Data-Centres i Energia

Data-Centers
(Centres de Processament de Dades)

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Introducció

"Els serveis TIC generen un 10% de les emissions de CO2 (mitjançant el consum elèctric).

Les companyies de CPDs intenten obtenir aquesta energia de fonts renovables"

Introduction

- ICT companies have realized the impact of DCs
  - Those who can are going “green”
    - Reduce their DC’s carbon footprint
    - … using only green energy
  - Solar/Wind-powered DCs
    - Green power-plants next to the Data-Center
    - “Consume” green energy from the grid
  - Companies like Google, Facebook, Intel, Microsoft…

Green Data-Centers

- Power Consumption
  - Energy for machines
    - High-Performance machines → high consumption (~240 watt x hour)
    - Low-Power machines → low power (~35 watt x hour) but low performance
  - Additional components
    - Routers/switches, PDUs/SAIs, …
    - Air Conditioning → 30% of power overhead!
  - "Power usage Effectiveness" (PUE)
    - Ratio of efficiency
    - Optimal centers mean $PUE = 1.0$
    - AC + other components can go $PUE = 1.6$

$$PUE = \frac{Total\ Facility\ Power}{IT\ Equipment\ Power}$$

Housing Green Data-Centers

- Construction of (Auto-generated) Green DCs
  - Find the best location
    - High insolation (solar power) or Moderate Wind (wind power)
    - Low price of land
    - Connection to cities, highways and Internet
  - Dimension the DC (in terms of power)
    - How many machines? How much they will consume?
    - How is the AC system? Add overhead!
  - Connection to the Grid
    - Get brown energy when Green is not enough
    - What about batteries?
      - They can be prohibitive!
      - What if there's not enough to fill them?

Housing Green Data-Centers

- Solar-Panel Data-Centers
  - Need high irradiation (~1kW/m^2 in STC)
    - Places with maximum insolation have high temperatures (↑AC)
    - Places with low temperatures don't have much irradiation (↓Power)

- Wind-Turbine Data-centers
  - Need wind speeds between 15m/s and 25m/s
    - Windy places have higher speeds
    - Non windy places are not enough

- https://en.wikipedia.org/wiki/Solar_cell_efficiency
- https://en.wikipedia.org/wiki/Wind_turbine_design

Sessió Pràctica

- Objectius de la Sessió Pràctica:

1. Localització d'un Data-Centre
   - Fer una mica de recerca de llocs on posar un data-centre solar/eòlic
   - Tenir en compte els factors energètics i de comunicació

2. Discutir els costos de construir un Green DC
   - Quins llocs serien bons, i quins inconvenients mostren
   - Quin rendiment tindria un emplaçament solar/eòlic

3. Planejar el pressupost
   - Fer una estimació quan costarien les màquines i "housing"
   - Fer una estimació de quin seria la potència requerida i el sobre-cost en AC
   - Fer una estimació de quan costaria posar una granja solar/eòlica per un DC petit