

EQUINIX

**Up And To The Right!
(Interconnection in 2025)**

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A View of Interconnection from 2025 and Beyond ...

- **A look at some possible demand drivers of network traffic**
 - You know this stuff already probably
- **Then I'll project out where some of those trends might take us**
 - Cats and Dogs Living Together, Mass Hysteria?
 - This Internet Fad may not blow over so quickly (Prediction #1!)
- **Why 10+ years out?**
 - Some trends are somewhat predictable, but others are less so
 - There's a very good chance you won't remember any of my predictions in a decade, so you probably won't hold me accountable if things don't go as I think
- **Don't panic, there won't be any hard math**

User Demographic Predictions

- **World Population**

- 7.2 Billion in 2015 (est US Census Bureau)
- Over 8 billion in 2025

- **Internet Users**

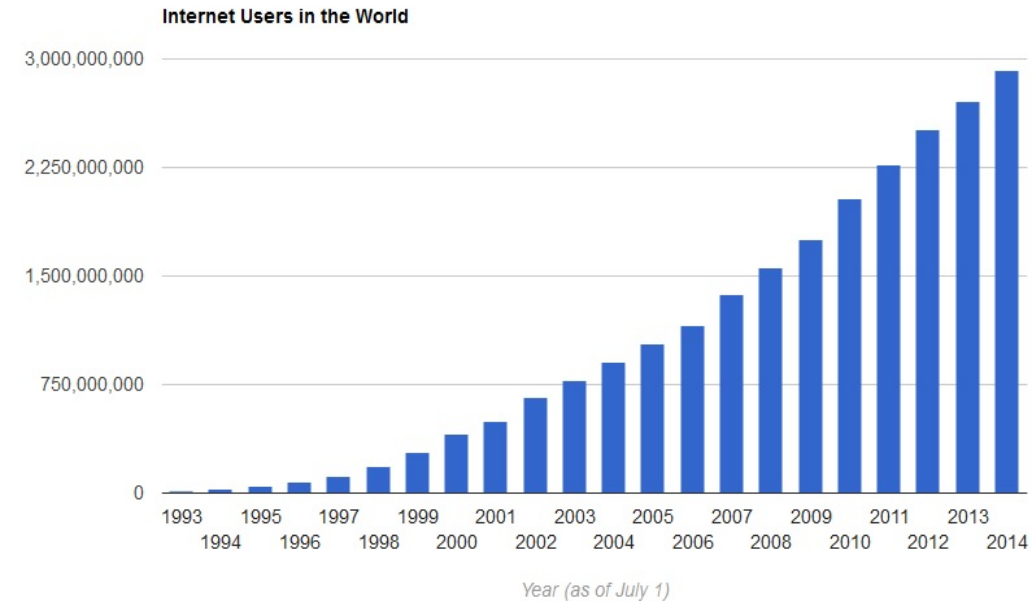
- ~2.8 billion users in 2014; predicted to be ~3 billion by 2020, 3.5 billion in 2025

- **Connected Consumer Devices**

- 4 IP user devices per person in 2025
- 32 BILLION USER DEVICES

- **Wired and Wireless Capacity Increases**

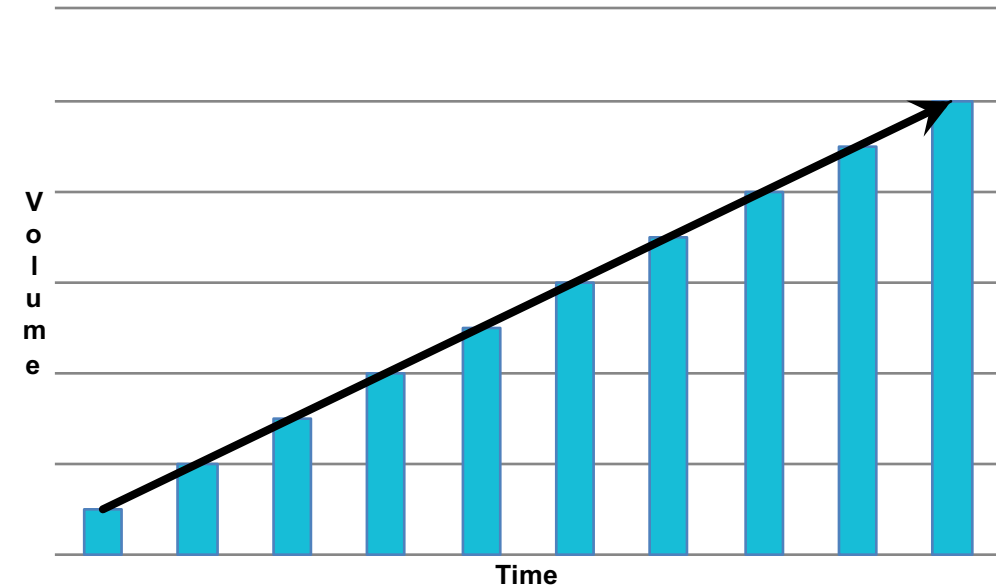
- Mobile IP data traffic predicted to grow 57% per year for next five years
- Residential wired bandwidth increasing ~53% per year historically (Nielsen's Law)



Internet as OTT Video Delivery Platform

- **Video distribution is dominating internet infrastructure**

- As of early 2015, Netflix estimated to be 37% of North American distribution network capacity (Sandvine)
- Cisco VNI study claims that 64% of consumer IP traffic is video now, and will grow to 80% (!) in less than 5 years



- **The OTT trend of real time entertainment will continue to grow (and grow)**

- More video streaming services beyond Netflix: Amazon, Youtube, Facebook, Hulu, HBO ...
- 4K Ultra HD streaming looks great, and takes up lots of capacity
- Video game broadcasting (Twitch and Youtube Gaming) and music festival broadcasting (Twitch)
- Sportsball! FIFA, MLB, PGA, Olympics have embraced streaming, more sports are sure to follow
- Real-time entertainment will expand dominance of access networks, comprising at least 85% of peak traffic in ten years

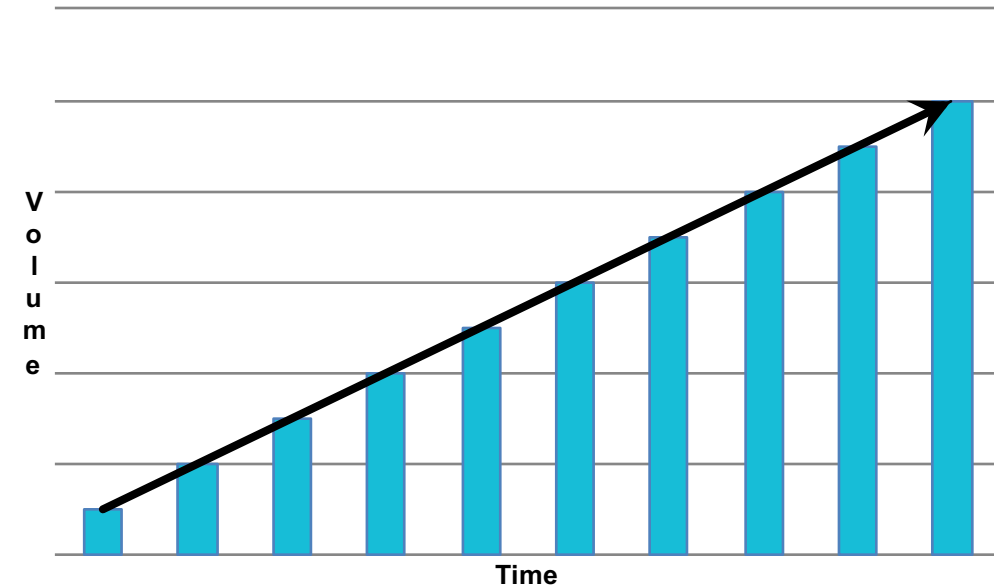
Internet of All The Things

- **Predictions have 100 BILLION devices online within 5 years**

- Industrial sensors, parking meters, cereal boxes, shoelaces, and on and on and on...
- Yes, much of this traffic is localized or using subsidiary LTE networks, doesn't cross backbone or residential/wireless networks
- But still, picture 200 BILLION devices autonomously using network resources in 10+ years

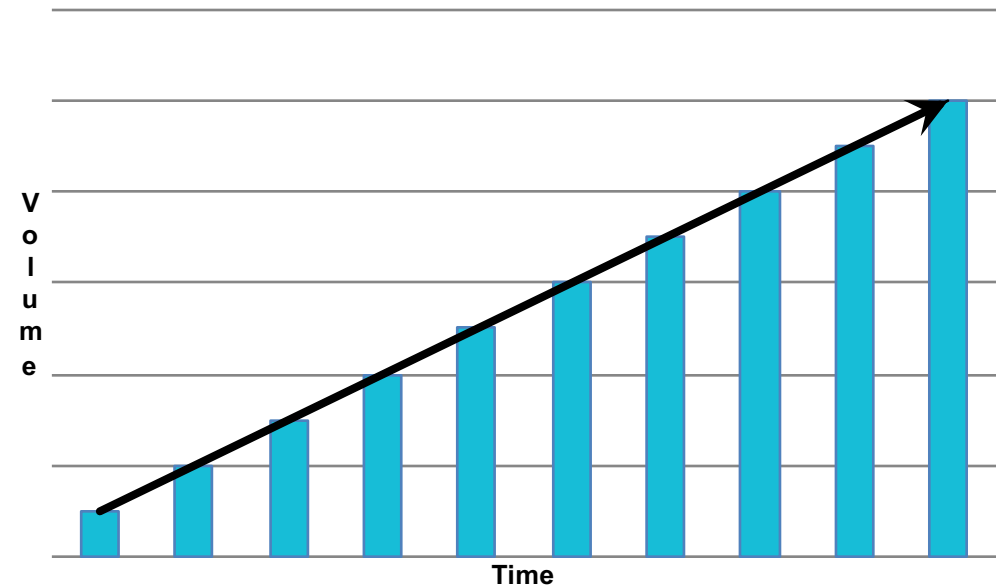
- **Different traffic patterns than we currently see**

- Small transactions between sensors and cloud services, orders of magnitude more small packets 64-bytes, networks not optimized, but does this traffic really count if it doesn't hit access or backbone networks?
- Are Wireless/LTE/RFID networks robust enough to support this traffic with "dial tone" service availability? Or does society break down when a network fails?



Interconnection Speeds

- **100G ports will be the common interface on interconnection links in primary (and some secondary) interconnection markets**
 - Cost to deploy will drop steeply
 - Deprecation of 1Gig in core markets
 - Nx100G common interface at public IX
 - Will exchanges even continue to offer 1G?
 - 1Tb ports will be a topic, but probably not quite in production yet
- **Strong growth in 100G PNI connections**
 - Over last few years, PNI has outpaced public interconnection by 9:1, and increasing share just slightly every year
 - About 95% of interconnection partnerships will happen over PNI by 2025



So Where Will Interconnection Happen?

So WHAT IF access network capacity continues to grow at slightly less than compute capacity?

Where will compute and network concentrate?

- Caching will still be essential to media distribution, and will be embedded deep within carrier networks, maybe even down to the headend/POP level
- Which still leaves a concentration of origin sources in traditional interconnection hubs, and the development of new primary hubs in emerging markets.
- Current trending towards PNIs over Public Peering will continue
- Still kinda serious about video caches in my house. Call me.



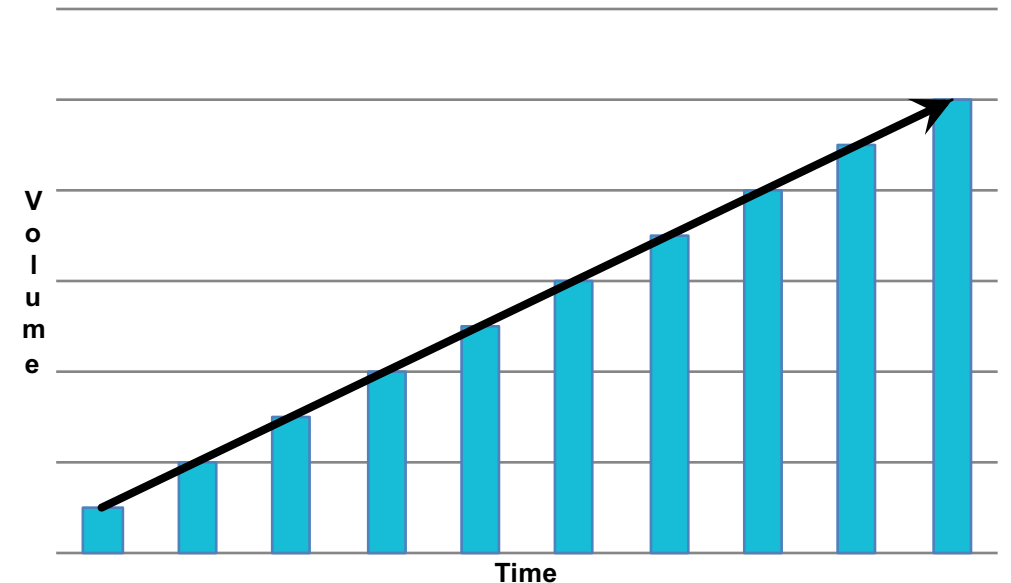
Submarine Fiber

- **Today there are about 300 international submarine cables, estimated 550,000 miles**
 - Currently 99% of transcontinental data travels them
 - 10 notable submarine outages in 2015 so far (at least one by unconfirmed shark attack)
- **Cable growth has averaged nearly 10% new cables per year over last few years**
 - Projecting only 8% annual growth more than doubles the current operational cable count
- **Increase in Australia, Asia, Latin America, Africa cables, all through shark-infested waters**
 - Sweet, delicious undersea fiber
 - More outages due to shark attacks, and the videos of them will drive more demand for capacity



And What ELSE Does More IP Traffic Mean?

- **More Network Conferences, Forums, NOGs, Summits**
 - 2013-2015 conference growth: ~10% annual increase in conferences
- **That same 10% CAGR over the next 10 years means roughly 150 conferences per year**
 - Average 3-day conference, 2 days of travel
 - 450 meeting days plus 200+ days of travel is over 650 conference person-days!
 - **Corollary:** We'll need **at least** two more Martin Levys to cover all those meetings



Prediction Summary

Contact your local oddsmaker or find me in 10 years

- 1. Internet will still be “a thing”**
- 2. Real-time Entertainment will be 85% of access network traffic**
- 3. IoT will have a limited impact on backbone and access network capacity**
- 4. IX and PNI connection will commonly happen at 100G in largish markets and someone will be talking about 1Tb ports.**
- 5. Compute will continue to concentrate in traditional primary markets, but will also expand more into emerging markets**
- 6. More sharks and conferences. So. Many. Conferences.**

Gracias!