

# Understanding the Hypercube Extraction Tool Demo

The purpose of this document is to explain the hypercube extraction tool demo. The application is build in Microsoft Excel. You can download the Excel file here:

<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/Hypercube-Extract.zip>

## Point of the Demo

The point of the demo is to see the things which are necessary from an XBRL document in order to build a usable interface into an information set. The demo is not an example of how to implement XBRL, it is an example of what you need from an XBRL processor in order to implement something useful to a business user. I have tried to remove as much complexity as possible, focusing on the key areas of the process.

Another thing I am trying to figure out is how to structure an XBRL taxonomy such that it maximizes what you get from XBRL with the minimum of effort. This demo is somewhat of a proof of concept of work done to create a logical model for business reporting and financial reporting that I am participating in. It will evolve to that end, proving that the logical model works.

Finally, the demo is to communicate the notion of an “interactive information hypercube”. An interactive information hypercube is a way to use information contained within an XBRL instance. When you think about this, thing Excel pivot table, multidimensional analysis, and the flexibility they offer. An interactive information hypercube breaks the interface into the following “areas”:

1. **Slicers:** the slicers are in the upper left hand corner just under the “Get Information” button. Slicers are measures or characteristics of the information which apply to each cell.
2. **Columns:** the columns are also measures or characteristics of the information but apply only to the information in that column.
3. **Rows:** the rows are also measures or characteristics which apply to the row.
4. **Cells:** the cells contain facts in this demo. They can also contain measures. Basically, the cells are described by the slicers, columns, and rows.

This should be very familiar to someone who understands business intelligence applications. This is basically the multidimensional model. However, there are three important differences between an interactive information hypercube and a business intelligence hypercube:

- a. Interactive information hypercubes deal equally well with text as they do with numbers. (Business intelligence, BI, hypercubes tend to focus on numbers.)
- b. Interactive information hypercubes don’t always anticipate OLAP (on line analytical processing) aggregation of the information. You can use OLAP to aggregate, but you are not forced to use OLAP.
- c. Interactive information hypercubes are about presenting information not aggregating information. See it as a flexible report, not as an aggregation tool. Any aggregation that you

want is done prior to rendering information in the interactive information hypercube. So, only the multidimensional model is used for its flexibility of representing information, not the OLAP piece which is also used by BI software.

## Getting Started

**Step 1:** After you download the file and unzip it, open the Excel spreadsheet. There are macros in the spreadsheet, so you need to enable macros to run the application. What you see should look like this:

	A	B	C
1	<b>Interactive Information Hypercube Viewer</b>		
2	<input type="button" value="Get Information"/>		
3	<b>Slices:</b>		
4	ReportingEntity:	US Census Bureau ( <a href="http://www.census.gov/popest/datasets.html">http://www.census.gov/popest/datasets.html</a> )	
5	Concept:	general:Population	
6	ReportingUnits:	xbrli:pure	
7			
8			
9			
10		<b>Label</b>	<b>Concept</b>
11		Network (Population Trends)	
12		Periods [Abstract]	factBook:PeriodsAbstract
13		7/1/2000	factBook:Instant_2000-07-01
14		7/1/2001	factBook:Instant_2001-07-01
15		7/1/2002	factBook:Instant_2002-07-01
16		7/1/2003	factBook:Instant_2003-07-01
17		7/1/2004	factBook:Instant_2004-07-01
18		7/1/2005	factBook:Instant_2005-07-01
19		7/1/2006	factBook:Instant_2006-07-01
20		7/1/2007	factBook:Instant_2007-07-01
21		7/1/2008	factBook:Instant_2008-07-01
22		7/1/2009	factBook:Instant_2009-07-01
23			
24			
25			
26			

Notice where the “slicers” are, the “columns”, the “rows” and the “cells”.

**Step 2:** Press the “Get Information” button. The following form is opened:

Interactive Information Hypercube Viewer

Step 1: Get a list of the information sets available.

Step 2: (Optional) View the metadata for the information set.

Step 3: Information for selected information set.

Slicers:

Rows:

Columns:

Period Start: 2008-12-31  
Period End: 2008-12-31

<http://www.xbrl.org/Demos/StateFactBook/StateFactBook/URL/HypercubeViewer/index2.xml>

You want to progress from left to right.

**Step 3:** Press the “Get Information Sets” button in the upper left corner of the form. Pressing this button will run a routine which grabs information from this file:

<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/HypercubeViewerIndex2.xml>

The purpose of this file is to organize the things needed to make the demo run. If you look at this XML file you see some information used by the demo. Basically the file is me “cheating”. I am intentionally not making use of an XBRL processor in the Excel demo. I have cheated by pre-processing several things which I need from an XBRL processor.

```
- <Item number="1" set="Set-001">
  <InformationSetName>General Information</InformationSetName>
  <ExtendedLinkURI>http://www.xbrlsite.com/Demos/StateFactBook/GeneralInformation</ExtendedLinkURI>
  <HypercubeName>factBook:GeneralInformationTable</HypercubeName>
  <LinkToInstance>http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-GeneralInfo-
instance.xml</LinkToInstance>
  <LinkToMemberConcepts>http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/_GeneralInformation-
Concepts.xml</LinkToMemberConcepts>
  <LinkToDimensions>http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/_GeneralInformation-
States.xml</LinkToDimensions>
- <Slicers>
- <Slicer>
  <Name>ReportingEntity</Name>
  <Value>US Census Bureau (http://www.census.gov/popest/datasets.html)</Value>
</Slicer>
- <Slicer>
  <Name>CalendarPeriod</Name>
  <Value>2008-12-31</Value>
</Slicer>
- <Slicer>
  <Name>ReportingUnits</Name>
  <Value>iso4217:USD</Value>
</Slicer>
</Slicers>
</Item>
```

I have basically pre-selected the extended links, the hypercubes that I want to work with. I point to the XBRL instance. I also point to the member concepts (list of concepts from the XBRL taxonomy which participate in the hypercube), the other members (dimensions) of the hypercube, and I have pre-determined the slicers for the XBRL instance fact values.

I have done this for two reasons. First, like I said, I don't want to use an XBRL processor for the demo. Second, I am not a good enough programmer to get an XBRL processor to generate this information.

So the way that you should look at this is the following: What I have staged is the information that I need from an XBRL processor in order to use that information in an application in order to build the interface that I need.

**Step 4:** After you press the “Get Information” button and the application goes into that XML file I mentioned above, the information sets available are populated in the list box below the button you pressed. It looks like this:

Step 1: Get a list of the information sets available.



Three information sets are available. You can see HTML representations of the information here as follows:

1. **General Information:**  
<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookhtml/StateFactBook-GenerallInfo.html>
2. **Financial Information:**  
<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookhtml/StateFactBook-FinancialInfo.html>
3. **Population Trends:**  
<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookhtml/PopulationTrends.html>

The nature of the information is really not relevant, but it should be understandable to you if you are bent on understanding what the information means. You can find more about this information from this URL: <http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookhtml/>

What is important is that the information have different measure concepts and measure dimensions. Each hypercube is different. Also, I am limiting the dimensions to only one in order to make programming the application easier. One could support multiple dimensions.

**Step 5:** Select one of the information sets. I will walk you through the first, "(Set-002) Financial Information". Select that and then press the "View Set Metadata" button. This populates the three list boxes below that button.

Step 1: Get a list of the information sets available.

Get Information Sets

- (Set-001) General Information
- (Set-002) Financial Information**
- (Set-008) Population Trends

Set-002

Period Start: 2008-12-31

Period End: 2008-12-31

Step 2: (Optional) View the metadata for the information set.

View Set Metadata

Slicers:

- ReportingEntity
- CalendarPeriod
- ReportingUnits

Rows:

- Annual Survey of State Government Finances [Line Items]
- Net Revenue over Expenditures (Expenditures over Revenues [Roll Up])
- General Revenues [Roll Up]
- Intergovernmental Revenue
- Taxes [Roll Up]
- General Sales Taxes
- Selective Taxes
- License Taxes
- Individual Income Taxes
- Corporate Income Taxes

Columns:

- States, All [Domain]
- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- Florida
- Georgia

You see the **sliders** loaded from that first XML file I mentioned. Remember that those were pre-processed, but they could be determined by an XBRL processor or by an XML application. Something is a slicer if it exists as a measure on every fact in the XBRL instance which participates in the hypercube you are using. For example if you go to the XBRL instance for the financial information (<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-FinancialInfo-instance.xml>) you will see that the entity identifier is EXACTLY THE SAME for every fact in the XBRL instance. That makes it a slicer:

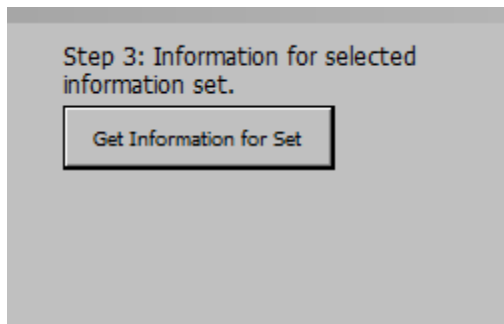
```
<identifier scheme="http://www.census.gov/popest/datasets.html">US Census Bureau</identifier>
```

The **rows** are the measure concepts. See the list and see this HTML file (<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/FinancialInformation-Concepts.html>) This shows you what the measure concepts are for the hypercube. The US GAAP taxonomy calls these “Line Items”. The XBRL Dimensions specification calls these “primary items”. In multidimensional analysis these are measures.

The **columns** are the members of the one measure “factBook:StatesAxis”. See the list box and this HTML file (<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/FinancialInformation-States.html>). Notice that the states have a “domain” or total called “States, All [Domain]”. That is the aggregation of all the states.

Again, remember that I am cheating here and only using on extended link, one hypercube, and only two measures: concepts which go into the row generally and the states measure which goes into the columns.

**Step 6:** Press the “Get Information for Set” button. See below.



You will see Excel grabbing information from the file which has the sliders, the file which has the concepts, the file which has the states dimension, and then after the frame of the interactive information hypercube is set, it uses that information to go grab the fact values from the XBRL instance, in this case this file

(<http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-FinancialInfo-instance.xml>).

**Step 7:** Repeat the process for the other two sets.

Notice the changes in the slicers, the columns and the rows. For example, if you look at the columns, the columns are always for the states, but the financial information has a total for all the states, the general information has no total, and the population trends has a total for all the states and also includes “District of Columbia” as a member in the columns.

### **Other Important Things**

Here are some other important things to recognize. One thing I am not doing here is validating the data prior to using it. For example see this calculation report for the financial information

([http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-FinancialInfo-instance\\_calctrace.html](http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-FinancialInfo-instance_calctrace.html)) which shows that all the state financial information foots. See the business rules report ([http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-FinancialInfo-instance\\_FormulaTrace.html](http://www.xbrlsite.com/Demos/StateFactBook/StateFactBookXBRL/StatesFactBook-FinancialInfo-instance_FormulaTrace.html)) shows....OPPS!!! Go look at the report, see the

“notSatisfied” in the report. The information does not cross case, there is an error. What is up with that? This may, or may not, be an error. See this blog post which discusses this

(<http://xbrl.squarespace.com/journal/2010/4/30/example-of-xbrls-ability-to-detect-information-errors->

[us-cen.html](#)) Basically, XBRL processors can validate the information during creation and prior to use. I am not doing this with my demo because I am not using an XBRL processor. But I did use an XBRL processor to validate the data sets I created for this demo, that is why this anomaly (may or may not be an error, someone is checking with the U.S. Census Bureau to get the answer to that question).

You will notice that the population trends has the dates in the rows, not the concept. The concept is the same for every fact, “general:Population”. As such, it is a slicer. What is different is the period, there are ten of those. So, the states are in the columns and the periods for this data set are in the rows. You could flip this and have the states in the rows and the periods in the columns. This is the ‘interactive’ nature of the hypercube. You could also put the periods in the “slicer” area. Again, this would limit the data to one or more periods, sort of like an Excel pivot table works. The XBRL taxonomy gives you more control over the ordering of the rows and columns of an interactive information hypercube (unlike a pivot table which is sometimes

### **Bottom Line**

Consider other information which you might want to show in this manner. Any information really. If you look at the information using the perspective of the multidimensional model, basically any information can be expressed using the multidimensional model.

The key to this is constructing your XBRL taxonomy correctly and consistently. More information on this later, but here is some information which can help you get started using this approach:

<http://xbrl.squarespace.com/journal/2010/3/11/top-ten-ideas-to-get-the-most-from-your-xbrl-architecture.html>