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Telecom Traffic Analysis to discover the highly congested telecom circle in India

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Abstract: **This paper aims to analyse the traffic in 1800 MHz frequency band in the corresponding telecom circles and to find out which one has the highest traffic.There are 23 telecom circles in India and 19 out of them use 4G LTE (1800 MHz) band. Thus, chosen this band. Similarly, common network operators are: Jio, Airtel, Vodafone, Idea.**

Traffic analysis enables you to determine the amount of bandwidth you need in your circuits for data and for voice calls. Traffic Measurements are conducted on a continuous basis and the results compiled into reports for management which are used in management decisions on various time scales. The busiest hour is defined as that four consecutive quarter hours whose traffic intensity is the greatest. Measurements taken outside the busy hour can be discarded. The reference intensity of traffic is then calculated by taking the average traffic intensity of the top thirty days in the year. Measurements taken on individual days can be discarded. This will give the normal high traffic intensity in the network, allowing network managers to make long-term strategic decisions.

Keywords: **DBSCAN, Telecom, Frequency, Bandwidth, Traffic.**

I. INTRODUCTION

Traffic is defined as either the amount of data or the number of messages over a circuit during a given period of time. It also includes the relationship between call attempts on traffic-sensitive equipment and the speed with which the calls are completed. Traffic analysis enables you to determine the amount of bandwidth you need in your circuits for data and for voice calls and thus the need to study teletraffic engineering.

The research paper comprises of eight pages. Five major sections have been covered here. These are:

1) Abstract
2) Introduction
3) Research Elaborations
4) Results or Finding
5) Conclusions

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Various research papers were read on the subject as well as the technique used. Each of the papers helped elicit a valuable key point. Those, when amalgamated together, gave rise to this idea : *to find out the highly congested telecom circle.*

Measurement of traffic within a network allows network managers and analysts to both make day-to-day decisions about operations and to plan for long-term developments. Traffic Measurements are used in many fundamental activities such as:

- Identification of traffic patterns and trends

- Calculating the traffic intensity in a specific circuit or group
- Monitoring the service
- Dimensioning and managing the network
- Calculating tariffs
- Performing forecasting
- Dimensioning and managing the SS7 network
- Checking the performance of the common channel signalling network

III. STUDIES AND FINDINGS

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o A paper titled 'Distributed Dynamic Cluster-Head Selection and Clustering for Massive IoT Access in 5G Networks' by Yifeng Zhao, Kai Liu , Xueting Xu, Huayu Yang and Lianfen Huang is a significant research on the topic.

o It discussed the research direction of energy efficiency in cellular communication and summarized a concrete method for each direction. Then, Section 2 established a system model based on the random access process combined with the wireless resource block.

o But it does not properly help in the research prone discussion and to locate the desired area on the Indian map.

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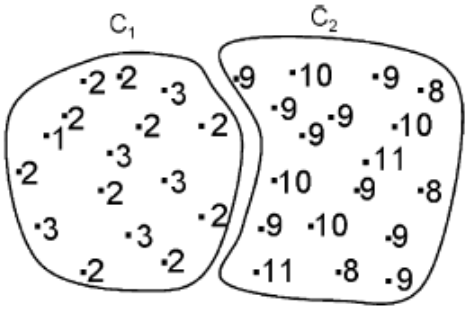
o In a paper titled 'ST-DBSCAN: An Algorithm for Clustering Spatial-Temporal Data' , Di Qin discussed the need and discovery of implementation of DBSCAN algorithm on spatial-temporal data. It described the algorithm and showed an application. He applied the algorithm on seawater data – '*The task is to discover the region that have similar seawater characteristic'*.

o It has solved various problems such as:

- Identifying adjacent clusters
- Comparing the average value of a cluster with new coming value.
- If the absolute difference between Cluster_Avg() and Object_Value is bigger than $\Delta\varepsilon$, The object is not appended to the cluster.



o But it takes two distance parameters, eps1 and eps2 ; which makes the task a bit complex.

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o In a paper titled 'Multi-density DBSCAN Algorithm Based on Density Levels Partitioning' by Zhongyang Xiong, Ruotian Chen, Yufang Zhang, Xuan Zhang; proposed DBSCAN-DLP algorithm tries to achieve multi-density clustering via density levels partitioning according to the statistical characteristics of density variation.

o Excellent performance on both synthetic and real-word datasets confirms its effectiveness.

- However, proposed algorithm needs k nearest neighbor distances and density variation values computed, stored as well. It's time and I/O consuming when input dataset is enormously large.
- To attack this problem, we can adopt sampling techniques before density levels partitioning for future research.

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- However, proposed algorithm needs k nearest neighbor distances and density variation values computed, stored as well. It's time and I/O consuming when input dataset is enormously large.
- To attack this problem, we can adopt sampling techniques before density levels partitioning for future research.
- But these focus more on QoS factor, rather than identifying traffic or discussing the traffic removal.

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- 'An Overview of Indian Telecom Sector' by Zaraq Zahoor gives light on the advancement in economic and social sectors brought by Teleommunication and Information Technology.

❖

- In 'Traffic Network and Optimization a Future Subscriber's Mobile Telecom Operator in Train' by Allami J*, Ez-Zahraouy H and Benyoussef A, We study a deterministic Mobility (subscribers in a cell in a train) by introducing a matrix of time slots of this model with the actual calculated probability of stationarity and transition are taken into account the number of subscribers, speed, time of association and movement stages for optimization and future planning of a cellular network by the technique of centroid (coordinate system) which gives a good prediction of the future position of Morocco operator : Inwi, Meditel and Telecom with integration a density of actual traces of GSM, GPRS, UMTS, WIMAX…, which leads us to predict a future telecom subscribers and control the future data telecom mobile signal and the operator will predict the future movement of the subscribers and will see if the destination area is saturated or not in terms of resources telecom for add resources to meet the needs of future subscribers.

Suitability of density based algorithm

Selection of any clustering technique is dependent on the type of data or application on which the analysis is to be applied. Seismic activity or earthquakes are event based activity. Going through the historical data pertaining to the seismic events it is easily visualized that earthquakes are not uniformly distributed. The clustering of the earthquake events is challenging since the information is available in the form of indistinct fault network based on the epicenters of the earthquake events. The faults too are not independent of each other and neighboring fault networks may interact with each other which further complicate the problem. Hence identification of seismic cluster boundaries is complex issue. Use of a density based algorithm aptly fits the requirement for the clustering of the seismic events as the

events are localized pertaining to a network of fault and hence closely related. Amongst the density based clustering algorithms, Density based spatial clustering of applications with noise (DBSCAN) is one of the most popular density based algorithm which provides the following advantages:

a) They discover the cluster of the arbitrary shape.

b) Insensitive to the ordering of points.

c) It has a notion of noise and hence outliers are filtered out.

A. Density Based Spatial Clustering of Applications with Noise(DBSCAN)

DBSCAN combines the points in high dense region into clusters which can be of any arbitrary shape. DBSCAN algorithm requires two parameters:

a) MinPts,

b) Eps i.e. Epsilon

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MinPts is the minimum number of points in the cluster and Eps is the neighborhood criteria i.e. the radius of the cluster. DBSCAN forms the clusters based on the density reachability of the point.

Let D be the set of points and p and q be the two points in the set D. The Eps neighborhood of a point p, denoted by Eps (p), is defined by (1):

$Eps(p) = \{q \in D \mid dist(p,q) <= Eps\}$ (1)

A cluster C is defined as a non-empty subset of a database of points D with respect to Eps and MinPts

satisfying the following conditions:

a) p, q: if p ϵC and q is density-reachable from p wrt Eps and MinPts, then q ϵC.

b) p, q ϵ C: p is density-connected to q wrt. Eps and MinPts.

Thus, any point may be classified as one of the three types:

a) *Core Point*: A point which has minimum of MinPts, number of neighbors.

b) *Boundary Point*: A point which has minimum one core point as the neighbor but may not have the MinPts number of neighbours.

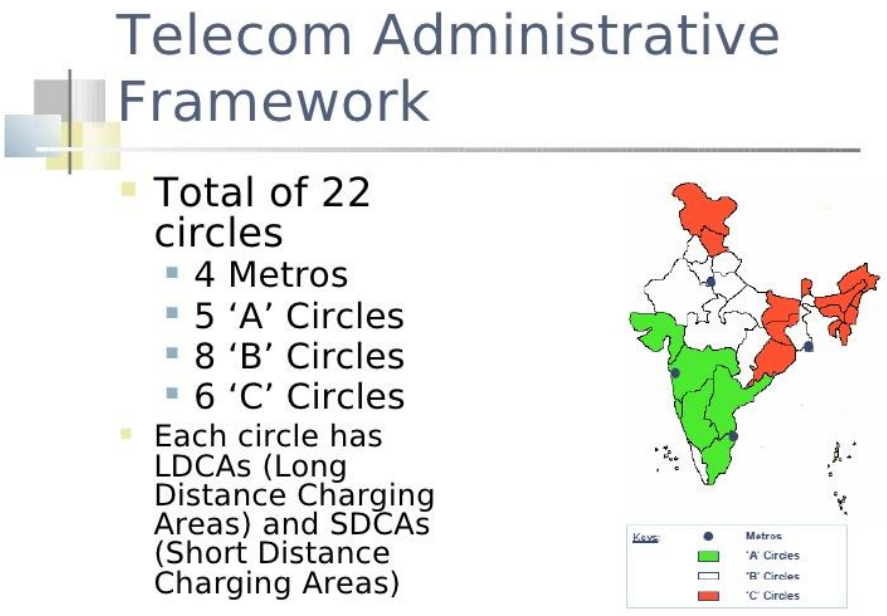
c) *Noise or Outlier*: A point which does not have MinPts number of neighbors.

The algorithm works by starting with any arbitrary point *p* under the considered dataset. All the points directly reachable from the point *p* are calculated. If the conditions are satisfied w.r.t Minpts and Eps then the point *p* is classified as Core Point and thereby cluster is discovered. If the point *p* is a border point, no further points are in the neighborhood and hence the next point *p* is picked and procedure is run again. At the end of the algorithm the points are grouped in clusters and noise is also detected.

IV. EXPERIMENTS

The area under consideration is India. The data taken for analysis is the Spectrum of frequency of October, 2016. The events are marked by frequencies ranging in the service area. The data is comprehensive. It has all the Uplink and Downlink frequencies, per telecom circle, per frequency band. We have chosen 1800 MHz.

For clustering, the values of basic parameters have been calculated. For the same, there is a data of cities with their respective Lat Long. The distance calculation for the determining the neighborhood between two points is calculated using *Haversine* formula. It calculates the great circle distance between two points on earth's surface.



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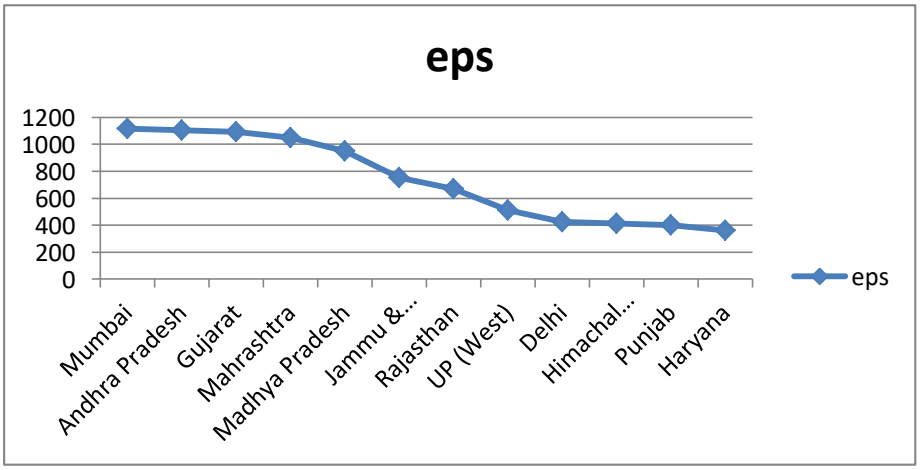
This table was used for calculating the distance:

Place	Latitude	Longitude
Tamil Nadu	11.05982	78.387451
Telangana	17.12318	79.208824
Madhya Pradesh	23.4733298	77.94794
Haryana	29.2384785	76.43188
Chhattisgarh	21.295132	81.828232
Haryana	29.065773	76.040497
Madhya Pradesh	25.794033	78.116531
Maharashtra	19.601194	75.552979
Tripura	23.745127	91.746826
Telangana	17.874857	78.100815
Karnataka	15.317277	75.71389
Kerala	10.850516	76.27108
Uttar Pradesh	28.207609	79.82666
Assam	26.244156	92.537842
Maharashtra	19.663280	75.300293
Tamil Nadu	11.127123	78.656891
West Bengal	22.978624	87.747803
Gujarat	22.309425	72.136230
Odisha	20.940920	84.803467
Rajasthan	27.391277	73.432617
Himachal Pradesh	32.084206	77.571167
Mumbai	18.987807	72.836447
Delhi	28.651952	77.231495
Kolkata	22.562627	88.363044
Andhra Pradesh	15.9129	79.74
Bihar	25.096073	85.313118
Punjab	31.147129	75.341217
Rajasthan	27.023804	74.217934
UP (East)	10.72237	-0.76848
UP (West)	10.32997	-2.1829
Jannu & Kashmir	33.88909	76.52844
North East	39.601082	-75.943031



✓ Values of parameters calculated from kdist graph- ϵ =949.6 km,
Minpts=5

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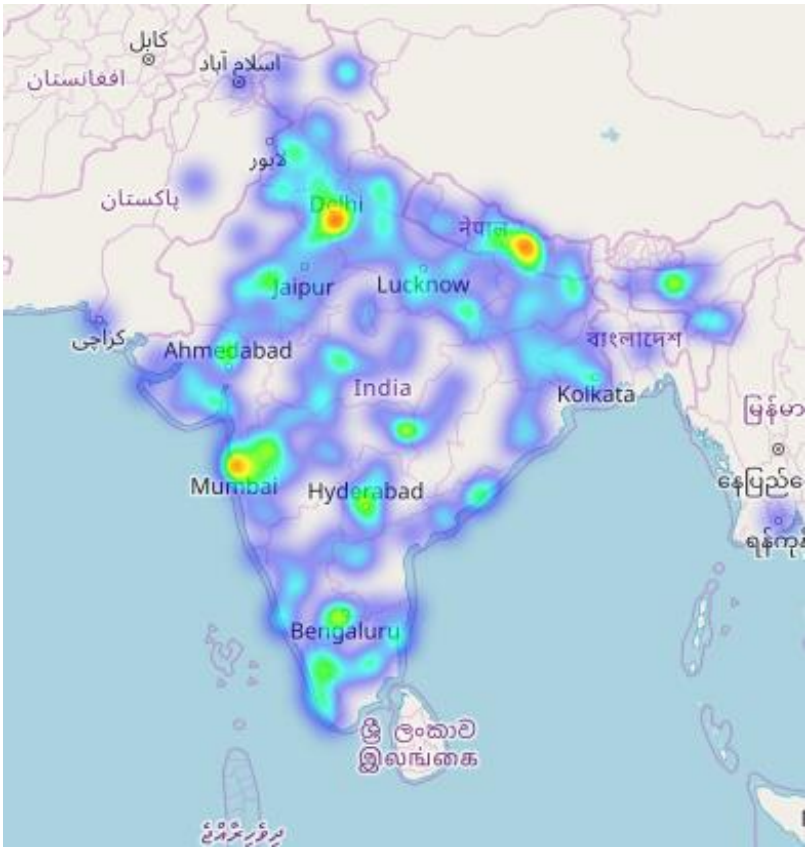
Result of the DBSCAN run is as follows:

Cluster ID	No. of events
1	236
2	212
3	277
4	277
5	236
6	236
7	200
8	277
9	161
10	161
11	171
12	88



V. RESULT

The major clusters are 1, 3, 4, 5, 6, 8.

The highest frequency has been found in Idea in Maharashtra circle. Consequently, there is the least traffic.

The lowest frequency has been found in Vodafone in UP (West) circle. Consequently, it has the highest traffic.

VI. CONCLUSION

So, UP(West) is the highly congested circle among the users of Vodafone. This can help improve the long-term development. It gives a clear determination of the bandwidth of the network operators in high usage.

Also, the places with the high bandwidth, like Maharashtra should be analysed to judge how to figure out the same. Teletraffic analysis will help discover and bring the fast communication in the country.

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