the summed result of all the throughput achieved at each station in the same region. Figure 2 presents the results obtained when we use existing IEEE 802.11 MAC protocol. From the figure, we observe the followings. **Firstly**, IEEE 802.11 DCF cannot guarantee any service differentiation nor fairness even among stations. Specifically, we observed: (i) in the period of \([0s, 40s]\), each region has only one station active, and DN STS at Region-1 uses 2.16 Mb/s while DN STS at Region-2 does 2.06 Mb/s; (ii) in the period of \([40s, 120s]\) when UP STS appears at Region-1, the throughput of DN STS at Region-1 is degraded to 0.73 Mb/s while that of DN STS at Region-2 is decreased to 0.97 Mb/s, but UP STS at Region-1 gains the higher throughput of 2.76 Mb/s; (iii) in the last period of simulation, which is \([120s, 160s]\), DN STS at Region-1 uses 2.74 Mb/s while DN STS at Region-2 does 1.64 Mb/s. **Secondly**, IEEE 802.11-based Network imposes unfairness on downloading stations (two DN STSs) compared to uploading station (UP STS) due to TCP-driven unfairness exaggerated with IEEE 802.11 DCF [35]–[37]; **Lastly**, there is no location-based service differentiation. Note that the aggregate throughput of Region-1, which is the summed throughput of two stations, is 3.49 Mb/s, but that of Region-2, which is simply the throughput of DN STS, is 0.97 Mb/s (during the period of \([40s, 120s]\)).

4 SERVICE DIFFERENTIATION ALGORITHM BASED ON PER-LOCATION LOAD

In order to compute the portion of link capacity assignable to each location for location-based service differentiation, we introduce per-location target load. The load represents a desirable degree of traffic that a designated location imposes to the network (to the