Power & Energy efficiency in EPs DCs

Agenda

- Power vs Energy- Efficiency?
- Who we are: DC management in EP
- Measures for power and energy efficiency
- Case studies
- Our efficiency plan

Power vs Energy- Efficiency?

- Power: rate of doing work, in Watt (W)
- Energy: total amount of work done, in Watt-hour (Wh)
- Efficiency: usefully used / the total input
- Metrics:

- DCiE = IT Equipment Power/Total Facility Power x 100%
- PUE = Total Data Center Source Energy/ IT Source Energy
- GEC = Green energy used by the data center/ Total Data Center Source Energy
- ...

Who we are: DC management in EP

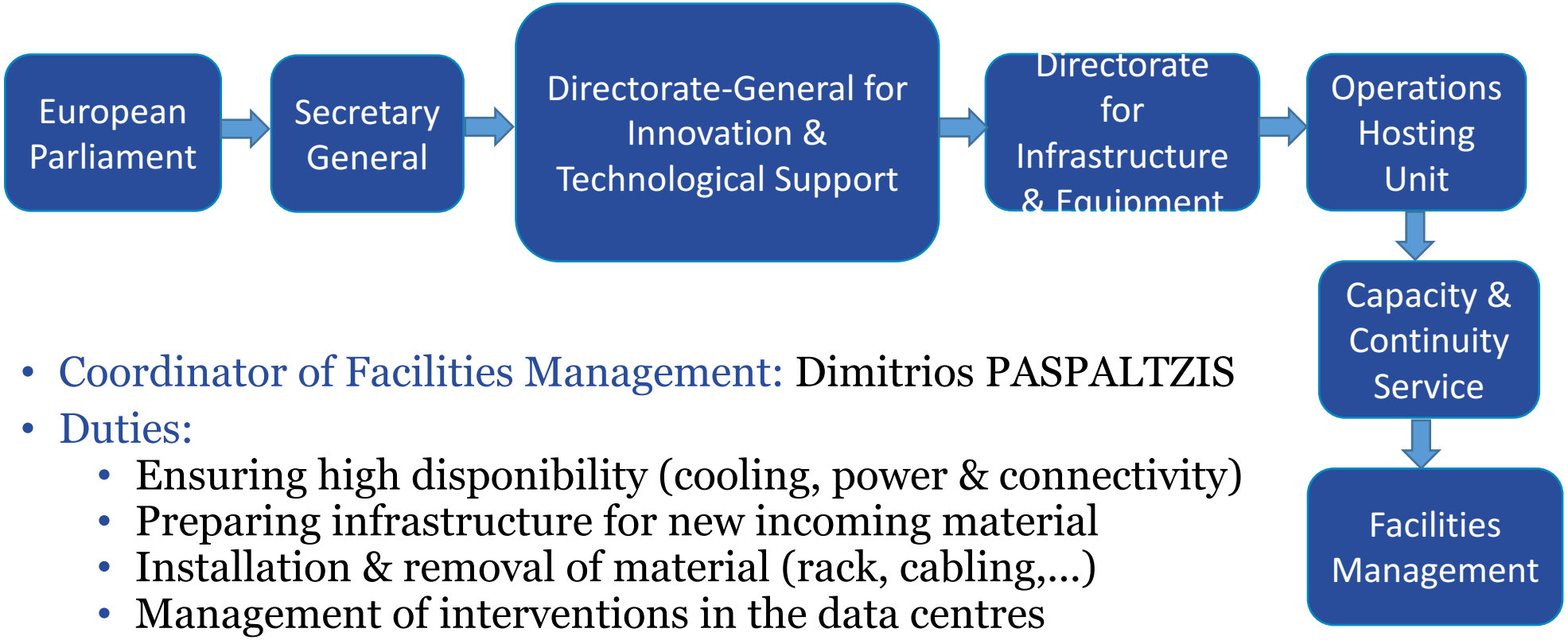
- Head of the Operations & Hosting Unit: Rafael RUIZ DE LA TORRE
- A team of 30 officials and 100 external consultants: Network, Servers: Unix & Windows, Storage: SAN, NAS, Backup, Virtualisation, Testing, Tools
- Offers the EP:

- ICT infrastructure and

- information systems running on it

Always!

Who we are: DC management in EP



- Coordinator of Facilities Management: Dimitrios PASPALTZIS
- Duties:
  - Ensuring high disponibility (cooling, power & connectivity)
  - Preparing infrastructure for new incoming material
  - Installation & removal of material (rack, cabling,…)
  - Management of interventions in the data centres
  - DC asset management
  - Security access management
  - Capacity reporting (consumption, space,…)
  - What is missing?

Measures for power and energy efficiency

The OPERATIONS unit is implementing policies and measures that reduce the global environmental impact of the European Parliament ICT infrastructure:

- Follow best practices- quick wins
- Consolidation of infrastructure in professional data Centres
- Acceleration of decommissioning procedures
- Virtualisation of servers
- Renewal of IT servers with more energy-efficient ones
- Use of renewable energy
- Regular contributions to EP EMAS programme
- Raising awareness

Follow best practices- quick wins

Cooling:

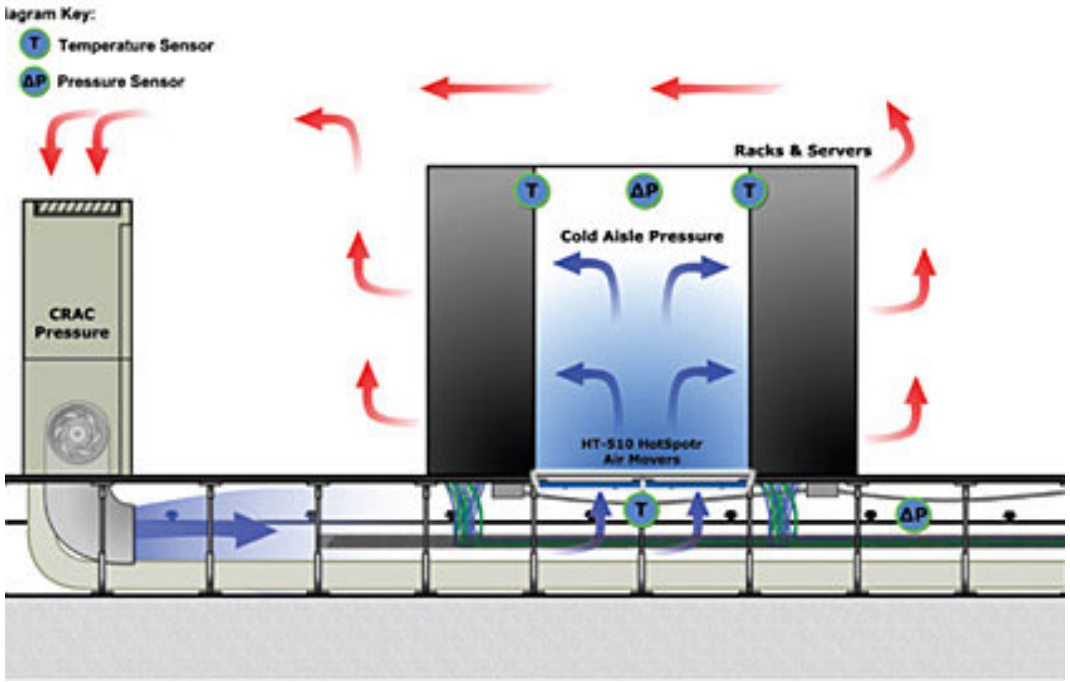
- Air Flow Management and Design:

Design – Hot / Cold aisle

Rack air flow management – Blanking Plates

Raised floor air flow management

- Cooling Management: Review of cooling before IT equipment changes



Other Data Centre Equipment:

- Office and Storage Spaces: Turn off Lights

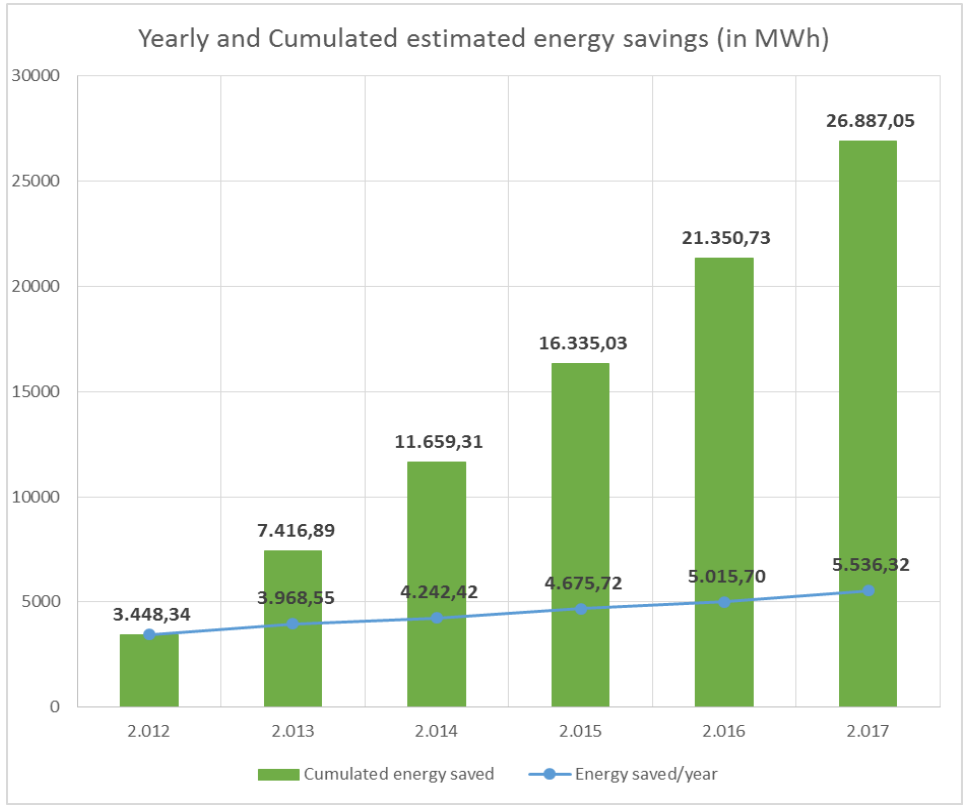
Monitoring:

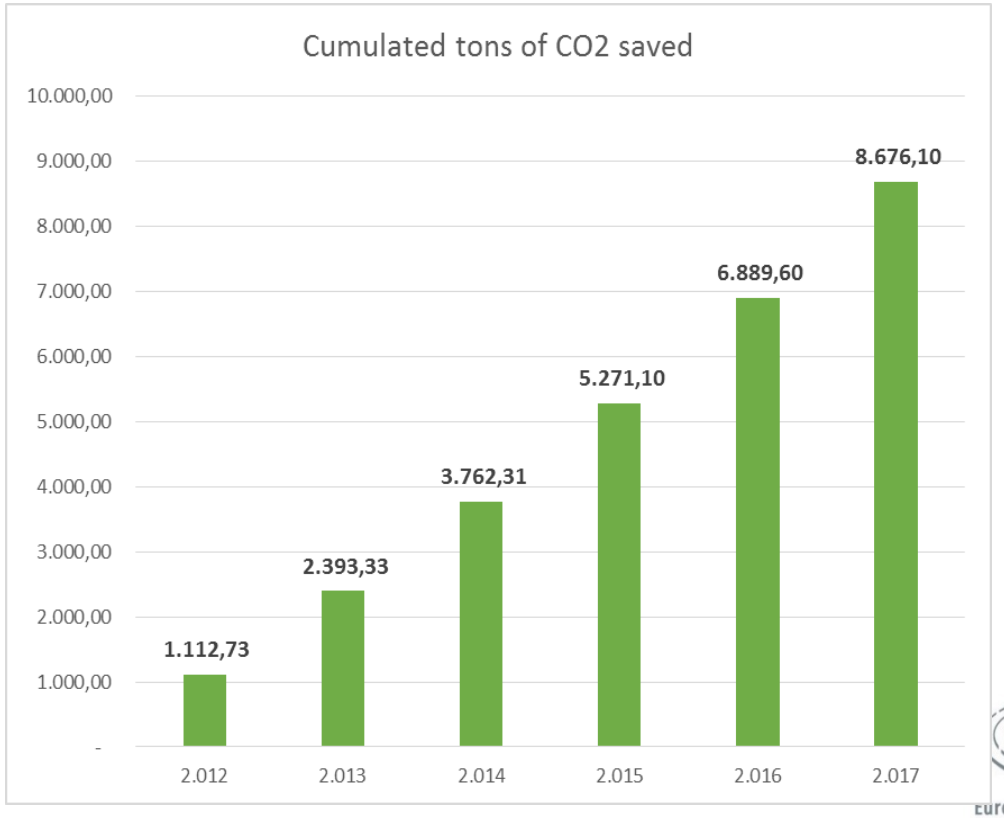
- Energy Use and Environmental Measurement: Incoming energy consumption meter, IT Energy consumption meter, Room level metering of air temperature and humidity, CRAC / CRAH unit level metering of supply or return air temperature

- Energy Use and Environmental Reporting: Written report

Measures for power and energy efficiency (more analytically)

- Data centre consolidation (& server renewal) => Cumulated reduction by 26.887 MWh and by 8.676 Tons of CO2.
- In 10 years we had consolidated from 22 computer rooms into 3 main DCs, hosting 96% of the total infrastructure.
- PUEs between 2,5 and 3,5 to PUEs between 1,6 and 2.





Measures for power and energy efficiency

- Acceleration of decommissioning (2 months faster) => Reduction of 504MWh and 163 Tons of CO2.

>1,000 IT equipment removed from the DCs with an average of 350 Watts of power consumption each.

- energy savings by removing fast the old high power equipment

- Corporate Social Responsibility by donating to OXFAM functional equipment

- We raise awareness also to people outside our Unit by actions like publishing articles (e.g. the article “Did you know emails also have a carbon footprint?”) or analyses concerning mostly energy efficiency and power consumption of components of the IT infrastructure such as the WIFI Infrastructure, incidents of massive email exchange and email footprint.

Measures for power and energy efficiency

Follow the latest tendencies and recommendations to the design and operation of our DCs. Most effective are the following:

- Virtualization: From physical to virtual servers to approximately 100%. Reduction of the power consumption >20%
- Replacement of old high power demanding IT equipment with new more power efficient, increasing the ratio of CPU speed per kW.

E.g., at the transition from the old email infrastructure to the new one OPERATIONS achieved 65% reduction of the carbon footprint for the email traffic and 75% reduction for the email backup and storage with the previous email migration.

The continuous renewal of infrastructure has resulted in a general reduction of the total power consumption of 10%, enhancing at the same time the infrastructure by adding 20% more servers (to fulfil growing demands) and multiplying the overall computing power by 2,5 times

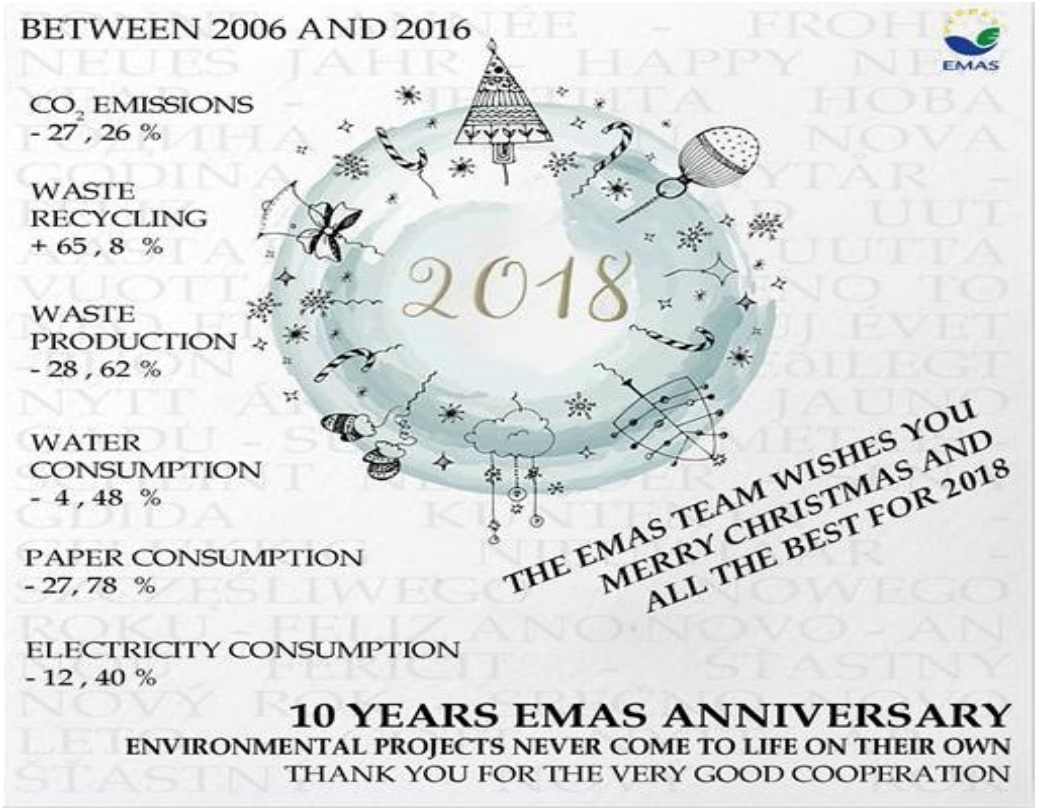
- Use of renewable energy: in both main DCs, 100% of the electrical energy used comes from renewable energy sources

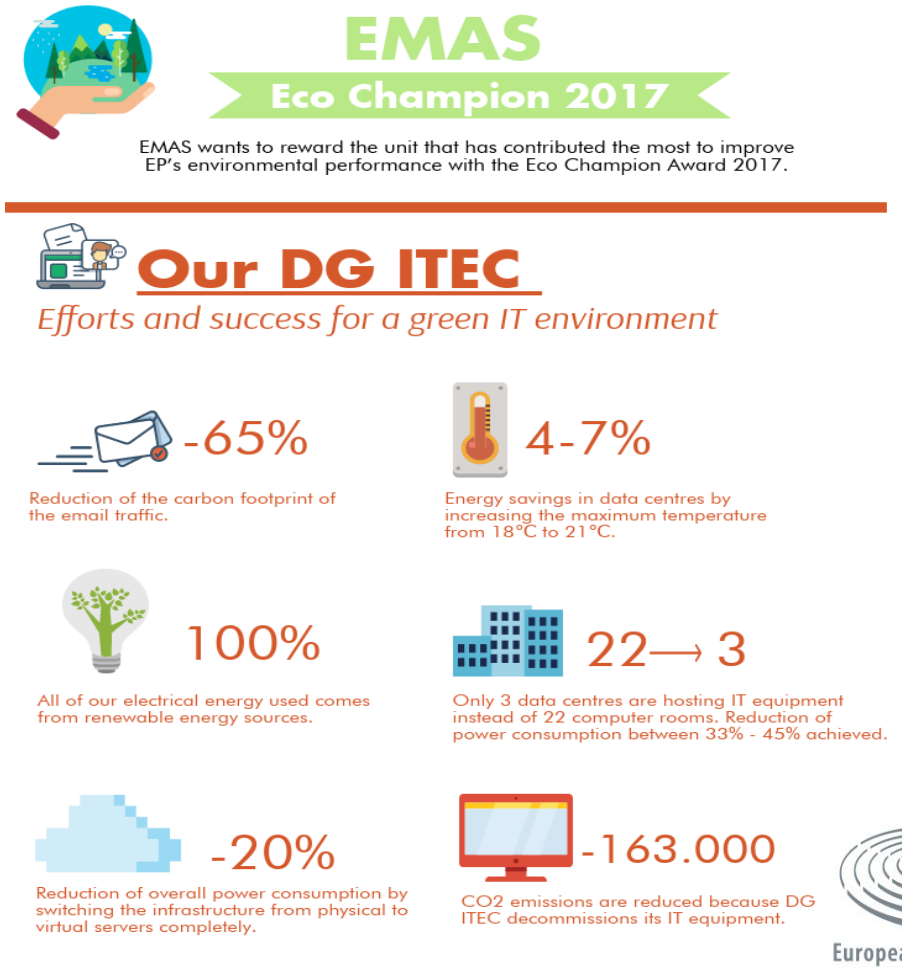
Measures for power and energy efficiency

- Involvement in EMAS yearly action plans.

EMAS: Eco-Management and Audit Scheme: tool to help organisations reduce their impact on the environment.

The Parliament is committed to reducing its carbon footprint by 30% by 2020.





Measures for power and energy efficiency

- Involvement in EMAS yearly action plans.

More specifically:

- Conducting energy audits and examining compliance of our main data centres with the European Conduct of Conduct. One DC is already compliant (participant) and the other one will be by March 2018.

- Studies on servers and other ICT infrastructure: Detailed study on emailing and servers CO2 production and determination of best actions to reduce it Extend the exercise done for emailing and CO2 to other ICT infrastructures (storage, applications in production, network etc.)

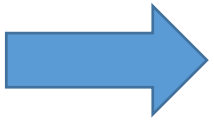
case studies

Facilities
Exchange assets inventory extraction
Create categories (servers, backup, storage,others)
Power consumption estimation
Network power consumption average
Datacenter PUE
=> *Total Facilities power consumption for*
- Exchange 2003
- Exchange transition period
- Exchange 2010

Mail
Number of Messages for 2012
Total volume traffic for 2012
Number of mailboxes
Average size of mailboxes
=> *Mail size average*
=> *Total storage size*
=> *Mail sent average*

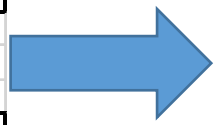
EMAS
CO^2e/kWh coefficient for Belgium and Luxembourg

All Teams
PCF (use excluded) for:
kg CO^2e per asset (EMAS)
kg CO^2e per HDD (EMAS)
Numbers of Assets/HDD (Facilities/Mail)



Traffic statistics
Power consumption by MB sent
Volume sent by KiloWatt
Volume sent by Watt
=> *Footprint (g CO^2e) for one mail*

Storage/Backup statistics
Power Consumption by Mailbox by year
Power Consumption by GB
=> *Annual Footprint for one mailbox*



Global Statistics
Footprint calculation for a usual user
Footprint calculation for a greedy user
Comparison with a efficient car

- Methodology for the email studies

European Parliament

case studies

- Did you know emails also have a carbon footprint?

- The annual footprint of the average user (35,96 kg/ CO_2e per year) corresponds to driving a typical car for 225 km per year (a typical car consumes 160g /km),

- The average user has approximately 2 GB of information in his primary mailbox and other 2 GB in his archive. It takes 37 kg of CO2/year to store 1 GB.

- Concerning the email traffic, the footprint of sending an email of 1 MB is 1,84 g CO_2e. The footprint to store this email in your mailbox for one year is 6,2g CO_2e.

- New email infrastructure affected the carbon footprint of email traffic: average size of a message has increased, the footprint to send it has decreased by 64%. The traffic volume per kWh has increased more than 3 times.

- Although average size of a mailbox has increased 6 times, the footprint for storage and traffic practically remained the same. Storage efficiency: for 1 GB of storage we now consume 6 times less energy

case studies

- “X incident" email storm; repercussions & Luxembourg to Cape Town!

- Spamming has a drastic effect on the environment by increasing email storage costs (not the traffic).

- The retention policy - too many users kept this e-mail in their inbox without deleting it, occupying 0,1% of the total storage used for e-mail.

- Before the new policy, these e-mails would have remained in the inbox and would have been archived, forever

- The storage resources used were 16 times the resources used by the average user for 1 year!

- Thanks to the retention policy these e-mails were kept only for 3 months, reducing the CO2 emissions produced from these incidents by 75% in the first year and 100% for the following years

- Environmental impact of this incident: driving an average car for 2,700 km which is like driving from Luxembourg to Athens

- Prior to the implementation of the new policy, this could have been as much as 14,000 km, like driving from Luxembourg to Cape Town

case studies

- So please, don’t send emails to more recipients than necessary and delete them regularly!
- **Don’t forget to:**

- Check regularly your mailbox size

- Delete your obsolete emails regularly

- Delete heavy attachments quickly

- Send links instead of heavy attachments

Our energy efficiency plan

Based on the latest tendencies and recommendations regarding the design and operation of DCs we have compiled our energy efficiency plan for the next years:

- Cloud computing: analysis of cloud computing possibilities
- Proposing and implementing best practices at our new DC such as use of cold containments, airflow optimization. The heat from the room will be used to warm the building.
- We are reviewing our cooling policy. We have already increased the maximum temperature in one DC from 18 °C to 21°C. The other DC will follow. We will test the infrastructure gradually by increasing slowly each time by 0,5 °C until we reach 27 °C. Every degree of increase in the Recommended Temperature Set Point can result in additional 4% to 7% energy savings in the Data Center
- Use of modern tools for the management and simulation of the DC. Proposal for new DCIM tool and a CFD analysis tool for the optimization of the airflow and cooling: holistic view of the data centre, ranging from the rack to the cooling infrastructure and energy utilization.

Questions ?

Thank you...

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