Optimizing Search in Un-Sharded Large-Scale Distributed Systems

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OVERVIEW
- New challenges relating to efficiently discovering, accessing, managing, and analyzing distributed data
- Search framework does not rely on sharding
- Applicable to a range of distributed storage models
- No general model for searching in unsharded environments.

MOTIVATION
- Storage systems are increasingly distributed
- Discovery and access are crucial for management and analysis of data
- Nodes in unsharded environments more autonomous and network traffic decreased
- No general model for searching in unsharded environments.

OBJECTIVES
- Search
  - Discover files based on names and contents
  - Emphasis on speed and scalability
  - Support for near-real-time discovery
- Environment
  - Each document remains intact on each node
  - Information stored in system not necessarily balanced among nodes

ARCHITECTURE
- Lucene
  - Handles indexing, query processing, searching and scoring of documents
  - Near real time indexing to search capabilities
  - Server-Client Model
    - Client interface and a server exists on each node
    - Server gets query and begins searching while taking care of query distribution and result collection
  - Query Distribution
    - Spanning tree constructed using membership list of nodes, allowing for dynamic changes in cluster membership
    - Spanning tree allows queries to be distributed efficiently and reduces network traffic
    - Optimized by sending queries to nodes with larger indexes first, which are more likely to have a longer search time

EVALUATION
- Test Bed
  - 90000 Wiki documents per m3.large node
  - common, rare, non-existent queries
  - Evaluated against Solr and Grep

RESULTS
- Lower overhead
- Faster and scaled better than Solr and Grep

CONTRIBUTION
- Easy to integrate fast, scalable text search for unsharded environments
- Tree-based query distribution model
- Faster search than alternatives when scaled

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