Plates-formes intergicielles pour l’IoT

@RomainRouvoy
INTERNET OF THINGS: PERFECT STORM OR WASH OUT?

Brian Partridge

Hybrid Cloud

Limitless Applications

Cloud + Big/Fast Data are critical

IoT=Business Process Change

M2M

Data Tools

New INSIGHTS=VALUE

DATA IS DRIVING VALUE

MACHINE DATA + AI

Connectivity

Cloud Computing

BY-PRACETICE

Flexibility

Experiment

De-Risk

Global/Local

Start Small Plan for Scale

BYO-BREATH

VM SPREAD

THINK ABOUT SPREAD

APIs

Makes sense as technical foundation

Talk about sprawl

APPLICATIONS

M2M

 Croatel

Perfect Storm

START SMALL

Plan for SCALE

START SMALL

Plan for SCALE

451 Research

©2015 451 RESEARCH, LLC

https://451research.com
Libelium Smart World

Air Pollution
Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wi-Fi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and and Wi-Fi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping
Getting advises in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking
Monitoring of parking spaces availability in the city.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location
Search of individual items in big surfaces like warehouses or harbours.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.
THE IOT ECOSYSTEM NEEDS TO COME TOGETHER QUICKLY
Concentration CO₂

1207 ppm

Temperature Sensor

31 °C
How to...

1. continuously **deploy** software atop of things
2. continuously **monitor** and collect things’ data
3. continuously **process** things’ data at scale
Smartphones, mobile PCs, tablets and mobile routers with cellular connection

- 300 million mobile PCs, tablets and mobile router subscriptions
- 1.9 billion smartphone subscriptions

5.6 BILLION smartphone subscriptions by the end of 2019

- 0.5 billion
- 0.8 billion
- 1.3 billion
- 2.6 billion
- 3.3 billion
- 4 billion
- 4.5 billion
- 5 billion
- 600 M
- 625 M
- 650 M
- 675 M
- 700 M

- Orange: Mobile PCs, tablets and mobile router subscriptions
- Red: Smartphone subscriptions
Crowd-sensing made easy!

1. Describe
2. Collect
3. Make sense!

- Open data
- Applications
- Visualizations
- Notifications
- Studies

http://apisense.io
Crowd & sensing

http://www.flickr.com/photos/40006794@N02/77235722802/
Crowd-sensing | kraʊd:sɛnsɪŋ |

Capability of lifting a (large) diffuse group of participants to delegate the task of retrieving trustable data from the field. This includes:

- **Participatory sensing** involves the user in the sensing task (eg. surveys)
- **Opportunistic sensing** uses mobile sensors carried by the user (eg. Smartphones)
Applications to data visualisation

source: http://opensignal.com
Applications to IoT monitoring
privacy

energy

data

security
```javascript
var distance = 0;
var provider = "gps";
var eachFiveMinutes = 1000*60*5;

var options = {
  provider: provider,
  period: eachFiveMinutes,
  distance: distance
};

location.onLocationChanged(options, function(event){
  trace.add(
    {
      latitude: event.latitude,
      longitude: event.longitude,
      provider: event.provider,
      accuracy: event.accuracy
    }
  );
  // OR
  // trace.add(event);
});
```
Device-level Sensing Task

**Event**
- onLocationChange
- onNetworkStateChange
- onBatteryStateChange
- onPhoneCall

**Action**
- Save Data
- Capture Media
- Survey
- Notify

**Facade**
- Location
- User Interaction
- Device State
- Battery Level

**Connections**
- publish
- subscribe
- act
```javascript
var location = requires('location');
var trace = requires('honeycomb');
var telephony = requires('gsm');

location.onLocationChange(function(event){
    trace.sync({
        lat : event.latitude,
        lng : event.longitude,
        signal : telephony.signalStrength()
    });
});
```
Crowd-scale Sensing Job

```javascript
sense(function() { ... })

accept(function() {
    if (network.connectionType() == 'mobile')
        return {battery: battery.level()};
});

timeCoverage('30 min', '1 H');
duplicate(1);

gemoCoverage([50.614291, 3.13282], [50.604159, 3.15239], '500 m');

ranking(function(users){
    return users.sort('battery');
});

recruit();
```

1. Virtual sensor deployment [Chowdhury10]

1. Virtual sensor deployment [Chowdhury10]
2. Connecting to physical devices

1. Virtual sensor deployment [Chowdhury10]
2. Connecting to physical devices
3. Assigning sensing tasks

Crowd-scale Sensing Job

1. Virtual sensor deployment [Chowdhury10]
2. Connecting to physical devices
3. Assigning sensing tasks
4. Executing sensing tasks

Evaluation of APISENSE®

**Reduction of 50–80% of Data Exchanges**

**Up to 82% Energy Savings**

**Maximum Coverage Loss of 2%**

### Table: W/B-Scanner opportunist vs Citizen journalist participative

<table>
<thead>
<tr>
<th></th>
<th>W/B-Scanner opportunist</th>
<th>Citizen journalist participative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APISENSE®</strong></td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Anonysense</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>Pogo</td>
<td>4</td>
<td>N/A</td>
</tr>
<tr>
<td>MyExperience</td>
<td>N/A</td>
<td>27</td>
</tr>
<tr>
<td>Medusa</td>
<td>N/A</td>
<td>45</td>
</tr>
<tr>
<td><strong>PRISM</strong></td>
<td>??</td>
<td>330</td>
</tr>
</tbody>
</table>
**Book chapters**


**Workshops**


**Conferences**


**Dissemination**


Le capteur, c'est vous! Nicolas Haderer, Christophe Ribeiro, Romain Rouvoy, Simon Charneau, Vassili Rivron, Alan Ouakrat, Sonia Ben Mokhtar, Lionel Seinturier L’Usine Nouvelle, l’Usine Nouvelle, 2013, 3353, pp. 74-75
