PreFeed: Cloud-Based Content Prefetching of Feed Subscriptions for Mobile Users

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Speaker:饒展榕

Outline

- INTRODUCTION
- RELATED WORK
- PREFEED FRAMEWORK
- SOCIAL RSS SHARING
- OPTIMIZATION OF PREFEED FRAMEWORK
- IMPLEMENTATION AND EVALUATION
- CONCLUSION

INTRODUCTION

- The user demands on mobile services have been significantly souring, but the wireless link capacity cannot keep up with the traffic demand.
- The gap between the traffic demand and the link capacity, along with time-varying link conditions, results in poor service quality of mobile services over current 3G/4G cellular networks, such as long loading/buffering time and intermittent disruptions.

- Many current research studies are carried out to improve mobile entertainment services, and many people are still reading news and articles via mobile devices as one of their habits, so-called “mobile reading,” while mobile reading is mostly based on the subscription of some information publishers, for example, **seeds**.

- The seeds will publish specific content related to their topics by Really Simple Syndication (RSS).

- RSS is an extensive markup language (XML) application, and the idea behind RSS is to enable users to be informed when the information on the Internet has changed.

- As the concise RSS formats allow relatively low-bandwidth data gathering even for several different sources, RSS is becoming a mobile technique for notifying the users of new content, particularly in frequently updated websites such as blogs and news portals.

- For receiving RSS-based content, the RSS feed could contain one or more channels for one RSS document.

- However, while serving RSS feeds with many subscribers, if one user downloads the RSS updates and thus the attached content files, multiple users will induce multiple downloads of the same files via the Internet; hence, there is the significant redundancy downloading problem.

- Therefore, in order to avoid unnecessary data delivery from the RSS service providers (SPs) to the clients, it is better to make a “clustering” point with caching functionality to gather RSS updates with content files, and once duplicated requests come, the cached content can be directly utilized without fetching again.

- In a mobile environment, users often suffer from low link quality and thus long downloading (buffering) time.
- In addition, when the signal is weak, it consumes more battery for transmission.
- Therefore, recently, the “cognitive” content delivery has become hot, which can automatically monitor user link quality and push the content with a proper rate or at a proper time when the link is good enough to serve the user with high QoS and low battery consumption.

Therefore, motivated by the trend of mobile RSS reading and the fast development of cloud computing, in this paper, we propose a framework to improve the quality of RSS service for mobile users, called **PreFeed**, consisting of two parts:

1) **cloud-assisted prefetching**
2) **cognitive pushing**

They list the features and the corresponding contributions of PreFeed framework as follows.

1) In PreFeed, users first share their subscribed RSS lists to the cloud agent, which will shrink the duplicated RSSs.

2) Depending on user activity profiling, the cloud agent will assign a specific duty cycle for periodically updating the RSS list to obtain new published content with proper interval.

3) From the RSS, after the cloud agent obtains the abstracted information of the content, it will further fetch the content y parsing the XML content and fetch the original multimedia files (mostly from HTML websites) and then store the obtained texts, images, and videos in the server locally.

4) The cloud agent will monitor the link quality and mobile activities of users, as well as the usage condition, so that an appropriate time will be chosen for pushing the content to the mobile devices cognitively.

5) Based on prototype implementation and related evaluation, the PreFeed cloud center can avoid duplicated downloads and reduce the total traffic load up to 74%.

PREFEED FRAMEWORK
A. Introduction of PreFeed Framework

- In the RSS, there are multiple abstracted information of the news or articles from the RSS source; a particular piece of news or article is called a **content**, which may be a mixture of text, image, audio, and video.

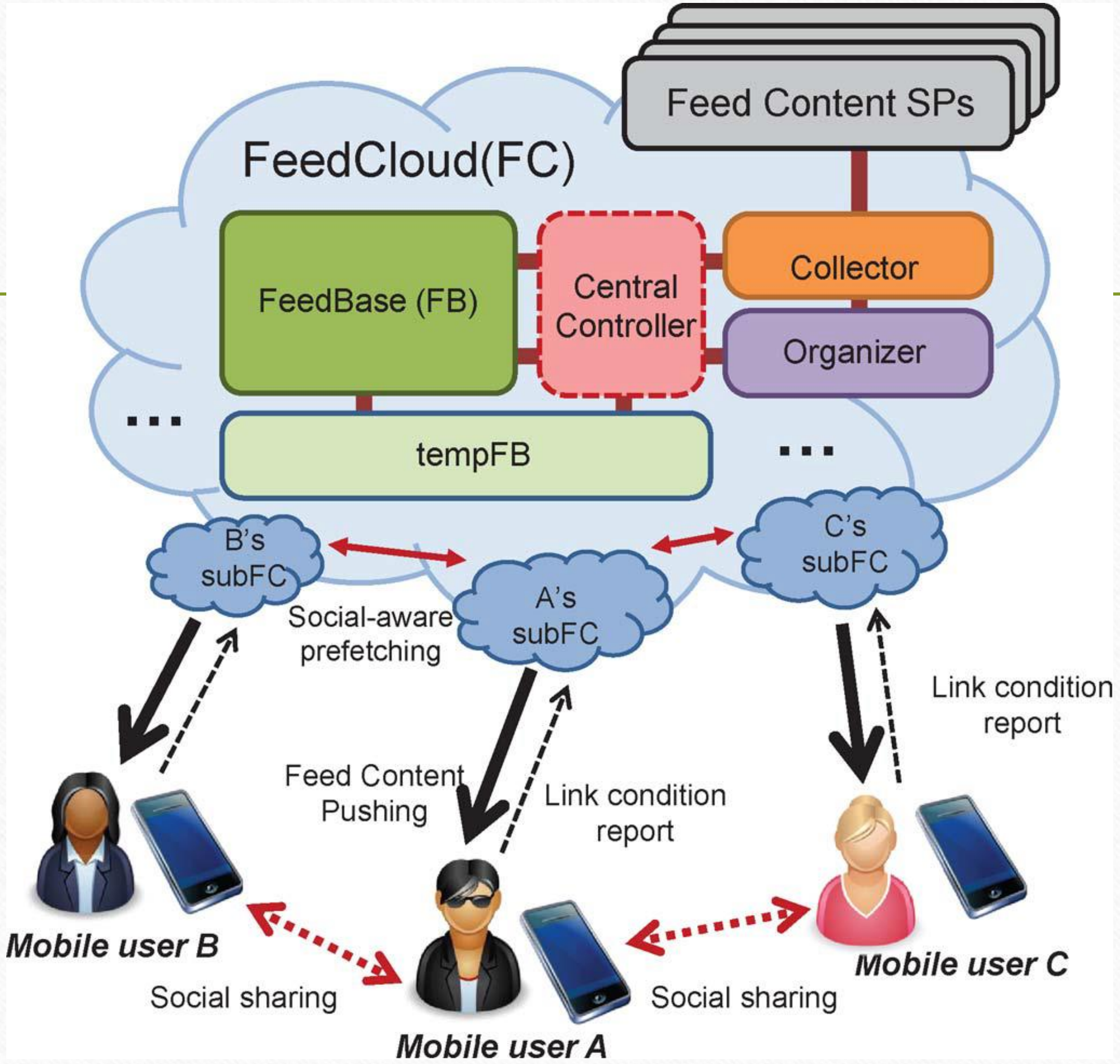
- PreFeed has one important centralized cloud called **feed cloud (FC)**, which is the key role of feed prefetching and pushing.

- In the FC, there is the main **feed base (FB)**, which stores all prefetched feed contents, including the XML-based updates of the feed and all text, image, and multimedia contents of the original website.

- There is also a tempFB, which temporarily stores new feeds, and once it is accessed by a required number of users, it will be moved to FB.

- There is the **organizer** to make a summary of all RSSs of all users by filtering out duplicated ones, and then the **collector** will fetch the RSS updates and the original content from the feed content SPs.

- In particular, for each active subscribing user, the cloud virtualizes a smart agent called **subFC** to monitor the user RSS requirement, as well as the wireless link quality, and then to decide how to request the RSS content and how to push content to the mobile user.


Feed Content SPs
FeedCloud(FC)
FeedBase (FB)
Central Controller
Collector
Organizer
...
tempFB
...
B's subFC
A's subFC
C's subFC
Social-aware prefetching
Link condition report
Feed Content Pushing
Link condition report
Mobile user B
Mobile user A
Mobile user C
Social sharing
Social sharing

B. Cloud-Assisted Prefetching

1) *RSS Filtering and Shrinking:* In PreFeed, users first share their subscribed RSS lists to the cloud agent subFC, which will report to FC's organizer to shrink the duplicated RSSs (due to the disparity of the RSS popularity) with the requests from other users.

2) *HTML Parsing and Content Fetching:* The RSS feed is only an XML-based file containing the URL address of the RSS site, and if we take HTML request to that address, a list of up-to-date news in format of abstract will be returned.

C. Cognitive Pushing by Monitoring Link Quality

- Every user has her own habit on mobile reading while she may be also in varying mobility conditions. Furthermore, the cellular link condition is fluctuating all the time.

- Hence, the cloud agent subFC will check the availability.

IV. SOCIAL RSS SHARING

- By RSS feeds, users can subscribe to well-known famous people and particular content publishers; moreover, there are various types of social activities among users, i.e., **rating** and **sharing** in current social RSS readers.

- They define different strength levels for those social activities to indicate the different possibilities that the RSS feed shared by one user may be accessed by the recipients of his/her sharing activities so that subFCs can carry out effective prefetching and push to users local storage.

- The amount of prefetched segments is mainly determined by the strength of the activities and users' link status.
- They classify the activities in RSS services into three kinds regarding the impact of the activities and the potential reacting priority from the point of view of the recipients , as denoted by ***FeedLv***.

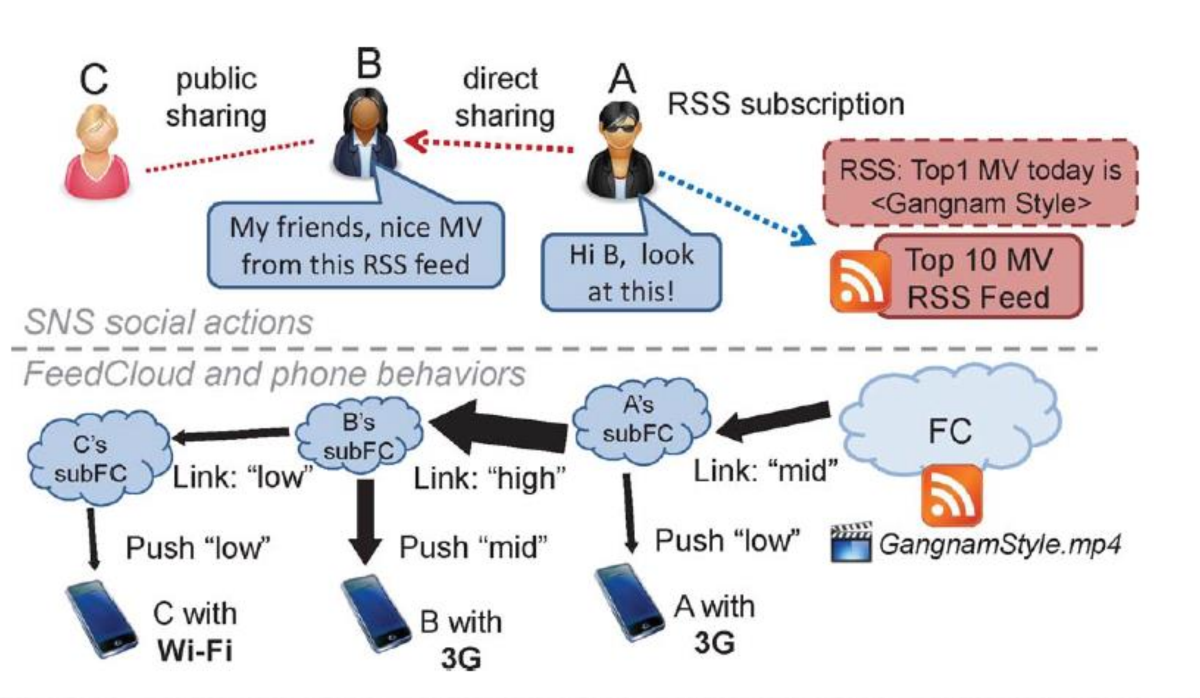
1) **Normal RSS subscription**
2) **Rating**
3) **Direct sharing**

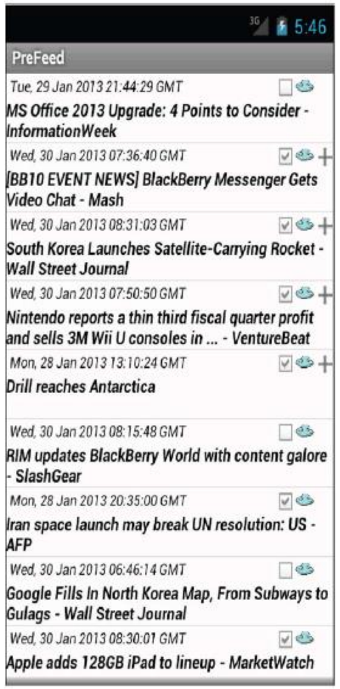
- They also define three prefetching priority levels ***PushLv*** regarding the social activities of users on the RSS feeds.

1) “**High**”
2) “**Mid**”
3) “**Low**”

- If a mobile user is covered byWi-Fi access, due toWi-Fi’s capable link and low price (mostly for free), subFC can push as much as possible in most cases regarding the prefetching levels.

- However, if he/she is with a 3G/4G connection, they propose to downgrade the prefetching level to save energy and money.


C
public sharing
B
direct sharing
A
RSS subscription
RSS: Top1 MV today is <Gangnam Style>
Top 10 MV RSS Feed
My friends, nice MV from this RSS feed
Hi B, look at this!
SNS social actions
FeedCloud and phone behaviors
C's subFC
B's subFC
A's subFC
FC
Link: "low"
Link: "high"
Link: "mid"
Push "low"
Push "mid"
Push "low"
GangnamStyle.mp4
C with Wi-Fi
B with 3G
A with 3G



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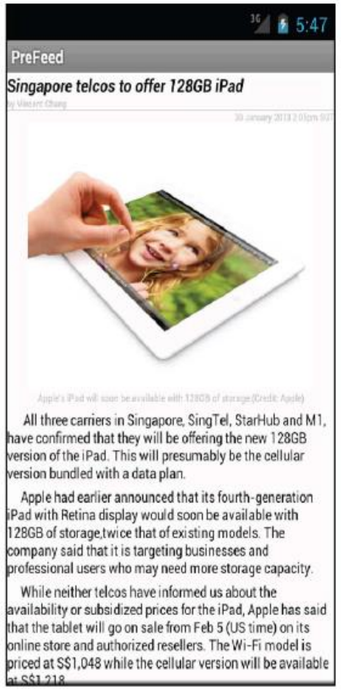


Singapore telcos to offer 128GB iPad

by Vincent Chang

30 January 2013 2:01pm SGT

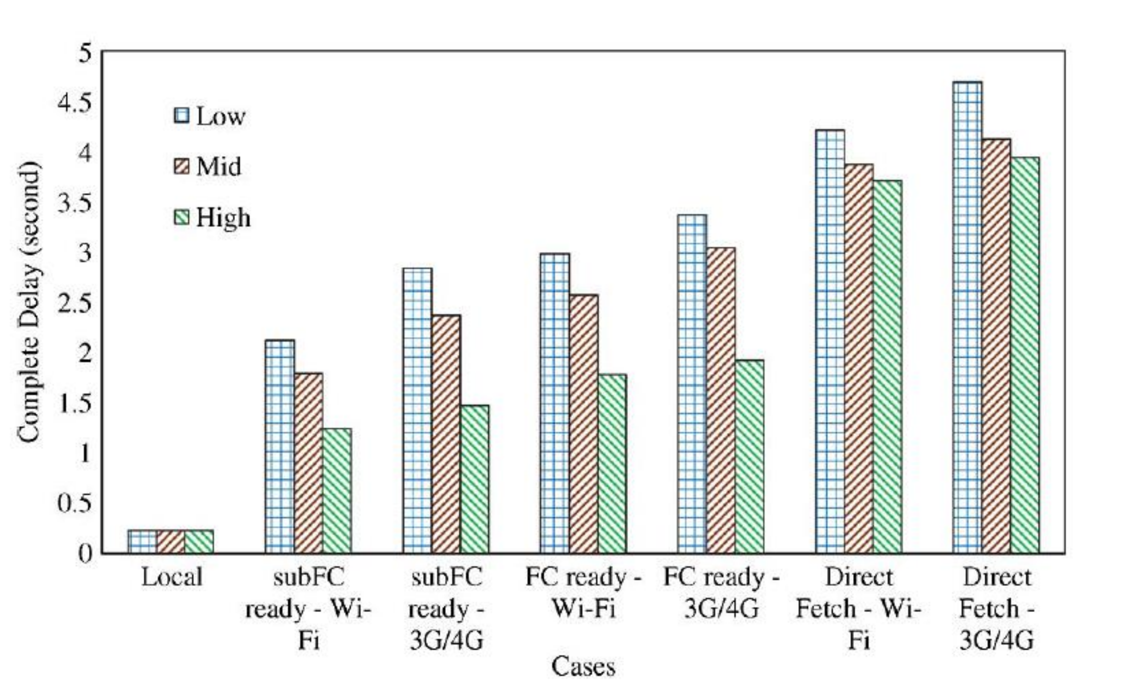
Apple's iPad will soon be available with 128GB of storage (Credit: Apple)

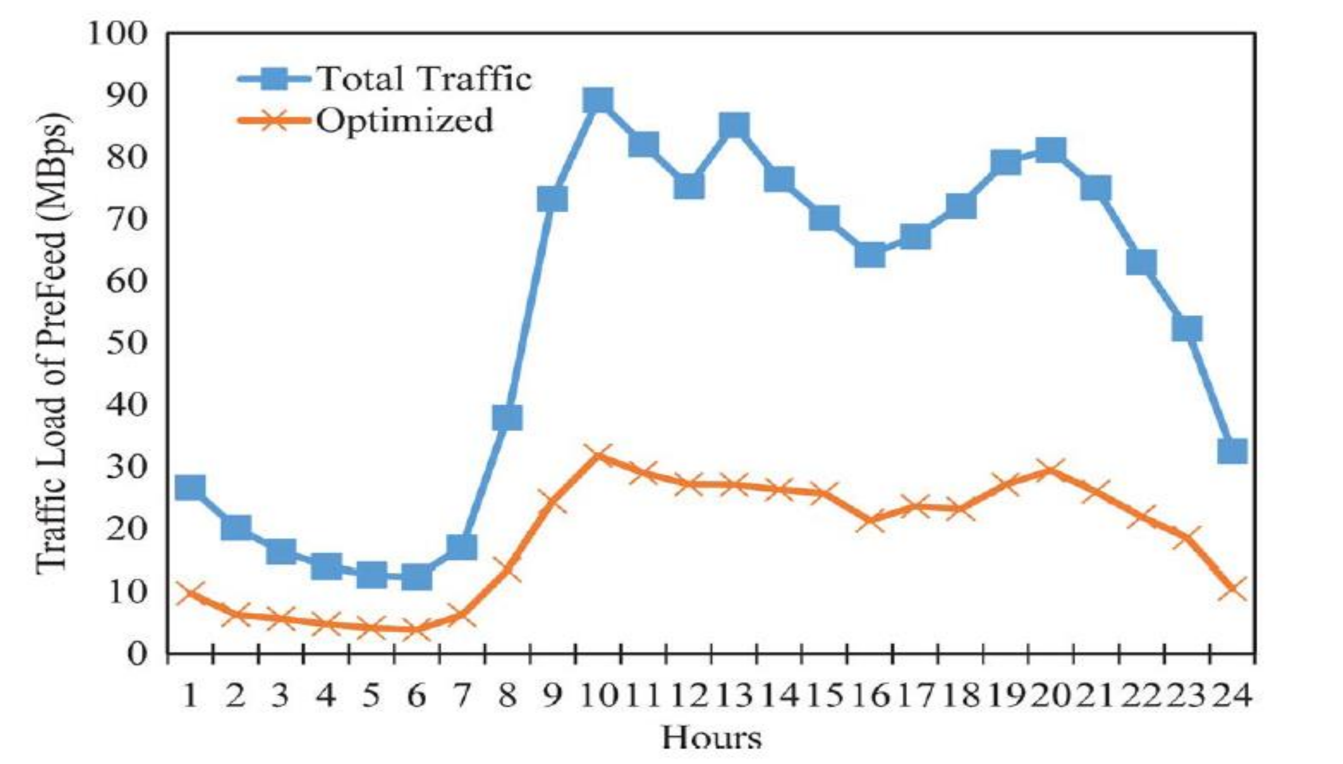
All three carriers in Singapore, SingTel, StarHub and M1, have confirmed that they will be offering the new 128GB version of the iPad. This will presumably be the cellular version bundled with a data plan.

Apple had earlier announced that its fourth-generation iPad with Retina display would soon be available with 128GB of storage,twice that of existing models. The company said that it is targeting businesses and professional users who may need more storage capacity.

While neither telcos have informed us about the availability or subsidized prices for the iPad, Apple has said that the tablet will go on sale from Feb 5 (US time) on its online store and authorized resellers. The Wi-Fi model is priced at S$1,048 while the cellular version will be available at S$1,218

VI. IMPLEMENTATION AND EVALUATION




Total Traffic
Optimized
Traffic Load of PreFeed (MBps)
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hours

VII. CONCLUSION

- In this paper, they have utilized the cloud computing technology to propose a new framework to improve the quality of RSS reading service for mobile users called PreFeed.
- PreFeed consists of two parts, i.e., cloud-assisted prefetching, and cognitive pushing.
- In the future, they will try to improve and optimize the PreFeed framework for large-scale deployment.