SER 321 C Session

SI Session

Sunday, June 23rd 2024

6:00 pm - 7:00 pm MST

Agenda

- Distribution Issues
- Node Structures
- Communication Walkthrough
- Consensus
  - Types
  - RAFT Example

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:

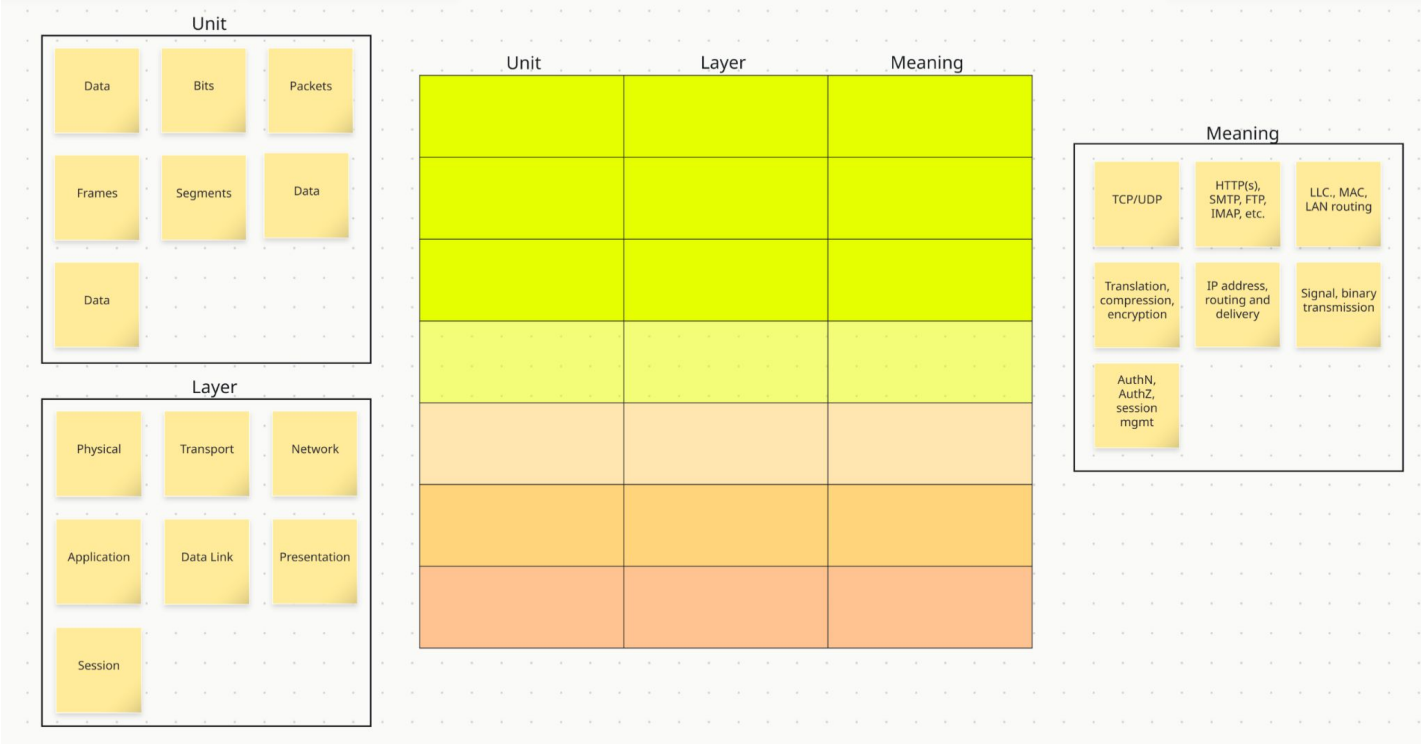
Zoom Features

Zoom Chat

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

SER 321
Distribution KWL

Let’s try something new!



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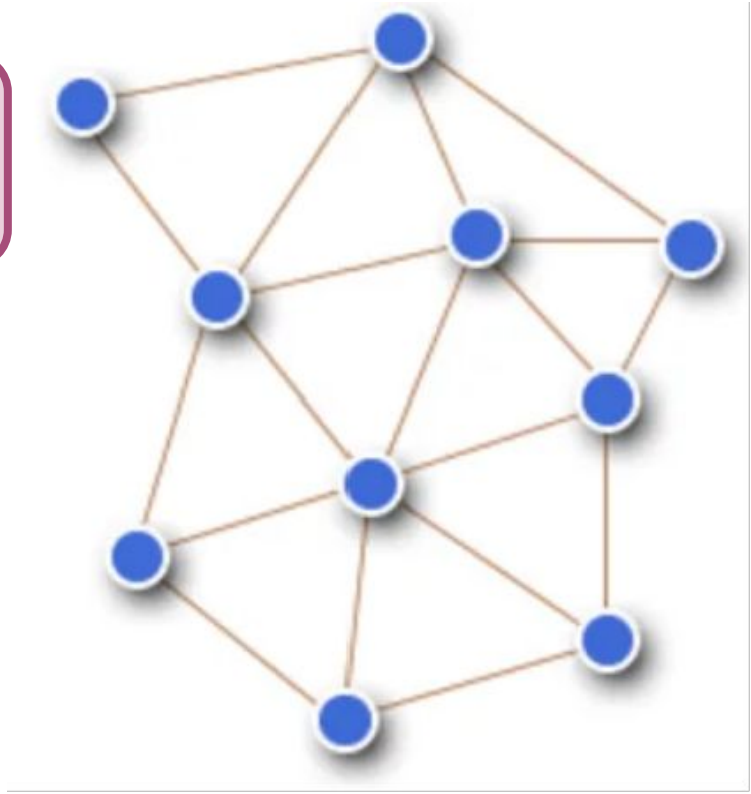
Distributed Systems

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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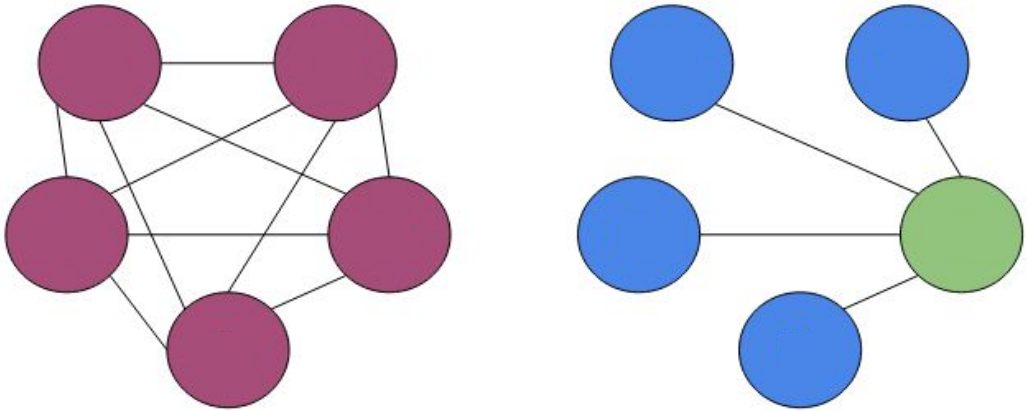
Distributed Systems

Main and Worker

Peer to Peer

Which is which?



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Distributed Systems

Main and Worker

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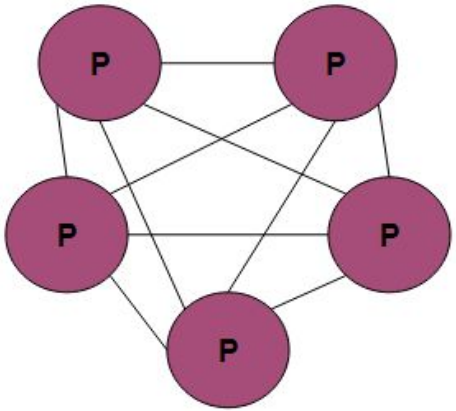
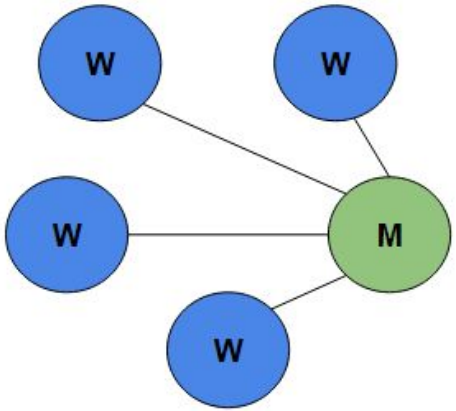
Which is which?

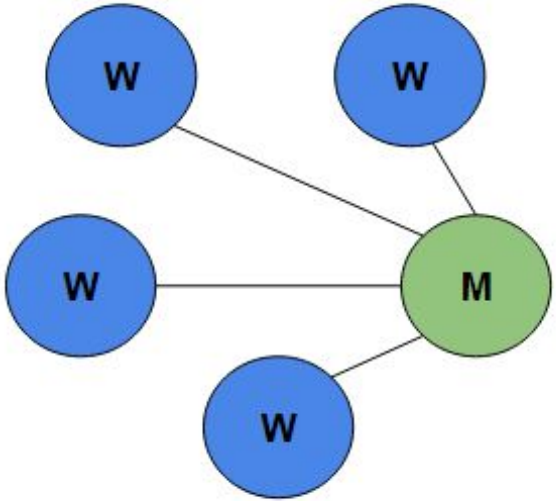
Peer to Peer





Main and Worker

Pros and Cons



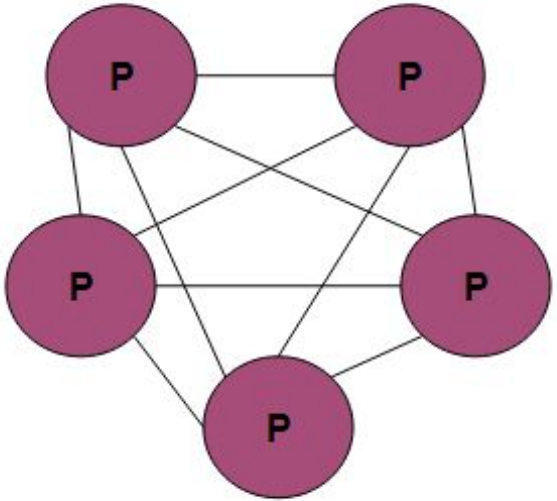
Pros:

- Straightforward setup
- Logic is centralized
- Communication is linear

Cons:

- Single point of failure

Pros and Cons



Pros:

- Peers can join or leave as needed
- Robust - no single point of failure

Cons:

- Communication is more *complex*
- Setup is not as straightforward
- Client connections are handled *differently*

We will cover this in a moment!

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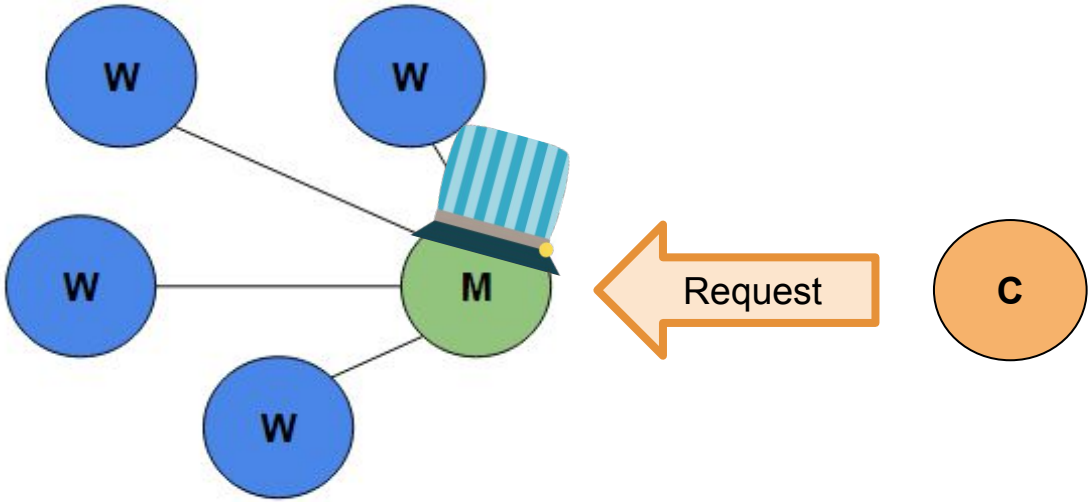
Distributed Systems

Process Flow!

DATA

Workers only do their task then report back



Main is like our server

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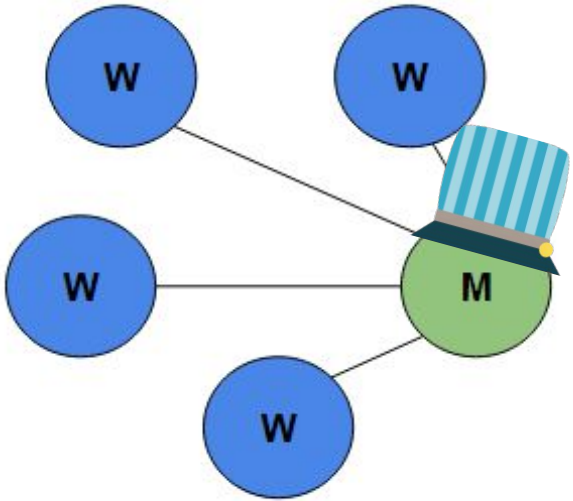
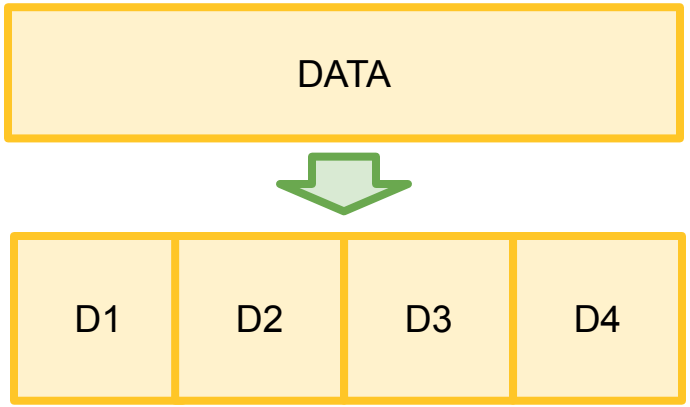
Process Flow!

Workers only do their task then report back





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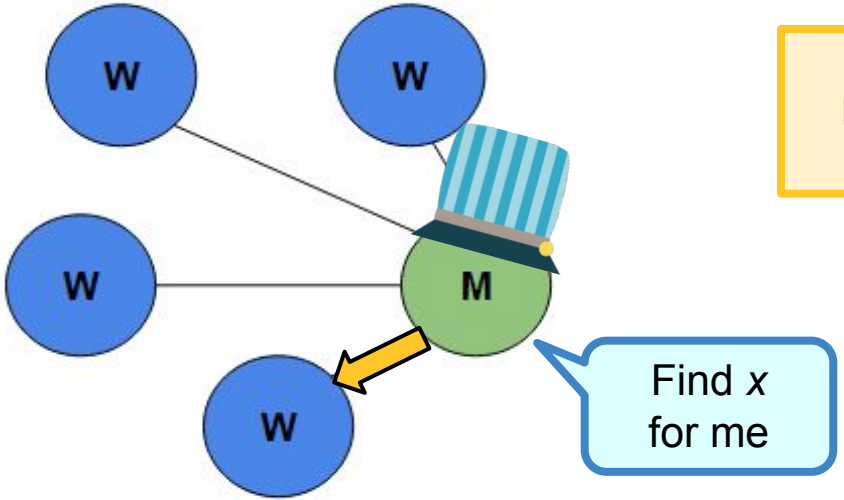
Distributed Systems

Process Flow!

DATA

D1	D2	D3	D4

Workers only do their task then report back



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Process Flow!

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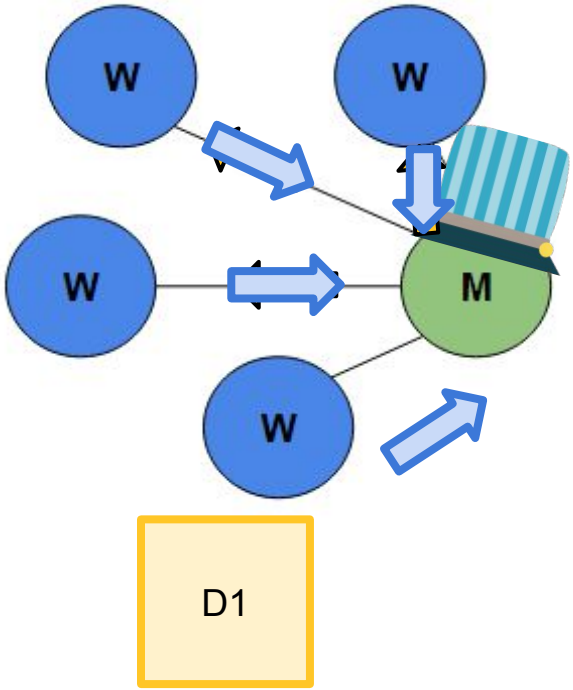

DATA

D1 | D2 | D3 | D4

D1 Result | D2 Result | D3 Result | D4 Result

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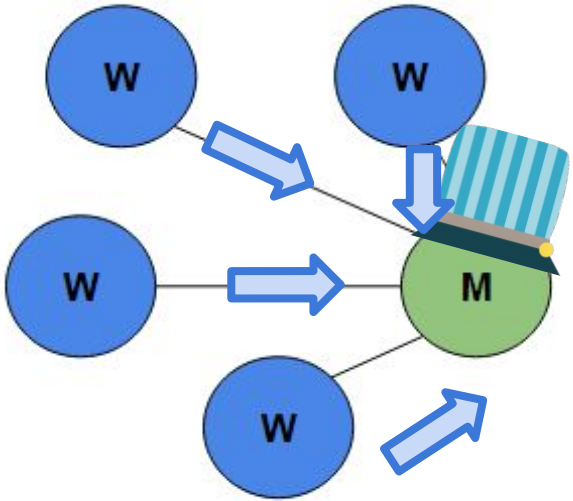
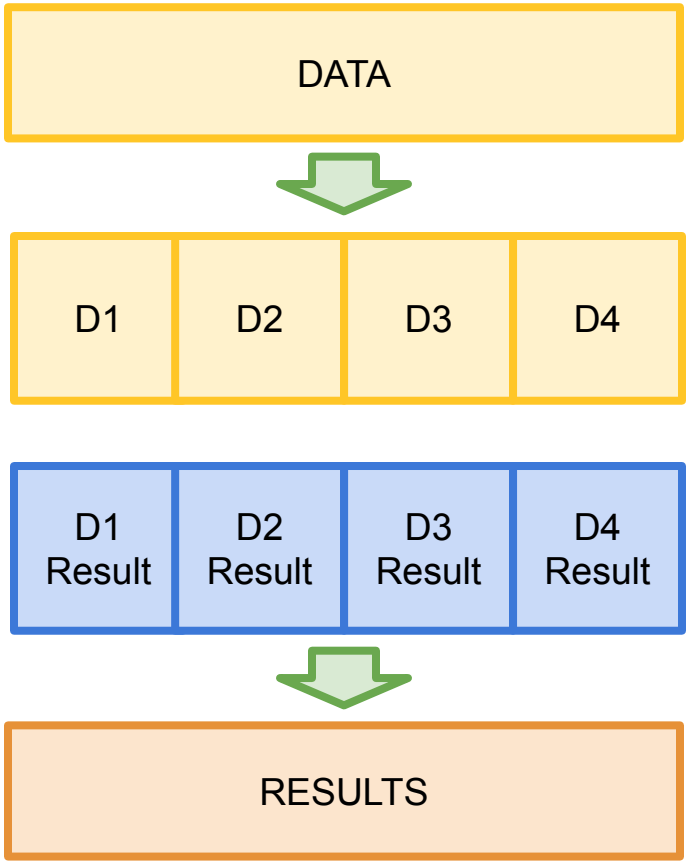
Distributed Systems

Process Flow!

Workers only do their task then report back





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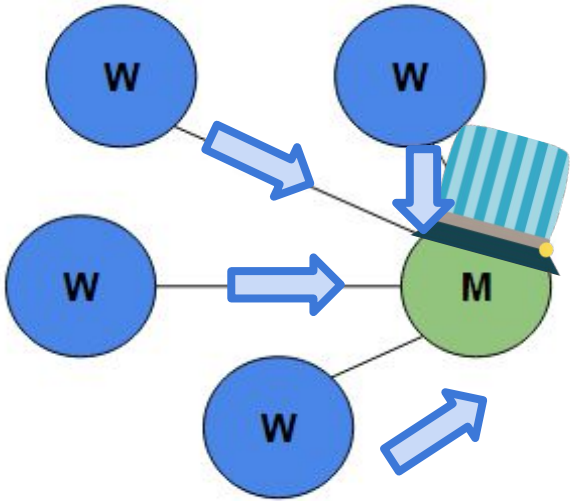
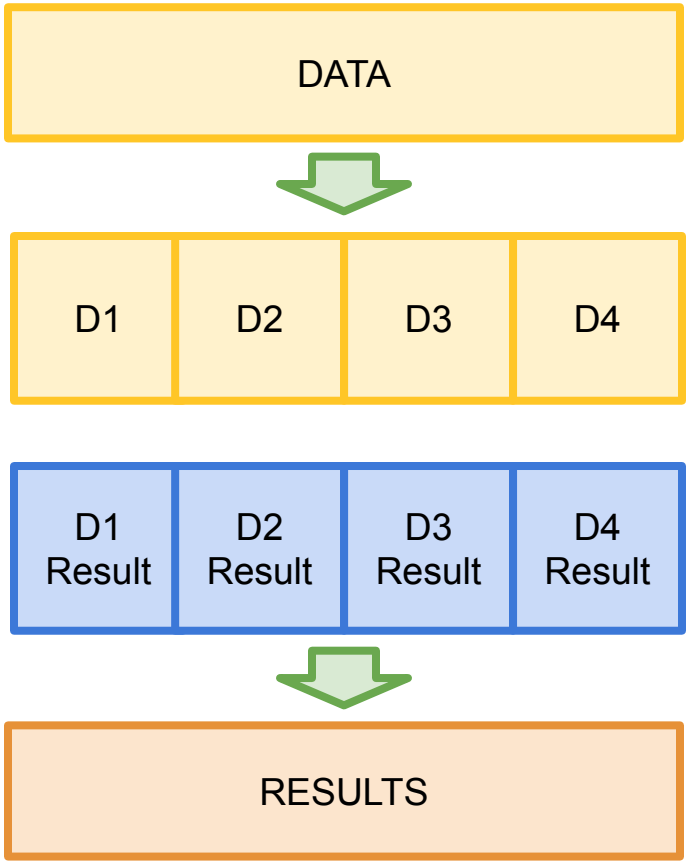
Does this look familiar?

How is this different from a parallel processing model?





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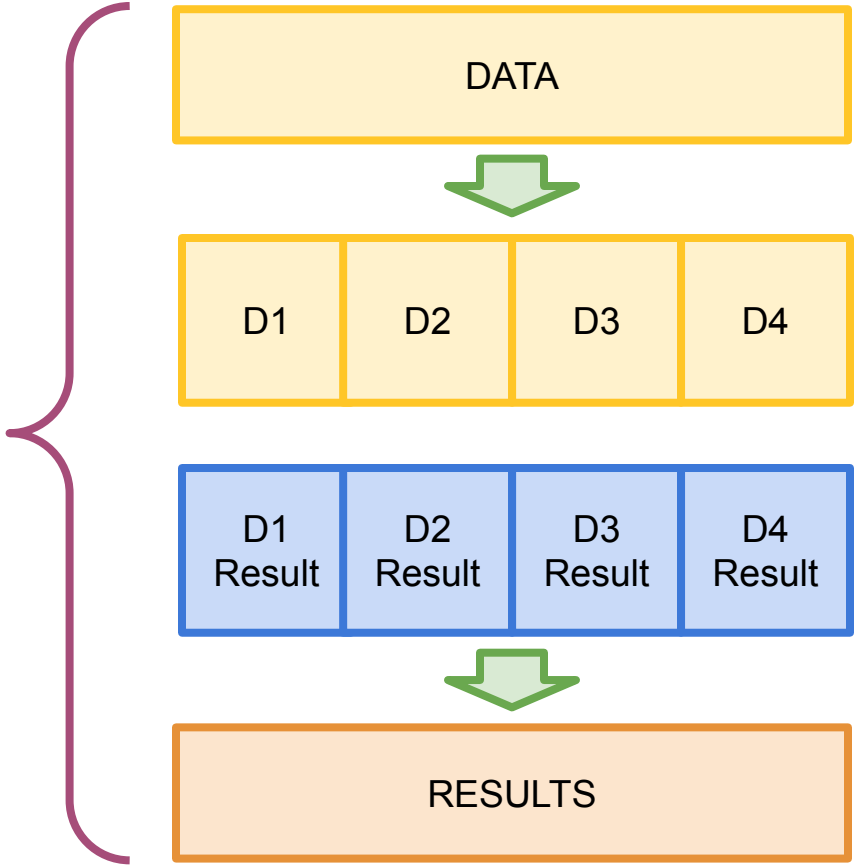
What about Peer to Peer?

Would this sequence *(the data handling)* change in the different structure?



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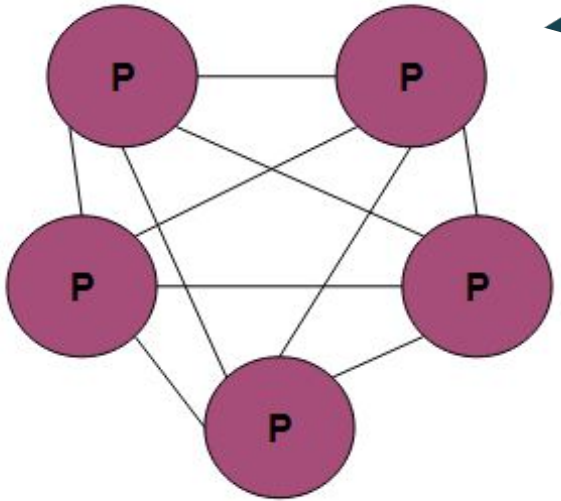
Distributed Systems

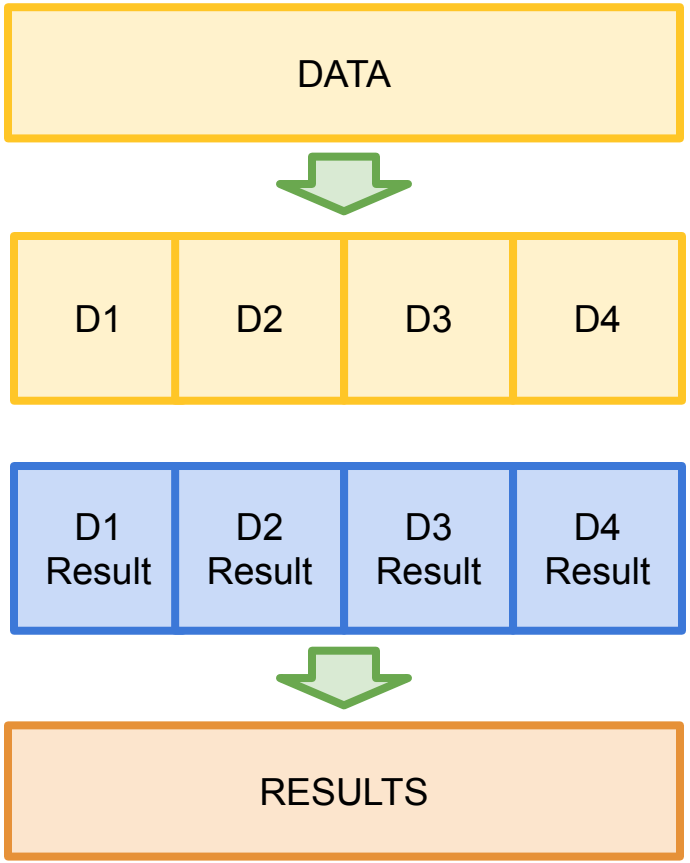
What about Peer to Peer?

We want someone to wear the conductor hat!

A ***LEADER***



How do we choose a leader?



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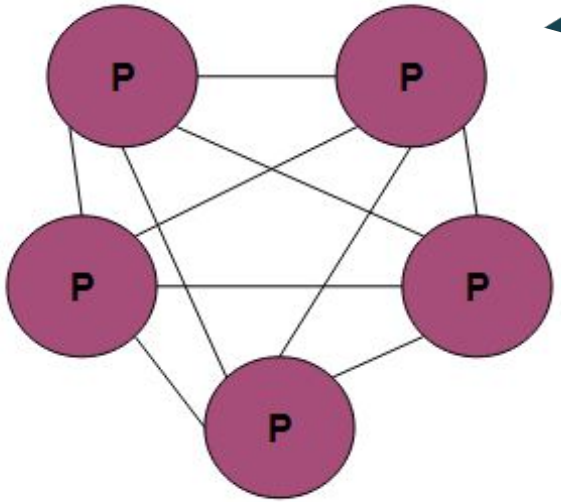

DATA

D1 | D2 | D3 | D4

D1 Result | D2 Result | D3 Result | D4 Result

RESULTS

Leader Election!

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Distributed Systems

What about Peer to Peer?

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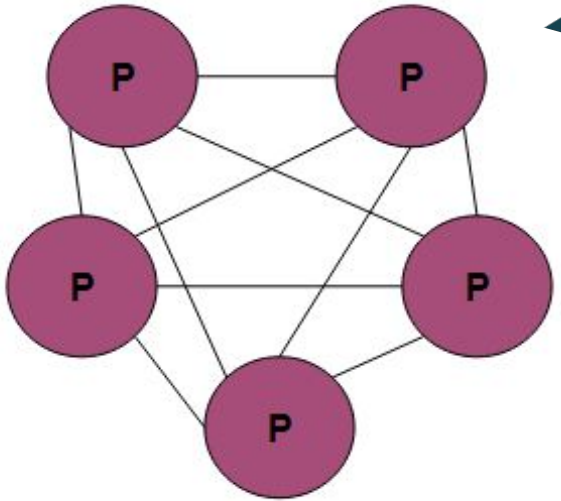
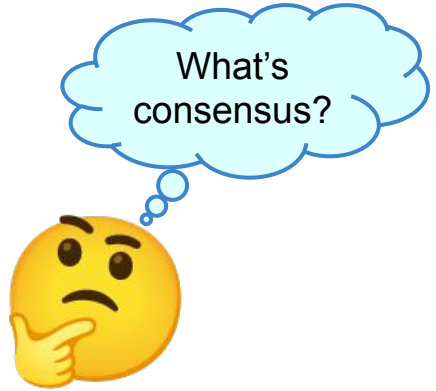
A ***LEADER***



Leader Election!

Type of ***CONSENSUS***



"General agreement or trust amongst a group"

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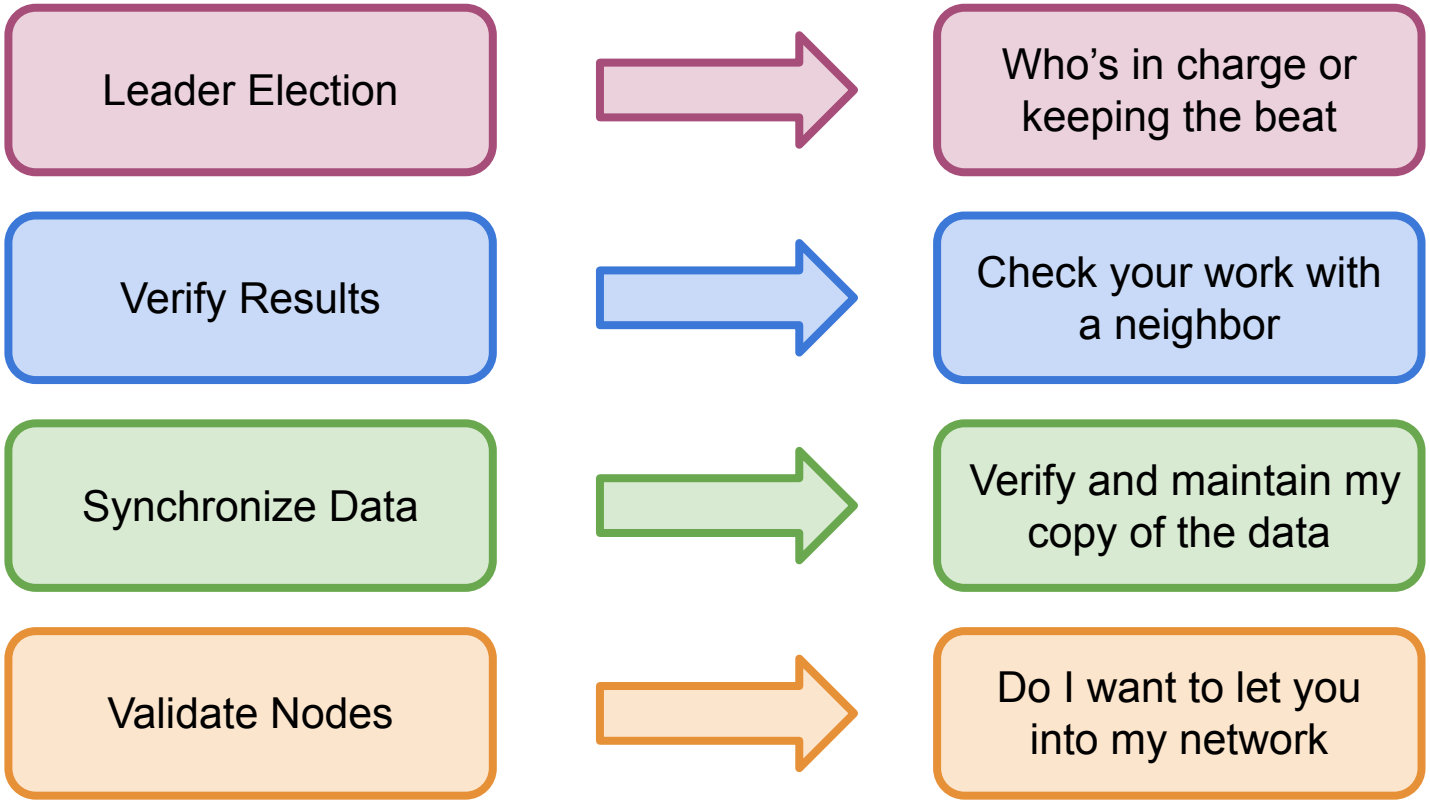
Consensus

"General agreement or trust amongst a group"

Types of Consensus?



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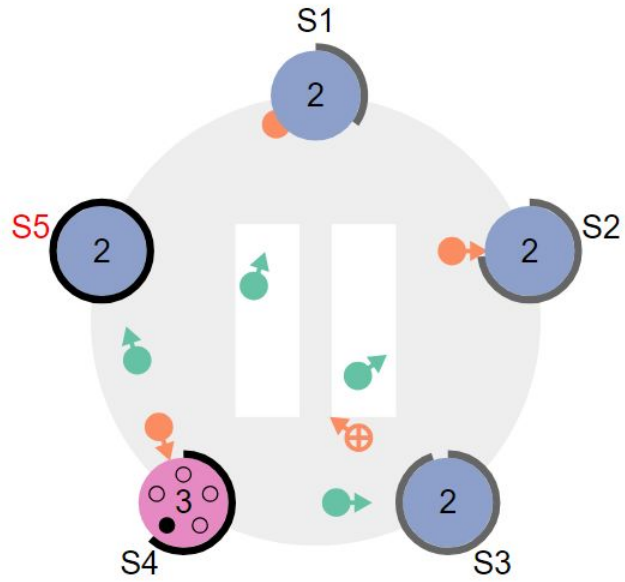
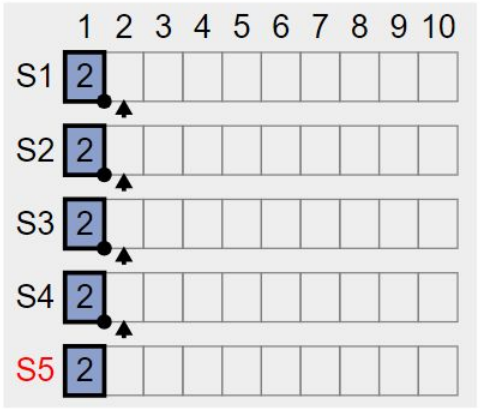
RAFT

RAFT is a great consensus example!

Leader Election

Log Replication





The Secret Lives of Data is a different visualization of Raft. It's more guided and less interactive, so it may be a gentler starting point.

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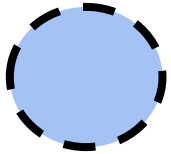
RAFT

Leader Election

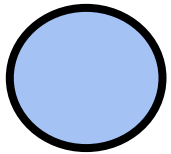
Nodes have 3 states:

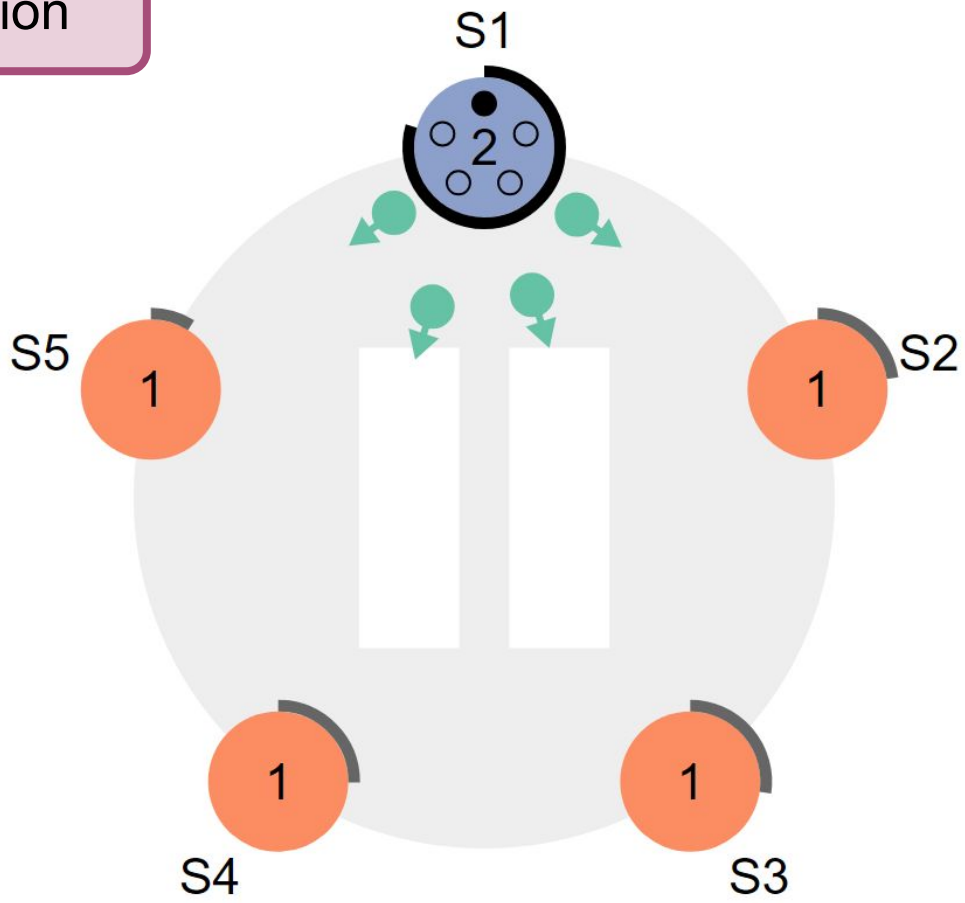
Follower

Candidate



Leader





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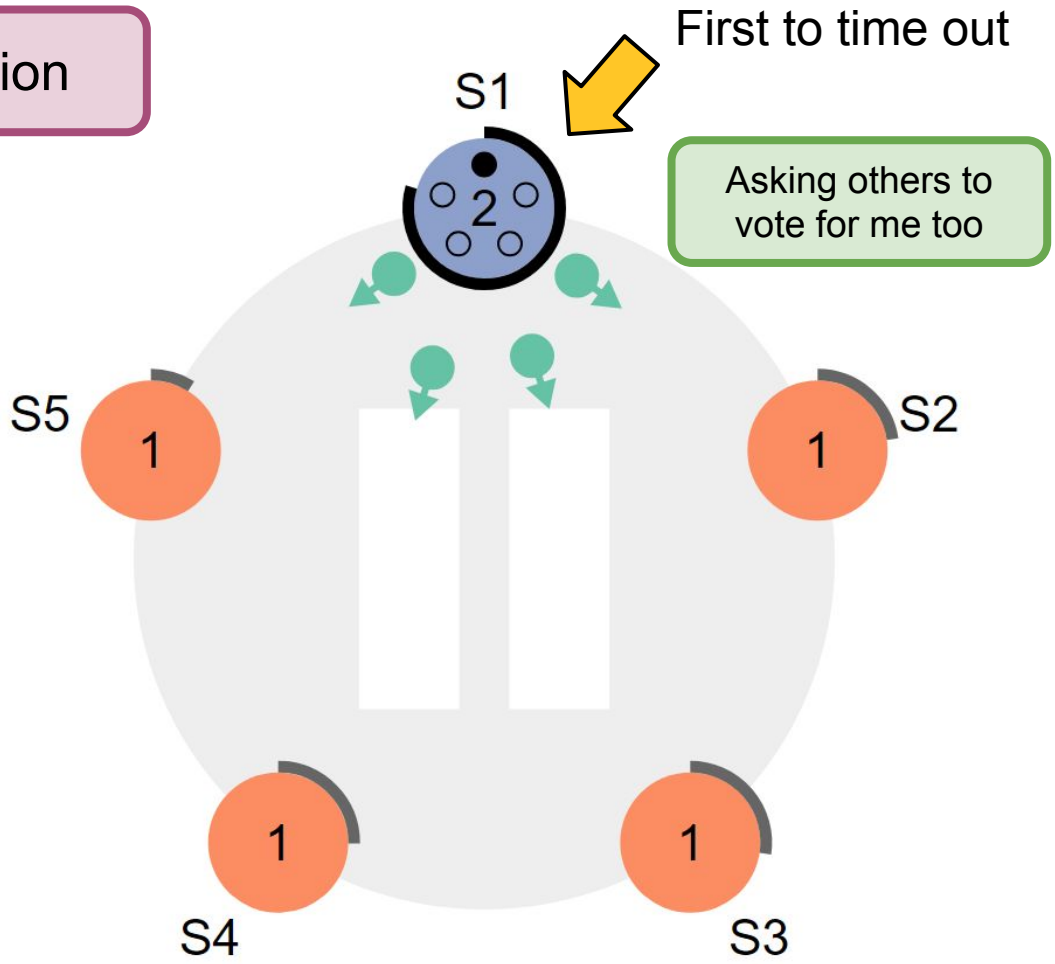
RAFT

Leader Election

This is the first election



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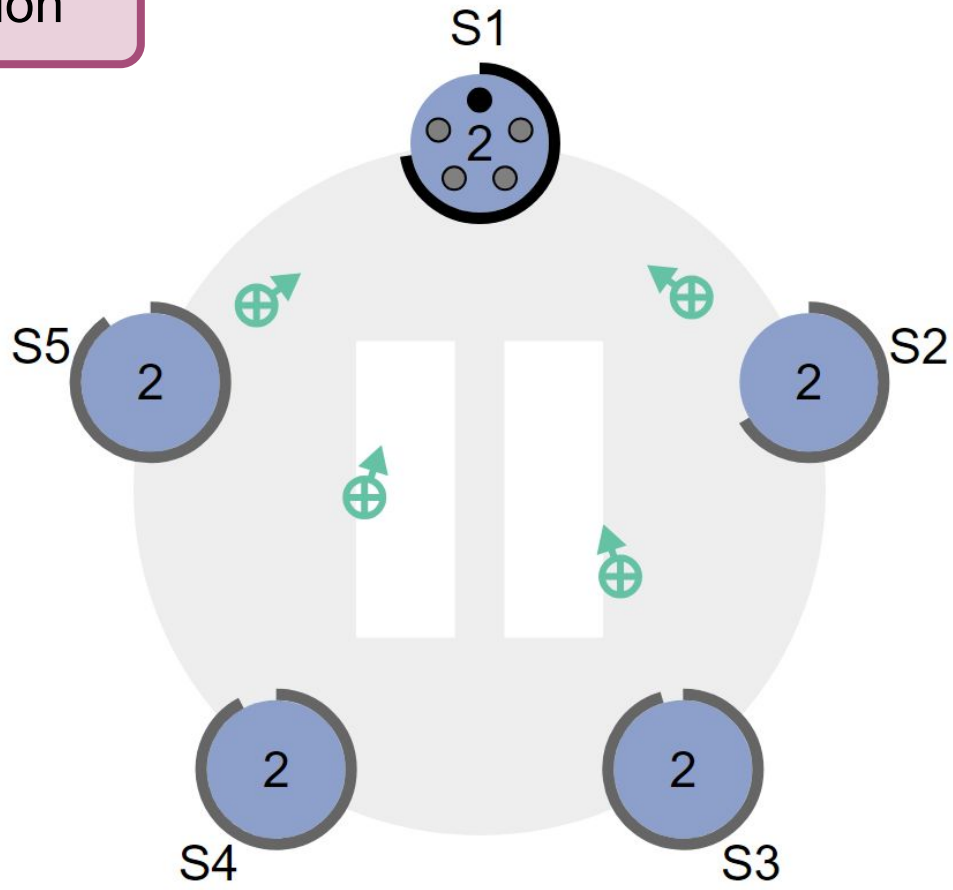
RAFT

Leader Election

Other nodes said sure whatever



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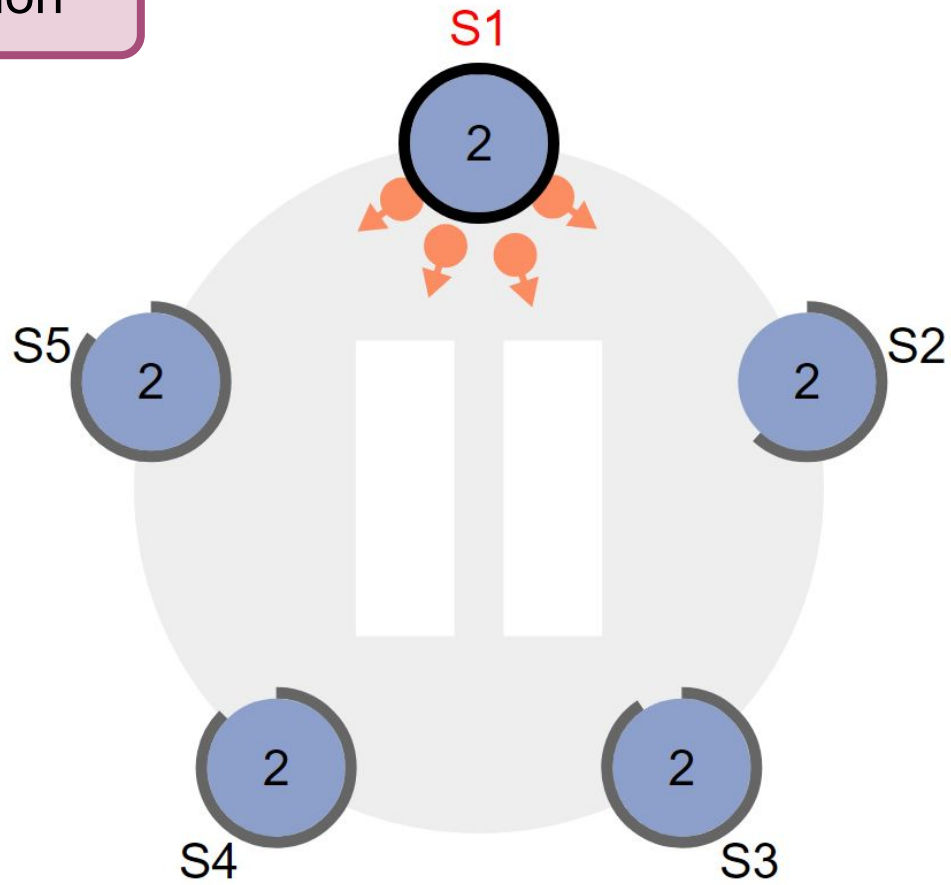
RAFT

Leader Election

Now confirmed as Leader



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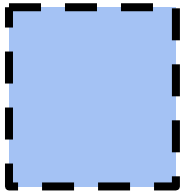
RAFT

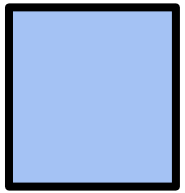
Log Replication

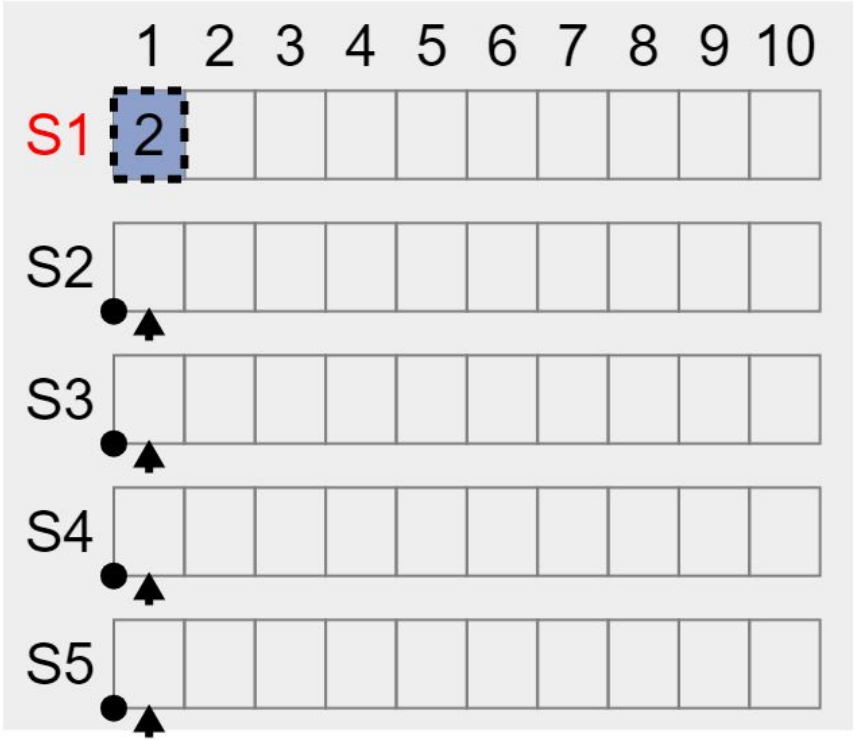
Same Pattern!

Candidate



Added





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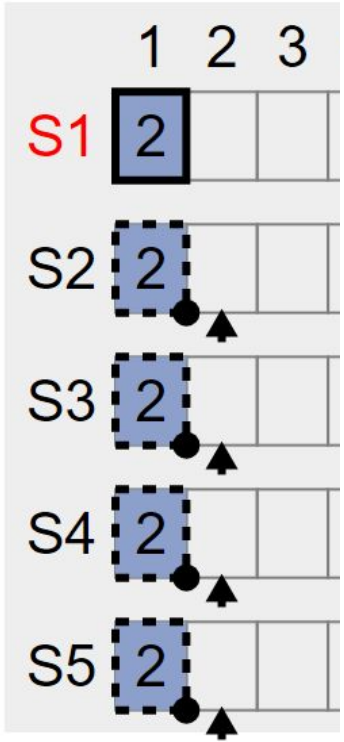
RAFT

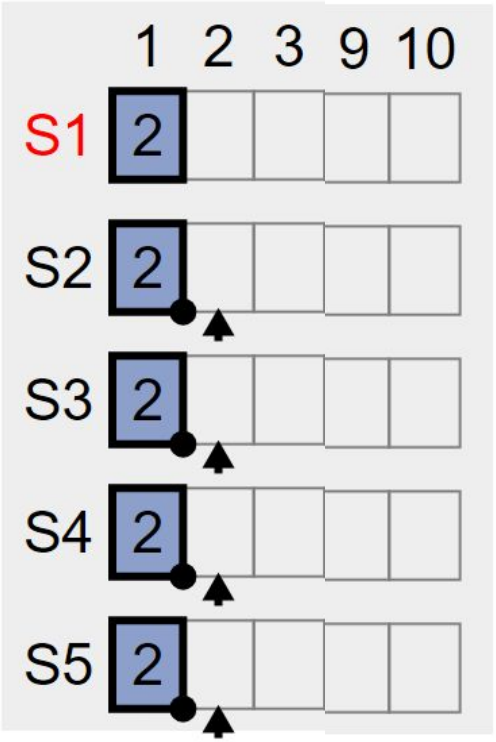
Log Replication

Same Pattern!

Candidate

Added





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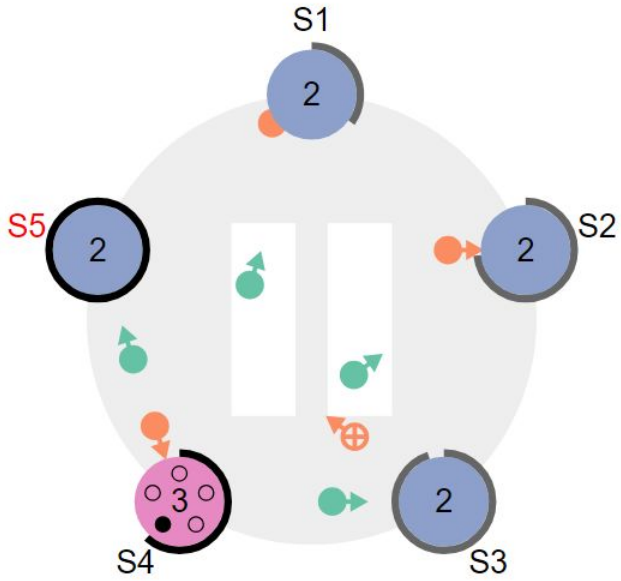
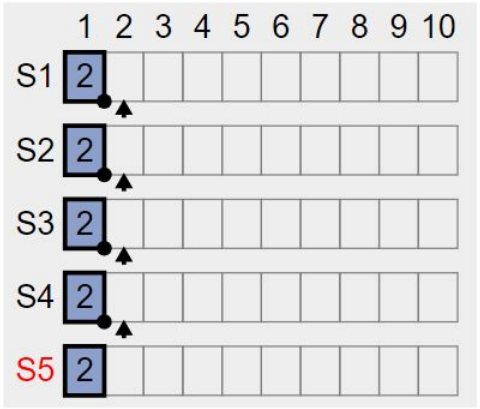
RAFT

RAFT





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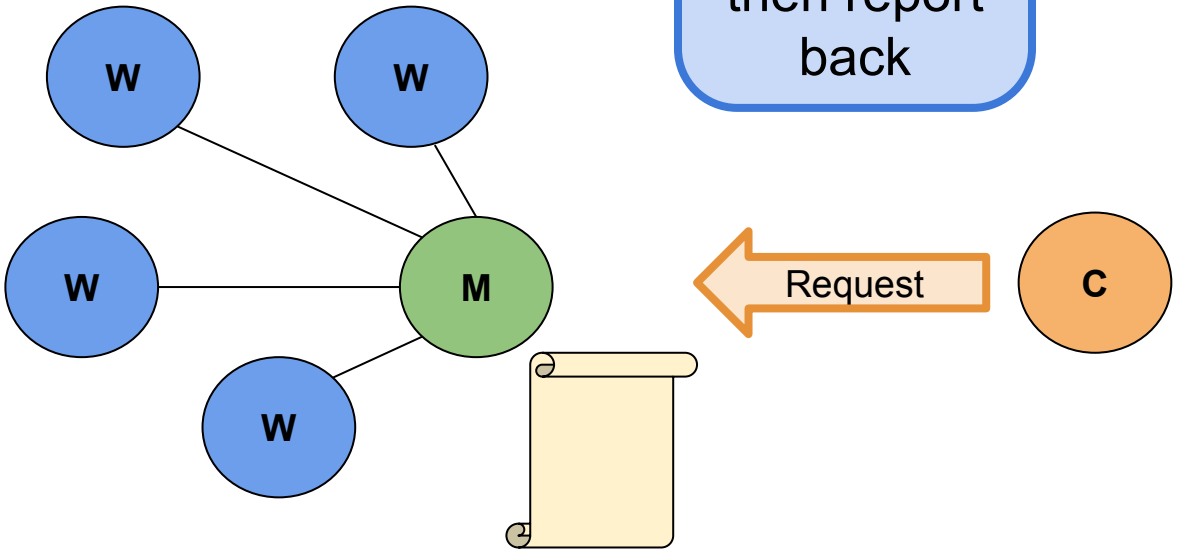
Communication

Workers only do their task then report back



Main is in charge of everything

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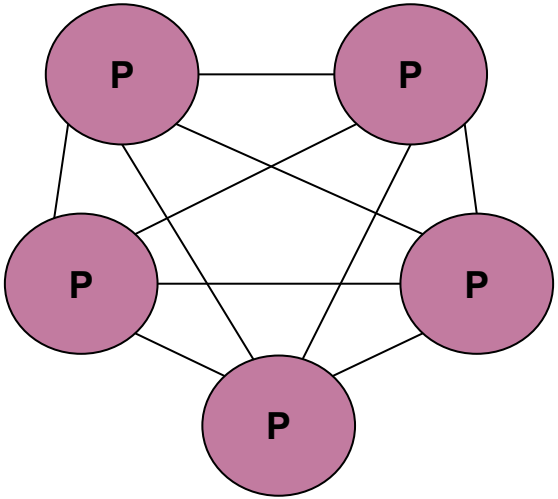
Communication

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



Request is sent to the *current leader*

or

Peer that received the request *acts as the leader*

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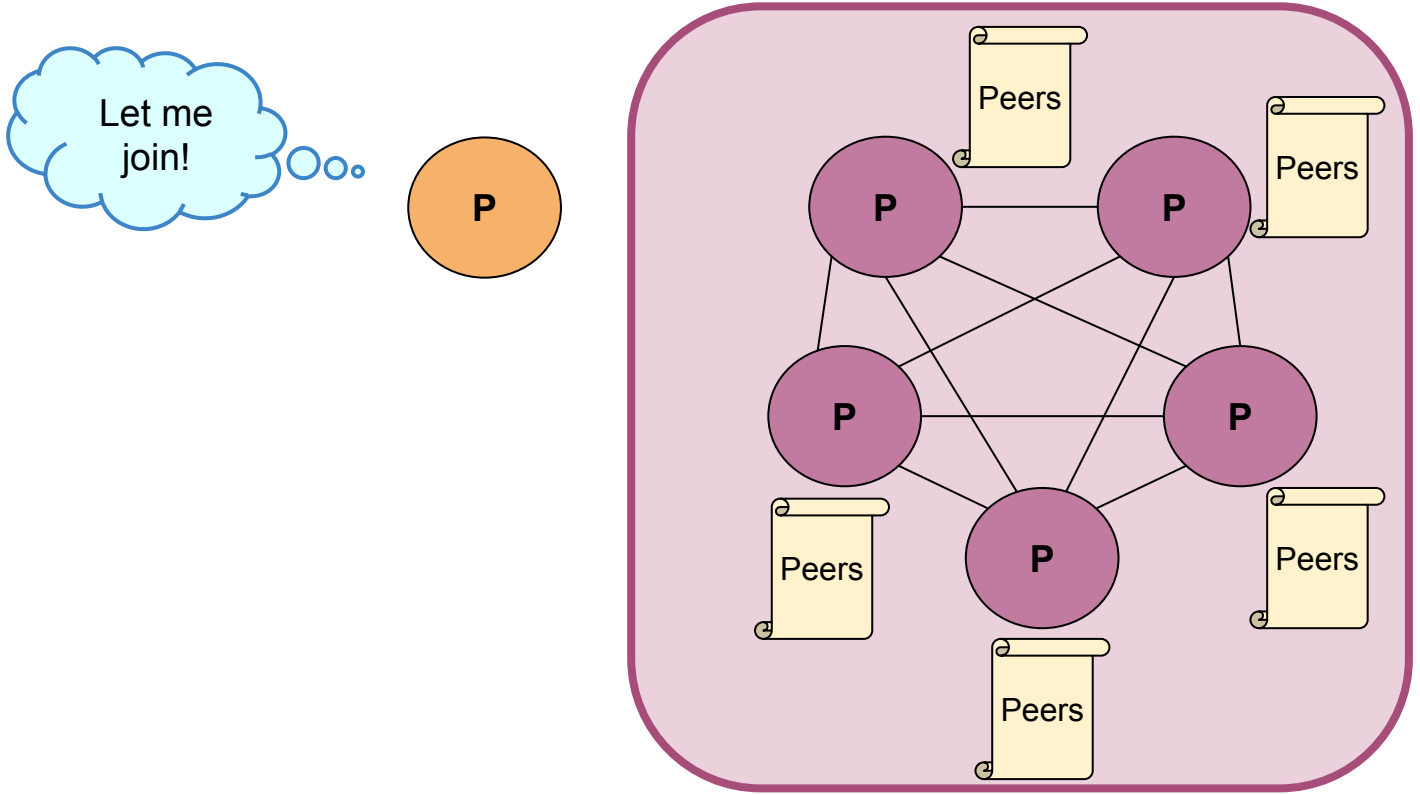
Communication

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



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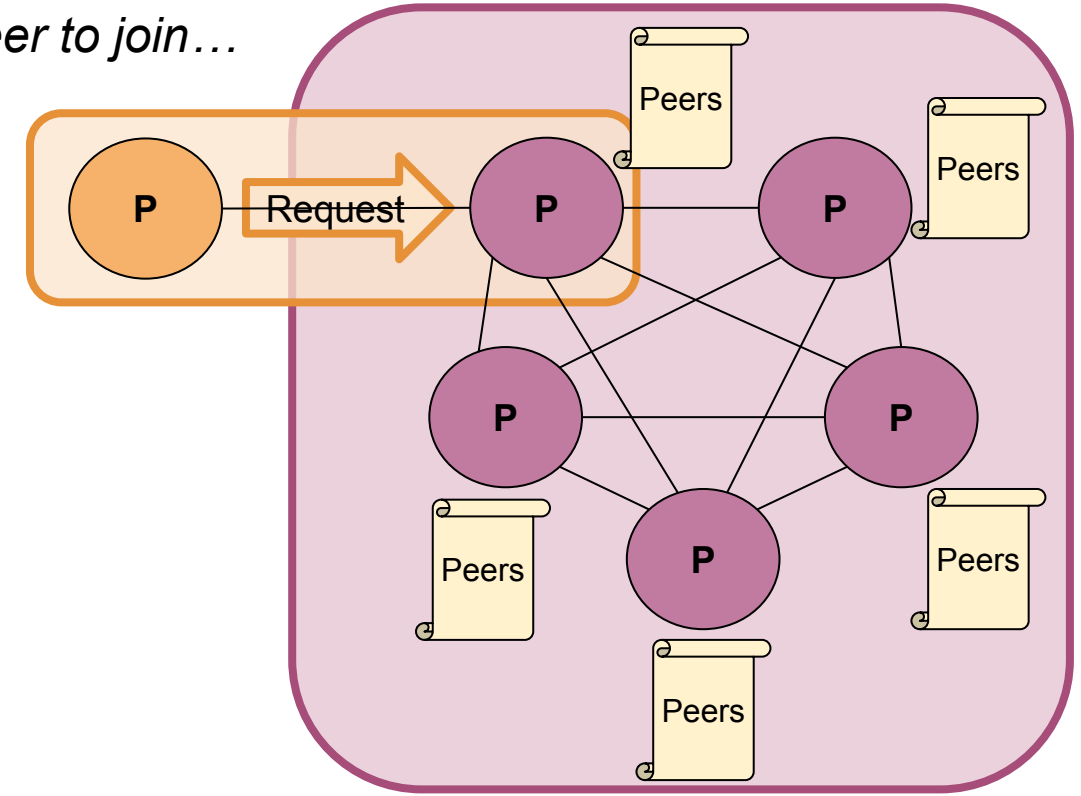
Communication

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

Assuming we want to allow the peer to join…

Is that all?



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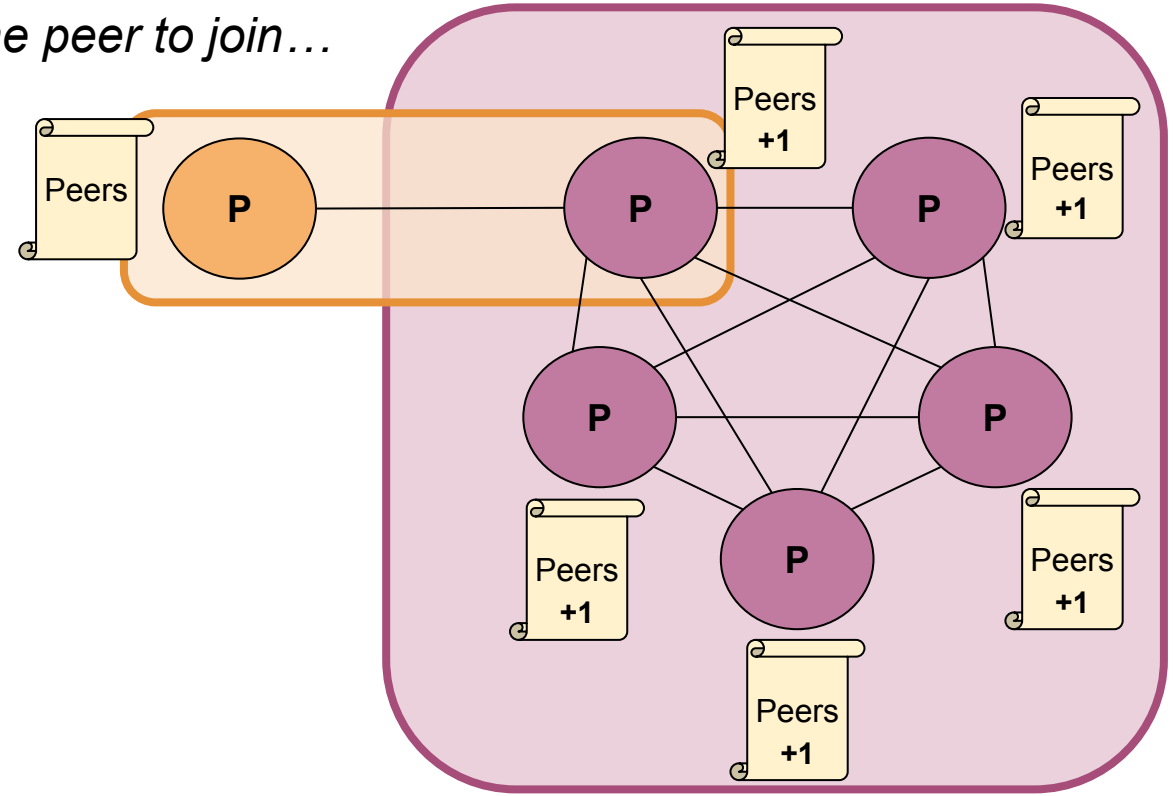
Communication

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

Assuming we want to allow the peer to join…

Three Additional Steps:

1.
2.
3.



SER 321

Scratch Space

Questions?

Survey:

http://bit.ly/ASN2324

36

Upcoming Events

SI Sessions:

- Monday, June 24th at 6:00 pm MST
- Thursday, June 27th at 6:00 pm MST
- Sunday, June 30th at 6:00 pm MST

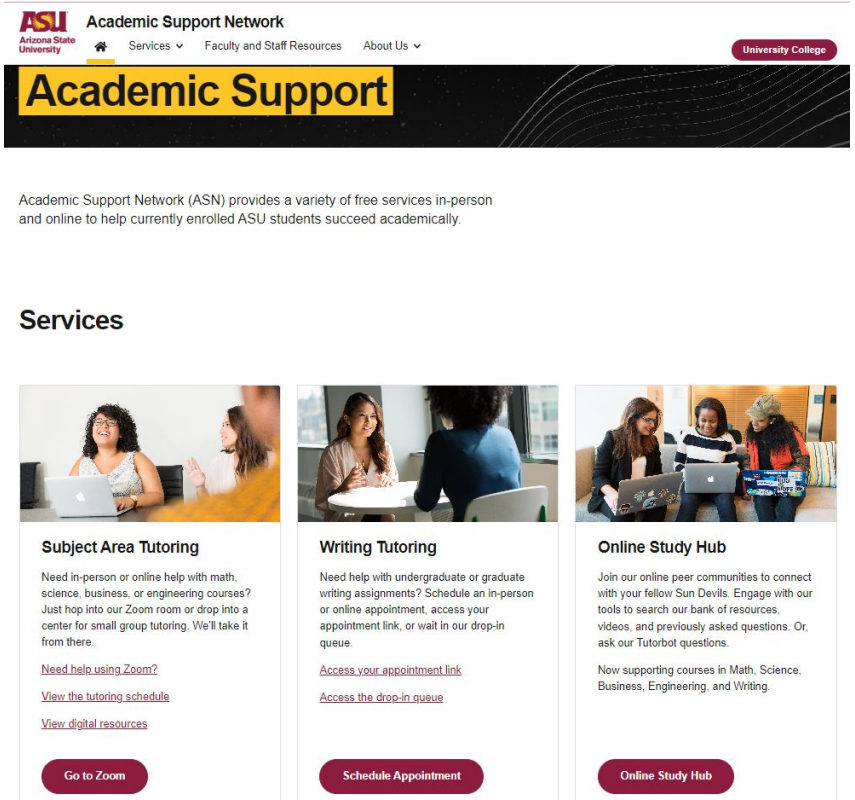
Review Sessions:

- 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

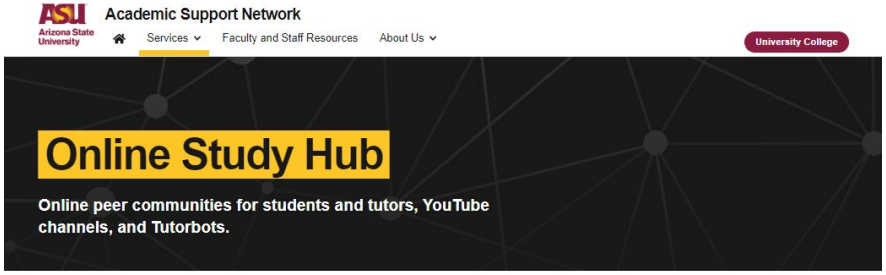


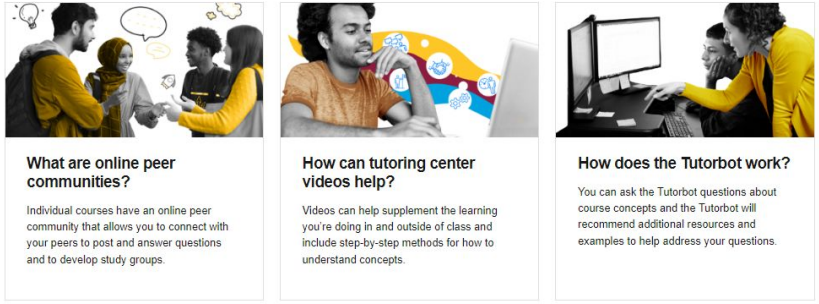
1. **Click on ‘Go to Zoom’ to log onto our Online Tutoring Center.**
2. **Click on ‘View the tutoring schedule’ to see when tutors are available for specific courses.**

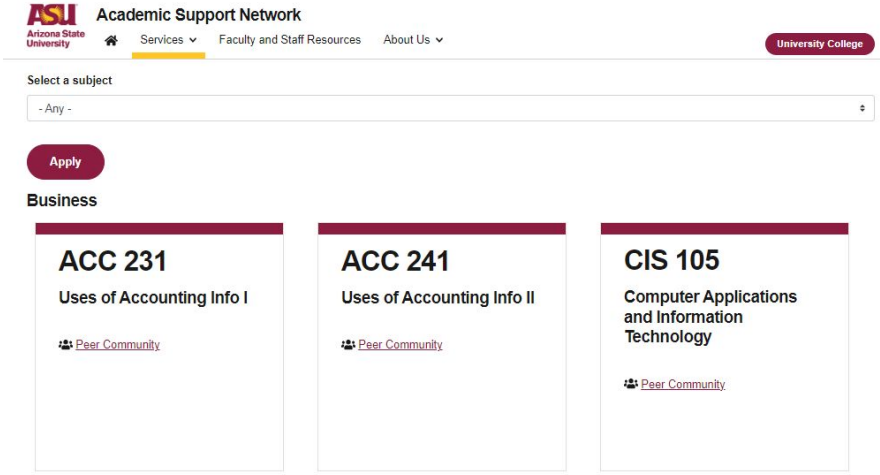
More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



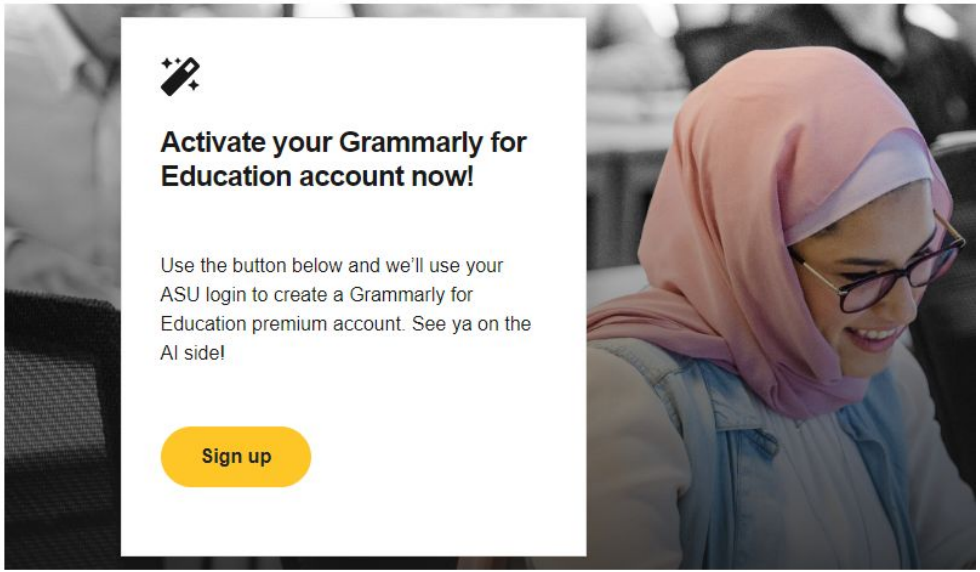




Don't forget to check out the Online Study Hub for additional resources!

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