Executive Summary

The way we use the Internet has changed, and the result has been exploding traffic growth that is projected to increase at a 30 to 50 percent compound annual growth rate over the next five years. A shift toward viewing TV content online as well as an intense use of mobile devices, enterprise cloud services, and the emergence of new technologies such as Internet of Things and 4K TV are driving this growth.

This trend means that total transport costs will continue to rise, even as the cost per port declines. Content providers and eyeball networks, including cable MSOs, mobile operators and other ISPs, support over-the-top and video-on demand applications such as Netflix, Hulu or X1 Cloud TV services. This is in addition to bandwidth-intensive applications such as gaming and cloud services. Rapidly growing backbone traffic, which is escalating costs and congestion, makes meeting this transport demand a challenge.

EdgeConneX addresses this transport issue by offering edge data centers that bring bandwidth-intensive content and latency-sensitive applications closer to the end-user. The result is lower network transport costs and improved customer experience.

ACG Research compared backbone transport cost with and without localized content for a fixed broadband service provider. The cost analysis includes a five-year projection of fixed broadband bandwidth requirements and optical cross-connects, as well as a cost of long-haul transport forecast, which is projected to decline by about one-third annually.

The potential cost savings estimate assumes that all managed content providers establish nodes in the metro area. This seems highly likely in that local content proximity provides an order of magnitude latency advantage over remotely located content. Managed content that fails to localize will provide poor quality experiences relative to its locally located rivals.

For a metro area reaching 1 million subscribers, local content proximity produces a $110 million savings in backbone transport cost over five years, a 50 percent savings. The move to local content proximity also reduces network latency by an order of magnitude, limits the impact of DDoS attacks and the time required to mitigate them.

KEY FINDINGS

EdgeConneX builds edge data centers that localize content for broadband providers and content providers. Compared to regional data centers, localization:

- Saves $5.5 billion (~50%) in backbone transport cost over five years for a nationwide market of 50 million residential broadband subscribers.
- Saves $110 million in transport cost over five years for a 1 million subscriber metro area.

Introduction

IP networking traffic demand is exploding with five-year projections ranging from a 30 to more than 50 percent compound annual growth rate (CAGR), depending on the market segment[1]. This growth is a result of the evolving way we use the Internet, including a fundamental shift in how traditional TV content is consumed by both residential and mobile subscribers.

For example, the accessibility of video content via streaming services has caused about five percent of traditional TV viewing to shift to streaming services during the last three years. This small shift in video viewing consumption, however, accounted for 59 percent of North American fixed broadband traffic last year.

There is a broad consensus that the majority of TV content will be consumed by streaming services within a decade. Other bandwidth drivers include the rapid adoption of mobile devices, the multiscreen phenomena, and the high-bandwidth requirements of 4K TV.

Broadband operators' network transport costs largely track this traffic growth. The cost pressure is especially severe in Tier 2 markets where the regional peering point is far from the metro area. Within five years Tier 2 markets will have the traffic capacity of today's Tier 1 markets. For instance, the Pittsburgh and Columbus of 2019 will deliver the same amount of data as today's Washington, DC and Boston, respectively.

Remote regional peering points also increase network latency, negatively impacting quality of experience, raising churn, and degrading subscribers' perceived service value. This will not only impact latency-sensitive services such as Internet of Things (IoT), web payments, and enterprise cloud applications, but also simple web browsing. For example, the objective of the industry is to deliver web pages within one to two seconds for an acceptable experience and minimal abandonment. However, Akamai reports that web page response time now averages five seconds, a 26 percent slowdown since 2012. The trend is toward even longer response times because of extensive use of mashups and complex images.

EdgeConneX Local Content Proximity

The EdgeConneX purpose-built edge data centers address these problems. The data centers place bandwidth-intensive content and latency-sensitive applications close to where eyeballs are aggregated, decreasing network transport cost and improving the customers' experiences. Specifically, the data centers address:

- Quality and cost issues driven by consumers' exponential growth in bandwidth consumption.
- Broadband providers' increasing backbone transport cost.
- Content providers' concerns about best-effort delivery via the public Internet.

Figure 1 shows the current and target markets for EdgeConneX's edge data centers.

[1] See http://acgcc.com/wp-content/uploads/2014/12/Forecast-of-Residential-Fixed-Broadband-Requirements-2014.pdf and http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html for projections of fixed and mobile broadband traffic demand.

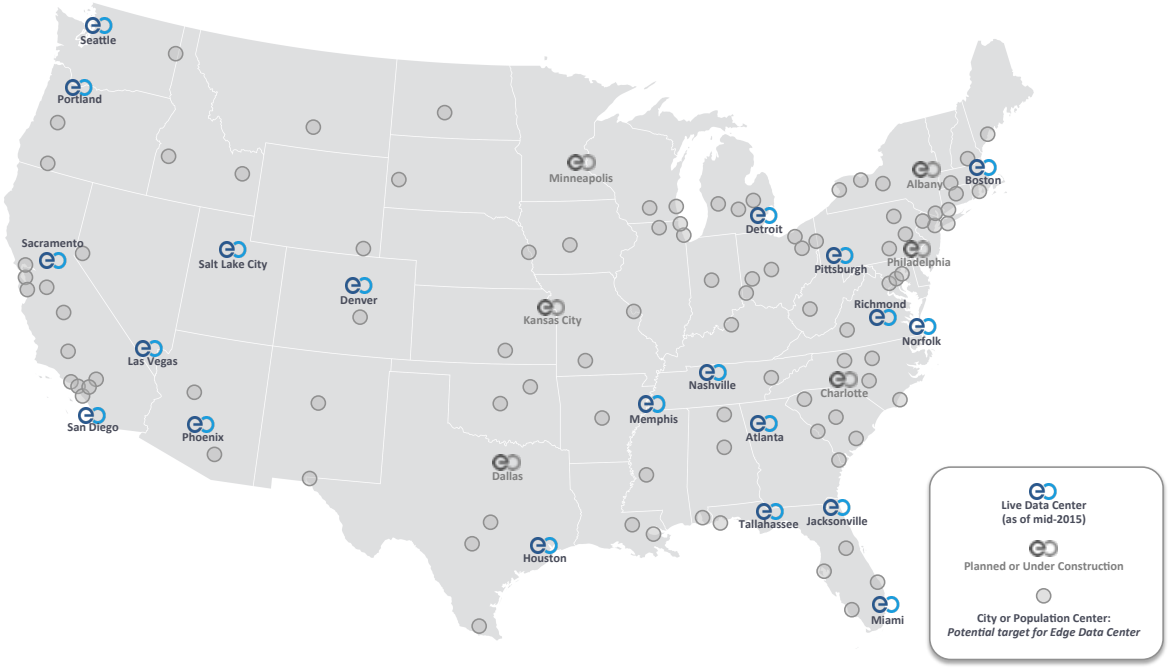

Figure 1 – Current and Target Markets for EdgeConneX Edge Data Centers

The Opportunity

A simple example (Figure 2) for the Phoenix metro area illustrates the opportunity to localize content.

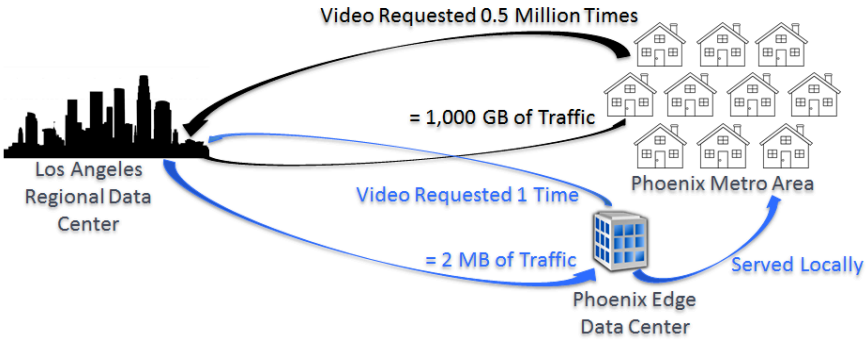

Figure 2 – Network Transport Capacity Requirements with/without Local Content Proximity

Until recently the Phoenix metro area's MSO Internet content was hosted in a regional data center located in Los Angeles. Each Internet video request made by its 1.5 million households, consequently, was streamed over the backbone transport link between Los Angeles and Phoenix. In the example a request to view a particular video asset is made 500,000 times and requires the long-haul transport of 1,000 GB of data in the absence of a local Internet presence.

Today, an edge data center has been established in the Phoenix metro area. As a result, 500,000 requests for the same video require 2 MB of backbone transport capacity. This creates the opportunity to significantly reduce backbone transport costs.

Estimating Local Content Proximity Backbone Transport Cost Savings

Broadband network operators' cost savings produced by local content proximity across a nationwide 50 million fixed broadband subscriber model is made by comparing backbone transport cost with and without local content proximity. The total savings nationwide could exceed $5.5 billion.

The analysis begins with estimating the busy hour bandwidth requirement on the backbone transport link with and without local content proximity. Figure 3 shows an ACG Research projection of the *total* busy period bandwidth per subscriber[2].

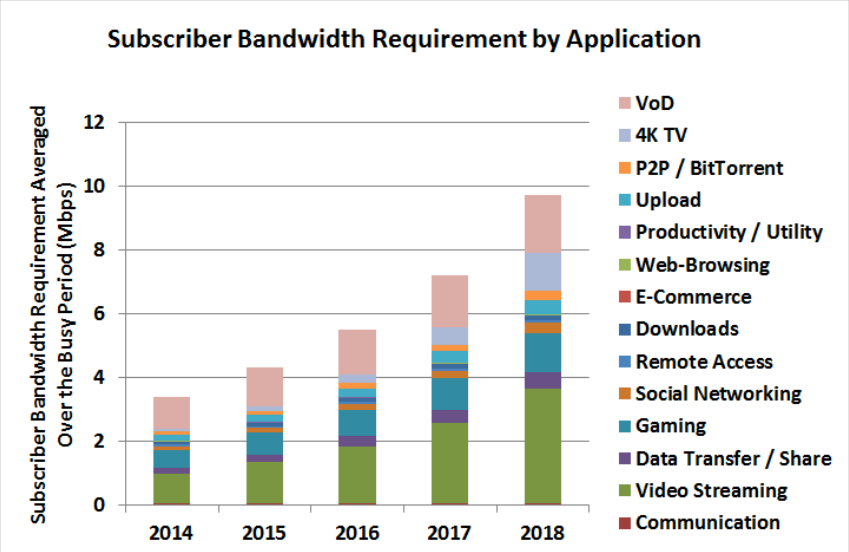

Figure 3 – Residential Subscriber Busy Period Bandwidth Requirement by Application

Video entertainment categories, including video on demand, 4K TV streaming, video streaming, and peer-to-peer applications, dominate the bandwidth requirements. Video streaming, which includes popular services such as Amazon Prime and YouTube, is the most significant demand driver. 4K TV video streaming is expected to provide an additional boost to bandwidth demand in about three to five years. The shift from broadcast to streaming video service and the proliferation of Internet connected devices in the home are the root causes of bandwidth growth.

The total backbone transport capacity requirement includes the demand requirement for the 50 million subscribers[3] plus additional spare capacity to accommodate traffic volatility and the lead time required to augment capacity. The total capacity CAGR assumption is 36 percent.

Traffic Reduction through Local Content Proximity

The second task in estimating the transport cost savings is to determine how much traffic can be eliminated on the backbone transport link by localizing content. The estimate is made in two steps:

1. Estimate the percentage of total content that can be localized.
2. Estimate the probability that a content request can be fulfilled at the local data center.

[2] See http://acgcc.com/wp-content/uploads/2014/12/Forecast-of-Residential-Fixed-Broadband-Requirements-2014.pdf for details.

[3] Fifty million subscribers multiplied by the annual projection shown in Figure 3.

Currently, about three-fifths of consumers' content is handled by CDNs, subscription video providers (cable MSOs), and directly by content providers[4], and the probability that a request for content will be met at the local data center is assumed to be 0.85. Therefore, the potential to reduce the backbone transport capacity requirement is 51 percent (0.6 X 0.85 = 0.51). The remaining content is unmanaged (best-efforts Internet service).

Cost of Backbone Transport Capacity

Transport costs are essentially the same for network operators that source capacity from another operator or build and operate their own transport facilities. The transport service market is fiercely competitive, and as such wholesale service prices have been driven down to a level equal to operating costs plus the cost of capital. This is equal to the transfer cost for internally sourced transport services. The monthly recurring cost for a 10 Gbps port for long-haul transport capacity is estimated to be $4,000 in 2015 and to decline by about one-third annually[5]. The downward cost trend on a Gbps basis has been maintained for many years. This effect can be observed in the transport equipment market where rapidly rising traffic growth has been offset by rapidly falling unit prices resulting in flat transport equipment revenue[6].

Optical cross-connect monthly recurring costs, an additional element of the cost analysis, are estimated to be $500 per 10 Gbps port.

Transport Cost Savings

Figure 4 compares the backbone transport costs with and without local content proximity.

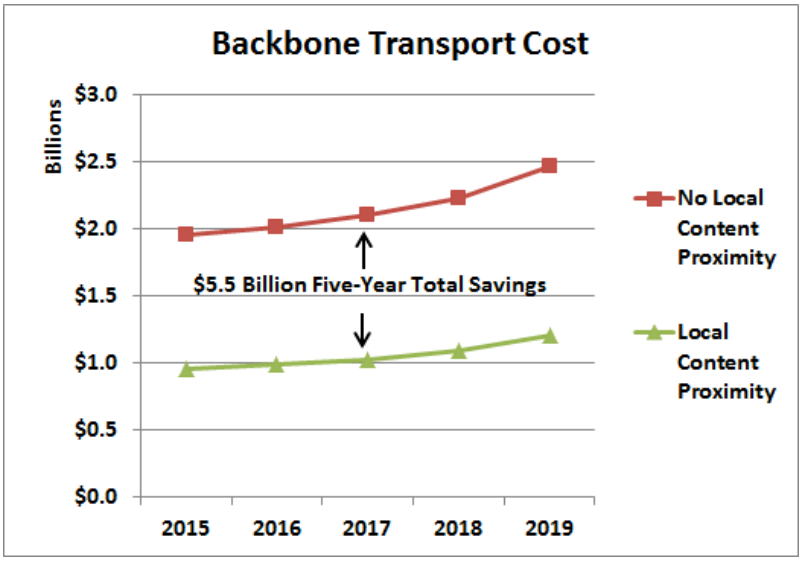

Figure 4 – Cost of Backbone Transport with/without Local Content Proximity: 50 Million Subscribers

[4] See http://www.businessinsider.com/the-online-video-ecosystem-explained-2014-5

[5] Source http://drpeering.net/white-papers/Internet-Transit-Pricing-Historical-And-Projected.php and ACG Research estimates.

[6] See for examples ACG Research's reports on the optical equipment market.

Establishing a local content presence across a nationwide footprint of 50 million subscribers has the potential to reduce backbone transport costs by $5.5 billion over five years, a 50 percent cost reduction. The savings for a metro area with 1 million subscribers is $110 million over five years.

The potential savings estimates assume that all providers of managed content establish a local presence. Competitive pressure among managed providers is likely to force full participation, because local proximity also improves latency by an order of magnitude[7]. Once the first managed provider is established in the metro area, the lower latency will provide a more responsive network and force competitors to act.

Edge Data Center Benefits to Businesses

Edge data centers provide space and power within Tier 2 cities, bringing content to the edge of the network and closer to the end-users. In addition to localizing consumer content, this approach offers several other benefits for business applications:

- The scale and time to mitigate DDoS attacks are reduced with edge data centers. Fewer subscribers will be affected if an attack is directed at servers in an edge data center than an attack at a regional data center, and the time to mitigate the attack will be significantly shorter since the mitigation process will be less complex[8].
- Cloud business services' performance is improved by the lower latency provided by local proximity while bringing the cloud closer to businesses and reducing backbone transport costs.
- IoT service performance is improved by bringing the IoT devices closer to their upstream databases.

Conclusion

The rapid adoption of high-bandwidth applications combined with increasing service delivery costs is driving service providers to place content closer to the network edge. Local content proximity delivers the high-quality user experience subscribers expect while relieving some of the broadband providers' cost pressures. EdgeConneX provides the needed local content proximity via its purpose-built edge data centers by employing a standard facility design and a single operating model featuring the same systems and data center automation tools nationwide.

About EdgeConneX

EdgeConneX provides space, power and connectivity to deliver digital content at the network edge. With EdgeConneX, data delivery is optimized by placing Edge Data Centers®, Edge Small Cells and Edge PoPs® at the most critical locations—as close as possible to the end user's point of access. With our services, digital content can be delivered with enhanced performance and lower latency to any device, anywhere.

Since late 2013, EdgeConneX has built 20 Edge Data Centers® across the US, creating a new Edge of the Internet and moving the content into local markets across the country and soon the globe. The unique operating model allows rapid deployment of purpose-built data centers in optimal locations for content delivery. In 2015, EdgeConneX plans to add approximately 10 additional Edge Data Centers across the

[7] Akamai estimates that the latency for video content is 16 ms for content residing in a regional data center versus 1.6 ms in a local data center.

[8] The n X (n – 1)/2 rule of network connectivity come into play here.

country. These efforts represent our continued commitment to satisfy the global appetite for latency-sensitive and bandwidth-intensive content.

About ACG Research

ACG Research is an analyst and consulting company that focuses in the networking and telecom space. We offer comprehensive, high-quality, end-to-end business consulting and syndicated research services.
 www.acgcc.com.