Social Networks
Chris Piech
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Face Pamphlet

FacePamphletServer

Starting server on port 8000...
addProfile (name=Mehran) => success
addProfile (name=Chris) => success
addProfile (name=Chris) => Error: Database already contains Chris.
getStatus (name=Chris) => none
setStatus (name=Chris, status=teaching) => success
getStatus (name=Chris) => teaching
addFriend (name2=Mehran, name1=Chris) => success
getFriends (name=Chris) => [Mehran]
addProfile (name=Julie) => success
getImg (name=Julie) => none
setStatus (name=Julie) => none
getFriends (name=Julie) => []
setImage (img=JulieZ.jpg, name=Julie) => success
getImg (name=Julie) => JulieZ.jpg
getStatus (name=Julie) => none
getFriends (name=Julie) => []
addFriend (name2=Chris, name1=Julie) => success
getImg (name=Julie) => JulieZ.jpg
getStatus (name=Julie) => none

FacePamphletClient

Name Chris

Friends
Mehran
Julie

Chris is teaching

Julie added as a friend.
The Name

FaceBook

Thanks Mehran for the cool name
The Name

FaceLittlebook

Thanks Mehran for the cool name
The Name

FaceNovela

Thanks Mehran for the cool name
The Name

FacePamphlet !!

Thanks Mehran for the cool name
Some Context

• A little background on Facebook
  – Facebook founded in 2004 by Mark Zuckerberg
    • He was a sophomore at Harvard
  – Facebook in 2012
    • More than 1 billion active users
    • 10+ billion minutes/day spent on Facebook

• You can do this!
  – Mike Schroepfer (Vice President, Engineering)
  – Jocelyn Goldfein (Director, Engineering)
  – Bret Taylor (former Chief Technology Officer)
  – All three were CS majors at Stanford
  – And all are former CS106A section leaders!
Review
Background: The Internet

The internet is just many programs sending messages (as Strings)

Thanks Nick for the teaching YEAH
The internet is just many programs sending messages (as Strings)

Thanks Nick for the teaching YEAH
Background: The Internet

Facebook datacenter

“Server”

Your computer (facebook.com)

“Client”

The internet is just many programs sending messages (as Strings)

Thanks Nick for the teaching YEAH
Background: The Internet

The internet is just many programs sending messages (as *Strings*)

Get status for “Nick Troccoli”

Facebook datacenter

“Server”

Your computer

(facebook.com)

“Client”

Thanks Nick for the teaching YEAH
Background: The Internet

Facebook datacenter → “Server”

“request”

Get status for “Nick Troccoli”

“teaching YEAH”

“response”

Your computer (facebook.com) → “Client”

The internet is just many programs sending messages (as Strings)

Thanks Nick for the teaching YEAH
FacePamphletlet

FacePamphletServer

“Server”

Your task

FacePamphletClient

“Client”

Extra credit

Thanks Nick for the teaching YEAH
Another way to get Server/Client

First, imagine a world before Server/Clients...

- FaceDatabase: Stores information
- FaceProfile: Interacts with user / displays information
- FaceGraphics: Displays information

* This blob represents one program on one machine
Another way to get Server/Client

First, imagine a world before Server/Clients…

* This blob represents one program on one machine
Another way to get Server/Client

Now our application runs across two programs

Server
- FaceDatabase
- FaceProfile

Client
- FaceGraphics

* Each blob represents one program on one machine
Another way to get Server/Client

Which means many clients can connect to the data

* Each blob represents one program on one machine
The Internet

Facebook datacenter

“Server”

“Client”

Tate Ole Keko’s computer (facebook.com)

Chris’ phone (facebook app)

Your mom’s computer (linux shell)

“Client”

REQUEST

RESPONSE

REQUEST

RESPONSE

REQUEST
Most of the Internet

Server / Clients

Aka “the backend”

Aka “the cloud”

Aka “the brains”

Aka “the frontend”

Aka “the GUI”
public String requestMade(Request request) {
    // server code goes here
}

// make a Server object
private SimpleServer server = new SimpleServer(this, 8000);

public void run(){
    // start the server
    server.start();
}
public String requestMade(Request request) {
    // server code goes here
}

// make a Server object
private SimpleServer server
    = new SimpleServer(this, 8000);

public void run(){
    // start the server
    server.start();
}
What is a Request?

- Request has a command
  ```java
  String command;
  ```
- Request has parameters
  ```java
  HashMap<String, String> params;
  ```

Request request

// methods that the server calls on requests
request.getCommand();
request.getParam(key);  //returns associated value
Requests are like Remote Method Calls

Server has a bunch of discrete things it can do

addUser

getStatus
Requests are like Remote Method Calls
Requests are like Remote Method Calls

```
request.getCommand();
=> "makeToast"
```

Server

addUser

getStatus

chocolate

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/**
 * Starts the server running so that when a program sends
 * a request to this computer, the method requestMade is
 * called.
 */

public void run() {
    println("Starting server on port " + PORT);
    server.start();
}

/**
 * When a request is sent to this computer, this method
 * called. It must return a String.
 */

public String requestMade(Request request) {
    String cmd = request.getCommand();
    println(request.toString());

    // your code here.

    return "Error: Unknown command " + cmd + ".";
}
Where we left off...
There are two types of internet programs. Servers and Clients.
Now, the client
A Client’s’s Purpose

1. Interact with the user
2. Get data from its server
3. Save data to its server
try {

  // 1. construct a new request
  Request example = new Request("getStatus");

  // 2. add parameters to the request
  example.addParam("name", "chris");

  // 3. send the request to a computer on the internet
  String result = SimpleClient.makeRequest(HOST, example);

} catch(IOException e) {

  // The internet is a fast and wild world my friend

}
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    } catch (IOException e) {

        // The internet is a fast and wild world my friend

    }

Chat Server and Client

ChatClient

> CJP: Testing
> LMS: Hellooooo
> LMS: I'm online!
> LMS: This is great
> LMS: And this is going to make it into lecture
addMsg
msg = Hello world

history = []
history = [
  Hello world
]

getMsgs
index = 0
Chat Server

**Java**

**Chat Server**

```java
addMsg
msg = text
```

```java
getMsgs
index = startIndex
```
There are two types of internet programs. Servers and Clients
public class ChatServer extends ConsoleProgram {

private static final int PORT = 8080;

private SimpleServer server = null;

/* The server database is an ArrayList of Strings */
private ArrayList<String> messages = new ArrayList<String>();

public void run() {
    setFont("Courier-24");
    println("Starting server on port " + PORT + " ... ");
    server = new SimpleServer(this, PORT);
    server.start();
}

... that’s not all
Chat Server

```java
public class ChatServer extends ConsoleProgram implements SimpleServerListener {

    private static final int PORT = 8080;

    private SimpleServer server = null;

    /* The server database is an ArrayList of Strings */
    private ArrayList<String> messages = new ArrayList<String>();

    public void run() {
        setFont("Courier-24");
        println("Starting server on port "+PORT+"...");
        server = new SimpleServer(this, PORT);
        server.start();
    }
}

... that's not all
```
public class ChatServer extends ConsoleProgram
implements SimpleServerListener {

    private static final int PORT = 8080;

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    private ArrayList<String> messages = new ArrayList<String>();

    public void run() {
        setFont("Courier-24");
        println("Starting server on port " + PORT + "...");
        server = new SimpleServer(this, PORT);
        server.start();
    }

    ... that's not all
```
public String requestMade(Request request) {
    println(request.toString());
    String command = request.getCommand();

    String result = "Error: Can't process request " + command;
    // we handle newMsg commands
    if(command.equals("newMsg")) {
        result = newMessage(request);
    }
    // we also handle getMsgs commands
    if(command.equals("getMsgs")) {
        result = getMessages(request);
    }

    println(" => " + result);
    return result;
}
public String requestMade(Request request) {
    println(request.toString());
    String command = request.getCommand();

    String result = "Error: Can't process request " + command;
    // we handle newMsg commands
    if(command.equals("newMsg")) {
        result = newMessage(request);
    }
    // we also handle getMsgs commands
    if(command.equals("getMsgs")) {
        result = getMessages(request);
    }

    println(" => " + result);
    return result;
}
public String requestMade(Request request) {
    println(request.toString());
    String command = request.getCommand();

    String result = "Error: Can't process request " + command;
    // we handle newMsg commands
    if(command.equals("newMsg")) {
        result = newMessage(request);
    }
    // we also handle getMsgs commands
    if(command.equals("getMsgs")) {
        result = getMessages(request);
    }

    println(" => " + result);
    return result;
}
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    String command = request.getCommand();

    String result = "Error: Can't process request " + command;
    // we handle newMsg commands
    if(command.equals("newMsg")) {
        result = newMessage(request);
    }
    // we also handle getMsgs commands
    if(command.equals("getMsgs")) {
        result = getMessages(request);
    }

    println(" => " + result);
    return result;
}
```
HAPPY CLIENT
Question: This is cool Chris. But didn’t you just really dumb down servers?
Answer: No
Question: Why isn’t this in a browser?
“Native” vs “Browser”

Chat Client

Send: hello from the browser

Messages

> Chrome: hello from the browser
> Piech: hello from a native app

Chat Server

Starting server on port 8080...
getMsgs (index=0) => []
newMsg (msg=Chrome: hello from the browser) => success
getMsgs (index=0) => [Chrome: hello from the browser]
getMsgs (index=0) => [Chrome: hello from the browser]
newMsg (msg=Piech: hello from a native app) => success
getMsgs (index=1) => [Piech: hello from a native app]
getMsgs (index=1) => [Piech: hello from a native app]

Chat Client

Enter username: Piech
> Chrome: hello from the browser
> Piech: hello from a native app
Question: Localhost forever?
Use ngrok to get a url
Any security holes?
Want to learn more?

CS144 Computer Networking

Or CS193P

Or CS193A

Or CS108
Social Networks
Your local social network

Piech, CS106A, Stanford University
You have some “groups”
But here is the love of your life

Your significant other

George

Piech, CS106A, Stanford University
Romantic Partnerships and the Dispersion of Social Ties: A Network Analysis of Relationship Status on Facebook

Lars Backstrom  
Facebook Inc.

Jon Kleinberg  
Cornell University

ABSTRACT
A crucial task in the analysis of on-line social-networking systems is to identify important people — those linked by strong social ties — within an individual’s network neighborhood. Here we investigate this question for a particular category of strong ties, those involving spouses or romantic partners. We organize our analysis around a basic question: given all the connections among a person’s friends, can you recognize his or her romantic partner from the network structure alone? Using data from a large sample of Facebook users, we find that this task can be accomplished with high accuracy, but doing so requires the development of a new measure of tie strength that we term ‘dispersion’ — the extent to which two people’s mutual friends are not themselves well-connected. The results offer methods for identifying types of structurally significant people in on-line applications, and suggest a potential expansion of existing theories of tie strength.

Categories and Subject Descriptors: H.2.8 [Database Management]: Database applications—Data mining

Keywords: Social Networks; Romantic Relationships.

they see from friends [1], and organizing their neighborhood into conceptually coherent groups [23, 25].

Tie Strength.
Tie strength forms an important dimension along which to characterize a person’s links to their network neighbors. Tie strength informally refers to the ‘closeness’ of a friendship; it captures a spectrum that ranges from strong ties with close friends to weak ties with more distant acquaintances. An active line of research reaching back to foundational work in sociology has studied the relationship between the strengths of ties and their structural role in the underlying social network [15]. Strong ties are typically ‘embedded’ in the network, surrounded by a large number of mutual friends [6, 16], and often involving large amounts of shared time together [22] and extensive interaction [17]. Weak ties, in contrast, often involve few mutual friends and can serve as ‘bridges’ to diverse parts of the network, providing access to novel information [5, 15].

A fundamental question connected to our understanding of strong ties is to identify the most important person in a person’s social network...


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Dispersion: The extent to which two people’s mutual friends are not directly connected.
Dispersion: The extent to which two people’s mutual friends are not directly connected.
The filter bubble
Elections, now hackable
The end.