Workshop introduction

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Alumni

The Abdus Salam International Centre for Theoretical Physics

United Nations Educational, Scientific and Cultural Organization

IAEA International Atomic Energy Agency

Workshop on Scientific Applications for the Internet of Things (IoT)

16-27 March 2015 Miramare - Trieste, Italy

WALC 2015
San Carlos - Costa Rica
16 al 20 de noviembre

18º
Taller sobre
Tecnologías de Redes Internet
para América Latina y el Caribe

Organización General:
Fundación EsLaRed

INTERNET DE LAS COSAS (IoT)

Escuela de Verano-Invierno 2016

Workshop material

INTERNET DE LAS COSAS

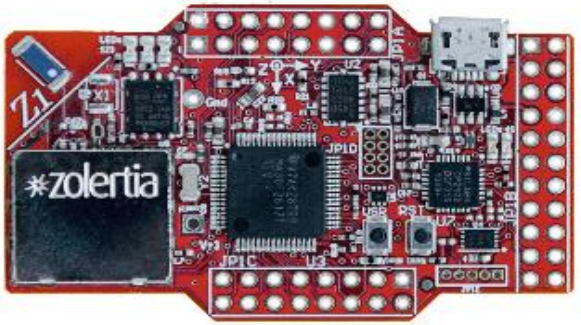
Antonio Liñán Colina, Alvaro Vives, Antoine Bagula, Marco Zennaro, Ermanno Pietrosemoli

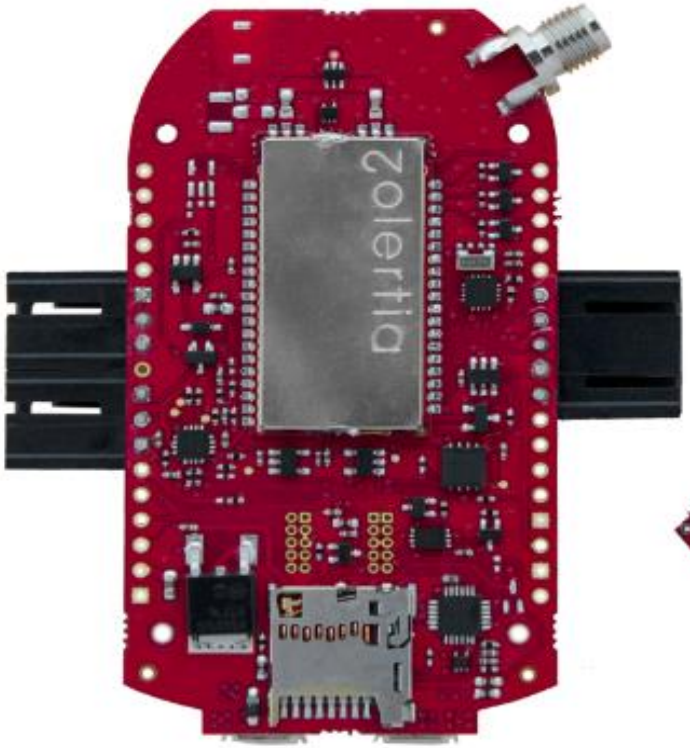
Traducción: Lourdes González Valera

https://github.com/alignan/IPv6-WSN-book
https://github.com/marcozennaro/IPv6-WSN-book

http://www.eslared.org.ve/index.php/libros

IoT Hardware: Zolertia



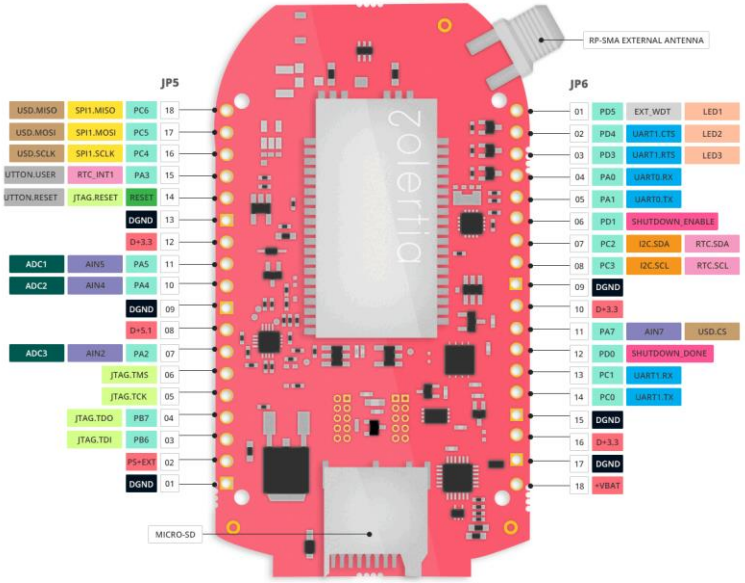


http://zolertia.io/

IoT Hardware: Zolertia

More information (guides, datasheet, schematics) is available at:

https://github.com/Zolertia/Resources/wiki
https://github.com/Zolertia/Resources



JP1A

Features	MSP430 Port#	Pin Name	Pin#	Pin Name	MSP430 Port#	Features
Phidget powered @5V, ADC input has resistor divider to allow 5V inputs		ADCGND	1 2	ADCGND		Phidget @3V
		USB+5V	3 4	Vcc+3V		
	P6.3	ADC3*	5 6	ADC7	P6.7	
	P6.4	ADC4	7 8	ADC6/DAC0	P6.6	
	P6.2	ADC2	9 10	ADC5/DAC1	P6.5	
Phidget powered @5V, ADC input has resistor divider to allow 5V inputs		ADCGND	11 12	ADCGND		Phidget @3V
		USB+5V	13 14	Vcc+3V		
	P6.0	ADC0*	15 16	ADC1	P6.1	

Table 3 — JP1A Pinout description

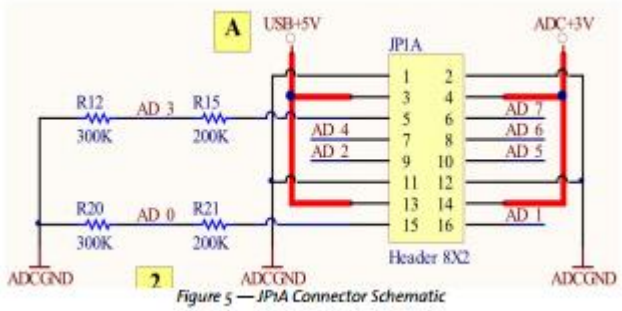


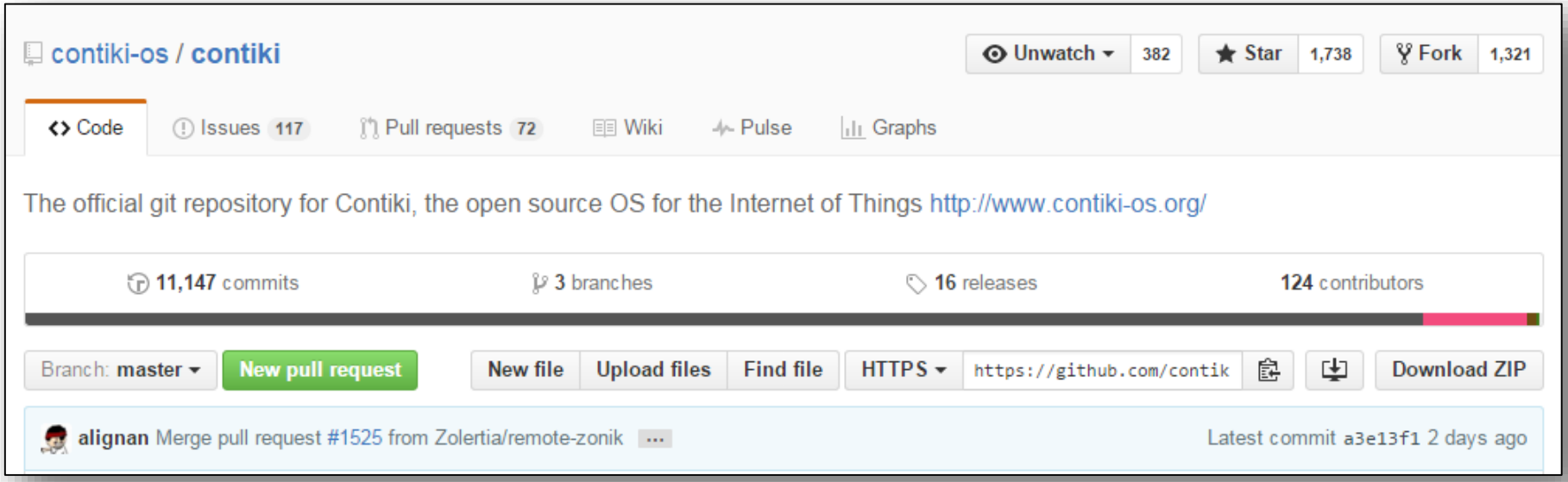
Figure 5 — JP1A Connector Schematic

Raspberry Pi

	NEW! Raspberry Pi 2
Processor Chipset	Broadcom BCM2836 ARMv7 Quad Core Processor powered Single Board Computer running at 900 MHz
RAM	1GB SDRAM @ 450 MHz
Storage	MicroSD
USB 2.0	4x USB Ports
Power Draw / voltage	1.8A @ 5V
GPIO	40 pin
Ethernet Port	Yes

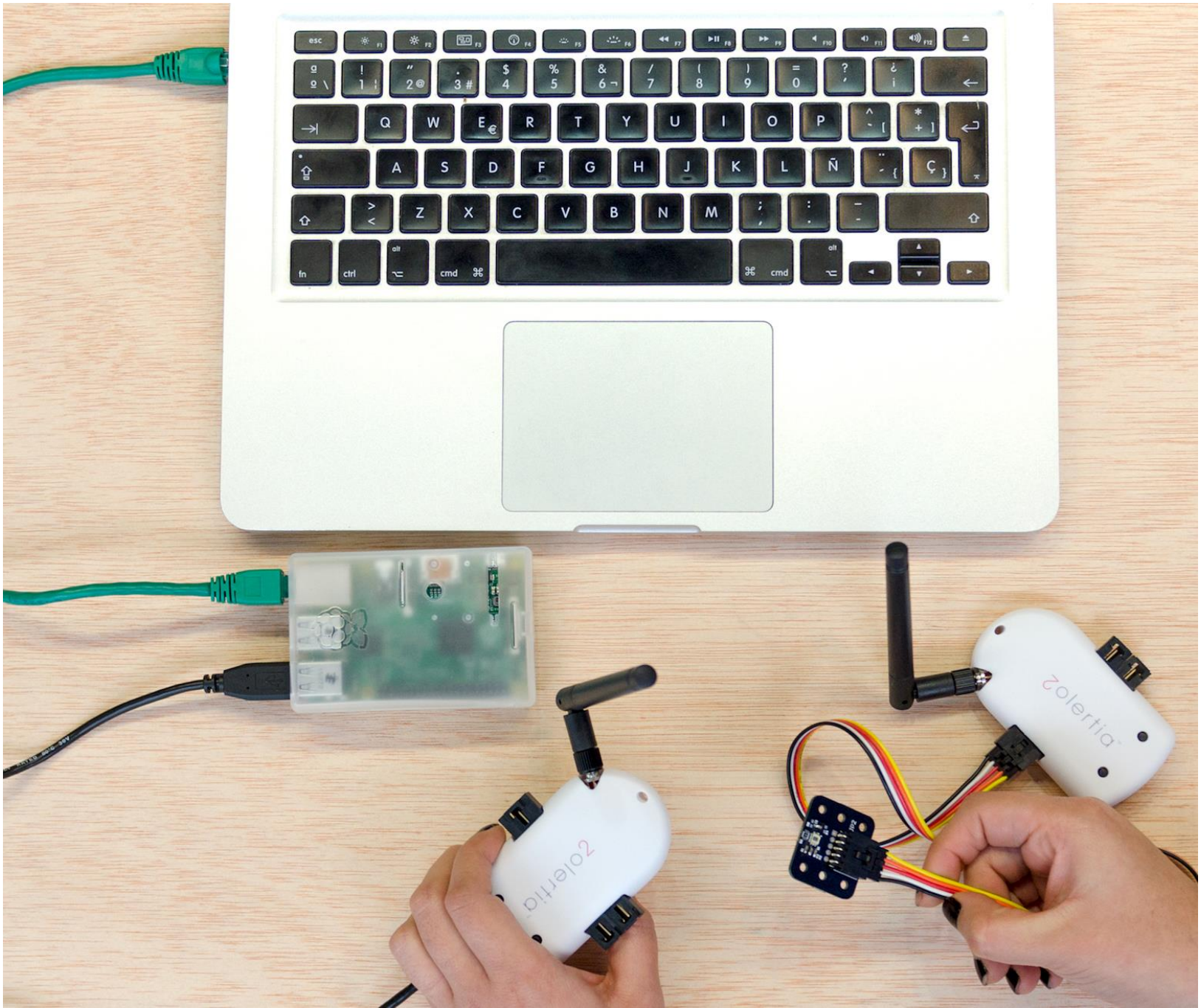
https://www.raspberrypi.org/

Contiki OS, an IoT Operating System



www.contiki-os.org

https://github.com/contiki-os/contiki



Development environment

Raspberry Pi

Raspbian OS (Linux distro)

A microSD image with dependencies and libraries already installed is available with:

- Contiki OS repository
- MSP430-4.7 compiler for ARM distros
- Python libraries used in examples
- Iceweasel web browser with Copper CoaP plugin
- Wireshark

Latest available from previous WALC'15 workshop in the link below.

https://sourceforge.net/projects/zolertia/files/VM/walc15-rpi-slim.rar
https://www.raspberrypi.org/

Raspberry Pi

Raspbian OS (Linux distro)

Access via SSH:

`ssh pi@192.168.1.8` (check the actual IP address)

Access via serial console (requires USB to serial converter):

User: pi
Password: walc2015

Same password for the SSH session.
Or connect an USB keyboard, mouse, HDMI monitor and boot in graphic mode

Expand the filesystem by running the following

```
sudo raspi-config
```

https://www.raspberrypi.org/

If you are using a laptop/PC and not a Raspberry PI, other options are:

Download VMWare player for Windowws and Linux[8] to run Contiki's virtual machine, it is free and widely used.

In OSX you can download VMWare Fusion[9]

Using VMWare just open the `Instant_Contiki_Ubuntu_12.04_32-bit.vmx` file, if prompted about the VM source just choose `I copied it` then wait for the virtual Ubuntu Linux boot up.

Log into Instant Contiki. The password and user name is `user`. Don't upgrade right now.

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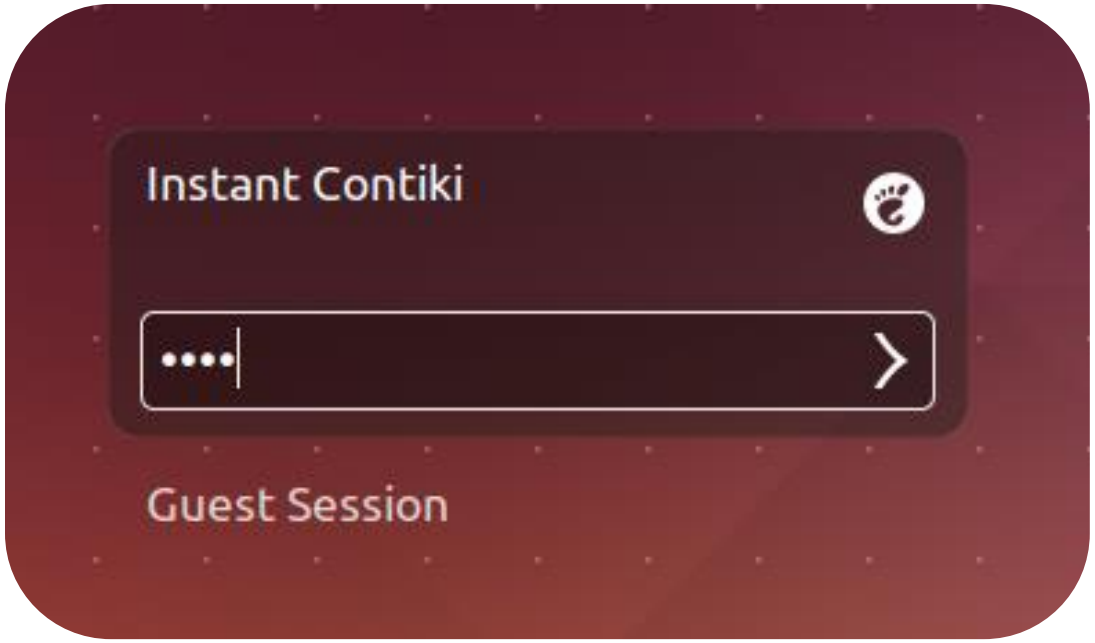
[8] https://my.vmware.com/web/vmware/free#desktop_end_user_computing/vmware_player/6_0

[9] http://www.vmware.com/products/fusion

Instant Contiki

Instant Contiki is an entire Contiki development environment in a single download. It is an Ubuntu Linux Virtual Machine, with the Contiki OS, development tools, compilers and emulator.

You can either grab an official Instant Contiki from Contiki website, or use the updated version following the “IoT in five days” book at the link below



http://contiki-os.org/start
https://sourceforge.net/projects/zolertia/files/VM/IoT_five_days_Instant_Contiki.rar

If you are using a laptop/PC and have a 32-bit Linux machine

```
sudo add-apt-repository ppa:wireshark-dev/stable
sudo apt-get –y install git git-core build-essential wireshark
git clone –recursive https://github.com/contiki-os/contiki.git
```

To install the toolchain (application to convert the source code into an image to program the Zolertia devices)

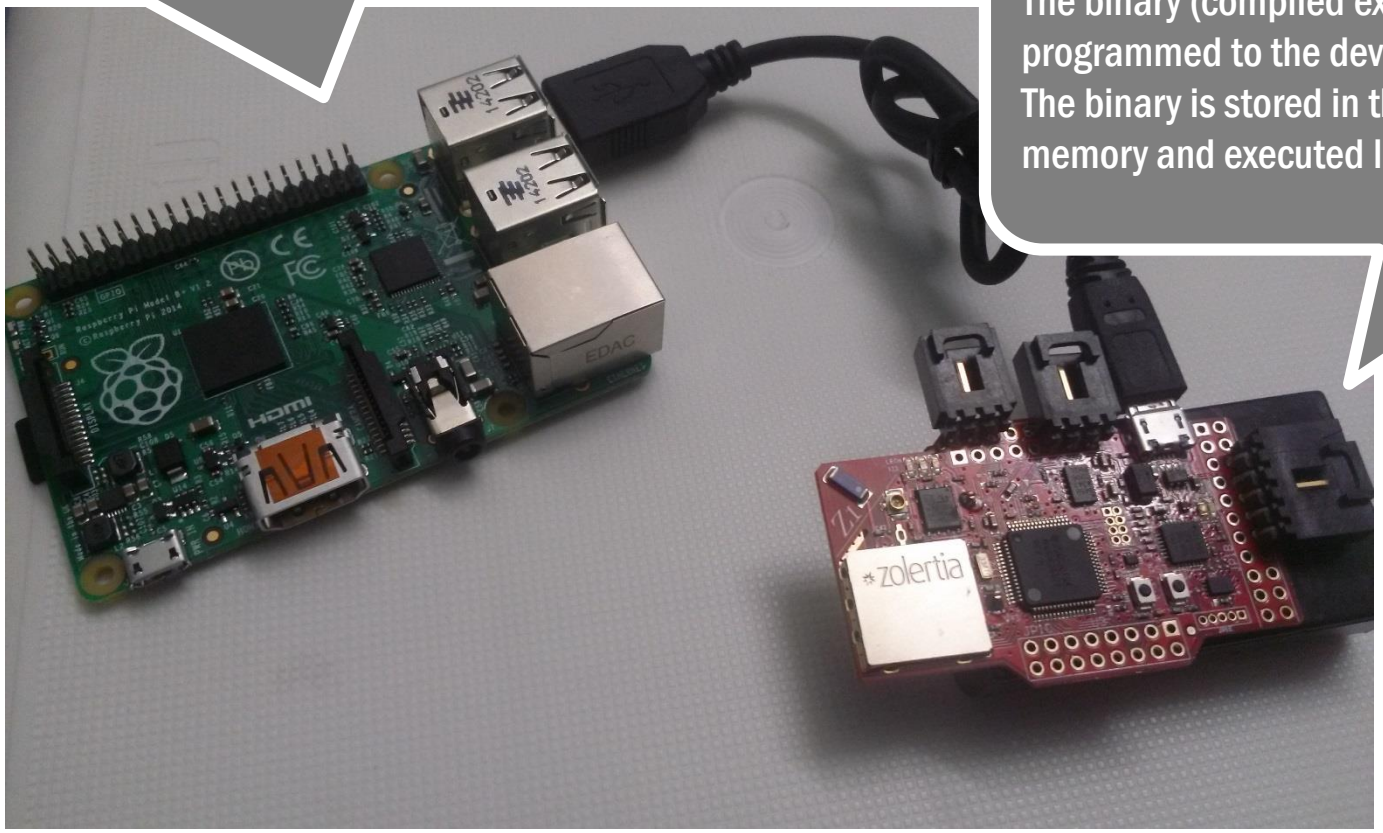
```
wget "https://sourceforge.net/projects/zolertia/files/Toolchain/msp430-47.tar.gz" -O
$HOME/msp430-47.tar.gz && tar -zxvf $HOME/msp430-47.tar.gz -C $HOME/msp430-47

sudo echo "export PATH=$HOME/msp430-47/bin:$PATH" >> $HOME/.bashrc && source
$HOME/.bashrc
```

Compiles examples and programs connected devices over USB connection.

Runs scripts, Border-Router, Wireshark, Sniffer and read output from connected devices

The binary (compiled example) is programmed to the device over USB. The binary is stored in the node's memory and executed locally



Workshop objective

Develop an IoT project using the workshop material and the lessons learnt in the course

- Team-up: different minds thinking together are better
- Propose a solution to a known or common problem
- Develop a *duct-tape* prototype and show!
- Each team will prepare a short presentation (4-slides) about the solution

WSN: isolated silos

M2M: connected silos

IoT: people and objects connected

The Joy of Tech™ by Nitrozac & Snaggy

FATTYPANTS IS KIDDING HIMSELF IF HE THINKS HE'S EATING LESS THAN 2000 CALORIES A DAY!

AT LEAST YOU GET *USED!* I NEVER DO! ALL HE EATS IS TAKE-OUT!

I *REFUSE* TO PICK UP THIS FRENCH FRY. LAZYBONES CAN DO IT HIMSELF!

HE SPENT A FORTUNE ON US SMARTBULBS AND HE ONLY USES THE "WHITE LIGHT" SETTING! *SIGH*

DUMMY NEEDS TO TEST ME NOW AND THEN, OR AT LEAST CHECK MY APP!

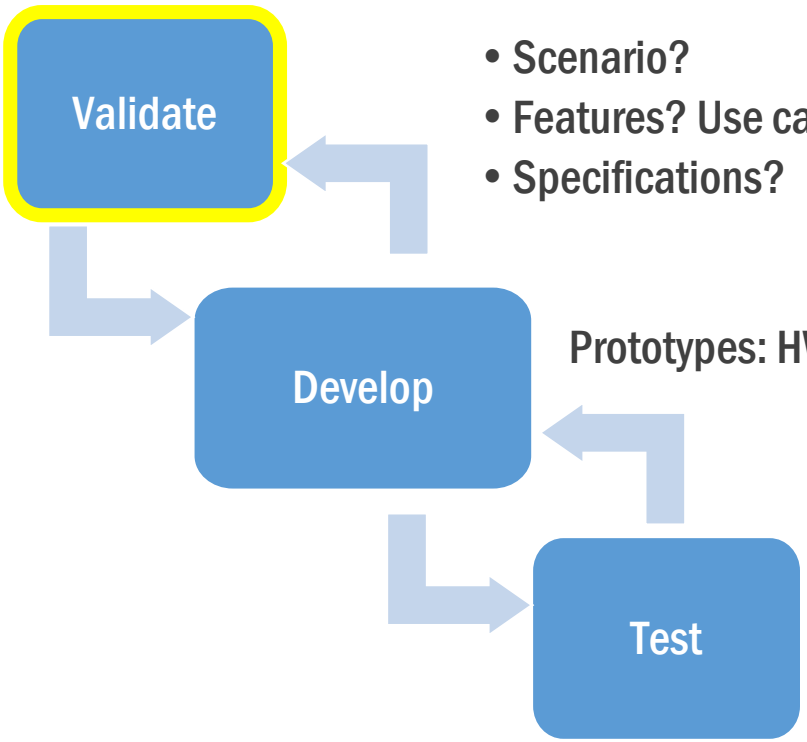
DON'T BOTHER HIM! THE PREVIOUS SMOKE DETECTOR, HE BEAT TO DEATH WITH A BROOM HANDLE!!

DID YOU SEE WHAT TIME HE GOT IN LAST NIGHT? *SCANDALOUS!*

HEY GUYS! THE HOUSE SMARTMETER IS TELLING EVERYONE THAT SCAREDY CAT STILL USES A NIGHT LIGHT! *HA HA!*

What your Internet of Things is saying about you...

joyoftech.com

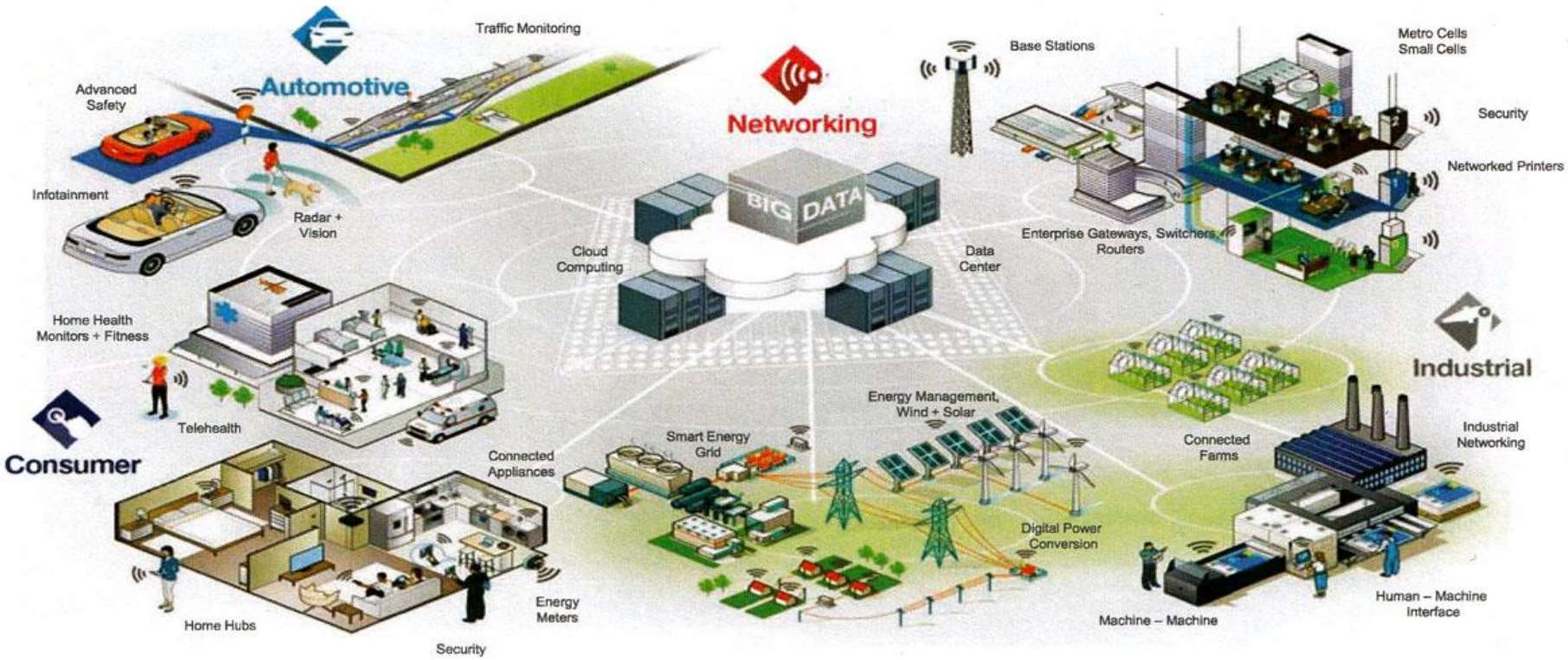


- Scenario?
- Features? Use cases?
- Specifications?

Prototypes: HW, FW, SW

- Features (user)
- Functional tests
- Simulations
- Field tests if apply

The Internet of Things



http://www.theregister.co.uk/

- What problem do we want to solve?
- How that problem affects people? How people are going to use this solution?

VS

- Solutions based on human necessities, not on technologies
- Avoid isolated silos!
- Avoid unnecessary features, focus on your MVP!
- Ask yourself: who is the user? How it will use our solution?
- What is our value proposition?

1

Find a human problems to solve

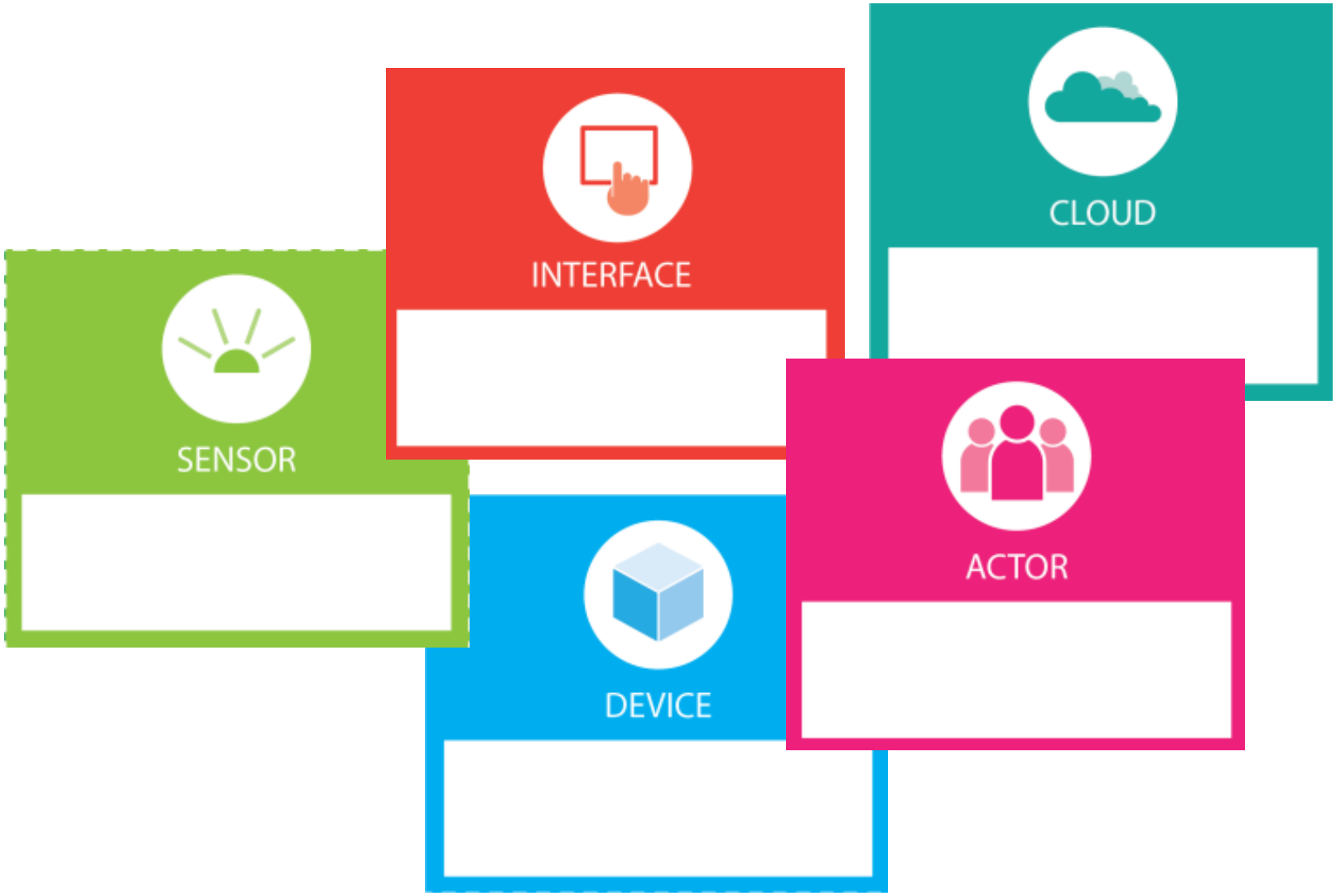
2

Create a solution that adds value to the user

3

Create a canvas of our solution, showing interactions between actors and technologies

http://www.claropartners.com/project/internet-of-things/



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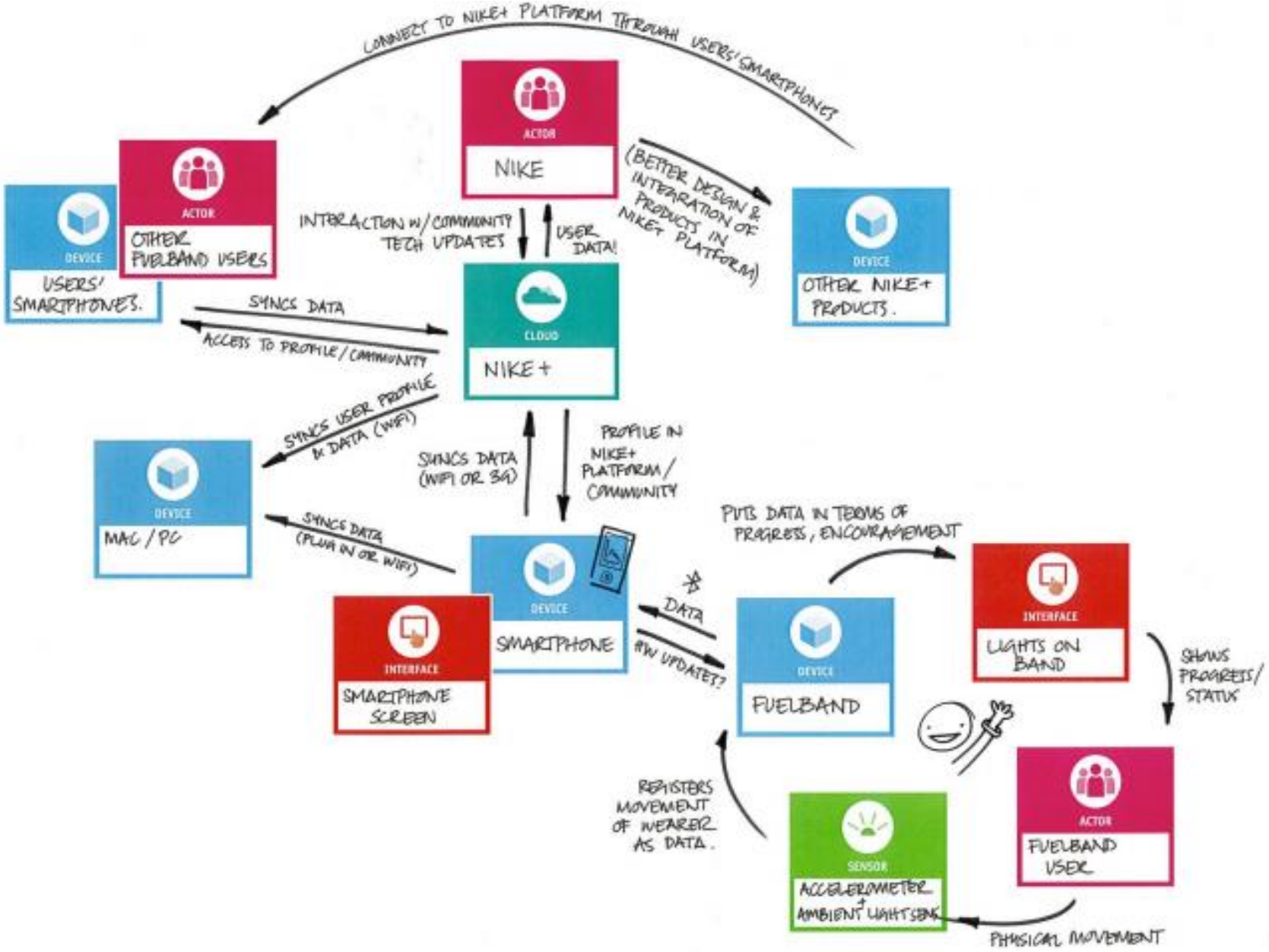

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