# Tech Topic #7

February 22, 2010

Outline

- Mohapatra paper

- Write-up suggestions

- Preliminary presentation details

- Exam decisions
  - Over what period of time to do it (start and finish time)

Multimedia + Device Flexibility

- ## Multimedia
  - A variety of factors that allow the bandwidth and complexity of the data to be altered: encoding method, quality, size, etc.
  - Because multimedia does not require 100% accuracy, there is also the flexibility of various amounts and types of redundancy

- ## Mobile Devices
  - Are battery constrained
  - Main consumers of power: CPU, display, and network
  - Worthwhile to investigate the tradeoffs between quality and battery consumption

- ## Also interesting to look at multimedia generation

Multimedia + Device Flexibility

- Different network architectures

- One example:
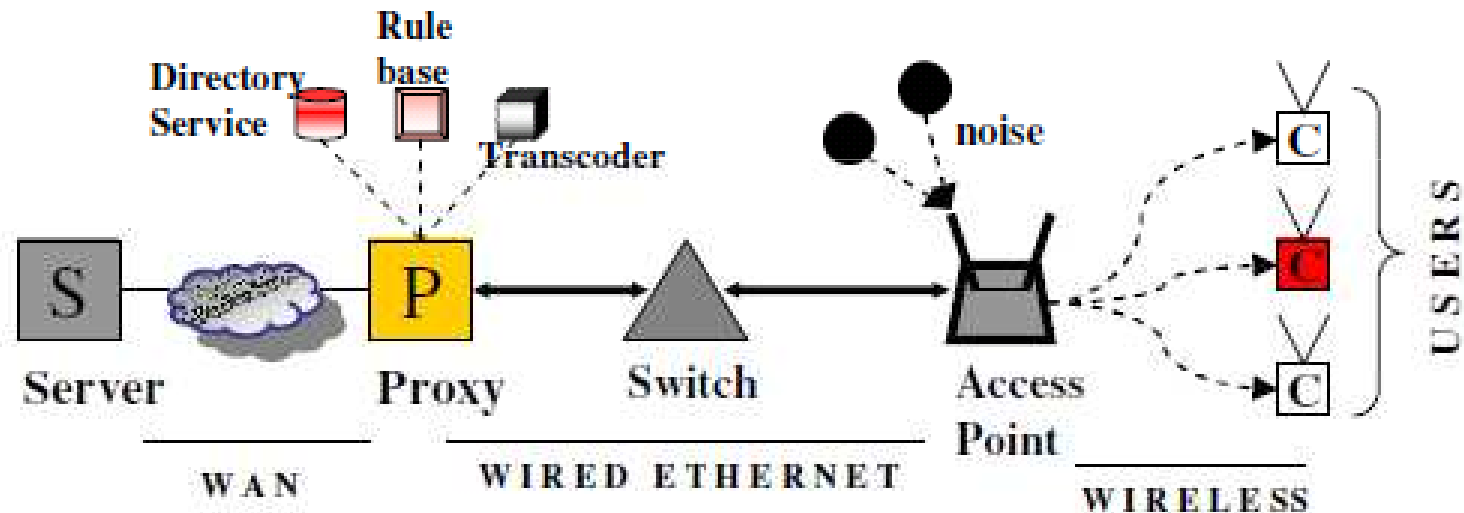
- – Typically a proxy
- – Can have multi-hop wireless network

Mohapatra Contributions

- Integrating techniques at different levels
  - Hardware, OS, middleware, user/application
  - "architecture tuning knobs" and "compilation techniques"
  - Tradeoffs of dynamic voltage scaling

- Feedback-based middleware for admission control, quality, and transcoding

- Power v. quality tradeoffs
  - "extensive survey results"

- Evaluation of network power gains

Extensive Survey Results

- How many people tested?

Quality	Transformation Parameters	Avg. Power (Windows CE)
Like Original (No improvement required)	SIF, 30fps, 650Kbps	4.42 W
Excellent	SIF, 25fps, 450Kbps	4.37 W
Very Good	SIF, 25fps, 350Kbps	4.31 W
Good	HSIF, 24fps, 350Kbps	4.24 W
Fair	HSIF, 24fps, 200Kbps	4.15 W
Poor	HSIF, 24fps, 150Kbps	4.06 W
Bad	QSIF, 20fps, 150Kbps	3.95 W
Terrible (poorer quality not acceptable)	QSIF, 20fps,100kbps	3.88 W

- Useful translation between power levels and different bandwidth rates
  - How does number of watts translate to battery lifetime?

Architecture Analysis

- Used a power simulator (wattch)
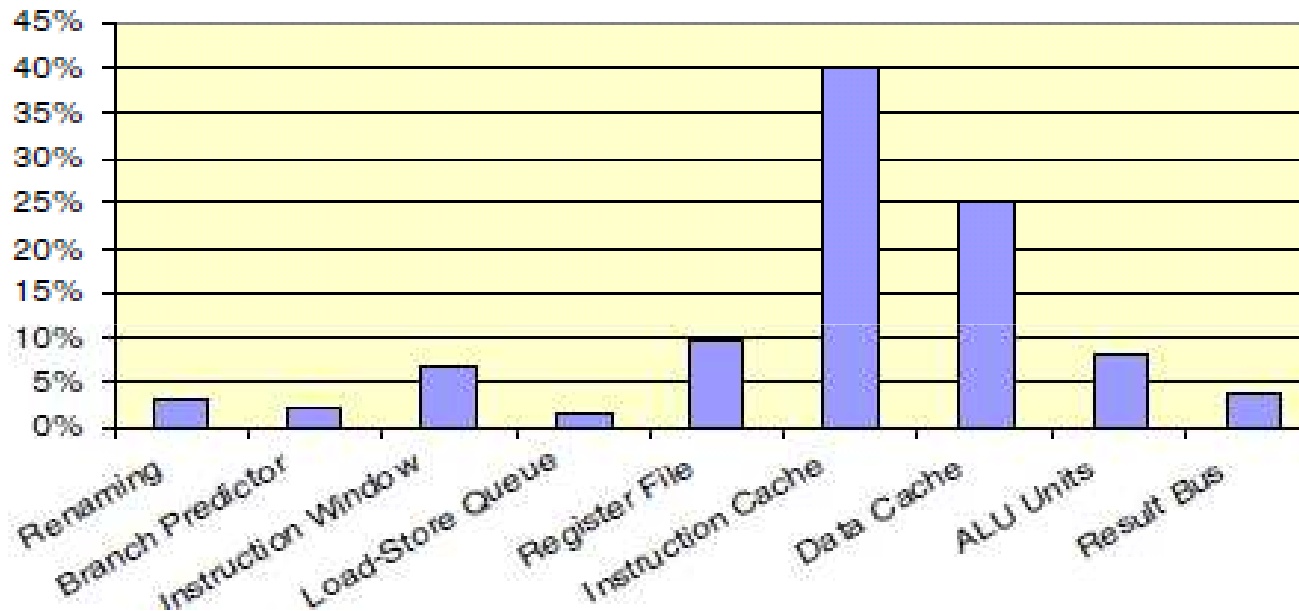
- "We briefly discuss the components identified above and suggest some additional improvements as part of future work."

Cache Size & Voltage Scaling

- "The best configuration of the cache is not easily predictable"
  - Do an exhaustive search of the space to find best value
  - Best value improves performance by 10%-20%

- "Our results are along the line suggested in previous work."

- Same for Dynamic Voltage Scaling

- Suggestion seems to be that if the parameters are known, they can reduce battery consumption
 - But how to know them in practice?

Middleware

- Energy-aware admission control
  - Not sure what that is

- Stream transformation
  - Standard proxy behavior

- Network traffic regulation
  - Seems to suggest sending video in bursts and then sleeping between bursts
  - Requires a great deal of coordination and an understanding of other traffic (not sure I believe their analysis)

Evaluation

- Lots of graphs and results…
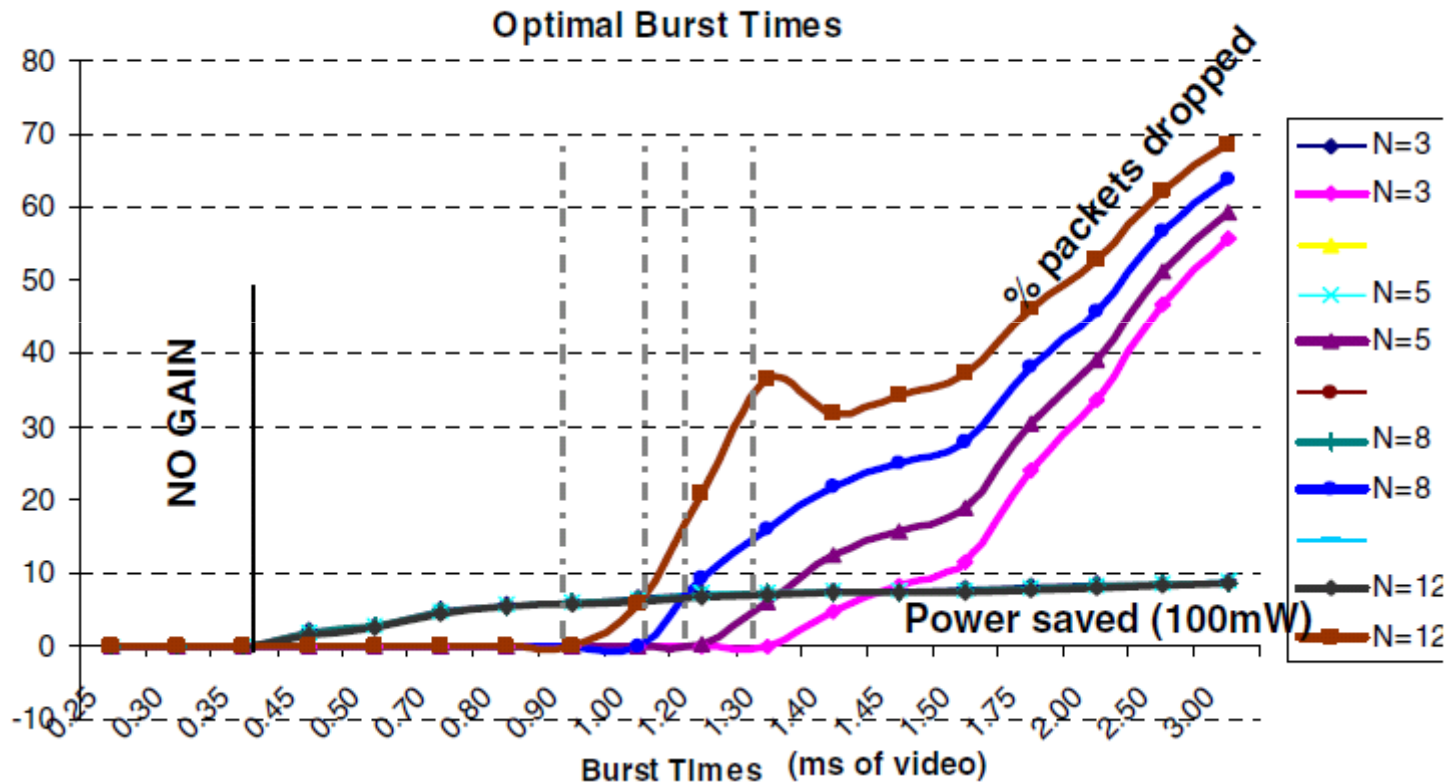
- Power savings by network bursts

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Summary

- Most important parts of the paper were insights on places for improvement…
  - …and the way they thought about what could be done
  - …and the way they did the evaluation

- Any one of these aspects could be investigated more deeply in another paper

- Ask the question: which of these techniques are most reasonable in practice?

CoolSpots

- WiFi: more bandwidth and range, requires more power
- Bluetooth: less bandwidth, range, and power

- Use Bluetooth for certain apps and WiFi for others

CoolSpots

- Idea was fairly limited in scope

- Part of the challenge is developing a believable evaluation
  - Measuring battery consumption is hard
  - Can do it with simulation (unreliable) or with monitor (which creates its own problems)

- In the end, the conclusions were pretty obvious

- Could have done a better job opening the door for future work

Random Coding on iPhone

- Network coding adds overhead and complexity, but increases resiliency to loss, what impact does it have on decode requirements?

- Study went into hardware details that demonstrated a nice balance of details without being redundant or stating the obvious

- General conclusions:
  - Network coding does add to CPU processing, and thereby increase power consumption
  - A modest increase for fairly high bandwidth video
  - Places limits on current hardware, but authors recognize hardware is evolving quickly

- Overall, a really nice study

What Haven't We Covered?

What Haven't We Covered?

- More cross layer design
  - Multimedia has tremendous flexibility between quality and bandwidth and lots can be done between layers
- More on multimedia encoding techniques (and transforms)
- Work on measuring human perception
- Multimedia in different network architectures (cellular)

- Other disciplines
  - OS support for multimedia

- Other "topics"
  - QoS, multimedia routing, congestion control, buffer mgt

Preliminary Project Reports

- Three aspects on which to focus
  - Background (problem, related work, motivation)
  - Idea
  - Evaluation

- The flow doesn't have to be the same temporally as the way you developed your idea
  - Sometimes you have an idea that needs a problem
  - Sometimes what you emphasize as the problem changes given what you realize you can and cannot evaluate
  - Sometimes your idea evolves based on what you learn in your evaluation

But Pay Attention to Flow

- The things you say in the introduction should be supported by the rest of the paper
  - Write rough intro first and then revise to match rest of paper

- "Things":
  - Problem: most logical to derive from weaknesses or limits of existing work
    - The solution must address these problems
    - The evaluation must quantify the improvement for a particular
  - Advantages: must be demonstratable through an evaluation
  - The "types of advantage" must match your metrics

- Just today, we've seen examples of papers with various strengths and weaknesses in this respect

Presentation

- Let the listener know what is coming:
  - "We now proceed to evaluate the performance of our hand-tuned implementation of random network coding, on an iPhone 3G and a second-generation iPod Touch. The focus of our attention is on the coding bandwidth, CPU usage, and energy consumption, in the context of a realistic application scenario for media streaming."

- Use an outline slide
  - Maybe not for preliminary presentation (to save time)

- The same goes for the paper and the reader
  - How many papers have you read this quarter where you didn't know where the authors were going?

Presentation Details

- We are starting at exactly 9am… be here 5 min early

- Presenters get exactly 12 minutes
  - Schedule shows start times 13 minutes apart

- Can either send me PPT and we'll use the classroom PC or you can use your own PC
  - Transitioning between the two comes out of your time

- I would keep presentations simple for this one and focus on background, idea, and evaluation (goals)

- Final presentations will be twice as long
  - Any interest in doing presentations during finals week?

Presentation Schedule

- 9:00   Troy+Peter
- 9:13   Lara
- 9:26   Neer+Damon+Julian
- 9:39   Daniel
- 9:52   Zak+Chris
- 10:05 David
- 10:18 Derek
- 10:31 Bryce
- 10:44 Hans+Per+Fahad
- 10:57 END

Exam

- ## How much time do you want?
  - Two extremes: four days or four hours

- ## When should it start?
  - See below

- ## When should it end?
  - Want to finish by Tuesday night
  - Best time would probably be midnight

- ## Class on Wednesday will be to "grade" exams