Thursday, January 9, 2020
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Data Warehousing: Dashboarding and Physical Design Lab

1 QUERIES

- **FH and FC per month filtered by aircraft model**

```
SELECT MONTHID, SUM(FLIGHTHOURS), SUM(FLIGHTCYCLES)
FROM
    AIRCRAFTUTILIZATION AU, TEMPORALDIMENSION TD, AIRCRAFTDIMENSION AD
WHERE
    AU.AIRCRAFTID=AD.ID
    AND AU.TIMEID=TD.ID
    AND AD.MODEL='777'
GROUP BY MONTHID
```

- **ADOSS and ADOSU per year filtered by aircraft ID**

```
SELECT SUM(SCHEDULEDOUTOFSERVICE), SUM(UNSCHEDULEDOUTOFSERVICE)
FROM
    AIRCRAFTUTILIZATION AU, TEMPORALDIMENSION TD, MONTHS M
WHERE
    AU.TIMEID=TD.ID
    AND M.ID=TD.MONTHID
    AND AU.AIRCRAFTID='XY-WTR'
GROUP BY Y
```

- **RRh, RRc, PRRh, PRRc, MRRh and MRRc per month filtered by aircraft model**

```
SELECT REPORTING.MONTHID, 1000*(MAREP+PIREP)/FH,
    100*(MAREP+PIREP)/FC, 1000*PIREP/FH, 100*PIREP/FC,
    1000*MAREP/FH, 100*MAREP/FC
FROM
    (SELECT MONTHID, SUM(FLIGHTHOURS) AS FH, SUM(FLIGHTCYCLES) AS FC
    FROM
        AIRCRAFTUTILIZATION AU, TEMPORALDIMENSION TD, AIRCRAFTDIMENSION AD
    WHERE
        AU.AIRCRAFTID=AD.ID
        AND AU.TIMEID=TD.ID
        AND AD.MODEL='777'
    GROUP BY MONTHID
    ) FHFC,
    (
    SELECT MONTHID,
        SUM(CASE WHEN PD.ROLE='M' THEN COUNTER ELSE 0 END) AS MAREP,
        SUM(CASE WHEN PD.ROLE='P' THEN COUNTER ELSE 0 END) AS PIREP
    FROM
        LOGBOOKREPORTING LR, PEOPLEDIMENSION PD, AIRCRAFTDIMENSION AD
    WHERE
        LR.AIRCRAFTID=AD.ID
        AND AD.MODEL='777'
        AND PD.ID=LR.PERSONID
    GROUP BY MONTHID
    ) REPORTING
WHERE FHFC.MONTHID=REPORTING.MONTHID;
```

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- **MRRh and MRRc per aircraft model filtered by the reporting person airport**

```
SELECT REPORTING.MODEL, 1000*MAREP/FH, 100*MAREP/FC
FROM
    ( SELECT MODEL, SUM(FLIGHTHOURS) AS FH, SUM(FLIGHTCYCLES) AS FC
      FROM
          AIRCRAFTUTILIZATION AU,
          AIRCRAFTDIMENSION AD
      WHERE
          AU.AIRCRAFTID=AD.ID
      GROUP BY MODEL
    ) FHFC,
    ( SELECT MODEL,
          SUM(CASE WHEN PD.ROLE='M' THEN COUNTER ELSE 0 END) AS MAREP,
          SUM(CASE WHEN PD.ROLE='P' THEN COUNTER ELSE 0 END) AS PIREP
      FROM
          LOGBOOKREPORTING LR, PEOPLEDIMENSION PD, AIRCRAFTDIMENSION AD
      WHERE
          LR.AIRCRAFTID=AD.ID
          AND PD.AIRPORT='KRS'
          AND PD.ID=LR.PERSONID
      GROUP BY MODEL
    ) REPORTING
WHERE FHFC.MODEL = REPORTING.MODEL
```

2 INDEXES

Given the fact that we can use up to 1900 blocks, we can't use large indexes such as clustered B+, as this will go over the data limit. We also have low cardinality for the indexed columns compared to the absolute size of the data, e.g. there are much fewer values of *aircraftID* than there are rows in *AircraftUtilization*.

These rows are not unique, so a Hash index would not be applicable. This leaves bitmap indexes as the only realistic option: we are regularly selecting single elements from *AircraftUtilization*, so a bitmap index gives a large speedup.

Given the below reasons we have created these indexes:

```
--do star-join on AircraftUtilization and LogBookReporting
ALTER SESSION SET star_transformation_enabled = TRUE;
COMMENT ON TABLE AIRCRAFTUTILIZATION IS 'star_transformation_enabled';
COMMENT ON TABLE LOGBOOKREPORTING IS 'star_transformation_enabled';

-- Create indexes
CREATE BITMAP INDEX LR_INDEX_P ON LogBookReporting(personID) PCTFREE 0;
CREATE BITMAP INDEX LR_INDEX_A ON LogBookReporting(aircraftID) PCTFREE 0;
CREATE BITMAP INDEX AU_INDEX_A ON AircraftUtilization(aircraftID) PCTFREE 0;
```

Our choice to use bitmap indexes over the foreign keys in the fact tables allowed us to use the 'star-join-transformation' in Oracle. This enables the DB to rewrite the queries that involve joining the fact and dimension tables, reducing the number of rows of the fact table to be scanned in the join by applying the selective predicate from the dimension table. This does not affect the size of the database, but will affect the access-plan for the queries, making them much faster.