Stop And Wait Algorithm
A COURSE PROJECT REPORT

By

Anant Duhan (RA1911003010564)

Alok Agarwal (RA1911003010562)

Shagun Jindal (RA1911003010544)

Under the guidance of

Yamini R.

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BONAFIDECERTIFICATE

Certified that this project report "**Stop and Wait Protocol** " is the bonafide workof**StudentName(Registerno)**whocarriedouttheprojectworkundermysupervision.

SIGNATURE

SubjectStaff
Designation
Department
SRMInstituteofScienceandTechnology

SRMNagar,Kattankulathur,

milNadu603203

SIGNATURE

Dr.E.Sasikala,
CourseCordinator
AssociateProfessor,

DataScienceandBusinessSystemsPotheri,

SRMInstituteofScienceandTechnologyTa
Potheri,SRMNagar,Kattankulathur,
TamilNadu603203

ABSTRACT

Before understanding the stop and Wait protocol, we first know about the error control mechanism. The error control mechanism is used so that the received data should be exactly same whatever sender has sent the data. The error control mechanism is divided into two categories, i.e., Stop and Wait ARQ and sliding window. The sliding window is further divided into two categories, i.e., Go Back N, and Selective Repeat. Based on the usage, the people select the error control mechanism whether it is **stop and wait** or **sliding-window**. This project implements the stop-and-wait protocol using sockets and threading. The stop-and-wait protocol is a special case of the Go-back-N protocol, with window size = 1. Through this we have illustrated and then tackled the possible errors that can happen through erroneous channels during stop-and-wait protocol communication.

Computernetworks–CourseProjectFormattingInstructions

1. ChapternumberandChapterheading–**fontsize16,uppercase,bold.**
2. SpacebetweenChapternumberandChapterheading-**doublespacing.**
3. Spacebetweenheadingandcontents–**doublespacing.**
4. Abstractheading–**fontsize16.**
5. Contentofabstract–**fontsize14,doublespacing.**
6. Sampledocumentisgivenbelow,followitfor**fontsize,upper/lowercase,spacing**
7. Sub-headingexampleasfollows.

3.3 REQUIREMENTSPECIFICATION(TimesNewRoman14)

3.3.1 HardwareRequirements(TimesNewRoman12)

Processor

:2.4GHzClockSpeedRAM

:1GB

HardDisk :500MB(Minimumfreespace)

3.3.2 SoftwareRequirements

OperatingSystem

:Windows7P

latform :Java

BackEnd :MySql

SpecialTools:Opencv,XuggleSer

ver :ApacheTomcat

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Before understanding the stop and Wait protocol, we first know about the error control mechanism. The error control mechanism is used so that the received data should be exactly same whatever sender has sent the data. The error control mechanism is divided into two categories, i.e., Stop and Wait ARQ and sliding window. The sliding window is further divided into two categories, i.e., Go Back N, and Selective Repeat. Based on the usage, the people select the error control mechanism whether it is **stop and wait** or **sliding-window**. This project implements the stop-and-wait protocol using sockets and threading. The stop-and-wait protocol is a special case of the Go-back-N protocol, with window size = 1. Through this we have illustrated and then tackled the possible errors that can happen through erroneous channels during stop-and-wait protocol communication.

INTRODUCTION

TheStop-and-Waitprotocolisatechniquethatisusedtoprovidereliability. Inthisprotocol,oneframe(inourcase,onbit)issentata time.Thesenderdoesnotsendanymoreframes,untilitreceivesanacknowledgementfromthereceiverforthesame.Iftheacknowledgementfails to arrive within a given time frame, the sender then re-sends the entireframe.Thisconditionisknownasatimeout.Onthereceiver’sside,itsendsanacknowledgementeachtimeitreceivesaframe.

REQUIREMENT ANALYSIS

3.1 Hardware Requirements

Processor : 2.4 GHz Clock Speed RAM : 1 GB

Hard Disk : 500 MB (Minimum free space)

3.2 Software Requirements

Operating System : Windows 7 Platform : Java

Back End : MySql

Special Tools : Opencv, Xuggle Server : Apache Tomcat

ISSUES IN COMMUNICATION

TheStopandWaitprotocolensurereliablecommunication.Inessence, the protocol gives insurance against a noisy (or otherwisedisturbed) channel that might cause a packet to drop while being sent fromthesendersideoftheprogram.Onthecorollary,anoisychannelalsomightcausetheacknowledgementsentback fromthereceiver'ssideto getlost. TheStopandWaitprotocolensurecommunicationinbothofthesecases.

IMPLEMENTATION

Ourimplementationoftheprotocolsimulatesapackagedropinanois ychannel.Eachsideoftheprogramaskstheuserforaprobabilityofthe packagegettingdroppedbasedonwhichwethenforciblyensureapac kagedrop.

Thesendersideoftheprogramasksforabitstringinputfromtheuser (which is to be transmitted across the channel), the probability ofpackagegettingdroppedandthepropagationtime.

```
#take input from user
bitstring  = str(raw_input("enter bit string"))
propogationtime = float(raw_input("enter propogation time"))
p_nosend = float(input("enter probability of message getting lost:"))
```

We use sockets in order to send given bitstring from the sender to thereceiver,withasuccessrateenteredbytheuser.Iftrue,thepacketiss enttothereceiver'sside.Wetheninduceatime.sleep(),whichismeantt osimulatethepropagationtime.

```
#if statement is true with a probability of (1-p_nosend)
if l[number] < (p_nosend*1000):
    #if true, send the bitstring.
    clientsocket.send(sendstring)
    #sleep to simulate the propogation time of the channel.
    time.sleep((propogationtime)/1.1)
    #after sleeping, record the current time.
```

Theothercaseiswhentheframeisdroppedbythechannel.Inthisscena rio,we again inducea sleep, inorder to simulate thepackage being sent. As far as the sender “knows”, it has sent the package, but it does notknowthattheframegotlostduetothenoisychannel.Afterwaitingforthegiventimeperiod,thesenderdoesnotreceiveanacknowledgement(since,receiverneverreceivedthepacket).

```
    #for info of user:
    print ("package dropped 1")
    #set ack flag to False, again.
    ackflag= False
```

Afterwaiting,thesenderattemptstosendthesamepacketagain,withthe same probability and repeats until the package is sent successfully, i.e. itreceivesanacknowledgementforit.

Forthereceiver’sside,anacknowledgementissenteverytimeaframe, orbit,isreceived,albeit withasuccessrategiven bytheuser.

```
else:
    str="Acknowledgement: Message Received"
    s.send(str.encode())
    print ("indices did not match. Sending ack for previous element")
```

Therefore,someacknowledgementsgetlostinthechannel.Therefore,sincesenderdoesnotreceiveacknowledgement,ittimesoutandsendsthesameframeagain.Thereceiver,howeverhadalreadysuccessfullygottentheframe.Inthiscase,sincetheindicesdonotmatch-theacknowledgementforthepreviousframeissent.

SENDER-CODE

```
import socket
from threading import *
import time
import random



#-------------------------------------------------------------------------
#create socket object and bind it.
s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
host = "localhost"
port = 8000
s.bind((host, port))

#-------------------------------------------------------------------------
#defines the class for client.
class client(Thread):
    #initialize everything
    def __init__(self, socket, address):
        Thread.__init__(self)
        self.sock = socket
        self.addr = address
        self.start()


    def run(self):

        while True:

            #take input from user
            bitstring  = str(raw_input("enter bit string"))
            propogationtime = float(raw_input("enter propogation time"))
            p_nosend = float(input("enter probability of message getting lost:"))

            #create a list of 1000 elements. (redundant, can be changed)
            l = []
            for i in range(0,1000):
                l = l +[i]

            #go through all the bits of the bitstring.
            i = 0
            while i < len(bitstring):
                #for each bit, create a dictionary with the current
                #window index (i%2 => 0,1,0,1...) and the bit itself
                datadict = {}
                datadict = {i%2 : bitstring[i], }
```

```
                #convert the dictionary to a string
                sendstring = str(datadict)

                #find a random number between 0,1000 (both included)
                number= random.randint(0,1000)

                #store current time
                time1 = time.time()

                #if statement is true with a probability of (1-p_nosend)
                if l[number] < (p_nosend*1000):
                    #if true, send the bitstring.
                    clientsocket.send(sendstring)
                    #sleep to simulate the propogation time of the channel.
                    time.sleep((propogationtime)/1.1)
                    #after sleeping, record the current time.
                    time2 = time.time()
                    #this flag indicates whether an acknowledgement has been
received.

                    ackflag= False

                #else statement is true with a probability of (p_nosend)
                #this simulates a packet being sent but getting lost
                #along the way (like our lives).
                else:
                    #imaginary send line here.
                    #wait for propogation time again.
                    time.sleep(propogationtime/1.1)
                    #record current time
                    time2 = time.time()
                    #for info of user:
                    print ("package dropped 1")
                    #set ack flag to False, again.
                    ackflag= False

                while True:
                    #if the time elapsed is less that prop time,
                    if time2-time1<= propogationtime:
                        #store current time
                        time2= time.time()

                        #set timeout to listen for an acknowledgement.
                        clientsocket.settimeout(propogationtime/1.1)

                        #raises exception when the timeout occurs.
                        try:
                            #attempt to listen for ack.
```

```
                            recieved = clientsocket.recv(1024)
                            print(recieved)

                            if recieved:
                                print "ack received"
                                i = i+1
                                ackflag = True
                                break

                        #this occurs when listening has timed out.
                        except:
                            #recheck if it has timed out (quite redundant):
                            if time2 - time1 >propogationtime and ackflag == False:
                                print ("timeout")

                                #at this stage, we again simulate a package drop
                                #with prob p_nosend
                                number= random.randint(0,1000)

                                #package sent
                                if l[number] < (p_nosend*1000):
                                    clientsocket.send(sendstring)
                                    time1 = time.time()
                                    time2 = time.time()
                                    print "package sent"

                                #package dropped:
                                else:

                                    time1 = time.time()
                                    time2 = time.time()
                                    #time.sleep(propogationtime/1.1)

                                    print("package dropped 2")







s.listen(5)
print ('Sender ready and is listening')
while (True):

    #to accept all incoming connections
    clientsocket, address = s.accept()
    print("Receiver "+str(address)+" connected")
```

```
    #create a different thread for every
    #incoming connection
    client(clientsocket, address)
```

RECEIVER-CODE

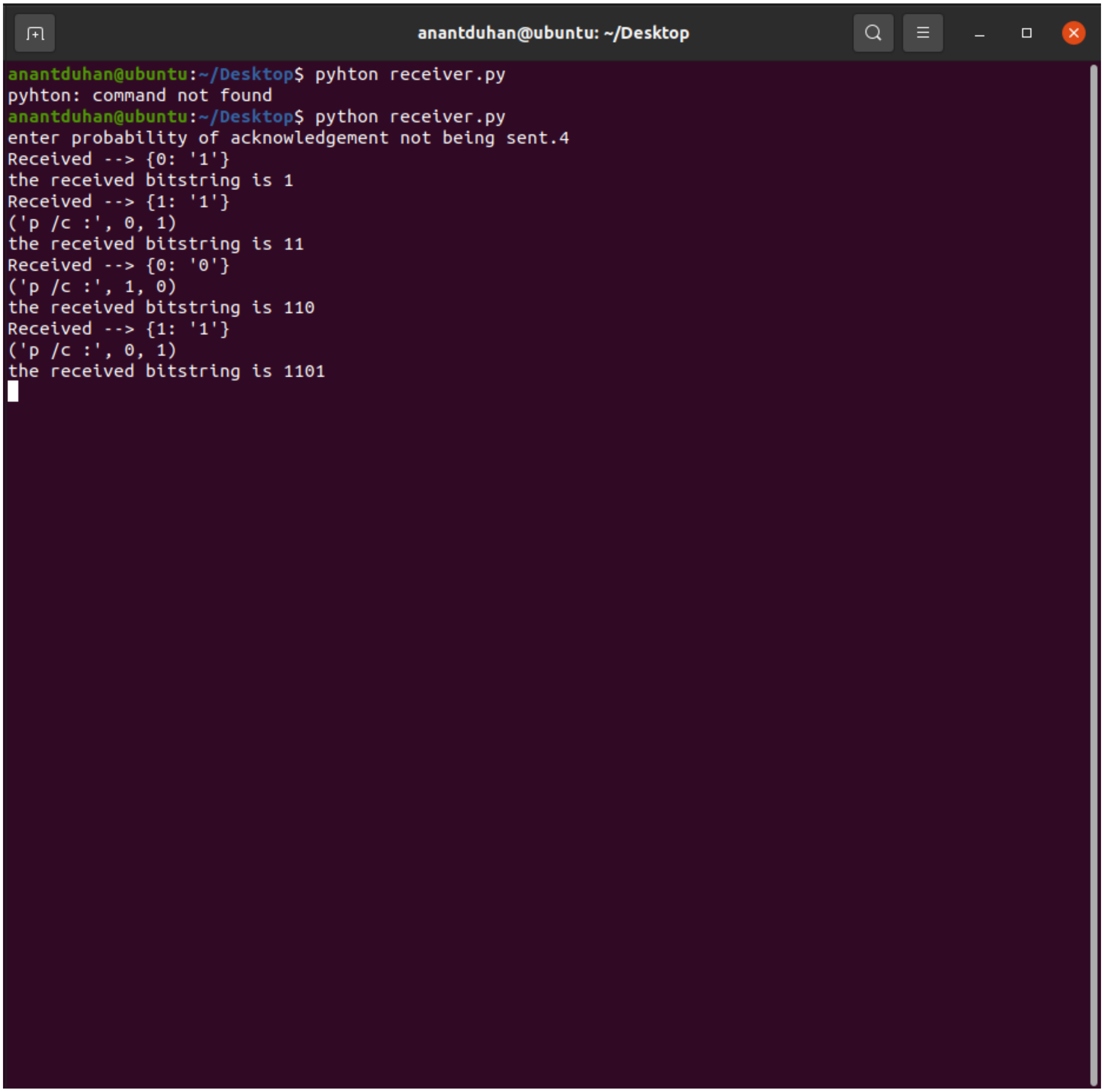
```
import socket
import random
from ast import literal_eval


#-------------------------------------------------------------------------
#create socket object and bind it.
s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
host ="localhost"
port =8000
s.connect((host,port))

#-------------------------------------------------------------------------

#take input from user
p_noack = float(input("enter probability of acknowledgement not being sent"))
count = 0


def try_ack(previous, current):
    if abs(previous-current) == 1:
        return True
    else:
        return False

l = []
for i in range(0,1000):
    l = l +[i]
output = ""

while 2:
    data=s.recv(8).decode()
```

```
    print("Received --> "+data)
    datadict = literal_eval(data)
    index = list((datadict).keys())[0]
    number= random.randint(0,1000)
    if count == 0:
        count = count +1
        current = index
        previous = 0
        if current == 0:
            previous = 1

    #simulating the acknowldgement message being lost on the way
    else:
        count = count +1
        previous = current
        current = index
        print ("p /c :", previous, current)
    if try_ack(previous, current):
        output  = output + list(datadict.values())[0]
        #print ("hello", l[number],p_noack*1000 )
        if l[number]<(p_noack*1000):
            print "Ack not sent"
            pass
        else:
            str="Acknowledgement: Message Received"
            #print ("!!!!!!!!!")

            #print datadict.values()
            s.send(str.encode())
    else:
        str="Acknowledgement: Message Received"
        s.send(str.encode())
        print ("indices did not match. Sending ack for previous element")
    print "the received bitstring is",output

s.close ()
```

OUTPUT – SENDER

```
anantduhan@ubuntu: ~/Desktop
anantduhan@ubuntu:~/Desktop$ python sender.py
Sender ready and is listening
Receiver ('127.0.0.1', 35450) connected
enter bit string1101
enter propogation time5
enter probability of message getting lost:.6
package dropped 1
timeout
package dropped 2
timeout
package sent
Acknowledgement: Message Received
ack received
package dropped 1
timeout
package dropped 2
timeout
package sent
Acknowledgement: Message Received
ack received
package dropped 1
timeout
package dropped 2
timeout
package sent
Acknowledgement: Message Received
ack received
Acknowledgement: Message Received
ack received
enter bit string
```

OUTPUT - RECEIVER



EXPERIMENT RESULT AND ANALYSIS

Wehaveimplementedthestop-and-waitprotocolthroughthisproject-andwhilewerealizethatitisindeedareliablemethodofcommunication(itensuresthatthesentframeisreceivedandacknowledgedreliably),wealsorealizedthatitisextremelyinefficient.Theconstant waiting, after sending a single frame makes the protocol slow andtherefore,werealizethattheGo-Back-NprotocolortheSelectiveRepeatprotocolisamuchfasterwaytoensurereliablecommunication.

ReportShouldcontainminimumof25pagesandmaximumof30pages