MobiDew: Socially-Aware Data Management for Mobile Users

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1. INTRODUCTION

We propose the use of social knowledge in data management and delivery for mobile users. We built MobiDew, our socially-aware data management service, in Mobius[1]. Mobius builds a two-tier infrastructure: a Mobile (wireless) human-centric tier, which runs mobile applications and collects geo-social context information; and a peer-to-peer (wired) system tier, which runs services on user-contributed resources in support of mobile applications and adapts to user's geo-social context to enable energy-efficient, secure, and reliable mobile applications. As a necessary departure from the dependence of mobile applications on cellular network operators, Mobius allows mobile applications running in the mobile tier to interact with user-deployed, persistent services running in the P2P tier.

Nowadays, mobile devices equipped with cameras and video recorders are producers of large media files. Exchanging media data among mobile devices today is costly and slow. Current data sharing services are subject to scalability, reliability, or functionality constraints mainly due to centralized services provided by cellular service providers.

We assert that social knowledge is beneficial for the design of a distributed data management system that supports mobile social applications. Including social knowledge in the supporting infrastructure for mobile social applications introduces the following benefits: it provides sensitivity to the geo-social context that can limit unwanted disturbances; it can exploit existing social incentives for resource sharing and participation in the P2P infrastructure and thus avoids centralized storage of social knowledge; it improves performance and resource management through geo-socially-aware load transfers from mobile devices to P2P resources.

These improvements significantly extend the gamut of mobile social applications by collecting, exploiting and protecting user's social context from a centralized Big Brother. Some of the representative classes of mobile applications that benefit from using social context (defined as a combination of user's location and the social relationship between participants at that location) are: (1) Socially-aware content sharing: Users may create media content on their mobile devices and may want to share it with a social group that is dynamically inferred from a history of temporal and social-context locality; (2) Software updates: The number of mobile devices is expected to increase dramatically, challenging the distribution of specialized data (such as security patches) to billions of mobile devices. Fast dissemination of software via ad-hoc communication between mobile devices can be filtered by trust inferred from the geo-social context; (3) Social firewall: Content-filtering based on users' geo-social context can enforce data-delivery rules to limit the distribution of insulting material via ad-hoc communication. (4) Personalized distributed sensing and alert: Location-aware personalized decisions can assist, for example, in deciding the evacuation routes for family members and friends to the same safe destination.

2. MOBIDEW ARCHITECTURE

We present MobiDew, a data management system that combines design objectives from P2P systems (such as data availability in the presence of node churn, low data access latency and optimized resource utilization) with performance objectives for mobile applications (such as limiting battery power consumption through high bandwidth and low latency data transfers).

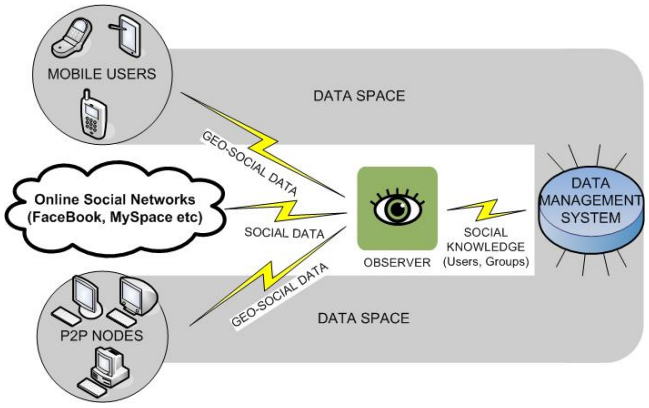

Figure 1. MobiDew architecture. Mobile users, online social networks, and P2P nodes are queried for geo-social data. The distributed Observer runs on users' devices. It collects and archives geo-social information and infers user social context. The data management service transforms social knowledge into metadata used for data placement and delivery.

Our architecture (Figure 1) allows flexible and adaptive management of data based on content, user specifications, and system objectives. In MobiDew, each file receives a set of metadata attributes that includes social knowledge. This set of metadata is used for decisions on data placement, replication, content delivery, data expiration, etc.

Our MobiDew prototype is based on BitDew[2], a data management system for distributed storage that supports a fixed set of metadata attributes. MobiDew extends BitDew's attributes to embed social knowledge and augments the distributed data management to support mobile users. Preliminary experiments show the benefits of embedding and exploiting social knowledge in data management through improved quality of service in data delivery to mobile users and better resource utilization.

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[1] *P2P Systems Meet Mobile Computing: A Community-Oriented Software Infrastructure for Mobile Social Applications*, C. Borcea and A. Iamnitchi. SelfMan, October 2008.

[2] http://bitdew.gforge.inria.fr/