

# SendHoldTimer and you

Ben Cartwright-Cox  
NONOG-6 / NIX 2024

# HoldTimer

- BGP is TCP
- TCP does not have built in connection timeouts
- BGP peers send "KEEPALIVE" frames typically every 30 seconds between each other to reset a hold timer of (normally) 90 seconds
- You can lower this time if you want, but if the other router gets very busy you might "hold timer expired" when you didn't want to
  
- You can disable the HoldTimer, but I think you are insane if you do

# The problem

- BGP is TCP
- TCP is an underspecified two-node consensus algorithm

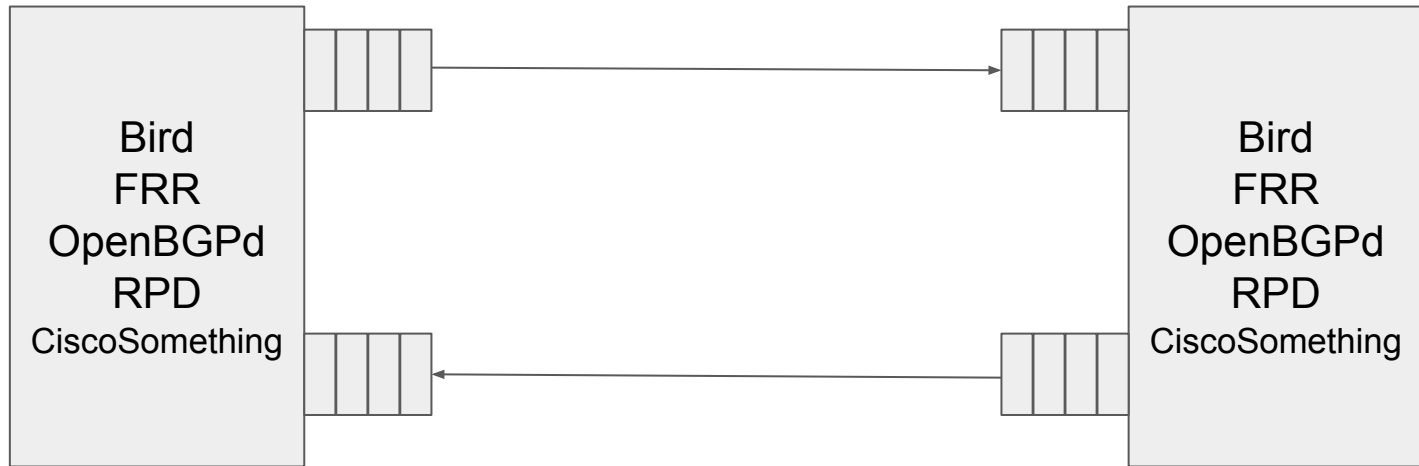
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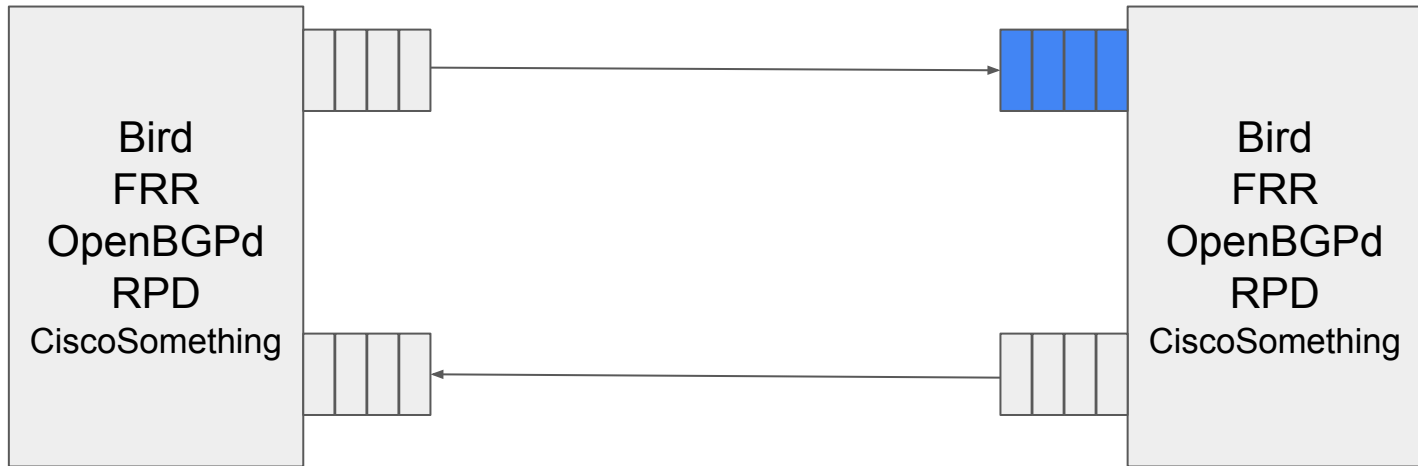
```
root@orange-ns:~# ss -plan
Netid State      Recv-Q Send-Q           Local Address:Port
...
tcp    ESTAB        0      50           193.251.143.108:1021
...
```



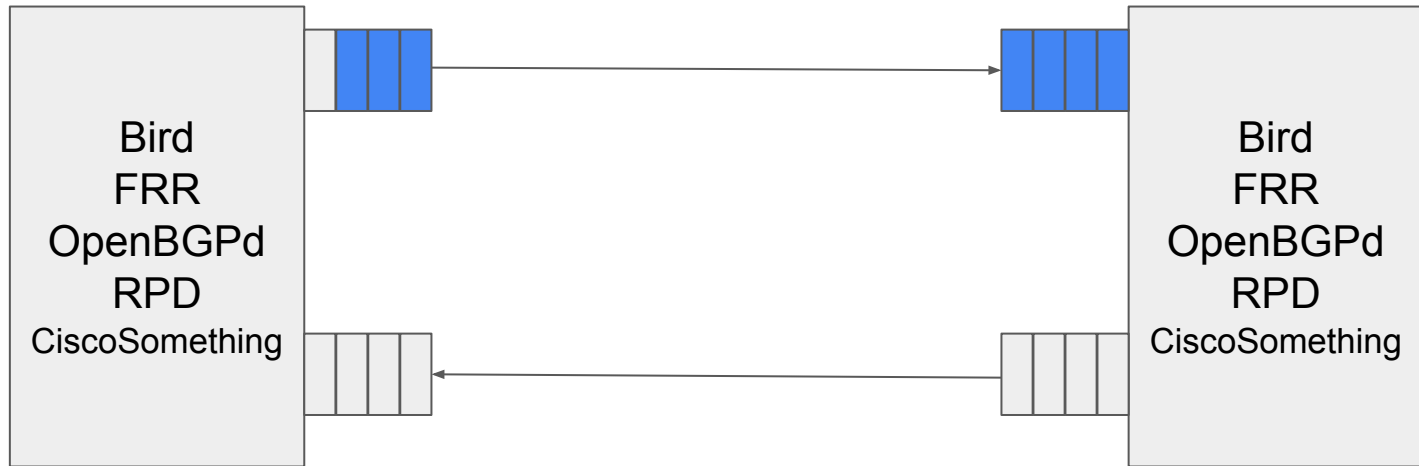
# The problem



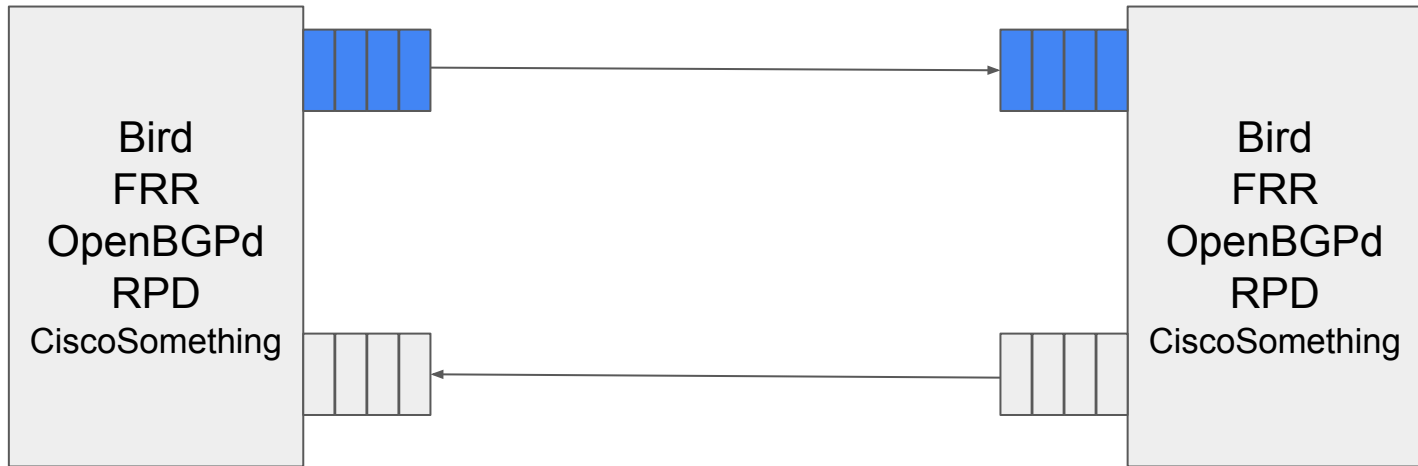
# The problem



# The problem

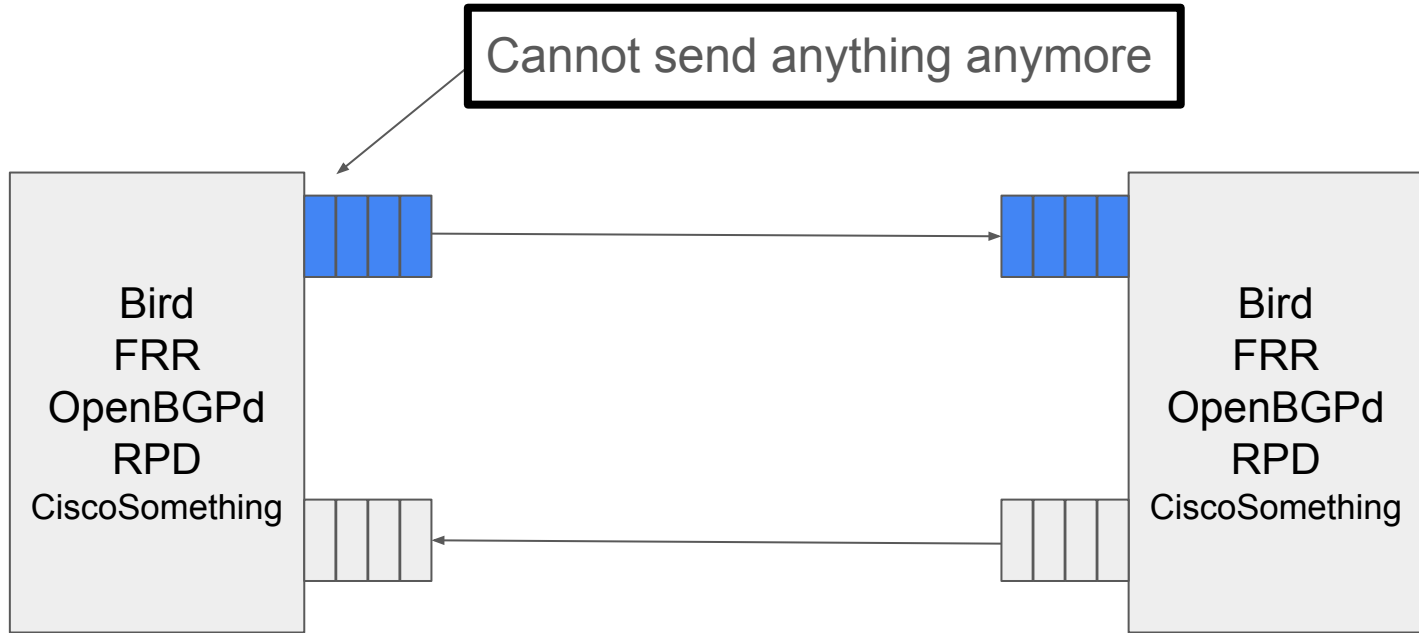


# The problem





# The problem



# The problem

- Being unable to send is actually quite normal
- When you are sending a full table to a customer, there is a high chance your bgpd is in this situation that it wants to send more, but it cannot
- So you cannot just disconnect all peers that end up in this situation otherwise BGP stops working as a whole

# The problem

- Being unable to send is actually quite normal
- When you are sending a full table to a customer, there is a high chance your bgpd is in this situation that it wants to send more, but it cannot
- So you cannot just disconnect all peers that end up in this situation otherwise BGP stops working as a whole
- But if you just hope that the socket will soon become unblocked. You may be stuck forever
- Typically the HoldTimer catches this because the other peer has died and wont send KEEPALIVEs anymore

# The problem

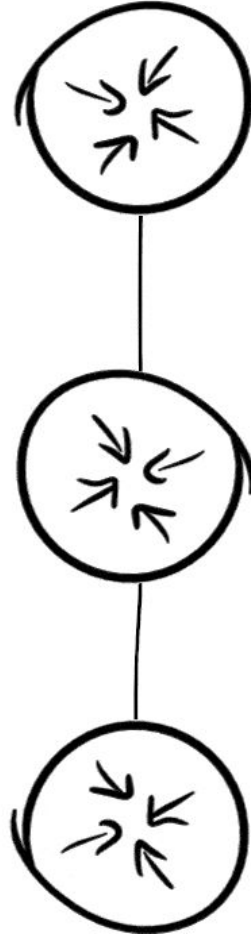
- Sometimes BGPd's can stop reading their socket, but keep sending KEEPALIVEs... Forever.
- Nuclear worst case, You cannot at this point send new/withdraw route updates and the session remains up forever
- But because the hold timer on your end is refreshed. Everything keeps working

# The Symptoms



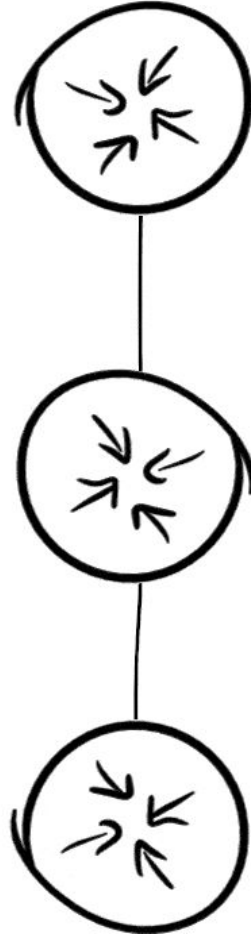
# The Symptoms

- Tables go "stale" with out of date routing data
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# The Symptoms

- Tables go "stale" with out of date routing data
- This impacts downstreams as well
  
- This surfaces often as "stuck routes"



## Why you should care about this?

- Providers would generally prefer that the AS-PATH is accurate, and that networks don't send route for prefixes they cannot get to
- Your own prefixes may get "stuck" in providers backbones and be either blackhole'd, or send down stupid paths that you cannot easily fix without contacting the offending network
  - Who may be a ex-supplier, possibly extra spicy





# Why do I care about this?

- I run bgp.tools
- bgp.tools is at the core, a BGP route collector
- "Stuck" BGP routing data not only makes the site worse, but also messes with my own monitoring and annoys my customers
- I am incentivised to fix this for my own sanity

## Browse the Internet ecosystem

Search by ASN (AS13335), Prefix (8.8.8.0/24), DNS (bgp.tools), or MAC Address (3c:ec:ef:6f:8d:75)

Start here...



[Jump to Looking Glass](#)

### You are connecting from

- IPv6: [redacted]
- Ben Cartwright-Cox ([AS206924](#))
- [2a0c:2f07:4663::/48](#)
- DNS: [redacted]
- DNS: [redacted]
- DNS: [redacted]

### Example Pages

- [Cloudflare \(AS13335\)](#)
- [LINX LON1](#)
- [Google DNS Prefix](#)

### Recent Updates

- [August 2024 Changelog](#)
- [July 2024 Changelog](#)

### Why use BGP.Tools?

#### We offer for free:



























- Near Realtime BGP Data
- User Friendly interfaces
- [Frequently updated external data](#)

# The AS204318 BGP Clock

- I put a /34 of IPv6 to work, and got a AS204318 to announce two prefixes
- First, the whole /34
  - Otherwise other networks IRR filter generation does not work in time
- Second, a /48 the represents the current hour of the year, in hexadecimal in the IPv6 prefix
- Right now, there are 13 "visible" prefixes according to bgp.tools for AS204318
  - Remember there should only be 2



































## Benjamin Cartwright-Cox

AS Number 204318

Overview	Prefixes	Connectivity	Whois
Prefixes Originated 0 IPv4, 13 IPv6 <a href="#">Show Low Visibility Prefixes</a>		Addresses Originated 0 /24's of IPv4 16384 /48's of IPv6	
	Prefix	Description	
 	<a href="#">2a13:4c00::/34</a>	-	
 	<a href="#">2a13:4c00:154d::/48</a>	-	
 	<a href="#">2a13:4c00:154e::/48</a>	-	
 	<a href="#">2a13:4c00:156a::/48</a>	-	
 	<a href="#">2a13:4c00:157f::/48</a>	-	
 	<a href="#">2a13:4c00:15dd::/48</a>	-	
 	<a href="#">2a13:4c00:15de::/48</a>	-	
 	<a href="#">2a13:4c00:15df::/48</a>	-	
 	<a href="#">2a13:4c00:15e1::/48</a>	-	
 	<a href="#">2a13:4c00:15e2::/48</a>	-	
 	<a href="#">2a13:4c00:166e::/48</a>	-	
 	<a href="#">2a13:4c00:166f::/48</a>	-	
 	<a href="#">2a13:4c00:17e1::/48</a>	-	

# The AS204318 BGP Clock (2)

- Actually I lied, bgp.tools sees 40 different prefixes for AS204318, but hides them because they have too low visibility
- Low visibility means that less than 30 "vantage points" (IE: BGP sessions) can see it
  - To be honest, this might need to be higher anyway
- But having 38 stuck prefixes on this setup alone, and only on IPv6 is pretty bad!
  - This setup would be incredibly expensive to run on IPv4
  - But the problem does exist on IPv4, just harder to measure

Overview	Prefixes	Connectivity	Whois
<b>Low Visibility Prefixes</b> may show prefixes that are stuck or no longer announced. <a href="#">Learn more about low visibility here</a>			
Prefixes Originated <b>0 IPv4, 13 IPv6</b> <a href="#">Hide Low Visibility Prefixes</a>		Addresses Originated <b>0 /24's of IPv4</b> <b>16384 /48's of IPv6</b>	
	Prefix	Description	
 	<a href="#">2a13:4c00::/34</a>	-	
  	<a href="#">2a13:4c00:291::/48</a>	-	
  	<a href="#">2a13:4c00:871::/48</a>	-	
  	<a href="#">2a13:4c00:9c6::/48</a>	-	
  	<a href="#">2a13:4c00:10c9::/48</a>	-	
  	<a href="#">2a13:4c00:10ca::/48</a>	-	
  	<a href="#">2a13:4c00:1488::/48</a>	-	
 	<a href="#">2a13:4c00:154d::/48</a>	-	
 	<a href="#">2a13:4c00:154e::/48</a>	-	
  	<a href="#">2a13:4c00:155d::/48</a>	-	
 	<a href="#">2a13:4c00:156a::/48</a>	-	
 	<a href="#">2a13:4c00:157f::/48</a>	-	
  	<a href="#">2a13:4c00:15c6::/48</a>	-	

# Ok, cool, but how do you plan to fix this



```
BLHIX_RS1_4 BGP      ---      up      2024-09-08      Established
  BGP state:          Established
  Neighbor address:  195.208.208.100
  Neighbor AS:       8631
  Local AS:          212232
  Neighbor ID:       195.208.208.100
[...]
```

```
  Session:            external AS4
  Source address:     195.208.208.202
  Hold timer:         77.776/90
  Keepalive timer:   25.632/30
```

# Ok, cool, but how do you plan to fix this

- Make a new hold timer!

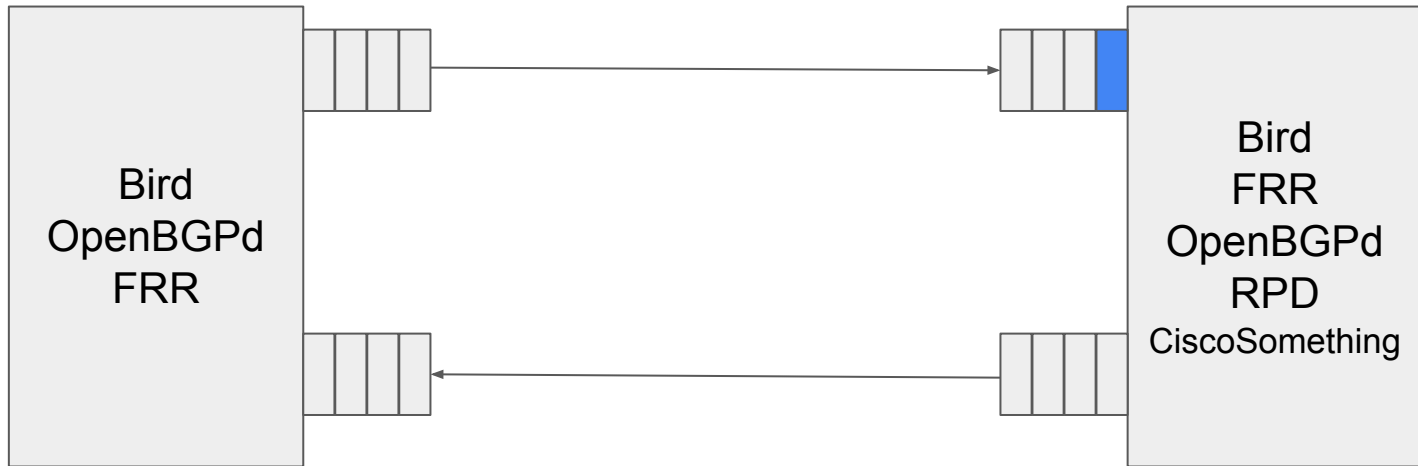
```
rrsflow    BGP          ---          up          2024-06-25    Established
  BGP state:          Established
  Neighbor address: 192.168.190.253
  Neighbor AS:       206924
  Local AS:          206924
  Neighbor ID:       192.168.180.5
[...]
```

Session: internal multihop route-reflector AS4  
Source address: 185.230.223.3  
**Hold timer: 115.525/240**  
Keepalive timer: 32.070/80  
**Send hold timer: 436.949/480**

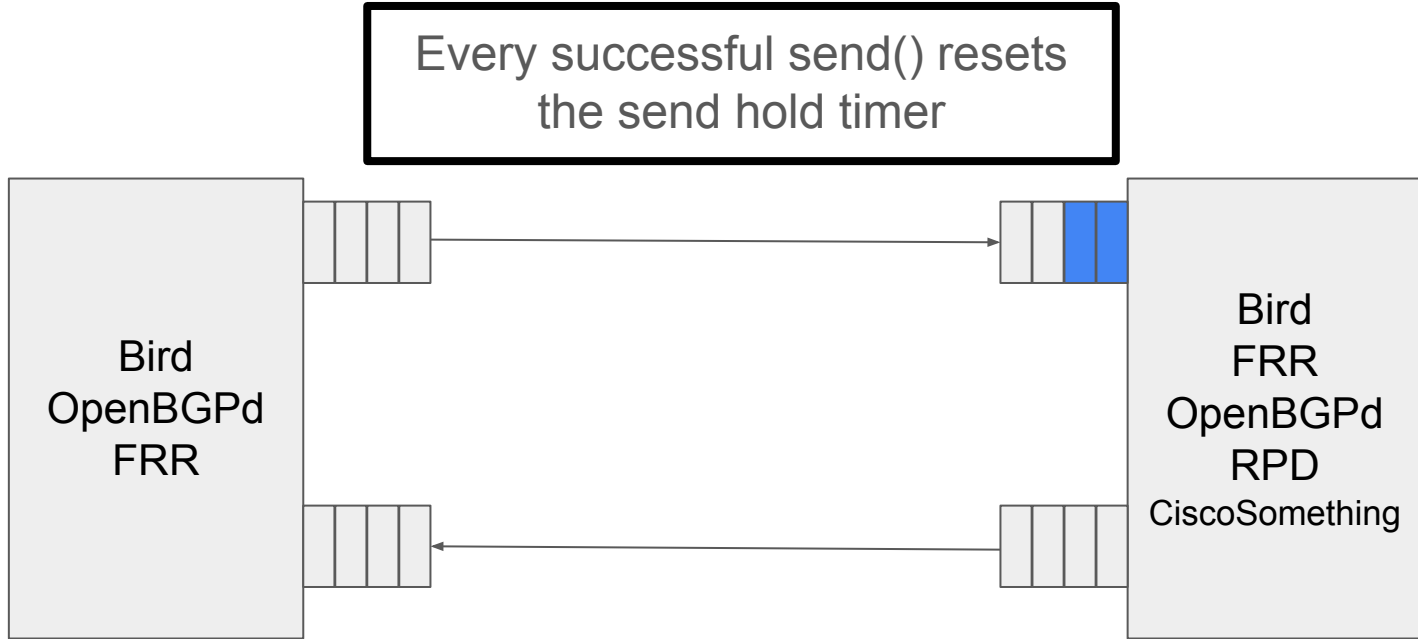


As seen  
in BIRD  
2.15.1

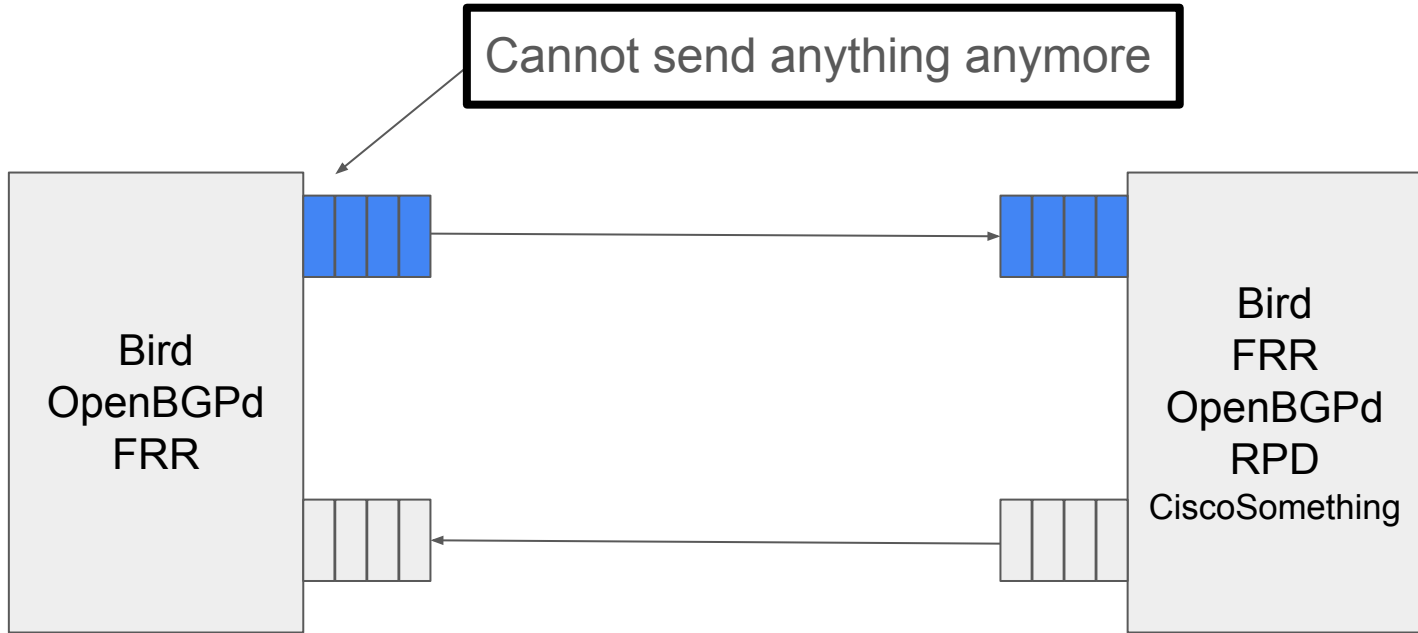
# The Mechanics



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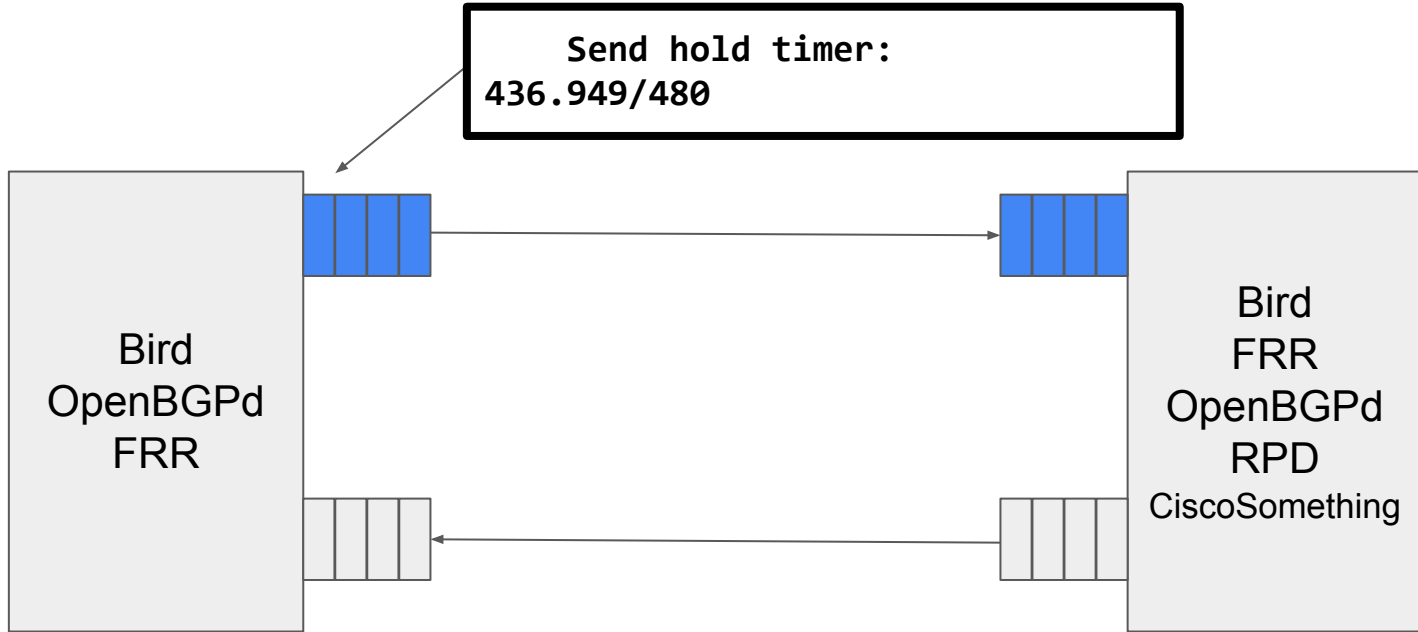


# The Mechanics

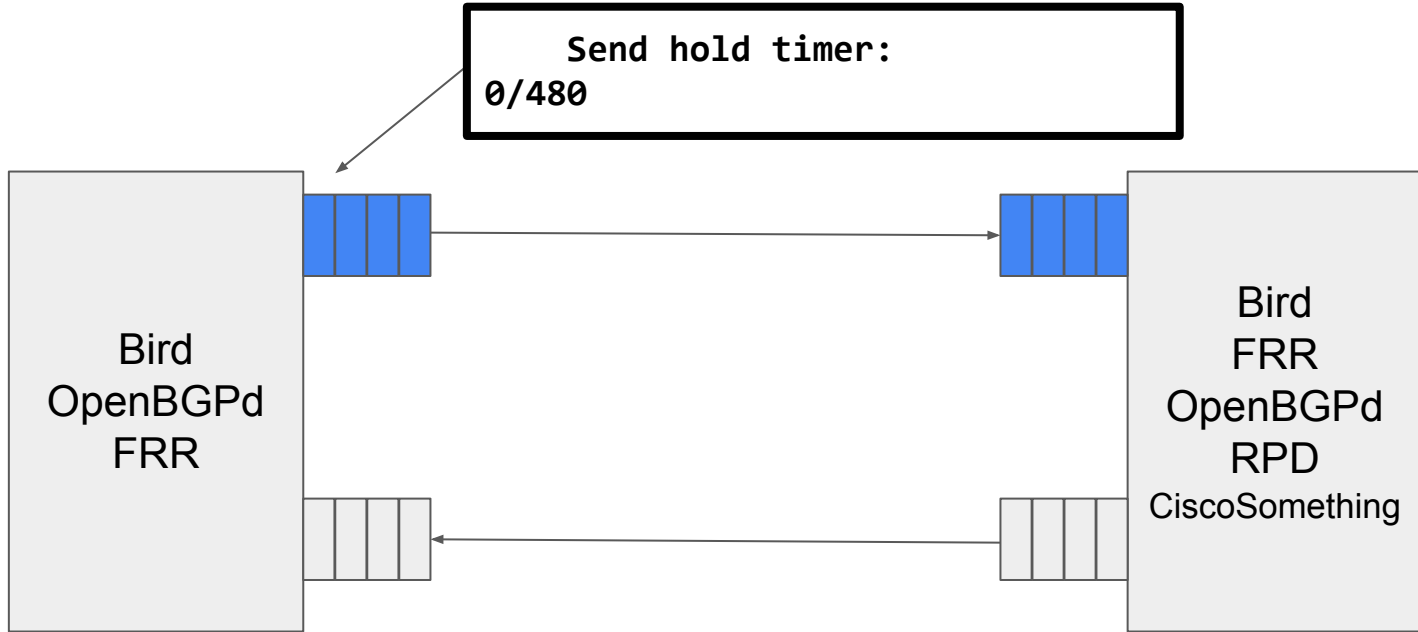




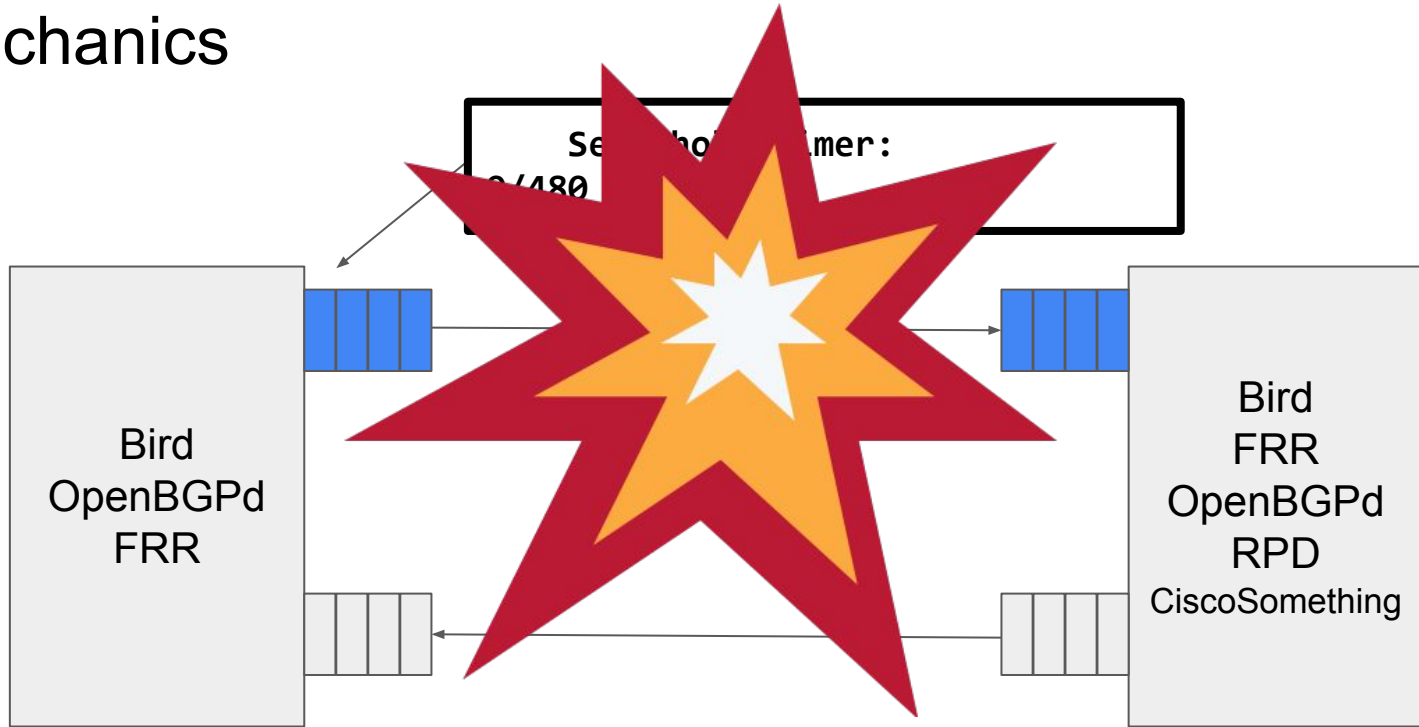
# The Mechanics



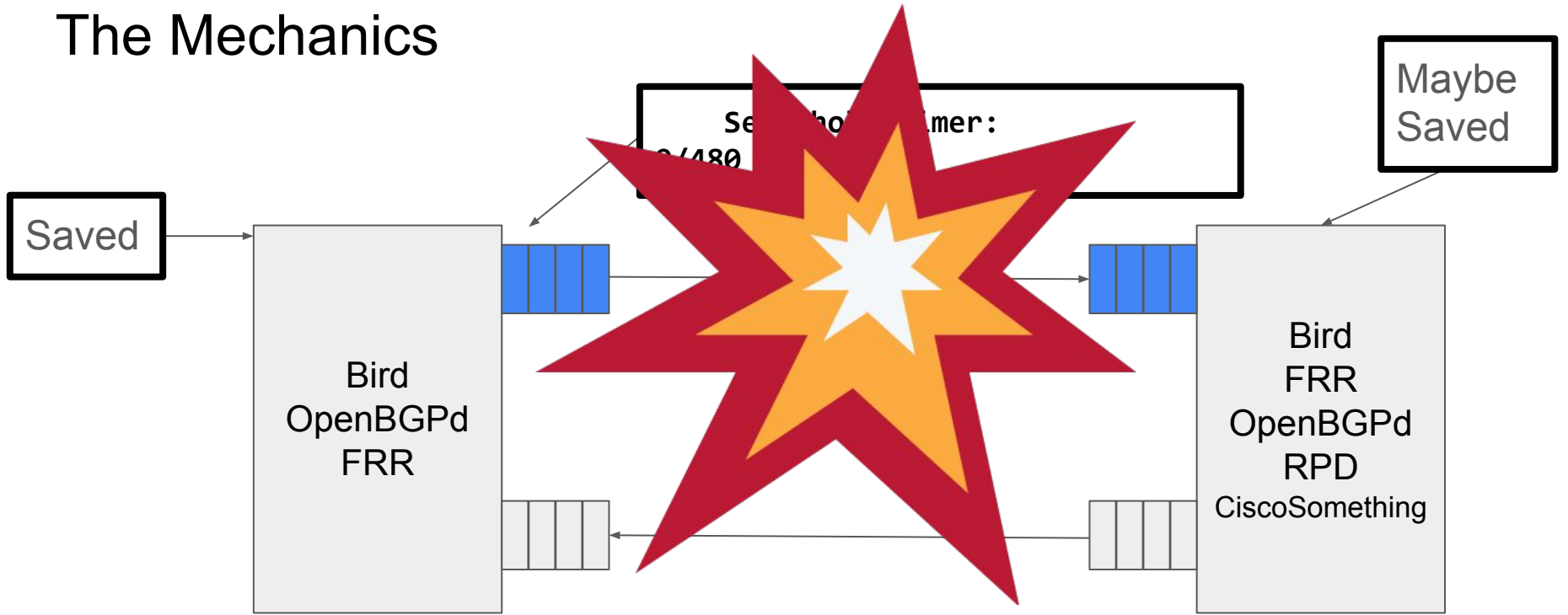
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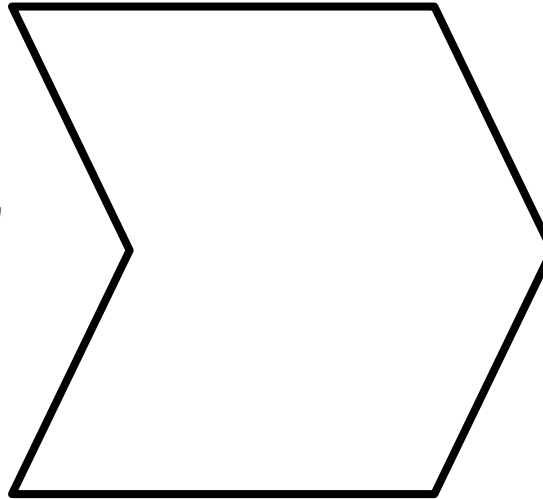


# Software Availability

- ✓ BIRD - 2.15+
- ✓ FRR - 8.3+
- ✓ OpenBGPd - 6.9+

- ✗ Cisco
  - ✗ NX-OS
  - ✗ iOS-XR
  - ✗ iOS-XE
  -  iOS-"Classic"

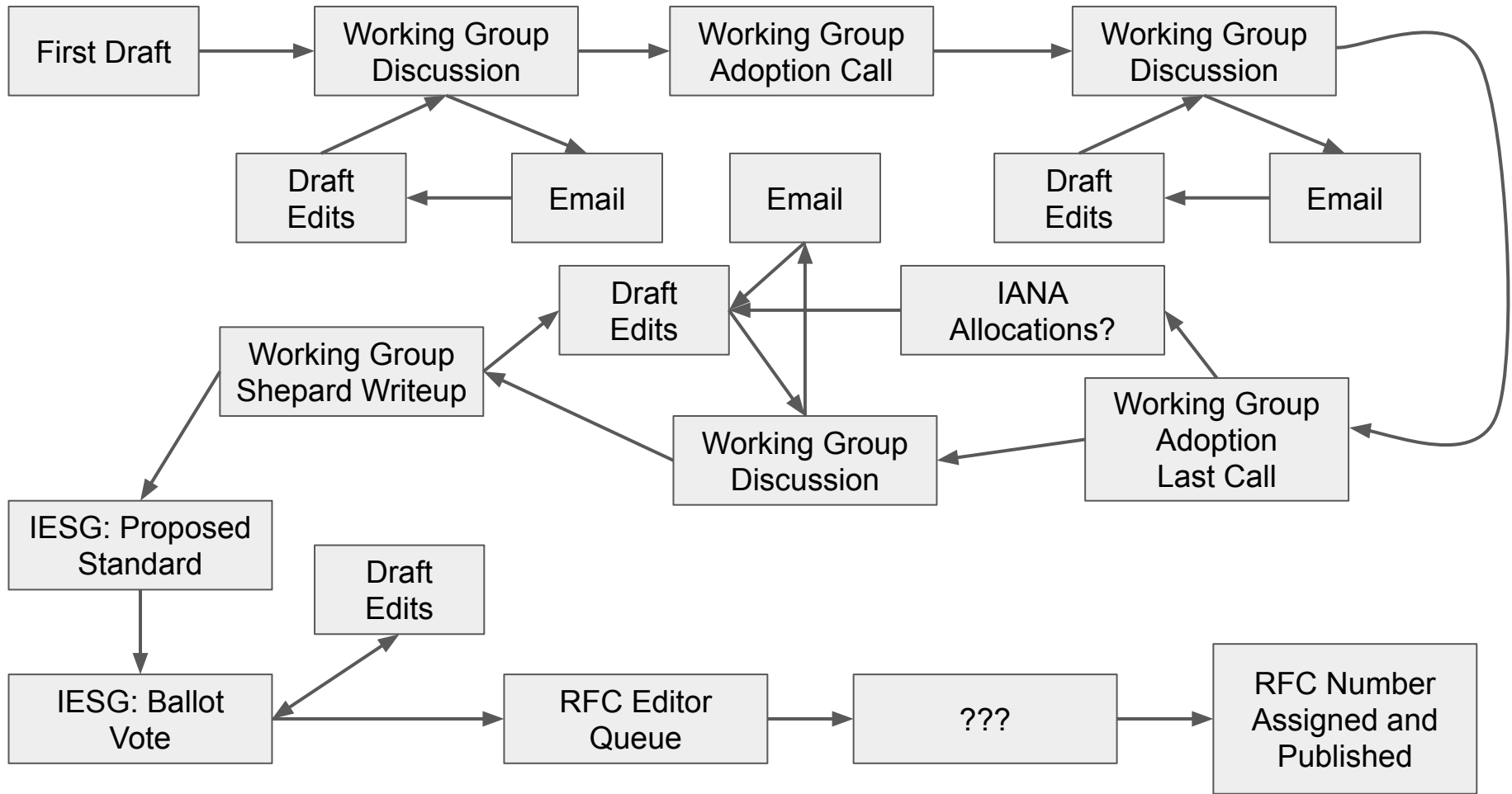
- ✗ MikroTik
- ✗ EXOS
- ✗ JunOS
- ✗ EOS
- ✗ SR-OS



Most of these are likely waiting for customer input or RFC status

# How hard can it be to get a RFC?

Hard, Maybe, Sometimes







# Border Gateway Protocol 4 (BGP-4) Send Hold Timer

## draft-ietf-idr-bgp-sendholdtimer-15

Status

[IESG evaluation record](#)

[IESG writeups](#)

[Email expansions](#)

[History](#)

### Versions:

[00](#) [01](#) [02](#) [03](#) [04](#) [05](#) [06](#) [07](#) [08](#) [09](#) [10](#) [11](#) [12](#) [13](#) [14](#) **15**

draft-spaghetti-idr-bgp-sendholdtimer

02 03 04 08 09

draft-ietf-idr-bgp-sendholdtimer

00 01 04 10 13 15



### Document

#### Type

Active Internet-Draft ([idr WG](#))

#### Authors

[Job Snijders](#) ✉, [Ben Cartwright-Cox](#) ✉, [Yingzhen Qu](#) ✉

#### Last updated

2024-08-30 (Latest revision 2024-08-06)

#### Replaces

[draft-spaghetti-idr-bgp-sendholdtimer](#)

#### RFC stream

Internet Engineering Task Force (IETF)

# IETF Timeline

- Apr 2021: "Hunting down the stuck BGP routes" and "draft-**spaghetti**-idr-bgp-sendholdtimer" is published
  - Spaghetti because you can put "anything" there before it is "adopted", so spaghetti it is.

# xml2rfc

draft-example.xml u • M Makefile

draft-example.xml

```
1 <?xml version="1.0" encoding="UTF-8"?>
2
3 <?rfc sortrefs="yes"?>
4 <?rfc subcompact="no"?>
5 <?rfc symrefs="yes"?>
6 <?rfc toc="yes"?>
7 <?rfc tocdepth="3"?>
8 <?rfc compact="yes"?>
9 <?rfc subcompact="no"?>
10
11 <rfc category="std" docName="draft-aaa-idr-skibidi-toilet-0" ipr="trust200902" submissionType="IETF" consensus="true">
12 <front>
13   <title abbrev="Skibidi Toilet">Skibidi Toilet</title>
14   <author fullname="Ben Cartwright-Cox" initials="B." surname="Cartwright-Cox">
15     <organization abbrev="Port 179">Port 179 Ltd</organization>
16     <address>
17       <postal><street/><city>London</city><code /><country>United Kingdom</country></postal>
18       <email>ben@benjojo.co.uk</email>
19     </address>
20   </author>
21   <keyword>meme</keyword>
22   <abstract>
23     <t>Skibidi toilet</t>
24   </abstract>
25 </front>
26
27 <middle>
28   <section title="Introduction">
29     <t>
```

Skibidi Toilet is a machinima web series released through YouTube videos and shorts, created by Alexey Gerasimov and uploaded on his YouTube channel DaFuq!?Boom!. Produced using Source Filmmaker, the series follows a fictional war between human-headed toilets and humanoid characters with electronic devices for heads.

# xml2rfc

```
root@ietf-containment-zone:~# pip3 install xml2rfc
[...]
root@ietf-containment-zone:~# xml2rfc draft.xml --html --text
Created file draft.txt
Created file draft.html
root@ietf-containment-zone:~#
```

# xml2rfc

```
# cat draft.txt
```

```
Network Working Group  
Internet-Draft  
Intended status: Standards Track  
Expires: 14 March 2025
```

```
B. Cartwright-Cox  
Port 179  
10 September 2024
```

```
Skibidi Toilet  
draft-aaa-idr-skibidi-toilet-0
```

```
Abstract
```

```
Skibidi toilet
```

# xml2rfc

Internet-Draft

Skibidi Toilet

September 2024

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### 1. Introduction

Skibidi Toilet is a machinima web series released through YouTube videos and shorts, created by Alexey Gerasimov and uploaded on his YouTube channel DaFuq!?Boom!. Produced using Source Filmmaker, the series follows a fictional war between human-headed toilets and humanoid characters with electronic devices for heads.

Since the first short was posted in February 2023, Skibidi Toilet has become viral as an internet meme across various social media platforms, particularly among Generation Alpha. Many commentators saw their embracement of the series as Generation Alpha's first

- It nicely renders txt files and HTML/PDF etc for you!

# IETF Datatracker

- Consumes this XML and (after Author email verification) publishes it to the site for others to see
- Everything onwards is basically done inside datatracker submissions, or other people do stuff on datatracker to your draft

## Internet-Draft submission

[Upload](#)[Status](#)[Instructions](#)[Approvals](#)[Manual Post Requests](#)

The last submission time for new Internet-Drafts before the meeting is 2024-10-21 23:59 UTC. After that, you will not be able to submit Internet-Drafts until after 2024-11-02 23:59 GMT (IETF-meeting local time)

By submitting your I-D, you are granting some rights to the IETF Trust. Before you submit your I-D, review the information in the [Note Well](#) and [BCP 78](#), "Rights Contributors Provide to the IETF Trust".

Before you submit your I-D, it is recommended that you check it for nits using the [ldnits](#) tool, and fix them.

### XML source of the I-D

 No file chosen

Preferably, submit a standalone [xml2rfc version 3](#) source file. You can use this online [conversion service](#) to convert your I-D to this format. (You may submit an older [xml2rfc version 2](#) file if you must.)

 Submit other formats

Please send reports about submission tool bugs to the Tools Team using one of the Bug Report links at the bottom of the page.

If you run into problems submitting an Internet-Draft and need to request manual posting of an Internet-Draft, please send the Internet-Draft and the reason for manual posting to [support@ietf.org](mailto:support@ietf.org). Be advised that manual processing always takes additional time.

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Apr 2021

Oct 2021

Apr 2022

Jul 2022

Feb 2023

May 2023

Dec 2023

Feb 2024

Apr 2024

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- Apr 2021: *Lively* initial mailing list discussion
  - About 40 emails exchanged with various people

# IETF Discussion

- The IETF is an interesting standards body, as it requires no monetary investment to participate in, Unlike:
  - IEEE SA
  - 3GPP
  - MPEG
  - GSM
  - ETSI etc
- This means that all types of people can chime in on mailing lists
  - This can be a good thing, more eyeballs can point out more flaws
  - This can be a bad thing, because people can be very annoying or potentially participate in bad faith

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- Jul 2022: Request adoption to the working group
  - *Lively* email discussion, About 90+ emails exchanged with a smaller group of people
  - Eventually Adopted in May 2023

# IETF Working groups / Adoptions / etc

- The IETF is split into different WG (Working Groups) for various common subjects/areas of work

# IETF Working groups

asap	stir	snac	bess	tvr
asdf	vcon	tictoc	bfd	ace
calext	wimse	anima	bier	acme
cbor	gendispatch	bmwg	cats	cose
cellar	6lo	dnsop	ccamp	dance
dispatch	6man	grow	detnet	dult
dmarc	add	iotops	idr	emu
ecrit	bpf	ippm	lisp	gnap
emailcore	deleg	ivy	lsr	ipsecme
extra	dhc	mboned	lsvr	jose
jmap	dmm	mops	manet	keytrans
mailmaint	dnssd	netconf	mpls	kitten
mediaman	dprive	netmod	nvo3	lake
mimi	drip	nmop	pals	lamps
mlcodec	dtn	opsawg	pce	mls
regext	intarea	sidrops	pim	oauth
satp	madinas	srv6ops	rft	ohai
sipcore	ntp	v6ops	roll	openpgp
sml	schc	babel	rtwgw	ppm
			savnet	pquip
			spring	privacypass
			teas	radext
				rats
				scim
				scitt
				secdispatch
				spice
				suit
				teep
				tls
				uta
				avtcore
				ccwg
				cdni
				core
				httpapi
				httpbis
				masque
				moq
				nfsv4
				quic
				taps
				tcpm
				tsvwg
				webtrans
				wish

# IETF Working groups

asap	stir	snac
asdf	vcon	tictoc
calext	wimse	anima
cbor	gendispatch	bmwg
cellar	6lo	dnsop
dispatch	6man	grow
dmarc	add	iotops
ecrit	bpf	ippm
emailcore	deleg	ivy
extra	dhc	mboned
jmap	dmm	mops
mailmaint	dnssd	netconf
mediaman	dprive	netmod
mimi	drip	nmop
mlcodec	dtn	opsawg
regext	intarea	sidrops
satp	madinas	srv6ops
sipcore	ntp	v6ops
sml	schc	babel

bess  
bfd  
bier  
cats  
ccamp  
detnet

**idr**

lisp  
lsr  
lsvr  
manet  
mpls  
nvo3  
pals  
pce  
pim  
rift  
roll  
rtgwg  
savnet  
spring

tvr		
ace		
acme		
cose		
dance		
dult	rats	
emu	scim	httpapi
gnap	scitt	httpbis
ipsecme	secdispatch	masque
jose	spice	moq
keytrans	suit	nfsv4
kitten	teep	quic
lake	tls	taps
lamps	uta	tcpm
mls	avtcore	tsvwg
oauth	ccwg	webtrans
ohai	cdni	wish
openpgp	core	
ppm		
pquip		
privacypass		
radext		

# IETF Working groups / Adoptions / etc

- The IETF is split into different WG (Working Groups) for various common subjects/areas of work
- You upload stuff to datatracker, talk about it on the WG mailing list
- Assuming you think people are not going to vote against it, you can ask the WG Chairs to Adopt the draft
- This means that the draft is now "part" of the working group, and generally means it's taken a lot more seriously, and tracked on chair's agenda
- It does not mean that you are going to "succeed" however in getting your draft published (aka, turned into a RFC)



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- Dec 2023: Working Group Last Call request

## Working Group Last Call

- Basically the last point where the mailing lists views are collected, if the "vibe" is right, then they are accepted
- After the last call (and it gets accepted) then you are basically just dealing with the WG Chairs, IESG, IANA etc

# IETF Timeline

- Apr 2021: "Hunting down the stuck BGP routes" and "draft-**spaghetti**-idr-bgp-sendholdtimer" is published
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# IESG

- Just before a working group chair write up happens that tries to summarize all of the discussion that has happened to your draft so far.
- Assuming all goes well, then it gets punted to the IESG, a different set of people who look over the document to see if it makes sense to them, it then goes for a "IESG Ballot"

Informational

IETF stream

Token

IANA review

Consensus

Reviews

**DNSSEC Trust Anchor Publication for the Root Zone**[draft-ietf-dnsop-rfc7958bis](#)[Warren "Ace" Kumari](#) ✉ (OPS)

Version Changed - Review Needed

Yes

[DNSDIR Telechat review by Petr Špaček](#) **Ready w/nits**[DNSDIR Telechat review \(of -05\) by Petr Špaček](#) **Ready w/issues**[DNSDIR Telechat review \(of -04\) by Petr Špaček](#) **Almost ready**[GENART Last Call review \(of -03\) by Dan Romascanu](#) **Ready w/issues**[ARTART Last Call review \(of -03\) by Scott Hollenbeck](#) **Ready w/nits**[SECDIR Last Call review \(of -03\) by Klaas Wierenga](#) **i Has nits**[DNSDIR Last Call review \(of -03\) by Petr Špaček](#) **! On the right track**[DNSDIR Early review \(of -00\) by Florian Obser](#) **Ready w/nits**[SECDIR Telechat Review due 2024-09-17](#) **Incomplete**[OPSDIR Last Call Review due 2024-08-08](#) **Incomplete**

Informational  
IETF stream  
Token  
IANA review  
Consensus  
Reviews

### DNSSEC Trust Anchor Publication for the Root Zone

[draft-ietf-dnsop-rfc7958bis](#)

[Warren "Ace" Kumari](#) (OPS)

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[DNSDIR Telechat review \(of -04\) by Petr Špaček](#) Almost ready

[GENART Last Call review \(of -03\) by Dan Romascanu](#) Ready w/issues

[ARTART Last Call review \(of -03\) by Scott Hollenbeck](#) Ready w/nits

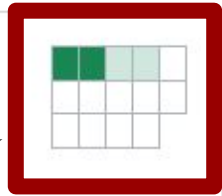
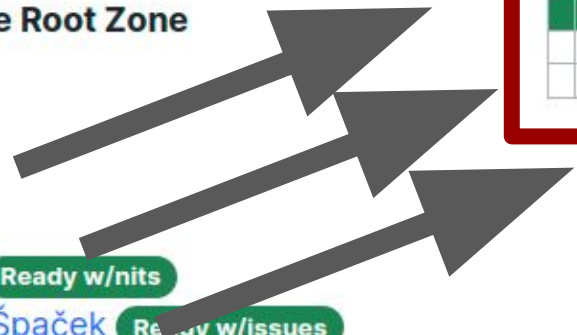
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[DNSDIR Last Call review \(of -03\) by Petr Špaček](#) ! On the right track

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- 4 possible states
- Discuss
  - As close to "no" as possible for the IETF
- Yes
- No Objection
  - For when people don't have a strong/educated view
- Recuse
  - Used when it is not appropriate for someone to vote (Conflict of Interest etc)

Ballot for draft-ietf-netmod-syslog-model ✕

**Discuss**

[Paul Wouters](#)

**Yes**

Warren Kumari

**No Objection**

[Éric Vyncke](#)

**Recuse**

[Mahesh Jethanandani](#)

**No Record**

Deb Cooley

Erik Kline

Francesca Palombini

Gunter Van de Velde

Jim Guichard

John Scudder

Murray Kucherawy

Orie Steele

Roman Danyliw

**Ballots:**

Approve (22) Approve (32)

**Summary:** Has a DISCUSS. Needs 7 more YES or NO OBJECTION positions to pass.

**Paul Wouters** **Discuss**

**Discuss (2024-09-09)** **Sent**

Thanks for this document. I have a few points to discuss that hopefully are minor and a result from my misunderstanding.

The layout is completely broken / wrapped, making the document fairly unreadable. Can this be fixed somehow ?

I don't see a method for syslog using TCP without TLS ? In fact, I am using that on my personal home router to my collection server, without TLS.  
Could the document not simply use:

```

+--rw (transport)
|   +--:(udp)
|   |   +--rw udp
|   |   +--rw address?   inet:host
|   |   +--rw port?     inet:port-number
|   |   +--rw tcp
|   |   +--rw address?   inet:host
|   |   +--rw port?     inet:port-number
|   +--:(tls)
          
```

Close

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# IETF Editor

- A group of people who are paid to be the final editor for drafts
- This is basically the last step before numbers are assigned and draft is published
- Stuff can spend a long time in here, if errors are found or if the document is really long!
- **This is where sendholdtimer currently is**
  - I *think* we are only weeks away from being published

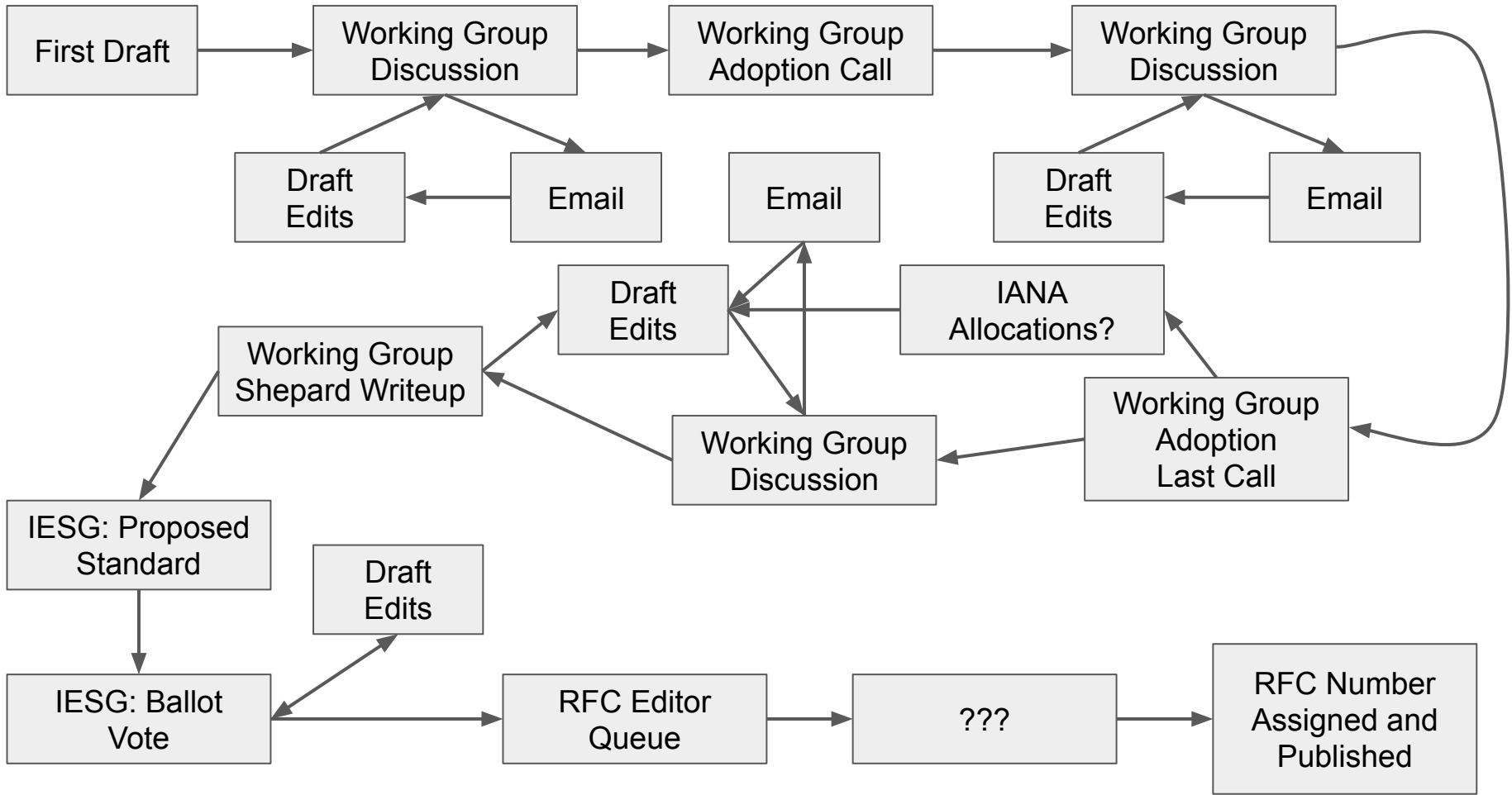
## Publication Queue

[\[About this page\]](#) [\[Summary statistics\]](#) [\[List of all active clusters\]](#)

Found 126 records

Current state	Weeks in state	Weeks in queue	Draft name (Authors)	Cluster	Pages
MISSREF*R(1G)	130.1	131.1	draft-ietf-ecrit-similar-location-19 B. Rosen, R. Marshall, J. Martin	C452	19
MISSREF*R(1G)	121.1	121.9	draft-briscoe-docsis-q-protection-07 B. Briscoe, Ed., G. White	C350	32
			draft-ietf-i2nsf-nsf-facing-interface-dm-29		

So, yeah



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# Hindsight

- I would likely not do this again, but I don't regret doing this
- You have to have someone experienced help you with this
  - Thank you to Job Snijders, who has been extremely knowledgeable
  - And also motivating me the many times when I wanted to give up on the IETF to keep going
- It's possible that this process was more painful due to COVID
  - But it's hard to prove
- Changing BGP behaviour is a extremely contentious thing to do
  - I was not expecting that much of a fight, I got quite a lot of one from a small-ish group of people

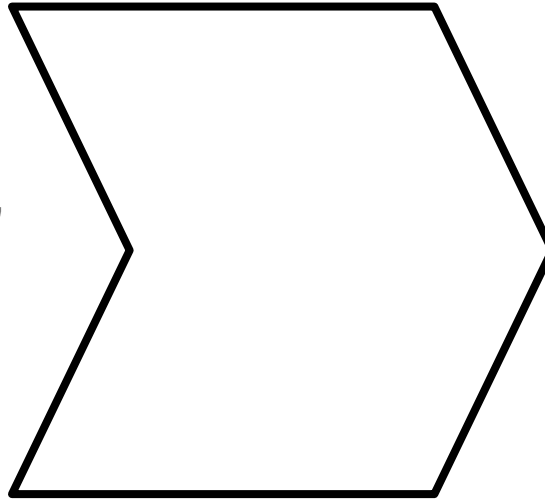
*Anyway*

# Software Availability

- ✓ BIRD - 2.15+
- ✓ FRR - 8.3+
- ✓ OpenBGPd - 6.9+

- ✗ Cisco
  - ✗ NX-OS
  - ✗ iOS-XR
  - ✗ iOS-XE
  -  iOS-"Classic"

- ✗ MikroTik
- ✗ EXOS
- ✗ JunOS
- ✗ EOS
- ✗ SR-OS



Most of these are likely waiting for customer input or RFC status

# Closing remarks

- If you are running software that could have this feature today, I would highly recommend upgrading to a version that has it
- Getting something to RFC is a whole skill level on it's own
  
- The fight is not over on stuck routes, I suspect these TCP "stick" failures are only ~30% of all stuck routes
  - The rest are unidentified(\*) vendor bugs
- But we do already have a confirmed case of SendHoldTimer triggering as intended against a hardware vendor's implementation



# Questions?

Shy? [nonog-talk@benjojo.co.uk](mailto:nonog-talk@benjojo.co.uk)