World Forum 2015
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Energy Efficiency and Future Data Centres

Guillaume GERARD, Senior Green IT Expert, Orange
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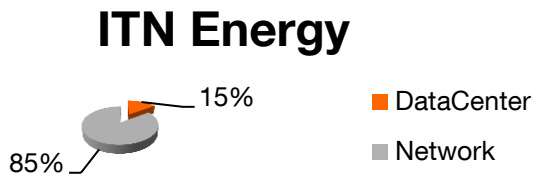
orange™

Introduction

Orange group: the DataCenter big picture

- No less than **77** DataCenters (including mixed telco/IT sites) scattered among **32** telco affiliates in countries and Orange Business Services.
- DataCenters consumed around **500 GWh** from grid electricity in 2013, that is 15% of technical energy, itself 2/3 of total Group Energy consumption.



- Orange Group has committed to **sustainability objectives** since 2007
  - Reduce Group CO_2 footprint by 20% between 2006 and 2020[1]
  - Reduce Group energy consumption by 15% between 2006 and 2020[1]
  - 25% of AMEA energy coming from solar energy in 2015
- Orange is an endorser of the **European Code of Conduct for Datacenters**, with 3 datacenters signed in: Nice, Normandie & Poland.

[1] Figures include technical energy as well as all buildings and vehicles

Two different areas: Datacentres and Network sites

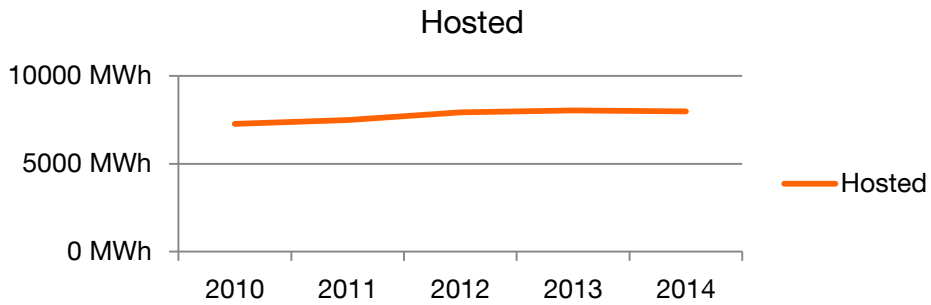
- Technical energy is used by data centres & network sites.
  - Network sites host only telecom equipment
  - Data centres host IT equipment and possibly telecom equipment
- They have a specific engineering: **Reliability first**
  - Any service disruption must be avoided, whatever the duration
  - A recent internal study showed that for Orange needs, using a greater number of less reliable data centres to ensure a given availability would consume more energy
- To reduce their impact on the planet,
  - **Reduction of energy consumption** is the primary objective
  - This encompasses both needs by hosted equipment and efficiency of hosting
- Renewable energy is used only for non-essential functions
  - opposed to lowest network sites where a short unavailability period is not considered a significant event

Energy-related initiatives

Energy consumption in Orange Datacentres

- Energy consumption in Orange data centres has stopped growing and forecasts are not showing growth

- Below shows an affiliate measured consumption



- Impact of IoT and Big Data is not known as of today;
  As of today, expected growth of energy needs is around 1% per year for Big Data

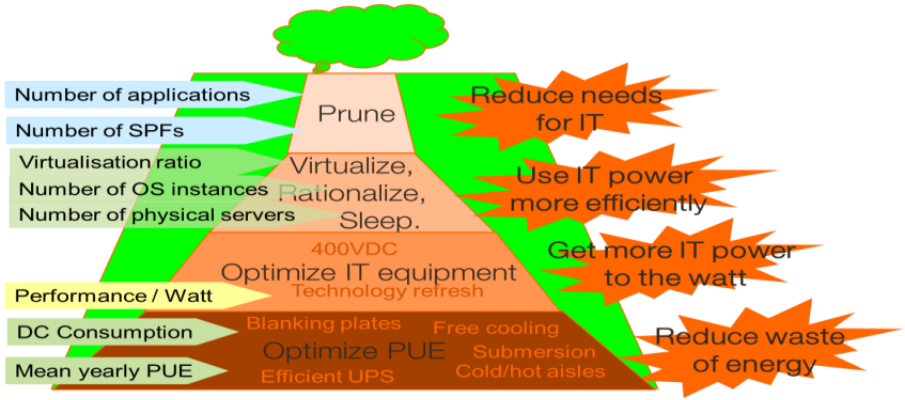
Assessment of energy management efficiency

- Orange has decided to use the emerging **DC_{EM}** global indicator instead of PUE for assessment of energy management performance in its data centres.
  - This indicator was defined by TC/ATTM ETSI following the mandate M/462 of European Community. It is now an ETSI standard and shall be promoted to European Standard in 2016.
  - It is a label based upon a global efficiency indicator that combines the old PUE with sustainable aspects of energy management: energy reuse & use of energy coming from local renewable power sources
  - References:
    - DC_{EM} KPI for performance of energy management in DC
    - ETSI ES 205 200-2-1 (Energy Management Global KPI for Data Centres),
- Orange considers switching to **DC_{EM}** for the rest of its ICT sites.

ETSI World Class Standards

Axes for energy reduction in Datacentres & IT

- Orange launched early 2009 the green data centre strategy program in order to reduce energy consumption of its data centres.



- This program is based on
  - a per-data centre layered approach.
    - **Less energy for hosting**
    - **More processing power to the watt**
    - **Better use of processing power**
    - **Fewer needs for processing power**
  - a technical site consolidation program
    - Across countries and for large countries, a data centre consolidation program
    - For smaller countries, a data centre + telco consolidation program
      - Each country still needs data centre ; these will also host telecom

- A similar program was launched for Network

Per-data centre initiatives

Current and foreseen energy saving levers

- Less energy for hosting
  - Current: Free cooling for new DataCenters and some refitted
  - Consolidation on newest technologies
  - Anticipation: **Submersion cooling,** 400 VDC
  - Research: “Follow the sun” micro data centres: IS is not ready yet for it.

- More processing power to the watt
  - Current: Removal of unused & obsolete equipment
  - Anticipation: 400 VDC
  - Research: Expected new techniques for IT equipment

- Better use of processing power
  - Current: Virtualization & cloud
  - Anticipation: **Low power modes**

- Fewer needs for IT processing power
  - Current: prune useless functions & consolidate scarcely used functions
  - Anticipation: Eco-Design

Less energy for hosting: Normandie DataCenter

- Room for 4 buildings, each able to host 10 MW,
  - 1 half building in operations, other half commissioned end of year 2014.
  - Target yearly PUE: 1,3
    - 85% total free cooling; 10% mixed recycling; 5% total recycling
  - Recycles heat for office heating, 50KW heat pump, plant wall
  - No ROI for solar panels (room still available on roofs)

Sustainability in Normandie DataCenter

- **Pollution-aware technical equipment**
  - Substitution of glycol in cooling systems
  - Limitation of number of batteries
  - Dry transformers
  - Refrigerant fluids without greenhouse effect
  - Non-polluting firefighting systems
  - Cooling system with low water consumption (chillers & humidifiers)
  - Retention containers wherever polluting products are used

- **Pollution-aware operations**
  - Responsible works
  - Pollution-free unloading area
  - Systematic retention of products in all storage areas

- **Energy efficient and modular technical equipment**
  - Power distribution system
  - Breakthrough air cooling system with low water consumption
  - Confinement, variable speeds, extended climatic ranges…

- **Low power lighting** of hosting rooms, common areas, office spaces, exterior spaces (except security), autonomous safety lighting blocks
  - using presence sensors and automatic timers whenever applicable

- **Energy efficient buildings**
  - HQE certification of offices (DC building to come, standard not defined yet)
  - Insulation of windows
  - Orientation of buildings

- **Energy reuse:** Office warming reusing heat from hosting rooms using heat pump

- **Local production of renewable energy:** able to implement solar energy (no ROI so far)

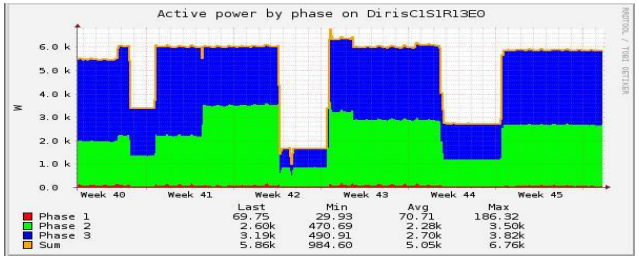
- **Local landscaping project**
  - Take care of existing biodiversity
  - Plant wall

IT Anticipation: Submersion cooling

- A prototype lent by *Green Revolution Cooling* Company was aimed at studying implementation conditions and performance of a cooling solution where servers were immersed in an oil loop.

- The experiment has been run in the Orange data centre near Nice. Servers were stripped off their fans and dipped into oil. Deep analyses of the technology behaviour were run and operability was controlled.

Observed performances were quite remarkable (*Phase 1 : Cooling ; Phases 2&3 : Servers*)



- **Benefits:** smaller primary power installations less depending on the yearly climate changes.
- **Caveats:** Does not apply to all kinds of IT components.
- **Next steps:** written support of the technology by IT component vendors. Validation of working conditions where the oil temperature can reach 50°C.
- **Still ongoing:** Studies on long term impact of the use of oil.

IT Anticipation:
Low power modes

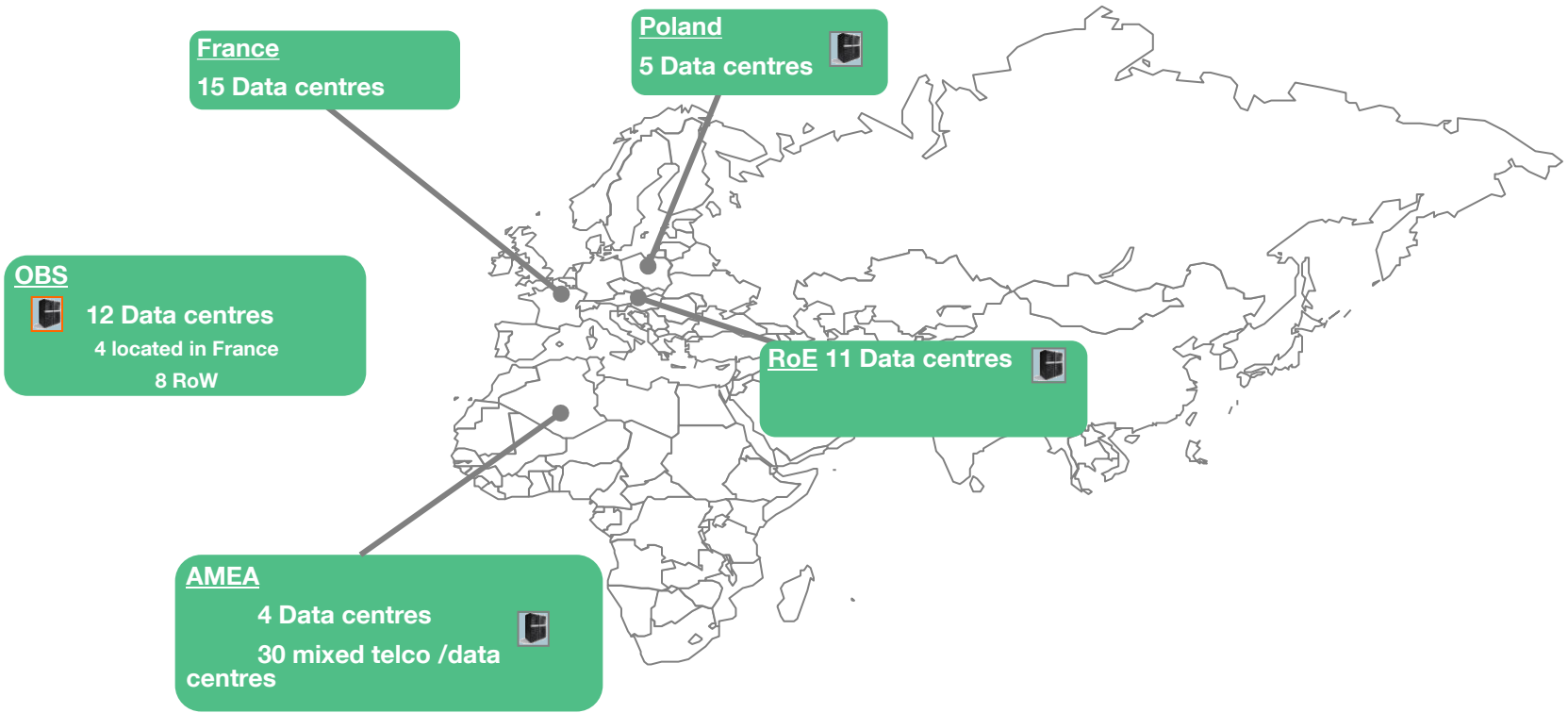
- The next major step in energy reduction is decrease of the need for power by IT.
  We wish an unused equipment consumes nothing.
- Approaches:
  - **By equipment itself** : current servers have power needs varying from 1 to 4 from idle to full use, this gap is increasing. **We do believe this is the future.**
  - **By IT Tools** to shut & restart IT equipment (Cisco, VMware…)
    - Mostly servers and workstations only today
    - Management of other kind of data centre equipment is less usual.
- Expected savings: 10% of IT energy consumption when applied to servers
  - Taking into account service platforms as well as traditional IS requirements
  - Note: Same savings may be expected from other kinds of IT equipment (fewer solutions available today)
- Expected impacts:
  - Energy consumption by IT load will become more and more variable
    - **Technical equipment will have to adapt to variable charges.**

Consolidation initiatives

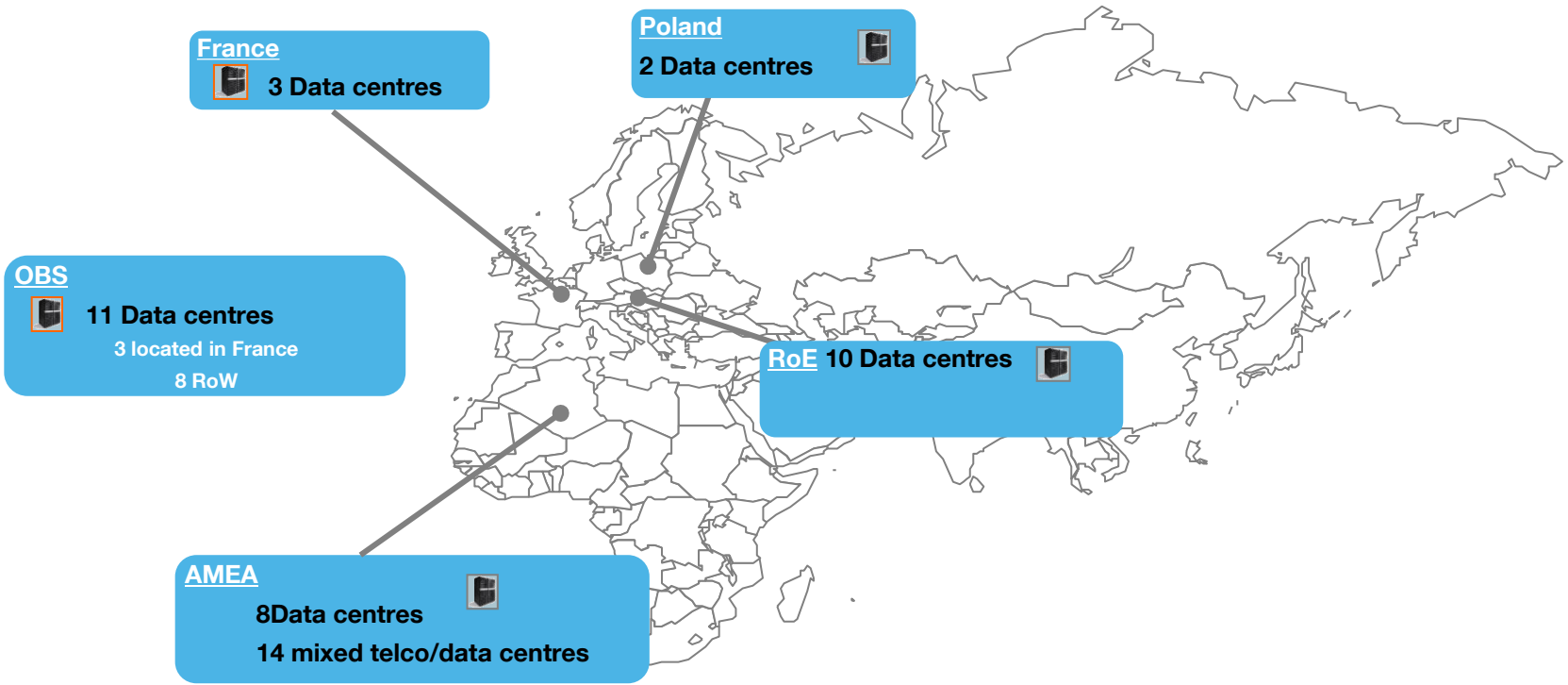
DataCenter consolidation program

- Group:
  - Use of centralized cloud for all telco affiliates & OBS.
    - Currently based on two European hubs
- France: Reduction from 18 DataCenters to 6 (3 Corporate, 3 business).
  - 1 new DataCenter, **Normandie**, Orange flagship DataCenter
  - Phase 1: 5 existing DataCenters remain
  - Phase next: Another Normandie will be built and some other data centres will be decommissioned.
- Africa: Two countries host centralized applications
- All new Data Centres have energy efficiency goals and replace a number of older non-efficient ones.

Orange Group in 2013…
around 77 DataCentres…



Orange Group in 2020…
around 54 DataCentres…



Conclusion

A way to more sustainable DataCentres

- Energy Reuse:
  - Implemented in some data centres, considered for all new data centres.
- Locally produced renewable energy:
  - Implemented today only in some network sites, and for non-essential data centre functions
  - **Note:** Use of renewable energy is not a substitute to reduction of energy consumption
- Expectations for IT vendors:
  - On Information Technology equipment:
    - **Support 400VDC**
    - **Support 20°C ambient as well as 35°C with no consumption increase**
    - Do nothing, consumes nothing
    - Support submersion cooling
  - On Technical Environment equipment
    - **Support 400 VDC**
    - on-demand power and cooling
  - On OS developments
    - **Support of deepest sleep modes**
  - On application development
    - **Eco-Design together with energy ratings of applications**
    - Active/Active multi sites design for the most critical applications
    - Rationalize functionalities across applications.

Thank you.
Questions ?