Peering Wars

Lessons Learned from the Cogent-Telia De-peering

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The Internet

- "The Internet is a distributed network comprising many *voluntarily* interconnected networks" with "no governing body."

- In the modern private-sector Internet, two forms of interconnection exist between Internet networks: *transit* and *peering*.

  - " … **transit** service is typically priced per megabit per second per month …"

  - "**Peering** is voluntary interconnection of administratively separate Internet networks" … where "neither party pays the other for the exchanged traffic."
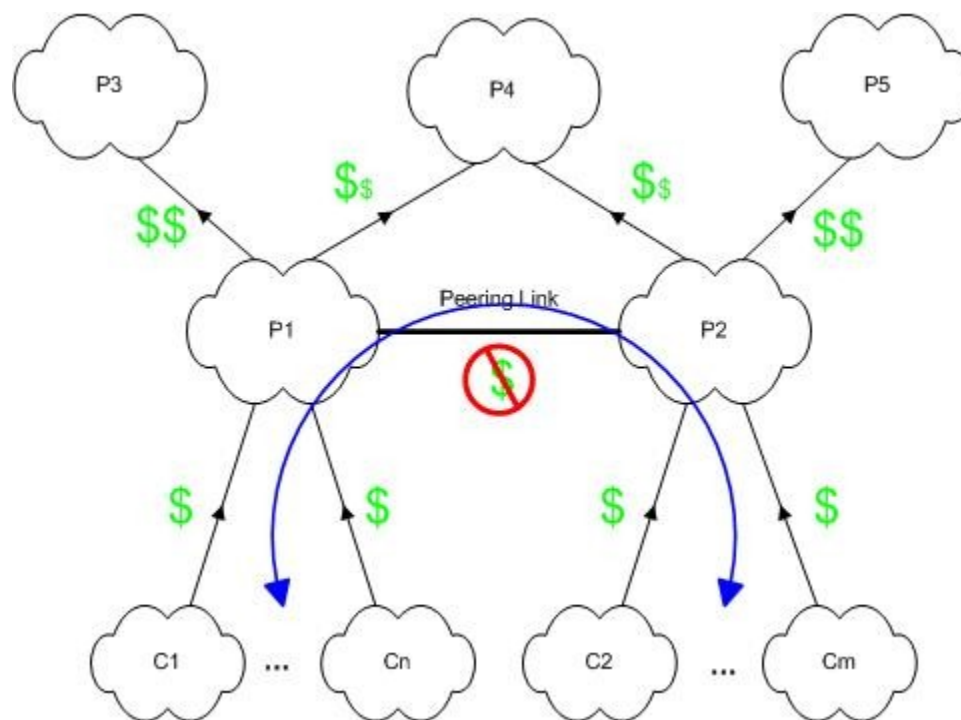
Source: Wikipedia

Peering Goal – Maximize $ In, Minimize $ Out
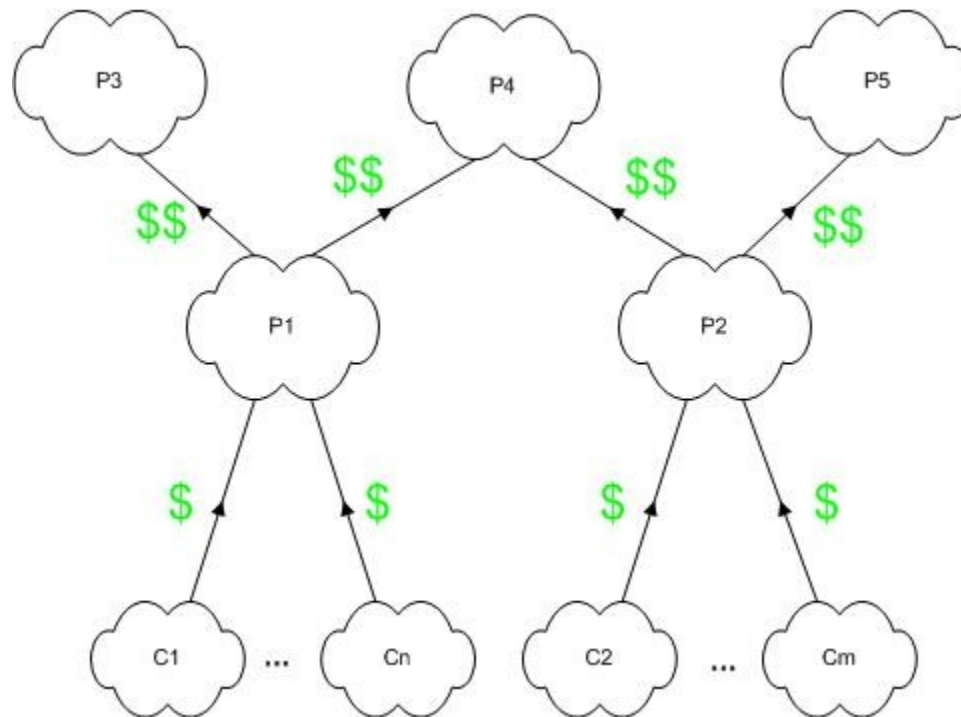
Reduce Transit Costs by Peering with Competitors
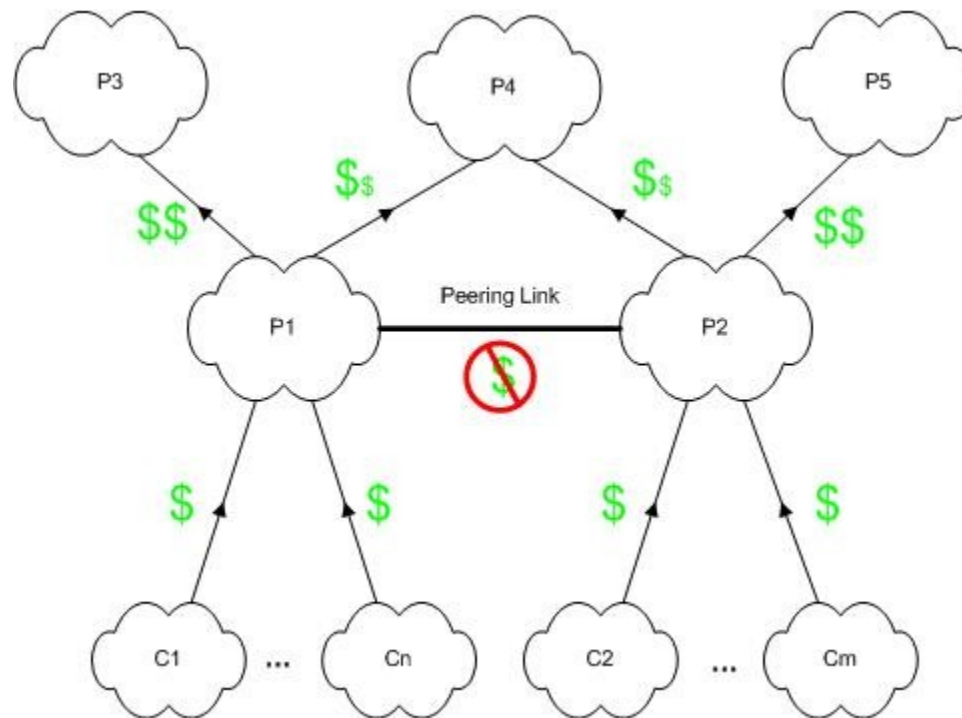
Customers of P1 and P2 exchange traffic without either provider incurring transit costs

Reasons to Peer

- Reduce transit costs (happier providers)
- Reduce latencies (happier customers)
  - Increased billable traffic to customers
- Enhance operational stability
  - Localize connectivity
- Roughly equal mutual benefit

Peering Wars

Top of the Internet Food Chain: Tier 1

"A **Tier 1 network** is an IP network which connects to the entire Internet solely via Settlement Free Interconnection, commonly known as peering."

Source: Wikipedia

For the Internet to maintain *global connectivity*, the Tier 1 providers must all peer with one another

Who are the Tier 1 providers?

- Sprint, AT&T, Level 3, …?
- Due to "paid peering", there are fewer than you think.
  - Tier 1 providers act like a cartel and have no incentive to add members
  - "Near" Tier 1 providers try to buy their way in via paid peering if they can't get a settlement free interconnect.

Renesys Classifies Business Relationships

- We observe over 7 million distinct AS paths from our 270+ full table peers.

- These paths are comprised of over 85,000 unique AS-AS adjacencies.

- Renesys' algorithms daily classify these adjacencies,
  - e.g., Customer -> Provider, Provider -> Customer, Peer -> Peer, Transit swap, AS cluster, etc.

- Paid peering cannot be distinguished from settlement free peering from routing data.

Cogent and Telia are Tier 1 wannabes

- Cogent and Telia peer

- Cogent gets transit only from NTT to reach AOL

- Telia appeared to get transit from Verizon to reach certain networks

  - On February 27th, we stopped seeing evidence of transit

  - Renesys promotes Telia to "Tier 1" – no known providers

  - Telia could still be paying for some of these interconnections

Overview of Cogent-Telia Peering Dispute

- March 13th, Cogent de-peers Telia, claiming breach of contract

- Renesys observes routes from Telia to Cogent via Verizon for 12 hours.

- These routes then disappear, partitioning the Internet for some
    - Single homed customers behind Cogent and Telia could not reach one another.

- March 28th, peering link is restored.

- The Internet is once again whole.

Which regions were impacted?

Telia cannot reach Cogent

Country	# Prefixes
US	1868
Canada	232
France	98
Spain	41
Germany	31
UK	27
Others	86

Cogent cannot reach Telia

Country	# Prefixes
Sweden	444
Finland	322
Russia	153
Poland	113
US	73
Latvia	62
Bulgaria	52
Spain	40
Denmark	35
Norway	30
Others	249

What happened to the routes via Verizon?

- Cogent blocked them?

  - Guess: Wanted Telia to feel the pain

- Verizon screwed up?

  - Guess: Telia really is now a settlement free peer, so Verizon had been providing free transit for 12 hours

- Telia blocked them?

  - Guess: Telia still buys from Verizon after all and didn't want to suddenly pay to reach Cogent

  - Fact: Verizon has no paid peering offering

Why did this happen?

- <u>Peering disputes with Cogent tend to be about peering ratios</u>

  - Imbalanced ratios along with hot potato routing => one party is carrying the other's traffic longer distances

- <u>Cogent is moving into Telia's "territory".</u>

- <u>Did Telia back Cogent into corner?</u>

- <u>Did Cogent view Telia as in a weaker position?</u>

  - How many European customers want to reach Cogent hosted content?

Now what?

- <u>Peering link has been restored</u>

- <u>Traffic ratios now balanced?</u>
  - Dates of Interest:
    - Before: 13 March 2008, 16:00 UTC
    - After: 29 March 2008, 00:00 UTC
  - **Routes advertised to Telia from Cogent**
    - Before: 5686 prefixes
    - After: 8620 prefixes
  - **Routes advertised to Cogent from Telia**
    - Before: 2084 prefixes
    - After: 1449 prefixes

Where did the prefixes go / come from?

Routes advertised to Telia from Cogent

723 prefixes disappeared

− How does Telia get there now?

Provider	ASN	# Prefixes
Teleglobe	6453	225
Tiscali	3257	74
Global Crossing	3549	64
Not Seen	-	56
JSC	20485	31
Level 3	3356	25

3300 prefixes appeared

− How did Telia used to get there?

Provider	ASN	# Prefixes
Level 3	3356	1209
Global Crossing	3549	888
Sprint	1239	359
XO	2828	195
Not Seen	-	104
Time Warner	4323	88

Does Telia now send more traffic to Teleglobe and less to Level 3 and Global Crossing?

Routes advertised to Cogent from Telia

766 prefixes disappeared

- How does Cogent get there now?

Provider	ASN	# Prefixes
Level 3	3356	196
Not Seen	-	145
Comstar	8359	140
Internet Solutions	3741	32
Teleglobe	6453	29
Verizon	701	25

131 prefixes appeared

- How did Cogent used to get there?

Provider	ASN	# Prefixes
Not Seen	-	56
Teleglobe	6453	23
Deutsche Telekom	3320	10
Telekom So. Africa	5713	9
NASK	15606	6
Interoute Comm.	5588	3

Does Cogent now send more traffic to Level 3 and Comstar and a little less to Teleglobe?

Lessons Learned

- <u>Being a Tier 1 is not easy</u>
  - You depend on everyone else in the cartel
  - You will be punished if you are perceived to be in a position of weakness.

- <u>Peering relationships are tricky</u>
  - Depend on both objective measures (ratios) and perceptions
  - Disputes can take a long time to resolve. The only driver is market pressure.

- <u>Being single-homed is dangerous</u>
  - Especially behind a near Tier 1

Thank You

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