Set up Automatic Builds and Testing of Pull Requests

To set up automatic builds on " jenkins " (A continuous integration server).Installation of jenkins and Jenkins plugins , GitHub and jdk is need full.

How to install Jenkins on ubuntu ?

The following commands are used ,

// adds the repository key to the system.

```
$ wget -q -https://pkg jenkins.io/debian/jenkins-ci.org.key
```

// Append the Debian package repository address to the server's source list.

```
$ sudo apt-key add jenkins_ci.org.key
```

// update apt-get will use new repository .

```
$ sudo apt-get update
```

// Installs jenkins and its dependencies , including java

```
$ sudo apt-get install jenkins
```

// starts jenkins and provides the path

```
$ sudo systemct1 start jenkins
$ sudo cat ( given path )
```

Once the jenkins admin user created , enter username , password, Full name and E-mail address

How to install GitHub on Ubuntu ?

```
$ sudo apt-get install git
```

How to install Java (or) jdk ?

// displays the available idk packages

```
$ java  - -version
```

//installs available jdk package

```
$ sudo apt-get install openjdk-8-home…
```

How to install Jenkins plugins ?

Run Jenkins. using a browser go to Jenkins running on port 8080

For example , http://nnn.nnn.nnn.nnn:8080 , where nnn.nnn.nnn.nnn is your system's IP address.

1. log in with your user name and password .
2. From the Jenkins Dashboard Jenkins menu, select on the Manage Jenkins.

Figure 1: Select Manage Jenkins

3. Click on Available and select all the required plugin
4. Click on Install without Restart.

Set Up Automatic Builds

1. Clone Git Repository ECL attributes

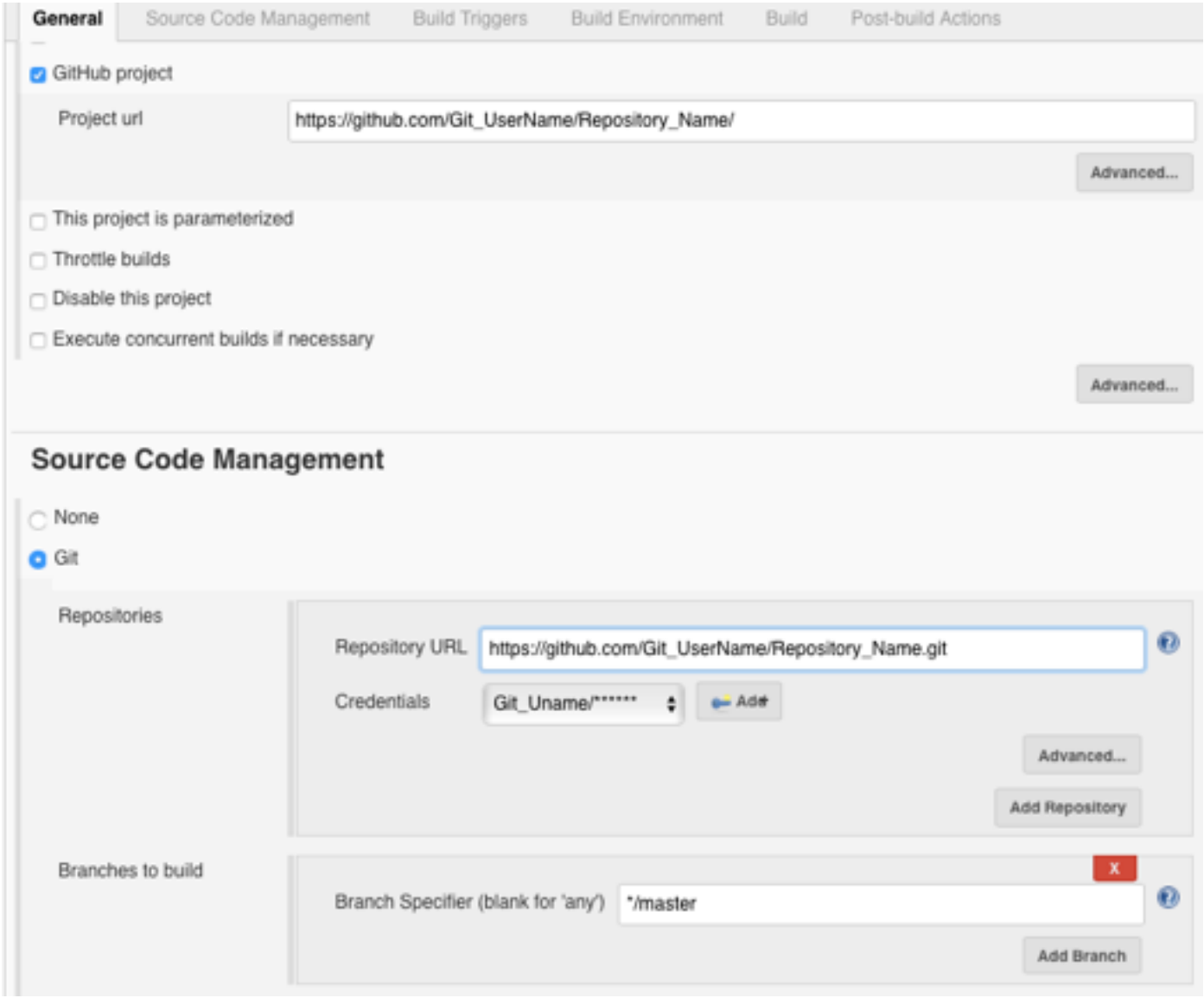
1.1 create Job

From the Jenkins Dashboard Jenkins menu, select on New Item (New Item >> enter Item Name >> Freestyle Project>>OK)

1.2 Configure the jenkins project (or) Item created to clone Git Repository

- Click on the jenkins project created
- From the project menu select on Configure
  - General section
    - provide Decription about the project
    - Enter the GitHub Project Url
  - Source Code Management
    - Provide Git repository URL and Git Credentials
    - Specify branch to be clone (or) build (by default it will be ‘Master’ branch)

Figure 2:Provide Git Project details



2. Automatically trigger the jenkins project

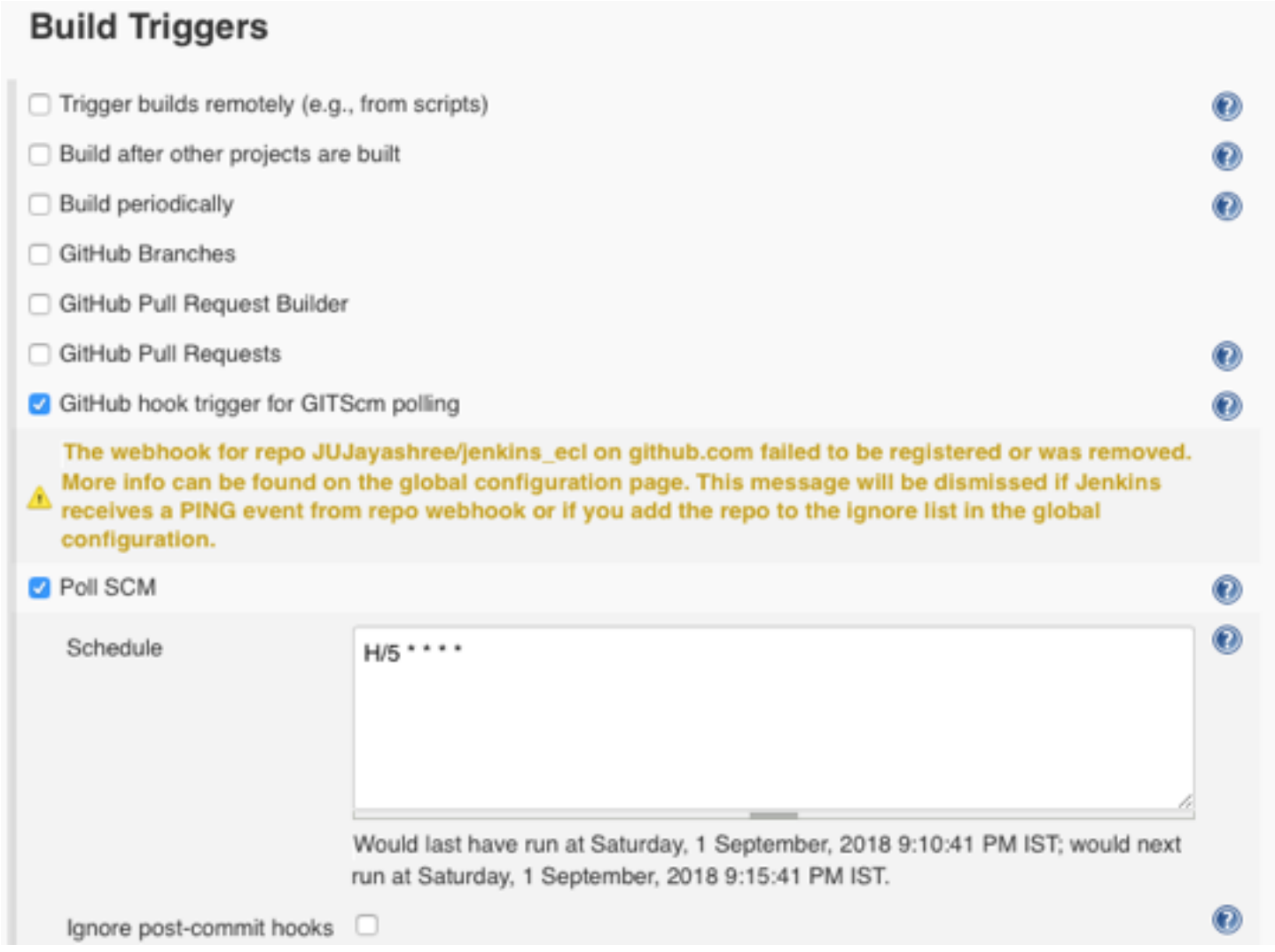
To build the jenkins project automatically there are several ways ,

- Build Periodically
- Poll SCM
- GitHub Pull Requests and so on

2.1. To Build the jenkins project automatically when the changes are made in git repository (polling every 5 minutes)

- From the project menu select on Configure
  - Build Triggers
    - select GitHub hook trigger for GITScm polling
    - Poll SCM >> write a expression to specify the schedule . Its basically 5 fields separated by TAB or whitespace: MINUTE HOUR DOM MONTH DOW

Figure 3: Automatic trigger_Polling every 5 minutes



2.2 To Build the jenkins project automatically when the pull Request is created to any git repository

To trigger the jenkins job automatically when the pull request is created to git repository, requires several prerequisites.

- Installation of GitHub Pull Request Builder plugin
- Configuration of GitHub Pull Request Builder plugin in jenkins.
- Add webhook in GitHub Repository.

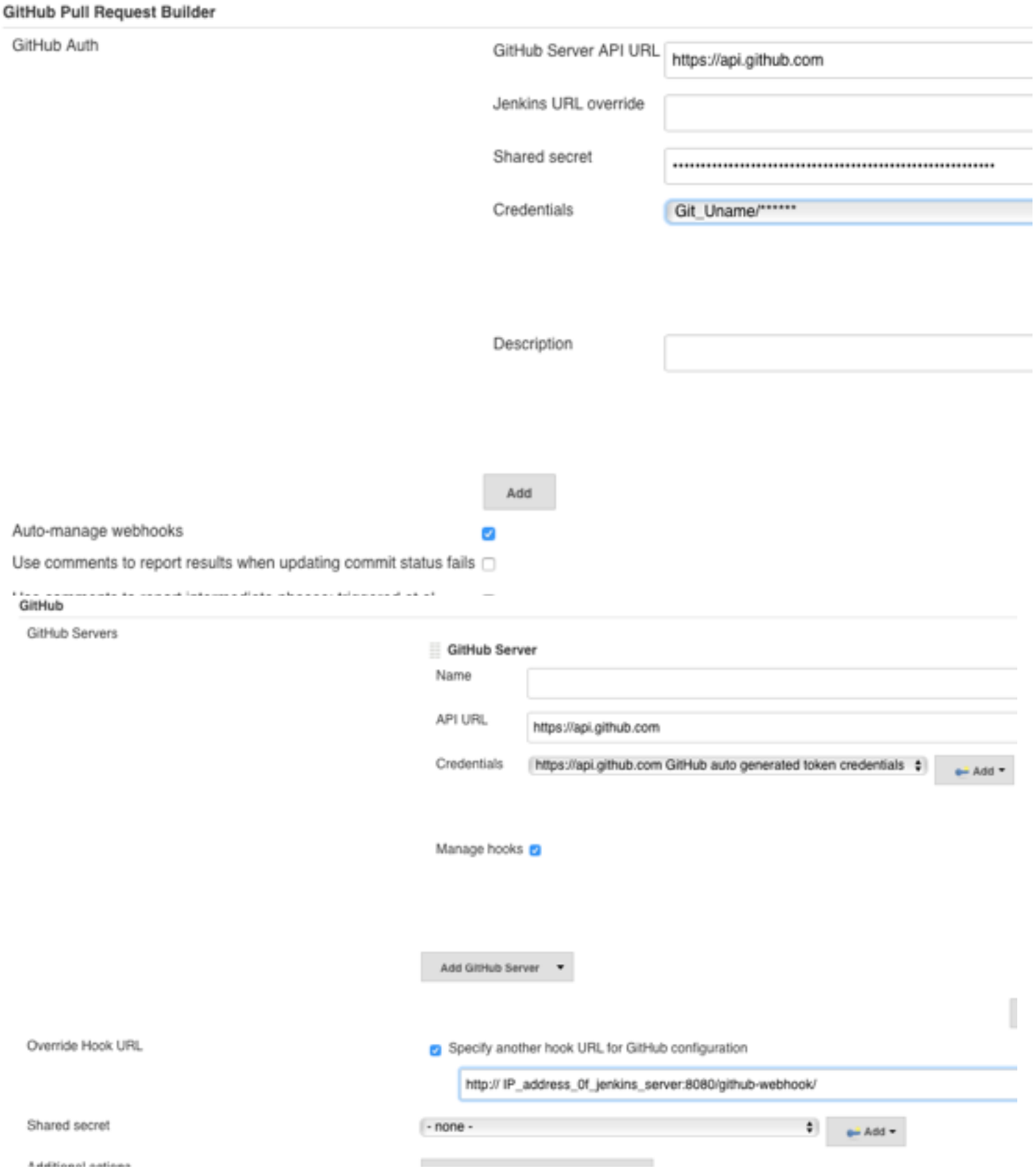
2.2.1 Install GitHub Pull Request Builder plugin

1. From the Jenkins Dashboard Jenkins menu, select on the Manage Jenkins.
2. Click on Available and select GitHub Pull Request Builder plugin
3. Click on Install without Restart.

2.2.2 Configuration of GitHub Pull Request Builder plugin in jenkins.

1. From the Jenkins Dashboard Jenkins menu, select on the Configure system.
    - Goto GitHub Pull Request Builder
        - Enter GitHub server API url as "https://api.github.com"
        - Add Git hub credentials i.e. your git account username and password .
        - Create API token in GitHub i.e 'personal Access Token' and paste the same into Shared secret field.
        - select Auto-manage webhooks
    - Goto GitHub Plugin
        - Add GitHub Servers
        - Add GitHub account credentials
        - Advanced >>select Override Hook URL >> copy git hub web hook Url
    - Save

Figure 4: System configuration of GitHub Pull Request Builder

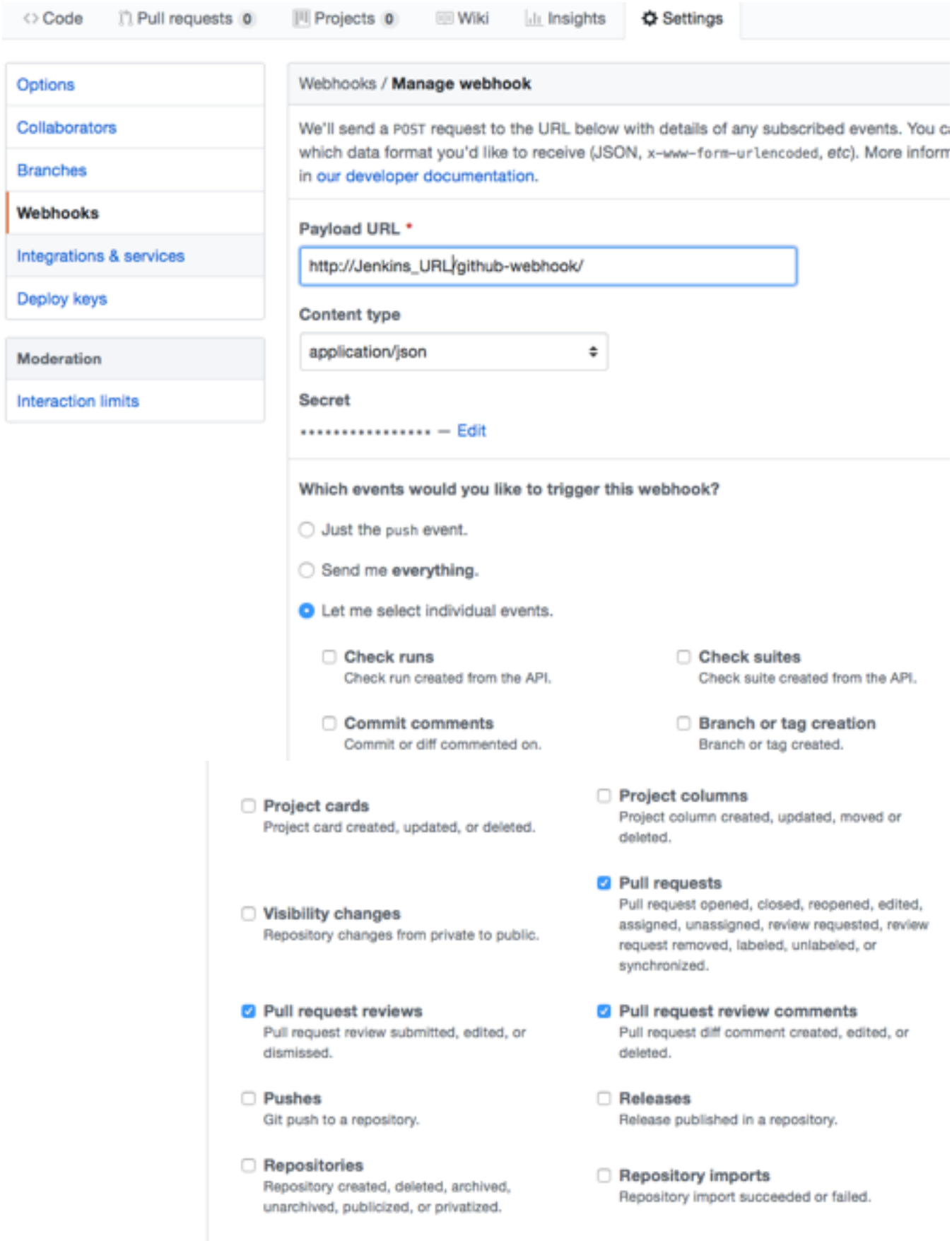


2.2.3 Add Web Hook in GitHub Repository.

To trigger the jenkins server project it is required to add web hook in GitHub Repository and the following steps are followed,

- Goto your GitHub Repository
    - Click settings >> select Webhooks from menu >> Click Add webhook
        - Enter G**itHub webhook Url** copied from github plugin of jenkins.
        - Select Content Type as **'application/x-www-form-urlencoded'**
        - Add 'personal Access Token' into secret field
        - Goto Which events would you like to trigger this webhook?
            - Select Let me select individual events>> select 'Pull requests' , 'Pull request review comments' and 'Pull request reviews'.
        - Click Add web hook to create webhook.

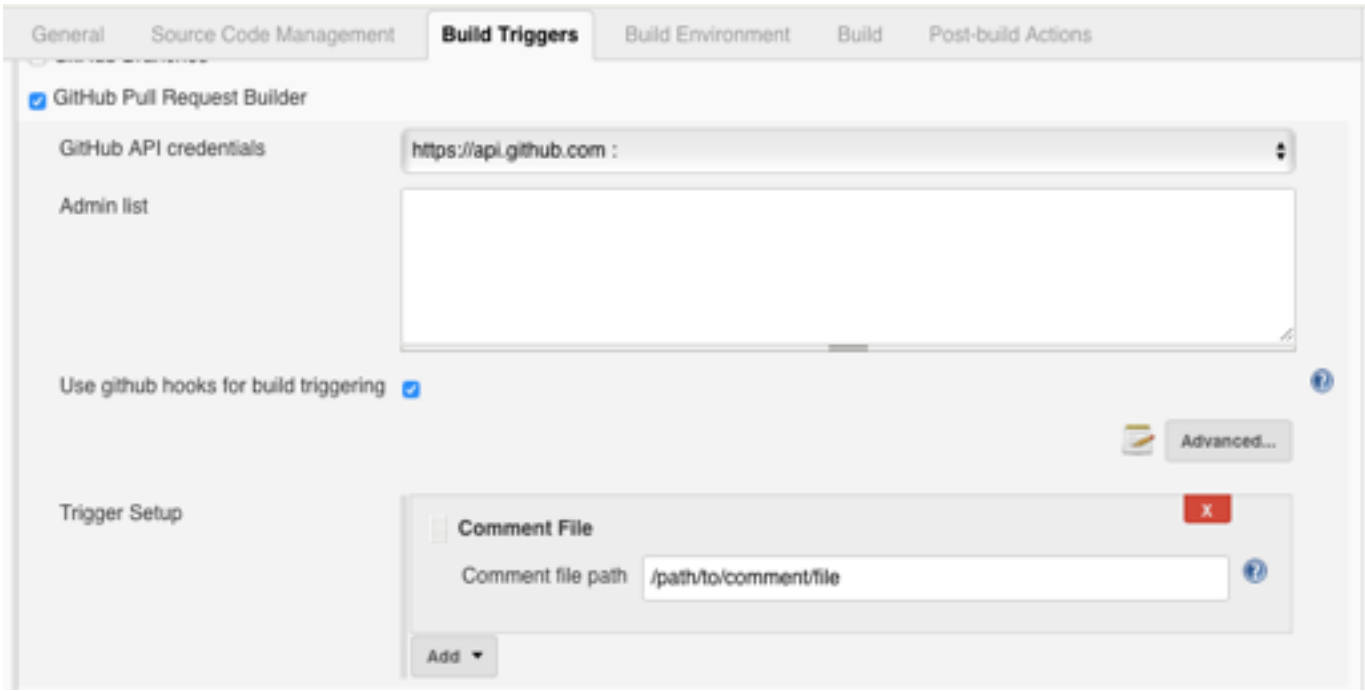
Figure 5: Web hook setting at GitHub Repo



After configuring prerequisites in jenkins project , the following configuration need to be done to trigger the project for build on pull request to GitHub repo.

- From the project menu select on Configure
  - **Build Triggers**
    - Select ‘GitHub Pull Request Builder’
      - Select Use github hooks for build triggering
      - select ‘Advanced’ Enter github user account name in ‘white list’ field so that it helps the web hook to trigger the project and upload the file as comment to pull request.
      - select ‘Trigger Setup ‘ >> Add comment file >> Enter comment file path, by this its possible to upload file as comment to pull request as post build action.

Figure 6: Project configuration of GitHub Pull Request Builder



3. Perform build operation and Post Build Actions

- As a part of build operation , ECL query syntax check of all “.ecl” files which are cloned from GitHub repository and the executable ecl file build can be performed.
- To perform ECL query ‘syntax check’ and ‘excitable ECL file build’ it requires the following steps
  - Installation of HPCC system
  - Set Up single node on system
  - install client tools
  - To perform the above steps follow the link “ http://cdn.hpccsystems.com/releases/CE-Candidate-6.4.22/docs/Installing_and_RunningTheHPCCPlatform-6.4.22-1.pdf “.
- **As a post build actions , several operations can be performed, like**
  - send E-mail notification about the build Result.
  - Send E-mail Notification with attachment of jenkins log file.
  - Send file as comment to pull Request on GitHub Repo.

3.1 Perform ECL query syntax check of all “.ecl” files as build operation and send E-mail notification as post build.

3.1.1. How to perform syntax check operation as build operation?

- From the project menu select on Configure
  - Goto Build
    - Add build step
    - Select Execute shell and write a shell script to perform ECL query syntax check and display result in the jenkins log

NOTE :Similarly shell script can be written to perform many other operation

- Build the executable ECL files .
- Build the executable ECL files and push the errors encountered to log file.
- Check the syntax of ECL file queries and push the errors encountered to log file
- To generate the log file with Jenkins Build Result, Build URL and summary of Errors and warning and so on .

Figure 7: Build _ shell script to check syntax of ECL file queries.

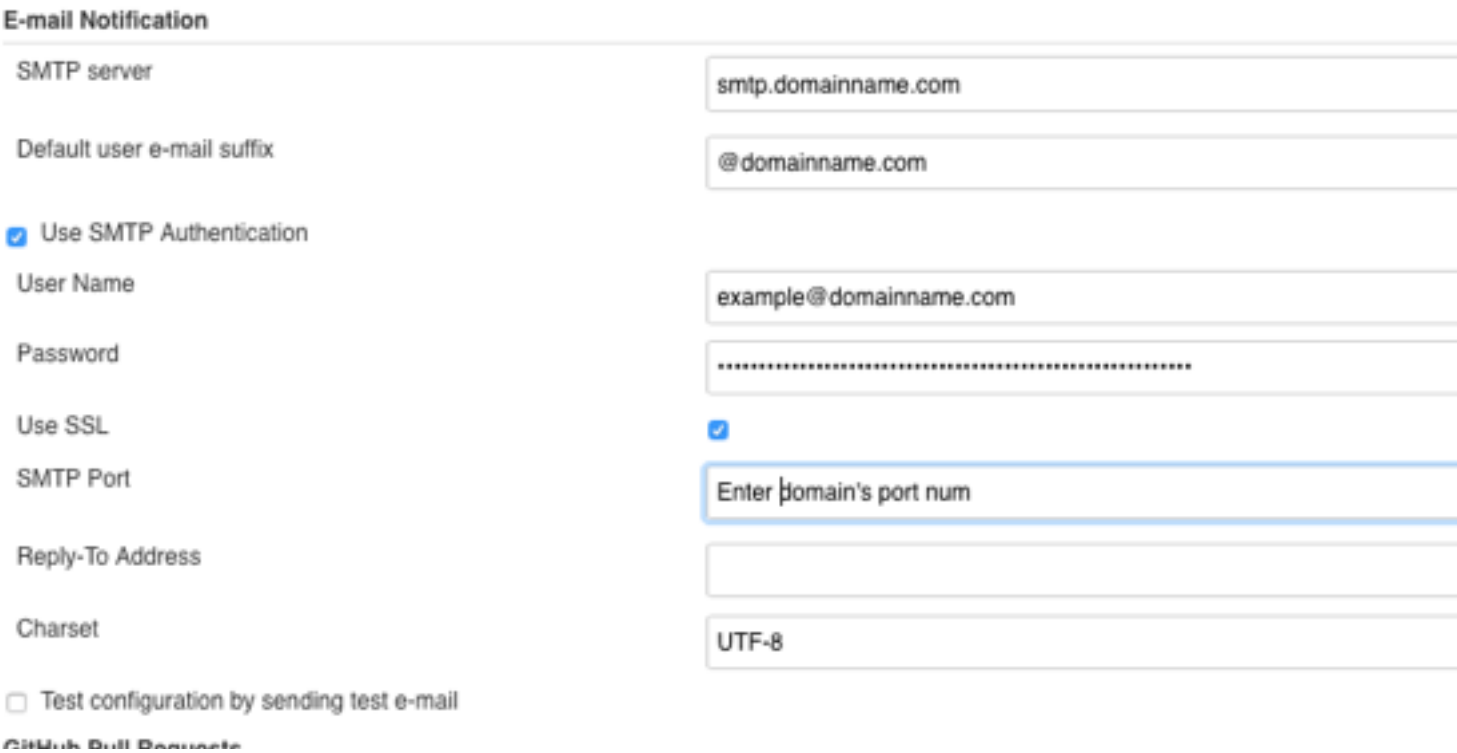
3.1.2 How to send E-mail notification on ‘Unstable’ build as post build operation ?

- It requires following steps,
    - Email Extension plugin - It is a basic plugin which is installed at the time of default plugin installation .
    - System configuration of Email Notification
    - Project configuration of Email Notification
- **System configuration of Email Notification**

To make use of Email Extension plugin to send email notification from jenkins, it is required to make setting in jenkins . It is general for all project which will be configured to send E-mail Notification.

1. From the Jenkins Dashboard Jenkins menu, select on the Manage Jenkins.
2. select on the Configure system.
3. Goto E-mail Notification
    - Enter SMTP server of the E-mail address . For example ,Gmail account SMTP server is ‘smtp.gmail.com’.
    - Give email suffix of the E-mail address
    - Click Advance
        - select SMTP Authentication
        - Provide sender E-mail id credentials
        - Enter SMTP port
4. Save

Figure 8: System configuration of Email Notification



- **Project configuration of Email Notification**

  To send E-mail notification from any jenkins project the following setting need to be done.

  - From the project menu select on Configure
    - Goto Post-build Actions
    - click add Post-build Actions >> select ‘Email-Notification’.
    - Enter recipient E-mail Address >> select ‘Send e-mail for every unstable build
    -

Figure 9: E-mail notification setting in individual project

3.1.3. How to send E-mail notification on ‘Stable’ build as post build operation ?

It requires following steps,

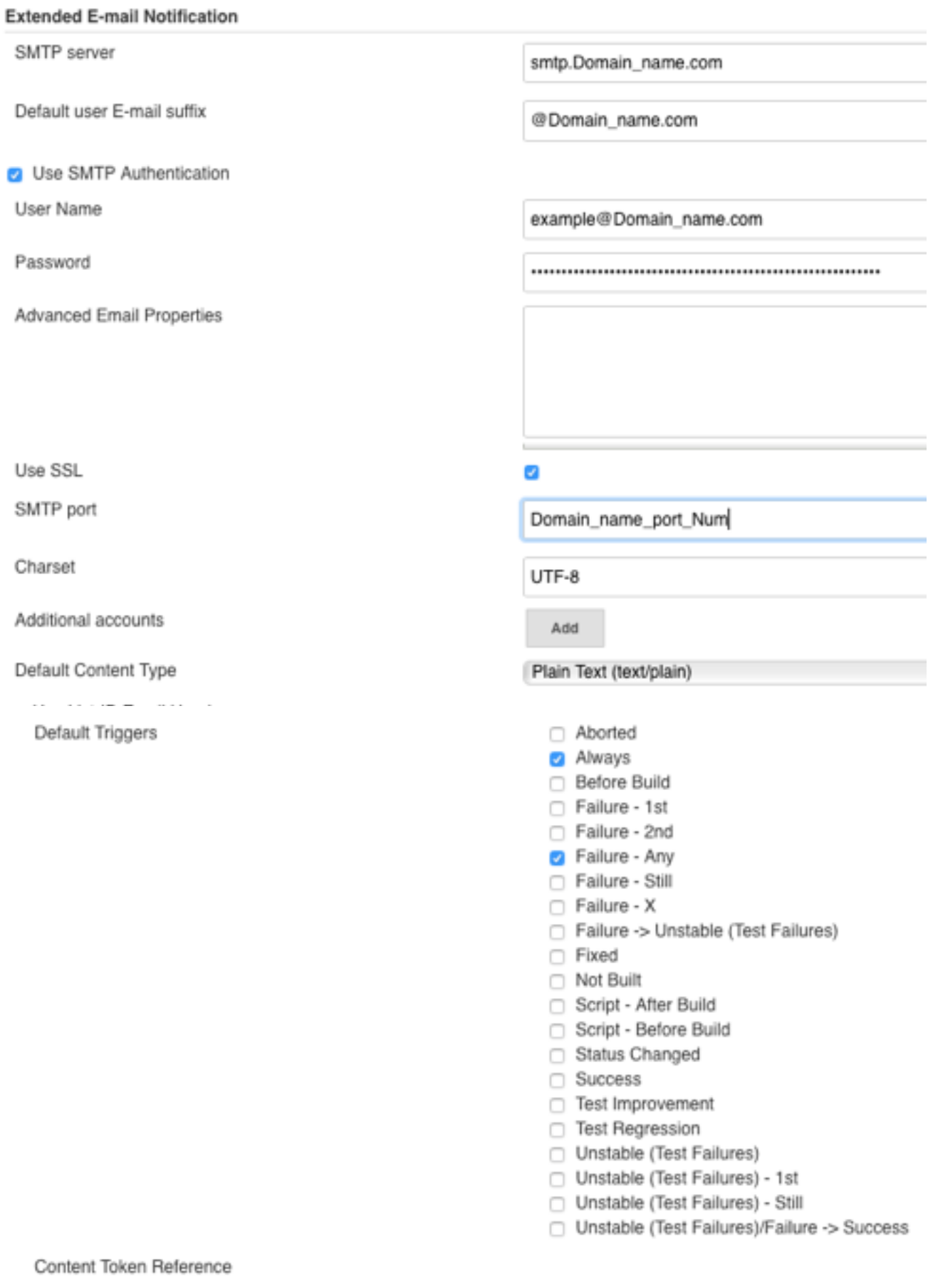
- Email Extension plugin - It is a basic plugin which is installed at the time of default plugin installation .
- System configuration of Extended Email Notification
- Project configuration of Extended Email Notification

- **System configuration of Extended Email Notification**

To make use of Email Extension plugin to send email notification on stable build or to upload console log as attached file to e-mail from jenkins, it is required to make setting in jenkins . It is general for all project which will be configured to send E-mail Notification.

1. From the Jenkins Dashboard Jenkins menu, select on the Manage Jenkins.
2. select on the Configure system.
3. Goto Extended E-mail Notification
   - Enter SMTP server of the E-mail address . For example ,Gmail account SMTP server is ‘smtp.gmail.com’.
   - Give email suffix of the E-mail address
   - Click Advance
     - select SMTP Authentication
     - Provide sender E-mail id credentials
     - Enter SMTP port . For example, Default port for gmail is ‘465’
   - click Default Triggers >> select ‘Always’. There are many options and can be selected as per the need.
4. Save

Figure 10: System configuration of Extended Email Notification

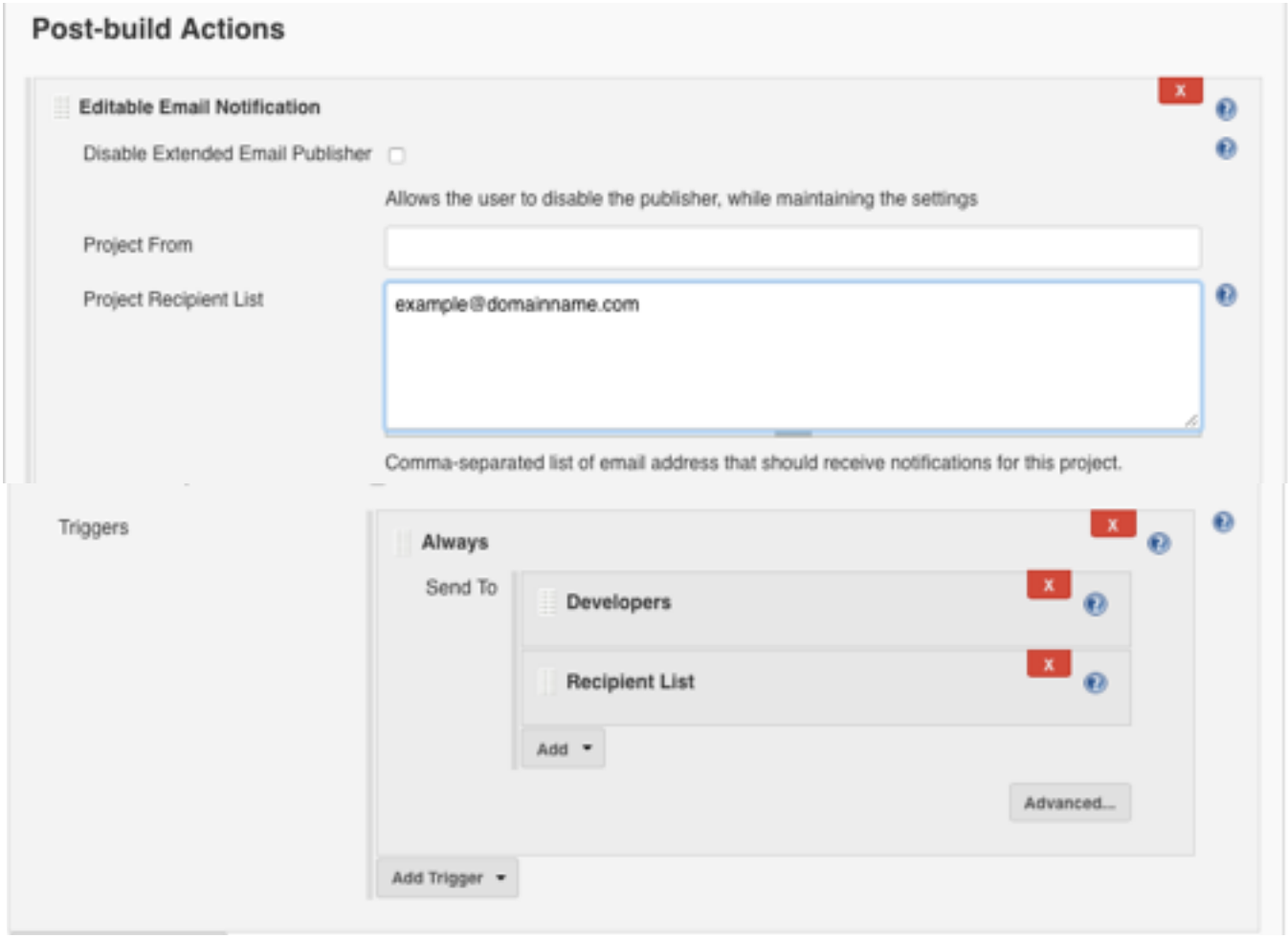


- **Project configuration of Email Notification**

  To send E-mail notification from any jenkins project on successful build the following setting need to be done.

  - From the project menu select on Configure
    - Goto Post-build Actions
    - click add Post-build Actions >> select ‘Editable Email-Notification’.
    - Enter recipient E-mail Address
    - Click on Advanced >> Goto Trigger >> add Trigger >> selecy Always>> add Recipient List.

Figure 11: Editable E-mail notification setting in individual project



3.1.4. How to send File as comment to pull request on GitHub Repo with Build Status and Build Url information ?

To send file which consists of Build Status, Build Url and Syntax check (or) ECL file build result summary as comment to pullRequest created in GitHub, it is required to write shell script in build part and groovy script to append Jenkins build status at post-build Actions and upload the file after build using GitHub Pull Request Builder setting in build trigger section.

Settings to be made is as follows

1. Write ShellScript to Append 'Syntax check' & 'ECL file build' Errors to a file. for example, '.log' file
2. Write groovy Script in Post-build Actions to append Build status to the same file which contains Error information. (or) upload Build status, Build Url and Job name to comment using messages of Pull Request Builder.
3. GitHub Pull Request Builder setting to upload file to pull request.

- **How to write ShellScript to Append 'Syntax check' & 'ECL file build' Errors to a file.**
  - Write the code on build section of project configuration.
  - The following is the example of shell script to check all cloned Ecl file syntax and append the error to a file ,It intern calls python code to identify Number of total Number of errors and warning and append information to the file.

  Example Code :

```
#!/bin/bash
#!/usr/bin/python

QUERY_PATH="/var/lib/jenkins/workspace/pr_buildstatus_comment/"
COMMENT_LOG_PATH="/home/jenkins/scripts/pr_buildstatus_comment/pr_buildsta
tus_comment.log"

if [ -f $COMMENT_LOG_PATH ]; then
   rm $COMMENT_LOG_PATH
fi

echo "Automated ECL syntax check :"$'\n' >> $COMMENT_LOG_PATH
#Execute ECL queries
for ecl_file in $( find $QUERY_PATH -name *.ecl)
do
        if [ -f "$ecl_file" ]; then
              eclcc -syntax "$ecl_file" 2>> $COMMENT_LOG_PATH | >1
        fi
done
```

```
#Sleep for some time
sleep 20

python3 pr_buildstatus_comment.py >> $COMMENT_LOG_PATH
```

Example Python Code :

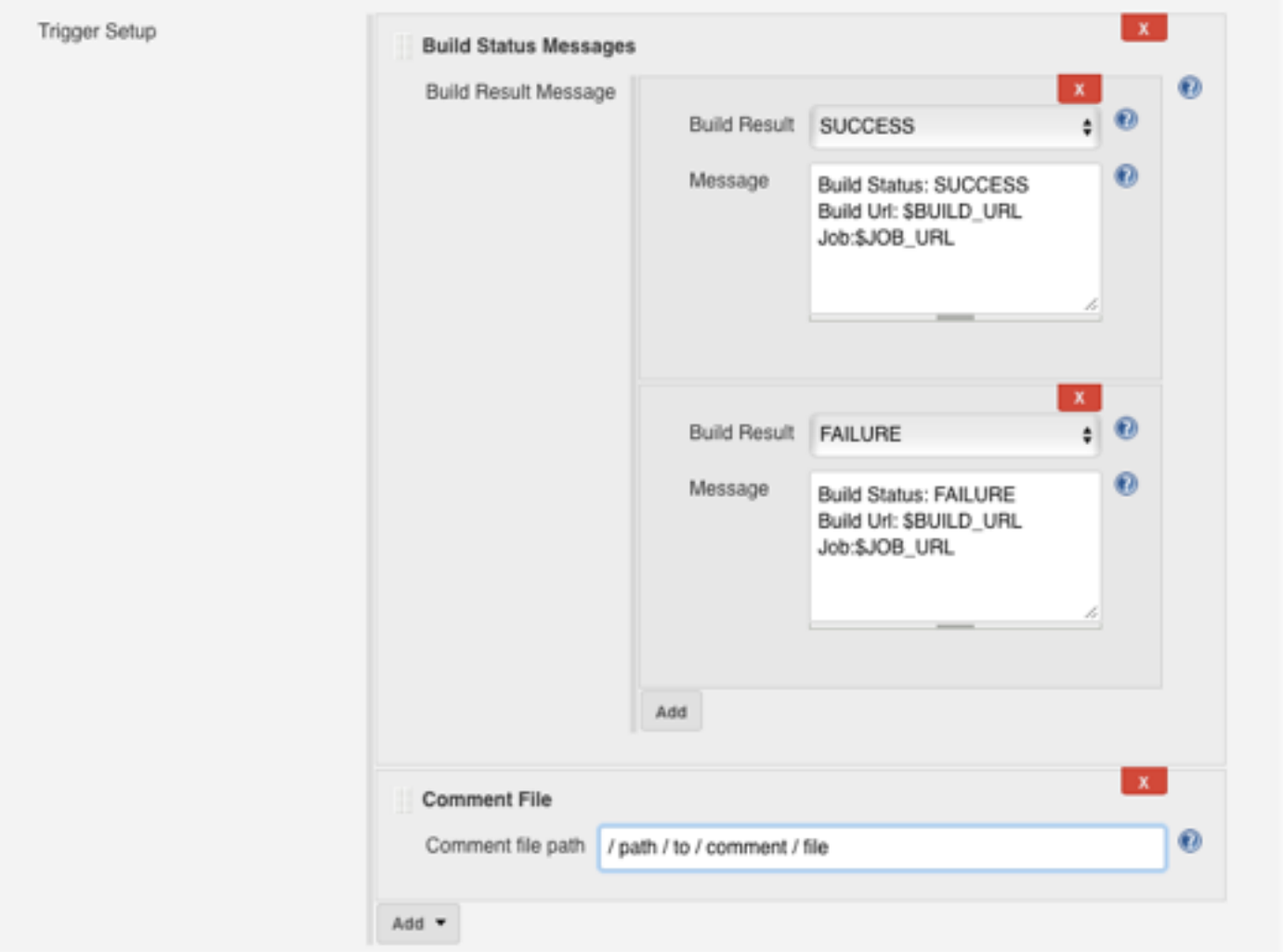
```
#!/usr/bin/python
import re
import jenkins
import time
import sys

COMMENT_LOG_PATH="/home/jenkins/scripts/pr_buildstatus_comment/pr_buildsta
tus_comment.log"
pattern = r"(\d+)\s+errors?\,\s+(\d+)\s+warnings?"

errors=0
warnings=0
with open(COMMENT_LOG_PATH, 'r') as f:
        for line in f:
                m=re.match(pattern,line)
                if m:
                        errors += int(m.group(1))
                        warnings += int(m.group(2))


print('******** After checking ECL file syntax ************')
print('****** Error and Warning Summary***')
print('Total Errors: {}'.format(errors))
print('Total warnings: {}'.format(warnings))
print('************************************')

if errors == 0:
        pass
else:
        sys.exit(5)
```

- **How to upload Build status, Build Url and Job name to comment using messages of Pull Request Builder**

  To send Build information to comment using pull request Builder

  - From the project menu select on Configure
    - Goto Build Triggers
    - Select GitHub Pull Request Builder
    - click Trigger setup >> add
    - select Build status messages
    - Add Build Result Messages >> select “build result as Success”>> write message which you wish to display as comment if build is successful.
    - Add Build Result Messages >> select “build result as Failure”>>write message which you wish to display as comment if build is unsuccessful.

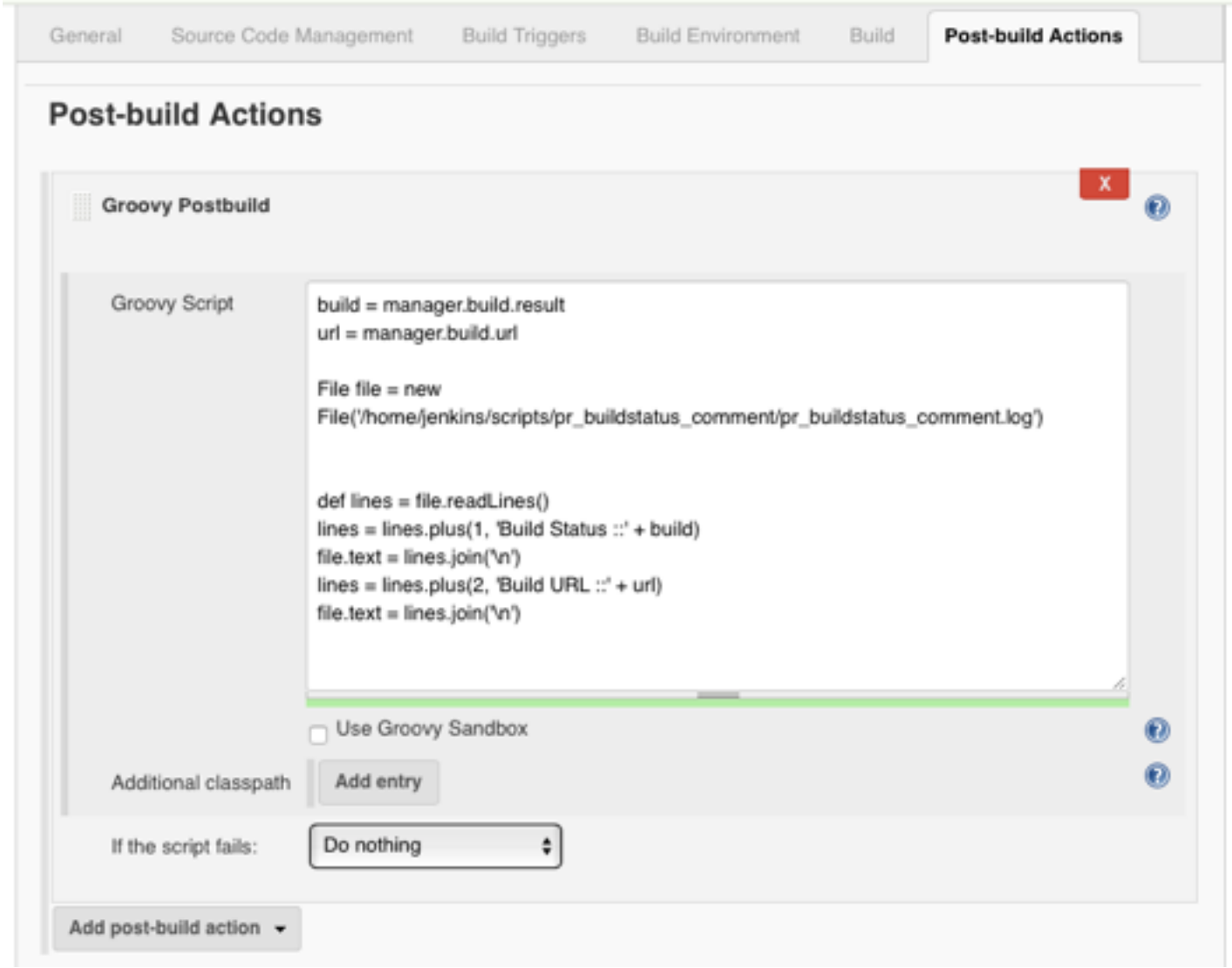
Figure 12 : Message indicating ‘build results’ to be displayed as comment



- **Write groovy Script in Post-build Actions to append Build status to the same file which contains Error information.**

To write groove script , need to install groovy postbuild plugin and write code by adding groovy post build on post built Action.

Figure 13: Groovy code on post build action to append build status to comment file

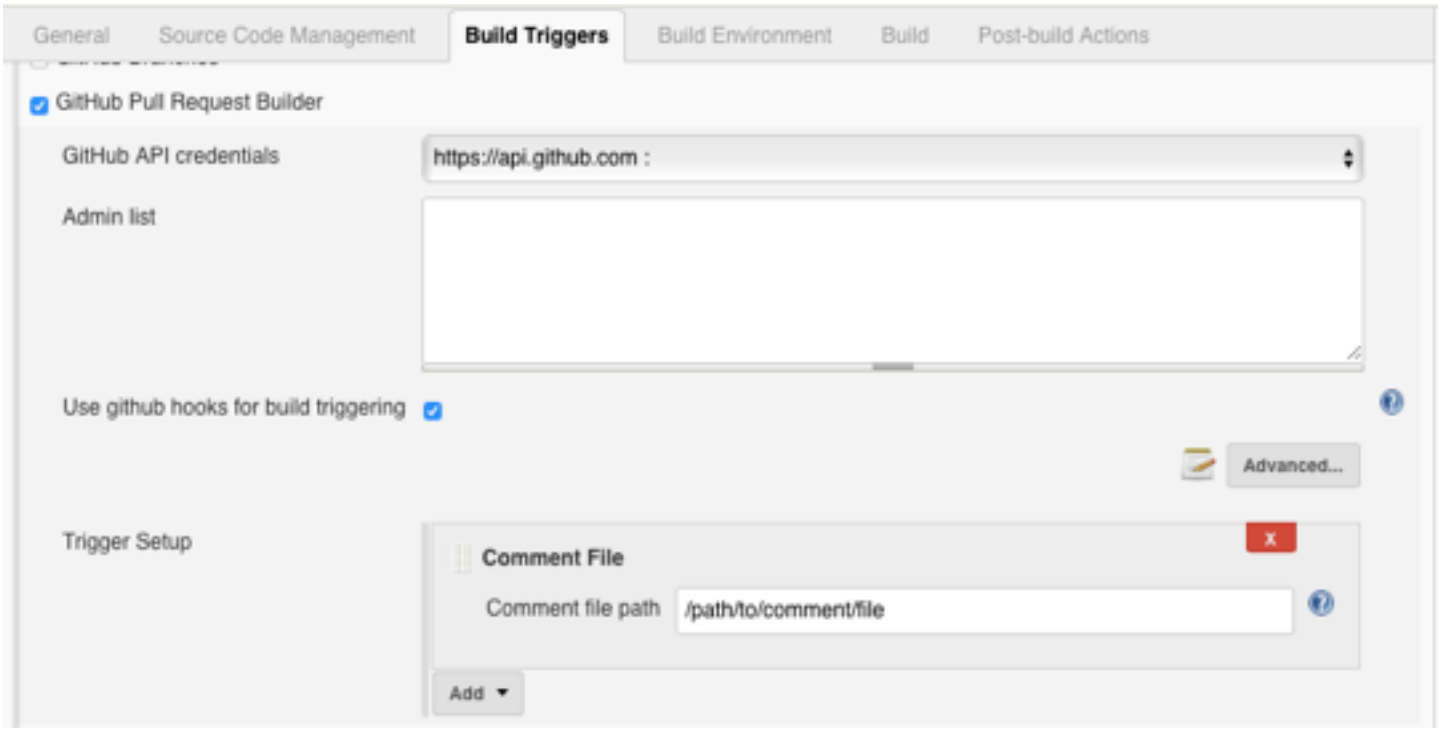


- **How to upload comment file to pull request using GitHub Pull Request Builder.**

To upload comment , jenkins project has to be triggered when pull request is created and the “GitHub Pull Request Builder” plugin settings are configured accordingly.

- The following are the steps,
- From the project menu select on Configure
  - **Build Triggers**
    - Select the ‘GitHub Pull Request Builder’
      - Select Use github hooks for build triggering
      - select ‘Advanced’ Enter github user account name in ‘white list’ field so that it helps the web hook to trigger the project and upload the file as comment to pull request.
      - select ‘Trigger Setup ‘ >> Add comment file >> Enter/comment/file/path, by this its possible to upload file as comment to pull request as post build action.

Figure 14: Setting to upload comment file to pull request after build



Note : How to send comment file where content of file are to be displayed using HTML tags ?

It is required to store the comment file to be sent to pull request as comment , in the workspace of jenkins (or) in the respective projects folder which is present inside the jenkins workspace.
For instance : if the jenkins project name is pr_buildstatus_comment then it is required to store comment file in the path “/var/lib/jenkins/workspace/pr_buildstatus_comment/ Comment_filename.log “.

3.1.5. How to trigger (or) pass control to a job from another job on successful build

Upstream job: The jenkins project which triggers or pass control to another job is considered as upstream job.

Downstream job: The jenkins project which triggered by another job is considered as downstream job.

To pass control from one job to another job the following steps can be used

- In Upstream job should include script to pass control to another job on successful build or depend on required condition.
- In downstream job need to configure the build trigger settings.

- **pass control to another job on successful build or depend on required condition of present job .**

The following code can be used in python script to pass control depend on the number of errors encountered while executing the code

```
#!/usr/bin/python
import re
import jenkins
import time
import sys
    // write code to find number of errors encountered .
if errors == 0:
    pass // pass control to another job or make the job's build status as Successful
else:
  sys.exit(5)    //  make the job's build status as Unstable
```

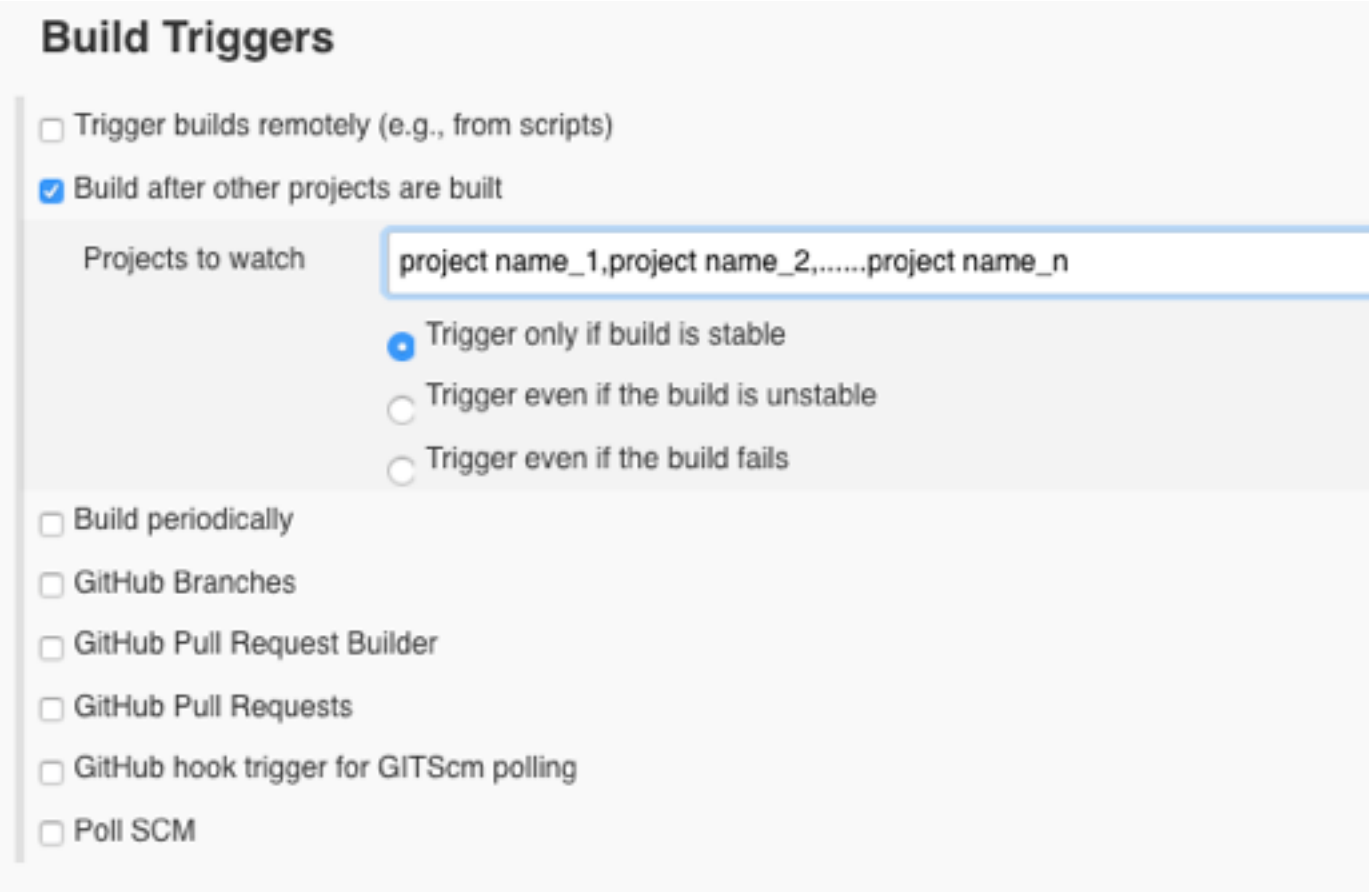
- **configuration of build trigger settings in downstream job.**

The following configuration is made in 'build trigger' block of project configuration.

From the project menu select on Configure

- **Build Triggers**
  - Select 'Build after other projects are built'
  - enter project or projects name after which this project to be build.
  - select the condition on which the build should be triggered, 3 conditions are provided
    - Trigger only if build is stable
    - Trigger even if the build is unstable
    - Trigger even if the build fails

Figure 15: Build Trigger setting in DownStream job



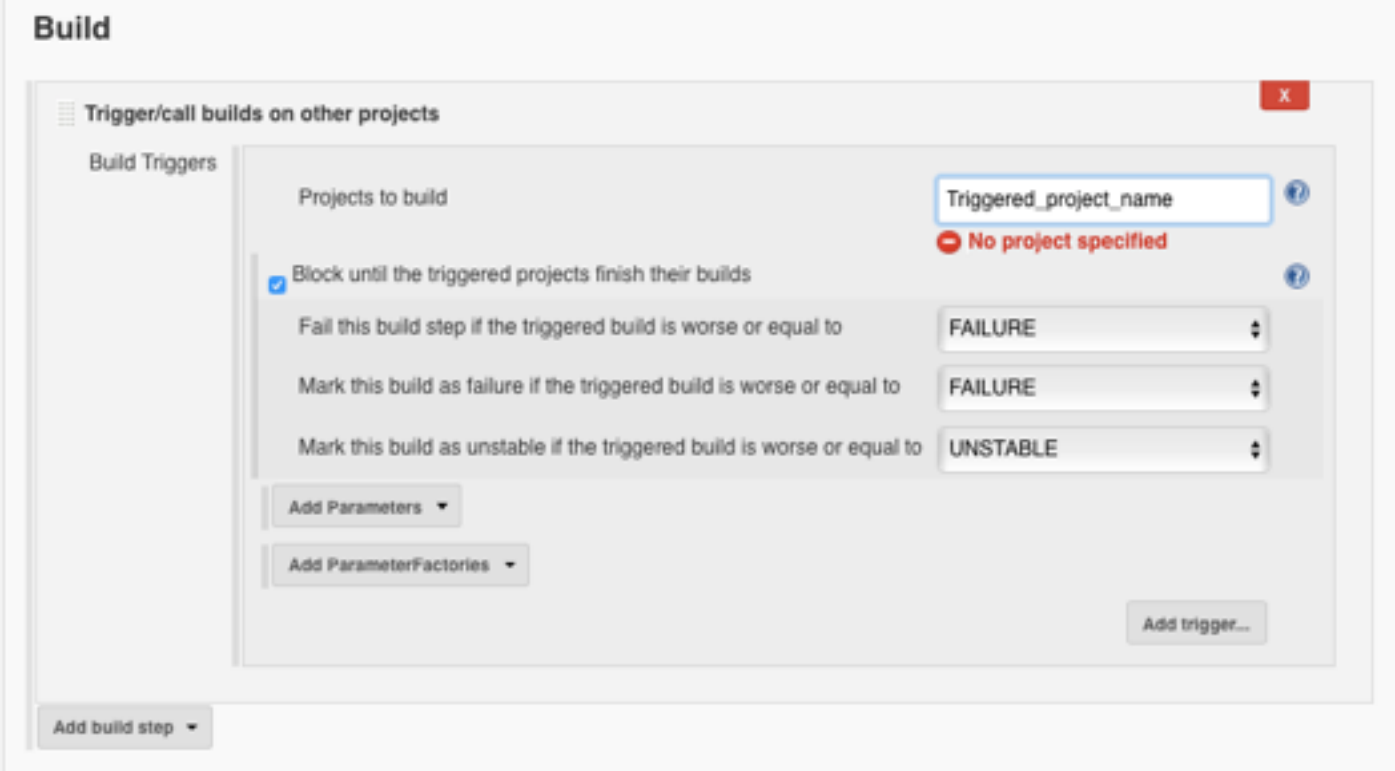
Note : To make the upstream job build status as downstream build state or to make the up-stream job to be blocked for the downstream job to build before sending comment file to pull request of GitHub as post build action the following steps can be used.

- Install Parameterized Trigger Plugin
- Configure the Parameterized Trigger Plugin settings in upstream job

  From the project menu select on Configure

  - **Build**
  - click Add build setup
  - select ‘Trigger/call builds on other projects’
  - Enter triggered project name as projects to build
  - select ‘Block until the triggered projects finish their builds’

Figure 16: Parameterized Trigger Plugin setting in UpStream job



List of Figures :