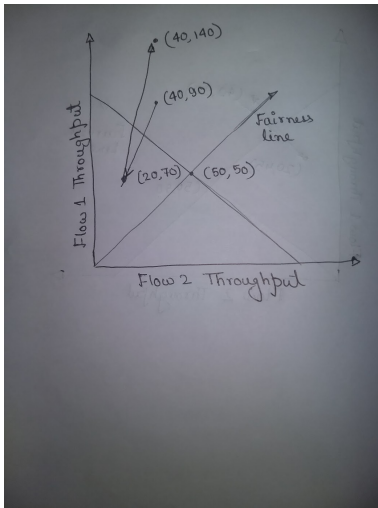# Part D - Fairness

Mridul Ranjan, SBU ID - 111482003

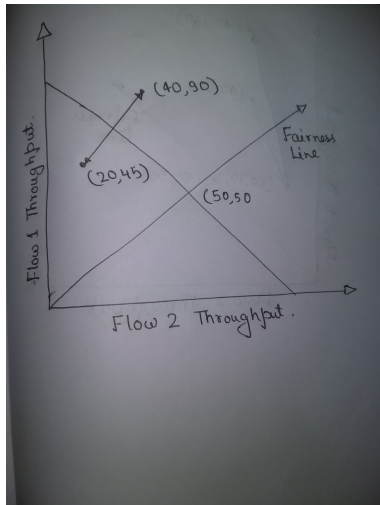**(1) Multiplicative Increase Additive Decrease is not fair:**

- In this feedback mechanism, there is multiplicative growth of congestion window with additive decrease with packet loss.

- From the diagram, we can see that graph will never converge towards the fairness point. It will always be biased towards one flow. For example, we take a point (40,90) to start with. With packet loss, let's it decrease by 20. So new point is (20,70). Next, with no packet loss, it is increased multiplicatively (say by factor 2), so new point is (40, 140). Thus, it will never converge to fair point (50,50)

(2) Multiplicative Increase Multiplicative Decrease is not fair:

- In this feedback mechanism, there is multiplicative increase in congestion window with multiplicative decrease with packet loss.

- From the diagram, we can see that graph will never converge towards the fairness point. For example, let the starting point be (40, 90). Let the multiplicative factor be 2 and 1/2. Now with packet loss, congestion window will be shifted to (20, 45). And then again it will increase to (40, 90). Thus it will keep on oscillating to and fro and will be biased towards to flow where it has started. This is not fair, as it will never converge to (50,50).

(3) Additive Increase Additive Decrease is not fair:

- In this feedback mechanism, there is additive increase in congestion window with additive decrease for packet loss.

- This will not be fair as we can see that, it will not converge to fair point (50,50). For example, let the starting point be (40,90). With packet loss, suppose its shifted to (20, 70). Now with no packet loss, again it will move to (40,90). Therefore it will keep on oscillating towards the same line and will never converge to fair point(50,50)