#### A Unified Data Infrastructure Architecture

**Query and Processing Ingestion and** Historical Predictive Sources Storage Output **Transformation Dashboards** Connectors **Data Warehouse OLTP Databases** (Fivetran, Stitch, (Looker, Superset, via CDC (Snowflake, BigQuery, Redshift) Matillion) Mode, Tableau) Applications/ERP **Embedded Data Modeling** (Oracle, Salesforce, **Analytics** (dbt, LookML) Netsuite, ...) (Sisense, Looker, cube.js) **Event Collectors** Workflow **Data Science Platform** (Segment, Snowplow) Manager Augmented (Databricks, Domino, Sagemaker, Dataiku, (Airflow, Dagster, Prefect) Analytics DataRobot, Anaconda, ...) (Thoughtspot, Outlier, Anodot, Sisu) Logs **Data Science and ML Libraries** (Pandas, Numpy, R, Dask, Ray, Spark, ... **Spark Platform** Data Lake **App Frameworks** Scikit-learn, Pytorch, TensorFlow, Spark ML, XGBoost, ...) (Databricks, EMR) 3rd Party APIs (Plotly Dash, Streamlit) (e.g., Stripe) Databricks/ Delta Lake, Iceberg, Ad Hoc Query **Python Libs** Hudi, Hive Acid **Engine** (Pandas, Boto, **Custom Apps** File and Object (Presto, Dremio/ Dask, Ray, ...) Drill, Impala) Storage Parquet, ORC, Avro **Batch Query** Engine Real-time . . . (Hive) **Analytics** (Imply/Druid, Altinity/ S3, GCS, ABS, HDFS Clickhouse, Rockset) **Event Streaming** (Confluent/Kafka, Pulsar, AWS Kinesis) Stream Processing (Databricks/Spark, Confluent/Kafka, Flink) Metadata Entitlements Observability **Quality and Testing** Management and Security (Unravel, Accel Data, (Great Expectations) (Collibra, Alation, Hive, Fiddler) (Privacera, Immuta) Metastore, DataHub, ...)

## Interpreting the Architecture

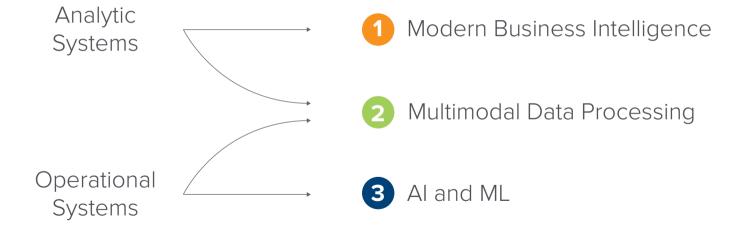
Query and Processing ———

Sources	Ingestion and Transformation	Storage	Historical	Predictive	Output
Generate relevant business and operational data	Extract data from operational systems (E)  Deliver to storage, aligning schemas between source and destination (L)  Transform data to a structure ready for analysis (T)	Store data in a format accessible to query & processing systems  Optimize for low cost, scalability, and analytic workloads (e.g., column store)  In some cases, provide additional data structures or guarantees	to derive ins Execute queries and da	nalysts and data scientists sights (query)  ta models against stored ted compute (processing)  Predict what will happen in the future  Build data-driven/ ML applications	Present results of data analysis to internal and external users  Embed data models into operational systems and applications

Coordinate the flow of data and the execution of computations across the full lifecycle

Ensure proper data quality, performance, and governance of all systems and datasets

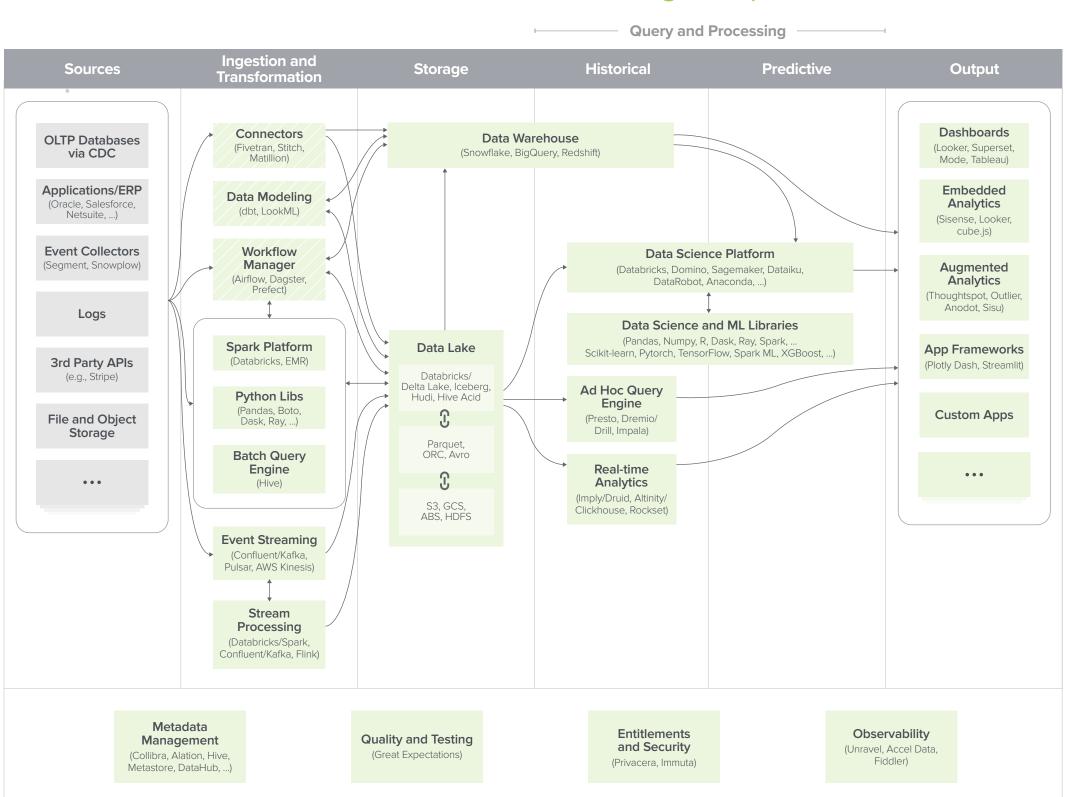
#### **Three Common Blueprints**



## 1. Modern Business Intelligence Blueprint

**Query and Processing Ingestion and** Historical Predictive Sources Storage Output **Transformation Dashboards** Connectors **Data Warehouse OLTP Databases** (Fivetran, Stitch, (Looker, Superset, via CDC (Snowflake, BigQuery, Redshift) Matillion) Mode, Tableau) Applications/ERP **Embedded Data Modeling** (Oracle, Salesforce, **Analytics** (dbt, LookML) Netsuite, ...) (Sisense, Looker, cube.js) **Event Collectors** Workflow **Data Science Platform** (Segment, Snowplow) Manager **Augmented** (Airflow, Dagster, DataRobot, Anaconda, ...) **Analytics** (Thoughtspot, Outlier, Anodot, Sisu) Logs Data Science and ML Libraries (Pandas, Numpy, R, Dask, Ray, Spark, Spark Platform Data Lake **App Frameworks** Scikit-learn, Pytorch, TensorFlow, Spark ML, XGBoost, ...) (Databricks, EMR) **3rd Party APIs** (Plotly Dash, Streamlit) (e.g., Stripe) Ad Hoc Query Python Libs Engine **Custom Apps** File and Object Dask, Ray, ...) Storage ORC, Avro **Batch Query** Engine Real-time . . . Analytics (Hive) (Imply/Druid, Altinity/ **Event Streaming** (Confluent/Kafka, Pulsar, AWS Kinesis) Stream Processing Confluent/Kafka, Flink) Metadata Entitlements Observability **Quality and Testing** Management and Security (Great Expectations) (Privacera, Immuta) Metastore, DataHub, ...)

#### 2. Multimodal Data Processing Blueprint



# 3. Al and ML Blueprint

