

# Data-Driven Mobile Optimization with the Cloud

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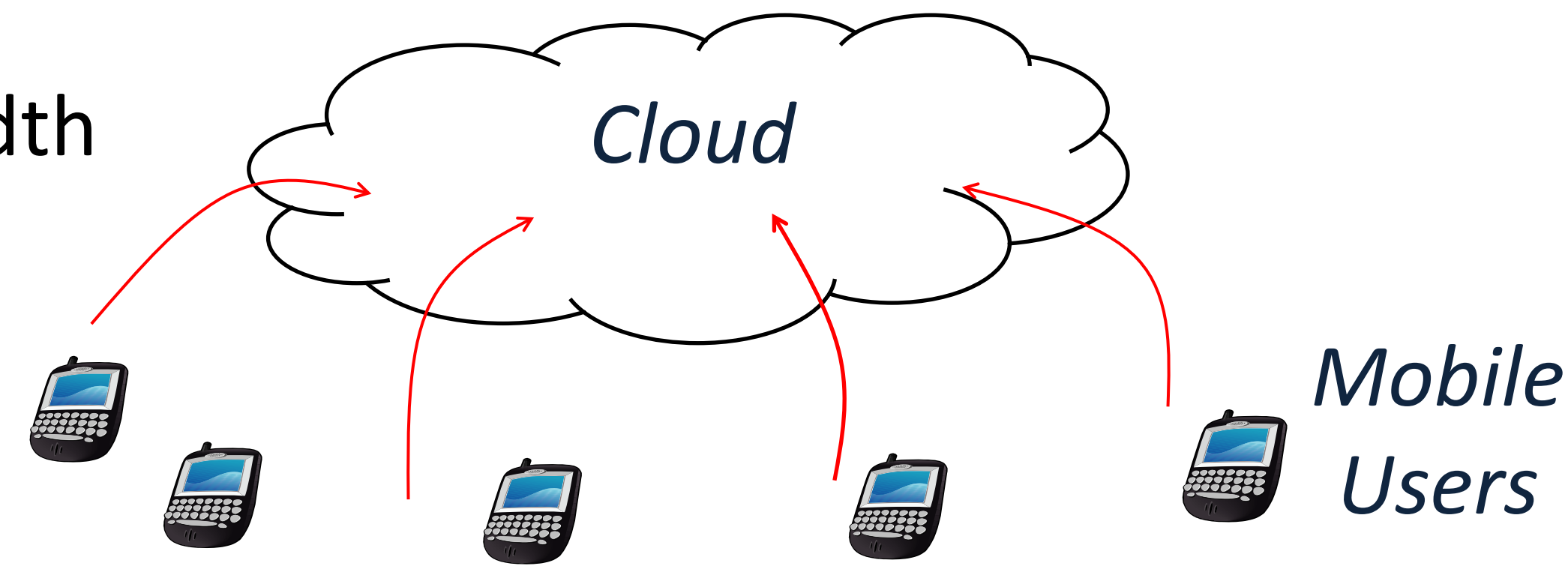
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## Motivations

- 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.

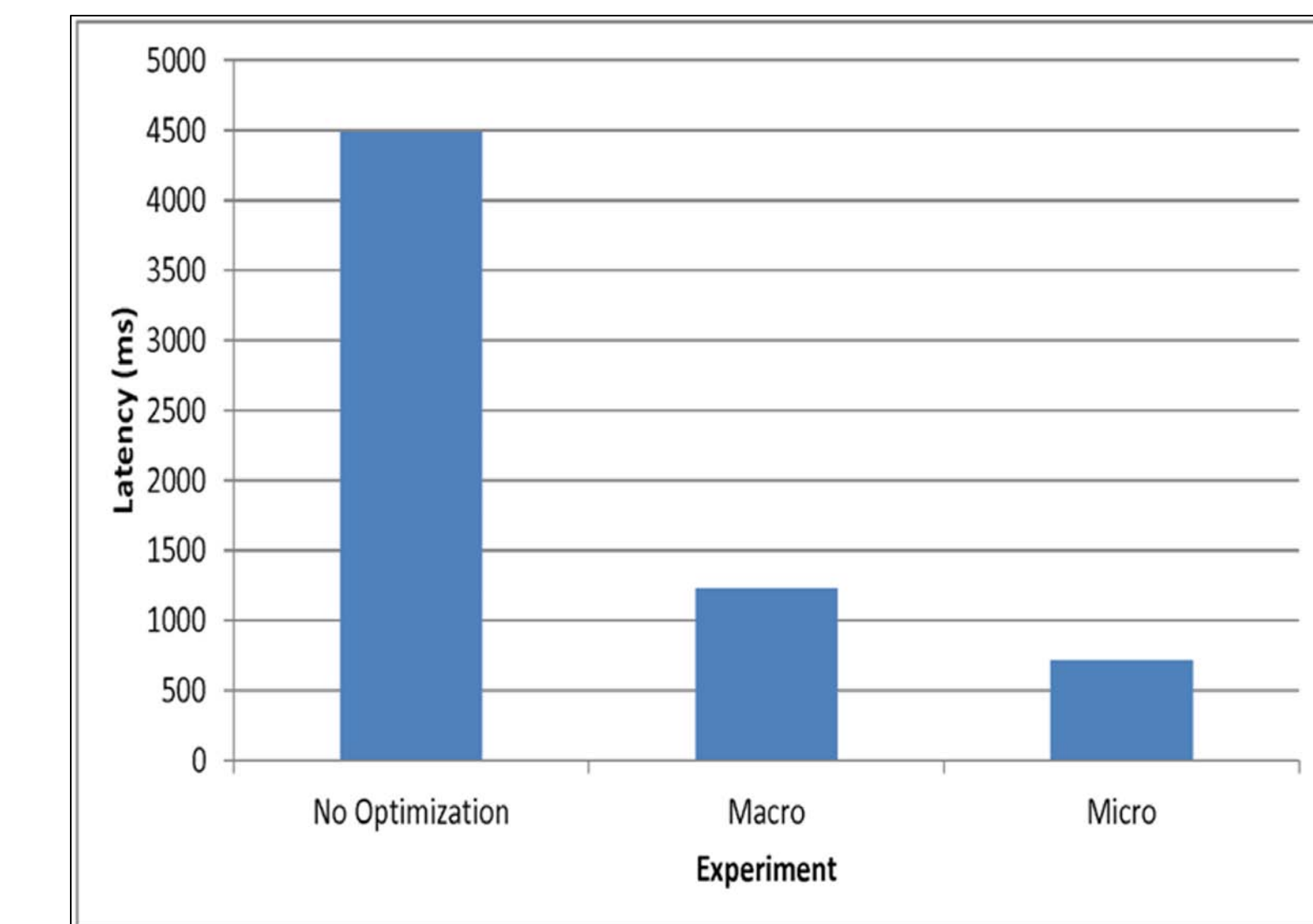
## Key Techniques

- 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

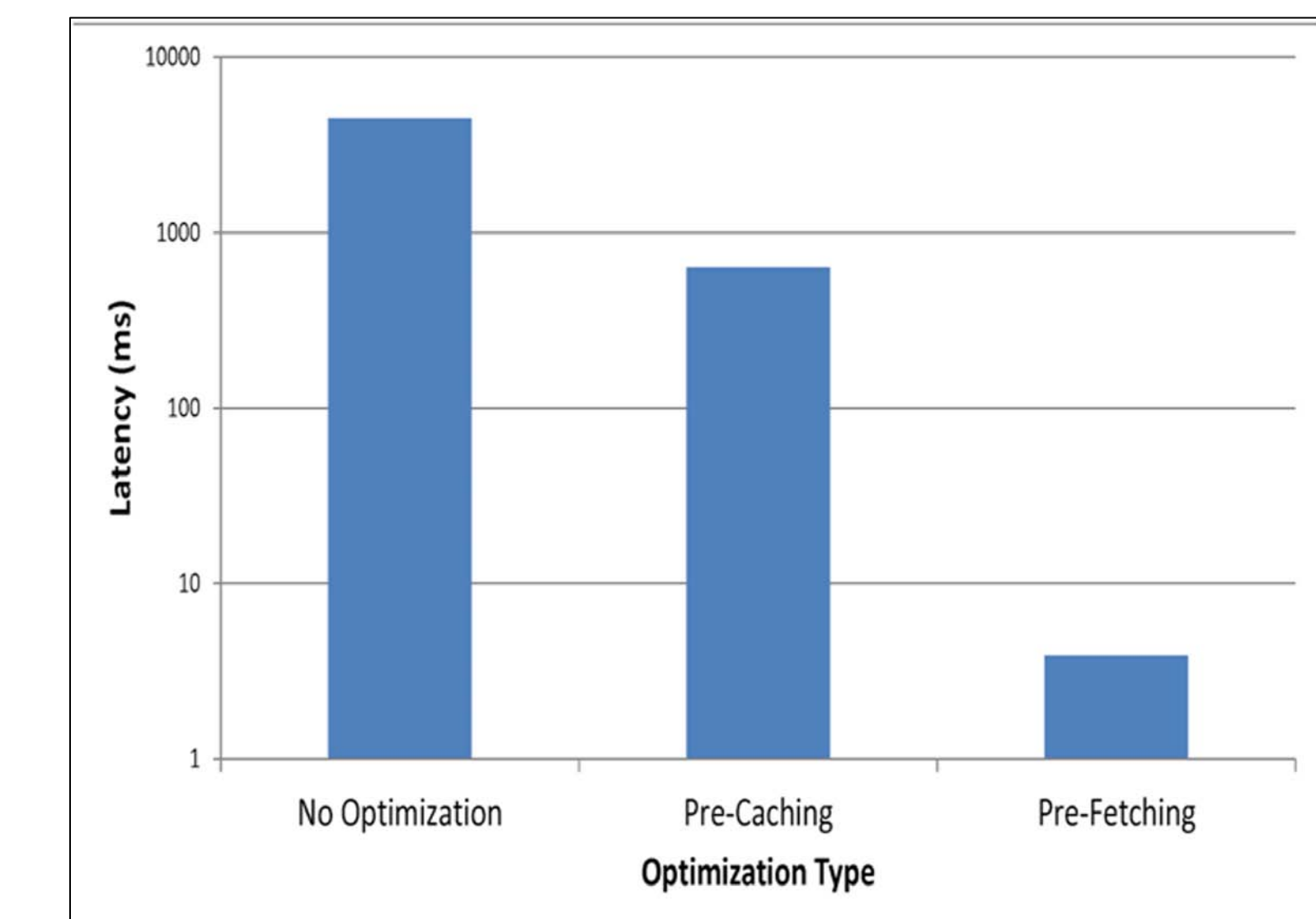
## Preliminary Results

### News Aggregation

Twitter News Streams



Combined Benefit of Optimization

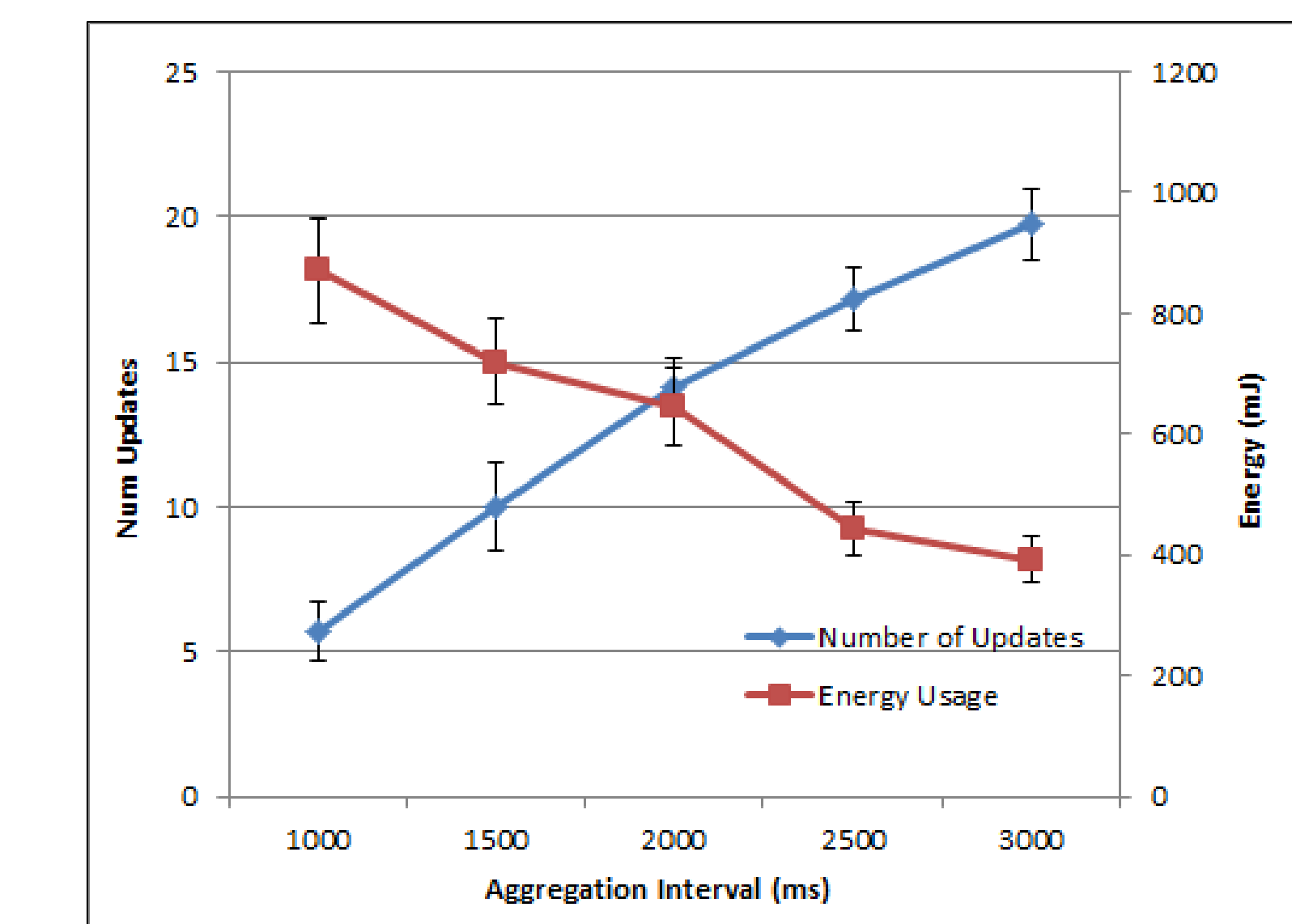


Optimization Comparison

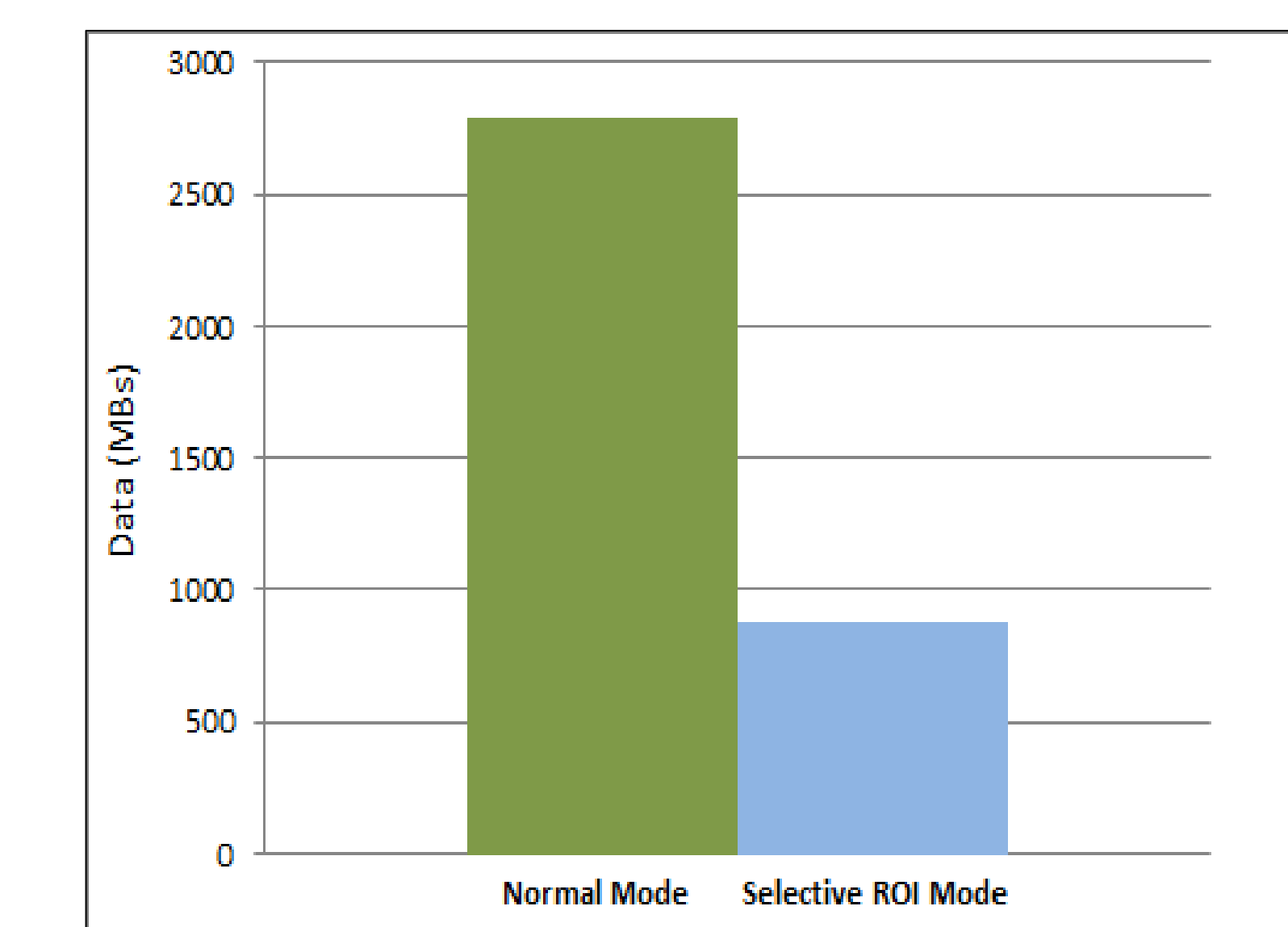
- Significant reduction in latency

### Collaborative Editing

Wikipedia Article Edits



Consistency Energy Tradeoff

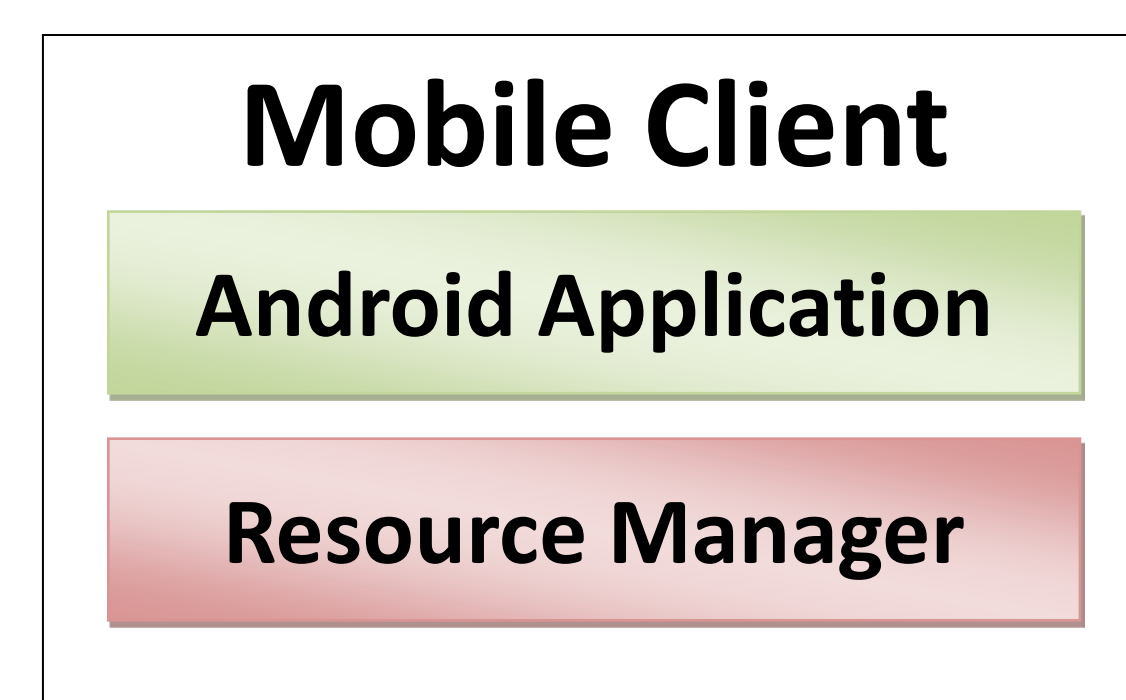


Overall Benefit Across Users

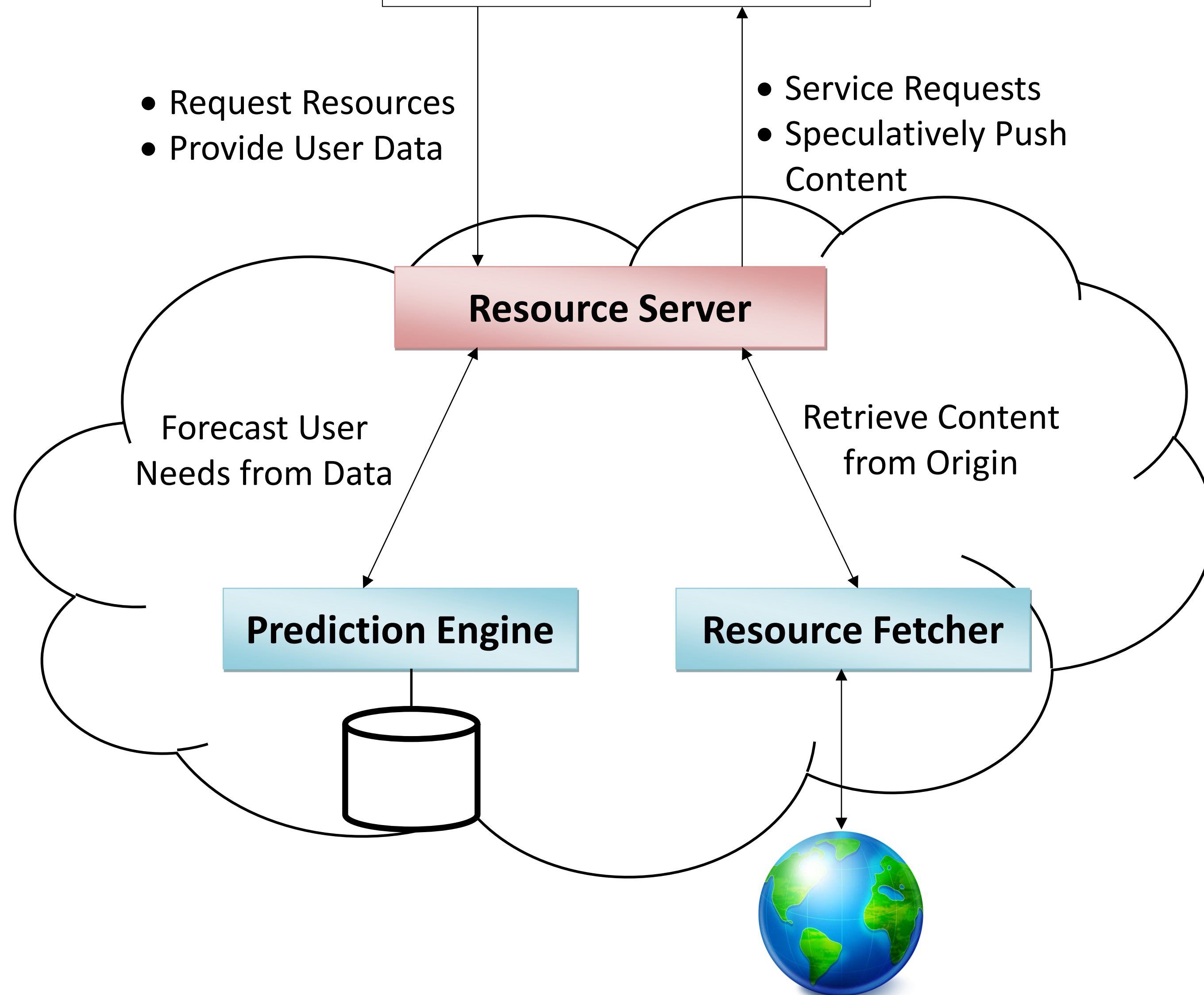
- Overall reduction in data transfer

## Personalized Content Aggregation

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

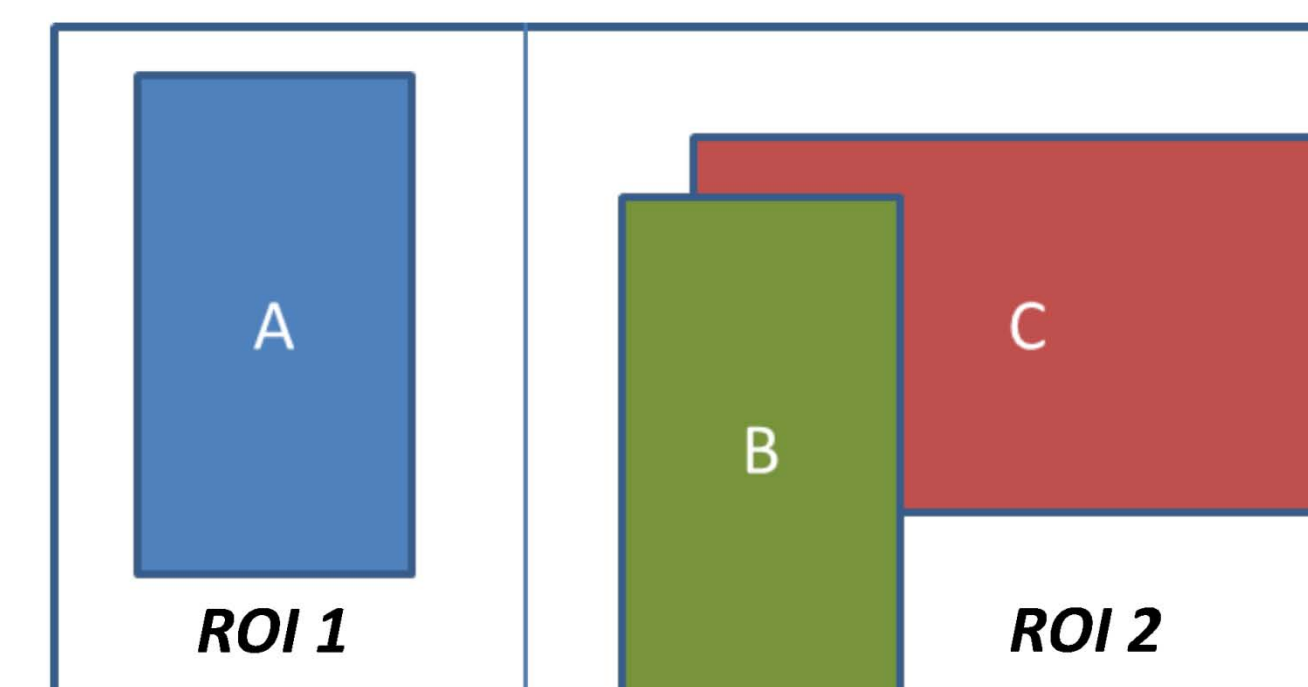


- Request Resources
- Provide User Data



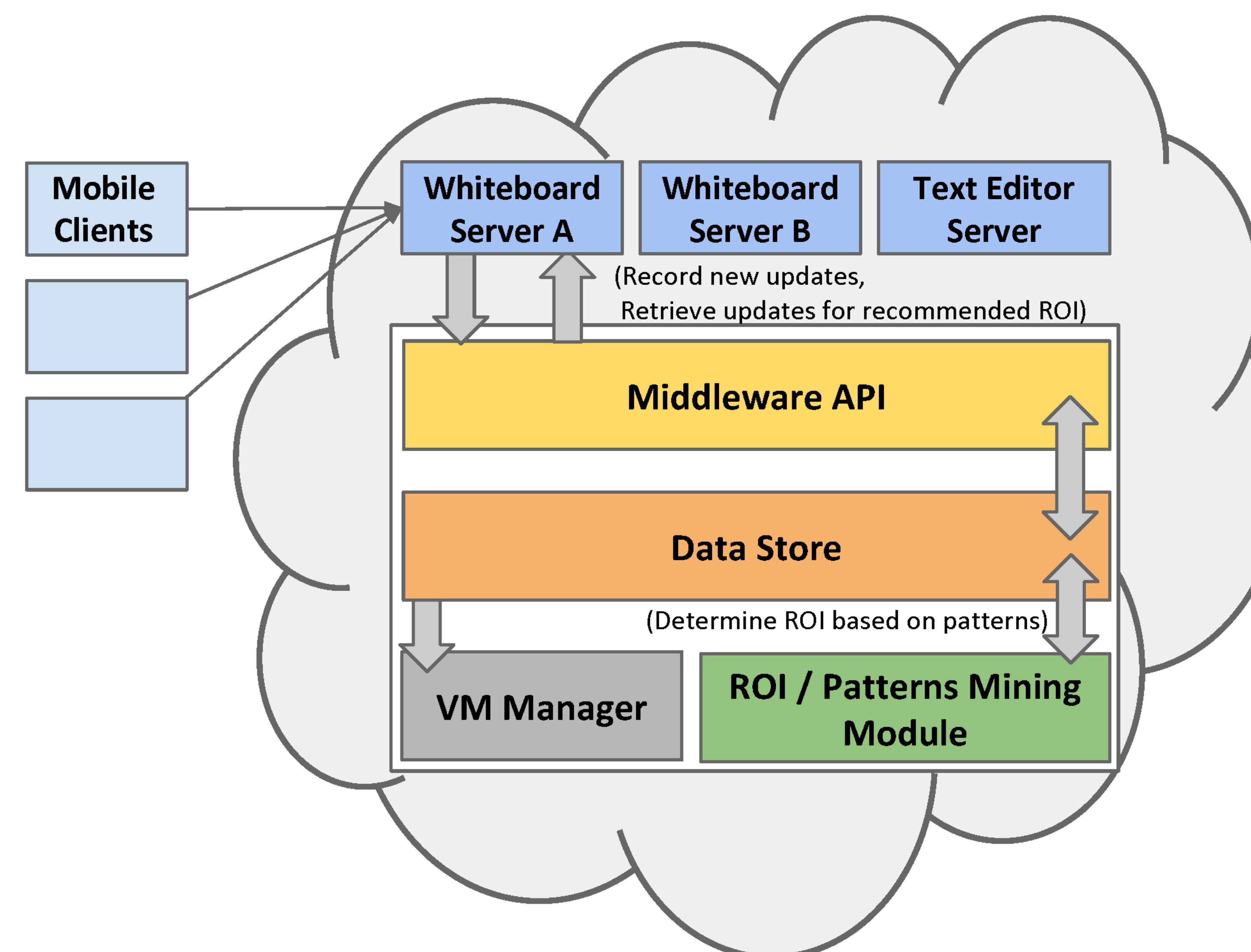
## Real-time Collaborative Editing

- 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



Overall Benefit Across Users