Output Layer

Input Layer

Machine

Hidden Layer3

Hidden Layer1

Hidden Layer2

SELECT ?S

WHERE{

Q1 ?S “hasFriend” person1 .

Q2 ?S “likePost” “post1” .

Q3 ?S “attendEvent” “event1”

}

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX ub: <http://www.lehigh.edu/~zhp2/2004/0401/univ-bench.owl#>

SELECT ?X

WHERE{

?X rdf:type ub:GraduateStudent .

?X ub:takesCourse http://www.Department0.University0.edu/GraduateCourse0}

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX ub: <http://www.lehigh.edu/~zhp2/2004/0401/univ-bench.owl#>

SELECT ?X

WHERE{

?X rdf:type ub:Publication .

?X ub:publicationAuthor http://www.Department0.University0.edu/AssistantProfessor0}

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX ub: <http://www.lehigh.edu/~zhp2/2004/0401/univ-bench.owl#>

SELECT ?X, ?Y1, ?Y2, ?Y3

WHERE

{?X rdf:type ub:Professor .

?X ub:worksFor <http://www.Department0.University0.edu> .

?X ub:name ?Y1 .

?X ub:emailAddress ?Y2 .

?X ub:telephone ?Y3}

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX ub: <http://www.lehigh.edu/~zhp2/2004/0401/univ-bench.owl#>

SELECT ?X, ?Y1, ?Y2, ?Y3

WHERE{

?X rdf:type ub:Professor .

?X ub:worksFor <http://www.Department0.University0.edu> .

?X ub:name ?Y1 .

?X ub:emailAddress ?Y2 .

?X ub:telephone ?Y3}

Current Window for

Stream A

Current Results

Window

Current Window for

Stream B

Current Window for

Stream A

Current Window for

Stream B

Stream A

Stream B

Resource

Manager

NodeManager

NodeManager

NodeManager

JobTracker

TaskTracker

TaskTracker

TaskTracker

Pregel

(Bagel)

Hive

(Shark)

Spark

Streaming

Spark

MapReduce

RDD

Functional

Programming

Local Version

YARN

HDFS/HBase

**Data**

**Data Block**

**Machine**

**Spout**

**Spout**

**Input Streams**

**Input Streams**

Stream Sources

Stream Transformation

**Nimbus**

**…**

**Zookeeper**

**Zookeeper**

**Supervisor**

**Supervisor**

**Executor**

**Executor**

**R1**

**R11**

**R4**

**R5**

**R9**

**R3**

**R13**

**R14**

**R10**

**R8**

**R12**

**R2**

**R18**

**R7**

**R6**

**R16**

**R17**

**R15**

R1

R2

R6

R7

R3

R4

R5

R13

R14

R11

R12

R15

R16

R8

R9

R10

R17

R18

**H1**

**H2**

**H3**

**H4**

**A**

**B**

**2**

**4**

**1**

**3**

**C**

**…**

**…**

**…**

**A**

**B**

**C**

**1**

**3**

**2**

**4**

**5**

**5**

**?**

**?**

**HTML**

**HTML**

**HTML**

**?**

**Thing1**

**Thing2**

**?**

**?**

**?**

**?**

**?**

**Are they talking about the same “Thing”?**

**?**

**Thing2**

**Thing1**

**HTML**

**HTML**

**HTML**

Triple 1 : <Sophie, hasSister, Ray>

Triple 2 : <Sophie, hasDaughter, Amelie>

Triple 3 : <Ray, hasDaughter, Yume>

**hasSister**

**Ray**

**Sophie**

**hasDaughter**

**hasDaughter**

**Yume**

**Amelie**

SELECT ?S ? ?

WHERE{

?S “workAt” ? .

?S “hasDiplome” ? .

?S “hasPaper” “kNN”

}

SELECT ?S ? ?

WHERE{

?S “workAt” ? .

?S “hasDiplome” ? .

?S “hasPaper” “kNN”

}

**“”**

**“”**

**“”**

**“”**

**“”**

**“”**

**“”**

**(1) Join Places and their type**

**(2) Query Topological Sort**

**Query**

**Planner**

**Topology**

**Executor**

**(1) Join Places and its type**

**(2) Query Topological Sort**

To be continued

**Distribute S on Column**

**S3**

**S2**

**S1**

**Distribute R on Row**

**S3**

**S2**

**S1**

**S3**

**S2**

**S1**

**S1**

**S2**

**S3**

**S1**

**S2**

**S3**

**R**

**S1**

**S2**

**S**

**S3**

**S2**

**S1**

**S3**

**kNN**

**Raw Data**

**Preprocessing**

**Reduce Dimension:**

- z-value projection

- LSH projection

**Partitioning**

**Distance Based**

**Size Based**

**kNN Join**

**One Round Job**

**Two Rounds Jobs**

**Raw Data**

**Preprocessing**

**Partitioning**

**kNN**

**kNN Join**

**T1, T2, T3**

**Q1**

**T9, T10, T11**

**Q2**

**T4, T5, T6**

**Q1**

**T7, T8**

**Q1**

**T23, T24**

**Q3**

**T21, T22**

**Q3**

**T18, T19, T20**

**Q2**

**T12, T13, T14**

**Q2**

**T15, T16, T17**

**Q2**

**Triples with predicate**

**Triples with predicate**

**Parallel and Distributed RDF Processing Environment**

JobTracker

TaskTracker

TaskTracker

TaskTracker

**Query Set R**

**Bloom Filter Send:**

**Bloom Filter Receive:**

**BF()**

**BF()**

**BF()**

**BF()**

**<?,, ?>**

**Prober**

**<?, , >**

**Builder**

**<?, , >**

**Builder**

**BF()**

**BF()**

**<?, , >**

**Builder**

**BF()**

**BF()**

**Bloom Filter Receive:**

**Bloom Filter Send:**

**<?,, ?>**

**Prober**

**+**

**Builder**

**BF()**

**<?, , >**

**Prober**

**+**

**Builder**

**BF()**

**BF()**

**Input**

Load Image

Scale Image

Filter Image

Display Image





**<?, , >**

**Builder**

**<?, , >**

**Prober**

**<?, , >**

**Builder**

**BF()**

**BF()**

**Bloom Filter Receive:**

**BF()**

**Bloom Filter Send:**

**BF()**