



Providing Self-Service to Google's Peers

Brian Rogan
Engineering Lead, Content Delivery

Background

Relevant Background on Google

Google...

- Is one of the largest content-providers on the Internet
 - Maintains a global peering footprint with a generally open peering policy
 - Offers an Google-managed cache for in-operator offload (GGC)
 - Scale requires advanced traffic-control system
 - Provides a transparency-report of network performance (Video Quality Report)
-

Peering At Google Scale

Presents challenges...

Communicating

Generally Open Peering Policy = thousands of relationships

Visibility

GGC+PNI makes it harder to understand how traffic is served

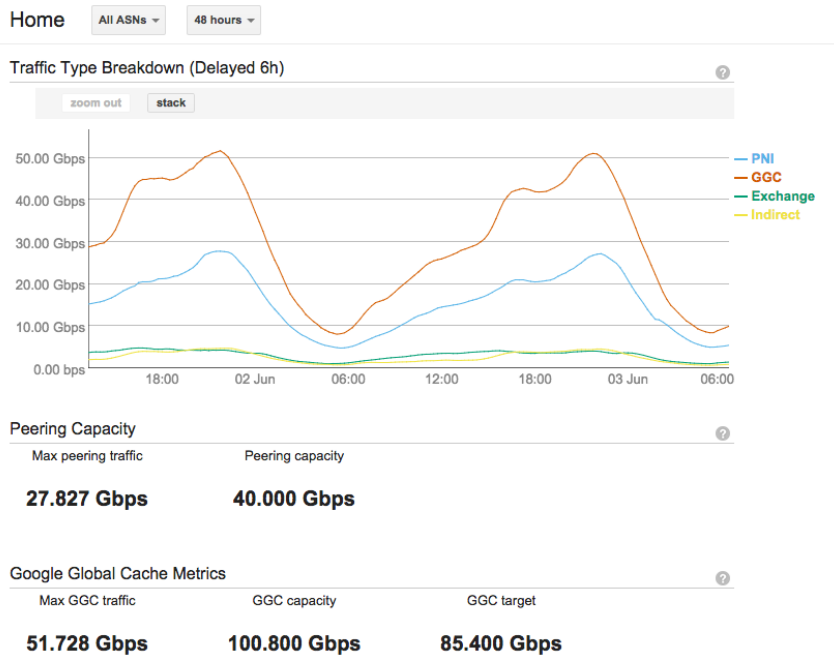
Deeper Dialog

How do we collaborate with operators to improve delivery quality and efficiency?

Google's ISP Portal

peering.google.com is...

- An external documentation site
- A logged-in portal for ISPs
- A ticketing system
- A workflow system
- A data-analysis tool
- An API endpoint



ISP Portal Goals

We want our portal to provide:

- Structured information exchange that speeds up routine interactions
 - Insight into how Google is sending traffic to your network (and why)
 - A clear view on what we'll need to grow together (traffic-levels, augments)
 - Actionable information about how to improve delivery quality and efficiency
-

Benefits

To ISPs	To Google
Low-friction interactions for routine operations	Fewer errors, more automation
Visibility into Google's traffic management	Informed peers and aligned actions
Clear capacity-planning information	On-time capacity
Performance data you can't easily get another way	Performance improvement for ISP/Google users

Streamlining Communication

Email is bad for scale and accuracy!

Build structured interactions for things like...

- Starting a relationship
 - Augments
 - Planned maintenance
 - Circuit down
 - Adjusting GGC configuration
 - Repairing failed GGC hardware
-

Exchange-Peering Turnup



Welcome

Welcome to the Google IX Turn Up tool.

ASN	<input type="text"/>	IX Name	<input type="text" value="Equinix Ashburn"/>
	Policy Contact		
Name	<input type="text"/>	Name	<input type="text"/>
Email	<input type="text"/>	Email	<input type="text"/>
Phone	<input type="text"/>	Phone	<input type="text"/>

Cancel Save

You can watch an Exchange-Peering provision in real-time!

GGC Node Upgrade



Welcome

Welcome to the GGC hardware refresh program. This page will be your communication channel through the refresh process.

The following addresses will be notified of any status changes:

Submit

Node Information

The following nodes have been identified as candidates for refresh

Number of replacement servers: 4

Server type: Server type

Submit

Refresh Details

Please confirm your shipping information.

Delivery Address

Address: +

City:

State / Province:

Zip Code / Postal Code:

Country:

Use delivery address for retrieval.

Retrieval Address

Address: +

City:

State / Province:

Zip Code / Postal Code:

Country:

Submit

Schedule Refresh

I've received my machines and I'm ready to schedule turn-up

Schedule Now

Visibility - Clear Operational Status

Home

All ASNs

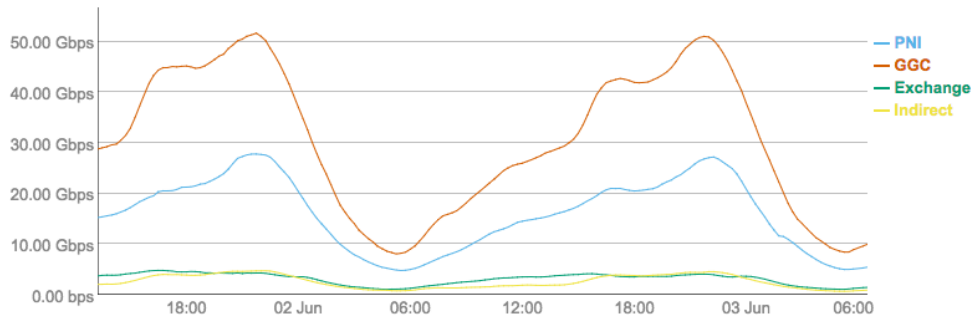
48 hours

Traffic Type Breakdown (Delayed 6h)



zoom out

stack



Quickly see traffic-breakdown and drill down into traffic-flows.

Peering Capacity



Max peering traffic

Peering capacity

27.827 Gbps

40.000 Gbps

Google Global Cache Metrics



Max GGC traffic

GGC capacity

GGC target

51.728 Gbps

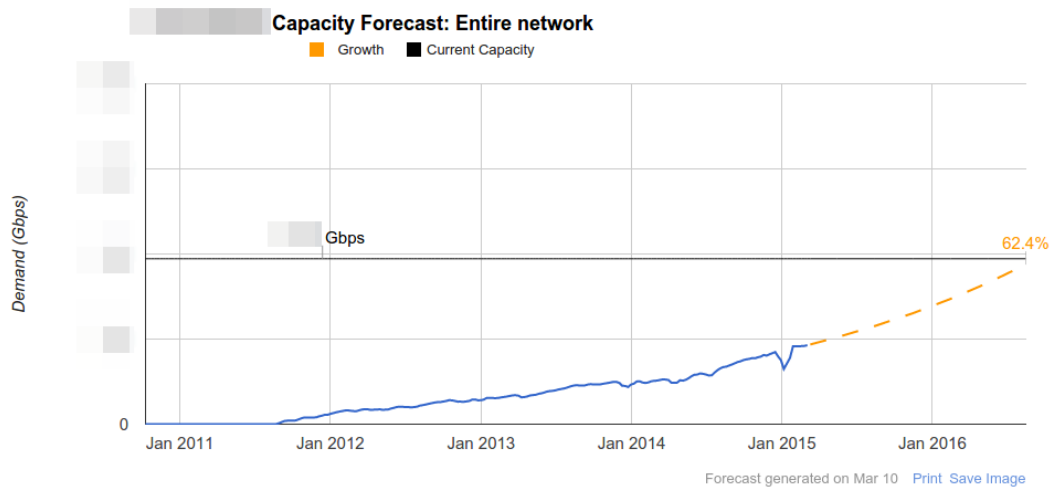
100.800 Gbps

85.400 Gbps

Visibility - Capacity

Capacity Forecasting

Google analyzes historical traffic data to estimate future demand to your network. These estimates may help guide future deployment of peering and GGC assets.



Launching Soon. Includes...

- Per-Asset Time-To-Capacity
- Proactive Notification of Fullness

Deeper Conversations

Going beyond capacity

Performance Overview

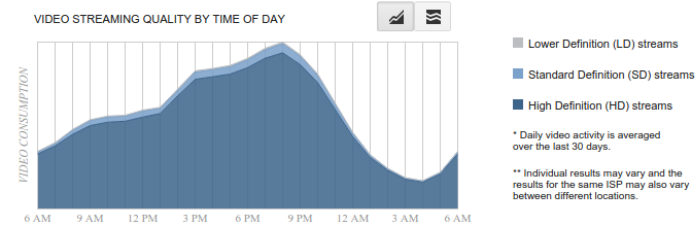
Location

City Download Locations Download Prefixes Search by text

CITY	QUALITY	HD	SD	LD	STREAMS
	HD	94.36%	4.73%	0.91%	8.28%
	HD	94.01%	5.13%	0.87%	4.02%
	HD	94.16%	4.95%	0.89%	3.61%
	HD	95.36%	3.92%	0.72%	3.58%
	HD	94.56%	4.63%	0.81%	3.47%
	HD	93.08%	5.69%	1.23%	3.2%
	HD	93.25%	5.86%	0.9%	3.2%
	HD	94.51%	4.6%	0.89%	3.08%
	HD	91.11%	7.96%	0.94%	2.94%
	HD	94%	5.06%	0.94%	2.66%
	HD	94.77%	4.41%	0.82%	2.59%
	HD	94.79%	4.4%	0.81%	2.45%
	HD	92.97%	5.95%	1.08%	1.8%
	HD	94.73%	4.45%	0.82%	1.75%
	HD	92.29%	6.77%	0.94%	1.6%
	HD	94.2%	4.92%	0.88%	1.59%

Previous 1 2 3 4 5 ... 11 Next

Hourly Breakdown

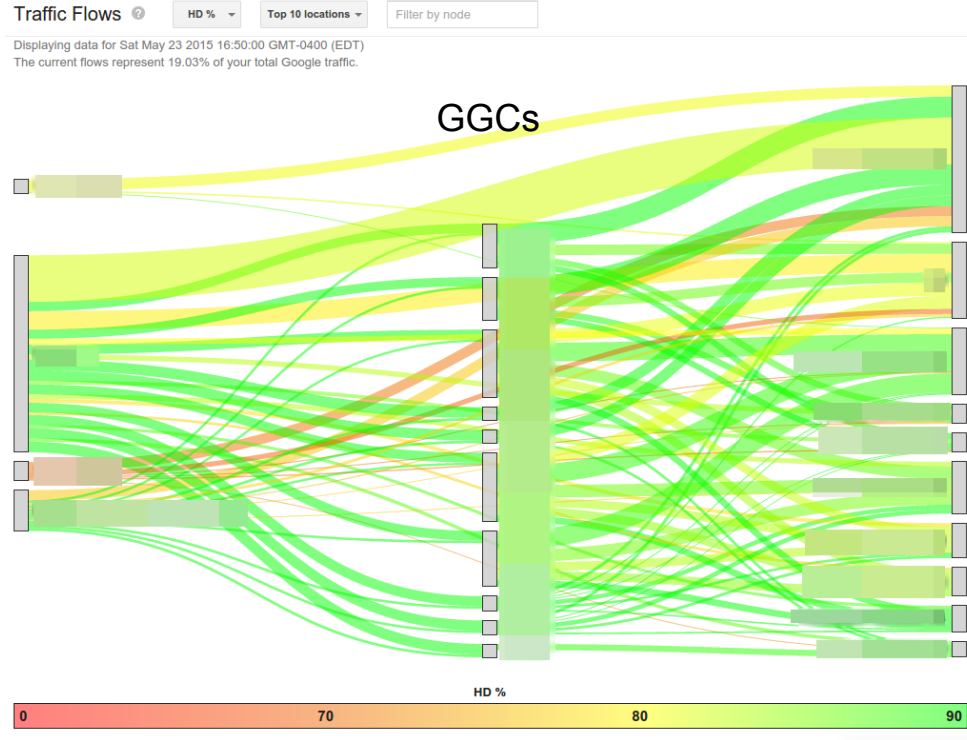


Prefix Breakdown

PREFIX	95TH% EGRESS	95TH% RETRANSMITS	HD STREAMS	STREAMS	HD STREAMS / STREAM
			1.78%	1.74%	1.02
			1.62%	1.65%	0.98
			1.33%	1.3%	1.02
			1.31%	1.28%	1.02
			1.25%	1.27%	0.98
			1.25%	1.24%	1.01
			1.26%	1.24%	1.02
			1.26%	1.23%	1.02
			1.19%	1.22%	0.98
			1.22%	1.21%	1.01
			1.21%	1.21%	1
			1.2%	1.18%	1.02
			1.17%	1.15%	1.02
			1.15%	1.14%	1.01
			1.15%	1.14%	1.01
			1.14%	1.12%	1.02
			1.11%	1.08%	1.03
			1.08%	1.07%	1.01
			1.07%	1.07%	1
			1.07%	1.06%	1.01
			1.07%	1.06%	1.01

Send feedback

Performance Tools



Actionable Suggestions

Notifications

Notifications are simple alerts indicating ways you can improve your use of GGC or the way you peer with Google's network. Click on a notification for more information and recommended steps to fix the issue. This view is updated on a daily basis.

Traffic is approaching capacity Capacity

Your peak traffic is at 71% of capacity

Some of your prefixes are not announced to GGC or peering BGP

33 of your prefixes are only announced to transit

Some of your prefixes are announced more specifically to transit BGP

1 prefix should be more specific for GGC and/or peering

None of your ASNs has an entry in PeeringDB PeeringDB

Some of your prefixes are not announced to GGC or peering

Your problematic prefixes:



... 23 more ...

What is the issue?

We have detected that some of your users' prefixes are being announced to transit but not to your GGCs or peering routers.

View a table of all problematic BGP announcements at the [BGP diagnostics](#) page.

How are my users affected?

When traffic is routed to transit instead of GGC or peering, it may travel a longer path than necessary and will not take advantage of your cache capacity. This can result in degraded user experience in the form of rebuffer rates.

How can I fix this?

Visit the detailed [BGP diagnostics](#) page to learn more about where and how Google is seeing your prefixes announced. Adjust your routing configuration to ensure that all prefixes announced to transit are announced to GGC and peering. Once the change is made, check back here in a day to verify that this notification is no longer active.

Success Stories

- Worked with one operator to go from 53% HD-rated to 95% with no capex
- Detected BGP misconfiguration affecting 150k users with prefix-report
- Detected unintended transit-overflows
- Multi-ASN network leaking inconsistent routes

Future

Deeper Performance Insight

We're continuing to work on...

- Linking application-level performance with network issues
 - Understand transport-level signals of issues
 - Deeper understanding of access networks
 - Understanding the best opportunities to expand deployment
-

Evolution

We're working on...

- Automation: more happens while you watch
 - APIs: ingest the data any way you like
 - Alerting: proactively notify of actionable events
 - Covering more performance issues with actionable suggestions
-

Getting Access

If you think this can help you, visit:

<http://peering.google.com/signup>
