INDEPTH Network

Introduction to ETL

Tathagata Bhattacharjee

iSHARE2 Support Team

INDEPTH Data Repository

iSHARE 2

an INDEPTH project

Data Warehouse

- A data warehouse is a system used for reporting and data analysis.
- Integrating data from one or more different sources to create a central repository of data, a data warehouse
- A data warehouse is a **subject-oriented**, **integrated**, **time-variant** and **non-volatile** collection of data

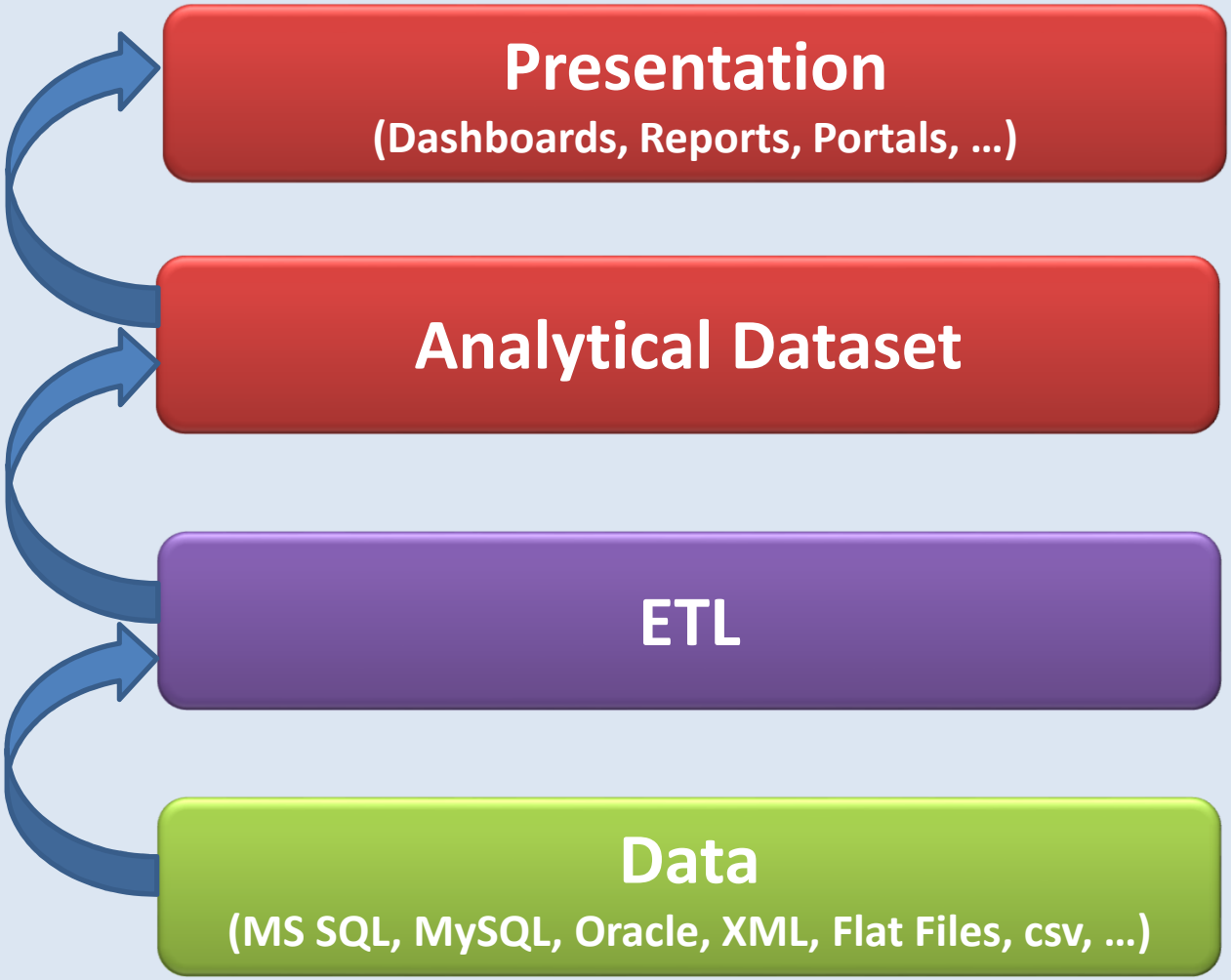
Data Warehouse

- **Subject-Oriented**: A data warehouse can be used to analyse a particular subject area. For example, “HDSS Data" is a particular subject area.
- **Integrated**: A data warehouse integrates data from multiple data sources. For example, source A and source B may have different ways of identifying an event date, but in a data warehouse, there will be only a single way of identifying an event date
- **Time-Variant**: Historical data is kept in a data warehouse. For example, one can retrieve data from 10 years, 5 years, ... This contrasts with a transactions system, where only the most recent data is kept.
- **Non-volatile**: Once data is in the data warehouse, it will not change. So, historical data in a data warehouse should never be altered.

ETL

iSHARE 2
an INDEPTH project

ETL Process



iSHARE 2
an INDEPTH project

Pre ETL Tasks

- **Profiling** the data:
  - Know your data
  - Will give direct insight in the data quality of the source systems.
  - Find out how many rows have missing or invalid values, or what is the distribution of values in a specific column.
- This knowledge will help to specify rules (data standards / quality checks) in order to cleanse the data and to keep really bad data out of the repository.
- Doing data profiling before designing the ETL process helps you to better design a system that is correct, robust and has a clear structure.

ETL

- Data moved from source to target data bases
- Focus: Preparing the data for reporting / analysis
- ETL = Extract -> Transform -> Load
  - **Extract:** Get the data from source(s) as efficiently as possible
  - **Transform:** Perform calculation / map data / clean data
  - **Load:** Load data to the target storage

iSHARE 2
an INDEPTH project

Value Addition

- Removes mistakes and corrects data
- Documented measures of confidence in data
- Capture the flow of transactional data
- Adjust data from multiple sources to be used together
- Structures data to be useable by any analysis tool
- Enables subsequest analytical data processing

iSHARE 2
an INDEPTH project

Dirty Data

- Absence of Data / Missing Data
- Multipurpose Fields
- Cryptic Data
- Contradicting Data
- Violation of Data Rules
- Reused Primary Keys
- Non-Unique Identifiers
- Data Integration Problems

Data Cleaning

iSHARE 2

an INDEPTH project

Data Cleaning: Parsing / Combining

- **Parsing** locates and identifies individual data elements in the source files and then *isolates* these data elements in the target files.
  - Examples include full name stored in one column

Name
Harry Johnson
Mary J. Blair
Dr. Chris Young
Martin K. Brown II

Title	First Name	Middle Name	Last Name	Suffix
	Harry		Johnson	
	Mary	J.	Blair	
Dr.	Chris		Young	
	Martin	K.	Brown	II

- **Combining** locates and identifies individual data elements in the source files and then *combines* these data elements in the target files
  - Examples include event date stored in different columns as date, month and year

Date	Month	Year
9	May	2016
06	04	2015

Date
2016-05-09
2015-04-06

iSHARE 2
an INDEPTH project

Data Cleaning: Correcting

- **Correct** parsed individual data components using sophisticated data algorithms and secondary data sources.

- Correct data according to data rules

- Example includes converting the combined date into a standard date format

Data Cleaning: Standardizing

- **Standardizing** applies conversion routines to transform data into its preferred (and consistent) format using both standard and custom data rules.

Sex
Male
F
M
Female
NULL
f
m

Sex
1
2
1
2
0
2
1

iSHARE 2
an INDEPTH project

Data Cleaning: Matching

- Searching and **matching** records within and across the parsed, combined, corrected and standardized data based on predefined data rules to eliminate duplications, sequences

Pregnancy Number	Outcome Date	Outcome
1	2011-06-07	Twin

DoB	Name
2011-06-07	Child1
2011-06-07	Child2

Pregnancy Number	Birth Date	Name
1	2011-06-07	Child1
1	2011-06-07	Child2

iSHARE 2
an INDEPTH project

Data Cleaning: Consolidating

- Analysing and identifying relationships between matched records and **consolidating**/merging them into correct representation

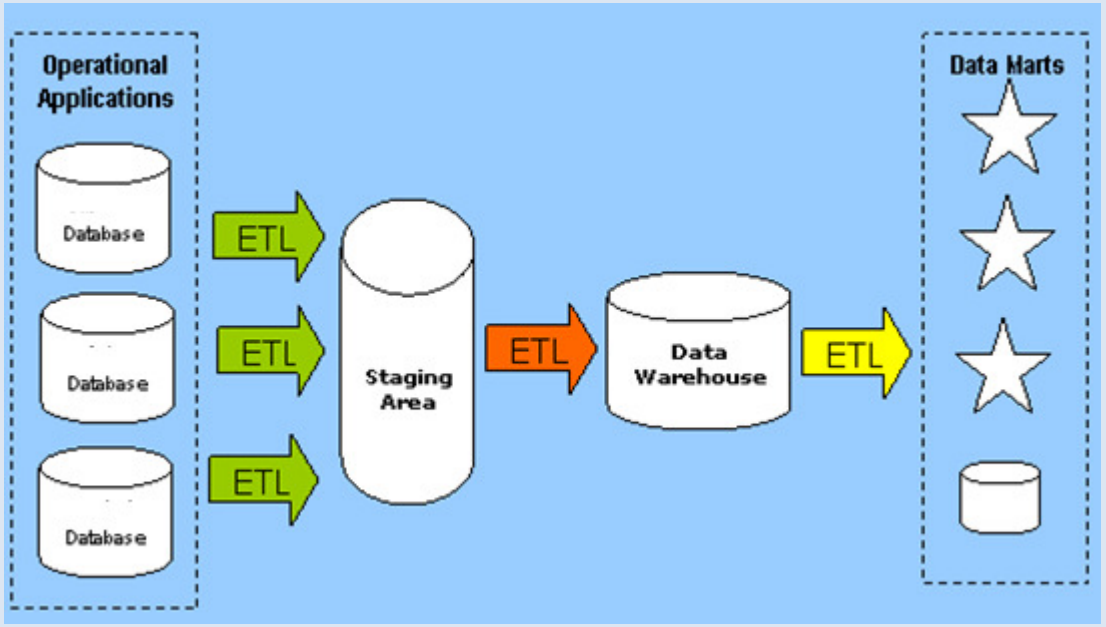
Migration Dates
2006-05-09
1995-06-06

Sequence	Event	Date
1	Inmigration	1995-06-06
2	Outmigration	2006-05-09

iSHARE 2
an INDEPTH project

Data Staging

- Used as an interim step between data extraction and later steps
- Accumulates data from asynchronous sources using native interfaces, flat files, FTP sessions, or other processes
- Data in the staging file is transformed and loaded to the warehouse
- There is no end user access to the staging file
- An operational data store may be used for data staging



iSHARE 2
an INDEPTH project

Data Transformation

- Transforms data in accordance with the data rules and standards that have been established

- Example include: format changes, splitting up fields, replacement of codes, derived values, and aggregates

ETL Tools

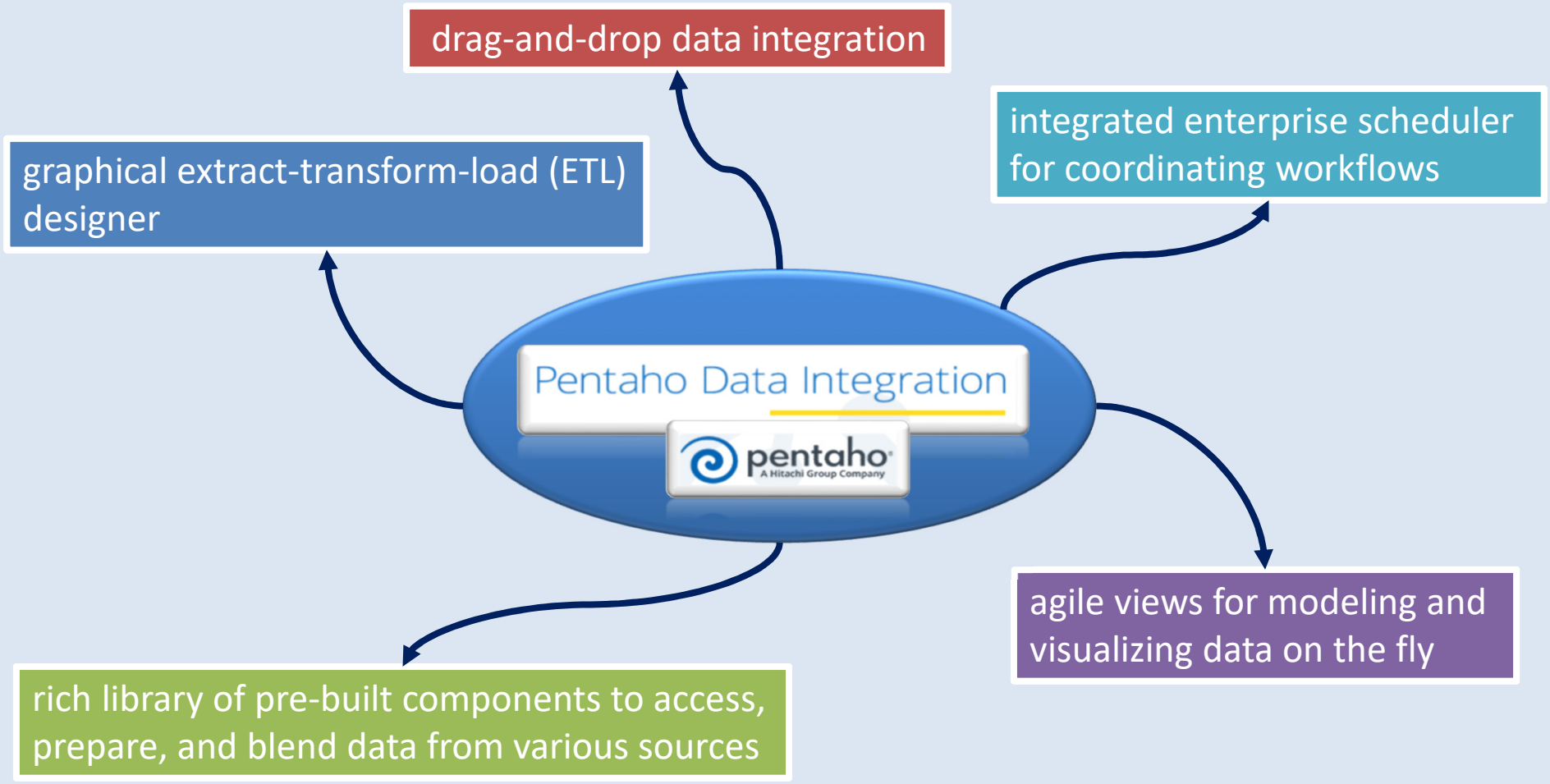
- Few popular commercial and freeware(open-sources) ETL Tools

- **Commercial ETL Tools:**
  - IBM Infosphere DataStage
  - Informatica PowerCenter
  - Oracle Warehouse Builder (OWB)
  - Oracle Data Integrator (ODI)
  - SAS ETL Studio
  - Business Objects Data Integrator(BODI)
  - Microsoft SQL Server Integration Services(SSIS)
  - Ab Initio

- **Freeware, open source ETL tools:**
  - Pentaho Data Integration (PDI) - Kettle
  - Talend Integrator Suite
  - CloverETL
  - Jasper ETL

iSHARE 2
an INDEPTH project

PDI Key Features

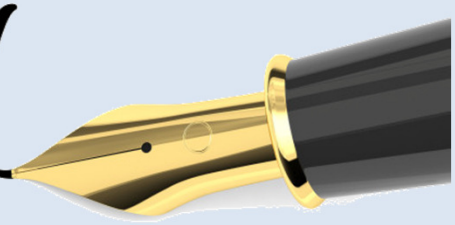


iSHARE 2
an INDEPTH project

iSHARE 2

an INDEPTH project

Thank you



iSHARE 2

an INDEPTH project