

inter.link

Tips for IP-Transit Customers

NANOG91

Who?

Stefan

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- Inter.link TechOps

Inter.link

- Supplier of carrier services
- Carbon neutral 2023
- NetZero in 2025
- IP Transit
- IP Access
- L2 VPNs
- DDoS Protection

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Agenda

What can IP-Transit customers do to protect their service?

- Recap - prefix filter list generation
- Data sources - which source to use for prefix filtering
- Authoritative sources - what data within that source to use
- Trusted sources - how to choose the right source
- Standard format - ensuring others can get your prefix data

Prefix Filters

Customer buys an ASN

```
$ whois -T aut-num AS48918  
aut-num:          AS48918  
status:           ASSIGNED
```

Customer buys a prefix
Prefix "origin" set to customer's ASN

```
$ whois -T route6 2a02:c98::/29  
route6:          2a02:c98::/29  
origin:          AS48918
```

Customer adds ASN to their AS-SET

```
$ whois -T as-set AS48918:AS-GLOBALWAYS  
as-set:          AS48918:AS-GLOBALWAYS  
members:        AS48918
```


Customer AS-SET "tree"

AS48918:AS-GLOBALWAYS

--> AS48918

--> 2a02:c98::/29

```
$ whois -h whois.ripe.net -T route6 -i origin AS48918
```

```
route6:          2a02:c98::/29
```

Customer orders IP-Transit



Customer AS-SET added to our AS-SET

```
$ whois -T as-set AS5405:AS-INTERDOTLINK  
members: AS48918:AS-GLOBALWAYS
```

Customer prefix in our AS-SET "tree"

AS5405:AS-INTERDOTLINK

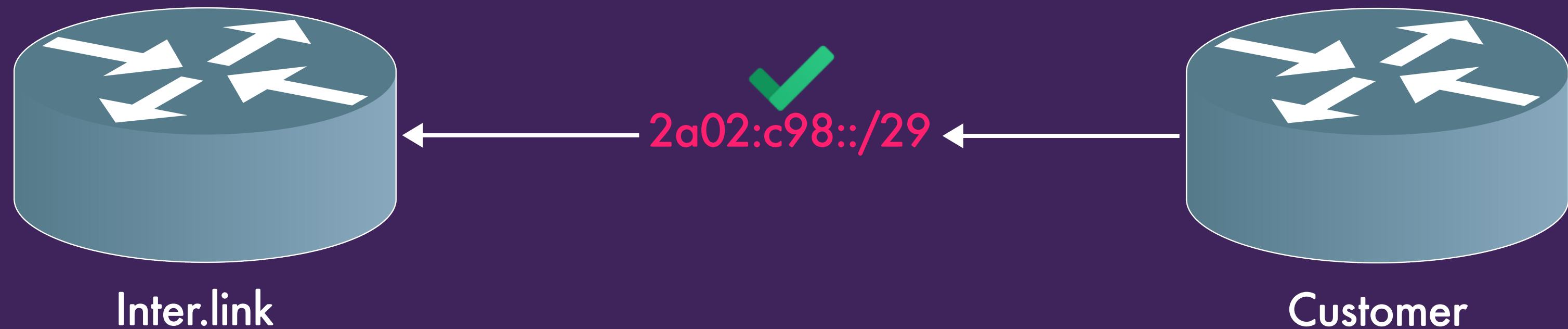
--> AS48918:AS-GLOBALWAYS

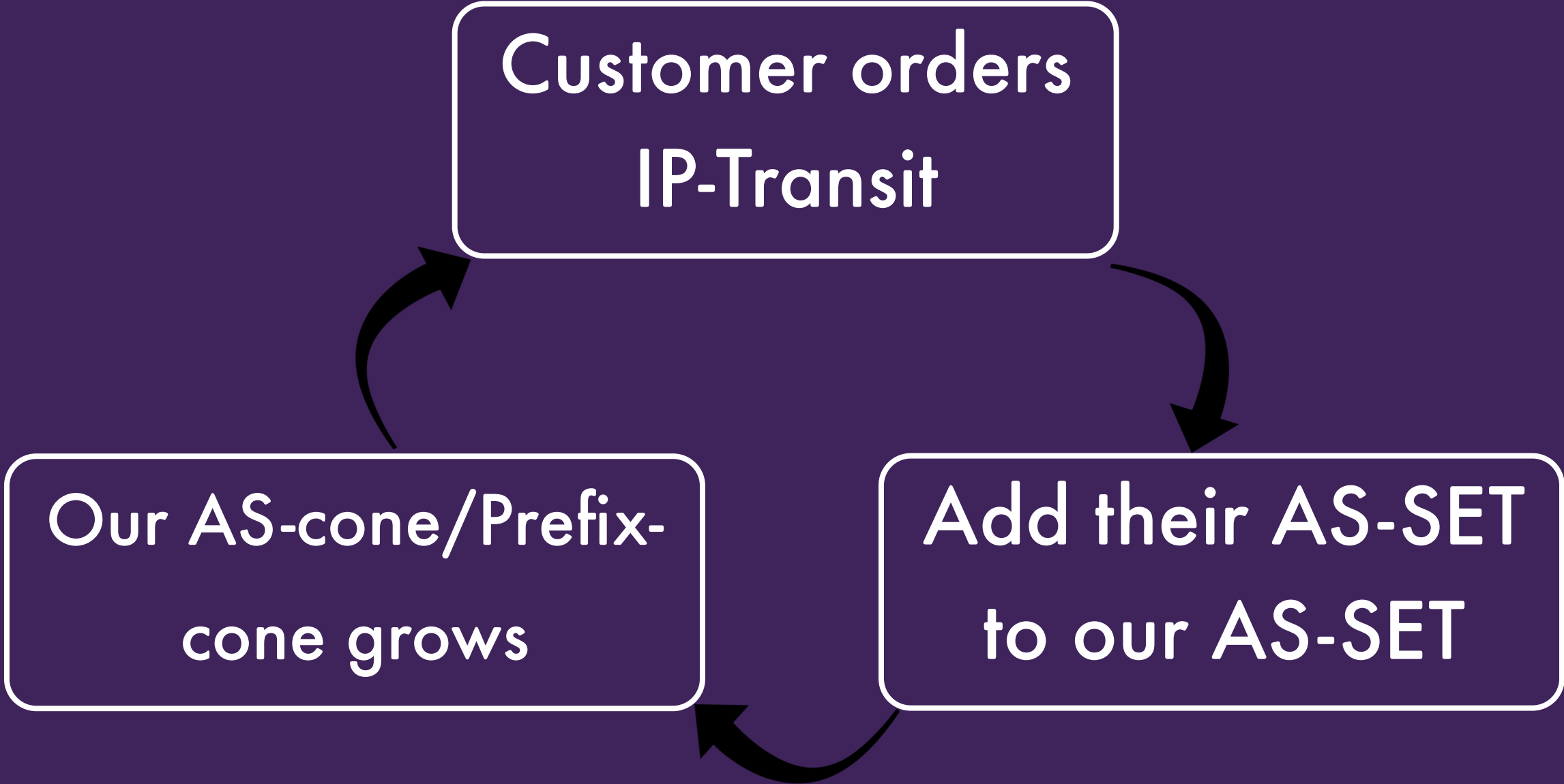
--> AS48918

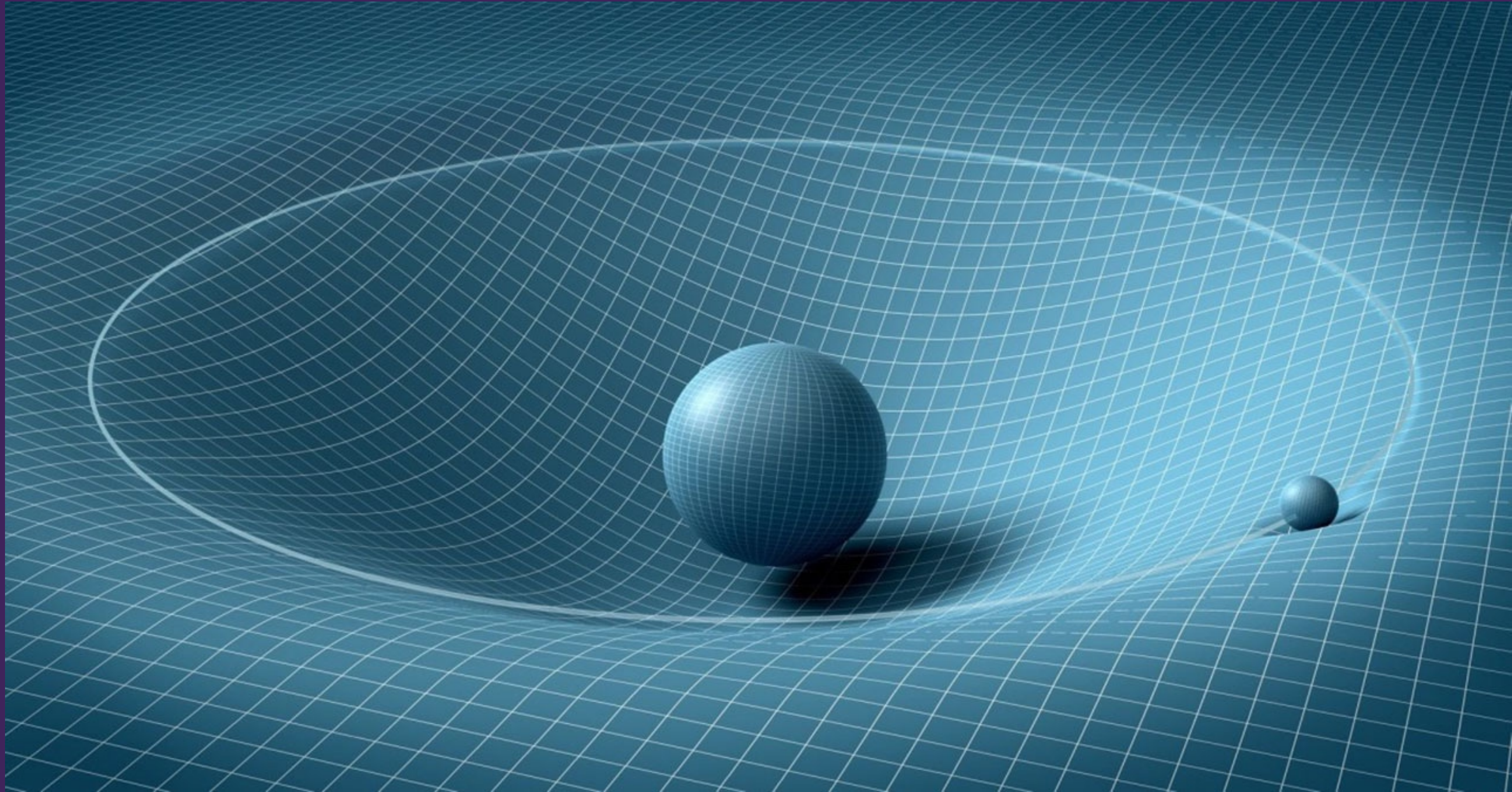
--> 2a02:c98::/29

Use bgpq4 to probably get the customer prefixes,
then filter route advertisements:

```
$ bgpq4 -6 -F "%n/%1\n" AS48918:AS-GLOBALWAYS  
2a02:c98::/29
```







[source](#)

Use [irrtree](#) to get an idea of the total number of prefixes in an AS-SET:

```
$ irrtree -4 -6 AS5405:AS-INTERDOTLINK
```

```
...
```

```
AS5405:AS-INTERDOTLINK (6607 ASNs, 46009 pfxs)
```




[source](#)

Data Sources

"Use bgpq4 to probably get the customer prefixes"

"Use irrtree to get an idea of the number of prefixes"

Why am I using the words "probably." and "idea" ?

Problem Statement:

Where should I (as your transit provider) get this information from?

- I need to get the name of your AS-SET → [PeeringDB](#)
- I need to then get the AS-SET data → ?

We need to query all of the IRR DBs to find customer prefix and ASN data

5x RIR operated IRR-DBs (+ delegations):

- AFRINIC
- APNIC
 - APJJ
 - CNNIC
 - JPNIC
 - KRNIC
 - TWNIC
 - VNNIC
 - IRINN
- ARIN
- LACNIC
 - NIC.MX
 - NIC.BR
- RIPE

And many more:

- ALTDB
- BELL
- BBOI
- CANARIE
- IDNIC
- LEVEL3
- NESTEGG
- NTTCOM
- PANIX
- RADB
- RIPE-NONAUTH
- REACH
- TC

Solution:

- We run local irrd servers
- We mirror the other IRR DBs locally
- We query our irrd servers
- Customer data from all DBs is in one place

```
$ whois -h irr1-ber2-de 2a02:c98::/29
route6:          2a02:c98::/29
source:          RIPE
```



Customer/peer AS-SET in multiple IRR-DBs

```
$ whois -h irr1-ber2-de AS-APPLE
```

```
as-set:          AS-APPLE
```

```
source:         RIPE
```

```
as-set:          AS-APPLE
```

```
source:         RADB
```


One AS-SET is empty!

```
$ irrtree -h irr1-ber2-de -4 -6 -1 RIPE AS-APPLE
AS-APPLE (2 ASNs, 0 pfxs)
+-- AS714 (0 pfxs)
+-- AS6185 (0 pfxs)
```

```
$ irrtree -h irr1-ber2-de -4 -6 -1 RADB AS-APPLE
AS-APPLE (2 ASNs, 244 pfxs)
+-- AS714 (195 pfxs)
+-- AS6185 (49 pfxs)
```


- "AS-SET" squatting across IRR-DBs

- Example, squatting AS-AMAZON

By Maintainer (Amazon)	NOT by Maintainer
as-set: AS-AMAZON descr: Amazon ASNs members: AS-AMAZON-NA, AS-AMAZON-AP, AS-AMAZON-EU admin-c: AC6-ORG-ARIN tech-c: AC6-ORG-ARIN notify: noc@amazon.com mnt-by: MAINT-AS16509 changed: noc@amazon.com 20151027 #17:32:13Z source: RADB	as-set: AS-AMAZON tech-c: DUMY-RIPE admin-c: DUMY-RIPE mnt-by: KATERINA-MNT created: 2022-10-23T19:05:59Z last-modified: 2022-10-23T19:05:59Z source: RIPE

Table 2 — The Amazon as-set shown in RADB (left) and RIPE (right) databases.

Without going into the details of whether it was/is a malicious attempt to create routing problems for Amazon, this is something that must not be allowed.

Thanks to the efforts of Job Snijders, Ben Cox, Nick Hilliard (MANRS Steering Committee Member), and many others, the community has moved quickly and proposed a change to its Whois policy.

How to plug one of many holes in the IRR: from community proposal <https://t.co/8UiY61CnHL> to testing <https://t.co/OASXXIra36> to deployment <https://t.co/3792nizQZI> in 29 days. Kudos to the @ripenc database team!

— Job Snijders (@JobSnijders) December 13, 2022

And on 13 December 2022, RIPE implemented the change in its production database. Now, non-hierarchical as-set creation is not possible in the RIPE Whois.

https://www.peeringdb.com/net/3554



PeeringDB

Apple Inc.

Unternehmen	Apple Inc.
Auch bekannt als	Apple CDN AS6185
Vollständiger Name	
Unternehmenswebseite	https://www.apple.com
ASN	714
IRR as-set/route-set ?	AS-APPLE

https://www.peeringdb.com/net/433



PeeringDB

Google LLC

Platin Sponsor

Unternehmen	Google LLC
Auch bekannt als	Google, YouTube (for
Vollständiger Name	
Unternehmenswebseite	https://about.google/ir
ASN	15169
IRR as-set/route-set ?	RADB::AS-GOOGLE

"::" is the dominant notation

- RIPE::AS-EXAMPLE
- AS-EXAMPLE@RIPE

```
# 2024-03-07 11:59:38
```

```
sqlite> SELECT count(asn) FROM peeringdb_network WHERE irr_as_set LIKE '%::%';  
2028
```

```
sqlite> SELECT count(asn) FROM peeringdb_network WHERE irr_as_set LIKE '%@%';  
24
```

Tip!

Add an IRR-DB source to PeeringDB



AS-EXAMPLE



RIPE::AS-EXAMPLE



Authoritative Sources

"AS-SET" squatting within IRR-DBs

```
$ whois -h whois.ripe.net AS-INTERDOTLINK  
mnt-by: INTERDOTLINK-MNT
```

```
$ whois -h whois.ripe.net AS5405:AS-INTERDOTLINK  
mnt-by: INTERDOTLINK-MNT
```

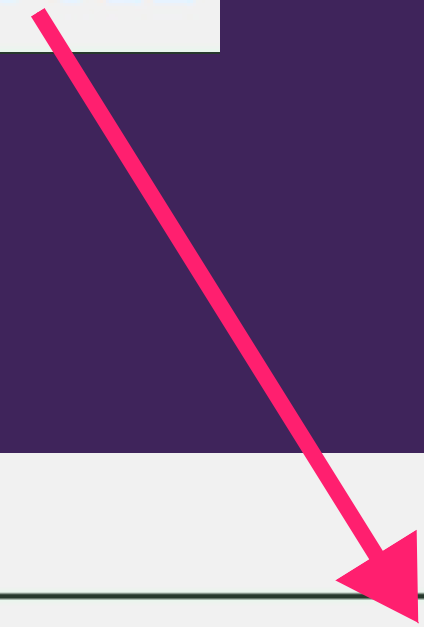
RIRs enforcing heirarchical AS-SET names in their IRR-DBs

RIR	Enforced	Source
AFRINIC	No	
APNIC	Yes	https://www.apnic.net/community/policy/proposals/prop-151/
ARIN	No	
LACNIC	Yes	Job did it
RIPE	Yes	https://www.ripe.net/ripe/mail/archives/db-wg/2022-November/007680.html

ASN	714
IRR as-set/route-set ?	AS-APPLE

ASN	15169
IRR as-set/route-set ?	RADB::AS-GOOGLE

ASN	5405
IRR as-set/route-set ?	RIPE::AS5405:AS-INTERDOTLINK



Tip!

Create a hierarchical AS-SETs.
Update PeeringDB with.



RIPE::AS-EXAMPLE



RIPE::AS64496:AS-EXAMPLE



Trusted Sources

Non-RIR DBs might have no authentication

```
# 2024-03-07 11:59:38
```

```
$ irr_dbs=$(sqlite3 peeringdb.sqlite3 "select irr_as_set from peeringdb_network  
where irr_as_set like '%::AS%' AND irr_as_set NOT LIKE '% %';" | awk -F "::"  
'{print $1}' | sort | uniq)
```

```
$ sqlite3 peeringdb.sqlite3 "select count(irr_as_set) from peeringdb_network  
where irr_as_set like 'ALTDB::%' or irr_as_set like 'BBOI::%' or irr_as_set  
like 'IDNIC::%' or irr_as_set like 'JPIRR::%' or irr_as_set like 'LEVEL3::%' or  
irr_as_set like 'NTTCOM::%' or irr_as_set like 'RADB::%' or irr_as_set like  
'TC::%' ;"
```

Tip!

Move your AS-SET into one of
the RIR maintained IRR-DBs



Standard Format

Multiple AS-SETs: Comma vs space in PeeringDB

```
# 2024-03-07 11:59:38
```

```
sqlite> SELECT count(irr_as_set) FROM peeringdb_network WHERE irr_as_set LIKE "%,%";  
5
```

```
sqlite> SELECT count(irr_as_set) FROM peeringdb_network WHERE irr_as_set LIKE "% %";  
260
```

- "-V6" to differentiate

RIPE::AS-TELIANET RIPE::AS-TELIANET-V6

- "6" to differentiate

AS-GBXS AS-GBXS6

- Two completely different AS-SETS

RADB::AS-PACNET RADB::AS-ANC

- Different AS-SETS for customers and non-customers?

AS-NEXELLENT AS-NEXELLENT-CUST

- Route-Sets and AS-SETs

RS-FLRNET-CONNECTORS-V4

RS-FLRNET-CONNECTORS-V6

AS-FLRNET-AGGREGATE

- IXP route servers have an AS-SET per LAN

AS-ECIX-BER AS-ECIX-DUS

AS-ECIX-FRA AS-ECIX-HAM

AS-ECIX-MUC

- The same AS-SET with and without a database source

AS-ASPA@RIPE RIPE::AS-ASPA AS-ASPA

Tip!

Consolidate your PeeringDB
record to a single AS-SET





Review

- Create a hierarchical AS-SET: "AS23456:AS-FOO"
- Add a source to your AS-SET in PeeringDB: "RIPE::AS64496:AS-FOO"
 - Use a provider who honours these values!
- Move your AS-SET into one of the RIR maintained IRR-DBs
- Consolidate your PeeringDB record to a single AS-SET

Questions?

- Create a hierarchical AS-SET: "AS23456:AS-FOO"
- Add a source to your AS-SET in PeeringDB: "RIPE::AS64496:AS-FOO"
 - Use a provider who honours these values!
- Move your AS-SET into one of the RIR maintained IRR-DBs
- Consolidate your PeeringDB record to a single AS-SET

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