

Bitcoin RDF Model in AllegroGraph

For more examples visit
– <https://github.com/franzinc/agraph-examples>

Introduction

This example demonstrates an RDF model for Bitcoin chain data as well as a Python tool to pull the data from a Bitcoin node into an instance of an AllegroGraph graph database. The model description itself can be found in the Turtle file `model.ttl`.

The following Turtle example demonstrates how this RDF model can be used to represent complete chain entities (given example is a genesis block – the first block in the mainnet Bitcoin chain; script strings omitted for brevity):

```
@prefix :   
<https://raw.githubusercontent.com/franzinc/agraph-examples  
/master/data/bitcoin/model.ttl#>  
@prefix btc: <bitcoin://>  
  
btc:blk0  
:height 0;  
:hash  
"000000000019d6689c085ae165831e934ff763ae46a2a6c172b3f1b60a  
8ce26f";  
:time 1231006505;  
:version 1;  
:transaction  
btc:4a5e1e4baab89f3a32518a88c31bc87f618f76673e2cc77ab2127b7  
afdeda33b.  
  
btc:4a5e1e4baab89f3a32518a88c31bc87f618f76673e2cc77ab2127b7  
afdeda33b  
:lockTime 0;  
:input [:unlockScript "..."].];
```

```
:output [:amount 5000000000; :lockScript "..."].
```

Setup

The following examples assume AllegroGraph triple store and assume it is already installed and running on the target machine. The following AG instance settings settings are assumed as well:

```
host: localhost (default);
port: 10035 (default);
username: aguser;
password: agpassword.
```

We also assume the following bitcoind settings:

```
host: localhost (default);
port: 8332 (default);
username: btcuser;
password: btcpassword.
```

First, install the tool by cloning this repository, setting up virtual environment and installing the dependencies:

```
git clone http://github.com/franzinc/agraph-examples
cd agraph-examples/data/bitcoin
python3 -m venv .
source ./bin/activate
pip3 install -r requirements.txt
```

The following command starts the process of loading bitcoin chain data into an AG repository named bitcoin using 4 loader processes:

```
./convert.py \  
-source=http://btcuser:btcpassword@localhost:8332 \  
-destination=http://aguser:agpassword@localhost:10035 \  
-name=bitcoin \  
-workers=4 \  
-clear
```

Example queries

Following are the examples of using SPARQL to extract different information about block data:

- number of known blocks:

```
PREFIX                                :  
<https://raw.githubusercontent.com/franzinc/agraph-examples  
/master/data/bitcoin/model.ttl#>  
SELECT (COUNT(*) AS ?count) WHERE { ?b a btcm:Block. }
```

- total number of transactions:

```
PREFIX                                :  
<https://raw.githubusercontent.com/franzinc/agraph-examples  
/master/data/bitcoin/model.ttl#>  
SELECT (COUNT(*) AS ?count) WHERE { ?tx a btcm:Transaction.  
}
```

- transaction in block 400:

```
PREFIX                                :  
<https://raw.githubusercontent.com/franzinc/agraph-examples  
/master/data/bitcoin/model.ttl#>  
SELECT ?txid  
WHERE {  
  ?b a :Block.  
  ?b :height "570001"^^xsd:int.  
  ?b :transaction ?tx.  
  ?tx :txid ?txid.  
}
```

- transactions sending more than 1000 BTC:

```
PREFIX                                :  
<https://raw.githubusercontent.com/franzinc/agraph-examples  
/master/data/bitcoin/model.ttl#>  
SELECT ?tx  
WHERE {  
  ?b a :Block.
```

```
?b :transaction ?tx.  
?tx :output ?out.  
?out :amount ?amt.  
}  
GROUP BY ?tx  
HAVING (SUM(?amt) > 1000000000000)
```

- transactions sending BTC to Pirate Bay's address:

```
PREFIX :  
<https://raw.githubusercontent.com/franzinc/agraph-examples  
/master/data/bitcoin/model.ttl#>  
SELECT ?tx  
WHERE {  
?tx :output ?out.  
?out :lockScript ?s.  
FILTER REGEX (?s, "<tpb address>").  
}
```