Global Enterprise Networks and Submarine Cable Capacity

Coverage, Pricing & Traffic Trends

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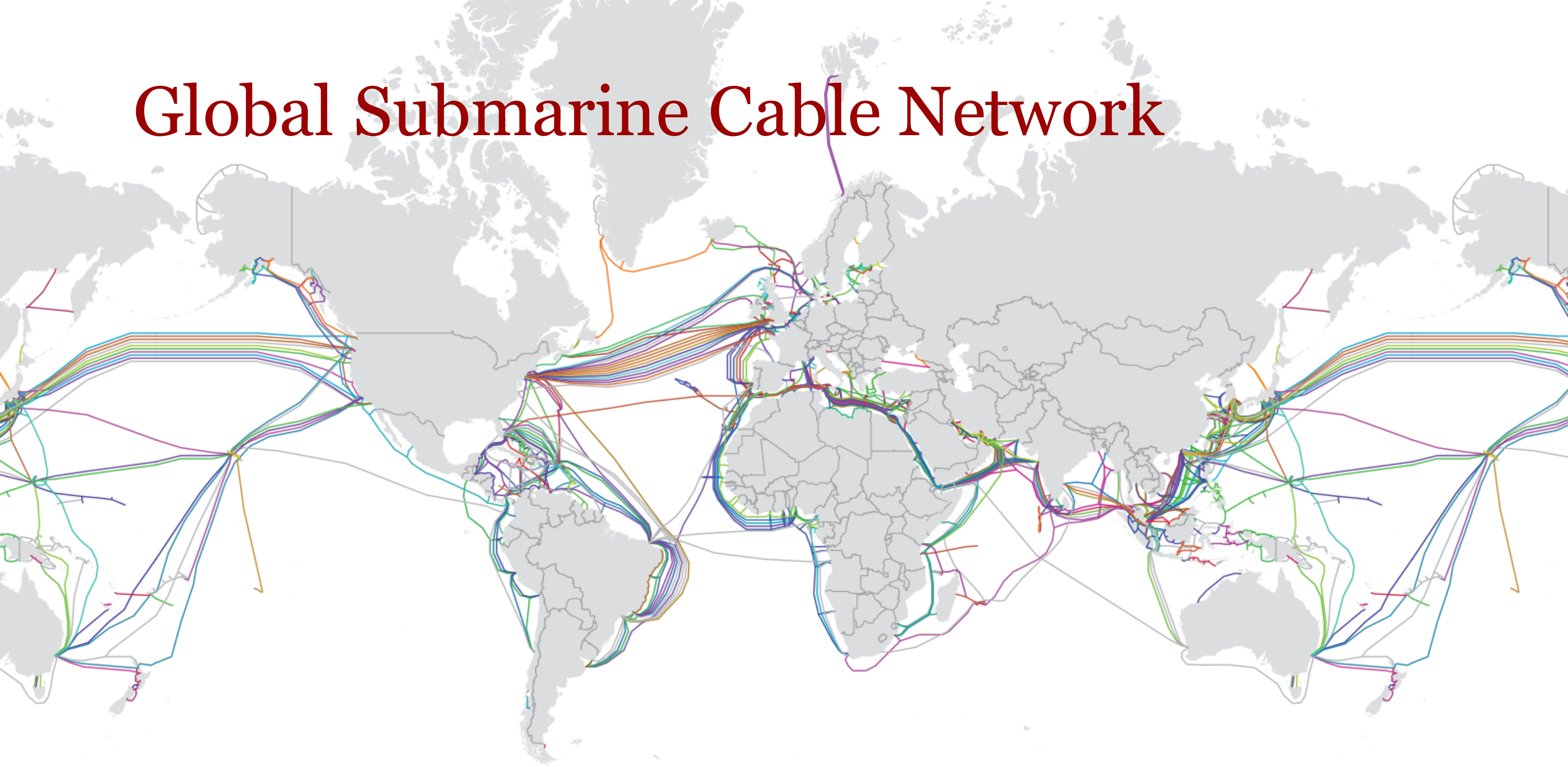
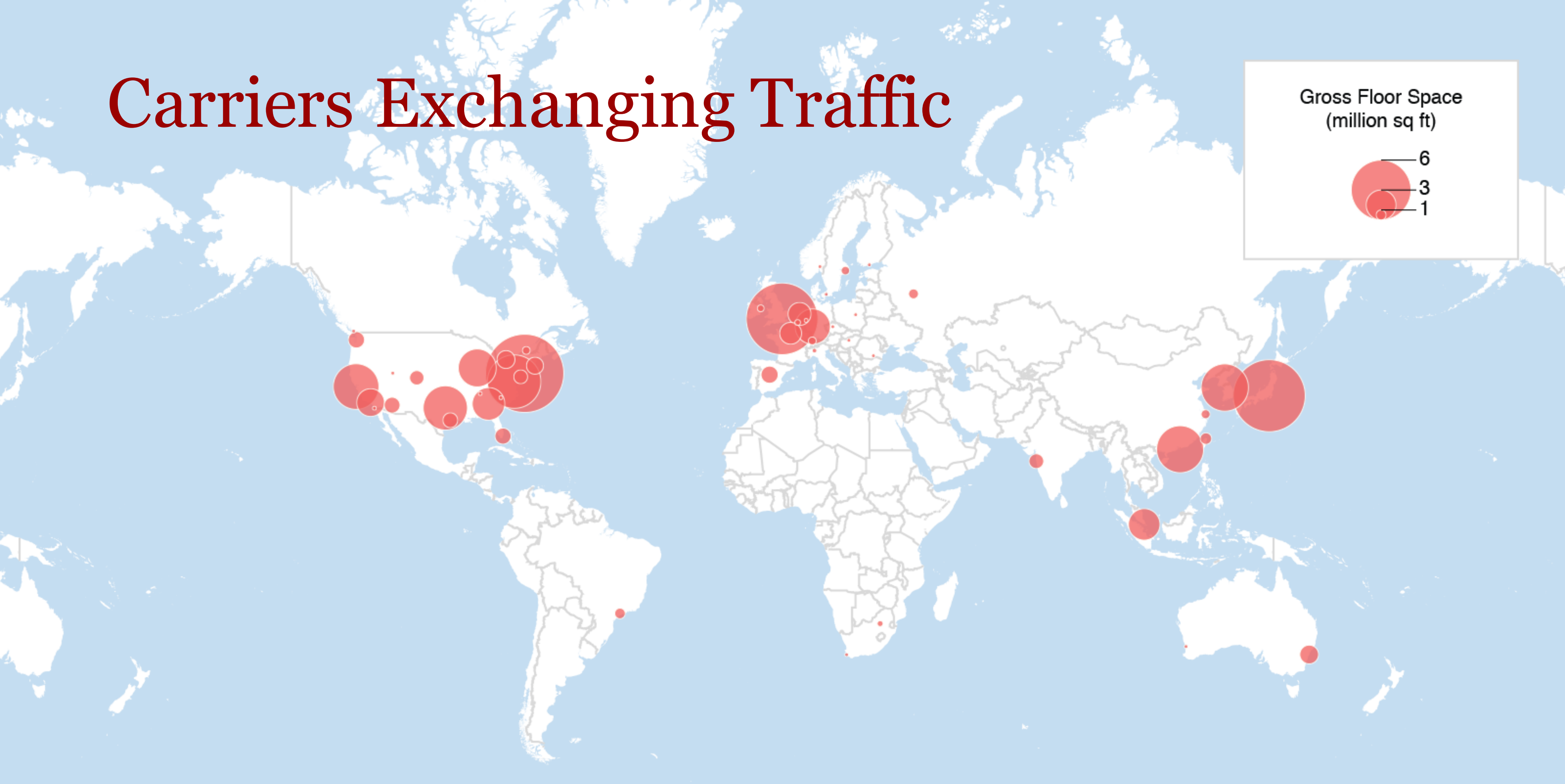
Cables, Colo and Capacity

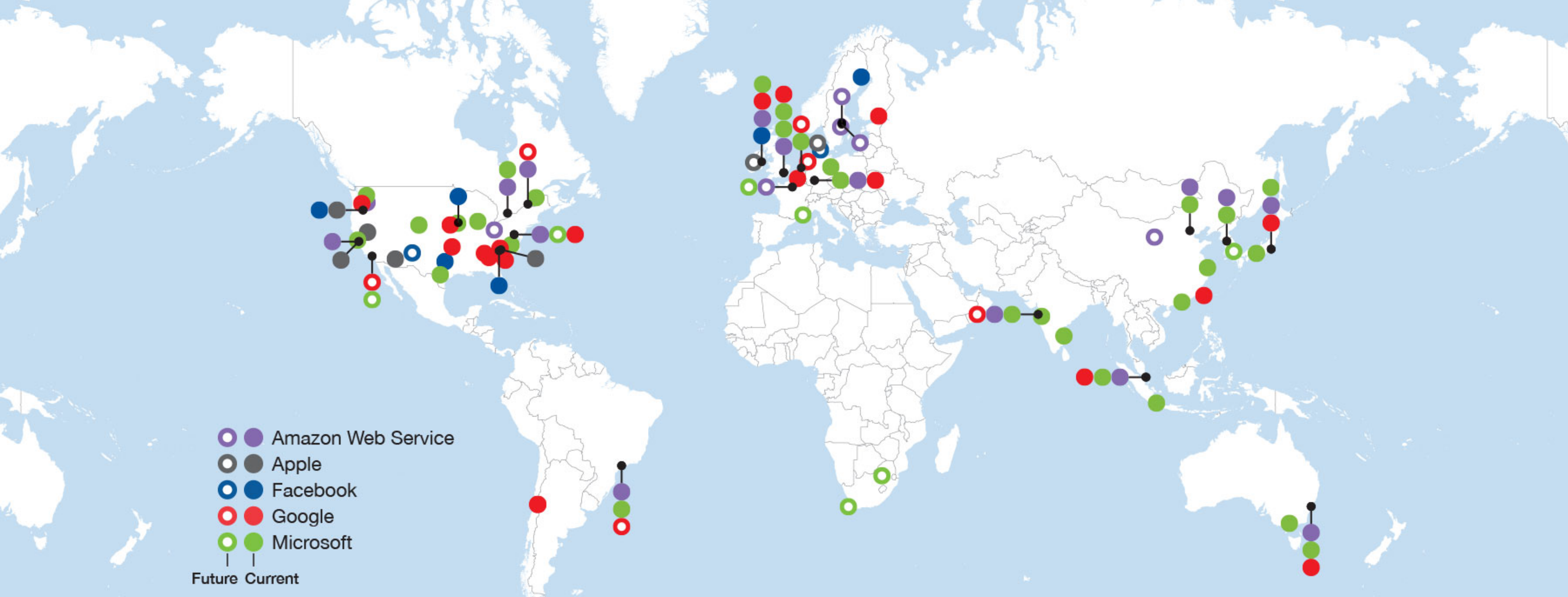
Global Submarine Cable Network



Carriers Exchanging Traffic

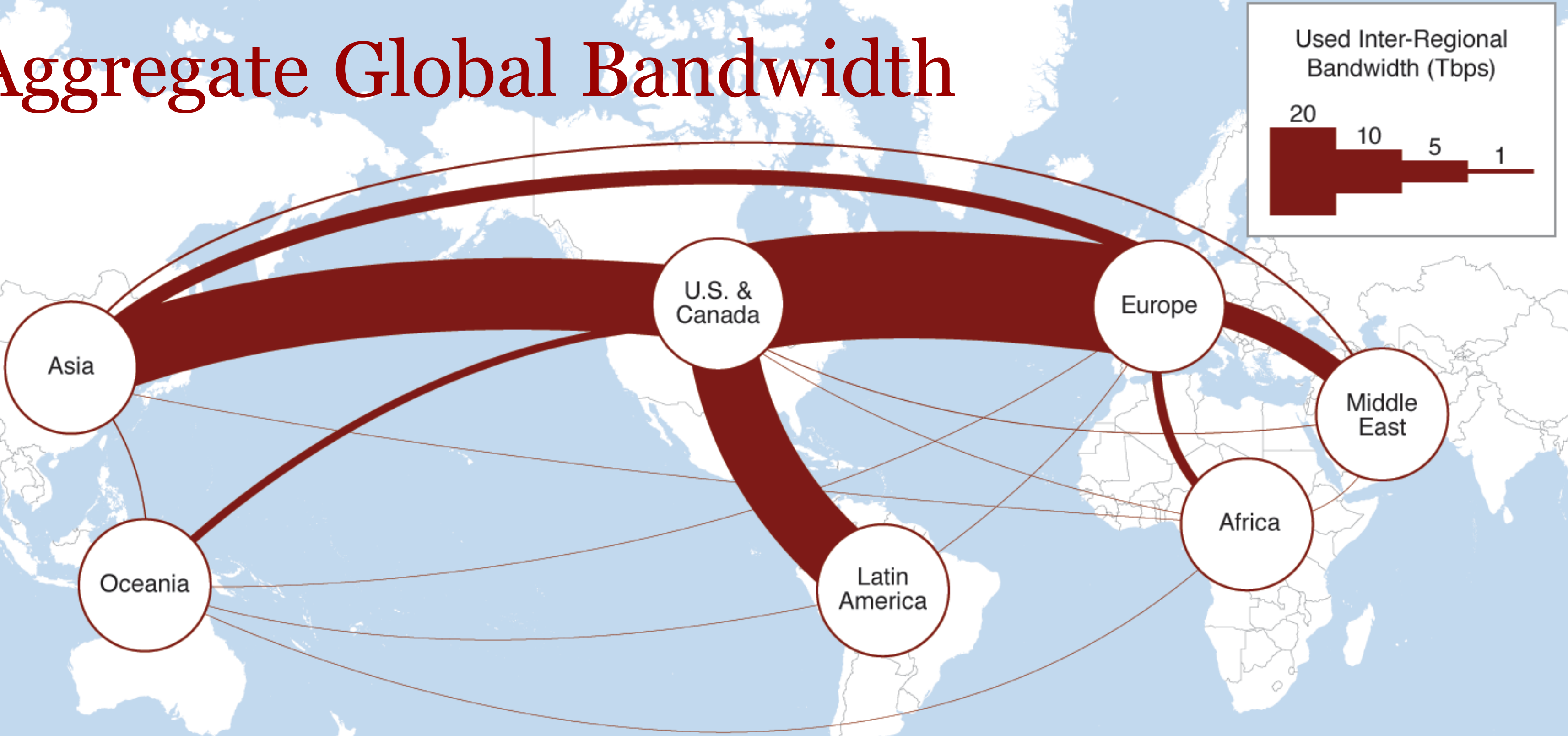


Linking Content and Applications



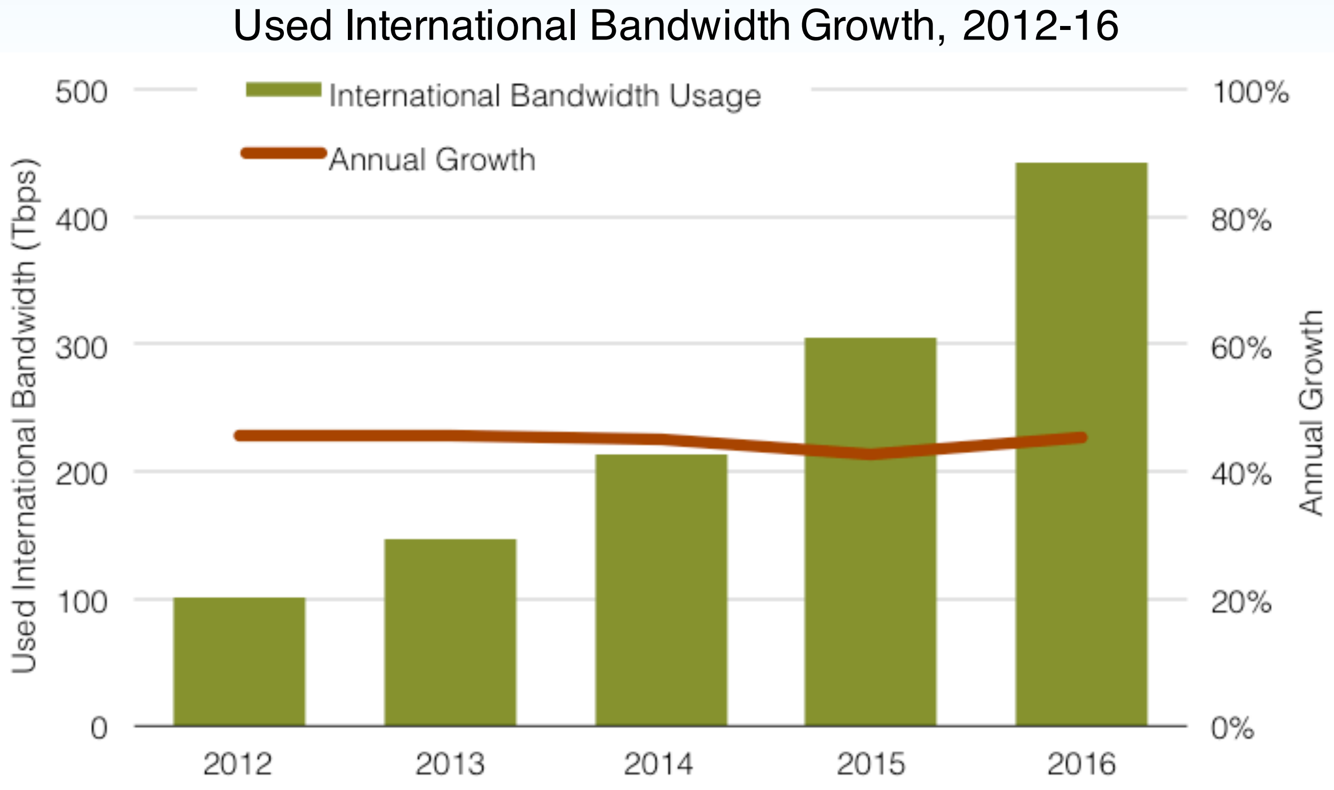
Major Content Provider Data Center Locations, 2017

Aggregate Global Bandwidth

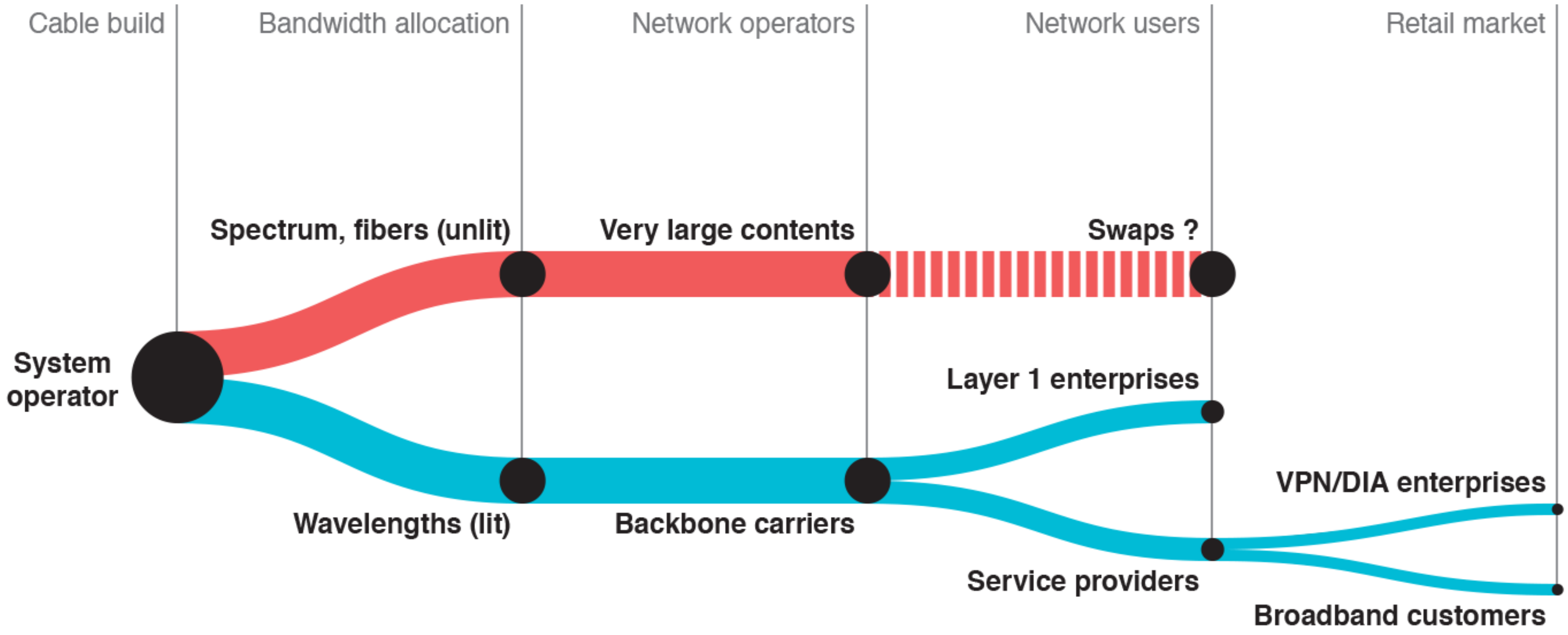


- Linking global hubs and users to hubs
- Favorable space, power, connectivity, population, business climate, etc.

Aggregate Demand Growth “Flat”



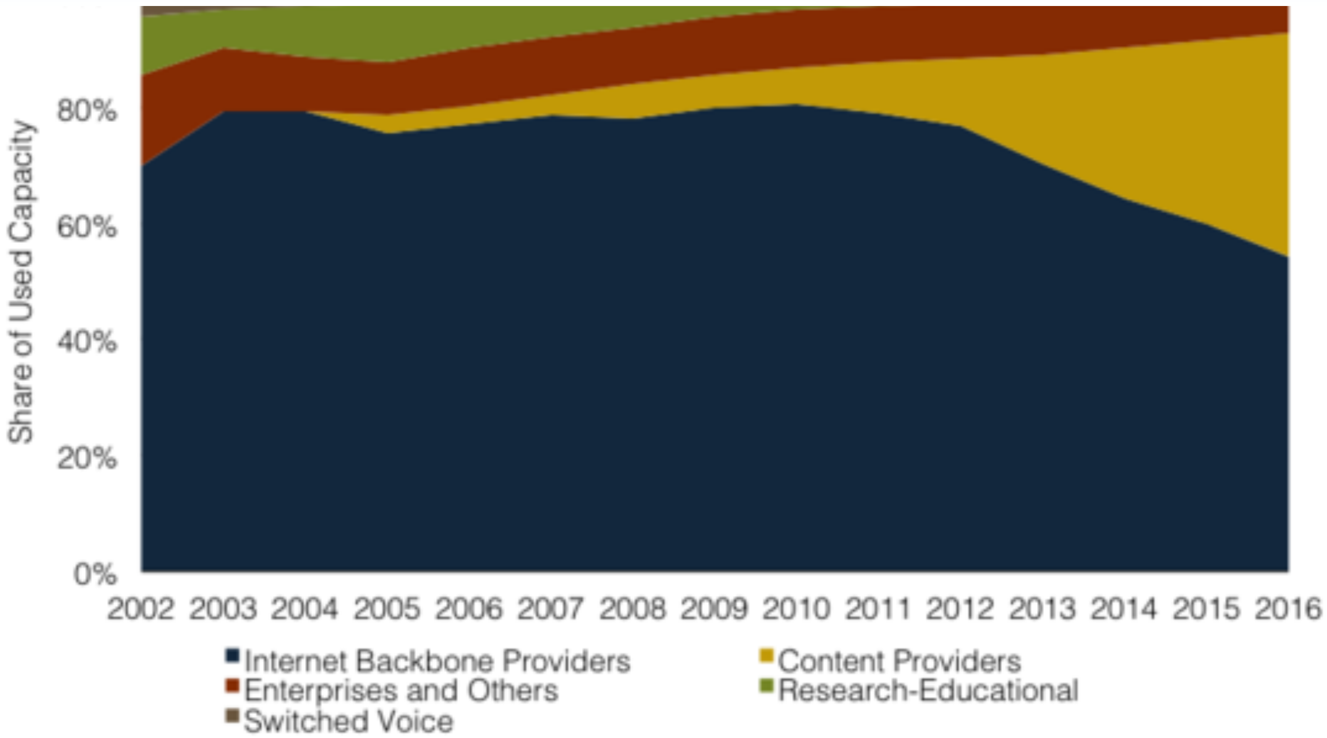
Cable Bandwidth Distribution



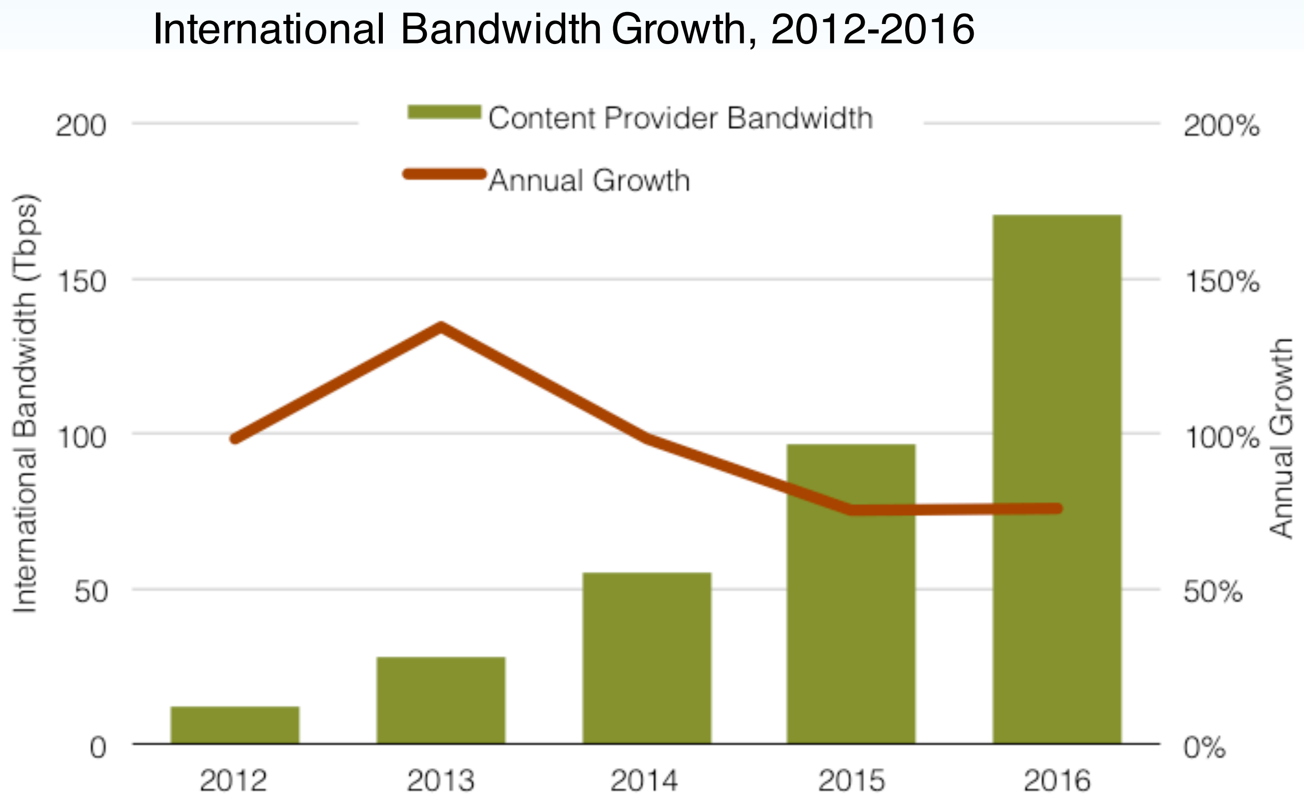
Content Providers

Private Networks Gaining Share

International Internet, Private Network, & Switched Voice Capacity, 2002-16

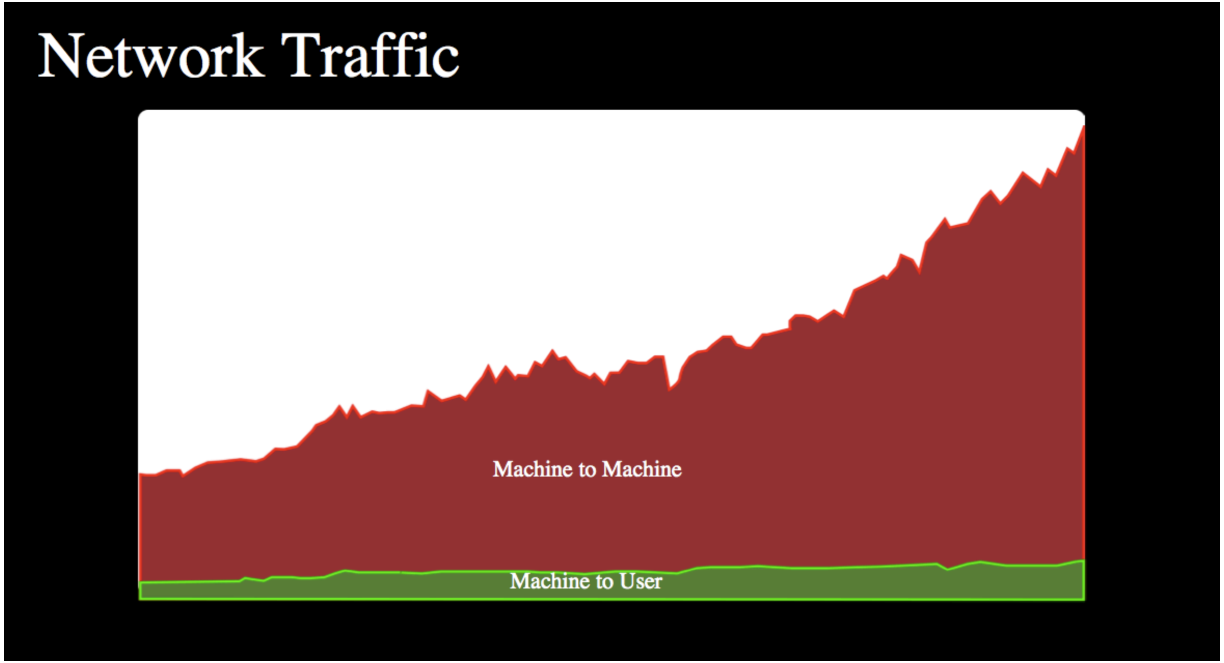


Content provider growth



Machines versus users

Facebook Network Traffic Profile

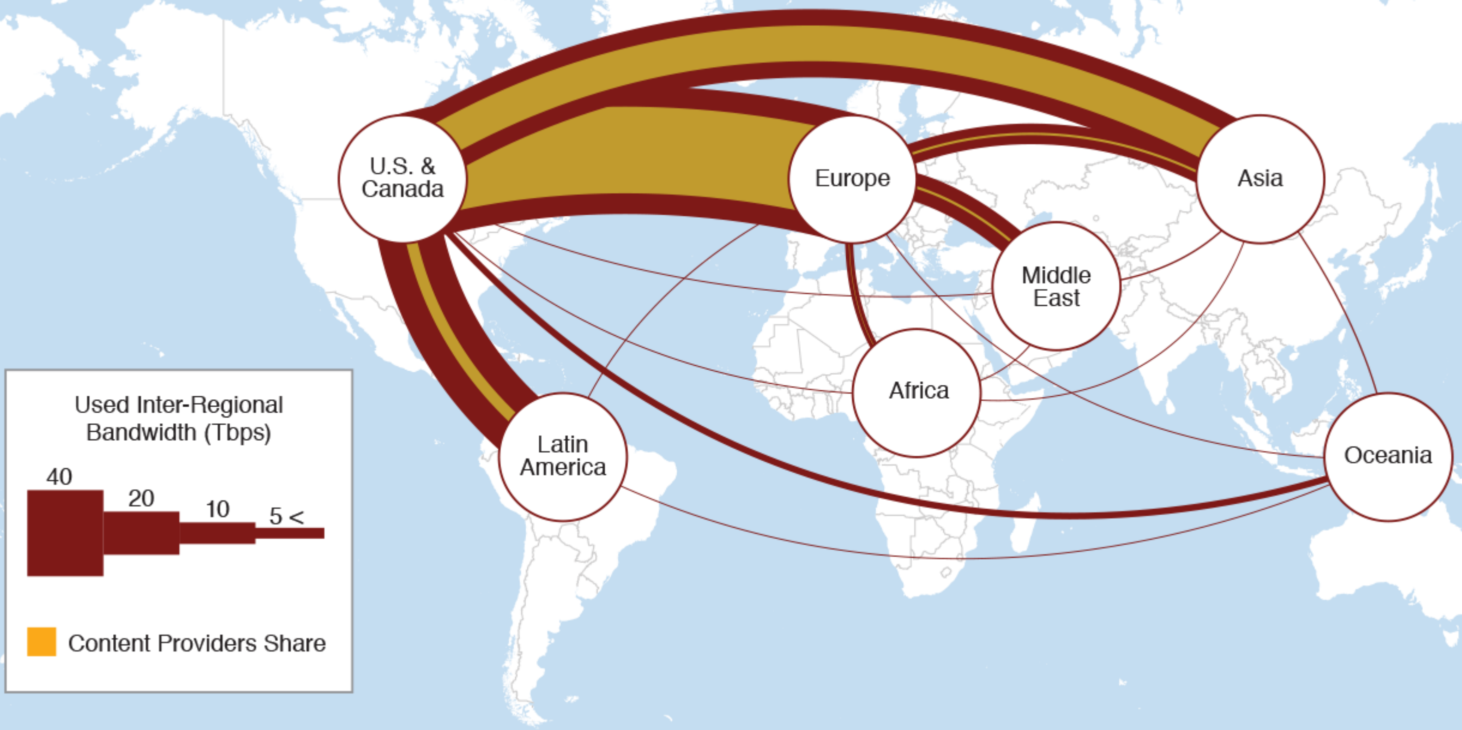


Content provider cable investments

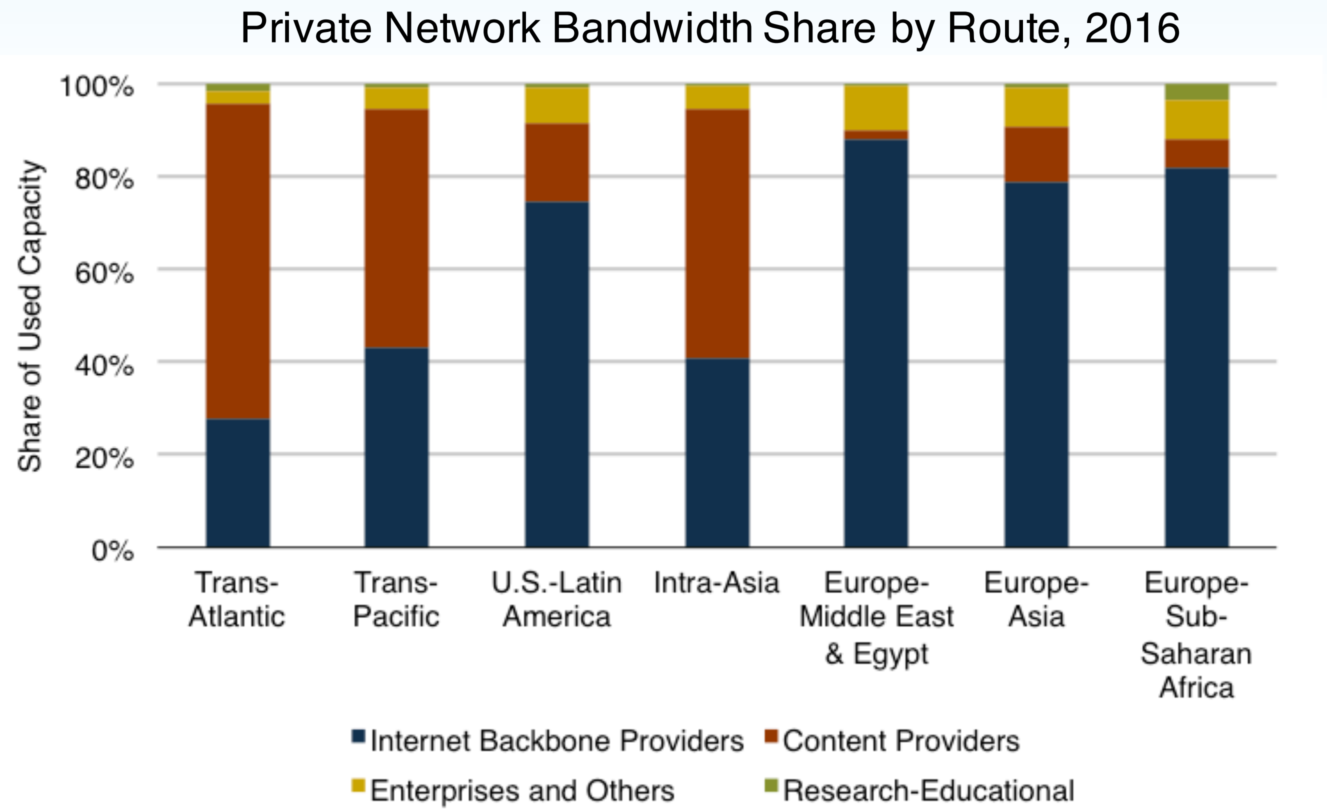
Provider	Cable	RFS
Google	Unity	2010
	Southeast Japan Cable (SJC)	2013
	FASTER	2016
	Monet	2017
	Tannat	2017
	Junior	2017
	Pacific Light Cable Network (PLCN)	2018
	INDIGO-West	2019
	INDIGO-Central	2019
Facebook	Asia Pacific Gatewy (APG)	2016
	MAREA	2018
	Pacific Light Cable Network (PLCN)	2018
	AE Connect	2018
Microsoft	Hibernia Express	2015
	AEConnect	2016
	New Cross Pacific	2018
	MAREA	2018
Amazon	Hawaiki	2018

Note: Only publicly disclosed content provider investments shown.

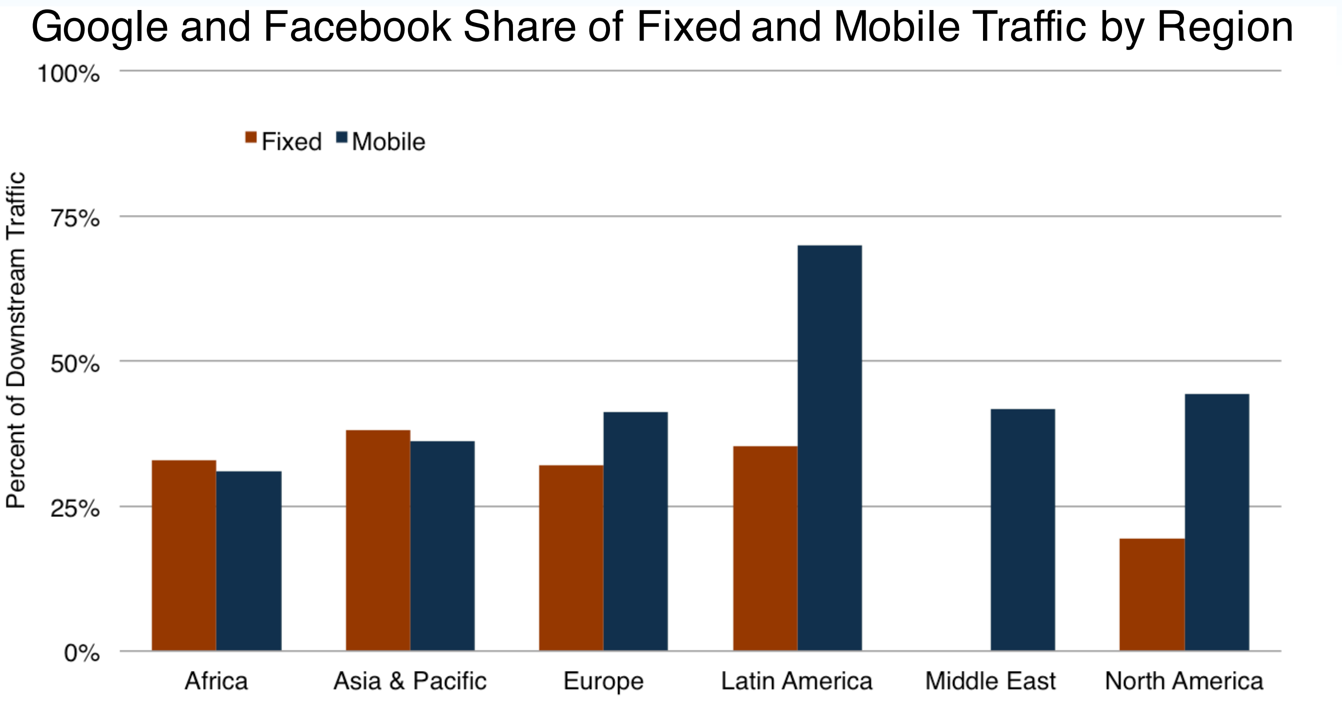
Content provider share of capacity



Private Network Share Varies by Route



Concentrated demand



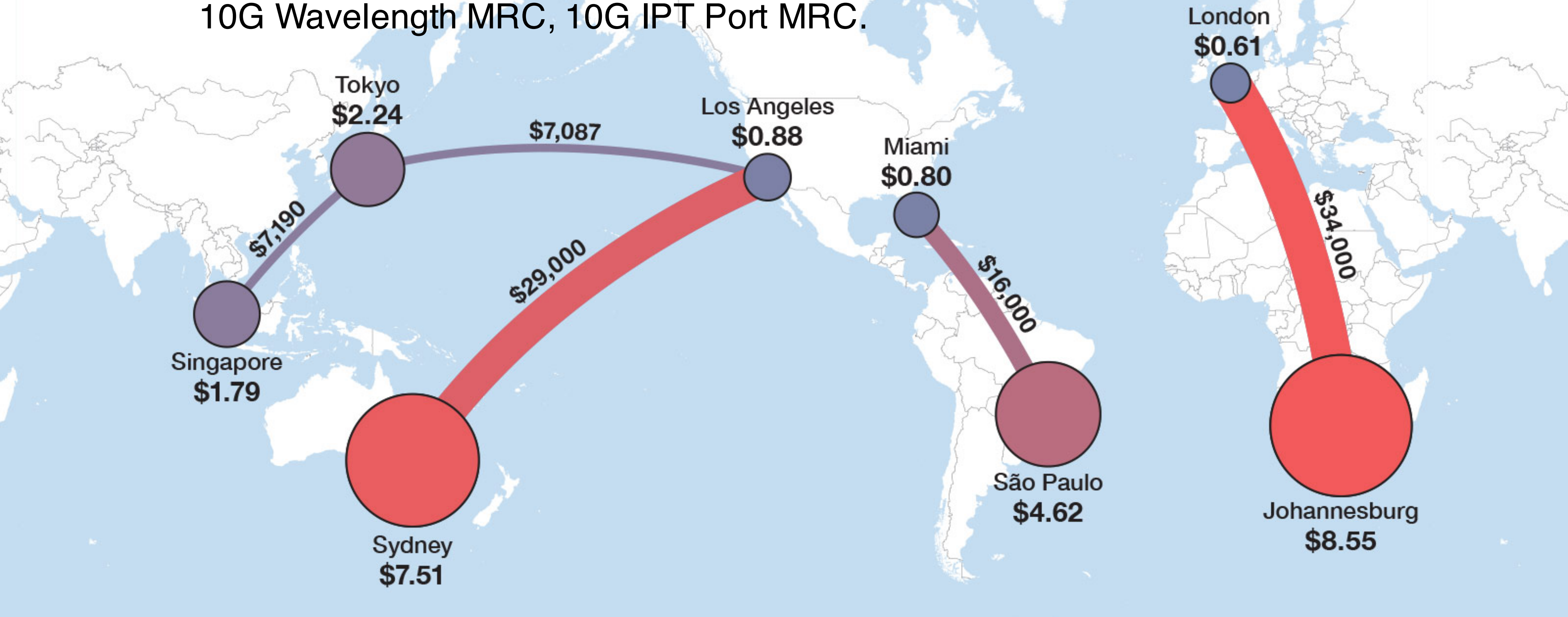
Notes: Data reflect sum of the share of traffic attributable to Google and Facebook appearing in the top 10 list of downstream traffic sources in Sandvine's Global Internet Phenomenon report. Data for Europe is from October 2015. Data for North America and Latin America is from June 2016. Data for Africa, Middle East, and Asia & Pacific is from October 2016. Fixed data unavailable for the Middle East.

Source: Sandvine

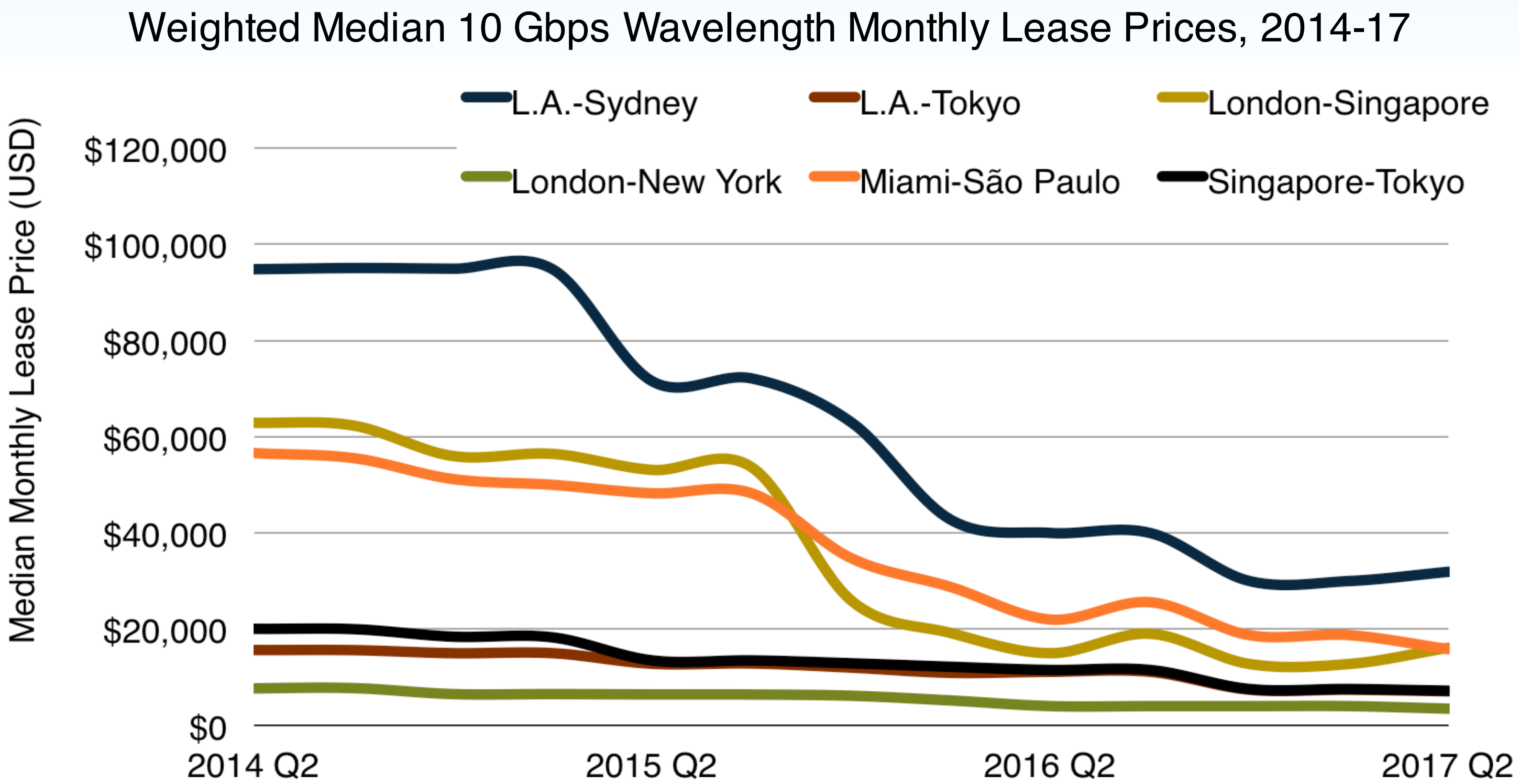
Pricing

Prices Vary by Geography

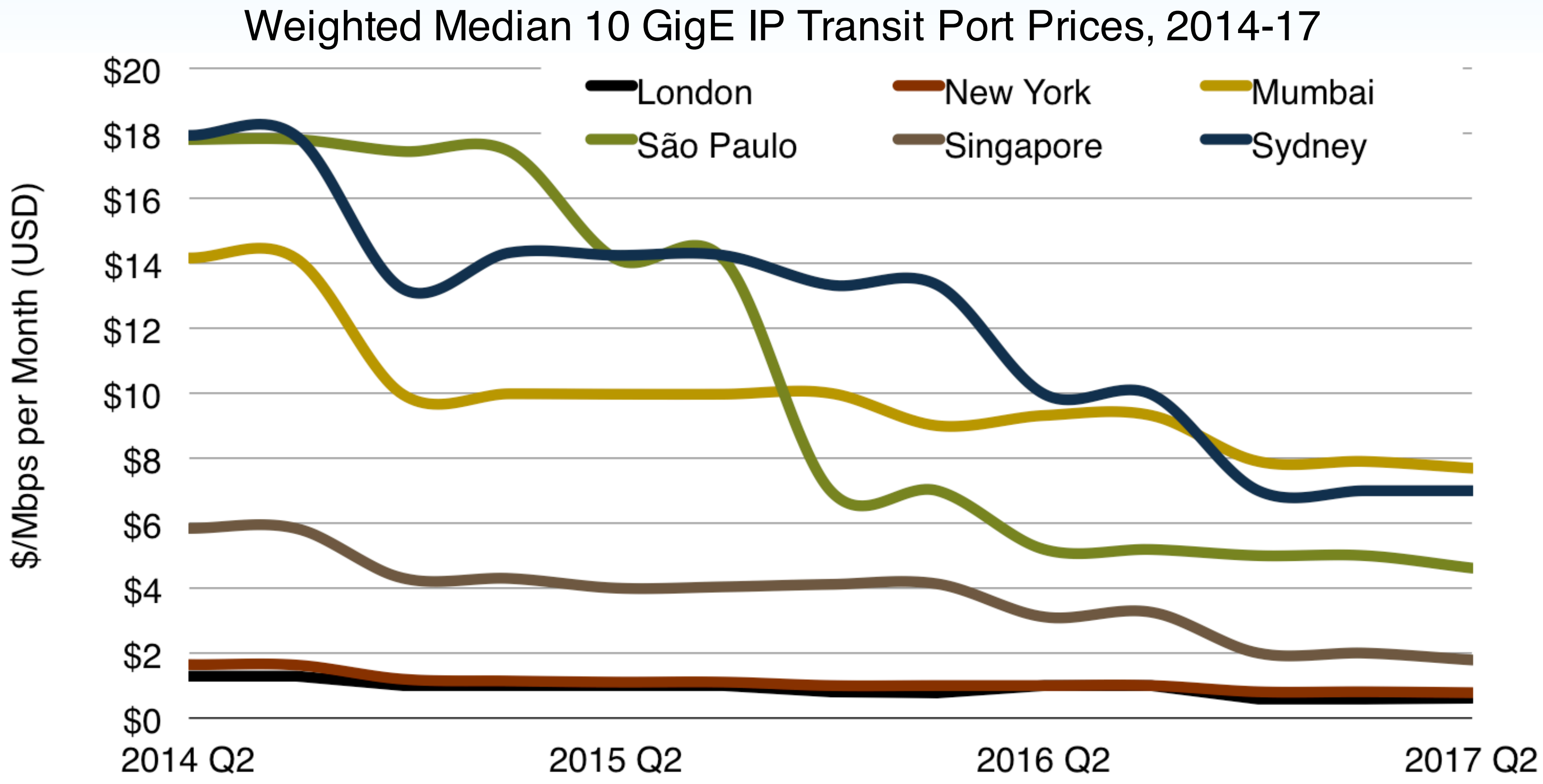
10G Wavelength MRC, 10G IPT Port MRC.



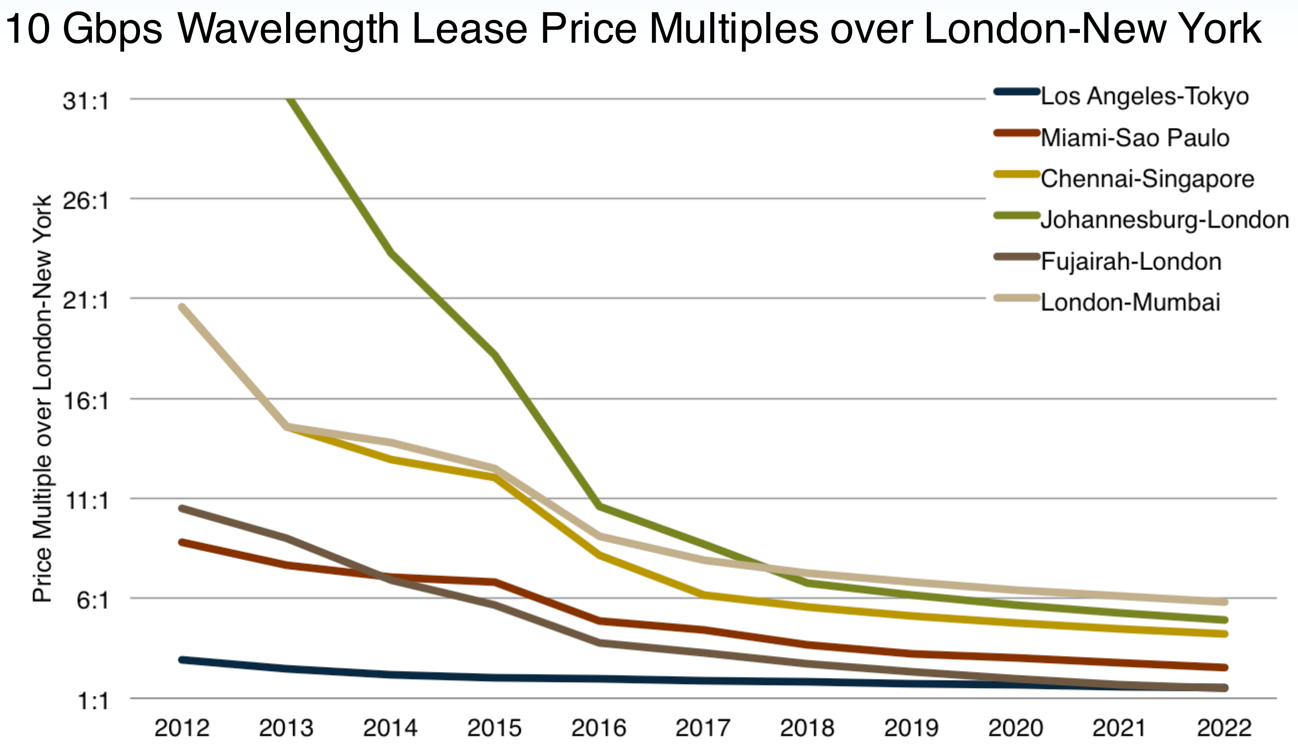
Transport Prices Decline



Transit Prices Follow

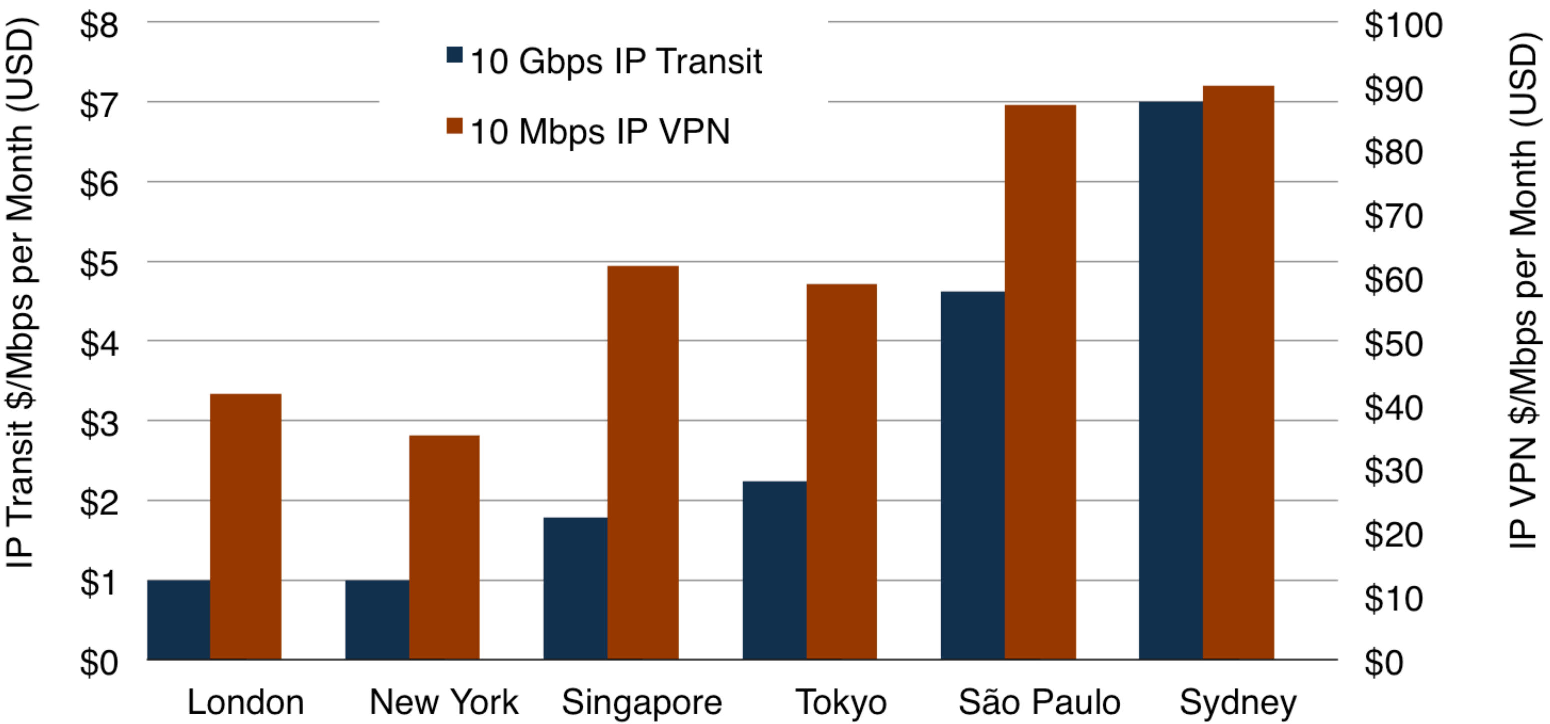


Price differences narrowing

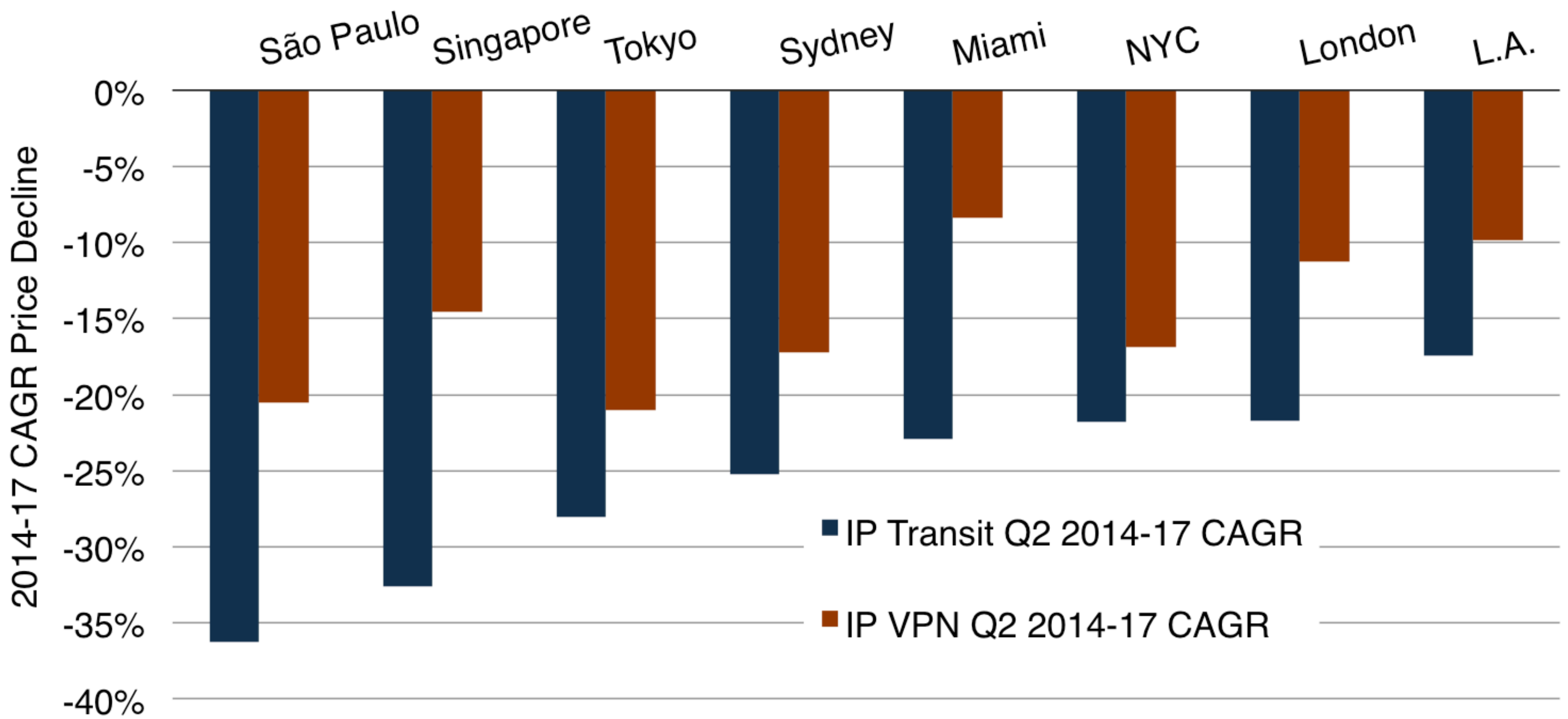


Enterprise Prices Map to Wholesale

Median 10 GigE IP Transit & 10 Mbps IP VPN Port Prices, 2017

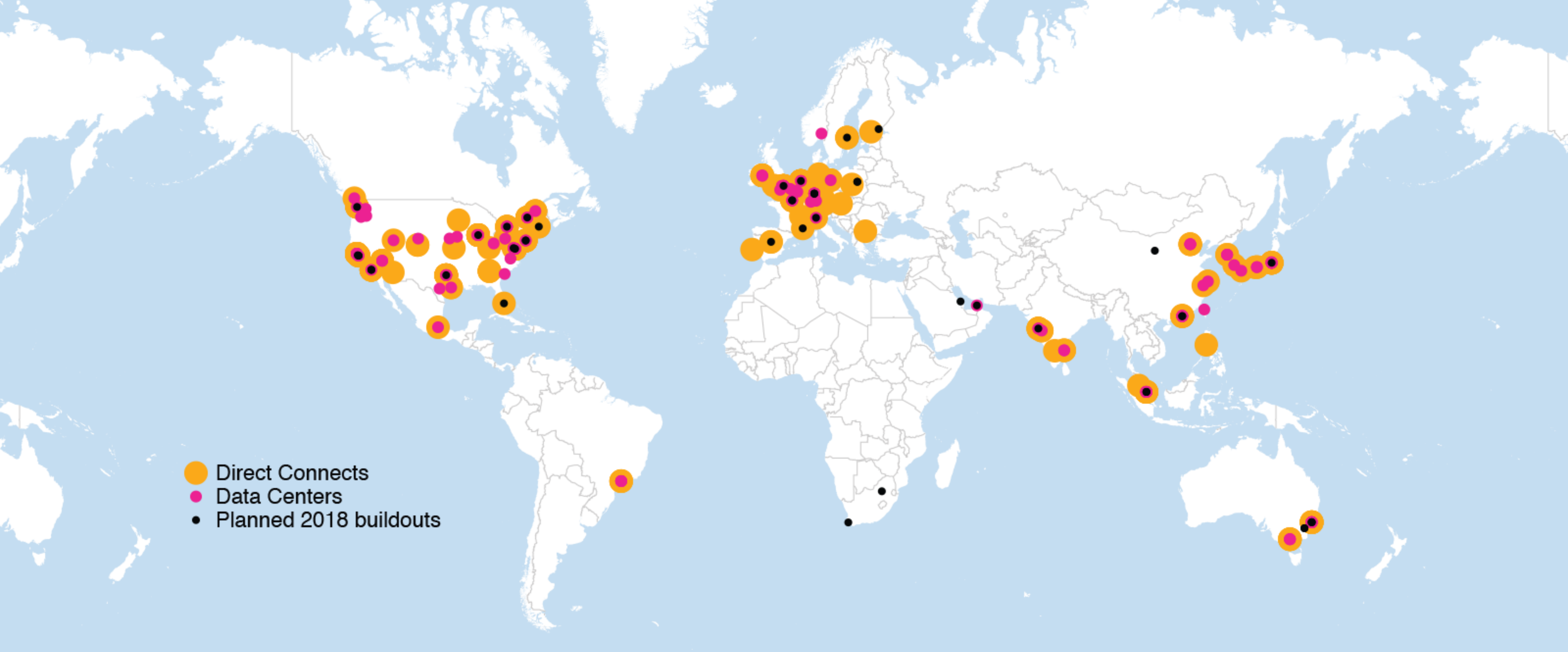


…and Exhibit Similar Trends

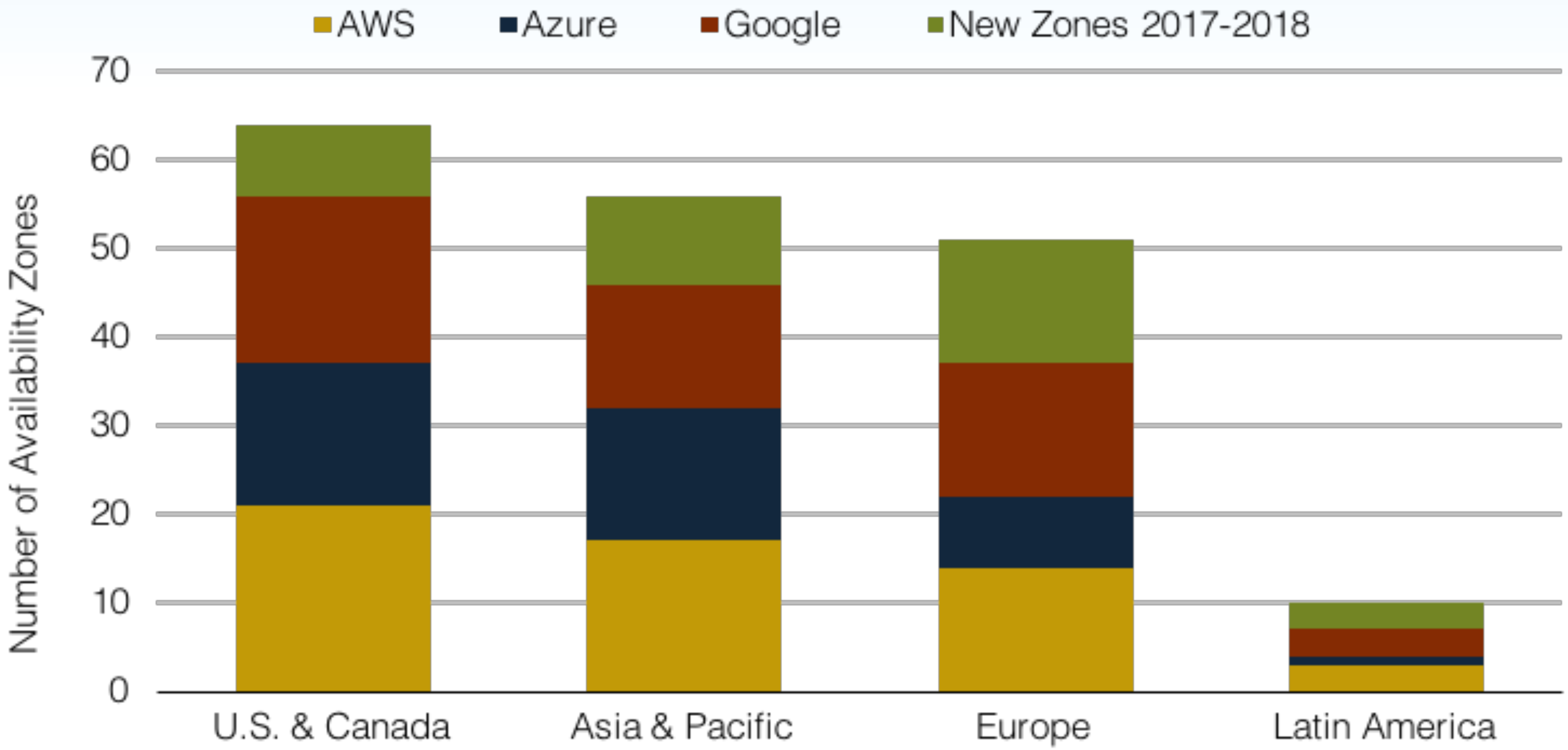


Cloud Providers

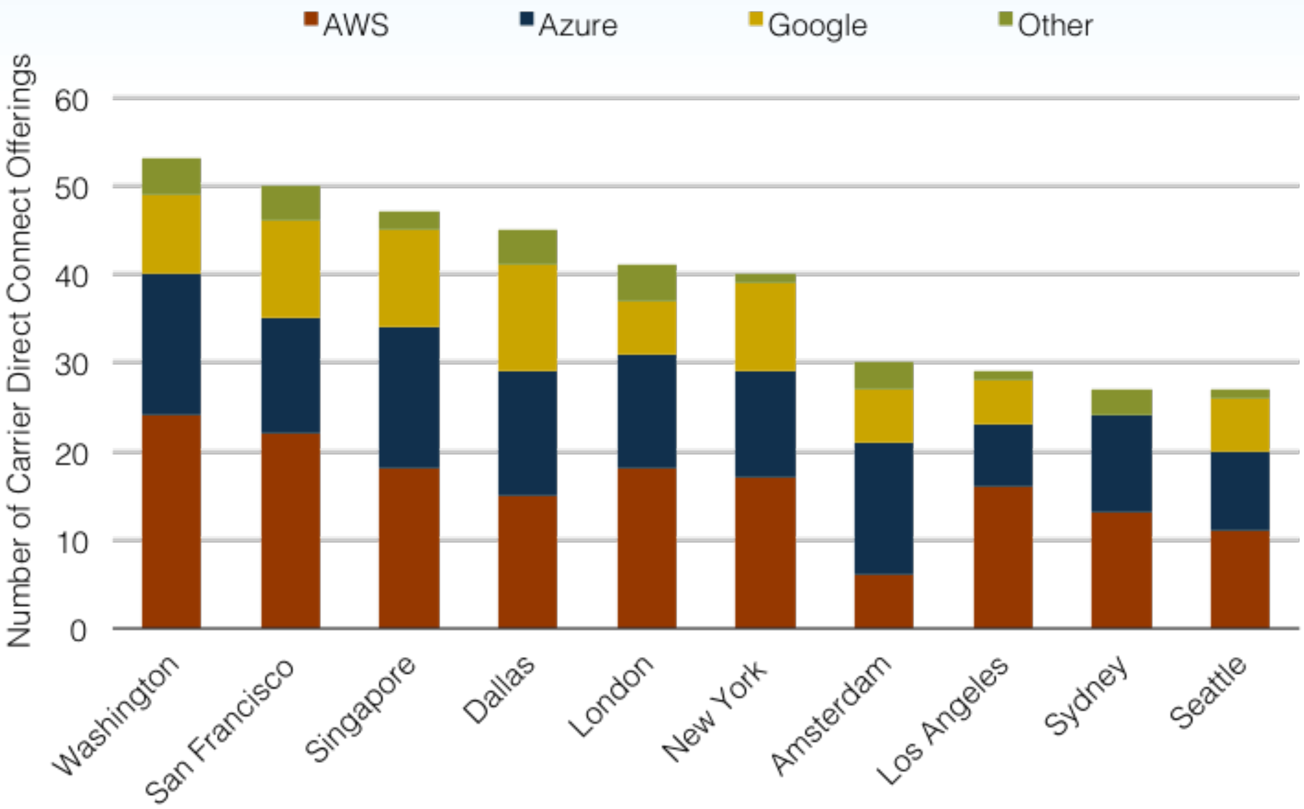
Cloud Data Centers & Direct Connects



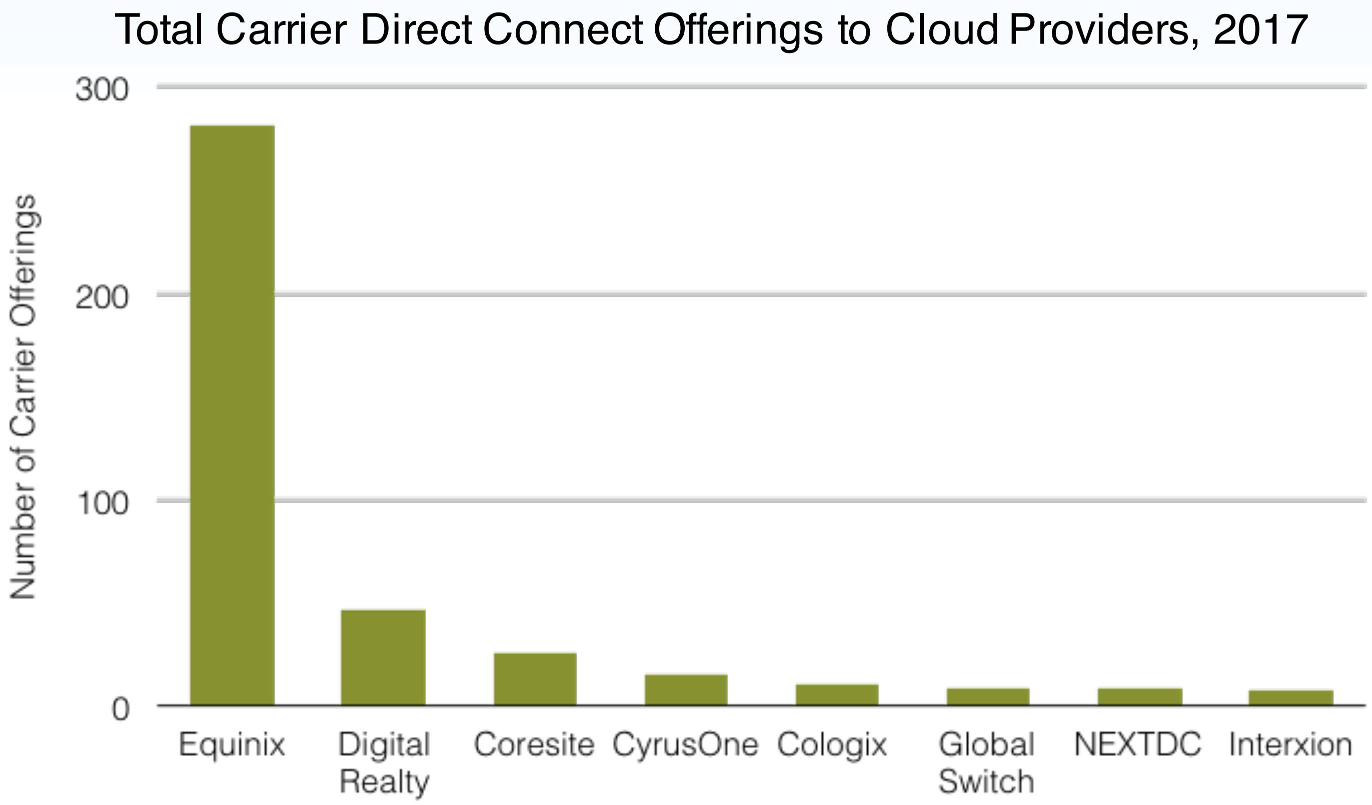
Cloud Provider Zones & Regions



Direct Connect Offerings by City



Colo Facilities Connecting WANs to the Cloud



Summary

- Global network of primary hubs
- Demand growth is as reliable as price erosion
- Enterprise WAN costs predicated on wholesale prices
- Content Provider growing faster than the internet
- Content Providers building out their networks to end-users
- Cloud Data Centers rapidly expanding in same markets, and starting into developing markets

Thank You!

Questions?

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