



Dynamic CDN Switching - DASH-IF Content Steering in dash.js

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ABSTRACT

This paper overviews the content steering specification currently being developed in DASH Industry Forum and first implemented in the dash.js reference player.

CCS CONCEPTS

• Networks → Application layer protocols; • Information systems → Multimedia streaming.

KEYWORDS

DASH, HLS, content delivery networks, MPD.

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OVERVIEW

Streaming providers typically deliver video content via an adaptive bitrate streaming format, such as Dynamic Adaptive Streaming over HTTP (DASH) and HTTP Live Streaming (HLS). Media segments and manifest files are hosted on a content delivery network (CDN) and, from there, delivered to the (media) players.

To prepare against outages or temporary performance problems, content distributors typically use multiple CDNs. According to [1], 37% of the streaming providers use multiple third-party CDNs and 20% use a combination of an in-house solution and a third-party CDN. Alternate URLs are generated, one for each CDN, pointing to identical content. Players may access alternate URLs in the event of delivery issues.

Content steering describes a deterministic capability for a content distributor to switch a player's content source, at startup or midstream, through a remote steering service. Content steering for HLS was introduced in the second edition of the HLS specification [4]. The DASH Industry Forum (DASH-IF) is also developing a content steering method for DASH [2]. The focus is on interoperability with the same steering server response sent to HLS players to facilitate homogeneous steering capabilities for content distributors leveraging both HLS and DASH.

The specification [2] introduces a new ContentSteering element at the root level of the MPD. This element defines the URL the

player must use to access the content steering server. To steer the player, we leverage the existing capability of @BaseURL to define alternate content sources that the player can access. We do this by leveraging the BaseURL@serviceLocation attribute, which defines a label to identify each source. The steering server returns a PATHWAY-PRIORITY array, which holds a prioritized list of the serviceLocations the player should access. Any time the player has a choice for which BaseURL to use, it looks for the highest priority match in the PATHWAY-PRIORITY array and uses that source. If the player is loading from a different source, then it will switch smoothly, without sacrificing the playback buffer, to the new priority source. Since the MPD also provides the ability for the player to switch the manifest loading to a new location via the Location element, the steering specification adds a new Location@serviceLocation attribute to allow the manifest refreshes to be steered by the same mechanism as the BaseURLs.

The first (draft) version of the DASH-IF content steering specification was implemented in the open-source dash.js reference player [3] to evaluate the feasibility and provide feedback to the specification editors. On the server side, two different CDNs were simulated by hosting the same content asset in two different folders alpha and beta. On the client side, several new classes, including a Content Steering Controller, handle the communication between the player and content steering server, guaranteeing a smooth switch between the available content sources. An illustration of this workflow is depicted in Figure 1. CDN alpha is selected at playback start, and after approximately 40 seconds, the player is steered to CDN beta.

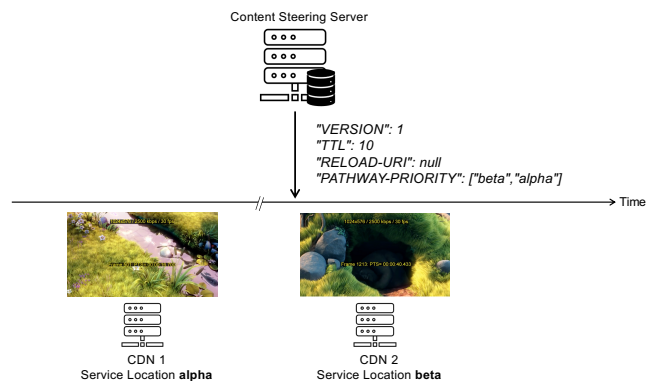


Figure 1: DASH content steering example in dash.js.

Future work in the content steering domain includes the evaluation of the CDN selection mechanisms for the content steering server. Moreover, use cases such as multiperiod playback and dynamic server-side ad insertion will be analyzed with their implications on content steering. Furthermore, interoperability aspects with other specifications, such as DVB DASH and SVTA client-side load balancing, will be examined.



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