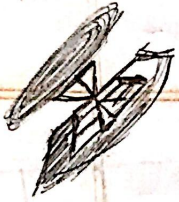# Routing Metrics

Link throughput [Between 2 nodes]

Path throughput [Between whole path]

→ Equally distribute Traffic

Network throughput [Collection of all the paths]
throughput

⊛ ETX — expected transmission count

$$\left[\frac{1}{\text{Link ETX}} = \text{Link Throughput} \right]$$

⊛ Route ETX = $\sum$ Link ETX

Successful Transmission $\implies$ Successful Data Transmission $+$ Successful ACK Reception

$$P(TX\ success) = P(Data\ success) * P(ACK\ success)$$

$$\text{Link ETX} = 1/P(TX\ success)$$

$P(data\ success)$ = forward delivery ratio

$P(ack\ success)$ = reverse delivery ratio

$$P(\text{data success}) = \frac{\#\text{ recd by } \cancel{B} F}{\#\text{ sent by } S}$$

S — Sender
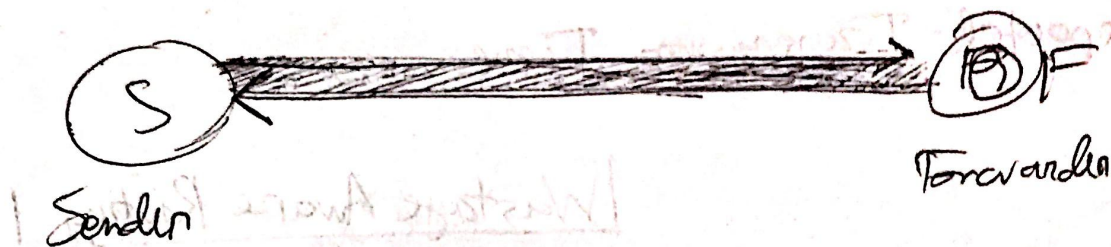
$\cancel{B}$ F — Forwarder

[Can be calculated from $\boxed{\text{previous history}}$ or

by exchanging $\boxed{\text{dummy packets}}$ $\longrightarrow$ $\boxed{\begin{array}{c}\text{Remember} \\ \text{Keywords} \\ \text{Only}\end{array}}$

$$[\text{Last } 100s] = \frac{90}{100} = \boxed{0.9}$$

$\downarrow$ Piggybacked by ~~sender th~~ forwarder transmitting next packet.

$$P(\text{ack}) = \frac{\#\text{ recd } S}{\#\text{ sent } F}$$

Limitation

$\rightarrow$ Dummy Packet / Small link probes may not be as realistic as sending an actual-big data packet.

[Using previous_history is better]

ETX Limitation → doesn't consider bandwidth of link

$$ETT = [Path\ ETX] \times \frac{Packet\ Size}{Bandwidth}$$

↳ Expected Transmission Time

Wastage Aware Routing

→ Consider the (battery %) of the connected nodes.

→ Energy Harvesting Sensor Network → there is some probability that energy will recharge

↳ Energy Wastage if battery gets overcharged.
   [Reduce this wastage]

Wastage Aware Routing
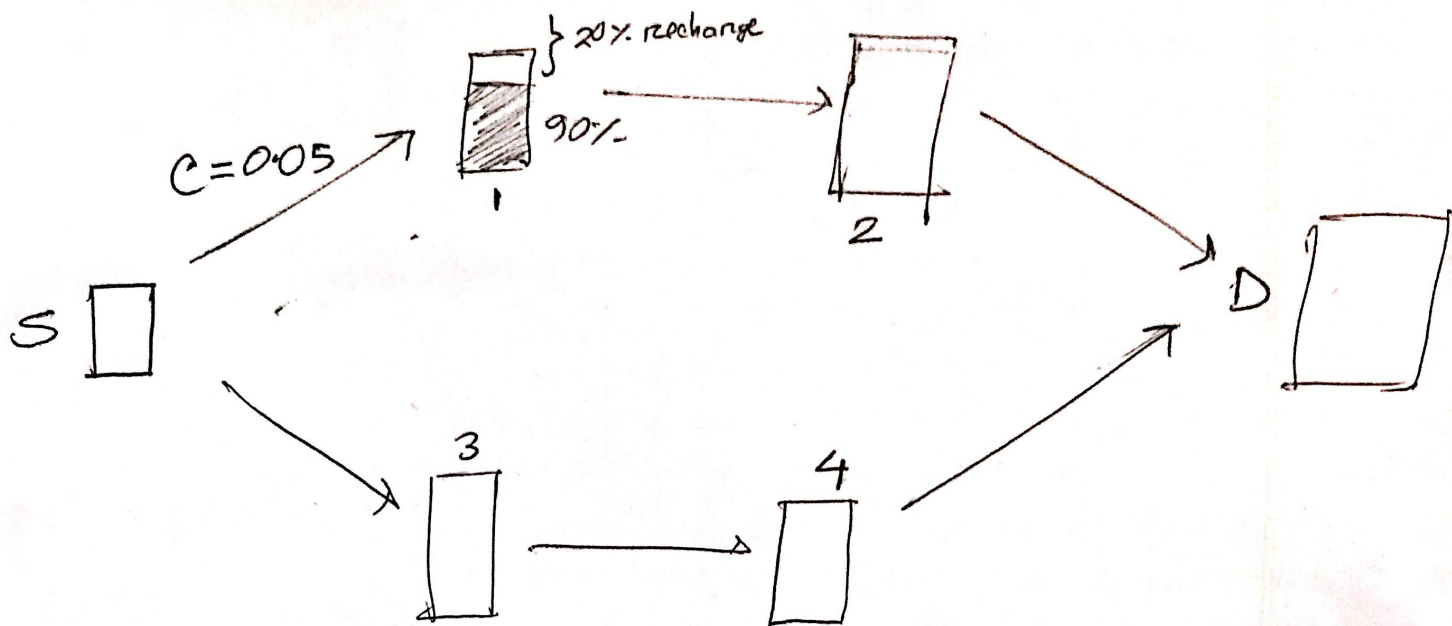
On Path Wastage [After using the path, what is the wastage]
Off Path Wastage [The ~~paths and~~ its nodes that aren't used,
is responsible for off path wastage]

Best Path = [On Path Wastage + Off Path Wastage
+ Transmission Cost] (minimum)

i) [First add harvested energy to the
current battery level, then calculate off-path wastage]

ii) [① subtract the path cost and calculate on-path wastage]

iii) [Remember to calcute off path wastage of alternate paths]