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COMIC READING ANDROID APPLICATION

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***Abstract*— Comics are a medium used to express ideas with images, often combined with text or other visual information. It typically takes the form of a sequence of panels of images. Textual devices such as speech balloons, captions, and onomatopoeia can indicate dialogue, narration, sound effects, or other information. The size and arrangement of panels contribute to narrative pacing.**
Comic-Ray is a Comic and Manga reading app in which a wide range of comics and mangas (many genres) will be available in pdf format. Comics have been around since at least the 19th century. The term manga is used in Japan to refer to both comics and cartooning. Outside of Japan, the word is typically used to refer to comics originally published in the country. In Japan, people of all ages read Manga. The medium includes works in a broad range of genres: action, adventure, business and commerce, comedy, detective drama, historical, horror, mystery, romance, science fiction, fantasy sports and games, and suspense among others.

***Keywords*— Android app, Comic books, Backend API, MVVM (Model-View-View Model)**

I. INTRODUCTION

Comic Ray is an Android app used for reading comic books. The system is simple, we fetch the comics from various websites that we web-scrap. For this, we created a REST API that does this job & an Android client act as a client which uses the API & displays the data to the user.
Once the data is fetched, we do cache it to avoid minimal network requests for the next fetch. Overall, the app follows material design guidelines so that it becomes easy for users to navigate into the app with a beautiful & simple use design interface.
The app will have many features including reading comics on the go. The system will also recommend comics based on the genres you like or visit daily. You can also subscribe to the updates of any comics you like so if there are any new issues, we will notify you through notifications.

II. OBJECTIVES

The main idea of this project is to give the users a smooth and comfortable reading experience of their preferred comics.
With an elegant and simple interface, this app allows you to browse and read all your favorite comics on your device.
The app will provide you with varieties of comics and mangas. You will not have to search for mangas separately anywhere else. Everything will be available at the same place.

Main Objectives:

- The intuitive and simple interface of the application will allow you to quickly find and read the comics.
- The idea of this app is that users won't face any problem in finding their preferred or favorite comicbook or manga.
- One of the advantages of this app is that it encourages reading.
- Reading engages various parts of your brain. The importance of a reading habit is that it strengthens mental muscles.
- Reading is one of the best mental workouts there is.

III. SCOPE

The scope is to create an easy-to-use application with powerful features that are straightforward to the users i.e. there should not be any confusion or doubts among users while using this application. Every feature should be smooth functioning and easy to understand. Let users emphasize reading (creating a distraction-free environment).

One of the advantages of this application will be that reading will be given the utmost importance. Maximize the availability of the application so it can reach many users as possible. A variety of comics with many issues of several genres will be available to users to read. This will make them engrossed in reading and can help the app in reaching many users. The application will be Open-source (but with proper Licensing). We have tried to keep it as simple as possible.

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IV. LITERATURE SURVEY

Sr. No.	Year and Name of Journal	Author	Title	Key Findings
1	Advances in Huma Factors in Training, Education, and Learning Sciences (July 2020)	Cao Yijie, Bing Xiao	Research on Digital Reading App Design to Stimulate Reading Motivation of Teenagers	Though digital reading is becoming more and more convenient, the quantity and quality of extracurricular reading among teenagers are still declining and most teenagers are lack of the motivation to read and have difficulty maintaining long-term reading behavior.
2	The 2nd International Conference on Applied Science and Technology (Oct 2017)	Wasan Abdulwahab Mohammed, Husniza Husni	Reading apps for children: Readability from the design perspective	This study sets out three objectives: 1) to evaluate five reading apps for young children from design perspectives; 2) to examine the readability for current existing mobile apps for reading and 3) to propose and

				evaluate mobile apps UI guideline for readability.
3	With Great Power Comes Great Pedagogy (Fed 2020)	James Kelley	The Uncanny Power of Comic Books: Achieving Interdisciplinary Learning through Superhero Comic Book	This chapter sets out to examine how superhero comic books can be used to teach students science literacies and concepts such as genetics, along with ELA content such as creative fiction writing in an after-school comic book club.
4	Comic Book Century: The History of American Comic Books (Jan 2007)	April. Spisak	Comic Book Century: The History of American Comic Books	The past century of American comic-book history is effectively distilled into a compact package in this trim and engaging volume. Although each section is necessarily short, Krensky captures the key moments of the evolution and transformations of comic books from the 1930s on, dividing the history into

				momentous events...
5	Stepping forward with reading software (Jan 1989)	Shelley Wepner	Stepping forward with reading software	A new perspective for using computers with reading disabled students is presented. Students' psychological, intellectual, and procedural needs are identified vis-à-vis computer usage. A rationale is put forward for using
				"whole language" software packages to address these needs while facilitating reading and writing development.
6	Psychology in the Schools (Jan 2006)	MJ Bishop, Lana Santoro	Evaluating beginning reading software for at-risk	This article presents a cross-disciplinary framework for evaluating software for

			learners	children with reading difficulties and provides examples of how interface design, instructional design, and reading content can be assessed.
7	Article Research on the development of business model based on mobile apps (Jan 2019)	Y. Zhang	Article Research on the development of business model based on mobile apps	They have studied its business model from the aspects of industrial chain model, profit model, communication channels and market positioning and makes a multi - level fuzzy comprehensive evaluation on it. Finally, suggestions are put forward to solve the problems found by evaluation.
8	Frontiers in Psychology (Sept 2021)	Mikel Ostiz-Blanco, Javier Bernacer, Patricia Diaz-Sanchez	Improving Reading Through Videogames and Digital Apps: A Systematic	The use of electronic interventions to improve reading is becoming a common resource. This systematic review aims to describe the

		, Irati Garcia-Arbizu	Review	main characteristics of randomized controlled trials or quasi-experimental studies that have used these tools to improve first-language reading, in order to highlight the features of the most reliable studies and guide future research.
9	Creative Education (Jan 2016)	Peri Mesquida, Kellin Cristina Melchior Inocêncio	Art and Education or Education through Art: Educating through Image	This article is part of a partial research report on education through art in preschool and elementary school, mainly in the last year of preschool and in the first year of primary school when the teachers start the process of children's literacy
10	American Journal of Civil Engineering and	Abdul Qadir, Mohammad Arif Kamal	Role of Traveling in Architectural Education: Visual Impact	The aim of this paper is to study the role that traveling has in architecture education and how educational

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	Architecture (Mar 2020)		and Experiential Learning	excursions contribute to the growth of students' learning experience.

V. PROPOSED COMIC APP ARCHITECTURE

A. Requirements –

- OS: Windows 10
- Processor: Intel Core i3 or higher.
- RAM: 8GB or higher
- Minimum 2GB Graphic Card
- Android Studio
- Android SDK
- JDK
- Android Emulator

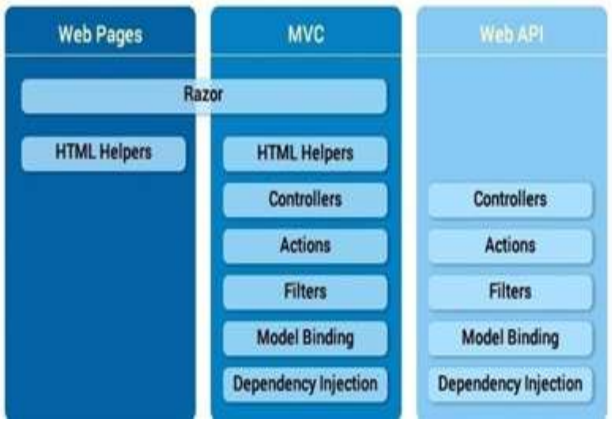
B. Project Architecture –

The paper presents Comic Ray architecture which contains thefollowing contents with figure
The whole system can be broken down into 2 components:

1. Client-side application (Android app)
2. Server-side (Backend API)
3. Client & Server libraries

Rest API –

REST stands for Representational State Transfer. It's a software architectural style for implementing web services. It is an architectural style for providing standards between computer systems on the web, making it easier for systems to communicate with each other.
Web services implemented using the REST architectural style are known as the REST ful web services.

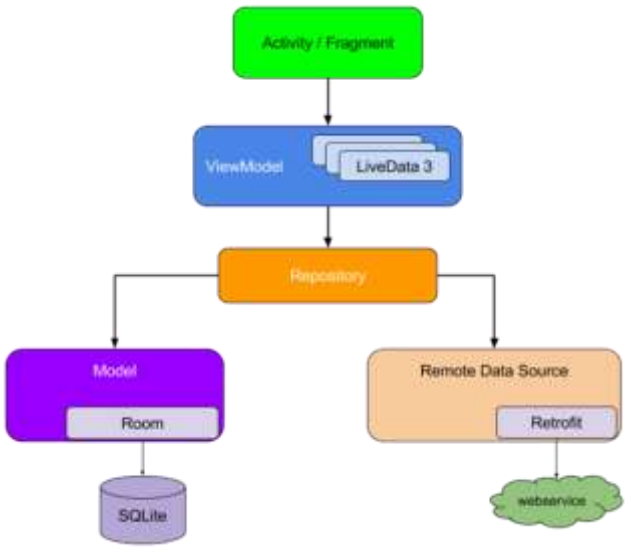


REST relies on client-server relationships. This essentially means that client applications and server applications must be able to evolve separately without any dependency on each other.

The communication between the client and the server is a stateless process. By that, I mean every communication between the client and the server is like a new one.
There is no information or memory carried over from the previous communications. So, every time a client interacts with the backend, the client has to send the authentication information to it as well. This enables the backend to figure out whether the client is authorized to access the data or not.
When implementing a REST API, the client communicates with the backend endpoints. This entirely decouples the backend and the client code.
So, what API is supposed to do is,

- Web-scrap some of the sites and show the data regarding comics data in JSON format on a given network request.
- So, to make this happen we are web-scraping this website using C#
- & ASP..NET core as a framework and fetching the required data.
- We build a RESTful Web API using ASP.NET Core and Entity Framework Core. This RESTful API provides all types of comics and manga including all types of genres.

Android –



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Above figure shows the Architecture Flow of our android app. We followed the MVVM architectural pattern to develop this app.
As Android apps grow in size, it's important to define an architecture that allows the app to scale, increases the app's robustness, and makes the app easier to test.
An app architecture defines the boundaries between parts of the app and the responsibilities each part should have. In orderto meet the needs mentioned above, you should design your app architecture to follow a few specific principles:

1. Separation of concerns

- The most important principle to follow is the separation of concerns. It's a common mistake to write all your code in an Activity or a Fragment.
- These UI-based classes should only contain logic that handles UI and operating system interactions. By keeping these classes as lean as possible, you can avoid many lifecycle-related problems.
- Keep in mind that you don't own implementations of Activity and Fragment; rather, these are just glue classes that represent the contract between the Android OS and your app.
- The OS can destroy them at any time based on user interactions or because of system conditions like low memory.
- To provide a satisfactory user experience and a more manageable app maintenance experience, it's best to minimize your dependency on them.

2. Drive UI from a model

- Another important principle is that you should drive your UI from a model, preferably a persistent model. Models are components that are responsible for handling the data for an app.
- They're independent of the View objects and app components in your app, so they're unaffected by the app's lifecycle and the associated concerns.
- Persistence is ideal for the following reasons:
- Your users don't lose data if the Android OS destroys your app to free up resources.
- Your app continues to work in cases when a network connection is flaky or not available.
- By basing your app on model classes with the well-defined responsibility of managing the data, your app is more testable and consistent.

Architecture Components are designed to be standalone, but they're most effective when they're incorporated into an effective app architecture. Android Architecture Components are a set of libraries to help with various challenges in dealing with Android architecture. The Room handles database persistence. Lifecycle helps you create components that are aware of the current Android lifecycle state. ViewModel holds data and survives configuration changes.
Android Architecture Components work together to implement asane app architecture, while they individually address developer pain points. The first set of these components helps you:

- Automatically manage your activity and fragment lifecycles to avoid memory and resource leaks
- Persist Java data objects to an SQLite database

VI. RESULT ANALYSIS

There are a variety of platforms used by developers to develop APIs and Android Apps. For this app, we used ASP.NET core to develop our backend API and native android platform to develop an android app with proper architecture.
In the scope of this paper, we will understand how this platform works under the hood and why it is better than other platforms in terms of performance.

A. ASP.NET Core –

The two major components of the .NET Framework are the Common Language Runtime and the .NET Framework Class Library.

- The Common Language Runtime (CLR) is the execution engine that handles running applications. It provides services like thread management, garbage collection, type safety, exception handling, and more.
- The Class Library provides a set of APIs and types for common functionality. It provides types for strings, dates, numbers, etc. The Class Library includes APIs for reading and writing files, connecting to databases, drawing, and more.

.NET applications are written in the C#, F#, or Visual Basic programming language. Code is compiled into a language-agnostic Common Intermediate Language (CIL). Compiled code is stored in assemblies—files with a .dll or .exe file extension.
When an app runs, the CLR takes the assembly and uses a just-in-time compiler (JIT) to turn it into machine code that can execute on the specific architecture of the computer it is running on.
ASP.NET extends the .NET platform with tools and libraries specifically for building web apps.

These are some things that ASP.NET adds to the .NET platform:

- A base framework for processing web requests in C# or F#
- Web-page templating syntax, known as Razor, for building dynamic web pages using C#
- Libraries for common web patterns, such as Model View Controller (MVC)

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- Authentication system that includes libraries, a database, and template pages for handling logins, including multi-factor authentication and external authentication with Google, Twitter, and more.
- Editor extensions to provide syntax highlighting, code completion, and other functionality specifically for developing web pages.

Processing Multiple Queries-:
In this test, each request is processed by fetching multiple rows from a simple database table and serializing these rows as a JSON response. The test is run multiple times: testing 1, 5, 10, 15, and 20 queries per request. All tests are run at 512 concurrencies.



With the techempower.com performance charts .Net core shows a clear high performance in various aspects. We did the same tests changing the physical DB to cloud DB and there was no difference. Net Core showed higher performance.

B. Android –
Android software development is the process by which applications are created for devices running the Android operating system. Google states that "Android apps can be written using Kotlin, Java, and C++ languages" using the Android software development kit (SDK), while using other languages is also possible.
All non-Java virtual machine (JVM) languages, such as Go, JavaScript, C, C++, or assembly, need the help of JVM language code, that may be supplied by tools, likely with restricted API support. Some programming languages and tools allow cross-platform app support (i.e. for both Android and iOS).
While native apps are often preferred over web apps, they're expensive to build and require consistent maintenance. To determine whether or not native apps are worth the investment, companies must thoroughly weigh the pros and cons of building one.

Pros of Native Apps	**Cons of Native Apps**
Speed Work offline Provide a recognizable look and feel Maintain aspect ratios	Lengthy downloading process No flexibility Expensive development Time-consuming development They require frequent upgrades

Native Apps Offer Speed
Because native apps are native to the platform, they work faster.
Many elements come preloaded. The user data is fetched from the web rather than the entire application, and since they work with the device's built-in features, they are speedy.
Native apps work even if there is no internet connectivity. So, in situations where you are stuck somewhere with limited or no service, such as an airplane, underground tunnel, or subway, native apps are accessible.

Native vs. Flutter vs. React Native
- Scenario 1: List View with Network Image

App	CPU %	Memory Consumed (Max)	Battery Usage
Native	2.6	72 Mb	56.6 mAh
Flutter	5.6	106 Mb	69.2 mAh
React Native	12.1	128 Mb	78.7 mAh

- Scenario 2: Animations

App	CPU %	Memory Consumed (Max)	Battery Usage
Native	16.8	172 Mb	14.76 mAh
Flutter	11.3	238 Mb	13.40 mAh
React Native	14.5	264 Mb	13.17 mAh

This proves how effective the Native android platform is compared to other platforms in terms of developing an Android application.

VII. CONCLUSION

This paper overcomes the problem of how learning can be efficient or how you can improve your vocabulary through reading interesting comics and liking your desired genre through apps like the Comic Ray app. Comic books aren't just about superheroes and villains. And they're certainly not just for kids so our application target audience is vague. Comic Ray will be a fast and slick comic reader and



comic manager. Itjust takes a tap of a button to have your device scanned and all your comics nicely arranged on the virtual bookshelf. So, it doesn't matter whether your comics are on-device storage, download folder, SD Card, cloud, or everywhere. You can manage and read your entire comic collection right from your bookshelf. You get lots of options to make the most of your reading experience. Native code base written and optimized for android devices with the best experience on both phones and tablets. Extremely fast and stable with no battery drain. Comic Ray comes with lifelong free updates that bring in new exciting features and usability improvements

VIII. REFERENCE

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