Self-Service Data Exploration with Apache Drill

Tomer Shiran, VP Product Management

MAPR®

Empowering “as it happens” businesses by speeding up the data-to-action cycle

MAPR®

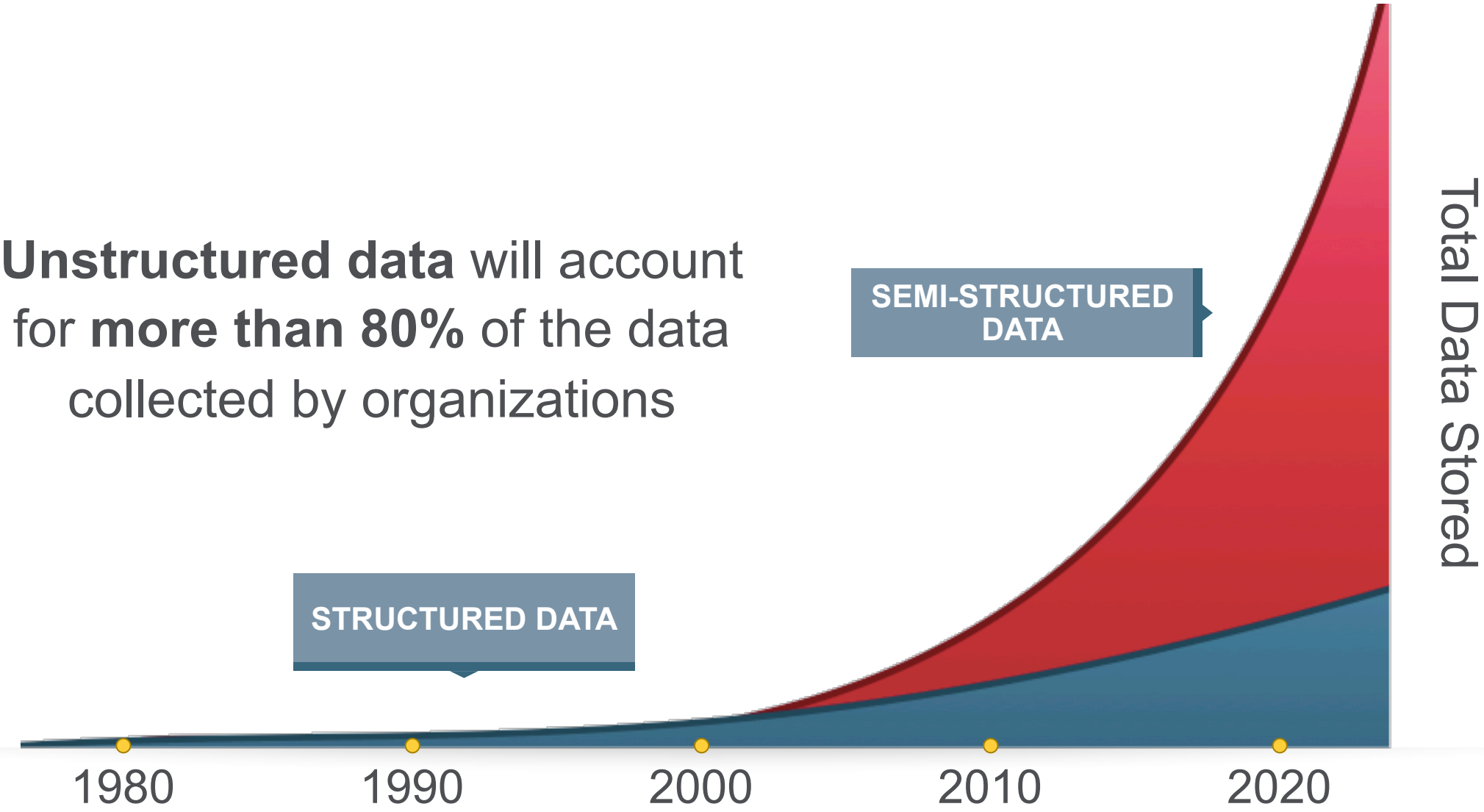
Top-Ranked **Hadoop** Distribution

Top-Ranked **NoSQL**

Top-Ranked **SQL-on-Hadoop** Solution

Data is doubling in size every two years

Unstructured data will account for **more than 80%** of the data collected by organizations



Source: Human-Computer Interaction & Knowledge Discovery in Complex Unstructured, Big Data

Data Increasingly Stored in Non-Relational Datastores

	RELATIONAL DATABASES	NON-RELATIONAL DATASTORES
Volume	MBs-TBs	TBs-PBs
Structure	Structured	Structured, semi-structured and unstructured
Development	Planned (release cycle = months-years)	Iterative (release cycle = days-weeks)
Database	ORACLE, Microsoft SQL Server, MySQL **Fixed schema** DBA controls structure	hadoop, APACHE HBASE **Dynamic schema (schema-free)** Application controls structure

1980 1990 2000 2010 2020

SQL in a Non-Relational World

DON'T WANT

- Create and maintain schemas on:
  - HDFS (Parquet, JSON, etc.)
  - HBase
  - …
- Transform or copy data

WANT

- SQL
- BI (Tableau, MicroStrategy, etc.)
- Low latency
- Scalability

APACHE DRILL

- Data exploration for Hadoop and NoSQL
- Low latency at scale
- Point-and-query vs. schema-first
- Extreme ease of use
- Industry-standard APIs: ANSI SQL, ODBC/JDBC, RESTful APIs

Agility

- Explore big data in its native format without IT intervention

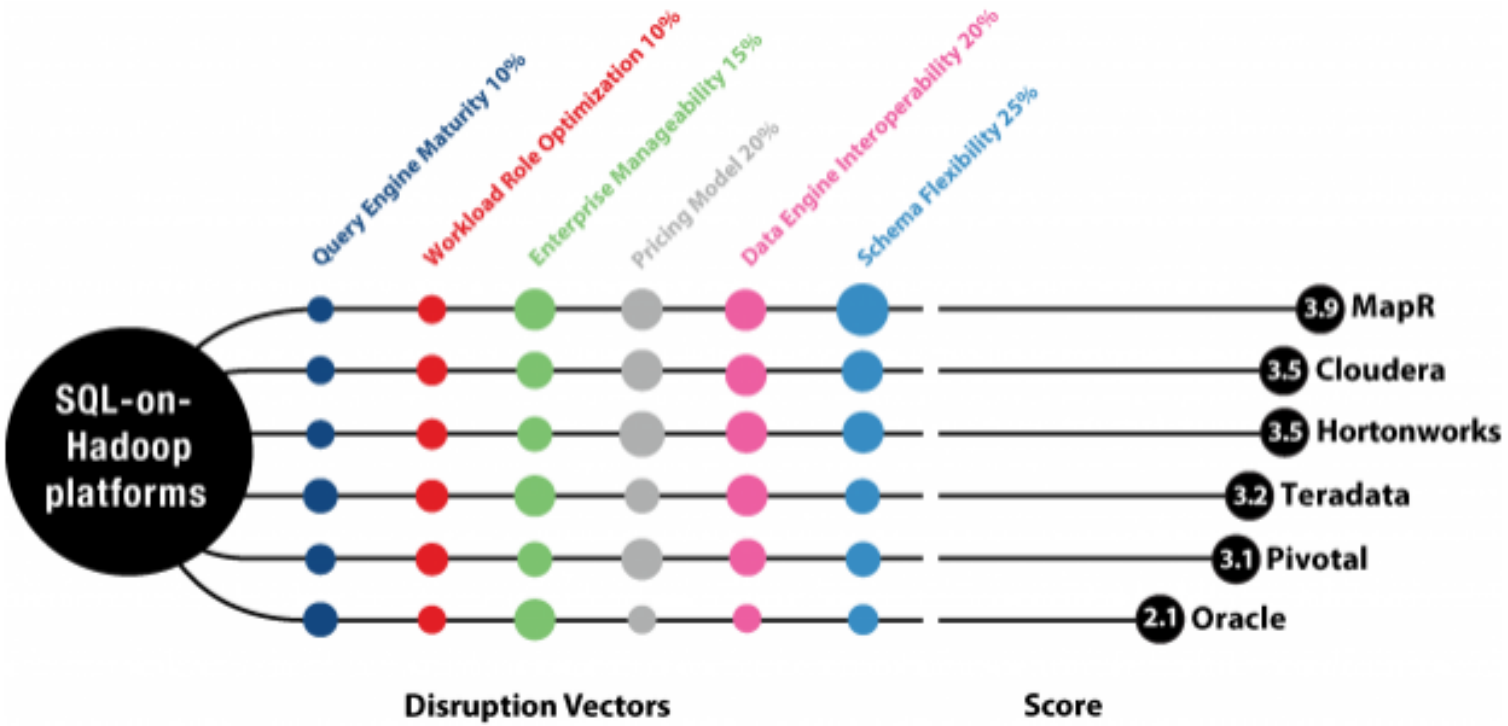
Flexibility

- Analyze semi-structured/ nested data coming from NoSQL applications and JSON sources

Plug-and-Play

- Leverage existing SQL skillsets, BI tools and Apache Hive deployments

Drill is the Top-Ranked SQL-on-Hadoop



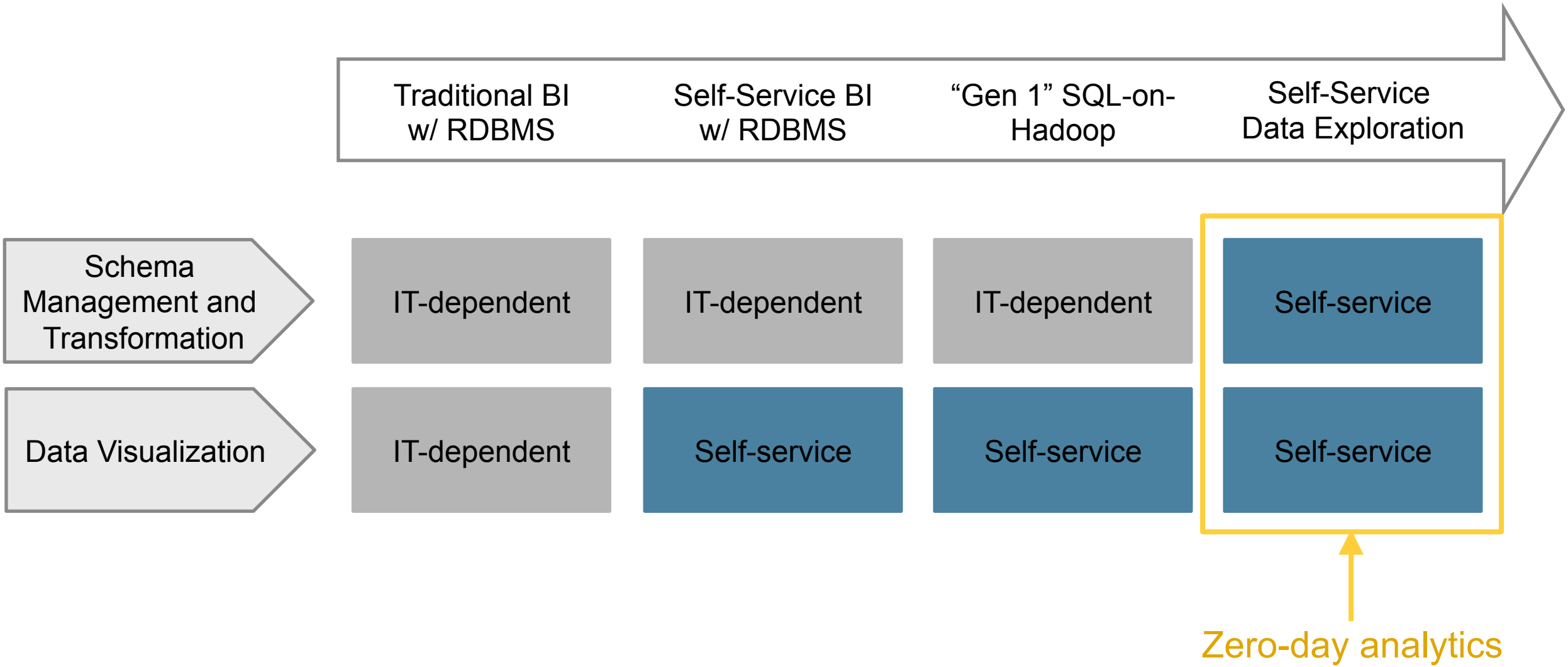
GIGAOM

Key:

- Number indicates companies relative strength across all vectors
- Size of ball indicates company's relative strength along individual vector

Source: Gigaom Research

Evolution Towards Self-Service Data Exploration



Drill's Role in the Enterprise Data Architecture

Raw data	"Optimized" data	Centrally-structured data	Relational data
• JSON, CSV, ...	• Parquet, …	• Schemas in Hive Metastore	• Highly-structured data

Exploration
(known and unknown questions)

Oracle, Teradata

Hive, Impala, Spark SQL

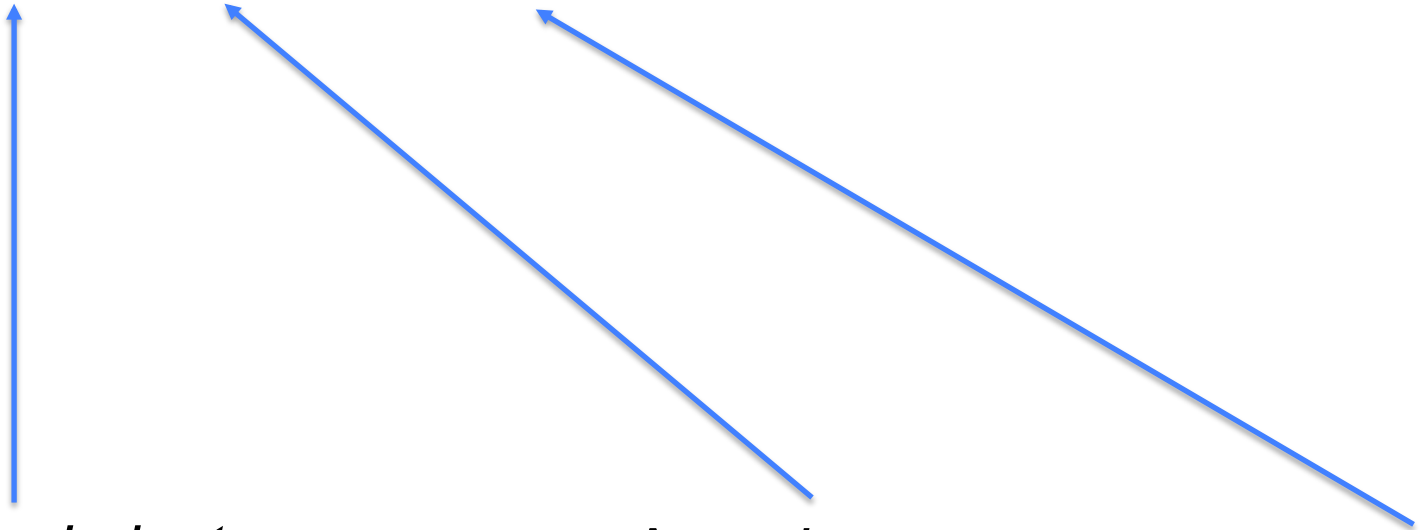
Leverage Existing SQL Tools and Skills

Leverage SQL-compatible tools (BI, query builders, etc.) via Drill's standard ODBC, JDBC and ANSI SQL support

Enable business analysts, technical analysts and data scientists to explore and analyze large volumes of real-time data

Combine Data from Multiple Sources on the Fly

```
SELECT * FROM dfs.demo.`yelp/business.json`
```



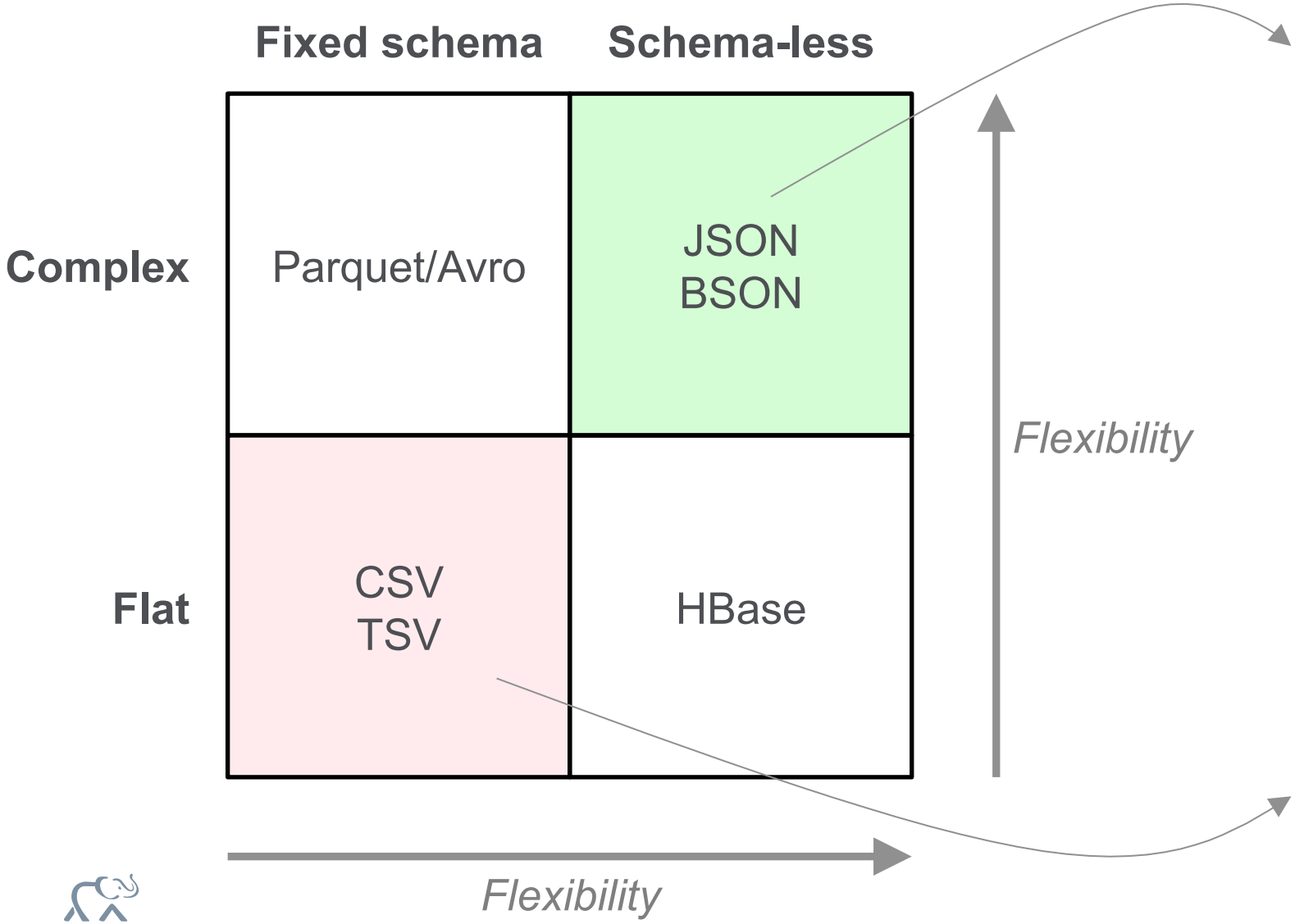
A *storage plugin instance*
- DFS
- Hbase/MapRDB
- Hive Metastore/HCatalog

A *workspace*
- Sub-directory
- Hive database
- HBase namespace

A *table*
- pathnames
- HBase table
- Hive table

How Drill Achieves Data Agility

Drill's Data Model is Flexible



Apache Drill table

```
{
  name: {
    first: Michael,
    last: Smith
  },
  hobbies: [ski, soccer],
  district: Los Altos
}
{
  name: {
    first: Jennifer,
    last: Gates
  },
  hobbies: [sing],
  preschool: CCLC
}
```

RDBMS/SQL-on-Hadoop table

Name	Gender	Age
Michael	M	6
Jennifer	F	3

Drill Supports *Schema Discovery On-The-Fly*

Schema Declared In Advance

- Fixed schema
- Leverage schema in centralized repository (Hive Metastore)

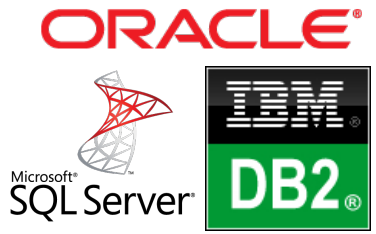
Schema Discovered On-The-Fly

- Fixed schema, evolving schema or schema-less
- Leverage schema in centralized repository or self-describing data

SCHEMA ON WRITE

SCHEMA BEFORE READ

SCHEMA ON THE FLY



Q&A

Engage with us!

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tshiran@mapr.com   maprtech

Under the Hood

High Level Architecture

Cluster of commodity servers

- Daemon (`drillbit`) on each node

ZooKeeper maintains ephemeral cluster membership information

- `Drillbit` uses ZooKeeper to find other `drillbits` in the cluster
- Client uses ZooKeeper to find `drillbits`

Built-in, optimistic query execution engine. Doesn't require a particular storage or execution system (MapReduce, Spark, Tez)

- Better performance and manageability

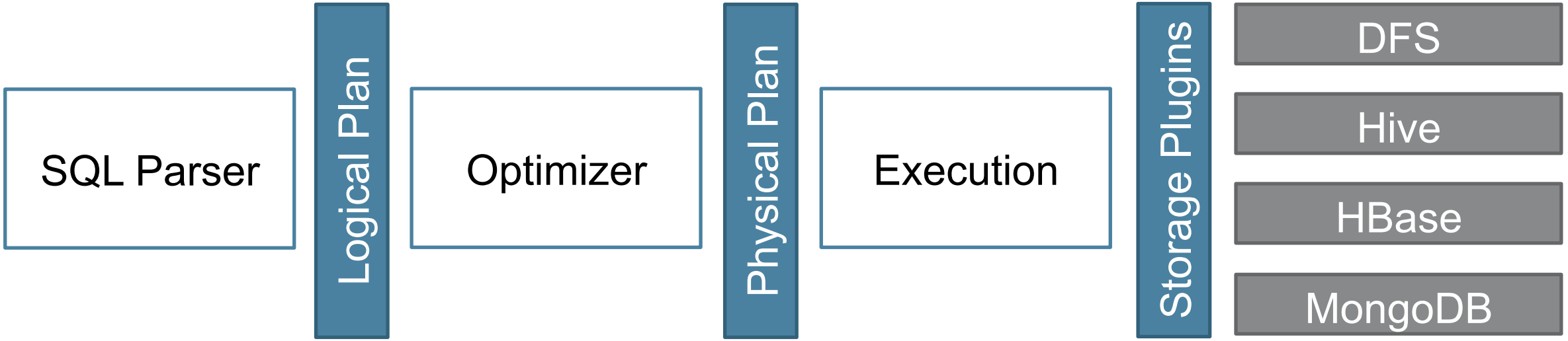
Data processing unit is *columnar record batches*

- Enables schema flexibility with negligible performance impact

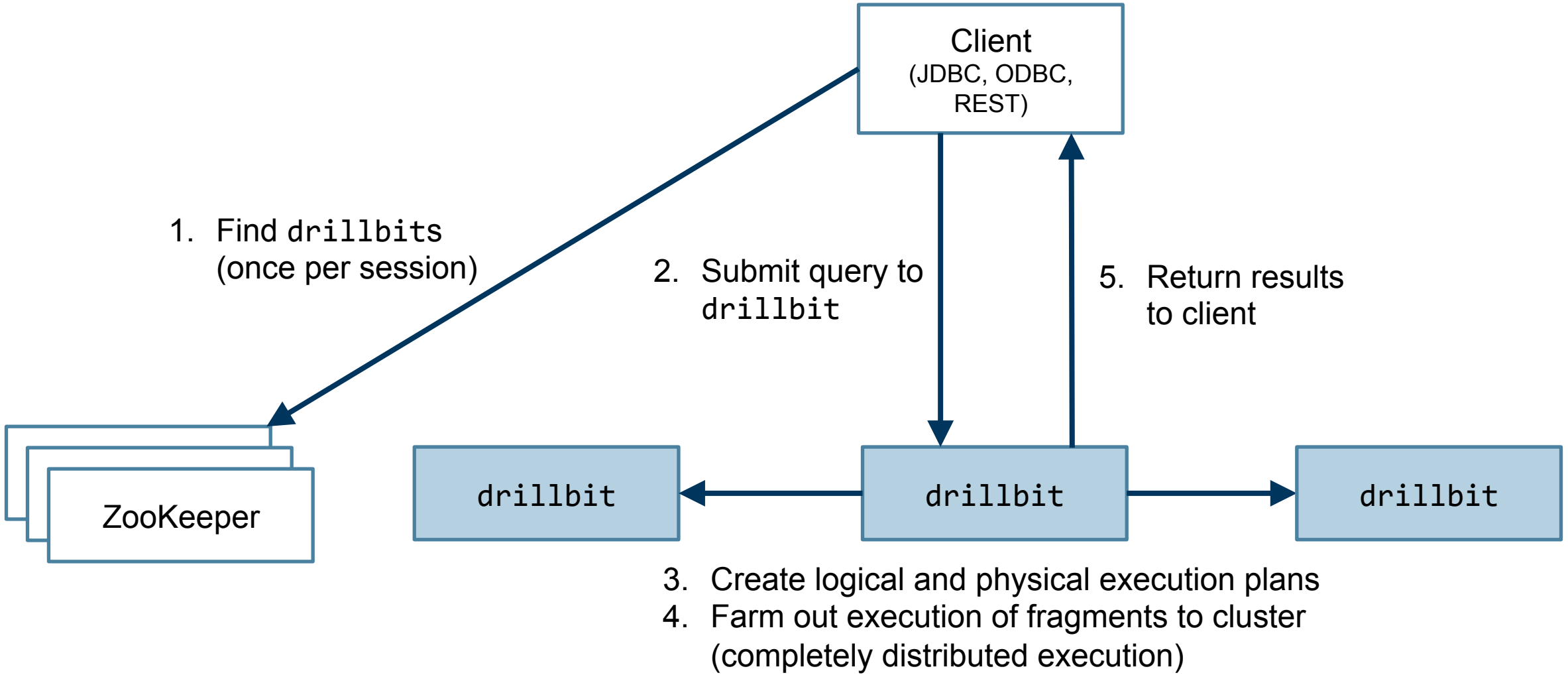
Drill Maximizes Data Locality

Data Source	Best Practice
HDFS or MapR-FS	drillbit on each DataNode
HBase or MapR-DB	drillbit on each RegionServer
MongoDB	drillbit on each mongod node (when using replicas, run it on the replica node)

Core Modules within `drillbit`



SELECT * Query Execution



* CTAS (CREATE TABLE AS SELECT) queries include steps 1-4