



LADM SPECIFICATION OF A RELATIONAL DATABASE FOR THE REPUBLIC OF CAPE VERDE

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1. INTRODUCTION

Considering that:

- the objective of the LADM is to provide an extensive base for the development and improvement of an effective and efficient cadastral system, and
- In the Republic of Cape Verde, the municipal cadastres began to receive greater attention with the publication of the Decree-law n° 29/2009, which establishes the judicial regime of the cadastre of the municipalities of Cape Verde,

The objectives of this research was to propose a conceptual model to Cape Verde based on the LADM and to test its application in a specific database model. For that, the study of a platform was carried out for its specification in a relational database.

2. CAPE VERDE

The Archipelago holds 10 islands and 5 main islets. The islands are divided into two groups: the windward islands and the leeward islands.





3. THE CADASTRE OF CAPE VERDE

Rural cadastre

- is of state responsibility, through the Rural Ministry, the General Directory of Agriculture, Forestry and Livestock;

Urban Cadastre

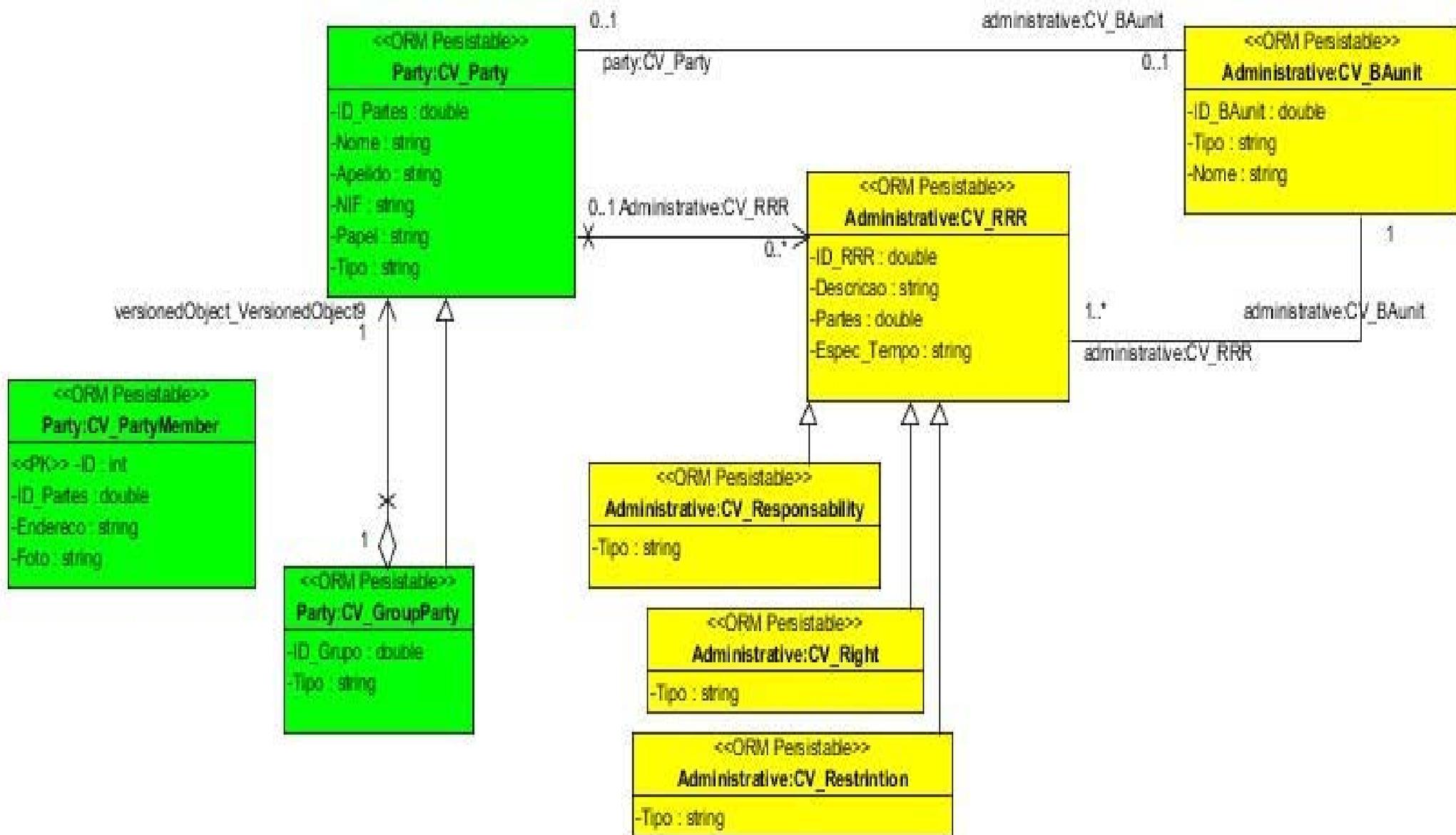
- is the responsibility of the municipalities, with guidelines from the Ministry of Habitation and Territorial Ordinance and Urban Planning, through the sector of cadastre.

Parcel (*predio*)

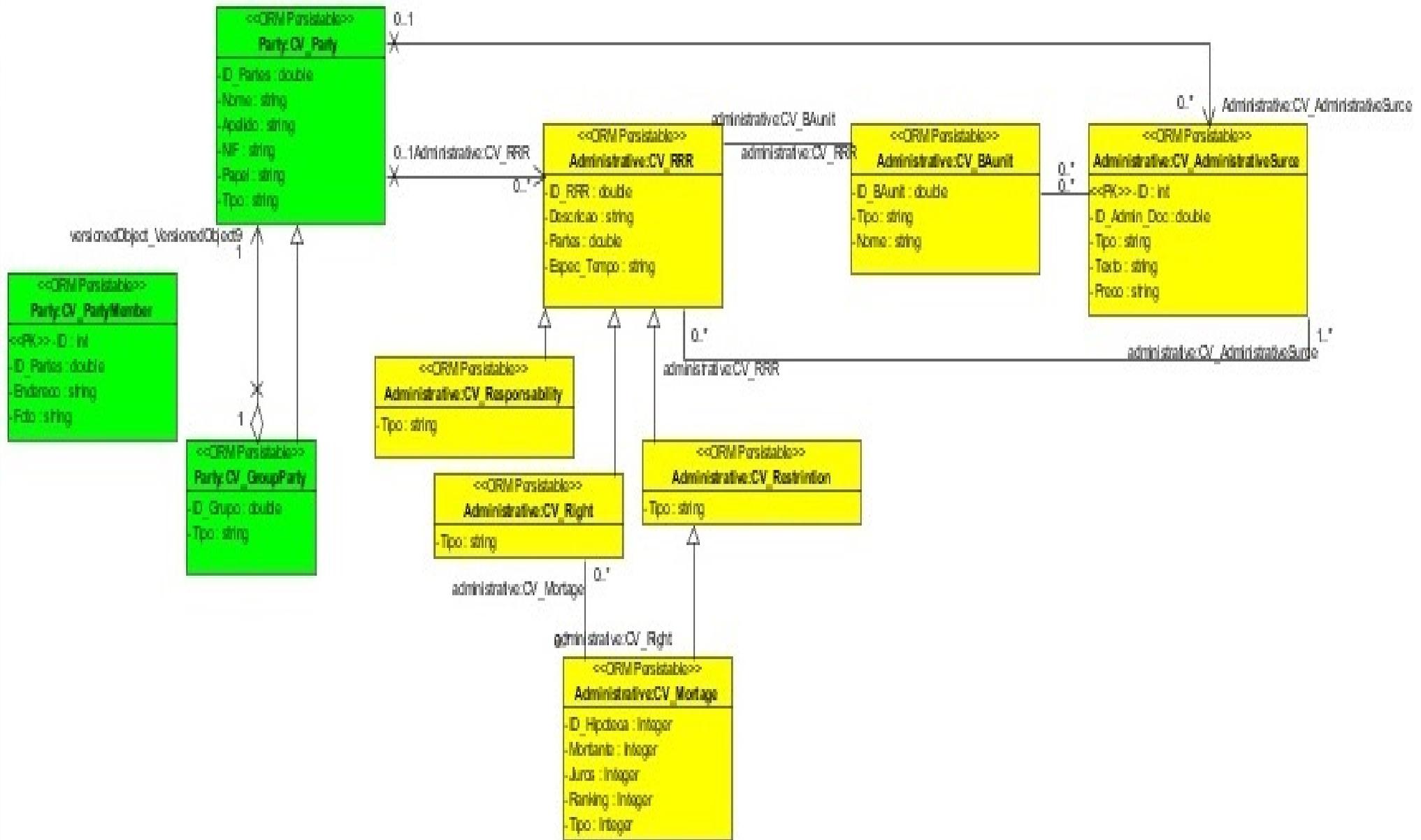
- the bounded part of the judicially autonomous land, including waters, plantations, buildings and constructions of any nature present on them or with any characteristic of permanence and any autonomous fraction in the horizontal property regime (Cabo Verde, 2009).

4. MODELING OF THE LADM_CV

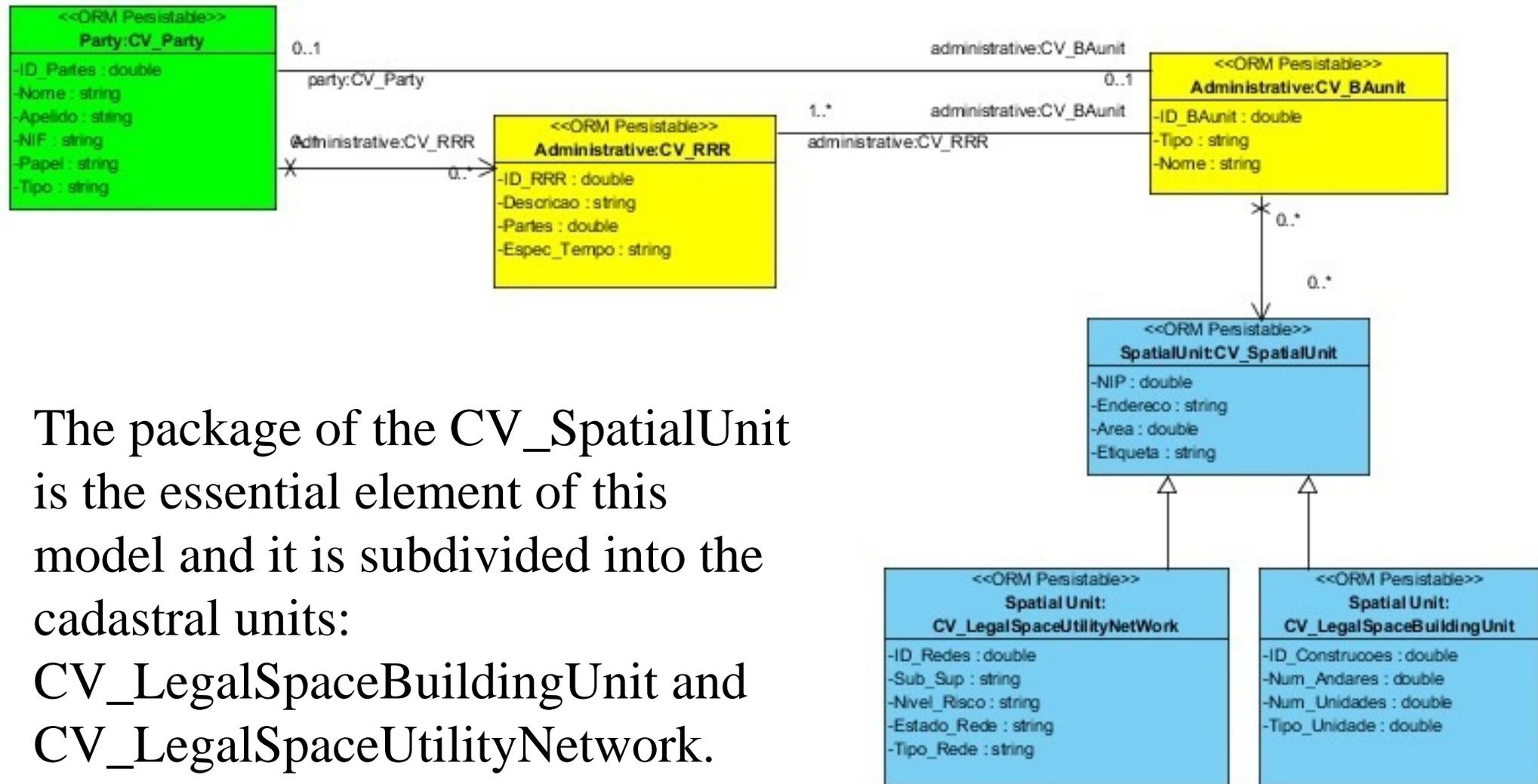
4.1 CV_Party Package



4.2 CV_Administrative Package



4.3 CV_Spatial Unit Package

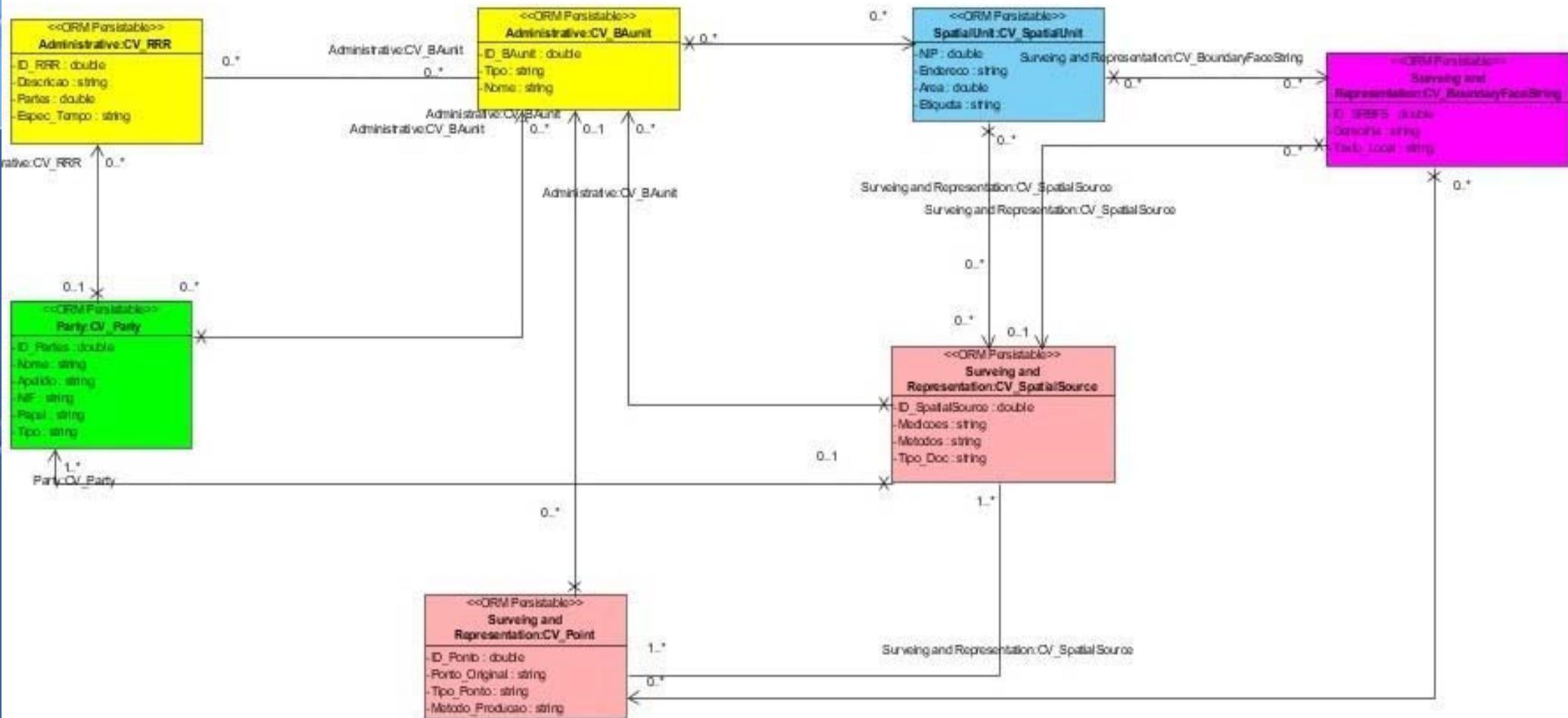


The package of the CV_SpatialUnit is the essential element of this model and it is subdivided into the cadastral units:

CV_LegalSpaceBuildingUnit and CV_LegalSpaceUtilityNetwork.

The concepts of the law decree 29/2009 were considered.

4.4 CV_Surveying and Representation Subpackage



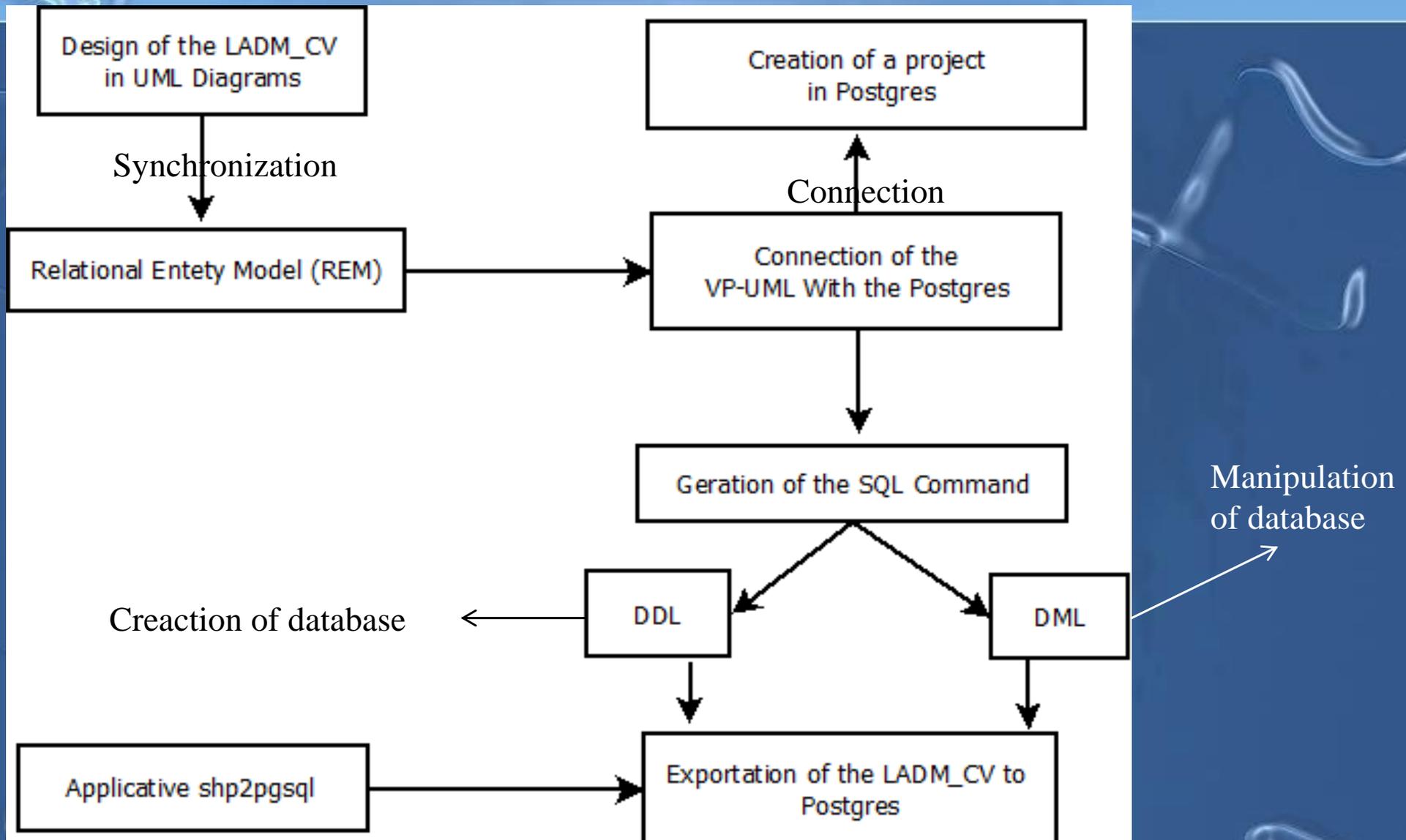
The LADM_CV only contemplates modeling in 2D, represented by the subclass CV_BoundaryFaceString, which describes the CV_SpatialUnit, which is associated to CV_Point for the documentation of all its geometry.



5. SPECIFICATION OF THE LADM_CV INTO A RELATIONAL DATABASE

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- The implementation of the conceptual model demands the study of the most adequate platform for the implementation of the model.
 - In this study, the option was to test a platform that allowed the specification of the conceptual and abstract model into a relational database using VP-UML. This platform has capacity of executing the whole modeling cycle, from the construction of the UML diagrams until its implementation in a database.
 - For this modeling, the MDA (*Model Driven Architecture*) technique was used, supported by CASE (*Computer-Aided Software Engineering*) tools, being implemented in the IDE (*Integrated Development Environment*), denominated as Visual Paradigm for UML.

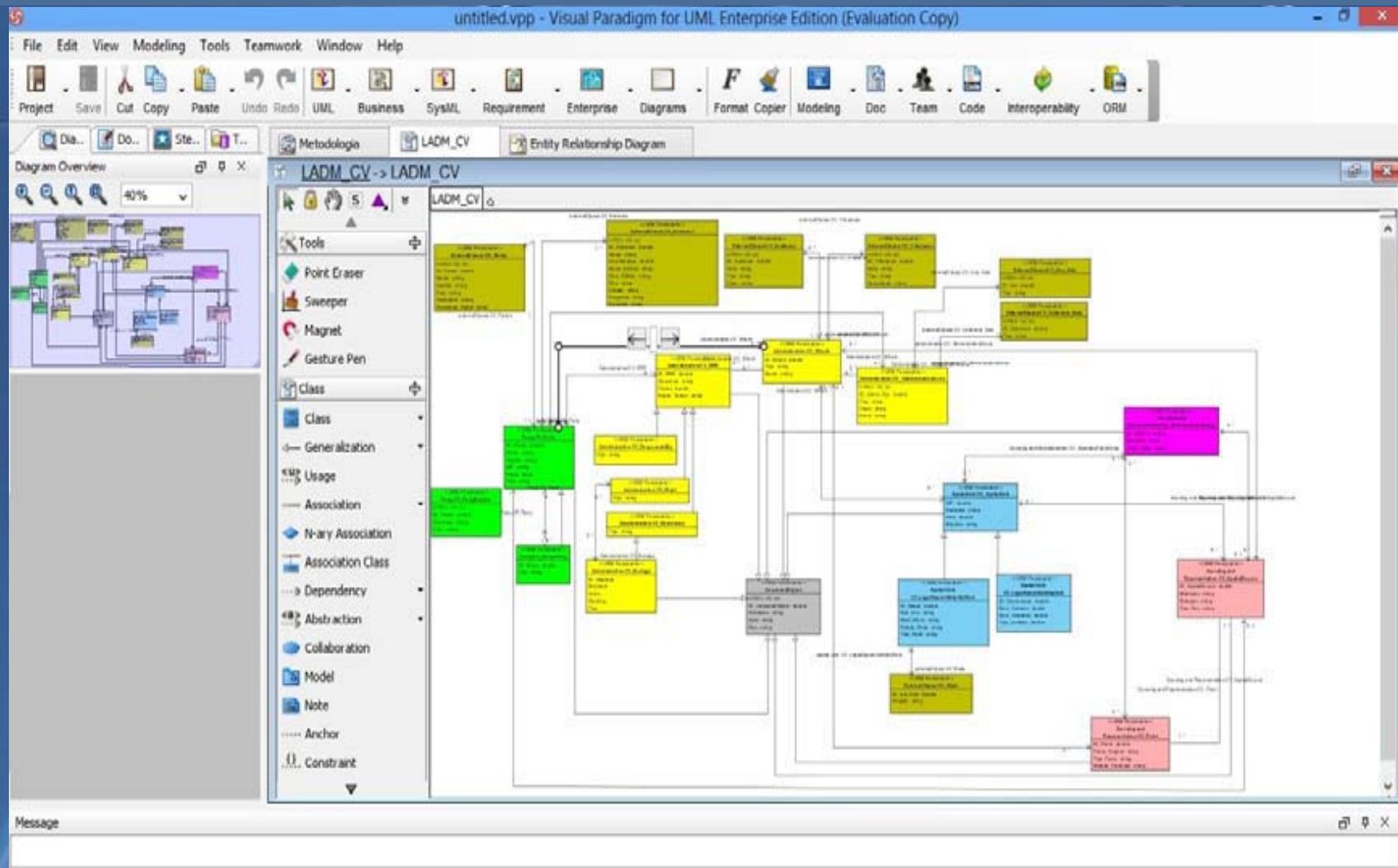
5. SPECIFICATION OF THE LADM_CV INTO A RELATIONAL DATABASE



The steps of the specification of the LADM_CV in a relational database.

5.1 Design of the LADM_CV in UML Diagrams

Modeling of the LADM_CV in the Visual Paradigm: a CASE tool which has various modeling options with the UML 2.0 diagrams, and also offers support to Relational Entity Diagrams.



Creation of the Database Project of the LADM_CV in the Postgres e its connection with VP-UML

```
CREATE DATABASE "LADM_CV"  
WITH ENCODING='UTF8'  
OWNER=postgres  
TEMPLATE=template_postgis  
CONNECTION LIMIT=-1;
```

Command SQL for the creation of the Database Project

Database Configuration

Language : Java

Database Setting

Driver : PostgreSQL

Driver file : lexgeogis\Downloads\postgresql-8.4-703.jdbc4.jar

Connection URL : Production

Host : localhost : 5432

Database name : LADM_CV

User : postgres Password :

Test Connection

Configuration of the Visual Paradigm connection with the Postgres.

Generation of SQL in the Visual Paradigm for the database in the Postgres.

Database : PostgreSQL Delimiter : ; Case : Upper Formatted SQL With constraint

DDL DML

Create :

```
CREATE TABLE VersionedObject_VersionedObject10 (VersionedObjectID int  
CREATE TABLE VersionedObject_VersionedObject8 (VersionedObjectID int  
CREATE TABLE VersionedObject_VersionedObject7 (VersionedObjectID int  
CREATE TABLE VersionedObject_VersionedObject6 (VersionedObjectID int  
CREATE TABLE VersionedObject_VersionedObject5 (VersionedObjectID int  
CREATE TABLE VersionedObject_VersionedObject4 (VersionedObjectID int  
CREATE TABLE VersionedObject_VersionedObject3 (VersionedObjectID int
```

Drop :

```
ALTER TABLE VersionedObject DROP CONSTRAINT FKVersioned0982106;
```

Alter :

CREATE TABLE Vers...ect (ID);

0 row(s) updated!
0 row(s) updated!

Close Help

DDL

Database : PostgreSQL Delimiter : ; Case : Upper Formatted SQL With constraint

DDL DML

Select :

```
SELECT VersionedObjectID, VersionedObjectID2 FROM VersionedObject_Ver
```

Insert :

```
INSERT INTO VersionedObject_VersionedObject10 (VersionedObjectID, Vers
```

Update :

```
UPDATE VersionedObject_VersionedObject10 SET WHERE VersionedObjectID =
```

Delete :

```
DELETE FROM VersionedObject_VersionedObject10 WHERE VersionedObjectID =
```

CREATE TABLE Vers...ect (ID);

0 row(s) updated!
0 row(s) updated!

Close Help

DML

Exportation of the LADM_CV to Postgres

The screenshot displays a database management interface. On the left, a tree view shows the database structure, with the 'Tables (18)' folder highlighted by a red rectangle. The tables listed are:

- Administrative:CV_AdministrativeSource
- ExternalClasse:CV_Avaliacao
- ExternalClasse:CV_Cobertura_Solo
- ExternalClasse:CV_Endereco
- ExternalClasse:CV_Partes
- ExternalClasse:CV_Tributacao
- ExternalClasse:CV_Uso_Solo
- Party:CV_PartyMember
- versionedobject
- versionedobject_versionedobject10
- versionedobject_versionedobject2
- versionedobject_versionedobject3
- versionedobject_versionedobject4
- versionedobject_versionedobject5
- versionedobject_versionedobject6
- versionedobject_versionedobject7
- versionedobject_versionedobject8
- versionedobject_versionedobject9

On the right, a statistics window shows the following data:

Transaction Rolled Back	0
Blocks Read	408
Blocks Hit	24740
Tuples Returned	46098
Tuples Fetched	18540
Tuples Inserted	1190
Tuples Updated	178
Tuples Deleted	1
Last statistics reset	2013-08-12 22:41:17.615-03
Tablespace conflicts	0
Lock conflicts	0
Snapshot conflicts	0
Bufferpin conflicts	0
Deadlock conflicts	0
Size	6345 kB

Below the statistics, the SQL pane shows the following query:

```
-- Database: "LADM_CV"
-- DROP DATABASE "LADM_CV";

CREATE DATABASE "LADM_CV"
  WITH OWNER = postgres
  ENCODING = 'UTF8'
  TABLESPACE = pg_default
  LC_COLLATE = 'English_United States.1252'
  LC_CTYPE = 'English_United States.1252'
  CONNECTION LIMIT = -1;
```

Relational Entity Model



Postgres database.

6. CONCLUSIONS

- The results showed that the LADM standard was considered adequate for the land administration system of Cape Verde, regulated by the Law-Decree 29/2009.
- The Visual Paradigm platform of this CASE tool supplies a direct solution for the specification of the UML model into a relational database.
- The UML is a standardization of the OMG (*Object Management Group*), and one of its main advantages is the fact that it is entirely extensible and adaptable.
- The relational database model presents as contributions a greater level of data independence than conventional models (of networks and hierarchies), and the unification of the representation of these models through the graphic formalism of the Entity-Relation Diagram.



7. REFERENCES

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THANK YOU VERY MUCH:

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For your attention!

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