Internet sustainability ?
Internet for sustainability ?

- Extending approaches: on quality, context, and the human in the loop

euronf
NETWORK OF EXCELLENCE

cost
www.cost804.org
Action IC0804

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How much can we gain? Estimates …

- ## Sustainable, green ICT
  - About 10 % of energy consumed by ICT
  - PCs (Gartner 2009: 30% of ICT energy use generated by PCs and peripherals); server farms (cooling, under-utilized servers), networks, embedded sys. etc.
  - Expected growth for ubiquitous broadband networks (Internet): LTE & 4G

- ## Using ICT
  - To manage and control the "smart grid"
  - To influence human behavior …
  - →To influence about 90% of the bill!

  kasamaproject.org

- ## Ongoing networking trends might cause some change: IoT, smart homes/cities, SaaS, etc.

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ICT/Internet sustainability – a **paradigm shift**

- Include energy → new **performance measures and modeling**
  - Watt, kWh, Joule/bit; accurate (software?), comparable measures, measure at application level (e.g. mobile apps); benchmarks; e.g., Green500's best (11/2010): IBM BlueGene/Q1684 MFLOPS/watt

- Perspective change: load balancing? → **consolidation of resources** (virtualization, migration); power save/off; algorithms

- **Disruptive ways of thinking**: decrease network coverage / connectivity, new QoE (Quality of Experience) - tradeoff

- Including **context (reactive/proactive)**
  - Environmental awareness (weather), current and predicted mobility and human activity, QoE
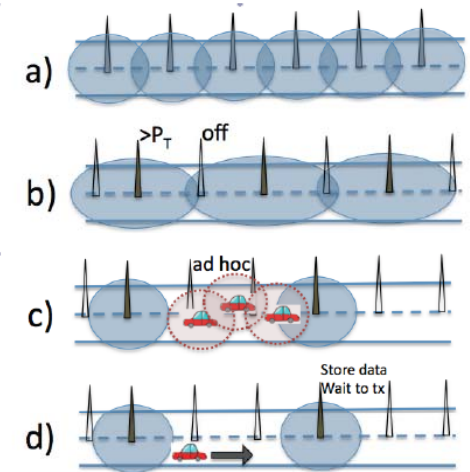

Fig. 3. Use case: the vehicular scenario. All BSs are on (a), EE with increase transmission power (b), EE with ad hoc networking (c), EE with DTN approach (d).

WMI (Euro-NF EEWMI)

[1] Y. Al-Hazmi, K.A. Hummel, M. Meo, H. Meyer, H.de Meer, and D. Remondo. Energy-efficient Wireless Mesh Infrastructures. IEEE Network Magazine, 25(2):32-38, 2011

ICT/Internet for sustainability

- Brussels: ICT4EE (23./24.2. 2011)

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— *Developing systemic metrics to measure progress towards sustainability for the ICT sector and society as a whole*

— *Establishing the centrality ICT to the sustainable smart-city model*

— *Expanding the role of ICT in the future energy market & infrastructures (smart metering and smart grids)*

— *Inducing **behavioural changes and opening sustainable choices** through ICT*

— *Supporting the role of ICT in reducing carbon emissions and energy consumption of freight logistics and transport operations*

— *Building on the potential of ICT for the sustainable management of non-renewable resources*

— *Promoting the importance of training professionals on "ICT and use of energy" in critical sectors*

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ICT ...TO MAKE A CHANGE !!!

Use case: on reducing CO_2 emissions

Ex: BMW 120d (3 doors)
- CO_2: 128 g/km

(www.bmw.com)

Ex: VW Polo Sportline 1.4 TDI
- CO_2: 119 g/km

(marktcheck.greenpeace.at)

Translate emission per km in emission per unit of time

Parking search times: 3.3 min (Grenoble), 11.8 min (Lyon), 10 min (Paris, commerce district) [1]

→ Reducing travel times means reducing energy consumption (here, CO_2 emissions),

[1] E. Gantelet, and A. Lefauconnier. The Time Looking for a Parking Space: Strategies, Associated Nuisances and Stakes of Parking Space Management in France. In European Transport Conference (ETC '06), ATC 2006

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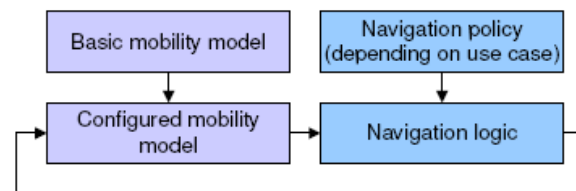
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Concluding: position

1) ## Sustainable Internet

  — Disruptive thinking: modeling trade-off and study effects (QoE)

  — Context-aware thinking (self-adaptive to demands/environment, mobility-aware, etc.)
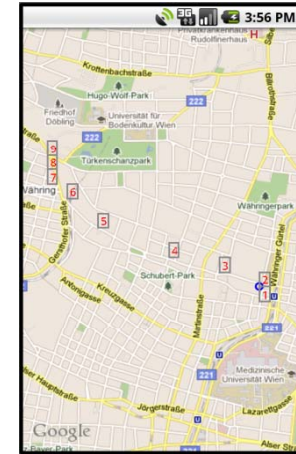
2) ## ICT/Internet for sustainability

  — Assure that the aims are achieved

  — Modeling a complex socio-technical system - e.g., feedback loop of mobility

  — Interdisciplinary – to understand the human in the loop

Approach of Euro-NF MOPPNET

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