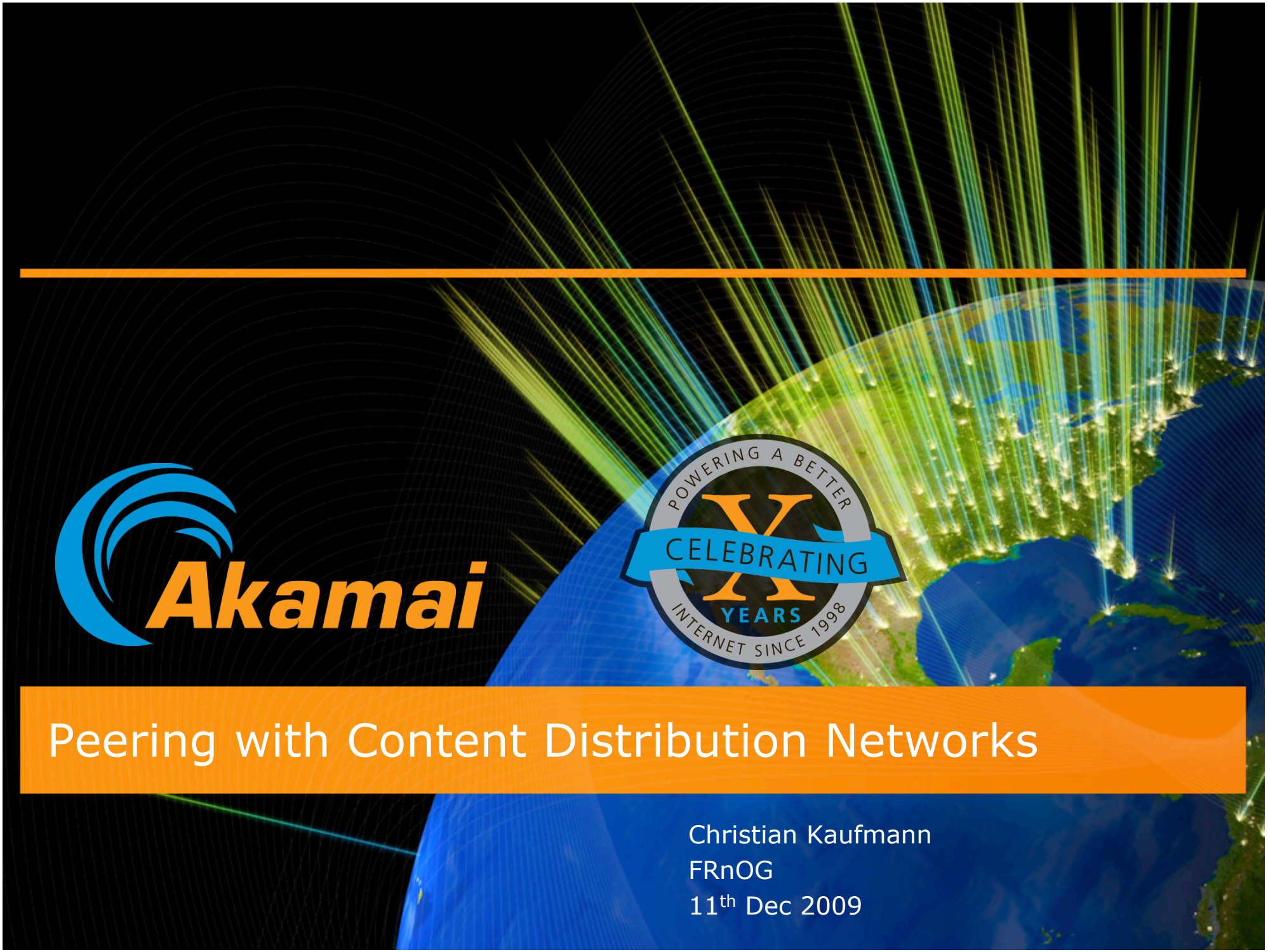

Peering with Content Distribution Networks

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Agenda

- Disclaimer
- What is a Content Distribution Network
- Why CDNs peer with ISPs
- Why ISPs peer with CDNs
- Peering at Multiple Locations
- Questions

Disclaimer

I work for Akamai Technologies, a Content Distribution Network

While all of the information here is applicable to at least one CDN, I cannot guarantee it is applicable to every CDN

In Other Words: Your Mileage May Vary

Feel free to ask me questions about specific CDNs after the talk

The Akamai System

The world's largest on-demand, distributed computing platform delivers all forms of Web content and applications for over 2,000 customers and 20,000 domains

The Akamai EdgePlatform:

56,000+ Servers	1500+ POPs	950+ Networks	660+ Cities	70+ Countries

Resulting in traffic of:
2.3 Tbps peak traffic
16 petabytes / day
440+ billion hits / day
350+ million unique clients IPs / day

What is a Content Distribution Network?

- The RFCs and Internet Drafts define a Content Distribution Network, “CDN”, as:

> **Content Delivery Network or Content Distribution Network. A type of CONTENT NETWORK in which the CONTENT NETWORK ELEMENTS are arranged for more effective delivery of CONTENT to CLIENTS.**

What is a Content Distribution Network - In English?

- A CDN is an overlay network, designed to deliver content from the optimal location
  - In many cases, optimal does not mean geographically closest
- CDNs are made of distinct, geographically disparate groups of servers, with each group able to serve all content on the CDN
  - Servers may be separated by type
  - E.g. One group may serve Windows Streaming Media, another group may serve HTTP
  - Servers are not typically shared between media types

What is a Content Distribution Network - In English?

- Some CDNs are network owned (Level 3, Limelight, at&t), some are not (Akamai, Edgecast, BitGravity, Panther Express)
- Network owned CDNs have all / most of their servers in their own ASN
- Non-Network CDNs place servers directly in other ASNs
  - This means things like NetFlow will not be useful for determining traffic to/from non-network CDNs

How CDNs Work

- When content is requested from a CDN, the user is directed to the optimal server
  - This is usually done through the DNS, especially for non-network CDNs
  - It can be done though anycasting for network owned CDNs
- Users who query DNS-based CDNs be returned different A records for the same hostname
- This is called “mapping”
- The better the mapping, the better the CDN

How CDNs Work

- Example of CDN mapping
  - Notice the different A records for different locations:

```
[NYC]% host www.symantec.com
www.symantec.com    CNAME   a568.d.akamai.net
a568.d.akamai.net   A       207.40.194.46
a568.d.akamai.net   A       207.40.194.49

[Boston]% host www.symantec.com
www.symantec.com    CNAME   a568.d.akamai.net
a568.d.akamai.net   A       81.23.243.152
a568.d.akamai.net   A       81.23.243.145
```

How CDNs Work

- CDNs use multiple criteria to choose the optimal server
  - These include standard network metrics:
    - Latency
    - Throughput
    - Packet loss
  - These also include things like CPU load on the server, HD space, network utilization, etc.
- Geography still counts
  - That whole speed-of-light thing
  - Should be able to solve that with the next version of ethernet…

Why CDNs Peer with ISPs

- The first and foremost reason to peer is improved performance
  - Since a CDN tries to serve content as "close" to the end user as possible, peering directly with networks (over non-congested links) obviously helps
- Peering gives better throughput
  - Removing intermediate AS hops seems to give higher peak traffic for same demand profile
  - Might be due to lower latency opening TCP windows faster
  - Might be due to lower packet loss

Why CDNs Peer with ISPs

- Redundancy
  - Having more possible vectors to deliver content increases reliability
- Burstability
  - During large events, having direct connectivity to multiple networks allows for higher burstability than a single connection to a transit provider
- Burstability is important to CDNs
  - One of the reasons customers use CDNs is for burstability

Why CDNs Peer with ISPs

- Peering reduces costs
  - Reduces transit bill (duh)
- Network Intelligence
  - Receiving BGP directly from multiple ASes helps CDNs map the Internet
- Backup for on-net servers
  - If there are servers on-net, the IX can act as a backup during downtime and overflow
  - Allows serving different content types

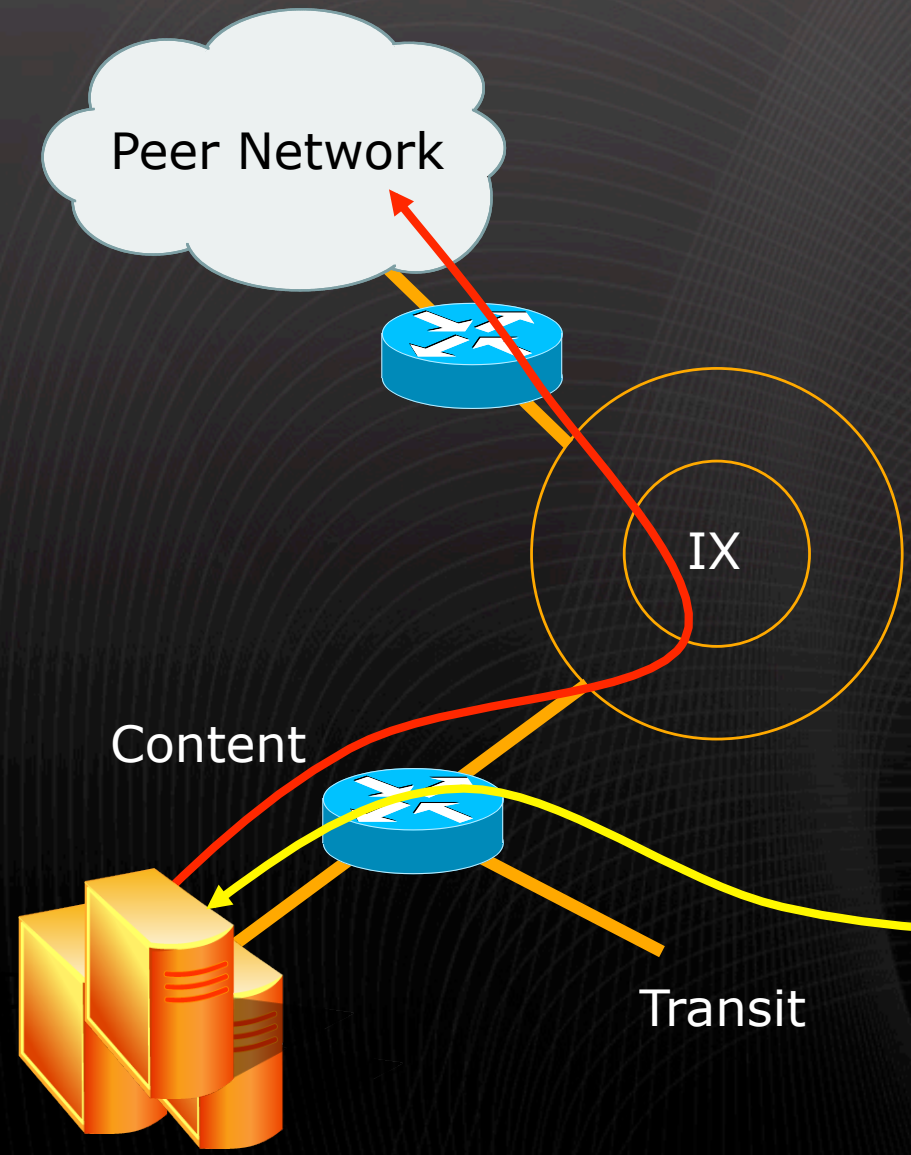
Why ISPs peer with CDNs

- Performance
  - CDNs and ISPs are in the same business, just on different sides - we both want to serve end users as quickly and reliably as possible
  - You know more about your network than any CDN ever will, so working with the CDN directly can help them deliver the content more quickly and reliably
- Cost Reduction
  - Transit savings
  - Possible backbone savings

Why ISPs peer with CDNs

- Marketing
  - Claim performance benefits over competitors
  - Keep customers from seeing “important” web sites through their second uplink
- Because you are nice :-)

How Non-Network CDNs use IXes



- Non-network CDNs do not have a backbone, so each IX instance is independent
- The CDN uses transit to pull content into the servers
- Content is then served to peers over the IX

How CDNs use IXes

- Non-network CDNs usually do not announce large blocks of address space because no one location has a large number of servers
  - It is not uncommon to see a single /24 from a CDN at an IX
- This does not mean you will not see a lot of traffic
  - How many web servers does it take to fill a gigabit these days?

Questions?

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