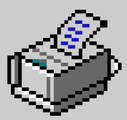






OSTORAGE JUICEFS

Evaluation of a distributed storage technology based on JuiceFS



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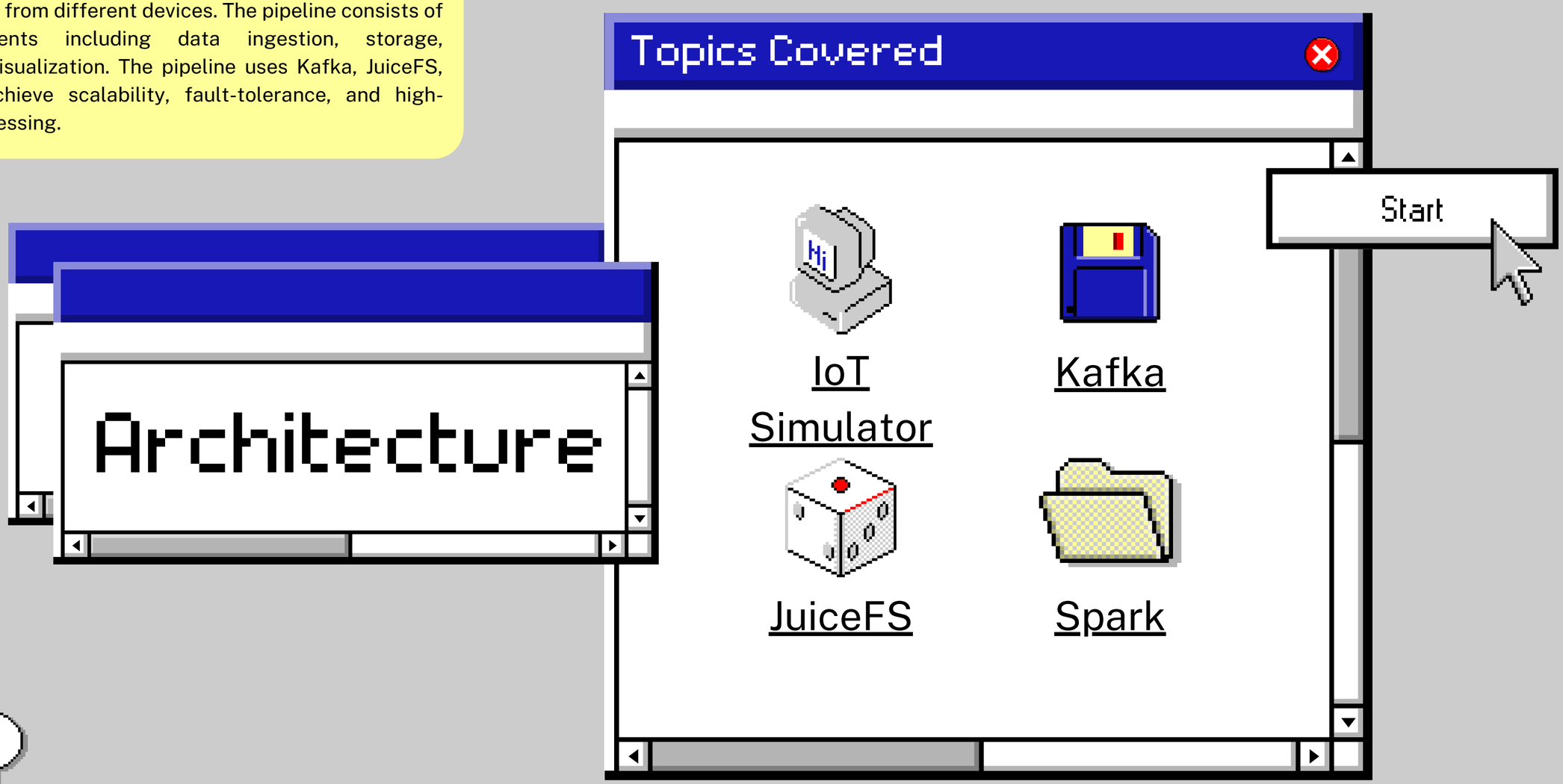
This project aims to create a data pipeline for processing and analyzing IoT data from different devices. The pipeline consists of various components including data ingestion, storage, processing, and visualization. The pipeline uses Kafka, JuiceFS, and Spark to achieve scalability, fault-tolerance, and high-performance processing.



IoT Simulator

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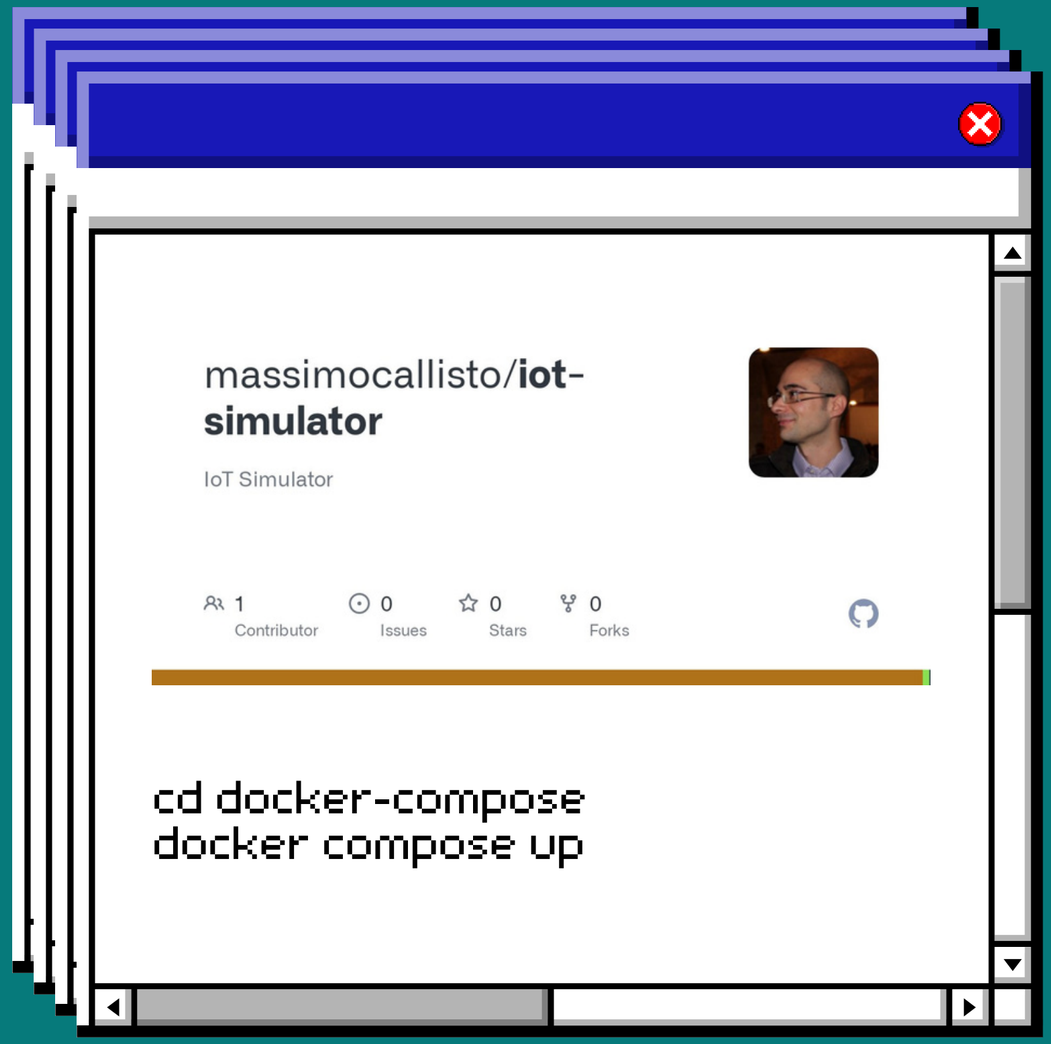
IoT Simulator

used to simulate IoT devices that send JSON messages to the Kafka broker.



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Apache Kafka

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Apache Kafka

receives the JSON messages from the IoT devices and stores them in topics.

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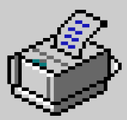
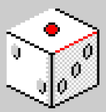
Apache Kafka

Whether you are looking to process data from IoT devices, to handle data pipelines in big data processing applications, or to provide real-time data feeds for data visualization and analysis, Apache Kafka is a highly effective solution that is well-suited to meet your needs





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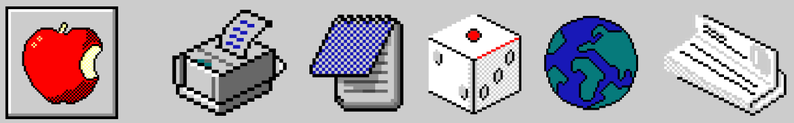
MQTT Protocol

Apache Kafka provides native support for MQTT, allowing MQTT data to be processed and stored using the Kafka platform.



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Persistor Prototype

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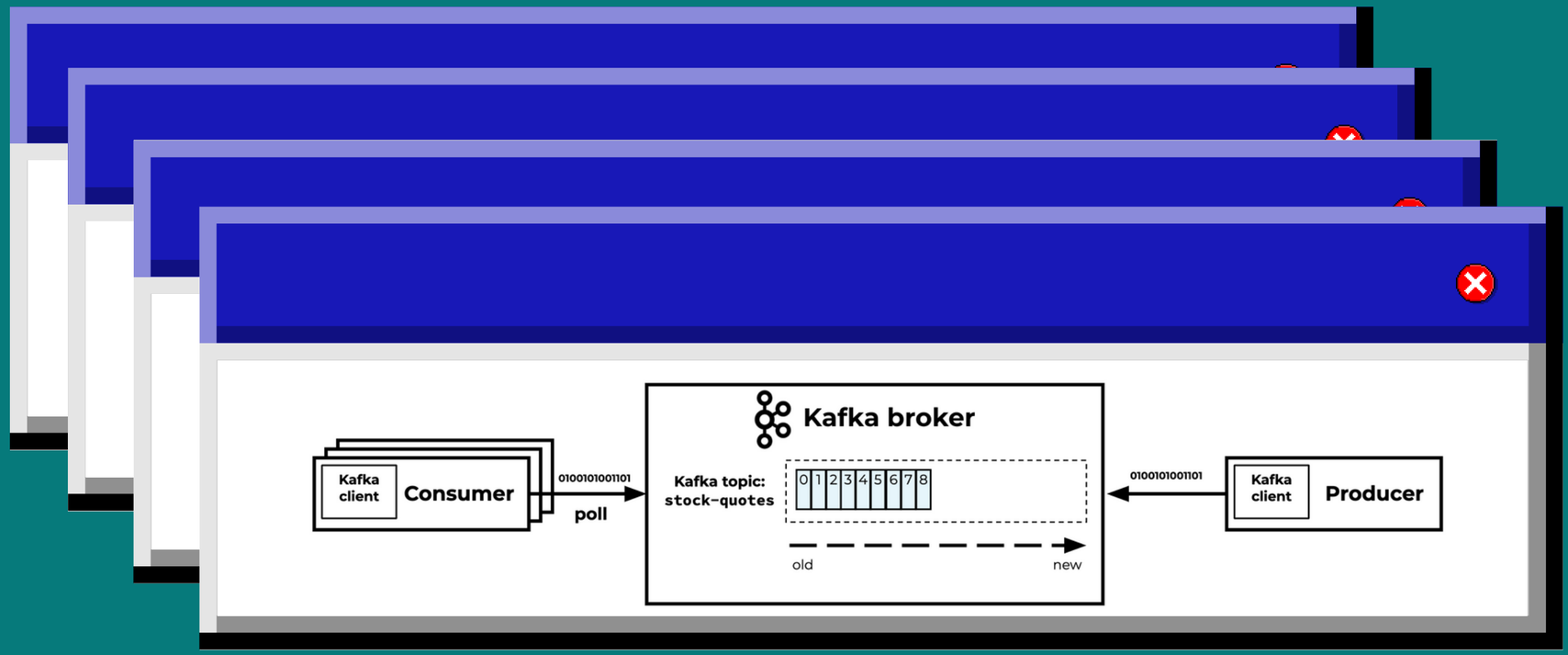
Persistor Prototype

composed of a producer and consumer that are connected to Kafka.



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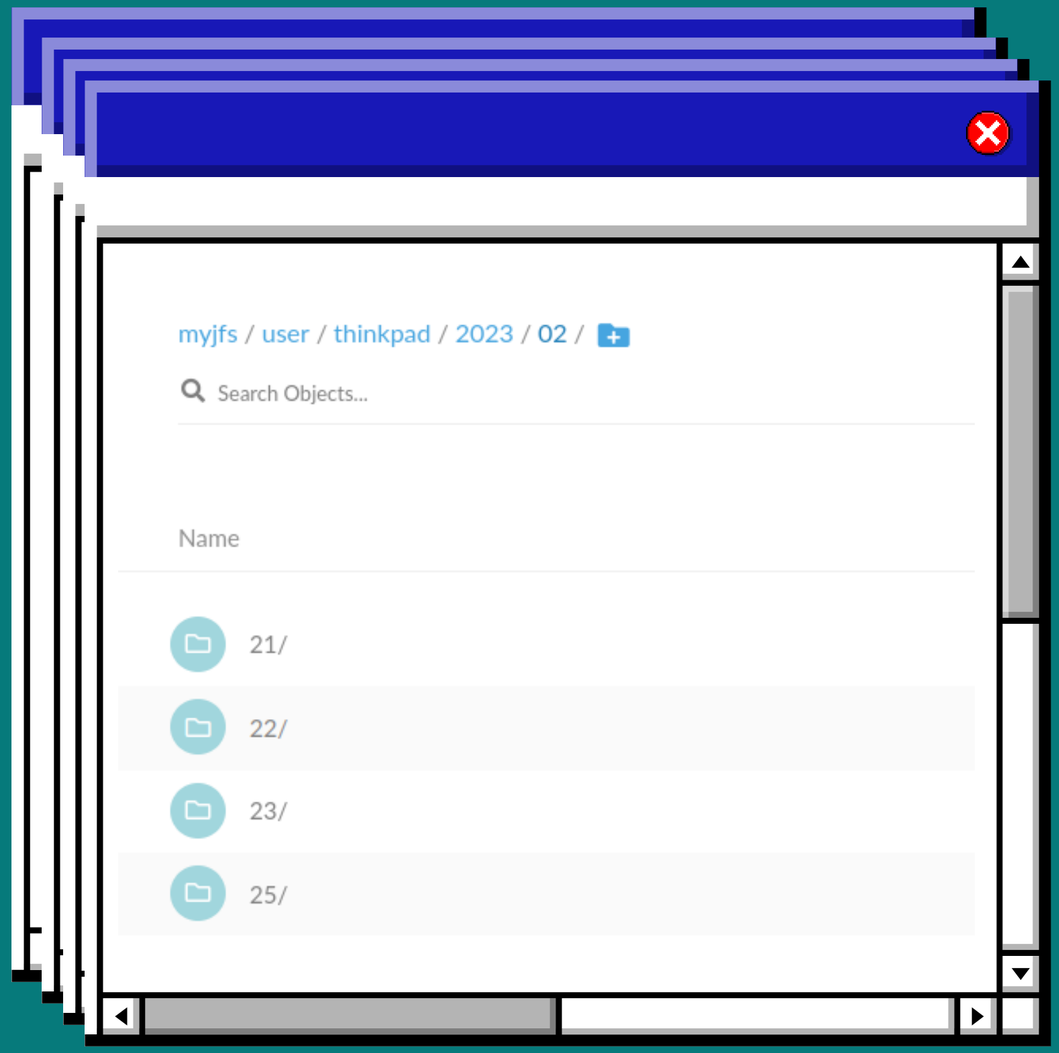
consumer stores the IoT json messages received from Kafka in JuiceFS

producer sends an ack with the UUID of the iot json file received

consume the messages from the ack topic and create a log file

Files Directory

the Consumer creates a path based on the year, month and day.



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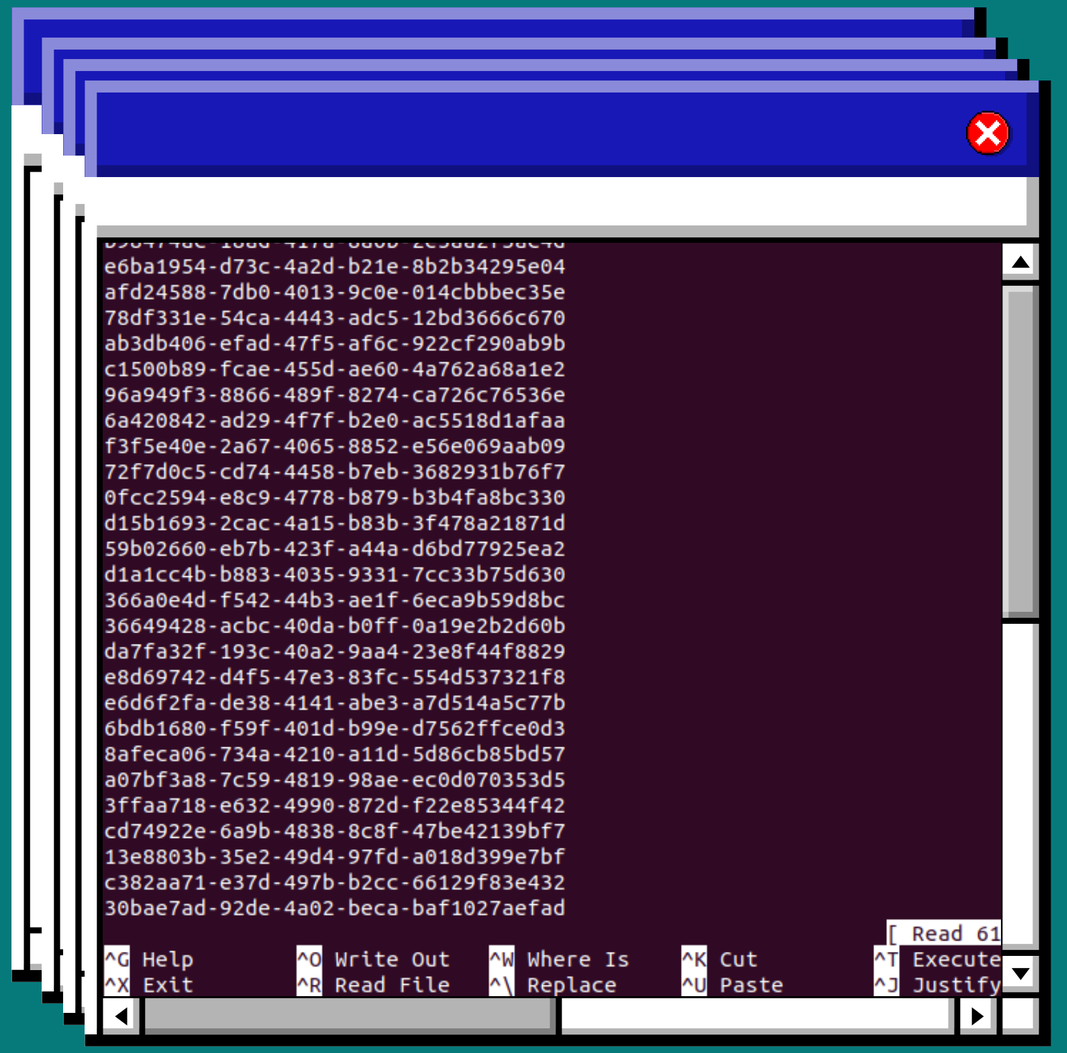
Log Files



if a message is sent on the topic ack, the Consumer calls a method that generates a log file with all the names of the saved file.

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JuiceFS
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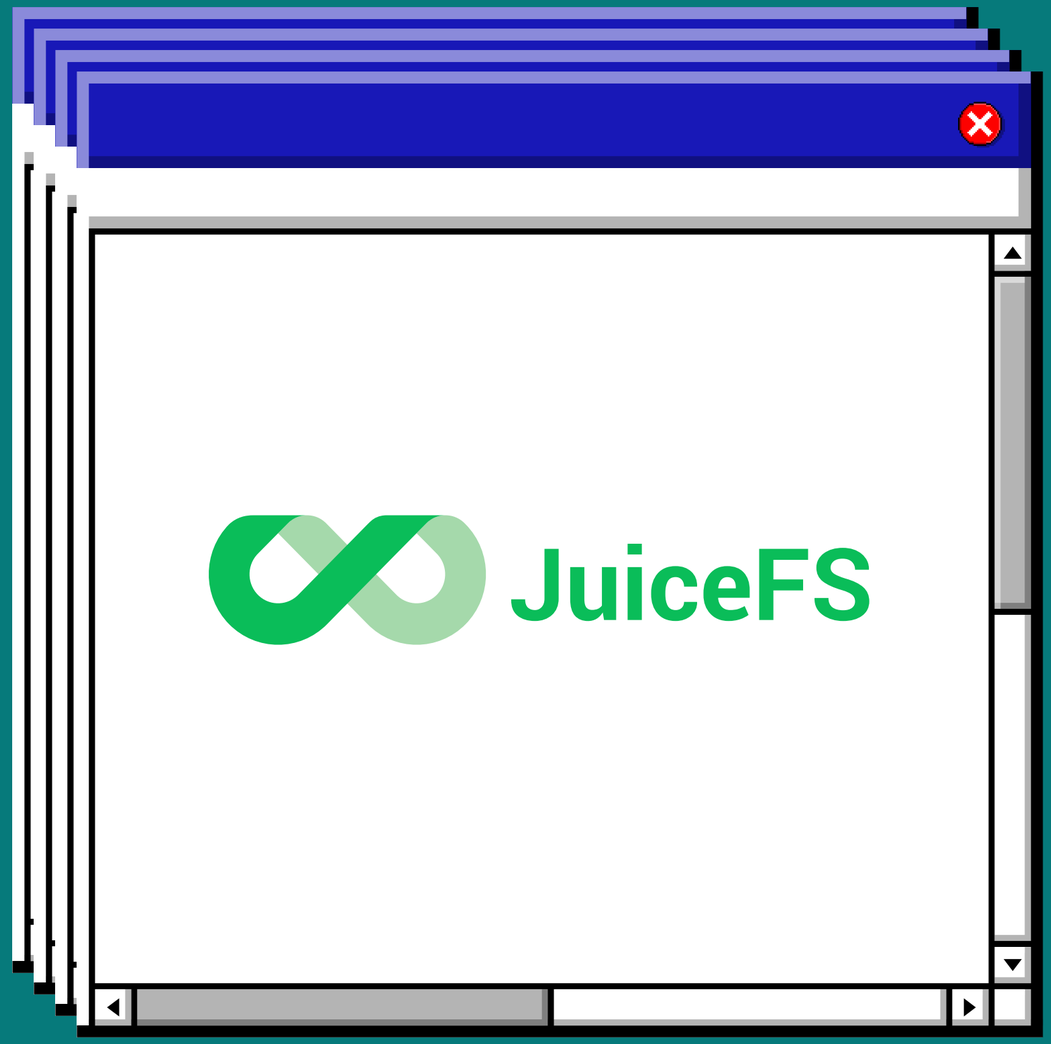
JuiceFS

a distributed file system that provides consistent and scalable storage for the IoT data.



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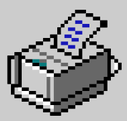
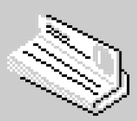
JuiceFS and IoT

One of the key benefits of JuiceFS is its ability to scale horizontally, allowing it to accommodate growing amounts of data without sacrificing performance. This makes it an ideal choice for use in IoT environments, where the amount of data generated by devices can be substantial.





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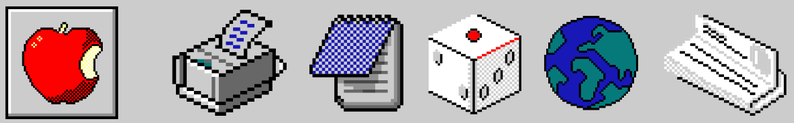
JuiceFS and Persistor Prototype

In the Persistor Prototype, JuiceFS is used to store data that is received from Kafka and processed by the Java consumer.



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where all file I/O happens

data will be split into chunks and stored in object storage

high performance metadata storage uses a multi-engine design

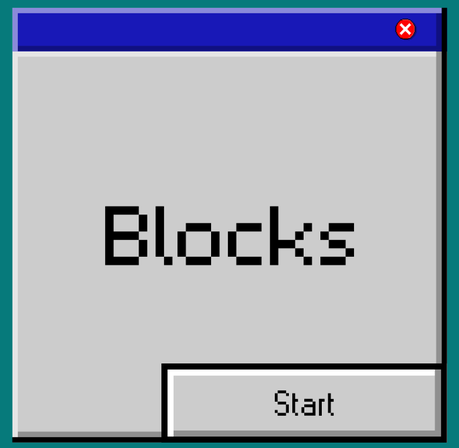
Storage

each file is divided

each with a size limit of 64 mb.

each chunk is divided

serve to optimize different types of write operations.



each slice is divided

of size 4 MiB by default.

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JuiceFS
Amazon S3
HDFS

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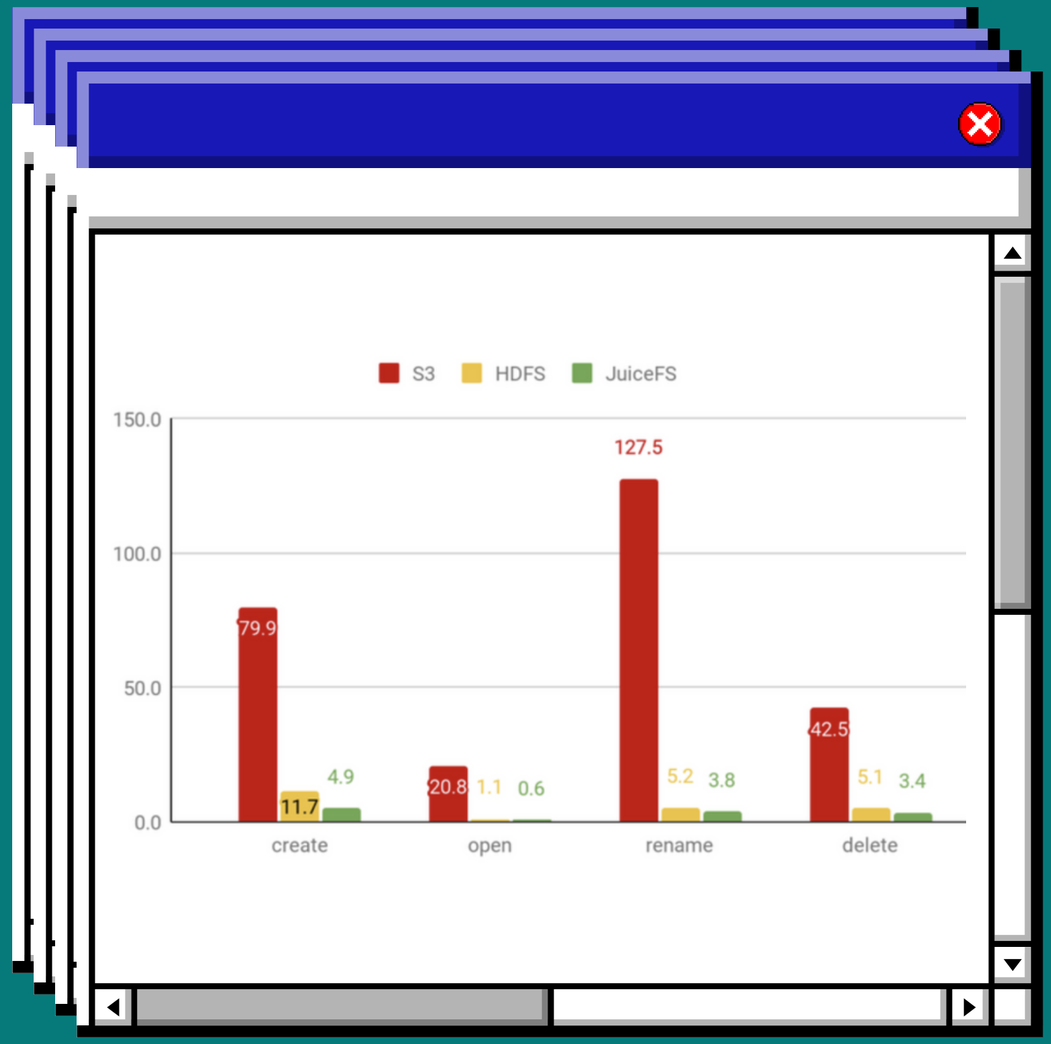
	JUICE FS	S3	HDFS
Support for Advanced Metadata Queries	✓	X	X
Shared Mounts	✓	X	X
Ensuring strong consistency	✓	✓	X
Local caching	✓	✓	X
File grouping	✓	X	X
Atomic operations	✓	X	X
Data compression	✓	X	✓
Object storage	✓	✓	X

JuiceFS
Amazon S3
HDFS

Metadata Latency (less is better).



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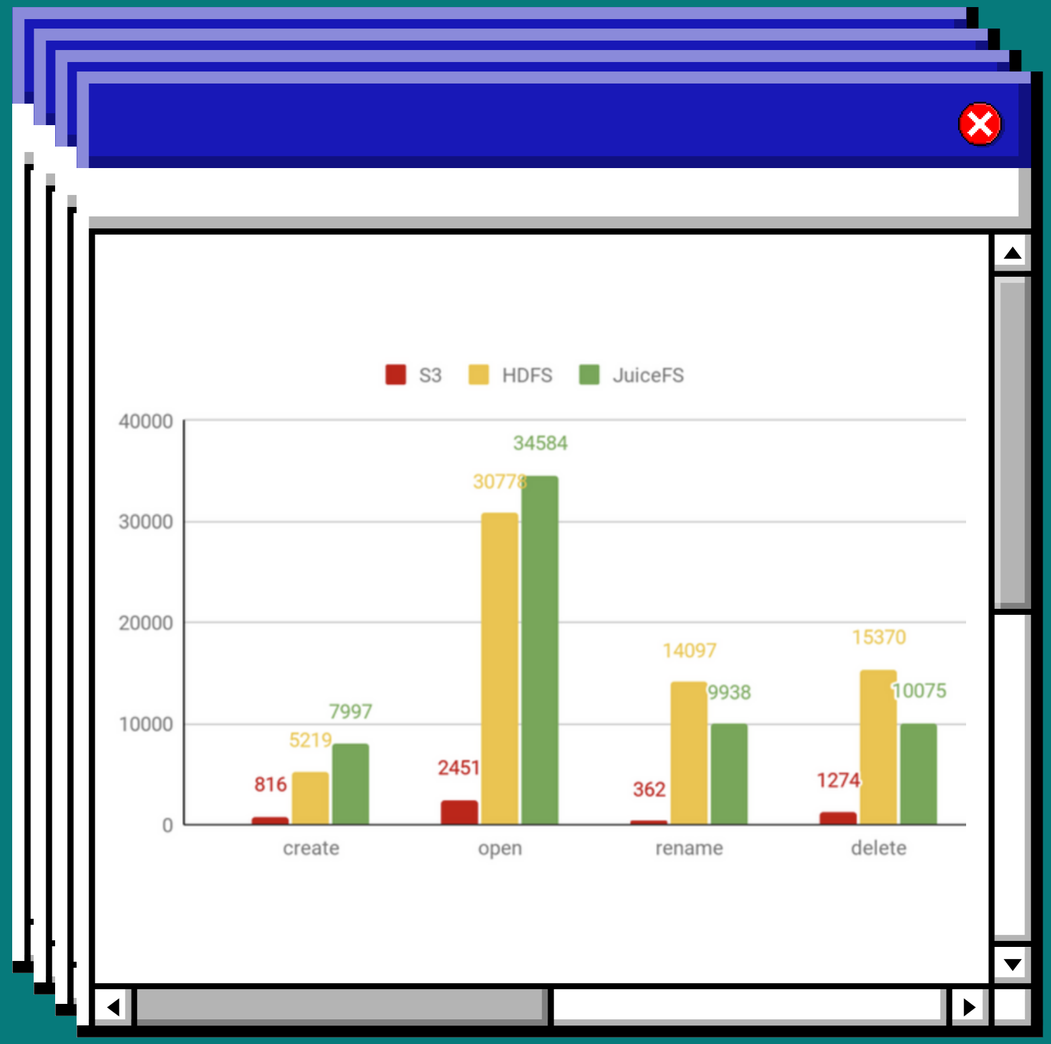
JuiceFS
Amazon S3
HDFS

Metadata Throughput (bigger is better).



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Spark

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Spark

provides fast and flexible ways to analyze large amounts of data in real-time.

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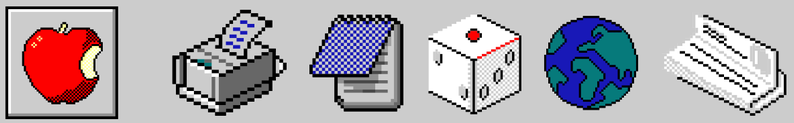
Spark and JuiceFS

once we have configured the Spark session, we can use the spark.read method to load the data from JuiceFS.



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Spark and JuiceFS

loaded the data into Spark, we can start querying it using Scala.

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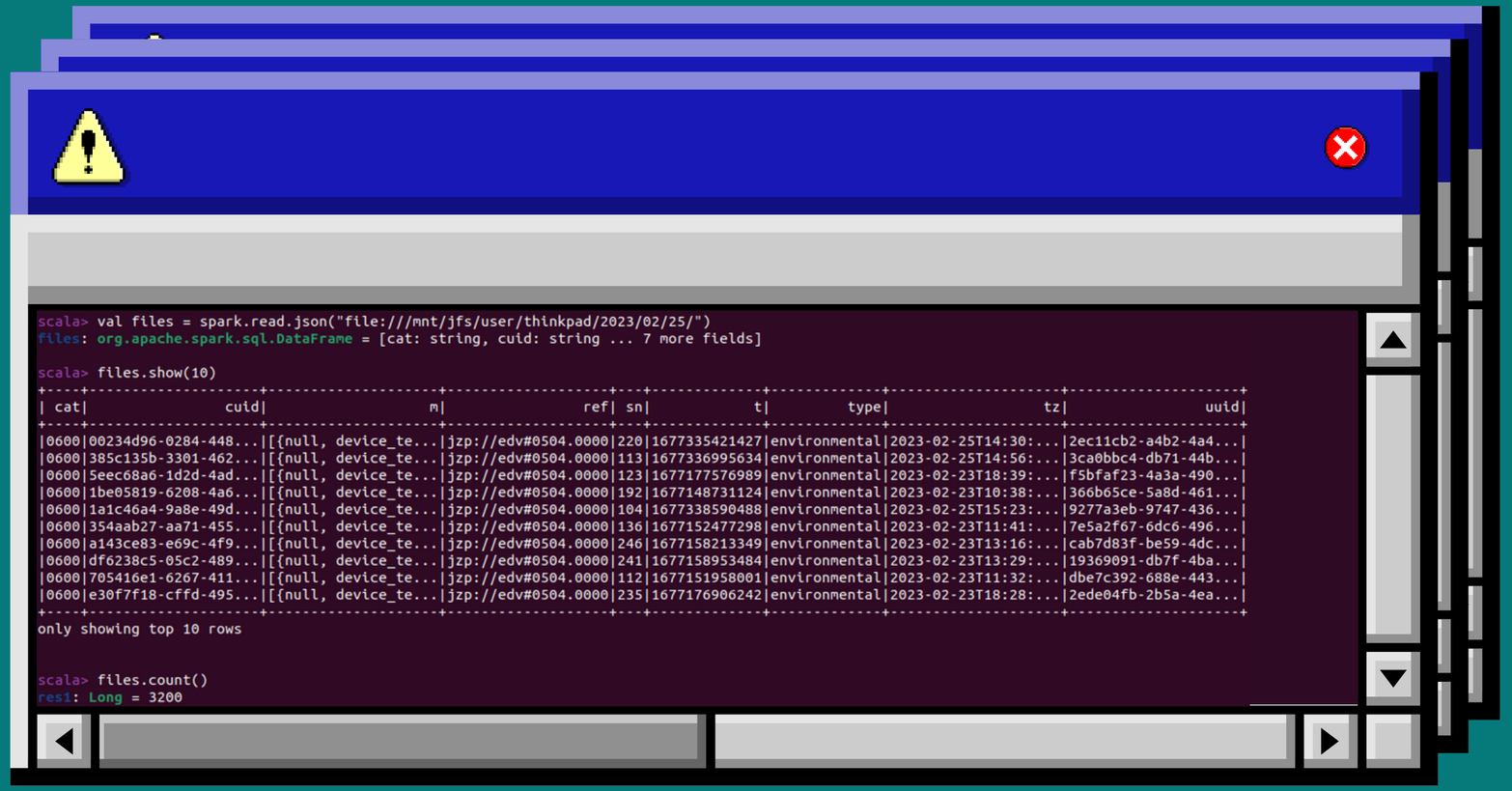
Spark Queries

the result of a Spark Query in Scala on JuiceFS.



```
scala> val files = spark.read.json("file:///mnt/jfs/user/thinkpad/2023/02/25/")
files: org.apache.spark.sql.DataFrame = [cat: string, cuid: string ... 7 more fields]

scala> files.show(10)
+----+--------------------+--------------------+--------------------+---+-------------+-------------+--------------------+--------------------+
| cat|                cuid|                   m|                ref| sn|            t|         type|                  tz|                uuid|
+----+--------------------+--------------------+--------------------+---+-------------+-------------+--------------------+--------------------+
|0600|00234d96-0284-448...|[{null, device_te...|jzp://edv#0504.0000|220|1677335421427|environmental|2023-02-25T14:30:...|2ec11cb2-a4b2-4a4...|
|0600|385c135b-3301-462...|[{null, device_te...|jzp://edv#0504.0000|113|1677336995634|environmental|2023-02-25T14:56:...|3ca0bbc4-db71-44b...|
|0600|5eec68a6-1d2d-4ad...|[{null, device_te...|jzp://edv#0504.0000|123|1677177576989|environmental|2023-02-23T18:39:...|f5bfaf23-4a3a-490...|
|0600|1be05819-6208-4a6...|[{null, device_te...|jzp://edv#0504.0000|192|1677148731124|environmental|2023-02-23T10:38:...|366b65ce-5a8d-461...|
|0600|1a1c46a4-9a8e-49d...|[{null, device_te...|jzp://edv#0504.0000|104|1677338590488|environmental|2023-02-25T15:23:...|9277a3eb-9747-436...|
|0600|354aab27-aa71-455...|[{null, device_te...|jzp://edv#0504.0000|136|1677152477298|environmental|2023-02-23T11:41:...|7e5a2f67-6dc6-496...|
|0600|a143ce83-e69c-4f9...|[{null, device_te...|jzp://edv#0504.0000|246|1677158213349|environmental|2023-02-23T13:16:...|cab7d83f-be59-4dc...|
|0600|df6238c5-05c2-489...|[{null, device_te...|jzp://edv#0504.0000|241|1677158953484|environmental|2023-02-23T13:29:...|19369091-db7f-4ba...|
|0600|705416e1-6267-411...|[{null, device_te...|jzp://edv#0504.0000|112|1677151958001|environmental|2023-02-23T11:32:...|dbe7c392-688e-443...|
|0600|e30f7f18-cffd-495...|[{null, device_te...|jzp://edv#0504.0000|235|1677176906242|environmental|2023-02-23T18:28:...|2ede04fb-2b5a-4ea...|
+----+--------------------+--------------------+--------------------+---+-------------+-------------+--------------------+--------------------+
only showing top 10 rows


scala> files.count()
res1: Long = 3200
```

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Thank you!
thevladdo - raphlat - muno1