It will constantly validates the Sensor measurements to execute an appropriate actions.
- **Sensor & Actuator Node**
  - Sensor measurements are periodically sent to the controller.
  - Actuators send acknowledgement messages to the controller to update the status.
  - Waspmotes with End-Device communication modules will act as a Sensor & Actuator node.
- **User Interface**
  - It will act as interface to display the complete communication logs, sensors measurements, status of the actuator and also to accept input to the Control Center.
  - Optimal range of sensor values to water the plant can be dynamically configured using the UI.

UI Mockup


Smart Green House
Sensors
Soil Moisture 123
Air Temperature 456
Humidity 789
Luminosity 012
Network Console
May 21 23:22:03 Smart.Green.House.Sensor.Node: Node is up
May 21 23:23:13 Smart.Green.House.Actuator.Node: Node is up
May 21 23:24:23 Smart.Green.House.Control.Center: Soil Moisture received
May 21 23:25:33 Smart.Green.House.Control.Center: Sent Command:Open Valve
May 21 23:26:13 Smart.Green.House.Actuator.Node: Valve opened

Work Split Up

- Sensor Node & Sensors
  - Sven Erik Jeroschewski
  - Martin Kessel
- Actuator Node & Actuators
  - Florian David Roubal
- Control Center & UI
  - Alexander Platz
  - Aravinth, S. Panchadcharam

Roadmap

- **23.05.14** - **Design Milestone**: Introduction to the project and the design of the project is presented. Boards and Tools needed for the project are acquired.

- **30.05.14** - Pending components will be ordered. Interface and Communication protocol among the Sensor nodes, Actuator nodes and Control Center will be defined. Hands on and first experience with WaspMote.

- **06.06.14** - First steps in controlling the sensors and actuators with the WaspMote. Control Center will be working with dummy data for Sensing, Actuating and Configuring.

Roadmap

- **13.06.14** - **Intermediate Presentation**: Data flow of the project among Control Center, Sensor node and Actuator node will be demonstrated with real components.
- **20.06.14** - User Interface will be implemented to get inputs from a user. The project will be tested with real living plant for a week.
- **27.06.14** - Project will be fine tuned and tested with user interactions.
- **04.07.14** - **Final Presentation**: Demonstration of fully functional Smart Green House Project.

Questions???