(APNIC Project)

Developing a Collaborative BGP Routing Analyzing and Diagnosing Platform

--The 3rd Technical Committee Meeting

August 3, 2022

清華大學
Tsinghua University

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Outline

- **Project Progress**
  - **The Updates of BGP Session Establishment with 9 Partners**
  - **The Improvement of Routing Path Search Function**
  - **User Registration, Subscription, and Email Alarm**
- **Next month plan**
- **Review overall work plan**
- **Comments/Suggestions**

BGP Route Information Sharing

We have established BGP session with 9 partners.
Data can be accessed at https://bgp.cgtf.net
And we are discussing detailed scheme with other partners
Maybe multi sessions are needed.

AS 7660(APAN-JP)

AS 63961(BDREN)

AS 4538(CERNET)

AS 3662(HARNET)

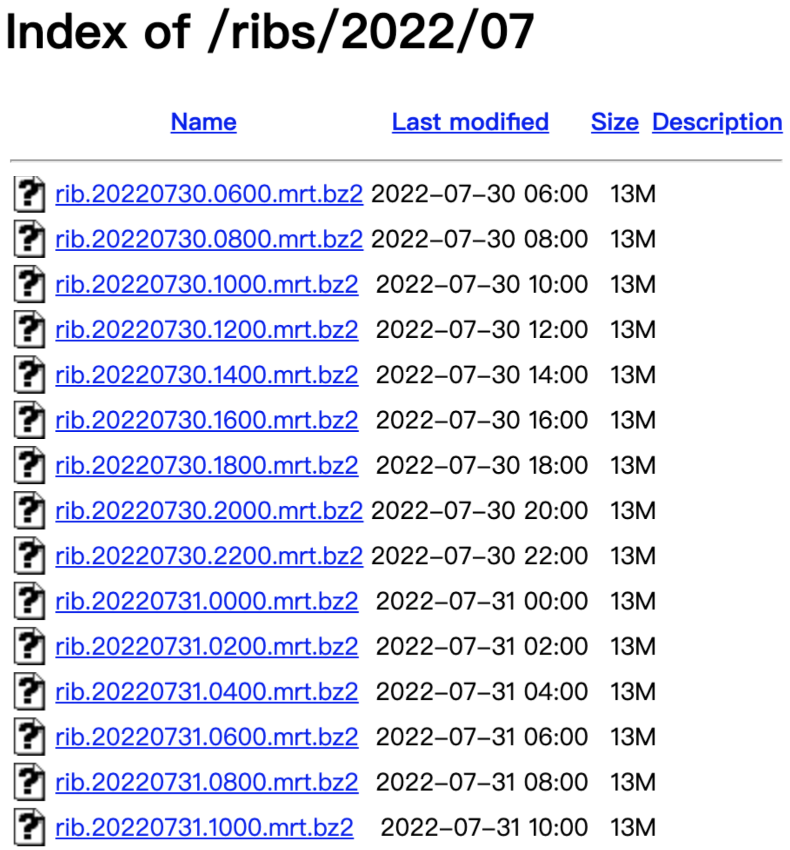
AS 17579(KREONET)

AS 38229(LEARN)

AS 24514(MYREN)

AS 23855(SINGAREN)

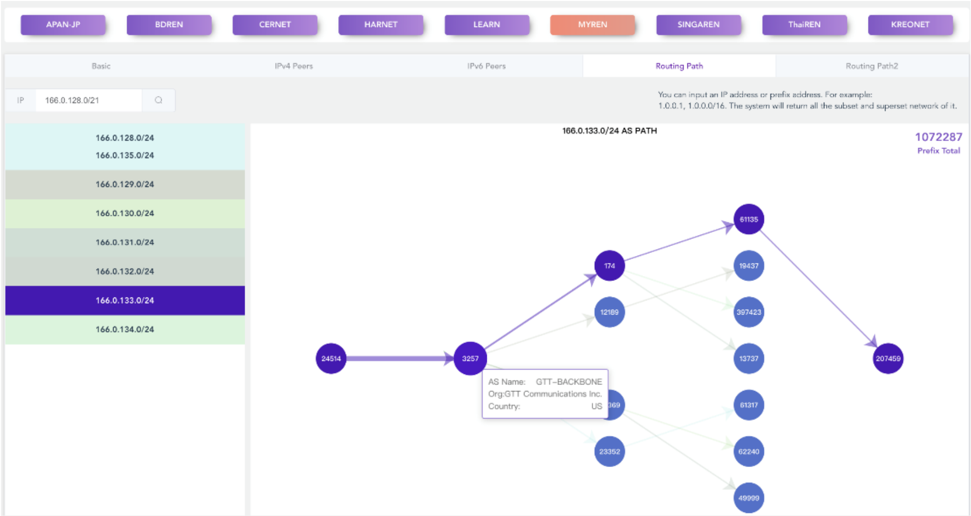
AS 3836(ThaiSARN)



Index of /ribs/2022/07

Name	Last modified	Size	Description
rib.20220730.0600.mrt.bz2	2022–07–30 06:00	13M	
rib.20220730.0800.mrt.bz2	2022–07–30 08:00	13M	
rib.20220730.1000.mrt.bz2	2022–07–30 10:00	13M	
rib.20220730.1200.mrt.bz2	2022–07–30 12:00	13M	
rib.20220730.1400.mrt.bz2	2022–07–30 14:00	13M	
rib.20220730.1600.mrt.bz2	2022–07–30 16:00	13M	
rib.20220730.1800.mrt.bz2	2022–07–30 18:00	13M	
rib.20220730.2000.mrt.bz2	2022–07–30 20:00	13M	
rib.20220730.2200.mrt.bz2	2022–07–30 22:00	13M	
rib.20220731.0000.mrt.bz2	2022–07–31 00:00	13M	
rib.20220731.0200.mrt.bz2	2022–07–31 02:00	13M	
rib.20220731.0400.mrt.bz2	2022–07–31 04:00	13M	
rib.20220731.0600.mrt.bz2	2022–07–31 06:00	13M	
rib.20220731.0800.mrt.bz2	2022–07–31 08:00	13M	
rib.20220731.1000.mrt.bz2	2022–07–31 10:00	13M	

Routing Path Search



166.0.128.0/21

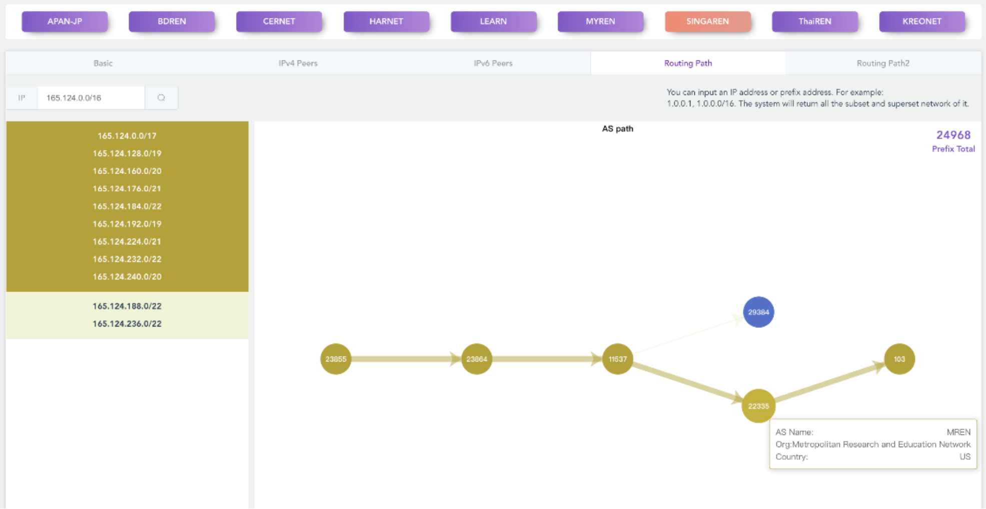
You can input an IP address or prefix address. For example:
1.0.0.1, 1.0.0.0/16. The system will return all the subset and superset network of it.

166.0.128.0/24
166.0.135.0/24
166.0.129.0/24
166.0.130.0/24
166.0.131.0/24
166.0.132.0/24
166.0.133.0/24
166.0.134.0/24

166.0.133.0/24 AS PATH

1072287
Prefix Total

AS Name: GTT–BACKBONE
Org:GTT Communications Inc.
Country: US



165.124.0.0/16

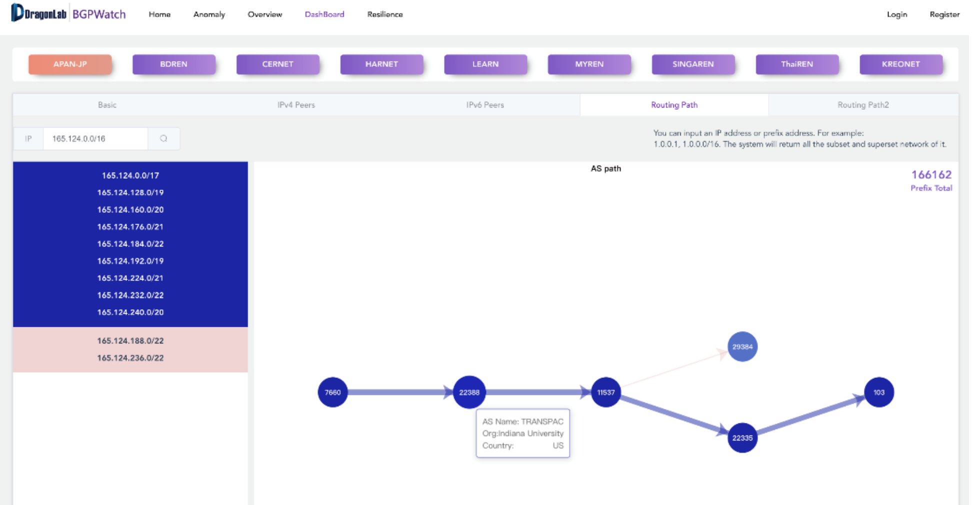
You can input an IP address or prefix address. For example:
1.0.0.1, 1.0.0.0/16. The system will return all the subset and superset network of it.

165.124.0.0/17
165.124.128.0/19
165.124.160.0/20
165.124.176.0/21
165.124.184.0/22
165.124.192.0/19
165.124.224.0/21
165.124.232.0/22
165.124.240.0/20
165.124.188.0/22
165.124.236.0/22

AS path

24968
Prefix Total

AS Name: MREN
Org:Metropolitan Research and Education Network
Country: US



165.124.0.0/16

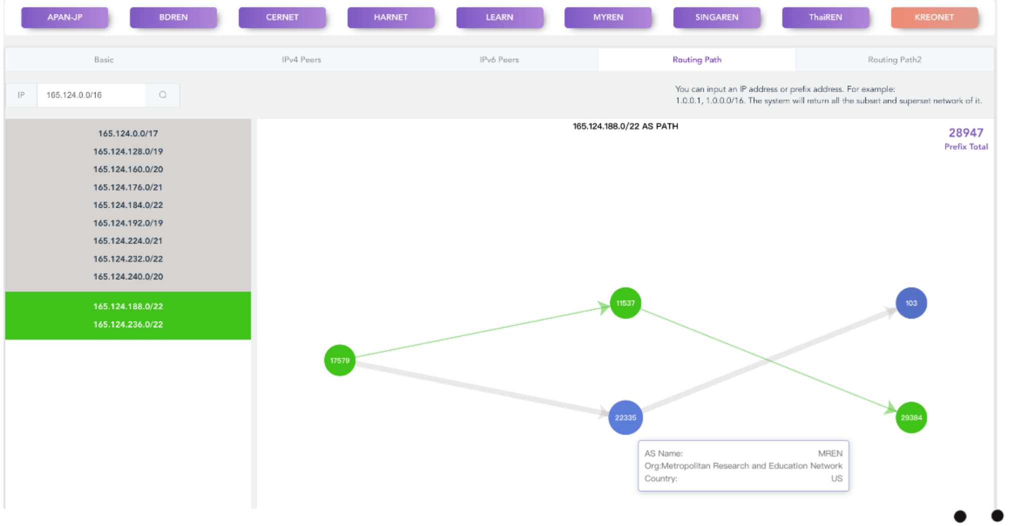
You can input an IP address or prefix address. For example:
1.0.0.1, 1.0.0.0/16. The system will return all the subset and superset network of it.

165.124.0.0/17
165.124.128.0/19
165.124.160.0/20
165.124.176.0/21
165.124.184.0/22
165.124.192.0/19
165.124.224.0/21
165.124.232.0/22
165.124.240.0/20
165.124.188.0/22
165.124.236.0/22

AS path

166162
Prefix Total

AS Name: TRANSPAC
Org:Indiana University
Country: US



165.124.0.0/16

You can input an IP address or prefix address. For example:
1.0.0.1, 1.0.0.0/16. The system will return all the subset and superset network of it.

165.124.0.0/17
165.124.128.0/19
165.124.160.0/20
165.124.176.0/21
165.124.184.0/22
165.124.192.0/19
165.124.224.0/21
165.124.232.0/22
165.124.240.0/20
165.124.188.0/22
165.124.236.0/22

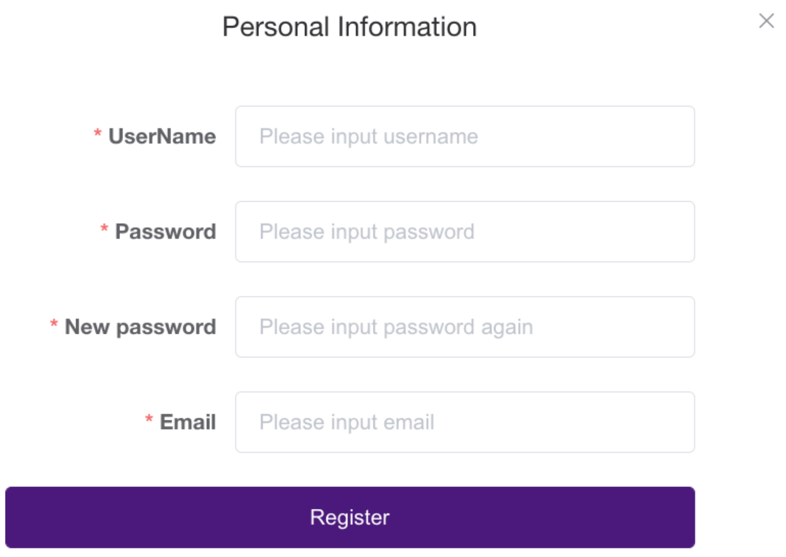
165.124.188.0/22 AS PATH

28947
Prefix Total

AS Name: MREN
Org:Metropolitan Research and Education Network
Country: US

Group Prefixes with the same routing path .
Return paths of all sub networks and super networks of the input prefix.

Register and Subscribe AS



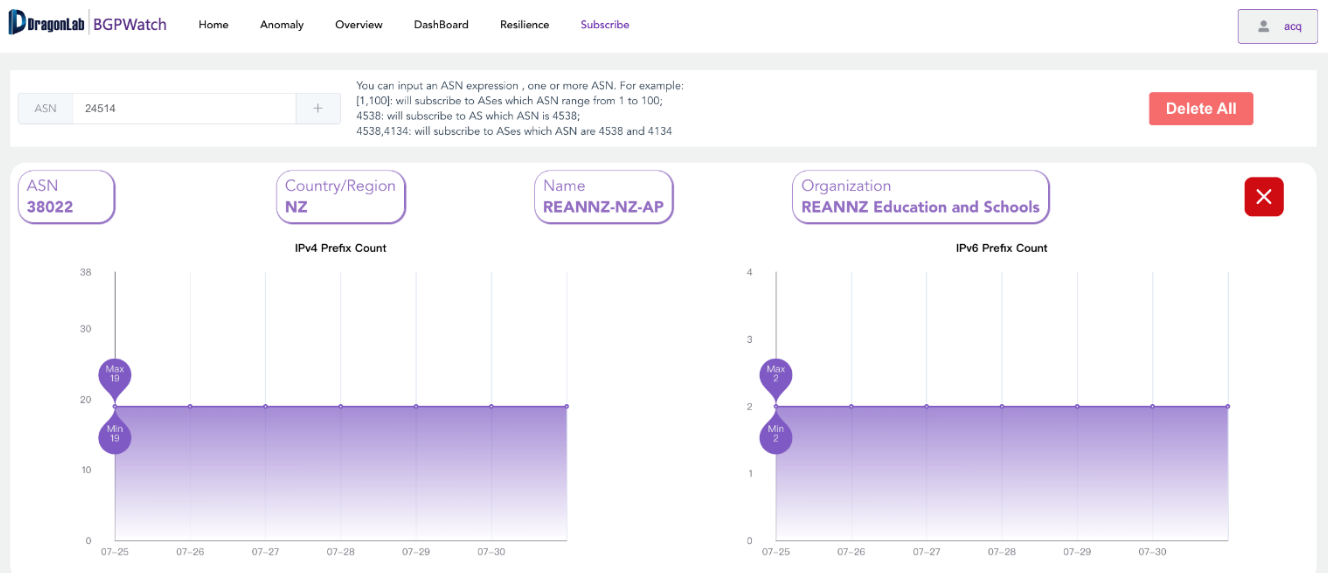
Personal Information

* UserName: Please input username

* Password: Please input password

* New password: Please input password again

* Email: Please input email



ASN: 24514 +

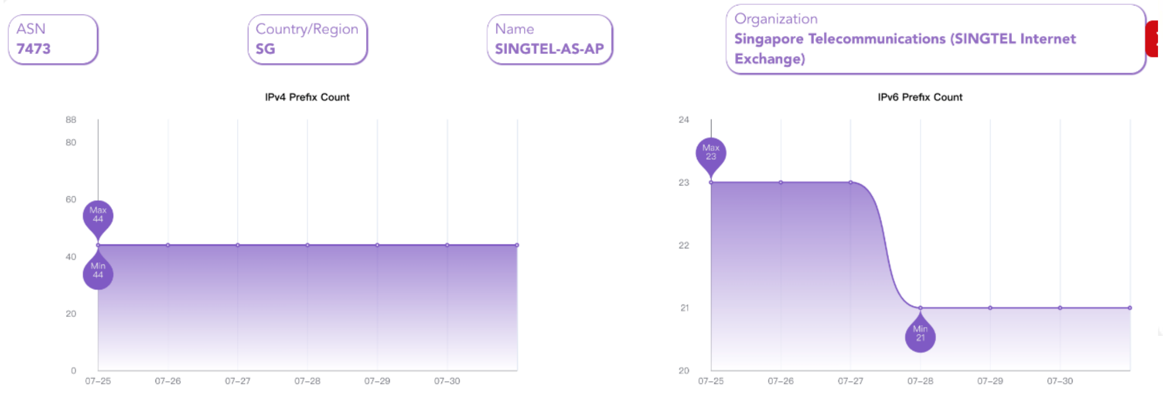
You can input an ASN expression , one or more ASN. For example:
[1,100]: will subscribe to ASes which ASN range from 1 to 100;
4538: will subscribe to AS which ASN is 4538;
4538,4134: will subscribe to ASes which ASN are 4538 and 4134

ASN: 38022

Country/Region: NZ

Name: REANNZ-NZ-AP

Organization: REANNZ Education and Schools

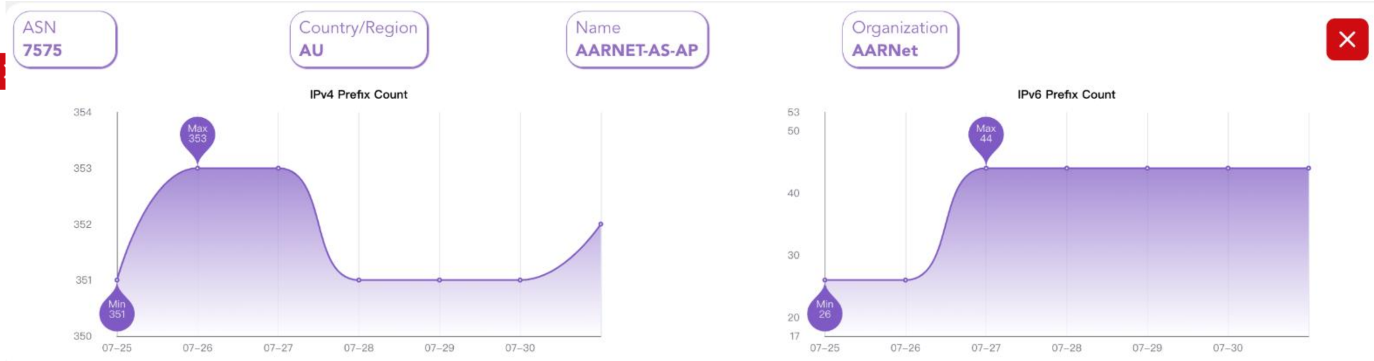


ASN: 7473

Country/Region: SG

Name: SINGTEL-AS-AP

Organization: Singapore Telecommunications (SINGTEL Internet Exchange)



ASN: 7575

Country/Region: AU

Name: AARNET-AS-AP

Organization: AARNet

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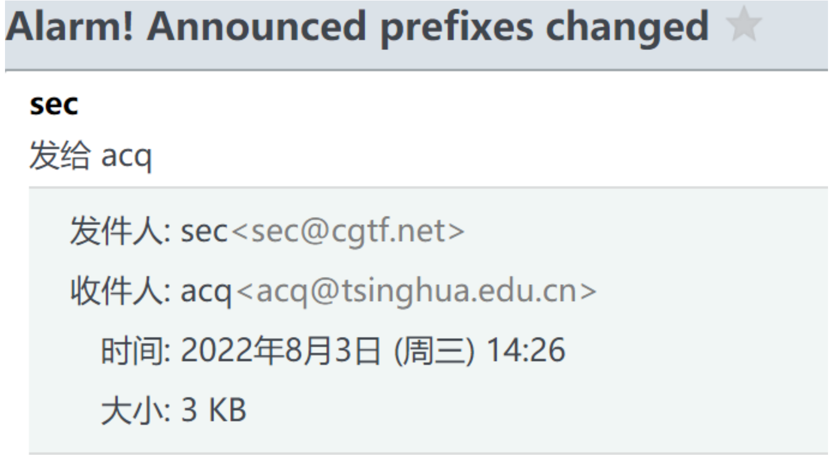
Send Alarm Email to Subscriber



Alarm! Announced prefixes changed

sec

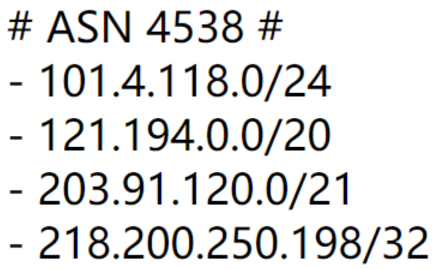
发给 acq

发件人: sec<sec@cgtf.net>

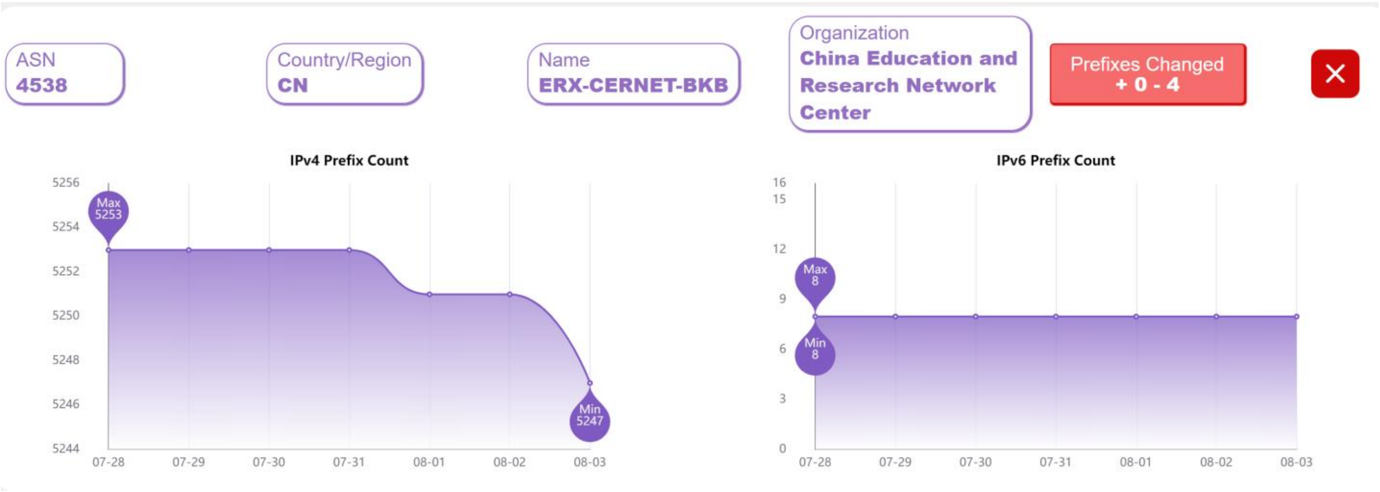
收件人: acq<acq@tsinghua.edu.cn>

时间: 2022年8月3日 (周三) 14:26

大小: 3 KB



```
# ASN 4538 #
- 101.4.118.0/24
- 121.194.0.0/20
- 203.91.120.0/21
- 218.200.250.198/32
```



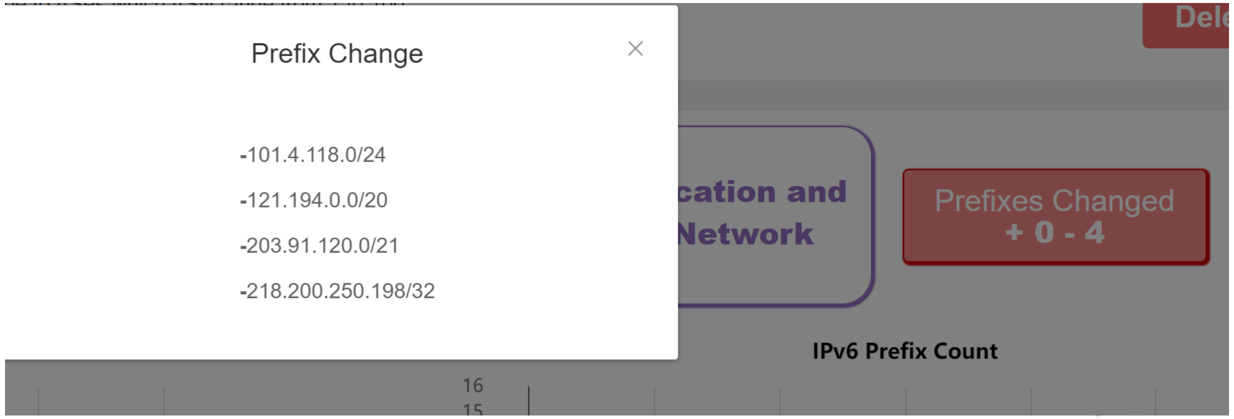
ASN: 4538

Country/Region: CN

Name: ERX-CERNET-BKB

Organization: China Education and Research Network Center

Prefixes Changed: + 0 - 4



Prefix Change

-101.4.118.0/24
-121.194.0.0/20
-203.91.120.0/21
-218.200.250.198/32

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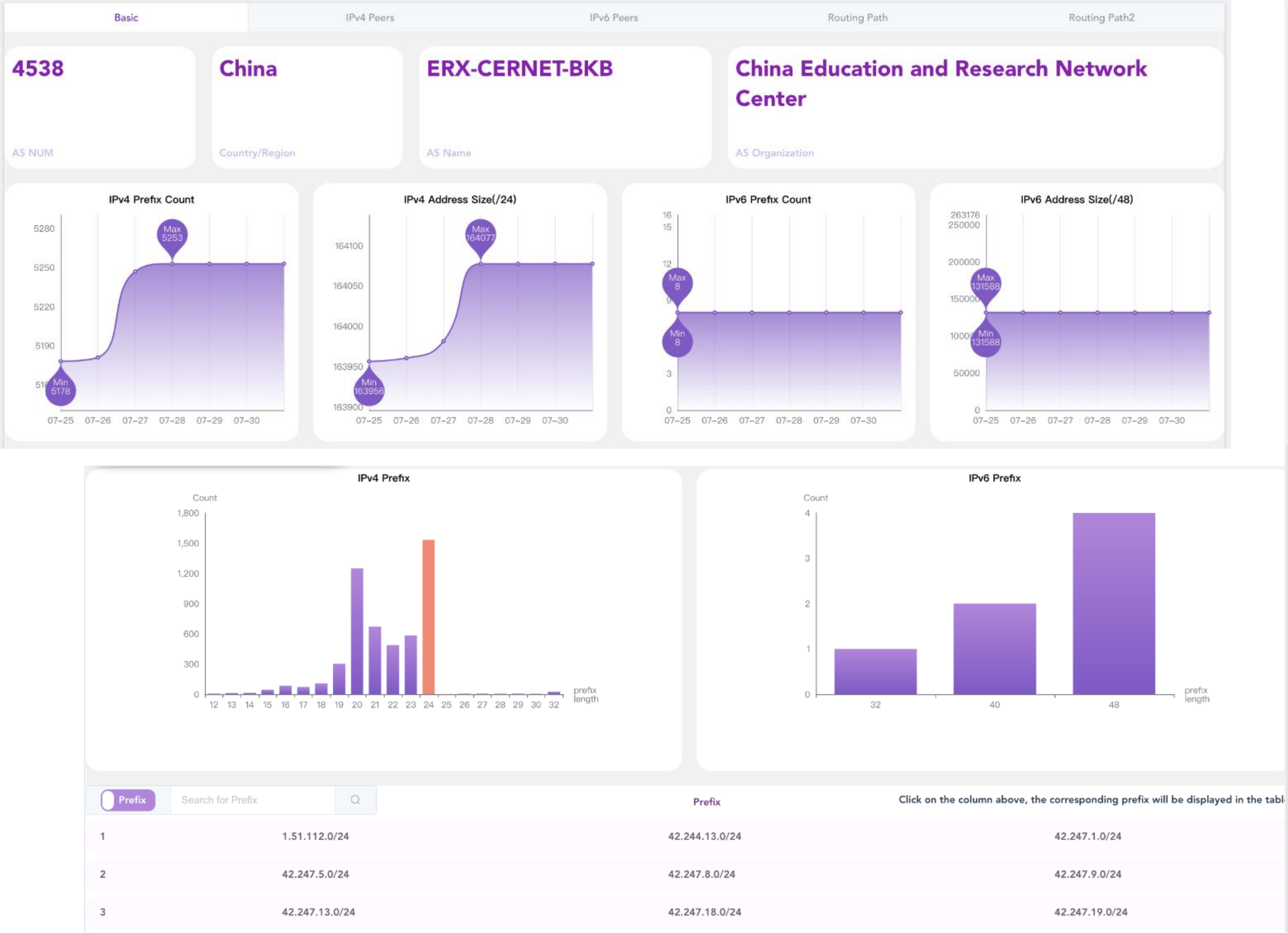
DashBoard --Basic Info

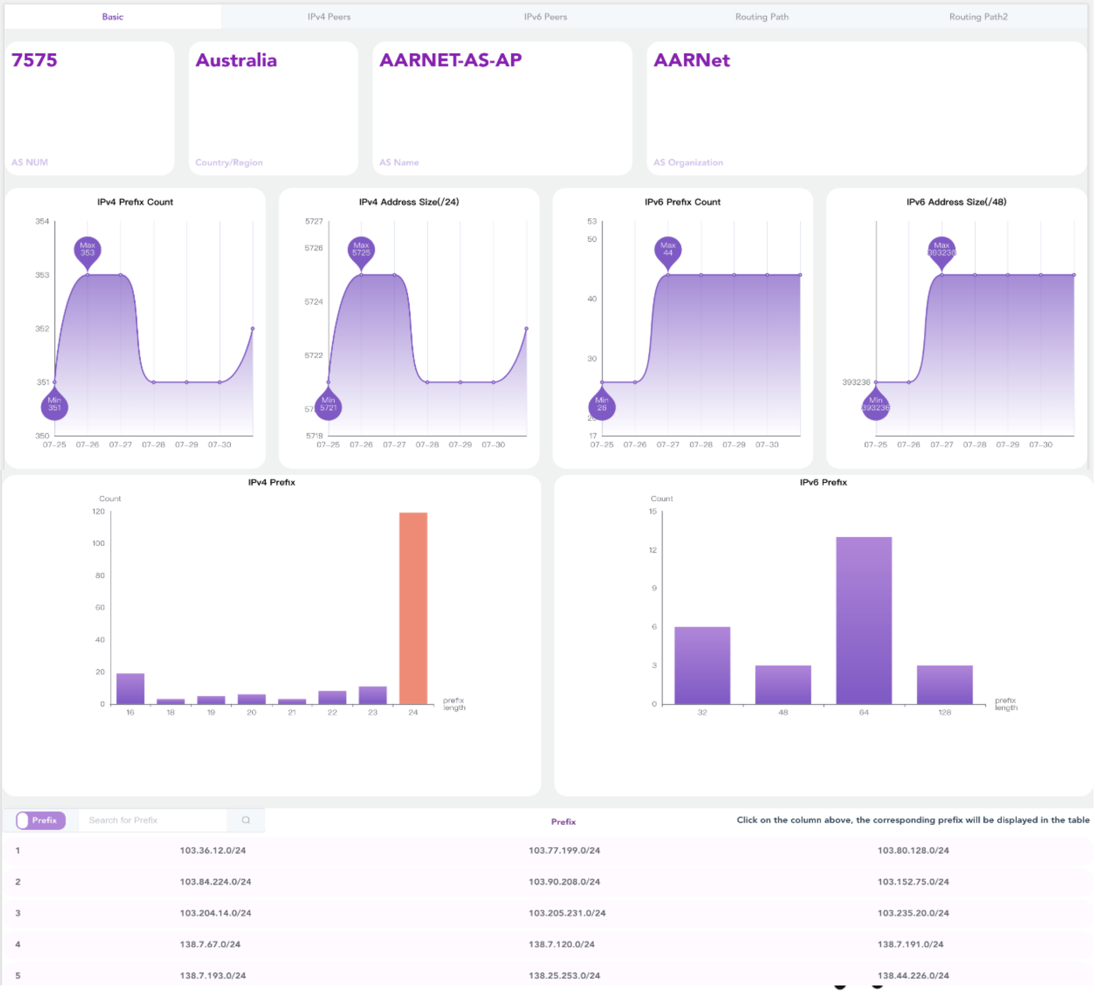


AS NUM	Country/Region	AS Name	AS Organization
4538	China	ERX-CERNET-BKB	China Education and Research Network Center

Prefix Search for Prefix

Click on the column above, the corresponding prefix will be displayed in the tabl

		Prefix	
1	1.51.112.0/24	42.244.13.0/24	42.247.1.0/24
2	42.247.5.0/24	42.247.8.0/24	42.247.9.0/24
3	42.247.13.0/24	42.247.18.0/24	42.247.19.0/24



AS NUM	Country/Region	AS Name	AS Organization
7575	Australia	AARNET-AS-AP	AARNet

Prefix Search for Prefix

Click on the column above, the corresponding prefix will be displayed in the table

		Prefix	
1	103.36.12.0/24	103.77.199.0/24	103.80.128.0/24
2	103.84.224.0/24	103.90.208.0/24	103.152.75.0/24
3	103.204.14.0/24	103.205.231.0/24	103.235.20.0/24
4	138.7.67.0/24	138.7.120.0/24	138.7.191.0/24
5	138.7.193.0/24	138.25.253.0/24	138.44.226.0/24

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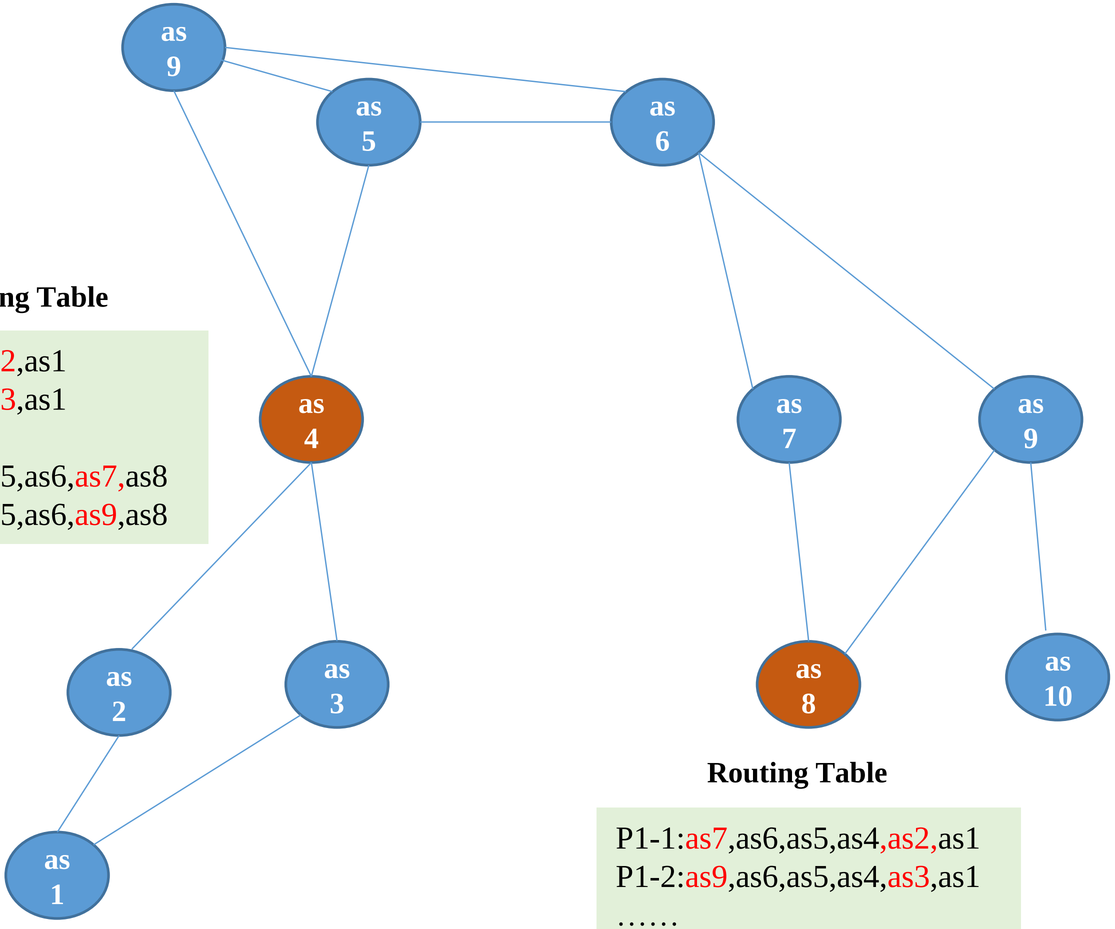
Next Month Plan

- Monitor prefix hijacking, and send alarm message to the victim
- Improve routing search function
- Research topic

Discussion About Routing Path Search

1. Search routing path from an AS to a prefix
2. Search routing path from a prefix to a prefix (2 equals 1)
3. Search routing path from an AS to an AS (split to 1)
4. Search routing path to an AS (split to 3)
5. Report routing path changing between 2 dates

How to Get Routing Path



Routing Table

P1-1:as2,as1
P1-2:as3,as1
……
P8-1:as5,as6,as7,as8
P8-2:as5,as6,as9,as8

Routing Table

P1-1:as7,as6,as5,as4,as2,as1
P1-2:as9,as6,as5,as4,as3,as1
……
P4-1:as7,as6,as5,as4
P4-2:as9,as6,as5,as4

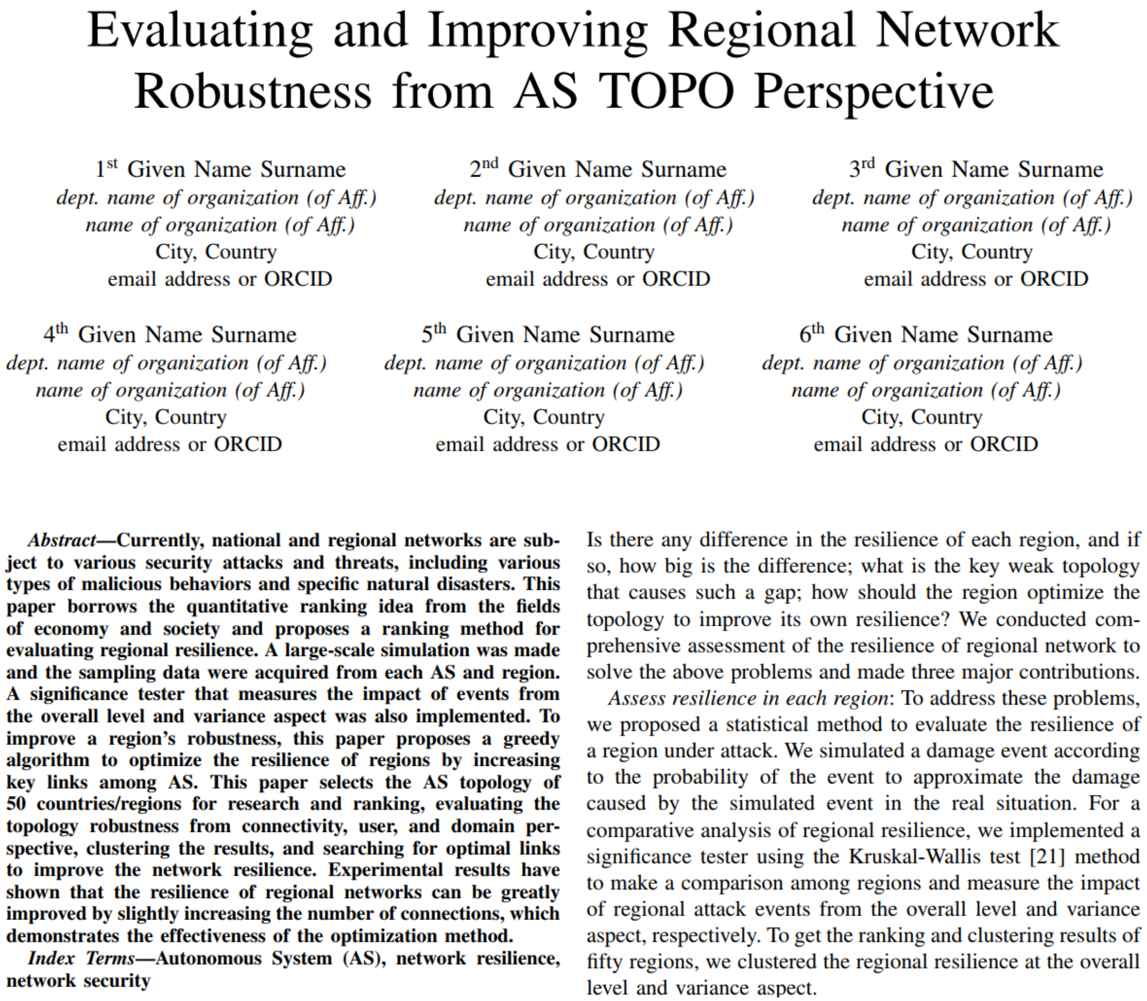
as 4 **Vantage point**

as 6 **other point**

Assume each ASi has 2 prefix: pi-1, pi-2

From vantage point	Q:From as4,as8 to any as/prefix Q:From p1-*, p8-* to any as/prefix	Get exact info
To vantage point	Q:Routing to as4/as8 Q:Routing to p4-*,p8-*	Infer, get part info
From other point	Q:From as5/as7 to any as/prefix Q:From p5-*,p7-* to any as/prefix	
To other point	Q:Routing to as5/as7 (p5-*,p7-*) Q:Routing to p5-*,p7-*	

Research Topic



Evaluating and Improving Regional Network Robustness from AS TOPO Perspective

1st Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

2nd Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

3rd Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

4th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

5th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

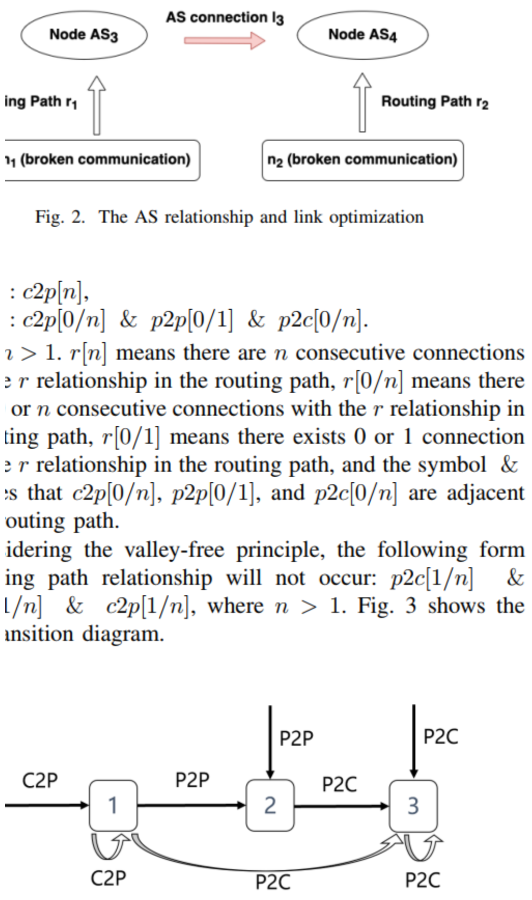
6th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

***Abstract*—Currently, national and regional networks are subject to various security attacks and threats, including various types of malicious behaviors and specific natural disasters. This paper borrows the quantitative ranking idea from the fields of economy and society and proposes a ranking method for evaluating regional resilience. A large-scale simulation was made and the sampling data were acquired from each AS and region. A significance tester that measures the impact of events from the overall level and variance aspect was also implemented. To improve a region's robustness, this paper proposes a greedy algorithm to optimize the resilience of regions by increasing key links among AS. This paper selects the AS topology of 50 countries/regions for research and ranking, evaluating the topology robustness from connectivity, user, and domain perspective, clustering the results, and searching for optimal links to improve the network resilience. Experimental results have shown that the resilience of regional networks can be greatly improved by slightly increasing the number of connections, which demonstrates the effectiveness of the optimization method.**

***Index Terms*—Autonomous System (AS), network resilience, network security**

Is there any difference in the resilience of each region, and if so, how big is the difference; what is the key weak topology that causes such a gap; how should the region optimize the topology to improve its own resilience? We conducted comprehensive assessment of the resilience of regional network to solve the above problems and made three major contributions.

Assess resilience in each region: To address these problems, we proposed a statistical method to evaluate the resilience of a region under attack. We simulated a damage event according to the probability of the event to approximate the damage caused by the simulated event in the real situation. For a comparative analysis of regional resilience, we implemented a significance tester using the Kruskal-Wallis test [21] method to make a comparison among regions and measure the impact of regional attack events from the overall level and variance aspect, respectively. To get the ranking and clustering results of fifty regions, we clustered the regional resilience at the overall level and variance aspect.

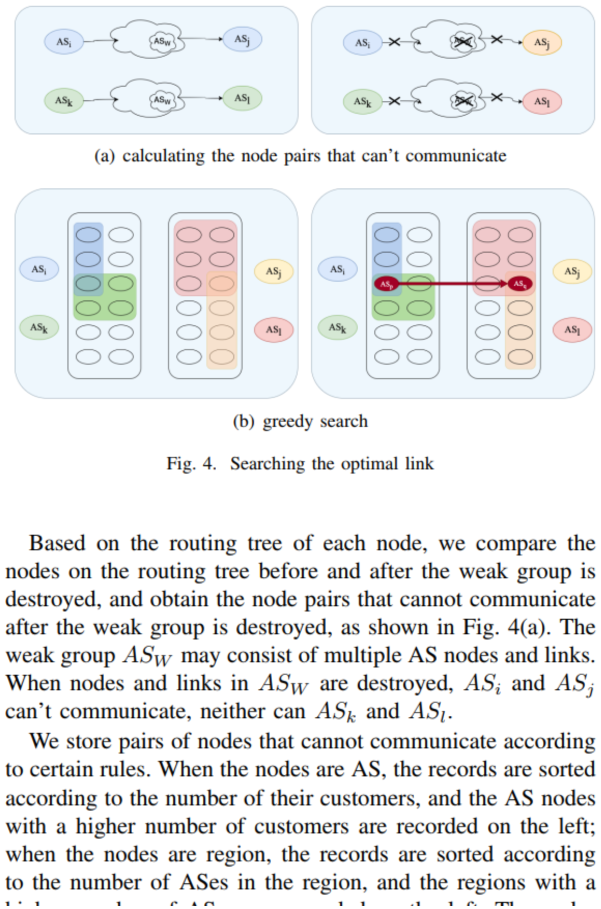


AS connection l_3
Node AS_3
Node AS_4
ing Path r_1
Routing Path r_2
n_1 (broken communication)
n_2 (broken communication)

Fig. 2. The AS relationship and link optimization

: $c2p[n]$,
: $c2p[0/n]$ & $p2p[0/1]$ & $p2c[0/n]$.
$\imath > 1$. $r[n]$ means there are n consecutive connections
 r relationship in the routing path, $r[0/n]$ means there
 or n consecutive connections with the r relationship in
ting path, $r[0/1]$ means there exists 0 or 1 connection
 r relationship in the routing path, and the symbol &
s that $c2p[0/n]$, $p2p[0/1]$, and $p2c[0/n]$ are adjacent
outing path.
idering the valley-free principle, the following form
ing path relationship will not occur: $p2c[1/n]$ &
$1/n]$ & $c2p[1/n]$, where $n > 1$. Fig. 3 shows the
ansition diagram.

C2P
1
P2P
2
P2C
3
P2P
P2C
C2P
P2C
P2C



AS_i
AS_W
AS_j
AS_k
AS_l
AS_p
AS_s

(a) calculating the node pairs that can't communicate

(b) greedy search

Fig. 4. Searching the optimal link

Based on the routing tree of each node, we compare the nodes on the routing tree before and after the weak group is destroyed, and obtain the node pairs that cannot communicate after the weak group is destroyed, as shown in Fig. 4(a). The weak group AS_W may consist of multiple AS nodes and links. When nodes and links in AS_W are destroyed, AS_i and AS_j can't communicate, neither can AS_k and AS_l.

We store pairs of nodes that cannot communicate according to certain rules. When the nodes are AS, the records are sorted according to the number of their customers, and the AS nodes with a higher number of customers are recorded on the left; when the nodes are region, the records are sorted according to the number of ASes in the region, and the regions with a

Welcome partners to join in this work

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	Detailed Technical Committee Work Plan	Tentative Timeline
Timeline	Discussion on Timeline	May
Project Web Site	Requirements/Design	May
	Partner’s information	May
	Setting up project website	May
BGP Routing Information Sharing	Requirements/Design(email, slack)	May-June
	Document info (How to implement, what partners need to do)	May-June
	Implement the peering (meeting, email, slack)	May- Continuously
Looking Glass Platform	Requirements/Design(email, slack)	August
	Document info (How to implement, what partners need to do)	
	Implement the connection with LG platform(meeting, email, slack)	
Hijack Detection and Mitigation	Problem and requirement sharing (meeting, email, slack)	June
	Confirm first stage functions	July
	Iterative feedback & development	July 2022 – July 2023
Research	Discussion on research topic, paper, technical document	July 2022 – July 2023
Knowledge Sharing	Any topic partners interested in , e.g. Problems, RPKI, BGPSEC, MANRS	regularly

Todo List

	Detailed Technical Committee Work Plan	Todo
BGP Routing Information Sharing	Document info (How to implement, what partners need to do)	Executive Team :send manual to partners, discuss with each partner, and implement the peering. Partners: setup peering.
	Implement the peering (meeting, email, slack)	
BGP Platform	Iterative feedback & development	Partners: Test new services Executive Team: Software Development
Looking Glass Platform	Document info (How to implement, what partners need to do)	Executive Team :send manual to partners, discuss with each partner, and implement the connection. Partners: setup connection.
	Implement the connection (meeting, email, slack)	

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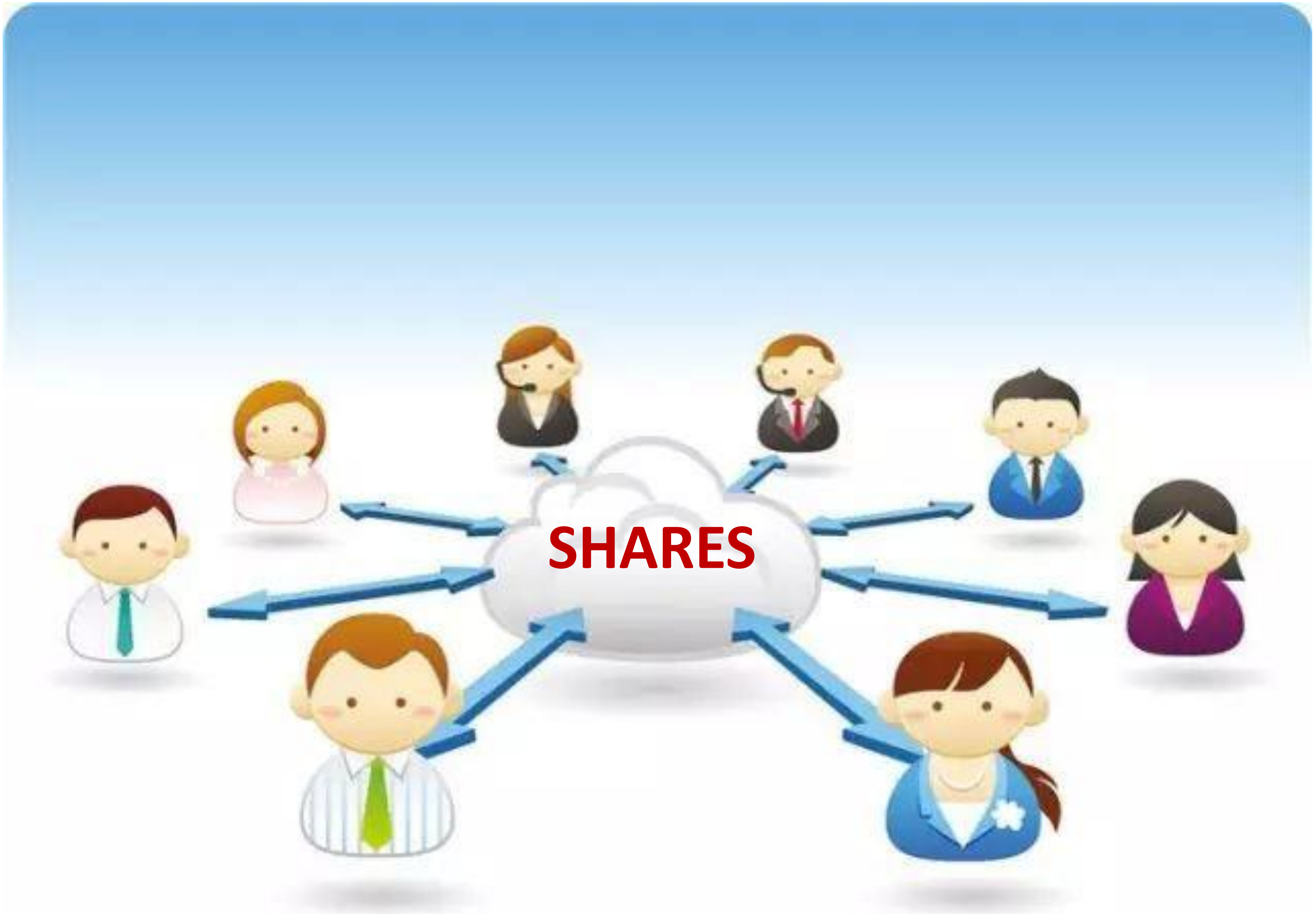
Comments/Suggestions

- ??


SHARES