Netflix Open Connect
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
Netflix Markets

Where is Netflix Available?
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
Client steering process

1. OCAs report health status, available assets.
2. “Play” request.
3. Determines required assets.
4. Picks OCA, generates URL.
5. Device gets OCA URL from Playback Apps, video streams from OCA to Device.

Netflix in AWS

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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
Netflix IPv4/IPv6 Traffic globally
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.
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
Locations
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
Example OCA Fill & Offload
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](http://openconnect.netflix.com)
Open Connect Appliance - Global
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
Questions?