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Behind the Scenes:

Observability with ClickHouse

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25th May 2023

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@boristane

Software Engineer

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Software Engineer

"observability without action is just storage"

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What is observability?

https://youtu.be/cJSarYwejzs

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understand how your software works

by looking at its external outputs

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How do we get there?

Instrumentation

Collection

Processing

Visualization

Provisioning

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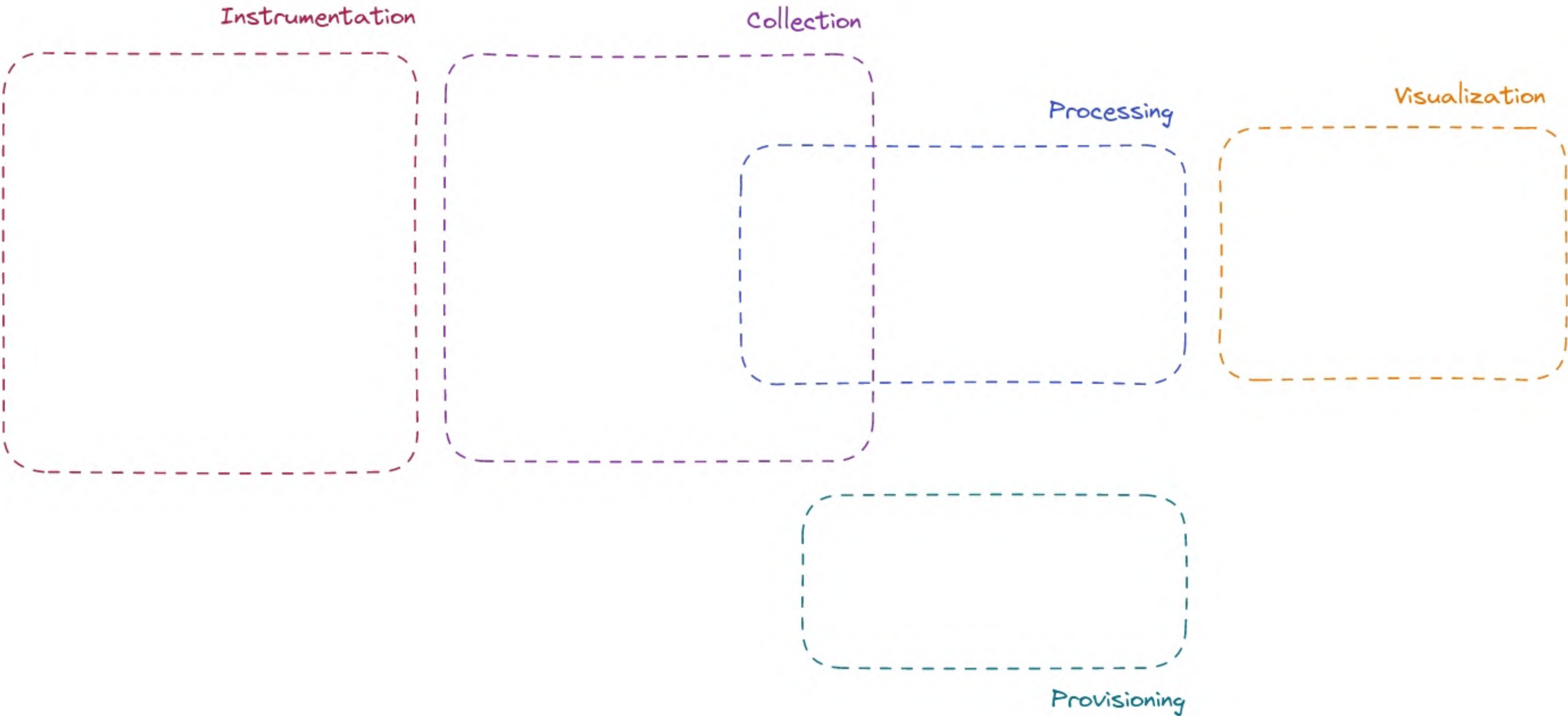
Instrumentation

How do we get there?

Instrumentation

Collection

Processing

Visualization
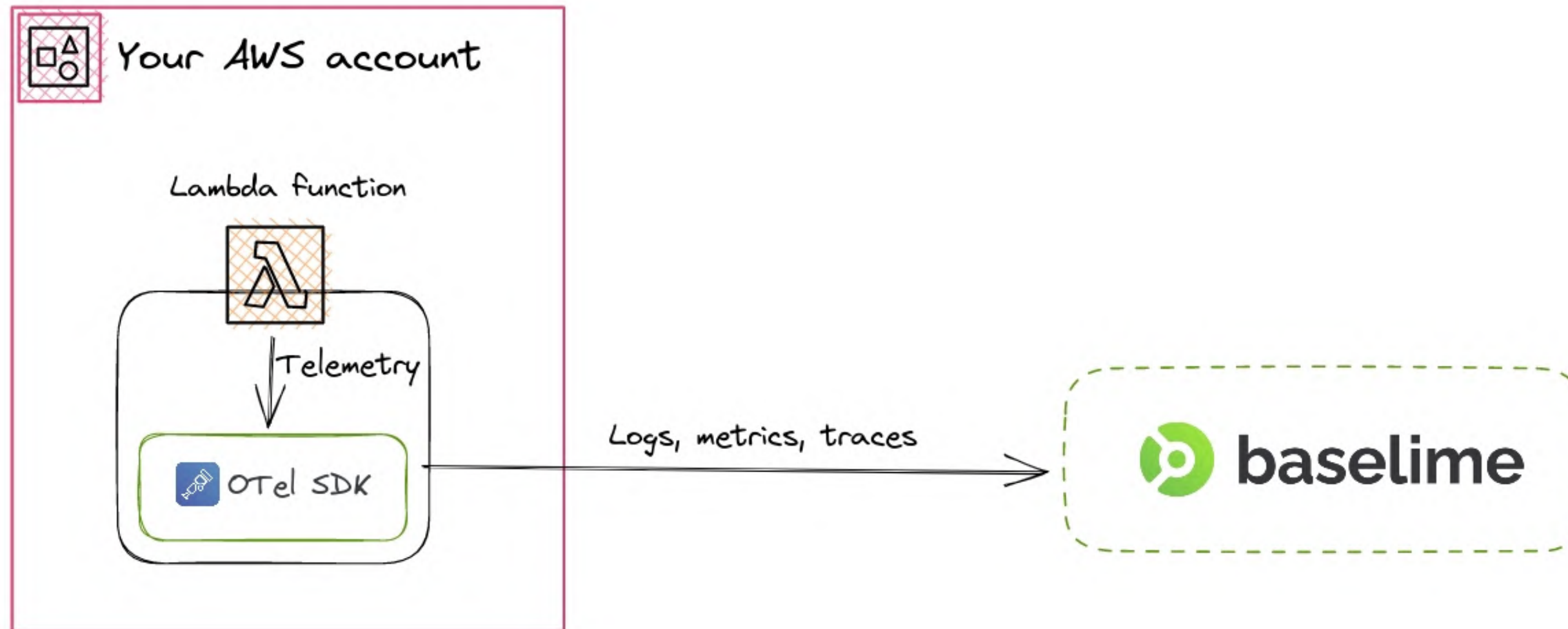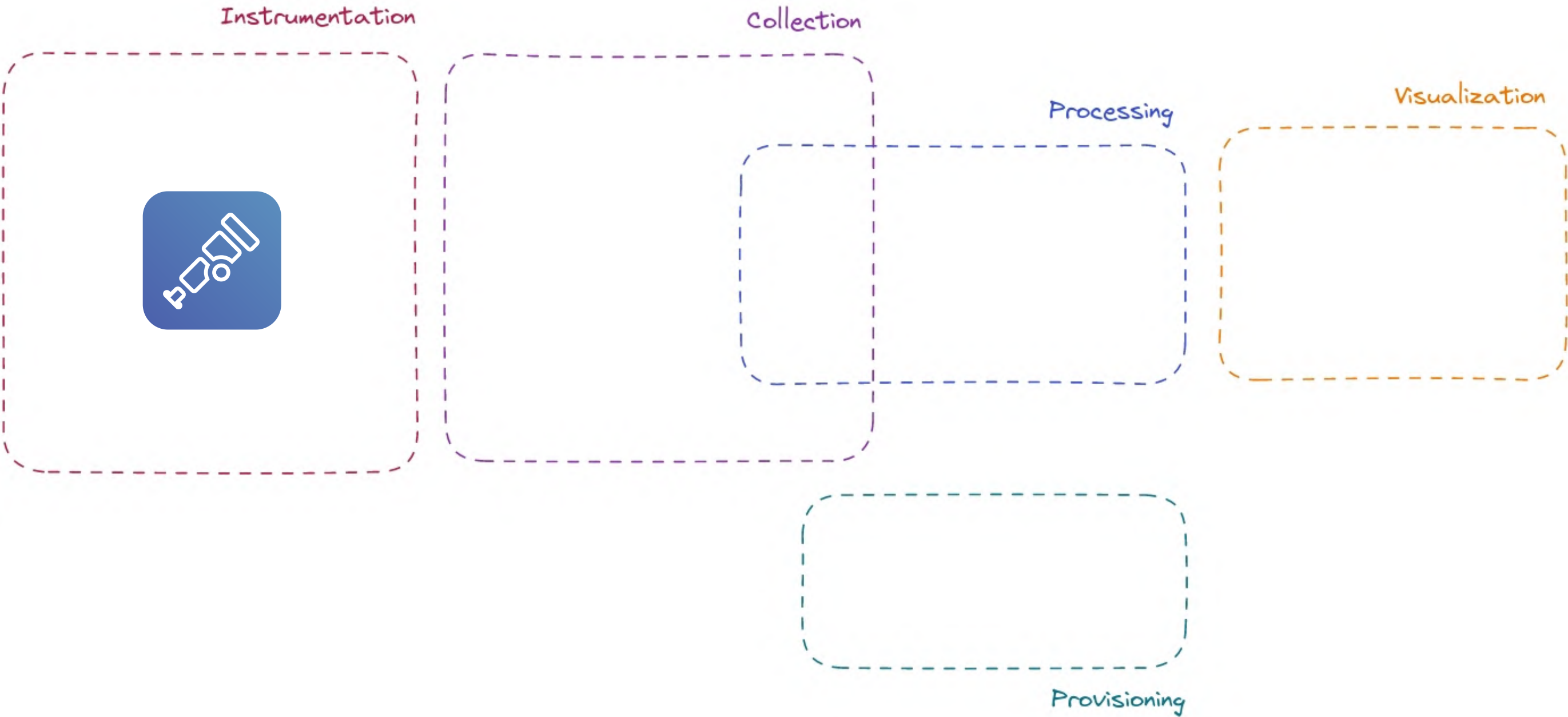
Provisioning

Collection

How do we get there?

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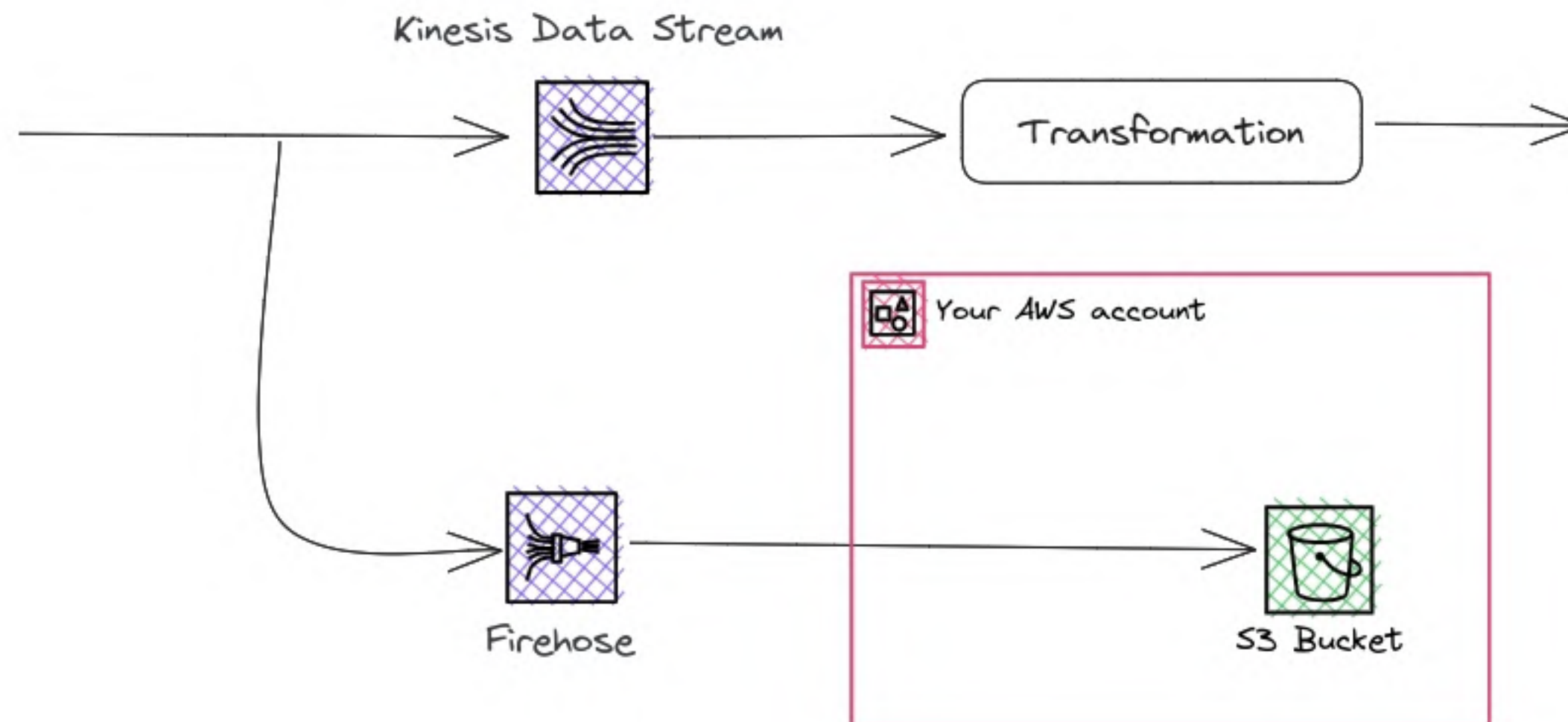
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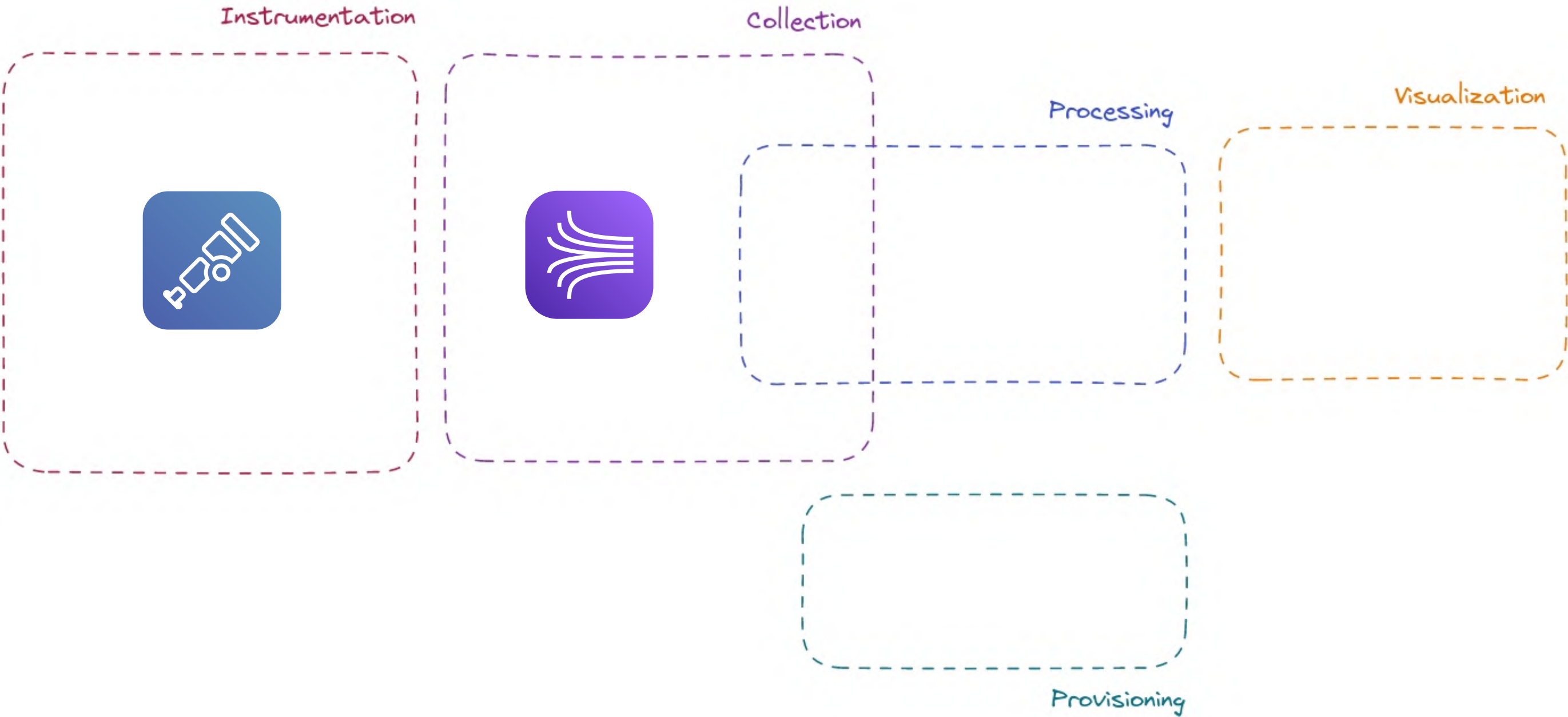
Provisioning

```
avg-invoice-error-cost:
  type: query
  properties:
    parameters:
      datasets:
        - lambda-logs
      calculations:
        - AVG(extra.price)
      filters:
        - message = Error sending the invoice to a workspace
```

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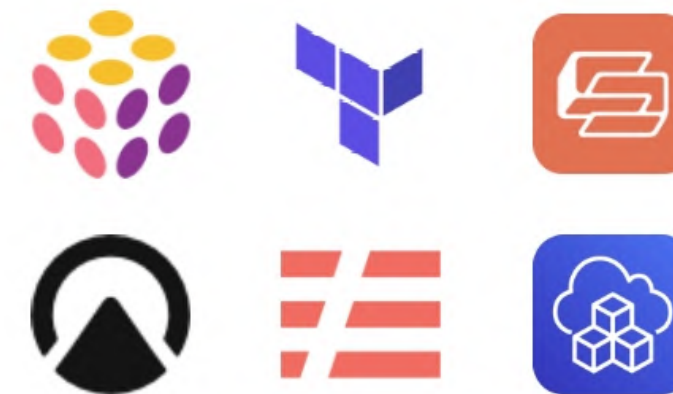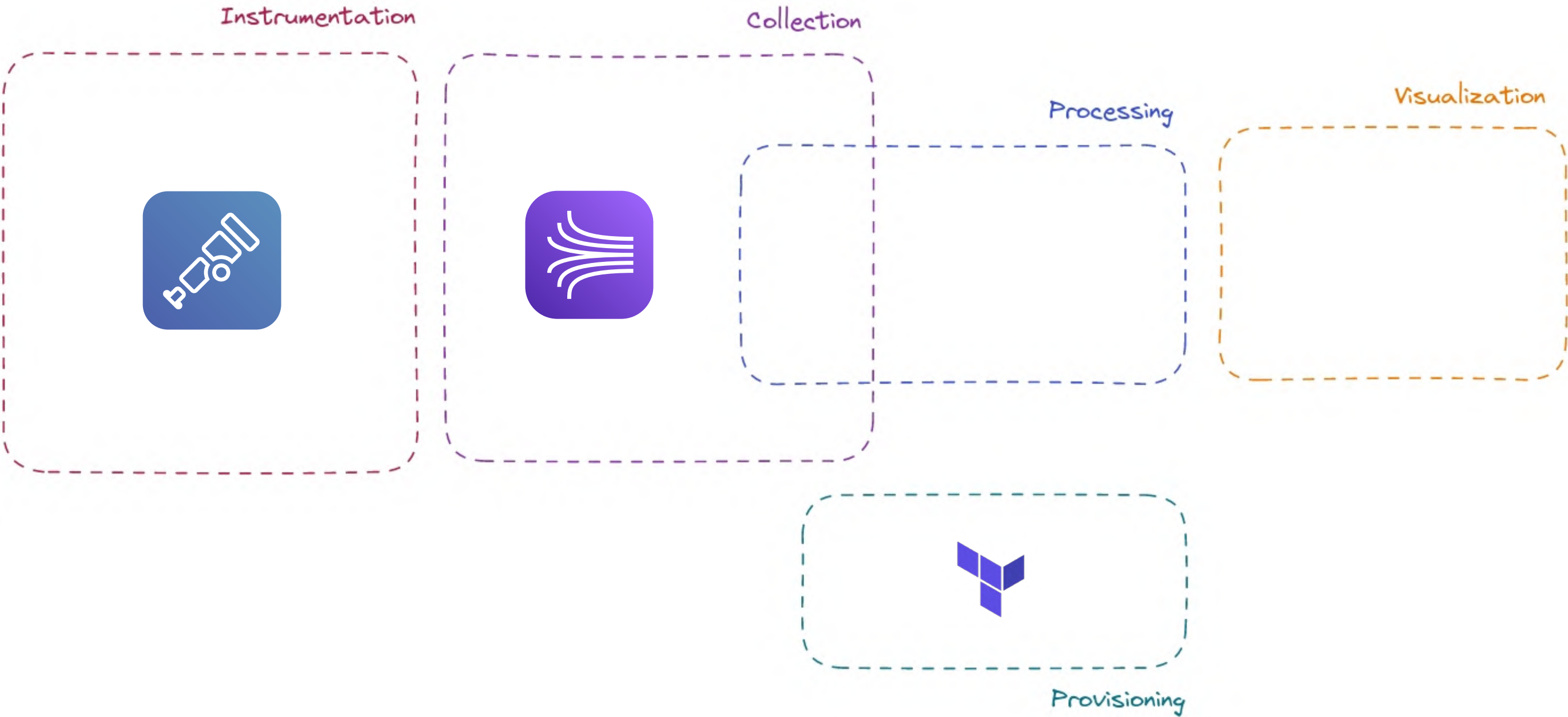# Provisioning

```yaml
avg-invoice-error-cost:
  type: query
  properties:
    parameters:
      datasets:
        - lambda-logs
      calculations:
        - AVG(extra.price)
    filters:
      - message = Error sending the invoice to a workspace
```

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How do we get there?

Instrumentation

Collection

Processing

Visualization

Provisioning

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Visualisation

Demo

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How do we get there?

Instrumentation

Collection

Processing

Visualization

Provisioning

Processing

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Why ClickHouse?

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Why ClickHouse?

- Fast

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Why ClickHouse?

- ## Fast

- ## Very Fast

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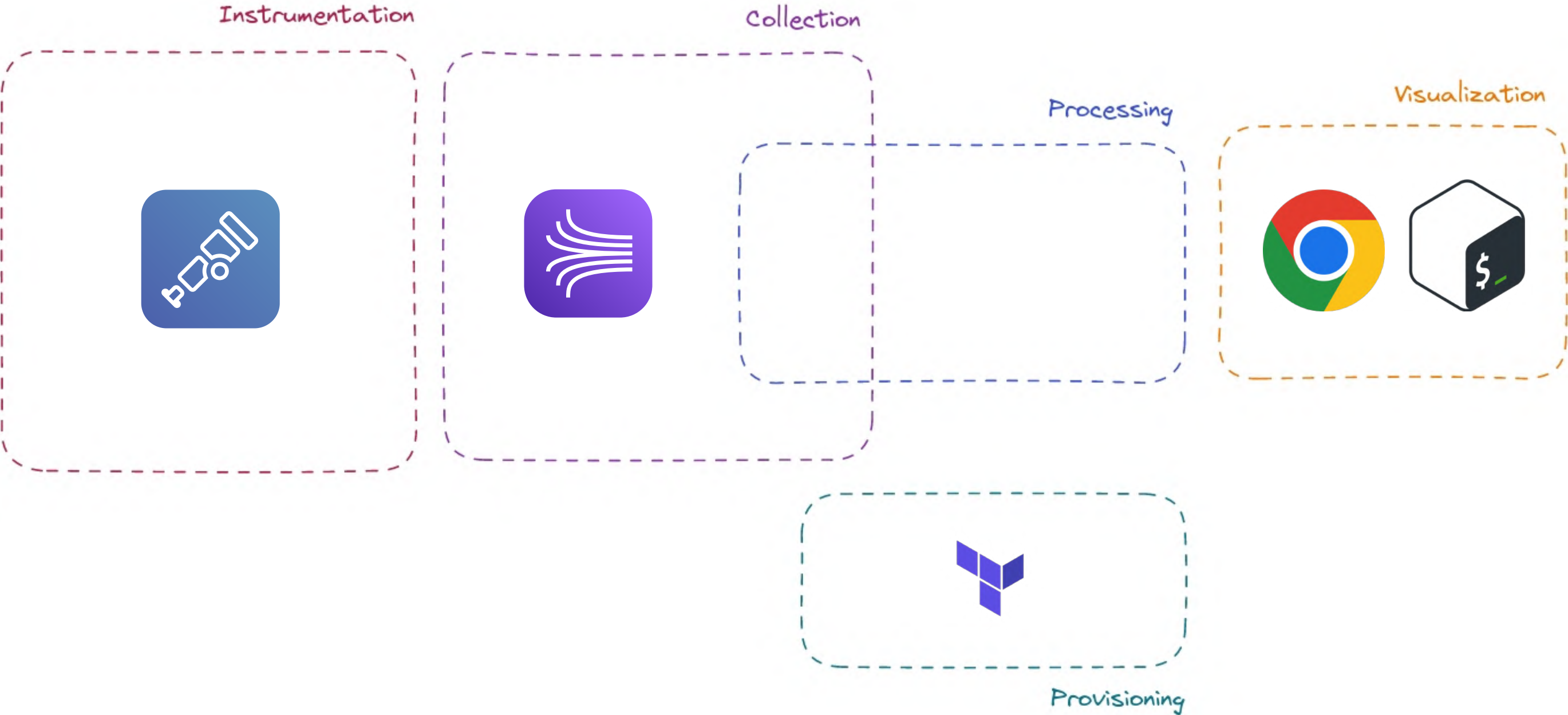
Why ClickHouse?

- Fast

- Very Fast

- Very Blazing Fast

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What's the data model?

- **Schemaless**

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What's the data model?

- ## Schemaless

- ## High Cardinality

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What's the data model?

- ## Schemaless

- ## High Cardinality

- ## Multi-tenant

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What's the data model?

- ## Schemaless

- ## High Cardinality

- ## Multi-tenant

- ## Fast

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What's the data model?

```sql
CREATE TABLE <table_name>
  (
    _tenantId LowCardinality(String) NOT NULL CODEC(ZSTD(1)),
    _timestamp DateTime64(3) NOT NULL CODEC(DoubleDelta, LZ4),
    _now DateTime64(3) NOT NULL CODEC(ZSTD(1)),
    _baselimeId FixedString(26) NOT NULL CODEC(ZSTD(1)),
    _ttl DateTime NOT NULL,

    _traceId String CODEC(ZSTD(1)),
    _requestId String CODEC(ZSTD(1)),
    _spanId String CODEC(ZSTD(1)),
    _coldStart UInt32 Codec(T64, LZ4),
    _parentSpanId String CODEC(ZSTD(1)),
    _startTime DateTime64(3) CODEC(DoubleDelta, LZ4),
    _endTime DateTime64(3) CODEC(DoubleDelta, LZ4),
    _duration UInt32 Codec(T64, LZ4),

    _source String NOT NULL CODEC(ZSTD(1)),

    `string.names` Array(String) CODEC(ZSTD(2)),
    `string.values` Array(String) CODEC(ZSTD(2)),
    `number.names` Array(String) CODEC(ZSTD(2)),
    `number.values` Array(Float64) CODEC(ZSTD(2)),
    `boolean.names` Array(String) CODEC(ZSTD(2)),
    `boolean.values` Array(UInt8) CODEC(ZSTD(2)),

    INDEX _idx_tenantId TYPE bloom_filter GRANULARITY 4,
    ...
  )
...
```

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What's the data model?

LowCardinality(String)

```
CREATE TABLE <table_name>
  (
    _tenantId LowCardinality(String) NOT NULL CODEC(ZSTD(1)),
    _timestamp DateTime64(3) NOT NULL CODEC(DoubleDelta, LZ4),
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    ...
  )
...
```

LowCardinality(String)

CODEC

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What's the data model?

LowCardinality(String)

CODEC

Frequently queried fileds

```
CREATE TABLE <table_name>
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    _tenantId LowCardinality(String) NOT NULL CODEC(ZSTD(1)),
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```

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LowCardinality(String)

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    INDEX _idx_tenantId TYPE bloom_filter GRANULARITY 4,
    ...
  )
...
```

CODEC

Frequently queried fileds

<type>.name
<type>.value

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‹type›.name | ‹type›.value

```json
{
  "message": "Sending to the backend",
  "extra": {
    "source": "vega",
    "sampled": true,
    "num": 143
  },
  "time": "2023-05-24T20:16:50.722Z",
  "level": "info",
  "@requestId": "b8398e09-030a-49bc-b19c-86c48d5a5b09"
}
```

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<type>.name | <type>.value

```json
{
  "message": "Sending to the backend",
  "extra": {
    "source": "vega",
    "sampled": true,
    "num": 143
  },
  "time": "2023-05-24T20:16:50.722Z",
  "level": "info",
  "@requestId": "b8398e09-030a-49bc-b19c-86c48d5a5b09"
}
```

```
string.names
["message", "extra.source", "time", "level", "@requestId"]

string.values
[
    "Sending to the backend",
    "vega",
    "2023-05-24T20:16:50.722Z",
    "info",
    "b8398e09-030a-49bc-b19c-86c48d5a5b09"
]
```

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<type>.name | <type>.value

```
{
    "message": "Sending to the backend",
    "extra": {
        "source": "vega",
        "sampled": true,
        "num": 143
    },
    "time": "2023-05-24T20:16:50.722Z",
    "level": "info",
    "@requestId": "b8398e09-030a-49bc-b19c-86c48d5a5b09"
}
```
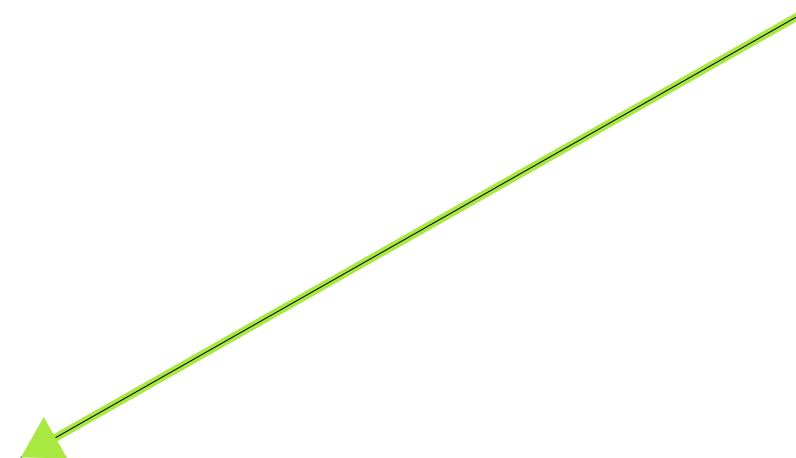
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<type>.name | <type>.value

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        "source": "vega",
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}
```

```
indexOf(`string.names`, 'extra.source')
```

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‹type›.name | ‹type›.value

```json
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    "level": "info",
    "@requestId": "b8398e09-030a-49bc-b19c-86c48d5a5b09"
}
```

```
indexOf(`string.names`, 'extra.source')
```

```
`string.values`[indexOf(`string.names`, 'extra.source')] = 'vega'
```

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‹type›.name | ‹type›.value

```
SELECT
    MAX(`number.values`[indexOf(`number.names`, 'extra.num')]) as `MAX(extra.num)
FROM
    <table>
WHERE
    `string.values`[indexOf(`string.names`, 'extra.source')] = 'vega';
```

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What's the data model?

```sql
CREATE TABLE <table_name>
  (
    _tenantId LowCardinality(String) NOT NULL CODEC(ZSTD(1)),
    _timestamp DateTime64(3) NOT NULL CODEC(DoubleDelta, LZ4),
    _now DateTime64(3) NOT NULL CODEC(ZSTD(1)),
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    `boolean.names` Array(String) CODEC(ZSTD(2)),
    `boolean.values` Array(UInt8) CODEC(ZSTD(2)),

    INDEX _idx_tenantId TYPE bloom_filter GRANULARITY 4,
    ...
  )
...
```

LowCardinality(String)

CODEC

Frequently queried fileds

<type>.name
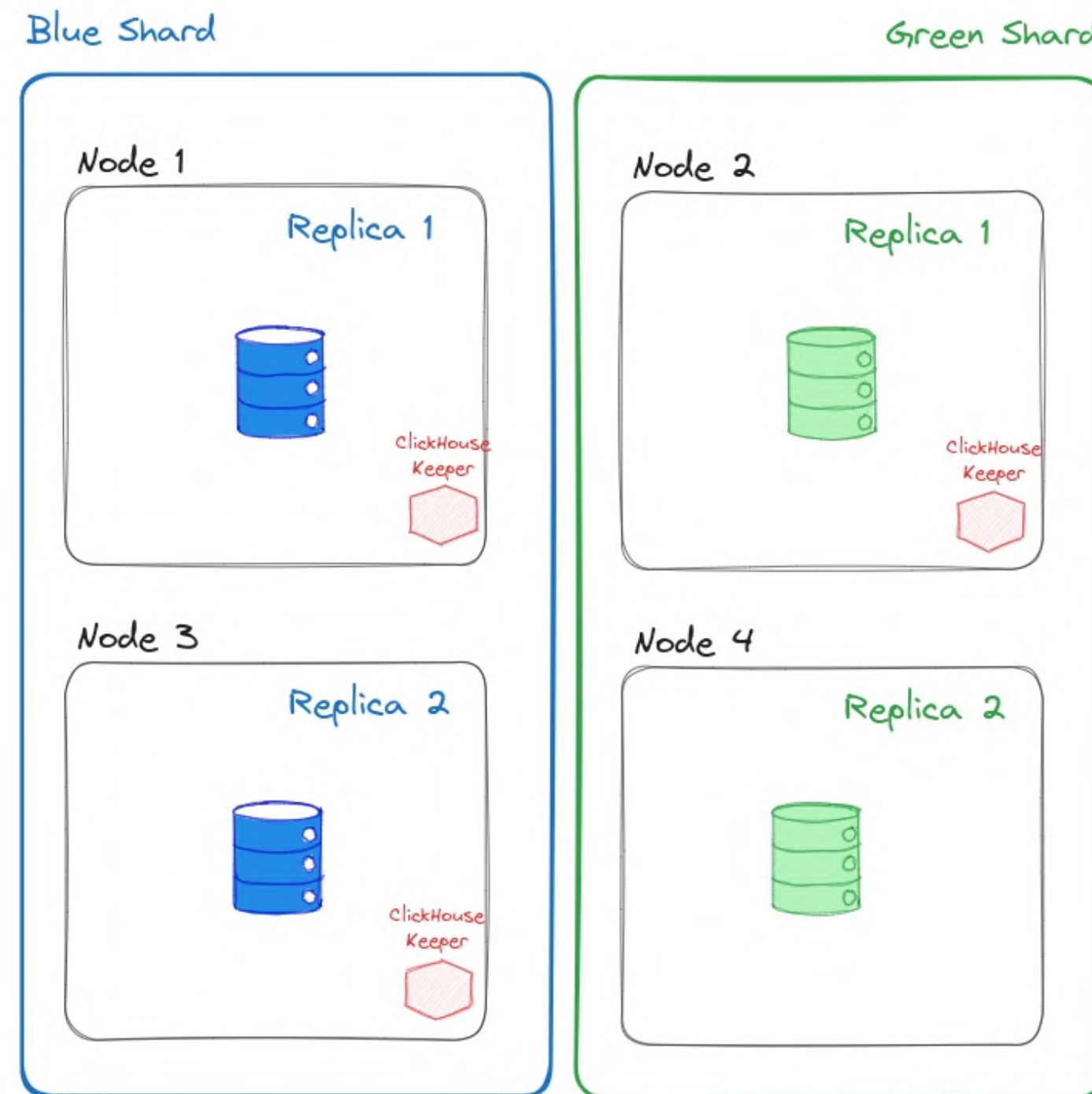<type>.value

bloom_filter

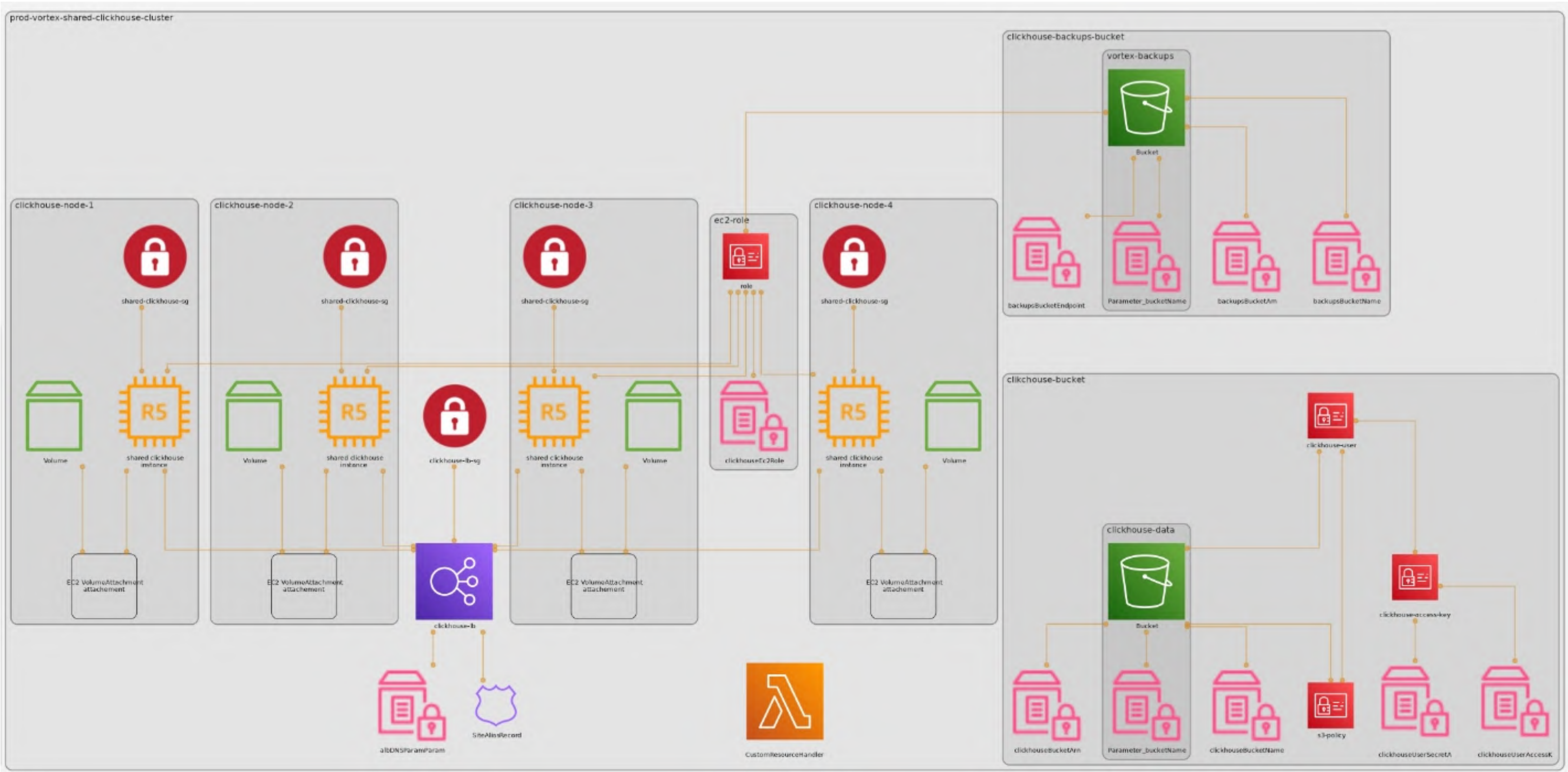Try Pitch

What's the engine?

Replicated Merge Tree

```
ENGINE = ReplicatedMergeTree('/clickhouse/tables/{cluster}/{shard}/{table}', '{replica}')
PARTITION BY toDate(_timestamp)
ORDER BY (_tenantId, _traceId, _timestamp)
TTL _ttl DELETE;
```
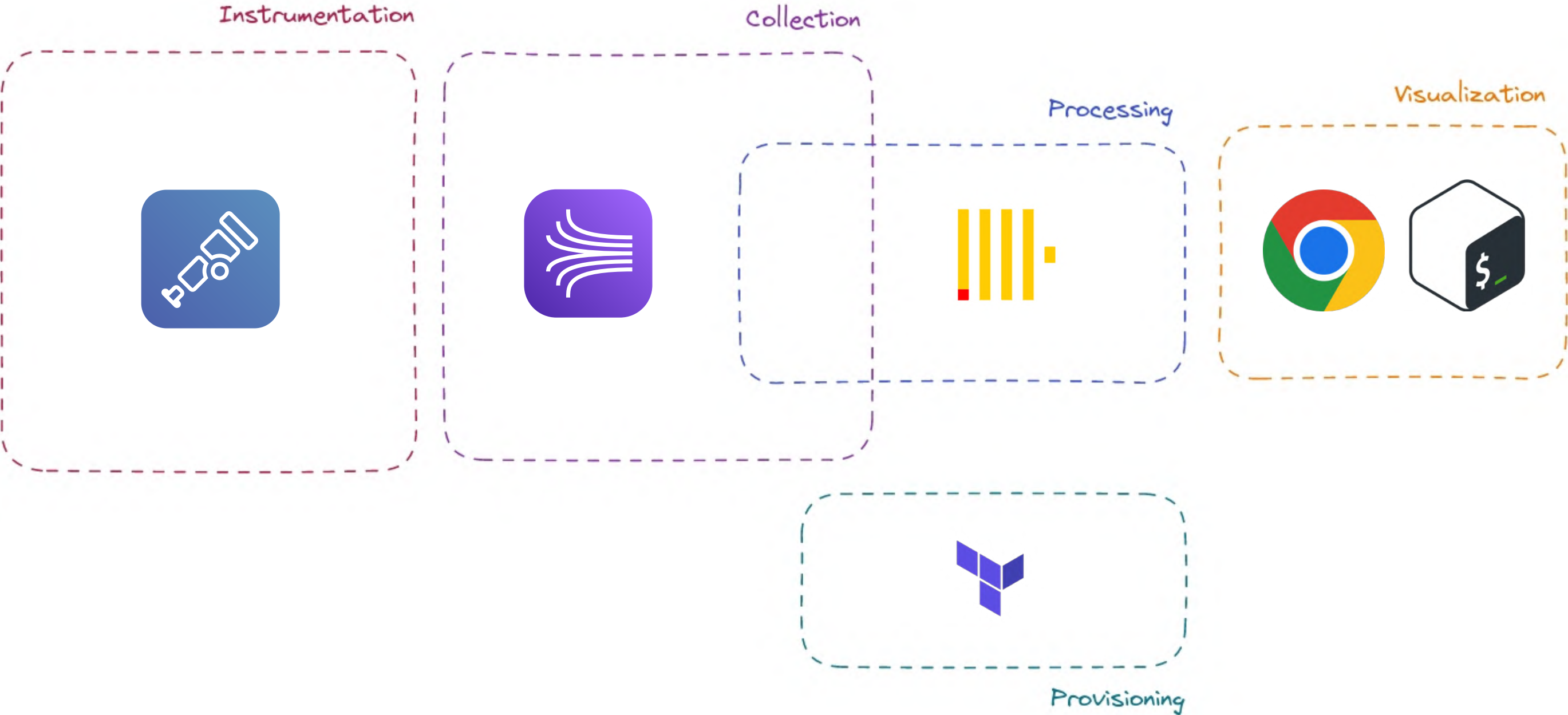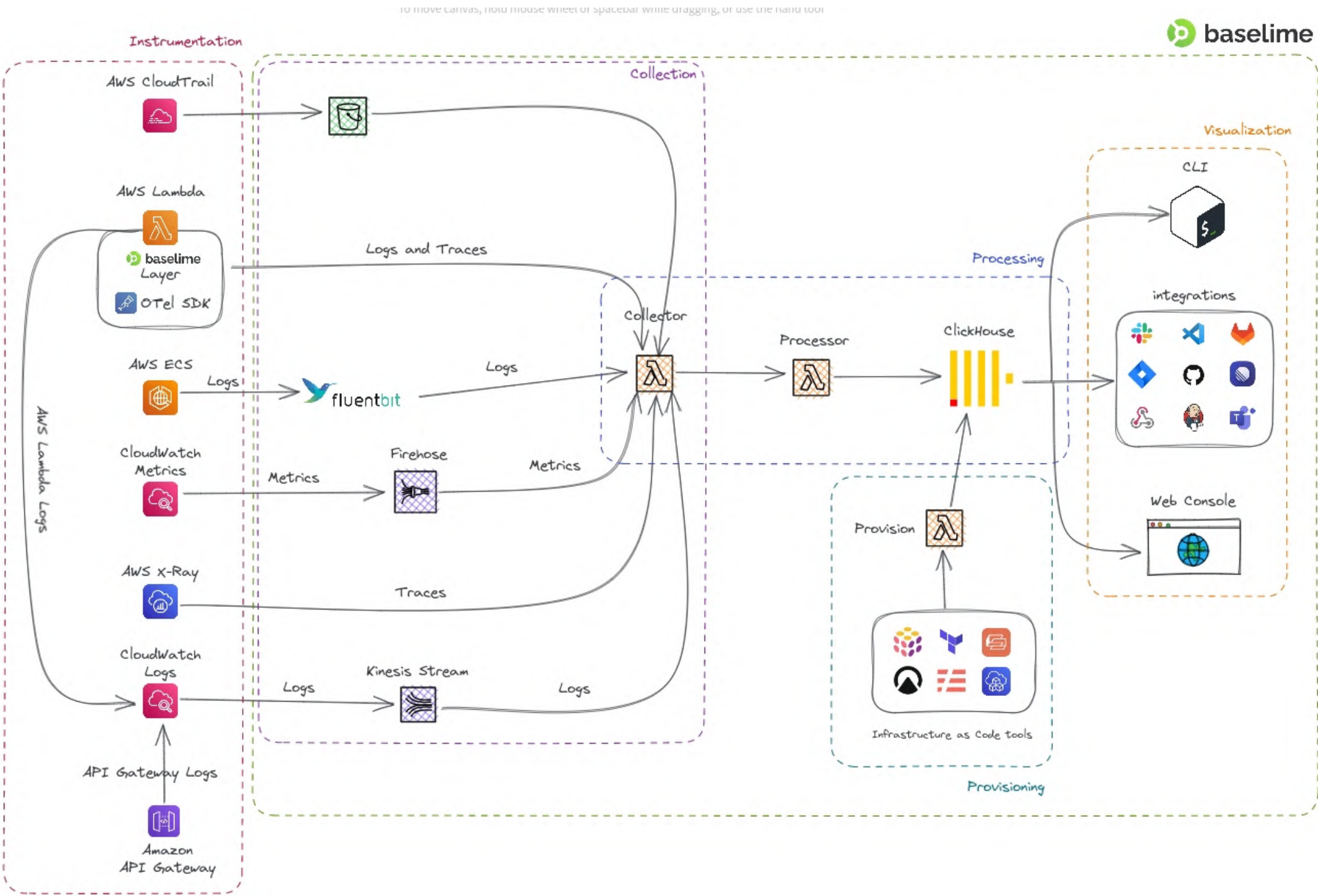
Sort Key

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What's the architecture?

What's the architecture?

How do we get there?

Instrumentation

Collection

Processing

Visualization

Provisioning

Baselime architecture

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Thanks for having me!

Boris Tane

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@boristane

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