Exhibit 1

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

OAKLAND DIVISION

In re RIPPLE LABS, INC., LITIGATION	
This Document Relates To: All Actions	Case No. 4:18-cv-06753-PJH

VIDEO DEPOSITION OF JEREMY W. CLARK

OCTOBER 20, 2023

SAN DIEGO, CALIFORNIA

Reported by

Cynthia J. Vega, RMR, RDR, CSR 6640, CCRR 95

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The video deposition of Jeremy W. Clark, a Witness herein, taken on behalf of Defendant, on Friday, October 20, 2023, before Cynthia J. Vega, CSR 6640, beginning at the hour of 9:06 a.m., at 770 First Avenue, Suite 250, in the City of San Diego, County of San Diego, State of California.

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WITNESS

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SAN DIEGO, CALIFORNIA

FRIDAY, OCTOBER 20, 2023, 9:06 A.M.

THE VIDEOGRAPHER: This is file number 1 of the videotaped deposition of Jeremy Clark, taken by lead plaintiff in the matter of -- regarding Ripple Labs, Incorporated, Litigation in the Court of Northern District of California, Oakland Division.

This deposition is being held at Regus, 770 First Avenue, Suite 250, San Diego, California 92101.

Today's date is October 20, 2023. The time is 9:06 Pacific Daylight Time.

My name is Joe Malone. I'm the videographer representing Digital Evidence Group.

The court reporter is Cindy Vega, also in association with Digital Evidence Group.

Will counsel please introduce yourselves for the record, after which time the court reporter will swear in the witness.

MR. TAYLOR-COPELAND: James Taylor-Copeland and Max Ambrose on behalf of lead plaintiff Bradley

Sostack.

MR. OPPENHEIMER: Bradley Oppenheimer and Lilian Smith from Kellogg Hansen on behalf of defendant Ripple Labs, Inc.

And just so the record is clear, this deposition today is being taken by the defendants.

Can anyone on Zoom enter appearance.

MS. SAWANT: Yes. Prachee Sawant from King & Spalding on behalf of Bradley Garlinghouse.

JEREMY W. CLARK,

Witness herein, being first duly sworn, testifies as follows:

EXAMINATION

BY MR. OPPENHEIMER:

Q. Good morning. Could you please state your name for the record.

A. Jeremy William Clark.

Q. What's your home address?

A. 115 Florida Drive, Beaconsfield, Quebec.

Q. And what's your business address?

A. I don't know it off the top of my head. It's something like 1515 Saint-Catherine Street West, Montreal.

Q. And you were just sworn in by the court reporter. You understand that you are testifying under the same oath that you would take if you were in court testifying before a judge or a jury; right?

A. I do.

Q. Is there any reason you can't give truthful and accurate testimony today?

A. No, there isn't.

Q. Now, you submitted both an expert -- an opening expert report and a rebuttal report in this case; right?

A. Yes. That's correct.

Q. I'm going to show you a document that we'll mark as Exhibit 159.

(Exhibit 159 marked for identification.)

BY MR. OPPENHEIMER:

Q. Mr. Clark, do you recognize Exhibit 159 as a copy of your opening expert report in this case?

A. Yes, I do.

Q. And this was submitted on June 7, 2023; is that right?

A. That sounds right.

Q. And this opening report contains all of the affirmative opinions you intend to offer in this case; correct?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I do say in the report itself that I reserve the right to amend the report in lieu of new evidence.

BY MR. OPPENHEIMER:

Q. You haven't issued any amendments to this report, have you?

A. I have not.

Q. Are there any affirmative reports -- we'll come to -- I'm sorry -- affirmative opinions -- we'll come to rebuttal opinions in a second. But are there any affirmative opinions that you intend to offer in this case that are not reflected in this opening report?

A. There are not.

Q. If you turn toward the back of this report,

the page numbering goes up to 92 and then it restarts at 1 of 30. But you see at page 92 there is a heading that says "Curriculum Vitae"?

A. I do see that.

Q. Is that your CV following that heading there?

A. That is mine.

Q. And the CV contains all the qualifications that you considered relevant to the opinions you're seeking to offer in this case; is that right?

A. So it certainly contains qualifications that I believe are relevant. I don't know about all.

Q. Do you have any other qualifications that you believe are relevant to your expertise in this case that are not disclosed in your CV?

A. The CV is up to date for the time of submission. There could be things that were added to the CV since, like papers that have been published.

Q. I don't think that answers my question, Mr. Clark.

My question is: Do you have any qualifications that you believe are relevant to your expertise in this case that aren't disclosed in the CV?

A. So maybe I don't understand the distinction, but all I'm saying is the only thing that is missing from the CV are things that I've done since the report has been submitted.

Q. And have you done anything in the roughly four months since the report has been submitted that you think bears on your qualifications to offer expert testimony in this case?

A. So I think that my expertise comes from the fact that I publish in the area, so if I publish additional papers in the area, that would add to my expertise.

Q. Have you published any additional papers in this area since June 7, 2023?

A. Indeed. Yes.

Q. And how many papers have you published since June 7?

A. At least one that I can think of.

Q. What is that paper?

A. It's called "Fast and Furious Roll-Ups" -- "Fast and Furious Withdrawals for Optimistic Roll-Ups."

Q. Does that paper address XRP?

A. It does not.

Q. Does it offer a comparison between different blockchain systems?

A. It does.

Q. What systems does it compare?

A. It compares -- so the nature of the paper is not a comparison, but implicit in the research is a comparison between Ethereum and Arbitrum.

Q. Where was that paper published?

A. It will appear next week at Advances in Financial Technology at Princeton.

Q. Is that a peer-reviewed journal?

A. It is. It is a peer-reviewed venue. It is not a journal. It is a conference.

Q. And that's the only additional paper you're aware of --

A. That's the only additional paper, yes.

Q. Let me finish the question.

A. Yes, sir.

Q. That's the only additional paper you're aware of that you've published since the time you submitted the CV attached to this expert report in Exhibit 159; correct?

A. That's correct.

Q. Okay. I'm now going to show you a document that we'll mark as Exhibit 160.

(Exhibit 160 marked for identification.)

BY MR. OPPENHEIMER:

Q. Do you recognize Exhibit 160 as a copy of the rebuttal report that you submitted in this case?

A. I do.

Q. And this rebuttal report was submitted on or about August 30, 2023; is that right?

A. That's my recollection, yes.

Q. Does this rebuttal report marked Exhibit 160 contain all of the rebuttal opinions that you intend to offer in response to the defendants' experts in this case?

A. So I didn't include the same language that

I did in the expert report, but I refer to that section of the expert report. So again, I would reserve the right to make any amendments to it.

Q. And you haven't made any amendments to this report before today; correct?

A. Yeah, that's correct.

Q. Are there any opinions that you intend -- strike that.

Are there any rebuttal opinions that you intend to offer in this case in response to defendants' experts that are not contained in this rebuttal report?

A. There are not.

Q. Now, in particular, your rebuttal report addresses the opinions offered by Professor Allen Ferrell and Professor Yesha Yadav; correct?

A. Yes, that's correct.

Q. You're not addressing any of the other expert reports that defendants submitted; correct?

A. Let me see.

So I was given a copy of all the expert reports for my consideration. And so I looked at

all of them. And so it's possible that there is language in here that's a reflection of having read that, but it's -- the actual citations are only to those two expert reports. Yeah, expert reports.

Q. So you read the other defendants' expert reports but did not offer any rebuttal opinions in response to them; correct?

A. They were provided to me.

Q. If you go to section 6 in your rebuttal report, list of additional materials considered. Do you see that?

A. I do.

Q. The first section lists some expert reports. And let's just take them one at a time.

Expert report of Alan Schwartz. You're not offering any rebuttal to the opinions that Professor Schwartz offered in this case, are you?

A. Again, I considered that material. That's why it is listed here. But I don't cite it directly in the rebuttal.

Q. Right. So my question isn't whether you cite it. My question is whether you were offering

an opinion in response to and rebutting Professor Schwartz's opinion in this case. Are you offering an opinion that rebuts Professor Schwartz's in this case?

A. I'm not.

Q. And same question with respect to the expert report of Bradley Borden. Are you offering an opinion that rebuts the opinion given by Professor Borden in this case?

A. Same answer.

Q. And would it be the same with respect to Professor Easton as well?

A. That's correct.

Q. Thank you.

Page 1 of your rebuttal report, at lines 6 to 7, you write, "My qualifications and other background information is set forth in my previous expert report."

That's a reference to the opening expert report we saw in Exhibit 159; correct?

A. That's correct. It would be pages -- or section 1 of that report.

Q. So all of the qualifications that you consider relevant to your rebuttal opinions are already contained in your opening report and the CV that's attached to it; is that right?

A. So I laid out my qualifications in my expert report. Is every -- is every qualification in the expert report? I think we already answered that question.

Q. Right. So putting aside the one additional paper that you published since your opening report was submitted, you believe the qualifications set out in your opening report are all of the ones that are relevant to both your opening and your rebuttal opinions; correct?

A. So there are additional things that I've added to my CV since beyond papers, but if we set that aside, then yes.

Q. What other things have you added to your CV other than papers since you submitted it in this case?

A. So evidence of impact, invited talks and seminars. So this is page 13 of 30 in the indexing

of the CV.

Q. What have you added there?

A. Several talks that I've given. Do you want me to enumerate them?

Q. If you know them all, sure.

A. So earlier this week I spoke at an event at Concordia University called CS Net. Last week I was at the University of Waterloo. I spoke at an event that is the Security and Privacy Institute at the University of Waterloo.

On Monday I spoke at an event that's the Cyberjustice Institute at the University of Montreal. Let's see. In the end of June, maybe early July, I spoke at a16Z crypto.

There could be others, but those are the ones that come to mind.

Q. No others that you remember sitting here today?

A. That's correct. No others that I remember sitting here today.

Q. Did any of those additional talks that you just mentioned involve XRP?

A. No, not directly.

Q. Did any of them involve the attributes of currencies?

A. Could you define what you mean by that? You mean like unit values or value?

Q. Right. Did any of them involve the economic attributes of currencies such as unit of accounts or value, et cetera?

MR. TAYLOR-COPELAND: Objection. Calls for a legal conclusion.

THE WITNESS: So I certainly don't have an opinion as to what qualifies as a currency or an asset. And I did not cover those three topics specifically in any of the talks.

BY MR. OPPENHEIMER:

Q. Did any of the talks that you just mentioned involve discussing or determining the location at which financial transactions occur?

A. No, they did not.

Q. Okay. Let's start with your rebuttal of Professor Ferrell's opinions in Exhibit 160. And that section begins at page 8; is that right?

A. That looks correct.

Q. Now, your rebuttal opinion here is directed specifically at Professor Ferrell's opinion that XRP has the characteristics of a currency; is that right?

A. More specifically the report described XRP as being a unit of account. And then the evidence that was offered was the fact that two websites offered the ability to purchase goods or services using XRP.

Q. Right. So you're not rebutting the other opinions that Professor Ferrell offered in his report; correct?

A. This report does not cover that.

Q. So, for example, Professor Ferrell conducted a principal components analysis to determine whether there was any -- what's called alpha in the price returns of XRP. You're not addressing that opinion; correct?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yeah, that's right. That's not addressed at all.

BY MR. OPPENHEIMER:

Q. Okay. And so just to be clear, the only opinion from Professor Ferrell's report that you're addressing is whether XRP qualifies as a unit of account; is that right?

A. Yes, that's correct.

Q. Okay. You're not an economist, are you?

A. No, I'm not.

Q. You don't have any degree in finance or economics, do you?

A. I do not have a degree in finance or economics.

Q. What special training, if any, do you have on how to evaluate what is or is not a unit of account?

A. So I've taken courses in the area of finance. I've read lots of research literature in that area. I've done research collaborations with economists. And so whatever I know about that field was through my research activities and my academics.

Q. The courses that you just mentioned, are those undergraduate or graduate courses?

A. Graduate.

Q. What courses did you take in the area of finance?

A. Financial -- financial engineering, I believe it was called.

Q. And did that course provide any instruction on how to determine what is or is not a unit of account?

A. I don't recall sitting here today.

Q. Okay. Have you ever published any papers that address how to determine what is or is not a unit of account?

A. So I don't recall exactly, but I suspect I have.

Q. Sitting here today you can't name a paper that you published that addresses that issue, can you?

A. So I could name a paper that I suspect has that in it, but I would have to review the paper to make sure that it is in.

Q. And what paper is that?

A. So if you turn to my CV, I'll point it out.

Okay. So on page 9 of 30, this is a topic -- I'll just tell you a few places in my CV that this could appear. So there is a possibility that it is discussed in J09, the ninth journal, which is "Systemizing the Challenges of Auditing Blockchain-Based Assets."

The next paper is called "Demystifying Stablecoins." That's another place that it could be.

And then if you flip to -- well, first off if you flip to my invited talks, a lot of them I'll deal with that particular issue. So just maybe to pick one. There is a lot of talks that I've given, for example, on page 14, to BMO, Bank of Montreal. It's called "Blockchain Technologies: Landscape and Future Directions."

So this is a standard talk that I give a lot. The slides vary, but the properties of money is something that I have had slides about. So I don't recall exactly if that -- at that particular event I covered it, but it is something.

And then if you flip to page 23 of 30,

you'll notice that I teach a course. It's called "Blockchain Technology." And so one of the lectures that I give covers this as well.

Q. Okay. So let's start with the talk that you just mentioned, BMO, Bank of Montreal. Do you have any notes or slides available from that talk that you've hosted on your website or elsewhere?

A. Yes. I believe they're on my website.

Q. And working backward from that, you mentioned the article demystifying stablecoins as one place where you may have addressed those; is that right?

A. That's right.

MR. OPPENHEIMER: I happen to have a copy of that article, so let's mark that as Exhibit 161.

(Exhibit 161 marked for identification.)

BY MR. OPPENHEIMER:

Q. Mr. Clark, do you recognize Exhibit 161 as the demystifying stablecoins article you were just describing?

A. Yes and no. So this is the magazine version of the article, which is the abbreviated

version. So there is a much -- like longer tech report that's cited in the article itself. So on page 46, citation 3 is the full version of it. And so this is the kind of thing that would have ended up in the appendix because it wasn't -- it was sort of an indirect thing.

Q. Okay.

A. So this does not include the appendix.

Q. Exhibit 161 was the version that was published in the communications of the ACM magazine; right?

A. That's correct.

Q. And feel free to take a look at it, but it sounds like you just said from your last answer that this material that was published in communications of the ACM does not have a discussion of unit of account; is that right?

MR. TAYLOR-COPELAND: Objection.

Take your time to read it.

THE WITNESS: So based on my brief review of the paper, I would say that that's correct.

MR. OPPENHEIMER: Okay. I'm going to show

you another document we'll mark as Exhibit 161.

(Exhibit 162 marked for identification.)

MS. SMITH: Yeah. I think this was 161.

MR. OPPENHEIMER: I'm sorry. 162. Thank you.

(Exhibit 162 marked for identification.)

BY MR. OPPENHEIMER:

Q. Is Exhibit 162 the full version of the demystifying stablecoins article that you were just describing?

A. Yes. I recognize it as being such.

Q. Okay. And if you look at page -- the bottom of page 12, you see the section headed A.5, functions of money?

A. I see it.

Q. Is that the portion of the appendix that you're referring to earlier that you believe discusses whether something is a unit of account?

A. So earlier when I referred to it, I just thought that this might have been a topic that was discussed in this paper. I certainly didn't have a particular section of the paper in mind.

Q. Okay. Is this the section of the paper that discusses that topic?

A. This appears to be a section of the paper that discusses -- that does discuss the topic.

Q. Okay. Feel free to read through the remainder. My question to you is: There is no other section that discusses whether something is a unit of account, is there?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I believe it's the only direct mention of that property. However, that property might inform other things that are said in the paper.

BY MR. OPPENHEIMER:

Q. Okay. But this is the only direct mention of unit of account; is that right?

A. Yes. So this is -- for the record, it is a 30-page paper and I looked at it for about five minutes. So to the extent that I looked at it, that's true.

Q. It's a 30-page paper that you published?

A. That's correct.

Q. Okay. Now, in this section A.5 that we were just talking about, there is no citations to any sources for the definition of unit of account; right?

A. Can I go back to your previous question?

Q. Sure. Well, let me ask you this. Answer the question I just asked and then we can go back. I'm happy to let you go back, but I want to make sure we don't miss this one.

A. Okay.

Q. I will ask it again. In this section A.5 that we were just talking about, there is no citation to any sources for the definition of unit of account; right?

A. That is correct.

Q. Okay. You had something to add to that?

A. Yes. So your previous question was but I published this paper. I just wanted to note that this was a co-authored paper. So I was a co-author on this paper.

Q. Got it. You can set that aside. I'll turn back to your rebuttal report in Exhibit 160.

Mr. Clark, how do you define "unit of account"?

A. So in the rebuttal report I didn't include his definition of unit of account, but I accepted his definition. So I wasn't seeking out to define it for myself.

Q. Are you aware of any definitions of unit of account that you believe to be prevailing in financial literature?

A. There is a very influential textbook. I believe Greg Mankiw was the author of it. It is a standard undergraduate textbook in economics. It may have even been the first to sort of define those properties of money, but that's a standard definition that's used.

Q. And do you know what definition the Mankiw textbook uses?

A. So I couldn't recite that definition sitting here today.

Q. Okay. Did you consult the Mankiw textbook when you were working on this opinion?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: No, I don't think I did.

BY MR. OPPENHEIMER:

Q. Now, you write at page 8, lines 14 through 15, "A currency that is used to denote the value of assets and liabilities is said to fulfill this property."

Is it your opinion that a currency that is used to say how much an asset or a liability is worth is a unit of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Let me reread it and then I'm going to have you ask your question again.

Okay. Can you ask your question again?

BY MR. OPPENHEIMER:

Q. Is it your opinion that a currency that is used to say how much assets or liabilities are worth is a unit of account?

A. Can you -- what do you mean to say, like someone says it?

Like if I say something like I'll accept three cows for that, that doesn't make it a unit of account.

Q. Well, let me ask it this way. I'm just trying to understand what you wrote here in lines 14 through 15. "A currency that is used to denote the value of assets and liabilities is said to fulfill this property."

That's what you wrote in your report; right?

A. That's correct.

Q. So my question is: Is it your opinion that if a currency is used when quoting how much assets and liabilities are worth, is that what makes it a unit of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So the unit of account -- okay. So assets and liabilities would be described on a balance sheet. These are often audited financial statements. And there is rules about what you can use to denote things. And so those would be called a unit of account, for example.

BY MR. OPPENHEIMER:

Q. So is it your opinion that a currency can only be a unit of account if it's used on audited

financial statements?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I wouldn't say "only." My opinion is that for the purposes of that financial system, that currency is the unit of account.

BY MR. OPPENHEIMER:

Q. So currencies don't have to be used on audited financial statements in order to be units of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: It's possible.

BY MR. OPPENHEIMER:

Q. What methodology did you use to determine -- strike that.

What methodology can anyone use to determine whether a currency is a unit of account?

A. So -- okay. So I can't recite a methodology sitting here today.

Q. And what methodology did you use to determine whether XRP was a unit of account?

A. I did not determine that XRP was a unit of account. That was not my opinion.

Q. I asked you -- you didn't reach a conclusion one way or the other; is that right?

A. No. I reached a conclusion that the evidence that was provided did not show that XRP was a unit of account.

Q. Okay. So you're not offering an opinion that XRP is not a unit of account; is that right?

MR. TAYLOR-COPELAND: Objection. Misstates testimony.

THE WITNESS: So my opinion is just what the report says, which is that the two examples that were provided in this report do not demonstrate that XRP is a unit of account.

BY MR. OPPENHEIMER:

Q. Okay.

A. And I am not offering an opinion beyond that.

Q. Okay. So you're not opining that XRP could not be a unit of account in other contexts?

A. That's correct.

Q. And you're not offering an opinion that XRP has never been a historical -- scratch that.

You're not offering an opinion that XRP has never historically been used as a unit of account somewhere?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yeah. That's correct.

MR. OPPENHEIMER: Let's take a look at Professor Ferrell's report, which was previously marked as Exhibit 149.

(Exhibit 149 was previously marked.)

BY MR. OPPENHEIMER:

Q. I'm going to direct you to page 34, paragraph 65. You see in the first sentence there Professor Ferrell says that XRP can be used, quote, "to express prices at cryptocurrency exchanges"?

Do you see that?

A. I don't. Sorry.

MR. TAYLOR-COPELAND: Objection. Misstates the document.

THE WITNESS: Can you clarify where I'm looking?

BY MR. OPPENHEIMER:

Q. The first sentence of paragraph 65, at the

end of that sentence.

MR. TAYLOR-COPELAND: Just for the record, the whole sentence says, "XRP can be used as a common base to express the price of a unit of XRP on the XRP Ledger, but also to express prices at cryptocurrency exchanges."

THE WITNESS: So I see the sentence that was just read.

BY MR. OPPENHEIMER:

Q. Okay. In your rebuttal report, you don't address whether XRP can be used to express prices on the XRP Ledger, do you?

A. So I don't address that in the rebuttal report.

Q. Okay. And you also don't address in your rebuttal report whether it can be used to express prices at cryptocurrency exchanges; right?

A. So I believe that's addressed indirectly.

Q. Where can I find that indirectly in your rebuttal report?

A. So if you go to page 8, line 20, the end of the sentence says, "website determining the price of

XRP in US dollars and offering a quote in XRP."

So that's not a direct -- I'm not directly responding to the sentence that you talked about, but it does indicate that prices are quoted on exchanges in XRP.

Q. Do you know which fiat currencies and cryptocurrencies are priced in XRP on exchanges?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I think that's a hard question to answer directly. It sort of goes into the mechanisms of how exchanges work.

BY MR. OPPENHEIMER:

Q. Are you aware that there are exchanges that allow trading between Bitcoin and XRP?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I'm aware that there are exchanges where, if you have Bitcoin, you can do a trade and it results in you having XRP. It's not quite exactly what you asked, but...

BY MR. OPPENHEIMER:

Q. Are you offering an opinion that when trading Bitcoin that someone owns in order to get

XRP or vice versa on an exchange that those prices are actually -- that the quoted prices are actually run through US dollars as an intermediary?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Sorry. You need to repeat the question.

BY MR. OPPENHEIMER:

Q. Are you offering opinion that when people trade Bitcoin for XRP on exchanges that the price quotes for Bitcoin to XRP are actually run through US dollars as an intermediary?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Is your question that that might happen or it always happens?

BY MR. OPPENHEIMER:

Q. My question is: Are you offering an opinion that that happens?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: That it always happens or that it could happen?

BY MR. OPPENHEIMER:

Q. Let's start with it always happens.

A. No, I'm not offering that opinion.

Q. Okay. And in your rebuttal report you didn't undertake any investigation of whether or how often that happens on digital asset exchanges, did you?

A. That's correct. So I have background knowledge of exchanges, but for the purposes of the expert report I didn't go out and conduct any experiments --

Q. Okay.

A. -- along those lines.

Q. Now, is it your opinion that if a seller is willing to accept XRP as payment for goods or services, that is still not a unit of account unless -- well, let me ask it this way. Strike that.

Is it your opinion that if a seller is willing to accept XRP as payment for goods or services, but the seller is ultimately going to convert it into US dollars, that that's not a unit of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So that is not the opinion that I'm offering in this report.

BY MR. OPPENHEIMER:

Q. Are you offering an opinion that if a quote is made in US dollars and then converted to XRP that XRP is not a unit of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Can you repeat the question?

BY MR. OPPENHEIMER:

Q. Are you offering an opinion that if a quote for a price is made in US dollars and then converted to XRP, that XRP is not a unit of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So my opinion is that XRP is not being used as the unit of account for that particular action. It doesn't say that anything about XRP more broadly than that.

BY MR. OPPENHEIMER:

Q. And you don't cite any sources in your rebuttal report to say that when XRP is used in that way, or when any currency is used in that way, that it is not a unit of account --

MR. TAYLOR-COPELAND: Objection.

///

BY MR. OPPENHEIMER:

Q. -- is that right?

A. So if your question is do I make any citations, the answer is no.

Q. Okay. One of the things you note in your rebuttal opinion at line 22 of page 8 is that one of the websites Professor Ferrell quoted -- or Professor Ferrell cited warns that you will only have 20 minutes to make the transaction; is that right?

A. Yes. That's correct. That's a direct quote from the website.

Q. Do you think that the presence of a countdown timer on a travel sites price quote means that the quoted currency isn't a unit of account?

A. I don't believe that's a necessary condition for the currency to be not considered a unit of account.

Q. There was a lot of negatives in there, so let me see if I can untangle that with you.

A. Yeah. So I think your question is, is it a necessary condition that there must be a countdown timer in order to conclude this, and the answer is no. You could conclude this without there being a countdown timer.

Q. Right. So my question is actually, if you want to use necessary or sufficiency as the terms, is your opinion that the presence of a countdown timer is sufficient to disqualify something as a unit of account?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: No, of course not.

BY MR. OPPENHEIMER:

Q. Okay. So how is the countdown timer relevant to your opinion?

A. So there is a function for the countdown timer, and it coheres with the story which is that this website is thinking of the web service, I guess, the domain name in US dollar terms. And so based on my experience in the area and people that I've talked to, the reason that this functionality is added to websites is because there is a fear that

the exchange rate is going to change and so the quote will go stale. And that presents an arbitrage opportunity, even if you have no interest in the domain name itself.

Q. Do you agree that other currencies such as US dollars can also change exchange rates over time?

A. Exchange rates with -- exchange implies there is two assets. So you mean like the US dollar to Canadian dollar exchange rate changes?

Q. Sure. Let's take that example. The exchange rate of US dollars to Canadian dollars can also change; right?

A. Can I just rephrase your question? You're asking does the exchange rate between US dollars and Canadian dollars change over time?

Q. Yes.

A. Yes, it does. That's my understanding, yes.

Q. That doesn't disqualify US dollars or Canadian dollars from being a unit of account, does it?

A. The fact that it is exchange rate with --

the Canadian dollars changes over time does not disqualify it for being a unit of account.

Q. So why is it different for XRP?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So my opinion isn't about XRP. My opinion is about this website and whether it is using XRP as a unit of account.

BY MR. OPPENHEIMER:

Q. Okay. You -- on page 10 of your rebuttal report, you describe some website rankings for the websites at issue. Is there a minimum level of popularity that you think a website has to have in order to qualify the currency it uses as a unit of account?

A. Sorry. Can you -- I'll let you drink and then maybe you can repeat the question.

Q. Is there a minimum level of popularity you think a website has to have in order to qualify the currency it uses as a unit of account?

A. So my opinion is that these websites do not use XRP as -- they do not use XRP as a unit of account. So that's regardless of if they're ranked

number 1 or 100,000.

Q. Then why is this ranking relevant to your opinion, if at all?

A. Okay. So let me just review the report.

If you happen to know where it's mentioned in the Ferrell report, you could save some time, but I can find it as well. I just want to reread what he said about these websites.

Q. Sure. I think earlier we were looking at paragraph 65 in the Ferrell report, if that helps.

A. Yes. I'm not exactly there.

Q. Just to make the record clear, I'll ask my question again. Why is the website ranking relevant to your opinion, if at all?

A. For the record, I'm just flipping through the document trying to find the reference to these websites.

MR. TAYLOR-COPELAND: It's paragraph 65.

THE WITNESS: It's not, though, is it?

MR. TAYLOR-COPELAND: In Ferrell's report.

THE WITNESS: Yes. Sorry. You were right. My mistake.

Okay. So this is just a side note that it is what it says, just that these two websites are very lowly ranked.

BY MR. OPPENHEIMER:

Q. In your Bitcoin and blockchain technology course that you mentioned earlier, you teach -- I think you mentioned you teach a lesson on whether Bitcoin and other cryptocurrencies satisfy the characteristics of currency; is that right?

A. So what I recall sitting here today is I introduced those three properties of money, and I probably note that it is controversial whether it meets that there is no universal consensus. So I'm certainly not saying that it does or does not.

Q. Isn't it true that you say that Bitcoin is a, quote, soft fail for satisfying those three properties of money in that lesson?

A. That sounds reasonable.

Q. Okay. If we can turn backward in your rebuttal report to the section addressing Professor Yadav's opinions. Your rebuttal report doesn't set out any qualifications from your education,

training, or experience relating to determining the domesticity of financial transactions, does it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So what I say about my qualifications is that it refers back to the expert report. The expert report contains a CV, and the CV contains references to the courses I've taught, the papers I've written. And so I feel that my expertise is covered by the CV itself.

BY MR. OPPENHEIMER:

Q. Okay. And what expertise do you have in determining the domesticity of financial transactions?

A. Can you define "domesticity"?

Q. Let's start with this. What expertise do you have in determining the -- actually withdrawn.

Do you have an understanding of what the term "domesticity" means in the context of financial transactions?

MR. TAYLOR-COPELAND: Objection. Calls for a legal conclusion.

THE WITNESS: I'm not here to offer legal

opinions.
BY MR. OPPENHEIMER:
Q. I'm not asking for a legal opinion. I'm asking whether you have an understanding -- yes or no, do you have an understanding of what the term domesticity means in the context of financial transactions?
MR. TAYLOR-COPELAND: Objection.
THE WITNESS: I don't know exactly what you mean by that term.
BY MR. OPPENHEIMER:
Q. Okay. What expertise do you have in determining the physical locations where financial transactions occur?
A. So by financial transactions, I think you're referring to where the exchanges are located, or are you asking something different?
Q. I'm not asking about exchange locations.
A. So I don't have a legal opinion of where the transaction would be located, should it be conducted on an online exchange.
Q. Okay. I'm asking more broadly. People all

over the world engage in financial transactions. They buy and sell currencies, securities, commodities, other assets. What expertise do you have in determining the physical location of where such transactions occur?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So what I know about how financial markets operate is, you know, through -- for example, on my CV, I have -- you'll see that I've held many grants with AMF, which is sort of the Quebec version of both the SEC combined with the CFTC. So these are kinds of discussions we have. They have an enforcement team that looks at these particular issues. I've consulted under an NDA with law enforcement on these issues. So that's sort of just a general background.

BY MR. OPPENHEIMER:

Q. When you say "on these issues" --

A. Determining the -- sorry. I should let you finish your question.

Q. Thanks. Appreciate it.

When you say "on these issues," are you

referring to specifically determining the location of which financial transactions take place?

A. I'm not referring specifically to that.

Q. Okay. You're talking about consulting on financial questions more broadly?

A. That would be inclusive of that question, yes.

Q. Okay. Let me show -- actually first, just to be clear, you've never published any papers on determining the physical location of where transactions occur; right?

MR. TAYLOR-COPELAND: Objection. Calls for a legal conclusion.

THE WITNESS: So I'll say that the methodologies that I've used in the rebuttal report I do have papers on, but I don't have a paper that spoke to exactly that question.

BY MR. OPPENHEIMER:

Q. So to be clear, you've not published a paper about how to determine the physical location of where a financial transaction occurs; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yes. So it's mentioned -- I mean, it is such a vague question, it is hard to answer. But, for example, a cryptocurrency location, if you define a location to be an IP address, that would be something that's covered in my research, to give you an example. So I don't want to say that I've never opined on that in any of my academic research.

I've certainly -- I've answered questions that are -- or I've made statements that do have to do with locations of where transactions take place. But it's not a research focus, which is maybe what you're getting at.

BY MR. OPPENHEIMER:

Q. My question is a little different.

You've never published a paper about how to figure out that location, have you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yes. So I believe that that -- so I can say for certain that I haven't published a paper where that's the main contribution of the paper, but I do believe that throughout my

academic papers there has been a lot of discussion of de-anonymizing transactions.

So as you know, things like Bitcoin have a veil of anonymity and the de-anonymization of transactions is a research topic that I'm very familiar with and it is something that I've addressed in my papers to the extent -- so the paper that jumps up to mind is I have a paper called "Mixcoin," and so that's one paper that perhaps would discuss it, but I don't recall exactly sitting here today what it says.

MR. OPPENHEIMER: Okay. So let's take a look at a document I'm going to mark as Exhibit 163. It is a copy of Professor Yadav's expert report.

(Exhibit 163 marked for identification.)

BY MR. OPPENHEIMER:

Q. Okay. If I can direct you to page 43 of Exhibit 163. You'll see at the very top of the page there is a heading Roman numeral V, it starts with "Opinion:" Do you see that?

A. I see it. Yes.

Q. Okay. So this first opinion in Professor

Yadav's report says, "Opinion: Offers to buy and sell currency" -- I'm sorry. Let's start again.

This first opinion says, "Opinion: Offers to buy and sell cryptocurrencies on an exchange are made on the exchange. Once offers to buy and sell are matched, they become final and binding trades on the exchange."

You're not disagreeing with that opinion, are you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Are you asking whether I agree with it or whether the report rebuts that?

///

BY MR. OPPENHEIMER:

Q. I'm asking whether your rebuttal report offers a rebuttal to that opinion.

A. It does not.

Q. Okay. Take a look at page 49, the next Roman numeral heading VI. This one says, "Opinion: Trades of cryptocurrencies on exchanges become final when orders are matched by an exchange pursuant to exchange rules, not when any transactions are

reflected on the blockchain (which may never occur)."

A. Sorry. I lost the page number.

Q. Page 49.

A. 49. Sorry. Okay.

Q. So page 49, the opinion here -- I'll read it again now that you're on the same page.

"Opinion: Trades of cryptocurrencies on exchanges become final when orders are matched by an exchange pursuant to exchange rules, not when any transactions are reflected on the blockchain (which may never occur)."

Your rebuttal report isn't offering an opinion in response to that opinion from Professor Yadav, is it?

A. So I believe there is references in this section that overlap with things that I do discuss in my report. So, for example, I might direct you to line 105 on page 55. So she writes that "blockchains may have fragilities in the form of malicious attacks or outages," which I believe I discuss in my expert report.

Q. I don't think that's quite my question. So maybe I can sharpen it.

A. Sure.

Q. Professor Yadav is offering an opinion that says, "Trades of cryptocurrencies on exchanges become final when orders are matched by an exchange pursuant to exchange rules, not when any transactions are reflected on the blockchain (which may never occur)."

Your rebuttal report doesn't disagree with that conclusion, does it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So the professor will have a basis for that opinion, and it's quite possible that my expert rebuttal addresses the basis of her opinion. It seems -- I mean, I'm just glancing at this now, but if she's bringing up this idea of attacks as the basis. Otherwise, I don't know why it would be in that section if it is not a basis for that opinion, then I might not agree with the entire basis of what she's saying.

BY MR. OPPENHEIMER:

Q. Where in your opinion in your rebuttal report do you offer an opinion that trades of cryptocurrencies on exchanges do not become final when orders are matched by an exchange pursuant to exchange rules?

A. So that's not an opinion that's contained in my report.

Q. Okay.

MR. TAYLOR-COPELAND: Now a good time for us to take a break? We've been going for about an hour.

MR. OPPENHEIMER: Sure. Let's go off the record.

THE VIDEOGRAPHER: Off the record, 10:07 a.m.

(Recess, 10:08 a.m. to 10:19 a.m.)

THE VIDEOGRAPHER: This begins media file number 2, today's testimony of Jeremy Clark. We're back on the record at 10:19 a.m.

BY MR. OPPENHEIMER:

Q. If we can continue in Professor Yadav's report, Exhibit 163. I'm going to direct you to

page 56.

At the very bottom there is a heading that says, "Opinion: For 20 of 25 of the exchanges listed in table A, there is no indication that the exchanges are located within the United States."

Your rebuttal report doesn't offer any opinion that any of those 20 exchanges are, in fact, located within the United States, does it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So in the rebuttal report I was provided with a set of exchanges and asked whether they were located in the United States. So the ones that I list -- Coinbase, Kraken, Poloniex, Bittrex -- are the ones that I analyze. Finance.US -- like do you want me to go through the list and see whether those things match?

BY MR. OPPENHEIMER:

Q. Do you know which of the exchanges that Professor Yadav said had no indication of being located in the United States?

A. Sitting here today I don't recall, but I could look it up.

Q. Okay. Let's take a look in Exhibit A, which begins at page 61 of her report.

It starts with Binance. Not Binance.US, but Binance. Do you see that on page 61?

A. I see it.

Q. And your rebuttal report is not offering an opinion about where Binance is located, is it?

A. That's correct. My report talks about Binance.US.

Q. Okay. Page 62, the exchanges listed on this page are bitbank, Bitfinex, and BitForex. Your rebuttal opinion doesn't address those exchanges, does it?

A. That's correct.

Q. Page 63, Bithumb and Bitlish, your opinion doesn't address those exchanges, does it?

A. That's correct.

Q. Page 64, BitMart, Bitmax, and Bitrue, your opinion doesn't address those exchanges, does it?

A. That's correct.

Q. Page 65, the first one listed is Bitstamp. Your opinion does not address Bitstamp, does it?

A. It does not.

Q. I think you mentioned Bittrex, so we can skip that one and come back to it.

A. Correct.

Q. On page 66 the first one listed is BW and the last one listed is CoinBene. Your opinion does not address either of those two; right?

A. Yes. That's correct.

Q. Page 67, Coinone, DigiFinex, HitBTC, your opinion doesn't address those three, does it?

A. That's correct.

Q. Page 68, Huobi Global, your opinion does not address that exchange, does it?

A. That's correct.

Q. Page 69, Korbit, your opinion does not address that exchange, does it?

A. That's correct.

Q. Page 71 --

A. So skipping over Kraken.

Q. Skipping Kraken, which I think you mentioned. We'll go to page 71. The first one listed here is Aux Cayes Fintech Co. Your opinion

doesn't address that change, does it?

A. That's correct.

Q. Page 72, Upbit, ZB, and ZBG, your opinion does not address those three exchanges, does it?

A. Yes. That's correct.

Q. Okay. Let's go to the exchanges that you do address. And looking at your rebuttal report, Exhibit 160. At page 2, line 1, what you say is "For all five exchanges above, I use an additional method to confirm their location."

And in particular your additional method is looking at their server authentication certificates; is that right?

A. Yes, that's correct.

Q. The server authentication certificates don't have to be registered to the same location where an exchange keeps its central limit order book, do they?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: By "keep," you mean running the code that implements the CLOB, Central Limit Order Book, C-L-O-B.

BY MR. OPPENHEIMER:

Q. Let's start with that. The server authentication certificates don't have to be registered to the same server where they're running code for the Central Limit Order Book; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: And if you mean the same physical machine, the answer is no.

BY MR. OPPENHEIMER:

Q. In fact, they don't even have to be in the same country as any machines running the Central Limit Order Book; right?

A. So the users' interaction with it would have to go through that server. So it's the first stop. What happens behind the scenes if there is redirects of traffic or offloading of computation elsewhere, that's correct. The certificate will not tell you what physical machine is actually doing the computation. It will only tell you where your packet ends up.

Q. Are you offering an opinion in this case that the location of an exchange's servers is

relevant to where transactions on that exchange take place?

MR. TAYLOR-COPELAND: Objection. Calls for a legal conclusion.

THE WITNESS: So the opinion I'm offering -- I was asked to determine -- or what evidence there was that these companies operated in the United States. And so that's -- I looked at the certificates and I report that in my report.

BY MR. OPPENHEIMER:

Q. Take a look at page 1 of your rebuttal report, starting at line 12. You write, "While Professor Yadav does not perform any analysis of Binance.US, the same factors utilized in her analysis of the other US-based exchanges show that Binance.US is also based in the United States."

Do you see that?

A. I see.

Q. Was there anything preventing you from analyzing where Binance.US was located at the time you wrote your original report?

A. By that you refer to Exhibit 159?

Q. Yeah.

A. So your question is could I have determined where Binance.US was located at the time I wrote my expert report?

Q. Yes.

A. So the evidence that I used has dates on it. So the certificate that I used was valid as of 11 August 2023 and the MSB registration was signed in October of 2022. So I'm bad with dates, but I think that maybe that MSB was available at the time I wrote the report, but maybe not the certificate. Is that the question?

Q. I think you just said the certificate was valid as of 11 November 2023?

A. That's correct.

Q. Today is October 20, 2023; right?

A. That's correct.

Q. So it is a future-dated certificate; correct?

A. Future from today or future from when I wrote the report?

Q. Well, let's start with from today.

November 11 is in the future compared to October 20 today; right?

A. I said August 11. Sorry.

Q. Oh, okay.

A. Canadian accent.

Q. Thank you.

At the time you submitted your initial report in this case, were you able to go and look up facts about where Binance.US was located?

A. So this methodology was available to me at the time that I wrote this report. I did not look at it at the time of the report. And the basis for that information, I don't know if that existed at the time of the report, but the methodology was available.

Q. At the end of that paragraph we were just looking at in Exhibit 160, so lines 14 through 16, you've got a parenthetical that lists some facts about Binance.US's location. You didn't include any citations accompanying that paragraph, did you?

MR. TAYLOR-COPELAND: Objection.

BY MR. OPPENHEIMER:

Q. I'm sorry. Accompanying that parenthetical in that paragraph?

MR. TAYLOR-COPELAND: Misstates the document.

THE WITNESS: Yeah. There is no citation to that.

BY MR. OPPENHEIMER:

Q. Okay. And none of the materials that you listed in the appendix list of materials considered -- list of additional materials considered -- strike that. Let me ask you a different way.

Your list of materials considered does not include the things referenced in this parenthetical such as the terms of service for Binance.US; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I believe that it is included in online materials, Binance.US, I believe that that's the location of this.

Let me just repeat it. I believe that when I cited the website Binance.US, the terms of service are on that website.

BY MR. OPPENHEIMER:

Q. Now, you're talking about dates from server certificates a minute ago. I want to return to that.

A. Yeah.

Q. None of the server certificates you discuss in your rebuttal report come from before 2019, do they?

A. That looks to be correct.

Q. I'll point you to the Poloniex certificate that you describe on page 3, lines 13 to 14. You describe the dates on that one as July 2019 through July 2021. Do you see that?

A. I do see it.

Q. Other than that Poloniex certificate, none of the server certificates you describe in your rebuttal report come from earlier than 2023; is that right?

A. That looks to be correct.

Q. Was there anything stopping you from trying to find earlier server certificates?

A. Nothing stopping me from trying to find

those certificates.

Q. Did you try to find them?

A. Yes.

Q. Were you able to find them?

A. Probably. I included one certificate for each. I think -- my recollection is that I might have tried to include the most recent one for each.

Q. Do you know when the class period in this case started?

A. Not off the top of my head.

Q. I'll represent to you that the class period begins in 2017 for this case.

Sitting here today with the materials in your rebuttal report, you're unable to say where the server certificates were located for any exchange in 2017; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So what I can say is that the certificates that I included had a validity period that was after 2017.

BY MR. OPPENHEIMER:

Q. Sitting here today you're unable to say

where the server certificates reported physical locations for any of these five exchanges that you're looking at in 2017; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it's not included in the rebuttal report.

BY MR. OPPENHEIMER:

Q. And as to Coinbase, Kraken, Bittrex, and Binance.US, sitting here today you're unable to say where the server certificates were located at any time before 2023; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it's not something I opine on in the expert report.

BY MR. OPPENHEIMER:

Q. Okay.

A. But it does -- it says where the company -- like the company lists its address. I mean, it is what it is.

Q. Well, the company lists its address in the current 2023 server certificates that you've looked at; right?

A. It does list its address in the certificates that I've looked at, including my report.

Q. And sitting here today you don't know whether they listed the same address in previous certificates, do you?

A. Yeah. So I don't recall that detail.

Q. Okay. And it's not in your report?

A. And it's not in my report.

Q. I notice you have a white binder in front of you that I don't think we gave to you. What is in the white binder?

A. So it's a copy of my expert report.

Q. Is that it?

A. Yes. With tabs. It's unmarked. There is no notes or marking or anything. And you're free to take it with you if you want.

Q. Thanks. I have plenty of paper.

Let's turn to your opening report in this case. Exhibit 159, I believe.

Now, in this report you were forming opinions about similarities and differences between

the XRP Ledger, Bitcoin, and Ethereum; is that right?

A. Yes. That's correct. Most of my opinions relate to that.

Q. And your conclusions on the relationship between these -- strike that.

Your conclusions about these three different blockchain systems involve how centralized or decentralized the XRP Ledger is relative to Bitcoin and Ethereum; is that right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I don't believe I opine on how decentralized a system is. That's a term that's hard to define.

BY MR. OPPENHEIMER:

Q. So you're not opining on centralization. You're just opining on how these three systems compare to each other?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So definitely my opinions are relevant. I mean, I address issues of centralization. But if you say how decentralized a

system is, that to me is a terminology that is hard to define. And so it would normally be broken down into components. And so I just -- I talk about the components that would go into those definitions without ever using that term, the way that you used it.

BY MR. OPPENHEIMER:

Q. Okay. So I just want to make sure I understand.

A. Yes.

Q. Your opinion here, your report does talk about centralization of these three different blockchain systems; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So the concept of centralization is something that's covered in my report.

BY MR. OPPENHEIMER:

Q. And your report compares different aspects of these three different blockchains through the lens of centralization; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So I agree with the first part. It does compare the three systems. It compares them along the dimensions that I compare them in the report. Whether you decide that's through the lens of centralization, that's more of a subjective thing.

So some -- I think some experts might look at the report and say that it is trying to say something about decentralization versus centralization. Others might not think that. They're not terms that I use. Or I don't use them to describe a complete system.

So, for example, I might use the term decentralize trust. A system could exhibit decentralized trust, but that doesn't mean the system is decentralized under every definition that there is in the academic literature about decentralization, because decentralization would try to cover every aspect of the system. So I'm picking on the specific -- what I think are the key areas to look at.

BY MR. OPPENHEIMER:

Q. So you're looking at certain specific areas for these three blockchains and comparing them in terms of centralization on those particular metrics; is that right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So the point of comparison I make is on who you have to trust and whether that's a single entity or if it is multiple entities. And so you could describe that as centralization. I think it is a natural way to say that if you rely on a single party that that exhibits centralized trust. But the language you're using and the language that's used in the report are different. So I'm just -- I'm trying not to -- anyway, I'll just end the question there.

BY MR. OPPENHEIMER:

Q. I'm not trying to mischaracterizes our report. I'm trying to understand, because you just said earlier that your report does deal with centralization. So I'm trying to understand how.

What role does centralization play in your analysis here?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Can you -- you can't define centralization for me?

BY MR. OPPENHEIMER:

Q. Well, you said that it's relevant to your report. I think you said the concept of centralization is something that's covered in my report. So I'm asking you what role is that playing in your report?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So the report opinions demonstrate that there is a difference between XRP Ledger and Bitcoin Ethereum in terms of what entities you need to trust. If there is a single entity that you need to trust, then you might say that that exhibits centralized trust.

So any opinion that I have, for example, that deals with a single entity being a trusted entity could be described as saying that the system exhibits centralized trust. But I don't believe I use the term centralized trust.

BY MR. OPPENHEIMER:

Q. Are you offering an opinion that anyone who bought or sold XRP had to trust Ripple Labs?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So there are things in my report that a person who would purchase XRP would have to do that would result in a trust of Ripple Labs.

BY MR. OPPENHEIMER:

Q. I don't think that answers my question.

Are you offering an opinion that anyone who bought or sold XRP had to trust Ripple Labs?

MR. TAYLOR-COPELAND: Objection. Calls for speculation.

THE WITNESS: I believe it's possible to purchase Ripple without trusting Ripple Labs or even knowing who Ripple Labs is. So I guess I would answer no.

BY MR. OPPENHEIMER:

Q. Okay. And just to be clear, you said purchase Ripple. Do you mean purchase XRP?

A. Yes. Sorry.

Q. No worries.

Now, you're not offering any opinions in your expert report about whether XRP is an investment contract; right?

A. That sounds like a legal opinion, and I don't provide a legal opinion.

Q. You're not offering any opinions about the beliefs held by any person who bought XRP during the class period, are you?

A. So that would call for speculation as to people's motives, and I don't believe that that's contained in my report.

Q. And you're not offering opinions about what a reasonable or hypothetical person evaluating XRP or the XRP Ledger during the class period would have believed, are you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Would -- can you clarify would have believed about what? Like what they would believe in general or what they would have believed about?

BY MR. OPPENHEIMER:

Q. Are you offering any opinions about what a

reasonable person evaluating XRP or the XRP Ledger during the class period would have thought about XRP or the XRP Ledger or Ripple?

A. What they would have thought about it, no, I'm not.

Q. Are you offering any opinion about whether it was reasonable for purchasers of XRP to expect profits as a result of Ripple's efforts while buying XRP?

A. Can -- I'm sorry. Can you just repeat it?

Q. Are you offering any opinion about whether it was reasonable for purchasers of XRP to expect profits as a result of Ripple's efforts when they bought XRP?

MR. TAYLOR-COPELAND: Objection. Calls for a legal conclusion.

THE WITNESS: So it is certainly not contained in my report.

BY MR. OPPENHEIMER:

Q. Okay. You aren't opining on the reasons why anyone might have bought XRP during the class period, are you?

MR. TAYLOR-COPELAND: Same objection.

THE WITNESS: So that's not an opinion that I offer in my report.

BY MR. OPPENHEIMER:

Q. You're not offering any opinion about what Ripple's motives were in selling XRP, are you?

A. To clarify, you mean Ripple Labs, the company?

Q. Correct.

A. That's correct, it is not in the report.

Q. And you're not offering any opinion about whether anyone who purchased XRP entered into a common enterprise with Ripple Labs or anyone else, are you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: That sounds like a legal definition. I don't know what a common enterprise is, so no.

BY MR. OPPENHEIMER:

Q. If you look at page 6, line 3, of your report under "Principles and methods," your first sentence says, "For purposes of this report, I

reviewed portions of the XRP Ledger code known as rippled."

Do you see that?

A. I do.

Q. Which version or versions of the rippled code did you review?

A. So I can narrow it down to the code that would have been the latest copy between the dates February and May 2023, but I don't have -- I don't recall the version number.

Q. Okay. So you didn't look at earlier versions before February of 2023; is that right?

A. No, that's not what I'm saying.

Q. Well, my question for you is: Which versions of the rippled code did you review?

A. So I relied on the versions that were in that time period. I think -- so I can't sit here today and say that I never looked at rippled's code before those dates.

Q. Can you tell me which versions you did look at?

A. Can I give you the version number that I

used to rely on this report or every time I've looked at the code ever?

Q. Let's start with what you relied on for this report. Can you tell me which versions you used, even if you're not using version numbers, if you're identifying it in some other way?

A. Yeah. So the -- it would have been the most recent version as of those dates.

Q. Okay. So just that one most recent version?

A. Correct. That's correct.

Q. You didn't look at prior or superceded versions of the rippled code, did you?

A. So "look at" is sort of a problematic word, I guess, because yes, I did look at those, yes.

Q. But you didn't rely on those to form your opinions; right?

A. So what I referenced is the latest version, but sometimes you might look at the -- what's called the commit history of a file to see how that file changed over time, so that would be reflecting some older versions of the code. So I wouldn't narrow it

down to I only looked at these versions, like nothing that I say is not in consideration of older versions of the code.

Q. Which older versions of the code did you consider?

A. So my approach to viewing the code would be more to look at a file. So, for example, one key file that I examined is the configuration file that defines what's called the dUNL distribution points.

And so just as an example in that case, I would look at the commit history of that and so I would see every version. Every time that file changed -- so if there was a version that did not make a change to that file, I didn't look at that version, right, but I would look at the full history of that.

Q. Your report says you reviewed portions of the XRP Ledger code. Which portions did you review?

A. So that was the main -- that was the most significant file that I looked at.

Q. Do you recall any other files that you reviewed other than the configuration file?

A. Not sitting here today. I know that there is more that I looked at for sure, but I couldn't give you the names of what I looked at.

Q. Did you look at the entirety of the configuration file when you were forming your opinions in this case?

A. Did I read it from top to bottom, yes, I believe I did.

Q. Okay. What was the earliest version of the configuration file that you looked at?

A. I can't be confident sitting here today. I suspect that it existed since the very first version of Ripple that was in the repository.

Q. But you're not sure one way or another?

A. But I'm not sure. I can't say with certainty.

Q. And you didn't list it in your report?

A. Yeah. That's correct. So what I relied on in the report for the conclusions that I formed were based just on the current version as of when I wrote the report plus or minus a couple months, because it took a couple months to write the report.

Q. It's fair to say sitting here today you don't know all of the different ways that the rippled code changed over the course of the class period in this case. Is that fair?

A. Can you define the class period?

Q. Do you know what the class period dates are?

A. Sitting here today I do not.

Q. Okay. Did you know at some point?

A. I'm sure it was in the disclosure that was given to me by counsel. For example, the complaint I'm sure had those dates. I just don't recall them sitting here today.

Q. Okay. I'm also going from memory, but I'll represent to you it is approximately July of 2017 until July of 2023.

A. Okay. Perfect. So to answer your question --

MR. TAYLOR-COPELAND: June of 2023, just for the record.

BY MR. OPPENHEIMER:

Q. June of 2023 is the cutoff. So July of

2017 until June of 2023.

A. No, I do not know every change that was made to the Ripple code during that time period.

Q. Okay.

A. And I did not try to know that information.

Q. All right. So looking back at page 6 of your report, at lines 4 through 6, you say, towards the end of line 4, "for critical facts, I examined the software using a time-box method to confirm the critical fact before including it in this report."

Do you see that?

A. I do.

Q. How did you determine which facts were critical?

A. So if I needed to look at the code to form the opinion -- so it was driven by the opinion that I was forming. And at certain points I felt that it was critical to look at the code. So that -- it wasn't that I started with the code and then formed the opinions; it was the opposite. I barely looked at the code.

Q. Got it.

A. I barely felt the need to look at the code.

Q. Which facts did you determine were critical for your opinion?

A. So an example of a fact that I determined that was critical is how this dUNL was distributed exactly precisely. So not just an English language description that would be included in the developer guide, but to actually see concretely mechanically at a programming level how it worked.

Q. Were there any other facts that you determined were critical?

A. So that's the one that I remember sitting here today. There certainly could be others in my report that I can't recall.

Q. Sitting here right now it is just the distribution of the dUNL is the only one you recall verifying in the software?

A. That's correct. But I wouldn't characterize it as verifying, like verifying what. I just said that I looked at that code.

Q. Okay. You looked at the code in relation to that fact, and that is the only fact that you

recall doing that for; is that right?

A. That's correct.

Q. You also mentioned the time-box method. That's not a computer science term. It's a time management term; right?

A. So it is used by auditors of software, so it is actually a very common term that's used when people audit software. So I know a lot of -- like my students, for example, work at auditing firms and so they -- that's just a term -- it's just a fancy term -- it's actually a disclaimer. So it is basically just saying you can't possibly understand all of there is to understand about the code. And so the best that you can do is that you can limit the amount of time that you look at it and learn what you can within that particular amount of time.

Q. So the idea of the time-box method is you set aside a certain amount of time to do the task, and once that time is over, you stop regardless of how far you've gotten?

A. So the stopping condition doesn't necessarily have to be predefined. So usually this

arises because someone is paying and the payment is made per hour. And so if I hire you to audit my code, we'll have a set number of hours and so that would dictate the stopping condition.

But it's not -- I mean, you're representing it as the potential that there is some serious problem and I'm starting to discover it, but then the clock says to stop and so I don't investigate it further. So that's my understanding. A respectful audit firm would never do that.

Q. How much time did you spend reviewing this software in connection with the critical fact you mentioned on how the dUNL was distributed?

A. So I don't recall exactly, but I would put it on the order of more than an hour and less than ten hours.

Q. If you flip back to page 5 of your report, in line 17 through 18 you write, "I also reviewed the technical details of Bitcoin and Ethereum as necessary."

What details of Bitcoin and Ethereum were necessary for you to review?

A. So I maybe can't give you like a full enumeration of everything, but I can give you some examples.

Q. As best as you recall sitting here today, what were the critical -- or sorry -- what were the details of Bitcoin and Ethereum that you reviewed?

A. Okay. So if you turn to -- let's just start on page 42. So this is the appendix in my report that goes through the cryptographic properties and primitives that are associated.

So there is small details. Like, for example, let's take line 19. "As of February 2023, the SHA2 family of hash functions are considered collision resistant and pre-image resistant by NIST," N-I-S-T.

Okay. So the date February 2023 would not be something that I knew off the top of my head. That's an example of something that I have to look up.

A lot of this was drawn from my course, and so I don't know if that counts. Like if I refer to my course notes, then I would say this entire

section was in reference to it. By this entire section, I should say all of appendix A.1.

Details such as on page 46, there is an equation that says blockHeader -- on line 23, near the bottom of the page, blockHeader equals the hash of Merkle root -- maybe I shouldn't read it. Everyone can see it.

These are the type of details that I would just double-check.

Another example would be on the next page, 47. There is -- it says, "For Alice to have BTC," and the sentence goes on. There is a technical name of a curve that's used. So I would just double-check that I -- I know that it is secp256k1 off the top of my head, but I want it to be technical and so I want to denote it exactly correct.

I don't know if you want me to continue because there is literally things like that on every page.

Q. I think for the court reporter's benefit, we can stop there.

(Reporter clarification.)

Q. Now, you listed five conclusions in this report. What methodology, if any, did you use to reach those conclusions?

A. I don't have the name of a methodology that was used to reach those conclusions.

Q. What did you do?

A. So I spent a long time reading about Ripple Labs, reading about the XRP Ledger, how it worked. And then these were my conclusions after reading it.

Q. Okay. If I can direct you --

A. I could say that I read it with an eye toward what I was asked to do, which is to look at points of comparison between Bitcoin and Ethereum. So the appendix is sort of just a run-through of all three protocols. And then the opinions are the points where I saw that there were differences between the three.

So I guess my methodology was to try to articulate every aspect of the system designed for all three, then ask myself are they the same or are they different. And then if they're materially

different, then I presented it in section 4.

Q. Now, you haven't listed every difference between the three systems in your report; right?

A. There are differences between the three systems that would not be contained in my report.

Q. And in areas where the three systems are similar, you haven't offered opinions on the similarities. You're focusing on the differences. Is that fair?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I do believe in many places will call it where they're similar, as well as the differences.

BY MR. OPPENHEIMER:

Q. And you've got five opinions that you numbered opinion 1 through opinion 5.

A. So --

Q. Let me finish.

None of -- you're not offering any opinions where you say Bitcoin, Ethereum, and the XRP Ledger are similar in the following ways, do you?

A. I guess I do.

Q. You do or do not --
A. I do.
Q. -- offer opinions saying where they're similar?
A. I guess I -- I do.
Q. Can you point me to where?
A. Sure. So maybe on page 35, line 25. It says, "The method for allocating XRP in the XRP Ledger is materially different than BTC and Bitcoin, and somewhat different from ETH in Ethereum."
So that's an example where I felt that there wasn't a material difference between XRP and ETH, for example. So they're similar in that regard.
Q. What about aspects where all three of the blockchains are generally similar, you don't focus on any of those in here, do you?
MR. TAYLOR-COPELAND: Objection.
THE WITNESS: The last part of your question was "in here." Do you mean just in section 4 or do you mean in the report?
BY MR. OPPENHEIMER:

Q. In the report.

A. So yes, no, I would say that I do focus on that in the report.

Q. All three blockchains, just to take one example, are run on the public Internet; right?

A. That's correct.

Q. You don't offer an opinion saying that that is one area of similarity, do you?

A. So I suspect that I do say that, but I can go through the report to try to find it.

Q. Maybe we're not communicating all the way here. You've got five opinions that are numbered opinion 1 through opinion 5.

A. That's correct.

Q. And I'm focusing on those things that you've highlighted as opinions in your report.

A. Yes.

Q. Those opinions are focused on what's different between the three blockchains, not what's the same; is that right?

A. Okay. So the idea of focus implies that I picked five things that were different between them.

The opinions are the opinions because they seem relevant to what I was asked to do. So that's why they're opinions. And it is true that in almost all of the five opinions a difference between XRP and Bitcoin or Ethereum -- and/or Ethereum is highlighted.

Q. Okay.

A. But the report itself, especially if you read the appendix, there is many places in the report where it talks about the similarities between the three systems.

Q. So let me point you to page 7 now at lines 2 through 4. On those lines what you write is, "I have been asked by counsel for lead plaintiff to analyze Ripple Labs' role in the creation, the creation, and functioning of the XRP Ledger protocol and to compare the XRP Ledger protocol to Bitcoin and Ethereum, the two most prominent blockchain technologies."

Do you see that?

A. I do.

Q. Are you offering an opinion in this case

that Ripple Labs played a significant role in the creation of the XRP Ledger protocol?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So the report, it talks about the creation of the XRP Ledger. I understand that it was created by what was -- what is now called the company Ripple Labs.

BY MR. OPPENHEIMER:

Q. And what was Ripple Labs' role or its predecessor, its corporate predecessor, if applicable, what was the role of Ripple Labs or its corporate predecessors in creating the XRP Ledger protocol?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So my understanding is that there were a set of individuals that worked on the code rippled around the same time -- or simultaneously they were also working on establishing a company, which is now called Ripple Labs. And my understanding is that the rippled code was copyrighted to Ripple Labs.

BY MR. OPPENHEIMER:

Q. Do you know when Ripple Labs was formed?

A. Sitting here today I don't know the exact dates, but -- first off, can I clarify? Do you mean when NewCoin was formed or when Ripple Labs -- when NewCoin became Ripple Labs?

Q. We can call it when NewCoin was formed. When the predecessor entity of what is now called Ripple Labs was formed.

A. I don't know the date off the top of my head.

Q. Do you know when the bulk of the coding for the XRP Ledger protocol was completed?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I didn't observe the creation of it. It happened behind scenes. I was shown a disclosure that included some email discussions from a time period that was -- I would describe it as maybe roughly a year before the incorporation of Ripple Labs. And based on those emails, I came to understand that they were working on, as you described it, the bulk of the coding. But I don't -- I don't have any specific knowledge

and I'm not opining on that in the report. It is not anywhere in the report.

BY MR. OPPENHEIMER:

Q. You say right here at the beginning of this paragraph that you were asked by lead plaintiff to analyze Ripple Labs' role in the creation of the XRP Ledger protocol.

So my question is: Are you offering an opinion in this case that Ripple Labs played a role in the creation of the XRP Ledger protocol?

A. Okay. I understand now.

Okay. So this sentence refers to what I was asked to do. So it's not me saying that it did. What I say about the origins is completely contained in -- I shouldn't say completely. I make reference to the origins of it in appendix C. I'll find you the exact page number.

Actually I think there is a better location. Just give me a second. I think early.

So maybe the most direct statement would be on page 24, line 24.

Q. For the record, what you wrote there is

"The rippled code is the open-source code underlying the XRP Ledger."

A. Yes. So the rest of the paragraph. I don't know if you want to read it into the record.

Q. Okay. Based on the answer you just gave a minute or two ago, it sounds like you agree that much of the coding for the XRP Ledger protocol was done before Ripple Labs or its predecessors were formed; is that right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So when you say the XRP Ledger, this goes back to your earlier point of version numbers. So there was a version that was released. So to my recollection sitting here today is that the corporation was formed first. Then the first version of the software was released after. And so there was a time between those two events and there was a time before the first event. I have no knowledge of how -- what percentage of the code was written in either of those two time periods.

BY MR. OPPENHEIMER:

Q. Okay. So let me direct you to page 5 of

your report, at line 19.

A. I see it.

Q. I want to ask you about appendix D here. What you say in this paragraph is, "Additional documents which I considered are itemized in appendix D."

And the last sentence of the paragraph says, "The documents in appendix D were not used as a primary source for any facts or opinions in this report."

So help me understand that. Are you saying here that you're not directly relying on the documents in appendix D?

A. So no. No.

Q. What do you mean in this sentence that we just read?

A. So what I mean is that the documents that I relied on show up in one of two places in this report. To me, you know, what is in appendix D is not something that I usually do as an academic, so we would have just -- what is section -- the reference section of the paper itself. And so I

felt the need -- I don't know why -- to try and explain why there was both a section called references on page 39 and why there was also an appendix D. They seem redundant.

And so the point of that paragraph is essentially if I write a sentence and I wanted to know exactly where that information came from, I would put it in the references, but there is a lot of general knowledge that I would write -- the sentences that I would write I wouldn't necessarily cite where it came from, but I did obviously learn that somewhere. And so that would be what would be in appendix D.

Q. Did you read all of the documents in appendix D yourself?

A. So the documents in appendix D were documents that were provided to me.

Q. By whom?

A. By counsel. Sorry. Let me say that appendix D includes documents that were provided to me by counsel.

Q. Did you read all of those documents?

A. So we included everything that I might have looked at. So I don't recall reading every single document.

Q. Sitting here today are you able to tell which ones you did read and which ones you didn't?

A. So I believe it's a pretty accurate count of things that I would have at least looked at. If you mean read top to bottom, that's -- I don't recall which ones I did or didn't read top to bottom, but a lot of this is automated. I don't know if I can -- if this is like attorney work privilege.

MR. TAYLOR-COPELAND: Don't talk about anything we talked about.

THE WITNESS: No, it's not that. It's just how -- okay. Anyways, I'll leave it there.

BY MR. OPPENHEIMER:

Q. I'm not asking you to disclose anything privileged. Let's see if we can work through one question at a time.

A. Sure.

Q. I think it's fair to say that you did not

read every document listed in appendix D in their entirety; right?

A. I think that's fair to say.

Q. Okay. And sitting here today you can't identify which ones you did and which ones you did not read in their entirety; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it's possible that I could, but based on -- you know, if I see, for example, on page 89, there is things that are titled RPLI_03552149. Based on that description, I couldn't tell you what that is, whether I read it in its entirety or not.

BY MR. OPPENHEIMER:

Q. Okay. So putting aside the documents that are identified by Bates number in section D.7, for all of the other sections here, which ones did you read top to bottom?

A. So I don't think there is a single document that I truly read top to bottom.

Q. Okay. How did you decide which portions of the documents to read?

MR. TAYLOR-COPELAND: Objection. Again, you shouldn't get into any discussions you had with counsel in your answer to this.

THE WITNESS: Are you instructing me to answer the question?

MR. TAYLOR-COPELAND: You can answer to the extent it doesn't get into anything we discussed.

THE WITNESS: Okay. Can you repeat the question?

BY MR. OPPENHEIMER:

Q. How did you decide which portions of the documents to read?

A. So I mean, there is a bunch of different ways that I would decide. So a lot of it was based on keyword search. So if there was a particular term that I was looking for, then I would search for that term. It would return a bunch of documents.

The technical system that we use will flag every document that I looked at. So it will automatically get added to this report just because I open that file in Everlaw or whatever. So that that's one way.

Q. Any other ways?

A. So I might be directed by counsel to look at a particular document.

Q. Any other ways?

A. Those are the two that I can think of sitting here today.

Q. So either keyword searches or counsel direction --

A. Correct.

Q. -- was how you chose which portions to read; is that correct?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So that's correct.

MR. OPPENHEIMER: Okay. Why don't we take a quick break here.

MR. TAYLOR-COPELAND: Sounds good.

THE VIDEOGRAPHER: Off the record, 11:19 a.m.

(Recess, 11:19 a.m. to 11:34 a.m.)

THE VIDEOGRAPHER: This begins media file number 3, today's testimony of Jeremy Clark. We're back on the record at 11:34 a.m.

BY MR. OPPENHEIMER:

Q. You would agree that the XRP Ledger has certain technical advantages compared to Bitcoin and Ethereum; correct?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So people might use the XRP Ledger because it has technical advantages.

BY MR. OPPENHEIMER:

Q. You agree -- let's take it one step at a time.

You agree that there are some technical advantages of the XRP Ledger compared to Bitcoin and Ethereum; right?

A. Yes, I agree with that.

Q. To take some examples, the XRP Ledger processes transactions faster than Bitcoin and Ethereum; right?

A. So let me see if I talk about that in my report, which I think I do.

So I don't know if that's an opinion that I'm offering in the report, but I do understand that to be true.

Q. Just to put some detail on it. You understand that Bitcoin transactions can take about an hour or so to become final; right?

A. If I can go back to your -- how about I answer this question and then I go back to your previous question.

Q. Yeah. Let's answer this one first.

A. Okay. The answer is actually probably it's together. So on page 74 on line number 4. Okay. The sentence starts with "Ledgers," and this is in reference to XRP Ledger. So "Ledgers are produced every 3 to 5 seconds, which is materially faster than Bitcoin which targets a block every ten minutes."

Your question is about blocks becoming finalized after about an hour, which would be six blocks. So that's something else I also would cover in my report. I'll find it for you.

Q. We might be able to save some time. I don't need the exact location of the report.

A. Okay.

Q. My question is just: Is it your

understanding that Bitcoin transactions on the Bitcoin blockchain take roughly an hour to become final?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So on page 49 is where I discuss this. I think there is some nuance. I know -- I know you just want a quick answer, but I think the nuance is worth it.

So in this whole section starting from line 1 to 14, I go through the idea of what's called 0-confirmed, 1-confirmed, 2-confirmed. And so what you're describing waiting six blocks is mentioned in line 10, which implies a one-hour wait for a Bitcoin transaction to be fully confirmed. So that's correct.

But it is the case that there are -- you know, there are situations that I outline here where you might not wait for a fully confirmed block. So anyway, you're going to be waiting somewhere between ten minutes and an hour.

BY MR. OPPENHEIMER:

Q. You agree that transactions on the

XRP Ledger generally settle in about 3 to 5 seconds; is that right?

A. So within 3 or 5 seconds a ledger becomes finalized. And the definition of finalized is something I go through. It's not the same as what it means to be confirmed in Bitcoin. But local to those systems, they're a definition of what becomes final, the comparison would be that Bitcoin would take an hour for the equivalent of what would be 3 to 5 seconds in XRP Ledger.

Q. Right. And the XRP Ledger can process a greater volume of transactions at any given time than Bitcoin; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So the volume of transactions is basically the size of a block multiplied by how fast blocks are produced. So what we've discussed so far is that XRP produces ledgers faster than Bitcoin produces blocks. That doesn't necessarily imply that the number of transactions is different.

For example, if Bitcoin's blocks were way

bigger -- so in an hour -- it would take an hour, but they would settle a ton of transactions, whereas XRP would have small ledgers that wouldn't. You can't really say how big a transaction is because the size is dependent on how complex the transaction is. So transactions are not of a fixed size.

But with all that nuance aside, it's very reasonable to say that XRP Ledger, you know, can finalize transactions, the volume -- a higher volume of transactions than Bitcoin.

BY MR. OPPENHEIMER:

Q. Okay. So some nuance to it. But you agree that in general terms the XRP Ledger can process a greater volume of transactions per unit of time than the Bitcoin ledger?

A. That's right. So in my report I list what that nuance is, and I do agree with that statement, although it may not be contained in the report itself.

Q. Would you also agree that the XRP Ledger uses less computing power per transaction compared to Bitcoin?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So again, there is a lot of nuance. That question, you know, the -- the computational work that I think you're referring to in Bitcoin is not tied to the number of transactions. So that is computational work that has to be done, even if there is zero transactions and there is what's called an empty block.

So I don't know if you want to rephrase your question, but so the work -- I mean -- okay. To directly answer your question, the amount to just process the transaction itself would be about the same between the two.

BY MR. OPPENHEIMER:

Q. To write one block on the Bitcoin ledger, it requires a significant amount of electricity through the proof of work mechanism; right?

A. That's correct.

Q. And approximately how many transactions are contained in a typical Bitcoin block?

A. So I'll see if I have that in the report.

So I think it's not a number that I report

in it. My recollection sitting here today is it would be in the range of 1,000, in the 1,000s.

Q. Right. And that's in a block that takes about ten minutes; right?

A. So yes, a block is produced on -- approximately every ten minutes.

Q. Okay. Are you aware that the XRP Ledger can record roughly 1,500 transactions per second?

A. So again, I don't know if that's a number that I have in my report, but it sounds accurate.

Q. Okay. And are you aware that the amount of electricity that is used for the XRP Ledger to write ten minutes' worth of ledgers is less than the amount of electricity that's used to write one block on the Bitcoin blockchain through the proof of work mechanism?

A. I'm sorry. Can you just repeat the question?

Q. Are you aware that the amount of electricity that is used for the XRP Ledger to write ten minutes' worth of ledgers is less than the amount of electricity that's used to write one block

on the Bitcoin blockchain with proof of work mechanism?

A. So I'd say that's roughly correct.

Q. Do you agree that the cost to transact on the XRP Ledger is generally lower than the cost of transacting on the Bitcoin and Ethereum ledgers?

A. So my understanding is that fees on the XRP Ledger are paid in XRP. Fees on the Bitcoin blockchain are paid in BTC. And so you're assuming an exchange rate between XRP and BTC, like what would it cost in the equivalent of US dollars to send a standard transaction on XRP versus Bitcoin.

Q. Let's start with that.

If you convert Bitcoin and XRP and Ethereum into a fiat currency of your choosing -- US dollars, Euros, Canadian dollars -- if you make that conversion so that you're talking about the same denominator for everything, the same unit for everything, do you agree that transactions on the XRP Ledger generally cost less than transactions on the Bitcoin and Ethereum ledgers?

A. Okay. So my general understanding is that

XRP is cheaper than Bitcoin. My general understanding is that Ethereum is cheaper than Bitcoin. It wouldn't surprise me to learn that XRP is cheaper than Ethereum. I don't know that sitting here today.

Q. Okay. Do you know approximately how much Bitcoin cost to write a transaction on the Bitcoin blockchain?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So this isn't something that's in my report. It's certainly something that -- they're numbers that I have seen before. I can't recall them sitting here today.

BY MR. OPPENHEIMER:

Q. Do you have a ballpark estimate? A tenth of a Bitcoin, a hundredth, 20 Bitcoins?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it would be a small fraction of a Bitcoin. I don't know what order of magnitude exactly.

BY MR. OPPENHEIMER:

Q. Okay. Ripple does not own the XRP Ledger

source code today; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: It sounds like a legal question about ownership.

BY MR. OPPENHEIMER:

Q. Are you aware that the XRP Ledger code is open source?

A. I am.

Q. And that means anyone can see it, copy it, propose changes to it; right?

A. Are you asking whether that's a definition of open-source software or whether that's true of rippled software?

Q. I'm asking in practice, because the XRP Ledger code is open source, anyone can see it and copy it; right?

A. Anyone can see and copy the rippled source code, yes.

Q. And anyone can propose changes to the rippled source code; right?

A. So anyone can, what we say, submit a pull request, which would be a technical way of saying

that they can code up the changes that they'd like to see reflected in the code. And then using the hosting software -- so it's not a function of it being open source. It's a function of it being on the repository GitHub. Then there is a mechanism for the people that control that repository to be alerted to the fact that somebody would like to change the code.

Q. And anyone who wants to is free to develop applications to run on the XRP Ledger; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Can you rephrase your question? What do you mean by "run applications"? You mean like a smart contract?

BY MR. OPPENHEIMER:

Q. You're familiar with the general notion of developing applications that run on blockchain technologies; right?

A. That's correct.

Q. You're aware that people have developed applications for the Bitcoin ledger; right?

A. No, I'm not.

Q. No? Are you aware that people have developed applications for the XRP Ledger?

A. I am not.

Q. Did you look for any evidence of whether people developed applications for the XRP Ledger in connection with your report?

A. I did.

Q. And you were just unable to find one way or the other?

A. No. I think the report covers the reason why.

Q. So is it your belief that nobody has developed any applications that run on the XRP Ledger?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So my belief is that the XRP Ledger does not support smart contracts.

BY MR. OPPENHEIMER:

Q. I'm not asking just about smart contracts. I'm asking about applications that people can develop that run on the XRP Ledger technology.

MR. TAYLOR-COPELAND: Objection.

BY MR. OPPENHEIMER:

Q. Is it your belief that nobody has developed any such applications?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So the question you're asking now is not the question that you asked me before. But the answer to your question now as you phrase it today, which is on the XRP Ledger technology, yes. People have run the applications on the technology. That's different than the ledger itself.

BY MR. OPPENHEIMER:

Q. Okay. And so let's turn to request that question now. Is it your view that no one has developed applications that run on the XRP Ledger itself?

A. That's correct.

Q. Okay. And do you know whether anyone has developed applications that run on the Ethereum ledger?

A. I do.

Q. Have they?

A. They have.
Q. Okay.
A. I have.
Q. Let's turn to page 31 of your opinion, Exhibit 159. I want to start at 6 to 8, the opinion that you list here says, "The XRP Ledger consensus protocol requires validators to agree on a list of trusted validators and use of the list published by Ripple Labs is a de facto requirement."
Do you see that?
A. I do.
Q. I want to ask you a general computer science question first, and I may hopelessly misunderstand this, so feel me to correct me if I get it wrong.
Are you familiar with something called the FLP impossibility result?
A. It doesn't ring a bell.
Q. Are you familiar with a principal of computer science that says it's impossible for a decentralized system, like the XRP Ledger or Bitcoin, to simultaneously guarantee liveness and

safety?

A. So the only theorems that I rely on would be the CAP theorem, which is stated differently than what you just stated.

Q. Okay. So how would you state the CAP theorem that you rely on?

A. Okay. So if you go to page 77. So line number 11, it says, "Consider a network partition of validators in a distributed system. Researchers consider a common assertion called the CAP theorem [citation 14], when reasoning about partitions and I describe it informally as follows."

Do you want me to read into the record the whole thing?

Q. I want you to just tell me how you understand the CAP theorem. If that's reading it into the record, that's fine. But what's your understanding of it?

A. Okay. I'll just read it into the record then. "As an example of a partition, partition being the 'P' of CAP, assume half of the validators are connected to each other on network A but

inaccessible, directly or indirectly, from the other half of validators which are" -- it should say connected -- "amongst themselves on network B. The theorem asserts that a system must sacrifice consistency, which is the C, or availability, A, or both." A system that prioritizes consistency over availability might halt -- a system prioritizing availability will continue but it will result in inconsistency. That's a paraphrase.

Q. And so in this CAP theorem you're describing there is a trade-off essentially between consistency and availability; is that right?

A. That's roughly correct, yes.

Q. And --

A. Under a partition.

Q. And just to make sure we have the terms clear, consistency refers to all of the network participants agreeing with one another; is that right?

A. That's correct.

Q. And availability refers to the network actually processing transactions and moving forward

with new transactions as they come up; is that right?

A. Yes. That's right. I might add that your question was phrased to me in terms of liveness and safety. And so availability is roughly the same as liveness, and safety is roughly the same as consistency.

Q. Great. Thank you for that.

There is no requirement that a blockchain ledger prioritize either liveness or availability on one hand or safety or consistency on the other hand; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So there is no requirement for anyone designing a blockchain system to prioritize one or the other.

///

BY MR. OPPENHEIMER:

Q. Okay. Now, are you opining that the actual code of the XRP Ledger protocol, the rippled protocol, forces validators to agree on a list of trusted validators?

A. I'm not.

Q. You're not offering an opinion that the code itself somehow prohibits validators from adopting a list that doesn't match a list that other validators use; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I think it is easier to just say what I am asserting, and so the word I use is "requires." So the XRP consensus protocol requires validators to agree -- you asked me about forces, which to me is distinct from requires. And in your last question you asked -- you used a different verb. I forget what it was.

BY MR. OPPENHEIMER:

Q. So is it your opinion that the code of the XRP Ledger protocol itself requires validators to agree on a list of trusted validators?

A. Yes. It's a de facto requirement.

Q. Well, what do you mean when you say de facto requirement?

A. So what I mean is there is a basis for saying that it is required. Do you want me to go

through the reasons?

Q. Let's take it one question at a time.

A. Sure.

Q. Let's say you run a validator and I run a validator on the XRP Ledger. And I've set up my list of trusted validators, whatever that list is. Is there something in the code of the XRP Ledger protocol that requires you to use the same list as me just from the code itself?

A. So you're asking me either one of two things. I'll just answer both of them.

So in general, code can't require you to do anything. If you mean like it forces you, you can always change code. If you have the source code, like can you change source code? Yes. You can change source code and run it any way you want.

And then the -- so in your scenario if you just have a list, then the software doesn't know about your list. So I don't even know about your list so, of course, the software isn't forcing me to use your list.

The point here is that it is forcing you

not -- anyways, the point is the relationship between the software and a list published by Ripple Labs, which is not your list in this case. It's not that two people -- it's not a question of whether people come together and agree on lists. It's a question of where do you get the default list from.

Q. Does the software prohibit people from making changes to the default list?

A. If by prohibit you mean -- well, actually I would say yes. Like so it recommends that you do not change the list. So if that's a prohibition, then yes, it prohibits you by saying that you should not change this list.

Q. Do you think recommending not to change something is the same as prohibiting someone from changing it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it sounds like maybe a legal question. I mean, if you prohibit alcohol does it mean that no one can drink alcohol? It does not. It just says that you should not do something and people could choose to follow that or not. So

the code is saying don't change this list.

Is it technically possible to go in and change the list? Yes.

///

BY MR. OPPENHEIMER:

Q. What does the code actually say about changing the list?

A. Good question. So I have some quotes in my report itself. And it will just take me a minute to find them.

So I'm going to give you an example. I'm not saying that this is the only thing that it says. Let's go to page 80, line 15.

"Changing the distribution points," that's -- the distribution points is my -- they use a different word, but that's my interpretation of what they meant -- "can cause your rippled instance to see a validated ledger that contradicts other rippled instances' validated ledgers (aka a ledger fork) if your validators lists do not sufficiently overlap with the lists used by others."

Q. Right. That language you just quoted

doesn't say if your validator list is not identical to the list used by others; right?

A. It does not say -- it does not use the term "identical." It uses the term "sufficiently overlap."

Q. And, in fact, you quote the XRP Ledger Foundation as saying that any overlap above 90 percent is completely safe from forking. That's on page 26. Is that right?

A. So I'm looking at page 79, line 22. I think that's the same quote, but I can go to your page.

Q. You saw that quote from the XRP Ledger Foundation; right?

A. Yes. It says -- okay. So it says, "If your UNL does not have enough overlap with the UNLs used by others" -- I'm just going to skip to the line that you're concerned about. "As long as your UNL has greater than 90 percent overlap with the one used by people you are transacting with, you are completely safe from forking."

Q. Greater than 90 percent is different from

identical to; right?

A. Greater than 90 percent is -- I would interpret identical as being 100 percent.

Q. Okay. So you agree that that's different from something that says greater than 90 percent?

A. I do agree with that.

Q. Okay. Stepping back for a second, what methodology did you use to reach your opinion 1 on page 31 that the XRP Ledger consensus protocol requires validators to agree on a list of trusted validators and that use of the list published by Ripple Labs is a de facto requirement?

A. So the methodology I used was to understand how XRP worked. I documented all of that in the appendix C. And then I formed that opinion based on what I read.

Q. And is there anything that prohibits someone who is running a validator on the XRP Ledger from deciding that they are willing to risk some consistency or availability or forking and use a lower degree of overlap than 90 percent?

A. Yes, there is.

Q. What's that?

A. So there is, you know, multiple things. I guess the first reason would be that there is absolutely no reason to do it. There is no benefit. You're taking on risk for no benefit.

Q. Any other reasons?

A. Another reason is that there is a protocol that was added recently called the negative UNL, if I can point it out in my report.

So if we go to page 79, line 10. It says -- I won't read the whole thing. But it -- maybe I'll just describe it. So if a validator is nonresponsive, there is now an ability to remove them from consensus. It requires 80 percent support from other validators. So if this note is not on your list, then you cannot contribute to this protocol. And that's harmful to the rest of the network.

We also have seen this protocol used in real life. And we see that because validators -- because validators that are put on this list gain 80 percent support, it indicates that everyone has

that particular validator on their list.

Q. And when you're talking about this list, you're referring to the negative UNL?

A. No. I'm referring to -- I don't recall what I referred to. So I'm sort of alternating between what's called the dUNL and the nUNL. If you want to read back, I can clarify.

Q. You just said validators that are put on this list gain 80 percent support.

A. Yes. So I was referring to the nUNL.

(Reporter clarification.)

Q. What you wrote in your report is that -- well, first of all, when was the nUNL feature added?

A. So I don't see it in my report. I don't recall off the top of my head. I know that it was -- if I had to put an approximate time frame, I would say probably in the last one to two years.

Q. Okay. So as best as you recall, the nUNL was not a feature of the XRP Ledger in 2017, '18, '19, for example?

A. I would be surprised to learn that it was there in 2017.

Q. Okay. What you wrote in your report is that the nUNL relates to validators that are not responsive. Do you think that forking or validating different transactions is the same as being nonresponsive?

A. So let's take those one at a time. I do not believe that forking is the same as being nonresponsive.

What was the second, something about transactions?

Q. Validating different transactions than other validators do.

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I do not believe that validating different transactions than others is the same as being nonresponsive.

BY MR. OPPENHEIMER:

Q. So what makes you believe that if a validator adopts a different UNL than other validators, that that will result in getting placed on the nUNL?

A. That's not an opinion that I have.

Q. Okay. So you testified earlier that the second reason why a validator would not adopt a list with less than 90 percent overlap is the nUNL, but now you're saying it is not because that validator might get placed on the nUNL. So what about the nUNL do you think prevents validators from adopting lists with less than 90 percent overlap?

A. So if validators want to contribute to the idea of an nUNL, then they must adopt the same dUNL.

Q. If they want to contribute to it?

A. Correct.

Q. Okay.

A. So this is an indication that they do use the same validator list because they do contribute to this protocol.

It's not about them being put on the list; it's about them putting other people on the list. That's where your confusion is.

Q. So a validator could choose to use less than 90 percent overlap and could choose not to put people on the nUNL; right?

A. A validator could choose to use less than

90 percent against the recommendations of the software. They're free to do that.

Q. Okay.

A. They're also free to participate in this protocol. They could also modify their software to not participate in this protocol. So again, this is a recommendation to do. It's not -- there is no forcing. You can't force anyone to do anything. It's just a recommendation, a requirement.

Q. You just said it's a recommendation, a requirement?

A. Yes. So a requirement to me would be if I tell you to do something. It's a requirement.

Q. So you're saying it's a recommendation, not a requirement?

A. I would say that a requirement --

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: -- is maybe the same as a recommendation or slightly stronger. So I was just trying to strengthen -- upgrade it from a recommendation to a requirement, because requirement is the term that I use in the -- requirement is the

term I used in the opinion itself.

BY MR. OPPENHEIMER:

Q. And you think that a requirement can be the same as a recommendation in some circumstances?

A. No, I don't. What I'm saying is that what I think is happening here is a requirement.

Q. You agree that nobody can force validators to pick any particular UNL; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yes. So what I think happens is that to the extent that you can require people to use the recommended UNL, that's exhausted and you can't go beyond. Like everything that you could do to try and get people to use it has been done, but at the end of the day, you can't say that someone is forced to do it.

BY MR. OPPENHEIMER:

Q. Okay. So to take my question, you do agree then that nobody can force validators to pick any particular UNL; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I mean, roughly correct.

BY MR. OPPENHEIMER:

Q. How is it roughly correct?

A. So you started with "no one," so that means that there is no circumstances under someone -- like if I held a gun to your head and said use this recommendation, then you could say that in this case you were being forced to use it.

Q. Okay.

A. So there is no evidence that Ripple Labs is forcing, under your definition of forcing, but you can't say that no one never could do that.

Q. Okay. So putting aside criminal intimidation and things like that, in the day-to-day operation of an Internet-based distributed ledger system, nobody can force another validator to adopt a particular UNL; is that right?

A. Yes. That's reasonable.

MR. TAYLOR-COPELAND: Objection.

BY MR. OPPENHEIMER:

Q. Okay. Have you done any investigation to figure out what lists of trusted validators any particular real-world validator is using?

A. Yes.

Q. What did you do?

A. So the first thing I did is I explored whether it is possible to know. So I noted that in the software there is a function that you can call so notes will report their lists. This function is marked requirement -- or sorry. This function is marked private, which means that only the operator of that note could run that function.

So, for example, I could rule out whether I, sitting at Concordia, could just query all of these validators and figure out what their lists are. So that's not possible.

Q. So you didn't attempt to query individual nodes to get their UNLs; correct?

A. Yes. I determined that that would not lead anywhere, and so I stopped the investigation at that point. So then I turned to indirect evidence. So as outlined in my report in many places, not using the same list will create artifacts. These artifacts would be visible.

So artifacts would be, for example, the

XRP Ledger stopping for a period of time. It could be forks that aren't resolved. It could be failures of people put on the negative UNL because there is not enough support because these nodes do not have -- these nonresponsive nodes on their list. So there is no artifacts that I could find that would suggest that people use different lists, so that's one basis for it.

Another basis is that there is simply no incentive to do it. So there is no -- I mean, there is no benefit to it. There is only risks that you take on.

Another point would be that it is against the recommendations of the code. It's against the recommendations of the XRP Ledger Foundation on their website. So sitting here today those are maybe four or five of my basis for thinking that. There may be others that are contained in the report.

Q. Do you know if the XRP Ledger has ever had an outage in which it stopped working?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So there is an incident that I describe in my report. I don't know if you would say it is -- it sort of depends, I guess, on your definition of "stop working," but I can pull it out.

BY MR. OPPENHEIMER:

Q. Well, you just said you looked for artifacts such as if the XRP Ledger stopped working. What did you mean by that?

A. Yeah. So I didn't see anything that would be consistent with the types of liveness failures that we would see. So the incident I was referring to is when the XRP Ledger lost the first couple -- I forget the exact time period, but they lost the first couple weeks, is my recollection, of ledger entries at the very beginning of XRP.

Q. Okay.

A. So that's kind of a liveness failure. But that was not the result of -- I would assume it's not the response of people using different dUNLs because there were only three nodes. All three nodes were controlled by Ripple Labs. And the list was provided by Ripple Labs so it doesn't make sense

that they would disagree.

Q. So you're talking about an incident from 2012; is that right?

A. Yes. So let me -- I think -- if you want --

Q. One question at a time.

A. Sorry. I thought your question was, are you talking about an incident from 2012, but that's not the question.

Q. That is the question, and I think you said yes. And that's -- I want to ask the next question.

You're not aware of any liveness failures on the XRP Ledger from 2013 to the present, are you?

A. I am not aware sitting here today.

Q. Okay. Are you aware of any forks on the XRP Ledger from 2013 to the present?

A. I am not.

Q. And -- let's see. Okay. Where did you go to look for evidence of whether there were liveness failures or forks on the XRP Ledger?

A. So the evidence I consider in my report was reading a lot of documents and like the resources

and materials that were considered. I don't know if I have a direct citation in the report. I don't think I do. But it was certainly a point that was discussed that these types of events had never occurred.

Q. Okay.

A. It may be from Ripple Labs themselves that made these assertions.

Q. Take a look at page 31 of your report. At lines 23 to 24 you argue that "trust cannot be smoothly transitioned away from Ripple Labs."

What methodology did you use to reach that conclusion?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I tried to enumerate the most reasonable cases by which that would happen. So they're enumerated right below that sentence, from 1 to 6. And then if you read through the list and read the reasoning that I provide, then that's the conclusion.

///

BY MR. OPPENHEIMER:

Q. Now, you suspect that today all of the validators are using the list published by Ripple Labs, but you don't know for certain whether that's true. Is that fair to say?

A. So the sentence I say is on page 31, line 21. "I suspect all validators use the Ripple Labs' list verbatim and this is consistent with my observations of the network."

Q. You suspect, but you don't know for certain. Is that fair?

A. It's correct. So I have a basis for why I suspect it and I think it's a reasonable explanation. But is it theoretically hypothetically possible that it's not true? Yes, it is hypothetically possible.

Q. And you don't know as of today or any historical date whether any individual validators have made changes to the UNL that they've adopted; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I have reason to believe they have.

BY MR. OPPENHEIMER:

Q. Okay. And --

A. Sorry. Actually, let me -- I just want to make sure I understand. Let me just read what you asked.

MR. TAYLOR-COPELAND: Ask him to restate the question if you don't understand it.

THE WITNESS: No. I understood it. It's just like the way you said it and what you meant were probably different.

BY MR. OPPENHEIMER:

Q. I'll ask you the question again.

A. Okay.

Q. You don't know as of today or as of any historical date whether any individual validators have made changes to the UNL that they've adopted, do you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So my belief is that when Ripple Labs updates their list, everyone updates their list. So they make changes.

BY MR. OPPENHEIMER:

Q. And you believe that those changes are driven by Ripple Labs updating its list?

A. That's correct.

Q. Hypothetically suppose the XRP Ledger Foundation published a UNL that was identical to the one published by Ripple. Would you be able to tell in that case whether people are sourcing their UNL from the XRP Ledger Foundation or from Ripple Labs?

A. So what you present as a hypothetical is actually true. So there is a list that as of the time of writing was published by that organization and was identical to the Ripple Labs.

So the basis for people preferring the Ripple Labs is because that's what the software will do and it's what the recommendation of the software is, is to not make changes. And so the default behavior is still the same.

Q. That's not my question.

So I understand you've taken it out of hypothetical and that's fine. Let's ask in real terms.

A. Sure.

Q. Given that the XRP Ledger Foundation publishes a UNL that's identical to the one published by Ripple Labs, can you tell whether any given validator is sourcing its UNL from the XRP Ledger Foundation or from Ripple Labs?

A. Okay. So I mean, it's the same statement. I suspect all validators use the Ripple Labs' list verbatim. And so if you want to insert as opposed to the other list, then it's the same. And it's the exact same basis for why I think that's the case.

Q. If all of the -- hypothetically, if all of the validators were using the XRP Ledger Foundation's list, that would be consistent with not seeing any forks or liveness failures or the other factors that you listed earlier; right?

A. Okay. So that's yes. So the -- I gave several basis for that assertion. And it's true that some of them are specific and some of them are not. And so the one that so requires is that it's -- or the one that still applies in this scenario is -- it's still the recommendation of the software itself.

Another basis I gave was that there is absolutely no reason to do it. There is no benefit to doing it, and so that also applies in this scenario. The artifacts due to safety and liveness and negative UNL would show up even in your scenario.

Q. So you're assuming --

A. I'm sorry. I should say they would not show up. So the artifacts would not show up.

Q. So you're assuming that validators would continue to source their UNL from Ripple rather than from the XRP Ledger Foundation, even though there is no empirical way to determine which one they are actually using; is that right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I suspect that all validators use the Ripple Labs' list.

BY MR. OPPENHEIMER:

Q. But from your position not having direct insight or access to any of the validators, you can't tell one way or the other if validators are using the Ripple Labs' list or the XRP Ledger

Foundation list; right?

A. So you would -- I mean, everything is based on a reasonable explanation. Right? And so there is always hypotheticals where things aren't what's the most probable. So the most probable is that people do not make -- like what you're suggesting requires you to go against the recommendation of the rippled source code, actually go into a file that tells you not to change it, and make that change. Right?

And so no, I don't think it's reasonable that everyone is doing that and no one is even talking about the fact that they're doing that, but I can't rule it out as a possibility.

Q. You agree that the source code points users to the XRP Ledger Foundation as a source where they can obtain a dUNL; right?

A. As a backup source.

Q. You agree that the code tells users that the XRP Ledger Foundation publishes a dUNL; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yes. So I agree that the

link to the dUNL from the XRP Ledger Foundation is included in the software.

BY MR. OPPENHEIMER:

Q. And you said only as a backup. What do you mean by that?

A. So what I mean by that is that the default behavior is that Ripple -- or sorry -- rippled, the software, will obtain the list from Ripple Labs.

Q. Did you test the software to see if that's true?

A. You mean -- yes. So no, I did not.

So the basis of it is by looking at the code. Also the testimony that other people gave when they talked about this. In the deposition it was -- you know, I think David Schwartz covers it in his deposition, for example, sitting here today I recall. So I didn't feel the need to run it to test it. I just went with what people said.

Q. And to be clear, you could have run your own instance of the rippled software on your own machines if you wanted to; right?

A. Yes. So it's possible to run rippled on

machines that I own.

Q. You didn't do that, though; correct?

A. No, I didn't.

Q. Okay. Now, turning back to page 7 at line 12 through 14, what you wrote there is "The consensus mechanism is responsible for validating transactions resolving potential conflicts, and ensuring that all validators within the system agree on the order and legitimacy of transactions."

What does "legitimacy" mean as you used it in that sentence?

A. So I can give you an example. So, for example, if I sent you five XRP, but my account balance only had two XRP, then that would be considered an invalid transaction.

Another example I can give you is as the owner of that XRP, I need to provide a digital signature. And so let's say I provided a digital signature that was wrong or I signed the wrong thing, that would be another example of an invalid transaction.

Q. Is there ever any scenario where validators

running rippled software would approve a transaction that's not legitimate as you've defined it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I think it's possible.

BY MR. OPPENHEIMER:

Q. Under what circumstances?

A. So without enumerating every circumstance, an easy circumstance would be that the validators -- a majority -- or as defined as a quorum, which is over 80 percent, the validators would be malicious. Malicious being that they aren't following the rules of the protocol.

Q. Okay. So I had asked -- and I'll sharpen this question.

A. Yes.

Q. Is there ever any scenario where what we can call an honest validator, a non-malicious validator that's running rippled software, the actual software that you can get off of GitHub without alteration, would approve a transaction that is not legitimate as you have defined the term legitimate?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So assuming that there is no problem with the software or bug in the software, then that seems reasonable.

BY MR. OPPENHEIMER:

Q. Okay. Now, getting rid of the constraint that I just put on of having an honest and non-malicious validator, are there any scenarios other than the one you already mentioned where 80 percent of validators are malicious in which validators would approve a transaction that is not legitimate as you've defined the term?

A. So first off, I don't feel that I did define what legitimate means, but I gave two examples of what it meant.

Q. In that case can you please define it?

A. I would say that it is legitimate according to the protocol itself. The protocol is in the software. So the software defines -- it will have a definition of what's considered legitimate or not. And so anyone running the software, and if the software correctly implements the rules, then they

will -- then they won't vote in favor of an illegitimate transaction for approval.

Q. So illegitimate transactions won't be approved unless there is a supermajority of malicious validators; is that right?

A. So that's a -- so a supermajority of malicious validators is a sufficient condition for the potential of an invalid transaction being approved.

Q. Is there any other sufficient condition?

A. So errors in software is another one that isn't just theoretical.

Q. Is there any real example of an error in the rippled software that has led to invalid transactions being approved?

A. Sitting here today I don't know of any.

Q. Okay.

A. And I believe I've read in the disclosure to the contrary that there have not been.

Q. Okay. And any other sufficient conditions?

To make the question complete here, are there any other conditions that would be sufficient

to have illegitimate transactions approved?

A. So the only other thing would be that there is some misunderstanding of the consensus. So when you say supermajority, that's based on some mathematical analysis. Those models don't always capture every possibility. We've actually seen it.

For example, in my report, you can look at -- let's see -- page 76. And it goes through kind of the literature and how these bounds changed over time. It could be that the number that people are throwing around is just not right because they didn't think of something.

So I would say that those are definitely the three primary ways: Software errors, malicious actors, or some consensus -- some problem with the analysis of the consensus.

Q. Sitting here today are you aware of any other conditions that would suffice?

A. No.

MR. OPPENHEIMER: Okay. Want to take a break for lunch?

MR. TAYLOR-COPELAND: Sure.

THE VIDEOGRAPHER: Off the record, 12:32 p.m.

(Recess, 12:32 p.m. to 12:44 p.m.)

THE VIDEOGRAPHER: This begins media file number 4, today's testimony of Jeremy Clark. We're back on the record at 12:44 p.m.

BY MR. OPPENHEIMER:

Q. If I can turn your attention to page 33 of your report. The second opinion that you've offered in this report, starting at line 13, you wrote "The XRP Ledger is a distributed system but Ripple Labs remains the root of trust."

The first question: What methodology did you follow to determine whether Ripple Labs is the root of trust?

A. So I would say the methodology I used is the same as everything else. I read everything I could about the XRP Ledger, how it works. And then going through all that material, combined with my knowledge of how Bitcoin and Ethereum worked, I identified this as a difference, like core difference between XRP Ledger and then Bitcoin and

Ethereum together.

Q. What do you mean when you say "root of trust" here?

A. Okay. So this is, I think, answered pretty well in the report itself. So just going down to line 19, it says, "During this time period all validators on the recommended validator list could have been vulnerable to the compromise of a single entity."

So that's what I would call the root of trust. I note that there is inconsistent terminology in the academic literature, but root of trust, trust anchor, single point of failure are all more or less the same terms.

Q. So having all -- sorry.

Having all validators vulnerable to the compromise of a single entity is what makes an entity a root of trust?

A. It's a sufficient condition.

Q. Okay. You didn't cite any publications here for that definition, do you?

A. So if your question is does line 21 have

any citations, the answer is no.

Q. Well, is there any source that you cite in your report that provides that definition you just gave?

A. So probably.

Q. Probably? You're not sure?

A. So I mean, these are standard -- okay. So let me rephrase again.

So I say insecurity, meaning in my field, this is what they're called. So this is -- the basis of this is my knowledge of my field. My CV, which includes a lot of publications, would use these terms. Are they in appendix D or in my references? I wouldn't know. I'd have to go through the citations one by one, but I wasn't intending to cite a specific paper for it. It was more of a general statement based on my knowledge of the field.

Q. Okay. And you don't cite any publications that offer a particular methodology for how to determine when an entity is a root of trust; right?

A. Okay. So you're asking what's the

methodology for determining, or once you see one are you saying -- how do you decide yes or no?

Q. Do you cite any publications that offer a particular methodology for how to determine whether an entity is a root of trust?

A. It's possible. Again, it's the same answer. So there is no citation on this line. It's something that I know from my general knowledge and there is not a specific citation, but the citations may cover -- may or may not cover that.

Q. Okay. So your opinion is that from January 2013 to June 2018, Ripple Labs was the root of trust because all of the validators on the recommended validator list were controlled by Ripple Labs; is that right?

A. No, that's not right.

Q. Why was -- why do you reach the conclusion that Ripple Labs was the root of trust between January 2013 and June 2018?

A. So it's -- the answer is in the next paragraph, starting on line 23. So -- well, I deal with the situation even after diversifying. So even

after this time period Ripple Labs continues to be a root of trust. So that is meant to be inclusive both of that period and today.

Q. Okay. So let's take it one piece at a time. I want to start with the January 2013 to June 2018 time period.

A. Correct.

Q. In that time period, your opinion is that Ripple Labs was the root of trust because it controlled all of the validators on the recommended validator list; is that right?

A. That's not right.

Q. Why did you reach that conclusion for the period January 2013 to June 2018?

A. For the same reason that I reached the conclusion for the entire time period.

Q. What is that reason?

A. So it's because Ripple Labs controls the list. So it's what -- basically what I'm saying here is there was this time period, so you might think it is obvious that they're the root of trust. But even beyond this, there is something else that's

the real reason.

Q. So the real reason why you think Ripple Labs is the root of trust is that it controls the unique node list; is that right?

A. I don't accept the real reason. I mean, this is also a sufficient reason. So let me phrase it this way.

From January 2013 to June 2018, there were two reasons why Ripple Labs was the root of trust. One of those reasons was because they were the only entity on the list. The second reason was because they controlled the list. After that there continued to only be one reason, so the one reason went away but the other one continued.

Q. Got it. Thank you.

Now, you agree that Ripple Labs has only a single validator on the recommended validator list now; right?

A. At the time I wrote my report, I looked -- and so as of right today, I don't know, but at the time of the report that was my understanding.

Q. As of the date of your report, there was

only one Ripple Labs validator out of 35 on the recommended list; right?

A. That's my understanding, yes.

Q. And we saw earlier the XRP Ledger Foundation's statement that you're completely safe if you have more than 90 percent overlap on the validator list.

Do you agree that if someone were to remove the one Ripple validator that they would still have more than 90 percent overlap with the remainder of the list?

A. Yes. So I agree that that 35 minus 1 is greater than that. I agree. I accept that.

Q. Now, the -- let's see. Are you familiar with an entity called Coil?

A. So in my disclosure -- sorry. In reading all the materials in preparing my expert report, I did encounter references to the company Coil.

Q. Are you aware that Coil also previously published a default unique node list?

A. So just give me a second to consult my report.

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So if you refer to page 80, line 10 -- actually let's do line 11. I make reference to what you're talking about, and so yes.

///

BY MR. OPPENHEIMER:

Q. You're not offering an opinion that Ripple Labs controlled the content of Coil's UNL, did you -- are you?

MR. TAYLOR-COPELAND: Objection. Calls for speculation.

THE WITNESS: So I have no idea what people at Coil were thinking when they constructed their list.

BY MR. OPPENHEIMER:

Q. Right. And you're not -- in this report here you're not saying that Ripple Labs was in control of Coil's list; correct?

MR. TAYLOR-COPELAND: Same objection.

THE WITNESS: It would define how you mean "in control." So the same reasons why everyone

would want to run the default list and not deviate it from those incentives would still apply to Coil. So if Coil came up with a list that was completely -- well, not completely different, but substantially different from XRP, then that would create turmoil in the network. It could create liveness and safety falls.

BY MR. OPPENHEIMER:

Q. Do you know if Coil's list was different from Ripple Labs' list?

A. So sitting here today I don't recall whether it was or not.

Q. Okay. We talked earlier a little bit about the list published by the XRP Ledger Foundation. Are you offering an opinion that Ripple controls the contents of the XRP Ledger Foundation's UNL?

MR. TAYLOR-COPELAND: Objection. Calls for speculation.

THE WITNESS: Okay. So the opinion on my report is just based on the simple observation that the lists are the same. The process by which these lists are constructed was covered in -- I read some

disclosure that discussed the relationship between them and sort of how they decide. And my takeaway from that was that there is coordination between the two in terms of the list.

And so it's quite reasonable to expect that they would continue to be the exact same list. And that's because of direct coordination between the people at the foundation and people at Ripple Labs.

Now, your question was whether Ripple Labs is forcing them. And I certainly haven't read anything that would suggest that they were forcing them to use the same list.

BY MR. OPPENHEIMER:

Q. To be clear, my question was whether you're offering an opinion that Ripple Labs controls the contents of the XRP Ledger Foundation's list.

A. So again --

MR. TAYLOR-COPELAND: Same objection.

THE WITNESS: So the influence on this organization is set by a set of circumstances which is partly in Ripple Labs' control. So there might be indirect ways, but it's not a direct control.

BY MR. OPPENHEIMER:

Q. So your view is that Ripple Labs indirectly influences the XRP Ledger Foundation by essentially having the XRP Ledger Foundation need to change its own UNL in order to match the Ripple Labs' UNL; is that right?

MR. TAYLOR-COPELAND: Same objection.

THE WITNESS: Sorry. I'm just going to read your question instead of asking you to repeat it, now that I know I can do that.

Yeah. So I would say that there are incentives for the XRP Ledger Foundation to change its lists to match Ripple Labs' list if Ripple Labs changed it.

///

BY MR. OPPENHEIMER:

Q. And do you believe that that's what's happening in practice?

A. No, I don't. I believe it's the opposite.

Q. So your understanding is that the XRP Ledger Foundation changes its list and then Ripple Labs makes changes to its own list to match

that?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: That's a possible explanation. It's a plausible explanation.

BY MR. OPPENHEIMER:

Q. Do you know if that is, in fact, what is happening in the real world?

A. So sitting here today I just know at a high level -- I can recall a discussion of this point that was in one of the depositions. And I'm not 100 percent confident which way it goes sitting here today.

Q. Do you believe that if the XRP Ledger Foundation is making changes to its own list at will and then Ripple Labs is updating its own list to match, that that means Ripple Labs controls the contents of the UNL?

MR. TAYLOR-COPELAND: Objection. Calls for speculation.

THE WITNESS: So Ripple Labs is free to make that decision or not. So there is no control there that I can see. It's still in complete

control of its own list.
BY MR. OPPENHEIMER:
Q. But it is not in complete control of the XRP Ledger Foundation's list; is that right?
A. It controls --
MR. TAYLOR-COPELAND: Objection. Calls for speculation.
THE WITNESS: It controls whether the list is included in rippled or not. So it can remove that list at any time, but it is not in direct control of the content of that list. It is only in control of whether that list is included or not.
BY MR. OPPENHEIMER:
Q. You agree that the XRP Ledger Foundation's list is included in the rippled software; right?
A. I agree that at the time I wrote the report, it is included as a backup.
Q. And you also agree that Ripple Labs doesn't dictate which validators appear on that list; right?
A. So I couldn't say one way or another. Sort of calls for speculation.
Q. Okay. And your --

A. But certainly -- if you run the other example of, let's say, they just started changing the list and it was completely different, that would create problems for the XRP Ledger. Right? So that's what I'm saying. It's just that if they changed it at will, it could create problems.

Q. And would it still be your opinion that Ripple Labs controls the list if the XRP Ledger Foundation was changing the list at will and Ripple was just mirroring it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Again, they still control whether the list -- so it's a question of delegation. So they've delegated a responsibility to another organization, but they chose to make that delegation. They can revoke that delegation at any time, therefore, they're still ultimately in control.

BY MR. OPPENHEIMER:

Q. The XRP Ledger code is available on GitHub; right?

A. Yes, it is. So the rippled software is

available.

(Reporter clarification.)

Q. You could go on GitHub today and propose removing the Ripple Lab's UNL from the code, couldn't you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yes. So I could remove it myself, and then I could propose a pull request that Ripple -- or whoever is in control of the repository would pull that.

BY MR. OPPENHEIMER:

Q. In fact, anyone who knows how to use GitHub could do that; right?

A. Anyone that knows how to use GitHub can do that.

Q. And do you know who is in control of that repository?

A. At the time of writing the reports, yes. So sitting here today I certainly don't know names. I think it was a question that was asked of them and it's in -- I know where the answer is, but I don't know what the answer is. I can point you to the

document.

Q. Do you know if the XRP Ledger Foundation is in control of the repository?

A. As of the time of writing the report, it was branded that way. So the sort of parent directory. That would indicate to me that they were in control.

Q. So assume for a moment that the XRP Ledger Foundation is in control of the GitHub repository. It can decide whether to remove the Ripple Labs' list from the rippled code or keep it there. And it can also choose whether it is going to make changes to its own list that Ripple can choose whether or not to mirror. Under those facts is it still your opinion that Ripple Labs controls the dUNL?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So my opinion is that Ripple Labs controls its dUNL. It is the default option. The people that control the repository for it can remove that recommendation cite at will. And my understanding is that the people that control the repository as of today is the XRPL Foundation.

BY MR. OPPENHEIMER:

Q. Do you know -- let me ask this: Are you offering an opinion that Ripple Labs controls the rippled software?

A. So I just have general information about it. So I understand that they originally -- so "controls" is a weird word, but let's just define that as being they have the commit piece for the repository.

So my understanding is that they were in control for a certain period of time. After a certain period of time, they transferred control to this XRPL Foundation. I don't know the exact relationship between these companies, foundations.

Q. Are you offering an opinion in this case that Ripple Labs is a root of trust for the rippled software?

A. I'm sorry. I don't have that information sitting here today. It would depend on who controls the repository. So just because it's branded a certain way, that doesn't -- that's not an indication of actually who controls it. You would

have to look and see who has those authorities, whether they're employees of Ripple Labs or not.

Q. So you're not sure one way or the other, but it's certainly not one of the opinions that you're offering in your report then?

A. So part of -- I mean, the opinion -- okay. So one thing that's in my report certainly is there were periods of time where Ripple Labs were those people. The exact makeup of who has those commit keys today, I'm not sure.

Q. Do you believe that Ripple has veto power over potential changes to the rippled code?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I suppose there is two ways a veto might take place. So one would be by not approving pull requests. So that would go to the question of who has those keys and whether they are employed there. And then there would be a softer form of veto, like through their political relationships. I'm not opining on that.

BY MR. OPPENHEIMER:

Q. You're not offering an opinion one way or

the other on that?

A. I'm not offering an opinion one way or another on that.

Q. At page 34, lines 5 through 8, you write, "Ripple Labs is a single point of failure for the system. An attack (insider or external) directly on Ripple Labs or it cryptographic signing key (hardcoded as a verification key into rippled) could lead to a catastrophic protocol failure that would require human intervention to repair."

Is that statement accurate as of the date you wrote this opinion?

A. To the best of my knowledge, it is.

Q. What do you mean by "compromise" when you say it in that sentence?

A. I don't think I used the word "compromise."

Q. I'm sorry. What do you mean by "catastrophic" when you say it in that sentence?

A. So catastrophic, I mean that the protocol could not repair itself.

Q. Are you aware of any examples of this actually happening to Ripple?

A. Not to Ripple, no, I'm not.

Q. How did you figure out what would happen if Ripple's cryptographic signing key were compromised?

A. So I came to understand what that key is used for. And if it were compromised, meaning someone else had a copy of it, they breached the server, then I understood what they could do with that key.

Q. And what is that key used for?

A. So it's used to sign the recommended validator list.

Q. If there were a problem with Ripple's recommended validator list, wouldn't XRP Ledger users be able to adopt the backup list from the XRP Ledger Foundation?

A. So this --

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: -- I think asked and answered. But again, would the software do it by default? No, because it still remains the default situation.

Is there a hypothetical scenario where all

users go in and change that file? Then yes. That's theoretically possible. But the default behavior would be that you would continue to use this compromise list.

BY MR. OPPENHEIMER:

Q. At page 28, line 6 to 7, you write that Ripple could modify its recommended validator list to overtake the network. What does "overtake the network" mean there?

A. Can you give me the line number again?

Q. Yeah. Lines 6 through 7 on page 28.

A. So I think what I meant was just that they could control what updates are made to the ledger fully.

Q. If people disagreed with changes that Ripple wanted to make in this hypothetical you've offered, wouldn't they be able to change their recommended validator list in order to reject it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So the short answer is yes.

And the sentence that you asked the previous question about that mentioned the

catastrophic failure was meant to dictate that scenario that it would require human invention. So everyone changing their list is what I mean -- or it's one of the things that I mean by human intervention.

BY MR. OPPENHEIMER:

Q. Okay. Now farther down on page 28, lines 12 to 14, you write, "Ripple Labs will continue to play this role until Ripple Labs itself decides to delegate it to someone else (e.g., XRP Ledger Foundation)."

A. Sorry. What page?

Q. Page 28, lines 12 to 14.

Did you believe at the time you wrote this report that Ripple Labs was currently playing the role you described?

A. So by this role, I mean that they are the list of validators. And yes, they do -- they do play that role.

Q. Hypothetically assume the XRP Ledger Foundation controls the GitHub code repository. Wouldn't the XRP Ledger Foundation be able to remove

Ripple Labs from this role by changing the dUNL in the rippled code without Ripple's approval or consent?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So in this scenario, basically whoever controls the commit keys for this repository would be -- they would be able to make that change. And then every instance of rippled would now use the change code. Rippled. Sorry.

BY MR. OPPENHEIMER:

Q. And so in that case it would not require Ripple Labs itself to decide to delegate its role. That could be done by whoever owns the commit keys; right?

A. Sorry. Let me just read it again.

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I suppose I'm thinking of them as the same thing. So meaning that -- okay. So I guess there is two ways that this delegation could happen. So one is by transferring control over the software and the second would be removing themselves from the file, but that can only be done

through control of the software anyway. So maybe they're the same in the end.

BY MR. OPPENHEIMER:

Q. And let's see. If somebody wanted to make changes to the software today and Ripple Labs disagreed and didn't want that change to happen, is Ripple Labs able to prevent that change from occurring?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So sitting here today I don't know the answer. It again goes to who controls the keys.

MR. OPPENHEIMER: Okay. Why don't we take our break here.

THE WITNESS: Okay.

THE VIDEOGRAPHER: Off the record, 1:13 p.m.

(Lunch recess, 1:14 p.m.)

SAN DIEGO, CALIFORNIA

FRIDAY, OCTOBER 20, 2023, 2:05 P.M.

THE VIDEOGRAPHER: This is the beginning of media file number 5 in the testimony of Jeremy Clark. We're back on the record. The time is 2:05 p.m.

BY MR. OPPENHEIMER:

Q. I'd like to direct you back into your expert report, Exhibit 159 to page 35. And in particular I'd like to focus you on the heading at the top for opinion 3 where you write "Ripple Labs is a gatekeeper to full participation."

Do you see that?

A. I do see it.

Q. What do you mean by "full participation"?

A. Let's say, for example, I decided I want to be a validator so I download the software rippled. I fire it up. So I start processing transactions, but nobody else is listening to me so I am not meaningfully contributing to consensus. So I would say that that's a sort of partial participation. I'm doing stuff, but I'm not fully participating.

This is in contrast to, say, something like Bitcoin or Ethereum where, when I fire up my validator, then I can meaningfully contribute fully. There is no limitation on what I can or cannot do.

Q. So full participation depends on whether you're meaningfully contributing to consensus; is that right?

A. That's right.

Q. So whether someone fully -- is fully participating in the blockchain, that doesn't turn on whether they can propose transactions; right?

A. Yes, that's correct.

Q. And in your view whether someone is

participating fully doesn't turn on whether they can propose amendments to the source code?

A. So these would be like necessary conditions for full participation, but not sufficient.

Q. Okay. You agree that someone who just fires up a new validator on the XRP Ledger protocol can propose amendments to the source code; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So anybody, including people who fire up validators, can propose amendments to the -- or submit code changes -- suggest code changes to the source code.

///

BY MR. OPPENHEIMER:

Q. And anyone including someone who just fires up a new validator can propose transactions on the XRP Ledger; right?

A. Yes. That's correct.

Q. And someone who fires up a new validator can still vote on and sign off on new ledgers; right?

A. I wouldn't say that that's true.

Q. Well, regardless of whether other validators are considering their votes, they can still sign off and say I agree with this ledger; right?

A. So the -- so you asked about voting and signing. So I agree that on the signing side, they could do it. On the voting side -- I mean, there isn't an explicit vote, but they're not contributing to the vote. So like sort of as an analogy, if you want to use the voting as an analogy, they aren't voting.

Q. Let's turn to Bitcoin for a minute.

Suppose somebody starts a new Bitcoin miner, but they don't have enough computing power to solve the next problem first and so this new miner never writes the next block in the Bitcoin blockchain. Would you still consider that full participation?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I don't accept the premise that they don't have enough computational power to solve the next block. I think everyone that joins

Bitcoin has that. Any amount of computation at some level of probability, you can solve the next block. It's super low probability, but it's not impossible.

BY MR. OPPENHEIMER:

Q. If you try to run a Bitcoin miner on an ordinary laptop --

A. Yes.

Q. -- without specialized graphics cards or other software and hardware specifically designed for Bitcoin mining, and that is the extent of your computing power, the probability that you will be able to solve the next block is asymptotic to zero, isn't it?

A. So phrase it differently, it's nonzero as opposed to XRP Ledger where it would be actually zero.

Q. And so your view is that as long as there is any chance, no matter how slim, as long as it is not zero, as long as there is any chance that a new miner could write the next block, that's full participation?

A. That's right. And so there is no gatekeeper to full participation.

Q. And what did you do to figure out that the odds of a newly launched validator on the XRP Ledger getting added to a recommended validator list are exactly zero as opposed to extremely close to zero?

A. So the statement I was making is that assuming you are not on the list, your probability is zero. I wasn't incorporating the probability that you would be added to the list. So again, whether you're on the list or not is Ripple Labs serving that gatekeeper role.

Q. So it is theoretically possible that somebody could launch a new validator and Ripple Labs or someone else maintaining a UNL could see that the new validator has launched and immediately add that to their list; right?

A. So Ripple Labs is free to add any validator they want to their list, including a validator that someone fired up.

Q. And the XRP Ledger Foundation is also free to do that; right?

A. That's correct.

Q. And when Coil was publishing its list, Coil was free to do that; right?

A. That's correct.

Q. Let's talk about Ethereum for a minute.

If a new Ethereum miner doesn't already own Ethereum, then isn't it true that they've got no ability to participate in the proof of stake consensus process?

A. That's correct. You require -- it requires owning ETH in order to participate in the proof of stake consensus mechanism.

Q. So someone can't just fire up a new Ethereum miner, they also have to buy some ETH; is that right?

A. It goes beyond that, but yes. Those are conditions, necessary conditions.

Q. Those are both necessary?

A. Yes.

Q. Okay. And you argue in this section that a new validator would need a preexisting relationship with Ripple Labs in order to make it onto the

recommended validator list; is that right?

A. So the sentence reads, "A new validator without a preexisting relationship with Ripple Labs that joins the XRP Ledger network for the first time will presumably not yet be on the recommended validator list."

So I don't think that's saying exactly how you phrased it, but...

Q. Okay. So your presumption is that without a preexisting relationship with Ripple Labs, validators can't make it on to the recommended validator list. Is that a fair summary?

A. No. I wouldn't say that. I would say that -- I would say it as it says for the first time. So it's not that they won't eventually be added on the list or that there isn't some possibility of that. It's just that if they fire up a validator and Ripple Labs has never heard of them, then they aren't going to be on the list.

Q. I see. So you're referencing here the first time that a new validator shows up on the network?

A. That's correct.

Q. Okay. Do you think that a preexisting relationship with Ripple Labs is necessary for a first-time validator to get on the recommended validator list maintained by the XRP Ledger Foundation?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I don't know why they add people or not add people to the list, "they" being the XRP Ledger Foundation.

BY MR. OPPENHEIMER:

Q. Did you do anything to figure out why they add or don't add people to the list?

A. I did.

Q. What did you do?

A. So I read some depositions of people that work at Ripple Labs that discussed it.

Q. Anything else?

A. That's it. No.

Q. Okay. So you didn't look at documentation published by the XRP Ledger Foundation itself?

A. I did look at documentation published by

the XRP Ledger Foundation in the report. It's cited extensively through the report.

Q. But not for this purpose?

A. For this purpose being specifically what the thought process is behind whether or not you could be added to the recommended validator list.

So vaguely I recall that there is some necessary conditions, like up time and things like that. So my recollection from everything I read, which would include these documents. So if your question is just whether I looked at those, I think I read them in that documentation.

Q. Okay. So I just want to make sure I covered everything that you did to figure it out.

Is there anything else that you did to figure out what criteria the XRP Ledger Foundation uses to add validators to its list?

A. No. So beyond the deposition and beyond whatever they publicly state on their website, I don't.

Q. Okay. Now further down on the same page, 35, at line 24, you write opinion 4, "XRP

distribution favors Ripple Labs."

Can you explain what you mean by that?

A. So XRP, as we know, is the digital asset, and all digital assets require an initial allocation. So they come from somewhere and they go to some person. And so what I do in this section is I just outline, in the case of XRP Ledger, how that initial allocation was. And then -- I mean, the report -- or sorry -- the opinion is basically summarized in the sentence 11 on page 36, which says, "It is reported that 80 billion units were allocated to Ripple Labs."

Q. What does it mean for a distribution to favor one particular entity?

A. So it means that they were included while others were not.

Q. So whether a distribution favors an entity is asking whether that entity is getting part of the distribution, that's your framework?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yeah. So let's say that they get a material amount of the distribution, the

initial distribution.

BY MR. OPPENHEIMER:

Q. Okay. And in deciding whether a distribution favors a given entity, did you consider whether the entities presold any of the asset before the asset was actually created?

A. So I'm generally aware that there were offers -- like I'm aware that there were some sales between Ripple Labs and the general public. I don't know all the inner details of that.

Q. That's not my question.

My question is: In deciding whether a distribution favors a given entity, did you consider whether the entity presold any of the asset before the asset was actually created?

A. Yeah. It was probably a consideration that I made.

Q. Okay. And you're aware that the Ethereum creators presold some ETH before they actually created the blockchain; right?

A. So I'm generally aware that they offered tokens in the exact chronology. I'm not exactly

sure, but it's technically possible to presell.

Q. Are you aware that Ripple Labs and the creators of the XRP Ledger did not presell any XRP before the XRP Ledger was launched?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So sitting here today, I don't recall whether they presold or not any XRP before the creation of the ledger.

BY MR. OPPENHEIMER:

Q. Why didn't you mention this factor within this opinion?

A. Because even if it is a presale, they take possession of it first. So it is still allocated to Ripple Labs. You can say that they have a legal obligation to fulfill the presale, so that's fine. I'm not here offering legal opinions. I'm just saying what the ledger tells us is that those units were given to Ripple Labs.

Q. Right. But you didn't take into account the fact that ETH was presold when the Ethereum ledger was launched?

A. So I can tell you what I wrote about that.

Q. Just answer my question, please.

A. Sure.

Q. You didn't take into account the fact that ETH was presold when the Ethereum ledger was launched, did you?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I probably took that into account.

BY MR. OPPENHEIMER:

Q. Where is that in your report?

A. So the reference to it would be on page 64, which is appendix B.4. So it doesn't go into mechanically what happened when, but it does note that there was an initial Coin offering of ETH. And that was -- I'm considering that as part of the initial allocation of ETH. So whether it went to Ethereum and then to someone else or went directly to other people is a distinction that is not in the report.

Q. You also didn't note in section 4.4 of your report how much Bitcoin went to Satoshi Nakamoto, did you?

A. So in section 4.4, I did not. I don't have an opinion on how much Bitcoin went to Satoshi Nakamoto.

Q. Are you aware that there is a Bitcoin wallet with more than 1 million Bitcoins in it that's believed to belong to Satoshi Nakamoto?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I'm aware of facts that that sounds similar to what you're presenting to me.

BY MR. OPPENHEIMER:

Q. And that's out of just 20 million or so Bitcoins that will ever be created; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it's true that Bitcoin has a cap at 21 million, I think.

BY MR. OPPENHEIMER:

Q. So out of the roughly 21 million Bitcoin that will ever be created, more than 1 million are in this one particular wallet; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So sitting here today I don't know if that's true, but let me accept that as

represented.

///

BY MR. OPPENHEIMER:

Q. Okay. Let's go to page 37 in your report. This is your opinion 5. It says, "Validators in the XRP Ledger require external incentives."

That's at line 1. Do you see that?

A. I do.

Q. How do you define "external incentives"?

A. So incentives would be some form of revenue that I would generate by being a validator. So all three systems give consideration to that question. What I would define as an internal incentive would mean that's internal to the protocol itself. So the protocol dictates the terms under which I receive it, when, how much, that type of thing. And then by saying that they require external incentives, I mean the implication is that there are no internal incentives.

But yet people continue to run the validators. And so people are running validators with no internal incentives. Then they must have an

incentive. Otherwise, there would be no one running it, therefore, it must be external.

Q. So to be clear you said incentives would be some form of revenue. Are you offering an opinion that financial incentives are required?

A. So --

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: -- I said that -- I don't know what I said, but certainly what I mean is that revenue is an example of an internal incentive. It's sufficient for it to be one, but it's not necessary.

BY MR. OPPENHEIMER:

Q. Okay. So you used the term "external incentives" in your report here.

A. Yes.

Q. I would like to know how you defined it. I don't want examples. I want your definition.

A. So an external incentive would be an incentive -- and that doesn't mean financial, just utility to the validator -- that is not coming from the protocol itself.

Q. Okay. So an external incentive doesn't have to be financial; is that right?

A. Correct.

Q. Well, if you look at page 38, at lines 1 through 4, you write, "The requirement that economically rational participants are incentivized to act as validators on the XRP Ledger only through outside financial incentives is a plausible explanation for why Ripple Labs was the only entity acting as a validator on the recommended validator list until July 2018."

So help me understand. Do you think that financial incentives are required or not?

A. So as it reads, financial incentives are a plausible explanation. That's not the same as saying they are required.

Q. Okay. So you're offering a plausible explanation. You're not saying that it is necessarily the only explanation?

A. That's correct.

Q. And you're not saying it's the only plausible explanation. There could be others;

right?

A. That sentence does not exclude that possibility.

Q. Okay. Now, you agree that an external incentive could be altruism; right? You write that in your report?

A. Can you point that out?

Q. Sure. Page 37, line 21.

A. Okay. So I see the word "altruism." So yes, I do agree.

Q. Someone can choose to run an XRP Ledger validator based on altruism; right?

A. Yes. That's what I meant by writing this.

Q. And someone can choose to run an XRP Ledger validator because they like the idea that it uses less electricity than Bitcoin; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I mean, if that were the rationale, then they wouldn't run it at all because that would use even less electricity.

BY MR. OPPENHEIMER:

Q. Someone could say --

A. I mean, you still make the choice to either run it or not.

Q. Someone could say, you know what, I think cryptocurrencies are here to stay, but I think the XRP Ledger uses a lot less electricity than Bitcoin and so I want to support the XRP Ledger by running a validator, couldn't they?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So it's correct that someone could say that. But the answer to your question is that the reason they're doing it is because they want to support the XRP Ledger. Right? So that -- that's sort of what I mean by altruism, is that they want to support the ledger. So that's a valid reason to run a validator.

BY MR. OPPENHEIMER:

Q. Someone could say, I think this rippled protocol is really interesting computer code and I just want to set up a validator that runs it, couldn't they?

MR. TAYLOR-COPELAND: Objection. Calls for speculation.

THE WITNESS: Yes. So I don't know why people would run it or not run it. I'm not offering that opinion. My opinion is just that there is no internal incentive to do it. But can I rule that out? No, I can't rule that out.

BY MR. OPPENHEIMER:

Q. How much does it cost to run an XRP Ledger validator?

A. I don't know the dollar amount.

Q. You don't know sitting here today if it costs a dollar or a million dollars; right?

A. So I could maybe put some rough bounds on it.

Q. You didn't attempt to do that in your report, did you?

A. Exactly. The report does not offer anything beyond the fact that it's not zero.

Q. Was there anything stopping you from trying to figure it out for your report?

A. So the -- I mean, what I'm arguing is comparisons between Bitcoin, Ethereum, and XRP. So that's not a difference -- besides the proof of work

that's contributed in Bitcoin, all of them basically require the same amount of work. So I wasn't -- it's a point of commonality between all three.

Q. You could have launched a XRP Ledger validator of your own and measured how much electricity it was using; right?

A. Yes. I can -- I could launch a validator myself and I could measure the amount of electricity it would use.

Q. Now, both the Bitcoin and Ethereum blockchains have nodes on them that aren't miners, but just report on what's in the blockchain and submit transactions to it, that sort of thing. Are you familiar with that concept of nodes?

A. So I'm familiar with the concept called full nodes, which I believe you're referring to.

Q. Okay. Is that a fair definition of full nodes? I'm happy to have you offer a different one if it's not.

A. Sure. So the idea of submitting transactions is never done by nodes. So users can do it for themselves. You don't have to run a node

to submit a transaction, so that --

Q. Okay.

A. So it's solely about validation.

Q. So what do full nodes do on the Bitcoin and Ethereum blockchains?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So a full node can serve one of two purposes. One reason is that -- or one purpose of it is so that you have -- you understand what the current state of the ledger is. So you can't understand that unless if you're running a node. Doesn't mean you want to contribute to consensus. You don't want to mine. You just want to have that data.

So there is lots of examples of, say, companies or things like that that need that data, and so that's why they would choose to run a full node.

The other answer is that it's more relevant on Ethereum, but there is this concept of an archival node or a historical archive node. And these will keep a complete history of the

blockchain, in addition to just validating new transactions that are happening.

BY MR. OPPENHEIMER:

Q. Full nodes on the Bitcoin and Ethereum -- let's try that again.

Full nodes on the Bitcoin and Ethereum blockchains don't get any internal incentives or rewards for being full nodes, do they?

A. So the way I define internal incentives as in the protocol gives them, so they don't.

Q. So presumably to run a full node on Bitcoin or Ethereum, it would also require the same external incentives as running a full node on the XRP Ledger; is that right?

A. Okay. So let's take it one at a time. So to run a full node on Bitcoin or Ethereum does require external incentives.

Q. Do you have any --

A. Are they the same external incentives in that case than -- well, you sort of transition to now talking about full nodes on XRP Ledger. I don't know if that was deliberate or you meant validators.

Q. Well, let me ask this. There is full nodes on the XRP Ledger as well; right?

A. So yes.

Q. Do you have any reason to think that there are different external incentives required to run a full node on the XRP Ledger compared to running a full node on the Bitcoin or Ethereum ledgers?

A. So I'm not crazy about you saying "required," but I mean, everyone -- you're doing it -- there is a reason for why you're doing it. And the set of the reasons would have a lot of overlap between the two protocols.

Q. And if someone is already running an XRP Ledger full node, what's the marginal cost of running a validator, in other words, the additional cost to run a validator once you've already decided to run a full node?

A. Okay. So I just need to clarify. You mean a validator that's on the list or not on the list?

Q. Let's start with not on the list.

A. And by cost do you mean like dollar amount and electricity, for example, or are you -- what

does cost mean?

Q. Any cost that you can think of that would go into running a full node and a validator.

A. Okay. So sitting here today I don't know the dollar amount of electricity that would be required. So the costs are basically -- you have the capital costs of acquiring the server. It needs to have high specifications. It's not just like any computer. Let's say we do a good job. Maybe ordinary computers could do something. So the capital cost would be the same.

I don't think that, you know, if you start signing transactions as opposed to just propagating them, it doesn't -- it just requires more computation. There will be electricity costs, but it will be marginal.

Q. Isn't it true that the additional cost to run a validator for someone who is already running a full node on the XRP Ledger is essentially zero?

A. It's -- I just -- the statement I said was that it is marginal.

Q. My question is: Isn't it true that it is

essentially zero?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: I would say it is nonzero. So no, I wouldn't accept that.

BY MR. OPPENHEIMER:

Q. You don't accept --

A. I would say that's small.

Q. You don't accept that it is essentially zero?

A. Yeah. I don't accept that it is essentially zero.

Q. Okay. Let me show you a document that we are going to mark as Exhibit 164.

(Exhibit 164 marked for identification.)

BY MR. OPPENHEIMER:

Q. Exhibit 164 is a copy of the transcript of the deposition of David Schwartz from the SEC matter. This is one of the documents that you considered in forming your opinions in this case; right?

A. I believe -- yeah, I recognize this document.

Q. Okay. Let me have you take a look at internal page 147 of this exhibit.

A. Okay.

Q. And what you can see is, at lines 2 through 14, the question is:

"What is the financial incentive for someone to run a validator?

"Answer: Generally, people would run a validator because they needed to run an XRP Ledger node anyway, like it was part of their business or part of what they were doing. The additional cost to run a validator is essentially zero.

"Question: So, for example, an exchange might run a validator for that reason?

"Answer: Right. They'd be running a server anyway in order to process transactions, and the additional cost to make it a validator is essentially zero. It's almost literally just you enter one command."

Are you offering an opinion that David Schwartz was wrong about the cost of running a validator?

A. Everything he said is I think exactly consistent with what I said.

Q. Okay. You can put that aside.

A. When I say "everything," in the quote, not everything that he ever said.

Q. Okay. I don't think anyone was going to have that confusion, but thank you for the clarification.

In forming this opinion, did you interview anyone who runs a validator?

A. I did not.

Q. Do you know one way or the other whether there are people who run validators on the XRP Ledger who don't receive any external financial incentives to do so?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I know -- I know things, but I guess the strict answer to that would be no.

So I do know people who run validators, but I do not know for sure whether or not it's a financial incentive or not.

BY MR. OPPENHEIMER:

Q. Do you know anyone who runs validators on the XRP Ledger system?

A. I do.

Q. Who?

A. So I know -- when I say "people," maybe not individuals, but I know professors who are part of the -- so on line 7 of page 38, I refer to the University Blockchain Research Institute. So I know people who are a part of that program.

What I know is that being part of that program requires running a validator. And so they at least orchestrated that a validator would be run. Whether that means they are personally running it or not, I wouldn't necessarily infer that.

Q. Are you aware that there was a sworn discovery response in this case discussing the number of validators on the XRP Ledger system that Ripple owns or controls -- manage or controls? Excuse me.

A. I didn't understand your question.

Q. Are you aware that there was a sworn discovery response in this case discussing the

number of validators that Ripple Labs manages or controls?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So I don't know what a sworn discovery response is.

BY MR. OPPENHEIMER:

Q. We'll start with this. You understand what discovery responses are; right?

A. Like a response report, correct.

Q. You listed a set of discovery responses as materials you considered in exhibit -- appendix D on your report; right?

A. So I included all the things that I considered. I don't know like what they're called, like what the official legal title of things are.

Q. Go to page 83 of your report, please. Line 15, heading D.5 says "Discovery Responses and Objections."

Do you know what that means?

A. So I believe that it's a list of documents that are responses.

Q. Did you come up with that heading?

MR. TAYLOR-COPELAND: Objection. I'm going to instruct him not to answer to the extent that that gets into the -- yeah, I'm going to instruct him not to answer.

THE WITNESS: I'll accept that instruction.

MR. OPPENHEIMER: You're instructing him not to answer if he came up with it? I think it's a yes or no question.

MR. TAYLOR-COPELAND: To the extent that there was back and forth regarding drafting, that's privileged, so...

BY MR. OPPENHEIMER:

Q. Mr. Clark, did you write your report yourself?

A. I did.

Q. Including appendix D?

A. So everything was edited and it was a collaboration --

Q. Okay.

A. -- between myself and my attorneys.

Q. So who came up with the term "discovery responses"? Was that you or the attorneys?

MR. TAYLOR-COPELAND: I'm going to instruct him not to answer the question.

THE WITNESS: I accept that.

MR. TAYLOR-COPELAND: Privilege is the basis.

BY MR. OPPENHEIMER:

Q. After seeing the heading in Exhibit D.5 -- or line heading D.5 -- sorry -- do you believe you have an understanding sitting here today of what discovery responses are?

A. I do.

Q. Okay. So I will represent to you that there were discovery responses that someone swore to under oath as true involving the number of validators that Ripple Labs managed or controlled.

Did you consider that discovery response in connection with offering an opinion about validators on the XRP Ledger?

A. So everything I considered is in this list. Are you saying there is something that's not in this list?

Q. Sure. Let me show you a new document.

We'll mark it as Exhibit 165.

(Exhibit 165 marked for identification.)

BY MR. OPPENHEIMER:

Q. Exhibit 165 is the Defendants' Supplemental Responses to Lead Plaintiff's Interrogatories, Set Three. This set of supplemental responses doesn't appear in your appendix D, does it?

A. I believe it's only contained in a footnote, not in appendix D.

Q. Which footnote contains this supplemental response?

A. So I believe page 25, footnote 12.

Q. That states the response to interrogatory number 7. Did you consider the response to interrogatories 5 and 6 from Exhibit 165?

A. So if it's not listed in the report, I believe I did not consider it.

Q. Okay. Now, interrogatory number 5 here that's on page 7 of Exhibit 165 calls for information about any validator participating in the consensus process, the person or entity who controlled the validator, that person or entity's

relationship to you, which I'll represent to you is defined as the defendants in this case.

Do you think that would have been useful information for you to have in forming your opinions in this case?

A. Okay. So let me clarify. In your earlier question, I understood you to say that the document we cited is not this document. But what you're saying is that we cited this document, but just I cited like one section of the document, but, of course, I had access to the whole document.

Q. Let's take this one step at a time.

You didn't list this document in exhibit -- appendix D; right?

A. I don't believe that I did --

Q. Okay.

A. -- but --

Q. Now, in footnote 12 on page 25, you listed the supplemental response to interrogatory number 7; right?

A. Okay. So that citation for my interpretation is I'm citing this document and then

I'm giving you a further like pointer to where in this document for this particular thing. So I am citing the document, but I'm also pointing out for what footnote 12 relates to in the report, which part of it.

And so generally if there is something that was either in the list of references or in the footnotes, it didn't necessarily make it into appendix -- well, whatever the appendix is.

Q. Did you read the response to interrogatory number 5 from this document before you wrote your report?

A. So this document looks familiar. I can't recall sitting here today what it -- if I read the whole thing or if I skimmed it or what.

Q. So you don't know one way or the other whether you read the response to interrogatory number 5?

A. That's correct.

Q. And I assume you'd have the same answer as to interrogatory number 6?

A. That is correct.

Q. Okay. As a general rule, having more miners on Bitcoin, on the Bitcoin blockchain, contributes to Bitcoin's security thanks to the proof of work protocol; right?

A. Yes. So it would contribute specifically to the collusion resistance of the protocol.

Q. And you agree that the XRP Ledger doesn't use proof of work for security; right?

A. Yes, I agree with that.

MR. OPPENHEIMER: Okay. Let's go off the record.

THE VIDEOGRAPHER: Off the record, 1:48 -- excuse me -- 2:48 p.m.

(Recess, 2:48 p.m. to 2:58 p.m.)

THE VIDEOGRAPHER: This begins media file number 6 in today's testimony of Jeremy Clark. We're back on the record at 2:58 p.m.

BY MR. OPPENHEIMER:

Q. I'd like to direct you to your report, Exhibit 159 at page 25. Now at lines 22 through 25 here, you write, "Every validator constructs a list of transactions it has seen and considers valid, and

circulates it to the other validators. Each validator keeps the transactions that are being supported by the other validators and discards the transactions that are not."

Do you see that?

A. I do.

Q. What's that understanding based on?

A. Okay. So this first front part of the report is a summary of like the details, the full details. So the -- it would be a repeat of the information but with further detail in the appendix. And then I'll try and see what citations I included.

So it would be covered in appendix C.3 on page 71. Most of it is based on the documentation from the XRPL website. And then -- I mean, I read a lot of material from everything that I considered, and so it's just -- it's things that I read somewhere.

Q. Things that you read somewhere?

A. Your question is do I know it because I read it somewhere? The answer is yes.

Q. But you don't know where?

A. So sitting here today I don't know the exact things. I'm sure it's -- I'm pretty confident that it's covered in the XRPL documentation, which I did read, that would go through it. But every like little small detail may have come from a different source.

Q. Okay. So when you say a validator discards the transactions that are unsupported by others, discards where? Where does it go?

A. So this is -- yes. So I'm trying to explain it in a way that a judge could understand.

So a transaction, it doesn't maybe discard -- anyways, so it removes it from its open ledger. Let's put it that way.

Where does it go? It goes back to the pool of pending transactions.

Q. Okay.

A. It may be included in future ledger updates. It can come back. So if there is -- in the future if all of a sudden now people are supporting it, then it will be included. So it's not ignored. It's just temporarily not included in

that ledger update.

Q. Do you consider that to be discarded?

A. Yeah. So it is discarded from the open ledger. I believe that's the terminology that's used more or less in describing it. It's pretty consistent with how people describe it.

Q. Okay. Will an honest node on the XRP Ledger ever discard entirely a transaction it considers valid?

A. Under this definition, yes. So if discard means remove it from the open ledger, it will. But again, it goes back to the pool of pending transactions. So it could -- it will -- it will keep it and keep trying to include it in a ledger until it gets the full -- not the full support, but a quorum of support.

Q. Okay. Let me take you to page 35 now.

A. Okay.

Q. At line 19 you write, "My conclusion is that the lack of meritocracy towards validators in the XRP Ledger represents a material difference between the XRP Ledger and Bitcoin/Ethereum.

Bitcoin/Ethereum are open, permissionless systems that allow -- that accept new validators without any enrollment or authorization from trust anchors. The XRP Ledger is not a permissionless system with respect to validators in practice."

Do you see that?

A. I do.

Q. In the Bitcoin ledger, if a Bitcoin miner is unhappy with the consensus process, how does that miner change the process?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So the way the consensus protocol would be changed in Bitcoin has nothing to do with whether you're a miner or not. It's just -- I mean, there is a protocol. And so if you want to have a change to the protocol, then there is a process that involves proposing the change. And then if enough miners accept the change -- so as a miner, you can sort of vote to accept it.

But this is all at a social level, so there is nothing in the protocol that says -- there is

nothing in the software that says -- sorry. There is nothing in the software itself that would actuate a change that was voted on.

BY MR. OPPENHEIMER:

Q. You agree that the XRP Ledger can also be changed at what you call the social level; right?

A. I do, yes. There is an amendment process that is very similar to how Bitcoin and Ethereum both would implement changes.

Q. And short of implementing amendments, the XRP Ledger can also be changed at the social level by having a large group of validators adopt a new UNL; right?

A. Okay. So this doesn't -- I mean, it doesn't change the XRP Ledger. It doesn't change the consensus mechanism of the XRP Ledger. But what that represents is a change in terms of who the validators are that are participating in the protocol itself.

So if you look at page -- so if you look at page 32, there is an enumerated list at number 6 and that list describes the case that you're talking

about.

Q. Now, Bitcoin miners can censor transactions from being included in the new blocks on the Bitcoin blockchain; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: No, that's not true.

BY MR. OPPENHEIMER:

Q. Bitcoin miners can choose to write empty blocks on the Bitcoin blockchain; right?

A. That is true.

Q. And they can delay or refuse the inclusion of transactions that they don't want to include if that particular miner gets to write the next block, can they?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Yes. So the way I would state it is that Bitcoin miner can censor transactions in their own blocks.

BY MR. OPPENHEIMER:

Q. Right. Censorship isn't permitted on the XRP Ledger, is it?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: Okay. So the way that censorship is handled on the XRP Ledger is different than how it's handled on Bitcoin. So a censoring node on the XRP Ledger cannot vote to include a transaction. That's the action that they can take.

Will it ultimately end up in the ledger if a quorum decides that it should end up in the ledger, then it will. So it's probably -- censorship is always probabilistic. So what's the probability you solve the next block in Bitcoin versus what's the probability that a quorum is going to reject a transaction on the XRP Ledger?

BY MR. OPPENHEIMER:

Q. Right. And in the Bitcoin blockchain, a single Bitcoin miner controls each block in its entirety; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So -- I mean, more or less correct. So just to be specific, so a miner can choose which transactions to include in a block or not.

BY MR. OPPENHEIMER:

Q. Right. But it's a single miner that gets to write each block as it comes up; right?

MR. TAYLOR-COPELAND: Objection.

THE WITNESS: So it doesn't work the way that you're saying.

BY MR. OPPENHEIMER:

Q. The miner that solves the computational problem on Bitcoin first gets to write the next block on the Bitcoin blockchain; correct?

A. Yes, that's not correct. That's incorrect.

Q. What's incorrect about that?

A. So the person who solves the computational puzzle will circulate that block. Then it's up for other miners to decide whether they want to compete with that block or if they want to extend it.

Assuming that all miners extend it, which is the natural -- that's what you want the protocol to do, then their block will become the next block in the blockchain.

But there is no guarantee -- there is absolutely cases where miners are not first, but their blocks still get included for reasons of

propagation and things like that.

Q. But if other miners decide to compete with that block, then ultimately what happens is another miner proposes the block that should come next in the chain; right?

A. That's correct, yes. So one -- at some point there will be another block in the chain and what transactions are included in that block or not was at the discretion of the miner that included it.

Q. Right. On the XRP Ledger, the next ledger in the chain gets decided by the agreement of multiple parties; right?

A. Can you repeat the question? Sorry.

Q. Yes. On the XRP Ledger, the next ledger that gets written in the chain, the transactions within that ledger we should say, get decided by agreement of multiple parties; right?

A. Yes. So there is a difference between how XRP and Bitcoin work, whereas XRP takes a consensus of a transaction by transaction level as opposed to a block base level.

Q. But multiple parties have to agree in order

to approve the inclusion of the transactions; right?

A. That's correct. So every transaction that's included in the next ledger receives a quorum of support from the validators.

Q. Okay. You talked earlier about the negative UNL, or nUNL, a bit. I want to take you back to that. It's at page 79 in your report.

And what you wrote here, at lines 11 through 13, is "If this negative validator list (negative UNL or nUNL) achieves 80 percent support from other validators on a given validator's validator list, the validator is not considered during the consensus phase."

What's your basis for saying that the nUNL has an effect on what's considered at the consensus phase?

A. So I see that I don't provide a citation, but this is described on the XRPL documentation, this protocol and how it works and what its purpose is.

Q. It's your understanding that a validator on the nUNL can't participate in the consensus process;

is that right?

A. So they -- okay. So the way I -- you might phrase it is that they're no longer considered in the quorum. So the quorum threshold changes because this validator got put on the list.

Q. Can a validator that's on the nUNL propose transactions?

A. Yes. Any -- you don't have to be a validator to propose a transaction. Any entity on the network can.

Q. Can it still sign transactions?

A. It can do everything. So a very common scenario is say it's offline or say like for some reason there is some sort of network issue, it's still running. It is still doing everything a validator does. It's just that people can't hear it for some reason. There is some network propagation.

So it's still -- it's participating in the sense that it is doing the work of validating. It's just not contributing meaningfully to consensus because, for whatever reason, its participation

isn't being reached by the other validators.

Q. Switching gears a bit.

You've never testified as an expert in litigation before; right?

A. That's correct.

Q. Have you ever been deposed before today?

A. No. This is my first time.

Q. You've never testified at trial as an expert before; right?

A. No, I have not.

Q. And I take it from those answers then that no court has ever ruled on whether your testimony would be admissible as expert opinion; right?

A. That's correct.

Q. What, if anything, did you do to prepare for today's deposition?

A. So I reread my expert report. I reread the rebuttal report. I met with counsel. I reviewed a deposition that was given on Monday from one of your witnesses. I looked at two exhibits that were part of that deposition. I reviewed those.

That's more or less what I can recall.

Q. Which two exhibits?

A. So my recollection is one was a magazine article and the other was a press release from Ripple Labs. Both of them describe the addition through the amendment process that we discussed earlier of an escrow feature to the XRP Ledger.

It was announced from Ripple Labs, so the implication being that Ripple Labs supported it and sort of engineered the software and had it added to the list. I noted that at that time they did control the entire dUNL.

And then the escrow subsequently was used to escrow some of the funds that were initially allocated to Ripple Labs during the initial allegation, which I also did discuss in my report.

Q. Did you consider those two particular exhibits at the time you wrote your initial report?

A. If they're not included in the appendix, I would not have considered them. If they are included, then they were provided to me, but I didn't have -- I don't recall looking at them in detail today.

Q. Okay. So you read them earlier this week, and sitting here today you don't recall reading them in detail at the time you worked on your original report; is that right?

A. That's correct.

Q. Okay. You mentioned that you met with counsel to prepare for your deposition today. How many times?

A. I believe it was three times.

Q. And approximately how long each time?

A. Two were two-hour virtual meetings, and one was an in-person meeting of -- I don't know -- maybe six hours.

Q. Was anyone present other than you and counsel?

A. No.

Q. Have you discussed your testimony today with anyone else?

A. You mean the content of the testimony or the fact that I'm giving testimony?

Q. Let's start with the content.

A. The content, I have not.

Q. How about the fact that you are giving testimony?

A. Yeah. Sure. So my family know that I'm here. My university knows. There is various times where I've had meetings that conflicted with my work on this file that I had to say why I wasn't working or why I was postponing a meeting or something to that extent.

Q. Approximately how many hours did you spend preparing your initial report in this matter?

A. So the total amount of time I spent on this was somewhere between, let's say, 200, 250 hours. I would say maybe 60 or 70 percent of that was -- I mean, a lot of it was just reading, which kind of goes into the report. It wasn't the drafting of the report, but I would say a substantial amount of that time was on the report itself.

Q. And approximately how much time did you spend preparing your rebuttal report?

A. I don't know. Maybe between -- maybe, let's say, about 20 hours, something like that.

Q. Okay. If I can direct you to page 6 of

your opening report. At lines 13 through 15 you write, "All opinions are mine and do not necessarily reflect those of the Raymond Chabot Grant Thornton, Catallaxy, the Natural Sciences and Engineering Research Council of Canada (NSERC), or Concordia University."

Did you discuss your opinions with anyone at any of those institutions?

A. I did not.

Q. Why did you feel the need to say that the opinions aren't theirs?

A. So if you go back to page 4, line 10, I listed those organizations here. And so I felt it was necessary because I had listed them there to also disclaim that they had nothing to do with the report.

Q. Okay. Have you ever purchased XRP?

A. No, I have not.

Q. How about Bitcoin?

A. Yes.

Q. Do you hold any Bitcoin today?

A. I do.

Q. How much approximately?

A. Approximately between 10,000 and $20,000 Canadian.

Q. Have you ever purchased any other cryptocurrencies?

A. So I have acquired other cryptocurrencies.

Q. Do you hold any of them today?

A. I do.

Q. What other cryptocurrencies do you hold today?

A. So there is too many to enumerate, but I can tell you sort of the biggest. So the biggest ones would be -- there is a token called ARB and then there is various flavors of ETH that I own as well. So I would say between BTC, ETH, and ARB, that would represent 90, 95 percent of what I hold.

Q. What's the approximate Canadian dollar value of the BTC, ETH, and ARB that you hold?

A. Roughly between 30 and $40,000 Canadian.

Q. We talked earlier about running an XRP validator that you hadn't. Have you ever run a miner or a validator on any other cryptocurrency

network?

A. I have.

Q. Which blockchains have you run a miner for?

A. So I did not run a miner. I have not run a miner on any blockchain.

Q. How about a validator?

A. So I have run a full node on Bitcoin.

Q. Approximately when did you run that full node?

A. Maybe in 2012, 2013. So I can clarify that at the time, if you use Bitcoin, you had to run a full node. You had no choice. So a full node is not a miner. It's just how the software works. Now today we have what are called lightweight clients where you can use Bitcoin without operating a full node.

Q. At page 6 of your opening report, lines 10 and 11, you say that you are being compensated by plaintiffs' counsel at 175 Canadian dollars per hour before university fees. Can you explain what "before university fees" means here?

A. Yes. So my payment is routed through my

university, and my university charges an overhead.

Q. So counsel pays the university and then the university pays you?

A. That's correct.

Q. Approximately what percentage or dollar amount is the university's overhead?

A. Of the 175, it would be less than $25.

Q. Okay.

A. Sorry. I should say less than -- no. That's correct. Less than $25.

Q. Okay. Let's turn to your CV starting at page 92 of your report. Actually a little past that, page 4 of the CV, you list degrees there.

You have a PhD in computer science; is that right?

A. That's correct.

Q. You got that PhD in 2011?

A. That's correct.

Q. Did you study cryptocurrencies during your PhD?

A. Okay. So the main focus of my research was on cryptography -- I mean, a lot of it has to

do with how you define a cryptocurrency. So Bitcoin was more or less not invented until the end of my PhD. I looked at Bitcoin. I looked at earlier versions of digital cash that use cryptographies, therefore, you could consider cryptocurrencies.

The main focus of my thesis was on cryptographic voting, so voting systems that use cryptography. The lead researcher on that is David Chaum who invented cryptocurrencies in 1982, '83. So we had a lot of discussions of cryptocurrencies, but the research output was more concentrated on the voting problem.

Q. Okay. Fair to say your experience with blockchains like Bitcoin and subsequently created ones came mostly after your PhD?

A. At the tail end of my PhD or at the start of my postdoc, yes. So my postdoc is listed on -- below.

Q. Right. And you currently work as an associate professor at Concordia University; right?

A. That's correct.

Q. That's the only university where you've

held a faculty position since your PhD and postdoc; right?

A. That's correct.

Q. Now, on page 3 of your CV, there is a section called consulting work. The first line that's listed there is undisclosed digital asset subject with Susman Godfrey. Is that this case?

A. That is.

Q. When were you first engaged in this case?

A. So I believe it was in the summer of 2022.

Q. Have you ever spoken to the lead plaintiff Bradley Sostack?

A. No, not to my knowledge.

Q. Okay. The second line in the section is undisclosed cryptocurrency subject, Williams & Connolly. I take it you never testified in that case; right?

A. It was not a case.

Q. Okay.

A. And I didn't testify because it wasn't a case.

Q. You didn't write any reports in connection

with that engagement?

A. That's correct.

Q. And the third one here, City of Toronto, that was not in connection with litigation; right?

A. That's correct.

Q. That's a case -- or that was an engagement that involved voting security; is that right?

A. Yeah. It was an analysis of voting systems that were under procurement by City of Toronto.

Q. Okay. So is this present engagement with Susman Godfrey the first time you've ever been engaged as a litigation expert?

A. It's the first time I've served as an expert witness. Is that the same as a litigation --

Q. As an expert witness.

A. Yes.

Q. Same thing.

A. Yes. Yes.

Q. Okay. And there haven't been any additional engagements as an expert witness since the time you wrote this CV?

A. Yeah, that's correct.

Q. So this is your only one?

A. This is my first and only.

Q. Okay. Approximately what percentage of your income is derived from your consulting engagement with Susman Godfrey over the last year or so?

A. I'd have to compute the numbers, but let's say -- rough math might be 20 percent or something.

Q. Okay. Rough math is fine for this purpose.

A. Okay.

Q. Let's go to page 23 of your CV. This is -- appears to be a list of courses that you've taught; is that right?

A. That's correct.

Q. And am I right that the first course that you taught on blockchain technology was in the fourth term of 2022?

A. No. That was the most recent.

Q. Okay. So there is earlier iterations of it that --

A. There are. So it's kind of --

Q. Let me finish.

So there are earlier iterations of it that aren't listed on this chart; is that right?

A. That's not correct.

Q. Okay. When did you teach blockchain technology before fourth term of 2022?

A. So the first time I taught it -- I know why it's confusing -- is listed under the course code INSE 6630 in 2017/2, which means the fall term.

So the reason is I -- if you want the explanation. At Concordia they have what's called a slot course. So slot course is a course code that's in the calendar. Any faculty can teach it on any subject. Once you teach it twice on a particular subject and it goes well and the students like it, then you're allowed to turn it into a permanent code.

So I taught the blockchain twice under 6630 and then it got turned into a permanent code. So it was taught for the first time in 2022 under the new code, but the course is the same all three years.

Q. Have you ever taught a course on XRP or the XRP Ledger?

A. So I've taught courses on blockchain technology. To the extent that XRP is a blockchain technology, it would be covered, but I've never taught a course that scoped only to XRP.

Q. Have you had any particular classes or units within a course that are scoped particular to XRP?

A. I have not.

Q. Did you ever review the rippled source code prior to your engagement in this case?

A. I don't recall a specific instance where I would have, but it's possible.

Q. But not that you recall?

A. But not that I recall.

Q. And you've never published something specific about XRP before; right?

A. So I -- going back to your earlier question of preparing for this deposition, I did try to see what I had said about XRP in my academic papers. So no academic paper is scoped to XRP directly, but there are mentions of it.

Q. None actually about XRP or the XRP Ledger;

correct?

A. There is -- yeah, there is statements about XRP, but they're not -- but they're not an entire paper.

Q. It's not the focus of any of your publications?

A. Sure. Sure. Let's go with that.

Q. Okay. On page 17 of your CV, you've got a section here titled "Press & Media." These are places where you've been quoted in the press or media, not your affirmative publications; is that right?

A. So I think it's a mix of both. So some are references to my research and some are where I'm specifically quoted. So it includes both.

Q. Okay. These aren't peer-reviewed publications, are they?

A. No. This is like journalism.

Q. Okay. On page 19, you've got a section headed "Concordia Promotional Activities."

Can you explain what that is?

A. So Concordia is the university that I work

at, and so these are a set of -- it could be an event or it could be a publication or a magazine that's put out by Concordia. And so I just -- when you go for tenure, you want to show that you are supporting the university, and so that's why they're separated out from everything else. So they could get blended in with everything else, but it's -- that's the reason why it's a separate section.

Q. Are you paid separately for this work or this is just part of your salary at Concordia?

A. For the work on this case?

Q. No. For the Concordia promotional activities.

A. This is part of my salary at Concordia.

Q. Have you gotten tenure from Concordia?

A. I have.

Q. Congratulations.

A. Thank you.

Q. Have you ever held a job working for an issuer of any cryptocurrency?

A. No, I have not.

Q. What about for any entity that is active in

cryptocurrency space, for example, the Ethereum Foundation?

A. No. I've never been employed by anyone other than Concordia University and Carleton University.

Q. Sure. When did you first become aware of the existence of the XRP Ledger Foundation?

A. So I couldn't say for sure sitting here today. It certainly became clear once I engaged on this case and started reading everything.

Q. Do you know if you had ever heard of it prior to your engagement in this case?

A. I suspect I may have, but -- I think it's probable that I had.

Q. How about Ripple Labs, had you ever heard of Ripple Labs before your engagement in this case?

A. I had.

Q. And how did you first become aware of Ripple Labs?

A. So I can't recall exactly today. I have a suspicion of how it went. Do you want to hear it or it's just what I know for sure?

Q. Sure.

A. So as you know, XRP --

Q. Just to make the record clear, what's your suspicion?

A. So XRP was -- became one of the most dominant cryptocurrencies, so I heard about it.

One of the core developers of the XRP Ledger is someone that I -- there is a website that both of us used to post very prolifically on it. I believe around that time he would have indicated that he worked for not Ripple Labs, but OpenCoin, I believe it was called at the time. I suspect at that time I at least sort of looked to try and figure out what exactly this company is.

Q. What was name of that developer?

A. So the screen name is Joel Katz and the real name is David Schwartz.

Q. And what was the name of the website that you both posted to?

A. It was called Stack Exchange.

Q. Did you form any opinions about Ripple Labs prior to your engagement in this case?

A. What do you mean? Like did I have thoughts about them?

Q. Did you have any views about Ripple Labs before you got engaged in this case?

A. No. I would say no.

MR. OPPENHEIMER: Let's go off the record.

THE VIDEOGRAPHER: Off the record, 3:33 p.m.

(Recess, 3:33 p.m. to 3:41 p.m.)

THE VIDEOGRAPHER: This begins media unit number 7 of today's testimony of Jeremy Clark. Back on the record at 3:41 p.m.

MR. OPPENHEIMER: Thank you, Mr. Clark. I have no further questions at this time.

MR. TAYLOR-COPELAND: I have just a couple of questions.

EXAMINATION

BY MR. TAYLOR-COPELAND:

Q. Professor Clark, earlier today you were asked whether you were opining about whether XRP purchasers had to trust Ripple Labs. Do you recall

that?

A. Yes, I do.

Q. Okay. What did you understand "trust" to mean in that question?

A. Trust in the recommended validator list from Ripple Labs.

Q. Are you offering any opinions about what XRP purchasers knew, understood, or believed when purchasing XRP?

A. No, I'm not.

Q. Are you offering any opinion about Ripple's marketing or promotion of XRP?

A. I'm not.

MR. TAYLOR-COPELAND: I have nothing further. Thank you.

MR. OPPENHEIMER: I think I had one question after that.

FURTHER EXAMINATION

BY MR. OPPENHEIMER:

Q. Are you offering any opinions in this case that XRP purchasers knew how the XRP Ledger operated

at the time they purchased XRP?

A. No. I don't know what was in the minds of XRP purchasers.

MR. OPPENHEIMER: Nothing further for me.

MR. TAYLOR-COPELAND: Nothing further.

THE VIDEOGRAPHER: This concludes today's testimony of Jeremy Clark. We're going off the record at 3:42 p.m.

THE REPORTER: I'm going to put on my record, Counsel.

Mr. Taylor-Copeland, did you need to order an expedite transcript?

MR. TAYLOR-COPELAND: Yes, please.

THE REPORTER: And rough draft?

MR. TAYLOR-COPELAND: I don't think we need a rough draft, no.

THE VIDEOGRAPHER: Do you need a copy of the video?

MR. TAYLOR-COPELAND: Yes, please.

THE REPORTER: Do you know when you want the transcript? I'll have it ready Tuesday.

MR. TAYLOR-COPELAND: That's fine.

(Deposition adjourned at 3:43 p.m.)

* * * * *

CERTIFIED SHORTHAND REPORTER'S CERTIFICATE

I, Cynthia J. Vega, a Certified Shorthand Reporter for the State of California, do hereby certify:

That the witness in the foregoing deposition was by me duly sworn; that the deposition was then taken before me at the time and place herein set forth; that the testimony and proceedings were reported by me stenographically and were transcribed through computerized transcription under my direction; and the foregoing is a true and correct record of the testimony and proceedings taken at that time.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named or in any way interested in the outcome of the cause in said caption.

IN WITNESS WHEREOF, I have subscribed my name this 24th day of October, 2023.

Reading and Signing was not requested.

Cynthia J. Vega

Cynthia J. Vega, CSR No. 6640

Jeremy W. Clark, c/o
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Case: In re Ripple Labs. Inc., Litigation
Date of deposition: October 20, 2023
Deponent: Jeremy W. Clark

Please be advised that the transcript in the above referenced matter is now complete and ready for signature. The deponent may come to this office to sign the transcript, a copy may be purchased for the witness to review and sign, or the deponent and/or counsel may waive the option of signing. Please advise us of the option selected. Please forward the errata sheet and the original signed signature page to counsel noticing the deposition, noting the applicable time period allowed for such by the governing Rules of Procedure. If you have any questions, please do not hesitate to call our office at (202)-232-0646.

Sincerely,
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Witness Name: Jeremy W. Clark
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I do hereby acknowledge that I have read and examined the foregoing pages of the transcript of my deposition and that:

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Case: In re Ripple Labs. Inc., Litigation
Witness Name: Jeremy W. Clark
Deposition Date: October 20, 2023

Page No.	Line No.	Change

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Signature Date

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