

# SER 321 B Session

**SI Session**

**Sunday, November 12th 2023**

*7:00 - 8:00 pm MST*

# Agenda



Consensus

Definition

Use & Examples

Types

RAFT Interactive

# 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**

**Consensus**

## ***What is Consensus?***

- A.** Systematic calculating and recording of information about a given population
- B.** General agreement or trust amongst a group
- C.** Controversial; causing or likely to cause an argument
- D.** No Idea...

*Check out the recording for the solution!*

**SER 321**

**Consensus**

# *What is Consensus?*

General agreement or trust amongst a group

Result of polling nodes

Do I believe your response?

The nodes in the system

Will vote yay or nay

Do I allow this node to join  
the system?

YAY or NAY for what?

Whatever the *thing* is

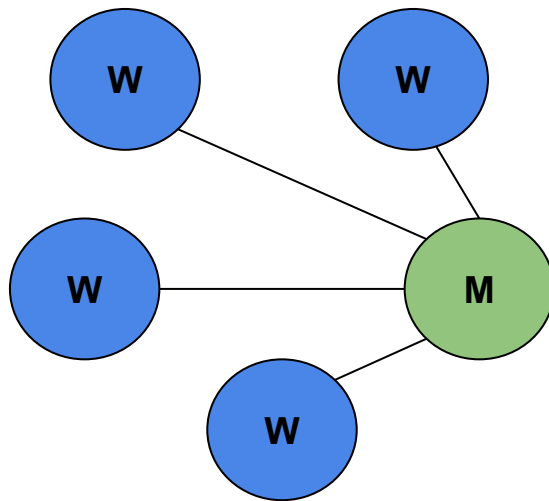
# SER 321

## Consensus

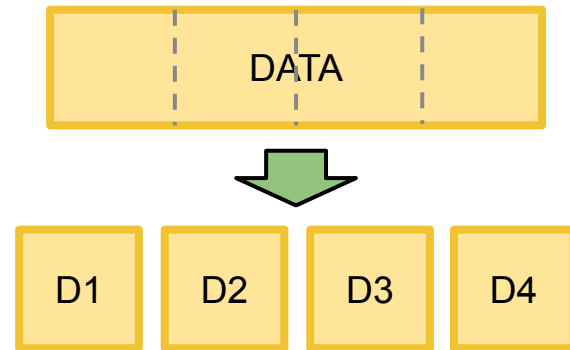
### *In Practice Example*

Well, first let's recall what the Main Node is doing...

And what the Worker Nodes are doing...



*“General agreement or trust amongst a group”*



*Check out the recording for the full walkthrough!*

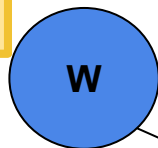
# SER 321 Consensus

## *In Practice Example*

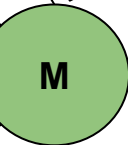
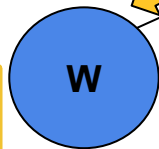
"New Data #"



ND2



ND1



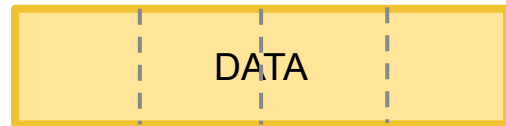
ND3

ND4

Well, first let's recall what the Main Node is doing...

And what the Worker Nodes are doing...

*"General agreement or trust amongst a group"*



D1

D2

D3

D4

Are we done?

*Check out the recording for the full walkthrough!*



# SER 321 Consensus

## In Practice Example

"New Data #"



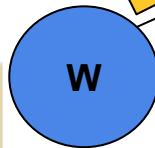
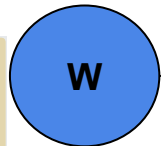
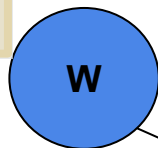
ND2

Well, first let's recall what the Main Node is doing...

ND3

And what the Worker Nodes are doing...

ND4



ND1



"General agreement or trust amongst a group"

DATA



D1

D2

D3

D4

ND1

ND2

ND3

ND4



NEW DATA

Check out the recording for the full walkthrough!

***That's just a distributed algorithm!***

# SER 321 Consensus

## So... What's consensus then?

What if one of the workers is wrong or faulty?

Consensus is like  
checking your work!

"New Data #"



ND2

W

W

ND1

W

M

W

ND4

ND3

DATA

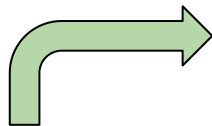


D1 D2 D3 D4

ND1 ND2 ND3 ND4



Main should be  
suspicious of all  
workers here



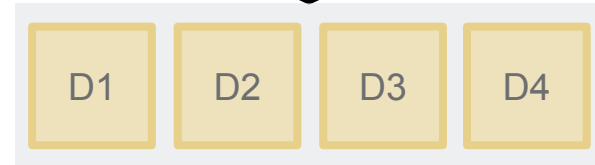
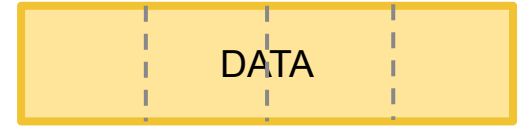
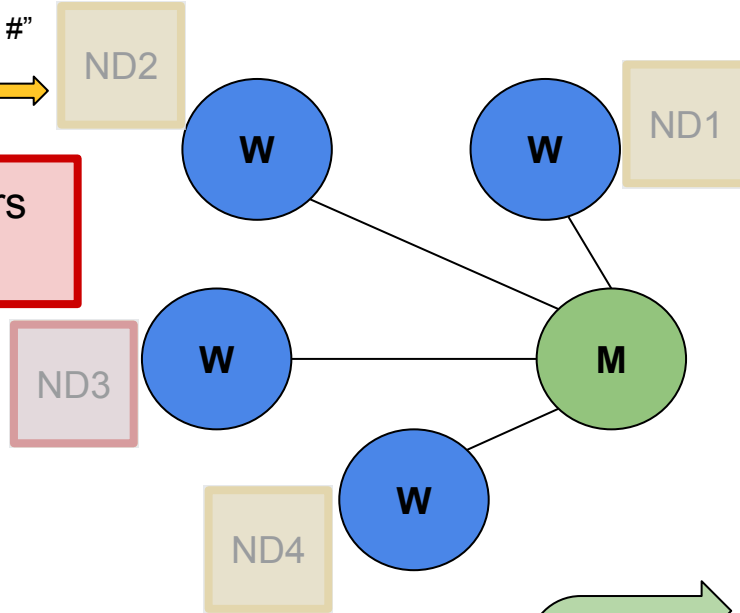
NEW DATA

# So... What's consensus then?

## SER 321 Consensus

What if one of the workers is wrong or faulty?

"New Data #"



What should  
Main do here?

Main should be  
suspicious of all  
workers here



*Check out the recording for the solution!*

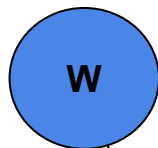
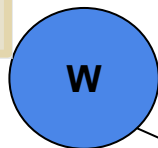
# SER 321 Consensus

## So... What's consensus then?

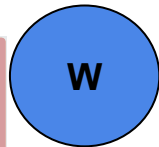
"New Data #"



ND2



ND1



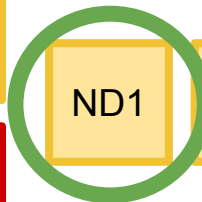
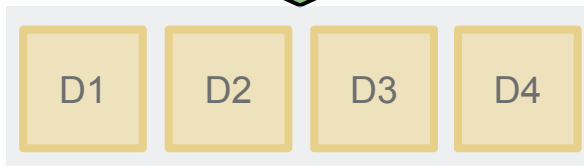
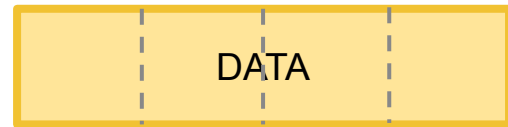
ND1

ND1

ND1

ND3

ND4



ND2

ND3

ND4



$\frac{2}{3}$  verify result

What if one of the workers is wrong or faulty?

What does that mean for the Worker we are checking?

Check out the recording for the solution!

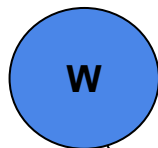
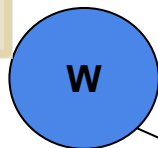
# SER 321 Consensus

## So... What's consensus then?

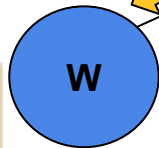
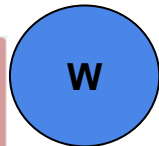
"New Data #"



ND2



ND1



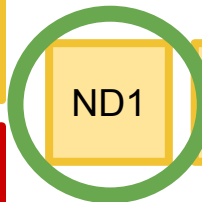
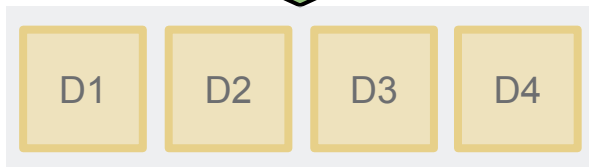
ND1

ND1

ND1

ND3

ND4



ND2

ND3

ND4



$\frac{2}{3}$  verify result

What if one of the workers is wrong or faulty?

What does that mean for the other Workers?

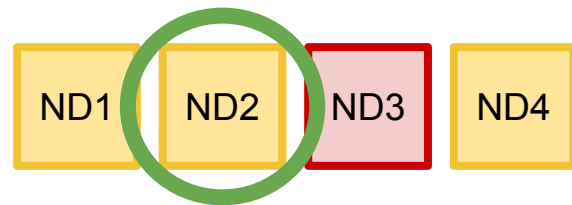
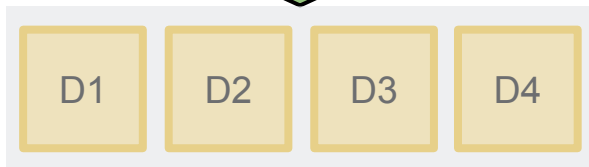
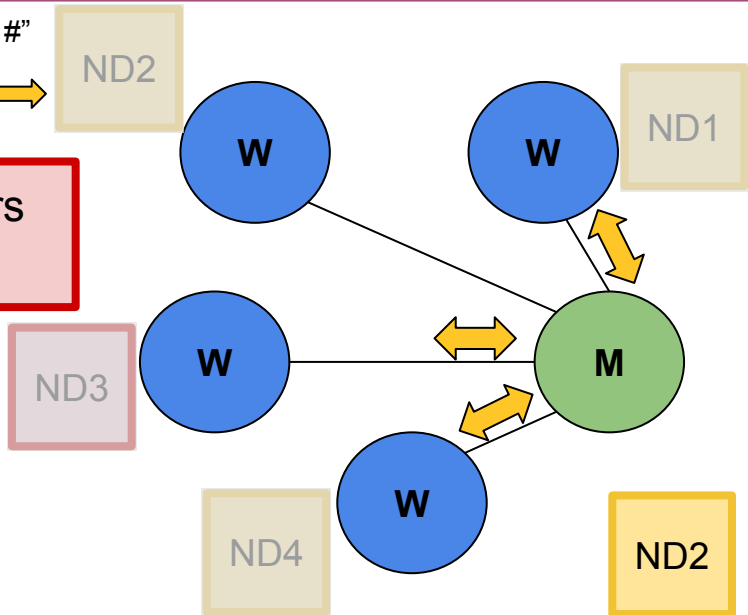
Check out the recording for the solution!

# SER 321 Consensus

## So... What's consensus then?

What if one of the workers is wrong or faulty?

"New Data #"



$\frac{2}{3}$  verify result

Check out the recording for the full walkthrough!

# SER 321 Consensus

## So... What's consensus then?

What if one of the workers is wrong or faulty?

"New Data #"



ND2

ND1

ND3

ND4

ND3

ND3

ND3

DATA



D1

D2

D3

D4

ND1

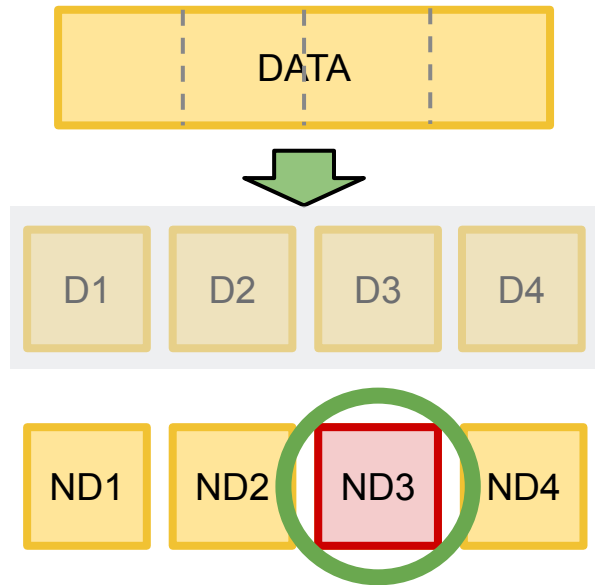
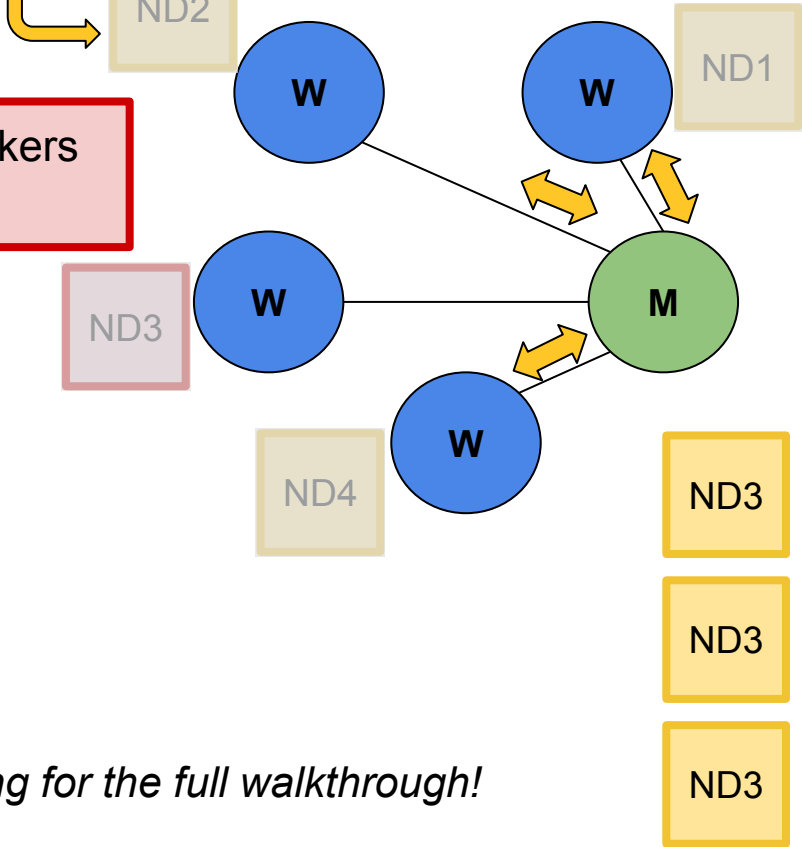
ND2

ND3

ND4

0/3 verify result

Check out the recording for the full walkthrough!



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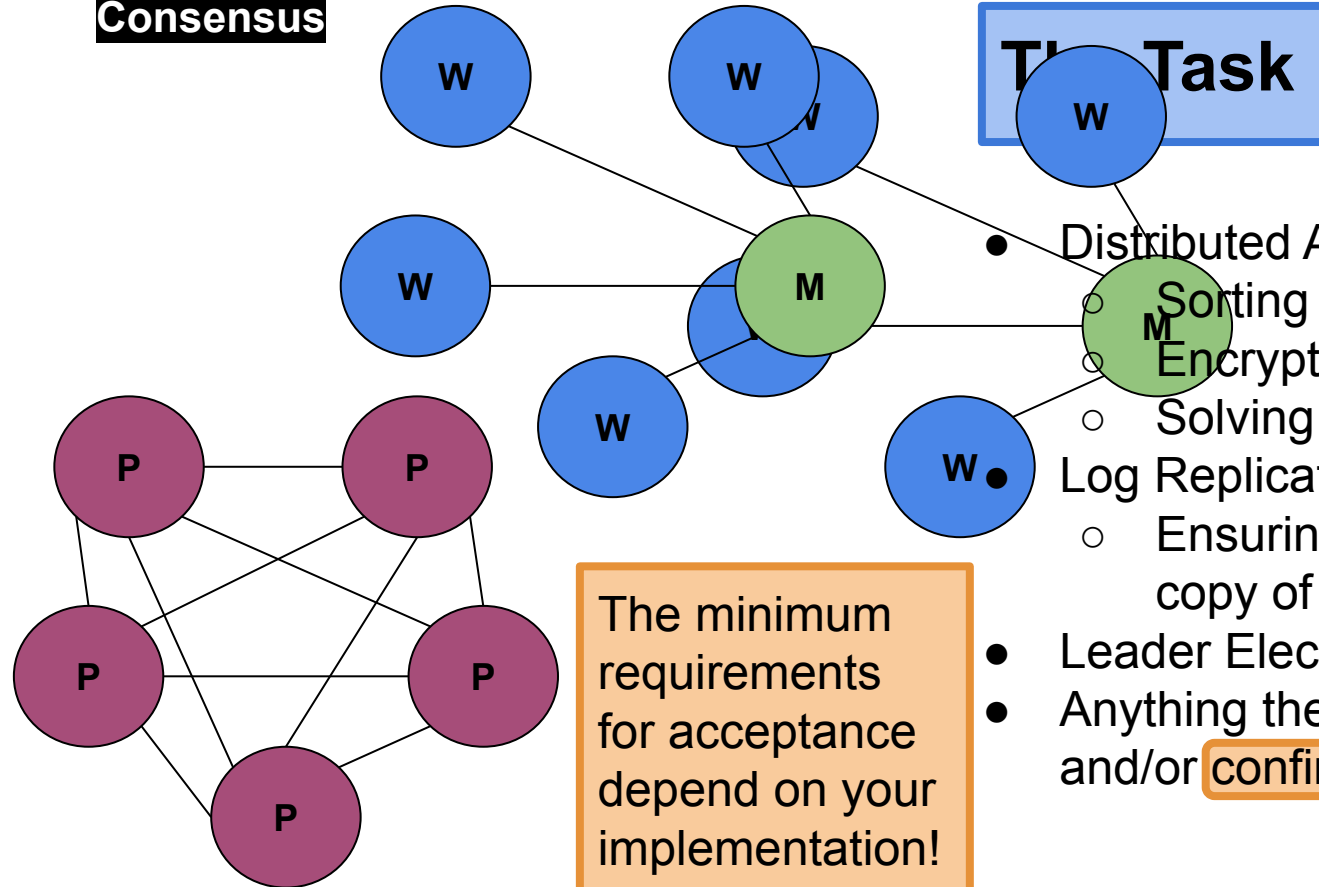
**Consensus**

## *Main and Worker only?*

**The Task**

- Distributed Algorithm
  - Sorting
  - Encrypting/decrypting
  - Solving an equation
- Log Replication ★
  - Ensuring each node has a copy of the given log
- Leader Election ★
- Anything the nodes can vote on and/or **confirm**

The minimum requirements for acceptance depend on your implementation!





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**Consensus**

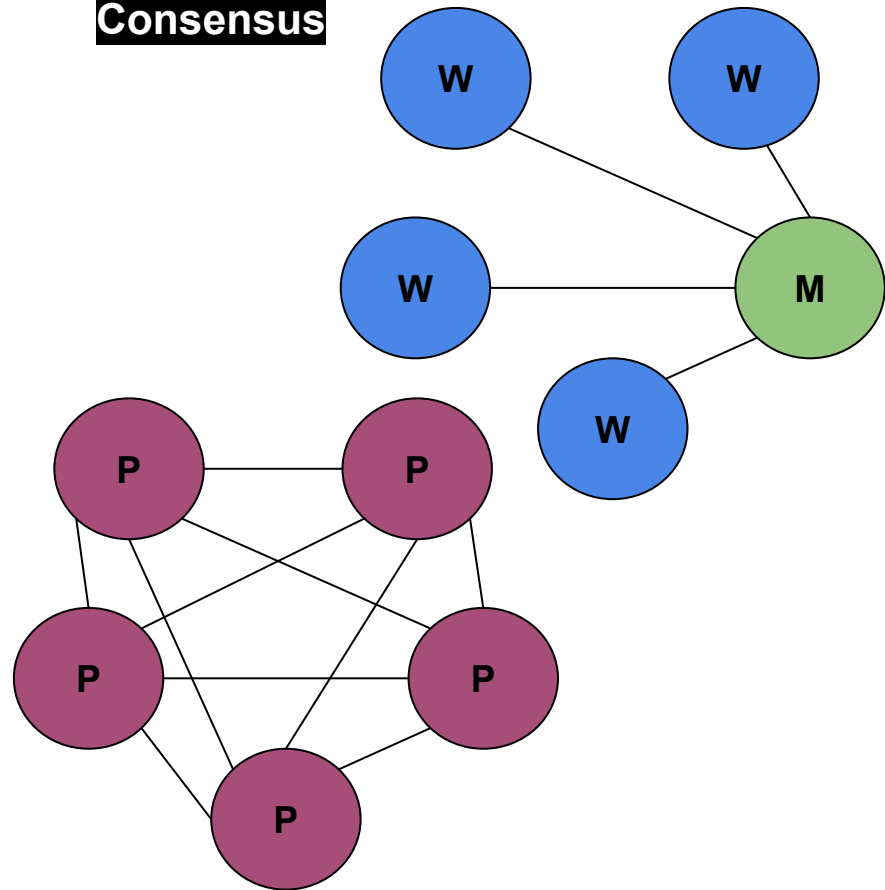
*How does P2P manage this?*

**A Leader**

One Peer acts as “main”

How do they determine  
which peer is the leader?

**Leader Election**



**SER 321**

**Consensus**

## *Algorithm Examples?*

**Proof of Work**

*Solve **this** to  
make a request*

*Really Complex*

*Computationally  
Expensive*

**2 Phase Commit**

*Ask Coordinator  
for permission*

*Commit on  
approval*

**RAFT**

*Log Replication*

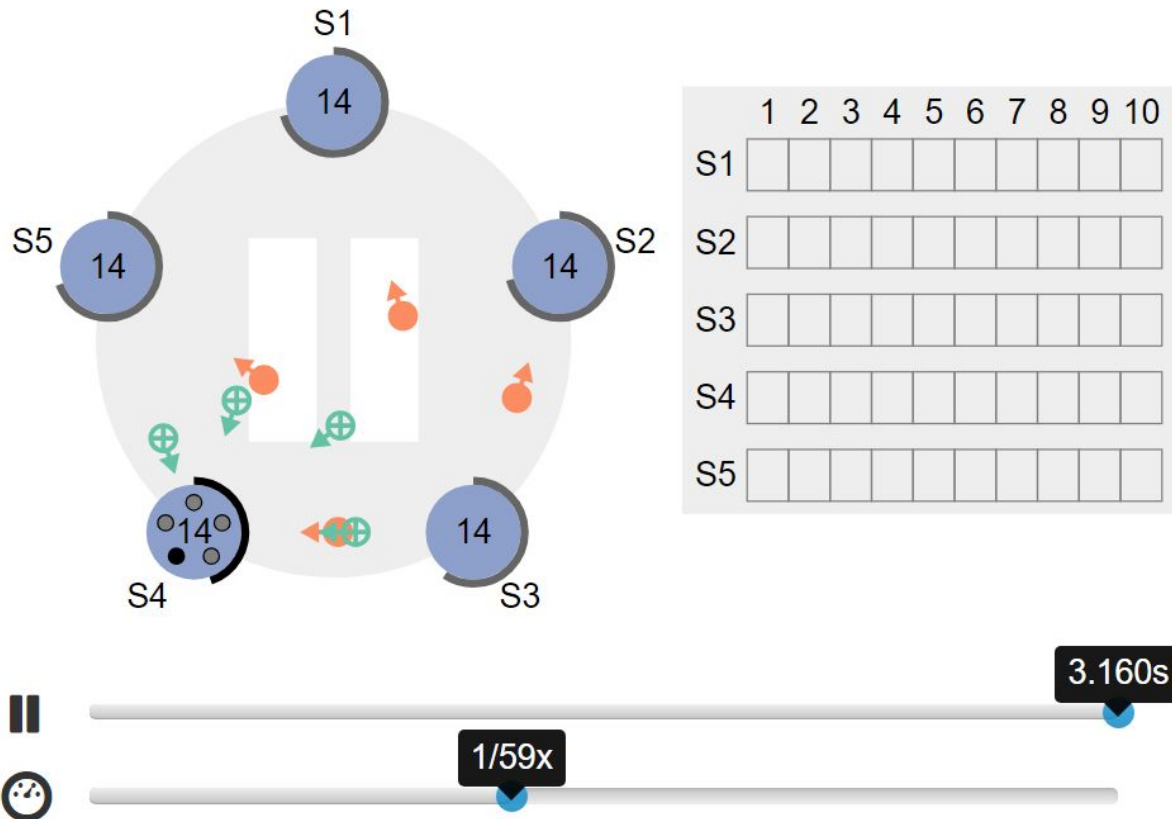
*Leader Election*

# How do you use consensus?

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RAFT

Let's look at the  
RAFT interactive for  
a **Log Replication**  
and a  
**Leader Election**  
example



RAFT

Check out the recording for the full walkthrough!

# Questions?

## Survey:

[https://bit.ly/asn\\_survey](https://bit.ly/asn_survey)



## Upcoming Events

### SI Sessions:

- Monday, November 13th 2023 at 4:00 pm MST
- Thursday, November 16th 2023 at 7:00 pm MST
- Sunday, November 19th 2023 at 7:00 pm MST
- Monday, November 20th 2023 at 4:00 pm MST

### Review Sessions:

- Survey is LIVE in the [#si\\_channel](#)
- Sunday, November 26th or Monday November 27th

# 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.

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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.

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1-

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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**

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[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.

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**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!

## Additional Resources

[CourRepo](#)

[Dining Philosophers Interactive](#)

[RAFT Interactive](#)