

Transparent Caching Primer

Local Content Delivery Foundation

What is transparent caching?

"Cache" is a commonly used engineering term for a component that stores data close to the requester so that future requests for that data can be served faster.

Transparent caching builds on the caching concept: identify and store the most popular Internet content - such as video - within the operator's network, closer to end-subscribers. Content can then be delivered locally to the subscriber from the operator's network, rather than retrieving it each and every time from a distant content source. This accelerates delivery speeds, improving Quality of Experience (QoE) and reducing bandwidth requirements, which saves cost.

The term transparent caching is used because the solution is invisible, or transparent, to both the content originator and the end user. This is important for security and efficiency.

cache (kæʃ)

— *noun*

1. a hidden store of provisions, weapons, treasure, etc.
2. the place where such a store is hidden
3. (computing) a small high-speed memory that improves computer performance

— *verb*

4. (tr) to store in a cache

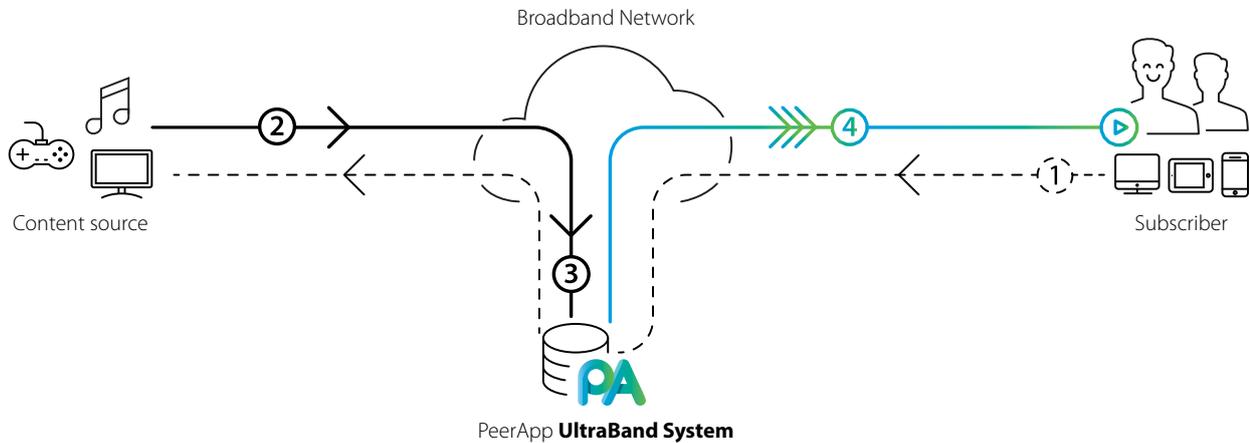
Usage: The operator uses PeerApp's UltraBand transparent cache to improve subscriber experience while saving network costs.



What problem does transparent caching solve?

Consumer demand for video and other OTT Internet content has grown quickly in recent years to the point where streaming video is now a mainstream activity. This puts huge demands on networks; and despite broadband network investments (such as FTTH, DOCSIS 3.0 and LTE/A), customer Quality of Experience (QoE) still suffers.

Transparent caching solves the problem of network congestion due to bandwidth constraints. It allows video, music, games and other over-the-top (OTT) content to be delivered quickly, with optimal quality, by bringing it closer to the subscriber.



- 1 Subscriber requests an object from a content source and establishes session; UltraBand inspects request and passes the request to the content source.
- 2 Content source executes content delivery logic (authorization, content adaptation, reporting, etc.) and delivers the requested object.
- 3 UltraBand inspects response header and payload.

- 4 Object that is already in Ultraband cache will be served directly from cache, and content source will be directed to stop serving the object.
Object that is not in cache will be delivered from the content source and stored for future use.

Why is this important?

While the volume and end-user quality expectations associated with the streaming media explosion are straining operator networks today, continued consumption - and the move to Ultra High-Definition (4K) video that is already under way - will further magnify delivery challenges. In some situations, operators have seen their superior "last mile" offering fail to either curb customer churn or achieve good standing in third-party regulatory or private benchmarks. Transparent caching enables operators to deliver OTT video and data content faster and more cost-effectively by bringing it closer to subscribers, improving Quality of Experience, a key factor in customer satisfaction and retention. Caching also reduces network load and smooths peaks, lowering cost.

What are the benefits of transparent caching?

Transparent caching:

- Improves performance and therefore Quality of Experience (QoE) for end users
- Reduces network bandwidth consumption, lowering cost
- Reduces capital expense (CAPEX) growth because existing network routers, switches, etc. can handle more traffic
- Reduces operating expense (OPEX) growth because existing Internet links (also called IP or Internet "transit") can handle more traffic

Who benefits?

Everyone along the value chain benefits from transparent caching.

- Users benefit because their videos are delivered more smoothly and with higher resolution, and their file downloads are faster.
- Network operators benefit from delivering Internet content content - including video - without putting a strain on their network. This keeps their costs down while making their users happier.
- Content owners and content providers benefit because their content is delivered with the best possible quality to their audiences and customers.



What types of content are cached?

Video content is the primary driver for transparent caching today, as it is the largest and fastest growing type of traffic, especially over mobile. But all types of traffic are growing: file-sharing; software, game and music downloads; cloud-based storage; photo sharing and more, all add to the network traffic load.

PeerApp's UltraBand open content caching solution features a unique cache policy engine that identifies content "classes" with associated delivery attributes and requirements, handling each class in the manner most appropriate for high efficiency. This makes it extremely resilient to service changes, and facilitates rapid adoption of new content formats and protocols that are constantly emerging.



When I hear "caching" or "content delivery" I think of CDNs. How is PeerApp different?

Generally speaking, global CDN providers offer their services to content providers with a value proposition of improving delivery across the wider Internet to maintain content quality. CDNs use geographically distributed data centers for this, and generally drop content into the operator's network.

In contrast, PeerApp's transparent cache is owned and operated by the network operator. PeerApp sits inside the operator's network, performing for the most popular content a job that is similar to that of a global CDN, but focused specifically on improving delivery to end-users.

Transparent caching enhances an operator's network to optimize "last mile" – or "local" - delivery. The last mile deals with a different situation than that of a global CDN, which is generally focused on getting content to the last mile. Global CDNs are in many cases pre-provisioned with known content. One could look at a CDN as a caching network that has knowledge of the content, the format, and the URLs.

In the world of transparent caching, content is not pre-provisioned. Content comes down a pipe and the cache has to identify which is the most popular content across various sources, and then store that content for local delivery. The caching and delivery can be done on statistical basis, by detecting the most requested content, or in accordance with business rules an operator would propagate to the local delivery layer via open APIs.

In short, global CDNs and transparent caching have some things in common, and do co-exist within the broader content delivery ecosystem. They are both needed pieces of an overall content delivery ecosystem.

Is it legal? What about Net Neutrality?

In short, yes.

PeerApp's UltraBand has been designed to ensure compliance with the Digital Millennium Copyright Act (DMCA), the European Union Electronic Commerce Directive, and equivalent digital copyright laws that specify clear provisions for routing and caching traffic. As long as operators adhere to these provisions, they are entitled to "safe harbor" protection from copyright claims.

To comply with these laws, PeerApp's UltraBand never "guesses" whether or not a user is entitled to receive a particular piece of content. It always waits for the origin server to give the go-ahead. UltraBand never modifies content either.

PeerApp looks at content purely from a bandwidth perspective, and caches the most frequently requested content, regardless of type or owner. Therefore, it complies with net neutrality principles because there is no discrimination based on the provider or the type of data.

Is it secure?

Yes. PeerApp's transparent caching does not introduce any additional access points that could pose a security breach for the operator's network. The transparent nature means that the cache does not even have an IP address that is visible on the network.



Is it as simple as that?

As the market matures, PeerApp believes that operators need a broader platform to more fully optimize their networks for cost and quality. Of course, transparent caching is a strong foundation of such a platform. The platform should be virtualized and deliver additional capabilities such as live streaming, content filtering and more. System openness to the broader content delivery ecosystem is also essential.

Beyond improving QoE and lowering costs, an open content delivery platform with open APIs adhering to industry standards can form the basis of services such as extending CDN capabilities into the last mile, or bundling OTT content. Open APIs enable easy integration of global CDNs and content publishers into the service provider network creating a highly scalable local content delivery channel.

The delivery of these capabilities goes hand in hand with larger SDN/NFV network transformation. In the context of NFV/SDN architecture, the local content delivery elements act as virtualized network function (vNF), participating in service chaining use cases, and tapping into elastic resource management, economies of scale and intelligent traffic steering capabilities, offered by such architectures.

Sample Supported Content Classes

Content Class	Examples
Progressive Download / Progressive Download / HTTP Chunk-Based Streaming	YouTube video, pandora, dailymotion, todou, youku, msn movies, veoh, yahoo video, metacafe, aol video, divx
Adaptive Bitrate (ABR) Video	Microsoft Silverlight HSS, Netflix, HLS
HTTP File Sharing	RapidShare, Dropbox, PutLocker, DLFree
Web Browsing	HTML, style sheets, javascripts
Software Update Services	Windows Update, Apple Software Update, anti-virus updates
Content Downloads	iTunes, App Stores, eBooks, Ringtones
Web Application Data	Google Maps, Farmville, Flickr, Tumblr, gaming
Peer-to-Peer File Sharing	BitTorrent, eDonkey, Gnutella

UltraBand adapts to changes in the content mix automatically, without requiring operator intervention. Alternatively, the operator can make direct adjustments at its discretion.



Who is PeerApp?

More than 450 mobile, cable, broadband and campus network operators in 100 countries are using PeerApp's award-winning open content caching solutions to accelerate the delivery of Internet video and other over-the-top (OTT) content. With PeerApp's open content delivery, video can be delivered 12x faster by bringing it closer to end-users. This significantly improves quality of experience and reduces network costs up to 50% or more. PeerApp's local content delivery solutions can also play a service delivery role, helping operators generate new revenue opportunities. PeerApp is headquartered in Newton, Massachusetts, USA.

For more information, visit www.peerapp.com and follow @peerapp on Twitter

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