Captivate for Brightcove: Deployment Guide

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Introduction

Linius Captivate enables the rapid development of direct-to-consumer social video applications using your existing Brightcove video platform.

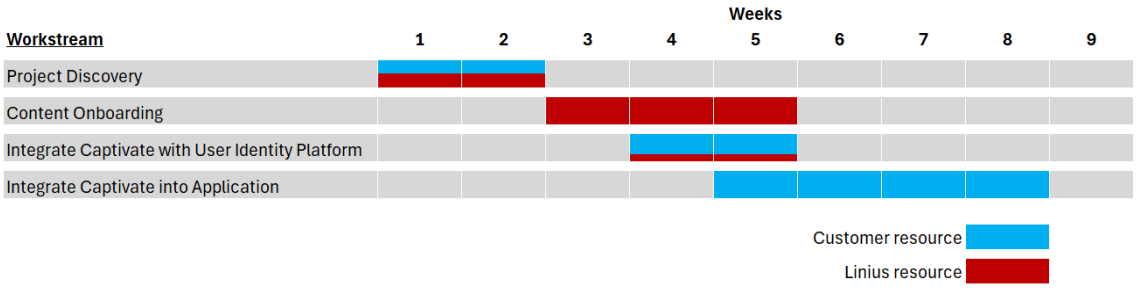
Captivate is built on the Linius Video Services (LVS) platform that can leverage your existing video assets held in Brightcove Video Cloud and your Brightcove Player to dynamically deliver an infinite combination of new video streams from your content without the need for any further encoding or additional storage.

LVS and Captivate are available on a SaaS basis through a set of microservices, accessed by Web APIs.

The Captivate services abstract the rich functionality of LVS to provide a highly focussed social video solution, which is simple to implement and functionally self-contained.

Standard Deployment Plan

A typical end-to-end deployment of Captivate for Brightcove will take between 8 and 12 weeks from commencement, depending on scope and other project variables.



The deployment plan for all projects comprises the same common workstreams, summarised below and described in more detail within this guide.

Workstream 1: Project Discovery

Linius run a series of remote workshops with you to understand your relevant business processes and content workflows, define the required integration points, and agree and document the specification for these.

Areas of focus in the workshops typically include:

- Video asset volumes and frequency/schedule of updates
- Streaming video formats availability from your Video Cloud account
- Storage location of streaming video assets and CDN/network access
- Sources and formats of metadata
- Types of consumer user journeys to be supported with video personalisation
- User/identity platform integration requirements
- Security considerations

Typical Resources You Require During Project Discovery

- Project lead
- Subject matter experts for your Video Cloud configuration, video content workflow and/or other streaming platform elements
- Video metadata subject matter expert or external metadata provider representative
- Website/application product owner
- Website/application development subject matter expert, typically internal development team or external digital agency
- Identity platform technical owner

Workshops will be focussed on particular areas of integration and not all resources listed here will be required for all workshops.

Duration: 1-2 weeks dependent on availability of all parties for workshops and post-workshop follow-up.

Workstream 2: Content Onboarding

Linius deployment team perform the integration with your Video Cloud account, your metadata, set up your tenancy, virtualise the video archive within LVS and make it available through the Captivate APIs.

Typical Resources You Require During Content Onboarding

Subject matter experts identified during the Project Discovery phase should be available to respond in a timely manner to occasional queries from the Linius implementation team. Otherwise minimal resourcing is required from you during this phase.

Duration: 2-4 weeks. Very large video archives (e.g. archives of many tens of thousands of hours) may take longer to fully complete virtualization due to the volume of processing required but this is unlikely to be a critical dependency on the other workstreams.

Workstream 3: Integrate Captivate with your User Identity Platform (IdP)

Captivate is designed to work with your own identity platform (IdP) or proprietary user database. Captivate is IdP agnostic and requires only a minimal level of integration which is implemented by you and tested by Linius during this phase. The integration allows you to continue using your existing user authentication sign-on flows and leverage your user data for presentation and tracking within your application in a consistent way, without needing to pass any personal data outside your own security perimeter to Captivate, or requiring any additional user sign-on or sharing of credentials.

Typical Resources You Require During IdP Integration

- Project lead
- Website/application development subject matter expert, typically internal development team or external digital agency
- Identity platform technical owner and/or maintainer, typically responsible for configuration of the platform but potentially responsible for its ongoing development

Duration: 2 weeks.

Workstream 4: Integrating Captivate into your Application

Following content onboarding, your developers are able to begin integrating Captivate functionality into your application(s) using the API documentation, development guides and code samples provided by Linius.

Captivate is highly modular, so during this phase it is possible to deploy different elements of Captivate functionality to iteratively augment existing applications or build out new ones. For example, functionality can support top-down 'push' models of video publishing (e.g. latest editorial video carousels on the homepage), 'pull' models allowing searching across the archive (e.g. all a

player's highlights from previous sporting seasons), through to personalisation and social taste making.

Typical Resources You Require During Captivate Integration

- Project lead
- Website/application product owner
- Website/application development subject matter expert, typically internal development team or external digital agency

Duration: 4-5 weeks for a relatively comprehensive integration.

Content Onboarding

Video Discovery - Adding a New Video from your Video Cloud library to Captivate

The first part of the video virtualization process is known as *discovery*.

During discovery, a virtualized asset record, optimized for data enrichment, reassembly and personalization is created in LVS for every asset in your video library. The video file is read from your Video Cloud account (see Accessing Your Video Assets) and key metadata is extracted. A virtual representation of the video file is added to the asset record. Where the same video is available in multiple formats, LVS can support multiple virtual representations per asset.

The discovery process takes only a few seconds per asset, without any re-encoding or file copying and leaves your source video files in their original locations.

Video Cloud Ingest Profile Specification

It is important that your video is available in a compatible format for Captivate before the initial Discovery phase. Ensure the ingest profile used during the upload of video content into Video Cloud for Dynamic Delivery - be it one of the standard ingest profiles or a custom one - provides the following video type.

- HLS video
- Adaptive bitrate or multi-bitrate (i.e. master manifest referencing multiple VOD media manifests for adaptive bitrate streaming - recommended) or single bitrate (i.e. single VOD media manifest)
- AVC/H.264 video
- AAC audio
- Closed GOP
- Segments packaged as fragmented MP4 (fMP4)
- Segment/chunk duration less than 10 seconds (shorter is better, 2 seconds recommended)
- Segments should always start with an IDR (instantaneous decoder refresh) frame
- Subtitle tracks are *not* supported
- Where multiple renditions (for ABR) are produced, all renditions must be of the same duration and all segments must align across renditions, as per the HLS specification.
- Each video of multiple renditions must include the same number of renditions and it is strongly recommended that these should be of similar bitrate and resolution i.e. the ABR ladder used should match. (It is not possible to create videos in Captivate from multiple video sources which contain mismatched renditions.) **Note, Context Aware Encoding is unsuitable because it builds a custom bitrate ladder for each piece of content.**
- For optimal audio/video synchronization, it is recommended that video and audio tracks are multiplexed together within the HLS segments.

Accessing Your Video Cloud Account

Before LVS can automatically access your catalogue in Video Cloud using Brightcove's APIs, you need to register the LVS application within Video Cloud and generate API credentials for LVS to use.

- Log in to Video Cloud.
- Open the Admin module.
- Click API Authentication. The API Authentication page loads.
- Click on the '+ Add Application' button.
- Enter Name as 'Linius Video Services'.
- Enter Description as 'Linius Captivate video virtualization engine' or a relevant description of your own.
- Under the list of Brightcove APIs, tick the box for 'Video Read' under the *CMS* section and tick the boxes for 'Key Read' and 'Key Write' under the *Playback Auth* section
- Click the 'Save' button.
- A Client ID and Client Secret will be generated and shown on screen.
- Make a copy of these two credentials now (you will not be able to retrieve them again) and pass them securely onto your Linius project lead.

For more information see https://studio.support.brightcove.com/admin/managing-api-authentication-credentials.html

Enabling Static URL Delivery

It is necessary that LVS holds a permanent record of the location of each video that is discovered. By default, however, the playback URL of your video is dynamically generated and is subject to change. To overcome this, you must have your account configured for static delivery, so URLs do not change.

Contact Brightcove Support to enable your account for Static URL Delivery.
For more information see https://apis.support.brightcove.com/playback/guides/static-url-delivery.html

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Video Enrichment

The second part of the video virtualization process is known as *enrichment*.

During enrichment, sources of metadata, which describe activity captured in the video, are analysed and the most important context for the business is extracted. The virtualised asset record is then further decomposed into a large number of virtual clips and the derived context is overlaid as metadata onto each clip.

The sources of metadata used for enrichment can be varied but may include internal logging and analytics data, external metadata from sports data providers and/or AI computer vision analysis.

Guidelines for Enrichment Metadata Sources

Your business use-cases will determine precisely the types of enrichment metadata that are required. Metadata may be stored in Video Cloud and/or other external data sources. However when evaluating the quality of metadata sources for enrichment, the following are useful initial attributes to seek out within a source:

- Metadata is structured and machine-readable and ideally human-readable too
- Metadata is consistent over the duration of the activity and does not contain errors or contradictory information
- Metadata is consistent over time, both in format and level of detail included (e.g. data coverage over years or decades)
- Metadata describes actions, events or incidents that occur (e.g. goal scored)
- Metadata describes when actions occur in real time, either at a given time or between a start time and end time (e.g. occurred 20:24.16 on 23 October 2023) and ideally also in game time and video play time
- Metadata describes the major actors involved, their role, relationship and affiliation (e.g. scorer is Bukayo Saka, on right wing, playing for Arsenal against Jordan Pickford, goalkeeper, playing for Everton)
- Metadata describes where actions occur, geographically and spatially (e.g. Emirates Stadium, London, UK and penalty box or X, Y pitch coordinates)
- Metadata describes why they are occurring or the occasion (e.g. Premier League football match, round 3, semi-finals etc.)
- Metadata describes the current status at the time of the event (e.g. score, points, period of play, remaining time, extra time allocated)
- Metadata describes qualitative assessments (e.g. good, poor)
- Metadata describes related responses and emotions (e.g. happy, angry)

User Identity Platform Integration

Captivate is designed to work with your own identity platform (IdP) or proprietary user database, requiring a minimal integration and thereby providing you flexibility in your application. It allows you to continue using your existing user authentication sign-on/sign-in flows and leverage existing user profile data within your application in a consistent way across all your services.

Captivate is agnostic to your chosen identity platform: A user ID and Unique Principal Name (UPN) are used to associate your end users' identities with their Captivate profiles and, if required, their Whizzard Portal creator account. No other user data is required by Captivate, although your application is able to make use of additional held user data in the delivery of enhanced Captivate features, without needing to share this with the Captivate services e.g. username display, profile picture or avatar image, email notifications etc.

Captivate User Profile Creation and API Authorization

Once a user of your application has successfully authenticated against your identity platform through your (existing) sign-in flow, the client application must take on the delegated authority of the user in interacting with Captivate and its content creator tool, Whizzard Portal.

To do this, the application must acquire a Captivate access token on behalf of the user to access the Captivate APIs. This access token takes the form of a JSON web token or JWT and is passed in the Authorization header of all the Captivate APIs as a Bearer token.

The first time a Captivate access token is requested for a given user, a new Captivate profile is automatically created for that user, so no advanced user account creation or synchronisation is required.

Two user attributes - a user ID and a Unique Principal Name (UPN) - from your IdP are necessary to identify the user when making the access token request.

To verify its origin, the request is signed with a secret key, provided to you by Linius, and the signature is passed in the payload of the call (see How to Generate a HMAC Signature). An access token for the user is returned for correctly signed requests.

How to Generate a HMAC Signature

The content of the signature is composed of the following parameters, all of which are also included in the request payload:

- the tenant ID, provided by Linius as part of the Content Onboarding phase
- the user ID, a unique key linking the user to their record in your IdP
- the unique principal name of the user in the format `<name>@<domain>`, typically an email address although no mail is sent to the user
- UNIX timestamp representing the current time

The parameters are SHA256 hashed, then base64 and URL encoded. The following Python and NodeJS code snippets describe the signing process.

```
import crypto from 'node:crypto'

const SECRET = '<my-super-secret-key>'
const INPUT = '<tenantId><userId><principal><timestamp>'

const hmac = crypto
  .createHmac('sha256', SECRET)
  .update(INPUT)
  .digest('hex')
const base64 = Buffer.from(hmac).toString('base64')
const signature = encodeURIComponent(base64)
```

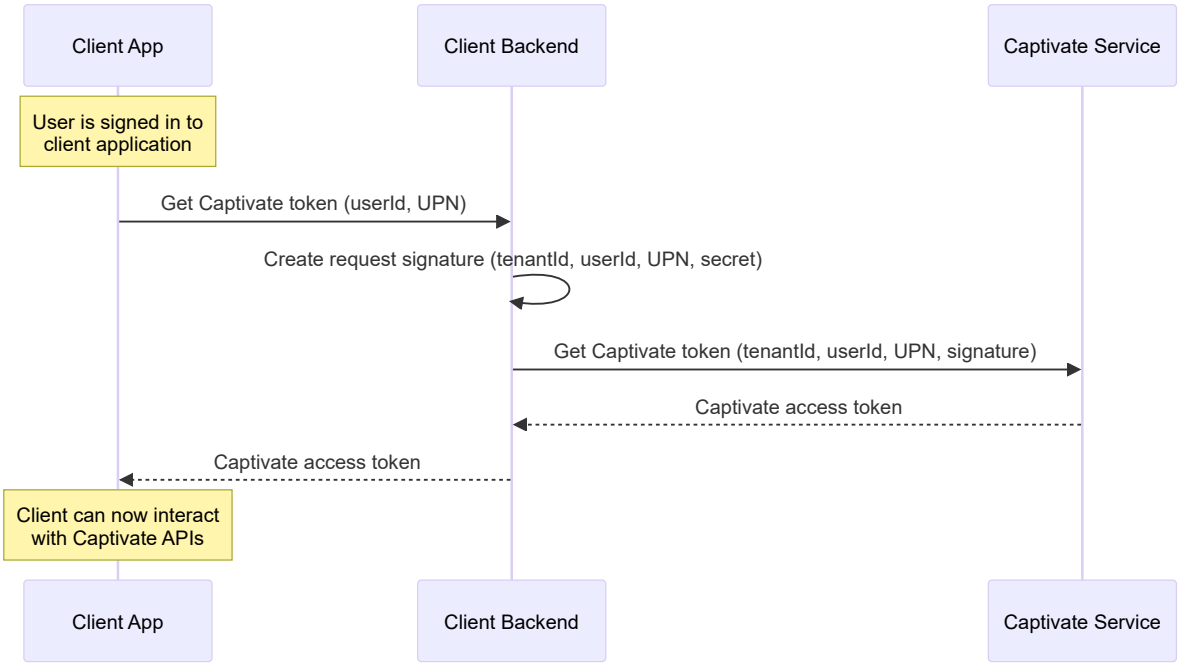
```
import hmac
import hashlib
import base64
import urllib.parse

SECRET = '<my-super-secret-key>'
INPUT = '<tenantId><userId><principal><timestamp>'

hmac = hmac.new(
    bytes(SECRET, 'utf-8'),
    msg = bytes(INPUT, 'utf-8'),
    digestmod = hashlib.sha256
).hexdigest()
base64 = base64.b64encode(bytes(hmac, 'utf-8'))
signature = urllib.parse.quote(encoded)
```

The signature is only valid for requests made over a short time window, typically around a minute, after which a new signature would need to be generated.

Security Considerations

It is important that the secret key used to generate the HMAC signature is not exposed and compromised. Therefore such secrets should never be used in the client application. It is suggested the client application should make a request to a back-end signing service responsible for signing the access token requests with the shared secret, and this back-end service should then make the access token request. In addition, to prevent spoofing of the client-to-signing service call, you must ensure this request originates from an authenticated session on the client side.

See the following sequence diagram for more details.



Support for Anonymous Users

If your application is required to support anonymous users, the following is one suggested approach to acquiring a Captivate access token without there being a pre-existing user account:

Create a temporary user ID and UPN for the session (e.g. user ID is `<someUUID>` and UPN is `<some_UUID>@<yourappdomain>`) and acquire a token for that user. Your application may be able to continue to use the temporary user credentials on that device for multiple sessions (e.g. stored in a cookie) for better usage tracking or even assign it to the user in the event that they subsequently sign up or sign in. Note that the Captivate services will treat this temporary user ID in the same way as a real user ID and so it will be your application's responsibility to control what a non-authenticated user can and cannot do, particularly when interacting with other users.

Access Token Management

The Captivate access token has a 60 minute lifetime, as specified by the timestamp in the `expiresAt` field in the response. Tokens should be re-used by the application for subsequent API calls until near their expiry, rather than making excessive, unnecessary delegated authentication calls. In addition, tokens should be managed by your application in line with the status of the user's session and be deleted if the user logs out, their session times out or they switch accounts etc.

Integrating Captivate into your Application

Collections

Collections are the core content element in a Captivate service. A collection is a (virtual) video, made up of one or, more usually, a number of (virtual) video clips and assembled and streamed on-demand.

Collections may be created by you in Linius Whizzard Portal, may be generated programmatically (e.g. auto-highlights, personalization), or curated by your end-user creators also through Whizzard Portal (user curated content).

A number of test collections are usually created during Content Onboarding to assist with the Captivate Integration phase.

Retrieving Video Collections

Each collection has a unique ID. Collections are retrieved using the Captivate Content API and the ID of the collection:

`GET` `https://middleware.linius.com/content/content/{collectionId}`

Example cURL

```
curl -L 'https://middleware.linius.com/content/content/collection_6a4026f1-7f41-
437b-999d-6ffd8c0ce83b' \
-H 'Authorization: Bearer <token>'
```

Example JSON response of a collection made up of 9 video clips


```
{
    "success": true,
    "result": {
        "liked": false,
        "id": "collection_6a4026f1-7f41-437b-999d-6ffd8c0ce83b",
        "title": "Biggest Cricket Bombs- Insane Sixes That Will Blow Your Mind",
        "description": "Mega hits - Cricket Sixes",
        "type": "static",
        "visibility": "public",
        "posterUrl": "https://middleware.lvs.linius.com/playback/poster/2320497?
ts=6681000",
        "items": [
            {
                "id": "video_clip_c37445874",
                "assetId": 2320497,
                "title": "2.1 : Matthew Gale to Jono Dean- 6 Run-Outside off",
                "startTime": 6660000,
                "endTime": 6702000
            },
```

```
            {
                "id": "video_clip_c39901412",
                "assetId": 2320502,
                "title": "3.1 : Jason Behrendorff to Luke Wright- 6 Run-Outside
off",
                "startTime": 640000,
                "endTime": 676000
            },
            {
                "id": "video_clip_c39902046",
                "assetId": 2320502,
                "title": "5.2 : Alex Keath to Shaun Marsh- 6 Run-Outside off",
                "startTime": 4712000,
                "endTime": 4766000
            },
            {
                "id": "video_clip_c39902139",
                "assetId": 2320502,
                "title": "5.5 : Alex Keath to Shaun Marsh- 6 Run-Outside off",
                "startTime": 4856000,
                "endTime": 4900000
            },
            {
                "id": "video_clip_c39902625",
                "assetId": 2320502,
                "title": "10.2 : Luke Wright to Michael Hussey- 6 Run-Down leg",
                "startTime": 5924000,
                "endTime": 5964000
            },
            {
                "id": "video_clip_c39902703",
                "assetId": 2320502,
                "title": "11.1 : John Hastings to Adam Voges- 6 Run-Outside off",
                "startTime": 6144000,
                "endTime": 6194000
            },
            {
                "id": "video_clip_c40498210",
                "assetId": 2320522,
                "title": "18.4 : Andrew Tye to Moises Henriques- 6 Run-Outside
off",
                "startTime": 4808000,
                "endTime": 4842000
            },
            {
                "id": "video_clip_c40498323",
                "assetId": 2320522,
                "title": "19.2 : Yasir Arafat to Moises Henriques- 6 Run-Outside
off",
                "startTime": 4966000,
                "endTime": 5008000
            },
            {
                "id": "video_clip_c40500236",
                "assetId": 2320522,
                "title": "16.1 : Doug Bollinger to Shaun Marsh- 6 Run-Off stump",
```

```
                "startTime": 10330000,
                "endTime": 10372000
            }
        ],
        "tags": ["six"],
        "createdAt": 1725945787,
        "updatedAt": 1725945807,
        "duration": 384000,
        "itemsCount": 9,
        "owner": "profile_6378",
        "videoUrl": "https://middleware.lvs.linius.com/playback/hls/XXXXXXXX-
XXXX-XXXX-XXXX-XXXXXXXXXXXX",
        "views": 5000001,
        "likes": 275000
    }
}
```


Collection Feeds

A number of API endpoints are available that provide paginated lists of video collections to enable the easy construction of feeds, carousels, reels, playlists etc. within your application.

Collection type	API call
Latest collections	`GET` `https://middleware.linius.com/content/content/explore`
Popular collections	`GET` `https://middleware.linius.com/content/content/popular`
Trending collections	`GET` `https://middleware.linius.com/content/content/trending`
Similar collections	`GET` `https://middleware.linius.com/content/content/similar/{contentId}`
User's collections	`GET` `https://middleware.linius.com/content/content/profile/{userId}`
Collections of followed users	`GET` `https://middleware.linius.com/content/content/following`

Example cURL

```
curl -L 'https://middleware.linius.com/content/content/popular?
page=2&pageSize=20' \
-H 'Authorization: Bearer <token>'
```

Displaying Collection Videos in the UI

The response data from the above collection API calls include the following fields for UI decoration of the videos within the application:

Name	Description
`title`	Title of the collection
`description`	Description of the collection
`posterURL`	URL of the poster image of the collection video
`tags`	An array of tags related to the collection video
`duration`	Total duration of the collection video in milliseconds
`itemsCount`	The number of clips in the collection video
`owner`	The userId of the user who published the collection video
`views`	Number of times the video has been watched
`likes`	Number of times the video has been liked

Playing a Collection Video

The `videoURL` field from the response data is a playable video resource (specifically the HLS playlist manifest file) that can be passed into your HLS video player of choice.

Note, to use your existing Brightcove Player for playback, you cannot use the normal Brightcove Playback API. Instead you need to explicitly set the player source to the playable video resource returned in the `videoURL` field.

Example code snippet to load the video and poster image into the Brightcove Player

```
const player = bc(document.querySelector('video'));

player.ready(function() {
  window.loadBrightcovePlayerIntoPage?.(this);
});

player.poster('https://middleware.lvs.linius.com/playback/poster/{$assetId}?
ts=6681000');
player.src({ type: 'application/x-mpegurl',
src:'https://middleware.lvs.linius.com/playback/hls/${playableId}'}
```

Searching

Captivate supports free text search by the user across video clips, video collections and user profiles.

These are implemented as three separate API calls, so the application developer is free to combine search queries (e.g. from one common search box) and/or results or make discrete search queries or segregate results visually or with filters etc.

Search results are ordered by relevance and are paginated.

Search type	API call
Clip search	`GET` `https://middleware.linius.com/content/search/clips`
Collection search	`GET` `https:middleware.linius.com/content/search/collections`
User profile search	`GET` `https://middleware.linius.com/content/search/profiles`

Example cURL

```
curl -L 'https://middleware.linius.com/content/search/clips?
query=basketball&page=1&pageSize=32' \
-H 'Authorization: Bearer <token>'
```

User Profiles

Get a User's Profile

`GET` `https://middleware.linius.com/content/profile/{userId}`

Get the Profiles of Users You Follow

`GET` `https://middleware.linius.com/content/profile/following`

Social Interactions

Following/Unfollowing a User's Profile

`GET` `https://middleware.linius.com/content/profile/{userId}/follow`
`GET` `https://middleware.linius.com/content/profile/{userId}/unfollow`

Like/Unlike a Collection

`GET` `https://middleware.linius.com/content/content/{collectionId}/like`
`GET` `https://middleware.linius.com/content/content/{collectionId}/unlike`

User Curated Collections

The Whizzard Portal is an optional stand-alone content creation tool which allows your users to create their own collections by curating (virtual) clips from your video content into new collections. They can save these as private collections in Whizzard and return to them later or publish them to Captivate for viewing by all users.

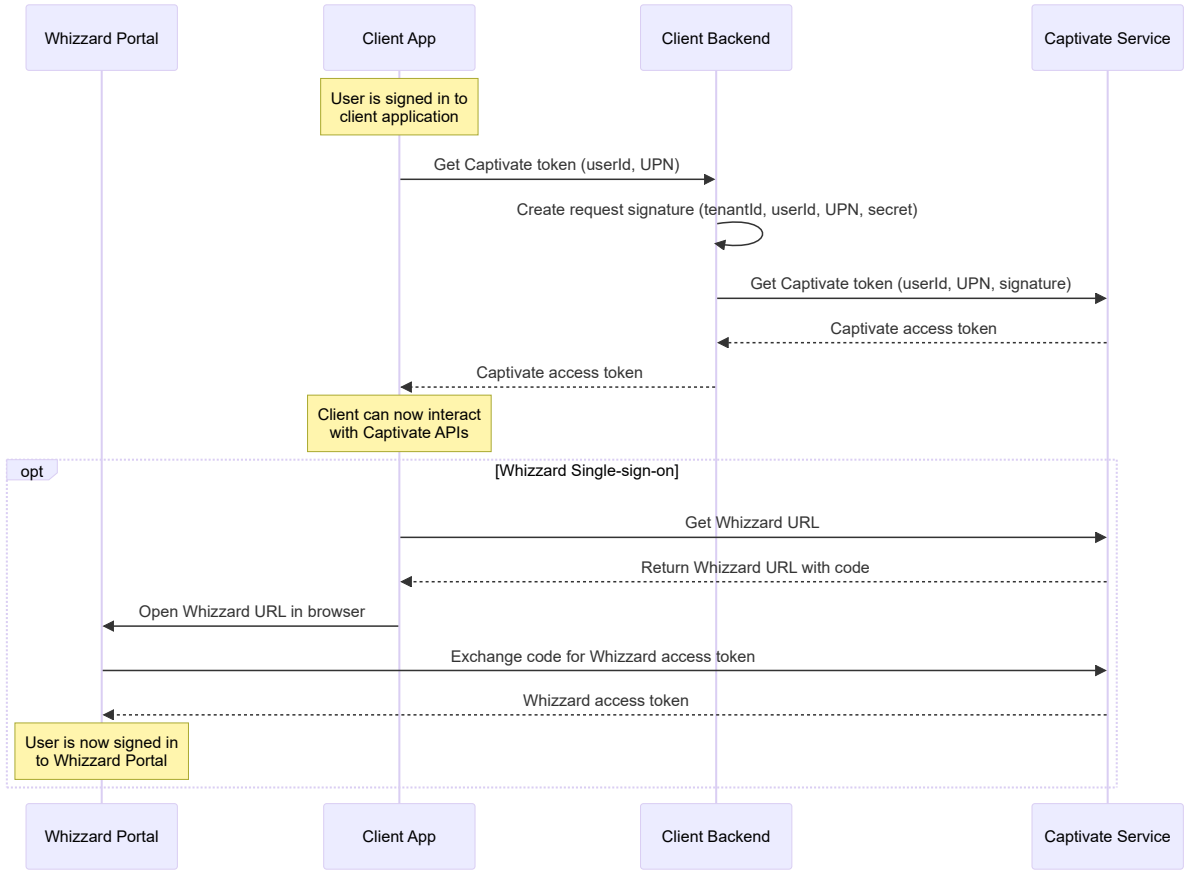
You control access to Whizzard from your application and can determine which of your users, if any, have permission to launch Whizzard to create their own collections.

Launching the Whizzard Portal

The Whizzard Portal launch URL is acquired through an authenticated Captivate API call from your application. The returned URL includes a one-time code which automatically logs in the current application user to their Captivate/Whizzard account without the need for another sign-on or further integration with your identity platform.

Note that once the URL has been used to launch Whizzard in the browser, it cannot be used again. Another launch URL will need to be requested from Captivate.

See the following diagram for the Whizzard launch sequence. Acquisition of the original Captivate access token is reproduced from the earlier diagram for clarity.



API Reference

Captivate Services swagger specification