That's not a data lake. This is a data lake.

By Eric Snyder

CHARIOT SOLUTIONS

What do we do with all of this data?

Data Warehouse, Data Lake, Data Ocean, Data Puddle

Easy Peasy Flink

AWS Data Lake

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Perspective

```
   average 2 sensors per hotel room
 x each sensor sends a message every 4 seconds (21,600 / day)
 x 256 bytes per event (sensor data, sensor id, account data)
```

> 5,000,000 hotel rooms in USA

```
0.5% of rooms contain sensors == 0.25 TiB / day
1.0% of rooms contain sensors == 0.5  TiB / day
5.0% of rooms contain sensors == 2.5  TiB / day
```

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Options

- **Time Series DB** - e.g. InfluxDB, Timescale DB.
  Ideal when time is primary.
- **Old Skool Relational** - e.g. postgresql
- **Relational Warehouse** - e.g. Amazon Redshift, Vertica, Snowflake
- **Data Lake**
  - persist as is or after on-the-fly transformation
  - “Just Land It”
  - often Hadoop-ish

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Fill That Lake

Short Term

Use Case: Chart the number of temperature changes in the last 5 minutes.

File/Object Formats: Row Based - avro, protobuf, capnproto, flatbuffers…

Long Term

Use Case: Find the top 10 hotels by water consumption per occupant in the last year.

File/Object Formats: Columnar - parquet, orc

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Why Avro?

- **Compact**: no wasted bytes, no row level field metadata. Compare to json. 1K of avro vs 1K of json.
- **Self-describing**: each file contains the schema definition used to write the file.
- **Schema evolution**: provide a reader schema that contains more or fewer fields than the writer schema.
- **Code generation (optional)**

```
{
  "namespace": "example.avro",
  "type": "record",
  "name": "User",
  "fields": [
    {
      "name": "name",
      "type": "string"
    },
    {
      "name": "favorite_number",
      "type": ["int", "null"]
    },
    {
      "name": "favorite_color",
      "type": ["string", "null"]
    }
  ]
}
```

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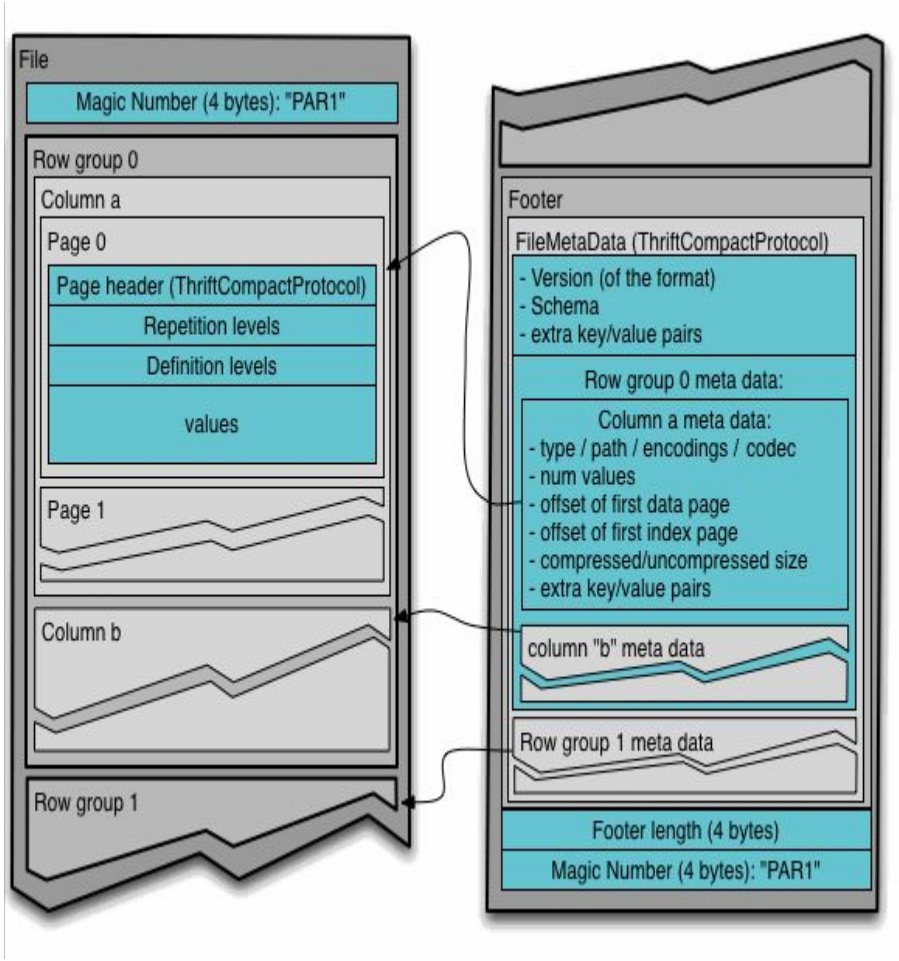
Why Parquet?

Columnar storage: data from the same column is stored together, which facilitates:

- predicate pushdown
- column level compression/encoding
- column level metadata



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Apache Flink

- data processing and data-driven applications with *data streams* as the core building block
- low latency
- supports many data transformation and enrichment tasks
- event-time processing
- HA w. exactly-once state consistency
- an official AWS EMR application

```
// ...imports…

case class WordCount(word: String, count: Int)

object WindowWordCount {

  def main(args: Array[String]) {
    val env = StreamExecutionEnvironment
      .getExecutionEnvironment

    val text = env.socketTextStream(
      "localhost", 9999)

    val counts = text.flatMap {
       _.toLowerCase.split("\\W+")
    }
    .map { WordCount(_, 1) }
    .keyBy("word")
    .timeWindow(Time.seconds(5))
    .sum("count")

    counts.print

    env.execute("Window Stream WordCount")
  }

}
```

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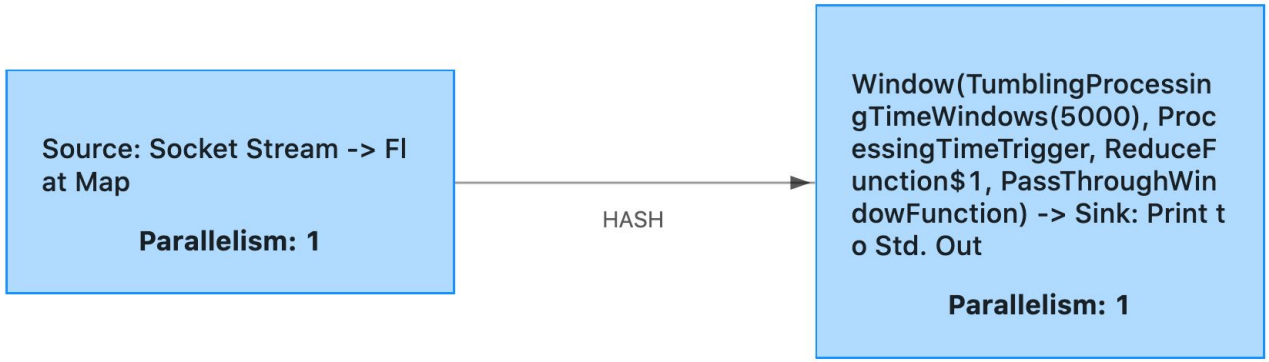
Socket Window WordCount

RUNNING | 2

ID: **3de928420bda94a63f06c36c5291f61a** | Start Time: **2019-10-15 22:22:16** | Duration: **2m 4s**

Cancel Job

Overview | Exceptions | TimeLine | Checkpoints | Configuration



Name	Status	Bytes Received	Records Received	Bytes Sent	Records Sent	Tasks
Window(TumblingProcessingTimeWindows(5000), ProcessingTi...	RUNNING	122 B	6	0 B	0	1
Source: Socket Stream -> Flat Map	RUNNING	0 B	0	0 B	6	1

Apache Beam

Unified Programming Model

- One programming model for batch and streaming.
- Execute pipelines on any supported or multiple execution environments (Spark, Flink, Google Cloud Dataflow, many others).
- Create and share common transformations and connectors.

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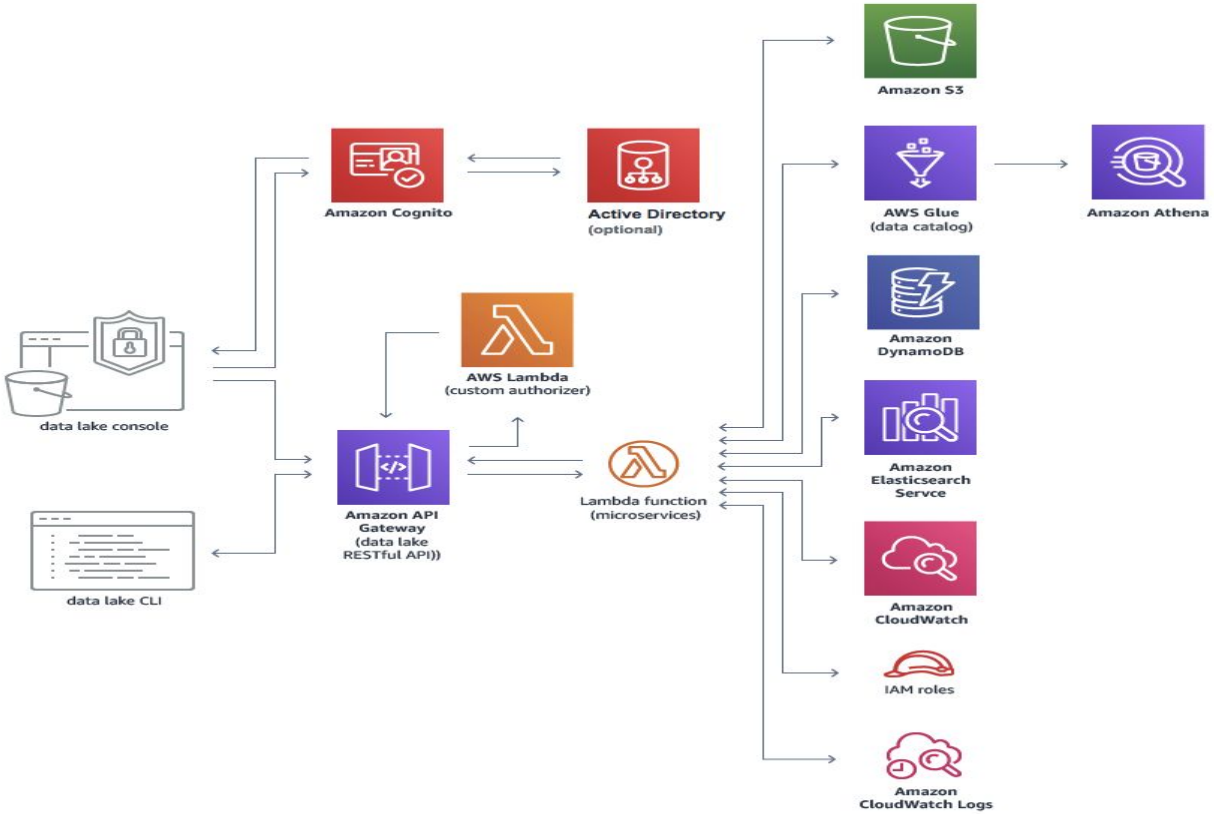
```
public class WindowedWordCount {
  static void runWindowedWordCount(Options options) {
    Pipeline pipeline = Pipeline.create(options);

    PCollection<String> input = pipeline
     .apply(
       TextIO.read().from(options.getInputFile()))
     .apply(
       ParDo.of(new AddTimestampFn(...)));

    PCollection<String> windowedWords = input
      .apply(
        Window.into(FixedWindows.of(
          Duration.standardMinutes(10))));

    PCollection<KV<String, Long>> wordCounts =
      windowedWords.apply(new WCount.CountWords());

    wordCounts
      .apply(
        MapElements.via(new WCount.FormatAsTextFn())
      )
      .apply(new WriteOneFilePerWindow(output, 8));

    PipelineResult result = pipeline.run();
    result.waitUntilFinish();
  }
}
```

AWS Data Lake



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References

Apache Flink

Apache Beam

AWS Data Lake

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Questions?

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