



# Software Architecture

## Mobile application architecture

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# Architecting Mobile applications



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Can you give some examples of mobile apps?

# Mobile applications

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## Examples

- Uber
  - Swiggy
  - Courier delivery
  - eCom
  - Banking
  - Spotify
  - Where Is My Train
  - ...
-

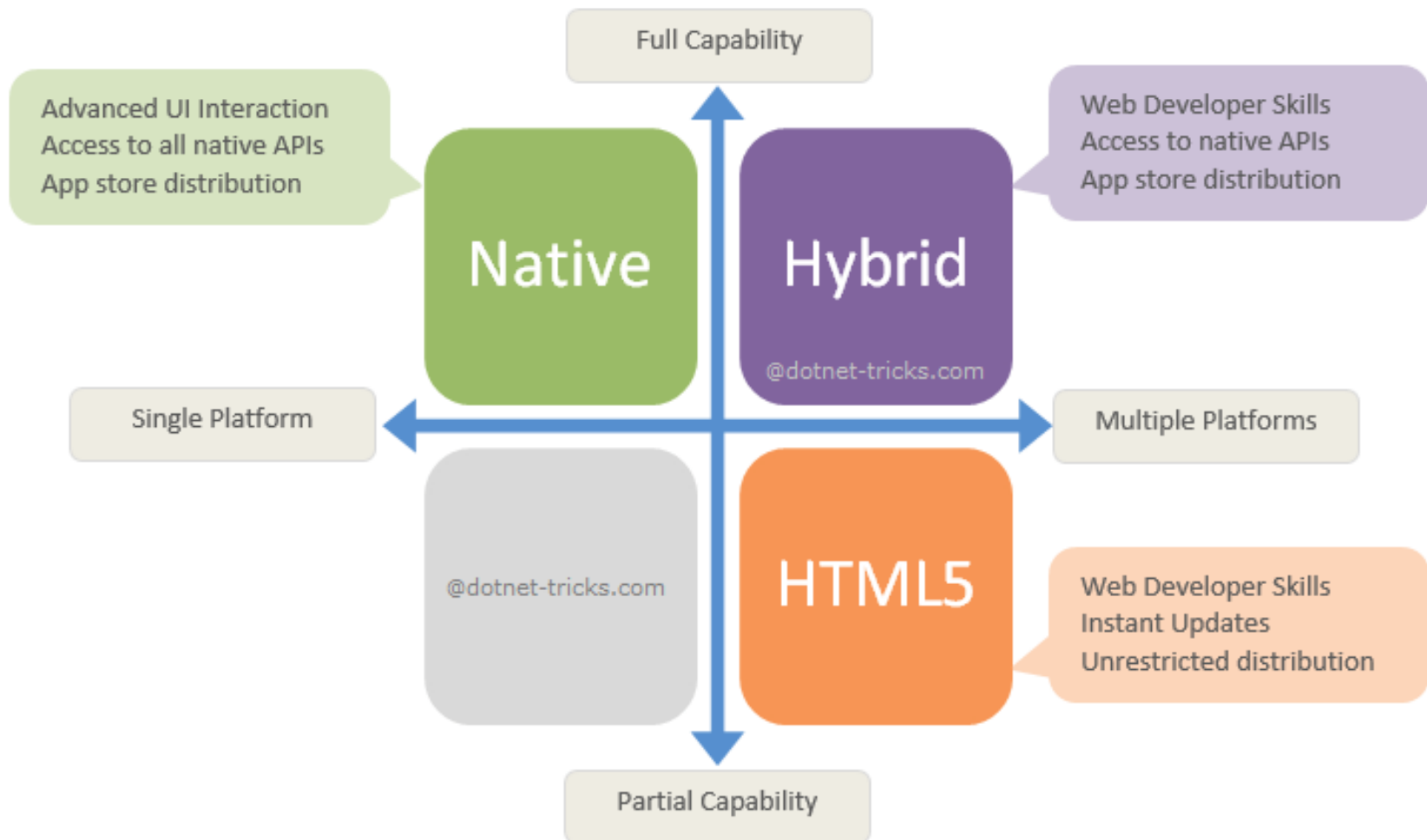
# Mobile Application: Design considerations

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- Simple User interface: Easy to type, Large buttons, Minimal features, menu options, actions
  - Responsive design: Adapt to different screen sizes & orientations
  - Compact code: Less usage of CPU, memory, storage
  - Few layers to ensure performance
  - Connectivity: Store data locally and synchronize later if connection is poor
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# Types of Mobile Apps



[Ref: buildfire.com](http://buildfire.com)

# Mobile Native app



- They are built for specific platforms
  - Examples: Google Maps, Facebook, LinkedIn – one version for iOS and one for Android
- Languages used:
  - Native iOS : Swift or Objective-C
  - Native Android: Java or Kotlin
- Integrated Development Environment (IDE) such as Android studio are used for this

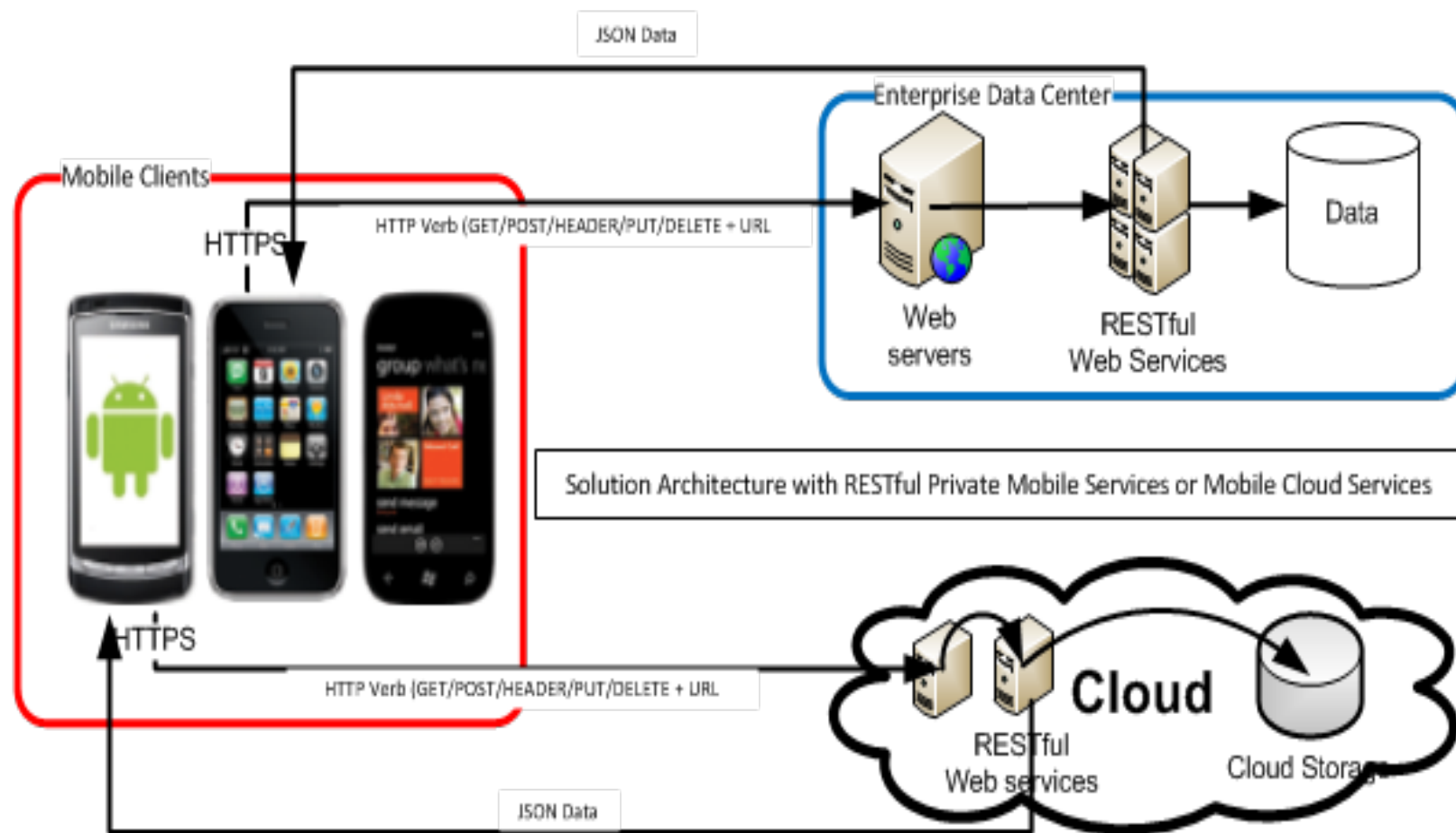
# Mobile Web apps



- Progressive web apps use modern web technology to deliver app-like experiences to users, right in their browsers.
- Examples:
  - Flipkart
  - BookMyShow
  - MakeMyTrip
- Uses HTML5, CSS3, JavaScript and runs on a browser



# Mobile web application



# Hybrid app



- A hybrid app combines elements of both [native apps](#) and [web applications](#).
  - Examples: Twitter, Uber, Instagram
- Hybrid apps are essentially web apps (HTML, CSS, Javascript) that have been put in a native app [shell](#).
- The shell is able to connect to native capabilities of the mobile platform such as camera, accelerometer, GPS, etc.
- Tools such as Xamarin and React Native allows app to run across platforms

# Pros & Cons



App type	Pro	Con
Native	<ul style="list-style-type: none"><li>• High performance</li><li>• Superior user experience</li><li>• Access to all features of OS</li></ul>	<ul style="list-style-type: none"><li>• Runs only on one platform</li><li>• Need to know special language</li><li>• Need to update versions</li></ul>
Web App	<ul style="list-style-type: none"><li>• Easy to deploy new versions</li><li>• Common code base</li></ul>	<ul style="list-style-type: none"><li>• Little scope to use device hardware</li><li>• Lower user experience</li><li>• Need to search for app</li></ul>
Hybrid	<ul style="list-style-type: none"><li>• Does not need browser</li><li>• Single code base</li><li>• Access to device hardware</li></ul>	<ul style="list-style-type: none"><li>• Slower</li></ul>

# UI design patterns

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- Action bars for quick access to frequently used actions
  - Login using Facebook, Google, etc. instead of separate user id / password
  - Large buttons for ease of use
  - Notifications of recent activity
  - Discoverable controls: Controls show up only when an item is selected (ex. In WhatsApp, the Forward button shows up when a message is selected)
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# Mobile optimized web site



All features



Reduced features

**DECCAN HERALD**  
DH E paper | Prajavani | PV E Paper | Sudha | Mayura | The Printers Mysore | DH Classifieds

Home | News | Karnataka | Bengaluru | Business | Budget 2018 | Supplements | Sports | Entertainment

Three soldiers killed as avalanche hits army post in Kashmir | Bad luck follows the 10 rupee coin | Swaraj, Ne



### U-19 World Cup final: India limit Australia to 216 after brilliant bowling show



### National health scheme to cost govt Rs 12K cr a year

For 2018-19, the government has made an initial provision of Rs 2,000 crore



Ahead of Modi's rally, BJP taps into techie support base



Bad luck follows the 10 rupee coin



Karnataka to launch universal health coverage scheme by Feb end



Cow Bill debate see subtle sarcasm to passionate arguments



Ramya turns social media teacher for Youth Cong workers

- Muslims opposing Ram temple must go to Pak: UP Shia Waqf board chief
- Mehbooba says she can accept going to hell to save Kashmir

**DH** DECCAN HERALD GET APP

TOP STORIES NATION CITY BUDGET 2018

### National health scheme to cost govt Rs 12K cr a year



The Union government is likely to pay an annual premium of less than Rs 1,200 per family for the ambitious national health protection scheme, for which approximately Rs 12,000 crore...



Bandh called off after High Court terms it illegal

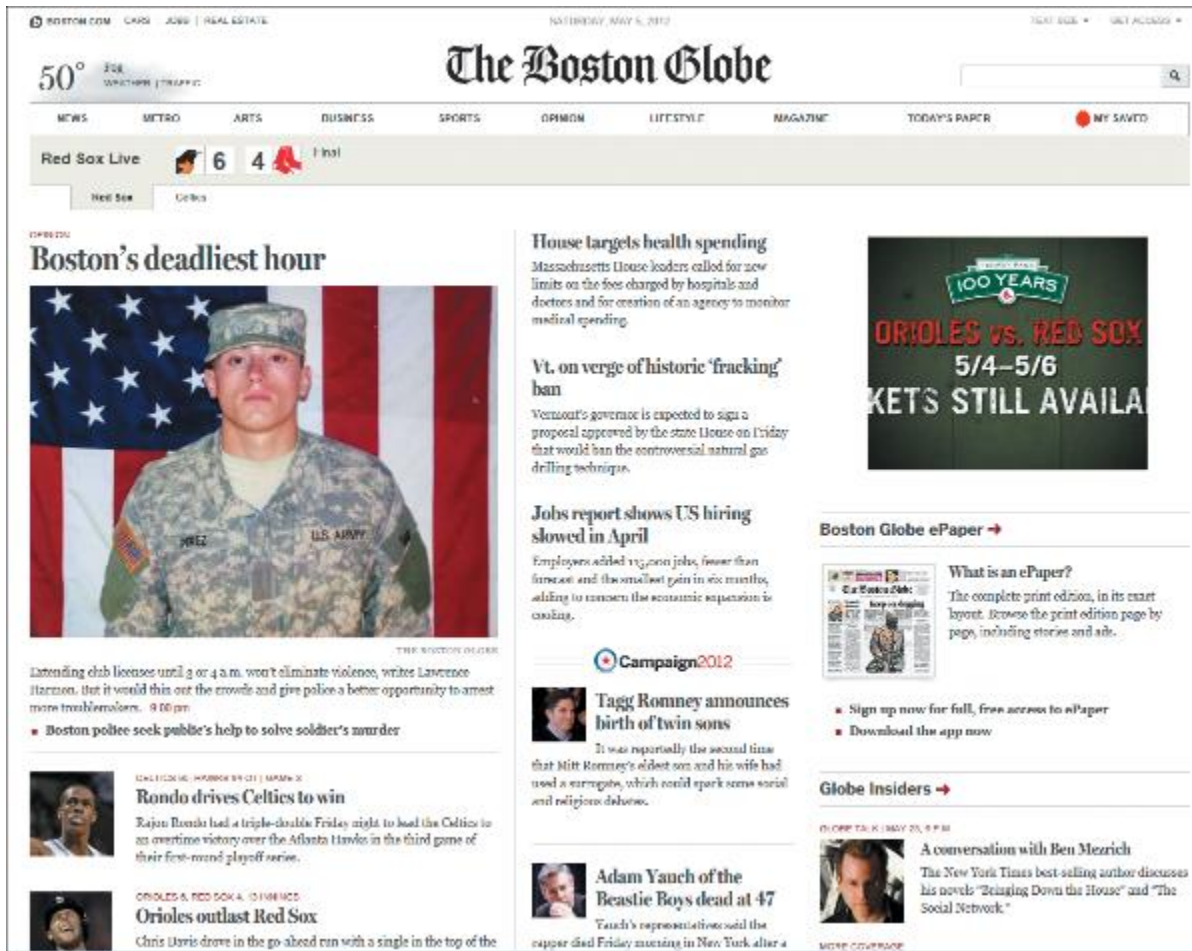
# Responsive design

innovate

achieve

lead

## Example: Boston Globe News



This is how  
the display  
looks on  
desktop



# Responsive design

innovate

achieve

lead

## Example: Boston Globe News



B



C

This is how  
the display  
looks on  
mobile

Adjusted  
vertically

# Responsive design



Single website for laptop & mobile & tablet

**Principle:** Adapt rendering depending on screen sizes & orientation



Ref: Wikipedia



# Responsive design



Ref: Wikipedia

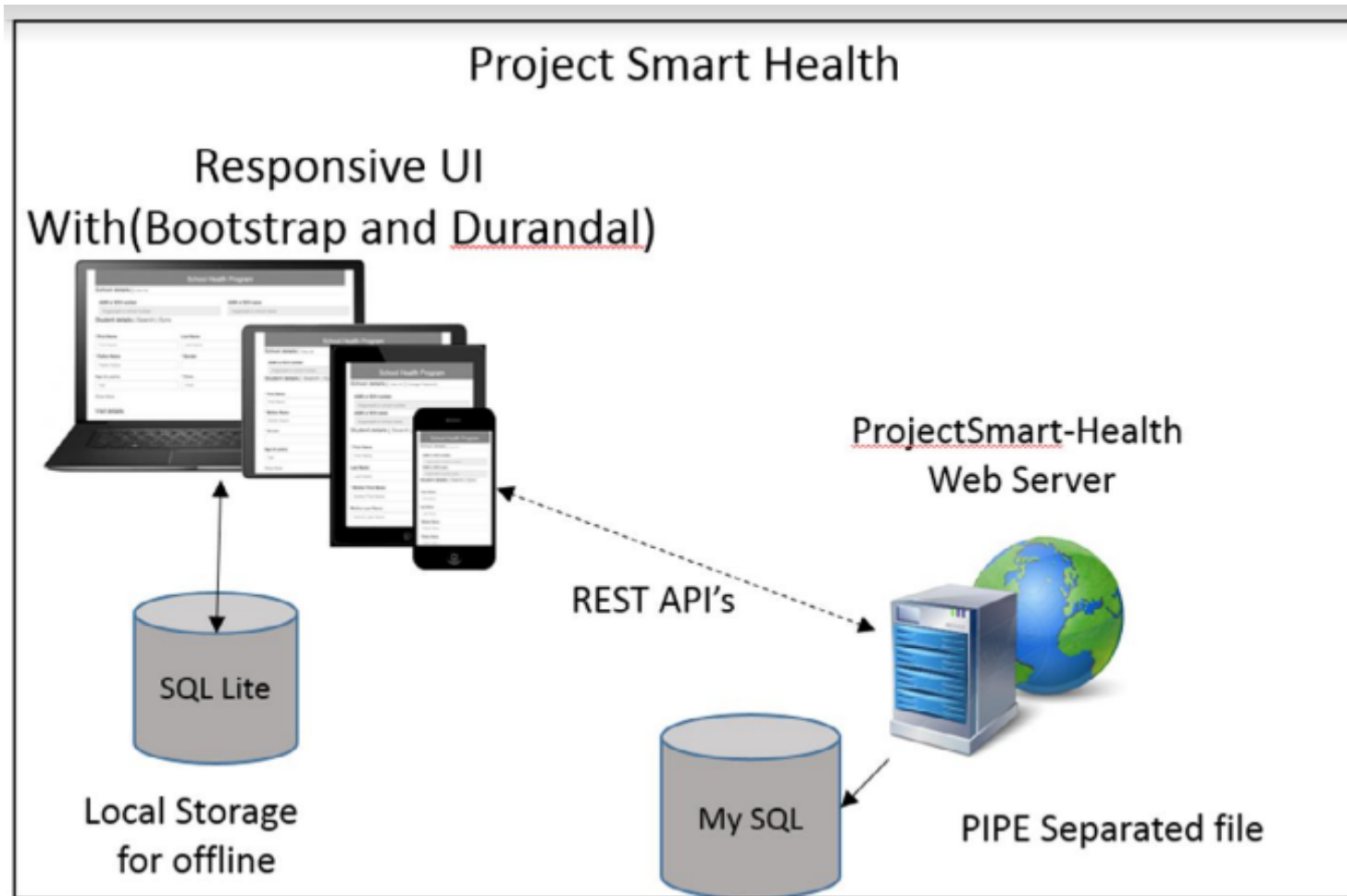


## Flexi grids

- Divide a screen into multiple columns
- Assign HTML elements to one or more columns
- Choose a different layout depending on screen size

# Store locally, Sync later

## In case of intermittent connectivity



Doctors enter patient data in mobile, which gets synced with server later

# Mobile Application Architecture

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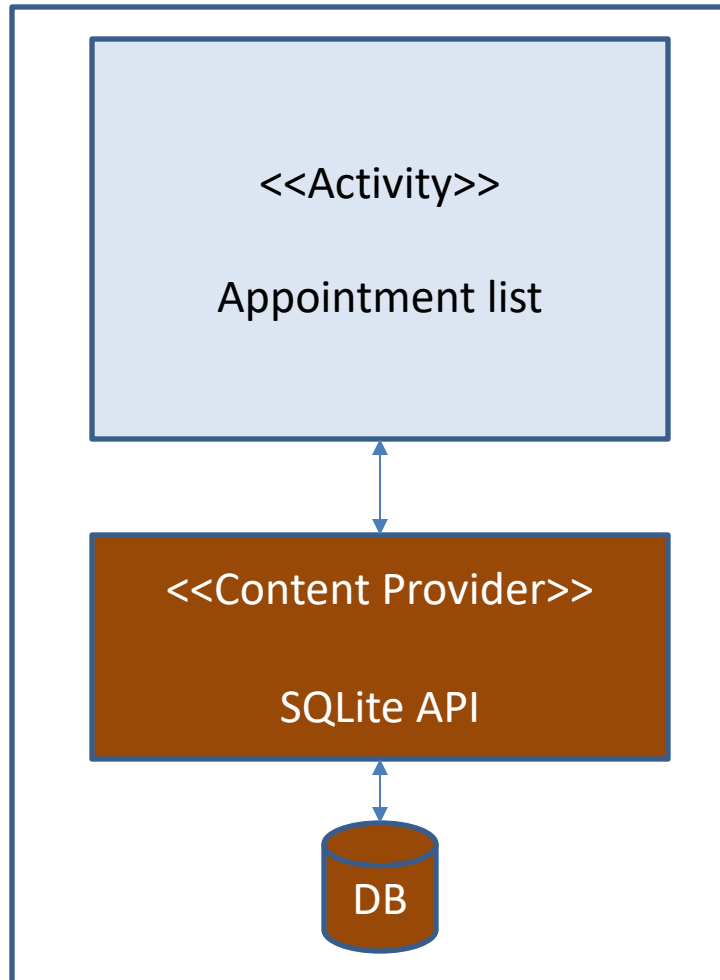
## Android application architecture

4 types of components

- Activity (UI)
  - Service (background process) - ex. playing music, download
  - Content provider (Storage) - ex. SQLite, files,
  - Broadcast receiver (Acts on events received from OS and other apps) - Ex arrival of SMS
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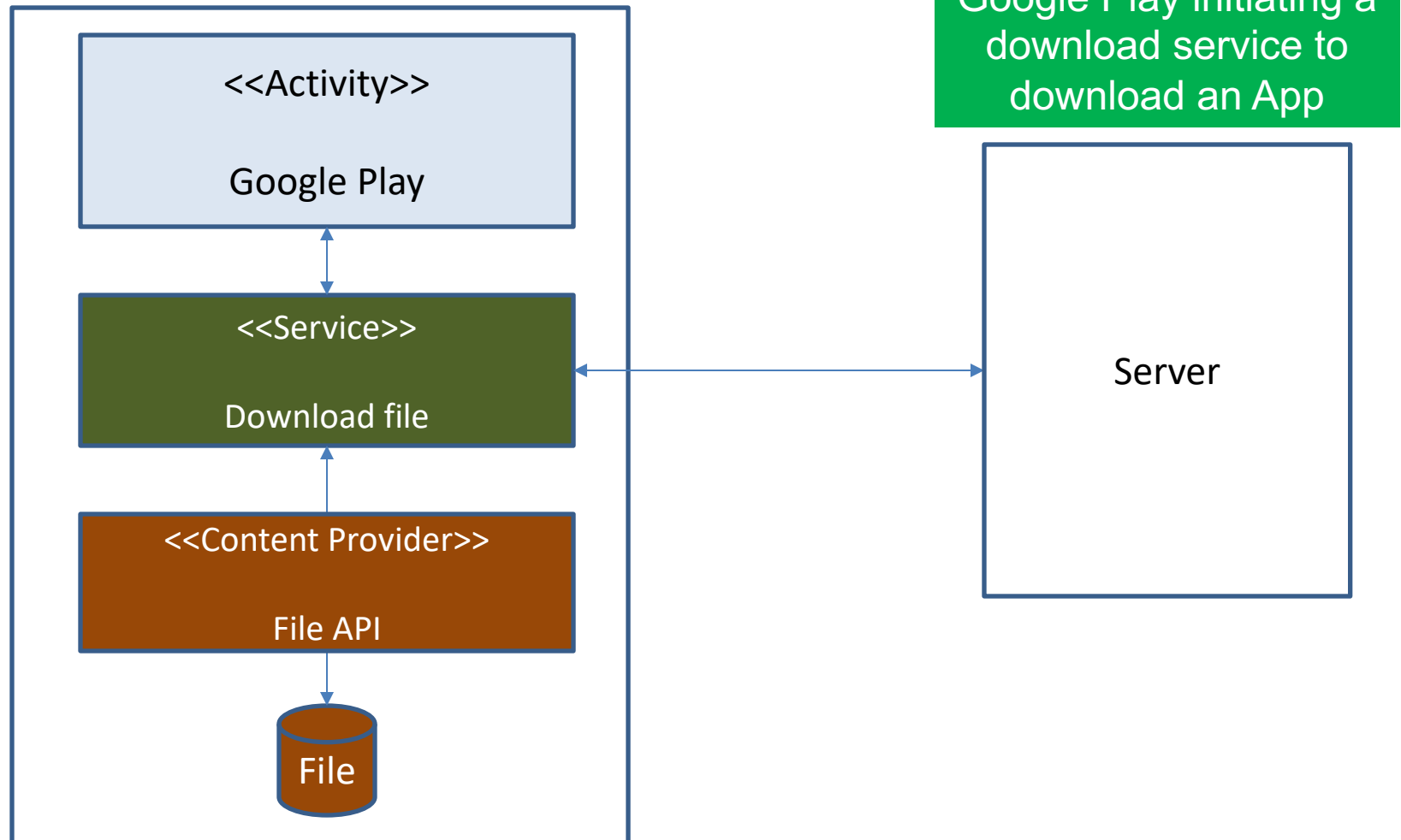
# Examples of components

# Activity & Content providers

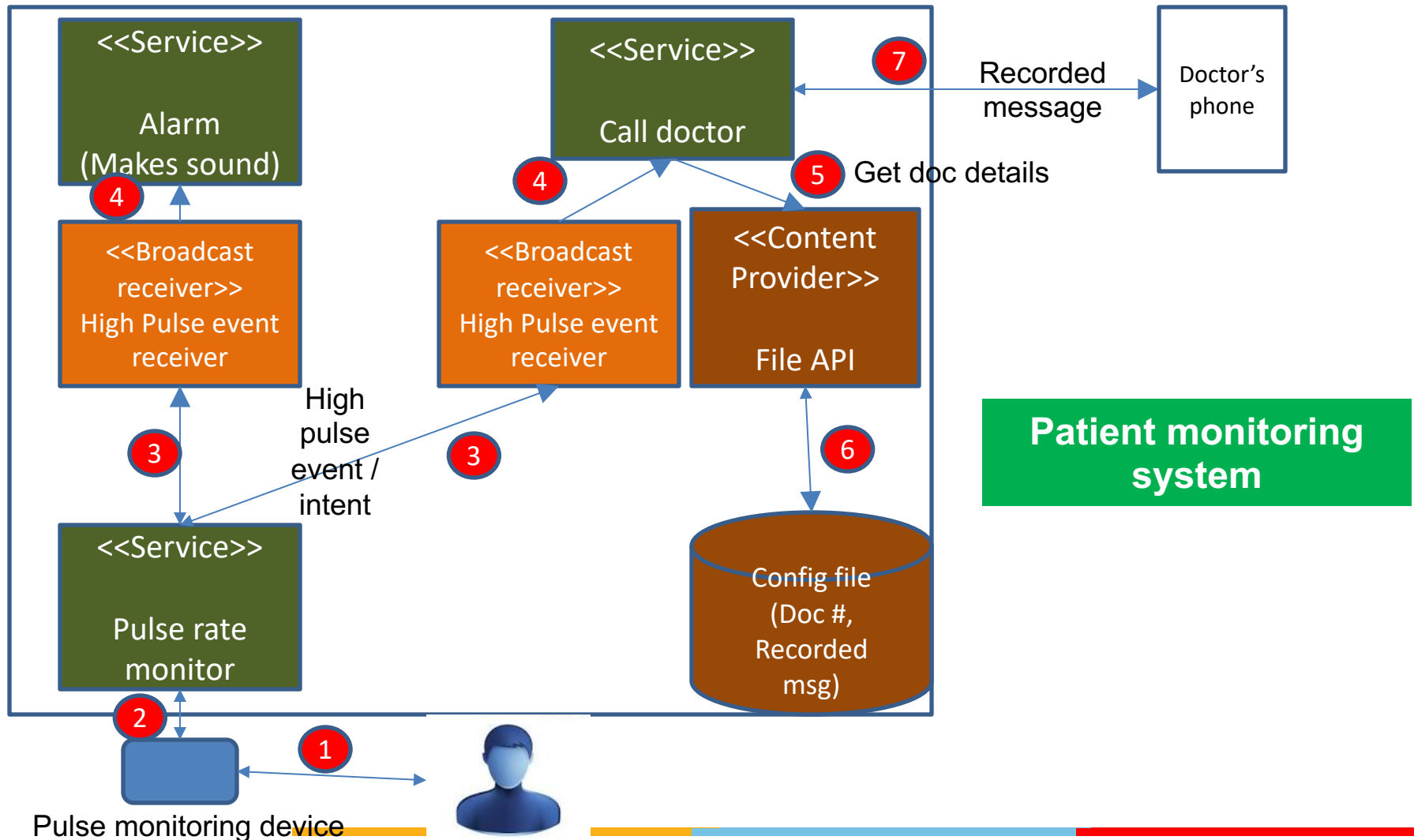


**Personal Calendar  
App**

# (Background) Service



# Broadcast receiver (Event handlers)



# Exercise: Mobile app components

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Give examples of mobile app components in **Uber app**.

UI

Screen to book a cab

Broadcast receiver

Receive location of cab from backend server and provide to UI for display

Service

Provide cab location to backend server after journey starts

Database

Configuration file containing user data

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# Exercise



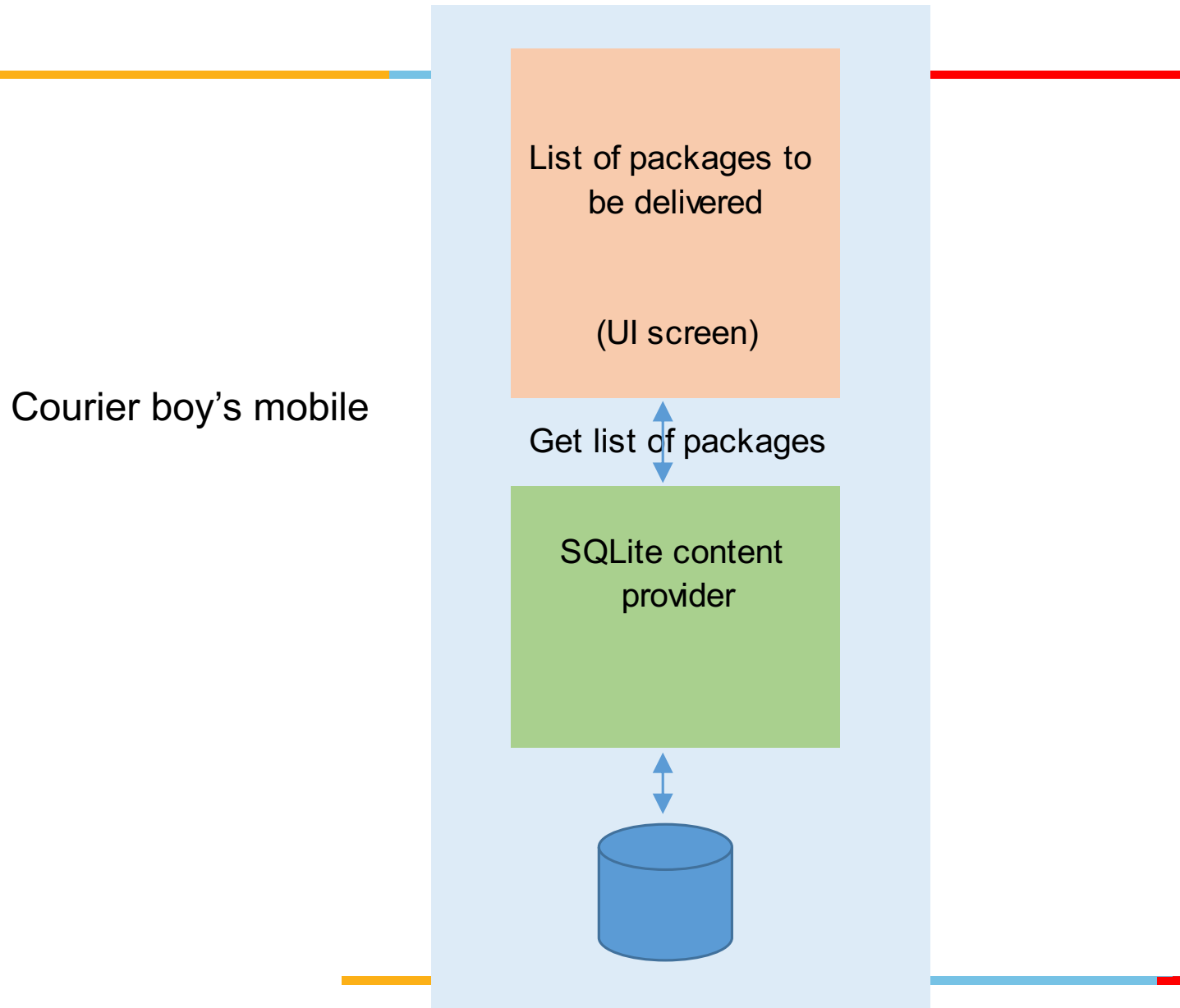
Consider a mobile app carried by the courier delivery boy.

The app should support the following functions:

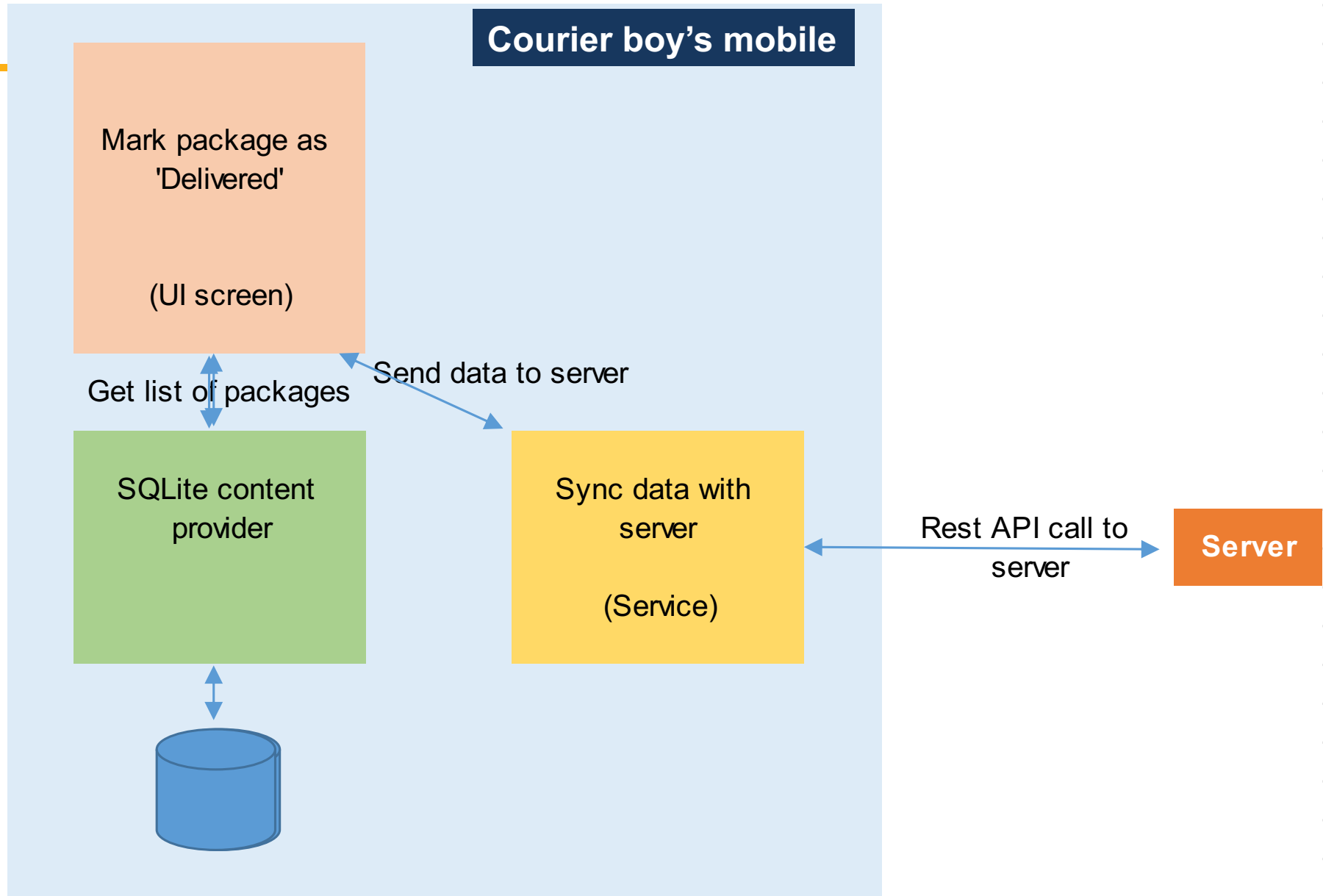
- a) View courier packages to be delivered
- b) Mark a package as delivered.
- c) Upon this event, the app should send information to central server

Identify the components of a mobile app & its inter-connections and draw an appropriate software architecture diagram

a) View courier packages to be delivered



b) Mark a package as delivered. Upon this event, the app sends information to central server



# Review questions



## Mobile apps

1. What is a cross platform mobile app?
2. If connectivity is poor, how do we ensure consistency between data in mobile phone and backend server?
3. What is 'Broadcast receiver' in an Android app?