HURRICANE ELECTRIC
INTERNET SERVICES

Global view of Internet Peering

Why its Good for Everyone
Internet Peering from a Global Networks Point of View

RIPE ENOG5
St. Petersburg Russia
27th - 28th May 2013

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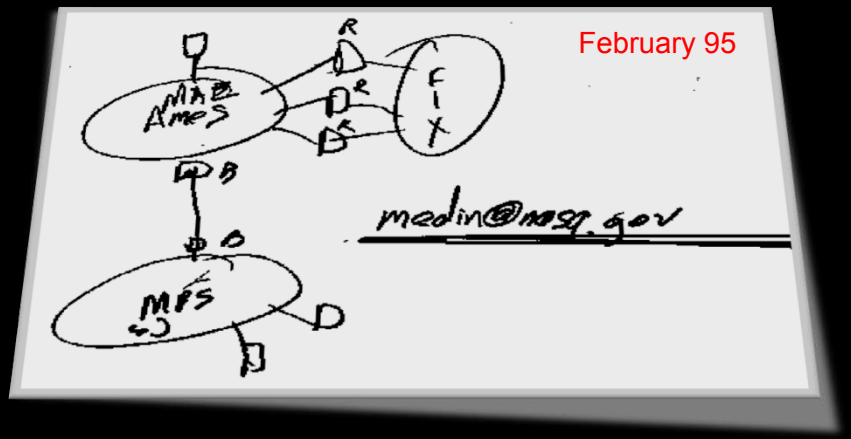
Hurricane Electric

Agenda

- Why Internet Exchange Points
- How Networks look when they interconnect
- Large Global Networks
- Summary

INTERNET EXCHANGE POINTS



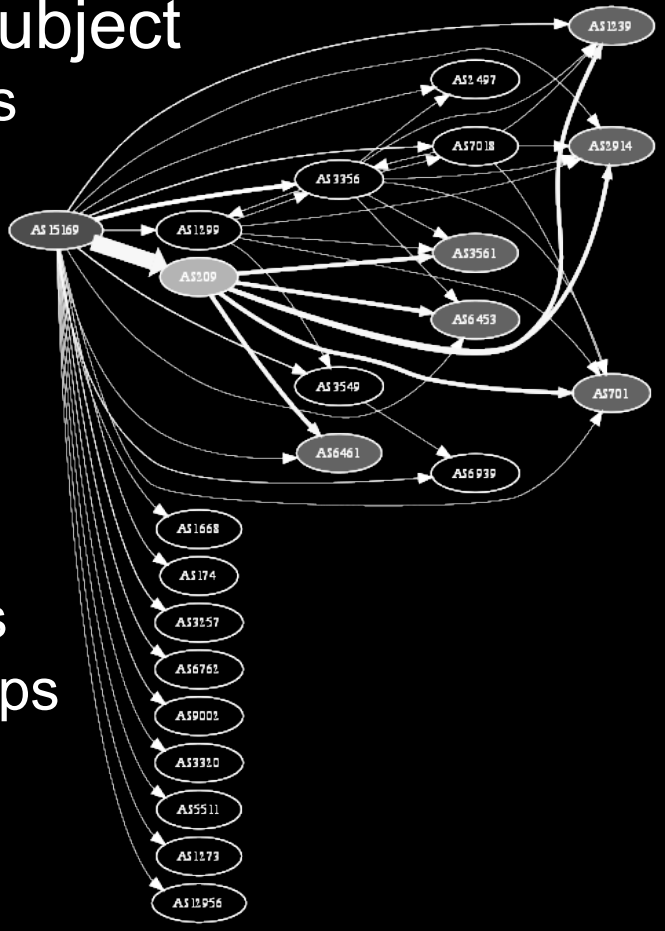
IXPs can start from very simple beginnings

Internet Exchange Points

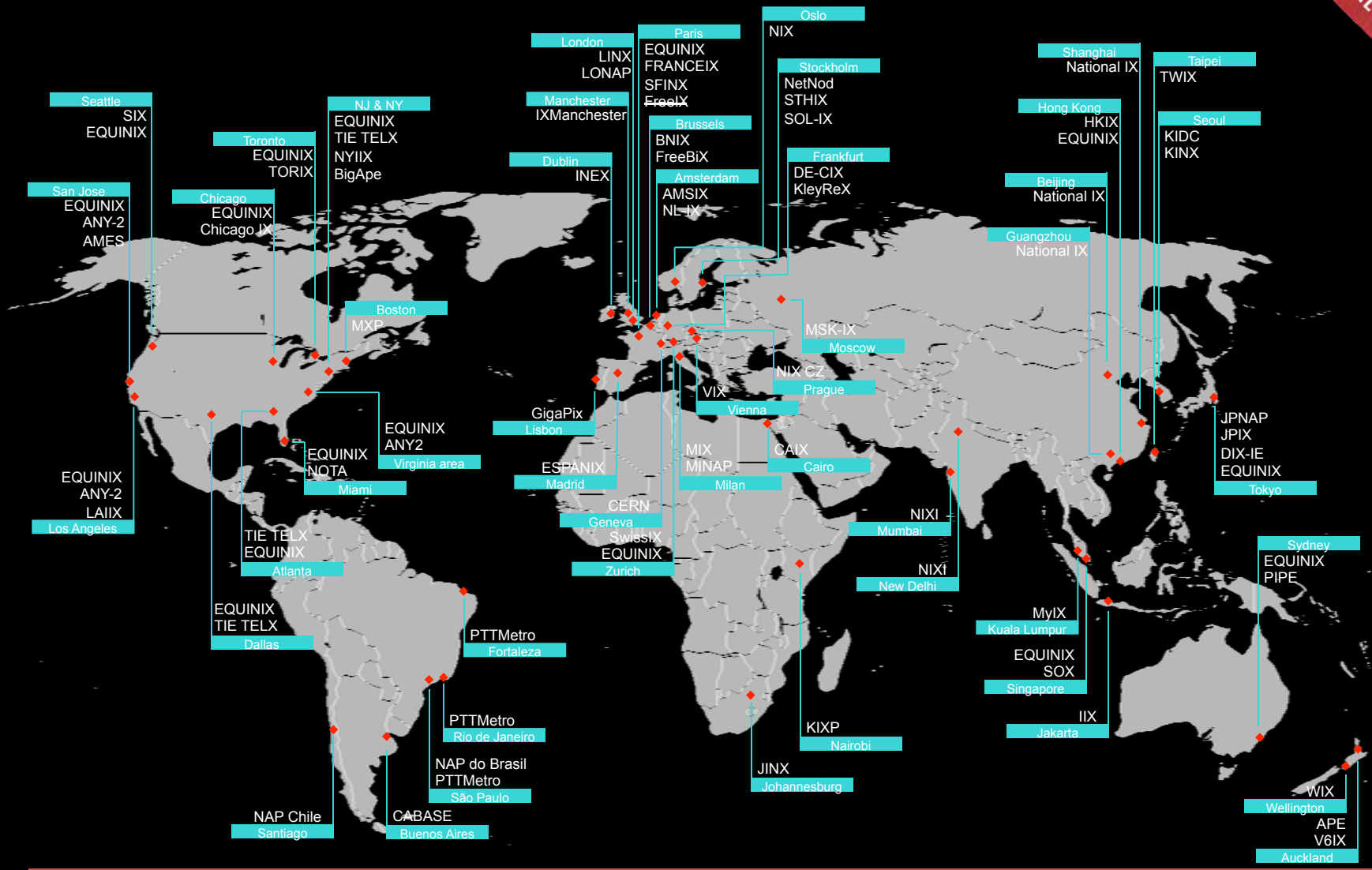
- Generic IXP pitch …
  - Internet Exchange Points (IXPs) are a good idea
  - Peering is a good idea
  - Local or regional self-reliance is a good idea
  - Critical services (DNS, NTP, etc) are a good idea
  - The Internet is not going away; in fact it's growing
- Global IXP pitch …
  - Every IXP (regional, national or international) improves Internet services locally
  - IXPs get cities (or regions) onto a good mindset when it comes to telecom infrastructure builds
  - Some networks (especially networks like ours) actively look for IXPs as a sign of mature cities

A quick reminder – how routing works

- Technically – it's a very complex subject
  - The Internet is a collection of networks
  - No network stands alone
  - Interconnections are required
  - Efficient interconnections are required
- Robustness can be created
  - Multi-homing (more than one transit)
  - Peering between "like" networks helps
  - Diversity (physical & logical) really helps
- Nothing is static!



IXPs (Internet peering points) globally

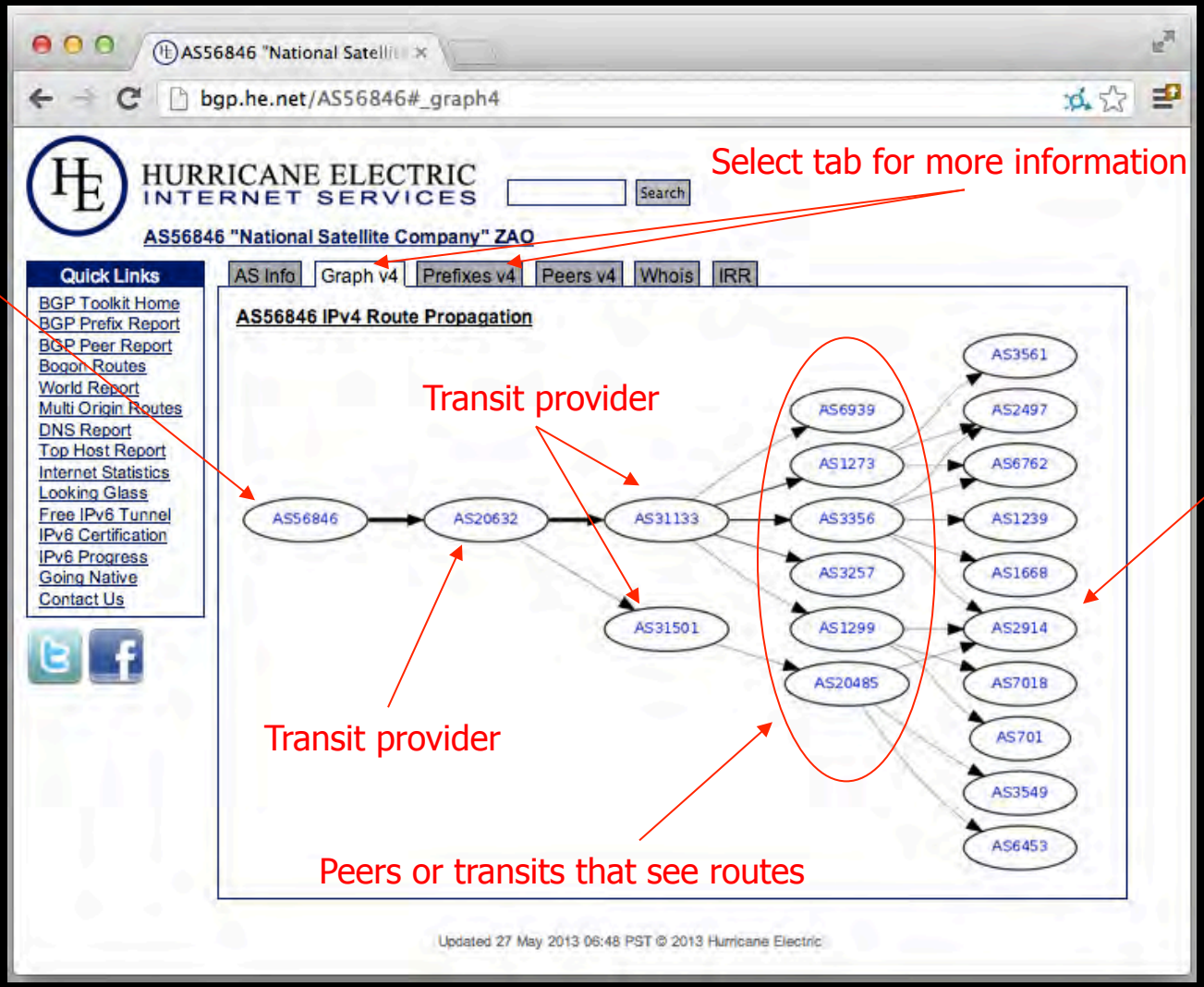


NATIVE IPv6 EVERYWHERE

Major IXs/NAPs represented; plenty more exist

PICTURING THE ENOG INTERNET SCENE

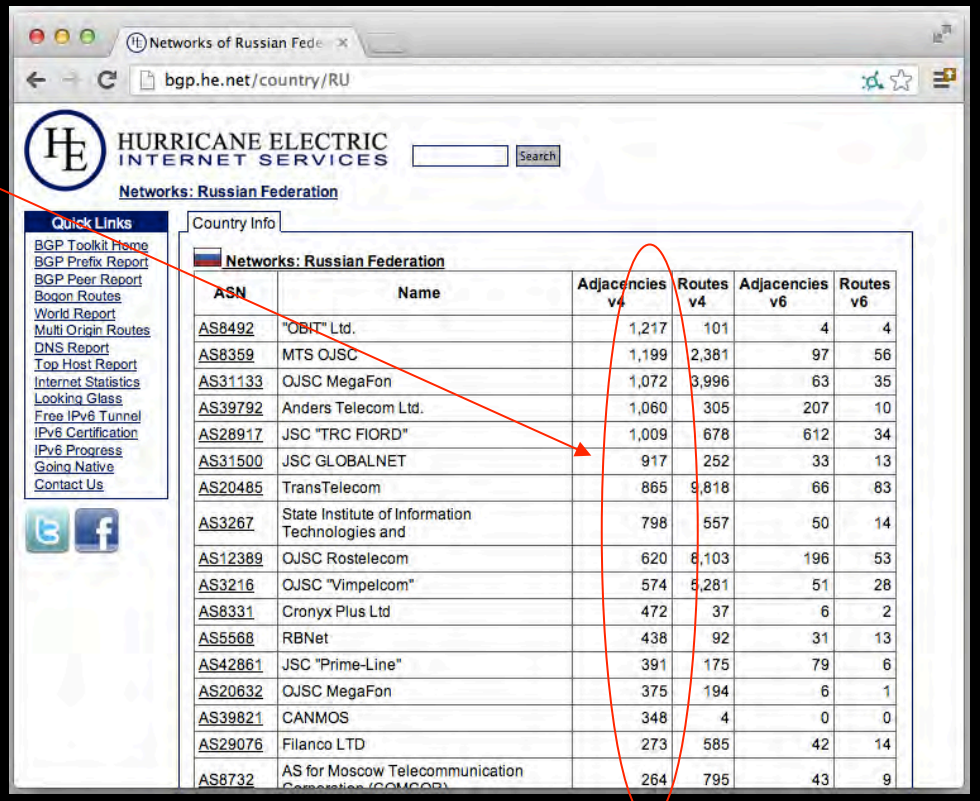
Measuring an ASN



Visualizing ASNs per country

- Full country listing at http://bgp.he.net/report/world
  - Per country listing of live ASNs
  - Assuming that the ASN is listed as “RU” within RIPE database

ASNs sorted by Adjacency count



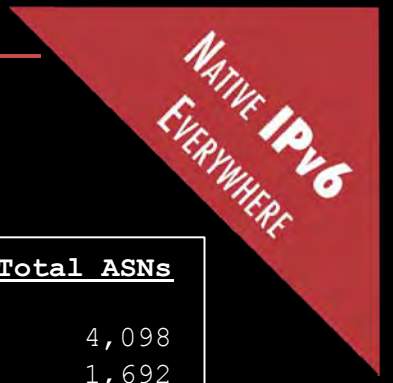
ASN	Name	Adjacencies v4	Routes v4	Adjacencies v6	Routes v6
AS8492	"OBIT" Ltd.	1,217	101	4	4
AS8359	MTS OJSC	1,199	2,381	97	56
AS31133	OJSC MegaFon	1,072	3,996	63	35
AS39792	Anders Telecom Ltd.	1,060	305	207	10
AS28917	JSC "TRC FIORD"	1,009	678	612	34
AS31500	JSC GLOBALNET	917	252	33	13
AS20485	TransTelecom	865	9,818	66	83
AS3267	State Institute of Information Technologies and	798	557	50	14
AS12389	OJSC Rostelecom	620	6,103	196	53
AS3216	OJSC "Vimpelcom"	574	5,281	51	28
AS8331	Cronyx Plus Ltd	472	37	6	2
AS5568	RBNet	438	92	31	13
AS42861	JSC "Prime-Line"	391	175	79	6
AS20632	OJSC MegaFon	375	194	6	1
AS39821	CANMOS	348	4	0	0
AS29076	Filanco LTD	273	585	42	14
AS8732	AS for Moscow Telecommunication	264	795	43	9

http://bgp.he.net/country/RU

IP cross-border routing in the region

- Measuring ASNs for international peering
  - Use data from BGP routing
  - Use country code as primary location of ASN
- Each network (ie: each ASN) categorized:
  - ASN connects to ASN only inside the same country
  - ASN connects to ASN outside the country
- Sum data and tabulate

IP cross-border routing in the region

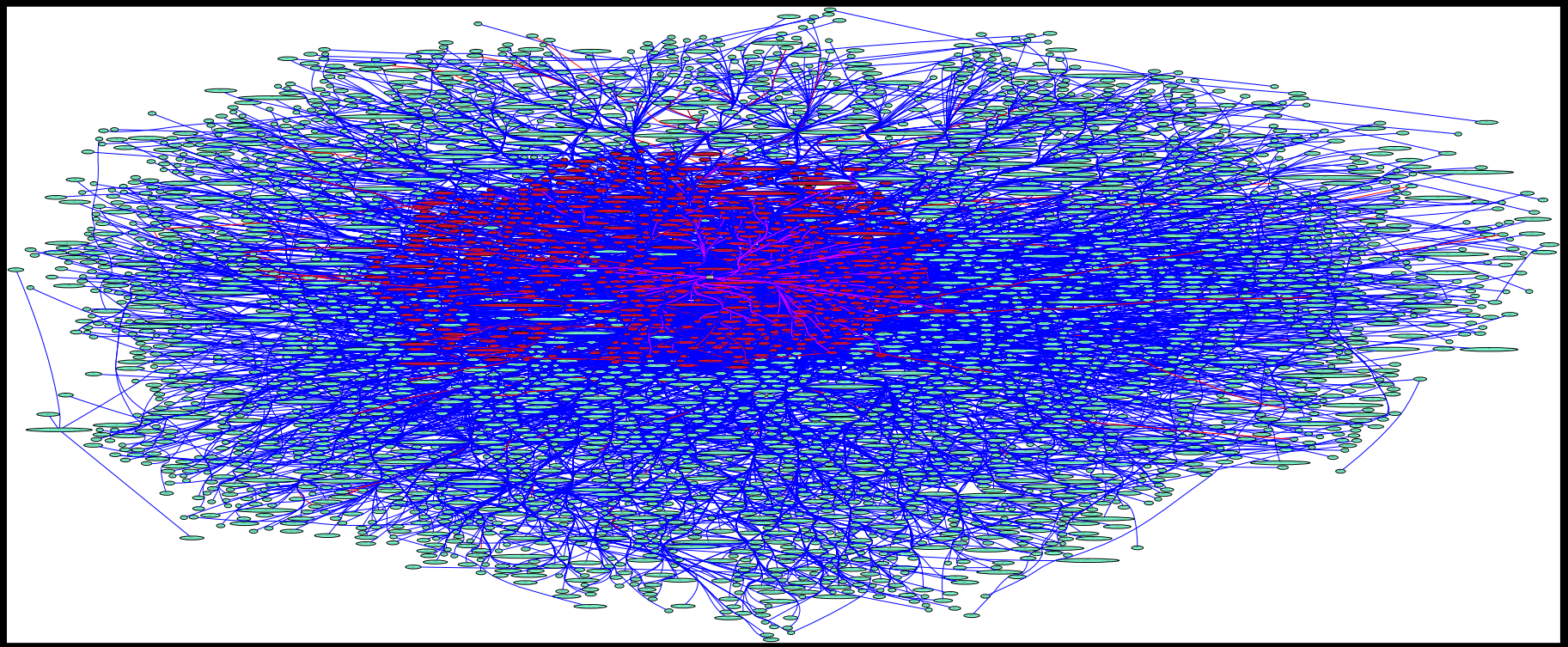


CC	Country	External ASNs	v6	v4	Total ASNs
RU	Russian_Federation	860	222	835	4,098
UA	Ukraine	420	44	414	1,692
LV	Latvia	41	9	41	203
LT	Lithuania	41	12	41	101
KZ	Kazakhstan	25	7	24	82
BY	Belarus	9	5	6	76
MD	Moldova	24	10	24	58
EE	Estonia	34	11	34	57
AM	Armenia	11	9	10	47
GE	Georgia	8	3	8	46
UZ	Uzbekistan	12	1	11	34
AZ	Azerbaijan	4	2	4	30
KG	Kyrgyzstan	15	1	15	27
TJ	Tajikistan	6	-	6	7
TM	Turkmenistan	2	-	2	3
PL	Poland	504	128	492	1,591
RO	Romania	225	25	224	1,102
BG	Bulgaria	73	24	71	459
SE	Stockholm	244	90	242	416
TR	Turkey	25	9	24	303
CN	China	66	9	64	257
IR	Iran	29	18	14	217
FI	Finland	91	38	88	185
HU	Hungary	60	21	57	179
MN	Mongolia	4	1	4	35
AF	Afghanistan	12	-	12	13

THE PICTURES

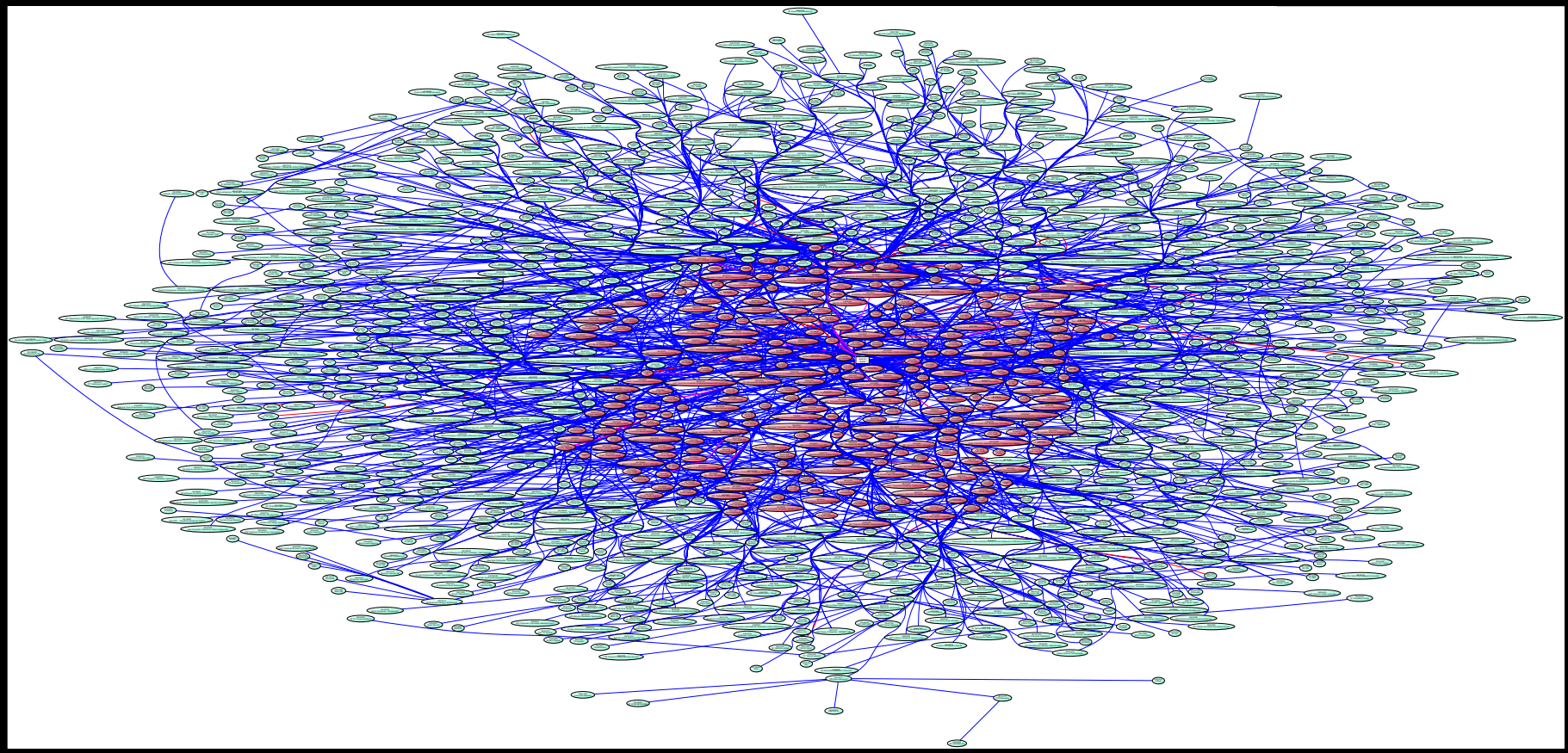
Visualizing IP routing within Russia

Russia: 4,098 ASNs (860 operate with external to the country connections)



Caveat: Not all links will show within these graphs

Visualizing IP routing within Ukraine



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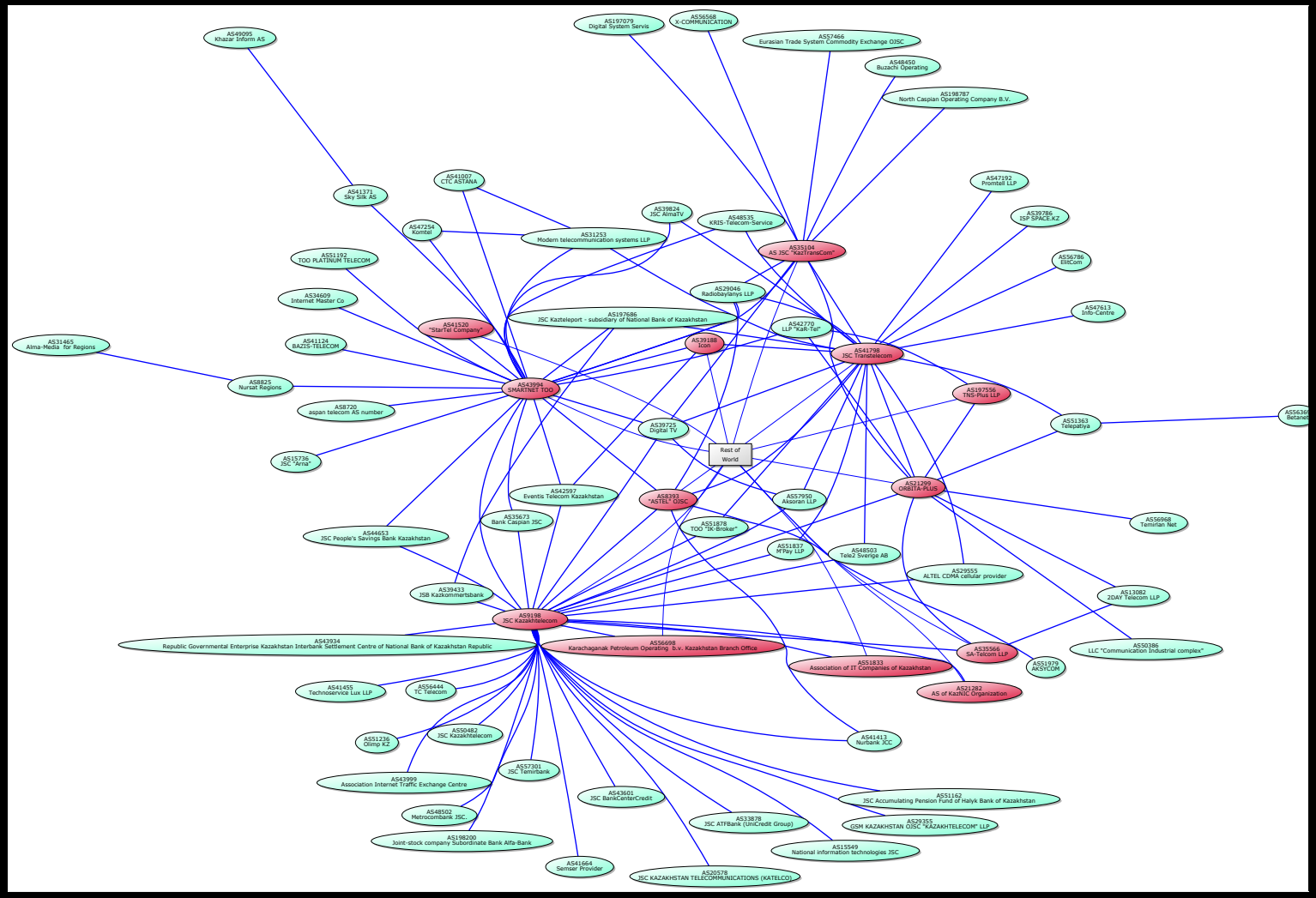
Visualizing IP routing within Kazakhstan



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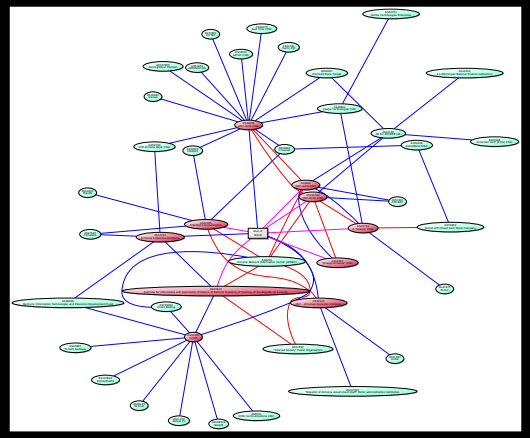
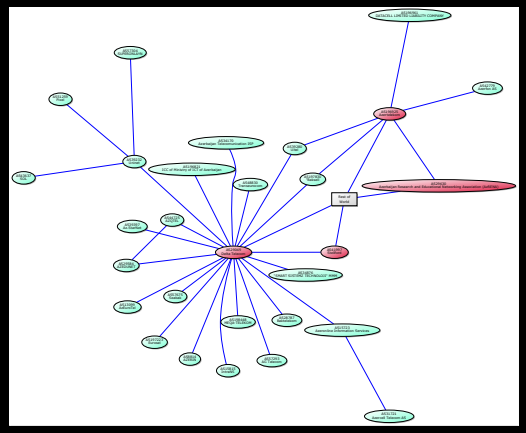
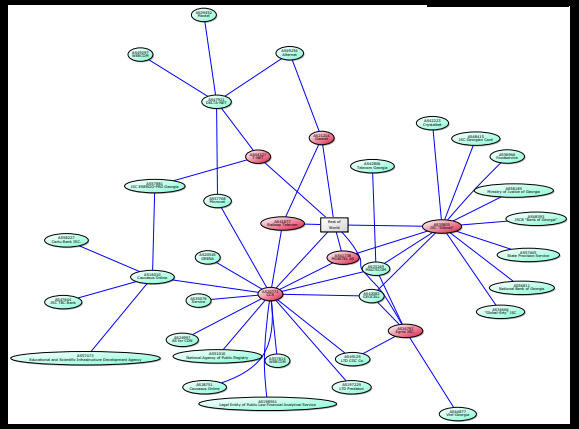
Visualizing IP routing and peering elsewhere



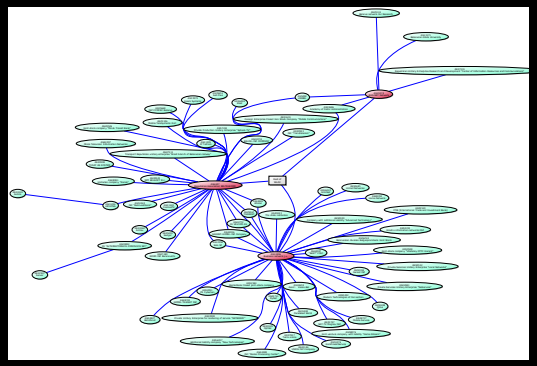
Armenia



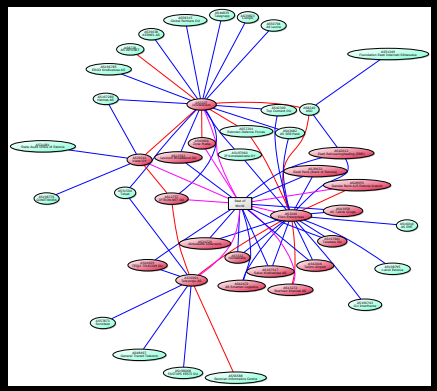
Azerbaijan



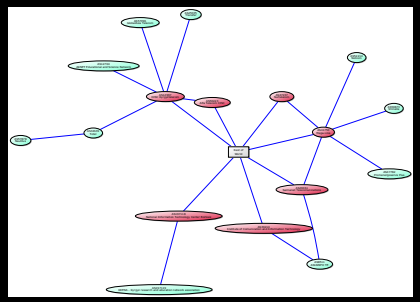
Georgia



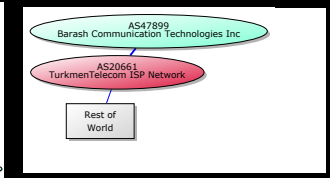
Belarus



Estonia



Kyrgyzstan



Turkmenistan

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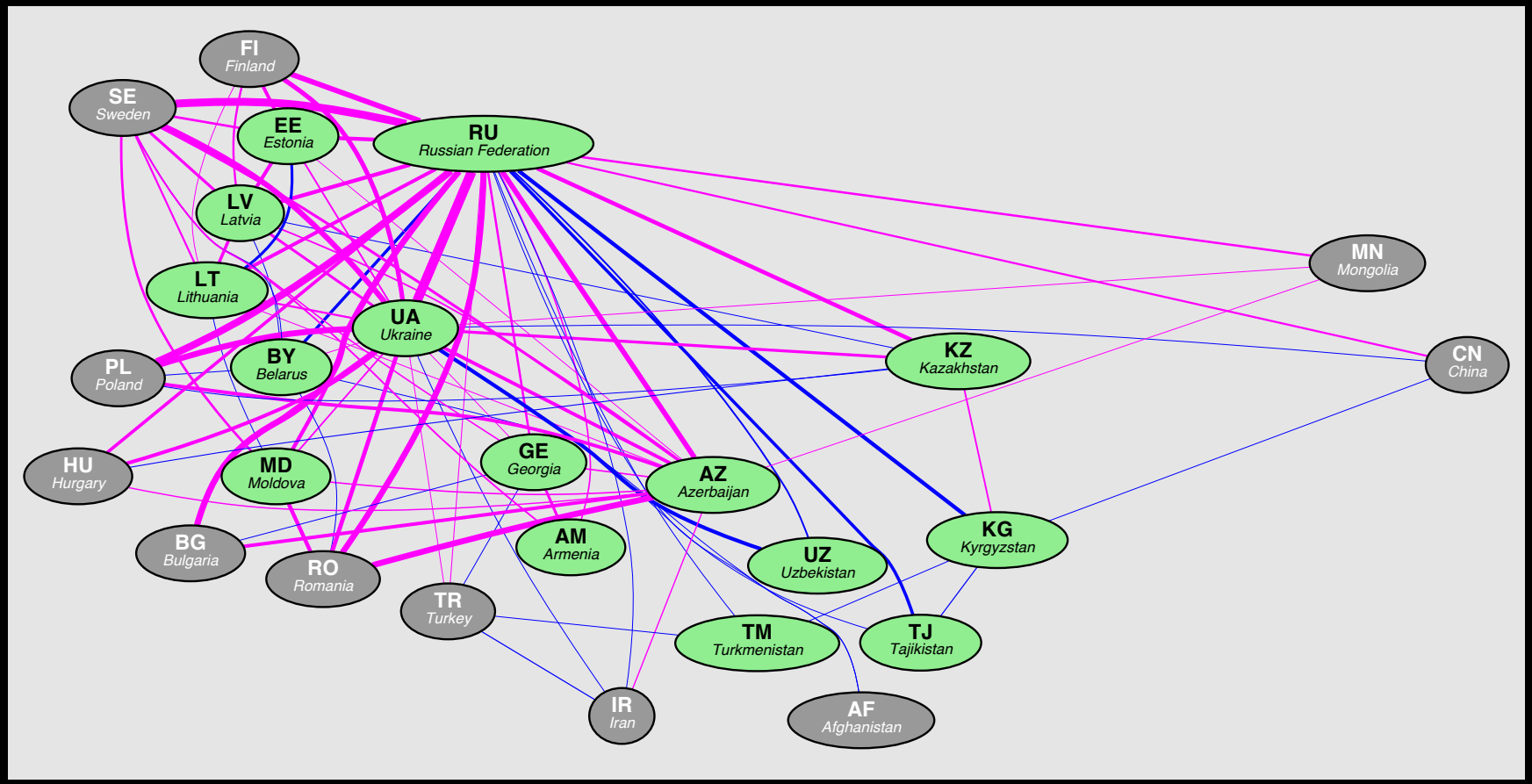
Visualizing IP routing and peering in the region

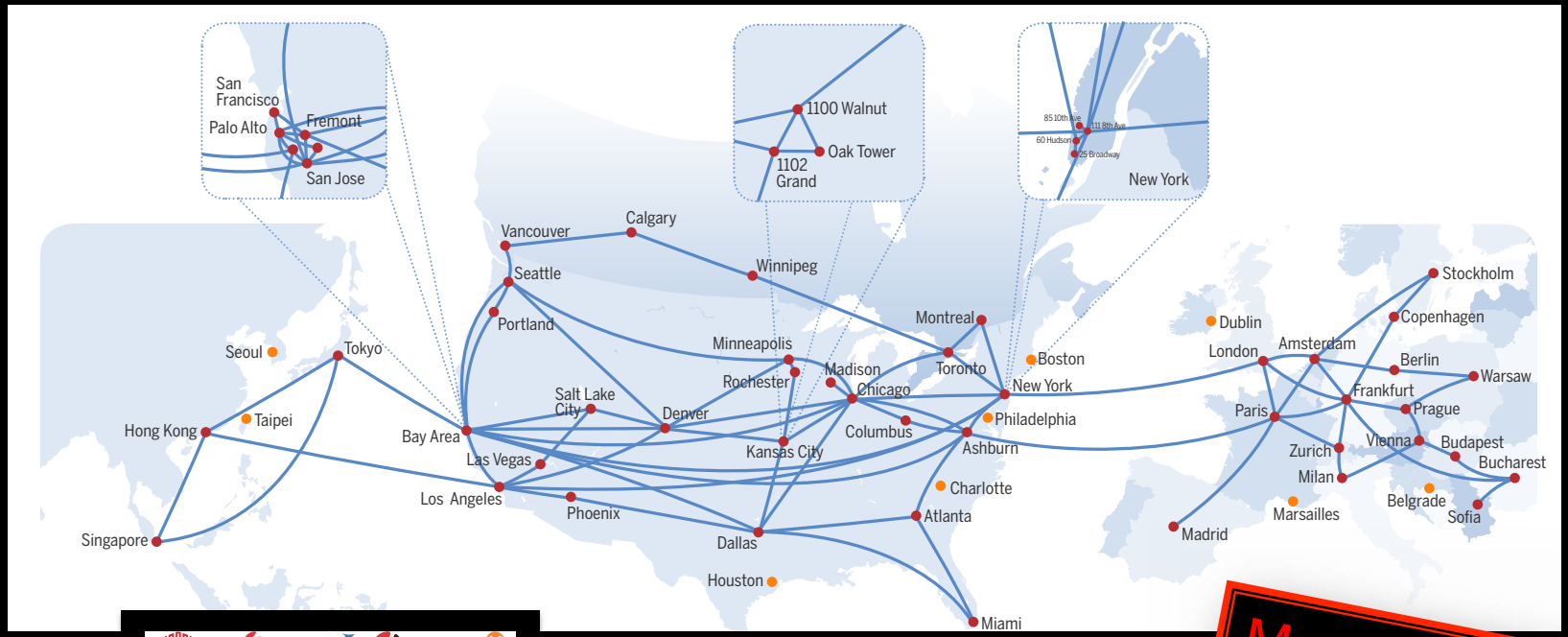


WHO IS HURRICANE ELECTRIC?

WHY DO WE CARE ABOUT PEERING?

Hurricane Electric – an IP Network at 59 IXPs

NATIVE IPv6 EVERYWHERE



Map outdated

IPv6 peering at all major peering points in US, Europe & Asia. Private and public peering capacity at 10Gbps and above.

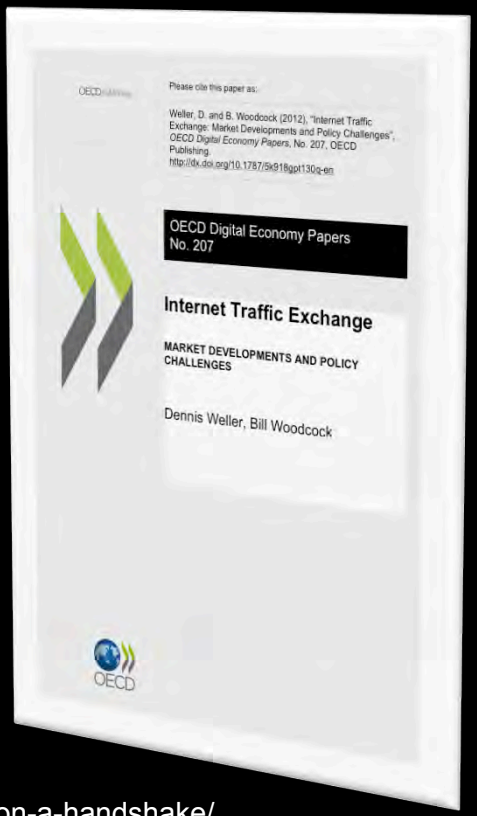
ADDITIONAL READING

The OECD report

Weller, D. and B. Woodcock (2012), "Internet Traffic Exchange: Market Developments and Policy Challenges", OECD Digital Economy Papers, No. 207, OECD Publishing.

http://dx.doi.org/10.1787/5k918gpt130q-en

- OECD
  - An International Treaty Organization
- Authored
  - 2012 edition by:
    - Dennis Weller – Navigant Economics
    - Bill Woodcock – PCH
- Published
  - October 2012
  - Part of a series, published every five years
- Audience
  - Policy Makers, Regulators, Lawmakers, Economists, etc



A total of 99 pages, 108 references. Plenty of Internet peering stats

http://oecdinsights.org/2012/10/22/internet-traffic-exchange-2-billion-users-and-its-done-on-a-handshake/

Why peering helps grow the local IP market

- Report Takeaway …
  - Peering and IXPs work (this is obvious)
  - Very good results with little regulation
- Peering improves traffic flows and reduces costs
  - Traffic flowing with less hops or latency is more efficient
  - Networks that peer can reduce transit expenditure
  - Networks that peer see local content or local eyeballs easier
- Peering reduces transit revenue from major players
  - Reduced revenue is a short term effect (but it's there)
  - As customer experience improves; network dependence grows
  - Peering never replaces 100% of transit needs

SUMMARY

Q&A

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