

### **SE-25.3 Combining Energy Saving Techniques in Data Centres using Model-Based Analysis (S)**

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Advanced power management and cooling techniques for data centres often co-exist as separate entities in current-day operation of data centres. This paper proposes to combine these techniques to achieve greater power savings. To this end, an existing theoretical thermal-aware model is integrated in an extensive simulation framework for data centres using power and performance models, which allows for a detailed study in power, performance and thermal metrics. The paper compares four distinct cases for studying the effect on these metrics: a data centre with (i) basic functionality; (ii) advanced power management; (iii) advanced cooling; and (iv) a combination thereof. The combined case shows a significant reduction in the energy consumption compared to the other cases while performance {em and} thermal demands are kept intact. The combination of these techniques shows improvements in energy savings and shows it is meaningful to investigate further into smart combined energy saving techniques.