

研究方向

郭大維

台灣大學 資訊工程學系
資訊網路多媒體研究所



Research Areas

- Smart Mobile Systems
- Storage Systems of Emerging Memory
- Normally-Off Computers
- In-Memory Computing



Reality in Embedded Computing

Optimization under Various Constraints

Performance, Energy Consumption, Cost, Heat Dissipation, etc.

User Experience.



2015/11/11

3

User-Centric Multi-Core Heterogeneous Mobile Systems

User-centric resource scheduling

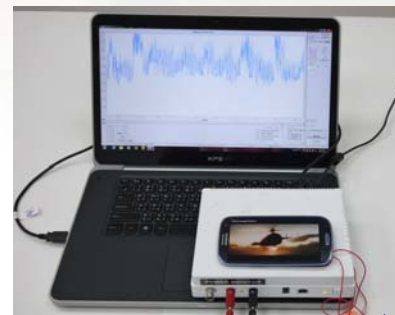
- Allocating different CPU resource to delay-sensitive and delay-tolerant applications

Technical problems

- How to quantify the impact of different applications' delay on user experience?
- How to schedule threads and manage CPU cores in an unfair manner?

Contributions

- Introducing application sensitivity into scheduler and governor designs
 - Thread Prioritization, allocation, and migration
 - DPM, DVFS, and cluster switching
- Integrating our design into Android
 - *IEEE/ACM DAC 2014

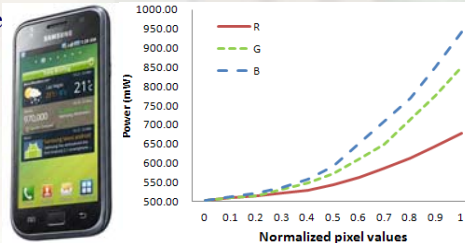


2015/11/11

4

Quality-retaining Power Saving on Mobile Devices

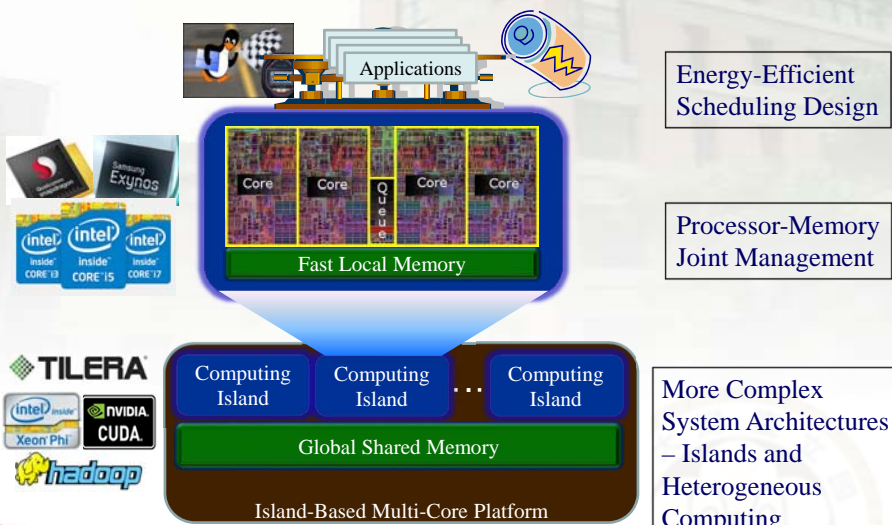
- ➔ **Image pixel scaling**
 - ▶ Scaling down pixel values to reduce OLED power required to display an image
- ➔ **A Technical problem**
 - ▶ **Determine an appropriate scaling for each pixel?**
 - ▶ Retaining the original quality
 - ▶ Minimizing OLED power
- ➔ **Contributions**
 - ▶ Linking visual attention to OLED power savings
 - ▶ An optimal algorithm w/o accurate power models
 - ▶ Implementing an OLED power-saving mode on Samsung tablets



2015/11/11

*IEEE/ACM DAC 2014

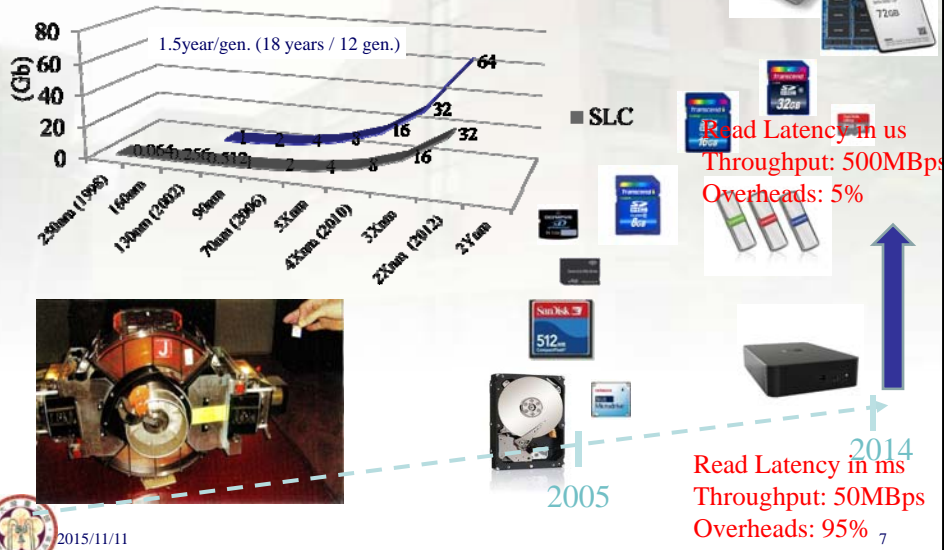
Real-Time Task Scheduling



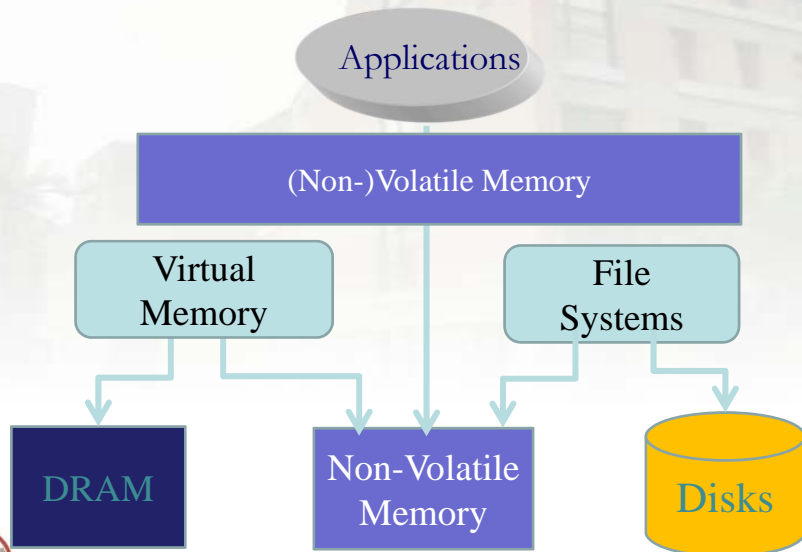
2015/11/11

6

Storage Innovation



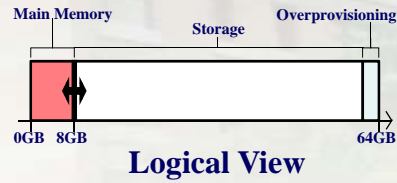
A Global Picture on Emerging Memory



Dual Roles in Main-Memory and Storage – Phase Change Memory

Technical Work

- How to Hide Overheads in the Storage Management Module
- New Commands to Provide Low Cost in Data Transfer between Storage and Memory



DRAM 1600MHz +
SSD (MacBook Air 2010)

All	S	100MB	C: 83% (35/42GB)
	Read [MB/s]	Write [MB/s]	
Seq	173.5	125.5	
512K	160.2	94.13	
4K	16.67	46.12	
512B	2.267	2.529	

NTL (W Commands)

All	S	100MB	E: 67% (44/66GB)
	Read [MB/s]	Write [MB/s]	
Seq	917.6	720.2	
512K	1017	784.4	
4K	1014	1665	
512B	277.5	167.8	

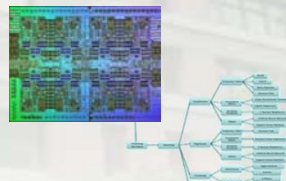
Chrystal Benchmark



Bing-Jing Chang, Yuan-Hao Chang, Hung-Sheng Chang, Tei-Wei Kuo, and Hsiang-Pang Li (2014, Oct). A PCM Translation Layer for Integrated Memory and Storage Management. ACM/IEEE CODES+ISSS, New Delhi, India [Best Paper Nomination]

Big Data and Future Computing

- Normally-Off Computers
- In-Memory Computing
 - Big Social Data Processing
- Cancer Treatments – Simulation Acceleration



2015/11/11

國際影響力 - 產業與學術

2015/11/11

➤ 理論與實作並重

- 頂尖會議/期刊論文
- 產業影響的系統設計

➤ 國內外肯定與國際能見度

- IEEE Fellow、ACM/IEEE 國際會議 Keynote與最佳論文獎
- 國科會傑出研究獎、國科會資訊學門召集人、上市櫃獨董
- IEEE Real-Time Systems Symposium General/Program Chairs
- Citations - Microsoft Academic Search – Field Ranking in Real-Time and Embedded Systems (5/29/2015)
 - 29th in Past 10 Years
 - 41th in All Years



11

Contact Information

➤ Professor Tei-Wei Kuo (郭大維)

- ktw@csie.ntu.edu.tw
- URL: <http://csie.ntu.edu.tw/~ktw>
- Office: +886-2-23625336-315
- Fax: +886-2-23628167
- Address:

Research Center for Information
Technology Innovation, Academia Sinica
Dept. of Comp. Sci. & Info. Engr.
National Taiwan University, Taipei, Taiwan



2015/11/11