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Altizure Development Platform

Welcome to Altizure Development Platform !

On Altizure, you can not only experience the most advanced 3D reconstruction technology to turn 2D photos to realistic 3D models, but also use the online 3D publishing service to share and enjoy the 3D models.

Join Altizure open platform to integrate the powerful 3D reconstruction and publishing services on Altizure to your business workflow. Unleash the power of realistic 3D models!

Let's start the journey.

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Learn more about Altizure at:

- Explore the 3D world on Altizure: altizure.com/explore
- [Facebook page](#)
- Official blog: blog.altizure.com
- Offline documentations: [pdf](#), [epub](#)

Contact us developers@altizure.com

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Concepts

Before you start to develop with Altizure, here we introduce a few concepts that are useful in the development. As our platform is designed to be easy-to-use, it would be a cakewalk for you to understand these commonly-used concepts if you had tried on some other online development platforms like facebook app or github sdk.

1. Developer account

If you do not have an Altizure account yet, please register at the [sign up page](#) and get one for free.

Then you can apply for [developer account](#). All development tools and privileges will be linked to this account. Please keep this account safe and secure.

2. App

App is the basic unit of application management on Altizure Development Platform. Each application also has its own unique app key, app secret, and authority level.

It would be better for developers to create different Apps and assign them to separate businesses and workflows respectively.

App key

App key is the unique identifier of each app on Altizure Development Platform. The information of the developers of an app will be shown to users when the app is asking an authorization from users in order to access the information of users. Users can identify an app by its App key and revoke the authorization anytime if users are not comfortable with the app.

App secret

The app secret is used to verify that the call to API comes from a corresponding developer account. Please do not leak the App secret in frontend web development. Just use it only on the server-side development.

3. User token

The user token is the kind of access token that the app obtains after a user authorizes the application. With this token, an authorized app can fetch user's information on Altizure. Altizure provides an authentication workflow based on OAuth 2.0. Hence, users' passwords are safe and never passed to any third party apps. An app should save user token if it wants to keep the login status, but it should not never induce other users to give password and save it for their own needs. On the user side, users can revoke a user token at anytime to prevent the app from accessing personal information.

4. GraphQL API

Altizure GraphQL API is a set of API in the syntax of [GraphQL](#). The API allows developers to fetch and modify the data on Altizure. Learn more at [GraphQL API](#)

5. Javascript SDK

Altizure Javascript SDK allows you to integrate rich 3D experience with our realistic 3D models to your business workflow. Learn more at [Javascript SDK](#)

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Developer Account

The developer account is only for enterprise users at the moment. If you are interested in it, please go to our developer site developers.altizure.com to fill in the application form.

For latest information about our open platform, please keep following us at:

- [Facebook page](#)
- Official blog: blog.altizure.com
- Altizure Developer Site: developers.altizure.com

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Altizure Graphql API

Altizure GraphQL API is a set of API in the syntax of [GraphQL](#). The API allows developers to fetch and modify the data on Altizure.

1. Prerequisite

- Altizure developer account
- App key
- User token (optional)

2. API Endpoint and Documentations

API endpoints and documentations: api.altizure.com/graphql.

3. Try out API in your browser

The above endpoint shows detailed documentation. However, you cannot execute the query or mutation that require your own app key and user token. Here is a tutorial on how to modify the http header in your browser to use your own app key and user token.

It is very convenience to test the API in browsers, because it provides instant feedback on the query results and detailed inline documentations. After the testing, you can easily copy and paste the query string to your code and trigger the API call.

We take Google Chrome as an example. Other browsers supporting extensions, e.g. Firefox, should work too.

Install extension

First, please install an extension that can modify the http request header. Here ModHeader is used. Please search and install `ModHeader` in the extension store of Google Chrome.



Modify http header

Please use ModHeader to add `key` field in request header with app key as the value.



Visit api.altitude.com/graphql after setting the key. You can find three sections: "query section", "result section", and "documentation", on the page.

Now please fill the following query string to the query section to calculate how many gigapixels there are in a set of images.

```
query {
  utility {
    sizeToGigaPixel(width: 4000, height: 3000, numImg: 100)
  }
}
```

Please click the action button to get the query results. This api call will compute how many giga pixels there are in 100 images at 4000x3000 resolution.

The screenshot shows the GraphQL Playground interface. On the left, a query is entered: `query { allProjects { edges { node { id name } } } }`. A red arrow points to the 'Run' button (a play icon) with the text 'Click the action button to run the query'. Below the query editor, the word 'Query' is written in red. On the right, the results of the query are displayed as a JSON object. Below the results, the word 'Results' is written in red. Further right, the 'Project' documentation is shown, listing fields like 'id', 'name', 'owner', 'isImported', 'ImportedState', 'projectType', 'visibility', 'description', 'views', 'stars', 'date', 'thumb', and 'thumbs'. The word 'Documentations' is written in red below the documentation.

4. Integrate the API in your code

The API can be called by any libs and programming languages that can issue a http post request.

For example:

JQuery in Javascript

```
$.ajax({
  type: 'POST',
  url: 'https://api.altizure.com/graphql',
  headers: {
    altitoken: 'user token',
    key: 'app key'
  },
  data: 'query=' + 'GraphQL query string'
})
```

5. Obtain user token

User token is obtained via the standard OAuth 2 flow.

The authorization endpoint is the following url:

```
`https://api.altizure.com/auth/start?client_id=${appKey}&response_type=token&redirect_uri=${redirect_uri}`
```

where **appKey** is your application key, and **redirect_uri** is one of the domains associated with your application.

Your application needs to route/open this url. A form will be shown to your users asking for their authorizations. After your users have authorized the request, the page will be redirected back to your **redirect_uri** with a url hash variable of key: **access_token**.

For mobile application, the **redirect_uri** will be your application's bundle identifier name (iOS) or your package name (android).

For a vanilla JS implementation, please refer to [here](#).

6. FAQ

6.1 How to access the api in Mainland China?

Please use `https://api.altizure.cn/graphql` . It is better to choose a reachable and faster endpoint whenever possible in the logic of your application instead of hardcoding the api endpoint.

6.2 Where to find more detailed documentations on GraphQL API

Please follow the above tutorial and browse api.altizure.cn/graphql with your browser. All documentations are embedded in the web frontend of our api endpoint.

7. Learn More

- Learn more about [GraphQL](#)
- Use [Altizure Javascript SDK](#) to developer rich 3D application
- More tools on GraphQL: [Awesome GraphGL](#)

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How to do 3D reconstruction via API

Overview

3D reconstruction service is provided in the form of reconstruction projects on Altizure. You need to create a project in order to trigger a 3D reconstruction task. Each user could create multiple projects. But one project could only be owned by one user. The project created via API is owned by the user whose user token is passed along the request.

1. Create a project

Send a GraphQL request with your application key and user token (not necessarily your own). Call with the required project name (not necessarily unique), and optional project type (free or pro). This step would not cost any coin to run. But if the coin balance is not enough for the pro project, it is not allowed to start a reconstruction task. If successful, the Project type will be returned, otherwise it would be null. From this type, you could get the id field. This project id is used as an argument in all of the project related queries and mutations.

Sample GraphQL request

```
mutation {
  createProject(name: "sample project", type: free) {
    id
  }
}
```

2. Upload images

After a project is created, you can start to let users upload images as [upload image tutorial](#). When the upload finishes, a reconstruction task could be created to start a reconstruction.

3. Start the reconstruction

Send a GraphQL request with the required project id, with an optional coupon id. The project id is obtained from either the mutation: `createProject` or query: `my.projects`. The coupon id (if any) is obtained from query: `my.coupons`. This step would cost coin if it is a pro project (without coupon).

If successful, a new task object would be created and returned. Otherwise, an error would be returned. There are 10 types of error. Details could be found in the GraphQL docs.

Sample GraphQL request

```
mutation {
  startReconstructionWithError(id: "54ed8e5741fbfa3e1967fe9b") {
    error {
      code
    }
    task {
      id
      state
    }
  }
}
```

4. Check project status

Once a reconstruction task is created. You could get its task state and other info within the Project type via the top level query:
`project` .

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Using the upload API

Overview

To speed up data transfer, images are uploaded directly from clients to Amazon or Aliyun. Your images are protected securely. Others could not read or modify your images. That is why you need to obtain the authorizations from our api. As filename is the only identifier in the buckets, the image is required to be uploaded to a specific url (S3) or prefix (OSS) so that Altizure knows which image is which.

1. Choose bucket

Choose one of the fastest S3 or OSS buckets. This is largely correlated to your network zone with the edge-points. You may simply query `GeoIPInfo.nearestBuckets` for hints for auto selecting the best edge for your clients.

2. Compute image checksum

Compute the sha1sum hash for each image. Before each upload, check if the current image has already been uploaded by calling the mutation `hasImage(pid, checksum)`. If it is not, proceed to the next step. Otherwise, skip to the next image.

3. Upload to OSS

If an OSS bucket is chosen, obtain STS and the related meta image info (e.g. id and hashed filename) by calling mutation `uploadImageOSS(pid, bucket, filename, type, checksum)`. STS is a temporary (1 hour) security token for the write only permission on the `/pid` prefix. If it has expired, renew with the same mutation. Otherwise, only request the `image gqf` fragment from the result, and re-use the same STS for performance reason. As signing from Aliyun is slow, one should not sign a new STS for each image. If the `wrapper` in [Aliyun OSS Javascript SDK](#) is used, please do not recreate new wrappers before STS expires to avoid an error about too many sockets.

Given the STS, images could be uploaded via any compatible protocol or library to OSS. It is required to upload with the specific hashed filename according to the image info returned from the `uploadImageOSS` mutation. Specifically, it is required to be put to the path `${pid}/${image.filename}` inside the bucket.

In order to keep track of the state, just before an image is uploaded, call mutation `startImageUpload(id)` to signal the start of the process. When the upload is done, call mutation `doneImageUpload(id)`.

4. Upload to S3

If a S3 bucket is chosen, uploading is much simpler. For each image, call the mutation `uploadImageS3(pid, bucket, filename, type, checksum)` to obtain a temporary (3 hours) signed url and the related meta image info.

Given the signed url, use the standard HTTP put to put the file to this url with `Content-type: JPEG` or other formats accordingly.

Just before each upload, it is required to call mutation `startImageUpload(id)`. There is no need to signal the end of uploading.

5. Wait for image processing

Uploaded images will be copied, verified and processed. Eventually, the image state will become either `Ready` or `Invalid`. If the total count of `Ready` matches the desired number, you may call mutation `startReconstructionWithError(id, options)` to start the reconstruction. Otherwise, you may consider re-uploading any outstanding image as indicated by the mutation `hasImage`.

If you do not concern about a few number of missing images and want to start the reconstruction immediately once all the images are ready, you could call mutation `preStartReconstruction(id, options)` .

Next

After images are processed, you could start a [reconstruction](#).

Learn more

- Learn more about [STS](#)
- Aliyun OSS Javascript SDK: [link](#)

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Changelog of Altizure GraphQL API

1.8.2

Release data: June. 22th, 2018

New features:

- Added query: `search.user(username)` for searching the account unique username

1.8.1

Release data: June. 15th, 2018

New features:

- Supported changing the imported model type via mutation: `setProjectProperties(importedModelType)`

Change:

- For query: `project.cropMask`, if crop mask does not exist, return a default mask instead of null

Fixes:

- Fixed issues of translating original image names to hashed image names in meta files if same image is uploaded multiple times
- Fixed changing `project.importedState` of imported-model-project to `Pending` immediately after a new upload URL is signed

1.8.0

Release data: May. 25th, 2018

New features:

- Supported Minio object storage server
- Added mutation: `uploadImageMinio`, to upload image to our private Minio server
- Added mutation: `downgradeProject`, for downgrading pro and non-done-once project to free project

Fixes:

- Fixed issue of pre-processing images indefinitely triggered from mobile apps, projects that have timeout images will be auto-started

Change:

- Changed `SandboxEntity`'s name from required to optional.
- Changed domains of `cdn` of various sandbox thumbs according to the region of api server

1.7.0

Release data: May. 18th, 2018

New features:

- Added mutation: `transferProject` for transferring ownership of projects to other user
- Added mutation: `transferCoins` for transferring coins to other user
- Added mutation: `transferCoupon` for transferring unused and non-expired timed coupons to other user

Breaking Change:

- Allowed zero transaction for starting reconstruction / upgrading project. (Previously, if total value of timed coupon used is bigger than required, no transaction will be conducted. Now, a transaction of zero amount will be carried out with relevant information such as the coupons used in the transaction.)

1.6.2

Release data: May. 11th, 2018

New features:

- Added type: frame in sandbox's animation

Fixes:

- Fixed setting project as modified if an image is removed
- Fixed missing message of 'Authentication Error' in various mutations

1.6.1

Release data: May. 4th, 2018

New features:

- Added transaction types: [BraintreeBuyCoin, AlipayBuyCoin, WechatBuyCoin, DepositCoinCoupon, Reconstruction, ProjUpgrade, Refund, SpecialCharge] in type: Transaction
- Supported custom transaction description by offering tokenized description arguments `descArgs` in type: Transaction
- Added ids of coupons used in relevant transaction
- Added sales mutation: refundProject and specialChargeUser

Fixes:

- Fixed issue of not refunding a pro project if it is stopped within 15 minutes

1.6.0

Release data: April. 27th, 2018

New features:

- Added mutation: sandbox.storyboard.{createStory + updateStory + removeStory + createStoryScene + removeStoryScene}
- Supported image file name that contains space(s), e.g. 'abc def ghi.JPG' in metafile (despite space is being used as delimiter)

Improvements:

- Reduced the latency of all the query (especially in China) with geo-distributed replica set

Fixes:

- Fixed typo of metafile filename to accept `group.txt` instead of `groups.txt`

Breaking Change:

- All images that are not in state: `Ready(Strong)` or `Invalid` will be forcefully switched to `Invalid` if their last `modifiedDate` is older than 65 minutes

1.5.1

Release data: April. 20th, 2018

New features:

- Supported markdown format in sales query: sendEmail
- Added mutation: setSandboxThumb for setting progressive sandbox thumbnails
- Added sales mutation: addUserNote and removeUserNote
- Added new buckets: Beijing, Virginia and London in enum: BucketS3Model, used in mutation: uploadModelS3
- Added new query: getGeoIPInfo.nearestModelBuckets to get the nearest buckets for uploading obj model

1.5.0

Release data: April. 13th, 2018

New features:

- Added field: importedModelType in Project, to indicate the imported model type
- Added field: developer.level in User, to store the base level of subsequent apps
- Allowed sales api to get/set developer base level and individual apps level
- Added sales api to send email

Fixes:

- Fixed setting default materials for imported models
- Allowed sales to query private coupon fields
- Enforced expiring developer status and all of his apps
- Properly handled the case when project image is removed when it is still in excited state

Breaking Change:

- Changed the definition of User.freeGPQuota to {free global quota + staff picked bonus + membership quota}, instead of just {free global quota + staff picked bonus}
- project.allMaterials were set as public, instead of private

1.4.0

Release data: April. 6th, 2018

New features:

- Added 2 new filters: ActiveUsed + ActiveUnused in FILTER_COUPON_TIME_STATE, which is used in query.my.coupons
- Added query.sandbox.sandbox + query.sandbox.allSandboxes + query.my.sandboxes
- Added mutation.sandbox
- Supported importing CAD, photogrammetric and point-cloud models

Fixes:

- Fixed status 500 server error if no user token is provided in any query
- Fixed handling pre-starting non-existing project
- Fixed unhandled promise rejection error when registering new user with empty fields

Breaking Change:

- Mutation: createProject accepts an additional arg: modelType for indicating the imported model type.

1.3.1

Release data: March. 29th, 2018

New features:

- Added resendVerificationEmail in query.support
- Added args: type in query.my.transactions to filter credit or debit transactions
- Added new field: MembershipInfo in User object

Fixes:

- Fixed issues of translating original image names to hashed image names in meta files
- Fixed issues of user login via OAuth

1.3.0

Release data: March. 23th, 2018

New features:

- Supported accepting multiple time based coupons in a single operation
- Added sales API

Fixes:

- Fixed redeem coupon link in http server mode
- Fixed ProjectImage's 'resized' ValidatorError when calling mutation: hasImage
- Fixed mis-judging 'Invalid' image as 'ReadyStrong'

Breaking Change:

- Mutation: upgradeProjectWithError, startReconstructionWithError and preStartReconstruction accept a list of coupon ids, instead of a single coupon id.

1.2.0

Release data: March. 16th, 2018

New features:

- User registration: send an email verification upon user registration
- Added query: project.allMaterials for getting all materials
- Added mutation: addProjectMaterial + updateProjectMaterial + removeProjectMaterial

Breaking Change:

- Mutation: PreStartProject will start the reconstruction task if all the images are in either 'Ready' or 'Invalid' state. So PreStartProject should be called after all images are uploaded. Previously, it is supposed to be called before all images are 'Ready' or 'Invalid'.

1.1.0

Release data: Feb. 12th, 2018

New features:

- Make endpoint: `/graphql` browsable without app key
- Added query: support.projectDoctor for diagnostic information
- Added super query: approveDeveloper

Improvements:

- Used provider pattern for selecting cloud providers upload services

Bug fixes:

- Fixed query: suggestedBuckets return values

Altizure Javascript SDK

Altizure Javascript SDK allows you to integrate rich 3D experience with our realistic 3D models to your business workflow.

- Simplify the loading and rendering of large-scale realistic 3D models.
- Simplify the fusion and rendering data from different sources.
- Simplify the development of integrating realistic 3D models to different business workflows.

Combined with tools like Electron and React Native, you can easily develop high quality 3D applications with realistic models for desktop and mobile apps.

1. Quick Start

Include SDK

In the `<head>` section of the html page, include our SDK as

```
<!-- Set the encoding to make sure that utf8 character is shown correctly -->
<meta charset="utf-8">
<!-- Set the viewport to make the page look correct on mobile -->
<meta name="viewport" content="width=device-width, initial-scale=1.0, user-scalable=no">
<!-- Include SDK -->
<script type="text/javascript" src="https://beta.altizure.com/sdk"></script>
```

Here we provide three links for our SDK.

- Latest: `<script type="text/javascript" src="https://beta.altizure.com/sdk"></script>`
- Stable: `<script type="text/javascript" src="https://www.altizure.com/sdk"></script>`
- Latest for Mainland China: `<script type="text/javascript" src="https://beta.altizure.cn/sdk"></script>`
- Stable for Mainland China: `<script type="text/javascript" src="https://www.altizure.cn/sdk"></script>`

Create a div as a container for 3D rendering

Our SDK will take over the downloading and rendering of realistic 3D models. Developers should create a `div` and attach a `sandbox` object to it. This div specifies where 3D contents will be rendered.

```
<body>
  <div id="page-content"></div>
</body>
```

Create a sandbox object

We now create a `sandbox` object and attach it to the div we created to hold this sandbox. Then the `sandbox` object will render all 3D contents in such a div.

```
// Create an option for configuring the sandbox
let options = {
  altizureApi:{
    // your app key
    key: 'your-app-key'
  }
}

// Create a sanbox object and attach it to the div page-content.
let sandbox = new altizure.Sandbox('page-content', options)
```

'page-content' is the id of `div` where the 3D contents are rendered. `options` is used to configure the sandbox. Please refer to our sample section for more information about how to configure a sandbox.

Summary

All codes can be put together as:

```
<html lang="en">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0, user-scalable=no">
  <script type="text/javascript" src="https://beta.altizure.com/sdk"></script>
</head>
<body>
  <div id="page-content"></div>
  <script>
    let options = {
      altizureApi:{
        // your app key
        key: 'your-app-key'
      }
    }

    let sandbox = new altizure.Sandbox('page-content', options)
  </script>
</body>
</html>
```

Save this code fragment to `<path>/altizure-sdk-test/earth.html` . Then start a http server in your console by typing

```
cd <path>/altizure-sdk-test/
python -m SimpleHTTPServer
```

This page can be accessed at `http://127.0.0.1:8000/earth.html` to load Altizure Earth

You can check this [demo](#) on our site to see how it looks.

In the following, you can learn more about our SDK via samples and demos.

2. Samples

2.1 Concepts

Here we start with some concepts in our SDK.

- Sandbox: `altizure.Sandbox` is the core of the 3D engine. It is the entry point of the development and handles all 3D rendering and data management.

2.2 List of Samples

Up-to-date live samples are at altizure.github.io/sdk/examples/examples.sdk.html.

The source code of these samples can be downloaded at github.com/altizure/sdk.examples. You can easily setup your server and run these samples following the tutorial.

Any questions and bugs, please feel free to write on our [issue page](#).

3. FAQ

Please check [FAQ](#) page for more information and [demo](#) page for more sophisticated demos. Please also check the [Reference](#) documents.

4. Learn More

- [ThreeJS](#)
 - [WebGL](#)
 - [OpenGL](#)
 - [Vulkan](#)
 - [OpenGL Transformation](#)
-

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Altizure JavaScript SDK Demo

Here we show how to use Altizure Javascript SDK to solve some real applications to demonstrate how to integrate realistic 3D models to business application.

If you have any questions, please feel free to write on our [issue page](#).

1. Timeline

Timeline is very useful for presenting a time series of a changing site. This is a essential tool for monitoring the progress of construction. We show several variation of timeline visualization.

1.1 Timeline in Grid Style

- Demo link: altizure.github.io/experimental-demo/timeline.html
- Keywords: Loading and setting multiple Altizure projects, text tags.
- Brief introduction: In this demo, a series of 3D models of a construction site are laid out in grid style. Each model is attached with a text tag to show the time stamp of the construction site.

1.2 Timeline with Sliders

- Demo link: altizure.github.io/experimental-demo/timeline-slider.html
- Keywords: Visibility of markers, interaction, camera flight, marker loading and destruction.
- Brief introduction: In this demo, a series of 3D models of a construction site are laid out with a slider. Users can drag the slider to switch the models in different time. The demo also shows how to control the camera flight animation to help users to fly around 3D models.

2. Sensors

Modern handheld mobile devices contain lots of sensors, measuring positions, poses, and velocities. In this section, we demonstrate how to integrate the information of sensors with 3D models to make the scenes more interactive.

2.1 GPS Tracking

- Demo link: altizure.github.io/experimental-demo/gps-tracker.html
- Keywords: Image tag, tag position, camera following, coordinate transformation, canvas with 3D elements, altitude reading.
- Brief introduction: This demo is only on mobile phones. After you press tracking, the demo will track your GPS location and show your track with aspect to the center of the scene. Your position is shown at realtime as an Altizure logo.

3. Performance Benchmark

3.1 Text Tag Rendering

- Demo link: altizure.github.io/experimental-demo/performance-test.html
- Keywords: Text tag, Rendering benchmark, Altitude reading.
- Brief introduction: The demo renders 1000 text tags by default. Users can change the number of text tags and click `generate` to generate a new scene. The more tags can be rendered smoothly, the more powerful is your system.

3.2 Line Rendering

- Demo link: altizure.github.io/experimental-demo/polycylinder-limittest.html
- Keywords: Cylinder line, Rendering benchmark.
- Brief introduction: The demo renders 100 cylinder lines with 7 points for each line by default. Users can change the number of cylinder lines along with the number of points for each line and click `Generate` to generate a new scene. The more cylinder lines with more points can be rendered smoothly, the more powerful is your system.

4. How to Get the Code?

All the demos are open source. You can get the codes by running:

```
git clone https://github.com/altizure/experimental-demo.git
cd experimental-demo
python -m SimpleHTTPServer
```

Open your browser and access `http://127.0.0.1:8000/` to run and check the demos.

5. Learn More

- [Altizure Javascript SDK](#)
- [Altizure Javascript SDK FAQ](#)
- [Altizure Javascript SDK Reference](#)

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Frequently Asked Questions

1 General Questions

1.1 How to start a testflight on Altizure Javascript SDK?

Please follow the guide altizure.github.io/sdk/examples/examples.sdk.html to test all samples. The source code can be cloned to your local computer for editing and testing.

1.2 The remote model cannot be loaded when I test the samples on my local computer.

Please make sure that you start a local http server and access the sample page via `127.0.0.1` instead of `localhost`

- Check whether a local http server is setup for testing. The simplest way to start a local http server is to use python and follow the guide at altizure.github.io/sdk/examples/.
- Use `127.0.0.1` instead of `localhost` to access the sample page hosted on your local computer.

1.3 The link of SDK script cannot be accessed.

If `https://www.altizure.com/sdk` and `https://beta.altizure.com/sdk` are not reachable. Please switch to `https://www.altizure.cn/sdk` and `https://beta.altizure.cn/sdk` .

1.4 Where can I find the reference manual?

Please check our samples and demos. They are detailed documented. We are constantly updating the samples and demos to illustrate the latest features.

1.5 How to get the user token?

Please refer to Section `5. how to get user tokens` on [GraphQL API](#).

1.6 In which programming language is the 3D rendering engine on Altizure developed?

We use Javascript. The underlying 3D API is WebGL. But we hardly write raw WebGL codes. Most of the features are developed on top of [ThreeJS](#).

1.7 Can I implement some elements in three.js and insert it to the scene created using Altizure Javascript SDK?

No, at the moment. We did lots of optimization on memory management to enable fast transfer and rendering of large-scale realistic 3D models, so it is not easy to integrate customized three.js objects to altizure scenes. However, we have plan to do so.

1.8 Do I have to learn about WebGL and computer graphics to use Altizure Javascript SDK?

In general, no, we design the SDK for non-computer graphics experts, anyone with the knowledge of Javascript and HTML should be able to use Altizure Javascript SDK to integrate the realistic 3D models to the business workflow. Nevertheless, it is always a plus if you know some basic knowledge on WebGL and computer graphics.

2 Common Use Cases

Coming soon

3. Learn More

- [List of samples](#)
- [Demos](#) illustrate more sophisticated examples.
- [Altizure Javascript SDK Reference](#)

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Changelog of Altizure Sandbox 3D SDK

0.1.62

Release data: Feb. 8th, 2018

New features:

- Shadow map and visibility analysis. [Sample 5.8](#)

Improvements:

- Rendering performance

Bug fixes:

- Bugs on touch event and mouse click event handle.