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*Keywords:* Operation and maintenance centre (OMC), traffic intensity, peak busy hour, stochastic process.

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# Determination of Busy Hour in Mobile Communication in Nigeria

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## I. INTRODUCTION

Recent time, the world has witnessed different standards of mobile communication network, ranging from second generation (2G) to third generation (3G) standards. What gave room to this

change is human quest to have better coverage quality, Grade of Service (GOS) and capacity (Gunner, 1998).

Despite all these evolution from one stage to another, mobile communication subscribers, still have some difficulties when making calls or initiating calls during some particular period of time. For us to determine the performance of the mobile communication, the grade of service must be determined, firstly the peak busy hour must also be determine, the peak busy hour it is the given period within a day that bears the highest traffic intensity. The 'peak busy hour' traffic is use to determine the equipment quantities of the network. The reason to use busy hour traffic is that this period usually has the highest amount of blocked or lost calls. If the dimensioning of equipment at this period is correct and blocked calls can be minimized, all other non-busy hour traffic should then be handled satisfactorily (Sanjay; 2010).

The operation and maintenance centre (OMC), the OMC-counter is in-built inside the mobile communication system. These OMC-counter is used to measure the traffic variation on the traffic interfaces.

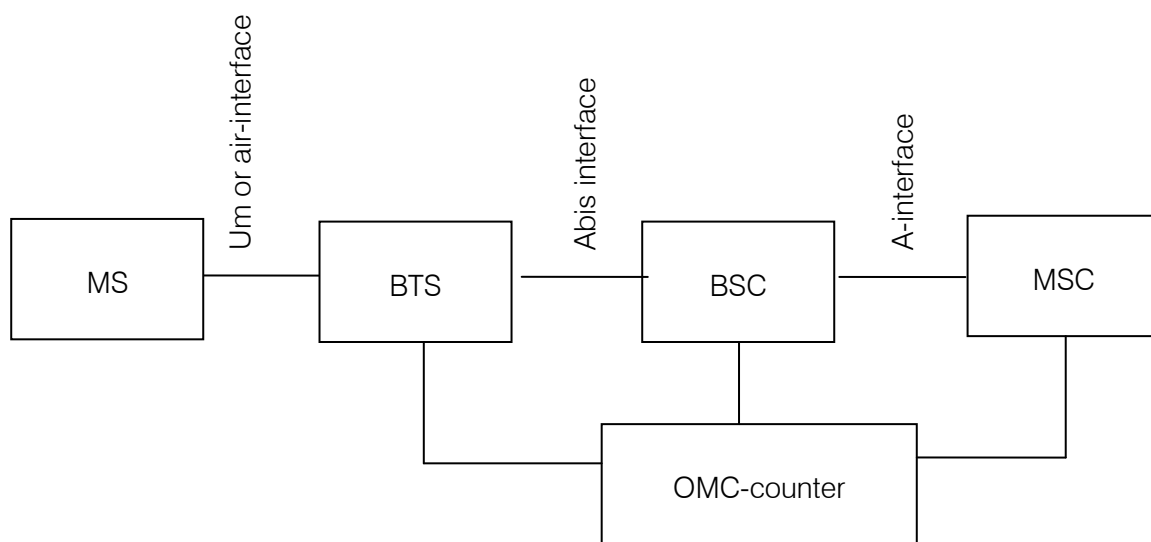


Fig 1.1: Traffic interface architecture

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The operation and maintenance centre is sub-divided into three. They are;

- Fault management
- Configuration management
- Performance management

The performance management unit is responsible for monitoring the performance of all the event (activities). Example are, calls intensity, time duration per call and time duration per hour. Etc. the traffic activities is being handled by sub-section known as (PMR) performance management traffic recording unit (John; 2005).

## II. EXPERIMENTAL PROCEDURE

To determine the peak busy hour of traffic saturation in mobile communication network in Nigeria, we can measure traffic by three different methods, they are;

- Driving test
- Protocol analyzer
- OMC-counter (Operational and Maintenance Centre-Counter) (Gunner, 1998).

In this experiment we deployed the use of the OMC-counter for measurement, which is in-built in mobile communication network, measurement have shown, that traffic is characterized by two major components they are;

- Stochastic component
  - ❖ Random generation of calls by subscribers (man)
- Deterministic component (machine)
  - ❖ Structure (hardware)
  - ❖ Operational strategy (software) (ITU-D, 2006).

Data was obtained from the above mentioned technique for a duration of one- year from the experiment, it was show that traffic has two types of variation associated with the stochastic component. They are;

1. Number of calls variation
2. Services times variation

This variation are the parameters used to determine the peak busy hour (Moltchanor, 2005).

## III. DATA PRESENTATION

The data obtained from operation and maintenance centre was presented in the following table below:

Table 1.1: Various peak busy hour, on different area and routes

S/NO	AREA	ROUTE ID	PEAK BUSY HOUR	ATTEMPT CALLS
1.	MUSHIN	BSC 0-10	19:00	1092
		BSC 1-10	19:00	818
		BSC 2-10	19:00	1511
2.	IKOTUN	BSC 0-10	20:00	858
		BSC 1-10	19:00	1218
		BSC 2-10	19:00	1915
3.	EJIGBO	BSC 0-10	20:00	672
		BSC 1-10	19:00	1083
		BSC 2-10	19:00	838
4.	APAPA	BSC 0-10	19:00	806
		BSC 1-10	15:00	1345
		BSC 2-10	11:00	666
5.	ALABA	BSC 0-10	20:00	247
		BSC 1-10	19:00	1071
		BSC 2-10	19:00	1337
6.	OYINGBO	BSC 0-10	19:00	1185
		BSC 1-10	19:00	847
		BSC 2-10	19:00	722

The above table have, different areas such are Mushin, Apapa, Alaba, Oyingbo, Ejigbo and Ikotun was consider in this research work due to their population intensity in Lagos.

Each area have a routes incorporated into 3 Base Station Controller (BSC). While 3 routes were consider under one base station controller (IBSC). The attempts calls for 24 hours, in each route are also recorded.

Table 1.2: Call intensity for each day of the week

S/No	Call Intensity	Days of the Week
1.	Sunday	12,119
2.	Monday	26,492
3.	Tuesday	19,080
4.	Wednesday	17,892
5.	Thursday	16,467
6.	Friday	23,138
7.	Saturday	15,491

## IV. RESULT ANALYSIS

The graphics below shows different peak busy hour of call intensity for various routes and six areas in Lagos State from a leading Mobile Communication Network in Nigeria. Data obtained was simulated by Excel package to obtain a resultant graphics.

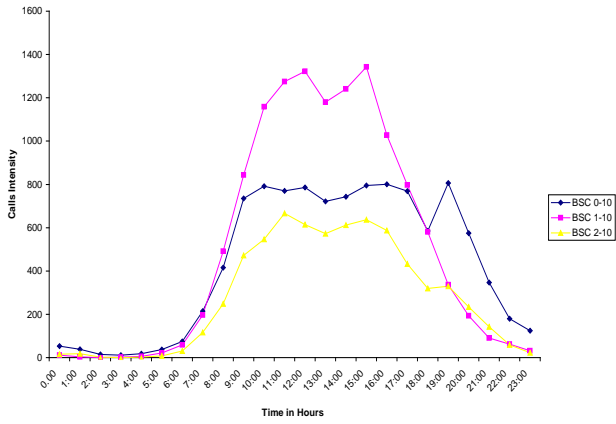


Fig. 2.1: Peak Busy Hour of Route for Apapa

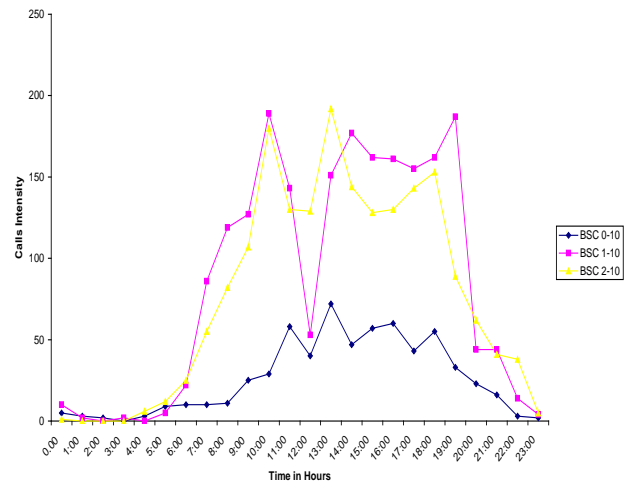


Fig. 2.5: Peak Busy Hour of Routes in Ejigbo

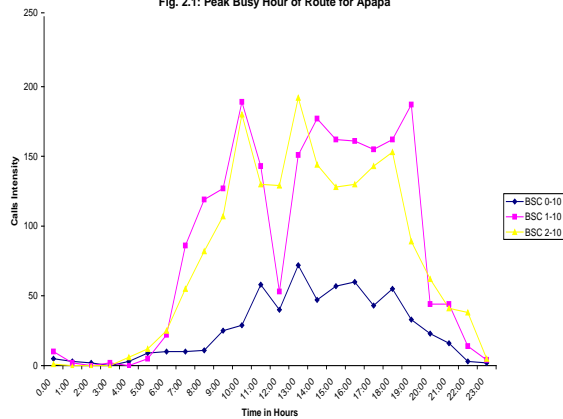


Fig. 2.2: Peak Busy Hour of Routes in Alaba

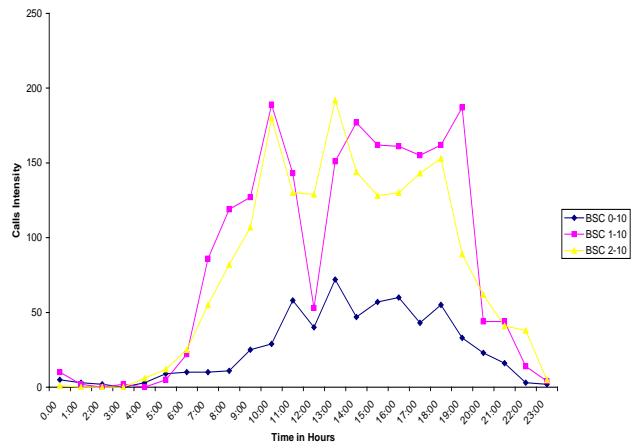


Fig. 2.6: Peak Busy Hour of Routes in Oyingbo

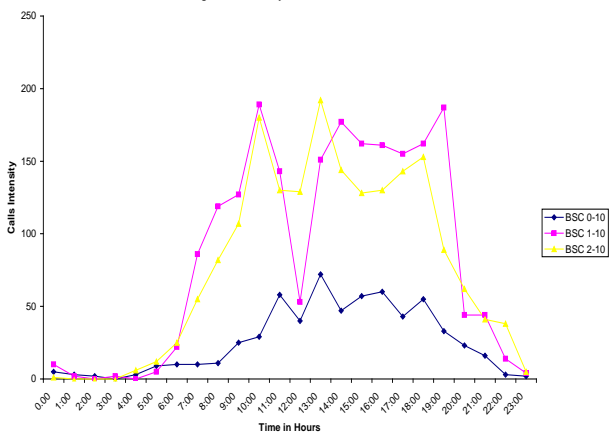
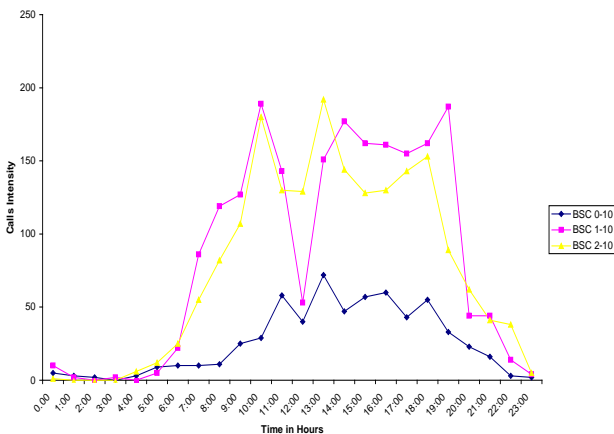


Fig. 2.4: Peak Busy Hours of Routes in Ikotun



F.g 2.3: Peak Busy Hour of Routes in Mushin

The highest call intensity was also determined for days of the week. From table 1.2 the resultant output shows that Monday has the highest call intensity, followed by Friday, Tuesday, Wednesday, Thursday, Saturday and Sunday. Shown in figure 2.7. For easy comparison the bar chart was used for different days of the week.



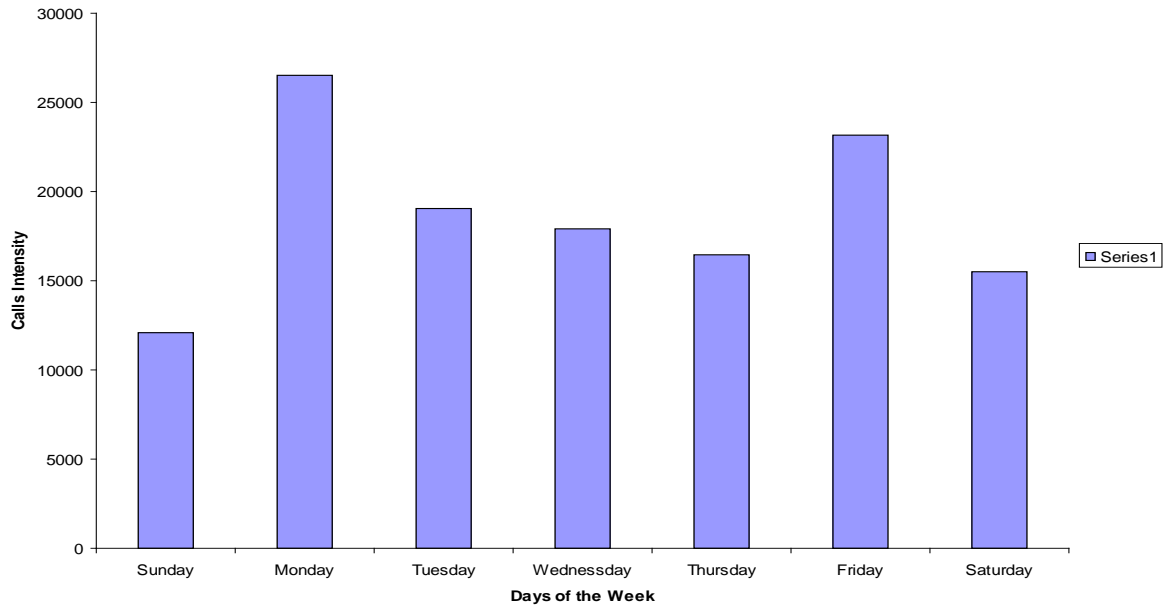


Fig. 2.7: Bar Chart for Total Call Intensity for Days of the Week

## V. DISCUSSION

The data obtained are represented in graphs for easy interpretation for various routes in fig. 2.1 to fig. 2.6. It was observed that average routes shown, the busy hour in mobile communication in Nigeria is 19:00 hour (7.00pm) for the performance of various route analyses carried out. The values of busy hour at 19:00 hour can be used to calculate the traffic load, the capacity of network and traffic performance indicator of the network such as offered traffic, carried traffic, block traffic, call completion rate (CCR), busy hour call attempt (BHCA) and grade of service (GOS). The various call intensity was correlated, and represented by bar chart for easy comparative between the various days call intensity as shown in fig. 2.7. Therefore, Monday which have the highest call intensity of 27,567, the value of the busy hour must be used to determine the traffic load and capacity. If the system capacity can handle the highest number of subscriber, therefore it can manage the rest in a good proportion.

## VI. CONCLUSION

From this thesis, the data was obtained from operation and maintenance centre (OMC-Counter). The data obtained was analyzed by Excel package. It was observed that there are two active busy hour, they are 10:00 hr and 19:00 hr. graphical representation of all the routes was shown in fig.2.1 to fig 2.6. The highest busy hour of the average route observed is 19:00 hr (7.00pm). Compared to what is obtained in other countries with their busy hour is at 16:00 (4.00pm). The reason for a radical shift from 4.00pm to 7.00pm in Nigeria time are due to the high business environment,

high population and transportation situation in Lagos (Nigeria).

The call intensity for various days of the week was examined. Monday with the highest call intensity 27,567, followed by Friday, Tuesday, Wednesday, Thursday, Saturday and Sunday, shown in figure 2.7.

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