Arduino and Nagios Integration for Monitoring

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1 Introduction
   - Commercial Solutions
   - Open hardware/Software solutions
   - Nagios
   - Arduino

2 Implementation
   - Software
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Commercial Solutions

Advantages

- Highly integrated environments
- Sensors and controllers nicely packaged
- Support
- Wide range of sensors available

Disadvantages

- Expensive for small Data-Centers (≤ 10 Racks?)
  - APC: $\sim 370€+\text{ sensors (}> 30€ \text{ each})$
  - AVTech: $\sim 110€+\text{ 1 sensor (}> 25€)$
  - ServersChecks: $\sim 180€+\text{ 1 sensor (}> 45€)$
  - Domodesk: $\sim 480€+\text{ sensors}$

- Expanding them requires, some times, to buy from the same vendor
Open hardware/Software solutions

Pros
- They can be highly integrated environments
- Highly customizable by the user
- Affordable.
- Wide range of sensors available
- Can be bought as a full solution

Cons
- Lots of work if DIY:
  - Software: Arduino, sensors and control programs
  - Hardware: some soldering
- Lack of support if DIY
- Could be expensive if bought from a vendor
It is a well known open source monitoring solution
Nagios

- It is a well known open source monitoring solution
- High number of sensors already available

SNMP
Current Load
Current Users
Disk use
HTTP
CVMFS
Ping
SSH
e tc...
Nagios

- It is a well known open source monitoring solution
- High number of sensors already available
- Easy to create new sensors
It is a well known open source monitoring solution

High number of sensors already available

Easy to create new sensors

Plenty of add-ons to extent basic functionality
Nagios

- It is a well known open source monitoring solution
- High number of sensors already available
- Easy to create new sensors
- Plenty of add-ons to extent basic functionality
- It is the monitoring software we have been using for ~10 years
It is a simple microcontroller board and a development environment
It is a simple microcontroller board and a development environment

- Inexpensive
- Cross-platform
- To have a Simple, clear programming environment
- Open source and extensible software
- Open source and extensible hardware
Arduino

- It is a simple microcontroller board and a development environment
- It was designed to be:
  - Inexpensive
  - Cross-platform
  - To have a Simple, clear programming environment
  - Open source and extensible software
  - Open source and extensible hardware
- Its capabilities can be extended with the use of shields, that is, boards that can be plugged on top of the Arduino.
**Software**

- **Implementation**
  - **Software**
    - Nagios
    - Nagiosgraph
    - Nagios Server
    - Sensor (python)
    - Critical Temp?
    - Query Arduino (python)
    - SNMP Relay (perl)
    - Send SMS
    - Query Sensor
    - Arduino+GSM shield
    - Response
    - Request
    - Information flow

- **Node 1**
  - SNMP Trap Handler (perl)

- **Node 2**
  - SNMP Trap Handler (perl)

- **Node 3**
  - SNMP Trap Handler (perl)

- **Information flow**
  - Server
  - Serial
  - SNMP Trap Handler
  - Node 1
  - Node 2
  - Node 3
  - ...
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Software

Implementation

Nagios
Nagiosgraph
Nagios Server
Sensor
(python)

Sensors

Information flow
Server
SNMP Relay
(perl)
Query Arduino
python

Critical Temp?

Yes

Critical?

Shutdown trap

Query Sensor
Arduino+GSM shield

Send SMS

Node 1
SNMP Trap Handler
(perl)

Node 2
SNMP Trap Handler
(perl)

Node 3
SNMP Trap Handler
(perl)

Arduino

SNMP Trap Handler
(perl)

Serial

SSH

Nagios
Nagiosgraph

Response
Request

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Software

Implementation

Nagios
Nagiosgraph
Nagios Server
Sensor
(python)
Sensors
Information flow
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Critical Temp?
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Send SMS
Arduino+GSM shield
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Information flow

Node 1
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Hardware

Humidity Sensor

Pressure Sensor

Temperature Sensors

Ground
Voltage
Data
CLK/SCL

Made with Fritzing.org

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Pressure Sensor

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Made with Fritzing.org
Project Costs

Our project:

1. Arduino Mega 2560 46€
2. GSM Shield 97€
3. 24 DS18B20 (Temperature) 198€
4. 1 Sensirion SHT75 (Humidity) 40€
5. 1 Bosch BMP085 (Pressure) 23€
6. 2 Prototype boards with continuous strips 20€

Total 424€

Other vendors (without GSM): APC ~ 1000€, AVTech ~ 1200€, ServerChecks ~ 1300€
Results

- Pressure sensor
- Humidity Sensor
Results

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Results

Temperature

Day

Week

Month

Year

Daily Pressure

Daily Humidity

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