

COMP6218: Content Caches



Prof Leslie Carr

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The Missing Piece of the Smart Home Revolution: The Operating System

Posted by [samzenpus](#) on Sunday January 04, 2015 @08:16PM
from the one-code-to-rule-them-all dept. 


An anonymous reader writes with this story about who will lead the IoT revolution, and whether it will follow in mobile's footsteps.

"As these technologies sense and and react to changes in your environment, there are obvious parallels to computer operating systems, which receive input and return output. [What does the 'operating system' for the smart home of the future look like?](#) Alex Hawkinson is trying to help answer that very question. The founder and CEO of IoT company SmartThings is not only a leader in the market, he's a consumer. He suggests there won't be a singular, cohesive operating system for your home, that this stuff isn't one-size-fits-all. 'I think it's up to everyone to determine their own bits,' Hawkinson said. 'Some people love cameras in house, my wife wants none. It's up to your preferences.'"

Read the **7** comments

 [os](#) [technology](#) [iot](#)

Museum's Adults-Only Nights Show That Alcohol and Science Are a Good Mix

Posted by [samzenpus](#) on Sunday January 04, 2015 @06:55PM
from the hall-of-drinking-man dept. 


[BarbaraHudson](#) writes

Museums and science centers are finding that [science nights with bar service](#) are quite popular with the public. "Organizer Merissa Scarlett said almost every science center across Canada opts for adults-only nights, where visitors can explore exhibits with an alcoholic drink in hand. It's also a trend taking off in many museums, including the Canadian Museum of Nature in Ottawa, where nights dubbed Nature Nocturne transform the building into a multi-stage bar and club."

Read the **58** comments

 [science](#) [beer](#)

Professor: Young People Are "Lost Generation" Who Can No Longer Fix Gadgets

Posted by [samzenpus](#) on Sunday January 04, 2015 @05:35PM
from the beyond-fixing dept. 

Slashdot.org

- ❑ The **Slashdot effect**, also known as **slashdotting**, occurs when a popular website links to a smaller site, causing a massive increase in traffic...

Slashdotting



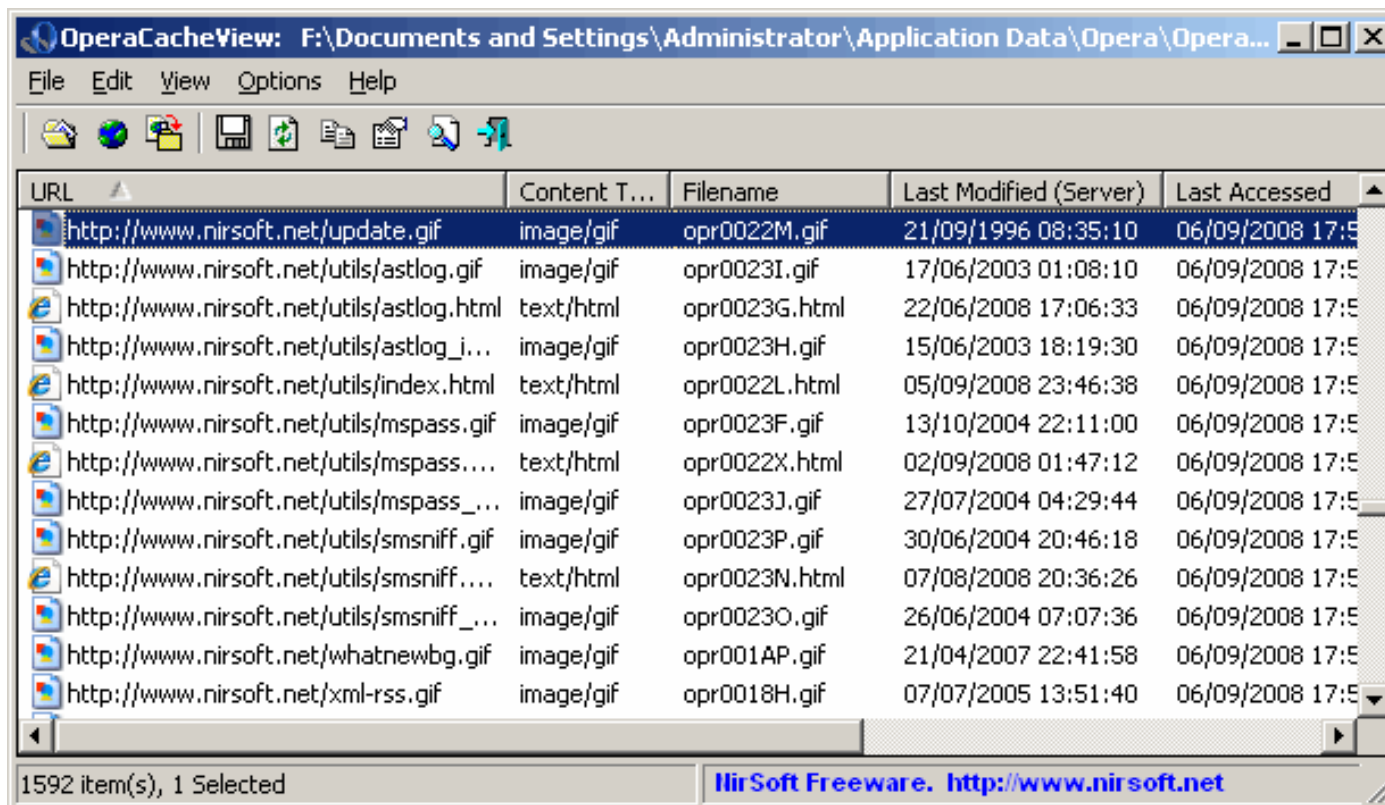
- ❑ This overloads the smaller site, causing it to slow down or even temporarily become unavailable.
- ❑ The name stems from the huge influx of web traffic that would result from the technology news site Slashdot linking to websites.
 - ❖ Somewhat like a DDOS effect
- ❑ This lecture is about how the Web solves the problem of too many viewers.

Cache

- The **temporary storage** of **frequently accessed data** stored for **rapid access**
- Original data is stored elsewhere – usually somewhere a long way away that is slower and more inconvenient to get access to
 - Reduces access time/latency for clients
 - Reduces bandwidth usage
 - Reduces load on a server

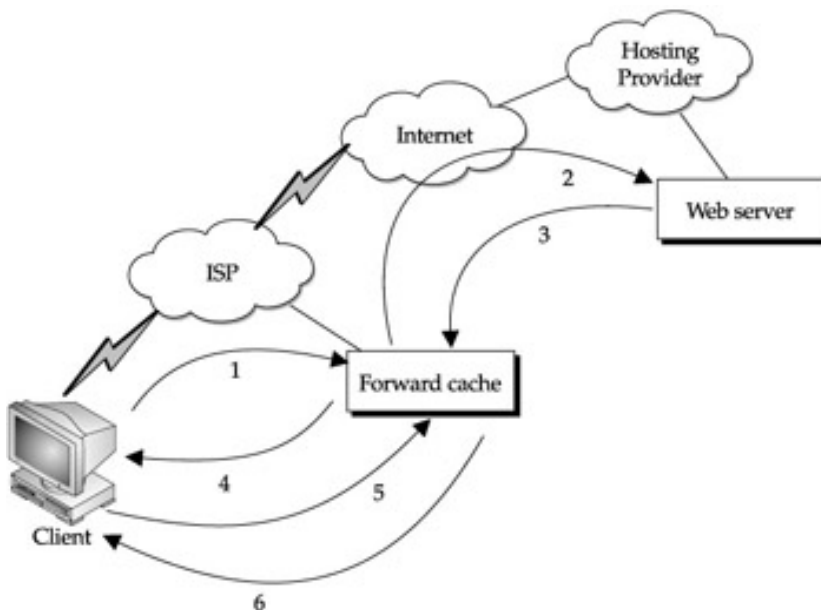
Browser cache

- Cache for a single user / application



Proxy cache

- Cache located close to the clients
 - e.g. University or Internet Service Provider
- Decreases external bandwidth usage
- Decreases network latency



Scale provides the advantage: many users within the ISP may all be asking for the same web pages

HTTP cache-control headers

- Freshness – how long the cached copy stays “fresh” without revisiting the origin server
- Validation – compare the cached copy to the origin document after it stops being “fresh”
- HTTP headers control browser and proxy caches

HTTP/1.1 200 OK

Date: Fri, 30 Oct 1998 13:19:41 GMT

Server: Apache/1.3.3 (Unix)

Cache-Control: max-age=3600, must-revalidate

Expires: Fri, 30 Oct 1998 14:19:41 GMT

Last-Modified: Mon, 29 Jun 1998 02:28:12 GMT

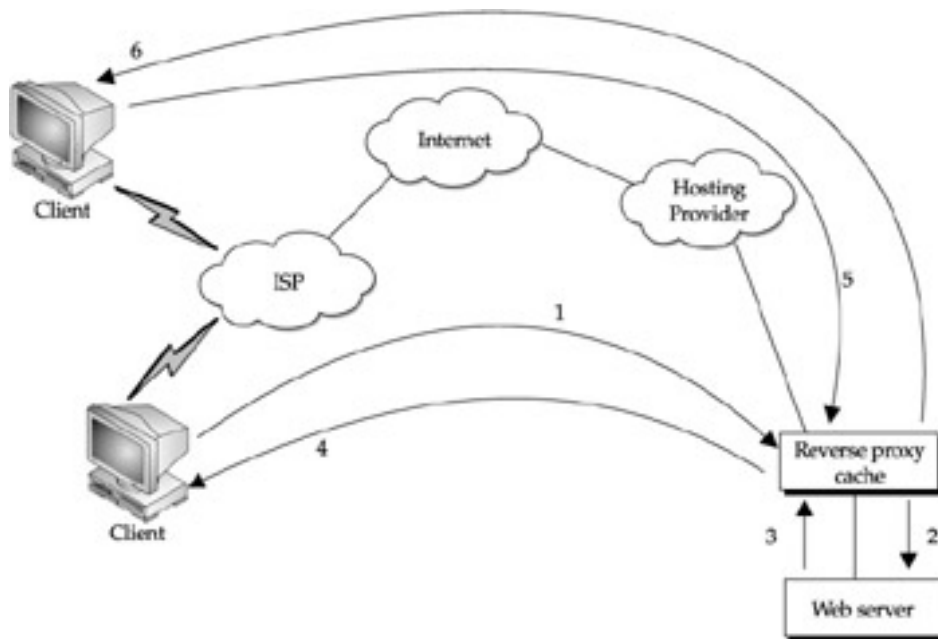
ETag: "3e86-410-3596fbbc"

Content-Length: 1040

Content-Type: text/html

Reverse proxy cache

- Cache proxy located closer to the **origin web server**
- Usually deployed by a Web hosting ISP
- Decreases load on the Web service (database)



- *Several reverse proxy caches implemented together can form a **Content Delivery Network***

Content distribution networks

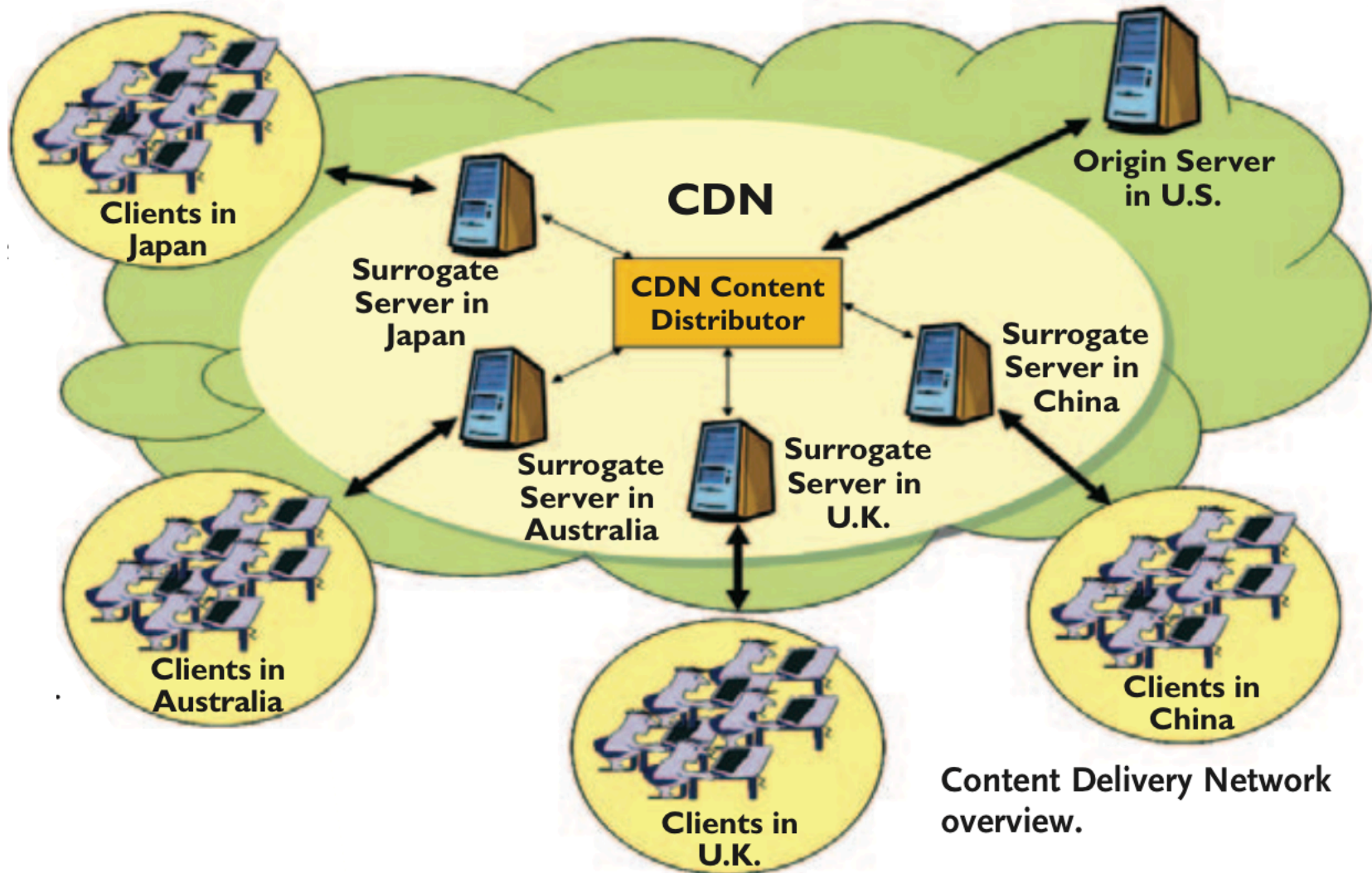
- ❑ *Business Requirement*: stream video content to hundreds of thousands of simultaneous users
- ❑ *Obvious Web solution*: single, large “mega-server”
 - ❖ single point of failure
 - ❖ point of network congestion
 - ❖ long path to distant clients
 - ❖ multiple copies of video sent over outgoing link

....this solution *doesn't work in practice*

Content distribution networks

- ❑ *Business Requirement:* stream video content to hundreds of thousands of simultaneous users
- ❑ *Working Web Solution:* store/serve many copies of videos at multiple geographically distributed sites (*CDN*)
 - ❖ *enter deep:* push CDN servers deep into many access networks
 - close to users
 - used by Akamai, 1700 locations

Content Delivery Networks

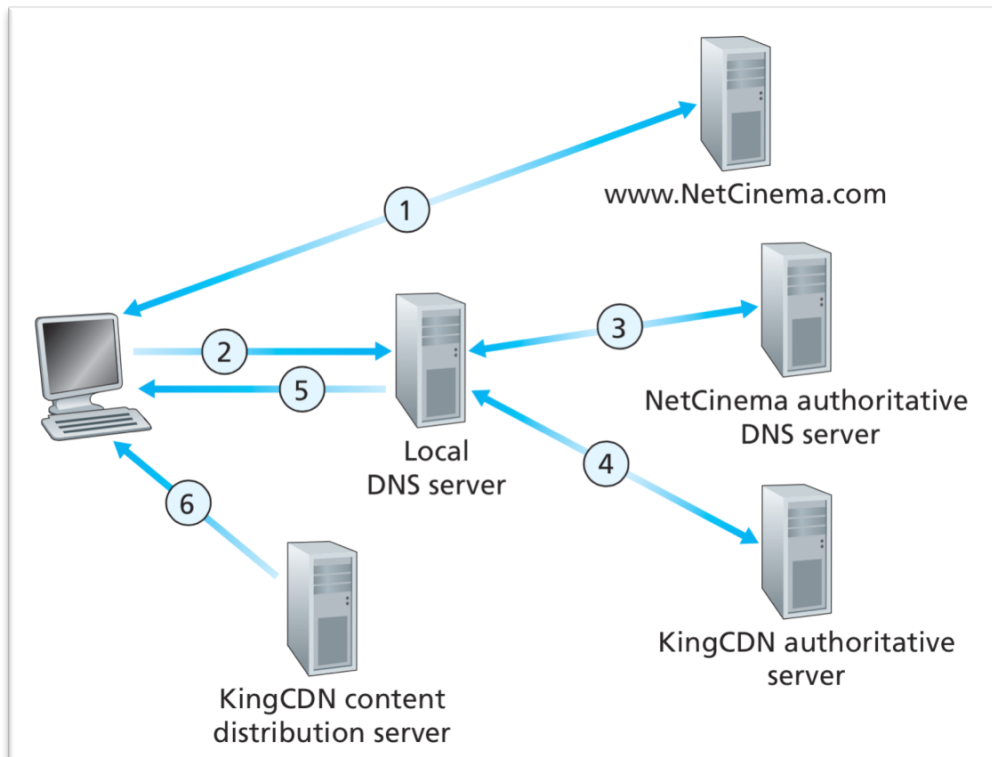


Content Delivery Network overview.

CDN: “simple” content access scenario

Bob (client) requests “Transformers 7” video from the NetCinema service <http://netcinema.com/>

- Link is to <http://video.netcinema.com/6Y7B23V>
- Video actually stored in CDN at <http://KingCDN.com/NetC6y&B23V>



Uses DNS creatively to decide which KingCDN distribution server to use

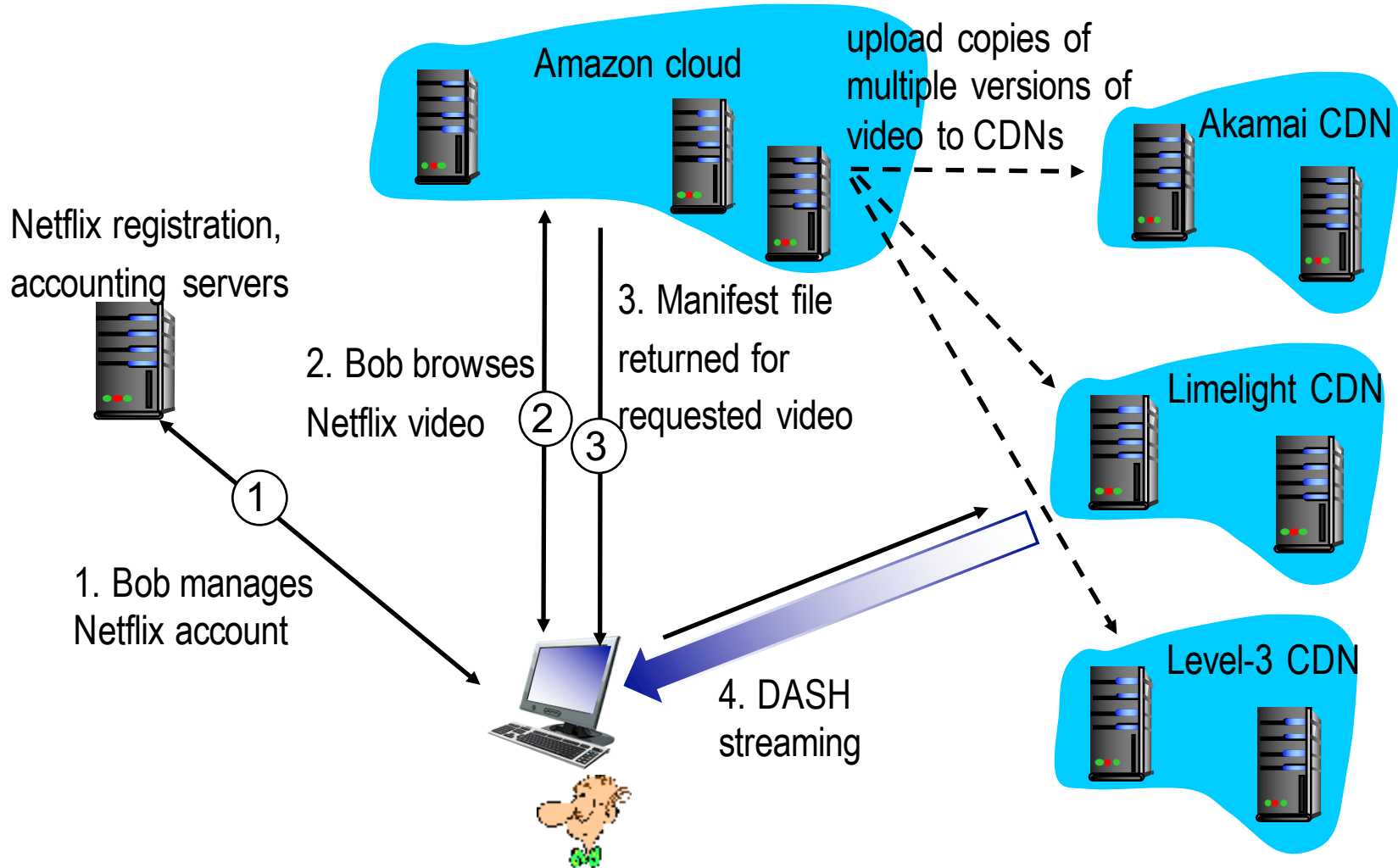
CDN cluster selection strategy

- how does CDN DNS select “good” CDN node to stream to client
 - ❖ pick CDN node geographically closest to client
 - ❖ pick CDN node with shortest delay (or min # hops) to client (CDN nodes periodically ping access ISPs, reporting results to CDN DNS)
- *alternative*: let *client* decide - give client a list of several CDN servers
 - ❖ client pings servers, picks “best”
 - ❖ Netflix approach

Case study: Netflix

- ❖ 30% downstream US traffic in 2011
- ❖ owns very little infrastructure, uses 3rd party services:
 - own registration, payment servers
 - Amazon (3rd party) cloud services:
 - Netflix uploads studio master to Amazon cloud
 - create multiple version of movie (different encodings) in cloud
 - upload versions from cloud to CDNs
 - Cloud hosts Netflix web pages for user browsing
 - *three* 3rd party CDNs host/stream Netflix content: Akamai, Limelight, Level-3

Case study: Netflix



Streaming multimedia: DASH

❖ *DASH: Dynamic, Adaptive Streaming over HTTP*

❖ *server:*

- divides video file into multiple chunks
- each chunk stored, encoded at different rates
- *manifest file*: provides URLs for different chunks

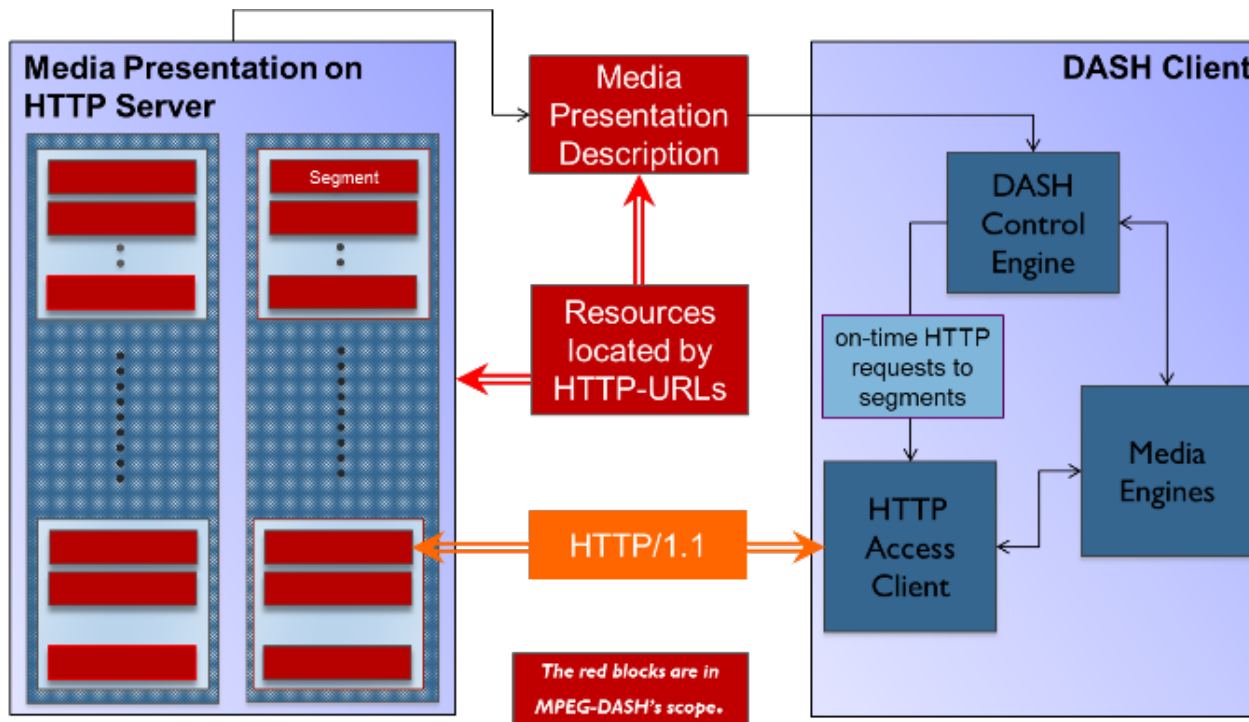
❖ *client:*

- periodically measures server-to-client bandwidth
- consulting manifest, requests one chunk at a time
 - chooses maximum coding rate sustainable given current bandwidth
 - can choose different coding rates at different points in time (depending on available bandwidth at time)

Streaming multimedia: DASH

- “*intelligence*” at client: client determines
 - ❖ *when* to request chunk (so that buffer starvation, or overflow does not occur)
 - ❖ *what encoding rate* to request (higher quality when more bandwidth available)
 - ❖ *where* to request chunk (can request from URL server that is “close” to client or has high available bandwidth)

MPEG-DASH structure



<http://dashif.org/mpeg-dash/>