Referata
- GeoInformática –

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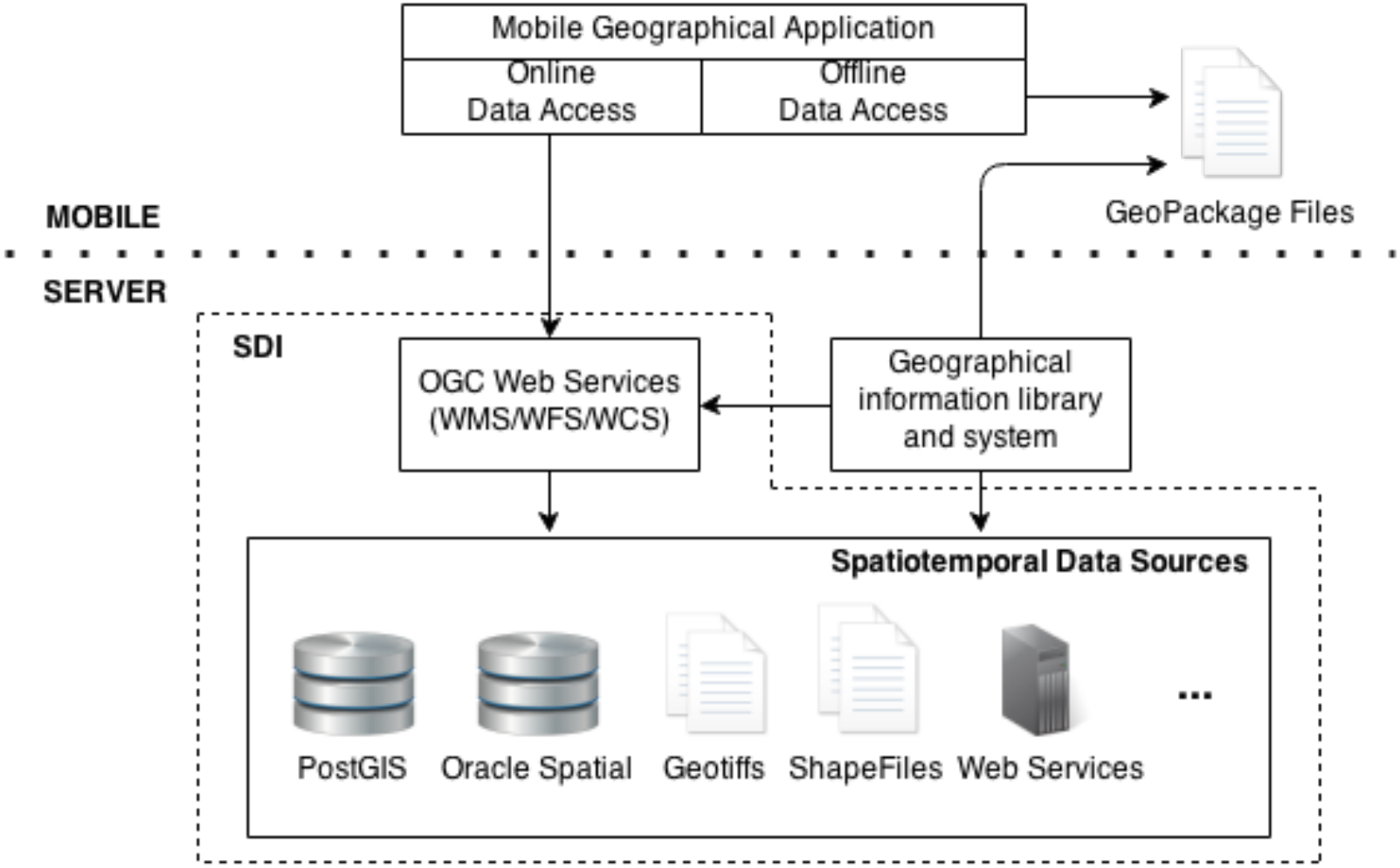
Topics

- Mobile
- Extending GIS with Spatiotemporal Data Types
  - RDF vocabulary for spatiotemporal observation data sources

Mobile – First steps

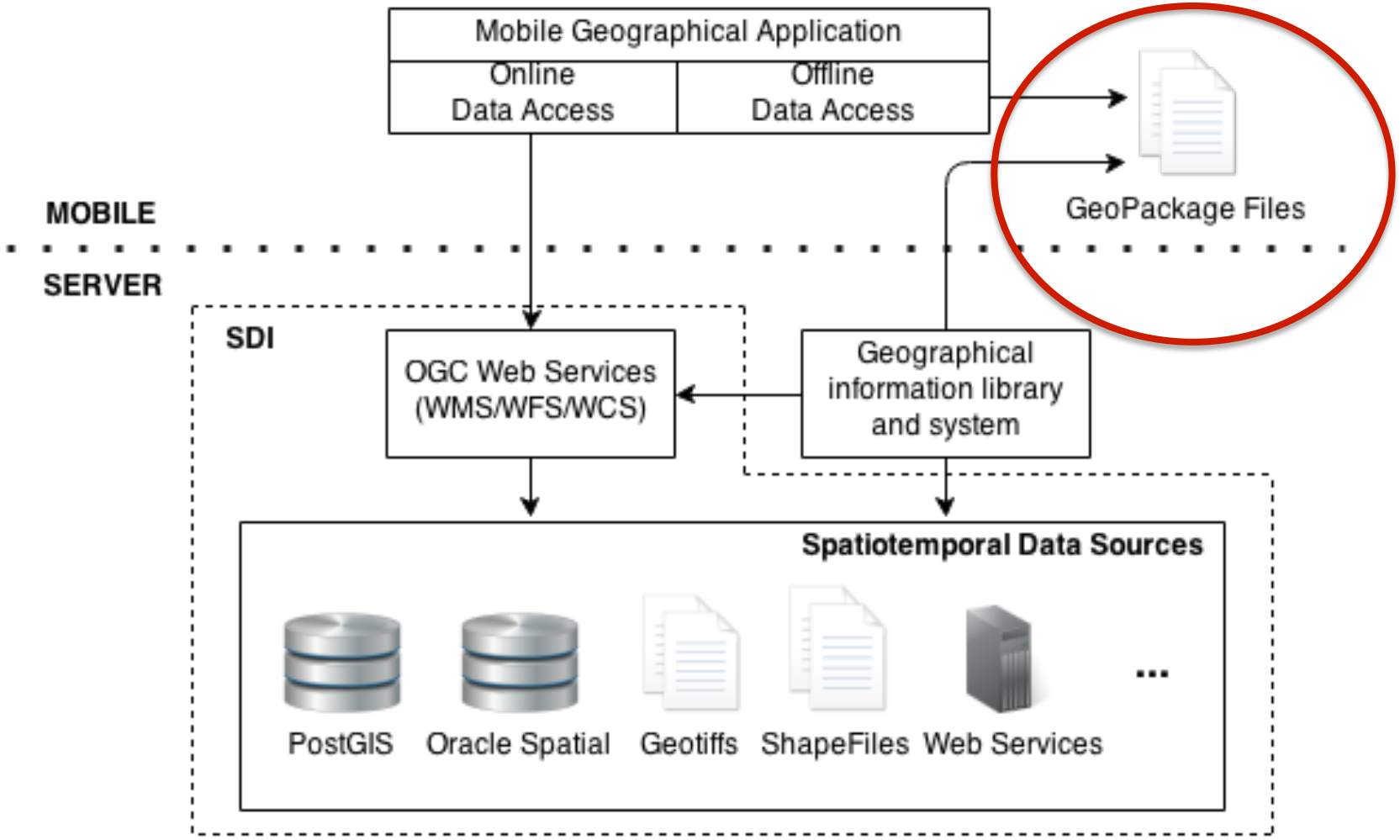
- Bogo: disciplina “Introdução a Geoprocessamento”
- Demandas: projeto Boeing, Isabel/Silvana, Maurano, ...
- Idea: “A Hybrid Architecture for Mobile Geographical Data Acquisition and Validation Systems”

Mobile - Architecture



Mobile - Architecture

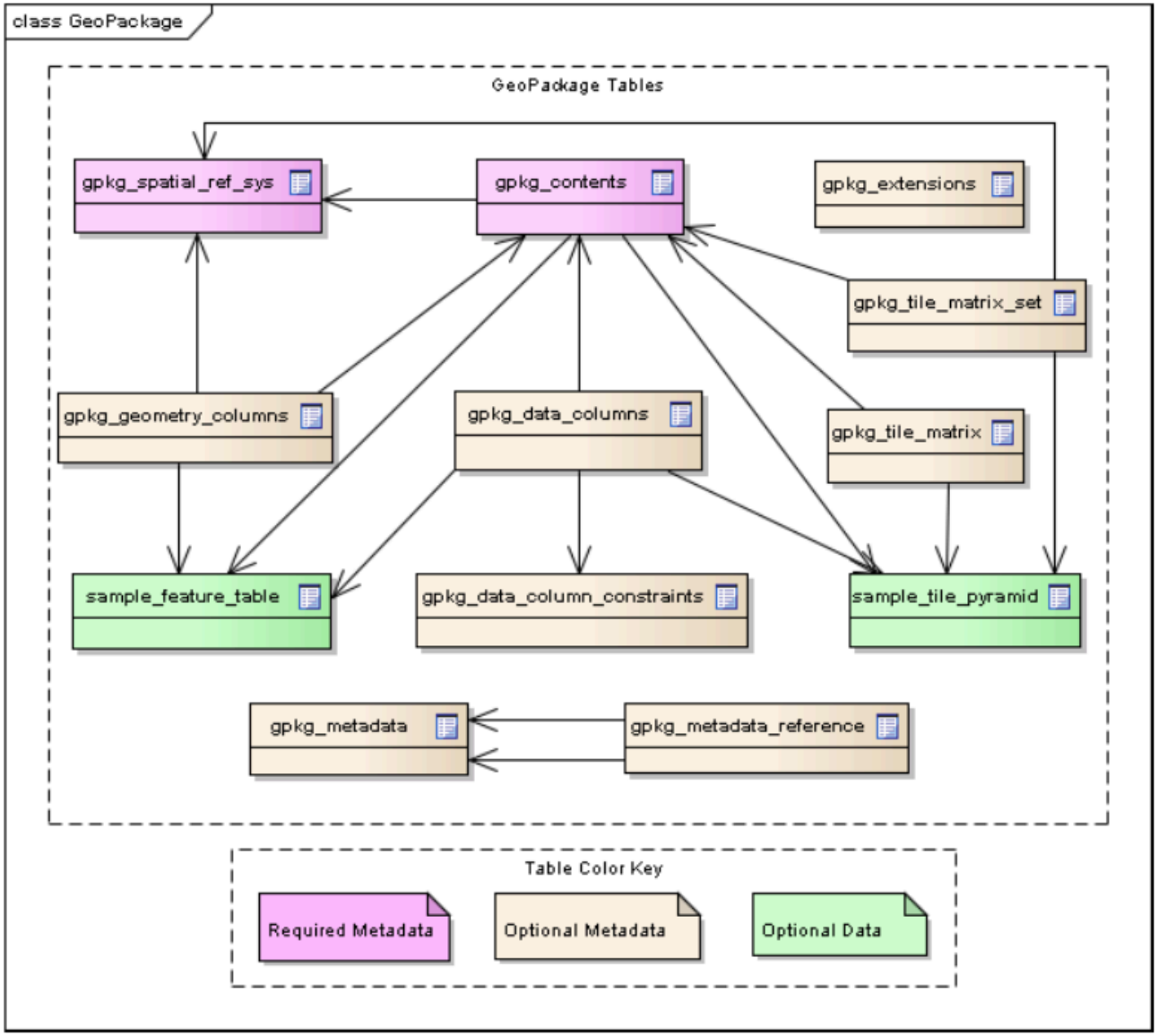
Geopackage documents as interoperable files between Spatial Data Infrastructures (SDI) and mobile geographical data acquisition and validation systems.



Geopackage

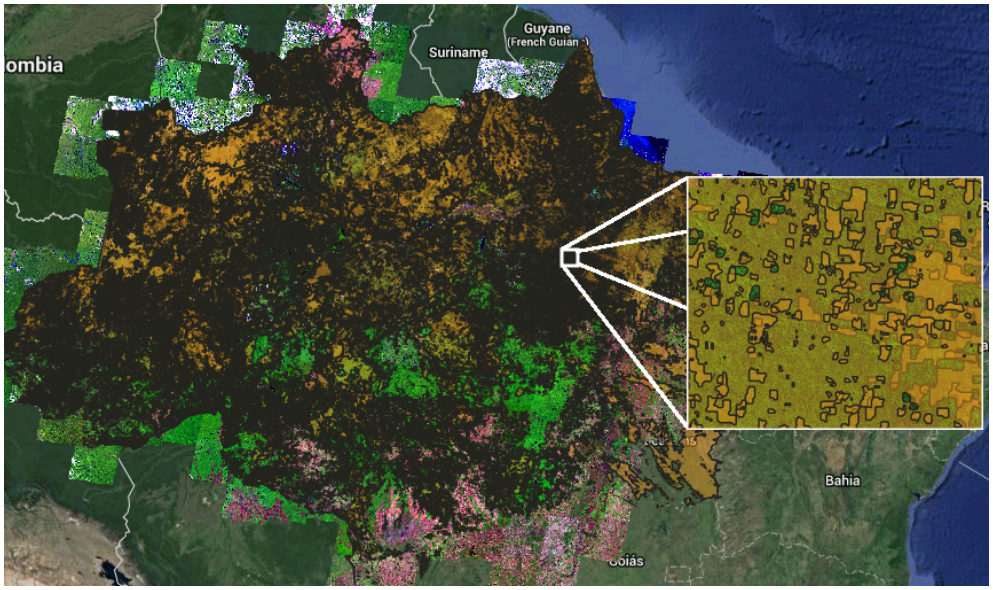
- OGC standard (OGC, 2014)
- Defines a SQL database schema designed for use with the SQLite software library. This schema contains a set of pre-defined tables to store spatial data sets (vector and tiled raster) and their metadata.
- Geopackage files are interoperable across different platforms, including personal computing environments and mobile devices.

Geopackage


class GeoPackage
GeoPackage Tables
gpkg_spatial_ref_sys
gpkg_contents
gpkg_extensions
gpkg_tile_matrix_set
gpkg_geometry_columns
gpkg_data_columns
gpkg_tile_matrix
sample_feature_table
gpkg_data_column_constraints
sample_tile_pyramid
gpkg_metadata
gpkg_metadata_reference
Table Color Key
Required Metadata
Optional Metadata
Optional Data

Geopackage – Tests and Evaluation

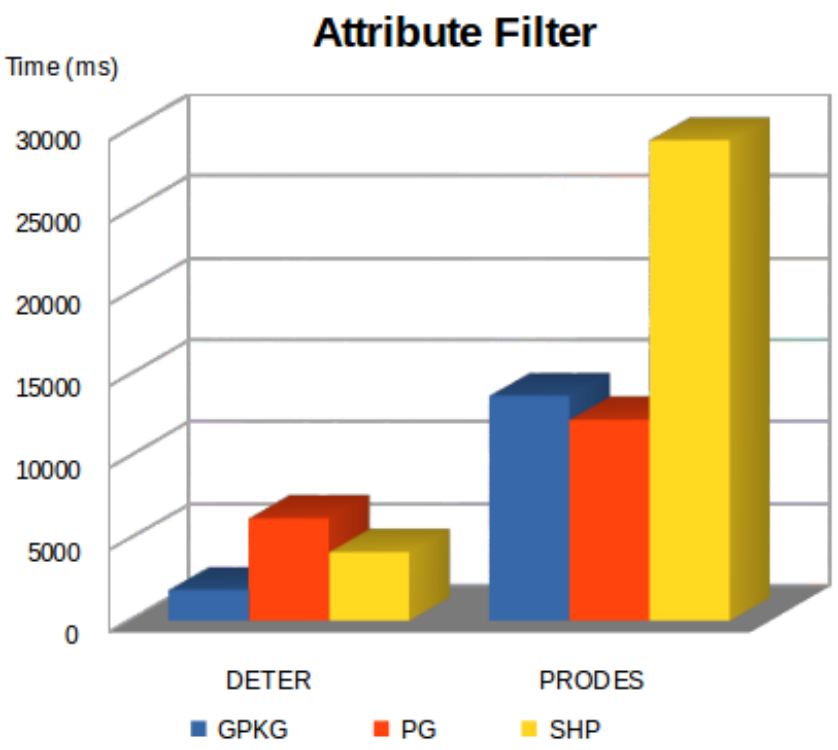
- Vector data sets:
  - DETER: 439,596 regions detected from 2004 and 2012
  - PRODES: 1,350,652 regions detected from 2001 to 2012

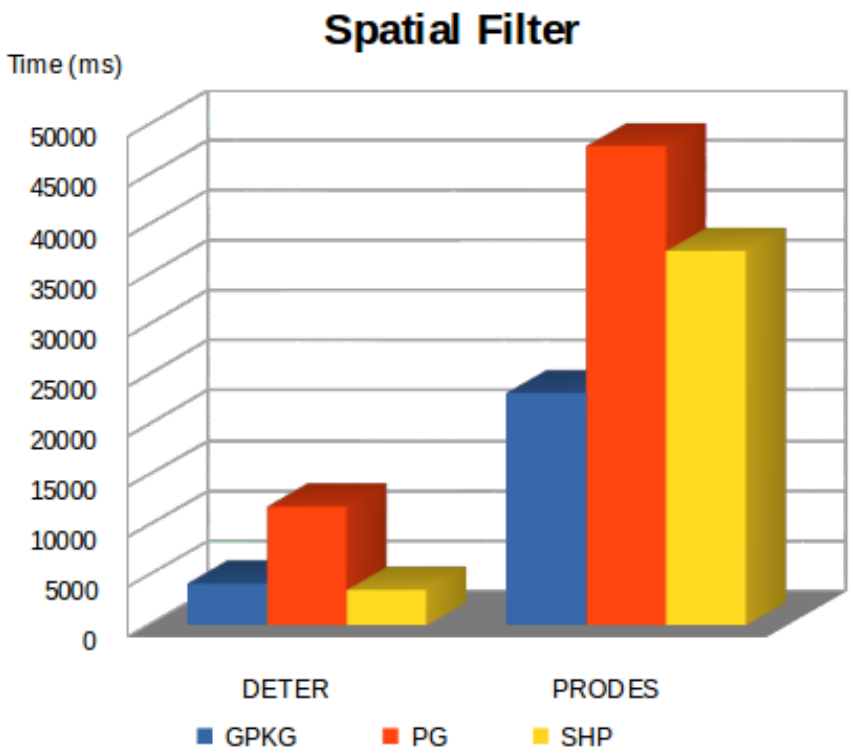


GPKG: Geopackage
PG: PostGIS / SHP: shapefile

Geopackage – Tests and Evaluation

- Attribute and spatial filters:

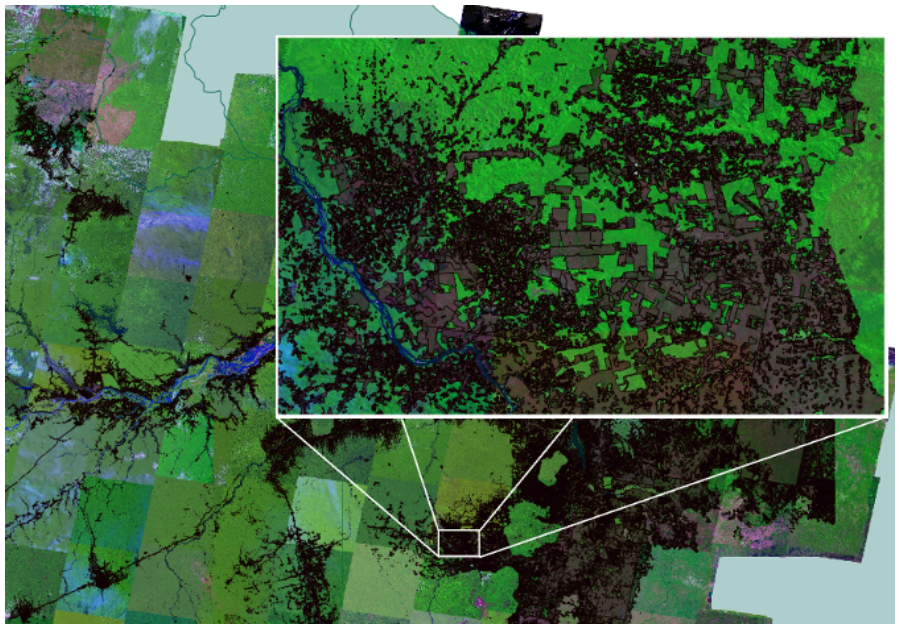


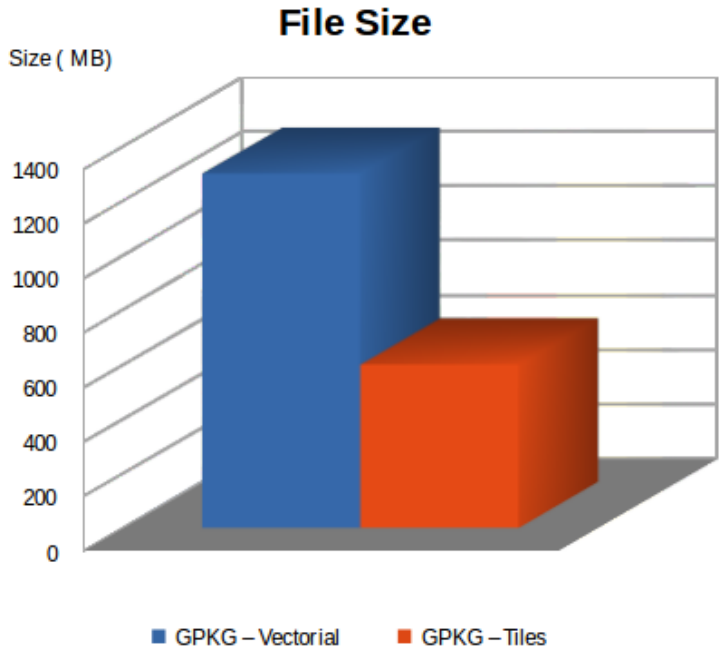


OGR library

Geopackage – Tests and Evaluation

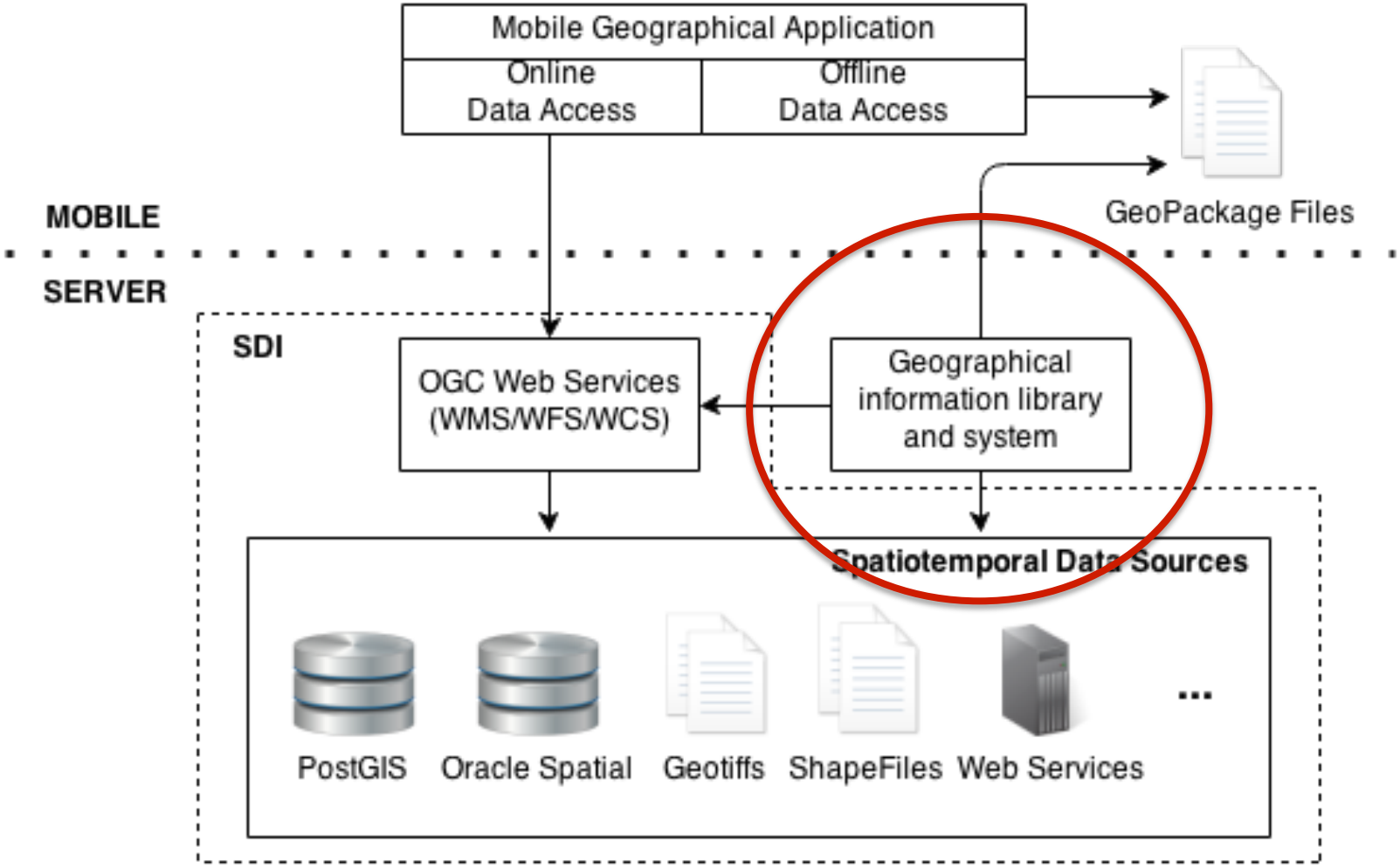
- Raster tiles: PRODES + Lansat 5
  - Pyramid with 10 levels and tiles of 256 x 256





Mobile Atlas Creator

Mobile - Architecture



Terralib e TerraView 5

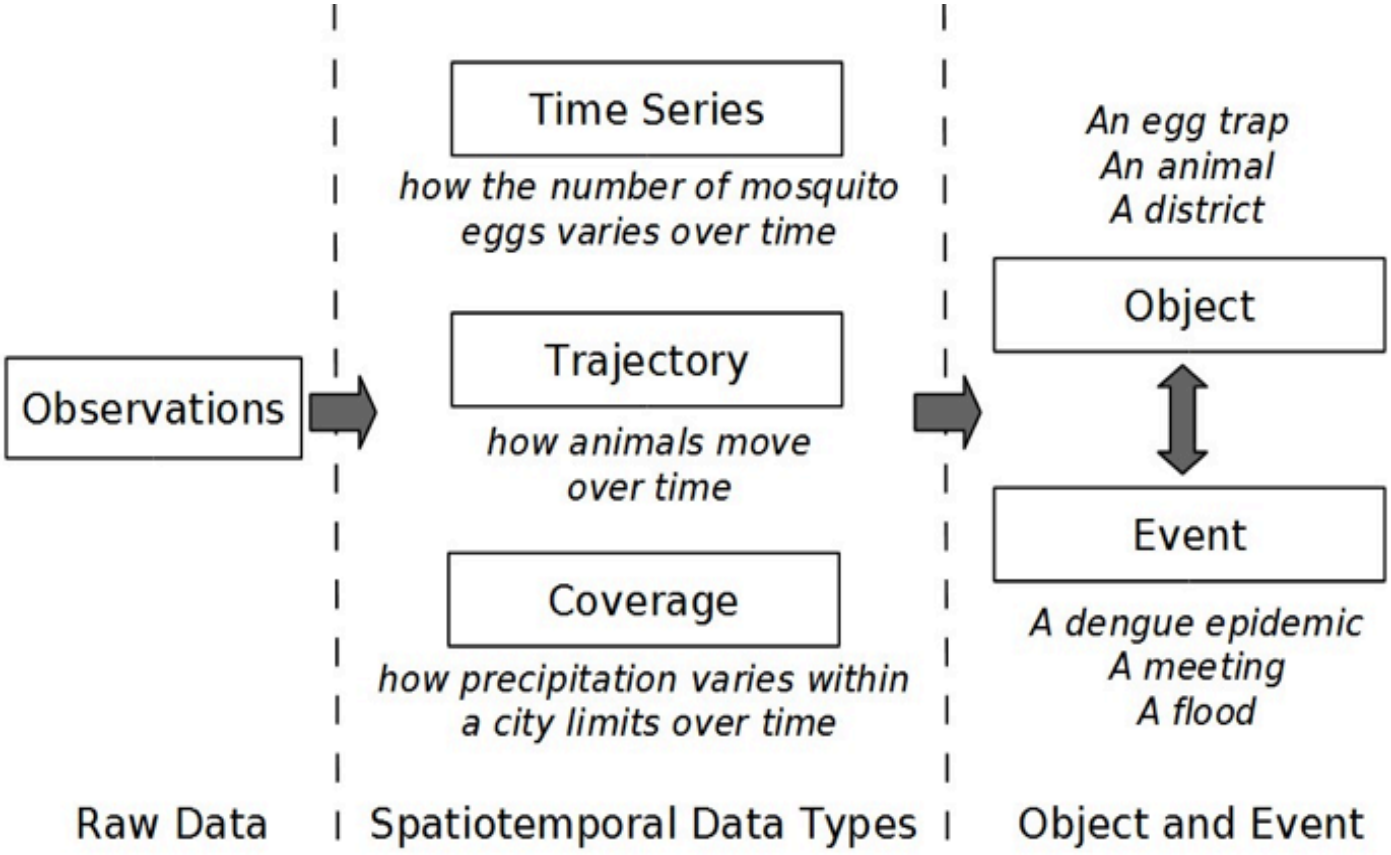
- Terralib functions and TerraView Plugin para gerar Geopackage files:
  - Vector and raster tiles

Mobile – Next steps

- Criação de um grupo de trabalho/pesquisa nessa área
- Primeiro protótipo => aplicativo para Isabel e Silvana levarem para campo em setembro de 2014.
  - Bira e Mané / Fernando / Isabel e Silvana / Alunas
- Bolsa IC : Karine e Isabel
- Outros: Nina do Exército
- Vários outros desafios da arquitetura:
  - Sincronização de dados
  - Trajetórias
  - Visualização temporal
  - Etc...

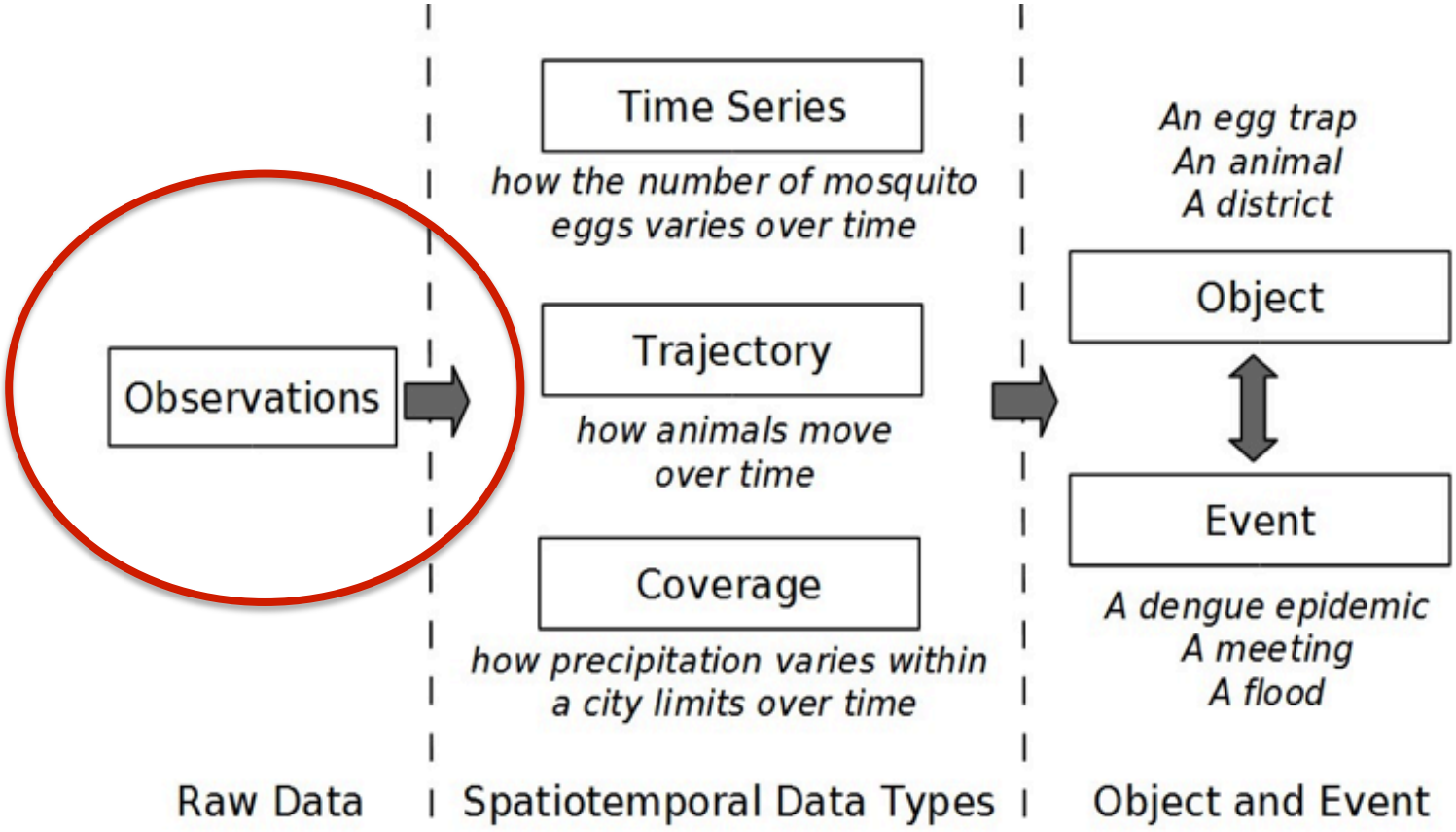
RDF vocabulary for spatiotemporal observation data sources

Observation-Based Model for SpatioTemporal Data



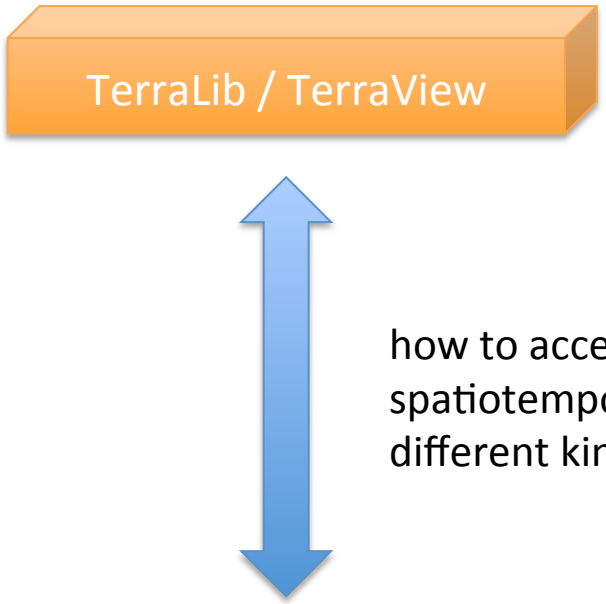
(Ferreira et al 2013)

Observation-Based Model for SpatioTemporal Data



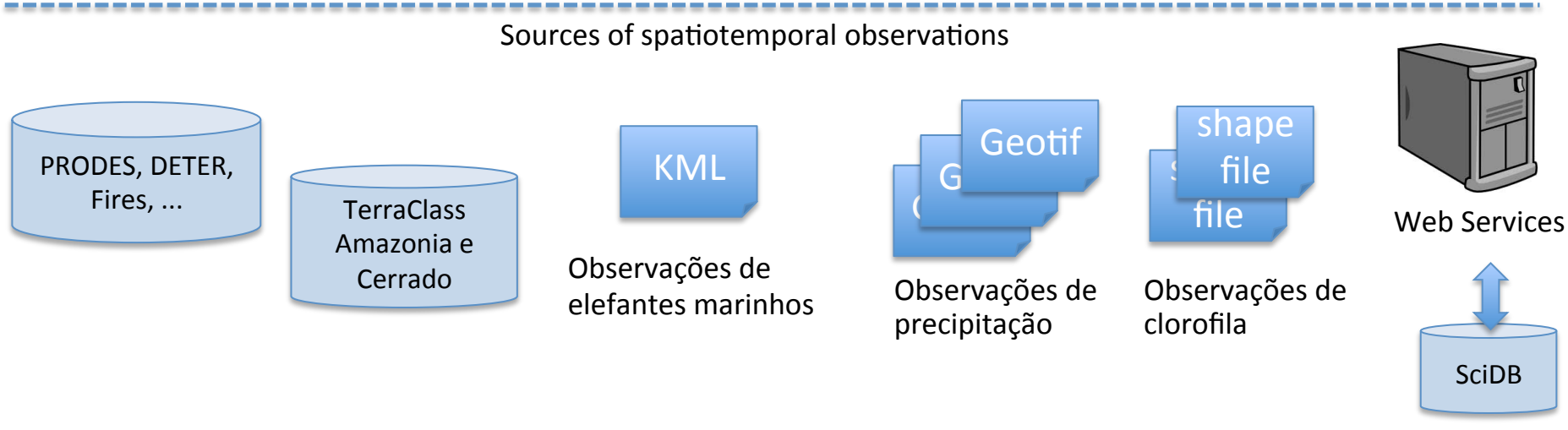
(Ferreira et al 2013)

The Problem

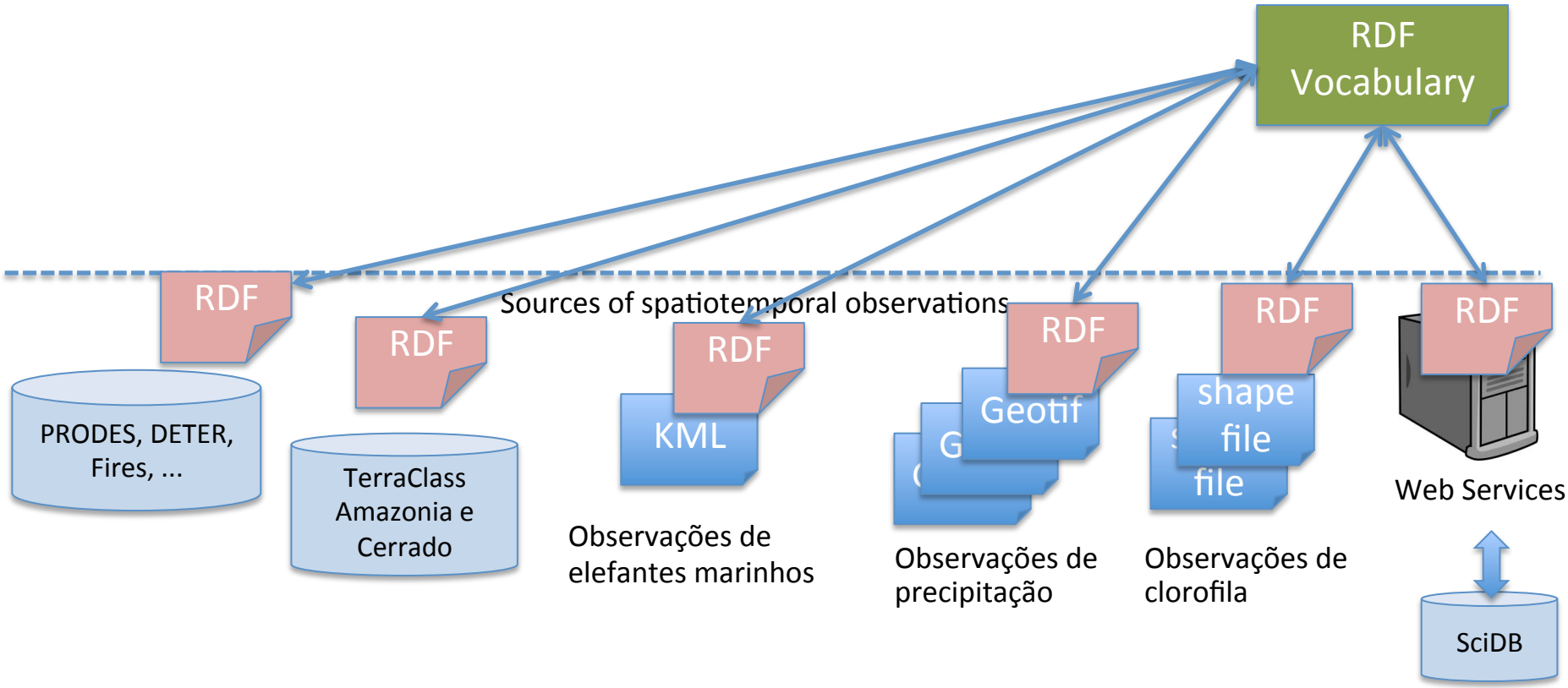

TerraLib / TerraView
Observation-Based Model for SpatioTemporal Data
how to access and combine spatiotemporal observations from different kinds of data sources
Sources of spatiotemporal observations
PRODES, DETER, Fires, ...
TerraClass Amazonia e Cerrado
KML
Observações de elefantes marinhos
Geotif
Observações de precipitação
shape file
file
Observações de clorofila
Web Services
SciDB

The Problem

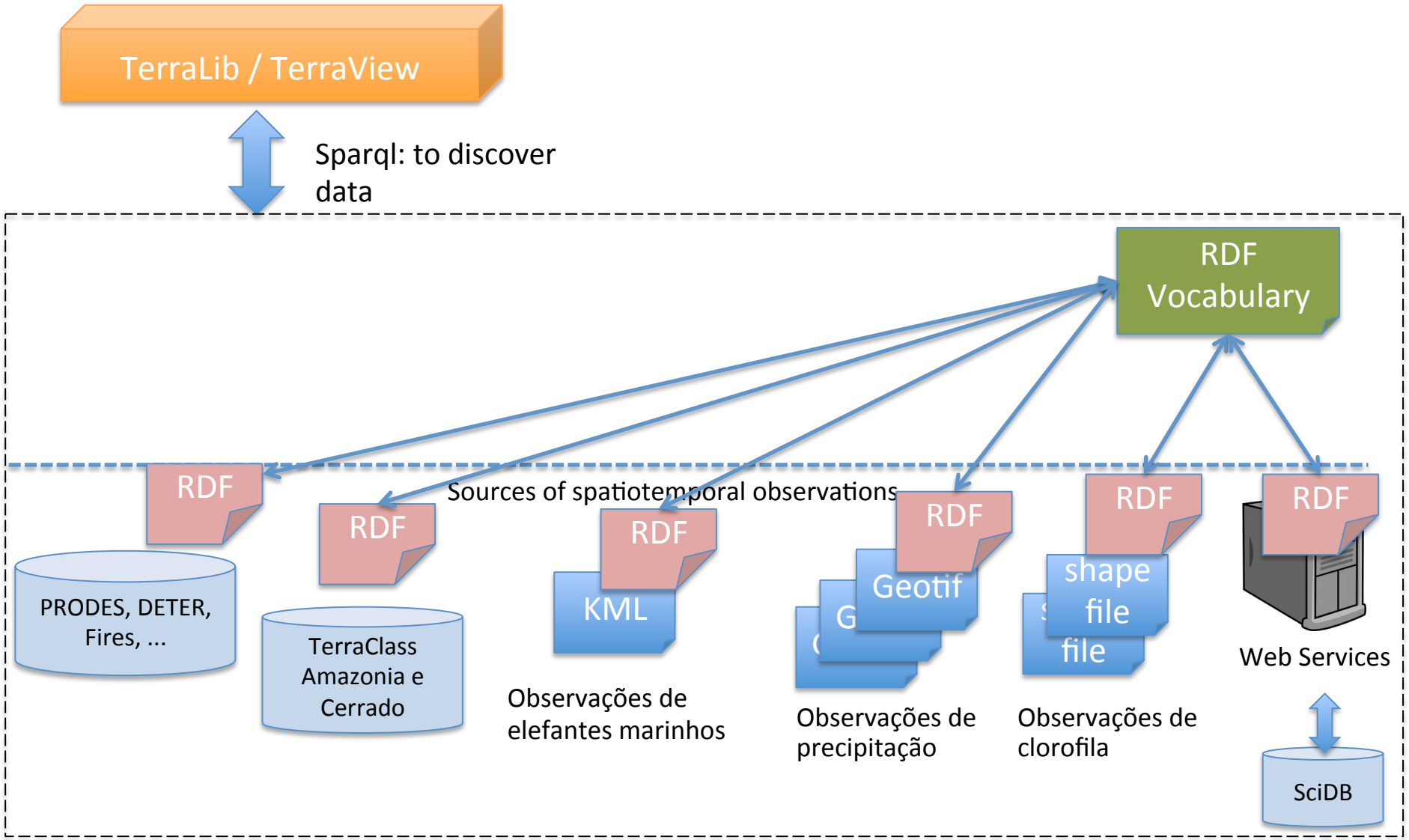
- Data sources store and provide observations about space, time and theme.
- Observation sources: raw data => without strong semantic
- GIS and other applications are responsible for giving semantics and deal with them. Semantics are necessary because operations are specific for each data type.



Idea: Semantic Web / RDF / Etc...



Idea: Semantic Web / RDF / Etc...



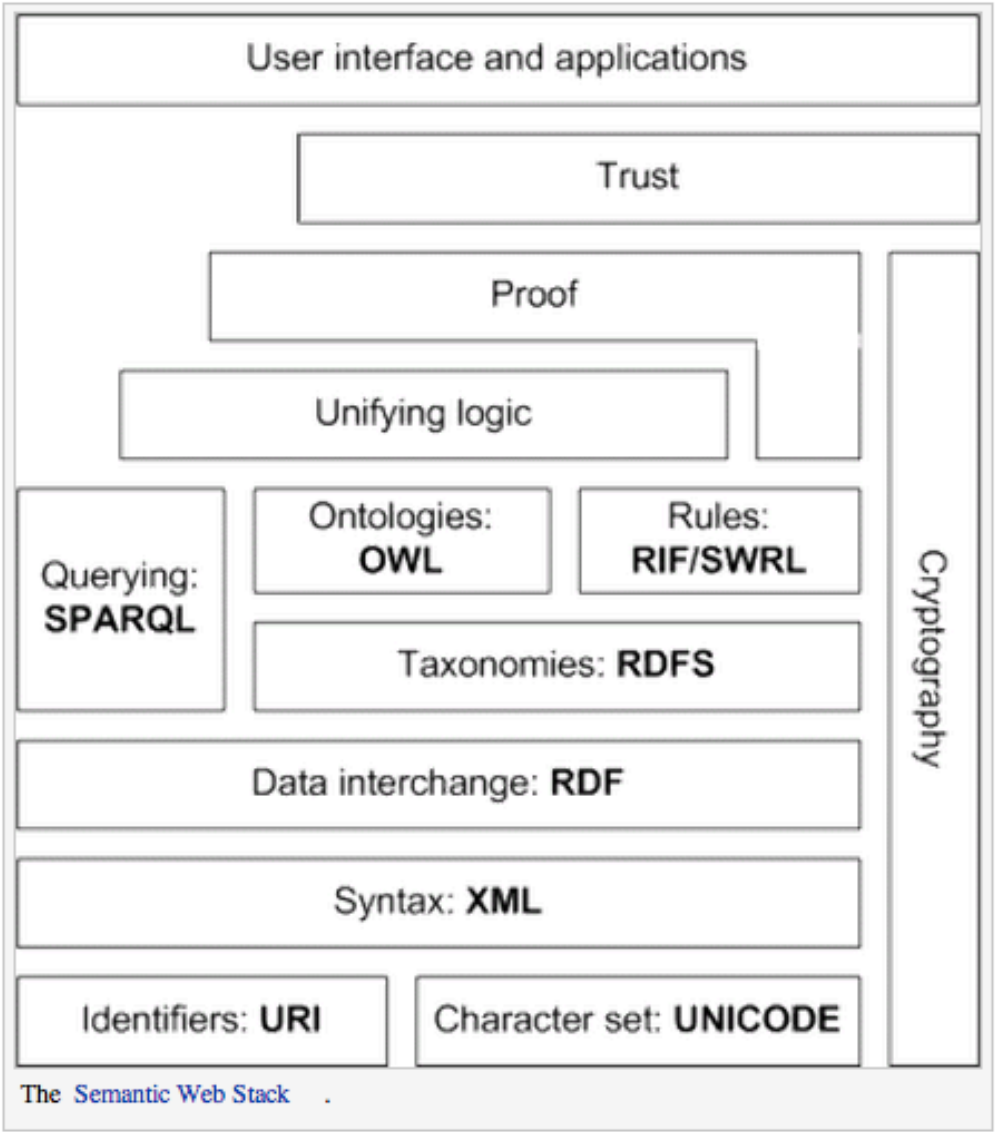
Ideas…

- Não vamos transformar os dados para RDF (pelo menos por enquanto…) como LinkedGeoData, GeoNames, etc…
- Vamos propor um vocabulário para descrever o dado (metadado):
  - Examples: Dublin Core is a set of predefined properties for describing documents: ex.: contributor, language, publisher, etc.
- Examples of Geo Vocabularies: GeoOWL, W3C Basic Geo Vocabulary, NeoGeo Vocabulary, GeoSPARQL (OGC standard)

- Nosso RDF Vocabulary: baseado no OGC O&M (propriedades observadas, tempo de observação, tempo de validação, …, etc…) e no OGC GeoSPARQL.

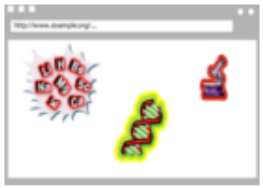
Concepts…

Semantic Web



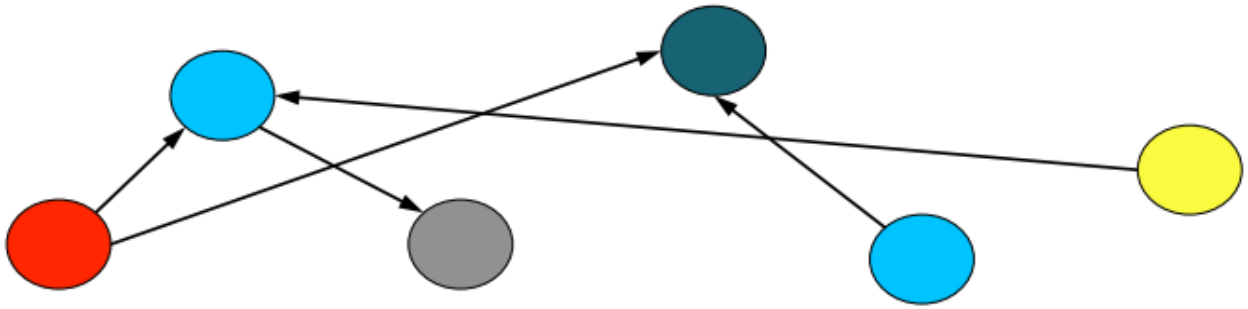
The Semantic Web Stack .

Semantic Web



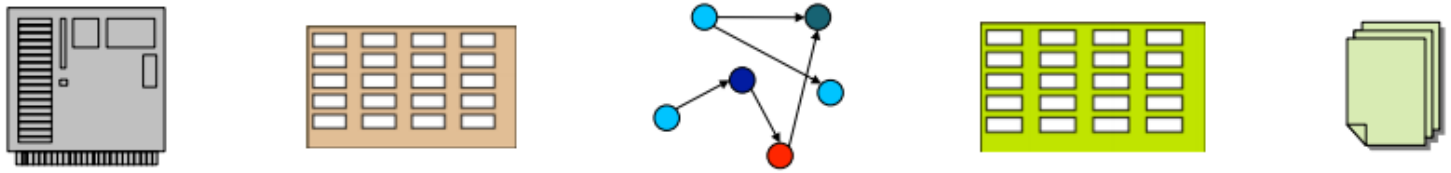
Applications

RESTful API
SPARQL,
Inferences
…



Data represented in RDF with extra knowledge (RDFS, SKOS, RIF, OWL,…)

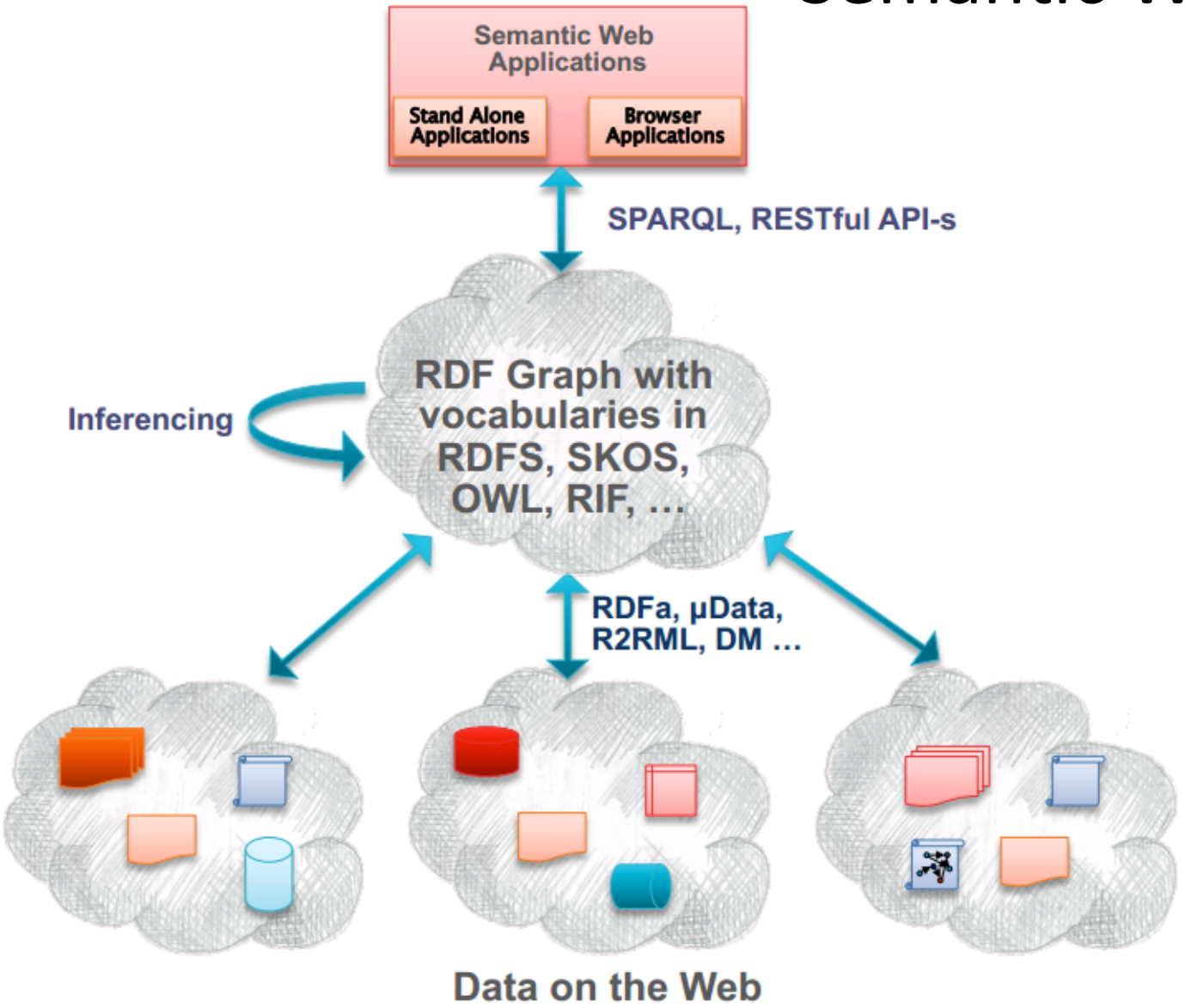
R2RML,
RDFa,
…



Data in various formats

[Tutorial Semantic Web W3C 2012]

Semantic Web



[Tutorial Semantic Web W3C 2012]

RDF

- *Resource Description Framework*
- RDF is a framework for describing resources on the web
- RDF is a fundamental standard of the Semantic Web.
- RDF is designed to be read and understood by computers
- RDF is written in XML
- RDF is a part of the W3C's Semantic Web Activity
- RDF is a W3C Recommendation
- RDF describes resources with classes, properties, and values.
- Example: describing properties for shopping items, such as price and availability.

[W3C school tutorials]

RDF

```
<?xml version="1.0"?>

<rdf:RDF
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:cd="http://www.recshop.fake/cd#">

<rdf:Description
rdf:about="http://www.recshop.fake/cd/Empire Burlesque">
  <cd:artist>Bob Dylan</cd:artist>
  <cd:country>USA</cd:country>
  <cd:company>Columbia</cd:company>
  <cd:price>10.90</cd:price>
  <cd:year>1985</cd:year>
</rdf:Description>

</rdf:RDF>
```

RDF Schema

- RDF Schema provides the framework to describe application-specific classes and properties.
- Classes in RDF Schema are much like classes in object oriented programming languages.
- RDF Schema is used to define a vocabulary for use in RDF models. In particular, it allows you to define the classes used to type resources and to define the properties that resources can have.

RDF Schema

```
<?xml version="1.0"?>

<rdf:RDF
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xml:base="http://www.animals.fake/animals#">

<rdf:Description rdf:ID="animal">
  <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
</rdf:Description>

<rdf:Description rdf:ID="horse">
  <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
  <rdfs:subClassOf rdf:resource="#animal"/>
</rdf:Description>

</rdf:RDF>
```

RDF Triples

- To do the link among resources!
- A labelled connection between two resources
- RDF triples form a directed, labeled graph (the best way to think about them!)

[Tutorial Semantic Web W3C 2012]

RDF triples (cont.)

- An RDF Triple (s,p,o) is such that:
  - "s", "p" are URI-s, ie, resources on the Web; "o" is a URI or a literal
    - "s", "p", and "o" stand for "subject", "property", and "object"
  - here is the complete triple:

```
(<http://…isbn…6682>, <http://…/original>, <http://…isbn…409X>)
```

- *RDF* is a general model for such triples (with machine readable formats like RDF/XML, Turtle, N3, RDFa, Json, …)

[Tutorial Semantic Web W3C 2012]

How to “assign” RDF data to resources

- This is important when the RDF data is used as “metadata”
- Some examples:
  - copyright information for your photographs
  - is a Web page usable on a mobile phone and how?
  - bibliographical data for a publication
  - annotation of the data resulting from a scientific experiment
  - Etc
- POWDER services: see the tutorial!!!!!!

[Tutorial Semantic Web W3C 2012]