SOLUTION BRIEF

Communications Service Providers
Content Delivery Networks

Qwilt's* Open Edge Cloud* Puts Content Delivery at the Network Edge

The Open Edge Cloud architecture allows mobile network operators to build low latency, highly scalable CDNs for their content services or for third-party content partners.

Introduction

Cisco's* 2018 Visual Networking Index (VNI) shows that up to half of all streamed video is viewed on wireless devices, which is driving a significant and sustained increase in demand for mobile bandwidth.[1] In addition, new high-bandwidth services that are on the horizon will continue to drive this demand. High quality of experience is essential for these services, which means that mobile network operators (MNOs) need to engineer their networks for low latency. To help MNOs meet these demands, Intel® Network Builders Edge Ecosystem partner Qwilt* has developed a next-generation content delivery network (CDN) that utilizes multi-access edge computing (MEC) technology to place CDN caching resources at the edge of the network to minimize latency and reduce data traffic on the core network.

Challenges of Delivering Great Video over the Mobile Network

While streaming video and access to cloud-based services are currently driving up demand for mobile network bandwidth, more applications are poised to add to the data demand onslaught facing MNOs. Virtual reality, augmented reality gaming, connected cars, and new consumer live video streaming systems such as nanny cams, pet cams, and home security cameras will soon add to the need for high-network throughput.

In addition to the potential for these applications to result in significant data flows to mobile data networks, all of these next-generation applications need very low network latency—as low as 10 milliseconds in the case of augmented reality gaming.[2]

Serving these applications from origin servers located in central data centers may result in additional latency because packets must travel farther on the transport network. Optical fiber transport networks have a latency of 5 microseconds per kilometer of fiber-optic cable.[3] That assumes a direct cable connection with no network congestion and no network hops. Congestion and network hops are expected in communications service providers' (CommSPs') networks and will add to latency.

Multi-access edge computing (MEC) is one solution to minimize transport network latency. This new cloud computing architecture consists of virtualized servers delivering network services and applications from physical locations that are at the edge of the network, including points of presence, customer premises, and cellular base stations. Since the servers are at the edge of the network and closer to the point of consumption, transport network latency can be reduced to a minimum. MEC is optimized for 4G/5G network access, but wireline CommSPs and internet service providers can utilize edge networking for the same functionality.

Solution: Open Edge Cloud

Qwilt's Open Edge Cloud* solution delivers CDN functionality over a MEC infrastructure, pushing the content caching and delivery as far out to the edge of the network as possible, including cable modem termination system (CMTS), DSL access multiplexer (DSLAM), broadband remote access server (BRAS), or multi-access edge compute (MEC) node. MNOs can establish a massively distributed layer of content caching resources on virtualized Intel® processor-based servers that enable content delivery from the edge location that is closest to the subscriber. Each edge server can be utilized by other virtual network function (VNF)-based services, which makes it cost effective enough to distribute throughout the MNO's serving area. This gives the solution an ability to scale up very rapidly without a long investment payback time.

The Open Edge Cloud platform (see Figure 1) can deliver four content-related services, including:

- Managed CDN: Allows the MNO to utilize CDN services for its own content
- Open caching: Allows for third-party access to CDN services via open APIs
- Transparent caching: Extends CDN services to live content streams
- Multicast adaptive bitrate (MABR): Allows streaming of live content over an MNO's closed multicast infrastructure within the access network

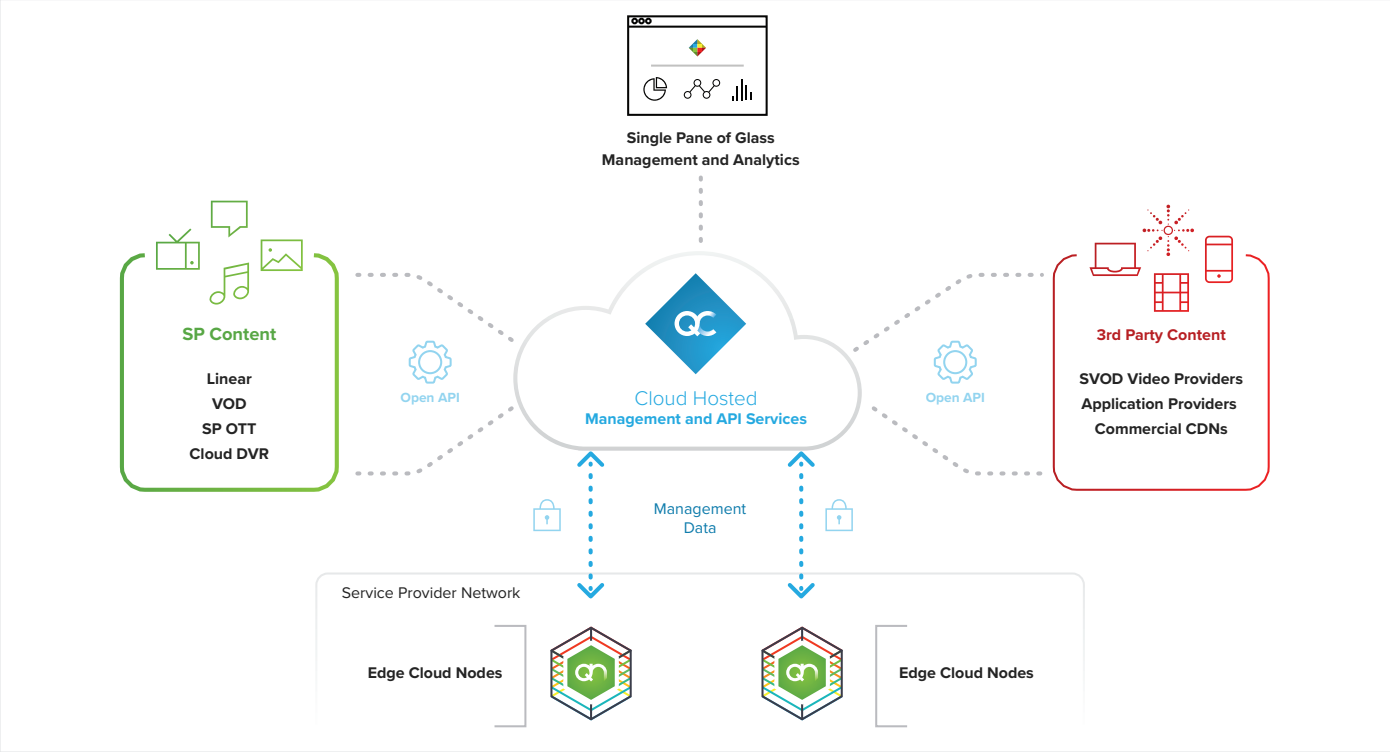

Figure 1. The Qwilt CDN features cloud-based QC control plane and QN edge delivery software.[4]

Qwilt Cloud (QC) Control Plane

The Qwilt Cloud (QC)* is the cloud-based control plane for the Qwilt CDN. It is based on Traffic Control,* an open source Apache* Top Level software project. Qwilt has productized Traffic Control and developed it for cloud-based deployments. The QC works with Qwilt Node (QN)* software, which is deployed on commodity server hardware located at the network edge and caches content and delivers it to customers.

QNs are designed to serve as a network edge reverse proxy that caches content from the content provider's origin server and serves that to users. In the case of very popular content, the QN can provide reverse proxy functionality from the ISP network core in the middle of the delivery network, which allows it to offload multiple content pulls from the origin server. This content would then be sent to the QN that is closest to the customer, offloading the origin server from the excess demand.

The QC control plane works with QN edge delivery software to deliver the following functions:

- **Discovery:** The QC registers QNs and provides the connectivity between the QN and QC. In addition, the discovery function provides ongoing compute system and interface health monitoring in order to spot problems and re-direct content delivery requests to other available QN resources and notify administrators.
- **Control:** The QC defines the delivery service, which defines how the CDN will distribute the content to customers. Operators can define a number of parameters, including host names and transport protocols. The control function also ensures content validation and content purging.
- **Request Routing:** The QC can select the QN closest to the customer to receive content either based on geographic criteria or factoring in QN congestion levels.

- **Logging:** All delivery actions are logged, and the QC aggregates the transaction logs from every QN, which the MNO can access from its management portal. Additionally, these logs can be streamed to third-party log management services that an MNO already has set up.
- **Analytics:** The QC presents a single dashboard for operating the CDN as well as for managing CDN performance, including the bandwidth being delivered, cache hits, and additional information on the health of the node.

The use of Open Cache APIs together with the broad CDN coverage developed for each MNO customer base makes it possible for MNOs to develop "CDN as a service" offerings that become a new revenue stream. If the MNO builds out an Open Edge Cloud CDN that completely covers its service area, it can provide the same access as today's commercial CDN offerings, but with the advantage of being closer to the customer for outstanding quality of experience (QoE).

Intel® Processors for Performance, Scalability

The Qwilt solution is specified for Intel® architecture processors, specifically Intel® Xeon® and Intel Atom® processor-based systems. Qwilt has written the software to take advantage of the common architecture, which allows the software to run unmodified in servers at the edge and in the core of the network.

QC control planes utilize servers based on Intel Xeon processors, which provide significant performance and power efficiency benefits for scaled-out data center and network virtualization applications. These CPUs include Intel Xeon Scalable processors, which offer the scalability to deliver workload-optimized performance in NFV applications.

Qwilt Edge Nodes make use of the Intel Atom® SoCs (systems on chips), which are ultra-low-voltage and designed for a variety of light scaled-out workloads that require very low power, high density, and high I/O integration.

For mass live streaming events, performance of the Qwilt solution depends on the CPU's ability to rapidly replicate the number of unicast streams to meet viewer demand. This is the key to offloading data from the transport network and the CPU's fast cache technology allows it to take in a single live seed stream and replicate it quickly.

In locations where there is really popular content, Qwilt will specify servers with Intel® Solid State Drives (Intel® SSDs). Intel SSDs are designed for storage performance, stability, efficiency, and low-power consumption. With no moving parts, Intel SSDs are excellent for use in servers and applications that require speed and reliability.

Conclusion

Qwilt's Open Edge Cloud is the CDN service that allows MNOs to build out a CDN infrastructure to meet the fast-growing demand for streaming video content. This enables the MNOs to take advantage of new opportunities, including their own content services, as well as offering CDNs as a service for content partners. With centralized control plane and content delivery nodes at the very edge of the network—all powered by Intel processors—the Open Edge Cloud offers the latency, scalability, and cost effectiveness required for these applications.

About Qwilt

A growing number of the world's leading cable, telco and mobile service providers rely on Qwilt for Edge Cloud applications. Founded in 2010 by industry veterans from Cisco and Juniper,* Qwilt is backed by Accel Partners, Bessemer Venture Partners, Cisco Ventures, Disrupt-ive, Innovation Endeavors, Marker and Redpoint Ventures.* Learn more at www.qwilt.com.

About Intel® Network Builders

Intel Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The Intel® Network Builders Edge Ecosystem is a new initiative gathering ecosystem partners with a focus on accelerating network edge solutions. As an integral part of the broader Intel Network Builders program, this initiative aims to facilitate partners' access to tested and optimized solutions for network edge and cloud environments. Learn more at https://networkbuilders.intel.com/networkedgeecosystem.

[1] https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-741490.html

[2] Source: "The Future X Network" https://www.bell-labs.com/our-research/future-x-vision/

[3] https://www.lightwaveonline.com/articles/print/volume-29/issue-6/feature/network-latency-how-low-can-you-go.html

[4] Figure provided courtesy of Qwilt.

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