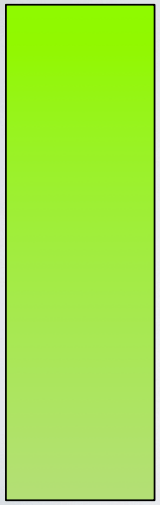
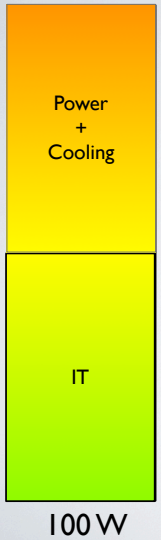
An idle server uses 70-90% of the power required at full load

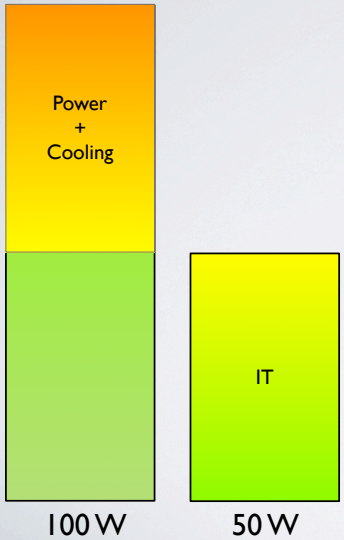
DATA CENTRE LOSSES



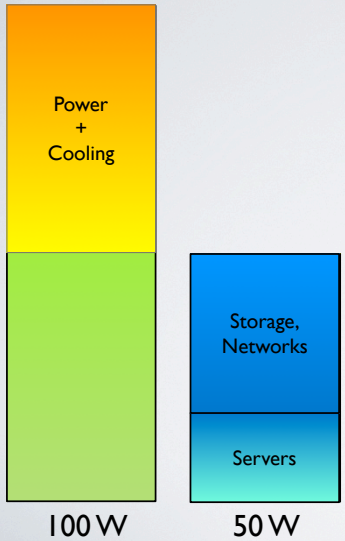
DATA CENTRE LOSSES



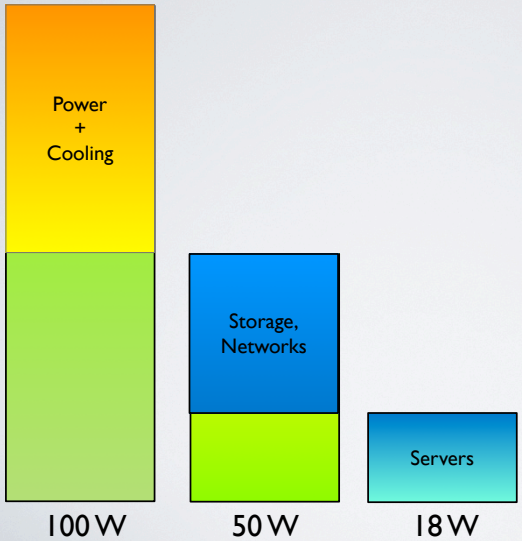
DATA CENTRE LOSSES



DATA CENTRE LOSSES



DATA CENTRE LOSSES



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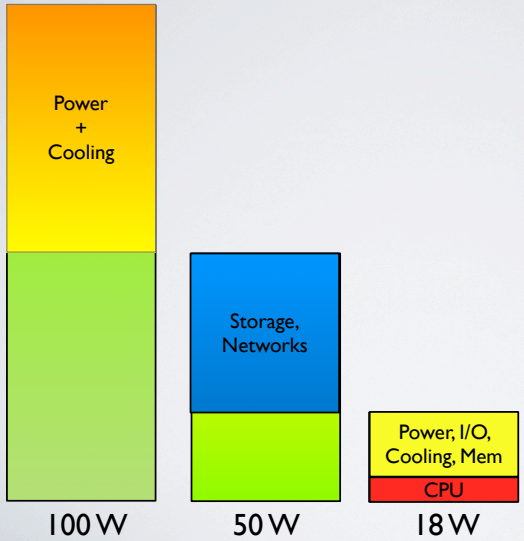
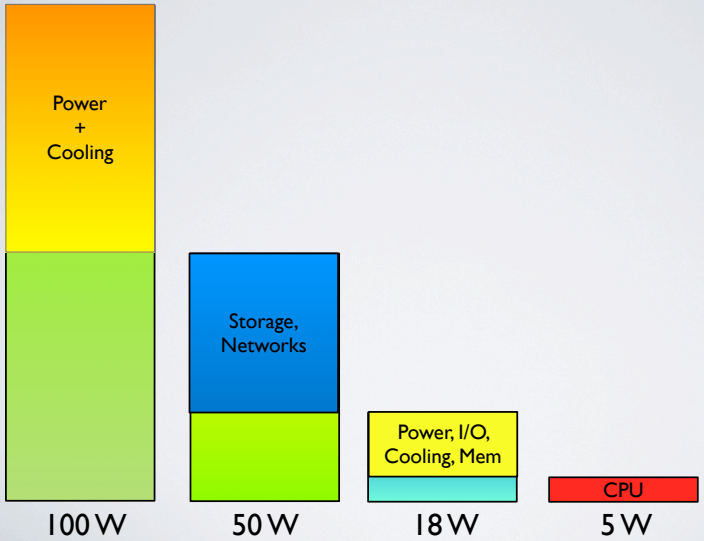


DATA CENTRE LOSSES



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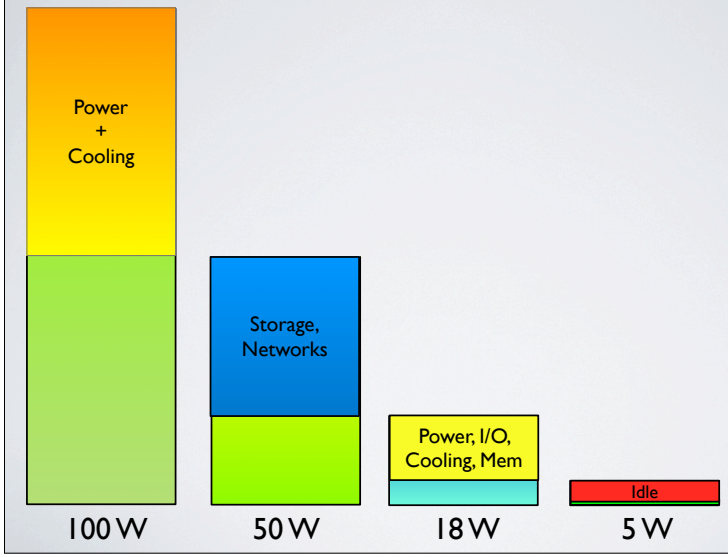

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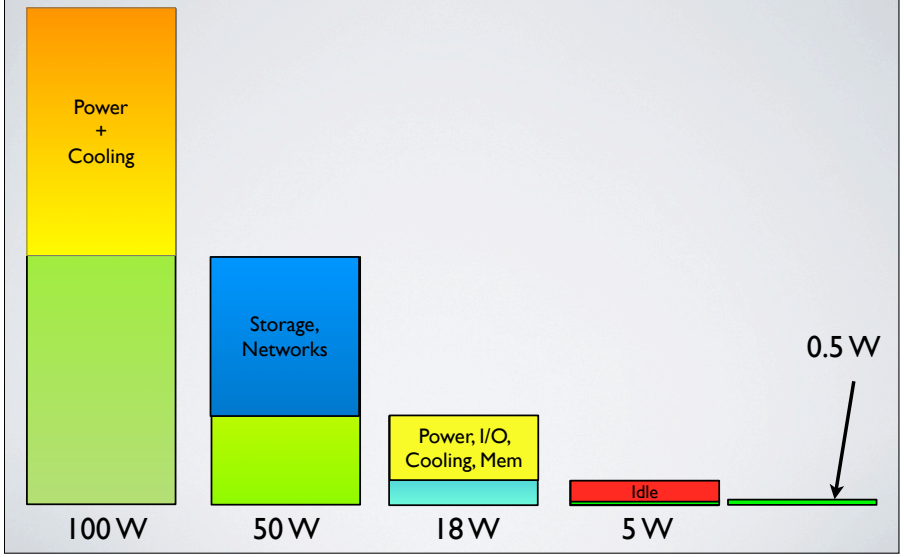

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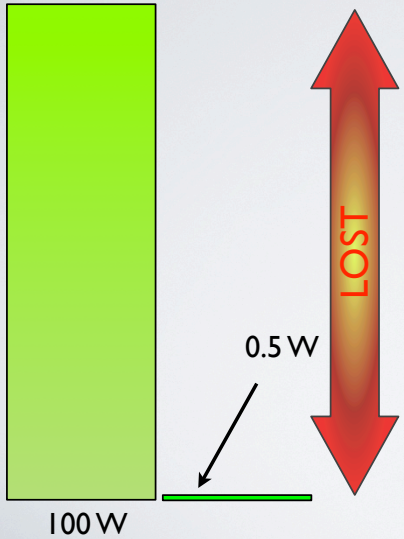


1-5% Efficient

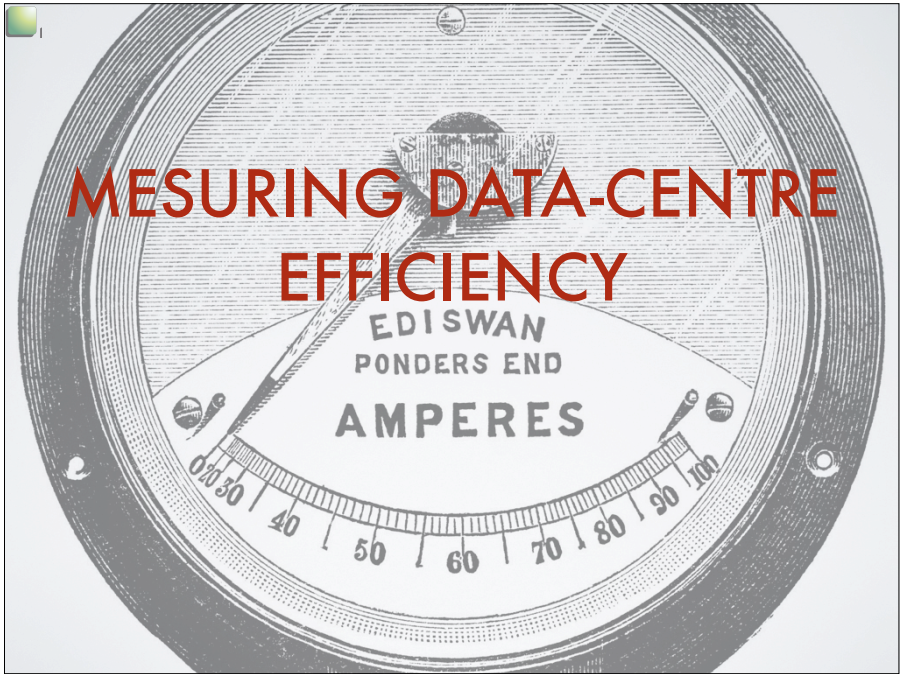
DATA CENTRE EFFICIENCY

10-15% Efficient

DATA CENTRE EFFICIENCY

10-15% Efficient

1-5% Efficient



MESURING DATA-CENTRE EFFICIENCY

DATA CENTRE METRICS

- DCiE/PUE
- SPECPower
- 80+
- EPEAT
- EnergySTAR
- European Code of Conduct (CoC)

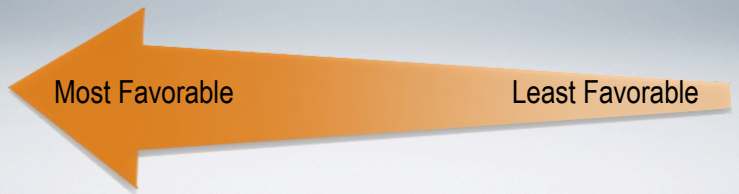
Data Centre Metrics

- DCiE/PUE
- SPECPower
- 80+
- EPEAT
- EnergySTAR
- European Code of Conduct (CoC)

METRICS: L/100KM

Greg Papadopoulos

METRICS: L/100KM



Greg Papadopoulos

METRICS: PASSENGERS * KM / L

Greg Papadopoulos

METRICS: PASSENGERS * KM / L

Least Favorable → Most Favorable

Greg Papadopoulos

USED PASSENGER KM / L

Greg Papadopoulos

USED PASSENGER KM / L

More Favorable ← Less Favorable → More Favorable

Greg Papadopoulos

EFFICIENCY

7l/100km

EFFICIENCY

EFFICIENCY

28l/100km

EFFICIENCY

8l/100km

EFFICIENCY

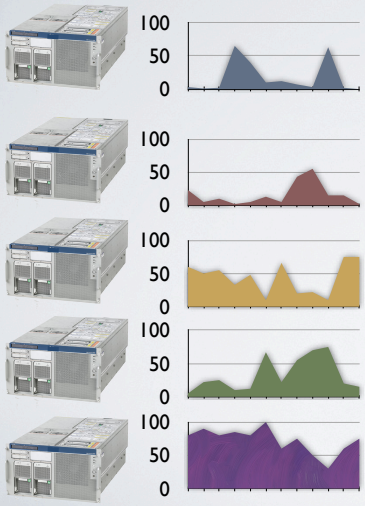
8l/100km

EFFICIENCY

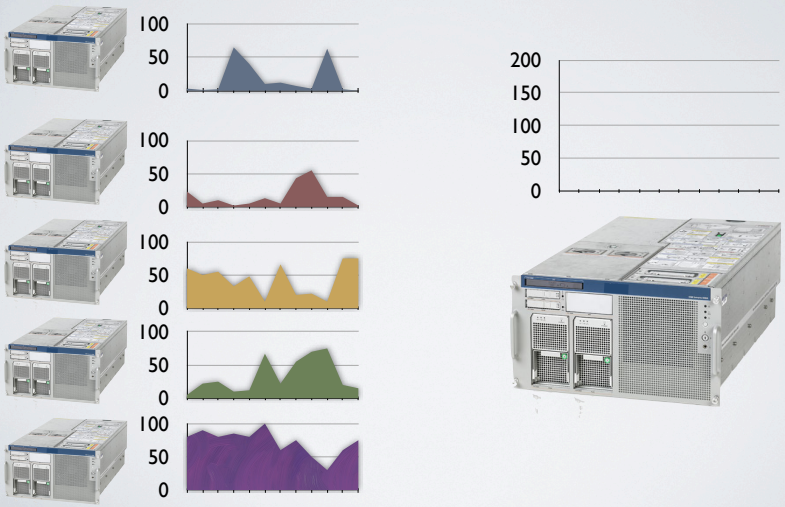
28l/100km

8l/100km

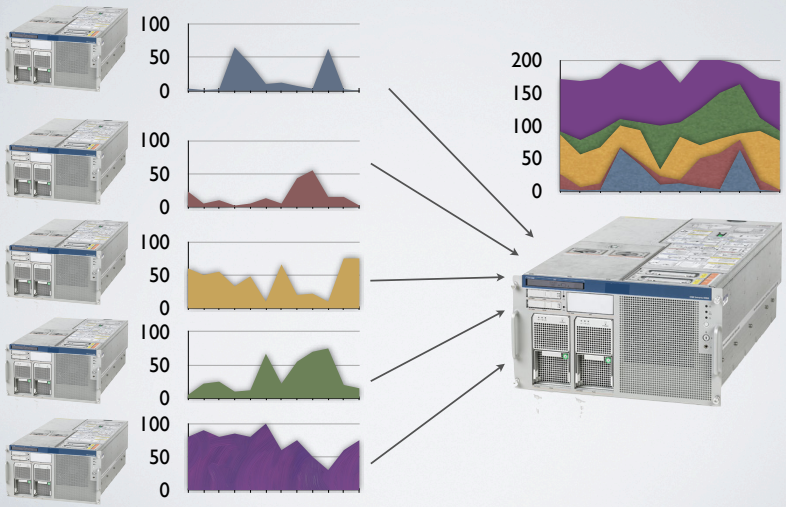
POOLING IT



POOLING IT



POOLING IT

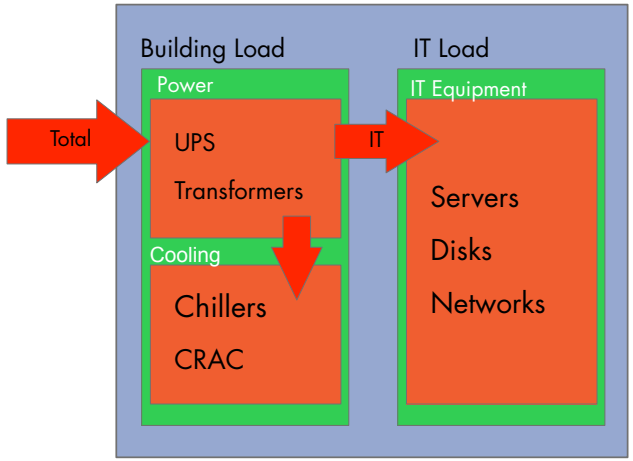


DCiE/PUE

Data Centre Infrastructure Efficiency

$$DCiE = \frac{POWER_{IT}}{POWER_{TOTAL}}$$

DCiE



$$DCiE = \frac{IT}{Total}$$

DCiE/PUE

Data Centre Infrastructure Efficiency

$$DCiE = \frac{POWER_{IT}}{POWER_{TOTAL}}$$

DCiE/PUE

Data Centre Infrastructure Efficiency

$$DCiE = \frac{POWER_{IT}}{POWER_{TOTAL}}$$

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Building}}$$

DCIE/PUE

Power Usage Effectiveness

$$PUE = \frac{1}{DCiE}$$

$$PUE = \frac{POWER_{Total}}{POWER_{IT}}$$

DCIE/PUE

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Infra}}$$

DCIE/PUE

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Infra}}$$

$$DCiE = \frac{100}{100 + 100} = 0.5$$

DCIE/PUE

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Infra}}$$

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DCiE/PUE

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Infra}}$$

$$DCiE = \frac{100}{100 + 100} = 0.5$$

10:1 Consolidation

$$DCiE = \frac{10}{10 + 40} = 0.2$$

DCiE/PUE

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Infra}}$$

$$DCiE = \frac{100}{100 + 100} = 0.5$$

10:1 Consolidation

$$DCiE = \frac{10}{10 + 40} = 0.2$$

DCiE/PUE

$$DCiE = \frac{POWER_{IT}}{POWER_{IT} + POWER_{Infra}}$$

Power reduced by factor of 4

DCiE got worse !

10:1 Consolidation

$$DCiE = \frac{10}{10 + 40} = 0.2$$

CONSUMPTION

8l/100km

CONSUMPTION

8l/100km

7l/100km

Green Grid Proxies

$$DCeP = \frac{\text{Useful Work}}{\text{Total Energy Consumed}} = \frac{\sum_{i=1}^{m}\left[V_i * U_i(t,T) * T_i\right]}{E_{DC}}$$

$$Proxy_{CUPS} = \frac{T * \sum_{i=m}^{n}\left(7^{\left(\frac{i-2002}{5}\right)} * Num_i * Util_i\right)}{E_{DC}}$$

$$Proxy_{SPECpower} = \frac{T * \sum_{i=1}^{n}\left(U_{AVG}CPU_i * S_i * \left(\frac{Clk_CPU_i}{Clk_B_i}\right)\right)}{E_{DC}}$$

Research Axes

Research Axes

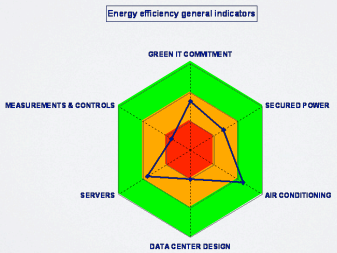
- Metrics
- Component optimisation
- Optimise ressource utilization
- Energy recovery

WHAT CAN YOU DO TODAY?

SITE AUDIT

SITE AUDIT

Scope → Mesure & Collect → Report Recommend

SITE AUDIT

Scope → Mesure & Collect → Report Recommend