BOINC Workshop

Grenoble, Sept 25th 2013

Peter Hanappe
Sony Computer Science Laboratory Paris

This work is supported by the International Desktop Grid Federation - Support Project (IDGF-SP), EU FP7 Capacities Programme, grant agreement nr RI-312297.
1. Collect estimates & models on cost & energy consumption

2. Measuring the energy consumption

3. Reducing the energy consumption

4. ... something else
1. Collect estimates & models on cost & energy consumption

Wiki:  http://low-energy-boinc.cslparis.fr/info
2. Measuring the energy consumption

- **BOINC client**
  - low-energy-boinc
    - (non-cpu-intensive app)
  - sensors
  - performance indicators

- **BOINC server**
  - trickle manager

- **Web site**
  - low-energy-boinc.cslparis.fr

- **OpenSensorData.net**
sensors

Energy

Temperature
Power usage
P-state
CPU load
CPU load of BOINC applications
Progress of BOINC workunits
CPU load of user applications
Ambient temperature
User absent or not
Fan speed
CPU temperature
Other

+ 
CPU benchmark
BOINC CPU% Setting
Performance-per-Watt = \frac{BOINC \text{ Performance}}{BOINC \text{ Power}}

BOINC power = total power
- power used for other activities
- reusable heat

total power = F(P\text{-state})

power used for other activities = F(user present, CPU load other applications)
3. Reducing the energy consumption

Run the computation at night

Run the computation during work

Run the computation during work in low-power mode

\[ E_1 = P_1 . D_1 \]

\[ E_2 = (P_1 - \text{Pidle}) . D_1 \]

\[ E_u = \text{Pidle} . D_1 \]

\[ E_3 = (P_2 - \text{Pidle}) . D_2 \]

\[ E_u = \text{Pidle} . D_2 \]

\[ P = C . V^2 . f \]
BOINC client

BOINC app
(non-cpu-intensive app)

OS

Driver

CPU
We hired Matthew Sykes for two months. Matthew has 15 year experience in Windows driver development.

1. The driver creates a kernel thread that jumps to each CPU once every N ms (configurable).

2. The thread gathers statistics about the time spent in each CPU performance state (similar to Linux).

3. The thread can maintain a CPU in a given Pstate.

4. A user-space API allows to talk to the driver.
4. ... something else

Suggested project:

100% renewable energy source

2-5 W

Always-on home server:
- 0% energy requirements
- personal file & email server
- runs BOINC
Raspberry Pi:
Whetstone benchmark: 270
Power consumption: 2W
Price: 31 € (37 € with power adaptor)
Performance/power: 270/2 = 135
Performance/cost: 270/37 = 7.3

Laptop Core2 Duo 2.4 GHz, 2 threads:
Whetstone benchmark: 4270
Power consumption: 48 W
Price: 1000 €
Performance/power: 4270/48 = 89
Performance/cost: 4270/1000 = 4.27
Microbial Fuel Cells  Biogas  Link with our P2P Food Lab project?