Data-Driven Mobile Optimization with the Cloud

Motivations
- Mobile devices are limited by:
  - CPU Performance
  - Energy
  - Storage
  - Bandwidth
- In contrast, the cloud has abundant:
  - Computing Power
  - Storage Capacity
- Strengths of the cloud can compensate for limitations of mobile devices
- Rich sources of user data can be used to make intelligent optimizations

Key Idea
Improve mobile application experience through cloud-based user profiling.

Key Techniques
- **Aggregation**: Identify related user activities and batch them to improve efficiency
- **Filtering**: Avoid sending unnecessary information to and from mobile devices
- **Speculation**: Perform computations ahead of time, before they are needed by the user

Personalized Content Aggregation
- Retrieving content has a cost: latency, energy, network communications
- Mitigate this with precomputation, prefetching
- Requires a forecast of user activity

Real-time Collaborative Editing
- Collaborative mobile apps: Whiteboard, Text Editor, Slideshow, Design Editor
- Communication-intensive, users may receive unnecessary updates from others
- Region of Interests (ROI) based on users activities
- When to send updates: smart batching
- Which ROI to deliver updates: smart forwarding

Preliminary Results
**News Aggregation**
Twitter News Streams

**Collaborative Editing**
Wikipedia Article Edits

**Consistency Energy Tradeoff**

**Overall Benefit Across Users**

**Combined Benefit of Optimization**

**Optimization Comparison**

**Significant reduction in latency**

**Overall reduction in data transfer**

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