8310110 Seminar: Energy-awareness in mobile systems (3 cr)

Prof. Sasu Tarkoma

University of Helsinki
Department of Computer Science
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Practical Info

- Time and place:
  - 20.01.-24.02. Wed 16-18 C220, 17.03.-28.04. Wed 12-14 B119 (detailed schedule will be posted later).
- Seminar will be held in English

Introduction

- The aim of this seminar is to investigate and discuss current state of the art solutions in energy and power management for mobile systems.

- Modelling and optimizing energy consumption is crucial for current and forthcoming mobile devices.

- The mobile application execution environment consists of a number of processes and typically applications can manage a number of threads and parallel connections.

- This makes the environment challenging for energy and power management.

- A number of solutions have been proposed for energy and power management.

- **The aim of the seminar is to identify and discuss recent developments in the area**

Completing the Seminar

- In order to successfully complete the seminar, you need to perform the following four tasks:
  - Write a paper about a topic agreed during the first meetings.
  - Review at least one seminar paper.
  - Prepare and give a presentation.
  - Participate in the seminar by being active during the sessions.

Working Mode

- The seminar is structured in two parts.
  - In the first phase, the students select a topic and prepare an article that surveys and discusses the topic.
  - The articles are then presented during the second part of the seminar.
  - A good length for the paper is about 6-7 pages using the IEEE Transactions format.
    - http://www.ieee.org/pubs/authors.html
  - The presentations are about 30 minutes in length.

Topics

- The topics span the networking stack and include the following:
    - Application layer energy management.
    - Transport layer energy optimization.
    - Energy profiling and monitoring.
    - Energy-enhancing proxies in the communications environment.
    - Energy related user interface issues in mobile systems.
    - Building energy profiles using regression methods.
    - Energy-efficient runtime.

Grading

- The grading will be based on the written article (40%), the presentation (40%), and activity during the seminar (20%).

- Participation to the seminar sessions are mandatory (80% participation is minimum).

Deadlines

- First session on 20.1.

- Paper finished by 10.3.

- Reviews done by 17.3.

- Presentations will be scheduled after 17.3.

More information about topics and relevant scientific articles

Mobile Devices

- 1. Y. Agarwal, R. Chandra, A. Wolman, P. Bahl K. Chin, and R. Gupta. Wireless wakeups revisited: energy management for voip over wi-fi smartphones. In MobiSys '07: Proceedings of the 5th international conference on Mobile systems, applications and services, pages 179-191, New York, NY, USA, 2007. ACM.

- 2. J. Flinn and M. Satyanarayanan. PowerScope: A Tool for Profiling the Energy Usage of Mobile Applications. In WMCSA '99: Proceedings of the Second IEEE Workshop on Mobile Computer Systems and Applications, Washington, DC, USA, 1999. IEEE Computer Society.

- 3. T. Pering, Y. Agarwal, R. Gupta, and R. Want. CoolSpots: reducing the power consumption of wireless mobile devices with multiple radio interfaces. In MobiSys '06: Proceedings of the 4th international conference on Mobile systems, applications and services, pages 220-232, New York, NY, USA, 2006. ACM.

- 4. M.-C. Rosu, C. M. Olsen, C. Narayanaswami, and L. Luo. PAWP: A Power Aware Web Proxy for Wireless LAN Clients. In WMCSA, pages 206-215. IEEE Computer Society, 2004.

Energy profiling

- 5. R. Fonseca, P. Dutta, P. Levis, and I. Stoica. Quanto: Tracking energy in networked embedded systems. In R. Draves and R. van Renesse, editors, OSDI, pages 323-338. USENIX Association, 2008.

- 6. A. Kansal, F. Zhao. Fine-Grained Energy Profiling for Power-Aware Application Design. ACM HotMetrics 2008.

- 7.A. Kansal and F. Zhao. Fine-grained energy pro ling for power-aware application design. SIGMETRICS Perform. Eval. Rev., 36(2):26-31, 2008.

- 8. L. Benini and G. d. Micheli. System-level power optimization: techniques and tools. ACM Trans. Des. Autom. Electron. Syst., 5(2):115-192, 2000.

Interfaces for energy and power management

- 9. M. Anand, E. B. Nightingale, and J. Flinn. Ghosts in the Machine: Interfaces for Better Power Management. In MobiSys. USENIX, 2004.

- 10. H. Zeng, C. S. Ellis, A. R. Lebeck, and A. Vahdat. Currentcy: a unifying abstraction for expressing energy management policies. In ATEC '03: Proceedings of the annual conference on USENIX Annual Technical Conference, Berkeley, CA, USA, 2003. USENIX Association.

OS issues

- 11. S. M. Rumble, R. Stutsman, P. Levis, D. Mazi eres, and N. Zeldovich. Apprehending joule thieves with cinder. In MobiHeld '09: Proceedings of the 1st ACM workshop on Networking, systems, and applications for mobile handhelds, pages 49-54, New York, NY, USA, 2009. ACM

- 12. A. Vahdat, A. Lebeck, and C. S. Ellis. Every joule is precious: the case for revisiting operating system design for energy e ciency. In EW 9: Proceedings of the 9th workshop on ACM SIGOPS European workshop, pages 31-36, New York, NY, USA, 2000. ACM.

Adaptation

- 13. C. Xian and Y.-H. Lu. Energy reduction by workload adaptation in a multi-process environment. In DATE '06: Proceedings of the conference on Design, automation and test in Europe, pages 514-519, 3001 Leuven, Belgium, Belgium, 2006. European Design and Automation Association.

- 14. J. Flinn and M. Satyanarayanan. Managing battery lifetime with energy-aware adaptation. ACM Trans. Comput. Syst., 22(2):137-179, 2004.

Datacenters and green networking

- 15. Asfandyar Qureshi, Rick Weber, Hari Balakrishnan, John V. Guttag, Bruce V. Maggs: Cutting the electric bill for internet-scale systems. 123-134. Sigcomm 2009.

- 16. M. Gupta, S. Singh, "Greening of the Internet", ACM SIGCOMM, Karlsruhe, Germany, August 2003.

- 17. P. Barford, J. Chabarek, C. Estan, J. Sommers, D. Tsiang and S. Wright, "Power Awareness in Network Design and Routing," IEEE INFOCOM, Phoenix, USA, April 2008.

- 18. Min Yeol Lim, Freeman L. Rawson III, Tyler K. Bletsch, Vincent W. Freeh: PADD: Power Aware Domain Distribution. 239-247. ICDCS 2009.

Energy consumption of security solutions

- 19. R. Karri and P. Mishra, "Optimizing the energy consumed by secure wireless sessions: wireless transport layer security case study," Mob.Netw. Appl., vol. 8, no. 2, pp. 177–185, 2003.

- 20. N. R. Potlapally, S. Ravi, A. Raghunathan, and N. K. Jha, "A study of the energy consumption characteristics of cryptographic algorithms and security protocols," IEEE Trans. Mob. Comput., vol. 5, no. 2, pp.128–143, 2006.

- 21. A. S. Wander, N. Gura, H. Eberle, V. Gupta, and S. C. Shant, "Energy analysis of public-key cryptography on small wireless devices," in Proc. IEEE International Conference on In Pervasive Computing and Communications (PerCom'05), vol. 3, 2005, pp. 324–328.