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Innovating project

Connected hive

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RICM4

Context

- Innovating Engineer project (embedded technology, sustainable development).
- Bees and honey production is in danger, because of pollution and the destruction of rural areas
- Repopulating bees in town, problem !
 - Monitoring the hive's health
 - Accessing critical data without being physically there
- Solution : Add sensors to monitor, and a radio system.

Context



- Embedded system, not obstructing
- The less waves and local data process
- **AUTONOMOUS and AUTOMATIC**

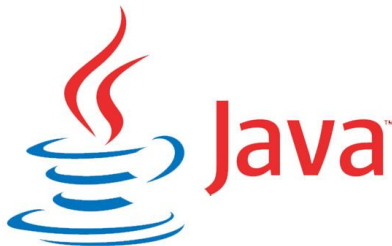
Technologies



- "Long Range" -> 20km
- Inside the programmable boards
- Low-frequency
- Low bit-rate



- Software and tools pack
- Database MySQL + php local server
- Intuitive, documented, useful

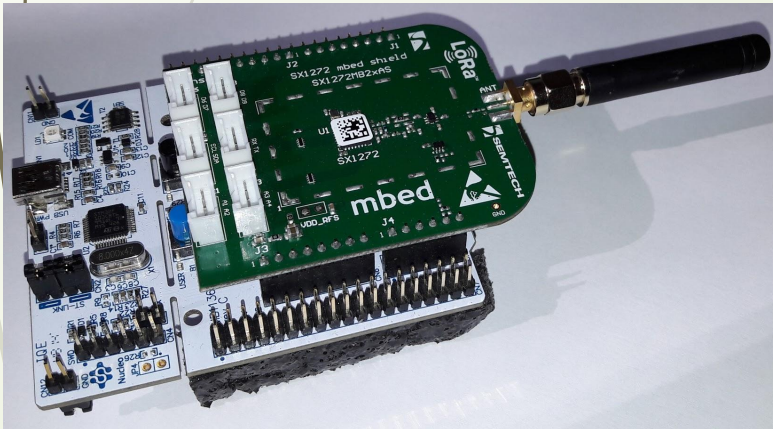


- Object oriented language, highly permissive
- Embedded technology and applications

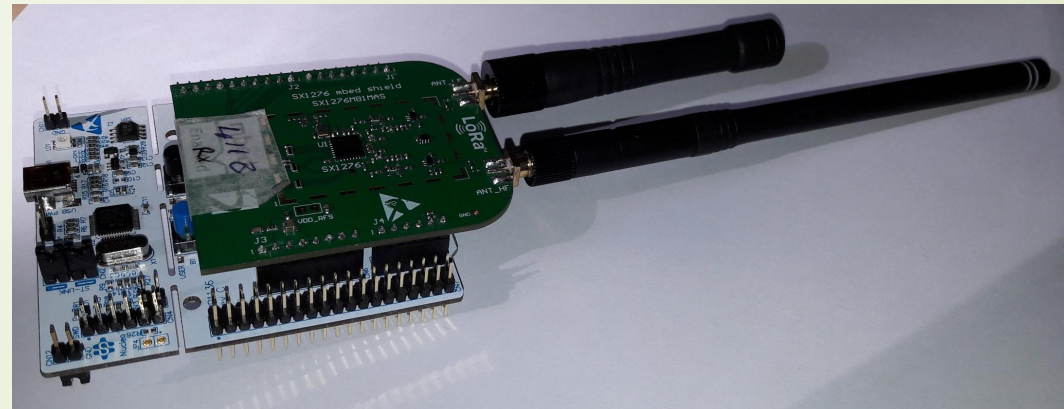
Matériel

- Two Semtech devices :

SX1272



SX1276

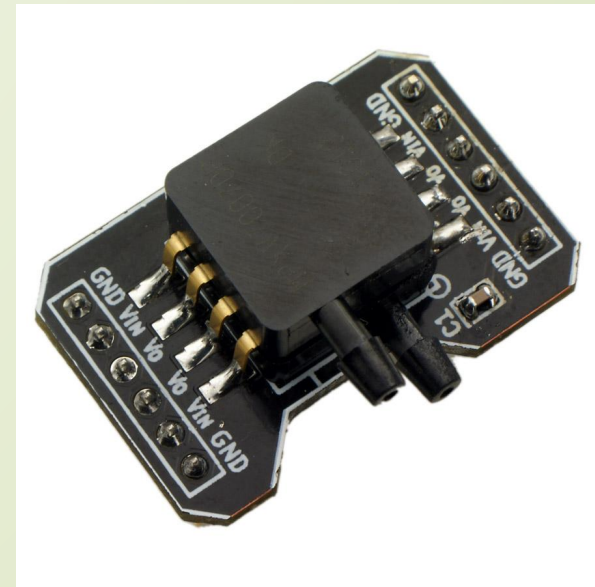
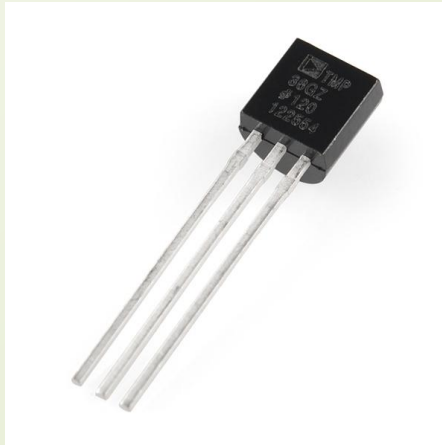


- RadioFrequency emitter and transmitter, with LoRa technology
- Mounted on a Nucleo board, allowing the transfer of code, Serial port, led+buttons

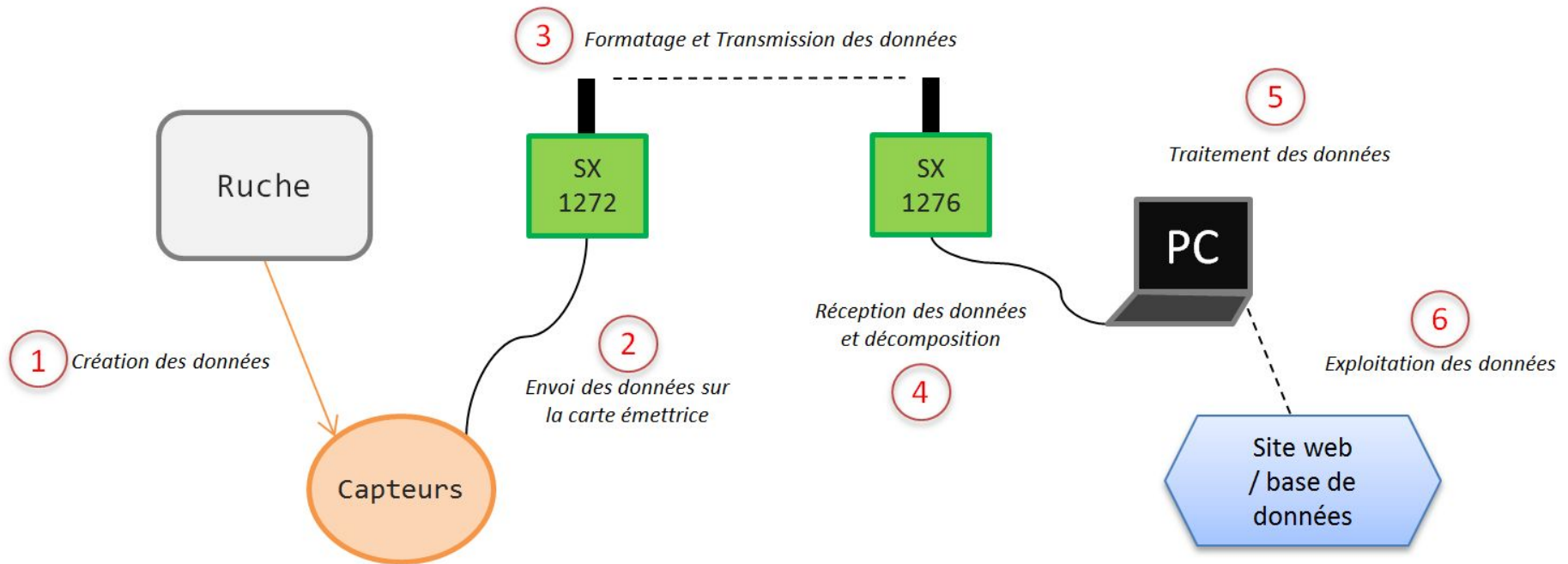
Matériel

➤ Sensors :

Compatible OK? Sensor OK



Prototype



Prototype : sending data

```
Sending data...  
...Data sent : 30.5;420.0;3.05  
> OnTxDone  
Sending data...  
...Data sent : 30.5;420.0;3.05  
> OnTxDone  
Sending data...  
...Data sent : 30.5;420.0;3.05  
> OnTxDone
```

- A data packet is sent at regular intervals
- It contains only the data sent = lessen the packet size

Prototype : receiving

```
Problems @ Javadoc Declaration Console
PortReader [Java Application] C:\Program Files\Java\jre1.8.0_
30.5;420.0;3.05
30.5;420.0;3.05
30.5;420.0;3.05
```

Java Application

Database

<div><div><div></div><div></div><div></div></div><div></div></div>						Date	Heure	Temperature	Poids	Pression	
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	10:31:22.000000	35.2	400.5	3.25
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	10:32:10.000000	35.5	405.5	3.24
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-28	19:31:04.000000	32.4	350.4	3.28
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	14:44:12.000000	23.1	4.2	460
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	14:59:22.000000	23.1	4.2	460
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:01:56.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:02:05.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:05:27.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:06:13.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:06:16.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:06:19.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:06:29.000000	30.5	420	3.05
<input type="checkbox"/>		Modifier		Copier		Effacer	2017-03-29	15:06:33.000000	30.5	420	3.05

Prototype : display

Last measurement to date was the 2017-03-29 at 15:06:33

Temperature was at 30.5 degrees.

Weight was at 420 kg.

Pressure was at $3.05 * 10^5$ Pascals.

Directly choose a date :

1 ▾ 1 ▾ 2017 ▾

Hive's sensors's measurement for the 2017-3-29

There is a measurement on 2017-03-29 at 15:06:33

Temperature was at 30.5 degrees.

Weight was at 420 kg.

Pressure was at $3.05 * 10^5$ Pascals.

There is a measurement on 2017-03-29 at 15:06:29

Temperature was at 30.5 degrees.

Weight was at 420 kg.

Pressure was at $3.05 * 10^5$ Pascals.

There is a measurement on 2017-03-29 at 15:06:19

Temperature was at 30.5 degrees.

Weight was at 420 kg.

Pressure was at $3.05 * 10^5$ Pascals.

There is a measurement on 2017-03-29 at 15:06:16

Ameliorations

- More sensors=Better monitoring
- Better php interface, more user-friendly, more control
- Controlling the emitter board (emission rate, refresh values)

Conclusion :

- ❖ Infrastructure-typed project
 - Easily editable and modifiable
 - Useful for other applications (domotic)
- ❖ What have we learned?
 - A new technology : LoRA
 - Project management
 - Correlating different programming languages