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Case Study 3 - Netflix

1.

    a. Edge Provider - An edge provider, in this case, Netflix, is the provider of content which will be distributed over the Internet. Netflix, as the edge provider, is the origin point of a streaming video packet.
    b. CDN - A CDN, or Content Delivery Network, serves as a cache of frequently accessed content, as well as a transit route for content. Hence, frequently accessed Netflix streaming videos will make thier way onto partner CDN servers, especially from companies such as Cogent and Level 3 as well as in-house Open Connect.
    c. ISP - The ISP, or Internet Service Provider, is responsible for providing the end user access to the internet, and by extension to content hosted on the internet. Therefore, the streaming video packet will make its way over the ISP's network of routers to the client device.

2. Much like the traffic that forms at the merge between two busy freeways, Netflix customers who use Comcast as their ISP experience a bottleneck in the transmission of Netflix streaming video packets to their client devices, leading to a degraded, and sometimes unusable watching experience.This bottleneck occurs at the junction between Netflix's various contracted Content Delivery Networks, and Comcast itself. By

Comcast's admission, the routes the CDNs were on were not sufficient to carry the increased traffic that came with a Netflix contract. Without further investment into network infrastructure, which Comcast has repeatedly charged CDNs an additional fee for, existing infrastructure would not be able to service the volume of data that was being transmitted over it.

3.

a. Our first option is to attempt to limit the number of customers being served at a given time by marketing and pricing Netflix as an upmarket streaming platform. By reducing the volume of users and data at any given point, Netflix can avoid paying additional fees to Comcast or any other Internet service providers.
b. Our second option is to limit the resolution options users have for the content they are streaming. Between high definition and our low preset, bandwidth can be reduced by up to 10 times.
c. Our third and final option is to reach a deal with Comcast, which would allow us to directly connect to Comcast network, and avoid the bottlenecks being created by third-party CDN connections into the Comcast infrastructure. This option comes with significant costs, but allows Netflix to maintain both its commitment to quality and its existing customer base.

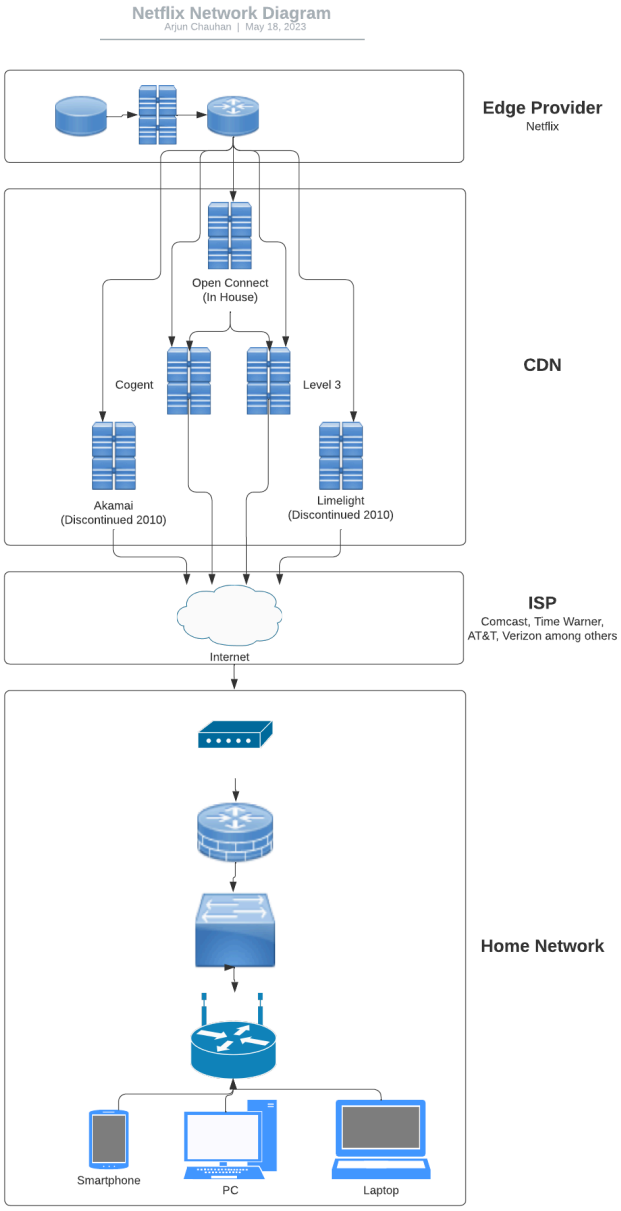
4. While options one and two attempt to mitigate the congestion issues, created by the volume of Netflix users on Comcast network, the only true way to solve the problem is to reach a deal with Comcast. Without reaching a mutually beneficial agreement, wherein Netflix has a direct connection to Comcast infrastructure, and thereby advantageous routes to Comcast customers, each company will suffer from a loss of customers and

damage to public perception. By reaching a deal to gain direct connection to Comcast's network, Netflix can bypass the interconnection points that caused bottlenecks in CDN connections with Comcast's network.

5. Ultimately, Netflix seeks a collocation agreement with Comcast, allowing Netflix through Open Connect to serve as its own CDN directly connected to Comcast's infrastructure. Such an agreement is to the benefit of both companies in terms of customer satisfaction, avoiding the numerous complaints to both companies about lackluster Netflix functionality on Comcast-connected households. Due to the magnitude of the deal, as well as its mutual benefits, Netflix seeks favorable terms relative to deals Comcast has reached with other CDNs after suggesting that they had exceeded the traffic that their agreements were designed for.

Appendix

A.



a. As a packet of data is retrieved from and leaves Netflix's servers, it passes through a router on its way to a Content Distribution Network (CDN). The CDN not only distributes the packet to the Internet Service Provider (ISP), but also caches packets that are a part of regularly requested content. Passing through the ISP's nodes, the packet makes its way to the local loop of the destination, whether

that destination is connected directly to the ISP or exists on a localized loop. Once the packet reaches the physical destination, it makes its way onto the local network of the destination. It passes through the modem, through a router which often has a firewall, out through a switch onto either an ethernet port connected to the destination device or a wireless access point to which that device is connected.

B. The congestion is the result of a massive demand for content from Netflix, leading to a flood of outgoing packets from Netflix servers. This flow reaches a bottleneck where these packets transfer onto the ISP's network for distribution to customers. In a similar way as traffic forms when a large amount of traffic suddenly makes it's way onto a freeway, the wiring and connections that form the internet have limited bandwidth. A representative for Comcast explains "Netflix began sending huge, unprecedented amounts of traffic over Level 3's transit links … which had not been provisioned to handle that amount of traffic".[1] Given that Netflix caused an unprecedented amount of additional traffic, som eof the fault for the congestion certainly lies with them. However, Comcast is also complicit, as they refused to upgrade their infrastructure without first collecting additional fees.

C.

   a. Make a deal with Comcast - Netflix can reach a deal with Comcast to compensate Comcast for excess bandwidth usage as well as upgrades to Comcast's infrastructure. This would theoretically allow the Netflix user experience to remain unchanged, building out the supporting infrastructure for future needs.

b. Reduce streaming quality - In order to reduce the bandwidth necessary to serve its current customers, Netflix could limit streaming quality options. By forcing users down to its low quality from HD, bandwidth usage could be reduced by 10x.[2]

c. Increase prices to artificially reduce subscriber numbers and utilization - In order to maintain streaming quality while reducing bandwidth usage and avoiding additional costs, Netflix would need to focus on limiting the number of users on the site. Raising the price of a Netflix subscription and marketing it as a premium product would certainly accomplish this aim, pricing out some customers from their existing subscriptions.

D. In this case, the preferred solution would be a deal with Comcast. By reaching to deal with Comcast, Netflix could maintain its commitment to delivering a quality experience to its customers. The other solutions proposed require a compromise. Either in Netflix, is commitment to quality, or in a potential reduction of revenue and profits. Reaching a deal with Comcast would certainly have significant costs involved, but this deal would pave the way for an improved Netflix experience today and headroom for additional growth in the future. In their dealings with CDNs, Comcast has demonstrated a willingness to cooperate with paid additional fees to do so.[1] Netflix, especially through their development of Open Connect, finds itself in a similar position to these CDNs, and therefore could leverage the same cooperation model to build out a solution that best fits Netflix's needs.

References

1. Greenstein, S., et al. (2017). *Streaming Over Broadband: Why Doesn't My Netflix Work?* HBS No. 9-616-007. Harvard Business School Publishing.
2. Netflix. (n.d.). *How to control how much data Netflix uses*. Help Center. https://help.netflix.com/en/node/87