

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
UNIVERSITY OF MASSACHUSETTS DARTMOUTH
ECE369 COMPUTER NETWORKS



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PROJECT INTRODUCTION

- MOST GROUP CHATS ARE UNORGANIZED AND A LEGITIMATE QUESTION OR IMPORTANT INFORMATION IS OFTEN IGNORED OR OVERLOOKED AMONGST OTHER CONVERSATION. TO BETTER OPTIMIZE THE INTERFACE AT WHICH PEOPLE VIEW THESE CHATS AND RESPOND TO THEM, WE WILL MAXIMIZE EFFICIENCY AND MAKE UTILIZATION SMOOTHER.
- AMITY COMMUNICATIONS IS A GROUP CHAT MESSAGING SYSTEM WITH THREE SEPARATED CHATS WITHIN EACH GROUP SERVER, WHICH CAN BE LAUNCHED FROM WITHIN THE APPLICATION.
- PRIORITIZE ORGANIZATION AND SIMPLICITY IN USERS EVERYDAY LIVES.
- BUILT ON A CLIENT/SERVER FRAMEWORK IN C# USING WINDOWS FORMS FOR GUI DESIGN



SOCKET PROGRAMMING EXPERIMENTS

I. CLIENT/SERVER FRAMEWORK-TCP

- CONNECTION ORIENTED
- SLOWER
- MORE RELIABLE/HAS ACK
- MUST RUN THE SERVER BEFORE RUNNING THE CLIENT

Terminal

```
File Edit View Search Terminal Help  
eng-svr-1:/home/cwhittle/Documents/369-P1/ECE369ProjHints>python TCPclient.py 13  
4.88.53.54 8054  
Type "quit" to exit the client or "shutdown" to turnoff the server  
Type a message: hello Server  
Received echo: HELLO SERVER  
Type a message: Bye  
Received echo: BYE  
Type a message: shutdown  
Received echo: SHUTDOWN  
TCP Client quits!
```

TCP CLIENT TEST

Terminal

```
File Edit View Search Terminal Help  
eng-svr-1:/home/jmccarthy9>python ./tcp_server.py 8054  
TCP Server is listening on port 8054 ...  
Accepted a connection from ('134.88.53.54', 41904)  
Received message: hello Server  
Received message: Bye  
Received message: shutdown  
TCP Server shuts down!
```

TCP SERVER TEST

I. CLIENT/SERVER FRAMEWORK-UDP

- CONNECTIONLESS
- FASTER
- LESS RELIABLE/LACKS ACK
- DO NOT NEED TO RUN THE SERVER BEFORE CLIENT

Terminal

```
File Edit View Search Terminal Help  
eng-svr-1:/home/cwhittle/Documents/369-P1/ECE369ProjHints>python UDPclient.py 13  
4.88.53.54 8055  
Type a message: hello server  
Received echo: HELLO SERVER  
Type a message: goodbye  
Received echo: GOODBYE  
Type a message: shutdown  
Received echo: SHUTDOWN  
Client quits!
```

UDP CLIENT TEST

Terminal

```
File Edit View Search Terminal Help  
eng-svr-1:/home/jmccarthy9>python ./udp_server.py 8055  
Server runs on eng-svr-1.umdar.umassd.edu at 134.88.53.54  
UDP Server is waiting on port 8055 ...  
Received message: hello server  
UDP Server is waiting on port 8055 ...  
Received message: goodbye  
UDP Server is waiting on port 8055 ...  
Received message: shutdown  
UDP Server shuts down!
```

UDP SERVER TEST

SOCKET PROGRAMMING EXPERIMENTS

II. MULTITHREADED SERVER

- A MULTITHREADED SERVER ALLOWS MULTIPLE CLIENTS TO CONNECT TO IT AT THE SAME TIME

```
Terminal - eng-svr-1:~
```

File Edit View Search Terminal Help
eng-svr-1:/home/jmccarthy9>python tcp_serverMultithread.py 8051
Server runs on eng-svr-1.umdar.umassd.edu at 134.88.53.54
Threaded TCP Server is listening on port 8051 ...
Threaded TCP Server is listening on port 8051 ...
Accepted a connection from 34492
Threaded TCP Server is listening on port 8051 ...
Accepted a connection from 34494
Received message: Hello from 34492
Received message: Hello 34492, this is 34494
Received message: Nice to meet you!
Received message: likewise!
Received message: ive got to go now
Received message: goodbye
Received message: bye
Received message: quit
Received message: shutdown

```
Terminal - eng-svr-1:~
```

File Edit View Search Terminal Help
eng-svr-1:/home/jmccarthy9>python tcp_client.py 134.88.53.54 8051
Type "quit" to exit the client or "shutdown" to turnoff the server
Type a message: Hello 34492, this is 34494
Received echo: HELLO 34492, THIS IS 34494
Type a message: likewise!
Received echo: LIKEWISE!
Type a message: ive got to go now
Received echo: IVE GOT TO GO NOW
Type a message: bye
Received echo: BYE
Type a message: quit
Received echo: QUIT
TCP Client quits!
eng-svr-1:/home/jmccarthy9>

```
Terminal - eng-svr-1:~
```

File Edit View Search Terminal Help
eng-svr-1:/home/jmccarthy9>python tcp_client.py 134.88.53.54 8051
Type "quit" to exit the client or "shutdown" to turnoff the server
Type a message: Hello from 34492
Received echo: HELLO FROM 34492
Type a message: Nice to meet you!
Received echo: NICE TO MEET YOU!
Type a message: goodbye
Received echo: GOODBYE
Type a message: shutdown
Received echo: SHUTDOWN
TCP Client quits!
eng-svr-1:/home/jmccarthy9>

TCP MULTITHREAD SERVER TEST

TCP CLIENT 1 TEST

TCP CLIENT 2 TEST

SOCKET PROGRAMMING EXPERIMENTS

III. TIMER CLIENT

```
eng-svr-1:/home/jmccarthy9>python udp_server.py 8052
Server runs on eng-svr-1.umdar.umassd.edu at 134.88.53.54
UDP Server is waiting on port 8052 ...
Received message: hi
UDP Server is waiting on port 8052 ...
Received message: goodbye
UDP Server is waiting on port 8052 ...
Received message: shutdown
UDP Server shuts down!
```

UDP Server Test

Terminal

```
File Edit View Search Terminal Help
eng-svr-1:/home/cwhittle/Documents/369-P1/ECE369ProjHints>python UDPclientTimer.py 134.88.53.54 8052
Type a message: hi
Received echo: HI in RTT: 0.000300168991089
Type a message: goodbye
Received echo: GOODBYE in RTT: 0.000234127044678
Type a message: shutdown
Received echo: SHUTDOWN in RTT: 0.000228881835938
Client quits!
eng-svr-1:/home/cwhittle/Documents/369-P1/ECE369ProjHints>
```

UDP Client Timer Test 1

```
eng-svr-1:/home/cwhittle/Documents/369-P1/ECE369ProjHints>python UDPclientTimer.py 134.88.53.54 8052
Type a message: hi
Time out! Message is lost.
Type a message: shutdown
Time out! Message is lost.
Client quits!
```

UDP Client Timer Test 2

PEER2PEER FRAMEWORK (UDP)

- BOTH CONNECT ON PORT #8050

Terminal

```
File Edit View Search Terminal Help
eng-svr-1:/home/cwhittle/Documents/369-P1>python UDPP2P.py 134.88.53.55 8050
Connected on 8050
hello
-Message from ('134.88.53.55', 8050) : test

goodbye
-Message from ('134.88.53.55', 8050) : bye
```

Terminal

```
File Edit View Search Terminal Help
eng-svr-2:/home/pmcgrory/Desktop/369/PArt4>python UDPP2P.py 134.88.53.54 8050
Connected on 8050
-Message from ('134.88.53.54', 8050) : hello

test
-Message from ('134.88.53.54', 8050) : goodbye

bye
```

PEER2PEER FRAMEWORK (TCP)

- BOTH CONNECT ON PORTS #8050 #8051

Terminal

```
File Edit View Search Terminal Help
eng-svr-2:/home/jmccarthy9>python p2p.py 134.88.53.54 8050 8051
Accepted a connection on socket 1 from ('134.88.53.54', 54088)
Accepted a connection on socket 2 from ('134.88.53.54', 35688)
Type "quit" to exit the client or "shutdown" to turnoff the server
Type a message: Hello Peter!
Received Message: HELLO
Type a message: see you later!
Received Message: GOODBYE
Type a message: quit
Received Message: QUIT
TCP Client quits!
```

Terminal

```
File Edit View Search Terminal Help
eng-svr-1:/home/pmcgrory/Desktop/369/PArt4>python TCPpeer.py 134.88.53.55 8050 8051
Accepted a connection on socket 1 from ('134.88.53.55', 44120)
Accepted a connection on socket 2 from ('134.88.53.55', 49356)
Type "quit" to exit the client or "shutdown" to turnoff the server
Type a message: hello
Received message: HELLO PETER!
Type a message: goodbye
Received message: SEE YOU LATER!
Type a message: quit
Received message: QUIT
TCP Client quits!
eng-svr-1:/home/pmcgrory/Desktop/369/PArt4>
```

INTEGRATION: UDP CLIENT TIMER IN C

- MESSAGES ECHO BACK FROM SERVER TO CLIENT
- IF SERVER IS INACTIVE OR PACKET IS LOST, A TIMEOUT OCCURS AND PACKAGE CAN BE RE-SENT.

Terminal

```
File Edit View Search Terminal Help
eng-svr-1:/home/cwhittle/Documents/369-P1/UDPclientTimer.c>./UDPCLI
ENTER MESSAGE: HelloServer
**SENT-->HelloServer
**REC-->HelloServer
ENTER MESSAGE: end
**SENT-->end
**REC-->end
...Shutting Down...
eng-svr-1:/home/cwhittle/Documents/369-P1/UDPclientTimer.c>./UDPCLI
ENTER MESSAGE: AreYouThere
**SENT-->AreYouThere
**TIMEOUT**
ENTER MESSAGE: Hello?
**SENT-->Hello?
**TIMEOUT**
ENTER MESSAGE: end
**SENT-->end
**TIMEOUT**
...Shutting Down...
```

Terminal

```
File Edit View Search Terminal Help
eng-svr-1:/home/cwhittle/Documents/369-P1/UDPclientTimer.c>./UDPSERV
**REC-->HelloServer
**SENT-->HelloServer
**REC-->end
**SENT-->end
...Shutting Down...
```

DEMO – UDP CLIENT TIMER IN C

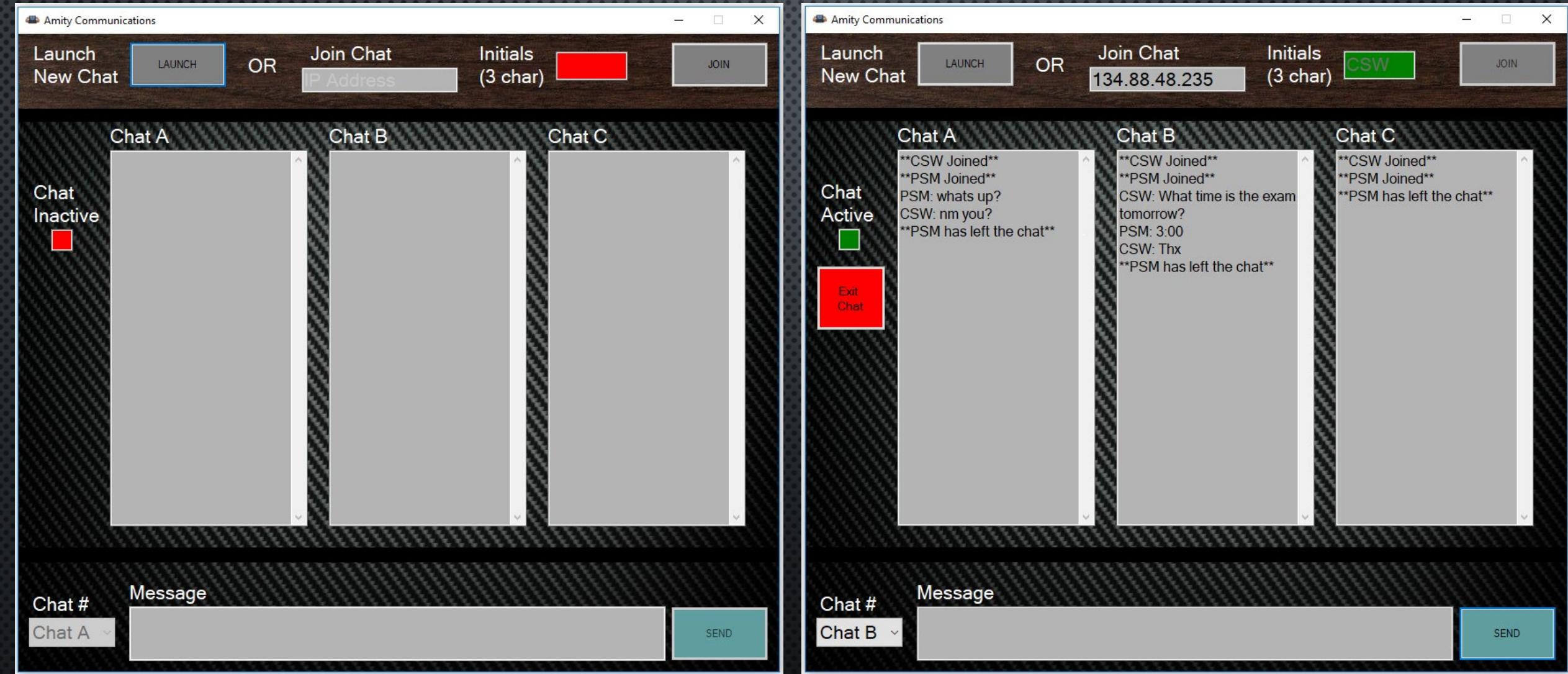
AMITY COMMUNICATIONS: DESIGN CHOICES

- AS A GROUP, WE DECIDED THAT A CLIENT/SERVER APPLICATION DESIGN WOULD BETTER SUIT OUR FINAL PROJECT.
- THE FIRST USER TO SET UP THE CHAT ROOM WILL ACT AS THE “SERVER” AND OTHER USERS WILL BE ABLE TO CONNECT. THESE USERS ACT SOLELY AS “CLIENTS” AND WILL BE ABLE TO CHAT THIS WAY.
- THE SERVER WILL TAKE IN MESSAGES FROM ALL CLIENTS, INCLUDING THE HOST, AND SEND THEM TO ALL USERS. THIS FRAMEWORK ALLOWS FOR A LIMITLESS NUMBER OF USERS TO JOIN INTO THE SAME CHAT GROUP, WHILE MAINTAINING COMMUNICATIONS WITHIN.
- WE DECIDED TO USE C#, AS OUR GROUP HAS STRONG KNOWLEDGE OF THE LANGUAGE, AND IT HAS A BUILT IN GUI PROGRAM CALLED WINDOWS FORMS.

AMITY COMMUNICATIONS: TECHNICAL CHALLENGE & MARKET VALUE

- OUR BIGGEST CHALLENGES WERE:
 - MAKING THE CHAT SYSTEM MULTITHREADED.
 - ALLOWING FOR A CLIENT TO LEAVE AND NOTIFY EACH MEMBER.
 - GETTING THE SERVER TO LAUNCH IN THE BACKGROUND OF THE APPLICATION.
 - MAKING THE GUI EFFECTIVE YET KEEPING IT SIMPLE. *KISS*
- TARGET AUDIENCE IS STUDENTS WITH BUSY WORK/SOCIAL LIVES.
- MARKET VALUE IS OPEN SOURCE FOR STUDENTS.

AMITY COMMUNICATIONS: GUI DESIGN



CONCLUSION

- LESSONS LEARNED:
 - SERVER/CLIENT & PEER2PEER FRAMEWORKS BOTH ARE EFFECTIVE WAYS TO BUILD A NETWORKING SYSTEM.
 - TCP AND UDP ARE SIMILAR PROTOCOLS THAT BOTH HAVE THEIR ADVANTAGES AND DISADVANTAGES.
 - IMPLEMENTING A TIMEOUT ARCHITECTURE ALLOWS FOR ERROR RECOVERY.
 - THERE ARE MANY DIFFERENT WAYS AND LANGUAGES IN WHICH A NETWORKING APPLICATION CAN BE DESIGNED AND CREATED IN.

DEMO – AMITY COMMUNICATIONS