Processing Data of Any Size with Apache Beam

Chapter 1

Introducing Apache Beam

- **What Is Beam?**
- Why Use Beam?
- Using Beam

Apache Beam

Apache Beam is a unified model for processing data

Was originally created at Google

- Later donated to the Apache Foundation as Apache Beam
- Now an Apache top level project

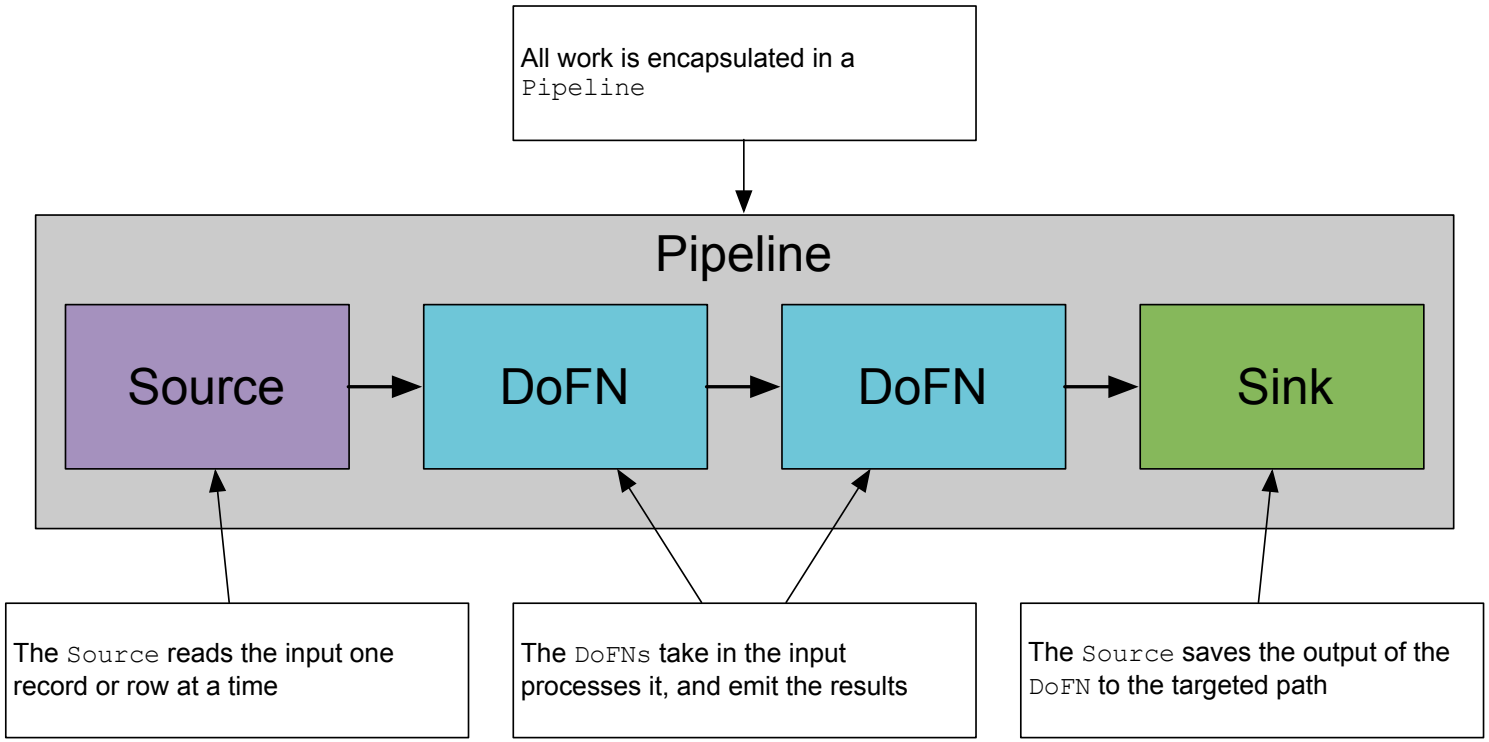
Beam code is written to its API

- Code is executed on different runners
- Not directly tied to a framework or runner

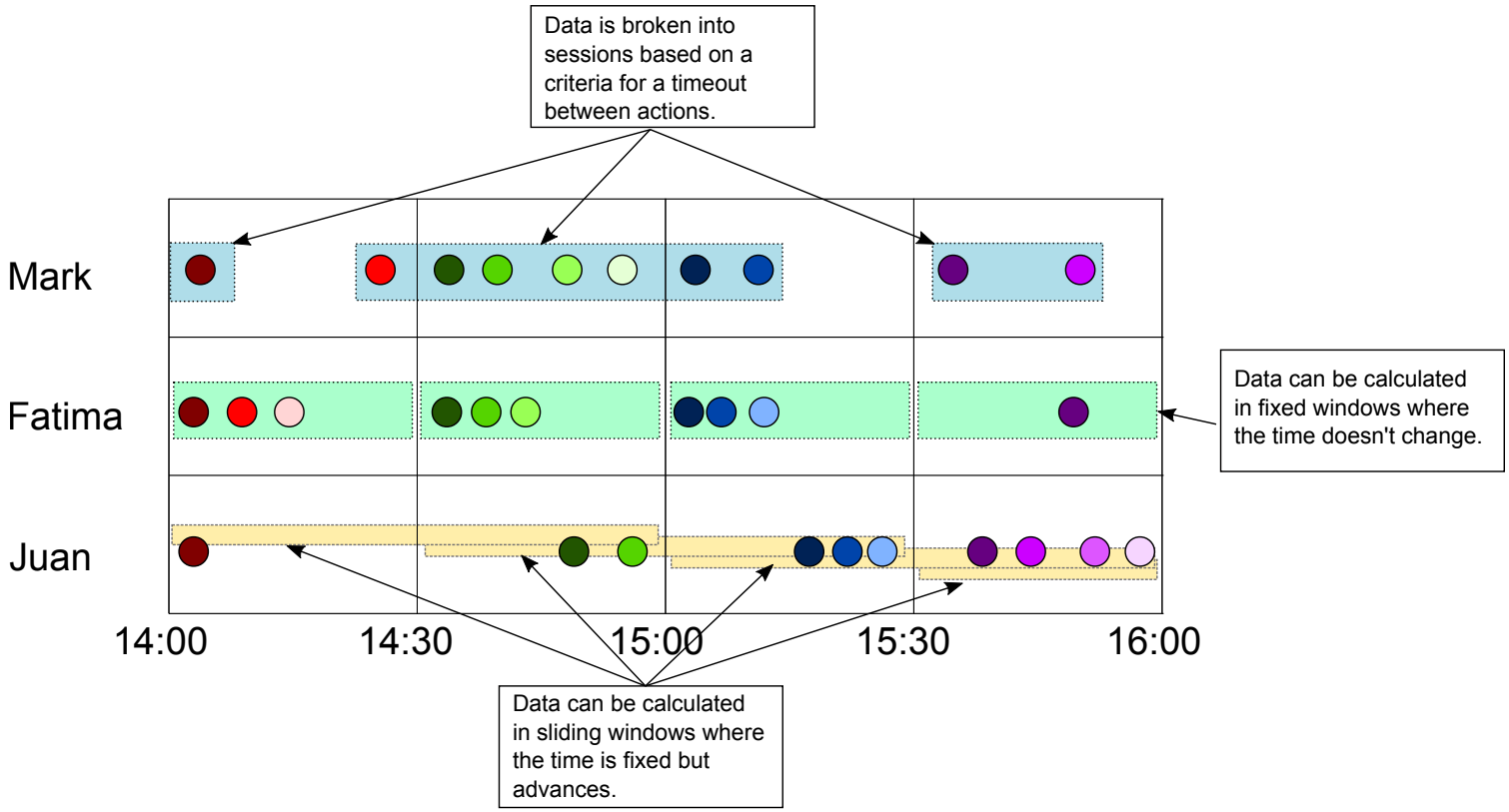
All interactions are done through pipelines

beam

Beam Pipelines Diagram



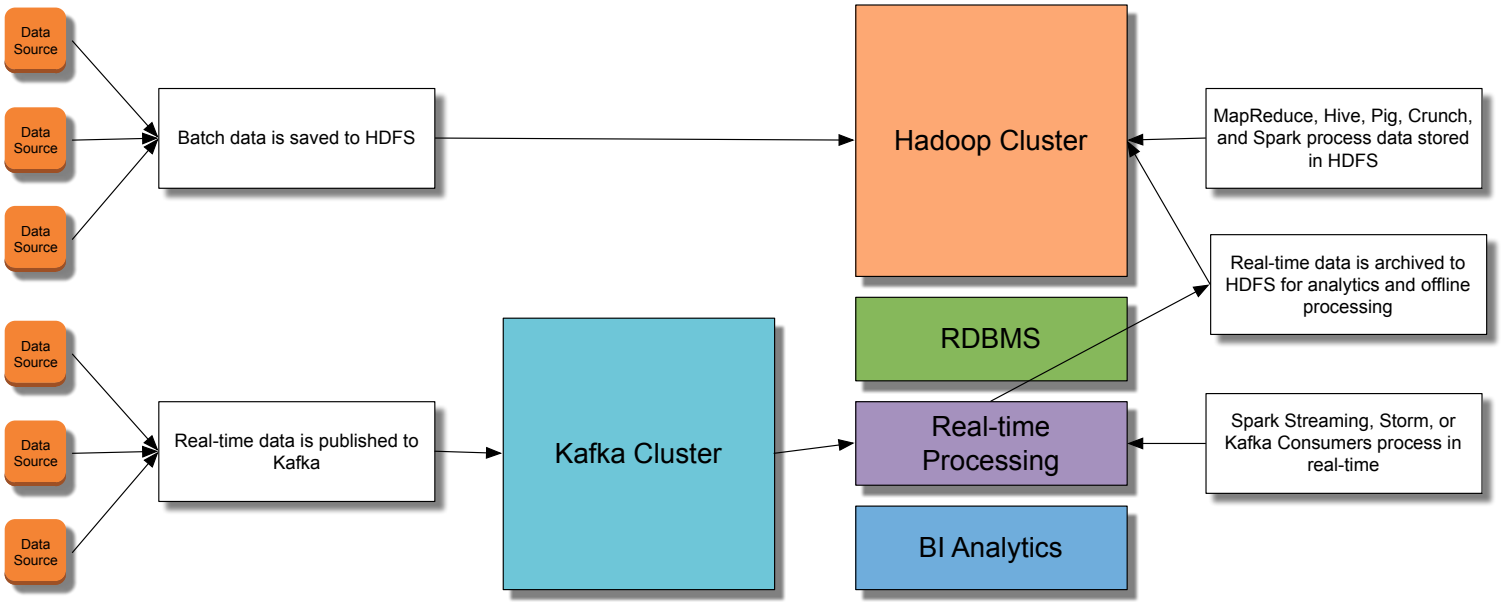
Beam Windowing



- What Is Beam?
- **Why Use Beam?**
- Using Beam

Learning framework-specific APIs every time a new framework comes out or completely changes their existing API doesn't create value

General Architecture Diagram



Why I'm Excited About Beam

One API to rule them all

- One API to learn
- Move between frameworks

The most unified batch and stream API I've used

Unified API to the ecosystem

Risk mitigation of frameworks

Multiple languages

Running Beam

Beam isn't tied to a specific framework

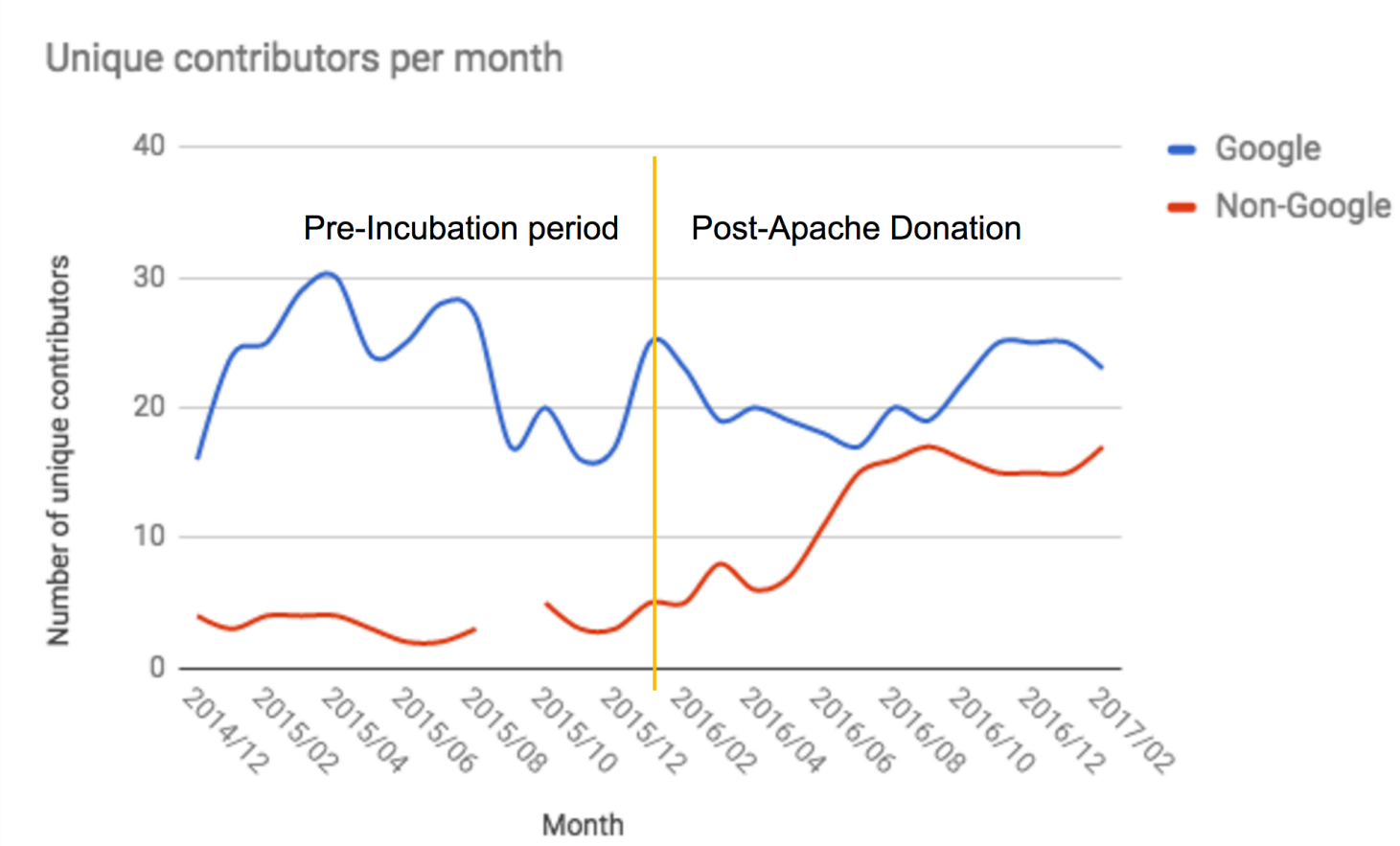
Apache Spark uses the `spark-submit`

Apache Flink can be submitted with the Maven runner

Google Cloud Dataflow can be submitted with the Maven runner

The DirectRunner can be started with the Maven runner

Beam Contributions



- What Is Beam?
- Why Use Beam?
- **Using Beam**

MapElements

```
I
cannot
teach
him
The
boy
has
no
patience
```

```
PCollection<String> etl = lines.apply(MapElements.into(
        TypeDescriptors.strings())
                                        .via(
                                                (String line) -> line.toUpperCase()
                                        ));
```

```
I
CANNOT
TEACH
HIM
THE
BOY
HAS
NO
PATIENCE
```

Regex Transform

```
I cannot teach him. The boy has no patience.
He will learn patience.
```

```
PCollection<String> linecount = lines.apply(Regex.matches("I.*\\."));
```

```
I cannot teach him. The boy has no patience.
```

Regular expressions can be used to parse KVs

```
I cannot teach him. The boy has no patience.
He will learn patience.
```

```
PCollection<KV<String, String>> twoSentences =
    lines.apply(Regex.findKV("(.*)\\. (.*)", 1, 2));
```

```
<I cannot teach him, The boy has no patience>
```

Example Custom DoFN

```
I cannot teach him. The boy has no patience.
He will learn patience.
```

```
PCollection<String> pats = lines.apply(ParDo.of(new PatLinesFN()));
```

```
static class PatLinesFN extends DoFn<String, String> {
    @ProcessElement
    public void processElement(DoFn<String, String>.ProcessContext
                               context)
    throws Exception {
        String[] pieces = context.element().split(" ");

        for (String piece : pieces) {
            if (piece.startsWith("pat")) {
                context.output(piece);
            }
        }
    }
}
```

```
patience.
patience.
```

Playing Card Algorithm

```
import org.apache.beam.sdk.Pipeline;
import org.apache.beam.sdk.io.TextIO;
import org.apache.beam.sdk.options.PipelineOptions;
import org.apache.beam.sdk.options.PipelineOptionsFactory;
import org.apache.beam.sdk.transforms.Count;
import org.apache.beam.sdk.transforms.Regex;
import org.apache.beam.sdk.transforms.ToString;

public class PicoWordCount {
    public static void main(String[] args) {
        PipelineOptions options = PipelineOptionsFactory.create();
        Pipeline p = Pipeline.create(options);

        p
        .apply(TextIO.read().from("playing_cards.tsv"))
        .apply(Regex.split("\\W+"))
        .apply(Count.perElement())
        .apply(ToString.elements())
        .apply(TextIO.write().to("output/stringcounts"));

        p.run();
    }
}
```

Next Steps

What are other people doing with Beam?

- http://tiny.jesse-anderson.com/beaminterview

Where is some sample Beam code?

- http://tiny.jesse-anderson.com/beamtutorial

Main Beam site

- https://beam.apache.org/

Convincing your boss

- http://tiny.jesse-anderson.com/beam1
- http://tiny.jesse-anderson.com/beam2

About Me

Current: Instructor, Thought Leader, Monkey Tamer

Previously:

- Curriculum Developer and Instructor @ Cloudera
- Senior Software Engineer @ Intuit

Covered, Conferences and Published In:

- GigaOM, ArsTecnica, Pragmatic Programmers, Strata, OSCON, Wall Street Journal, CNN, BBC, NPR

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