9.3. Member arrangement patterns

Member arrangement patterns explain how the members which make up a domain partition aggregate or how one member relates to another member. This section explains the different types of aggregation models. First we will help you understand exactly what we mean by a domain partition aggregation model.

9.3.1.Recall that Domains are Sets of Members

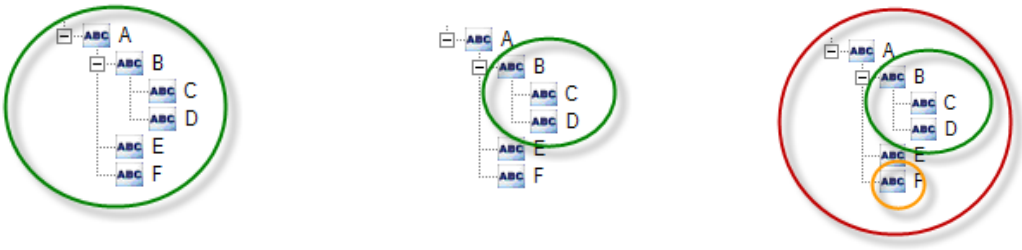
A **domain** is a cohesive set of members. For example, consider the screen shot below:

Sample Company
For Period Ending December 31,
(thousands of dollars)

	2010	2009	2008
Sales, all Business Segments, all Geographic Areas	32,038	35,805	32,465
Breakdown by Business Segment:			
Pharmaceuticals	20,181	18,150	15,275
Generics	2,433	1,973	1,823
Consumer Health	6,675	6,514	5,752
Other Segments	2,749	9,168	9,615

The screen shot shows a breakdown of sales by business segment and a total for sales for all business segments. This is an example of a domain partition aggregation. The concept "Sales" is part of a table which has the axis "Business Segments" with the member "All Business Segments" which represents a total of the other members Pharmaceuticals, Generics, Consumer Health, and Other Segments.

Consider the more general example:



Assume that the above trees are the [Member]s of an [Axis]. In the diagram, A is a domain with members A, B, E, F, C and D. Also, B is a domain with the members B, C and D. And I also believe that F is a domain with the only member being itself.

9.3.2.Recall that Domains have Partitions

Domains have partitions. A partition is collectively exhaustive and mutually exclusive set of members within a domain. Partitions do not overlap. Give a set X, a partition is a division of X into non-overlapping and non-empty "parts" or "blocks" or "cells" that cover all of X. More formally, these "cells" are both collectively exhaustive and

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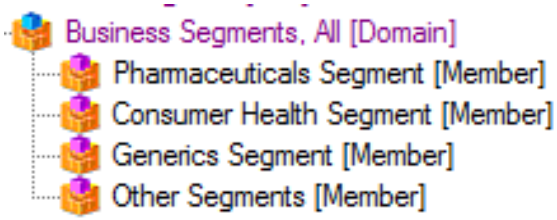
mutually exclusive with respect to the set being partitioned. Domains always has at least one partition and may have many partitions.

Referring back to the business segment breakdown example, the table might be modelled something like the following:

Looking specifically at the Business Segment [Axis] you see the following:



The Business Segment [Axis] has one partition or one breakdown of its set of members. It could have other breakdowns which would be expressed as another domain partition.

9.3.3.Aggregation

Intuitively, it is not a huge jump to make to believe that the sum of the [Member]s should add up to the total of all business segments, modelled above as the "Business Segments, All [Domain]." However, the breakdown is modelled in an XBRL taxonomy using business rules expressed as XBRL Formulas to articulate this aggregation to a software application.

The XBRL Dimensions specification does not address dimensional aggregation. As you can see by looking at the specification, there is no section in the XBRL Dimensions specification (http://www.xbrl.org/Specification/XDT-REC-2006-09-18+Corrected-Errata-2009-09-07.htm) which addresses dimensional aggregation.

9.3.4.Summary of Member Arrangement Patterns

While above we provided a very basic example to help you become familiar with the ideas which we want to discuss, aggregation is a bit more complex. Here is the spectrum of domain partition or member aggregation models:

Model	Description	Example

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Partial set (or no aggregation)	A partial set is a set which is incomplete so it can never aggregate or a set which describes non-numeric concepts which could never aggregate. A set of numeric concepts which could be aggregated but the aggregated value is illogical or never used is considered a partial set.	A partial set of the classes of cash, a set which describes the accounting policies such as the depreciation method of useful lives of each class. Subsequent events (which are never aggregated) are a partial set. The aggregate value of the useful lives of PPE (a numeric value) is a partial set as the value is illogical.
Complete flat set (has numeric concept which aggregates)	A complete flat set is a set which is both complete and characterizes a numeric concept which can be mathematically aggregated. A complete flat set is similar to a [Roll Up] information model. The aggregation scheme is that the members of the list aggregate to the parent of those members. A complete flat set has no subdomains.	A value of all classes of property, plant and equipment and the value of each class of property, plant and equipment is a complete flat set.
Complete hierarchical set	A complete hierarchical set is a set comprised of a collection of complete flat sets, basically a domain which has one or more subdomains. A business rule will always describe the aggregation scheme.	A breakdown of revenues by geographic area whereby the domain of geographic areas has a hierarchy of geographic regions such as "North America" which makes up one hierarchy and countries such as "United States" and "Canada" which comprise a second hierarchy nested within the first hierarchy.
Complex set	A complex set is a set which has some other set of complex relations or set of subdomains expressed within a business rule.	Some complex disclosure.

There is no "standard" XBRL terminology at this time for these types of relations, all the terminology is taxonomy specific. This is because XBRL Dimensions does not address aggregation of domain members.

However, although XBRL Dimensions does not define how members of a domain aggregate or if they aggregate at all, you can use XBRL Formulas to clearly define such aggregation if they exist. This XBRL Formulas definition both articulates the aggregation scheme and can also be used to validate XBRL instances against that scheme. XBRL Formulas can handle quite complex models.

But, since the SEC does not allow XBRL Formulas to be submitted with an SEC XBRL filing, these filings can have aggregation schemes which are inconsistent with aggregation schemes you may come up with or different than how you might interpret the XBRL taxonomy. SEC XBRL filers can still create a valid scheme of aggregation, test any XBRL instances created against it in their SEC XBRL filing but not submit that XBRL Formula set with their SEC XBRL filing. One way or another, SEC XBRL filers should prove that their XBRL instances do in fact follow their defined scheme by validating their XBRL instance.

9.3.5.Modelling Options Impact Aggregation Models

How things are modelled impacts the aggregation models. An example will help your understanding. Consider how one might model the domain of US states:

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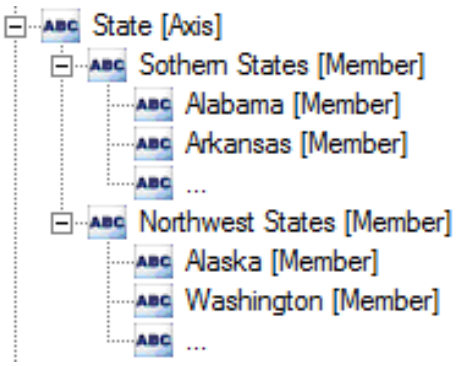
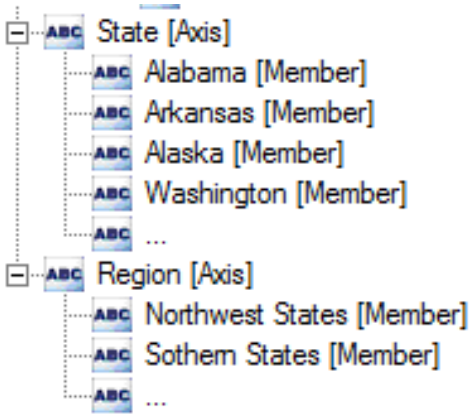


An alternate approach to modelling this information is to not use one axis as was done above, but rather to use two [Axis], one for the state and another for the region:



There is not necessarily one right or wrong answer here; how you would model your business use case depends on the dynamics of what it is you are modelling. The primary point I am making here is that if there are multiple ways to model the same information; then what criteria do you use to determine the most appropriate modelling approach?

9.3.6.Intersections Between Tables

[Table]s may intersect with one or more other [Table]s, sharing specific facts between those [Table]s. When a fact is shared between [Table]s the characteristics of the fact may be different in each [Table]. For example consider the following:

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	2010	2009
Sales, all Business Segments, all Geographic Areas	32,038	35,805
Breakdown by Business Segment:		
Pharmaceuticals	20,181	18,150
Generics	2,433	1,973
Consumer Health	6,675	6,514
Other Segments	2,749	9,168
Breakdown by Geographic Area:		
North America	10,214	12,649
Europe	11,901	10,374
Asia	5,639	4,371
Other regions	4,284	8,411

Sales are reported in the information above. Sales are broken down by business segment and by geographic area. The totals for each breakdown are the same. Total sales would also be reported within the income statement where reported information is the total of all business segments and all geographic areas; but those characteristics are not explicitly stated on the income statement.

The characteristics of reported facts therefore have to morph between different [Table]s which have different characteristics. This is handled using "dimension defaults". This will be discussed later.

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