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TP5 Base de données Réparties

Plan d'exécution repart

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Sommaire

1. Introduction.....	3
2. Plan d'exécution avec Sélection	3
➤ Plan d'exécution Oracle local :	3
• PLAN_TABLE	3
• Forme Graphique de SQL developer	4
➤ Plans d'exécution Oracle distants :	4
• PLAN_TABLE	4
• Forme Graphique de SQL developer	5
➤ Arbre global optimal sur fragment :	7
3. Plan d'exécution avec vs sans descente de la Sélection	8
➤ Plan d'exécution Oracle local :	8
• PLAN_TABLE	8
• Forme Graphique de SQL developer	9
➤ Plans d'exécution Oracle distants :	10
• PLAN_TABLE	10
• Forme Graphique de SQL developer	11
➤ Arbre global optimal sur fragment :	12
➤ Proposition d'une solution pour aider la SGBD à optimiser le calcul de la requête :	13
➤ Dédution de l'arbre global optimisé sur fragment :	13
4. Plan d'exécution avec optimisation sur l'attribut de fragmentation horizontale.....	14
➤ Plan d'exécution Oracle local :	14
• PLAN_TABLE	14
• Forme Graphique de SQL developer	15
➤ Plans d'exécution Oracle distants :	16
• PLAN_TABLE	16
• Forme Graphique de SQL developer	17
➤ Arbre global optimal sur fragment :	18
➤ Modification des fragments de <i>GAGNER_I</i> :	19
➤ Proposition d'une solution pour aider la SGBD à optimiser le calcul de la requête :	20
➤ Dédution de l'arbre global optimisé sur fragment :	20
5. Conclusion	21

1. Introduction

Dans un SGBD réparti, pour garantir l'efficacité et la rapidité des traitements, il est essentiel d'optimiser des requêtes globales. Mais avant d'optimiser, lors de ce TP, on a exécuté d'abord les requêtes telles qu'elles sont, et ensuite, en se servant du mécanisme d'Oracle pour visualiser le plan d'exécution, on a pu analyser et proposer des versions optimisées. En résumé, ce TP a pour objectif de comprendre comment le SGBD réparti une requête globale en sous-requêtes, en utilisant le mécanisme de consultation des plans d'exécution (Explain Plan) pour mieux voir les sélections, les projections et les filtrages effectués au niveau des différents fragments.

2. Plan d'exécution avec Sélection

➤ Plan d'exécution Oracle local :

• PLAN_TABLE

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)
1	0	NESTED LOOPS	(null)	(null)	(null)	(null)	{#keys=0} "G"."NDD" [NUMBER,22], "NDA" [NUMBER,22]
2	1	VIEW	(null)	DISCIPLINE	(null)	(null)	"D"."NDD" [NUMBER,22]
3	2	SORT	UNIQUE	(null)	(null)	(null)	{#keys=5} STRDEF[22], STRDEF[50], STRDEF[1], STRDEF[1], STRDEF[3]
4	3	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22], STRDEF[50], STRDEF[1], STRDEF[1], STRDEF[3]
5	4	FILTER	(null)	(null)	NULL IS NOT NULL	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "CDS" [CHARACTER,3]
6	5	REMOTE	(null)	DISCIPLINE_1	(null)	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "CDS" [CHARACTER,3]
7	4	REMOTE	(null)	DISCIPLINE_2	(null)	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "CDS" [CHARACTER,3]
8	4	REMOTE	(null)	DISCIPLINE_3	(null)	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "GENRED" [CHARACTER,1], "CDS" [CHARACTER,3]
9	1	VIEW	(null)	GAGNER_I	(null)	(null)	"G"."NDD" [NUMBER,22], "NDA" [NUMBER,22]
10	9	SORT	UNIQUE	(null)	(null)	(null)	{#keys=4} STRDEF[22], STRDEF[22], STRDEF[1], STRDEF[7]
11	10	UNION-ALL	PARTITION	(null)	(null)	(null)	STRDEF[22], STRDEF[22], STRDEF[1], STRDEF[7]
12	11	REMOTE	(null)	GAGNER_I_1	(null)	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]
13	11	REMOTE	(null)	GAGNER_I_2	(null)	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]
14	11	REMOTE	(null)	GAGNER_I_3	(null)	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]

OTHER

(null)

(null)

(null)

(null)

(null)

(null)

SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_1" "DISCIPLINE_1" WHERE "CDS"='JUD'

SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_2" "DISCIPLINE_2" WHERE "CDS"='JUD'

SELECT "NDD","NOMD","TYPED","GENRED","CDS" FROM "DISCIPLINE_3" "DISCIPLINE_3" WHERE "CDS"='JUD' AND "GENRED"='W'

(null)

(null)

(null)

SELECT /*+ INDEX ("GAGNER_I_1") */ "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_1" "GAGNER_I_1" WHERE "NDD"=:1 AND "MEDAILLE"='G'

SELECT /*+ INDEX ("GAGNER_I_2") */ "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_2" "GAGNER_I_2" WHERE "NDD"=:1 AND "MEDAILLE"='G'

SELECT /*+ INDEX ("GAGNER_I_3") */ "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_3" "GAGNER_I_3" WHERE "NDD"=:1 AND "MEDAILLE"='G'

• **Forme Graphique de SQL developer**

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST	OBJECT_NODE
SELECT STATEMENT				1	8
NESTED LOOPS				1	8
VIEW	DISCIPLINE			5	6
SORT		UNIQUE		5	6
UNION-ALL					
FILTER					
Filter Predicates					
NULL IS NOT NULL					
REMOTE	DISCIPLINE_1			4	3 DBL_ETUPRE
SERIAL_FROM_REMOTE	SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_1" "DISCIPLINE_1" WHERE "CDS"='JUD'				
REMOTE	DISCIPLINE_2			3	3 DBL_ETUSEC
SERIAL_FROM_REMOTE	SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_2" "DISCIPLINE_2" WHERE "CDS"='JUD'				
REMOTE	DISCIPLINE_3			1	3 DBL_ETUTER
SERIAL_FROM_REMOTE	SELECT "NDD","NOMD","TYPED","GENRED","CDS" FROM "DISCIPLINE 3" "DISCIPLINE 3" WHERE "CDS"='JUD' AND "GENRED"='W'				
VIEW	GAGNER_I			1	2
SORT		UNIQUE PARTITION			
UNION-ALL					
REMOTE	GAGNER_I_1			1	3 DBL_ETUPRE
SERIAL_FROM_REMOTE	SELECT /*+ INDEX ("GAGNER_I_1") */ "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_1" "GAGNER_I_1" WHERE "NDD"=:1 AND "MEDAILLE"='G'				
REMOTE	GAGNER_I_2			1	2 DBL_ETUSEC
SERIAL_FROM_REMOTE	SELECT /*+ INDEX ("GAGNER_I_2") */ "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_2" "GAGNER_I_2" WHERE "NDD"=:1 AND "MEDAILLE"='G'				
REMOTE	GAGNER_I_3			1	3 DBL_ETUTER
SERIAL_FROM_REMOTE	SELECT /*+ INDEX ("GAGNER_I_3") */ "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_3" "GAGNER_I_3" WHERE "NDD"=:1 AND "MEDAILLE"='G'				

➤ **Plans d'exécution Oracle distants :**

- **PLAN_TABLE**
- **Sur etupre**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_1	"CDS"='JUD'	(null)	"NDD" [NUMBER,22] , "NOMD" [VARCHAR2,50] , "TYPED" [CHARACTER,1] , "CDS" [CHARACTER,3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	BY INDEX ROWID BATCHED	GAGNER_I_1	"MEDAILLE"='G'	(null)	"NDD" [NUMBER,22] , "NDA" [NUMBER,22] , "MEDAILLE" [CHARACTER,1] , "DATEG" [DATE,7]	(null)
2	1	INDEX	RANGE SCAN	PK_GAGNER_I_1	(null)	"NDD"=TO_NUMBER(:1)	"GAGNER_I_1".ROWID [ROWID,10] , "NDD" [NUMBER,22] , "NDA" [NUMBER,22]	(null)

- **Sur etusec**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_2	"CDS"='JUD'	(null)	"NDD" [NUMBER,22] , "NOMD" [VARCHAR2,50] , "TYPED" [CHARACTER,1] , "CDS" [CHARACTER,3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	BY INDEX ROWID BATCHED	GAGNER_I_2	"MEDAILLE"='G'	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]	(null)
2	1	INDEX	RANGE SCAN	PK_GAGNER_I_2	(null)	"NDD"=TO_NUMBER(:1)	"GAGNER_I_2".ROWID [ROWID,10], "NDD" [NUMBER,22], "NDA" [NUMBER,22]	(null)

• Sur etuter

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_3	"CDS"='JUD' AND "GENRED"='W'	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "GENRED" [CHARACTER,1], "CDS" [CHARACTER,3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	BY INDEX ROWID BATCHED	GAGNER_I_3	"MEDAILLE"='G'	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]	(null)
2	1	INDEX	RANGE SCAN	PK_GAGNER_I_3	(null)	"NDD"=TO_NUMBER(:1)	"GAGNER_I_3".ROWID [ROWID,10], "NDD" [NUMBER,22], "NDA" [NUMBER,22]	(null)

- Forme Graphique de SQL developper
- Sur etupre

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			7	3
TABLE ACCESS	DISCIPLINE_1	FULL	7	3
Filter Predicates				
CDS='JUD'				

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			1	3
TABLE ACCESS	GAGNER_I_1	BY INDEX ROWID BATCHED	1	3
Filter Predicates				
MEDAILLE='G'				
INDEX	PK_GAGNER_I_1	RANGE SCAN	3	2
Access Predicates				
NDD=TO_NUMBER(:1)				

• Sur etusec

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			7	3
TABLE ACCESS	DISCIPLINE_2	FULL	7	3
Filter Predicates				
CDS='JUD'				

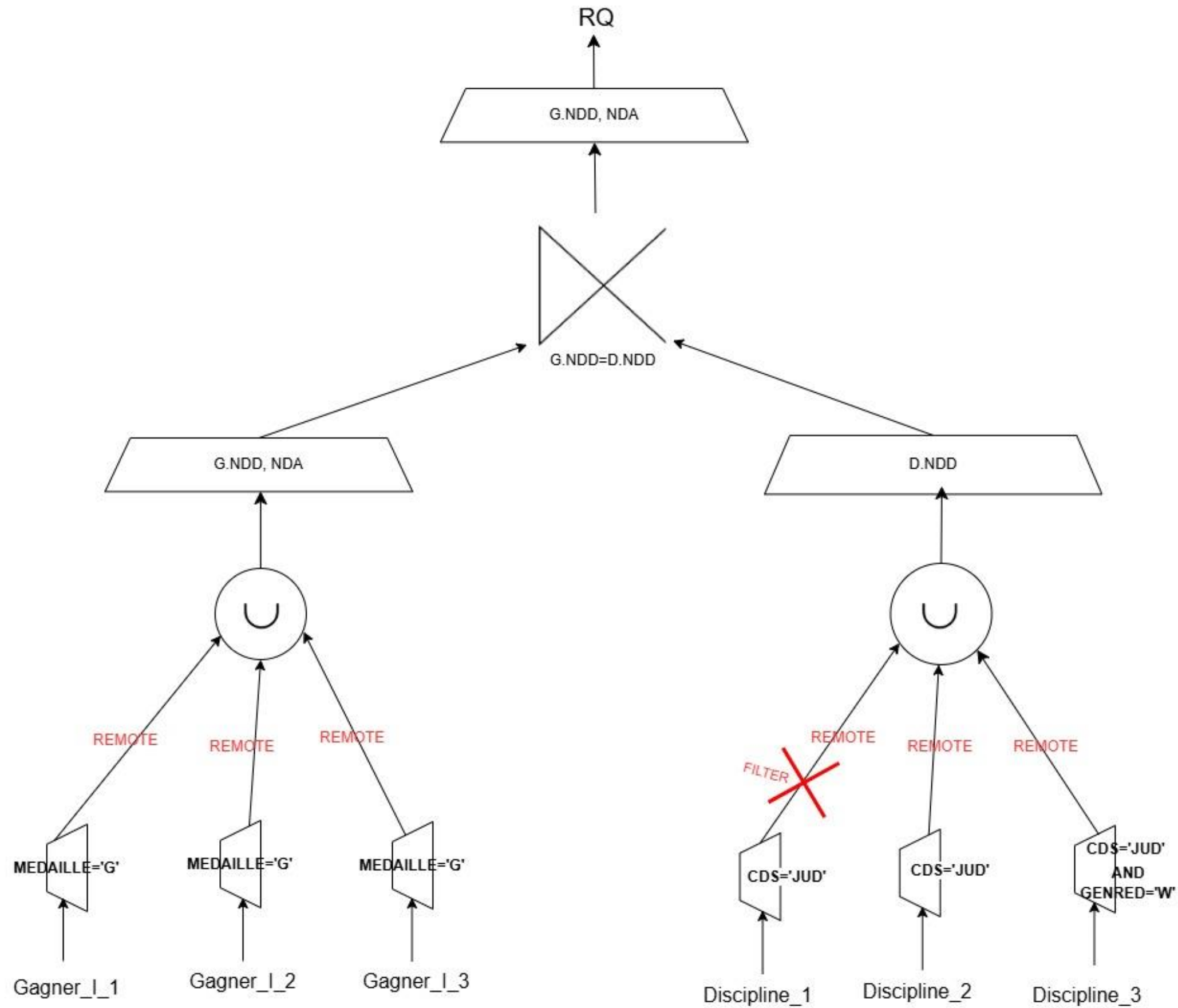
OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			1	2
TABLE ACCESS	GAGNER_I_2	BY INDEX ROWID BATCHED	1	2
Filter Predicates				
MEDAILLE='G'				
INDEX	PK_GAGNER_I_2	RANGE SCAN	3	1
Access Predicates				
NDD=TO_NUMBER(:1)				

- Sur etuter

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			1	3
TABLE ACCESS	DISCIPLINE_3	FULL	1	3
Filter Predicates				
AND				
CDS='JUD'				
GENRED='W'				

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			1	2
TABLE ACCESS	GAGNER_I_3	BY INDEX ROWID BATCHED	1	2
Filter Predicates				
MEDAILLE='G'				
INDEX	PK_GAGNER_I_3	RANGE SCAN	3	1
Access Predicates				
NDD=TO_NUMBER(:1)				

➤ Arbre global optimal sur fragment :



3. Plan d'exécution avec vs sans descente de la Sélection

➤ Plan d'exécution Oracle local :

• PLAN_TABLE

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)
1	0	HASH JOIN	(null)	(null)	"G"."MEDAILLE"='G'OR"G"."MEDAILLE"='S'AND"CDS"='JUD'	"G"."NDD"="D"."NDD"	(#keys=1)"A"."NCOMPLET" [VARCHAR2,50]
2	1	VIEW	(null)	DISCIPLINE_V	(null)	(null)	"D"."NDD" [NUMBER,22]"GDS" [CHARACTER,3]
3	2	SORT	UNIQUE	(null)	(null)	(null)	(#keys=5)STRDEF[22],STRDEF[50],STRDEF[1],STRDEF[1],STRDEF[3]
4	3	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22],STRDEF[50],STRDEF[1],STRDEF[1],STRDEF[3]
5	4	REMOTE	(null)	DISCIPLINE_1	(null)	(null)	"NDD" [NUMBER,22]"NOMD" [VARCHAR2,50]"TYPED" [CHARACTER,1]"CDS" [CHARACTER,3]
6	4	REMOTE	(null)	DISCIPLINE_2	(null)	(null)	"NDD" [NUMBER,22]"NOMD" [VARCHAR2,50]"TYPED" [CHARACTER,1]"CDS" [CHARACTER,3]
7	4	REMOTE	(null)	DISCIPLINE_3	(null)	(null)	"NDD" [NUMBER,22]"NOMD" [VARCHAR2,50]"TYPED" [CHARACTER,1]"GENRED" [CHARACTER,1]"CDS" [CHARACTER,3]
8	1	HASH JOIN	(null)	(null)	(null)	"A"."NDA"="G"."NDA"	(#keys=1)"A"."NCOMPLET" [VARCHAR2,50]"G"."NDD" [NUMBER,22]"G"."MEDAILLE" [CHARACTER,1]
9	8	VIEW	(null)	ATHLETE_V	(null)	(null)	"A"."NDA" [NUMBER,22]"A"."NCOMPLET" [VARCHAR2,50]
10	9	SORT	UNIQUE	(null)	(null)	(null)	(#keys=9)STRDEF[22],STRDEF[50],STRDEF[1],STRDEF[22],STRDEF[22],STRDEF[7],STRDEF[30],STRDEF[30],STRDEF[3]
11	10	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22],STRDEF[50],STRDEF[1],STRDEF[22],STRDEF[22],STRDEF[7],STRDEF[30],STRDEF[30],STRDEF[3]
12	11	REMOTE	(null)	ATHLETE_1	(null)	(null)	"NDA" [NUMBER,22]"NCOMPLET" [VARCHAR2,50]"TAILLE" [NUMBER,22]"POIDS" [NUMBER,22]"DATEN" [DATE,7]"VILLEN" [VARCHAR2,30]"PAYSN" [VARCHAR2,30]"CIO" [CHARACTER,3]
13	11	REMOTE	(null)	ATHLETE_2	(null)	(null)	"NDA" [NUMBER,22]"NCOMPLET" [VARCHAR2,50]"TAILLE" [NUMBER,22]"POIDS" [NUMBER,22]"DATEN" [DATE,7]"VILLEN" [VARCHAR2,30]"PAYSN" [VARCHAR2,30]"CIO" [CHARACTER,3]
14	8	VIEW	(null)	GAGNER_I_V	"G"."MEDAILLE"='G'OR"G"."MEDAILLE"='S'	(null)	"G"."NDD" [NUMBER,22]"G"."NDA" [NUMBER,22]"G"."MEDAILLE" [CHARACTER,1]
15	14	SORT	UNIQUE	(null)	(null)	(null)	(#keys=4)STRDEF[22],STRDEF[22],STRDEF[1],STRDEF[7]
16	15	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22],STRDEF[22],STRDEF[1],STRDEF[7]
17	16	REMOTE	(null)	GAGNER_I_1	(null)	(null)	"NDD" [NUMBER,22]"NDA" [NUMBER,22]"MEDAILLE" [CHARACTER,1]"DATEG" [DATE,7]
18	16	REMOTE	(null)	GAGNER_I_2	(null)	(null)	"NDD" [NUMBER,22]"NDA" [NUMBER,22]"MEDAILLE" [CHARACTER,1]"DATEG" [DATE,7]
19	16	REMOTE	(null)	GAGNER_I_3	(null)	(null)	"NDD" [NUMBER,22]"NDA" [NUMBER,22]"MEDAILLE" [CHARACTER,1]"DATEG" [DATE,7]

OTHER

(null)

(null)

(null)

(null)

(null)

SELECT"NDD","NOMD","TYPED","CDS"FROM'DISCIPLINE_1'"DISCIPLINE_1"

SELECT"NDD","NOMD","TYPED","CDS"FROM'DISCIPLINE_2'"DISCIPLINE_2"

SELECT"NDD","NOMD","TYPED","GENRED","CDS"FROM'DISCIPLINE_3'"DISCIPLINE_3"

(null)

(null)

(null)

(null)

SELECT"NDA","NCOMPLET","TAILLE","POIDS","DATEN","VILLEN","PAYSN","CIO"FROM'ATHLETE_1'"ATHLETE_1'WHERE'CIO'='FRA'

SELECT"NDA","NCOMPLET","TAILLE","POIDS","DATEN","VILLEN","PAYSN","CIO"FROM'ATHLETE_2'"ATHLETE_2'WHERE'CIO'='FRA'

(null)

(null)

(null)

SELECT"NDD","NDA","MEDAILLE","DATEG"FROM'GAGNER_I_1'"GAGNER_I_1"

SELECT"NDD","NDA","MEDAILLE","DATEG"FROM'GAGNER_I_2'"GAGNER_I_2"

SELECT"NDD","NDA","MEDAILLE","DATEG"FROM'GAGNER_I_3'"GAGNER_I_3"

- Forme Graphique de SQL developer

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST	OBJECT_NODE
SELECT STATEMENT				1406	47
HASH JOIN				1406	47
Access Predicates G.NDD=D.NDD					
Filter Predicates					
OR					
G.MEDAILLE='G'					
AND					
G.MEDAILLE='S'					
CDS='JUD'					
VIEW	DISCIPLINE_V			333	12
SORT		UNIQUE		333	12
UNION-ALL					
REMOTE	DISCIPLINE_1			159	3 DBL_ETUPRE
SERIAL_FROM_REMOTE					
SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_1" "DISCIPLINE_1"					
REMOTE	DISCIPLINE_2			152	3 DBL_ETUSEC
SERIAL_FROM_REMOTE					
SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_2" "DISCIPLINE_2"					
REMOTE	DISCIPLINE_3			22	3 DBL_ETUTER
SERIAL_FROM_REMOTE					
SELECT "NDD","NOMD","TYPED","GENRED","CDS" FROM "DISCIPLINE_3" "DISCIPLINE_3"					
HASH JOIN				41800	34
Access Predicates A.NDA=G.NDA					
VIEW	ATHLETE_V			55	22
SORT		UNIQUE		55	22
UNION-ALL					
REMOTE	ATHLETE_1			28	10 DBL_ETUPRE
SERIAL_FROM_REMOTE					
SELECT "NDA","NCOMPLET","TAILLE","POIDS","DATEN","VILLEN","PAYSIN","CIO" FROM "ATHLETE_1" "ATHLETE_1" WHERE "CIO"='FRA'					
REMOTE	ATHLETE_2			27	10 DBL_ETUSEC
SERIAL_FROM_REMOTE					
SELECT "NDA","NCOMPLET","TAILLE","POIDS","DATEN","VILLEN","PAYSIN","CIO" FROM "ATHLETE_2" "ATHLETE_2" WHERE "CIO"='FRA'					
VIEW	GAGNER_I_V			760	12
Filter Predicates					
OR					
G.MEDAILLE='G'					
G.MEDAILLE='S'					
SORT		UNIQUE		760	12
UNION-ALL					
REMOTE	GAGNER_I_1			391	3 DBL_ETUPRE
SERIAL_FROM_REMOTE					
SELECT "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_1" "GAGNER_I_1"					
REMOTE	GAGNER_I_2			360	3 DBL_ETUSEC
SERIAL_FROM_REMOTE					
SELECT "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_2" "GAGNER_I_2"					
REMOTE	GAGNER_I_3			9	3 DBL_ETUTER
SERIAL_FROM_REMOTE					
SELECT "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_3" "GAGNER_I_3"					

➤ Plans d'exécution Oracle distants :

- **PLAN_TABLE**
- **Sur etupre**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_1	(null)	(null)	"NDD" [NUMBER, 22], "NOMD" [VARCHAR2, 50], "TYPED" [CHARACTER, 1], "CDS" [CHARACTER, 3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	ATHLETE_1	"CIO"='FRA'	(null)	"NDA" [NUMBER, 22], "NCOMPLET" [VARCHAR2, 50], "TAILLE" [NUMBER, 22], "POIDS" [NUMBER, 22], "DATEN" [DATE, 7], "VILLEN" [VARCHAR2, 30], "PAYSN" [VARCHAR2, 30], "CIO" [CHARACTER, 3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	GAGNER_I_1	(null)	(null)	"NDD" [NUMBER, 22], "NDA" [NUMBER, 22], "MEDAILLE" [CHARACTER, 1], "DATEG" [DATE, 7]	(null)

- **Sur etusec**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_2	(null)	(null)	"NDD" [NUMBER, 22], "NOMD" [VARCHAR2, 50], "TYPED" [CHARACTER, 1], "CDS" [CHARACTER, 3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	ATHLETE_2	"CIO"='FRA'	(null)	"NDA" [NUMBER, 22], "NCOMPLET" [VARCHAR2, 50], "TAILLE" [NUMBER, 22], "POIDS" [NUMBER, 22], "DATEN" [DATE, 7], "VILLEN" [VARCHAR2, 30], "PAYSN" [VARCHAR2, 30], "CIO" [CHARACTER, 3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	GAGNER_I_2	(null)	(null)	"NDD" [NUMBER, 22], "NDA" [NUMBER, 22], "MEDAILLE" [CHARACTER, 1], "DATEG" [DATE, 7]	(null)

- **Sur etuter**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_3	(null)	(null)	"NDD" [NUMBER, 22], "NOMD" [VARCHAR2, 50], "TYPED" [CHARACTER, 1], "GENRED" [CHARACTER, 1], "CDS" [CHARACTER, 3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	GAGNER_I_3	(null)	(null)	"NDD" [NUMBER, 22], "NDA" [NUMBER, 22], "MEDAILLE" [CHARACTER, 1], "DATEG" [DATE, 7]	(null)

- **Forme Graphique de SQL developper**
- **Sur etupre**

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			159	3
TABLE ACCESS	DISCIPLINE_1	FULL	159	3

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			28	15
TABLE ACCESS	ATHLETE_1	FULL	28	15
Filter Predicates	CIO='FRA'			

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			391	3
TABLE ACCESS	GAGNER_I_1	FULL	391	3

- **Sur etusec**

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			152	3
TABLE ACCESS	DISCIPLINE_2	FULL	152	3

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			27	15
TABLE ACCESS	ATHLETE_2	FULL	27	15
Filter Predicates	CIO='FRA'			

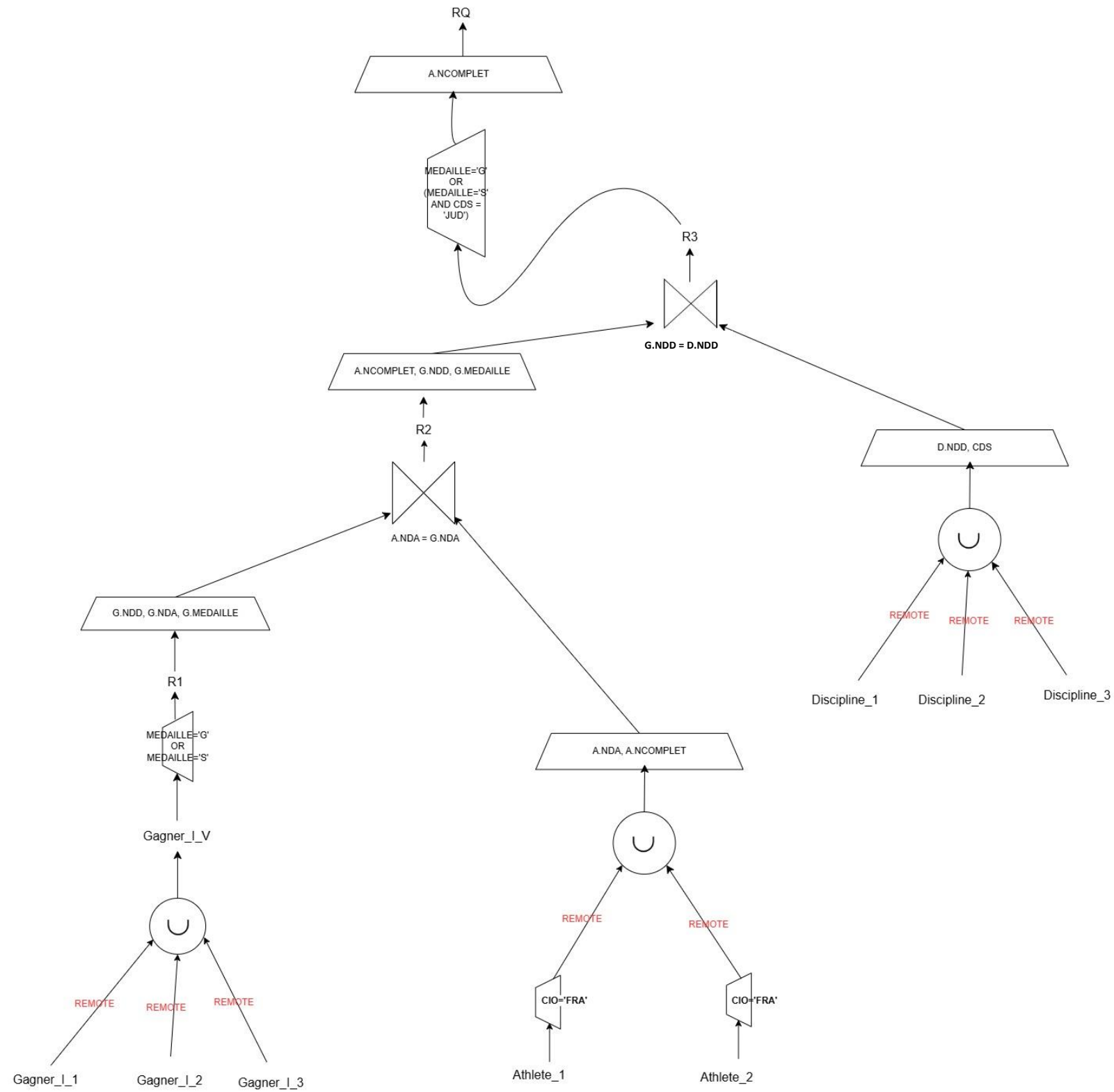
OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			360	3
TABLE ACCESS	GAGNER_I_2	FULL	360	3

- **Sur etuter**

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			22	3
TABLE ACCESS	DISCIPLINE_3	FULL	22	3

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			9	3
TABLE ACCESS	GAGNER_I_3	FULL	9	3

➤ **Arbre global optimal sur fragment :**

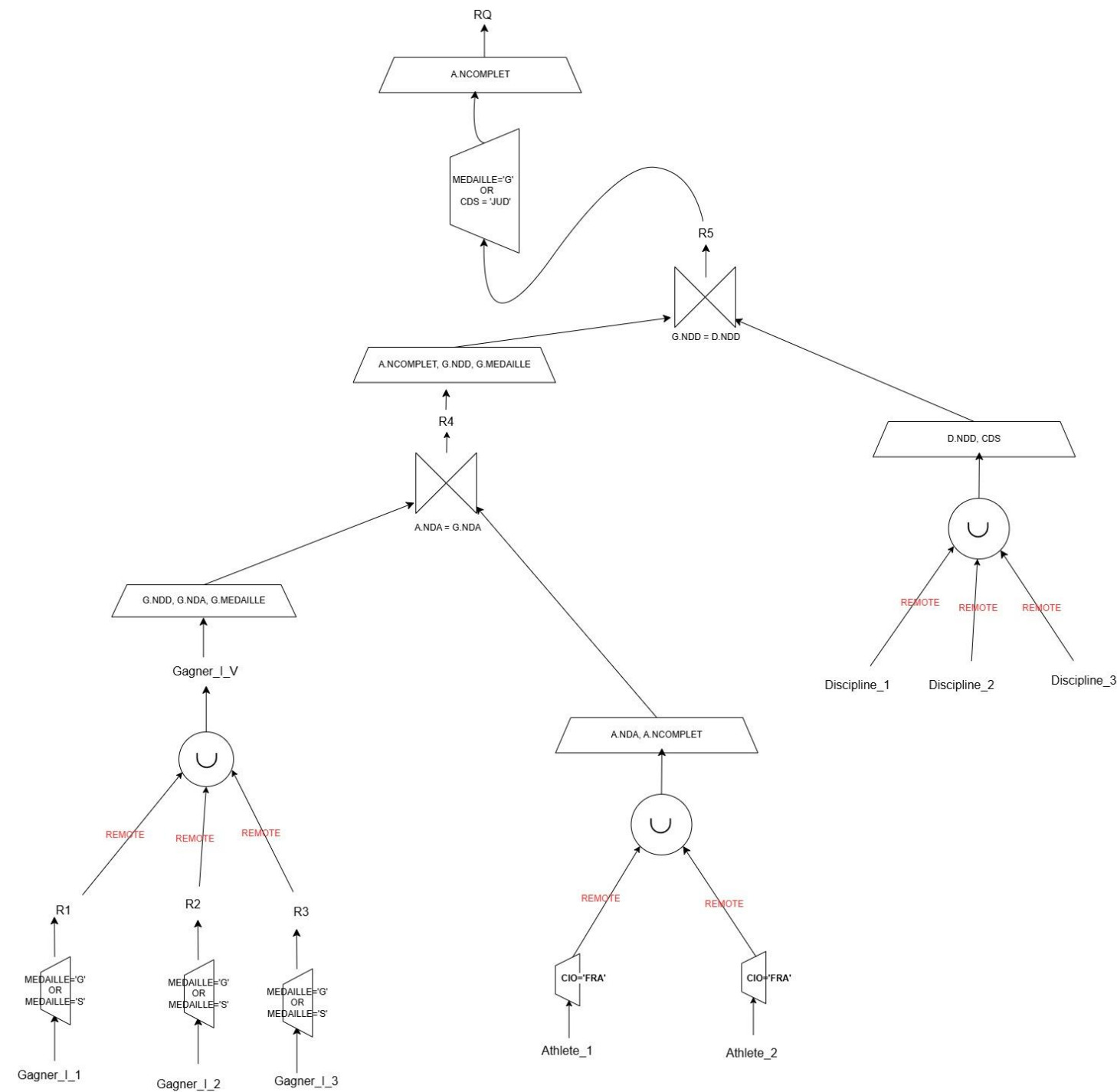


On constate qu'il est impossible de faire descendre les prédicats de sélections car ils ne sont pas optimisés.

➤ Proposition d'une solution pour aider la SGBD à optimiser le calcul de la requête :

```
SELECT a.ncomplet
FROM Athlete a, Gagner_I g, Discipline d
WHERE a.nda = g.nda
      AND g.ndd = d.ndd
      AND a.cio = 'FRA'
      AND (g.medaille = 'G' OR g.medaille = 'S')
      AND (g.medaille = 'G' OR cds = 'JUD');
```

➤ Dédution de l'arbre global optimisé sur fragment :



4. Plan d'exécution avec optimisation sur l'attribut de fragmentation horizontale

➤ Plan d'exécution Oracle local :

- PLAN_TABLE

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)
1	0	HASH JOIN	(null)	(null)	(null)	"G"."NDD"="D"."NDD" (#keys=1) "A"."NCOMPLET" [VARCHAR2,50]	
2	1	VIEW	(null)	DISCIPLINE_V	(null)	(null)	"D"."NDD" [NUMBER,22]
3	2	SORT	UNIQUE	(null)	(null)	(null)	(#keys=5) STRDEF[22], STRDEF[50], STRDEF[1], STRDEF[1], STRDEF[3]
4	3	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22], STRDEF[50], STRDEF[1], STRDEF[1], STRDEF[3]
5	4	FILTER	(null)	(null)	NULL IS NOT NULL	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "CDS" [CHARACTER,3]
6	5	REMOTE	(null)	DISCIPLINE_1	(null)	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "CDS" [CHARACTER,3]
7	4	REMOTE	(null)	DISCIPLINE_2	(null)	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "CDS" [CHARACTER,3]
8	4	REMOTE	(null)	DISCIPLINE_3	(null)	(null)	"NDD" [NUMBER,22], "NOMD" [VARCHAR2,50], "TYPED" [CHARACTER,1], "GENRED" [CHARACTER,1], "CDS" [CHARACTER,3]
9	1	HASH JOIN	(null)	(null)	(null)	"A"."NDA"="G"."NDA" (#keys=1) "A"."NCOMPLET" [VARCHAR2,50], "G"."NDD" [NUMBER,22]	
10	9	VIEW	(null)	ATHLETE_V	(null)	(null)	"A"."NDA" [NUMBER,22], "A"."NCOMPLET" [VARCHAR2,50]
11	10	SORT	UNIQUE	(null)	(null)	(null)	(#keys=9) STRDEF[22], STRDEF[50], STRDEF[1], STRDEF[22], STRDEF[22], STRDEF[7], STRDEF[30], STRDEF[30], STRDEF[3]
12	11	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22], STRDEF[50], STRDEF[1], STRDEF[22], STRDEF[22], STRDEF[7], STRDEF[30], STRDEF[30], STRDEF[3]
13	12	REMOTE	(null)	ATHLETE_1	(null)	(null)	"NDA" [NUMBER,22], "NCOMPLET" [VARCHAR2,50], "TAILLE" [NUMBER,22], "POIDS" [NUMBER,22], "DATEN" [DATE,7], "VILLEN" [VARCHAR2,30], "PAYSN" [VARCHAR2,30], "CIO" [CHARACTER,3]
14	12	REMOTE	(null)	ATHLETE_2	(null)	(null)	"NDA" [NUMBER,22], "NCOMPLET" [VARCHAR2,50], "TAILLE" [NUMBER,22], "POIDS" [NUMBER,22], "DATEN" [DATE,7], "VILLEN" [VARCHAR2,30], "PAYSN" [VARCHAR2,30], "CIO" [CHARACTER,3]
15	9	VIEW	(null)	GAGNER_I_V	(null)	(null)	"G"."NDD" [NUMBER,22], "G"."NDA" [NUMBER,22]
16	15	SORT	UNIQUE	(null)	(null)	(null)	(#keys=4) STRDEF[22], STRDEF[22], STRDEF[1], STRDEF[7]
17	16	UNION-ALL	(null)	(null)	(null)	(null)	STRDEF[22], STRDEF[22], STRDEF[1], STRDEF[7]
18	17	REMOTE	(null)	GAGNER_I_1	(null)	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]
19	17	REMOTE	(null)	GAGNER_I_2	(null)	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]
20	17	REMOTE	(null)	GAGNER_I_3	(null)	(null)	"NDD" [NUMBER,22], "NDA" [NUMBER,22], "MEDAILLE" [CHARACTER,1], "DATEG" [DATE,7]

OTHER
(null)
(null)
(null)
(null)
(null)
(null)
SELECT "NDD", "NOMD", "TYPED", "CDS" FROM "DISCIPLINE_1" "DISCIPLINE_1"
SELECT "NDD", "NOMD", "TYPED", "CDS" FROM "DISCIPLINE_2" "DISCIPLINE_2"
SELECT "NDD", "NOMD", "TYPED", "GENRED", "CDS" FROM "DISCIPLINE_3" "DISCIPLINE_3" WHERE "GENRED"='W'
(null)
(null)
(null)
(null)
SELECT "NDA", "NCOMPLET", "TAILLE", "POIDS", "DATEN", "VILLEN", "PAYSN", "CIO" FROM "ATHLETE_1" "ATHLETE_1" WHERE "CIO"='FRA'
SELECT "NDA", "NCOMPLET", "TAILLE", "POIDS", "DATEN", "VILLEN", "PAYSN", "CIO" FROM "ATHLETE_2" "ATHLETE_2" WHERE "CIO"='FRA'
(null)
(null)
(null)
SELECT "NDD", "NDA", "MEDAILLE", "DATEG" FROM "GAGNER_I_1" "GAGNER_I_1" WHERE "MEDAILLE"='G'
SELECT "NDD", "NDA", "MEDAILLE", "DATEG" FROM "GAGNER_I_2" "GAGNER_I_2" WHERE "MEDAILLE"='G'
SELECT "NDD", "NDA", "MEDAILLE", "DATEG" FROM "GAGNER_I_3" "GAGNER_I_3" WHERE "MEDAILLE"='G'

- Forme Graphique de SQL developer

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST	OBJECT_NODE
SELECT STATEMENT				228	43
HASH JOIN				228	43
Access Predicates G.NDD=D.NDD					
VIEW	DISCIPLINE_V			164	9
SORT		UNIQUE		164	9
UNION-ALL					
FILTER					
Filter Predicates NULL IS NOT NULL					
REMOTE	DISCIPLINE_1			159	3 DBL_ETUPRE
SERIAL_FROM_REMOTE SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_1" "DISCIPLINE_1"					
REMOTE	DISCIPLINE_2			152	3 DBL_ETUSEC
SERIAL_FROM_REMOTE SELECT "NDD","NOMD","TYPED","CDS" FROM "DISCIPLINE_2" "DISCIPLINE_2"					
REMOTE	DISCIPLINE_3			11	3 DBL_ETUTER
SERIAL_FROM_REMOTE SELECT "NDD","NOMD","TYPED","GENRED","CDS" FROM "DISCIPLINE_3" "DISCIPLINE_3" WHERE "GENRED"='W'					
HASH JOIN				139	34
Access Predicates A.NDA=G.NDA					
VIEW	ATHLETE_V			55	22
SORT		UNIQUE		55	22
UNION-ALL					
REMOTE	ATHLETE_1			28	10 DBL_ETUPRE
SERIAL_FROM_REMOTE SELECT "NDA","NCOMPLET","TAILLE","POIDS","DATEN","VILLEN","PAYSN","CIO" FROM "ATHLETE_1" "ATHLETE_1" WHERE "CIO"='FRA'					
REMOTE	ATHLETE_2			27	10 DBL_ETUSEC
SERIAL_FROM_REMOTE SELECT "NDA","NCOMPLET","TAILLE","POIDS","DATEN","VILLEN","PAYSN","CIO" FROM "ATHLETE_2" "ATHLETE_2" WHERE "CIO"='FRA'					
VIEW	GAGNER_I_V			253	12
SORT		UNIQUE		253	12
UNION-ALL					
REMOTE	GAGNER_I_1			130	3 DBL_ETUPRE
SERIAL_FROM_REMOTE SELECT "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_1" "GAGNER_I_1" WHERE "MEDAILLE"='G'					
REMOTE	GAGNER_I_2			120	3 DBL_ETUSEC
SERIAL_FROM_REMOTE SELECT "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_2" "GAGNER_I_2" WHERE "MEDAILLE"='G'					
REMOTE	GAGNER_I_3			3	3 DBL_ETUTER
SERIAL_FROM_REMOTE SELECT "NDD","NDA","MEDAILLE","DATEG" FROM "GAGNER_I_3" "GAGNER_I_3" WHERE "MEDAILLE"='G'					

➤ Plans d'exécution Oracle distants :

- **PLAN_TABLE**
- **Sur etupre**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	GAGNER_I_1	"MEDAILLE"='G'	(null)	"NDD" [NUMBER, 22], "NDA" [NUMBER, 22], "MEDAILLE" [CHARACTER, 1], "DATEG" [DATE, 7]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	ATHLETE_1	"CIO"='FRA'	(null)	"NDA" [NUMBER, 22], "NCOMPLET" [VARCHAR2, 50], "TAILLE" [NUMBER, 22], "POIDS" [NUMBER, 22], "DATEN" [DATE, 7], "VILLEN" [VARCHAR2, 30], "PAYSN" [VARCHAR2, 30], "CIO" [CHARACTER, 3]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_1	(null)	(null)	"NDD" [NUMBER, 22], "NOMD" [VARCHAR2, 50], "TYPED" [CHARACTER, 1], "CDS" [CHARACTER, 3]	(null)

- **Sur etusec**

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	GAGNER_I_2	"MEDAILLE"='G'	(null)	"NDD" [NUMBER, 22], "NDA" [NUMBER, 22], "MEDAILLE" [CHARACTER, 1], "DATEG" [DATE, 7]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	ATHLETE_2	"CIO"='FRA'	(null)	"NDA" [NUMBER, 22], "NCOMPLET" [VARCHAR2, 50], "TAILLE" [NUMBER, 22], "POIDS" [NUMBER, 22], "DATEN" [DATE, 7], "VILLEN" [VARCHAR2, 30], "PAYSN" [VARCHAR2, 30], "CIO" [CHARACTER, 3]	(null)




ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_2	(null)	(null)	"NDD" [NUMBER, 22], "NOMD" [VARCHAR2, 50], "TYPED" [CHARACTER, 1], "CDS" [CHARACTER, 3]	(null)




- **Sur etuter**



ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	GAGNER_I_3	"MEDAILLE"='G'	(null)	"NDD" [NUMBER, 22], "NDA" [NUMBER, 22], "MEDAILLE" [CHARACTER, 1], "DATEG" [DATE, 7]	(null)

ID	PARENT_ID	OPERATION	OPTIONS	OBJECT_NAME	FILTER_PREDICATES	ACCESS_PREDICATES	PROJECTION	OTHER
0	(null)	SELECT STATEMENT	(null)	(null)	(null)	(null)	(null)	(null)
1	0	TABLE ACCESS	FULL	DISCIPLINE_3	"GENRED"='W'	(null)	"NDD" [NUMBER, 22], "NOMD" [VARCHAR2, 50], "TYPED" [CHARACTER, 1], "GENRED" [CHARACTER, 1], "CDS" [CHARACTER, 3]	(null)




- **Forme Graphique de SQL developper**
- **Sur etupre**




OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			305	15
 TABLE ACCESS	<u>ATHLETE_1</u>	FULL	305	15
 Filter Predicates				
				CIO='FRA'



OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			120	3
 TABLE ACCESS	<u>GAGNER_I_1</u>	FULL	120	3
 Filter Predicates				
				MEDAILLE='G'

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			159	3
 TABLE ACCESS	<u>DISCIPLINE_1</u>	FULL	159	3




- **Sur etusec**

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			295	15
 TABLE ACCESS	<u>ATHLETE_2</u>	FULL	295	15
 Filter Predicates				
				CIO='FRA'

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			120	3
 TABLE ACCESS	<u>GAGNER_I_2</u>	FULL	120	3
 Filter Predicates				
				MEDAILLE='G'

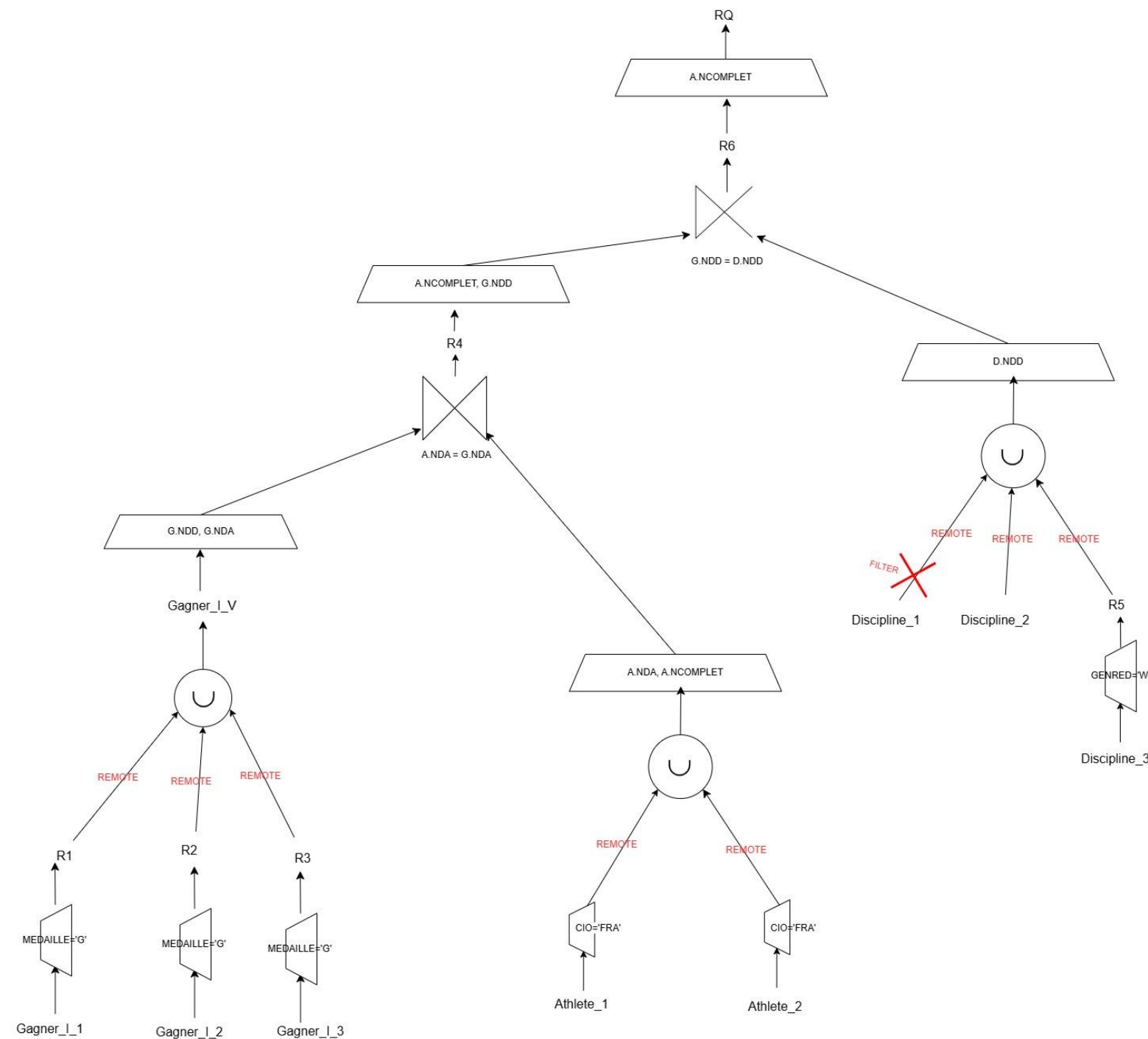
OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			152	3
 TABLE ACCESS	<u>DISCIPLINE_2</u>	FULL	152	3

- **Sur etuter**

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
 SELECT STATEMENT			3	3
 TABLE ACCESS	<u>GAGNER_I_3</u>	FULL	3	3
 Filter Predicates				
				MEDAILLE='G'

OPERATION	OBJECT_NAME	OPTIONS	CARDINALITY	COST
SELECT STATEMENT			4	3
TABLE ACCESS	DISCIPLINE_3	FULL	4	3
Filter Predicates	GENRED='W'			

➤ Arbre global optimal sur fragment :



On constate qu'au niveau des fragments Gagner_I (1, 2 et 3), on affiche que le prédicat médaille ='G'. Cela signifie que le prédicat sur l'attribut de fragmentations n'a pas pu être descendu. Et, ce qui peut empêcher le SGBD de filtrer correctement et couper des branches ci-nécessaire.

➤ **Modification des fragments de *GAGNER_I* :**

```
-----Gagner_I-----
-- Modification de La fragmentation Horizontale de Gagner_I sur etupre
COPY FROM LPL3702A/"EbatrDi"@teline.univ-tlse3.fr:1521:etupre -
TO LPL3702A/"EbatrDi"@teline.univ-tlse3.fr:1521:etupre -
REPLACE Gagner_I_1_bis -
USING SELECT g.* , genred -
        FROM Gagner_I g, Discipline d-
        WHERE g.ndd=d.ndd -
        AND typed='P' -
        AND genred='M';

-- Modification de La fragmentation Horizontale de Gagner_I sur etusec
COPY FROM LPL3702A/"EbatrDi"@teline.univ-tlse3.fr:1521:etusec -
TO LPL3702A/"EbatrDi"@brehat.univ-tlse3.fr:1521:etusec -
REPLACE Gagner_I_2_bis -
USING SELECT g.* , genred -
        FROM Gagner_I g, Discipline d-
        WHERE g.ndd=d.ndd -
        AND typed='P' -
        AND genred='W';

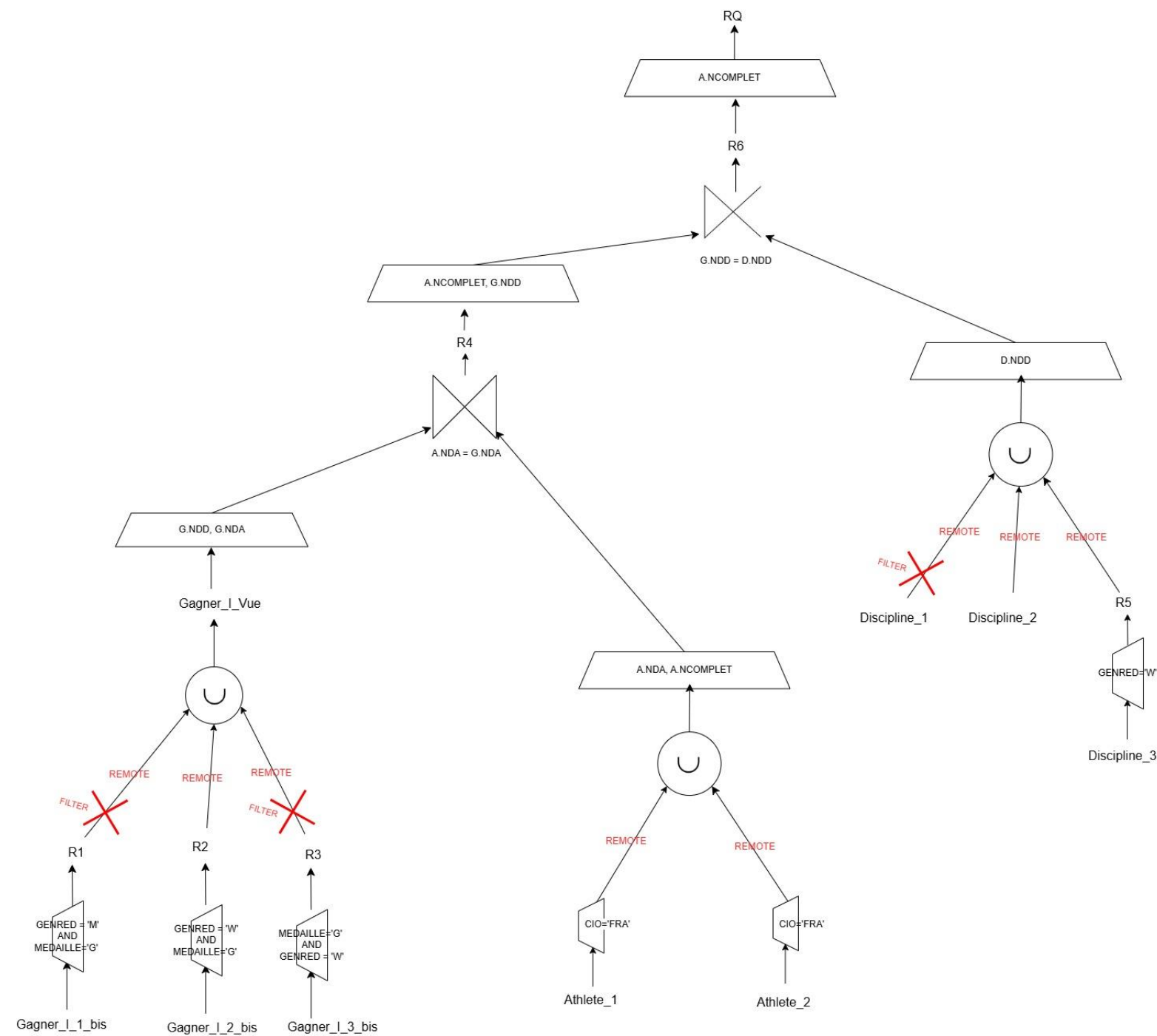
-- Modification de La fragmentation Horizontale de Gagner_I sur etuter
COPY FROM LPL3702A/"EbatrDi"@teline.univ-tlse3.fr:1521:etuter -
TO LPL3702A/"EbatrDi"@teline.univ-tlse3.fr:1521:etuter -
REPLACE Gagner_I_3_bis -
USING SELECT g.* , genred -
        FROM Gagner_I g, Discipline d-
        WHERE g.ndd=d.ndd -
        AND typed='P' -
        AND genred IN ('X','O');

----- Redéfinition de La vue -----
CREATE OR REPLACE VIEW Gagner_I AS SELECT *
FROM Gagner_I_1_bis@dbl_etupre
WHERE genred = 'M'
UNION
SELECT *
FROM Gagner_I_2_bis@dbl_etusec
WHERE genred = 'W'
UNION
SELECT *
FROM Gagner_I_3_bis@dbl_etusec
WHERE genred IN ('X', 'O');
```

➤ Proposition d'une solution pour aider la SGBD à optimiser le calcul de la requête :

```
SELECT a.ncomplet
FROM Athlete a, Gagner_I g, Discipline d
WHERE a.nda = g.nda
      AND g.ndd = d.ndd
      AND g.medaille = 'G'
      AND d.genred = 'W'
      AND g.genred = 'W'
      AND cio = 'FRA';
```

➤ Dédution de l'arbre global optimisé sur fragment :



5. Conclusion

En conclusion, ce TP nous a permis de savoir comment construire un arbre global optimal à partir du plan d'exécution que le SGBD nous fournit.