



**AHMEDABAD**  
**UNIVERSITY**

School of Engineering  
and Applied Science

# Cloud Computing

## Cloud Based Code Manager

### Project Report

Branch: - ICT

Group No: - 2

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## Acknowledgement

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## Abstract

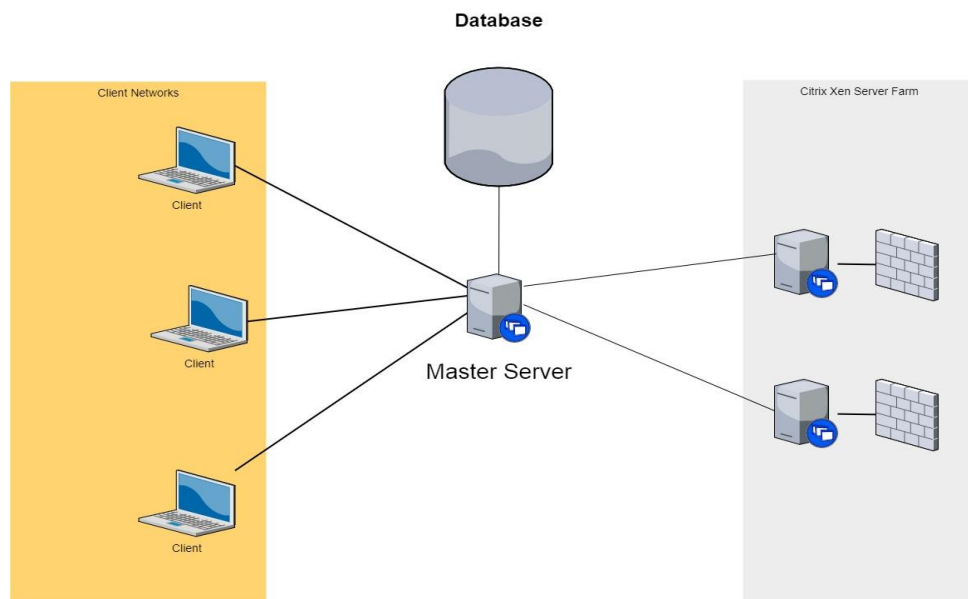
Build cloud based web application that provides developer an interface which helps in code compilation, execution, storage, analysis and also provides code optimisation related suggestion if required in code.

## Project Description

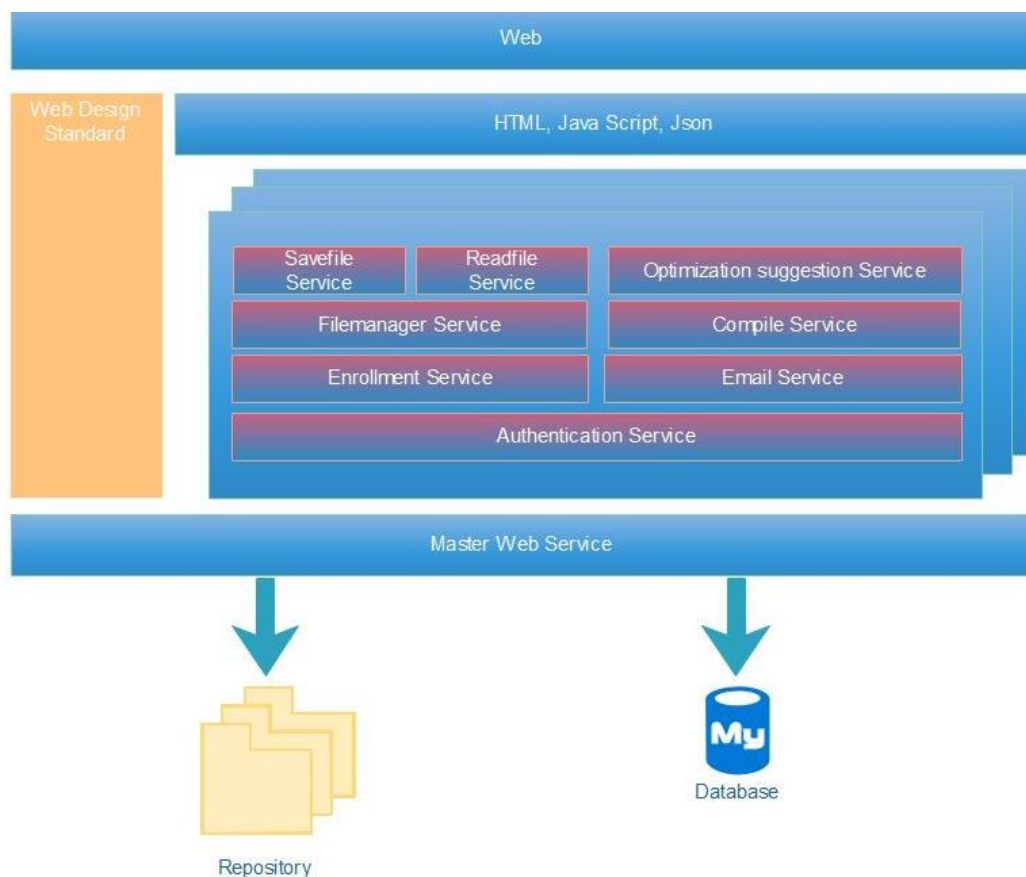
- Generally, for writing and practicing of code, programmer has to install different IDEs for different coding languages or has to set up coding environment on their PCs. Instead of that we are providing cloud based service oriented platform where, one can find different coding languages available online on cloud. One only needs a browser to access all services like authentication, registration, compilation, execution, analysis of code and get suggestions for code optimizations. User can also save their code for future reference and access.
- In code analysis, we provide the Memory and Time Usage of the code. In code optimization, we suggest the user that which lines in the code can be removed to improve the code performance.
- In future, we are planning to provide service which enables solution of error generated during code compilation.

## Physical and Logical Design

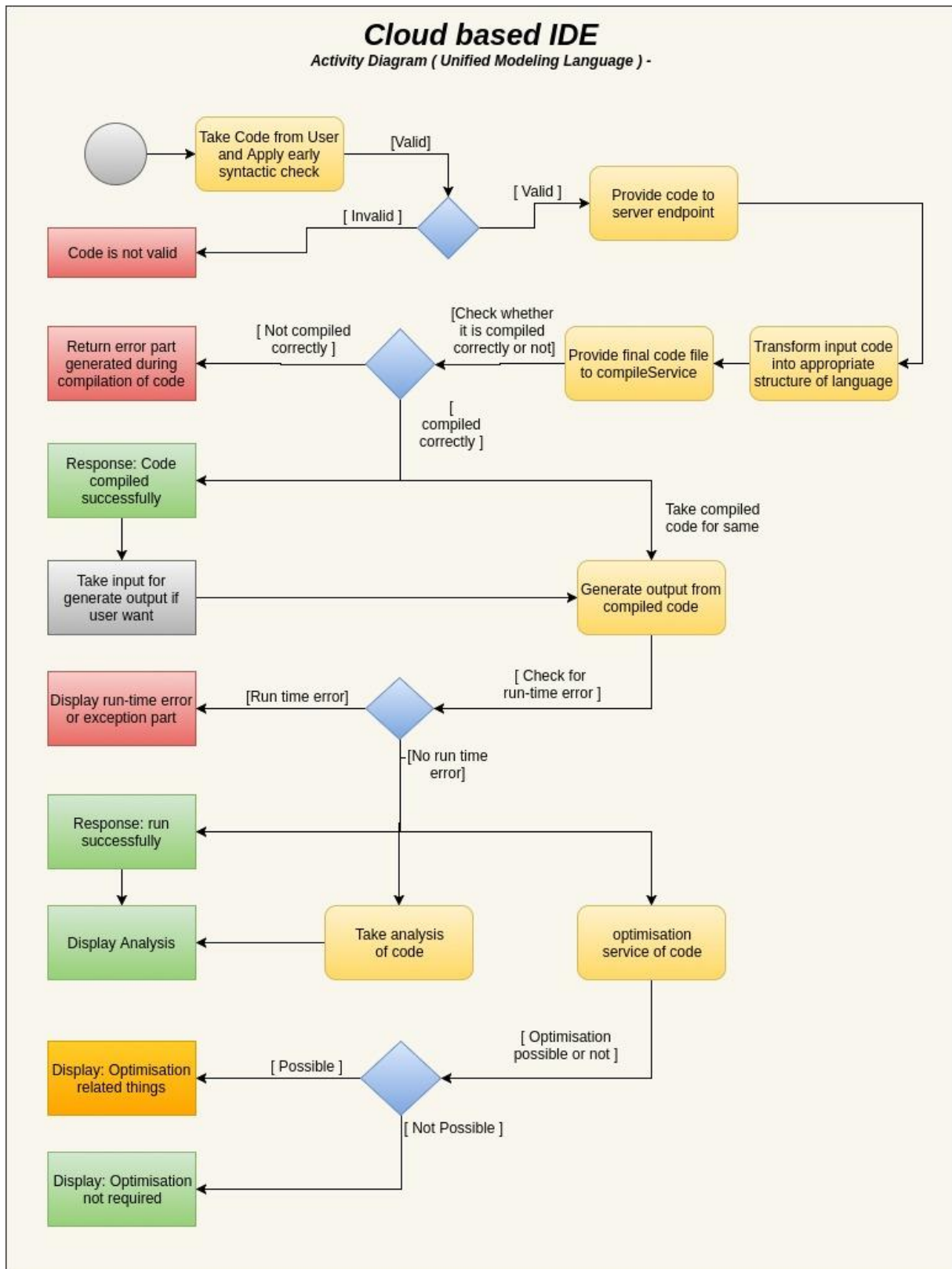
### Cloud Architecture



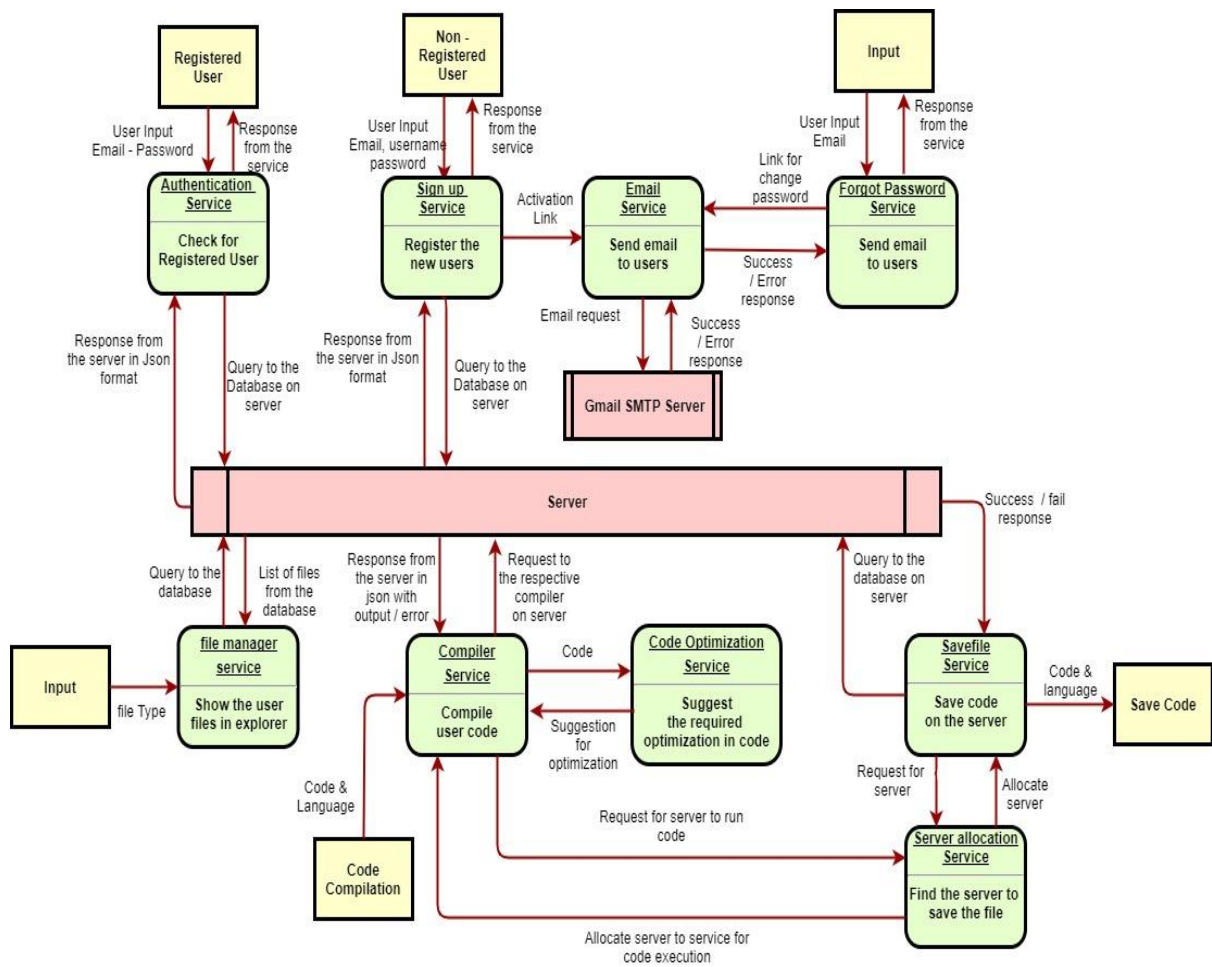
### Application Architecture



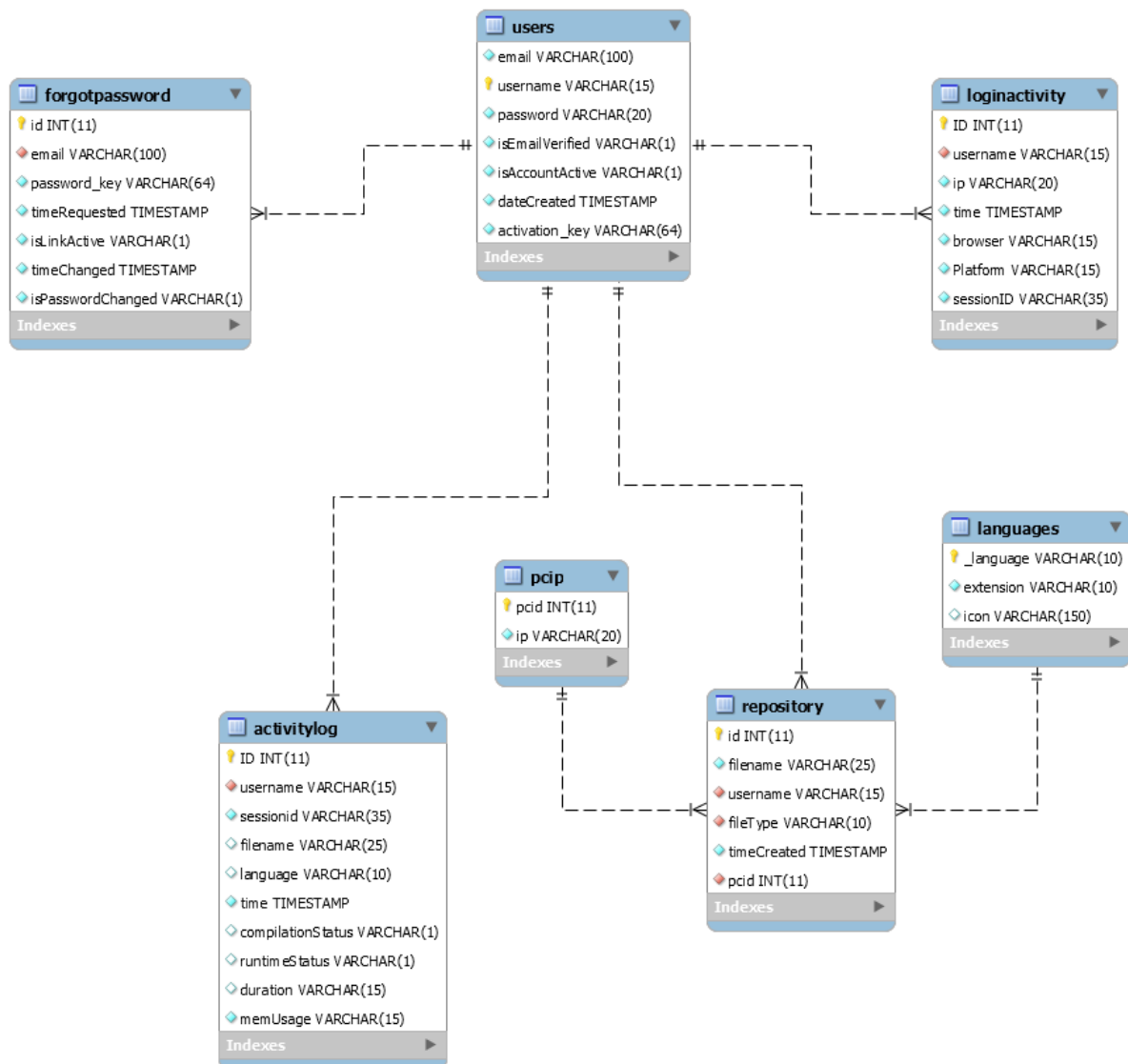
## Logical Design



## Dataflow Diagram



## Database Schema





## Services

### Authentication

This service compares the credentials provided by the user with the database of authorized users' information. If the credentials match, the process is completed and the user is granted authorization for access. If the credentials do not match, the user is not granted access and is requested to enter valid credentials to gain access.

### Sign-up

If the user is not registered, then the user can use this service and enter his details (sign - up) which will be added to the database of authorized users. This service provides the email service with the activation link that the user can use to complete the registration process.

### Email

This service, using the **Gmail SMTP Server**, sends emails to the users containing the link for completing the registration process or for changing the password in case the user forgot the password.

### Forgot password

In case the user has forgotten the password, this service can be used to change the password. It provides the email service with the link that the user can use to change the password.

### File manager

This service shows the user all the files that the user has saved. In addition, it also provides the user, specific types of files which the user wishes to see.

### Compilation

This service performs the primary function i.e. it performs the compilation of the codes for the users. It requests the server allocation service to allocate a machine for the compilation of the code. The user provides the service as an input: the code and the language in which it has to be compiled. If the compilation of the code was successful, then this service calls the code optimization service which takes the code as an input and provides suggestions for optimization. In this case, the output of the code and the suggestions for optimization of the code are both returned to the user. If the compilation of the code was not successful, it returns the error which occurred during the compilation process.

At this stage, the compiler service compiles the code for C, C++, Java and Python.

### Code Optimization

This service takes the file containing the code as an input, analyses the code and provides suggestions, which if implemented can optimize the performance in terms of the memory usage or the run-time of the code.

At this stage, this service optimize the code for Java and Python.

### Savefile

This service is used to save the code entered by the user in the database so that it can be accessed in the future. It requests the server allocation service to allocate a machine in which the code can be stored.

### Server allocation

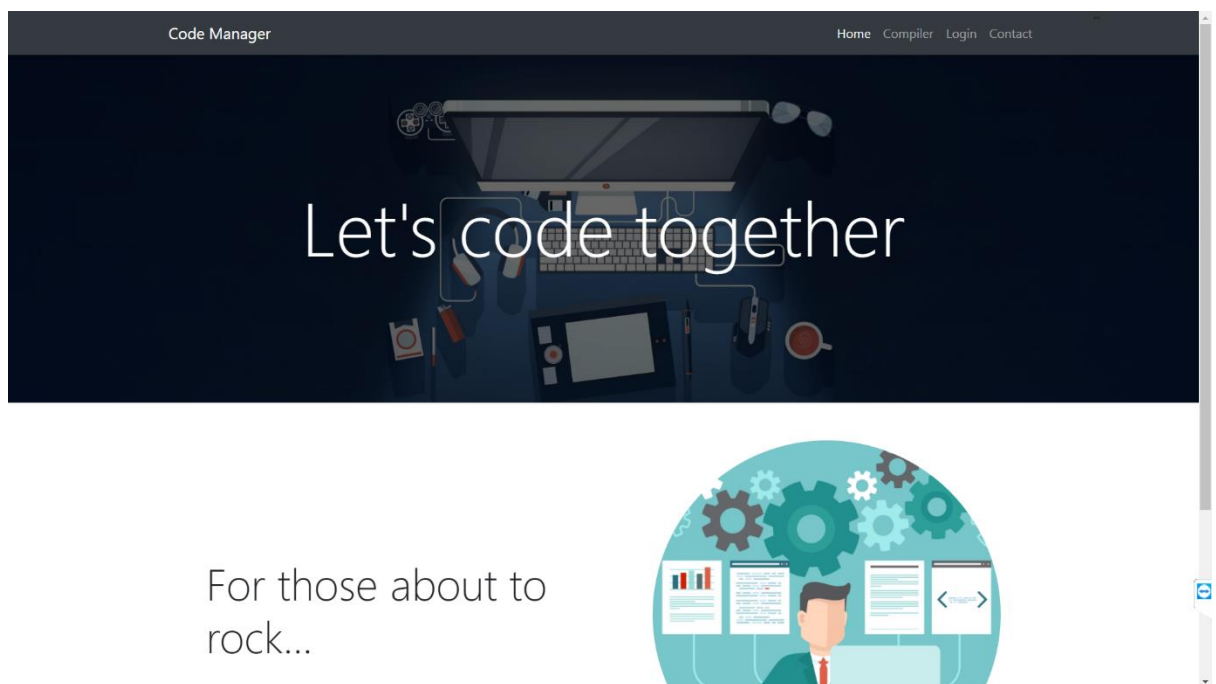
This service performs the function of allocating the machines and distributing the jobs for compilation and data storage. It checks the status for memory usage and storage availability in various machines that are available on the server side and allocates the machine which will be most suitable for compilation of the code or for storing the file containing the code.

## Features

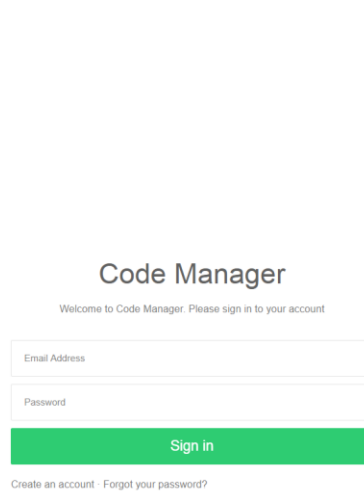
- |   |                                 |
|---|---------------------------------|
| • Multitenancy                                    | Developed                       |
| • Customizable GUI                                | Working                         |
| • Customizable business logic                     | Working                         |
| • Subscription                                    | Developed                       |
| • Monitoring and billing                          | Developed [Monitoring]          |
| • Security and privacy                            | Developed [privacy], Working on |
| Security  |                                 |
| • Scalability, high availability and reliability  | Developed                       |
| • Managing and administration for separate tenant | Developed                       |
| • Runtime per tenant customization                | Working                         |

## Result

- Home Screen

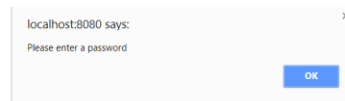


- Login Screen

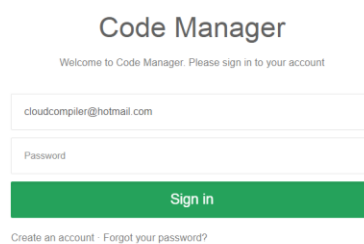


The screenshot shows a web browser window with the title "Code Manager". The page content includes a heading "Code Manager", a subtitle "Welcome to Code Manager. Please sign in to your account", and two input fields labeled "Email Address" and "Password". Below these fields is a green "Sign in" button. At the bottom of the form, there are links for "Create an account" and "Forgot your password?".

- Error based on user side input validation

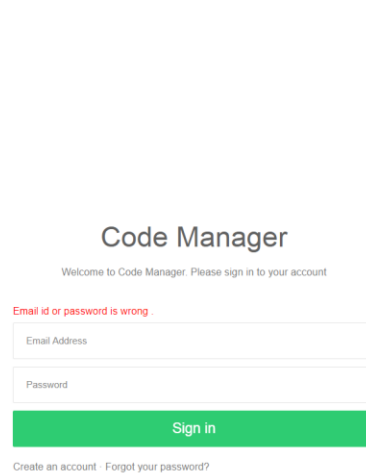


The screenshot shows a JavaScript alert dialog box with the title "localhost:8080 says:". The message inside the dialog is "Please enter a password". There is a blue "OK" button at the bottom right of the dialog.



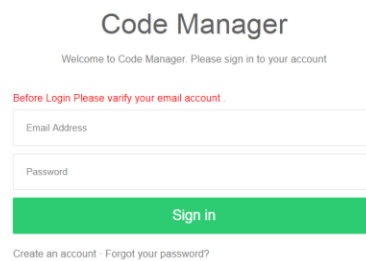
The screenshot shows the same "Code Manager" login screen as before, but with the "Email Address" field now containing the text "cloudcompiler@hotmail.com". The "Password" field is empty, and the "Sign in" button remains green.

- Error based on server side validation



The screenshot shows the login page of 'Code Manager'. At the top, it says 'Welcome to Code Manager. Please sign in to your account'. Below this, there is a red error message: 'Email id or password is wrong .'. Underneath the error message are two input fields: 'Email Address' and 'Password'. A green 'Sign in' button is positioned below the password field. At the bottom of the form, there are links for 'Create an account' and 'Forgot your password?'.

- User need to verify the account before login by clicking the link sent to user's mail account



The screenshot shows the login page of 'Code Manager'. At the top, it says 'Welcome to Code Manager. Please sign in to your account'. Below this, there is a red message: 'Before Login Please verify your email account .'. Underneath the message are two input fields: 'Email Address' and 'Password'. A green 'Sign in' button is positioned below the password field. At the bottom of the form, there are links for 'Create an account' and 'Forgot your password?'.

- Sign up screen

## Code Manager

Create your account.

<input type="text"/>
<input type="text"/>
<input type="password"/>
<input type="password"/>
<input type="button" value="Create Account"/>

Already have an Account? [Sign In](#) · [Forgot your password?](#)

By clicking sign in up, you agree to our [Terms of services & Policies](#).

- Server side validation for sign up

## Code Manager

Create your account.

Email id is already registered .

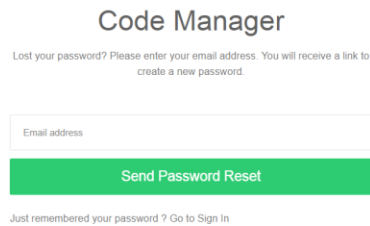
Username is already registered .

<input type="text"/>
<input type="text"/>
<input type="password"/>
<input type="password"/>
<input type="button" value="Create Account"/>

Already have an Account? [Sign In](#) · [Forgot your password?](#)

By clicking sign in up, you agree to our [Terms of services & Policies](#).

- Forgot password Screen

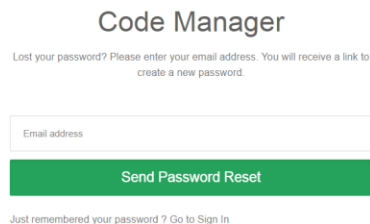


The screenshot shows a web interface titled "Code Manager". Below the title, a message reads: "Lost your password? Please enter your email address. You will receive a link to create a new password." There is a text input field labeled "Email address". Below the input field is a green button labeled "Send Password Reset". At the bottom of the form, there is a link: "Just remembered your password ? Go to Sign In".

- User side validation for forgotpassword

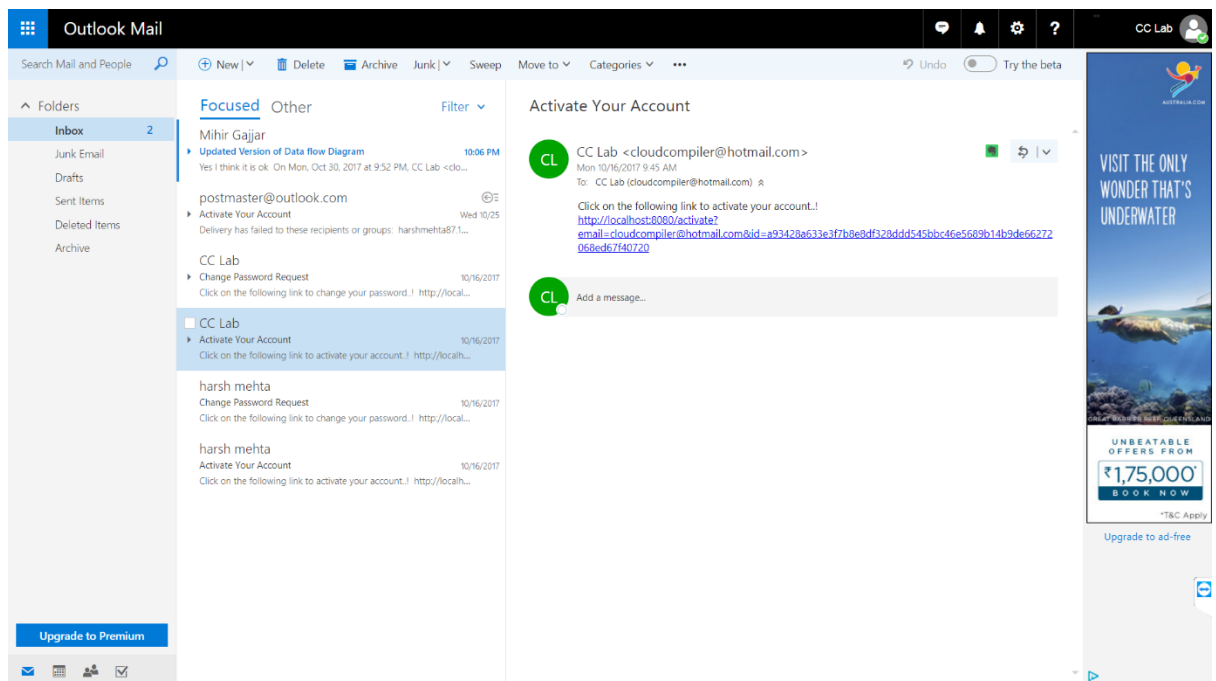


The screenshot shows a small dialog box with a title bar that says "localhost:8080 says:". The main text inside the dialog box says "please enter email address". There is a blue button labeled "OK" in the bottom right corner.



This is a duplicate of the first screenshot, showing the "Code Manager" forgot password screen with the "Email address" input field, "Send Password Reset" button, and "Go to Sign In" link.

- Link sent to user to activate account



- When user go to the link for activation of an account

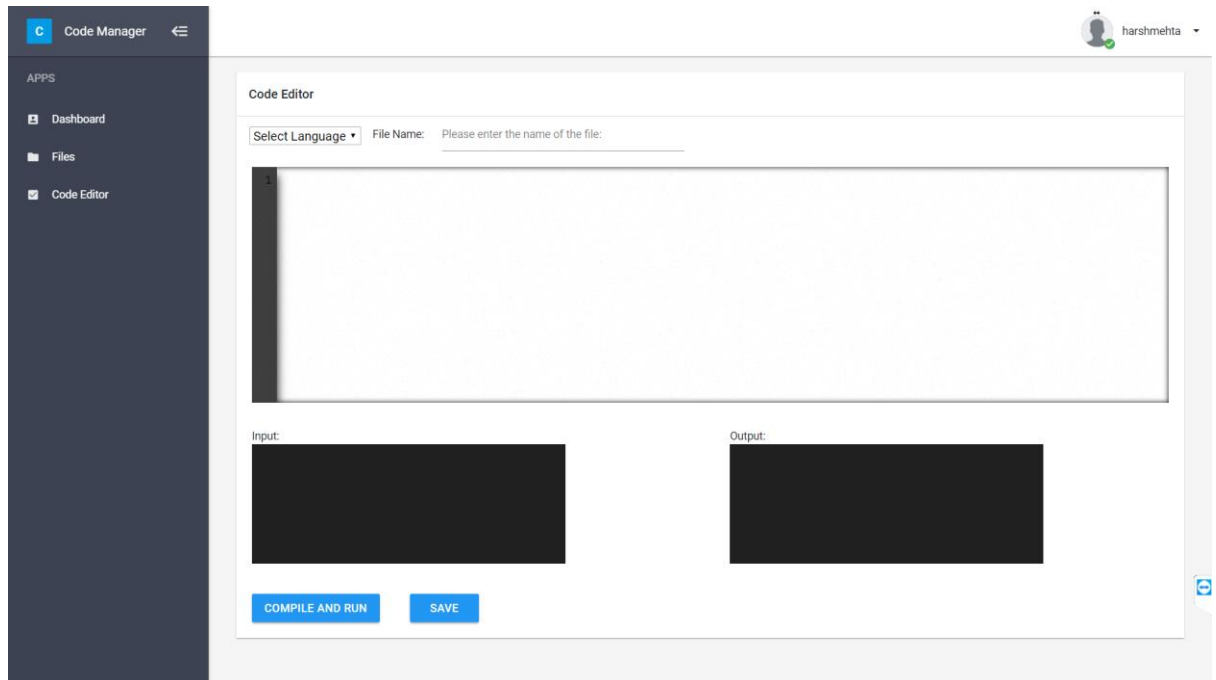
Congratulation..!  
You have been successfully  
activated your account :-)

[Go To Login Page](#)

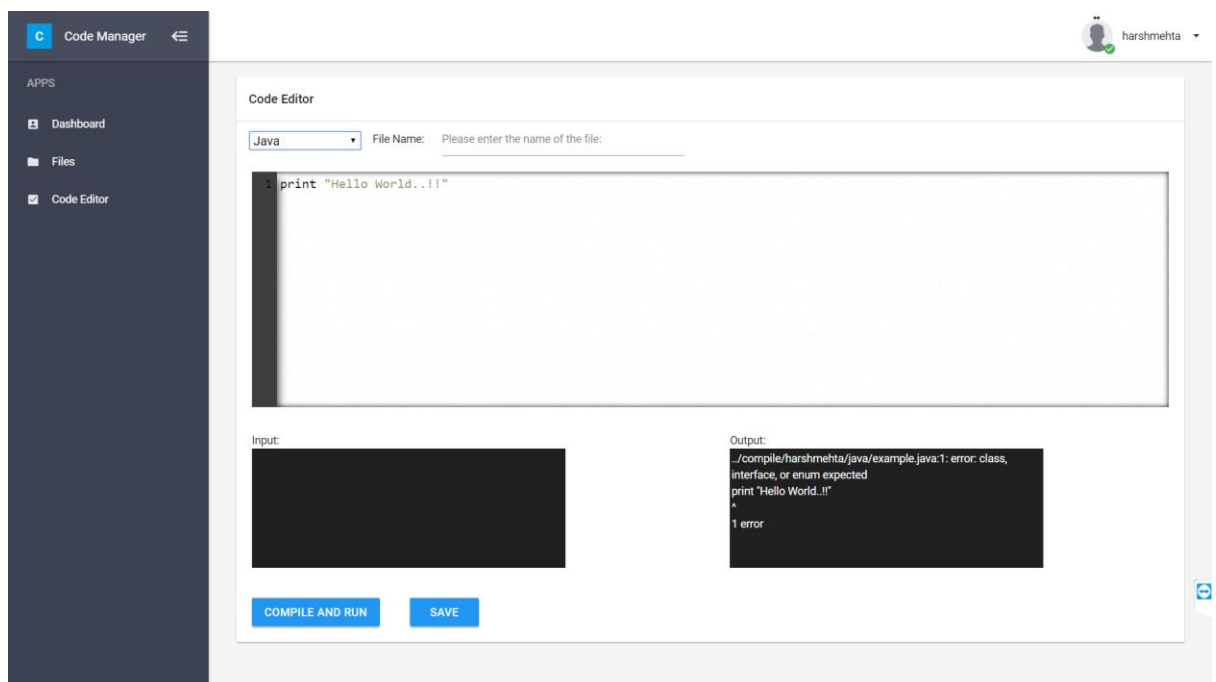




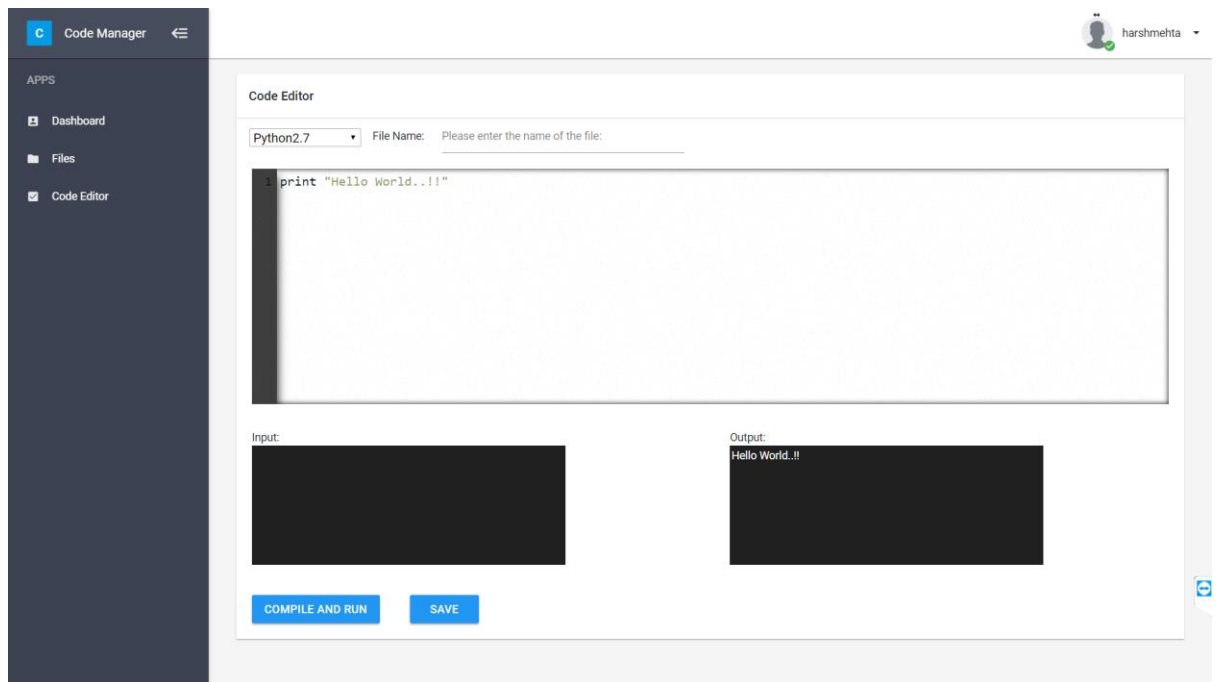
- Code Editor screen



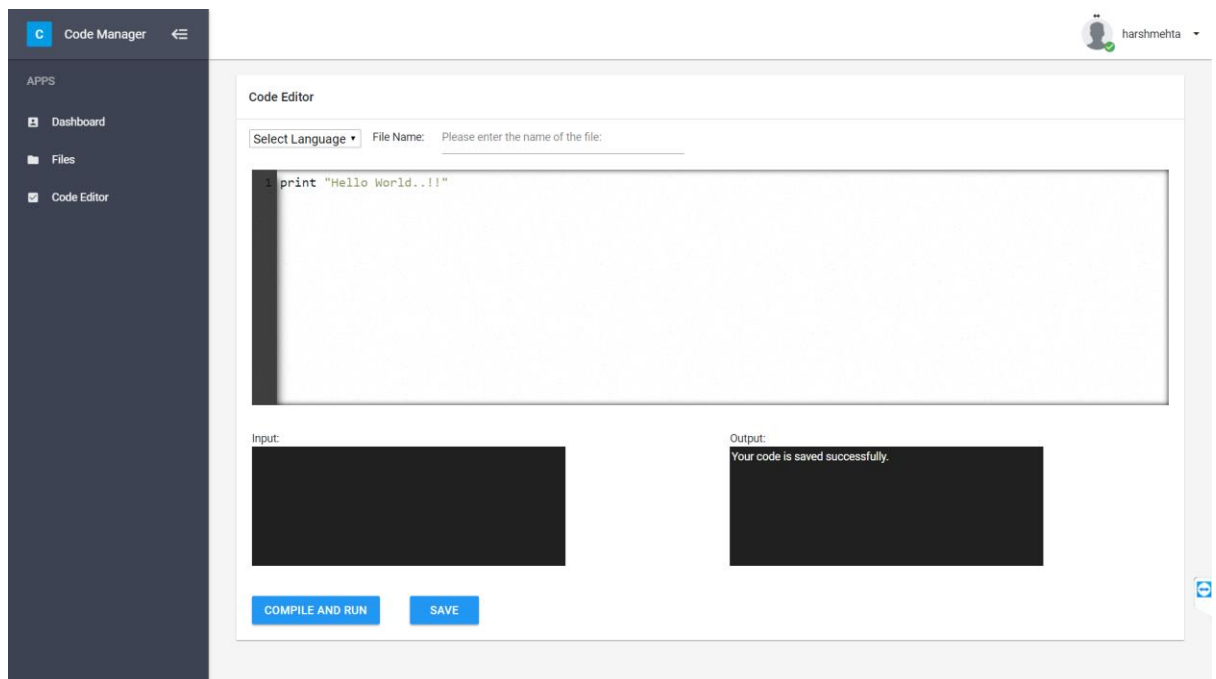
- Compilation error is showing in output



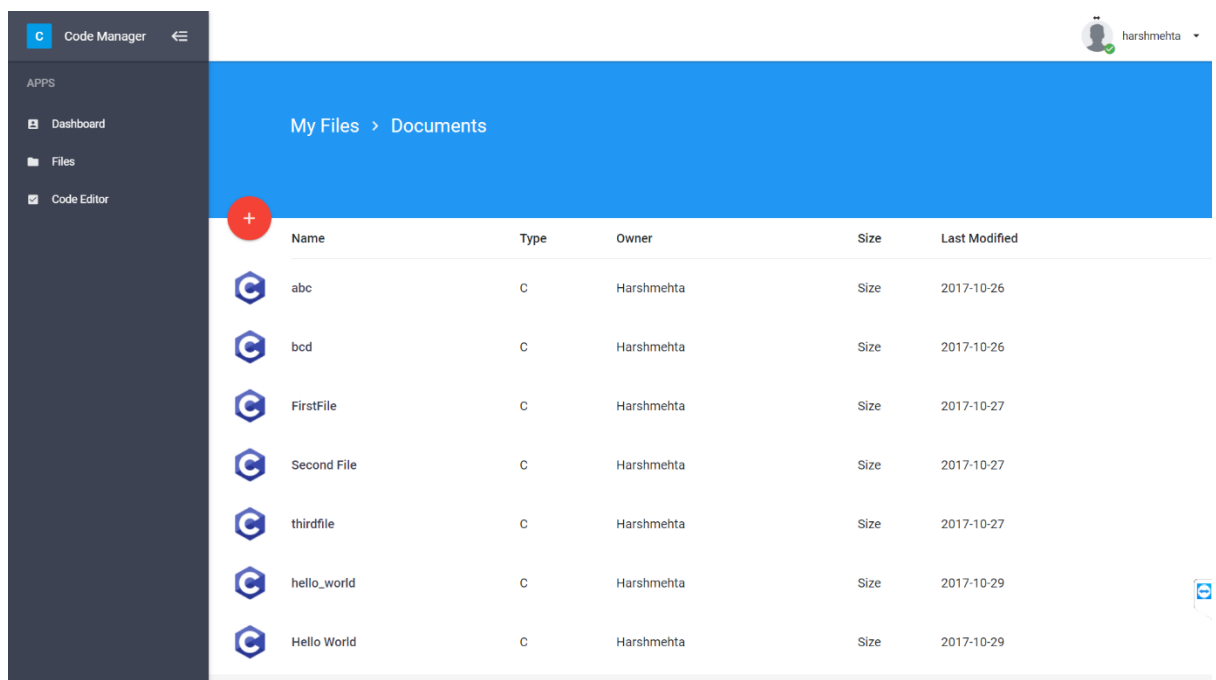
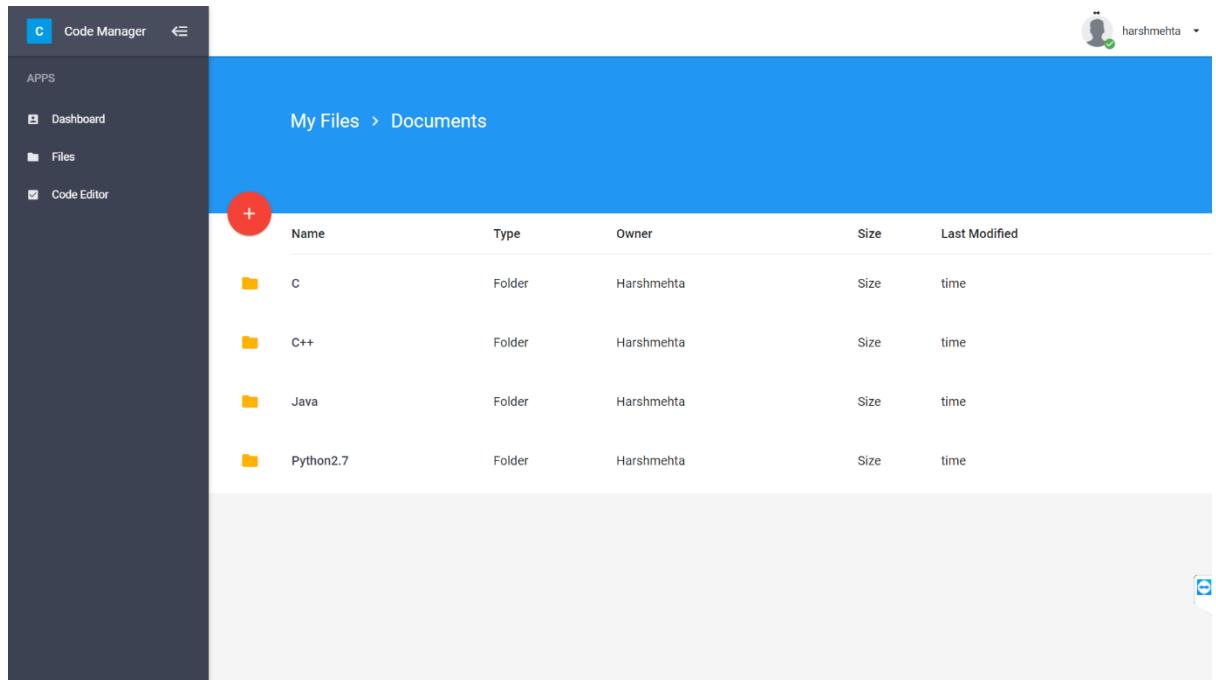
- Successful compilation



- Save file



- File manager screen

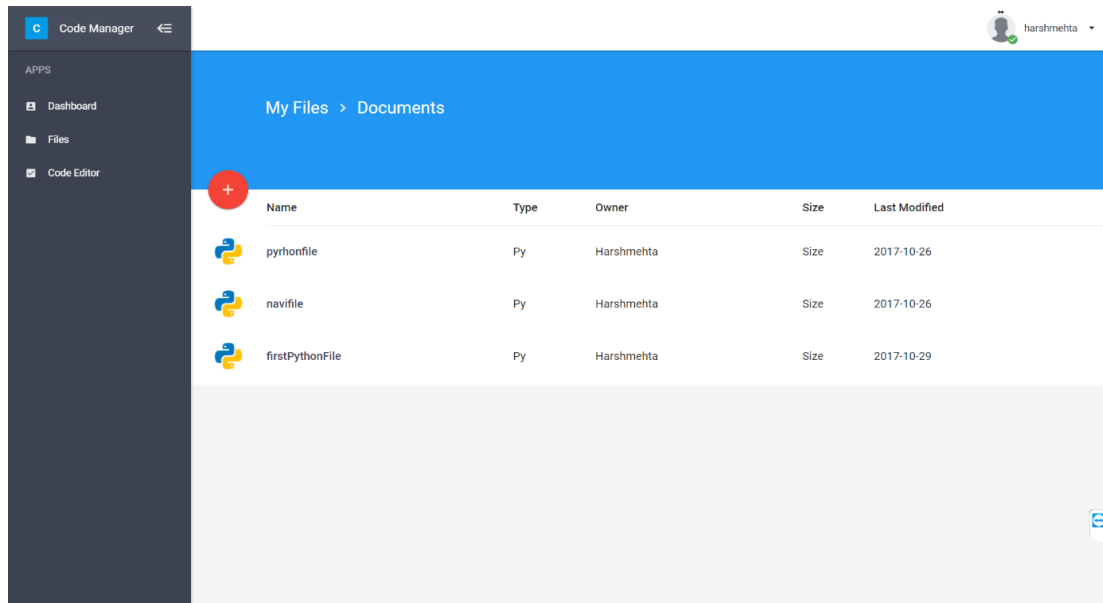


The screenshot shows the Code Manager interface. On the left is a dark sidebar with a 'Code Manager' header and a menu containing 'Dashboard', 'Files', and 'Code Editor'. The main area has a blue header 'My Files > Documents' and a table of files. A red '+' button is at the top left of the table. The table has columns: Name, Type, Owner, Size, and Last Modified. It lists two C++ files: 'cplusplus' and 'input', both owned by 'Harshmehta' and modified on 2017-10-26 and 2017-10-29 respectively. A user profile 'harshmehta' is in the top right.

Name	Type	Owner	Size	Last Modified
cplusplus	Cpp	Harshmehta	Size	2017-10-26
input	Cpp	Harshmehta	Size	2017-10-29

The screenshot shows the Code Manager interface with the same sidebar. The main area header is 'My Files > Documents'. The table now shows a single Java file named 'javafile', owned by 'Harshmehta' and modified on 2017-10-26. A red '+' button is at the top left of the table. The user profile 'harshmehta' remains in the top right.

Name	Type	Owner	Size	Last Modified
javafile	Java	Harshmehta	Size	2017-10-26



## Conclusion

Successfully implemented cloud based service oriented architecture which provides user a web based interface for compilation, execution, code suggestion and storage of code.

## Future Work

- Provide code optimization for c, c++, python
- Provide same set of service for other frequent set of programming languages
- Provide solution to error generated during compilation

## References

- Ansari, Aamir Nizam, Siddharth Patil, Arundhati Navada, Aditya Peshave, and Venkatesh Borole. "Online C/C++ compiler using cloud computing." 2011 International Conference on Multimedia Technology, 2011. doi:10.1109/icmt.2011.6002124.
- Ghaleb, Taher Ahmed. "Toward open-source compilers in a cloud-based environment: the need and current challenges." 2015 International Conference on Open Source Software Computing (OSSCOM), 2015. doi:10.1109/osscom.2015.7372684.
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- Xu X., Hu H., Hu N., Ying W. (2012) Cloud Task and Virtual Machine Allocation Strategy in Cloud Computing Environment. In: Lei J., Wang F.L., Li M., Luo Y. Network Computing and Information Security. Communications in Computer and Information Science, vol 345. Springer, Berlin, Heidelberg

## Annexure

Find following code which get input code and return status, compilation outputs, execution output and code optimization suggestions.

```
from multiprocessing import Process, Queue
from suggestion import suggestJava
import os, signal, sys
import subprocess
import time
import threading
import psutil

def memory_usage(z, thread_q):
    """Memory usage of the current process in kilobytes."""
    status = None
    memory = 0
    result = {'peak': 0, 'rss': 0, 'data': 0, 'stk': 0}
    try:
        # This will only work on systems with a /proc file system
        # (like Linux).
        status = open("/proc/"+str(z)+"/status")
        for line in status:
            parts = line.split()
            key = parts[0][2:-1].lower()
            if key in result:
                result[key] = int(parts[1])
        finally:
            if status is not None:
                status.close()
    memory = result['data']+result['stk']
    thread_q.put(memory)

def getFileDetails(filename):
    filename = filename.rsplit('.',1)
    exe = filename[1]
    filename = filename[0].rsplit('/',1)
    file = filename[1]
    path = filename[0]
    return path, file, exe

def getCompilationStatus(compilation_args):
    compilation_result = {}
    popen = subprocess.Popen(compilation_args, shell=True, stdout=subprocess.PIPE,
stderr=subprocess.PIPE)
    compilation_result['stdout'] = popen.stdout.read()
    compilation_result['stderr'] = popen.stderr.read()
    return compilation_result

def getOutputStatus(execution_args, q):
    thread_queue = Queue()
    execution_result = {}
    popen = subprocess.Popen(execution_args, shell=True, stdout=subprocess.PIPE,
stderr=subprocess.PIPE)

    thr = threading.Thread(target=memory_usage, args=[popen.pid, thread_queue])
    thr.start()
    ru = os.wait4(popen.pid, 0)[2]
    thr.join()

    execution_result['stdout'] = popen.stdout.read()
    execution_result['stderr'] = popen.stderr.read()
    execution_result['mem_usage'] = str(thread_queue.get()*0.001)+' MB'
```

```

q.put(execution_result)

def timer(timeout):
    time.sleep(timeout)

def compile(path, fname, exe, lan, timeout):
    compilation_status = {'stdout': '', 'stderr': '', 'exe_time': ''}
    final_status = {}

    execution_command = ""
    if exe=="c":
        args = ("gcc -o "+path+"/"+fname+" "+path+"/"+fname+"."+exe)
        compilation_status = getCompilationStatus(args)
        execution_command = (path+"/"+fname+" < "+path+"/"+fname+"_input.txt")
    elif exe=="java":
        args = ("javac "+path+"/"+fname+"."+exe)
        compilation_status = getCompilationStatus(args)
        execution_command = ("java -cp "+path+" "+fname+" < "+path+"/"+fname+"_input.txt")
    elif exe=="cpp":
        args = ("g++ -o "+path+"/"+fname+" "+path+"/"+fname+"."+exe)
        compilation_status = getCompilationStatus(args)
        execution_command = (path+"/"+fname+" < "+path+"/"+fname+"_input.txt")
    elif exe=="py" and lan=="py":
        execution_command = ("python "+path+"/"+fname+"."+exe+" < "+path+"/"+fname+"_input.txt")
    elif exe=="py" and lan=="py3":
        execution_command = ("python3 "+path+"/"+fname+"."+exe+" < "+path+"/"+fname+"_input.txt")
    else:
        final_status['valid_selection']="False"
        return final_status

    final_status['valid_selection']="True"
    if compilation_status['stderr']=="":
        final_status['compilation_status']="True"
        final_status['compilation_error']=""
        q = Queue()
        start = time.time()
        p1 = Process(target=getOutputStatus, args=(execution_command,q,))
        p2 = Process(target=timer, args=(timeout,))
        p1.start()
        p2.start()

        while p1.is_alive() and p2.is_alive():
            continue

        stop = time.time()
        if p1.is_alive():
            final_status['execution_status'] = "False"
            final_status['execution_error'] = "Terminated due to timeout"
            final_status['execution_output'] = ""
            final_status['execution_time'] = "-"
            os.kill(p1.pid,signal.SIGKILL)
        else:
            checkoutoutput = q.get()
            os.kill(p2.pid,signal.SIGKILL)

            if checkoutoutput['stderr']=="":
                final_status['execution_status'] = "True"
                final_status['execution_error'] = ""
                final_status['execution_output'] = checkoutoutput['stdout']
                final_status['execution_time'] = stop - start
                final_status['memory_usage'] = checkoutoutput['mem_usage']
                final_status['suggestion'] = ""
                if exe=="java":
                    final_status['suggestion'] = suggestJava(path, fname, 'cc2')
            else:

```

```

        final_status['execution_status'] = "False"
        final_status['execution_error'] = checkoutput['stderr']
    else:
        final_status['compilation_status']="False"
        final_status['compilation_error']=compilation_status['stderr']
    return final_status

def getCompile(filename, lan, timeout):
    path,file,exe = getFileDetails(filename)
    return compile(path, file, exe, lan, timeout)

if __name__=="__main__":
    filename="../compile/123/java/example.java"
    print getCompile(filename, 'java', 10)

```

Following code is service code return using flask App which act as a socket between application logic and input user

```

import shutil
from flask import Flask, request
from saveFile import saveFILE
from compileCode import getCompile

app = Flask(__name__)

@app.route('/compile', methods=["POST"])
def compile():
    timeout = 10
    jsonRes = request.get_json()
    code = jsonRes['getCode']
    lan = jsonRes['type']
    userID = jsonRes['userid']
    filename = jsonRes['filename']
    inp = jsonRes['input']

    code = str(code.decode('utf-8'))
    lan = str(lan.decode('utf-8'))
    userID = str(userID.decode('utf-8'))
    filename = str(filename.decode('utf-8'))
    inp = str(inp.decode('utf-8'))

    getpath = saveFILE(code, lan, userID, filename, inp)
    compilation_status = getCompile(getpath,lan, timeout)
    #shutil.rmtree('../compile/'+str(userID))
    return str(compilation_status)

if __name__ == '__main__':
    app.run(host='0.0.0.0', port=5004, debug=True, threaded=True)

```

\* We cannot copy paste all the codes related system considering length of document.