A8: Visualizing Flight Delays

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Objective

Visualize the mean delay of the five most active airlines and for the five most active airports in the country from given historical data.

Data Processing

In order to obtain delay data for airports and airline, we first gather the data by discarding invalid records. We run a **single** MapReduce job for that purpose.

Mapper: The map phase of the mapreduce job is responsible for - Validating each record by performing sanity checks - Emitting valid records with `airline`, `airport`, `year` and `month` as a key and `delay` as value

Reducer: In the reduce phase all the same flights are aggregated and we calculate the mean delay for each flight. To reduce the shuffling of data over the network, we use the same reducer as **combiner** as well.

Since, there could be many similar flights in the same month of the same year, using combiner in our design significantly reduces the amount of data that is shuffled for the reduce phase.

Performance

AWS Cluster Configurations

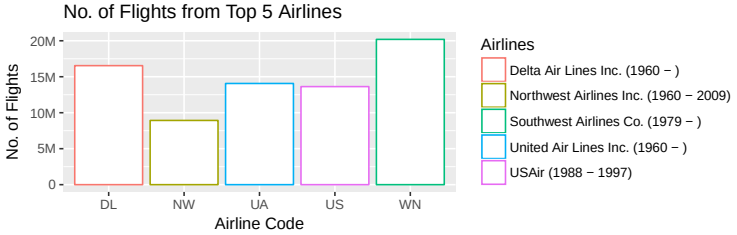
The Amazon Map Reduce cluster was setup using Amazon EMR.

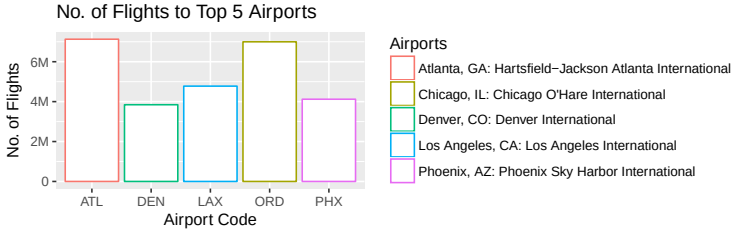
config	value
Instance Type	m3.xlarge
Hadoop Distribution	Amazon 2.7.3 (EMR 5.8.0)
Memory	15GB
Storage	2 x 40GB SSD
vCPU	4
No. Nodes	4

On a 4-node m3.xlarge cluster, it takes about **13 minutes** to run our job. Note that this is a noticable improvement over previous submission where it took **19 minutes** to run jobs. This is because 3 mapreduce jobs were employed in that approach.

Most Active Airports and Airlines

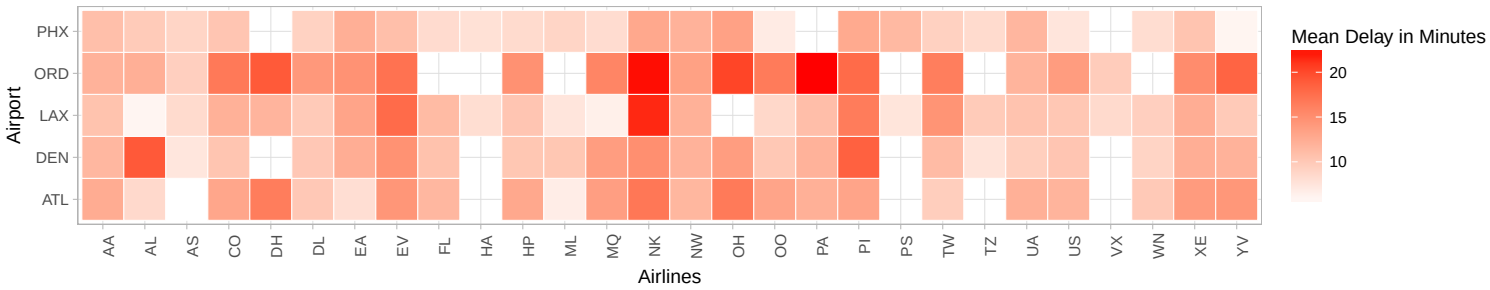
We plot the top 5 most active airports and airlines below along with the number of flights as the measure of activity. We observe that *South West Airlines* is the most active airline and *ATL* is the most active airport, while *ORD* closely comes at second place.



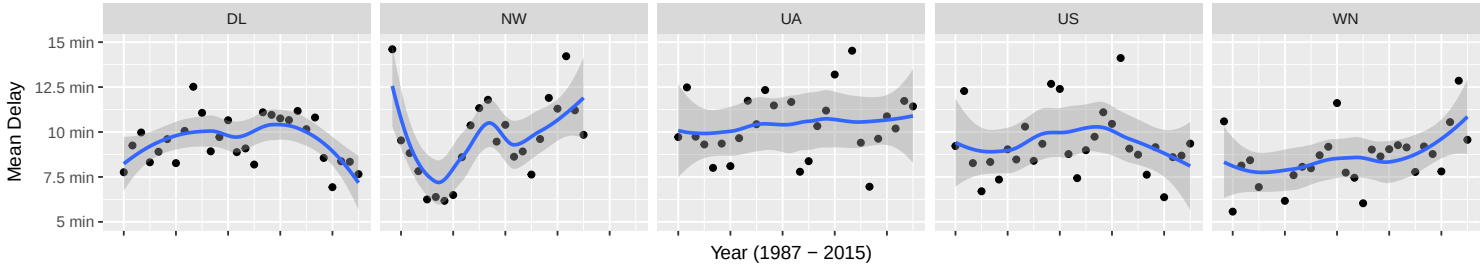


Delays

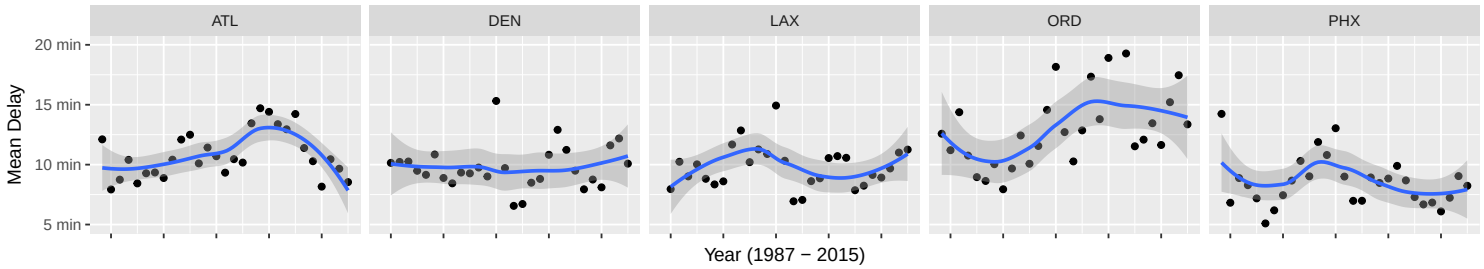
Fig 1. Mean delays from all airlines to top 5 airports across all years



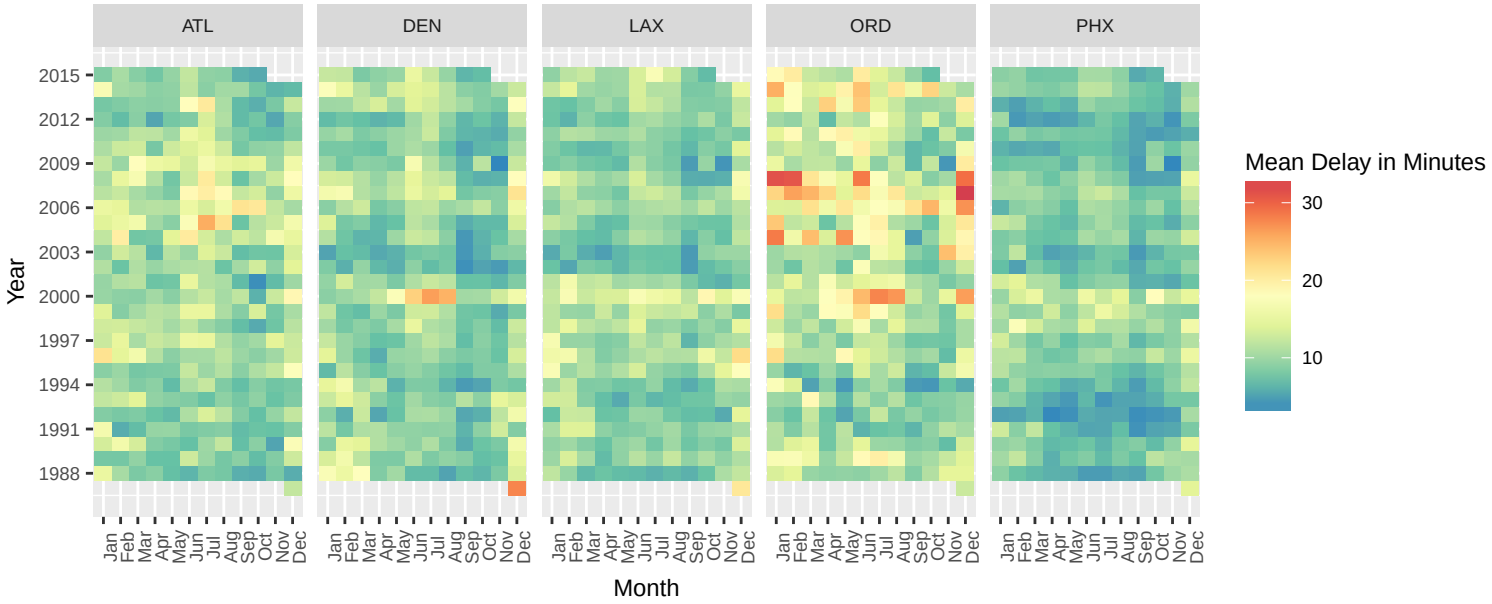
Mean delays for top 5 airlines per year



Mean delays for top 5 airports per year



Mean delays for top 5 airports per year per month



Mean delays for top 5 airlines per year per month