Netflix Open Connect

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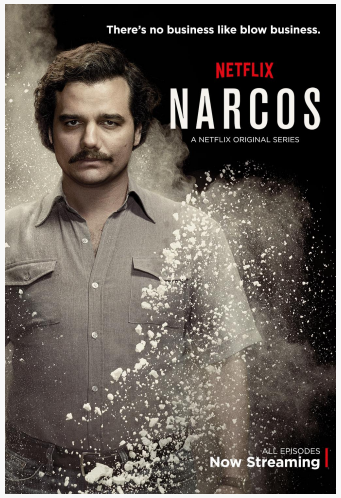
Netflix Update

Background

- With our Jan 6 2016 global launch we serve 190+ countries
- Over 1 billion hours of streaming per month
- 81.5 million global members as of Q1 2016
- 450 million potential broadband households



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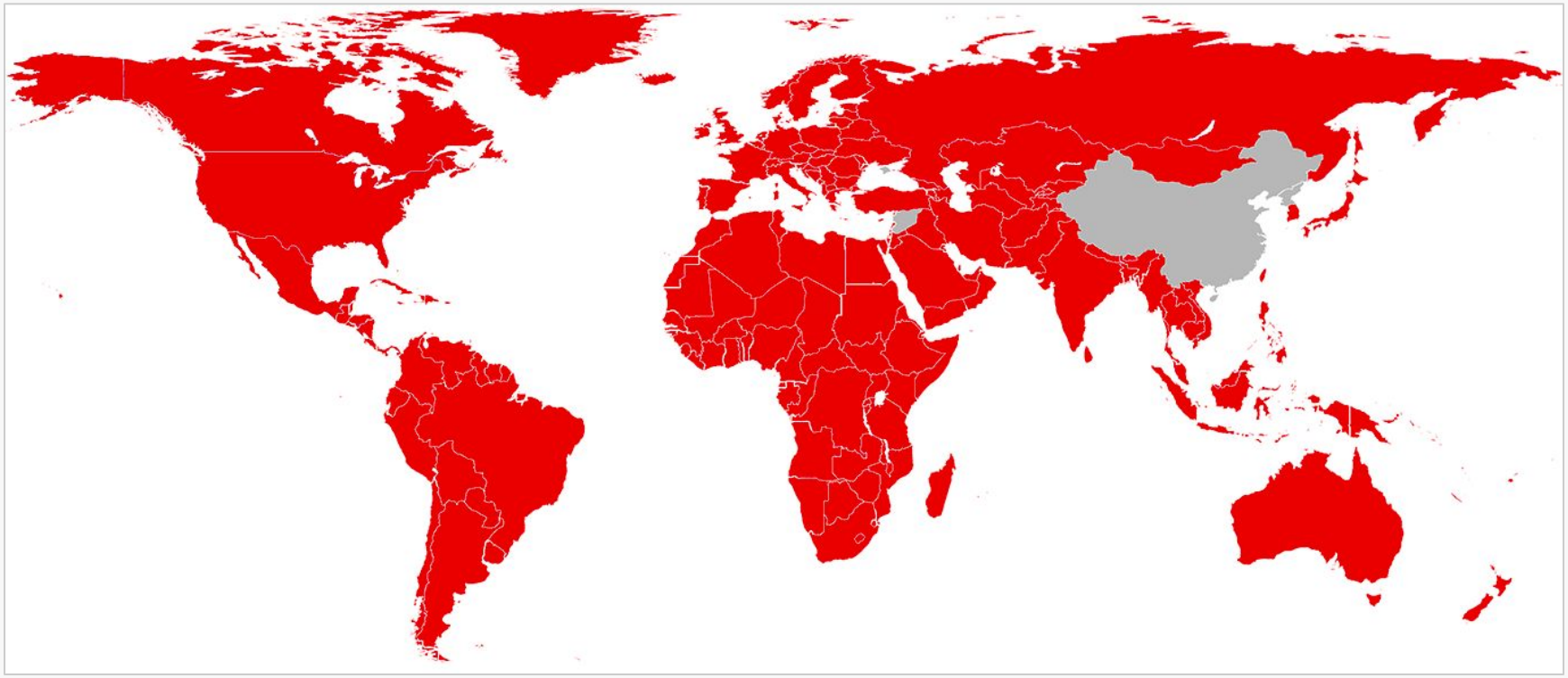
Netflix Markets



Where is Netflix Available?

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Netflix Original Content

- Netflix Original Premier Dates

- **Highlights of Recent and Planned Releases**
  - Fuller House
  - House of Cards - Season 4
  - Marvel's Daredevil - Season 2
  - Bloodline - Season 2
  - Orange is the New Black - Season 4
  - The Crown
  - Marco Polo - Season 2
  - Stranger Things
  - The Get Down

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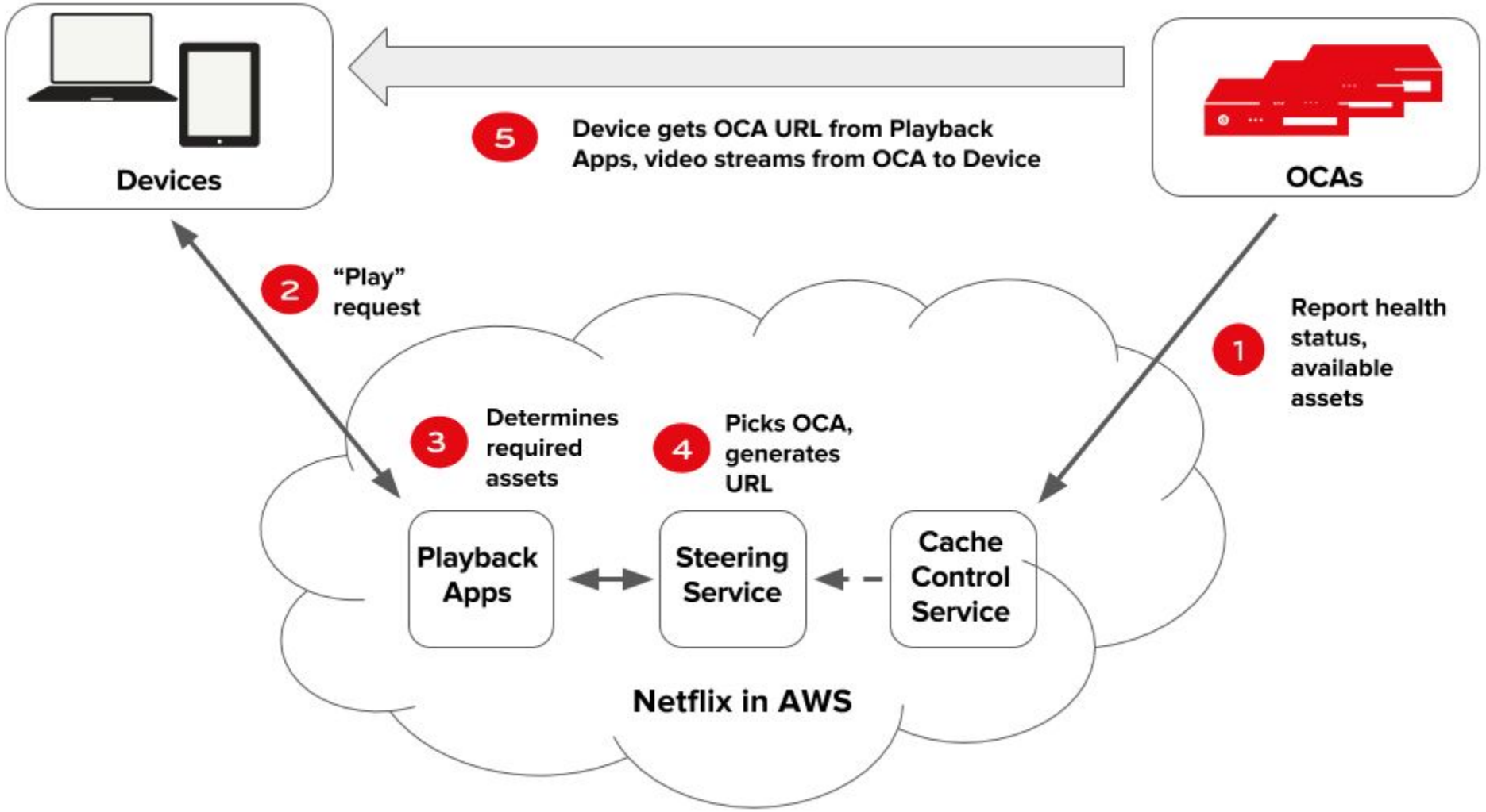
Client steering process



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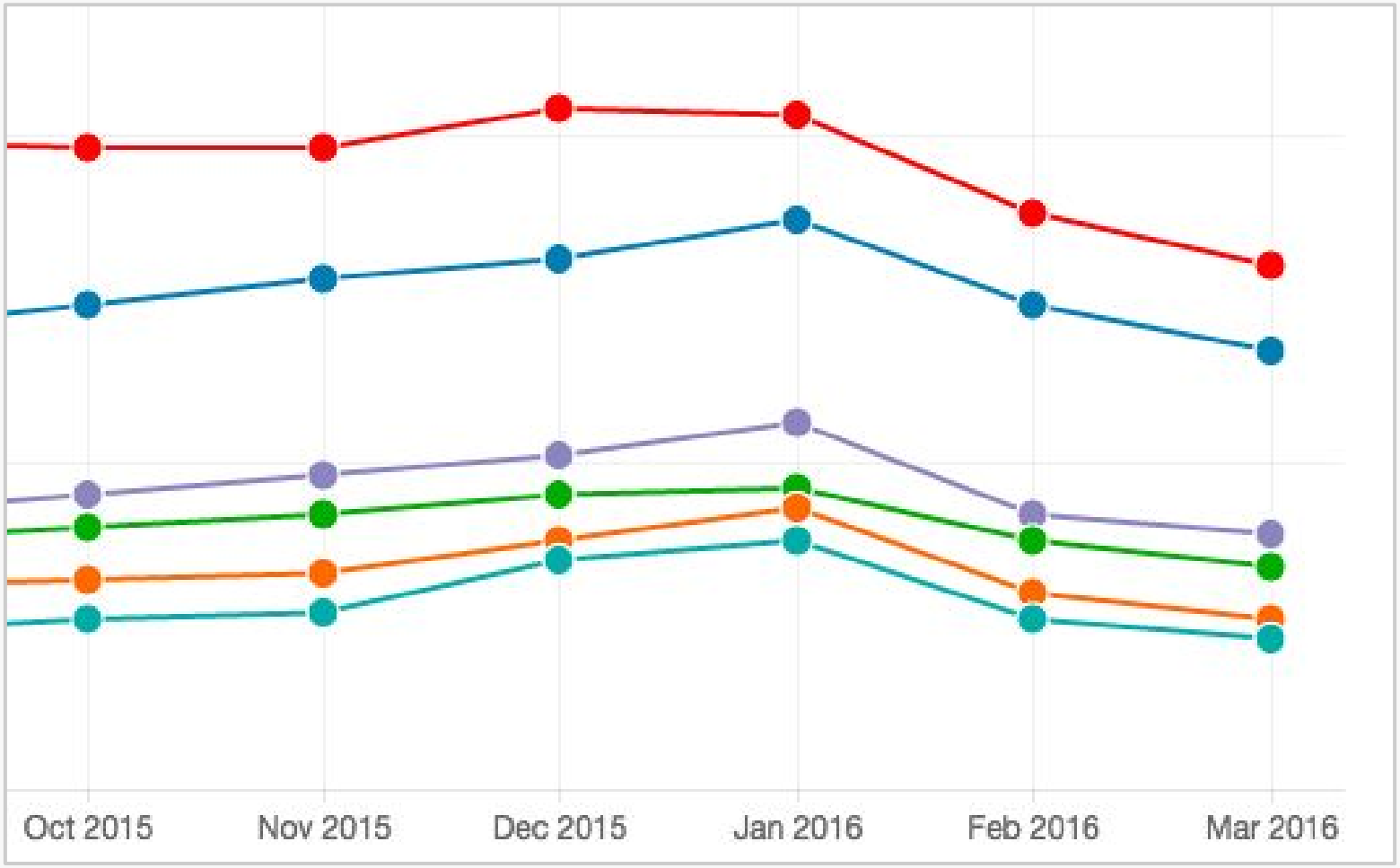
ISP Speed Index Trends



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ISP Speed Index Trends

- **Complexity-Based Encoding Introduction**
  - Announced in December 2015: http://techblog.netflix.com/2015/12/per-title-encode-optimization.html
  - 80% deployed as of April 2016
- **Best Possible User Experience**
  - Per-title content optimization based on on video signal analysis
  - Minimize bandwidth while maximizing video quality
    - Some sections of titles have increased short-term bitrates
  - Continued optimization efforts are ongoing
- **Maximize Bandwidth Utilization**
  - Minimize consumer bandwidth required for an excellent experience

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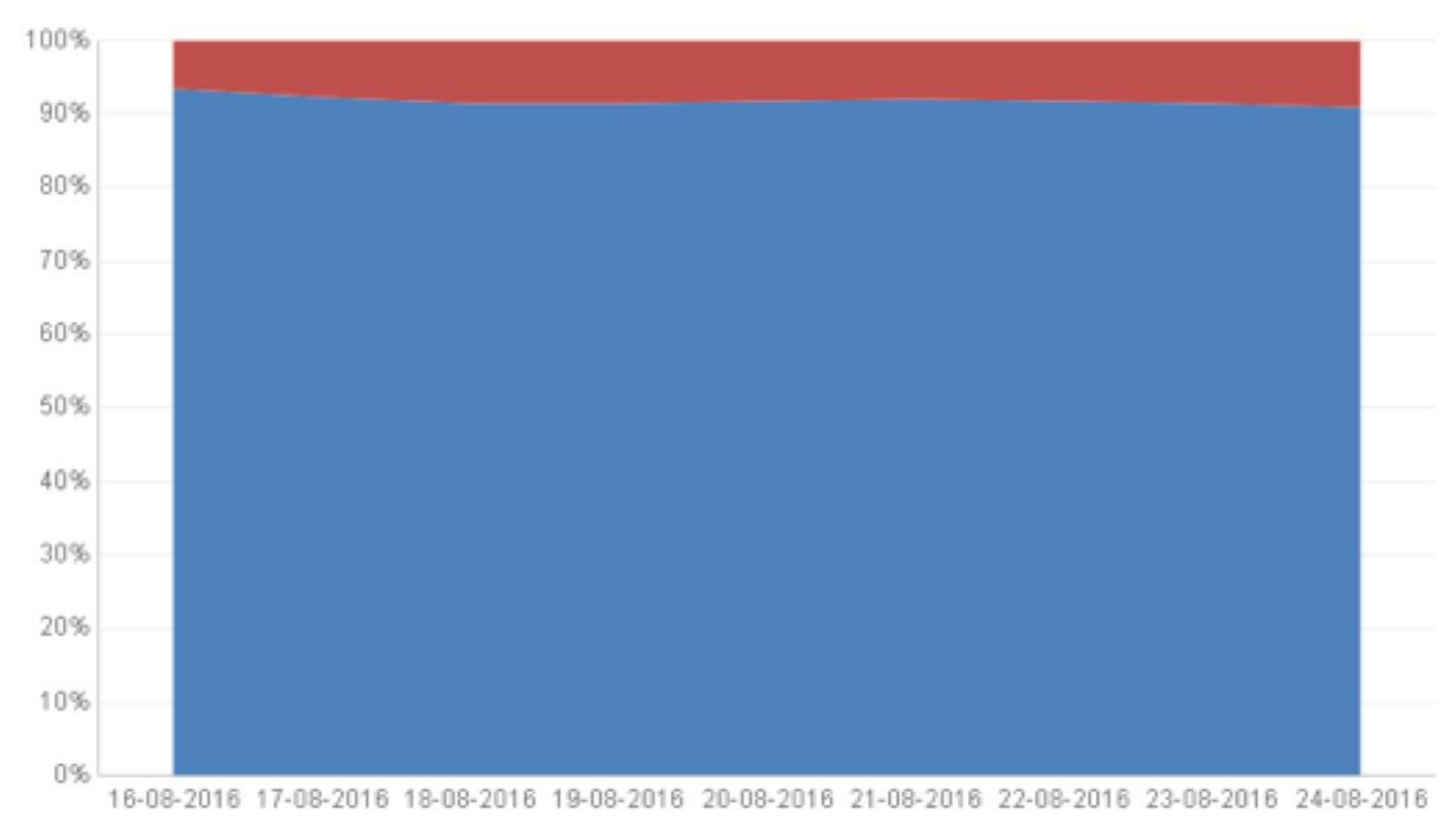
Netflix IPv4/IPv6 Traffic globally



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Netflix IPv6

- **Open Connect is dual stacked**
  - Network
    - IXPs
    - Private Peers
  - OC appliances
- **Clients**
  - When devices support IPv6, the Netflix Client support IPv6
  - When supported devices run on dual stacked network, the Netflix client uses IPv6 as default, but can fall back to IPv4 if needed.
  - OCA urls all have a AAAA records
- **Steering**
  - v6 works identical to v4 and best path is always chosen based on BGP no matter which protocol is used.

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Netflix Open Connect

Mission

Enable Internet Service Providers to provide a great Netflix experience

How?

- ISPs can Embed Netflix Open Connect Appliances (OCAs) at no cost
- Private interconnection at global locations using 10G, 40G, and 100G
- Peering over public internet exchange points

Locations

- Over 50 global points of presence
- Thousands of content appliances within ISP networks
- Deployments in every significant Netflix market

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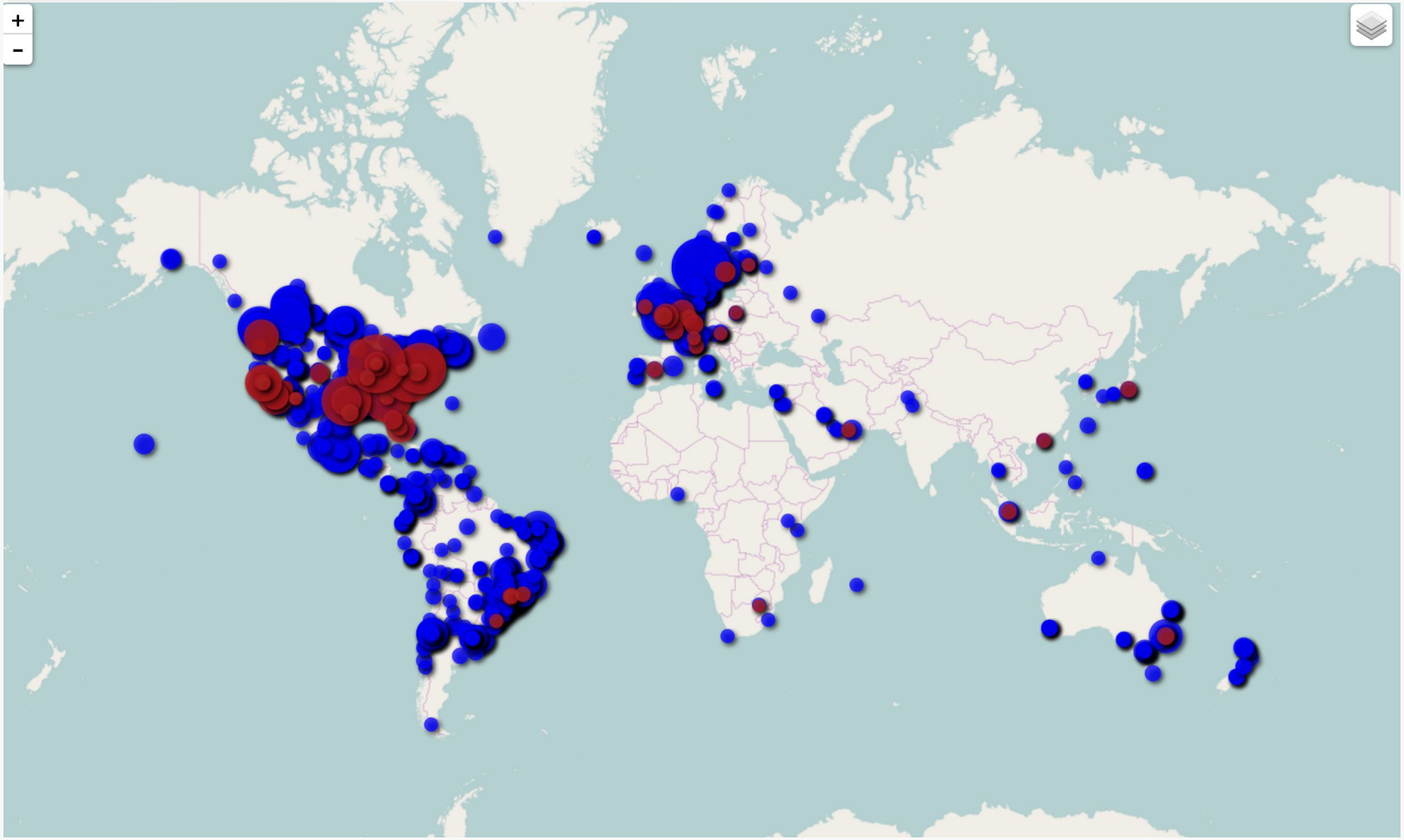
Locations



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Open Connect Appliances (OCA)

- Up to 100% of Netflix content served from within ISP network
  - Reduces or eliminates Netflix traffic from upstream links during peak hours
  - Offload percentage based on scale of deployment
- Content replenishment during off-peak hours (e.g. 2 PM - 2 AM)
- ISP controls routing decisions via BGP
- Multiple form factors
  - Custom architecture for each ISP to optimize offload
  - Industry-leading throughput per watt / rack unit
- Based on open source software (FreeBSD, Nginx, BIRD)
- Native IPv6 Support

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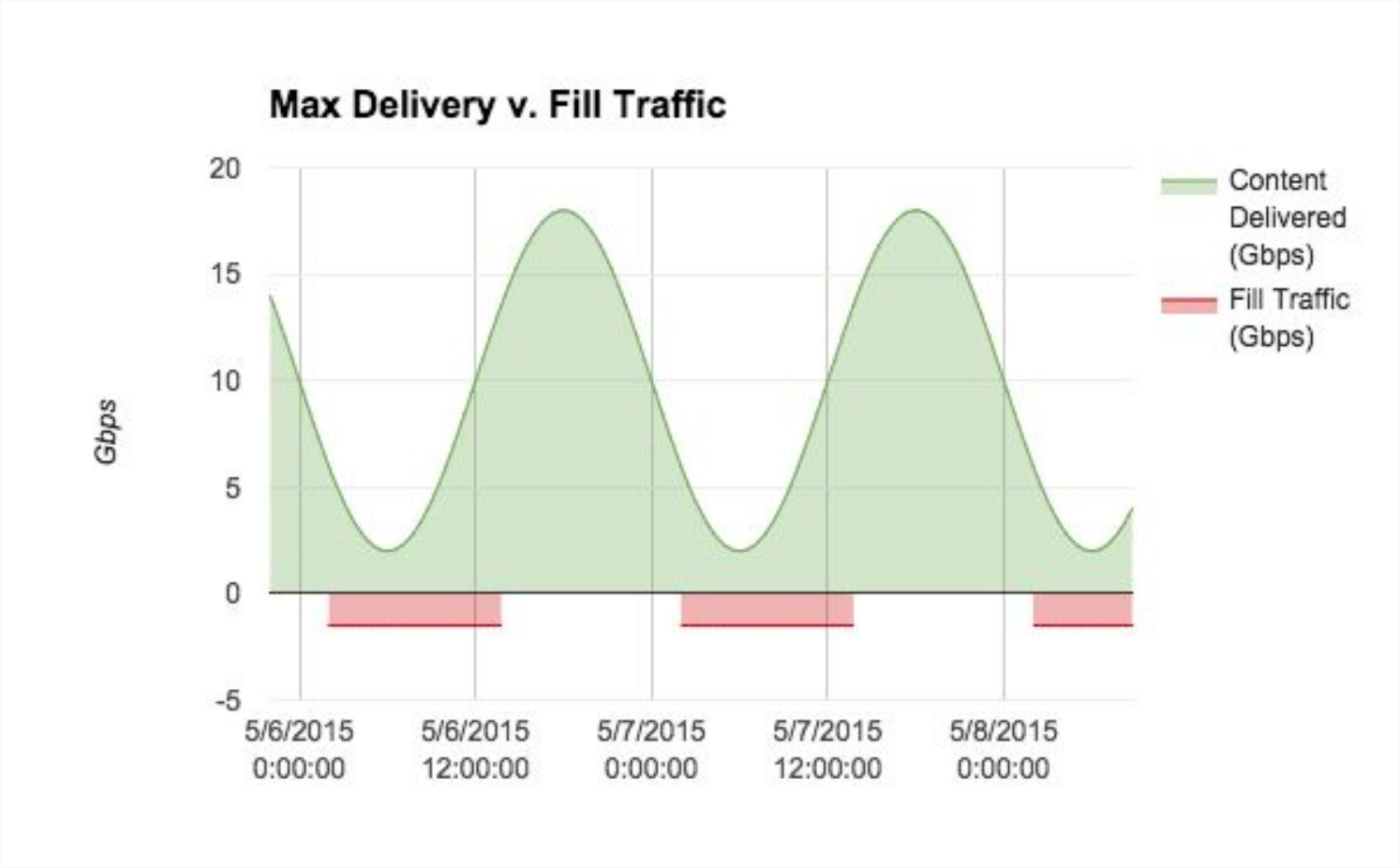
Example OCA Fill & Offload



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OCA ISP Requirements

- Minimum Peak Traffic Requirements
  - Based on Netflix country catalog sizes
  - > 5G in North America and Western Europe
  - > 1G in rest of world
- Space and Power
  - Minimum 1U of rack space / 250 watts
  - 2U and 1U expansions, deployment architecture dependent
- 2x10G for connectivity (4x10G for flash expansion)
  - Hardware architecture customized for the ISP's network
- Process
  - Short Agreement: Software license and Hardware transfer
  - Deployment architecture with Netflix CDN Operations
  - Site survey for each location
  - Additional information - http://openconnect.netflix.com

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Open Connect Appliance - Global

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Netflix in Africa

- **One Pop**
  - Private and Public peering in Teraco, Johannesburg, SA
- **Embedding**
  - ISPs are deploying OCA
- **More IXPs**
  - Solution for small IXPs using the same model as for ISP in strategic locations

We are here to listen and learn

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Questions?

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