



CDN: what is edge CDN and virtual CDN (vCDN)?

Content and gaming providers face increasing competition to offer users the best quality of experience in the face of increasing demand for fast and high-quality streaming. The COVID-19 environment has put new strains on the network that means it is much more difficult to ensure delivery of content in a way that optimises user experience. There are two key trends emerging in CDN that could address this challenge: edge CDN and vCDN.

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What are the limitations of CDN today?

There is growing pressure on content and gaming providers to deliver fast streaming of high-quality content to end-users, and to meet both localised and distributed peaks in demand. To an extent, these needs can be met using a Content Delivery Network (CDN). However, most CDN infrastructure today does not enable the level of scalability and flexibility of content caching and delivery that will be needed to meet future demand.

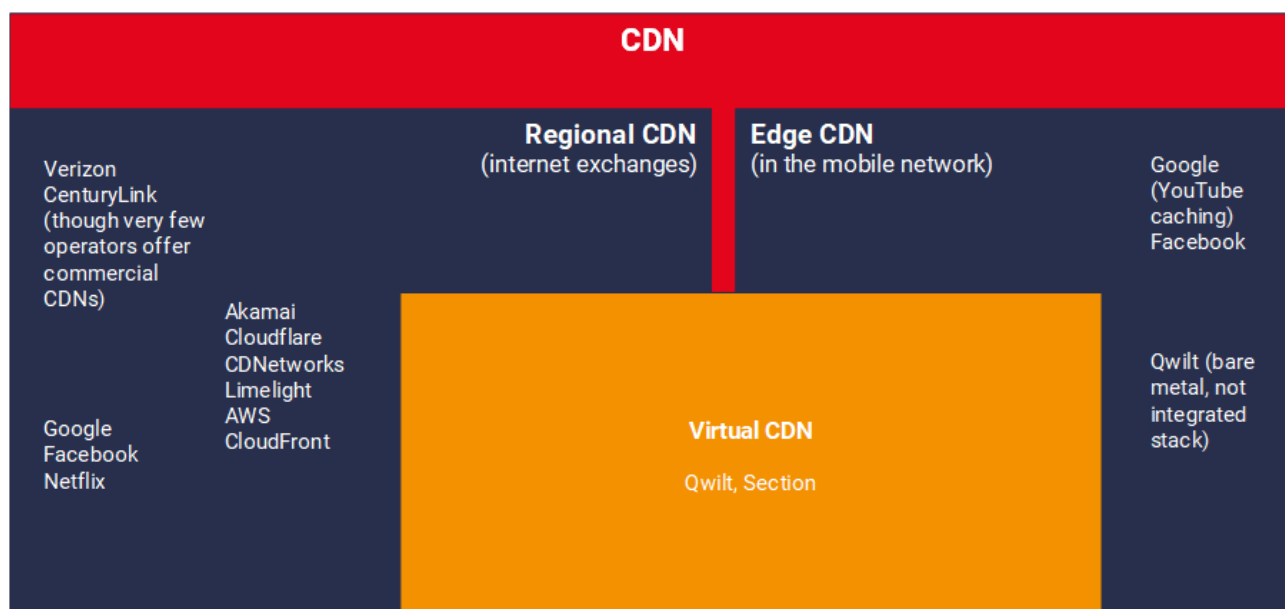
Currently, most CDN servers are located at points of presence (PoPs) in the internet exchange (IXP) or at distributed data centres, enabling content to be cached closer to end-users. Rather than content travelling from a central origin server to fulfil each request, some content can be cached in distributed servers, meaning it does not have to travel as far to reach the end-user. However, the current distribution of these servers is too centralised to enable content and gaming providers to ensure a high quality of experience (QoE) for end-users in the face of growing demand.

Users increasingly expect to ingest content on the go, as well as at home, assuming a consistent QoE across multiple devices. For example, in gaming, even a few milliseconds of delay in download speeds can significantly reduce QoE, as users expect real-time responses and fast ping times. Though current CDN infrastructure can enable lower latency than a central cloud server, for an optimal gaming experience, servers would need to be within a few hundred miles of each end-user. You can read more about the role of edge computing in cloud gaming [here](#).

How can edge CDN and vCDN address these limitations?

To overcome the constraints of current CDN functions, and to meet future demand, there are two key trends emerging: edge CDN and virtual CDN (vCDN).

Content providers are looking to establish virtualised CDN functions at the edge



Edge CDN

Edge CDN results in greater distribution of CDN servers. Today, most CDN functions happen at IXPs, but these functions are increasingly moving to edge sites in the mobile network. Though edge CDN can be at an on-

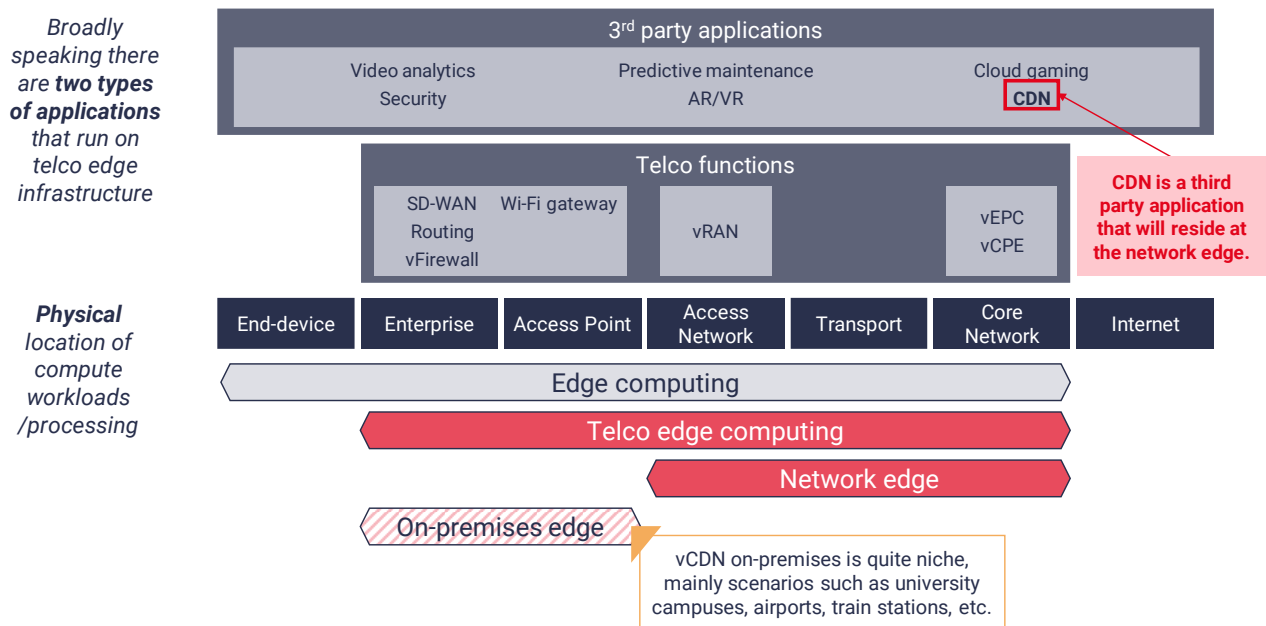
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premises site, for example a university campus or an airport, where there is high demand for streaming in a localised area, most deployments will be at core nodes in the mobile network (inner edge), or in the RAN (outer edge).

vCDN

vCDN is virtualised CDN software applications that can run CDN workloads on proprietary, baremetal, virtualised or container-based infrastructure, or on telco **MEC platforms**. Previously, CDN software platforms were tightly coupled with the underlying hardware making them inflexible. vCDN can occur at CDN PoPs at internet exchanges, as well as at network or on-premises edge sites.

vCDN can run CDN workloads at the network or on-premises edge



Edge CDN and vCDN each bring unique benefits that can enable content and gaming providers to cache content even more locally than current CDN distribution permits, and to flexibly run CDN functions on shared servers to address spikes in demand or users accessing content on the go.

Edge CDN offers 3 key benefits:

1. **Low latency:** caching content at edge sites means that the content travels a shorter distance to reach end users, resulting in a faster transfer of data and quick buffering/ping times
2. **Reduced backhaul:** by routing fewer requests to the central cloud, there is a lighter centralised data load, resulting in an increased network capacity without the need to invest in additional network infrastructure
3. **Quality of service:** content providers can offer end users fast and high-quality streaming from any location connected to the network

Though vCDN can enhance functions at IXP PoPs, its benefits would be felt more widely at edge locations, enabling additional scalability and flexibility on top of the benefits of edge CDN:

1. **Cost effective:** virtualising infrastructure enables software and hardware functions to be disaggregated, which is less expensive for content providers

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2. **Space:** the ability to run CDN functions on shared infrastructure can save on facility space as providers do not need to have separate hardware stacks (this only applies if the vCDN infrastructure is open, i.e. shared multi-purpose servers)
3. **Flexibility:** content providers can use CDN on demand – for example, caching content in a specific location for a short period of time to meet a sudden spike in demand

Though most edge CDN deployments will be virtualised and run on open, shared infrastructure, some providers will prefer proprietary (v)CDN models, where either a virtualised software platform runs CDN workloads on the CDN provider's dedicated hardware, or CDN functions run on baremetal hardware with no virtualisation layer. The benefit of the proprietary model is that CDN providers, or larger content providers with their own CDN, can keep their solution bundled together for control, and do not need to share infrastructure with other providers. There are also certain cases where it would be better to run CDN directly on bare metal infrastructure, as virtualisation layers eat server capacity. In instances where high throughput is needed, and vast amounts of data need to be processed on one server, it may not make sense to have a virtualisation layer.

What are the business models for CDN?

There are two key CDN business models: **commercial** (generating revenue) and **non-commercial** (cutting costs and improving quality of service).

Commercial

Operators have historically been locked out of the commercial model as CDN is hosted in data centres or IXPs, not within the mobile network. This model is therefore dominated by providers such as Akamai and Limelight who seek to generate revenue from CDN, charging customers, for example smaller content providers like Disney, to use their servers.

Non-commercial

For operators, the non-commercial model is still the primary business case to play in CDN. By caching content locally and reducing backhaul traffic from high bandwidth video content, creating capacity on the network, operators can improve customer experience and reduce operating costs. Larger content providers, such as Netflix and Facebook, also play in this model. They may have their own CDNs to optimise the quality of their content, but do not seek to generate direct revenue from their CDN services.

How will these business models change at the edge and allow mobile operators to monetise CDN?

These business models will also exist at the edge. However, there are two key edge site models that could offer operators additional ways to generate revenue and partner for CDN solutions: the **co-location** model and **edge platform** model.

Co-location

Today, in addition to saving costs by improving network capacity, operators can also generate a small amount of revenue by providing facilities (including space, power and cooling) for (v)CDN solution providers, or content providers, to put their equipment: i.e. co-location at the edge.

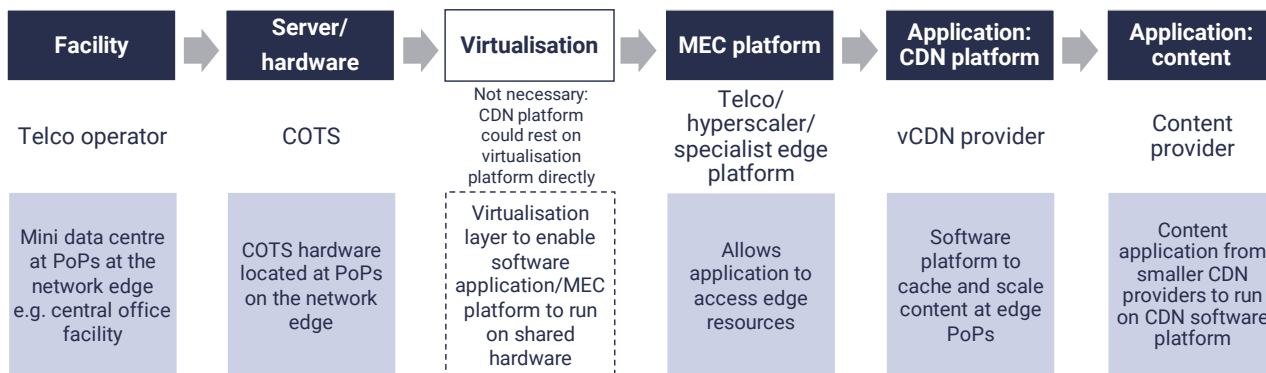
Edge platform

However, this could change as the benefits of new business models are realised. In the edge platform model, operators can still generate revenue from boosting the efficiency of their network but can also partner with vCDN companies who offer their services to content providers, receiving a revenue share for providing virtualised compute infrastructure, or providing IaaS direct to content providers.

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vCDN solution providers, such as Qwilt, are working to partner with operators and help them understand their potential in a vCDN edge platform model, and how they could become key players in the edge CDN value chain. There is also opportunity for telcos, hyperscalers or specialist edge platform providers (e.g. AlefEdge) to provide a MEC platform, enabling content and vCDN applications to access edge resources.

Key ecosystem partners in a vCDN edge solution



What does this mean for the future of content delivery?

Both edge CDN and vCDN are set to change the landscape of content delivery. There is an opportunity for telcos to play a more significant role in the CDN ecosystem and take advantage of new monetisation opportunities. Some telcos are exploring these opportunities, and content and gaming providers are already **partnering** with vCDN platform providers to meet the changing needs of end-users.

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