BLAZINGDB

Data Lake to AI on GPUs

CPUs can no longer handle the growing data demands of data science workloads

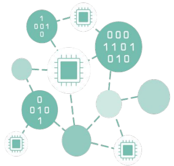
Slow Process

Preparing data and **training models** can take days or even weeks.

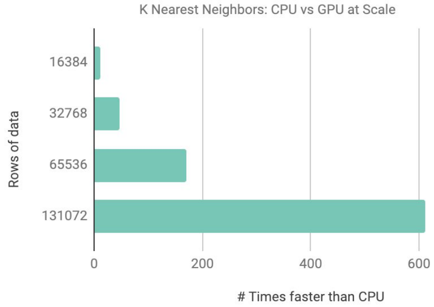
Suboptimal Infrastructure

Hundreds to **tens of thousands of CPU servers** are needed in data centers.

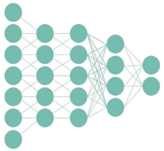
GPUs are well known for accelerating the training of machine learning and deep learning models.



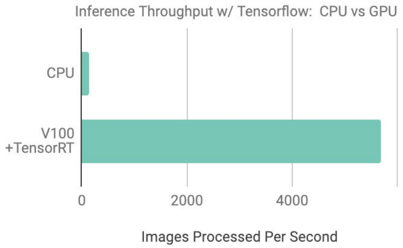
Machine Learning



Performance improvements increase at scale.

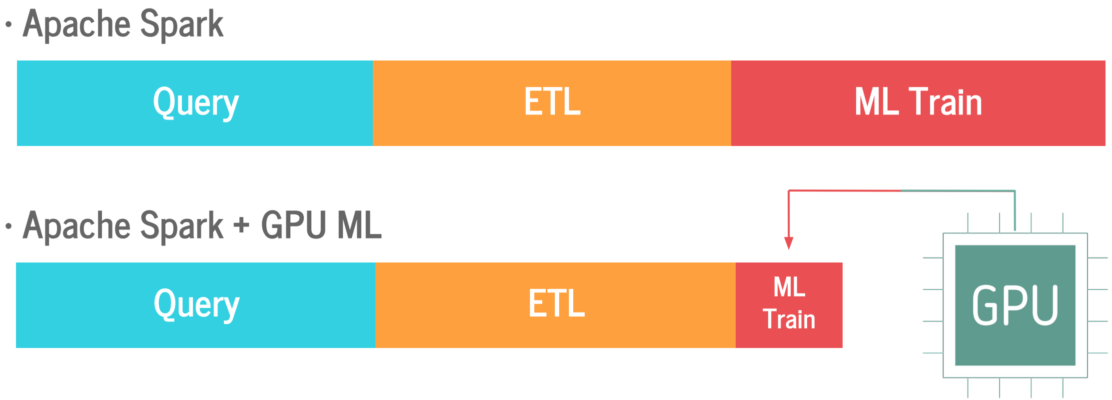


Deep Learning
(Neural Networks)



40x Improvement over CPU.

But data preparation still happens on CPUs, and can't keep up with GPU accelerated machine learning.



Enterprise GPU users find it challenging to **"Feed the Beast"**.

An end-to-end analytics solution on GPUs is the only way to maximize GPU power.

RAPIDS (All GPU)

Query	ETL	ML Train

RAPIDS
Open GPU Data Science

BLAZINGDB

Expertise:
- GPU DBMS
- GPU Columnar Analytics
- Data Lakes

NVIDIA

Expertise:
- CUDA
- Machine Learning
- Deep Learning

ANACONDA

Expertise:
- Python
- Data Science
- Machine Learning

RAPIDS, the end-to-end GPU analytics ecosystem

RAPIDS
Open GPU Data Science

A set of **open source** libraries for **GPU** accelerating **data preparation** and **machine learning**.

Data Preparation → Model Training → Visualization

cuDF
Data Preparation

cuML
Machine Learning

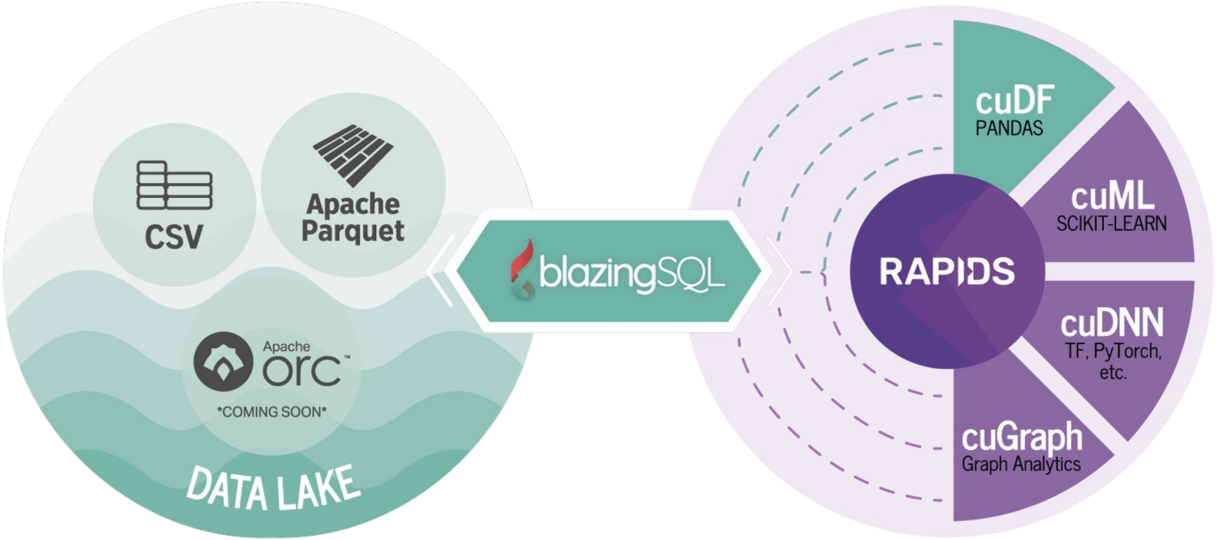
cuGRAPH
Graph Analytics

APACHE ARROW In GPU Memory

```
import cudf
from cuml import KNN
import numpy as np

np_float = np.array([
 [1,2,3], #Point 1
 [1,2,3], #Point 2
 [1,2,3], #Point 3
]).astype('float32')

gdf_float = cudf.DataFrame()
gdf_float['dim_0'] = np.ascontiguousarray(np_float[:,0])
gdf_float['dim_1'] = np.ascontiguousarray(np_float[:,1])
gdf_float['dim_2'] = np.ascontiguousarray(np_float[:,2])

print('n_samples = 3, n_dims = 3')
print(gdf_float)

knn_float = KNN(n_gpus=1)
knn_float.fit(gdf_float)
Distance,Index = knn_float.query(gdf_float,k=3)
# Get 3 nearest neighbors

print(Index)
print(Distance)
```

BlazingSQL: The GPU SQL Engine on RAPIDS

A SQL engine built on RAPIDS.
Query enterprise data lakes lightning fast with full interoperability with the RAPIDS stack.



BlazingSQL, The GPU SQL Engine for RAPIDS

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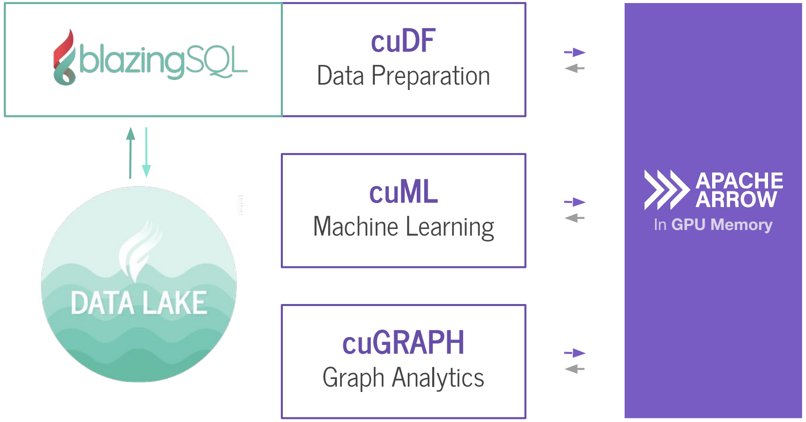
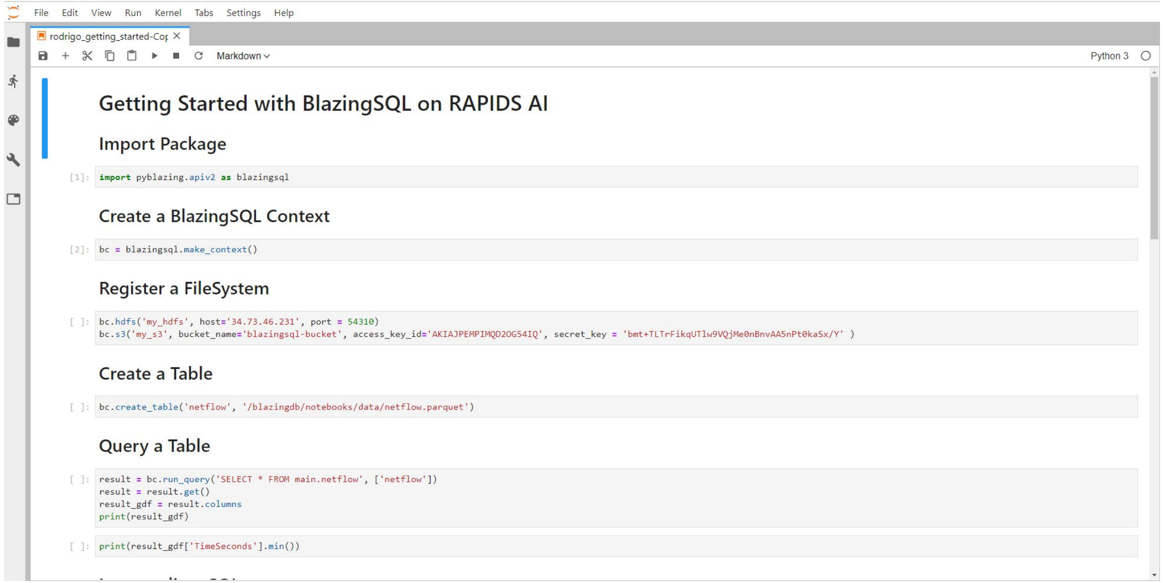



```python
from blazingsql import BlazingContext

bc = BlazingContext()

#Register Filesystem
bc.hdfs('data', host='129.13.0.12',
port=54310)

# Create Table
bc.create_table('performance',
file_type='parquet',
path='hdfs://data/performance/')

#Execute Query
result_gdf = bc.run_query('SELECT * FROM
performance WHERE
YEAR(maturity_date)>2005')

print(result_gdf)
```

Getting Started Demo



Getting Started with BlazingSQL on RAPIDS AI

Import Package

```
[1]: import pyblazing.apiv2 as blazingsql
```

Create a BlazingSQL Context

```
[2]: bc = blazingsql.make_context()
```

Register a FileSystem

```
[ ]: bc.hdfs('my_hdfs', host='34.73.46.231', port = 54310)
     bc.s3('my_s3', bucket_name='blazingsql-bucket', access_key_id='AKIAJPEMPIMQD2OG54IQ', secret_key = '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' )
```

Create a Table

```
[ ]: bc.create_table('netflow', '/blazingdb/notebooks/data/netflow.parquet')
```

Query a Table

```
[ ]: result = bc.run_query('SELECT * FROM main.netflow', ['netflow'])
     result = result.get()
     result_gdf = result.columns
     print(result_gdf)
```

```
[ ]: print(result_gdf['TimeSeconds'].min())
```

BlazingSQL + XGBoost Loan Risk Demo

Train a model to assess risk of new mortgage loans based on Fannie Mae loan performance data

Mortgage Data
4.22M Loans
148M Perf. Records
CSV Files on HDFS

ETL/ Feature Engineering

XGBoost Training

Spark CLUSTER

4 Nodes
+
8 vCPUs per node
+
30GB RAM

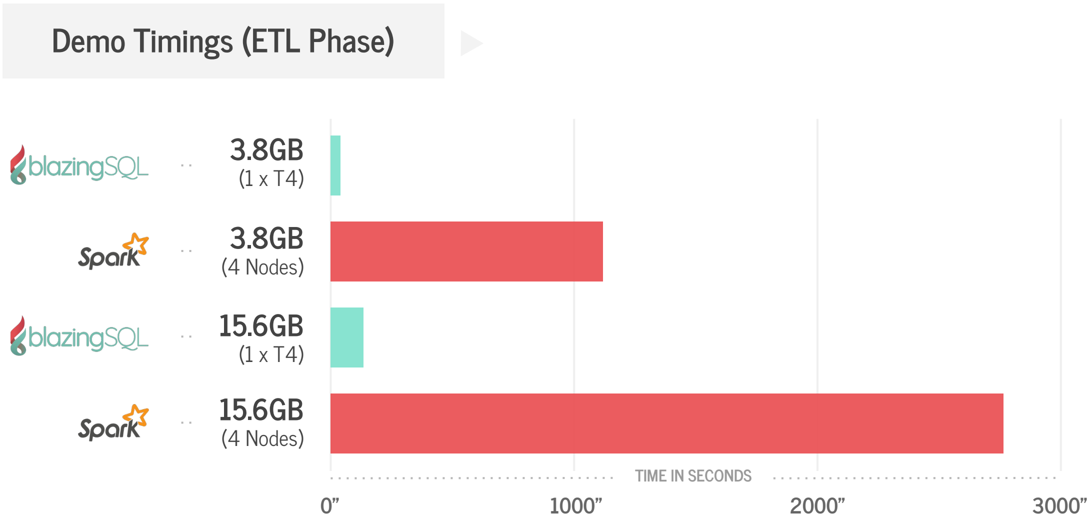
blazingSQL CLUSTER

1 Nodes
+
16 vCPUs per node
+
1 Tesla T4 GPU

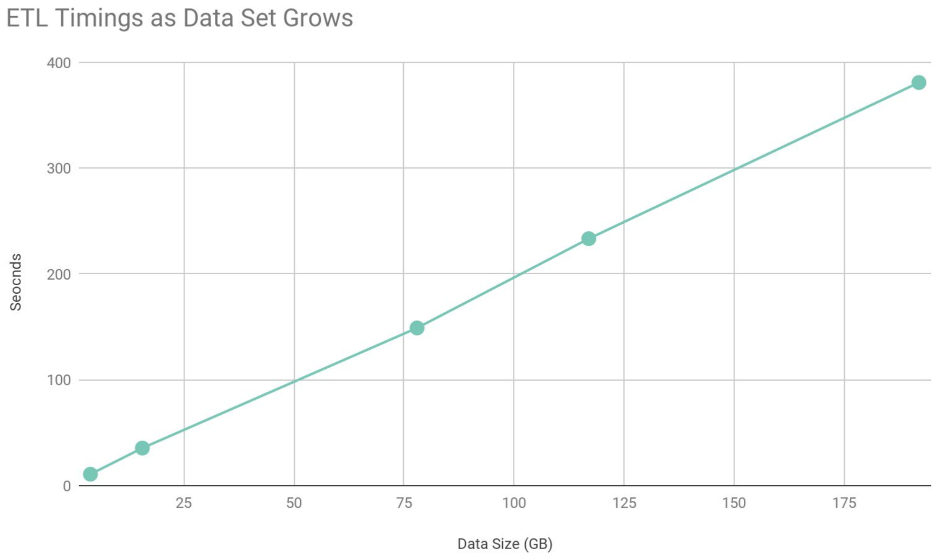
2560 CUDA Cores

16GB VRAM

RAPIDS + BlazingSQL outperforms traditional CPU pipelines

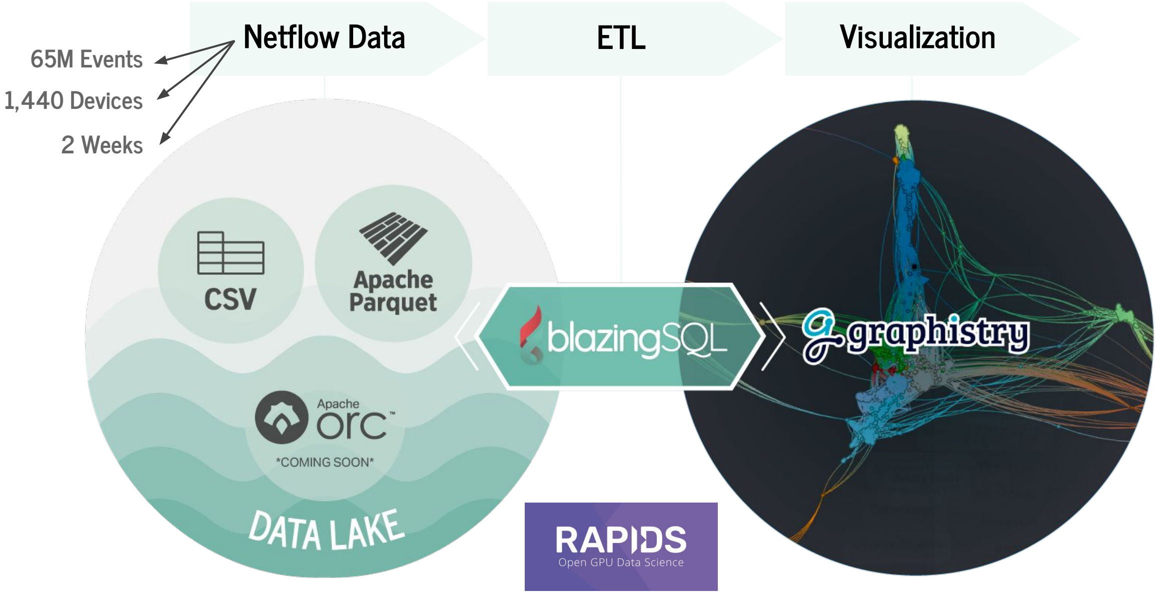


Scale up the data on a DGX
4 x V100 GPUs

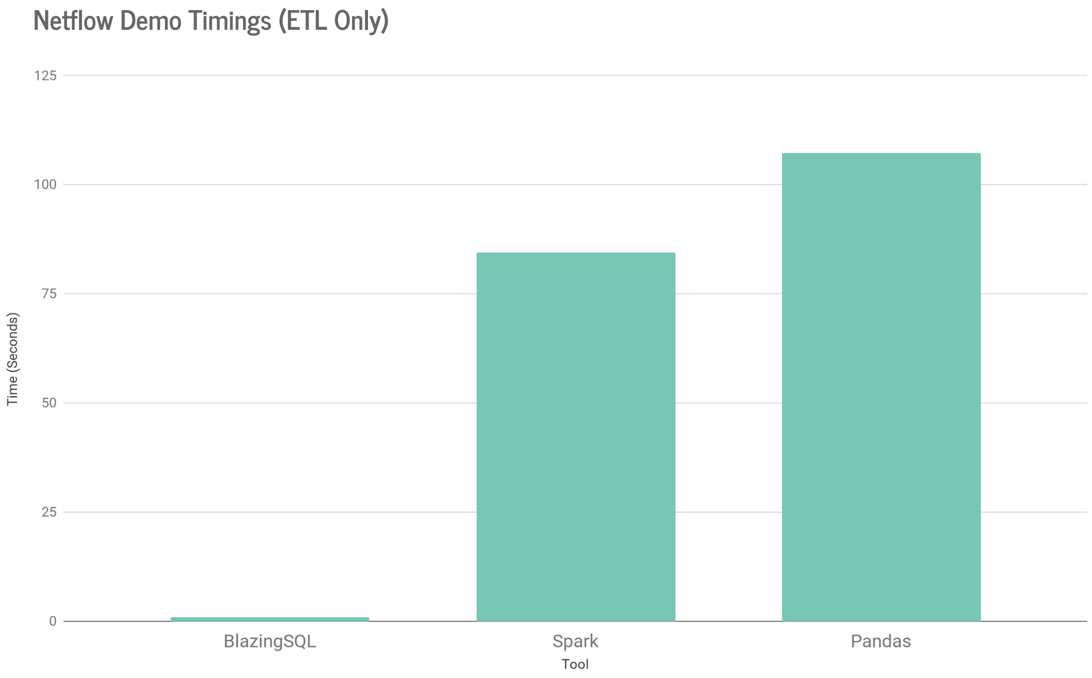


BlazingSQL + Graphistry Netflow Analysis

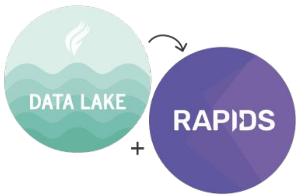
Visually analyze the VAST netflow data set inside Graphistry in order to quickly detect anomalous events.



Benchmarks


Netflow Demo Timings (ETL Only)
125
100
75
50
25
0
Time (Seconds)
BlazingSQL
Spark
Pandas
Tool

Benefits of BlazingSQL



Data Lake to RAPIDS

Query data from Data Lakes directly with SQL in to GPU memory, let RAPIDS do the rest.

Blazing Fast.

Massive time savings with our GPU accelerated ETL pipeline.

Minimal Code Changes Required.

RAPIDS with BlazingSQL mirrors Pandas and SQL interfaces for seamless onboarding.

Stateless and Simple.

Underlying services being stateless reduces complexity and increase extensibility.

Upcoming BlazingSQL Releases

V0.1

Query GDFs

Use the PyBlazing connection to execute SQL queries on GDFs that are loaded by the cuDF API

V0.2

Direct Query Flat Files

Integrate FileSystem API, adding the ability to directly query flat files (Apache Parquet & CSV) inside distributed file systems.

V0.3

String Support

String support and string operation support.

V0.4

Distributed Scheduler

SQL queries are fanned out across multiple GPUs and servers.

V0.5

Physical Plan Optimizer

Partition culling for where clauses and joins.

Get Started

BlazingSQL is quick to get up and running using either DockerHub or Conda Install: