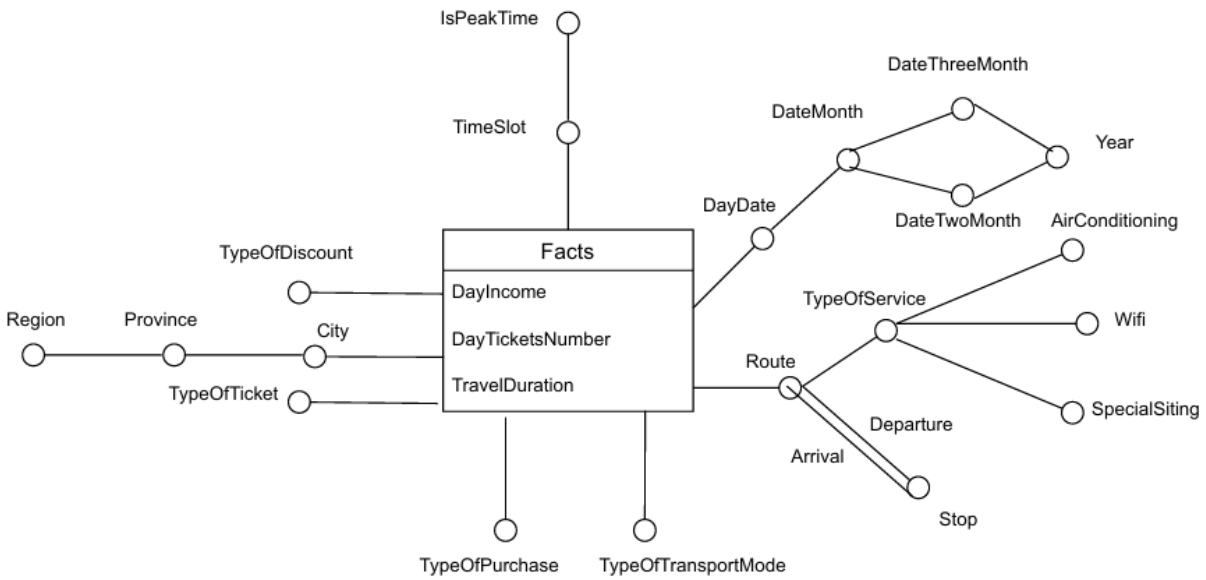
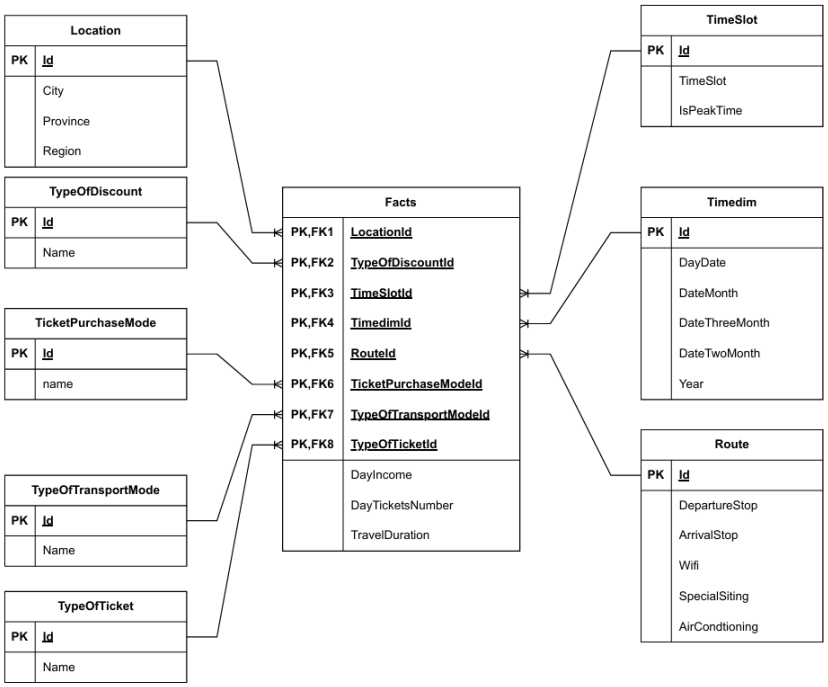
1:

Schema concettuale:



N.B. Si è supposto che le misure Income, TicketsNumber e TravelDuration abbiano subito un processo di ETL per la rappresentazione qua proposta. TravelDuration è la somma dei tempi relativi a quel fatto (tragitto, spostamento).

Modello logico:



FACTS(LocationId, TypeOfDiscountId, TimeSlotId, TimedimId, RouteId, TicketPurchaseModeId, TypeOfTransportModeId, TypeOfTicketId, DayIncome, DayTicketsNumber, TravelDuration)

TIMEDIM(Id, DayDate, DateMonth, DateThreeMonth, DateTwoMonth, Year)

TIMESLOT(Id, TimeSlot, IsPeakTime)

ROUTE(Id, DepartureStop, ArrivalStop, Wifi, SpecialSiting, AirConditioning)

TYPEOFTRANSPORTMODE(Id, Name)

TYPEOFTICKET(Id, Name)

LOCATION(Id, City, Province, Region)

TYPEOFDISCOUNT(Id, Name)

TICKETPURCHASEMODE(Id, Name)

2:

a):

```
SELECT T.Year, T.DateMonth,TTM.Name,
    SUM(SUM(F.DayTicketsNumber)) OVER(PARTITION BY T.DateMonth, TTM.Name) /
COUNT(DISTINCT T.DayDate) AS AvgDayTicketsNumber,
    SUM(SUM(F.DayTicketsNumber)) OVER(PARTITION BY T.Year, TTM.Name ORDER BY
T.Year, T.DateMonth ROWS UNBOUNDED PRECEDING) AS CumulativeTicketsSumForMonth,
    SUM(F.DayTicketsNumber) / SUM(SUM(F.DayTicketsNumber)) OVER(PARTITION BY
T.YEAR, T.DateMonth) * 100 AS PercentualTicketsForTypeTransportaionModeForMonth
FROM Facts F, TypeOfTransportMode TTM, Timedim T
WHERE F.TypeOfTransportModeId = TTM.Id and F.TimedimId = T.Id
GROUP BY TTM.Name, T.DateMonth, T.Year ORDER BY T.Year, T.DateMonth, TTM.Name
```

b):

```
SELECT L.City, R.Id AS RouteId, R.DepartureStop, R.ArrivalStop, TTM.Name,
AVG(F.TravelDuration) AS AvgTravelDuration,
    SUM(SUM(DayIncome)) OVER(PARTITION BY L.City) AS TotalIncomeForCity,
    SUM(DayIncome) / SUM(SUM(DayIncome)) OVER(PARTITION BY L.City, TTM.Name) * 100
AS PercIncomeRouteOnCity,
    RANK() OVER(PARTITION BY L.CITY, TTM.Name ORDER BY SUM(DayIncome) DESC) AS
RankPercIncome
FROM Facts F, TypeOfTransportMode TTM, Location L, Timedim T, Route R
WHERE F.TypeOfTransportModeId = TTM.Id and F.LocationId = L.Id and F.TimedimId =
T.Id and F.RouteId = R.Id and T.Year >= 2022
GROUP BY L.City, R.Id, R.DepartureStop, R.ArrivalStop, TTM.Name ORDER BY L.City,
R.Id, R.DepartureStop, R.ArrivalStop, TTM.Name
```

3:

a):

```
CREATE MATERIALIZED VIEW FACTS_TTM_DateMonth
BUILD IMMEDIATE
REFRESH FAST ON COMMIT
AS
SELECT TTM.Name, T.DateMonth, T.Year, SUM(F.DayIncome) AS MonthIncome,
SUM(DayTicketsNumber) AS MonthTicketsNumber
FROM Facts F, TypeOfTransportMode TTM, Timedim T
WHERE F.TypeOfTransportModeId = TTM.Id and F.TimedimId = T.Id
GROUP BY  TTM.Name, T.DateMonth, T.Year
```

b):

```
CREATE MATERIALIZED VIEW LOG ON Facts
WITH SEQUENCE, ROWID
(TypeOfTransportModeId, TimedimId, DayIncome, DayTicketsNumber)
INCLUDING NEW VALUES;

CREATE MATERIALIZED VIEW LOG ON TypeOfTransportMode
WITH SEQUENCE, ROWID
(Id, Name)
INCLUDING NEW VALUES;

CREATE MATERIALIZED VIEW LOG ON Timedim
WITH SEQUENCE, ROWID
(Id, DateMonth, Year)
INCLUDING NEW VALUES;
```

c): INSERT INTO Timedim (...) VALUES(...)

INSERT INTO TypeOfTransportMode (...) VALUES(...)

INSERT INTO Facts (...) VALUES(...)

4:

a, b, c):

```
CREATE TABLE FACTS_TTM_DATEMONTH_VIEW_TABLE (
    Name VARCHAR(20),
    DateMonth NUMBER(2),
    Year NUMBER(4),
    MonthIncome NUMBER(10, 2),
```

```
    MonthTicketsNumber NUMBER,
    PRIMARY KEY (Name,DateMonth,Year)
)

INSERT INTO FACTS_TTM_DATEMONTH_VIEW_TABLE (Name, DateMonth, Year, MonthIncome,
MonthTicketsNumber)
(
    SELECT TTM.Name, T.DateMonth, T.Year, SUM(F.DayIncome), SUM(DayTicketsNumber)
    FROM Facts F, TypeOfTransportMode TTM, Timedim T
    WHERE F.TypeOfTransportModeId = TTM.Id and F.TimedimId = T.Id
    GROUP BY  TTM.Name, T.DateMonth, T.Year
)

CREATE OR REPLACE TRIGGER TRIGGER_FACTS_TTM_DATEMONTH_VIEW_TABLE
AFTER INSERT ON Facts
FOR EACH ROW
DECLARE
    TmpName VARCHAR(20);
    TmpDateMonth NUMBER(2);
    TmpYear NUMBER(4);
    N INTEGER;
BEGIN
        SELECT Name INTO TmpName
        FROM TypeOfTransportMode
        WHERE Id = :NEW.TypeOfTransportModeId;

        SELECT DateMonth, Year INTO TmpDateMonth, TmpYear
        FROM Timedim
        WHERE Id = :NEW.TimedimId;

        SELECT COUNT(*) INTO N
        FROM FACTS_TTM_DATEMONTH_VIEW_TABLE
        WHERE Name = TmpName AND DateMonth = TmpDateMonth AND Year = TmpYear;

        IF N > 0 THEN
            UPDATE FACTS_TTM_DATEMONTH_VIEW_TABLE
            SET MonthTicketsNumber = MonthTicketsNumber + :NEW.DayTicketsNumber,
                MonthIncome = MonthIncome + :NEW.DayIncome
            WHERE Name = TmpName AND DateMonth = TmpDateMonth AND Year = TmpYear;
        ELSE
            INSERT INTO FACTS_TTM_DATEMONTH_VIEW_TABLE (Name, DateMonth, Year,
MonthIncome, MonthTicketsNumber)
            VALUES (TmpName, TmpDateMonth, TmpYear, :NEW.DayIncome,
:NEW.DayTicketsNumber);
        END IF;
END;
/
```

d): Solo le INSERT in Facts attivano il trigger sopra mostrato