Fixing the leaking tap

--- power management enabling and tuning for IA Tizen phone

Austin Zhang
Yong Wang

TIZEN™ DEVELOPER CONFERENCE 2013 SAN FRANCISCO

Agenda

- Power management requirements to mobile devices
- Tizen mobile power management implementation
- The way of enabling new platform and tuning
- Cases study from IA phone
- Summary

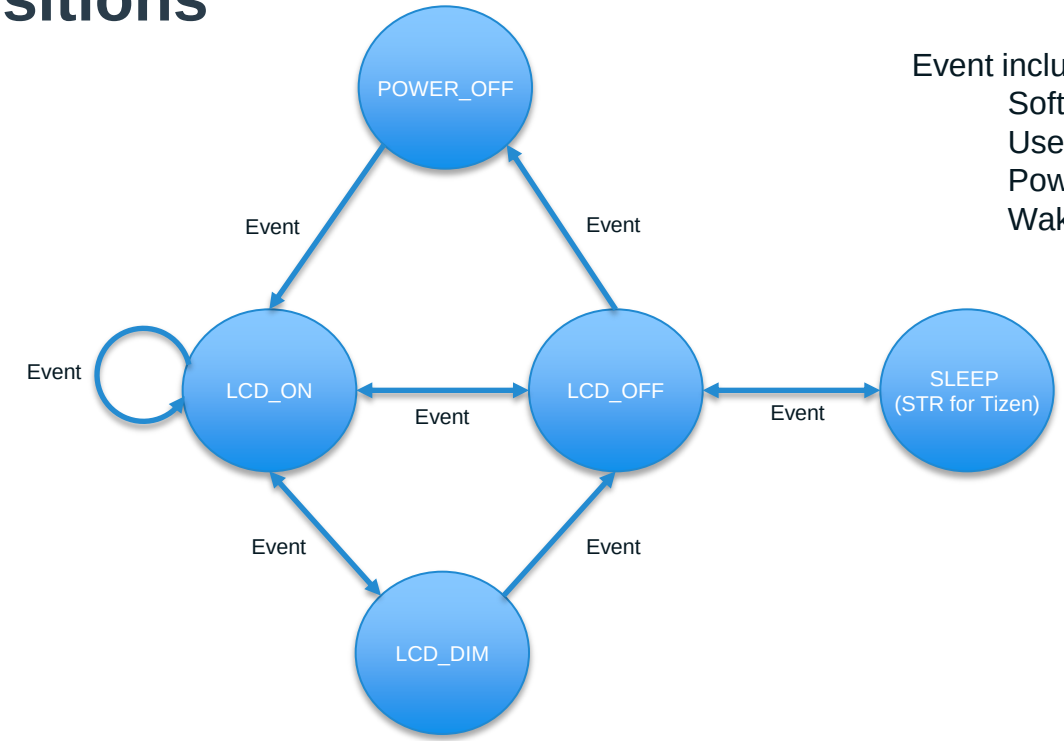
What are the differences?

Additional Requirements

- **Longer battery life**
  - Only did needed jobs
  - Did job as fast as possible
  - Enter into low power status as much as possible
  - Avoid unnecessary wakeup as much as possible
- **Avoid race conditions**

How did Tizen mobile?

How does Tizen mobile implement PM – power states & transitions



Event including:

- Software timeout
- User interactive
- Power APIs calling
- Wakeup events

How does Tizen mobile implement PM – Kernel space

- **Standard way of suspend/resume and enter into sleep state (STR for Tizen)**
- **Wakeup Events Framework from 2.6.36**

  /sys/power/wakeup_count

  pm_stay_awake / pm_relax / pm_wakeup_event

How does Tizen mobile implement PM – User space

- power-manager: one daemon to implement and manage those states
- Device manager: provide platform specific callbacks

How does Tizen mobile implement PM – APIs (till to Tizen2.1)

- **power**
  - power_lock_state / power_unlock_state / power_wakeup ……
- **libslp-pm**
  - pm_lock_state / pm_unlock_state / pm_change_state
- **power-manager**
  - Receive input from others
- **how it works**

Then how to enable new platform and tune?

Enabling NEW platform – Kernel space

- Implement traditional suspend/resume
- Implement runtime power management
- Using wakeup event framework interface in drivers if needed

Enabling NEW platform – Fill callback gaps for platform

- **Platform specific callbacks implementation**
  - Implement platform plugin of device-manager

    device-manager-plugin-xxx
  - Implement those power related callbacks

    wakeup event, lcd, backlight
- **Using power APIs in middleware/applications**

Enabling NEW platform – User space tuning

- **Most part of cases are from user space apps**
- **Power budget**
  - Power consumption in key scenarios
  - Monitor regressions, no surprise in the last day
- **IA platform specific tuning for various scenarios**
  - System idle
  - Media playing
  - Browser
  - Telephony

Enabling NEW platform – Way and Tools for tuning

- **Regular regression monitor**
- **Tizen commits logs and ‘bisect’**
- **Power/performance tools**
  - PowerTOP : who is waking up the system frequently?
  - perf : are those hotspots reasonable?

Cases study from IA phone

Cases study -1

- **Are you using Android implementation?**
  - As to power management field, It is easy to transform to Tizen solution☺

Cases study -2

- **Control the screen on/off may have different way for different platform**
  - power-manager prefers to control this by itself
  - Driver implement of display operations in different platform with different way

Cases study -3

- **Unexpected wake-up brings system back from idle to active**
  - Unnecessary timer

More learning

- **Graphics**
  - Wrong status restore leads to low performance in GPU after resumed from suspend
- **Modem**
  - Always remember to put the modem into low power when not use
  - Disable non-critical modem events to reduce the wakeup from suspend
- **Multimedia**
  - HW acceleration features help a lot in power saving
- **And …...**

Summary

Summary

- **What?**

  For mobile devices: Additional requirements
- **How?**

  In Tizen
  - Standard Linux PM framework and Wakeup Event framework
  - User space PM daemon as decision maker
- **And then?**

  For enabling new platform
  - Implement platform specific callbacks in from kernel/driver to user space
  - Tuning is very important
- **Always keep Power Management in mind in full development cycle**

Credits to:

- **Peng Li, Yan Zhang, Halley Zhao, Caiwen, Zhang, Vivian Zhang, Yan Yin, Yu Ma, Guobing Chen, Jie Chen, Dongsheng Sun, Seunghun Pi, MyungJoo Ham… sorry if I missed anyone.**

Questions?

TIZEN™

DEVELOPER CONFERENCE

2013

SAN FRANCISCO