Overview of Central Asian Internet Connectivity

Kazakhstan
Kyrgyz Republic
Uzbekistan
Tajikistan
Turkmenistan

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Central Asian Regional Internet Connectivity

- During the Soviet period, the 15 Union Republics were held together by trade networks, centrally planned prices and subsidies, and a common currency

- After the collapse, everything reset. Geography (connections to neighbors) and infrastructure (energy pipelines, rail networks) became the major determinants of the evolution of the Internet

- Different countries reacted differently to the sudden availability of international transit, depending on the role of the national incumbent and the available competing paths to new transit markets

- The Baltics had the most choices; Central Asia had the fewest.

- Baltic states, Moldova, Belarus, Ukraine have fiber to EU
- Caucasus states follow pipelines to the EU
- **Central Asia needs diverse terrestrial paths to submarine landings**
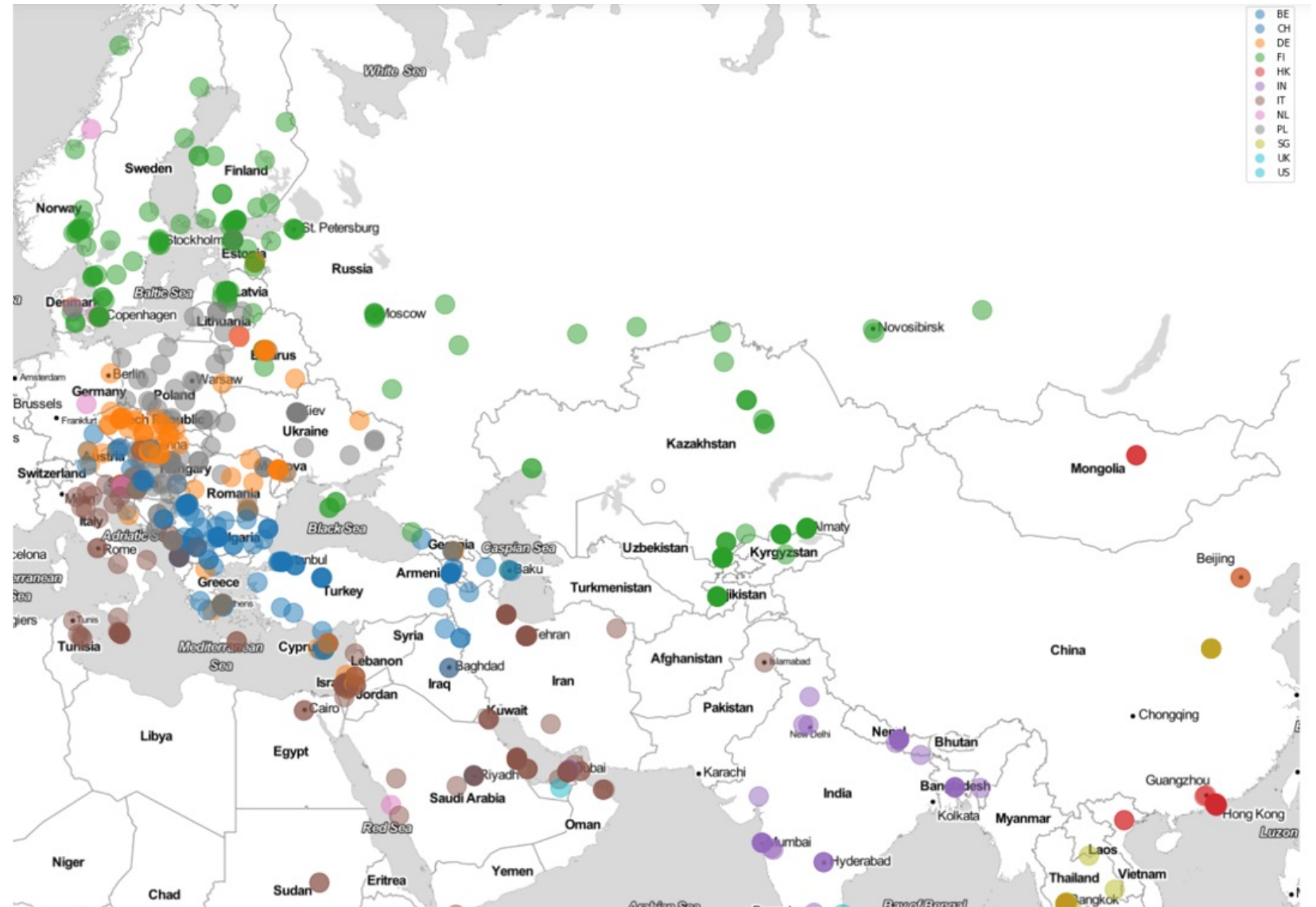
8.8.8.8 (Google Public DNS)

Random sample of RIPE Atlas Probes from each country were asked:

"Which specific instance of Google Public DNS responds when you query anycast 8.8.8.8?"

Here, probes are colored by their responding instance.

8.8.8.8 (Google Public DNS)

Random sample of RIPE Atlas Probes from each country were asked:

"Which specific instance of Google Public DNS responds when you query anycast 8.8.8.8?"

This is one way of looking at the natural Internet watersheds that surround Central Asia.

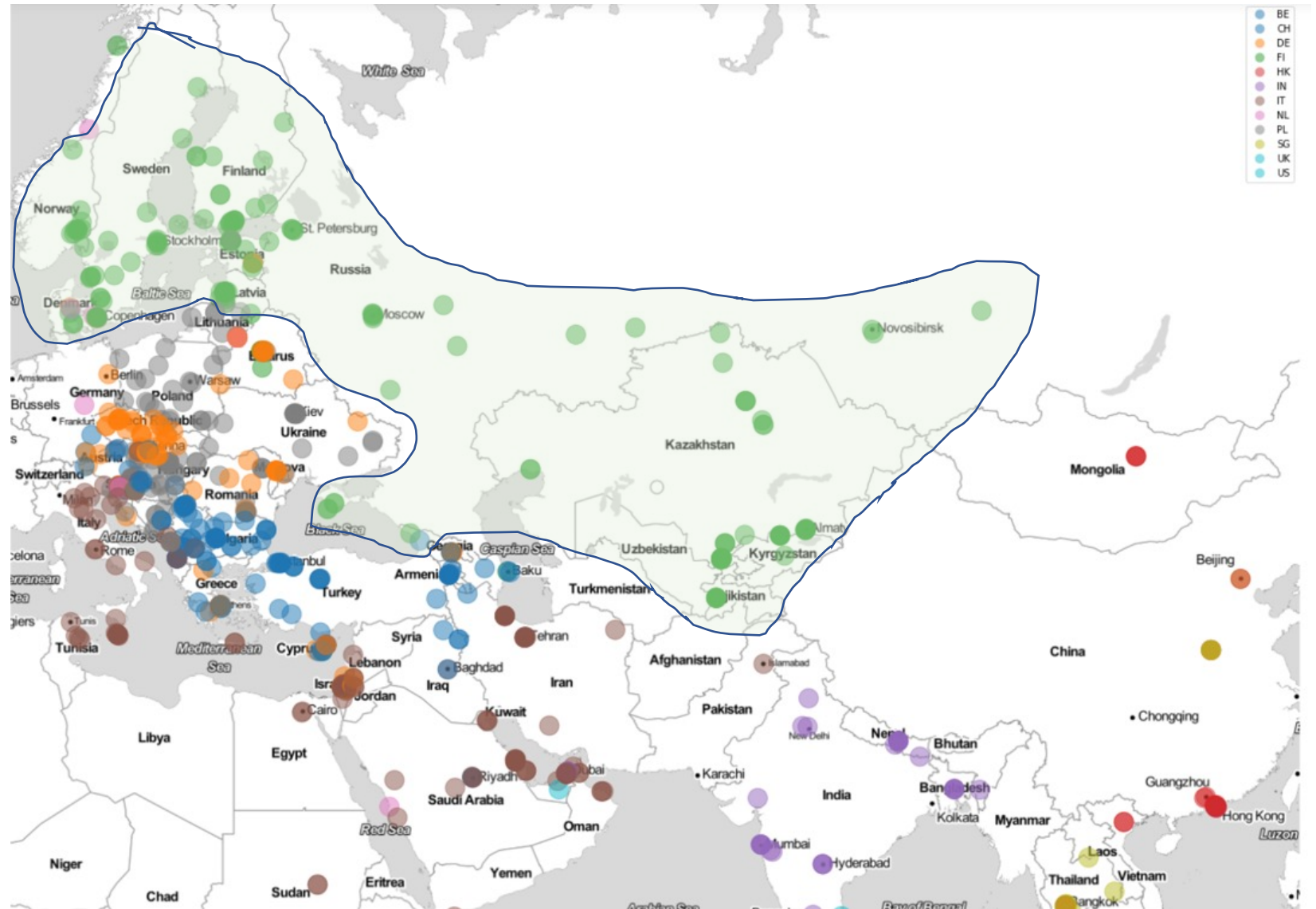**Central Asia is the natural meeting place of FIVE different Internet watersheds.**
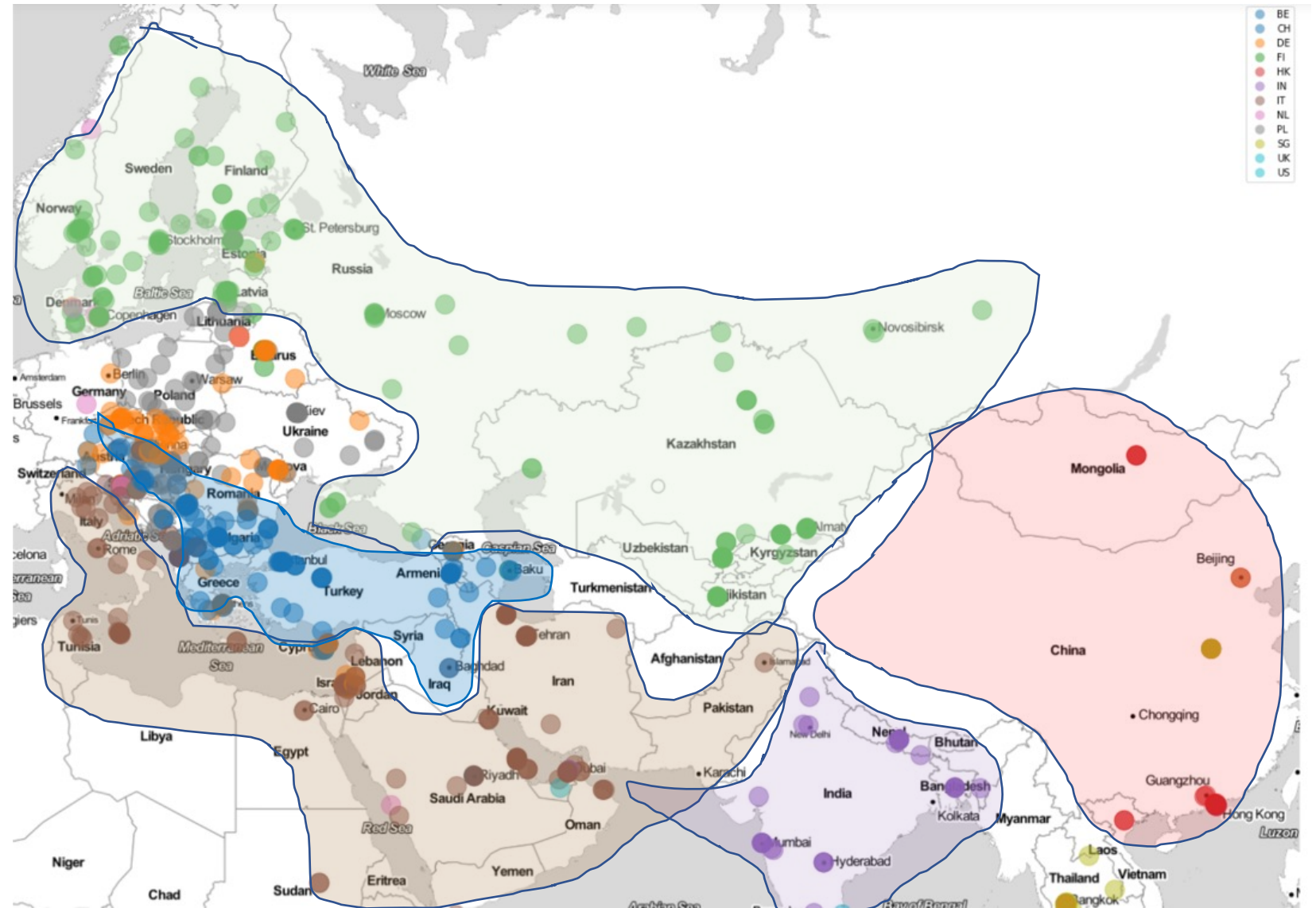
Most Central Asian probes are answered from **Lappeenranta, Finland (lpp, green)**

This region relies on Russian transit, and Russian transit relies on TeliaSonera/Arelion (AS1299)

What are the other alternatives?

Connectivity to China would connect the region to Google's instance in Hong Kong
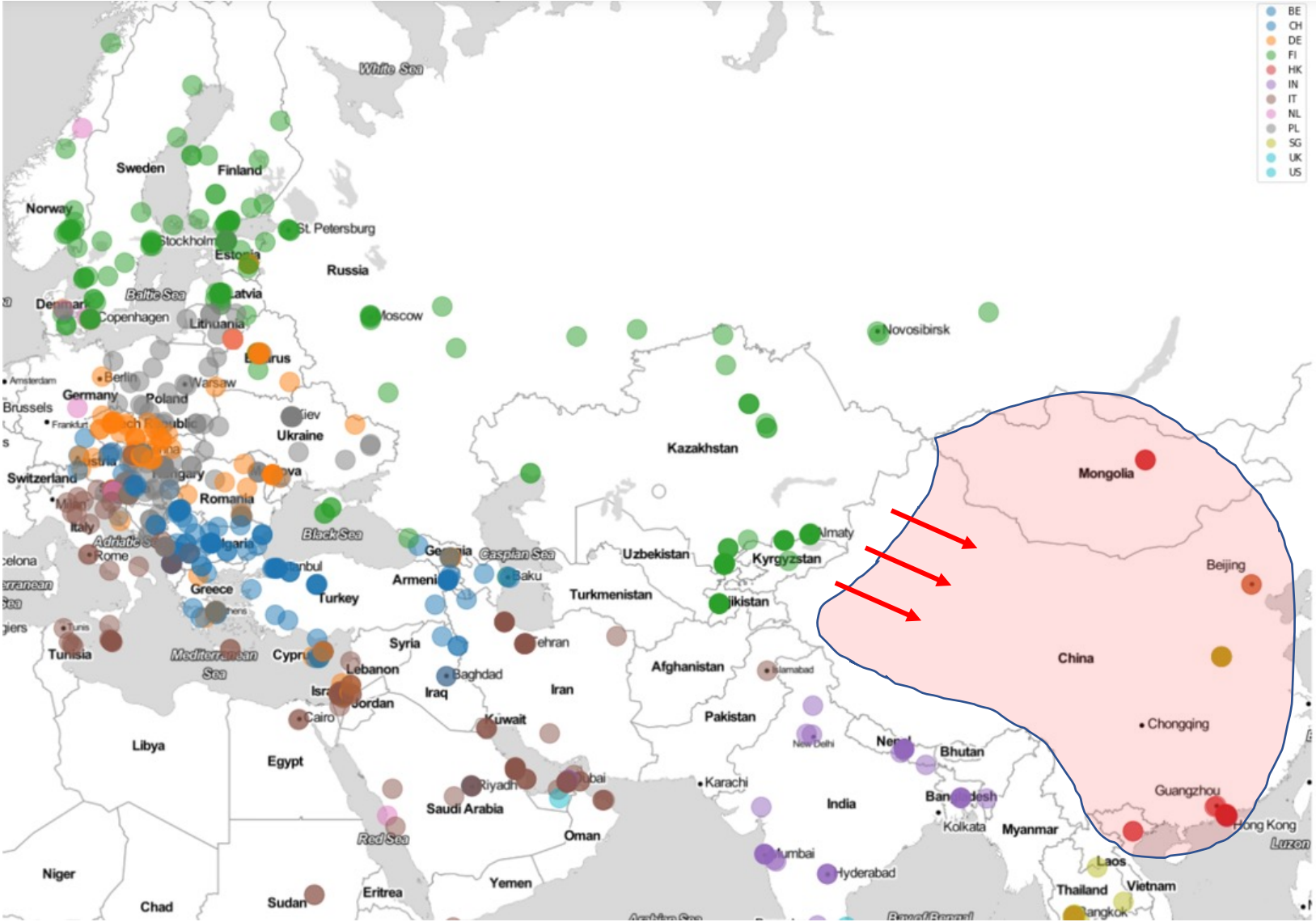
Status: plausible

Connectivity to China would connect the region to Google's instance in Hong Kong

Status: plausible but not currently visible in latency plots (paths return to Europe)
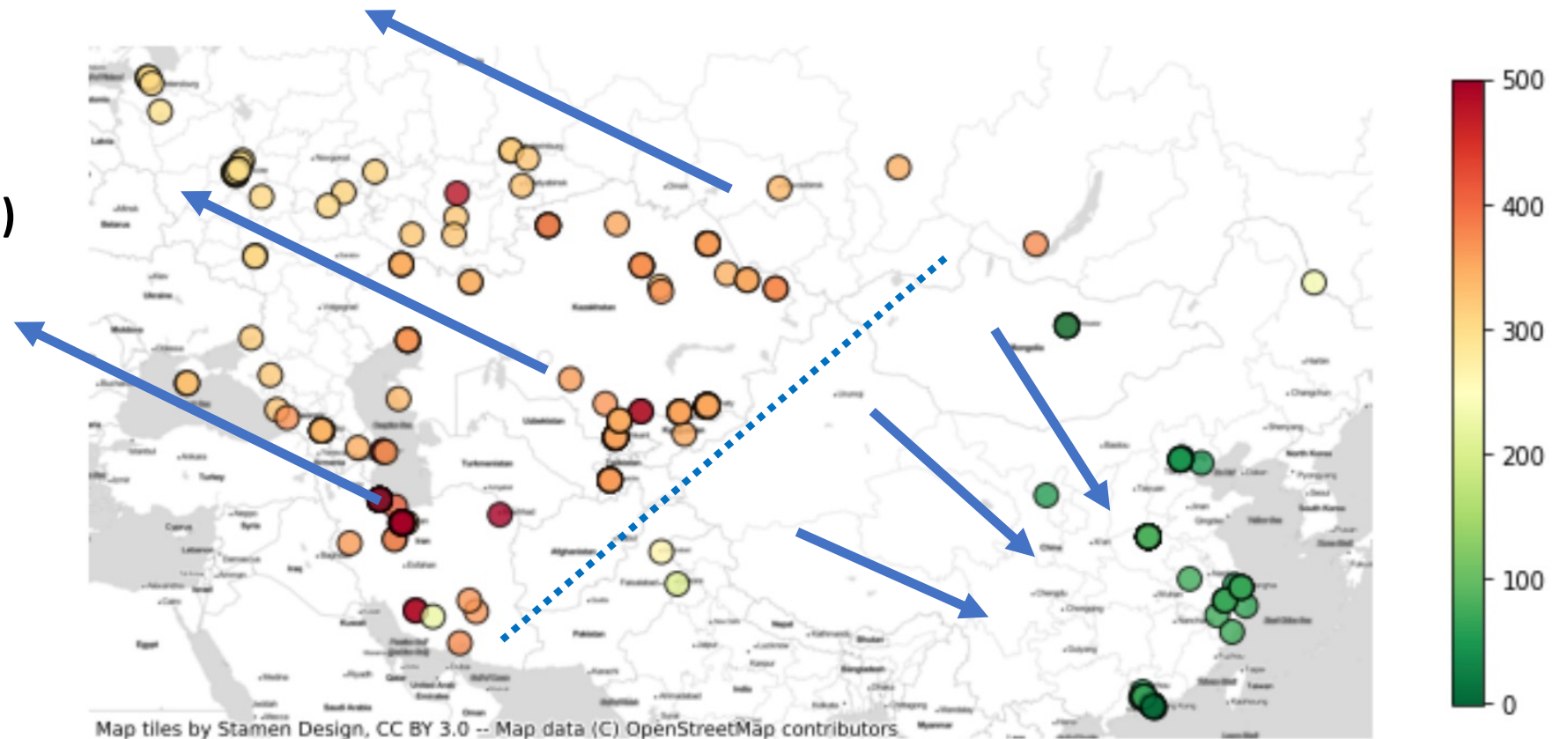
Latencies to 8.8.8.8 in Hong Kong (ms)

Map tiles by Stamen Design, CC BY 3.0 -- Map data (C) OpenStreetMap contributors

India?

India has significant interest in improving economic connectivity with Central Asia, but Gulf connectivity seems more likely than terrestrial through Afghanistan/Pakistan to reach **Mumbai**

Status: challenging

North South Transport Corridor (NSTC)
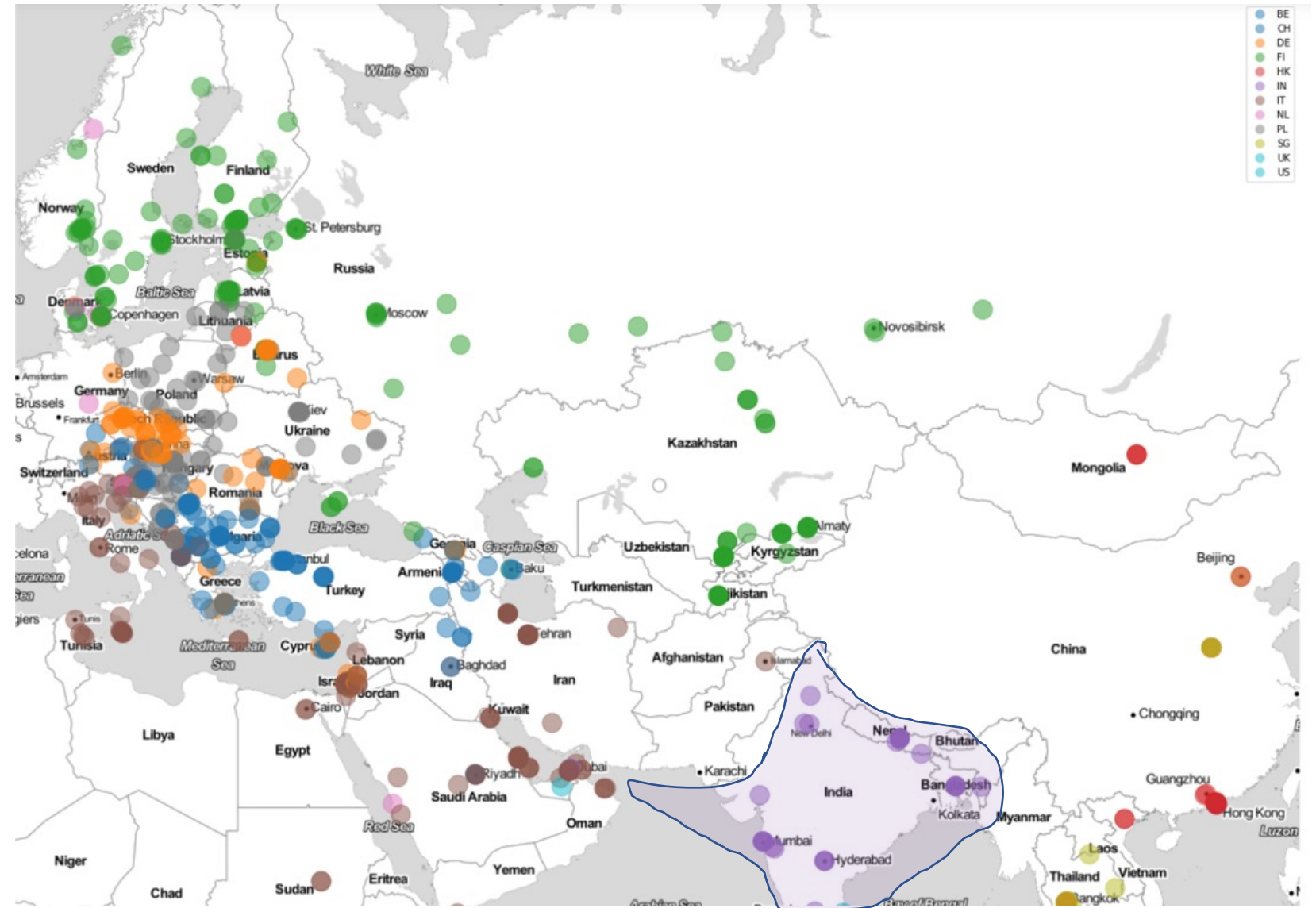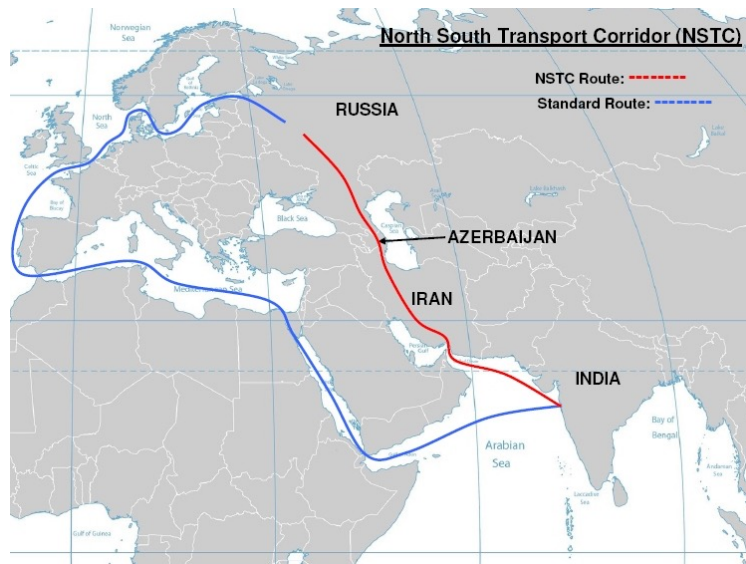
Connectivity around the south side of the Caspian Sea would connect the region to the Gulf cable landings,

...which in turn would provide Mediterranean paths to Google's instance in Milan, Italy (brown)

Status: plausible
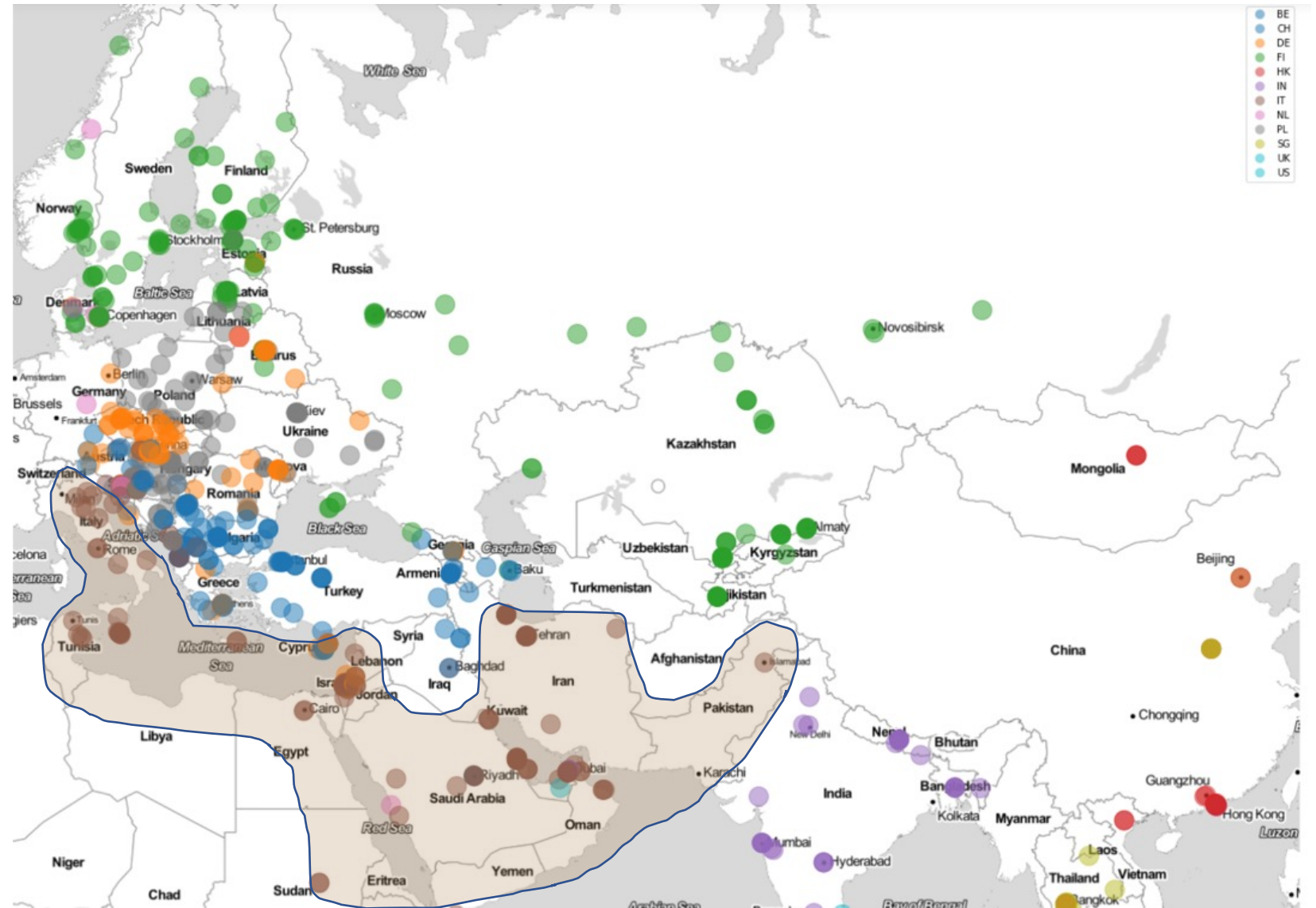
Connectivity across (or around the south side of) the Caspian Sea would connect the region to the Caucasus Cable System,

...or Turkish Terrestrial Routes

...which in turn would provide terrestrial European paths through Bulgaria to Google's instance in Zurich

Status: plausible, perhaps even active (Turkmenistan?)

Top Foreign Providers: Central Asia

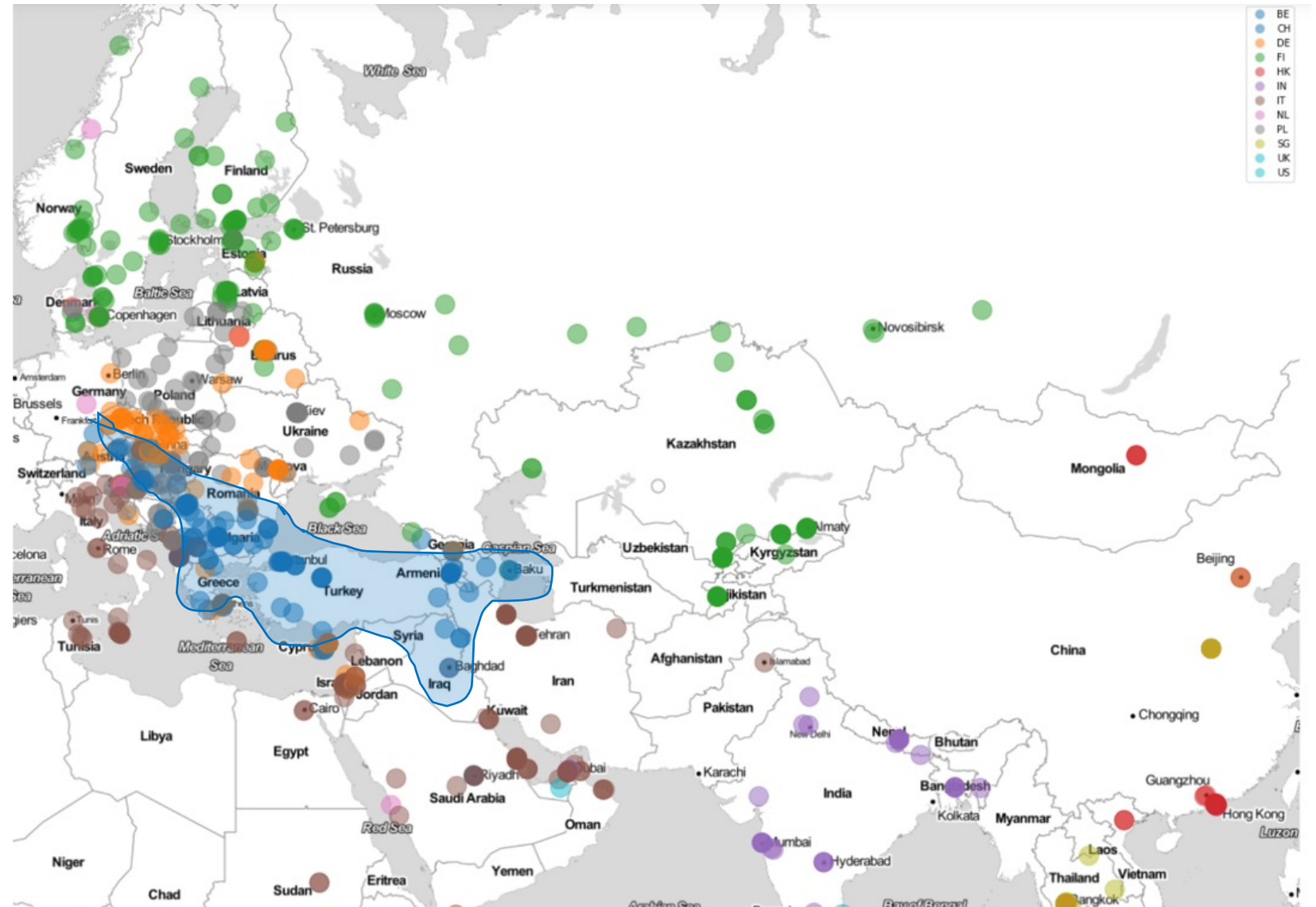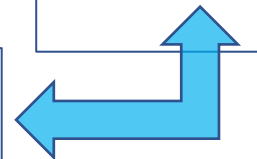|	Kyrgyz Republic	Kazakhstan	Uzbekistan	Tajikistan	Turkmenistan
200105	WOLKEE-AS	ROSPRINT-AS	BSKYB-BROADBAND-AS	KPN	Level3
200205	AS20535.0	TSF-IP-Core	Gascom-Net	AS2820.0	ROSPRINT-AS
200305	RELCOM-AS	EQUANT-ASIA	CHINANET-BACKBONE	SNR-RO	ROSPRINT-AS
200405	RTCOMM-AS	EQUANT-ASIA	AS29059.0	AS2820.0	ROSPRINT-AS
200505	KAZTELECOM-AS	NEWSKIES-AS-AP	KAZTELECOM-AS	AS2820.0	SATISNET-AS
200605	RTCOMM-AS	SPRINTLINK	ROSTELECOM-AS	SATISNET-AS	SATISNET-AS
200705	GTS-BACKBONE	TRANSTELECOM	KAZTELECOM-AS	SATISNET-AS	SATISNET-AS
200805	KAZTELECOM-AS	TRANSTELECOM	KAZTELECOM-AS	SATISNET-AS	DCI-AS
200905	KAZTELECOM-AS	TRANSTELECOM	SOVAM-AS	SOVAM-AS	SatGate
201005	KAZTELECOM-AS	ROSTELECOM-AS	iTelecom	SOVAM-AS	SatGate
201105	KAZTELECOM-AS	TRANSTELECOM	ROSTELECOM-AS	KTNET	ROSTELECOM-AS
201205	TTI-NET	TRANSTELECOM	ROSTELECOM-AS	SOVAM-AS	AS6453
201305	Prime-Telecom-AS	TRANSTELECOM	ROSTELECOM-AS	DINET-AS	AS6453
201405	SOVAM-AS	SOVAM-AS	ROSTELECOM-AS	IHOME-AS	TTNet
201505	SOVAM-AS	TRANSTELECOM	ROSTELECOM-AS	KAZTELECOM-AS	KAZTELECOM-AS
201605	KVANT-TELECOM	ROSTELECOM-AS	ROSTELECOM-AS	AS8449-ELCAT	KAZTELECOM-AS
201705	TNS-Plus-Core	ROSTELECOM-AS	KAZTELECOM-AS	AS8449-ELCAT	AS6453
201805	KVANT-TELECOM	MF-MGSM-AS	MF-MGSM-AS	TTC-AS	AS6453
201905	TNS-Plus-Core	KVANT-TELECOM	MF-MGSM-AS	TTC-AS	ROSTELECOM-AS
202005	TRANSTELECOM	KVANT-TELECOM	KVANT-TELECOM	TTC-AS	ROSTELECOM-AS
202105	SOVAM-AS	KVANT-TELECOM	HURRICANE	TTC-AS	ROSTELECOM-AS
202205	TNS-Plus-Core	MF-MGSM-AS	reacom	SOVAM-AS	Delta-Telecom-AS

	Kyrgyz Republic	Kazakhstan	Uzbekistan	Tajikistan	Turkmenistan
Top exit provider(%)	AS35168 (40%)	AS31133 (24%)	AS210222 (22%)	AS3216 (50%)	AS29049 (48%)
Top exit country(%)	KZ (59%)	RU (84%)	RU (37%)	RU (81%)	AZ (48%)

Moving away from satellite is good, but nearly all of the remaining transit for Central Asia is still **Russian or transitively Russian via neighbors**.

Note Turkmenistan's Tata and Turkish and Azeri transit over time…

Leveraging Both Worlds: Azerbaijan

Month	Top foreign ASN	#2	#3
200105	SOVAM-AS	UUNET	SMS-NET
200205	UUNET	SOVAM-AS	SMS-NET
200305	SMS-NET	ASN-BICS	AS-ISOL
200405	ASN-BICS	SMS-NET	TTNet
200505	TWELVE99	SMS-NET	RADIO-MSU
200605	TWELVE99	RADIO-MSU	AS20535.0
200705	TWELVE99	DTAG	AS20535.0
200805	AS6453	CAUCASUS-CABLE-SYSTEM	TWELVE99
200905	TTNet	ROSTELECOM-AS	TWELVE99
201005	ROSTELECOM-AS	TTNet	GEANT
201105	ROSTELECOM-AS	LEVEL3	CAUCASUS-CABLE-SYSTEM
201205	ROSTELECOM-AS	TRANSTELECOM	GTT-BACKBONE
201305	LEVEL3	ROSTELECOM-AS	TRANSTELECOM
201405	ROSTELECOM-AS	TRANSTELECOM	TWELVE99
201505	ROSTELECOM-AS	TRANSTELECOM	LEVEL3
201605	ROSTELECOM-AS	TRANSTELECOM	NTT-LTD-2914
201705	TRANSTELECOM	LEVEL3	MF-MGSM-AS
201805	MF-MGSM-AS	LEVEL3	TRANSTELECOM
201905	TRANSTELECOM	TWELVE99	NetIX
202005	TWELVE99	LEVEL3	CAUCASUS-CABLE-SYSTEM
202105	NetIX	TWELVE99	LEVEL3
202205	TWELVE99	LEVEL3	NetIX

Russian providers, evolving to tier1 carriers (Cogent, Telia, Level3, Tata) met in Sofia (NetIX)

Turkish connectivity was briefly interesting…
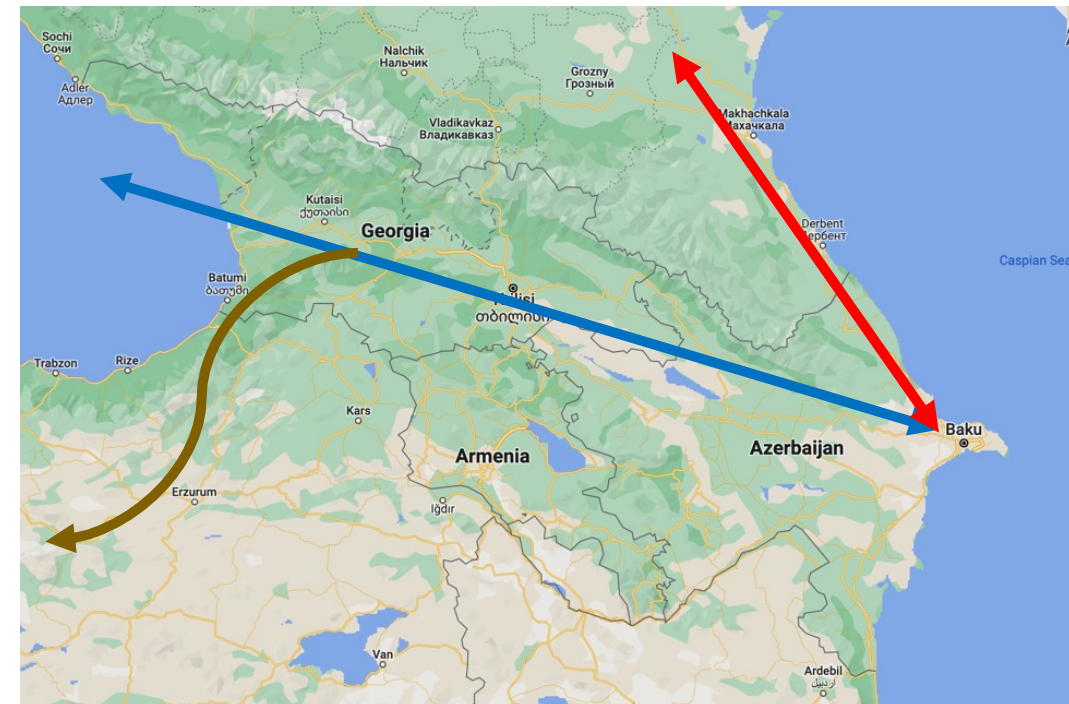
"Could it happen in your country?"

Renesys (2012) proposed a rule of thumb for judging the risk of national-scale Internet disconnection

A "cross-border" Internet provider is one that demonstrates the ability to exchange traffic with a foreign provider

We can count these adjacencies in the routing table. Every country should have at least 40 such 'cross-border' relationships to feel reasonably resistant to large-scale disconnection.

'Cross-Border' IPv4 ASNs, 2001-2022

month	RU	UA	LT	EE	LV	KZ	MD	BY	GE	AZ	AM	KG	TJ	UZ	TM
200105	219	89	19	16	15	9	10	5	7	5	11	5	1	2	4
200205	219	130	24	17	22	10	10	11	8	5	11	4	2	3	1
200305	265	172	24	17	24	17	11	15	13	6	11	7	3	5	1
200405	294	198	24	19	25	20	14	22	12	8	12	8	6	7	1
200505	401	206	24	20	28	23	17	23	12	6	14	7	6	5	1
200605	526	230	30	25	34	33	30	25	15	3	12	9	3	8	1
200705	642	281	41	29	43	44	37	27	14	3	13	10	3	5	1
200805	769	336	43	34	50	53	50	31	19	4	18	12	6	8	1
200905	861	314	54	36	52	39	54	33	17	6	12	11	9	11	1
201005	997	332	60	47	56	42	58	33	24	8	10	16	10	17	1
201105	1100	342	66	50	63	39	56	36	27	9	14	16	8	19	3
201205	1206	344	68	53	72	48	48	40	26	16	19	10	10	16	3
201305	1263	376	73	66	63	56	48	40	29	14	17	13	9	28	4
201405	1306	386	77	78	62	49	41	26	25	12	15	18	12	33	5
201505	1306	387	74	81	63	60	33	30	28	10	14	17	11	30	4
201605	1343	424	85	92	73	61	35	26	31	7	11	16	10	25	7
201705	1312	503	79	94	76	62	35	26	24	9	14	17	12	23	7
201805	1314	535	82	93	91	71	34	25	26	10	18	19	5	26	6
201905	1387	581	100	112	97	82	32	28	31	10	21	19	6	32	6
202005	1427	682	123	112	97	77	41	36	27	15	21	15	8	32	6
202105	1401	674	140	121	104	69	50	41	33	17	19	13	12	14	7
202205	1360	660	160	134	109	62	58	44	32	28	23	15	12	6	4

40+: Resistant to Disconnection

10+: Low Risk of Disconnection

3-9: Significant Risk of Disconnection

1-2: Severe Risk of Disconnection

Conclusions

Internet ecosystems in which consumers and enterprises have more good choices are plausibly more resilient and faster-growing

Diverse regional connectivity is a challenge in Central Asia, but there are good options to improve digital connectivity

Thank you!

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