Mobile Application Development

Chapter Two: Factors in Developing Mobile Applications

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Contents

Mobile Software Engineering

- Mobile Software Engineering: is a process of creating software product that is intended to be used by people while they are mobile.
- Mobile application development: is the set of processes and procedures involved in writing software for small, wireless computing devices, such as smart-phones and other hand-held devices.
- Factors that influence mobile app development process
- Distribution Channel
  - As a developer, you must first identify which platform best supports your grand idea.
  - Although the Google's Play Store and Apple's App Store serve the same function, they have different guidelines→ strictly follow it
    - ⋆ Distribution channel features such as App. description and Image gallery arrangement play a great role in your app's user engagement.

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- Audience Research
  - For your idea to become successful, you must first conduct audience research.
  - Knowing your audience involves;
    - ★ Understanding the industry and
    - ★ Getting in-depth knowledge about the people that might use your apps.
  - Guess your users' tastes
  - Conduct surveys

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- App. Idea
  - Apps don't come out of thin air.
  - They start as brilliant ideas.
  - Unfortunately, not all ideas become great and successful once you turn them into an app.
  - Working on an app development project requires money, effort, and time.
  - You must first check if your design is unique and right.
  - Most of all, you must be able to differentiate your idea from the what's already available on the platforms.
  - It must also be able to resolve the weaknesses of the existing competitive apps.

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- App. Development Strategy
  - To properly execute your app idea, you must come with a plan.
  - In this case, you must have a solid app. development strategy.
  - A cohesive strategy answers all the questions you have towards the app. development process.
  - Example
    - ★ Perform deep market research & development process model
    - ★ Use cloud technology
    - ★ Data security mechanism
    - ★ Performance improvement mechanisms
    - ★ Focus on UI/UX
    - ★ Think about the upcoming new technologies
- UI/UX
  - User interface (UI) and user experience (UX) are part of what keeps users hooked on an app.
  - Successful apps are those that provide a hassle-free experience aside from serving its purpose.
  - Users prefer apps that are "handier" compared to those that require too much effort to operate.

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- Testing
  - Developing and designing your mobile app idea is only half of the job in your mobile app development journey.
  - You must do tests to ensure your design and application runs smoothly.
  - It's a way to secure that your mobile app has no exceptions and bugs.
  - If you launch your app without testing it, you can run into problems that can spark fires which are difficult to manage.
- Security
  - Security must be part of your app development process.
  - Users should not have to think of the threat of malware when they use your app.
  - You should leverage the security features of the device's OS.
  - You can keep the user's information safe through encryption.
  - You should also restrict your app's permissions to a minimum.
  - Always prioritize security to ensure your app isn't vulnerable to external threats.

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- Monitoring
  - You still have work to do after you publish your mobile app.
  - You must be hands-on with fixes, performance improvements, changes, and adding new features.
  - As a developer, you must track crashes and look at technical information which helps you to resolve the problems that the users might encounter.

Frameworks and Tools

- In the field of mobile applications development, we primarily develop apps and programs for the following most popular platforms:
  - iOS
  - Android

Android Development Frameworks

- Ionic
  - Very popular open-source mobile framework that was released in 2013.
  - It's also free
  - Ionic can be used to build and ship beautiful cross-platform hybrid & Progressive Web Apps easily.
  - It is cross-platform framework, which means that you can create apps and then customize them for Android, iOS, Windows, etc.
  - Ionic has documentation support with real-life examples.
- Xamarin
  - Xamarin is an extremely popular mobile framework (With over 1.4 million developers using it)
  - Acquired by Microsoft in 2016 and is currently a Microsoft subsidiary.
  - Apps built using Xamarin look and feel is native.
  - Xamarin can be used to write native Android, iOS and Windows apps with a C sharp codebase.
  - It is also popular framework with Microsoft Visual Studio IDE and can be used to create native apps with AutoComplete/ IntelliSense.

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- Adobe PhoneGap:
  - Open-source mobile application development framework that was purchased by Adobe Systems in 2011.
  - Its unique feature is that it can be used to build mobile applications using HTML5, CSS3, and JavaScript instead of using APIs for Android, iOS, or Windows Phone.
- React Native
  - Open-source mobile framework that was created by Facebook and released in 2015.
  - It provides support for various IDEs and mobile app development tools.
  - It is used by many companies such as Instagram, Tesla, Walmart, Baidu etc. to develop their mobile apps.

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- Flutter
  - Comparatively recent open-source development framework that was released by Google in 2017.
  - Flutter is Google's portable UI toolkit for building beautiful, natively-compiled applications for mobile, web, and desktop apps.
  - Written in the Dart programming language (Also developed by Google)
  - It is currently used by famous companies such as Alibaba, Tencent, Google.
- Titanium SDK
  - Open-source framework that was created by Appcelerator, Inc. and released in 2018.
  - It's quite popular and has been used in around 70, 000+ Mobile Applications till now.
  - The Titanium environment helps organizations get to market 60% faster and achieve a significant competitive advantage.

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- JQuery Mobile
  - Touch-Optimized Web Framework that was developed by the jQuery team and released in 2010.
  - It is based on HTML5 and can be used to create responsive web sites and apps that can be accessed using multiple devices such as smartphones, tablets, desktops etc.
  - "write less, do more"
  - Provides support for different operating systems such as Windows, Mac OS, Blackberry etc.
- Corona SDK
  - Developed by Corona Labs Inc. and released in 2009.
  - Great platform for creating apps for mobile and desktop systems.
  - Corona is incredibly fast.

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- Native Script
  - Open-source framework for creating native mobile apps that were developed by Progress and initially released in 2014.
  - It was developed using JavaScript/TypeScript
- Mobile Angular UI
  - Mobile Angular UI is a mobile UI framework that allows the creation of HTML5 hybrid mobile apps using a combination of Angular JS and Bootstrap.

Generic UI Development

- A good User Interface (UI) focuses on making user's interactions simple and efficient.
- User would appreciate a website with intuitive user interface that leads them towards their task in most engaging way.
- UI design focuses on thinking of a user, what they might need to do when they visit website/app and ensure that the interface has elements that are easy to access and understand.
- As a UI designer, you need to understand the goals, skills, preferences & tendencies of the user to make a better interface.
- The Generic User Interface (Generic UI, GUI) framework allows you to create UI screens using Java and XML.
- XML provides a declarative approach to the screen layout and reduces the amount of code which is required for building the user interface.

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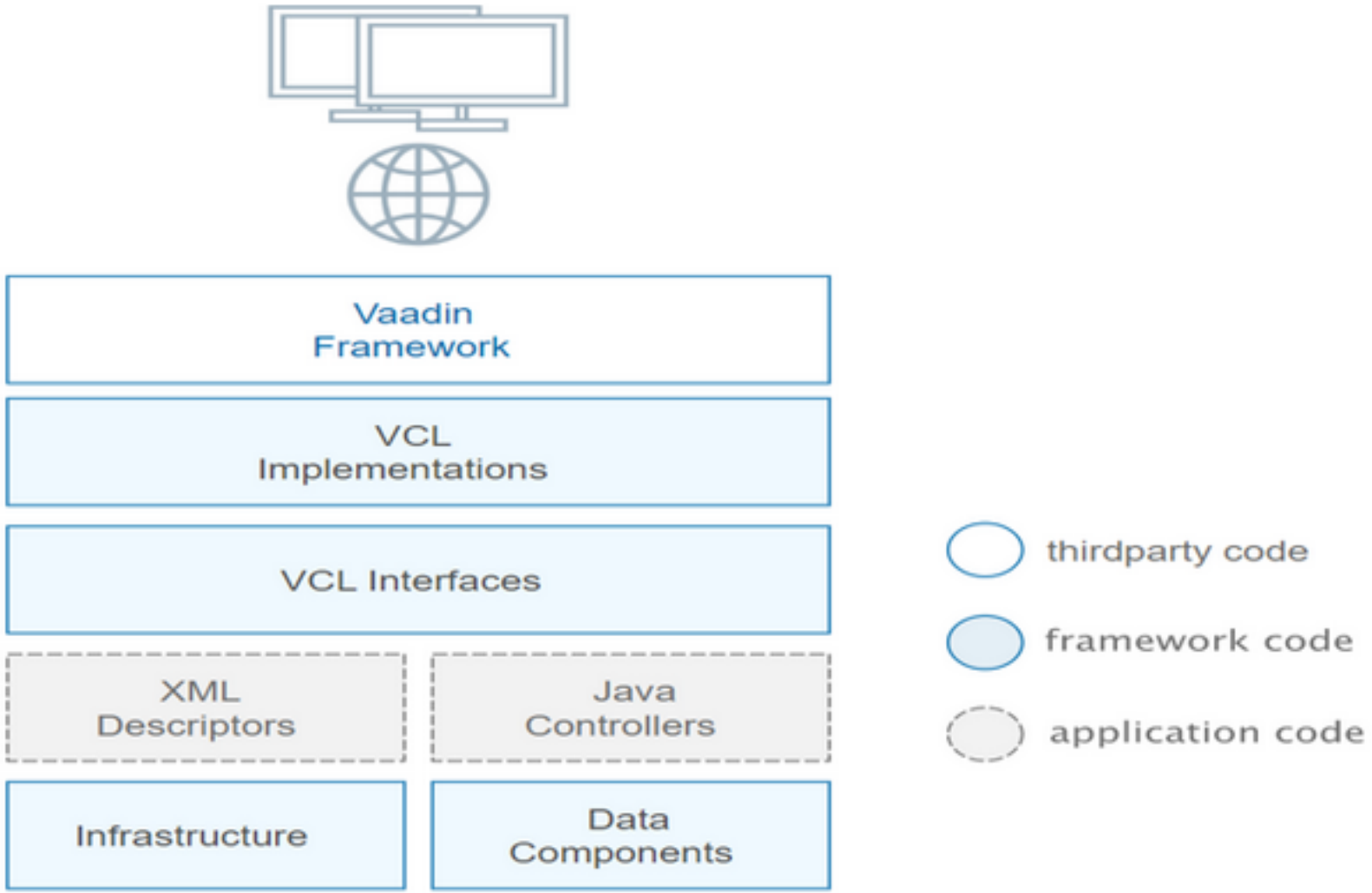
Vaadin
Framework
VCL
Implementations
VCL Interfaces
XML
Descriptors
Java
Controllers
Infrastructure
Data
Components
thirdparty code
framework code
application code

...Cont'd

- The application consist of the following parts:
  - Descriptors: XML files for declarative definition of the screen layout and data components.
  - Controllers: Java classes for handling events generated by the screen and its UI controls, and for programmatic manipulation with the screen components.
- The code of application screens interacts with visual component interfaces (VCL Interfaces).
- These interfaces are implemented using the Vaadin framework components → Java web app. development framework designed for the creation & maintenance of high quality web based UI.
- Visual Components Library (VCL): contains large set of ready-to-use components.
- Data Components: provide a unified interface for binding visual components to entities and for working with entities in screen controllers.
- Infrastructure: main application window.

Android User

- Android is the most popular operating system in the world, with over 2.5 billion active users spanning over 190 countries.
- Created by Andy Rubin as the open-source alternative to iPhone.
- Android quickly became the favorite operating system for most mobile manufacturers in the early 2010s.
- Industies such as Samsung, LG, Motorola and HTC are all launching phones running Android.
- It quickly became the most popular mobile OS, hitting billions active users by 2014.
- Android has added more users every year since its inception.

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Year	Active users
2012	0.5 billion
2013	0.7 billion
2014	1 billion
2015	1.4 billion
2016	1.7 billion
2017	2 billion
2018	2.3 billion
2019	2.5 billion
2020	2.8 billion

User Interface Design

- User interface (UI) design is the process designers use to build interfaces in software or computerized devices, focusing on looks or style.
- UI design refers to graphical user interfaces and other forms, e.g., voice-controlled interfaces.
- User interfaces are the access points where users interact with designs.
- They come in three formats:
  - Graphical user interfaces (GUIs): users interact with visual representations on digital control panels. e.g; Desktop UI
  - Voice-controlled interfaces (VUIs): users interact with these through their voices.
  - Smart assistants, e.g., Siri on iPhone and Alexa on Amazon devices are VUIs.
  - Gesture-based interfaces: users engage with 3D design spaces through bodily motions: e.g., in virtual reality (VR) games.

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- A user interface can be judged by three main properties:
  - Ease-of-use: how easy it is to use a certain user interface
  - Efficiency for inputting information: how fast information can be input through the user interface
  - Efficiency for outputting information: how fast the user can process the information coming back from the system

VUIs and Mobile Apps, Text-to-Speech Technique

- Voice user interfaces are user interfaces that are used through speech.
- Typical examples include smart speakers and voice assistants.
- VUIs employ speech recognition & natural language understanding technologies to transform user speech into text and meaning.
- Speech is a tool for enhancing traditional touch user interfaces into multi-modal voice user interfaces.
- Voice user interfaces are highly intuitive as they use the most natural way for us to communicate $\rightarrow$ through speech.
- They are significantly faster than typing to input information but slower than reading/ seeing to output information from the computer system back to the user.

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- The first voice user interfaces were IVR, Interactive Voice Response, systems that enabled users to interact with a phone system by using speech.
- Typically, IVRs recognized only digits, but nonetheless they were early voice user interfaces.

Type	Purpose	Output channel	Input channel	Use case
IVR	Specific	Voice	Voice	Narrow
Smart speakers	General	Voice	Voice	Wide
Voice command device (VCD)	Specific	Voice, display	Voice	Narrow
Multimodal voice UIs	Specific	All	All	Wide

Designing the Right UI

- In mobile app development, the UI and UX play the most significant roles in a mobile app's success.
- From the perspective of a designer, an exceptional UI for mobile app can only be ensured when you follow some tried and tested UI design principles.
- It is always advisable to stick to certain principles that are accepted by the designers' community.
- Such UIs not only attract the user, but also help in retaining them in the long run.

Designing the Right UI

Check the UI principles listed below:

- Consistency of the design layout: different sections of the app must be coherent in the design, and there must be a consistent flow of the layout throughout the app.
- Unambiguous interactive elements: design elements that are interactive in nature must be clearly depicted.
- Single trial learning experience: the term 'Intuitive' is often used to describe mobile apps when suggesting that they are very user-friendly.
- Users understand the flow of the app without remembering the operational steps.

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- Anticipate and answer users' queries: when a user's tap a button, they want to know whether the process has started and how long will it take.
- Gmail app is a good example of such a design, as it displays messages like "saved in draft, message sent, etc." to inform the users about the completion of the task.
- Layered user experience: UX should be layered.
- Layered here refers that all the features of an app must not be exposed at once.
- WhatsApp offers a good layered experience as users explore new features as they go deeper into the app.

Multi-channel and Multi-modal UI

- One of the breakthroughs, users can benefit is that automatic speech recognition (ASR) which has been improved significantly over the last few years.
- ASR now works good for dictation tasks.
- Some applications use speech input for form filling.
- However, filling each single slot by speech is often not more efficient than typing.
- The question arises: What are the important challenges in using speech as a “mainstream” modality?
- On the technical side one of the next challenges is therefore to realize conversational speech interaction in many applications.
- e,g; speech accent

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- Understanding the factors influencing users' modality choice will enable UI/UX designers to adapt applications to the advantage of the user, and to inform the user about extra possibilities of interaction.
- Difference
  - Multi-modal: there is partial integration between channels, as customers can interact via two or more channels simultaneously.
    - ★ Provide several distinct mechanisms for both input and output.
    - ★ It is not fully possible to shift a conversation across all channels and maintain context.
    - ★ You can perform tasks across multiple channels seamlessly.
  - Multi-channel: no integration between channels.
    - ★ One channel at a time for single task.

Android Features

- It is open-source.
- There are lots of mobile applications that can be developed by it.
- Provides beautiful UI
- Provides many interesting features like weather details, opening screen, location services.
- Provides support for messaging services → SMS & MMS,
- Web browser→ support many web browsers
- Storage → SQLite,
- Connectivity → GSM, CDMA, Bluetooth, Wi-Fi
- Media support → audio, video, graphics and image
- Multi-language support → localization

Android Versions, Code-name and API

Version	Code name	API Level
1.5	Cupcake	3
1.6	Donut	4
2.1	Eclair	7
2.2	Froyo	8
2.3	Gingerbread	9 and 10
3.1 and 3.3	Honeycomb	12 and 13
4.0	Ice Cream Sandwitch	15
4.1, 4.2 and 4.3	Jelly Bean	16, 17 and 18
4.4	KitKat	19
5.0	Lollipop	21
6.0	Marshmallow	23
7.0	Nougat	24-25
8.0	Oreo	26-27

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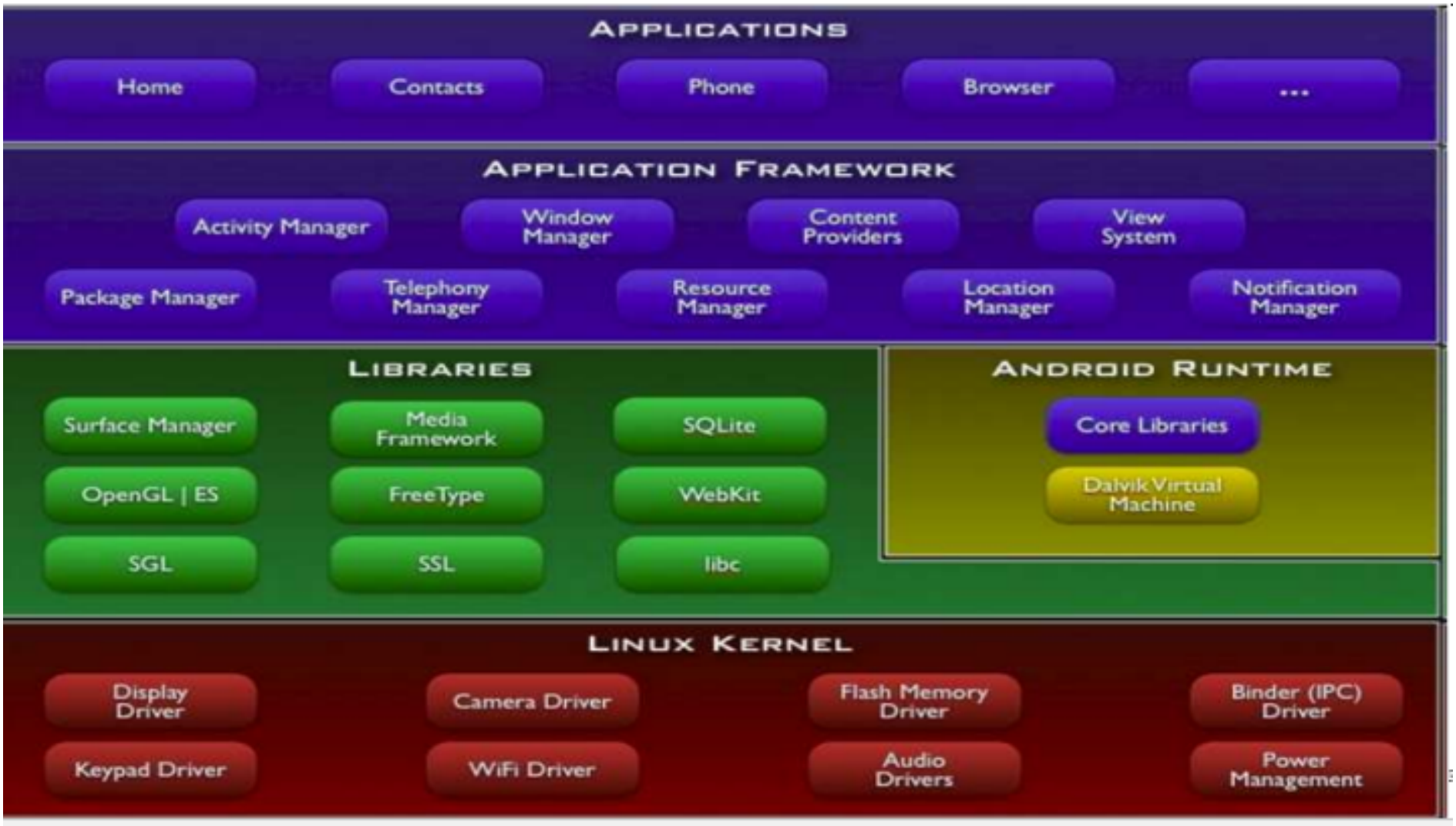
Version	Code name	API Level
9	Pie	28
10	Android10	29
11	Android11	30
12	Android12	31
12.1	Android12L	32

Android Architecture



Thank you!!!