

DevCom Assignment

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Table Of Contents

1. Backend Assignment-----	3
1.1. Research-----	3
1.2. Think -----	5
2. Android Assignment -----	8
2.1. Research-----	8
2.2. Task -----	10

1. Backend Assignment

1.1. Research

a. What is the entire cycle of events that follows when you type in the url of a webpage?

Step 1: The browser checks the cache for a DNS record to find the corresponding IP address of the url [DNS simplifies the task for us by mapping the list of urls with their respective IP addresses, so as to make sure we don't have to remember all the IP addresses]

Step 2: If the requested URL is not in the cache, ISP's DNS server initiates a DNS query to find the IP address of the server that hosts the url [To obtain the IP address, the DNS query is created to search multiple DNS servers on the internet till it gets the correct IP]

Step 3: The browser initiates a TCP connection with the server [A connection is established between the browser and the computer which hosts the server of the website so that data can be transmitted]

Step 4: The browser sends an HTTP request to the web server [A GET or POST request is sent to the web server depending on the url]

Step 5: The server handles the request and sends back a response [The server contains a web server that receives the request from the browser and passes it to a request handler to read and generate a response, this response is generated in either JSON, XML or HTML format]

Step 6: The server sends out an HTTP response [This contains the web page along with other important information like status code, etc]

Step 7: The browser displays the HTML content

b. How are urls mapped to website hosted on a server in Bangalore?

Once the pages are created locally in a computer, they can be viewed only on that computer. So one needs a server to "host" the webpages. Many companies are "hosts" or "hosting providers", and they let people host the webpage files on their servers.

Further, a domain name has to be bought from "domain name registrars" and then point that domain to the server in Bangalore.

c. Read up in brief about TCP and UDP, that enable your request to reach a particular server, hopping from one router to another.

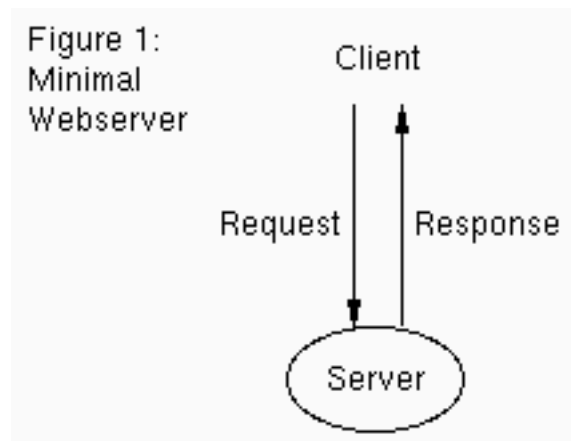
TCP (Transmission Control Protocol) is a suite of communication protocols used to interconnect network devices on the internet. TCP specifies how data is exchanged over the internet by providing end-to-end communications that identify how it should be broken

into packets, addressed, transmitted, routed and received at the destination. UDP (User Datagram Protocol) is an alternative communications protocol to TCP.

d. What does setting up a server even mean?

A server is a software or hardware device that accepts and responds to requests made over a network. Setting up such a device and creating the corresponding network, would refer to the process of setting up the server.

e. Get an overall idea of how a server resolves a request? [Google Apache and NginX, and see what role they play].



When client sends request for a web page, the web server search for the requested page, if requested page is found then it will send it to client with an HTTP response.

f. Suppose you built a html page for the first time [you should if you haven't already :P], and you are very enthusiastic to show it to your friend on his device. How would you do this if you are not allowed to share your code with him or upload your website. [Every laptop is a server. There's actually a place like 127.0.0.1]

Every system that is connected to a router or switch gets an IP address assigned to it from the administrator (Static IP addresses) or by default (with DHCP protocol). This IP address is used to identify a system on the network. So with this IP address you can request information or send information to another device.

Step 1: Ask the friend to connect to the same network as mine

Step 2: IP address of both the units should have same class and range, e.g if in one machine you are using 192.168.1.2 with the default subnet mask other unit should have same class, say 192.168.1.3

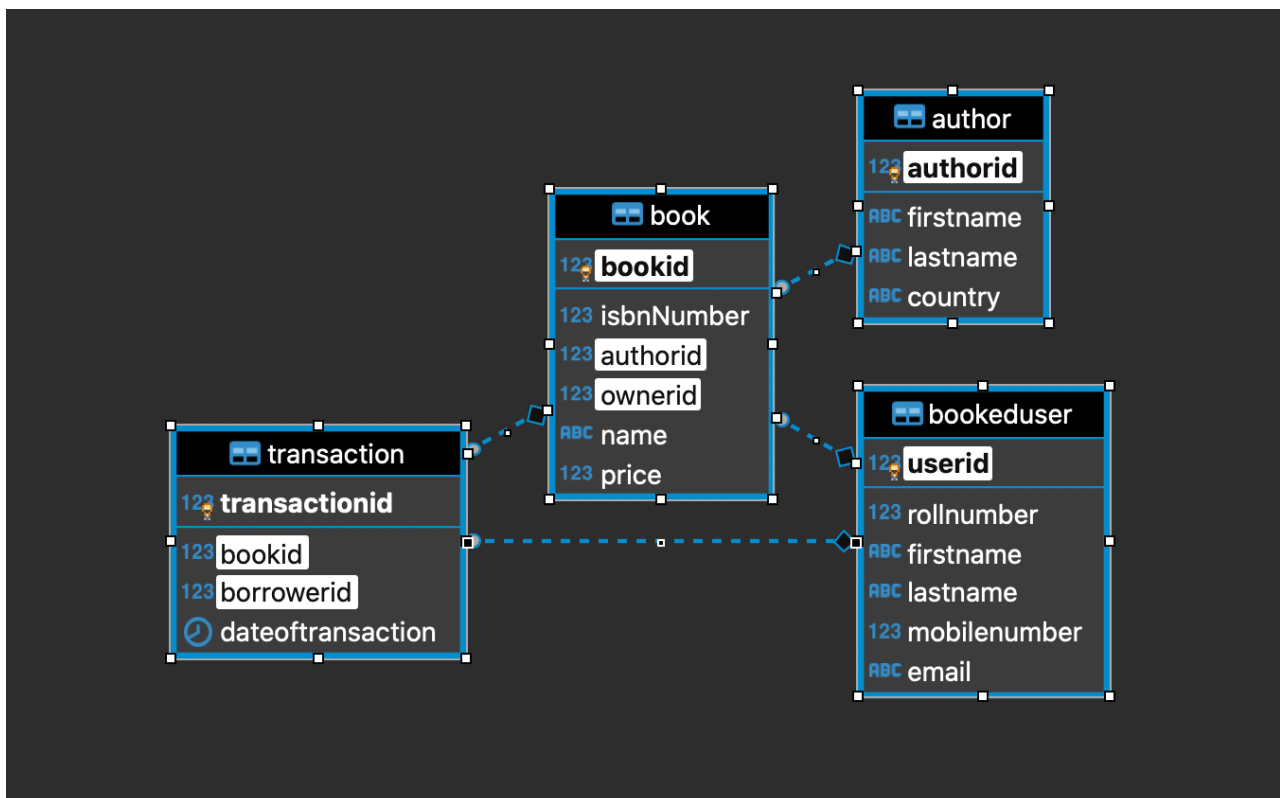
Step 3: Permissions like read only/ read and write, etc have to be given for the files

Step 4: In the friend's PC, get the files by accessing my PC's IP

1.2. Think

1. Suppose you want to now design the database schema of Book-ed!. This should include the name of the book, author, isbn number, short_description, and any other field you deem necessary. Similarly you'd have to design the scheme for the users and define the relationship between a book(s) and a user(s). Assume all the data that you need is already available.

ERD (Entity Relationship Diagram) [Created using DBeaver and PostgreSQL DB]



4 tables are shown here (author, bookeduser, book, transaction).

The topmost row of each table is the name of the table, followed by the primary key of the table and then followed by all the other columns in that table.

Here, book is the table which contains the details of the “books” and “bookeduser” is the table which contains the details of the users.

The book and its owner are related to each other by the foreign key relation (i.e, the userid of a book-ed user created earlier will be mapped to the book’s ownerid)

2. You want to introduce the feature that the books are searchable by the author? What will be the best way to accommodate these. Keep in mind there is additional load on the server when you are querying the tables to get the information.

- a. You want to minimise the number of queries. The simplest way is to fetch all the books and match the author for each of them. Can you do any better?

Step 1: Once the author name is entered, the corresponding authorid can be found from the author table

Step 2: All the books corresponding to this authorid can then be obtained from the book table

- b. Write the models.py file for this, similar to the one you have observed in the bodies section.

Included as a separate file

3. [BONUS] Whenever the user wants to browse the list of all books available, you want to display them based on his interests, and not randomly. A similar model is implemented for the events in InstiApp (you have to dive into the repo here).

- a. Can you figure out the approximate calculations behind it and understand which factors are given the most weightage?

<code>BASE = 1000</code>	<code># Base points</code>
<code>FINISHED_PENALTY = 600</code>	<code># Direct penalty if event is done</code>
<code>WEIGHT_START_TIME = 800</code>	<code># Weight of time from event start</code>
<code>WEIGHT_END_TIME = 800</code>	<code># Weight of time from event end</code>
<code>TIME_SD = 2.5</code>	<code># Standard deviation of time distribution</code>
<code>TIME_L_END = 1.2</code>	<code># Lambda for exponential of ended penalty</code>
<code>BODY_FOLLOWING_BONUS = 100</code>	<code># Bonus if the body is followed</code>
<code>TIME_DEP_BODY_BONUS = 200</code>	<code># Bonus if the body is followed dependent on time</code>
<code>BODY_BONUS_MAX = 400</code>	<code># Maximum bonus for followed bodies</code>
<code>TIME_PENALTY_FACTOR = 0.05</code>	<code># Multiplying factor for event length penalty</code>
<code>LINEAR_DECAY = 0.05</code>	<code># Slope of linear decay</code>
<code>FAR_OFF_THRESHOLD = 15</code>	<code># Time in days after which events are considered far off</code>
<code>NOT_TAG_TARGET_PENALTY = 2000</code>	<code># Penalty if not targeted in a restricted event</code>

As used above, maximum weightage is given to NOT_TAG_TARGET_PENALTY, i.e Penalising for not being tagged in restricted audience.

- b. Since the books do not follow any hierarchy, how would you decide the order? [Assume all the data that you require is already available to you]

Assuming we have classified the books into their respective subjects/authors, then we can get the list of book bought by the user and use the percentage of books based on subject/author.

Further based on the roll number, we get to know the details of the student [Eg. Which year is the student currently studying in?] and use this to present a subject wise book list to the user.

2. Android Assignment

2.1. Research

a. What is Android? Who created it? What are Android Apps?

Android is a mobile operating system developed by a group of developers with the main contributor being Google.

An Android app is a software application running on the Android platform, which is usually on a device running on Android OS.

b. What is the software used in the development of Android Apps?

Android Studio is the official integrated development environment (IDE) for Google's Android operating system

c. Which are the languages commonly used in the development of android apps? Which language does InstiApp use?

Common languages used are Java, Kotlin, C++, C#, Python, etc

InstiApp (mobile) is written in Java

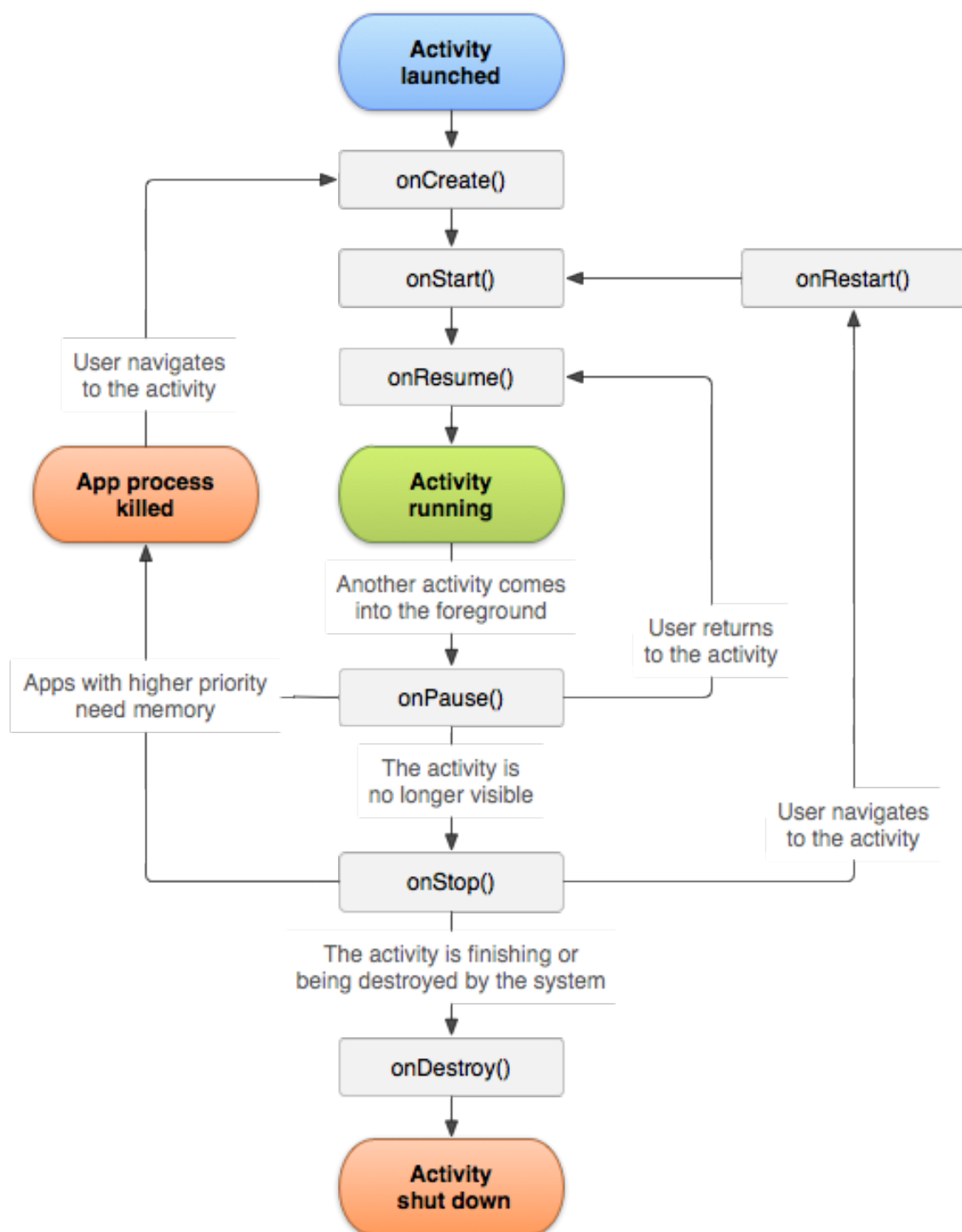
[InstiApp (web) is written in Angular using TypeScript, HTML, CSS and JavaScript]

d. What is the activity cycle of a basic Android application? Diagrams/flowcharts preferred

The app is run by a core set of six callbacks [functions], which are:

onCreate(), onStart(), onResume(), onPause(), onStop(), onDestroy()

The system calls one of these functions when it enters a new state.



e. What are 5 different UI elements in an android app? One example is a “TextView”.

The different elements are:

- TextView
- EditText

- AutoCompleteTextView
- Button
- ImageButton
- ToggleButton
- CheckBox
- RadioButton
- RadioGroup
- ProgressBar
- Spinner
- TimePicker
- DatePicker
- SeekBar
- AlertDialog
- Switch
- Rating Bar

The main elements are TextView, Button, CheckBox, DatePicker, AlertDialog

- f. **[BONUS] What are some of the salient features of those languages(part c)? How similar are they to C++?**

Java, Kotlin and Python are all object oriented just like C++, i.e they also use classes and objects to perform various operations.

Similarities between Java and C++:

- Java and C++ have similar syntax.
- Java and C++ have similar comments syntax.
- Java and C++ have similar loops (like while, for etc.) and conditional statements (like if-else, switch etc.)
- In both Java and C++, execution of both the C++ and Java programs starts from the main function:
- Both languages have same primitive data types
- Many of their keywords are the same

2.2. Task

1. **Read about relative and linear layouts and how they are used to design the UI of Apps.**

The basic building block for user interface is a View object that is created from the View class and occupies a rectangular area on the screen. Views are the base class for UI components like TextView, Button, EditText etc.

The ViewGroup is a subclass of View. One or more Views can be grouped together into a ViewGroup.

Linear and Relative layouts are examples of ViewGroups.

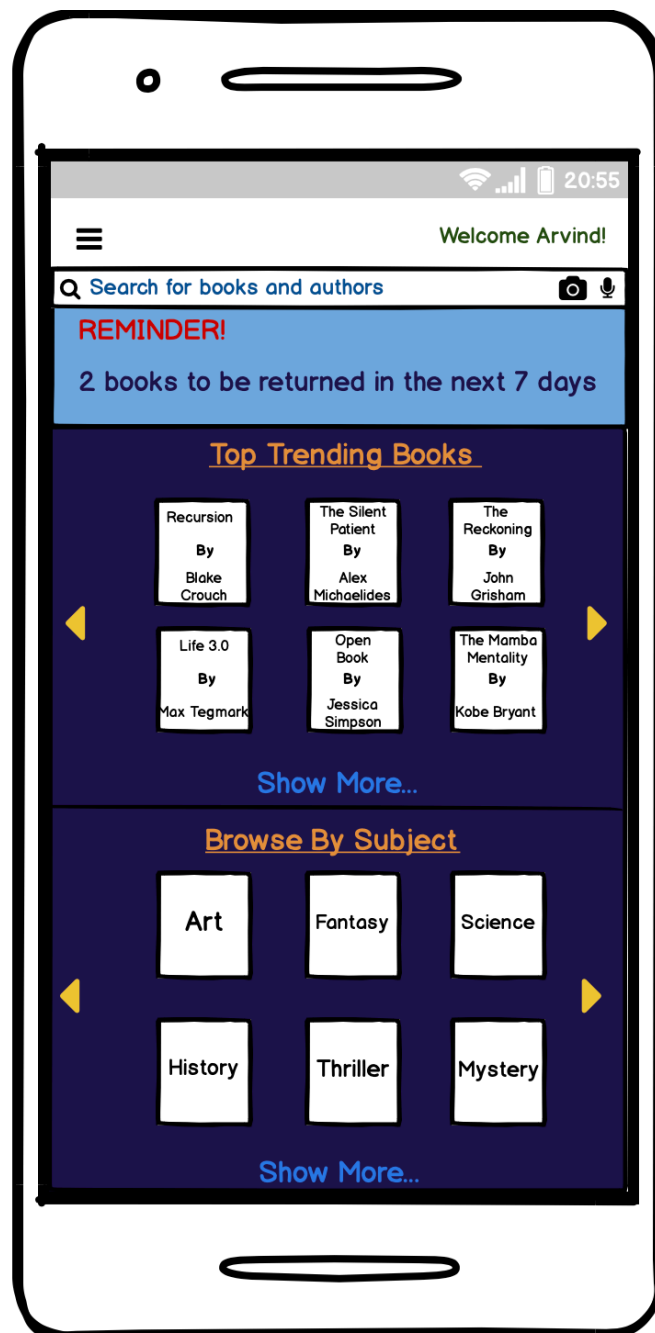
LinearLayout is a ViewGroup that aligns all children in a single direction, vertically or horizontally

RelativeLayout is a ViewGroup that displays child views in relative positions.

2. Now suppose you want to design the landing screen / dashboard of Book-ed!, what do you think should be the various features of that screen?

The necessary features must be:

- a. Search Bar : One can search for books, authors by using keywords and suggestions would be given to the user asynchronously.
 - b. Browsing books by subject, author, etc would make the job easier for borrowers.
 - c. A list of top trending books would give the user an idea of the current trend.
 - d. Books to be returned within a week would be indicated as a reminder.
1. Landing Page [Designed using Balsamiq.cloud]



3. Now break down your design into various layouts and elements. Clearly mark what is a linear layout, what are the various elements being used in your design. For example if there is a piece of text somewhere on the screen, that part would be the “TextView”.

