Monitoring and Diagnosis in Large Scale P2P Video Streaming Networks

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Outline

- Introduction
- Background
- Evaluation
- Proposed Solution
- Conclusion

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Introduction

- Monitor and diagnose large scale P2P networks.
- There are On-Demand and Live streaming of P2P video. Previous results show that normal streaming goes smoothly.
- Undertake a measurement study to find if there are some problems

Motivation: A measurement study

- There must be some problems in large scale networks
  - What are they?
- The protocols are proprietary
- Attempted to reverse engineer PPLive protocol
- Things important for us
  - Peer lists: peers of a particular client
  - Buffer maps: ready to play chunks of a client
- Indicate quality of streaming

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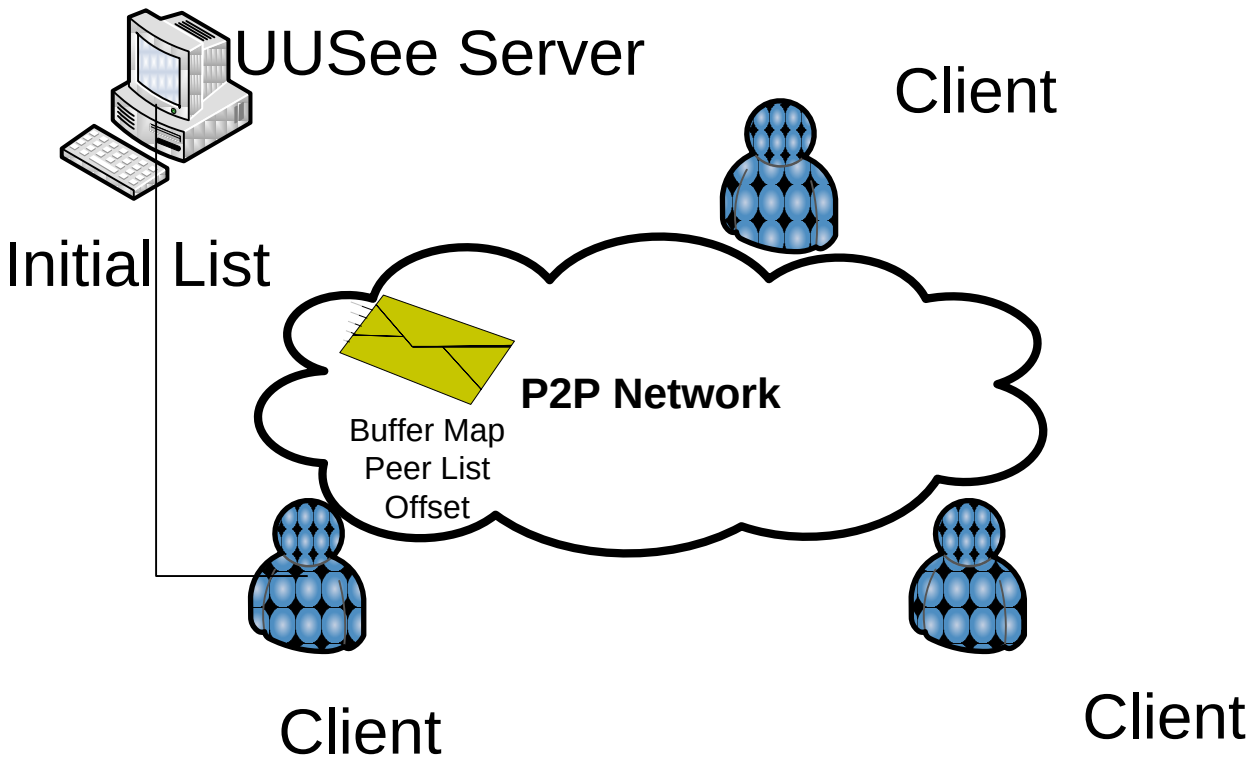
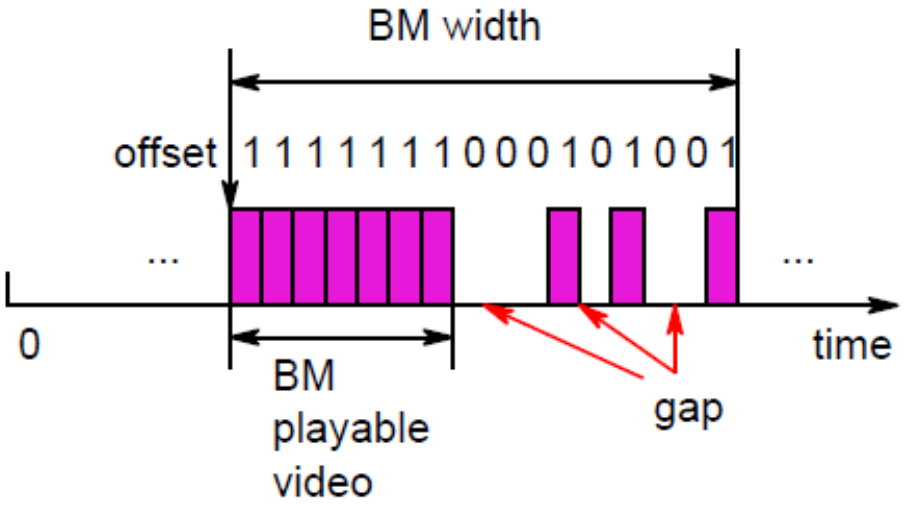
P2P Network


UUSee Server
Client
Initial List
P2P Network
Buffer Map
Peer List
Offset
Client
Client

Exchanging Protocol

- Buffer Map and Offset



- Peer Lists

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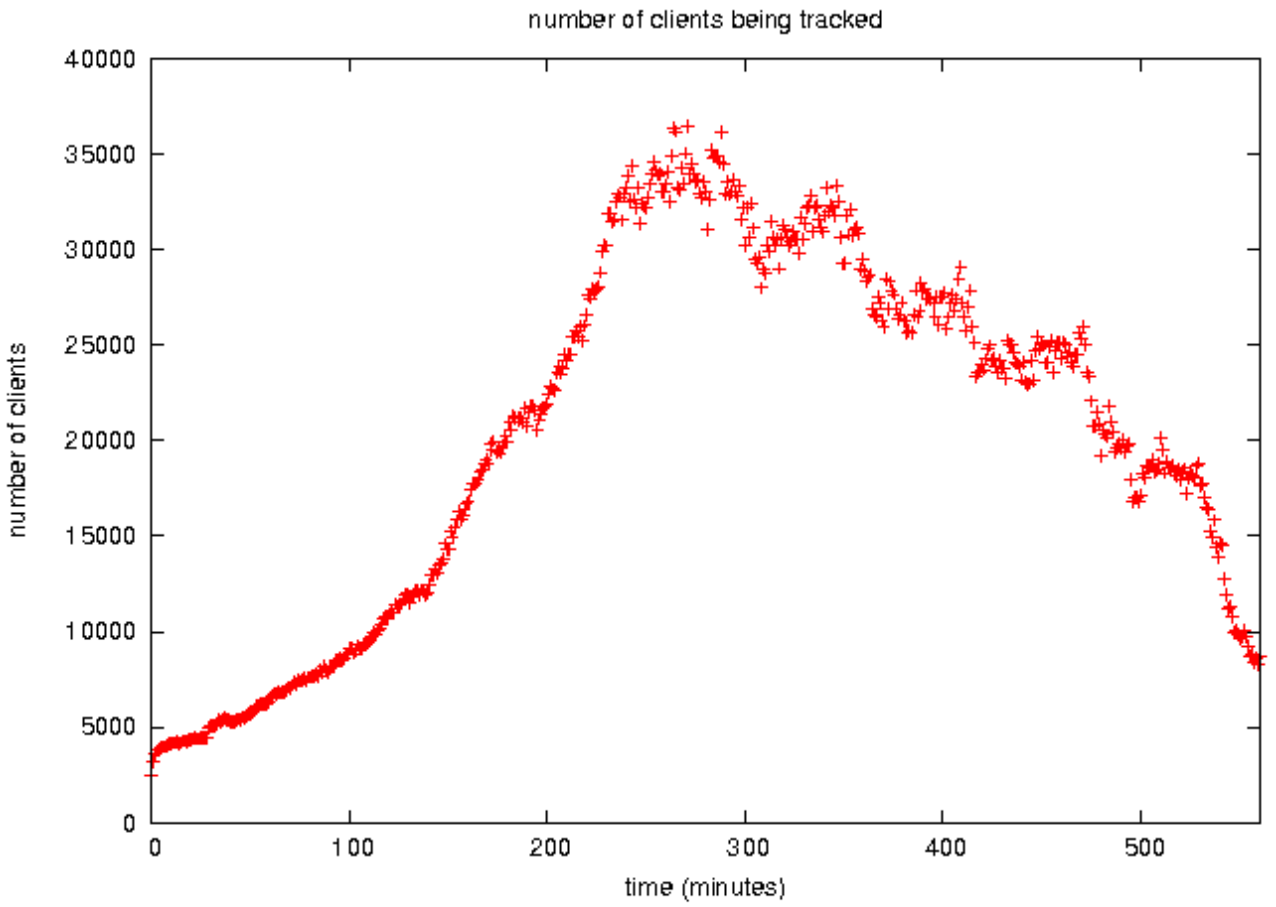
Evaluation

- Experiment Setup
- Number of IP tracked
- Problematic IPs
- Slow Start
- Peer List Information

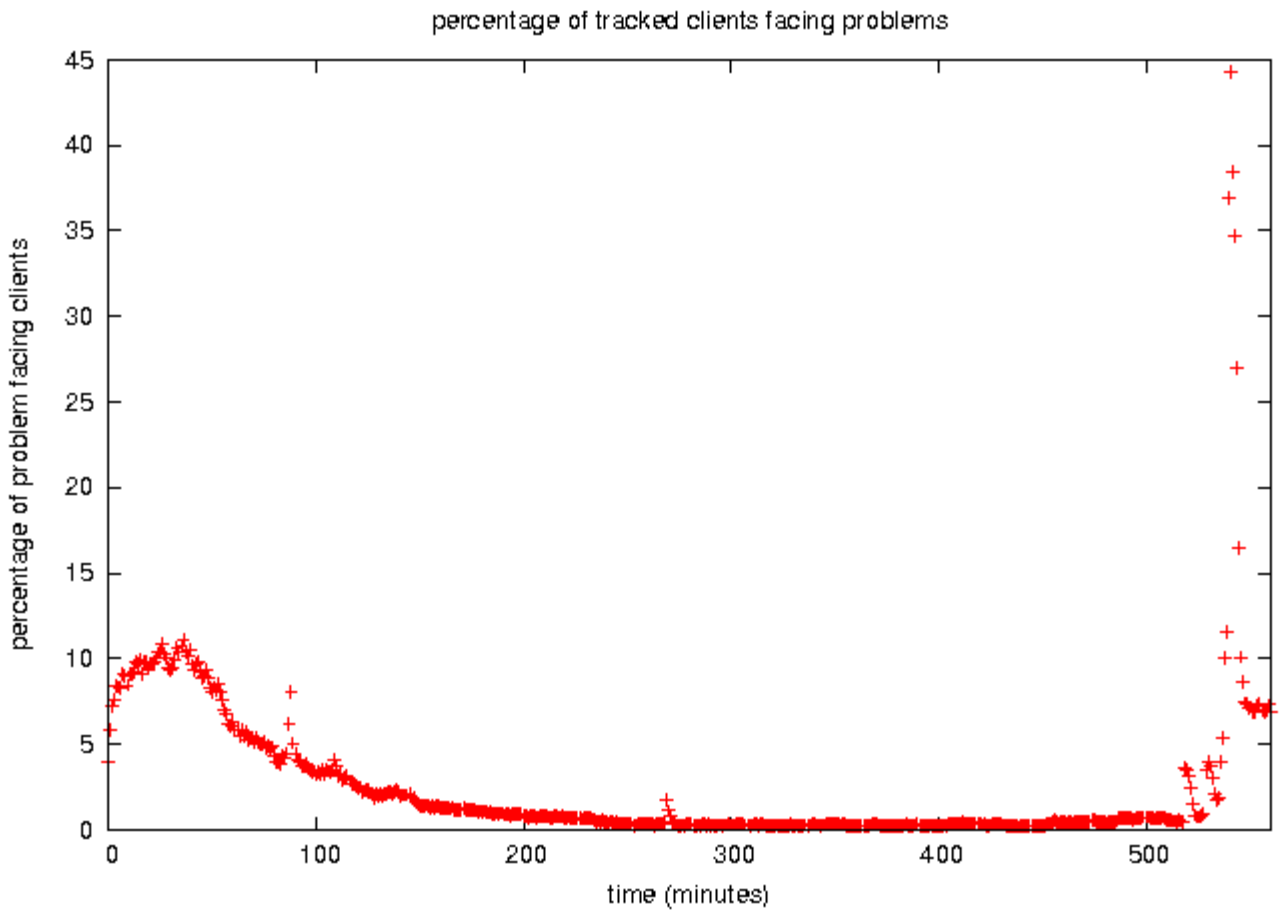
Experiment Setup

- Massive passive measurements of the Feb 13
- Chinese New Year Celebration broadcasts on the UUSee network
- Used 300+ nodes from PlanetLab to monitor the UUSee network
- Collected ~64 GB of compressed logs over a period of 9 hours Analysis continuing

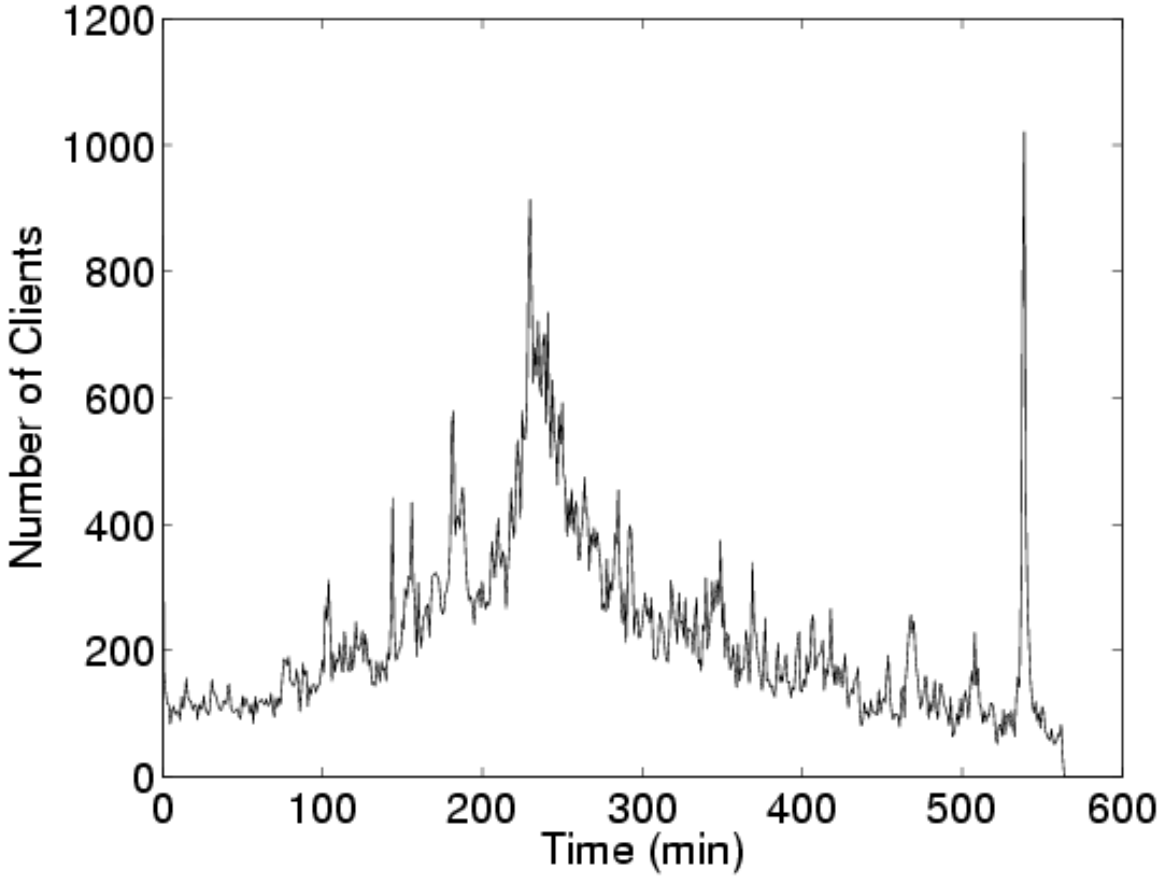
Number of Clients Being Tracked



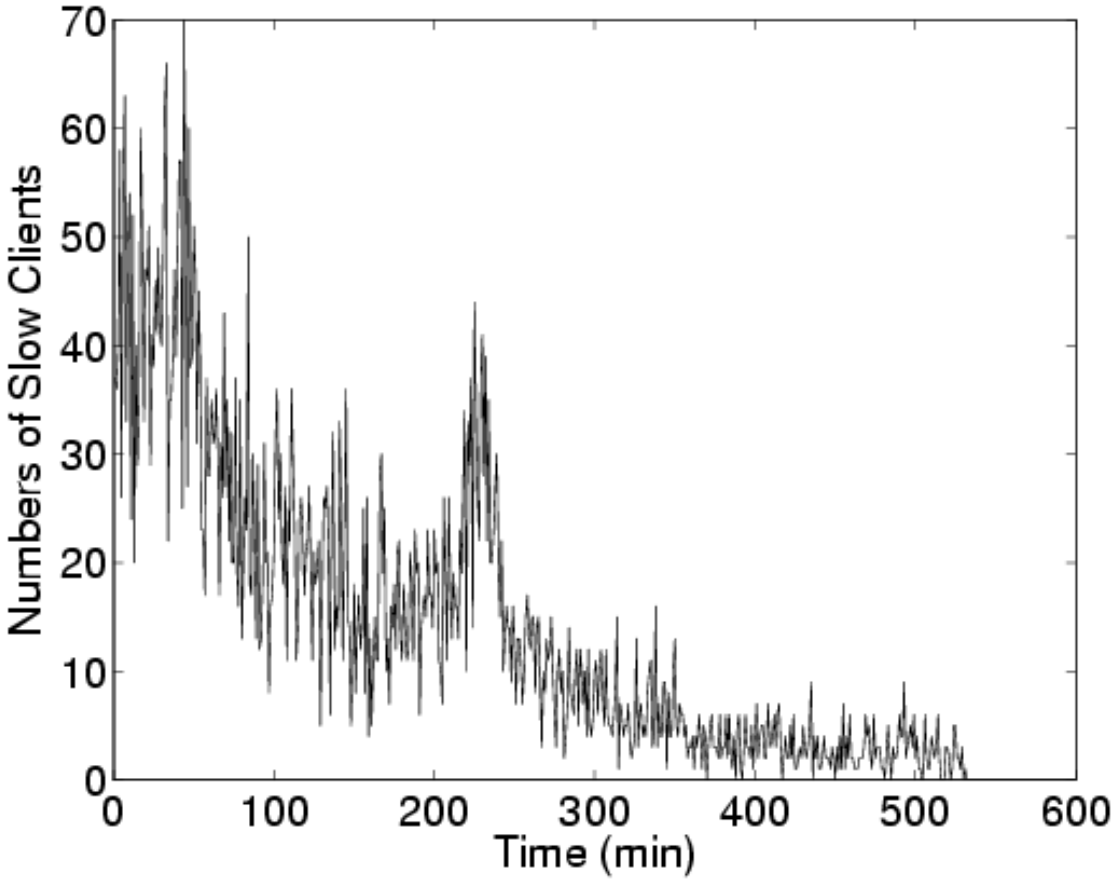
Clients Facing Problems



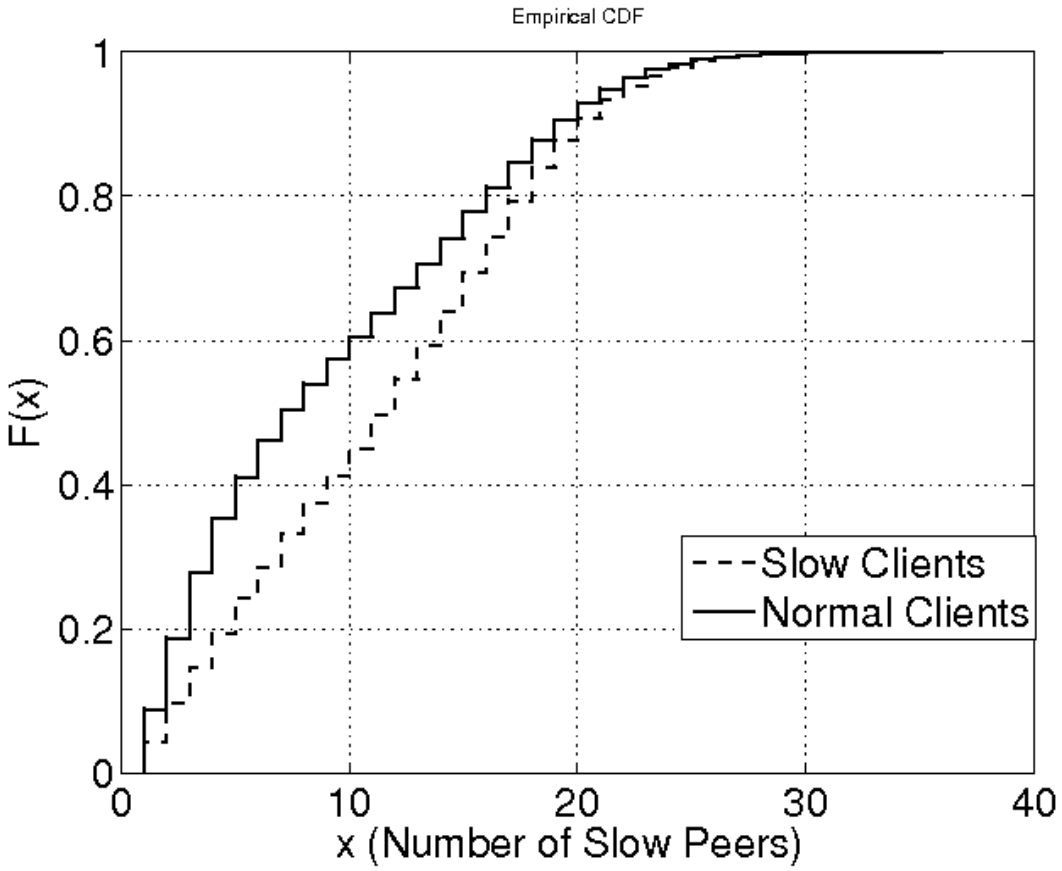
Numbers of New IPs over Time



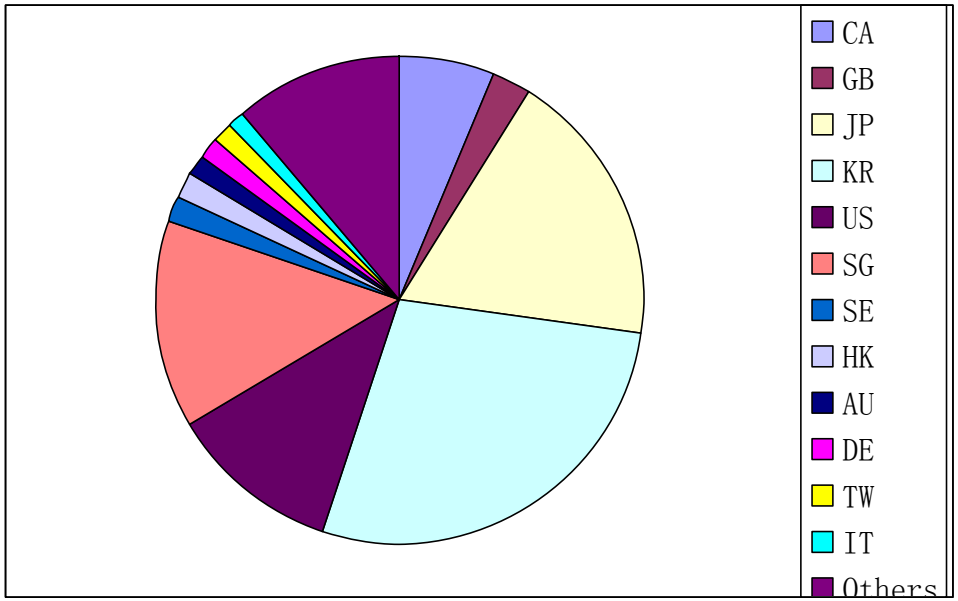
Numbers of New Slow IPs over Time



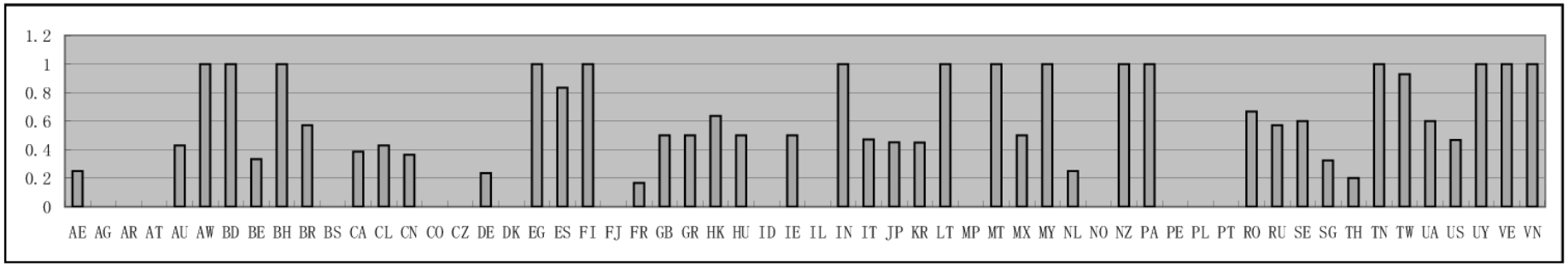
Cumulative Distribution Function of Numbers of Slow Peers



Geographic Information (Except CN)



Slow IP Ratio



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Proposed Solution

- Use sufficient redundancy to cope with peer churn
- Organize the network into a hierarchical structure
  – Peers send data to collector through nodes higher up in the hierarchy
  – Reduces the redundancy required by imposing a structure
- Use compression and aggregation at intermediate nodes to limit communication overheads

Theoretical Analysis

- N peers
- Partitioned case: n peers partition
  - Exhaustive exchange within partition
  - N/n probes suffice
- Without partition
  - Assume same number of messages exchanged as in partitioned case
  - Best case same as unpartitioned

Theoretical Analysis

- Without partition
  - Worst case number of peers for which server can collect data is $n\left\lceil \frac{N}{n\binom{n}{2}} \right\rceil$
  - For $n = N^{\frac{1}{3}}$, this number is like $2N^{\frac{1}{3}}$.

Theoretical Analysis

- Without partition: Average case
  - Probability collector collects information from a node

$$\sum_{k=1}^{m-1} \frac{\binom{p}{k}\binom{N-p}{m-k}}{\binom{N}{m}} + \frac{\binom{N-p}{m}}{\binom{N}{m}} \frac{p}{N}$$

where $p = N/n$ and $m = n - 1$

  - Some calculations show this probability is only around 0.65

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Conclusion

- We measure UUSee network about flush crowd.
- Our results show that UUSee network experience some problem during start and end time of flush crowd
- We propose some solutions.

Thanks