XML Indexing I

CPS 216

Advanced Database Systems

Announcements (April 12)

- Homework #3 due today
  - Office hours 3-4pm and after 6pm
- Reading assignment due next Monday
  - The Selinger paper on query optimization

XML indexing overview

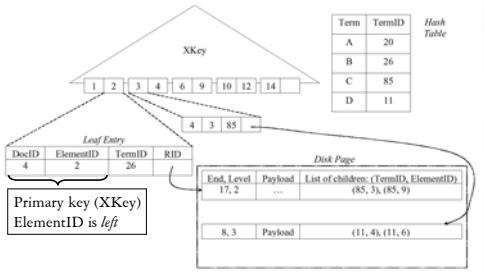
- It is a jungle out there
  - Different representation scheme lead to different indexes
  - Will we ever find the "One Tree" that rules them all?
- Building blocks: B^+-trees, inverted lists, tries, etc.
- Indexes for node/edge-based representations (graph)
- Indexes for interval-based representations (tree)
- Indexes for path-based representations (tree)
- Indexes for sequence-based representations (tree)
- Structural indexes (graph)

Warm-up: indexes in Lore (review)

- Label index: (child, label) → parent
  - B^+-tree
- Edge index: label → (parent, child)
  - B^+-tree
- Value index: (value, label) → Node
  - B^+-tree
- Path index: path expression → node
  - Structural index: DataGuide (more in next lecture)

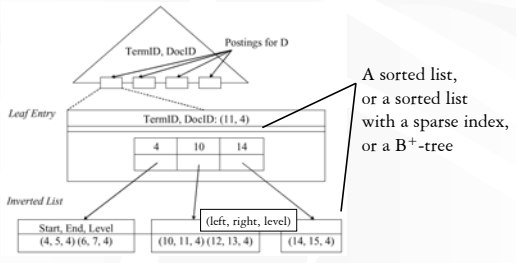
Niagara: data manager index

- A combination of node/edge-based and interval-based representations using B^+-tree



Niagara: index manager index

- Essentially an inverted-list index for tag names with entries in each list sorted by XKey

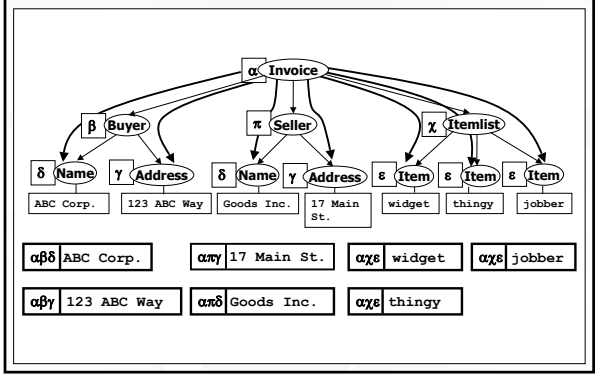


Index Fabric: a path-based index

Cooper et al. "A Fast Index for Semistructured Data." *VLDB* 2001

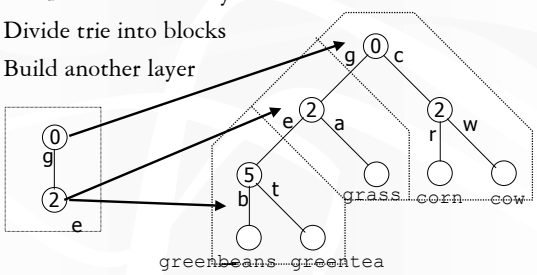
- Use a label-path encoding for XML
  - Each element is associated with a sequence of labels on the path from the root (e.g., `/Invoice/Buyer/Name/ABC Corp.`)
  - Encode the label path as a string (e.g., `/Invoice/Buyer/Name` $\rightarrow \alpha\beta\delta$)
- Index all label paths in a Patricia trie
  - And try to make the trie balanced and I/O-efficient

Example of label paths in Index Fabric



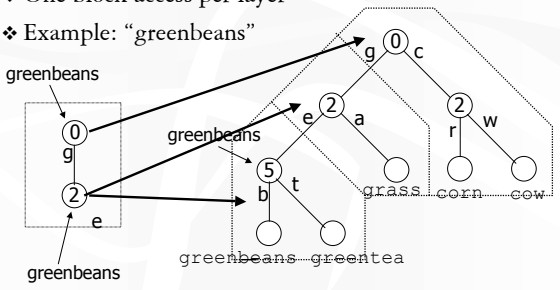
Balancing Patricia trie in Index Fabric

- Recall that Patricia trie indexes first point of difference between keys
- Divide trie into blocks
- Build another layer



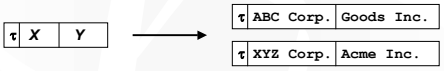
Searching Patricia trie in Index Fabric

- Start searching in the root layer
- One block access per layer
- Example: "greenbeans"



Refined paths in Index Fabric

- Queries supported by Index Fabric so far:
  - Label paths from the root (e.g., `/Invoice/Buyer/Name/`)
  - How about `//Buyer/Name`, or `//Buyer/Name|Address`?
- Refined paths: frequent queries
  - Just invent labels for these queries and index them in the same Patricia trie
  - Example: find invoices where *X* sold to *Y*



☞Extra refined paths → more space required