SER 321 A Session

SI Session

Thursday, February 13th 2025

7:00 pm - 8:00 pm MST

Agenda

- Protobuf Examination
- Distributed Systems Overview
- Parallel vs. Distributed Processing
- Distributed Structures
- Consensus

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

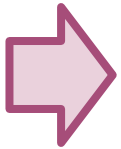
- Use the chat feature to interact with the presenter and respond to presenter's questions.
- Annotations are encouraged

Serialization/ProtocolBuffers

SER 321

Protobuf Examination

Operation Protocol for ***ProtocolBuffers*** in the example repo



Protobuf Lecture & Walkthrough

```
syntax = "proto2";

package operation;

option java_package = "buffers";
option java_outer_classname = "OperationProtos";

message Operation {
  optional string val1 = 1;
  optional string val2 = 2;
  optional int32 base = 3;
  enum OperationType {
    ADD = 0;
    SUB = 1;
    MUL = 2;
    DIV = 3;
  }
  enum ResponseType {
    JSON = 0;
    STRING = 1;
  }
  optional OperationType operationType = 4 [default = ADD];
  optional ResponseType responseType = 5 [default = JSON];

}
```

Serialization/ProtocolBuffers

SER 321

Protobuf Examination

What **CLASS** would you use for this?

What **FIELDS** do you add for use?

Can you change the Protobufs for the Assignments?

Protobuf Lecture & Walkthrough

```
syntax = "proto2";

package operation;

option java_package = "buffers";
option java_outer_classname = "OperationProtos";

message Operation {
  optional string val1 = 1;
  optional string val2 = 2;
  optional int32 base = 3;
  enum OperationType {
    ADD = 0;
    SUB = 1;
    MUL = 2;
    DIV = 3;
  }
  enum ResponseType {
    JSON = 0;
    STRING = 1;
  }
  optional OperationType operationType = 4 [default = ADD];
  optional ResponseType responseType = 5 [default = JSON];
}
```

Check out the recording for the solution!

Serialization/ProtocolBuffers

SER 321

Protobuf Examination

Let’s request “7 x 8” in Base 10:

Solution

Protobuf Lecture & Walkthrough

```
syntax = "proto2";

package operation;

option java_package = "buffers";
option java_outer_classname = "OperationProtos";

message Operation {
  optional string val1 = 1;
  optional string val2 = 2;
  optional int32 base = 3;
  enum OperationType {
    ADD = 0;
    SUB = 1;
    MUL = 2;
    DIV = 3;
  }
  enum ResponseType {
    JSON = 0;
    STRING = 1;
  }
  optional OperationType operationType = 4 [default = ADD];
  optional ResponseType responseType = 5 [default = JSON];
}
```

Check out the recording for the solution!

Serialization/ProtocolBuffers

SER 321

Protobuf Examination

As the Server, how would you determine the requested operation type?

```
Operation request =
                Operation.parseDelimitedFrom(in);
```

Solution

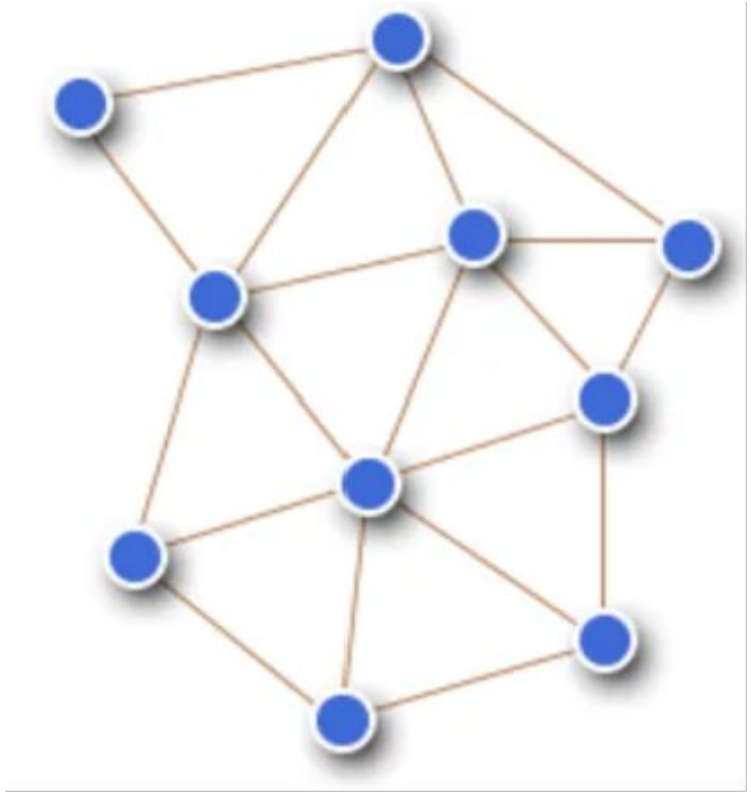
Protobuf Lecture & Walkthrough

```
syntax = "proto2";

package operation;

option java_package = "buffers";
option java_outer_classname = "OperationProtos";

message Operation {
  optional string val1 = 1;
  optional string val2 = 2;
  optional int32 base = 3;
  enum OperationType {
    ADD = 0;
    SUB = 1;
    MUL = 2;
    DIV = 3;
  }
  enum ResponseType {
    JSON = 0;
    STRING = 1;
  }
  optional OperationType operationType = 4 [default = ADD];
  optional ResponseType responseType = 5 [default = JSON];
}
```

Check out the recording for the solution!

SER 321
Distributed Systems

What do we mean by
"Distributed Systems"
or
"Distributed Algorithms"?

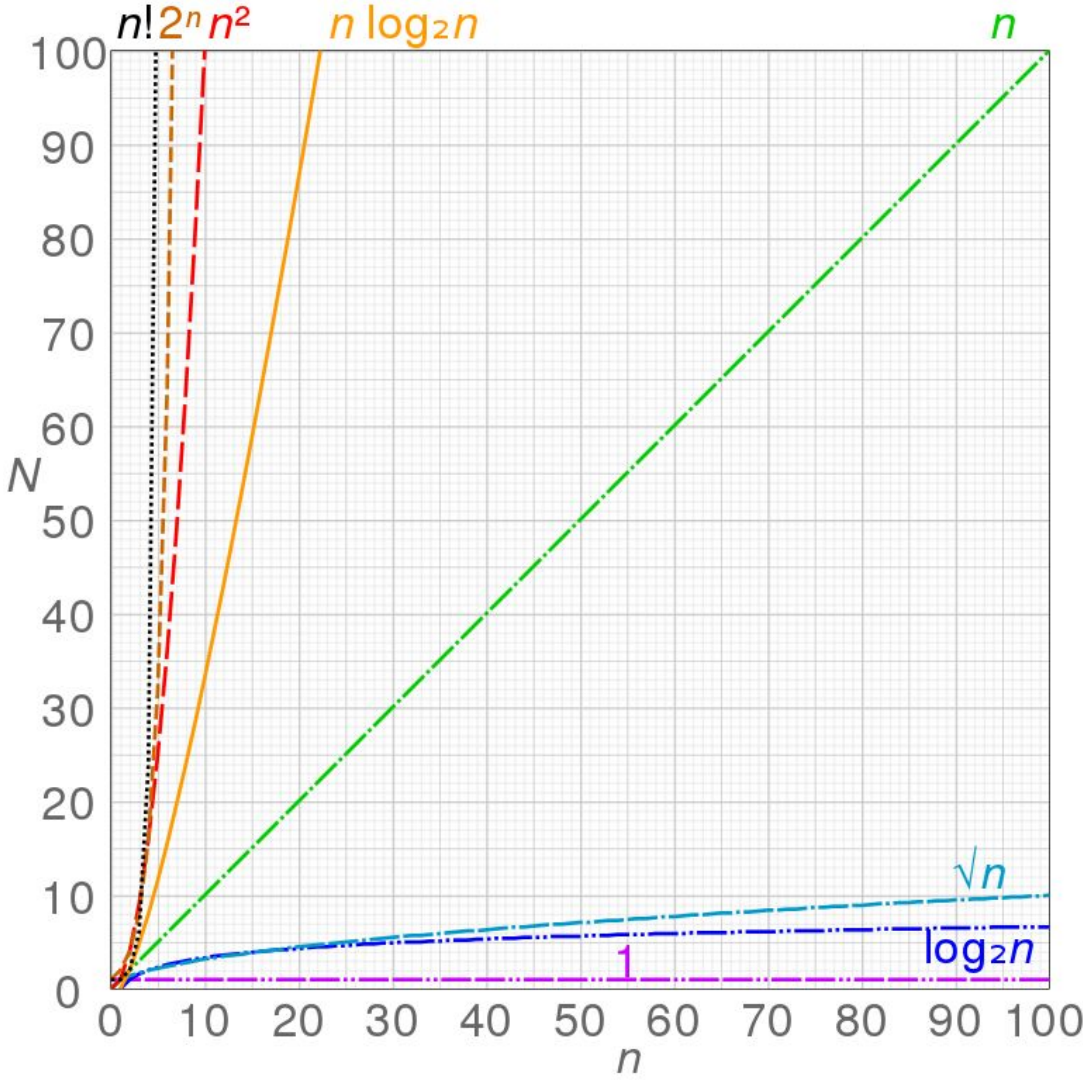


Check out the recording for the discussion!

SER 321
Distributed Systems

When should we *consider* distributing?

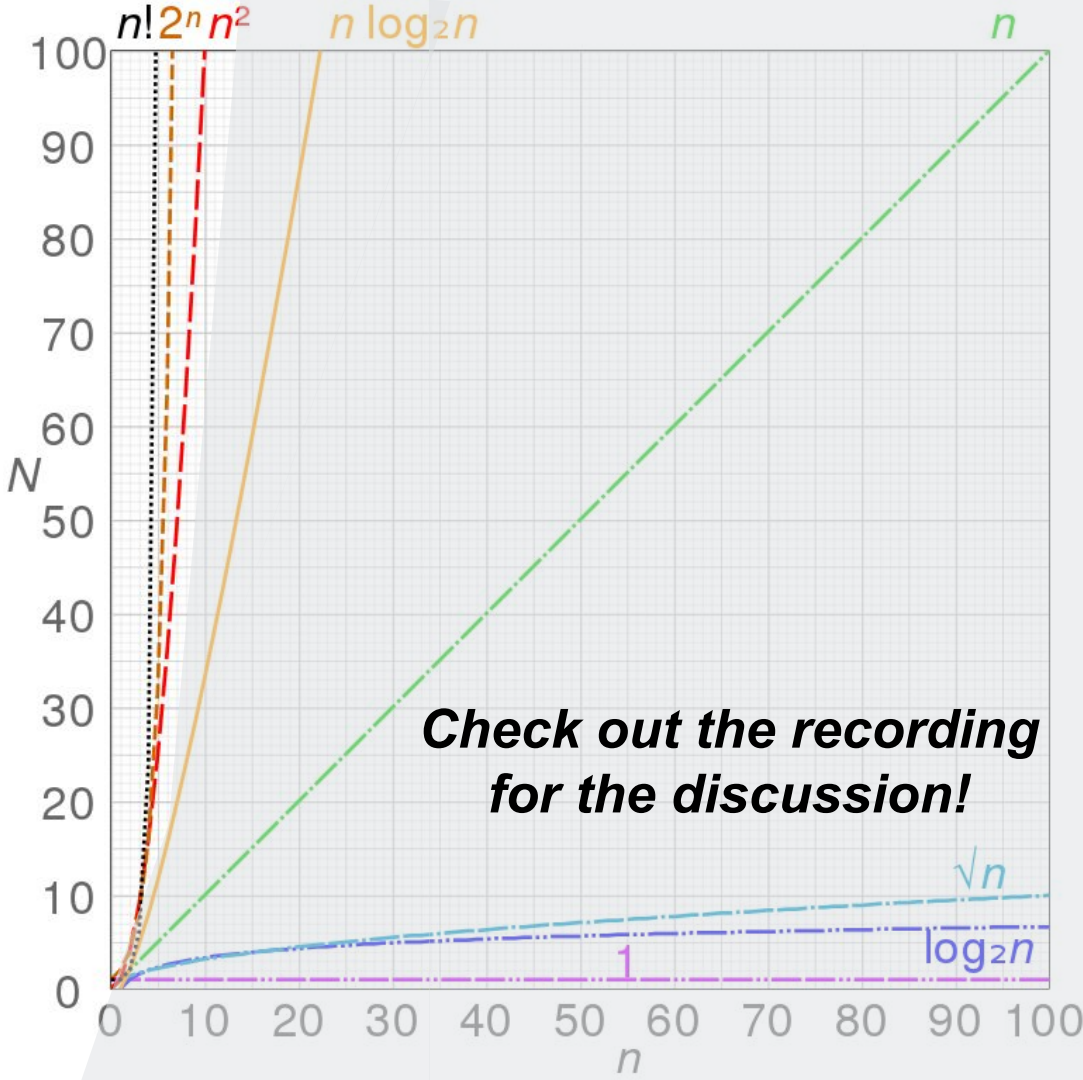
Check out the recording for the discussion!



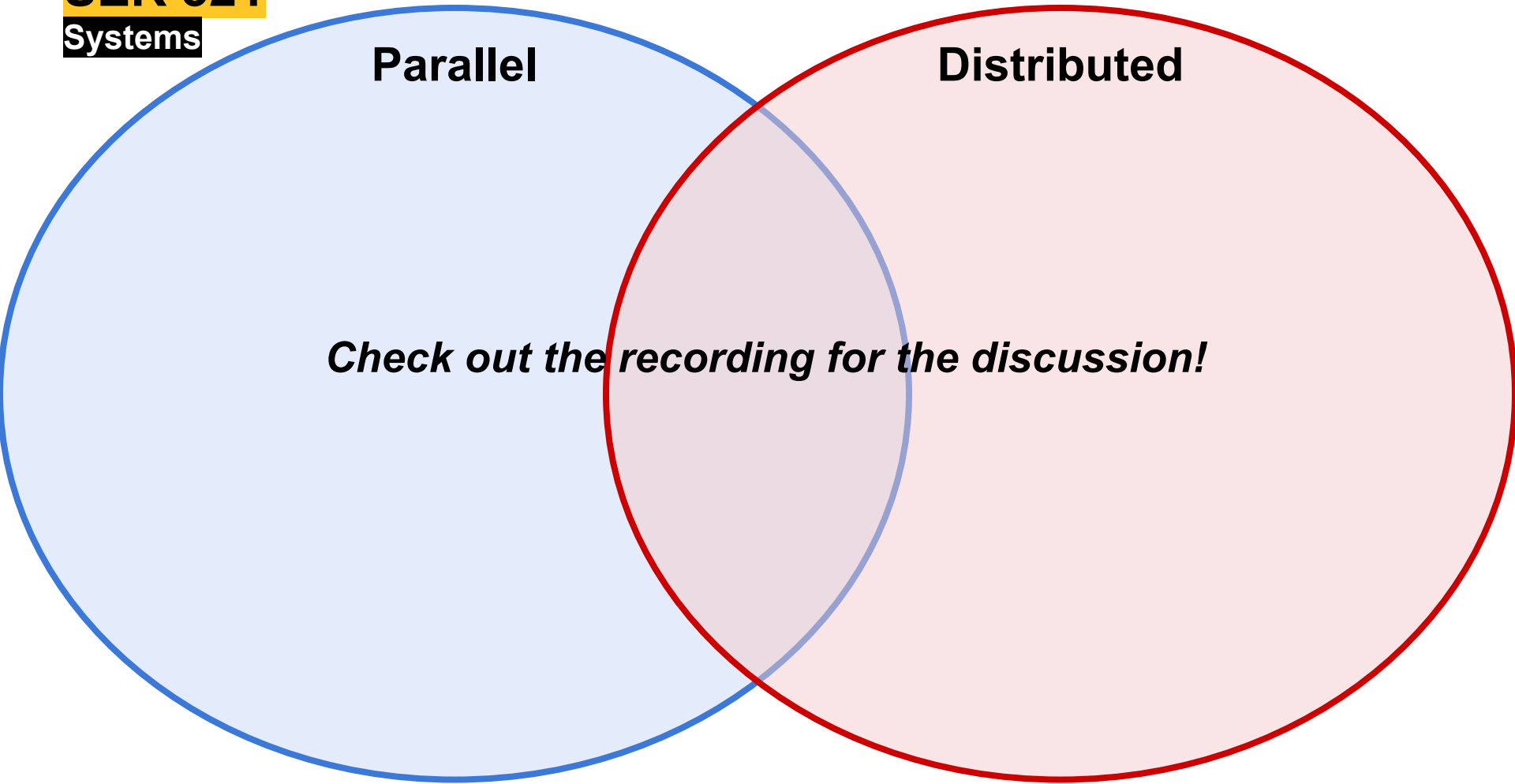
SER 321
Distributed Systems

When should we *consider* distributing?

Super Duper Extra Extra Large Orders of Magnitude!

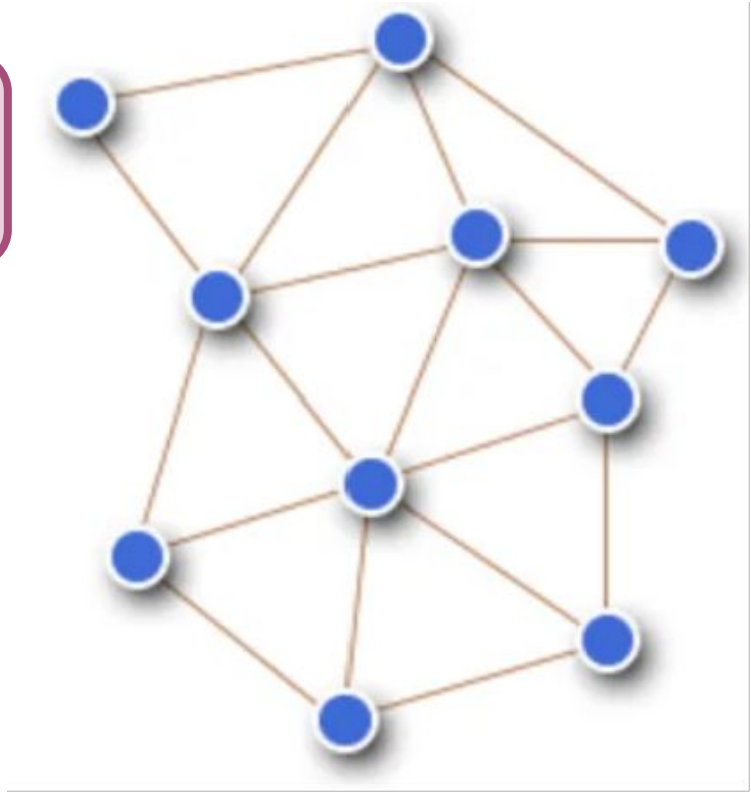


SER 321
Systems



SER 321
Distributed Systems

Remember that we are operating in ***reality***



- *No* global clock
- 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

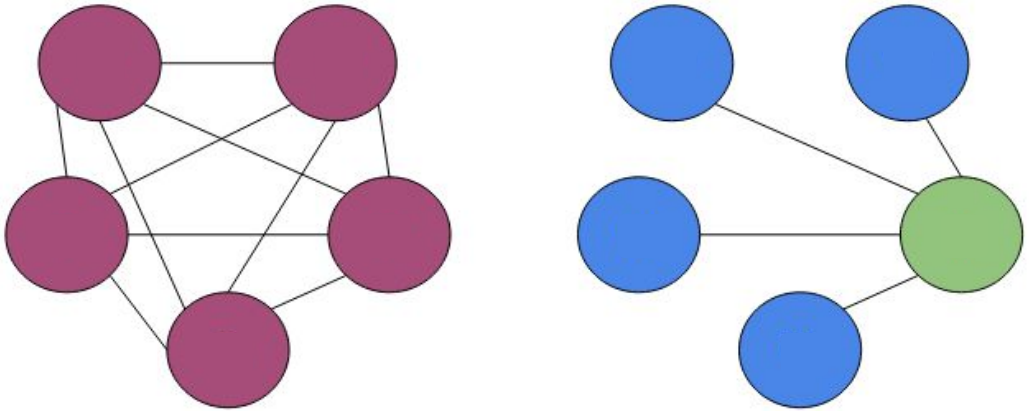
Check out the recording for the discussion!

SER 321
Distributed Systems

Main and Worker

Peer to Peer

Which is which?

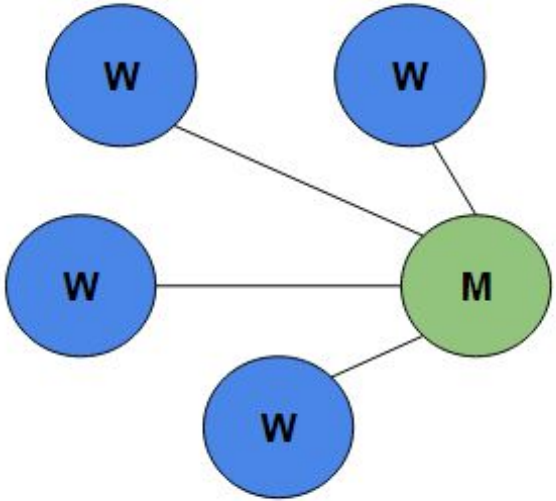


Check out the recording for the solution!

SER 321
Distributed Systems

Pros and Cons

Check out the recording for the discussion!



Pros:

- Straightforward setup
- Logic is centralized
- Communication is linear

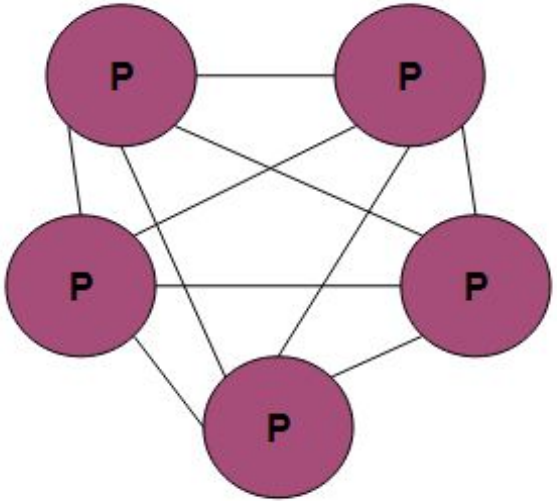
Cons:

- Single point of failure

SER 321
Distributed Systems

Pros and Cons

Check out the recording for the discussion!



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!

SER 321

Scratch Space

Upcoming Events

SI Sessions:

- Sunday, February 16th at 7:00 pm MST
- Tuesday, February 18th at 11:00 am MST
- Thursday, February 20th at 7:00 pm MST

Review Sessions:

- Tuesday, February 25th at 11:00 am MST - **Q&A Session**
- Thursday, February 27th at 7:00 pm MST - **Exam Review Session (2hrs)**

Questions?

Survey:

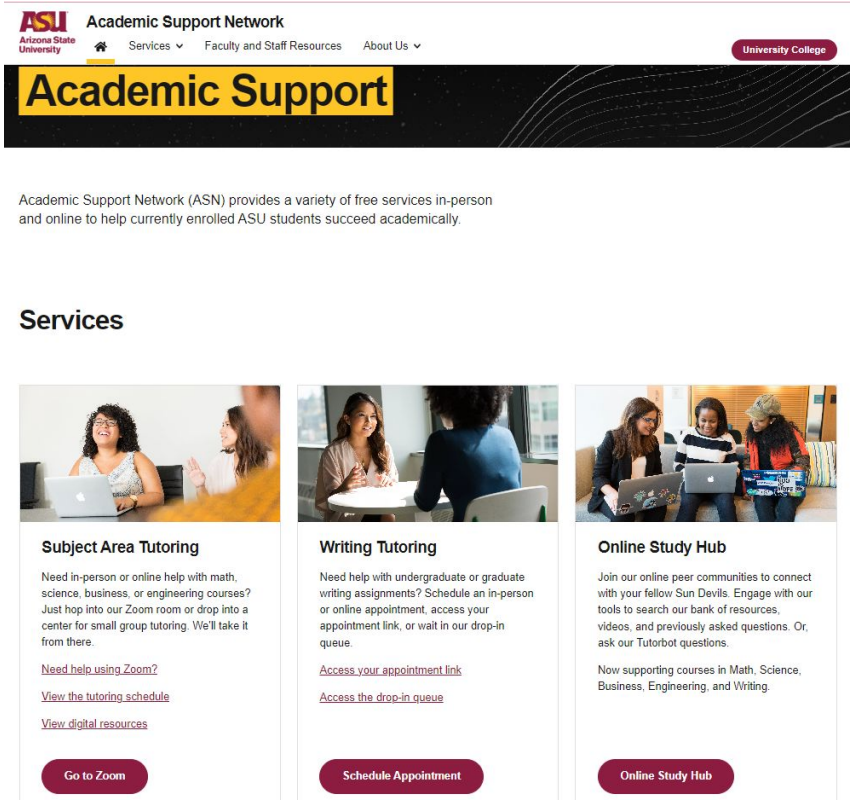
https://asuasn.info/ASNSurvey

19

More Questions?

Check out our other resources!

tutoring.asu.edu

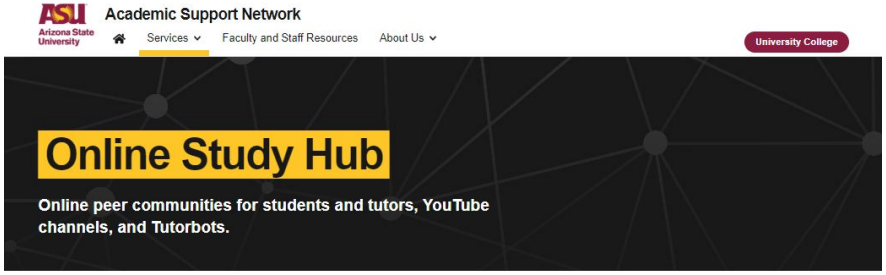


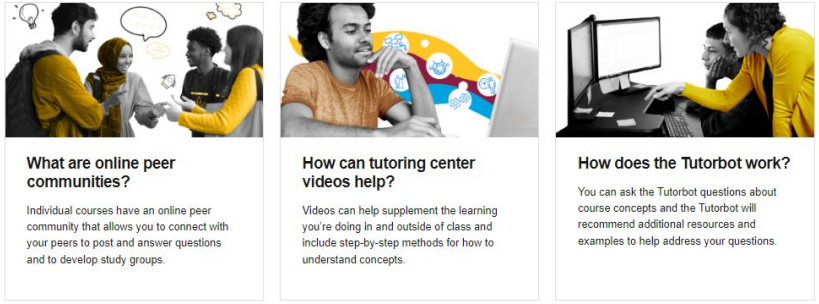
1. **Click on ‘Go to Zoom’ to log onto our Online Tutoring Center.**
2. **Click on ‘View the tutoring schedule’ to see when tutors are available for specific courses.**

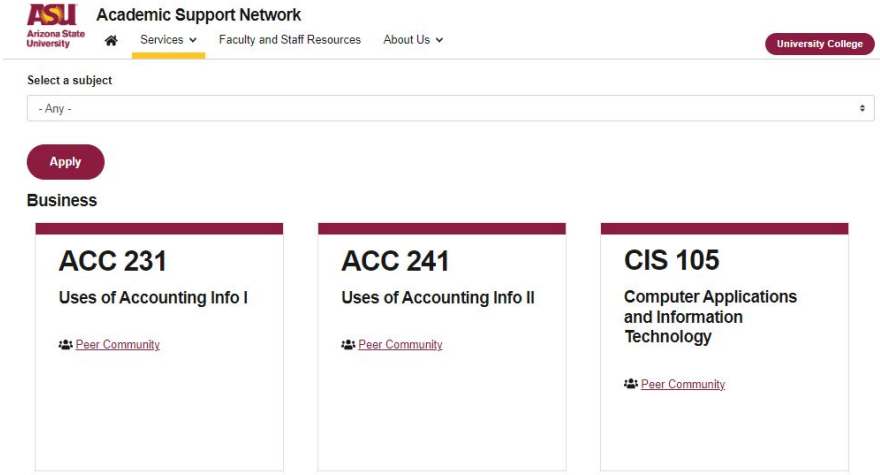
More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



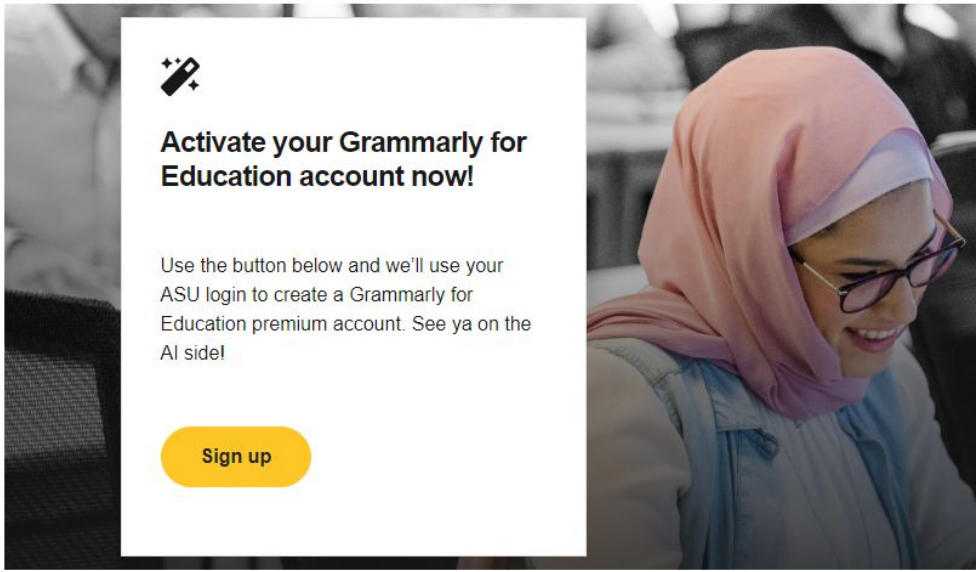




Don't forget to check out the Online Study Hub for additional resources!

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