

SER 321 B Session

SI Session

Thursday, April 4th 2024

7:00 pm - 8:00 pm MST

Agenda



Last Minute 3-2 Questions

Serialization

Using Threads

Threading Pitfalls

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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Serialization

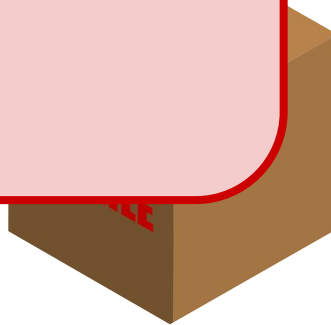
Any last-minute
3-2 Questions?

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Serialization

What is *Serialization*?

Why do we care?



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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

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Serialization

Binary

Text

What does
this imply?

Who uses ***BINARY***?

Text

JSON

Binary

Java Object
Serialization

Binary

Protocol Buffers

Text

XML

Quick PSA for Protobufs!

If you use IntelliJ, you must do this first!!

IntelliJ users!

- `gradle generateProto` will generate the protocol buffer files but may not be recognized by IntelliJ because it may not be able to locate them. Add this block of code into your `build.gradle` file →

```
sourceSets {  
    main {  
        java {  
            srcDirs 'build/generated/source/proto/main/java/proto'  
        }  
    }  
}
```

The file path needs to point to the generated Protobuf files so make sure the file path you are declaring in the `sourceSets` block matches the actual path to your generated Protobuf files for your project

- In the `protobuf` files, the `java_package` declaration determines the package name for the generated files and `java_outer_classname` determines this Protobuf's generated file name → in the given starter code's Protobuf files the package name is declared as "proto" so generated Protobuf files will be placed in a package called "proto" (under `build/generated/source/proto/main/java`)

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Protobufs

Step 1

The screenshot shows an IDE window for a project named 'WordGuessingStudents'. The left sidebar displays the project structure, with the 'build.gradle' file selected under the 'proto' directory. The main editor area shows the contents of 'build.gradle', which is a Gradle build script for a Java project. The script includes the following code:

```
1 plugins {  
2     id 'java'  
3     id "com.google.protobuf" version "0.8.13" apply true  
4 }  
5  
6  
7 description = "Protocol Buffers Socket Example"  
8  
9 repositories {  
10     mavenCentral()  
11 }  
12  
13 // json and protobuf dependencies  
14 dependencies {  
15     implementation group: 'org.json', name: 'json', version: '20200518'  
16     implementation group: 'com.google.protobuf', name: 'protobuf-java', version: '3.18.0'  
17 }  
18  
19 protobuf {  
20     protoc {  
21         artifact = 'com.google.protobuf:protoc:3.21.1'  
22     }  
23     generateProtoTasks {  
24         all().each { task ->  
25             task.builtins {  
26                 }  
27             }  
28         }  
29     }  
30     def host :String = 'localhost'  
31     def port :Integer = 9099  
32  
33     // task reading in the arguments if any given, if not the default from above will be used
```

The status bar at the bottom indicates the current file is 'build.gradle' in the 'WordGuessingStudents' project, with a timestamp of 33:90, LF line endings, UTF-8 encoding, and 4 spaces for indentation.

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Protobufs

Step 1

Project structure:

- WordGuessingStudents
 - .gradle
 - .idea
 - gradle
 - src
 - main
 - java
 - client
 - Player
 - SocketBaseClient
 - server
 - Game
 - SocketBaseServer
 - proto
 - request.proto
 - response.proto
 - resources

build.gradle (WordGuessingStudents):

```
1 plugins {  
2     id 'java'  
3     id "com.google.protobuf" version "0.8.13" apply true  
4 }  
5  
6  
7 description = "Protocol Buffers Socket Example"  
8  
9 sourceSets {  
10     main {  
11         java {  
12             srcDirs 'build/generated/source/proto/main/java/proto'  
13         }  
14     }  
15 }  
16  
17 repositories {  
18     mavenCentral()  
19 }  
20  
21 // json and protobuf dependencies  
22 dependencies {  
23     implementation group: 'org.json', name: 'json', version: '20200518'  
24     implementation group: 'com.google.protobuf', name: 'protobuf-java', version: '3.18.0'  
25 }  
26  
27 protobuf {  
28     protoc {  
29         artifact = 'com.google.protobuf:protoc:3.21.1'  
30     }  
31     generateProtoTasks {  
32         all().each { task ->  
33             task.builtins {
```

Status bar: 16:1 LF UTF-8 4 spaces

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Protobufs

Step 2

The screenshot shows an IDE with the following components:

- Project Explorer:** Displays the project structure for 'WordGuessingStudents'. The 'src/main/java/server' directory is expanded, showing 'Game.java' and 'SockBaseServer.java'.
- Code Editor:** Shows the 'SockBaseServer.java' file with the following code:

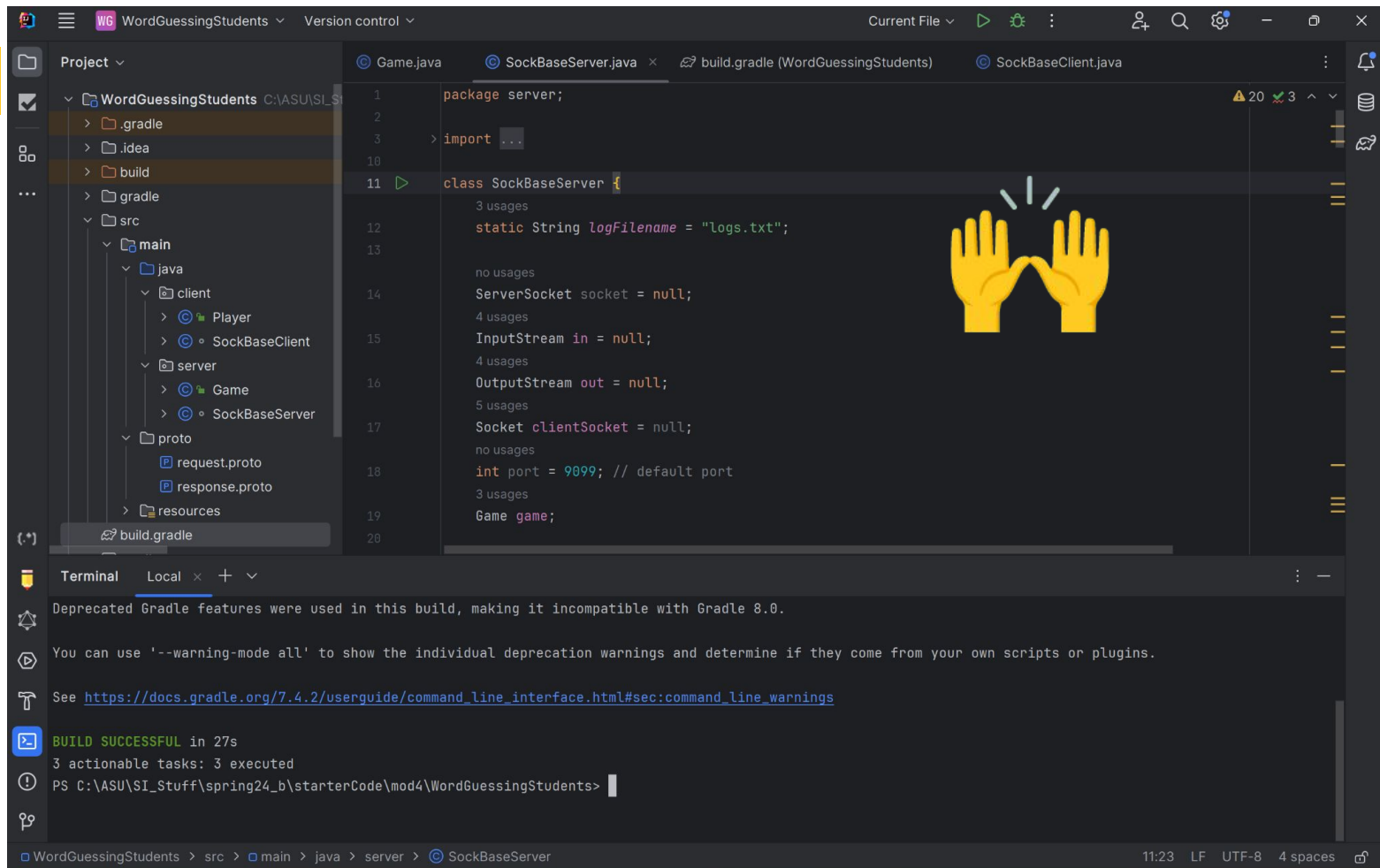
```
1 package server;
2
3 > import ...
4
5 class SockBaseServer {
6     3 usages
7     static String logFilename = "logs.txt";
8
9     no usages
10    ServerSocket socket = null;
11
12    4 usages
13    InputStream in = null;
14
15    4 usages
16    OutputStream out = null;
17
18    5 usages
19    Socket clientSocket = null;
20
21    no usages
22    int port = 9099; // default port
23
24    3 usages
25    Game game;
```
- Terminal:** Shows the command 'gradle generateProto' being executed in a Windows PowerShell window.

The status bar at the bottom indicates the current file is 'SockBaseServer.java' and the encoding is UTF-8.

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Protobufs

Step 2



The screenshot shows an IDE with the following components:

- Project View:** Displays the project structure for 'WordGuessingStudents'. The 'src/main/java/server' directory is expanded, showing 'Game' and 'SockBaseServer' classes. The 'proto' directory contains 'request.proto' and 'response.proto'.
- Code Editor:** Shows the 'SockBaseServer.java' file. The code includes a package declaration, imports, and a class definition for 'SockBaseServer' with various fields and a port number of 9099. A yellow emoji with raised hands is placed over the code.
- Terminal:** Displays a message indicating that the build was successful in 27 seconds, with 3 actionable tasks executed. The prompt shows the current directory as 'C:\ASU\SI_Stuff\spring24_b\starterCode\mod4\WordGuessingStudents'.

```
package server;

import ...

class SockBaseServer {
    3 usages
    static String logFilename = "logs.txt";

    no usages
    ServerSocket socket = null;
    4 usages
    InputStream in = null;
    4 usages
    OutputStream out = null;
    5 usages
    Socket clientSocket = null;
    no usages
    int port = 9099; // default port
    3 usages
    Game game;
}
```

Deprecated Gradle features were used in this build, making it incompatible with Gradle 8.0.

You can use '--warning-mode all' to show the individual deprecation warnings and determine if they come from your own scripts or plugins.

See https://docs.gradle.org/7.4.2/userguide/command_line_interface.html#sec:command_line_warnings

BUILD SUCCESSFUL in 27s
3 actionable tasks: 3 executed
PS C:\ASU\SI_Stuff\spring24_b\starterCode\mod4\WordGuessingStudents>

WordGuessingStudents > src > main > java > server > SockBaseServer 11:23 LF UTF-8 4 spaces

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Serialization

Generic
Superclass

Streams and their types

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

Buffered Stream

Bytes

Data Stream

Primitive DATA Types

Object Stream

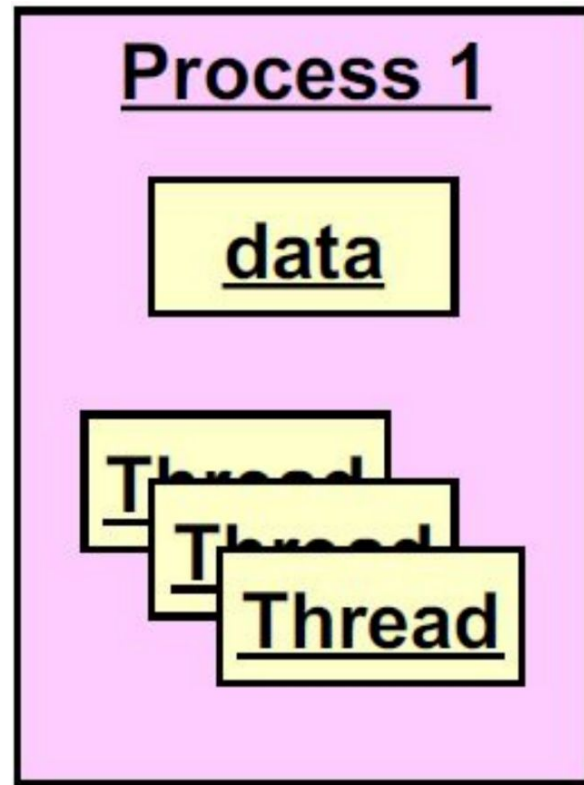
Java Objects

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Threads

Remember that they exist
within the parent process

What does that imply?



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Threads

Do we remember the standard server socket steps?

How do we introduce threads into these steps?

1. Define Params

2. Create Socket

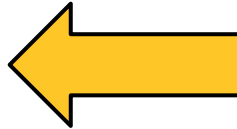
3-5. Mark Socket to Listen

6. Wait for Connection

7. Handle Client Connection

8. Close Client Connection

9. Continue Listening

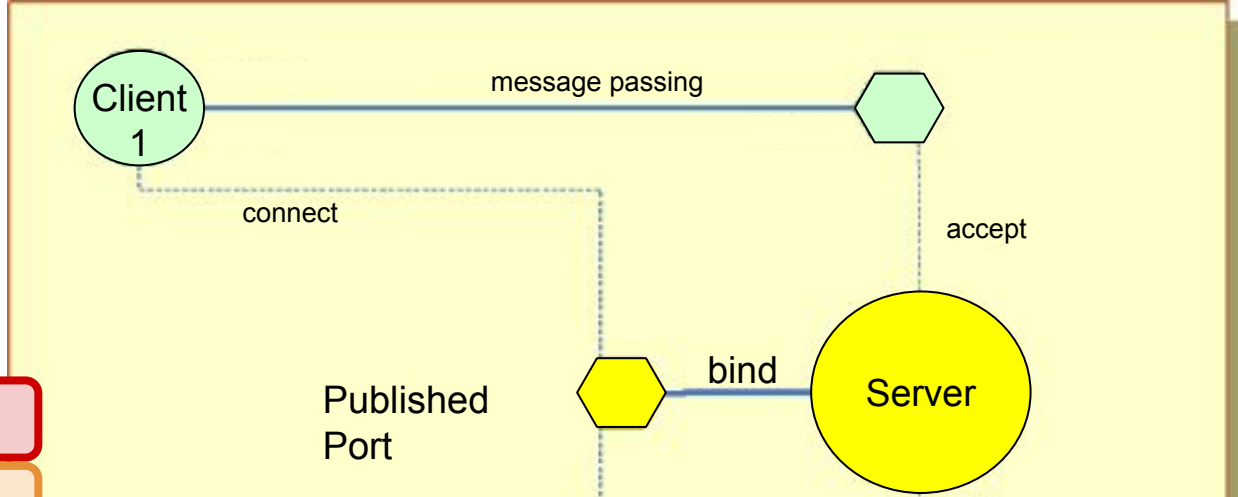


7. Send Client Socket to thread

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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

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Threading Pitfalls

Race Condition

A thread never gains access to the resource it needs

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

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Threading Pitfalls

Race Condition

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Threading Pitfalls

What does *Spaghetti Consumed* represent?

What does *Thinking* represent?

What does *Hungry* represent?

powered by NetLogo

Dining Philosophers

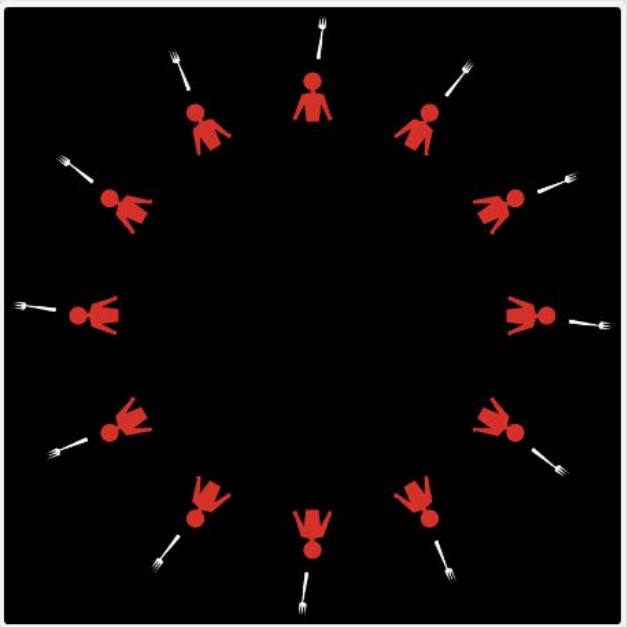
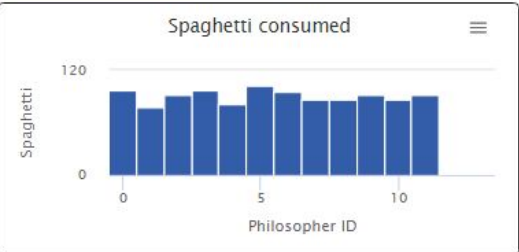
File: New Revert to Original
Export: NetLogo HTML

Mode: Interactive Commands and Code: Bottom

model speed

ticks: 6712

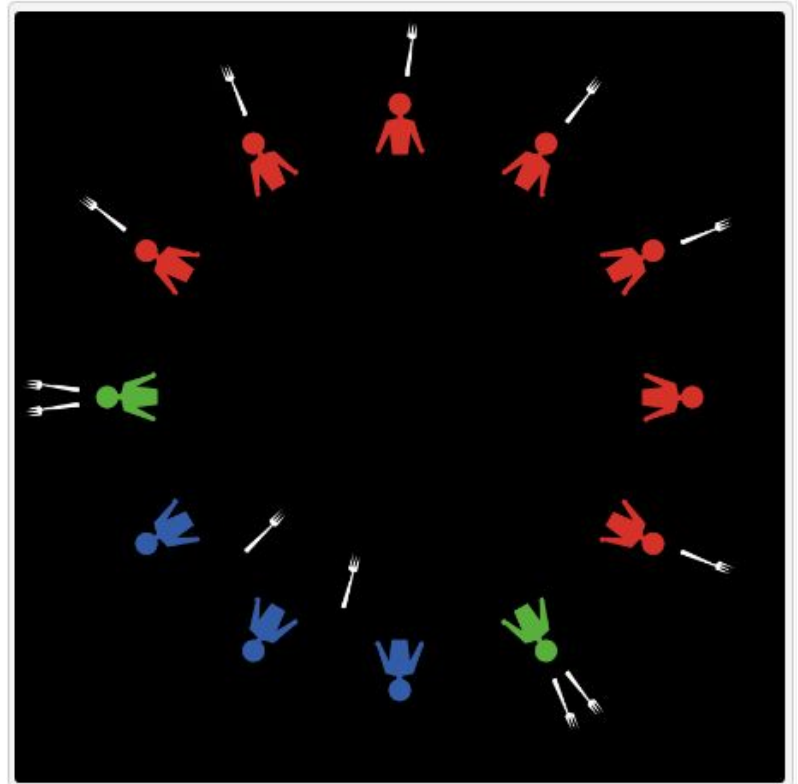
num-philosophers 12
setup go go once
hungry-chance 0.5
full-chance 0.5
cooperation?



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Threading Pitfalls

Can we identify any concurrency issues here?



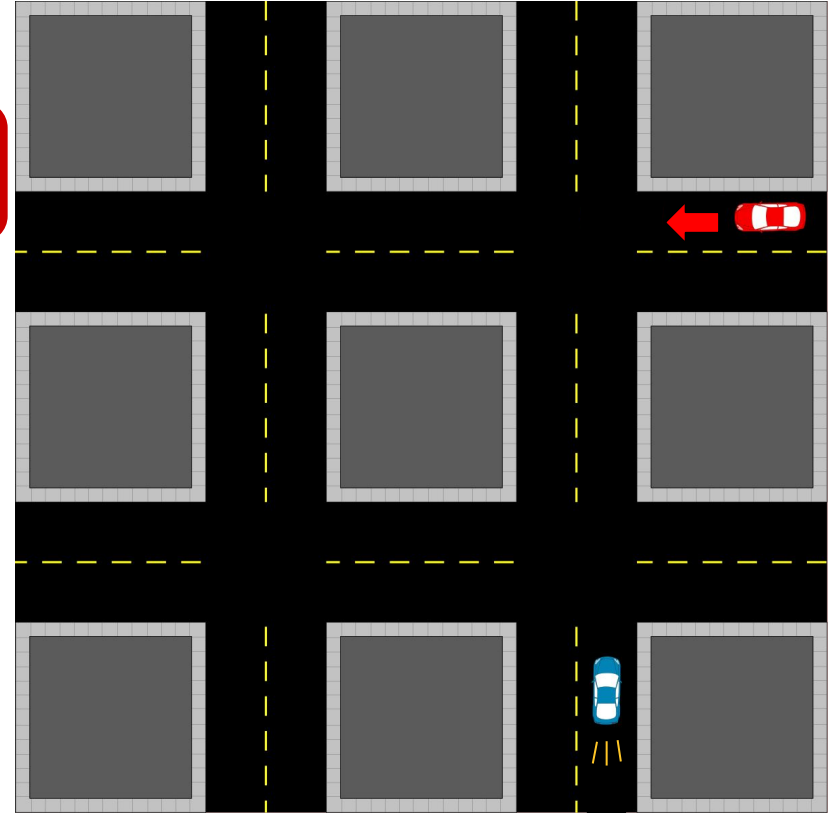
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Threading Pitfalls

Race Condition

Crash

More than one thread accesses a single resource at once



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Threading Pitfalls

Race Condition

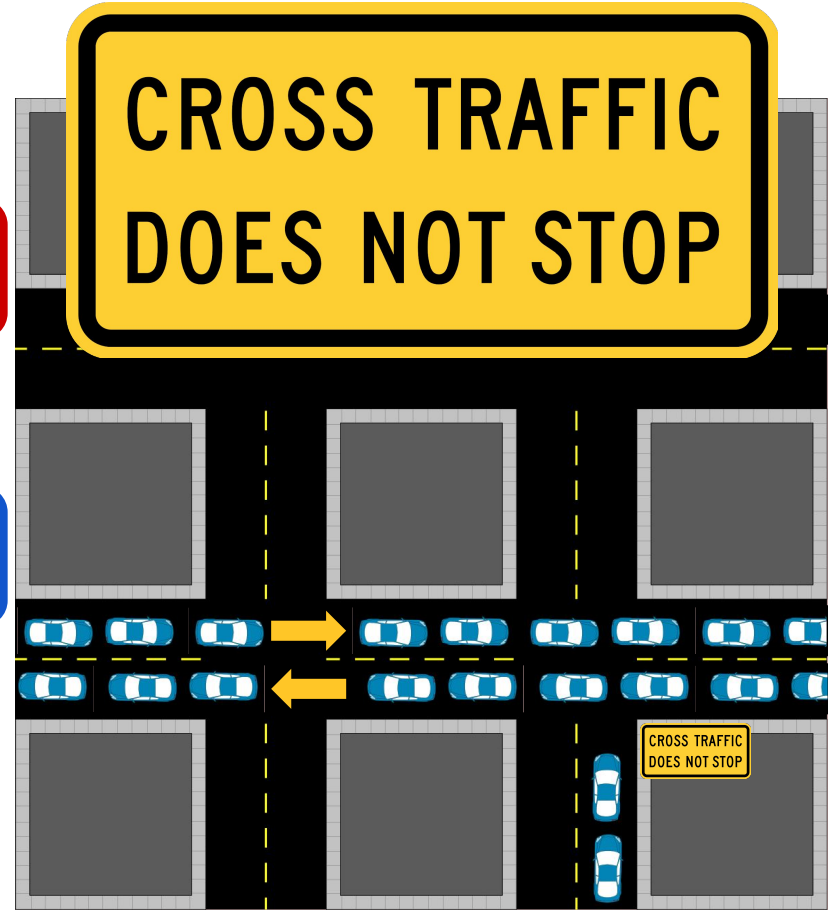
Crash

More than one thread accesses a single resource at once

Starvation

Cross Traffic

A thread never gains access to the resource it needs



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Threading Pitfalls

Race Condition

Crash

More than one thread accesses a single resource at once

Starvation

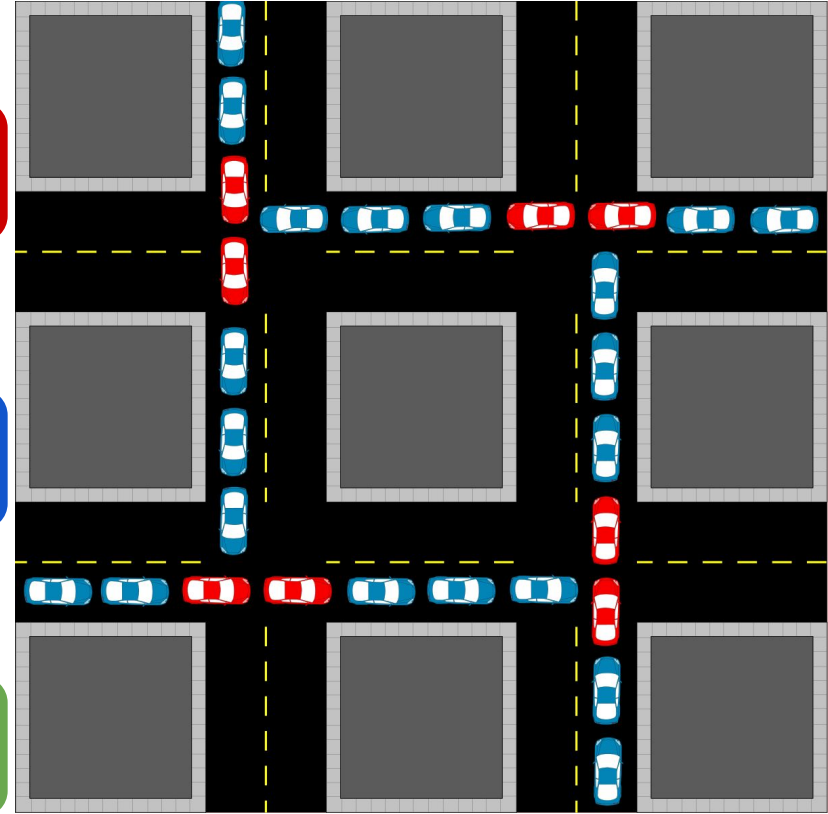
Cross Traffic

A thread never gains access to the resource it needs

Deadlock

Gridlock

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



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Scratch Space

Questions?

Survey:

<http://bit.ly/ASN2324>



Upcoming Events

SI Sessions:

- Sunday, April 7th at 7:00 pm MST
- Monday, April 8th at 7:00 pm MST
- Thursday, April 11th at 7:00 pm MST

Review Sessions:

- Sunday, April 21st at 7:00 pm MST
- **Thursday, April 25th Session is *cancelled***

More Questions?

Check out our other resources!

tutoring.asu.edu



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

Services



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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.

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Check out our other resources!

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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

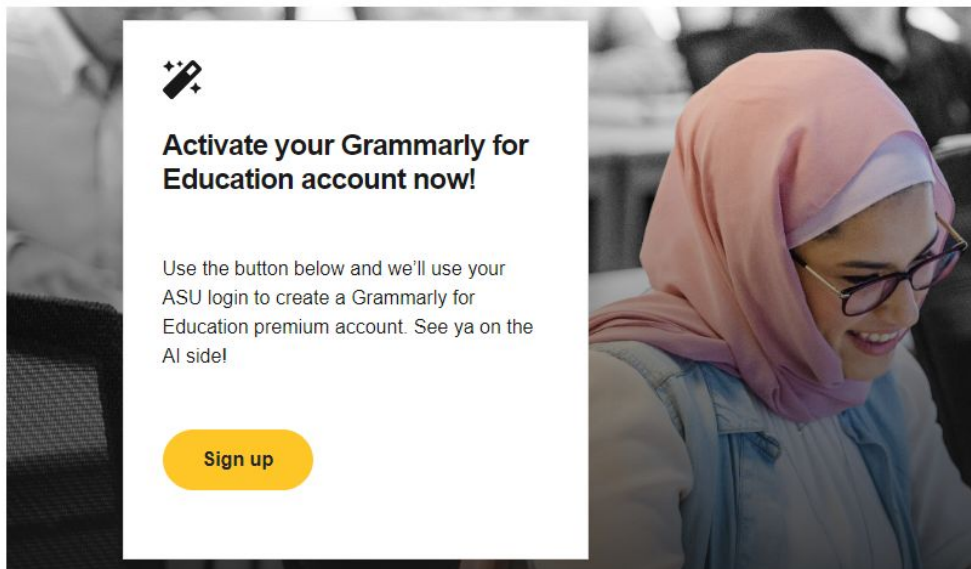
Computer Applications and Information Technology

 [Peer Community](#)

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

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](#)