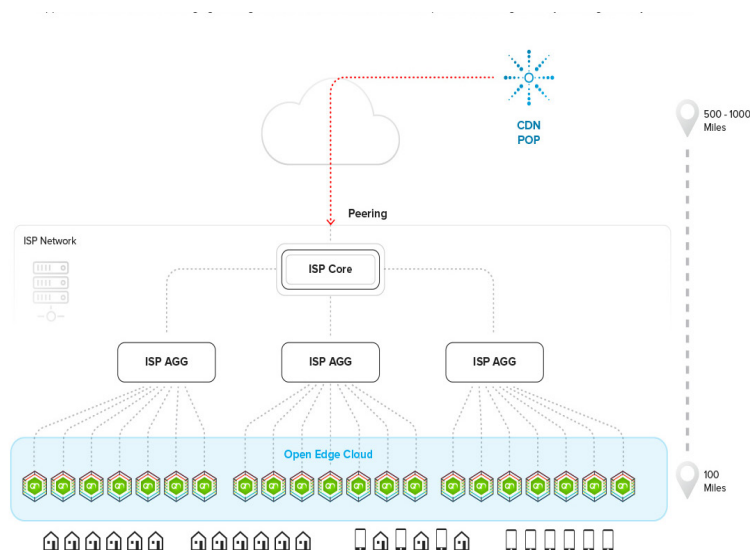# Qwilt

Open Edge Cloud

Whitepaper

INTRODUCTION

Cloud everything - we've become accustomed to having every type of application we can think of - be it video, gaming or your enterprise CRM application, streamed to us from a centralized cloud located many miles away. Innovation in software allowed the cloud to scale applications across geographies while still achieving performance and stability levels, previously only attainable with on-premise software install.

However, a new generation of application is right around the corner requiring new levels of performance unattainable on today's content delivery schemes. Be it high bitrate encoding and heavy bandwidth required for a 4K video to stream without stuttering, or instant response time needed by autonomous cars to make the right decision when driving on the road - the current application delivery infrastructure simply falls short.

The solution is to bridge the delivery distance gap and enable low-latency, near-side delivery options that will enable the network to scale efficiently while bringing near zero latency delivery capabilities required by these apps. The centralized cloud is not over by any means, but it has to be augmented by a new layer built by service providers, working harmoniously with the clouds of yesteryear.

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OPEN EDGE CLOUD

The edge cloud establishes a massively distributed layer of common off the shelf (COTS) compute and storage enabling content delivery from the closest possible location to your subscribers. Qwilt's Edge Cloud Architecture leverages cloud management and connectivity, open APIs and a powerful small form factor software nodes to deliver true edge content delivery capabilities built for tomorrow's application and content delivery demands. We built the software that can unlock the potential of this layer leveraging hundreds of deployments at the true edge of the network - software that is 100% cloud managed, that packs maximum performance from a small form factor and that is elastic and resilient at the same time.
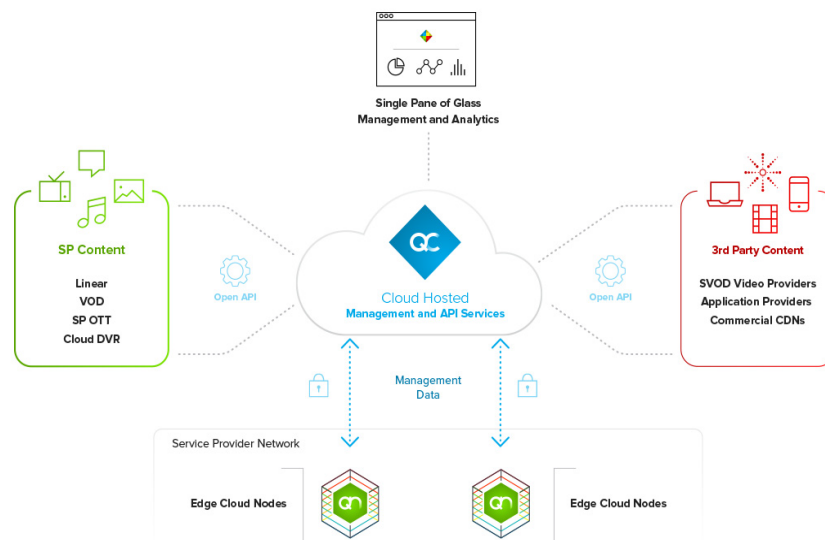
Closer is Better – Qwilt's edge cloud nodes leverage the three most important aspects in content delivery: location, location, and location. Content delivery locations that are closer to the users mean there are fewer hops and shorter distance for packets to travel. The result is that there's a smaller chance packets will encounter congestion and a greater ability to deliver high throughput and faster response times. Unlike traditional CDN nodes that are centrally located in the mid-mile, the edge cloud is deployed at the closest possible locations to the users - often tens of miles to a few feet away. This allows applications and content leveraging the edge cloud to achieve the ultimate QoE possible. That's good for the network and great for your users.

VALUE TO CONTENT AND APPLICATION ECOSYSTEM

With hundreds of deployments embedded deep in the ISP network edge throughout the globe, the Open Edge Cloud improves QoE through the principal of "Closer is Better". When it comes to delivering streamed content, bridging the distance gap a content provider's best shot at delivering a great experience for its users. With the advent of 4K and VR in the market proximity and caching become ever more critical. Qwilt enables new applications to be delivered with our Edge cloud architecture with superior QoE - our set of open APIs allows content providers to tap into this massively distributed layer of computing and storage power.
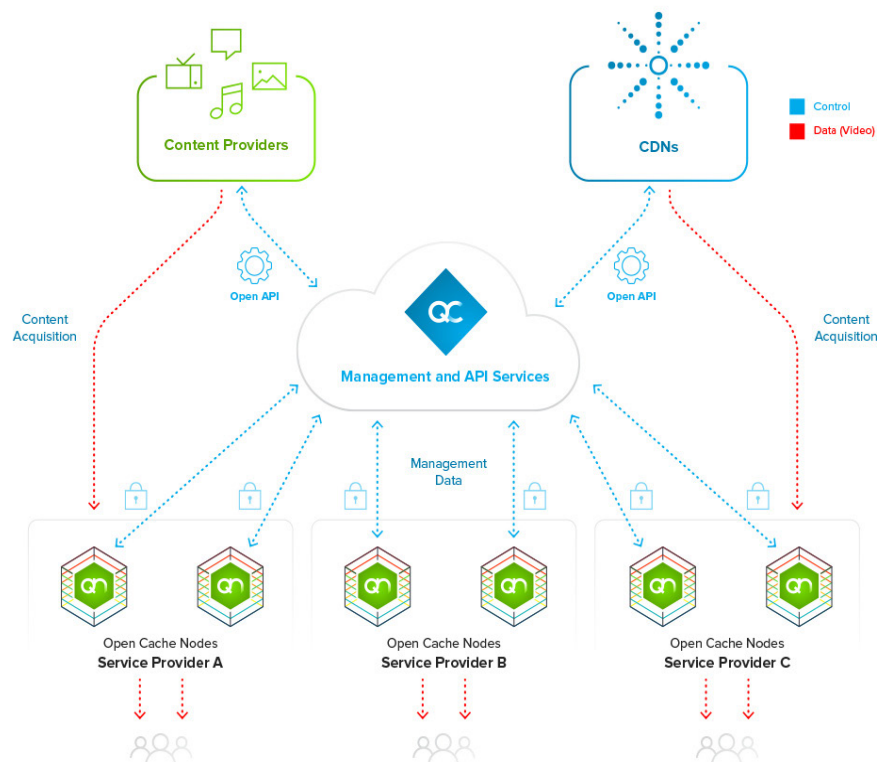
The edge cloud complements a content provider's CDN infrastructure establishing a final tier of content delivery deep within ISP networks which can come in handy during flash crowds and live events when everyone is tuning in at the same moment.

Scalability and Quality of Experience

Interconnecting multiple CDNs as well as multiple network operator edge clouds offers clear scalability and quality of experience benefits for the entire ecosystem, as each element offers a separate network footprint, whereas the aggregate footprint substantially outsizes than any individual CDN.

Such benefits mainly include footprint extension, capacity overflow prevention, network congestion avoidance as well as various other use cases.

The edge cloud footprint exists independently of CDN deployments, carrying a large volume of traffic, often in network locations where CDN-only caching nodes would not economically exist.

Interconnection between the various CDNs and individual video fabrics offers an alternative means of extending and spanning the CDN footprint working for all content providers.

Footprint extension

Content providers and CDNs are able to virtually extend their own footprint in order to:

- Reduce overall network transport costs

- Reach network locations not available for 3rd party gear, both in terms of geographic coverage (e.g. region where the CDN has no footprint) as well as in terms of proximity to the consumers (subscriber edge cache deployments at the town or neighborhood level).

- Achieve optimal equipment utilization by offloading heavy lifting of popular content to the video fabric layer.

- Improve quality of experience by leveraging close proximity caching nodes

Capacity overflow

Content providers and CDNs alike may face an overflow of capacity due to temporary spikes in content consumption (e.g. iOS launch event). The edge cloud can act as a first caching tier can help offset consumption spikes inherently:

- Elastically adjusts to consumption demands pulling internal edge resources address traffic spikes.

- Content providers and CDNs can reduce their need to provision additional capacity and de-provision that capacity after the spike has ended

- Content providers, CDNs and network operators do not need to incur additional network costs and performance degradation through increased content access latency and content delivery via sub-optimal paths

Content spike offload

Content providers and CDNs may use the edge cloud to address both predictable and non-predictable consumption spikes such as the Olympics, software update releases or other events that are known in advance. Temporary peak demand can be met while reducing the footprint increase needed to do so, as it may not be needed after the spike is over.

- The CDN layer can use the edge cloud to provision additional resources closer to the end users or enabling offload only for the period of the spike.

- The resources may include additional edge cloud storage and bandwidth capacity that would otherwise be required by the CDN layer.

- The CDN layer may mark specific assets that are anticipated to drive the consumption increase, to the edge cloud for prioritized caching. Such content assets may be identified individually, or by association with particular content provider. For example, a CDN provider may provision and mark content of the Apple iOS launch ahead of launch day.

Live streaming offload

Various live stream events such as sports or rock concerts are known to drive substantially high capacity requirements of the CDN layer, demanding higher bitrates than regular video assets.

By leveraging the edge cloud, CDNs and content providers can deliver live streams on a massive scale without incurring a substantial footprint overhead, using the edge cloud as a de-facto aggregation and L7 broadcast point.

VALUE TO SERVICE PROVIDERS

Qwilt enables network operators to architect their network in an optimized manner suited for online video, the most dominant traffic type in today's networks, by:

- Reducing CAPEX costs associated with continuous investments in the aggregation/core parts of the network, by intelligently caching content at the edge of the network.

- Reducing OPEX costs associated with the cost the Service Provider pays for peering/transit bandwidth.

- Serving the content closer to the subscriber to provider better consumer experience

We've found that in most operator networks, deploying an edge cloud infrastructure actually pays for itself in under a year by the network architecture benefits alone. At the same time, the edge cloud establishes a new infrastructure for creating new monetization avenues for network operators.

MONETIZE YOUR EDGE CLOUD

The Edge Cloud enables service providers to become profiting members of the application and content delivery value chain. Rather than merely being used as "pipes" by content providers and 3rd party content delivery networks (CDNs), service providers can assume delivery of traffic previously carried by 3rd party CDNs.

This newfound capability establishes the vehicle for multiple revenue-sharing partnerships with CDNs and content providers alike, whereas the service providers can be compensated for traffic delivered from within their own networks. By delivering popular video titles from the network's true edge, service providers enable CDNs to achieve significant infrastructure savings by scaling back the ongoing costly network expansion efforts to accommodate the rapidly increasing volume of video traffic.

As the demand for video continues to grow, carriers and CDNs alike will benefit from the increase in overall volume of video traffic, with CDNs achieving substantially higher margins on video traffic they deliver to the eyeball networks.

Additionally, service providers can choose to serve video content from specific CDN partners, achieving an increase in overall traffic throughput for the CDN, and in some cases extending CDNs' and content providers' reach into markets where they do not currently have presence. By serving video content from close proximity to the subscriber, network operators dramatically improve the end user QoE, enabling their CDN partners to develop premium service level offerings for content providers.

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