

# Peering Wars

Lessons Learned from the Cogent-Telia De-peering

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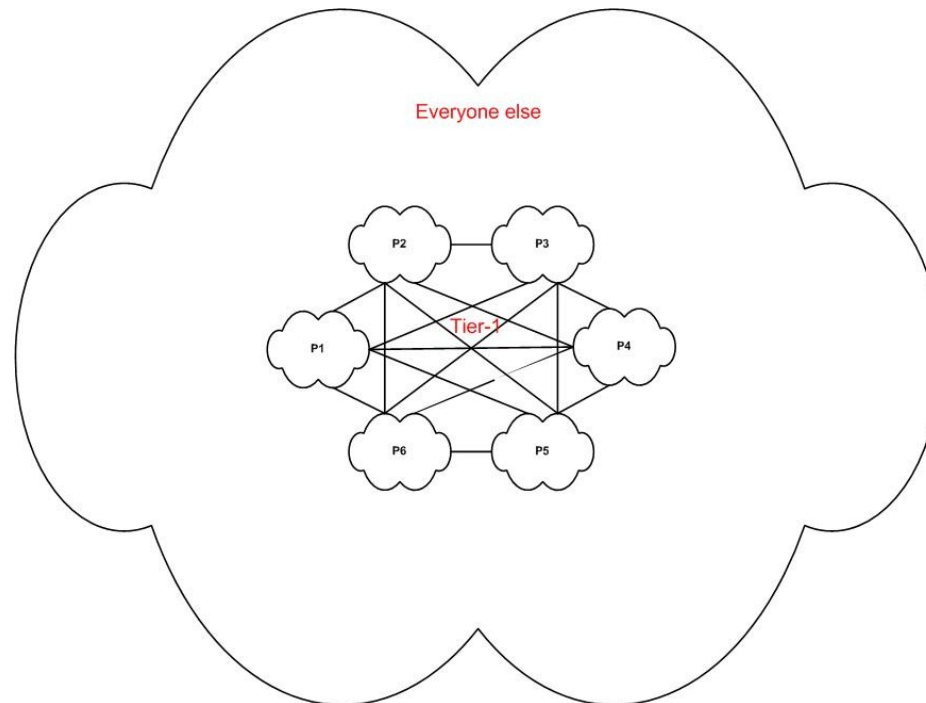
# Reasons to Peer

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

# Top of the Internet Food Chain: Tier-1

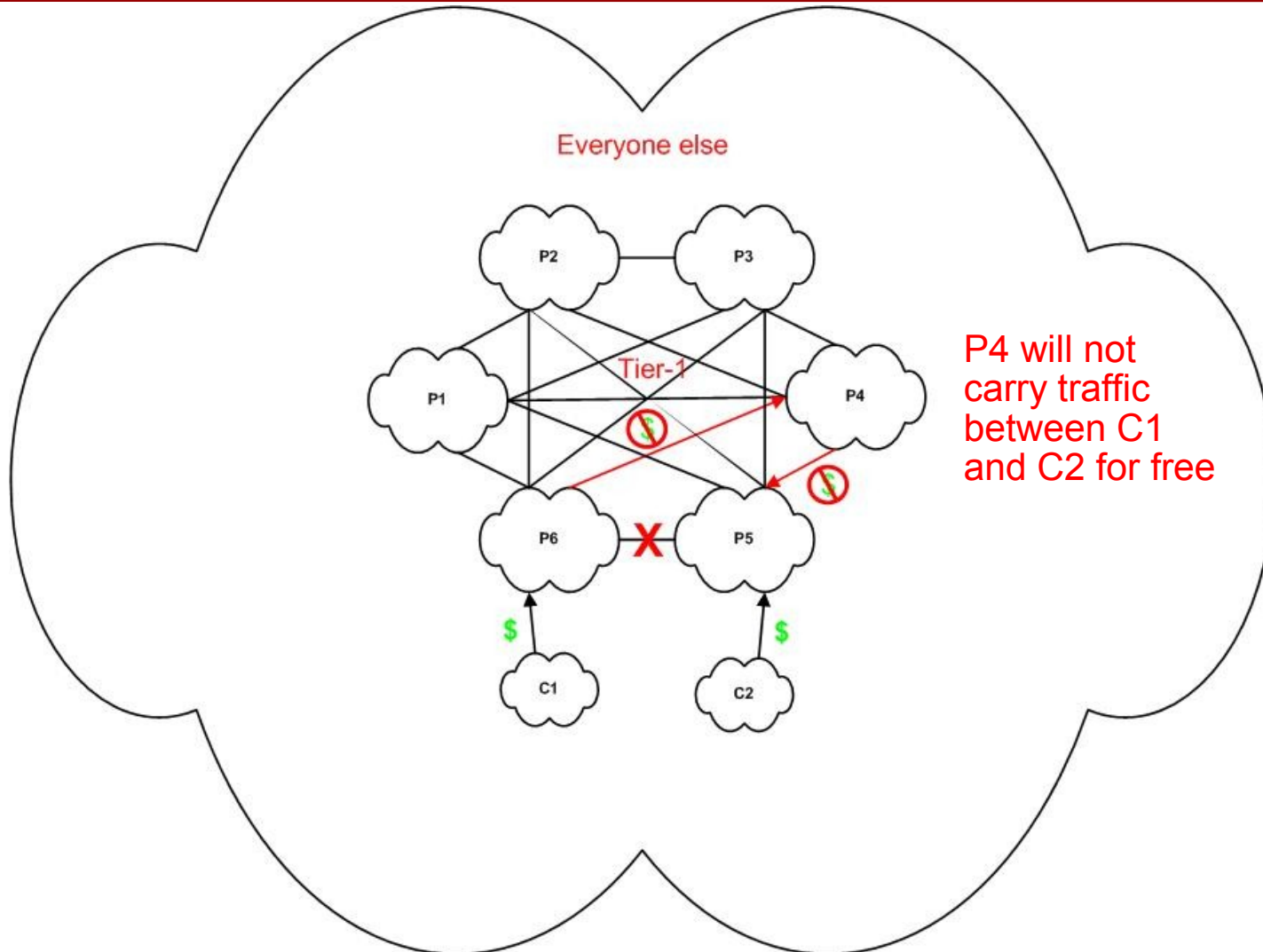
A **Tier-1 network** has no transit providers – only peers and customers. (“Tier-1” term is inconsistently used.)

To maintain *global connectivity*, the Tier-1 providers must all peer with one another.



# Follow the Money –

if P5 & P6 de-peer, their single-homed customers can't communicate



# Who are the Tier-1 providers?

- Sprint, AT&T, Level 3, NTT, Savvis, etc.
- Tier-1 providers act like a cartel and have no incentive to add members
- “Near” Tier-1 providers can try to buy their way into the club (via “paid peering”).

# Business relationships:

## Easy to observe, difficult to classify

- We observe over 8.7 million distinct AS paths.
- These paths are comprised of over 93,000 unique AS-AS adjacencies.
- Each adjacency represents a business relationship, e.g.,
  - Customer → Provider
  - Provider → Customer
  - Peer → Peer (paid vs. settlement-free peering cannot be distinguished)
  - Transit swap
  - AS cluster (multiple ASes now part of the same organization)
- These relationships can be computed algorithmically with a high degree of confidence. (Renesys does this daily.)

# Cogent and Telia want to be Tier-1

- 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 27<sup>th</sup>, 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 13<sup>th</sup>, 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 28<sup>th</sup>, 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

# Single homed ASes – by top countries

## Cogent (282 ASes)

- US (226)
- Canada (17)
- France (10)
- Estonia (10)
- England (5)

## Telia (22 ASes)

- Poland (4)
- Norway (3)
- US (2)
- Russia (2)
- Germany (2)

# Single homed ASes

## – by decreasing Renesys score

### Cogent

- University of Iowa, US (AS 3676)
- MAGPI, US (AS 10466)
- Cybersurf, Canada (AS 11814)
- Balticore, US (AS 33321)
- Canaca-com, Canada (AS 33139)

### Telia

- Pionier, Poland (AS 13293)
- NextGentel, Norway (AS 15659)
- NetCom, Norway (AS 12929)
- NRK, Norway (AS 21293)
- Lycos Europe, Sweden (AS 12832)

# 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?

- Peering disputes with Cogent tend to be about peering ratios
  - Imbalanced ratios along with hot potato routing → one party is carrying the other's traffic longer distances
- Cogent is moving into Telia's "territory"
- Did Telia back Cogent into corner?
- Did Cogent view Telia as in a weaker position?
  - How many European customers want to reach Cogent hosted content?

# Now what?

- Peering link has been restored
- Traffic ratios now balanced?
  - 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?

# Where did the prefixes go / come from?

## 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?

# New peerings established during the outage

## Telia:

- None

## Cogent:

- EDS Industrien, Germany (AS 6900)

# New customer wins during the outage

## Telia (2):

- Edgewebhosting.net, US (AS 27524)
- Xeex, US (AS 22903)

## Cogent (18):

- 14 new US customers
- Kaos Redes, Estonia (AS 20721)
- iDAQ, England (AS 34660)
- Satis Superque Merce, Netherlands (AS 30514)
- Melbourne Network Solutions, England (AS 39451)

# Lessons Learned

- Being a (near) Tier-1 is not easy
  - You depend on everyone else in the cartel
  - You will be punished if you are perceived to be in a position of weakness.
- Peering relationships are tricky
  - Depend on both objective measures and perceptions
  - Disputes can take a long time to resolve. The only driver is market pressure.
- Being single-homed is dangerous

# Thank You

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