- Assume 5 contents and 10 edge nodes and a central server
- Assume 20 vehicles present in network
- Create a popularity array(size = 1*5)
- Popularity Matrix is:

$$\begin{bmatrix} 0.1 & 0.3 & 0.4 & 0.1 & 0.1 \end{bmatrix}$$

- Create a vector for average requests to each edge node (size = 10 * 1)

$$\begin{bmatrix} 100 \\ 50 \\ 20 \\ 40 \\ 30 \\ 12 \\ 80 \\ 30 \\ 20 \\ 10 \end{bmatrix}$$

- Assumption is Equal Share Of Bandwidth between vehicles
- Modelling bandwidth

1. edge node to vehicles bandwidth
2. edge node to edge node bandwidth
3. Edge Node to Cloud Server Bandwidth

- Modelling length(km) of coverage area of each Edge
- Node Matrix size will be [10*1]

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$$\begin{bmatrix} 10 \\ 20 \\ 5 \\ 20 \\ 10 \\ 3 \\ 5 \\ 5 \\ 8 \\ 8 \end{bmatrix}$$

- Modelling Jam Density worst case(number of vehicles per km)
- The matrix of size 10 * 1 is:

$$\begin{bmatrix} 10 \\ 10 \\ 18 \\ 12 \\ 12 \\ 8 \\ 9 \\ 11 \\ 11 \\ 9 \end{bmatrix}$$

- Now modelling Available bandwidth between edge nodes and vehicles:
- The matrix size will be 10 * 1

$$\begin{bmatrix} 100 \\ 100 \\ 100 \\ 100 \\ 100 \\ 100 \\ 100 \\ 200 \\ 100 \\ 200 \end{bmatrix}$$

- Now modelling available bandwidth between two edge nodes (matrix size is 10*10):
- Assume every connection is 100 Mbps

- Now modelling available bandwidth between an edge node and server:
- Matrix size is 10*1 where edge node and a server has a dedicated link of 100 Mbps

- Now modelling the size of each file content-matrix size will be (1*5)

$$\begin{bmatrix} 500 & 1000 & 1000 & 2000 & 1200 \end{bmatrix}$$

- Now modelling the tranmission delay between edge node and vehicle when a file is requested.

$$t_{i,c} = \frac{Size_c}{B_i/(Density_i * L_i)}$$

- $t_{i,c}$ matrix is of size 10 * 5

- Now modelling the transmission delay between two edge nodes

$$t_{i,j,c} = \frac{Size_c}{100 \; mbps}$$

- Now modelling transmission delay between an edge node and server

$$t_{i,s} = \frac{Size_c}{100 \; mbps}$$

- Introducing bandwidth and Mobility Constraints

- Bandwidth Constraint:
- Assumption is every vehicle moves with constant velocity(2 m/sec)
- Minimum Data an edge node can serve

$$Data_{v,e}^{min} = \frac{B_e}{Density_e * velocity_v}$$

- Bandwidth Constraint is:

$$\forall e, c \ X_{e,c} * size_c \leq Data_{v,e}$$

- Considering Max Service Processing Time for each edge node Matrix will be size (10*1):

$$\begin{bmatrix} 5 \\ 2 \\ 7 \\ 10 \\ 14 \\ 12 \\ 19 \\ 15 \\ 13 \\ 19 \end{bmatrix}$$

- Considering Mobility Constraint,