

Using User-hosted (gist) Secrets in Requests

This tutorial shows you how to send a request to a Decentralized Oracle Network to call the [Coinmarketcap API](#) . After [OCR](#) completes offchain computation and aggregation, it returns theBTC/USDasset price to your smart contract. Because the API requires you to provide an API key, this guide will also show you how to encrypt, sign your API key, and share the encrypted secret offchain with a Decentralized Oracle Network (DON).

The encrypted secrets are never stored onchain. This tutorial uses the threshold encryption feature. The encrypted secrets are stored by the user [agists](#) . Read the [Secrets Management page](#) to learn more.

Read the [Using Secrets in Requests](#) tutorial before you follow the steps in this example. This tutorial uses the same example but with a slightly different process:

1. Instead of uploading the encrypted secrets to the DON, you will host your encrypted secrets as gist.
2. Encrypt the gist URL.
3. Include the encrypted gist URL in your Chainlink Functions request.

caution

Chainlink Functions is still in BETA. The use of secrets in your requests is an experimental feature that may not operate as expected and is subject to change. Use of this feature is at your own risk and may result in unexpected errors, possible revealing of the secret as new versions are released, or other issues.

note

Chainlink Functions is a self-service solution. You must ensure that the data sources or APIs specified in requests are of sufficient quality and have the proper availability for your use case. You are responsible for complying with the licensing agreements for all data providers that you connect with through Chainlink Functions. Violations of data provider licensing agreements or the [terms](#) can result in suspension or termination of your Chainlink Functions account.

Prerequisites

note

You might skip these prerequisites if you have followed one of these [guides](#) . You can check your subscription details (including the balance in LINK) in the [Chainlink Functions Subscription Manager](#) . If your subscription runs out of LINK, follow the [Fund a Subscription](#) guide.

Set up your environment

You must provide the private key from a testnet wallet to run the examples in this documentation. Install a Web3 wallet, configure [Node.js](#) , clone the [smartcontractkit/smart-contract-examples](#) repository, and configure `a.env.encfile` with the required environment variables.

Install and configure your Web3 wallet for Polygon Mumbai:

1. [Install Deno](#) so you can compile and simulate your Functions source code on your local machine.
2. [Install the MetaMask wallet](#) or other Ethereum Web3 wallet.
3. Set the network for your wallet to the Polygon Mumbai testnet. If you need to add Mumbai to your wallet, you can find the chain ID and the LINK token contract address on the [LINK Token Contracts](#) page.
4. [Polygon Mumbai testnet and LINK token contract](#)
5. Request testnet MATIC from the [Polygon Faucet](#) .
6. Request testnet LINK from [faucets.chain.link/mumbai](#) .

Install the required frameworks and dependencies:

1. [Install the latest release of Node.js 20](#) . Optionally, you can use the [nvm package](#) to switch between Node.js versions with `nvm` use 20.

Note: To ensure you are running the correct version in a terminal, type `node -v`.

`node -v`node-vv20.9.0.2 . In a terminal, clone the [smart-contract-examples](#) repository and change directories. This example repository imports the [Chainlink Functions Toolkit NPM package](#) . You can import this package to your own projects to enable them to work with Chainlink Functions.

`git clone https://github.com/smartcontractkit/smart-contract-examples.git` & `cd ./smart-contract-examples/functions-examples/` 3. Run `npm install` to install the dependencies.

`npm install` 4. For higher security, the examples repository encrypts your environment variables at rest.

1. Set an encryption password for your environment variables.

`npmx env-enc set-pw` 2. Run `npmx env-enc set` to configure `a.env.encfile` with the basic variables that you need to send your requests to the Polygon Mumbai network.

- POLYGON_MUMBAI_RPC_URL: Set a URL for the Polygon Mumbai testnet. You can sign up for a personal endpoint from [Alchemy Infura](#) , or another node provider service.
- PRIVATE_KEY: Find the private key for your testnet wallet. If you use MetaMask, follow the instructions [to Export a Private Key](#) .Note: Your private key is needed to sign any transactions you make such as making requests.

`npmx env-enc set`

Configure your onchain resources

After you configure your local environment, configure some onchain resources to process your requests, receive the responses, and pay for the work done by the DON.

Deploy a Functions consumer contract on Polygon Mumbai

1. [Open the FunctionsConsumerExample.sol contract](#) in Remix.

[Open in Remix](#) [What is Remix?](#) 2. Compile the contract. 3. Open MetaMask and select the Polygon Mumbai network. 4. In Remix under the Deploy & Run Transaction tab, select Injected Provider - MetaMask in the Environment list. Remix will use the MetaMask wallet to communicate with Polygon Mumbai. 5. Under the Deploy section, fill in the router address for your specific blockchain. You can find both of these addresses on the [Supported Networks](#) page. For Polygon Mumbai, the router address is `0x6E2dc0F9DB014aE19888F539E59285D2Ea04244C`. 6. Click the Deploy button to deploy the contract. MetaMask prompts you to confirm the transaction. Check the transaction details to make sure you are deploying the contract to Polygon Mumbai. 7. After you confirm the transaction, the contract address appears in the Deployed Contracts list. Copy the contract address.

Create a subscription

Follow the [Managing Functions Subscriptions](#) guide to accept the Chainlink Functions Terms of Service (ToS), create a subscription, fund it, then add your consumer contract address to it.

You can find the Chainlink Functions Subscription Manager at [functions.chain.link](#) .

Tutorial

This tutorial is configured to get the BTC/USD price with a request that requires API keys. For a detailed explanation of the code example, read the [Examine the code](#) section.

You can locate the scripts used in this tutorial in the [examples/6-use-secrets-gist](#) directory .

1. Get a free API key from [CoinMarketCap](#) and note your API key.
2. The [request.js](#) example stores encrypted secrets as [gists](#) to share them offchain with the Decentralized Oracle Network. To allow the `request.js` script to write gists on your behalf, create [github fine-grained personal access token](#) .
3. Visit [Github tokens settings page](#) .
4. Click on Generate new token.
5. Provide a name to your token and define the expiration date.
6. Under Account permissions, enable Read and write for Gists. Note: Do not enable additional settings.
7. Click on Generate token and copy your fine-grained personal access token.
8. Run `npmx env-enc set` to add an encrypted `GITHUB_API_TOKEN` and `COINMARKETCAP_API_KEY` to your `a.env.encfile`.

npm run env:encset

To run the example:

1. Open the filerequest.js, which is located in the6-use-secrets-gistfolder.
2. Replace the consumer contract address and the subscription ID with your own values.

constconsumerAddress="0x8dF78B7EE3128D00E90611FBED20A71397064D9"// REPLACE this with your Functions consumer addressconstsubscriptionId=3// REPLACE this with your subscription ID 3. Make a request:

nodeexamples/6-use-secrets-gist/request.jsThe script runs your function in a sandbox environment before making an onchain transaction:

\$ node examples/6-use-secrets-gist/request.js secp256k1 unavailable, reverting to browser version Start simulation... Performing simulation with the following versions: deno 1.36.3 (release, aarch64-apple-darwin) v8 11.6.189.12 typescript 5.1.6

Simulation result { capturedTerminalOutput: 'Price: 25805.19 USD\n', responseBytesHexString: '0x00276027' } Decoded response to uint256: 2580519n

Estimate request costs... Duplicate definition of Transfer (Transfer(address,address,uint256,bytes), Transfer(address,address,uint256)) Fulfillment cost estimated to 0.0000000000000215 LINK

Make request... Creating gist...

✓ Gist created https://gist.github.com/aelmanaa/5b0f8d755e71d59c5676c45b26977316/raw . Encrypt the URLs..

✓ Functions request sent! Transaction hash 0x01bdc545f4751d117192c37ff2080455a551d0d3af1481afda29ebc8732090ab. Waiting for a response... See your request in the explorer https://mumbai.polygonscan.com/tx/0x01bdc545f4751d117192c37ff2080455a551d0d3af1481afda29ebc8732090ab

✓ Request 0x8c497cddb192fd0c1c20ec5c118587571185684de5179ea514b64a95f8d45fd fulfilled with code: 0. Cost is 0.000038697782833742 LINK. Complete response: { requestId: '0x8c497cddb192fd0c1c20ec5c118587571185684de5179ea514b64a95f8d45fd', subscriptionId: 3, totalCostInJuels: 38697782833742n, responseBytesHexString: '0x00276027', errorString: '', responseDataBytesHexString: '0x', fulfillmentCode: 0 }

✓ Decoded response to uint256: 2580519n Delete gistUrl https://gist.github.com/aelmanaa/5b0f8d755e71d59c5676c45b26977316/raw

✓ Gist https://gist.github.com/aelmanaa/5b0f8d755e71d59c5676c45b26977316/raw deletedThe output of the example gives you the following information:

- Your request is first run on a sandbox environment to ensure it is correctly configured.
- The fulfillment costs are estimated before making the request.
- A gisthttps://gist.github.com/aelmanaa/5b0f8d755e71d59c5676c45b26977316/rawcontaining the encrypted secrets was created .
- The gist URL is encrypted before sending it in the request.
- Your request was successfully sent to Chainlink Functions. The transaction in this example is0x01bdc545f4751d117192c37ff2080455a551d0d3af1481afda29ebc8732090ab and the request ID is0x8c497cddb192fd0c1c20ec5c118587571185684de5179ea514b64a95f8d45fd.
- The DON successfully fulfilled your request. The total cost was:0.000038697782833742 LINK.
- The consumer contract received a response inbyteswith a value of0x00276027. Decoding it offchain touint256gives you a result:2580519.
- After the request is fulfilled, the gisthttps://gist.github.com/aelmanaa/5b0f8d755e71d59c5676c45b26977316/rawis deleted.

Examine the code

FunctionsConsumerExample.sol

```
// SPDX-License-Identifier: MIT
pragma solidity 0.8.19;
import {FunctionsClient} from "@chainlink/contracts/src/v0.8/functions/dev/v1_0_0/FunctionsClient.sol";
import {ConfirmedOwner} from "@chainlink/contracts/src/v0.8/shared/access/ConfirmedOwner.sol";
* THIS IS AN EXAMPLE CONTRACT THAT USES HARDCODED VALUES FOR CLARITY. * THIS IS AN EXAMPLE CONTRACT THAT USES UN-AUDITED CODE. * DO NOT USE THIS CODE IN PRODUCTION.

contract FunctionsConsumerExample is FunctionsClient, ConfirmedOwner {
    using FunctionsRequest for FunctionsRequest;
    Request;
    bytes32 public s_lastRequestId;
    bytes public s_lastResponse;
    bytes public s_lastError;

    // @notice Send a simple request
    // @param source JavaScript source code
    // @param encryptedSecretsUrls Encrypted URLs where to fetch user secrets
    // @param donHostedSecretsSlotId Don hosted secrets slotId
    // @param donHostedSecretsVersion Don hosted secrets version
    // @param args List of arguments accessible from within the source code
    // @param bytesArgs Array of bytes arguments, represented as hex strings
    // @param subscriptionId Billing ID
    function sendRequest(string memory source, bytes memory encryptedSecretsUrls, uint64 donHostedSecretsSlotId, uint64 donHostedSecretsVersion, string[] memory args, bytes[] memory bytesArgs, uint64 subscriptionId) public {
        FunctionsRequest.Request memory req;
        req.initializeRequestForInlineJavaScript(source);
        if (encryptedSecretsUrls.length > 0) req.addSecretsReference(encryptedSecretsUrls);
        else if (donHostedSecretsVersion > 0) req.addDONHostedSecrets(donHostedSecretsSlotId, donHostedSecretsVersion);
        if (args.length > 0) req.setArgs(args);
        if (bytesArgs.length > 0) req.setBytesArgs(bytesArgs);
        s_lastRequestId = _sendRequest(req);
        // @notice Send a pre-encoded CBOR request
        // @param request CBOR-encoded request data
        // @param subscriptionId Billing ID
        // @param gasLimit The maximum amount of gas the request can consume
        // @param donId ID of the job to be invoked
        // @return requestId The ID of the sent request
        function sendRequestCBOR(bytes memory request, uint64 subscriptionId, uint32 gasLimit, bytes32 donId) external onlyOwner returns (bytes32 requestId) {
            (s_lastRequestId, _sendRequest(request, subscriptionId, gasLimit, donId), returns _lastRequestId);
        }
        // @notice Store latest result/error
        // @param requestId The request ID, returned by sendRequest()
        // @param response Aggregated response from the user code
        // @param err Aggregated error from the execution pipeline
        // Either response or error parameter will be set, but never both
        function fulfillRequest(bytes32 requestId, bytes memory response, bytes memory err) internal override {
            if (s_lastRequestId != requestId) {
                revert UnexpectedRequestID(requestId);
            }
            s_lastResponse = response;
            s_lastError = err;
            emit Response(requestId, s_lastResponse, s_lastError);
        }
        // Open in Remix What is Remix?
        // To write a Chainlink Functions consumer contract, your contract must import FunctionsClient.sol and FunctionsRequest.sol . You can read the API references FunctionsClient and FunctionsRequest .
    }
}
```

These contracts are available in an NPM package, so you can import them from within your project.

```
import {FunctionsClient} from "@chainlink/contracts/src/v0.8/functions/dev/v1_0_0/FunctionsClient.sol";
import {FunctionsRequest} from "@chainlink/contracts/src/v0.8/functions/dev/v1_0_0/libraries/FunctionsRequest.sol";
* Use the FunctionsRequest.sol library to get all the functions needed for building a Chainlink Functions request.
```

using FunctionsRequest for FunctionsRequest.Request; * The latest request id, latest received response, and latest received error (if any) are defined as state variables:

bytes32 public s_lastRequestId; bytes public s_lastResponse; bytes public s_lastError; * We define theResponseevent that your smart contract will emit during the callback

event Response(bytes32 indexed requestId, bytes response, bytes err); * Pass the router address for your network when you deploy the contract:

constructor(address router) FunctionsClient(router) * The three remaining functions are:

- sendRequestfor sending a request. It receives the JavaScript source code, encrypted secretsUrls (in case the encrypted secrets are hosted by the user), DON hosted secrets slot id and version (in case the encrypted secrets are hosted by the DON), list of arguments to pass to the source code, subscription id, and callback gas limit as parameters. Then:
- It uses theFunctionsRequestlibrary to initialize the request and add any passed encrypted secrets reference or arguments. You can read the API Reference forinitializing a request, adding user hosted secrets, adding DON hosted secrets, adding arguments, andadding bytes arguments .

FunctionsRequest.Request memory req; req.initializeRequestForInlineJavaScript(source); if (encryptedSecretsUrls.length > 0) req.addSecretsReference(encryptedSecretsUrls); else if (donHostedSecretsVersion > 0) { req.addDONHostedSecrets(donHostedSecretsSlotId, donHostedSecretsVersion); } if (args.length > 0) req.setArgs(args); if (bytesArgs.length > 0) req.setBytesArgs(bytesArgs); } It sends the request to the router by calling theFunctionsClient.sendRequestfunction. You can read the API reference forsending a request . Finally, it stores the request id ins_lastRequestIdthen return it.

s_lastRequestId = _sendRequest(req.encodeCBOR(), subscriptionId, gasLimit, jobId); return s_lastRequestId;Note: _sendRequestaccepts requests encoded inbytes. Therefore, you must encode it usingencodeCBOR. * _sendRequestCBORfor sending a request already encoded inbytes. It receives the request object encoded inbytes, subscription id, and callback gas limit as parameters. Then, it sends the request to the router by calling theFunctionsClient.sendRequestfunction.Note: This function is helpful if you want to encode a request offchain before sending it, saving gas when submitting the request. * fulfillRequestto be invoked during the callback. This function is defined inFunctionsClientasvirtual(readfulfillRequestAPI reference). So, your smart contract must override the function to implement the callback. The implementation of the callback is straightforward: the contract stores the latest response and error ins_lastResponseands_lastErrorbefore emitting theResponseevent.

s_lastResponse = response; s_lastError = err; emit Response(requestId, s_lastResponse, s_lastError);

JavaScript example

source.js

The JavaScript code is similar to theUsing Secrets in Requests tutorial.

request.js

This explanation focuses on therequest.js script and shows how to use theChainlink Functions NPM package in your own JavaScript/TypeScript project to send requests to a DON. The code is self-

explanatory and has comments to help you understand all the steps.

The script imports:

- [path](#) and [fs](#) : Used to read the [source file](#) .
- [ethers](#) : Ethers.js library, enables the script to interact with the blockchain.
- [@chainlink/functions-toolkit](#): Chainlink Functions NPM package. All its utilities are documented in the [NPM README](#) .
- [@chainlink/env-enc](#): A tool for loading and storing encrypted environment variables. Read the [official documentation](#) to learn more.
- [./abi/functionsClient.json](#): The abi of the contract your script will interact with. Note: The script was tested with the [FunctionsConsumerExample contract](#) .

The script has two hardcoded values that you have to change using your own Functions consumer contract and subscription ID:

`const consumerAddress = "0x8dFf78B7EE3128D00E90611FBED20A71397064D9"; // REPLACE this with your Functions consumer address`
`const subscriptionId = 3; // REPLACE this with your subscription ID`
The primary function that the script executes is `makeRequestMumbai`. This function can be broken into six main parts:

1. Definition of necessary identifiers:
2. `routerAddress`: Chainlink Functions router address on Polygon Mumbai.
3. `donId`: Identifier of the DON that will fulfill your requests on Polygon Mumbai.
4. `explorerUrl`: Block explorer url of Polygon Mumbai.
5. `source`: The source code must be a string object. That's why we use `fs.readFileSync` to read `source.js` and then `callToString()` to get the content as a string object.
6. `args`: During the execution of your function, These arguments are passed to the source code. The `args` value is `["1", "USD"]`, which fetches the BTC/USD price.
7. `secrets`: The secrets object that will be encrypted.
8. `gasLimit`: Maximum gas that Chainlink Functions can use when transmitting the response to your contract.
9. Initialization of `ethers signer` and `provider` objects. The signer is used to make transactions on the blockchain, and the provider reads data from the blockchain.
10. Simulating your request in a local sandbox environment:
11. Use `simulateScript` from the Chainlink Functions NPM package.
12. Read the response of the simulation. If successful, use the Functions NPM package `decodeResult` function and `ReturnType` enum to decode the response to the expected returned type (`ReturnType.uint256` in this example).
13. Estimating the costs:
14. Initialize a `SubscriptionManager` from the Functions NPM package, then call the `estimateFunctionsRequestCost` function.
15. The response is returned in Juels (1 LINK = 10**18 Juels). Use the `ethers.utils.formatEther` utility function to convert the output to LINK.
16. Encrypt the secrets, then create a gist containing the encrypted secrets object. This is done in two steps:
17. Initialize a `SecretsManager` instance from the Functions NPM package, then call the `encryptSecrets` function.
18. Call the `createGist` utility function from the Functions NPM package to create a gist.
19. Call the `encryptSecretsUrls` function of the `SecretsManager` instance. This function encrypts the gist URL. Note: The encrypted URL will be sent to the DON when making a request.
20. Making a Chainlink Functions request:
21. Initialize your functions consumer contract using the contract address, abi, and ethers signer.
22. Call the `sendRequest` function of your consumer contract.
23. Waiting for the response:
24. Initialize a `ResponseListener` from the Functions NPM package and then call the `listenForResponseFromTransaction` function to wait for a response. By default, this function waits for five minutes.
25. Upon reception of the response, use the Functions NPM package `decodeResult` function and `ReturnType` enum to decode the response to the expected returned type (`ReturnType.uint256` in this example).
26. Call the `deleteGist` utility function from the Functions NPM package to delete the gist.