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,
  - Effectivity of tunings (on various HW).
- Public ⇒ everybody can attend.
  - Your HW is needed :)

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Fedora 16 PM Test Day

- Results:
  

- 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:

  - 78.74% Passed
  - 14.17% Passed with warning
  - 7.09% Failed

• 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://www.fedora.cz](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:

<table>
<thead>
<tr>
<th>KWin</th>
<th>Flash Disabled E [Wh]</th>
<th>Flash Enabled E [Wh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>14.82</td>
<td>16.33</td>
</tr>
<tr>
<td>Forced stop</td>
<td>14.69</td>
<td>14.70</td>
</tr>
<tr>
<td>Forced stop savings</td>
<td>0.88 % +3 min</td>
<td>9.98 % +33 min</td>
</tr>
</tbody>
</table>
PM Regression Testing

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

- USB TMC / GPIB, implemented client software.

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Lab Setup – Single

AC 220 V —> Watt-meter —> AC 220 V

System under test / Test controller

Temperature compensation

USB

USB TMC control
Lab Setup – Split

Watt-meter

System under test

Temperature compensation

AC 220 V

TCP/IP Control & monitoring

USB TMC control

AC 220 V

Test controller

AC 220 V

USB
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 system],
  - 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](http://fedoraproject.org/wiki/SIGs/PowerManagement)
- Mailing list:
  - [power-management@lists.fedoraproject.org](mailto:power-management@lists.fedoraproject.org)
- Blog:
  - [http://pm-blog.yarda.eu](http://pm-blog.yarda.eu)
- Feel free to join us.
Thank you for your attention.