SANOG 43

THIMPHU: BHTAN

Why Bhutan Still Buffers: CDN & Peering Realities

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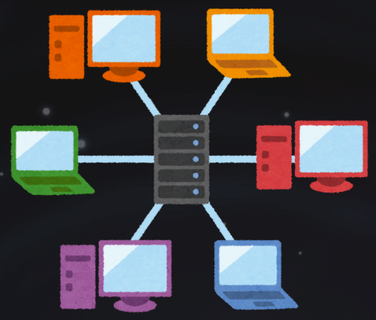
AGENDA

- Bhutan's Internet Landscape
- What is CDN – Quick Refresher
- Popular CDNs
- The State of Peering
- CDN vs Caching
- Bhutan's CDN & Peering Gaps
- BtIX Needs for Shared Responsibility
- The Way Forward: Building a Collaborative CDN & Peering Ecosystem

BHUTAN'S INTERNET LANDSCAPE

Landlocked country with ~750,000 population

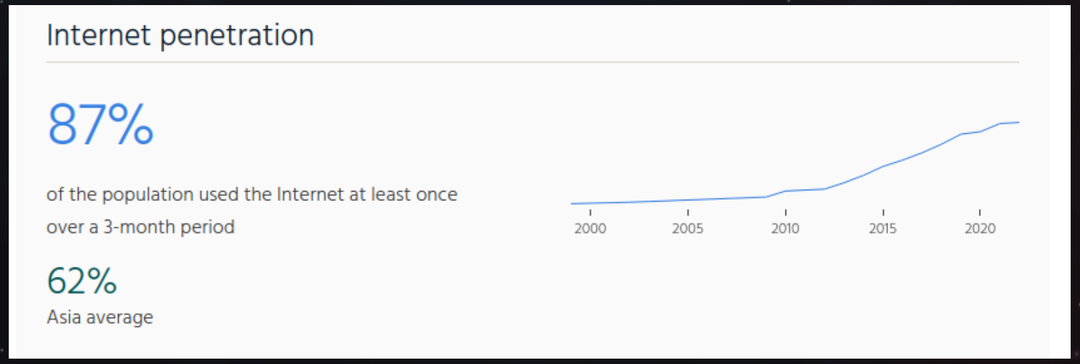


Reliance on upstream connectivity via India(Airtel and TATA)

High international transit costs

Minimal local hosting and data center activity

Local Internet Exchange Point (IXP)



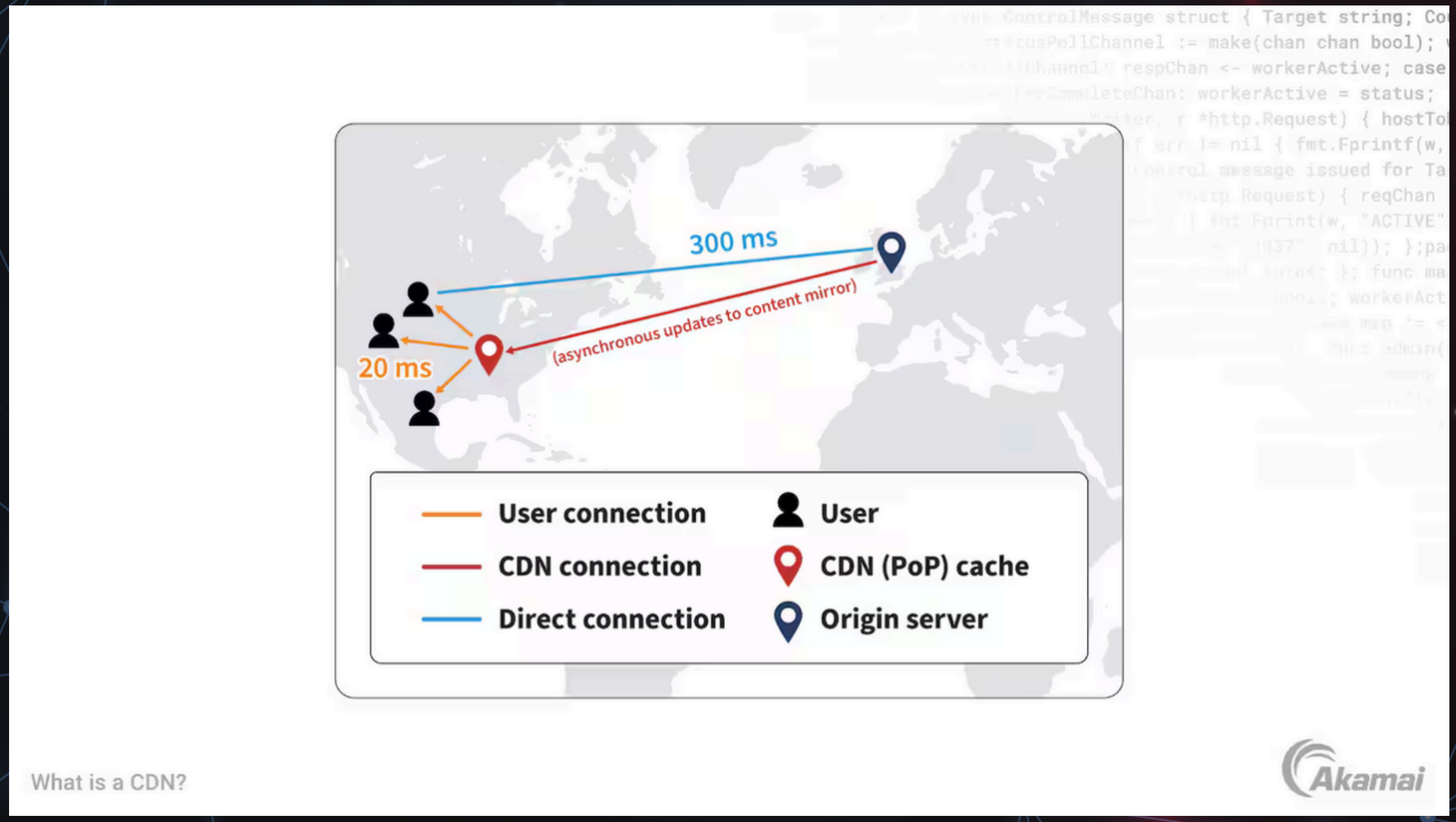
source: internetsociety
https://pulse.internetsociety.org/en/reports/BT/#network-infrastructure

Major ISPs in Bhutan

WHAT IS CDN (CONTENT DELIVERY NETWORK)-QUICK REFRESHER

A CDN is a group of geographically distributed servers that speed up the delivery of web content by bringing it closer to the location of the users accessing the content.

Reduces latency, saves bandwidth, improves user experience. Key for video streaming, app downloads, and latency-sensitive services



THE BENEFITS OF A CDN

Enhanced Security

Reduced Latency

Reduced Bandwidth Costs

Video & Media
Streaming Optimization

Faster Content Delivery

SOME POPULAR CDNS

THE STATE OF PEERING

- Peering = ISPs exchanging traffic directly without cost (or minimal cost)
- Helps avoid expensive transit routes
- Usually facilitated by IXPs

Reduced latency

Cost savings

Improved resiliency and performance

CDN VS CACHING

CDN: A CDN focuses on distributing content across multiple locations globally. By placing copies of web content in various data centres or edge servers, a CDN ensures that users can access content from a server geographically closer to them.

CDNs are versatile and can handle static and dynamic content deliveries. This includes everything from HTML files and images to video streams and interactive web applications.

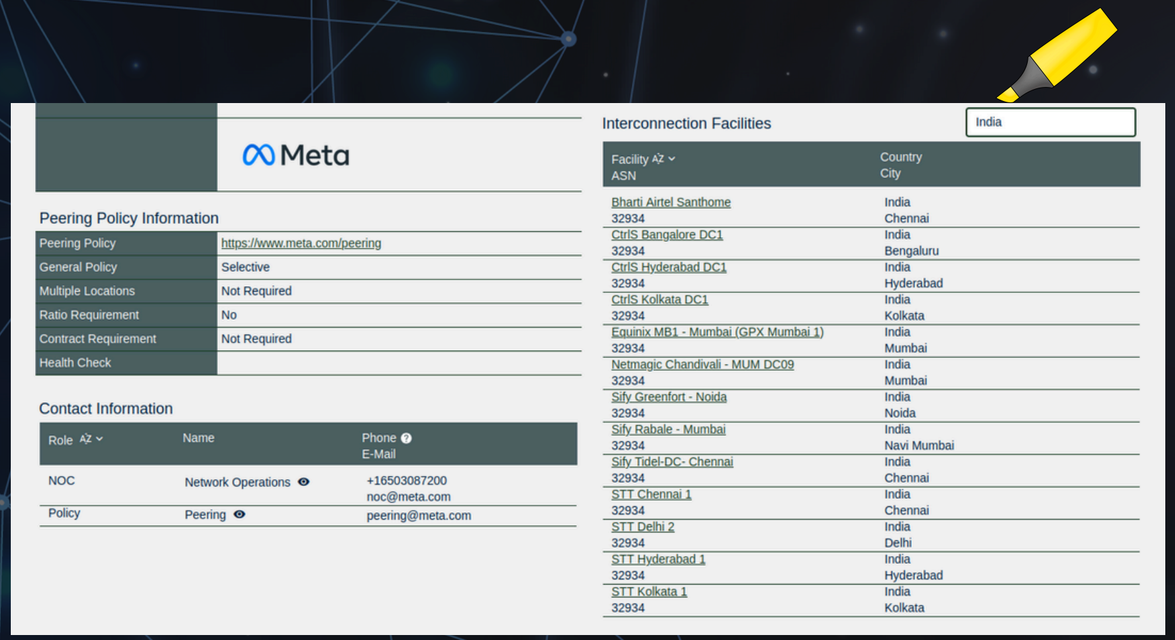
Caching: Caching involves temporarily storing content for quick access. It can occur on a local server. The primary goal is to speed up subsequent requests for the same content by reducing the need to fetch it from the origin server repeatedly.

Caching is primarily used for static content, such as images, files, and other static assets.

BHUTAN'S CDN & PEERING GAPS

CDN and Peering Gaps:

- **Limited Local CDN Presence:** No dedicated CDN PoPs like Google GGC, Facebook FNA, or Fastly exist in Bhutan. While Cloudflare has some presence, it primarily serves static content. The nearest full-feature CDN nodes are located in India.



Meta

Peering Policy Information

Peering Policy	https://www.meta.com/peering
General Policy	Selective
Multiple Locations	Not Required
Ratio Requirement	No
Contract Requirement	Not Required
Health Check	

Contact Information

Role	Name	Phone / E-Mail
NOC	Network Operations	+16503087200 noc@meta.com
Policy	Peering	peering@meta.com

Interconnection Facilities — India

Facility / ASN	Country / City
Bharti Airtel Santhome 32934	India Chennai
CtrlS Bangalore DC1 32934	India Bengaluru
CtrlS Hyderabad DC1 32934	India Hyderabad
CtrlS Kolkata DC1 32934	India Kolkata
Equinix MB1 - Mumbai (GPX Mumbai 1) 32934	India Mumbai
Netmagic Chandivali - MUM DC09 32934	India Mumbai
Sify Greenfort - Noida 32934	India Noida
Sify Rabale - Mumbai 32934	India Navi Mumbai
Sify Tidel-DC- Chennai 32934	India Chennai
STT Chennai 1 32934	India Chennai
STT Delhi 2 32934	India Delhi
STT Hyderabad 1 32934	India Hyderabad
STT Kolkata 1 32934	India Kolkata

source: peeringdb

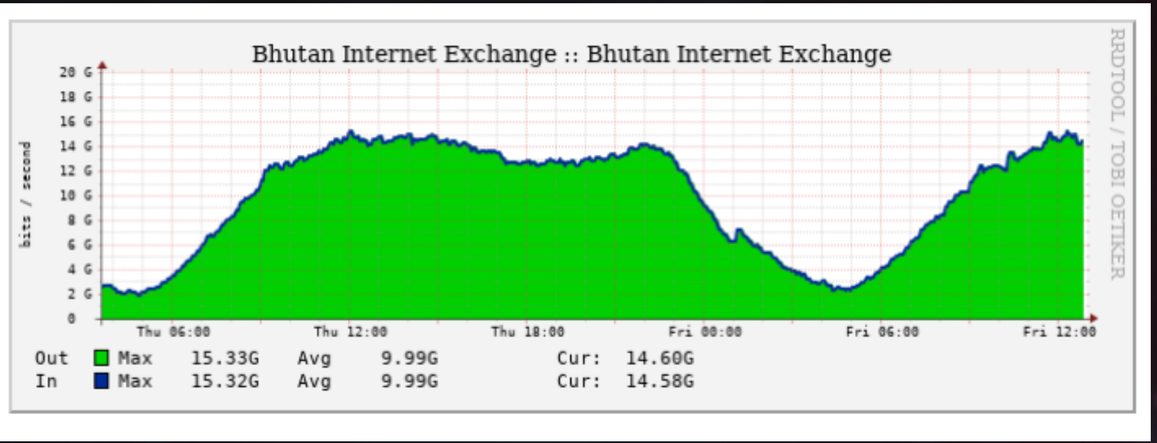
```
namkha (192.168.9.168) -> google.com (142.250.194.174)
Keys:  Help   Display mode   Restart statistics   Order

Host
1. _gateway
2. if205-core1-tpu.as23955.tashicell.com
3. lt200-cr1-tpu.as38740.tashicell.com
4. if100-cr1-plg.as38740.tashicell.com
5. if001-edge1-in.as38740.tashicell.com
6. 72.14.202.78
7. 172.253.69.191
8. 142.251.52.219
9. del12s06-in-f14.1e100.net
```

```
namkha (192.168.9.168) -> meta.com (163.70.145.20)
Keys:  Help   Display mode   Restart statistics   Order

Host
1. _gateway
2. if205-core1-tpu.as23955.tashicell.com
3. lt200-cr1-tpu.as38740.tashicell.com
4. if100-cr1-plg.as38740.tashicell.com
5. if001-edge1-in.as38740.tashicell.com
6. 43.241.139.115
7. po402.asw01.del2.tfbnw.net
8. psw03.del2.tfbnw.net
9. msw1ab.02.del2.tfbnw.net
10. edge-star-shv-02-del2.facebook.com
```

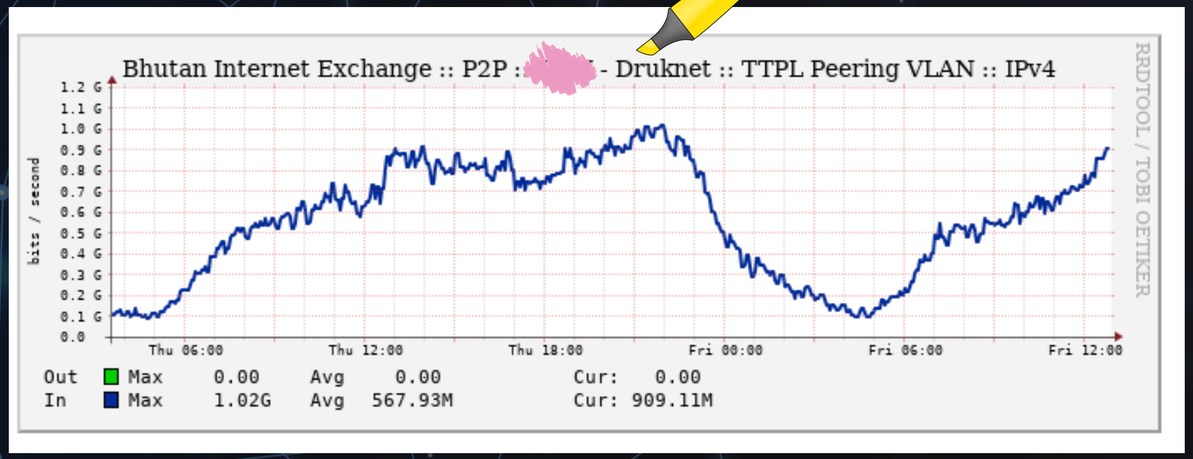
```
namkha (192.168.9.168) -> cloudflare.com (104.16.133.
Keys:  Help   Display mode   Restart statistics   Ord

Host
1. _gateway
2. if205-core1-tpu.as23955.tashicell.com
3. 43.241.136.163
4. cloudflare-as13335.btix.bt
5. 104.16.133.229
```

BHUTAN'S CDN & PEERING GAPS

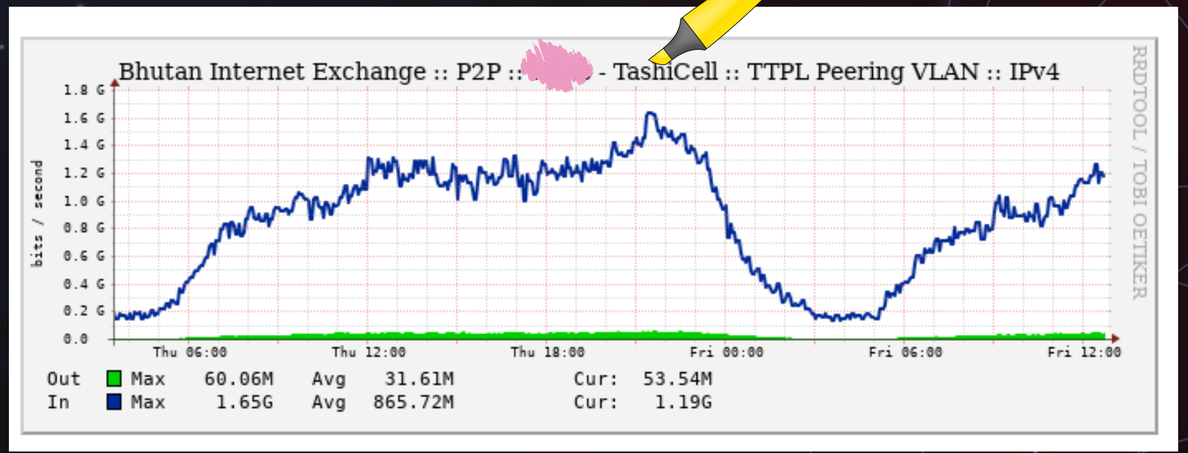
Unequal Cachefill Burden: Currently, major ISPs like BT and TashiCell bear most of the cachefill and CDN infrastructure costs. Without a collaborative cost-sharing model, this setup is unsustainable, and content availability via BtIX may degrade over time.



Total BtIX traffic



BT peering to one of the members at BtIX



TashiceII peering to one of the members at BtIX

BHUTAN'S CDN & PEERING GAPS

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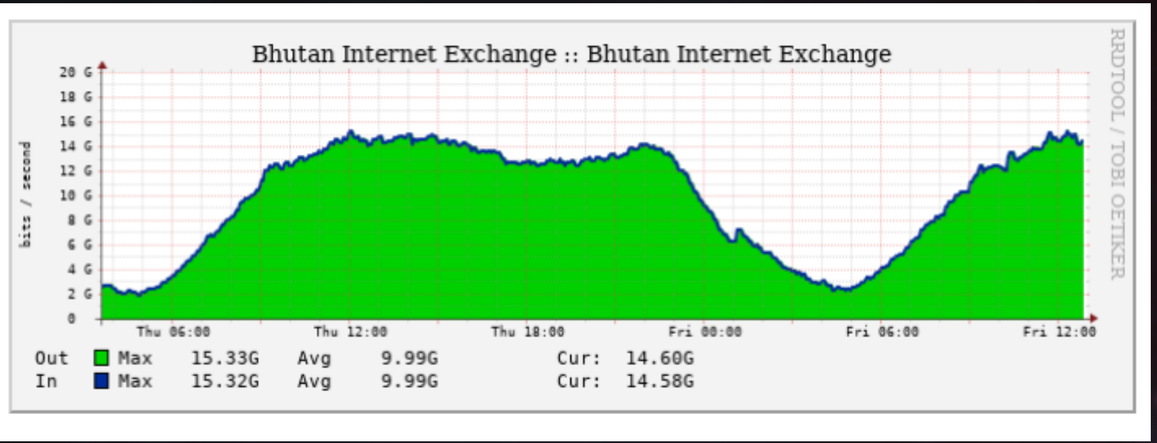

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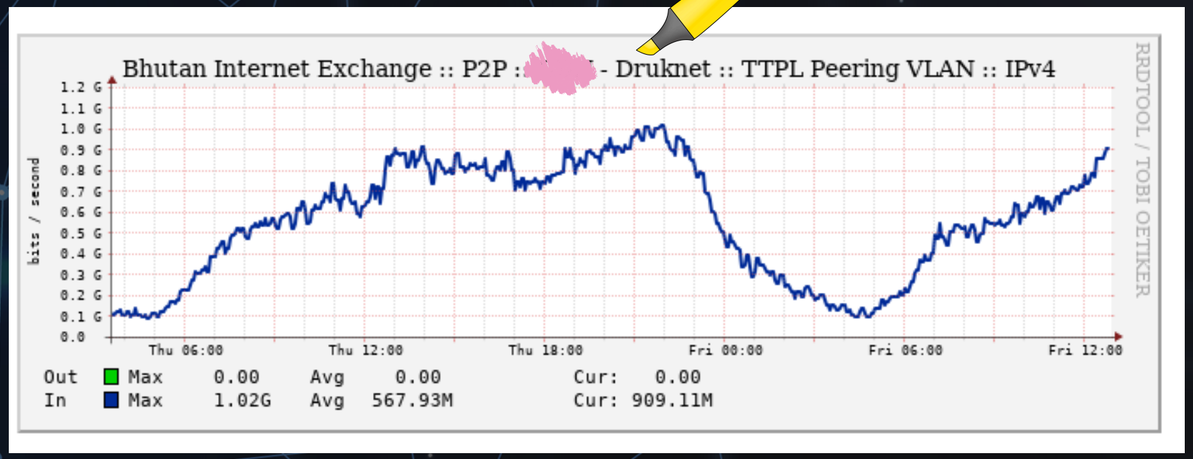
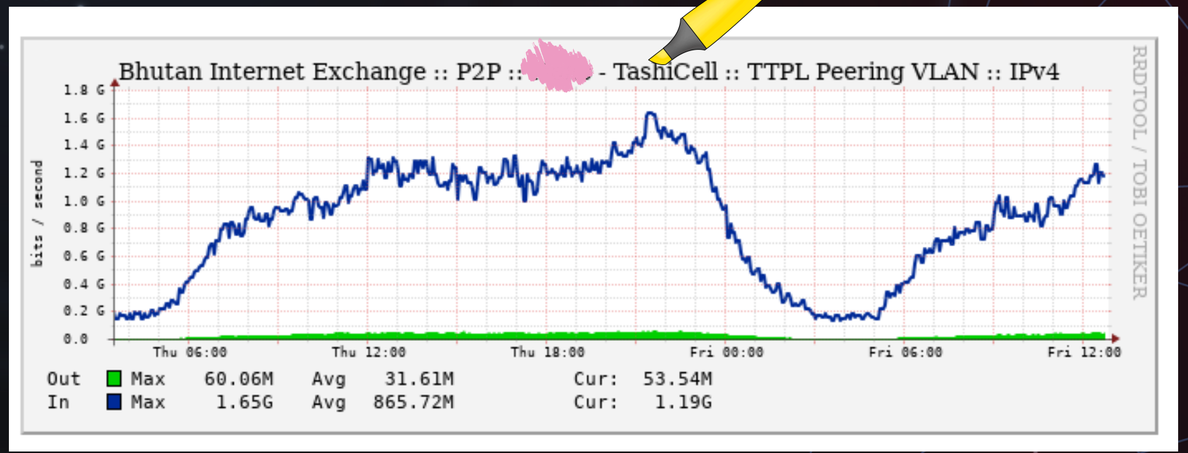


BT peering to one of the members at BtIX



TashiceII peering to one of the members at BtIX

BTIX NEEDS FOR SHARED RESPONSIBILITY

Current Situation:

- BtIX is operational but mainly supported by BT and TashiceII.
- These two ISPs provide cache infrastructure and bear cachefill bandwidth costs.
- Other ISPs benefit but do not share operation or costs.

Key Concern:

- Without shared responsibility, major ISPs may withdraw support.
- This could limit content access and reduce BtIX effectiveness.

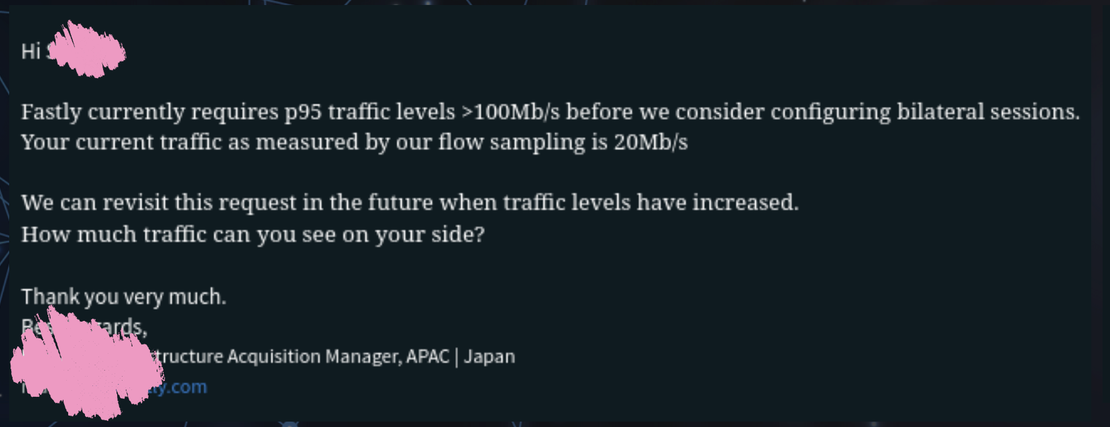
What's Needed:

- Neutral governance structure for BtIX.
- Cost-sharing model among all members.
- Clear O&M commitments from every participating ISP.

BHUTAN'S CDN & PEERING GAPS

Insufficient Traffic Volume for CDN & Peering:

The combined traffic from Bhutanese ISPs does not yet meet the thresholds required by major CDN providers to justify deploying local PoPs. Similarly, low traffic and limited mutual trust among ISPs hinder the growth of effective peering at BtIX.

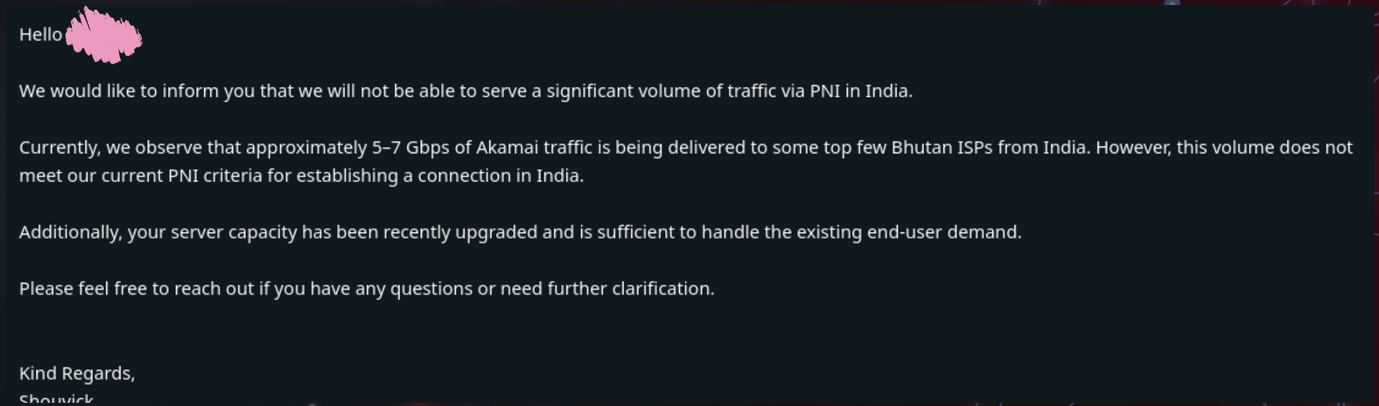


Hi [redacted]

Fastly currently requires p95 traffic levels >100Mb/s before we consider configuring bilateral sessions.
Your current traffic as measured by our flow sampling is 20Mb/s

We can revisit this request in the future when traffic levels have increased.
How much traffic can you see on your side?

Thank you very much.
Best regards,
[redacted] tructure Acquisition Manager, APAC | Japan
[redacted]y.com



Hello [redacted]

We would like to inform you that we will not be able to serve a significant volume of traffic via PNI in India.

Currently, we observe that approximately 5–7 Gbps of Akamai traffic is being delivered to some top few Bhutan ISPs from India. However, this volume does not meet our current PNI criteria for establishing a connection in India.

Additionally, your server capacity has been recently upgraded and is sufficient to handle the existing end-user demand.

Please feel free to reach out if you have any questions or need further clarification.

Kind Regards,
Shouvick

The Way Forward: Building a Collaborative CDN & Peering Ecosystem

Aggregating ISP Demand to Attract CDN Nodes

- Initiate joint CDN request from All ISPs and aggregate CDN traffic data from BT, TIPL, NANO, etc.
- Provide CDN-ready facilities with stable power, IPv6, BGP, and remote management support.
- Set up CDN-ready rackspace at BtIX or TIPL/BT/GDC co-location.
- Create a neutral and trusted operational environment for CDN nodes managed collaboratively.

Collaborative Cachefill: Shared Cost, Shared Benefit

Create a Cost-Sharing Model Among ISPs

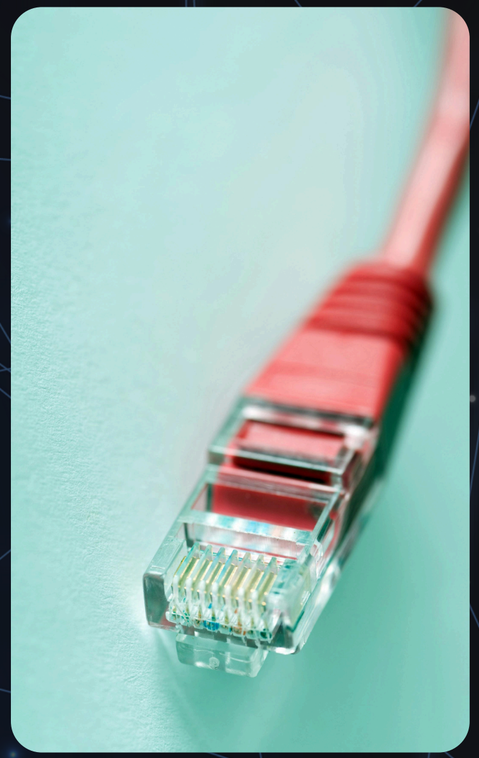
- Propose shared funding for cachefill bandwidth and hosting
- Examples:
  - Pro-rata based on traffic volume
  - Fixed monthly contributions
  - Subsidy from the government
- Establish a BtIX Operations Committee with one rep from each member.

Local Peering and Hosting: Keeping Bhutanese Traffic at Home

- Encourage local peering among Bhutanese ISPs at BtIX to reduce unnecessary international routing.
- Promote local hosting of Bhutanese websites, services, and microservices in country-based data centers.
- Promote the development of a sovereign cloud or local cloud service for government, education, and business platforms.
- Deploy local DNS resolvers and root servers to minimize latency and external lookups.

CDN Deployment and National Strategy

- **Aggregate CDN Traffic Across ISPs:** Bhutanese ISPs should combine their CDN traffic to collectively meet deployment thresholds and host shared nodes at BtIX.
- **Implement Shared Cost Model for CDN Hosting:** All ISPs in Bhutan should contribute to the cost of CDN infrastructure, cachefill bandwidth, and rackspace through a fair and transparent model.
- **Create a National CDN/Peering Policy:** The regulator (BICMA or GovTech) should lead a policy framework promoting peering, local hosting, and incentives for CDN providers to invest in Bhutan.



"A truly inclusive internet doesn't just connect the big cities, it serves the smallest networks."

Let Bhutan cache up. Let Bhutan peer up.

THANK YOU

Let's discuss ideas, experiences, and opportunities for Bhutan to leap forward in the content delivery ecosystem.