

Social Networks

Chris Piech
CS106A, Stanford University

Download the Chat Client!

Face Pamphlet

FacePamphletServer

```
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
getStatus (name=Julie)
  => none
getFriends (name=Julie)
  => []
setImg (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

FacePamphletClient

Name Add Delete Lookup

Chris


Chris
Friends
Mehran
Julie

Chris is teaching

Julie added as a friend.



The Name

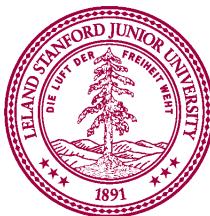


+



FaceBook

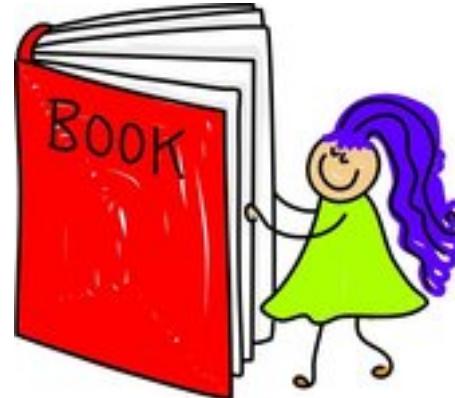
Thanks Mehran for the cool name



The Name



+



FaceLittlebook

Thanks Mehran for the cool name



The Name



+



FaceNovela

Thanks Mehran for the cool name



The Name

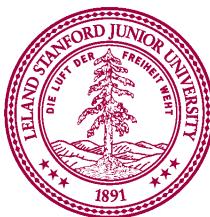


+



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!



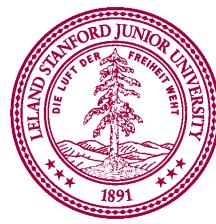
Review

Background: The Internet



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

Thanks Nick for the teaching YEAH



Background: The Internet



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*)

Thanks Nick for the teaching YEAH



Background: The Internet

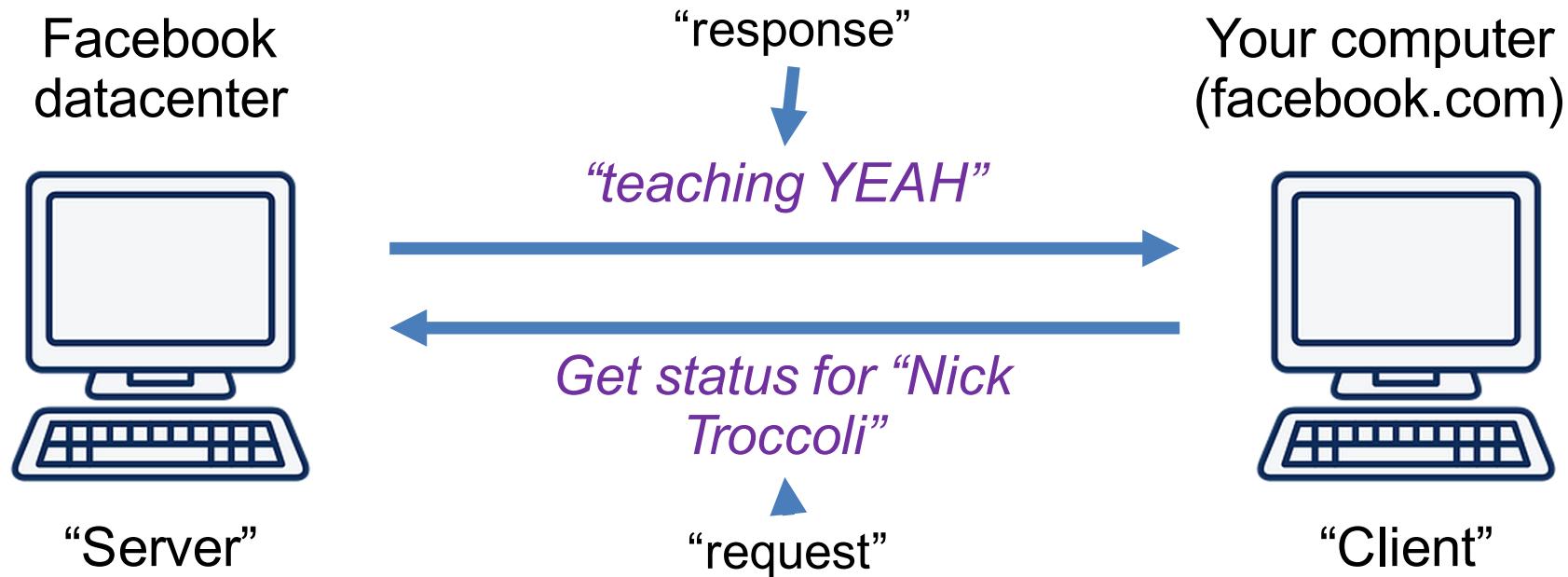


The internet is just many programs sending messages (as *Strings*)

Thanks Nick for the teaching YEAH

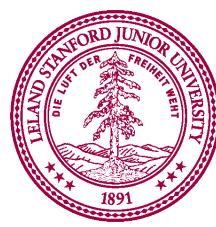


Background: The Internet



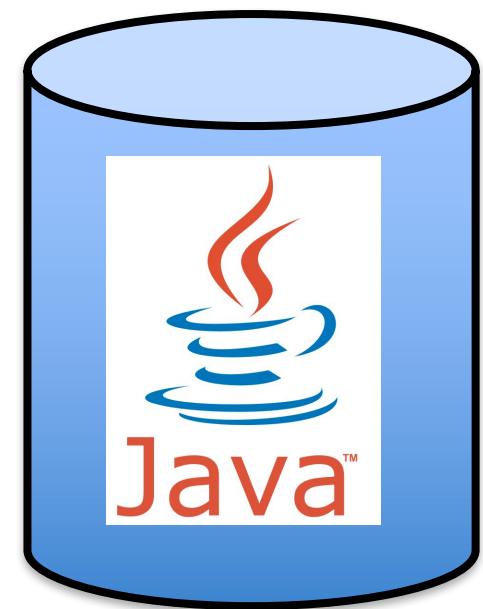
The internet is just many programs sending messages (as *Strings*)

Thanks Nick for the teaching YEAH

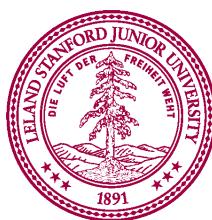


Face Book Server

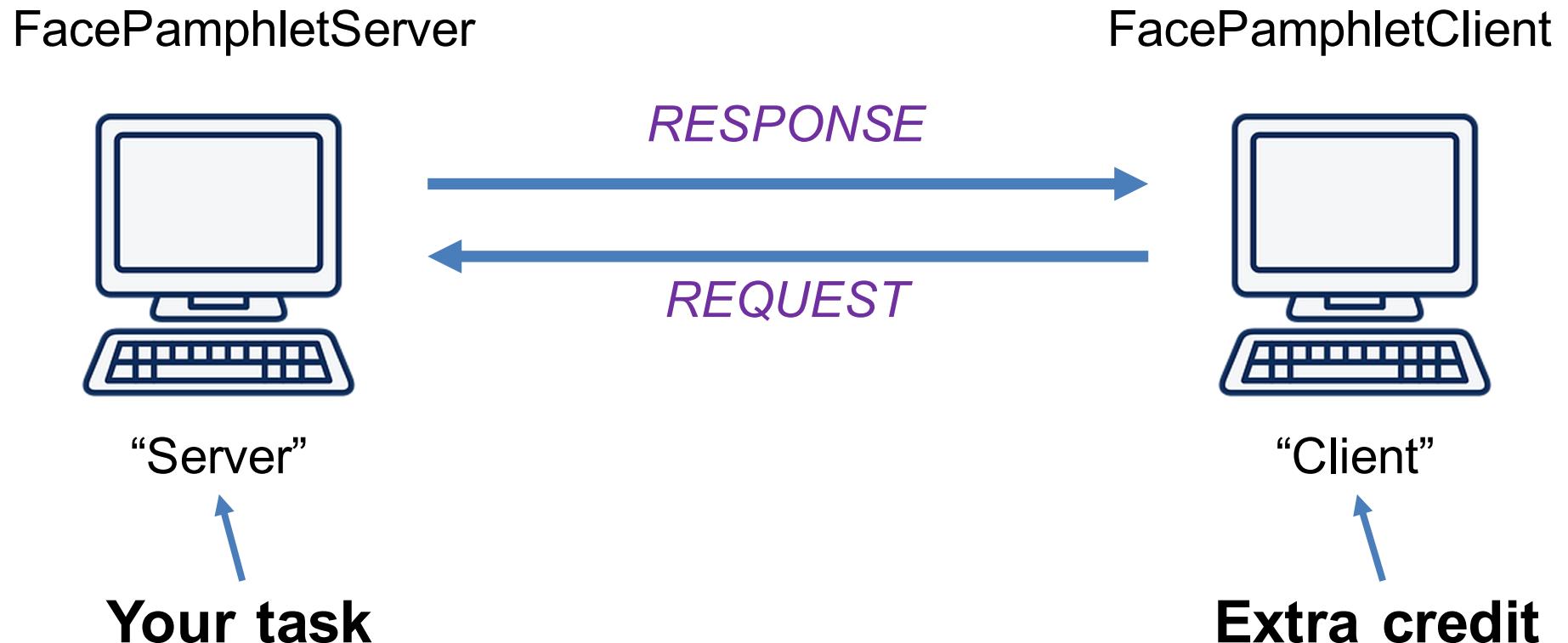
Send the **status** for
piech@cs.stanford.edu



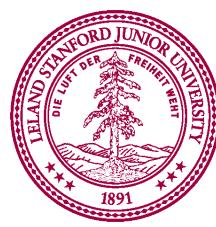
“Teaching”



FacePamphlet

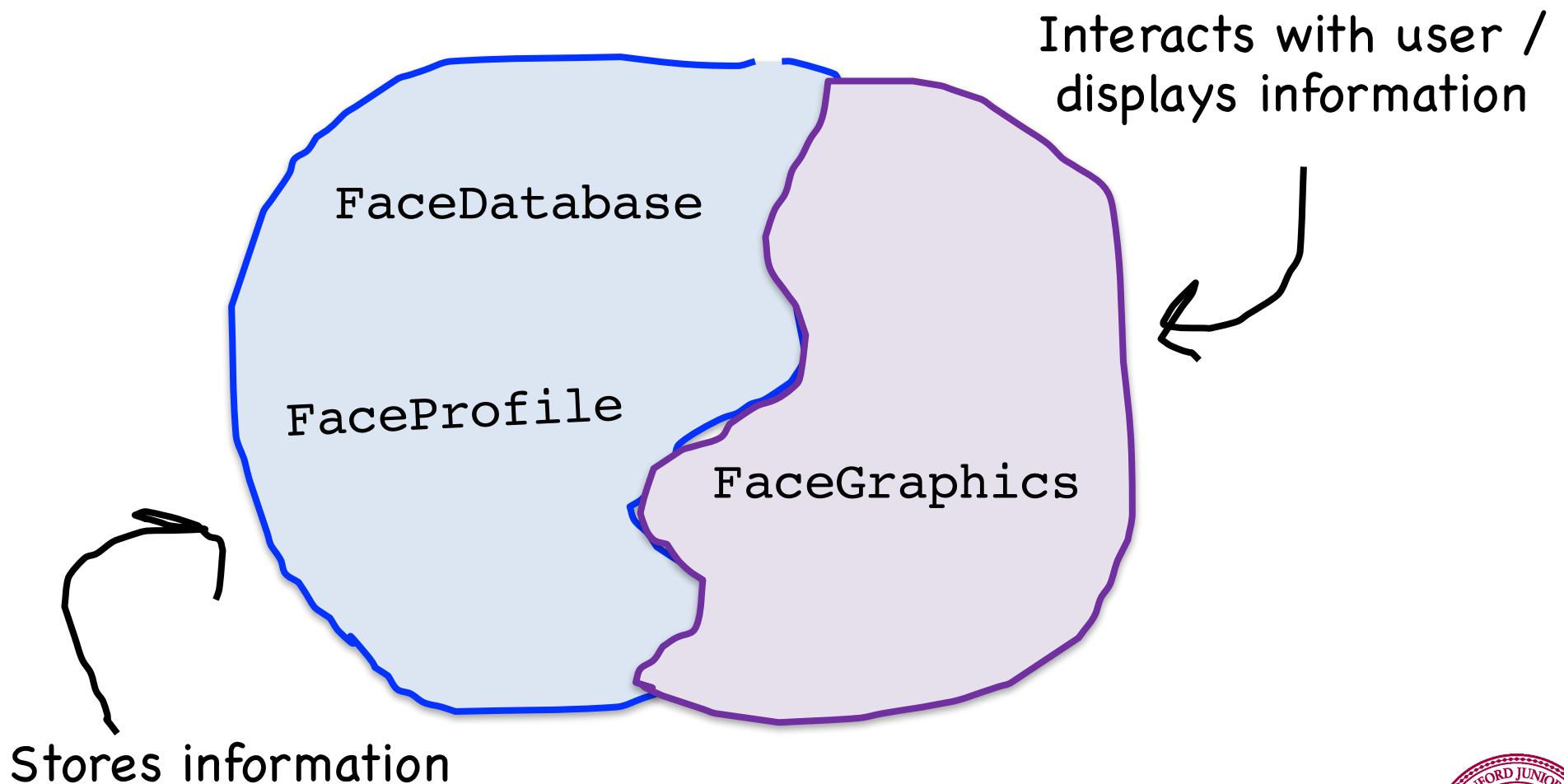


Thanks Nick for the teaching YEAH



Another way to get Server/Client

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

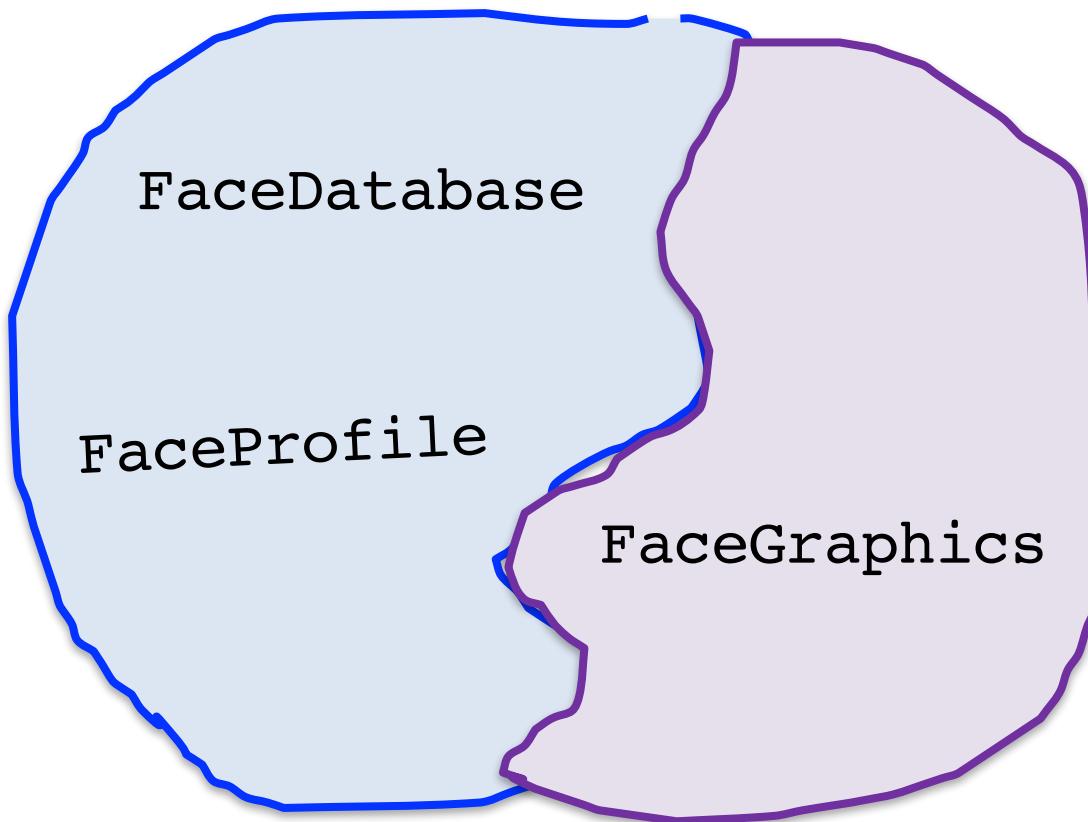


* This blob represents one program on one machine

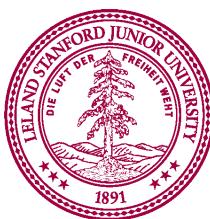


Another way to get Server/Client

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

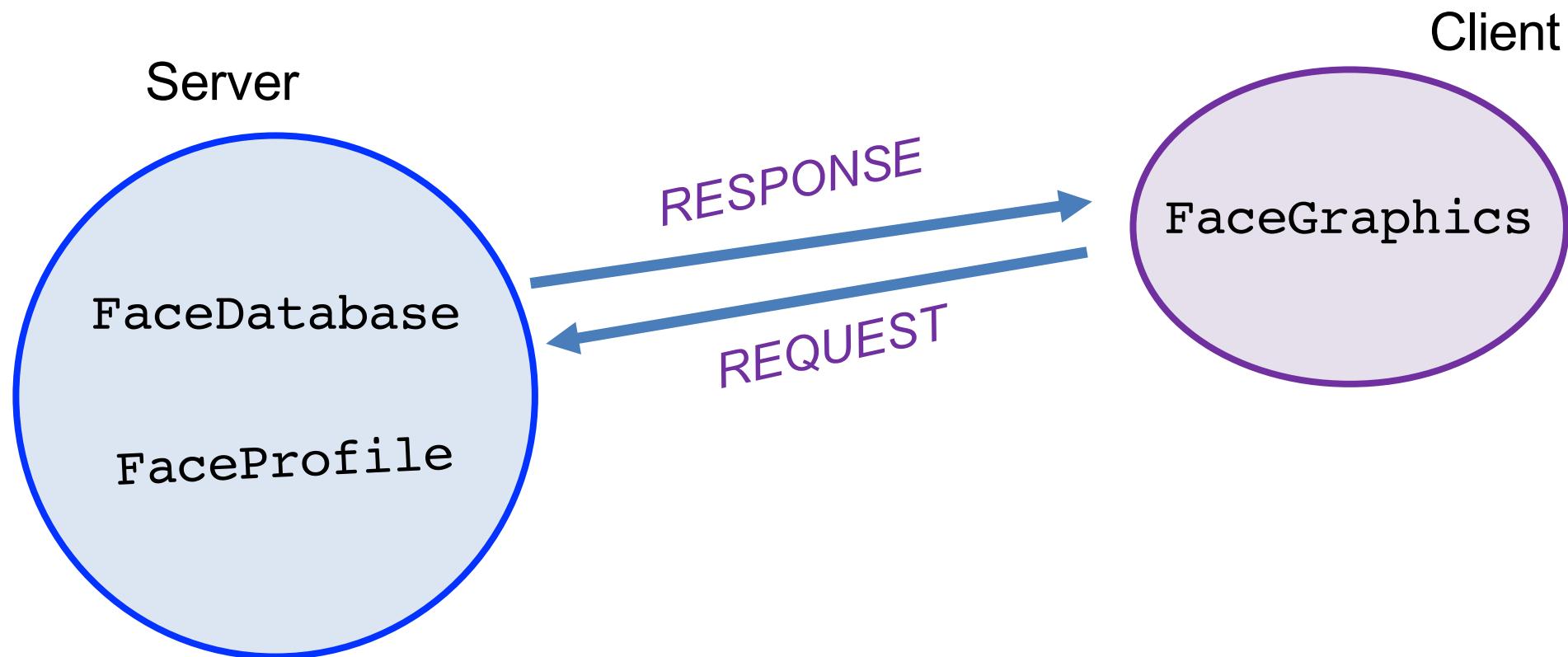


* This blob represents one program on one machine



Another way to get Server/Client

Now our application runs across two programs

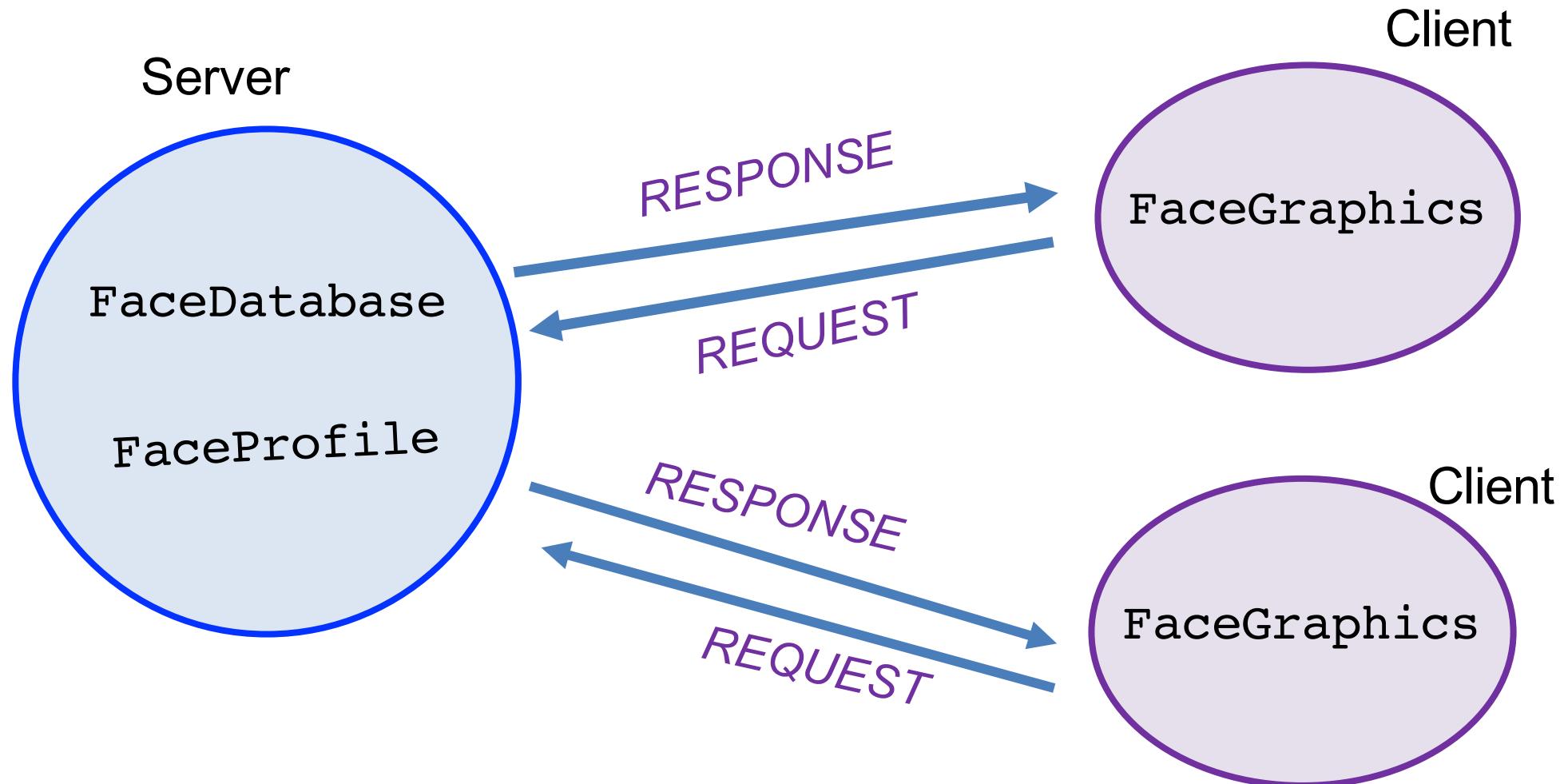


* Each blob represents one program on one machine



Another way to get Server/Client

Which means many clients can connect to the data

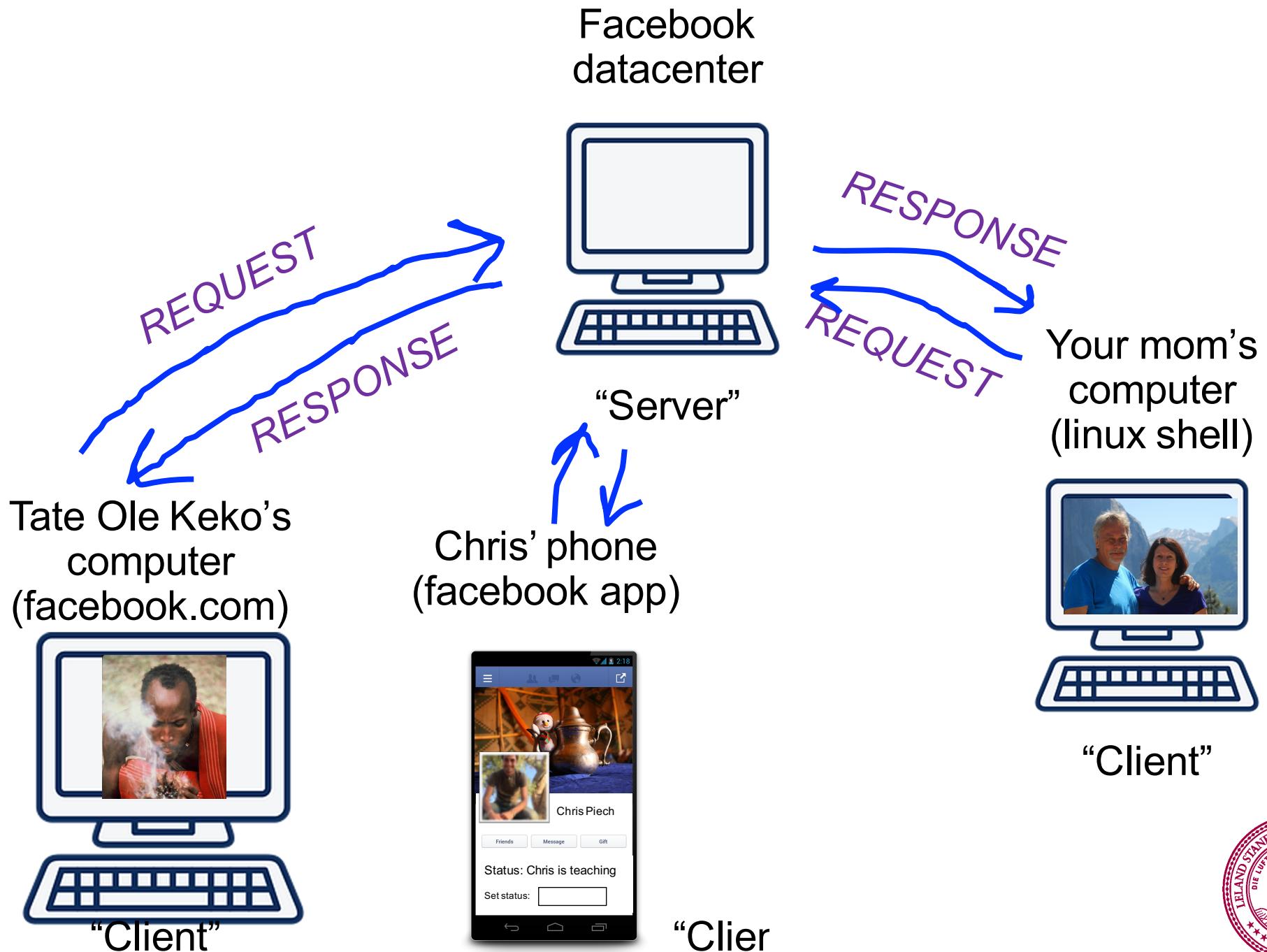


* Each blob represents one program on one machine

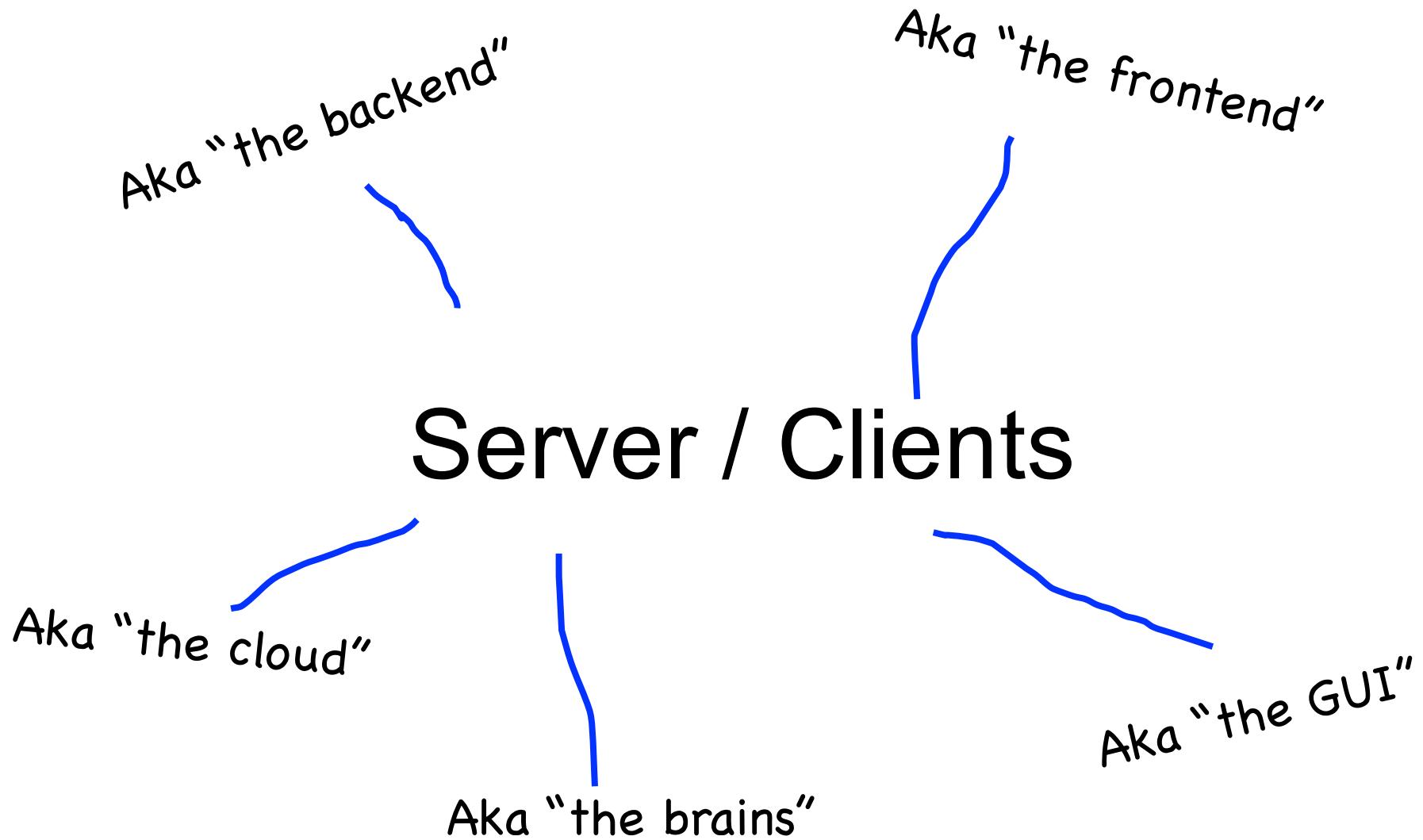


Many computers can connect
to the same server

The Internet



Most of the Internet



For the first time ever in
CS106A...

(technically the second
time because we saw this
yesterday)

Servers on one slide

1

```
public String requestMade(Request request) {  
    // server code goes here  
}
```

2

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

3

```
public void run(){  
    // start the server  
    server.start();  
}
```



Servers on one slide

1

```
public String requestMade(Request request) {  
    // server code goes here  
}
```

2

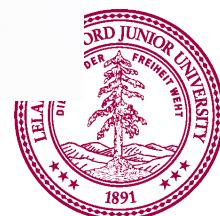
```
// make a Server object  
private SimpleServer server  
    = new SimpleServer(this, 8000);
```

3

```
public void run(){  
    // start the server  
    server.start();  
}
```



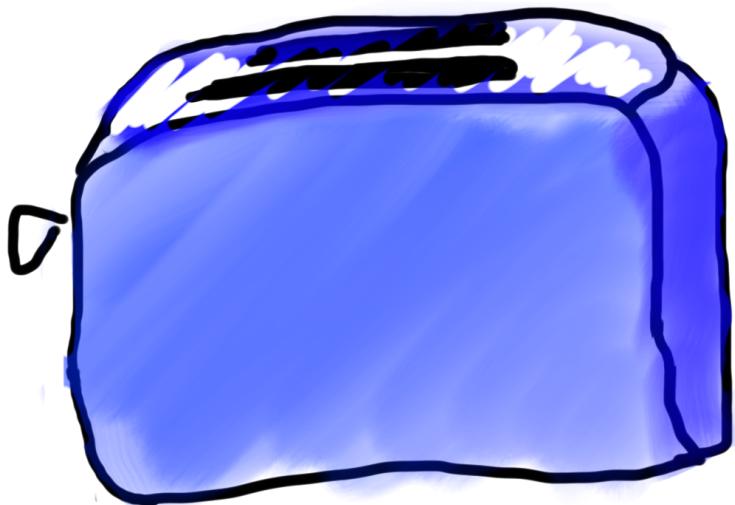
Requests are like Remote Method Calls



Requests are like Remote Method Calls



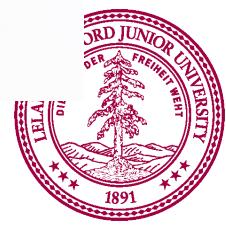
Server



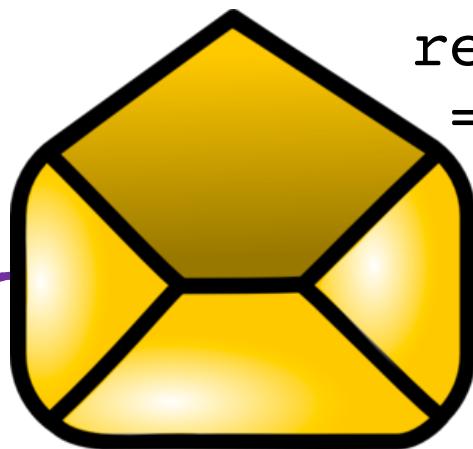
makeToast



getChocolate

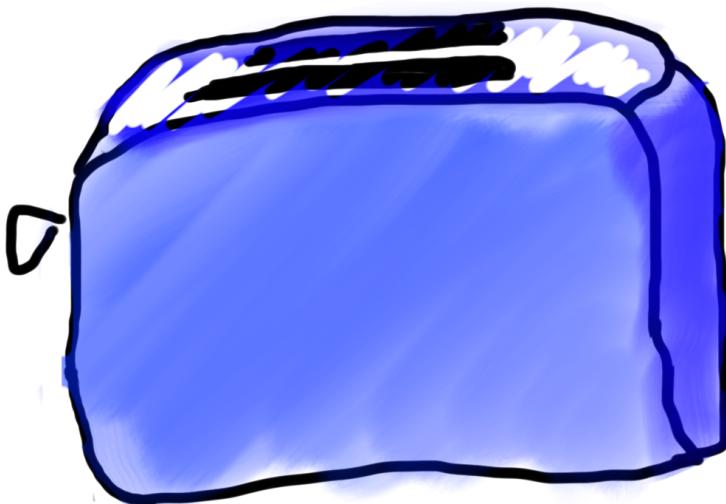


Requests are like Remote Method Calls



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

Server



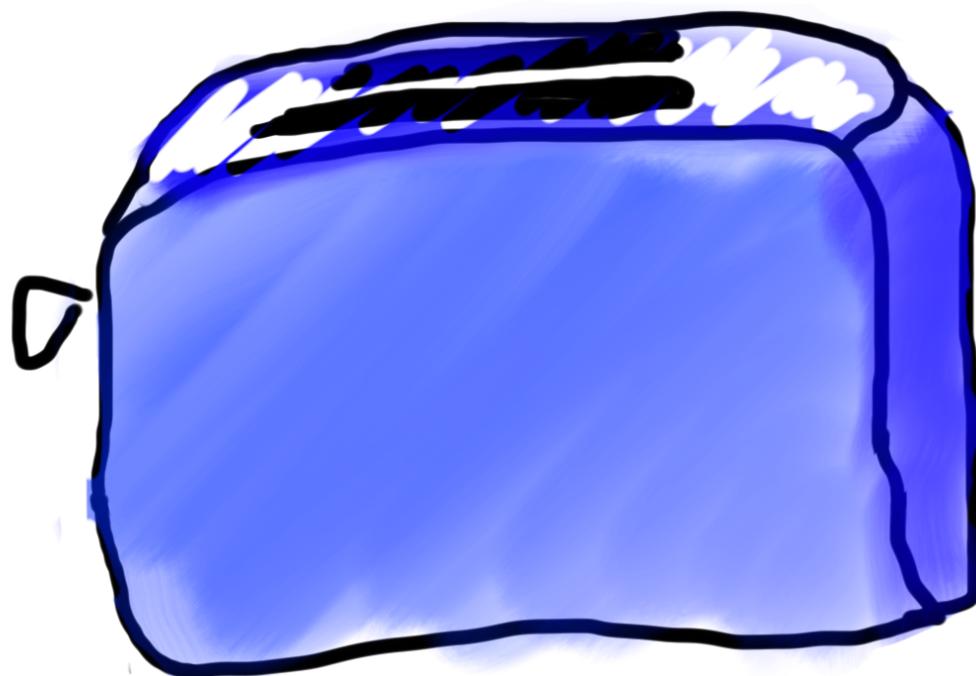
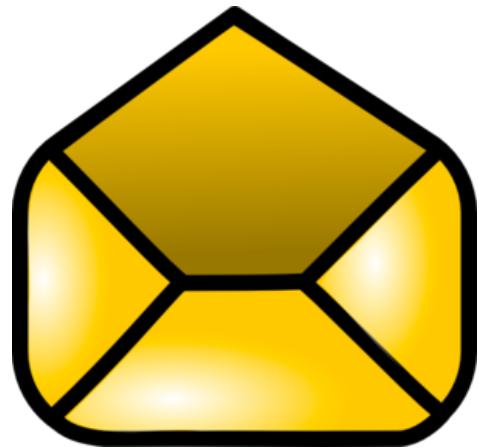
`makeToast`



`getChocolate`



Requests are like Remote Method Calls

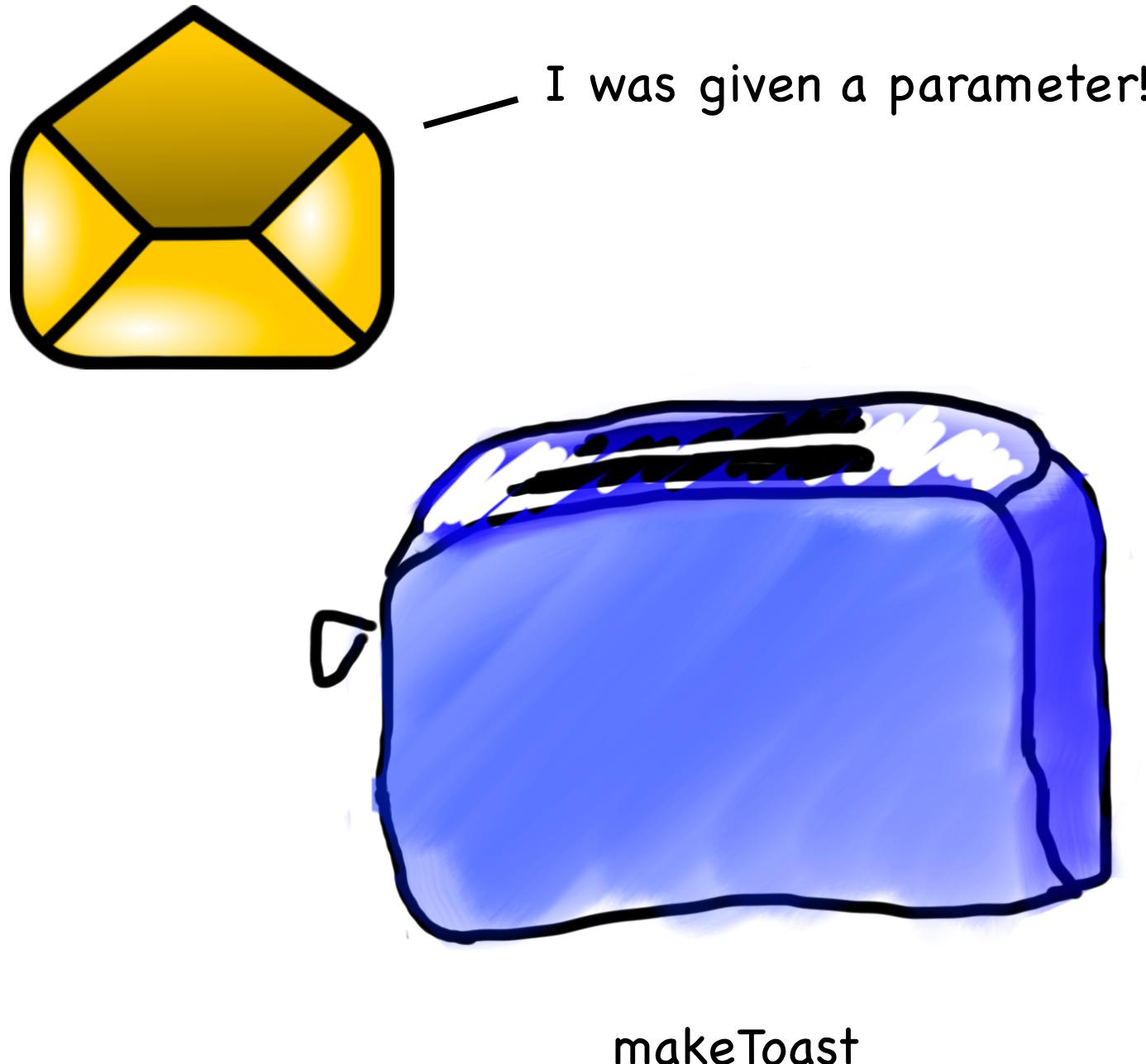


To make toast, I need a parameter which is the kind of bread

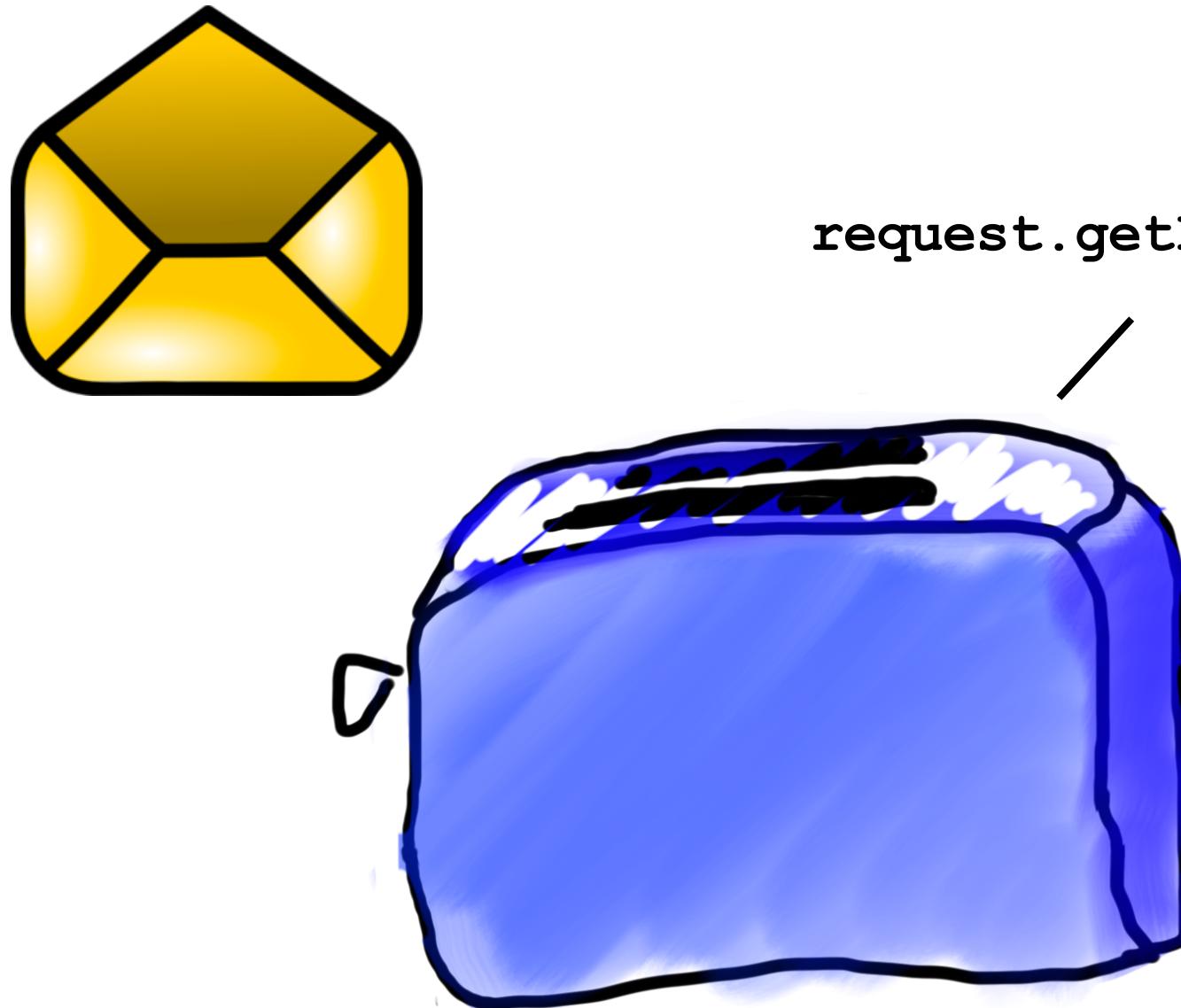
makeToast



Requests are like Remote Method Calls



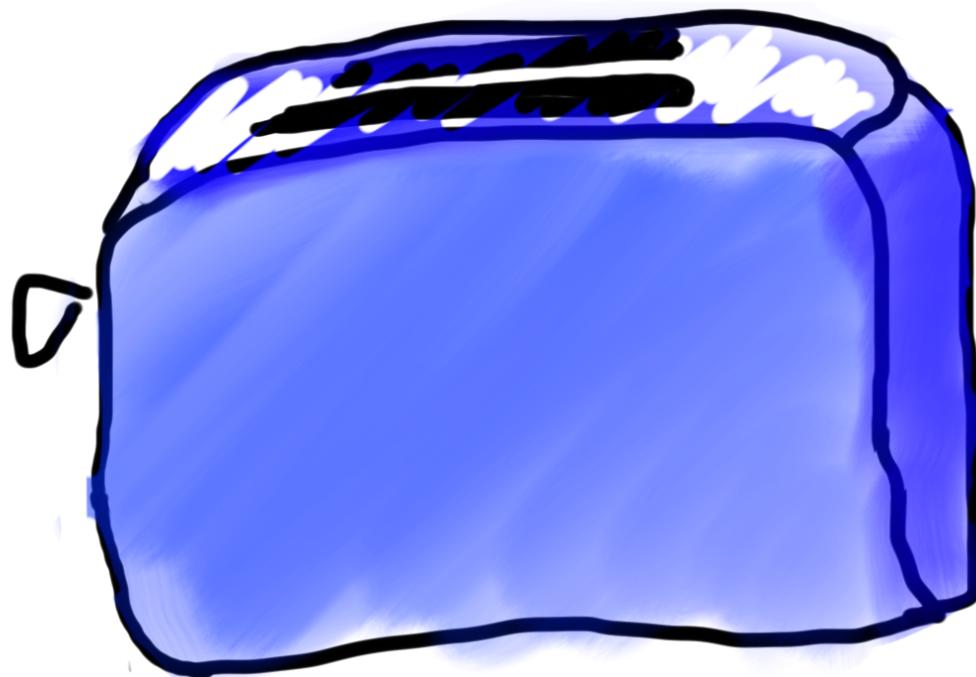
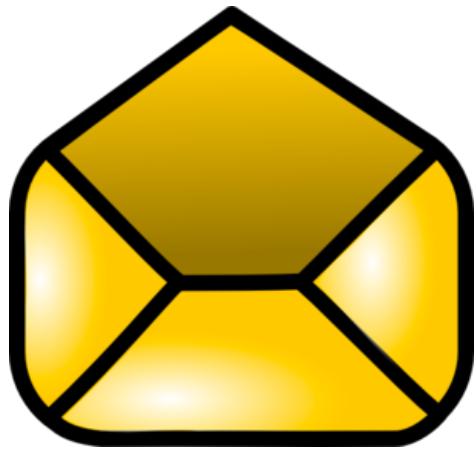
Requests are like Remote Method Calls



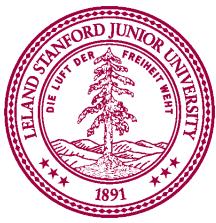
makeToast



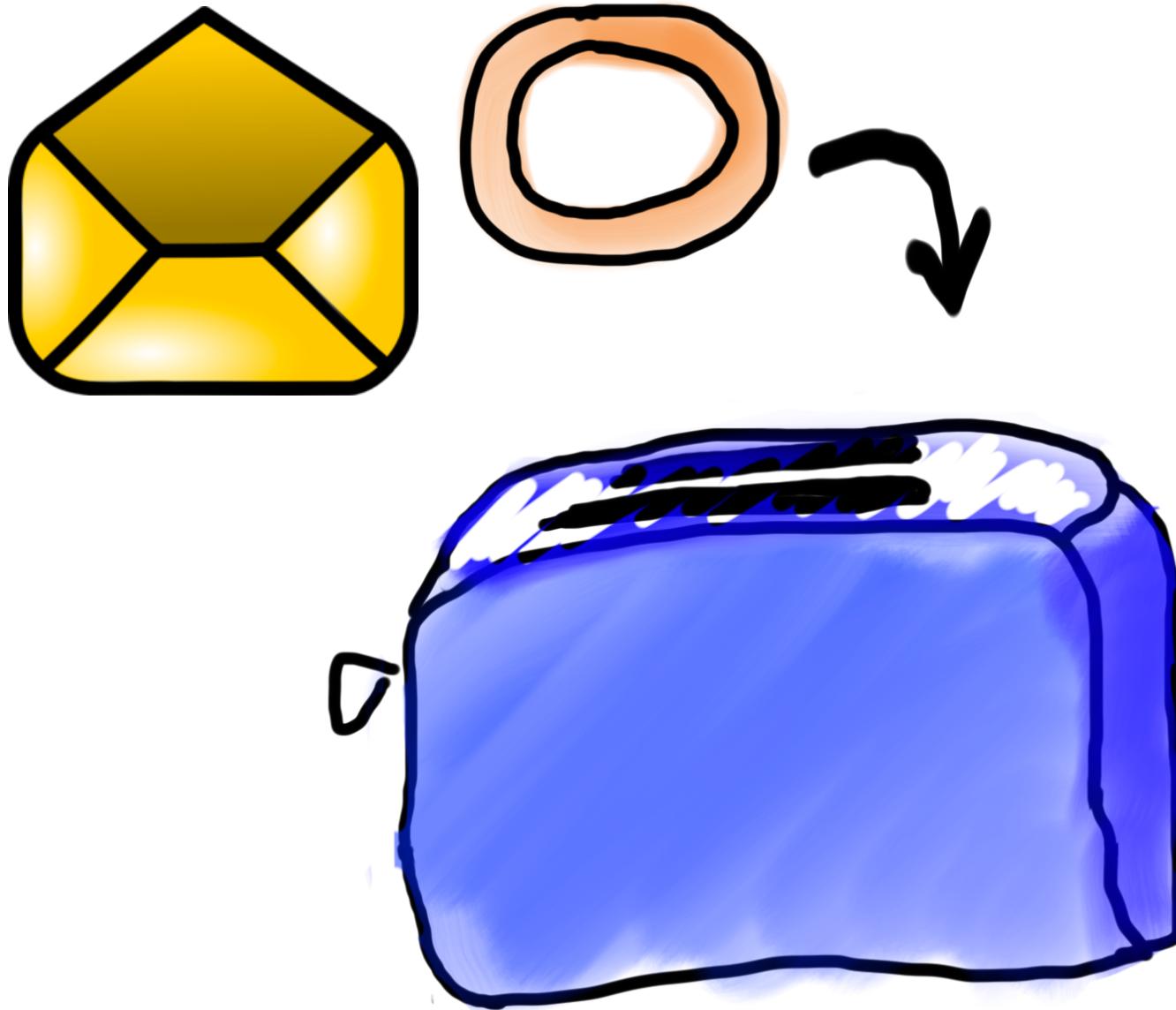
Requests are like Remote Method Calls



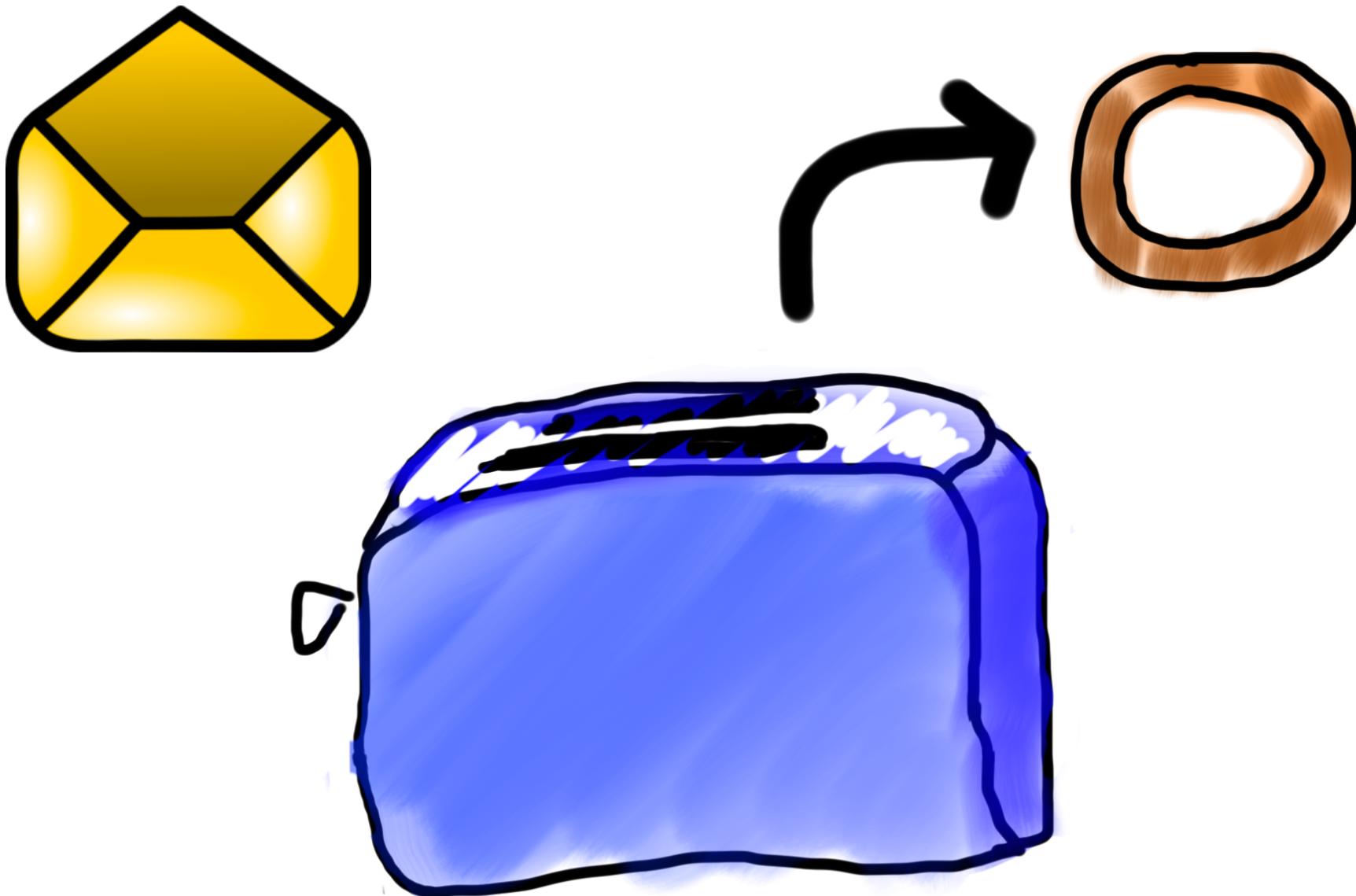
makeToast



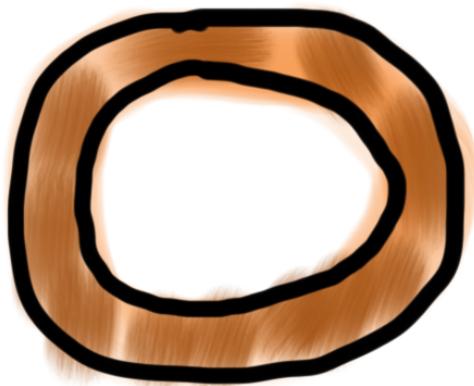
Requests are like Remote Method Calls



Requests are like Remote Method Calls



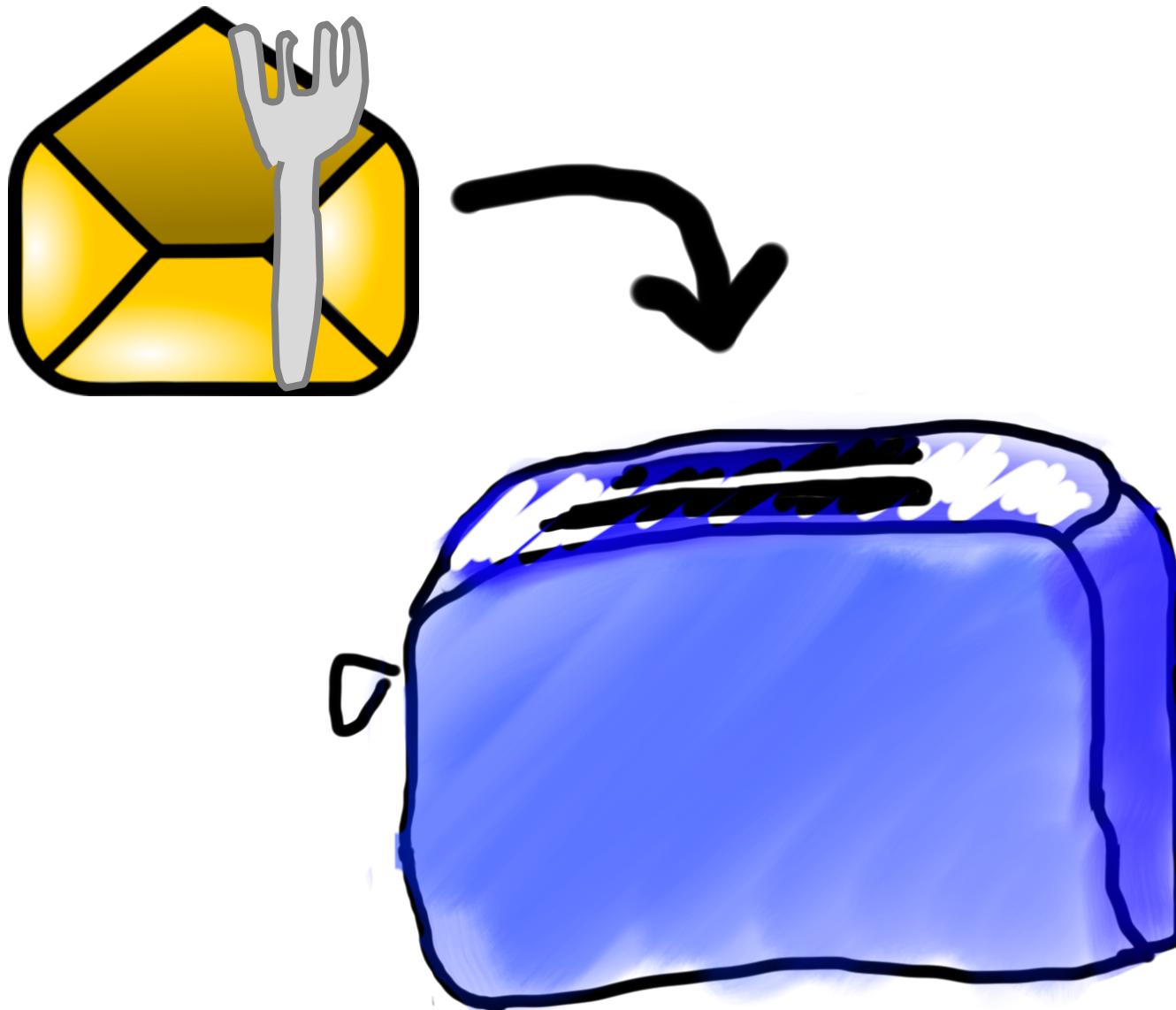
```
public String requestMade(Request request) {  
    String cmd = request.getCommand();  
    if(cmd.equals("makeToast")) {  
        Bread input = request.getParam("bread");  
        Bread output = runToaster(input);  
        return output.toString();  
    }  
    ...  
}
```



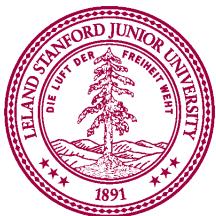
.toString() ???



Requests are like Remote Method Calls



Piech, CS106A, Stanford University



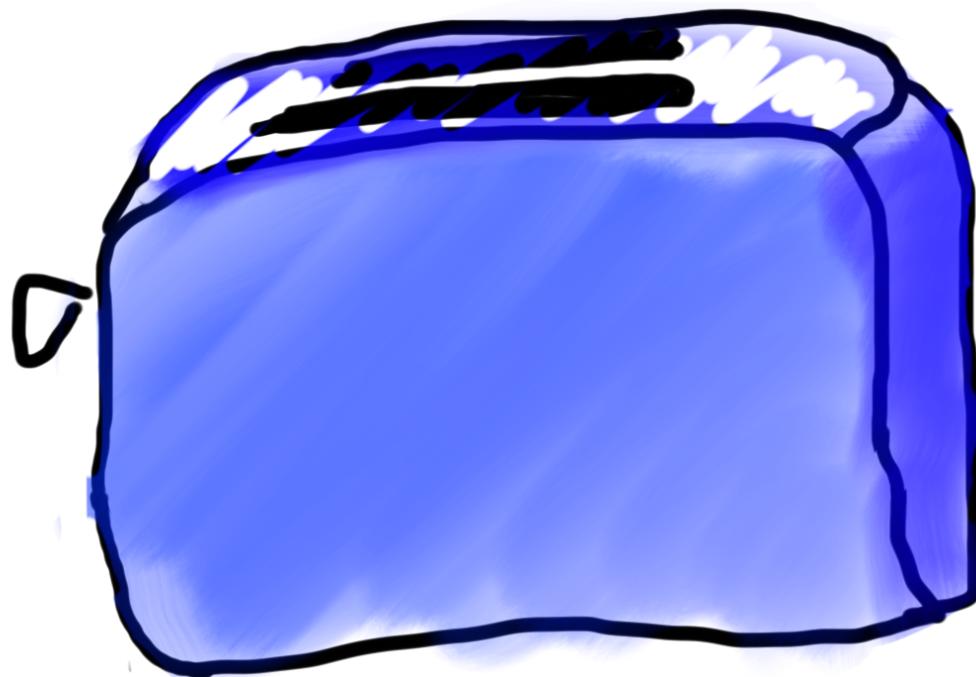
Requests are like Remote Method Calls



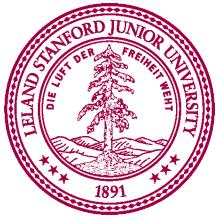
Piech, CS106A, Stanford University



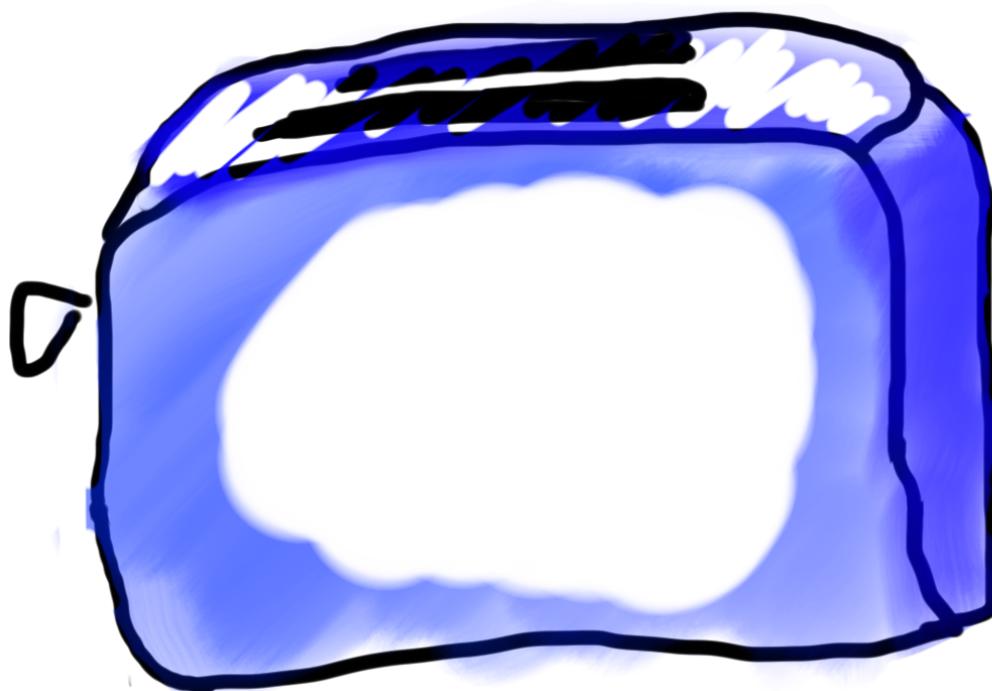
Requests are like Remote Method Calls



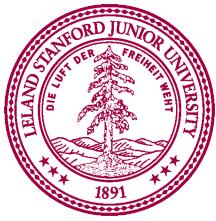
Piech, CS106A, Stanford University



Requests are like Remote Method Calls



Piech, CS106A, Stanford University



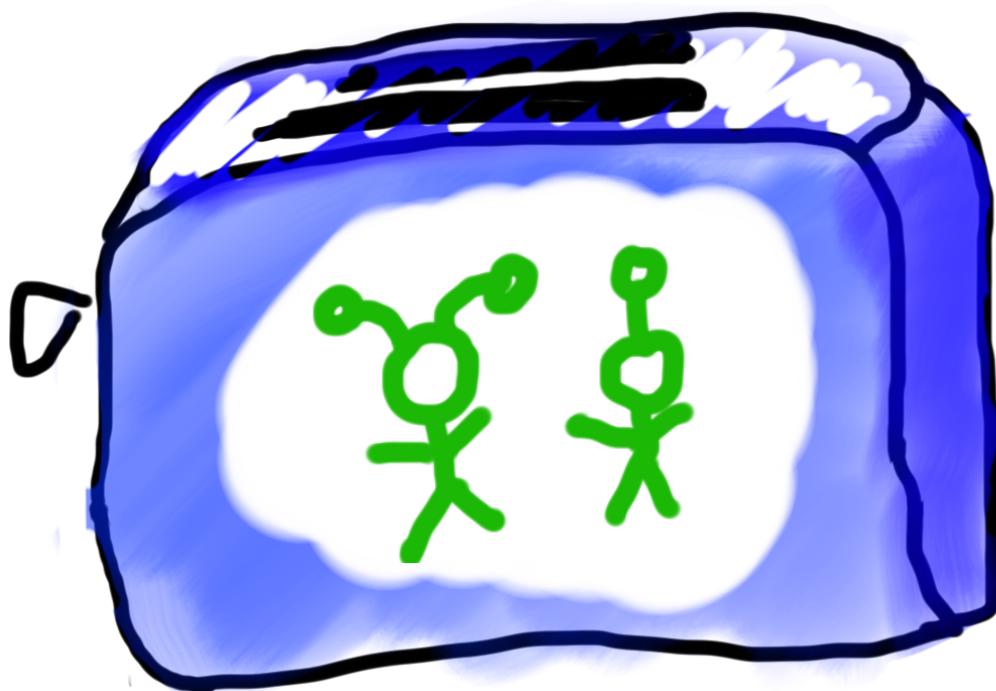
Requests are like Remote Method Calls



Piech, CS106A, Stanford University



Requests are like Remote Method Calls



Piech, CS106A, Stanford University



What is a Request?



```
/* Request has a command */  
String command;  
  
/* Request has parameters */  
HashMap<String, String> params;
```

Request request

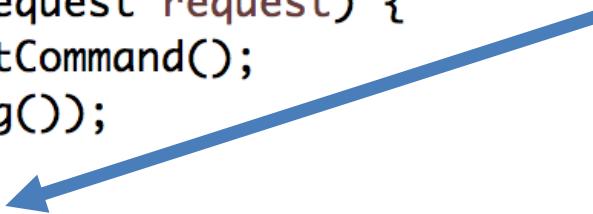
```
// methods that the server calls on requests  
request.getCommand();  
request.getParam(key); //returns associated value
```



Your Server Code

```
/**  
 * 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 is  
 * 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 + ".";  
}
```

Respond to requests here. *The String you return will be sent as the response.*



Where we left off...

Chat Server and Client

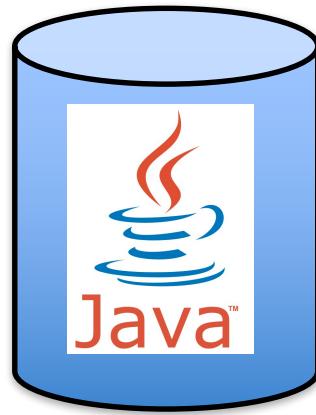
ChatClient

```
> CJP: Testing
> LMS: Hellooooo
> LMS: Im online!
> LMS: This is great
> LMS: And this is going to make it into lecture
```

Message:

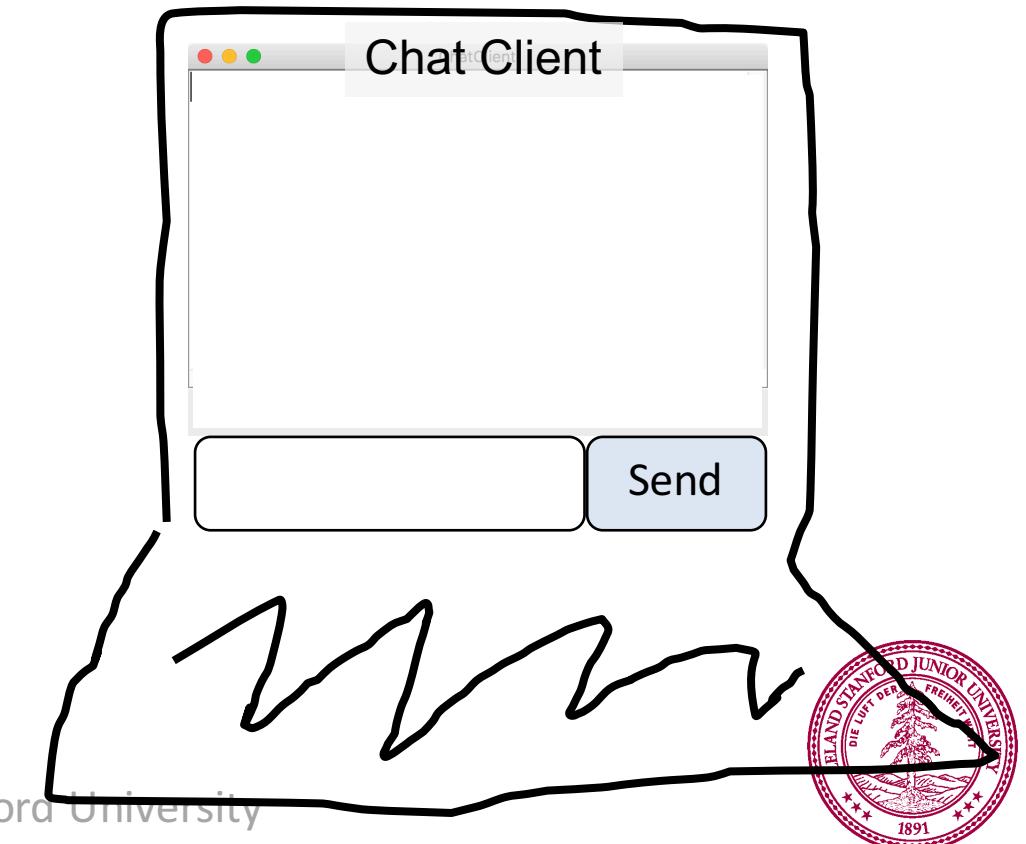
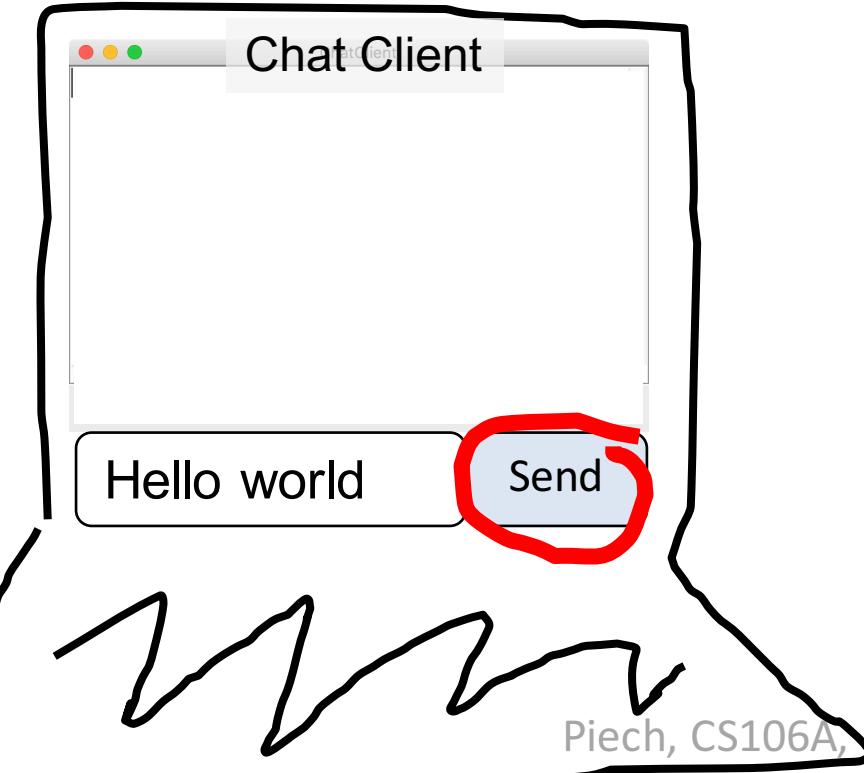
Send Refresh





```
history = [  
]
```

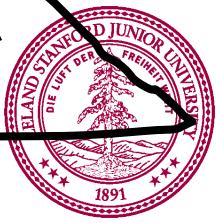
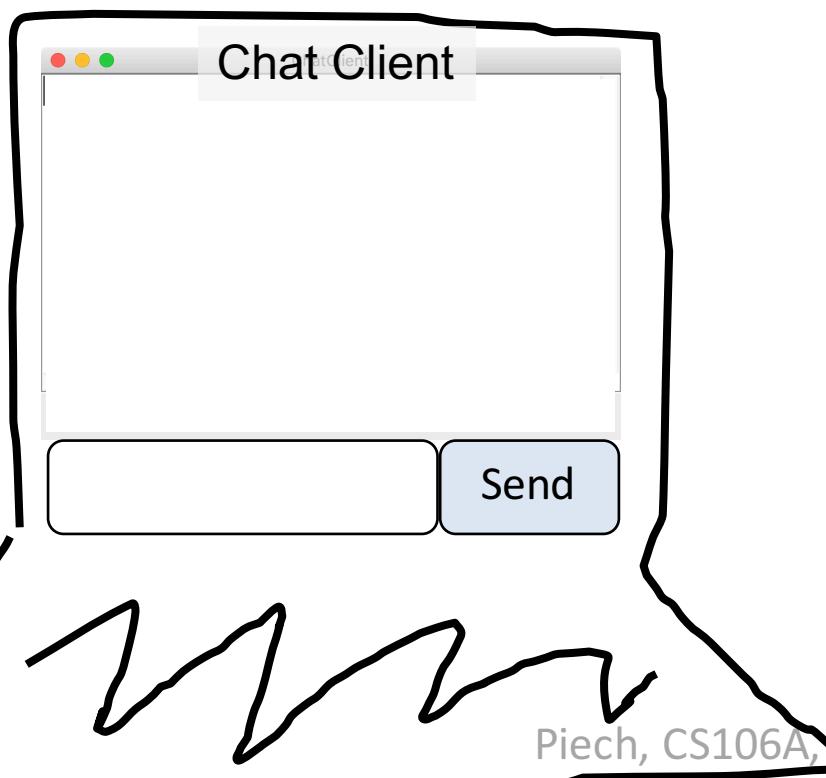
addMsg
msg = Hello world





```
history = [  
    Hello world  
]
```

getMsgs
index = 0



Chat Server

Chat Server



addMsg
msg = *text*



getMsgs
index = *startIndex*



Chat Server

```
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



Chat Server

```
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



Chat Server

```
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



Chat Server

```
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



Chat Server (continued)

```
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;  
}
```



Chat Server (continued)

```
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;  
}
```



Chat Server (continued)

```
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;  
}
```



Chat Server (continued)

```
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;  
}
```



HAPPY

CLIENT



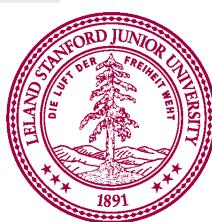
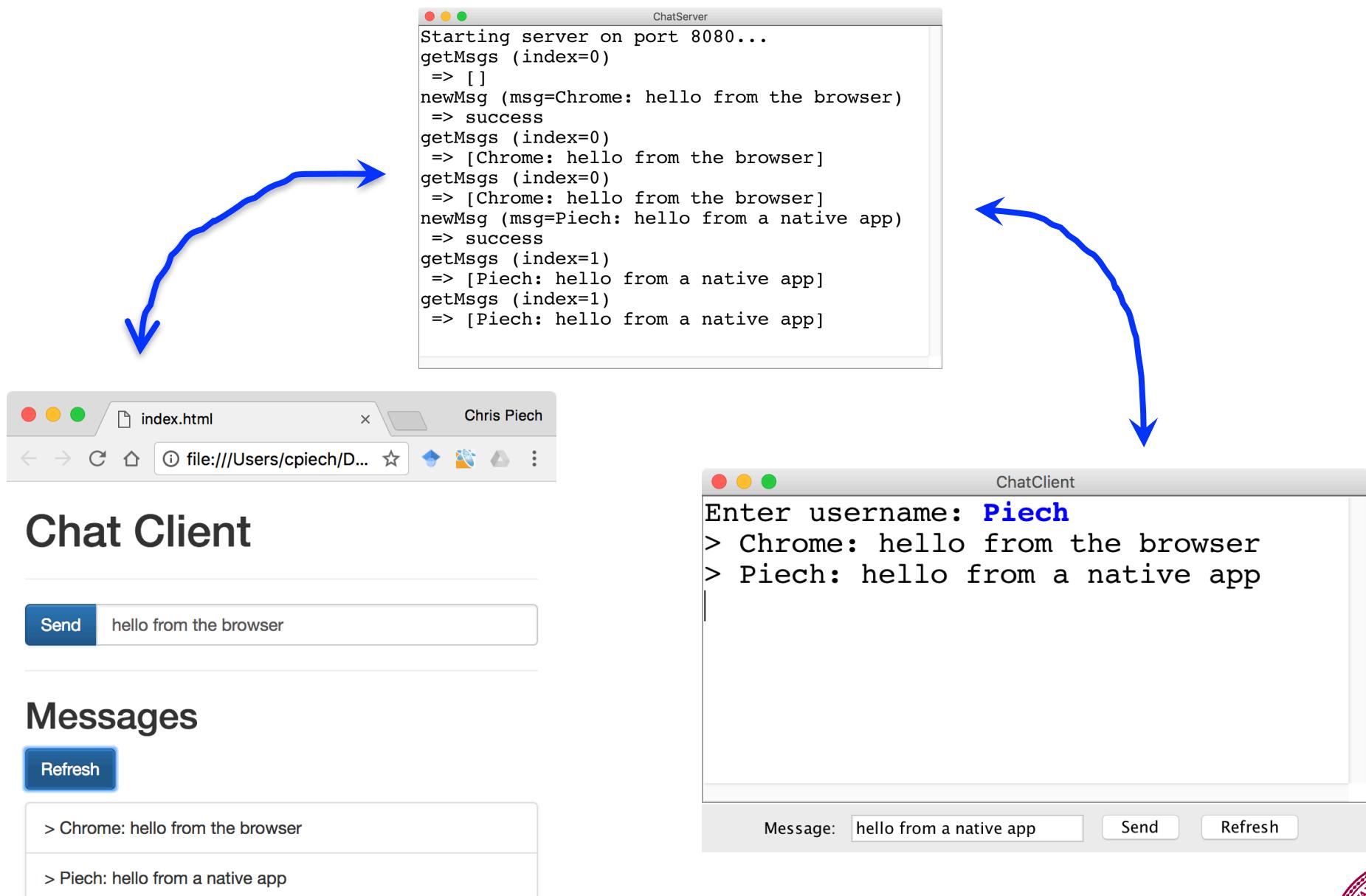
FAQ

Question: This is cool Chris.
But didn't you just really
dumb down servers?

Answer: No

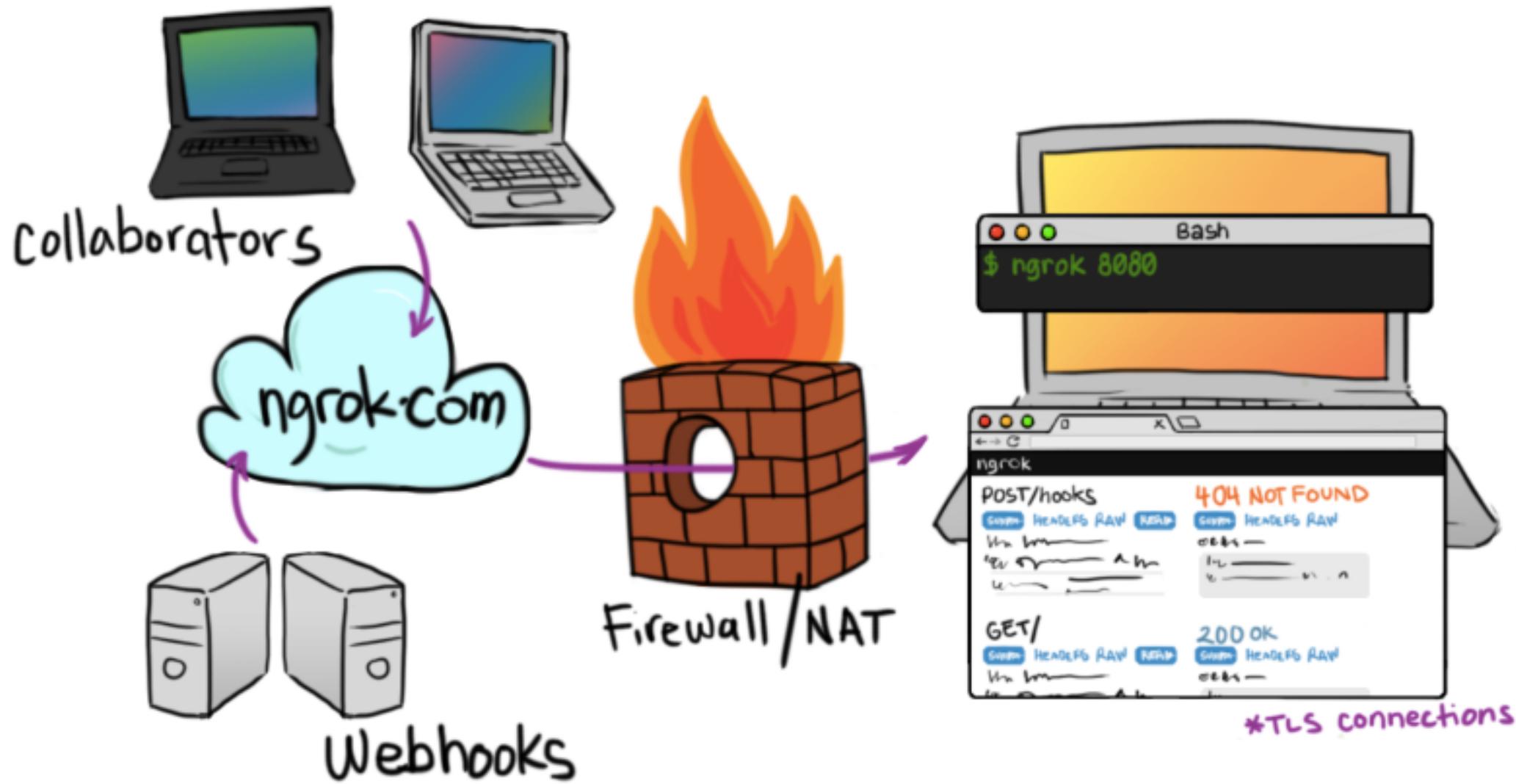
Question: Why isn't this in a browser?

“Native” vs “Browser”



Question: Localhost forever?

Use ngrok to get a url





Any security holes?

Want to learn more?

CS144 Computer Networking

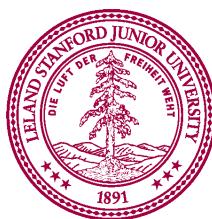


Or CS193P

Or CS193A

Or CS108

Piech, CS106A, Stanford University



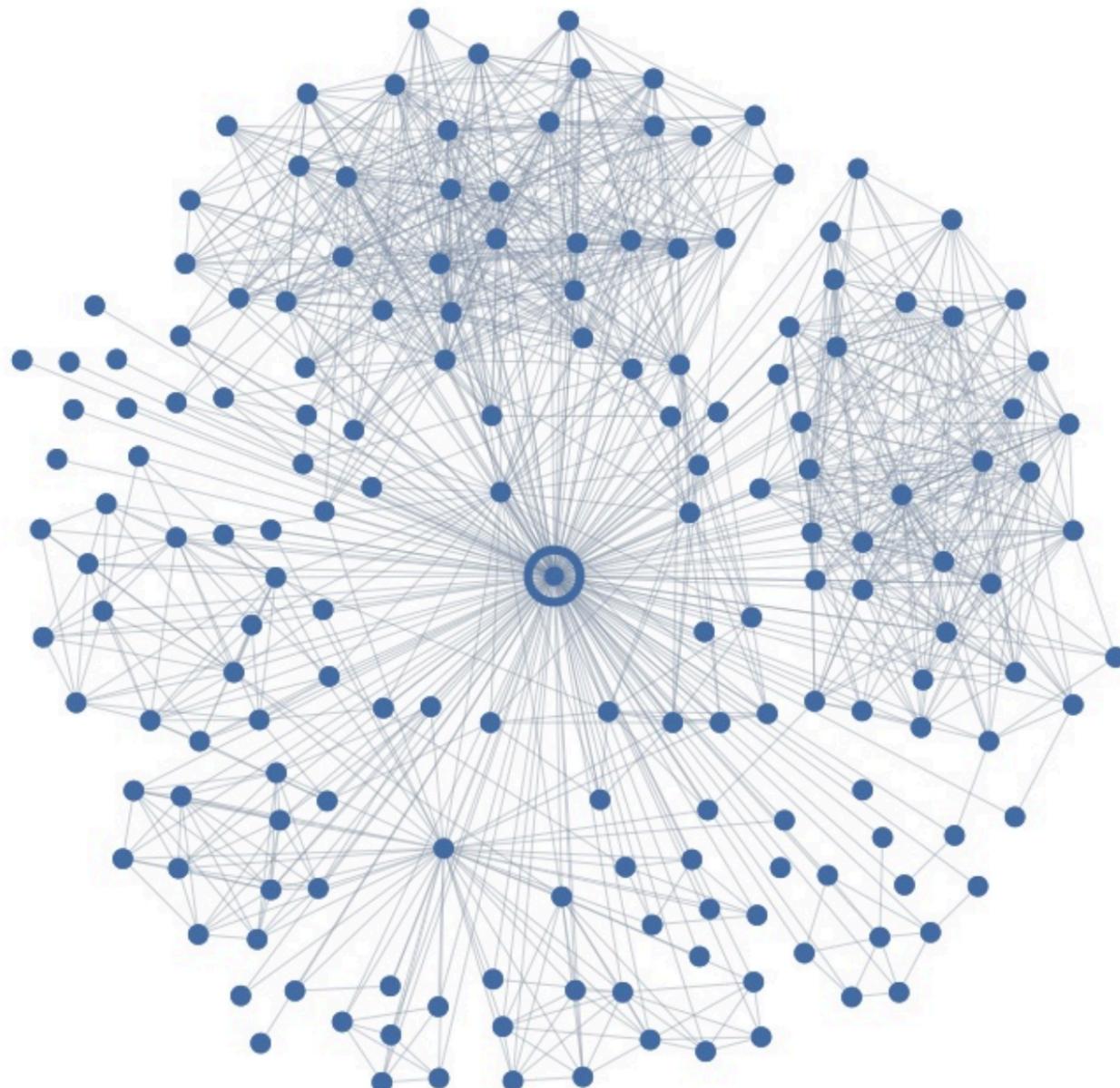
Social Networks

Who do you love?

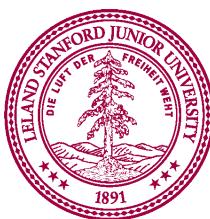
And how does Facebook know?



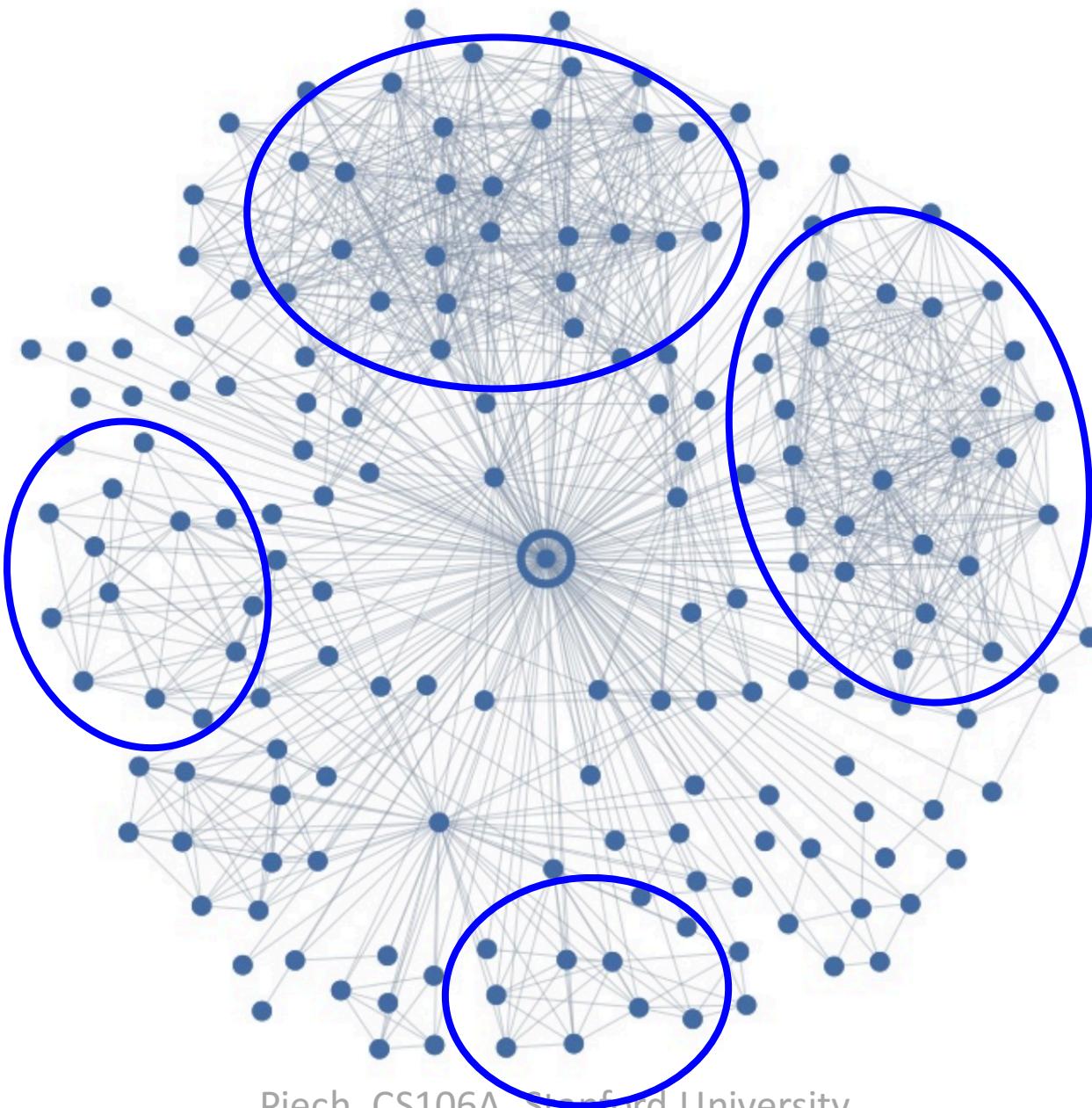
Your local social network



Piech, CS106A, Stanford University



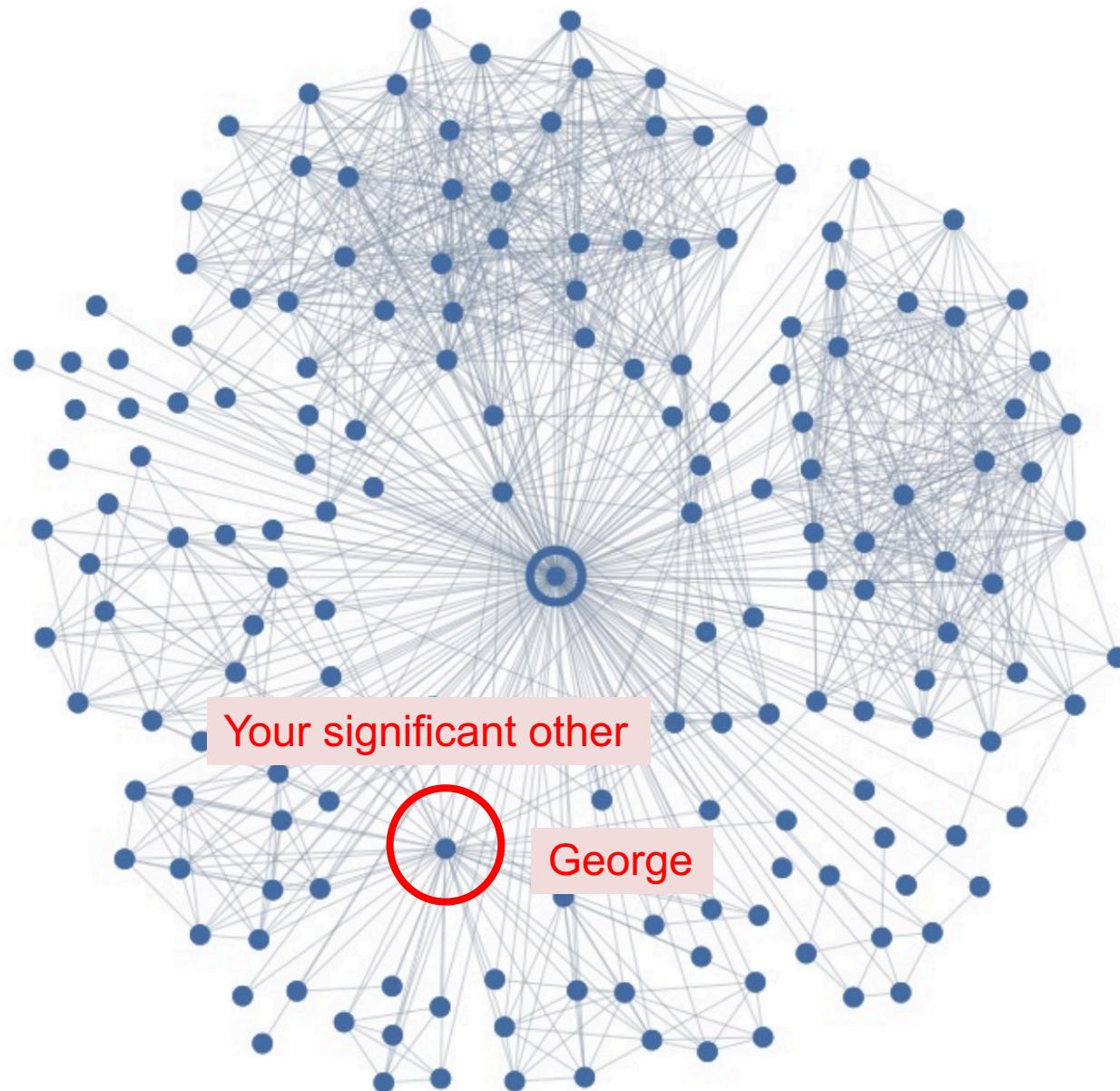
You have some “groups”



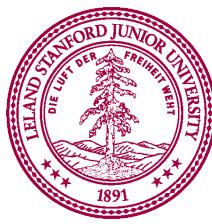
Piech, CS106A, Stanford University



But here is the love of your life



Piech, CS106A, Stanford University



Romance and Social Networks

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.

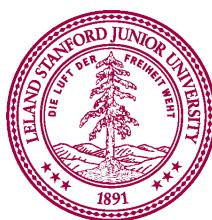
Tie strength forms an important dimension along which to characterize a person’s links to their network neighbors. Tie strength informally refers to the ‘closeness’ of a friendship; it captures a spectrum that ranges from strong ties with close friends to weak ties with more distant acquaintances. An 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’s social network

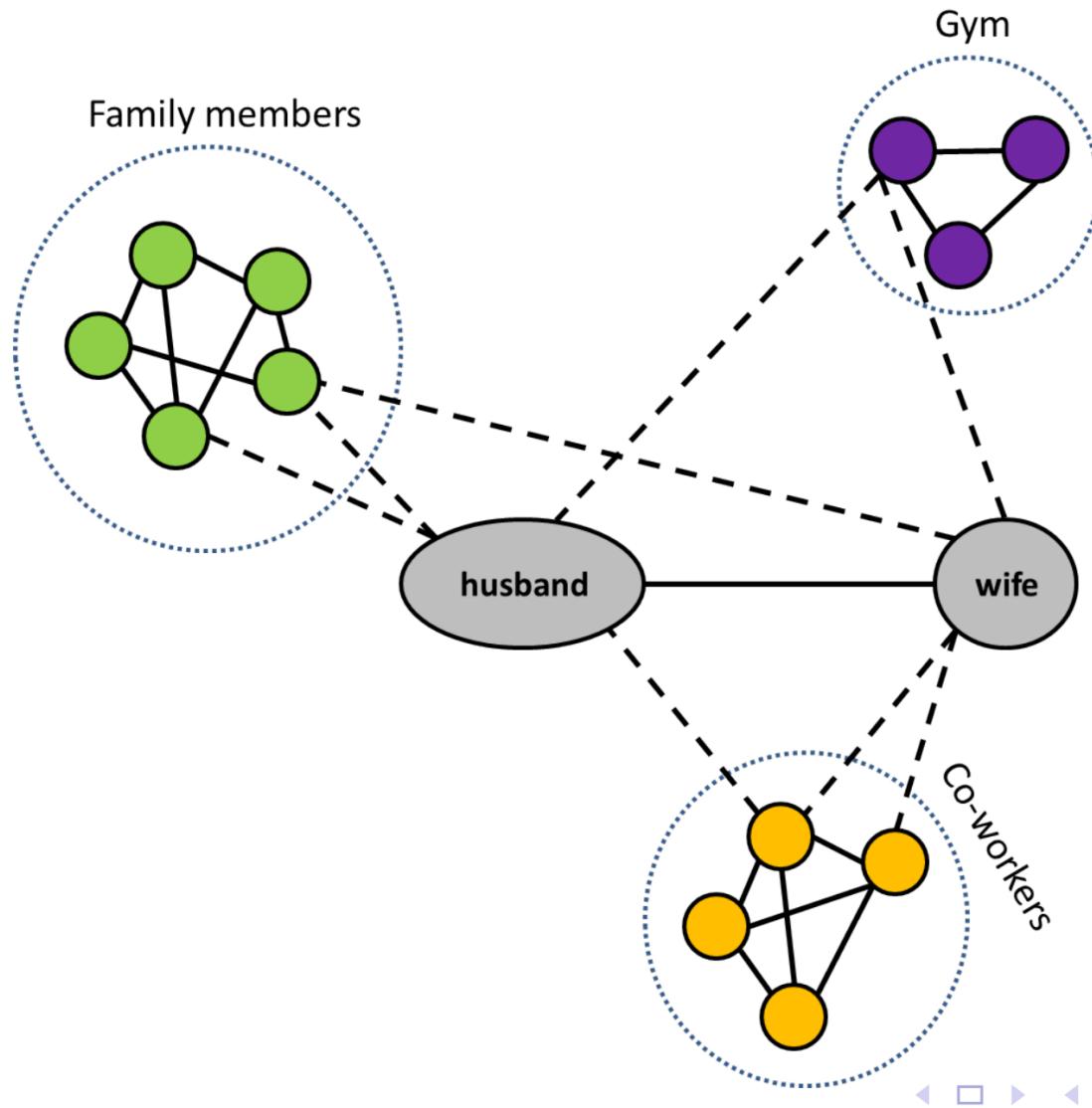
October 2013

<http://arxiv.org/pdf/1310.6753v1.pdf>

Piech, CS106A, Stanford University



Romance and Social Networks



Dispersion: The extent to which two people's mutual friends are not directly connected



The filter bubble

The end.