

Yifan Zhu

Do you want me to walk through the hole and with our draft? Just go us the scan the probability and make some modifications.

Doctor Johnson

I think we've largely reviewed it. If you want a chance to practice in front of an audience so you, you're welcome to do so.

Yifan Zhu

Ok, let's begin:

Good afternoon everyone, welcome come to our presentations. We are team5, industrial control lab exercise 2.0. The team members are Yuhao Li, Yi Ding and Yifan Zhu. Dr.Johnson is our sponsor, Joe and Smadi are our mentors.

The main content we are gonna illustrate is the background, objective, value proposition, requirement of the project, also the others are mainly about our project development and what we did and encountered from beginning to the end.

Firstly, let me introduce the background of our project.

It is well known that the industrial control systems have seen an increased application in industry and in research projects. Therefore, it is necessary to provide students with a better hands-on understanding of the behavior of industrial control systems. For us, three overseas students would like to try developing labs that place bound students can do remotely.

The value proposition of our project is to develop some experiments that can be performed through remote access computer. Because some students may not be able do experiments in the laboratory themselves and self-purchasing industrial control systems equipment is too expensive.

As a result, we would like to create and implement remote labs related to ECE444/544 as our main objective. Besides, also provide some suggestions on remote access tool.

The requirement we may use in remote access is shown, it contains a software called remote-control desktop in our laptop and some equipment like SEL849 and SEL AcSELerator RTAC, etc.

Our project development could be simply divided into 2 parts. In the Fall semester, we were learning some basic knowledge of ECE444 and the lab materials from prior team. After that, we choose Mininet as our network emulation software and 2 remote access software. In Spring semester, we started to implement labs in both network emulation and remote access.

Let us introduce the network emulation first. We designed 5 labs related to ECE444/544. We are aware of the existence of difficulties for overseas students to do the labs remotely. These 5 labs are intended to help students have a better understanding of the network labs in the ECE444/544 class. The software for emulation is called the 'Mininet'. It's more user-friendly compared to other software. Students can easily operate on them without possessing any knowledge from Python, Java or C++.

The labs are divided into 5 parts.

LAB 0

The lab 0 is the most fundamental one. We specifically illustrated the basic commands in Mininet to build and test a network system. How to do the ping test and how to edit the 2nd level file, etc.

There are two basic elements, the RYU controller and the Mininet itself.

The RYU controller is to make sure the system captures all the packages so that when we run the ping command, it would not lose all of the hosts.

LAB 1

The first Lab in ECE444/544 requires students to get familiar with the basic equipment and the relevant commands to analyze the data and flows by using Wireshark.

So in our designed lab 1, we use the mininet to draw the schematic and run the wireshark. The procedure is the same as lab 0, except for running the wireshark.

LAB 2

The second Lab in ECE444/544, it requires students to record the speed and analyze the data to check if it qualifies the equation used in the class. Our lab 2 uses the wireshark to capture the package. The procedure is quite similar, for example, the lab 2 in ECE444/544 class requires to intentionally cut one path, and we do it in the same way. However, the limitation is, it can't record all types of data as requested in the second lab of ECE444/544.

LAB 3

Still, the third lab in ECE444/544, it requires students to record the speed and analyze the data to check if it qualifies the equation used in the class. So in this lab, we draw the similar schematic and run it by Mininet, RYU controller and the Wireshark

LAB 4

In lab 4, we extend the introduction to the mininet commands, the students can observe and modify the flows manually to check the connection.

So for summary

- The lab 1 to the lab 3 is quite similar with the 3 labs in ECE444/544's. I'm not saying it's exactly the same because Mininet may not have the ability to test all equipment and catch the speed of each switch. The layout and procedure may look the same, but the final result is quite different.
- In UI's lab, I believe the students can have a better understanding of the knowledge from ECE444/544 course. As for the emulation lab, the greatest convenient is that the students can do these labs anywhere at any time they want.
- There is one thing to be sure, the students can gain the experience in operating the Mininet, they can run the relevant network labs outside the campus, even at home.

The next part is remote access. Thanks to relevant staffs. They helped us connect two computers in the UI lab. Our initial thinking was to connect to UI's computer through TeamViewer or Anydesk. Then we dropped them because of the safety concern. The ITs helped us built the connections so that we can use the remote desktop app on the Microsoft to log in their computer remotely, then in that computer, we need to connect to the second one. Then we can operate on that computer.

We roughly choose some important parts during the connections. As you can see from this video. Firstly, we log into the IP address in our own computer. We need to type in our vandal account and password. These Chinese words means whether the user trust the certificate or not. Here we click 'Yes'. Then the original computer is directed to the first computer in the UI lab. The first computer is like a transfer station, we need to open that remote desktop app in the first computer, using the password provided by ITs to connect to the second one. Here, we connect the second computer called 'remote'. The second one is the computer for the remote access labs.

After finishing the related connections provided by the lab materials, we could start to do the lab. However, the whole procedure is not as smooth as our original thoughts. We still get confused with the connection issues and since we are not accessed to the equipment, it is difficult for us to discover problems. The lab we implemented is aimed to use Accelerator RTAC and Accelerator QuickSet to complete the interconnection of equipment, and to change the equipment settings to measure voltage, current and phase angle.

This picture shows an error we encountered during the process of doing the second lab from prior team.

Based on the software feedback and the suggestions provided by Joe, we need to do some examinations. The first thing We did is the ping test, and it reflects that there did exist the network problem. It implies that the computer we connect is unable to reach the RTAC IP address. Therefore, the next thing we should do is to check the physical connection, then the physical link. However, due to time limits, we can't finish it.

As to the rest diagnosis, our mentor Joe provides us with a typical approach when looking at diagnosing of the Ethernet stack from the perspective of the Open Systems Interconnection (OSI) model. It is one of the oldest and most relied upon methods of modelling an Ethernet communication stack. Students could use the "walking up the ladder" mode, starting at the Physical layer, and slowly progressing towards the Application layer. Checking the cable itself is the Physical layer check, then checking for the flashing Light Emitting Diode (LED) indicators is the Data Link check. Following these checks (and validating that these layers are in an operable state), we'll then look to validate that IP addresses are in an appropriate network segment to communicate with one another.

Here we concluded some challenges during the whole process of remote access labs. The first is we don't have a comprehensive understanding of the ECE444/544 course. At beginning, we did not consider that it is complex to accomplish all the required labs while it is much difficult than we thought. As to some factors like the available lab materials, the images can't provide us with sufficient information, and we are not sure whether our understanding is correct or not. Besides, a lot of time was spent on communication and connections unnecessarily because of time zone difference.

For the risk management, we think compared to the software like TeamViewer and Any desk we originally chose, remote-control desktop is much safer. But it is better to check if the virus protection, VPN and firewall are running.

In summary, although distance learning makes a lot of trouble for us, we learned a lot during the whole process of the project. We would provide some relevant suggestions for what the next team could do. I think our suggestions for where the next team should start and pay attention could be a great help for them. Like get familiar with the relevant equipment and make sure the understanding of connections is correct when going through the lab materials so that it could save a lot of time. For example, it is like when we were doing the reading, we should combine the article and questions together rather than go through article and questions separately which would waste a lot of time.

These are all content we would like to share with you, and we really appreciate the efforts made by others who helped us.

Thank you for your listening!

Doctor Johnson

Thank you.

Yifan Zhu

Do you have any suggestions for us to modify this activity?

Doctor Johnson

A couple. First suggestions, one is, it would be a good idea to put slide numbers on your presentation.

Because sometimes a lot of people, when they have questions, they'll refer to you, they'll refer to a specific slide number.

If you could go back to slide one.

This is minor, but you should have a space before and be in my name, at the bottom of near the middle of the page. My name.

Yeah. And then Abdallah. You have Abdallah's names reversed.

I think I'd corrected that when I sent you the comments before.

Let's go on to the one that says project development, one thing whenever you have these slides like, because you're doing this on zoom, it's a little bit easier. But generally, you want to have a bit. Any of the slides where you have bullets, or you have a list like this? It's like you're barely using any of the space on this page. So, there's no reason why you can't use bigger fonts for the texts.

And then you need a space before the 'learning' .

Yeah, you already had spaces and 'part b' and 'part c' but you're a gonna miss the 'part a' .

Then go to the next slide.

Again, for the bottom, things at the bottom have those bullets. Just select all three of them then go up to the Top where you can select

on this, choose all three of them, highlight all three of them. Now then go up here and then choose press this. No, not bold.

And then if we go to the 'lab', like the 'lab zero', 'lab one', 'lab two', it's a 'lab zero'. It's got a 'lab zero' first.

I would recommend putting a space between the word 'lab' and 'zero' and do the same. Yeah, there's.

And then if you go to the text on 'lab two', or a 'lab one.

So 'wireshark' should start with an upper case 'w', that's a assuming it's a trademark name.

Then you got, I would divide the sentences in the bullets.

And then 'lab 2'. This first sentence again does bullets.

Too many 'lab 2' s. You need to delete one.

Then for 'make one path broken', I would say 'we break one path'

Joe

I guess one thing um. I was thinking about that you might consider, just as a talking point towards the end of your presentation, would be just to talk about some of the challenges that you face while working on this project. So, what we're what were things that were difficult for you and your team to conduct the work and to get started and um, really kind of get your head wrapped around, what the lab material was. And are there ways that that can be improved in in? In anyway? Are there things that you think you didn't really have a good grasp on at first that would have been helpful to get started with the labs or are there think parts of the labs that just didn't really make sense up front and started to later on? That could have been maybe reordered reorganized.

And I guess my question is really sort of directed it. Some of the material that you've really only just started to cover the material from last year's capstone group. I think you guys had a pretty good understanding of doctor Johnson's 444/544 lab material once you got started with that. But I know there have been some challenges with last

year's lab material. So, I think if there are key points in that that, you want to highlight as being challenging, that would be really helpful.

Yifan Zhu

And I think that's all for today's meeting. Thank you for your coming and all the efforts you made for us.

Doctor Johnson

Thank you, I you're the. We're here to help you. Thank you for all your hard work. I know it's been challenging, and you guys have you've done a lot.

So thank you very much. Yes.

Yifan Zhu

Or duty, sure.

Doctor Johnson

Thank you, everyone. See you Friday.

Yifan Zhu

Bye.