TRAFFIC ENGINEERING

ETI2506 - Telecommunication Systems

Monday, 21 November 2016

BUSY HOUR

1. **Busy Hour** – A continuous one hour period during which the traffic volume or number of call attempts is greatest.

2. **Peak Busy Hour** – The busy hour observed over a 24-hour period. Peak busy hour varies from day to day.

3. **Time Consistent Busy Hour** – The 1-hour busy hour starting at the same time each day for which the traffic volume or number of call attempts is greatest over the number of days under observation.

CALL COMPLETION RATE

1. **Call Completion Rate (CCR)** is the ratio of the number of successful calls to the number of call attempts.

$$CCR = \frac{Successful\ Calls}{Call\ Attempts}$$

2. **CCR** is used to dimension the network capacity. Most telecommunication networks are designed with a CCR of over 70%.

BUSY HOUR CALLING RATE (BHCR)

2. **Busy Hour Calling Rate (BHCR)** is the average number of calls originated by a subscriber during the busy hour.

$$BHCR = \frac{Average\ number\ of\ Calls\ during\ Busy\ Hour}{Total\ Number\ of\ Subscribers}$$

WORKED EXAMPLE

A telephone exchange has 3,000 subscribers. If the Busy Hour Call Attempts (BHCA) is 12,000 and the Call Completion rate (CCR) is 80%, calculate the busy hour calling rate (BHCR).

SOLUTION

Average Number of Busy Hour Calls = BHCA X CCR

= 12,000 X 0.8 = 9,600

Busy Hour Calling rate = $\frac{Average\ Busy\ Hour\ Calls}{Total\ Number\ of\ Subscribers} = \frac{9{,}600}{3{,}000} = 3.2$

TRAFFIC/TRAFFIC INTENSITY OF A SERVER

- For analytical purposes, all common equipment used in a telecommunication network are referred to as servers.

- **Traffic Intensity** = $\frac{Period\ for\ which\ the\ server\ is\ occupied}{Total\ Period\ of\ Observation}$

WORKED EXAMPLE

Assume that during an observation period of 3 hours, a server belonging to a group of 12 in a telecommunication network is occupied for an average of 45 minutes. What is the traffic carried by the whole group.

SOLUTION

Traffic carried by a server $= \frac{Occupied\ Duration}{Observation\ Peiod} = \frac{45}{3\times60} = 0.25E$

Traffic carried by the whole group = 12 X 0.25 = 3 E

WORKED EXAMPLE 2

- A group of 20 servers carry a total traffic of 10E. If the average duration of a call is 2.5 minutes, calculate the number of calls put through by a the group in one hour.

SOLUTION

Traffic per server = $\frac{10}{20} = 0.5E$

This means that a server is busy 30 minutes per hour.

The number of calls put through by a server in one hour = $\frac{30}{2.5} = 12$

The number of calls put through by the group = 12X20 = 240 calls

OTHER UNITS OF TRAFFIC INTENSITY

Centum Call Second (CCS) represents the number of calls made in 100 seconds. CCS as a measure of traffic is valid only in telephone/circuit switched networks.

EXAMPLE

A subscriber makes four telephone calls for 3 minutes, 3 minutes, 2 minutes and 1 minute. Calculate the subscriber's traffic in Centum Call Seconds (CCS).

SOLUTION

Traffic in CCS = $\frac{(3+3+2+1)\times 60}{100} = 9 \times 0.6 = 5.4\ CCS$

OTHER UNITS OF TRAFFIC INTENSITY

- **Call Seconds (CS)** is the total number of calls carried in a second or the total holding time in seconds.

- **Call Minutes (CM)** is the total number of calls carried in a minute or the total holding time in minutes.

WORKED EXAMPLES

Suppose a subscriber makes four telephone calls for 3 minutes, 3 minutes, 2 minutes and 1 minute. Calculate the subscriber's traffic in:

(i) Call Seconds (CS)

(ii) Call Minutes(CM).

SOLUTION

Traffic in CCS = (3+3+2+1)x60 = 54 CS

Traffic in minutes = 3+3+2+1 = 9 CM