



SANOG 38

[HTTPS://AIORI.IN](https://aiori.in)

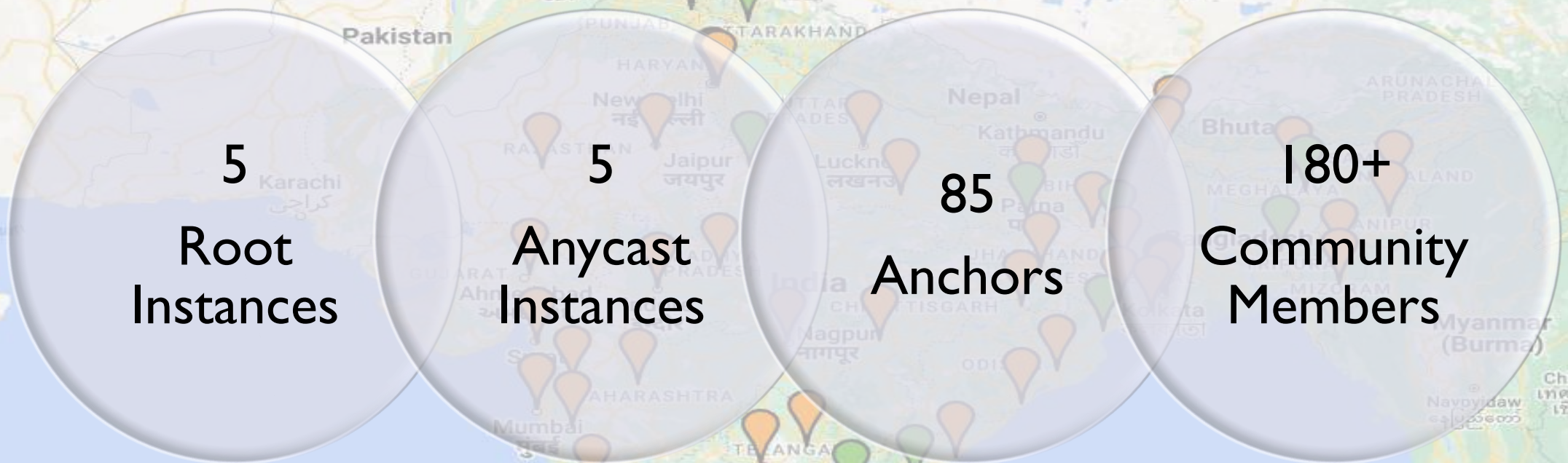
1. ABOUT THE PROJECT

- Large scale measurement of performance matrices is important to understand the performance of the network and quality of Internet experience by end-users.
- AIORI (Advanced Internet Operations Research in India) program has created a network of devices (anchors) deployed across India and Internet measurement platform that actively measures Internet connectivity and reachability, providing an unprecedented understanding of the state of the Internet in real time.
- Starting in 2021, 85 anchors have been deployed across India till now with another 500 in pipeline the program helps in improving our understanding of the Internet as a whole and intends to benefit end-users, researchers, network owners and policy makers.

WHY NOT USING EXISTING MEASUREMENT PLATFORMS – RIPE ATLAS?

- Large Scale Deployment not in India
- Tried to get in large numbers but failed.
- Dependent on the measurement available in the platform and experimenting with news ones is not supported
- What AIORI is having
 - Edge performance and measurement using Pub/Sub model
 - Integrating new measurements is easy with the new architecture
 - API availability to ingrate with use cases
 - Anycast/CDN measurement and Infrastructure to build and reserach

TODAY AIORI IN NUMBERS



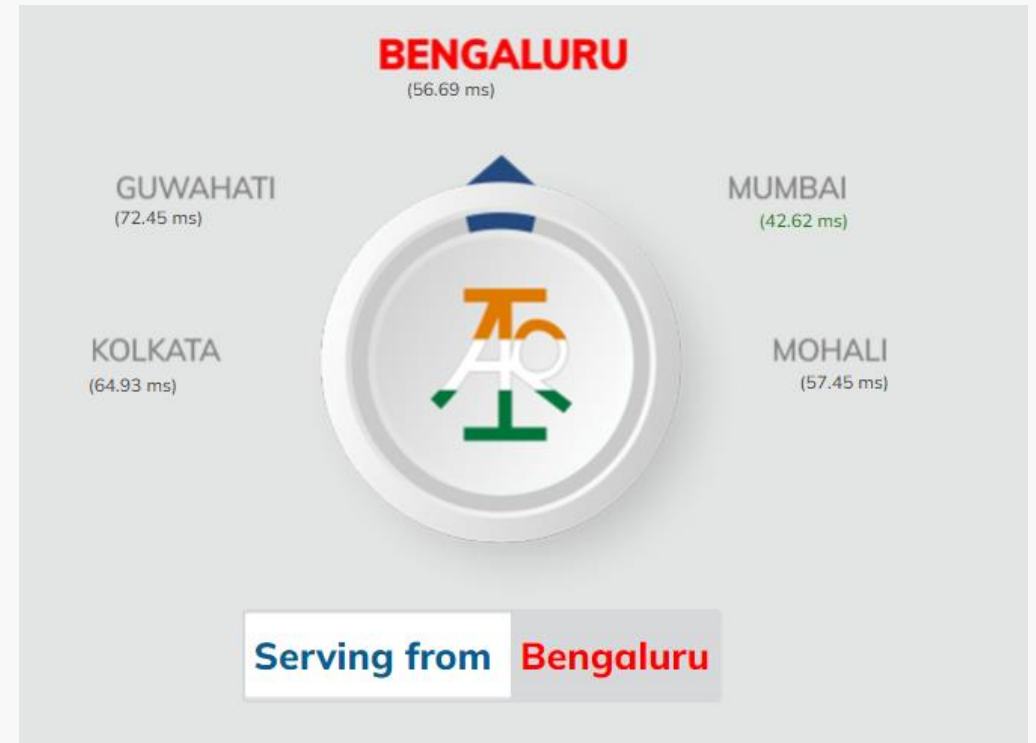
Root Instances

4 L Root Instances – GAW, BLR, MOH, MUM at STPI NOC/ DC
1 F Root Instance in KOL at IIFON NOC; M, K & D In Progress
Anchors – 500 by EoP.

Community Members – In multiple of 3X of Anchors Deployed.

USE CASE 1: ANYCAST MEASUREMENT

- The AIORI portal is hosted using the same Anycast IP for WWW and DNS in multiple locations and when users are visiting the site, they are contributing to mining the routing latency measurements data to help understand the routing and peering state of the region. This will help us in studying and proposing routing and peering fixes for more resilient and responsive Internet experience.

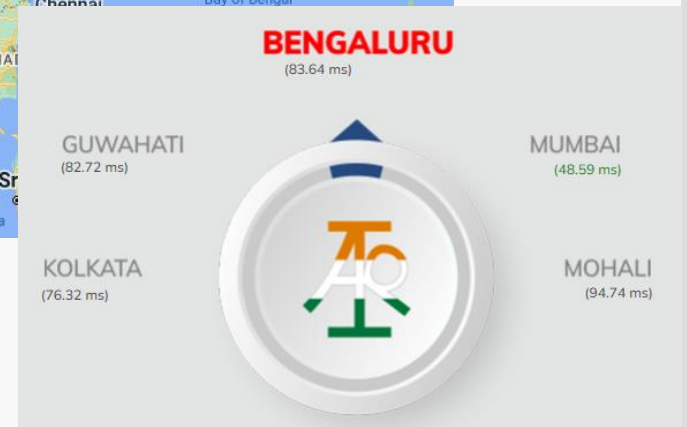
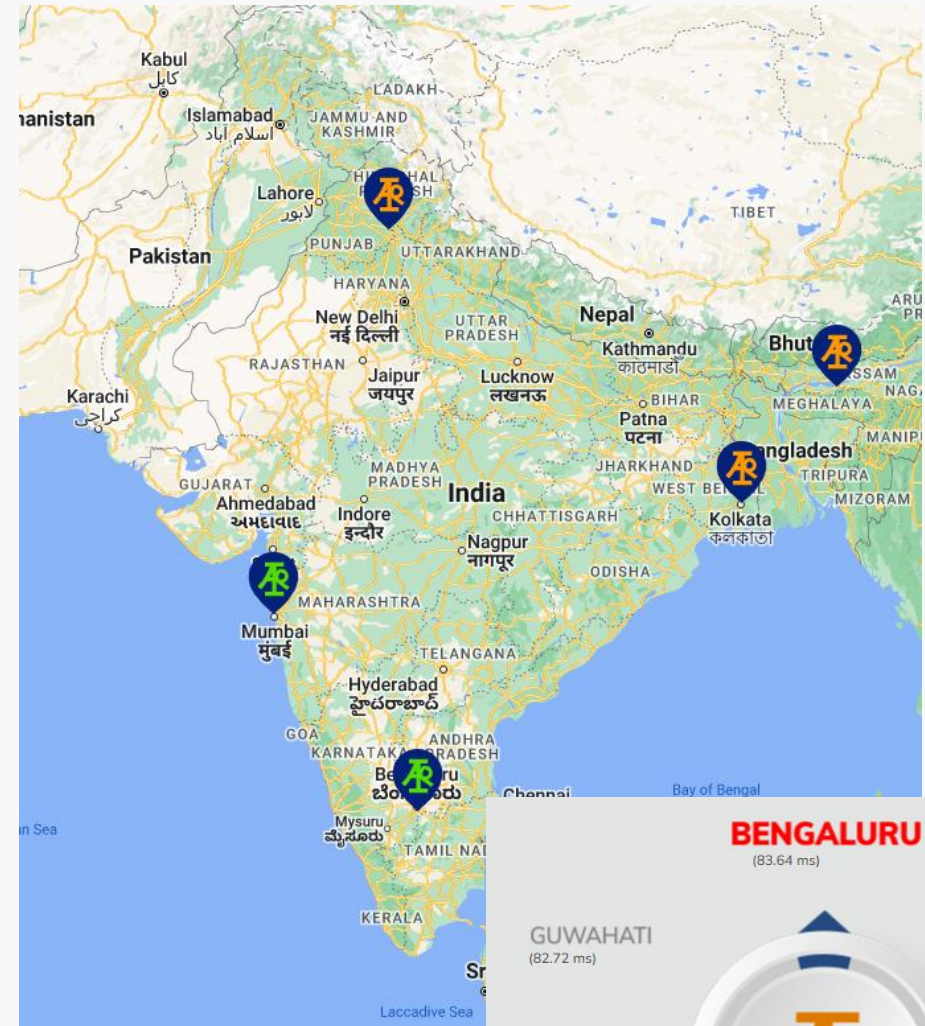


I am accessing <https://aiori.in> from Kolkata. The best latency is Mumbai but serving from Bengaluru. The latency should be less than ~30 ms from Kolkata.

ANYCAST TESTBED

ANYCAST PRIVATE CLOUD INFRASTRUCTURE

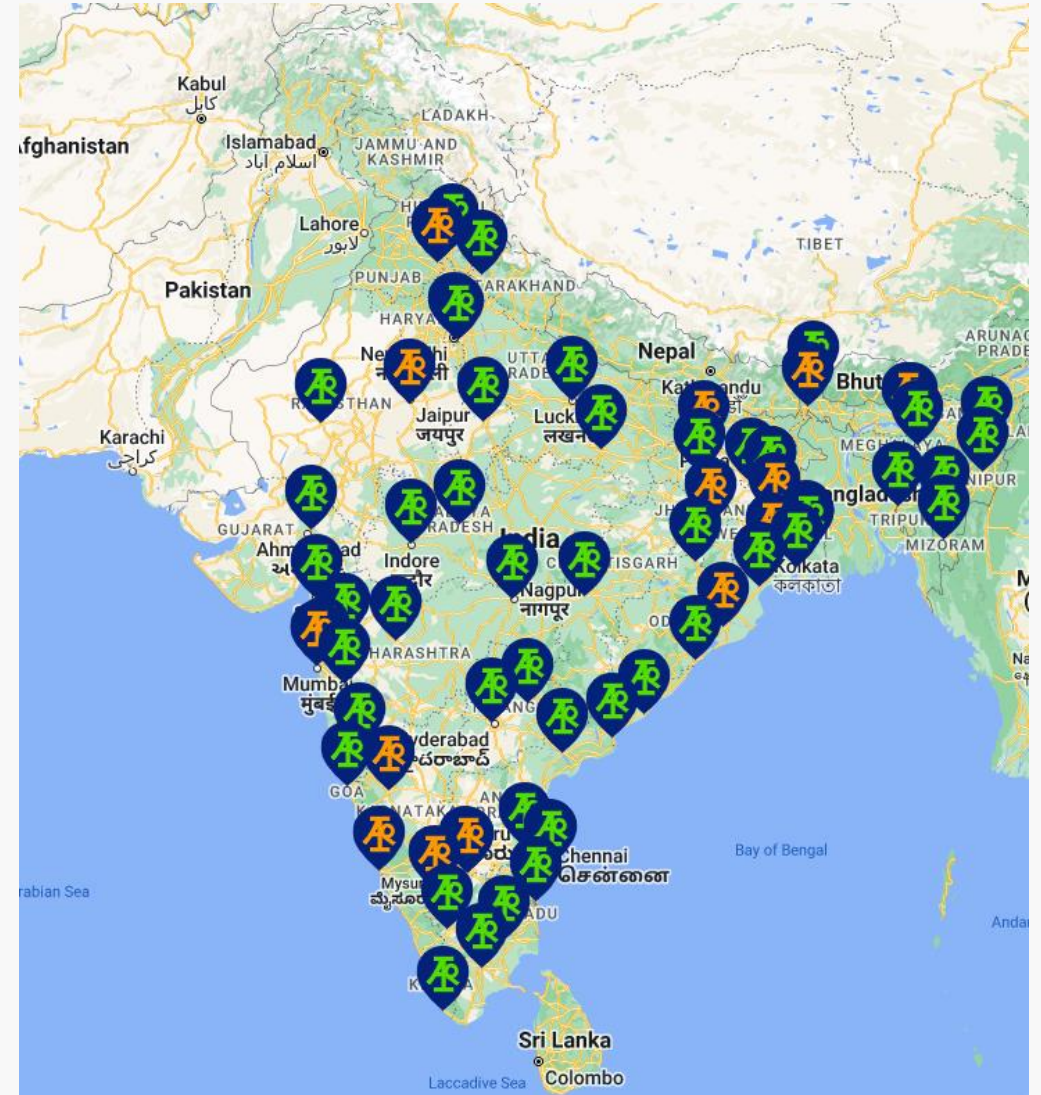
- In Five Locations across INDIA
- This is helping us measure the local interconnection availabilities and uncover the issues related to resilient functioning of Internet.
- We are adding more academic institutions to host the testbed for more research initiatives to be taken up from academia.



ANCHOR NETWORK

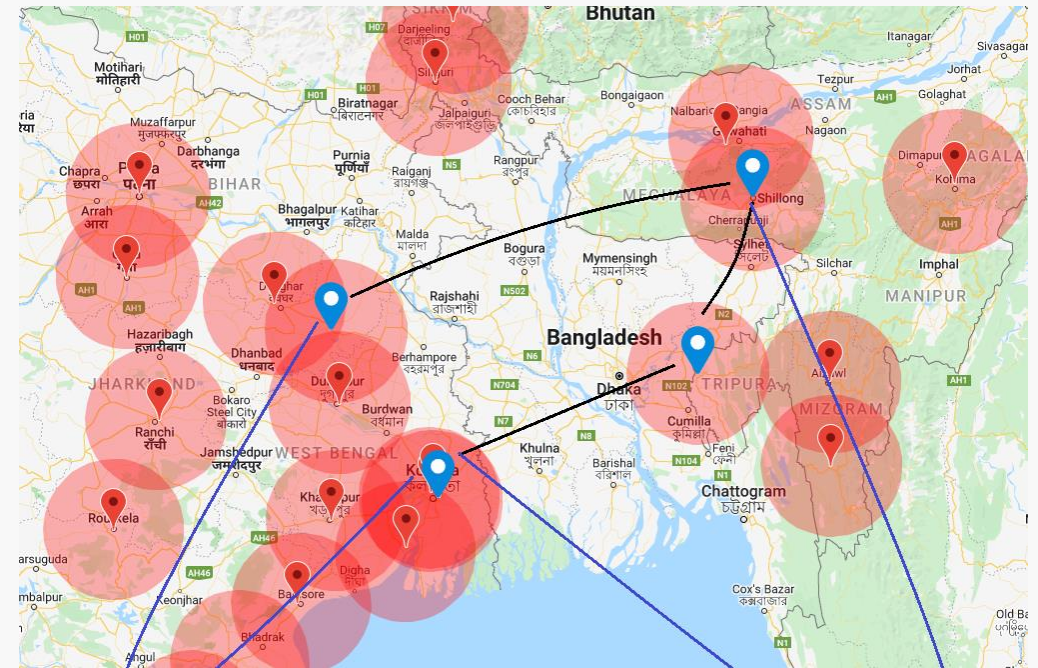
REMOTE MEASUREMENT ANCHORS

- Complete Indigenous development
- In 85+ locations across India, Next 430 locations in progress
- This is helping us measure the user level services availability and routing



USE CASE 2 : ROUTING DETOURS FORENSIC

- The AIORI Interment Measurement infrastructure will help to analyze the data in transit paths taken when user connects for services from one ASN to another inside the country. This will uncover ASN-to-ASN peering routes as well as help us uncover international routing detours.




In one of the experiments, we have found one of the hop having reverse DNS set as nsg-corporate-14.246.186.122.airtel.in for IP 122.186.246.14 – The IP in the DNS name belongs to Vietnam Posts and Telecommunications Group

USE CASE 3 : MEASURING SERVICES LATENCY

- The AIORI Interment Measurement infrastructure will help to analyze the latency of services in different parts of country. This will be useful for government, business to understand the reachability issues of their domains.
- We have given color codes to understand the latency better. In our study we are plotting nixi.in latency across the country.
- The slides proceeding will show the latency health

Know Your Latency

nixi.in I'm not a robot  [Latency Check](#) [Show in Map](#)

Show 5

Anchor Location	Rtt Max	Rtt Avg	Rtt Min
Agartala	79.35	77.49	75.63
Aizawl	64.15	63.95	63.81
Aurangabad	22.48	22.07	21.83
Balasore	106.02	105.53	105.17
Bengaluru	26.94	25.65	23.64

Previous 1 2 3 4 5 ... 11 Next



AIORI

Less 30 : ●

31 to 50 : ●

51 to 70 : ●

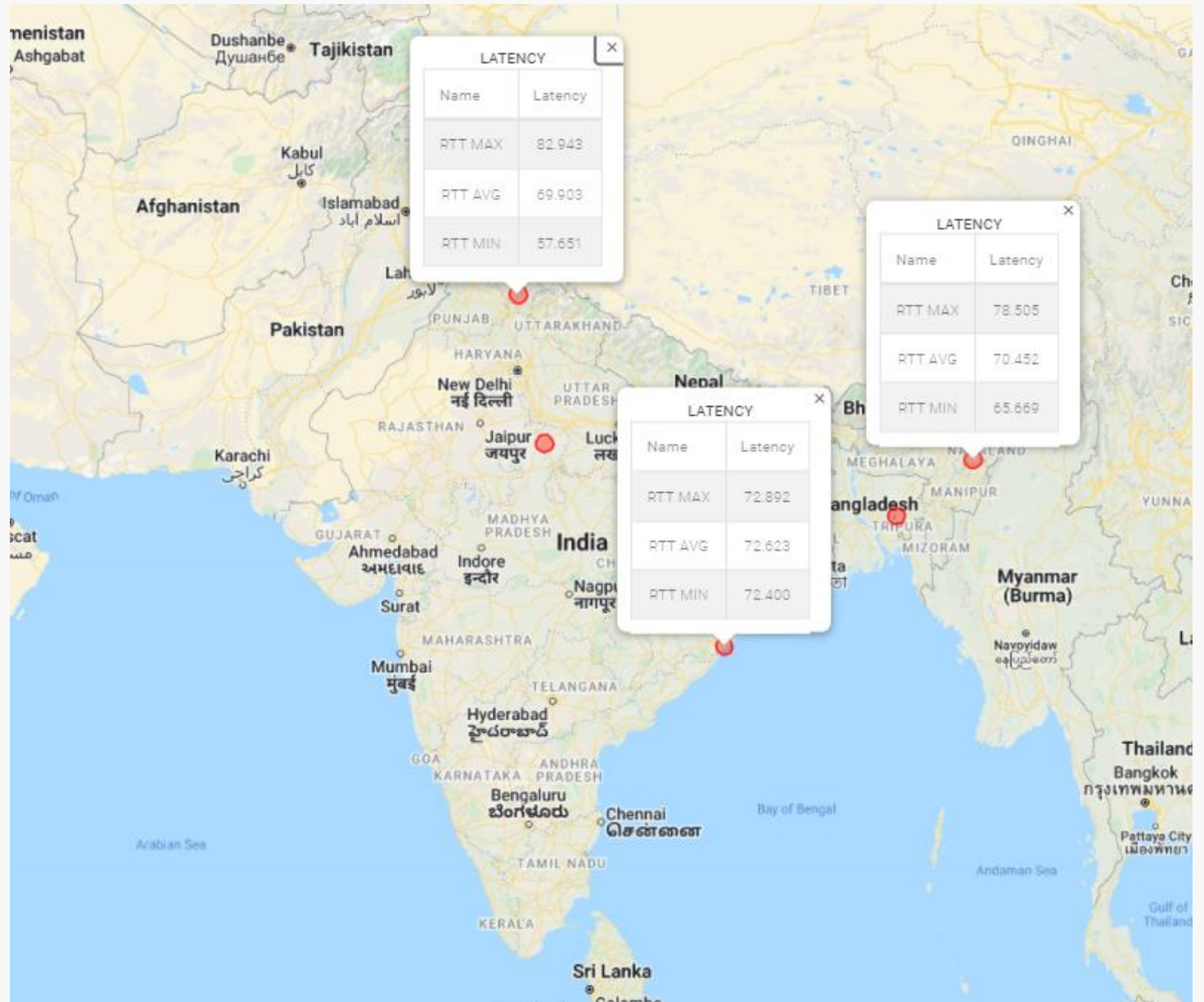
Above 70 : ●



Use Case 3 : Illustration

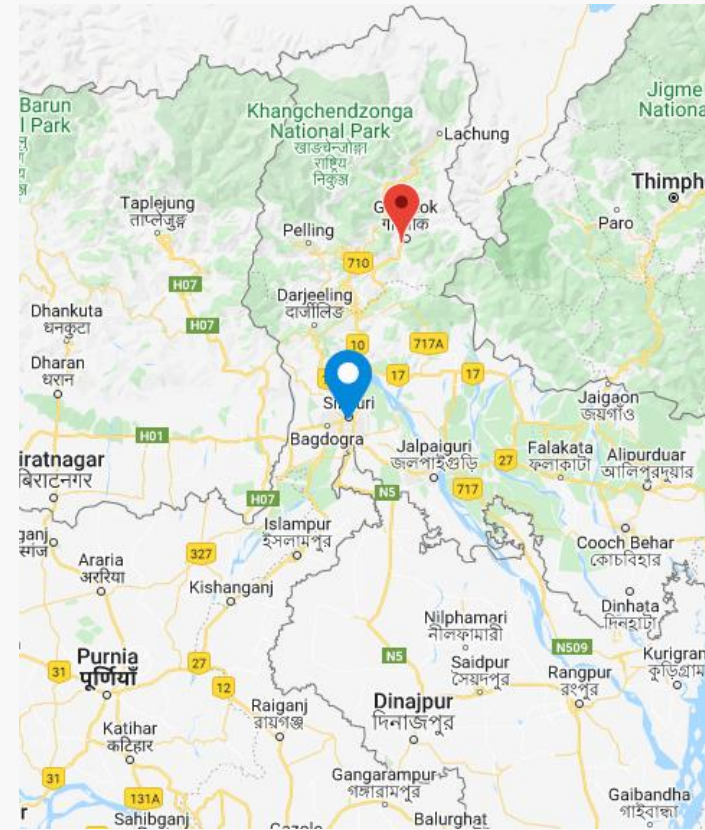
Based on the results the AIORI portal provides further tools and measurements to analyze:

1. Which networks are responsible for slow performance.
2. What is the status of peering where the content is hosted.
3. More tools....



USE CASE 4 : DNS RESILIENCY FROM USER ENDPOINT

- The AIORI Interment Measurement infrastructure will help to analyze the DNS resiliency from use end point in terms of availability and latency of the hierarchy. This will be great tool for resiliency enforcement by different zone maintainers.
- **Measurement : meity.gov.in A record**
- **Location : Guwahati Anchor**



Because of L root deployment in Guwahati the latency in [6.21 ms], wherein the maximum is for E [339.43]

Measurement : meity.gov.in A record

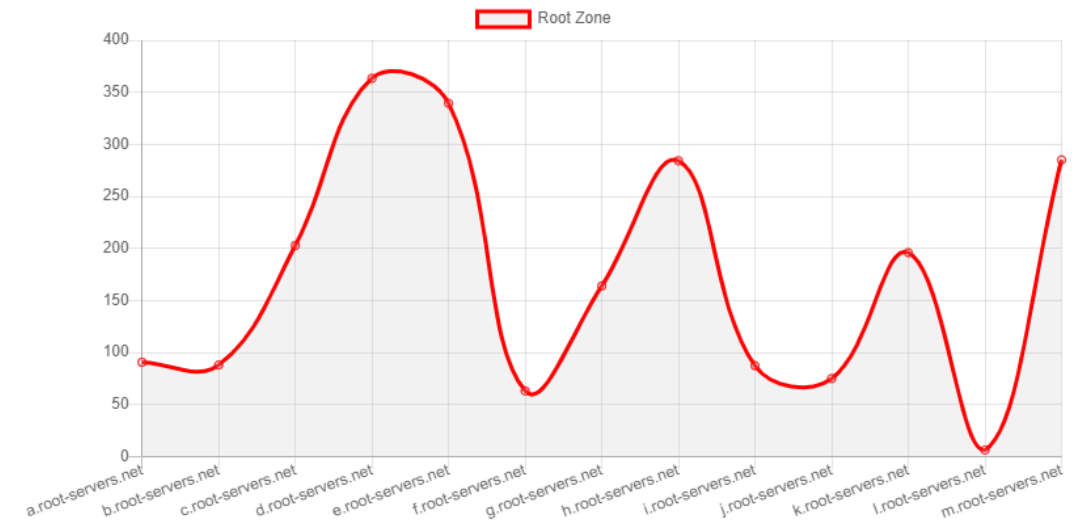
Location : Guwahati Anchor

Zone: Root [.]

Root Zone

Resource Record	Value	Time(ms)
a.root-servers.net	198.41.0.4	90.59
b.root-servers.net	199.9.14.201	87.93
c.root-servers.net	192.33.4.12	202.78
d.root-servers.net	199.7.91.13	363.43
e.root-servers.net	192.203.230.10	339.43
f.root-servers.net	192.5.5.241	63.11
g.root-servers.net	192.112.36.4	163.91
h.root-servers.net	198.97.190.53	284.22
i.root-servers.net	192.36.148.17	87.26
j.root-servers.net	192.58.128.30	74.93
k.root-servers.net	193.0.14.129	195.89
l.root-servers.net	199.7.83.42	6.21
m.root-servers.net	202.12.27.33	285.08

Root Zone Graphical View



Because of L root deployment in Guwahati the latency in [6.21 ms], wherein the maximum is for E [339.43]

Measurement : meity.gov.in A record

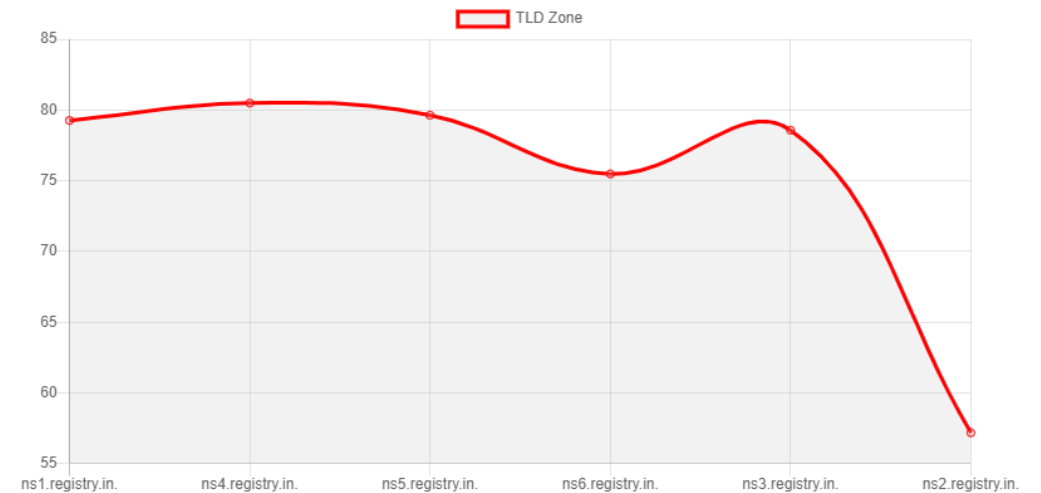
Location : Guwahati Anchor

Zone : [gov.in.]

TLD Zone

Resource Record	Value	Time(ms)
ns1.registry.in.	37.209.192.12	79.26
ns4.registry.in.	37.209.198.12	80.49
ns5.registry.in.	156.154.100.20	79.63
ns6.registry.in.	156.154.101.20	75.48
ns3.registry.in.	37.209.196.12	78.57
ns2.registry.in.	37.209.194.12	57.19

TLD Zone Graphical View



Measurement : meity.gov.in A record

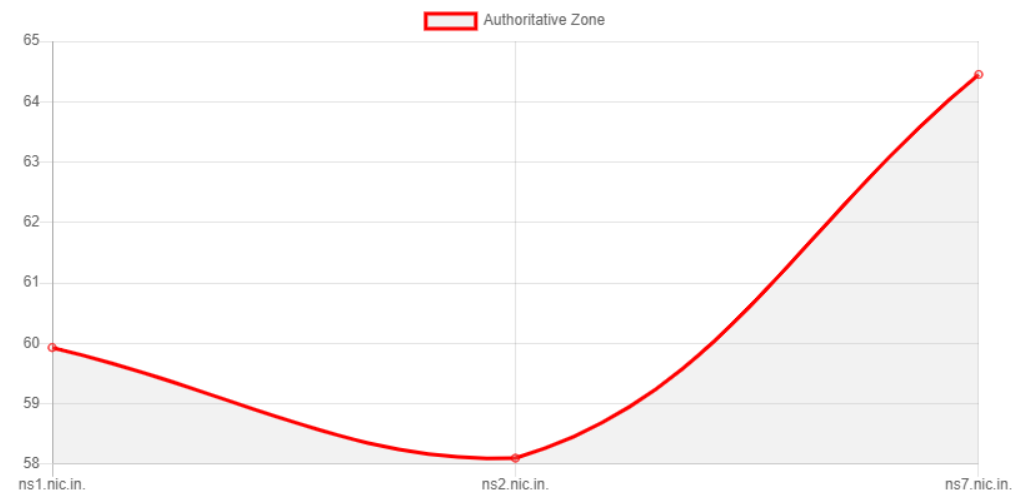
Location : Guwahati Anchor

Zone : [meity.gov.in.]

Anchor Authoritative Zone

Resource Record	Value	Answered	Time(ms)
ns1.nic.in.	164.100.14.3	true	59.93
ns2.nic.in.	164.100.10.18	true	58.10
ns7.nic.in.	164.100.2.11	true	64.45

Anchor Authoritative Zone Graphical View



USE CASE 5 : DNSSEC VISUALIZER

Dnssec Visualiser

india.gov.in,dot.gov.in,tdsat.gov.in,traigov.in,tec.gov.in ANY Query

dot.gov.in

SOA	
serial	2022010701
tech	nsadmin.nic.in.

NS	
0	ns7.nic.in.
1	ns10.nic.in.

A	
0	164.100.94.186

AAAA	
0	2001:4408:1081:1002::212

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graph TD; Root((.)) --> In((in)); In --> Gov((gov)); Gov --> India((india)); Gov --> Dot((dot)); Gov --> Tdsat((tdsat)); Gov --> Trai((traigov.in)); Gov --> Tec((tec));
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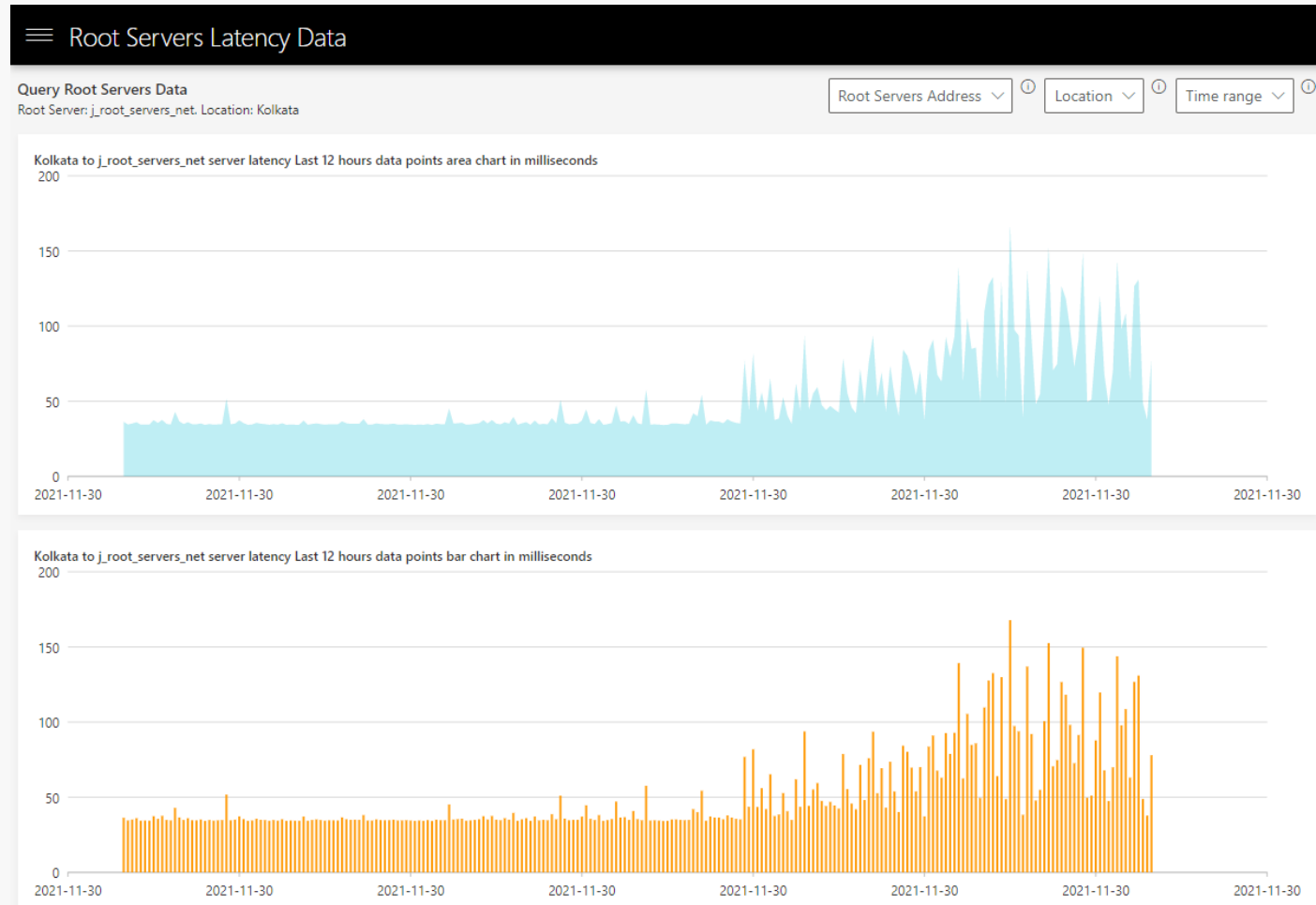

USE CASE 6 : DNS SERVER HEALTH MEASUREMENT IN A GEOGRAPHIC REGION

Measurement : 13 root server latency from anchors

The historic data will provide us inputs in the event of DDoS attacks or other failures, and it will act as alarm system from users' perspective.

Best suited for edge deployment measurements

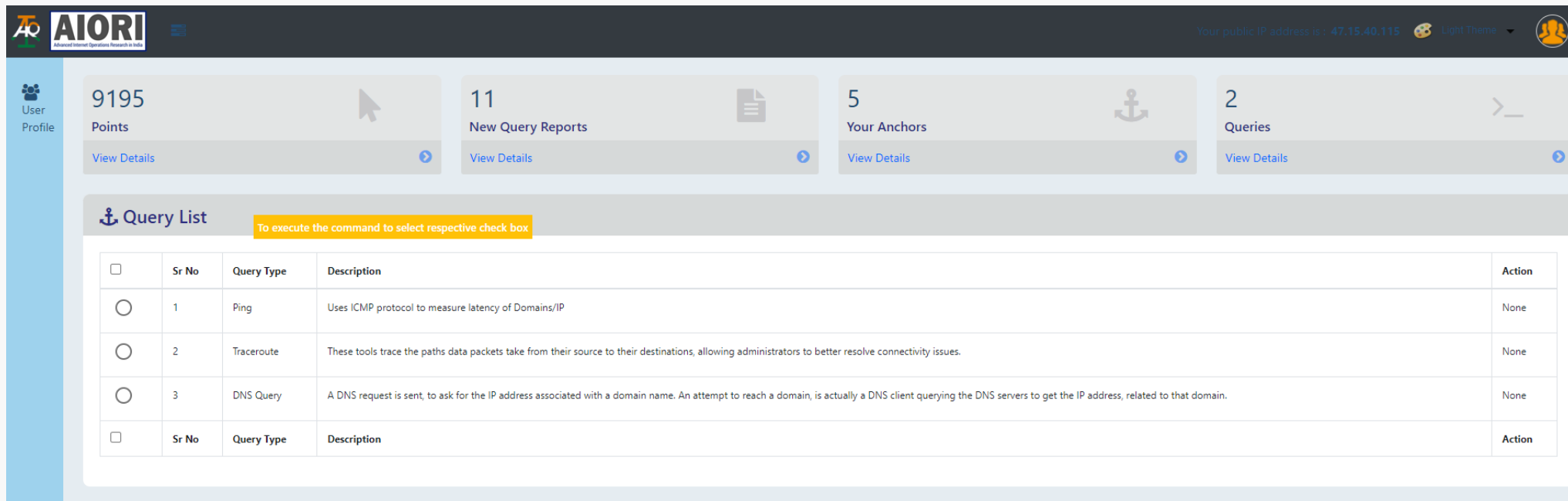
Sample data available in <https://tools.aiori.in>



USE CASE 8 : NETWORK MEASUREMENT TOOL FOR ISP/ENTERPRISE NETWORKS/CDN/DATA CENTER OPERATORS/IXPS ETC.

The AIORI portal (<https://aiori.in>), anycast nodes and anchor management network is an indigenously developed first of its kind tool for different stakeholders for Internet measurement.

Anyone can login into the portal and use the network measurement tools to troubleshoot network issues and measure the health.



The screenshot displays the AIORI portal interface. At the top, the AIORI logo is visible on the left, and the user's public IP address (47.15.40.115) and theme settings (Light Theme) are on the right. The dashboard features four main widgets: 'User Profile' with 9195 Points, 'New Query Reports' with 11 reports, 'Your Anchors' with 5 anchors, and 'Queries' with 2 queries. Below these is a 'Query List' section with a yellow instruction box: 'To execute the command to select respective check box'. The table below lists three query types: Ping, Traceroute, and DNS Query, each with a description and an 'Action' column.

<input type="checkbox"/>	Sr No	Query Type	Description	Action
<input type="radio"/>	1	Ping	Uses ICMP protocol to measure latency of Domains/IP	None
<input type="radio"/>	2	Traceroute	These tools trace the paths data packets take from their source to their destinations, allowing administrators to better resolve connectivity issues.	None
<input type="radio"/>	3	DNS Query	A DNS request is sent, to ask for the IP address associated with a domain name. An attempt to reach a domain, is actually a DNS client querying the DNS servers to get the IP address, related to that domain.	None
<input type="checkbox"/>	Sr No	Query Type	Description	Action



THANKS

TEAM AIORI

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