# Assignment Overview
# Visualizing the Internet Topology

# Assignment Overview (1/3)

- Motivation
  - The Internet works as large-scale and complex interconnections among many routers belonging to various ISPs.  If you want to know how those routers and ISPs are interconnected between the source and destination hosts, how would you do so?
- Instructions
  - Perform traceroute from many source hosts to many destination hosts with showing **AS numbers**.
  - If you cannot secure many source hosts, consider the use of public looking glass.
  - Use "whois" database to know 1) the operator / organization name, and 2) the range of IP address of each AS (ISP) shown in the traceroute results.
  - Visualize the AS path where traceroute packets traversed from source and destination hosts.
  - Report your findings through the hands-on (free text / contents)

# Assignment Overview (2/3)

- Deliverables
  - The visualization (a picture or/and a video capture) of the Internet topology (MUST)
  - The raw data you collected (MUST)
  - The code & scripts that were used to process & visualize data
  - The processed data you used visualize data
  - The written report to describe 1) your deliverable, and 2) your findings about the Internet topology (preferably less than 400 words for each point)

- Evaluation Criteria (Full Mark: 50 Marks)
  - The number of source and destination hosts is reasonably many (for example, at least 5 sources and at least 10 destinations) (10 marks)
  - The visualization is informative, **INTEGRATED**, and neatly furnished (25 marks)
  - The written report contains meaningful information.  Limited explanation and/or Copy-and-Paste of the traceroute results will get less marks. (15 marks)
  - Impressive efforts may get some extra score (up to 5 marks)

# Assignment Overview (3/3)

- Group work
  - The maximum number of group members is 3 (THREE), and non-negotiable.
  - One submission per group is accepted.  Please make sure the name and roll ID of all the members are mentioned in the deliverable.
  - Common score will be given to the group members.

- Submission Deadline
  - August 25$^{th}$ (FRI)

# Hint Information

- Ping & Traceroute from your laptop, smartphone, etc.
  - If Traceroute does not work well from your devices, use **Looking Glass**.

- Looking Glass by ISPs
  - WEB based UI to perform
  - Ping & Traceroute to the other part of the Internet
  - BGP Information (Interconnections among ISPs)

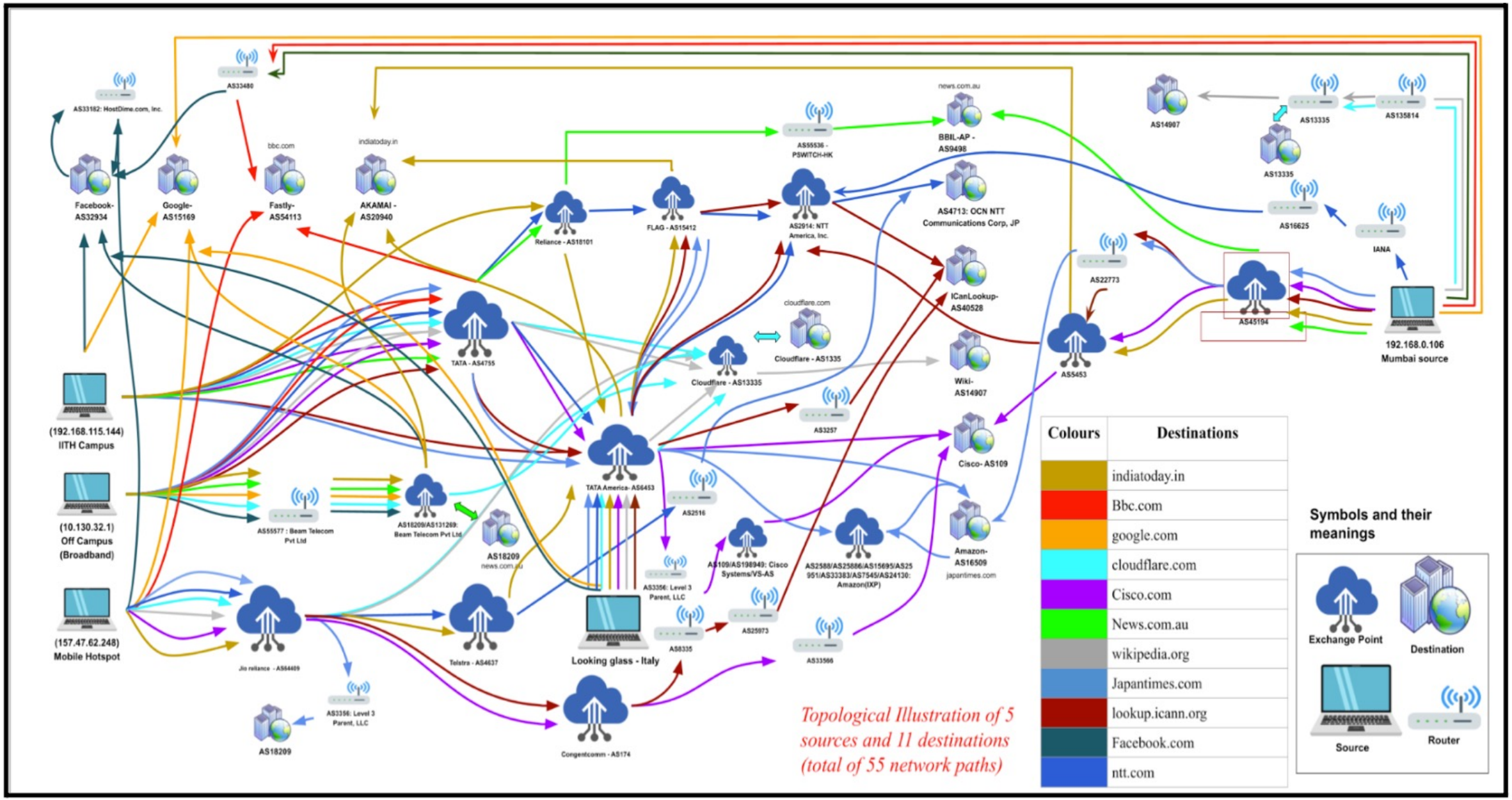
- What to visualize?  ISPs in the end-to-end communication?
  - Size (in terms of what?) of ISP, Geolocations of ISP, Latency among ISPs

# Looking Glass

- https://www.gin.ntt.net/looking-glass-landing/
- https://stixlg.singtel.com/dashboard
- https://lg.as6453.net/bin/lg.cgi

- And many more.  Let’s search!

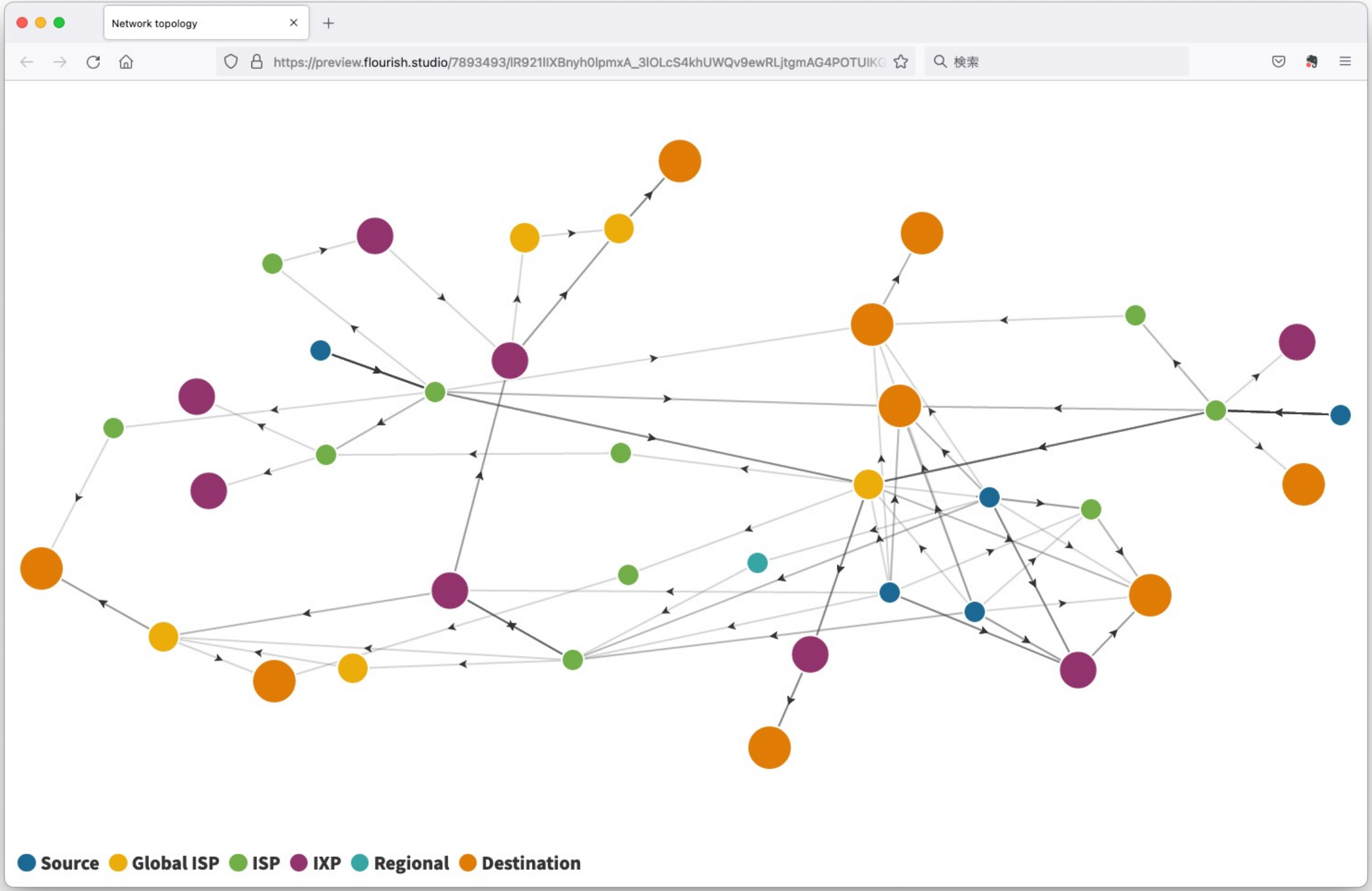
# Past Impressive Submission #1


AS33480
AS33182: HostDime.com, Inc.
Facebook- AS32934
Google- AS15169
bbc.com
Fastly- AS54113
indiatoday.in
AKAMAI - AS20940
Reliance - AS18101
FLAG - AS15412
AS55536 - PSWITCH-HK
news.com.au
BBIL-AP - AS9498
AS2914: NTT America, Inc.
AS4713: OCN NTT Communications Corp, JP
AS14907
AS13335
AS135814
AS16625
IANA
AS22773
AS45194
192.168.0.106 Mumbai source
ICanLookup- AS40528
AS5453
cloudflare.com
Cloudflare - AS1335
Cloudflare - AS13335
TATA - AS4755
Wiki- AS14907
AS3257
(192.168.115.144) IITH Campus
(10.130.32.1) Off Campus (Broadband)
(157.47.62.248) Mobile Hotspot
AS55577 : Beam Telecom Pvt Ltd
AS18209/AS131269: Beam Telecom Pvt Ltd
AS18209 news.com.au
TATA America- AS6453
AS2516
Cisco- AS109
AS109/AS198949: Cisco Systems/VS-AS
AS2588/AS25886/AS15695/AS25951/AS33383/AS7545/AS24130: Amazon(IXP)
Amazon- AS16509 japantimes.com
AS3356: Level 3 Parent, LLC
AS25973
AS8335
AS33566
Looking glass - Italy
Telstra - AS4637
Jio reliance - AS64469
AS3356: Level 3 Parent, LLC
AS18209
Cogentcomm - AS174
Topological Illustration of 5 sources and 11 destinations (total of 55 network paths)
Colours
Destinations
indiatoday.in
Bbc.com
google.com
cloudflare.com
Cisco.com
News.com.au
wikipedia.org
Japantimes.com
lookup.icann.org
Facebook.com
ntt.com
Symbols and their meanings
Exchange Point
Destination
Source
Router

| AS Number | Range | Organization |
|---|---|---|
| AS4755 | 14.0.0.0 -14.255.255.255 | TATA Communications |
| | 121.0.0.0-121.255.255.255 | |
| AS6453 | 180.0.0.0-180.255.255.255 | TATA COMMUNICATIONS (AMERICA) INC |
| AS2914 | 129.250.0.0-129.250.255.255 | NTT America, Inc. |
| | 120.0.0.0-120.255.255.255 | |
| | 204.0.0.0 - 204.3.255.255 | |
| | 129.250.0.0 - 129.250.255.255 | |
| | 122.0.0.0-122.255.255.255 | |
| AS4713 | 153.0.0.0-153.255.255.255 | OCN NTT Communications Corporation, JP |
| | 61.0.0.0-61.255.255.255 | |
| AS13335 | 104.16.0.0 - 104.31.255.255 | Cloudflare, Inc. |
| | 172.64.0.0 -172.71.255.255 | |
| AS14907 | 103.0.0.0 - 103.255.255.255 | Wikimedia Foundation Inc. |
| AS55577 | 183.0.0.0 - 183.255.255.255 | Beam Telecom Pvt Ltd |
| AS18209/AS1312 | 183.0.0.0 - 183.255.255.255 | Beam Telecom Pvt Ltd |
| | 157.240.0.0 - 157.240.255.255 | |
| AS32934 | 173.252.64.0 - 173.252.127.255 | Facebook, Inc. |
| AS33182 | 129.134.0.0 - 129.134.255.255 | HostDime.com, Inc. |
| AS4755 | 14.0.0.0 - 14.255.255.255 | TATA Communications |
| AS109 | 128.107.0.0 - 128.107.255.255 | CISCO SYSTEMS, INC |
| AS109/AS19894 | 72.163.0.0 - 72.163.255.255 | CISOC-GEN-7/VS-AS |
| AS40528 | 192.0.32.0 - 192.0.47.255 | ICANN-LAX |
| AS15169 | 108.170.192.0 - 108.170.255.255 | Google LLC |
| | 142.250.0.0 - 142.251.255.255 | |
| | 72.14.192.0 - 72.14.255.255 | |
| AS54113 | 151.101.0.0 - 151.101.255.255 | Fastly (SKYCA-3) |
| AS20940 | 104.64.0.0 - 104.127.255.255 | AKAMAI-ASN1, NL |
| AS16509 | 150.222.0.0 - 150.222.255.255 | Amazon Technologies Inc. (AT-88-Z) |
| AS2588/AS25886/AS15695/AS25951/AS33383/AS7545/AS24130 | 15.228.0.0 - 15.231.255.255 | Amazon Technologies Inc. (AT-88-Z) |
| AS14618/AS165 | 52.84.0.0 - 52.95.255.255 | Amazon Technologies Inc. (AT-88-Z) |
| AS20947 | 96.16.0.0 - 96.17.255.255 | Akamai Technologies, Inc. (AKAMAI |

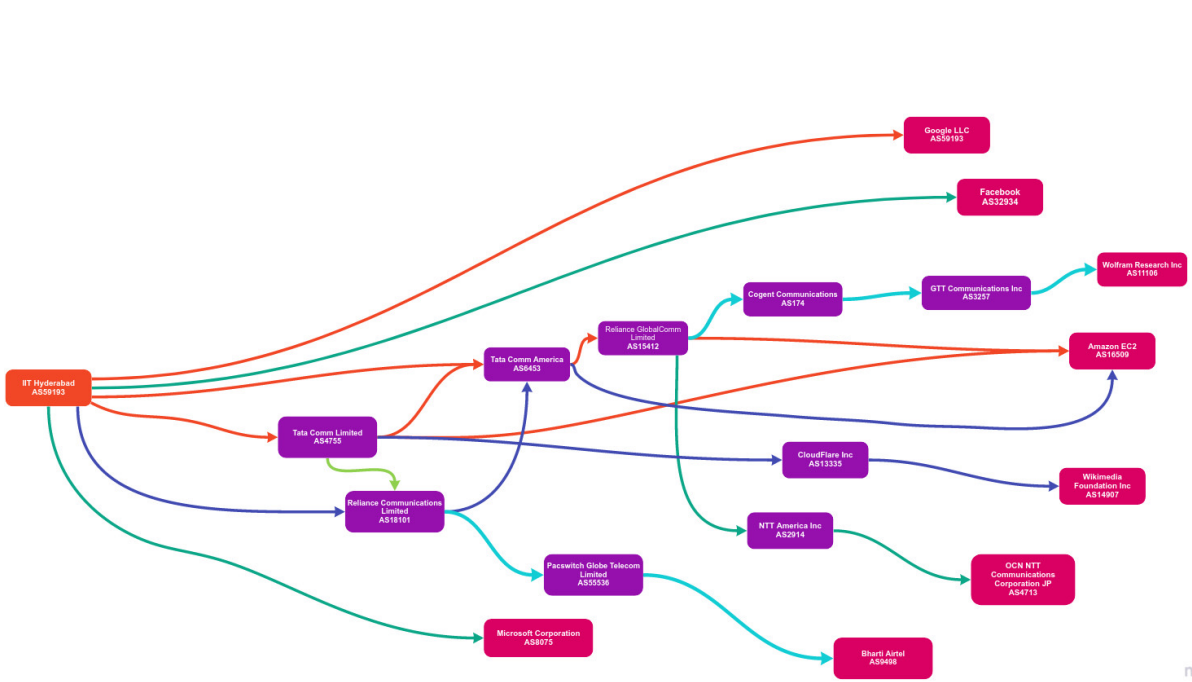
| AS Number | Range | Organization |
|---|---|---|
| AS4755 | 115.0.0.0 - 115.255.255.255 | TATACOMM-AS |
| AS18101 | 115.0.0.0 - 115.255.255.255 | RELIANCE-COMMUNICATIONS-IN |
| AS15412 | 80.0.0.0 - 80.255.255.255 | FLAG-AS |
| AS6453 | 180.0.0.0 - 180.255.255.255 | TATA COMMUNICATIONS (AMERICA) INC |
| AS2914 | 129.250.0.0 - 129.250.255.255 | NTT-COMMUNICATIONS-2914 |
| AS4713 | 153.0.0.0 - 153.255.255.255 | OCN |
| AS59193 | 103.0.0.0 - 103.255.255.255 | D3079306AFIN-AS |
| AS13335 | 162.158.0.0 - 162.159.255.255 | CLOUDFLARENET |
| AS14907 | 103.0.0.0 - 103.255.255.255 | WIKIMEDIA |
| AS32934 | 157.240.0.0 - 157.240.255.255 | FACEBOOK |
| AS109 | 72.163.0.0 - 72.163.255.255 | CISCOSYSTEMS |
| AS15169 | 74.125.0.0 - 74.125.255.255 | GOOGLE |
| AS16509 | 52.192.0.0 - 52.223.191.255 | AMAZON-02 |
| AS54113 | 199.232.0.0 - 199.232.255.255 | FASTLY |
| AS55536 | 116.0.0.0 - 116.255.255.255 | PSWITCH-HK |
| AS9498 | 23.32.0.0 - 23.67.255.255 | BBIL-AP |
| AS20940 | 72.246.0.0 - 72.247.255.255 | AKAMAI-ASN1 |
| AS16625 | 104.64.0.0 - 104.127.255.255 | AKAMAI-AS |
| AS135814 | 103.0.0.0 - 103.255.255.255 | EXTREME-IX-AS |
| AS33480 | 103.0.0.0 - 103.255.255.255 | WEBWERKSAS1 |
| AS45194 | 27.0.0.0 - 27.255.255.255 | SIPL-AS |
| AS22773 | 172.16.0.0 - 172.31.255.255 | ASN-CXA-ALL-CCI-22773-RDC |
| AS15169 | 142.250.0.0 - 142.251.255.255 | GOOGLE |
| AS16509 | 150.222.0.0 - 150.222.255.255 | AMAZON-02 |
| AS2588 | 15.228.0.0 - 15.231.255.255 | LATNET-AS |
| AS54113 | 103.0.0.0 - 103.255.255.255 | FASTLY |
| AS20940 | 96.16.0.0 - 96.17.255.255 | AKAMAI-ASN1 |
| AS15169 | 142.250.0.0 - 142.251.255.255 | Google LLC (GOGL) |
| AS64049 | 103.0.0.0 - 103.255.255.255 | Asia Pacific Network Information Centre (APNIC |
| AS4637 | 210.0.0.0 - 210.255.255.255 | Asia Pacific Network Information Centre (APNIC) |
| AS2516 | 27.0.0.0 - 27.255.255.255 | Asia Pacific Network Information Centre (APNIC) |
| AS4713 | 61.0.0.0 - 61.255.255.255 | Asia Pacific Network Information Centre (APNIC) |

# Past Impressive Submission #2


Network topology
https://preview.flourish.studio/7893493/lR921lIXBnyh0lpmxA_3lOLcS4khUWQv9ewRLjtgmAG4POTUlK
検索
Source
Global ISP
ISP
IXP
Regional
Destination

# Past Submission #3

Good try, but some steps to become implessive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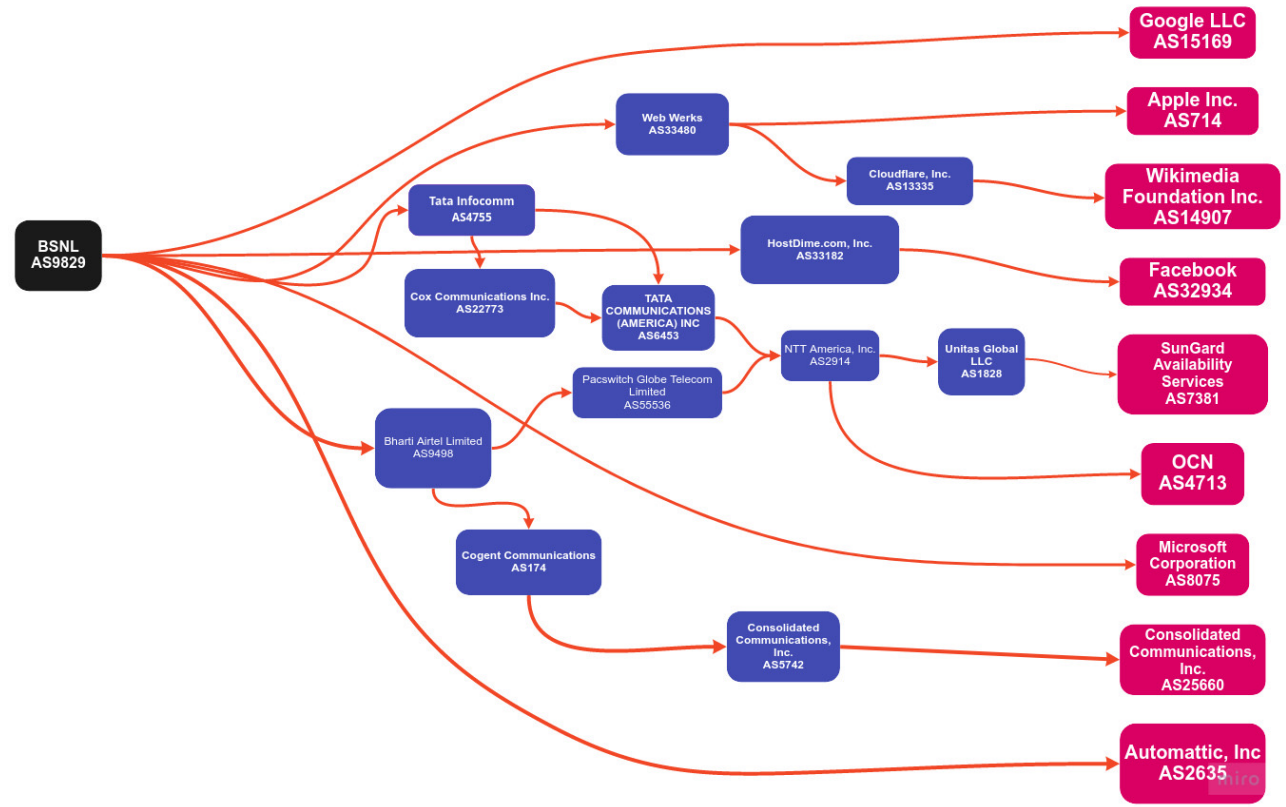
AS59193
Google LLC
AS59193
Facebook
AS32934
Tata Comm Limited
AS4755
Tata Comm America
AS6453
Reliance GlobalComm Limited
AS15412
Cogent Communications
AS174
GTT Communications Inc
AS3257
Wolfram Research Inc
AS11100
Amazon EC2
AS16509
Reliance Communications Limited
AS18101
CloudFlare Inc
AS13335
Wikimedia Foundation Inc
AS14907
NTT America Inc
AS2914
Pacswitch Globe Telecom Limited
AS55536
OCN NTT Communications Corporation JP
AS4713
Microsoft Corporation
AS8075
Bharti Airtel
AS9498

miro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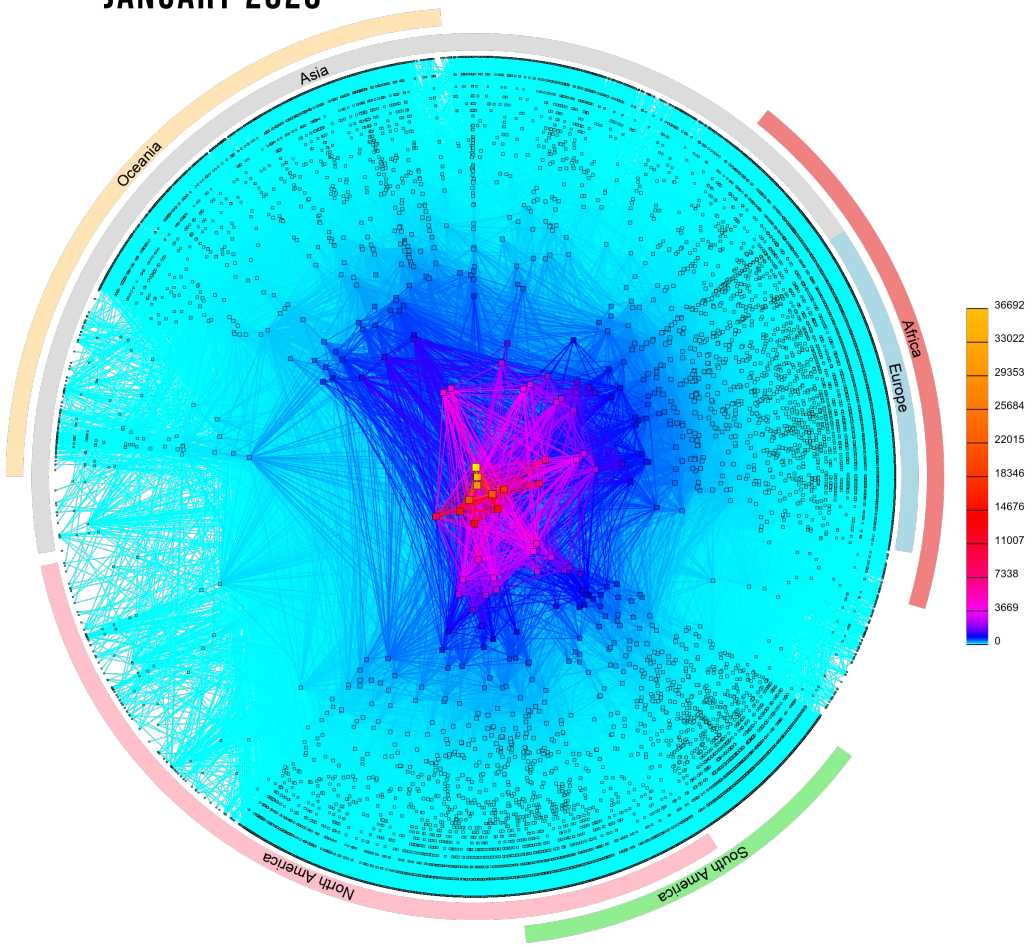
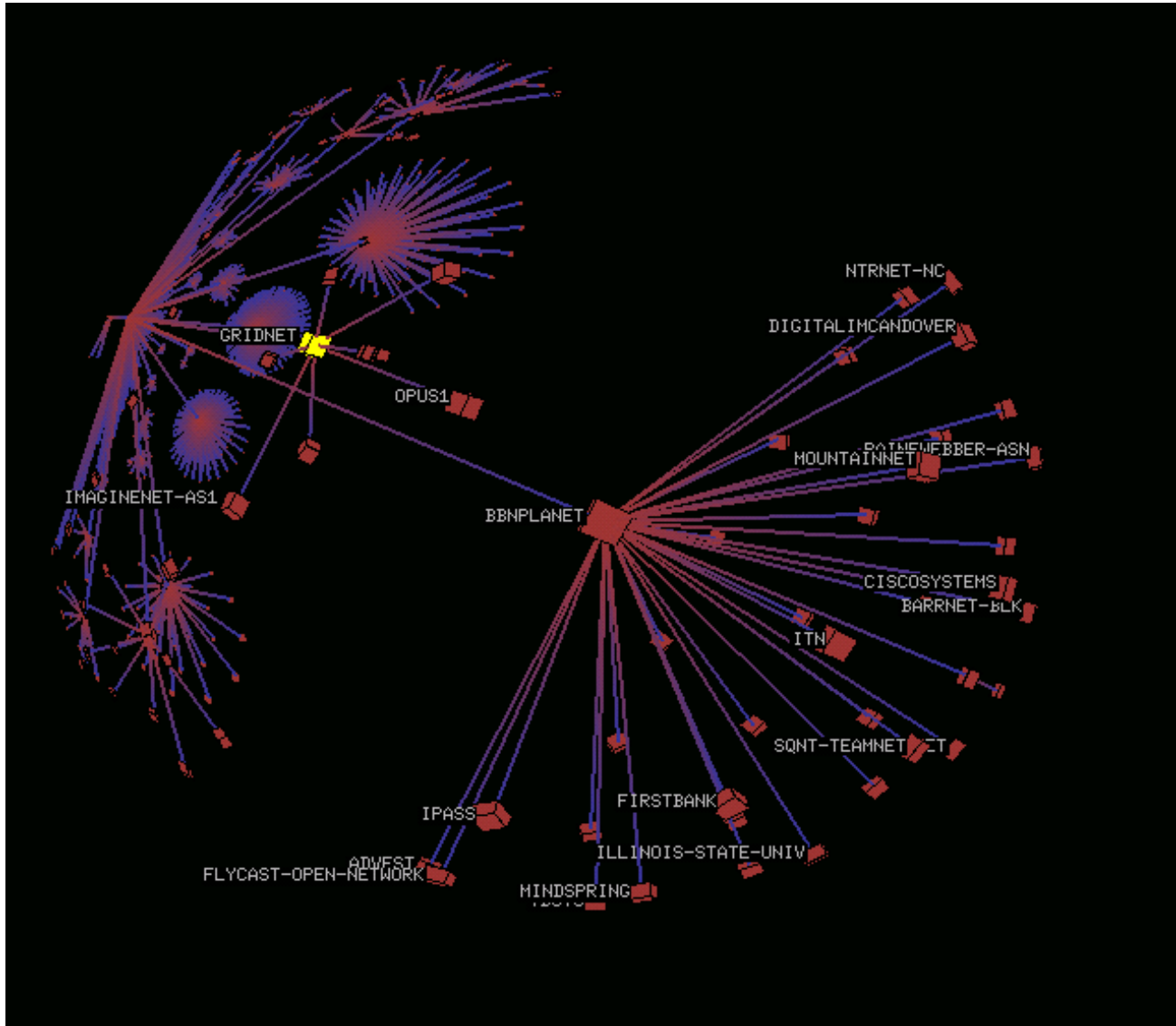
AS9829
Google LLC
AS15169
Web Werks
AS33480
Apple Inc.
AS714
Cloudflare, Inc.
AS13335
Wikimedia Foundation Inc.
AS14907
Tata Infocomm
AS4755
HostDime.com, Inc.
AS33182
Facebook
AS32934
Cox Communications Inc.
AS22773
TATA COMMUNICATIONS (AMERICA) INC
AS6453
NTT America, Inc.
AS2914
Unitas Global LLC
AS1828
SunGard Availability Services
AS7381
Pacswitch Globe Telecom Limited
AS55536
Bharti Airtel Limited
AS9498
OCN
AS4713
Cogent Communications
AS174
Microsoft Corporation
AS8075
Consolidated Communications, Inc.
AS5742
Consolidated Communications, Inc.
AS25660
Automattic, Inc
AS2635

# Inspiration from other fancy examples

# CAIDA (caida.org)

CAIDA'S IPV4 AS CORE GRAPH
JANUARY 2020

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