Identifying BGP Routing Table Transfer

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Tool URL: http://netsec.cs.colostate.edu

!Machu Picchu! 

http://www.culturefocus.com/machu-picchu-1.htm
BGP Table Transfers

Session Resets & Table Transfers

- TCP session breakdown
- Loss of KeepAlive messages
- Router internal errors

Throw away whatever is learned from $R$
Why Identify Table Transfers?

- **Remove Data Collection Artifacts**
  - Table Transfers don’t reflect routing dynamics
  - First stage of most BGP analysis

- **Understand How Often Resets Occur**
  - Nearly 15 - 20% of updates due to table transfers!
  - Optimize BGP differently if problem is frequent resets instead of frequent incremental updates

- **Prior approaches relied on ad-hoc techniques**
  - Delete updates if # of update > 1000 in 30 seconds
  - Delete all *duplicate* announcements

Our approach is show to be accurate
Table Transfer Problem

• Objective: Detect all table transfers

• For each table transfer, identify:
  – starting time: timestamp of first table transfer update
  – duration: how long the transfer lasted

Minimum Collection Time Algorithm
Collection Time

For an update received at time $t$, define it’s **collection time**, $s(t)$, as the time it takes for all (unique) prefixes to be announced.

![Diagram](image)

Update Stream and Collection Time

Basic Approach

![Graph](image)

Sample $s(t) \sim t$

Basic MCT Algorithm:

1. For each update at time $t$, calculate its collection time, $s(t)$
2. Find all local minima of $s(t)$
3. Each local minimum is considered as a table transfer.
   1. **starting time** is $t$ (timestamp)
   2. **duration** is $s(t)$ (collection time)
Practical Tune-Ups

- Expected Table Size Estimation
- Conflicting Table Transfers
- Other practical tune-ups in paper

Expected Table Size

- Get Table Size from latest RIB snapshot
  - RIB as close as possible to updates

- Table Size may vary during downtime!
  - Incremental updates change table size too..

- Don’t count all prefixes from table size
  - Instead, use a fraction $N$ of last know table size
    - Where $N = 0.99$ (99%)
Conflicting Table Transfers

• Monotonicity breaks due to update timing!

![Diagram showing conflicting table transfers]

• $s(14)$, $s(21)$ are two conflicting local minima!
  – A table transfer started (at $t=21$) when another table transfer is in progress (from $t=14$, to $14+10 = 24$)

• Assume table transfers take short duration to complete
  – $S(14) = 10 > 2(21) = 6$, throw away $s(14)$ and keep $s(21)$

Results

• Validation using RIPE Session Reset logs

• Detection Accuracy
  – Does our approach find the exact starting time?

• Table Transfers in RouteViews Data
  **Note:** RouteViews does not provide session state logs

Tool Download URL:
http://netsec.cs.colostate.edu
Validation Using RIPE Data

Detection Accuracy

• Inaccuracy (Offset)
  – Difference of:
    • Detected transfer start time
    • First update after reset log

• Zero Offset for 90% of Table Transfers

• For those with Non-Zero Offset
  – 50% are below 30 seconds
  – 50% have only 1 update (within offset time)
Table Transfers in RV Data

Comparison With Prior Approaches

• Duplicate removal approach
  – Remove all duplicate announcements
• 30 sec bin based approach
  – Remove if # of updates > 1000 in 30 seconds

• Both remove table transfer updates
• But .. both remove a lot of valid updates!

• Our Approach identifies table transfers accurately
Conclusion & Future Work

• Download our tool and see for yourself
  http://netsec.cs.colostate.edu

• Future Work:
  – Identify table transfers due to remote resets

Questions?