CS 378 – Big Data Programming

Lecture 7

File Formats

Review

- Assignment 3 – InvertedIndex
- Questions/issues?
- Specifying key/value output types to Hadoop
  - Map output
  - Reduce output
- Default constructor for Writable implementer

File Formats - Review

- What does **`TextInputFormat`** do?
  - Via its **`RecordReader`** implementer

- Identifies the next line of input
  - Text through the next newline
- Creates the **`Text`** object with this content
- Calculates the position of this line in the input split
- Creates the **`LongWritable`** with this number
- Reports progress via **`getProgress()`**

File Formats - Review

- What does **`TextOutputFormat`** do?
  - Via its **`RecordWriter`** implementer

- Calls **`toString()`** on the key, writes this string
- Writes a tab character
- Calls **`toString()`** on the value, writes this string

File Formats

- Suppose we wanted to use the output of WordCount as input to another map-reduce job
  - Maybe we collected word counts for each day's emails
  - Now we want to sum up stats from multiple days

- One approach: Use **`TextInputFormat`**
  - Map input is **`LongWritable`**, **`Text`**
  - We'd have to parse the value in the Text object to separate the key and value (separated by a tab)

File Formats

- Another approach: implement a custom file format

- What do we need to do?
- In our custom input file format class …
  - Define a **`RecordReader`** interface implementer to:
  - Grab one line of input from the input split
  - Find the key/value separator
  - Return the key (the word) as a **`Text`** object
  - Return the value (the count) as a **`LongWritable`** object
- Seems like a convenient class to have around

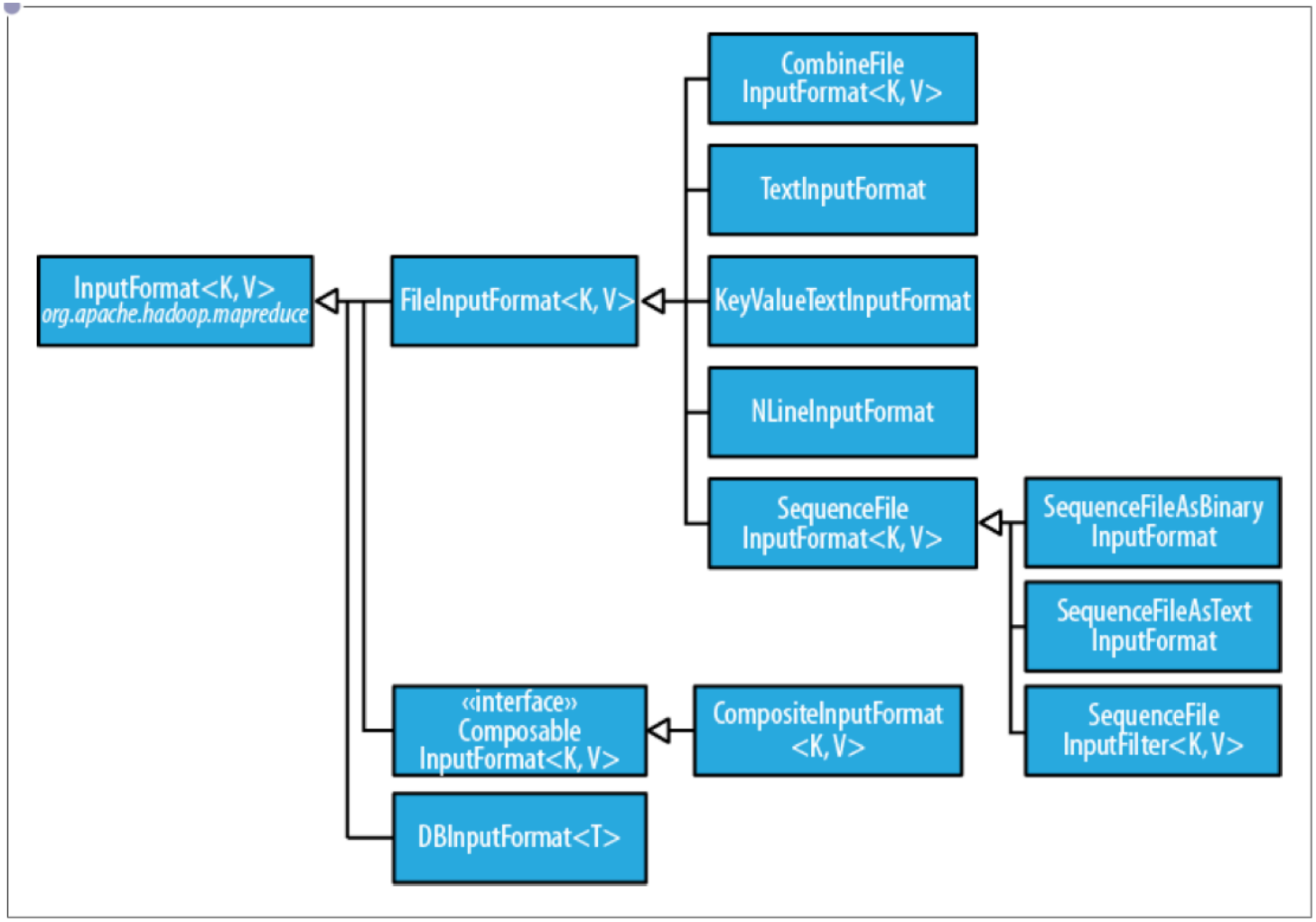
File Formats

- Hadoop provides (almost) this class for us:
- **`KeyValueTextInputFormat`**
  - You can set the separator character (by default, tab)
  - Key and value types are **`Text`**

- Other file formats and readers provided by Hadoop
  - Reading from a database
  - Each mapper receives exactly N lines
  - XML stream processing
  - Sequence files (binary)

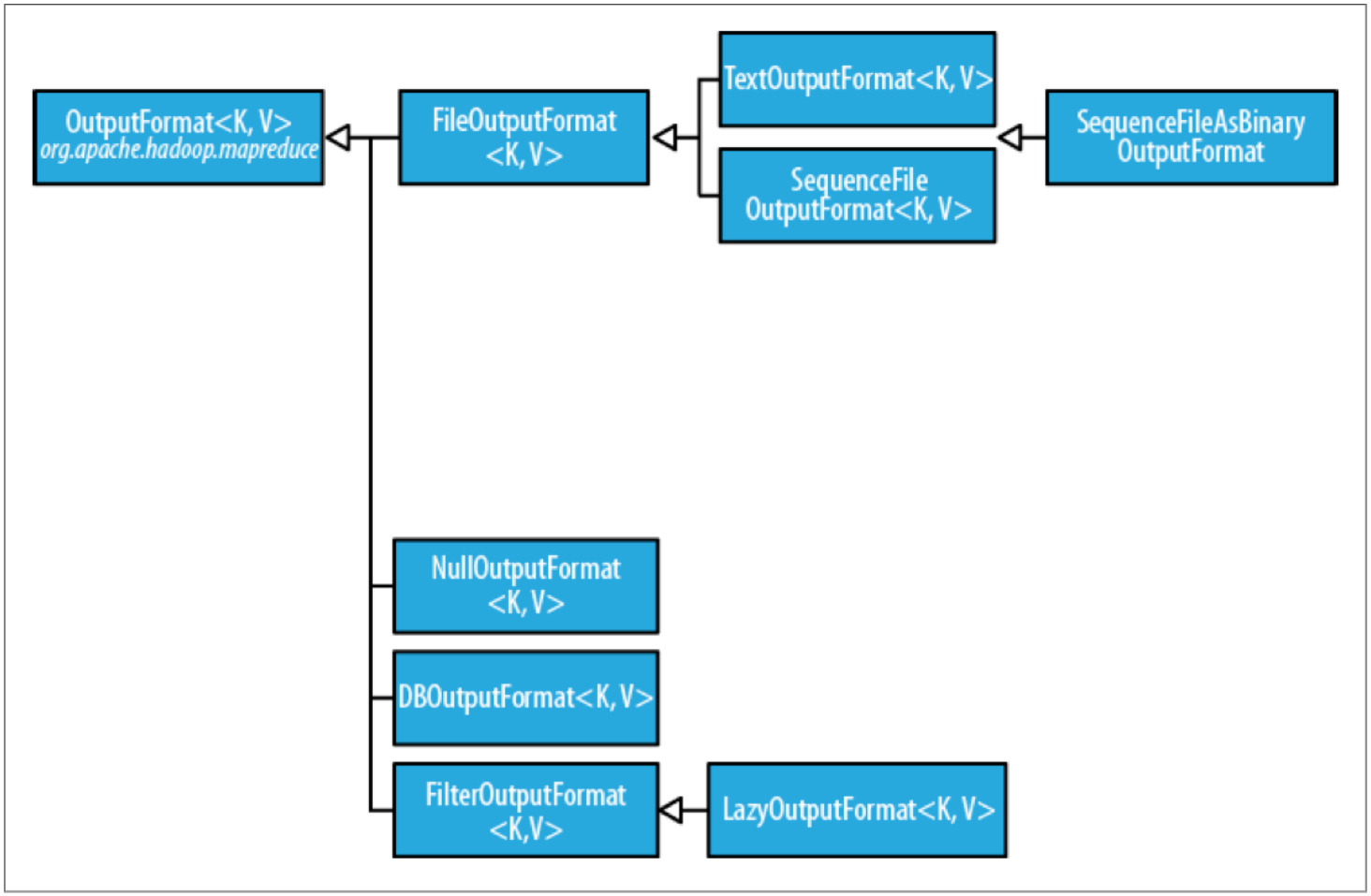
File Formats

Figure 8-2, Hadoop: The Definitive Guide 4th Edition



File Formats

Figure 8-4, Hadoop: The Definitive Guide 4th Edition

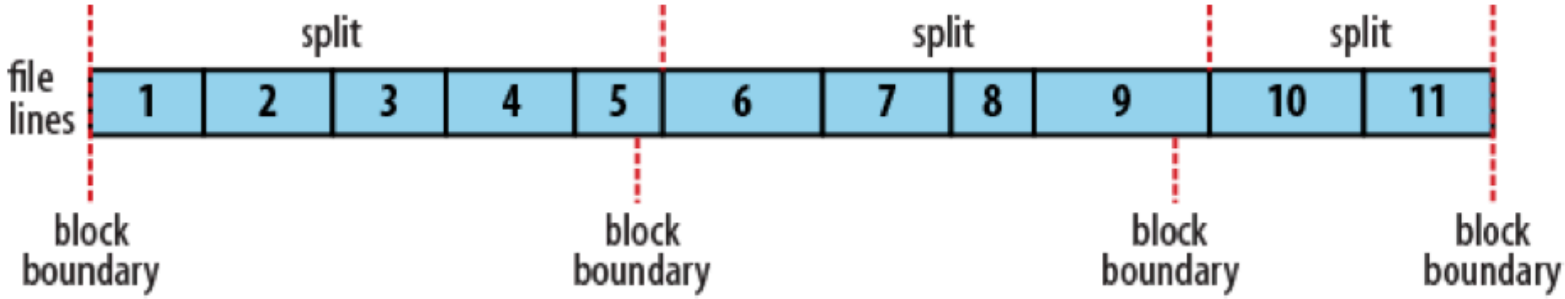


Input Format

- What does an **`InputFormat`** do?
  - Validate input configuration (is the data there?)
  - Split input blocks/files into logical chunks
    - Logical chunks are of type **`InputSplit`**
    - Each is assigned to a mapper
  - Create the **`RecordReader`** that generates key/value pairs from the **`InputSplit`**
- **`RecordReader`** also has to fix up records that span splits
- We've used **`TextInputFormat`**

Processing Splits

Figure 8-3, Hadoop: The Definitive Guide 4th Edition



Input Format

- **`TextInputFormat`** uses **`LineRecordReader`**
  - Reads an input split to get the next input line (`'\n'`)
  - At the beginning of an input split, find first newline
  - Reads past the split boundary until it finds an end-of-line
  - Key returned: position in the input split
  - Value: the input line

- **`KeyValueTextInputFormat`**
  - How is it different from **`TextInputFormat`**?

Generating Random Data

- Random data can be used for testing when:
  - Real data does not yet exist, and/or
  - You want to control the "shape" of the data

- We can create a custom input format to generate random data
  - No actual input is read
  - The **`RecordReader`** will generate random values as "input"

`InputFormat` Interface

- Two methods to implement:

- **`getRecordReader()`**
- **`getSplits()`**

- **`InputSplit`** methods:

- **`getLength()`**
- **`getLocations()`**

`RecordReader` Interface

- Methods to implement:

- **`initalize()`**
- **`getCurrentKey(), getCurrentValue()`**
- **`nextkeyValue()`**
- **`getProgress()`**
- **`close()`**