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Dynamic Resource Management for Cellular Cognitive Networking

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Abstract— Mobile networks are going to experience some major changes in the coming years in order to hold the continuously increasing load which is engendered by the increasing phones. And among those, the one which is more dynamic to the network assets is the Cognitive networking, which help to adopt to the mobile demands in consuming resources. Cognitive networking techniques have the capability of mining huge amounts of mobile traffic data collected in the network. So that it understands the resource utilization of current status of network at automatically. The proposed work is to analyze the allocation of the assets in the cognitive network, fabricate the profile on demand and avoid unusual situations in networks. And to evaluate this framework , real world mobile traffic datasets are used.And even singles out a large number of outlying behaviors in real world mobile traffic datasets, which are mapped to social events or technical issues in the network.
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I. INTRODUCTION

In this world global mobile traffic is rising at theatrical way. Compound annual growth rate (CAGR) was more than that internet traffic recorded over the last decade and in the years between 2014 and 2018 similar drift with predictable 11- fold growth are expected. But the challenge for mobile operators are the rise in the demand of the mobile .And so the upcoming 5G cellular networks are the only way to meet all the demands, and both in wireless capacity and support for connected devices there is an increase of 1000 fold and 100 fold respectively. Because of these goals only 5G architectures is not been introduced with respect to 3G and 4G networks.

5G is also been designed for re-configurability and suppleness. The two new architecture which is used to support for resource management are C-RAN (cloud radio access network) and SDN(software defined networking) .even these architecture will provide support to the cognitive networking. cognitive networking is related to the cellular mobile networks where the consumption of the resources by the subscriber in very different ways depending on time and location of accessing the network. Cellular cognitive network will also be able to notice such variation in the user demand and react according to the demand. With the changes of the network resources like increase in the mobile demand , their establishment, the modification ,relocation of the mobile etc algorithmic solution is being provided.

Here , in these paper we tried to design mobile traffic analysis for the investigation of the data composed in the cellular network .we propose a structure for the programmed sketch of mobile demand in the huge area network. Our frame work runs parameter less and functioned on the data gathered and even creates sort of the demand according to the consumer population. This proposes framework even can identify the odd actions of the customer. This will have social and also the technical origins.

II. RELATED WORK

The detailed examination of mobile data for phone has received important over the last few years.MOBILE TRAFFIC ANALYSIS AND NETWORKING. Numerous works on human mobility leverage mobile phone data, normally presented under the form of call detail records, to illustrate individual and population moments and calculate them. Whereas this method allows escaping problem of sparsity in the data provided by CDR,it also well known to mingling data mentioning to typical and unusal performances in the mobile network. The evaluate of D4D challenge datasets to determine irregular patterns in the communication flows of ivory coast population over a 5 month period. The future method labels as outliers those time slots with a high quantity of base stations displaying an hourly traffic powerfully deviating from its expectation. Inversely from our solution, the method deeply relies on randomly defined parameters and thresholds. Further recent works on country scale CDR Datasets purpose at secondary network planning, processes variance detection, by revealing the socio economic construction of an area and capturing the effect of one area on another. Earlier works mainly absorbed on the total traffic volume when describing users performance. Reviewing this metric only reproduces large positive or negative differences in the total mobile traffic volume over the studied area, and does not description for specific geographical variations withinit.This works taken the features by considering the traffic volume in each area of a exact region to be controlled with respect to the total traffic volume in the area. conversely, these studies only focus on the normalized volume, and do not reflect any measure of resemblance between traffic patterns nor delivers a organization of network usage profiles. IMPROVING

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MOBILE NETWORKS WITH TRAFFIC ANALYSIS. mobile traffic analytics has newly been used to calculate and improve performance of current mobile networks. the local mobile traffic peaks and proposes the tuning of the radio resource controller protocol state mechanism in demand to avoid performance degradation in existence of these distinct measures. To decrease the energy consumption of user apparatus by enhancing the working of the RRC state machine..Their future system saves more than 50% of the energy on the operator side. This studies focus on the recent cellular planning and mobile phone data are hardly used to evaluate novel designs and instruments for next generation 5G cellular networks. virtually, when using such massive datasets to study evolved networking architectures, the focus is generally on the addition of device to device communication in mobile networks. At the same time ,topic such as C-RAN, green networking and machine to machine support gain popularity in the context of 5G designs. The work is balancing to the results, profiling the demand and tolerating the operators to decide when and where to start the dissimilar adaptive mechanism.

Framework

For the mobile network usage sketch, our framework is classified. This runs on the snapshots of the mobile demand hauled out from the type of existing mobile traffic data .So the depiction of the load which is produced by the mobile user during a predetermined time interval is called the snapshots. Snapshots can explain the volume of the traffic at every seconds or the traffic volume is being averaged over longer time intervals at each base station or is being amassed over larger network areas either for one or multiple services like voice calls, short text messages internet based application etc.

Here, T denoted as the set of snapshots and each snapshot will be uniquely identified. And similarly Z is denoted as a set of network area. And according to the available mobile network, we will select T and Z. Practical examples of snapshots is also been provided. Once the snapshot is defined, it processed through four phases. The number of network usage categories by analyzing the snapshot is defined in the first three phase and the fourth phase define the added usage sketch.

So the steps which is followed in the proposed method is

- Traffic volume similarity
- Traffic distribution similarity
- Cluster forming
- Demand filling

Following figure shows the proposed system of the framework

Fig.1. Block Diagram

Snapshot Graph

First, as a training set, T'⊆T of snapshots is selected over which network categories are defined. We selected T' according to the mobile data traffic. The snapshot may be decided either directly from the previously recorded profiles or to pre process them and then to remove potential biases which is introduced because of the training set. Even a synthetic training set T is possible to generate by iterating over T'.A snapshot graph G(T',E) (undirected weighted graph) is sketched by the snapshot in T'.

Traffic volume similarity

A traffic volume similarity let V was taken which accounts geographical sub areas when traffic volume variations is computed between two snapshots i& j. formally,

$$v = \frac{1}{\sqrt{\sum z \in Z\, (v_i^z - v_j^z)^2}}$$

Let us consider in Z there is only one area, if we map the whole region then V represents the total volume variation. Then the next step if the region is divided into number of areas, then the spatial diversity is captured by V in the mobile traffic.

Traffic distribution similarity

The complete description of the user profile is not completely described by the metric V.when complete variation of the mobile traffic over separate areas is accounted then how traffic is distributed over that area is ignored. So a traffic distribution similarity D is introduced, which define how mobile traffic is separated in the diverse areas. The weigh between snapshot i& j is :

$$D = \frac{1}{\sqrt{\sum z \in Z\, (v_i^z/Vi - v_j^z\, /Vi)^2}}$$

Vi is denoted as traffic volume recorded in the whole region during the snapshot i.So D considered the normalized volume at each area z 2 Z.This describe how independently traffic is distributed over the region.

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Cluster forming

The weight similarity measures are being estimated by using V and D, the normalized value is used to form the cluster.

wij = v + D / 2

Demand filling

When new user is entering into the area to analyze with iverse network assets and join with the satisfied network then this is called as demand filling.

Datasets

Our framework depends on two case studies. The first one refer to the dataset which is provided by Orange within the content of D4D test of 2013.The next one refer to the data which is published as the part of the Big Data Challenge which is organized by the telecom Italian in the year of 2014.

D4D Orange Dataset

Our first case dataset is based on the orange customers in Ivory Coast, and in terms of the number of voice calls between the base stations, which is aggregated on a hourly basis, the mobile traffic volume is depicted. When we talk about the urban environments, we focus on the city of Abidjan, which is the economic capital of the Ivory Coast, where there is a population of 4 million over the area of 500 km^2.The data set is strained by only one information in which the antennas of Abidjan is involved , nearly about of 364 base station is involved.

With D4D dataset, snapshot is measured to combined data at each hour. Thus our set T contains s over almost 3600 snapshots, where each explains the network usage over a definite hour. Z set of network areas over which traffic volume is combined is mapped with the set of consumers in the city. Additionally it is proved that the division of Abidjan which includes behavior of different base stations described in the D4D dataset. The available dataset contain voice call volume, therefore it refer to the voice traffic.

During the analysis, we found that information regarding the 364 Abidjan is not always present for the entire examination period. Three main behavior is acknowledged and explained by different collection phases ,and a voice call is traced during each period, for diverse subset of base station.When the forth scenario is acknowledged which include snapshots affected by technical problems which is met by the operators in the collection of the data and the power grid failure in Abidjan.Our decision of snapshot analyzing is composed in different periods which implies the two different snapshots i.e.i& j € T which contain different number of base station. In order to reasonably work out the relationship $w_{ij}$of snapshot i& j with different number of base stations, we consider the base station which appear in both the snapshot i& j.

Big Data challenge Dataset

Telecom Italia provided the big data challenge dataset which is based on the surface of the city of Millan in cells. These cell signify the maximum spatial granularity where Italian operators provide mobile traffic measurements and according to the Abidjan , no information about the deployment of actual base station is provided in the area.

To illustrate the geographical areas Z for traffic volumes aggregation, a Decentralization Zone is being described. The dataset is analyzed in this paper which report on subscriber communication activity, in terms of incomingcalls and outgoing calls, receiving and sending text messages, and internet data usage. This data has been extracted according to each cell of millangrid. We again combined the available data to 1 hour bins. So at last the final dataset contain about 1488 snapshots. So it is found that The Milan dataset more consistent then Abidjan.

SIMULATION RESULTS

We exploited our framework to analyze to the different kinds of subscriber activity.i.e.,incoming and outgoing calls,incoming and outgoing text messages and internet data.Due to space limitations.Here we present only the results for incoming calls,which represents an interesting sample of the mobile traffic.The figure report on the number of volume similarity versus number of clusters,computed with the V similarity measures.The three categories identified by the V measure associate with neat behavior in relation to call in volumes.

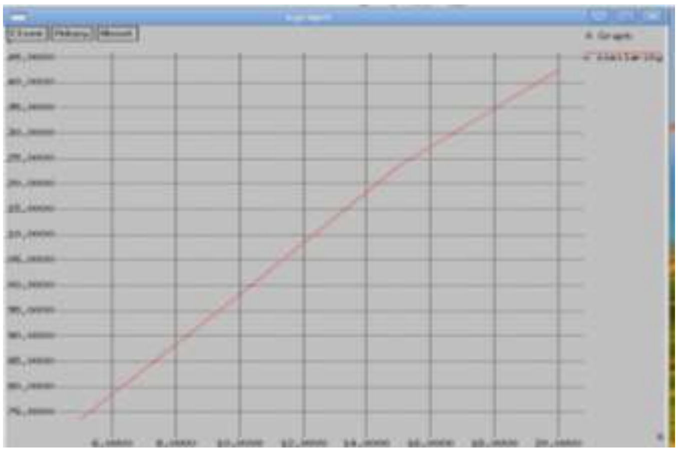

Fig.2.Similarity measure V

The D measure identifies four categories, in terms of traffic distribution.It mainly includes snapshots related to working time, and presents the highest concentration of call in activity in the center location, with a much lower relative traffic in all other zones. There will be high demand in the network which has more traffic, due to more number of users and also there will be high demand in industrial and high density residential

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areas. Each category maps to one specific profile of the network wide mobile traffic load.

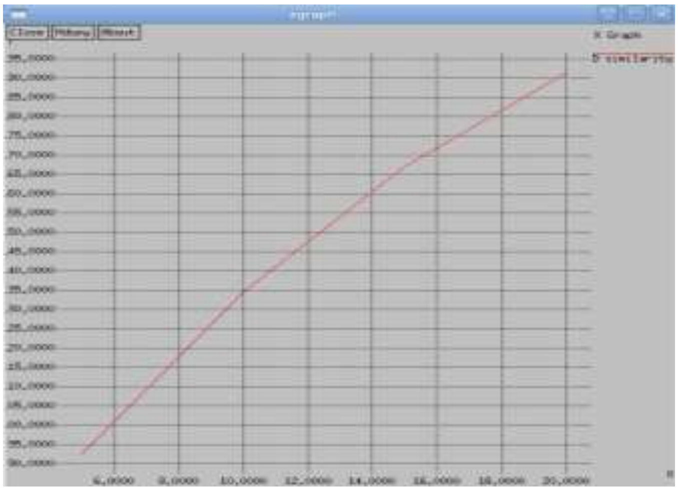

Fig.3.Similarity measure D

III. CONCLUSION

The proposed frame work sketch the user demand which is recorded in the mobile network. When we saw the case studies we found the limited set of significant network usage categories. And each category identifies one particular profile of the wide area network having mobile traffic load. But it is observed that categories when identified of two urban areas are diverse. The frameworks define how Abidjan and Millean have dissimilar pulses.

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