Enhanced AS-Loop Detection for BGP

draft-chen-grow-enhanced-as-loop-detection-00

Huainan Chen, China Telecom

Yunan Gu, Shunwan Zhuang, Huawei

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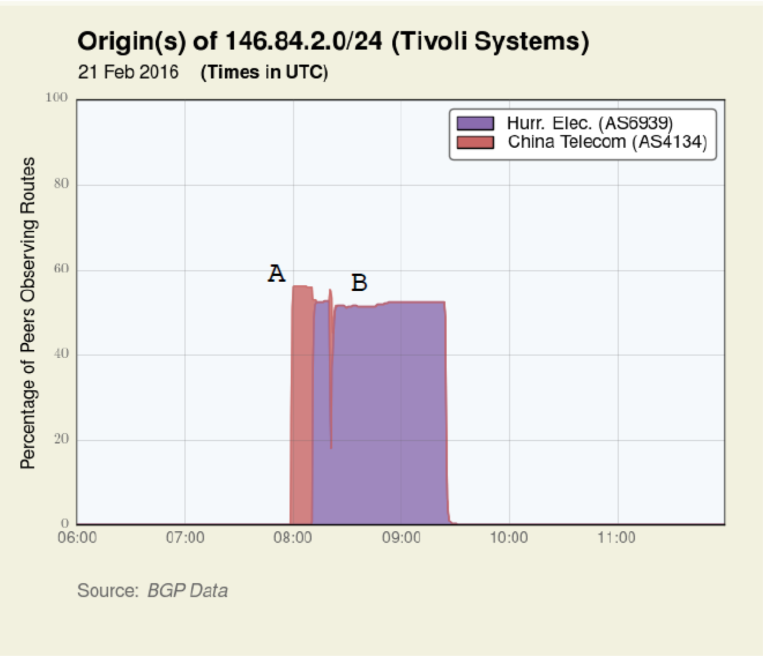
Forge AS Path Example

More forged AS paths by BackConnect

```
A) ... 3223 203959 4134

B) ... 3223 203959 4134 42708 36236 6939
```



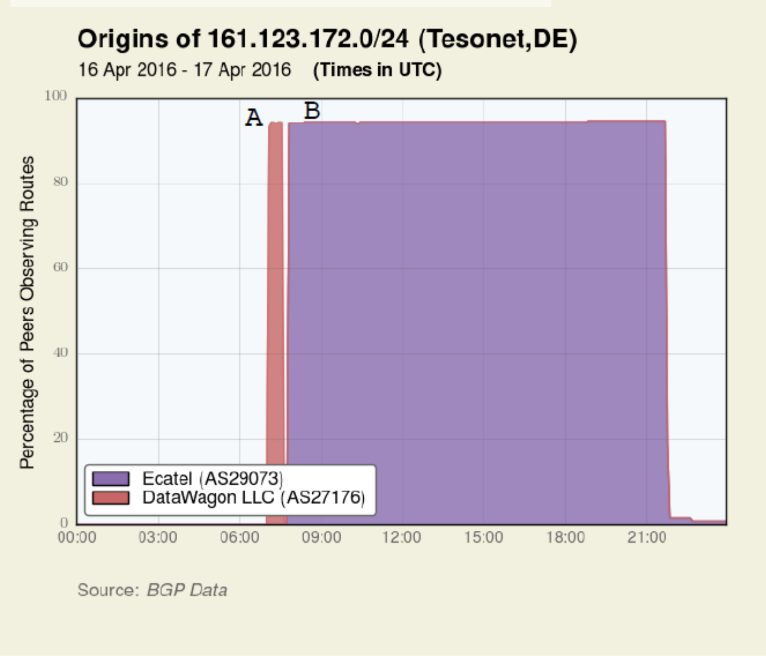
Origin(s) of 146.84.2.0/24 (Tivoli Systems)

21 Feb 2016 **(Times in UTC)**

Source: *BGP Data*

```
A) ... 3223 203959 27176

B) ... 3223 203959 29073
```



Origins of 161.123.172.0/24 (Tesonet,DE)

16 Apr 2016 - 17 Apr 2016 **(Times in UTC)**

Source: *BGP Data*

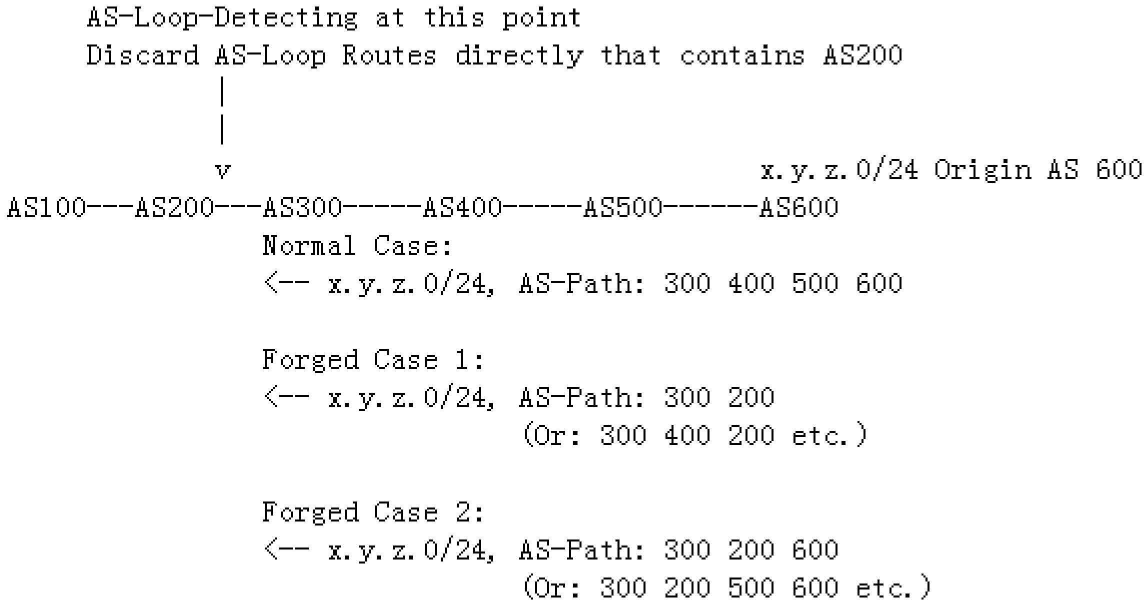
Source: https://www.nanog.org/sites/default/files/20161016_Madory_Backconnect_S_Suspicious_Bgp_v2.pdf

BGP Route Hijack and Motivation

- RFC7908
  - BGP Route Leaks Type 5: Prefix Re-origination with Data Path to Legitimate Origin
- Inbound policy for as-loop detection:
  - RFC4271, 9.1.2. Phase 2: Route Selection: "…If the AS_PATH attribute of a BGP route contains an AS loop, the BGP route should be excluded from the Phase 2 decision function… "
- Outbound policy for as-loop detection
  - Split-Horizon: Split-Horizon for EBGP is an optional function that a BGP sender will not advertise any routes that were previously received from that same AS.
- Due to misconfigurations or malicious attack, upon the detection of as loop, the current inbound/outbound check may cause:
  - Failure of route reception from certain AS
  - Failure of route advertisement to certain AS

Inbound policy enhancement

- A route advertised from AS300 to AS200
    - AS200 is added in AS-PATH by AS300 incorrectly
- Without enhancement
    - AS200 simply drops the route received from AS300
- AS200 Inbound Enhancement with AS-PATH analysis
    - ROA (already done)
    - Check local AS relationship database (with neighboring ASes)
- After enhancement
    - AS200 identifies possible hijacks



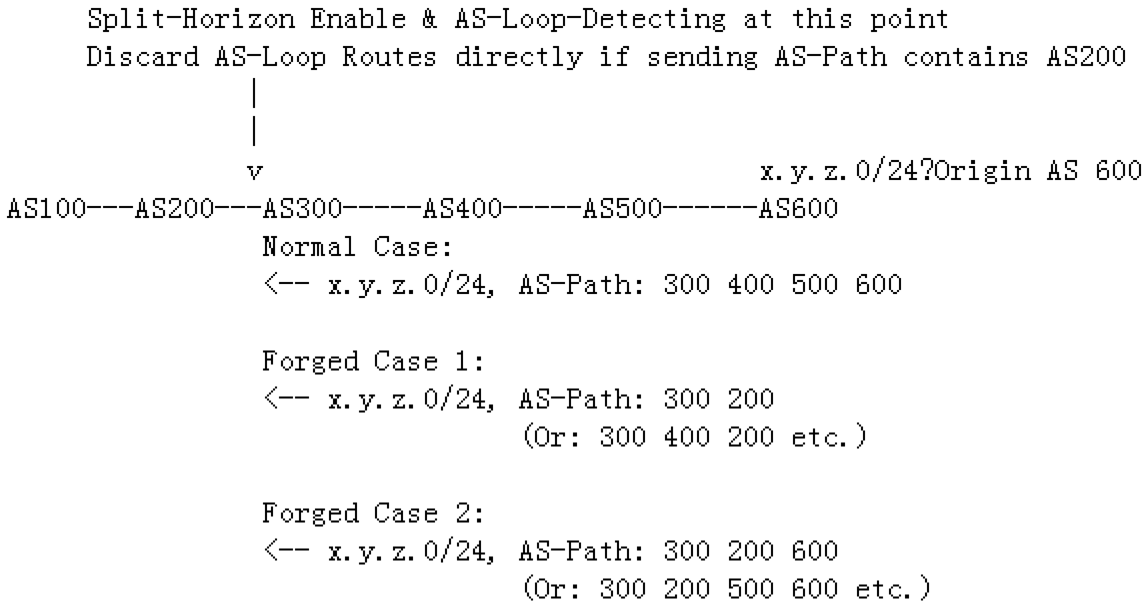
```
     AS-Loop-Detecting at this point
     Discard AS-Loop Routes directly that contains AS200
             |
             |
             v                                 x.y.z.0/24 Origin AS 600
AS100---AS200---AS300-----AS400-----AS500------AS600
                Normal Case:
                <-- x.y.z.0/24, AS-Path: 300 400 500 600

                Forged Case 1:
                <-- x.y.z.0/24, AS-Path: 300 200
                                (Or: 300 400 200 etc.)

                Forged Case 2:
                <-- x.y.z.0/24, AS-Path: 300 200 600
                                (Or: 300 200 500 600 etc.)
```

Outbound policy enhancement

- A route advertised from AS300 to AS200
  - AS200 is added in AS-PATH by AS300 incorrectly
- Without enhancement
  - AS300 simply drops the route to be advertised to AS200
- AS300 Outbound enhancement with AS-PATH analysis
  - Check local AS relationship database (with neighboring ASes)
- After enhancement
  - AS300 identifies possible hijacks



```
     Split-Horizon Enable & AS-Loop-Detecting at this point
     Discard AS-Loop Routes directly if sending AS-Path contains AS200
               |
               |
               v                               x.y.z.0/24?Origin AS 600
AS100---AS200---AS300-----AS400-----AS500------AS600
                Normal Case:
                <-- x.y.z.0/24, AS-Path: 300 400 500 600

                Forged Case 1:
                <-- x.y.z.0/24, AS-Path: 300 200
                                (Or: 300 400 200 etc.)

                Forged Case 2:
                <-- x.y.z.0/24, AS-Path: 300 200 600
                                (Or: 300 200 500 600 etc.)
```

Summary

- Next step
    - Rename the “result type”
    - Identify “suggested actions” for each “result type”