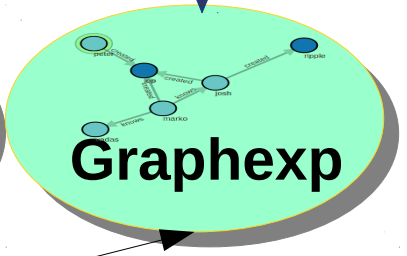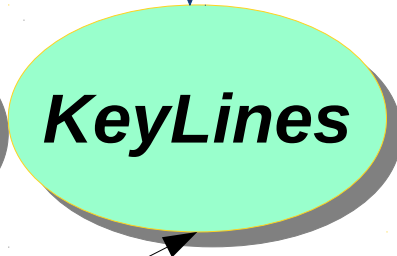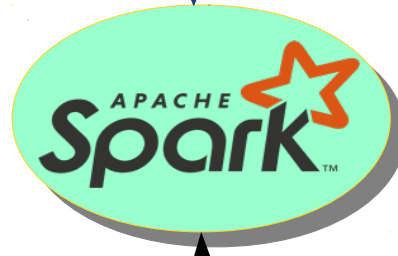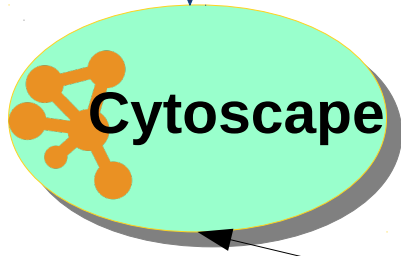# Analytics Layer

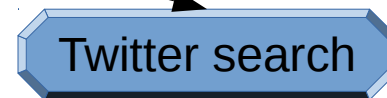| Ad Hoc Discovery	Advanced Analytics	Executive Dashboards	Data-driven Apps	BI Enterprise Reporting

Cytoscape

elasticsearch

Apache Spark

KeyLines

Graphexp

Apache HBASE

JanusGraph

cassandra

API

Apache Nutch	Go-ethereum	bitaps.com	Twitter search
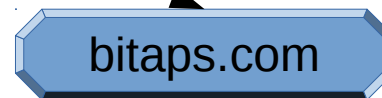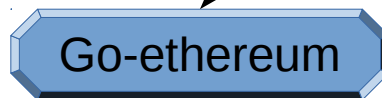
WWW

Ethereum

Bitcoin

Twitter

JanusGraph Schema and Data Model

transactionID=0xe8ac01e05e26914ddae185b1a799fb4fc66e
19ac0097631a24b06e2f1a6e9143
sender=0xfdfed57e62f78c86d4b9dc7e8f77a2e0cf84dd51
value=3343893666611120000
blockNumber=5160469
receiver=0xc6eb8d29117cebd1b1287e9df642b028ec90659c

Vertex
type:eth_address
Id:0x97c1ff3108...

Vertex
type:eth_transaction
Id:0xe8ac01e05e...
blockN:5160469

Vertex
type:eth_address
Id:0x4825833147...

Edge
type:transfer
direction:from
value:3343...

Edge
type:transfer
direction:to
value:3343...
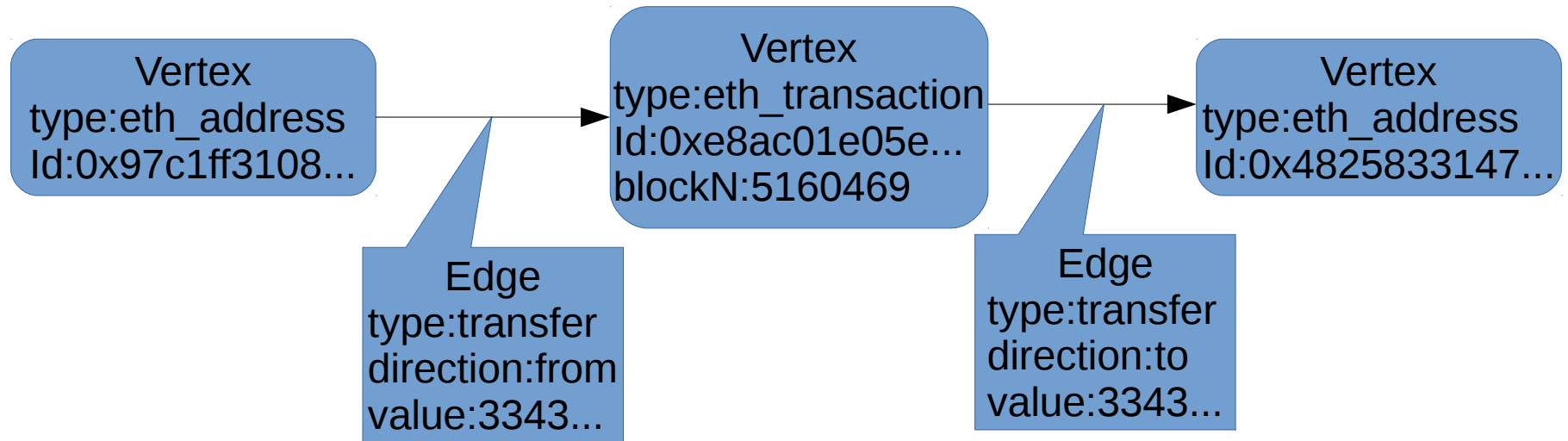
JanusGraph Schema and Data Model

transactionID=0xff0f84e91f2857e57b1b4d15f2f1c23c93c79555a86f6283b1e75aab74b5f719
sender=0xb42b20ddbeabdc2a288be7ff847ff94fb48d2579
value=0
blockNumber=5160468
action=contractCreation
contractAddress=0x52a9dab491ea706c6e94975a194b1b4499b9ffae

Vertex
type:eth_address
Id:0x6b1ae07f0f5...

Vertex
type:eth_transaction
Id:0x51d9953eba...
blockN:5160468

Vertex
type:eth_contract
Id:0x4825833147...

Edge
type:action
direction:from

Edge
type:function
name:contract_creation
value:0
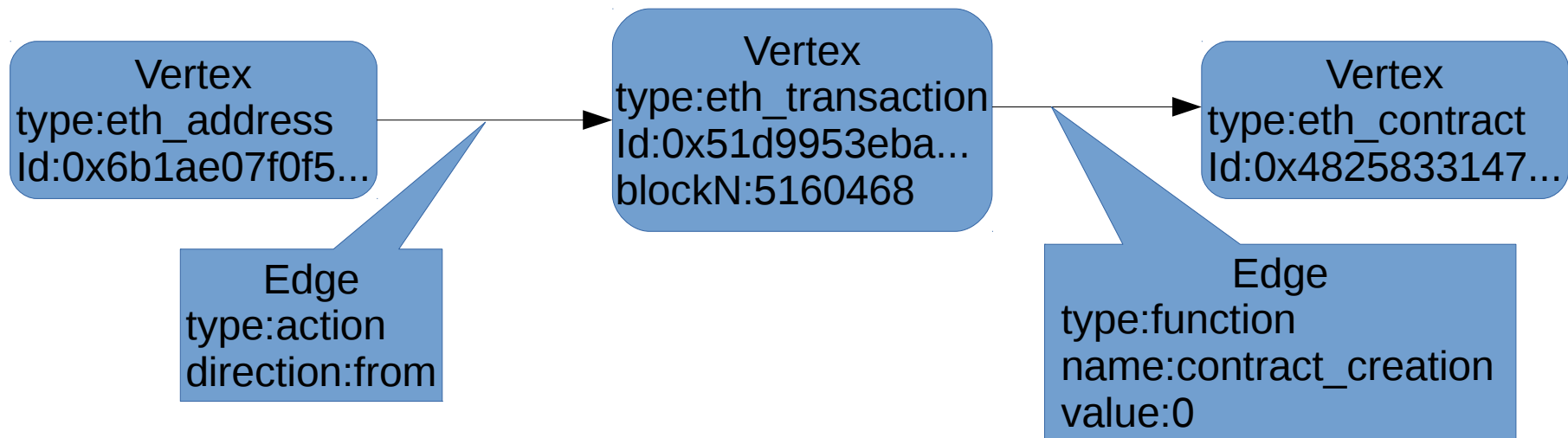
JanusGraph Schema and Data Model

transactionID=0x51d9953eba16e7307b5d9166da0a11940a4123e296d3
35cdbea59578b01b1526
sender=0x6b1ae07f0f55d09c54f3ea805866d27bef025178
value=0
blockNumber=5160468
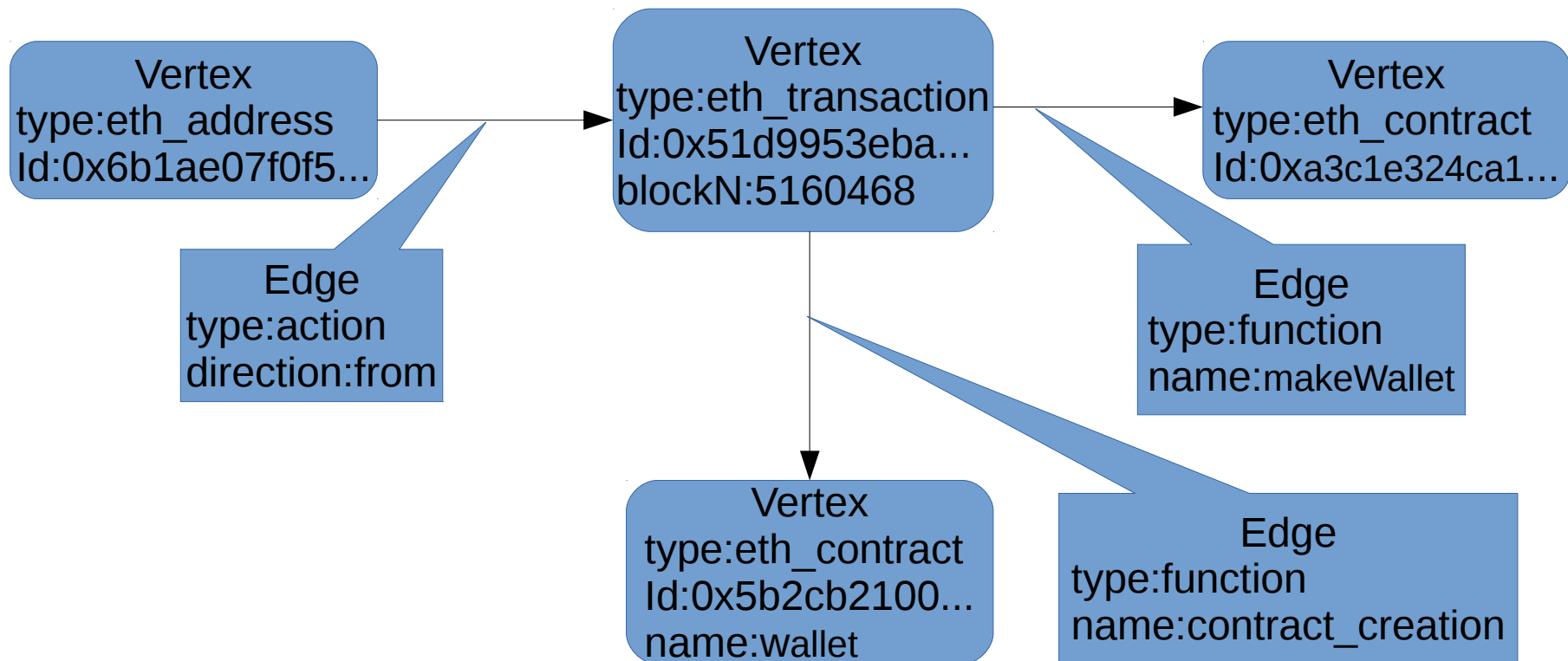receiver=0x151202c9c18e495656f372281f493eb7698961d5
token_type=transfer
toToken=0x5b2cb21009bf8515b3e58676ebe5940d73a5c4b4
valueToken=4950

Vertex
type:eth_address
Id:0x6b1ae07f0f5...

Vertex
type:eth_transaction
Id:0x51d9953eba...
blockN:5160468

Vertex
type:eth_contract
Id:0x4825833147...

Edge
type:transfer
direction:from
value:4950

Edge
type:function
name:transfer
value:0

Vertex
type:eth_token
Id:0x5b2cb2100...

Edge
type:token_transfer
direction:to
value:4950

JanusGraph Schema and Data Model

transactionID=0x60c481200da8f62d4e88a4f15490f601d93ae92a2a4fe25db9eadf5cdab39d65
sender=0x6cace0528324a8afc2b157ceba3cdd2a27c4e21f
value=0
blockNumber=5160468
contractAddress=0xa3c1e324ca1ce40db73ed6026c4a177f099b5770
walletAddress=0x3063aa230afe29e00c7dd08371f82d2027a44324
action=makeWallet

Vertex
type:eth_address
Id:0x6b1ae07f0f5...

Vertex
type:eth_transaction
Id:0x51d9953eba...
blockN:5160468

Vertex
type:eth_contract
Id:0xa3c1e324ca1...

Edge
type:action
direction:from

Edge
type:function
name:makeWallet

Vertex
type:eth_contract
Id:0x5b2cb2100...
name:wallet

Edge
type:function
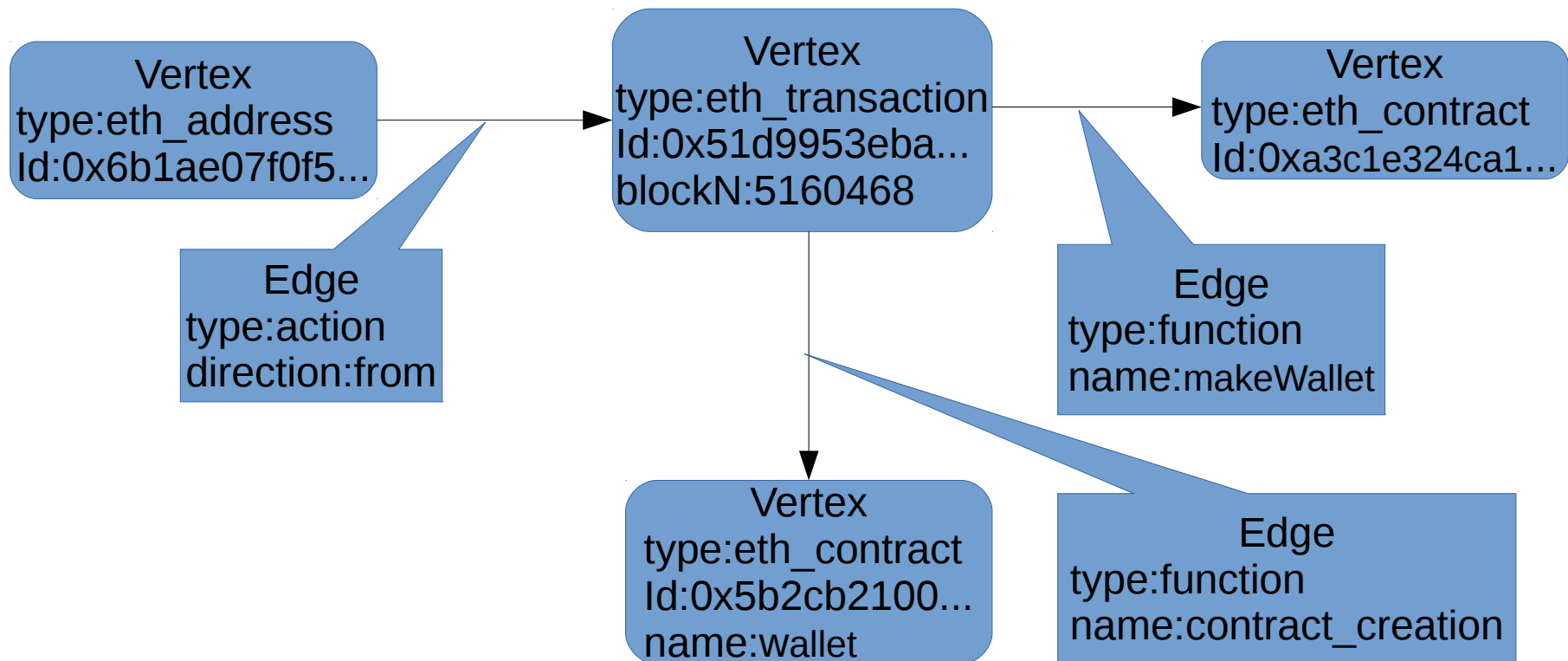name:contract_creation
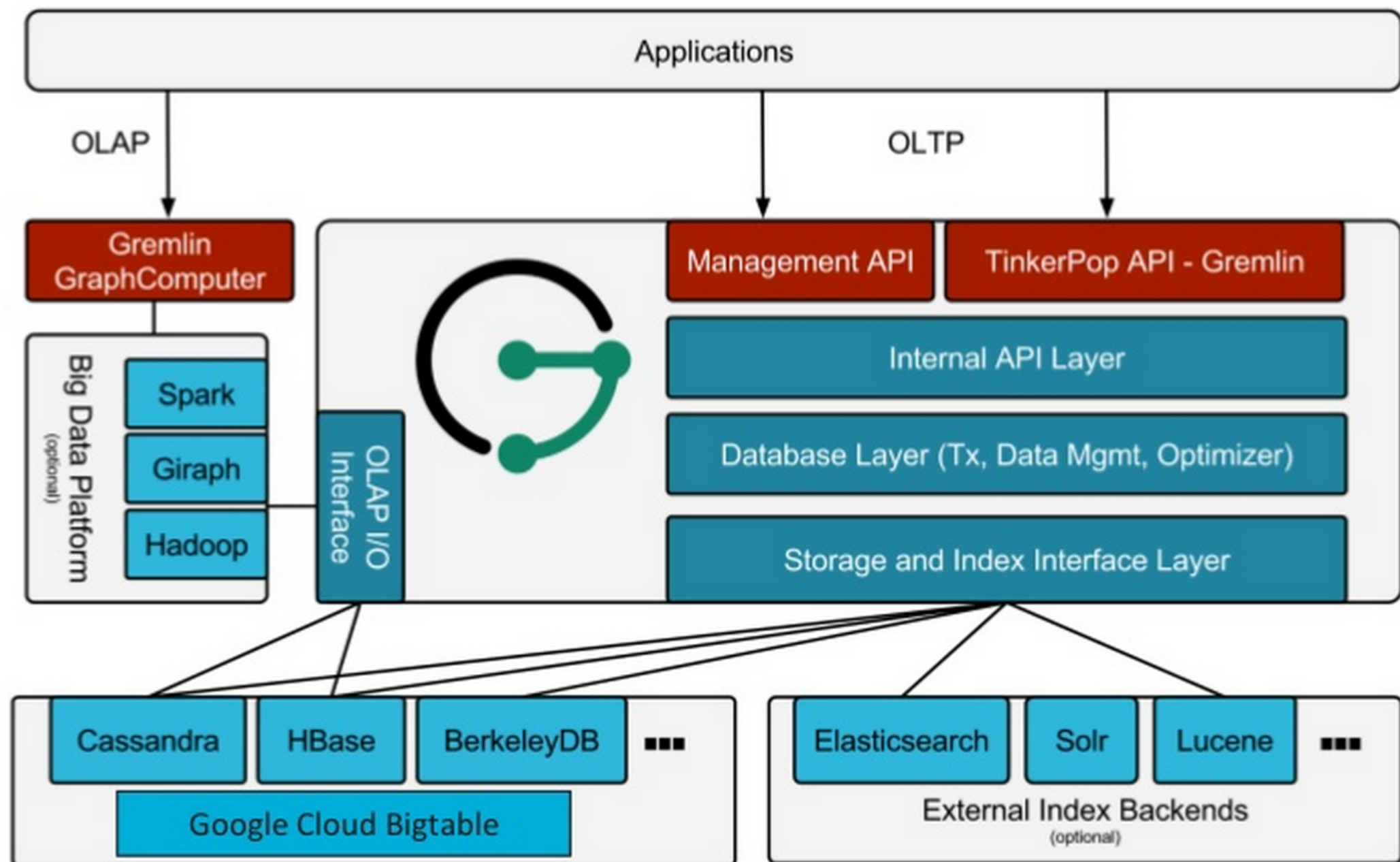
JanusGraph Schema and Data Model

transactionID=0x60c481200da8f62d4e88a4f15490f601d93ae92a2a4fe25db9eadf5cdab39d65
sender=0x6cace0528324a8afc2b157ceba3cdd2a27c4e21f
value=0
blockNumber=5160468
contractAddress=0xa3c1e324ca1ce40db73ed6026c4a177f099b5770
walletAddress=0x3063aa230afe29e00c7dd08371f82d2027a44324
action=makeWallet

Vertex
type:eth_address
Id:0x6b1ae07f0f5...

Vertex
type:eth_transaction
Id:0x51d9953eba...
blockN:5160468

Vertex
type:eth_contract
Id:0xa3c1e324ca1...

Edge
type:action
direction:from

Edge
type:function
name:makeWallet

Vertex
type:eth_contract
Id:0x5b2cb2100...
name:wallet

Edge
type:function
name:contract_creation

JanusGraph is a scalable graph database optimized for storing and querying graphs containing hundreds of billions of vertices and edges distributed across a multi-machine cluster. JanusGraph is a transactional database that can support thousands of concurrent users executing complex graph traversals in real time.

JanusGraph Architecture

Applications

OLAP

OLTP

Gremlin
GraphComputer

Management API

TinkerPop API - Gremlin

Big Data Platform (optional)

Spark

Giraph

Hadoop

OLAP I/O Interface

Internal API Layer

Database Layer (Tx, Data Mgmt, Optimizer)

Storage and Index Interface Layer

Cassandra

HBase

BerkeleyDB

∎∎∎

Google Cloud Bigtable

Elasticsearch

Solr

Lucene

∎∎∎

External Index Backends
(optional)

JanusGraph with HBase

- HBase – Perfect Storage Backend for JanusGraph

  - Big enough for your biggest graph!
  - The storage model
  - Read and write speed
  - Scalability and partitioning
  - Strong consistency
  - Tight integration with Hadoop Ecosystem
  - Great open community!
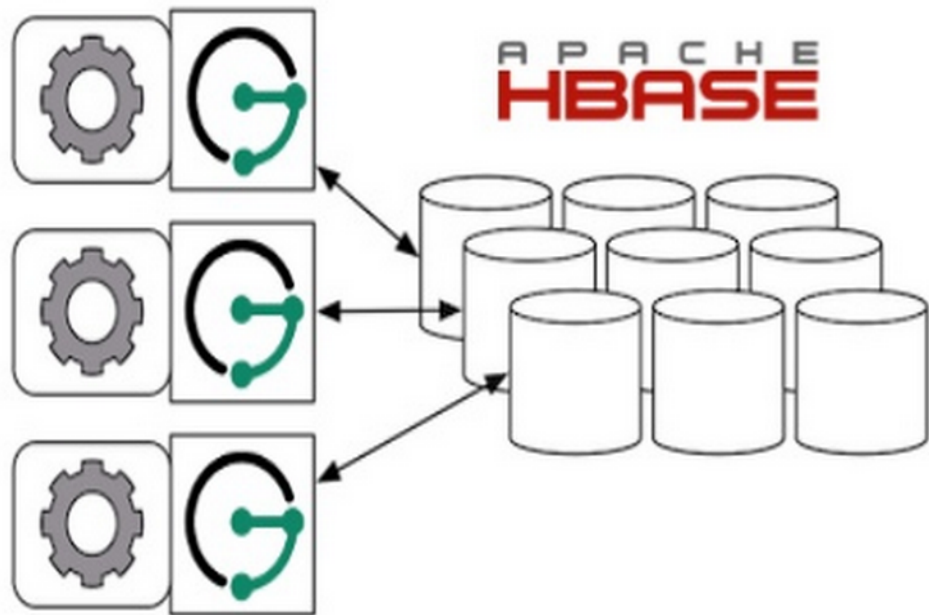
JanusGraph with HBase

- HBase – Perfect Storage Backend for JanusGraph

  - Simple configuration!

    - conf/janusgraph-hbase-solr.properties

      - ✓ storage.backend=hbase
      - ✓ storage.hostname=zookeeper-host1,zookeeper-host2,zookeeper-host3
      - ✓ storage.hbase.table=janusgraph
      - ✓ storage.hbase.ext.zookeeper.znode.parent=/hbase ← *Optional*
      - ✓ storage.hbase.ext.hbase.zookeeper.property.clientPort=2181 ← *Optional*

  - Just open your graph!

    - graph=JanusGraphFactory.open('conf/janusgraph-hbase-solr.properties')

JanusGraph with HBase

- HBase – Perfect Storage Backend for JanusGraph

  - ➤ Throw in an Index Backend for better performance

    - conf/janusgraph-hbase-solr.properties

    - ✓ index.search.backend=solr

    - ✓ index.search.solr.mode=cloud

    - ✓ index.search.solr.zookeeper-url=zookeeper-host1:2181/solr,zookeeper-host2:2181/solr,zookeeper-host3:2181/solr

    - ✓ index.search.solr.configset=janusgraph

JanusGraph with HBase

- HBase – Perfect Storage Backend for JanusGraph

  - ➢ Look into more details

    - Stores to Column Families

      - ✓ Edge store → e

      - ✓ Index store → g

      - ✓ ID store → i

      - ✓ Transaction log store → l

      - ✓ System property store → s

    - CF attributes can be set. E.g. compression, TTL.

JanusGraph with HBase

- HBase – Perfect Storage Backend for JanusGraph

  - Look into more details

    g.V().has("name", "Alice").out("knows").out("knows").values("name")
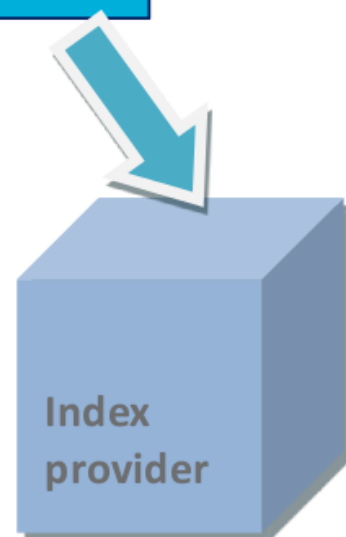
Graphexp

Get graph info

Node properties:
☑ name
☐ age
☐ lang

Edge properties:
☐ weight

Node color by: label ▼

Graph Info

Type	Count
Node labels	
software	2
person	4
Nodes properties	
[name, age]	4
[name, lang]	2
Edge labels	
created	4
knows	2
Edge properties	
[weight]	6
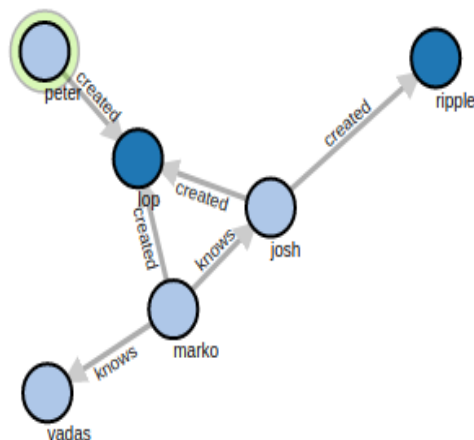
Query: "
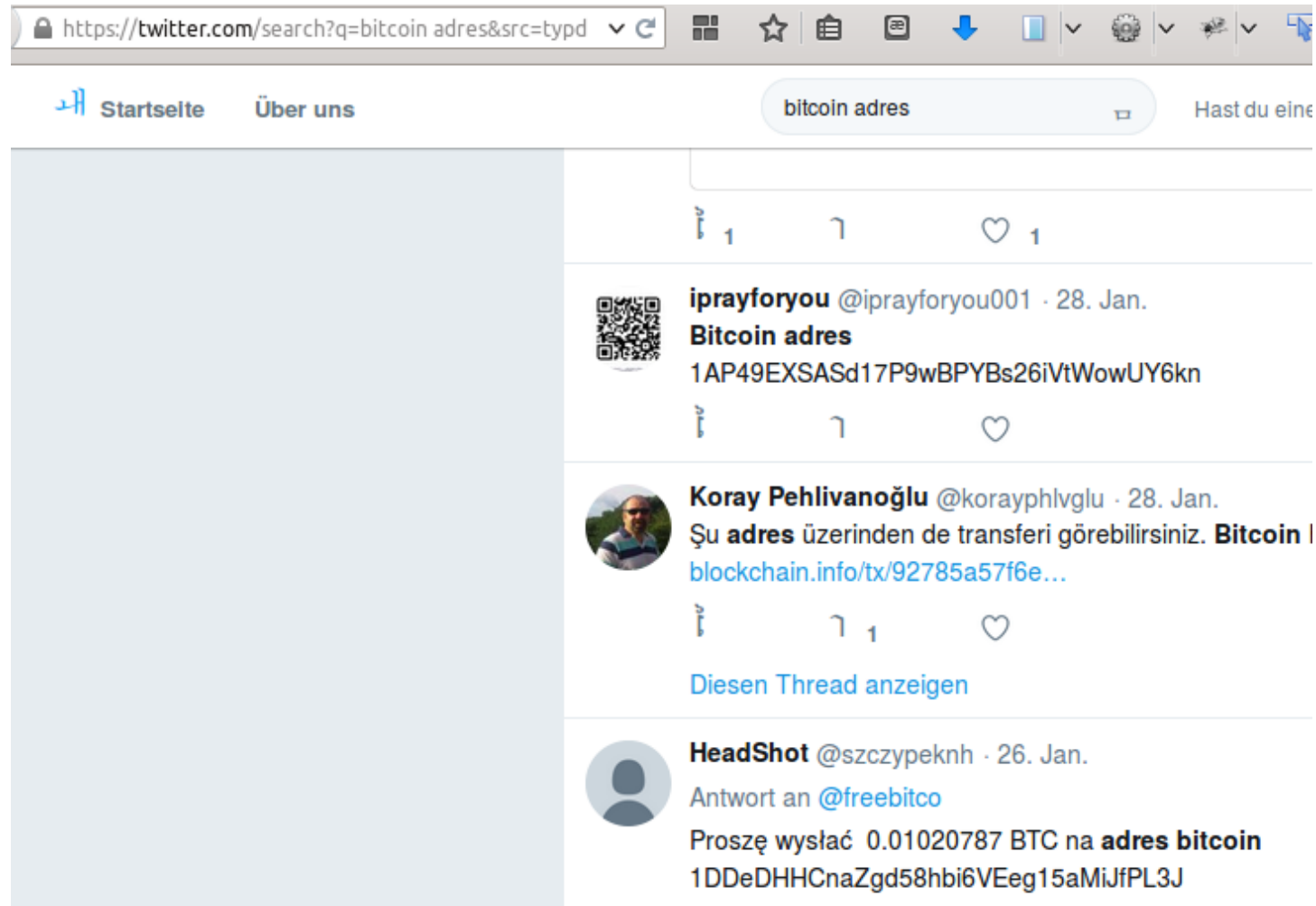
Item Info

Key	Value	
id	6	
label	person	

Key	Value	Id
name	peter	11
age	35	12

Twitter API

https://blog.twitter.com/official/en_us/a/2017/full-archive-search-api.html