

1. Very Basic XBRL Technical Primer

In this section take a very basic introductory look at the physical and logical details of XBRL and provided an over-arching framework that is helpful in pulling the details together. The goal is to provide you with a high-level understanding of XBRL and a path to greater understanding. We expose XBRL to you in layers with each level building on the previous. We are not going to teach you specific software applications in this document, you are on your own for finding the software you need.

We will not be covering the subtleties and nuances of XBRL here. We do provide a foundation upon which to build. You do not need to understand accounting or financial reporting to understand this section; but because many people understand the basics of a financial report and because this is targeted mainly at professional accountants and because I am a professional accountant; I will be providing a lot of financial reporting related examples.

1.1. How XBRL Works

For step one in your journey into XBRL-based digital financial reporting, I would suggest that you watch the popular video, *How XBRL Works*¹. The video will supply you with a very brief explanation as to what XBRL actually is and how it works.

In the next section, we are going to show you the ugly, technical details of XBRL. The good news is that you will never need to look at XBRL at this technical level ever again if you do not want to. That level is intended for consumption by a computer.

1.2. Hello World! (technical perspective)

If you don't like technical stuff, then skip this section, move on to the Hello World! (logical perspective). If you are curious about the technical details, read on.

Everyone these days knows what a hello world example is. We start our very basic primer with a *Hello World* example of XBRL. Consider this graphic below:

Property, Plant and Equipment, Net [Roll Up]	Period [Axis]	
	2020-12-31	2019-12-31
Property, Plant and Equipment, Net [Roll Up]		
Land	5,347,000	1,147,000
Buildings, Net	244,508,000	366,375,000
Furniture and Fixtures, Net	34,457,000	34,457,000
Computer Equipment, Net	4,169,000	5,313,000
Other Property, Plant and Equipment, Net	6,702,000	6,149,000
Property, Plant and Equipment, Net	295,183,000	413,441,000

What do you see? You see five items that add up to a total. Information is shown for two years. You can tell that this is a total because of the single and double underscores

¹ YouTube.com, Charles Hoffman, CPA, *How XBRL Works*, <https://www.youtube.com/watch?v=nATJBPOiTxM>

above and below the total value. The cell of the totals is green indicating that the items add up to the total.

The screen shot above was generated using XBRL. You can fiddle with that XBRL-based report using this rendering which was generated from the XBRL². What we are going to do is explain to you how the information above was represented in XBRL. In order to enable a computer work with the information, we need to put the information into machine-readable form. We will use the XBRL technical syntax. XBRL is a type of XML³. Don't worry about that now, just know that XBRL is XML.

XBRL Taxonomy

The following is a taxonomy schema that is used as we begin to represent the information from that graphic in machine readable XBRL form.

```
<?xml version="1.0" encoding="utf-8"?>
<schema
  xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:xbrli="http://www.xbrl.org/2003/instance"
  xmlns:helloWorld="http://www.xbrlsite.com/DigitalFinancialReporting/HelloWorld"
  targetNamespace="http://www.xbrlsite.com/DigitalFinancialReporting/HelloWorld">
  <element
    id="helloWorld_Land"
    name="Land"
    type="xbrli:monetaryItemType"
    substitutionGroup="xbrli:item"
    xbrli:periodType="instant" />
  <element
    id="helloWorld_BuildingsNet"
    name="BuildingsNet"
    type="xbrli:monetaryItemType"
    substitutionGroup="xbrli:item"
    xbrli:periodType="instant" />
  <element
    id="helloWorld_FurnitureAndFixturesNet"
    name="FurnitureAndFixturesNet"
    type="xbrli:monetaryItemType"
    substitutionGroup="xbrli:item"
    xbrli:periodType="instant" />
  <element
    id="helloWorld_ComputerEquipmentNet"
    name="ComputerEquipmentNet"
    type="xbrli:monetaryItemType"
    substitutionGroup="xbrli:item"
    xbrli:periodType="instant" />
  <element
    id="helloWorld_OtherPropertyPlantAndEquipmentNet"
    name="OtherPropertyPlantAndEquipmentNet"
    type="xbrli:monetaryItemType"
    substitutionGroup="xbrli:item"
    xbrli:periodType="instant" />
  <element
    id="helloWorld_PropertyPlantAndEquipmentNet"
    name="PropertyPlantAndEquipmentNet"
    type="xbrli:monetaryItemType"
    substitutionGroup="xbrli:item"
    xbrli:periodType="instant" />
</schema>
```

² Hello World example human readable rendering, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/evidence-package>

³ W3C, Extensible Markup Language (XML) 1.0 (Fifth Edition), <https://www.w3.org/TR/xml/>

Note the “name” in the XBRL in what is called the taxonomy schema shown above. You can go to that actual XBRL taxonomy schema⁴. Note that there is an element which has a “name” for every line in the graphic on the prior page. You see elements with the name “Land”, “BuildingsNet”, “FurnitureAndFixturesNet”, “ComputerEquipmentNet”, “OtherPropertyPlantAndEquipmentNet”, and “PropertyPlantAndEquipmentNet”.

An XBRL taxonomy schema is an XML Schema⁵.

Labels

Those names are sort of ugly to work with, so XBRL allows you to add labels and associate a label with a name. So, let’s add labels to make the human readable rendering of the information easier to read. Those labels are created using what is called a linkbase⁶. Below you see a linkbase of labels, called an **XBRL label linkbase**:

```
<?xml version="1.0" encoding="utf-8"?>
<linkbase
  xmlns="http://www.xbrl.org/2003/linkbase"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xlink="http://www.w3.org/1999/xlink">
  <labelLink xlink:type="extended" xlink:role="http://www.xbrl.org/2003/role/link">
    <loc xlink:type="locator" xlink:label="helloWorld_BuildingsNet" xlink:href="HelloWorld.xsd#helloWorld_BuildingsNet" />
    <labelArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/concept-label" xlink:from="helloWorld_BuildingsNet"
  xlink:to="helloWorld_BuildingsNet_Ibl" />
    <label xlink:type="resource" xlink:label="helloWorld_BuildingsNet_Ibl" xlink:role="http://www.xbrl.org/2003/role/label">Buildings, Net</label>
    <loc xlink:type="locator" xlink:label="helloWorld_ComputerEquipmentNet" xlink:href="HelloWorld.xsd#helloWorld_ComputerEquipmentNet" />
    <labelArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/concept-label" xlink:from="helloWorld_ComputerEquipmentNet"
  xlink:to="helloWorld_ComputerEquipmentNet_Ibl" />
    <label xlink:type="resource" xlink:label="helloWorld_ComputerEquipmentNet_Ibl" xlink:role="http://www.xbrl.org/2003/role/label">Computer
  Equipment, Net</label>
    <loc xlink:type="locator" xlink:label="helloWorld_FurnitureAndFixturesNet" xlink:href="HelloWorld.xsd#helloWorld_FurnitureAndFixturesNet"
  />
    <labelArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/concept-label" xlink:from="helloWorld_FurnitureAndFixturesNet"
  xlink:to="helloWorld_FurnitureAndFixturesNet_Ibl" />
    <label xlink:type="resource" xlink:label="helloWorld_FurnitureAndFixturesNet_Ibl" xlink:role="http://www.xbrl.org/2003/role/label">Furniture
  and Fixtures, Net</label>
    <loc xlink:type="locator" xlink:label="helloWorld_Land" xlink:href="HelloWorld.xsd#helloWorld_Land" />
    <labelArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/concept-label" xlink:from="helloWorld_Land"
  xlink:to="helloWorld_Land_Ibl" />
    <label xlink:type="resource" xlink:label="helloWorld_Land_Ibl" xlink:role="http://www.xbrl.org/2003/role/label">Land</label>
    <loc xlink:type="locator" xlink:label="helloWorld_OtherPropertyPlantAndEquipmentNet"
  xlink:href="HelloWorld.xsd#helloWorld_OtherPropertyPlantAndEquipmentNet" />
    <labelArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/concept-label"
  xlink:from="helloWorld_OtherPropertyPlantAndEquipmentNet"
  xlink:to="helloWorld_OtherPropertyPlantAndEquipmentNet_Ibl" />
    <label xlink:type="resource" xlink:label="helloWorld_OtherPropertyPlantAndEquipmentNet_Ibl"
  xlink:role="http://www.xbrl.org/2003/role/label">Other Property, Plant and Equipment, Net</label>
    <loc xlink:type="locator" xlink:label="helloWorld_PropertyPlantAndEquipmentNet"
  xlink:href="HelloWorld.xsd#helloWorld_PropertyPlantAndEquipmentNet" />
    <labelArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/concept-label"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNet"
  xlink:to="helloWorld_PropertyPlantAndEquipmentNet_Ibl" />
    <label xlink:type="resource" xlink:label="helloWorld_PropertyPlantAndEquipmentNet_Ibl"
  xlink:role="http://www.xbrl.org/2003/role/label">Property, Plant and Equipment, Net</label>
  </labelLink>
</linkbase>
```

⁴ Hello World XBRL Taxonomy Schema, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/HelloWorld.xsd>

⁵ W3C, W3C XML Schema Definition Language (XSD) 1.1 Part 1: Structures, <https://www.w3.org/TR/xmlschema11-1/>

⁶ W3C, XML Linking Language (XLink) Version 1.1, <https://www.w3.org/TR/xlink11/>

If you look closely at the information in the linkbase above, you can see the names of the concepts and you can see labels. The human readable labels are associated with the names of the taxonomy schema. Each name in the taxonomy schema has a human readable label associated with it in the XLink linkbase that is shown above. Here is the Hello World XBRL label linkbase⁷.

Pretty ugly stuff, right? Well, it gets even uglier...because there are more linkbases.

XBRL calculations

Again, looking at the human readable rendering of the information you see that there are mathematical computations in the information that is being represented. In this case, there is a common type of mathematical computation called a roll up. XBRL uses XLink, just like for the labels, to articulate the mathematical computation, the roll up in this case, that the information we are trying to represent has. You can see the

XBRL calculation relations below:

```
<?xml version="1.0" encoding="utf-8"?>
<linkbase
  xmlns="http://www.xbrl.org/2003/linkbase"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xlink="http://www.w3.org/1999/xlink">
  <roleRef xlink:type="simple"
    xlink:href="HelloWorld.xsd#PropertyPlantAndEquipmentByComponent"
    roleURI="http://www.xbrlsite.com/DigitalFinancialReporting/HelloWorld/PropertyPlantAndEquipmentByComponent" />
  <calculationLink xlink:type="extended"
    xlink:role="http://www.xbrlsite.com/DigitalFinancialReporting/HelloWorld/PropertyPlantAndEquipmentByComponent">
    <loc xlink:type="locator" xlink:label="helloWorld_PropertyPlantAndEquipmentNet"
      xlink:href="HelloWorld.xsd#helloWorld_PropertyPlantAndEquipmentNet" />
    <loc xlink:type="locator" xlink:label="helloWorld_Land" xlink:href="HelloWorld.xsd#helloWorld_Land" />
    <calculationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/summation-item"
      xlink:from="helloWorld_PropertyPlantAndEquipmentNet" xlink:to="helloWorld_Land" order="1" weight="1" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_BuildingsNet" xlink:href="HelloWorld.xsd#helloWorld_BuildingsNet" />
    <calculationArc
      xlink:type="arc"
      xlink:arcrole="http://www.xbrl.org/2003/arcrole/summation-item"
      xlink:from="helloWorld_PropertyPlantAndEquipmentNet"
      xlink:to="helloWorld_BuildingsNet" order="2" weight="1" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_FurnitureAndFixturesNet" xlink:href="HelloWorld.xsd#helloWorld_FurnitureAndFixturesNet" />
    <calculationArc
      xlink:type="arc"
      xlink:arcrole="http://www.xbrl.org/2003/arcrole/summation-item"
      xlink:from="helloWorld_PropertyPlantAndEquipmentNet"
      xlink:to="helloWorld_FurnitureAndFixturesNet" order="3" weight="1" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_ComputerEquipmentNet" xlink:href="HelloWorld.xsd#helloWorld_ComputerEquipmentNet" />
    <calculationArc
      xlink:type="arc"
      xlink:arcrole="http://www.xbrl.org/2003/arcrole/summation-item"
      xlink:from="helloWorld_PropertyPlantAndEquipmentNet"
      xlink:to="helloWorld_ComputerEquipmentNet" order="4" weight="1" use="optional" />
    <loc
      xlink:type="locator"
      xlink:label="helloWorld_OtherPropertyPlantAndEquipmentNet"
      xlink:href="HelloWorld.xsd#helloWorld_OtherPropertyPlantAndEquipmentNet" />
    <calculationArc
      xlink:type="arc"
      xlink:arcrole="http://www.xbrl.org/2003/arcrole/summation-item"
      xlink:from="helloWorld_PropertyPlantAndEquipmentNet"
      xlink:to="helloWorld_OtherPropertyPlantAndEquipmentNet" order="5" weight="1" use="optional" />
  </calculationLink>
</linkbase>
```

Here is the XBRL calculations linkbase that you see above⁸.

XBRL presentation relations

Unfortunately, there is one other ugly set of XLink linkbase relations we need to show you. Notice that the lines in that graphic of the property, plant, and equipment roll up

⁷ Hello World XBRL label linkbase, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/HelloWorld-label.xml>

⁸ Hello World XBRL calculation linkbase, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/HelloWorld-calculation.xml>

are in a specific order. **XBRL presentation relations** are used to describe the ordering of the information you want to represent.

```
<?xml version="1.0" encoding="utf-8"?>
<linkbase
  xmlns="http://www.xbrl.org/2003/linkbase"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xlink="http://www.w3.org/1999/xlink">
  <roleRef xlink:type="simple" xlink:href="HelloWorld.xsd#PropertyPlantAndEquipmentByComponent"
  roleURI="http://www.xbrl.org/DigitalFinancialReporting/HelloWorld/PropertyPlantAndEquipmentByComponent" />
  <presentationLink xlink:type="extended"
  xlink:role="http://www.xbrl.org/DigitalFinancialReporting/HelloWorld/PropertyPlantAndEquipmentByComponent">
    <loc xlink:type="locator" xlink:label="helloWorld_Land" xlink:href="HelloWorld.xsd#helloWorld_Land" />
    <presentationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/parent-child"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNetRollUp" xlink:to="helloWorld_Land" order="1" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_BuildingsNet" xlink:href="HelloWorld.xsd#helloWorld_BuildingsNet" />
    <presentationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/parent-child"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNetRollUp" xlink:to="helloWorld_BuildingsNet" order="2" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_FurnitureAndFixturesNet" xlink:href="HelloWorld.xsd#helloWorld_FurnitureAndFixturesNet" />
    <presentationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/parent-child"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNetRollUp" xlink:to="helloWorld_FurnitureAndFixturesNet" order="3" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_ComputerEquipmentNet" xlink:href="HelloWorld.xsd#helloWorld_ComputerEquipmentNet" />
    <presentationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/parent-child"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNetRollUp" xlink:to="helloWorld_ComputerEquipmentNet" order="4" use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_OtherPropertyPlantAndEquipmentNet"
  xlink:href="HelloWorld.xsd#helloWorld_OtherPropertyPlantAndEquipmentNet" />
    <presentationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/parent-child"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNetRollUp" xlink:to="helloWorld_OtherPropertyPlantAndEquipmentNet" order="5"
  use="optional" />
    <loc xlink:type="locator" xlink:label="helloWorld_PropertyPlantAndEquipmentNet"
  xlink:href="HelloWorld.xsd#helloWorld_PropertyPlantAndEquipmentNet" />
    <presentationArc xlink:type="arc" xlink:arcrole="http://www.xbrl.org/2003/arcrole/parent-child"
  xlink:from="helloWorld_PropertyPlantAndEquipmentNetRollUp" xlink:to="helloWorld_PropertyPlantAndEquipmentNet"
  preferredLabel="http://www.xbrl.org/2003/role/totalLabel" order="6" use="optional" />
  </presentationLink>
</linkbase>
```

Here are the XBRL presentation linkbase that you see above⁹.

There is another linkbase, the **XBRL definition relations** linkbase which is more advanced in nature, we will explain that and a few other linkbases later.

XBRL instance

Finally, we look at the XBRL instance. An XBRL instance contains the information for the report itself. Everything we were looking at previously is used to represent the model of the report. We will explain models in future sections.

```
<?xml version="1.0" encoding="utf-8"?>
<xbrl xmlns="http://www.xbrl.org/2003/instance"
  xmlns:xbrl="http://www.xbrl.org/2003/instance"
  xmlns:link="http://www.xbrl.org/2003/linkbase"
  xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:helloWorld="http://www.xbrl.org/DigitalFinancialReporting/HelloWorld"
  xmlns:iso4217="http://www.xbrl.org/2003/iso4217"
  xsi:schemaLocation="http://xbrl.org/2006/xbrldi http://www.xbrl.org/2006/xbrldi-2006.xsd">
  <link:schemaRef xlink:type="simple" xlink:href="HelloWorld.xsd" />
  <context id="I-2020">
    <entity>
      <identifier scheme="http://www.SampleCompany.com">SAMP</identifier>
    </entity>
  </context>
```

⁹ Hello World presentation linkbase, <http://xbrl.org/2020/master/hello-world/HelloWorld-presentation.xml>

```
<period>
  <instant>2020-12-31</instant>
</period>
</context>
<context id="I-2019">
  <entity>
    <identifier scheme="http://www.SampleCompany.com">SAMP</identifier>
  </entity>
  <period>
    <instant>2019-12-31</instant>
  </period>
</context>
<unit id="U-Monetary">
  <measure>iso4217:USD</measure>
</unit>

<helloWorld:Land contextRef="I-2020" unitRef="U-Monetary" decimals="INF">5347000</helloWorld:Land>
<helloWorld:Land contextRef="I-2019" unitRef="U-Monetary" decimals="INF">1147000</helloWorld:Land>
<helloWorld:BuildingsNet contextRef="I-2020" unitRef="U-Monetary" decimals="INF">244508000</helloWorld:BuildingsNet>
<helloWorld:BuildingsNet contextRef="I-2019" unitRef="U-Monetary" decimals="INF">366375000</helloWorld:BuildingsNet>
<helloWorld:FurnitureAndFixturesNet contextRef="I-2020" unitRef="U-Monetary"
decimals="INF">34457000</helloWorld:FurnitureAndFixturesNet>
<helloWorld:FurnitureAndFixturesNet contextRef="I-2019" unitRef="U-Monetary"
decimals="INF">34457000</helloWorld:FurnitureAndFixturesNet>
<helloWorld:ComputerEquipmentNet contextRef="I-2020" unitRef="U-Monetary"
decimals="INF">4169000</helloWorld:ComputerEquipmentNet>
<helloWorld:ComputerEquipmentNet contextRef="I-2019" unitRef="U-Monetary"
decimals="INF">5313000</helloWorld:ComputerEquipmentNet>
<helloWorld:OtherPropertyPlantAndEquipmentNet contextRef="I-2020" unitRef="U-Monetary"
decimals="INF">6702000</helloWorld:OtherPropertyPlantAndEquipmentNet>
<helloWorld:OtherPropertyPlantAndEquipmentNet contextRef="I-2019" unitRef="U-Monetary"
decimals="INF">6149000</helloWorld:OtherPropertyPlantAndEquipmentNet>
<helloWorld:PropertyPlantAndEquipmentNet contextRef="I-2020" unitRef="U-Monetary"
decimals="INF">295183000</helloWorld:PropertyPlantAndEquipmentNet>
<helloWorld:PropertyPlantAndEquipmentNet contextRef="I-2019" unitRef="U-Monetary"
decimals="INF">413441000</helloWorld:PropertyPlantAndEquipmentNet>

</xbrl>
```

Here is the XBRL instance that you see above¹⁰.

Putting Everything Together

The XBRL instance references the XBRL taxonomy. You can see the same names in the XBRL instance as was in the XBRL taxonomy schema. We will explain the technical details later.

What we want to point out is that when a computer loads the XBRL instance; the XBRL instance points to the XBRL taxonomy schema. The XBRL taxonomy schema points to each of the linkbases associated with the model and will load those. All of this happens automatically and is part of the XBRL technical specification and how software is supposed to process the XBRL.

So, here are all the XBRL files and other information for the example above which you can download and have a look at:

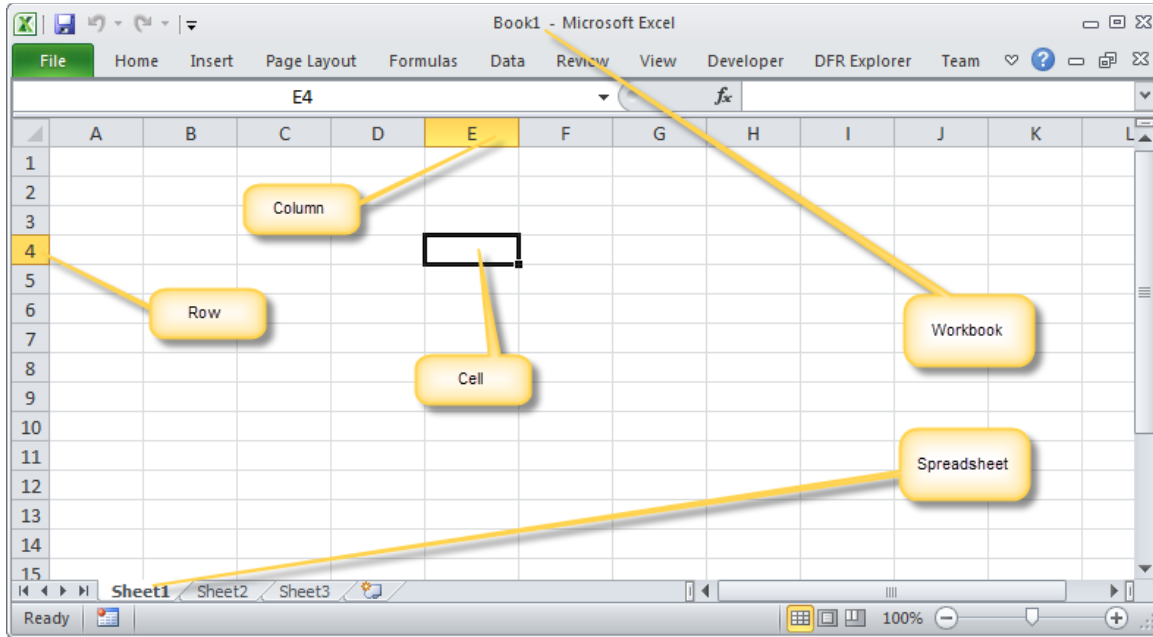
<http://xbrlsite.azurewebsites.net/2020/master/hello-world/>

So, those are the ugly technical details. There is great news! Professional accountants will never have to deal with those ugly technical details. Why? Because there is this other technical thing called a conceptual model.

¹⁰ Hello World XBRL instance, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/HelloWorld-SampleInstance.xml>

1.3. Hello World! (logical perspective)

You have used a conceptual model if you are an accountant and probably don't even realize it. Electronic spreadsheets are broken down into the rows, columns, cells, sheets, and workbooks that make up the pieces of an electronic version of a spreadsheet. Those ideas came from the paper-based spreadsheet that likewise had rows, columns, cells, and sheets.



Did you realize that Excel is actually similar to the XBRL XML files? Create a workbook, rename the extension ".zip", and then go into the ZIP file. You will see a bunch of XML files. Do you ever work with Excel at the level of those XML files? Probably not. It is also highly-likely that you will never work with XBRL at the level of the XML files that holds the contents of the XBRL either.

So, we will start with exactly the same screen shot of the same fragment of a financial report that we used to look at the ugly technical syntax. Here is that:

Property, Plant and Equipment, Net [Roll Up]	Period [Axis]	
	2020-12-31	2019-12-31
Property, Plant and Equipment, Net [Roll Up]		
Land	5,347,000	1,147,000
Buildings, Net	244,508,000	366,375,000
Furniture and Fixtures, Net	34,457,000	34,457,000
Computer Equipment, Net	4,169,000	5,313,000
Other Property, Plant and Equipment, Net	6,702,000	6,149,000
Property, Plant and Equipment, Net	295,183,000	413,441,000

We enter the terms in a software application called Luca which you can download for free and use to create this Hello World example¹¹. The Luca application uses a

¹¹ Luca, <http://xbml.squarespace.com/journal/2020/9/15/luca.html>

conceptual model, the *Logical Theory Describing Financial Report*¹², to hide the XBRL technical syntax to the software user, exposing only accounting logic which accountants understand.

Terms (simple terms)

From a logical perspective, we first define the terms that are used by the report model and the report itself. If you use Luca, after you have entered each term you see the following: (simple terms)

Category	Standard Label	Prefix	Name	Data Type	Balance Type	Period Type
Abstract	Property, Plant and Equipment, Net [Roll Up]	helloWorld	PropertyPlantAndEquipmentNetRollUp			
Concept	Land	helloWorld	Land	Monetary	Debit	Instant
Concept	Buildings, Net	helloWorld	BuildingsNet	Monetary	Debit	Instant
Concept	Furniture and Fixtures, Net	helloWorld	FurnitureAndFixturesNet	Monetary	Debit	Instant
Concept	Computer Equipment, Net	helloWorld	ComputerEquipmentNet	Monetary	Debit	Instant
Concept	Other Property, Plant and Equipment, Net	helloWorld	OtherPropertyPlantAndEquipmentNet	Monetary	Debit	Instant
Concept	Property, Plant and Equipment, Net	helloWorld	PropertyPlantAndEquipmentNet	Monetary	Debit	Instant

Structures (complex terms)

From a logical perspective, we need to define structures into which terms and association types will be used to explain the associations or relationships between terms. There is only one structure in the Hello World example:

Identifier	Title	Sequence
HelloWorld	30000 - Property, Plant, and Equipment by Component	1

Associations

From a logical perspective, we must explicitly define the associations that enable a machine to understand how to organize facts and terms into the rendering that you see above. There are two sets of logical relations that we must express.

Presentation ordering

Structure Type	Network Identifier	Association From Name	Association Role	Association To Name	Calculation Polarity	Preferred Label Role	Sequence
Presentation	HelloWorld	PropertyPlantAndEquipmentNetRollUp	Parent-Child	Land			1
Presentation	HelloWorld	PropertyPlantAndEquipmentNetRollUp	Parent-Child	BuildingsNet			2
Presentation	HelloWorld	PropertyPlantAndEquipmentNetRollUp	Parent-Child	FurnitureAndFixturesNet			3
Presentation	HelloWorld	PropertyPlantAndEquipmentNetRollUp	Parent-Child	ComputerEquipmentNet			4
Presentation	HelloWorld	PropertyPlantAndEquipmentNetRollUp	Parent-Child	OtherPropertyPlantAndEquipmentNet			5
Presentation	HelloWorld	PropertyPlantAndEquipmentNetRollUp	Parent-Child	PropertyPlantAndEquipmentNet			6

¹² Logical Theory Describing Financial Report, <http://xbrl.squarespace.com/logical-theory-financial-rep/>

Mathematical relations (one alternative approach for representing roll ups)

Structure Type	Network Identifier	Association From Name	Association Role	Association To Name	Calculation Polarity	Preferred Label Role	Sequence
Calculation	HelloWorld	PropertyPlantAndEquipmentNet	Total-Item	Land	Add		1
Calculation	HelloWorld	PropertyPlantAndEquipmentNet	Total-Item	BuildingsNet	Add		2
Calculation	HelloWorld	PropertyPlantAndEquipmentNet	Total-Item	FurnitureAndFixturesNet	Add		3
Calculation	HelloWorld	PropertyPlantAndEquipmentNet	Total-Item	ComputerEquipmentNet	Add		4
Calculation	HelloWorld	PropertyPlantAndEquipmentNet	Total-Item	OtherPropertyPlantAndEquipmentNet	Add		5

Rules (optional, we already defined rule using XBRL calculations above)

From a logical perspective, we must explicitly define rules that enable a machine to understand required and/or permissible constraints, restrictions, derivation, assertions, and other such rules.

In this case, the only mathematical computation is the roll up of property, plant and equipment net which is expressed using XBRL calculation relations. We will duplicate this rule using a consistency rule:

Rule Type	Rule Code	Rule	Network	Concept	Sequence	Commentary
Consistency	BS1	\$PropertyPlantAndEquipmentNet = \$Land + \$BuildingsNet + \$FurnitureAndFixturesNet + \$ComputerEquipmentNet + \$OtherPropertyPlantAndEquipment	HelloWorld	helloWorld:PropertyPlantAndEquipmentNet	1	

Key	RuleCode	Rule	Network	Concept	Sequence
6	IS01	\$PropertyPlantAndEquipmentNet = (\$Land + \$BuildingsNet + \$FurnitureAndFixturesNet + \$ComputerEquipmentNet + \$OtherPropertyPlantAndEquipmentNet)	HelloWorld	helloWorld:PropertyPlantAndEquipmentNet	1

Facts

From a logical perspective, we must explicitly represent the facts that will be provided within the report.

Reporting Entity Aspect	Calendar Period Aspect	ConceptAspect	Fact Value	Units	Rounding	Sequence
SAMP http://www.reportingscheme.com/ID	2020-12-31	helloWorld:Land	5347000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2019-12-31	helloWorld:Land	1147000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2020-12-31	helloWorld:BuildingsNet	244508000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2019-12-31	helloWorld:BuildingsNet	366375000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2020-12-31	helloWorld:FurnitureAndFixturesNet	34457000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2019-12-31	helloWorld:FurnitureAndFixturesNet	34457000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2020-12-31	helloWorld:ComputerEquipmentNet	4169000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2019-12-31	helloWorld:ComputerEquipmentNet	5313000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2020-12-31	helloWorld:OtherPropertyPlantAndEquipmentNet	6702000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2019-12-31	helloWorld:OtherPropertyPlantAndEquipmentNet	6149000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2020-12-31	helloWorld:PropertyPlantAndEquipmentNet	295183000	iso4217:USD	INF	
SAMP http://www.reportingscheme.com/ID	2019-12-31	helloWorld:PropertyPlantAndEquipmentNet	413441000	iso4217:USD	INF	

IMPORTANT NOTE!!! Notice the "Save" button above the facts that were entered. Be sure to press that "Save" button or the facts will not be saved by the application.

The end result is exactly the same as the technical perspective representation. The logical representation is used to generate the technical representation.

If you are interested, this link below has a Microsoft Access database application that generated all of the Hello World example files. If you are motivated, this is a great way to understand how to represent the conceptual model of a financial report within a relational database:

<http://xbrlsite.azurewebsites.net/2020/master/hello-world-db/>

The database generated application is a bit more sophisticated because it contains XBRL references and Inline XBRL examples. Software engineers trying to create financial reporting or business reporting tools that output XBRL might find this example useful.

1.4. Hello World! (commercial software perspective)

Now we are going to look at the exact same thing as that ugly technical stuff but we will look using a commercially available software tool provided by XBRL Cloud called the Evidence Package. We are using this because it is simply a set of HTML pages that shows you what is contained in those XBRL files in terms a professional accountant can understand.

Now, in the explanation of the technical details of taxonomy schemas and linkbases I left a few details out to make the bigger picture easier to grasp. As I said, we will drill down into many of those details in this document. But to master all of the technical details will require more work than just reading this very basic primer.

But, let's go through the technical details again but this time again applying a logical conceptual model and see how much easier all this stuff is to read.

Terms

Remember the taxonomy schema and the label linkbase we talked about. Well, here that information is again in a nicer computer-generated rendering¹³:

#	Label	Data Type	Period Type	Balance Type	Prefix	Standard label, Documentation, References, Concept name	Count
1	Buildings, Net	Monetary	As Of (instant)	Debit	helloWorld	Filer label: Buildings, Net Documentation: References: NONE Name: helloWorld:BuildingsNet	1
2	Computer Equipment, Net	Monetary	As Of (instant)	Debit	helloWorld	Filer label: Computer Equipment, Net Documentation: References: NONE Name: helloWorld:ComputerEquipmentNet	1
3	Furniture and Fixtures, Net	Monetary	As Of (instant)	Debit	helloWorld	Filer label: Furniture and Fixtures, Net Documentation: References: NONE Name: helloWorld:FurnitureAndFixturesNet	1
4	Land	Monetary	As Of (instant)	Debit	helloWorld	Filer label: Land Documentation: References: NONE Name: helloWorld:Land	1
5	Other Property, Plant and Equipment, Net	Monetary	As Of (instant)	Debit	helloWorld	Filer label: Other Property, Plant and Equipment, Net Documentation: References: NONE Name: helloWorld:OtherPropertyPlantAndEquipmentNet	1
6	Property, Plant and Equipment, Net	Monetary	As Of (instant)	Debit	helloWorld	Filer label: Property, Plant and Equipment, Net Documentation: References: NONE Name: helloWorld:PropertyPlantAndEquipmentNet	1

Rules

¹³ Evidence Package, Terms, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/evidence-package/contents/index.html#ReportElementsAdded-Concepts.html>

And, remember the mathematical relations represented by the XBRL calculation relations. Well, here are those in an easier to read form¹⁴:

Label	Rendered	Reported	Calculated	Balance	Decimals	Message
Property, Plant and Equipment, Net [Roll Up]						
Land	5,347,000 +	5,347,000	5,347,000	DR		INF
Buildings, Net	244,508,000 +	244,508,000	244,508,000	DR		INF
Furniture and Fixtures, Net	34,457,000 +	34,457,000	34,457,000	DR		INF
Computer Equipment, Net	4,169,000 +	4,169,000	4,169,000	DR		INF
Other Property, Plant and Equipment, Net	6,702,000 +	6,702,000	6,702,000	DR		INF
Property, Plant and Equipment, Net	295,183,000	295,183,000	295,183,000	DR		INF OK

Label	Rendered	Reported	Calculated	Balance	Decimals	Message
Property, Plant and Equipment, Net [Roll Up]						
Land	1,147,000 +	1,147,000	1,147,000	DR		INF
Buildings, Net	366,375,000 +	366,375,000	366,375,000	DR		INF
Furniture and Fixtures, Net	34,457,000 +	34,457,000	34,457,000	DR		INF
Computer Equipment, Net	5,313,000 +	5,313,000	5,313,000	DR		INF
Other Property, Plant and Equipment, Net	6,149,000 +	6,149,000	6,149,000	DR		INF
Property, Plant and Equipment, Net	413,441,000	413,441,000	413,441,000	DR		INF OK

Associations

Finally, here are the XBRL presentation relations represented in an easier to read form¹⁵:

Label	Report Element Class	Period Type	Balance	Name
<i>Property, Plant and Equipment, Net [Roll Up]</i>	[Abstract]			pattern:PropertyPlantAndEquipmentNetRollUp
Land	[Concept] Monetary	As Of	Debit	pattern:Land
Buildings, Net	[Concept] Monetary	As Of	Debit	pattern:BuildingsNet
Furniture and Fixtures, Net	[Concept] Monetary	As Of	Debit	pattern:FurnitureAndFixturesNet
Computer Equipment, Net	[Concept] Monetary	As Of	Debit	pattern:ComputerEquipmentNet
Other Property, Plant and Equipment, Net	[Concept] Monetary	As Of	Debit	pattern:OtherPropertyPlantAndEquipmentNet
Property, Plant and Equipment, Net, Total	[Concept] Monetary	As Of	Debit	pattern:PropertyPlantAndEquipmentNet

Report

A little more computer magic¹⁶; you take all those machine-readable details, run them through what is called an XBRL processor, and presto-chango; you get that nice looking, easy to read computer-generated rendering. And remember, the information is also readable by machine-based processes¹⁷:

¹⁴ Evidence Package, Rules, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/evidence-package/contents/index.html#BusinessRulesSummary.html>

¹⁵ Evidence Package, Associations, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/evidence-package/contents/index.html#ModelSummary.html>

¹⁶ YouTube.com, *How XBRL Works*, <https://www.youtube.com/watch?v=nATJBPOiTxM> (it really is not using magic)

¹⁷ Evidence Package, Rendering, <http://xbrlsite.azurewebsites.net/2020/master/hello-world/evidence-package/contents/index.html#Rendering-N0-Implied.html>

Property, Plant and Equipment, Net [Roll Up]	Period [Axis]	
	2020-12-31	2019-12-31
Property, Plant and Equipment, Net [Roll Up]		
Land	5,347,000	1,147,000
Buildings, Net	244,508,000	366,375,000
Furniture and Fixtures, Net	34,457,000	34,457,000
Computer Equipment, Net	4,169,000	5,313,000
Other Property, Plant and Equipment, Net	6,702,000	6,149,000
Property, Plant and Equipment, Net	295,183,000	413,441,000

Again, remember that I left some of the details out to help provide an easy to understand introduction to XBRL. One commercial software vendor provides a static rendering and other reports that explains the information in an XBRL document that I can provide here for you to fiddle with¹⁸. If you want to dig into the XBRL technical syntax, here is a ZIP file that provides the actual XBRL that is behind the human readable reports¹⁹.

1.5. Essence of a General Purpose Financial Report

A general purpose financial report is a high-fidelity, high-resolution, high-quality information exchange mechanism. The report is a collection of values and disclosures (complex logical information) required by statutory and regulatory requirements plus whatever management of an economic entity wants to voluntarily disclose. The report represents quantitative and qualitative information about the financial condition and financial performance of an economic entity. There are a number of different financial reporting schemes²⁰ that might be used to create that report: US GAAP, IFRS, IPSAS, GAS, FAS, etc.

But, financial reports are not forms. Financial reports are not uniform. Financial reports have variability allowed by reporting rules. This consciously allowed variability is an essential, characteristic trait of robust reporting schemes such as US GAAP, IFRS, and others. This variability contributes to the richness, high-fidelity, and high-resolution of reported financial information that is unique to an industry sector, a style of reporting, or an economic entity. This variability is a feature of such reporting schemes. Different reporting styles, different subtotals used to aggregate details, and using some specific approach given a set of allowed alternatives are examples of variability. Variability does not mean “arbitrary” or “random”. There are known identifiable patterns.

And so, any technical implementation of financial reporting needs to be able to properly, correctly, and fully support that allowed variability so that those reporting information and those consuming that reporting information are on the same page.

¹⁸ Hello World example human readable information, <http://xbrlsite.azurewebsites.net/2018/HelloWorld/evidence-package/#Rendering-N0-RE10.html>

¹⁹ Hello World example machine readable XBRL, <http://xbrlsite.azurewebsites.net/2018/HelloWorld/RollUp.zip>

²⁰ Charles Hoffman, CPA, *Comparison of Financial Reporting Schemes High Level Concepts*, <http://xbrlsite.azurewebsites.net/2018/Library/ReportingSchemes-2018-12-30.pdf>

And keep in mind that one of the users of this information could be a machine such as an intelligent software agent.

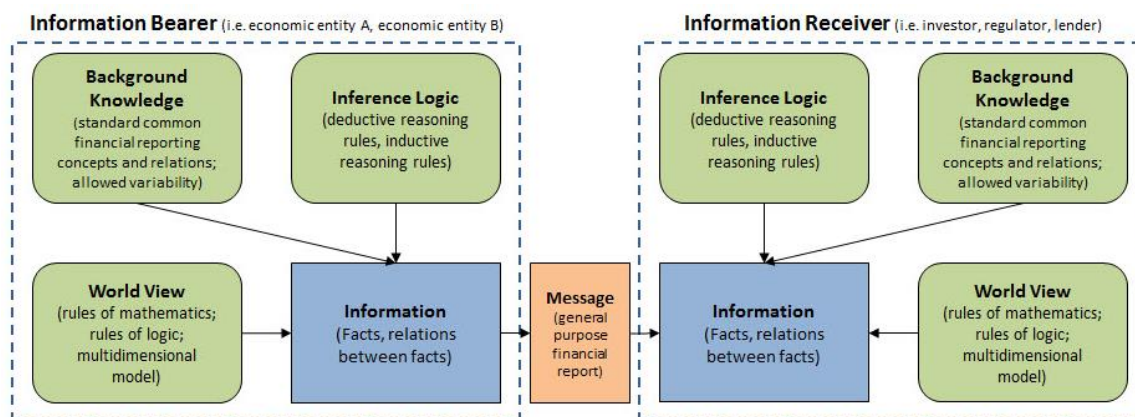
Consider the following use case of a general purpose financial report:

Two economic entities, A and B, each have information about their financial position and financial performance. They must communicate their information to an investor who is making investment decisions which will make use of the combined information so as to draw some conclusions. All three parties (economic entity A, economic entity B, investor) are using a common set of basic logical principles (facts, statements, deductive reasoning, inductive reasoning, etc.), common financial reporting standard concepts and relations (i.e. US GAAP, IFRS, IPSAS, etc.), and a common world view so they should be able to communicate this information fully, so that any inferences which, say, the investor draws from economic entity A's information should also be derivable by economic entity A itself using basic logical principles, common financial reporting standards (concepts and relations), and common world view; and vice versa; and similarly for the investor and economic entity B.

The following is a set of principles related to a general purpose financial report:

- A general purpose financial report is a high-fidelity, high-resolution, high-quality information exchange mechanism.
- Prudence dictates that using information from a financial report should not be a guessing game.
- All formats conveying information should convey the exact same meaning be that format paper, e-paper, or some machine readable format.
- Explicitly stated information from information bearers or reliably derived information is preferable to requiring information receivers to make assumptions.
- Double entry accounting enables processes that allow for the detection of information errors and to distinguish errors (unintentional) from fraud (intentional).
- Catastrophic logical failures are to be avoided at all cost as they cause systems to completely fail.

Depicted graphically; the essence of what is taking place when an economic entity, an information bearer, provides information to some information receiver such as an investor, regulator, or lender; is such:



All of this can be described logically in a manner that is easy for a professional accountant to understand. A logical theory, such as the *Logical Theory Describing a Business Report*²¹, defines and describes things. A general purpose financial report is a specialization of the more general business report.

Rules are used to articulate allowed variability and “channel” creators of reports in the right direction and therefore control variability, keeping the variability within standard limits. That keeps report quality where it needs to be. Rules enable things like preventing a user from using a concept meant to represent one thing from unintentionally being used to represent something different. Further, the discipline of describing something in a form a computer algorithm can understand also assists you in understanding the world better; weeding out flaws in your understanding, myths, and misconceptions about accounting and reporting standards.

Given the sophisticated requirements of something like a general purpose financial report the XBRL technical syntax needs to be able to deliver specific functionality to make XBRL-based digital general purpose financial reports work appropriately.

2. XBRL Framework

Like the technical stuff? Then keep reading. If you don’t want to explore the technical details, you can skip the next three sections.

2.1. Grasping the XBRL Framework

The core of XBRL is the XBRL 2.1 Specification²². Additional modules build upon the base XBRL specification, providing additional functionality²³. You choose whether to use other XBRL modules based on your needs. In this primer I will stick with the base XBRL Specification but will point out important modules of XBRL as deemed necessary.

The XBRL Specification provides a framework that divides XBRL into two main parts:

²¹ Charles Hoffman, CPA and Rene van Egmond, *Logical Theory Describing a Business Report*, <http://xbrlsite.azurewebsites.net/2019/Library/LogicalTheoryDescribingBusinessReport.pdf>

²² XBRL International, *Extensible Business Reporting Language (XBRL) 2.1*, <http://www.xbrl.org/Specification/XBRL-2.1/REC-2003-12-31/XBRL-2.1-REC-2003-12-31+corrected-errata-2013-02-20.html>

²³ XBRL International, XBRL Specifications, <https://specifications.xbrl.org/specifications.html>

- **XBRL taxonomies**, which are XML Schemas that define the concepts, articulate a controlled vocabulary, define relations between concepts, and define business logic used by XBRL instances.
- **XBRL instances**, which contain the facts being reported, along with contextual information for those facts which helps you distinguish one fact from another.

And so we break our initial explanation of XBRL into two parts: XBRL taxonomies and XBRL instances. An XBRL taxonomy has a lot more moving parts to it than an XBRL instance. But XBRL taxonomies and XBRL instances interact with each other. We put these two pieces of the XBRL framework together and explain how the two interact.

After we cover these key parts, we will drill into the pieces that make up an XBRL taxonomy and an XBRL instance. We give you the level of understanding of the important details that you need without overwhelming you with areas of XBRL you'd likely never run across.

A big part of the **XBRL framework** is the flexibility offered by XBRL's extensibility. We show you how XBRL's extension capabilities are provided by XBRL taxonomies and used by XBRL instances. After introducing the important key ideas, we drill into the key notions to expand your level of understanding in a few specific areas.

The two most important modules of XBRL to understand is the XBRL Dimensions²⁴ specification and XBRL Formula²⁵ specification. XBRL Dimensions defines a multidimensional model that can be leveraged by XBRL taxonomies. XBRL Formula allows those creating XBRL taxonomies and XBRL instances to create rules for describing and verifying information against a description.

The XBRL Open Information Model²⁶ and the XBRL Abstract Model 2.0²⁷ describe the logical model of a business report.

2.2. Fundamentals of XML for XBRL Users

As XBRL is an XML language, we need to tell you a little about eXtensible Markup Language (XML)²⁸. XML is a language for creating markup languages, which XBRL is. XBRL is an XML language. XBRL uses other pieces of the XML family, including namespaces, XML Schema, XML Base, XLink, XPath, and XPointer. But XBRL uses XML differently than most other XML languages. XBRL is actually more like RDF, OWL, and SHACL than it is most XML languages.

If you happen to be knowledgeable about XML, you may find these tips useful:

- XBRL has an XML schema²⁹, which defines many but not all aspects how you create XBRL taxonomies and XBRL instances.

²⁴ XBRL International, *XBRL Dimensions 1.0*, <http://www.xbrl.org/specification/dimensions/rec-2012-01-25/dimensions-rec-2006-09-18+corrected-errata-2012-01-25-clean.html>

²⁵ XBRL International, *XBRL Formula 1.0*, <https://specifications.xbrl.org/work-product-index-formula-formula-1.0.html>

²⁶ XBRL International, *XBRL Open Information Model 1.0*, <https://specifications.xbrl.org/work-product-index-open-information-model-open-information-model.html>

²⁷ XBRL International, *XBRL Abstract Model 2.0*, <http://www.xbrl.org/specification/abstractmodel-primary/pwd-2012-06-06/abstractmodel-primary-pwd-2012-06-06.html>

²⁸ W3C, *Extensible Markup Language (XML) 1.0 (Fifth Edition)*, <https://www.w3.org/TR/xml/>

²⁹ XBRL International, *XBRL's XML schema*, <http://www.xbrl.org/2003/xbrl-instance-2003-12-31.xsd>

- Another schema describes how to create XBRL Linkbases³⁰.
- If you're familiar with traditional approaches to creating XML languages, when you first look at XBRL, you may get confused. XBRL doesn't just build a traditional XML schema that explains how instances are to be created. What XBRL does is build a layer on *top* of what XML provides that is used to create a metalanguage, which is used to create in part something you may be familiar with, an XML Schema.
- In XBRL, a taxonomy schema (which is part of an XBRL taxonomy) serves the same function as an XML Schema. A taxonomy schema defines XML elements and attributes, just like XML languages normally do. But XBRL adds metadata needed for business reporting, such as period information and whether a concept is a point in time, for a period of time, and so on. This additional metadata is common in business reporting, so XBRL adds it to the schema. The taxonomy schema is the XML Schema, which articulates how to create XML instances in XBRL.
- Another part of an XBRL taxonomy is the linkbase. You can add metadata to the XBRL taxonomy via the use of linkbases. While not required, linkbases provide useful and often necessary information for understanding an XBRL taxonomy and using an XBRL instance. Linkbases enable the expression of many kinds of semantics.
- XML Schema elements with a specific substitutionGroup attribute value are XBRL concepts. All XBRL concepts are global because of the way XML Schema substitutionGroup attributes work. This makes the elements of a taxonomy schema a flat list. You can use linkbases to add any number of hierarchies to that flat schema.
- XBRL Formula is a special type of linkbase that is very powerful. XBRL Formula is used to represent mathematical relations that exist within a financial report.
- An XBRL user should work with the help of an XBRL processor, not just an XML parser. In most cases, you'll drive yourself mad if you try to use XBRL with only an XML parser.

Again, while XBRL is an XML language; XBRL is actually more similar to RDF + OWL + SHACL but (a) add an explicit multidimensional model, (b) adds mathematical computations, and (c) adds the higher level notion of a "fact" that is not decomposable.

2.3. XBRL Builds on Top of XML

XBRL is an approach to using XML³¹. XBRL is actually more similar to RDF than it is to traditional approaches to using XML. XBRL is XML; XBRL uses the XML syntax. Therefore, XBRL can leverage the entire family of XML specifications³². XML allows you to construct "trees". XBRL and RDF allow you to construct "graphs"³³. This primer

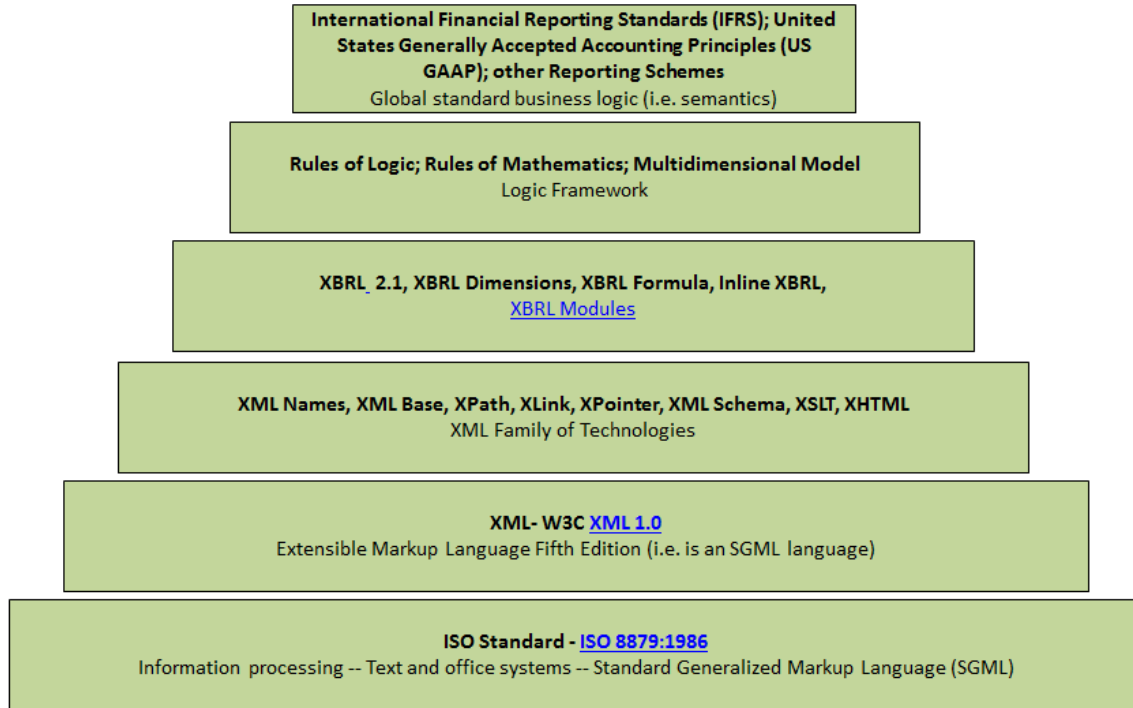
³⁰ XBRL International, XBRL's Linkbase schema, <http://www.xbrl.org/2003/xbrl-linkbase-2003-12-31.xsd>

³¹ XBRL Builds on Top of XML, <http://xbrl.squarespace.com/journal/2009/4/25/xbrl-builds-on-top-of-xml.html>

³² Airi Salminen, *XML Family of Languages*, <http://users.jyu.fi/~airi/xmlfamily.html>

³³ If you don't understand the difference between a tree and a graph, please read the *Computer Empathy* document.

assumes a familiarity with XML. If you are not familiar with XML, consider the book *Communicating with XML*³⁴.



XBRL expresses semantics (meaning, business logic) in a global standard format. XML only articulates syntax. You can create mechanisms using XML to represent meaning. For others to do what XBRL does with XML, you would basically have to reinvent what XBRL has already created. Because this meaning, the business logic can be expressed in a global standard format that meaning and business logic can be effectively exchanged.

XBRL allows validation against the expressed meaning and business logic also. Because the meaning (semantics) are expressed in machine readable form; it is possible to validate XBRL instances against that expressed meaning or business logic. And XBRL has created global standard mechanisms for performing this validation, such as XBRL calculations, XBRL definition relations, and XBRL Formulas.

XBRL separates concept definitions from the content model. Typically, with XML languages, the concept definitions and the content model are mixed together within an XML schema. This makes it difficult to reuse either the concepts or the concept definition. Further, XML provides you with only one implicit set of relations (because it has only one content model) and the definition of those relations is mixed with the definition of elements and attributes. XBRL, on the other hand, uses an atomic approach (flat XML content model) similar to RDF in defining concepts and moves the expression of relations away from the XML schema. This separation of concept and relation definition leads to the next benefit of XBRL, you can express more than one set of relations and each of those sets of relations can be explicitly identified as being for a specific purpose.

³⁴ Airi Saminen and Frank Tompa, *Communicating with XML*, <https://www.amazon.com/Communicating-XML-Airi-Salminen/dp/1461409918>

XBRL can express multiple hierarchies of explicit relations. Because XBRL separates concept and relation definitions, you can define more than one hierarchy of such relations. Further, the hierarchies of relations defined are explicit rather than XML's implicit content model. But, you must keep those XBRL hierarchies consistent in terms of meaning. One representation of meaning or business logic should not be inconsistent with another representation.

XBRL provides prescriptive extensibility. XML's greatest strength is also its greatest weakness. XML is extensible everywhere, in every direction. XBRL is extensible in a specific, prescriptive, and therefore predictable manner. As such, the extensibility is usable without modifying software for the extension. You can think of this as XBRL always having the same "shape".

While XBRL does define a business report model it is often unclear to those reading the XBRL technical specification because there are multiple ways to implement that model. OMG's forthcoming Standard Business Report Model (SBRM) overcomes issues with this sometimes vague business report model in three ways. First, it makes the business report logical conceptualization explicit and clear. Second, it provides an application profile for implementing XBRL. Third, it provides clear boundaries in terms of required rules to verify XBRL-based reports are of high quality.

XBRL provides a multidimensional model. The multidimensional provides a consistent model with flexibility in the right areas which provides for flexible presentation of information and the ability to "slice and dice" information. Although XML can be made to fit into a multidimensional model in many cases, doing so can be a struggle.

XBRL enables "intelligent", metadata driven connections to information. With XBRL, connections to information can be created by business users adjusting metadata rather than by requiring technical people writing code. As such, rather than building multiple point solutions, XBRL enables the creation of effective and efficient solutions that allow extensibility and don't require programming modifications to connect to new information or new information models. Again, this is because of the prescriptive manner of XBRL's extensibility, the predictable "shape" of XBRL is always the same. With XML, every new connection pretty much has to be enabled by a programmer writing code because XML only communicates technical syntax and does so at the data level, not the meaning or business logic level, of information and because the shape of different implementations of each XML implementation can be so varied.

JSON is similar to XML in that it is a syntax. Some people prefer the JSON syntax over the XML syntax; but to use all the features offered by XBRL in JSON; just like if you wanted to use XML to do what XBRL does; to use JSON like XBRL can be used, you would basically need to reinvent XBRL in the JSON syntax. This is similarly true with other syntaxes such as RDF+OWL+SHACL, label property graphs, Prolog, etc.

XBRL + SBRM when used together one can create a digital business reporting solution that will be usable by enterprises large and small. This is summarized in the method³⁵ used and explained in this document.

But here in this primer we focus on XBRL. Keep in the back of your mind that XBRL is only a part of a complete solution.

³⁵ Charles Hoffman, CPA, Method, http://www.xbrlsite.com/mastering/Part02_Chapter05.N1_Method.pdf

3. Exploring XBRL Taxonomy Parts

XBRL taxonomies have various physical pieces and express concepts, resources, and relations (see Chapter 3). These pieces, described in the following sections, work together to provide the functionality you need to express the meaning of business information that is to be exchanged.

3.1. Taxonomy schemas and linkbases

XBRL taxonomies are comprised of two parts:

- **Taxonomy schemas** are the XML Schema part of the XBRL taxonomy. Taxonomy schemas contain concept definitions that take the form of XML Schema elements. For example, the business concept Cash may be an XML Schema element that has a name attribute value of “Cash” and other attributes.
- **Linkbases** are the XLink part of the XBRL taxonomy and are also XML documents. The term *linkbase* is an abbreviation for link database. Linkbases are physical things used to express a logical thing, networks. Networks come in two types: resource and relation. (We explain networks, resources, and relations in the upcoming section “Networks and extended links.”) Resource and relation networks are expressed in the XLink syntax in the form of what is called an *extended link*.

Extended links are basically containers that hold the data contained within linkbases. We don’t want to get into a big technical discussion of extended links here; if you want that, read the XLink specification³⁶.

3.2. Discoverable taxonomy sets

A single XBRL taxonomy may be comprised of a set of multiple taxonomy schemas and linkbases. This set has a specific and important name in XBRL, the discoverable taxonomy set (DTS).

A DTS is governed by discovery rules, specified by the XBRL Specification, that XBRL processors understand. A DTS can contain any number of taxonomy schemas and/or linkbases and can start from either a taxonomy schema, a linkbase, or an XBRL instance.

3.3. Networks and extended links

Networks are a logical aspect of XBRL expressed physically as a set of linkbases. Linkbases exist within the physical model and are collections of extended links. Extended links work slightly differently in XLink than they do in XBRL. In XLink, each extended link is physically separated. In XBRL, a role attribute is added to an extended link. A network is a collection of all the extended links of a specific type with the same *extended link role*. The set of linkbases that are of the same type and have the same extended link role is called a *base set*. An extended link role is nothing more than a unique identifier expressed as a role attribute of an extended link.

You use networks to separate and organize resources and relations. Networks have different extended link roles and different unique identifiers, which creates the

³⁶ W3C, *XML Linking Language (XLink) Version 1.1*, <http://www.w3.org/TR/xlink/>

separation. Network roles and extended link roles are exactly the same thing. The creators of XBRL taxonomies define these roles within taxonomy schemas.

3.4. Resources and relations within networks

Physically, networks come in two types categorized by the type of extended links they use:

- **Resource** networks provide additional information about a concept. The additional information is in the form of an XLink resource. Of the six standard types of linkbases, *label*, *reference*, and *formula* are resource linkbases; and they express resource networks. Resources can have different resource roles to help further categorize resources. An example of additional information is an English label, Property, Plant and Equipment, with a standard role that is associated with the concept of the name PropertyPlantAndEquipment within a taxonomy schema. An example of a reference is a URL to a company's accounting manual or, say, some descriptive information about the chapter, section, subsection, or page of that manual.
- **Relation** networks express relations between concepts using XLink arcs. Of the five standard types of linkbases, *presentation*, *calculation*, and *definition* are relation linkbases, which they express as relation networks. Relations (expressed as an XLink arc) can have different arc roles to help further categorize relations. An example of a relation network is the presentation network with the network role Balance Sheet that indicates that the concept PropertyPlantAndEquipment is part of that Balance Sheet and related to Assets.

3.5. Identifying XBRL Instance Parts

Compared to XBRL taxonomies, XBRL instances are simple and straightforward. XBRL instances are single physical files that contain the following pieces: references to DTS information, facts, contexts, units, and footnotes. All these components help you use that business information on your terms.

3.6. Achieving Flexible Business Information Exchange

XBRL is a knowledge media³⁷. XBRL taxonomies and XBRL instances provide for business information exchanges, the fundamental objective of XBRL. Key relationships between the parts of XBRL explained in this document is critical to understanding XBRL. This understanding can make the difference between making XBRL meet your needs and fighting XBRL at every step along the way. This section explains these key ideas both logically and how they're physically implemented.

3.7. Defining concepts and organizing with taxonomy schemas

Concepts are defined in taxonomy schemas, which are really XML schemas. The XBRL concepts are XML Schema elements. Basically, XBRL leverages XML Schema as the means of defining XBRL concepts. XBRL adds a few attributes to XML Schema elements.

³⁷ Charles Hoffman, *Understanding that XBRL is a Knowledge Media*, <http://xbrl.squarespace.com/journal/2017/1/16/understanding-that-xbrl-is-a-knowledge-media.html>

Taxonomy schemas can point to other taxonomy schemas already defined. XBRL uses the XML Schema mechanisms *import* and *include* to combine sets of concepts defined in separate physical files. XBRL also provides mechanisms *schemaRef* and *linkbaseRef* for combining DTS components. All these taxonomy schemas become part of the DTS. These mechanisms allow you to build modular taxonomy schemas. Another discovery mechanism for taxonomy schemas is any reference from a linkbase to a taxonomy schema.

Taxonomy schemas can also point to resource or relation networks that likewise become part of the DTS.

3.8. Using networks to separate and organize sets of resources

Resource networks are physically contained in XLink linkbases in the form of extended links with a specific extended link role. A resource defined within these networks allows you to add information to the XBRL concepts defined in the taxonomy schema. XBRL provides two types of resource networks in the XBRL specification: labels and references. The XBRL modules add other types of resources, such as formulas and formatting information. You can add your own types of resources using the Generic Linkbase specification³⁸. Taxonomy schemas or XBRL instances can connect a resource network to the DTS.

3.9. Separating and organizing sets of relations by using networks

XLink linkbases physically contain relation networks in the form of extended links with a specific extended link role. Relation networks allow you to associate one concept with another concept in various precise ways for many purposes. XBRL provides three types of relation networks in the XBRL specification: presentation, calculation, and definition. You can add your own types of relations using the Generic Linkbase specification. Taxonomy schemas or XBRL instances can connect a relations network to the DTS.

3.10. Exchanging facts with XBRL instances

XBRL instances contain the information that is being exchanged. That information is expressed in the form of facts. Each fact is associated with a concept from an XBRL taxonomy, which expresses the concept and either defines it or points to a definition of the concept external to the XBRL taxonomy by using one or more XBRL references. Concepts are associated with an XBRL instance by being part of the DTS. Other information in networks connected to the XBRL instance provides additional information that helps you understand and use the facts within an XBRL instance. Contextual information is also associated with facts to help further explain things like which entity and which period a fact relates to. Numeric information has additional contextual information called units. You can use XBRL footnotes (not to be confused with what an accountant calls a footnote) to communicate additional information, such as comments.

³⁸ XBRL International, *XBRL Generic Links 1.0*, <http://www.xbrl.org/specification/gnl/rec-2009-06-22/gnl-rec-2009-06-22.html>

3.11. Gaining flexibility through extension

The ability to express concepts, resources, and relations is well and good, but if the XBRL taxonomy isn't exactly what you want, guess what? You can change it. This characteristic is why XBRL is called the *Extensible Business Reporting Language*. One of the most powerful features of XBRL is that it's dynamic when it needs to be. Although this extensibility is there if you need it, you don't have to use it.

XBRL's need for extensibility makes the physical syntax level seem somewhat confusing. All these separate pieces provide the required flexibility needed to make XBRL's extensibility work as needed. The good news is that XBRL processors hide much of this physical syntax from you. The logical view of XBRL is much easier to work with.

You never change someone else's taxonomy schema or linkbases, but you can create your own taxonomy schemas or linkbases, which add to or change things others have defined by becoming part of the DTS. You can even nullify what exists in someone else's taxonomy, rendering it unusable. As such, you can change the overall DTS, effectively virtually changing what you should never change physically. Further, the users of the XBRL instance information can clearly see the changes you've made because you communicated those changes in the form of an XBRL taxonomy that is part of the DTS.

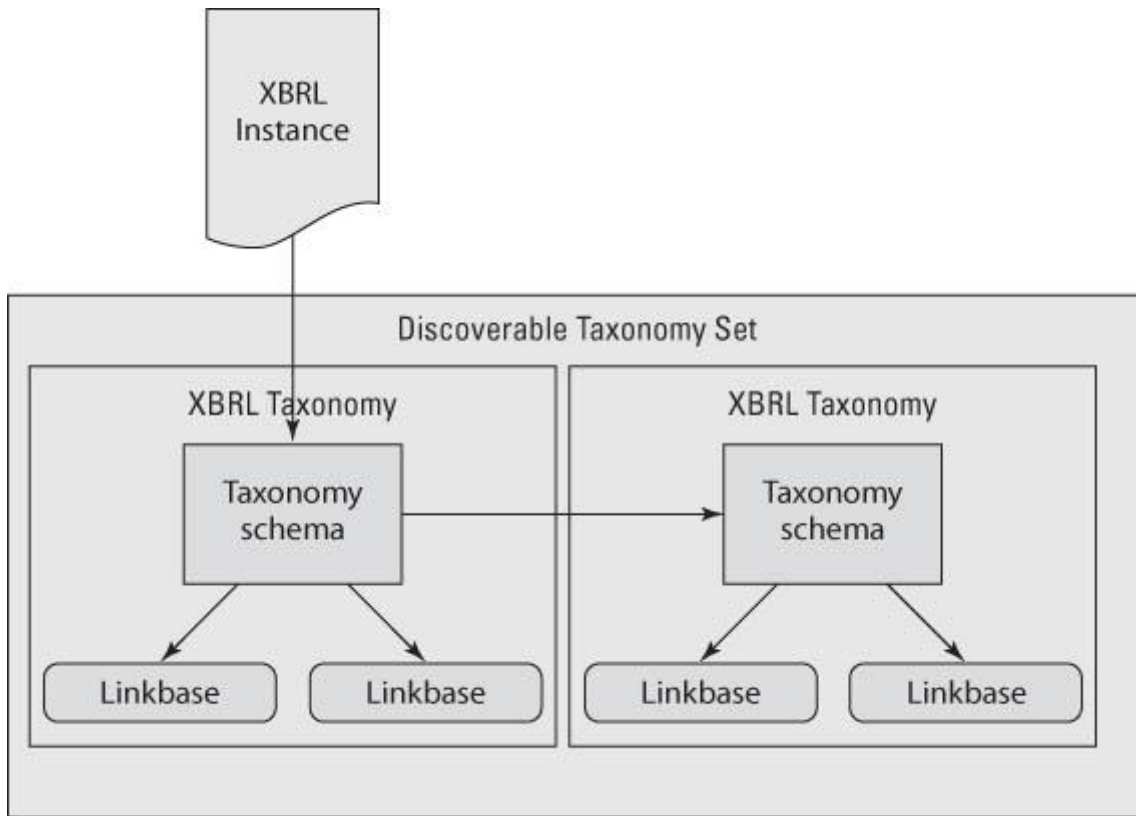
3.12. Achieving interoperability through validation

Does all this stuff seem complex? Business reporting *is* complex; sometimes incredibly complex. The good news is that computers, not you, deal with this complexity. Software guides you through the process, makes sure that you follow the rules of XBRL, and otherwise helps you achieve your goals. Software verifies that everything is okay by checking to be sure that your XBRL instances and XBRL taxonomies don't have any logical, structural, mechanical, or mathematical errors, a process known as *validation*. You can make a mistake in lots of different ways and places, so you can check for errors in many different ways.

3.13. Demystifying the DTS

XBRL requires everything in an XBRL instance to be explicitly defined. An XBRL instance must directly or indirectly physically reference all those XBRL taxonomies whose concepts, resources, and relations have bearing on the XBRL instance's contents. The first thing an XBRL processor does when it encounters an XBRL instance is attempt to discover all its related XBRL taxonomies; if it can't, it goes no further!

Schema files in XML and XBRL taxonomies work differently. The XBRL taxonomies must exist and be discoverable. XML can provide hints about the schema or point to a schema, or it may not provide a schema at all. Not with XBRL. Those schemas that are XBRL taxonomies must exist because the XBRL taxonomies enable you to understand the information in the XBRL instance. The graphic below shows how multiple taxonomy schemas and linkbases are brought together into a DTS. The XBRL instance is connected to a set of two XBRL taxonomies. Each XBRL taxonomy is comprised of one taxonomy schema and two linkbases. The DTS is the combined set of all taxonomy schemas and linkbases from both XBRL taxonomies. Note that an XBRL instance is never considered part of the DTS, but it can contain references to taxonomy schemas, XML Schemas, and linkbases that are part of the DTS.



3.14. Grasping the functioning of networks

When we talk about networks, we're not talking about computer networks, broadcasting networks, or any other form of communication. Although *network* is clearly not an accounting or business term, it's a way to describe something that does occur in business information. Networks have two important states:

- **Unresolved or raw form:** In XBRL jargon, this state is called the *base set*. A base set is the actual physical relations in what can best be described as an unresolved or raw state. For example, if a relation is expressed between two concepts, and then another relation is created to prohibit that relation, in the base set, two relations exist. These two relations are more the physical form of the actual relations. To better understand what we mean, contrast it to the resolved form.
- **Resolved form:** In XBRL jargon, this state is called a network or a network of relations. A network is the resolved form of the set of relations. If you have two relations; one that defines a relation and a second that prohibits that relation; the resolved form of this set of relations is no relation. The resolved form of the set of relations is more the logical result of all the physical relations.

Here's an example of a network: Property, Plant and Equipment, Net is an accounting concept that would likely be designed in a calculation network in XBRL to denote their mathematical accounting relationship of the information represented within an XBRL instance:

(=) Property, Plant and Equipment, Net
(+) Land
(+) Buildings
(+) Furniture and Fixtures
(+) Other

The graphic shows that XBRL is saying that Property, Plant and Equipment, Net = Land + Buildings + Furniture and Fixtures + Other. To express relations in an XBRL taxonomy, you must have at least one network because all resources and relations exist within a network.

3.15. When to use networks

When you build an XBRL taxonomy, you express resources and relations within networks. Understanding why you'd use a network helps you understand what networks are. You separate relations into different networks for two general reasons:

- **Convenience:** The taxonomy creator may want to create several smaller networks rather than one big network. For example, in the US GAAP taxonomy, the information contained in the taxonomy is broken up into multiple networks. Another way that the taxonomy may have been created is by combining all those networks into one single network. Sometimes working with several smaller pieces rather than one big piece is easier. Networks allow you to create pieces, if you want.
- **Out of necessity:** Sometimes you *have* to create networks. Eliminating conflicts when one parent concept has two or more possible sets of child concepts is another reason to create a network. For example, it would be impossible to express these three different ways to arrive at the one value for Receivables, Net in one network:
 - Receivables, Net = Receivables, Gross minus Allowance for Bad Debts
 - Receivables, Net = Receivables, Net, Current plus Receivables, Net, Noncurrent
 - Receivables, Net = Trade Receivables, Net plus Financing Receivables, Net plus Other Receivables, Net, and so on

On the left side of the graphic below, nothing is physically separating the three ways to compute Receivables, Net. Humans can see this separation; we understand that they're distinct. But how would a computer know that they're separate? On the right side, see how networks physically separate the three different computations? Computers need to be told that the three computations are, in fact, separate. Otherwise, they'd collide. Networks provide that physical separation, communicating that separation to software applications.

Conflicts would exist		Networks separate conflicting computations	
		<i>Network (By Component)</i>	
Receivables, Net		Receivables, Net	
Trade Receivables, Net		Trade Receivables, Net	
Financing Receivables, Net		Financing Receivables, Net	
Other Receivables, Net		Other Receivables, Net	
		<i>Network (By Net/Gross)</i>	
Receivables, Net		Receivables, Net	
Receivables, Gross		Receivables, Gross	
Allowance for Bad Debts		Allowance for Bad Debts	
		<i>Network (By Current/Noncurrent)</i>	
Receivables, Net		Receivables, Net	
Receivables, Net, Current		Receivables, Net, Current	
Receivables, Net, Noncurrent		Receivables, Net, Noncurrent	

Trying to express all three of these relations within one network would result in collisions in the relations. To get around this issue, you must use three different networks, one expressing each of the different calculation relations.

3.16. Other important aspects of networks

Here are some other important points about networks to keep in mind:

- You shouldn't physically change networks others created, but you can create your own networks, hide original relationships to effectively nullify them, and redefine new relations. Networks exist within a set of physical files. You may not change someone else's physical file. Instead, relations you create take precedence over the existing relations that existed, in effect creating new relations. You create new relations by prohibiting someone else's relations, creating new relations, or both. This process, in effect, creates a new set of relations and also documents exactly how you've changed what previously existed.
- Although you may not change someone else's taxonomy's set of physical files, you don't have to use the linkbase files that contain the relations. If you don't refer to the linkbase files, for all practical purposes, the relations don't exist in the context of the DTS because the file will never get discovered.
- You can't order networks within XBRL. For example, say that you have three networks: Balance Sheet, Income Statement, and Cash Flow Statement. Users of an XBRL instance may use them in the order of Income Statement, Balance Sheet, and Cash Flow Statement. Although XBRL has no means for prescribing a specific order, you can use proprietary approaches to prescribe the specific order of networks. However, keep in mind that they're proprietary and shouldn't be relied on outside of any specific piece of software that supports that proprietary approach.
- Users can fabricate a network to their liking without the creator of the XBRL instance being involved or otherwise consenting by using XBRL's extensibility.

As a result, XBRL is sometimes called interactive data. Users can make use of the XBRL instance information as they see fit, without consideration for how the creator of the information may want it used. However, when information users do reorganize information, they take on the responsibility of getting the relations correct.

3.17. Drilling into Taxonomy Schemas

Taxonomy schemas are one of two parts of an XBRL taxonomy (linkbases being the other) for expressing the information model of XBRL instances. Taxonomy schemas have several pieces, each of which helps you express meaning relating to that information model. You don't have to use all the pieces, but you can, if you want.

The important pieces of a taxonomy schema are concepts and pointers to other concepts, resources, and relations.

XML namespace prefixes add readability to XML markup. Although these prefixes aren't required, they can be anything you want (clearly within the bounds of proper XML syntax). We use these namespace prefixes when we show you XML markup:

- **xs:** XML Schema namespace
- **xbkli:** XBRL Instance namespace
- **link:** XBRL Linkbase namespace
- **basic:** Taxonomy schema of our example

3.18. Concepts

Essentially, taxonomy schemas are all about concepts, modeling the pertinent aspects of a collection of business concepts (controlled vocabulary) related to some exchange of business information. XBRL instances use concepts from a taxonomy schema to express fact values for the purpose of exchanging this information.

Concepts have the following characteristics expressed as attributes of XML Schema `xs:element` elements:

- **Name:** Every concept must have a name attribute. The name identifies the concept within a taxonomy schema.
- **ID:** Every concept may have an id attribute. If you're using linkbases, you need that id when you add resources or express relations because this id is how the resource or relation is connected to the concept. The id does two things. First, it uniquely identifies a concept across all taxonomy schemas. Second, relations and resources use id's (not names) as unique keys to create the connection between the relation or resource and the concept to which the relation or resource relates.
- **Type:** Every concept must have a type attribute. You may know the term as *data type* from other technologies. Data types constrain content, such as string, integer, or date. XBRL has similar primitive types, but it also has a number of more specialized types common to the business world, such as monetary or shares. You can also define your own types.
- **Substitution Group:** Every concept must have a substitutionGroup attribute, and the value of that attribute will most likely be `xbkli:item`, which means the element is an XBRL concept. Substitution groups can get pretty involved. Just

realize that there is a lot to them and be careful how you use them. Ninety-nine percent of all the substitution groups you run across will be `xbri:item`, which is straightforward.

- **Period Type:** Every concept must have an `xbri:periodType` attribute. The `xbri:periodType` provides information about the kind of period the concept relates to. Two values are most commonly used: `instant` and `duration`. An `instant` `xbri:periodType` denotes a point in time. Conversely, a `duration` `xbri:periodType` denotes a span of time between two instants. For example, a balance sheet reflects information as of a specific point in time, say December 31, 2008, and thus has a `xbri:periodType` value of `instant`. An income statement reflects information for a span of time, such as “For the Year Ended December 31, 2008,” or a duration from January 1, 2008 to December 31, 2008, and thus has a `periodType` value of `duration`.
- **Balance:** Concepts may have a `xbri:balance` attribute, but aren’t required to. If it does have a value, the value must be either `debit` or `credit`. If you’re an accountant, you get debits and credits. If not, you probably don’t have to deal with debits and credits, or you have an accountant helping you, so go ask them about debits and credits.

Here’s what a concept looks like within a taxonomy schema expressed as an XML Schema element:

```
<xs:element
  name="NetIncomeOrLoss"
  id="basic_NetIncomeOrLoss"
  type="xbri:monetaryItemType"
  substitutionGroup="xbri:item"
  xbri:periodType="duration"
  xbri:balance="credit"
>
```

The preceding fragment expresses the concept `NetIncomeOrLoss` in the form of an XML Schema `xs:element` element within a taxonomy schema. The element has a number of attributes. Many of these attributes are provided by XML Schema, including the `name`, `id`, `type`, and `substitutionGroup`. The `xbri:periodtype` and `xbri:balance` are attributes added to XML Schema by XBRL. The values for the attributes are rather straightforward; refer to the list before the fragment.

Sometimes concepts are referred to as *elements* because they exist within the physical part of an XBRL taxonomy known as a taxonomy schema, which is an XML Schema. But not all XML Schema elements within a taxonomy are concepts. Single value XBRL facts always have a `substitutionGroup` value of `xbri:item`, which is how you know they’re XBRL concepts.

3.19. Pointers to other concepts, resources, or relations

Another piece of the taxonomy schema that you may find are references to other taxonomy schemas and linkbases. You can create references using the following elements:

- **Import:** You can use an XML Schema `xs:import` element within a taxonomy schema file to refer to another taxonomy schema or XML schema file. Each imported XML Schema has a different namespace identifier.
- **Include:** An XML Schema `xs:include` element does something similar to the `xs:import` element. The difference is that included files pull elements into the namespace of the file containing the include element, and included files don't contain a namespace identifier.
- **LinkbaseRef:** A `link:linkbaseRef` element or linkbase reference points to a linkbase, which contains networks of either resources or relations.

These pointers allow you to use taxonomy schemas, XML schemas, or linkbases others have created; let you modularize your taxonomy so that you or others can use some parts of your XBRL taxonomy without being forced to use other parts; and otherwise physically separate the files that make up your XBRL taxonomy.

3.20. Drilling into Resource Networks

Resource networks let you express additional information for concepts. Labels and references are two types of resource networks that the XBRL standard provides. The XBRL Formulas specification provides a third type of resource. This list explains these different types of resource networks:

- **Label:** Label resources, as the name suggests, allow the creator of an XBRL taxonomy to create labels for each concept in the taxonomy. Basically, they provide a more user-friendly label in place of the ugly XML element names. Another use for labels is to provide multilingual support and multidialect support. Labels also provide documentation for a concept, such as a human-readable definition of the concept.
- **Reference:** Reference resources allow the creator of an XBRL taxonomy to express references to external sources (such as a paragraph in a manual) that explain or further define a concept in human terms. References are pointers to a reference, not the references themselves.
- **Formula:** Not in the base XBRL Specification but added by the XBRL Formula Specification, formula resources allow the creator of an XBRL taxonomy to express various types of business rules. XBRL instances that make use of an XBRL taxonomy that contains these rules must comply with these rules.

You can express an infinite number of different types of resource networks. You can specify your own type of resource networks using the XBRL Generic Linkbase Specification.

Resources are connected to concepts in a taxonomy schema. Resources can have different resource roles, many of which XBRL predefines, but taxonomy creators can also define their own resource roles. These roles let taxonomy creators further categorize resources, if needed.

You can categorize resources by the preceding resource roles. This categorization helps when partitioning one type of resource from another. This resource role is different than the role of the network (extended link role), which contains the resources. Finally, remember that the resources are connected to the id element of a concept expressed within a taxonomy schema.

The documentation for each concept expressed in an XBRL taxonomy is commonly implemented as labels with a specific label role of "http://www.xbrl.org/2003/role/documentation". XML Schema offers documentation in the form of an xs:appinfo element, but it's not standardized, not extensible, is generally ignored by most XBRL processors, can't be prohibited, and therefore is a bad idea to use.

3.21. Drilling into Relation Networks

You can use the following types of standard relation networks to express relations between concepts:

- **Presentation:** Presentation relations allow you to express a simple parent-child type of relationship, basically a hierarchy. Presentation relations are primarily intended to help organize the XBRL taxonomy. You can also use presentation-type relations to help generate human-readable renderings of an XBRL instance.
- **Calculation:** Calculation relations allow you to express certain types of computations between concepts within an XBRL taxonomy. XBRL calculation relations handle only addition and subtraction, and concepts must be in the same XBRL context. This is many times helpful, but can also be somewhat limiting. Need more power in your computations? Then use XBRL Formulas.
- **Definition:** You can use definition relations for many purposes. Definition relations basically let you express any type of relation. You can define any arcrole, which explains what type of relation you've created. For example, the XBRL Dimensions Specification uses definition relations to express multidimensional type relations.

You can express an infinite number of different types of relation networks. You can specify your own type of relation networks using the XBRL Generic Linkbase Specification.

Relations and the concept in a taxonomy schema to which the relation relates are connected. XBRL processors understand this connection. Relations can have different arcroles, many of which XBRL predefines, but taxonomy creators can also define their own arcroles. Arcroles differentiate or categorize relations, should you have that need.

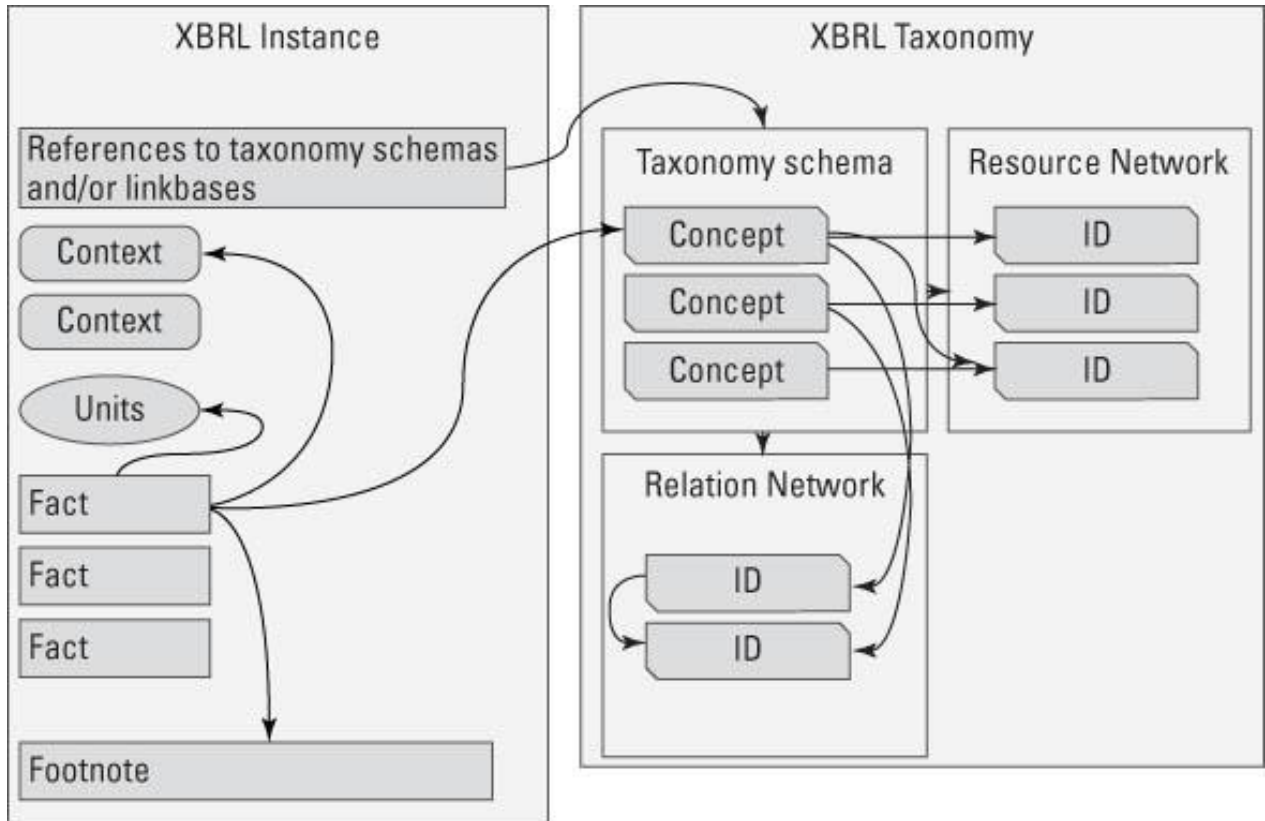
4. Drilling into XBRL Instances

XBRL instances are the physical documents that contain business information that is published, transferred, or otherwise exchanged. Here are the parts of an XBRL instance:

- Reference(s) to XBRL taxonomy(s)
- Contexts
- Units

- Facts
- XBRL Footnotes (that is, comments)
- Other technical odds and ends

The graphic below shows the parts of an XBRL instance and the relation to XBRL taxonomies that support the instance. The figure shows the parts of an XBRL instance and the relations between the parts on the left, the connection between the XBRL instance and the XBRL taxonomy, the relations between the XBRL instance and the XBRL taxonomy, and the relations within the XBRL taxonomy on the right.



4.1. References to XBRL taxonomies

XBRL instances always refer to an XBRL taxonomy or a set of XBRL taxonomies, collectively known as the DTS. Because the XBRL taxonomies make up the DTS that determines the controlled vocabulary and the other semantic meaning expressed by the XBRL taxonomies, you'll want to know where to get those all those XBRL taxonomy pieces. The references to these physical files tell you where to get the XBRL taxonomy pieces that explain the controlled vocabulary the XBRL instance uses and all the other meaning expressed for the information model by the DTS.

An XBRL instance can refer to pieces of the DTS in two ways:

- **SchemaRef:** A link:schemaRef element, or schema reference, points to a taxonomy schema file or an XML schema file. Those files can contain references to even more files. These physical files may be components others created or components created by you that express new concepts, relations, or resources used by your information model or that modify the information of other XBRL

taxonomies you refer to. Your modifications are commonly referred to as an *extension*.

- **LinkbaseRef:** A link:linkbaseRef element, or linkbase reference, points to a linkbase that contains relations or resources. The linkbases themselves generally reference the taxonomy schemas that contain the concepts associated with that linkbase.

You can connect linkbases directly to XBRL instances with a linkbaseRef. Alternatively, you can use a schemaRef to connect linkbases to a taxonomy schema, which then references one or more linkbases.

An XBRL processor is responsible for grabbing all the referenced XBRL taxonomy pieces that make up the DTS, putting all the pieces together correctly, and communicating any issues relating to that process to the user of the XBRL instance.

Here is an example schemaRef:

```
<link:schemaRef xlink:type="simple" xlink:href="Example.xsd" />
```

The preceding code fragment shows a schema reference to the taxonomy schema with the name Example.xsd. A linkbase reference is similar, with the only difference being a different element name.

Software can add linkbases to a DTS dynamically by connecting the linkbase to the XBRL instance. For example, consider an XBRL instance that refers to an XBRL taxonomy that has only English labels in it. Suppose that someone else creates a linkbase that provides Spanish labels for that same XBRL taxonomy. Further, suppose that your native language is Spanish, and you'd prefer to use those Spanish labels, but the linkbase isn't physically connected to the XBRL instance. No problem! All you have to do is load the XBRL instance, which will automatically load the DTS that the XBRL instance points to. Then you use your software to point to the linkbase with the Spanish labels. Voilà! You can use the Spanish labels! Pretty slick, eh? That is why XBRL is sometimes referred to as interactive data.

You can use the same approach to reorganize the way you view XBRL instance information. If you don't like the way the creator of the XBRL instance or XBRL taxonomy organized the information, you can simply reorganize the instance information by creating your own XBRL taxonomy extension. You can then use your view, provided by your XBRL taxonomy, instead of the XBRL instance creator's view of the information it contains.

4.2. Giving facts context

Contextual information helps users of the information in the XBRL instance understand the context in which the information is being used. Context is provided using the xbrli:context element, which contains

- **ID:** Every context within an XBRL instance has an id that uniquely identifies the context so that one or more fact values can refer to it. A context id attribute can look something like X10B72009. These IDs have no meaning, other than to uniquely identify the context. They're like an identification number. The meaning is expressed within the elements and attributes of the context.
- **Entity:** The xbrli:entity element is part of the context and has two pieces; the first is required, and the second is optional. The required piece is the xbrli:identifier element. The scheme attribute of the xbrli:identifier element

communicates which identification scheme is being used. The value of the `xbrli:identifier` is the actual identifier from that scheme. For example, the U.S. SEC has a numbering system called a CIK number. XBRL instances going to the SEC use a pointer to that scheme, which may be something like `http://www.sec.gov/CIK`. The identifier value is the actual CIK number, such as 0000066740. The second and optional piece of information is the entity `xbrli:segment` element. You can put any information you desire into the `xbrli:segment` element in order to provide information that helps users gain needed contextual information to understand the fact value. Note that the XBRL Dimensions specification is a way to express this type of contextual information, and the use of XBRL Dimensions information in the `xbrli:segment` element is emerging as a best practice. However, any valid XML is allowable, other than XBRL. You can express an infinite number of elements within a segment.

- **Period:** The `xbrli:period` element communicates contextual information about the period to which a fact value relates. The `xbrli:periodType` attribute is defined within a taxonomy schema. The `xbrli:periodType` on a concept within the taxonomy schema must match the period used within a context used on that concept. The two common `xbrli:periodType` values are
 - **Instant:** If the XBRL taxonomy concept defines the concept as an instant, the element used within the period will be `xbrli:instant` and will contain a single date — for example, `<xbrli:instant>2009-12-31</xbrli:instant>`.
 - **Duration:** If the taxonomy concept says duration, two elements will be within the `xbrli:period`, `xbrli:startDate`, and `xbrli:endDate`. Each one has a value to communicate the starting and ending dates of the duration (date range). The start date may look like `<xbrli:startDate>2009-01-01</xbrli:startDate>`, and the end date may look like `<xbrli:endDate>2009-12-31</xbrli:endDate>`. There is one other possibility for period, but its usage is rare. The value `xbrli:forever` means no date is provided, and that context is always applicable.
- **Scenario:** The `xbrli:scenario` element works in a manner similar to the `xbrli:segment` element of the `xbrli:entity` context described earlier in this list. The `xbrli:scenario` element is optional. The `xbrli:scenario` element can contain any valid XML other than XBRL. One way of expressing this information is to use XBRL Dimensions, and it's becoming a best practice to use this approach. Literally, you can put any type of contextual information into the `xbrli:scenario` element, such as whether information is actual, budgeted, and so on. You can express an infinite number of elements within a scenario.

Putting these pieces together, here's an example of a `xbrli:context` element:

```
<xbrli:context id="D-2009">
  <xbrli:entity>
    <xbrli:identifier scheme="http://www.Sample.com">SAMP</identifier>
    <xbrli:segment>
      >>>>segment information would go here<<<<<
```



```
</xbrli:segment>
</xbrli:entity>
<xbrli:period>
  <xbrli:startDate>2009-01-01</xbrli:startDate>
  <xbrli:endDate>2009-12-31</xbrli:endDate>
</xbrli:period>
<xbrli:scenario>
  >>>>scenario information would go here<<<<
</xbrli:scenario>
</xbrli:context>
```

The preceding code sample shows the components a xbrli:context element from an XBRL instance. The context has an id value of D-2009, which is the same value of the contextRef on one or more facts, which we discuss in the upcoming section “Expressing the values for facts.” The entity xbrli:identifier element has a value of SAMP, which comes from the scheme <http://www.Sample.com>. The segment element in our example is empty (we just wanted to show you where it would be located). The xbrli:period element has a duration (a period of time) value with a start date of 2009-01-01 and an end date of 2009-12-31. As with the xbrli:segment, the xbrli:scenario element values aren’t shown, as we don’t want to get into this topic at this time.

4.3. Units provide additional context for numeric facts

In order to provide the proper context for a numeric value, you need to know the units for the numeric values. For example, say that you have a value of 1,000. Is that some particular currency, and if so, is it U.S. dollars, euros, yen, or some other currency? Or, is it square feet, the number of employees, or something else?

An XBRL instance contains units whenever you have any numeric fact values. A xbrli:unit element contains the additional context:

- **ID:** Every xbrli:unit element has an id attribute that uniquely identifies the unit so that numeric fact values can point to it. The id on the units works exactly the same way that a context id attribute works.
- **Measure:** Units generally have one xbrli:measure element, but they can have any number of measures. The value of the xbrli:measure element is the actual units for the fact value — for example, iso4217:EUR, which is the ISO currency code for the euro. If the fact value has no units, such as a percentage, the measure would have a value of xbrli:pure, which indicates that it’s a pure number with no real units.

Have a look at how you can express units within an XBRL instance:

```
<xbrli:unit id="U-Monetary">
  <xbrli:measure>iso4217:EUR</xbrli:measure>
</xbrli:unit>
```

The code sample of unit shows the unit element with an id attribute value of U-Monetary that would correspond to one or more fact unitRef attribute value, which ties the fact to this unit. The xbrli:unit element has a xbrli:measure element with the value of iso4217:EUR, which means that the ISO 4217 standard currency code value of EUR for euros is the unit of measure.

4.4. Expressing the values for facts

An XBRL instance's meat is the fact that the XBRL instance is communicating. What a fact looks like can be slightly different depending on whether it's numeric. Numeric facts need to indicate the units in which the numeric fact value is expressed and the decimal places of the numeric value.

These parts make up a fact in an XBRL instance:

- **Concept name:** Every fact is data for a concept defined by one of the taxonomy schemas within the DTS of the XBRL instance. For example, a concept name may be something like gaap:CashAndCashEquivalents. The concept name is actually not exactly the name from the taxonomy, but rather the qualified name (sometimes called the QName), which is the name plus what is called the namespace prefix of the taxonomy schema from which the concept came. A *namespace prefix* is basically shorthand for referring to a namespace identifier. The *namespace identifier* basically identifies the taxonomy schema. We know, boring technical stuff. But the technical people dig this sort of thing and make all these connections behind the scenes for you.
- **ID:** Facts can have an id attribute that uniquely identifies the fact, but it's optional. Generally, the id isn't really necessary on a fact.
- **Context reference:** Every fact has a contextRef or context reference attribute. The contextRef attribute refers to one of the id attributes of a context element defined in your XBRL instance. The context element contains information that's necessary to understanding the context in which the fact value is being used.
- **Unit reference:** Every fact with a numeric concept has a unitRef or unit reference attribute. The unitRef refers to one of the id attribute of one of the unit elements defined in your XBRL instance. Concepts like strings, dates, and a few other odds and ends don't need unit information, so you don't need to provide one for facts with those types. Your software can help you sort out whether units are needed on a fact.
- **Decimals:** Every fact with a numeric concept must have either a decimals or possibly a precision attribute. Both the decimals and precision attributes provide virtually the same functionality, explaining the number of decimal places to which the fact value is accurate. Decimals are preferred because most people to understand them more easily. You can specify, say, 2 as the decimals value to indicate that a fact value is accurate to 2 decimal places, or -3 to indicate that a number is accurate to thousands. Software applications generally guide you to the appropriate choice.
- **Fact value:** Facts have a value, which is referred to as the fact value. A fact value can be a number, such as 1000, a text, such as LIFO, or any other data type, including an entire narrative with several paragraphs of text. The taxonomy schema determines and enforces the data type.

Here is an example of a numeric fact:

```
<basic:NetIncomeOrLoss  
  contextRef="D-2009"  
  unitRef="U-Monetary"  
  decimals="-3">5347000</basic:NetIncomeOrLoss>
```

The preceding XBRL instance fragment shows a fact with the value of 5347000. That fact expresses information for the concept `basic:NetIncomeOrLoss`. It points to a context with the `contextRef` of D-2009 and units information with the `unitRef` of U-Monetary. The numeric fact is accurate to -3 decimal places (in thousands), as you can see in the `decimals` attribute value of -3.

4.5. Commenting with XBRL footnotes

XBRL instances can also contain what are basically comments but are referred to in XBRL as *footnotes*. XBRL footnotes are used in the XBRL instance as comments or notations that refer to one or more fact values.

XBRL footnotes are effectively a resource network physically contained within an XBRL instance. The footnote network is expressed as a linkbase and operates just like any other resource type linkbase.

Footnotes are good to know about and useful if you have a special case where you need them, but in the grand scheme of things, they really aren't that important.

Many people confuse XBRL footnotes with the term *footnote* as it applies to a financial statement. They're not the same thing. What XBRL footnotes actually provide in terms of functionality, how people use them, and how software vendors implement them are rather inconsistent, and you should avoid using footnotes, if possible. When a specific regulator or someone *does* specify what they should be used for and how they operate, however, you should follow the guidance of that regulator.

4.6. Gaining Flexibility through Extension

Many businesses need XBRL-required information models to be dynamic (flexible), and XBRL was created to fulfill that need. XBRL lets you modify XBRL taxonomies, but you don't *have* to if you don't need to.

We use the term *modified* in a special way here. These modifications don't change other people's physical files, but rather those creating extensions add new XBRL taxonomy components that can *virtually* change what others have created. It also articulates how you changed it.

Here are two terms you need to know to understand how extension works:

- **Base XBRL taxonomy:** You can think of a *base* XBRL taxonomy as an XBRL taxonomy that another XBRL taxonomy is extending. Other terms sometimes used to refer to these taxonomies are *standard taxonomies* or *anchor taxonomies*. For example, a taxonomy mandated by a regulator may be a base taxonomy.

- **Extension XBRL taxonomy:** You can think of an *extension* XBRL taxonomy as an XBRL taxonomy that extends some base XBRL taxonomy. Other terms sometimes used to refer to these taxonomies are *custom taxonomy* or *company taxonomy*. Extension XBRL taxonomies are generally customizations created of some base XBRL taxonomy for someone’s specific use. For example, a company that files with a regulator who allows extension may create a company extension taxonomy that extends the base taxonomy created by the regulator.

An XBRL taxonomy that is a base has no real physical difference from a taxonomy that is an extension. In fact, an XBRL taxonomy can be both a base and an extension. For example, an XBRL taxonomy may extend some other XBRL taxonomy, and then someone else can use those two XBRL taxonomies as the base for its extension XBRL taxonomy.

XBRL extensibility has two fundamental facets:

- **Extension:** Adding to or altering, through extension, an existing DTS. Extension entails creating a new extending XBRL taxonomy that references (but doesn’t directly impact or replace) the original, which is often referred to as the *base* XBRL taxonomy. The extending XBRL taxonomy adds concepts, resources, relations, or resource/relation networks.
- **Prohibition:** Removing by nullifying relations or resources from an existing taxonomy, through extension XBRL taxonomy. The key point is that you’re getting rid of something by adding something. Note that you can’t prohibit concepts themselves. Prohibiting a relation or resource entails creating one or more new resources or relations in the new extending XBRL taxonomy that voids and nullifies a specific resource or relation in the referenced pre-existing base XBRL taxonomy.

Neither type of extension has any impact on the pre-existing base XBRL taxonomy. Many organizations can concurrently extend the same base XBRL taxonomy in entirely different ways with zero impact on each other or the base XBRL taxonomy. But, extensions can impact the overall DTS.

4.7. Understanding extension

Suppose that someone created an XBRL taxonomy that included concepts, resources, and relations. An extension can

- Add one or more new concepts.
- Prohibit the use of existing resources, effectively nullifying them.
- Prohibit the use of existing relations, effectively nullifying them.
- Add one or more new resources or relations.
- Add one or more new resource or relation network.

The user who wants to extend some base XBRL taxonomy creates a new XBRL taxonomy, pulls that base XBRL taxonomy into her extension XBRL taxonomy by referencing it, and thus modifies the DTS with the extension and/or prohibition information from the extension XBRL taxonomy she created. So basically what you’re doing with either extension or prohibition is adding pieces (taxonomy schema or linkbase) to the set that comprises the DTS, thus modifying the overall DTS.

The exact opposite of an extension is a form. A form is static. The person completing the form can't change a form to meet his needs. (The creator, though, can update the form from year to year to add new things.) If your information is static like a form, the extensibility features of XBRL may not be that useful to you. But other XBRL features, such as the ability to express the semantics (meaning) of the form, might still be useful, such as form computations or other relations. The underlying point here is that forms are static and don't need extension, whereas many types of business information aren't forms; they are dynamic.

Here are two examples of static versus dynamic data:

- **Static:** Most tax forms
- **Dynamic:** Most financial statements of U.S. public companies

4.8. *Reasons to extend*

The three primary reasons why you may want to create an extension XBRL taxonomy are to

- **Tweak existing information models.** If need be, you can totally redefine relations or create your own XBRL taxonomies, which is fine. However, if another XBRL taxonomy exists and it's close to what you need, rather than creating a new XBRL taxonomy, simply extend the existing one to get what you desire. An example is a form that you might like to tweak a little. You like 90 percent of what exists in that form, but you don't like the other 10 percent and want to add another 5 percent, rather than starting from scratch. So instead you simply create an XBRL extension. You're extending the form to create a new, modified form based on another form.
- **Express information your way.** Often, organizations even in the same industry use different terminology — for example, different labels for the same concept or different ways to compute values. If need be, maybe you can tweak those models, if the system in which you operate allows it. Or, you may simply want to add labels in a different language than what someone else provided. How you tweaked the base XBRL taxonomy information model is articulated within your extension XBRL taxonomy information model, and those who use your XBRL instance information can see and understand the tweaks you made.
- **View information your way.** You can totally reorganize someone's taxonomy and not change the meaning of the information expressed by taxonomy. For example, the US GAAP XBRL taxonomy is a consensus-based taxonomy created by accountants. Analysts have a different view of exactly the same information. Analysts could reorganize portions of the US GAAP XBRL taxonomy or totally reorganize the entire taxonomy if they see fit and not change the meaning of the information model at all.

What *is* allowed with respect to XBRL taxonomy extension is typically based on the agreed practices of business partners or regulators for the system with which you interact.

One scenario in which extensibility is valuable is in the financial reporting of publicly traded companies. Particularly in the United States, even companies in the same industry don't all report similar information in precisely the same way. In other words, financial statements aren't forms that must be filled in; they're more dynamic. Financial statements have a lot in common, but companies have flexibility in reporting

their financial information, taking into consideration the unique aspects of their business. Flexibility, in this case, may mean including a concept that no other business uses, adding things up slightly differently, or putting things in one place rather than in another. XBRL was built to handle this flexibility.

4.9. *Understanding the Dimensional Nature of Information*

Logical models help communication and provide a framework for understanding. The multidimensional logical model is a model for understanding information³⁹. Every professional accountant works with multidimensional information every day but don't generally realize it. XBRL provides an approach to representing information using the multidimensional model called *XBRL Dimensions*⁴⁰.

Just like an electronic spreadsheet has a logical model (workbook, spreadsheet, row, column, cell); a digital financial report has a logical model. The logical model of a digital financial report follows the multidimensional logical model. Here are the high-level pieces of a digital financial report:

- **Fact:** A fact defines a single, observable, reportable piece of information contained within a financial report, or fact value, contextualized for unambiguous interpretation or analysis by one or more distinguishing characteristics. Facts can be numbers, text, or prose.
- **Characteristic:** A characteristic describes a fact (a characteristic is a property of a fact). A characteristic provides information necessary to describe a fact and distinguish one fact from another fact. A fact may have one or many distinguishing characteristics.
- **Fact table:** A fact table is a set of facts which go together for some specific reason. All the facts in a fact table share the same characteristics.
- **Relation:** A relation is how one thing in a business report is or can be related to some other thing in a business report. These relations are often called business rules. There are three primary types of relations (others can exist):
 - **Whole-part:** something composed exactly of their parts and nothing else; the sum of the parts is equal to the whole (roll up).
 - **Is-a:** descriptive and differentiates one type or class of thing from some different type or class of thing; but the things do not add up to a whole.
 - **Computational business rule:** Other types of computational business rules can exist such as "Beginning balance + changes = Ending Balance" (roll forward) or "Net income (loss) / Weighted average shares = Earnings per share".
- **Grain:** Grain is the level of depth of information or granularity. The lowest level of granularity is the actual transaction, event, circumstance, or other phenomenon represented in a financial report. The highest level might be a line item on a primary financial statement such as a balance sheet.

³⁹ *Introduction to the Multidimensional Model for Professional Accountants*, <http://xbrl.squarespace.com/journal/2016/3/18/introduction-to-the-multidimensional-model-for-professional.html>

⁴⁰ XBRL International, *XBRL Dimensions 1.0*, <http://www.xbrl.org/specification/dimensions/rec-2012-01-25/dimensions-rec-2006-09-18+corrected-errata-2012-01-25-clean.html>

Diving into the details of XBRL Dimensions and the multidimensional model is beyond the scope of this basic primer. Just be aware that XBRL Dimensions exists.

4.10. Satisfying the Need for Pixel Perfect Presentation

XBRL instances and XBRL taxonomies focus on representing the meaning of information. But sometimes people worry about the presentation of information within the form of a document. Inline XBRL⁴¹, or iXBRL, is an additional model layer on top of “raw XBRL”, or XBRL that does not take advantage of the Inline XBRL layer. Inline XBRL is a method of representing facts and their contexts within an HTML document (actually XHTML). The model of the report and the information conveyed by the report is exactly the same whether Inline XBRL is used or raw XBRL is used to represent the facts and contextual information. Inline XBRL is beyond to scope of this basic primer, but we did want to make you aware of its existence. Inline XBRL is a power alternative to microformats⁴².

⁴¹ XBRL International, *Inline XBRL*, <https://www.xbrl.org/the-standard/what/ixbrl/>

⁴² Microformats.org, *Microformats Wiki*, <http://microformats.org/wiki/about>