WRIT 3562W
Technical Definition
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Application Programming Interface

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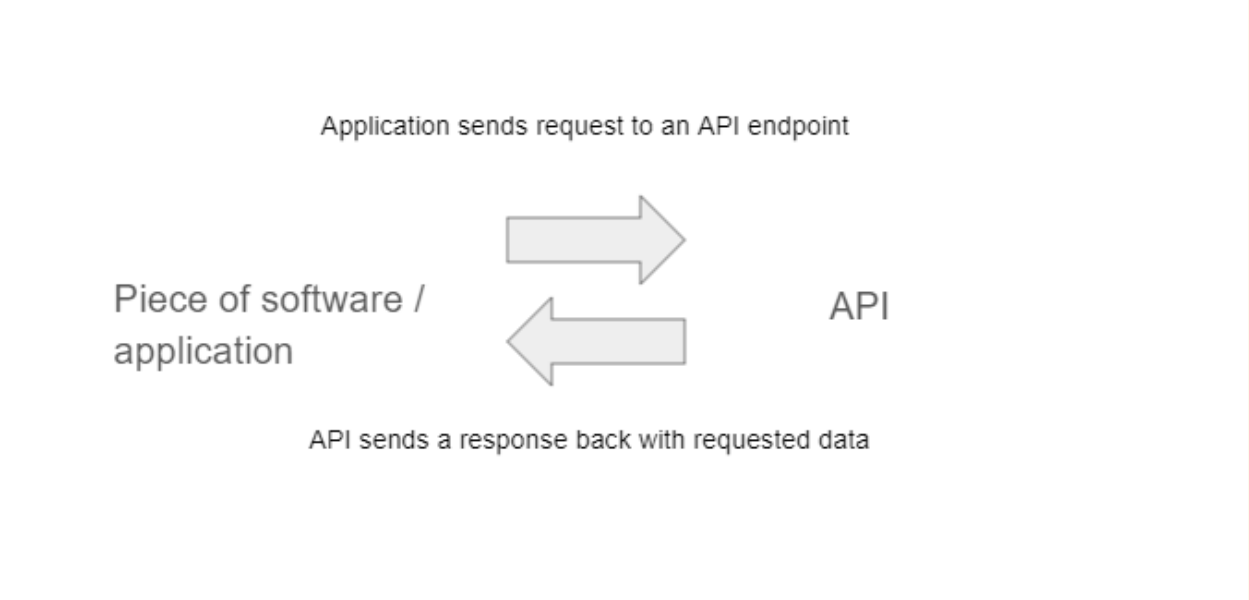

Figure 1. Bidirectional communication with an API and a piece of software.

Introduction

The term API (Application Programming Interface) is used in the computer science field to describe *a piece of software that provides a service to other pieces of software.* APIs are what allow software applications to "talk" to each other. API is a very broad term that can apply to many different software constructions, and almost every application uses an API somehow. APIs are an important topic for anyone interested in software development or computer science.

API Specifications

HTTP

An API is something that a piece of software can send a request to. Then, the API will send a response back to the requester (Figure 1). For this reason, many API's are hosted on the Internet and follow HTTP specifications. HTTP stands for HyperText Transfer Protocol, and it is the protocol for how data is exchanged on the web. Whenever you open up a page in your web browser, your browser is making an HTTP GET request to the specific domain you requested. A web API that's hosted on the internet can listen for these HTTP requests, and then send responses back to the piece of software making the request. For example, take a look at the results if you type https://pokeapi.co/api/v2/pokemon/ditto into your web browser:


{"abilities":[{"ability":{"name":"limber","url":"https://pokeapi.co/api/v2/ability/7/"},"is_hidden":false,"slot":1},{"ability":
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ruby","url":"https://pokeapi.co/api/v2/version/25/"}},{"rarity":50,"version":{"name":"alpha-sapphire","url":"https://pokeapi.co/api/v2/version/26/"}},{"rarity":50,"version":
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moon","url":"https://pokeapi.co/api/v2/version/30/"}}]}],"id":132,"is_default":true,"location_area_encounters":"https://pokeapi.co/api/v2/pokemon/132/encounters","moves":[{"move":
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up","url":"https://pokeapi.co/api/v2/move-learn-method/1/"},"version_group":{"name":"red-blue","url":"https://pokeapi.co/api/v2/version-group/1/"}},
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method/1/"},"version_group":{"name":"gold-silver","url":"https://pokeapi.co/api/v2/version-group/3/"}},{"level_learned_at":1,"move_learn_method":{"name":"level-
up","url":"https://pokeapi.co/api/v2/move-learn-method/1/"},"version_group":{"name":"crystal","url":"https://pokeapi.co/api/v2/version-group/4/"}},

It looks like a jumbled mess. This image is the Pokemon API's response when a request is made to the above API endpoint. An API endpoint is a specific URL of an API, and the endpoint holds

data about a specific resource. In this example, we are making a request to the endpoint which holds data about the Pokemon Ditto. Every API provides a service, and this particular API serves Pokemon data. Other pieces of software can send requests to this API to integrate Pokemon data into an application. Here's an easier to read version of some of the data:


```
{
  - abilities: [
    - {
        - ability: {
            name: "limber",
            url: "https://pokeapi.co/api/v2/ability/7/"
          },
          is_hidden: false,
          slot: 1
      },
    - {
        - ability: {
            name: "imposter",
            url: "https://pokeapi.co/api/v2/ability/150/"
          },
          is_hidden: true,
          slot: 3
      }
  ],
    base_experience: 101,
  - forms: [
    - {
          name: "ditto",
          url: "https://pokeapi.co/api/v2/pokemon-form/132/"
      }
  ],
  - game_indices: [
    - {
          game_index: 76,
        - version: {
            name: "red",
            url: "https://pokeapi.co/api/v2/version/1/"
          }
      },
    - {
          game_index: 76,
        - version: {
            name: "blue",
            url: "https://pokeapi.co/api/v2/version/2/"
```

The response is written in JSON (JavaScript Object Notation). JSON is a machine-readable syntax used to send data through API's. JSON isn't the only way to send data through an API (you could also send HTML, plain text, etc.). However, it's the most popular way of formatting API responses and requests because of its ease of use and compatibility with JavaScript (the most popular programming language for the web).

REST

Another important API specification is called REST (representational state transfer). An API is said to be a REST API if it follows the constraints of REST architectural style and allows for interaction with RESTful web services ("What is a REST API?"). REST is not a protocol like HTTP, but an architectural style which has a set of criteria that the API must follow. It's a way to build an API so it will be scalable as the API becomes larger and larger with more endpoints. The criteria is a bit lengthy, but here's some things a REST API should do/have:

- It should use a uniform interface - all resources of an API should be uniquely identified through a single URL, and should only be able to be manipulated by way of HTTP requests (GET, PUT, POST, DELETE, etc.) (Gillis).
- It should have a layered architecture composed of multiple servers.
- It should have code on demand - an API will usually send static JSON back to the requester, but it should also be able to send executable code.

What qualifies as a REST API and what doesn't is a highly controversial subject in the API world. Many people agree that it's fine not to get hung up on whether your API is RESTful or not as long as it's designed well.

Instagram Example

Instagram is a very popular photo and video sharing app. Because Instagram is such a large application, it has its own API. One of the most prevalent use cases of an API is to move data around in an application (adding new data, fetching data, updating data, deleting data, etc.). Imagine you are scrolling through Instagram and you click on someone's profile. Every user on Instagram is assigned an ID that uniquely identifies them. When you click on someone's profile, a GET request is made to Instagram's API endpoint that holds information about that specific user (such as how many followers they have, their photos, likes on their photos, etc.). Then, Instagram can display that data in the application.

Something similar happens when a new user creates an Instagram account. When a new user clicks the submit button to make a new account, a POST request is sent to the Instagram API. POST requests are used to add new data to a server. The POST request adds the new user to Instagram's user database. Similarly, when someone deletes an account or photo, a DELETE request is sent to Instagram's API.

(The process outlined above may not be how Instagram's application actually works. There are some API tools that don't use different HTTP requests, such as GraphQL. GraphQL only sends POST requests, even when fetching data. However, I wanted to use Instagram as an example because it's an application that many people are familiar with.)

Another important part of API's is that they make data consistent across different platforms. Instagram has a few different platforms for the application: a website, iOS application, Android application, and probably more. It would be a disaster if platforms showed different data at the

same time. For example, imagine that you just liked somebody's picture on the Instagram iOS app. Now, you go to the instagram website and try to like the same photo again. Because Instagram has the same API for all platforms, the photo will already be marked as "liked". If Instagram didn't have an API, you'd be able to like a photo twice. That's no good because Instagram wants every like to be from a unique user. This situation shows that having an API for an application comes in really handy. All the different platforms can make requests to the same API, which ensures that data will be consistent across platforms.

Conclusion

API's are very useful for software developers who are building applications. They provide services to other pieces of software and assist with moving data around in an application. Since most pieces of software use APIs, it's important to have a solid understanding of this technical topic.

Works Cited

Gillis, Alexander S. "What Is REST Api (RESTful API)?" *SearchAppArchitecture*, TechTarget, 22 Sept. 2020, searchapparchitecture.techtarget.com/definition/RESTful-API.

"What Is a REST API?" *Red Hat*, 8 May 2020, www.redhat.com/en/topics/api/what-is-a-rest-api.