

# Eco Design within Orange Technocentre :

## From the box to the software

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# Orange Group

# More than 236 millions customers in the world...



Orange is operator in 32 countries

Orange supports is business customers in more than 220 countries

with 160 000 employees for Orange Group



# Environmental Impacts of Orange infrastructures

## ICT & World Demand

- Silver: 12 %
- Gold: 30 %...
- Copper : 30 % ...



Orange boxes one of the most energy consuming equipment in the house hold.  
Network infrastructure



- 1/3 WEEE Recycled
- 1/3 probably recycled
- 1/3.....



# Orange & Eco Design



# Why eco design our products & services ?

- **Reduce Orange environmental foot print**
- **Reduce Orange environmental foot print on customers side**
- **Help our customers to reduce their environmental foot print**

# What is eco design product & services for Orange?

- **Source of cost reduction (€) for Orange (TCO)**
- **Source of reduction of environmental footprint**
- **Bring more values for the customer end**

# Environmental impacts of Livebox 3

# Focus on Environmental foot print of the LB3

LCA of Livebox 3 developed by Orange Labs Team (EIME tool)

All the life cycle phases have been considered

From raw material extraction...up to end of life

Functional unit based on 5 years real usage

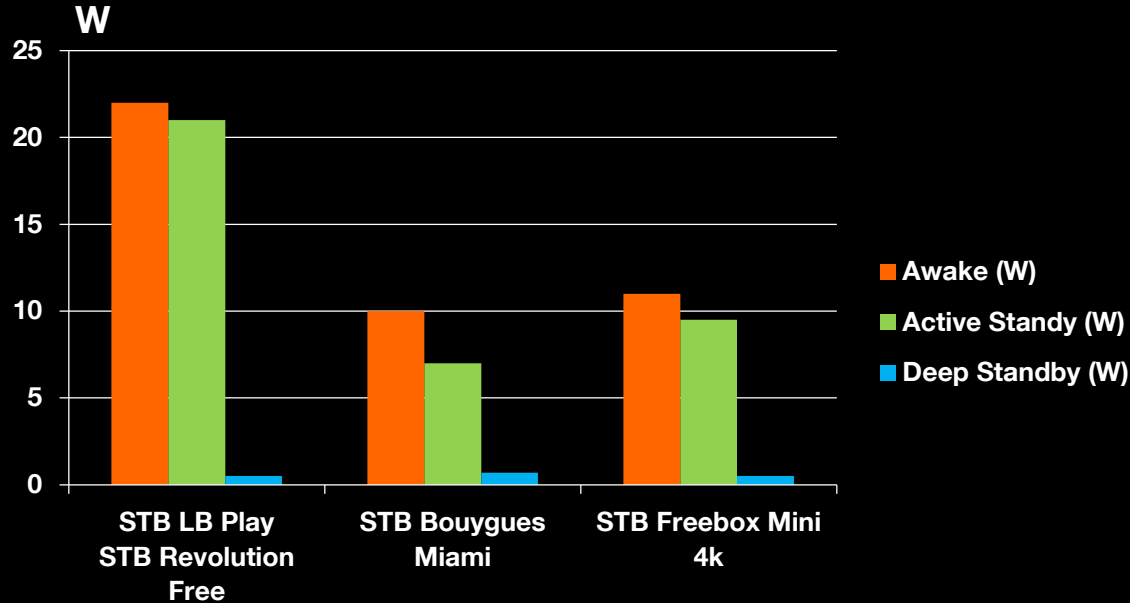
Primary Energy consumption : 90% during use Phase

2 actions : reduce active power consumption & active low power mode



**Two approaches to reduce the energy consumption during use phase**

# First approach to reduce Energy consumption : Hard Ware



**The ARM techno (Mobil) : real reduction of energy consumption**

## Second approach to reduce Energy consumption : Software

- A Livebox is not a mobile device ... No relevant low power mode
- A Livebox is running 24/7 due to in life services : Voice, home automation (security...)
- Too many software layers to manage : Ship set, Board, Middleware, Service...

**It is urgent to reduce environmental impact of software layers !**

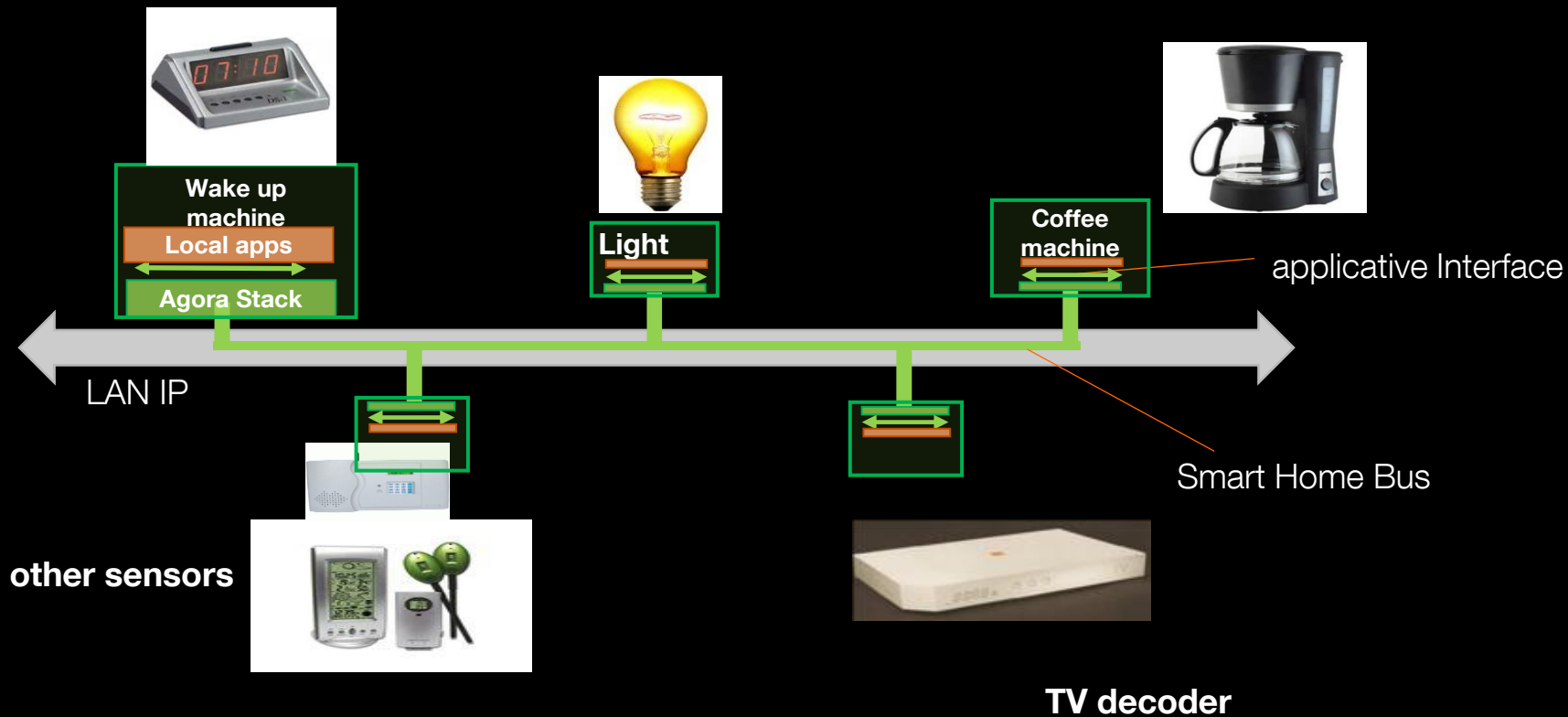
# Software Eco Design actions within Orange

# First eco design software project

- **Project launch in January 2014 for 18 months (following a call for project from ADEME)**
- **Partnership with Kaliterre**
- **Objective : Eco design an application & develop tools for software eco design**
- **Application : home automation service (R&D Orange project)**
  - **Regular architecture : an home automation box manages all the connected devices**



# Home Automation Application : Global view of new architecture



# First eco design software project

- **Application features**
  - Main functionalities : Allow communication between devices
  - Techno : Java (& C++)
  - Library : All Joyn (Qualcomm) to allow communication between IoT (Standart library)
  - Size :
    - All Joyn (C) : 600ko
    - Application : 10k lines (Java)
- **Kaliterre has developed 2 tools :**
  - Greenspector : to identify dirty patterns (Java...)
  - Metter : to measure the energy consumption of the application

# Project Organisation

- **After each sprint (6) a version of the app was send to Kaliterre for analyses**
  - **Kaliterre feedback : a list of energy consuming patterns to be replaced**
- **One sprint to implement all the recommendations (the last one)**
- **Compare energy consumption of optimized & non optimized versions**

## Phase 1 : feed back on Kaliterre recommendations

<b>Total of proposed recommendations</b>	<b>1134</b>	
<b>Applied recommendations</b>	<b>750</b>	<b>66%</b>
<b>Non applied recommendations</b>	<b>386</b>	<b>33%</b>

**- Reason for non applied recommendations: operation & maintenance**

## Energy gain measurement

- **Configuration tests :**
  - The test environment was installed on a PC (Linux) (applications + measurement tools)
  - From 3 to 7 devices have been modeled

**Energy Gain :** from 0,5 to 1,5 %... disappointment...Why?

**Reasons :** AllJoyn Library was the main energy consuming part of the application...it doesn't make sense to optimize the added coding lines...

**Unsatisfactory results !**

## Eco design of the second version of the application

- **Version with the same functional perimeter but develop as a first version (non standard development)**
  - **Developed in Java only**
  - **No external library**
  - **Size : 14 k lines**
- **Environment tests**
  - **First installed on PC... but the consumed energy by the application on the PC was too small**
  - **So the application was installed on a small PC : Raspberry Pi**

## Recommendations for the second version :

<b>Total of proposed recommendations</b>	<b>1136</b>	
<b>Applied recommendations</b>	<b>336</b>	<b>30%</b>
<b>Non applied recommendations</b>	<b>464</b>	<b>40%</b>
<b>Unclear or non applicable recommendations</b>	<b>336</b>	<b>30%</b>

**Gain in Energy between optimized and non optimized version : 7%**

# Conclusion of the Project

- **Eco design software approach could not be applied on all kind of applications**
  - It is needed to develop a « decision tree » to see if an apps is a good client or not
- **Relevant functional & unitary tests are needed to be able to measure energy gain on these applications**
- **The test environment has to be optimized**
  - The measured energy for a running application does not have to represent only few percent of the full power of the underlying equipment
  - The hardware has to be adapted to the software (PC versus Raspberry pi)
- **The energy probe has to be well calibrated**



# Orange recommendation on Software Eco Design

Software eco design has to be considered at different levels :

- **Marketing needs** : Limit number of offered functionalities to relevant ones
- **Software architecture** : Chose the relevant library or develop the needed functionalities
- **Coding** : Avoid dirty patterns

# Conclusion regarding Software eco design approach

Software eco design is new approach to reduce environmental impact

- **Software developers & architects are not aware about the impacts of their developments**
- **It will take time before to be implemented in the industrial development process**

# Next steps

- **2 mobile Orange applications are under eco design process**
- **Objective : Orange apps have to be energy efficient, especially those which :**
  - are deployed in AMEA
  - run in background on smart phone
- **Expected result by T3 2015**
- **Then find a web application to show that it is possible to reduce energy consumption at the Service Plat form side**

# Thank you

## Thank also to Kaliterre Team

