



BUILDING YOUR OWN CDN FOR VIDEO DELIVERY: **WHY, WHEN, AND HOW**

Improve Quality of Service (QoS) while Maintaining Control and Reducing Costs

A Frost & Sullivan White Paper

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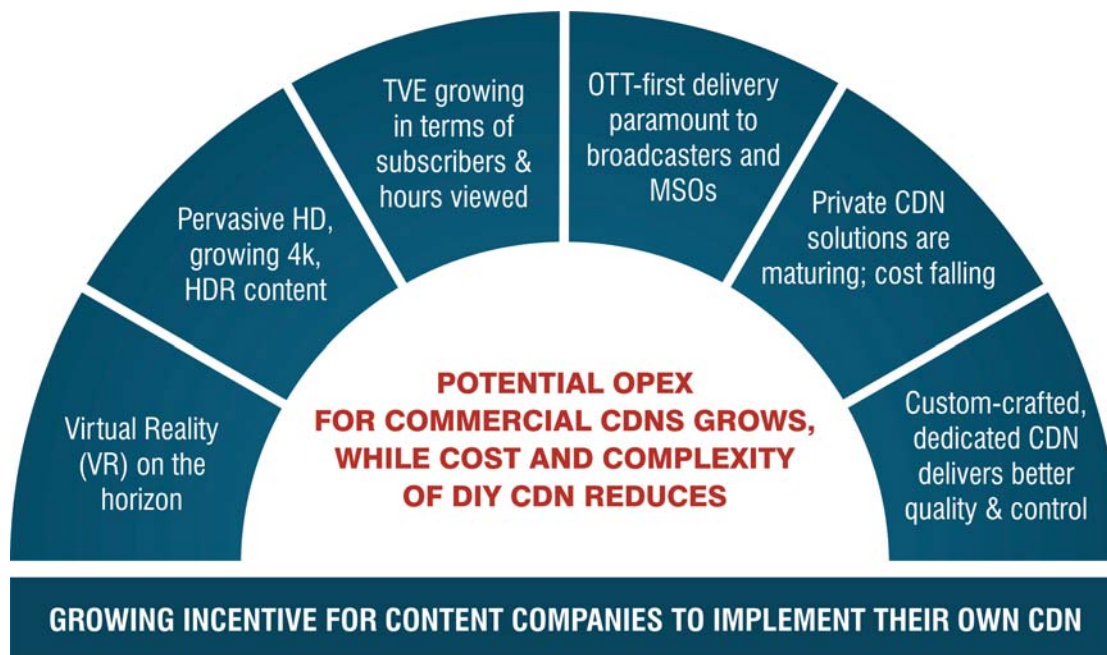
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INTRODUCTION

We are in the age of digital businesses. The global society is increasingly communicating, transacting, buying, learning, and relaxing via the Internet. TV services are in the midst of immense disruption enabled by online services. OTT-capable consumer device sales will grow from 2.9 billion units in 2016 to 3.5 billion units by 2021. Cisco System's Visual Networking Index forecasts that global data transfers will grow at a whopping 22% CAGR from 2015 to 2022, reaching 194EB/mo in that timeframe¹. Per capita online video consumption is growing steadily worldwide by every metric. Video is expected to account for more than 80% of that traffic. Adobe's Q1 2016 Digital Video Benchmark Report, for example, showed a 107% year-over-year increase in authenticated video viewing.

Content Delivery Networks (CDNs) are specialized network solutions to ensure high-quality, low-latency delivery of digital data to end consumers. Global CDN revenues for video alone will cross \$4B in 2017, with regions like Latin America growing at a CAGR of over 25% over the next five years². CDN customers saw their traffic grow by 85% in 2016 alone. There is a rich ecosystem of CDN vendors serving the needs of businesses to reach consumers in domestic and worldwide markets. However, a growing number of content providers—managed Pay TV service operators such as telcos and MSOs—are finding that building their own CDNs better serve their business interests. Content companies—video service operators, broadcasters and OTT service providers—are seeing both subscriber counts and video traffic grow at rapid rates. With content libraries becoming increasingly uniform across providers, differentiation relies heavily on quality of service and profitability relies increasingly on operational efficiency.



¹ <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html>

² Frost & Sullivan Research

³ Current State of the CDN Market, Dan Rayburn, May 2016

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As traffic grows and quality of service becomes a paramount differentiator, private CDNs give companies better quality control and long-term total cost of ownership when compared to commercial CDNs. Private CDNs, sometimes referred to as managed CDNs or do-it-yourself (DIY) CDNs, are built and run by a given company for their own use. Private CDNs are most well known for their use by the largest global content providers. For example, Apple is estimated to have shifted nearly three-fourths of its traffic to its private CDN⁴. YouTube has long leveraged its own CDN, supported by Google's own servers collocated in the data centers of ISPs worldwide. Netflix, Pandora, Twitch... the list of content companies that have built their own CDNs and reaped clear business benefits from that decision continues to grow. That said, DIY CDN is a major undertaking. It is best suited for companies with adequate in-house expertise, high expected traffic growth and regionally-dense subscribers/viewers. As OTT video consumption grows, regional density is emerging as one of the most important factors in the decision to use a private or a commercial CDN. In this paper, we look at build v/s buy considerations for CDNs in the context of industry use cases, Frost & Sullivan research, and best practices recommendations.

CDNS: FACTORS INFLUENCING THE BUILD V/S BUY DILEMMA

TOTAL COST OF OWNERSHIP

On the surface of it, it appears that commercial CDNs are becoming increasingly affordable. CDN prices have come under significant pressure, with the largest customers able to negotiate significant discounts on list prices. According to recent findings⁵, commodity CDN pricing continues to fall with average pricing down 20% in 2015, but pricing lowered by nearly half for the largest customers. Pricing varies by geography; the lowest rates in the United States are approaching \$0.0025 per GB delivered for the largest customers, but market average rates are about \$0.05 per GB and can be as high as \$.12 per GB for high-SLA applications in sparsely networked countries. Online Video Platform (OVP) vendors are a good source of preferred pricing for smaller customers who can benefit from bulk discounts negotiated by OVPs with major CDN vendors.

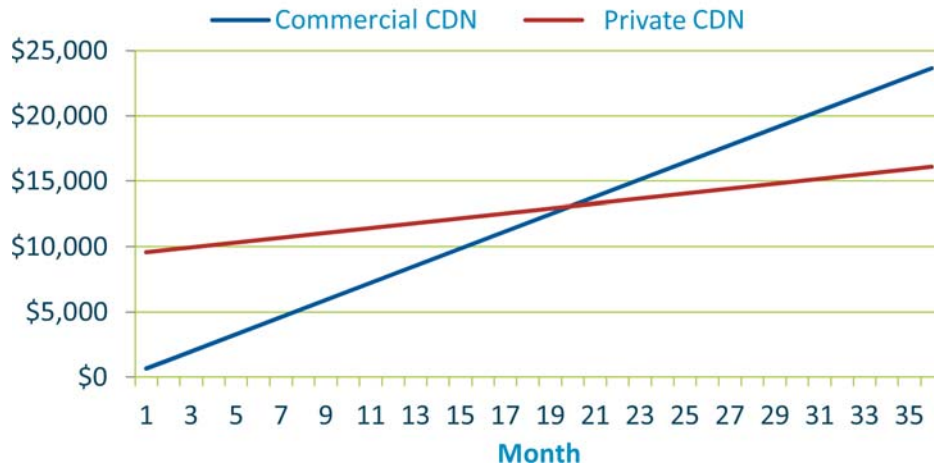
Nonetheless, as content volumes grow, the cost of owning and operating a private CDN begins to look more attractive than pay-as-you-go, even with these heavily discounted rates. This is increasingly true as equipment and software licensing costs for DIY CDNs continue to fall. The chart below shows an example of how this pricing dynamic plays out over time. While there is an upfront CAPEX and an upfront delay in service deployment, the investment quickly pays for itself and then costs are controlled over the long term.

Commercial CDN pricing, even with substantial discounts, is eventually correlated to the bitrate of video streams, the number of subscribers, and the number of hours of video watched per subscriber. With increase in resolution past HD to 4K, and consistent transition away from linear TV to on-demand consumption on devices, these costs will inevitably increase over time. This strengthens the value proposition of a build v/s buy decision.

⁴ <http://blog.streamingmedia.com/wp-content/uploads/2016/05/2016CDNSummit-Rayburn-Pricing.pdf>

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Cumulative Expenditure



Under the assumption that the private CDN performs reliably, cost eventually becomes a solid consideration in the build v/s buy decision. It is important for us to emphasize that this is a big assumption. The network must operate reliably and flawlessly across all target geographies, and in the face of network outages, unexpected traffic spikes, and so forth.

ECONOMIES OF SCALE

Private CDNs have historically not been for the faint of heart and are typically the more cost-effective choice only for the largest of content providers. It is important to note that this content need not be limited to entertainment video; radio, gaming, and social media are all massive video data use cases in their own right. Companies that have adopted private CDNs today include Amazon, Facebook, Google, Microsoft, Netflix, Twitter, and Valve. While some of these (e.g., Netflix) have brought all their traffic in-house, most are taking a staged approach and continue to use third-party CDNs for some portion of delivery. On the flip side, it is worth noting that well-recognized content providers such as Disney and the NFL do not currently build their own CDN. This is because their scattered audiences, relatively lower traffic volumes, and highly demanding live streaming applications do not currently justify the cost or effort of building, managing and maintaining an in-house operation.

At the current point of time, **100,000 subscribers in a close geographical area is the rule-of-thumb inflection point for strongly considering private CDN deployments.** [Tweet this!](#) This number is expected to fall gradually over time.

Several factors are driving the value proposition for private CDNs. Products and solutions that help operators build and deploy private CDNs are maturing. Server and networking equipment vendors are better able to serve the needs of enterprises, and data volumes continue to soar. Private CDNs offer value in terms of quality of service and lower operating costs for even Tier II and Tier III operators with geographically dense subscribers.

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We believe that these factors will cause more and more content companies to fall within the profile that could benefit from choosing DIY. Accordingly, we expect that a growing number of content companies will move toward private CDNs over the next five years. In fact, our CDN market analysis uncovered that increasing use of private CDNs is one of the more significant restraints against growth of commercial CDN revenues.

FEATURES, REACH AND EFFICIENCY

Given that private CDNs are specifically built for the company's own operations, they need not include the rich feature sets and wide portfolio of value-added services that commercial CDN vendors need to implement. As solutions to build private CDNs grow in number and increase in maturity, it is becoming less expensive, less difficult and less risky for companies to build and run high-performance CDNs on their own. Time to implement is also falling into the range of weeks rather than months.

Another motivation for choosing the private CDN approach is the potential for acquiring deeper insight; thus, enabling richer, more real-time analytics. Commercial CDN customers are largely forced to rely on limited data available from their CDN provider. In contrast, content companies with their own CDNs can get very granular insight into both customer behavior and network problems. Data points that can be gathered, analyzed, and acted upon include which device is being used by a given subscriber, what program is being streamed, what network type is in use, fine-grained views into network performance, and so on. This in turn allows delivery of better, more personalized services to users. It also enables better targeting of advertisements and better customer relationship management. On the flip side, real-time insights and analytics allow the rapid identification, diagnosis and remediation of potential network issues, thus maintaining quality of service and maximizing user satisfaction.

The option to use private CDNs for a portion of traffic while offloading the rest to third-party CDNs allows companies to hedge their bets and gradually scale up on deployments. For example, companies will often make the trade-off of using their private CDN for large clusters of audiences in their home market or in given regions, while handing off traffic to third-party CDNs for more globally distributed users. To give another example, companies can build out internal CDN capacity for their typical concurrent subscriber volumes and offload any temporary peaks or unexpected surges to a commercial CDN.

CONTROL AND QUALITY

Commercial CDNs must necessarily juggle their infrastructure and resources across all their individual customers. The "secret sauce" used to run and optimize these networks is a differentiator for the CDN vendor but results in loss of fine-grained control for individual companies. In contrast, private CDNs offer the option of more control and therefore allow the opportunity for tightly controlling individual components in the workflow. When executed properly, this allows companies to achieve tighter control over quality and reliability while simultaneously managing and controlling costs.

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For instance, the operator of a private CDN has complete control over the size and contents of all caching components, which form a critical piece of the CDN. Tailored control over what data is available in edge caches and origin caches, and how cache misses are handled can improve cache hit rates. This in turn can dramatically reduce traffic to origin servers, particularly under surge conditions. Facebook⁶, for example, used this strategy to its benefit while implementing its live video feature. Such optimization delivers game-changing results, such as lower latency, lower infrastructure needs, and higher operational efficiency across the entire workflow. In addition, companies have the freedom and ability to optimize the deployment of caches according to geographic regional need, again reducing latency and improving user experience.

Similar control is also beneficial from a security standpoint, where a company's data is never collocated with other vendors' datasets, and the company remains in control of all its physical and virtual assets. Coming back to the criterion of scale, companies that already own major data centers of their own or have access to underutilized data center capacity from their telecommunications provider can leverage these assets towards operating their private CDN. This further bolsters the economical side of the argument. It simultaneously strengthens the company's ability to differentiate on user experience and minimize glitches or latency that might interfere with user engagement and business transactions.

Frost & Sullivan provides a case study that illustrates the tangible benefits gained by an Asian broadcaster which expanded its online video services with a private CDN to enable efficiencies in quality of delivery, service and experience for its viewers.

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CASE STUDY

The Company

An Asian broadcaster is the major local-language content on TV in its market. Alongside its traditional satellite broadcast distribution, it has launched a range of online TV services, including SVOD and catch-up services. It offers content in HD and 4K and has rapidly grown its on-line services to reach hundreds of thousands of subscribers. The broadcaster had launched its services using a large global CDN service provider.

The Challenge

While the initial launch was successful, the company began to face several challenges over time. Continuous increase in traffic and subscribers was causing CDN service fees to become prohibitively high. This was exacerbated by relatively high data rates in the broadcaster's target region. As the service gained in sophistication, the broadcaster wanted more control over the quality of its viewers' experience. While the option of building its own CDN was looking increasingly attractive from a cost of ownership perspective, the broadcaster was wary of stepping outside of its core business and core competency. The company realized it would be absolutely critical to find a private CDN solution that would be easy to manage and operate.

The Solution

The broadcaster built its own CDN by deploying TV servers from Edgware to cache and stream content within greater proximity of viewers. The broadcaster chose not to operate its own network. Rather, it deployed the TV servers at peering and exchange points that are in turn well-connected to its viewers' ISPs (Internet Service Providers). The company selected Edgware's servers, as they are purpose-built for TV applications. The servers come pre-integrated with their operating software, and offer the promise of being easy to operate in remote locations. These servers had the added advantage of low power consumption which in turn delivered much higher reliability. With a mean time between failure (MTBF) of over 10 years, the broadcaster was assured of a low-touch operational model with minimal requirements for redundancy and low risk of service interruption or failure.

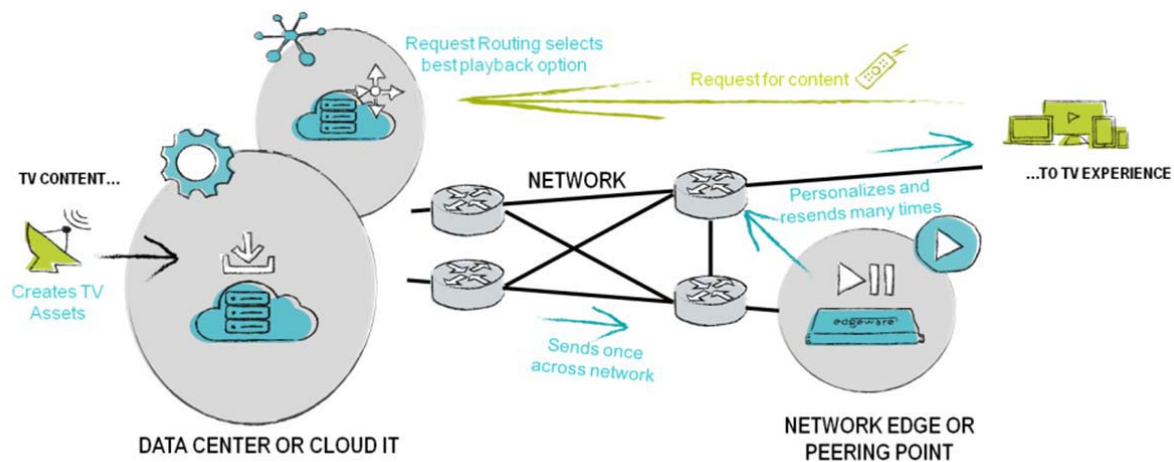
A private CDN requires a backbone of sturdy equipment that promises very low latency and optimal quality. Solutions such as that from Edgware can be purpose built, are scalable and combine the hardware and software required for seamless video delivery over broadband for IPTV or OTT video delivery.

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SOLUTION BRIEF: EDGEWARE

Edgware is a vendor of TV workflow and delivery solutions. Edgware provides hardware and software systems that deliver TV content over IP networks, with the stated goal of delivering TV with no buffering, no delays and no glitches. The company provides the hardware infrastructure and software intelligence required by operators to process, deliver, and monitor streaming video content.

Edgware's TV CDN architecture includes content processing functions such as creating Live-to-VoD content, which are delivered on centralized cloud IT infrastructure. It then provides distributed delivery elements to allow this video/TV content to successfully scale up to high streaming volumes. A key aspect of allowing such scaling is request routing functions, which are intelligent algorithms designed to select the best source to stream TV to each user. Edgware delivers request routing functions that scale to very large volumes of viewing requests, are delivered from a software-based layer, and run on standard IT or cloud infrastructure.



Their delivery solution includes a number of features that are designed to streamline delivery in order to reduce costs and improve quality of service. For example, to scale out the delivery of personalized TV streams, Edgware uses distributed TV servers that stream, cache, repackage, pause-live TV, perform ad insertion, and encryption. The TV servers can be virtualized, running on general purpose hardware. That said, most operators prefer to use purpose-built TV servers for highest density and highest reliability. This architecture enables a highly deterministic experience for the viewer; it delivers TV without buffering, with low latency and with equipment that is easy to operate.

This TV CDN architecture provides a comprehensive solution for operators seeking to take control of their TVE/OTT workflows and strategically plan ahead to take the fullest advantage of emerging market opportunities.

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CONCLUSIONS

- OTT is the new normal for every type of content business. Growing on-demand, device-based content consumption is stressing networks and operations budgets alike. The advent of 4K and virtual reality content is only one example of why data volumes will continue to grow over time. These soaring data volumes, coupled with the business criticality of services and content delivered over the Internet, are continually elevating the role of a CDN as a make-or-break operation for digital businesses.
- The DIY option for CDNs today is most meaningful for large companies delivering terabytes of data to hundreds of thousands of users. These companies are most reliant on high-performing network capabilities and are most sensitive to cumulative OPEX costs. They derive the highest gains from building and operating their own CDNs. Furthermore, only these companies have the internal scale and expertise to justify the outlay and effort of building one's own CDN and, over time, running and maintaining it.
- Private CDNs will gradually gain footprint across content companies as data volumes increase for all enterprises, as equipment costs fall, and as private CDN solutions become more sophisticated and easier to deploy. Over the next five years, more and more service providers and broadcasters are expected to find themselves fitting the profile of a company who can benefit from its own CDN.

CALL TO ACTION

As video delivery and consumption over broadband becomes a way of life, it is imperative for content companies to evaluate their options that affect cost of ownership and business differentiation for the long term. When viewership for multi-screen and online video gains critical mass, then there are several factors that need to be considered before making the decision. Frost & Sullivan draws up a list of questions that can help. If you answer "yes" to more than two of these, you should seriously evaluate the option of building your own CDN.

Criterion	Question	Yes/No
Scale	Do your concurrent viewers routinely exceed 50,000 in number?	
	Is your traffic volume predictable, with few sudden spikes?	
Reach	Is your audience densely packed or geographically concentrated (v/s sparsely scattered across disparate regions)?	
	Is your audience located in regions where commercial CDN traffic costs are high and/or bargaining power is low?	
Quality	Is TVE/OTT a critical part of your viewer engagement strategy?	
	Do you offer on-demand HD and 4K content?	

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