Recursive Calculation

- *Find how much rivets are used in one wing?*
- A temporary view is defined to show the list of each subpart's quantity used in a specified part :

```
WITH wingpart (subpart, qty) AS
    ((SELECT subpart, qty                    ---initial query
      FROM components
      WHERE part='wing')
    UNION ALL
     (SELECT c.subpart, w.qty*c.qty  ---recursive qry
      FROM wingpart w, components c
      WHERE w.subpart=c.part))
```

wingpart

Subpart	QTY	
strut	5	Used directly
aileron	1	Used directly
landing gear	1	Used directly
rivet	100	Used directly
rivet	50	Used on strut
hinge	2	Used on aileron
rivet	5	Used on aileron
hinge	3	on landing gear
rivet	8	on landing gear
rivet	8	on aileron hinges
rivet	12	on L G hinges

Recursive Calculation

- *Find how much rivets are used in one wing?*

```
WITH wingpart (subpart, qty) AS
        ((SELECT subpart, qty                    ---initial query
          FROM components
          WHERE part='wing')
        UNION ALL
         (SELECT c.subpart, w.qty*c.qty          ---recursive qry
          FROM wingpart w, components c
          WHERE w.subpart=c.part))
SELECT sum(qty) AS qty
FROM wingpart
WHERE subpart='rivet' ;
```

- The result is :

qty
183

Recursive Calculation

- *Find all subparts and their total quantity needed to assemble a wing :*

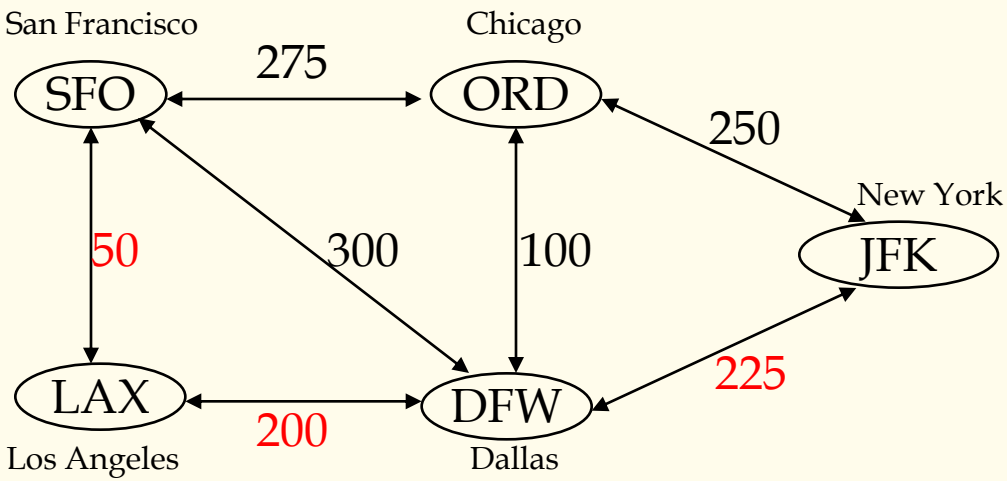
```
WITH wingpart (subpart, qty) AS
        ((SELECT subpart, qty                    ---initial query
          FROM components
          WHERE part='wing')
        UNION ALL
         (SELECT c.subpart, w.qty*c.qty ---recursive qry
          FROM wingpart w, components c
          WHERE w.subpart=c.part))
SELECT subpart, sum(qty) AS qty
FROM wingpart
Group BY  subpart ;
```

- The result is :

subpart	qty
strut	5
aileron	1
landing gear	1
hinge	5
rivet	183

Recursive Search

- Typical airline route searching problem
- *Find the lowest total cost route from SFO to JFK*



Flights

FlightNo	Origin	Destination	Cost
HY 120	DFW	JFK	225
HY 130	DFW	LAX	200
HY 140	DFW	ORD	100
HY 150	DFW	SFO	300
HY 210	JFK	DFW	225
HY 240	JFK	ORD	250
HY 310	LAX	DFW	200
HY 350	LAX	SFO	50
HY 410	ORD	DFW	100
HY 420	ORD	JFK	250
HY 450	ORD	SFO	275
HY 510	SFO	DFW	300
HY 530	SFO	LAX	50
HY 540	SFO	ORD	275

Recursive Search

```
WITH trips (destination, route, nsegs, totalcost) AS
     ((SELECT destination, CAST(destination AS varchar(20)), 1, cost
       FROM flights                                          --- initial query
       WHERE origin='SFO')
     UNION ALL
      (SELECT f.destination,                                 --- recursive query
                  CAST(t.route||','||f.destination AS varchar(20)),
                  t.nsegs+1, t.totalcost+f.cost
       FROM trips t, flights f
       WHERE t.destination=f.origin
                  AND f.destination<>'SFO'                   --- stopping rule 1
                  AND f.origin<>'JFK'                        --- stopping rule 2
                  AND t.nsegs<=3))                           --- stopping rule 3
SELECT route,  totalcost                                     --- final query
FROM trips
WHERE destination='JFK' AND totalcost=                       --- lowest cost rule
                                  (SELECT min(totalcost)
                                   FROM trips
                                   WHERE destination='JFK') ;
```