Demo:
Energy Consumption via CPU Frequency Tuning Plugin

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Aim

• Optimize the energy used by a running application by changing the CPU parameters (DVFS parameters):
  – Frequency
  – Governor: „frequency behaviour policies“

• Parameters accessible via the CPUFreq kernel infrastructure:
  – only as privileged user (root)

• Measurement of the energy consumption by accessing special hardware counters
  – only privileged users

• Need of daemons and servers to allow users actions.
Demo

- Running in SuperMUC:
  - 16 Frequencies: 1.2GHz to 2.7GHz (increment 100MHz)
  - 5 Governors
- SIP (Strongly Implicit Procedure) application (sparse linear system of equations solver)
- Hybrid (MPI+OMP) parallel application
- Implemented using Fortran language
- Instrumented with PTF for dvfs tuning
Demo (II)

- **6 selected scenarios:**
  - 6 freqs: 1.2GHz, 1.5GHz, 1.8GHz, 2.1GHz, 2.4Ghz, 2.7GHz
  - 1 governor: userspace (certain frequency indep. workload)

- **2 Properties:**
  - Energy consumption
    - Motherboard: CPU (cores), Socket (cores + uncore), Memory
    - Node: DC and AC
  - Runtime
Results

- More frequency → less time
- More frequency → more power
- Power = Energy / time

- Energy to solution ↔ balance energy AND time