Query Optimizations For Partitioned Tables

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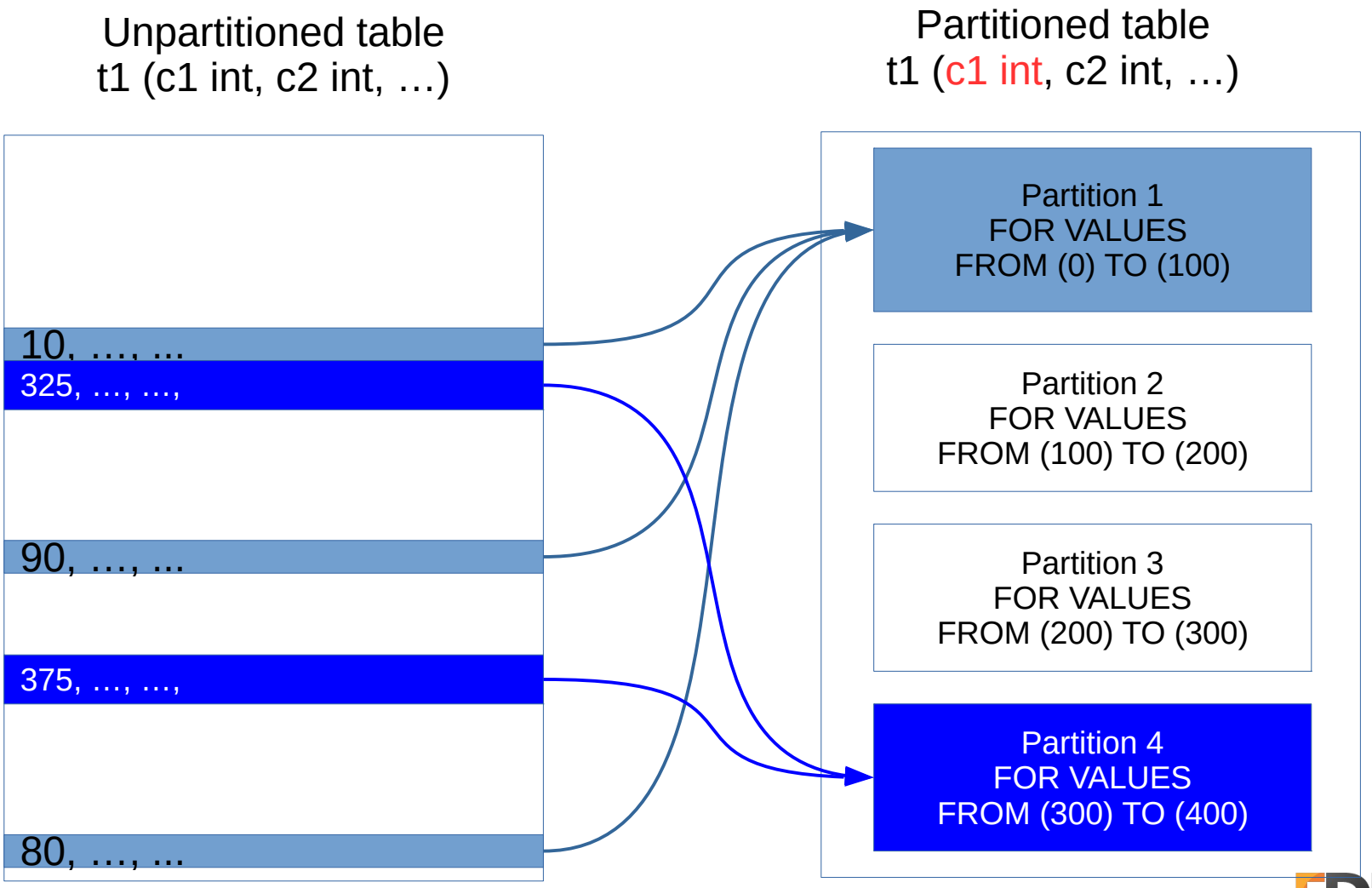
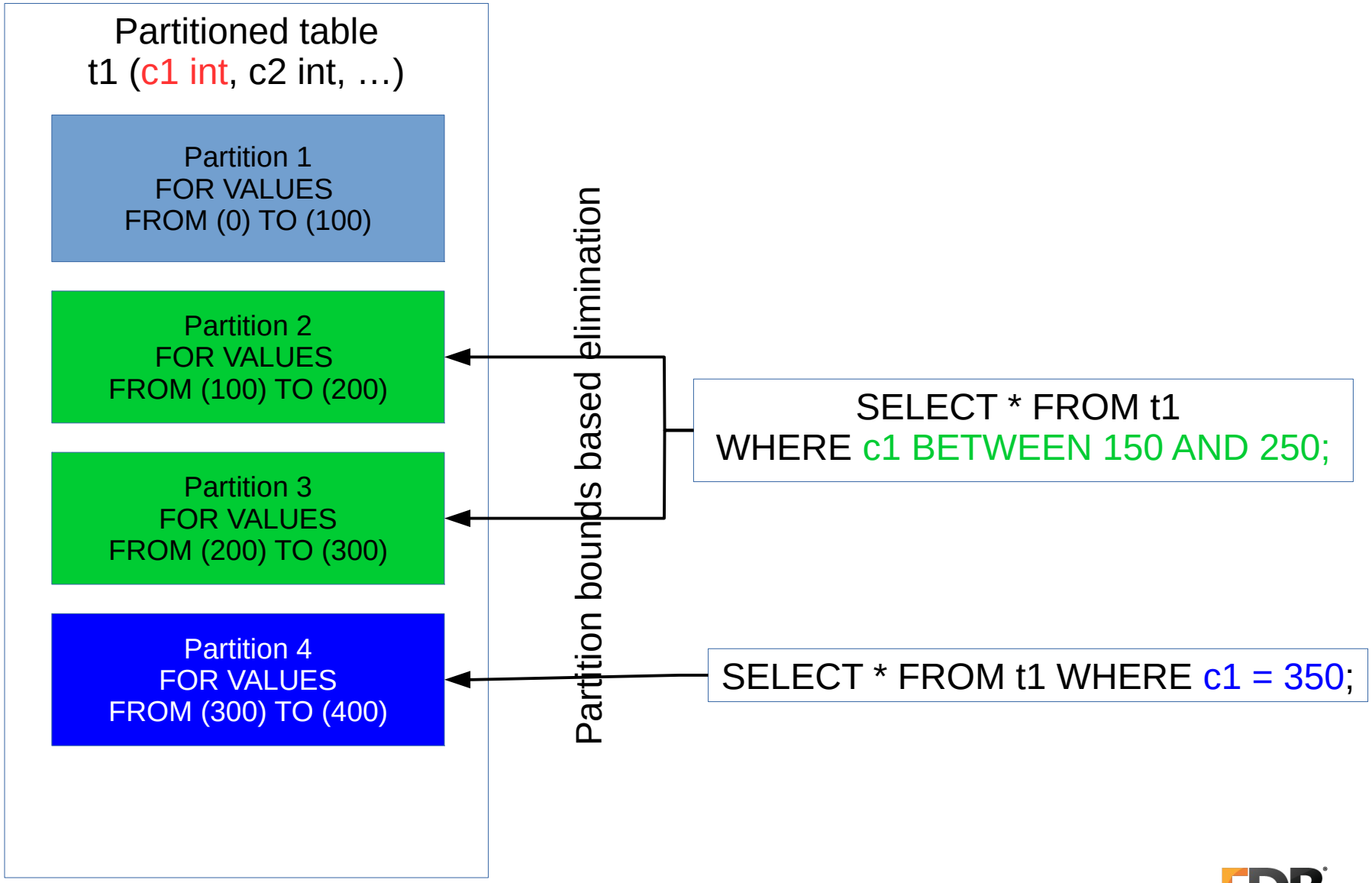
Query Optimization Techniques

- Partition pruning
- Run-time partition pruning
- Partition-wise join
- Partition-wise aggregation
- Partition-wise sorting/ordering

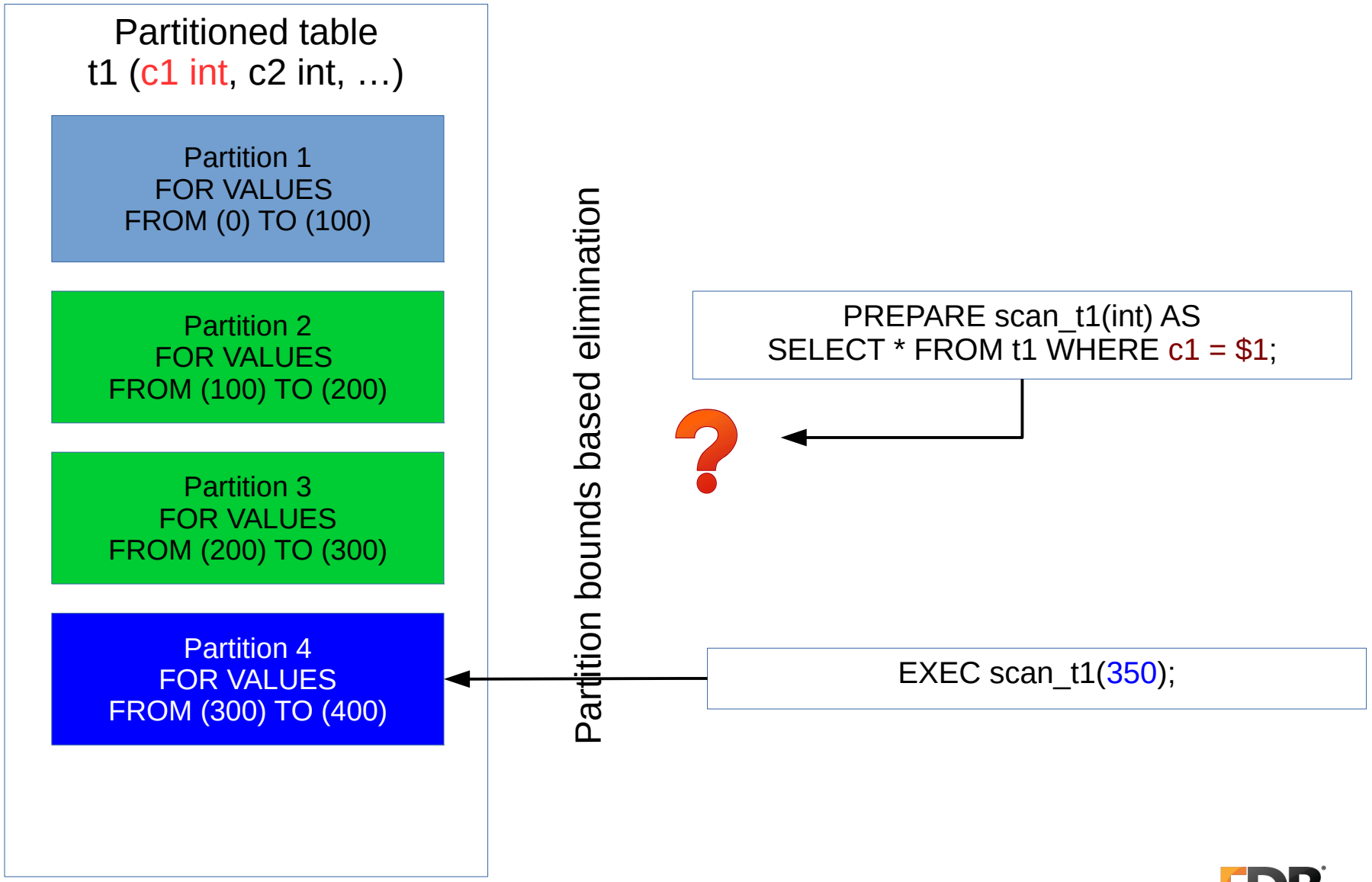
Partitioned Table



Partition Pruning

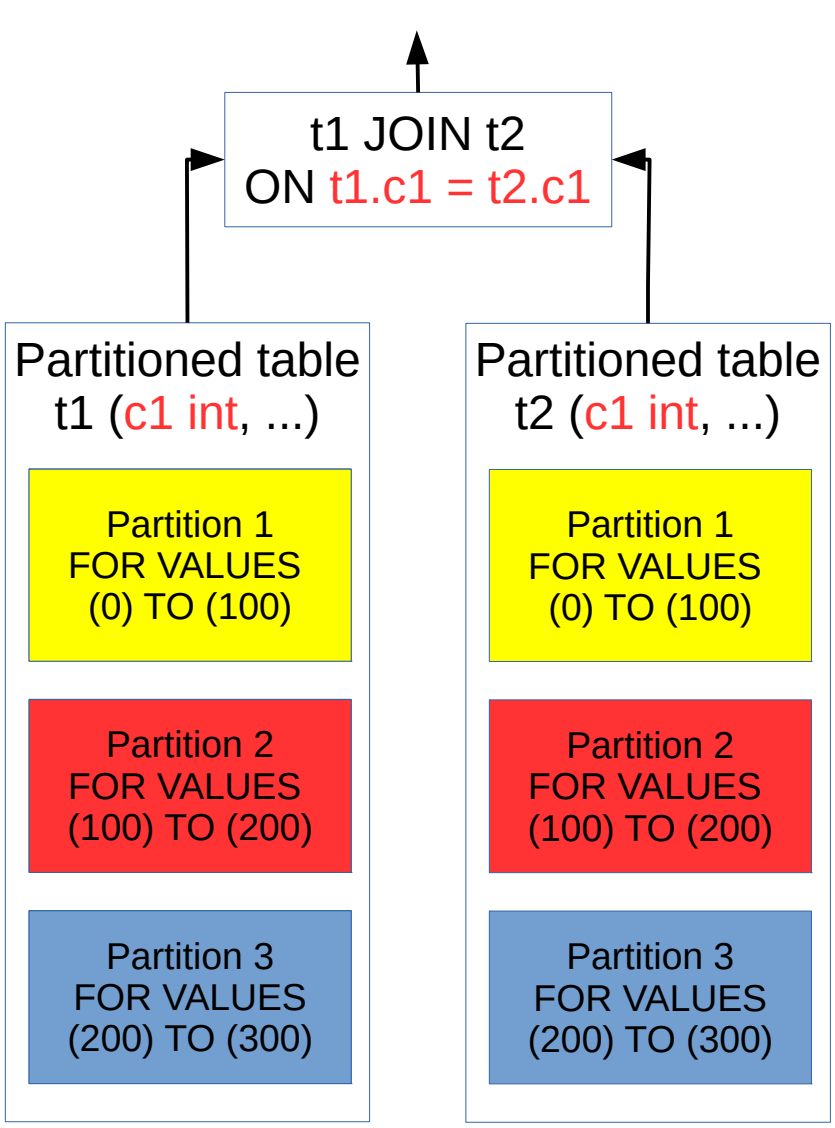


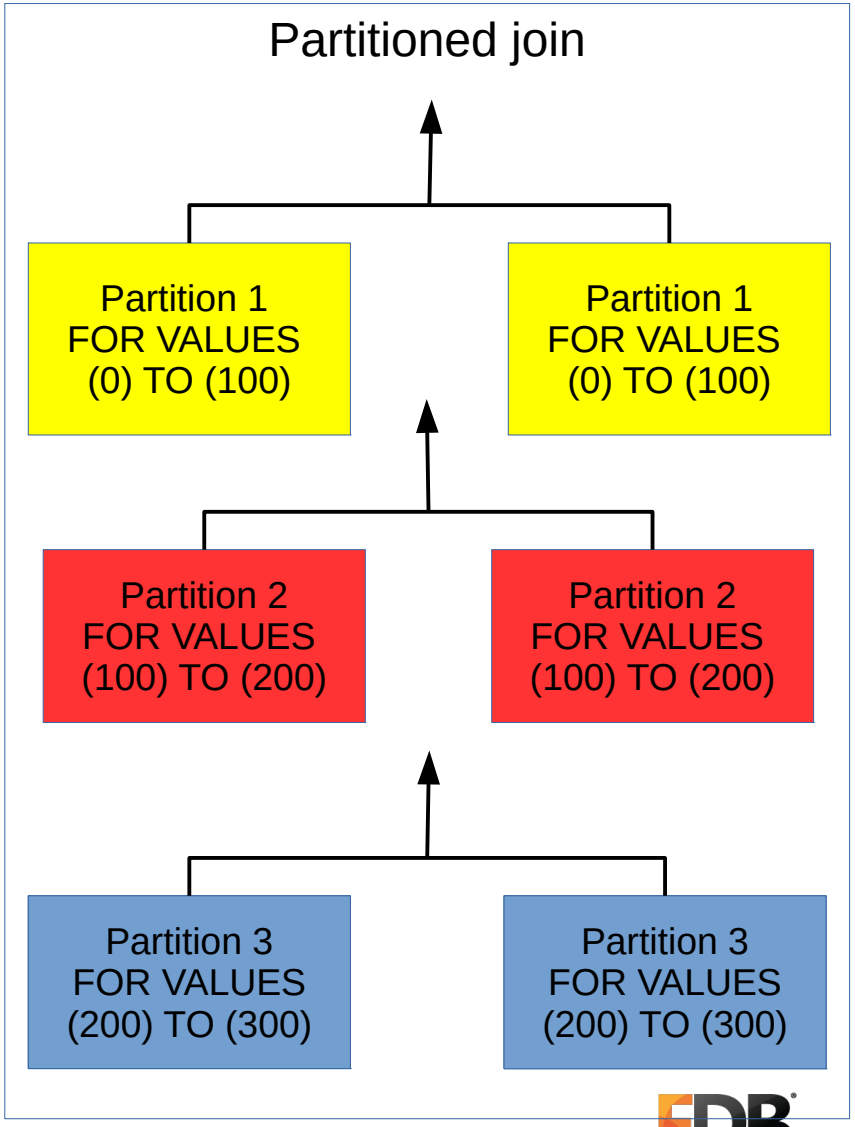
Run-time Partition Pruning



Partition-wise Join

Partition-wise Join

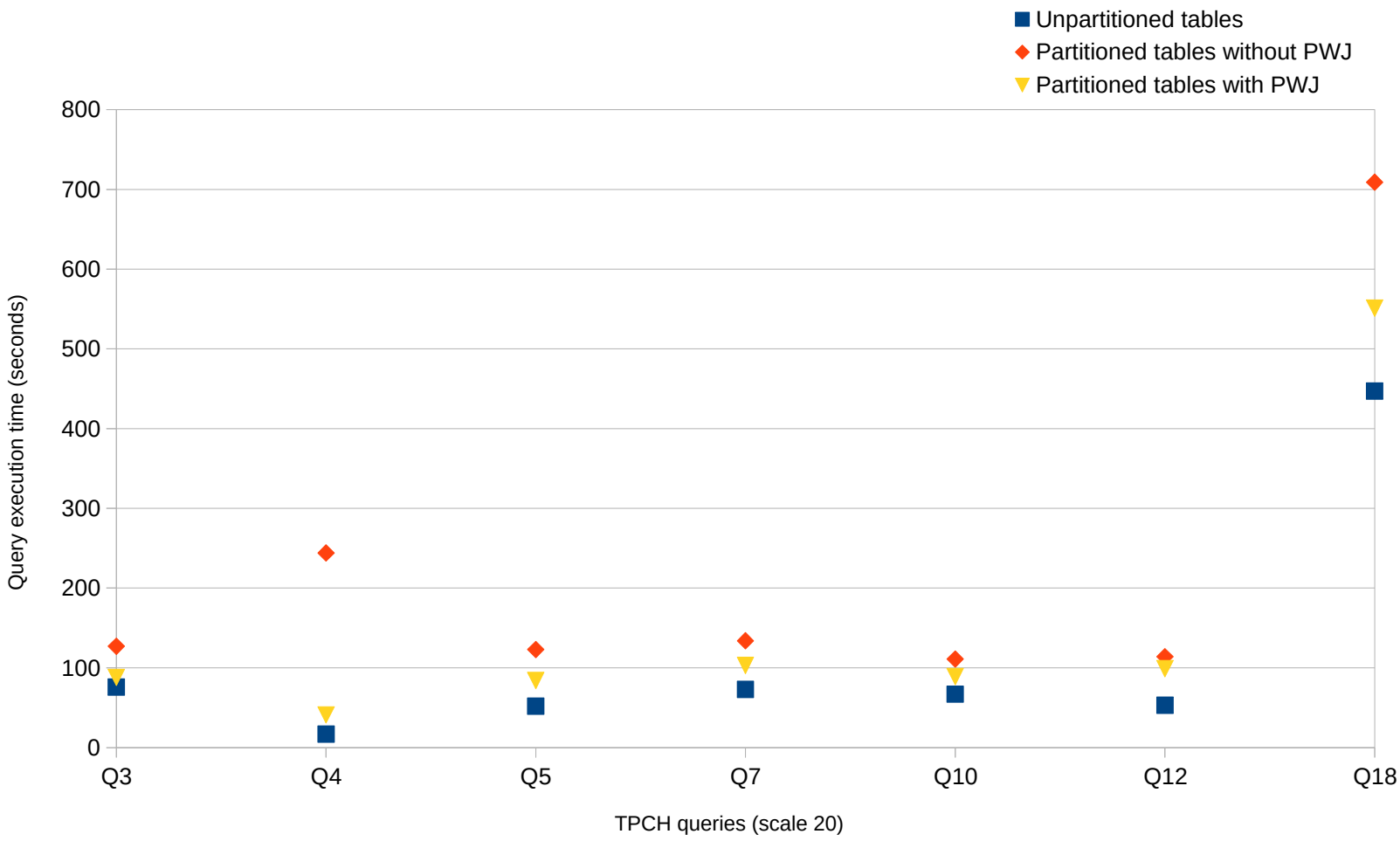




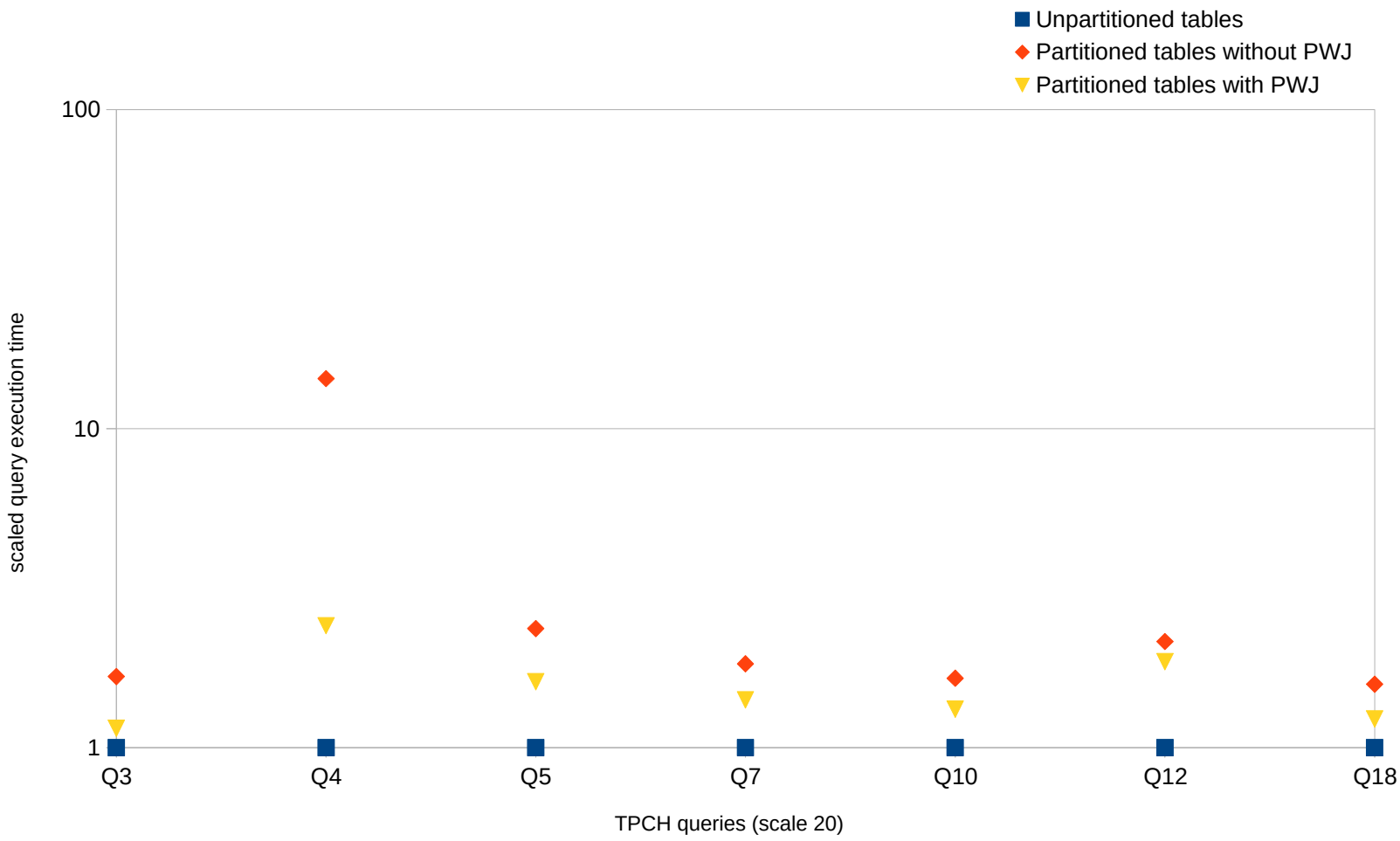
TPCH Vs. Partition-wise Join (Scale 20)

- Scale 20
- Schema changes
  - lineitems PARTITION BY RANGE(l_orderkey)
  - orders PARTITION BY RANGE(o_orderkey)
  - Each with 17 partitions
- GUCs
  - work_mem - 1GB
  - effective_cache_size - 8GB
  - shared_buffers - 8GB
  - enable_partition_wise_join = on

TPCH Vs. Partition-wise Join (Scale 20)
(linear time scale)



TPCH Vs. Partition-wise Join (Scale 20)
(scaled execution time)



TPCH Vs. partition-wise join: observations

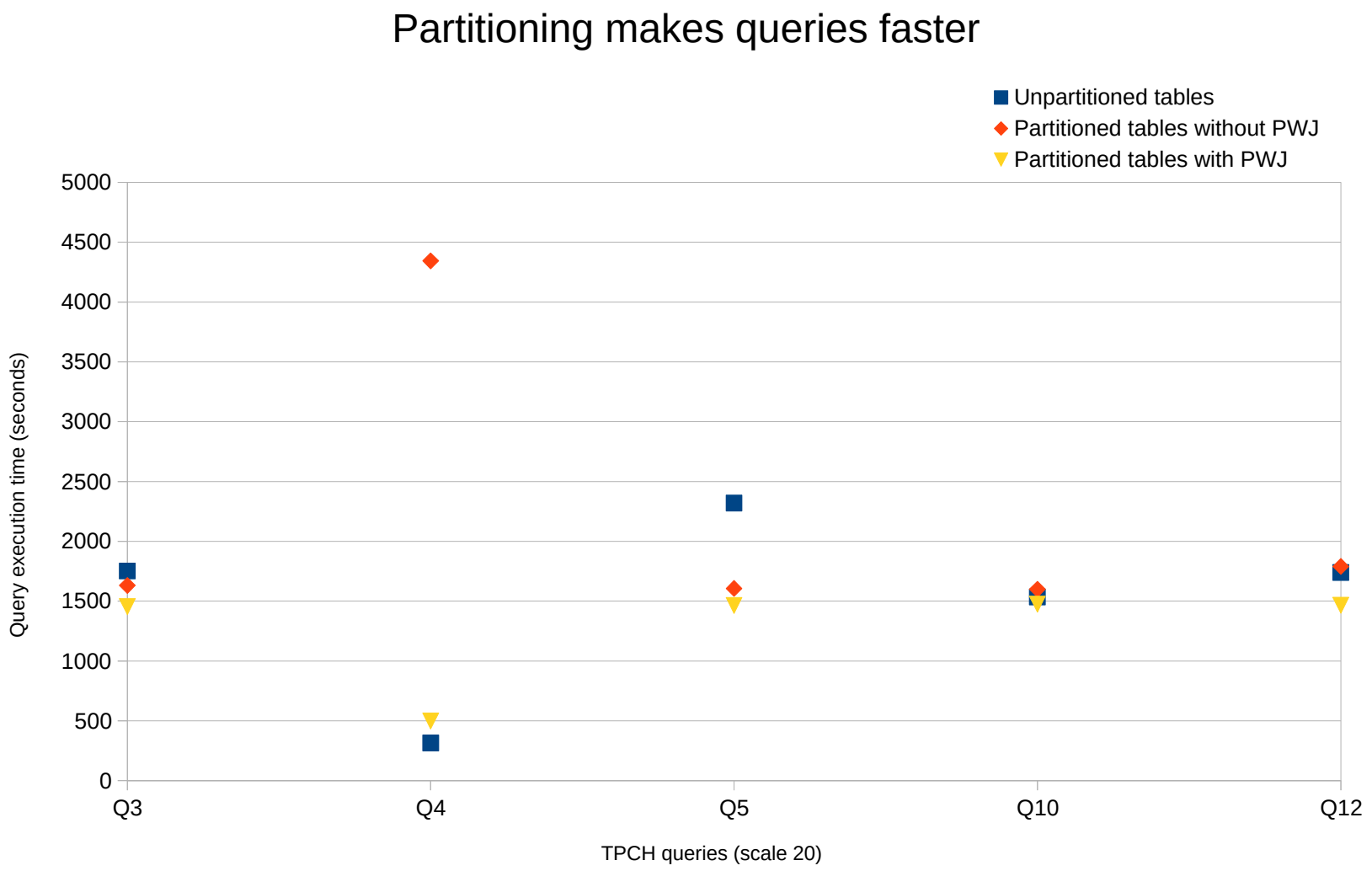
- Join strategy change from join between partitioned tables to join between partitions
  - MergeJoin to HashJoin
    - Q3, Q5, Q10, Q12, Q18
  - HashJoin to parameterized NestLoop join
    - Q4
- Different join strategies for different partition-joins
    - Q7
- Change in order of joining partitioned tables
  - Q3, Q5, Q10, Q12, Q18, Q7

TPCH Vs. Partition-wise Join (Scale 300)

Reported by Rafia Sabih

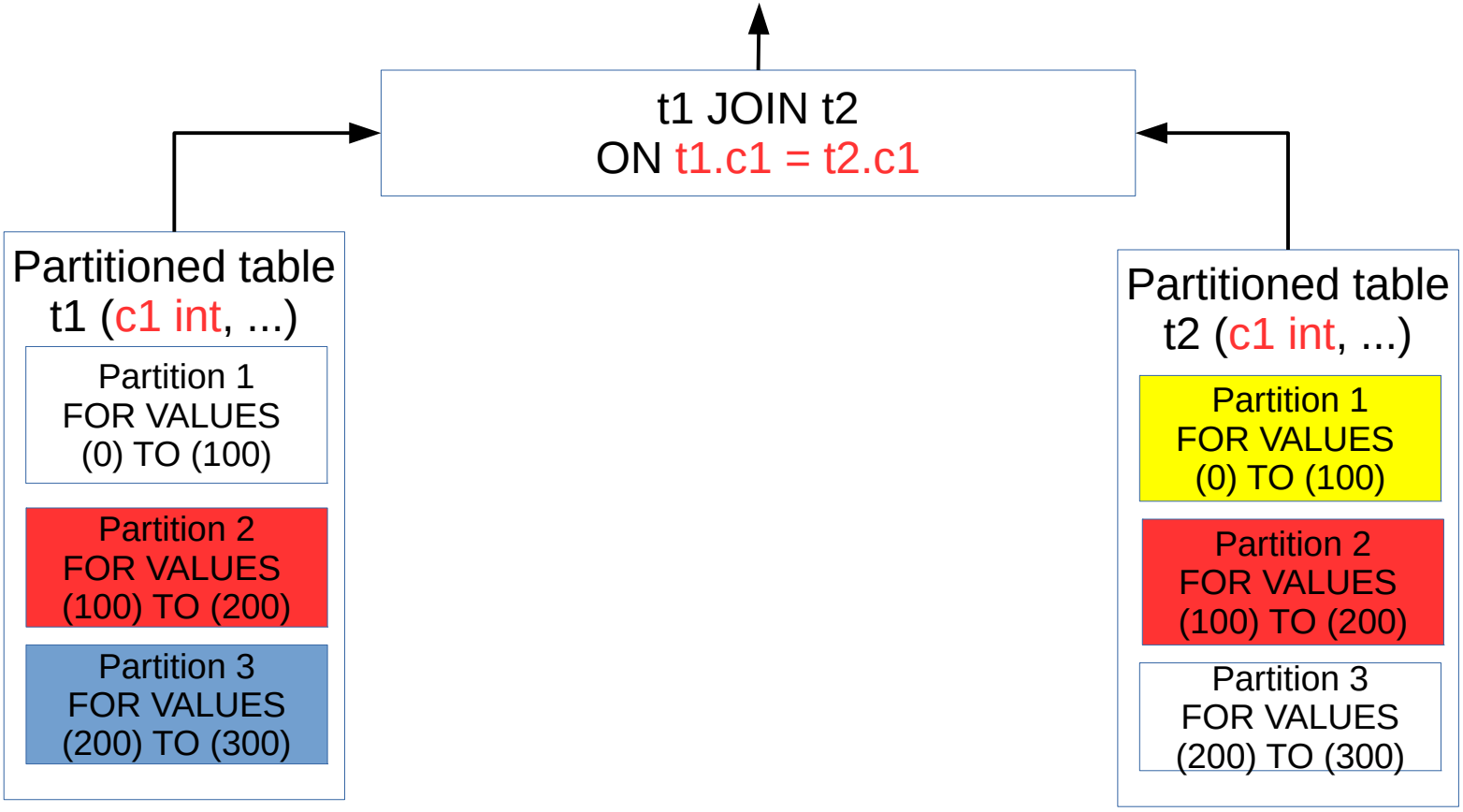
- Scale 300
- Schema changes
  - lineitems PARTITION BY RANGE(l_orderkey)
  - orders PARTITION BY RANGE(o_orderkey)
  - Each with 106 partitions
- GUCs
  - work_mem - 1GB
  - effective_cache_size - 10GB
  - shared_buffers - 10GB
  - enable_partition_wise_join = on
  - max_parallel_workers_per_gather = 4

TPCH Vs. Partition-wise Join (Scale 300)

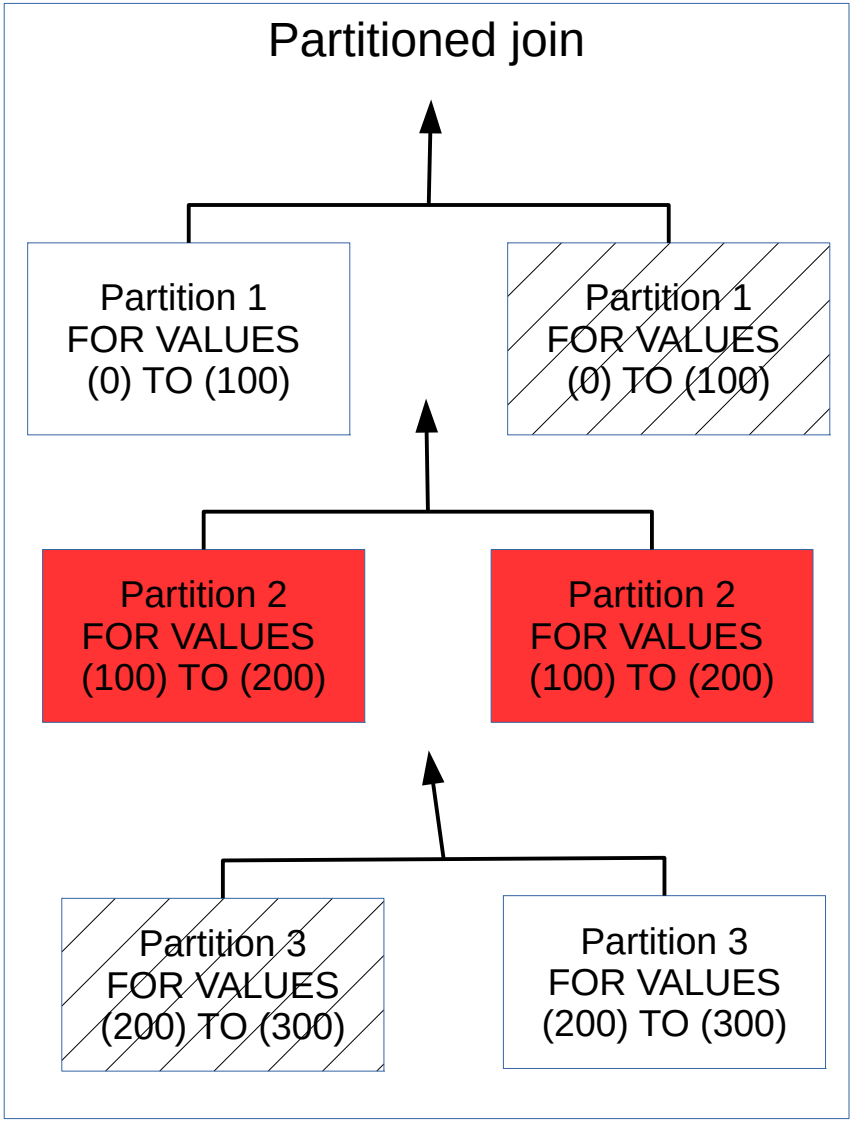


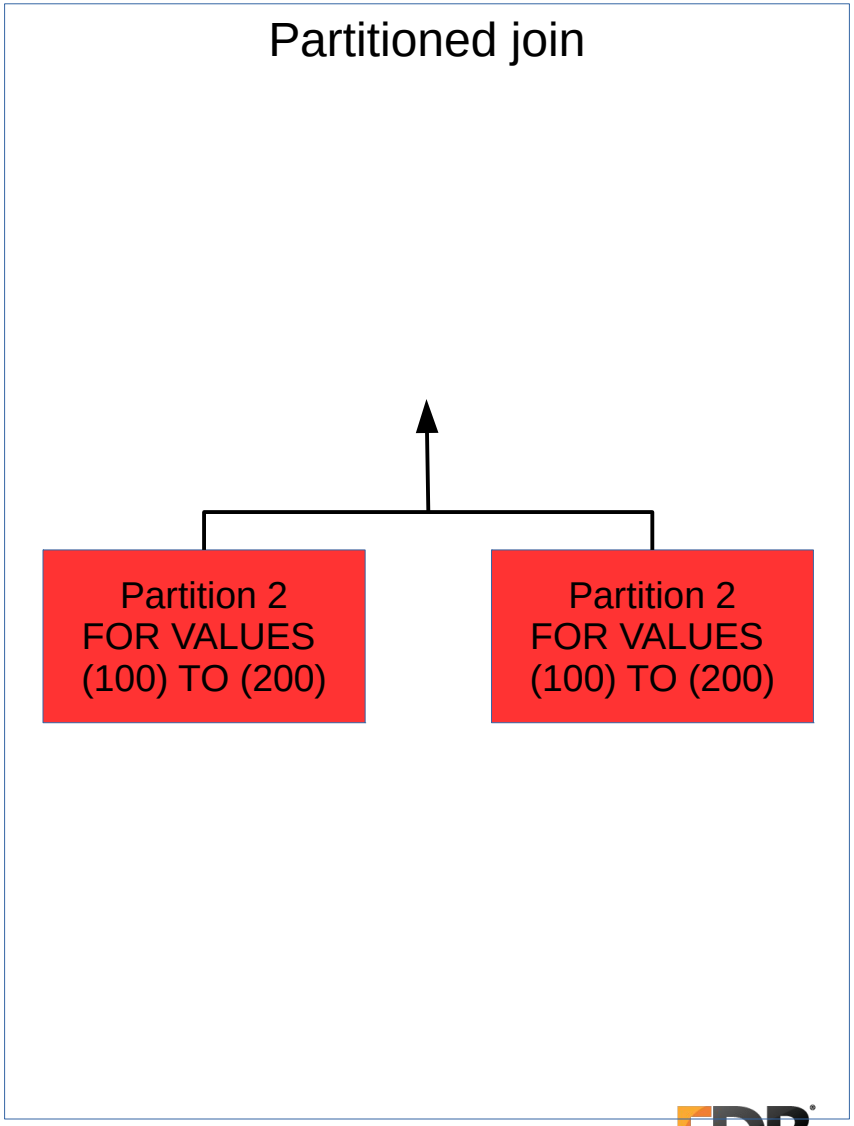
Partition pruning and Partition-wise Join

SELECT … FROM t1 JOIN t2 ON t1.c1 = t2.c1
WHERE t1.c1 > 100 AND t2.c1 < 200



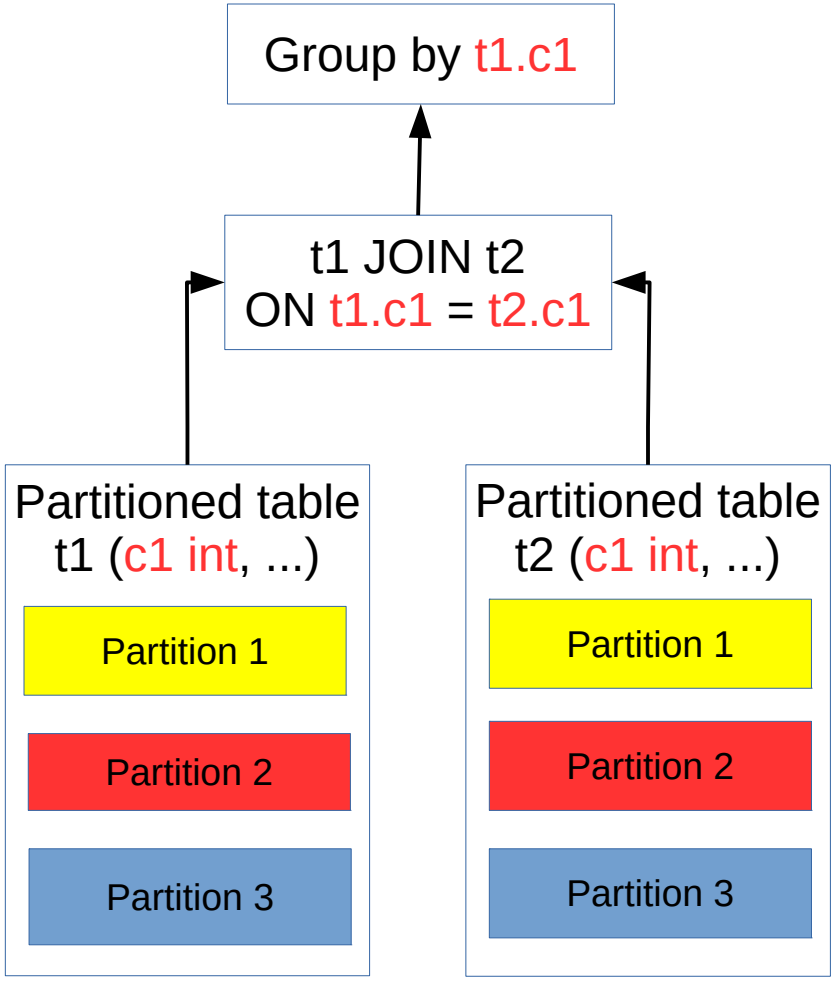
Partition pruning and Partition-wise Join

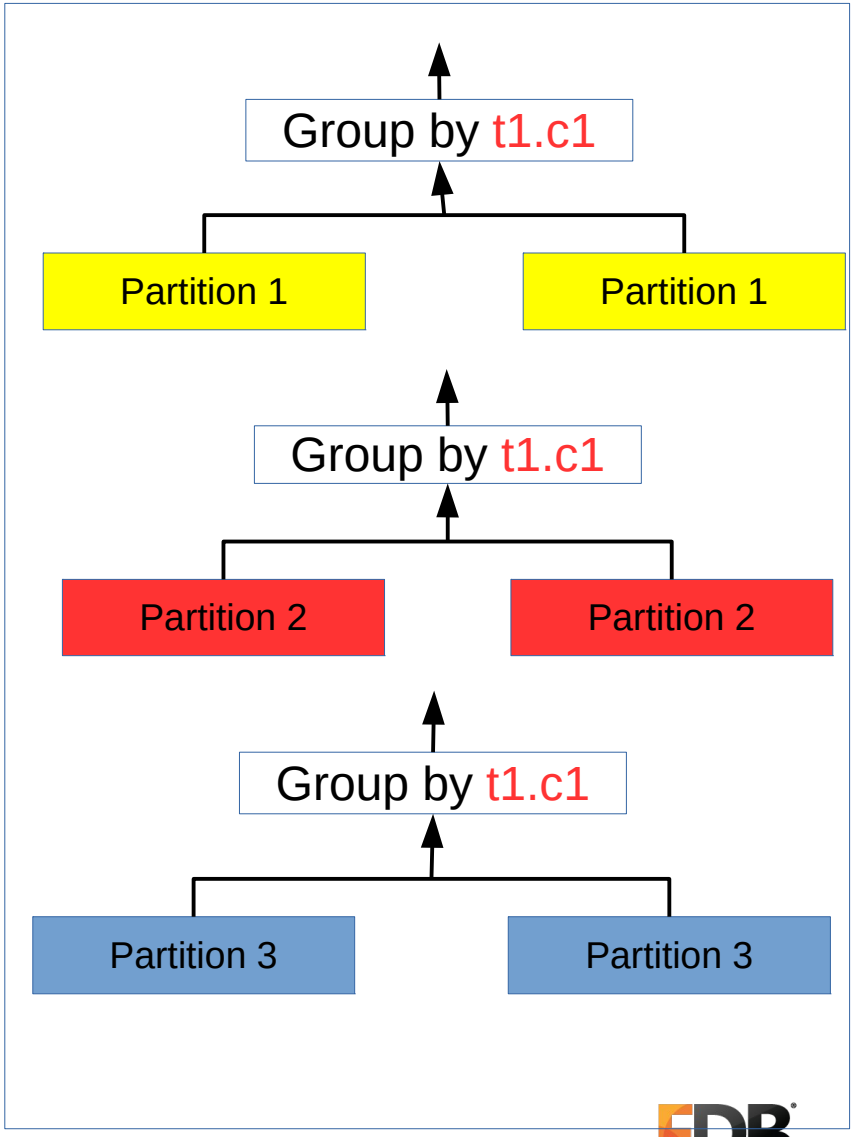




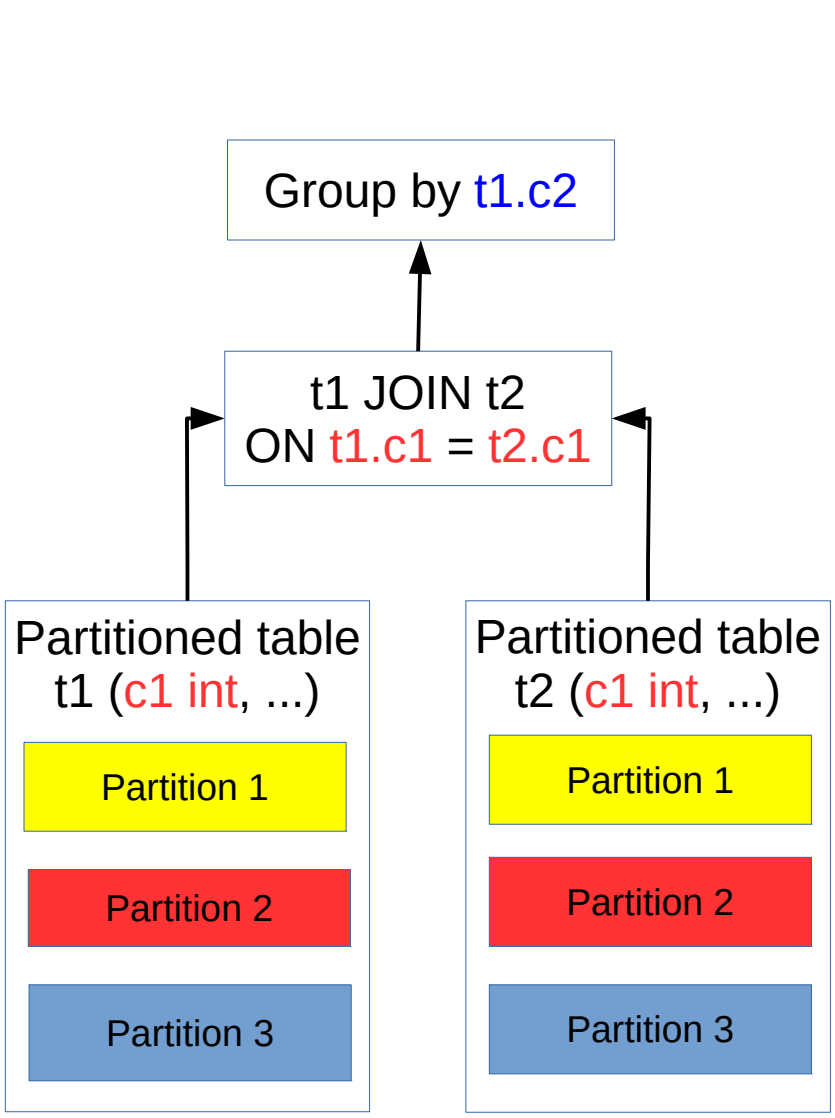
Partition-wise aggregation and grouping

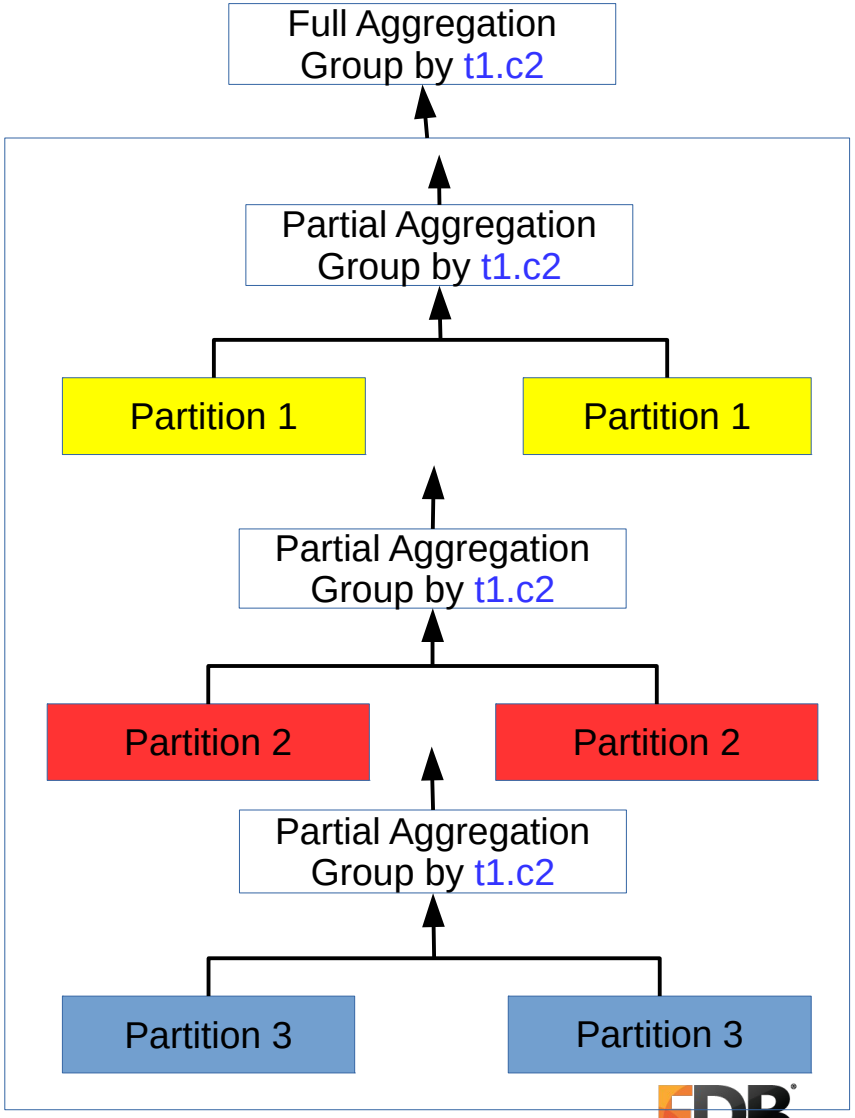
Full partition-wise aggregation





Partial partition-wise aggregation



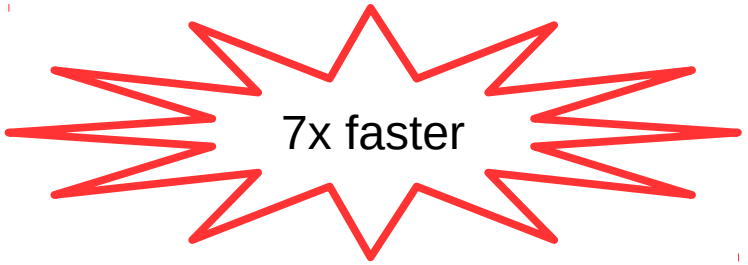


Example

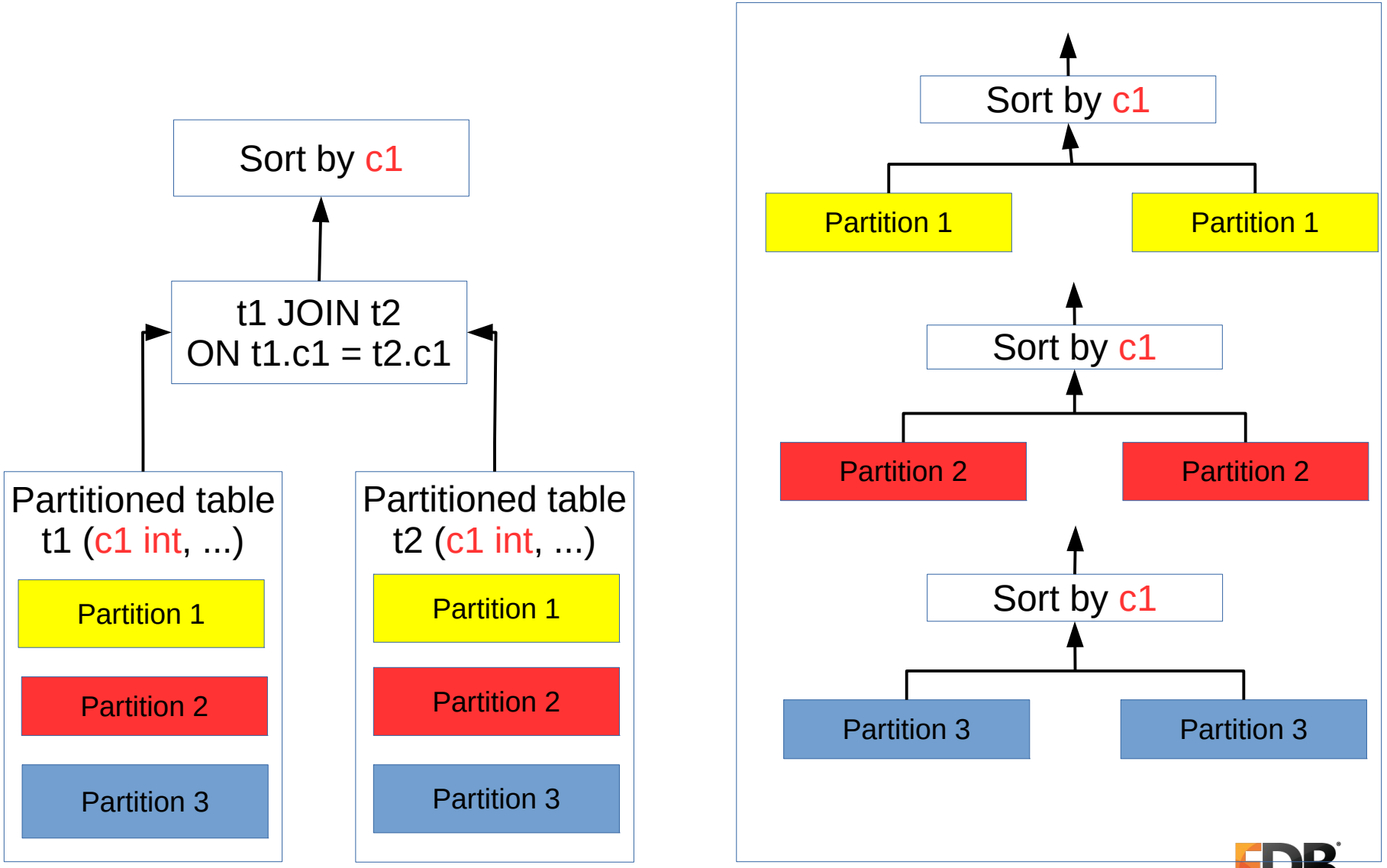
```
Source: Jeevan Chalke's partition-wise aggregate proposal
Query: SELECT a, count(*) FROM plt1 GROUP BY a;
plt1: partitioned table with 3 foreign partitions, each with 1M rows

Query returns 30 rows, 10 rows per partition
enable_partition_wise_agg to false
QUERY PLAN
------------------------------------
 HashAggregate
   Group Key: plt1.a
   ->  Append
         ->  Foreign Scan on fplt1_p1
         ->  Foreign Scan on fplt1_p2
         ->  Foreign Scan on fplt1_p3
 Planning time: 0.251 ms
 Execution time: 6499.018ms ~ 6.5s

enable_partition_wise_agg to true
QUERY PLAN
-----------------------------------------------------
 Append
   ->  Foreign Scan: Aggregate on (public.fplt1_p1 plt1)
   ->  Foreign Scan: Aggregate on (public.fplt1_p2 plt1)
   ->  Foreign Scan: Aggregate on (public.fplt1_p3 plt1)
 Planning time: 0.370ms
 Execution time: 945.384ms ~ .9s
```



Partition-wise sorting



Parallel Append and Partitioning

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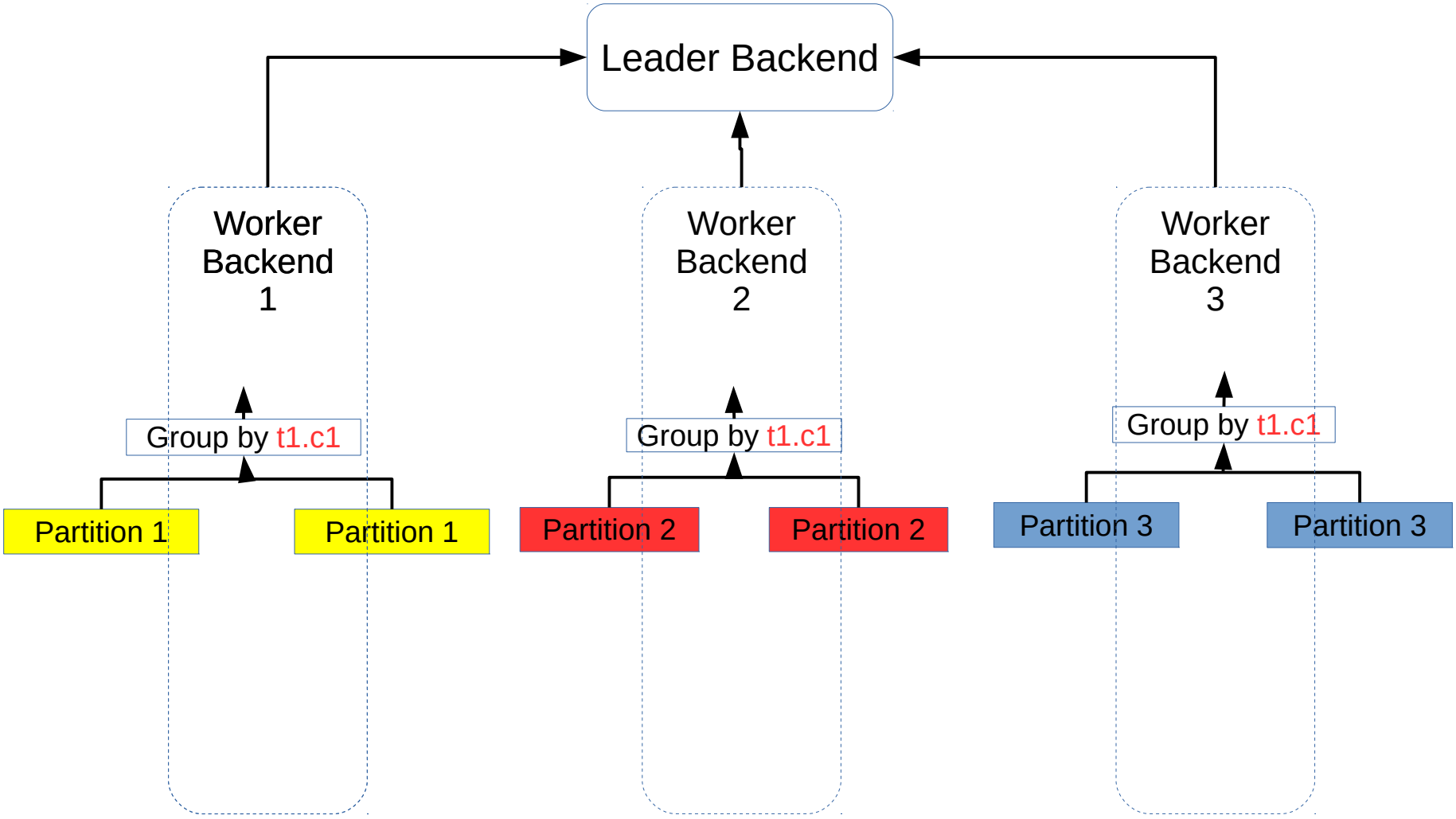
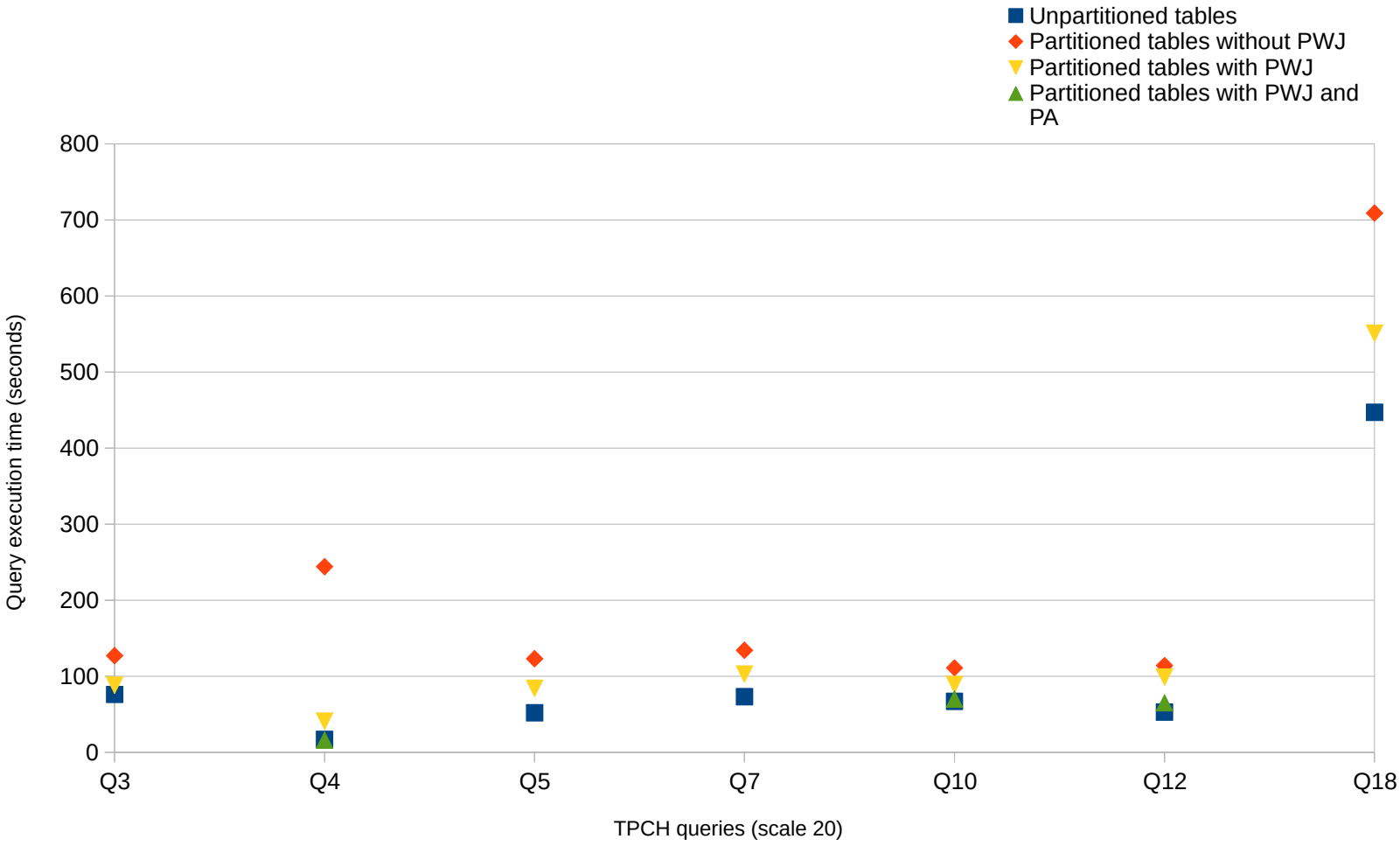


TPCH Vs. PWJ + PA



Query Optimization Techniques - patches

- Committed patches
  - Basic partition-wise join - Ashutosh Bapat (EDB)
  - Parallel append – Amit Khandekar (EDB)
- Patches submitted on hackers and being reviewed
  - Partition pruning – Amit Langote (NTT)
  - Run-time partition pruning – Beena Emerson (EDB)
  - Partition-wise aggregation – Jeevan Chalke (EDB)
  - Partition-wise sorting/ordering – Ronan Dunklau, Julien Rouhaud (Dalibo)
- Benchmarking by Rafia Sabih (EDB)


THANK YOU
grazie
merci
spasiba
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gratzias
manana
mahalo
kitos
cheers
hvala
welalin
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grassie
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