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Information Sharing System For Human Network

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Abstract— **With fast-growing consumer demands and rapidly-developing mobile technologies, portable mobile devices are becoming a necessity of our daily lives. However, existing mobile devices rely on the wireless infrastructure to access Internet services provided by central application providers. This architecture is inefficient in many situations and also does not utilize abundant inter device communication opportunities in many scenarios. This paper proposes the human network (HUNET), a network architecture that enables information sharing between mobile devices through direct inter device communication. We design B-SUB, an interest-driven information sharing system for HUNETs. In B-SUB, content and user interests are described by tags, which are human-readable strings that are designated by users. An experiment is performed to demonstrate the effectiveness of this tag-based content description method. To facilitate efficient data dissemination, we invent the Temporal Counting Bloom filter (TCBF) to encode tags, which also reduces the overhead of content routing. Comprehensive theoretical analyses on the parameter tuning of B-SUB are presented and verify B-SUB's ability to work efficiently under various network conditions. We then extend B-SUB's routing scheme to provide a stronger privacy guarantee. Extensive real-world trace-driven simulations are performed to evaluate the performance of BSUB, and the results demonstrate its efficiency and usefulness.**

Key Words— **Content-based publish/subscribe, interest-driven information sharing, human network, bloom filter.**

I. Introduction

Existing wireless networking technologies only allow mobile devices to communicate with each other through wireless infrastructures, for example, GSM/3G/LTE, and so on. Given the existing architecture, however, they have to connect with central service providers, which would fail in many situations such as failure due to limited network resources. For example, in a conference room, the Wi-Fi and cellular connection can be crippled because too many users are competing for the channels simultaneously as well as this architecture does not take advantage of the abundant inter device communication opportunities. Again, take the conference room scenario as an example; because of the high density of wireless devices, there can be excellent wireless connections between nearby mobile devices. Existing wireless networks are unable to utilize such communication opportunities.

Recently, a new architecture of networking portable wireless devices have emerged, which is called the delay tolerant networks (DTNs). DTNs adopt a "store-carry and- forward" model, which significantly expands the communication capability of mobile device. Driven by the new application demands and the limitations of the existing architecture, we envision a new type of dynamic networking service called human networks (HUNETs). Physically, a HUNET is composed of human-carried mobile devices, which have the same structure as DTNs. These devices use short-range wireless communication technologies, such as Wi-Fi or Bluetooth, to communicate with each other. Functionally, HUNETs enable information sharing between users in a completely decentralized manner without the aid of an wireless communication infrastructure.

We present B-SUB, an interest-driven information sharing system for HUNETs, which stands for the bloom-filter-based publish/SUBscribe. B-SUB is designed for small to medium sized networks composed of dozens of devices restricted in a limited physical area where inter device communication opportunities are abundant. Typical application scenarios are researchers inside a conference room, students inside a department building, visitors in a recreation center, and so on.

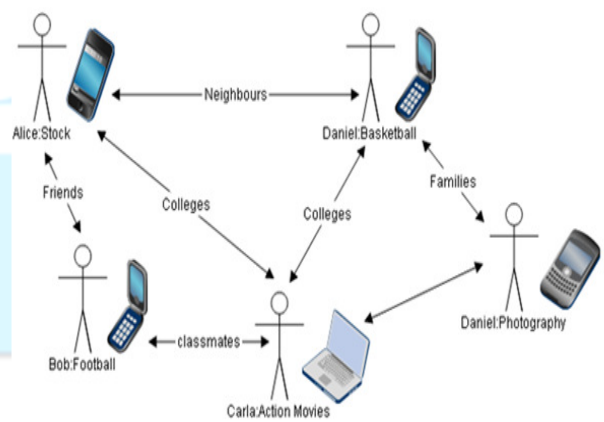

Fig. 1 A High-Level Illustration of the HUNET

II. Existing System

A new architecture of networking portable wireless devices has emerged, which is called the delay tolerant networks DTNs adopt a "store-carry-and-forward" model, which significantly expands the communication capability of mobile device. In traditional networks, publishers post messages to an intermediary message broker or event bus, and subscribers register subscriptions with that broker, letting the broker perform the filtering. The broker normally performs a store and forward function to route messages from publishers to subscribers. In addition, the broker may prioritize messages in a queue before routing. Pub/sub system have loose coupling within space, time and synchronization.

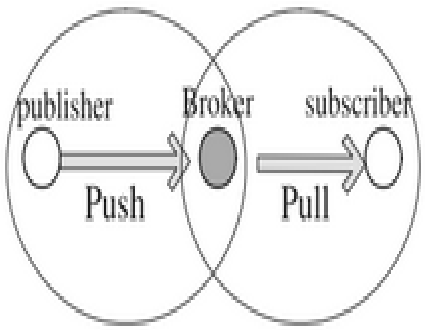

Fig. 2 Traditional Network

This network is inefficient in many situations like it is well for small networks with a small number of publishers and subscriber nodes and low message volume. However, as the number of nodes and messages grows, the likelihood of instabilities increases.

2.1 Disadvantages of existing system

Mobile devices have weak processors and are powered by batteries. Their computational capability is rather limited.

TCBF has false positives in their queries, which causes useless messages to be forwarded to nodes that are not really interested in their content.

III. Proposed System

We propose HUNET, a novel network architecture that facilitates efficient information sharing between portable mobile devices. We design B-SUB, an interest-driven information sharing system for HUNETs, a content-based publish/subscribe that achieves infrastructure-less communication between mobile devices.

We invent the TCBF, an extension to the counting Bloom filter. We conduct extensive theoretical analyses and real world trace driven simulations to evaluate the performance of B-SUB.

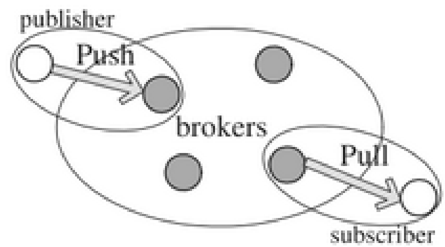

Fig. 3 HUNETs / DTN

3.1 Advantages of proposed system

This provides stronger privacy guarantee.

Gives better protect user privacy.

IV. Methodology: Counting filters

Counting filters provide a way to implement a delete operation on a Bloom filter without recreating the filter afresh. In a counting filter the array positions (buckets) are extended from being a single bit to being an n-bit counter. In fact, regular Bloom filters can be considered as counting filters with a bucket size of one bit. Counting filters were introduced by Fan et al. (1998). The insert operation is extended to increment the value of the buckets, and the lookup operation checks that each of the required buckets is non-zero. The delete operation then consists of decrementing the value of each of the respective buckets. Counting Bloom filters, at each element insertion, the hashed counters are incremented by a hashed variable increment instead of a unit increment. To query an element, the exact values of the counters are considered and not just their positiveness. If a sum represented by a counter value cannot be composed of the corresponding variable increment for the queried element, a negative answer can be returned to the query.

V. Conclusion

In this paper, we present B-SUB, an interest-driven information sharing system for HUNETs. B-SUB employs content-based networking to achieve infrastructure-less communication between mobile devices. Specifically, B-SUB employs a tag-based content description model. A novel data structure, the TCBF, is invented to compress user interests and guide content routing. The use of TCBF reduces the memory and bandwidth consumption of B-SUB. We systematically analyze the impact of several parameters of B-SUB on its behaviors and performance. An extension of B-SUB called B-SUB-P is then proposed to better protect user privacy. Extensive real-world trace-based simulations are performed to verify the performance of B-SUB and B-SUB-P. The results have proven that B-SUB and B-SUB-P archive similar delivery ratio and delay as the optimal method (PUSH), but consumes much less resources.

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