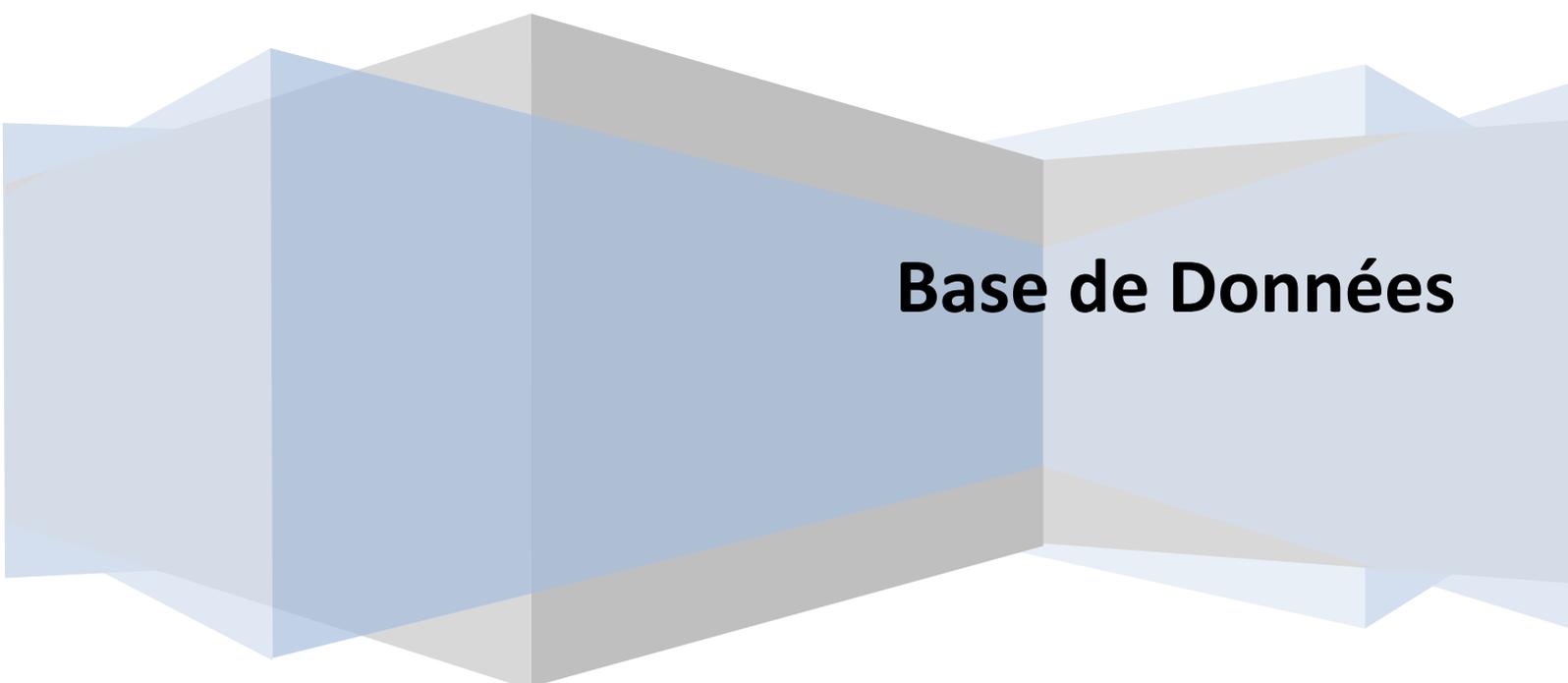


RAPPORT TP Noté

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Base de Données

1. Optimisation de Requêtes

1. Création de la Base de Données

Afin de pouvoir utiliser la base de données d'Arel nous avons du la corriger :

```
drop table "RELS" cascade constraints PURGE;
drop table "MATIERES" cascade constraints PURGE;
drop table "ACTIVITES" cascade constraints PURGE;
drop table "RELS_RELATIONS" cascade constraints PURGE;
drop table "DOCUMENTS" cascade constraints PURGE;
drop table "RELS_TYPERES" cascade constraints PURGE;
drop table "RELS_SOUS_TYPERES" cascade constraints PURGE;
```

```
CREATE TABLE "RELS_TYPERES"
(
    "P_ID" NUMBER NOT NULL ENABLE,
    "LIBELLE" VARCHAR2(50 BYTE) NOT NULL ENABLE,
    CONSTRAINT "PK_RELS_TYPERES" PRIMARY KEY ("P_ID")
);
```

```
CREATE TABLE "RELS_SOUS_TYPERES"
(
    "P_ID" NUMBER NOT NULL ENABLE,
    "LIBELLE" VARCHAR2(50 BYTE) NOT NULL ENABLE,
    CONSTRAINT "PK_RELS_SOUS_TYPERES" PRIMARY KEY ("P_ID")
);
```

```
CREATE TABLE "RELS"
(
    "P_ID" NUMBER NOT NULL ENABLE,
    "LIBELLE" VARCHAR2(110 BYTE) NOT NULL ENABLE,
    "DATE_MAJ" DATE DEFAULT sysdate NOT NULL ENABLE,
    "DATE_CRE" DATE DEFAULT sysdate NOT NULL ENABLE,
    "ETAT" VARCHAR2(20 BYTE) NOT NULL ENABLE,
    "LIBELLE_COURT" VARCHAR2(15 BYTE),
    "DATE_PUBLICATION" DATE DEFAULT sysdate NOT NULL ENABLE,
    "F_TYPE" NUMBER, -- les types des rels
    "F_SOUS_TYPE" NUMBER, -- les sous types des rels
    CONSTRAINT "CK_RELS_2" CHECK (etat IN('BROUILLON','PUBLIEE','ATTENTE')) ENABLE,
    CONSTRAINT "PK_RELS" PRIMARY KEY ("P_ID"),
    CONSTRAINT "FK_RELS_2" FOREIGN KEY ("F_TYPE")
    REFERENCES "RELS_TYPERES" ("P_ID") ENABLE,
    CONSTRAINT "FK_RELS_3" FOREIGN KEY ("F_SOUS_TYPE")
    REFERENCES "RELS_SOUS_TYPERES" ("P_ID") ENABLE
);
```

```
CREATE TABLE "MATIERES"
(
    "PF_ID" NUMBER NOT NULL ENABLE,
    "PRESENTATION" CLOB,
    "SYLLABUS" CLOB, +

    CONSTRAINT "PK_MATIERES" PRIMARY KEY ("PF_ID"),
    CONSTRAINT "FK_MATIERES_1" FOREIGN KEY ("PF_ID")
    REFERENCES "RELS" ("P_ID") ON DELETE CASCADE ENABLE
);
```

```
CREATE TABLE "ACTIVITES"
(
    "PF_ID" NUMBER NOT NULL ENABLE,
```

```
"ORGANISATION_TRAVAIL" VARCHAR2(50 BYTE) NOT NULL ENABLE,
"DESCRIPTION" CLOB,
"MODE_EVALUATION" NUMBER(1,0),
CONSTRAINT "CK_ACTIVITES_1" CHECK (organisation_travail IN ('INDIVIDUEL','GROUPE','PROMO')) ENABLE,
CONSTRAINT "PK_ACTIVITES" PRIMARY KEY ("PF_ID"),
CONSTRAINT "FK_ACTIVITES_1" FOREIGN KEY ("PF_ID")
REFERENCES "RELS" ("P_ID") ON DELETE CASCADE ENABLE
);

CREATE TABLE "RELS_RELATIONS"
(
    "PF_PERE" NUMBER NOT NULL ENABLE,
    "PF_FILS" NUMBER NOT NULL ENABLE,
    "RELATION" varchar2(50),
    "P_ID" NUMBER NOT NULL ENABLE,
    CONSTRAINT "PK_RELS_RELATIONS" PRIMARY KEY ("P_ID")
);

CREATE TABLE "DOCUMENTS"
(
    "PF_ID" NUMBER NOT NULL ENABLE,
    "F_TYPE_XML" NUMBER,
    "MD5" NUMBER NOT NULL ENABLE,
    "FILENAME" CLOB,
    CONSTRAINT "PK_DOCUMENTS" PRIMARY KEY ("PF_ID"),
    CONSTRAINT "FK_DOCUMENTS_1" FOREIGN KEY ("PF_ID")
REFERENCES "RELS" ("P_ID") ON DELETE CASCADE ENABLE
);
```

Nous avons retiré les *AreIV3*. et rajouté les *DROP TABLE* afin que les tables se créaient correctement. Nous allons à présent passer aux requêtes.

2. Plan de requêtes

- **Requête SQL 1** : Liste de toutes les RELS rangées par ordre de libelle

*select * from RELS order by libelle;*

- **EXPLAIN PLAN**

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	144	3 (34)	00:00:01
1	SORT ORDER BY		1	144	3 (34)	00:00:01
2	TABLE ACCESS FULL	RELS	1	144	2 (0)	00:00:01

Oracle a parcouru toute la table Arel, et l'a trié par le libellé.

- **Requête SQL 2** : Liste de toutes les Matières avec libelle, date_maj, date_cre, syllabus

*select libelle, date_maj, date_cre, syllabus from MATIERES m, RELS r
where r.P_ID = m.PF_ID;*

- **EXPLAIN PLAN**

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	2103	3 (0)	00:00:01
1	NESTED LOOPS					
2	NESTED LOOPS		1	2103	3 (0)	00:00:01
3	TABLE ACCESS FULL	RELS	1	88	2 (0)	00:00:01
* 4	INDEX UNIQUE SCAN	PK_MATIERES	1		0 (0)	00:00:01
5	TABLE ACCESS BY INDEX ROWID	MATIERES	1	2015	1 (0)	00:00:01

Predicate Information (identified by operation id):

```
4 - access("MATIERES"."PF_ID"="RELS"."P_ID")
```

Oracle a parcouru entièrement la table en passant par l'index (TABLE ACCESS FULL), et nous a ressorti l'ensemble des matières avec le libellé, la date de mise à jour, la date de création et le syllabus.

- **Requête SQL 3** : Liste de toutes les activités avec libelle de l'activité, date_maj, date_cre, libelle de la matière.

```
select rels.libelle ,rels.date_maj,rels.date_cre,
(select r1.libelle from rels r1 where
(select pf_pere from rels_relations,activites where
rels_relations.pf_fil = activites.pf_id)=rels.p_id)
from rels,activites where activites.pf_id = rels.p_id;
```

- **EXPLAIN PLAN**

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	101	2 (0)	00:00:01
* 1	FILTER					
2	TABLE ACCESS FULL	RELS	1	57	2 (0)	00:00:01
3	NESTED LOOPS		1	39	2 (0)	00:00:01
4	TABLE ACCESS FULL	RELS_RELATIONS	1	26	2 (0)	00:00:01
* 5	INDEX UNIQUE SCAN	PK_ACTIVITES	1	13	0 (0)	00:00:01
6	NESTED LOOPS		1	101	2 (0)	00:00:01
7	TABLE ACCESS FULL	RELS	1	88	2 (0)	00:00:01
* 8	INDEX UNIQUE SCAN	PK_ACTIVITES	1	13	0 (0)	00:00:01

Predicate Information (identified by operation id):

```
1 - filter( (SELECT "PF_PERE" FROM "ACTIVITES"
"ACTIVITES","RELS_RELATIONS" "RELS_RELATIONS" WHERE
"RELS_RELATIONS"."PF_FILS"="ACTIVITES"."PF_ID")=:B1)
5 - access("RELS_RELATIONS"."PF_FILS"="ACTIVITES"."PF_ID")
8 - access("ACTIVITES"."PF_ID"="RELS"."P_ID")
```

Oracle a parcouru entièrement la table en passant par l'index d' *Activites*, puis la table *RELS*. Oracle a enfin fait une jointure entre ces deux tables. Il fait ensuite de même avec l'index d' *Activites* et la table *Relations*. Enfin il parcourt la table *RELS* en listant toutes les activités avec le libelle de l'activité, la date_maj, la date_cre et le libellé de la matière.

- **Choix des index :**

D'après les annexes, la sélectivité étant forte nous avons choisi d'utiliser des index b-tree sur les libellés des rels, les types des rels et les sous types des rels.

2. CLUSTER

```
drop table "RELS" cascade constraints PURGE;
drop table "MATIERES" cascade constraints PURGE;
drop table "ACTIVITES" cascade constraints PURGE;
drop table "RELS_RELATIONS" cascade constraints PURGE;
drop table "DOCUMENTS" cascade constraints PURGE;
drop table "RELS_TYPES" cascade constraints PURGE;
drop table "RELS_SOUS_TYPES" cascade constraints PURGE;
CREATE CLUSTER id_rels(idrels NUMBER);
```

```
CREATE TABLE "RELS_TYPES"
(
    "P_ID" NUMBER NOT NULL ENABLE,
    "LIBELLE" VARCHAR2(50 BYTE) NOT NULL ENABLE,
    CONSTRAINT "PK_RELS_TYPES" PRIMARY KEY ("P_ID")
);
```

```
CREATE TABLE "RELS_SOUS_TYPES"
(
    "P_ID" NUMBER NOT NULL ENABLE,
    "LIBELLE" VARCHAR2(50 BYTE) NOT NULL ENABLE,
    CONSTRAINT "PK_RELS_SOUS_TYPES" PRIMARY KEY ("P_ID")
);
```

```
CREATE TABLE "RELS"
(
    "P_ID" NUMBER NOT NULL ENABLE,
    "LIBELLE" VARCHAR2(110 BYTE) NOT NULL ENABLE,
    "DATE_MAJ" DATE DEFAULT sysdate NOT NULL ENABLE,
    "DATE_CRE" DATE DEFAULT sysdate NOT NULL ENABLE,
    "ETAT" VARCHAR2(20 BYTE) NOT NULL ENABLE,
    "LIBELLE_COURT" VARCHAR2(15 BYTE),
    "DATE_PUBLICATION" DATE DEFAULT sysdate NOT NULL ENABLE,
    "F_TYPE" NUMBER, -- les types des rels
    "F_SOUS_TYPE" NUMBER, -- les sous types des rels
    CONSTRAINT "CK_RELS_2" CHECK (etat IN('BROUILLON','PUBLIEE','ATTENTE')) ENABLE,
    CONSTRAINT "PK_RELS" PRIMARY KEY ("P_ID"),
    CONSTRAINT "FK_RELS_2" FOREIGN KEY ("F_TYPE")
    REFERENCES "RELS_TYPES" ("P_ID") ENABLE,
    CONSTRAINT "FK_RELS_3" FOREIGN KEY ("F_SOUS_TYPE")
    REFERENCES "RELS_SOUS_TYPES" ("P_ID") ENABLE
) cluster id_rels(P_ID);
```

```
CREATE TABLE "MATIERES"
(
    "PF_ID" NUMBER NOT NULL ENABLE,
    "PRESENTATION" CLOB,
    "SYLLABUS" CLOB,
    CONSTRAINT "PK_MATIERES" PRIMARY KEY ("PF_ID"),
    CONSTRAINT "FK_MATIERES_1" FOREIGN KEY ("PF_ID")
    REFERENCES "RELS" ("P_ID") ON DELETE CASCADE ENABLE
) cluster id_rels(PF_ID);
```

```
CREATE TABLE "ACTIVITES"
(
    "PF_ID" NUMBER NOT NULL ENABLE,
    "ORGANISATION_TRAVAIL" VARCHAR2(50 BYTE) NOT NULL ENABLE,
    "DESCRIPTION" CLOB,
```

```
"MODE_EVALUATION" NUMBER(1,0),
CONSTRAINT "CK_ACTIVITES_1" CHECK (organisation_travail IN ('INDIVIDUEL','GROUPE','PROMO'))
ENABLE,
CONSTRAINT "PK_ACTIVITES" PRIMARY KEY ("PF_ID"),
CONSTRAINT "FK_ACTIVITES_1" FOREIGN KEY ("PF_ID")
REFERENCES "RELS" ("P_ID") ON DELETE CASCADE ENABLE
)cluster id_rels(PF_ID);
```

```
CREATE INDEX idx_cluster_id_rels ON CLUSTER id_rels;
```

```
CREATE TABLE "RELS_RELATIONS"
(
  "PF_PERE" NUMBER NOT NULL ENABLE,
  "PF_FILS" NUMBER NOT NULL ENABLE,
  "RELATION" varchar2(50),
  "P_ID" NUMBER NOT NULL ENABLE,
  CONSTRAINT "PK_RELS_RELATIONS" PRIMARY KEY ("P_ID")
);
```

```
CREATE TABLE "DOCUMENTS"
(
  "PF_ID" NUMBER NOT NULL ENABLE,
  "F_TYPE_XML" NUMBER,
  "MD5" NUMBER NOT NULL ENABLE,
  "FILENAME" CLOB,
  CONSTRAINT "PK_DOCUMENTS" PRIMARY KEY ("PF_ID"),
  CONSTRAINT "FK_DOCUMENTS_1" FOREIGN KEY ("PF_ID")
REFERENCES "RELS" ("P_ID") ON DELETE CASCADE ENABLE
);
```

3. XMLType

```

DROP TABLE AREL_XML;

-- Création et enregistrement du schéma xsd de arel dans la base de données

BEGIN
-- Register the schema
DBMS_XMLSCHEMA.registerSchema('http://www.eisti.fr/schemas/arel.xsd',
'<?xml version="1.0" encoding="utf-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <xsd:element name="matiere" type="tmatiere"/>
  <xsd:complexType name="tmatiere">

    <xsd:sequence>
      <xsd:element name="activite" type="tactivite" minOccurs="0" maxOccurs="unbounded" />
      <xsd:element name="rels" type="trels" minOccurs="1" maxOccurs="1"/>
    </xsd:sequence>
    <xsd:attribute name="syllabus" type="xsd:String" use="required" />
    <xsd:attribute name="presentation" type="xsd:String" use="required" />
  </xsd:complexType>

  <xsd:complexType name="trels">
    <xsd:sequence>
      <xsd:element name="document" type="tdocument" minOccurs="0" maxOccurs="unbounded" />
    </xsd:sequence>
    <xsd:attribute name="libelle" type="xsd:String" use="required"/>
    <xsd:attribute name="date_maj" type="xsd:Date" use="required"/>
    <xsd:attribute name="date_cre" type="xsd:Date" use="required"/>
    <xsd:attribute name="etat" type="xsd:String" use="required"/>
    <xsd:attribute name="libelle_cout" type="xsd:String" use="required"/>
    <xsd:attribute name="date_publication" type="xsd:Date" use="required"/>
    <xsd:attribute name="f_type" type="xsd:integer" use="required"/>
    <xsd:attribute name="f_sous_type" type="xsd:integer" use="required"/>
  </xsd:complexType>

  <xsd:complexType name="tdocument">
    <xsd:attribute name="f_type_xml" type="xsd:integer" use="required" />
    <xsd:attribute name="md5" type="xsd:integer" use="required" />
    <xsd:attribute name="filename" type="xsd:String" use="required" />
  </xsd:complexType>
</xsd:schema>',true,true,false);
end;
/

CREATE TABLE AREL_XML(arel XMLType);
XMLType COLUMN arel
XMLSCHEMA "http://www.eisti.fr/schemas/arel.xsd"
ELEMENT "matiere";

```