Visualizations for Differential Taxonomy Analysis

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Scope Of Work

- Differential analysis of taxonomies that are “close”, e.g.,
  - consecutive versions of us-gaap
  - an extended corporate taxonomy used for filings versus the underlying regulatory taxonomy
  - versions of a corporate taxonomy

Constraints

- Web-based deployment of visualization facilities: no s/w installation required.
- Rich client model, requiring little server involvement, driven by XML.
- Acceptable performance
- Potential for commercial exploitation: focus on analysis of filings

Enabling Technologies

- Commercial XBRL Parsing Engine
- XSLT 2.0 + Saxon
- Graph Layout Engines & Transcoders
- Java-based XML Artifact Factory (ANT)
- Flash and Flex from Adobe.

Scope Of Analysis

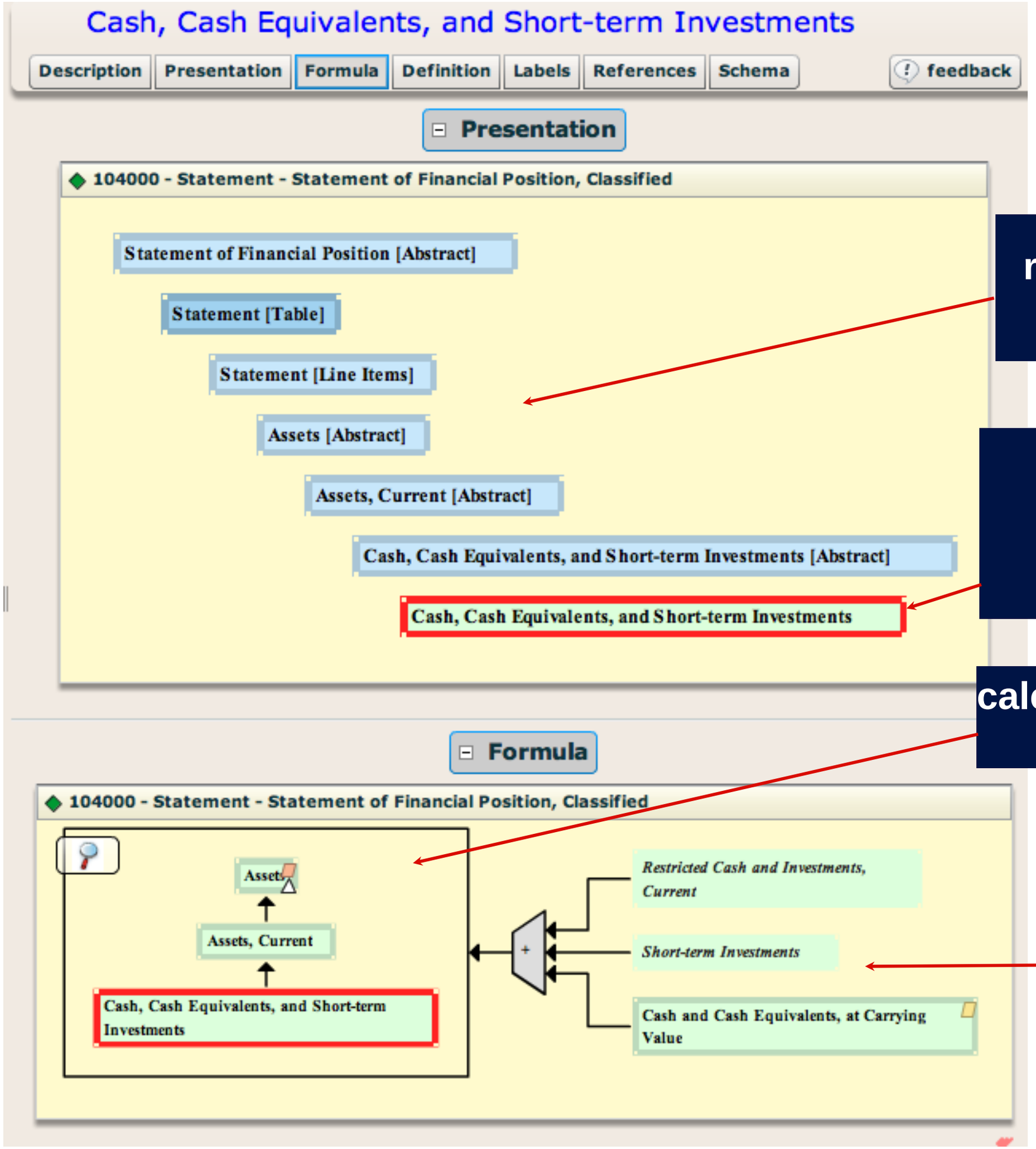
- concept centric
- remapping of
  - calculations, presentations, tables, essence-alias relations
  - primary concepts to tables
- label changes,
- reference changes

Review of Normal Visualizations

(as per http:taxonomyguides.com)

- Large-scale holistic views via *Financial Schematics*
- Concept-relative *Subjective Diagrams*
  - embedded in concept pages
    - depict root context = path to root of relevant hierarchy
    - depict local context, i.e., “children”
- All visualizations fully navigable and scalable

Subjective Diagrams



root presentation context

subject element marked in red color green =$

calculation roll-ups to root

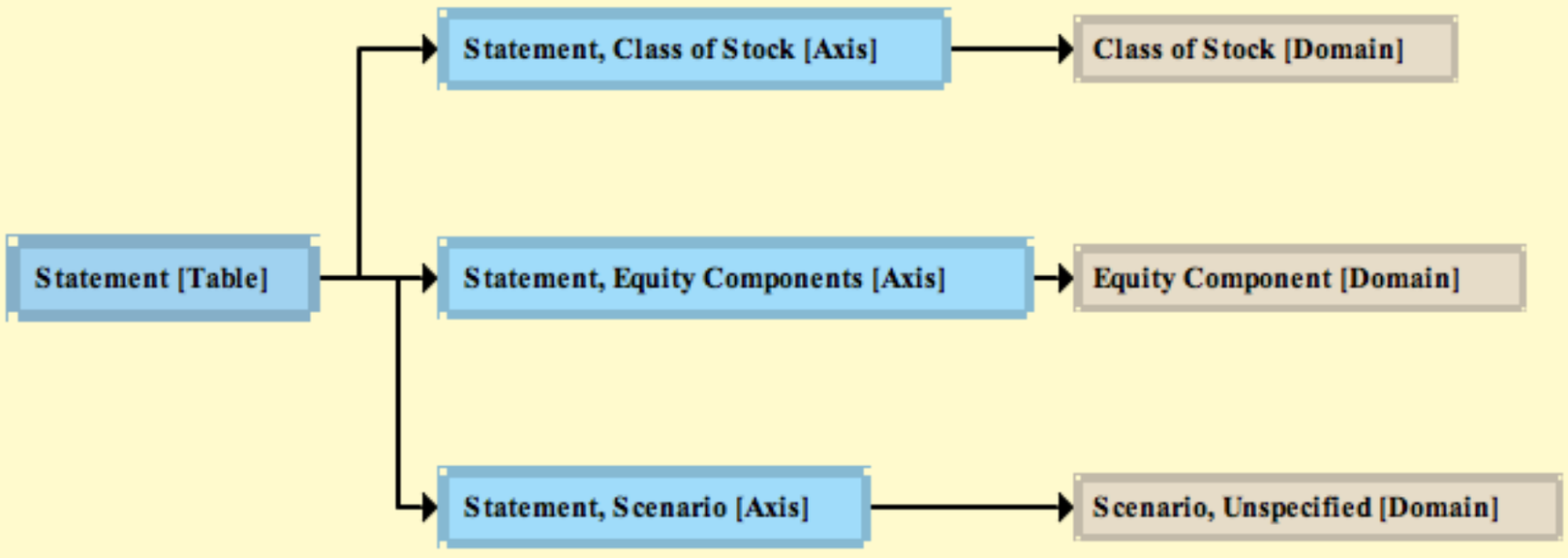
local “formula”

Structure of a multi-dimensional table concept

Statement [Table]

Description | Presentation | Definition | Labels | References | Schema | feedback | print

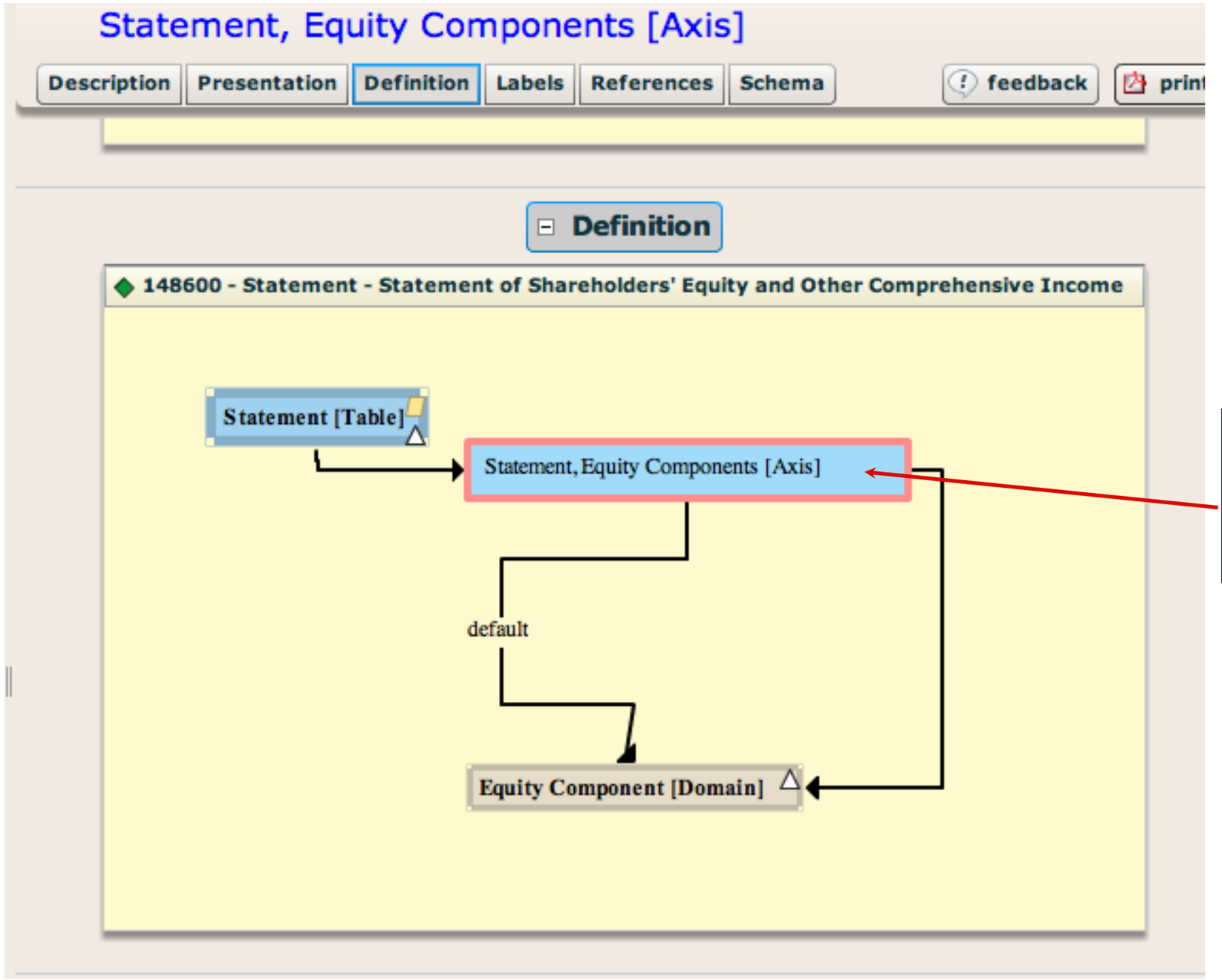
- 104000 - Statement - Statement of Financial Position, Classified
- 124000 - Statement - Statement of Income (Including Gross Margin)
- 148400 - Statement - Statement of Other Comprehensive Income
- 152200 - Statement - Statement of Cash Flows
- 172600 - Statement - Statement of Cash Flows, Direct Method Operating Activities
- 148600 - Statement - Statement of Shareholders' Equity and Other Comprehensive Income



The root primary domain elements that map to this hypercube are:

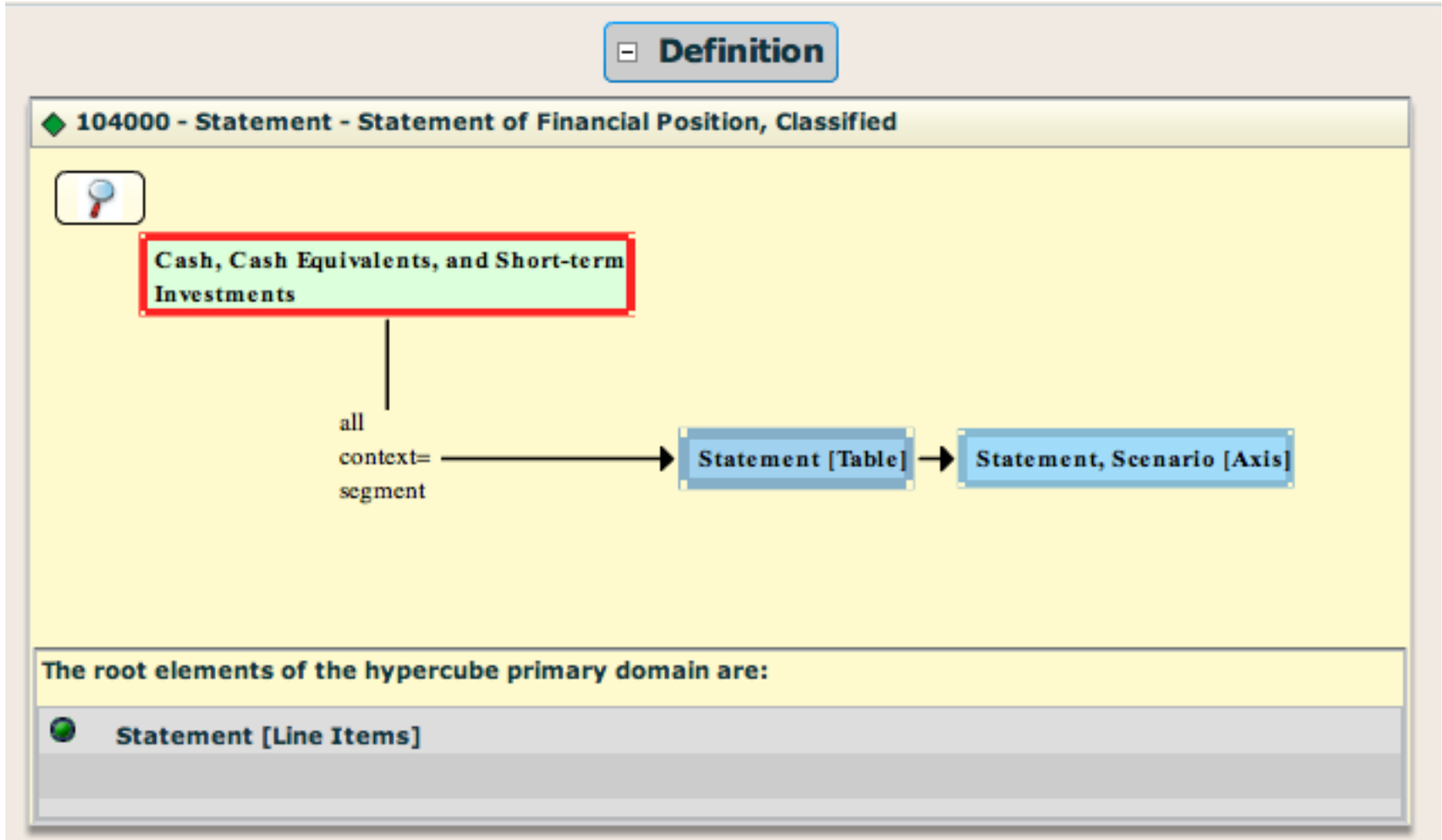
- Statement [Line Items]

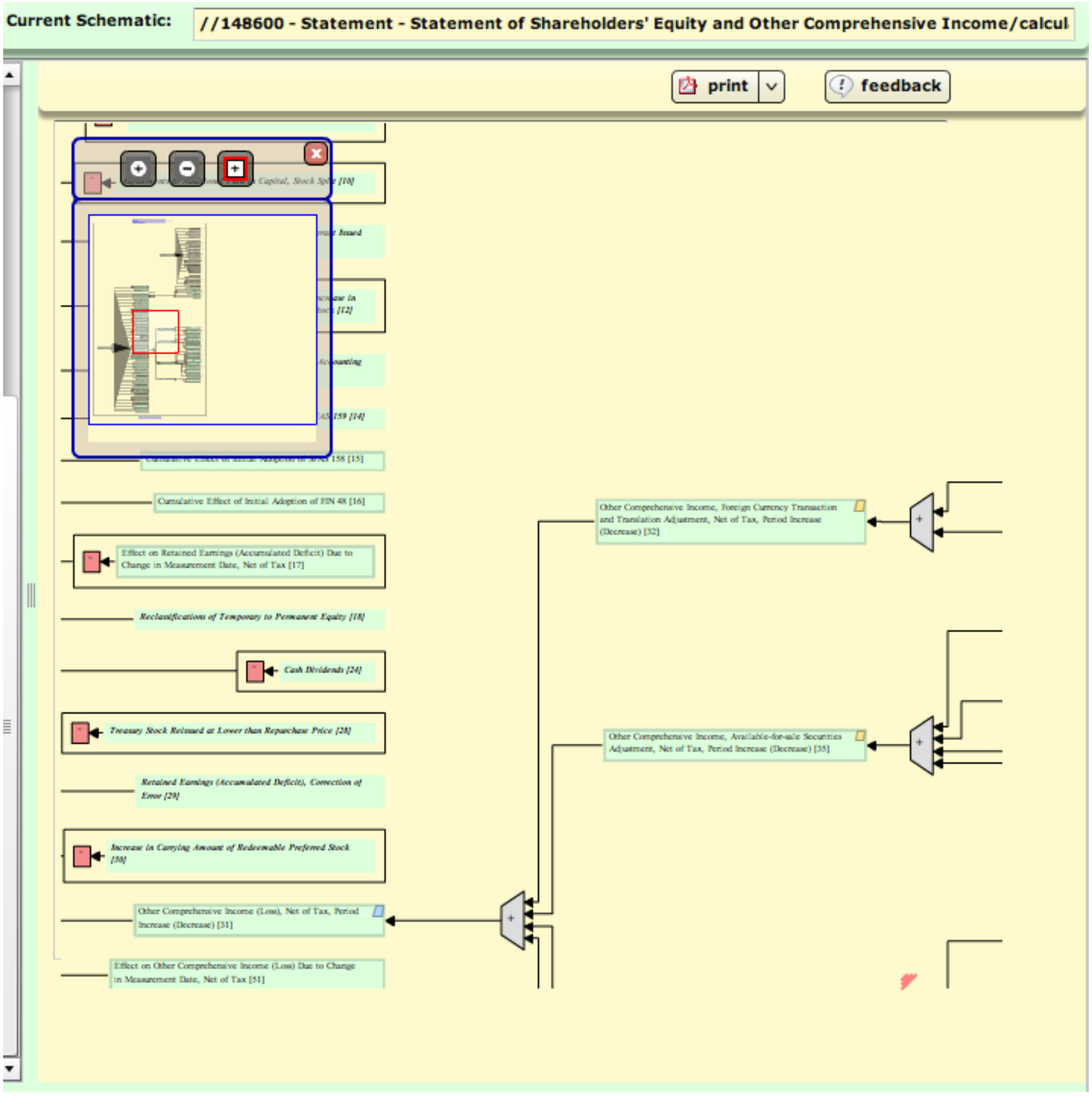
Table Dimension/Axis



abstract elements are shades of blue

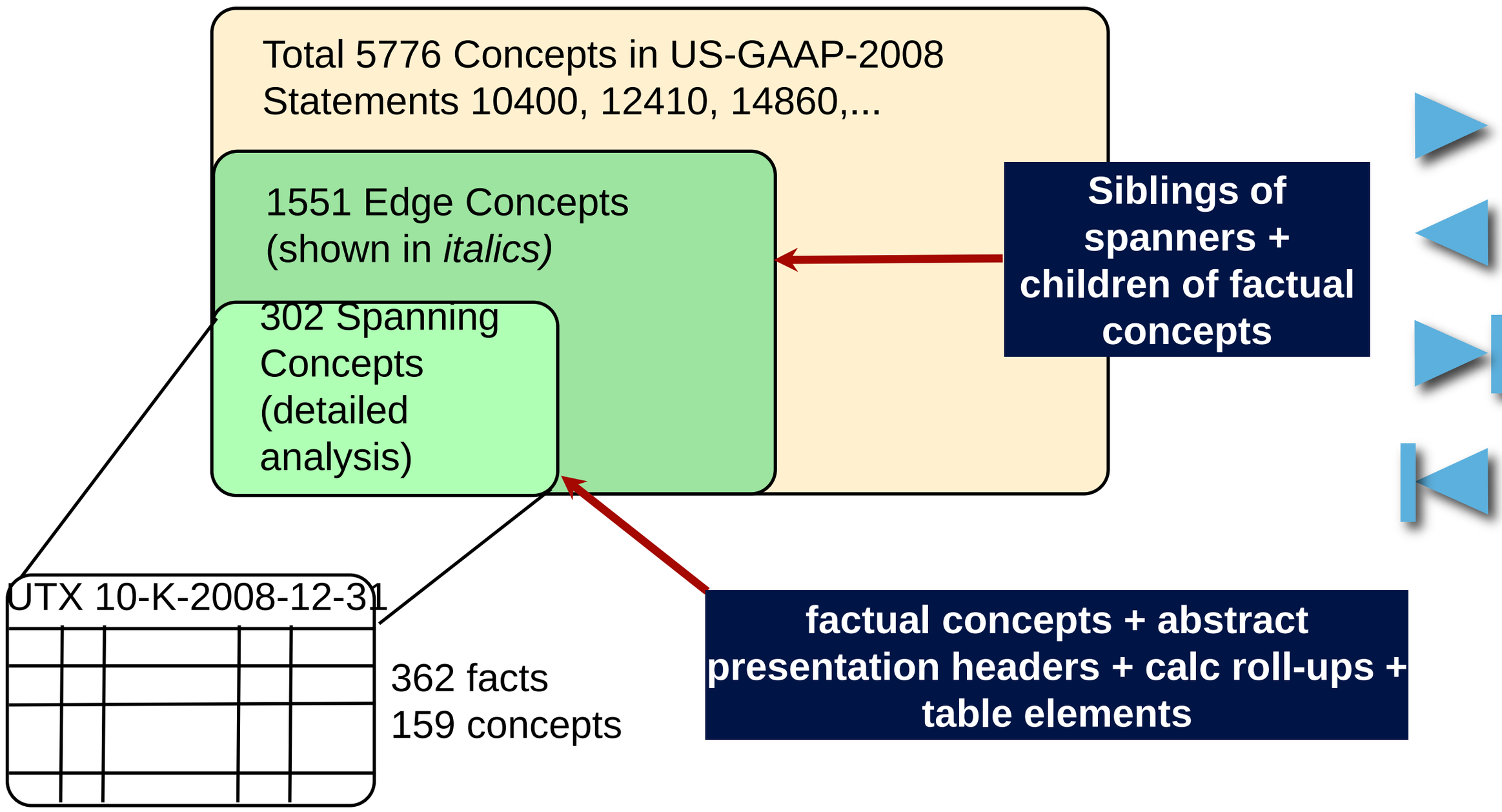
Primary domain to table mapping





Fragmentary view of a calculation schematic

Instance Analysis: Taxonomy Coverage



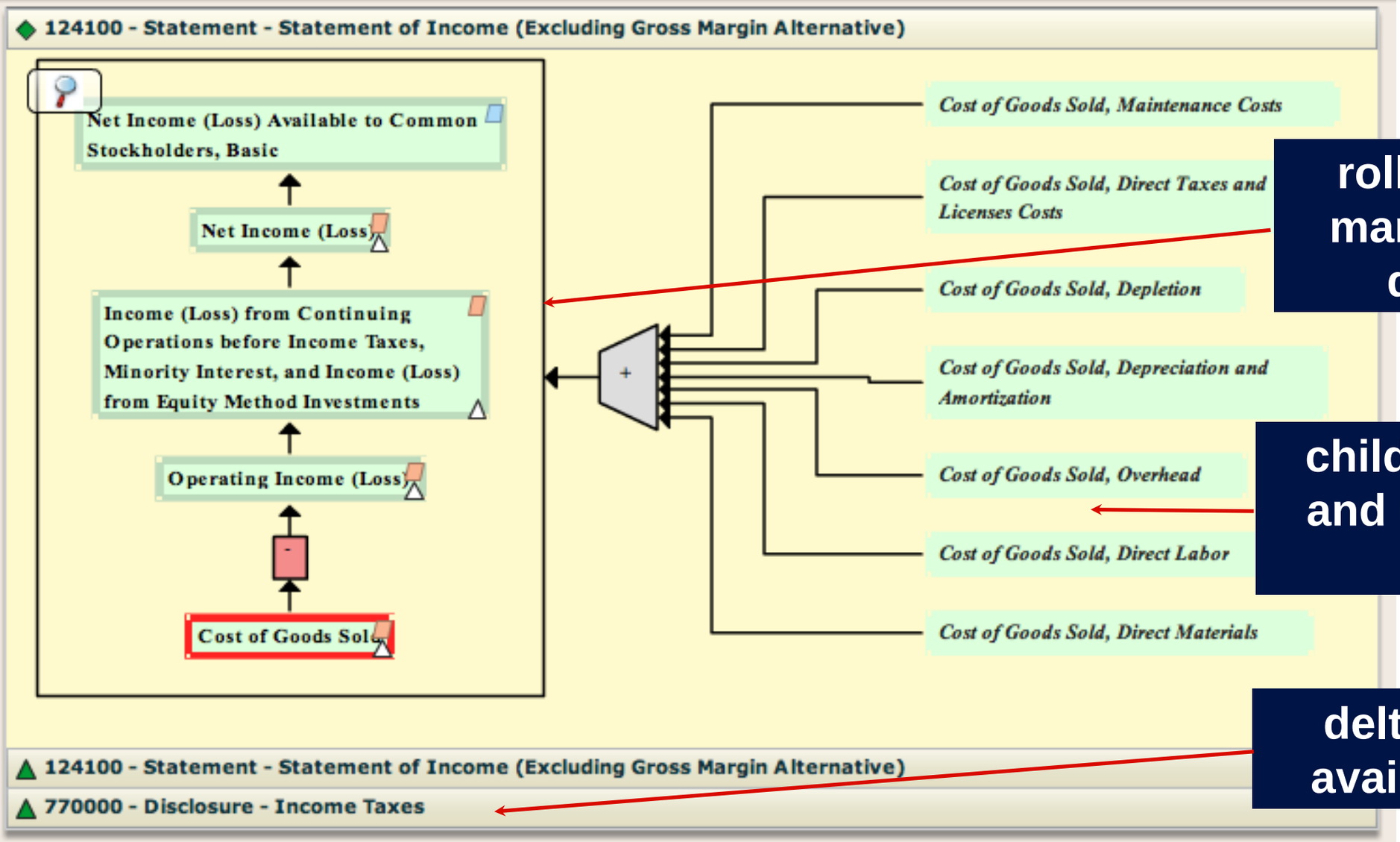
Rendering guidelines

- New diagram types: *delta diagrams* and *delta schematics*
- Use of evocative visual cues
- Only render differences relative to baseline taxonomy
- Render differences graphically when possible
- Provide in-line textual descriptions, e.g,

[X]:removal; [+]: addition; [++]: new concept; [+/-]: balance change; [XX]: purged concept, changes labels: underlined, etc.

Cost of Goods Sold

Description | Presentation | Formula | Labels | References | Schema | feedback | print



roll-up to root: many changes detected.

children unused and unchanged

delta diagram available: click

Labels

Active Labels

Label Intent	Label Text
Documentation	See description above.
Label	Cost of Goods Sold
Total Label	Cost of Goods Sold, Total

available labels

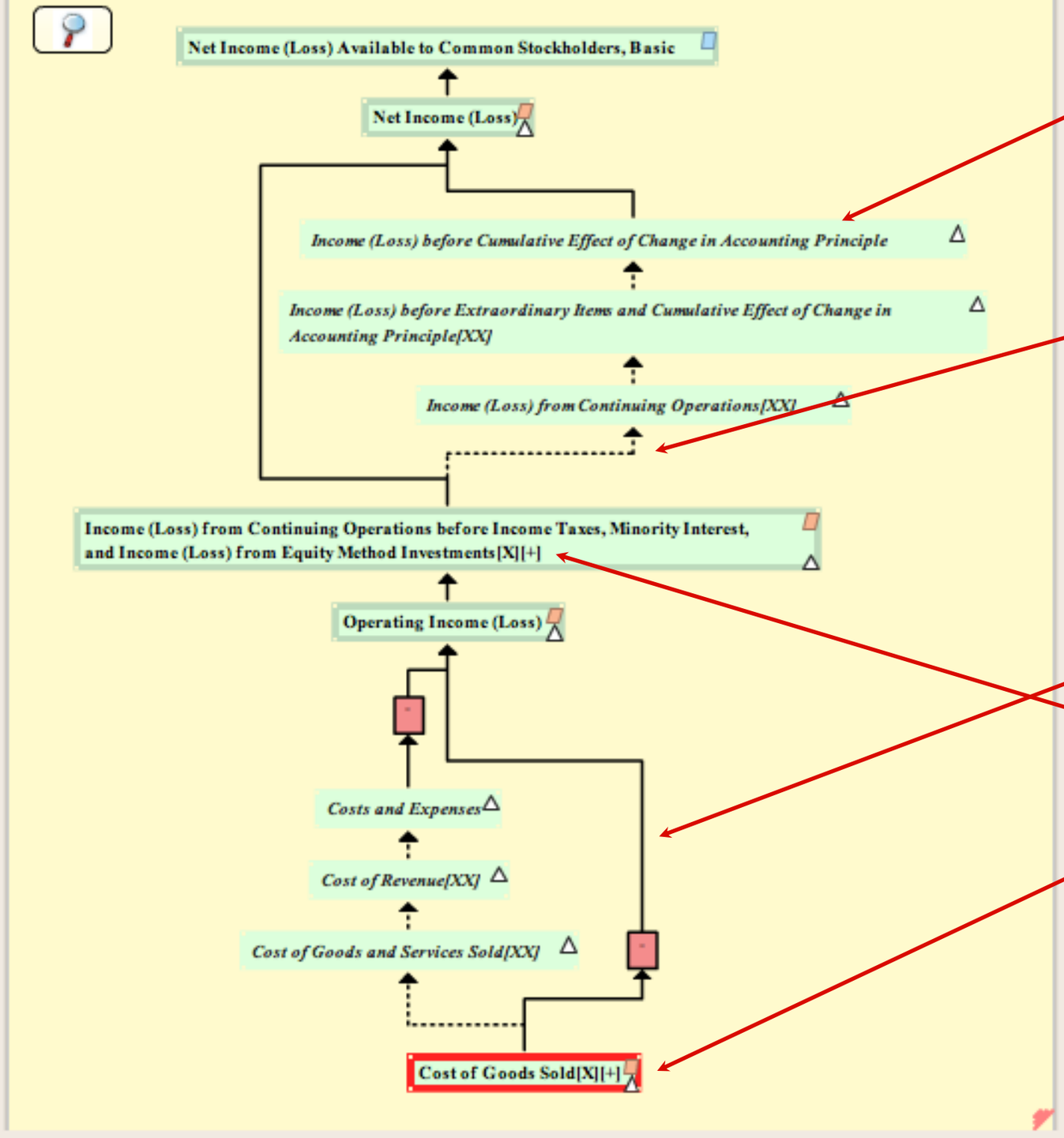
Cost of Goods Sold

Description | Presentation | Formula | Labels | References | Schema | feedback | print

Formula

124100 - Statement - Statement of Income (Excluding Gross Margin Alternative)

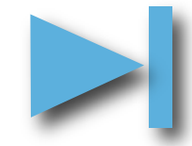
124100 - Statement - Statement of Income (Excluding Gross Margin Alternative)



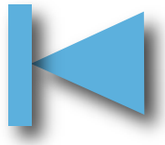
italicized items: thrown to edge

dashed arrow: source detached from target

solid arrow: source attached to target



Note [X][+]



children not shown because unchanged

Label changes (also references) shown in separate *delta panels*

Labels

Active Labels

Label Intent	Label Text
Label	Amendment Description

Standard Labels With Changes

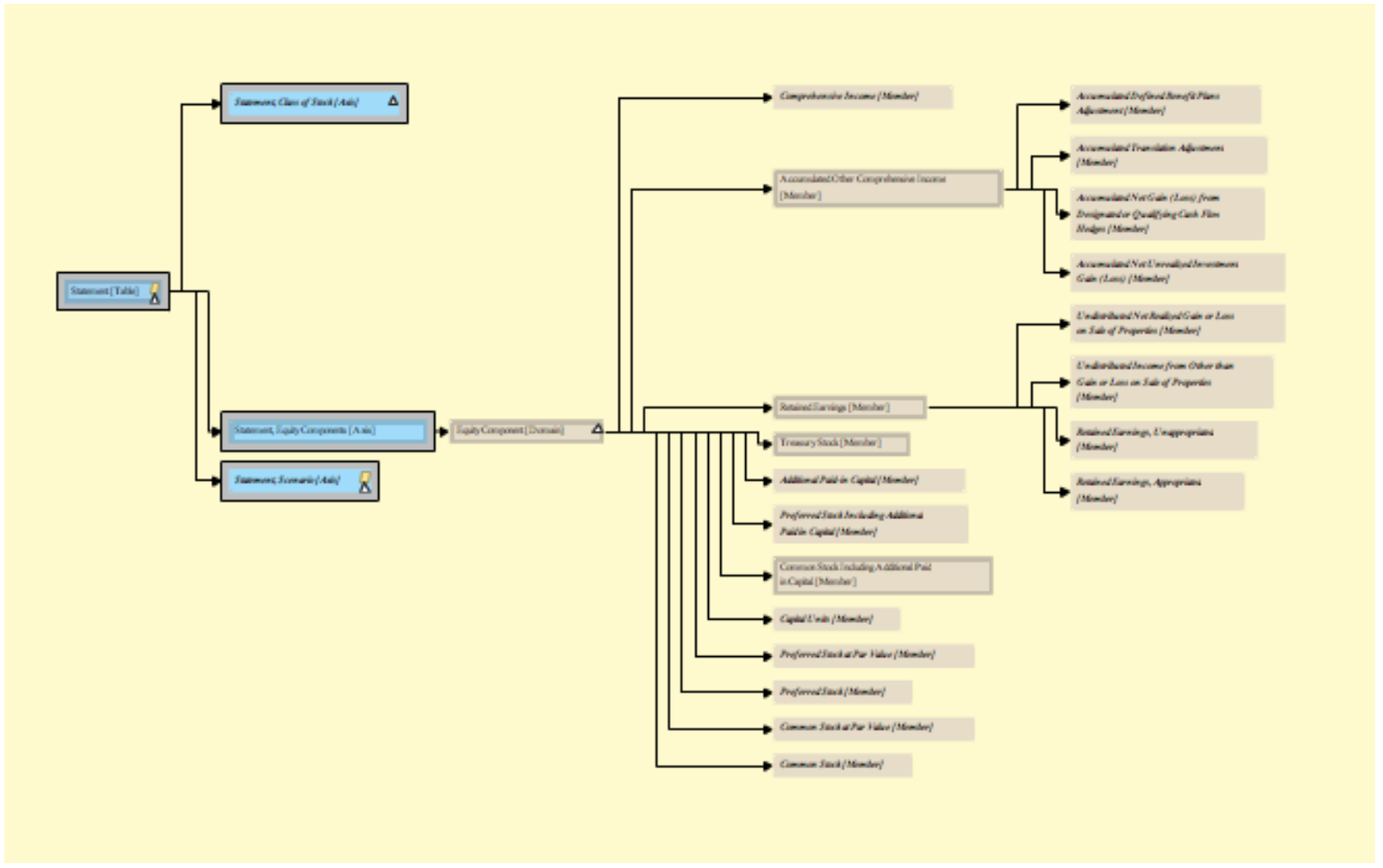
Labels

Active Labels

Standard Labels With Changes

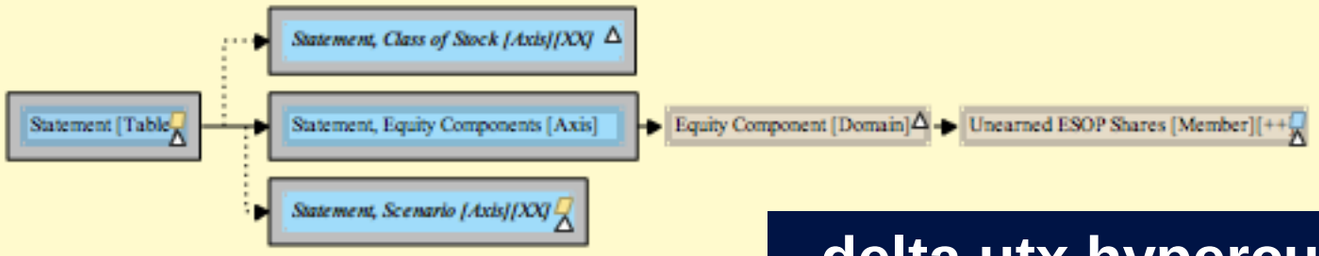
Change	Label Intent	Label Text
✖	Documentation	Description of changes contained within amended document.

Statement of Stockholder Equity ... : Base Hypercube



instance-restricted us-gaap hypercube

Taxonomy:
Statement [Table]
148600 - Statement - Statement of Shareholders' Equity and Other Comprehensive Income -- delta hypercube/table 1/1



instance-restricted us-gaap hypercube

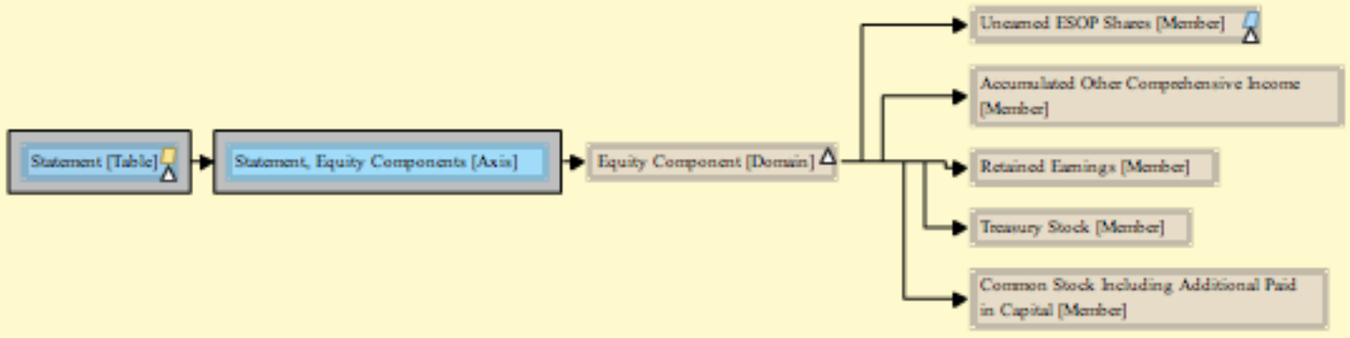
delta utx hypercube

change application

pruning

spanning utx hypercube

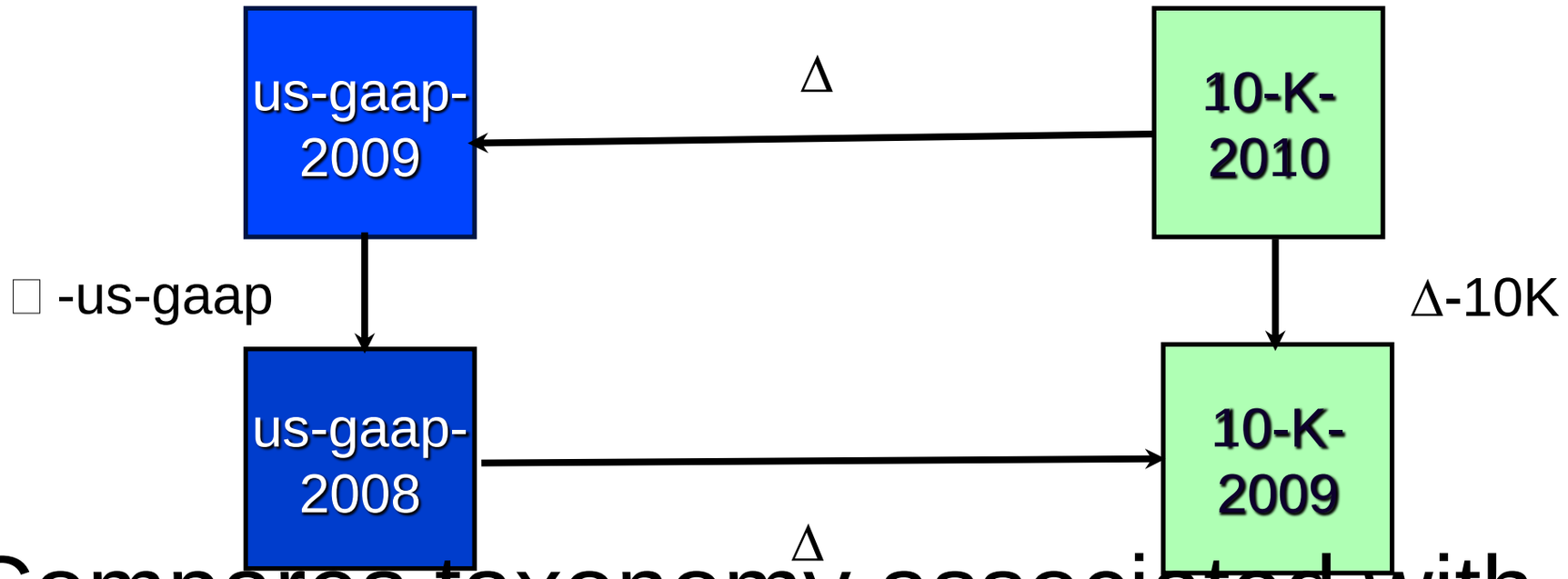
Taxonomy:
Statement [Table]
148600 - Statement - Statement of Shareholders' Equity and Other Comprehensive Income -- spanning hypercube/table 1/1



Corporate Taxonomy Drift Analysis

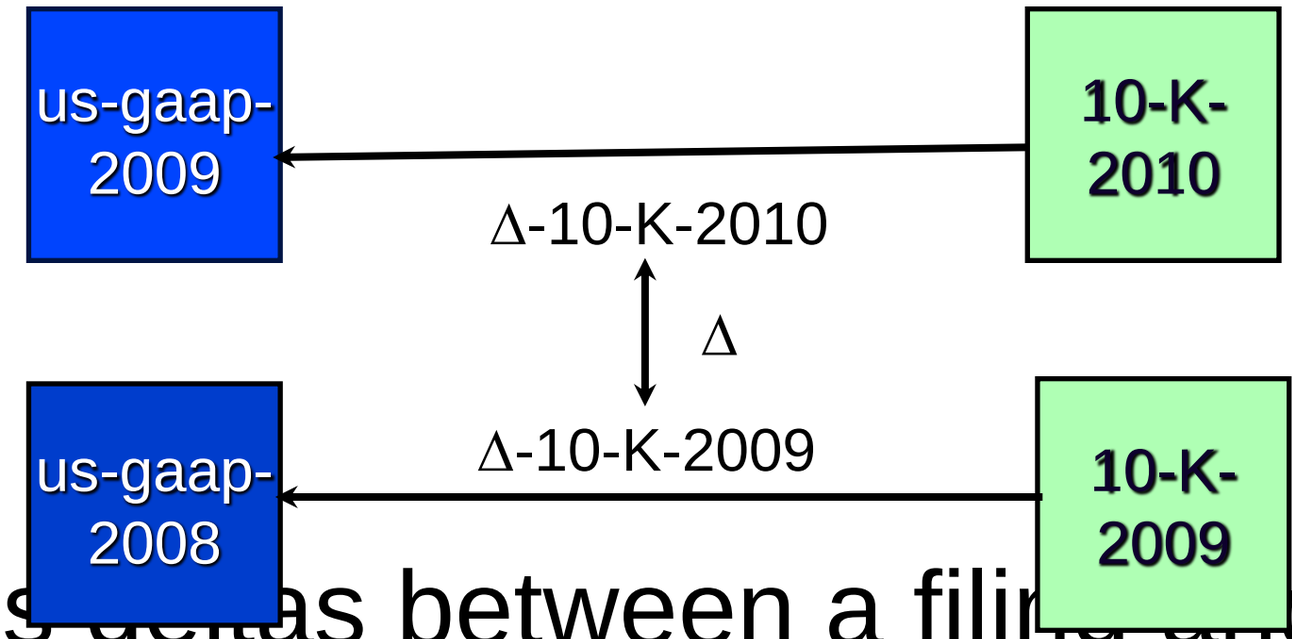
- Analysis of corporate taxonomy changes over time, and across versions of US-GAAP (or the like)

Direct Method



- Compares taxonomy associated with 10-K-2010 directly with that of 10-K-2009 (base taxonomy)
- Potentially confusing, as it also factors in Δ-us-gaap spanning us-gaap-2009 and us-gaap-2008

Indirect Method



- Reifies deltas between a filing and its base taxonomy
- Save reified deltas in OLAP cube for analysis
- Compare reified deltas (e.g. as structured text) in a pivot table.

Anomalies

- Reified Deltas generalized as Anomalies
- Anomalies (per concept and report) may be
  - structural/taxonomical: e.g., deltas relative to base, errors & omissions, questionable usage patterns
  - factual: e.g, missing/invalid/incorrect data, new data, dropped data
- Anomaly categories (e.g. label change, remapped calcs) may be ranked according to potential severity by end-user

UTX-10-K2008-12-31: Anomaly Table for 10400 Statement of Financial Position, Classified

Anomaly Table

Show | Pivot

Reference Taxonomy
us-gaap-all
Filing
utx-10-K-2008-12-31

red	Customer Financing Assets	missing hypercube mapping	• Inconsistent mapping of concepts to table: missing m
	Common Stock, Including Additional Paid in Capital	missing hypercube mapping	• Inconsistent mapping of concepts to table: missing mapping
orange	Deferred Tax Assets, Net, Noncurrent	remapped calculation	• Calculation: detached from parent: us-gaap_AssetsNoncurrent • Calculation: new parent assignment: us-gaap_Assets • Calculation: new child added: us-gaap_DeferredTaxAssetsGrossNoncurrent • Calculation: new child added: us-gaap_DeferredTaxAssetsValuationAllowanceNoncurrent • Calculation: new child added: us-gaap_DeferredTaxAssetsGrossNoncurrent • Calculation: new child added: us-gaap_DeferredTaxAssetsValuationAllowanceNoncurrent
	Property, Plant and Equipment, Net	remapped calculation	• Calculation: detached from parent: us-gaap_AssetsNoncurrent • Calculation: new parent assignment: us-gaap_Assets
	Goodwill	remapped calculation	• Calculation: detached from parent: us-gaap_AssetsNo • Calculation: new parent assignment: us-gaap_Assets
	Intangible Assets, Net (Excluding Goodwill)	remapped calculation	• Calculation: detached from parent: us-gaap_AssetsNoncurrent • Calculation: new parent assignment: us-gaap_Assets
	Other Assets, Noncurrent	remapped calculation	• Calculation: detached from parent: us-gaap_AssetsNoncurrent • Calculation: new parent assignment: us-gaap_Assets
	Assets	remapped calculation	• Calculation: child added: us-gaap_OtherAssetsNoncur • Calculation: child added: us-gaap_DeferredTaxAssetsNetNoncurrent • Calculation: child added: us-gaap_PropertyPlantAndEquipmentNet • Calculation: child added: us-gaap_Goodwill • Calculation: child added: us-gaap_IntangibleAssetsNetExcludingGoodwill • Calculation: new child added: utx_CustomerFinancing
	Short-term Borrowings	remapped calculation	• Calculation: detached from parent: us-gaap_DebtCurrent

color coding by potential severity

structured text

one filing per column

Pivot table also used for statement rendering

Conclusion

- Differential taxonomy analysis can be integrated to high-end renderers of interest to
  - auditors (internal or external) in advance of a filing
  - sophisticated investors & analysts
- User feedback needed.

TaxonomyGuides.com