



Evolution of the Georgian Internet

Jim Cowie, Chief Scientist

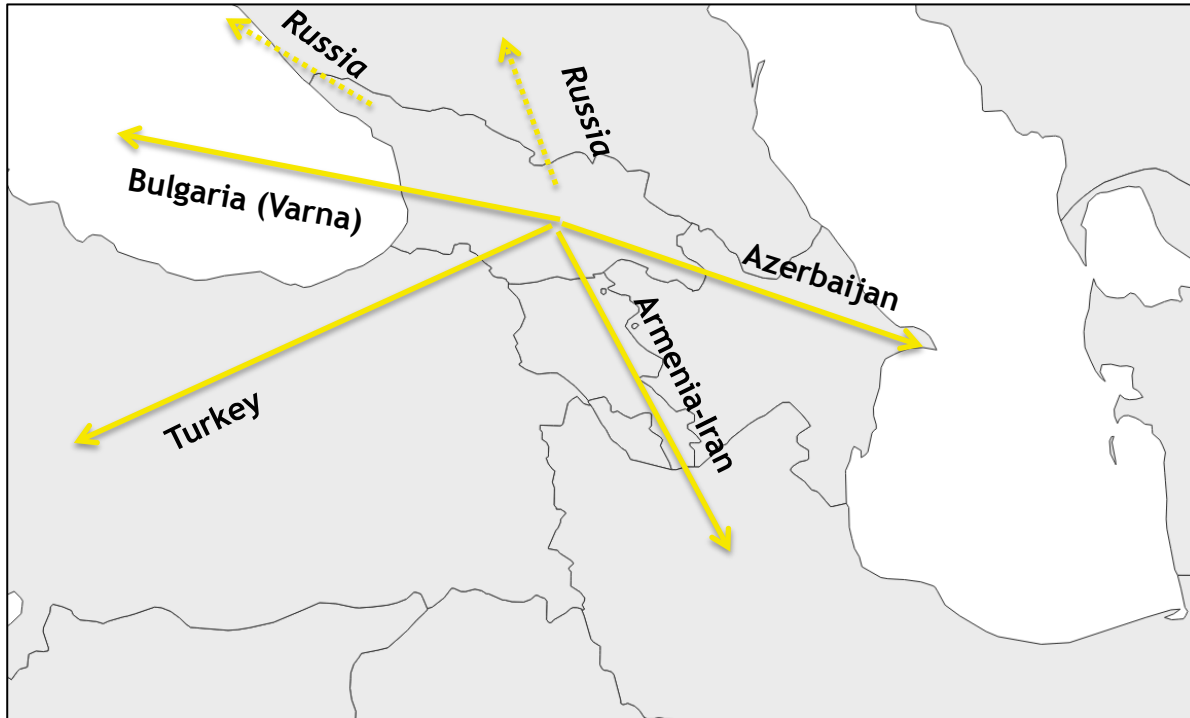
Tbilisi, Georgia

19 May 2015

**INTERNET
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Georgia's Regional Connections

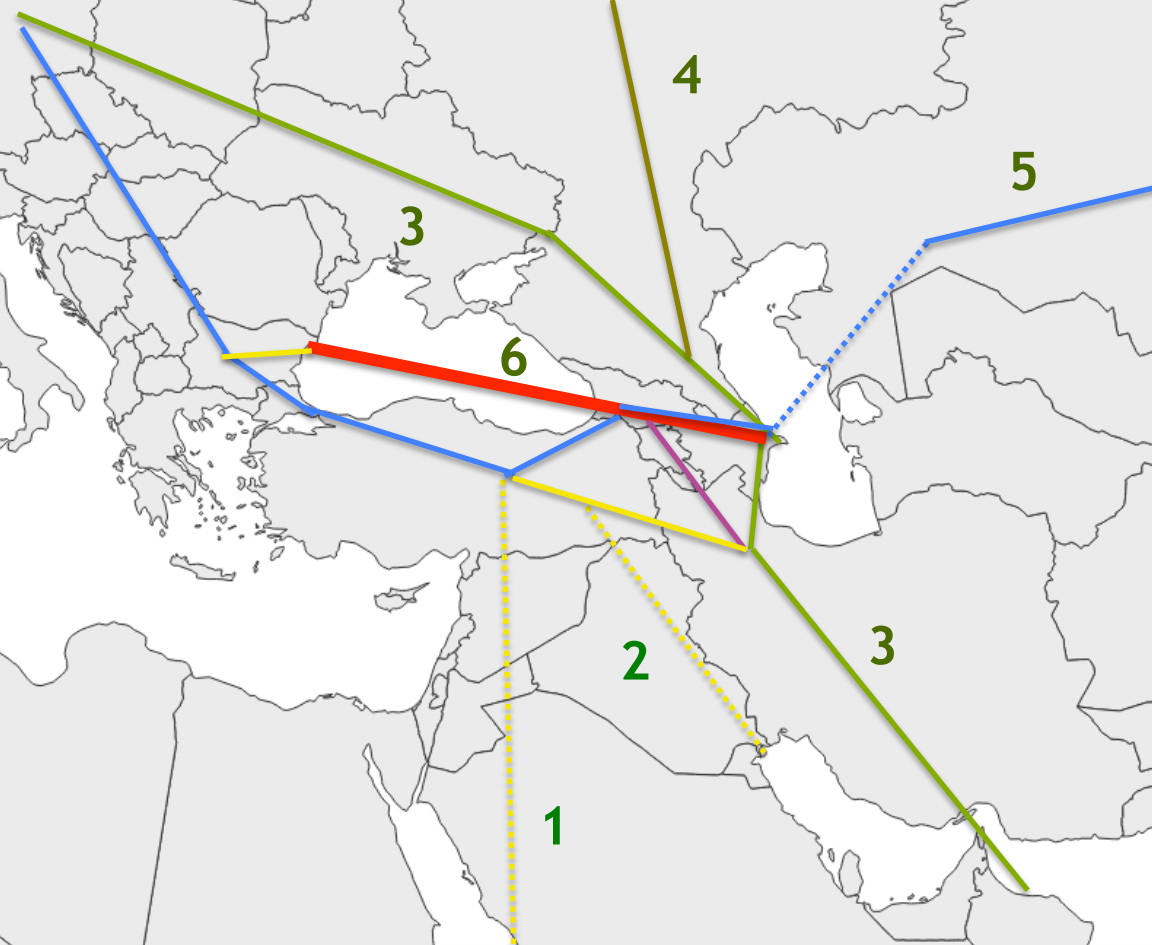


The Caucasus region is a natural bridge between Central Asia, Middle East and Europe

Georgia's railways and energy pipelines provide natural routes for fiberoptic interconnection



Regional Context

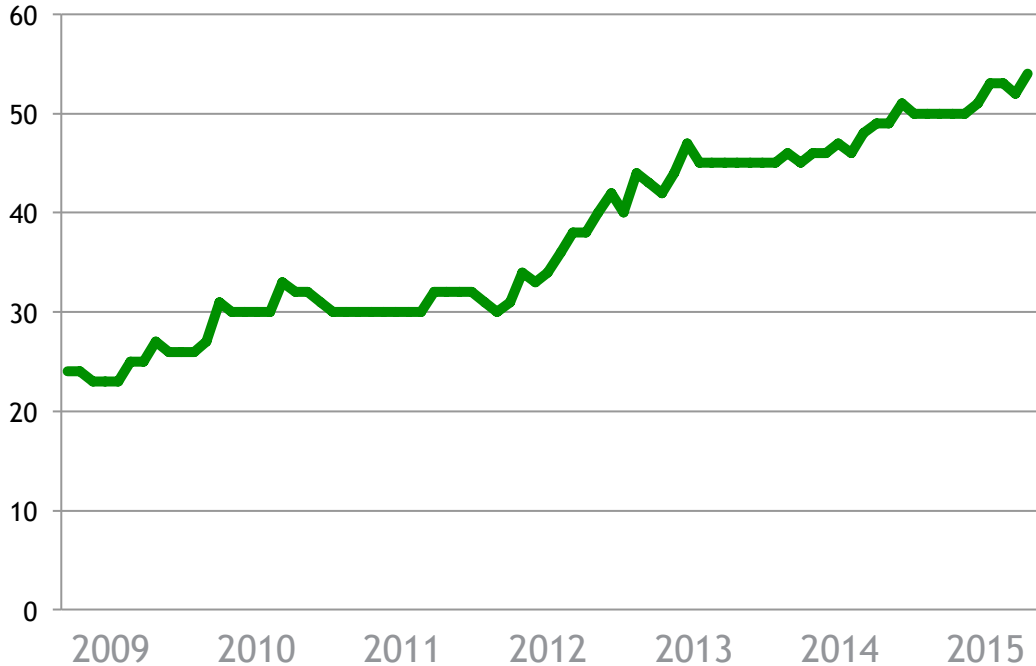


- 1 Jeddah Amman Damascus Istanbul
- 2 Gulf Bridge / Iraqi ITPC
- 3 Europe-Persia Express Gateway
- 4 Russian connectivity
- 5 **TASIM**
- 6 **Caucasus Cable System**



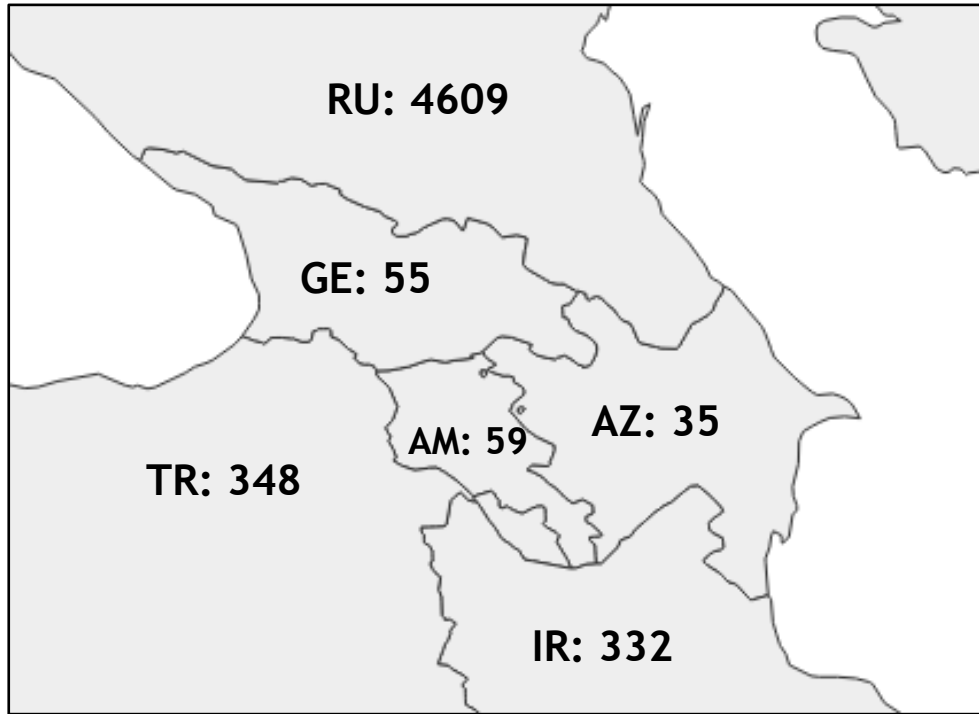
MARKET STRUCTURE, GROWTH, AND DIVERSITY

Domestic ASN growth in Georgia



- 125% growth since 2009 - very strong
- Compare to worldwide growth of 65% in the same period

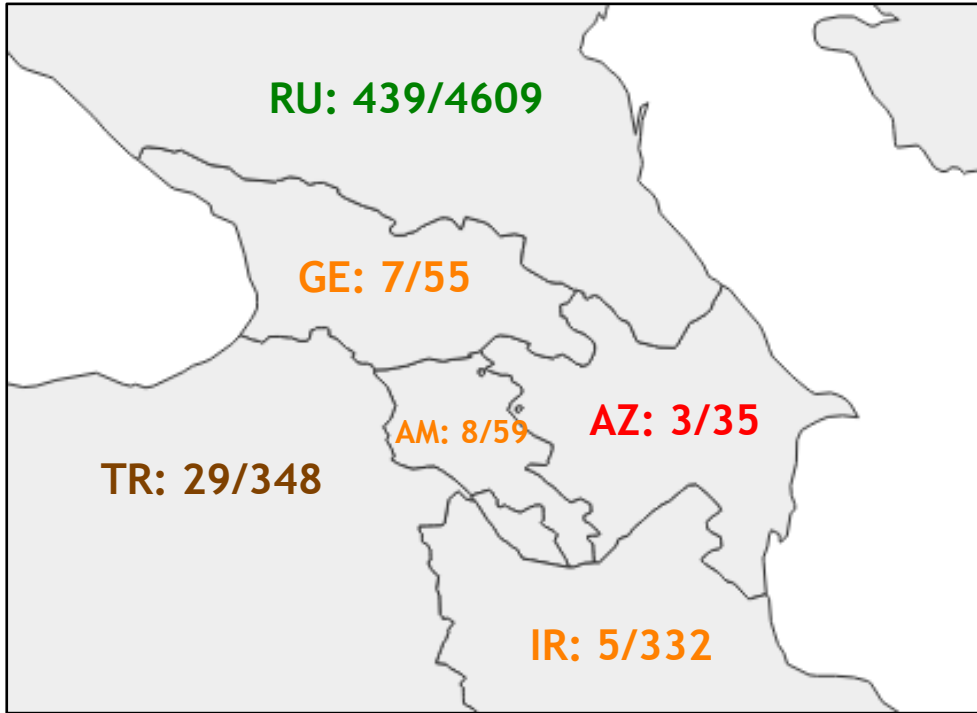
Domestic ASNs regionally



Compare to:

- Ecuador (53)
- Egypt (54)
- Kuwait (54)
- Puerto Rico (55)
- Cyprus (56)

Domestic ASNs connected cross-border

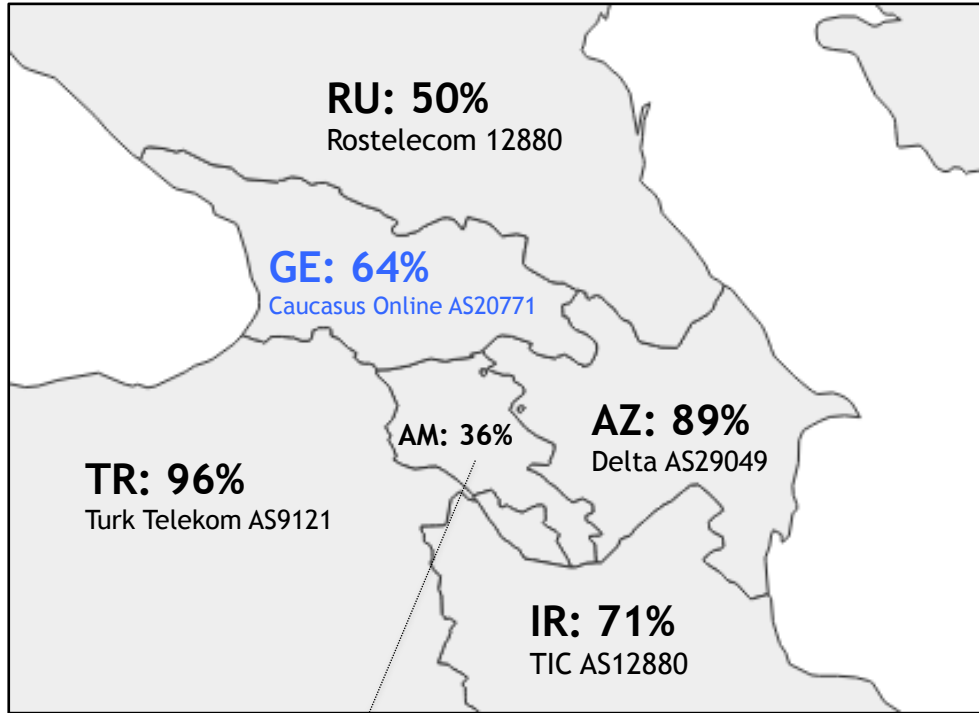


“Too few” cross-border ASN connections may indicate an increased risk of accidental Internet disconnection

- <3: **severe risk**
- <10: **significant risk**
- <40: **low risk**



Percent of market on-net, largest providers



GNC-ALFA AS196709

High on-net market capture suggests limitations on competition, powerful incumbent role in market

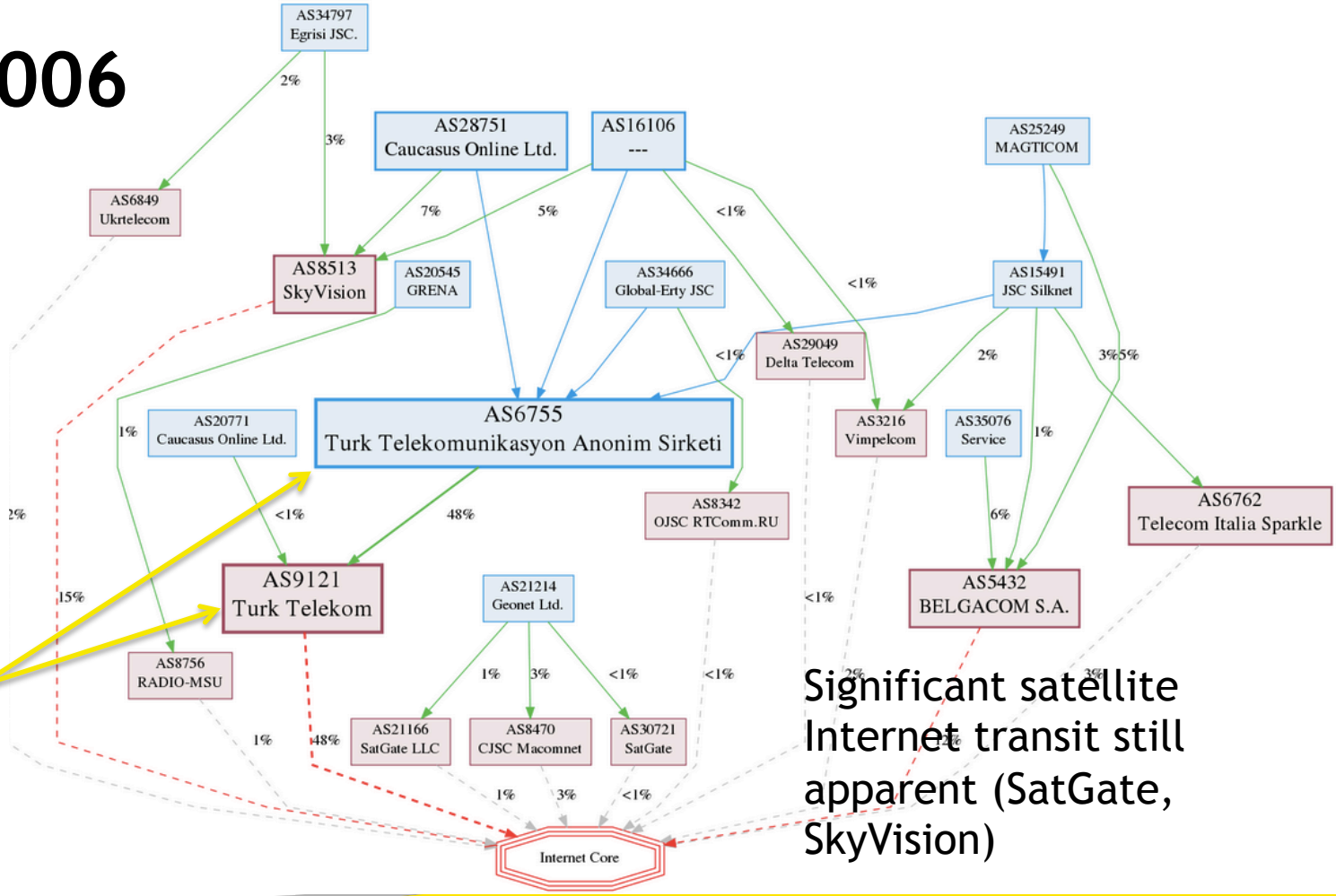
W. Europe median:	37%
Middle East median:	68%
Central Asia median:	64%



2006-2015

EVOLUTION OF TRANSIT INTERCONNECTION

Georgia 2006



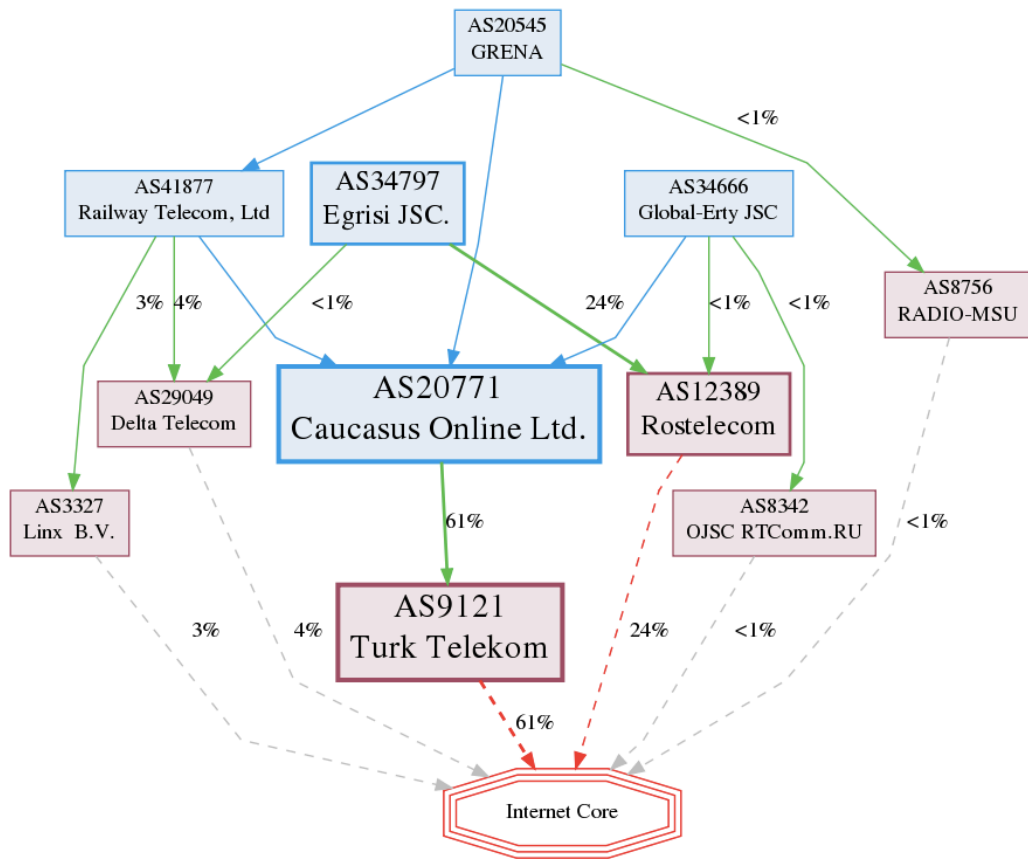
Primary national connectivity was through Turk Telekom

Significant satellite Internet transit still apparent (SatGate, SkyVision)

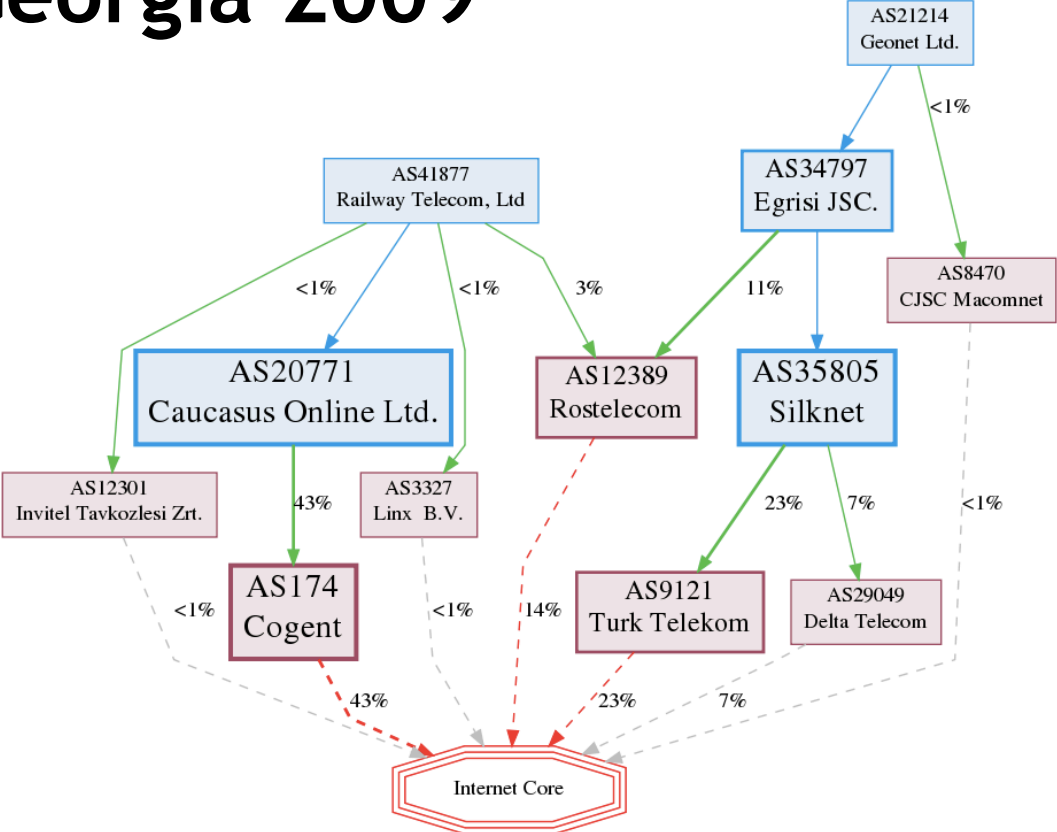
Georgia 2008

Dependence on Turk Telekom has increased significantly

More expensive satellite Internet is being phased out, driving transit consolidation



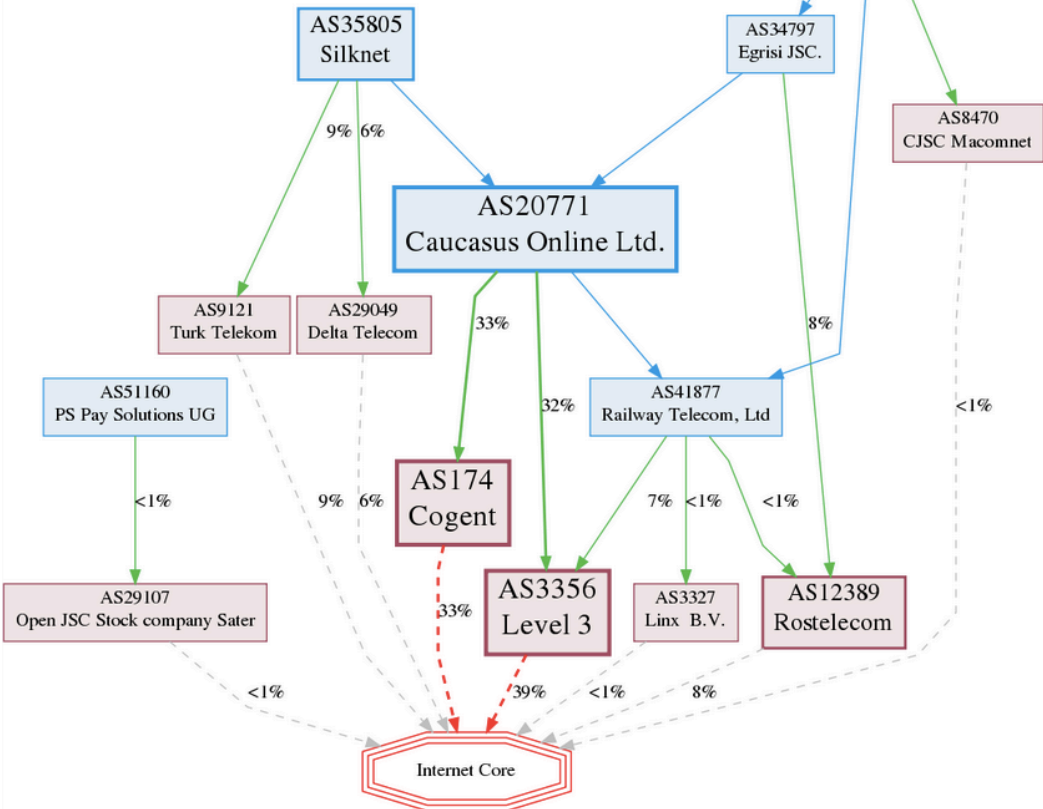
Georgia 2009



Cogent arrives, becomes significant transit provider

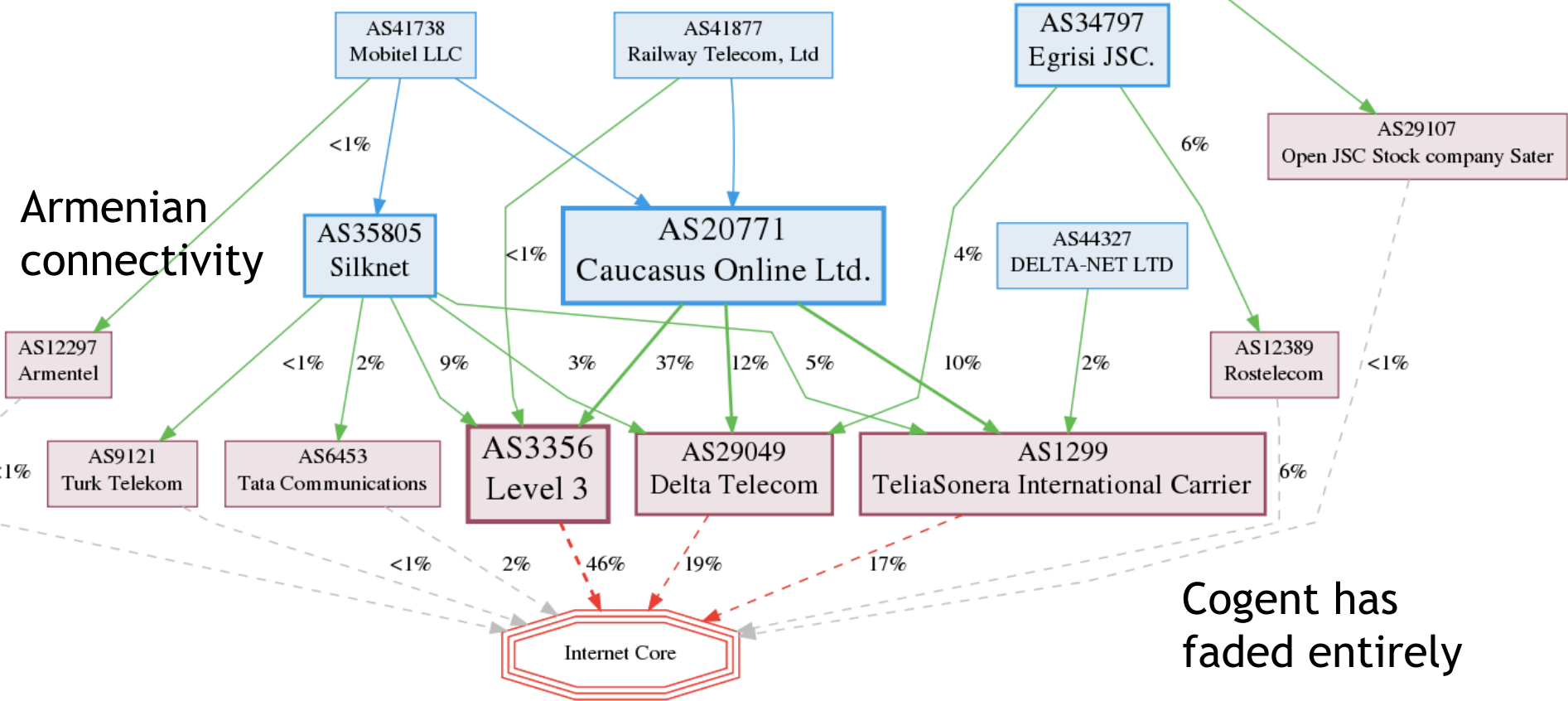
Georgia 2011

Level3 service from Sofia arrives via CCS and expands rapidly



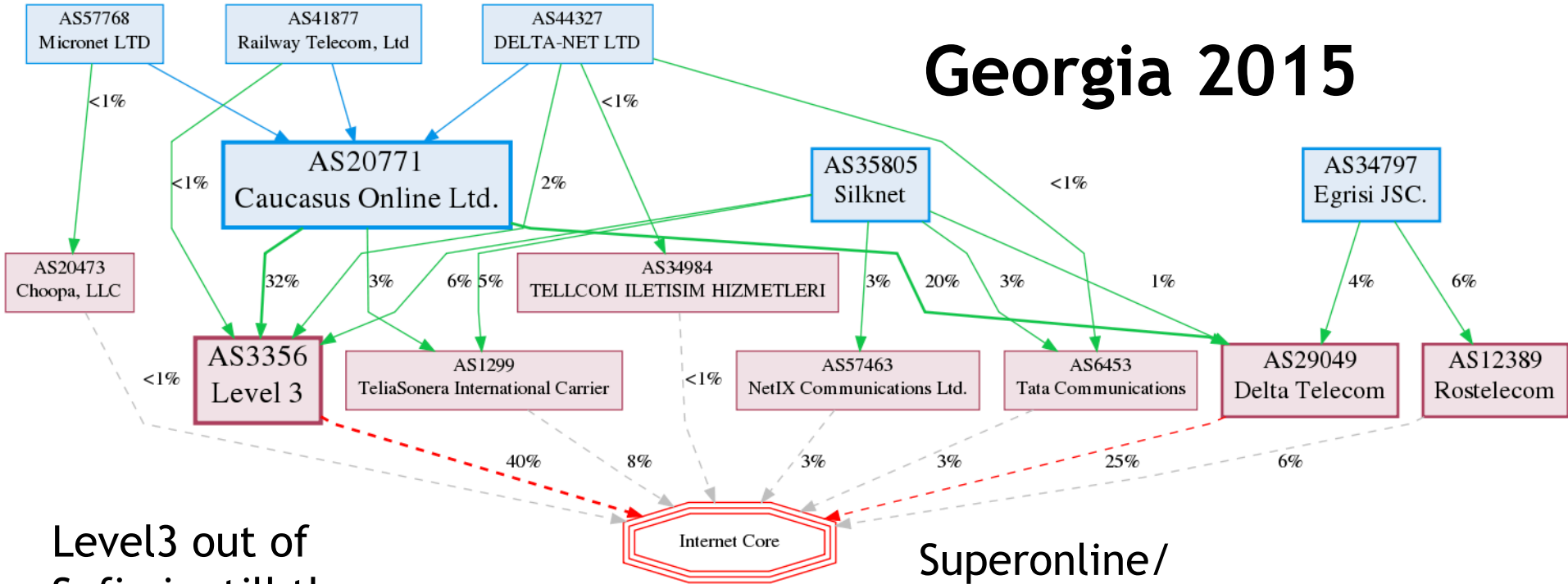
Georgia 2013

Armenian connectivity



Cogent has faded entirely

Georgia 2015



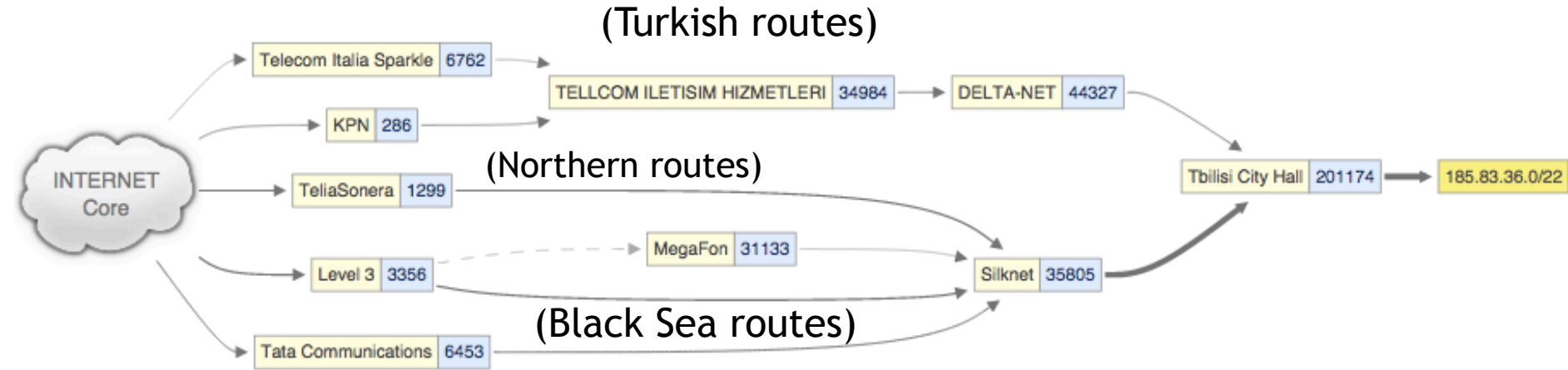
Level3 out of Sofia is still the dominant transit provider

Superonline/ Tellcom has replaced Turk Telekom

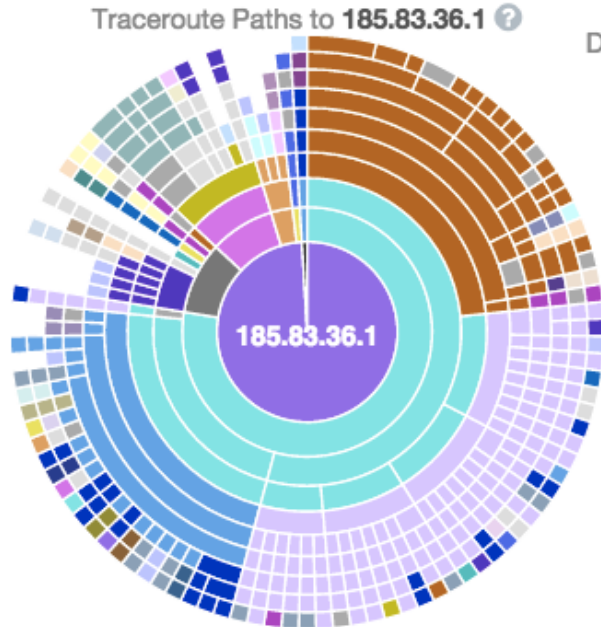


**HOW DOES DIVERSITY
TRANSLATE INTO
USER EXPERIENCE?**

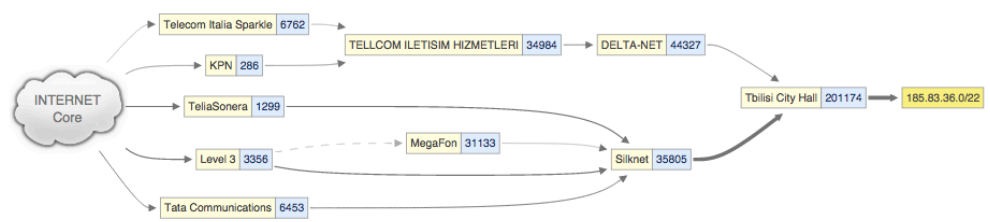
Regional path redundancy: Tbilisi City Hall



Visible diversity: Tbilisi City Hall

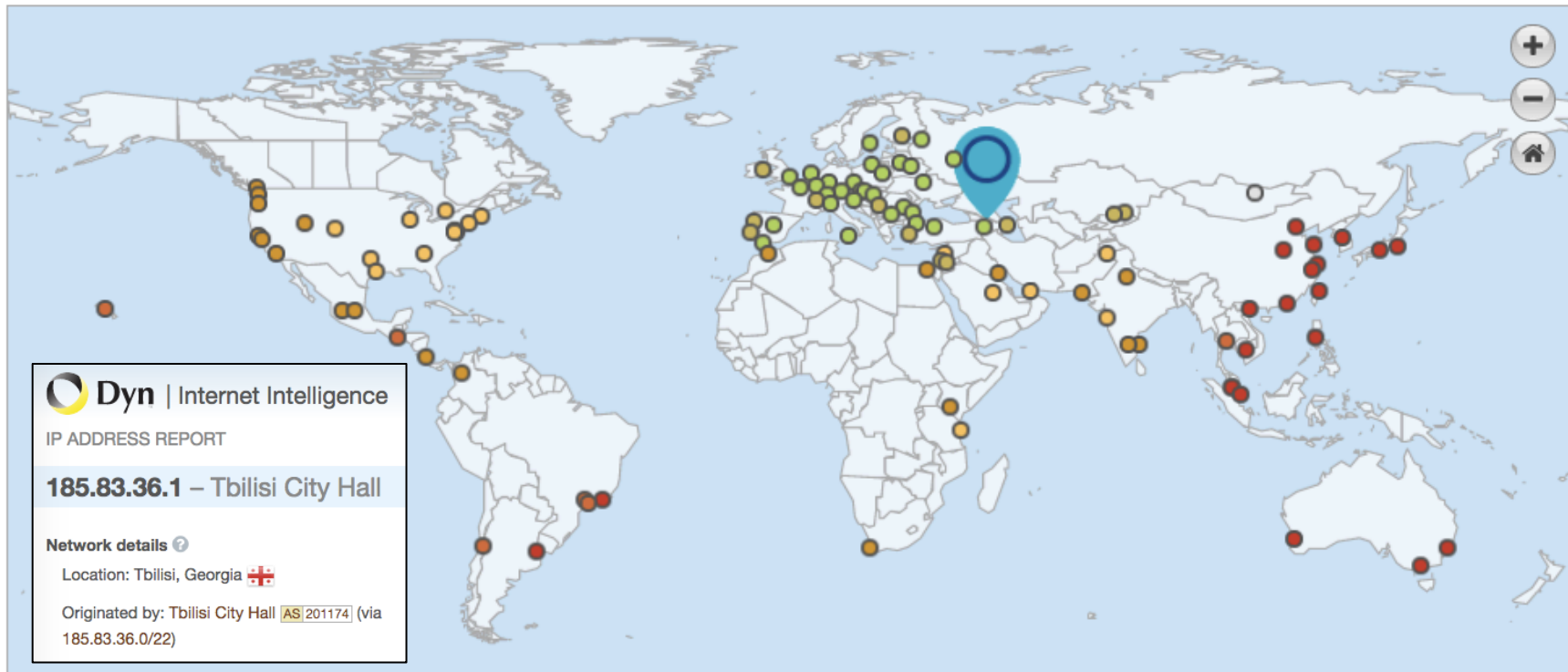


Displayed Hops



Top Providers

- Tbilisi City Hall (AS 201174) 99%
- Silknet (AS 35805) 78%
- TeliaSonera (AS 1299) 32%
- Tata Communications (AS 6453) 24%
- Level 3 (AS 3356) 23%



Latencies to Tbilisi Town Hall





LATENCIES MATTER

WHEN CONTENT

IS FAR AWAY



Georgia's popular content: RTT latencies

facebook.com	foreign	amazon.com	foreign	myvideo.ge	domestic	wikipedia.org	foreign	europa-bet.com	domestic
google.com	domestic	crystalbet.com	domestic	mail.ru	foreign	flashscore.com	foreign	palitrav.ge	domestic
youtube.com	domestic	ambebi.ge	domestic	bongacams.com	foreign	mymarket.ge	domestic	aliexpress.com	foreign
google.ge	foreign	myauto.ge	domestic	forum.ge	domestic	interpressnews.ge	domestic	tbconline.ge	domestic
ok.ru	foreign	yahoo.com	foreign	ebay.com	foreign	google.ru	domestic	beforeward.jp	foreign

USA
150-250ms

Russia
50-100ms

Netherlands
50-100ms

Czech Republic
50-100ms

Japan
300+ms

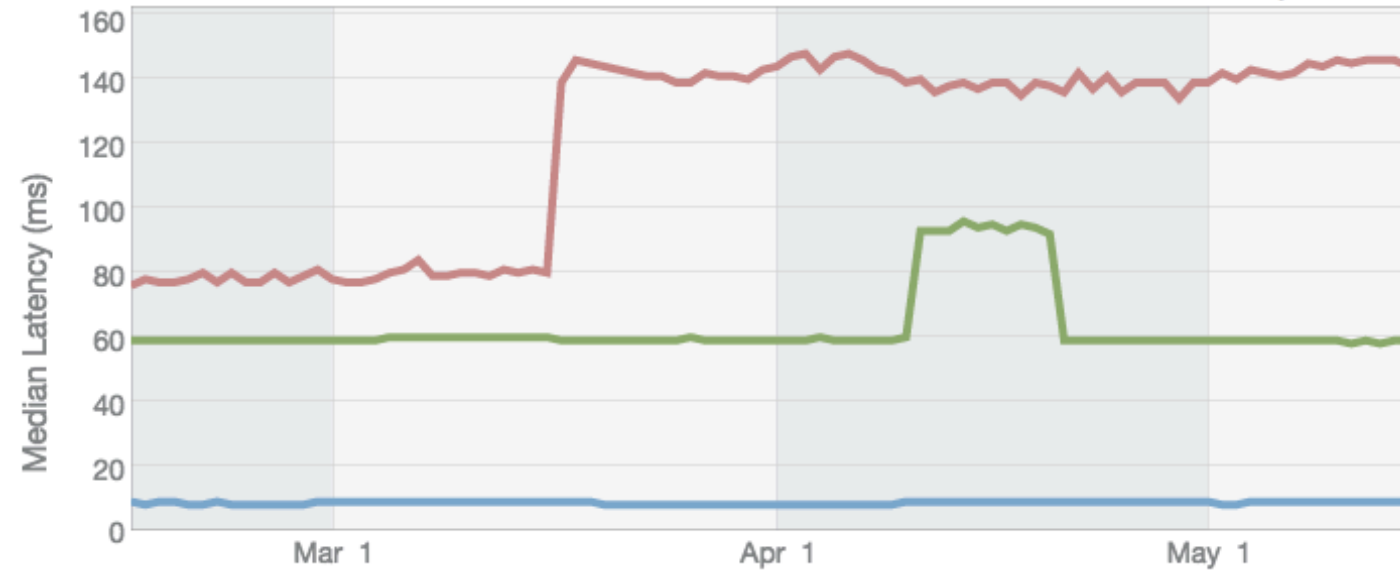


WHEN YOU CAN, EXCHANGE TRAFFIC LOCALLY

Interconnection Choices Impact Consumers...

Long Range Performance: Baku, Azerbaijan 🇦🇷 → Tbilisi, Georgia 🇬🇪

Feb 15, 2015 – May 15, 2015



Silknet: 142ms

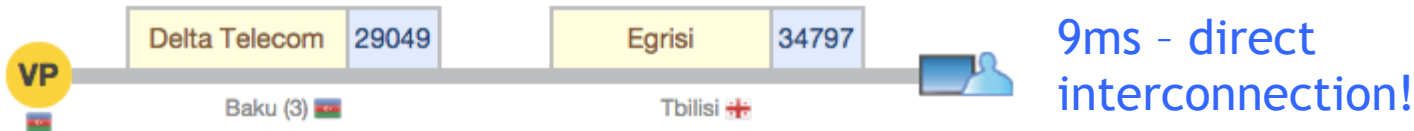
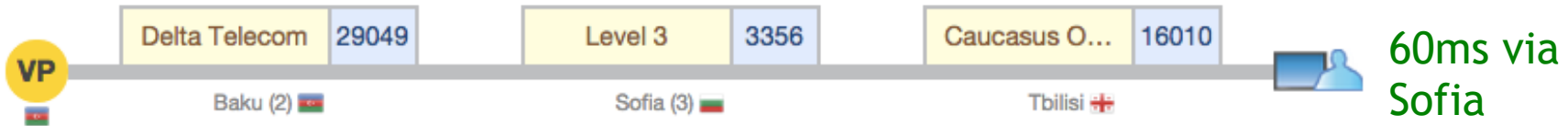
Caucasus
Online: 60ms

Egrisi: 9ms



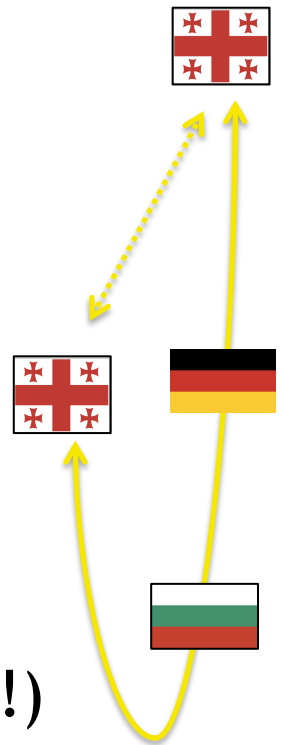
... Because peering in remote places adds delay

142ms via Frankfurt



Conclusions

- Georgian connectivity is geographically diverse
 - Strong potential to be regional hub
- End user experience depends on:
 - Content locality (is it hosted here?)
 - Local peering (can I get to it?)
 - In-region interconnection (avoid hairpinning!)
- Lots of profitable work and growth ahead!





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