Streaming OODT:

An Open-Source Platform for Big-Data Processing

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Agenda

- Data and Processing
- Data Systems
- Apache OODT
- Apache Spark
- Streaming OODT
- Examples
- Where can I get the code?
- Acknowledgements
- Questions

Data and Processing

Data and Processing

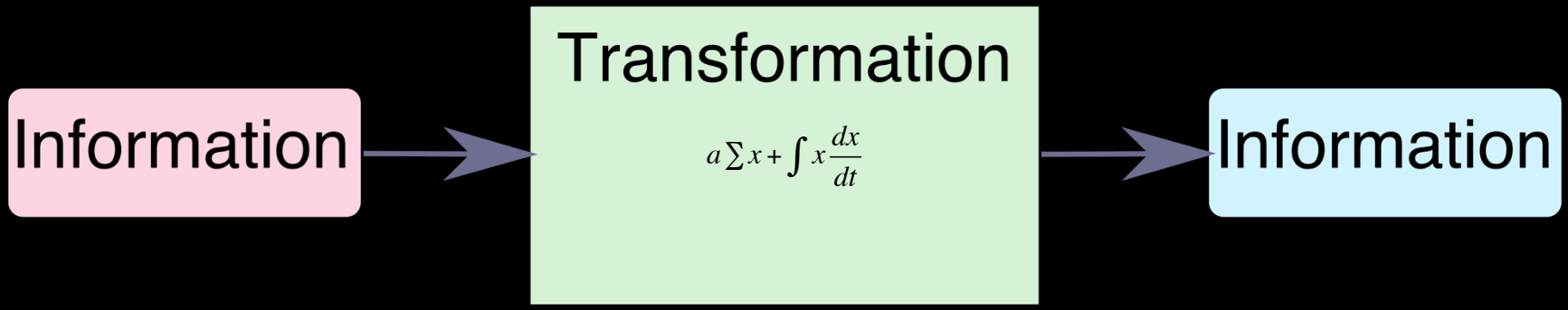


Figure 1: What is data processing?

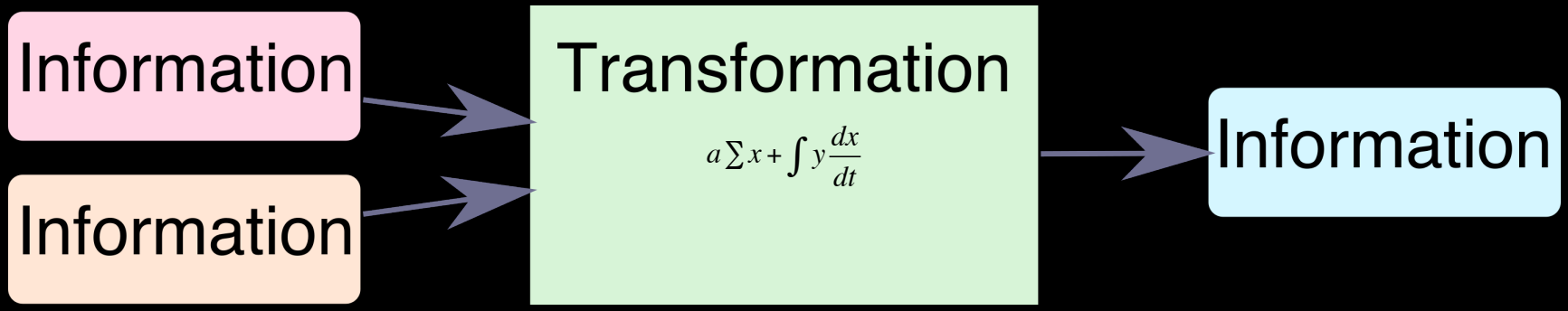


Figure 2: More complex data processing

Parallelization

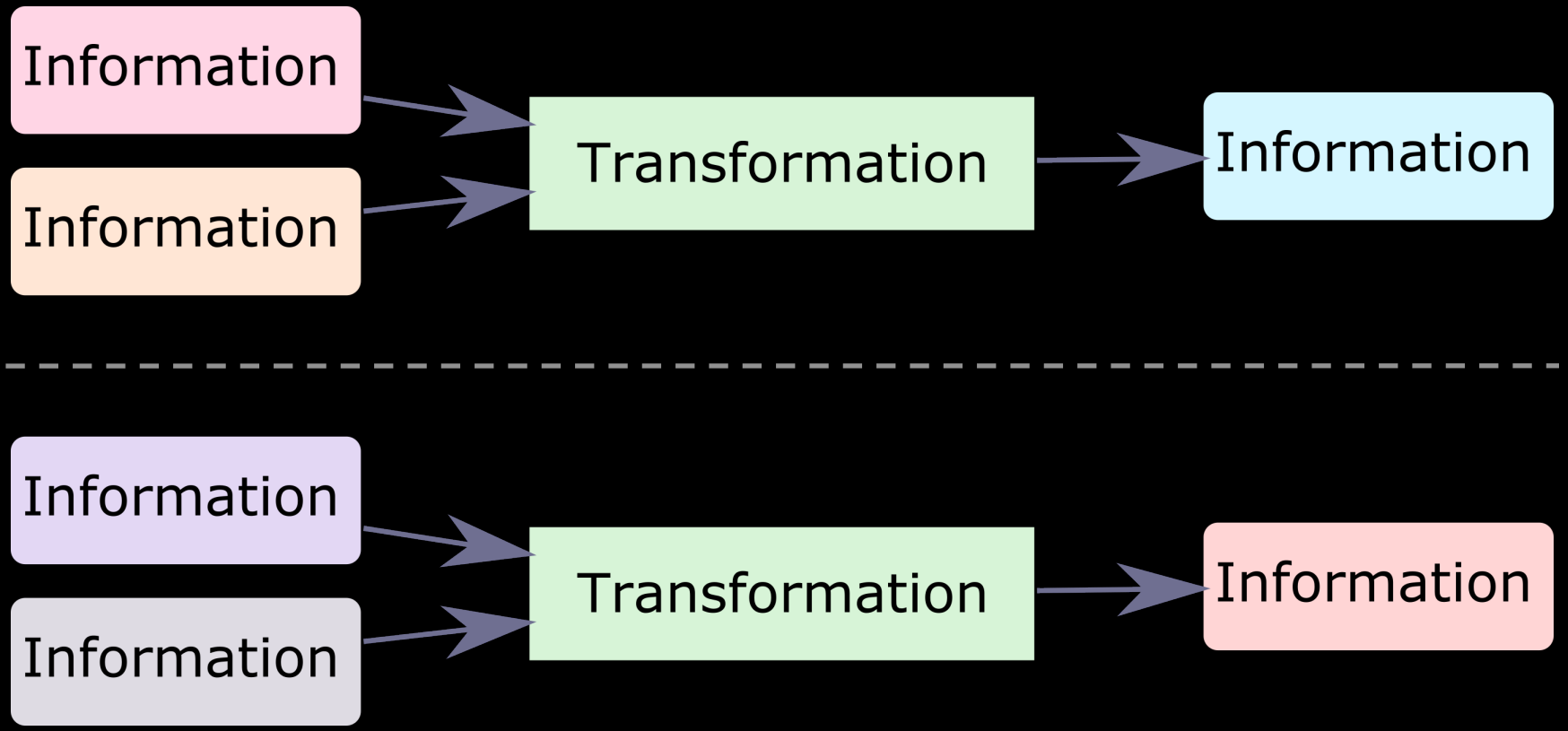


Figure 3: Parallelizing data processing

Big Data

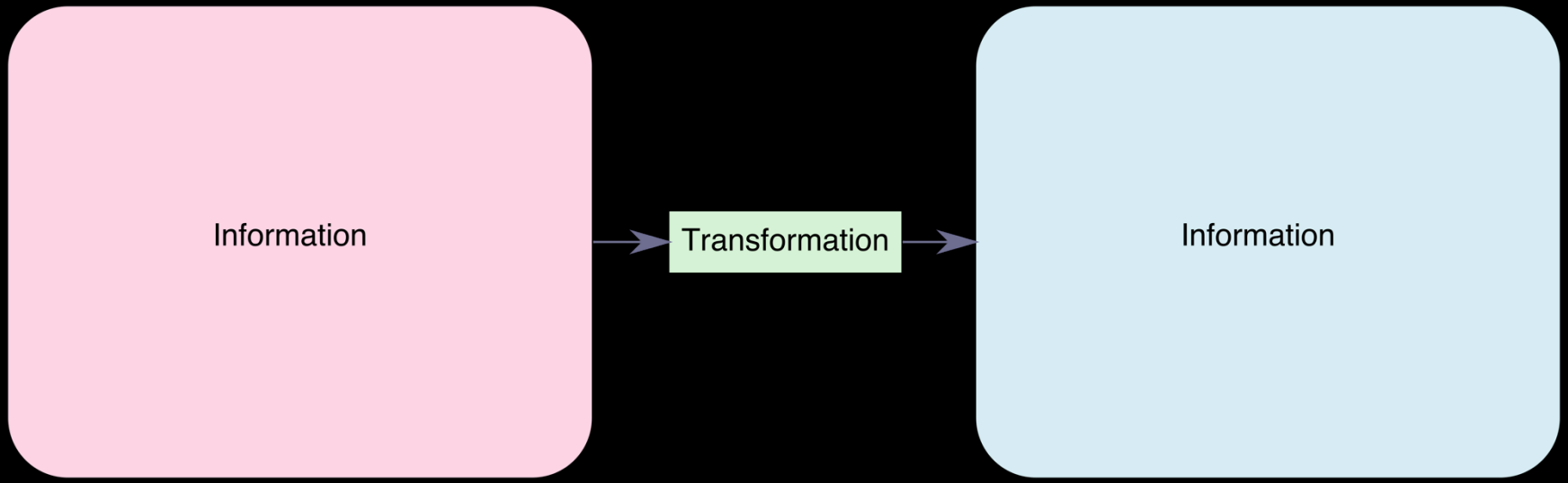


Figure 4: Data is becoming very large

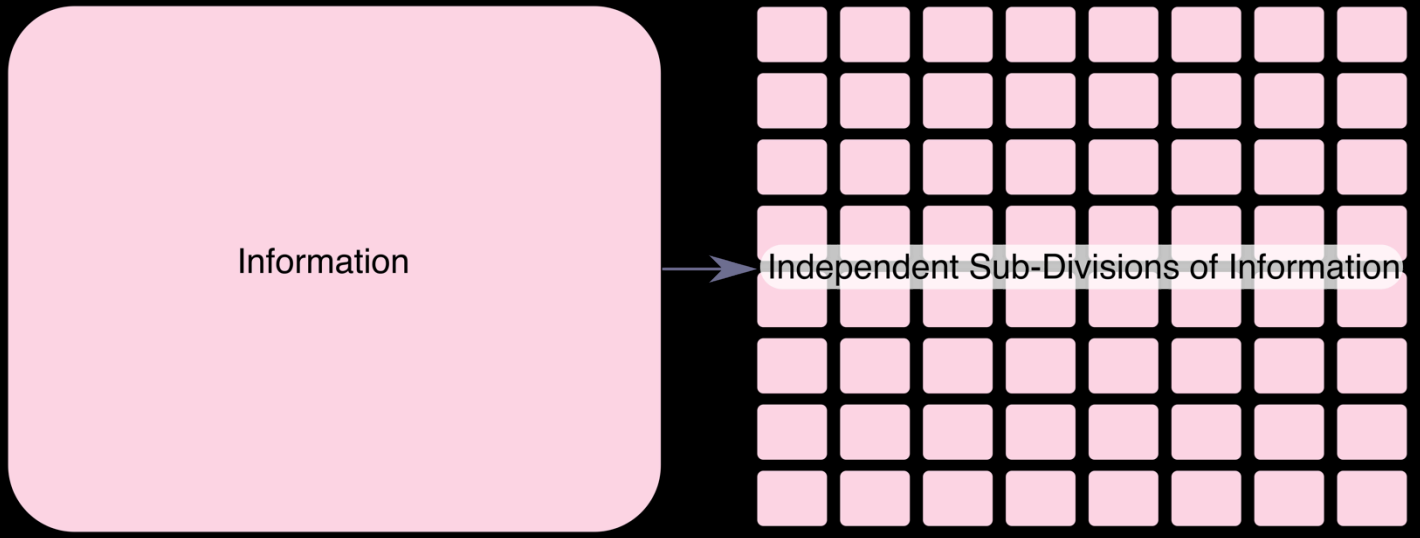


Figure 5: Parallelizable big-data

Data Systems

Archival and Search

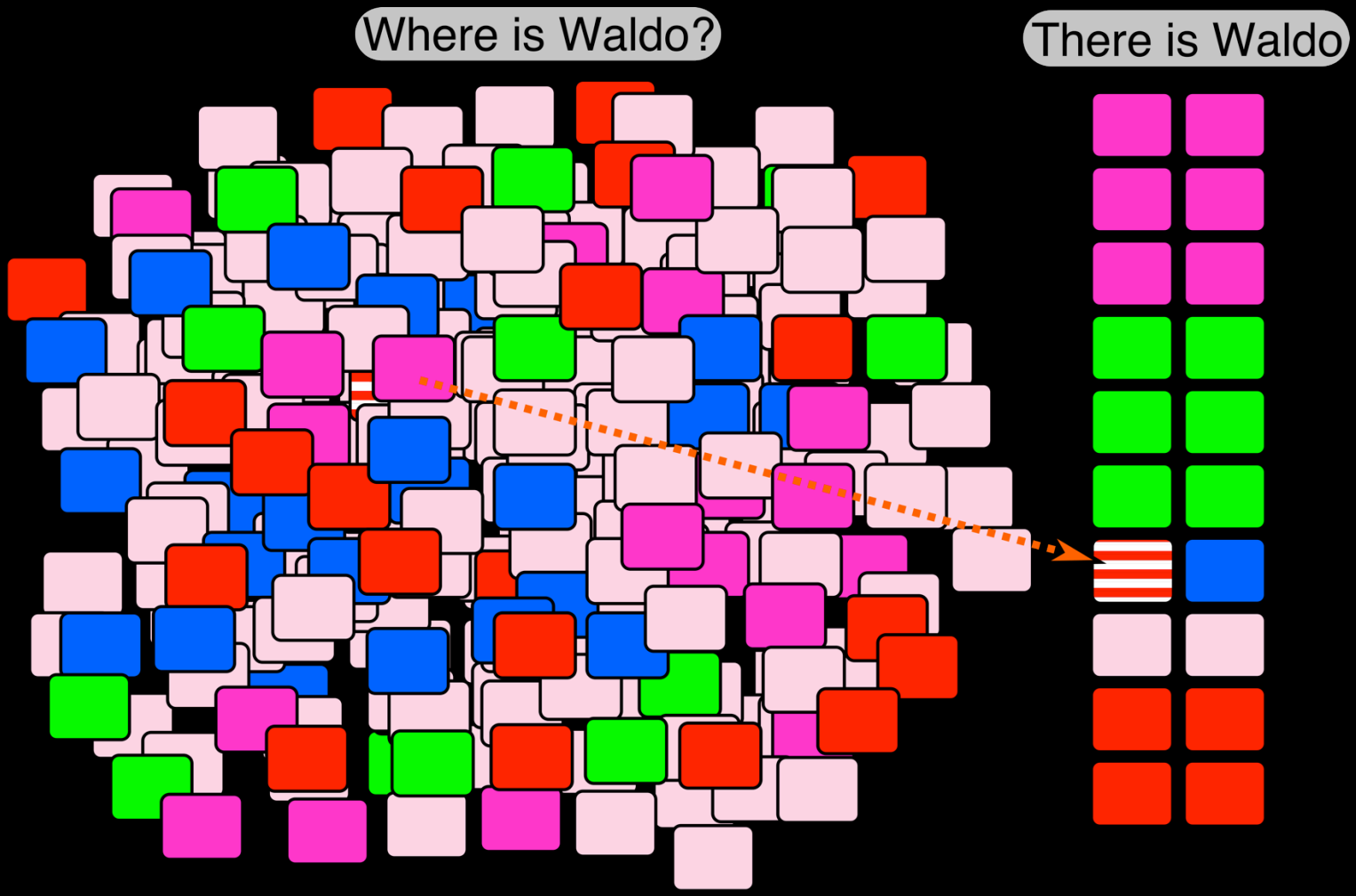


Figure 6: Archiving and searching in data sets

Processing and Resource Management

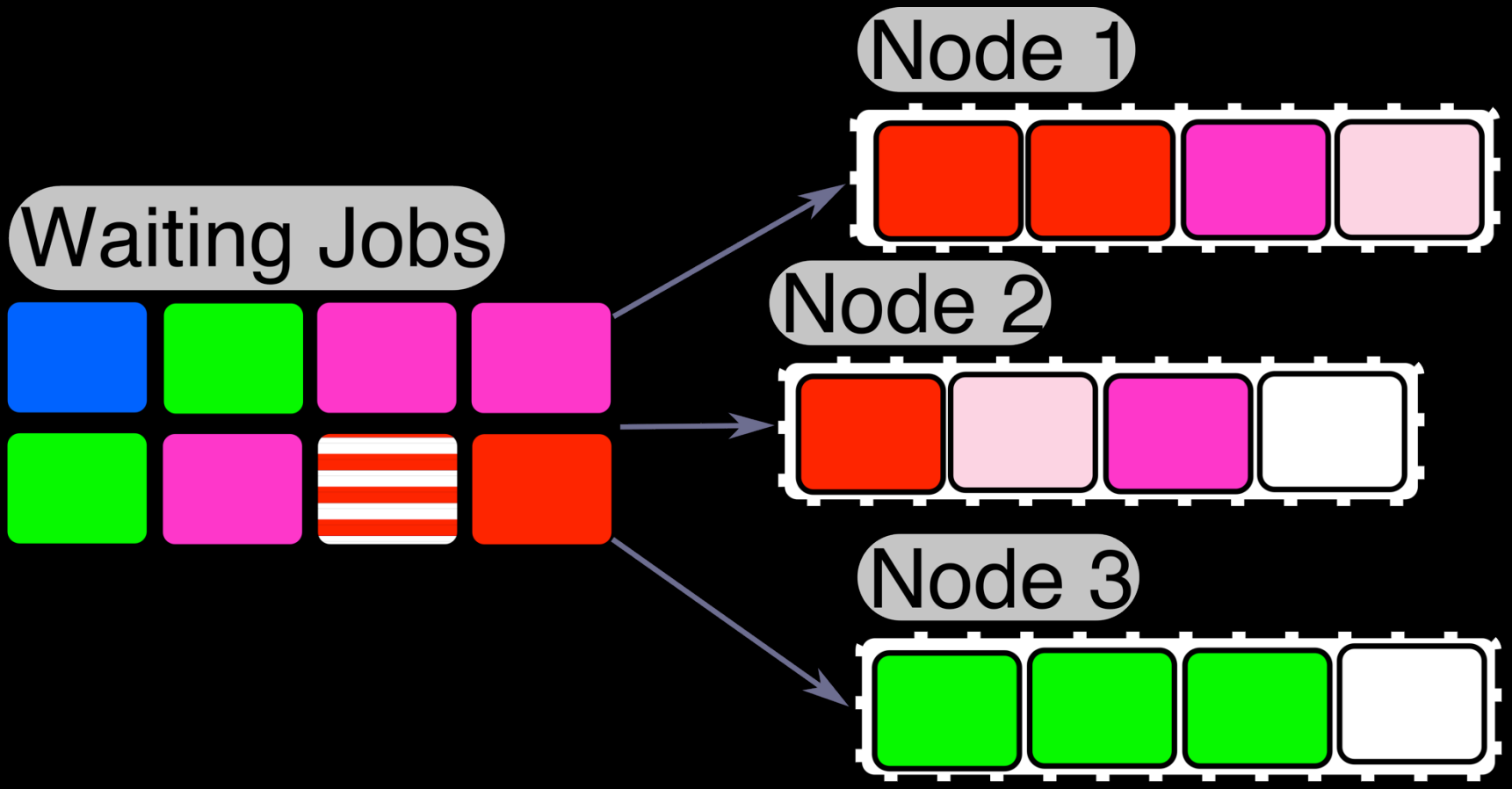


Figure 7: Processing and resource management

Data Ingest and Delivery

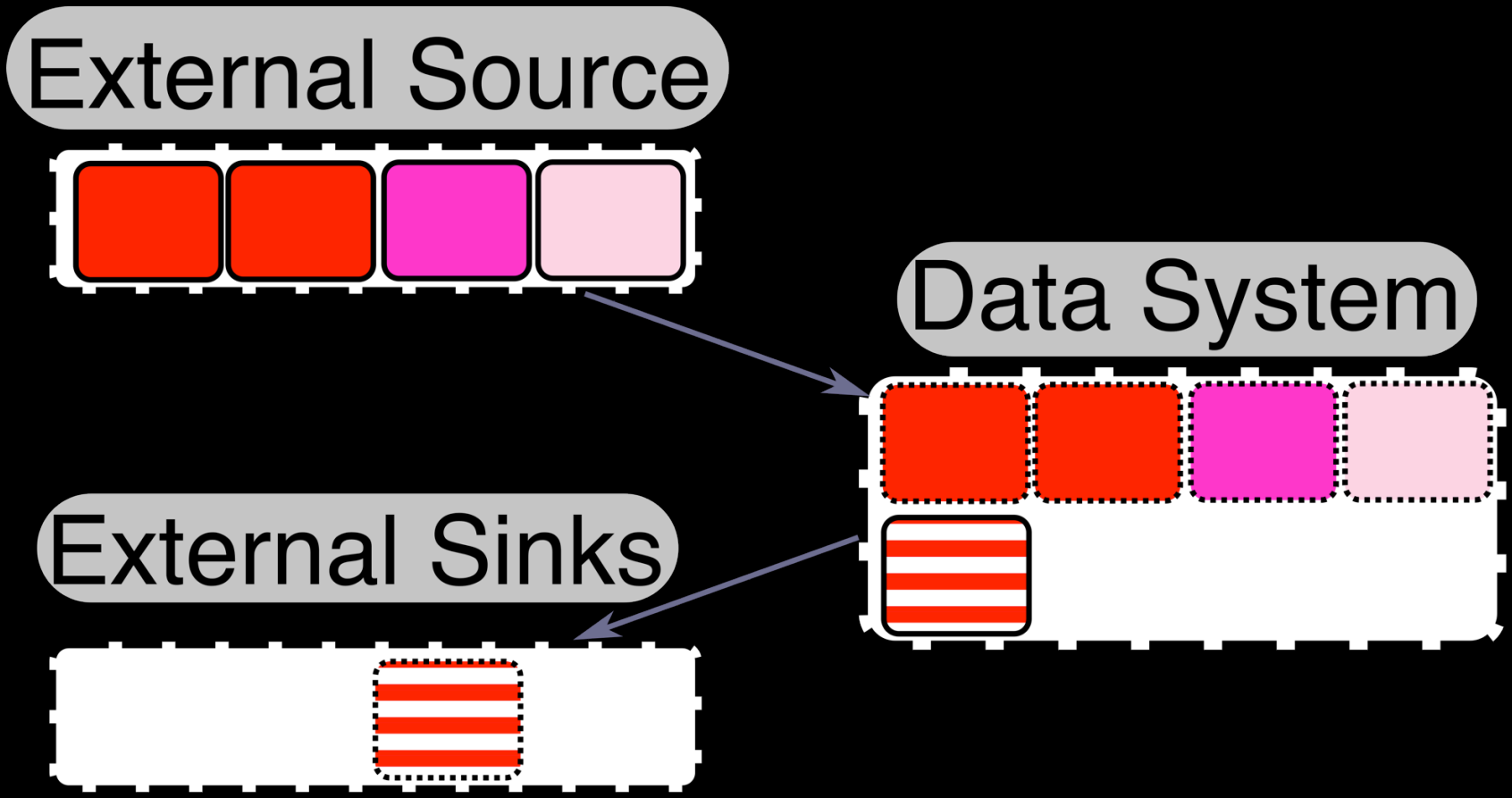


Figure 8: Data ingestion and delivery

Apache OODT

Apache OODT

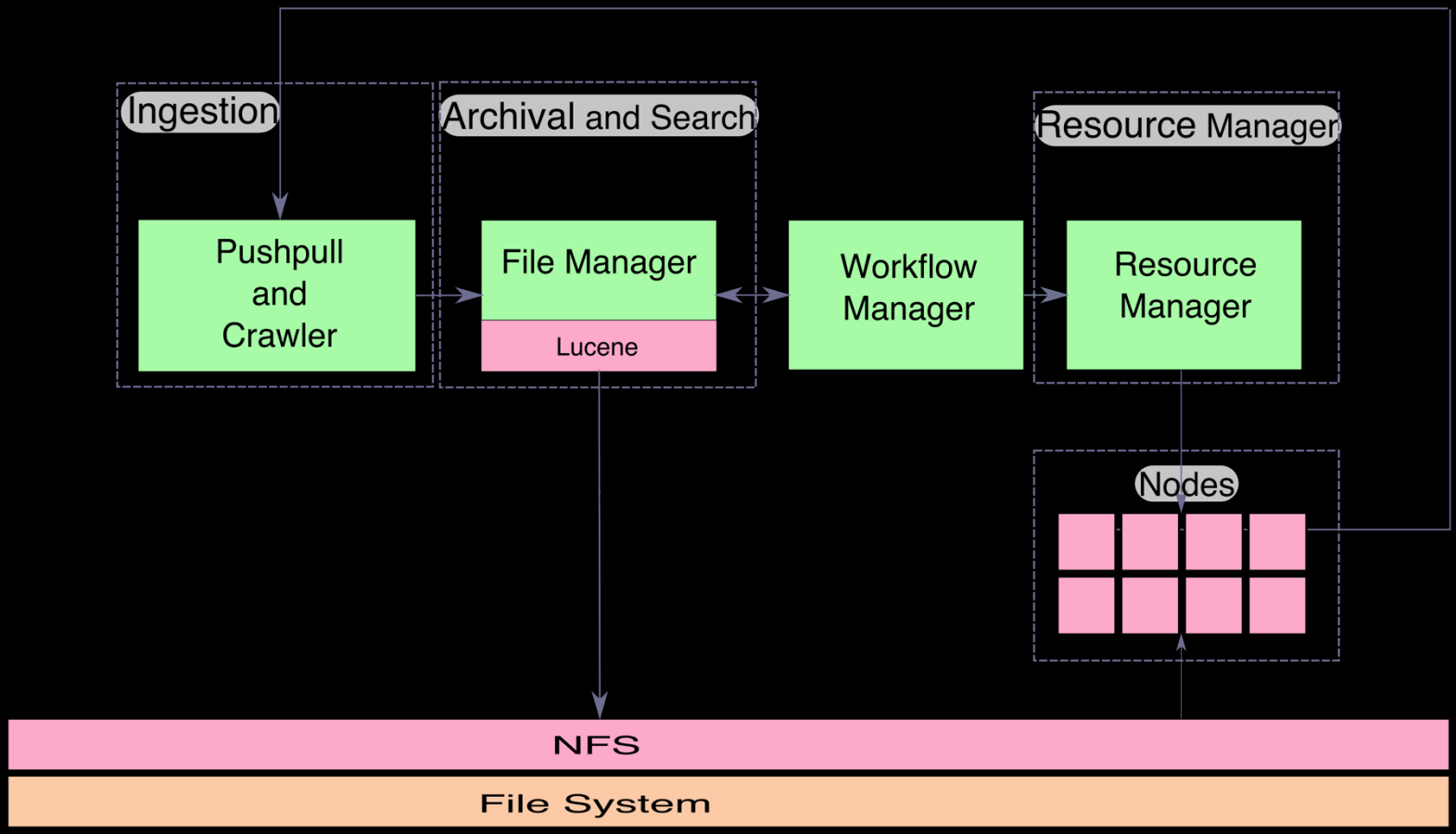


Figure 9: Generic Object-Oriented Data Technology (OODT)

Apache Spark

Map Reduce Processing

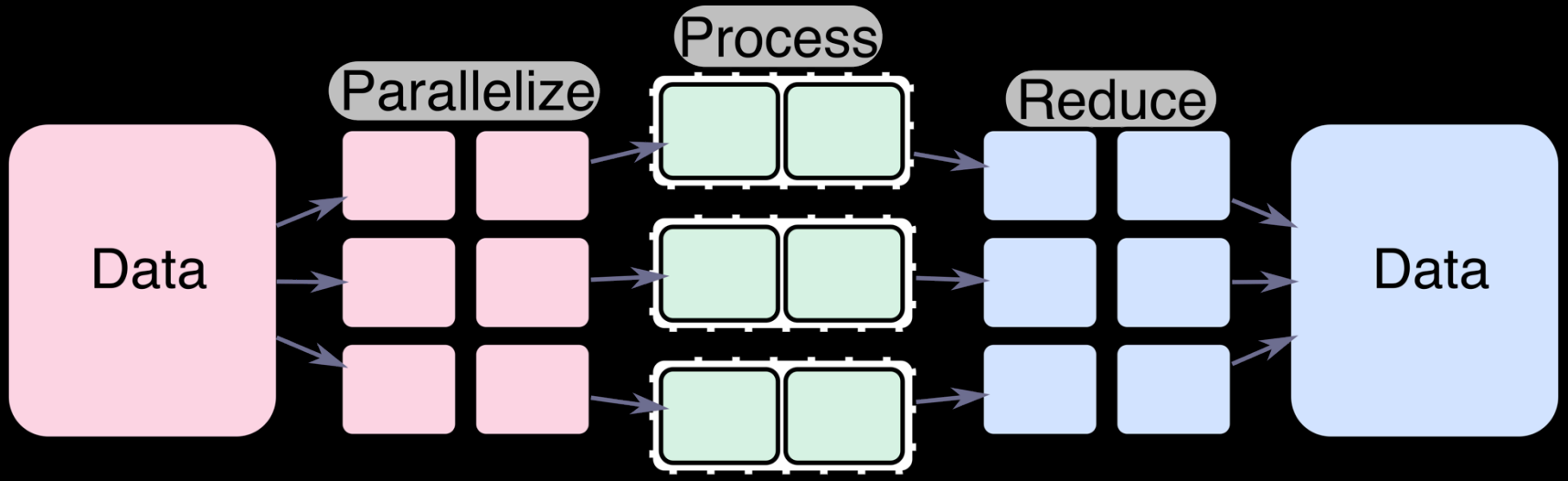


Figure 10: Map Reduce Processing

Berkley Data Analysis Stack

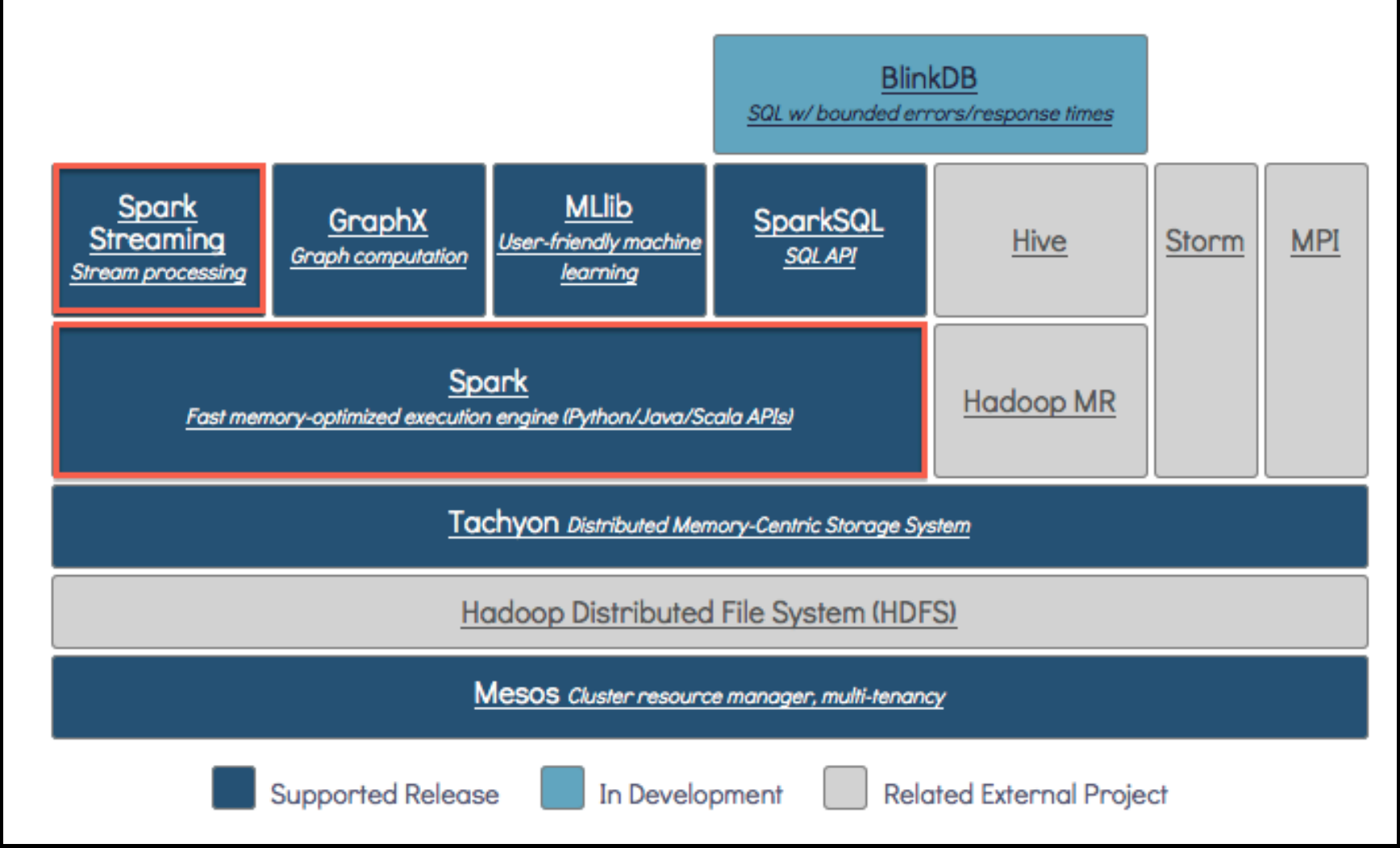


Figure 11: Berkley data analysis stack components Source: https://amplab.cs.berkeley.edu/software/

Apache Spark

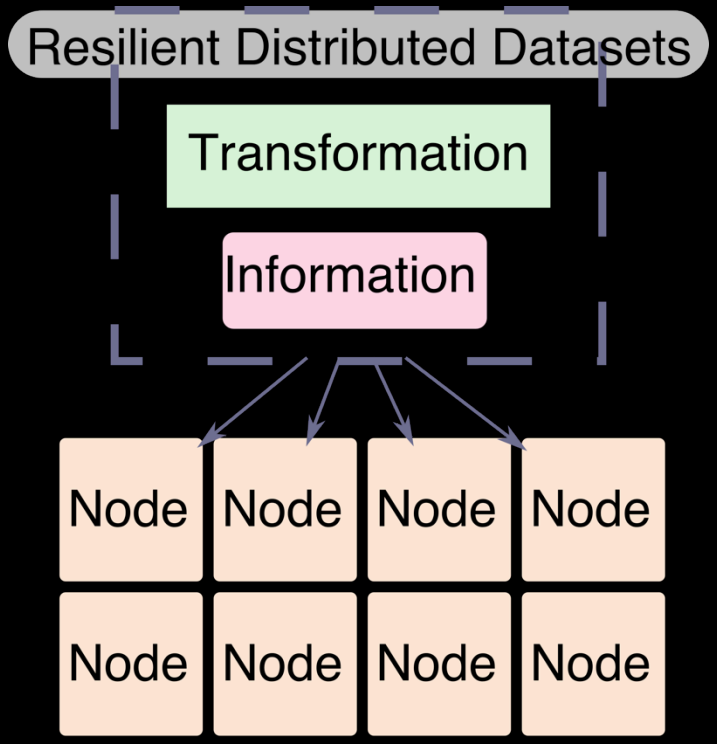


Figure 12: Resilient Distributed Datasets

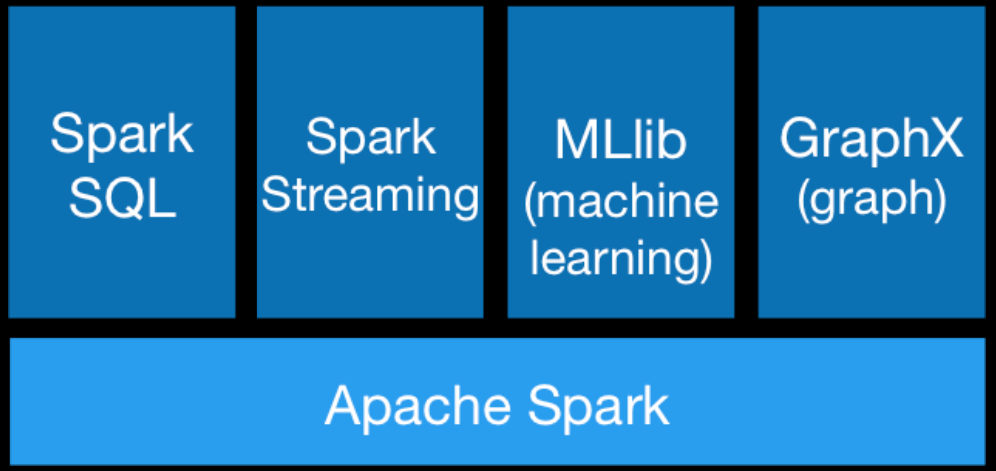


Figure 13: Apache Spark libraries

Source: https://spark.apache.org/images/spark-stack.png

Streaming OODT

Streaming OODT Design

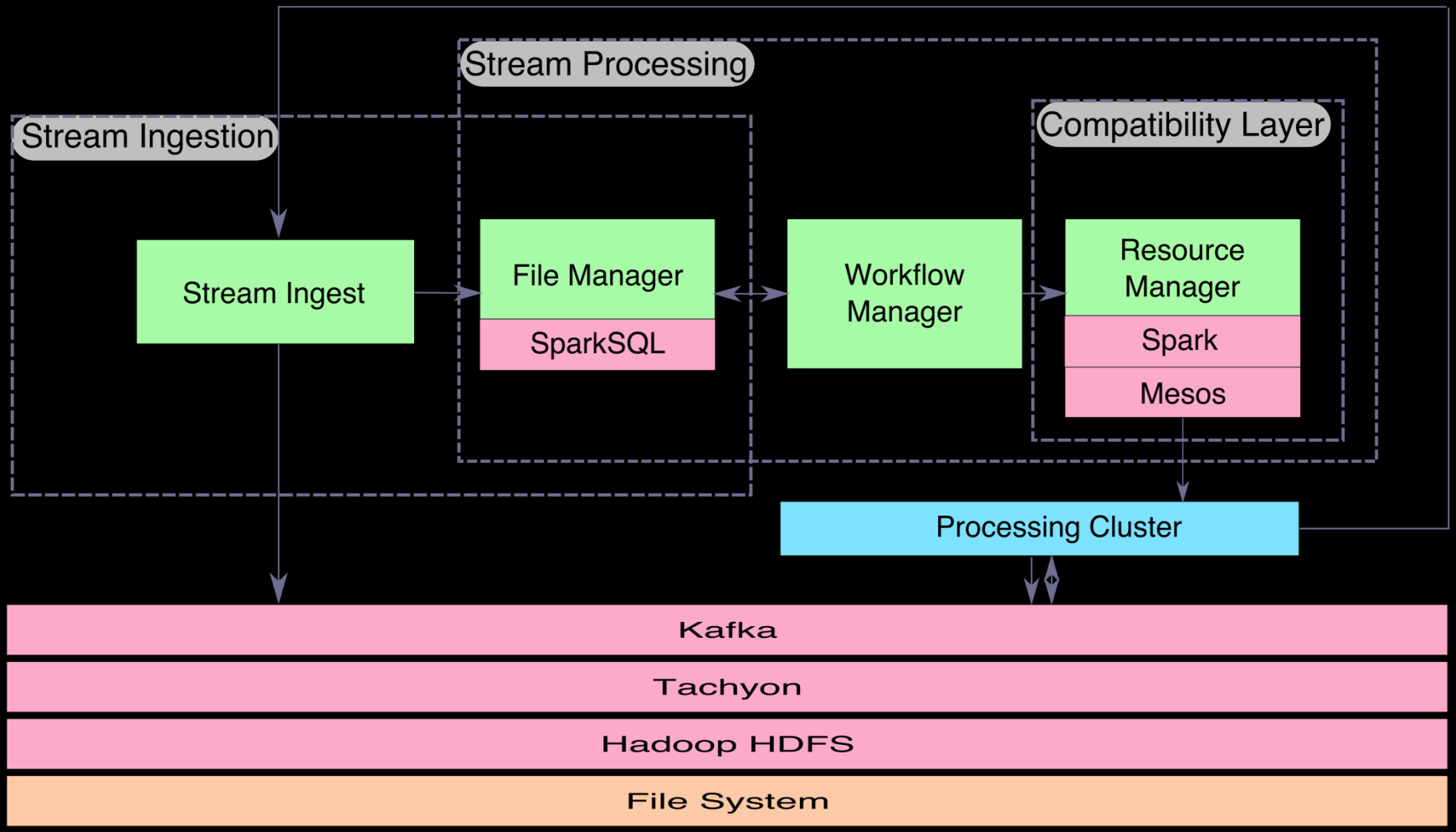
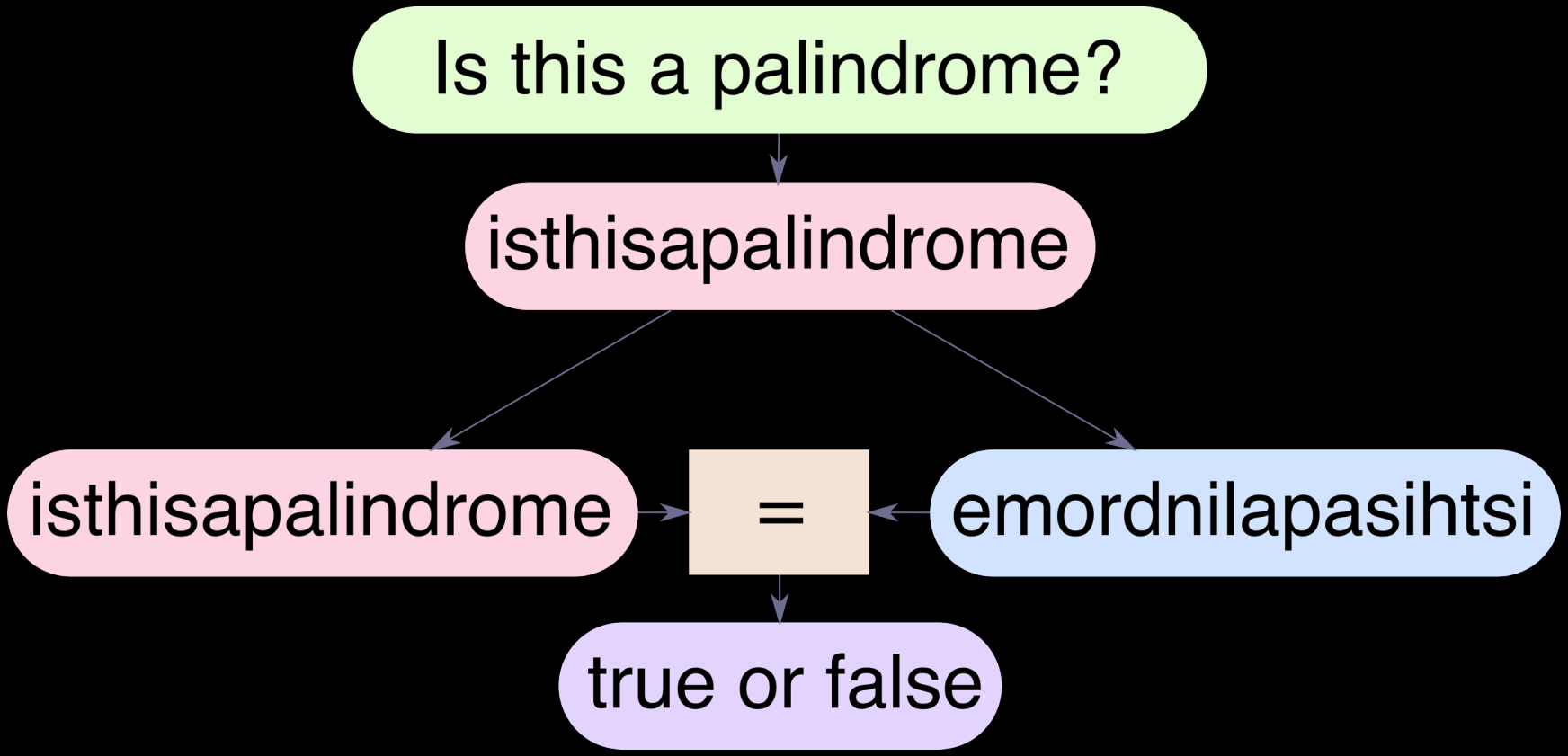


Figure 14: Design and implementation of Streaming OODT

Examples

Example - Palindromes



Example 15: Palindrome detection algorithm

Example - Code

```
//Example detection algorithm
...
public static boolean isPalindrome(String line) {
  line = line.replaceAll("\\s","").toLowerCase();
  return line.equals(new StringBuilder(line).reverse().toString());
}
...
//Spark wrapper class for detection algorithm
static class FilterPalindrome implements Function<String, Boolean>
{
  public Boolean call(String s) {
    return isPalindrome(s);
  }
}
...
```

Sample 1: Palindrome detection shared code

Example – Data Set

```
clowring infratrochanteric unlimitable overstaffing ...
nonsubstantiality incongeniality ghbor
gargil semiconventionality betokens clinodome ...
pulviniform actualize cousins moocha Mosaism craals
midstout desightment Boehmenism LP ravelins underskirt CSB
cossas xen- nonlucidness unvagrantness togata
noncaptiousness dromioid lambie undergarments salvages...
LAP
revealableness outsnore headstalls metallography
outgazed unstintingly boongary provinces trans-Mongolian...
```

Sample 2: Palindrome file sample

...

10,805,887,353 Bytes (11 GB)

46284 palindromes

Example – Shootout

~~Spark~~

429.774s

1 CPU

```
//Sample java code
...
String file =
  input.getValue("file");
br = new BufferedReader(new
  FileReader(file));
String line;
while ((line = br.readLine())
          != null) {
  if (PalindromeUtils
        .isPalindrome(line))
    count++;
  }
...
```

Sample 3: Naïve file processing code

Spark

16.72s

~92 CPUs

```
//Sample java code
...
JavaRDD<String> rdd = sc.textFile(
  input.getValue("file"));
JavaRDD<String> filtered =
  rdd.filter(new PalindromeUtils
    .FilterPalindrome());
long count = filtered.count();
...
```

Sample 4: Spark file processing code

Example - Streaming

```
JavaReceiverInputDStream<String> stream =
  ssc.socketTextStream(input.getValue("host"),
      Integer.parseInt(input.getValue("port")));
JavaDStream<String> filtered = stream.filter(new
  PalindromeUtils.FilterPalindrome());
final JavaDStream<Long> count = filtered.count();
/* Begin: output code */
count.foreachRDD(new Function<JavaRDD<Long>,Void>(){
  public Void call(JavaRDD<Long> jrdd) throws Exception {
    synchronized(output) {
      Long[] collected = (Long[])jrdd.rdd().collect();
      for (Long item : collected)
        output.println("Found "+item.longValue()+ " palindromes.");
    }
    return null;}});
/* End: output code*/
ssc.start();
ssc.awaitTermination();
```

Sample 5: Streaming palindromes code

Example – Streaming Configuration

```
...
<instanceClass name=
"org.apache.oodt.cas.resource.spark.examples.StreamingPalindromeExample" />
<inputClass name=
 "org.apache.oodt.cas.resource.structs.NameValueJobInput">
  <properties>
     <property name="host" value="host" />
     <property name="port" value="7007" />
     <property name="time" value="60000" />
     <property name="output" value="/home/user/files/output-streaming-palindrome.txt" />
  </properties>
</inputClass>
<queue>quick</queue>
<load>1</load>
...
```

Sample 5: Streaming palindromes configuration

Example – Streaming In Action

```
Found 34 palindromes.
Found 118 palindromes.
Found 115 palindromes.
```

```
Found 34 palindro
Found 118 palindr
Found 115 palindr
Found 90 palindro
Found 103 palindr
```

```
Found 34 palindromes.
Found 118 palindromes.
Found 115 palindromes.
Found 90 palindromes.
Found 103 palindromes.
Found 124 palindromes.
Found 117 palindromes.
Stopping after 60 seconds.
```

Where can I get the code?

It’s Open Source! Jump on in!

Apache OODT SVN:

https://svn.apache.org/repos/asf/oodt/trunk/

Mailing List:

dev@oodt.apache.org

Acknowledgments

NASA Jet Propulsion Laboratory

Research & Technology Development

“Archiving, Processing and Dissemination for the Big Data Era”

Apache Software Foundation

Apache OODT Project

Avez-vous des questions?

你有沒有問題？

Haben Sie Fragen?

Questions?

¿Tienen preguntas?