



Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
Université des Sciences et de la Technologie Houari Boumediene

Faculté d'Informatique

Spécialité : MASTER 1 Big Data Analytics

Rapport de TP6 ENDO

Travail présenté à Monsieur Selmoune Nazih

Travail présenté par :
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2021/2022

1. Quels sont les nombres d'appels **mensuels** par Wilaya pour chaque TypeAppel (Mois, NomWilaya, TypeAppel).

```
SQL> SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NBAppels
  2  FROM FAppel a,DTypeAppel ta,DTemps t, DClient c
  3  WHERE a.CodeTemps = t.CodeTemps
  4  AND a.CodeClient = c.CodeClient
  5  AND a.CodeTypeAppel = ta.CodeTypeAppel
  6  GROUP BY t.Mois, c.NomWilaya, ta.TypeAppel
  7  ORDER BY t.Mois, c.NomWilaya, ta.TypeAppel;
```

MOIS	NOMWILAYA	TYPEAPPEL	NBAPPELS
-----	/ -----	/ -----	/ -----
12/2021	WYTVCCCP	Nationale	1384
12/2021	YLQWUSDB	Internationale	3006
12/2021	YLQWUSDB	Nationale	3218
12/2021	ZBIBYJRK	Internationale	2144
12/2021	ZBIBYJRK	Nationale	2234

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2784 rows selected.

Elapsed: 00:00:09.34

Execution Plan

Plan hash value: 3146036401

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1392	70992		15195 (4)	00:00:01		
1	SORT GROUP BY		1392	70992		15195 (4)	00:00:01		
2	MERGE JOIN		1392	70992		15194 (4)	00:00:01		
3	TABLE ACCESS BY INDEX ROWID	DTYPEAPPEL	2	32		2 (0)	00:00:01		
4	INDEX FULL SCAN	PK_DTYPEAPPEL	2			1 (0)	00:00:01		
* 5	SORT JOIN		1392	48720		15192 (4)	00:00:01		
6	VIEW	VW_GBC_17	1392	48720		15191 (4)	00:00:01		
7	HASH GROUP BY		1392	62640		15191 (4)	00:00:01		
* 8	HASH JOIN		4499K	193M		14849 (2)	00:00:01		

9	TABLE ACCESS FULL	DTEMPS	730	8760		5	(0)	00:00:01		
* 10	HASH JOIN		4499K	141M	29M	14809	(2)	00:00:01		
11	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107	(2)	00:00:01		
12	PARTITION LIST ALL		4499K	68M		5201	(2)	00:00:01	1	4
13	TABLE ACCESS FULL	FAPPEL	4499K	68M		5201	(2)	00:00:01	1	4

Predicate Information (identified by operation id):

```

5 - access("ITEM_1"="TA"."CODETYPEAPPEL")
   filter("ITEM_1"="TA"."CODETYPEAPPEL")
8 - access("A"."CODETEMPS"="T"."CODETEMPS")
10 - access("A"."CODECLIENT"="C"."CODECLIENT")

```

```
SQL> alter system flush shared_pool;
```

System altered.

```
SQL> alter system flush buffer_cache;
```

System altered.

2. Introduire les sous totaux (sur la requête 1) avec la clause rollup by

```

SQL> SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NBAppels
2  FROM Fappel a,DTypeAppel ta,DTemps t, DClient c
3  WHERE a.CodeTemps = t.CodeTemps
4  AND a.CodeClient = c.CodeClient
5  AND a.CodeTypeAppel = ta.CodeTypeAppel
6  GROUP BY ROLLUP (t.Mois, c.NomWilaya, ta.TypeAppel)
7  ORDER BY t.Mois, c.NomWilaya, ta.TypeAppel;

```

MOIS	NOMWILAYA	TYPEAPPEL	NBAPPELS
01/2020	AGXQPTQE	Internationale	1728
01/2020	AGXQPTQE	Nationale	1895
01/2020	AGXQPTQE		3623
01/2020	AJUGWBFB	Internationale	1362
01/2020	AJUGWBFB	Nationale	1536
01/2020	AJUGWBFB		2898
01/2020	APYTOFVS	Internationale	1810

01/2020	APYTOFVS	Nationale	2067
01/2020	APYTOFVS		3877
01/2020	ATAUBYSJ	Internationale	2056
01/2020	ATAUBYSJ	Nationale	2262
01/2020	ATAUBYSJ		4318
01/2020	AVNSPXTI	Internationale	1461
01/2020	AVNSPXTI	Nationale	1691
.			
.			
.			
12/2021	YLQWUSDB	Internationale	3006
12/2021	YLQWUSDB	Nationale	3218
12/2021	YLQWUSDB		6224
12/2021	ZBIBYJRK	Internationale	2144
12/2021	ZBIBYJRK	Nationale	2234
12/2021	ZBIBYJRK		4378
12/2021			185222
			4500000

4201 rows selected.

Elapsed: 00:00:14.43

Execution Plan

Plan hash value: 622480785

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1392	84912		15228 (5)	00:00:01		
1	SORT GROUP BY ROLLUP		1392	84912		15228 (5)	00:00:01		
* 2	HASH JOIN		4499K	261M		14886 (2)	00:00:01		
3	TABLE ACCESS FULL	DTEMPS	730	8760		5 (0)	00:00:01		
* 4	HASH JOIN		4499K	210M		14847 (2)	00:00:01		
5	TABLE ACCESS FULL	DTYPEAPPEL	2	32		3 (0)	00:00:01		
* 6	HASH JOIN		4499K	141M	29M	14809 (2)	00:00:01		
7	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107 (2)	00:00:01		
8	PARTITION LIST ALL		4499K	68M		5201 (2)	00:00:01	1	4
9	TABLE ACCESS FULL	FAPPEL	4499K	68M		5201 (2)	00:00:01	1	4

Predicate Information (identified by operation id):

```

-----
2 - access("A"."CODETEMPS"="T"."CODETEMPS")
4 - access("A"."CODETYPEAPPEL"="TA"."CODETYPEAPPEL")
6 - access("A"."CODECLIENT"="C"."CODECLIENT")

```

```
SQL> alter system flush shared_pool;
```

System altered.

```
SQL> alter system flush buffer_cache;
```

System altered.

3. Introduire les sous totaux (sur la requête 1) avec la clause cube by

```

SQL> SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NBAppels
2  FROM FAppel a,DTypeAppel ta,DTemps t, DClient c
3  WHERE a.CodeTemps = t.CodeTemps
4  AND a.CodeClient = c.CodeClient
5  AND a.CodeTypeAppel = ta.CodeTypeAppel
6  GROUP BY CUBE (t.Mois, c.NomWilaya, ta.TypeAppel)
7  ORDER BY t.Mois, c.NomWilaya, ta.TypeAppel;

```

MOIS	NOMWILAYA	TYPEAPPEL	NBAPPELS
-----	-----	-----	-----
01/2020	AGXQPTQE	Internationale	1728
01/2020	AGXQPTQE	Nationale	1895
01/2020	AGXQPTQE		3623
01/2020	AJUGWBFB	Internationale	1362
01/2020	AJUGWBFB	Nationale	1536
.			
.			
.			
01/2020	ZBIBYJRK	Internationale	2068
01/2020	ZBIBYJRK	Nationale	2320
01/2020	ZBIBYJRK		4388
01/2020		Internationale	90606
01/2020		Nationale	100505
01/2020			191111
.			
.			
.			

	ZBIBYJRK	Internationale	49782
	ZBIBYJRK	Nationale	55428
	ZBIBYJRK		105210
		Internationale	2131593
		Nationale	2368407
			4500000

4425 rows selected.

Elapsed: 00:00:14.66

Execution Plan

Plan hash value: 2009846509

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1392	84912		15228 (5)	00:00:01		
1	SORT GROUP BY		1392	84912		15228 (5)	00:00:01		
2	GENERATE CUBE		1392	84912		15228 (5)	00:00:01		
3	SORT GROUP BY		1392	84912		15228 (5)	00:00:01		
* 4	HASH JOIN		4499K	261M		14886 (2)	00:00:01		
5	TABLE ACCESS FULL	DTEMPS	730	8760		5 (0)	00:00:01		
* 6	HASH JOIN		4499K	210M		14847 (2)	00:00:01		
7	TABLE ACCESS FULL	DTYPEAPPEL	2	32		3 (0)	00:00:01		
* 8	HASH JOIN		4499K	141M	29M	14809 (2)	00:00:01		
9	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107 (2)	00:00:01		
10	PARTITION LIST ALL		4499K	68M		5201 (2)	00:00:01	1	4
11	TABLE ACCESS FULL	FAPPEL	4499K	68M		5201 (2)	00:00:01	1	4

Predicate Information (identified by operation id):

- 4 - access("A"."CODETEMPS"="T"."CODETEMPS")
- 6 - access("A"."CODETYPEAPPEL"="TA"."CODETYPEAPPEL")
- 8 - access("A"."CODECLIENT"="C"."CODECLIENT")

SQL> alter system flush shared_pool;

System altered.

```
SQL> alter system flush buffer_cache;
```

System altered.

4. Filtrer la requête précédente pour garder uniquement les chiffres d'affaire de chaque Wilaya en utilisant la fonction Grouping_ID.

```
SQL> SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NbrAppelM,  
2  GROUPING_ID(t.Mois, c.NomWilaya, ta.TypeAppel) as GID  
3  FROM FAppel a,DTypeAppel ta,DTemps t, DClient c  
4  WHERE a.CodeTemps = t.CodeTemps  
5  AND a.CodeClient = c.CodeClient  
6  AND a.CodeTypeAppel = ta.CodeTypeAppel  
7  GROUP BY CUBE (t.Mois, c.NomWilaya, ta.TypeAppel)  
8  ORDER BY t.Mois, c.NomWilaya, ta.TypeAppel;
```

MOIS	NOMWILAYA	TYPEAPPEL	NBRAPPELM	GID
-----	-----	-----	-----	-----
01/2020	AGXQPTQE	Internationale	1728	0
01/2020	AGXQPTQE	Nationale	1895	0
01/2020	AGXQPTQE		3623	1
.				
.				
.				
12/2020	ZBIBYJRK	Internationale	2131	0
12/2020	ZBIBYJRK	Nationale	2310	0
12/2020	ZBIBYJRK		4441	1
12/2020		Internationale	90570	2
12/2020		Nationale	100416	2
12/2020			190986	3
.				
.				
.				
	ZBIBYJRK	Internationale	49782	4
	ZBIBYJRK	Nationale	55428	4
	ZBIBYJRK		105210	5
		Internationale	2131593	6
		Nationale	2368407	6
			4500000	7

4425 rows selected.

Elapsed: 00:00:13.37

Execution Plan

Plan hash value: 2009846509

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1392	84912		15228 (5)	00:00:01		
1	SORT GROUP BY		1392	84912		15228 (5)	00:00:01		
2	GENERATE CUBE		1392	84912		15228 (5)	00:00:01		
3	SORT GROUP BY		1392	84912		15228 (5)	00:00:01		
* 4	HASH JOIN		4499K	261M		14886 (2)	00:00:01		
5	TABLE ACCESS FULL	DTEMPS	730	8760		5 (0)	00:00:01		
* 6	HASH JOIN		4499K	210M		14847 (2)	00:00:01		
7	TABLE ACCESS FULL	DTYPEAPPEL	2	32		3 (0)	00:00:01		
* 8	HASH JOIN		4499K	141M	29M	14809 (2)	00:00:01		
9	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107 (2)	00:00:01		
10	PARTITION LIST ALL		4499K	68M		5201 (2)	00:00:01	1	4
11	TABLE ACCESS FULL	FAPPEL	4499K	68M		5201 (2)	00:00:01	1	4

Predicate Information (identified by operation id):

- 4 - access("A"."CODETEMPS"="T"."CODETEMPS")
- 6 - access("A"."CODETYPEAPPEL"="TA"."CODETYPEAPPEL")
- 8 - access("A"."CODECLIENT"="C"."CODECLIENT")

SQL> alter system flush shared_pool;

System altered.

SQL> alter system flush buffer_cache;

System altered.

5. Donner le classement dense et non dense des Wilaya **dans chaque année** selon le nombre d'appels.

```
SQL> SELECT t.Annee, c.NomWilaya, sum(a.NBAppels) as NbrAppelM,  
2 Rank() over (ORDER BY sum(a.NBAppels) desc) as classement,  
3 Dense_Rank() over (ORDER BY sum(a.NBAppels) desc) as classement_Dense  
4 FROM FAppel a,DTemps t, DClient c  
5 WHERE a.CodeTemps = t.CodeTemps  
6 AND a.CodeClient = c.CodeClient  
7 GROUP BY t.Annee, c.NomWilaya  
8 ORDER BY t.Annee, c.NomWilaya;
```

ANNE	NOMWILAYA	NBRAPPELM	CLASSEMENT	CLASSEMENT_DENSE
----	/ -----	/ -----	/ -----	/ -----
2020	AGXQPTQE	41078	53	53
2020	AJUGWBFB	32947	75	75
2020	APYTOFVS	45468	32	32
2020	ATAUBYSJ	49825	23	23
.				
.				
.				
2021	BRDXWGGL	52906	16	16
2021	CQYBJEJD	24966	101	101
2021	CRGGOOUP	40496	58	58
2021	DSAQEHFS	33360	69	69
2021	DZMNEZRO	32441	79	79
.				
.				
.				
2021	VREIYVTQ	32973	74	74
2021	WOWJLILZ	21063	107	107
2021	WYTVCCCP	32411	80	80
2021	YLQWUSDB	74334	2	2
2021	ZBIBYJRK	52443	18	18

116 rows selected.

Elapsed: 00:00:05.21

Execution Plan

Plan hash value: 948723601

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		83	3237		15236 (9)	00:00:01		
1	SORT ORDER BY		83	3237		15236 (9)	00:00:01		
2	WINDOW SORT		83	3237		15236 (9)	00:00:01		
3	HASH GROUP BY		83	3237		15236 (9)	00:00:01		
* 4	HASH JOIN		4499K	167M		14210 (2)	00:00:01		
5	TABLE ACCESS FULL	DTEMPS	730	6570		5 (0)	00:00:01		
* 6	HASH JOIN		4499K	128M	29M	14171 (2)	00:00:01		
7	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107 (2)	00:00:01		
8	PARTITION LIST ALL		4499K	55M		5201 (2)	00:00:01	1	4
9	TABLE ACCESS FULL	FAPPEL	4499K	55M		5201 (2)	00:00:01	1	4

Predicate Information (identified by operation id):

- 4 - access("A"."CODETEMPS"="T"."CODETEMPS")
- 6 - access("A"."CODECLIENT"="C"."CODECLIENT")

Note

- this is an adaptive plan

SQL> alter system flush shared_pool;

System altered.

Elapsed: 00:00:00.30

SQL> alter system flush buffer_cache;

System altered.

6. Donner la répartition cumulative du nombre d'appels, par Wilaya dans chaque année.

```
SQL> SELECT t.Annee, c.NomWilaya, sum(a.NBAppels) as NbrAppelM,
 2  Cume_Dist() over (Partition by(t.Annee) ORDER by sum(a.NBAppels) desc) as PC
 3  FROM FAppel a,DTemps t, DClient c
 4  WHERE a.CodeTemps = t.CodeTemps
 5  AND a.CodeClient = c.CodeClient
 6  GROUP BY t.Annee, c.NomWilaya
 7  ORDER BY t.Annee;
```

ANNE	NOMWILAYA	NBRAPPELM	PC
2020	YLQWUSDB	75379	.017241379
2020	VMHGBHEX	62568	.034482759
2020	EMIEVCXC	61706	.051724138
.			
.			
.			
2020	AGXQPTQE	41078	.465517241
2020	CRGGOUP	40908	.482758621
2020	GJKRFBBD	40855	.5
2020	AZPVWZSC	37496	.517241379
2020	UNQUQLOJ	37143	.534482759
.			
.			
.			
2021	WOWJLILZ	21063	.931034483
2021	KYAYFTSF	20342	.948275862
2021	IQADGJLX	20293	.965517241
2021	RPLHMRCA	16490	.982758621
2021	OICCGMNP	7944	1

116 rows selected.

Elapsed: 00:00:03.41

Execution Plan

Plan hash value: 325879413

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
----	-----------	------	------	-------	---------	-------------	------	--------	-------

	0		SELECT STATEMENT				83		3237				14552	(5)		00:00:01					
	1		WINDOW SORT				83		3237				14552	(5)		00:00:01					
	2		HASH GROUP BY				83		3237				14552	(5)		00:00:01					
	*	3		HASH JOIN			4499K		167M				14210	(2)		00:00:01					
	4		TABLE ACCESS FULL		DTEMPS		730		6570				5	(0)		00:00:01					
	*	5		HASH JOIN			4499K		128M		29M		14171	(2)		00:00:01					
	6		TABLE ACCESS FULL		DCLIENT		1065K		17M				2107	(2)		00:00:01					
	7		PARTITION LIST ALL				4499K		55M				5201	(2)		00:00:01		1		4	
	8		TABLE ACCESS FULL		FAPPEL		4499K		55M				5201	(2)		00:00:01		1		4	

Predicate Information (identified by operation id):

3 - access("A"."CODETEMPS"="T"."CODETEMPS")
5 - access("A"."CODECLIENT"="C"."CODECLIENT")

SQL>

SQL> alter system flush shared_pool;

System altered.

SQL> alter system flush buffer_cache;

System altered.

7. Donner pour chaque wilaya sa durée d'appel globale, et segmenter les wilayas en 4 segments à l'aide de la fonction ntile.

```
SQL> SELECT c.NomWilaya, SUM(a.Duree) as SommeDuree,  
2 NTile(4) over (ORDER BY SUM(a.Duree) desc) as DC  
3 FROM FAppel a, DClient c  
4 WHERE a.CodeClient = c.CodeClient  
5 GROUP BY c.NomWilaya  
6 ORDER BY c.NomWilaya;
```

NOMWILAYA	SOMMEDUREE	DC
-----	-----	-----
AGXQPTQE	2495114	2
AJUGWBFB	2012468	3
APYTOFVS	2749889	2
ATAUBYSJ	3021931	1
AVNSPXTI	2235798	3
AZPVWZSC	2274377	2
BGUSXQJH	1977463	3
BRDXWGGL	3230318	1
CQYBJEJD	1523096	4
CRGG00UP	2492678	2
DSAQEHFS	2029936	3
DZMNEZRO	1990762	3
ECDPYCZS	2210270	3
EMIEVCXC	3747965	1
FGHTWADP	2523012	2
FIGXKQUU	2755810	2
FLKRMVJU	1735722	4
FPAZVYME	1549501	4
GHOHUAIZ	2516124	2
GJDRJOGS	1743943	4
GJKRFBB	2477220	2
GXJBSCCJ	3282923	1
HRNAFWQB	2527487	2
IHPHOHMQ	1781888	3
IHUSQQEJ	3522208	1
ILCPBAFA	2737186	2
IQADGJLX	1237701	4
IZKVCFMP	1504801	4
JMKPPNCZ	1484577	4
KCJZSVQI	2240030	3
KYAYFTSF	1241778	4

LAWIOQSX	1722433	4
LEGLFSZN	3269402	1
LTAYIJSW	1743326	4
MEODCHMG	1772703	3
MZNVJERB	2553038	2
NDQZQFKA	3089372	1
NOZOQQML	3042125	1
NRVLVSYJ	1975861	3
OICCGMNP	484177	4
PQUSXEHJ	2740744	2
QPPBVWQP	2957977	1
QUEFQCTQ	2713349	2
RDTWOYUM	3041726	1
RPLHMRCA	1002682	4
RZOOZUHN	1739917	4
UDDIIOOI	2517216	2
UFSHMSPJ	2727759	2
UNQUQLOJ	2254771	3
UODYFYLO	1767384	3
UOKSBAFW	3262212	1
VDOHLROH	2996746	1
VMHGBHEX	3821285	1
VREIYVTQ	2000537	3
WOWJLILZ	1273577	4
WYTVCCCP	1997294	3
YLQWUSDB	4556542	1
ZBIBYJRK	3195891	1

58 rows selected.

Elapsed: 00:00:04.57

Execution Plan

Plan hash value: 2942845993

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		58	1508		14353 (9)	00:00:01		
1	SORT ORDER BY		58	1508		14353 (9)	00:00:01		
2	WINDOW SORT		58	1508		14353 (9)	00:00:01		
3	HASH GROUP BY		58	1508		14353 (9)	00:00:01		

* 4	HASH JOIN		4499K	111M	29M	13327	(2)	00:00:01		
5	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107	(2)	00:00:01		
6	PARTITION LIST ALL		4499K	38M		5208	(2)	00:00:01	1	4
7	TABLE ACCESS FULL	FAPPEL	4499K	38M		5208	(2)	00:00:01	1	4

Predicate Information (identified by operation id):

4 - access("A"."CODECLIENT"="C"."CODECLIENT")

Note

- this is an adaptive plan

SQL> alter system flush shared_pool;

System altered.

SQL> alter system flush buffer_cache;

System altered.

8. Donner les moyennes mobiles des nombres d'appels sur 3 mois.

```
SQL> SELECT t.Mois, SUM(a.NBAppels) as NBAppels,
2  AVG(SUM(a.NBAppels)) over (Order by t.Mois Rows 2 preceding) as MOY_NBAppels_3_Mois
3  FROM FAppel a, DTemps t
4  WHERE a.CodeTemps = t.CodeTemps
5  GROUP BY t.Mois;
```

MOIS	NBAPPELS	MOY_NBAPPELS_3_MOIS
01/2020	191111	191111
01/2021	190545	190828
02/2020	179155	186937
02/2021	172593	180764.333
03/2020	191738	181162
03/2021	191304	185211.667
04/2020	184444	189162
04/2021	184496	186748
05/2020	190593	186511
05/2021	190762	188617

06/2020	184849	188734.667
06/2021	185329	186980
07/2020	191177	187118.333
07/2021	190987	189164.333
08/2020	191293	191152.333
08/2021	191169	191149.667
09/2020	183851	188771
09/2021	185482	186834
10/2020	191179	186837.333
10/2021	191414	189358.333
11/2020	184565	189052.667
11/2021	185756	187245
12/2020	190986	187102.333
12/2021	185222	187321.333

24 rows selected.

Elapsed: 00:00:02.83

Execution Plan

Plan hash value: 1974072941

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		24	456	5582 (9)	00:00:01		
1	WINDOW BUFFER		24	456	5582 (9)	00:00:01		
2	SORT GROUP BY		24	456	5582 (9)	00:00:01		
* 3	HASH JOIN		4499K	81M	5240 (3)	00:00:01		
4	TABLE ACCESS FULL	DTEMPS	730	8760	5 (0)	00:00:01		
5	PARTITION LIST ALL		4499K	30M	5201 (2)	00:00:01	1	4
6	TABLE ACCESS FULL	FAPPEL	4499K	30M	5201 (2)	00:00:01	1	4

Predicate Information (identified by operation id):

3 - access("A"."CODETEMPS"="T"."CODETEMPS")

SQL> alter system flush shared_pool;

System altered.


```
SQL> alter system flush buffer_cache;

System altered.
```

9. Donner pour chaque Wilaya son ratio de nombre d'appels **dans chaque année**.

```
SQL> SELECT c.NomWilaya as Wilaya, t.Annee as Annee, SUM(a.NBAppels) as NBAppels,
 2  Ratio_to_Report (SUM(a.NBAppels)) over() as Ratio_to_Report
 3  FROM FAPPEL a, DClient c, DTemps t
 4  WHERE a.CodeClient = c.CodeClient
 5  AND a.CodeTemps = t.CodeTemps
 6  GROUP BY c.NomWilaya, t.Annee
 7  ORDER BY c.NomWilaya, t.Annee;
```

WILAYA	ANNE	NBAPPELS	RATIO_TO_REPORT
-----	/	-----	-----
AGXQPTQE	2020	41078	.009128444
AGXQPTQE	2021	41004	.009112
AJUGWBFB	2020	32947	.007321556
AJUGWBFB	2021	33054	.007345333
APYTOFVS	2020	45468	.010104
APYTOFVS	2021	45158	.010035111
ATAUBYSJ	2020	49825	.011072222
ATAUBYSJ	2021	49379	.010973111
AVNSPXTI	2020	36872	.008193778
AVNSPXTI	2021	36656	.008145778
AZPVWZSC	2020	37496	.008332444
AZPVWZSC	2021	36980	.008217778
BGUSXQJH	2020	32545	.007232222
BGUSXQJH	2021	32334	.007185333
BRDXWGGL	2020	53414	.011869778
BRDXWGGL	2021	52906	.011756889
CQYBJEJD	2020	24932	.005540444
CQYBJEJD	2021	24966	.005548
.			
.			
.			
VREIYVTQ	2021	32973	.007327333
WOWJLILZ	2020	20910	.004646667
WOWJLILZ	2021	21063	.004680667

WYTVCCCP		2020		33137		.007363778
WYTVCCCP		2021		32411		.007202444
YLQWUSDB		2020		75379		.016750889
YLQWUSDB		2021		74334		.016518667
ZBIBYJRK		2020		52767		.011726
ZBIBYJRK		2021		52443		.011654

116 rows selected.

Elapsed: 00:00:04.22

Execution Plan

Plan hash value: 1457217249

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		83	3237		14552 (5)	00:00:01		
1	WINDOW BUFFER		83	3237		14552 (5)	00:00:01		
2	SORT GROUP BY		83	3237		14552 (5)	00:00:01		
* 3	HASH JOIN		4499K	167M		14210 (2)	00:00:01		
4	TABLE ACCESS FULL	DTEMPS	730	6570		5 (0)	00:00:01		
* 5	HASH JOIN		4499K	128M	29M	14171 (2)	00:00:01		
6	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107 (2)	00:00:01		
7	PARTITION LIST ALL		4499K	55M		5201 (2)	00:00:01	1	4
8	TABLE ACCESS FULL	FAPPEL	4499K	55M		5201 (2)	00:00:01	1	4

Predicate Information (identified by operation id):

```

3 - access("A"."CODETEMPS"="T"."CODETEMPS")
5 - access("A"."CODECLIENT"="C"."CODECLIENT")

```

SQL> alter system flush shared_pool;

System altered.

SQL> alter system flush buffer_cache;

System altered.

10. Pour chaque année quel est l'opérateur destinataire dont le nombre d'appels est maximal.

```
SQL> SELECT t.Annee, d.NomOperateurDestinataire, SUM(a.NBAppels) as NBAppelsD,  
2 MAX(SUM(a.NBAppels)) over (Partition by t.Annee) as Max_Produit_NBAppels  
3 FROM FAppel a, DTemps t, DDestinataire d  
4 WHERE a.CodeTemps = t.CodeTemps  
5 AND a.CodeOperateurDestinataire = d.CodeOperateurDestinataire  
6 GROUP BY t.Annee, d.NomOperateurDestinataire;
```

ANNE	NOMOPERATEURDESTINATAIRE	NBAPPELSD	MAX_PRODUIT_NBAPPELS
----	/ -----	/ -----	/ -----
2020	ACSRZRIFPN	4356	4515
2020	AEKOILIMBS	4229	4515
2020	AGNVEGEZDW	4282	4515
2020	AHCPQKQGDQ	4299	4515
2020	ALVAAEJNKS	4230	4515
.			
.			
.			
2020	ZVTJJPKBGO	4366	4515
2020	ZWOSRIMAIL	4330	4515
2021	ACSRZRIFPN	4258	4516
2021	AEKOILIMBS	4290	4516
.			
.			
.			
2021	ZTGWBGIK	4327	4516
2021	ZTZGYPTSSB	4294	4516
2021	ZVTJJPKBGO	4210	4516
2021	ZWOSRIMAIL	4242	4516

1044 rows selected.

Elapsed: 00:00:06.72

Execution Plan

Plan hash value: 1125278691

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		739	25865	5619 (10)	00:00:01		

	1		WINDOW BUFFER				739		25865		5619		(10)		00:00:01					
	2		SORT GROUP BY				739		25865		5619		(10)		00:00:01					
	*	3		HASH JOIN			4499K		150M		5277		(4)		00:00:01					
	4		TABLE ACCESS FULL		DTEMPS		730		6570		5		(0)		00:00:01					
	*	5		HASH JOIN			4499K		111M		5238		(3)		00:00:01					
	6		TABLE ACCESS FULL		DDESTINATAIRE		522		7830		3		(0)		00:00:01					
	7		PARTITION LIST ALL				4499K		47M		5201		(2)		00:00:01		1		4	
	8		TABLE ACCESS FULL		FAPPEL		4499K		47M		5201		(2)		00:00:01		1		4	

Predicate Information (identified by operation id):

- 3 - access("A"."CODETEMPS"="T"."CODETEMPS")
- 5 - access("A"."CODEOPERATEURDESTINATAIRE"="D"."CODEOPERATEURDESTINATAIRE")

SQL> alter system flush shared_pool;

System altered.

SQL> alter system flush buffer_cache;

System altered.

11. Parmi les requêtes précédentes laquelle a consommé plus de temps ?

Requête	Temps d'exécution
1	00:00:09.34
2	00:00:14.43
3	00:00:14.66
4	00:00:13.37
5	00:00:05.21
6	00:00:03.41
7	00:00:04.57
8	00:00:02.83
9	00:00:04.22
10	00:00:06.72

La requête 3 a consommé plus de temps.

- Proposez et mettez-en œuvre les différentes techniques d'optimisation étudiées et montrez et comparez leur impact (temps et plan d'exécution).

Techniques d'optimisation étudiées :

1) Vue matérialisée :

```
SQL> CREATE MATERIALIZED VIEW VMDeSt
2 BUILD IMMEDIATE REFRESH COMPLETE ON DEMAND
3 ENABLE QUERY REWRITE AS
4 SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NBAppels
5 FROM FAppel a,DTypeAppel ta,DTemps t, DClient c
6 WHERE a.CodeTemps = t.CodeTemps
7 AND a.CodeClient = c.CodeClient
8 AND a.CodeTypeAppel = ta.CodeTypeAppel
9 GROUP BY CUBE (t.Mois, c.NomWilaya, ta.TypeAppel);
```

Materialized view created.

Elapsed: 00:00:03.84

```
SQL> SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NBAppels
2 FROM FAppel a,DTypeAppel ta,DTemps t, DClient c
3 WHERE a.CodeTemps = t.CodeTemps
4 AND a.CodeClient = c.CodeClient
5 AND a.CodeTypeAppel = ta.CodeTypeAppel
6 GROUP BY CUBE (t.Mois, c.NomWilaya, ta.TypeAppel)
7 ORDER BY t.Mois, c.NomWilaya, ta.TypeAppel;
```

MOIS	NOMWILAYA	TYPEAPPEL	NBAPPELS
01/2020	AGXQPTQE	Internationale	1728
01/2020	AGXQPTQE	Nationale	1895
01/2020	AGXQPTQE		3623
01/2020	AJUGWBFB	Internationale	1362
01/2020	AJUGWBFB	Nationale	1536
.			
.			
.			
	ZBIBYJRK	Internationale	49782
	ZBIBYJRK	Nationale	55428

	ZBIBYJRK		105210
		Internationale	2131593
		Nationale	2368407
			4500000

4425 rows selected.

Elapsed: 00:00:00.79

Execution Plan

Plan hash value: 4181107599

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		4425	138K	10 (10)	00:00:01
1	SORT ORDER BY		4425	138K	10 (10)	00:00:01
2	MAT_VIEW REWRITE ACCESS FULL	VMDEST	4425	138K	9 (0)	00:00:01

- La vue matérialisée a optimisé le temps de 00:00:14.66 à 00:00:00.79.
- Le plan d'exécution a affiché la vue matérialisée utilisé durant l'exécution de la requête 3.

2	MAT_VIEW REWRITE ACCESS FULL	VMDEST	4425	138K	9 (0)	00:00:01
---	------------------------------	--------	------	------	-------	----------

2) Index :

- Création des indexes :

```
SQL> CREATE BITMAP INDEX R3_index1
  2  ON FAppel(DTypeAppel.TypeAppel)
  3  FROM DTypeAppel, FAppel
  4  WHERE FAppel.CodeTypeAppel = DTypeAppel.CodeTypeAppel;
```

Index created.

```
SQL> CREATE BITMAP INDEX R3_index2
  2  ON FAppel(DTemps.Mois)
  3  FROM DTemps, FAppel
  4  WHERE FAppel.CodeTemps = DTemps.CodeTemps;
```

Index created.

```
SQL> CREATE BITMAP INDEX R3_index3
  2  ON FAppel(DClient.NomWilaya)
  3  FROM DClient, FAppel
  4  WHERE FAppel.CodeClient = DClient.CodeClient;
```

Index created.

```
SQL> SELECT t.Mois, c.NomWilaya, ta.TypeAppel, sum(a.NBAppels) as NBAppels
  2  FROM FAppel a,DTypeAppel ta,DTemps t, DClient c
  3  WHERE a.CodeTemps = t.CodeTemps
  4  AND a.CodeClient = c.CodeClient
  5  AND a.CodeTypeAppel = ta.CodeTypeAppel
  6  GROUP BY CUBE (t.Mois, c.NomWilaya, ta.TypeAppel)
  7  ORDER BY t.Mois, c.NomWilaya, ta.TypeAppel;
```

MOIS	NOMWILAYA	TYPEAPPEL	NBAPPELS
-----	-----	-----	-----
01/2020	AGXQPTQE	Internationale	1728
01/2020	AGXQPTQE	Nationale	1895
01/2020	AGXQPTQE		3623
01/2020	AJUGWBFB	Internationale	1362
01/2020	AJUGWBFB	Nationale	1536
.			
.			
.			
	ZBIBYJRK	Internationale	49782
	ZBIBYJRK	Nationale	55428
	ZBIBYJRK		105210
		Internationale	2131593
		Nationale	2368407
			4500000

4425 rows selected.

Elapsed: 00:00:03.80

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time
0	SELECT STATEMENT		1392	131K		21063 (3)	00:00:01
1	SORT GROUP BY		1392	131K		21063 (3)	00:00:01

	2	GENERATE CUBE			1392	131K		21063	(3)	00:00:01
	3	SORT GROUP BY			1392	131K		21063	(3)	00:00:01
*	4	HASH JOIN			3878K	358M		20771	(2)	00:00:01
	5	TABLE ACCESS FULL	DTYPEAPPEL	2	32		3	(0)	00:00:01	
*	6	HASH JOIN			3878K	299M		20739	(2)	00:00:01
	7	TABLE ACCESS FULL	DTEMPS	730	8760		5	(0)	00:00:01	
*	8	HASH JOIN			3884K	255M	29M	20704	(1)	00:00:01
	9	TABLE ACCESS FULL	DCLIENT	1065K	17M		2107	(2)	00:00:01	
	10	TABLE ACCESS FULL	FAPPEL		3884K	192M		5307	(2)	00:00:01

Predicate Information (identified by operation id):

- ```

4 - access("A"."CODETYPEAPPEL"="TA"."CODETYPEAPPEL")
6 - access("A"."CODETEMPS"="T"."CODETEMPS")
8 - access("A"."CODECLIENT"="C"."CODECLIENT")

```

Note

- ```

- dynamic statistics used: dynamic sampling (level=2)

```

- Les indexes ont optimisé le temps d'exécution du 00:00:14.66 à 00:00:03.80.
- Le plan d'exécution n'affiche pas les indexes.