HLS Content Steering Specification (v1.2b1)
Preliminary

This specification defines Master Playlist syntax that allows a content vendor to specify how clients should prioritize access to different pathways to its content, using an external Steering Manifest that is periodically reloaded by the client.

This syntax is backward-compatible with all HLS clients.

#EXT-X-CONTENT-STEERING:<attribute-list> (OPTIONAL, MASTER PLAYLIST, ZERO-OR-ONCE)

    The following attributes are defined:

        SERVER-URI, quoted-string (REQUIRED, ONLY-ONCE)

    The SERVER-URI attribute is a URI to the Steering Manifest. The SERVER-URI MAY contain an asset identifier if the steering server requires it to produce the Steering Manifest. It MAY use the data URI scheme to provide the manifest in-line in the Master Playlist; in that case, subsequent manifest reloads can be redirected to a remote steering server using the RELOAD-URI parameter (see the "Steering Manifest" section).

        PATHWAY-ID, quoted-string (OPTIONAL, ONLY-ONCE)

    The PATHWAY-ID attribute, if present, identifies the Pathway that MUST be applied by the client (see "Applying a Pathway" below) until the initial Steering Manifest has been obtained. Its value MUST be a legal Pathway ID, as specified in the "Steering Manifest" section.

#EXT-X-STREAM-INF, #EXT-X-I-FRAME-STREAM-INF

    A new optional PATHWAY-ID attribute is defined for these tags. The PATHWAY-ID attribute indicates that the Variant Stream belongs to the identified Pathway. The absence of the PATHWAY-ID attribute indicates that the Variant Stream belongs to the Pathway ".".

    A Content Provider SHOULD provide all Rendition Groups on all Pathways. A Variant Stream belonging to a particular Pathway SHOULD use Rendition Group(s) on that Pathway.

Steering Manifest

    <To do: Add Content (MIME) Type definition for Steering Manifest, as application/vnd.apple.steering-list./>

    The definition of all query parameters for resources of this Content Type which begin with "_HLS_" are reserved by this specification.

    The client sends a request with the Steering Manifest URI to obtain the Steering Manifest. It MAY add the following query parameters to the URI:

        _HLS_pathway="<CURRENT-PATHWAY-ID>"

    CURRENT-PATHWAY-ID is the ID of the Pathway currently in use.

        _HLS_throughput=<THROUGHPUT>

    THROUGHPUT is an integer number of bits per second. It represents a current prediction of media download throughput made by the client for the applied Pathway. The exact method of bit rate estimation will vary by client.

    Note that HTTP proxy caches SHOULD be configured to exclude highly variable query parameters such as _HLS_throughput from their cache keys, or treat the Steering Manifest response as non-cacheable.

    The Steering Manifest response is a JSON object:

```
{
    "VERSION": number              // REQUIRED, must be an integer
```

```
        "TTL": number,                  // REQUIRED, number of seconds
        "RELOAD-URI": string,           // OPTIONAL, URI
        "PATHWAY-PRIORITY": [           // REQUIRED, array of Pathway IDs
            One or more Pathway IDs in order of preference
        ]
    }
```

A client MUST ignore any member or sub-member of the Steering Manifest JSON object that it does not recognize. Note that manifest keys are case-sensitive.

This specification defines Steering Manifest **VERSION** 1. A client MUST refuse to use a Steering Manifest with a higher **VERSION** number than it recognizes.

The **TTL** specifies how many seconds the client MUST wait before reloading the Steering Manifest. The recommended value is 300 seconds (5 minutes). The steering server can vary the TTL by client to distribute server load.

The **RELOAD-URI**, if present, specifies the URI the client MUST use the next time it obtains the Steering Manifest. It can be a relative URI based on the current Steering Manifest URI.

PATHWAY-PRIORITY is an array of Pathway IDs. A Pathway ID is a non-empty string containing characters from the set [a..z], [A..Z], [0..9], '.', '-', and '_'.

Elements in the **PATHWAY-PRIORITY** array are ordered by Pathway preference, with the first being most preferred. A Steering Manifest MUST contain at least one Pathway. A Pathway ID in the PATHWAY-PRIORITY array MUST NOT appear more than once. Clients MUST ignore unrecognized Pathway IDs in the **PATHWAY-PRIORITY** array.

Applying a Pathway

A Pathway is applied by choosing a particular Pathway ID. The set of Variant Streams to which the client is allowed to switch is then restricted to those belonging to that Pathway. If a client is currently playing a Variant Stream that does not belong to the applied Pathway, it MUST switch to one that does.

Client Behavior

1. When playing a Master Playlist with an **EXT-X-CONTENT-STEERING** tag, load the Steering Manifest. A client that wishes to play before it obtains the Steering Manifest SHOULD apply the Pathway specified by the **PATHWAY-ID** of the **EXT-X-CONTENT-STEERING** tag. If the **EXT-X-CONTENT-STEERING** tag does not contain a **PATHWAY-ID** attribute, the client MAY use any Pathway until it obtains the Steering Manifest.

2. When a Steering Manifest is received, perform a Content Steering evaluation (step 5).

3. If all the Variant Streams from the current Pathway fail with a network error, mark the current Pathway as penalized, and perform a Content Steering evaluation (step 5).

4. If the client decides that the Pathway has been penalized long enough that it may have recovered, it MAY un-penalize the Pathway and perform a Content Steering evaluation (step 5).

5. Content Steering evaluation: If no Pathway is currently applied, or the current Pathway is not the first in the list, or is no longer on the list, or is being penalized, then apply the first non-penalized Pathway on the list. If no such Pathway is available, the client SHOULD remain on the current Pathway.

6. When the current Steering Manifest expires, as defined by the TTL attribute, issue a new Steering Manifest request for the URI specified by RELOAD-URI or the previous server URI if none. The RELOAD-URI may be

absolute or relative to the previous server URI.

If the client receives HTTP 410 Gone in response to a manifest request, it MUST NOT issue another request for that URI for the remainder of the playback session. It MAY continue to use the most-recently obtained set of Pathways.

If the client receives HTTP 429 Too Many Requests with a Retry-After header in response to a manifest request, it SHOULD wait until the time specified by the Retry-After header to reissue the request.

7. If the Steering Manifest cannot be loaded and parsed correctly, the client SHOULD continue to use the previous values and attempt to reload it after waiting for the previously-specified TTL (or 5 minutes if none).

Notes

At playback time, it is important for the Master Playlist and the preferred Pathway of the initial Steering Manifest to agree. Immediately redirecting a player to a different Pathway on startup will delay playback and increase network utilization.

Example Master Playlist

Fetched from https://example.com/videos/video12/master.m3u8

```
#EXTM3U

#EXT-X-CONTENT-STEERING:SERVER-URI="/steering?video=00012",PATHWAY-ID="CDN-A"

#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="A",NAME="English",DEFAULT=YES,
LANGUAGE="en",URI="audio.m3u8"

#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="B",NAME="ENGLISH",DEFAULT=YES,
LANGUAGE="en",URI="https://backup.example.com/content/videos/video12/
audio.m3u8"

#EXT-X-STREAM-INF:BANDWIDTH=1280000,AUDIO="A",PATHWAY-ID="CDN-A"
low/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=7680000,AUDIO="A",PATHWAY-ID="CDN-A"
hi/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=1280000,AUDIO="B",PATHWAY-ID="CDN-B"
https://backup.example.com/content/videos/video12/low/video.m3u8

#EXT-X-STREAM-INF:BANDWIDTH=7680000,AUDIO="B",PATHWAY-ID="CDN-B"
https://backup.example.com/content/videos/video12/hi/video.m3u8
```

Example Steering Manifest

```
{
    "VERSION": 1,
    "TTL": 300,
    "RELOAD-URI": "https://example.com/steering?video=00012&session=123",
    "PATHWAY-PRIORITY": [
        "CDN-A",
        "CDN-B"
    ]
}
```

Example CONTENT-STEERING tag using a data URI

```
#EXT-X-CONTENT-STEERING:PATHWAY-ID="CDN-A",SERVER-URI="data:application/
vnd.apple.steering-
list;base64,eyJWRVJTSU9OIjoxLCJUVEwiOjMwMCwiUkVMT0FELVVSSSI6Imh0dHBzOi8vZXhhbXB
sZS5jb20vc3RlZXJpbmc/
dmlkZW89MDAwMTImc2Vzc2lvbj0xMjMiLCJQQVRIV0FZLVBSSU9SSVRZIjpbIkNETi1BIiwiQ0ROLUI
iXX0="
```

Document Revision History

This table describes the changes to *HLS Content Steering Specification*

Date	Revision	Notes
2021-02-15	1.0b1	First public draft.
2021-03-04	1.1b1	Reworked to eliminate dependency on EXT-X-DEFINE. Made PATHWAY-ID optional.
2021-04-12	1.2b1	Use multiple declared variants instead of URI replacement