8. Networking

B-b. Remote Processing or Reprocessing

The planned DØ Regional Analysis Centers (DØRAC) will permanently cache 10-20% of all raw data for processing or reprocessing and corresponding DSTs. They will also hold 100% of the thumbnail data set. The total number of such DØRACs will be on the order of 10 throughout the collaborating regions. This will require a total aggregated data size shown in Table 1.

Table 1 Estimated total size of data set to be transferred from Fermilab Central Analysis Center to Regional Analysis Centers. Data replication factor of 2 for raw and DST have been used to allow some level of replication between the RAC. In addition, a replication factor of 10 has been used for Thubmnail data set due to 100% replication of the data set. The total number of RACs used in this calculation is 10.

Run Boundary	Total Raw (Factor 2 replication)	Total DST (Factor 2 replication)	Total Thmn (Factor 10 replication)	Average Bandwidth (Mbytes/sec)
Run IIa (2yrs)	600TB	206TB	103TB	14Mbytes/sec
Run IIb (4yrs)	5.6PB	1.9PB	960TB	130Mbytes/sec

Since some fraction of raw data are permanently stored in RAC's cache storage area, data processing or reprocessing will not require additional bandwidth. However, data must be transferred at all times, utilizing 14Mbytes/sec and eventually to 130Mbytes/sec, just to store sufficient data set at RACs. The average bandwidth needs means a DC data transfer throughout the given period of the run.

B-c. Data analyses

The principle idea behind the DØRACs is to limit network traffic within its own network sensible geographical area. In other words, a person's analysis should be self sufficient within his/her own Regional Network until one's analysis is sufficiently finalized. This is one of the policy matters that have to be elaborated in the DØRAC requirement document. Therefore, the most important bandwidth requirement is imposed on the RACs, because they must be able to transfer 1.4Mbytes/sec of data from the central analysis center all the time and be able to provide access to its data to the users within its own regional network. Assuming on the average 8 institutions will be in the network of an RAC, each institutions have 20 people actively participating data analysis, and all of them want to access the full Run IIa Thumbnail, the total aggregated data size to be transferred is 10.3TB. Assuming each RAC is equipped with a gigabit network link, it would take 463 hours, excluding the 1.4Mbytes/sec preoccupied by the RAW data transfer.

Now for the network requirements of the central analysis center, I will that there are only 20% of the students and postdocs will be approved to get at the full data set that resides throughout the collaboration network. I will also assume all these people will want to get at Fermilab's central analysis facility to access the full statistics to estimate a worst case scenario. Given the average total number of student and postdocs at around 200, I assume 40 people would like to access full statistics at any given time simultaneously, and the total network bandwidth is 10 gigabits/sec to the world, it would

take 93 hours to deliver full Run IIa Thumbnail to all 40 people, excluding the bandwidth occupied by data transfer to RACs.