



**SUDAN UNIVERSITY OF SCIENCE &
TECHNOLOGY
COLLEGE OF COMPUTER SCIENCE &
INFORMATION TECHNOLOGY**

HYBIRD MOBILE APPLICATIONS DEVELOPMENT IN CLOUD

**A THESIS SUBMITTED AS A PARTIAL REQUIREMENTS OF B.Sc.
(HONORS) DEGREE IN COMPUTER SYSTEMS AND NETWORKS**

OCTOBER 2017

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



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الآية

هُوَ الَّذِي جَعَلَ الشَّمْسَ ضِيَاءً وَالْقَمَرَ نُورًا وَقَدَرَهُ مَنَازِلَ لِتَعْلَمُوا عَدَدَ السِّنِينَ وَالْحِسَابَ مَا

خَلَقَ اللَّهُ ذَلِكَ إِلَّا بِالْحَقِّ يُفَصِّلُ الْآيَاتِ لِقَوْمٍ يَعْلَمُونَ ﴿٥٤﴾

يونس (٤-٥)

الحمد لله

اللهم لك الحمد والشكر في الأولى ولك الحمد والشكر في الآخرة ولك الحمد والشكر من قبل ولك الحمد والشكر من بعد وأثناء الليل وأطراف النهار وفي كل حين ودائماً وأبداً.
الحمد لله الذي بعزته وجلاله تتم الصالحات، يا ربّ لك الحمد كما ينبغي لجلال وجهك ولعظيم سلطانك، اللهم أغفر لنا وأرحمنا وأرض عنا، وتقبّل منا وأدخلنا الجنة ونجنا من النار، وأصلح لنا شأننا كله، اللهم أحسن عاقبتنا في الأمور كلّها، وأجرنا من خزي الدنيا وعذاب الآخرة، اللهم يا من أظهر الجميل وستر القبيح، يا من لا يؤاخذ بالجريرة ولا يهتك الستر، يا عظيم العفو وحسن التجاوز.

الحمدُ للعدلِ الحكيمِ الباري *** المُستعانِ الواحدِ القهارِ
ذي الحكمةِ البالغةِ العليّةِ *** والحُجّةِ الدامغةِ القويّةِ
قضى بِكونِ ما يشاءُ فابْرَمَهُ *** وشرّعَ الشرعَ لنا وأحْكَمَهُ
بأنّه الربُّ بلا مُنارَعه *** وهُوَ الإلهُ الحقُّ لا يدبُّ معه
فبالقضا نؤمنُ والتألهُ *** بشرِعه فالخلقُ والأمرُ لهُ
وكُلُّها يصدرُ عن مشيئتهِ *** وعلمه وعدله وحكمتهُ
أحْكَمَ كلَّ الخلقِ بالإتقانِ *** والأمرِ بالعدلِ والإحسانِ
أحمدُهُ والحمدُ من إنعامِهِ *** إذْ ذكّرنا إِيَّاهُ من إلهامِهِ

Dedication

For all of my teachers, no words can describe our love and gratitude for the years of caring, love, and tenderness; for your patience, generosity, and boundless thoughtfulness. Your imprint lives forever in the hearts and minds of all of us.

No influence is as powerful as that of the mother. Our mothers are our root, our foundation. They planted the seed that we base our life on, the belief that the ability to achieve starts in your mind, to our mothers.

Thanks for acting like a kid when I was a kid, acting like a friend when I needed a friend, and acting like a parent when I needed one. You are the best men we ever knew.

The price of success is hard work, dedication to the work at hand, and the determination that whether we win or lose, we have applied the best of ourselves to the task at hand, I am thanking Be Smart crew for this adventure, this awesome journey full of learning new things.

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Abstract

Mobile Programming is now one of the essential skills that the developer need to build in his carrier, because of the wide spread of Mobile devices between users and the need to this type of applications in this time. But the developer face the problem of multi-platforms of the Mobile since there is so many Operating Systems for them now and so there is different programming language associated with them, Even the development companies face the problem of building the same application for different platforms because they need to build the same application many times.

Hybrid application development is one of the ways of building cross-platform application; it is a way of building mobile application using web technologies.

Hybrid Mobile Application Development using Cloud Environment is a system runs on the cloud that provides Editor to write the code with many feature associated to it and a Drag and Drop interface to help in building the application interface. In addition, supply the user with the main plugins needed to interact with the Mobile hardware capabilities. The Environment is supporting the two main Mobile platforms –Android and iOS- the developer can build his application to the selected platform and get the output file immediately.

All the process of building the application is running on the server side so all the developer is ever needs is the web browser and the internet connection.

المستخلص

أصبحت برمجة الهواتف النقالة من اهم المهارات التي يجب علي المطور إكتسابها، نظراً للإنتشار الهائل للهواتف النقالة و اعتماد معظم المستخدمين علي البرامج المكتوبة عليه. لكن تواجه المطور مشاكل عدة في اكتساب هذه المهارة منها تعدد انظمة التشغيل وتعدد لغات البرمجة المستخدمة في التطوير لكل نظام علي حدى، كما ايضا تواجه الشركات مشاكل في تطوير نفس البرنامج لأنظمة التشغيل المختلفة فتطوير نفس الخصائص في برنامج لنظامي تشغيل مختلفين قد يمثل تكلفة تتمثل في كتابة نفس البرنامج مرتين. كما تمثل ايضا مواصفات الحاسوب مشكلة رئيسية في تطوير مثل هذه البرامج حيث تحتاج الي برمجيات تستهلك مساحات واسعة من الذاكرة والمعالج. البرمجة الهجينة هي طريقة لكتابة برامج الهواتف النقالة بإستخدام لغة الويب، البرنامج الهجين يعمل علي اكثر من نظام تشغيل للهواتف النقالة.

بيئة تطوير البرامج الهجينة علي الحوسبة السحابية هو نظام يوفر للمطور محرر نصوص لكتابة البرامج بإستخدام تقنيات الويب، واجهة جر ولصق (Drag and Drop) بسيطة تساعد علي تصميم الواجهات و يحتوي علي ال (plugins) اللازمة للتفاعل مع المكونات الفيزيائية للهاتف النقال. يُمكن النظام المطورين من تطوير برامج لنظامي التشغيل (Android and iOS) من نفس الكود , كما يمكن المطور الوصول إلي البيئة عن طريق استخدام متصفحات الانترنت. تتم جميع العمليات علي المخدم أي ان المطور يحتاج فقط الي متصفح و وصول إلي الانترنت.

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List of abbreviation

#	Term	Description
13	API	Application Programming Interface
2	APK	Android Package Kit
3	IPA	IPhone Application Archive
4	JSON	JavaScript Object Notation
5	SAAS	Software as a Service
6	iOS	iPhone Operating System
7	AJAX	Asynchronous JavaScript and XML AJAX
8	XML	eXtensible Markup Language
9	HTML	Hypertext Markup Language
10	CSS	Cascading Style Sheets
11	UML	Unified Modeling Language
12	HTTP	Hypertext Transfer Protocol
13	OS	Operating System
14	DnD	Drag and Drop
15	SDK	Software Development Kit
16	SQL	Structured Query Language
17	GB	Giga Byte
18	RAM	Random Access Memory
19	VM	Virtual Machine
20	IaaS	Infrastructure as a Service
21	PaaS	Platform as a Service
22	CLI	Command-Line Interface

23	MVC	Model View Controller
24	PC	Personal Computer
25	SPA	Single Page Applications
26	UI	User interface
27	DNS	Domain Name System
28	SMTP	Simple Mail Transfer Protocol
29	NPM	Node package manager
30	VCS	Version Control System
31	JDK	Java Development Kit
32	PHP	Hypertext Preprocessor
33	ORDBMS	Object-Relational Database Management System
34	IDE	Integrated Development Environment
35	ODBC	Open Database Connectivity

1 CHAPTER ONE

INTRODUCTION

1.1 Introduction

One of the most important skills a developer can learn is mobile development. Now a day there are many smartphone platforms: Android, iOS, Ubuntu, BlackBerry, and Windows phone, it would be nice if there was a way to reuse the skills and knowledge you already have as a web developer to create mobile applications, and using those skills to develop mobile applications that runs in more than one mobile platform.

Therefor developing cross-platform mobile applications has become very important because of the growing number of mobile operating systems and platforms. In addition, the developers must first setup different environments for each platform and they need expertise with each OS, not only OSs but also different programming languages are required for different mobile platforms. Moreover, developers need to be familiar with the features supported by each mobile platform.

This is where Cordova enters the picture. Cordova is an open source framework that lets you convert HTML, JavaScript, and CSS into a native application that can run on iOS, Android, and other mobiles platform, Cordova provides access to hardware features like the camera and accelerometer [1].

Using Cordova in cloud with an IDE provides the developer with all he needs to build the cross-platform application on the Cloud. Developer now can use the web-based UI to interact with the environment and get the output file. From clients view the environment represent Software as a services because its provide services over the Internet, so there is no need to install any software to the end user's devices. [2].

1.2 Problem statements:

The current system deal with the following problems :

1. Wasting the resources in one application, that is because you need to have developer for each individual platform.
2. Developing equivalent experiences in native code be significantly more complex and time consuming.
3. Having a multiple codebase application increase the long term maintenance costs.
4. The software's used to develop the mobile application consume memory space, for example 12 GB spare is barely enough for the OS to create and utilize swap space , Remember that when installing Xcode, as an example, you need:
 - space for the download/package
 - space to unpack
 - space to install [3]
5. A computer device with high hardware capabilities is required ,for example the least hardware needed to run android studio is 3 GB RAM minimum, 8 GB RAM recommended; plus 1 GB for the Android Emulator [4]

1.3 Suggest solution:

Cloud Environment that contains an IDE and a simple Drag and Drop interface, a developers use only HTML5, CSS3 and Javascript to develop a mobile applications. No need to install any software, just the browser and internet connection are required. The environment takes the codes and gives the result application to the intended platform.

1.4 Objective

The research aim to :

1. Develop and compile in the same place.
2. Provide cross-platform application.
3. Save the burden of learning new language for web developers.
4. Reduce costing of building application run in multiple platforms.
5. Access the code online from anywhere and anytime.

1.5 Importance:

We need only web languages for build hybrid application, one code is running in several mobile platforms and the limitation of hardware capabilities is no longer a big problem.

1.6 The scope

Build android and iOS applications, web page that manages your Project files, Web based IDE that enable you to write web application codes, simple Drag and drop interface, download executable files, Import project and export project.

1.7 Research Methodology

After requirement analysis, the project had been built using the client server architecture, specifically the software as a services model. The server is prepared to execute Cordova Command Lines and the database installed in it.

Then the Docker had been prepared to make the environment suitable for each platform (Android, IOS). PostgreSQL database used to store the data of the developer,

administrator and the projects paths. The project files are all stored in the server file system.

1.8 Outlines

Chapter two containing the previous studies and the tools and technique used in this study.

Chapter Three is discussing the analysis of the system the tables of the database.

Chapter Four is explaining the system interfaces and how the environment deployed.

Chapter Five is about what we get and what we hope the student who comes after as to get from this study.

2 CHAPTER TWO
LITERATURE REVIEW, TOOLS AND
TECHNIQUES

2.1 Introduction

This part of the research is about related current applications and their history; it also presents techniques and tools that used to develop this application.

2.2 Literature Review

2.2.1 Cloud computing

The National Institute of Standards and Technology definitions for Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. [5]

In such an environment, service provider has two main roles:

1. Infrastructure provider who manage cloud platforms and lease resources according to usage based pricing model.
2. Service provider is the one who rent resources from one or many Infrastructure providers to serve the end users.

From the layered model perspective, the cloud computing architecture divided into four main layers:

- 1 - Hardware layer which is responsible for managing the physical resources of the cloud, including physical servers, routers, switches, power and cooling systems.

2 - Infrastructure layer that creates a pool of storage and computing resources by partitioning the physical resources using virtualization technologies

3 - Platform layer consists of operating systems and application frameworks. The purpose of the platform layer is to minimize the burden of deploying applications directly into VM container

4 - Application layer consists of the actual cloud applications

Cloud applications are different from other applications; cloud applications can leverage the automatic-scaling feature to achieve better performance, availability and lower operating cost.

Based on the categories described in the above section we can say that every layer implemented as a service to the layer above, so cloud services grouped into three categories: infrastructure as a service (IaaS), platform as a service (PaaS) and -the one we are about in this study software as a service (SaaS). [6]

2.2.2 Software as a service (SaaS)

The service provided at this model for user is to use the provider's applications running on a cloud infrastructure. These applications are accessible for all clients from different devices using client interface, such as a web browser or a program interface.

Although client is not allowed to control the underlying cloud infrastructure including network, servers, operating system, storage, or even individual application capabilities, with the possible exception of limited user specific application configuration settings. [7]

2.2.3 Mobile operating systems of today

There are currently two major OS for mobile devices around the world, Apple iOS, Google's Android. All these OS support different IDEs and utilizes different programming languages and Software Development Kits (SDK) for developing native applications to their OS. [8]

2.2.3.1 Android

Android is an open source mobile operating system, which originally created by Android Inc, a company acquired by Google in 2005.

Android Operating System based on the Linux Kernel and consisting of an applications written in Java running on top of the application frameworks and the Dalvik Virtual Machine and they uses libraries written in C/C++. [8]

2.2.3.2 iOS

iOS is an OS developed by Apple for Apple-manufactured devices, it was originally called the iPhone OS but was renamed to iOS in 2010. iOS is a stripped-down version of the OS X operating system.

2.2.3.3 Hybrid application Development

The hybrid application development is a combination of web application and native application; they have built using technologies like HTML5, CSS3 and JavaScript but embedded in a native container by using a framework like Apache Cordova. Since the web application is placed in native container the application will need to be installed on the actual device.

The container is simply a WebView that covers the entire screen of the device and device capabilities are accessible in the WebView through an abstraction layer from the framework used to generate the native container. [8]

2.3 Previous studies

This study is not the first in the field there are so many other studies with advantages and of course with disadvantages, here is a view description of these studies.

2.3.1 Ionic

Ionic framework is an open-sourced software development kit that is used in order to create hybrid mobile applications. It is built using AngularJS and Apache Cordova. Ionic provides users with all the components, tools and functionalities that are used in native mobile development -software development kits (SDKs’).

Developers can design their applications using tools and sample codes provided by the Ionic framework documentation and help website.

AngularJS is used in developing single-page applications and Apache Cordova lets developers build mobile applications using Javascript, CSS and HTML instead of using platform specific APIs’ [9].

Ionic has amazing tools like CLI for Ionic and Ionic Creator which use the drag and drop interface, but in order to use the CLI you need to install both Ionic and Apache Cordova, also Ionic has no editor so if you want to build an application you have to install your own editor. [10] [11]

2.3.2 Appcelerator Titanium:

Titanium is an open source mobile development application framework that provides an environment to create or build native cross-platform mobile application using HTML, CSS and JavaScript.

Titanium provides optional MVC framework built on top of Titanium called Alloy use for separating the app user interface, business logic and data models. On the other hand Titanium require installing Titanium SDK Titanium APIs and Studio(Eclipse-based IDE) in your computer device to start using Titanium and writing native apps which mean you need a computer with good performance. [12]

2.3.3 Monaca

Monaca is a development environment for building hybrid mobile applications for smartphone and tablet applications provided by Asial Corporation.

Monaca allows developers to develop their applications in two ways. First complete cloud development environment gives developers flexibility without need to install any additional software in their computers, Second the cloud-synced local development enables users to use their owns environment but enjoy features like device live-sync and remote build.

Monaca provides development tools for developers such as browser-based cloud IDE as a service. Monaca Localkit is a local environment development that allows developers to develop their applications on local PC. Monaca CLI provides command line interface to use Monaca cloud and Monaca Debugger is an application that allows developers to test and debug applications on real devices without building the applications during the development.

Disadvantages considered was Monaca have no drag and drop interface and the platform is not free to use. [13]

2.3.4 Phonegap build

Phonegap is an open source development framework for building cross-platform application with HTML5, CSS3 and Javascript.

The Phonegap applications are able to interact with mobile device hardware and build and packaged like native applications, meaning that they can be distributed through the Apple app store or the Android Market.

Phonegap build is a server where the Phonegap application can be compiled in the cloud, no need to download the Phonegap SDK when you want to use the Phonegap build platform but you have to write the code in your own editor. [14]

Looking for the Phonegap Build from other side it's not completely free, the platform only free for one open sources applications and there is limitation in the size of these application. Free private application offerable to upload file sizes of up to 50MB, paid users will be able to upload a max of 100MB and Creative Cloud subscribers can upload up to a massive 1GB. [15]

2.4 Tools and Techniques

2.4.1 Angular js

AngularJS is an extensible and exciting new JavaScript MVC framework developed by Google for building well-designed, structured and interactive single-

page applications (SPA). It lays strong emphasis on Testing and Development best practices such as templating and declarative bi-directional data binding.

2.4.2 Node.js

Node.js is an open source platform that allows developers to build fast and scalable network applications using JavaScript programming language. Node.js is built on top of V8, a modern JavaScript virtual machine that powers Google's Chrome web browser.

Node.js can handle multiple concurrent network connections with little overhead, making it ideal for data-intensive, real-time applications.

With Node.js developers can build many kinds of networked applications. Such as web application service, HTTP proxy, DNS server, SMTP server, and other process that that is network intensive, with JavaScript, that makes writing networked applications fun and easy. In addition, Node.js makes it easy for developers to use third-party open source modules. By using Node Package Manager (NPM), you can easily install, manage, and use any modules that are contained in a big repository.

[16]

2.4.3 JQuery

Is a JavaScript framework, that simplifying the way of writing a large complex JavaScript code in few simple lines, which means a lot of common tasks that require many lines of JavaScript code to accomplish, and wraps them into methods that you can call with a single line of code throw jquery. [17]

2.4.4 Bootstrap

Bootstrap is one of the open source Front-end framework. Developed by the team at Twitter, It is a combination of HTML, CSS, and JavaScript code. That enable users to get beautiful design to their web pages in simple way and in a few minutes, by a many of the beautiful design components that introduced by the framework.

Bootstrap also gives you the ability to easily create responsive designs, which means creating web sites which automatically adjust themselves to look good on all devices, from small phones to large desktops.

Moreover, the good thing about Bootstrap is compatible with all modern browsers (Chrome, Firefox, Safari, Opera, and Internet Explorer). [18]

2.4.5 JsTree

JsTree is completely free, open source jquery plugin that provides interactive trees.

JsTree is easily extendable, theme able and configurable it supports HTML & JSON data sources, AJAX loading for nodes. And we use it to list user project files that stored in server as tree in the web page to enable the user to interactive, updating and modifying his files. [19]

2.4.6 Git

The Version Control System is software that helps software developers to work together and maintain a complete history of their work, there is tow type of the VCS Centralized and Distributed Version Control System.

Here comes the GIT in the picture, GIT is a Distributed Version Control System. GIT client check out the latest snapshot of the directory and mirror the repository and if the server goes down the data from any client can be copied back to the server to restore it and because GIT does not rely on central server clients can perform operations of line.

GIT is an open source, fast and small, perform implicit backup, secure and need no powerful hardware. [20].

2.4.7 Ace

Stand for Ajax.org Cloud9 Editor, open source embeddable code editor written in JavaScript. It matches the features and performance of native editors such as eclipse and Sublime. Moreover, Ace can be easily embedded in any web page and JavaScript application. In addition, Ace editor is used and modify it is features and add our new feature to make our own editor. [21]

2.4.8 Django

Django is free open source Python Web framework written in Python that support fast development. The framework was built by Adrian Holovaty and Simon Willison, the framework began created in 2003 and first released in July 2005, it takes care of much of Web development problems, and save you from reinvent the wheel in writing your app. Django was designed to help developers to develop your app faster and easier, and avoid many security errors. [22]

2.4.9 Java

Java is an object-oriented, high-level language developed by Sun Microsystems. The language was developed by a small team (Green Team), initiated in 1991. And

originally called OAK, and in 1995 sun change the language name from OAK to java, in 2009 the ownership of java is changed from Sun Microsystems to Oracle with Solaris, java derives syntax from C and C++, but it has little low-level facilities, to compile java code, debug, and run applications Needed to JDK that contains the software and tools. [23]

2.4.10 Python

Python is high-level, object-oriented programming language for general-purpose programming, released in 1991 and created by Guido van Rossum.

Python is interpreted language; the edit-test-debug cycle in python is incredibly quick. And debugging programs is easy: a bad input not cause an any fault, the features of Python language is a dynamic type system and automatic memory management and supports multiple programming paradigms, Python interpreters are support many operating systems, allowing Python code to run on different systems. [24]

2.4.11 Pycharm-community-2017.1

Python IDE for developers used to implements codes in client and server sides.

2.4.12 CORDOVA

Is a free, open source framework for building cross-platform native applications using HTML5. The initial benefit of Apache Cordova is the native capabilities above beyond what is normally supported in the browser. At the time all of this started, the best way to build a mobile application that worked on multiple mobile devices was to build it using HTML. Unfortunately for mobile developers, though, many mobile applications needed to do more than HTML and web browsers could support, and

building a web application that interacted with the device camera or the local contacts application simply was not possible. To get around this limitation, Cordova implements a suite of APIs that extend native device capabilities (such as the camera, accelerometer, Contacts, application and so on) to a web application running within the native container.

When many developers first learn about this technology, they immediately assume that the web application is somehow translated into the native language for each supported mobile device platform—converted into Objective-C for iOS or Java for Android, for example—but that’s not what’s happening here. Some mobile application frameworks take that approach, but for Cordova, the web application simply runs unmodified within a native application shell. [25]

2.4.13 Docker

Docker is an open source platform for developing, packaging and running distributed applications. Docker allows developers and system admins to build and ship and run applications on any platform such as a PC, virtual machine, data center or the cloud. Docker provides code, the runtime libraries, and the system tools and libraries required by applications, Docker makes the processes of the application development and execution very easy by packaging all the required software for an application including the applications dependencies into a single software unit called a Docker image that can run on any platform and environment.

Docker images unique and different from virtual machine images, because Docker images run within the same Operating system kernel so it lightweight, while each virtual machine image runs on a separate guest OS so it heavyweight. With Docker software can runs in an isolated environment called a Docker container that

includes its own filesystem and environment variables, so this container are isolated from each other and from the underlying OS.

Those containers contain all requirements and files needed to run the application software. Docker containers maybe linked with each other. So that the environment variables and software from another Docker container available to a Docker container. [26]

2.4.14 Android SDK

The Android SDK (software development kit) is a set of development tools used to develop applications for Android platform The Android SDK includes sample projects with source code, development tools, an emulator, debugger, documentations, and required libraries to build Android applications. Applications written using the Java programming language and run on a custom virtual machine designed for embedded use that runs on top of a Linux kernel. [26]

2.4.15 VMware

Is a software product that allows the user to create one or more separate environments, each simulating its own set of hardware (CPU, hard disk, memory, network controllers, and other components) and its own software. Ideally, each virtual machine should behave like a fully independent computer with its own operating system. VMware released VMware Fusion 1.0 on August 6, 2007. [27]

2.4.16 Unified Modeling Language (UML)

The UML is a general-purpose, developmental modeling language in the field of software engineering, intended to provide visual templates and create an integrated visual design for your project by producing an initial code for the final program.

2.4.16.1 Sequence diagram

Use to describe the interaction among objects or components of a system in terms of an exchange of messages, events, and actions over time.

2.4.16.2 Activity diagram

An activity diagram visually presents a series of actions or flow of control in a system.

2.4.16.3 Usecase

Use Case diagrams used in describing the functionality of a system that should or can perform by some system or systems (subject) [28]

2.4.16.3 Enterprise

Is an extensive UML analysis and design tool for UML. Cover and handle software development from requirements gathering through to the analysis stages, design models, testing and maintenance.

2.4.17 JavaScript Object Notation

It was developed by Douglas Crockford , Is data interchange format, derived from Javascript programming language, it is not programming language but it is a data exchange format, it is also known as data interchange standard.

JSON is text based, lightweight, and a human readable format for data exchange between both browser and server and even server to server, JSON is language independent, and support for the JSON data format is available in all popular languages, for example python, PHP, Java, Ruby, C++ and C#.

Data can be structured as a collection of name/value pairs or an ordered list of values. The implementations of the two structures are represented in the forms of the object and array. [30]

2.4.18 PostgreSQL

PostgreSQL is an Object-Relational Database Management System (ORDBMS) that has been developed at the University of California at Berkeley (1977– 1985). They began development of PostgreSQL's ancestor relational database known as Ingres. Relational Technologies/Ingres Corporation turned Ingres into a commercial product. [31]

PostgreSQL is widely considered the most advanced open source database system in the world. It provides many features including

- PostgreSQL is an open source project.
- Support Object-relational.
- Transaction processing PostgreSQL protects data and coordinates multiple concurrent users through full transaction processing.
- PostgreSQL supports referential integrity, which is used to insure the validity of a database's data.
- Multiple-client APIs PostgreSQL supports the development of client applications in many languages by providing an interface to PostgreSQL from C, C++, Python, Perl, PHP, Ruby, and ODBC.
- Unique data types PostgreSQL provides a variety of data types.
- Extensibility one of the most important features of PostgreSQL is that it can be extended.
- PostgreSQL uses a process-per-user client/server architecture.

- The PostgreSQL community provides active support to users of PostgreSQL via a number of mailing lists. [32]

2.5 Conclusion

All of the previous studies are great and led to a great improvement in the field, but in each study we notice shortens somehow, the major disadvantages was whether the software is not free or you need to download the software to develop your application.

A simple peace of description in this chapter that took the technologies used to accomplish this project. In addition, literature survey about the same field. In the next chapter the system analysis and functions executed is explained

3 CHAPTER THREE

System analysis and Design

3.1 Introduction

This chapter explains and illustrates the design of the system and database using the unified modeling language (UML) diagrams.

3.2 System description

The environment is for developer who wants to develop Hybrid applications. Environment is consisting of different part. Dashboard interface, IDE and a Drag and Drop interface with the ability of building the applications for both platforms provided by the system.

3.3 System Environment

The system built on the Software as a Service model. Data storage, building the application, uploading project and creating new one are all at the server side of the system, and the interfaces that provided for client are on the client side of the system.

3.4 System Functions

The developer can perform several functions in this environment.

3.4.1 Create project

By entering the project name, The system execute Cordova command lines in the server to create Cordova project in Developer directory with the specified project name, System also store project name and project directory path in system database.

3.4.2 Show project details

System view project details without need to open project in IDE by read project config.xml information and updated database if project information changed in the IDE.

3.4.3 Open project in IDE

The main function of the system is to allow developers to edit their project online, Developer select project that want to open it in the IDE, System use selected project id and load all project files and all information of project needed by Developer to the IDE.

3.4.4 Add platform

Developer need to add a platform to his project in order to be able to build it into the output file. Therefore, the system is providing the choice of two main platforms the android and the iOS. When the Developer selects a platform, the Cordova add platform command will executed on the server adding the specified platform to the project.

3.4.5 Build projects

When the developer select a platform (android, iOS), The system execute command lines to build to produce executable file (APK, IPA) of platform specified and save output of execution process in project log file.

3.4.6 Add and remove plugin

When developer chose a plugin to add to his project the system execute Cordova command that add the plugin, and the same is for the removal operation.

3.4.7 Import project

Developer can edit his project source code anywhere and upload project as compressed zip file, system extracted zip project in user temp directory, if project is Cordova based project then system move project in user directory and save project information in system database.

3.4.8 Export project

Developer select a project to be export, system uses project directory path to compress project and store output file in user temp directory, then user can download project zip file.

3.4.9 Delete project

User can delete project for any reason, user select project to be delete, system delete project information in database and project directory.

3.4.10 Authentications

Client can register in the environment and log in to the account after verifying the used email and edit his profile information and do all the forgotten password process.

3.4.11 Download product

After user build project user can download executable file of selected platform.

3.4.12 Simple Drag and Drop

Developer can make a code using the drag and drop interface.

3.4.13 Phone view

Develop is able to view the application in the phone even before building the application to the specified platform by showing the result in the phone view.

3.4.14 Developer general interaction with IDE Editor

Developer can perform several functions on the IDE like copy, past, find and replace, create file, delete file, create and delete folder, drag and drop opened taps, copy and cut files and folders. Each one of these functions described in the sequence diagrams below.

3.5 Analysis using UML diagrams:

The following section is the UML diagrams illustrating the system functions.

3.5.1 Use case diagram

Is a list of steps the system needs to follow to reach goal.

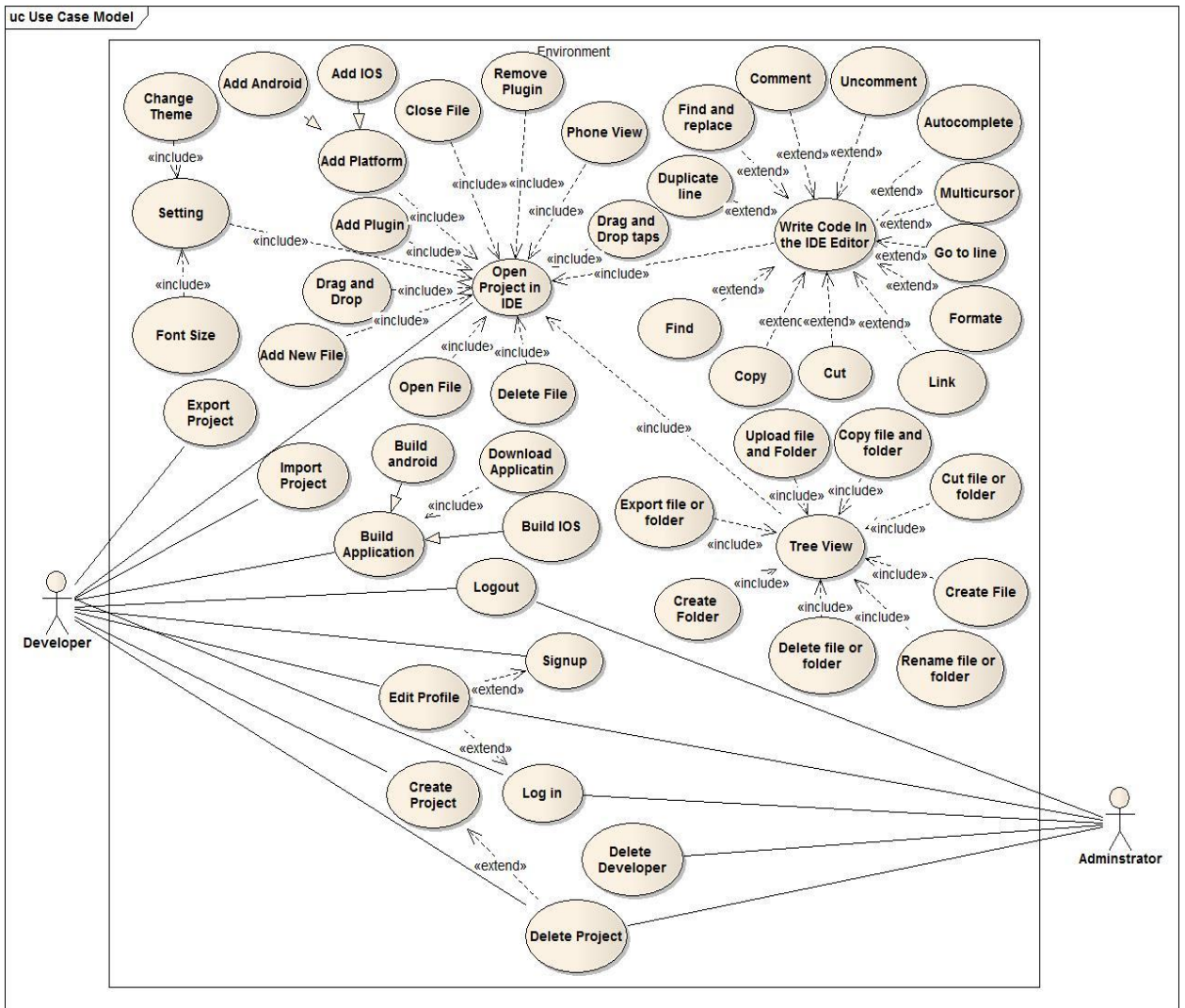


Figure 3-1 (use case)

3.5.2 Activity diagram

An activity diagram visually presents a series of actions or flow of control in a system.

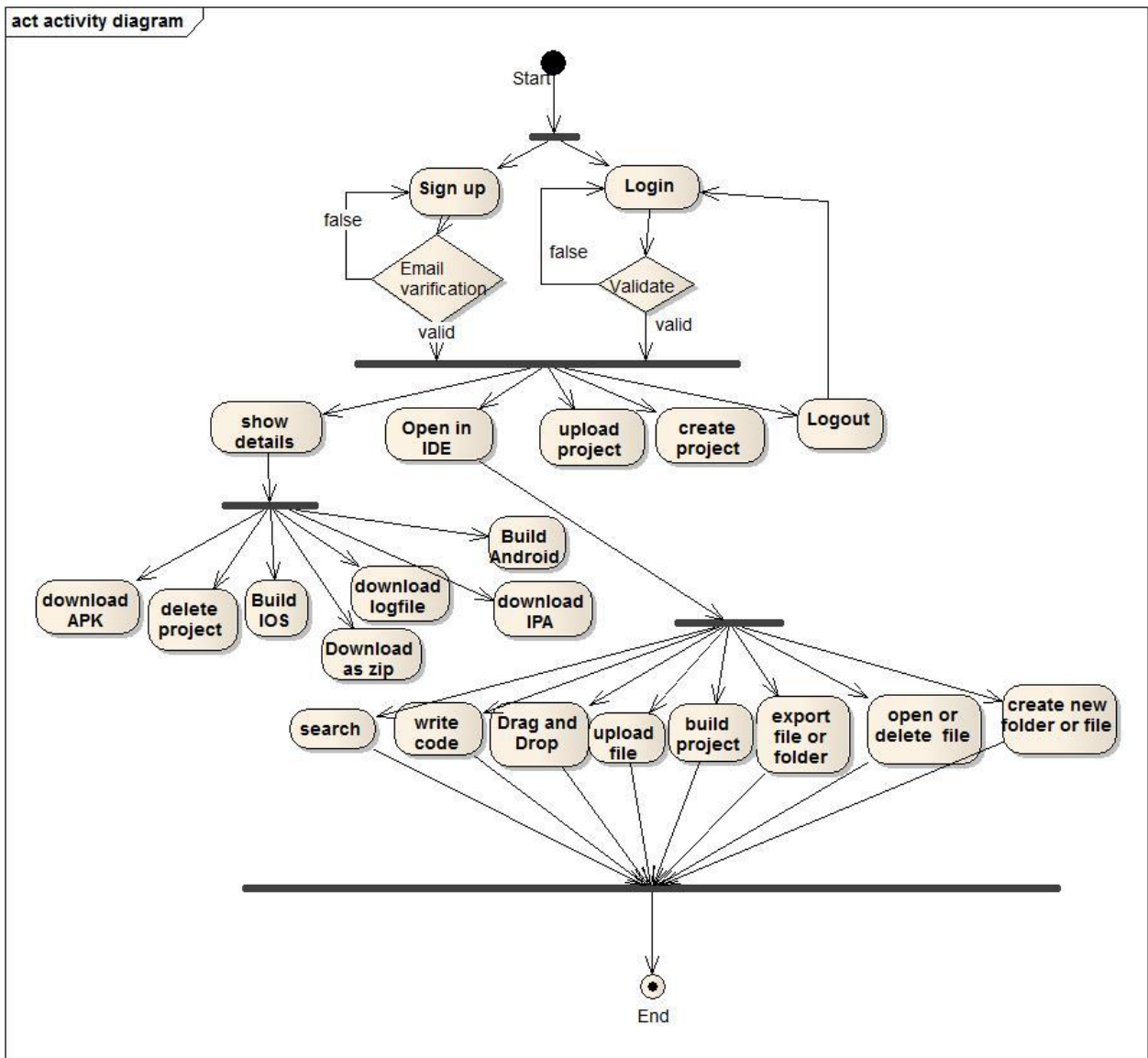


Figure 3-2 (activity diagram)

3.5.3 Sequence diagram

Show the logical interaction between different part of the system and the flow of data and messages between objects and the various system components. Horizontal components in Figures describe the shared objects in the system.

Vertical components describe the ordered exchanged messages depend on the order that is in the system

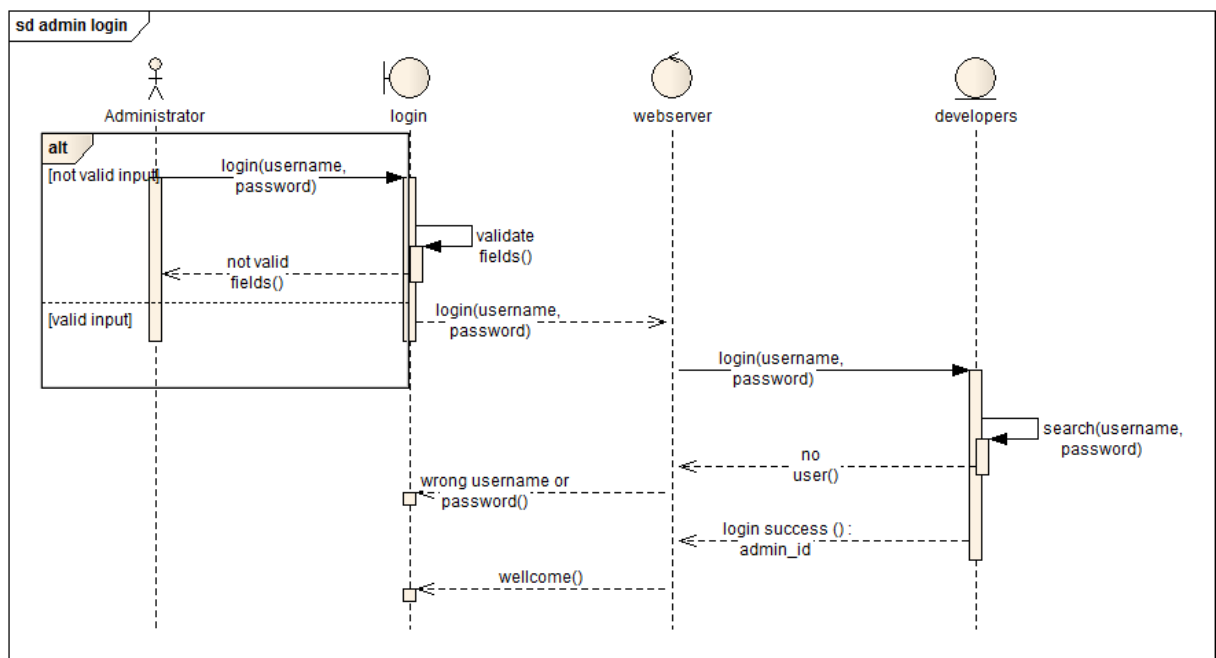


Figure 3-3 (Admin Login)

Admin Login:

The Administrator input is obviously is the username and the password, the client side login screen make sure that the entered data are valid then the webservice send the data to the database to check for matches. The output is the id of the administrator if found.

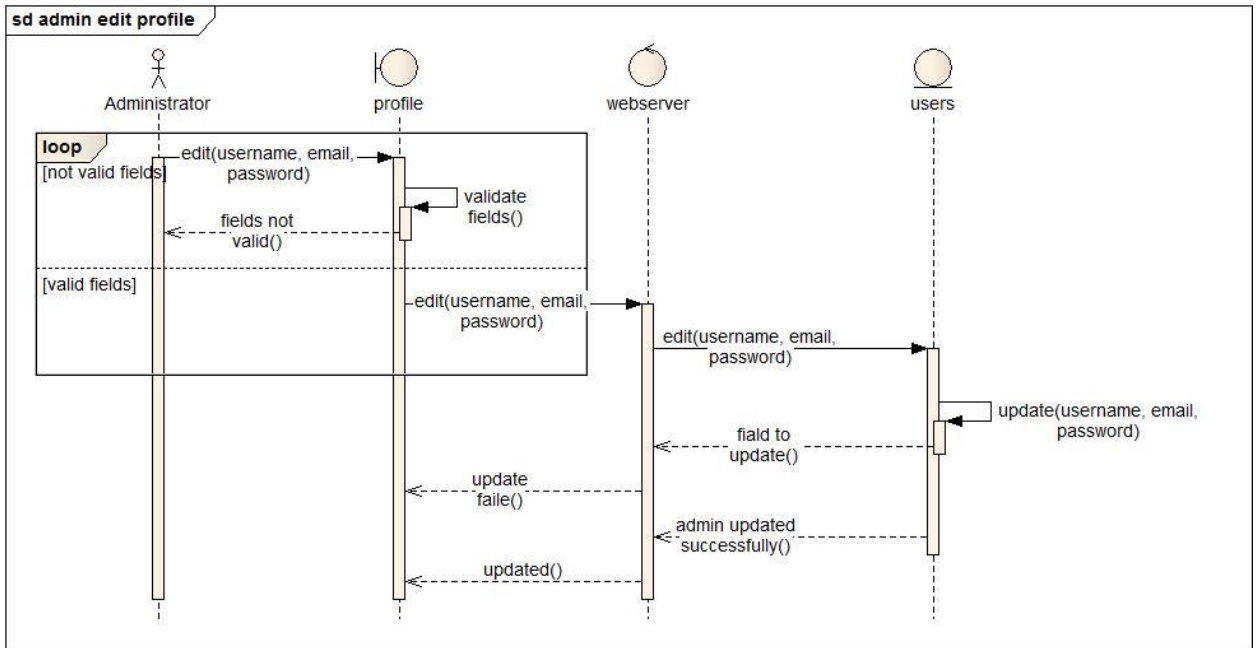


Figure 3-4 (Admin Edit Profile)

Admin edits profile:

The Administrator enter his username, email and password to the profile screen which is validate the data and send it to the server which is updating the admin profile data in database. The output of this process is a Boolean value that determines the success of the process.

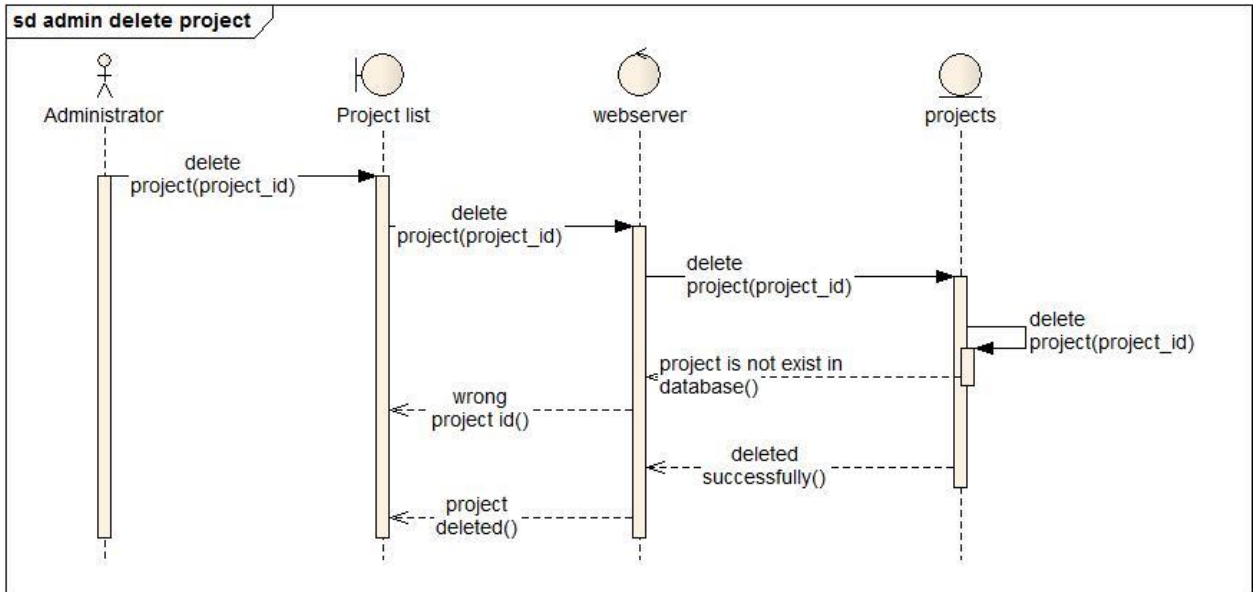


Figure 3-5 (Admin Delete Project)

Admin delete project:

The admin choose the project from the projects list, the list pass the id of the chosen project to the server that pass the id to the database that delete the project from the projects table. The output is a Boolean value for success or failure.

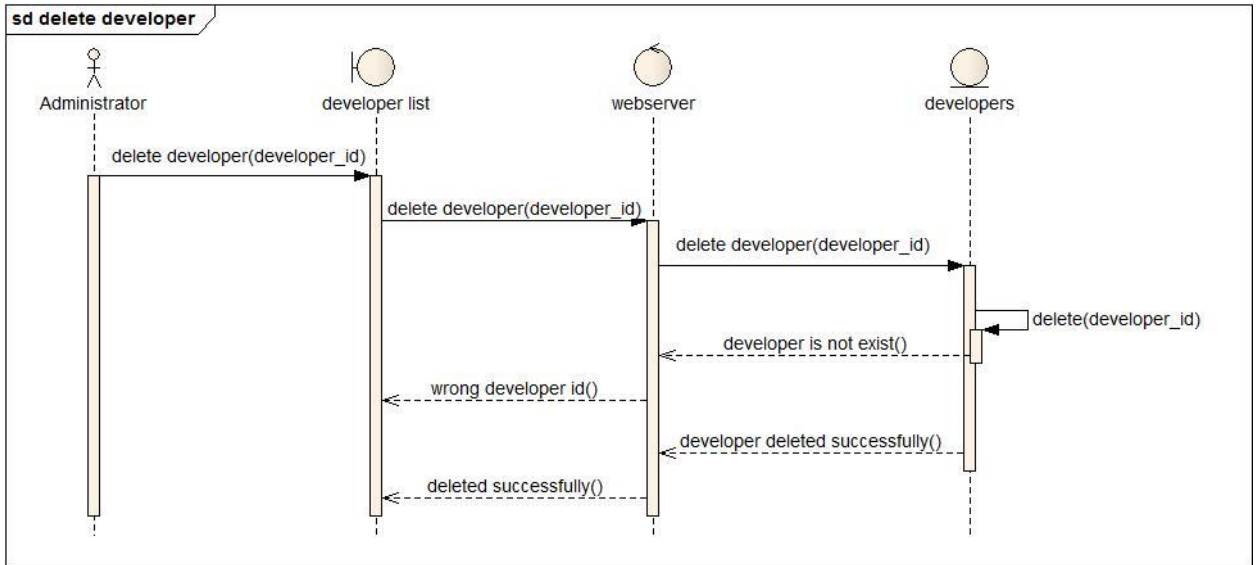


Figure 3-6 (Admin Delete developer)

Admin delete developer:

The admin choose a developer from the developer list then the id of the chosen developer sent to the server that sends the id to the database to delete the developer from the developers table. The output is a Boolean value that show if the process is successful or fail.

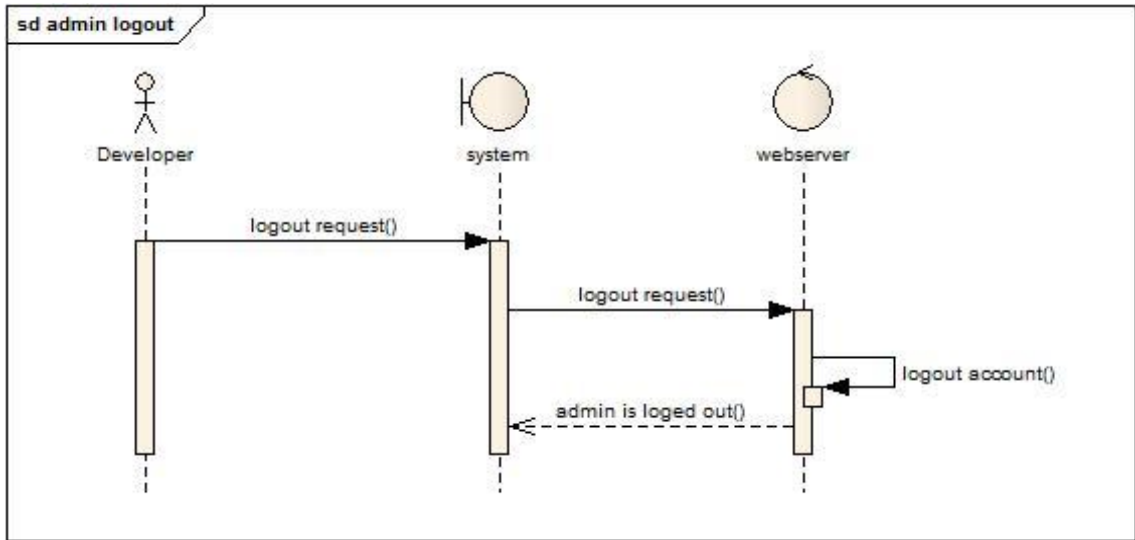


Figure 3-7 (Admin Logout)

Admin logout:

The admin chose to logout then the system perform the logout process.

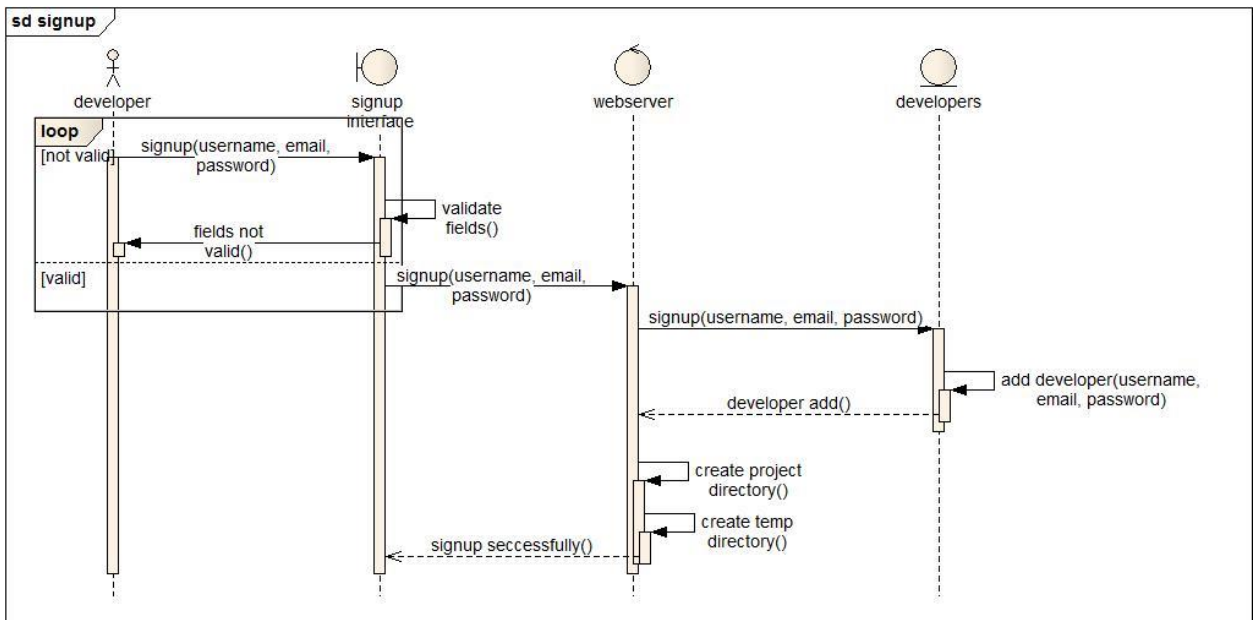


Figure 3-8 (Signup)

Signup:

The developer input is username, email and password. The signup screen is validating the input then sends it to the server that sends it to the database to save the new developer. The output is a Boolean value dedicated to the success of the process.

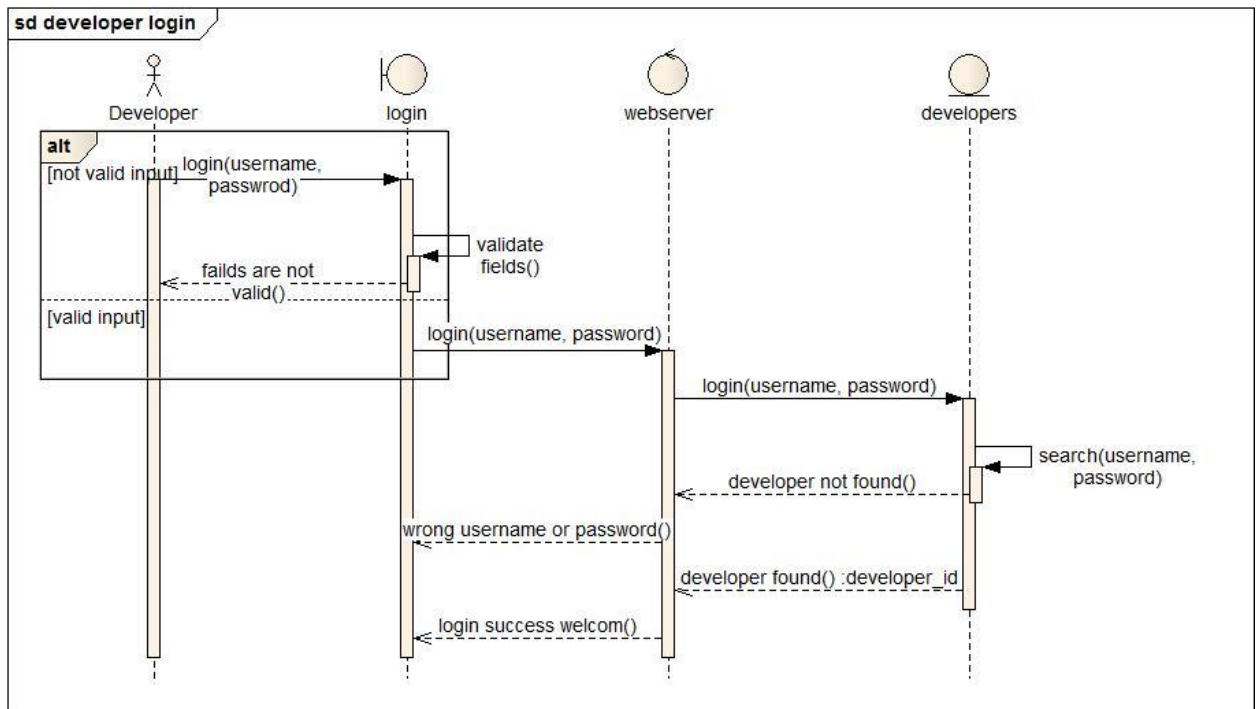


Figure 3-9 (Developer Login)

Developer Login:

The input is obviously is the username and the password, the client side login screen make sure that the entered data are valid then the webservice send the data to the database to check for matches. The output is the id of the developer if found.

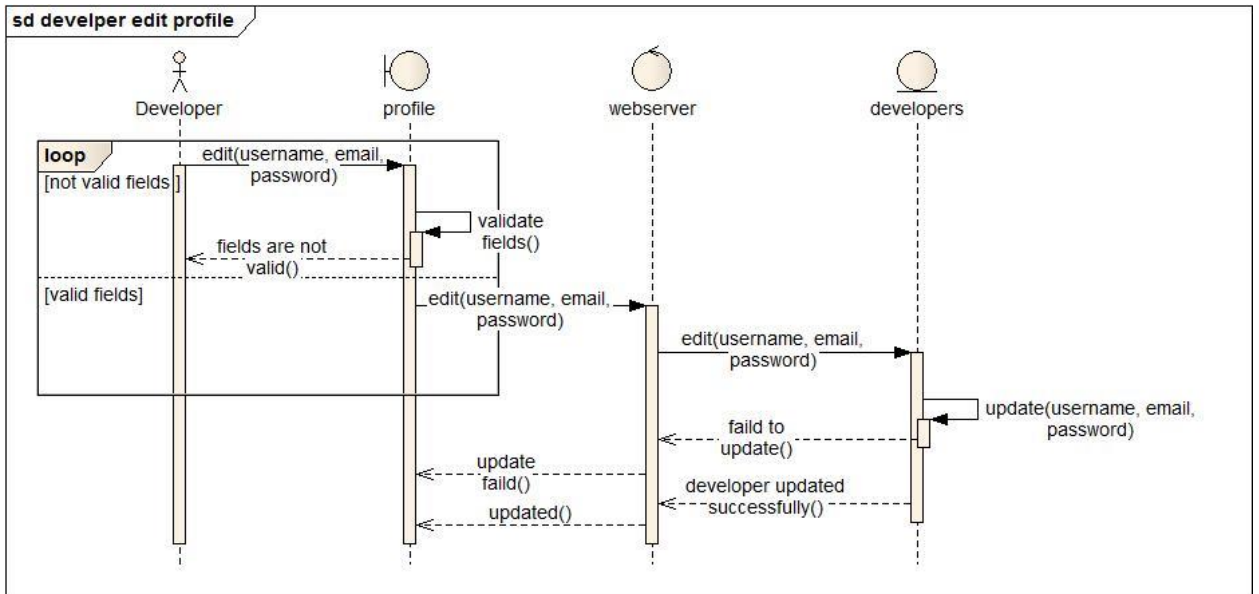


Figure 3-10 (Developer Edit profile)

Developer edits profile:

The Developer enter his username, email and password to the profile screen which is validate the data and send it to the server which is updating the developer profile data in database. The output of this process is a Boolean value that determines the success of the process.

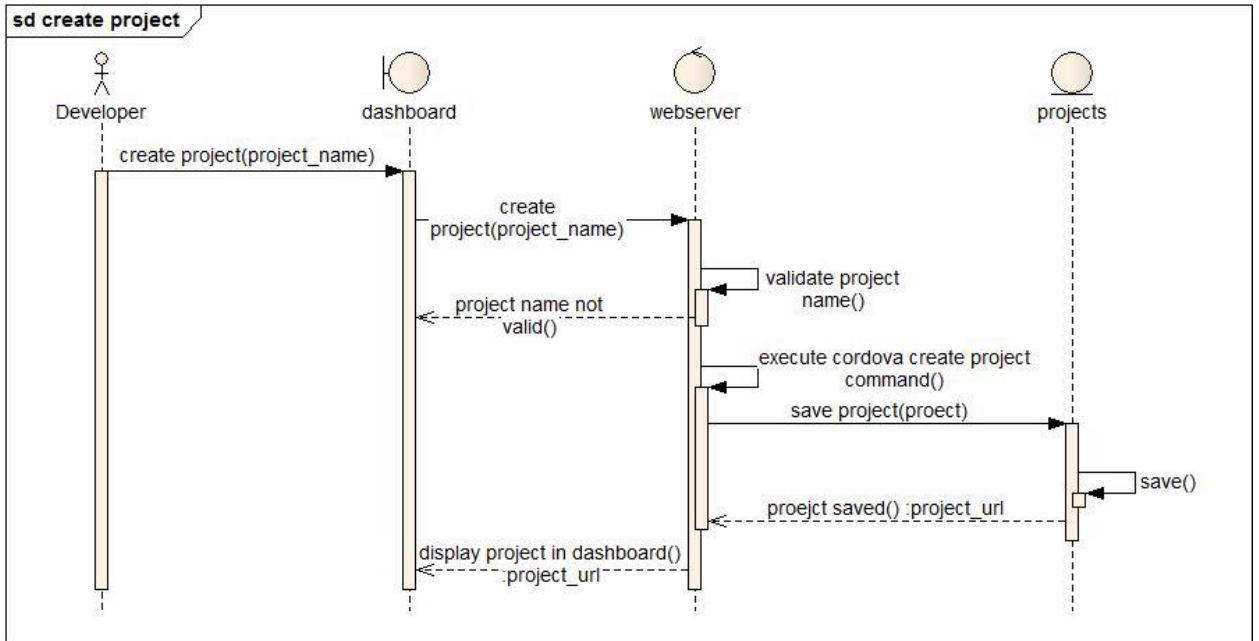


Figure 3-11 (create project)

Create Developer:

In the dashboard the developer click the create project button then inter the name of the project, the interface sends the name to the server which is validating the name and create the project files and save the project to the database. The output is a Boolean value.

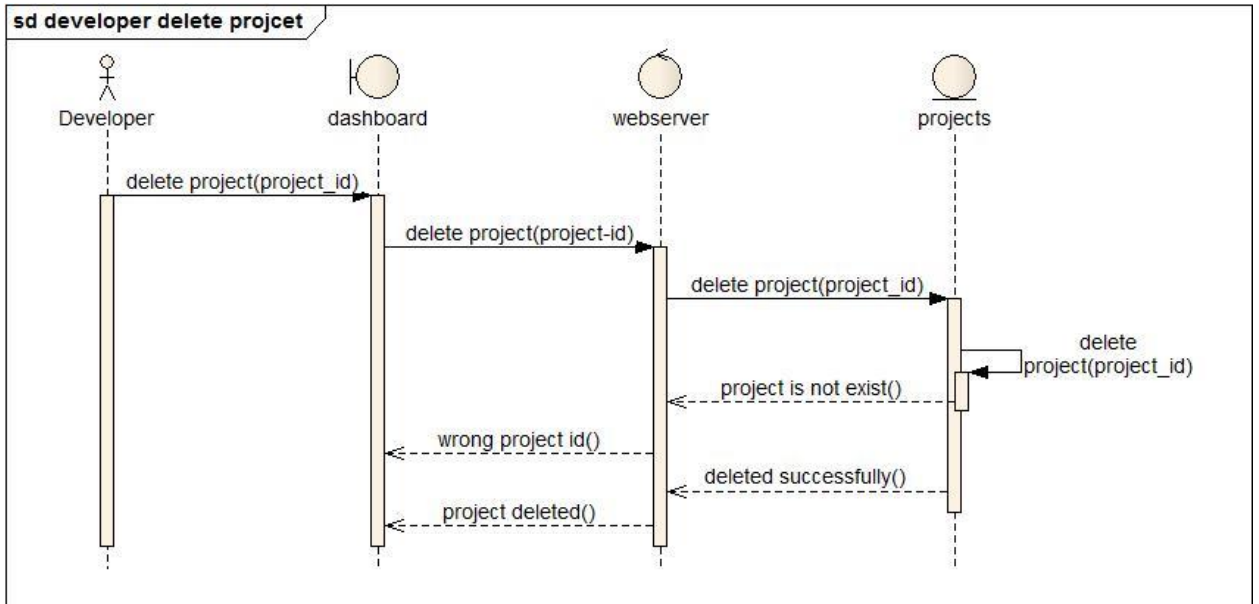


Figure 3-12 (Developer delete project)

Admin delete project:

The developer choose the project from the projects list, the list pass the id of the chosen project to the server that pass the id to the database that delete the project from the projects table. The output is a Boolean value for success or failure.

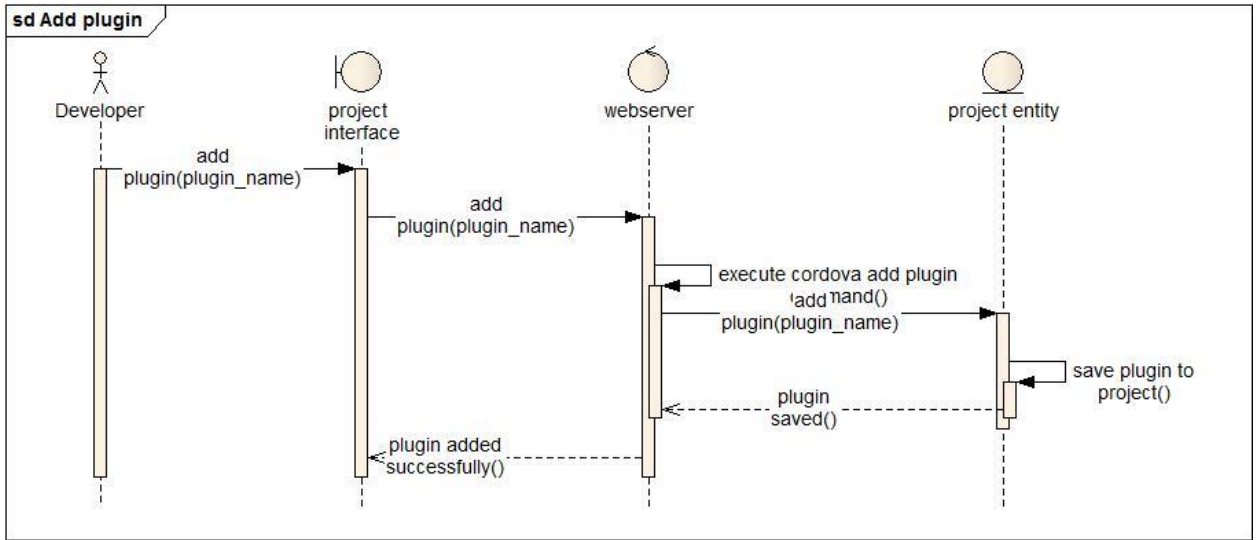


Figure 3-13 (Add Plugin)

Add plugin:

Developer chose one of the plugin in the project interface, the plugin name sent to the server that is add the plugin to the project file structure and save the changes to the project. The output is Boolean.

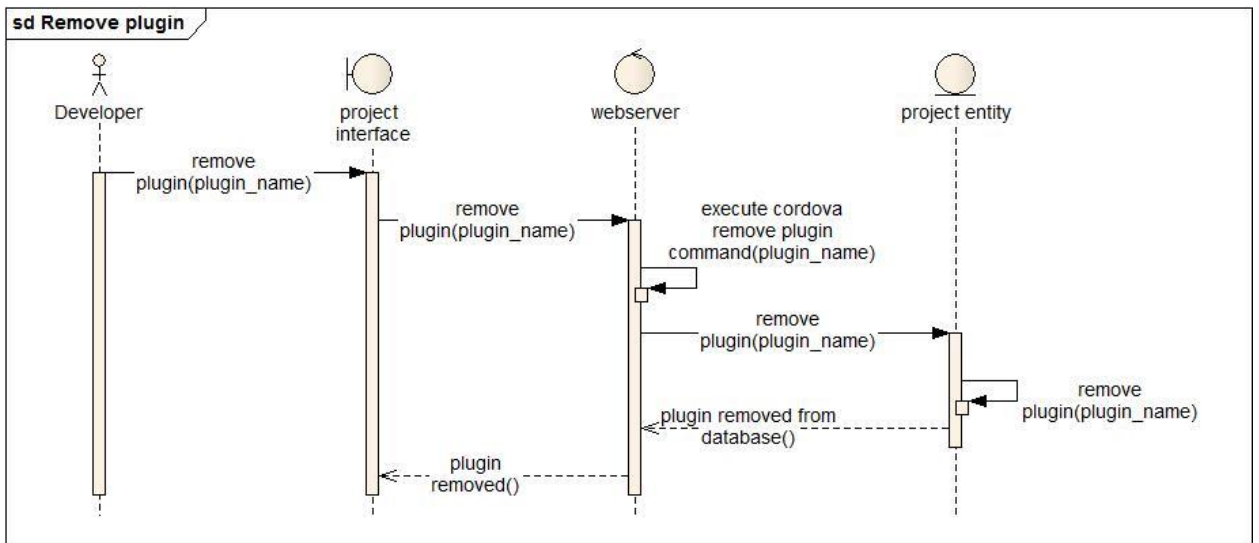


Figure 3-14 (Remove plugin)

Remove plugin:

Developer chose one of the plugin in the project interface, the plugin name sent to the server that is remove the plugin from the project file structure and save the changes to the project. The output is Boolean.

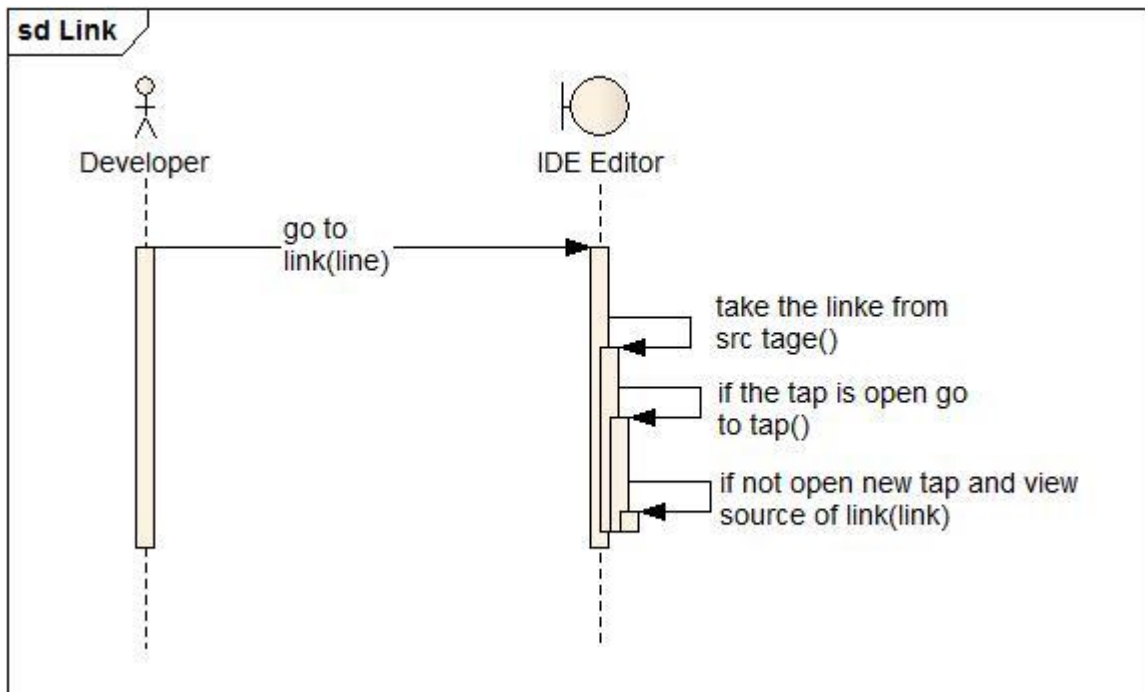


Figure 3-15 (Link)

Link:

The developer hover over the link in the IDE then the link will become active and link the user to the corresponding page.

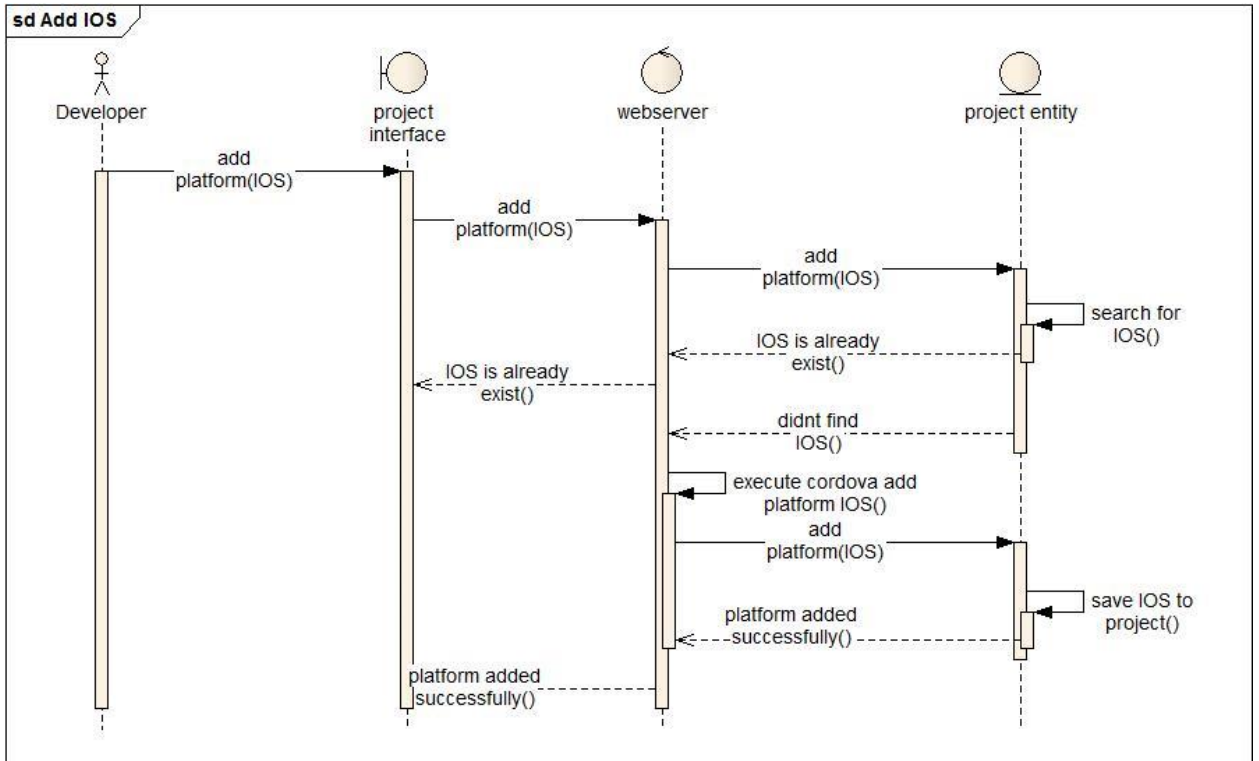


Figure 3-16 (Add IOS)

Add iOS:

Developer chose iOS platform in the project interface, the platform name sent to the server that is add the platform to the project file structure and save the changes to the project. The output is Boolean.

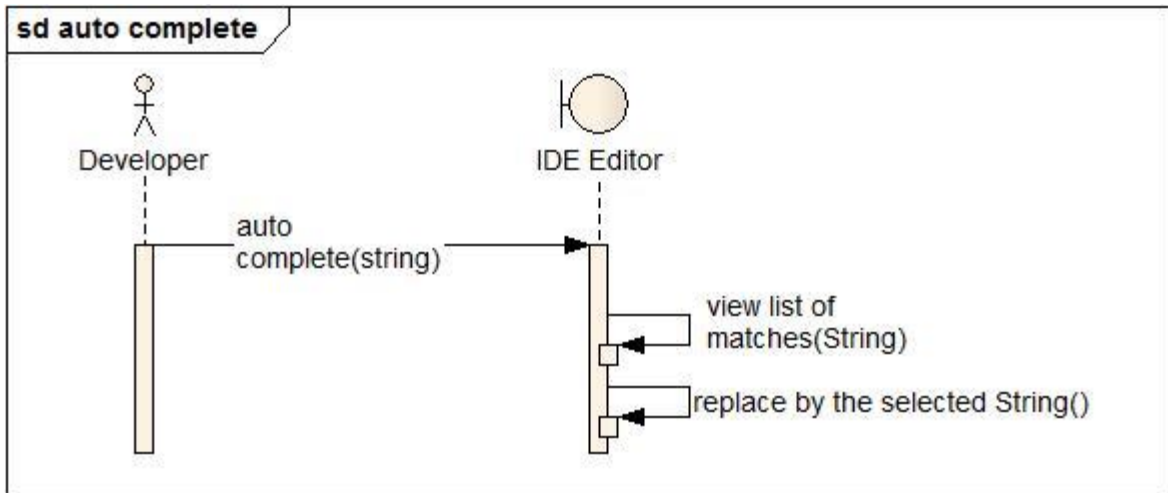


Figure 3-17 (Autocomplete)

Auto complete:

The developer while typing the code the string sent to the IDE interface to search for matching, if found the IDE show a list of matches for developer to choose one to replace the typed string.

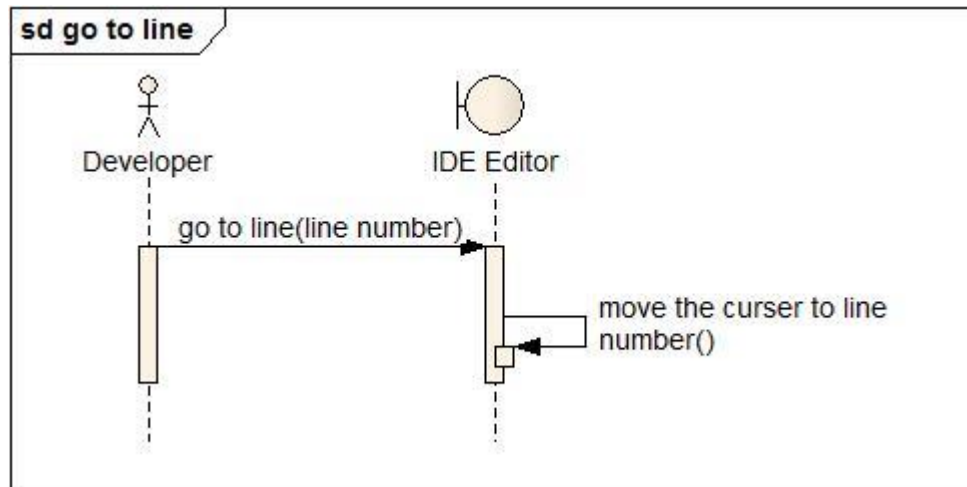


Figure 3-18 (Go to line)

Go to line:

The Developer enters the line number then the IDE move the cursor correspondent input.

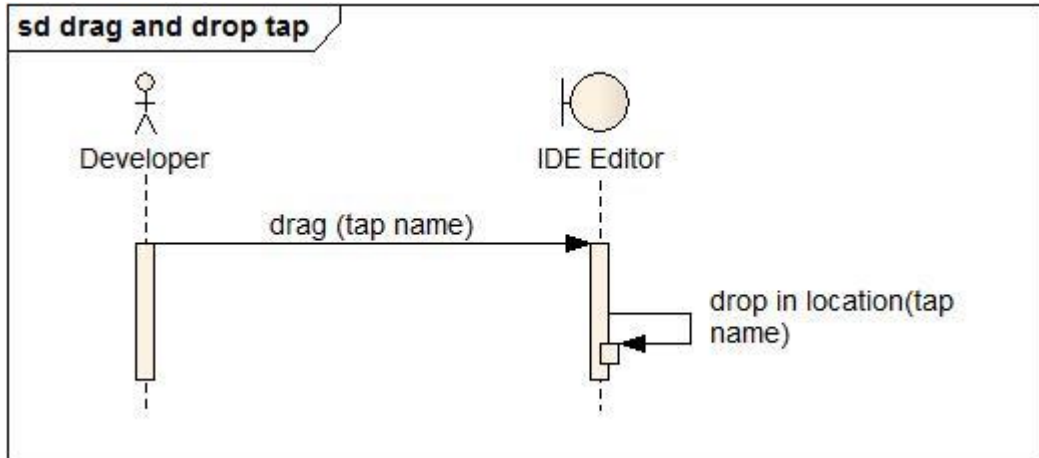


Figure 3-19 (drag and drop a tap)

Drag and drop taps:

The developer drags the tap from one location to drop it into another. The input is the tap name.

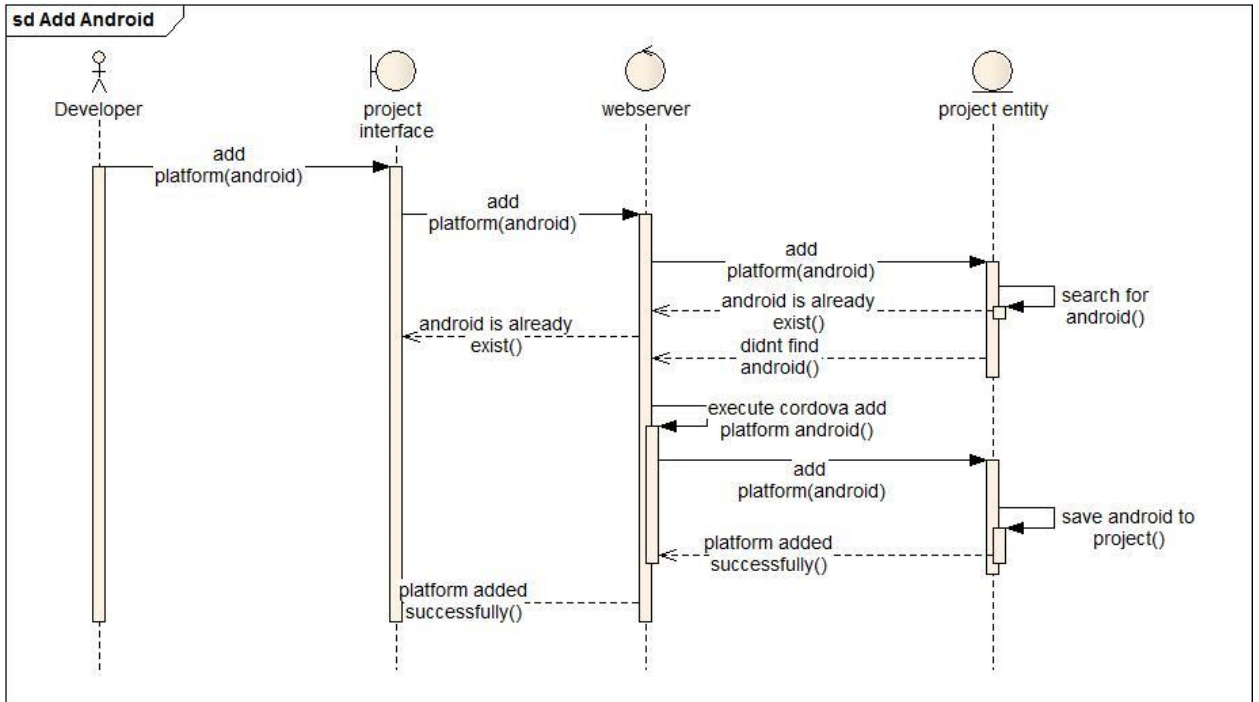


Figure 3-20 (Add android)

Add Android:

Developer chose Android platform in the project interface, the platform name sent to the server that is add the platform to the project file structure and save the changes to the project. The output is Boolean.

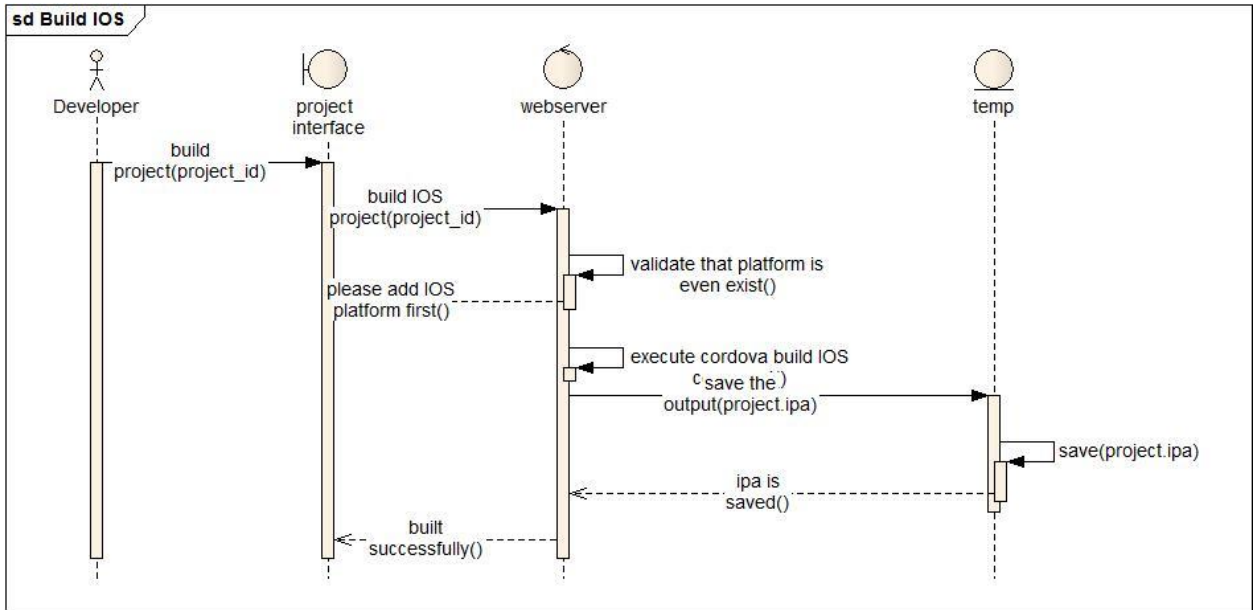


Figure 3-21 (Build IOS)

Build iOS:

The developer choose from the project interface to build the project for a iOS platform, the platform name is sent to the webservice to validate if the platform is added to the project file structure. The server then execute the building process and save the output file to the temp directory.

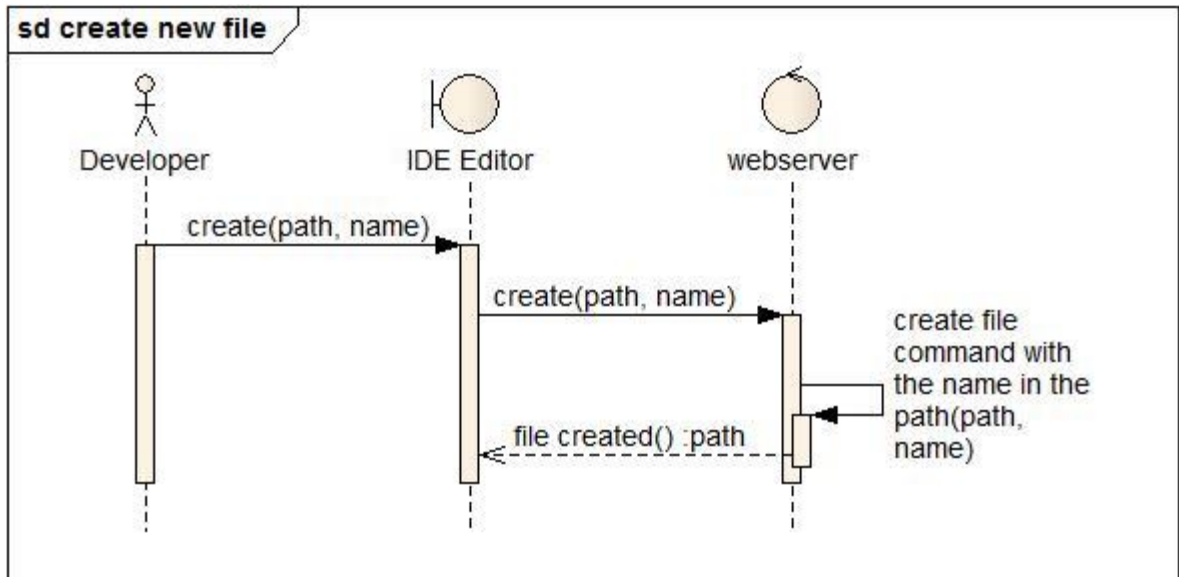


Figure 3-22 (Create new file)

Create new file:

In the IDE Editor interface the developer choose the create new file and enter the file name then the IDE send the name and the path of the file to the server where the create file command executed. The output is the new path of the new file.

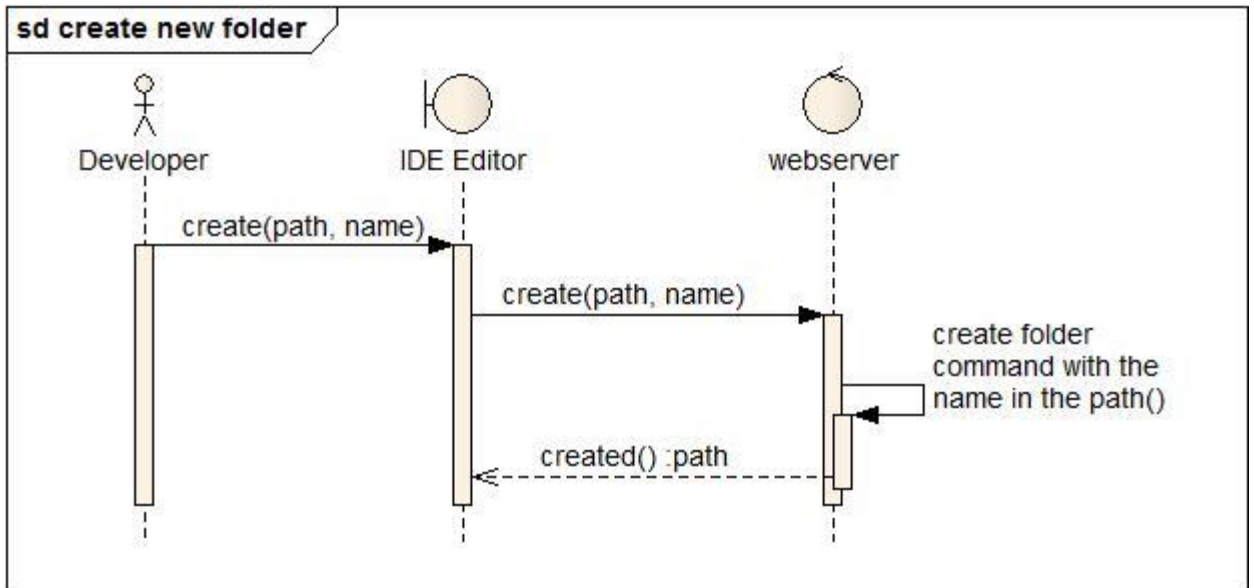


Figure 3-23 (create new folder)

Create new folder:

In the IDE Editor interface the developer choose the create new folder and enter the folder name then the IDE send the name and the path of the folder to the server where the create folder command executed. The output is the new path of the new folder.

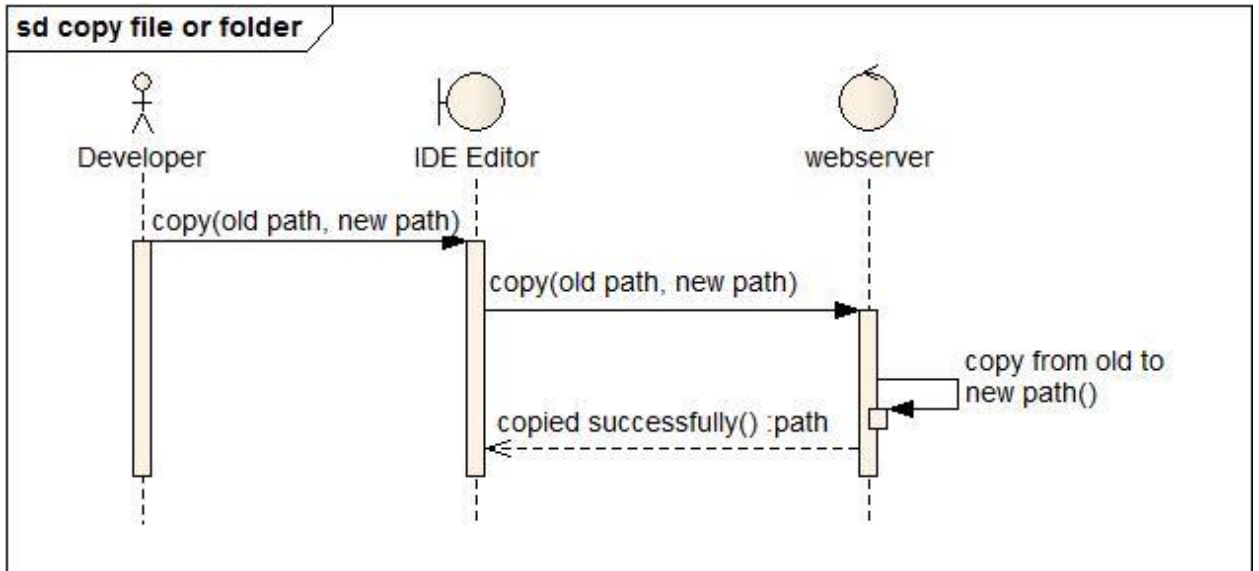


Figure 3-24 (Copy file or folder)

Copy file or folder:

The developer choose to copy the file or folder to new path then the IDE editor sends the old and new path to the server to copy the file or folder to the new path. The output is the new path.

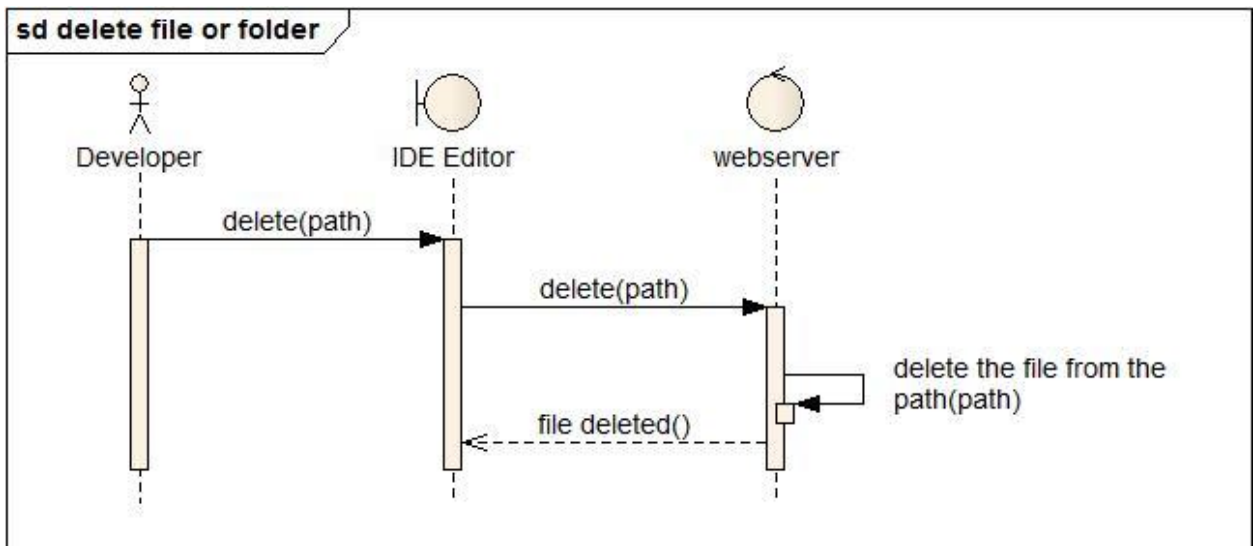


Figure 3-25(delete file or folder)

Delete file or folder:

The developer chooses to delete the file or folder. The path sent to the server that executes the delete file command. The output is Boolean.

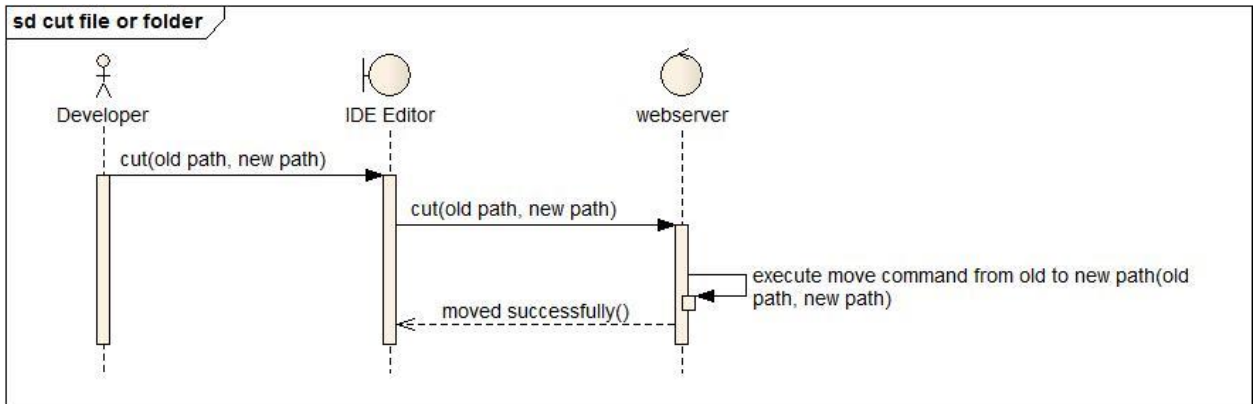


Figure 3-26 (cut file or folder)

Cut file or folder:

The developer choose to cut the file or folder to new path then the IDE editor sends the old and new path to the server to cut the file or folder to the new path. The output is the new path.

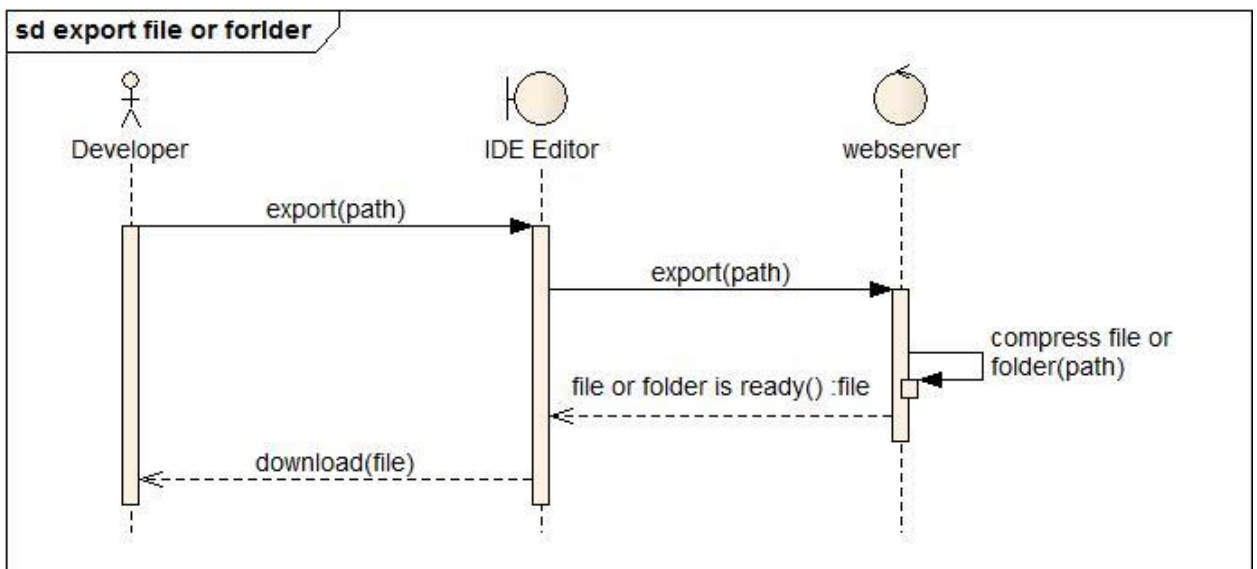


Figure 3-27 (Export file or folder)

Export file or folder:

Developer chooses to export file or folder to his computer, the IDE Editor sent the path to the server that compress the file and download it to the developer computer. The output is the compressed file.

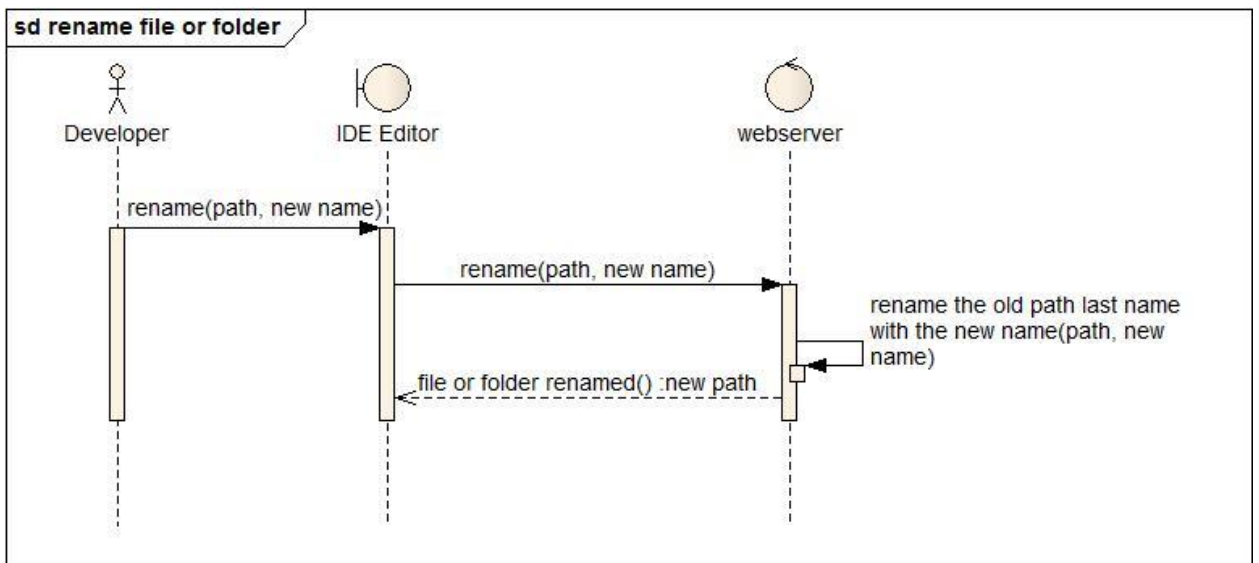


Figure 3-28 (Rename file or folder)

Rename file or folder:

Developer chooses to rename file or folder so the IDE Editor send the path and the new name of the file or folder to sever that rename the file or folder. The output is the new path with the new name.

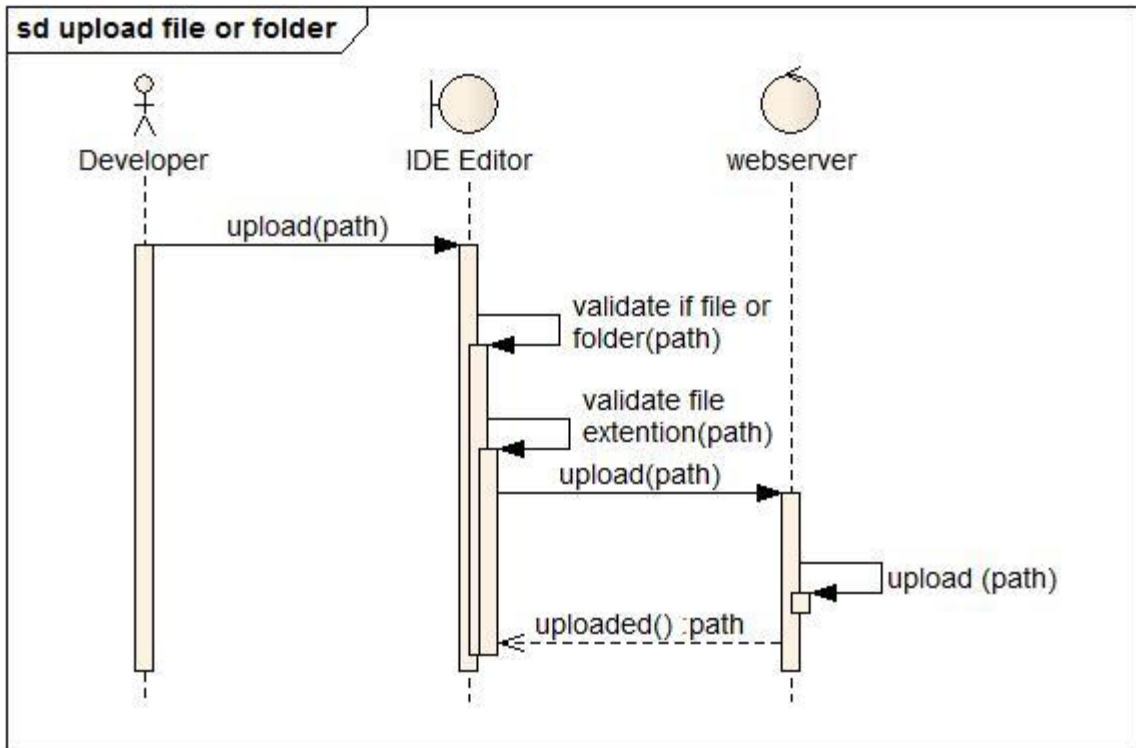


Figure 3-29 (Upload file or folder)

Upload file or folder:

The developer chooses to upload file or folder and choose one form his computer. The path of the chosen file or folder then validated in the client side and sent to the webservice to be uploaded and located in the correspondent path. The output is the path of the uploaded file or folder.

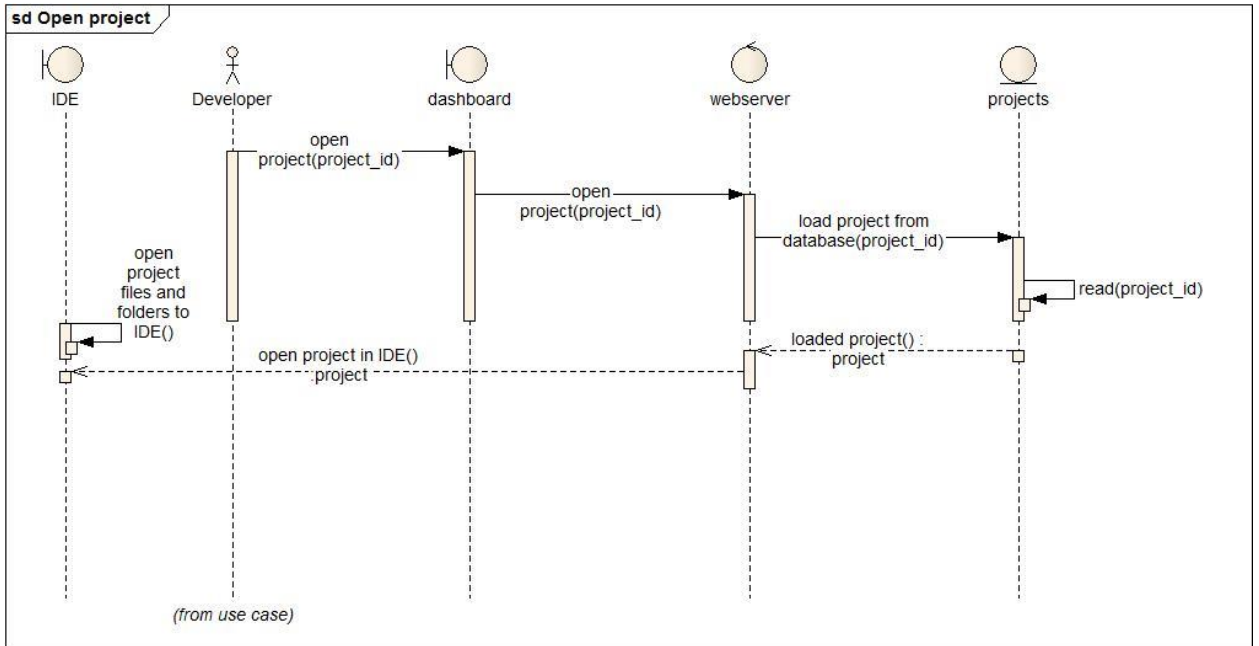


Figure 3-30 (Open project)

Open project:

In dashboard interface, the developer chooses to open the project in IDE the dashboard interface sent the project id to webservice that retraced the project path from the database and sent the path to IDE Editor to load the project files from.

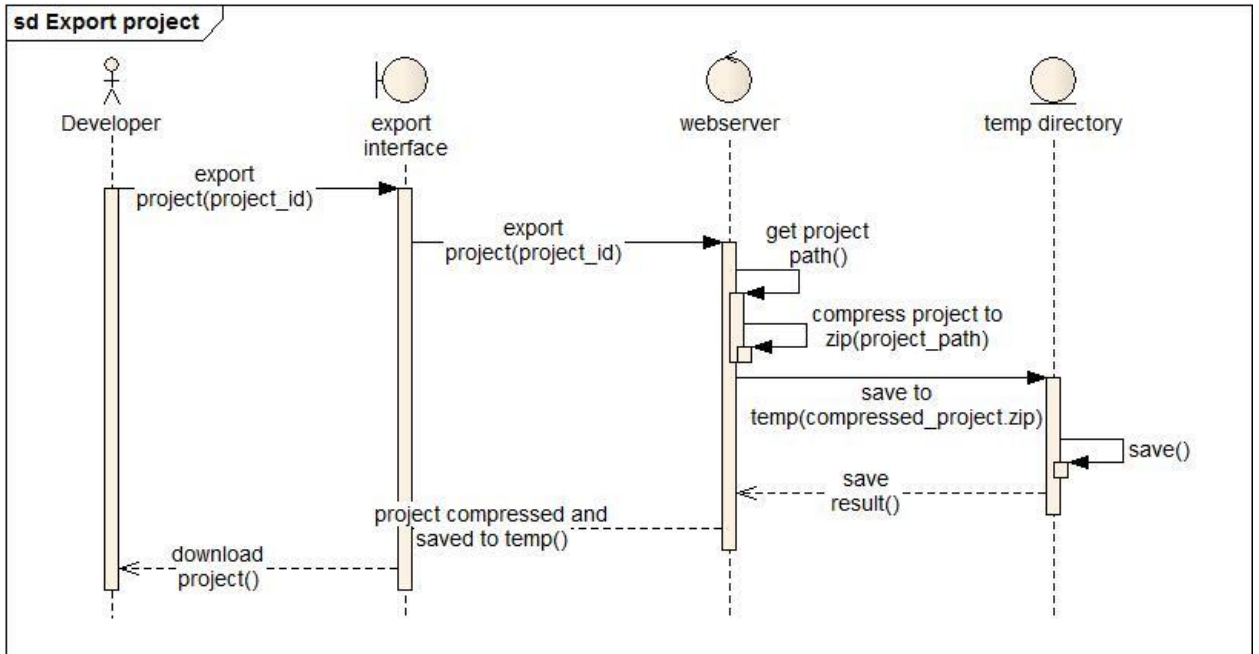


Figure 3-31 (Export project)

Export project:

The developer select the export project choice, the interface send the project id to the server that get the path of the project and compress the project files and save the compressed fie to the temp directory and then the server allow the developer to download the compressed file.

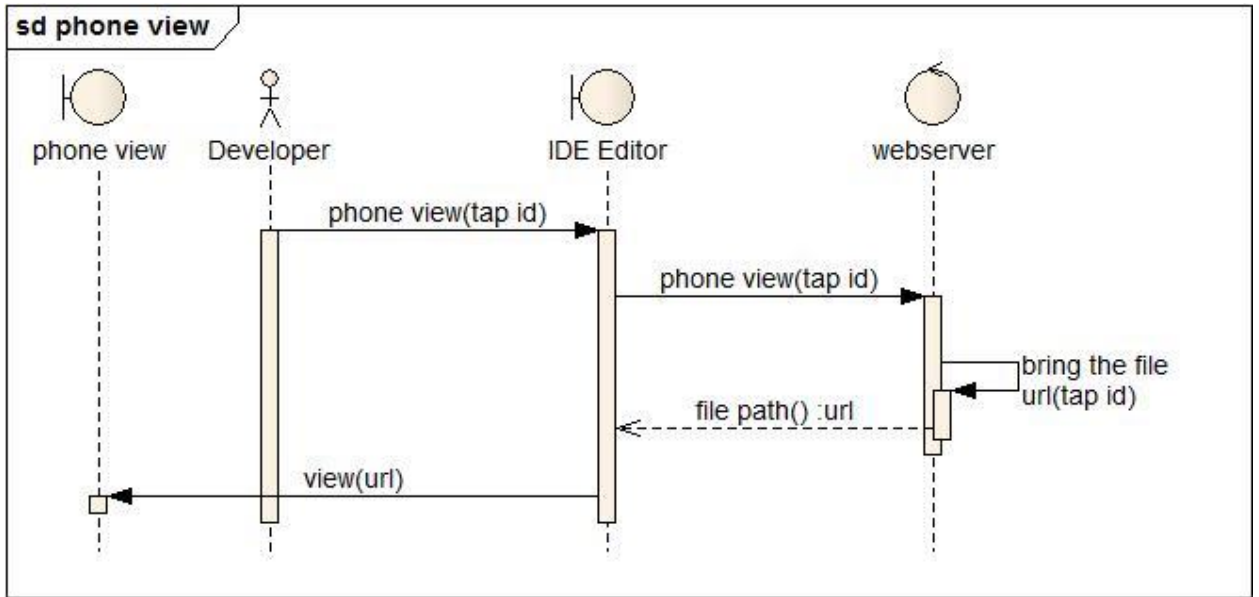


Figure 3-32 (phone view)

Phone view:

The developer choose to view his code result in phone view, the IDE Editor send the tap id that contain the code to the server, the server return the URL of the code to the Phone view to view the result.

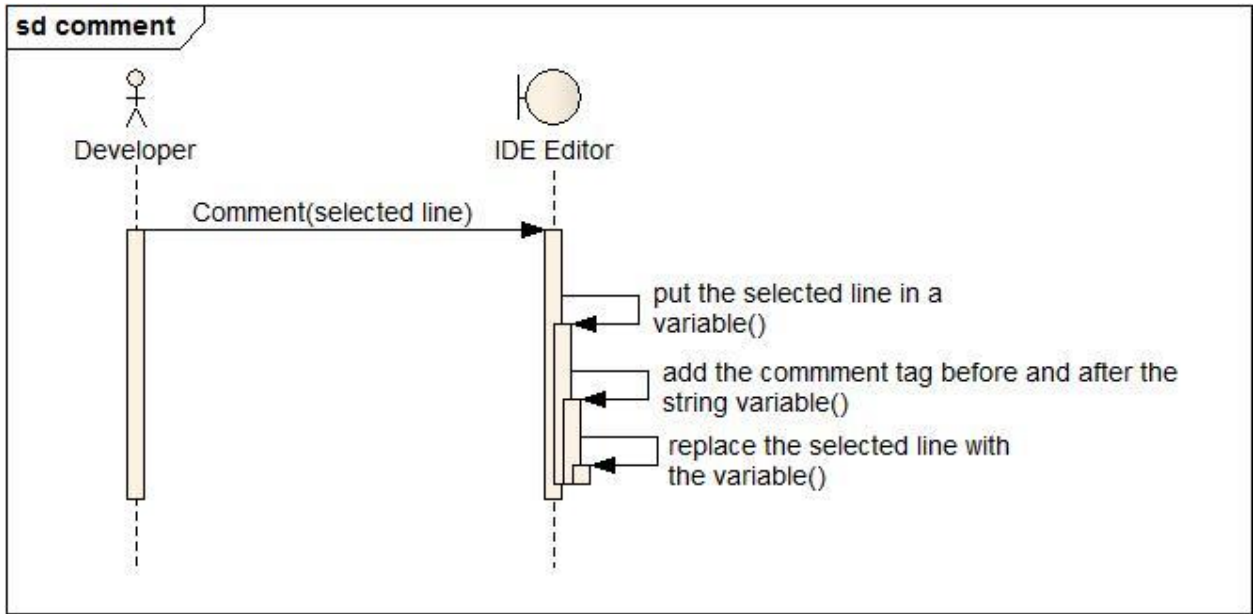


Figure 3-33 (Comment)

Comment:

The developer select lines to comment, the selected lines sent to the IDE Editor where they replaced with a string that contain the comment tags before and after the string.

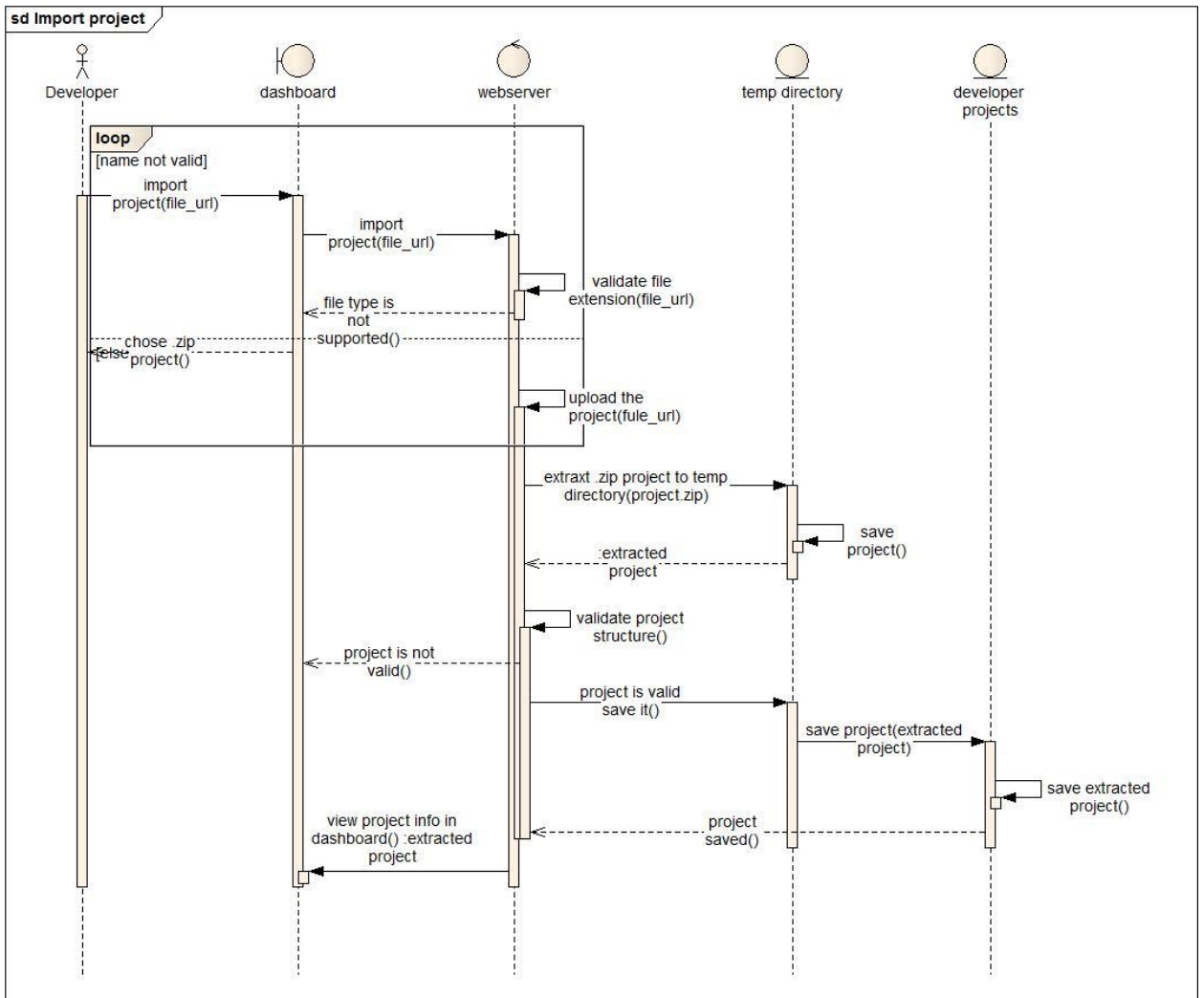


Figure 3-34 (Import project)

Import project:

The developer choose to upload the project to dashboard where the uploaded file is validated to make sure the extension is correct then the file is sent to the server where is get extracted and saved to the server file system and add the project to the developer projects

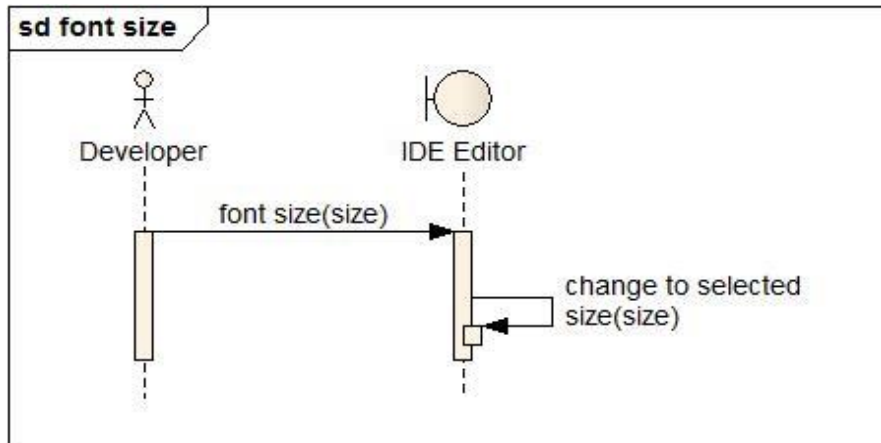


Figure 3-35 (font size)

Font size:

Developer choose the font size in the IDE Editor then text font size will change to the selected size

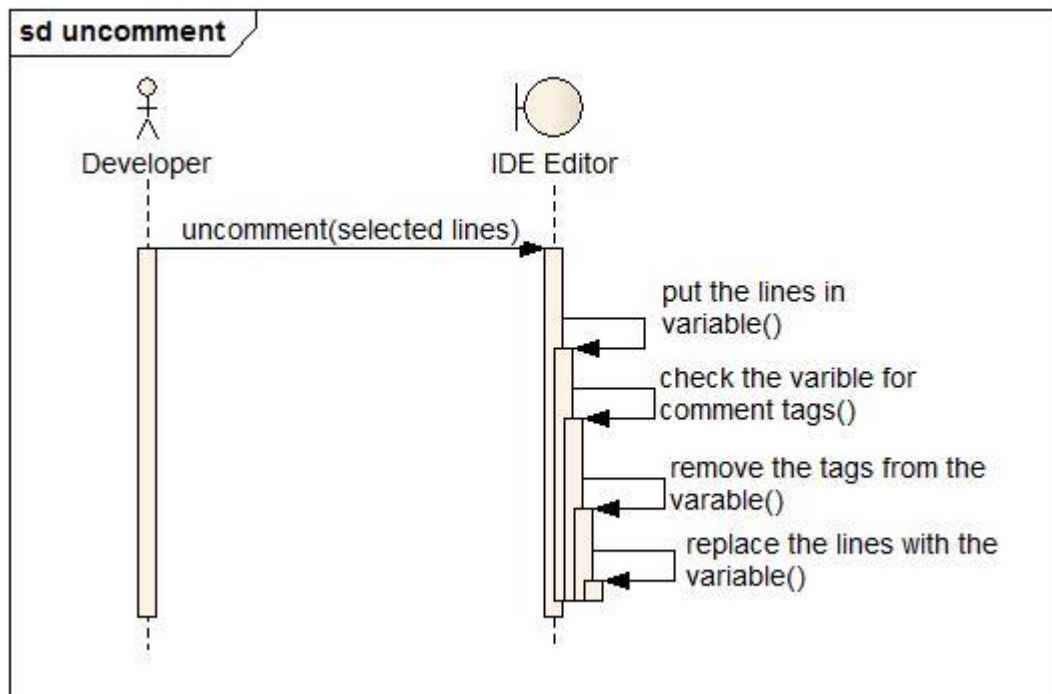


Figure 3-36 (Uncomment)

Uncomment:

The developer select lines to uncomment, the selected lines sent to the IDE Editor where they replaced with a string that the comment tags are removed from.

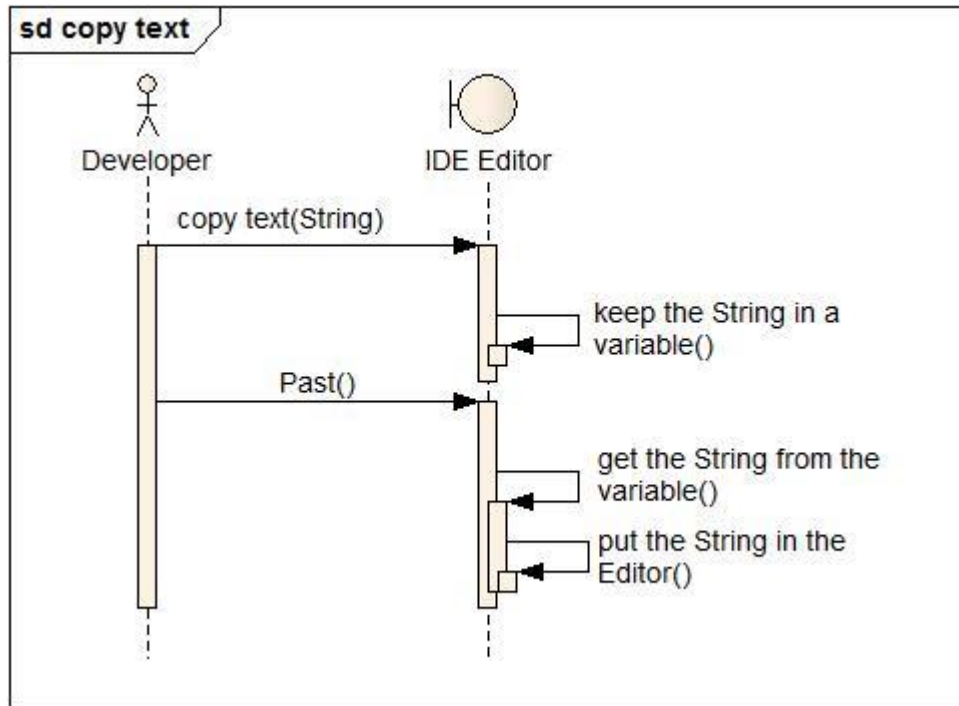


Figure 3-37 (Copy text)

Copy text:

The Diagram shows the copy text process.

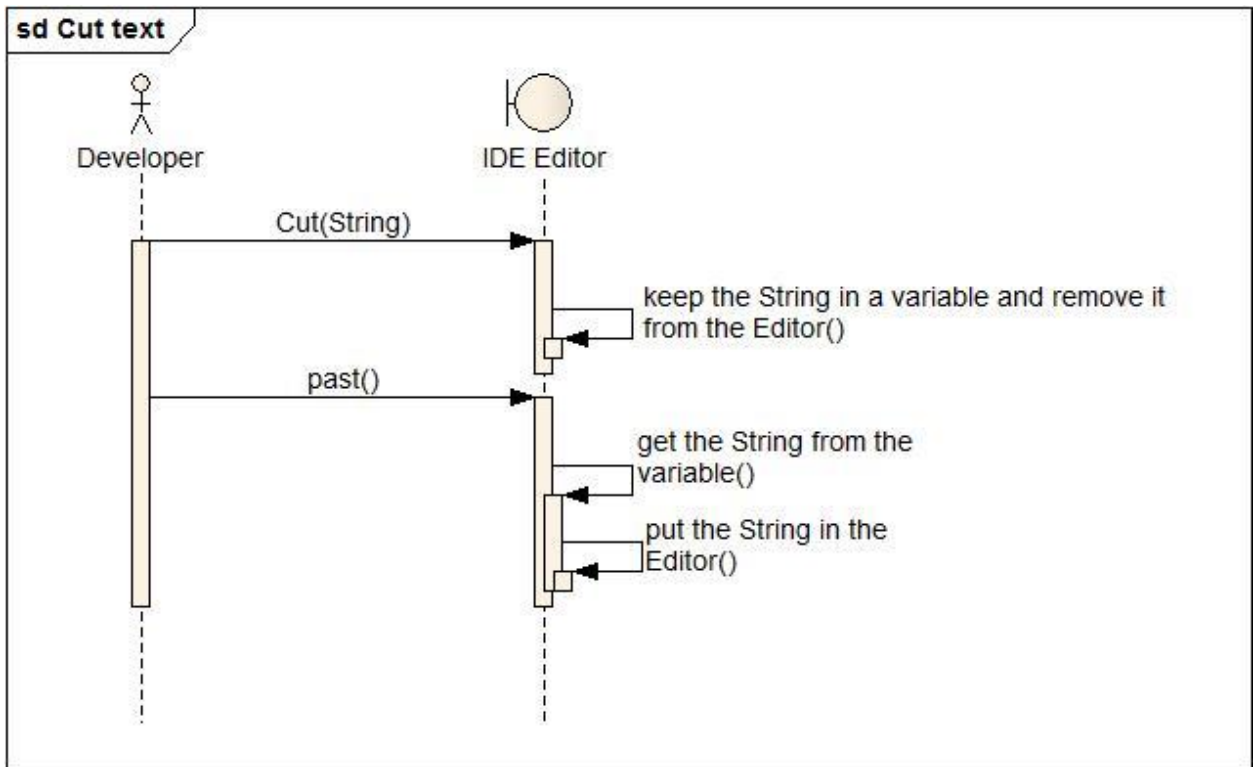


Figure 3-38 (Cut text)

Copy text:

The Diagram shows the copy text process.

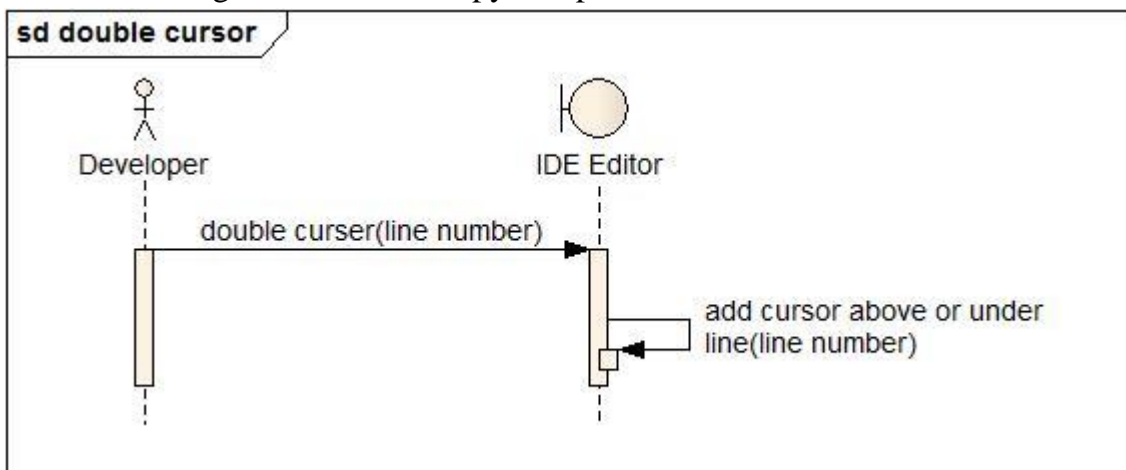


Figure 3-39 (double cursor)

Double cursor:

Developer can duplicate cursor to add cursor above or under the selected line.

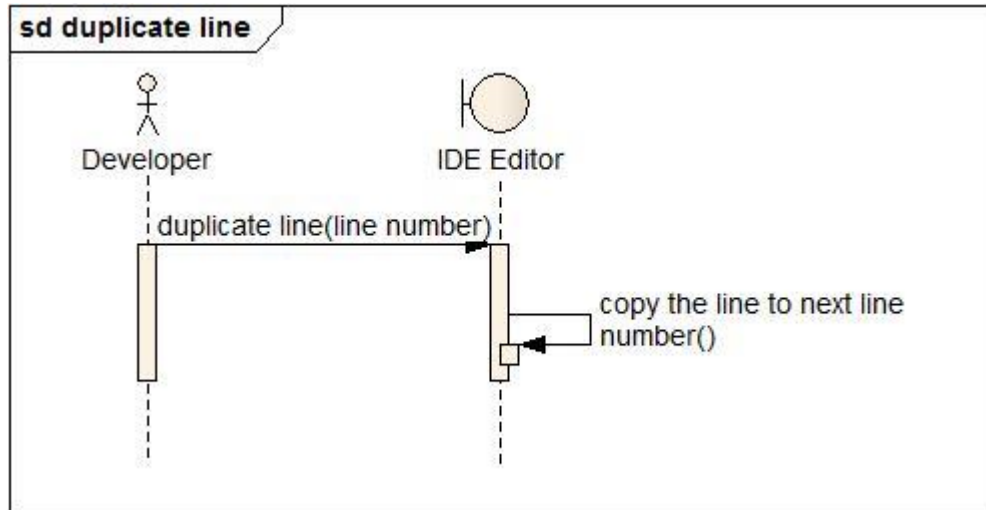


Figure 3-40 (Duplicate line)

Duplicate line:

Illustrate how to duplicate a line by copying the line into the next one.

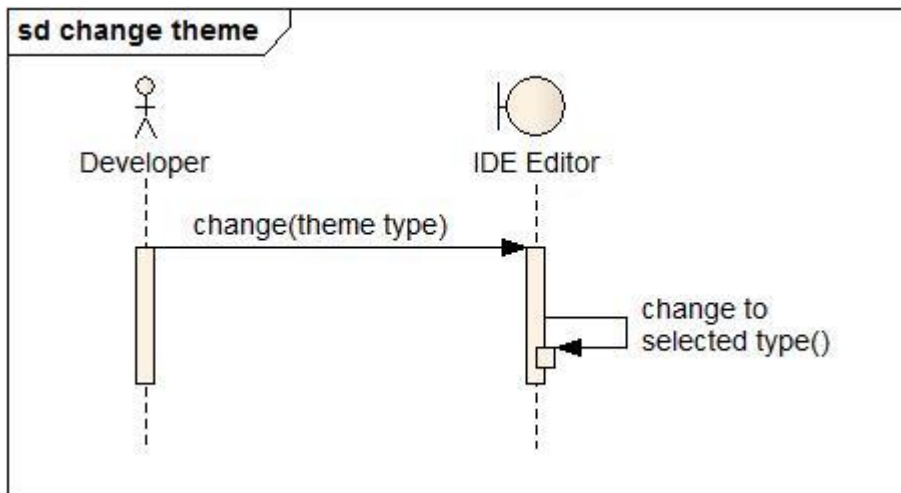


Figure 3-41 (Change theme)

Change theme:

The input is the theme type, the IDE Editor is changing the theme to the selected type.

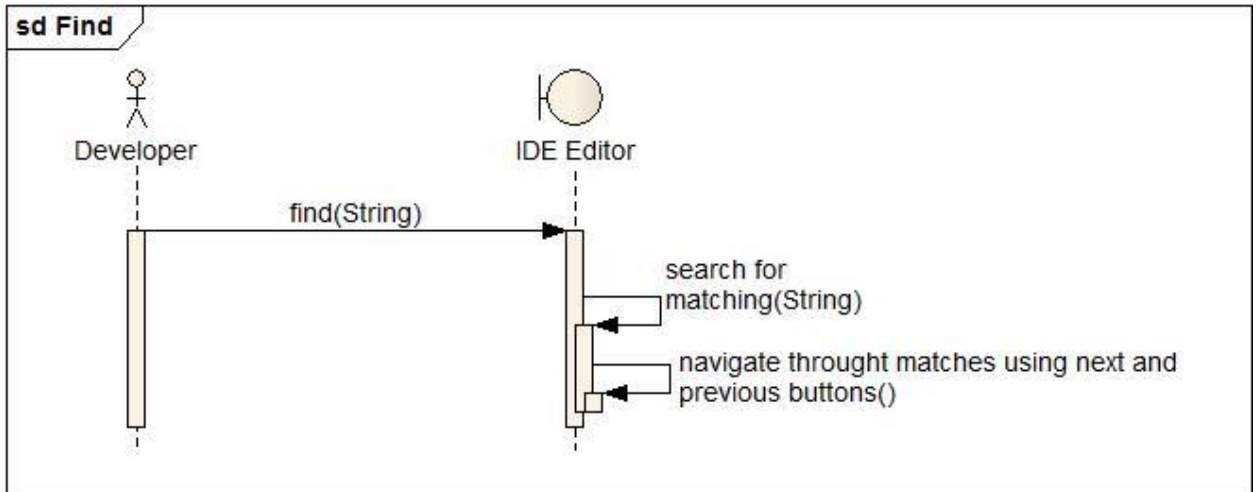


Figure 3-42 (Find a text in the Editor)

Find:

Developer type a string in the find interface, the IDE Editor then search in the current file for matches and navigate throw them.

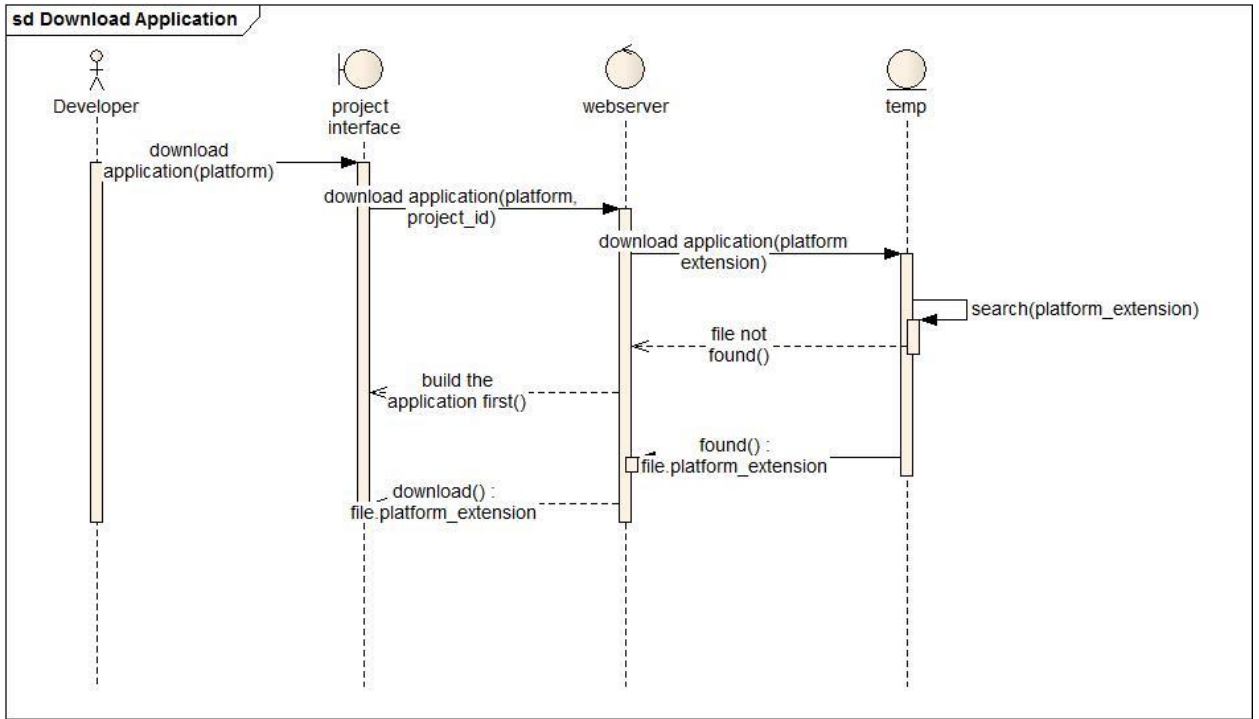


Figure 3-43 (Download the output file)

Download application:

The input from the developer is just the platform type that the application will work on, the project interface sends this project id and the platform name to the server, the server then takes the execution file from the temp directory where the executable files will be saved after building the application. The output is the executable file that is downloaded for the developer.

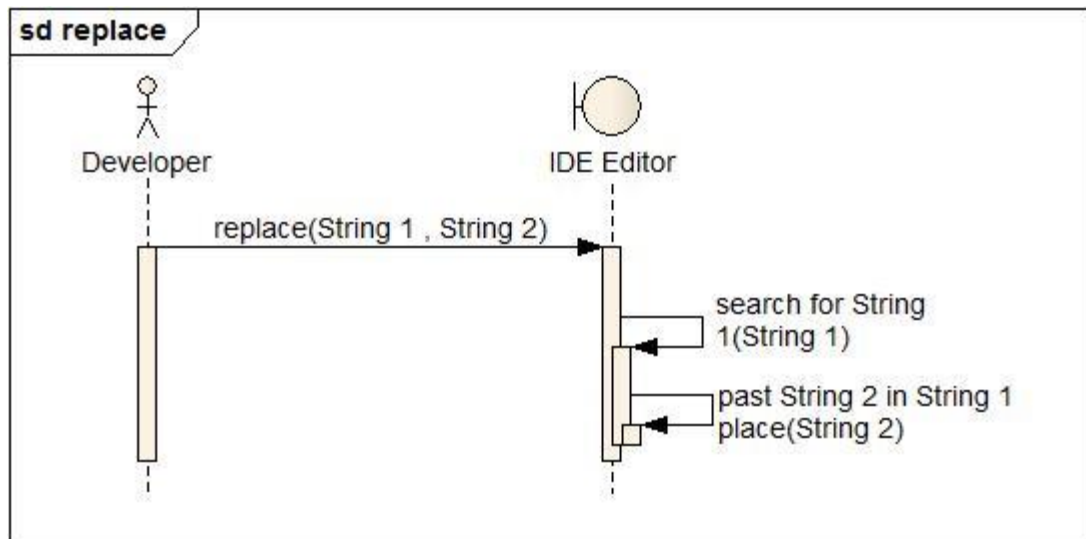


Figure 3-44 (Find a text and replace it with another)

Replace:

The diagram illustrates the replacement of strings with one another.

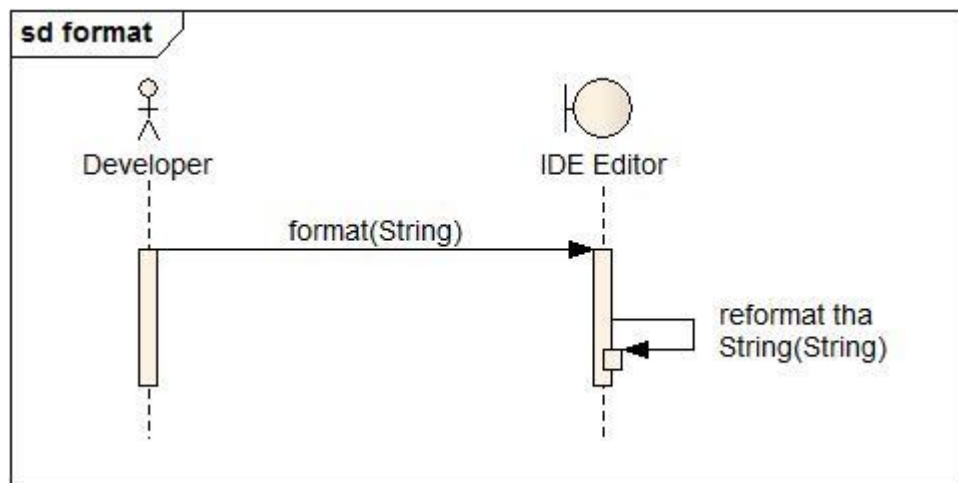


Figure 3-45 (Format the code)

Format:

The format function is sends the string of the opened tap to the IDE Editor and then reformats the string and replaces it with the formatted string.

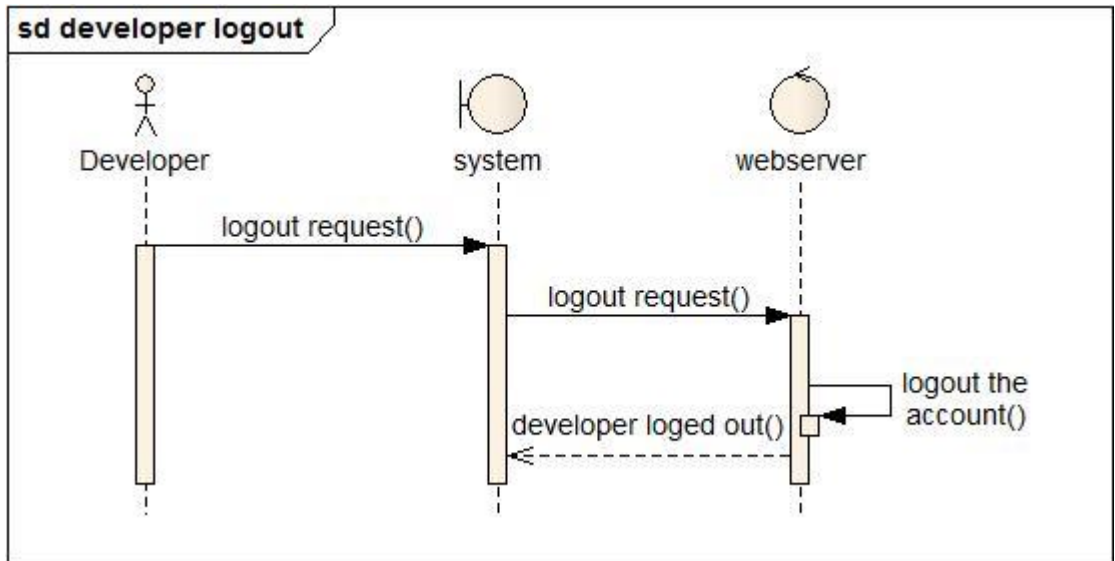


Figure 3-46 (Developer logout)

Developer logout:

The developer chose to logout then the system perform the logout process.

3.5.4 Deployment Diagram

Is a diagram that illustrates the physical execution of the project on devices.

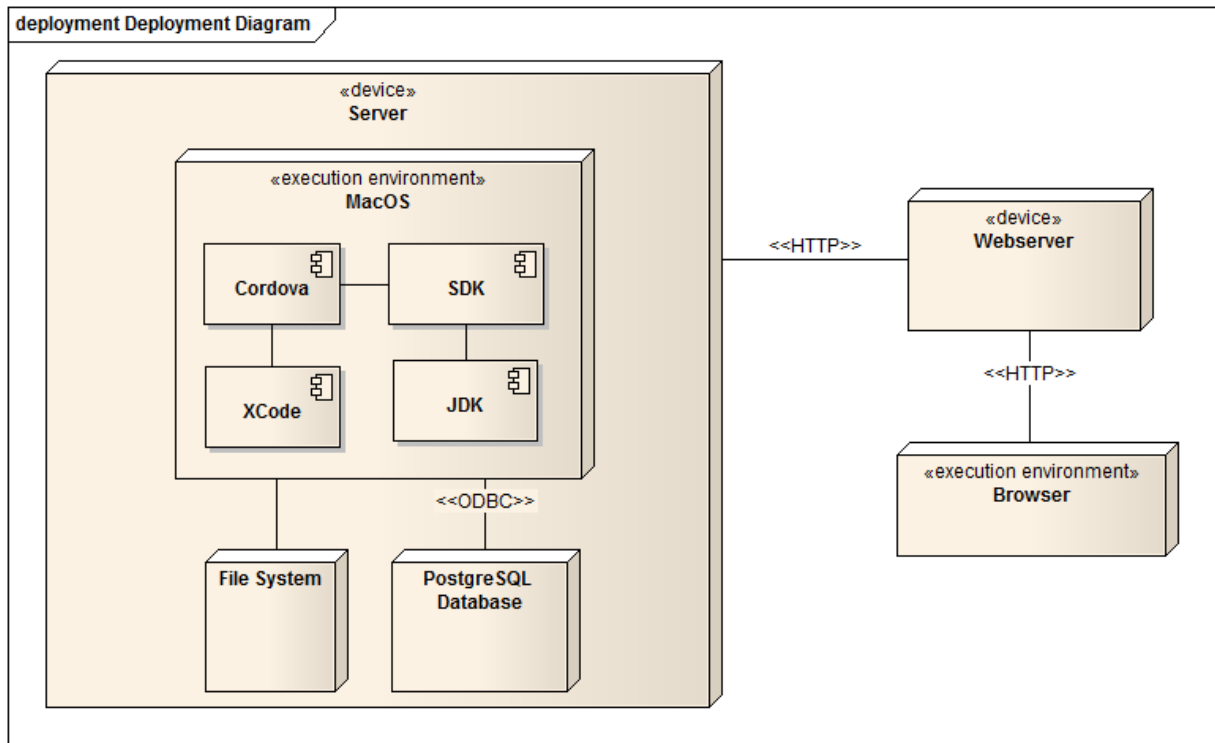


Figure 3-47 (Deployment Diagram)

The browser communicates with the webservice through the http requests the webservice transfers the requests to the server. In the server the operating system is the MacOS, in this operating system many software are installed. The SDK and JDK software are used in building the Android platform, the XCode is used in building the iOS platform applications. Cordova is the framework that used in building the hybrid applications to their platforms

PostgreSQL database is used in saving the data of users and the paths of the project. The File system is used in storing the created projects files.

3.6 Database Tables

We used the PostgreSQL database in storing the developer, administrator and the project path associated with each developer so we have two tables in the database.

3.6.1 Developer table

Serial	Name	Type	Size	Note
1	ID	Int	20	Primary key
2	Username	Varchar	255	unique
3	Email	Varchar	255	unique
4	Password	Varchar	255	
5	Directory	Varchar	255	
6	Temp_directory	Varchar	255	

Table 3-1(Developer table)

3.6.2 Project table

Serial	Name	Type	Size	Note
1	ID	Int	20	Primary key
2	User	Int	20	Foreign key
3	Name	Varchar	50	
4	Directory	Varchar	255	
5	Temp_directory	Varchar	255	

Table 3-2(Administrator table)

3.7 Conclusion

This chapter of the research explains the system analysis, functionalities and the interaction of the different aspects of the system with each other. The next chapter illustrates how the system deployed.

4 CHAPTER FOUR IMPLEMENTATION

4.1 Introduction:

This chapter shows the system graphical interfaces, and demonstrates how user interacts with system.

4.2 Graphical User Interface:

4.2.1 Home page

Main web page of website used to provides information about system.

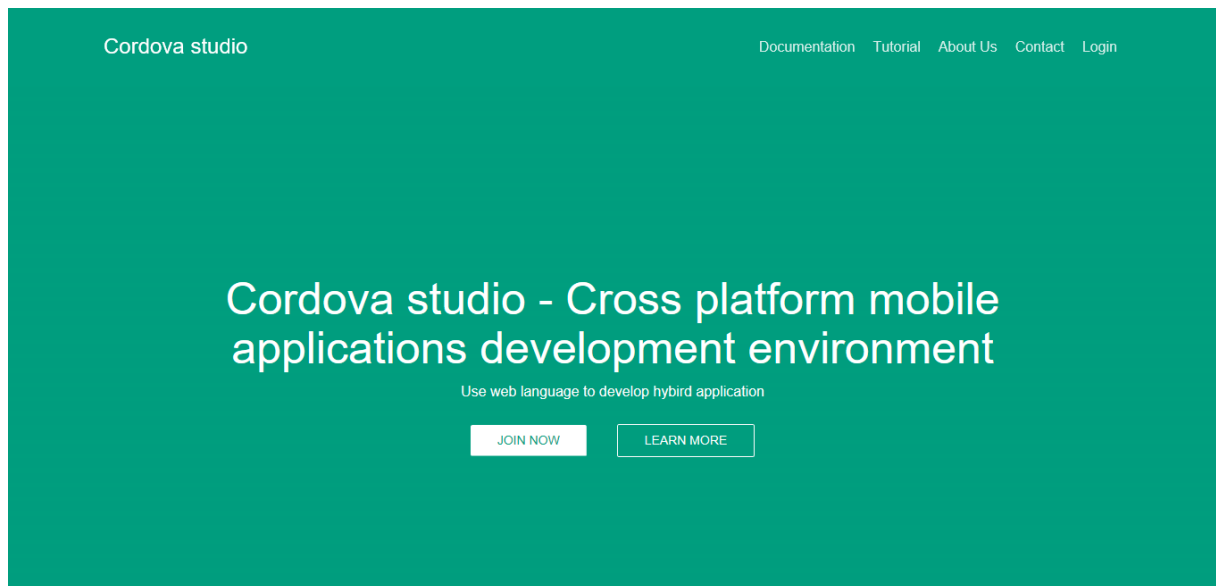


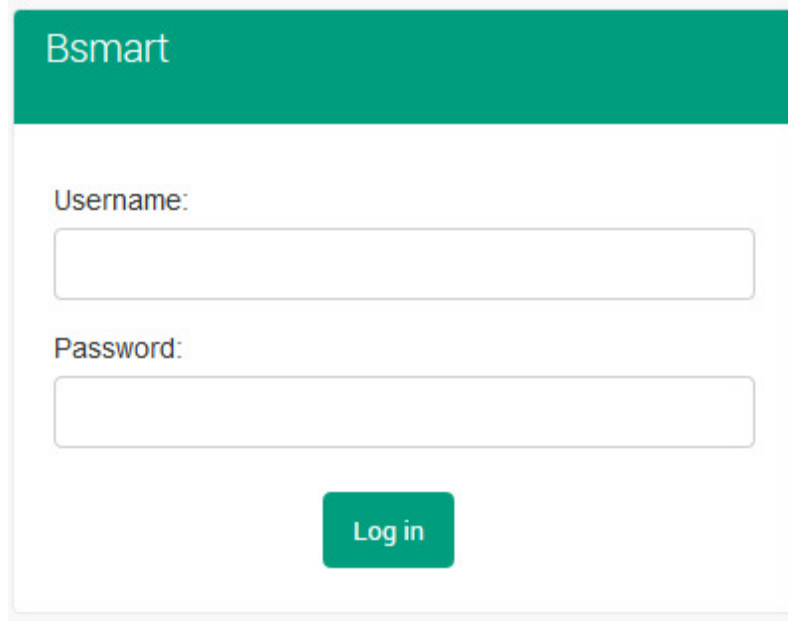
Figure 4-1(Home Page)

4.2.2 Administrator

Administrator is person who has permission allows him to manage system. Admin account has a complete control over system.

4.2.2.1 Login

Administrator can login into system by username and password in order to access and control users information and data.

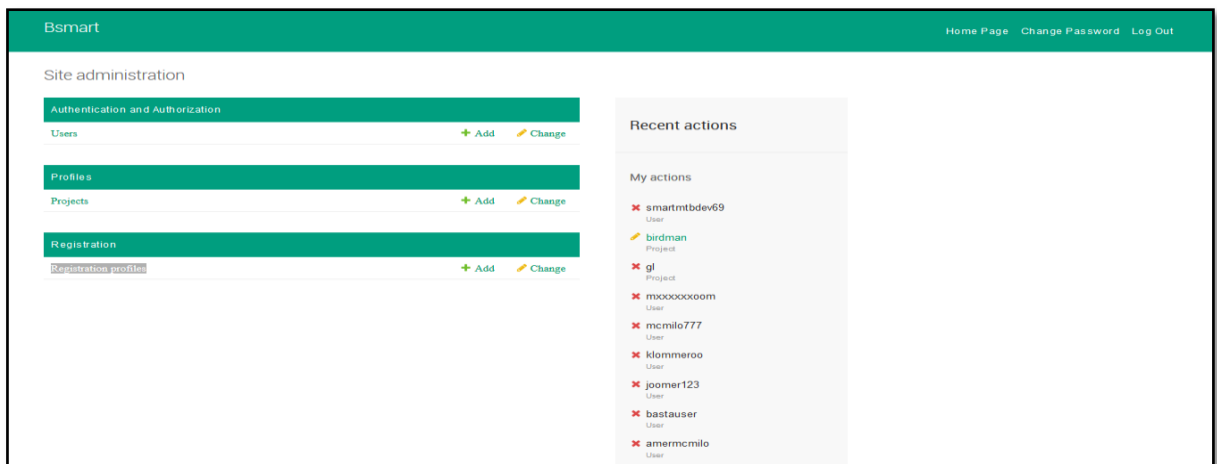


The image shows a login form for 'Bsmart'. It features a green header with the text 'Bsmart'. Below the header, there are two input fields: 'Username:' and 'Password:'. Each field is a simple rectangular box. Below the password field is a green button with the text 'Log in' in white.

Figure 4-2 (Admin log in)

4.2.2.2 Dashboard

The main page that allows Administrator to control system



The image shows the 'Bsmart' Admin Dashboard. The top navigation bar is green and contains the text 'Bsmart' on the left and 'Home Page', 'Change Password', and 'Log Out' on the right. The main content area is white and is divided into two columns. The left column is titled 'Site administration' and contains three sections: 'Authentication and Authorization' with a 'Users' row and '+ Add' and 'Change' buttons; 'Profiles' with a 'Projects' row and '+ Add' and 'Change' buttons; and 'Registration' with a 'Registration profile' row and '+ Add' and 'Change' buttons. The right column is titled 'Recent actions' and contains a list of actions under the heading 'My actions'. The actions are: 'smartmtbdev69' (User, marked with a red 'x'), 'birdman' (Project, marked with a yellow pencil), 'gl' (Project, marked with a red 'x'), 'moooooooooom' (User, marked with a red 'x'), 'mcmilo777' (User, marked with a red 'x'), 'klommeroo' (User, marked with a red 'x'), 'joomer123' (User, marked with a red 'x'), 'bastausser' (User, marked with a red 'x'), and 'amermcmilo' (User, marked with a red 'x').

Figure 4-3(Admin dashboard)

4.2.2.3 Users list

This page display all users in system, Administrator can select user or any number of users for deletion, or can search for specific user using user email or username.

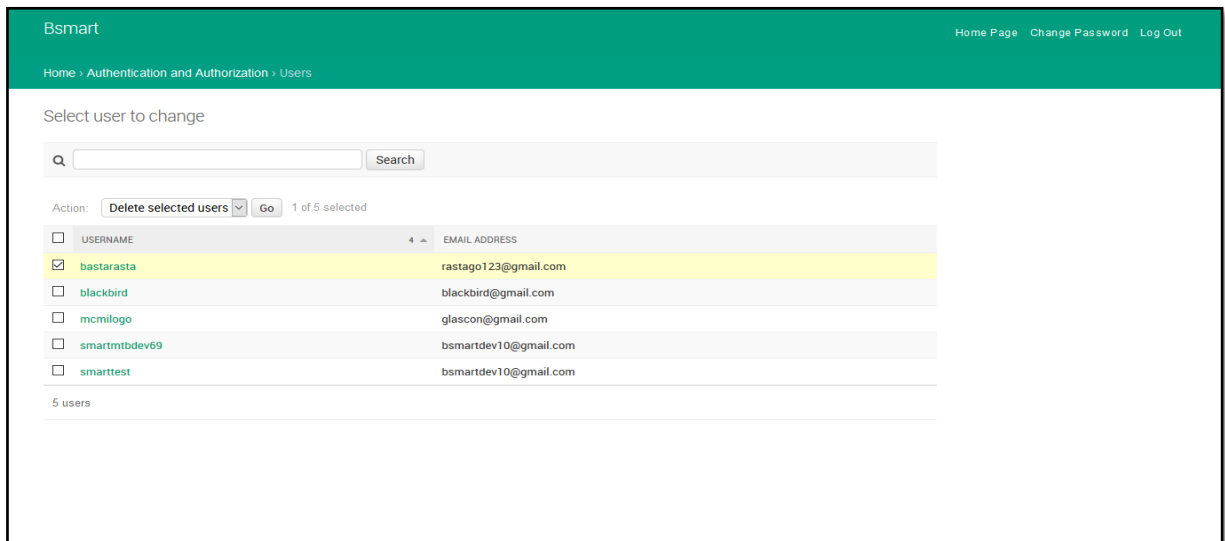


Figure 4-4 (Users list)

4.2.2.4 Projects list

This page display all projects in system, Administrator can select any project or any number of projects for deletion, or open project to update its details.

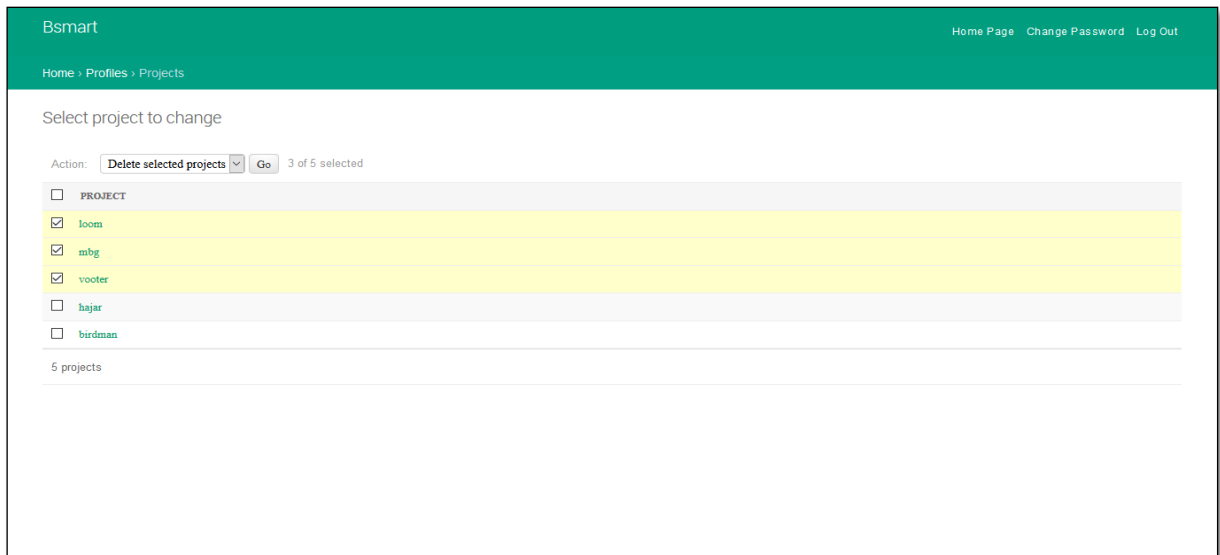


Figure 4-5(Project list)

4.2.2.5 Project details

This page display project details, administrator can update project directories, or delete this project.

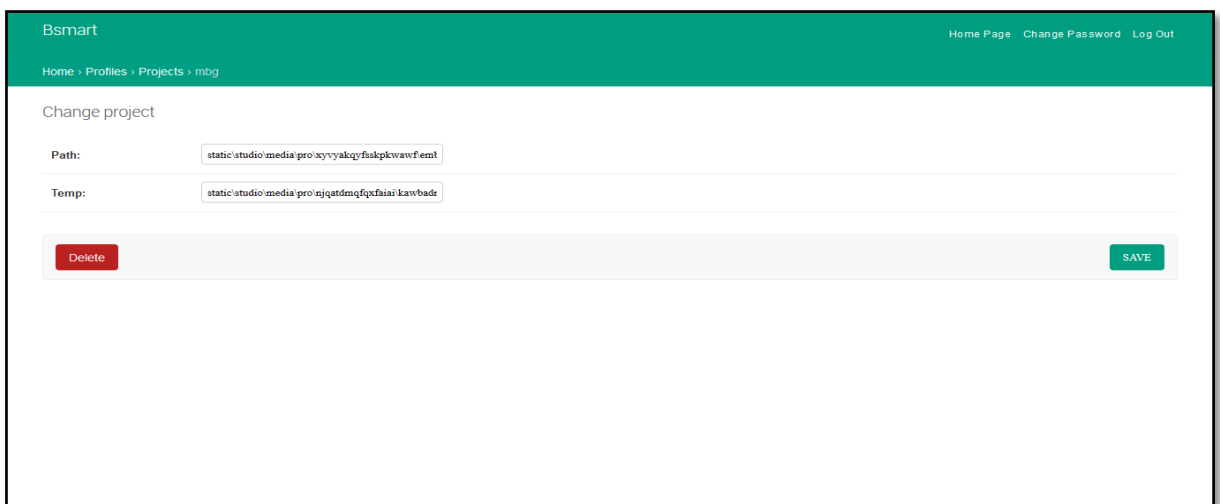


Figure 4-6(Project Details)

4.2.3 User

This section illustrates the user's interfaces.

4.2.3.1 Registration

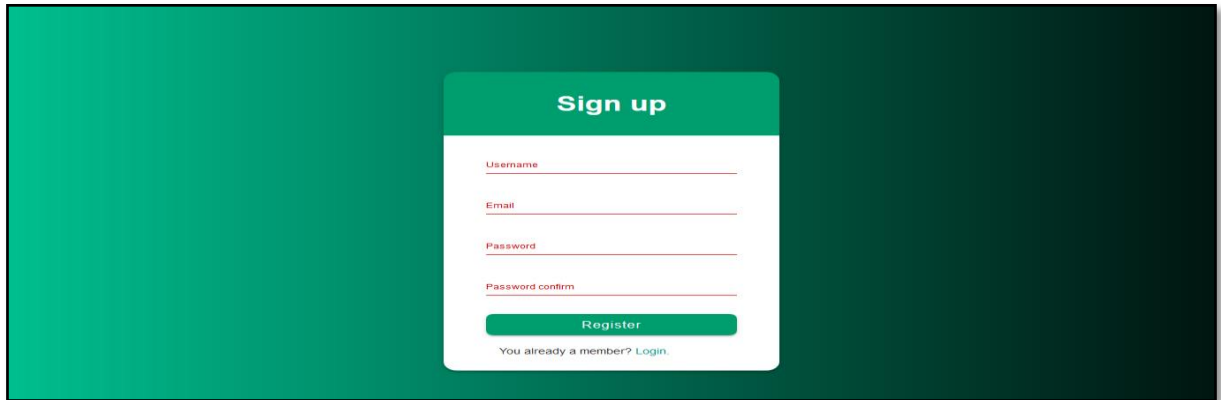
A screenshot of a registration form titled "Sign up". The form is centered on a dark green background. It features four input fields: "Username", "Email", "Password", and "Password confirm". Below the fields is a green "Register" button. At the bottom of the form, there is a link that says "You already a member? Login."

Figure 4-7 (Developer registration)

User must create an account first, by enter username, email address, password, and password confirm.

4.2.3.2 Registration complete

This page will appear after user creates new an account immediately, it is notify user to check his email to complete registration process.

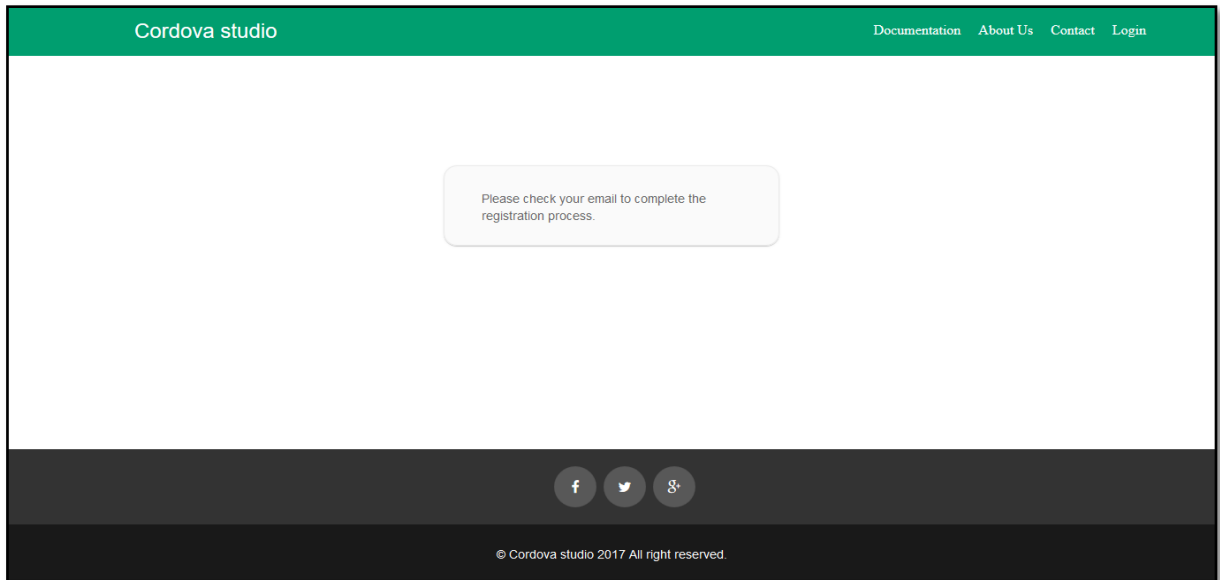


Figure 4-8 (Registration complete)

4.2.3.3 Register closed

This page will appear when user want register new an account, but registration process stopped in server due to maintenance or server too busy.

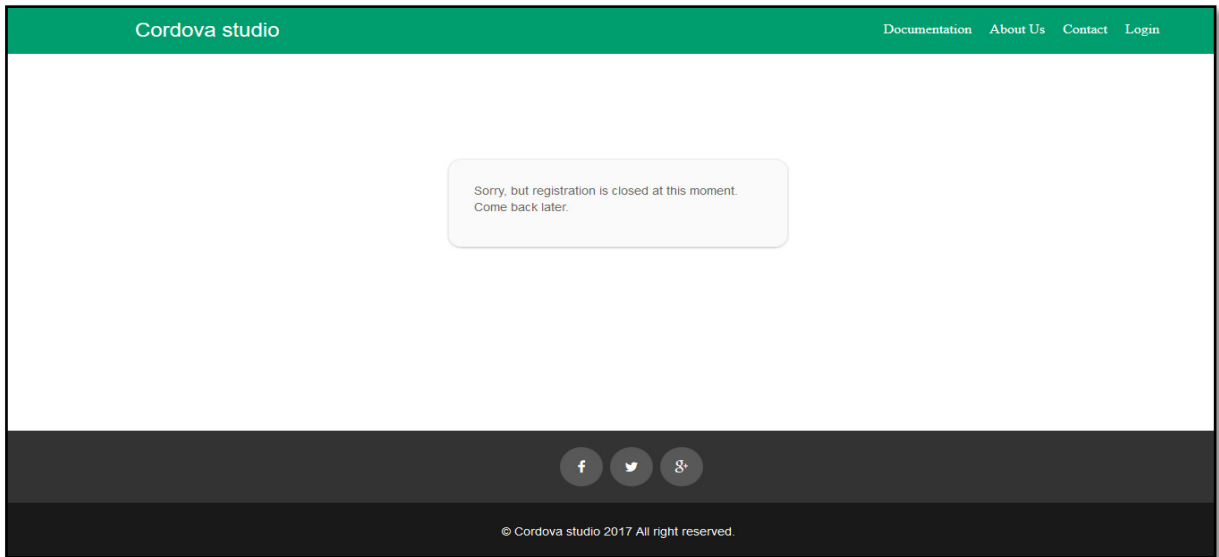


Figure 4-9 (Registration is closer)

4.2.3.4 Activation complete

When user creates new account, the system send verification link to user email to activate his account, when user clicks this link a system activates this account and redirect browser to this page.

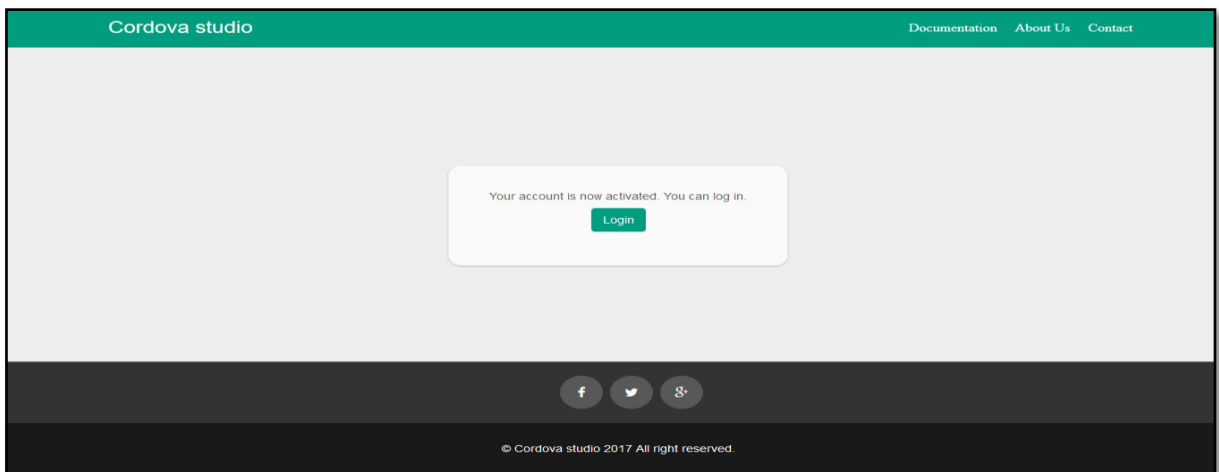


Figure 4-10(Activation complete)

4.2.3.5 Activation resend email

When users created new accounts, there are number of days for users to activate those accounts. If users does not activate those an accounts within that period, the account will remain inactive, this page allows user enter his email address so that a system resend verification link to him.

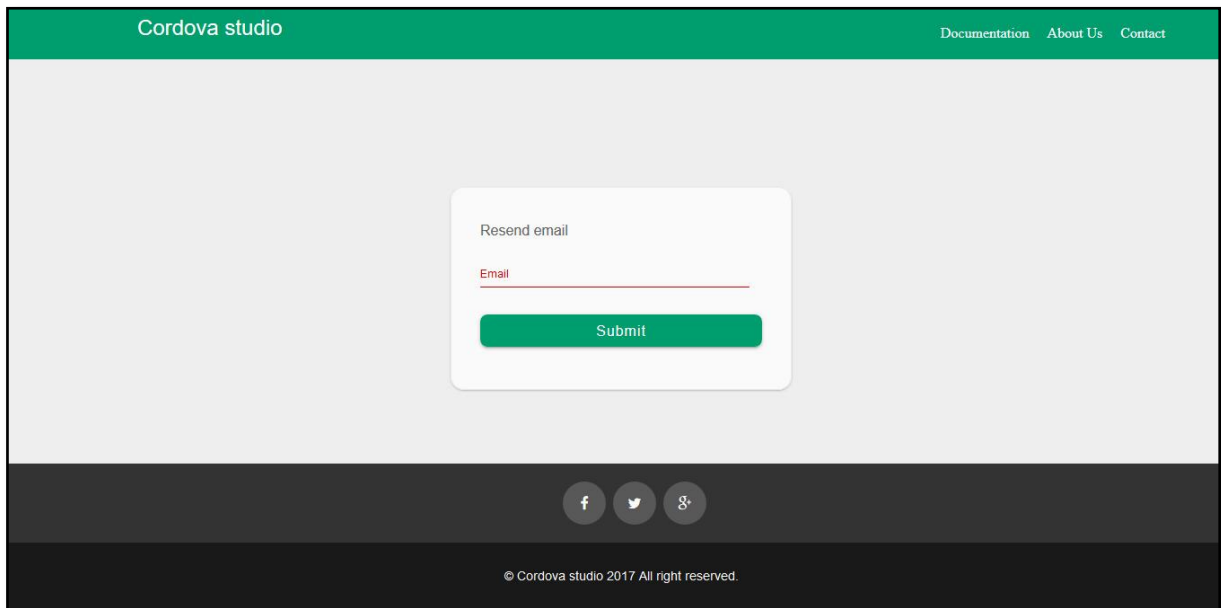


Figure 4-11(Activation resend main)

4.2.3.6 Login

After created an account, user can login into system, by username and password.

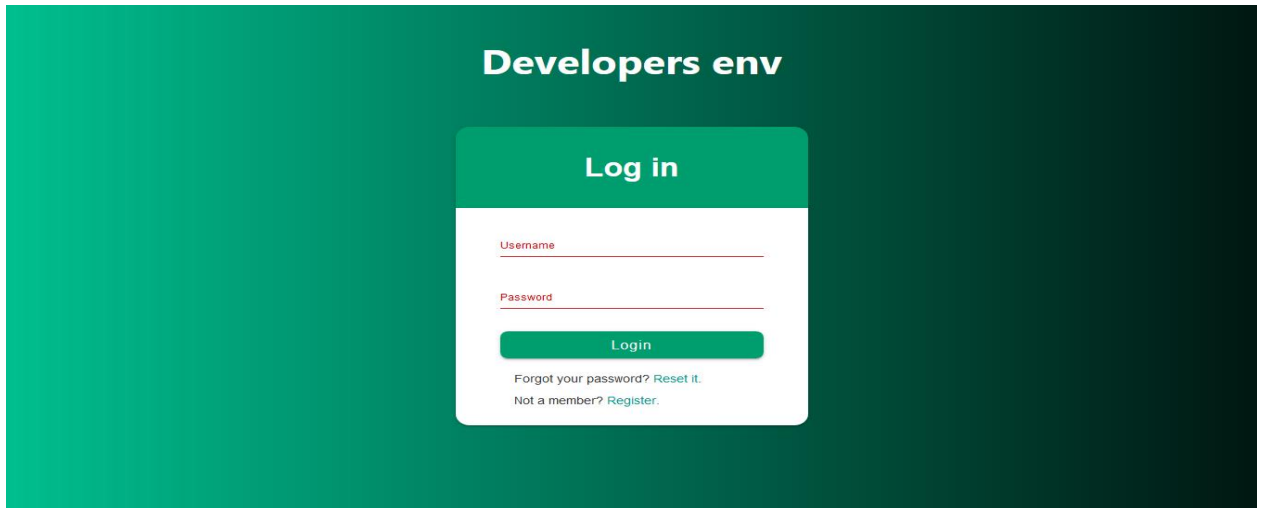


Figure 4-12(Developer log in)

4.2.3.7 Dashboard

The main page that display all user projects, user can select project to open it in IDE or show project details, it is also allow user to create new projects or upload projects.

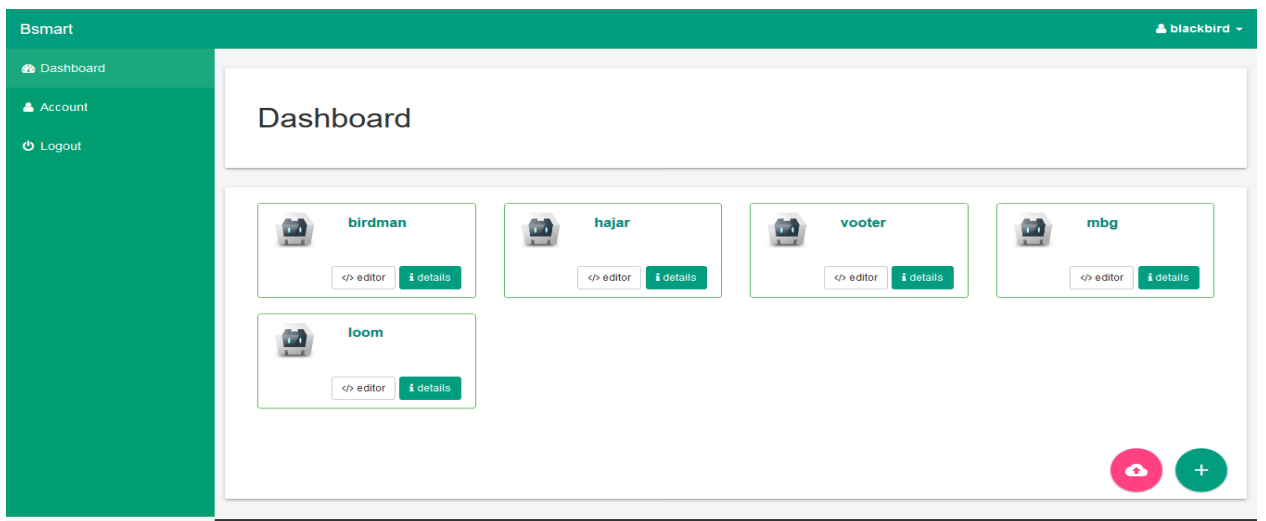


Figure 4-13(Developer Dashboard)

4.2.3.8 Show Project details

This page show project information and allow user to download project source code as zip file. It is also allow user build or rebuild project (android, iOS) and download executable and log files without need to open project in IDE, also user can open project in IDE directly.

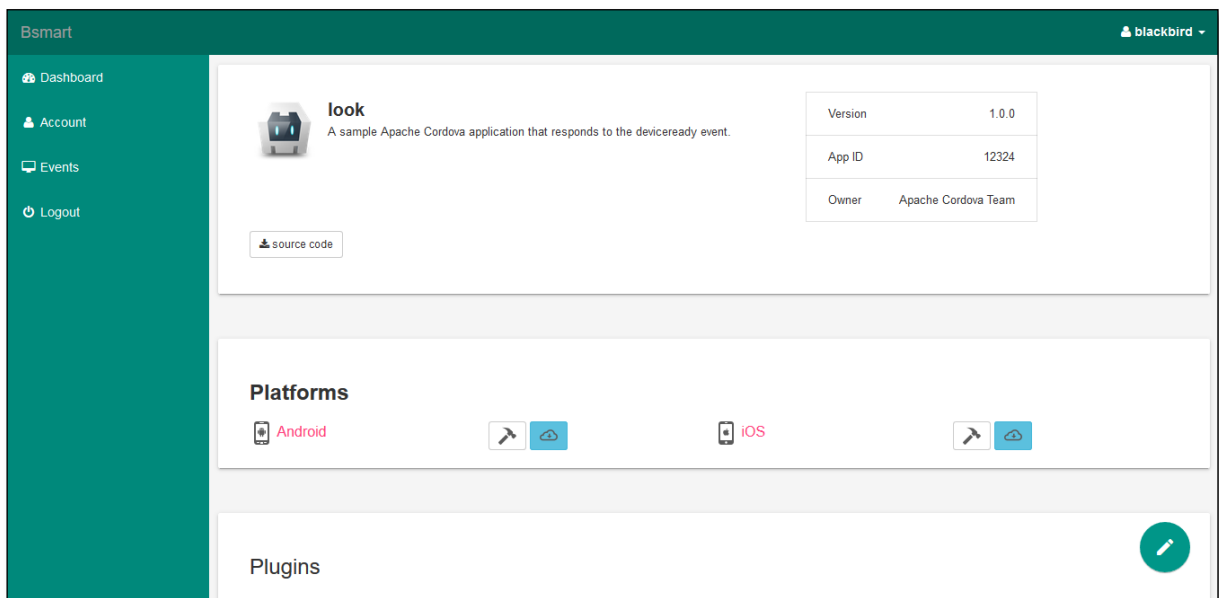


Figure 4-14(Show Project details)

4.2.3.9 Change password

This page allows user to change account password. User must enter his old password and new password.

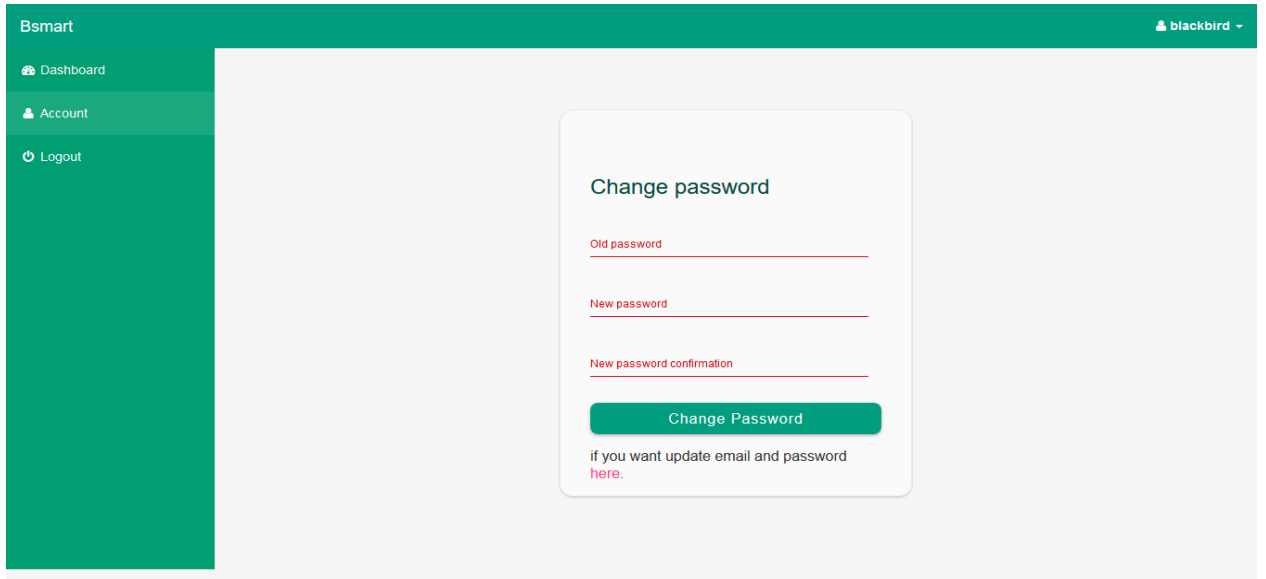


Figure 4-15(Change Password)

4.2.3.10 Password reset

If user forgot his password, he can simply use this page to reset it, using his email address.

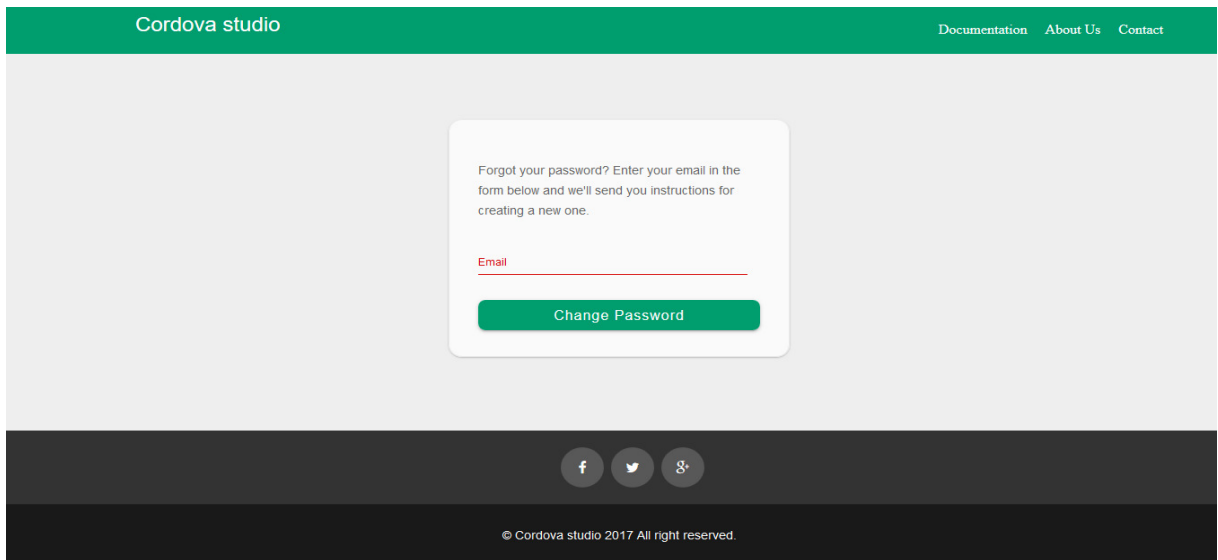


Figure 4-16(send reset to email address)

4.2.3.11 Password reset done

After user selected to reset password, the system sends an email contain a link to reset password, so user can confirm reset password.

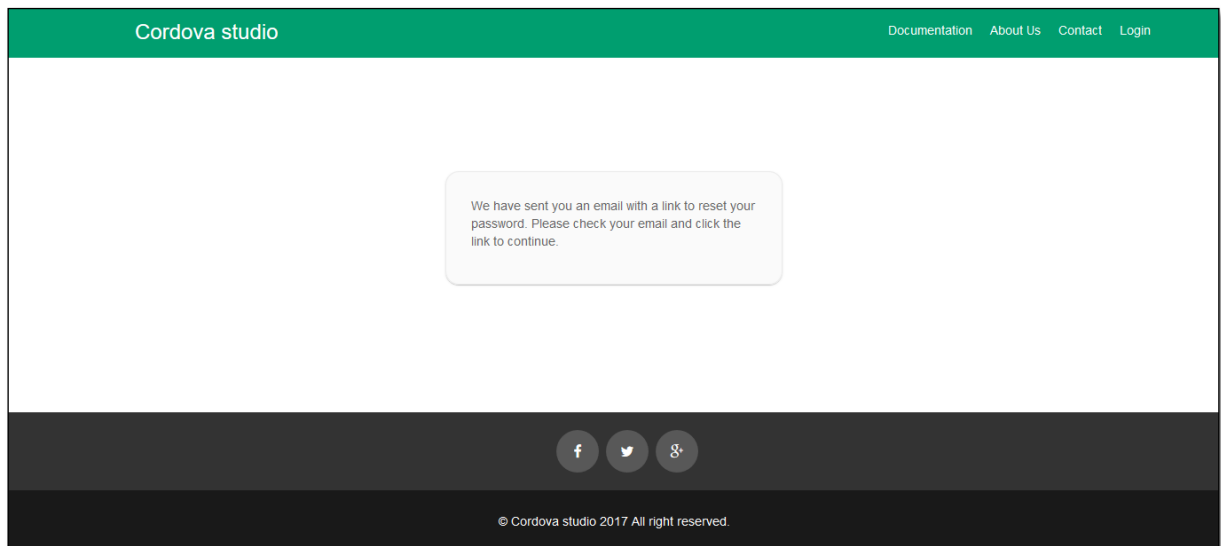


Figure 4-17(Password rest done)

4.2.3.12 Password reset confirm

This page allow reset password by enter new password.

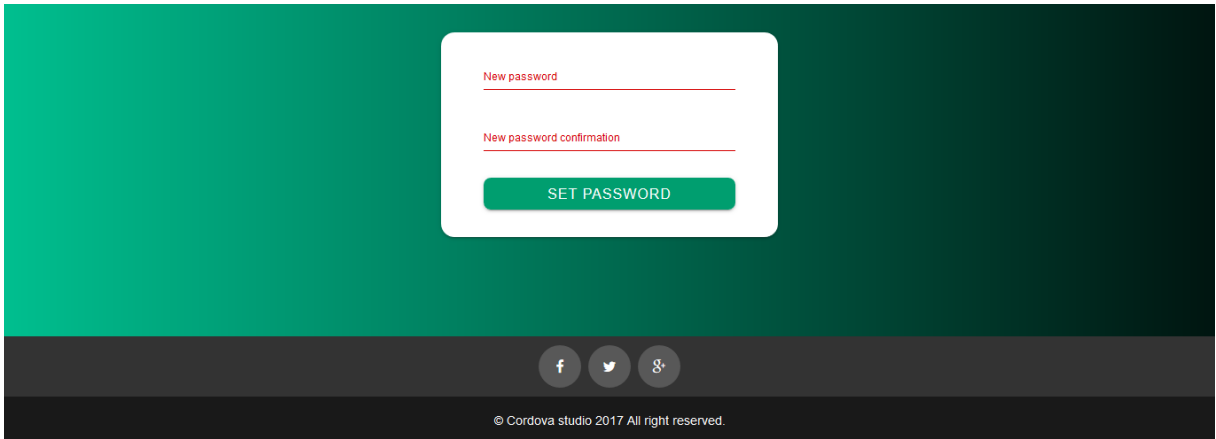


Figure 4-18(Password rest confirm)

4.2.3.13 Password reset complete

This page use to notify user that password reset is did successfully. Now user can login by new password.

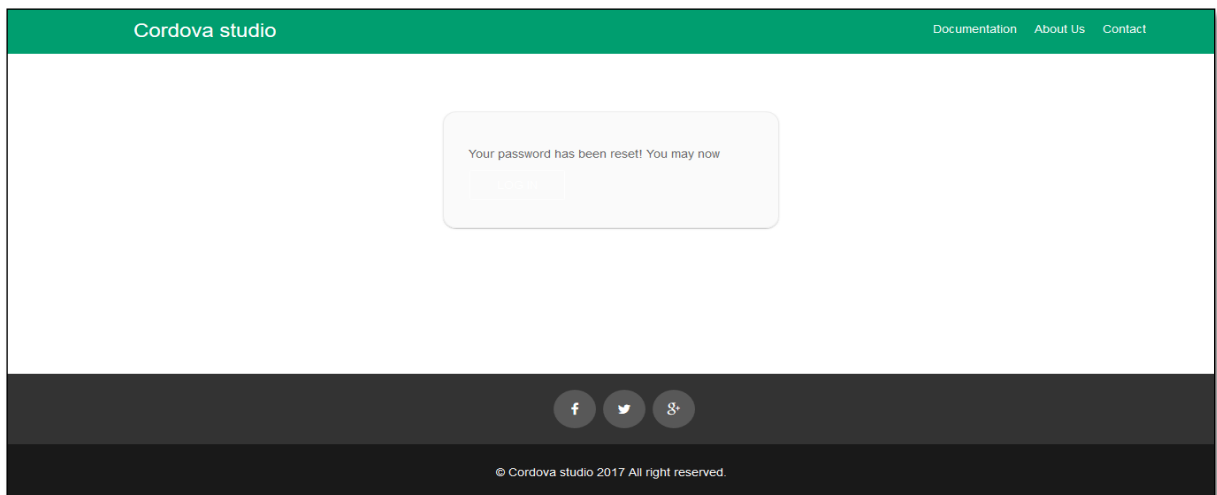


Figure 4-19(Password reset completed)

4.2.4 IDE

Main IDE page.

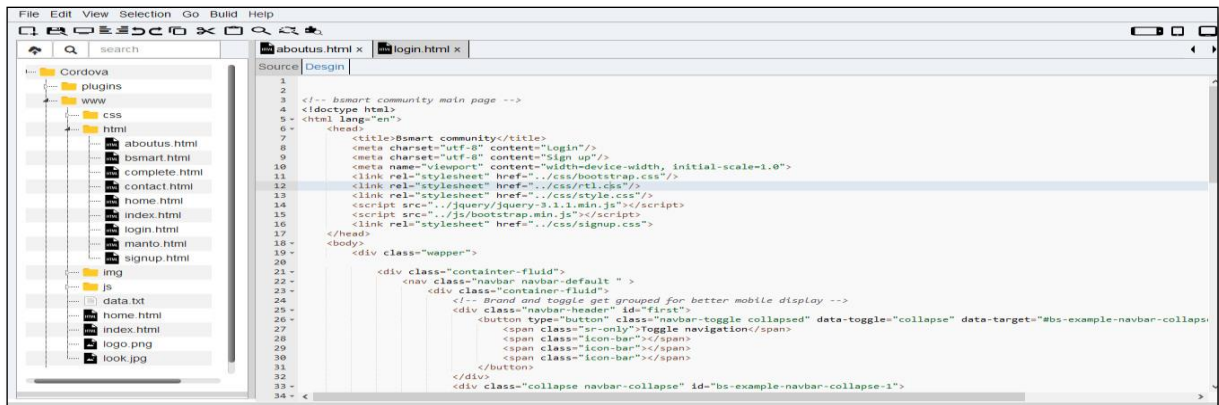


Figure 4-20(the IDE)

4.2.4.1 Main menu

4.2.4.1.1 File

Include the following functions:

1. New file

Create new file with specified name and extension in selected folder.

2. New Folder

Create new folder with specified name and type in selected folder.

3. New Project

Close current project, and create new Cordova project with specified name and open this project in current browser tab.

4. Close Project

Close current project, and return back to dashboard page.

5. Save

Save current active file data, save all changes on project opened files.

6. Import project

Upload Cordova project that was compress as zip file from desktop to cloud, and open this file in current browser tab.

7. Export project

Download current project source codes as zip file.

8. Plugins

Open project plugins tab, which allows user to add cordova plugin to project.

9. Preferences

- Theme

Change editor region theme.

- Font size

Change font size of text displayed on editor region.

- Font family

Change font family of text displayed on editor region.

- Font style

Change font style of text displayed on editor region.

- Tab size

Change number of characters of tab key.

- Autocomplete

Disable or enable an autocomplete.

- Format on save

Format file when user saved file changes.

- Word wrap

The text automatically "wraps" to the next line when it gets to the end of text field.

- Code folding

Show and hide section of code to make it easier to navigate through file contents.

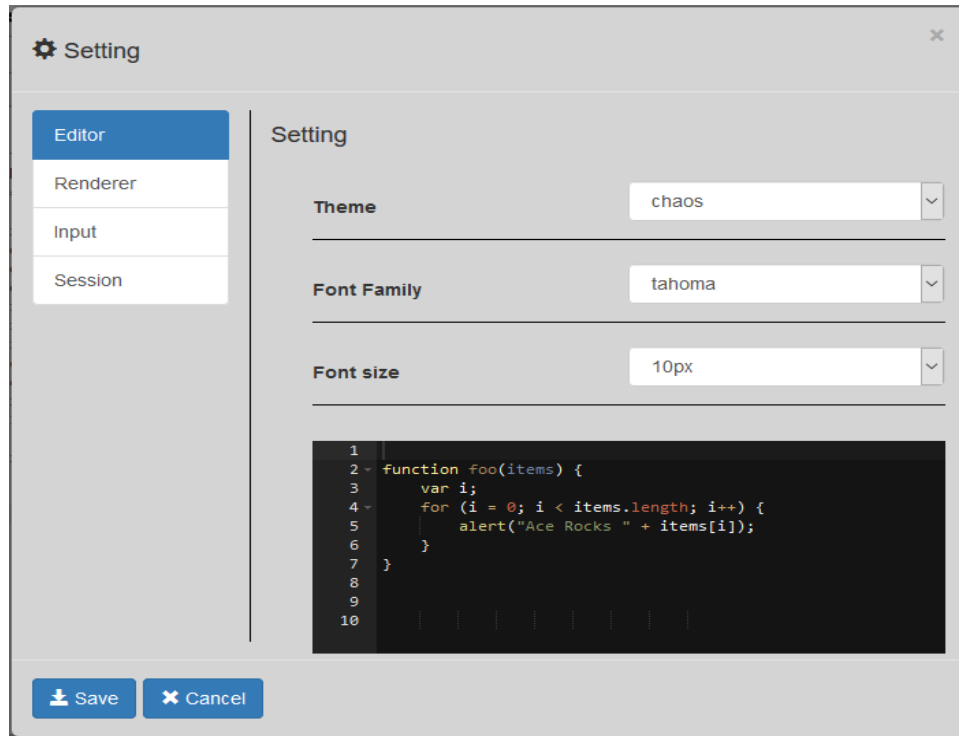


Figure 4-21(Setting)

10. Exit (close and logout)

Close current project and directly logout for system.

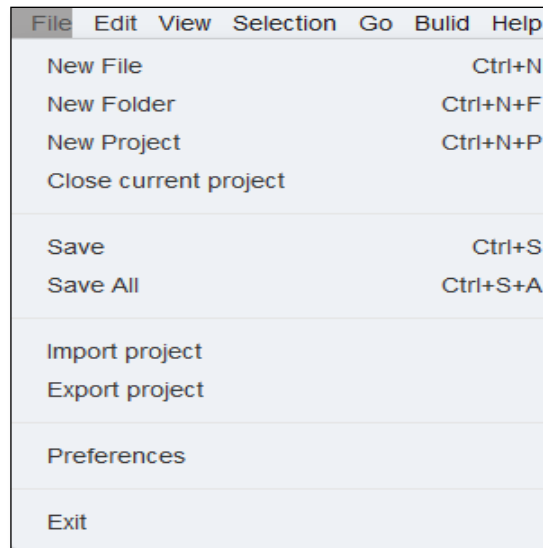


Figure 4-22(File)

4.2.4.1.2 Edit

Include the following functions:

1. Undo

Reverses the last action developer performed, for example if user do many changes, redo can restore the changes again.

2. Redo

Undo developer last Undo action.

3. Copy

Copy selected text, and saved it on buffer.

4. Cut

Cut selected text.

5. Paste

Insert data from clipboard into selected location. Before paste command user must use copy or cut command to save data to clipboard.

6. Find

Widget use to search for specific text in file content, and highlight this text.

7. Replace

Replace specific text with new text.

8. Format

Make file contents readable to users, by user desired indentation level.

9. Replace all

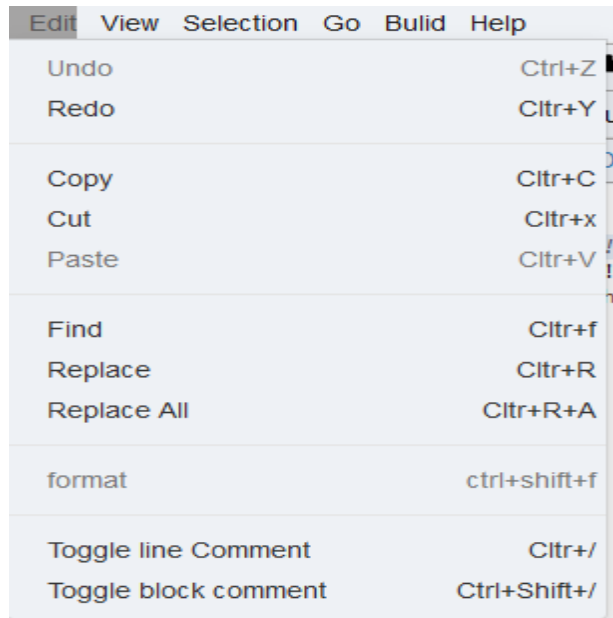
Replace all select text with new text.

10. Toggle line comment

Make current line a comment.

11. Toggle block comment

Make current selected block a comment.



Menu Item	Keyboard Shortcut
Undo	Ctrl+Z
Redo	Ctrl+Y
Copy	Ctrl+C
Cut	Ctrl+x
Paste	Ctrl+V
Find	Ctrl+f
Replace	Ctrl+R
Replace All	Ctrl+R+A
format	ctrl+shift+f
Toggle line Comment	Ctrl+/-
Toggle block comment	Ctrl+Shift+/-

Figure 4-23(Edit)

4.2.4.1.3 View

Used to display or hide the following elements:

1. Toolbar
2. File explorer
3. Full screen
4. Properties list
5. Elements list
6. Elements behaviors list
7. Phone view list

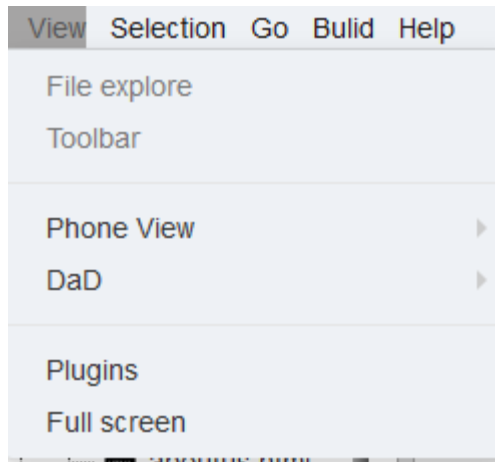


Figure 4-24(View menu)

4.2.4.1.4 Selection

Include the following functions:

1. Select all
Select all text of active file.
2. Select to match
Select all text of selected block from begin to end of this block.
3. Select start
Select all text from current location up to start of file.
4. Select to end
Select all text from current location to until end of file.
5. Duplicate line up
Copy current line text and paste this text on line before this line.
6. Duplicate line down
Copy current line text and paste this text on line after this line.
7. Remove line
Remove current line text where cursor is.

8. Remove select

Remove current selected text.

9. Remove to line end

Delete all text form begin of file to current line where cursor is.

10. Remove to line start

Remove all text form current line until first line.

11. Change to upper

Change current selected text to capital letters.

12. Change to lower

Change current selected text to small letters.

13. Add multiple cursor

Add new cursor in selected location.

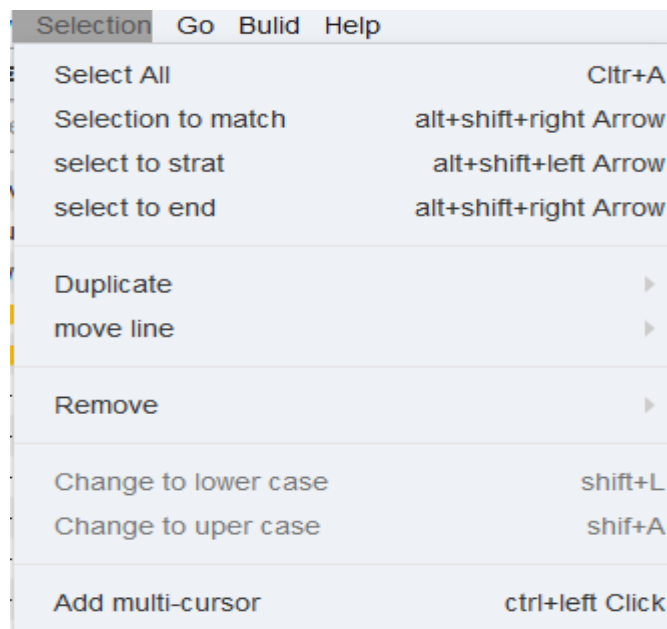


Figure 4-25(Selection)

4.2.4.1.5 Go

Include the following functions:

1. Next Editor
Select right opened file to be an active.
2. Previous Editor
Select left opened file to be an active.
3. Go to line
Widget move cursor to line specified by number.
4. Go to start
Move cursor to begin of file.
5. Go to end
Move cursor to end of end.

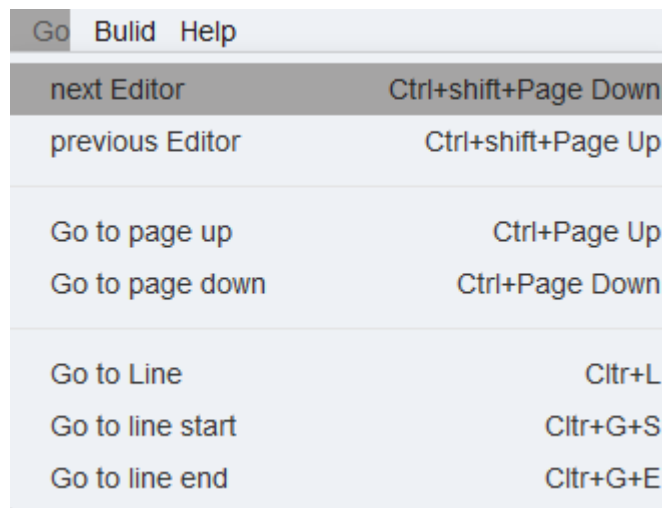


Figure 4-26(Go)

4.2.4.1.6 Build

Include the following functions:

1. Android

The process of convert Cordova project source code files to android executable file, then download this file.

2. iOS

The process of convert Cordova project source code files to iOS executable file, then download this file.

3. Build log

Download the output of build process as log file.

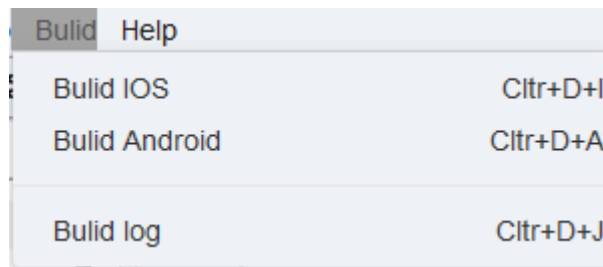


Figure 4-27(Build)

4.2.4.1.7 Help

Include the following functions:

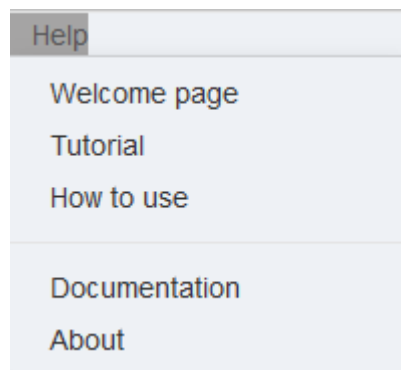


Figure 4-28(Help menu)

1. Welcome

Display welcome widget

2. Tutorial

Open tutorial page in new browser tab.

3. Documentation

Open how to use page in new browser tab.

4. About

Display widget contains information about the editor.

4.2.4.2 Toolbar

Provide fast and efficient editing options.



Figure 4-29 (tool bar)

4.2.4.3 File explorer (Tree view)

Display all project files and folders in hierarchy tree. Use to open, search, upload, download and manage files and folders.

It also consist of context menu that provides options to manage file and folders, this options include create, rename, delete, move files and folders.

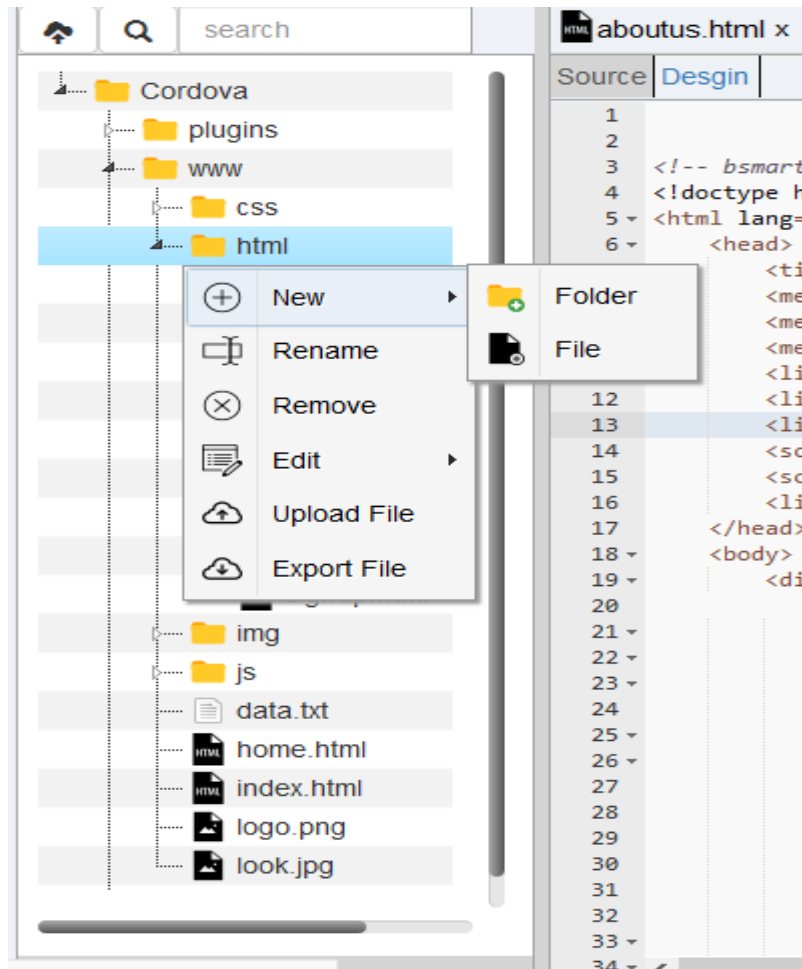


Figure 4-30(Tree View)

4.2.4.4 Main Editor

Display list of files that previously opened, it is includes the following two parts:

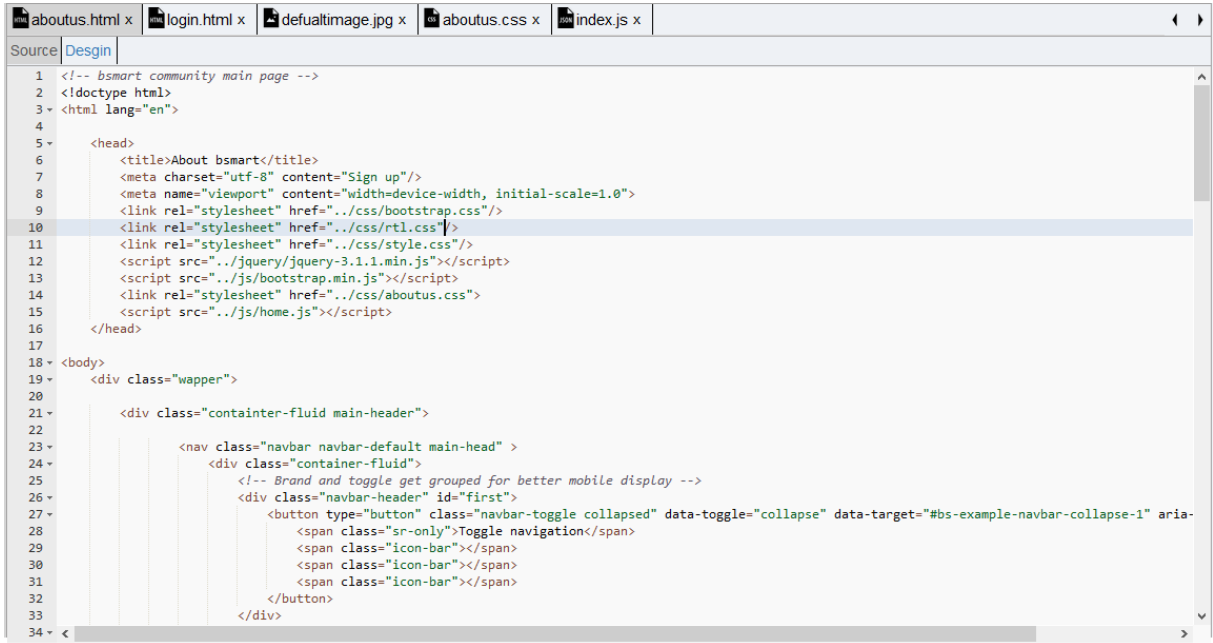


Figure 4-31(Main Editor)

4.2.4.4.1 Tabs Header

Contain tab(s), when user open file from file explorer, a new tab is created and assigned to that file, each tab consist of file name, icon that represent file type and button to close file.

User can easily navigate between files by click file tab to its file, last opened file call active file, the content of this file displayed in editor region.



Figure 4-32(Tabs Header)

4.2.4.4.2 Editor region

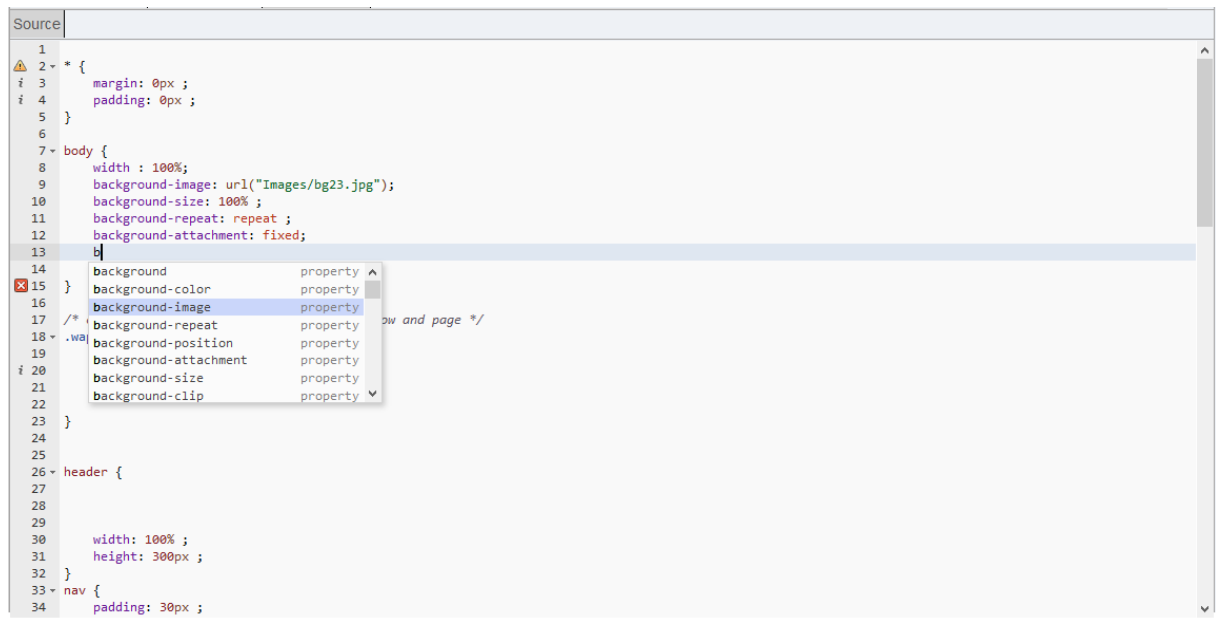


Figure 4-33(Editor region)

Main area where content of active files displayed to be edit. It is include the following:

1. Text

Represent file contents.

2. Context menu

According to file type this menu provides options for quick and efficient editing, for example copy, paste, cut and etc.

3. Search widget

Search for specific text in content of file, or even replace this text with new text.

4. Autocomplete

Pop up menu triggered when user type something to provide suggestions to him.

It is support HTML, CSS and JavaScript.

5. Simple DnD interface

This interface available only for HTML files, its allow html elements to be dragged and dropped, it provides fast and efficient web pages development, its includes the following

i. Elements

A menu contains HTML5 elements that dragged and dropped on phone area. The system supported HTML5 elements includes Button, label, textarea, input (text, search, phone, date, radio, checkbox), selection, audio, video.

ii. Phone area

It is an area that represent html page, and it's the place where dragged elements are dropped.

iii. CSS properties

A menu contains CSS3 properties values according to selected html5 element.

iv. JavaScript function

A menu contains JavaScript function names associate with elements behaviors.

4.3 Server side:

4.3.1 Web server

Used Django as web server frameworks, that uses HTTP to serve files that create web pages to users in response to their requests, and forward this response to user.


```
C:\Users\bsmar\Desktop\pro\go\pro>python manage.py runserver 8888
Performing system checks...

System check identified no issues (0 silenced).
October 17, 2017 - 17:41:57
Django version 1.11, using settings 'pro.settings'
Starting development server at http://127.0.0.1:8888/
Quit the server with CTRL-BREAK.
[17/Oct/2017 17:42:00] "GET / HTTP/1.1" 200 20373
```

Figure 4-34(Web server)

4.3.2 Postgresql

Use to store and retrieve users and project information in system.

4.3.3 Cordova CLI

Use to create, add or remove platforms (iOS, Android) and build Cordova projects to produce executable files.

4.3.4 Docker

Use to minimize server load, by create isolate environment where Cordova CLI can run and build Cordova projects.

4.4 Conclusion

This chapter explained how system work and how users interacts with it.

5 Chapter Five

Conclusions and Recommendations

5.1 Introduction

This chapter states conclusions and suggests recommendations for future research and studies.

5.2 Results

The outcome results of this study:

1. The environment been built in the cloud so it provides coding and building the project in the same environment.
2. The hybrid application development been used in the project so that it provides the user with a cross-platform application.
3. The environment provides accessing the project online from anywhere at any time.
4. The developers do not need to install any software on his computer device because they installed in the cloud.

5.3 Recommendations

- Support windows phones platform.
- Provide online android emulator and iOS simulator.
- Support ionic framework that is hybrid mobile application framework.
- Support Arabic language.
- Increase the Drag and drop interface features.

5.4 Conclusion

This chapter summarizes the results that achieved from this study

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