BGP-Origins: A Public Space System

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Problem

- Automatically mapping BGP prefixes to the AS that are authorized to announce them is challenging
- Allowing operational autonomy and freedom complicates structured approaches
- Can we let real-world trust shed light on ambiguity?

Existing Approaches

- MyASN: Based on registered mapping information
  - Information can become stale
- PHAS: based on observed data
  - Easy to operate
  - Low certainty in answers, but useful for prefix owners
- 3rd parties should have the ability to “verify” information about routing announcements
- SIDR: Good and needed. However
  - Will take time to roll out
  - Still need to see if needed granularity will be offered

BGP-Origins' Approach

- Built upon the concept of the ***public space***
  - Anyone claiming that an origin is valid for a prefix is simply making their [informed] opinions public
- BGP-Origins avoids the difficulty of verifying authorized origins

BGP-Origins Project

- **Main goal**: providing a complementary origin lookup service
  - Design is geared towards automated clients
  - Strengthened by crypto, see later…
- Data sources for prefix-AS binding
  - Observations from announced prefix origins, together with historical statistics
  - From users who publish what *they* think

What BGP-Origins Offers

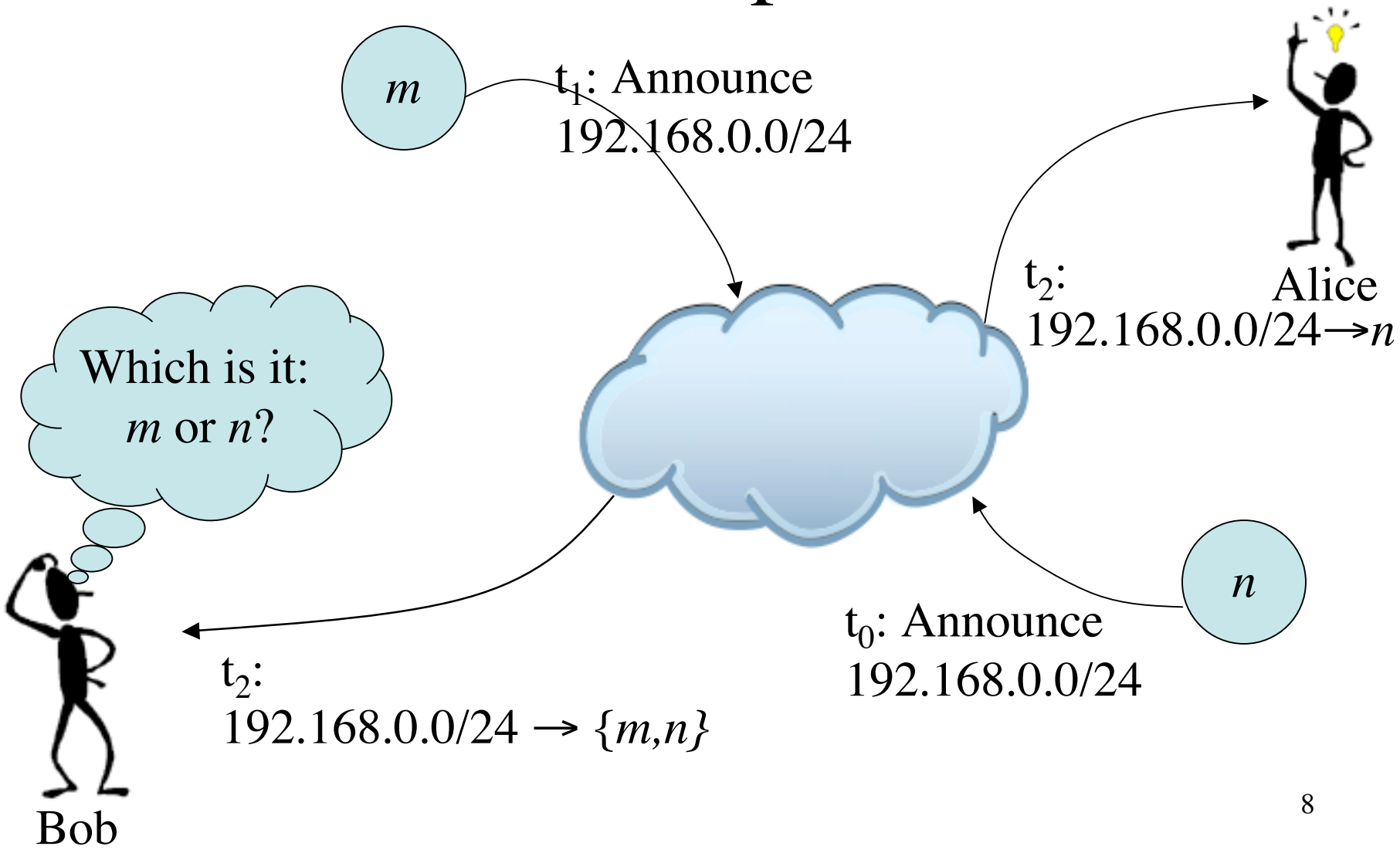
- Offers a rigorous framework for this lookup system
- Input: cryptographically signed data
  - Observation data: signed by PHAS site
  - User attestations: signed by PGP key (so we can know if you are a dog:-P)
- Output: Quick but not dirty
  - DNS interface for look up: quick, universally usable
  - Signs data so clients can verify that it has come from BGP-Origins

What BGP-Origins Does Not Do

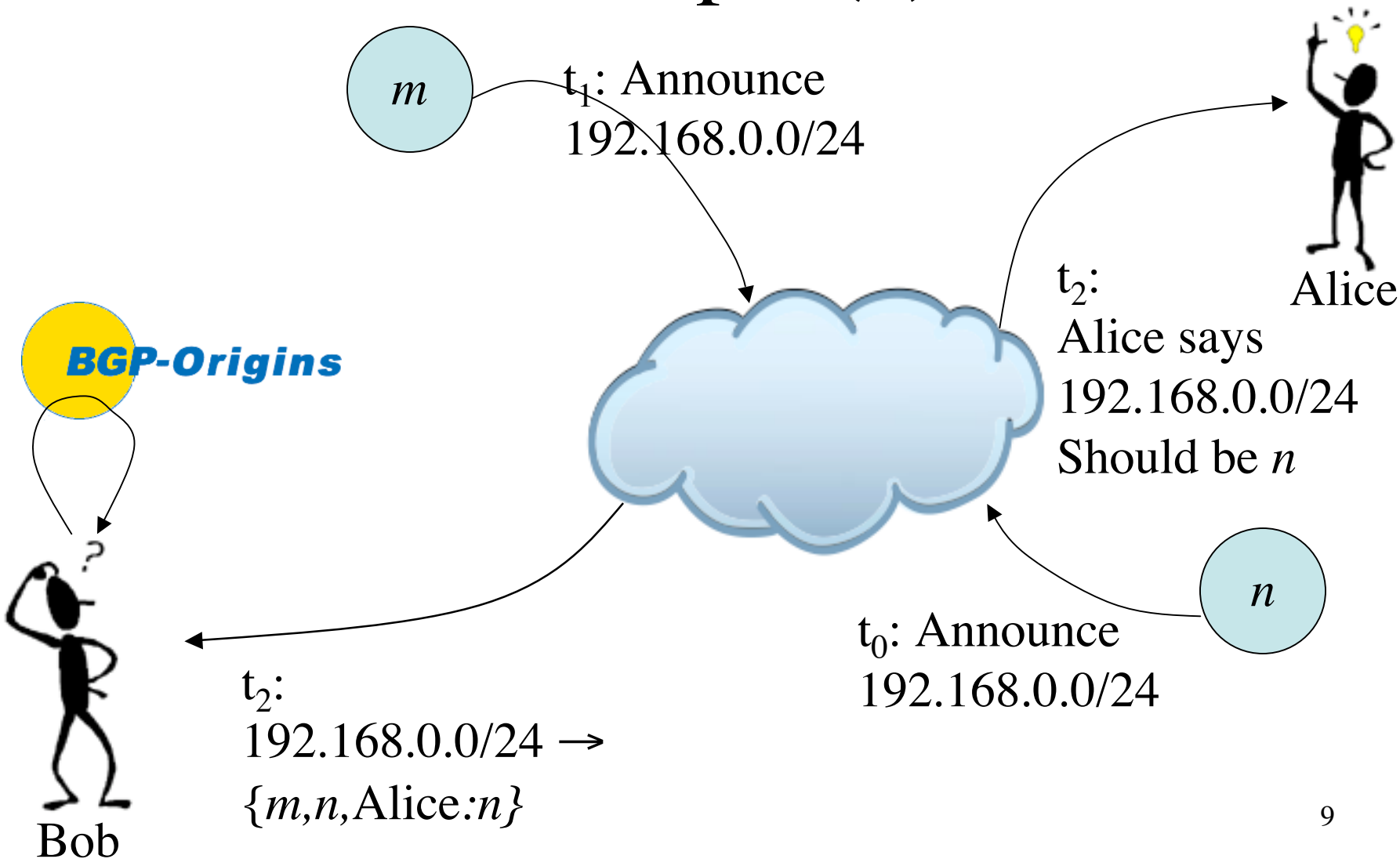
- Does not guarantee data correctness
- Does not guarantee conflict-free data

- BGP-Origins only provides source authenticity

Example


m
t1: Announce
192.168.0.0/24
Alice
t2:
192.168.0.0/24→n
Which is it:
m or n?
n
t0: Announce
192.168.0.0/24
t2:
192.168.0.0/24 → {m,n}
Bob

Example (2)


m
t1: Announce
192.168.0.0/24
BGP-Origins
t2:
Alice says
192.168.0.0/24
Should be n
Alice
n
t0: Announce
192.168.0.0/24
t2:
192.168.0.0/24 →
{m,n,Alice:n}
Bob

Example (3)

- Which origin is the right one?
- Opinions about valid origins may vary, and trust is subjective
- When querying, BGP-Origins users may ask for:
  - Observations
  - Attestations (trust anchors, such as Alice)

Operational Use

- Operators (or automated policies) can make informed decisions
- Everyone makes her/his own decisions
- BGP-Origins is designed to be a look-aside validation system
  - Rather than in-line validation

Observed Data

- Viewing updates from multiple peers (ala PHAS) provides a comprehensive view
  - PHAS currently uses RouteViews and is working towards integration with RIS (RIPE NCC) data
  - http://www.nanog.org/mtg-0610/lad.html
- BGP-Origins aims to provide a meaningful subset of all available prefix/origin data…

Observed Data (2)

- BGP-Origins will act as a low-pass filter and try to filter out erratic data

  $Formula = (T_{announced} * \alpha) + (Past * (1 - \alpha))$

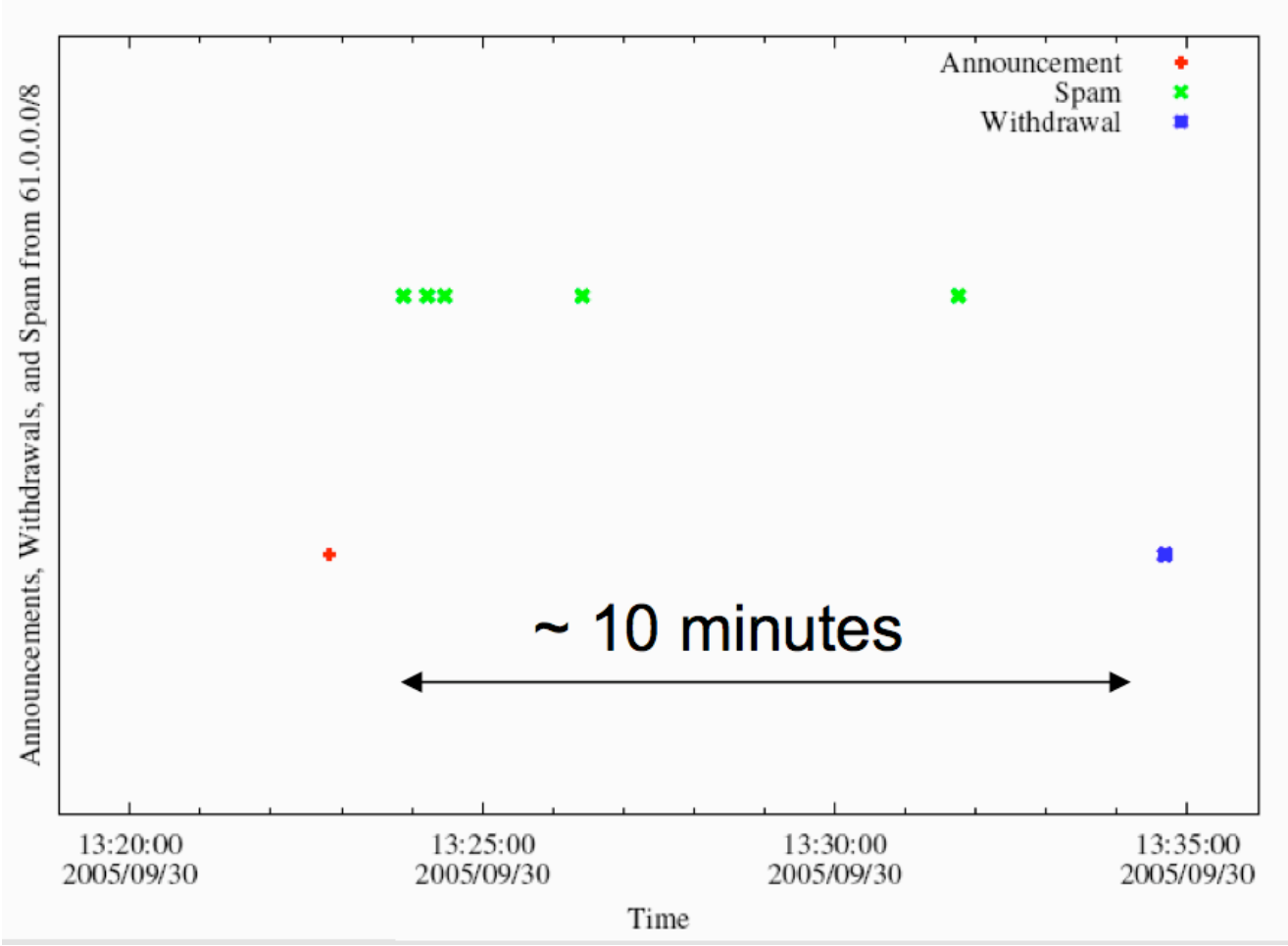
- Timeline will use a moving average:
  - Will squelch origins based on patterns of transient announce/withdraws
  - Reward consistency announced origins
  - Accept newcomers

What to Squelch?

- Spammers originate /8s for ~10 minutes at a time [Feamster et al]
  - We aim to squelch these
- But, large outages may cause new origins to appear too
  - We aim to present these

Spamming Prefixes

[Feamster - NANOG 37]



User Feedback

- Operational trust can be gained externally to BGP-Origins (i.e. people trust real-life friends)
- The opinions of a trusted associate can be used to make decisions
- Anyone can query with DNS
  - dig works great, and writing tools is easy too

dig 16/0.0.179.131.actions.bgp-origin.org txt

```
-bash-3.00$ dig 16/0.0.179.131.actions.bgp-origin.org txt

; <<>> DiG 9.2.4 <<>> 16/0.0.179.131.actions.bgp-origin.org txt
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 271
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 2, ADDITIONAL: 2

;; QUESTION SECTION:
;16/0.0.179.131.actions.bgp-origin.org. IN TXT

;; ANSWER SECTION:
16/0.0.179.131.actions.bgp-origin.org. 51 IN TXT "16/0.0.179.131:52:2BFB6AE822636502:Eric Osterweil:1"
16/0.0.179.131.actions.bgp-origin.org. 51 IN TXT "16/0.0.179.131:52:::1"

;; AUTHORITY SECTION:
bgp-origin.org.         515869  IN      NS      celtics.cs.ucla.edu.
bgp-origin.org.         515869  IN      NS      phasmain.netsec.colostate.edu.

;; ADDITIONAL SECTION:
celtics.cs.ucla.edu.    14400   IN      A       131.179.96.121
phasmain.netsec.colostate.edu. 53368 IN A       129.82.138.5

;; Query time: 13 msec
;; SERVER: 131.179.128.16#53(131.179.128.16)
;; WHEN: Mon Jun  4 16:59:15 2007
;; MSG SIZE  rcvd: 258
```

Submitting

- User feedback must be signed by PGP/GPG keys that exist in existing online key-servers
  - PGP is ubiquitous, keys tie signatures to specific users/entities
- Easily done / readily deployable through the use of DNS dynamic updates

bgpo-client.pl -a <prefix>

```
-bash-3.00$ ./bgpo-client.pl -a 131.179.0.0/16
Origin: 52
How many days until expiration (0 == no expiration):
Are you specifying:
1 - trust
2 - distrust
3 - revocation of former trust
Please enter the number: 1

You need a passphrase to unlock the secret key for
user: "Eric Osterweil <eoster@iwon.com>"
1024-bit DSA key, ID 226B6502, created 2006-10-09

-bash-3.00$
```

How BGP-Origins Gets Work Done

- Uses GPG/PGP keys to verify signatures
- Pulls PGP keys from key-servers
- DNS queries lower the bar to access
- DNS updates are used to upload cryptographically signed mappings
- Simple reference scripts offer an interactive command-line interface for this

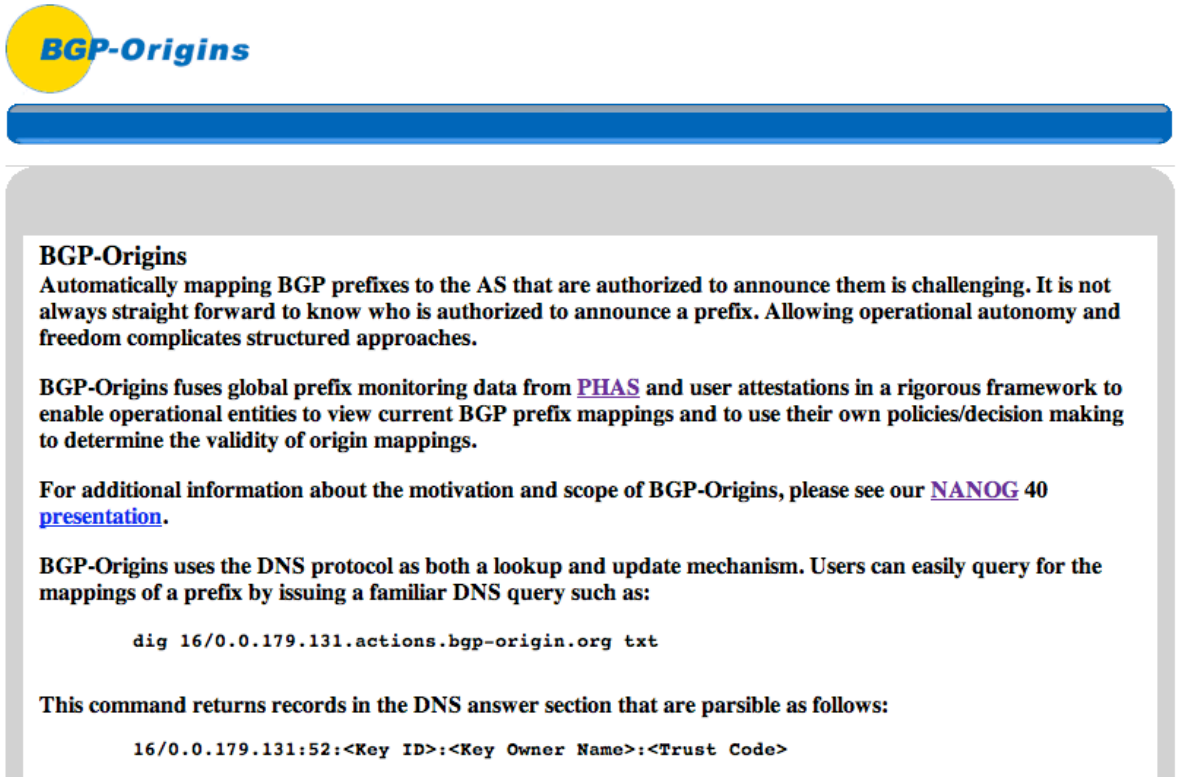
Conclusion

- BGP-Origins does not determine if data is "valid"
- Users can submit any prefix/origin binding
- The onus is placed on clients to determine whose attestations to trust
- BGP-Origins is a non-repudiation framework
- BGP-origins is readily usable ***today***
  - Utilizes DNS for input/output

Check Us Out

- Further information available at:

  http://www.bgp-origin.org/



Thank You

Questions?