

Eco Design within Orange Technocentre :

From the box to the software

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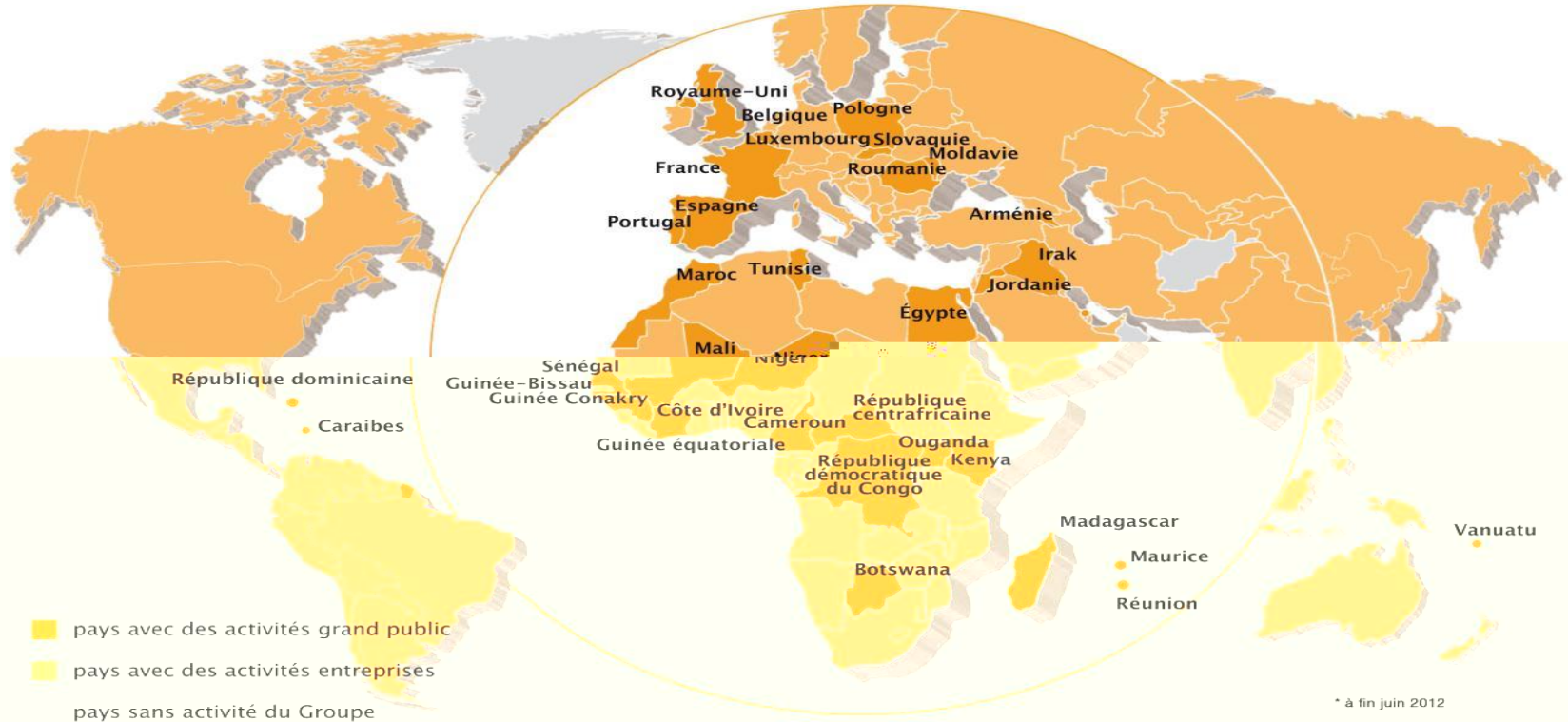
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Orange Group

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



Network



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?



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

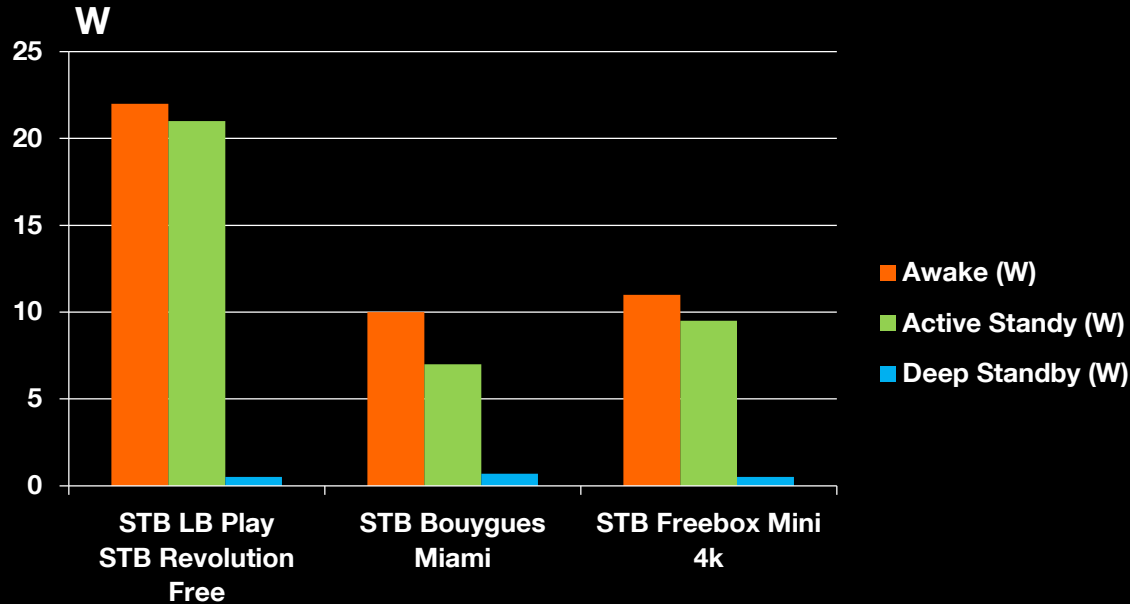
Primary Energy consumption : 90% during use Phase

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...

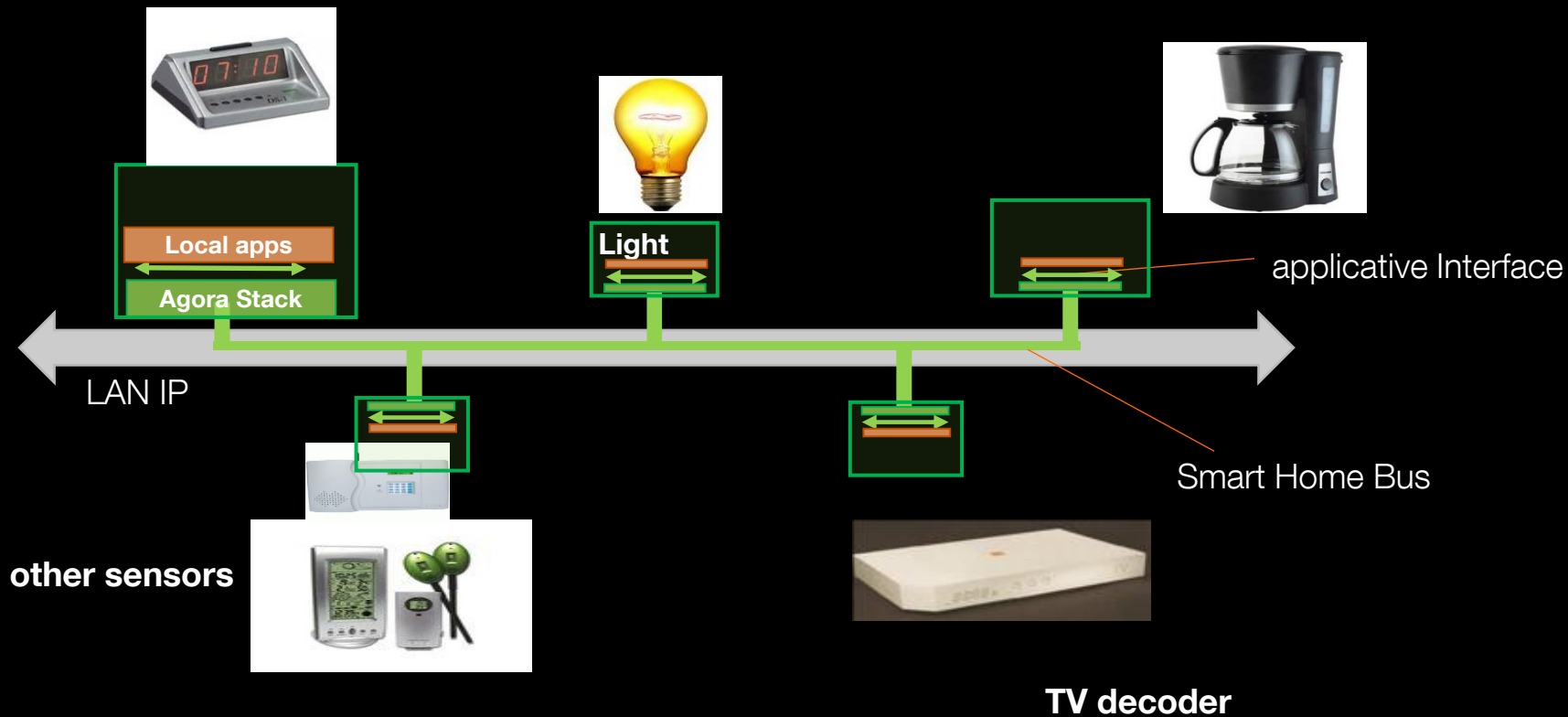
It is urgent to reduce environmental impact of software layers !

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

	750	66%
	386	33%

- 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 :

	336	30%
	464	40%
	336	30%

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

