Mackinac:
Bridging the Software/Channel Gap

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State of the Art of...

Mobile computing (the CS world):

- adaptive software layers
  - end-to-end discovery of resource changes
  - change fidelity of data, caching policy, ...
- protocol-level modifications
  - infer congestion vs. interference, asymmetry, etc.

Wireless computing (the EE world):

- understand fine-grained detail about channel
- can optimize traffic by varying several parameters
  - power, coding rate, redundancy

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Packet abstraction

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Costs of Opacity and Transparency

Opacity hides information, power

- software must infer information (partially) known at device
- devices must assume traffic needs to optimize
- applications can't trade power, performance, reliability
  - based on predicted needs
  - based on application semantics

Full transparency (integration) could solve these problems

- building a monolithic system too complex
- inflexible in the face of improved software, hardware

Translucent Interface

Allow applications to disclose to/advise devices

- coloring packets based on application semantics (disclose)
- explicit directives for power, coding, etc. (advise)

Provide hints from devices to applications

- provide performance characteristics of local channel
  - enables fast convergence on end-to-end
- provide "exchange rates" for trade-offs: 2x power, 10x loss
  - allows applications to know what they are buying

Policy-enabled handoffs are an example of translucency

The Battle, on Two Fronts

How much can you benefit from simple translucency?

- combine Odyssey with ITT's handheld multimedia terminal
- Odyssey colors with 2 bits: tolerate latency, tolerate loss
- HMT tells application local available bandwidth, loss rates
- compare performance/quality with and without disclosure

What would full transparency actually buy you?

- model video conferencing fully integrated with smart radio
- compare to model of fully opaque design
- what parameters are most influential on results?

Meet in the middle