SER 321 B Session

SI Session

Tuesday, November 26th 2024

10:00 am - 11:00 am MST

Agenda

- Distributed Structure Communication
  - Main and Worker
  - Peer to Peer
- Middleware
  - What is it?
  - Why we care

SI Session Expectations

Thanks for coming to the **SER 321** SI session. We have a packed agenda and we are going to try to get through as many of our planned example problems as possible. This session will be recorded and shared with others.

- If after this you want to see additional examples, please visit the drop-in tutoring center.
- We will post the link in the chat now and at the end of the session.
  - tutoring.asu.edu
- Please keep in mind we are recording this session and it will be made available for you to review 24-48 hours after this session concludes.
- Finally, please be respectful to each other during the session.

Interact with us:

Zoom Features

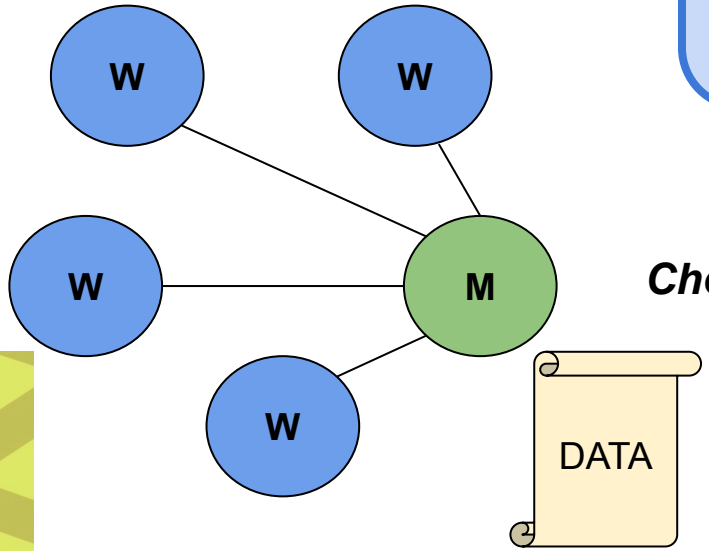
Zoom Chat

- Use the chat feature to interact with the presenter and respond to presenter's questions.
- Annotations are encouraged

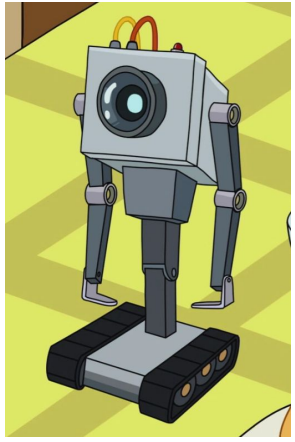
SER 321
Communication

Workers only do their task then report back

Think worker bees or specialized machinery



Check out the recording for the discussion!



Main is in charge of everything

Similar to _____ in our previous implementations

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Communication

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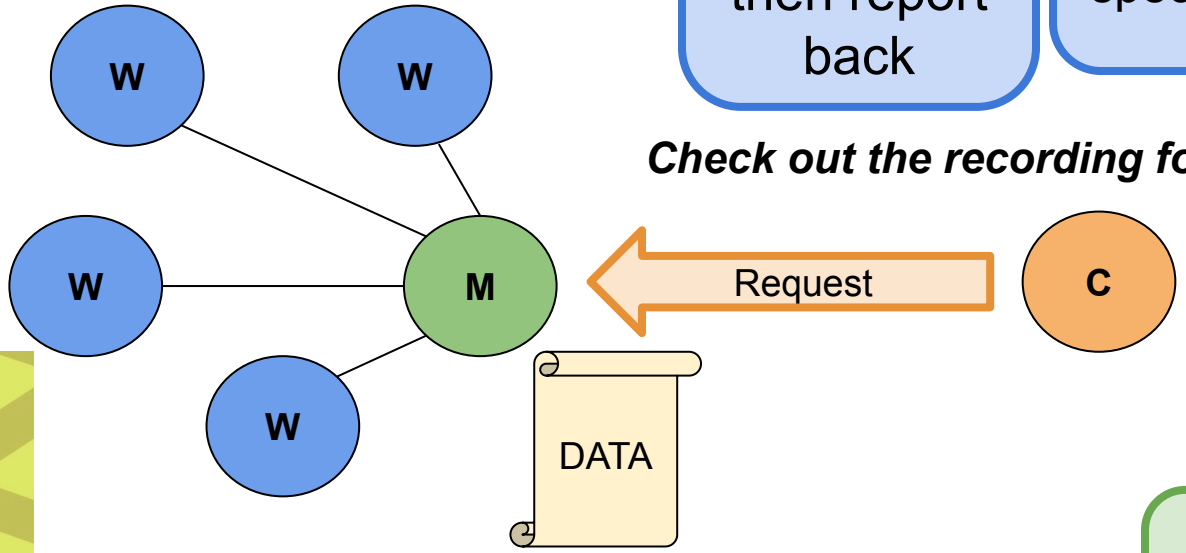

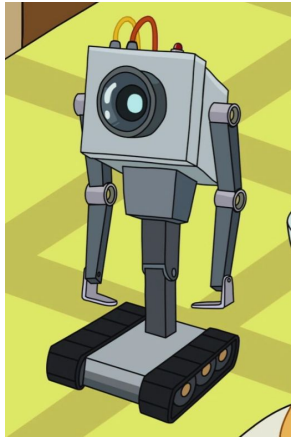

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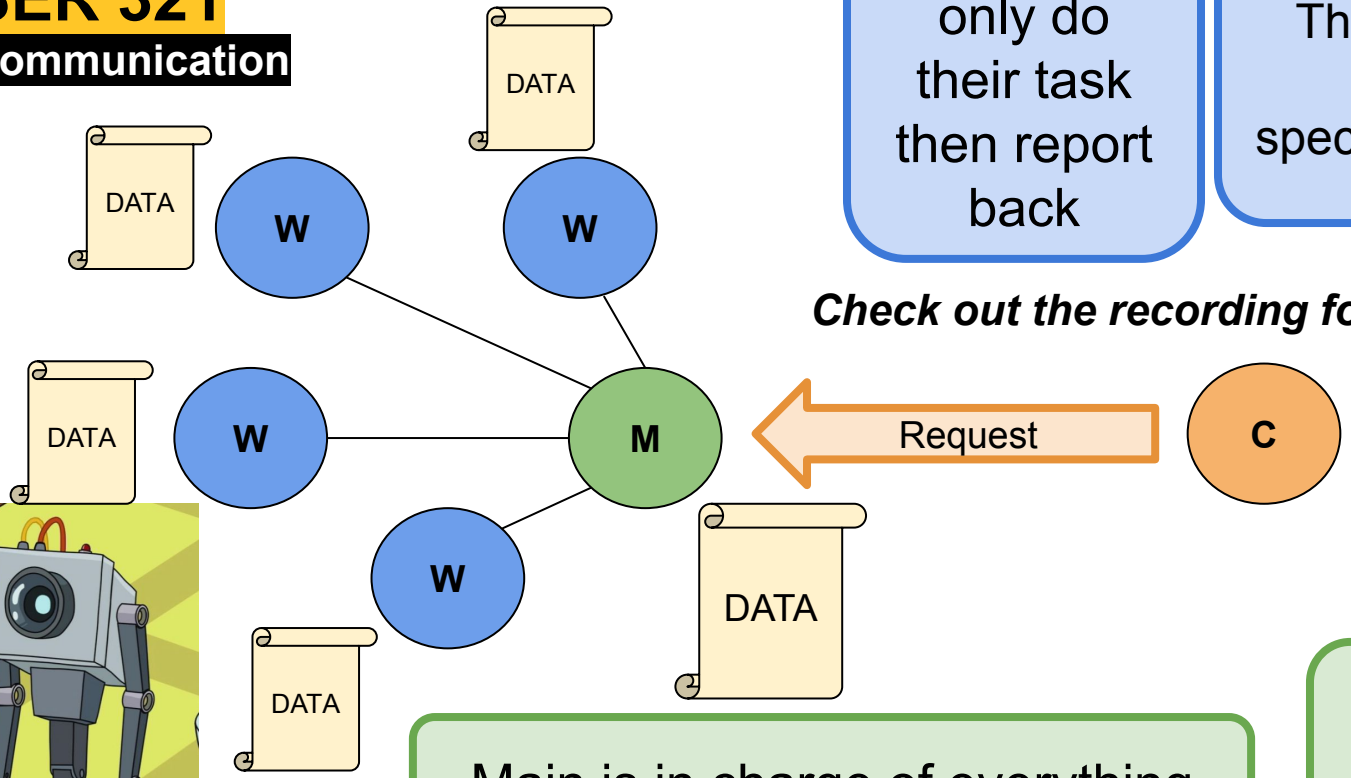

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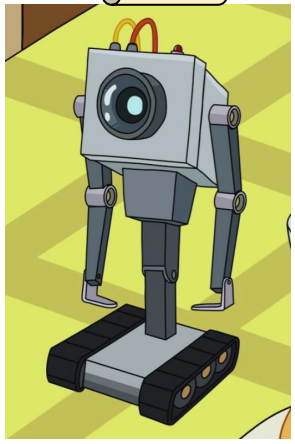

Main is in charge of everything

Similar to _____ in our previous implementations

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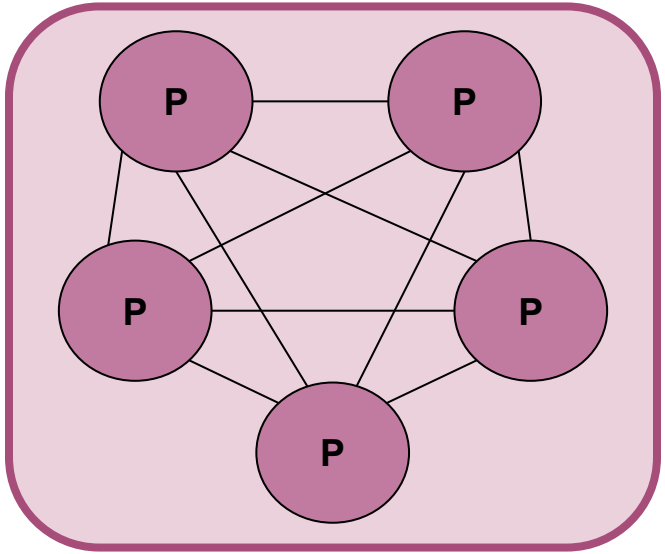
How do we handle the client in a Peer to Peer system?



Check out the recording for the discussion!

Request is sent to the *current leader*

or

Peer that received the request *acts as the leader*

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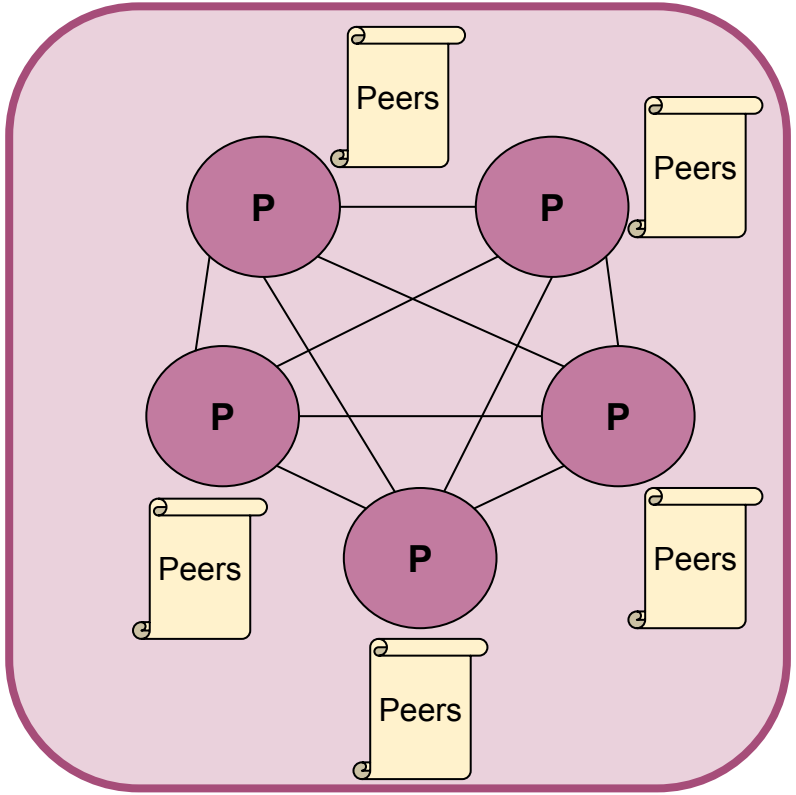
What about ***adding*** a Peer to the Cluster?



Check out the recording for the discussion!

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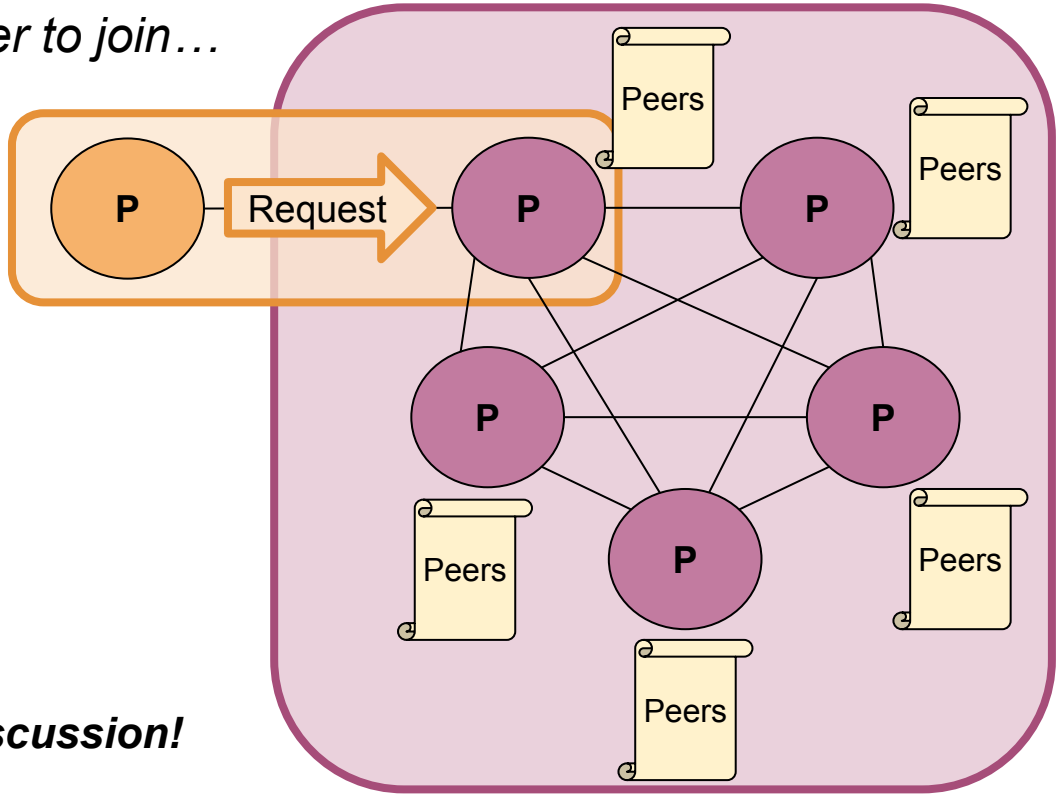
What about ***adding*** a Peer to the Cluster?

Assuming we want to allow the peer to join…



Is that all?

Check out the recording for the discussion!

SimplePeerToPeer

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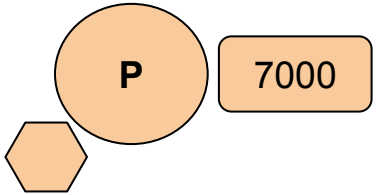
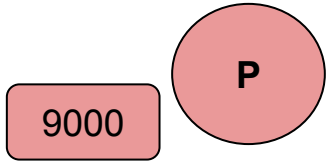
Communication

Remember that the OS allocates a new port for the client socket!

Run With:

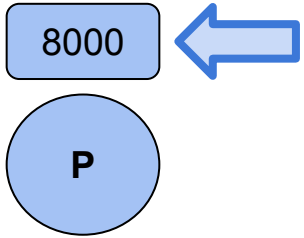
```
gradle runPeer --args "Name Port"
```





Check out the recording for the discussion!

We are going to take a closer look at the code in a moment!




```
gradle runPeer --args "Peer8000 8000"
```

SimplePeerToPeer

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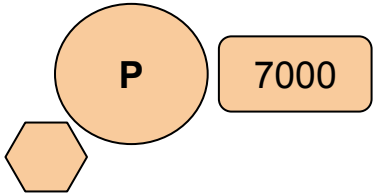
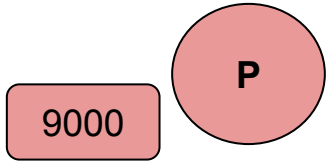
Communication

```
gradle runPeer --args "Peer7000 7000"
```

```
> Task :runPeer
Hello Peer7000 and welcome! Your port will be 7000
> Who do you want to listen to? Enter host:port
<=========----> 75% EXECUTING [21s]
> :runPeer
```





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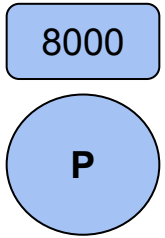


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SimplePeerToPeer

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Communication

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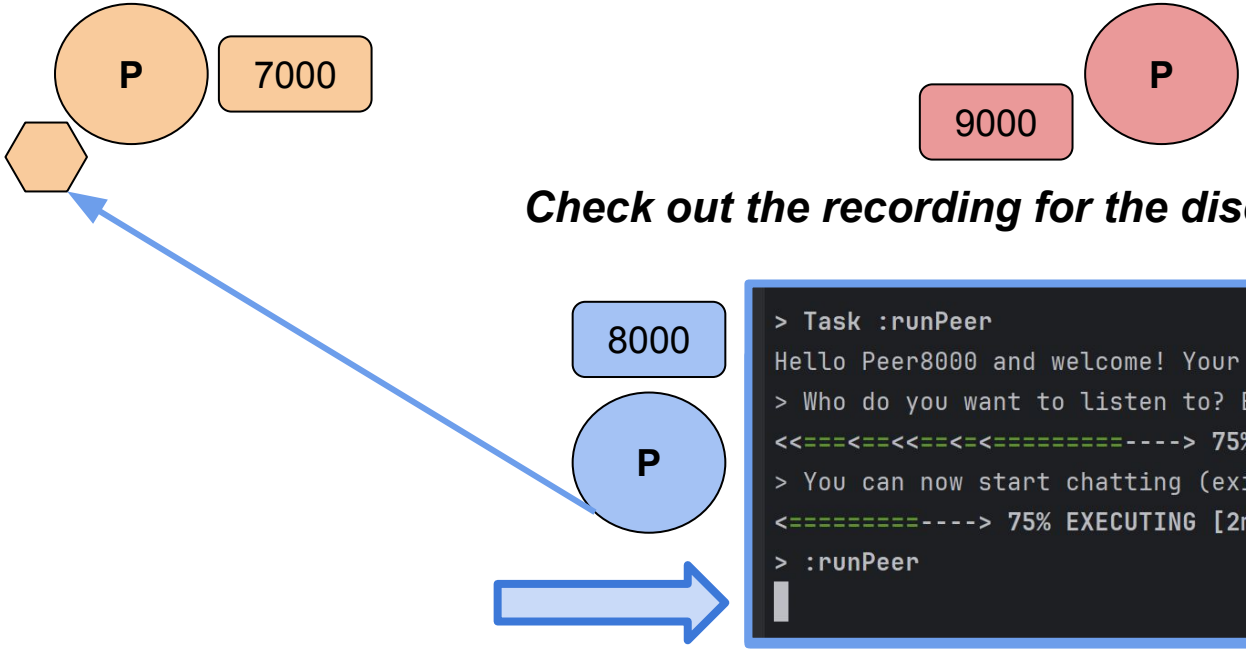

Check out the recording for the discussion!

```
> Task :runPeer
Hello Peer8000 and welcome! Your port will be 8000
> Who do you want to listen to? Enter host:port
<<===<==<<==<=<=========----> 75% EXECUTING [1m 56s]
> You can now start chatting (exit to exit)
<=========----> 75% EXECUTING [2m 3s]
> :runPeer
```

SimplePeerToPeer

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Communication

What will happen?

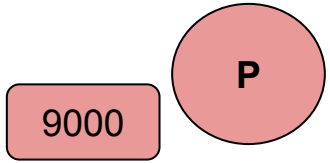
```
> Task :runPeer
Hello Peer7000 and welcome! Your port will be 7000
> Who do you want to listen to? Enter host:port
<=========----> 75% EXECUTING [21s]
> :runPeer
```

```
> Task :runPeer
Hello Peer8000 and welcome! Your port will be 8000
> Who do you want to listen to? Enter host:port
<<===<==<<==<=<=========----> 75% EXECUTING [1m 56s]
> You can now start chatting (exit to exit)
<<<==<=<=========----> 75% EXECUTING [3m 33s]
<=========----> 75% EXECUTING [3m 37s]
hi 7000
```

```
PS C:\ASU\SER321\examples_repo\ser321examples\Sockets\S
Starting a Gradle Daemon, 1 busy and 1 stopped Daemons
```

```
> Task :runPeer
Hello Peer7000 and welcome! Your port will be 7000
> Who do you want to listen to? Enter host:port
<=========----> 75% EXECUTING [2m 48s]
> :runPeer
```

Why?



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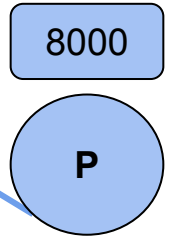
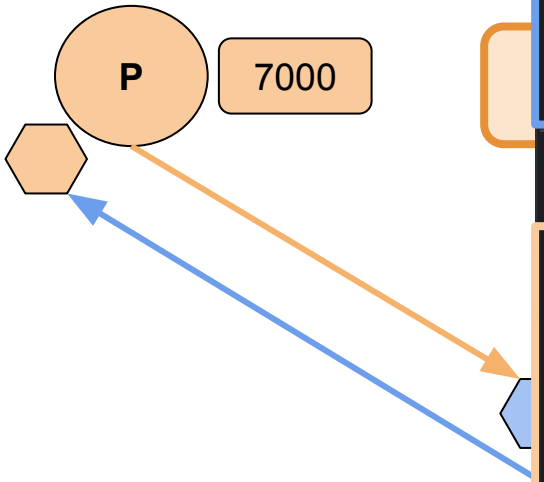



```
> Task :runPeer
Hello Peer8000 and welcome! Your port will be 8000
> Who do you want to listen to? Enter host:port
<<===<==<<==<=<=========----> 75% EXECUTING [1m 56s]
> You can now start chatting (exit to exit)
<<<==<=<=========----> 75% EXECUTING [3m 13s]
> :runPeer
hi 7000
```

SER 321
Communication

```
> Task :runPeer
Hello Peer7000 a
> Who do you war
<=<====<==<===<=
> :runPeer
localhost:8000
```




```
> Task :runPeer
Hello Peer8000 and welcome! Your port will be 8000
> Who do you want to listen to? Enter host:port
<===<<====<=<=<=========----> 75% EXECUTING [3m 4s]
> You can now start chatting (exit to exit)
[Peer7000]: Hi Peer8000!
<=========----> 75% EXECUTING [4m 4s]
> :runPeer
```

Check out the recording for the discussion!

```
PS C:\ASU\SER321\examples_repo\ser321examples\Sockets\
```

```
> Task :runPeer
Hello Peer7000 and welcome! Your port will be 7000
> Who do you want to listen to? Enter host:port
<=<====<==<===<=========----> 75% EXECUTING [3m 43s]
> You can now start chatting (exit to exit)
<<<=<===<==<<=========----> 75% EXECUTING [3m 58s]
<=========----> 75% EXECUTING [4m 1s]
Hi Peer8000!
```

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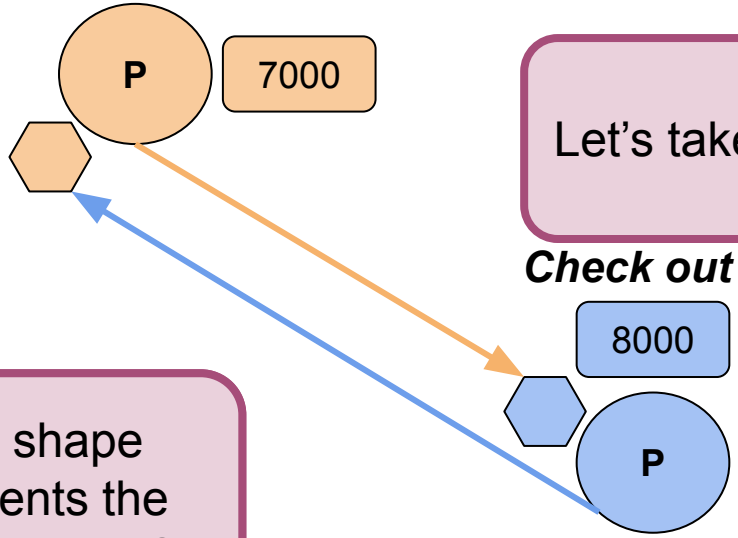
Communication

```
> Task :runPeer
Hello Peer7000 and welcome! Your port will be 7000
> Who do you want to listen to? Enter host:port
<=<====<==<===<=========----> 75% EXECUTING [3m 22s]
> :runPeer
localhost:8000
```



Let's take a closer look at the Code!

Check out the recording for the discussion!

```
> Task :runPeer
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> Who do you want to listen to? Enter host:port
<<===<==<<==<=<=========----> 75% EXECUTING [1m 56s]
> You can now start chatting (exit to exit)
<=========----> 75% EXECUTING [2m 3s]
> :runPeer
```

What shape represents the **ClientThread?**

SimplePeerToPeer

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Communication

```java
public static void main (String[] args) throws Exception {

    BufferedReader bufferedReader = new BufferedReader(new InputStreamReader(System.in));
    String username = args[0];
    System.out.println("Hello " + username + " and welcome! Your port will be " + args[1]);

    // starting the Server Thread, which waits for other peers to want to connect
    ServerThread serverThread = new ServerThread(args[1]);
    serverThread.start();
    Peer peer = new Peer(bufferedReader, args[0], serverThread);
    peer.updateListenToPeers();
```

ServerThread

Peer

```java
public class ServerThread extends Thread{
    2 usages
    private ServerSocket serverSocket;
    2 usages
    private Set<Socket> listeningSockets = new HashSet<~>();

    1 usage
    public ServerThread(String portNum) throws IOException {
        serverSocket = new ServerSocket(Integer.valueOf(portNum));
    }

    Starting the thread, we are waiting for clients wanting to talk to us, then save the socket in a list
    public void run() {
        try {
            while (true) {
                Socket sock = serverSocket.accept();
                listeningSockets.add(sock);
            }
        } catch (Exception e) {...}
    }

    Sending the message to the OutputStream for each socket that we saved
    1 usage
    void sendMessage(String message) {
        try {
            for (Socket s : listeningSockets) {
                PrintWriter out = new PrintWriter(s.getOutputStream(), true);
                out.println(message);
            }
        } catch(Exception e) {...}
    }
}
```

ClientThread

```java
public class ClientThread extends Thread {
    2 usages
    private BufferedReader bufferedReader;

    1 usage
    public ClientThread(Socket socket) throws IOException {
        bufferedReader = new BufferedReader(new InputStreamReader(socket.getInputStream()));
    }
    public void run() {
        while (true) {
            try {
                JSONObject json = new JSONObject(bufferedReader.readLine());
                System.out.println("[" + json.getString("username")+"]: " + json.getString("message"));
            } catch (Exception e) {...}
        }
    }
}
```

Check out the recording for the discussion!

SimplePeerToPeer

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Communication

```java
public static void main (String[] args) throws Exception {

    BufferedReader bufferedReader = new BufferedReader(new InputStreamReader(System.in));
    String
    Syste

    // st
```

```java
public class ClientThread extends Thread {
    2 usages
    private BufferedReader bufferedReader;

    1 usage
    public ClientThread(Socket socket) throws IOException {
        bufferedReader = new BufferedReader
            (new InputStreamReader(socket.getInputStream()));
    }
    public void run() {
        while (true) {
            try {
                JSONObject json =
                    new JSONObject(bufferedReader.readLine());
                System.out.println
                    ("[" + json.getString("username")+"]: "
                        + json.getString("message"));
            } catch (Exception e) {...}
        }
    }

}
```

ClientThread

```java
public void updateListenToPeers() throws Exception {
    System.out.println("> Who do you want to listen to? Enter host:port");
    String input = bufferedReader.readLine();
    String[] setupValue = input.split(" ");
    for (int i = 0; i < setupValue.length; i++) {
        String[] address = setupValue[i].split(":");
        Socket socket = null;
        try {
            socket = new Socket(address[0], Integer.valueOf(address[1]));
            new ClientThread(socket).start();
        } catch (Exception c) {
            if (socket != null) {
                socket.close();
            } else {
                System.out.println("Cannot connect, wrong input");
                System.out.println("Exiting: I know really user friendly");
                System.exit(0);
            }
        }
    }
    askForInput();
```

Check out the recording for the discussion!

Peer.updateListenToPeers

Check out the recording for the discussion!

SER 321
Middleware

We have been:

Serializing Messages

Sending Messages

Parsing Messages

Handle Messages

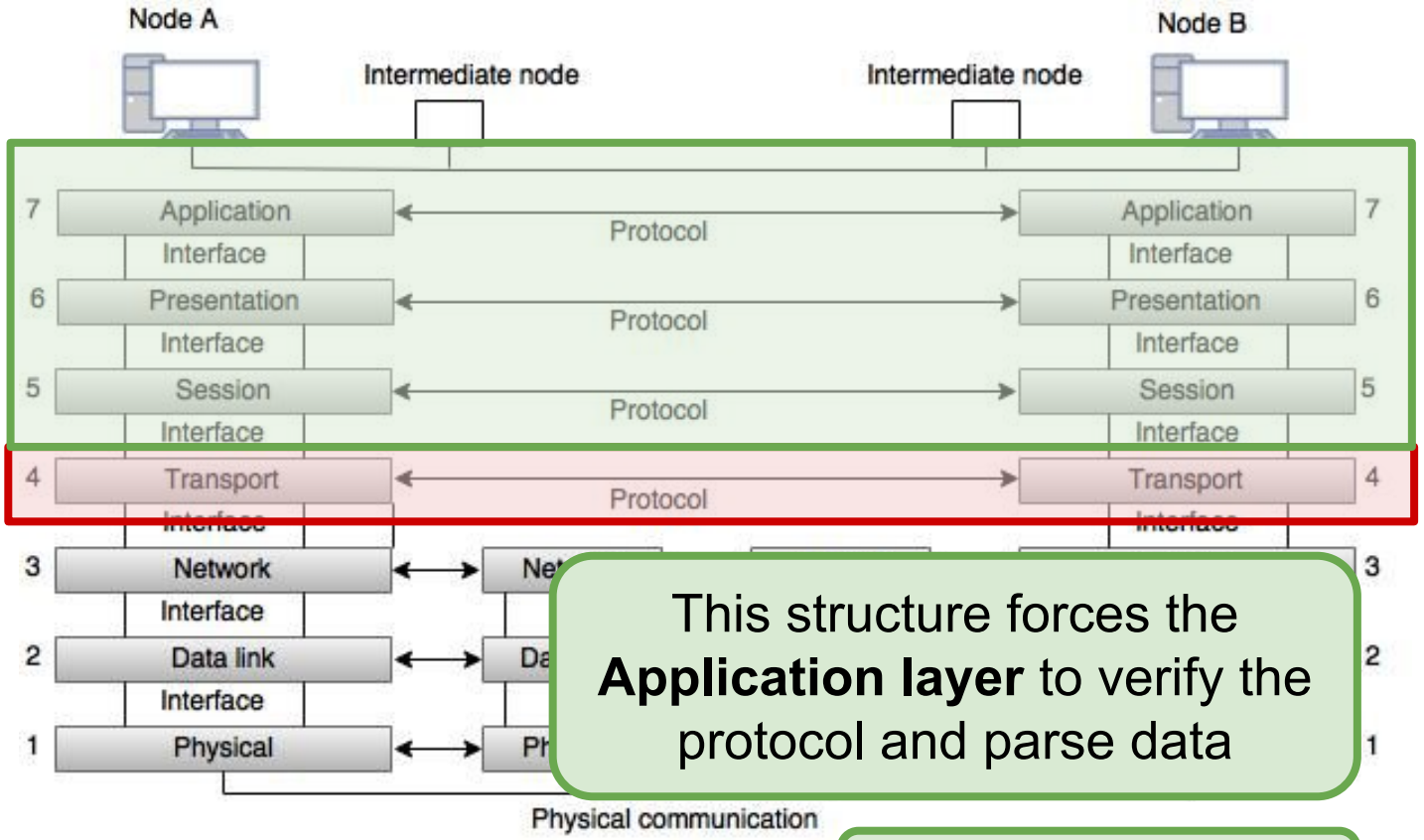

Fig: OSI Model

This structure forces the **Application layer** to verify the protocol and parse data

Not really its job…

Check out the recording for the discussion!

SER 321
Middleware

With Middleware:

Serializing Messages

Sending Messages

Parsing Messages

Handle Messages

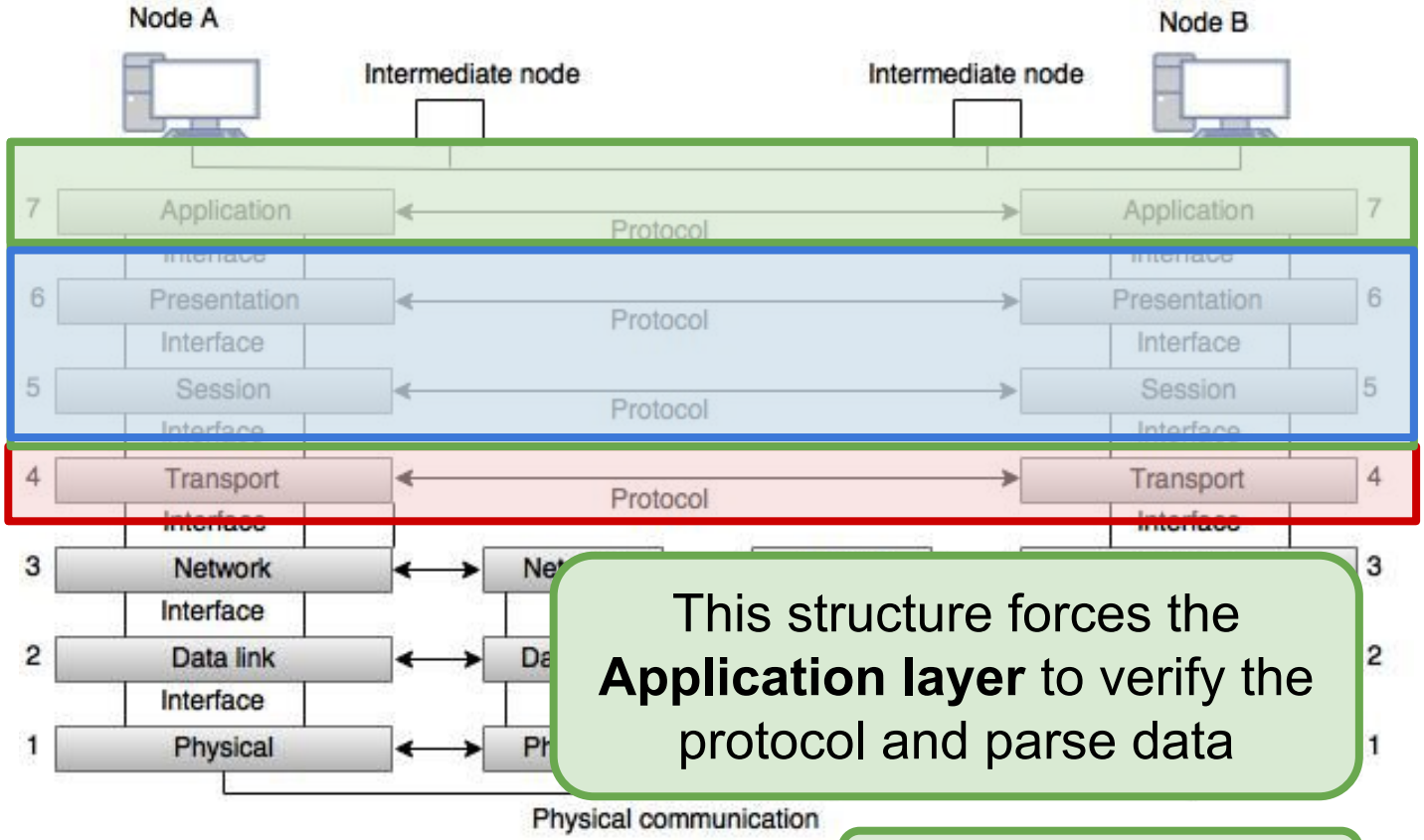

Fig: OSI Model

This structure forces the **Application layer** to verify the protocol and parse data

Not really its job…

Check out the recording for the discussion!

SER 321
Middleware

With Middleware:

Serializing Messages

Sending Messages

Parsing Messages

Handle Messages

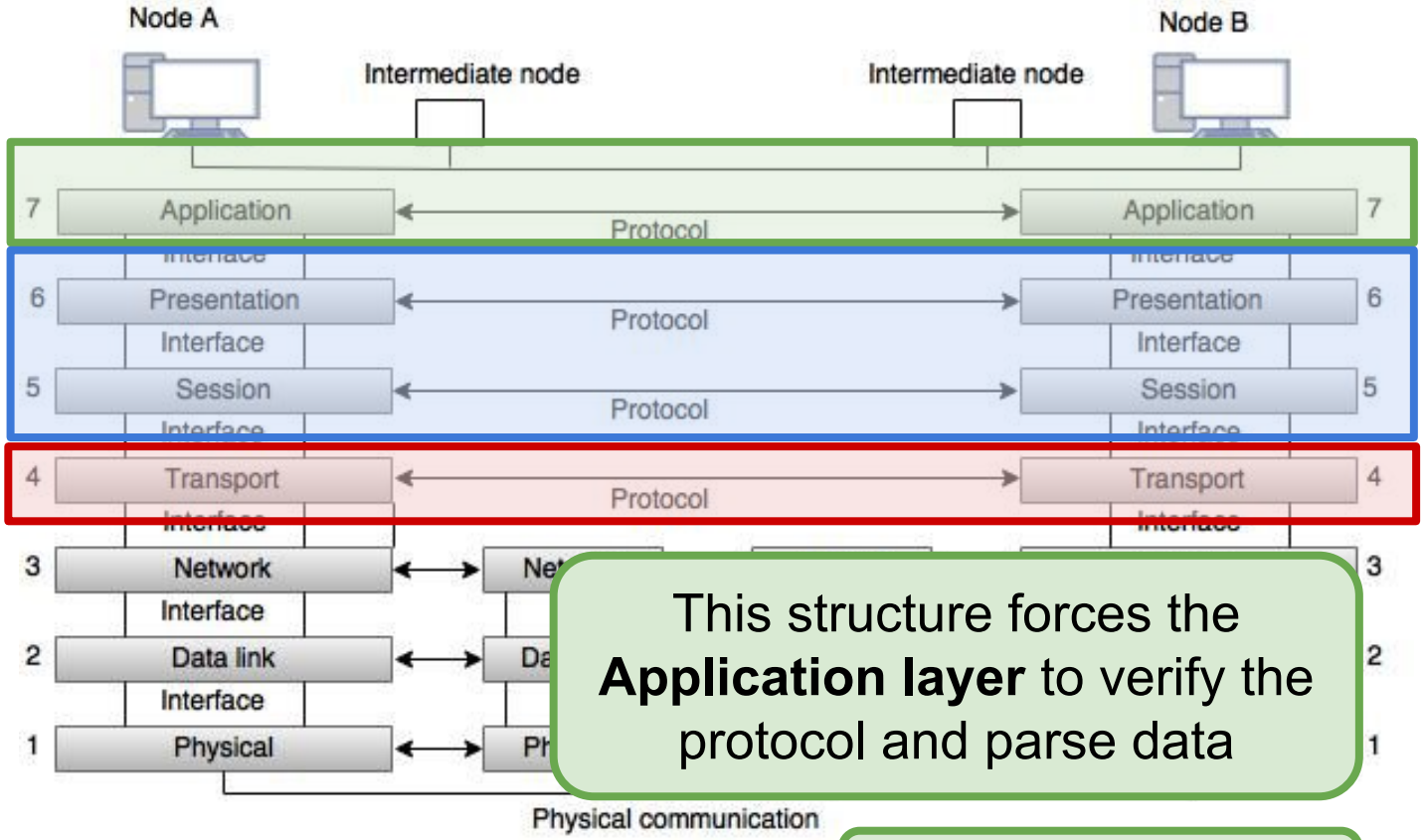

Fig: OSI Model

This structure forces the **Application layer** to verify the protocol and parse data

Not really its job…

Check out the recording for the discussion!

SER 321
Middleware

Middleware:

Session Layer Responsibilities:

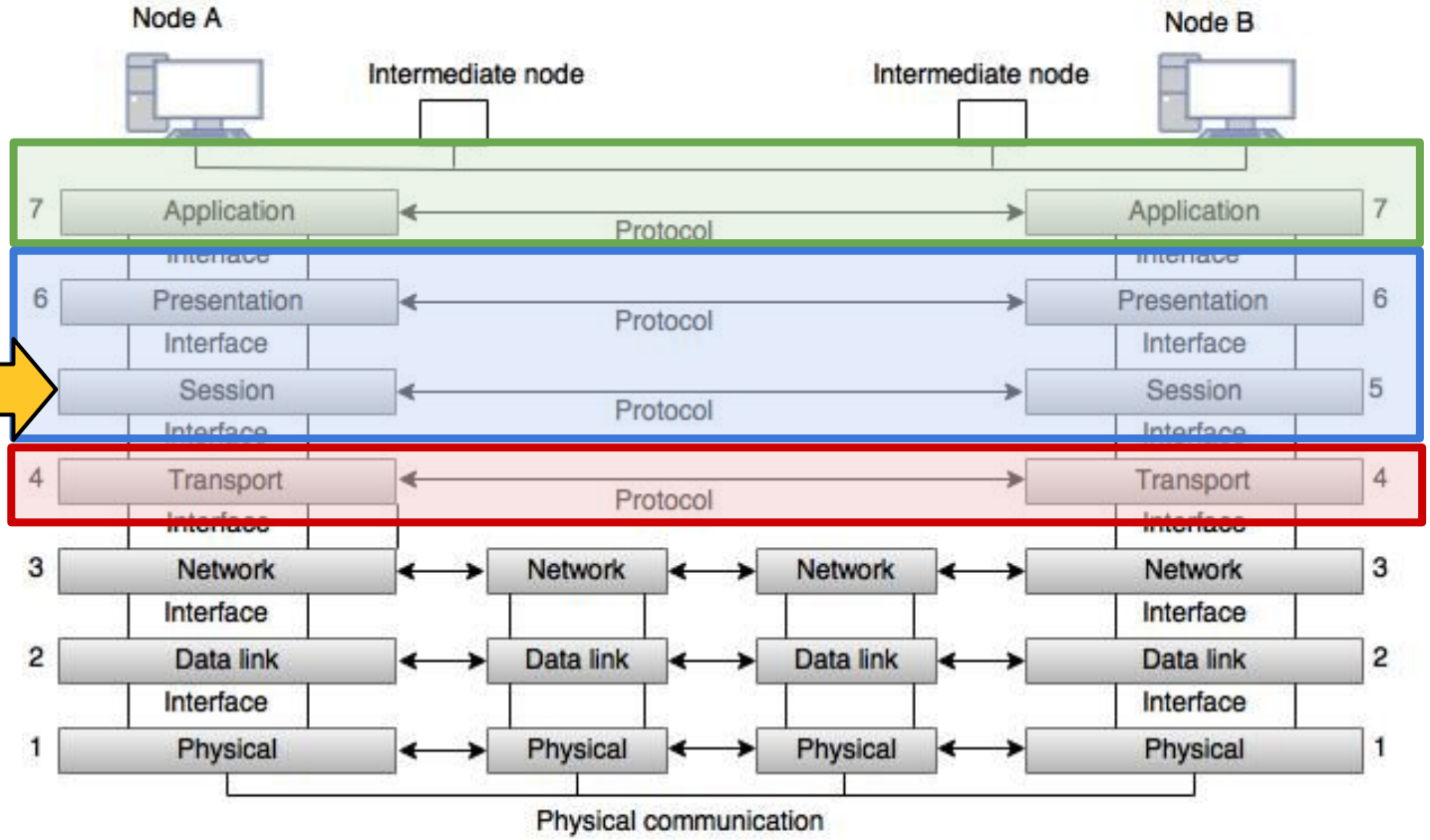

Fig: OSI Model

Check out the recording for the discussion!

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Middleware

Middleware:

Presentation Layer Responsibilities:

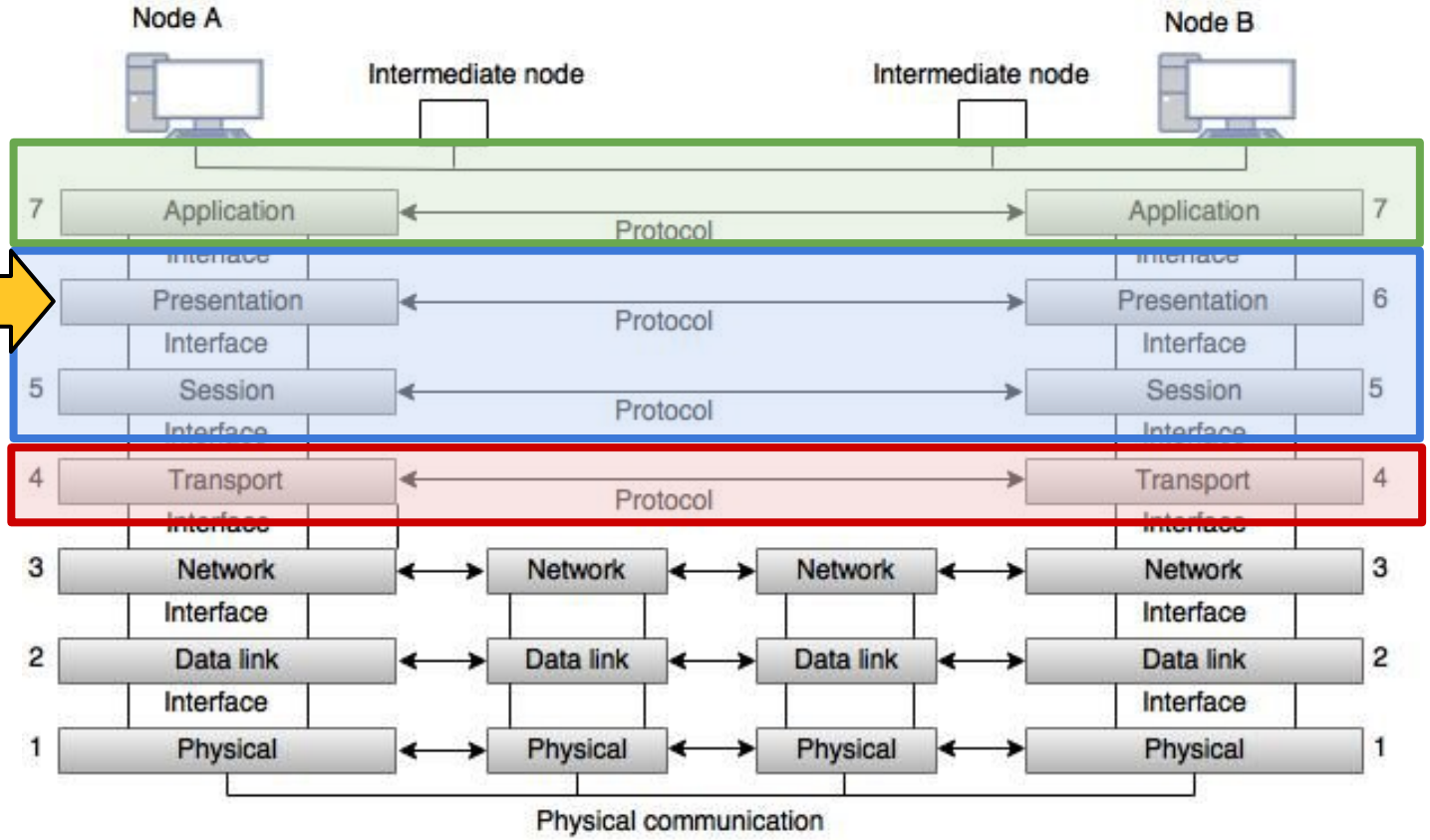

Fig: OSI Model

SER 321
Middleware

Examples?

Check out the recording for the discussion!

Message Oriented Middleware (MOM)

Web Frameworks

Remote Procedure Calls (RPC)

App. Programming Interface (API)

SER 321
Middleware

Why do we care?

Check out the recording for the discussion!

Agility

Reusability

Efficiency

Cost Effectiveness

Portability

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Middleware

Why do we care?

Sort of like publishing a contract

Check out the recording for the discussion!

"If you follow these rules, I will handle your request."

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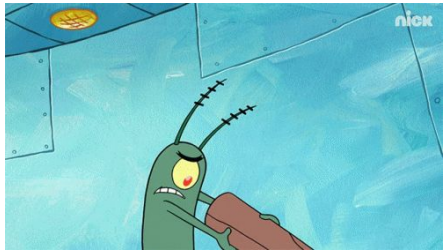
Middleware

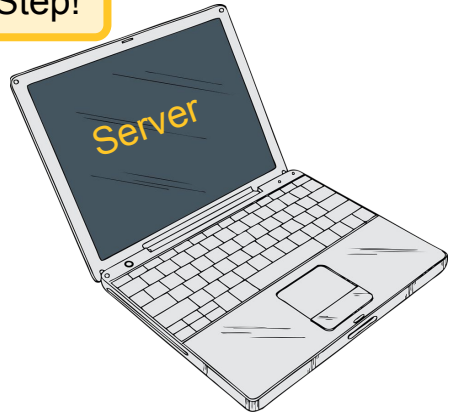



```
{
        "type" : "addUser",
        "name" : "katie",
        "password" : "password"
}
```

Check out the recording for the discussion!

- Get data from user
- Validate data
- Determine Request Format
- Construct Valid Request
- Establish Connection
- Send Request
- Wait for Response
  - Read Response from Stream
  - Parse Response
  - Display Response to User

Critical Step!



SER 321
Middleware

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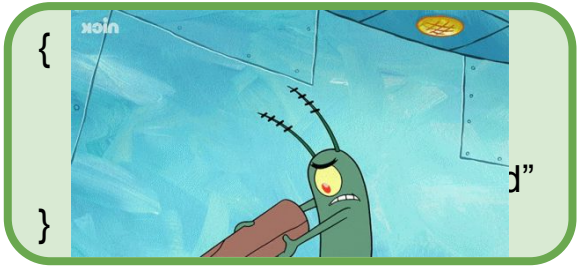


How do we know?

Add User

- Read data from Stream
- Parse Data
- Validate Request Format
- Determine Request Type
- *Perform Requested Action*
- Determine Response Format
- Construct Valid Response
- [Re-establish connection]
- Send Response

Done!

Wants to Add User

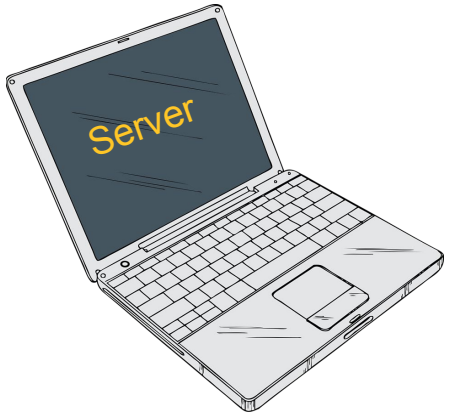
Check out the recording for the discussion!

SER 321
Middleware

With Middleware:

Add User:
Name = Katie
Password = password

API



Check out the recording for the discussion!

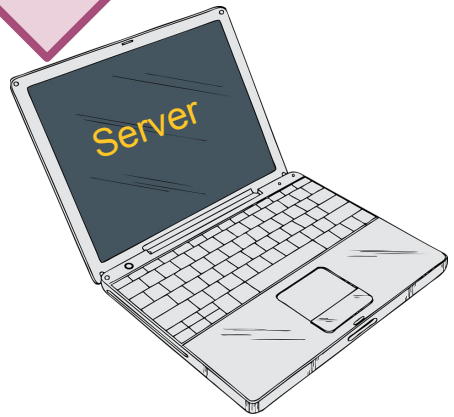
SER 321
Middleware

With Middleware:

Add User:
Name = Katie
Password = password

API

```
{
        "type" : "addUser",
        "name" : "katie",
        "password" : "password"
}
```



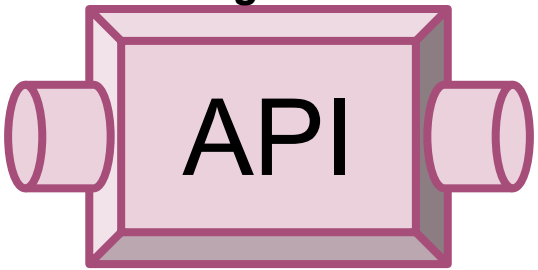
Check out the recording for the discussion!

SER 321
Middleware

With Middleware:

Check out the recording for the discussion!

Get repositories for a specific user



GitHub REST API

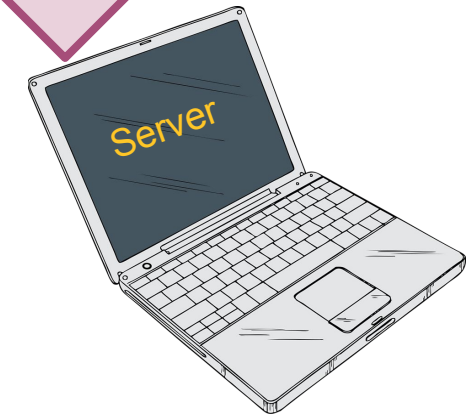
Code samples for "List repositories for a user"

Request example

GET /users/{username}/repos

cURL | JavaScript | GitHub CLI

```
curl -L \
  -H "Accept: application/vnd.github+json" \
  -H "Authorization: Bearer <YOUR-TOKEN>" \
  -H "X-GitHub-Api-Version: 2022-11-28" \
  https://api.github.com/users/USERNAME/repos
```

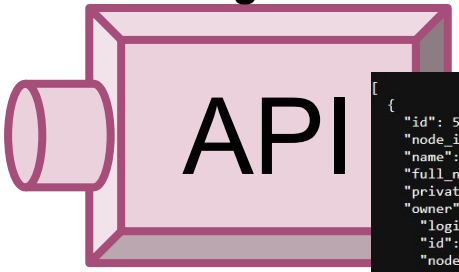


SER 321
Middleware

With Middleware:

Check out the recording for the discussion!

Get repositories for a specific user



Code samples for "List reposito

Request example

GET /users/{username}/repos

cURL JavaScript GitHub CL

```
curl -L \
  -H "Accept: application/vnd.gi
  -H "Authorization: Bearer <YOU
  -Api-Version: 2022-
  github.com/users/US
```

https://api.github.com/users/kgrinne3/repos

GitHub REST API


```
[
  {
    "id": 550568457,
    "node_id": "R_kgDOINECCQ",
    "name": "assign1git",
    "full_name": "kgrinne3/assign1git",
    "private": false,
    "owner": {
      "login": "kgrinne3",
      "id": 115493885,
      "node_id": "U_kgDOBuJL_Q",
      "avatar_url": "https://avatars.githubusercontent.com/u/115493885?v=4",
      "gravatar_id": "",
      "url": "https://api.github.com/users/kgrinne3",
      "html_url": "https://github.com/kgrinne3",
      "followers_url": "https://api.github.com/users/kgrinne3/followers",
      "following_url": "https://api.github.com/users/kgrinne3/following{/other_user}",
      "gists_url": "https://api.github.com/users/kgrinne3/gists{/gist_id}",
      "starred_url": "https://api.github.com/users/kgrinne3/starred{/owner}{/repo}",
      "subscriptions_url": "https://api.github.com/users/kgrinne3/subscriptions",
      "organizations_url": "https://api.github.com/users/kgrinne3/orgs",
      "repos_url": "https://api.github.com/users/kgrinne3/repos",
      "events_url": "https://api.github.com/users/kgrinne3/events{/privacy}",
      "received_events_url": "https://api.github.com/users/kgrinne3/received_events",
      "type": "User",
      "site_admin": false
    },
    "html_url": "https://github.com/kgrinne3/assign1git",
    "description": "Katie Grinnell",
    "fork": false,
    "url": "https://api.github.com/repos/kgrinne3/assign1git",
    "forks_url": "https://api.github.com/repos/kgrinne3/assign1git/forks",
    "keys_url": "https://api.github.com/repos/kgrinne3/assign1git/keys{/key_id}",
    "collaborators_url": "https://api.github.com/repos/kgrinne3/assign1git/collaborators{/collaborator}",
    "teams_url": "https://api.github.com/repos/kgrinne3/assign1git/teams",
    "hooks_url": "https://api.github.com/repos/kgrinne3/assign1git/hooks",
    "issue_events_url": "https://api.github.com/repos/kgrinne3/assign1git/issues/events{/number}",
    "events_url": "https://api.github.com/repos/kgrinne3/assign1git/events",
    "assignees_url": "https://api.github.com/repos/kgrinne3/assign1git/assignees{/user}",
    "branches_url": "https://api.github.com/repos/kgrinne3/assign1git/branches{/branch}",
    "tags_url": "https://api.github.com/repos/kgrinne3/assign1git/tags",
    "blobs_url": "https://api.github.com/repos/kgrinne3/assign1git/git/blobs{/sha}",
    "git_tags_url": "https://api.github.com/repos/kgrinne3/assign1git/git/tags{/sha}",
```

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Scratch Space

Upcoming Events

SI Sessions:

- ~~Thursday, November 28th at 7:00 pm MST~~ **CANCELLED - Happy Thanksgiving!**
- Sunday, December 1st at 7:00 pm MST - **2 hour Review Session**
- Tuesday, December 3rd at 10:00 am MST - **Q&A Session**

Review Sessions:

- Sunday, December 1st at 7:00 pm MST - **2 hour Review Session**
- Tuesday, December 3rd at 10:00 am MST - **Q&A Session**

Questions?

Survey:

https://asuasn.info/ASNSurvey

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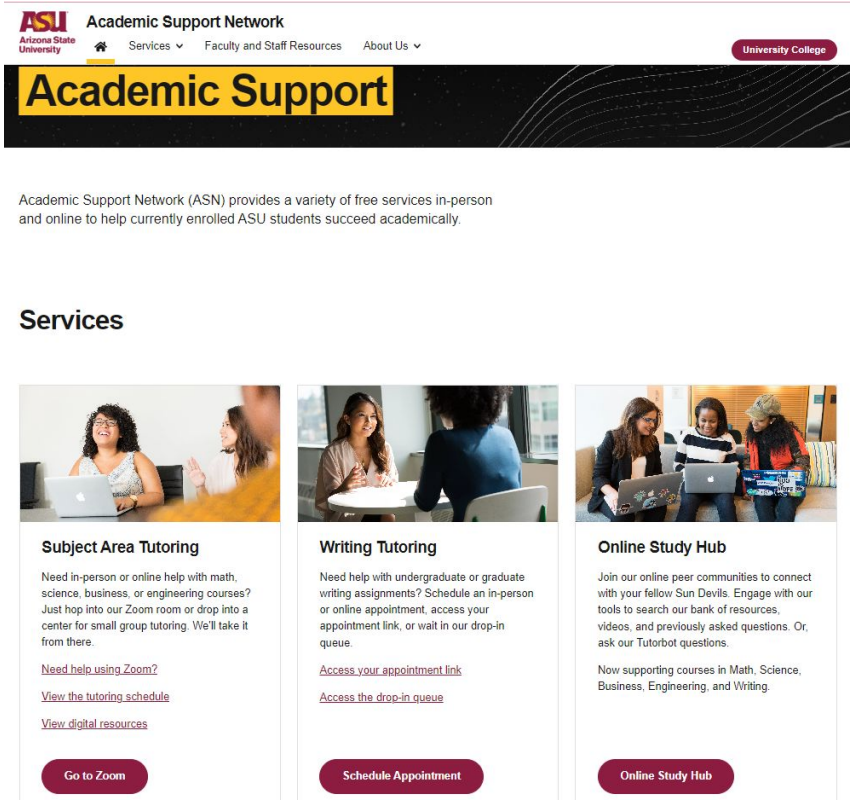
More Questions?

Check out our other resources!

tutoring.asu.edu



1 – Go to Zoom

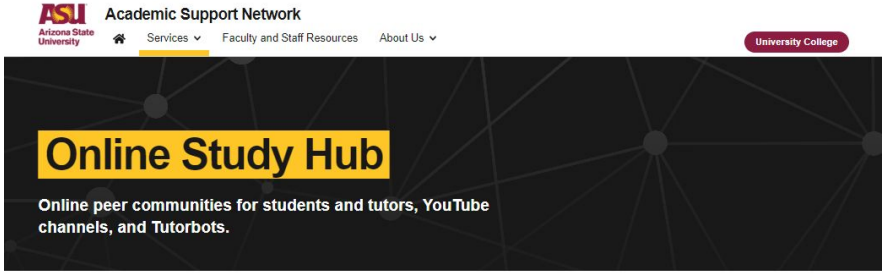
2- Need help using Zoom?
View the tutoring schedule
View digital resources

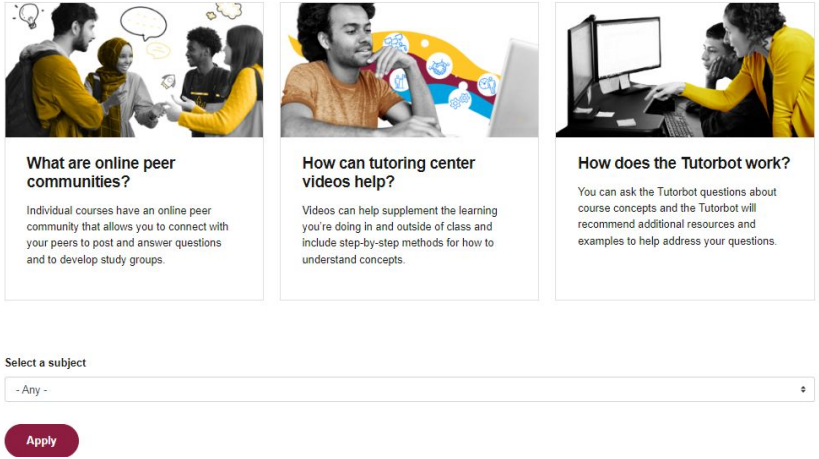
1. **Click on 'Go to Zoom' to log onto our Online Tutoring Center.**
2. **Click on 'View the tutoring schedule' to see when tutors are available for specific courses.**

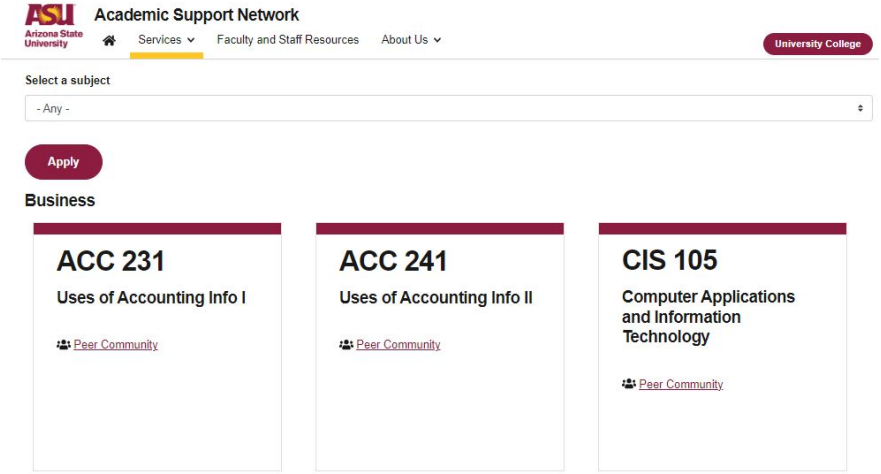
More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



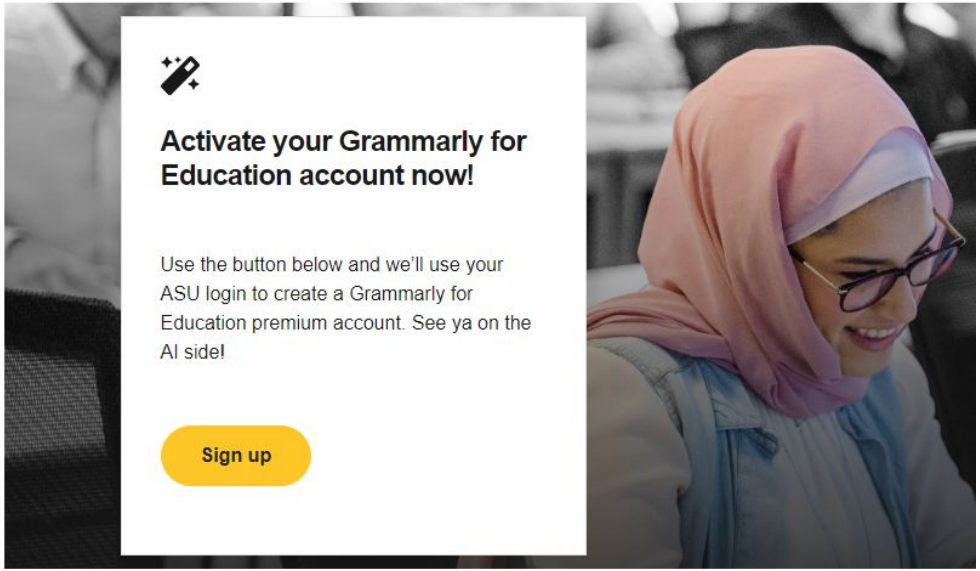




Don't forget to check out the Online Study Hub for additional resources!

Expanded Writing Support Available

Including Grammarly for Education, at no cost!



tutoring.asu.edu/expanded-writing-support

*Available slots for this pilot are limited

Additional Resources

- Course Repo
- Gradle Documentation
- GitHub SSH Help
- Linux Man Pages
- OSI Interactive
- MDN HTTP Docs
  - Requests
  - Responses
- JSON Guide
- org.json Docs
- javax.swing package API
- Swing Tutorials
- Dining Philosophers Interactive
- Austin G Walters Traffic Comparison
- RAFT