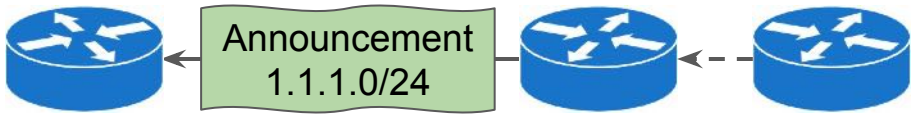
Route Flap Damping in the Wild?!

RIPE 80 - May 2020

Clemens Mosig, Randy Bush, Cristel Pelsser,
Thomas C. Schmidt, Matthias Wählisch

Motivation: Flapping routes.

Flaky network interfaces



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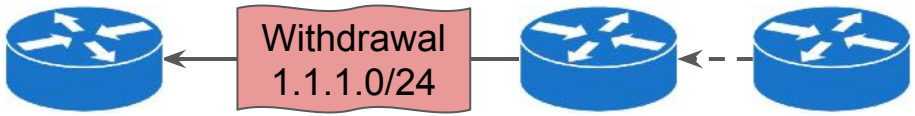

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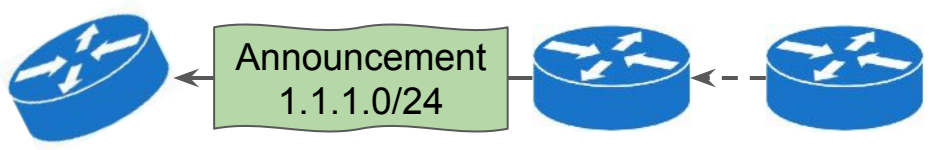
Flaky network interfaces

Ahhhhhh!
That's it, I'm out!

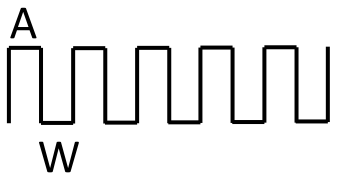


RFD suppresses flapping routes

Route

10.20.30.0/24

Flap



Damping

Oh wait, what about BGP convergence process?

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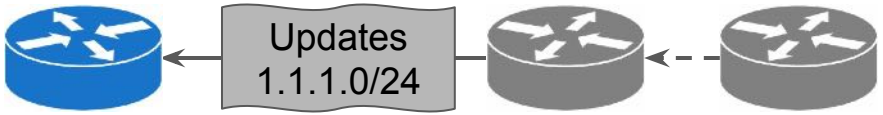

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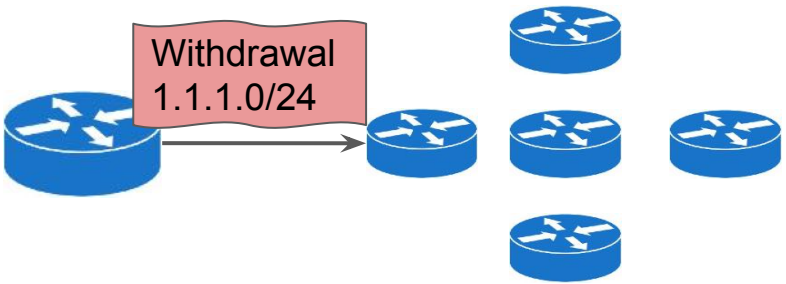

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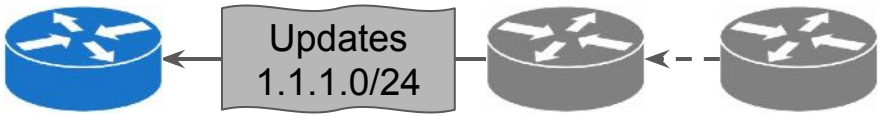

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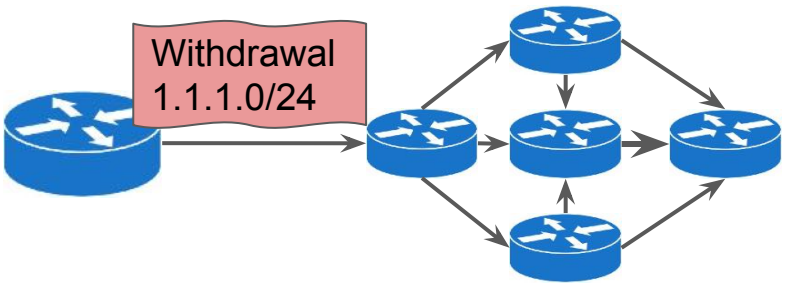

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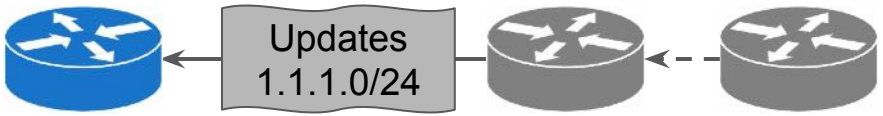

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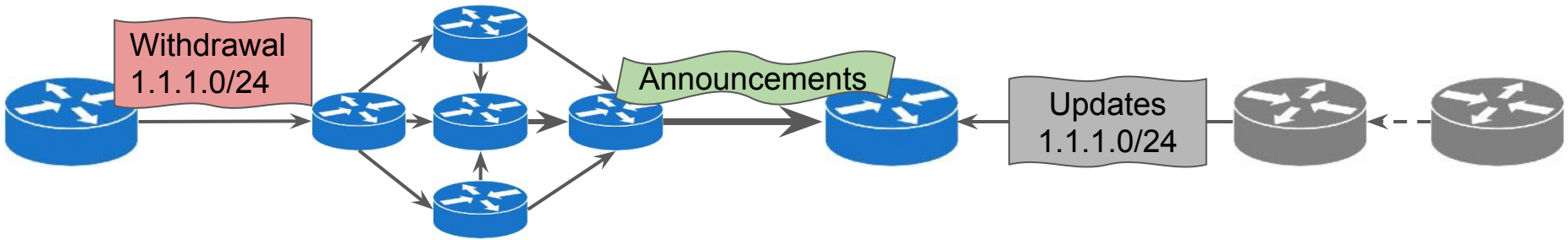


One Withdrawal can cause several updates distant in topology and trigger Route Flap Damping.

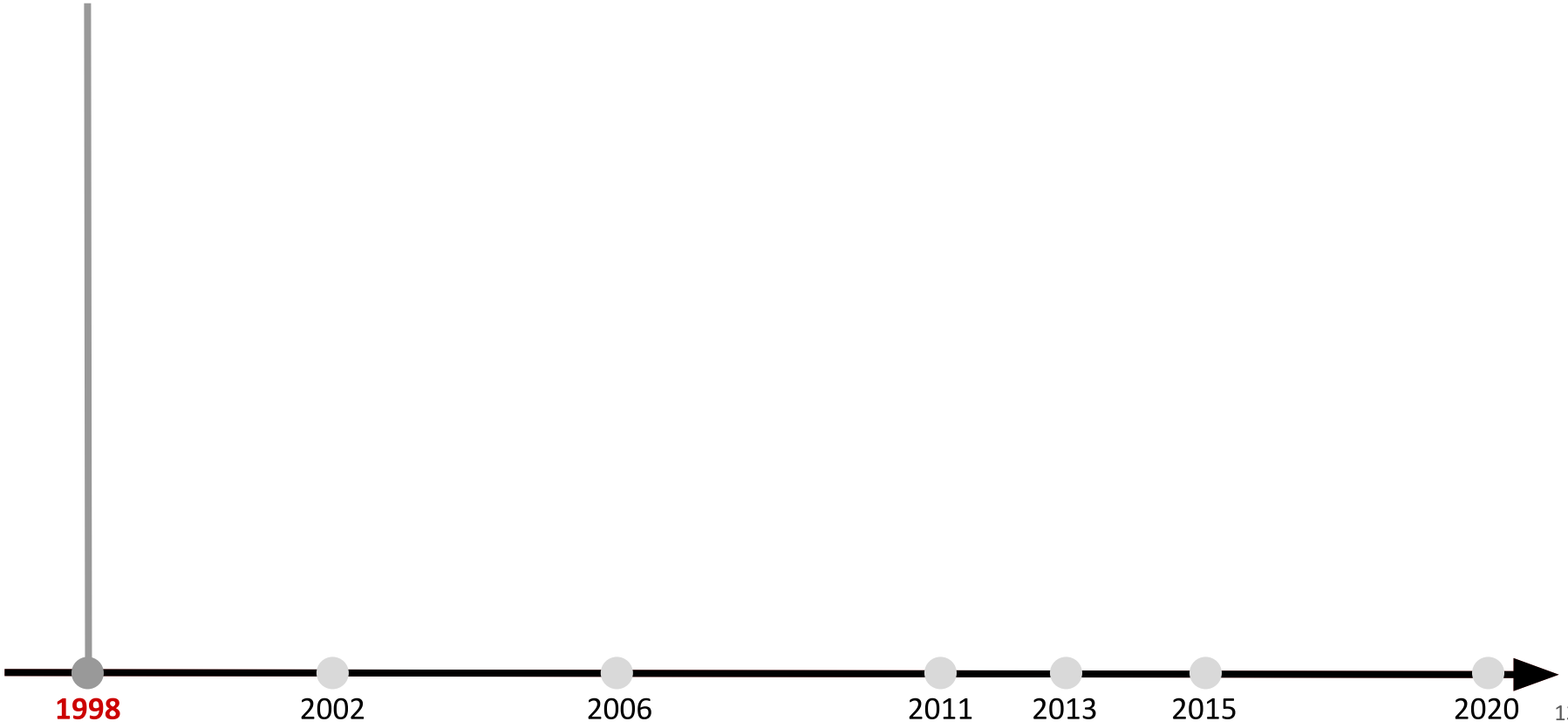
Route Flap Damping is controversial!

What is this talk about? Measuring RFD deployment.

1. Route Flap Damping History.
2. How we detect RFD.
3. Which ASs deploy RFD?
4. Which RFD configurations are used?

Is Route Flap Damping recommended?

RFD originally published in RFC 2439



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Route Flap Damping Exacerbates Internet Routing Convergence

Zhuoqing Morley Mao, *UC Berkeley*, zmao@cs.berkeley.edu
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George Varghese, *UC San Diego*, varghese@cs.ucsd.edu
Randy H. Katz, *UC Berkeley*, randy@cs.berkeley.edu

ABSTRACT

Route flap damping is considered to be a widely deployed mecha-

1. INTRODUCTION

Routing mechanisms that trade-off route convergence or opti-

1998 **2002** 2006 2011 2013 2015 2020

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We are measuring deployment of Route Flap Damping.


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Why should you care about RFD deployment?

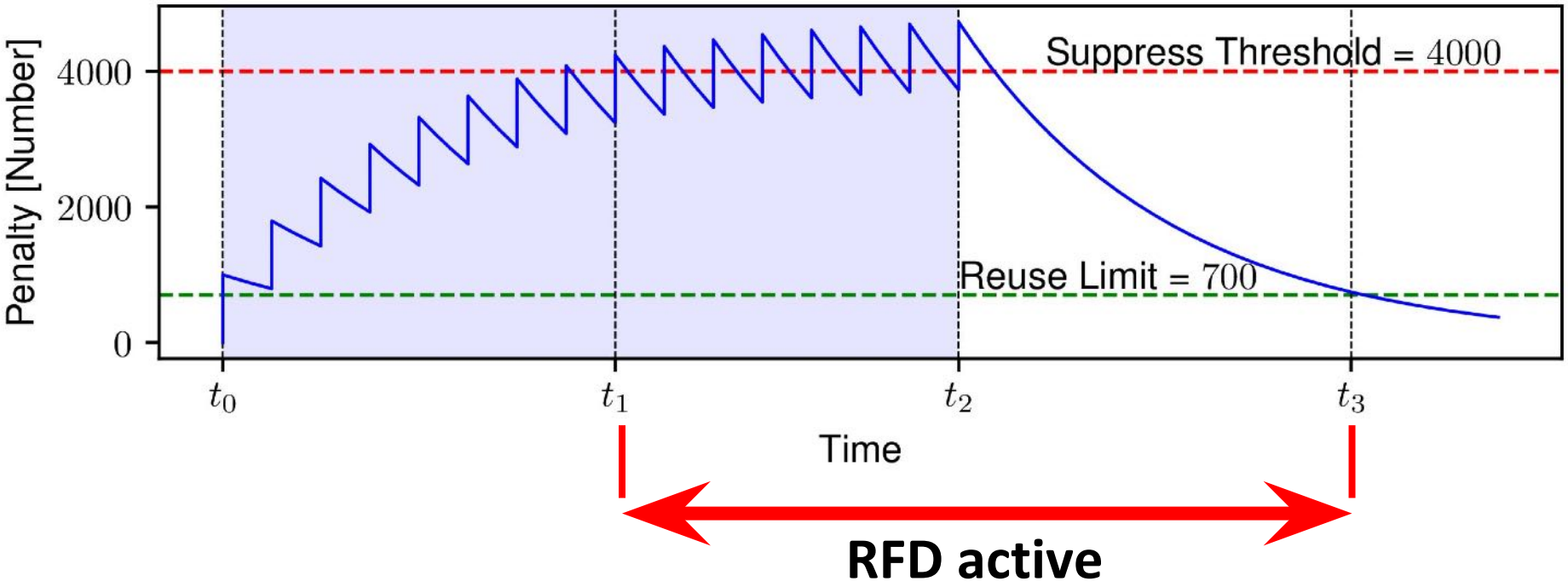
Many **different recommendations** in the past.
Different configurations may lead to conflicting goals.

Deprecated default **parameters affect Internet reachability.**
Especially in today's rich topology.

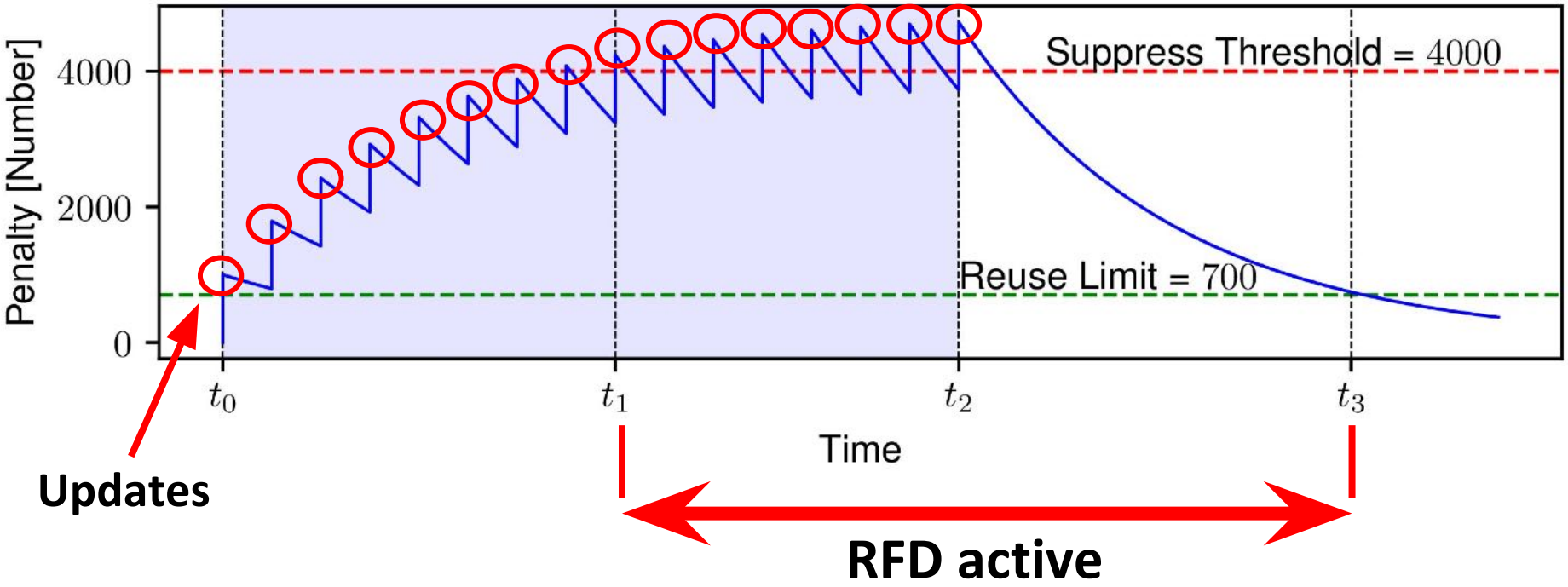
RFD **impacts** passive and active BGP **measurements**.
Current results on BGP Update noise may be an underestimation.

Let us measure deployment of RFD.

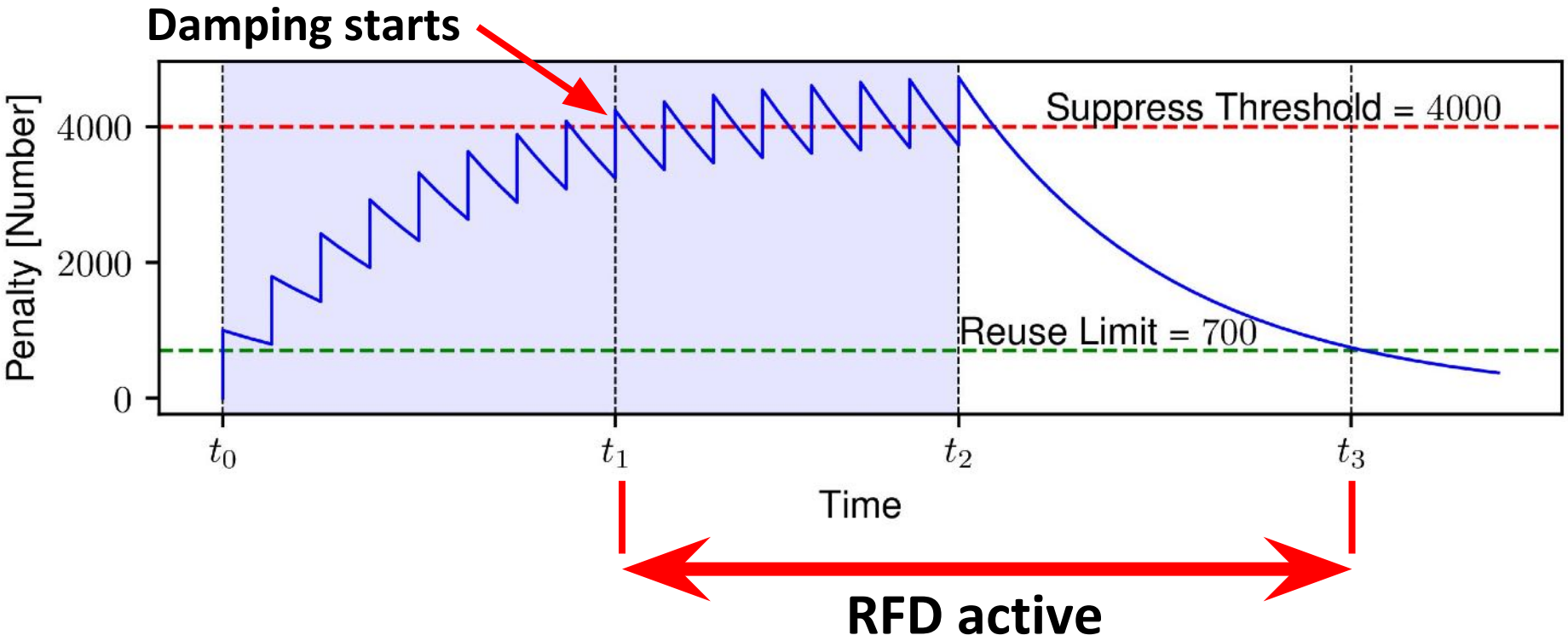
How does Route Flap Damping work?



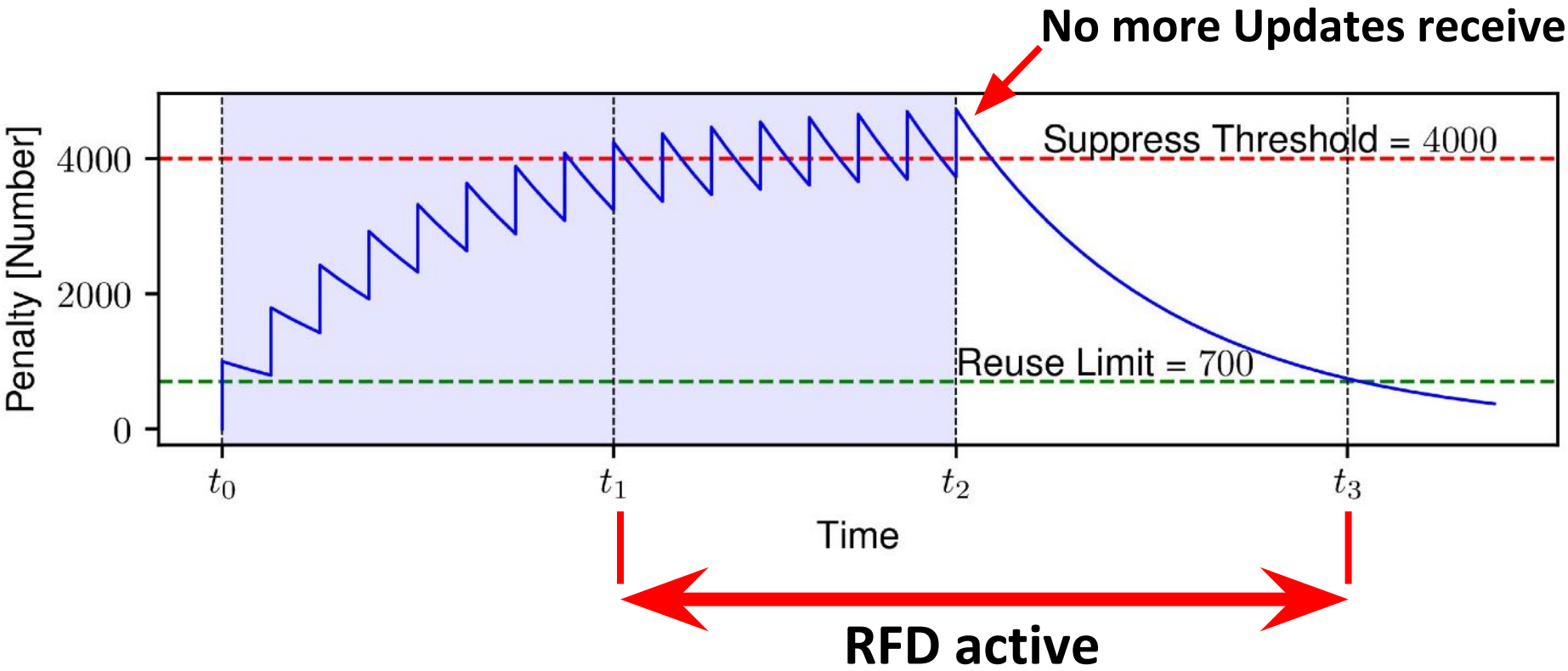
How does Route Flap Damping work? AIMD Principle.



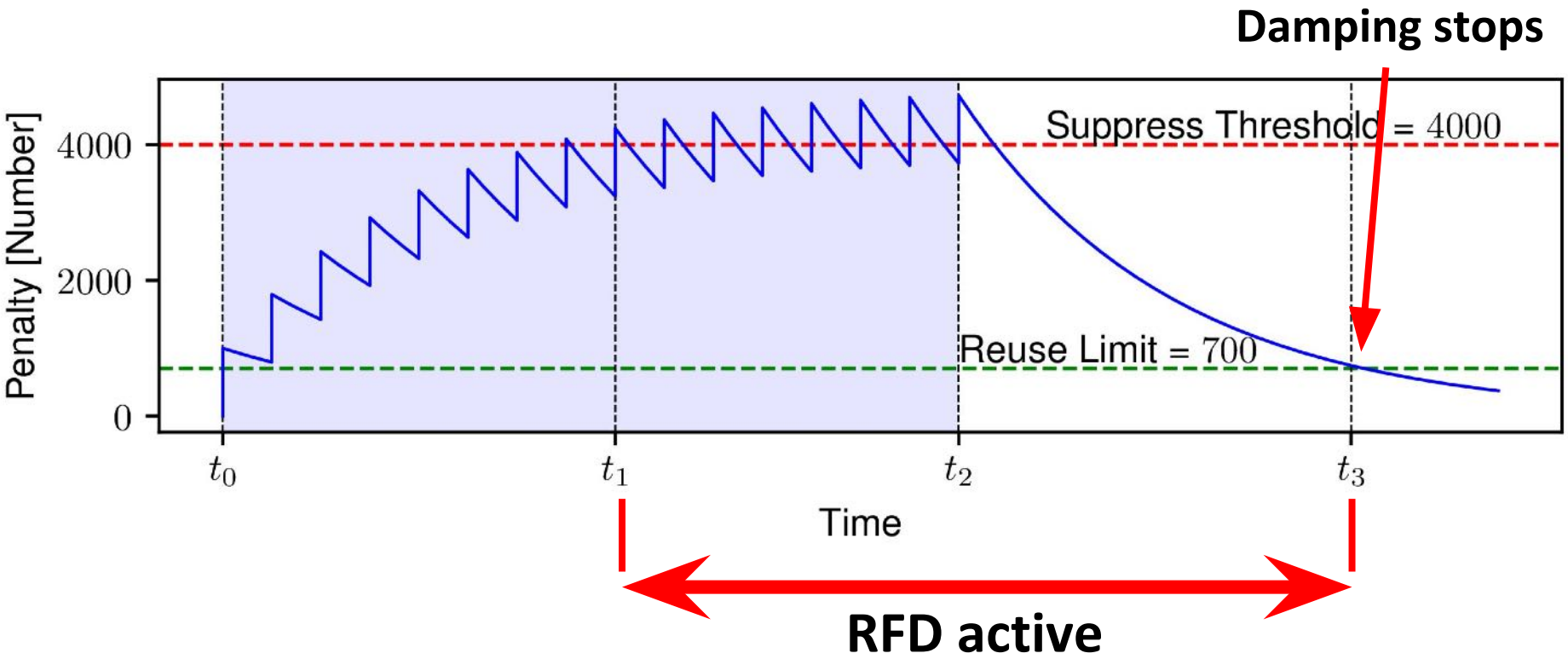
How does Route Flap Damping work? Start.



How does Route Flap Damping work? Wait.



How does Route Flap Damping work? Release.

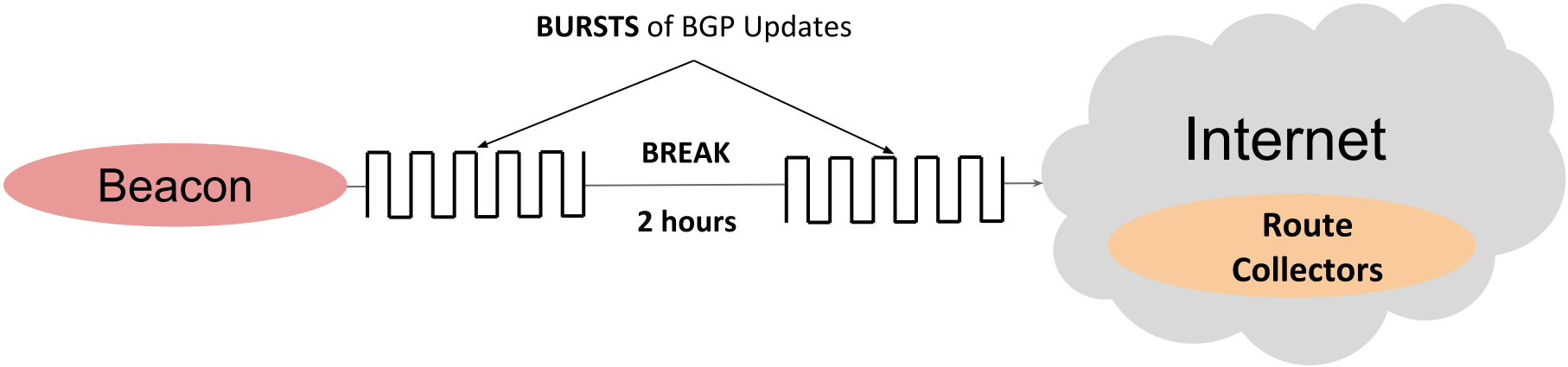


BGP Beacons with different frequencies

Beacon prefixes	Update patterns
147.28.35.0/24	 long update interval
147.28.34.0/24	
147.28.33.0/24	 short update interval

Details see https://rfd.rg.net/beacons.html

Sending Burst and Breaks



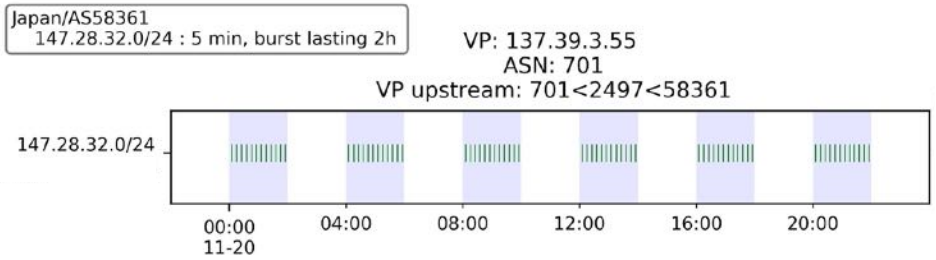
BGP Update Bursts TRIGGER RFD somewhere on the Internet

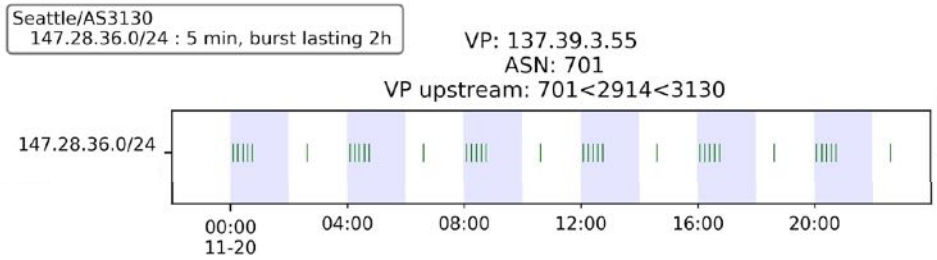
Breaks RESET the **PENALTY** for our prefixes in routers to 0.

RFD causes a very recognizable pattern.

View from a Vantage Point

Our prefixes are damped during the Burst (Blue) and re-advertised during the Break (White).





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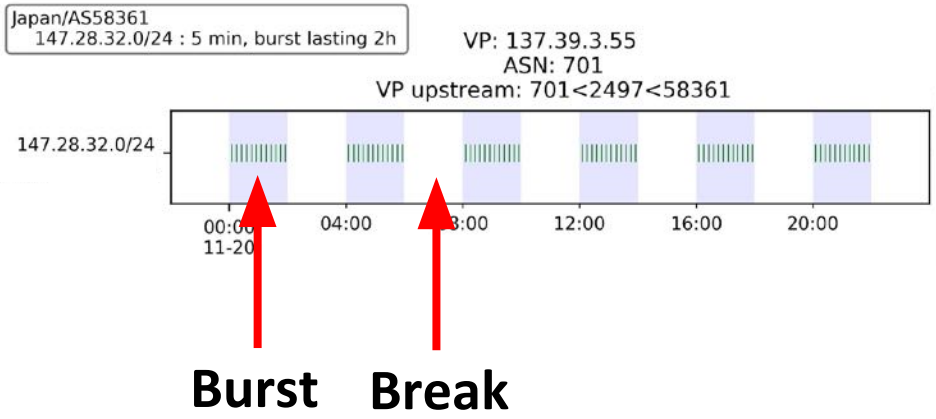

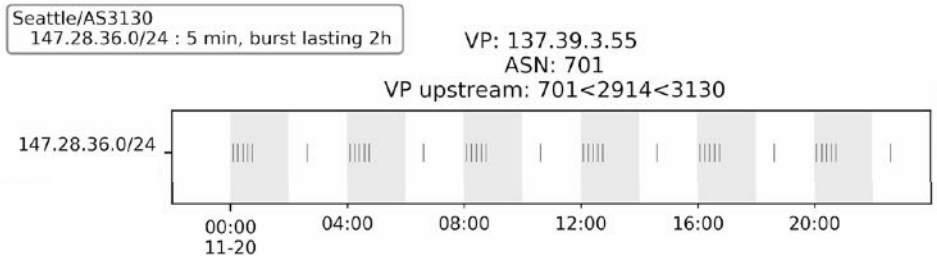

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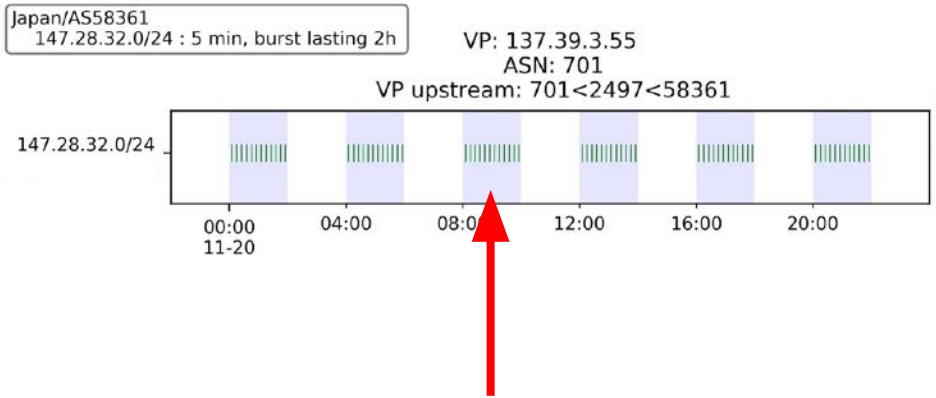

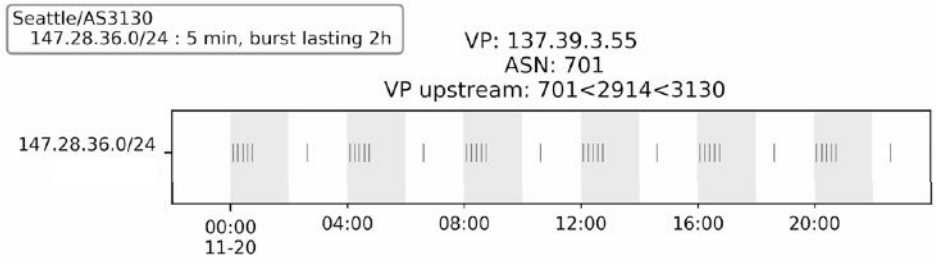

NO Route Flap Damping

View from a Vantage Point

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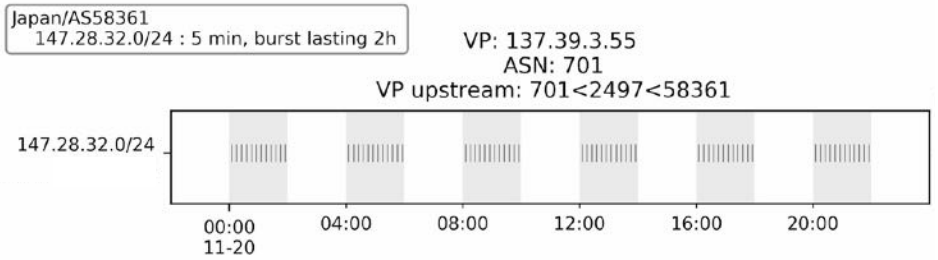

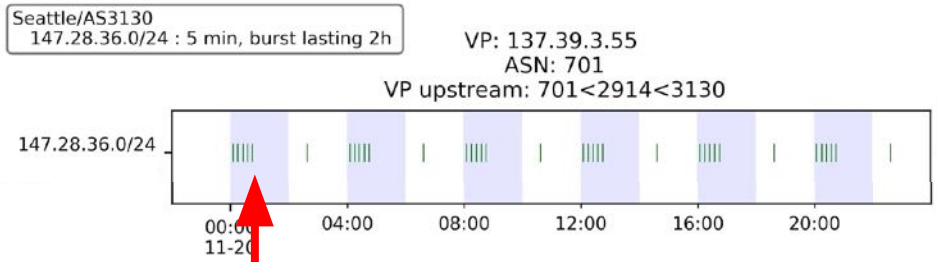

Signal Stops

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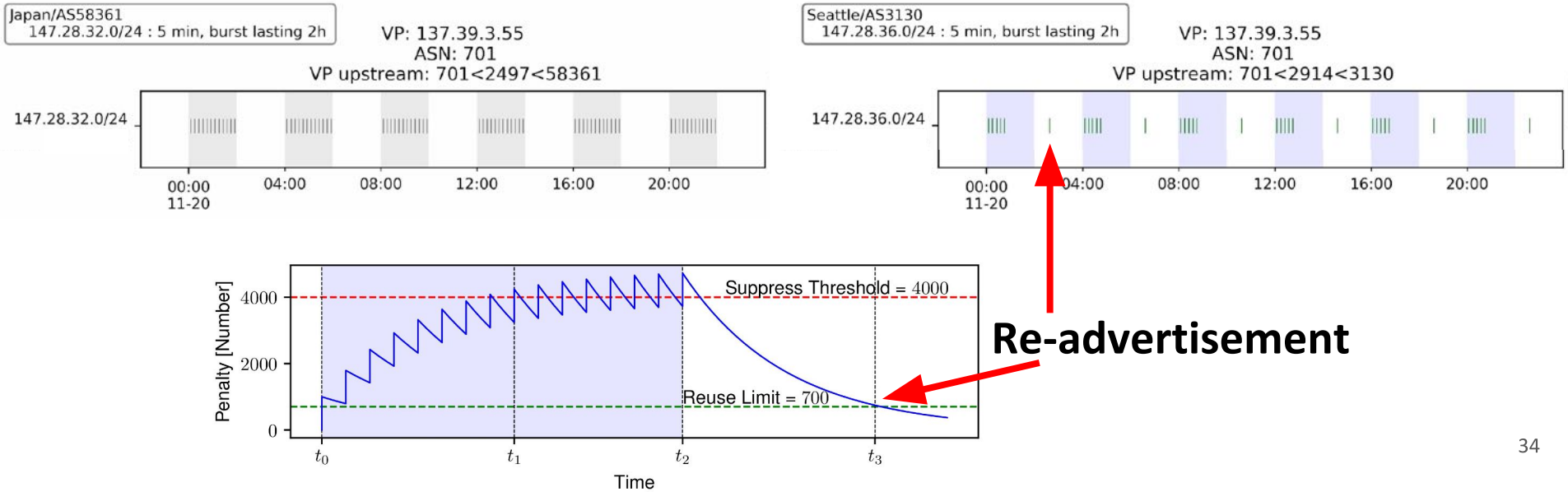

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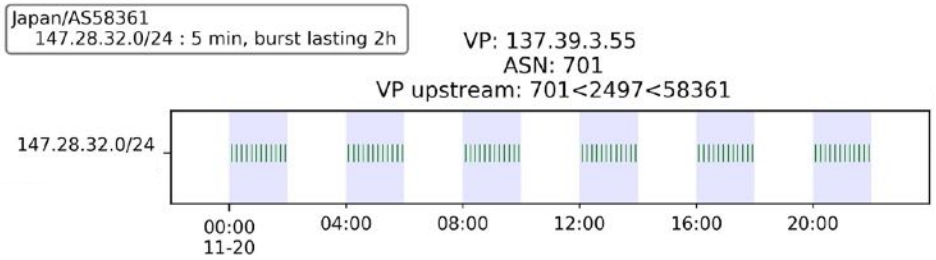

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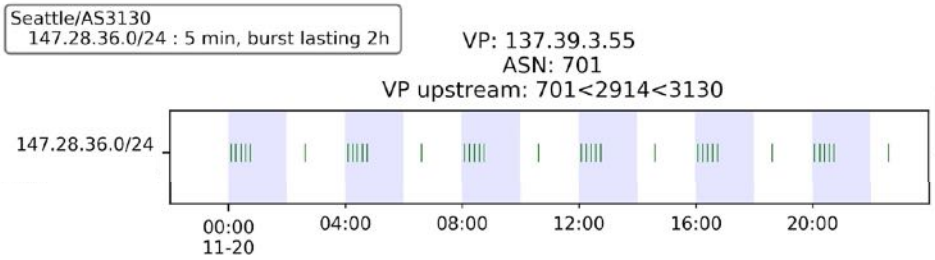

Route Flap Damping

Utopian Solution

With this setup we are able to tell
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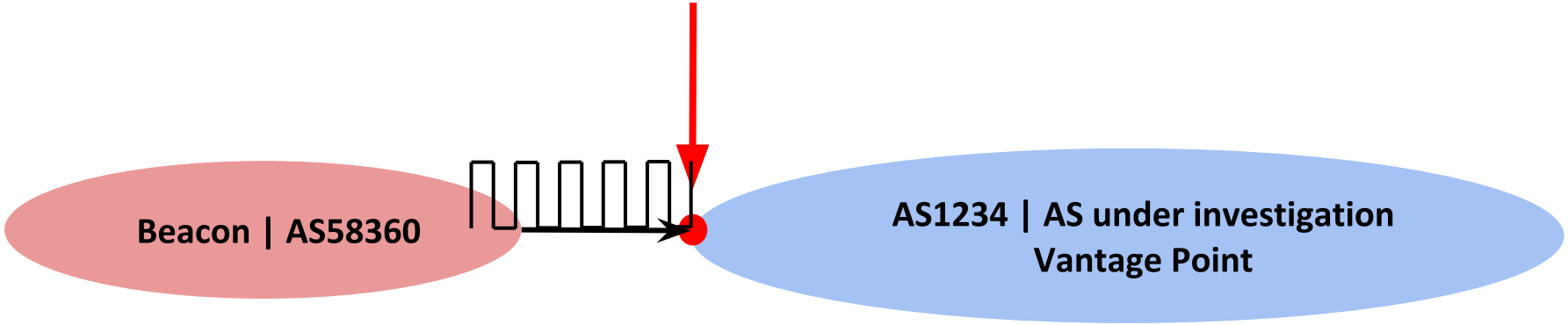

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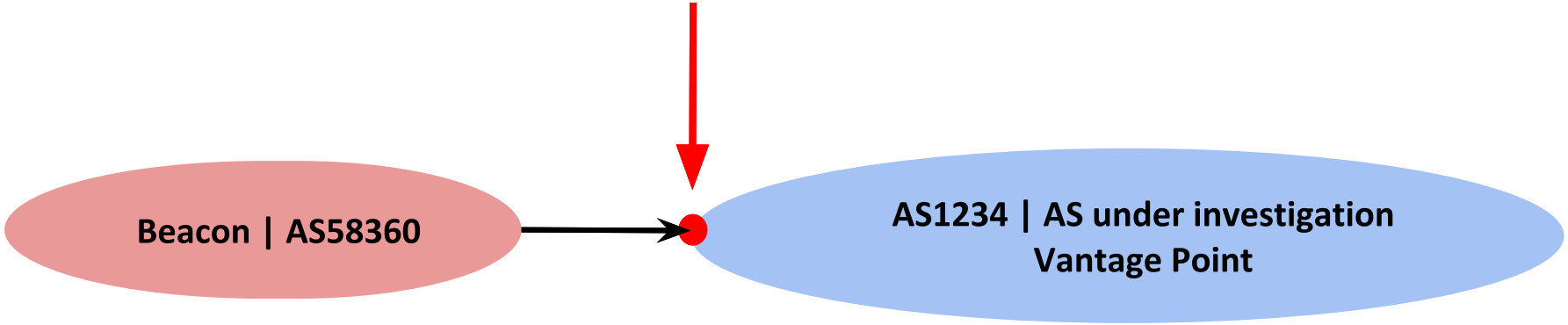

There are 60,000 ASs on the Internet.
We cannot setup this many Beacons and VPs! :(

We sent Beacons from 7 different locations.

Locations of our BGP Beacons

Bangkok, TH

Johannesburg, ZA

København, DK

München, DE

São Paulo, BR

Seattle, US

Tokyo, JP

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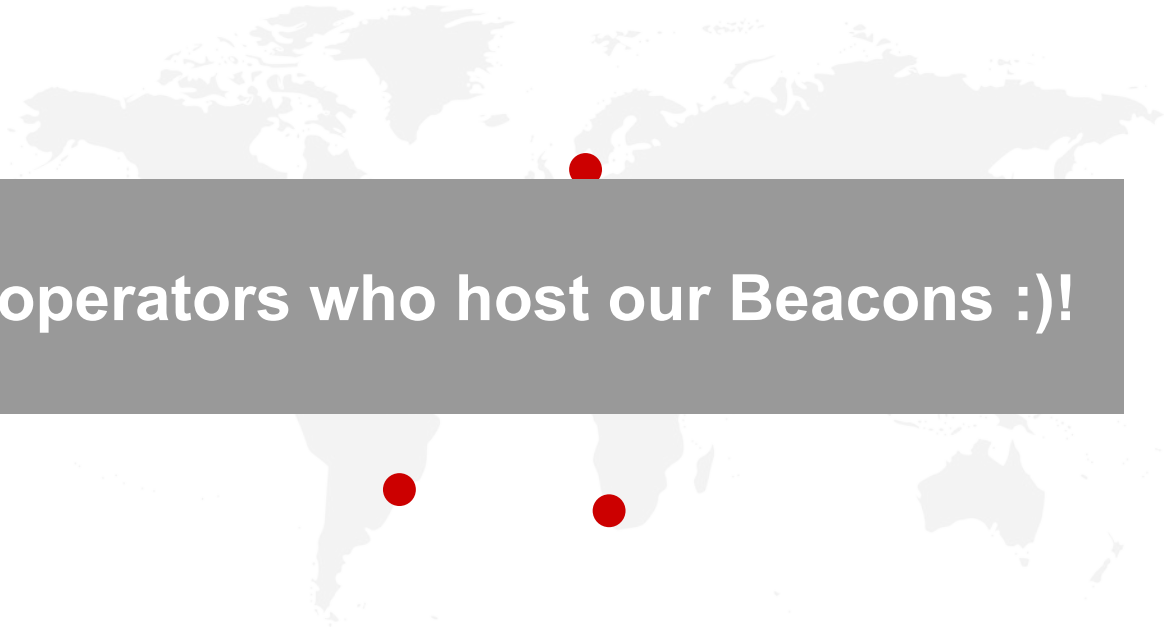
Many thanks to the operators who host our Beacons :)!

São Paulo, BR

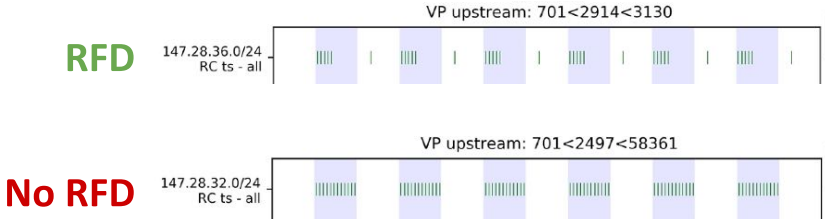
Seattle, US

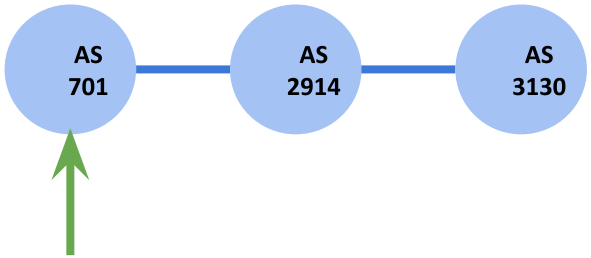
Tokyo, JP



We analyze updates from route collectors by Isolario, RIPE RIS, and Routeviews.

Label AS paths → Pinpoint RFD ASs





Challenges

1) If we find the Route Flap Damping pattern at some vantage points, **the damper could be anywhere on the AS path** between the vantage point and the Beacon.

2) Some ASs use **Route Flap Damping selectively** on a subset of neighbors.

3) BGP is an excellent **information hiding protocol**.

We have developed a **heuristic** to determine which AS is using Route Flap Damping on the Internet.

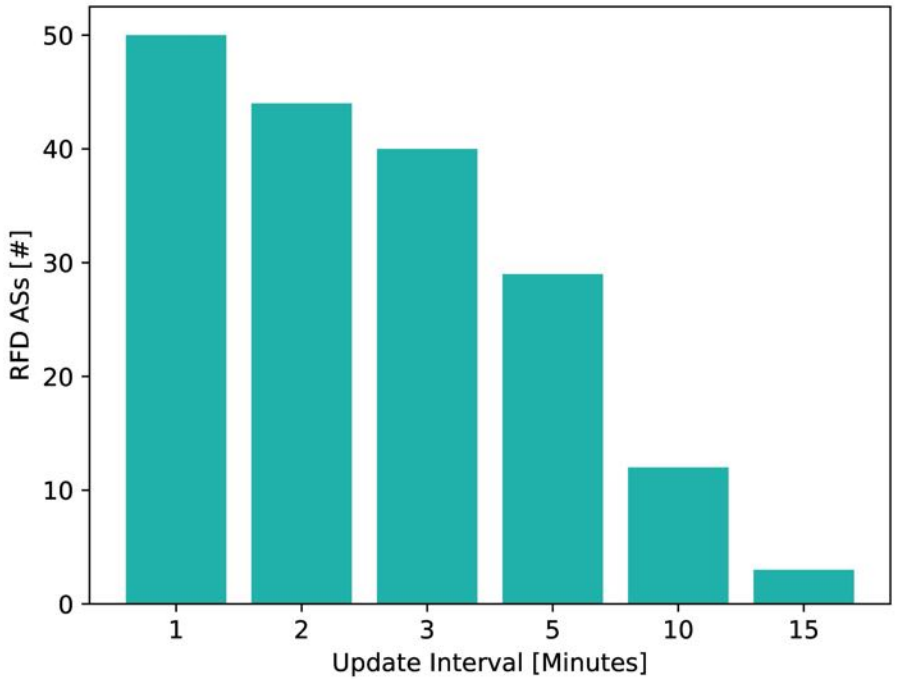
Our heuristic is based on three principles

1: Signal Ratio	2: Alternative Paths	3: Update Distribution
Relative occurences of an AS on a path showing Route Flap Damping signal.	Damped routes are withdrawn. Neighboring AS may announce alternative paths to vantage point.	On average, damping ASs should send fewer updates towards the end of the burst.

How many ASs are damping?

Small ISPs as well as **Tier 1 providers** such as Telia utilize Route Flap Damping.

At least **8% of 610 measured ASs** are using Route Flap Damping.



Which RFD parameters are deployed?

Most ASs use **deprecated** **vendor default configurations**.

This could be you!

Some ASs report usage of RFD in whois records.

Most ASs are referencing RIPE-229, which is the (outdated) recommendation from 2001.

```
$ whois AS...
---------------------------------------------------------------------
remarks:
remarks:   Applied Route Flap Damping Policy conformant to RIPE-229
remarks:
remarks:
---------------------------------------------------------------------
```

Validating Results

To validate our findings we contacted all identified RFD ASs.

We have **received replies from 27 ASs** and we have 1 false positive. Most ASs are using vendor default parameters!

Expectation vs. Reality

- The networking community thinks **RFD is rarely used**
- **IETF + RIPE recommendation** are used in practise

- **RFD is not uncommon -** multiple Tier 1 providers use RFD
- Most ASs use deprecated default **values from 2001**

Lessons learned

RFD is used on the Internet.

Tier1 provider as well as small ISPs deploy RFD.

Most vendors provide deprecated, harmful default configurations. Most ASs use them.

Recommendations to you!

Thank you!

1. Check the **configurations of your routers** whether you have unpurposely enabled RFD.
2. Check whether your **whois entries** are up to date.
3. Consider using **recommended parameters** (adjusting suppress-threshold) or disabling RFD.

   See https://www.ripe.net/publications/docs/ripe-580

You do want to help improving our results?

Give feedback on our results!

Confirm our observations, send us your RFD configuration ;) ...

https://rfd.rg.net | **clemens.mosig@fu-berlin.de**