

RUTGERS
Rutgers Business School
Newark and New Brunswick

38th World Continuous Auditing & Reporting Symposium



November 4&5, 2016

Rutgers Business School, Newark, NJ 07102

GeoXBRL: A Web-based Standard for Geospatial and Business Taxonomies

Prof. Dr. Paulo Caetano da Silva
paulo.caetano@pro.unifacs.br
Msc. Marcio Alexandre

Saturday, november 5 2016

Agenda

- ▶ Geographic Information System
- ▶ XBRL
- ▶ Scenario
- ▶ Geographic XBRL Linkbase
- ▶ Sample Application

What's GIS - Geographic Information System?

- GIS has been researched since 60's;
- GIS means many technologies together for:
 - Visualization,
 - Maintenance,
 - Distribution and
 - Information Retrieval.



What's GIS?

- Spurred by:
 - High-speed internet;
 - High-performance processing in devices;
 - Web 2.0:
 - User interaction has been increased;
- New tools and apps has came up:
 - Geovisualization-based Systems in many domains;

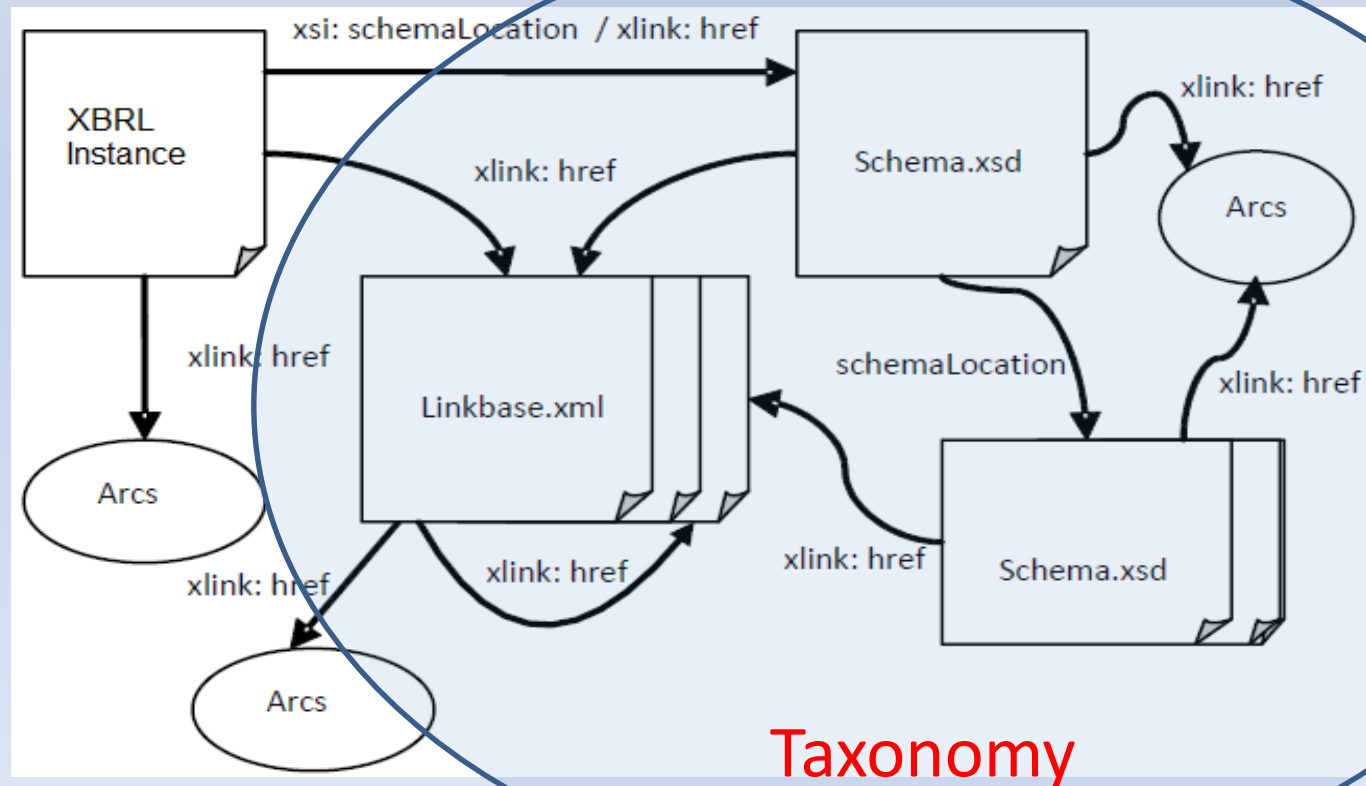
There is an increasing demand for continuous auditing and financial analysis through geovisualization.



XBRL

- XBRL Taxonomy

- XML instance, XML Schema, Xpath, Xlink, Namespaces, ...



Geovisualization-based Financial System

- Related Works:
 - [Lux, 1997] Exhibition of the GDP (Gross Domestic Product) each country, over a global map;
 - [Sylvester, 2008] Geovisualization of market behaviour per area (growth or decline);
 - [Teodoro, 2012] Tax management, visualization of the delinquency areas;

None of these works
address **XBRL**



Actual Scenario – XBRL

- **Traditional XBRL** data only identify the company that sends the financial reporting, but these data do **NOT** support any geoprocessing.

Filing Date: 2014-11-05 Form Type: 10-Q Description: Quarterly report

Document and Entity Information

Consolidated Balance Sheets

Consolidated Balance Sheets (Parenthetical)

Consolidated Statements of Operations (Unaudited)

Consolidated Statements of Comprehensive Income (Unaudited)

Consolidated Statements of Cash Flows (Unaudited)

Note 1. Basis of Presentation

Note 2. Summary of Significant Accounting Policies

Note 3. Intangible Assets and Goodwill

Note 4. Stockholders' Equity

Document and Entity Information	9 Months Ended Sep. 30, 2014	Nov. 05, 2014
Document And Entity Information		
Entity Registrant Name	ISSUER DIRECT CORP	
Entity Central Index Key	0000843006	
Document Type	10-Q	
Document Period End Date	Sep. 30, 2014	
Amendment Flag	false	
Current Fiscal Year End Date	--12-31	
Is Entity a Well-known Seasoned Issuer?	No	
Is Entity a Voluntary Filer?	No	
Is Entity's Reporting Status Current?	Yes	
Entity Filer Category	Smaller Reporting Company	
Entity Common Stock, Shares Outstanding		2,085,944
Document Fiscal Period Focus	Q3	
Document Fiscal Year Focus	2014	

Main idea

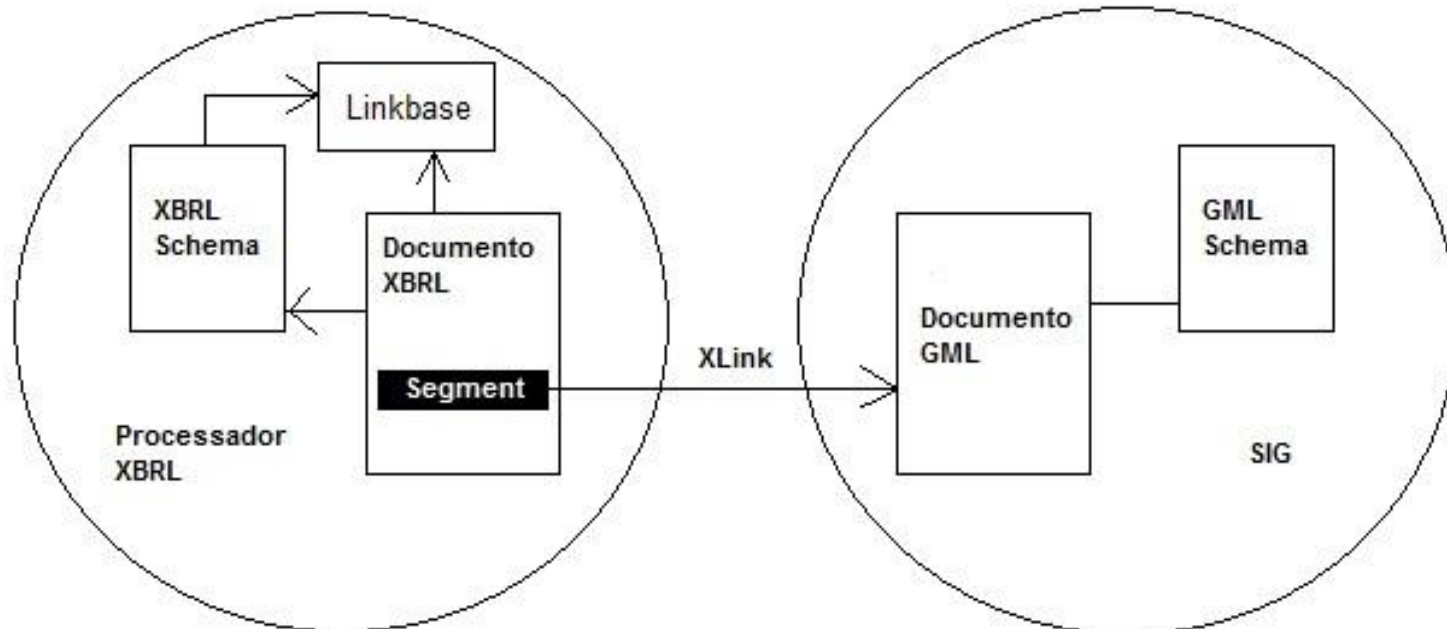
**Geospatial data
represented within XBRL
taxonomies based on
Xlink, XBRL definitions
and GML**

First Approach

XBRL GIS – INTEGRATING GEOGRAPHIC INFORMATION IN XBRL INSTANCE DOCUMENTS

XBRL GIS

- Adopted technologies:
 - xLink;
 - GML Instance;
 - XBRL Instance;



XBRL GIS - PRÓS

- Integration about two XML-based languages:
 - GML
 - XBRL
- Preservation of the specifications:
 - GML 3.2/3.3;
 - XBRL 2.1;
- Separation of the complexity inherent to development of both technologies;
- Link between instances developed in common language;

Extending the idea

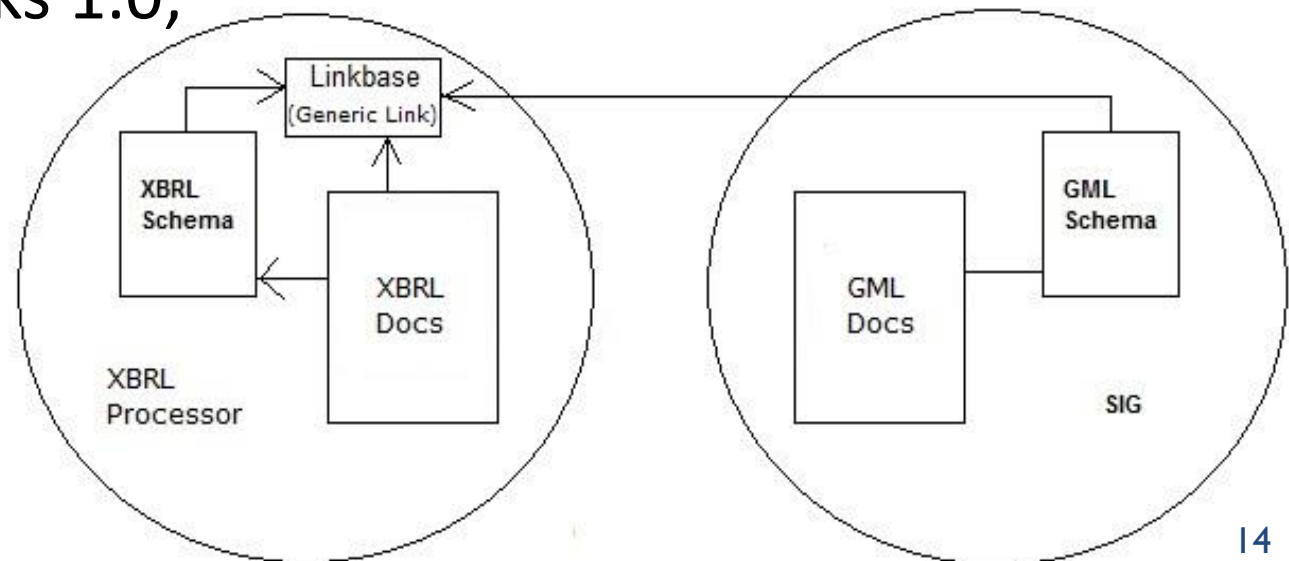
Geographic XBRL Linkbase: A new Approach to Financial Reporting and Analysis

Geographic XBRL Linkbase

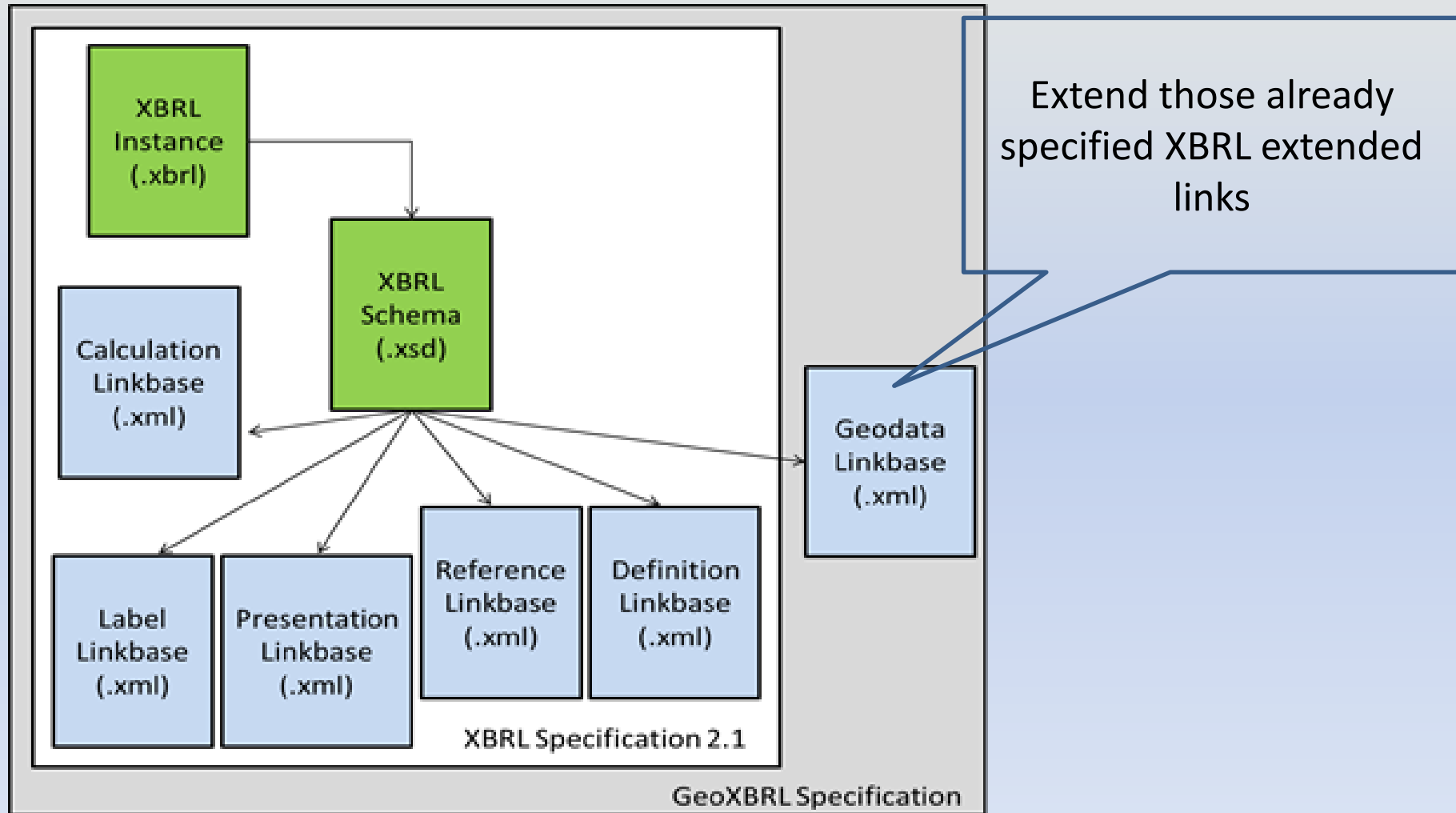
- Objectives:
 - Geodata definition by XBRL Taxonomy developer;
 - Manipulation of the geospatial elements into XBRL taxonomy;
- Found Scenario:
 - XBRL developer does **not** have access to geospatial concepts contained in the GML Schemas;
 - It is not possible to :
 - Define any geospatial elements;
 - Manipulate the geodata freely.

Geographic XBRL Linkbase

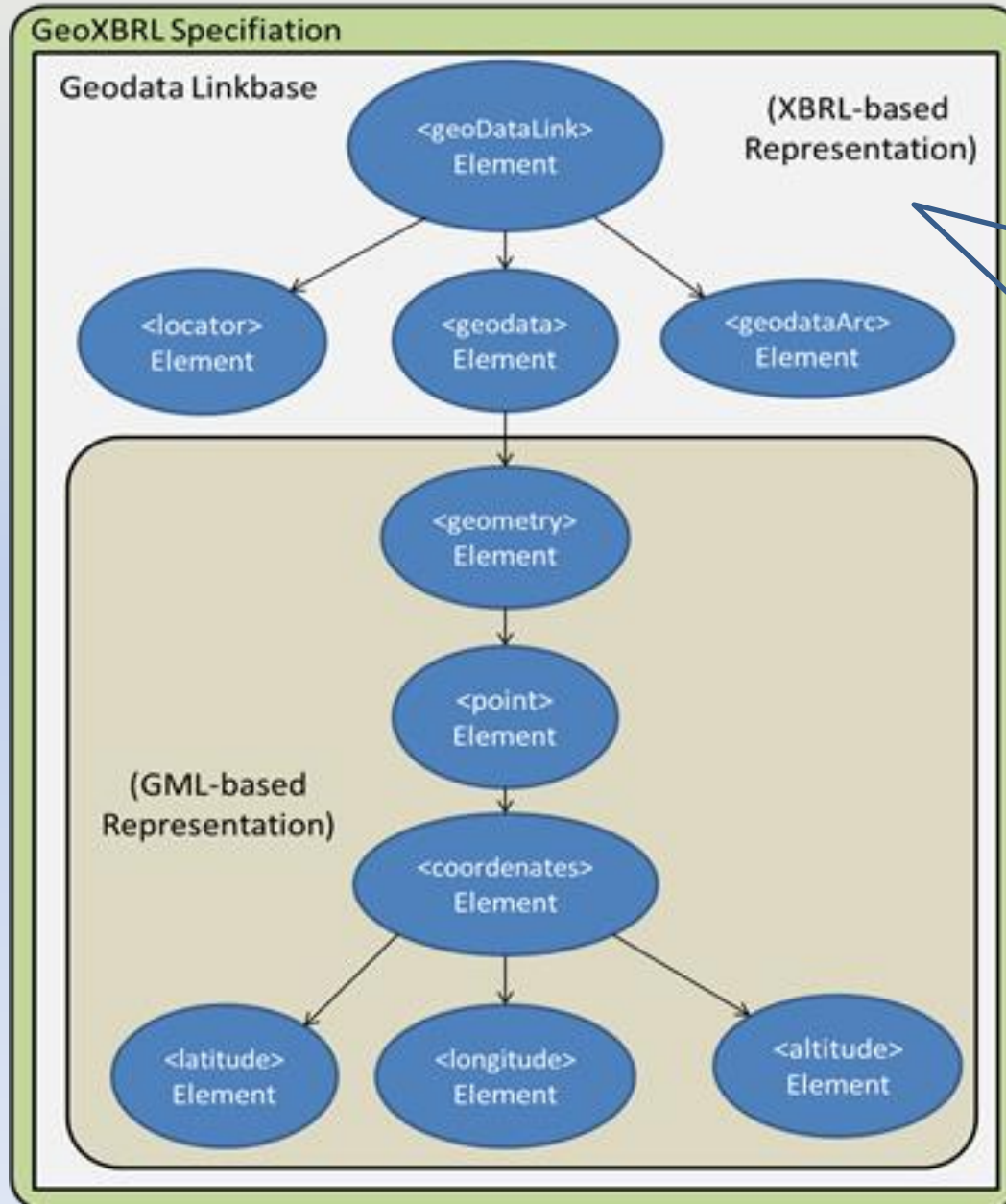
- Technologies adopted in solution:
 - XLink (simple, extended);
 - Linkbase
 - XML Schema;
 - GML Taxonomy 3.2/3.3;
 - XBRL Taxonomy 2.1;
 - Generic Links 1.0;



GeoXBRL

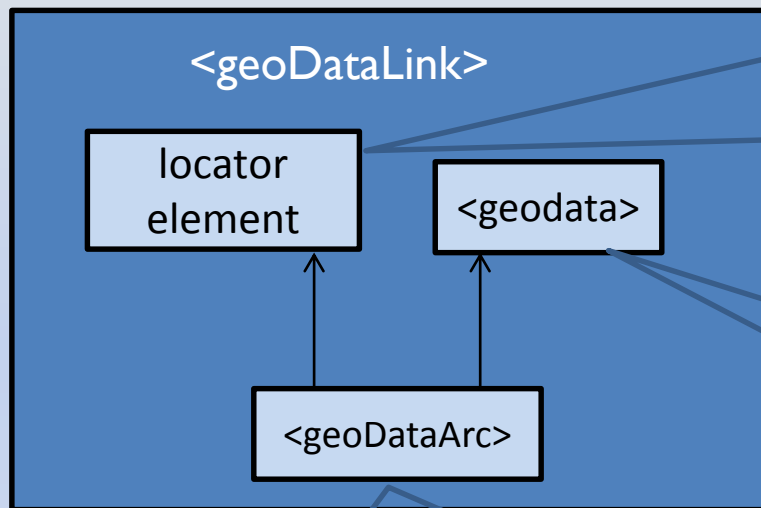


GeoXBRL



Geospatial data can be represented within XBRL taxonomies based on XLink and XBRL definitions

GeoXBRL – GeoData Linkbase



The locator element is an already specified element from Extended Link definitions, whose role is to locate another concept within XBRL taxonomies (e.g. it could locate the company that sends the business statement)

establishes a linking between
`<locator>` and `<geodata>`

A element specified to be a resource (i.e. a XML fragment defined by taxonomist that relates up to other XBRL elements, creating the geospatial semantic). The `<geodata>` element has to contain GML based data (e.g. it can define a topographic position).

Thus a relationship between XBRL and GML elements is done.

GeoData Specification: GeodataLink

The <geoDataLink> is a generic link based on XBRL Generic Link Specification

```
31 |
32 | <!-- geodataLink Element -->
33 | <element name="geodataLink" type="gen:link"
34 | substitutionGroup="xl:extended">
35 | <annotation>
36 | | <documentation>
37 | | | Geospatial Extended Link
38 | | </documentation>
39 | </annotation>
40 | </element>
```

GeoData Specification: GeodataLink

```

42 <!-- Geodata Element -->
43 <element name="geodata" substitutionGroup="xl:resource">
44   <annotation>
45     <documentation>
46       Definition of the geodata resource element.
47     </documentation>
48   </annotation>
49   <xsd:complexType mixed="true">
50     <xsd:complexContent mixed="true">
51       <xsd:all minOccurs="1" maxOccurs="unbounded">
52         <element ref="gml:_Geometry" />
53       </xsd:all>
54     </xsd:complexContent>
55   </xsd:complexType>
56   <xsd:attribute name="id" type="ID" use="optional"/>
57   <xsd:anyAttribute
58     namespace="http://www.w3.org/XML/1998/namespace"
59     processContents="lax"/>
60 </element>

```

Minimum occurrence of a
<geodata> element must be defined
as one

This new element
(ref="gml:Geometry") is required as a
part of Geodata Linkbase (sub element
of <geodata> element), which must
reference GML based elements;

The namespace "gml" indicates this
element is from GML schema

GeoData Specification: GeodataLink

```
61  
62 <!-- geodataArc Element -->  
63 <element name="geodataArc" type="gen:genericArcType" >  
64   <annotation>  
65     <documentation>  
66       Arc between locator and Geodata Elements  
67     </documentation>  
68   </annotation>  
69 </element>  
70 </schema>
```

The Generic Links specification has defined a new linking type (called genericArcType), extending arcType to elements not specified by XBRL 2.1

The <geoDataArc> element has been specified to create a relationship between those elements contained in Geodata Linkbase, of which one of them is a GML-based data.

Sample: Facebook GeoXBRL

- To exemplify the GeoXBRL usage, a Geodata linkbase has been created and integrated in a Facebook XBRL taxonomy 2016, which is available on US SEC website

```

1 <?xml version='1.0' encoding='iso-8859-1'?>
2 <link:linkbase
3   xsi:schemaLocation="http://www.xbrl.org/2003/linkbase
4     http://www.xbrl.org/2003/xbrl-linkbase-2003-12-31.xsd"
5   xmlns:link="http://www.xbrl.org/2003/linkbase"
6   xmlns:xlink="http://www.w3.org/1999/xlink"
7   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
8   xmlns:geoxbrl="http://www.xbrlframework.com/geoxbrl/geoxbrl 1.0.xsd">
9   <link:roleRef xlink:href="http://www.xbrl.org/2008/generic-link.xsd#standard-link-role"
10     xlink:type="simple" roleURI="http://www.xbrl.org/2008/role/link"/>
11   <geoxbrl:geodataLink xlink:type="extended">
12     <link:loc xlink:type="locator" xlink:href="http://xbrl.sec.gov/dei/2014/dei-2014-01-31.xsd#dei:dei_EntityRegistrantName"
13       xlink:label="dei_EntityRegistrantName"/>
14     <geoxbrl:geodata xlink:type="resource" xlink:label="fb geodata" id="fb_geodata">
15       <gml:geometry xlink:label="fb_geometry" id="fb_CompanyGeometry">
16         <gml:point xlink:label="fb_point" id="fb_point">
17           <gml:coord xlink:label="fb_coordinates" id="fb_coordinates">
18             <gml:x xlink:label="fb_latitude" id="fb_latitude">37.4834075</gml:x>
19             <gml:y xlink:label="fb_longitude" id="fb_longitude">-122.1517019,17</gml:y>
20             <gml:z xlink:label="fb_altitude" id="fb_altitude">0</gml:z>
21           </gml:coord>
22         </gml:point>
23       </gml:geometry>
24     </geoxbrl:geodata>
25     <geodataArc xlink:type="arc" xlink:arcrole="http://www.xbrlframework.com/geoxbrl/arcrole/concept-geospatial"
26       xlink:from="dei_EntityRegistrantName" xlink:to="fb geodata"/>
27   </geoxbrl:geodataLink>
28 </link:linkbase>
  
```

The geographic data container

The locator of financial facts or other XBRL definitions

- The geo datas
- Sub elements based on GML

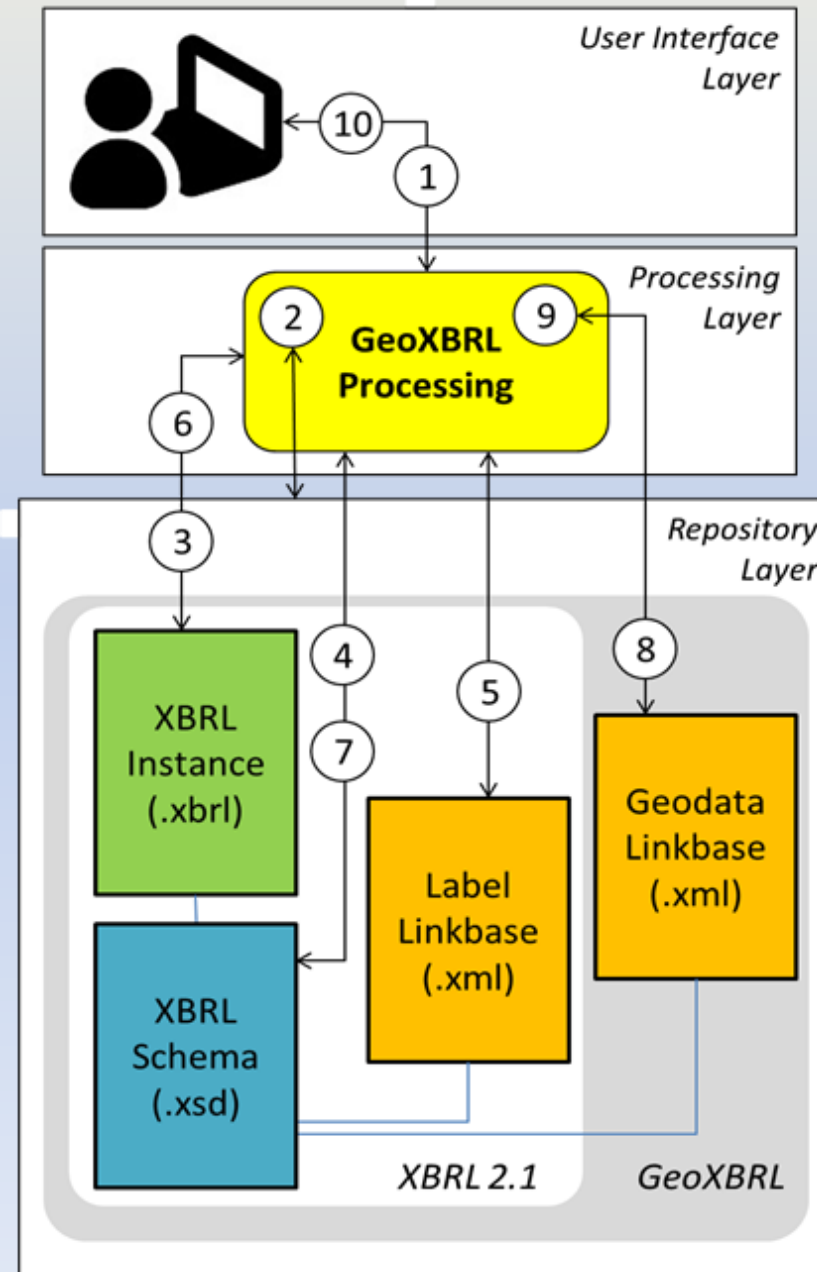
All attribute values must be defined by XBRL taxonomy developer

The link

A GeoXBRL - based Web Application

A web application has been built in order to show how data from GeoXBRL specification can be used for providing new geodata inputs for the financial auditing and analysis, in a standardized way.

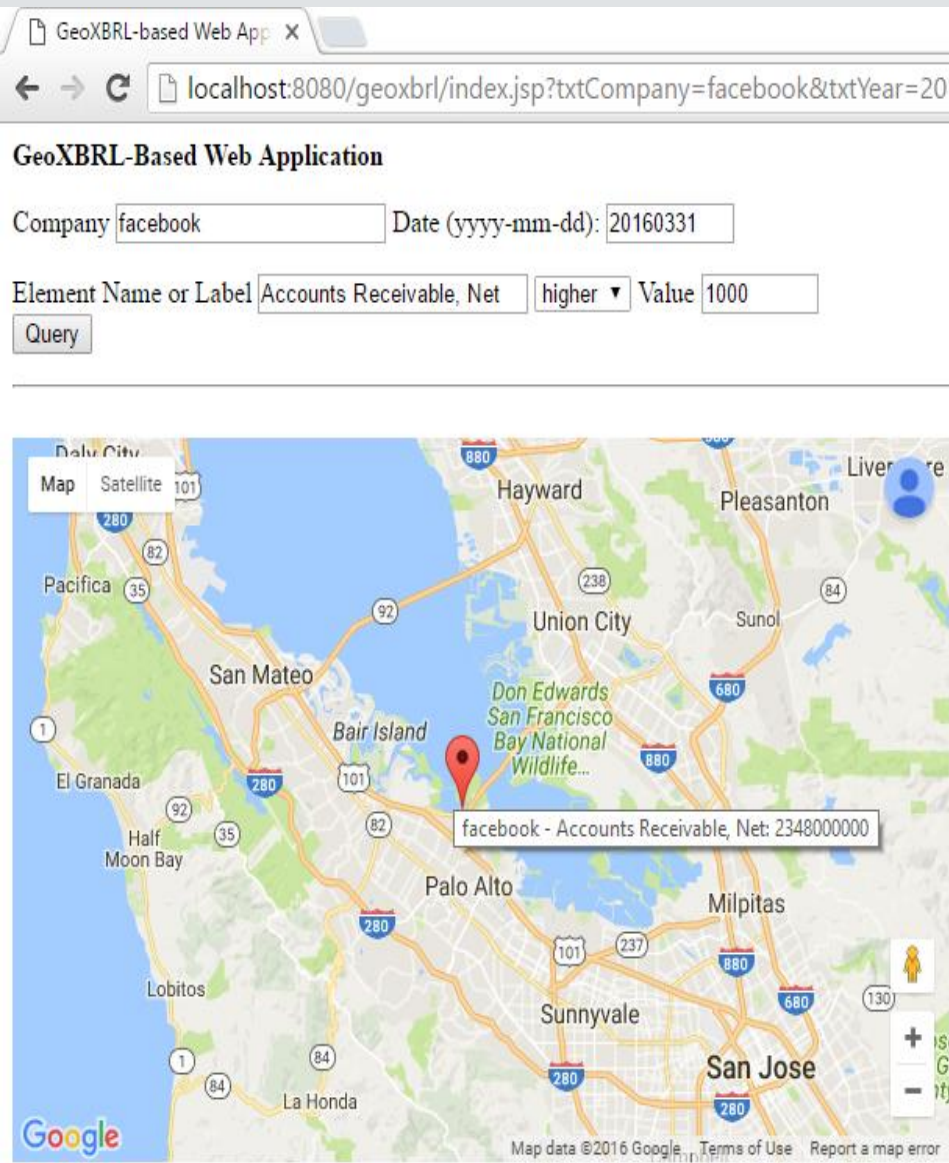
A GeoXBRL-based Web Application



A GeoXBRL-based Web Application

- Some XBRL files have been downloaded from SEC website.
- Companies from different cities and dates, whose business activities is also different, such as:
 - Facebook, Microsoft, Apple, Yahoo, Google, Oxford Technologies, Amerisource Bergen, Black Berry, CVS Health, General Motors, Mc Donald, United Health, Starbucks, Opko Health, FMC, Technologies, Amcon, Big Cat Energy, APX Group.
- Following the GeoXBRL specification, for each company's taxonomy a Geodata Linkbase file has been built and added in it.
- Google Maps API has been used for providing a virtual map as a user data output.

A GeoXBRL-based Web Application



The screenshot shows a web browser window with the title "GeoXBRL-based Web App". The address bar displays the URL: `localhost:8080/geoxbrl/index.jsp?txtCompany=facebook&txtYear=20160331`.

The application interface includes the following elements:

- Company:** A text input field containing "facebook".
- Date (yyyy-mm-dd):** A text input field containing "20160331".
- Element Name or Label:** A dropdown menu showing "Accounts Receivable, Net".
- higher:** A dropdown menu showing "higher".
- Value:** A text input field containing "1000".
- Query:** A button to execute the query.

Below the form is a map of the San Francisco Bay Area. A red pin is placed on the map, and a tooltip displays the text: "facebook - Accounts Receivable, Net: 2348000000". The map shows various cities including San Francisco, San Jose, and Palo Alto, along with major highways and geographical features like the Golden Gate Bridge and San Francisco Bay.

- There are XBRL files from Facebook in the repository that the financial element (whose label is “Accounts Receivable, Net”) is higher than 1000 and the date is 2016/03/31.

A GeoXBRL-based Web Application

GeoXBRL-based Web App

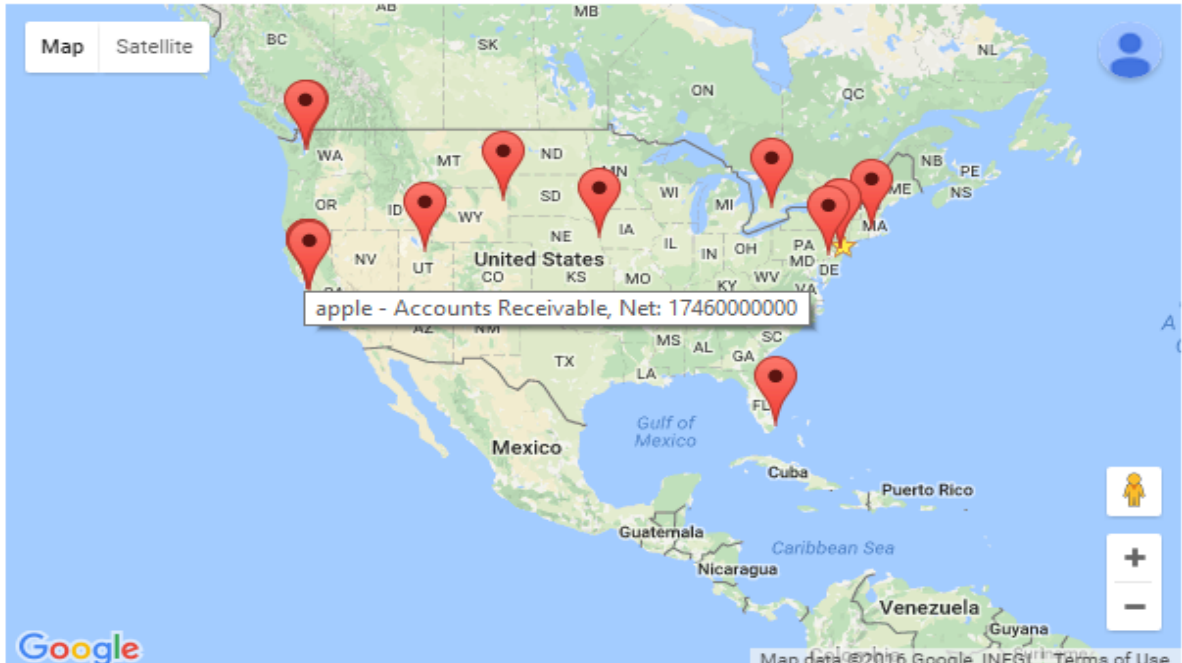
localhost:8080/geoxbrl/index.jsp?txtCompany=all&txtYear=all&txtEle

GeoXBRL-Based Web Application

Company Date (yyyy-mm-dd):

Element Name or Label Value

1. Company: facebook (Data: 20130930). Coordinates: 37.484795, -122.148265.
2. Company: facebook (Data: 20160331). Coordinates: 37.484795, -122.148265.
3. Company: microsoft (Data: 20130930). Coordinates: 47.639626, -122.128372.
4. Company: apple (Data: 20140927). Coordinates: 37.331831, -122.029600.
5. Company: yahoo (Data: 20160331). Coordinates: 37.417190, -122.025020.
6. Company: google (Data: 20151231). Coordinates: 37.419738, -122.087715.
7. Company: oxfordtechnologies (Data: 20130930). Coordinates: 40.599714,



Map Satellite

apple - Accounts Receivable, Net: 17460000000

Google

Map data ©2016 Google, INEGI Terms of Use

- Search for all companies and all dates

Conclusion

- Geo XBRL is a Geospatial Representation in XBRL Context;
- Specification for Geospatial and Business data integration is a way of standardizing the relationships among geospatial and business data;
- Handling of Concepts from GML Schema within XBRL Taxonomy represents the possibility of defining the geospatial elements in XBRL taxonomies based on GML standard;

Conclusion

- Adaptable in Current XBRL Taxonomies:
 - it means the adaptability of the solutions in XBRL taxonomies already in use in the financial systems;
 - It means the GeoXBRL based representation does not affect the processing of those XBRL reporting already in use in business systems, because even though GeoXBRL is a new specification, its structure is based on international standards (i.e. XBRL 2.1, Generic Links 1.0 and GML 3.2/3.3);
 - **XBRL tools are easily adapted to handle Geo XBRL data**



Thanks!

<https://xbrlframework.wordpress.com>



Prof. Dr. Paulo Caetano da Silva
paulo.caetano@pro.unifacs.br
<http://www.ppgcomp.unifacs.br>

