Technical white paper

Using Scality RING in a CDN

Software-Defined Storage at petabyte scale for CDN origin servers

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A tidal wave of content is forcing a change in the content infrastructure

The Web is a huge part of our professional and private lives. At work, we have videoconferences, email, and globally collaborative projects. We end our days with status updates, sharing pictures and our favorite TV series, streamed off a media service. As a result of our increased online activities, global IP traffic will increase threefold over the next five years. Analysts predict that by 2018, nearly a million minutes of video content will cross the Internet each second. IP video traffic will be 79 percent of all IP traffic and consumer video-on-demand (VoD) traffic will double.[1]

Key in the delivery of much of the digital data is the service provided by Content Delivery Networks (CDNs). The high-level architecture of a CDN consists of two essential storage components: origin servers, which can contain petabytes of data and are typically deployed in a small number of data centers, and edge servers, which are smaller faster streaming servers deployed closer to users.

Figure 1. Traditional CDN architecture
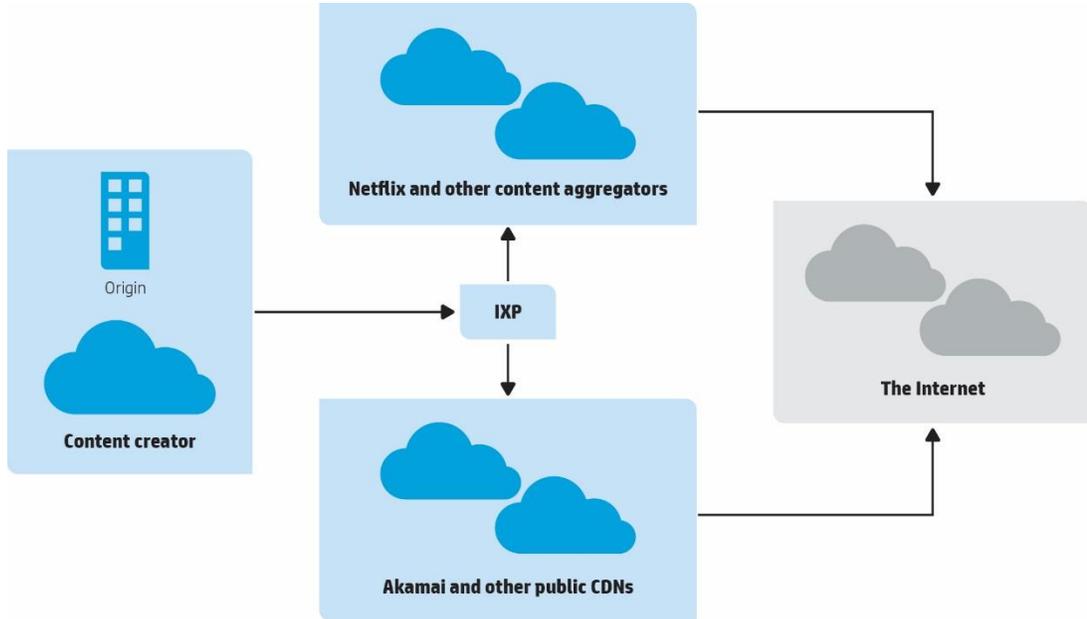
CDNs come in two flavors: private and public. For a private CDN, all content movement is owned by a single commercial entity including movement from origin servers to edge servers and over the last mile. Public CDN providers (such as Akamai or Limelight) operate sites around the world. Public CDN providers operate sites around the world connecting to content creators at one network ingress point and content providers at multiple egress points. The content providers own the last mile, and the content is streamed over their network infrastructure after being transferred by the public CDN to the content provider's ingress site.

Many content creators are building their own origin server infrastructures based on the Scality RING Software-Defined Storage architecture instead of paying storage subscription fees to public CDN operators. Owning and operating the origin server infrastructure allows these companies to offer new content services, move content through multiple CDN providers using least cost routing, gain access to more content streaming providers, and reduce their overall TCO while increasing their data resiliency and eliminating the need for data backup. Similarly, many content providers are also building their own origin server infrastructures based on the Scality RING.

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[1] cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html

Why choose Scality RING for rich content distribution?

The drive to own the content server infrastructure is motivated by the rapidly increasing amount of video content. Choosing Scality RING software for content distribution allows a company to expand storage at a linear cost while reducing the company's CAPEX investment in hardware for any level of data resiliency when compared to a traditional RAID-based solution. Scality RING also reduces ongoing OPEX costs by simplifying the management of the deployed storage.

Three screen solutions require an ever-increasing amount of storage capacity

Today, a content creator will likely create high definition and standard definition encoding for cable and telco users in addition to ABR encoding for mobile devices, tablets, and PCs. The aggregate bit rate for a single hour of encoded video content is very likely to look similar to:

- For TVs served by a cable or telco provider:
  - HD at 19.0 and 12.0 Mbps
  - SD at 3.5 and 2.8 Mbps
  - Taken together 19.0 +12.0 + 3.5 + 2.8 = 37.3 Mbps

- For ABR encoding used by mobile phones, tablets, and PCs:
  - Bit rates similar to 0.8, 1.2, 1.6, and 2.6 Mbps
  - For Flash, Silverlight, Apple HLS, and MPEG-DASH
  - Taken together 4 x 6.2 Mbps = 24.8 Mbps

Altogether, the various encodings represent 62.1 Mbps of data in aggregate (or 27.95 GB/hr), for a content creator that has a business requirement to be able to sell content in six different formats to content providers. Every 10,000 hours of content represents 279 TB of storage. When content providers start providing encoding for 4K TVs, the amount of storage per hour will increase by at least 50 percent (single bit rate). If multiple 4K encodings are provided at different bit rates, storage requirements will likely double.

Similarly, content providers will not only purchase the rights to a large amount of video content from content creators but typically will also offer services such as NDVR, which requires a large amount of additional storage capacity above and beyond the storage capacity needed to hold the content purchased from the content creators.

A telco or cable operator typically uses the following criteria for recording content:
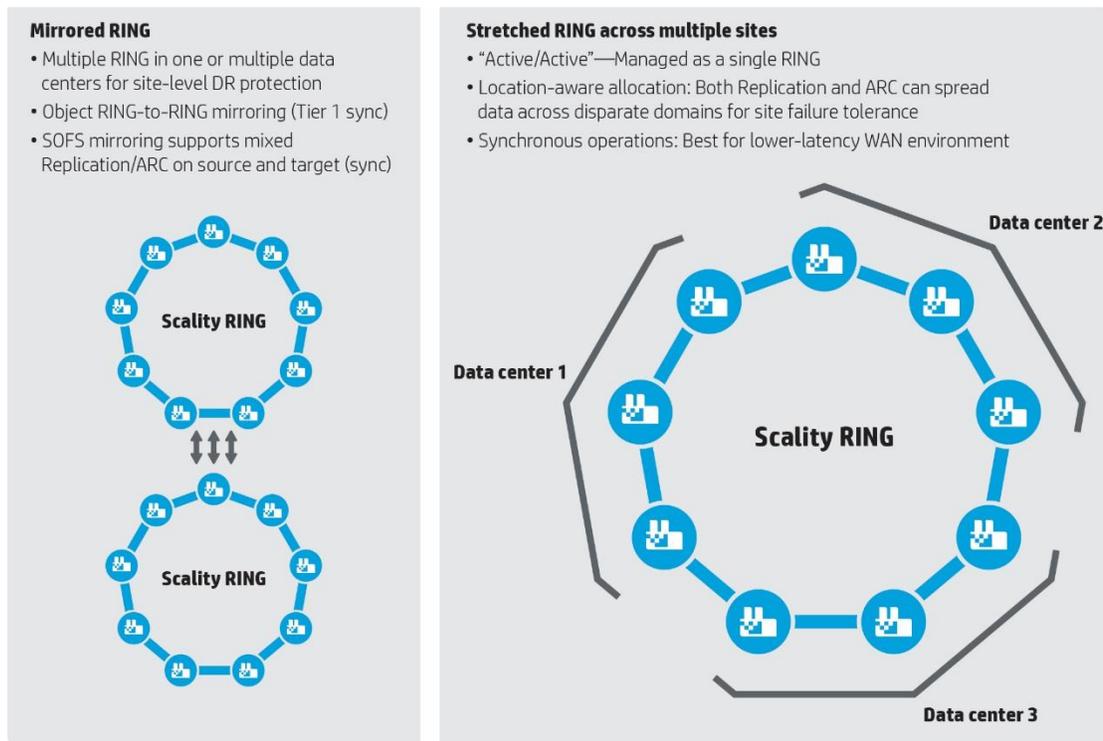
- HD @ 12.5 Mbps
- SD @ 3.5 Mbps
- Four hours per day with a retention window of 180 days

With these criteria, an operator recording 300 SD and 300 HD channels would require nearly 1.6 petabytes of storage to hold the NDVR content in an addition to the storage capacity needed to hold videos downloaded by the ISP from content creators via a public CDN or dedicated private connection.

Optimal data resiliency and geo-dispersion designed for minimal CAPEX and OPEX cost

Scality RING software supports both mirrored RINGs (one RING per physical site) and stretched RINGs (a single RING spread over multiple sites) as referenced in figure 2 to protect against a site failure.

Figure 2. Scality architecture for geo-dispersed RINGs

Mirrored RING
- Multiple RING in one or multiple data centers for site-level DR protection
- Object RING-to-RING mirroring (Tier 1 sync)
- SOFS mirroring supports mixed Replication/ARC on source and target (sync)

Stretched RING across multiple sites
- "Active/Active"—Managed as a single RING
- Location-aware allocation: Both Replication and ARC can spread data across disparate domains for site failure tolerance
- Synchronous operations: Best for lower-latency WAN environment

In addition to protecting against site failure by implementing a geo-dispersion solution, the Scality RING software can serve content on a regional basis to cater to an ISP's network infrastructure.

Key Scality RING software advantages over traditional origin server implementations when using a mirrored RING approach are:

1. For the video CDN environment, all of the objects can be erasure coded, since RING supports object-level data protection policies, and videos are typically large enough to benefit more from erasure coding. Erasure encoding provides greater data resiliency and reduced CAPEX costs vs. traditional RAID-based origin server solutions.
2. The mirrored RING solution can be used by ISPs that wish to serve content from multiple geographically-mirrored origin server sites in combination with DNS redirection to serve the content over the least cost network path.

Summary

Adopting a Scality RING solution enables organizations to build scalable distribution infrastructures that meet all the performance requirements for high-definition media streaming at a fraction of the cost of storage used by public CDN providers.

Enabling network digital/personal video recorder and VoD models at a "cloud storage" price point, which:

- Lowers cost for content owners to distribute video content to multiple content providers.
- Is more cost efficient than AWS S3, with no hidden bandwidth costs.
- Provides unlimited, linear scalability as storage capacity needs to increase.
- With a lower TCO than any origin server solution using traditional RAID or requiring data backup.
- The self-healing attributes of the Scality RING software make backups unnecessary.
- Supports mirrored origin server sites for ISP content providers that wish to minimize the cost of video streaming by sending users to the "lowest-cost site."

# Customer references

Large production house

A major Hollywood-based production house has deployed a 1.5 PB Scality RING as an origin server for all of their transcoded content. The RING will be used by CDNs and other VoD streaming providers such as HBO GO, Netflix, and Hulu. Prior to the deployment of the Scality RING, the company's content was stored in origin servers hosted by a CDN provider. The increasing volume of data held made this financially unsustainable. Another reason for RING deployment was that the CDN provider did not allow other content providers to access this data. By building their own origin server infrastructure, the company multiplied the potential for providers to use their content and therefore improving monetization. The production house had very high requirements for their platform and considered products like EMC Isilon before realizing they would not scale as needed and would be too expensive.

RTLi

RTL interactive, a subsidiary of RTL Group (Europe's leading entertainment company), has deployed Scality RING for its VoD offering, which serves 1.2 billion video views annually. RTL's growing subscriber base, coupled with the growth of new forms of media consumption using RTL's NOW application for iPhone® and Android, led to its massive growth in its storage requirements.

RTLi required a solution that combined high performance at all scales, extraordinary data resilience, ease of integration with existing applications, and outstanding cost efficiency. It required a system capable of managing tens of thousands of media titles and providing hundreds of thousands of simultaneous VoD sessions while meeting their strict SLAs. After in-depth on-site testing of products from Scality and EMC Isilon, as well as SAN offerings from HP and Dell, RTL interactive ultimately chose Scality RING on HP hardware as the solution best capable of satisfying its stringent performance, scalability, and reliability requirements.

Figure 3. RTLi VoD solution architecture
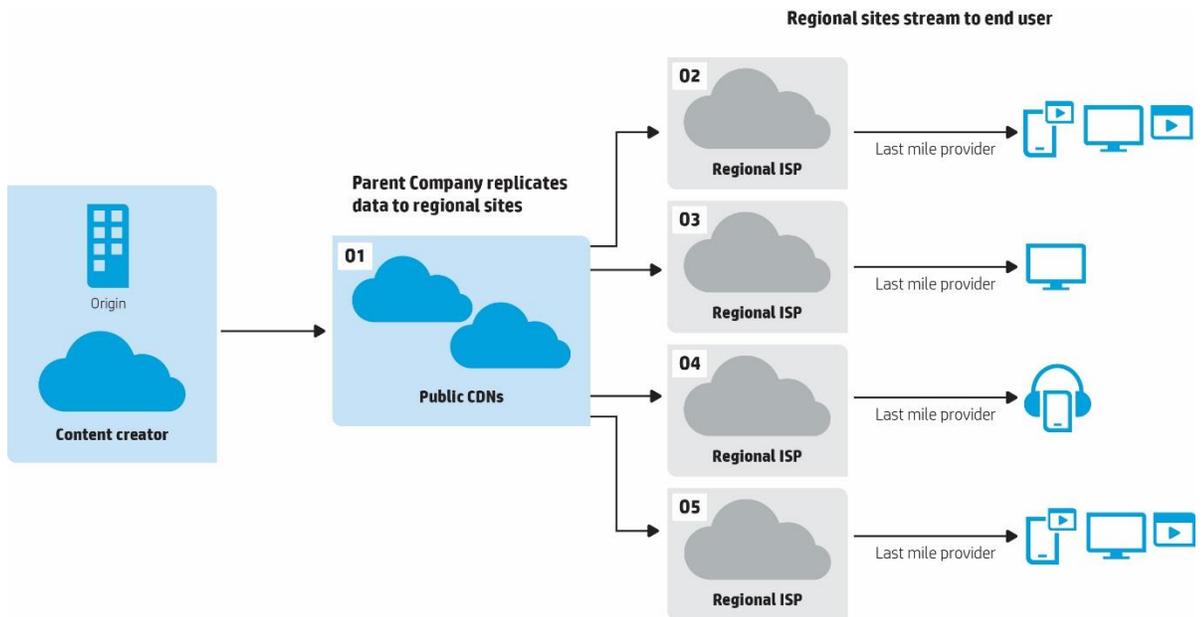
Resources

With increased density, efficiency, serviceability, and flexibility, the HP Apollo 4500 Gen9 Family of Servers is the perfect solution for scale-out storage needs. To learn more, visit hp.com/go/Apollo.

The HP ProLiant DL360 Gen9 Server brings the power, density, and performance required to support the management and access features of object storage, all within HP's Converged Infrastructure (if that message is so important to you). To learn more, visit hp.com/servers/dl360.

HP Integrated Lights-Out simplifies server setup, promotes remote administration, engages health monitoring, and maintains power and thermal control. For more information, see hp.com/go/ilo.

HP simplifies, integrates, and automates networking so organizations can focus on what they do best. Visit hp.com/go/networking for more information.
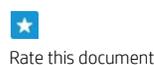
Find out more information about HP and Scality's object storage solutions on industry-standard servers at hp.com/servers/objectstorage/scality.

The HP switches used in this document are HP 2920-48G and HP 5900AF-48XG-4QSFP+-48G.

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4AA5-8670ENW, June 2015