Exploiting the Spam Correlations in Scalable Online Social Spam Detection

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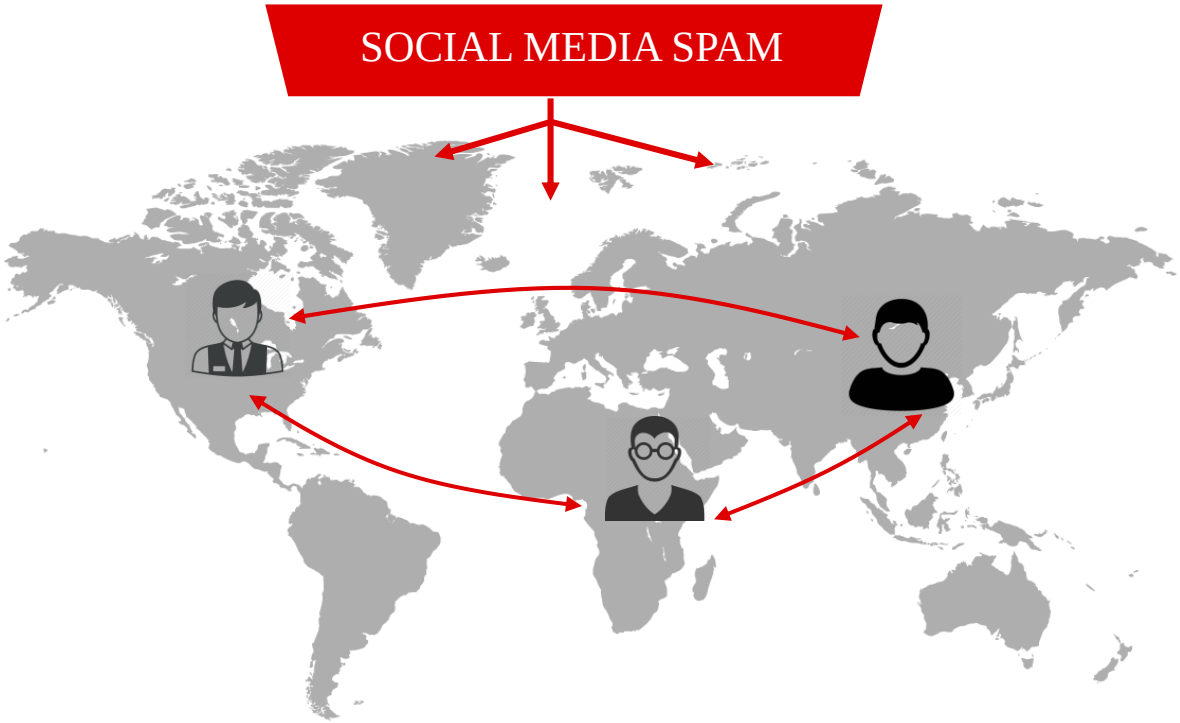
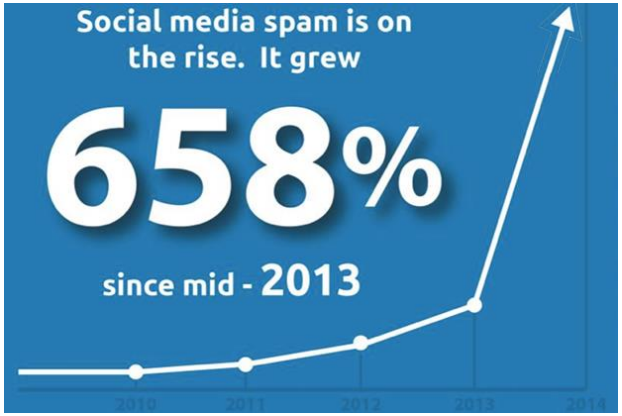
Outline

- **Background**
  - Background & Problem
  - Challenges
- **System Design**
  - Workflow
  - Implementation Details
  - Design Benefits
- **Evaluation**
  - Spam Detection Evaluation
  - System Evaluation
- **Conclusion & Future Work**

Background





Twitter

- 450,00
- 5.7 mill
- 70 milli

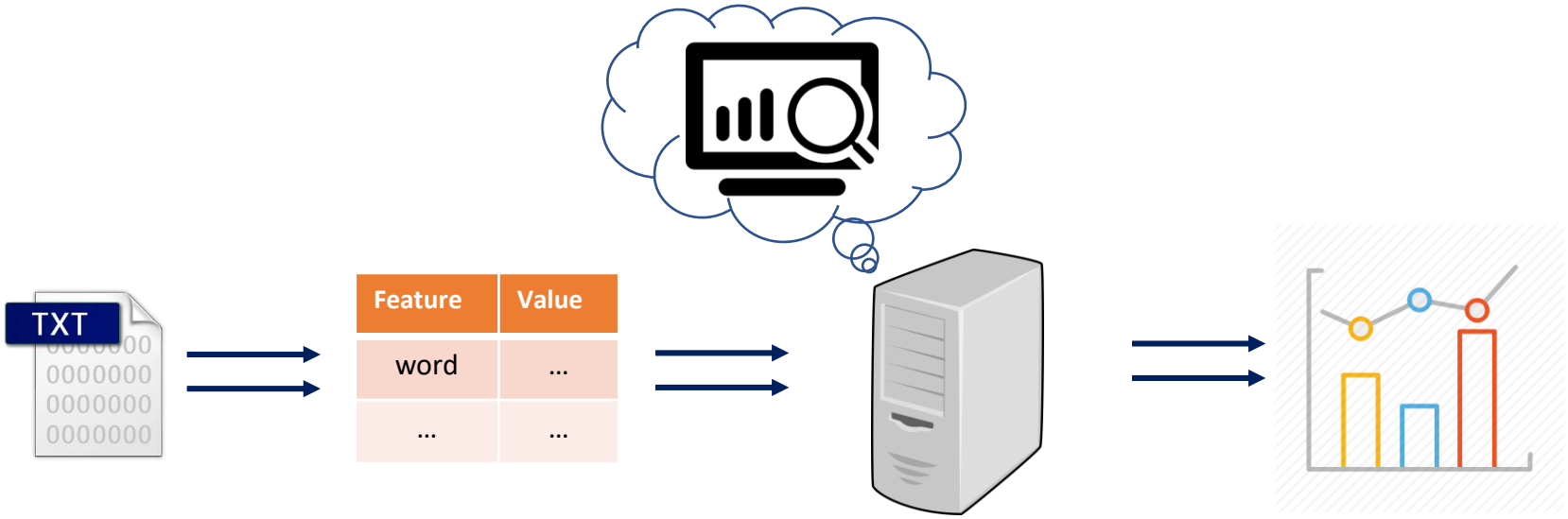
Facebook

users
ook profiles

47% of social users are witnessing increased spam !

Background – Traditional Methods

Limited Data + Offline Detection

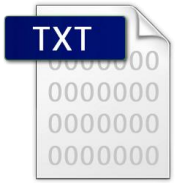


single dataset feature set analysis results

Problem

Limited Data

Single view from a limited dataset

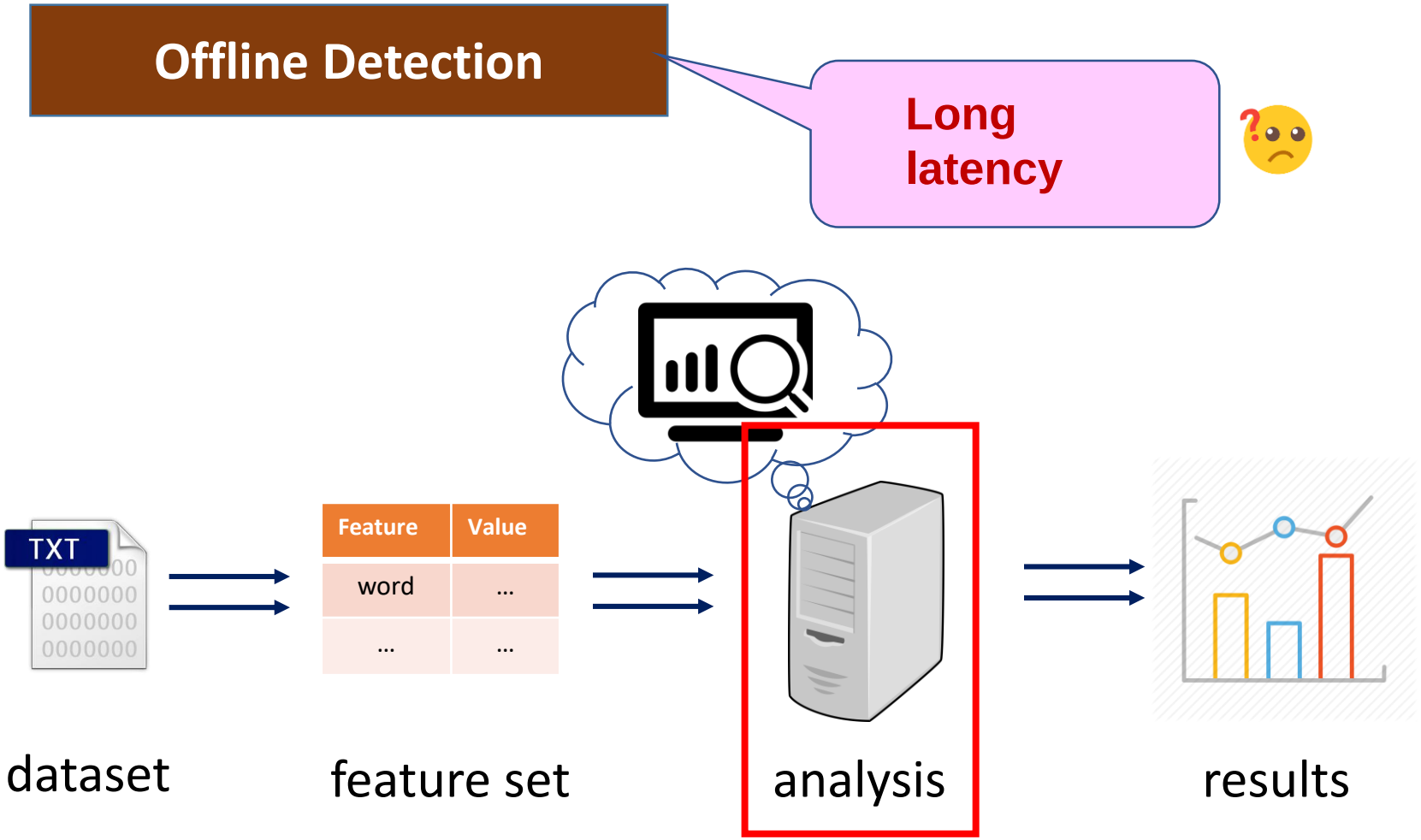


limited data

Limit #1
Lost global view

(the analysis bases on data from a single/limited dataset without the view of online global data from multiple data sources)

Problem


Offline Detection
Long latency
TXT
Feature
Value
word
...
...
...
dataset
feature set
analysis
results

Limit #2
Long latency

(traditional offline processing costs days/months in feature engineering, cannot effectively handle online social spam detection)

Global social spam

- Different platforms show high similarity in spam posts of corresponding topics.
- Users in same platform with different locations or groups show high correlations/similarity in spam post with same topics.

Challenges

How to detect online large-scale social spam with global views?

Single dataset

spam correlations

Global data sources

Offline local processing

Scale out

Distributed **online** processing

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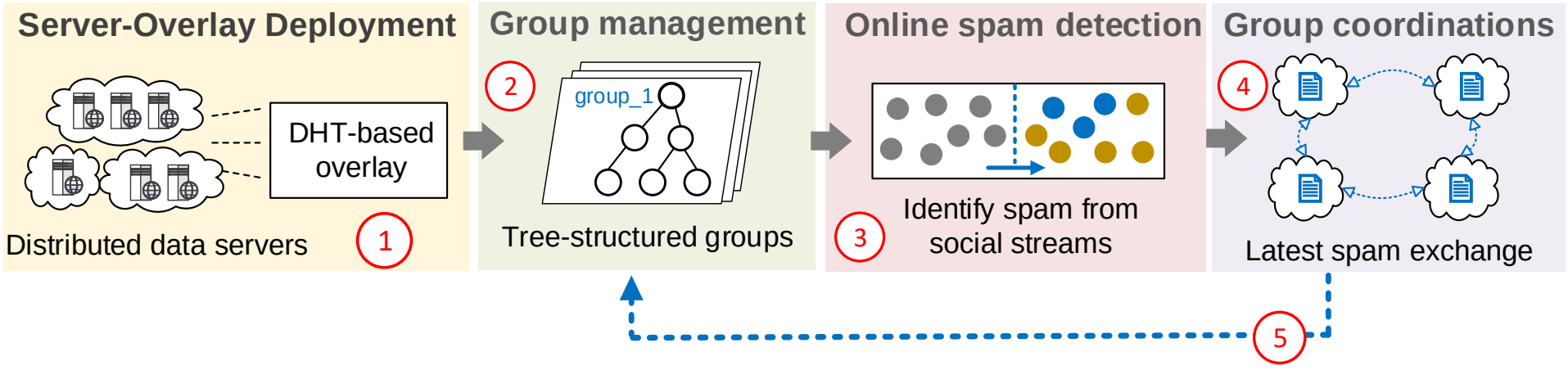
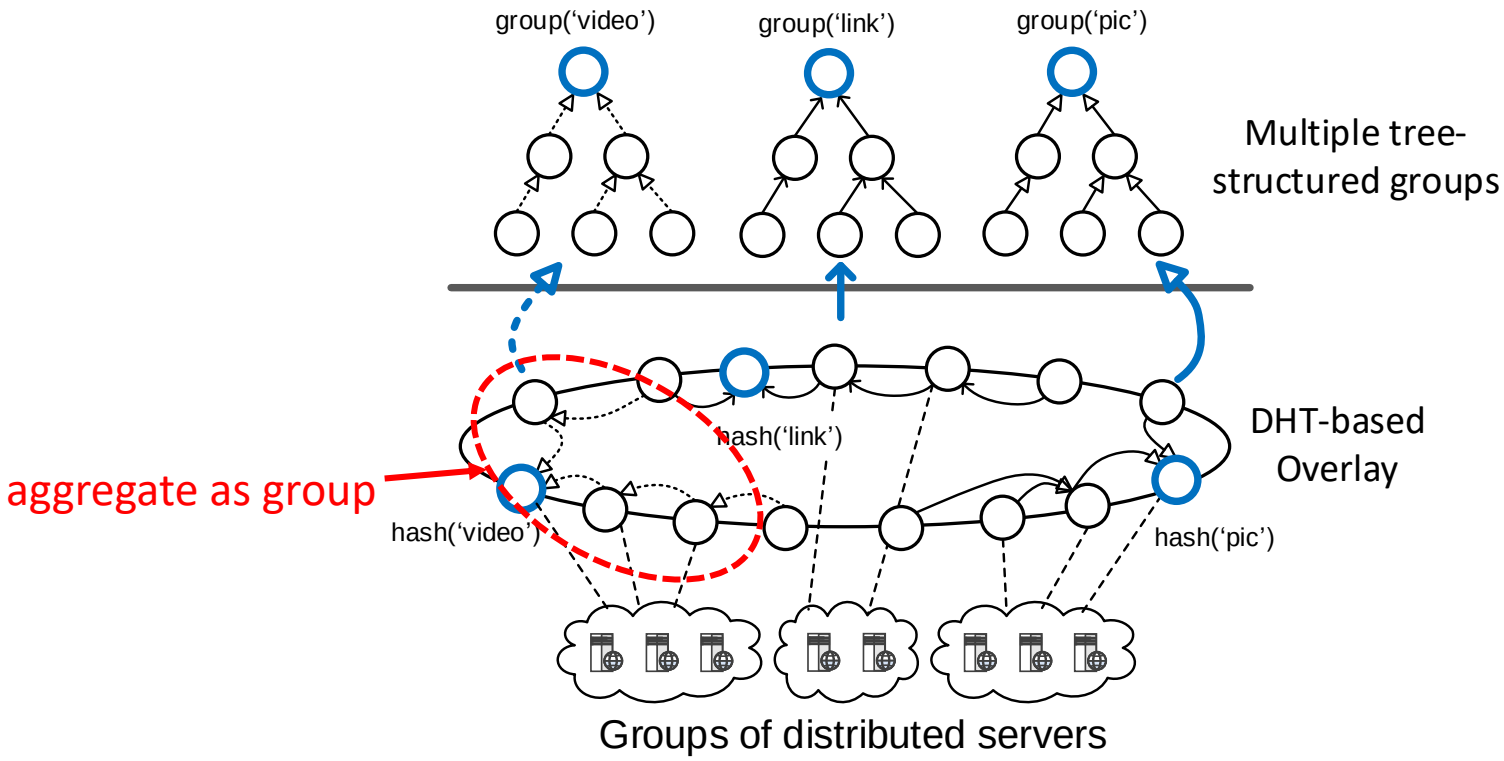
Workflow

- SpamHunter Workflow
  - Online data collection, peer-to-peer overlay based, online data processing and spam classification, group coordination, update continuing spam detection



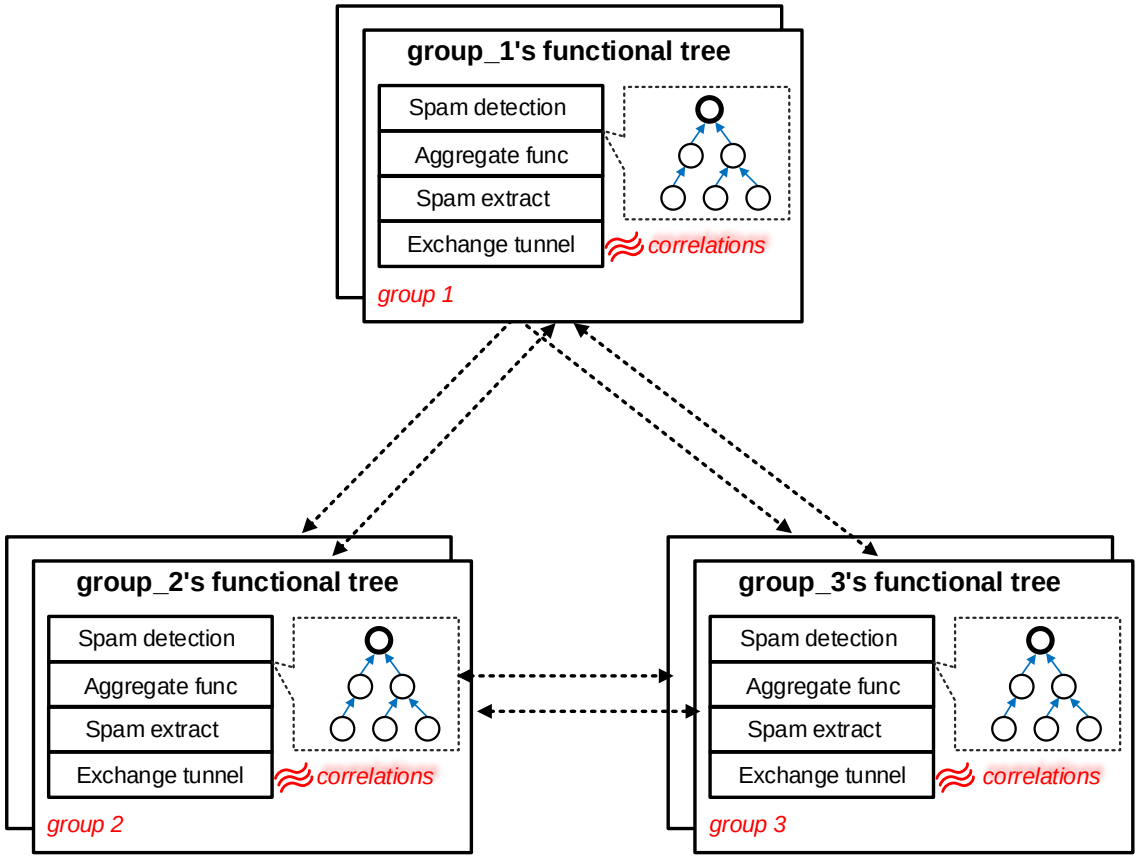
Design

- SpamHunter DHT-based overlay
  - Distributed servers connect to nodes, support multiple functional groups, group acts as tree-structure



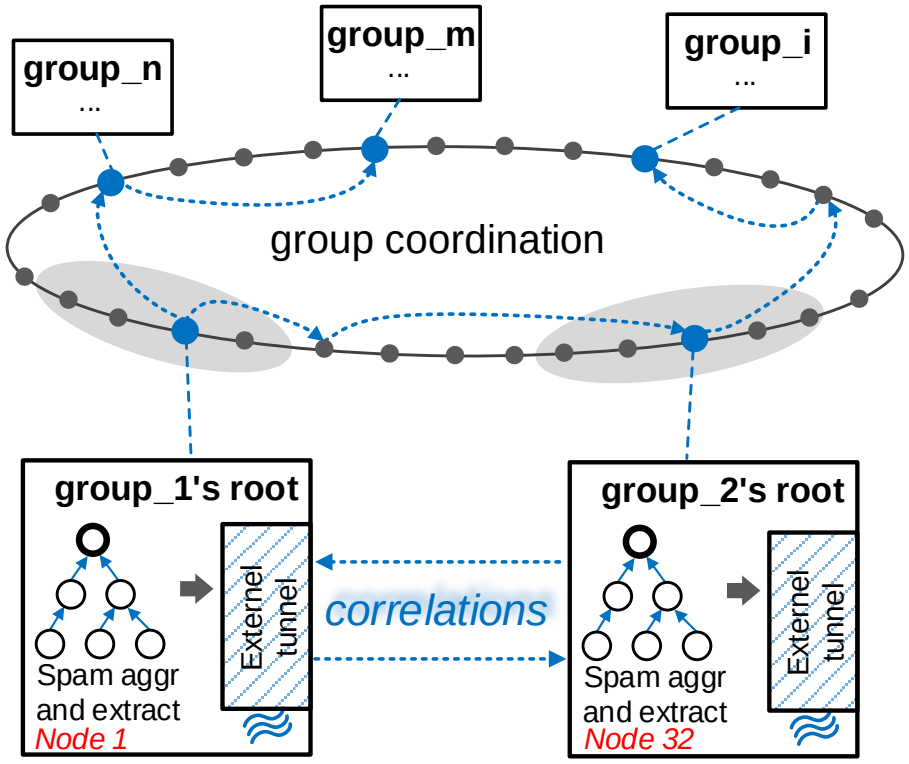
Design

- Group's functional tree
  - Orchestrate the processing flow, aggregate interim results, gather latest spam info, exchange tunnel for coordination



Design

- Group coordination
  - Root is responses for sharing spam, using exchange tunnel with other groups' roots



Design Benefits

❑ Utilize the newest correlated spam info:

- collect the online social data
- detect the social spam in various groups
- keep pace with the latest social spam
- interact with the correlated spam data

❑ Support scalable spam processing:

- handle multiple distributed servers' logs
- easily scale to multiple large-scale data sources

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Evaluation

Testbed setups

Hardware/Software	Specification
Servers	10
CPU	3.4GHz
Memory	4 GB
Disk	30 GB
Operating system	Ubuntu 16.04
Language	Java SE 1.8
Twitter	3,000,000 tweets from API

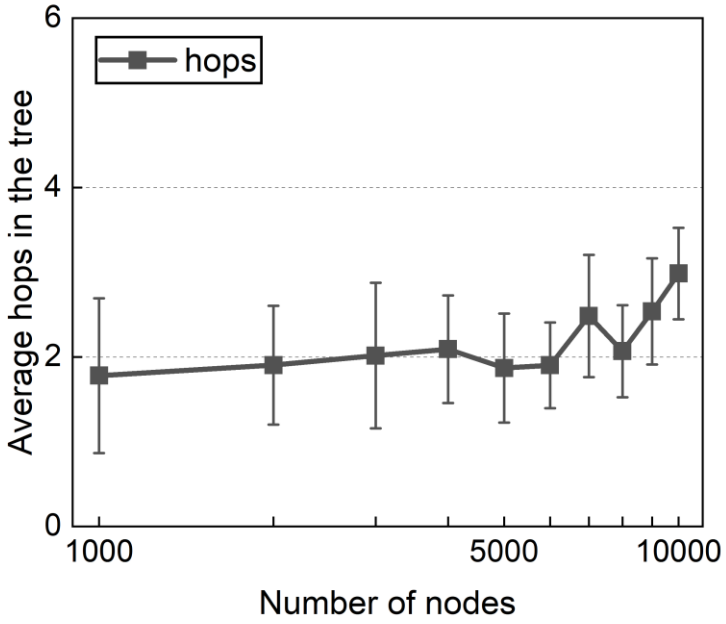
Spam Detection Evaluation

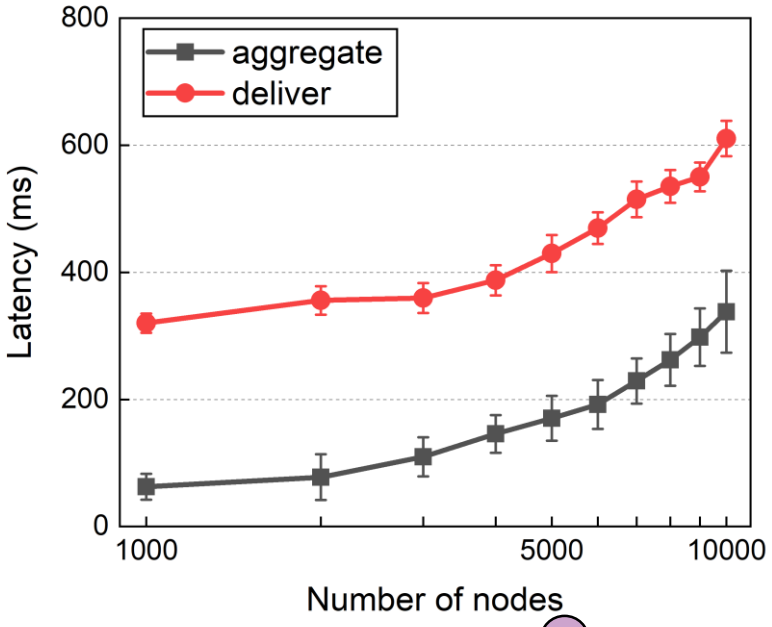
A sample dataset which consists of 50,000 posts (37465 posts are *Ham* and 12535 posts are *Spam*)

Table 1: Results of spam detection.

Model	F1	Precision	Recall
RF	0.951	0.951	0.951
SVM	0.942	0.945	0.944
RT	0.927	0.928	0.927
Logistic	0.859	0.866	0.855

System Evaluation

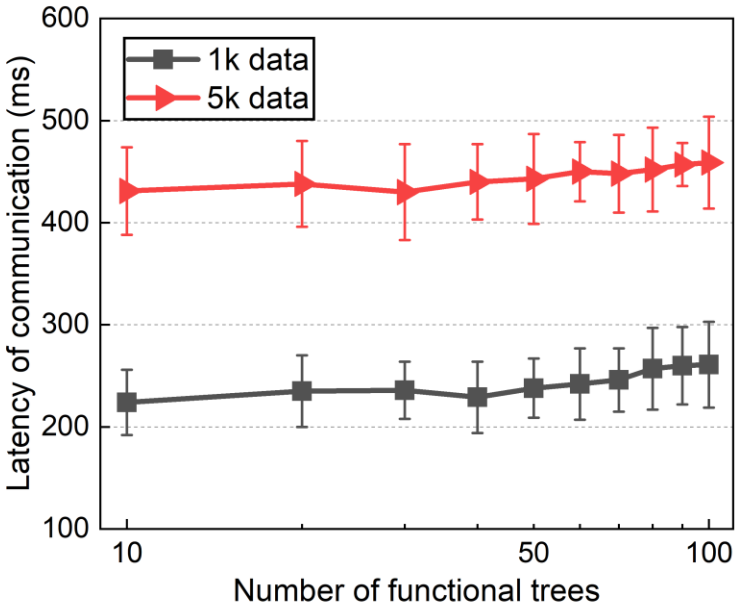


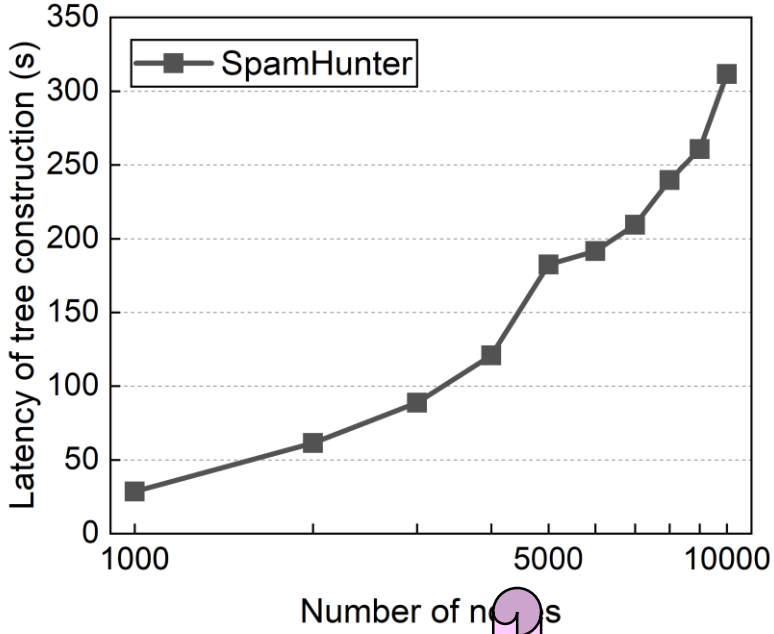


(a) Averag aggregate.

The linear increment of time is determined by the tree depth O(logN), indicates that tree structure exhibits a good balance.

System Evaluation





(a). Laten ...uction time.

The group coordination exhibits consistent performance in exchanging data.

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Conclusion & Future work

SpamHunter introduces an extensible and online social spam detection system by utilizing correlated spam:

- **Extensible and online**: processing can extend to new online data with relatively low latency.
- **Spam correlation**: group coordination allows to utilize the correlated spam from global view

Future work:

- explore the entire processing latency
- balance the scale and the latency of distributed agents in the system
- reduce the runtime overhead
- achieve load-balance with highly efficient data processing

Thank you.

Questions?