Data Sharing Made Easier through Programmable Metadata

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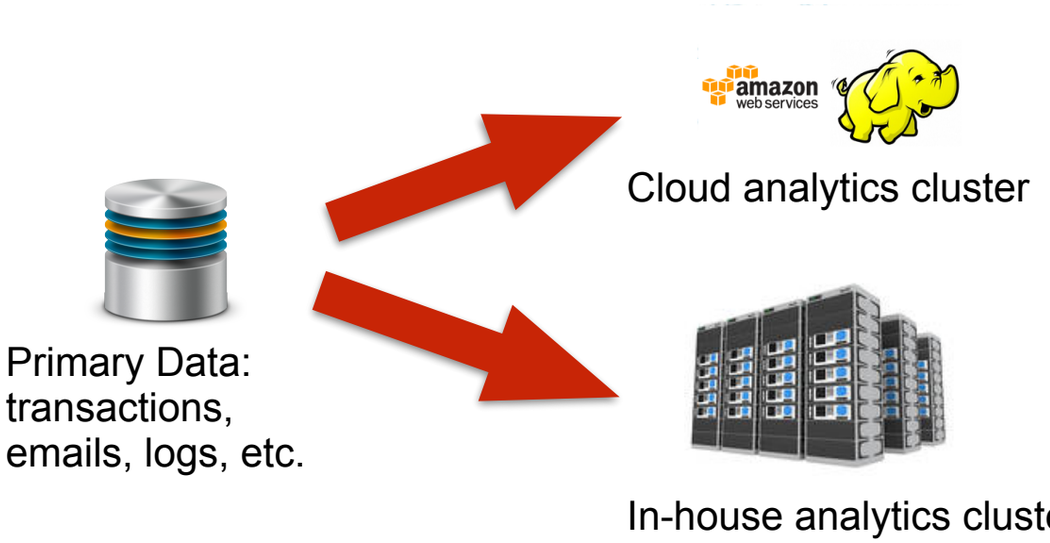
How do applications share data today?

–Syncing data between storage systems:
- Commonly used big data workflow
- Slow, stale and strenuous



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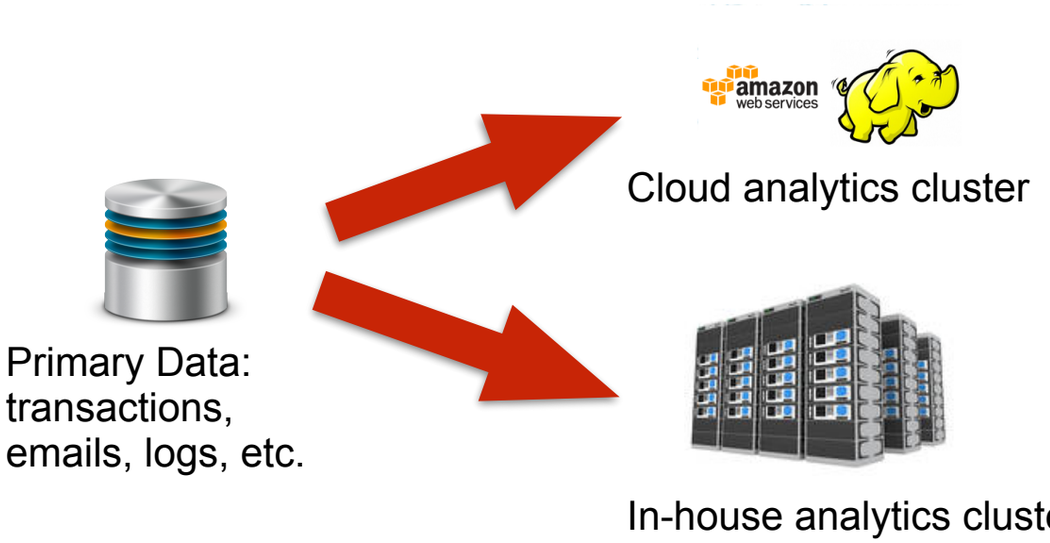
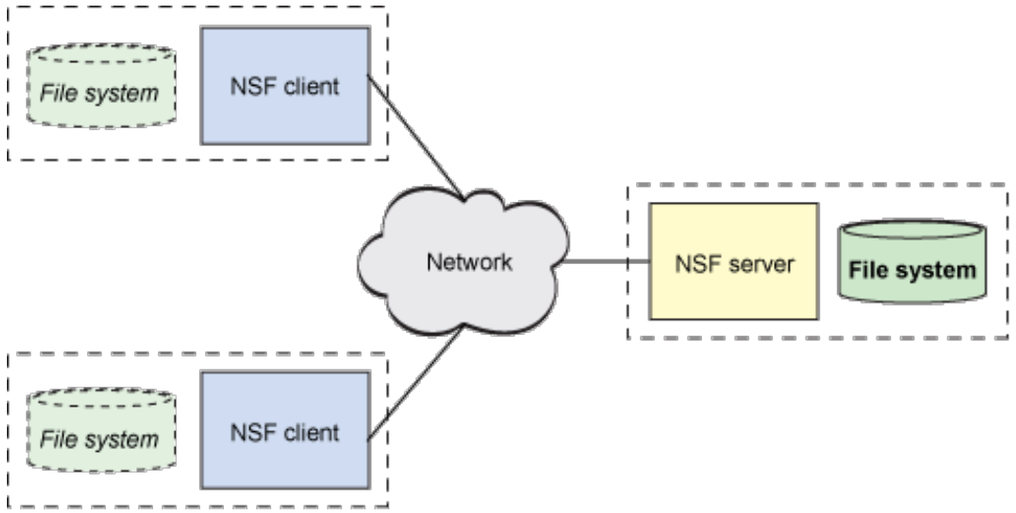


– Mounting and using shared storage systems:
  - Difficult to serve heterogenous workloads
  - Heavy workload on centralized name nodes



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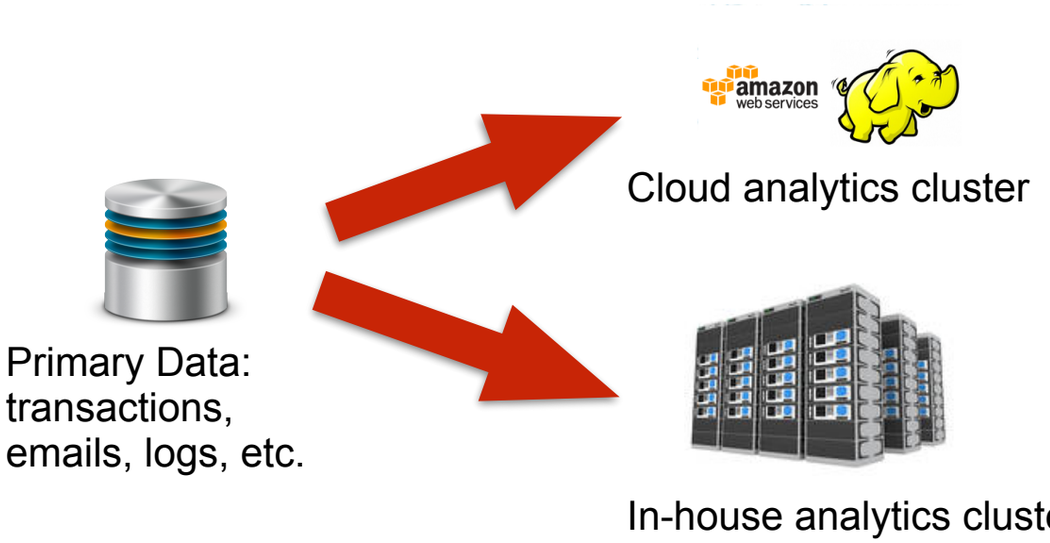

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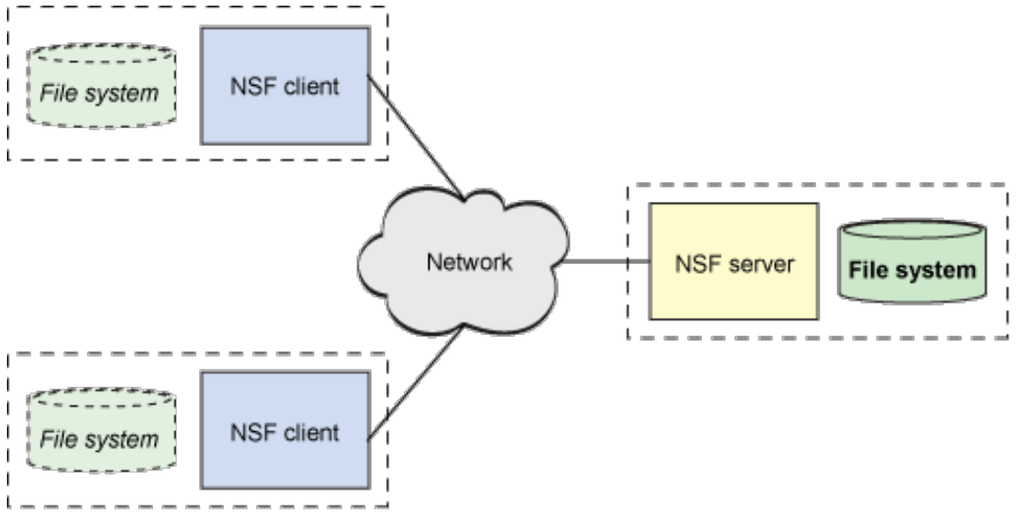

Observations

–Data *always* written and read through the same storage system (filesystem, DB, etc.)
- Metadata updated with writes
- Metadata used in reads

–Data produced in form *A* and consumed in form *B*?
- *View* DB records as a file?
- Analyze thousands of local log files as a single text file?

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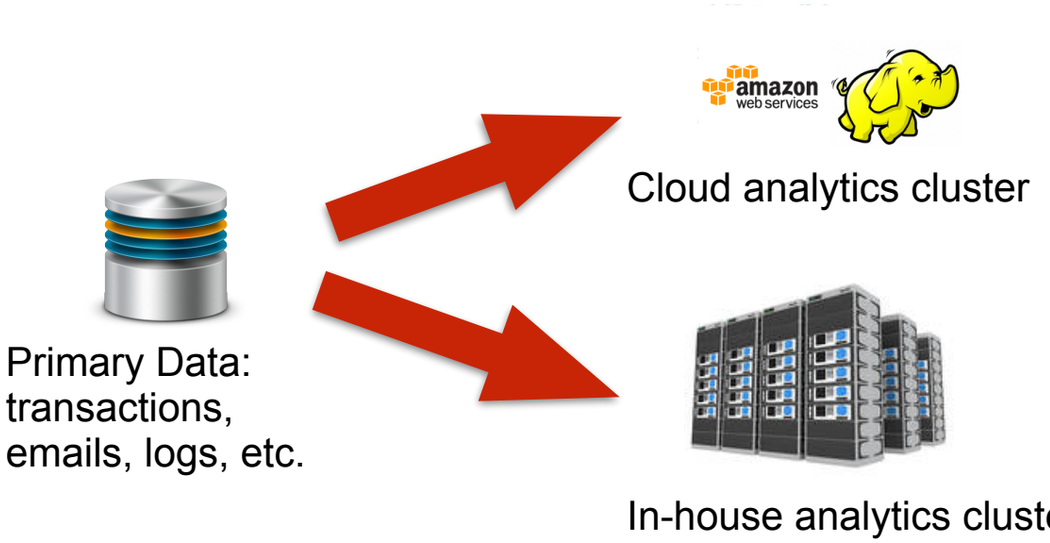

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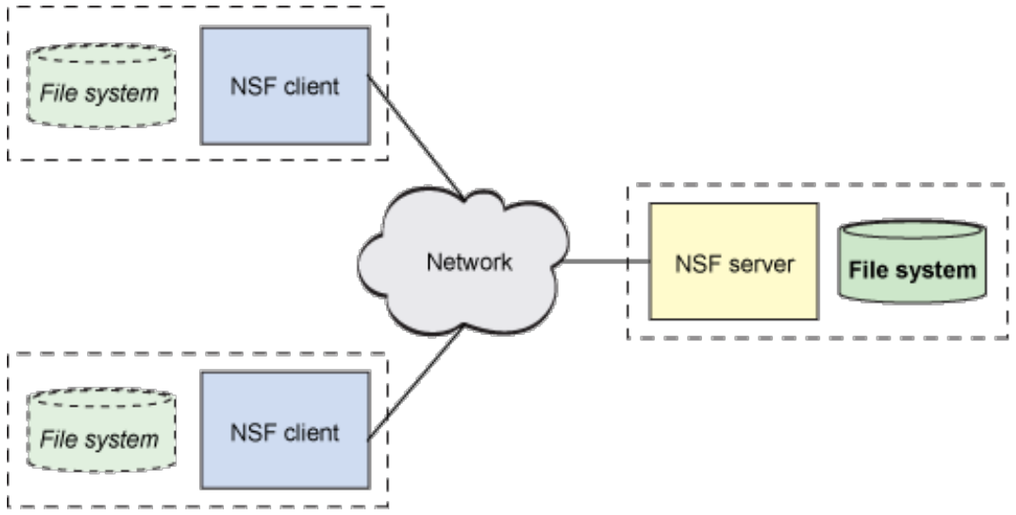

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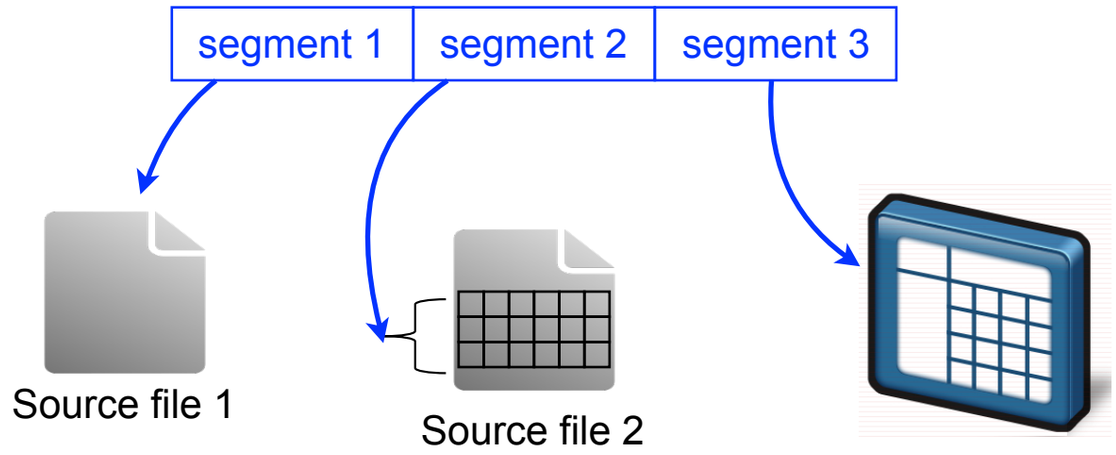

Logical definition

Under the hood

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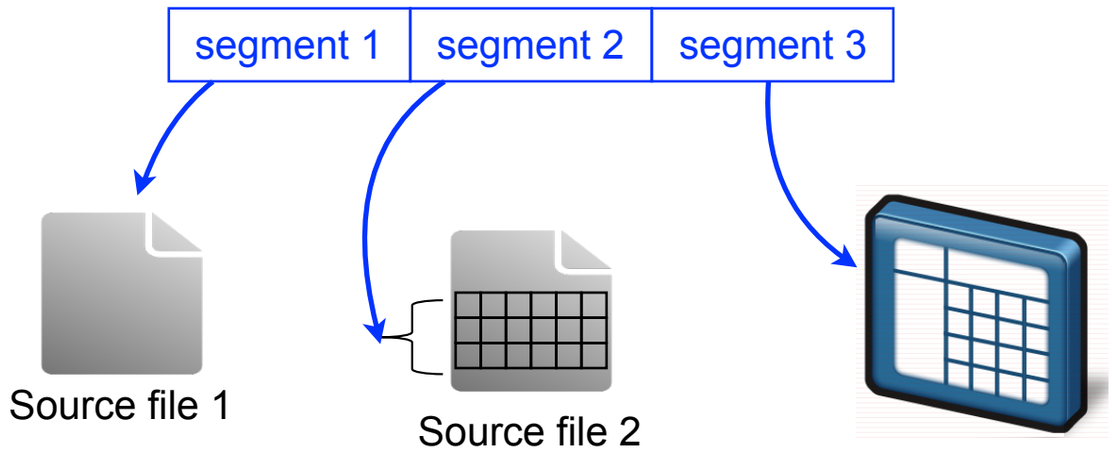

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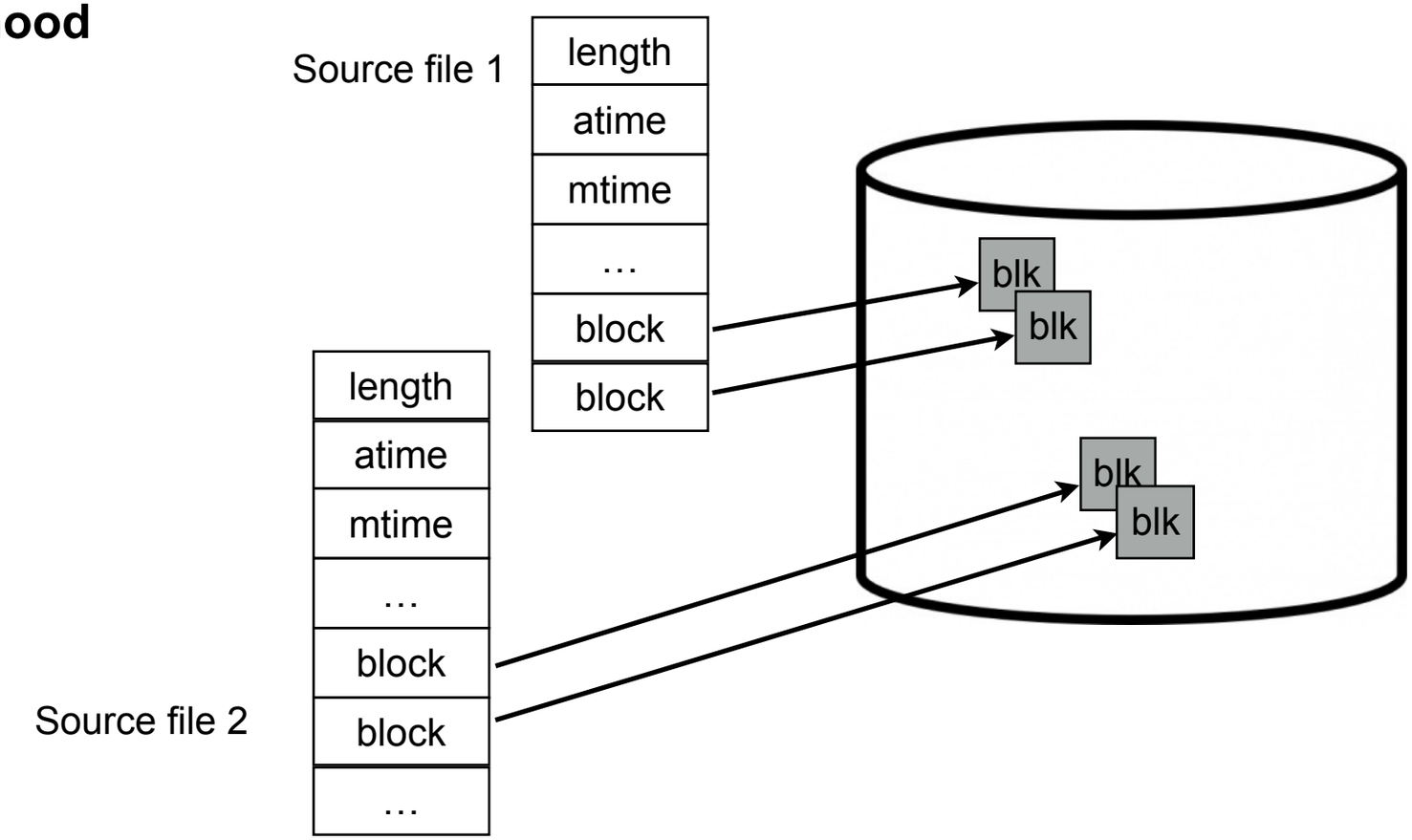

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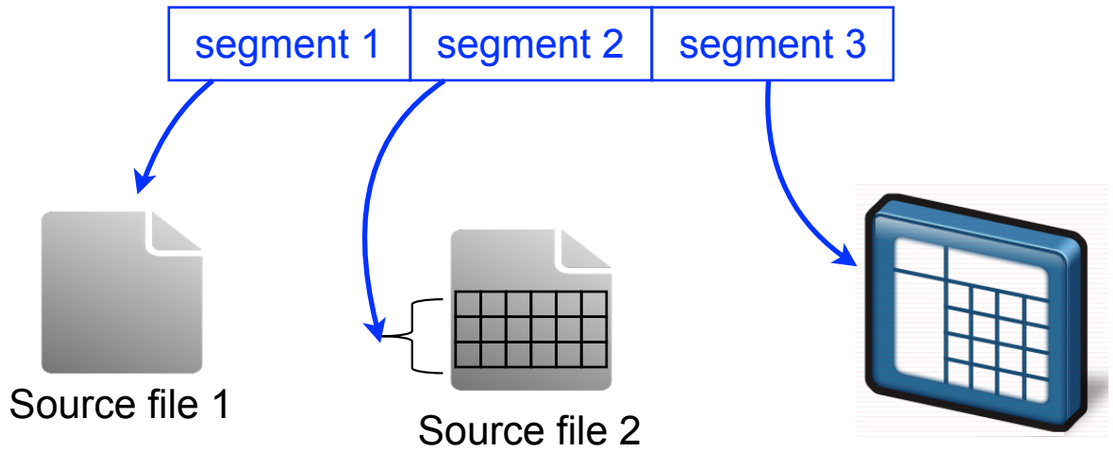

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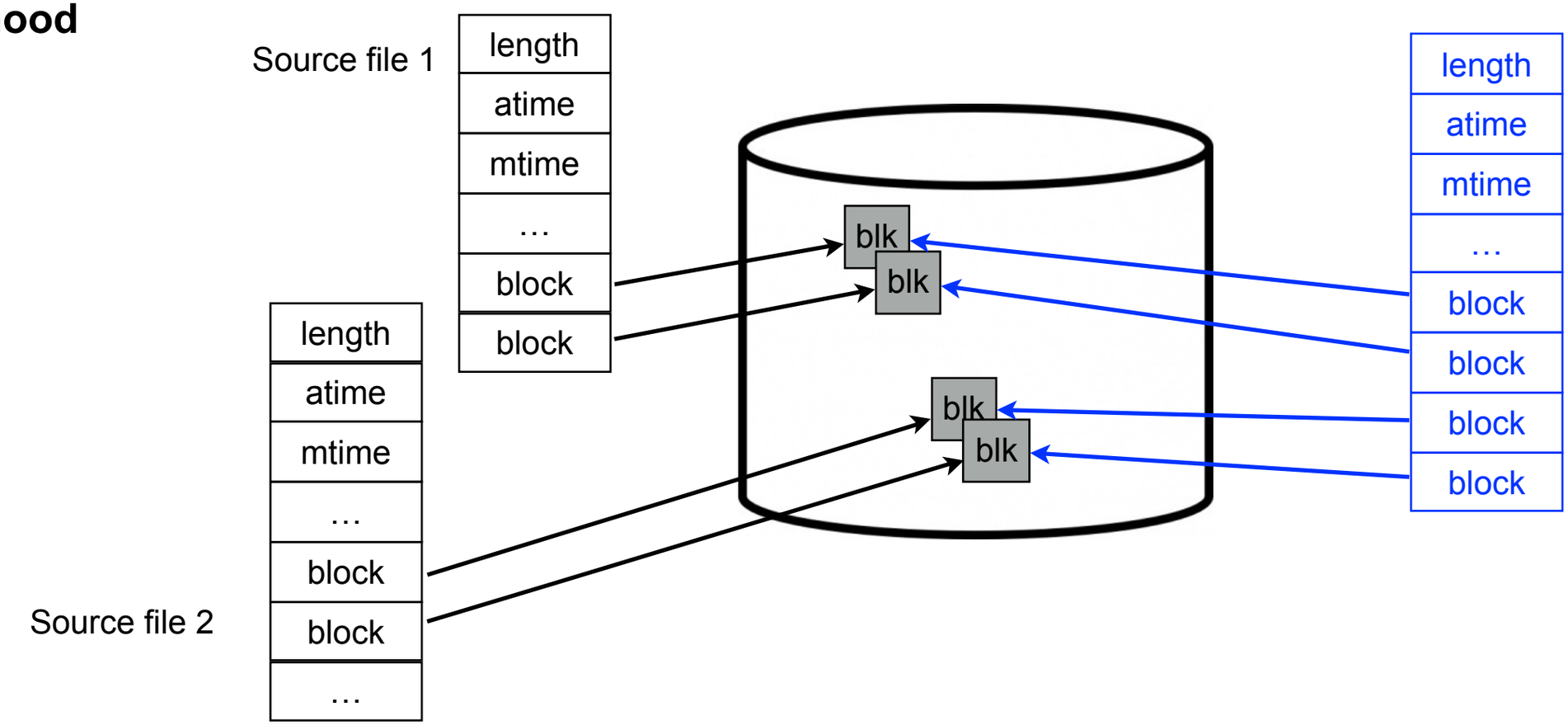

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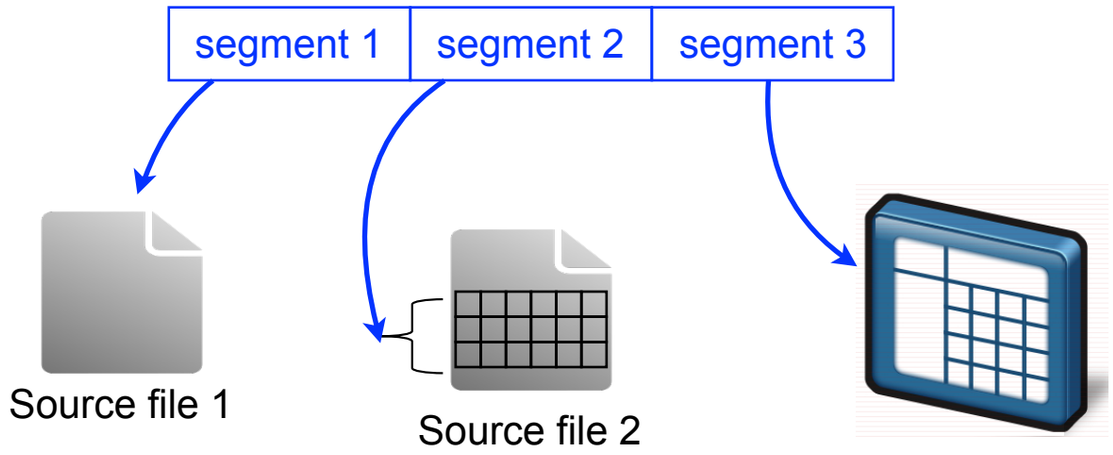

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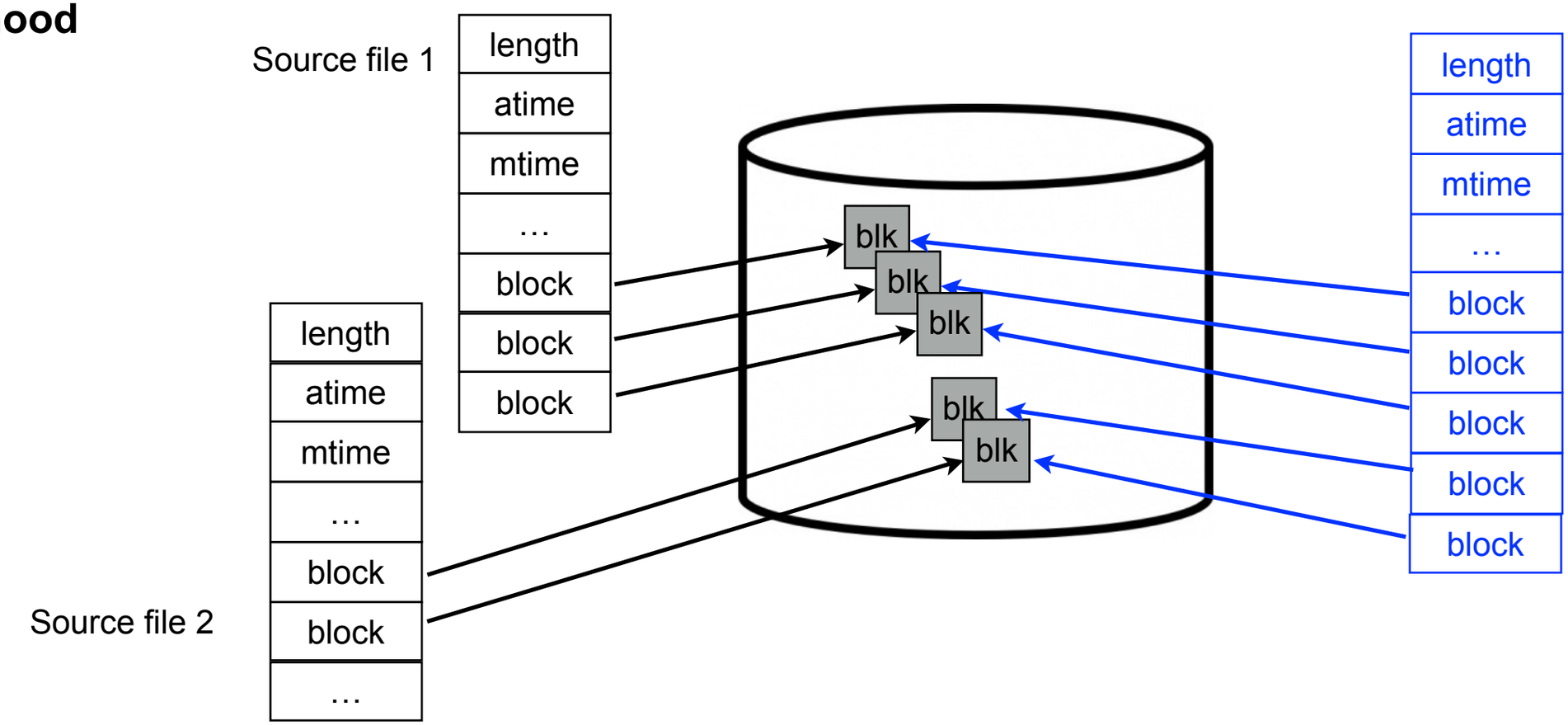
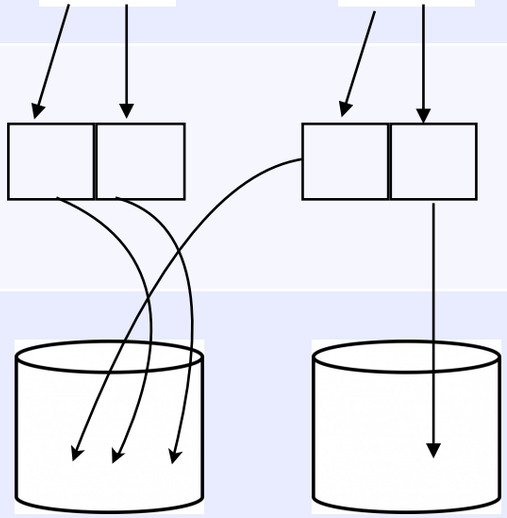


Challenges

- **API challenge: identification / namespace of source data**
  - How to define a file in VM1 to include a source file in VM2?
  - Granularity-based source file selection: 1 out of 10 lines of text?
  - Content-based source file selection: all lines containing certain keyword?
  - Arbitrary “SELECT * FROM * WHERE *” in source DB tables?
- **Performance challenge: frequent metadata updates**

Layers		Example of Liseners
Applications		• Map to destination file if keyword matches • Map every 1 line out of 10 lines of text to destination file
VFS		• Map entire file to destination file • Map every 1MB out of 10MB to destination file
Block storage		• All VFS listeners can be implemented on block layer with a reverse pointer from block to inode

Use Case: Distributed Live Analytics

- **hadoop dfs -composeFromLocal <configuration file> <path to HDFS file>**
- **Configuration file**
  slave1:/opt/IBM/*/*.log
  slave2:/var/*.log
  …
- **Challenges**
  - Informing NameNode of local file size changes
  - Balancing workload