SER 321 B Session

SI Session

Tuesday, April 15th 2025

10:00 am - 11:00 am MST

Agenda

- Socket Steps Review
- Threading the Server Examination
- Concurrency Structures
- Distributed Systems
  - When to Distribute
  - Parallel vs. Distributed

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

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Socket Steps

Check out the recording for the activity!

Let’s put the socket steps for use in order!

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Threaded Server

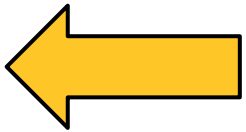
Given the standard server socket steps…

Ideas on how we could introduce threads?

1. Define Params
2. Create Socket

3-5. Mark Socket to Listen

6. Wait for Connection
7. Handle Client Connection
8. Close Client Connection
9. Continue Listening



Why do we send the *client socket* to the thread?

7. Send Client Socket to thread

Check out the recording for the discussion!

JavaThreadSock

SER 321
Threads

1. Define Params
2. Create Socket
3-5. Mark Socket to Listen
6. Wait for Connection
7. Send Client **Socket** to Thread
8. Close Client Connection
9. Continue Listening

```
public static void main(String args[]) throws IOException {
  Socket sock = null;
  int id = 0;
  try {
    if (args.length != 1) {
      System.out.println
          ("Usage: gradle ThreadedSockServer --args=<port num>");
      System.exit( code: 0);
    }
    int portNo = Integer.parseInt(args[0]);
    if (portNo <= 1024)
      portNo = 8888;
    ServerSocket serv = new ServerSocket(portNo);

    while (true) {
      System.out.println
          ("Threaded server waiting for connects on port " + portNo);
      sock = serv.accept();
      System.out.println
          ("Threaded server connected to client-" + id);
      // create thread
      ThreadedSockServer myServerThread =
          new ThreadedSockServer(sock, id++);
      // run thread and don't care about managing it
      myServerThread.start();
    }
  } catch (Exception e) {
    e.printStackTrace();
  } finally {
    if (sock != null) sock.close();
  }
}
```

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2 & 3-5

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Check out the recording for the discussion!

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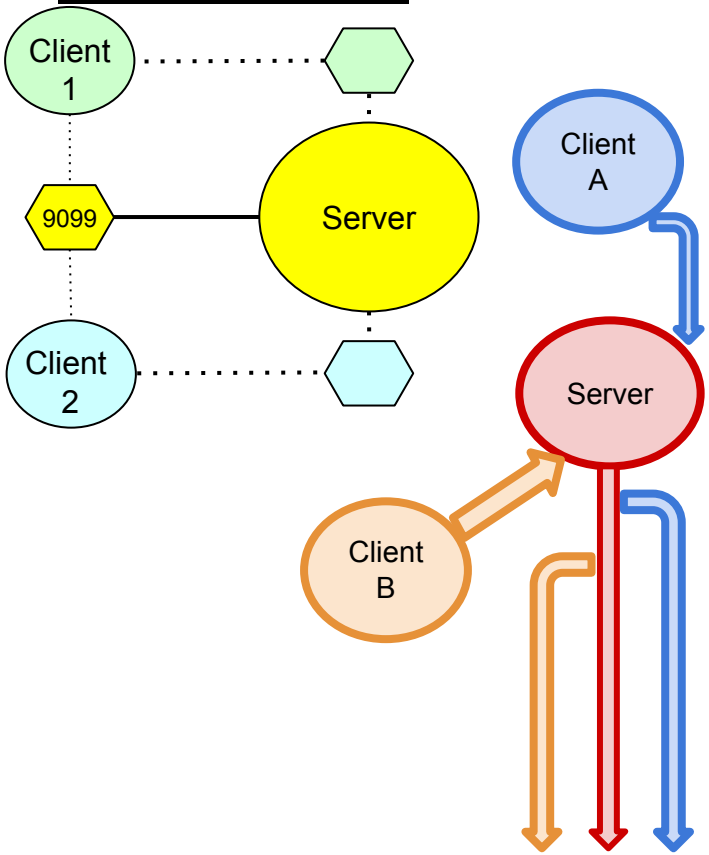
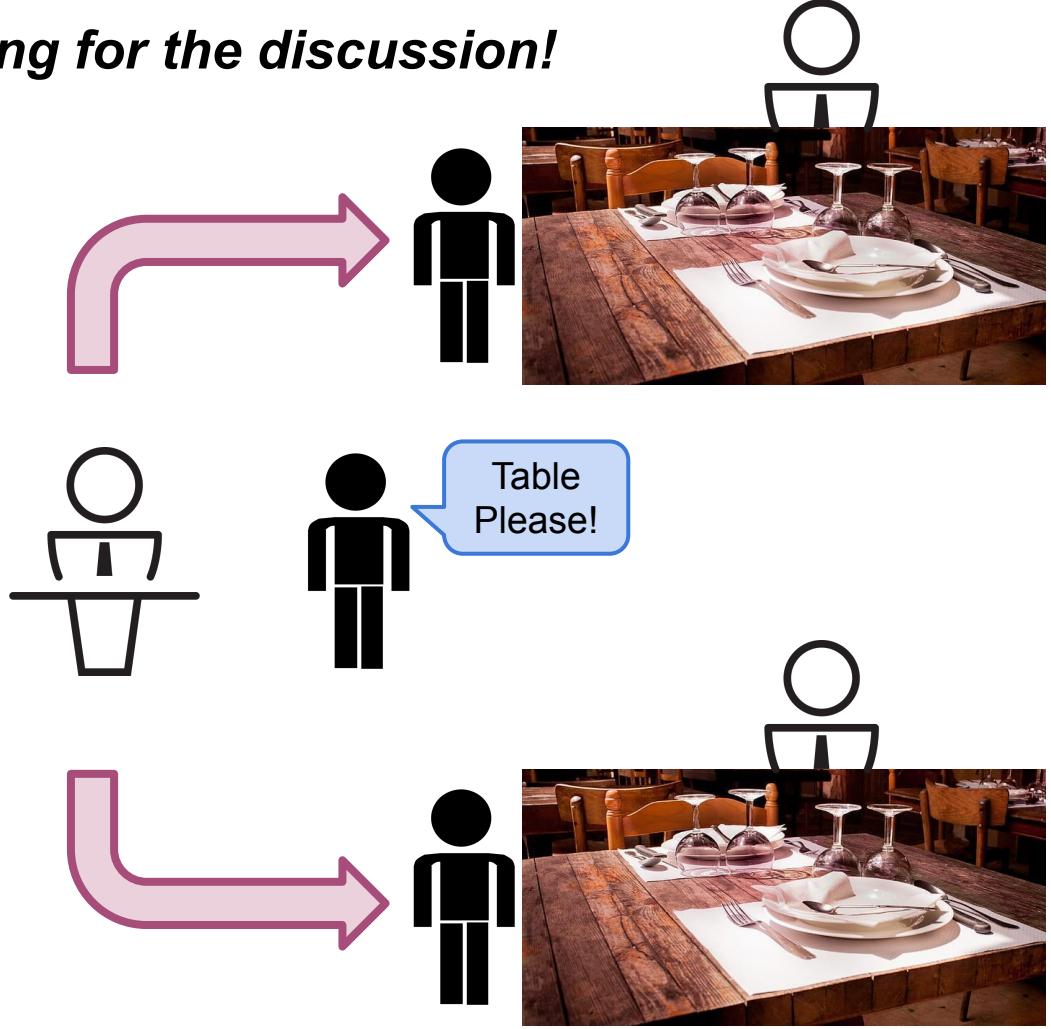
Port Examination





JavaThreadSock

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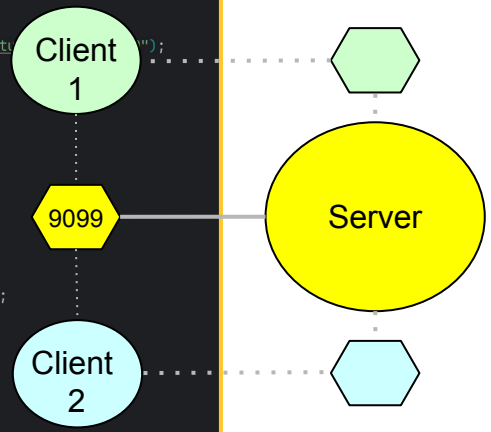
Threads

```
public void run() {
  try {
    // setup read/write channels for connection
    ObjectInputStream in = new ObjectInputStream(conn.getInputStream());
    ObjectOutputStream out = new ObjectOutputStream(conn.getOutputStream());

    // read the digit being send
    String s = (String) in.readObject();
    int index;
    // while client hasn't ended
    while (!s.equals("end")) {
      Boolean validInput = true;

      // checks if input only contains digits
      if (!s.matches( expr: "\\d+")) {
        validInput = false;
        out.writeObject("Not a number: https://gph.is/2yDymkn");
      }
      // if it contains only numbers
      if (validInput) {
        // convert to an integer
        index = Integer.valueOf(s);
        System.out.println("From client " + id + " get string " + index);
        if (index > -1 & index < buf.length) {
          // if valid, pull the line from the buffer array above and write it to socket
          out.writeObject(buf[index]);
        } else if (index == 5) {
          // fun surprise for mostly correct
          out.writeObject("Close but out of range: https://youtu                    ");
        } else {
          // really wrong
          out.writeObject("index out of range");
        }
      }
      //  wait for next token from the user
      s = (String) in.readObject();
    }
    // on close, clean up
    System.out.println("Client " + id + " closed connection.");
    in.close();
    out.close();
    conn.close();
  } catch (Exception e) {
    e.printStackTrace();
  }
}
```

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```

Check out the recording for the discussion!

Check out the recording for the discussion! Austin Walter's Traffic Comparison

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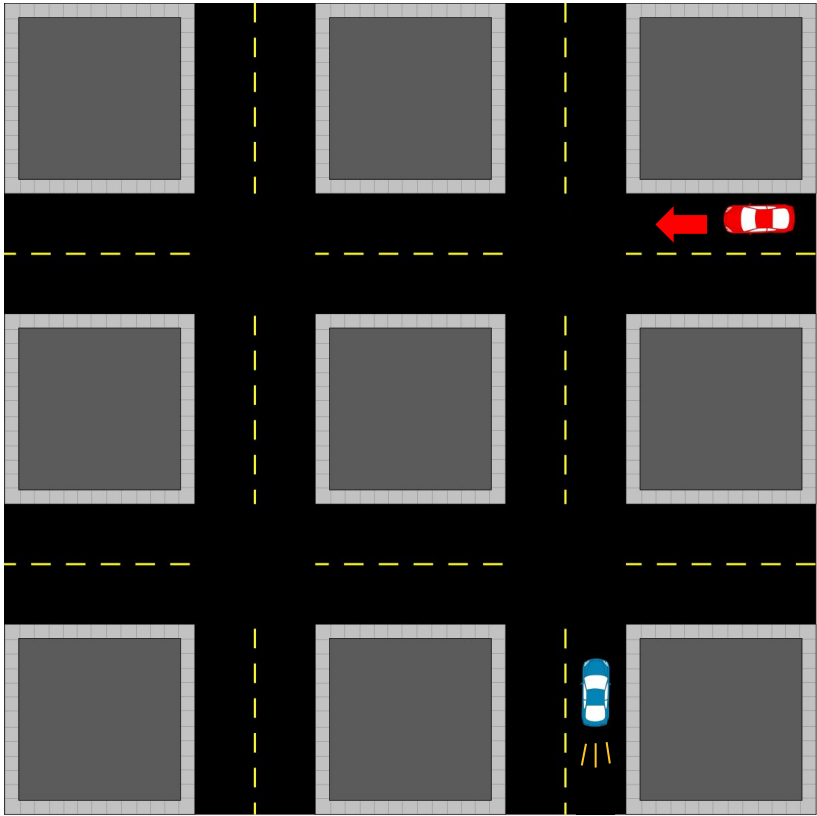
Threading Pitfalls

Race Condition

Crash

More than one thread accesses a single resource at once



Check out the recording for the discussion! Austin Walter's Traffic Comparison

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Threading Pitfalls

Race Condition

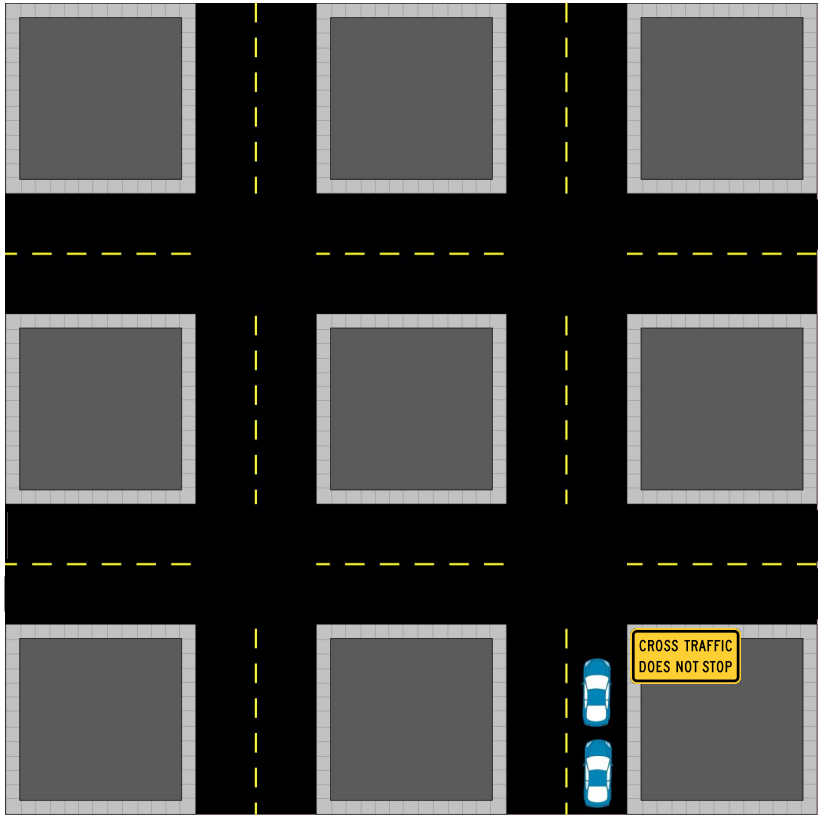
Crash

More than one thread accesses a single resource at once

Starvation

Cross Traffic

A thread never gains access to the resource it needs



Check out the recording for the discussion! [Austin Walter's Traffic Comparison]

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Threading Pitfalls

Race Condition

Crash

More than one thread accesses a single resource at once

Starvation

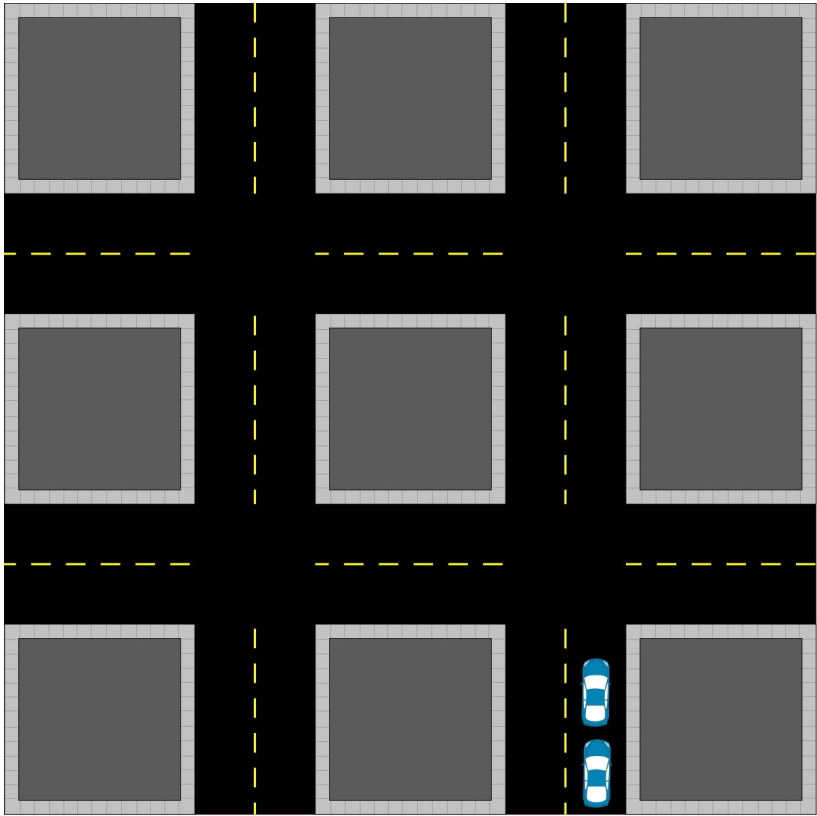
Cross Traffic

A thread never gains access to the resource it needs

Deadlock

Gridlock

A thread is only able to acquire some of the needed resources



Check out the recording for the discussion!

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Concurrency Structures

Can we name some concurrency structures?

Atomic Operations & Variables

Locks

Semaphores

Monitors

Check out the recording for the discussion!

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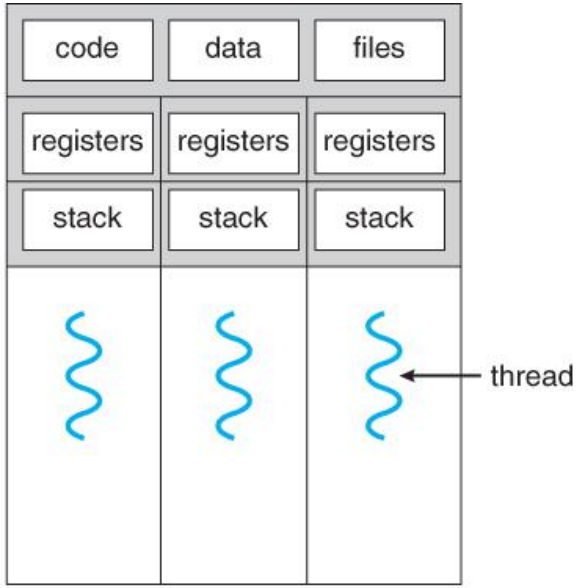
Concurrency Structures

Atomic Operations & Variables

Recall *registers*…

Ensures updates are immediately visible for the local copy in *each thread*




```
main:
    pushq   %rbp
    movq    %rsp, %rbp
    subq    $48, %rsp
    call    __main
    movl    $5, -4(%rbp)
    movl    $12, -8(%rbp)
    movl    -4(%rbp), %eax
    addl    $7, %eax
    movl    %eax, -12(%rbp)
    movl    -8(%rbp), %edx
    movl    -12(%rbp), %eax
    addl    %edx, %eax
    movl    %eax, -16(%rbp)
    movl    -16(%rbp), %eax
    movl    %eax, %edx
    leaq    .LC0(%rip), %rax
    movq    %rax, %rcx
    call    printf
    movl    $0, %eax
    addq    $48, %rsp
    popq    %rbp
    ret
```

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Scratch Space

Upcoming Events

SI Sessions:

- Thursday, April 17th at 7:00 pm MST
- Sunday, April 20th at 7:00 pm MST
- Tuesday, April 22nd at 10:00 am MST

Review Sessions:

- Sunday, April 27th at **6:00 pm** MST - **2 hour Exam Review Session**
- Tuesday, April 29th, at 10:00 am MST - **Q&A Session**

Questions?

Survey:

https://asuasn.info/ASNSurvey

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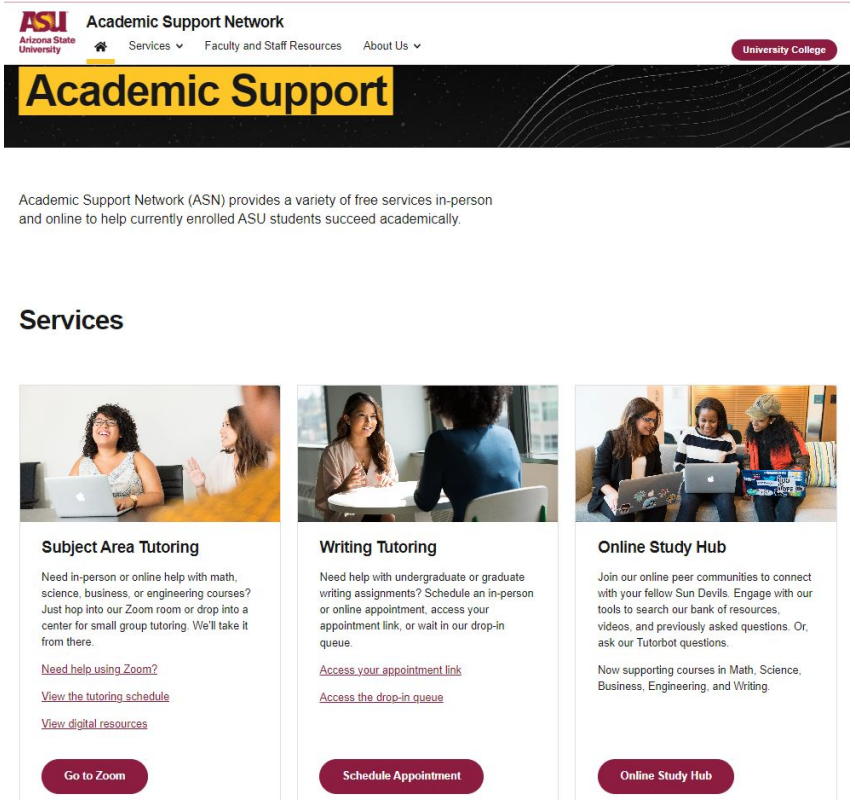
More Questions?

Check out our other resources!

tutoring.asu.edu

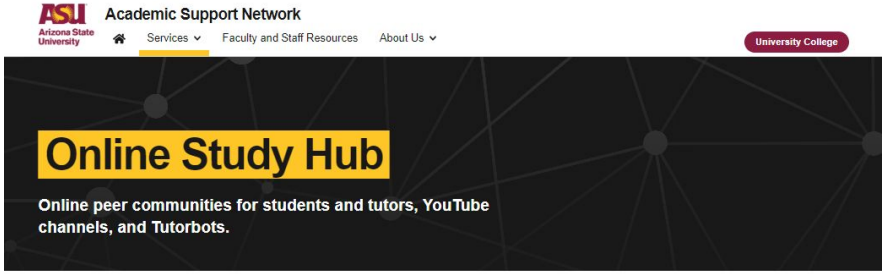


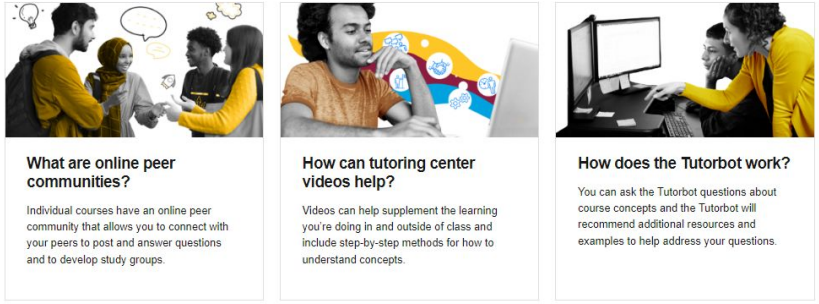
1. **Click on ‘Go to Zoom’ to log onto our Online Tutoring Center.**
2. **Click on ‘View the tutoring schedule’ to see when tutors are available for specific courses.**

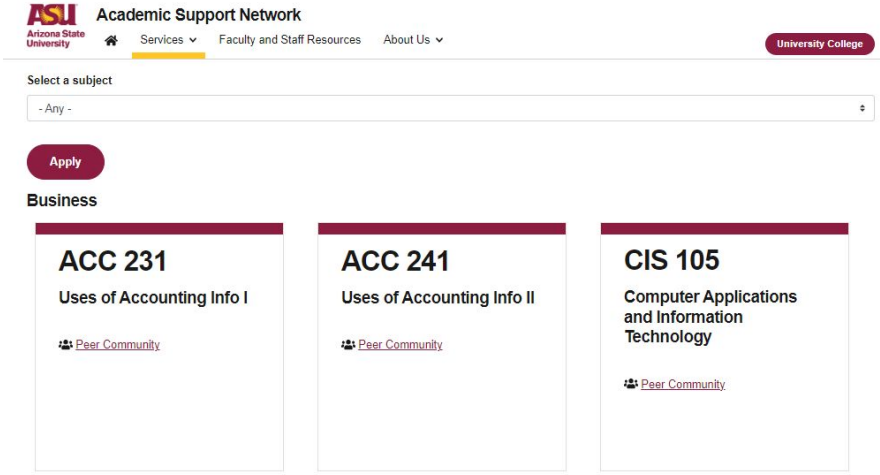
More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



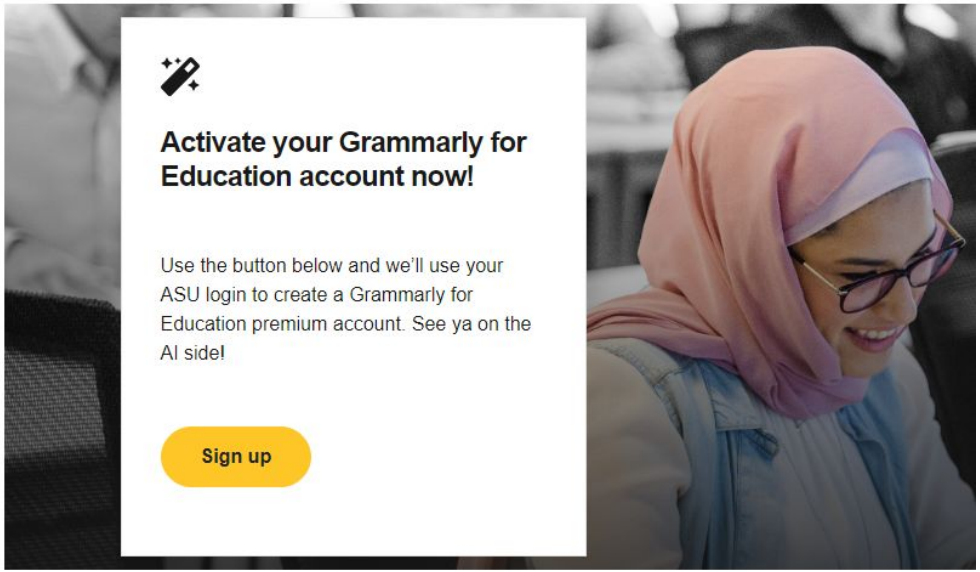




Don't forget to check out the Online Study Hub for additional resources!

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