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Summary

A Content Delivery Network (CDN) is a network of distributed servers that host files, applications, images, video and other Internet content, with logic built into the system to enable that content to be delivered to an end user from their closest location.

If you're in London, and you watch a YouTube video, that video is served to you from a London datacenter. A person in San Francisco, watching the same video, gets it from a datacenter in San Francisco. Both users get fast local performance, and it's a CDN that makes it happen.

CDNs are ultimately responsible for the performance and user experience of any online service that depends on fast, low latency delivery of files, images, scripts and other content.

They are fundamental to online broadcasters and other Over-The-Top service providers, who either build their own private network for content delivery, or partner with a CDN service provider. CDNs provide a revenue stream for companies with distributed network infrastructure, such as telcos, who can monetize that infrastructure by using it to take CDN services to market – and use CDNs to control traffic flow across that infrastructure, to reduce costs.

Gaming companies rely on CDNs for software installers, DLC (downloadable content) and patches. For media websites, blog sites, social media networks and e-commerce companies, CDNs offer a way to boost customer loyalty, increase revenues and optimize SEO.

For each of these companies there have been significant barriers to CDN adoption, deployment and usage. The CDN market is dominated by a handful of very large specialist providers, which has kept prices artificially high. There are cheap and even free CDN services available, but these don't have the security or reliability needed for online services. Telcos, and other companies with their own distributed datacenters, have infrastructure in place to build their own private CDNs, but often lack the expertise to do so.

The CDN market is evolving rapidly, however, and there are new approaches to CDNs emerging which overcome many of these challenges. Key to these new approaches is a 'federated' approach to IT infrastructure access, management and service delivery.

This paper explains the pros and cons of traditional private and managed CDN deployments for enterprises and service providers. It also provides an overview of OnApp CDN, a 'third way' to deploy CDN that delivers the benefits of traditional CDN models, together with much greater flexibility, but without the cost and complexity.

The CDN market is now worth an estimated $4.95bn per year, with that figure set to grow to $15.73bn by 2020[1].

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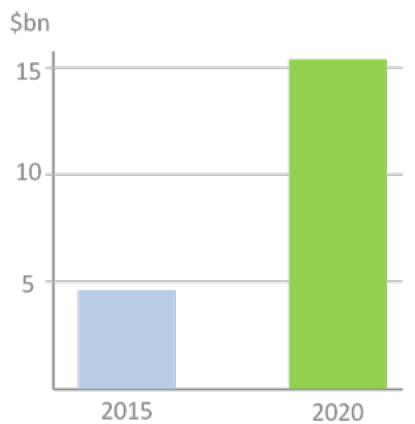
Predicted CDN market growth

Until recently the lion's share of this market was owned by a small number of established, specialist CDN providers. But change is on the horizon. Global public cloud vendors are moving to offer content acceleration as a default feature for customers hosting apps on their platforms – which means the rest of the world's service providers will need to respond.

At the same time, telecoms providers, MSPs and other large service providers, with multiple distributed datacenters, are looking at the potential for self-owned, self-managed private CDNs to power the next phase of their growth.

What drives these developments? It's a combination of service providers looking for new revenue streams, new ways to sweat their investments in infrastructure, and new ways to compete with the hyperscale global cloud providers; the inexorable growth in content consumption and the demand for high quality video; and the almost ubiquitous use of mobile devices to produce and consume that content, across the world.

CDN today is where cloud was five years ago, as the first generation of infrastructure hosting companies began moving from traditional shared and dedicated hosting to true Infrastructure-as-a-Service cloud. The early adopters reaped the benefits. Now CDN presents an even greater opportunity for companies that enter the space early.

For enterprises and service providers with their own distributed infrastructure, especially, CDN is an opportunity that cannot be missed: given the runaway growth in content creation and consumption, across the spectrum of users, any business without a CDN strategy in place – one that maximizes the use of their own assets, rather than relying on a third party – is simply leaving money on the table for their competitors.

By taking a strategic approach to CDN today, forward-looking companies can do more than just protect their business. They can increase revenues, grow their customer base and maximise margins. The secret to success is selecting the right CDN model.

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[1] Content Delivery Network (CDN) Market by Solutions - MarketsandMarkets, October 2015

CDN models

Historically, CDNs have either been built from the ground up (usually by a large media company or service provider) or outsourced to one of the handful of specialist CDN operators on the market. For service providers and enterprises moving into the CDN space, the same basic choices apply: build your own, or license CDN from one of the specialists. There are significant challenges with each approach - but now there is also a third way.

Build your own/private CDN

Few organisations have the resources to deploy a CDN from scratch. It takes time, expertise and significant capital investment in distributed infrastructure.

For businesses who already have a distributed network, using that infrastructure to create a private CDN has the potential to deliver significant value. Service providers with their own fibre networks may have already seen CDNs accounting for large amounts of traffic. A private CDN represents a clear route to monetizing that market.

For other enterprises, there is potential to capitalize on that network infrastructure to reduce third party CDN costs, and use private CDN to support the core business - be it OTT video, software distribution or even internal content delivery.

However, the strength of these organizations typically lies in their core business, and not in CDN software development or management. The benefits are attractive, but as with any large project, the risks are high.

Private CDN
Local infrastructure

Challenges:
- Cost
- Complexity
- Expertise
- Time to market

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Managed/licensed CDN

For large organizations with their own network, the answer has traditionally been to partner with one of the specialist CDN providers - either licensing software, and using the CDN specialist's network; or adopting a managed CDN approach, where the specialist deploys a PoP in your network under a revenue sharing model.

Both approaches have significant limitations, in terms of the cost, margin and ultimate ownership and control of the network and the end user customer.

For smaller companies, without significant infrastructure of their own, or the capital to build their own network, the only real choice available has been to partner with a CDN specialist.

At the lower end of the market are free CDN providers, whose services can be bolted on to paid hosting and cloud services. While the cost advantages are obvious, these services lack enterprise-grade security features and critically, they do not offer enterprise-grade support.

At the higher end of the market, a smaller provider can resell capacity from one of the specialist CDNs - but the cost is high; they are restricted only to the locations made available to them; and for service providers, margins are low.

Managed/licensed CDN
Third party service

Challenges:
- Cost/margins
- Control
- Restricted locations
- Customer ownership

The third way: hybrid private/managed CDN

Against this backdrop, OnApp offers a third way: a CDN platform that offers the software components to build a private CDN, and provides access to managed network resources via the OnApp Federation, a global network of cloud and CDN infrastructure.

Either can be used in isolation, to great effect, but combining the two creates many new opportunities for large and smaller enterprises to capitalize on the CDN opportunity.

Larger businesses can build a private CDN on their own hardware, using OnApp's proven components, and access elastic resource from the OnApp Federation when required.

By avoiding the traditional managed/licensed CDN model,they can leverage their own network investments; benefit from the expertise of a third party CDN software specialist; and retain overall control of the network, the customer, and the cost and margins of the CDN service.

When network traffic is at normal levels, the provider can rely on their own infrastructure. But when demand rises fast, additional capacity can be brought online quickly from OnApp's managed Federation network. When demand is low, private capacity can also be sold back into the OnApp Federation, creating a new revenue stream.

Smaller companies can opt to rely entirely on capacity from the OnApp Federation, without building any CDN infrastructure of their own. This enables them to offer fully supported, enterprise-grade CDN services in any geographic territories they choose, without capital investment in building their own network. Commercially, because the Federation is a wholesale network, it enables smaller service providers to offer CDN services to customers at affordable, mass-market prices, while retaining much better margins than traditional licensed models afford.

Private CDN
Local infrastructure

CDN Federation
On-demand infrastructure
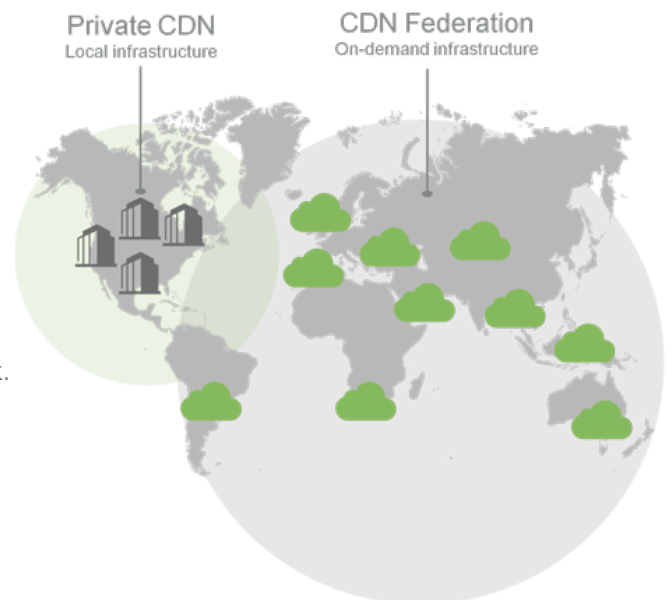
The OnApp approach - in detail

OnApp CDN is a complete framework of CDN software components, which gives companies the tools to create, launch, manage and bill for a wide range of CDN services, either as an integrated part of a cloud hosting service, or as a standalone CDN.

OnApp CDN software runs on commodity datacenter infrastructure. For companies with one or more datacenters, it enables the creation of caching servers, dynamic acceleration servers, live streaming or video-on-demand (VOD) streaming servers - supported by a full suite of management, metering and billing tools.

Working in tandem with the software components is the OnApp Federation: a global network of on-demand infrastructure, including 170+ CDN locations in 43 countries.
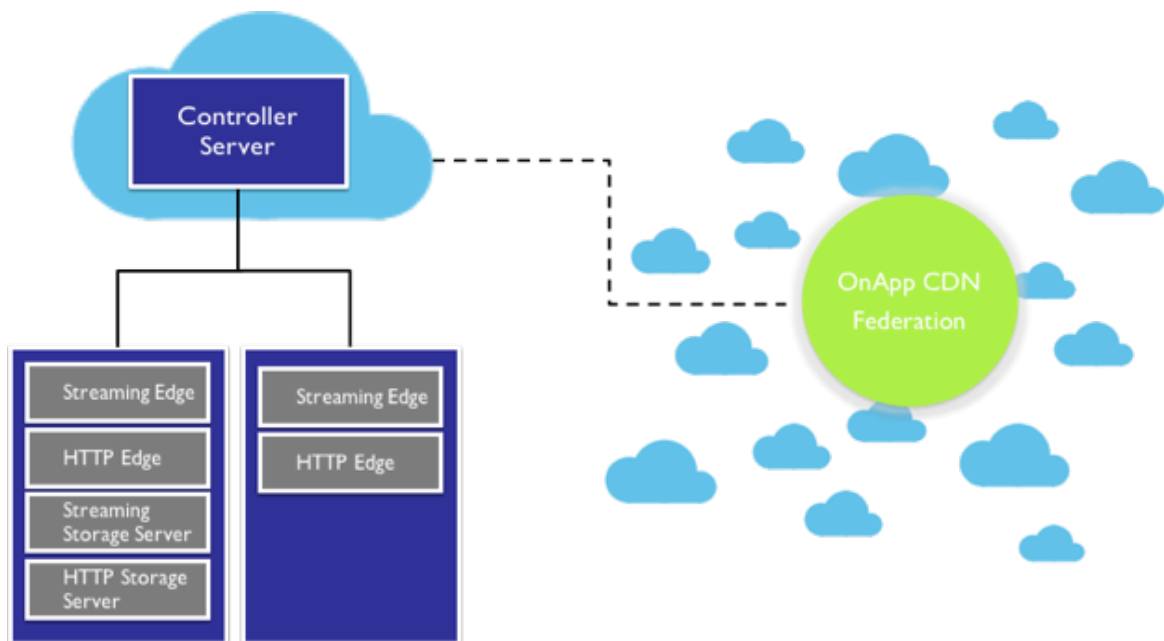
Typical private CDN configuration with OnApp controlling local servers, and additional capacity sourced from the OnApp Federation

OnApp CDN - key benefits

The unique combination of the OnApp CDN software stack, and the OnApp Federation, provides the benefits of traditional private or managed CDN while overcoming many of the commercial disadvantages:

- **Total control over the infrastructure** – use OnApp to build a self-owned/self-managed/private CDN, where you determine the location of edge servers, how bandwidth is shared, and how traffic flows across your infrastructure.

- **Total control over geographic distribution** - make full use of your own datacenter locations and add as many locations from the OnApp Federation as you like, to ensure your CDN PoPs are as close as possible to any given audience.

- **Total pricing control** - by controlling your own CDN, you can set your own CDN pricing. Pricing can be varied by territory, and you can even offer 'surge' models with prices responding automatically to changes in demand. OnApp Federation resources are offered at wholesale prices: for CDN service providers this offers the potential to price aggressively while retaining more margin than traditional licensed/managed CDNs.

- **True ownership of the customer** - allowing for higher margins and opportunities to cross-sell other products and services, beyond CDN

- **Automation** - traffic flow is optimised automatically, both geographically and in terms of load on individual POPs; and you can burst into additional capacity according to configurable thresholds

- **Additional revenue streams** - use the Federation to sell under-utilized CDN infrastructure, too. Publish edge servers to the Federation, set your wholesale price, and get paid when your infrastructure is used by other Federation members

- **Future proof** - OnApp CDN shares the same technology platform as OnApp Cloud, a complete multi-platform, multi-location cloud management solution. Build out your CDN with new capabilities, in the same integrated environment

OnApp CDN stack - key features

The OnApp CDN platform has minimal hardware requirements. It is quick and cost-effective to deploy, running on bare metal or virtual machines, and with a full web interface and API is straightforward to integrate with your existing IT.

For many providers, OnApp offers the most cost-effective way to expand their portfolio and, crucially in the case of CDNs, their geographic reach.

As Forrester points out, "While most CDN buyers already understand that delivering web experiences over large distances increases latency, increasingly socio-political or compliance reasons dictate the need for local delivery capabilities."[2]

- Easily deployed, proven software components that run on Debian (on VMs or bare metal)

- Flexible deployment options, including a choice of virtual or dedicated edge servers.

- Load balancing of all servers

- Full failover capabilities to ensure high availability

- A web-based dashboard for administration, monitoring and reporting

- 24/7 enterprise-grade support and a 15-minute SLA

- Fixed, volume-based pricing
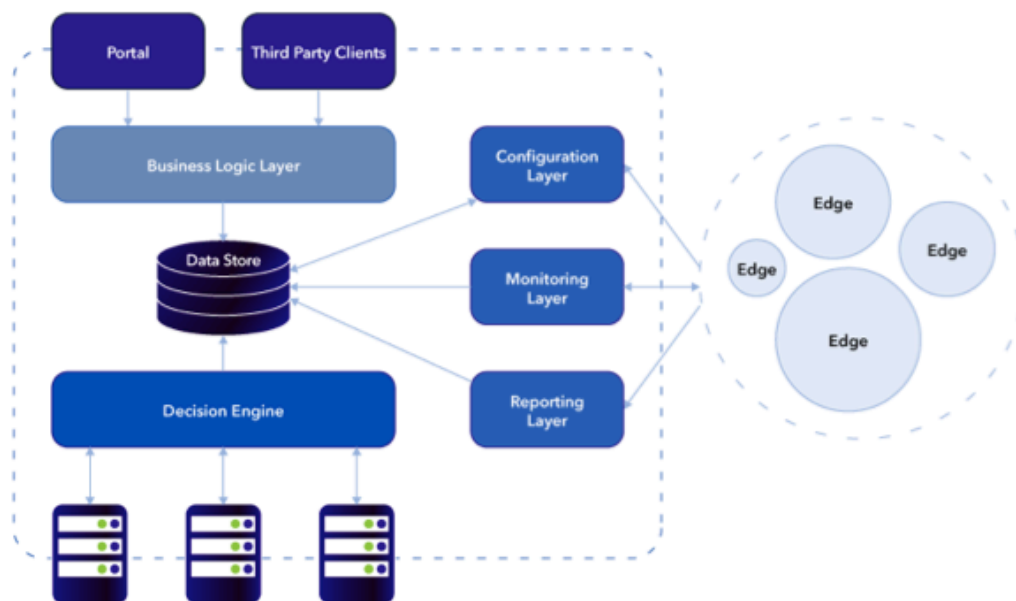
OnApp CDN - high-level architecture

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[2] Forrester, "CDN and Digital Acceleration Vendor Landscape, Q3 2014"

OnApp CDN stack - components

This section of the paper details OnApp CDN's software and Federation components.

Controller Server

The Controller Server hosts your OnApp CDN control panel and gives you, your customers, users and resellers an easy way to manage CDN services, from setting up edge servers and zones, to configuring CDN resources and security policies. The control panel is fully rebrandable, supports localization and has a full API.

Edge Servers

OnApp CDN includes an advanced edge server appliance that caches and distributes content. The edge server can be deployed on hypervisors in an OnApp Cloud, or on dedicated server hardware. In each case, edge servers are managed by an OnApp Controller Server, through the OnApp control panel.
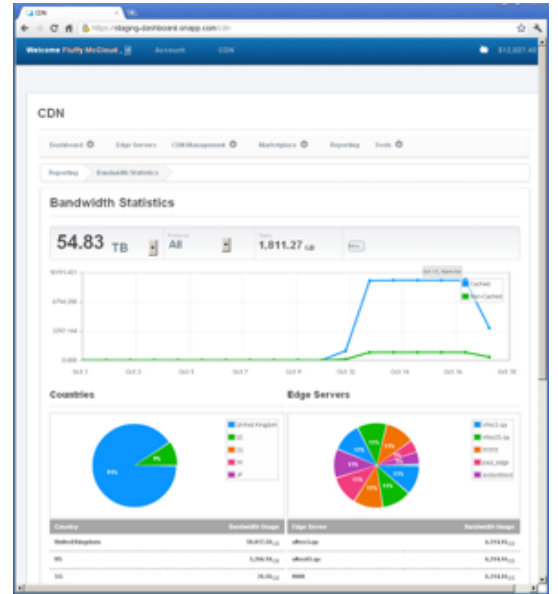

OnApp CDN control panel

Storage Servers

OnApp CDN lets you add dedicated storage servers to your CDN infrastructure. These remove the workload from origin servers and help to reduce latency and throughput bottlenecks, by pushing content stored across multiple locations.

Anycast DNS

OnApp's global Anycast DNS service and routing engine is the intelligence behind OnApp CDN. Hosted by OnApp at datacenters around the world, it automatically directs content requests to the nearest CDN location, using DNS routing to reduce the number of network hops required, which is much faster than traditional DNS configurations. OnApp CDN also integrates with Google DNS and Open DNS.
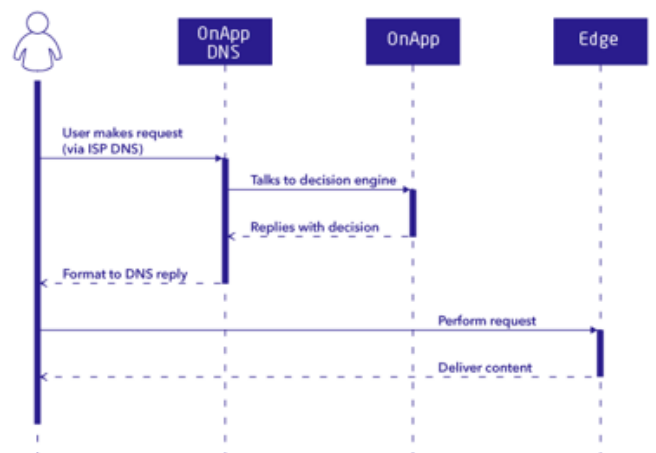
Anycast DNS logic - high level

OnApp Federation

The OnApp Federation is global network of compute cloud and CDN infrastructure, spanning 170+ locations in 113 cities, across 43 countries. There are two main ways to use the Federation as part of your CDN:

Public Federation

The public Federation provides on-demand access to any or all of the infrastructure available, at wholesale prices, through a single marketplace.

- Public Federation capacity is delivered by individual service providers, who publish their infrastructure to the Federation marketplace, and set their own wholesale prices

- To use the Federation as part of your CDN service, you choose the locations you want, set your retail pricing, and make them available to your customers via OnApp's built-in user role, permissions and billing systems

- You can use Federation locations alongside any infrastructure you own

- Federation and local infrastructure is managed through the OnApp CDN control panel

With granular coverage at city level, across multiple geographies, and with a wide range of price and performance options available, the Federation enables service providers to create cloud or CDN services with a global footprint - without having to invest in building new infrastructure.

For CDN, it supports a wide range of content types and protocols, making it perfect for website acceleration, software delivery, video on demand (VOD) and live streaming.

Because OnApp Federation infrastructure is contributed by individual service providers, it also gives those providers a way to monetize spare capacity. Unused local infrastructure can be published to the marketplace for other providers to subscribe to: the owner gets paid when their infrastructure is used.

Private Federations

For service providers with infrastructure distributed nationally or regionally, OnApp also enables the creation of "private Federations" across those sites, for the exclusive use of a company's customers, employees or partners.

Private Federations enable the creation of Private CDNs for OTT video delivery, software delivery, internal content delivery, wholesale telco CDN and other use cases.

Real-world deployments

Service providers

Most large service providers will benefit from a self-owned CDN built with OnApp components, with access to the OnApp Federation for additional capacity when required. By building a private CDN with OnApp, a provider can capitalize on its regional strength (e.g. across Europe or Latin America) and use the Federation to deliver a global CDN service – vital when dealing with media giants who only want to negotiate one contract.

Smaller hosts and VSPs can use the Federation alone, creating virtual CDNs that meet different market or customer needs – for example, focused regional coverage or high performance – and sell CDN services with no capital expenditure on CDN infrastructure.

Use case: Pacnet (carrier CDN)

Pacnet built a self-owned CDN platform across its own substantial datacenter and subsea infrastructure using OnApp CDN components, extended through the OnApp Federation.

A network of PoPs in its own datacenters spans eight countries in the Asia-Pacific region. These are supported by additional Asia-Pacific locations from the OnApp Federation, and ten managed Federation PoPs in the U.S. and Europe. The network can be extended on demand with any of the locations available via the OnApp Federation. Pacnet's retail and reseller CDN businesses now run on OnApp CDN, too.

As a result, the business has capitalized on its investment in cross-continent infrastructure, gained greater flexibility, and reduce operating costs significantly.

Telcos and carriers

According to 451 Research, "mobile is shaping up as a big opportunity for CDNs"[3] , as more and more end users consume internet content using devices other than the PC.

Telcos face particular challenges, however. Most want to evolve from being pure network owners to delivery partners for content providers, thereby increasing their margins and delivering incremental value to their wholesale customers.

Again, the recommendation is a self-owned CDN built with OnApp, including access to the Federation. The benefits for telcos include:

- The ability to offer new wholesale CDN services to service provider customers (e.g. smaller telcos, ISPs)
- The potential to leverage existing infrastructure investment and sweat those assets
- Greater control of the traffic flowing across its network - which helps reduce network cost (less requirement to upgrade)
- A much stronger market position: by becoming a CDN provider they can own the customer

The OTT sector

Over-The-Top (OTT) operators need to distribute better quality streaming content to their end-users, while reducing the demands on the network backbone and cutting infrastructure costs. This is no small task. Movies are now commonly produced at 8k resolution, which means basic streaming will soon require about 250 gigabits per user. In this context, a few cents on every gigabit will make a tangible difference to the bottom line. The more efficiently content can be cached and delivered, the more profitable the operation will be.

By building their own CDN using OnApp components – again, with Federation access – service providers can gain better control over their resources and thereby provide a better experience to an OTT company's end users.
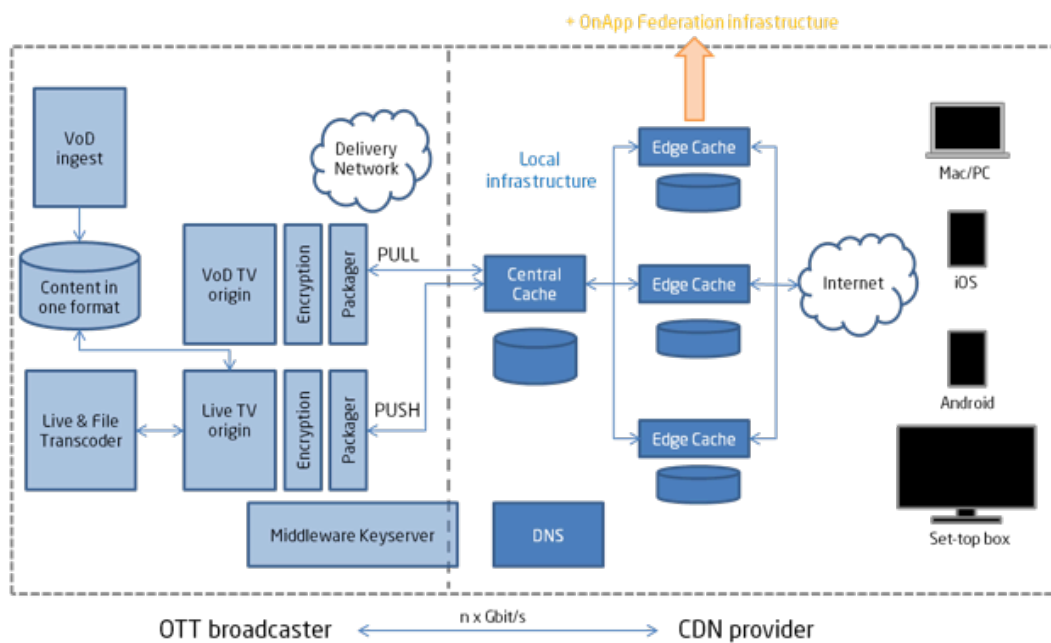
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[3] 451 Research: "Global Content Delivery Networks Market Overview 2014"

Typical OTT video architecture with OnApp CDN

Demand for CDN software and services is clearly growing apace. In the coming years, several trends can be expected to influence the market for CDNs. Chief among them is the growing ubiquity of content acceleration. Leading public cloud providers are already making the speed of CDNs an integral part of their offering, ensuring the fast and efficient delivery of apps and data deployed on their platforms. Carriers and service providers who fail to counter this threat will soon fall behind. Content delivery therefore represents a pressing issue as well as an opportunity.

By taking a strategic approach to CDN now, forward-looking companies can increase revenues, grow their customer base, reduce cost and maximize margins. The time to act is now. The rewards will include more control, more customers, higher revenues and healthier margins. The key is to select the right approach for your business.

As high-bandwidth content becomes more important to businesses of all kinds, the self-owned/private CDN model, with the added flexibility of the Federation, is expected to account for a significant share of the CDN market in years to come.

For a demo and more information:

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