CS5604, Information Retrieval, Fall 2016

# Collection Management (Tweets) Final Presentation

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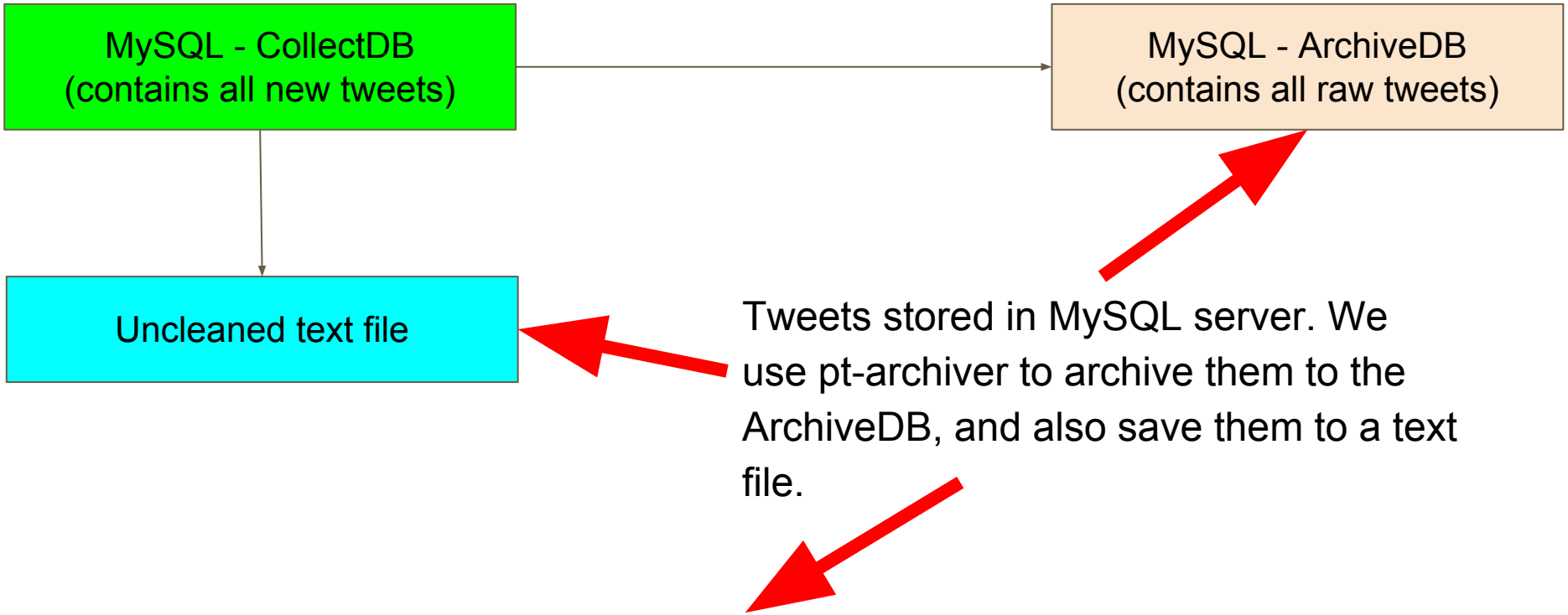
# Additions regarding tweet updates

| | | Before | Now |
|---|---|---|---|
| MySQL to HDFS | Mode of transfer | Batch mode | Incremental update |
| HDFS to HBase | | Batch mode | Incremental update |

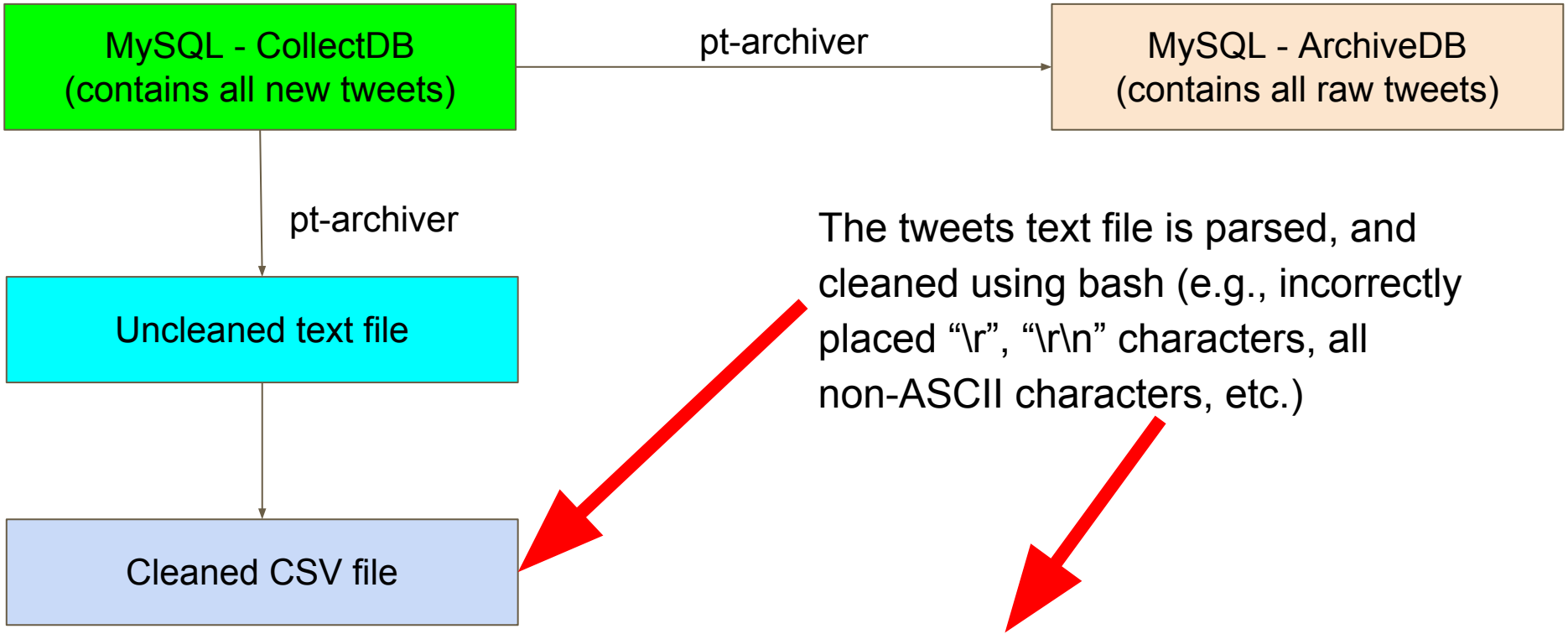
# What features did we improve?

| What was done before? | How did we improve it? |
| --- | --- |
| Limited amount of tweet parsing. | We are extracting a lot more fields now as per different teams' requirements. |
| Social network based on users as nodes, and links using mentions and re-tweets. Only one kind of node, with little emphasis on importance value. | Three kinds of nodes - users, tweets, and URLs. We are using the Twitter API to calculate an importance value for the users and the tweets, and taking the number of occurrences of a URL in a tweet collection as an indication of its importance within that collection. |

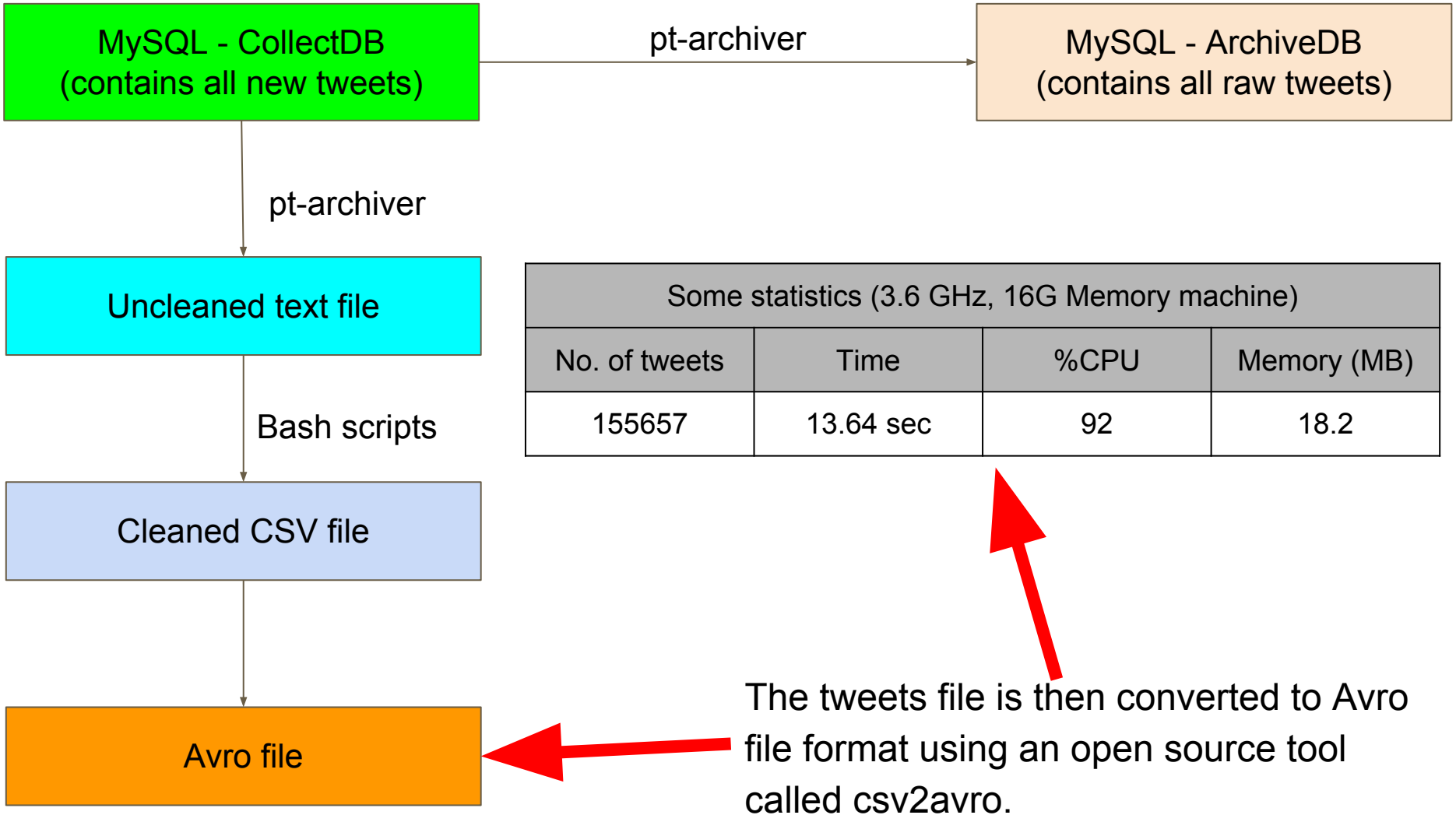
# Incremental Update From MySQL to HDFS



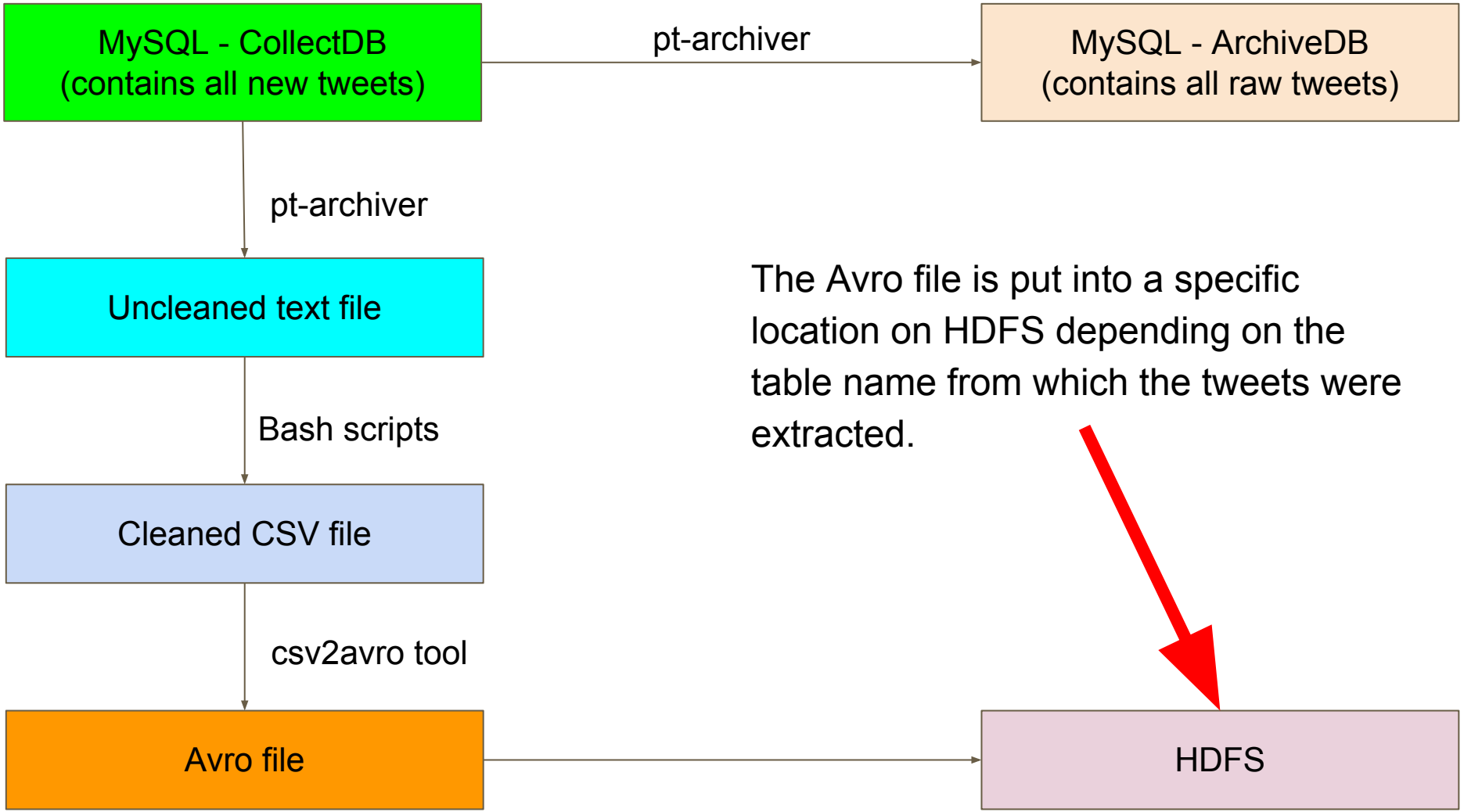

| Some statistics (3.6 GHz, 16G Memory machine) | | | |
|---|---|---|---|
| No. of tweets | Time | %CPU | Memory (MB) |
| 155657 | 1 min 35 sec | 29 | 19.7 |

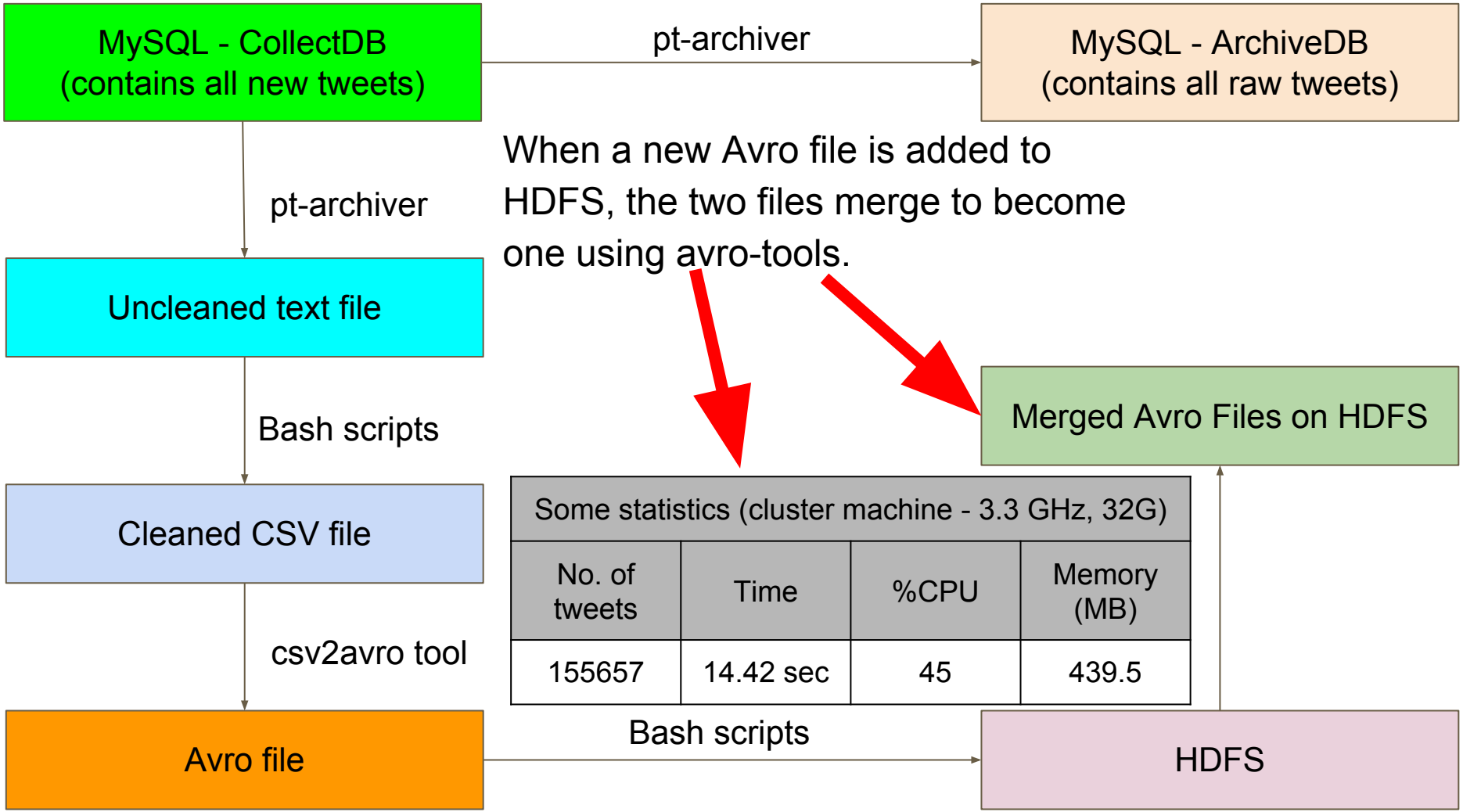



| Some statistics (3.6 GHz, 16G Memory machine) | | | |
|---|---|---|---|
| No. of tweets | Time | %CPU | Memory (MB) |
| 155657 | 7.89 sec | 57 | 169.9 |

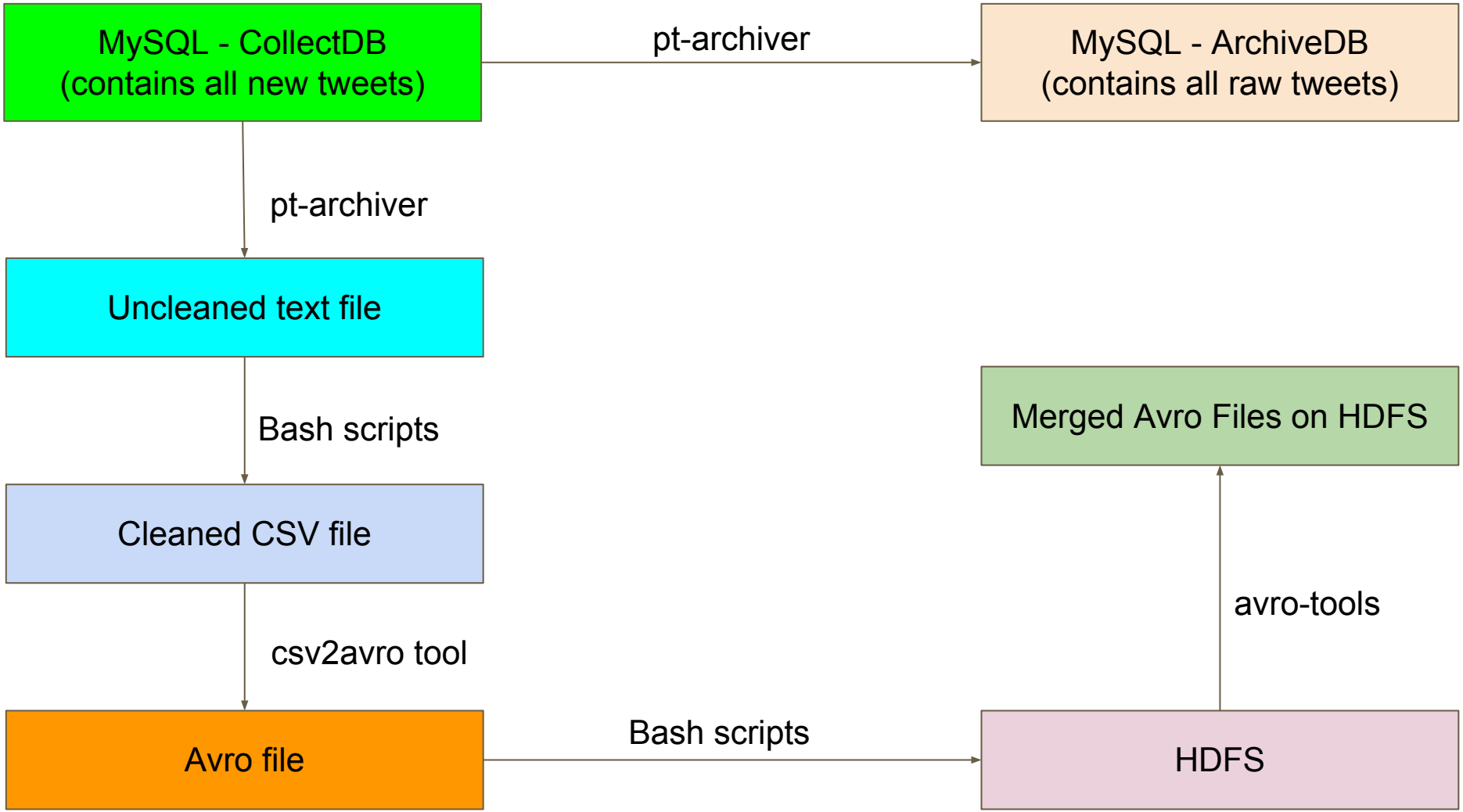



| Some statistics (3.6 GHz, 16G Memory machine) | | | |
|---|---|---|---|
| No. of tweets | Time | %CPU | Memory (MB) |
| 155657 | 13.64 sec | 92 | 18.2 |


MySQL - CollectDB
(contains all new tweets)
pt-archiver
MySQL - ArchiveDB
(contains all raw tweets)
pt-archiver
Uncleaned text file
Bash scripts
Cleaned CSV file
csv2avro tool
Avro file
HDFS
The Avro file is put into a specific location on HDFS depending on the table name from which the tweets were extracted.




| Some statistics (cluster machine - 3.3 GHz, 32G) | | | |
|---|---|---|---|
| No. of tweets | Time | %CPU | Memory (MB) |
| 155657 | 14.42 sec | 45 | 439.5 |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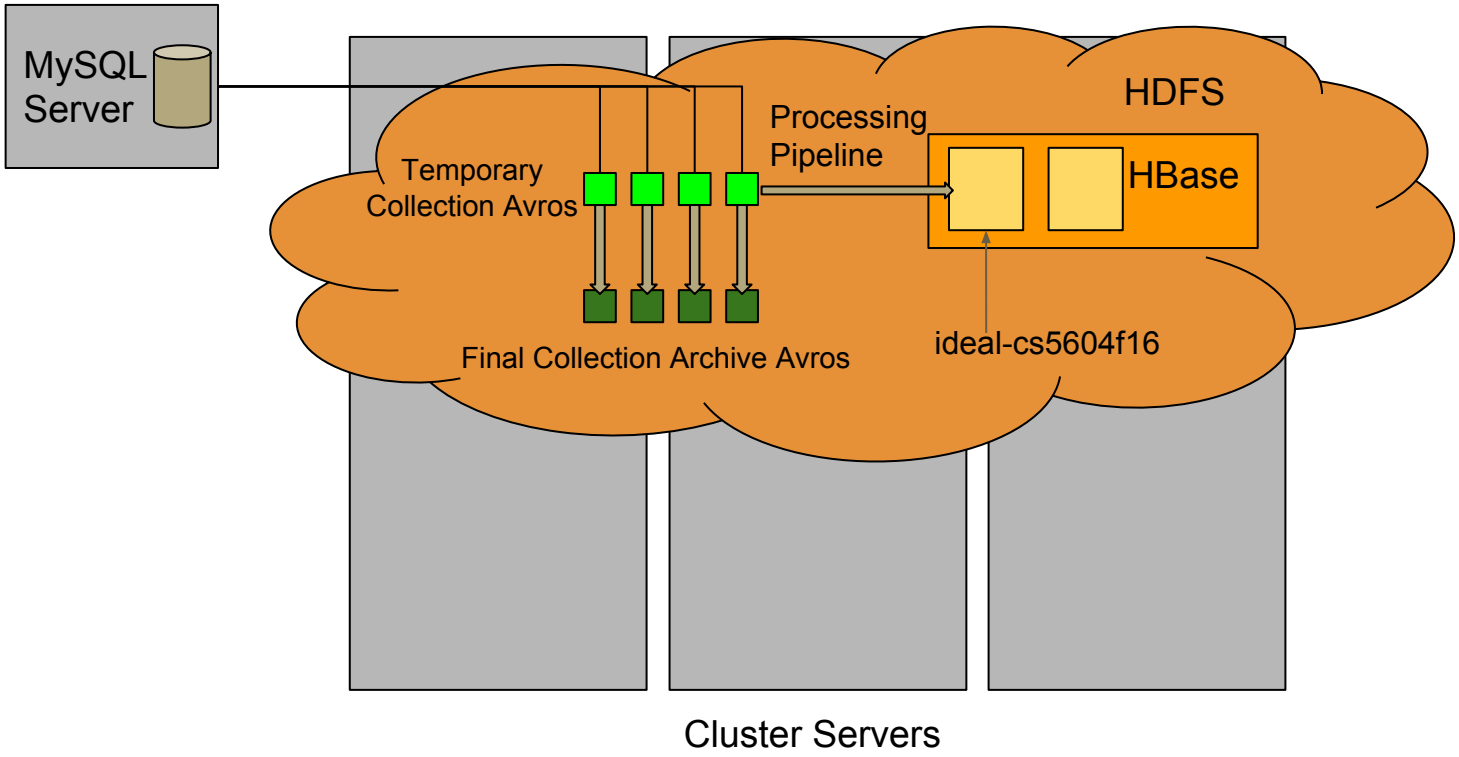
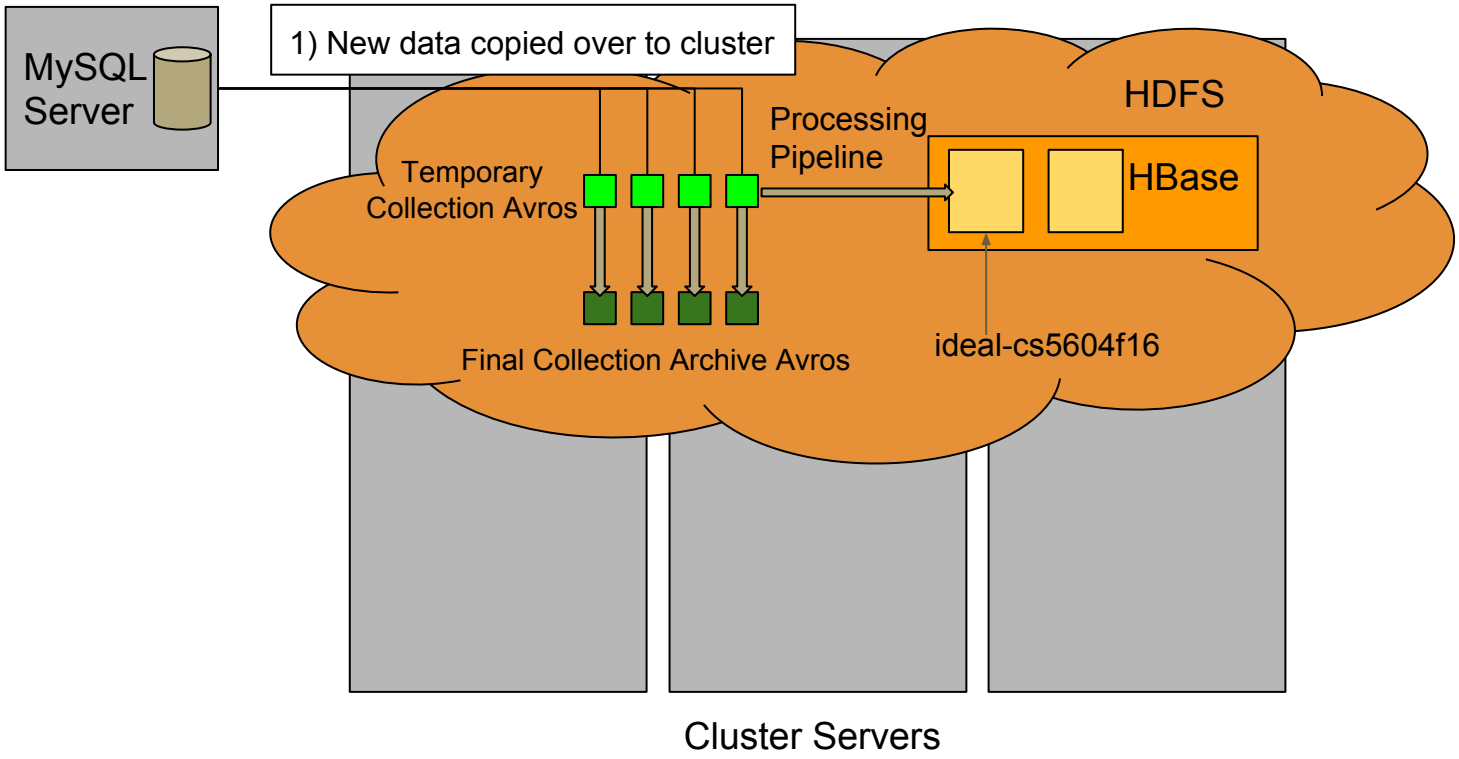
Avro file
Bash scripts
HDFS
avro-tools
Merged Avro Files on HDFS

# Incremental Update from HDFS to HBase + Tweet Processing

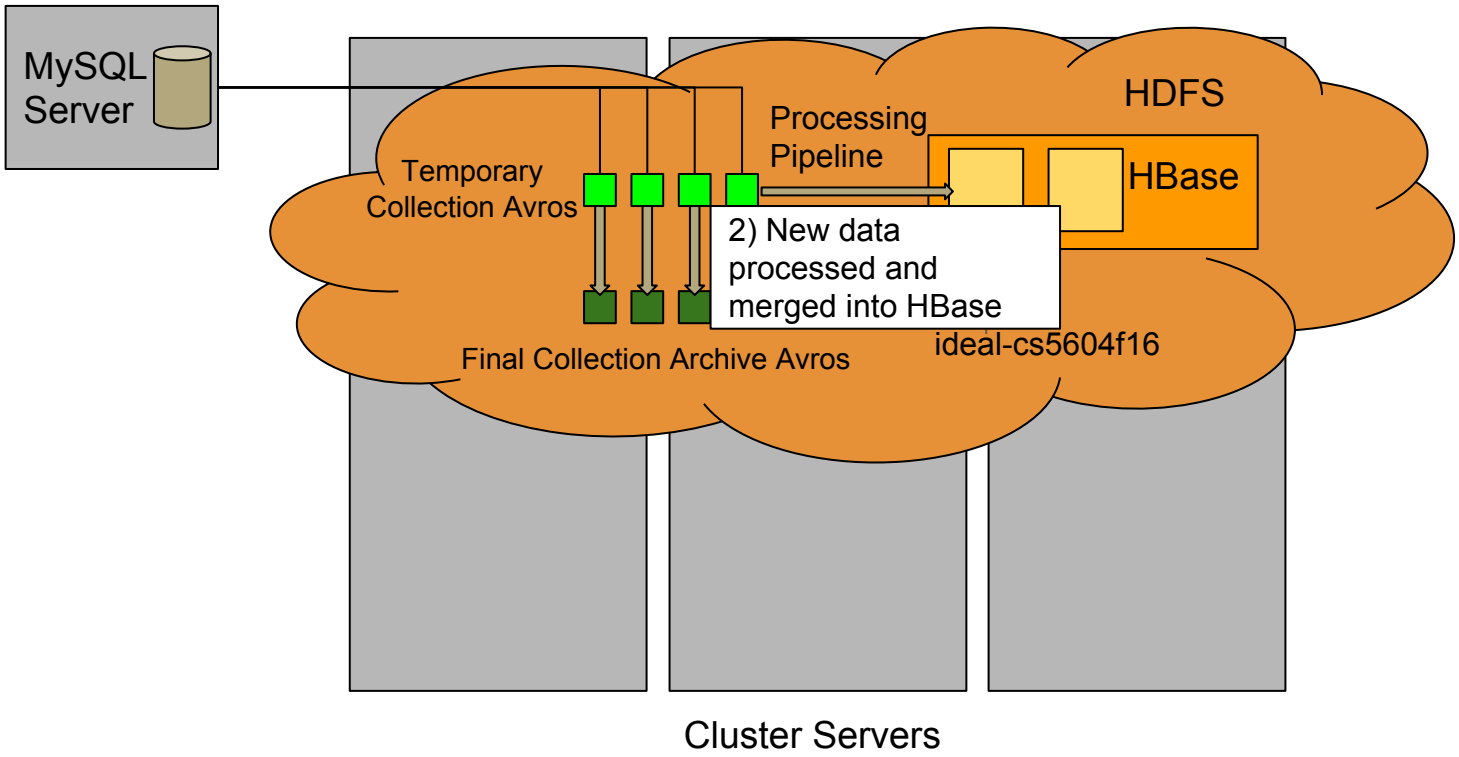
# Tweet Loading Pipeline



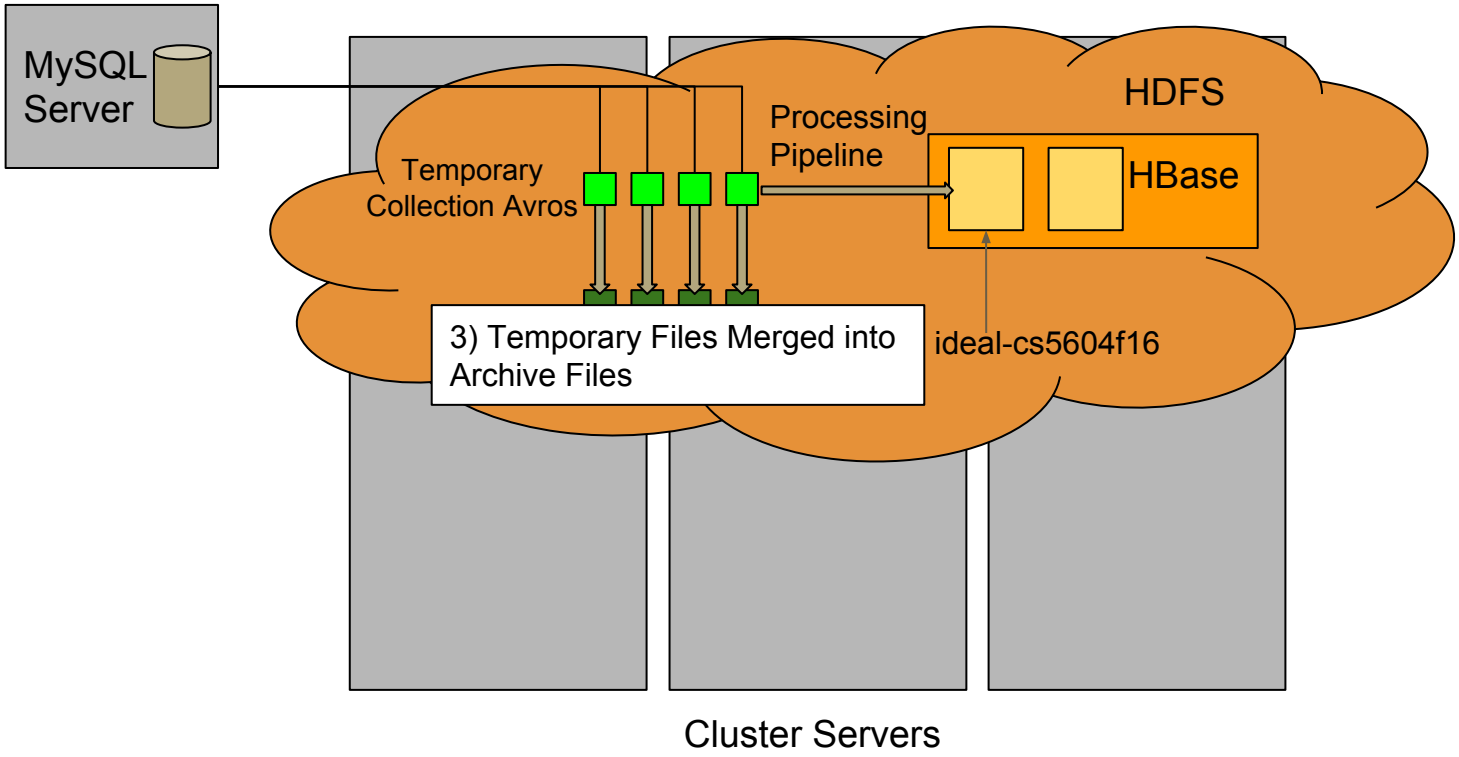
# Tweet Loading Pipeline



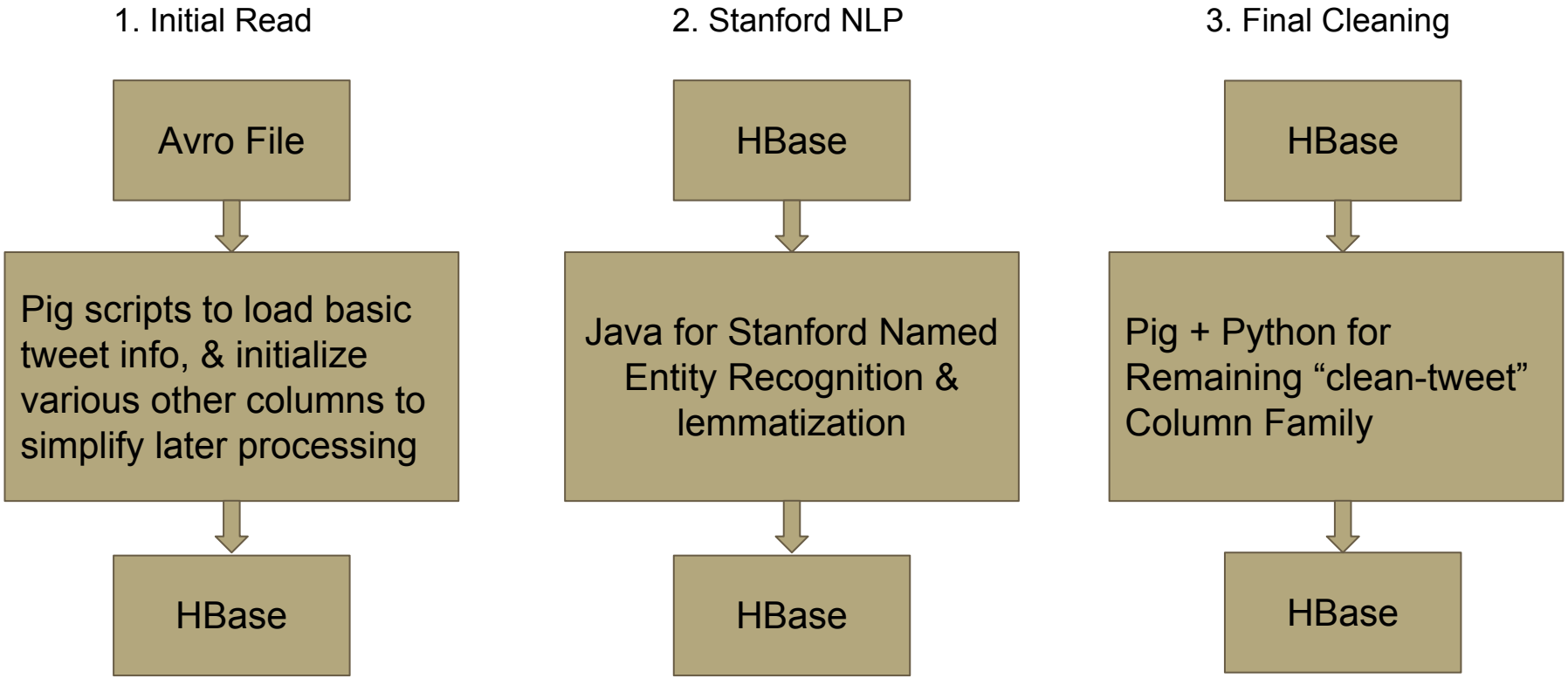
# Tweet Loading Pipeline



# Tweet Loading Pipeline



# Tweet Processing Pipeline



# Running Time Test

**Collection**: 312 (Water Main Break)

**Number of Tweets:** 155657

**Initial Read:** ~ 2 minutes

**Lemmatization:** ~33 minutes

**Cleaning Step:** ~27 minutes

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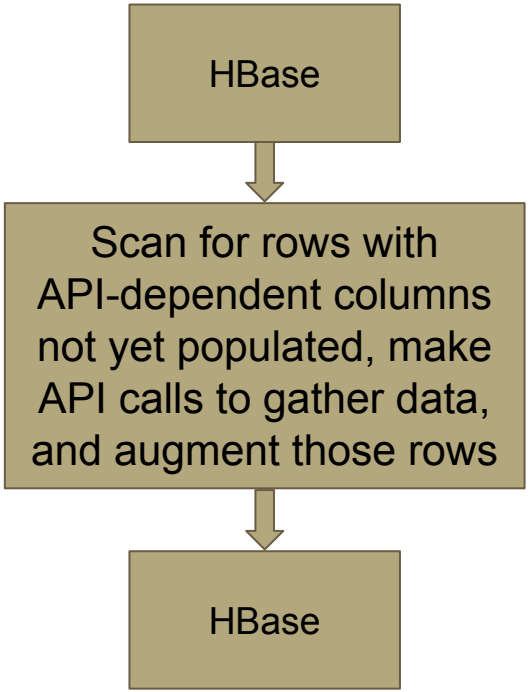
**Total time:** 1 hour

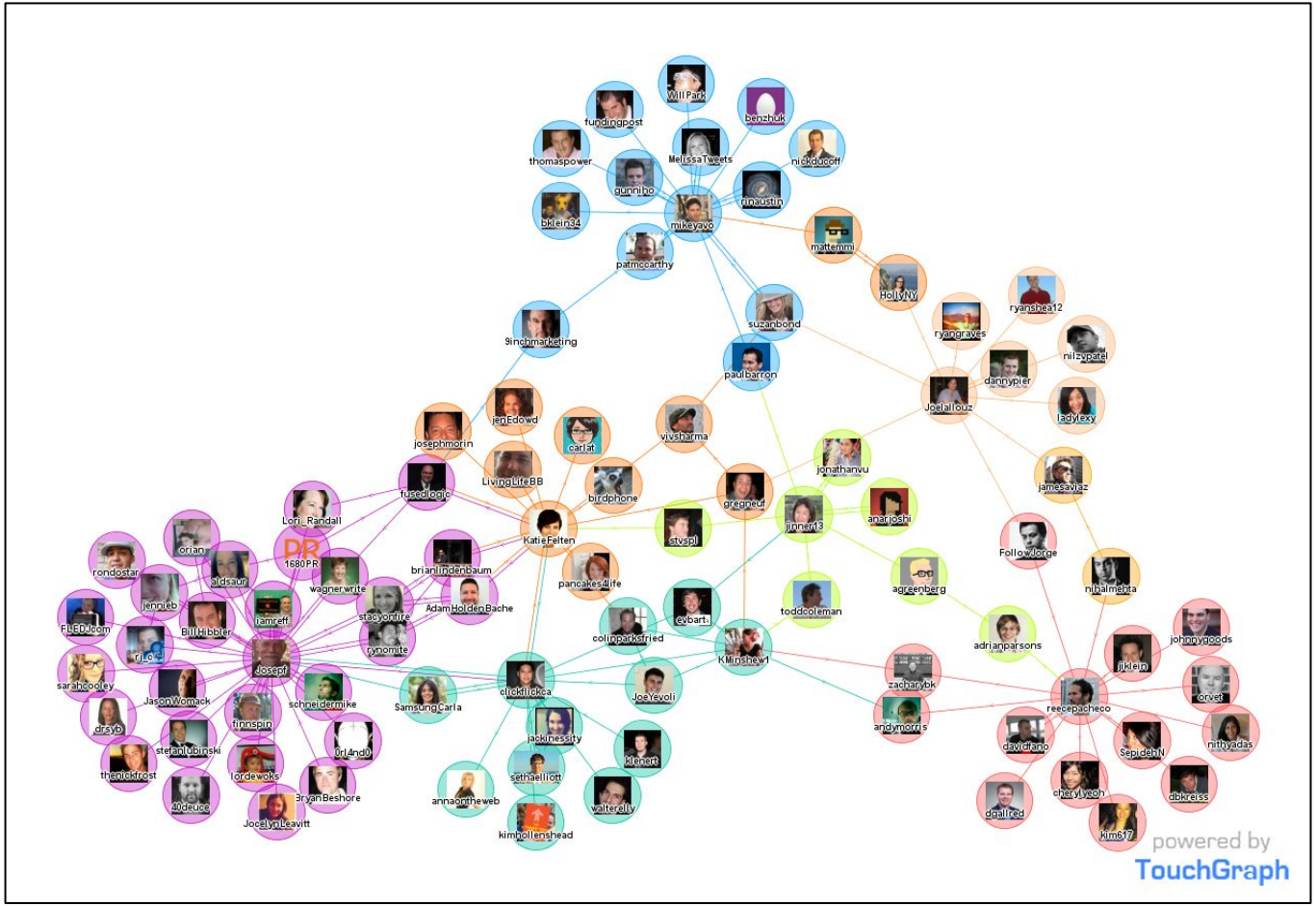
# Asynchronous Updates

Two clean-tweet columns are better suited for asynchronous updates:

- URL Extraction (Twitter has best information on URLs in tweets, rate-limited)
- Google Geolocation (rate-limited)



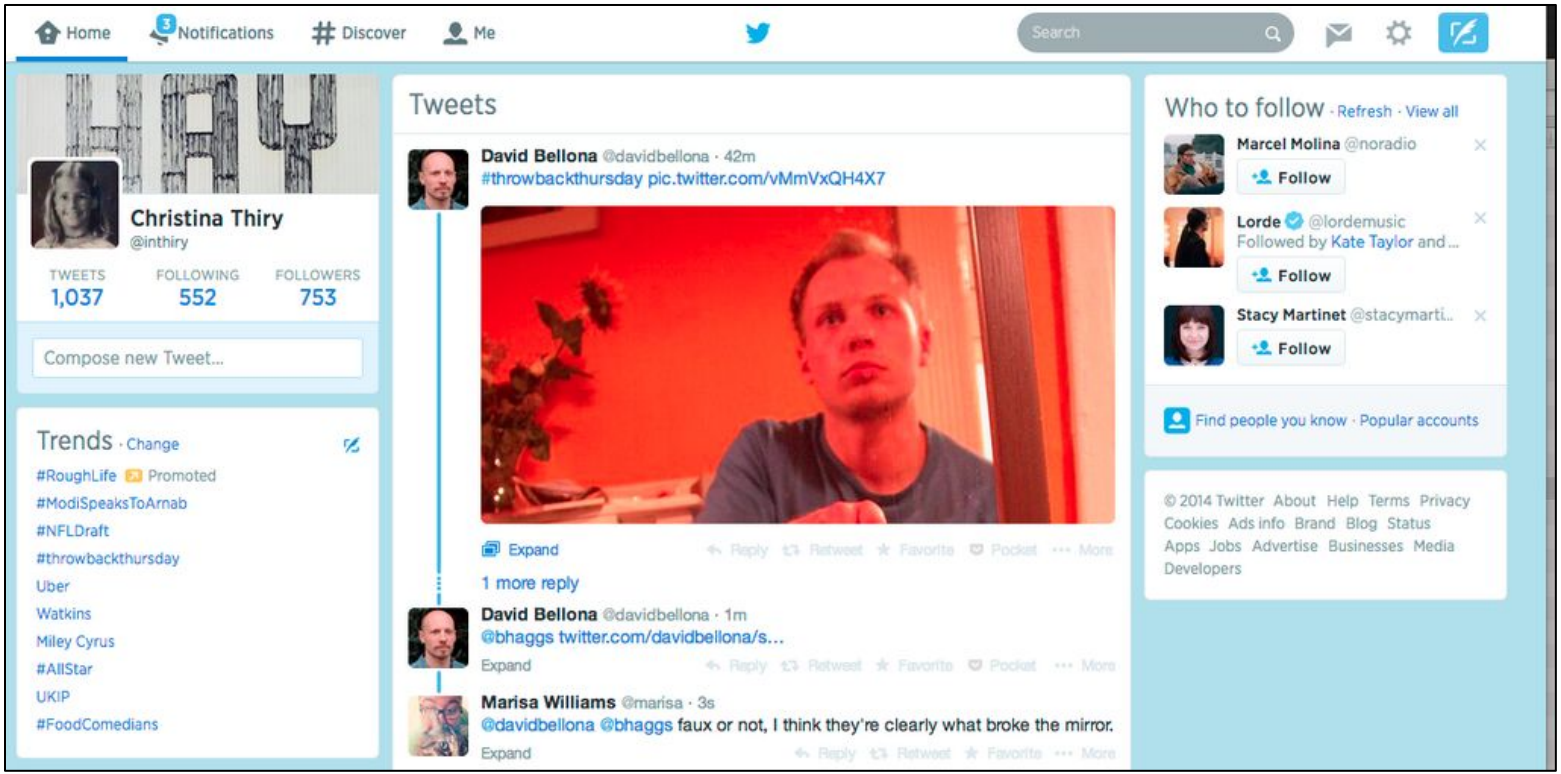
# Social Network




**Build a social network based on the tweet collection**

Credit: http://www.touchgraph.com

# Objective




**Rank the nodes for social network based recommendations**

Credit: http://thenextweb.com/twitter/2014/05/09/twitter-updates-web-layout-third-column-content-recommendation/

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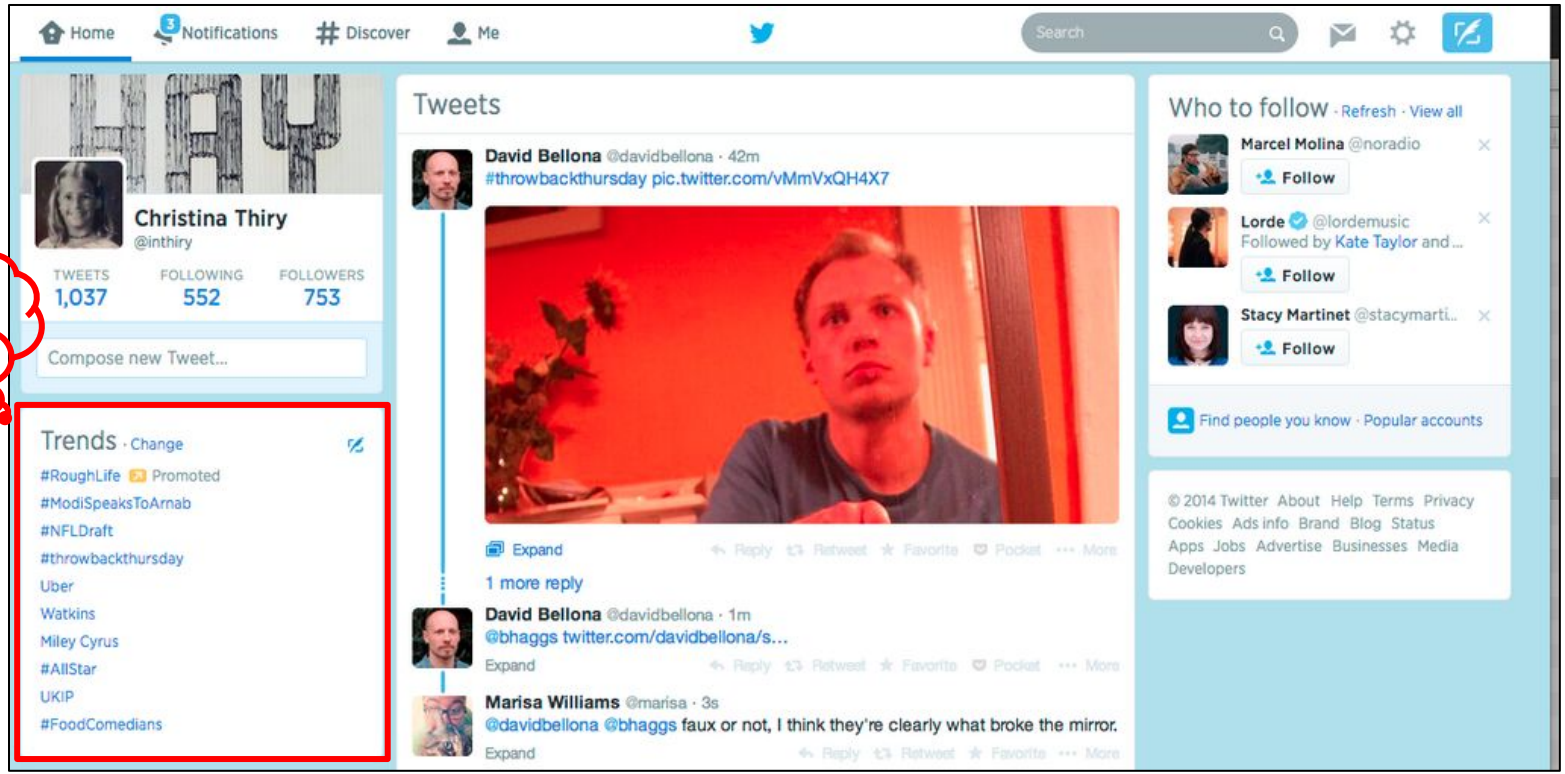



Hot topics

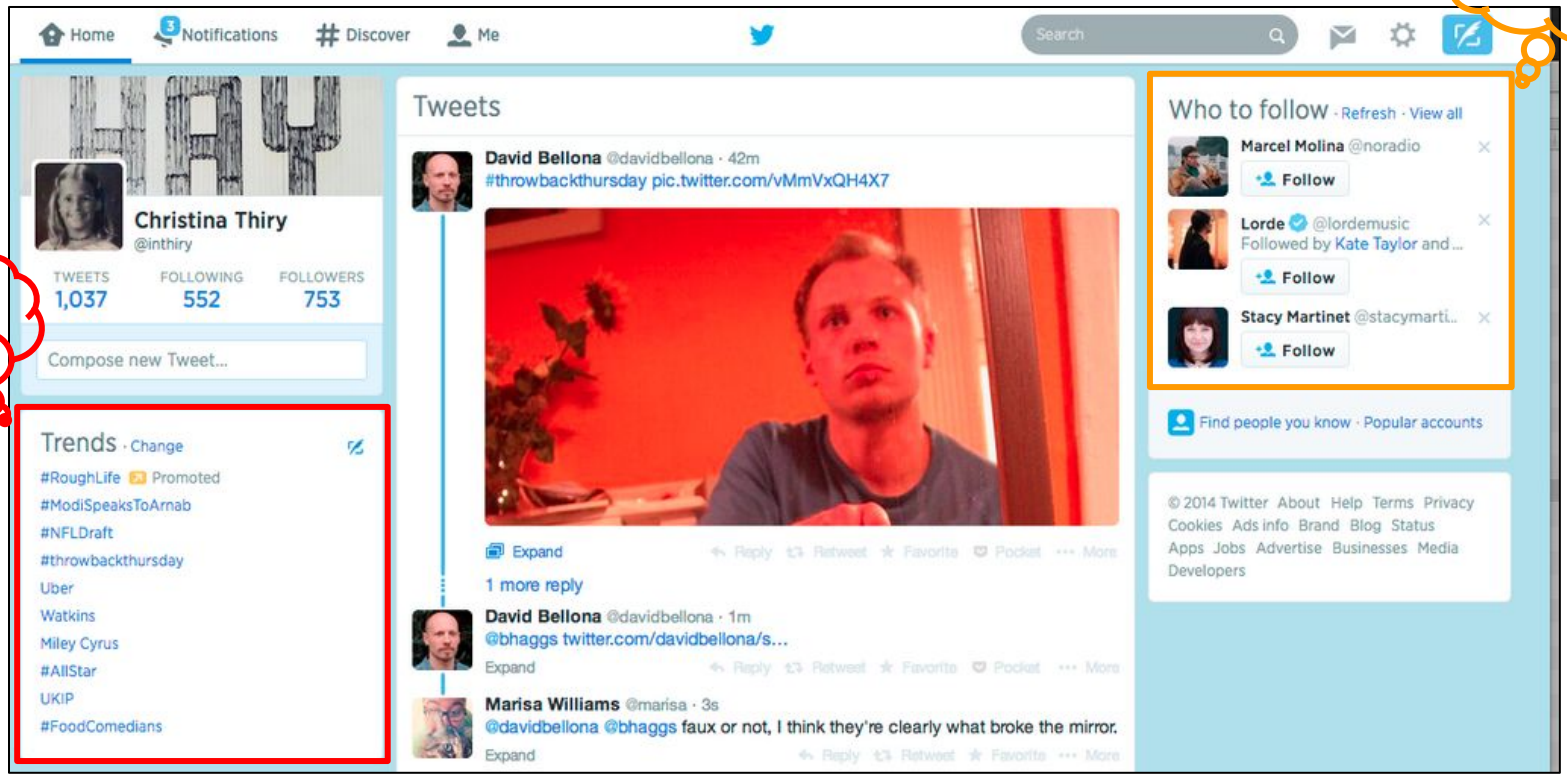
**Rank the nodes for social network based recommendations**

Credit: http://thenextweb.com/twitter/2014/05/09/twitter-updates-web-layout-third-column-content-recommendation/

# Objective

Popular people

Hot topics




**Rank the nodes for social network based recommendations**

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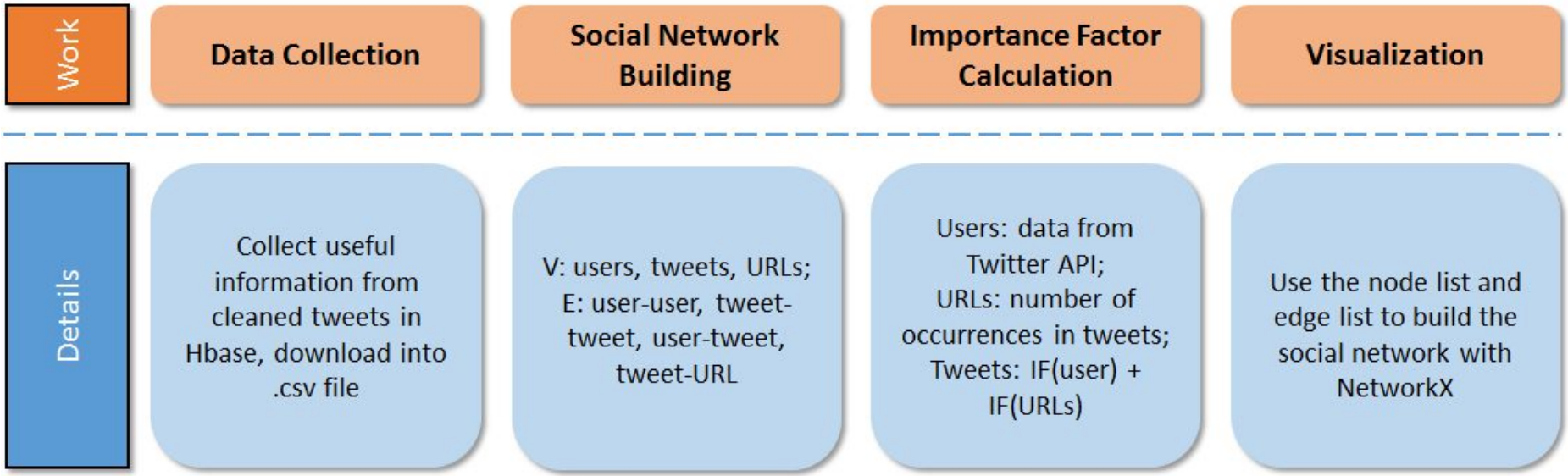
# Pipeline

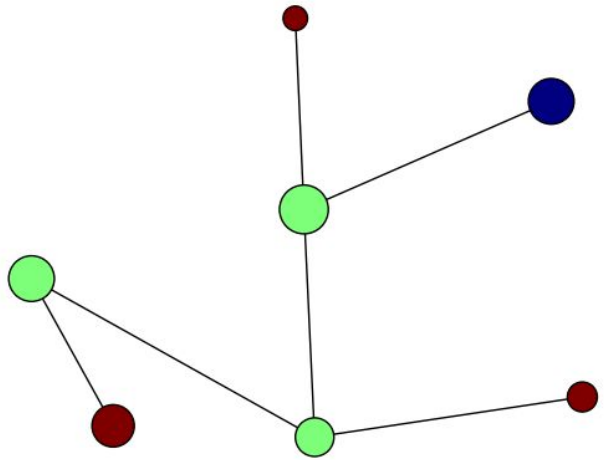

Work
Data Collection
Social Network Building
Importance Factor Calculation
Visualization
Details
Collect useful information from cleaned tweets in Hbase, download into .csv file
V: users, tweets, URLs; E: user-user, tweet-tweet, user-tweet, tweet-URL
Users: data from Twitter API; URLs: number of occurrences in tweets; Tweets: IF(user) + IF(URLs)
Use the node list and edge list to build the social network with NetworkX

# Previous work

- The S16 team built a social network G(V, E) where:
- Nodes (V): Users
- Edges (E): Edges between users according to RTs and mentions (@)
- Importance factor (IP): For edges (count)

# Nodes

| Nodes | Color |
| --- | --- |
| Users | Red |
| URLs | Blue |
| Tweets | Green |



# Edges

| Edges | Sources |
| --- | --- |
| User - User | Retweet (RT) , Mention (@) |
| Tweet - Tweet | Retweet (RT) |
| User - Tweet | If User posts the tweet |
| Tweet - URL | If the tweet includes the URL |

# Importance Factor

| Nodes | Importance Factor (IF) | Methods |
|---|---|---|
| Users | #followers, #friends, #statuses, #favorites, #listed (Twitter API) | IF(user) = 0.25 * #followers + 0.25 * #friends + 0.15 * #statuses + 0.25 * #favorites + 0.1* #listed |
| URLS | Number of occurrences of the URL in the tweet collection | IF(URLs) = #occurrences of a given URL / total number of URLs in the collection |
| Tweets | Importance factor of the tweeter and importance factor of URLs in the tweet | IF(Tweet) = .70 * IF(Users) + .30 * IF(URLs) |

# Visualization

- Tools
  - Python (NetworkX)

- Statistics
  - Number of tweets: 300
    - Collection z_3
  - Twitter API imposes size constraints
    - (180 queries every 15 minutes)

- Nodes
  - 300 tweet nodes
  - 158 user nodes
  - 110 URL nodes

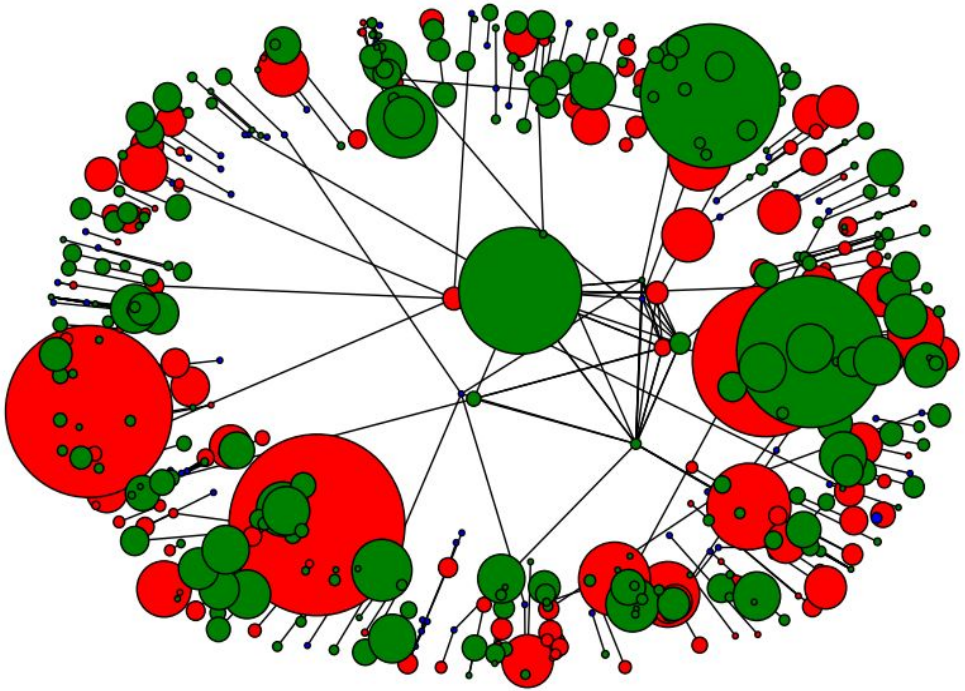
- Edges
  - 73 user-user edges
  - 54 tweet-tweet edges
  - 300 user-tweet edges
  - 140 tweet-URL edges

# Visualization

Green: tweets

Red: users

Blue: URLs

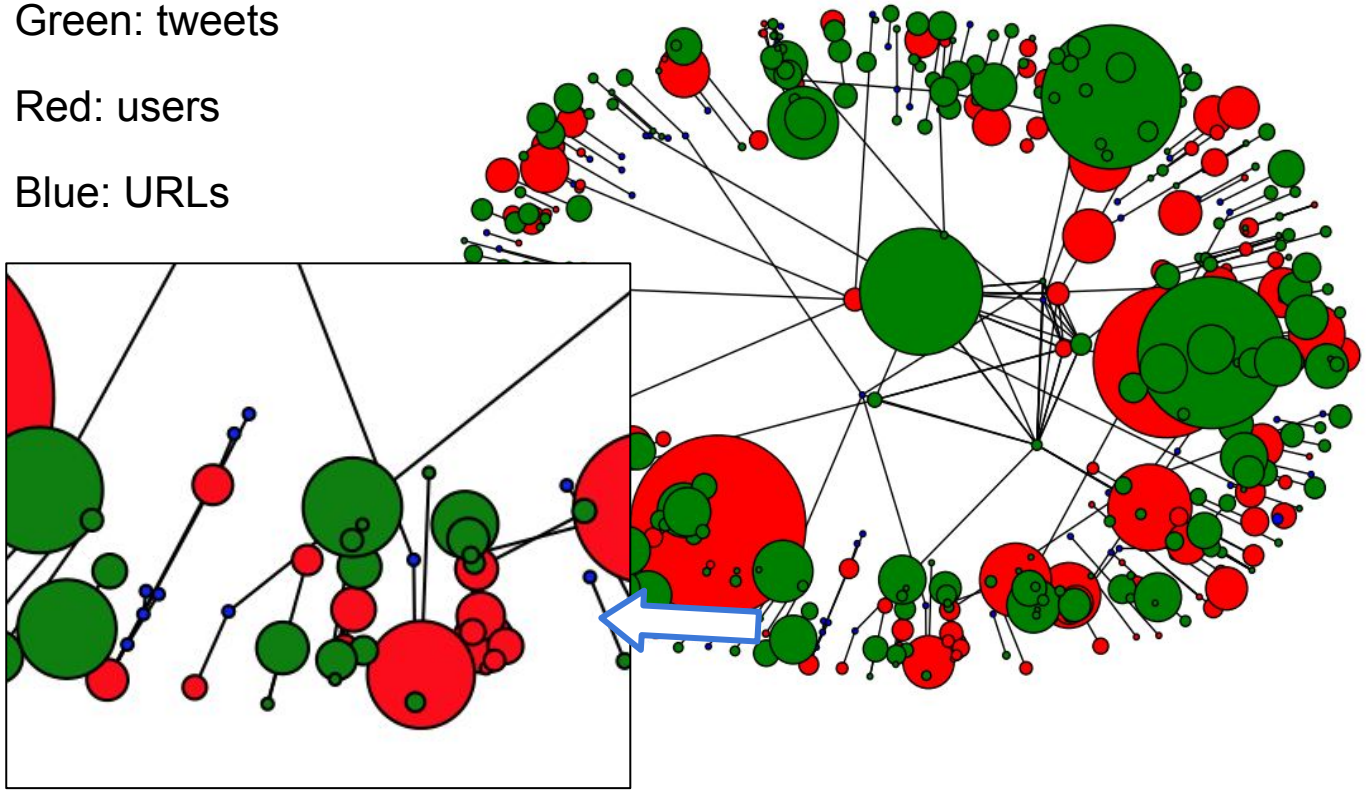


# Visualization

Green: tweets

Red: users

Blue: URLs



# Summary & Future Work

- We have delivered a robust ETL pipeline for moving tweets

- Can store and process thousands of tweets quickly
  - Flexible scripts accommodate large or small volumes of tweets

- In the future:
  - Do not remove comma, and double quotes from the text file of tweets
  - Develop asynchronous scripts to enhance tweets via API calls
  - Rigorous speed tests/processing pipeline optimization (including schema)
  - More extensive plan for handling profanity
  - Add hashtags to social network

# Challenges Faced

- Incomplete documentation from the previous semester
  - Schema
- Unfamiliarity with HBase, Pig, Twitter, Stanford NER
- Large, pre-existing system to understand
- Working in groups
  - Meeting time that works for all
  - Difficult to divide work based on our varying expertise
  - Dilemma to work together, or individually on parts of the project

# As a Learning Experience

- Exposure to different technologies
  - HBase + Hadoop Framework
  - Pig
  - Stanford NLP
  - Regex

- Concepts:
  - Extract, Transform, Load (ETL) Pipeline
  - NoSQL databases
  - Text parsing
  - Communication & synchronization between teams

- Overall
  - Divide responsibilities
  - Work iteratively
  - Ask questions

# Acknowledgement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- Dr. Edward A. Fox
- GRA: Sunshin Lee

# References


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