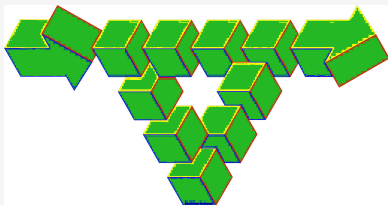


Ctrl-A turns Green:
How can the team contribute to sober and frugal IT ?
Ctrl-A Seminar, Grenoble

Sophie CERF, Quentin GUILLOTEAU

2021-07-06



Specific impact of IT

A new polluting industry

GHG 2018: 4 % (+6 % per year, x2 / 12 years)

Type	Périmètre	TIC = solution	TIC = problème
1er ordre (directs)	technologie		Cycle de vie des TIC
2e ordre (indirects)	application	Optimisation Substitution	Induction Obsolescence
3e ordre (systémiques)	économie et société	Transition numérique Production et consommation durables	Interdépendance accrue Effets rebond

(Berkhout and Hertin, 2001 ; Hilty, 2008)

From eco-info

Impact of the Team

Negative Impact

- **Buying new machines** → Energy + travel + materials (+ ethics)
- **Trips** → Mandatory ? Trains instead of Planes ? Visio ?
- **Usage of Computing Grids** → e.g. Grid'5000 nodes

Positive Impact

Our Research !

Potential Domains of Interest

High Performance Computing

- Node Power consumption
- Cooling system

↔ Do we always need performance ? (e.g. ARM cluster)

Artificial Intelligence

- Cost of training
- Specific Hardware: GPU, TPU (Tensor Processing Unit)

- Internet of Things
- Streaming video/audio

- Network
- Blockchain: Bitcoin Electricity Consumption

Potential Actuators & Sensors in HPC

Actuators in HPC

- Node Shutdown / Node Hibernation
- Dynamic Voltage and Frequency Scaling (DVFS)
- Adaptive Link Rate
- Energy budget aware scheduling
- Power Capping
- Quantity of jobs/nodes

Sensors in HPC

- Instant power consumption
- CPU power/frequency/temperature
- ...

GreenIT: Where is the catch ?

Consume less energy **but** ...

Potential Concessions

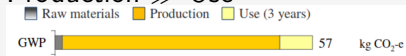
- Same operation takes longer (↔ financially viable for companies ?)
- The installation/maintenance of the solution is costly
- Spectrum of operation too narrow
- ...

↔ How to design a greener solution that **can** be adopted ?

Aside from energy considerations

- Metals and other elements

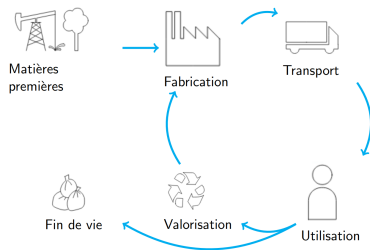
- Production \gg Use



From ecoinfo

- Heat generation, Cooling
- Software eco-design
- Obsolescence
- Usage

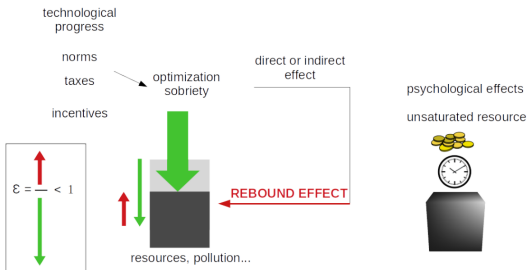
Life Cycle Assessment



From ecoinfo

Rebound Effect

Definition



(source : Jacques Combaz)

Examples

- usage increase
- + users moving to green solutions

Solutions ?

- rethink/influence usages
- degrowth, frugal IT

Green Energy: an ally for the GreenIT ?

The One Million Dollar Question

Should we use Green Energy or reduce energy consumption instead ?
both ?

Some Examples

- VM migration based on the input of green energy in the data center
- DataZero2: off the grid data center
- Opportunistic Scheduling: Delay start of job when spike in green energy

Identify Ctrl-A Collaborations

- Measuring, evaluation
 - Anne-Cecile Orgerie
- Green Energy
 - DataZero(2) Georges Da Costa
 - STEEP ?

Resources

Groups

- GDR GPL GT Logiciel Eco-Responsable
<https://gdr-gpl.cnrs.fr/Groupes/Eco-Resp/Description>
- GDS ÉcolInfo <https://ecoinfo.cnrs.fr/le-gds-ecoinfo/>

Debate Time !

