Gestion et recyclage de l'énergie dans les data centres

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Le ~~(4/4)~~ 3/3 de l'énergie

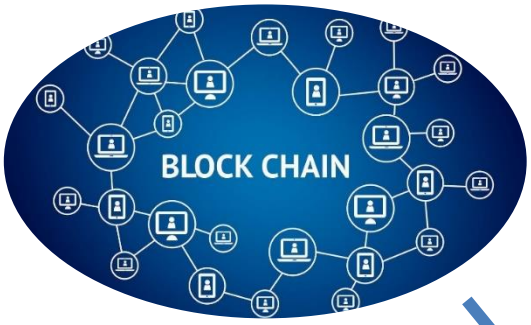
Industrie

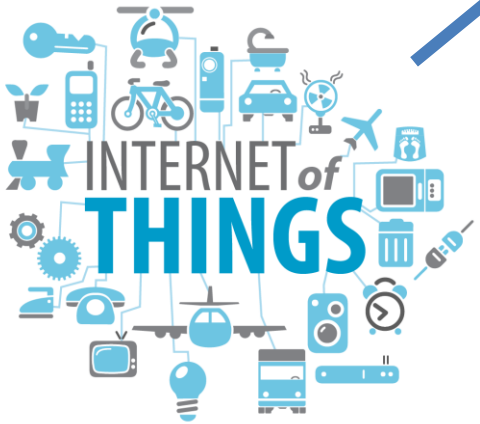
Transport

Services + Résidentiel

x 2 en 40 ans

UCL
Université
catholique
de Louvain





x 3 en 10 ans

L'énergie coûte plus cher que les serveurs dans un data centre

Les data centre en 2016:

- 3% de la consommation mondiale
- 2% des émissions de gaz à effet de serre

= même empreinte carbone que l'industrie aéronautique

416,2 TWh = 1,4 fois la consommation annuelle du Royaume Uni

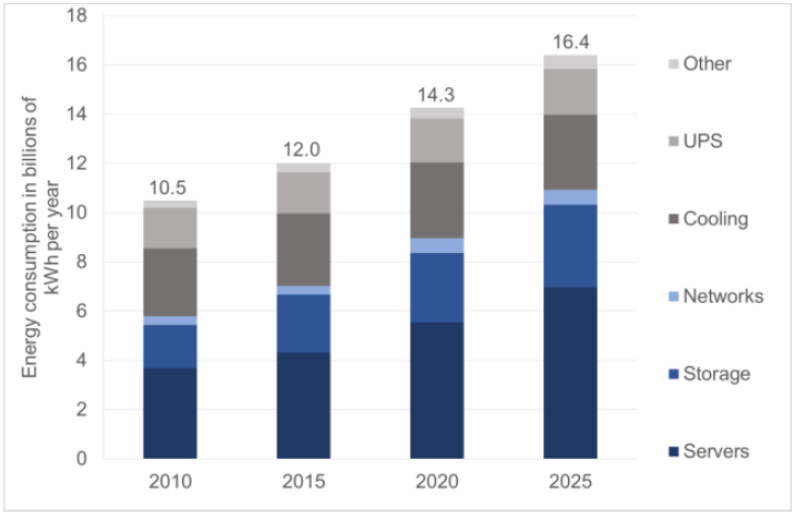
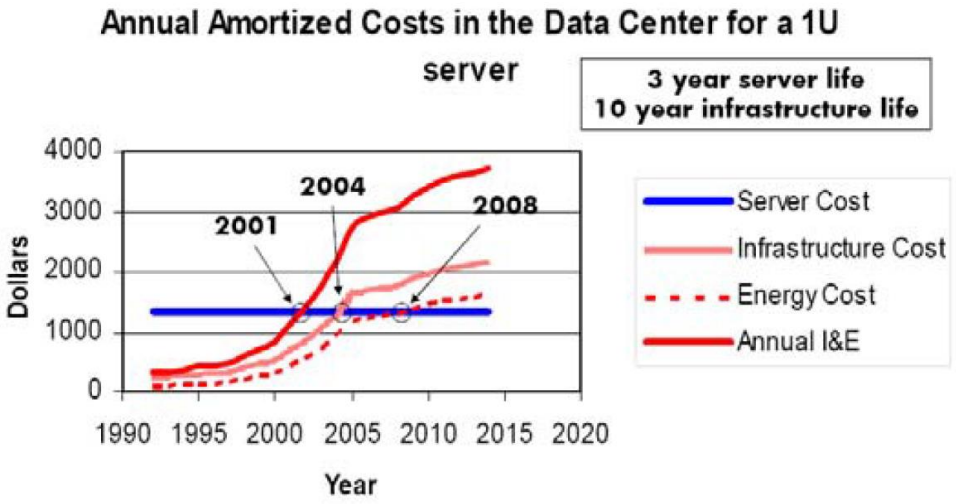
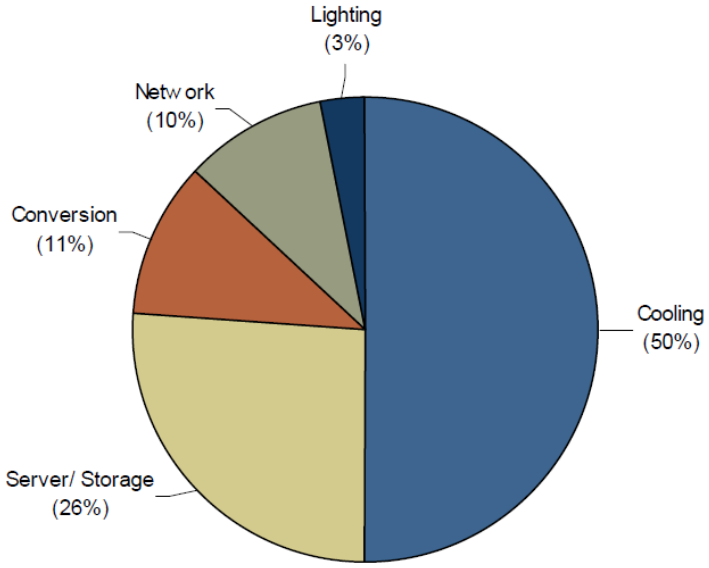
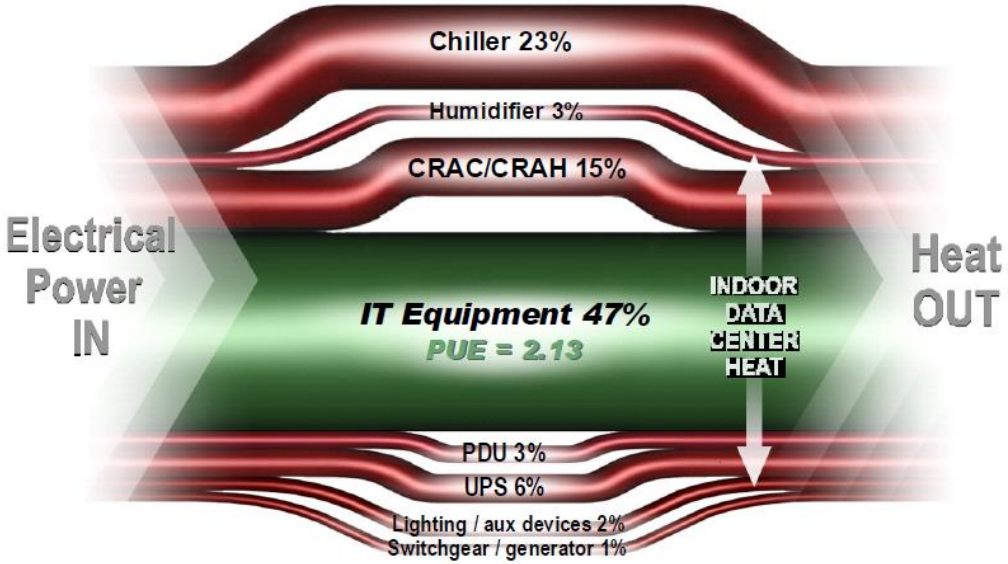


Figure 1: *Energy consumption of servers and data centers in Germany from 2010 to 2015 and forecast to 2025 (Source: BMWi, 2015)*

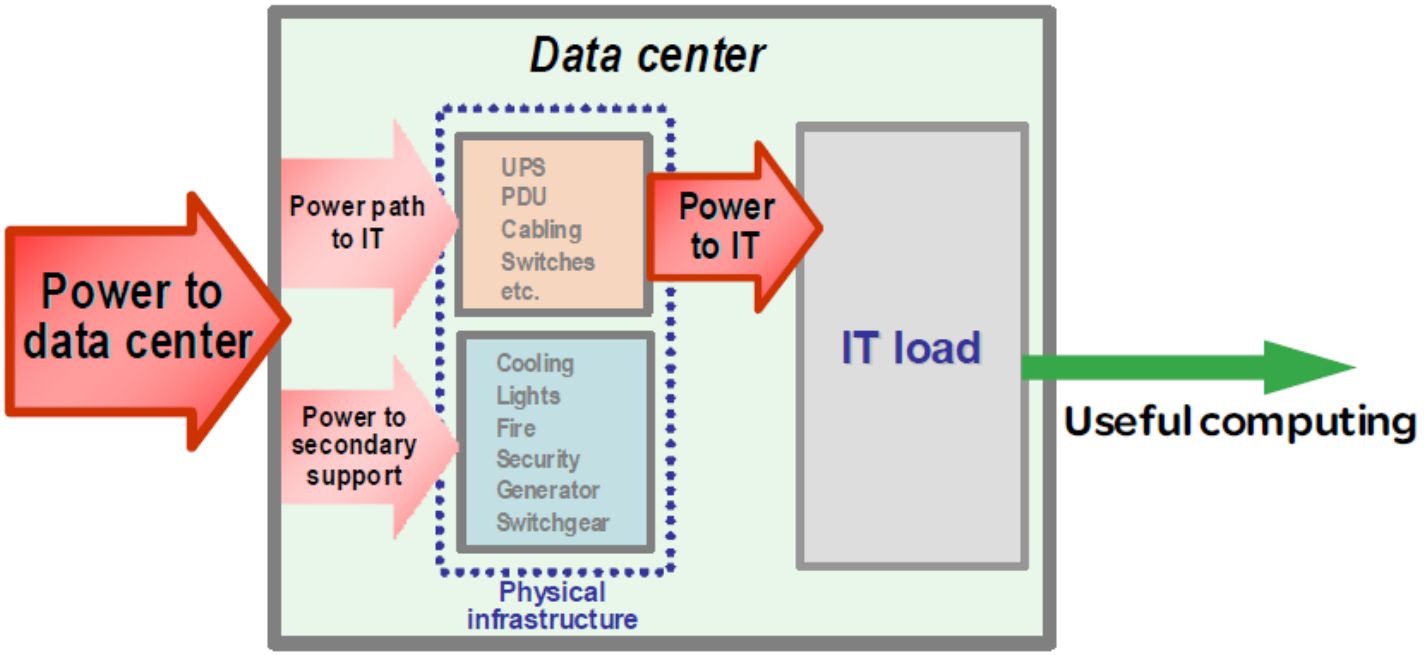


Pourquoi Faut-il refroidir un data center?





Indicateur d'efficacité énergétique



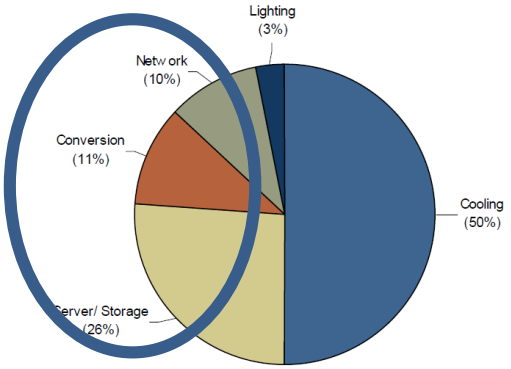
PUE = Power to data center / Power to IT

Power
Usage
Effectiveness

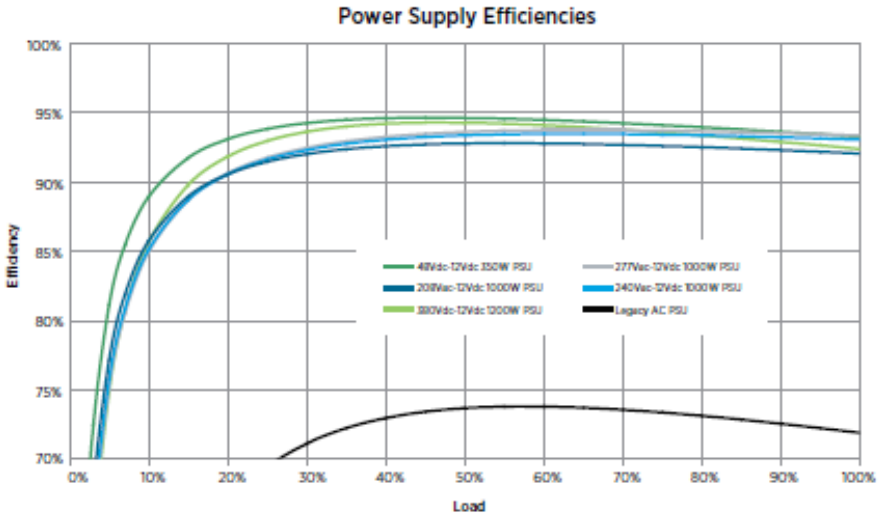
Smaller is better

***1** is perfect*

Comment faire des économies? (1/2)



UPS à haut rendement



Serveurs et systèmes de stockage efficaces

- Processeurs de dernières génération
- SSD vs HDD
- Design et usage rationnel

(Virtualisation, optimisation de la charge,…)

1x 100%

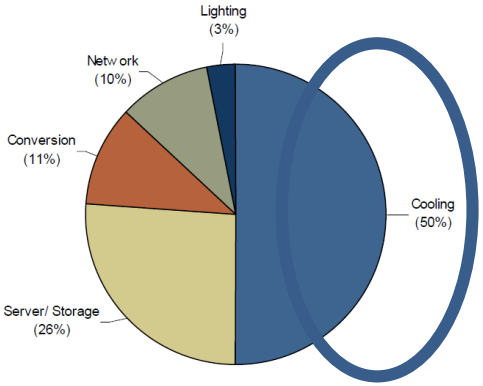
V

<

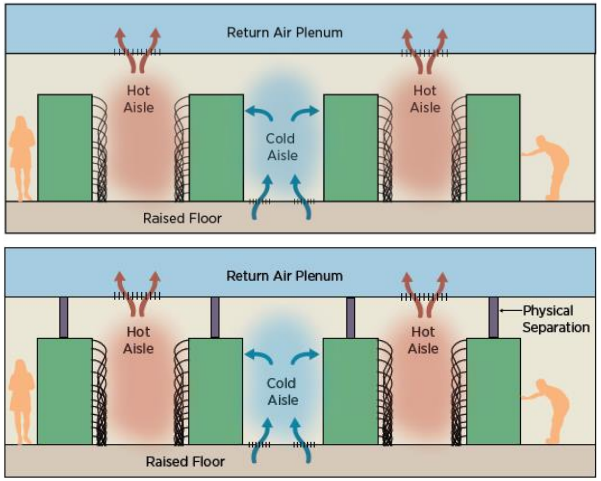
5x 20%

X

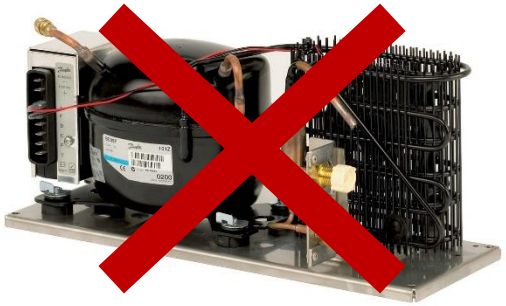
Comment faire des économies? (2/2)



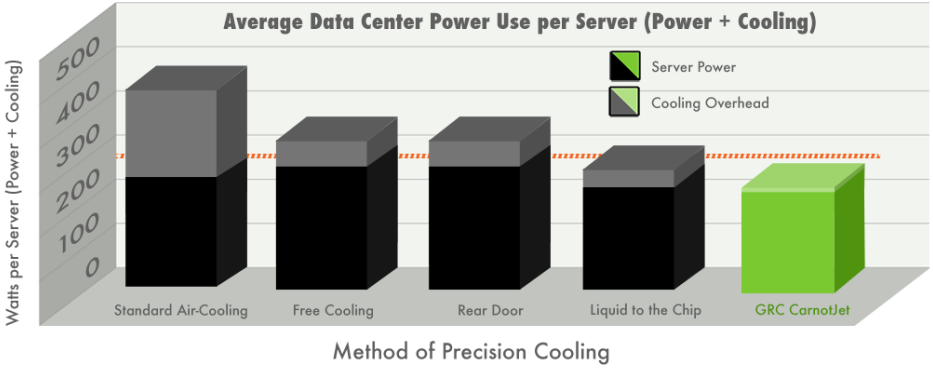
Air Management



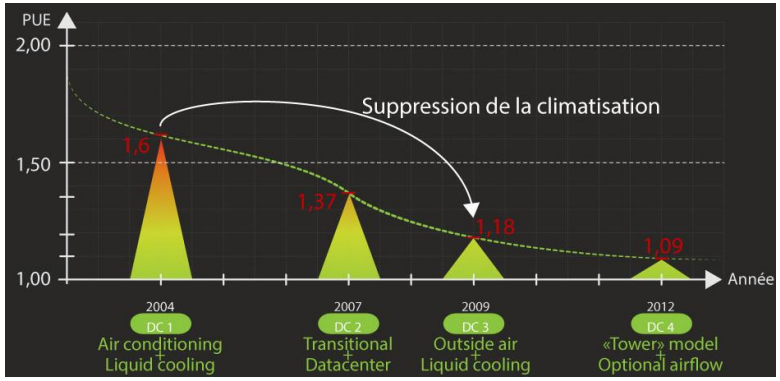
« Free » Cooling



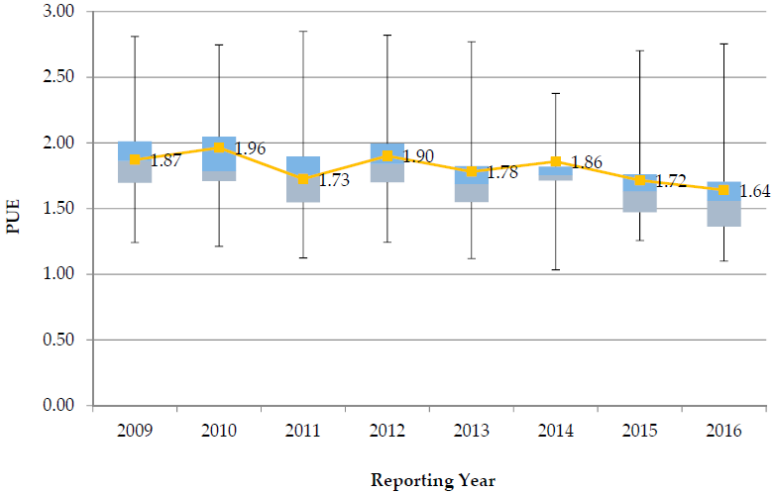
(Immersed) Liquid Cooling

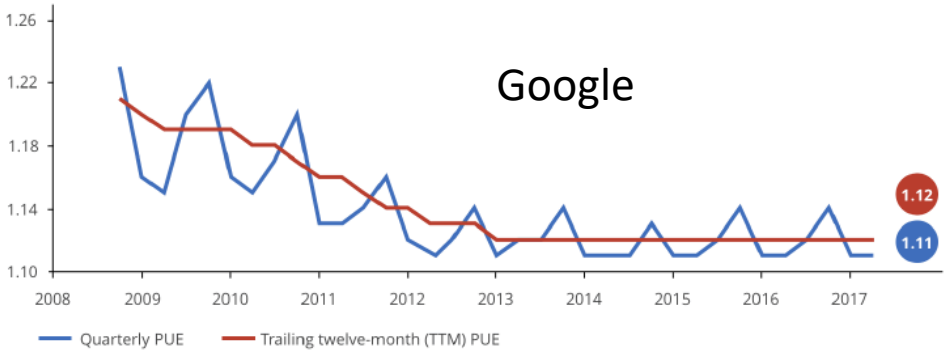


Les data centres optimisés existent, mais la majorité des data centres en europe pourrait faire mieux



OVH





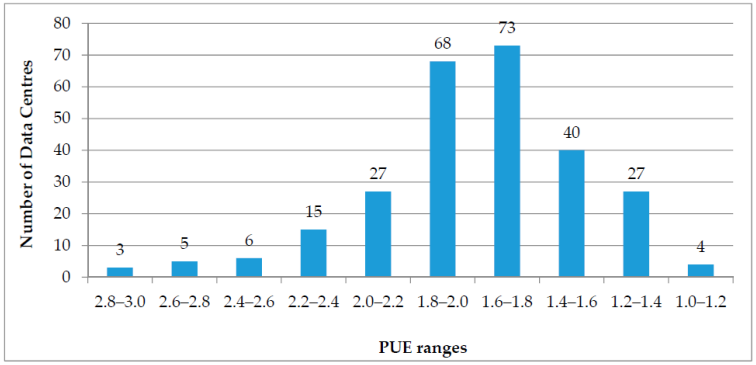


Figure 2. Number of Data Centres per Power Usage Effectiveness (PUE) range.

Avgerinou *et al.* 2017

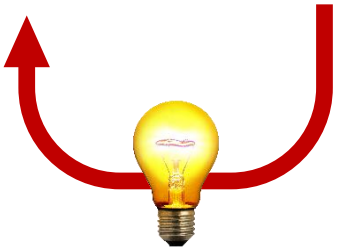
La chaleur perdue peut aussi être utile!

Piscine (CH)

Arboretum (FR)

500 maisons (FIN)

Bureaux (CA)



Conversion
Thermo-électrique?

Qarnot Computing (FR)

η=10%, PBT<5 ans

Conclusion

- L'énergie est un enjeu majeur pour les data centres
- Il y a un fort potentiel d'amélioration des performances en Europe
- Pour l'amélioration des performances énergétiques, on peut jouer sur tous les fronts
- Le système de refroidissement est un composant critique qu'il faut concevoir et gèrer de manière optimale
- La chaleur dégagée par les data centre peut être récupérée
- Les data centre pourront un jour auto-produire une partie de leur énergie

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