RESTful API && Web Clients

RESTful web service or REST API -- is based on representational state transfer (REST), which is an architectural style and approach to communications often used in web services development.

1. JSONPlaceholder - Free Fake REST API (typicode.com)
2. Adding client dependencies | Ktor
3. How to Make HTTP Requests With Ktor-Client (Cooler Than Retrofit!) - Android Studio Tutorial – YouTube
4. Hosting RESTful web service:
   a. How to Build a Simple REST API With Ktor + Android App – YouTube
   OR
   b. Getting started with the REST API - GitHub Docs

What is a Web API?

- Web API = Web accessible Application Programming Interface accessible via HTTP to allow programmatic access to applications
  - Also known as Web Services
  - Can be accessed by a broad range of clients including browsers and mobile devices
- Web API is a web service that accepts requests and returns **structured data** (JSON in most cases)
  - Programmatically accessible at a particular URL
  - You can think of it as a Web page returning JSON instead of HTML
- Major goal = **interoperability between heterogeneous systems**

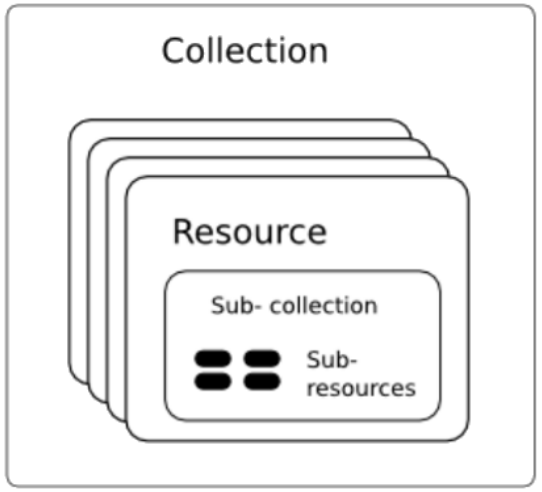
Naming Resources

- Web API uses URL to identify resources

Often **api** path is used for better organization

  - http://localhost/**api**/books/
  - http://localhost/api/books/ISBN-0011
  - http://localhost/api/books/ISBN-0011/authors

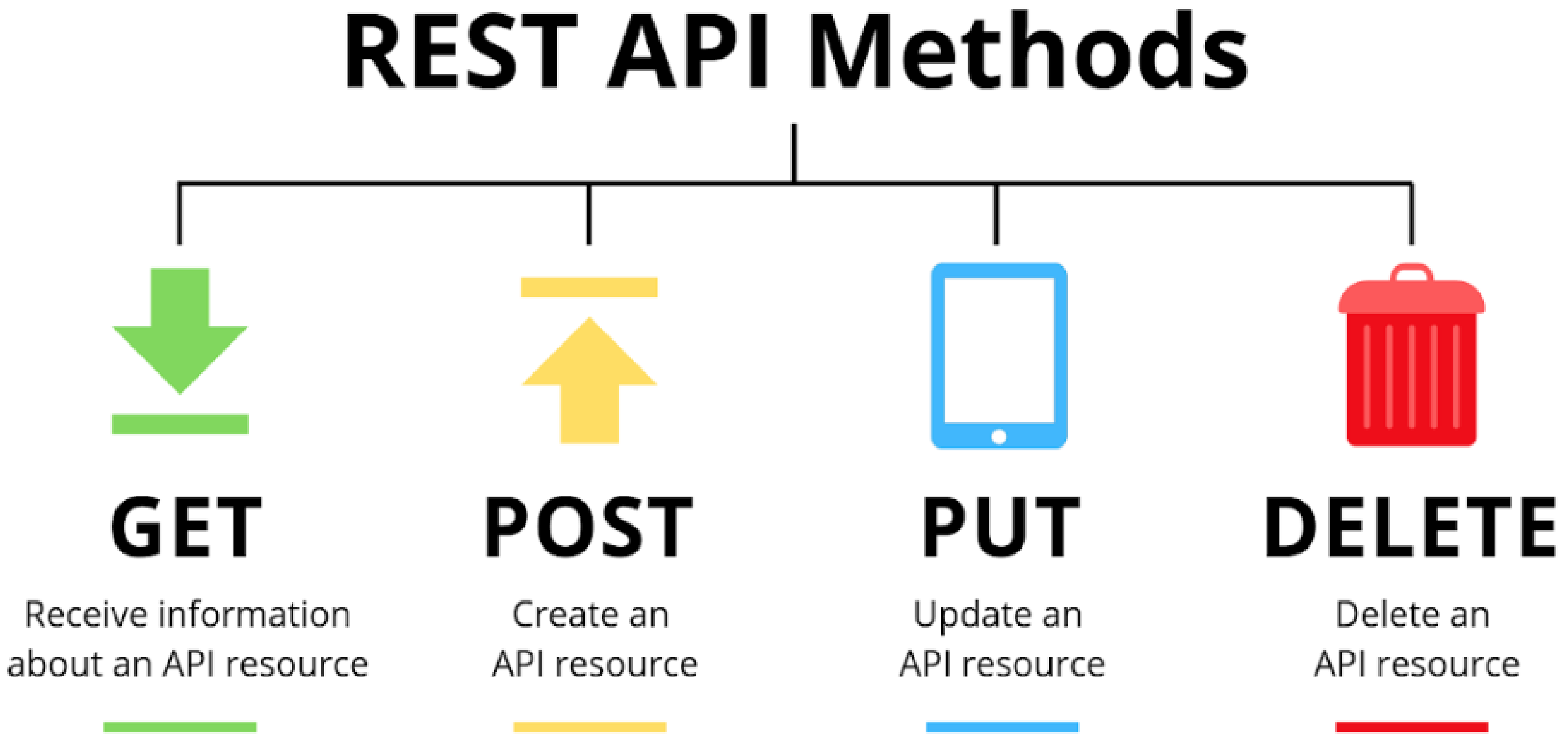
  - http://localhost/api/classes
  - http://localhost/api/classes/cmps356
  - http://localhost/api/classes/cs356/students



- As you traverse the **path** from more generic to more specific, you are navigating the data

HTTP Verbs

HTTP Verbs represent the **actions** to be performed on resources



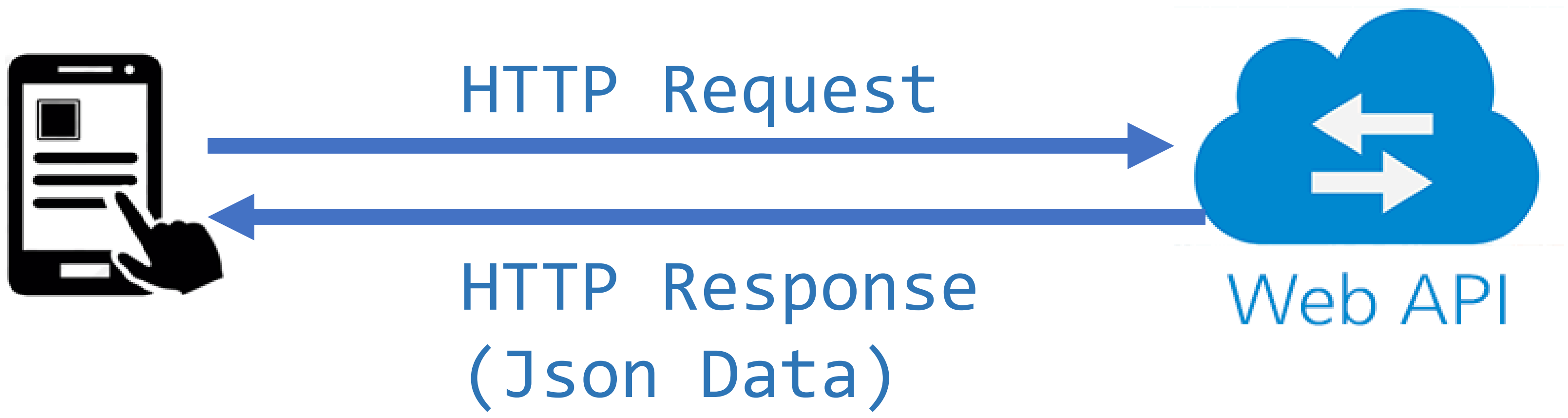
CRUD (Create, Read, Update and Delete) Operations and their Mapping to HTTP Verbs

- **GET** - Read a resource
  - **GET** /books - Retrieve all books
  - **GET** /books/:id - Retrieve a particular book
- **POST** - Create a new resource
  - **POST** /books - Create a new book
- **PUT** - Update a resource
  - **PUT** /books/:id - Update a book
- **Delete** – Delete a resource
  - **DELETE** /books/:id - Delete a book

The resource data (e.g., book details) are placed in the **body** of the request

Ktor Client

- **Ktor** provides HTTP client library for a mobile app to call a remote Web API
  - Make HTTP requests and handle responses



Ktor – 3 Programming Steps

1. Define **Serializable Data Classes** for input/output objects used when interacting with the Web API

2. Create a **Ktor client** and add the necessary plugins

3. Use the client **`.get`**, **`.post`**, **`.put`**, **`.delete`** methods to interact with the remote Web API

1. Define Serializable Data Classes for input/output objects used when interacting with the Web API

```kotlin
@Serializable
data class Country (
    // Map alpha3Code property in the json file
    // to the code property
    @SerialName("alpha3Code")
    val code: String = "",
    val name: String,
    val capital: String,
    @SerialName("region")
    val continent: String,
    @SerialName("subregion")
    val region: String,
    val population: Long,
    val area: Double = 0.0,
    val flag: String,
)
```

2. Ktor Client

- Create the client

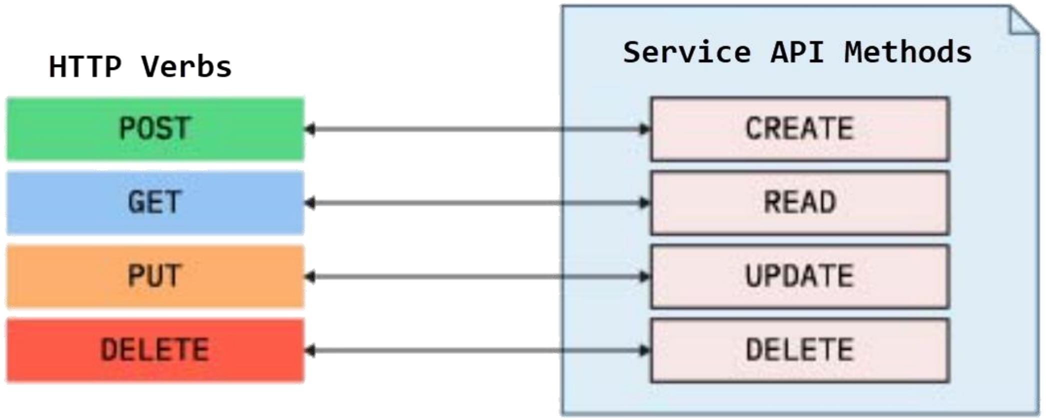
```
import io.ktor.client.*
val client = HttpClient()
```

- Add plugins to extend the client functionality, such JSON serialization, and Logging

```
val client = HttpClient() {
//Json Plugin auto-parse from/to json when sending and
receiving data from the Web API
    install(JsonFeature) {
        serializer = KotlinxSerializer()
    }
    //Log HTTP request/response details for debugging
    install(Logging) {
        level = LogLevel.ALL  // or .Headers or .Body
   }
}
```

3. Use Get/Post/Put/Delete to interact with the Web API

- HttpClient provides specific functions for basic HTTP methods: get, post, put, and delete.



```kotlin
const val BASE_URL = "https://api.polygon.io/v1/open-close"
val symbol = "Tesla"
val url = "$BASE_URL/$symbol"
println(">>> Debug: getStockQuote.url: $url")
val stockQuote  = client.get<StockQuote>(url)
```

Path Parameters vs. Query Parameters

- Required parameters can be passed using **path parameters** appended to the URL path
  - E.g., **/students/1234** this will return the details of the student with the id 1234

- Named **query parameters** can be added to the URL path after a **?** E.g., **/posts?sortBy=createdOnDate**
- Query parameters are often used for **optional** parameters (e.g., optionally specifying the property to be used to sort of results)

Post / Put Request

- Set the body of a request using body property
  - It accepts different types of payloads, including plain text or an object that get auto-serialized to a Json document

```kotlin
val response = client.post<HttpResponse>("http://localhost:8080/posts") {
    body = "Body content"
}
```

```kotlin
val response = client.post<HttpResponse>("http://localhost:8080/customers") {
    contentType(ContentType.Application.Json)
    body = Customer(3, "Ktor", "Client")
}
```

Delete Request

- Use the client.**`delete`** method to delete a resource
  - Specify the resource id to be deleted in the request url

```
val url = "https://jsonplaceholder.typicode.com/todos/1"
val response = client.delete<HttpResponse>(url)

if (response.status == HttpStatusCode.OK) {
    // HTTP-200
}
```