

# SER 321 C Session

**Exam Review Session**

**Wednesday, July 3rd 2024**

*6:00 pm - 8:00 pm MST*

# Agenda



Exam Info

Study Guide

Review!

# 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](https://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**

**Exam Information**

[Exam Info Page](#)

80 minutes

Very similar to  
the quizzes

Make sure to look at  
the Study Guide!

**Opens:** Monday  
July 8th  
@ 12:01 AM

**Closes:** Wednesday  
July 10th  
@ 11:59 PM

Front and Back!

MUST BE *Handwritten*



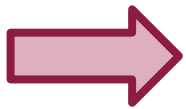
**SER 321**

**OSI Model**

Unit

Layer

What we are *really*  
talking about

**SER 321**

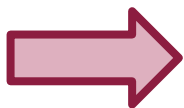
**OSI Model**

Unit

Layer

What we are *really*  
talking about

Bits	Physical	Signal, Binary transmission



**SER 321**

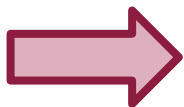
**OSI Model**

Unit

Layer

What we are *really*  
talking about

Frame	Data Link	LLC, MAC, data transmission in LAN
Bits	Physical	Signal, Binary transmission





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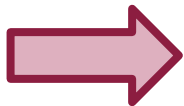
**OSI Model**

Unit

Layer

What we are *really*  
talking about

Packet	Network	IP address, routing and delivery
Frame	Data Link	LLC, MAC, data transmission in LAN
Bits	Physical	Signal, Binary transmission



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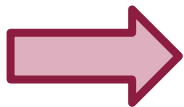
## OSI Model

Unit

Layer

What we are *really*  
talking about

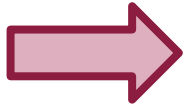
Segment	Transport	TCP/UDP
Packet	Network	IP address, routing and delivery
Frame	Data Link	LLC, MAC, data transmission in LAN
Bits	Physical	Signal, Binary transmission



**SER 321****OSI Model**

Unit

Layer

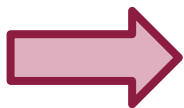
What we are *really*  
talking about

Data	Session	AuthN, authZ, session mgmt
Segment	Transport	TCP/UDP
Packet	Network	IP address, routing and delivery
Frame	Data Link	LLC, MAC, data transmission in LAN
Bits	Physical	Signal, Binary transmission

**SER 321****OSI Model**

Unit

Layer

What we are *really*  
talking about

Data	Presentation	Translation, compression, encryption
Data	Session	AuthN, authZ, session mgmt
Segment	Transport	TCP/UDP
Packet	Network	IP address, routing and delivery
Frame	Data Link	LLC, MAC, data transmission in LAN
Bits	Physical	Signal, Binary transmission

**SER 321**

**Network Layer - IP**

Given the following IP address, identify the...

Port

128.148.32.110 **8080**

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**Network Layer - IP**

Given the following IP address, identify the...

Subnet

128.148.32.110:8080

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**Network Layer - IP**

Given the following IP address, identify the...

Network

128.148.32.110:8080

**SER 321**

**Network Layer - IP**

Given the following IP address, identify the...

Host

128.148.32.110:8080



What are the main differences?

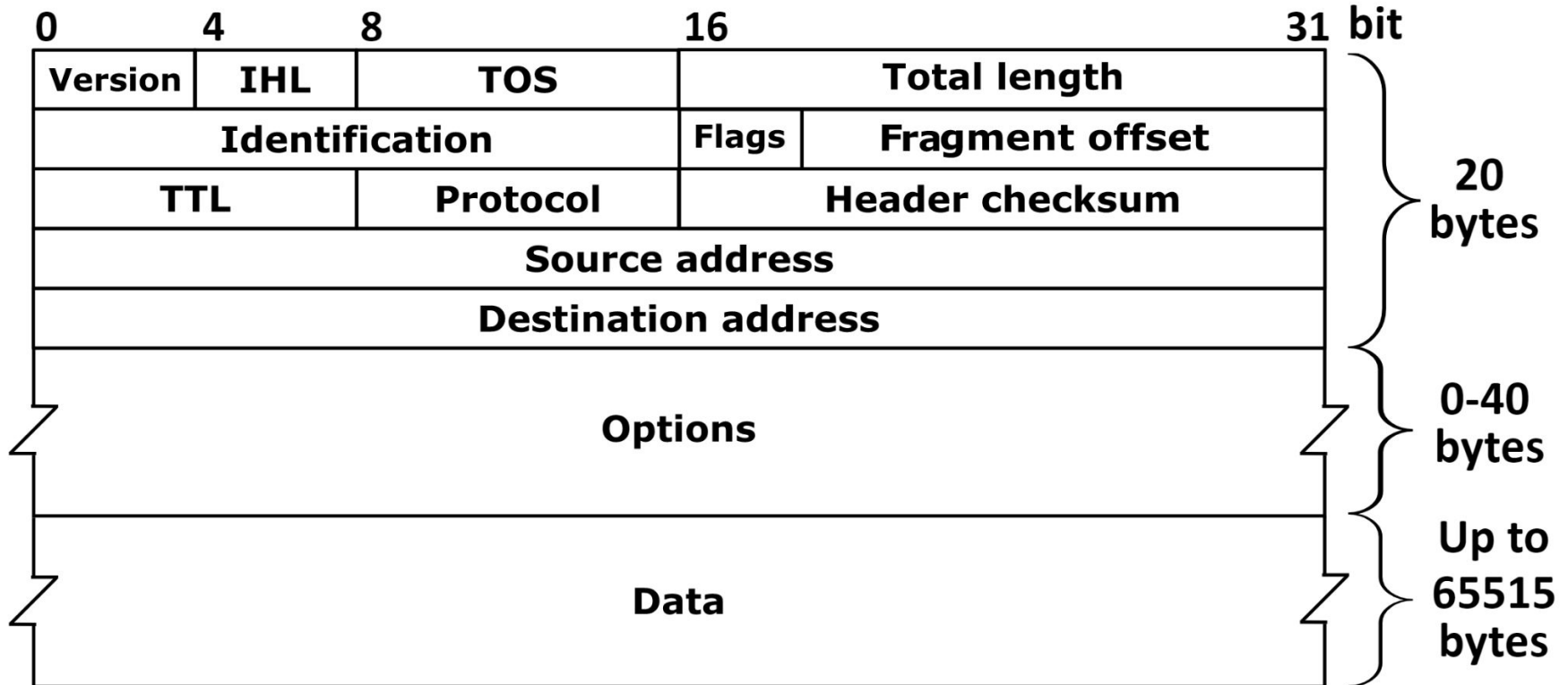
TCP	UDP

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**Headers**

What type of header is this?

IP Header



## Headers

TCP or UDP Header?

Offsets		0								1								2								3							
Octet	Bit	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0	0	Source port																Destination port															
4	32	Sequence number																															
8	64	Acknowledgment number (if ACK set)																															
12	96	Data offset				Reserved 0 0 0 0				C W R	E C E	U R G	A C K	P S H	R S T	S Y N	F I N	Window Size															
16	128	Checksum																Urgent pointer (if URG set)															
20	160	Options (if <i>data offset</i> > 5. Padded at the end with "0" bits if necessary.)																															
:	:																																
56	448																																

**SER 321**

**URLS**

Given the following URL, identify the...

**Query**

<https://www.google.com/search?q=asu>

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**URLS**

Given the following URL, identify the...

**Protocol**

**https://www.google.com/search?q=asu**

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**URLS**

Given the following URL, identify the...

**Path**

<https://www.google.com/search?q=asu>

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**URLS**

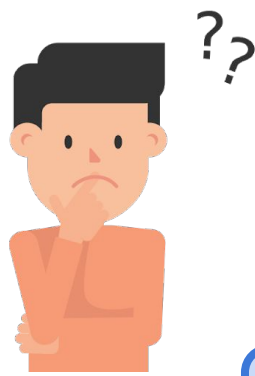
Given the following URL, identify the...

**Host**

<https://www.google.com/search?q=asu>

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**HTTP(S)**



Stateful

OR

Stateless

Synchronous

OR

Asynchronous



What's the difference?

1. GET

2. POST

3. PUT

4. DELETE

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## HTTP Responses

Status Codes →

1XX

2XX

3XX

4XX

5XX

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## Sockets!

Sockets allow our client and server to communicate!

Location

Connection  
Semantics

Message Format

Need to define **3 properties** before usage

IP or DNS

142.251.46.206

www.google.com

TCP or UDP

Connection  
Oriented

Connectionless

Protocol Specs

Synchronous

Asynchronous

Stateless

Stateful

Binary

Text

Headers

No Headers



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**Client Socket**

## Steps for the **Client Socket**

1.

2.

3.

4.

5.

6.

7.

8.

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**Server Socket**

# Steps for the **Server Socket**

1.

2.

3.

4.

5.

6.

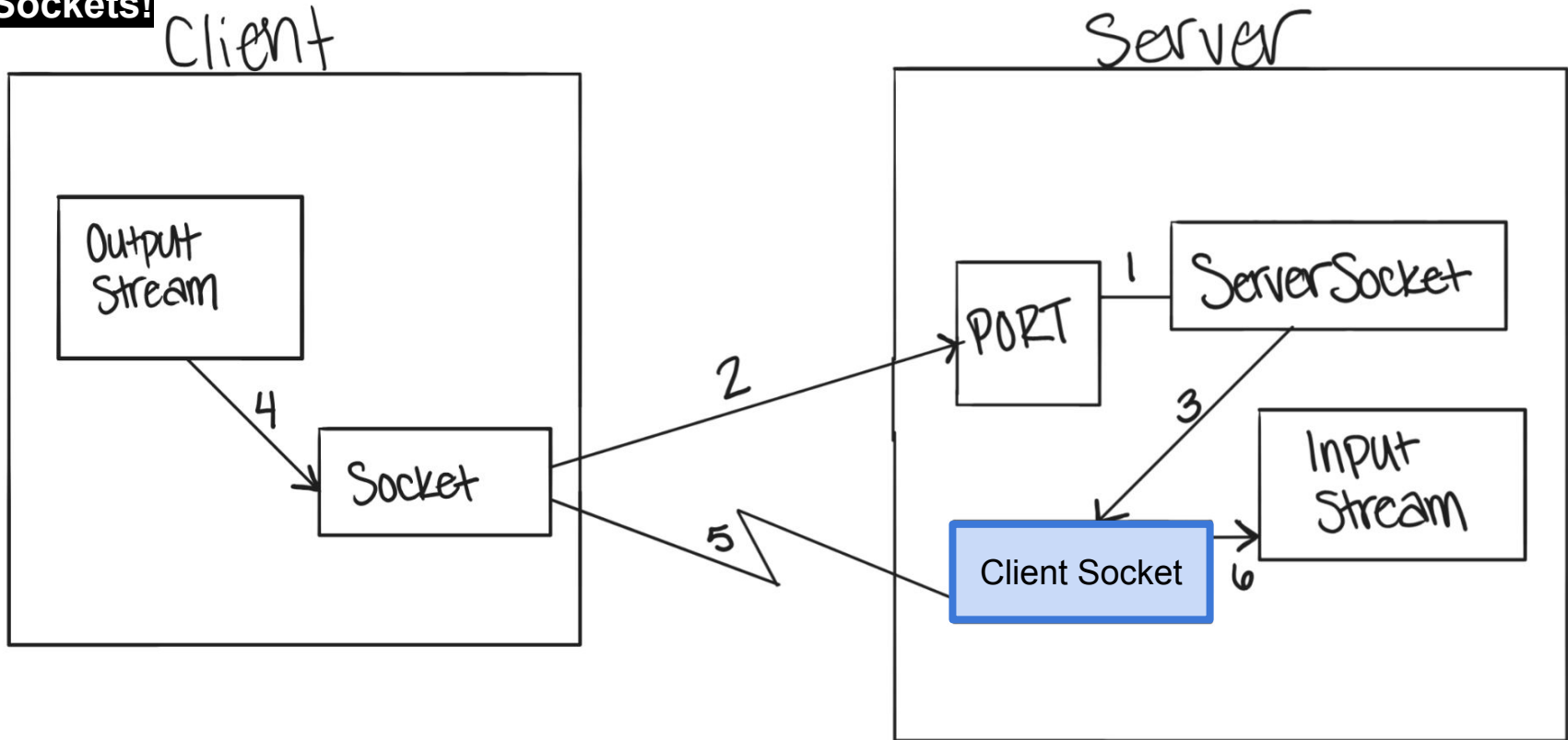
7.

8.

9.

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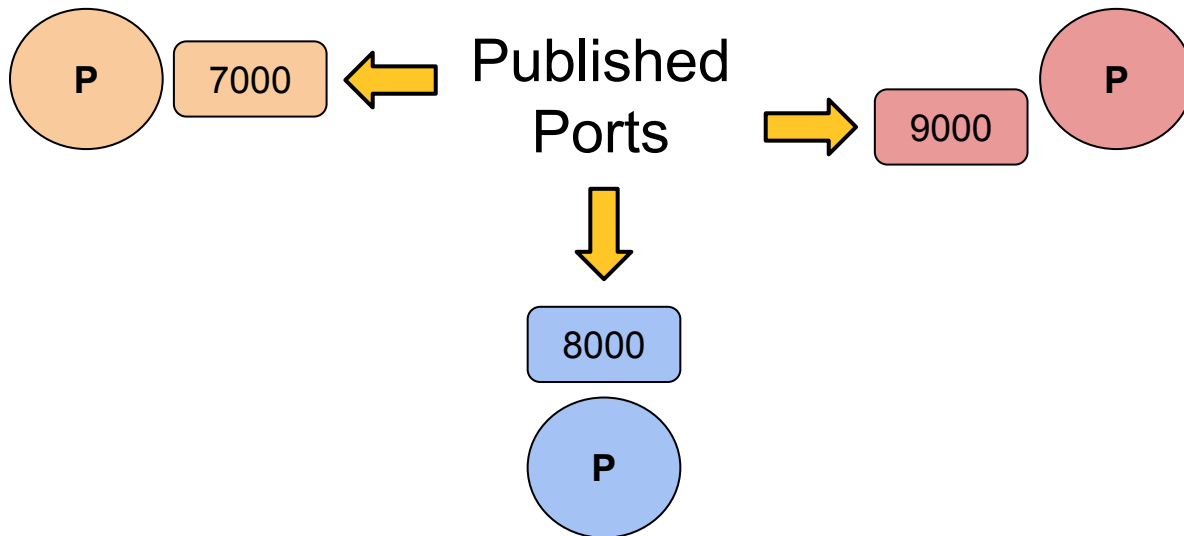
## Sockets!



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## Communication

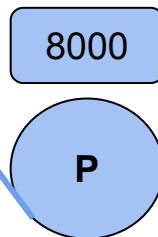
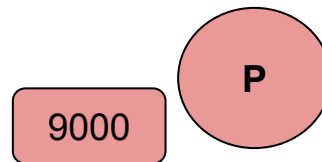
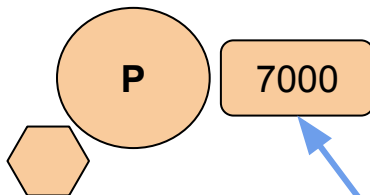
Remember that the OS allocates a new port for the client socket!



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## Communication

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



```
sock = server.accept()
```

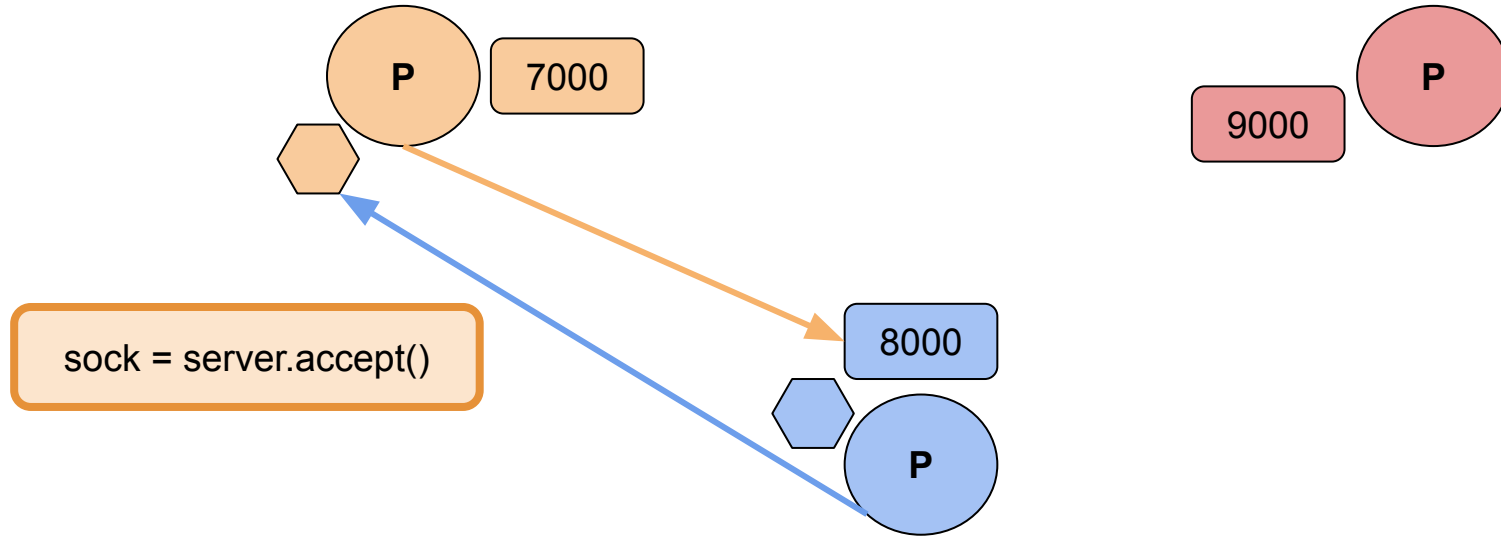
Remember that the OS allocates a new port for the client socket!



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## Communication

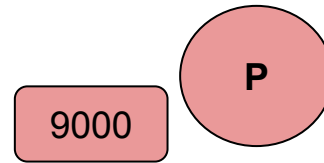
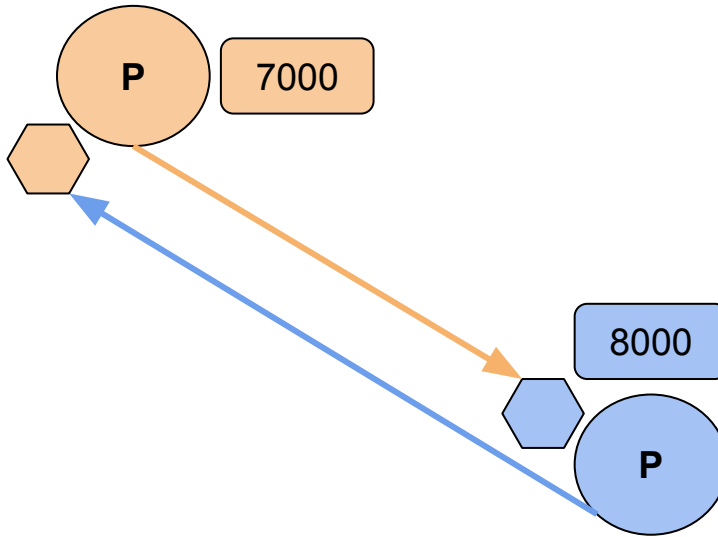
Remember that the OS allocates a new port for the client socket!



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**Communication**

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

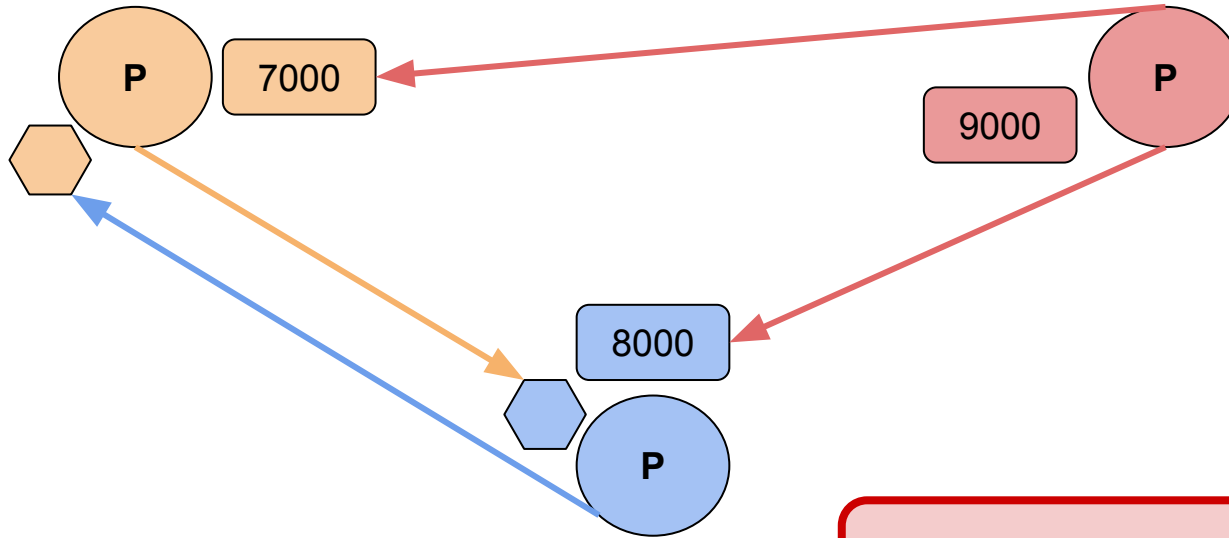


What about Peer 9000?

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## Communication

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

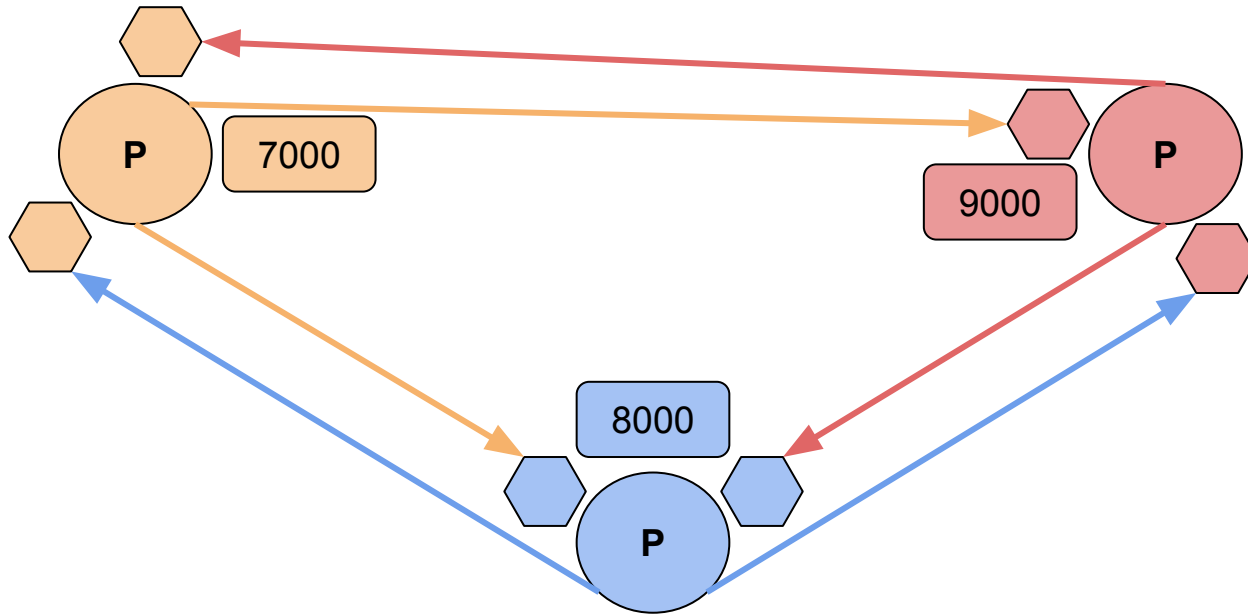


What about Peer 9000?

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## Communication

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



# SER 321

## Threading Pitfalls

Starvation

A thread is only able to acquire some of the resources it needs

Deadlock

More than one thread accesses a single resource at the same time

Race Condition

A thread never gains access to the resource it needs

# SER 321

## Threading Pitfalls

Starvation

A thread is only able to acquire some of the resources it needs

Deadlock

More than one thread accesses a single resource at the same time

Race Condition

A thread never gains access to the resource it needs

### What's the difference?

#### Starvation

A thread never gains access to the resource it needs

Waiting to access the **CPU**

vs.

#### Deadlock

A thread is only able to acquire some of the resources it needs

Waiting to access the **resource**

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**Serialization**

Can we recall some of the formats?

JSON

Java Object  
Serialization

Protocol Buffers

XML



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## Serialization

Binary

Text

Two main  
approaches for  
storing the  
content...

What about the data format?

JSON

Java Object  
Serialization

Protocol Buffers

XML

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## Serialization

Binary

Text

Who uses *TEXT*?

Text

JSON

Java Object  
Serialization

Protocol Buffers

Text

XML

# SER 321

## Serialization

Binary

Text

What does this imply?

Who uses ***BINARY***?

Text

JSON

Binary

Java Object  
Serialization

Binary

Protocol Buffers

Text

XML

**SER 321**

**Serialization**

Generic  
Superclass

# Streams and their types

```
OutputStream out = sock.getOutputStream();
```

Buffered Stream

Bytes

Data Stream

Primitive DATA Types

Object Stream

Java Objects

**SER 321**

**Systems**

**Parallel**



A Venn diagram with two overlapping circles. The left circle is light blue with a blue outline and is labeled 'Parallel'. The right circle is light red with a red outline and is labeled 'Distributed'. The intersection of the two circles is shaded with a mix of blue and red. The text 'SER 321' is in a yellow box at the top left, and 'Systems' is in a black box below it.

**Distributed**

### Parallel

- Single computer
- Work split among different *processors*
- Memory is shared **or** distributed
- Communicate through *bus*

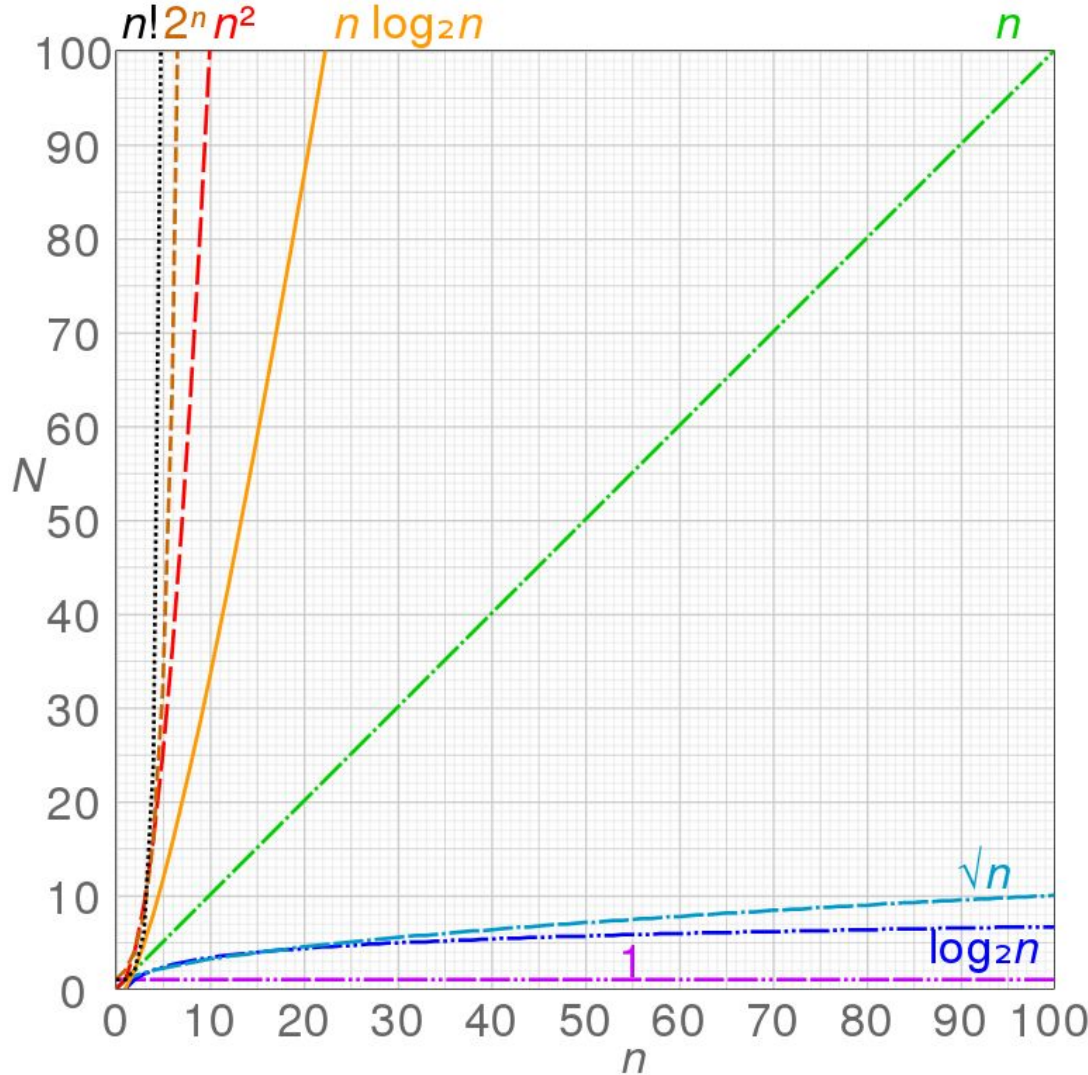
### Distributed

- Work is partitioned
- Partitions processed individually
- **Can** improve performance
- **Can** improve speed
- Many computers
- Work split among different *locations*
- Memory is distributed
- Communicate through *message passing*

# SER 321

## Distributed Systems

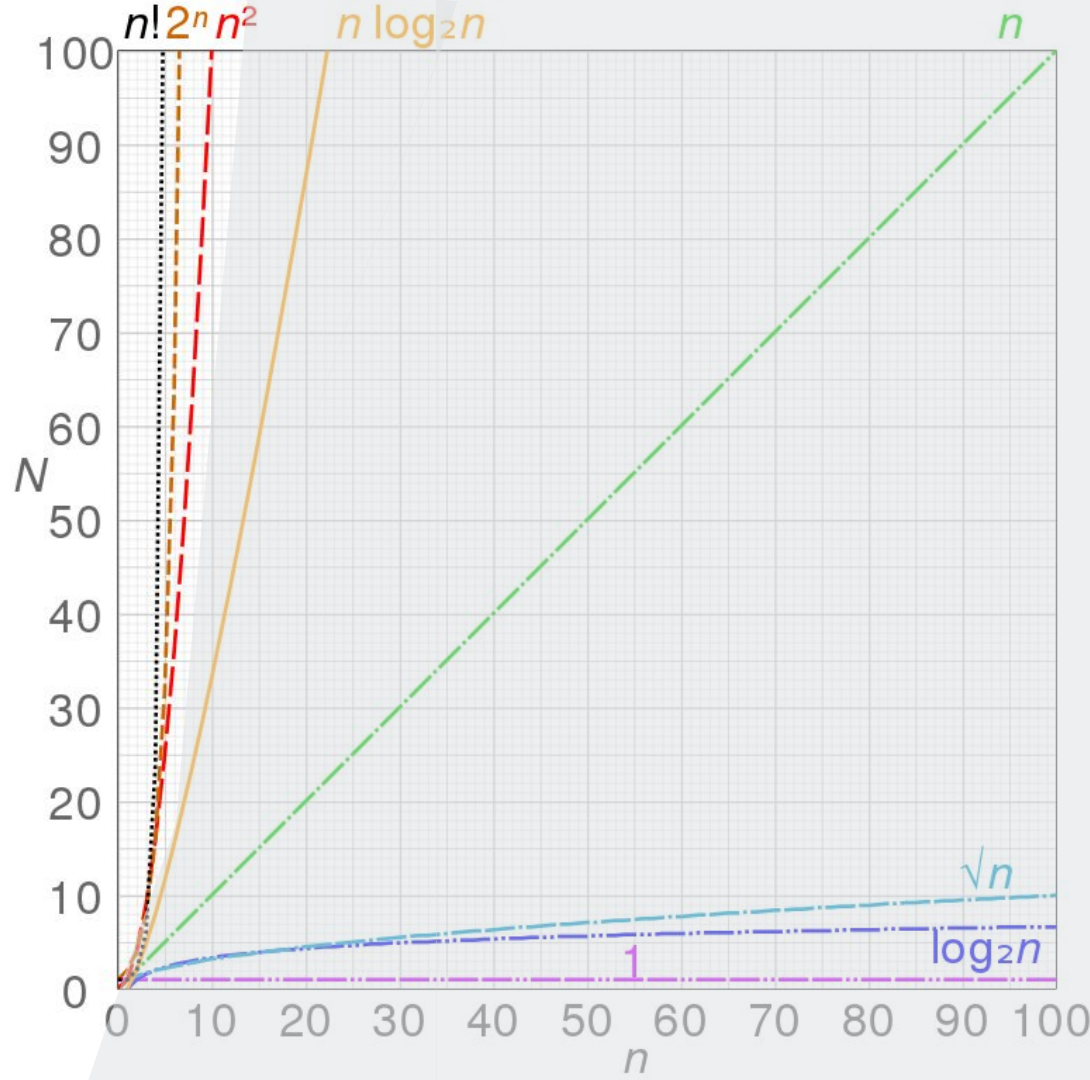
When should  
we *consider*  
distributing?



# Distributed Systems

When should  
we *consider*  
distributing?

Super Duper Extra Extra  
Large Orders of Magnitude!



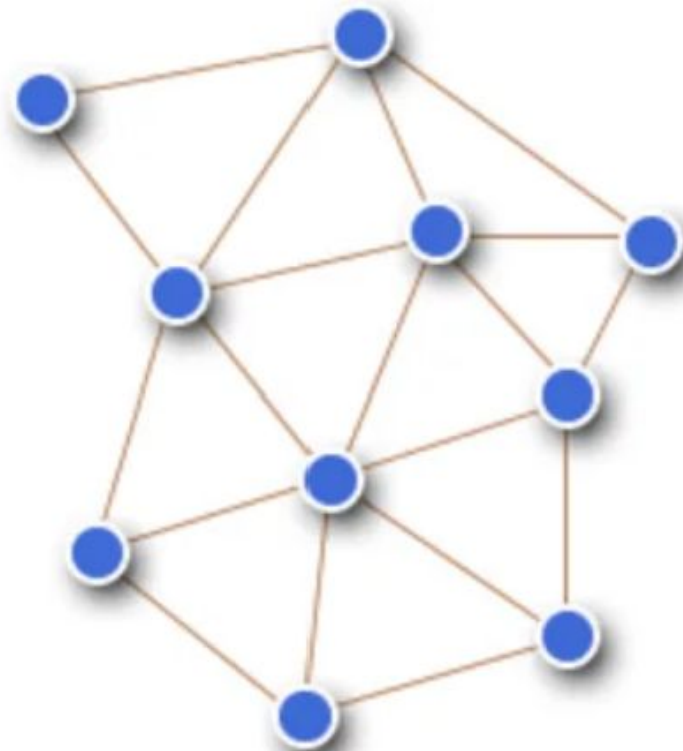


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## Distributed Systems

Remember that we are operating in *reality*

- Nodes *will* fail
- Web of nodes *will constantly* change
- Network is not *always* reliable
- Latency is *always present*
- The path traversed *changes*
- Some resources *must be shared*
- *You* need to prevent the pitfalls!
  - No deadlocks
  - No starvation
  - No error states



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## Consensus

“General agreement or trust amongst a group”

Thoughts on usage?

Who's in charge or keeping the beat



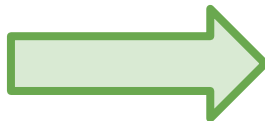
Leader Election

Check your work with a neighbor



Result Verification

Verify and maintain my copy of the data



Log Replication

Do I want to let you into my network



Validate Nodes

# SER 321

## Middleware

We have been:

Serializing  
Messages

Sending  
Messages

Parsing  
Messages

Handle  
Messages

*Check out the recording for the discussion!*

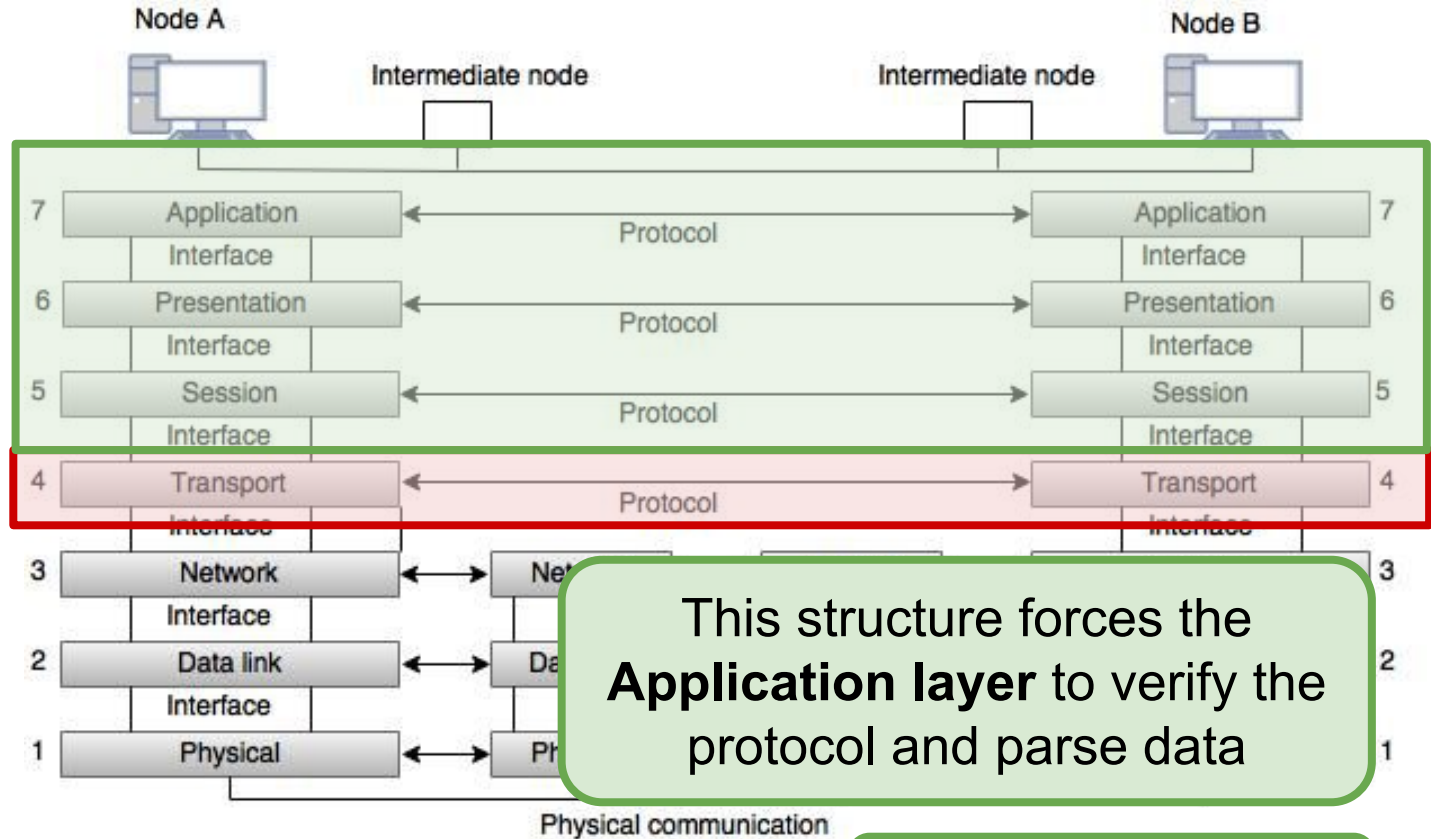


Fig: OSI Model

Not really its job...

*Check out the recording for the discussion!*

# SER 321 Middleware

With Middleware:

Serializing  
Messages

Sending  
Messages

Parsing  
Messages

Handle  
Messages

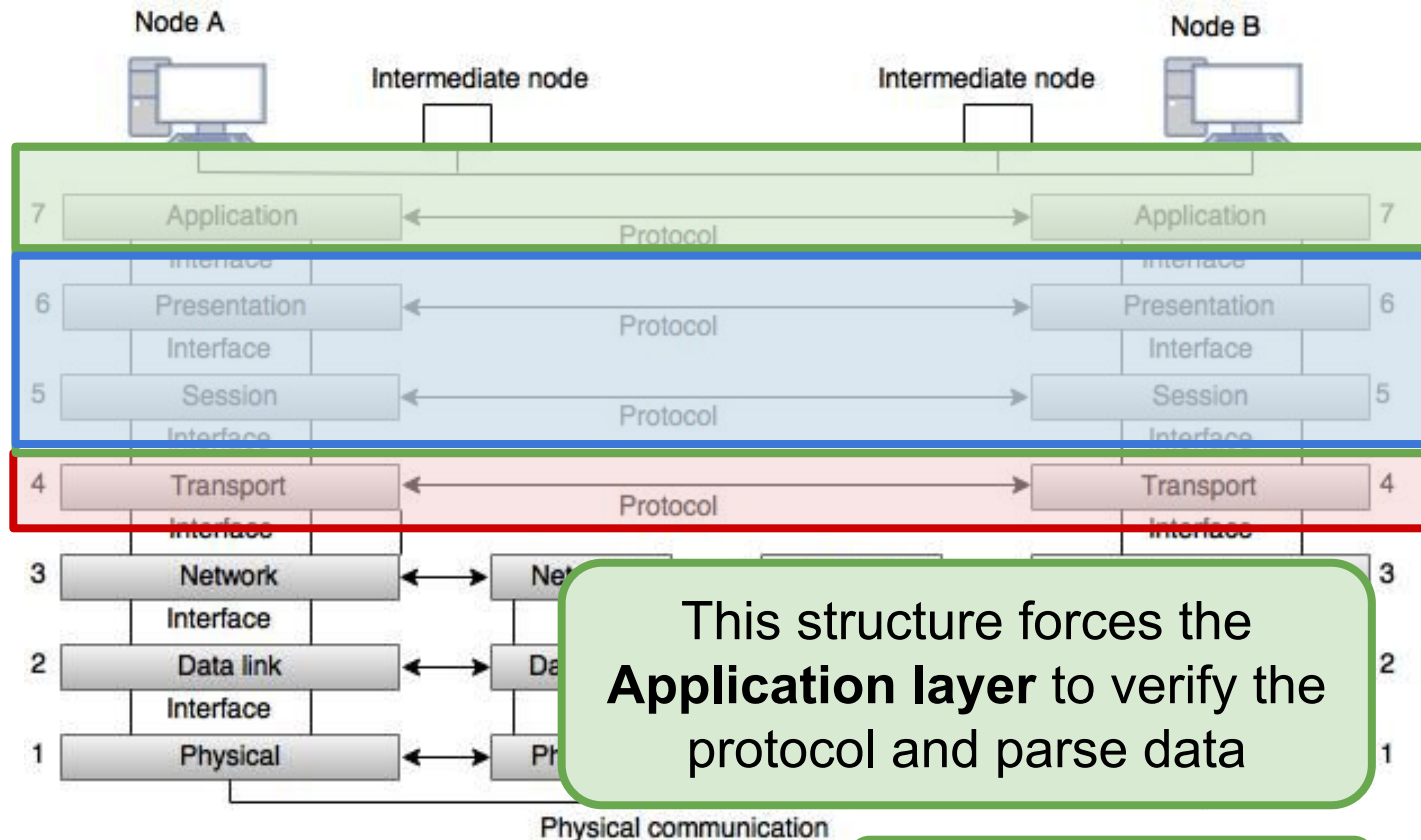


Fig: OSI Model

Not really its job...

# SER 321 Middleware

With Middleware:

Serializing  
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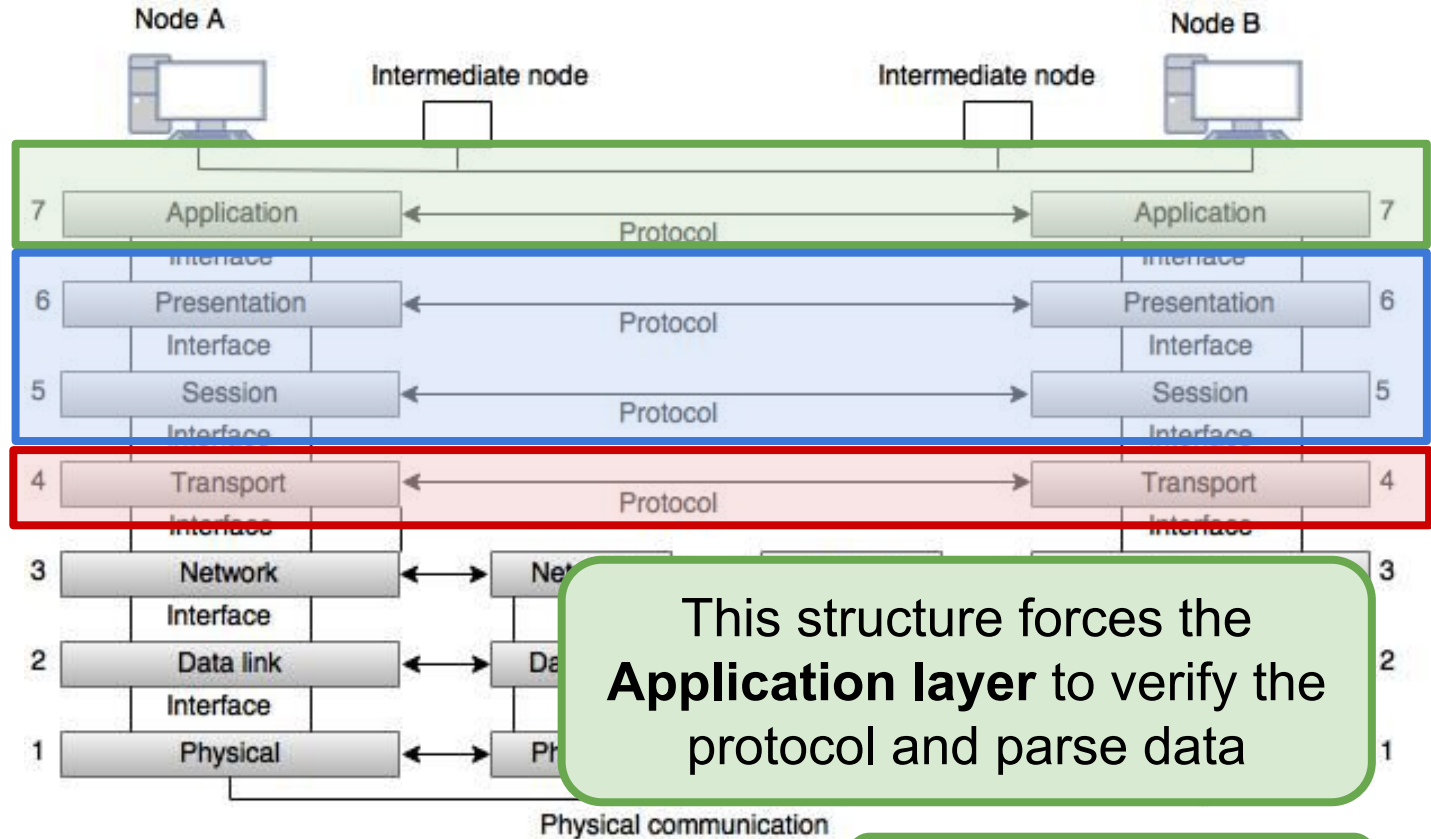


Fig: OSI Model

Not really its job...

*Check out the recording for the discussion!*

## SER 321 Middleware

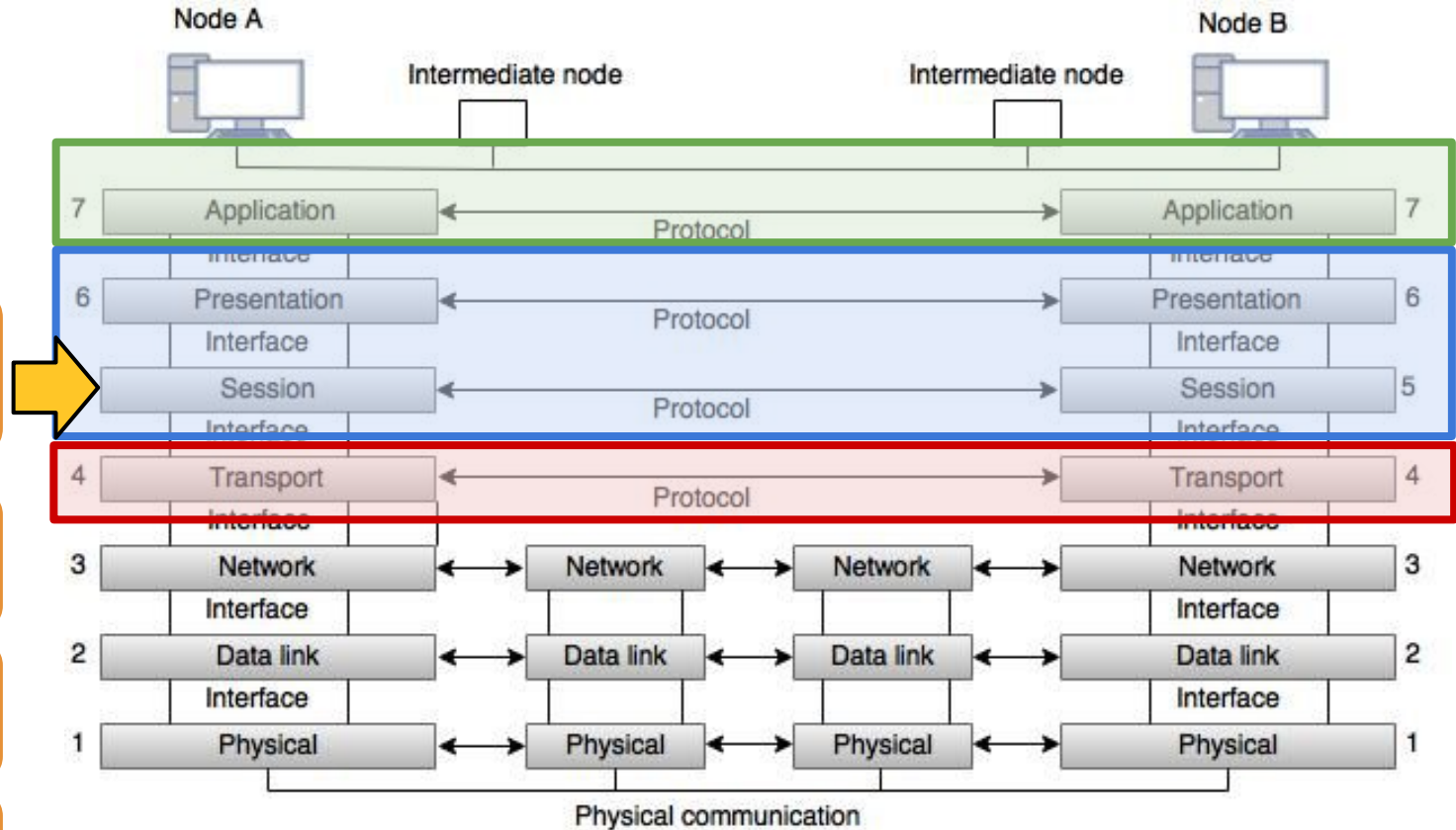
Middleware:

*Session Layer  
Responsibilities:*

Authentication

Authorization

Session  
Management



**Fig: OSI Model**

**Check out the recording for the discussion!**

# SER 321 Middleware

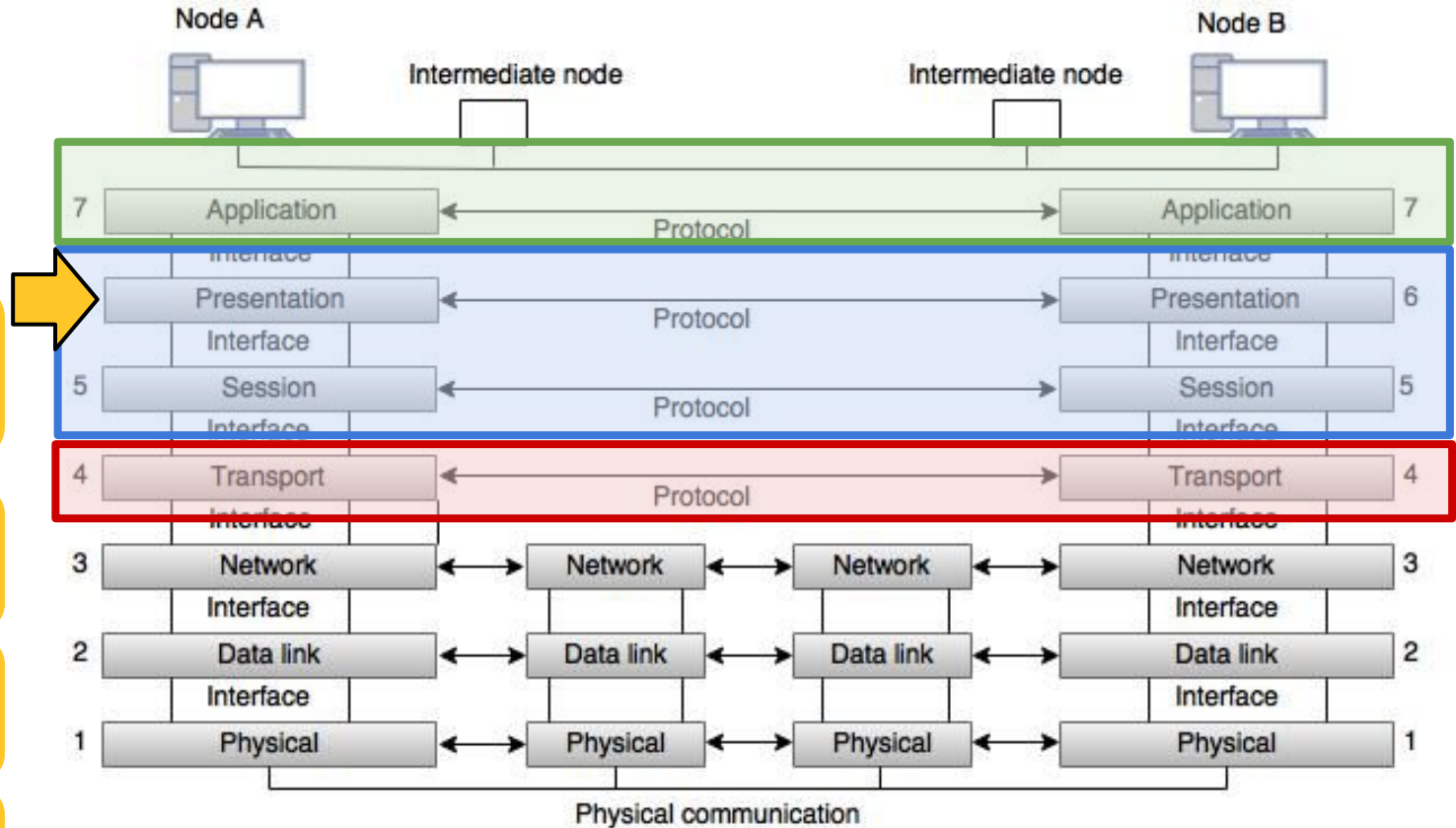
Middleware:

*Presentation  
Layer  
Responsibilities:*

Translation

Compression

Encryption



**Fig: OSI Model**

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**Middleware**

# Why do we care?

Agility

Reusability

Efficiency

Cost  
Effectiveness

Portability

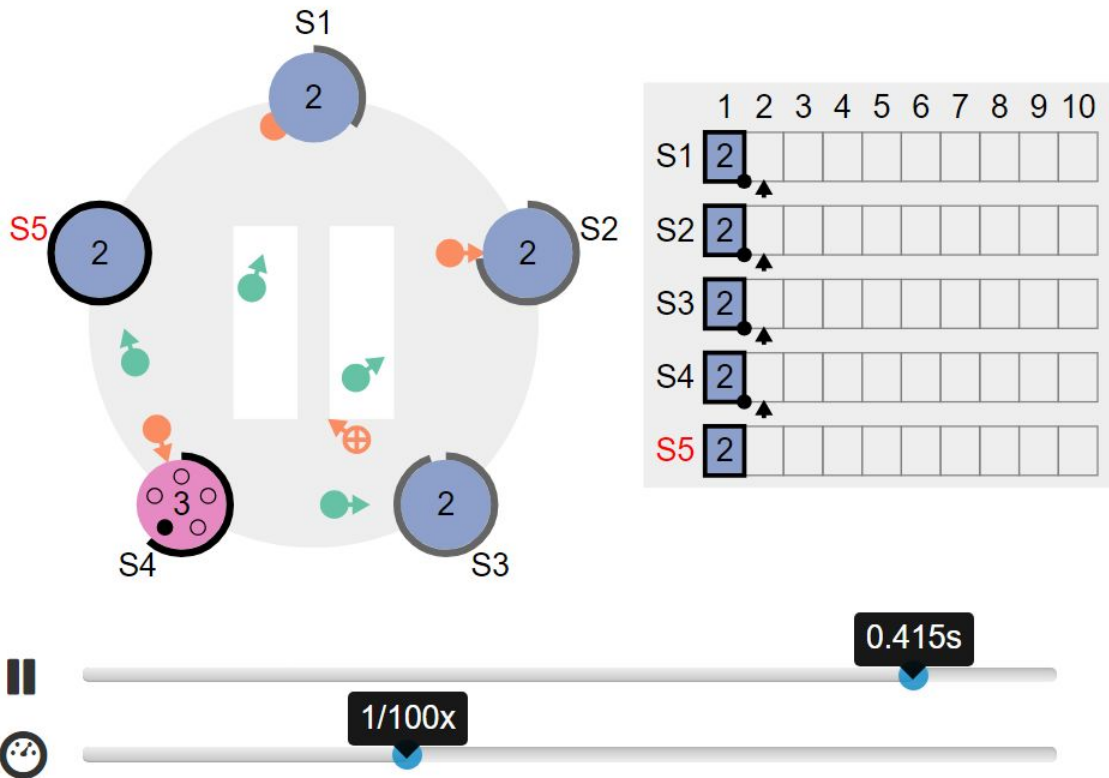


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**RAFT**

How do we  
feel about  
Consensus?

RAFT



# SER 321

Scratch Space

# Questions?



## Survey:

<http://bit.ly/ASN2324>



## Upcoming Events

### SI Sessions:

- No Session Tomorrow - Happy Fourth of July!
- Sunday, July 7th at 6:00 pm MST - *Final Session*

### Review Sessions:

- Review Session - **Wednesday**, July 3rd at 6:00 pm MST (2 hr Session)
- Q&A Session - Sunday, July 7th at 6:00 pm MST (Final Session)

# More Questions?

Check out our other resources!

tutoring.asu.edu



## Academic Support

Academic Support Network (ASN) provides a variety of free services in-person and online to help currently enrolled ASU students succeed academically.

### Services



#### Subject Area Tutoring

Need in-person or online help with math, science, business, or engineering courses? Just hop into our Zoom room or drop into a center for small group tutoring. We'll take it from there.

[Need help using Zoom?](#)

[View the tutoring schedule](#)

[View digital resources](#)

Go to Zoom



#### Writing Tutoring

Need help with undergraduate or graduate writing assignments? Schedule an in-person or online appointment, access your appointment link, or wait in our drop-in queue.

[Access your appointment link](#)

[Access the drop-in queue](#)

Schedule Appointment



#### Online Study Hub

Join our online peer communities to connect with your fellow Sun Devils. Engage with our tools to search our bank of resources, videos, and previously asked questions. Or, ask our Tutorbot questions.

Now supporting courses in Math, Science, Business, Engineering, and Writing.

Online Study Hub

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](https://tutoring.asu.edu/online-study-hub)

 **Academic Support Network**

 [Services](#)  [Faculty and Staff Resources](#) [About Us](#) 

[University College](#)

## Online Study Hub

Online peer communities for students and tutors, YouTube channels, and Tutorbots.



### What are online peer communities?

Individual courses have an online peer community that allows you to connect with your peers to post and answer questions and to develop study groups.



### How can tutoring center videos help?

Videos can help supplement the learning you're doing in and outside of class and include step-by-step methods for how to understand concepts.



### How does the Tutorbot work?

You can ask the Tutorbot questions about course concepts and the Tutorbot will recommend additional resources and examples to help address your questions.

Select a subject

- Any -

Apply



Academic Support Network



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[University College](#)

Select a subject

- Any -

Apply

Business

### ACC 231

Uses of Accounting Info I

 [Peer Community](#)


### ACC 241

Uses of Accounting Info II

 [Peer Community](#)

### CIS 105

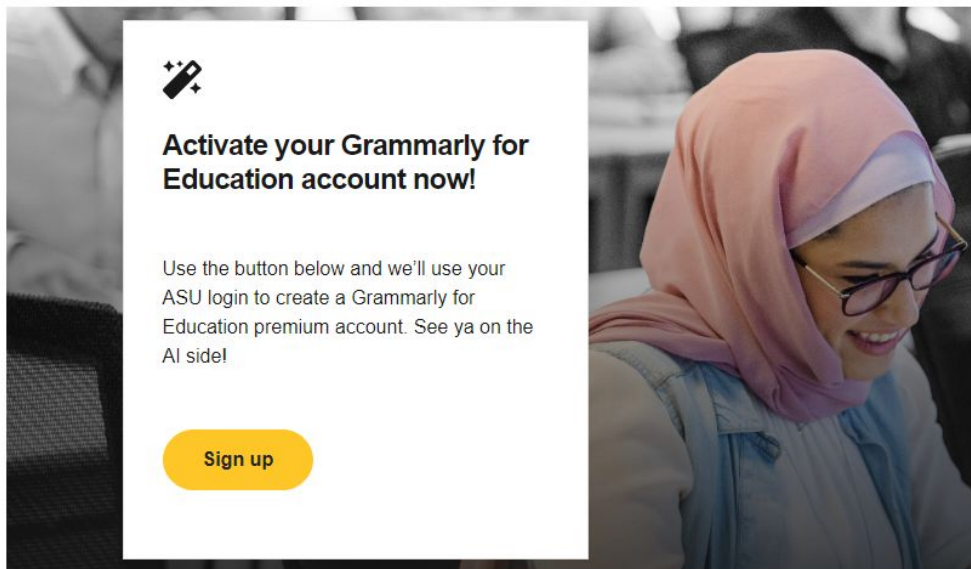
Computer Applications and Information Technology

 [Peer Community](#)

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](https://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](#)