

Energy Optimisation

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- Why should we worry about it?
 - Environment – to be ‘Green’
 - Feel good factor
 - Image of lab...
 - Reduce costs
 - Extend the capacities of existing infrastructure
 - More computing power with same electrical/cooling infrastructure...

- Lot being made of energy saving in industry with push to be 'Green' whatever that should mean and emphasis on the PUE as a measurement
 - PUE perhaps not the best measure
 - What is it? Lots of different interpretations
 - How should it be measured? Annual measurement not instantaneous
 - Does not take into account efficiency improvements at the server level
 - Does not take into account potential reuse of heat
- However, there are many areas which can be addressed and they don't all impact the PUE

- Computer hardware
 - Newer equipment
 - Better disks
 - Processors
 - Higher efficiency PSUs
 - Custom hardware (removing all unneeded components) e.g. Open Compute Initiative
- Cooling infrastructure
 - Free cooling (low temperature ambient air, evaporating water, or a large thermal reservoir)
 - Variable speed motors
 - Dynamic matching of cooling to actual needs

- Electrical infrastructure
 - More modern equipment
 - UPS and generators? Only use if really necessary ...
 - High voltage to as close to the servers as possible
 - Reduce number of conversion steps
- Computer room optimization
 - Hot/cold aisles (good separation of hot and cold air flows)
 - Use of blanking plates
 - Improve cold air distribution and remove leaks (use of CFD can identify not only hot spots but also over cooled areas). Just enough cold air and uniform – depending on whether layout is homogeneous or not
 - AHUs vs. CRAC vs. in-line vs. water-cooled racks (active and passive)
 - DC distribution
 - Higher inlet temperature (gain more from free cooling)
 - Downside – less time to react if cooling is lost

- Operations
 - Powering down
 - Capping and load profiling
- Recuperation and re-use of heat
 - For heating offices or other
 - However, temperature is usually too low and needs to be raised



- Changing location
 - Better free cooling options
 - Weather and/or environment (rivers/lakes/fjords)
 - Lower electrical costs
 - Not really energy saving directly (indirect)
 - Renewable energies
 - Still not zero environmental impact



- Dedicated track on measures adopted at the different sites?
- Working group to share experience and advice on what measures could be taken by specific sites?

