Power Management SIG

Presented by

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Outline

- Introduction
- PM test days
- Tuned 2.0
- Benchmarking / regression testing
- Future plans
- Conclusion

Introduction

- Power Management (PM) SIG:
  - http://fedoraproject.org/wiki/SIGs/PowerManagement
- Goals:
  - Improvement of PM in Fedora (user space):
    - Development of new PM features.
    - Maintenance of PM utilities (bug fixing).
    - Tuning for energy saving.
  - Hosting of PM test days.
  - Benchmarking, measurement, regression testing

PM Test Day

- Occurs once during new release development.
- Testing of new features.
- Testing of existent features (to spot regressions):
  - suspend, hibernate, resume, backlight control, devices PM,...
  - Efectivity of tunings (on various HW).
- Public $\Rightarrow$ everybody can attend.
  - Your HW is needed :)

Fedora 16 PM Test Day

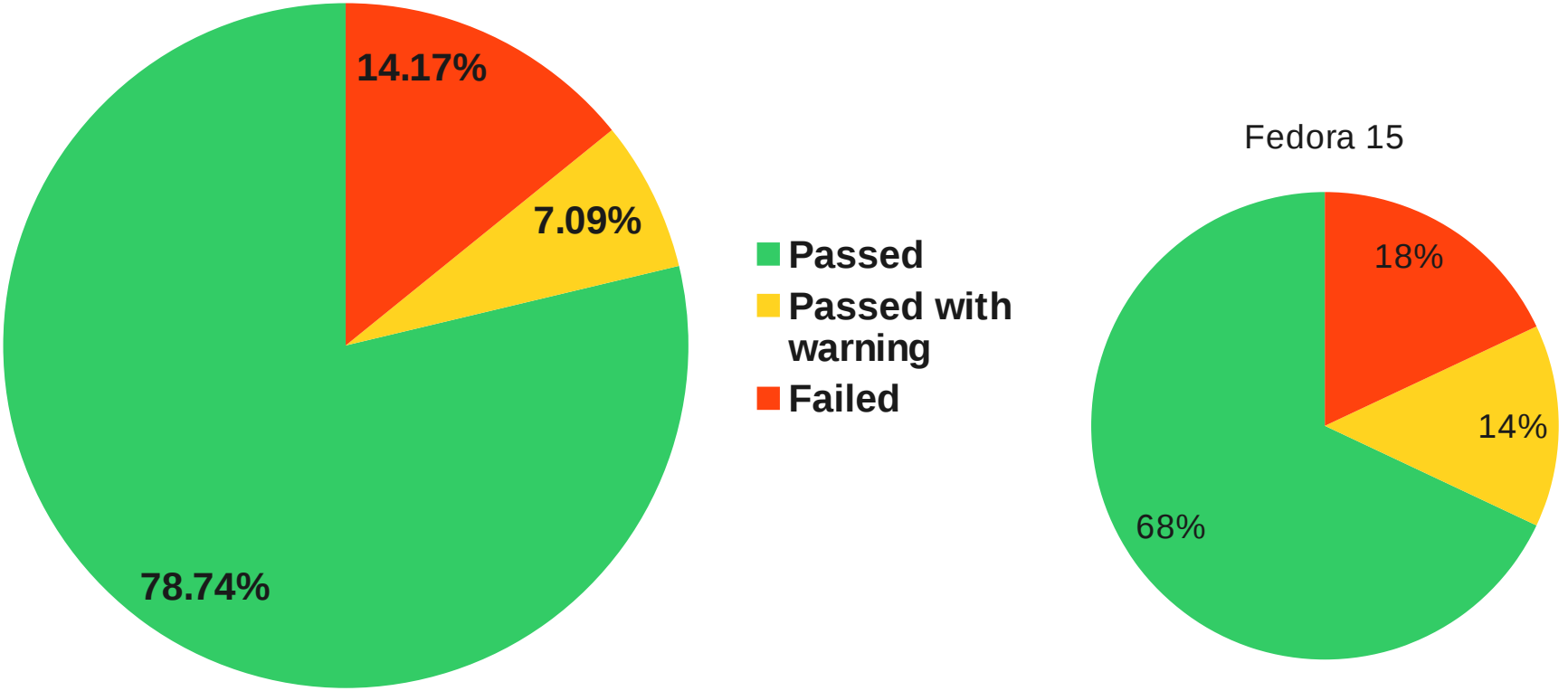
- Results:

  http://fedoraproject.org/wiki/Test_Day:2011-09-29_PowerManagement

- Stats:
  - Number of participants: **20**
  - Unique HW: **19**
  - Number of test cases prepared: **9**
  - Test cases ran by participants: **90.71 %**
  - Bug reports filled: **5**

Fedora 16 PM Test Day

- Test day results:



- 65 % of all failures was suspend / hibernate.

Fedora 16 PM Test Day

- Included automatic benchmark that compared tuned / untuned (default) system.
- For tuning our „tuned“ tool was used.
- Results for active idle tuned system:
  - Average reported power savings: **138 mWh**
    - 1.5 % approx. **+5** minutes standby (approx. for T500 laptop)
  - Max. reported power savings: **650 mWh**
    - 7.5 % approx. **+25** minutes standby (approx. for T500 laptop)

Fedora 17 PM Test Day

- Planned on **2012-04-04**.
- Together with Red Hat Brno Open House.
  - Live media and assistance will be provided.
- Participation:
  - Online, instruction will be uploaded to:
    - http://fedoraproject.org/wiki/Test_Day:2012-04-04
    - http://www.fedora.cz
  - Or come to Red Hat Brno Office
    - bring your HW there :)

Tuned

- Tool for static and dynamic tuning:
  - Static:
    - sysctl / sysfs, scripts (ALPM, ASPM, WiFi, audio codecs, GPU, cpuspeed, scheduler,...).
  - Dynamic:
    - PM QoS, ethernet speed, FSB (some netbooks), disk spin down, (WiFi PS poll).
- Profile based:
  - Power saving, low latency, high throughput,...
- Command line / Matahari interface for profiles changing.

Tuned design

- Why profiles?
- Why Python?
- Overhead?
  - tuned: 1 wake / 10 s,
  - typical system: more than 20 wakes / s,
  - tuned: 203. / 208 on „top“ listing,
  - tuned: falls out from the „powertop“ listing.

Tuned 2.0 – Fedora 17

- D-Bus interface.
- Improved / simplified config:
  - One file per profile.
  - Distribution shipped config: */usr/lib/tuned*
  - Custom config: */etc/tuned*
  - Configs inheritance (include directive).
  - User configs from „powertop“ suggestions.
- KVM host / guest profiles.
- Ready for more autonomous function (e.g. A/V players plugins).

Desktop Power Savings

- Desktop applications – non optimal design:
  - CPU demanding even when minimized.
    - E.g. Firefox with many open tabs, scripts, plugins (especially Flash).
- Forced stop idea: when minimized, stop it.
  - What apps are safe to stop?
    - Whitelist,
    - User configurable,
    - Wake-up intervals (not to be kicked offline).

Forced Stop: Implementation

- Proof of concept:
  - Implementation by Jan Kaluža.
  - KDE's KWin patch:
    - Broadcast minimize / unminimize events through D-Bus
  - Listener workhorse (in the future our „tuned“):
    - Logic (whitelist, policy, ...)
    - SIGSTOP / SIGCONT handling.
- Deployment:
  - All window managers needs to be patched.

Forced Stop: Experiment

- System under test:
  - HP ProLiant DL360 G6, Xeon E5504 @ 2 GHz
  - Fedora 16, Firefox 10.0.
  - News site: http://www.mobilmania.cz
  - 15 min idle with / without Flash.
- Results:

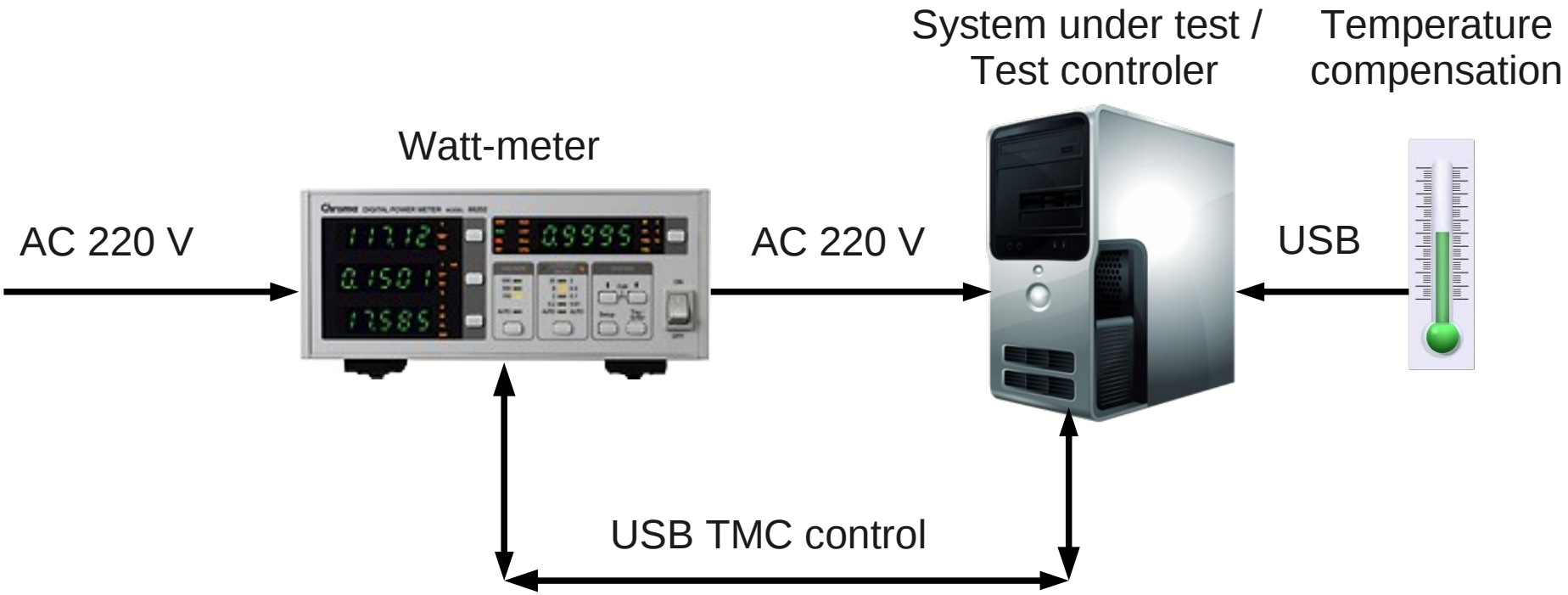
KWin	Flash Disabled E [Wh]	Flash Enabled E [Wh]
Default	14.82	16.33
Forced stop	14.69	14.70
Forced stop savings	**0.88 % +3 min**	**9.98 % +33 min**

PM Regression Testing

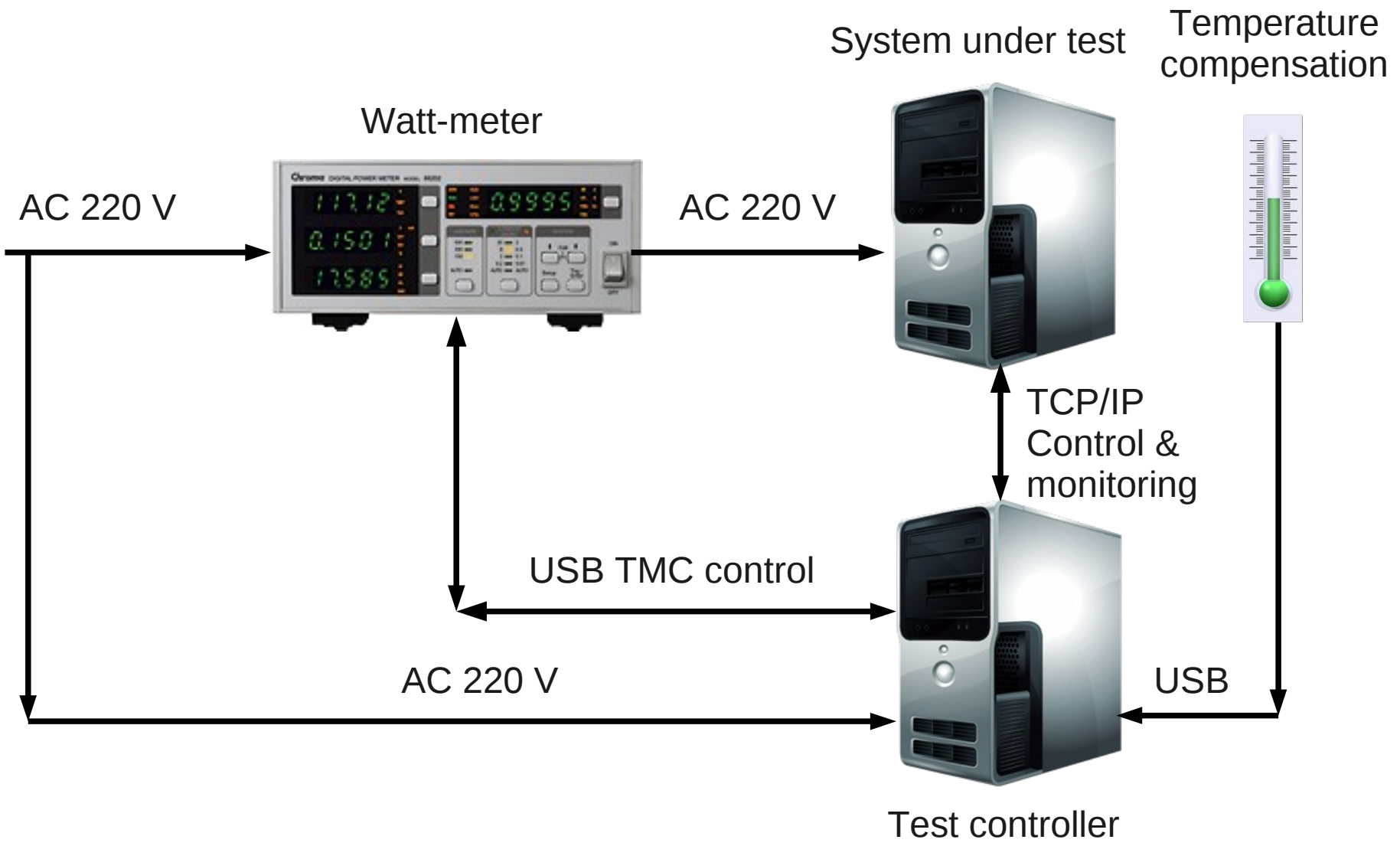
- Chroma 66202, ENERGY STAR compliant AC watt-meter, 240 kHz @ 16 bit ADC:

- USB TMC / GPIB, implemented client sofware.

Lab Setup – Single



Lab Setup – Split



PM Regression Testing

- Test controller written in Bash / C.
- Monitors performance and energy consumption.
- Test suite is run between Fedora / RHEL releases.
- Implemented test cases:
  - Kernel rebuild,
  - Sequential / random read / write,
  - Unpack of archives,
  - Active idle (1 hour),
  - PowerTOP,
  - DOTS (ATCJ1/2) [mysql],
  - AB [apache],
  - Postmark [file sytem],
  - HPL [computational],
  - Internal tests.
- Results are automatically uploaded (experimental) to:
  - http://jskarvad.fedorapeople.org/pm-tests/

Future Plans

- Benchmarking:
  - DC measurement platform
    - IO card 16 bit, 8 channels at least ⇒ 4 probes (e.g. chipset, CPU, GPU, disc).
    - Instrumented motherboard (built-in probes).

Conclusion

- PM SIG goal is to actively improve PM in Fedora.
- Home:
  - http://fedoraproject.org/wiki/SIGs/PowerManagement
- Mailing list:
  - power-management@lists.fedoraproject.org
- Blog:
  - http://pm-blog.yarda.eu
- Feel free to join us.

Thank you for your attention.