ORACLE PARTITIONING FOR DBAS AND DEVELOPERS

WHY, WHEN AND HOW TO DO IT

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Pythian

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ORACLE ACE

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25

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450+

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350+

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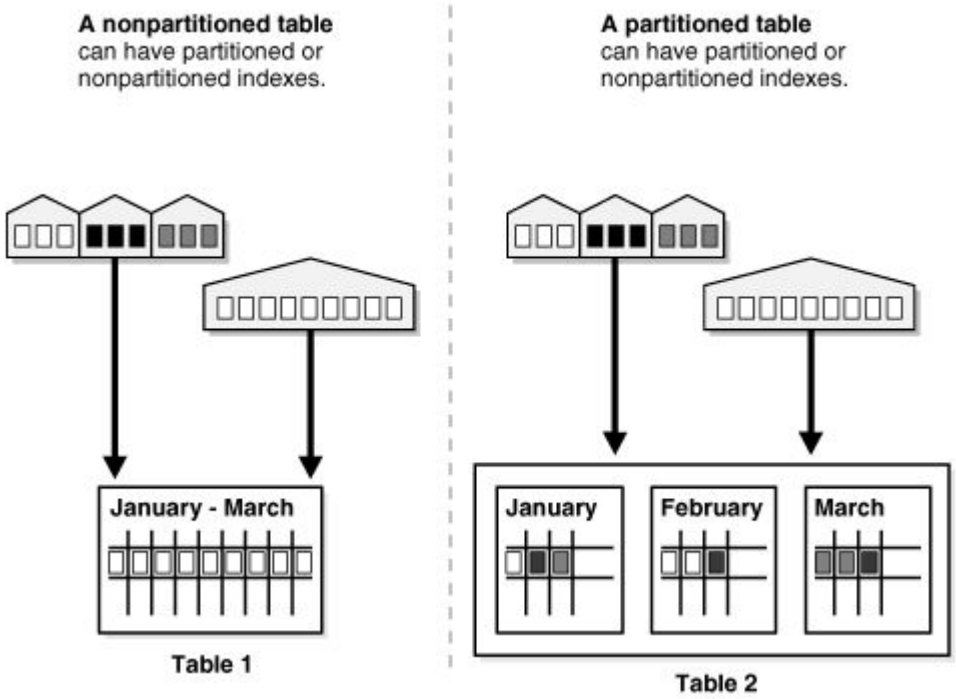
WHY THIS PRESENTATION?

AGENDA

- Partitioning concept
- Background
- Partitioning benefits (Why)
- Implementation scenarios (When)
- Types of partitioning (When)
- Range, List, Interval e Hash partitioning (How)
- The execution plan

PARTITIONING CONCEPTS

- Break down a table/index into smaller pieces
- Partition Key
  - Single or multicolumn
  - Up to 16 columns
  - Unique values are not required
- Every partition is a segment
- Tables
  - Heap tables
  - Index-organized tables
- Indexes
- Materialized Views
- Clusters
- Performance
  - Partition Pruning
  - Concurrency on DML



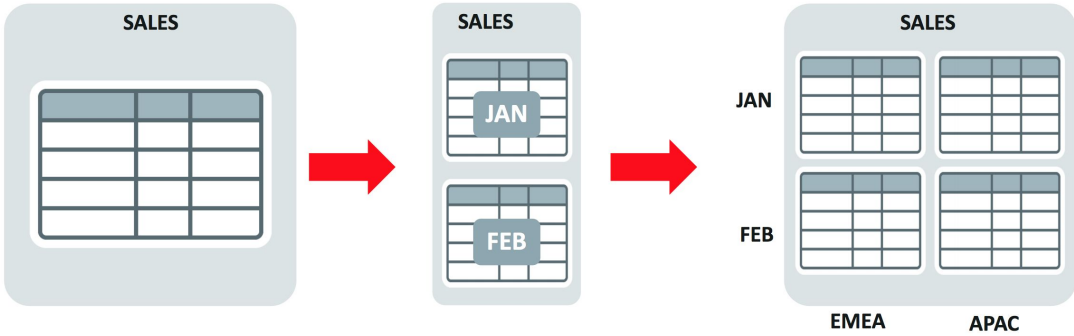
BACKGROUND HISTORY

- Since Oracle 8 (1997)
- Requires extra licensing and EE
- Manual partitioning using views
- New features every new release
- **19c** Hybrid partitioning (Hive, HDFS, External file)

	Core Functionality	Performance	Manageability
Oracle 8.0	Range partitioning Global range indexes	Static partition pruning	Basic maintenance: ADD,DROP,EXCHANGE
Oracle 8*i*	Hash partitioning Range-hash partitioning	Partition-wise joins Dynamic pruning	Expanded maintenance: MERGE
Oracle 9*i*	List partitioning		Global index maintenance
Oracle 9*i* R2	Range-list partitioning	Fast partition SPLIT	
Oracle 10*g*	Global hash indexes		Local index maintenance
Oracle 10*g* R2	1M partitions per table	Multidimensional pruning	Fast DROP TABLE
Oracle 11*g*	Virtual column based partitioning More composite choices REF partitioning		Interval partitioning Partition Advisor Incremental stats management
Oracle 11*g* R2	Hash-hash partitioning	"AND" pruning	Multibranch execution Segment creation on demand*
Oracle 12*c*	Interval-reference partitioning Partial Indexes for partitioning		Partition maintenance on multiple partitions / Online move partition
Oracle 12cR2	Auto-list and Multicolumn list partitioning, Partitioned external tables		Table creation for partition exchange, read-only partitions, Filtered partition maintenance, Online table conversion to partitioned table
Oracle 18c	Modifying the Partitioning Strategy	Parallel Partition-Wise SQL Operations	Online Merging of Partitions and Subpartitions

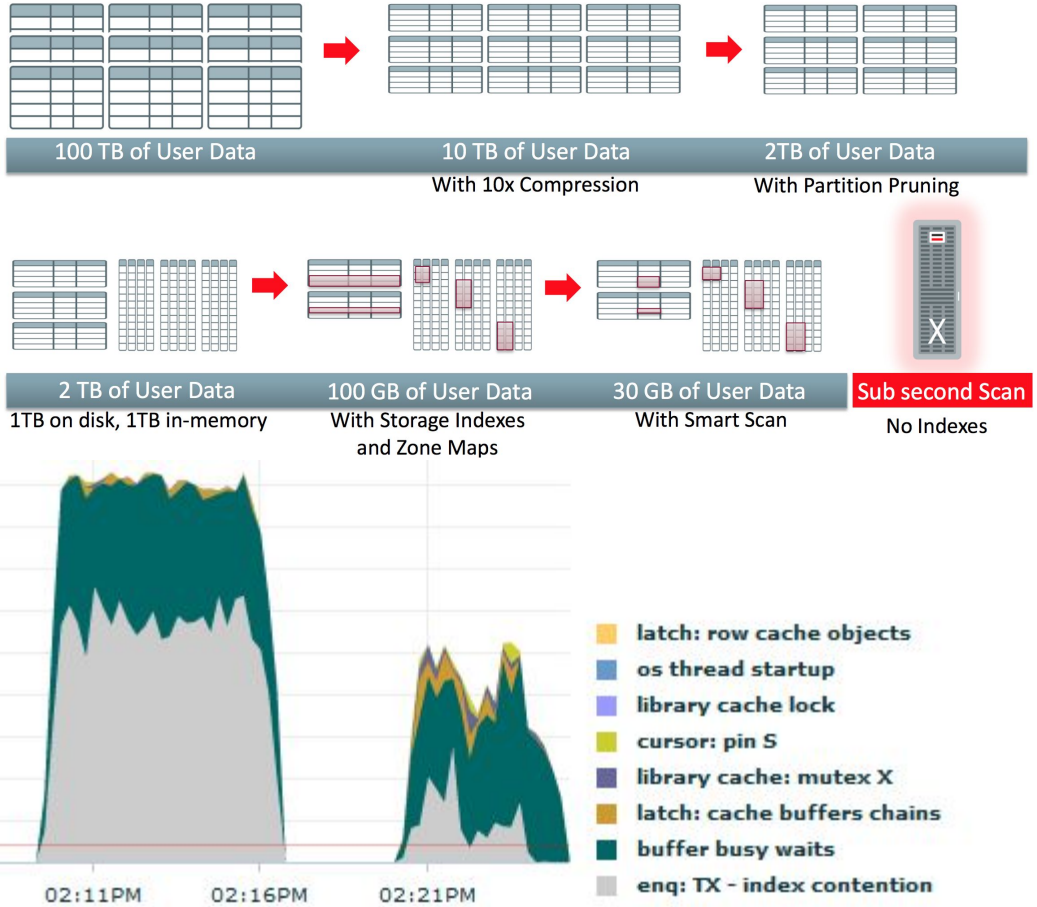
PARTITIONING BENEFITS (WHY)

- Increases availability of data
- Eases administration of large segments
- Might improve the performance of some queries
- Might reduce contention on hot OLTP segments



IMPLEMENTATION SCENARIOS (WHEN)

- Large volume of data when administration becomes difficult
- Query performance on large tables suffers
- Buffer busy waits on high-concurrency tables
- Horizontal scalability in RAC
- Decreased storage cost
- Compression and row archival



TYPES OF PARTITIONING (HOW)

- Range Partitioning
  - Dates and numbers are good candidates
  - Upper boundary
- Hash Partitioning
  - High-concurrency OLTP segments
  - Data is evenly distributed across partitions
- List Partitioning
  - Categories, colors, sports, brands
  - Default values accepted
- Interval Partitioning
  - Automated range partitions
- Reference Partitioning
  - Relational model PK-FK
- Interval Reference Partitioning
  - All child tables will be automatically maintained
- Virtual Column Based Partitioning
- Interval List Partitioning
  - Automated list partitions
- Composite Partition
  - Partition + Subpartition
  - E.g.: Range + Hash
- **Hybrid Partitioning (19c)**

RANGE PARTITIONING (HOW)

```
CREATE TABLE sales_part (
    id              NUMBER,
    flag            NUMBER,
    product         CHAR(14),
    channel_id      NUMBER,
    cust_id         NUMBER,
    amount_sold     NUMBER,
    order_date      DATE,
    ship_date       DATE
)
    PARTITION BY RANGE ( order_date )
    (
    PARTITION before_2017     VALUES LESS THAN ( TO_DATE('01/01/2017','dd/mm/yyyy') ),
    PARTITION p2017_01        VALUES LESS THAN ( TO_DATE('01/02/2017','dd/mm/yyyy') ),
    PARTITION p2017_02        VALUES LESS THAN ( TO_DATE('01/03/2017','dd/mm/yyyy') ),
    PARTITION p2017_03        VALUES LESS THAN ( TO_DATE('01/04/2017','dd/mm/yyyy') ),
    PARTITION p2017_04        VALUES LESS THAN ( TO_DATE('01/05/2017','dd/mm/yyyy') ),
    PARTITION p2017_05        VALUES LESS THAN ( TO_DATE('01/06/2017','dd/mm/yyyy') ),
    PARTITION p2017_06        VALUES LESS THAN ( TO_DATE('01/07/2017','dd/mm/yyyy') ),
    PARTITION p2017_07        VALUES LESS THAN ( TO_DATE('01/08/2017','dd/mm/yyyy') ),
    PARTITION p2017_08        VALUES LESS THAN ( TO_DATE('01/09/2017','dd/mm/yyyy') ),
    PARTITION p2017_09        VALUES LESS THAN ( TO_DATE('01/10/2017','dd/mm/yyyy') ),
    PARTITION p2017_10        VALUES LESS THAN ( TO_DATE('01/11/2017','dd/mm/yyyy') ),
    PARTITION p2017_11        VALUES LESS THAN ( TO_DATE('01/12/2017','dd/mm/yyyy') ),
    PARTITION p2017_12        VALUES LESS THAN ( TO_DATE('01/01/2018','dd/mm/yyyy') ),
    PARTITION p2018_01        VALUES LESS THAN ( TO_DATE('01/02/2018','dd/mm/yyyy') ),
    PARTITION p2018_02        VALUES LESS THAN ( TO_DATE('01/03/2018','dd/mm/yyyy') ),
    PARTITION p2018_03        VALUES LESS THAN ( TO_DATE('01/04/2018','dd/mm/yyyy') ),
    PARTITION p2018_04        VALUES LESS THAN ( TO_DATE('01/05/2018','dd/mm/yyyy') ),
    PARTITION p2018_05        VALUES LESS THAN ( TO_DATE('01/06/2018','dd/mm/yyyy') ),
    PARTITION p2018_06        VALUES LESS THAN ( TO_DATE('01/07/2018','dd/mm/yyyy') )
    );
```

RANGE PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
BEFORE_2017	1	TO_DATE(' 2017-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	19024
P2017_01	2	TO_DATE(' 2017-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2017_02	3	TO_DATE(' 2017-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
P2017_03	4	TO_DATE(' 2017-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2017_04	5	TO_DATE(' 2017-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
P2017_05	6	TO_DATE(' 2017-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2017_06	7	TO_DATE(' 2017-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
P2017_07	8	TO_DATE(' 2017-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2017_08	9	TO_DATE(' 2017-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2017_09	10	TO_DATE(' 2017-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
P2017_10	11	TO_DATE(' 2017-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2017_11	12	TO_DATE(' 2017-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
P2017_12	13	TO_DATE(' 2018-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2018_01	14	TO_DATE(' 2018-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2018_02	15	TO_DATE(' 2018-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
P2018_03	16	TO_DATE(' 2018-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
P2018_04	17	TO_DATE(' 2018-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
P2018_05	18	TO_DATE(' 2018-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	6
P2018_06	19	TO_DATE(' 2018-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	0

LIST PARTITIONING (HOW)

```
CREATE TABLE cars_part (
    id      NUMBER,
    car     VARCHAR(100),
    model   VARCHAR(30),
    brand   VARCHAR(100),
    price   NUMBER
)
    PARTITION BY LIST ( brand ) ( PARTITION bmw VALUES ( 'BMW' ),
        PARTITION ford VALUES ( 'FORD' ),
        PARTITION fiat VALUES ( 'FIAT' ),
        PARTITION ferrari VALUES ( 'FERRARI' ),
        PARTITION toyota VALUES ( 'TOYOTA' ),
        PARTITION honda VALUES ( 'HONDA' ),
        PARTITION kia VALUES ( 'KIA' ),
        PARTITION mercedes VALUES ( 'MERCEDES' ),
        PARTITION landrover VALUES ( 'LANDROVER' ),
        PARTITION mini VALUES ( 'MINI' ),
        PARTITION vw_ag VALUES ( 'AUDI','LAMBORGHINI','BUGATTI','BENTLEY','PORSCHE','SEAT','VOLKSWAGEN' ),
        PARTITION all_others VALUES ( DEFAULT )
    );
```

LIST PARTITIONING (HOW)

```
insert into cars_part values (1, 'FOCUS','mmmmmmmmm','FORD',50000);
insert into cars_part values (2, 'A3','mmmmmmmmm','AUDI',50000);
insert into cars_part values (3, 'C 180','mmmmmmmmm','MERCEDES',50000);
insert into cars_part values (4, 'CERATO','mmmmmmmmm','KIA',50000);
insert into cars_part values (5, 'HILUX','mmmmmmmmm','TOYOTA',50000);
insert into cars_part values (6, 'DEFENDER','mmmmmmmmm','LANDROVER',50000);
insert into cars_part values (7, 'CIVIC','mmmmmmmmm','HONDA',50000);
insert into cars_part values (8, 'BRAVO','mmmmmmmmm','FIAT',50000);
insert into cars_part values (9, 'COOPER S','mmmmmmmmm','MINI',50000);
insert into cars_part values (10,'COOPER','mmmmmmmmm','MINI',50000);
insert into cars_part values (11,'VEYRON','mmmmmmmmm','BUGATTI',50000);
insert into cars_part values (12,'VYPER','mmmmmmmmm','DODGE',50000);
insert into cars_part values (13,'300C','mmmmmmmmm','CHRYSLER',50000);
insert into cars_part values (14,'GOLF','mmmmmmmmm','VOLKSWAGEN',50000);
insert into cars_part values (15,'JETTA','mmmmmmmmm','VOLKSWAGEN',50000);
insert into cars_part values (16,'POLO','mmmmmmmmm','VOLKSWAGEN',50000);
insert into cars_part values (17,'AMAROK','mmmmmmmmm','VOLKSWAGEN',50000);
insert into cars_part values (18,'TIGUAN','mmmmmmmmm','VOLKSWAGEN
```

PNAME	POS	HIGH_VALUE	NUM_ROWS
BMW	1	'BMW'	0
FORD	2	'FORD'	1
FIAT	3	'FIAT'	1
FERRARI	4	'FERRARI'	0
TOYOTA	5	'TOYOTA'	1
HONDA	6	'HONDA'	1
KIA	7	'KIA'	1
MERCEDES	8	'MERCEDES'	1
LANDROVER	9	'LANDROVER'	1
MINI	10	'MINI'	2
VW_AG	11	'AUDI', 'LAMBORGHINI', 'BUGATTI', 'BENTLEY', 'PORSCHE', 'SEAT', 'VOLKSWAGEN'	7
ALL_OTHERS	12	DEFAULT	2

HASH PARTITIONING (HOW)

```
CREATE TABLE cars_hashpart (
    id      NUMBER,
    car     VARCHAR(100),
    model   VARCHAR(30),
    brand   VARCHAR(100),
    price   NUMBER
)
    PARTITION BY HASH ( brand ) (
    PARTITION p1,
    PARTITION p2,
    PARTITION p3,
    PARTITION p4,
    PARTITION p5,
    PARTITION p6,
    PARTITION p7 );
```

HASH PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
P1	1	–	2
P2	2	–	1
P3	3	–	5
P4	4	–	7
P5	5	–	2
P6	6	–	1
P7	7	–	0

HASH PARTITIONING (HOW)

```
CREATE TABLE cars_hashpart2 (
    id      NUMBER,
    car     VARCHAR(100),
    model   VARCHAR(30),
    brand   VARCHAR(100),
    price   NUMBER
)
    PARTITION BY HASH ( brand ) (
    PARTITION p1,
    PARTITION p2,
    PARTITION p3,
    PARTITION p4,
    PARTITION p5,
    PARTITION p6 );
```

HASH PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
P1	1	–	2
P2	2	–	1
P3	3	–	5
P4	4	–	7
P5	5	–	2
P6	6	–	1

HASH PARTITIONING (HOW)

```
CREATE TABLE cars_hashpart3 (
    id      NUMBER,
    car     VARCHAR(100),
    model   VARCHAR(30),
    brand   VARCHAR(100),
    price   NUMBER
)
    PARTITION BY HASH ( brand ) (
    PARTITION p1,
    PARTITION p2,
    PARTITION p3,
    PARTITION p4,
    PARTITION p5,
    PARTITION p6,
    PARTITION p7,
    PARTITION p8 );
```

HASH PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
P1	1	–	2
P2	2	–	1
P3	3	–	5
P4	4	–	6
P5	5	–	2
P6	6	–	1
P7	7	–	0
P8	8	–	1

HASH PARTITIONING (HOW)

```
CREATE TABLE cars_hashpart4 (
    id      NUMBER,
    car     VARCHAR(100),
    model   VARCHAR(30),
    brand   VARCHAR(100),
    price   NUMBER
)
    PARTITION BY HASH ( id ) (
    PARTITION p1,
    PARTITION p2,
    PARTITION p3,
    PARTITION p4,
    PARTITION p5,
    PARTITION p6,
    PARTITION p7,
    PARTITION p8 );
```

HASH PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
P1	1	–	2
P2	2	–	1
P3	3	–	1
P4	4	–	3
P5	5	–	1
P6	6	–	3
P7	7	–	3
P8	8	–	4

HASH PARTITIONING (HOW)

```
CREATE TABLE sales_hashpart (
    id              NUMBER,
    flag            NUMBER,
    product         CHAR(14),
    channel_id      NUMBER,
    cust_id         NUMBER,
    amount_sold     NUMBER,
    order_date      DATE,
    ship_date       DATE
)
    PARTITION BY HASH ( id ) PARTITIONS 8;
```

HASH PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
SYS_P5579	1	-	2482
SYS_P5580	2	-	2512
SYS_P5581	3	-	2563
SYS_P5582	4	-	2469
SYS_P5583	5	-	2437
SYS_P5584	6	-	2472
SYS_P5585	7	-	2557
SYS_P5586	8	-	2508

HASH PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
SYS_P5587	1	–	2482
SYS_P5588	2	–	2512
SYS_P5589	3	–	2563
SYS_P5590	4	–	4977
SYS_P5591	5	–	2437
SYS_P5592	6	–	2472
SYS_P5593	7	–	2557

INTERVAL PARTITIONING (HOW)

```
CREATE TABLE sales_intervalpart (
    id              NUMBER,
    flag            NUMBER,
    product         CHAR(14),
    channel_id      NUMBER,
    cust_id         NUMBER,
    amount_sold     NUMBER,
    order_date      DATE,
    ship_date       DATE
)
    PARTITION BY RANGE ( order_date ) INTERVAL ( numtoyminterval(1,'month') )
    (
    PARTITION before_2017
        VALUES LESS THAN ( TO_DATE('01/01/2017','dd/mm/yyyy') )
    );
```

INTERVAL PARTITIONING (HOW)

PNAME	POS	HIGH_VALUE	NUM_ROWS
BEFORE_2017	1	TO_DATE(' 2017-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	19024
SYS_P5611	2	TO_DATE(' 2017-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5612	3	TO_DATE(' 2017-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5613	4	TO_DATE(' 2017-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5614	5	TO_DATE(' 2017-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5615	6	TO_DATE(' 2017-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5616	7	TO_DATE(' 2017-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5617	8	TO_DATE(' 2017-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5618	9	TO_DATE(' 2017-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5619	10	TO_DATE(' 2017-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5620	11	TO_DATE(' 2017-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5621	12	TO_DATE(' 2017-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5622	13	TO_DATE(' 2018-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5623	14	TO_DATE(' 2018-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5624	15	TO_DATE(' 2018-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5625	16	TO_DATE(' 2018-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5626	17	TO_DATE(' 2018-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5627	18	TO_DATE(' 2018-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	6

INTERVAL PARTITIONING (HOW)

```
insert into sales_intervalpart values (31497139,31497140,'Apple MacBook', 8, 198, 12475, '10/07/2018', '14/10/2018' );
insert into sales_intervalpa
insert into sales_intervalpa
insert into sales_intervalpa
insert into sales_intervalpa
insert into sales_intervalpa
insert into sales_intervalpa
insert into sales_intervalpa
insert into sales_intervalpa
commit;
```

PNAME	POS	HIGH_VALUE	NUM_ROWS
BEFORE_2017	1	TO_DATE(' 2017-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	19024
SYS_P5611	2	TO_DATE(' 2017-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5612	3	TO_DATE(' 2017-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5613	4	TO_DATE(' 2017-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5614	5	TO_DATE(' 2017-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5615	6	TO_DATE(' 2017-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5616	7	TO_DATE(' 2017-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5617	8	TO_DATE(' 2017-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5618	9	TO_DATE(' 2017-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5619	10	TO_DATE(' 2017-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5620	11	TO_DATE(' 2017-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5621	12	TO_DATE(' 2017-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5622	13	TO_DATE(' 2018-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5623	14	TO_DATE(' 2018-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5624	15	TO_DATE(' 2018-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5625	16	TO_DATE(' 2018-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5626	17	TO_DATE(' 2018-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5627	18	TO_DATE(' 2018-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	6
SYS_P5628	19	TO_DATE(' 2018-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	2
SYS_P5629	20	TO_DATE(' 2018-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5630	21	TO_DATE(' 2018-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5631	22	TO_DATE(' 2018-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5632	23	TO_DATE(' 2018-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5633	24	TO_DATE(' 2019-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5634	25	TO_DATE(' 2019-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5635	26	TO_DATE(' 2019-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1

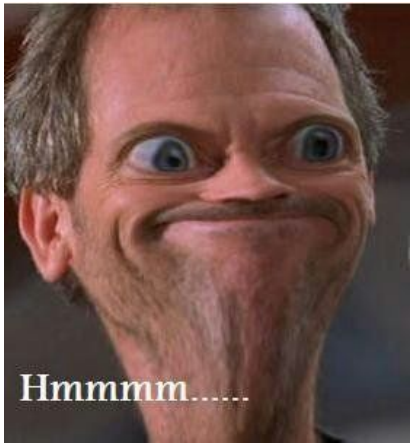
INTERVAL PARTITIONING (HOW)

```
insert into sales_intervalpart values (5149908712,5149908713,'Apple MacBook', 9, 191, 12475, '10/02/2021', '14/02/2021' );
commit;
```

PNAME	POS	HIGH_VALUE	NUM_ROWS
BEFORE_2017	1	TO_DATE(' 2017-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	19024
SYS_P5611	2	TO_DATE(' 2017-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5612	3	TO_DATE(' 2017-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5613	4	TO_DATE(' 2017-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5614	5	TO_DATE(' 2017-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5615	6	TO_DATE(' 2017-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5616	7	TO_DATE(' 2017-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5617	8	TO_DATE(' 2017-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5618	9	TO_DATE(' 2017-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5619	10	TO_DATE(' 2017-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5620	11	TO_DATE(' 2017-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5621	12	TO_DATE(' 2017-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5622	13	TO_DATE(' 2018-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5623	14	TO_DATE(' 2018-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5624	15	TO_DATE(' 2018-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5625	16	TO_DATE(' 2018-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5626	17	TO_DATE(' 2018-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5627	18	TO_DATE(' 2018-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	6
SYS_P5628	19	TO_DATE(' 2018-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	2
SYS_P5629	20	TO_DATE(' 2018-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5630	21	TO_DATE(' 2018-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5631	22	TO_DATE(' 2018-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5632	23	TO_DATE(' 2018-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5633	24	TO_DATE(' 2019-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5634	25	TO_DATE(' 2019-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5635	26	TO_DATE(' 2019-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5636	27	TO_DATE(' 2021-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1

INTERVAL PARTITIONING (HOW)

```
insert into sales_intervalpart
commit;
```



PNAME	POS	HIGH_VALUE	NUM_ROWS
BEFORE_2017	1	TO_DATE(' 2017-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	19024
SYS_P5611	2	TO_DATE(' 2017-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5612	3	TO_DATE(' 2017-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5613	4	TO_DATE(' 2017-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5614	5	TO_DATE(' 2017-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5615	6	TO_DATE(' 2017-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5616	7	TO_DATE(' 2017-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5617	8	TO_DATE(' 2017-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5618	9	TO_DATE(' 2017-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5619	10	TO_DATE(' 2017-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5620	11	TO_DATE(' 2017-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5621	12	TO_DATE(' 2017-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5622	13	TO_DATE(' 2018-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5623	14	TO_DATE(' 2018-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5624	15	TO_DATE(' 2018-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	56
SYS_P5625	16	TO_DATE(' 2018-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	62
SYS_P5626	17	TO_DATE(' 2018-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	60
SYS_P5627	18	TO_DATE(' 2018-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	6
SYS_P5628	19	TO_DATE(' 2018-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	2
SYS_P5629	20	TO_DATE(' 2018-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5630	21	TO_DATE(' 2018-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5631	22	TO_DATE(' 2018-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5632	23	TO_DATE(' 2018-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5633	24	TO_DATE(' 2019-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5634	25	TO_DATE(' 2019-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5635	26	TO_DATE(' 2019-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5637	27	TO_DATE(' 2020-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1
SYS_P5636	28	TO_DATE(' 2021-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	1

```
'10/02/2020', '14/02/2021' );
```

THE EXECUTION PLAN

PNAME	POS	HIGH_VALUE	NUM_ROWS
BEFORE_2017	1	TO_DATE(' 2017-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	45115
P2017_01	2	TO_DATE(' 2017-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2017_02	3	TO_DATE(' 2017-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	140
P2017_03	4	TO_DATE(' 2017-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2017_04	5	TO_DATE(' 2017-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	150
P2017_05	6	TO_DATE(' 2017-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2017_06	7	TO_DATE(' 2017-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	150
P2017_07	8	TO_DATE(' 2017-08-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2017_08	9	TO_DATE(' 2017-09-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2017_09	10	TO_DATE(' 2017-10-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	150
P2017_10	11	TO_DATE(' 2017-11-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2017_11	12	TO_DATE(' 2017-12-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	150
P2017_12	13	TO_DATE(' 2018-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2018_01	14	TO_DATE(' 2018-02-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2018_02	15	TO_DATE(' 2018-03-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	140
P2018_03	16	TO_DATE(' 2018-04-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2018_04	17	TO_DATE(' 2018-05-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	150
P2018_05	18	TO_DATE(' 2018-06-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	155
P2018_06	19	TO_DATE(' 2018-07-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')	150
PMAX	20	MAXVALUE	2155

THE EXECUTION PLAN

ID	FLAG	PRODUCT	CHANNEL_ID	CUST_ID	AMOUNT_SOLD	ORDER_DATE	SHIP_DATE
215	216	Oracle Exadata X8-2 Full Rack	0	215	5000	20-NOV-92	21-NOV-92
216	217	Oracle Exadata X8-2 Full Rack	1	216	5000	21-NOV-92	22-NOV-92
217	218	Oracle Exadata X8-2 Full Rack	2	217	5000	22-NOV-92	23-NOV-92
218	219	Oracle Exadata X8-2 Full Rack	3	218	5000	23-NOV-92	24-NOV-92
219	220	Oracle Exadata X8-2 Full Rack	4	219	5000	24-NOV-92	25-NOV-92
220	221	Oracle Exadata X8-2 Full Rack	0	220	5000	25-NOV-92	26-NOV-92
221	222	Oracle Exadata X8-2 Full Rack	1	221	5000	26-NOV-92	27-NOV-92
222	223	Oracle Exadata X8-2 Full Rack	2	222	5000	27-NOV-92	28-NOV-92
223	224	Oracle Exadata X8-2 Full Rack	3	223	5000	28-NOV-92	29-NOV-92
224	225	Oracle Exadata X8-2 Full Rack	4	224	5000	29-NOV-92	30-NOV-92
225	226	Oracle Exadata X8-2 Full Rack	0	225	5000	30-NOV-92	01-DEC-92
226	227	Oracle Exadata X8-2 Full Rack	1	226	5000	01-DEC-92	02-DEC-92
227	228	Oracle Exadata X8-2 Full Rack	2	227	5000	02-DEC-92	03-DEC-92
228	229	Oracle Exadata X8-2 Full Rack	3	228	5000	03-DEC-92	04-DEC-92
229	230	Oracle Exadata X8-2 Full Rack	4	229	5000	04-DEC-92	05-DEC-92
230	231	Oracle Exadata X8-2 Full Rack	0	230	5000	05-DEC-92	06-DEC-92
231	232	Oracle Exadata X8-2 Full Rack	1	231	5000	06-DEC-92	07-DEC-92
232	233	Oracle Exadata X8-2 Full Rack	2	232	5000	07-DEC-92	08-DEC-92
233	234	Oracle Exadata X8-2 Full Rack	3	233	5000	08-DEC-92	09-DEC-92
234	235	Oracle Exadata X8-2 Full Rack	4	234	5000	09-DEC-92	10-DEC-92

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  20ydmgyuhwp61, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '01/Feb/2015' and
'31/Jul/2015'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation               | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT        |            |      1 |        |       |   161 (100)|          |       |       |      1 |00:00:00.01 |     471 |
|   1 |  SORT AGGREGATE         |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |     471 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |    910 | 10010 |   161   (1)| 00:00:01 |     1 |     1 |    905 |00:00:00.01 |     471 |
|*  3 |    TABLE ACCESS FULL    | SALES_PART |      1 |    910 | 10010 |   161   (1)| 00:00:01 |     1 |     1 |    905 |00:00:00.01 |     471 |
-----------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  f40w4vpjta20p, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '01/Jul/2015' and
'31/Jul/2015'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |   161 (100)|          |       |       |      1 |00:00:00.01 |     471 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |     471 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |    160 |  1760 |   161   (1)| 00:00:01 |     1 |     1 |    155 |00:00:00.01 |     471 |
|*  3 |    TABLE ACCESS FULL     | SALES_PART |      1 |    160 |  1760 |   161   (1)| 00:00:01 |     1 |     1 |    155 |00:00:00.01 |     471 |
-----------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  17f15ybps0g29, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '30/Jul/2015' and
'31/Jul/2015'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |   161 (100)|          |       |       |      1 |00:00:00.01 |     471 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |     471 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |     15 |   165 |   161   (1)| 00:00:01 |     1 |     1 |     10 |00:00:00.01 |     471 |
|*  3 |    TABLE ACCESS FULL     | SALES_PART |      1 |     15 |   165 |   161   (1)| 00:00:01 |     1 |     1 |     10 |00:00:00.01 |     471 |
-----------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  17f15ybps0g29, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '30/Jul/2015' and
'31/Jul/2015'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |   161 (100)|          |       |       |      1 |00:00:00.01 |     471 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |     471 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |     15 |   165 |   161   (1)| 00:00:01 |     1 |     1 |     10 |00:00:00.01 |     471 |
|*  3 |    TABLE ACCESS FULL     | SALES_PART |      1 |     15 |   165 |   161   (1)| 00:00:01 |     1 |     1 |     10 |00:00:00.01 |     471 |
-----------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  b07ngs4mjfh2n, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '01/Feb/2017' and
'31/Jul/2017'

Plan hash value: 308944665

-----------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |    11 (100)|          |       |       |      1 |00:00:00.01 |      36 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |      36 |
|   2 |   PARTITION RANGE ITERATOR|           |      1 |    910 | 10010 |    11   (0)| 00:00:01 |     3 |     8 |    905 |00:00:00.01 |      36 |
|* 3 |    TABLE ACCESS FULL      | SALES_PART |      6 |    910 | 10010 |    11   (0)| 00:00:01 |     3 |     8 |    905 |00:00:00.01 |      36 |
-----------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  2c101v6jmtp3q, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '01/Jul/2017' and
'31/Jul/2017'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |     3 (100)|          |       |       |      1 |00:00:00.01 |       6 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |       6 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |    155 |  1705 |     3   (0)| 00:00:01 |     8 |     8 |    155 |00:00:00.01 |       6 |
|*  3 |    TABLE ACCESS FULL     | SALES_PART |      1 |    155 |  1705 |     3   (0)| 00:00:01 |     8 |     8 |    155 |00:00:00.01 |       6 |
-----------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  8tgc0jhwg1w31, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '30/Jul/2017' and
'31/Jul/2017'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |     3 (100)|          |       |       |      1 |00:00:00.01 |       6 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |       6 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |     10 |   110 |     3   (0)| 00:00:01 |     8 |     8 |     10 |00:00:00.01 |       6 |
|*  3 |    TABLE ACCESS FULL     | SALES_PART |      1 |     10 |   110 |     3   (0)| 00:00:01 |     8 |     8 |     10 |00:00:00.01 |       6 |
-----------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

SQL Worksheet

```
1  create index idx_salesp_od on sales_part(order_date);
2  exec dbms_stats.gather_table_stats('','SALES_PART',cascade=>true,no_invalidate=>false);
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  5up8xsq8msytt, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics index(sales_part
idx_salesp_od) */ sum(amount_sold)    from sales_part    where
order_date between    '30/Jul/2017' and '31/Jul/2017'

Plan hash value: 1182382279

-----------------------------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                           | Name          | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                    |               |      1 |        |       |    17 (100)|          |       |       |      1 |00:00:00.01 |       6 |
|   1 |  SORT AGGREGATE                     |               |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |       6 |
|   2 |   TABLE ACCESS BY GLOBAL INDEX ROWID BATCHED| SALES_PART    |      1 |      9 |    99 |    17   (0)| 00:00:01 |     8 |     8 |     10 |00:00:00.01 |       6 |
|*  3 |    INDEX RANGE SCAN                 | IDX_SALESP_OD |      1 |     15 |       |     2   (0)| 00:00:01 |       |       |     10 |00:00:00.01 |       2 |
-----------------------------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

SQL Worksheet

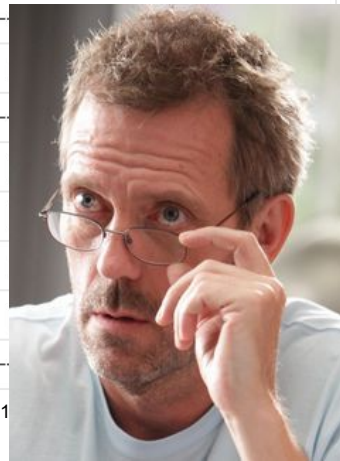
```
1  create index idx_salesp_od_l on sales_part(order_date) local;
2  exec dbms_stats.gather_table_stats('','SALES_PART',cascade=>true,no_invalidate=>false);
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  4yy14f8mzau1b, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics index(sales_part
idx_salesp_od_l) */ sum(amount_sold)    from sales_part    where
order_date between    '30/Jul/2017' and '31/Jul/2017'

Plan hash value: 3760996097

-----------------------------------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                                | Name           | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |   A-Time   | Buffers |
-----------------------------------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                         |                |      1 |        |       |     5 (100)|          |       |       |      1 |00:00:00.01 |       5 |
|   1 |  SORT AGGREGATE                          |                |      1 |      1 |    11 |            |          |       |       |      1 |00:00:00.01 |       5 |
|   2 |   PARTITION RANGE SINGLE                 |                |      1 |      9 |    99 |     5   (0)| 00:00:01 |     8 |     8 |     10 |00:00:00.01 |       5 |
|   3 |    TABLE ACCESS BY LOCAL INDEX ROWID BATCHED| SALES_PART     |      1 |      9 |    99 |     5   (0)| 00:00:01 |     8 |     8 |     10 |00:00:00.01 |       5 |
|*  4 |     INDEX RANGE SCAN                     | IDX_SALESP_OD_L |      1 |      9 |       |     1   (0)| 00:00:01 |     8 |     8 |     10 |00:00:00.01 |       1 |
-----------------------------------------------------------------------------------------------------------------------------------------------------------
```

THE EXECUTION PLAN

```
PLAN_TABLE_OUTPUT
SQL_ID  8tgc0jhwg1w31, child number 0
-------------------------------------
select /*My statement*/ /*+ gather_plan_statistics */ sum(amount_sold)
  from sales_part    where order_date between    '30/Jul/2017' and
'31/Jul/2017'

Plan hash value: 3843654642

-----------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                | Name       | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | Pstart| Pstop | A-Rows |
-----------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |            |      1 |        |       |     3 (100)|          |       |       |      1 |
|   1 |  SORT AGGREGATE          |            |      1 |      1 |    11 |            |          |       |       |      1 |
|   2 |   PARTITION RANGE SINGLE|            |      1 |     10 |   110 |     3   (0)| 00:00:01 |     8 |     8 |     10 |
|*  3 |    TABLE ACCESS FULL     | SALES_PART |      1 |     10 |   110 |     3   (0)| 00:00:01 |     8 |     8 |     10 |
-----------------------------------------------------------------------------------------------------------------------------
```



PARTITIONING MAINTENANCE OPERATIONS

```
select segment_name, PARTITION_NAME, segment_type, tablespace_name, bytes/1024/1024 MB from user_segments;

SQL> SQL>
SEGMENT_NAME         PARTITION_NAME       SEGMENT_TYPE       TABLESPACE_NAME                     MB
-------------------- -------------------- ------------------ ------------------------------ ----------
SALES_PART           P2018_05             TABLE PARTITION    USERS                              .0625
SALES_PART           P2018_04             TABLE PARTITION    USERS                              .4375
SALES_PART           P2018_03             TABLE PARTITION    USERS                              .4375
SALES_PART           P2018_02             TABLE PARTITION    USERS                              .4375
SALES_PART           P2018_01             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_12             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_11             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_10             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_09             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_08             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_07             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_06             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_05             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_04             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_03             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_02             TABLE PARTITION    USERS                              .4375
SALES_PART           P2017_01             TABLE PARTITION    USERS                              .4375
SALES_PART           BEFORE_2017          TABLE PARTITION    USERS                                120
SALES_INDEXED                             TABLE              USERS                                128
SALES_IDX01                               INDEX              USERS                                 43
SALES                                     TABLE              USERS                                127

21 rows selected.
```


```
alter table sales_part
merge partitions
BEFORE_2017, P2017_01, P2017_02, P2017_03, P2017_04, P2017_05, P2017_06, P2017_07, P2017_08, P2017_09,P2017_10, P2017_11, P2017_12
into partition BEFORE_2018;
```

online

PARTITIONING MAINTENANCE OPERATIONS

```
select segment_name, PARTITION_NAME, segment_type, tablespace_name, bytes/1024/1024 MB from user_segments;
SQL> SQL>
SEGMENT_NAME         PARTITION_NAME       SEGMENT_TYPE       TABLESPACE_NAME                     MB
-------------------- -------------------- ------------------ ------------------------------ ----------
SALES_PART           P2018_05             TABLE PARTITION    USERS                              .0625
SALES_PART           P2018_04             TABLE PARTITION    USERS                              .4375
SALES_PART           P2018_03             TABLE PARTITION    USERS                              .4375
SALES_PART           P2018_02             TABLE PARTITION    USERS                              .4375
SALES_PART           P2018_01             TABLE PARTITION    USERS                              .4375
SALES_PART           BEFORE_2018          TABLE PARTITION    USERS                                127
SALES_INDEXED                             TABLE              USERS                                128
SALES_IDX01                               INDEX              USERS                                 43
SALES                                     TABLE              USERS                                127

9 rows selected.
```

PARTITIONING MAINTENANCE OPERATIONS

online

```
SQL> alter table sales_part move partition BEFORE_2018 row store compress advanced tablespace comp_data;

Table altered.

SQL> select segment_name, PARTITION_NAME, segment_type, tablespace_name, bytes/1024/1024 MB from user_segments;

SEGMENT_NAME         PARTITION_NAME       SEGMENT_TYPE       TABLESPACE_NAME                        MB
-------------------- -------------------- ------------------ ------------------------------ ----------
SALES_PART           P2018_05             TABLE PARTITION    USERS                                .0625
SALES_PART           P2018_04             TABLE PARTITION    USERS                                .4375
SALES_PART           P2018_03             TABLE PARTITION    USERS                                .4375
SALES_PART           P2018_02             TABLE PARTITION    USERS                                .4375
SALES_PART           P2018_01             TABLE PARTITION    USERS                                .4375
SALES_INDEXED                             TABLE              USERS                                 128
SALES_IDX01                               INDEX              USERS                                  43
SALES                                     TABLE              USERS                                 127
SALES_PART           BEFORE_2018          TABLE PARTITION    COMP_DATA                              80

9 rows selected.
```

CONCLUSION

- Range Partitioning, Hash Partitioning, List Partitioning, Interval Partitioning
- 12cR2 onwards can perform most partitioning operations online
- Performance problems in read or write operations can get better or worse with partitioning, so plan well
- New releases -> New features, it's been like that for years.
- **Questions?**

Stay in touch!

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- Twitter: https://twitter.com/frankyweber
- LinkedIn: https://linkedin.com/in/frankyweber/en
- Oracle ACE: https://bit.ly/2YxU6bK