ProCCN:Proximity-based Content Centric Networking

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***Abstract*—With the increase of global mobile and smart device users, such as smartphone, smart watch, tablet, etc. motivates the end-users to create and share the contents within proximity location or on Internet. The existing proximity based services such as mobile social network, marketing, etc. exploit the location of user equipment for service discovery and information sharing, where service discovery and service information is mapped with end-user equipment location. However, proximity discovery may violate the end-user privacy through sharing location information. The Content Centric Networking (CCN) proposed as an alternative to the current IP based networking, where the content is requested by name rather than the IP address, can help in content sharing and service discovery without sharing end-user location. In this paper, we proposed proximity-based Content Centric Networking (ProCCN), which is related to proximity content and service discovery without using location information. End user request called Interest Packet can be used to retrieve the content and service information.**

I. Introduction

In the recent couples of decades, the number of contents, mobile & smart devices, and means to communicate over internets has grown rapidly, and in this heterogeneity of these entities, Information Centric Networking, a new Internet architecture Content Centric Networking (CCN) has been introduced, in which considers content as primitive [1].

As of now, there is no several studies related to CCN mobility [2], but with the increase of global mobile and smart device users such as smartphone, smart watch, tablet, etc., CCN offers more opportunity for mobile end-users. In CCN Contents can be shared without using host identifier or location information; there is no need for mobile users to update location information during the handoff. On content not received, consumer can resubmit Interest in new location [2]. In view of the above, through the use of CCN, users can communicate among themselves without sharing their updated location information within proximity location or on Internet.

The existing proximity based services such as mobile social network, marketing, etc. exploit the location of user equipment for service discovery, where service discovery and service information is mapped with user equipment location [3]. However, mapping user equipment location and service may violate the end-user privacy who want to keep his location information private. The Content Centric Networking (CCN) proposed as an alternative to the current IP based networking, where the content is requested by name rather than the IP address, can help in sharing content without sharing end-user location.

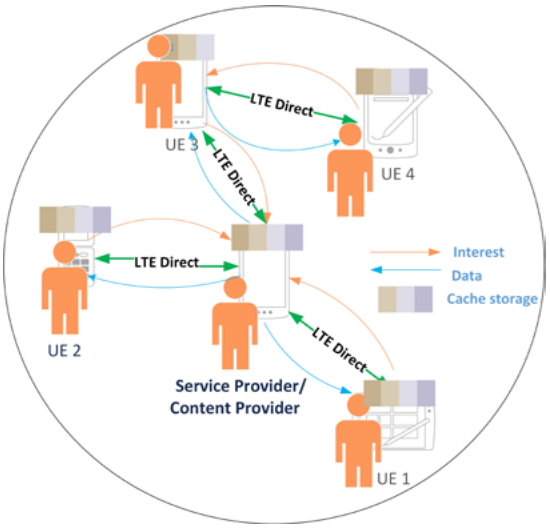

Fig. 1. Proximity-based Content Centric Networking

In this paper, we proposed proximity- based Content Centric Networking ($ProCCN$) in which is related in proximity content and service discovery without using location information, but in case the end-user/service provider wants to share his location, he can include his location information in the content.

II. Proximity based service overview

One of the key enable technology of Proximity based service is LTE direct in $3GPPP$ release 13 which require direct communication between device to device ($D2D$), which offers more advantages such as: (1) user may get high data rates with lower end to end delay due to the short range data communication. (2) The end-user equipment may communicate directly without need cell towers ($eNodeB$) to connect, especially when cellular coverage fails or is not available. (3) Offloads cellular traffic [4].

LTE direct has a range up to 500 meters, which is far more than WIFI and Bluetooth, and it does not utilize location information in determining proximity. LTE direct uses radio

signals called expressions, which are common languages for applications, and facilitate the applications to discover each other [5].

III. Proximity-based Content Centric Networking (ProCCN)

With the increase of mobile and smart devices usage, the users are not only the consumers of the contents, they participate in contents creation and distribution. This makes mobile and smart devices around us to become the source of contents and services, which can be shared among the users within proximity location, without using public network such as Internet which sometimes requires more delay and payment.

CCN considers content name as central point of communication, where content is requested and retrieve by name. Retrieving content by name can help the end-users in service discovery and content sharing within proximity location without using location information. In our system model described in figure 1, we proposed proximity- based Content Centric Networking, which is related to the proximity content and service discovery without using location information through the use of LTE direct interface. UEs 1, 2, and 3 can retrieve content or service information from Content Provider and Service Provider, while UE 4 can retrieved cached content and service information from UE3.

To get the content through the use of LTE direct interface, end-user requests the content or service information through flooding content request called Interest Packet. Any UE in LTE direct coverage, which has the content or service information, returns the content or service information (with service location) to the requester.

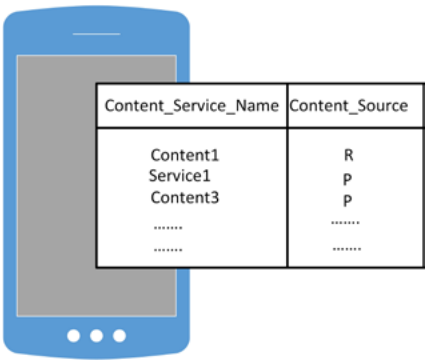

Fig. 2. Content Store table(CS) for End-user Equipment

Normally, the end-user creates the content and stores it in his mobile device. To differentiate the content that the end-user does not want to share, and the CCN content which can be served to any UE on demand; we propose the modification of the Content Store table(CS) or content memory, where the content received from other $node(s)$ will be denoted R, while the content created by end-user will be denoted P. The end-user equipment serves only the content denoted P. However, when the end-users wants to share cached content in R category, he can update content source field by replacing R by P (Ref. Figure 2).

With the help of three main CCN Data structures, namely: (a) Content Store (CS) or memory, (b) Pending Interest Table (PIT), which records unsatisfied Interest packets with their incoming faces, and (c) Forwarding Information Base (FIB) which records outgoing faces, we present our CCN Proximity-based forwarding flowchart in figure 3.

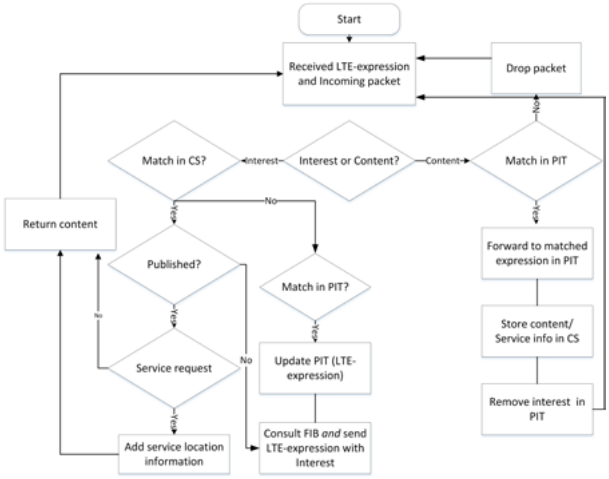

Fig. 3. CCN Proximity-based forwarding

In our proposal, we consider also the mobility of source of content/service or the requester. When source of content/service or the requester change the location, on content not received with Interest life time, end-user/ requester can re-express again Interest in new location.

IV. Conclusion

In this paper, we proposed proximity- based Content Centric Networking (ProCCN), which is related to proximity content and service discovery without using the end-user location information through the use of LTE direct. In our proposal, the Interest Packet can be used to retrieve the content and service information. In the future, we aim to extend our work with simulation and more analysis.

References

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