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Regional Internet Growth Trends

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ENOG 3, Odessa
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@renesys

Before We Begin

- The data used in today's presentation are those used in Renesys Market Intelligence
- We maintain 500+ full-table BGP peering sessions (IPv4 + IPv6)
- We traceroute to 1,000,000 hosts daily from 70+ vantage points around the world
- Please let me know if you'd like to help improve our Eurasian coverage by peering with us or hosting a traceroute collector

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Today's Agenda

- IPv6 and IPv4 growth, regionally
- Brief examination of Ukraine's connectivity
- How one provider's success farther East is affecting the dynamics of Internet markets
- What this might mean for Ukraine and its neighbors, strategically
- *Intermission / перерыв*
- A closer look: Caucasus and Central Asia

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A word about IPv6

- Today, when I talk about “the Internet” I shall be referring to the IPv4 Internet (99.9% of traffic)
- Sadly, IPv6 Internet is not completely connected; less than 15% of ASNs worldwide participate
- In the Eurasian region it’s lower: only **5.78%**
- We already succeeded in convincing a **small** number of **large** ASNs
- Now we need to convince **large** numbers of **small** ASNs to implement IPv6

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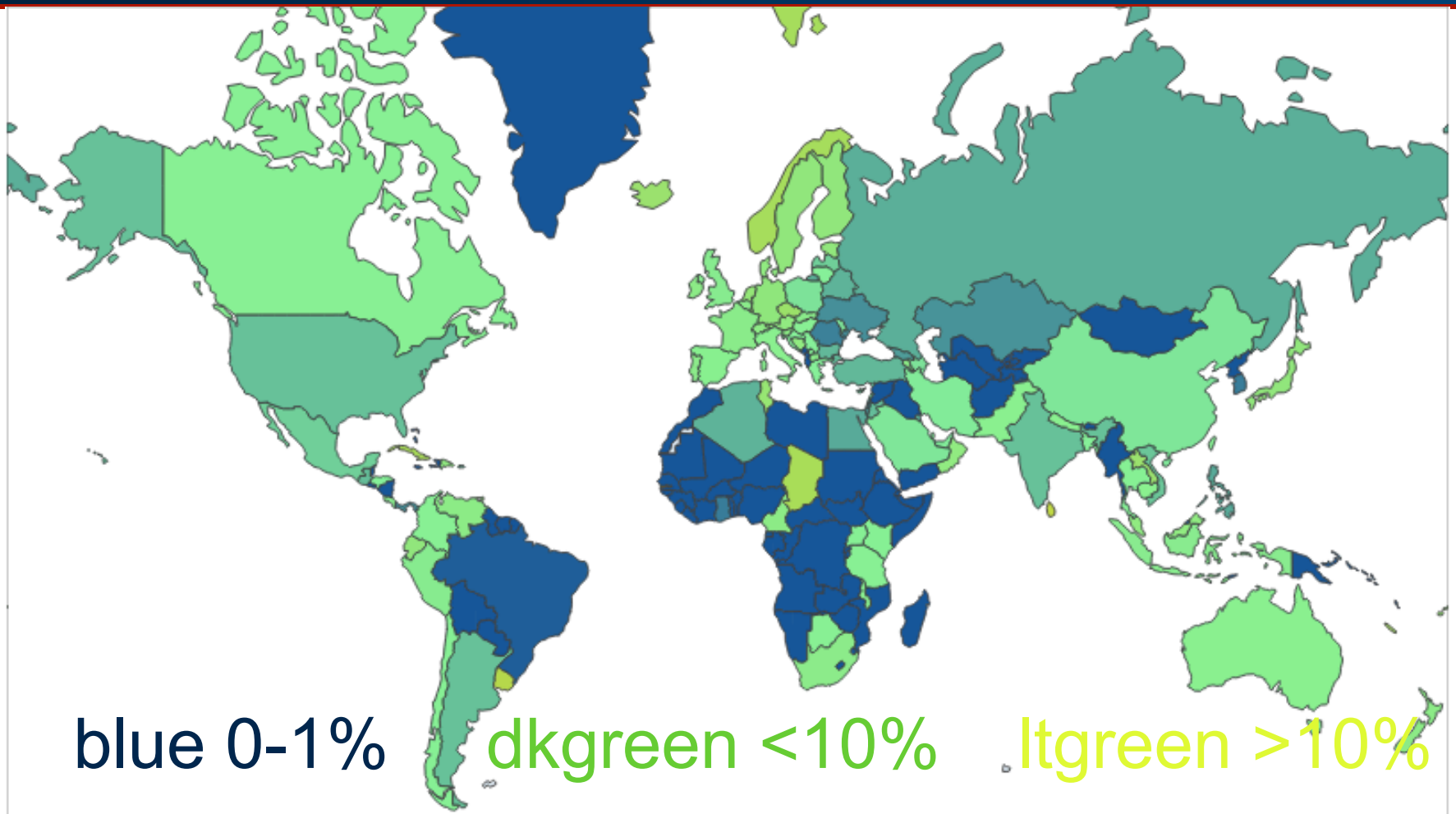
IPv6 Adoption Percentage, ASNs



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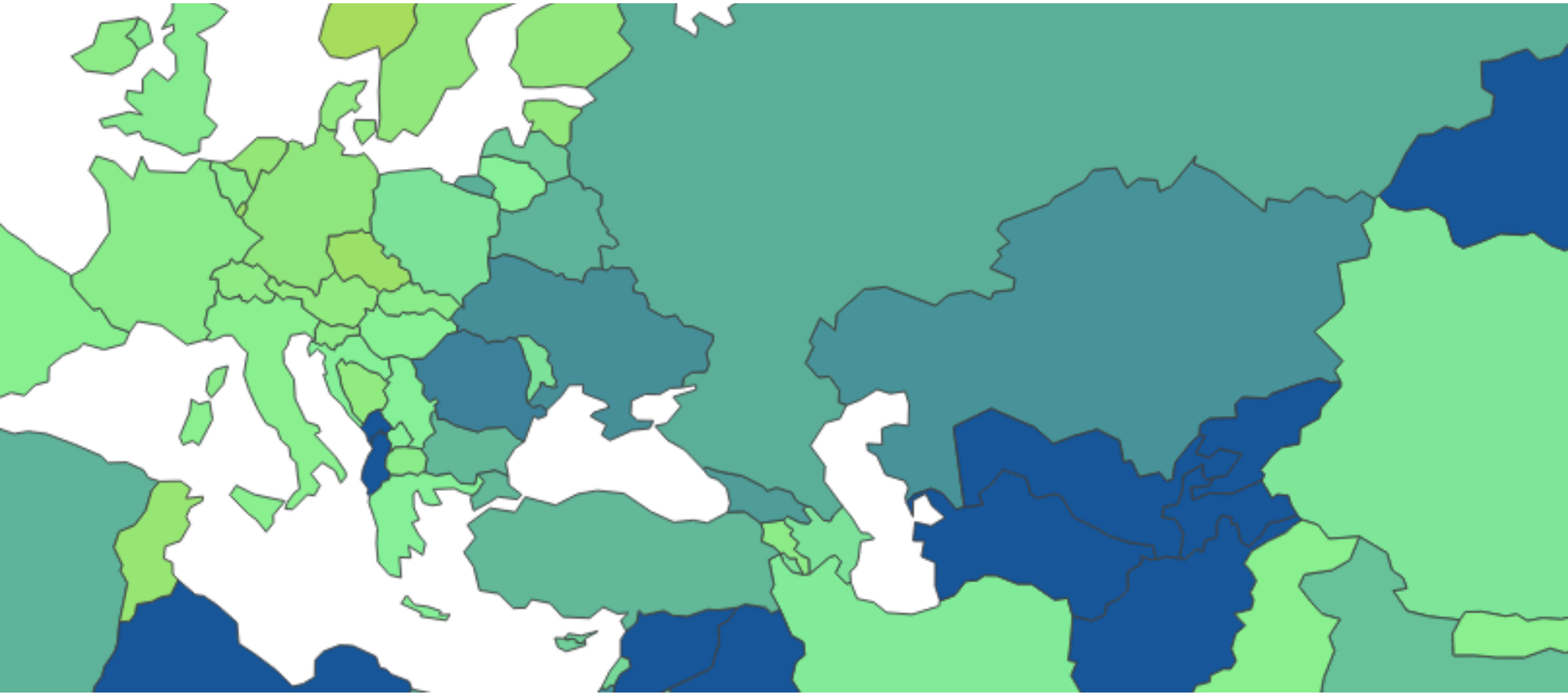
IPv6 Adoption Percentage, ASNs



blue 0-1% dkgreen <10% ltgreen >10%

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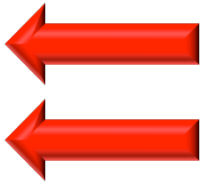
Different IPv6 Strategies Are Evident

- 27% of Estonia's 51 ASNs are doing IPv6
- 20% of Armenia's 50
- Central Asia's strategy is "wait and see"

Country	IPv4 ASNs	IPv6 ASNs	%pct IPv6
LV	203	16	7.88
LT	101	10	9.9
EE	51	14	27.45
UA	1636	64	3.91
BY	80	5	6.25
MD	65	6	9.23
RU	3844	229	5.95
AM	50	10	20
AZ	33	3	9.09
GE	42	2	4.76
KZ	94	4	4.25
UZ	38	0	0
KG	21	0	0
TJ	13	0	0
TM	4	0	0



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Back to IPv4: Measuring “Retail Growth”

- A **retail autonomous system** is one that originates prefixes in the region, or provides transit to stub ASNs
- This filters out the purely wholesale/backbone NSPs who serve a region but don’t originate prefixes there
- Strong growth in retail ASN count signals diversity, competition, investment potential in an emerging market

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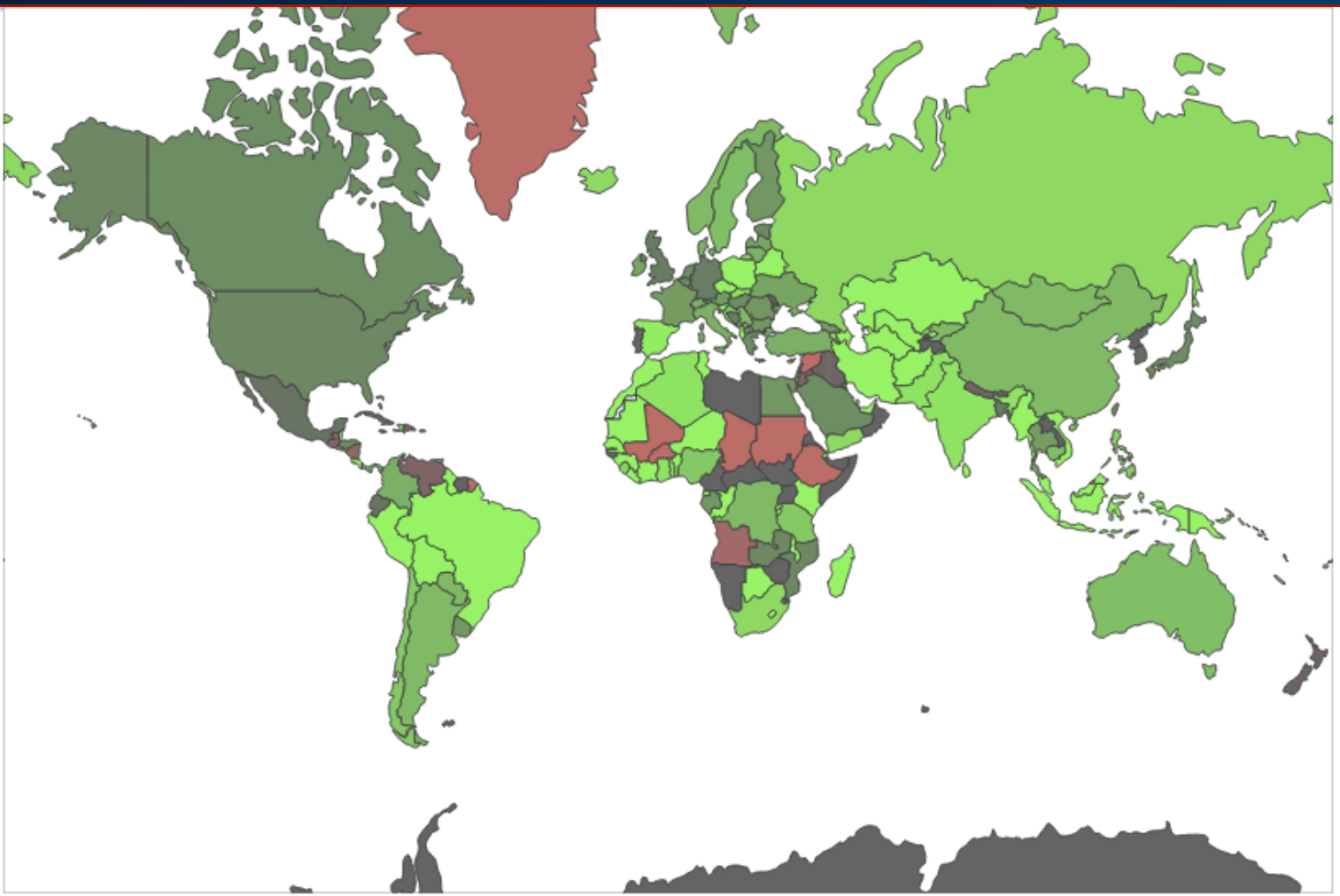
Percentage Growth, # of IPv4 Retail ASNs



Green: positive growth, adding new ASNs

Red: negative growth (ASN loss)

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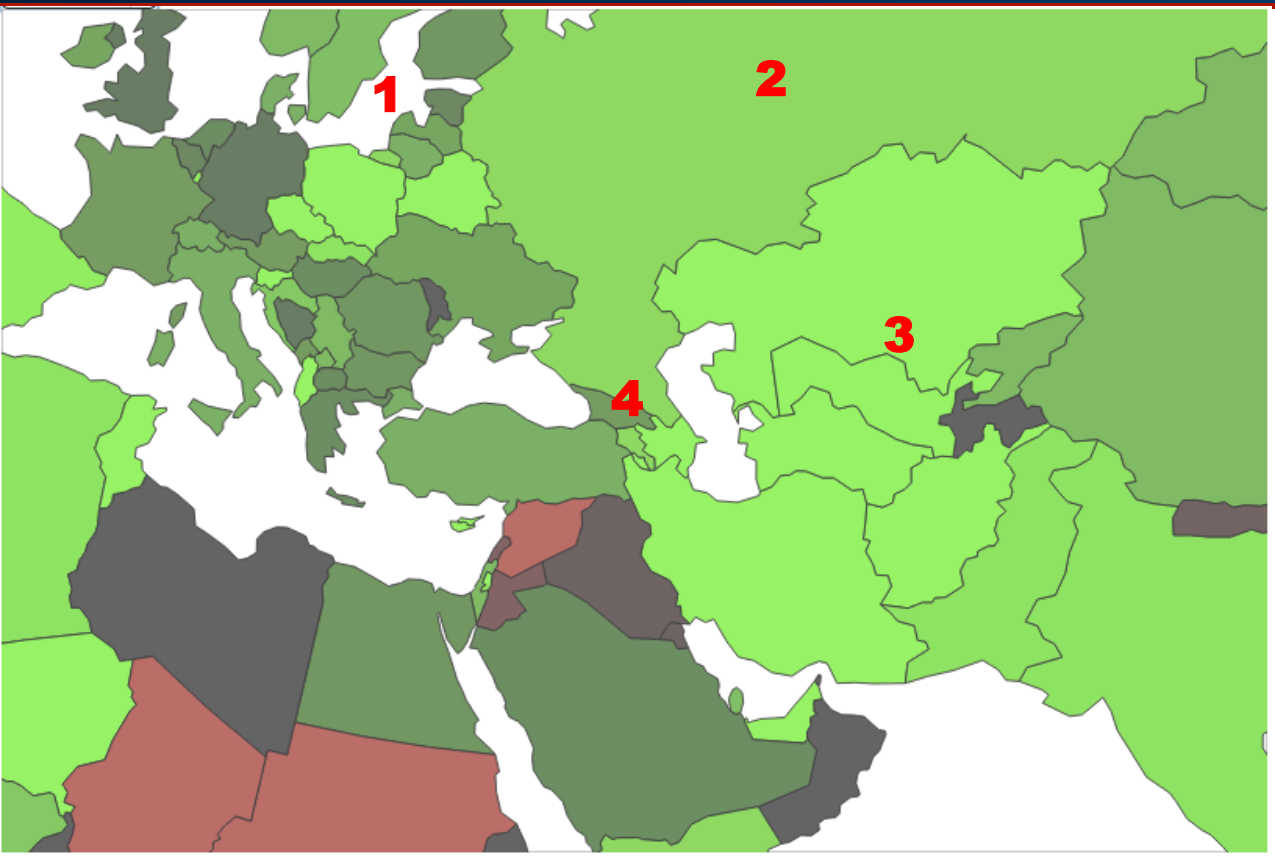
Growth Across the Eurasian Region



1 **Baltics** (4-9%) are growing slowest

2 **Russia** (14%) similar to the regional average (12%)

3 **Central Asia** (17%) faster but uneven

4 **Caucasus** (21%) growing fastest

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Growth By Region, Country

	May 2011	May 2012	Increase
Baltics			7%
Estonia	57	59	4%
Latvia	194	209	8%
Lithuania	100	109	9%
Eastern Partnership			8%
Moldova	64	64	0%
Ukraine	1551	1674	8%
Belarus	70	82	17%
Russia	3419	3895	14%

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Growth By Region, Country (continued)

	May 2011	May 2012	Increase
Russia	3419	3895	14%
Central Asia			17%
Kazakhstan	86	102	19%
Uzbekistan	32	38	19%
Turkmenistan	3	6	100%
Tajikistan	17	17	0%
Kyrgyzstan	20	22	10%
Caucasus			21%
Georgia	45	49	9%
Armenia	48	56	17%
Azerbaijan	24	37	54%

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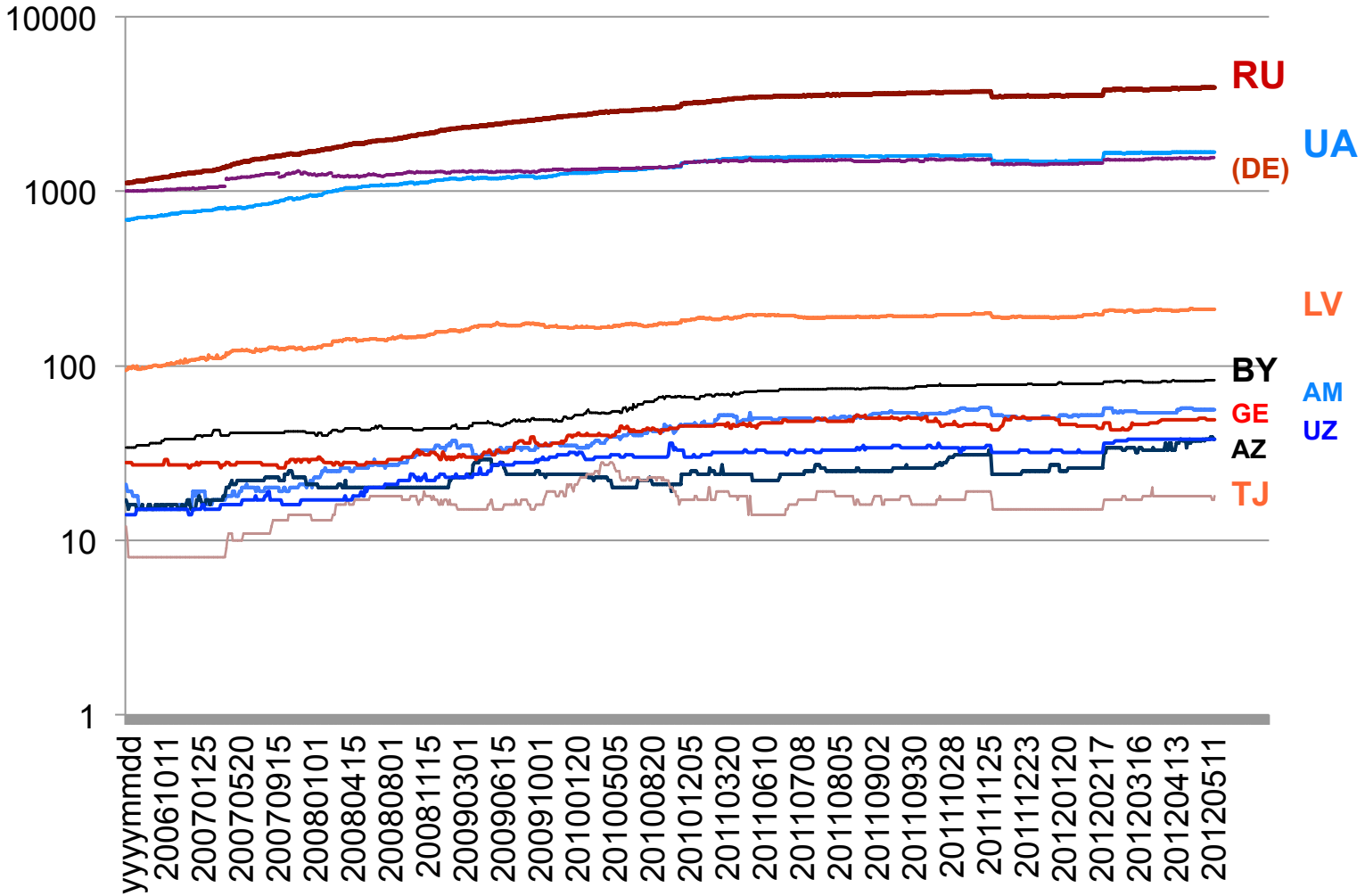
Retail ASNs, 2006-2012 (logscale)



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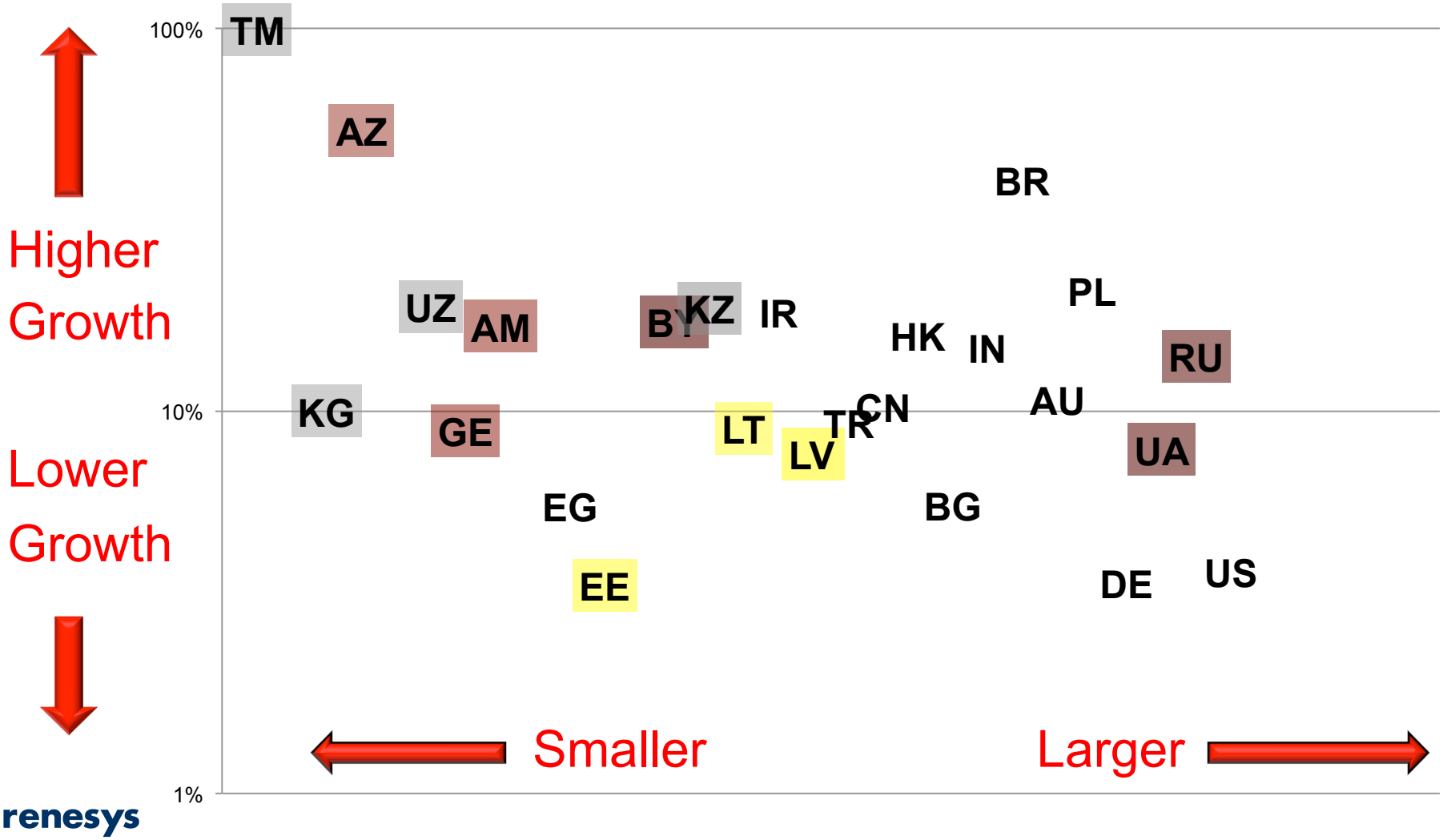
Size versus Growth, In Context



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What's driving this growth?

- Better international connectivity
- More domestic interconnection options
- Falling transit prices
- Increased domestic consumer demand
- Financial industry
- Explosion of mobile data

- **Now, let's take a look at Ukraine's Internet.**

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Ukrainian Internet

- Ukraine now has more retail ASNs than Germany --- over 1,600 in service!
- Best feature: standard Western European connectivity through major exchanges
- Latency/performance tends to be “Frankfurt plus 40ms” year-in and year-out
- A great platform to build on, offering services to markets farther East and South
- So what are we missing?

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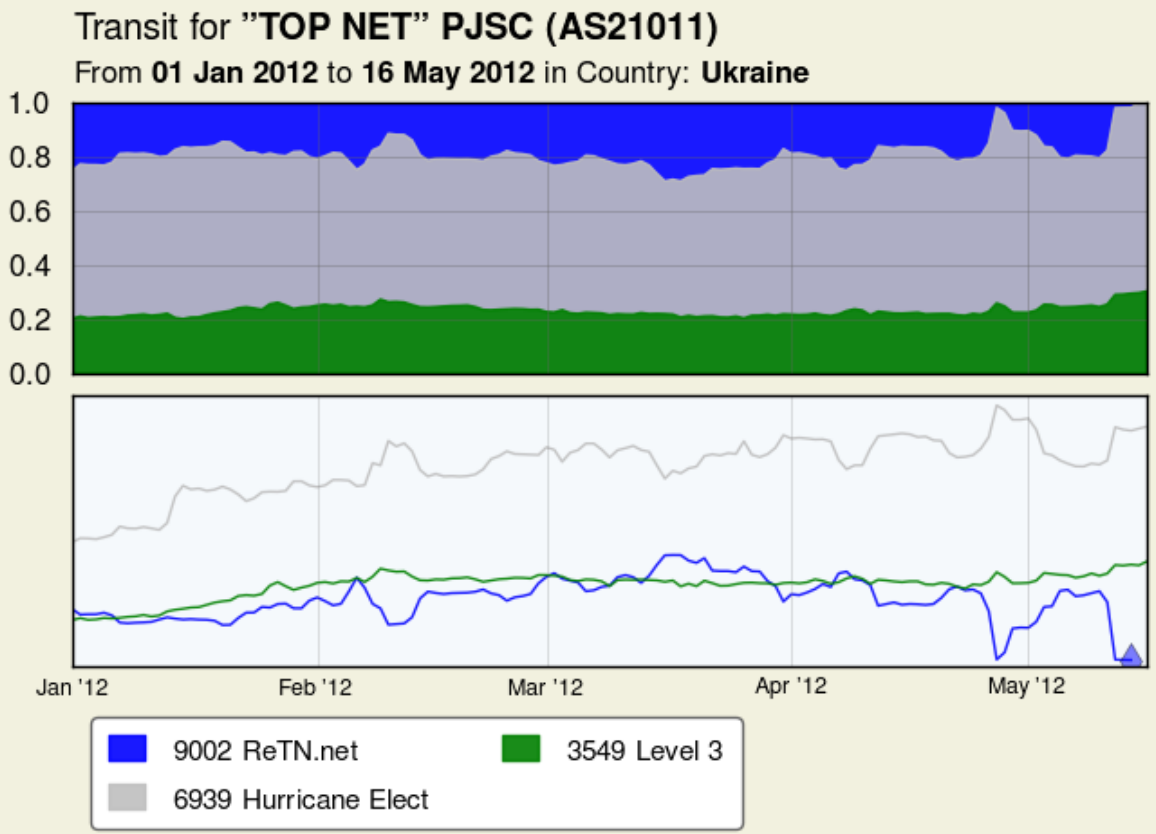
Consider: Ukrainian “Top Net” (AS21011)

- Phases out **ReTN** as provider within the last week
- **Level3** and **Hurricane Electric** are the remaining providers



Source: *BGP Data*

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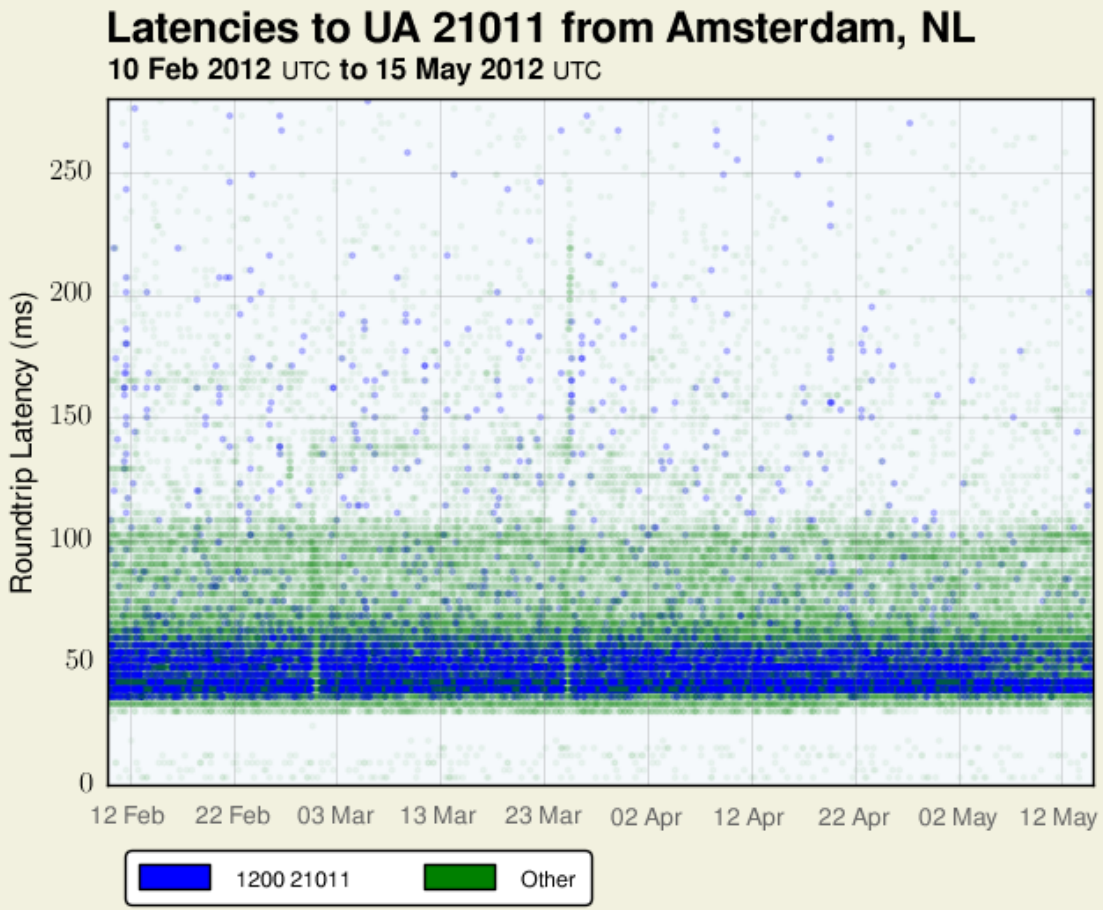
Upside: Stable European Connectivity

- For that conservative mix of large Western providers, you get extremely stable round-trip times to and from Western Europe



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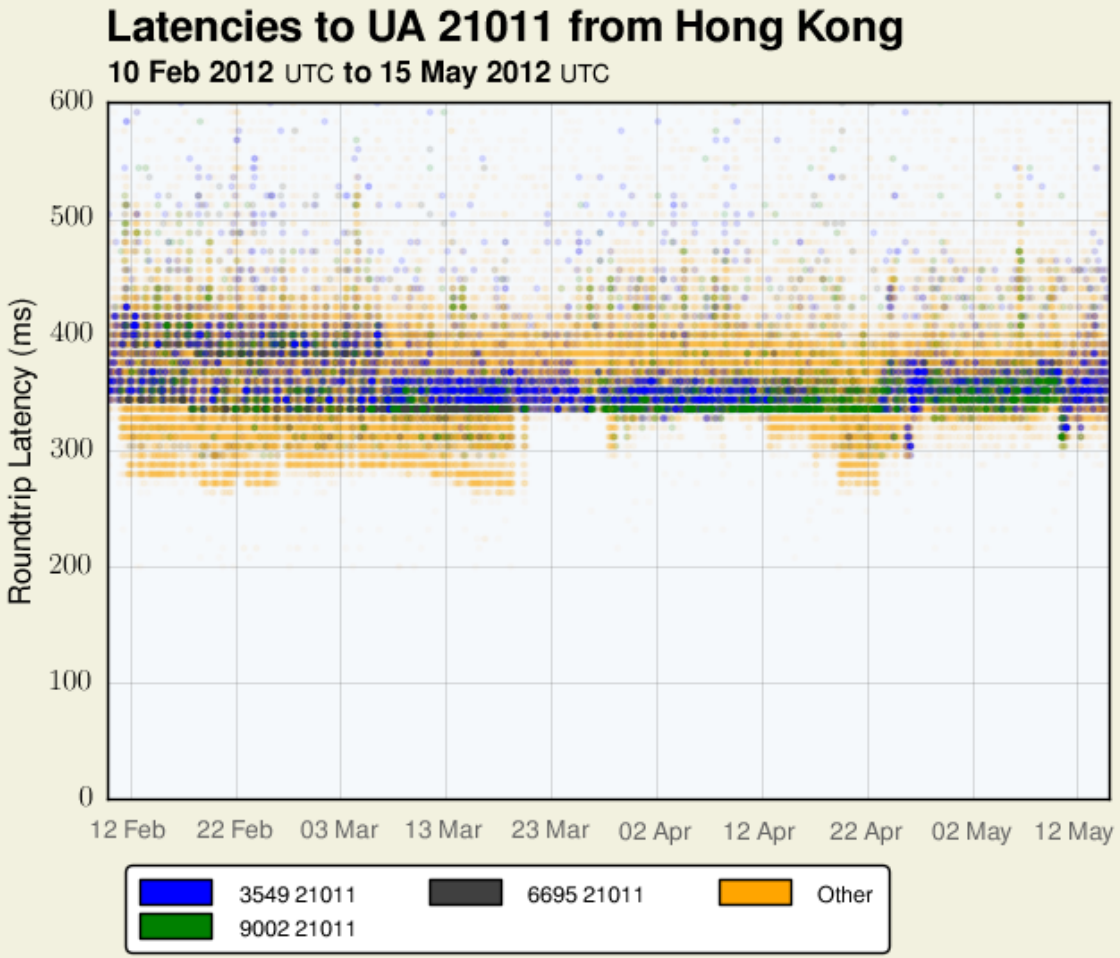
Downside: the “Slow Boat to China”

- You also get a fairly stable, but slow, traditional, Western European carrier’s paths to Asian markets on submarine cables.



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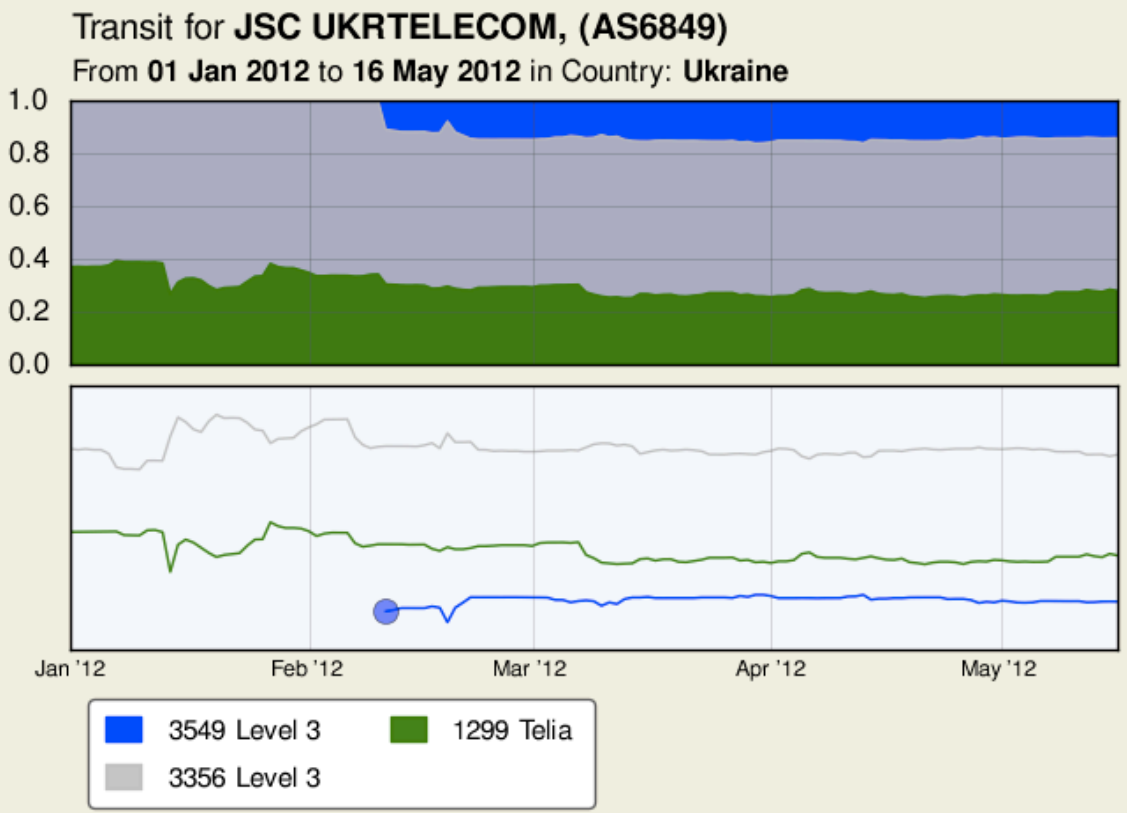
Ukrtelecom (AS6849)

- Transit:
  - Level3,
  - Level3,
  - And Telia.

- *See if you can spot a common Ukrainian transit pattern.*



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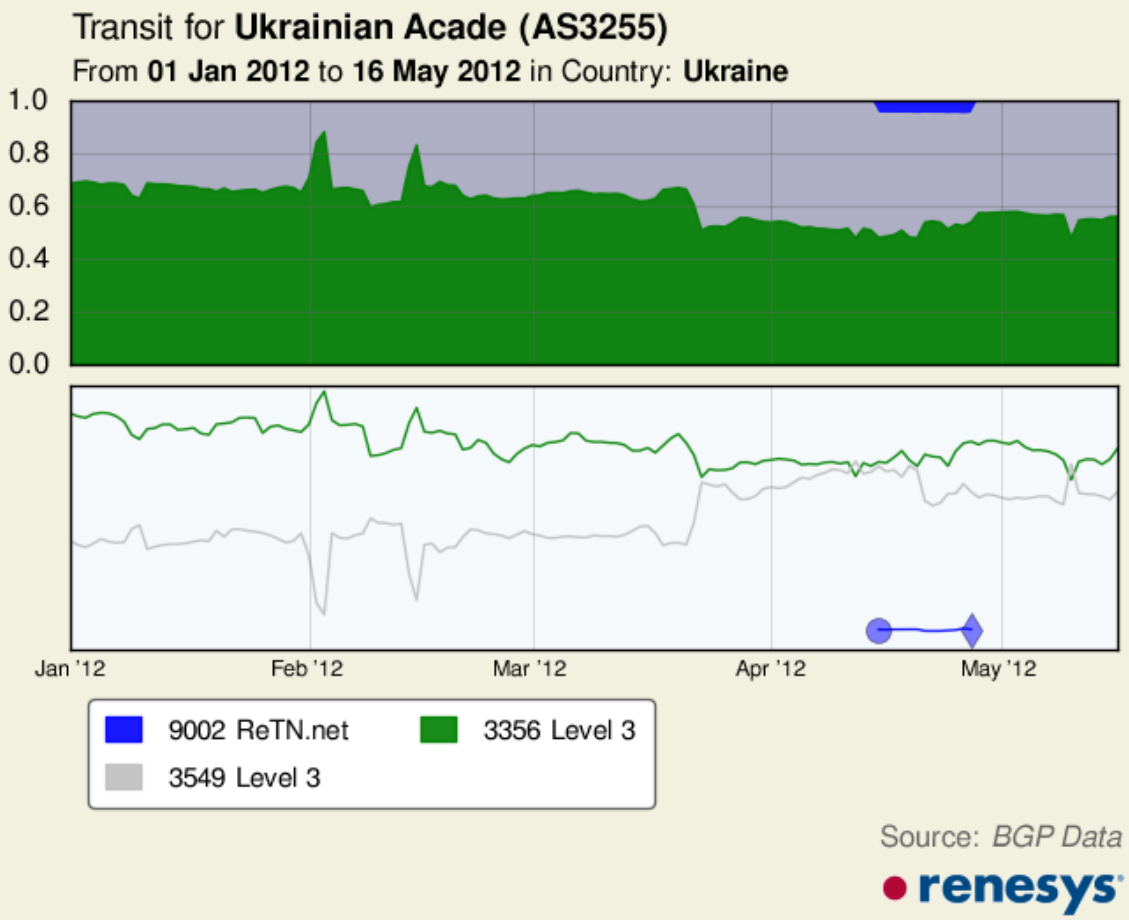
Ukrainian Academy of Sciences (AS3255)

- Transit: Level3 and… Level3.
- *Ukraine was the country affected most strongly by the Level3/ Global Crossing merger.*



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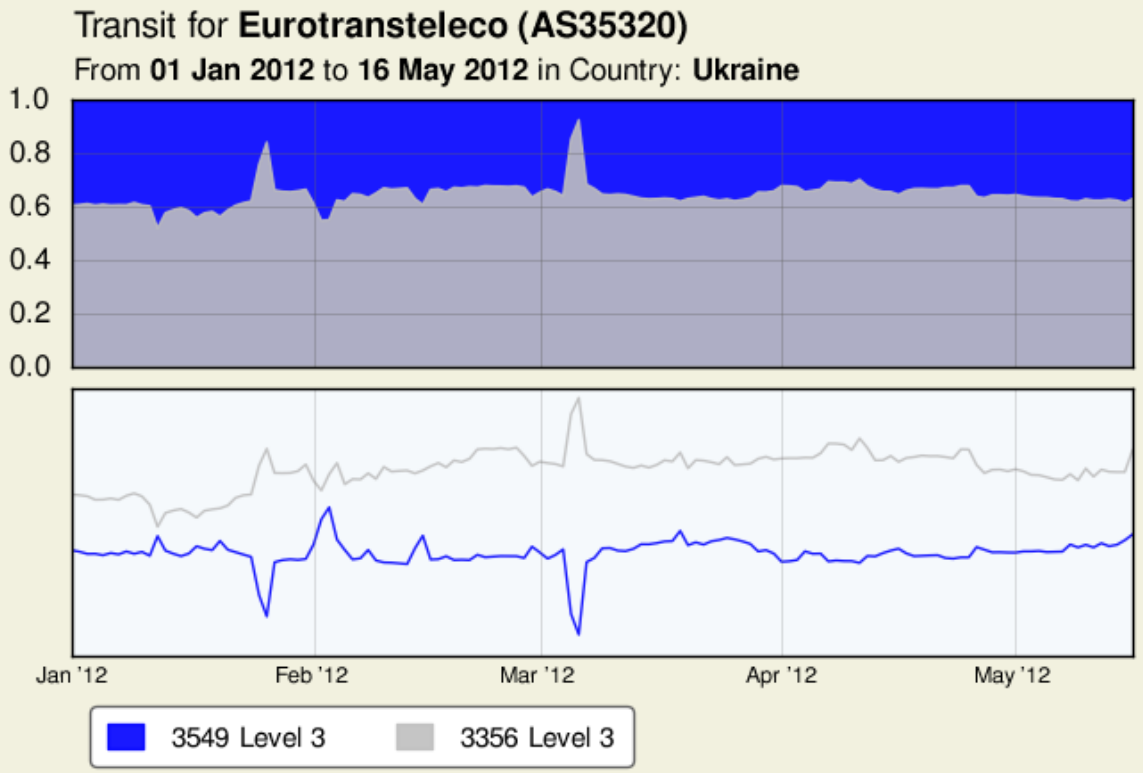
Eurotranstelecom (AS35320)

- Level3, and
- Level3.

- *Many providers were left effectively single-homed, may not realize the danger.*



Source: *BGP Data*

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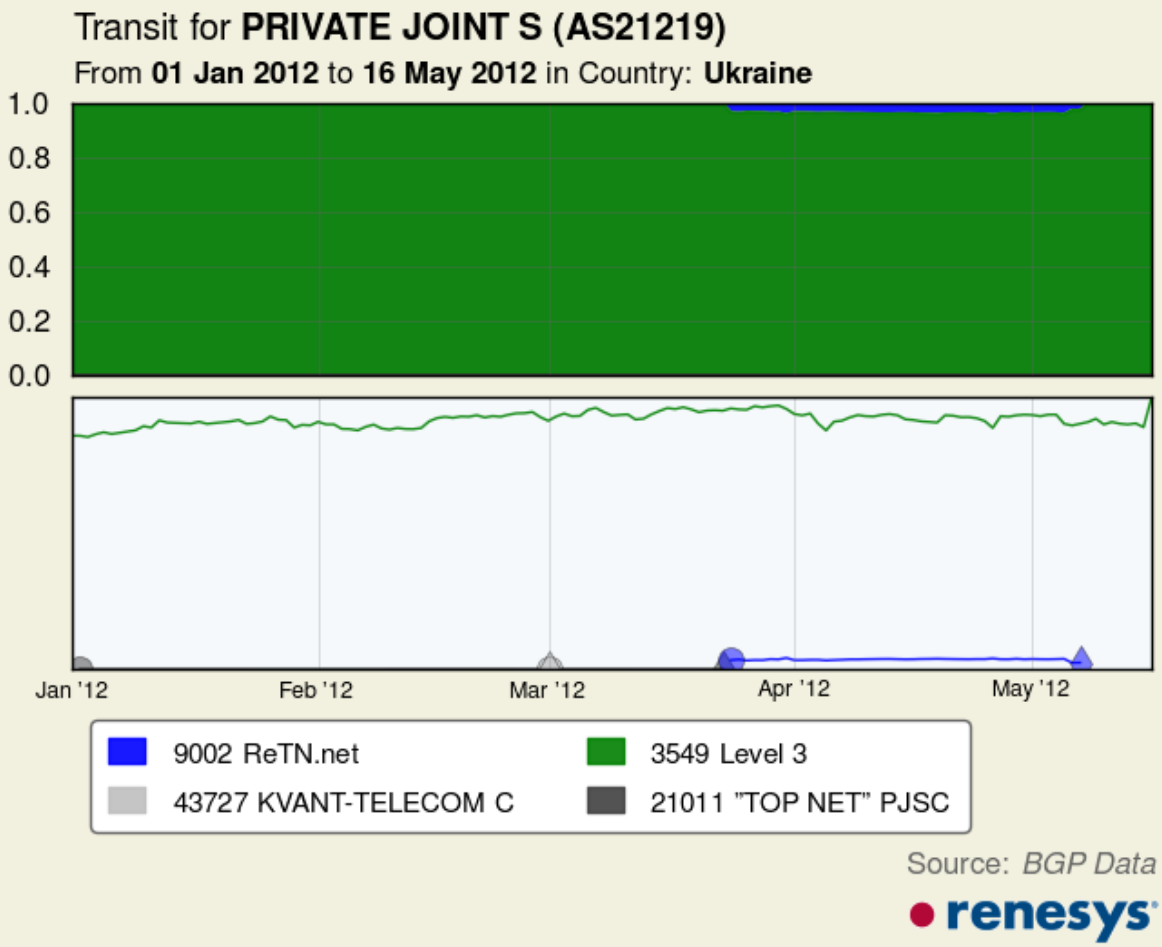
Datagroup (AS6849)

- Level3.
- *What if Level3's backbone has a problem, or they depeer an important network, like… Cogent?*
- *Ukraine could lose partial Internet connectivity until the problem is resolved.*



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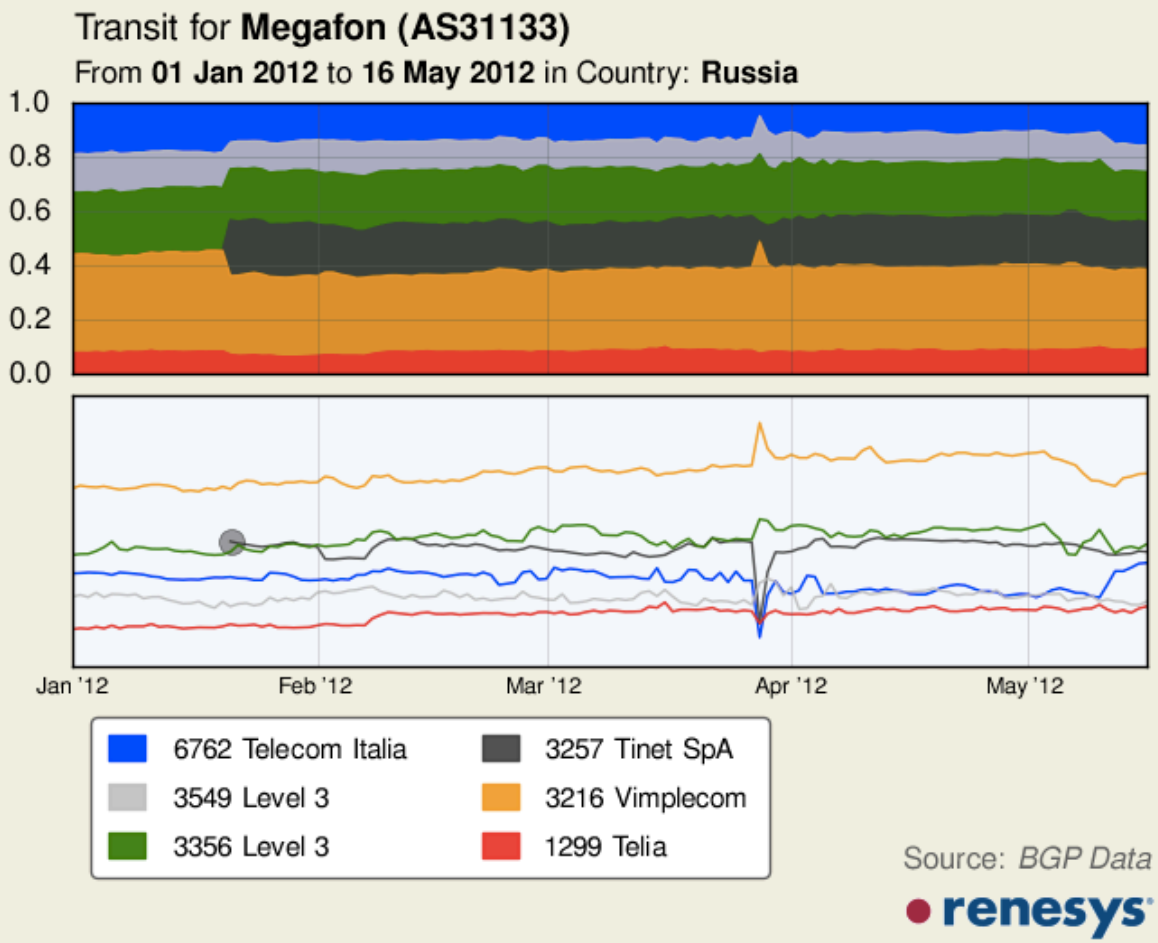
Compare to Russia's Megafon (AS31133)

- Finished the merge with Synterra
- Jan 2012: adds Tinet transit, for total of six (5) international carriers
- Expanding internationally



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Speaking of Russia…

- Mobile provider ‘troika’ has finished its wave of acquisitions of fixed-line Internet backbones
- Rostelecom/Svyazinvest is restructuring
- 4G/LTE competition on the horizon, with network sharing and a fresh chance for Rostelecom to access mobile data growth potential

- **Multiple providers seeking land paths to Asia**

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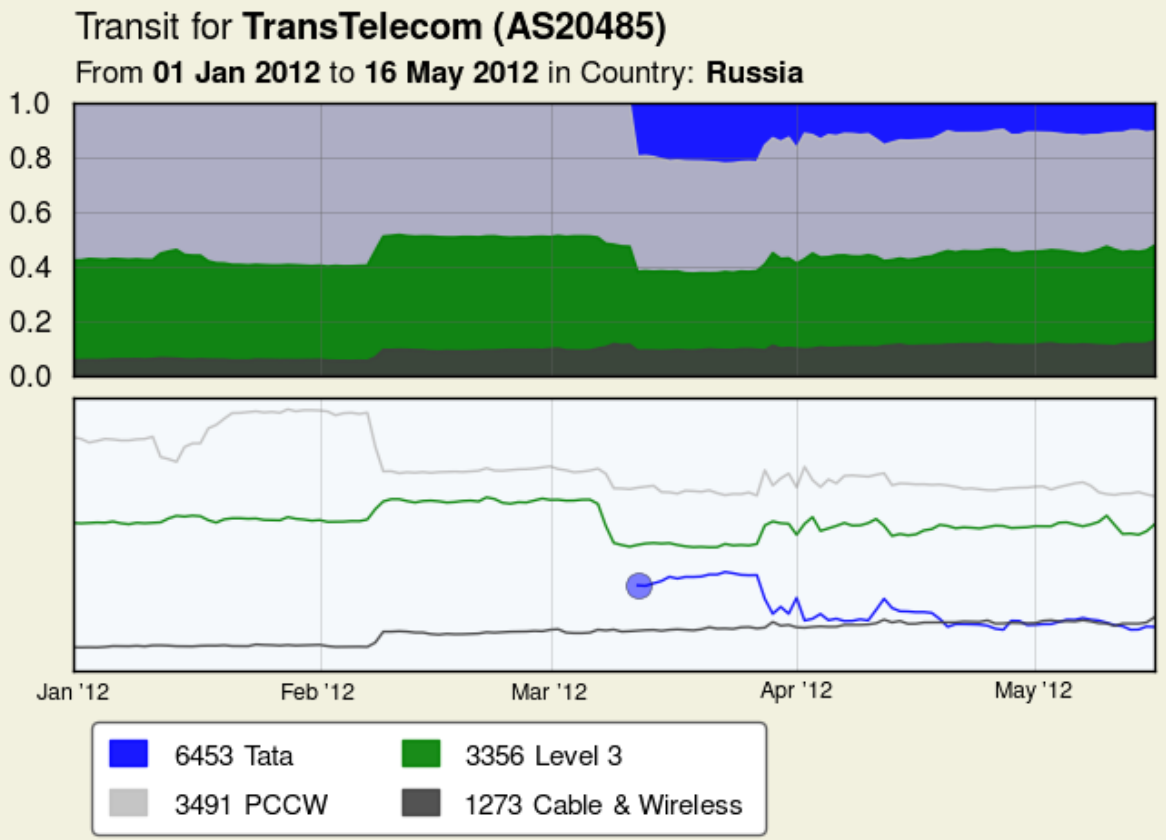
Russia: Transtelekom (AS20485)

- March 2012: selling in Hong Kong, adds Tata
- **Lower-latency terrestrial paths begin to appear**
- This is creating competitive advantages for TTK in Central Asia, elsewhere



Source: *BGP Data*

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Transtelekom's Hong Kong Paths

- **Significant** reductions in latency compared to existing submarine cable routes
- Starting to become visible in traceroutes from the Far East to networks in Russia, Central Asia
- These paths seem to be rarely selected; we infer that they must have been very **expen$ive**
- In the last 60 days, providers appear to be using these paths much more frequently
- Let's see some examples.

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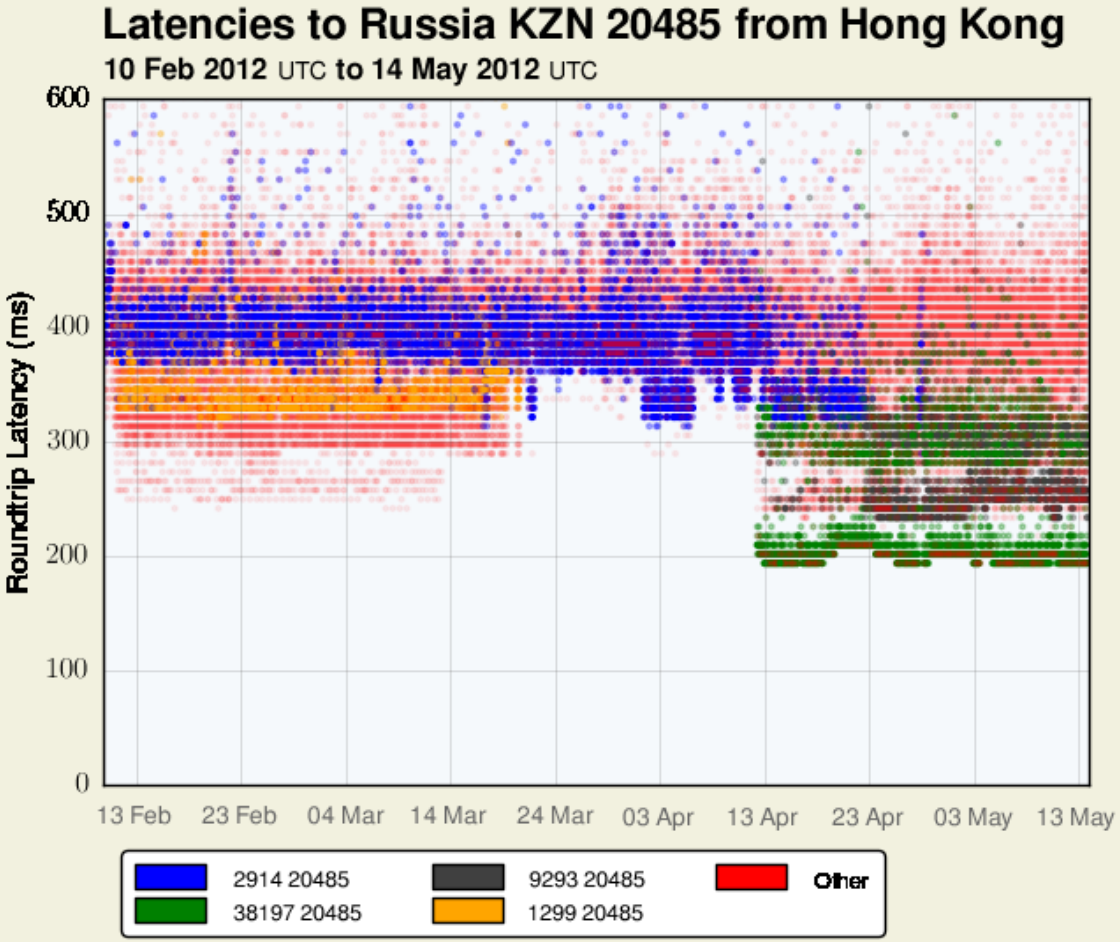
Latencies from Hong Kong to Kazan

- Start of 2012: Transtelecom delivers 400ms via NTT
- Since April: Transtelecom delivers **sub-200ms** direct from Hong Kong NSPs



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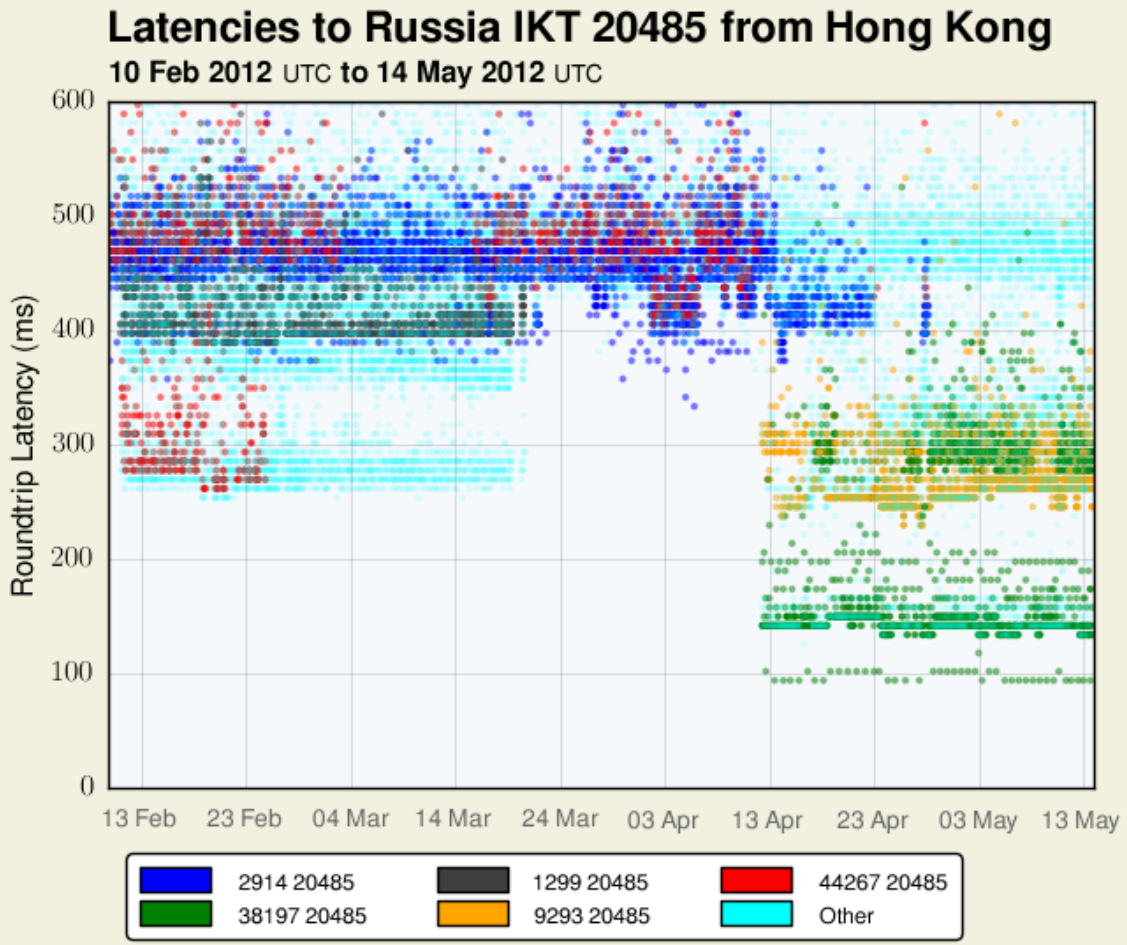
Latencies from Hong Kong to Irkutsk

- Start of 2012: 450ms+ via NTT
- Since April: Transtelecom delivers **100-200ms** direct from Hong Kong NSPs



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Ukraine Summary: Things to Watch in 2012

- Ukraine enjoys stable European connectivity
- Ukraine has a growth rate less than Eurasia as a whole, on par with Western Europe and the Baltics, less than Russia, Central Asia, Caucasus
- Two reasons to carefully monitor transit options:
  - **1. Many providers at risk from lack of diversity after the Level3-Global Crossing merger**
  - **2. Ukraine will have to look East again to get its financial industry faster paths to critical Asian markets**

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Thank you! **Дуже дякую!**

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Part 2: Central Asia and Caucasus

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Growth By Region, Country (reminder)

	May 2011	May 2012	Increase
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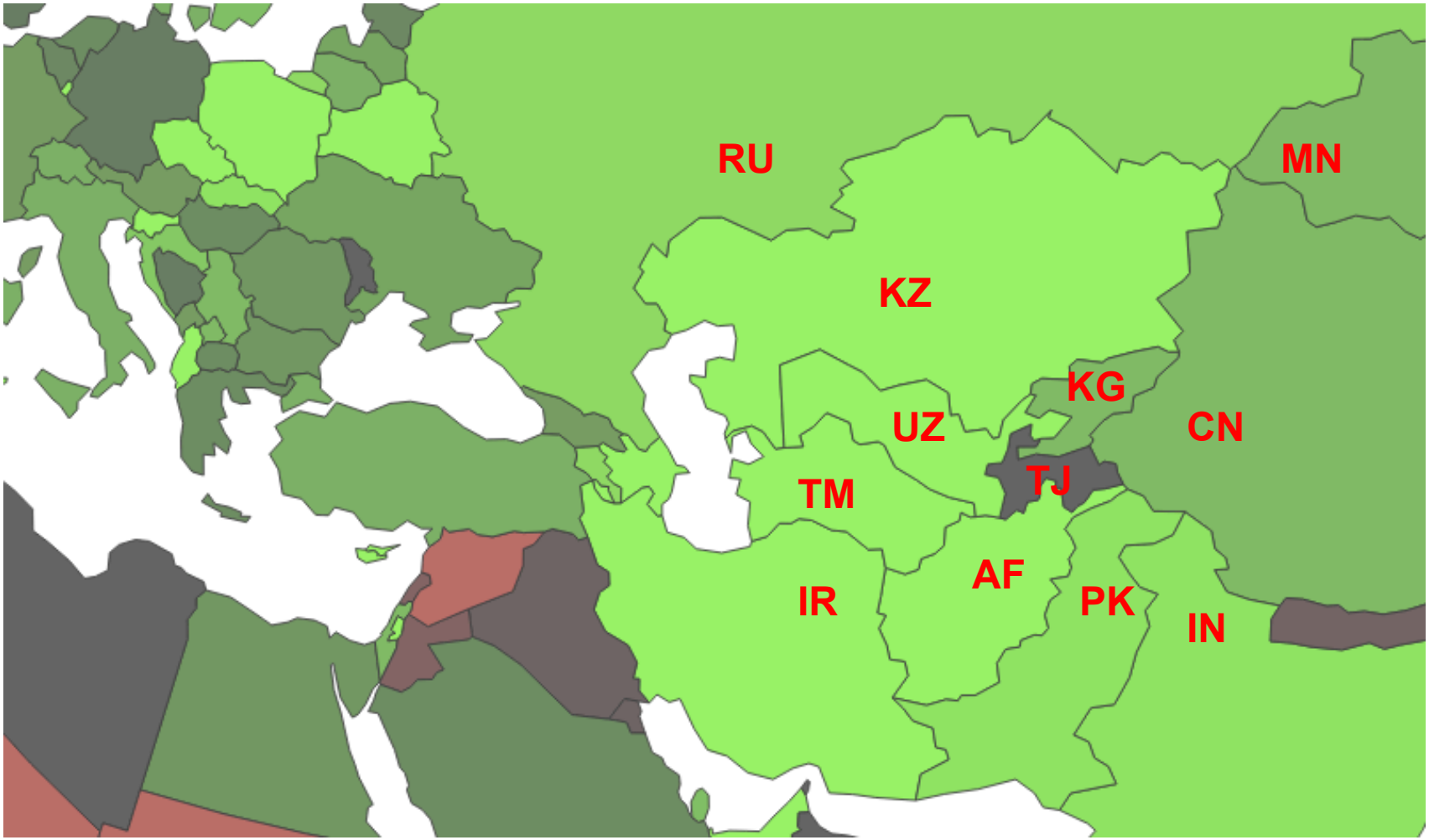
Central Asian Internet Growth



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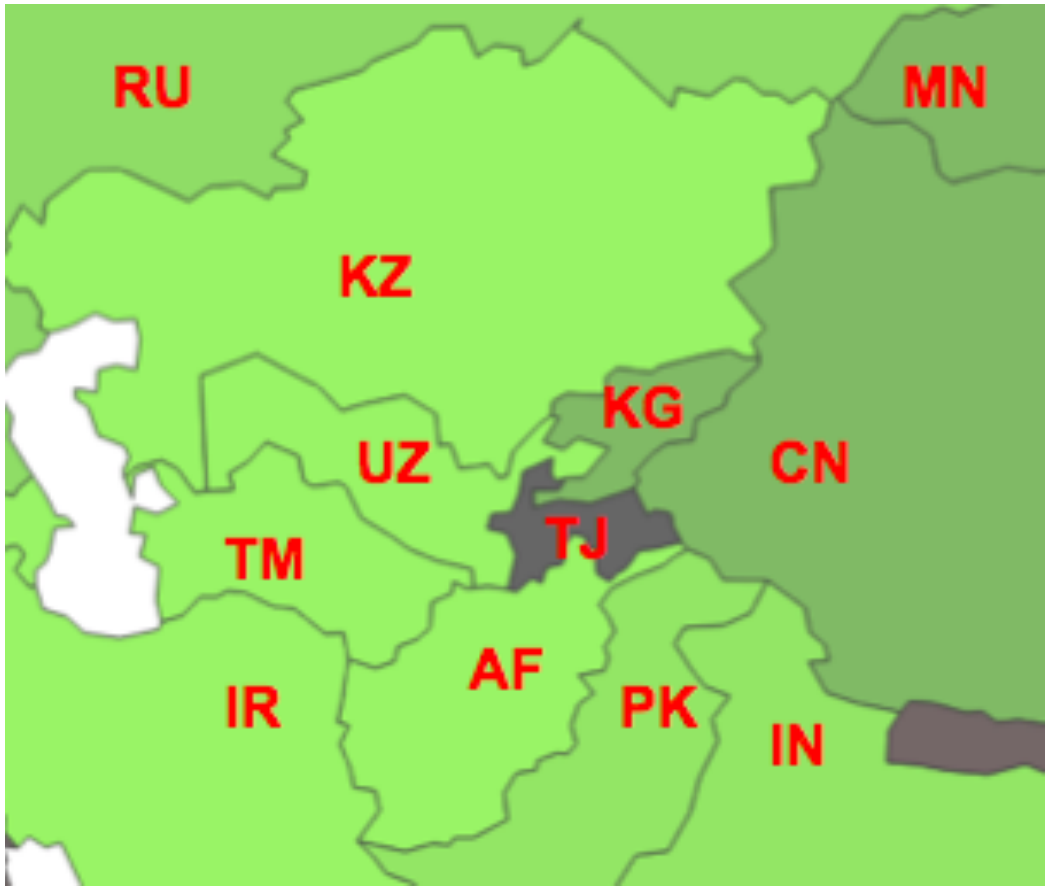
Summary: Kazakhstan Drives The Region

- Provides attractive transit to Kyrgyzstan, Uzbekistan, Tajikistan, and on into Afghanistan
- With TTK's terrestrial Hong Kong routes, these countries now have improved latencies to Asian markets



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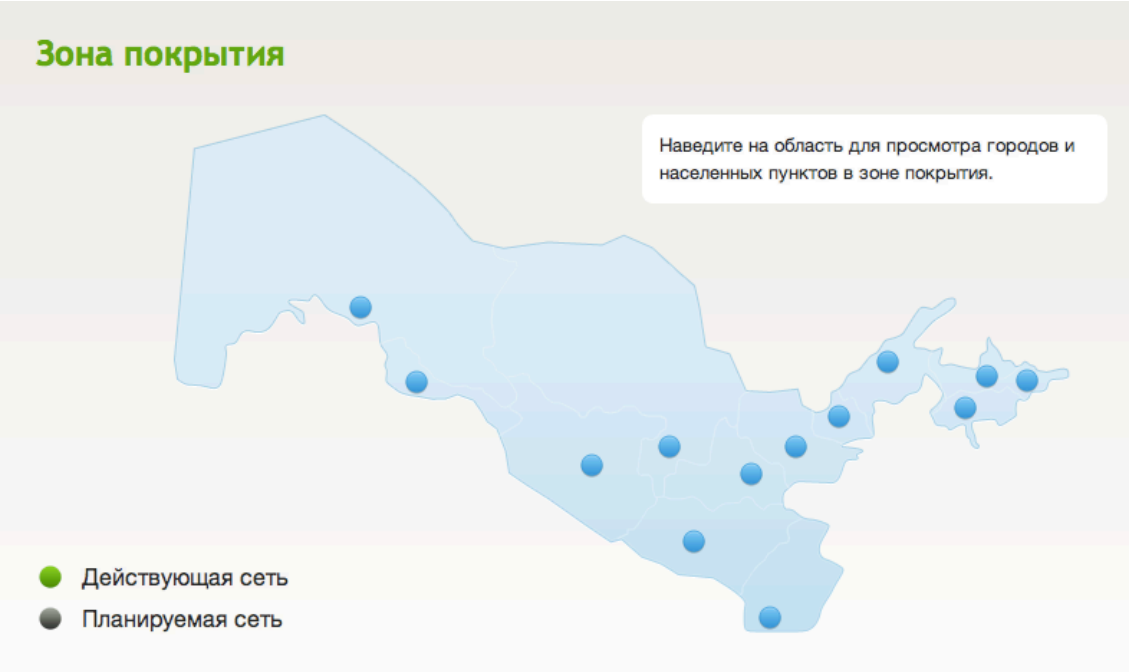
Uzbek Growth Drivers

- Chinese and Russian investment in modernizing Uzbek telecoms
- TAE cable to China
- Four 3G networks leapfrog fixed-line deployment



- Uzbekistan even exports Internet transit to Afghanistan, though not as much as in previous years

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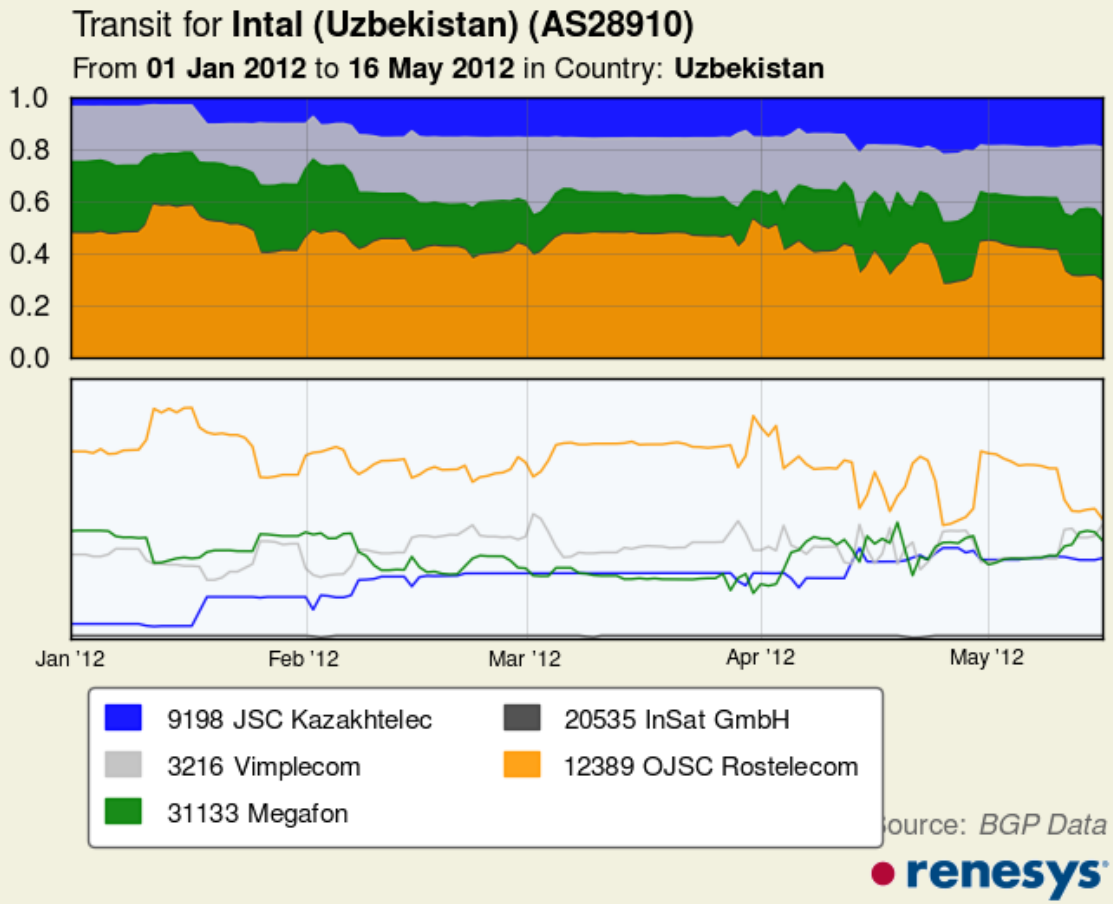
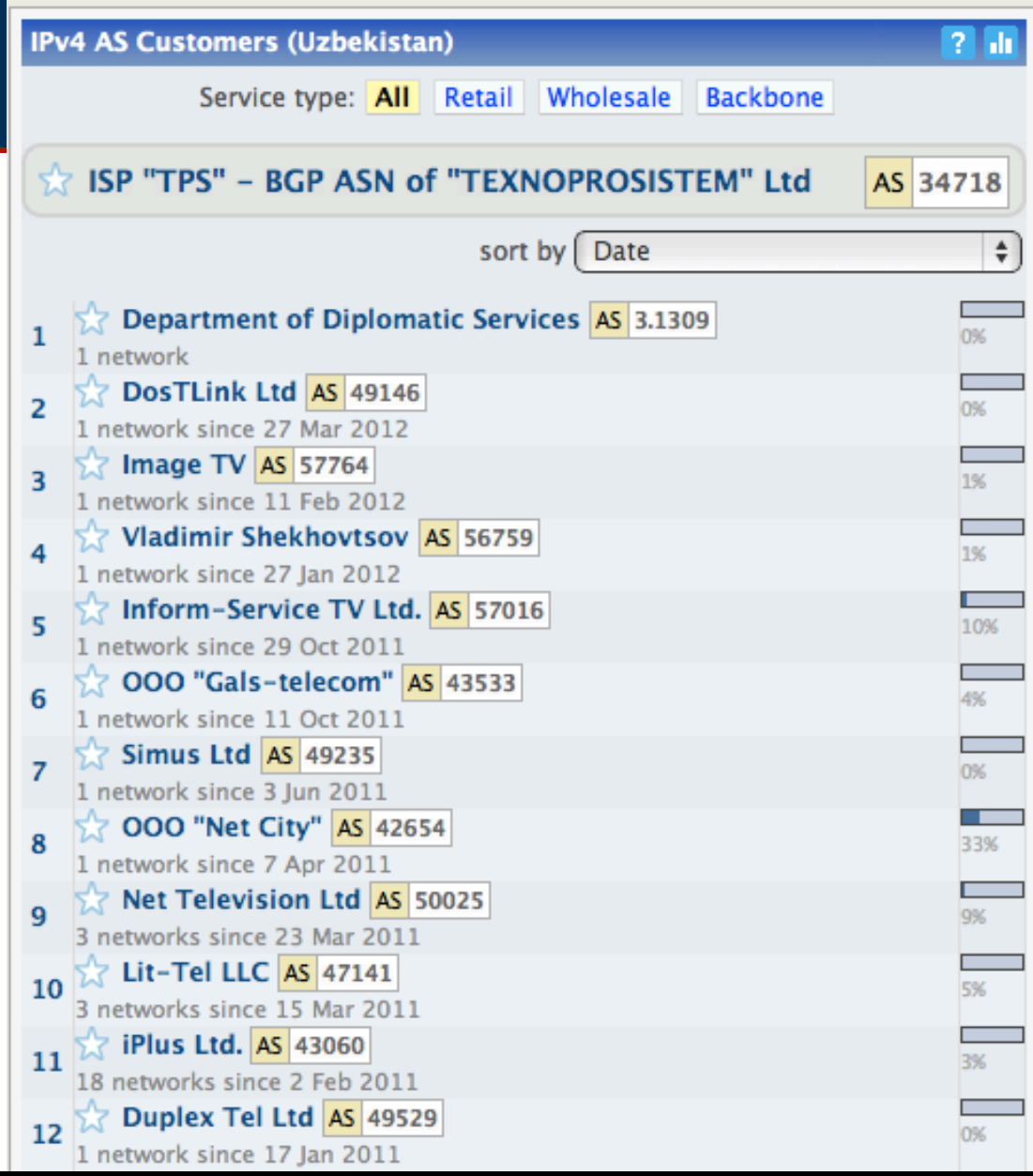
Uzbek Telecom (Intal): Dominant

- Balanced transit via Kazakhtelecom, Vimplecom, Megafon, Rostelecom
- Still retains small amount of InSat satellite transit



Texnoprosistem (AS34718)

- Source of most of Uzbek ASN growth in 2011-2012
- Note proliferation of IPTV – digital TV providers
- Result of a June 2011 tender by the government



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Kazakhstan's Growth Story

- Financial industry modernisation
- Banks and even a mobile payment company are among the new Kazakh ASNs in 2012

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Finance Loves The Internet

- Financial industry modernisation is a classic driver of Internet expansion
- The Internet creates huge opportunities, especially for consumer finance, and lets you trade in the world's financial centers from your home base
- Finance looks for Internet diversity, low or at least predictable latency, and fast access to London, New York, Tokyo, Hong Kong, …

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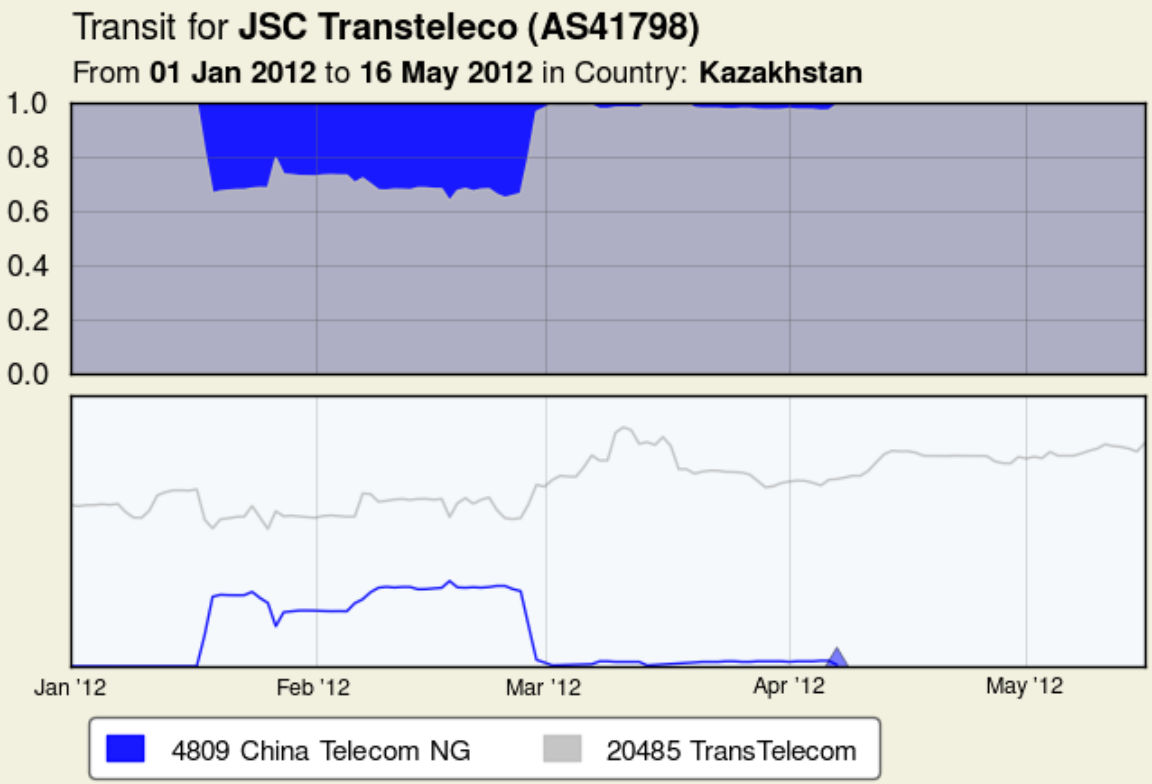
Transtelekom in Kazakhstan (AS41798)

- January 2012: adds TEA transit via **China Telecom (AS4809)**
- Lasts for about 45 days in strength, torn down April 2012
- Why?



Source: *BGP Data*

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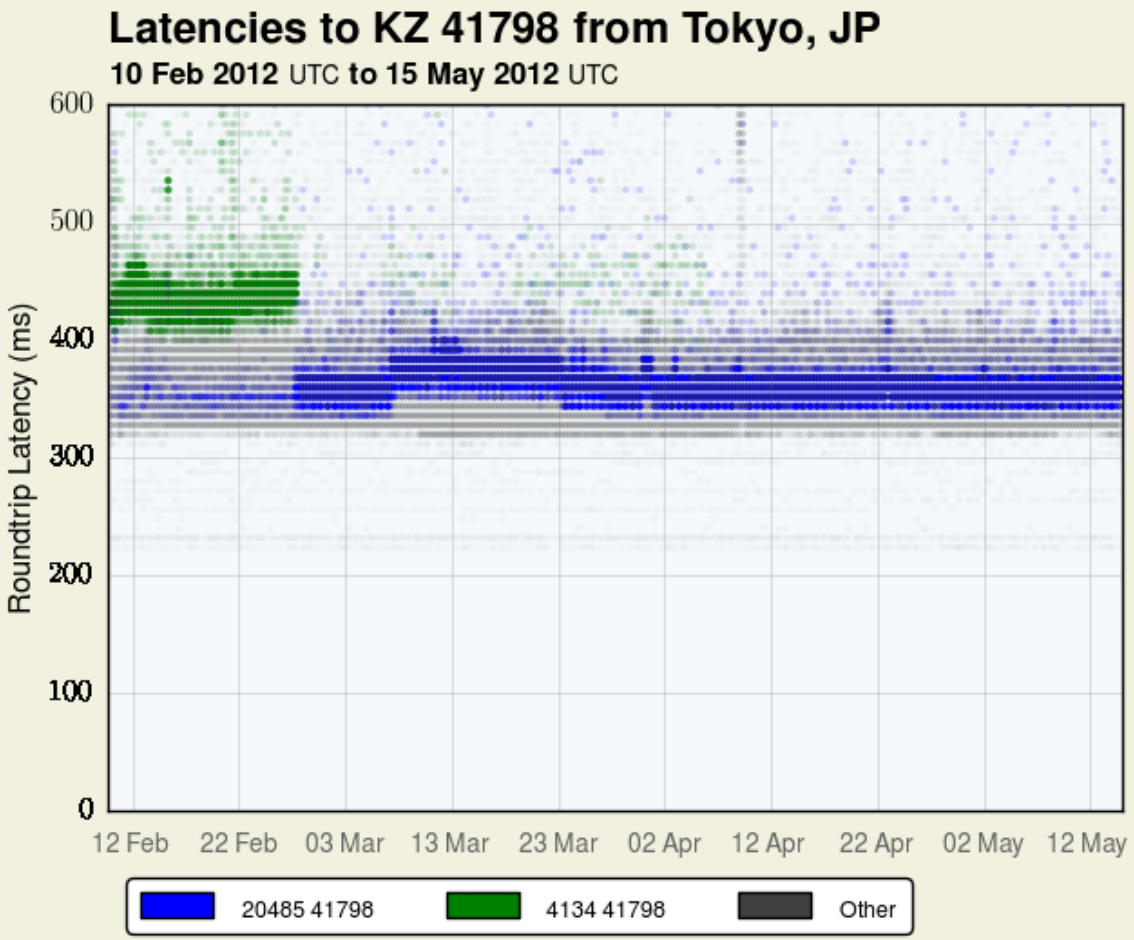
Problem: Chinese routes not the fastest.

- Round-trip latencies from Tokyo to Kazakhstan (ms)
- China Telecom 425ms
- TTK's traditional routes replace CT experimental routes in March, 350ms



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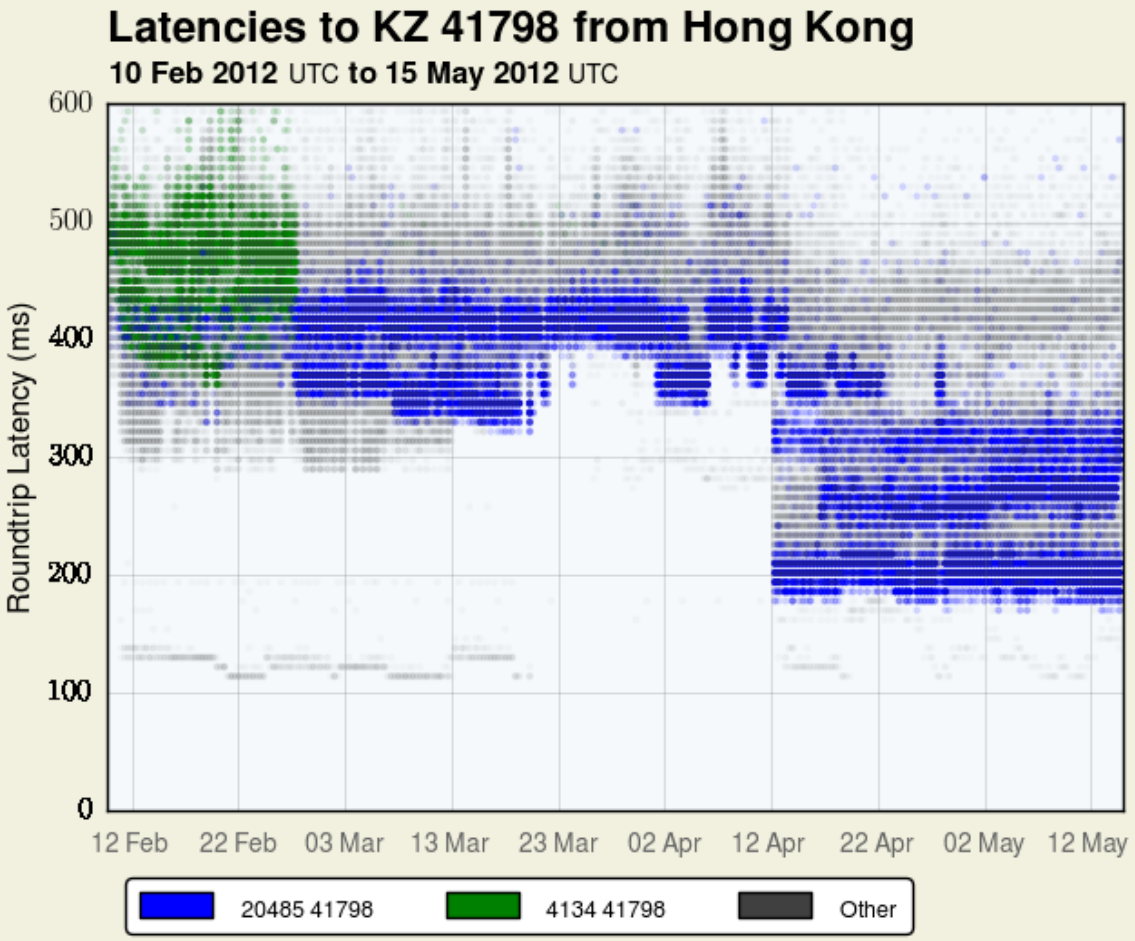
Hong Kong to Kazakhstan

- China Telecom 400-500+ ms
- TTK's existing connectivity 350ms
- Improves to **190ms** on 12 April: activation of some fast paths



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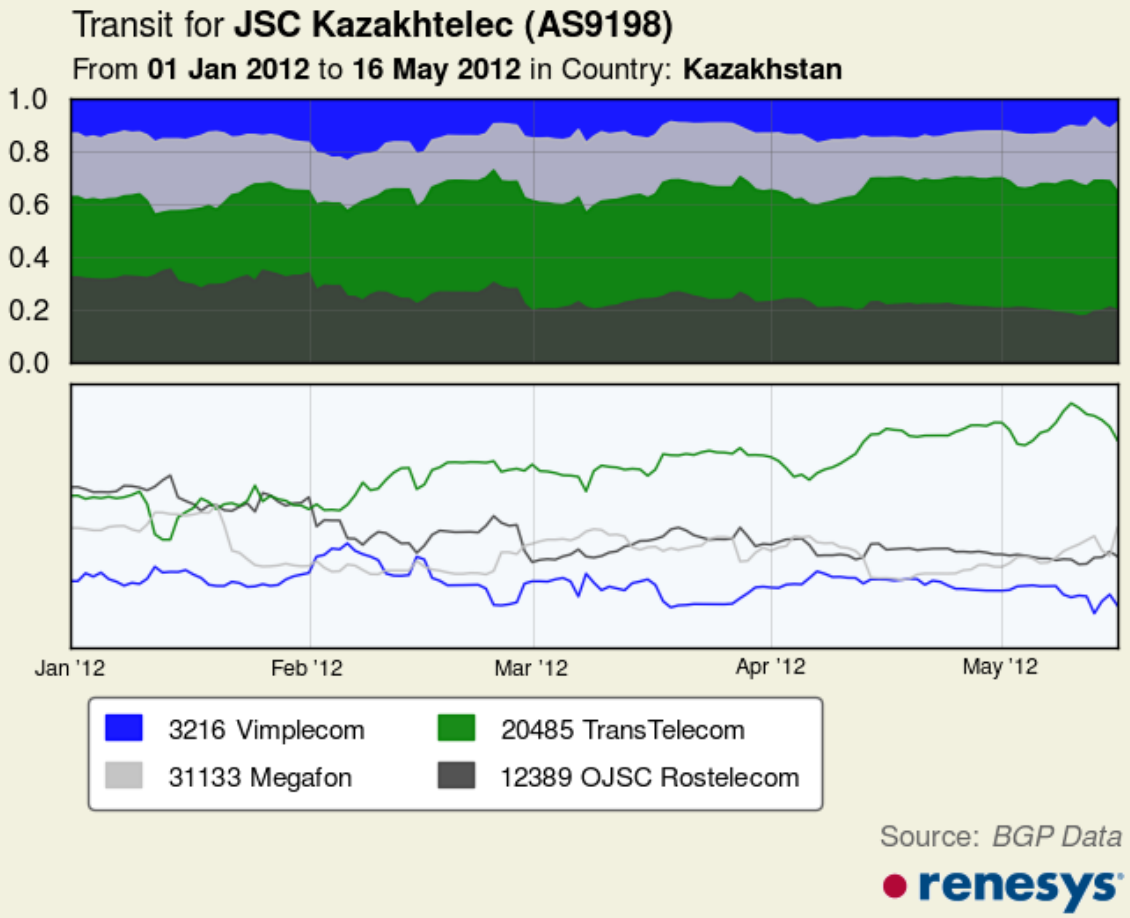
Kazakhtelekom (AS9198)

- Note TTK, Rostelecom, Vimplecom, and Megafon transit
- TTK share increases steadily in 2012



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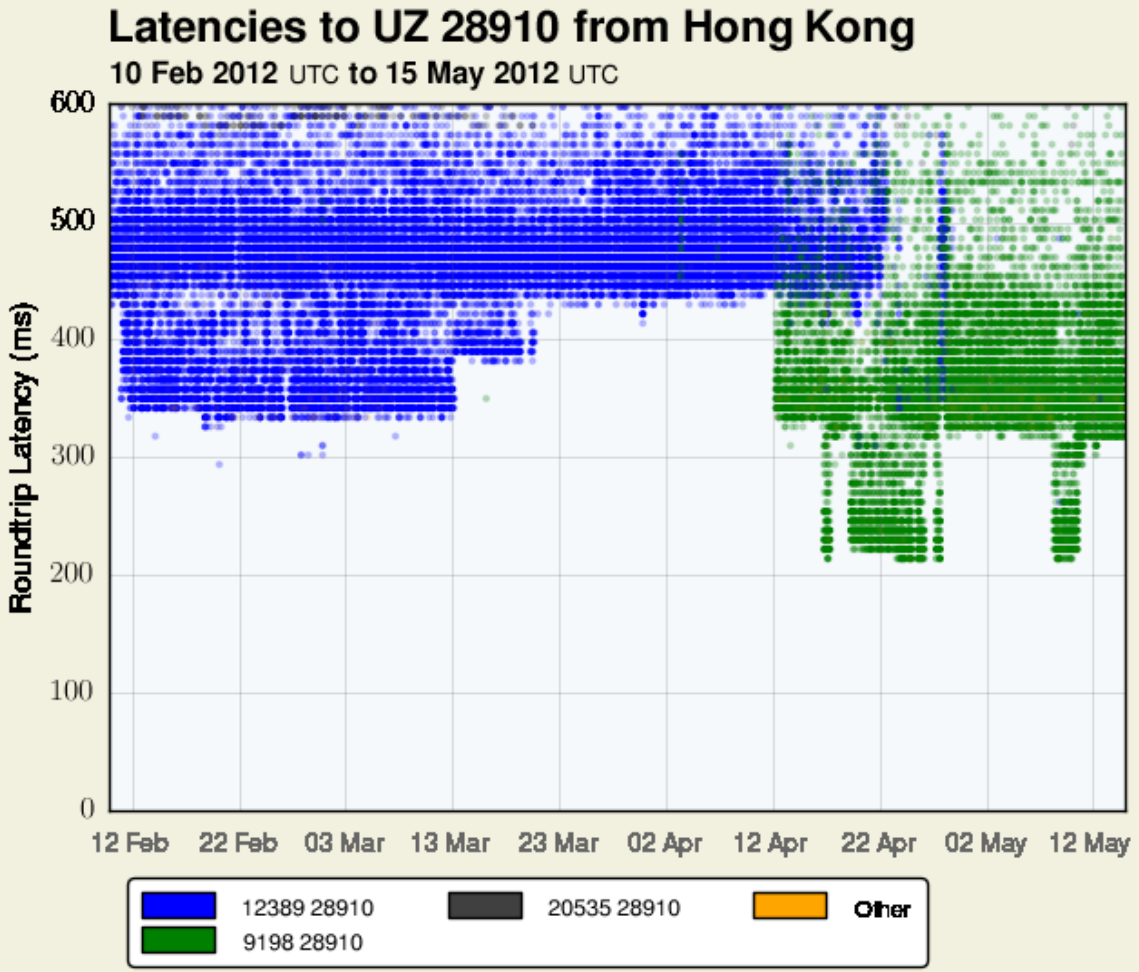
Hong Kong to Uzbekistan via TTK+Kazakht.

- Rostelecom: 340ms, 450ms
- Replaced by Transtelekom +Kazakhtelecom in April 2012: 210ms possible
- Note overlapping transition window of one week



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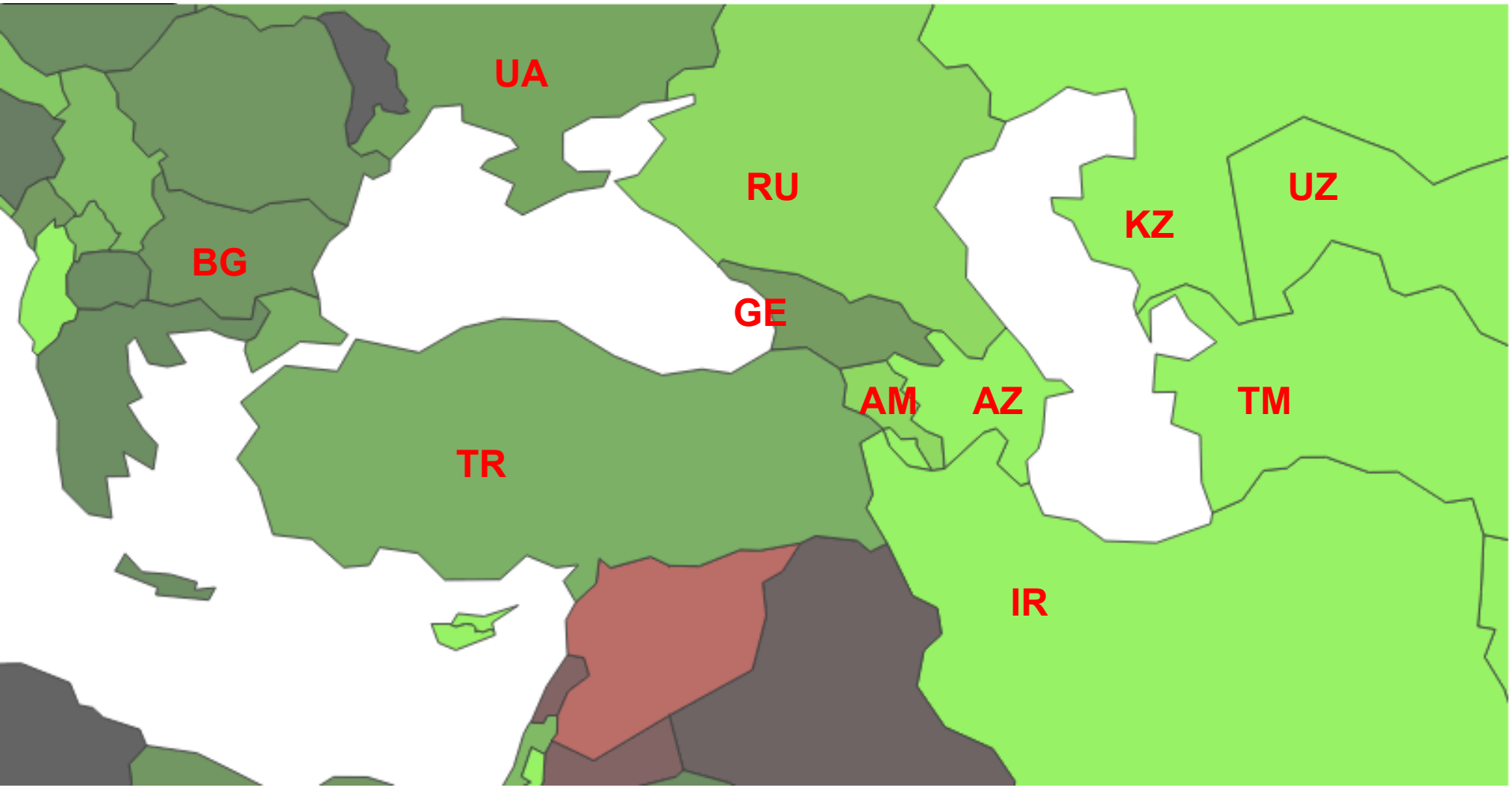
Caucasus and the Transcaspian



Caucasus and the Transcaspian

- Highest-growth region, particularly Azerbaijan
- Fiber follows energy (e.g., Baku-Tbilisi-Ceyhan)
- Companies from east and west fighting to provide service to the growing Internet market here
  - Georgia looks west, to **Turkey and Bulgaria**
  - Azerbaijan looks to **Russia, Iran,** and eastward
  - Armenia in the middle, key investments may tip the balance
  - Turkmenistan at the end, isolated for now

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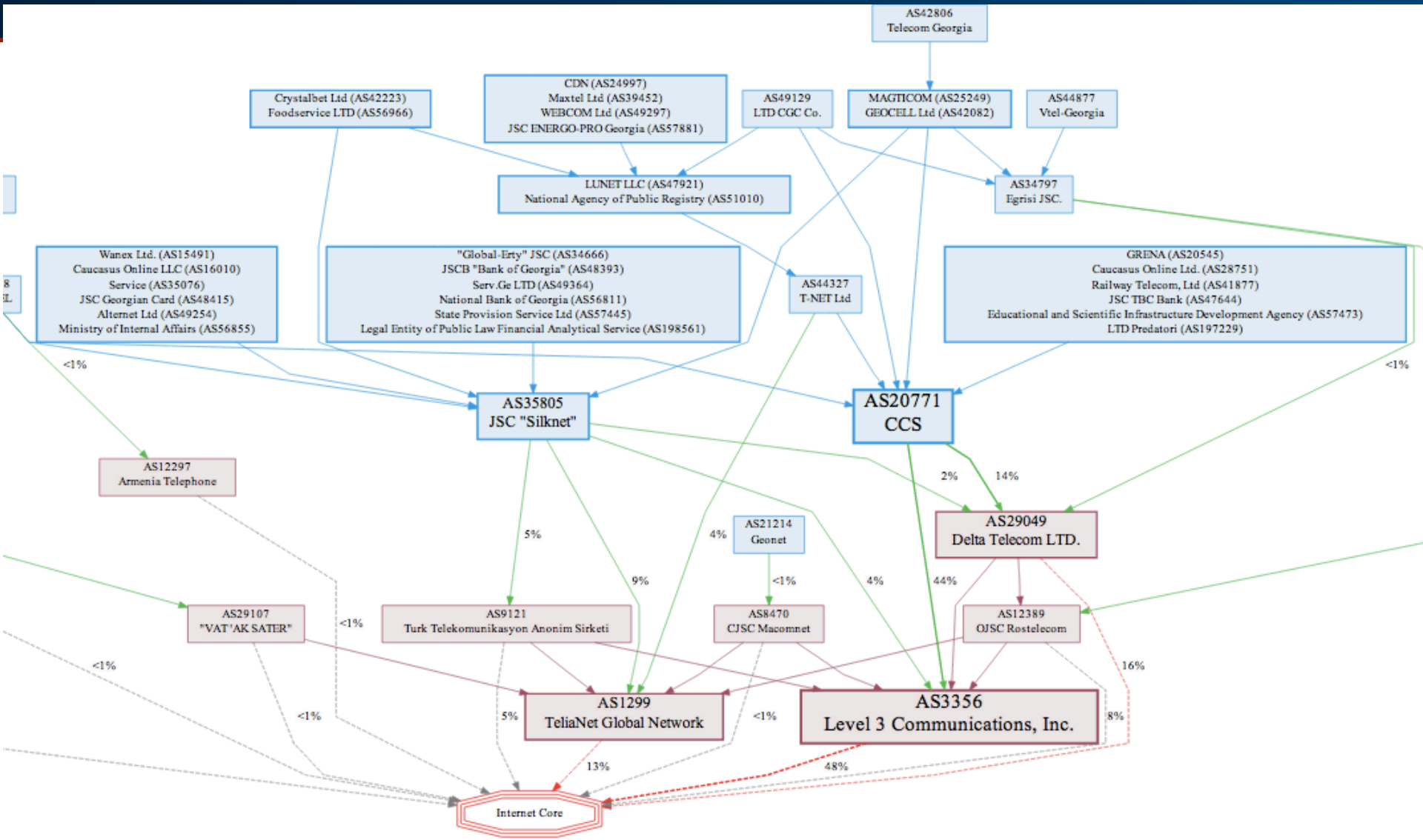
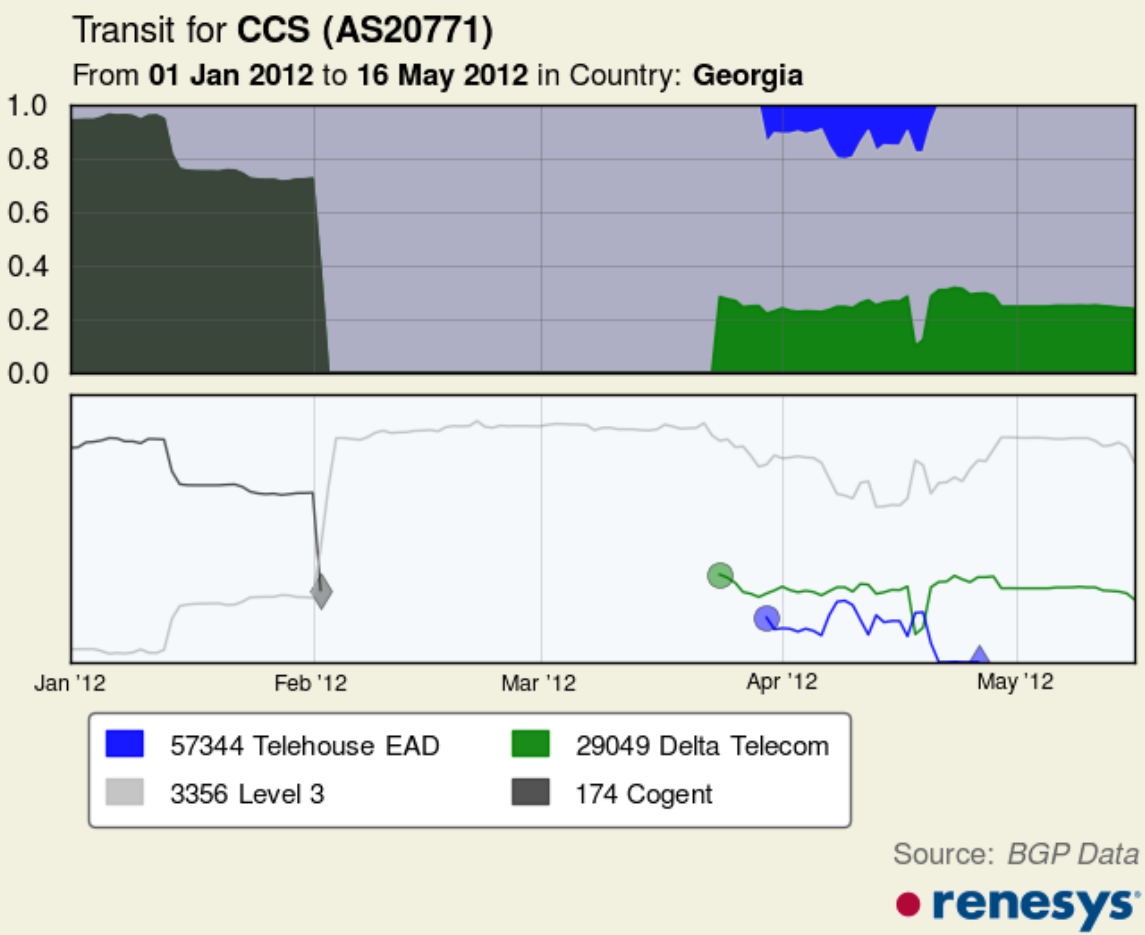
Georgia's choices



Georgia: Caucasus Cable System (AS20771)

- Black Sea cable from Poti, Georgia to Varna, Bulgaria
- Dropped Cogent in February 2012
- Backup transit eastbound through Delta Telecom Azerbaijan



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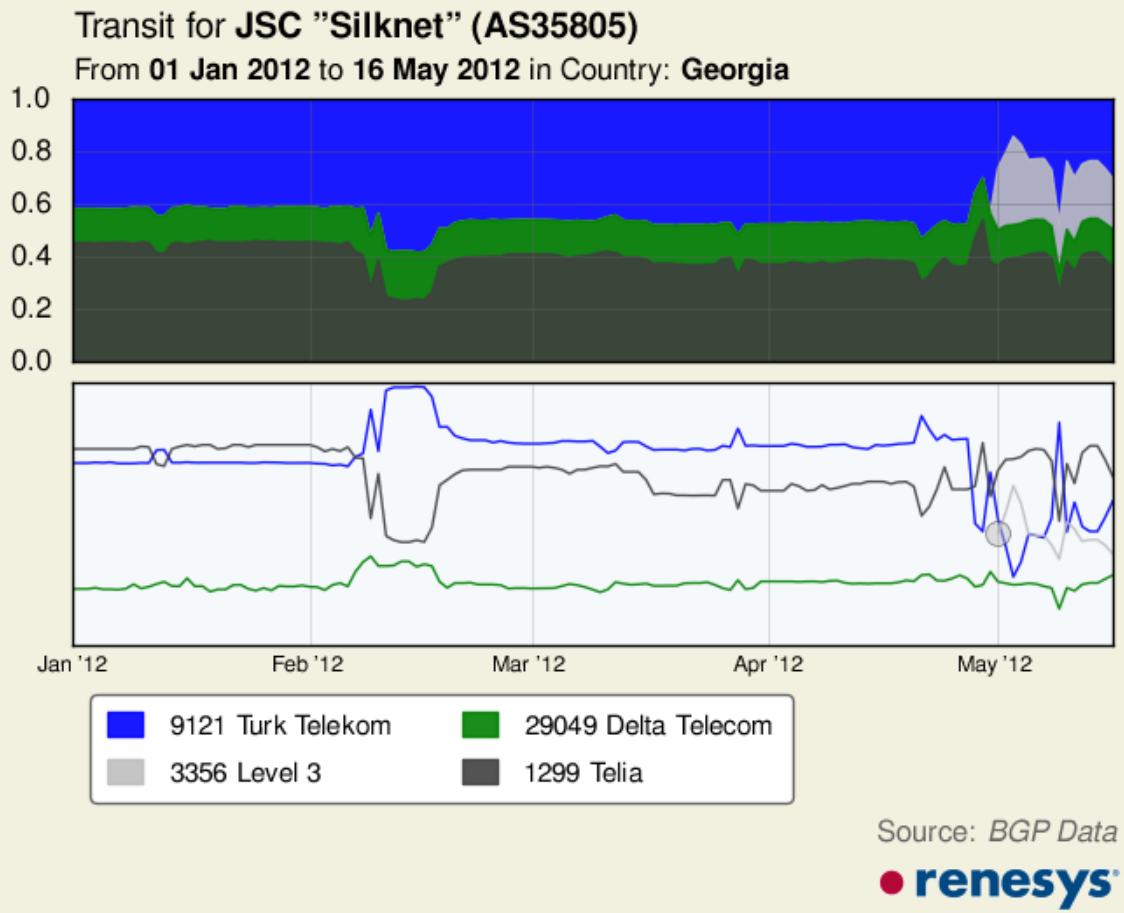
Georgia: Silknet (AS35805)

- Silknet picks up Level3 in May 2012 as 4th provider
- East and west: Turk Telekom, Level3, Delta, Telia



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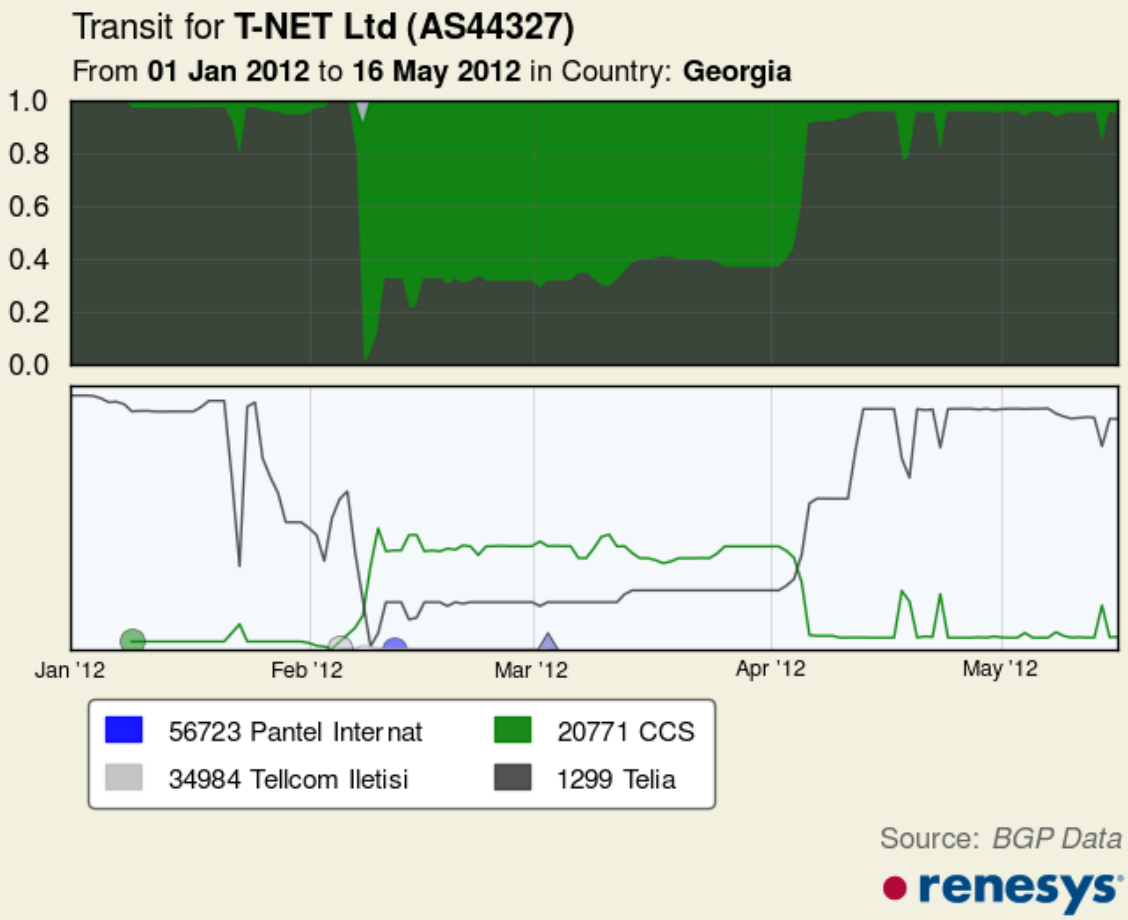
Georgia: T-Net (AS44327)

- The third way out of Georgia: across the Turkish border.
- Connections to Turkey's Tellcom/ Superonline and Pantel (Turk Telekom Intl) suggest experimentation



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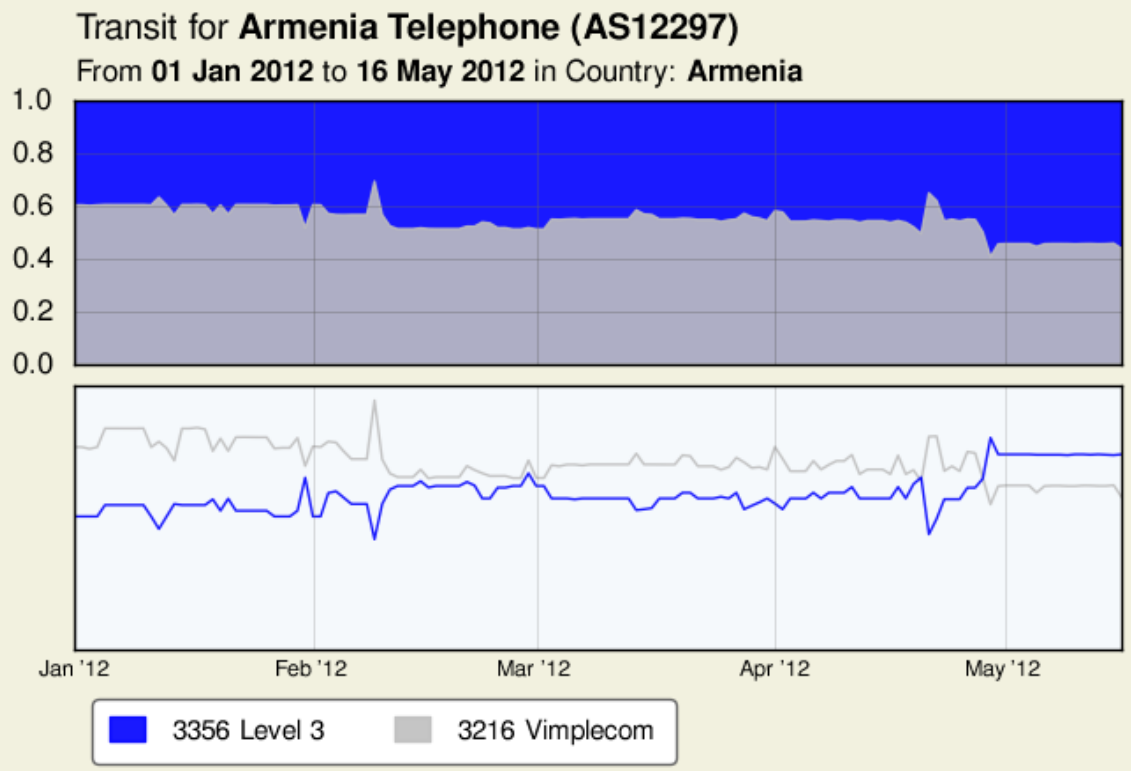
Armenia: Looking East and West

- Old Armenian Telephone (AS12297)
- Half transit west to **Level3** on CCS
- Half transit east to **Vimplecom**
- No other way to get redundancy
- Potential Iran-Turkey path



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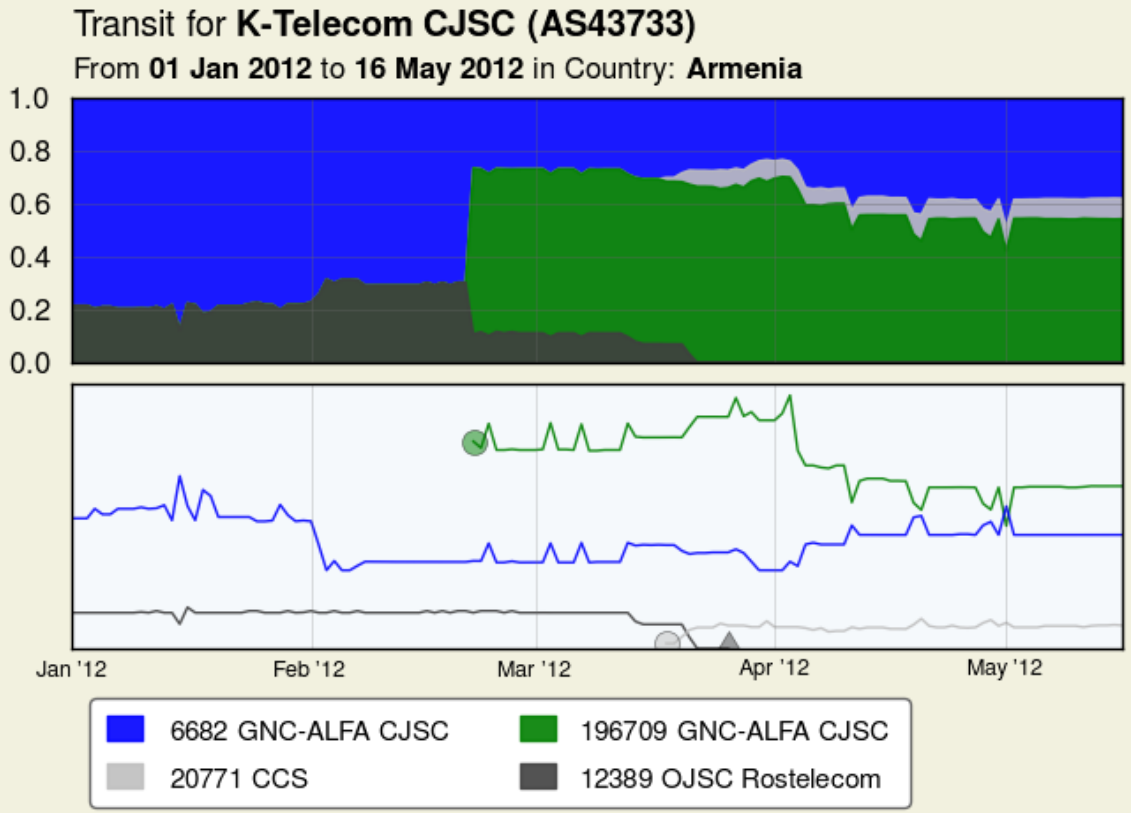
Armenia: GNC-Alfa acquired by Rostelecom

- Feb 3rd 2012: acquires 75%+1
- Dual ASNs now in use: AS6682 headed west on the CCS, AS196709 headed east to Rostelecom
- Here's customer K-Telecom reacting



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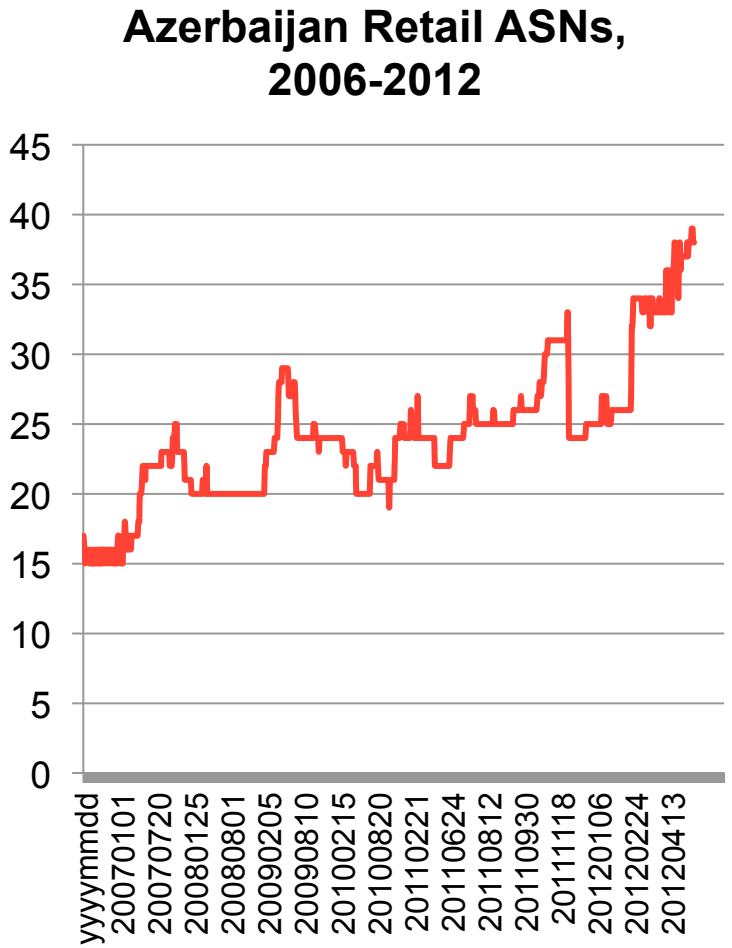
Azerbaijan: Highest Regional Growth

- In the last year, have gone from 24 to 37 retail ASNs
- 32-bit ASNs DO matter!
  - AS57293, AG Telecom
  - AS57675, Seabak LLC
  - AS57304, SuperOnlayn LTD
  - AS197223, Eurosel LLC
  - AS196821, Ministry ICT AZ
  - AS196925, Azertelekom
  - AS196961, Datacell LLC
  - AS197830, Baksell LTD
  - AS198448, Meqa-Telekom LTD



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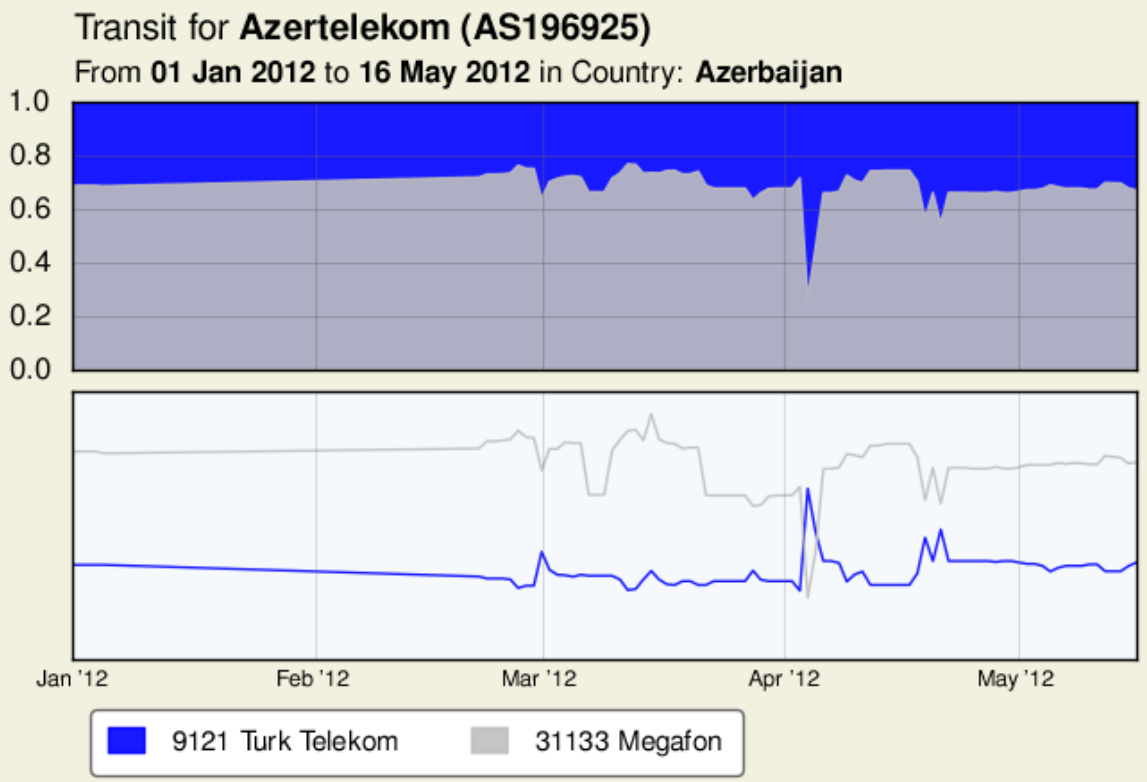
Azerbaijan is diversifying, slowly

- Azertelekom (AS196925) buys independent transit from Turk Telekom and Russian Megafon
- Azerfon and Baksell are ASN customers



Source: *BGP Data*

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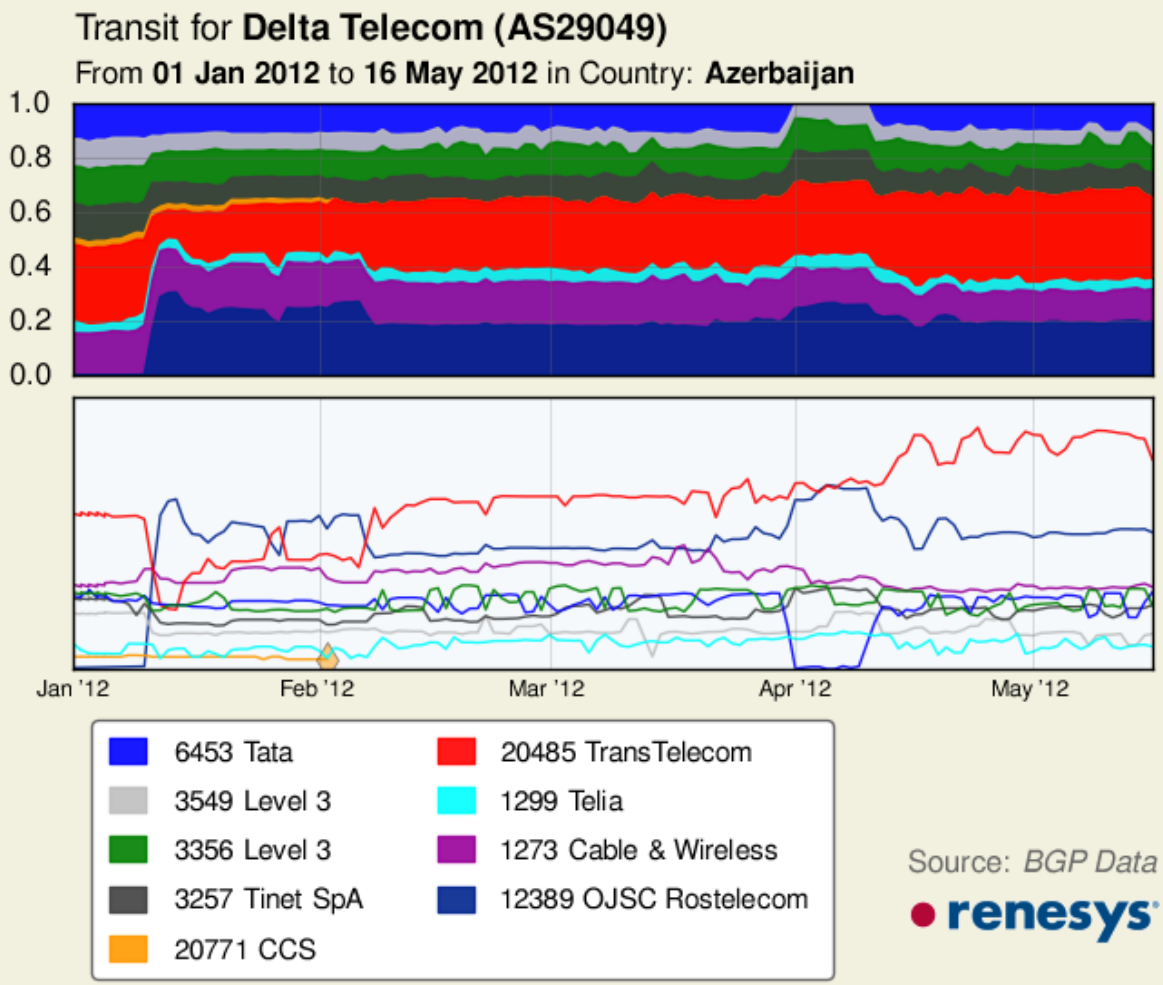
Azerbaijan's Delta Telecom (AS29049)

- Replaces CCS with **Rostelecom** in Jan-Feb 2012
- Remaining European transit is stable or shrinking
- TTK is growing in importance, especially for routes from Asia



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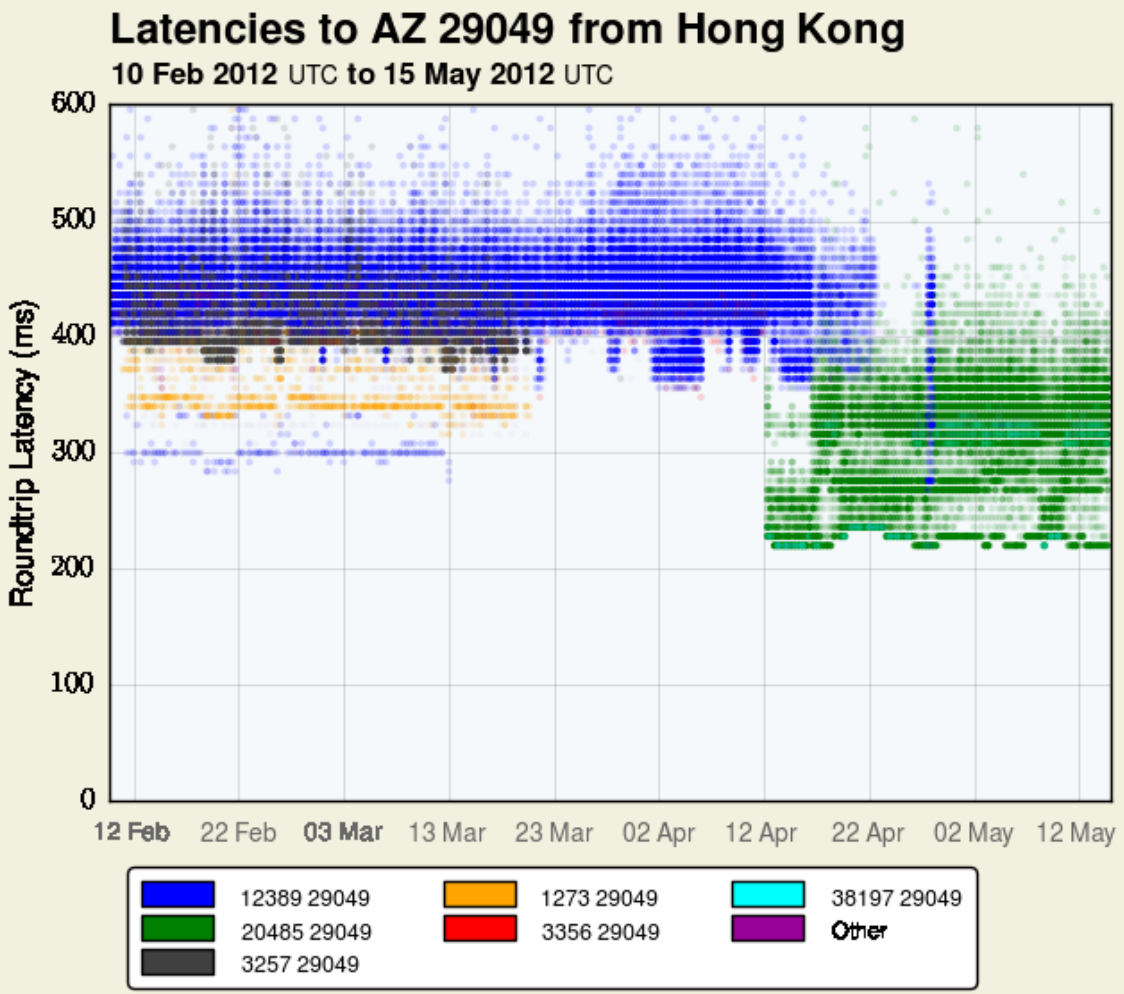
Azerbaijan's Delta Telecom (AS29049)

- Note how traceroutes from Hong Kong shift in April 2012
- Was: Rostelecom, C&W, Level3, Tinet
- Now: 220ms RTT Transtelecom.



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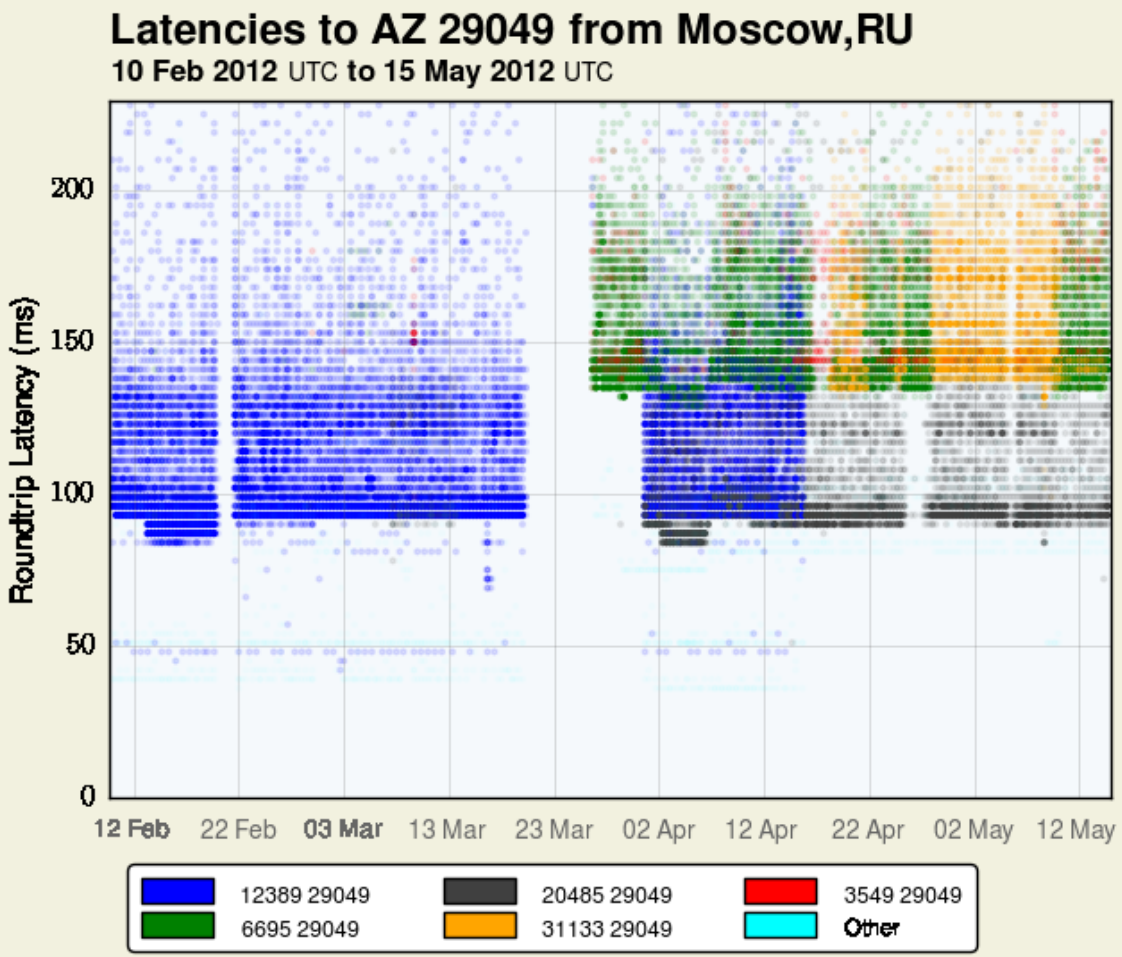
Azerbaijan's Delta Telecom (AS29049)

- From Moscow:
- Rostelecom and TTK have more direct paths <100ms
- DECIX, Megafon, GLBX/Level3 have slower paths through Frankfurt
- Significant variability, though



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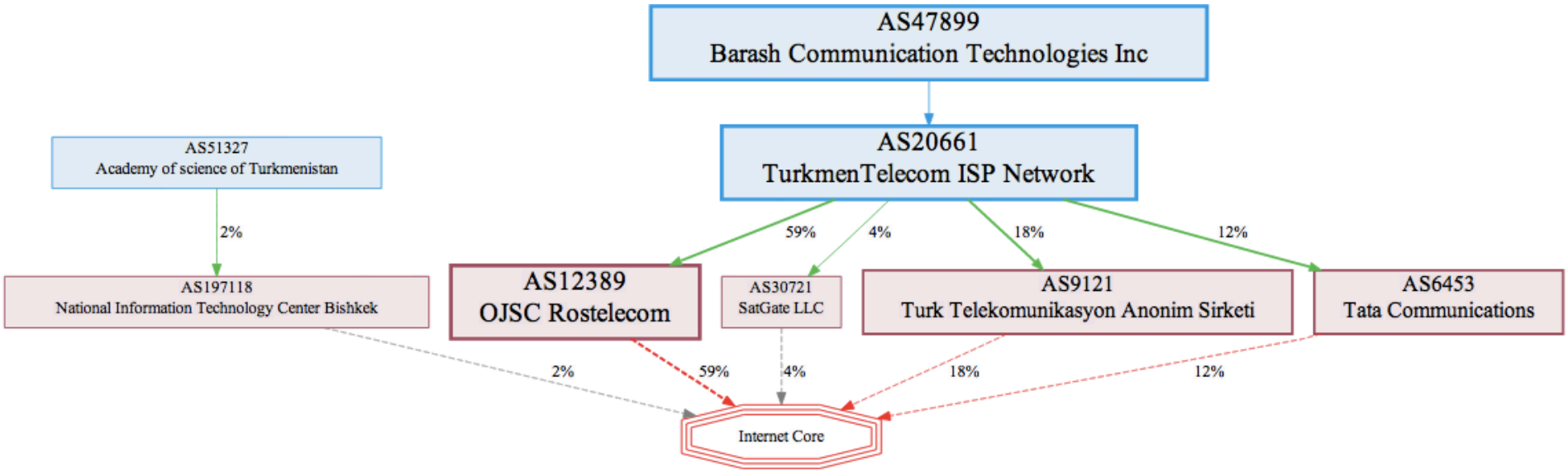
A final word: Turkmenistan

- Separated from the Caucasus by the Caspian
- Separated from Central Asia by the Karakom
- Separated from Iran by the Kopet Dag



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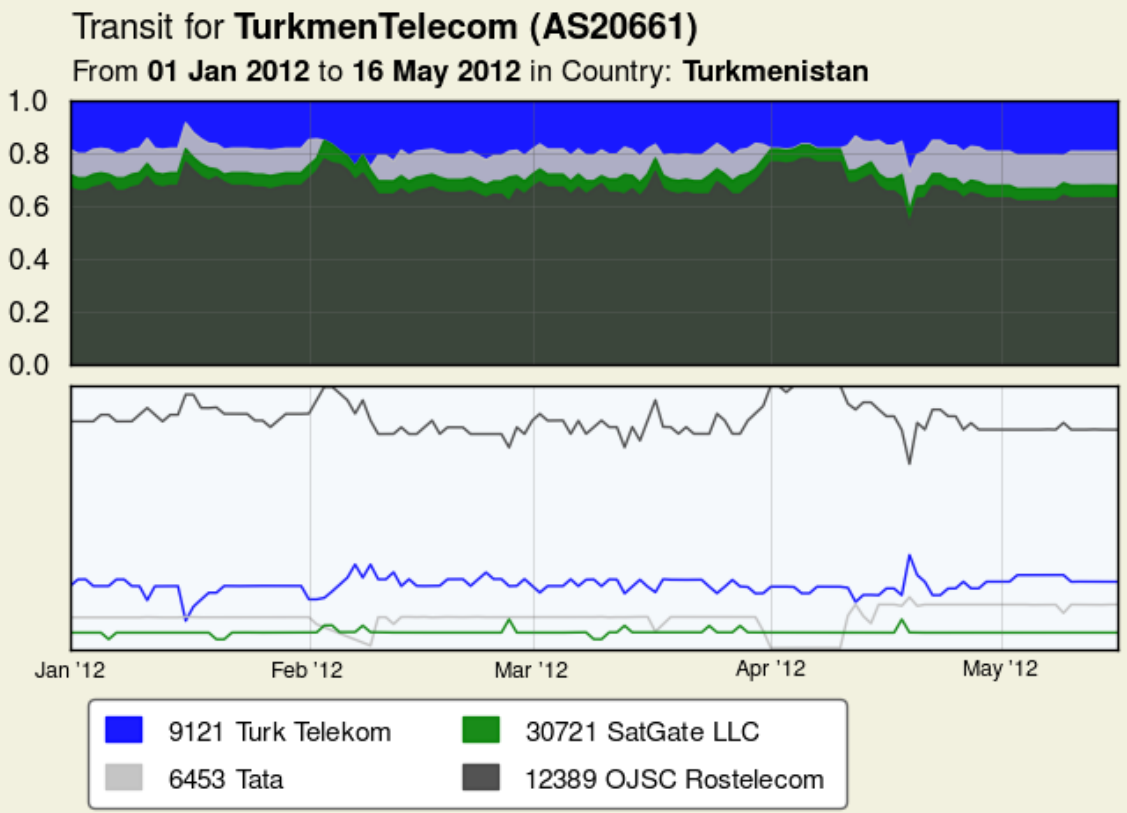
Turkmen Telecom (AS20661)

- Turk Telekom, Tata, Rostelecom provide transit
- Satellite connectivity for a single IPv4 prefix, “just in case”
- I remember great excitement at ENOG1 when seeing Turk Telekom turn on..



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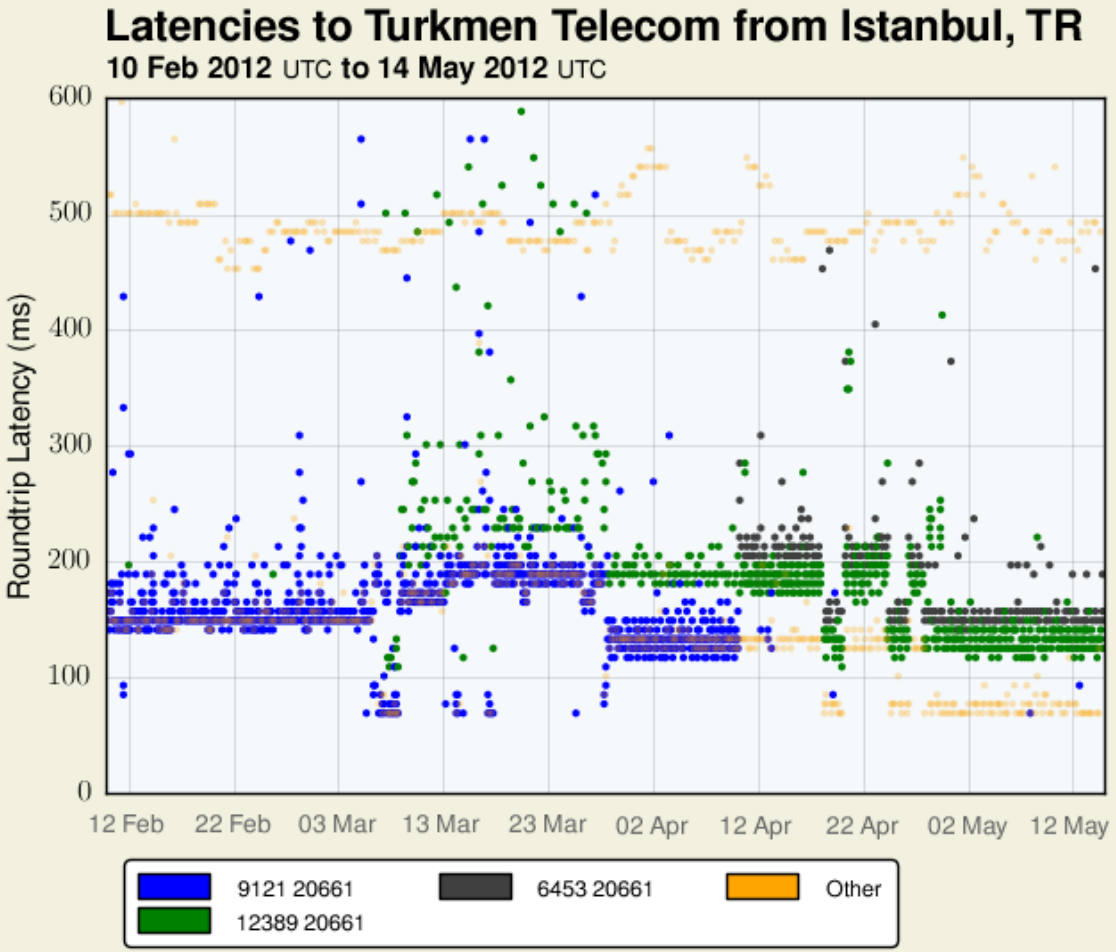
Turkmen Telecom latencies from Istanbul

- But latencies very similar, whether you arrive on **Turk Telekom**, **Rostelecom**, or **Tata**
- **Can we hope for a Transcaspian fiber solution?**



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Someday: 200ms Istanbul – Hong Kong?

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Thanks again!

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