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Final Write Up

- Topics covered
 - Android Studio
 - TCP/UDP servers on Android
 - What you can and can't do on Android using Android Studio with Java
- What did you learn from this activity?
 - These past couple of weeks I have learned about Android Studio and how to create simple applications using it for android. You have a choice to use Java or Kotlin (Fun fact!: Kotlin was made the official/preferred language by Google for Android back in May 2019. Kotlin is similar to Java and is derived from Java.). I chose to use Java for this learning module as I could get the most out of it. I learned how to convert from certain things that are different on Android then normal Java as on Android they do not have AWT or the javax packages, for example instead of using the normal built in Java BufferedImages and you instead have to use Android Bitmaps. I learned how to start a server on Android and connect to it from a PC.
- What problems did you encounter and how did you deal with them?
 - One problem I encountered as stated above was the differences in Android and normal Java as it does not have all the packages. For instance it does not have AWT (java.awt) as stated above as awt stands for abstract windowing toolkit and is made for machines that have windows, android does not have windows. To convert android bitmaps to normal java.awt BufferedImages I converted the images to jpeg byte arrays and turned them back in to a bitmap or bufferedimage when needed. Of course android does not have the ImageIO class either so I would have to use androids BitmapFactory I believe it was called to read the byte array as a jpg and convert it to a bitmap.
 - Another problem was figuring out how to get the android camera images and microphone. The hardest part was the microphone (which is why I was disappointed in the video in my presentation when I couldn't screen record it). Getting the microphone as a constant stream of bytes from android was way more difficult than it should have been, but eventually I was able to figure it out. Java isn't the best language for working with system things such as sound due to limitations of the JVM.
- What suggestions do you have for others who might pursue this activity?
 - Learn TCP/UDP first
 - Have a good understanding of Java (maybe slightly more than just what is learned in APCS A)
- A summary on your experience.
 - In the end I had created 5 examples in test ranging in complexity
 - Simple udp string sender from android to pc
 - Image sender using TCP
 - PC Webcam stream to Android (UDP)
 - UDP Video Call (PC to Android)
 - UDP Controlling your pc from android
 - Important Note: all of these examples can be done from anywhere, meaning you could video call someone from california and be in NYC using my program.
- List of resources you used including helpful websites
 - <https://developer.android.com/docs>
 - <https://www.baeldung.com/a-guide-to-java-sockets>

- <https://developer.android.com/reference/android/graphics/Bitmap>
- <https://github.com/controlwear/virtual-joystick-android>