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BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.,	)	
INSTAGRAM INC.,	)	
WHATSAPP LLC, META	)	
PLATFORMS TECHNOLOGIES,	)	
LLC AND GIPHY, INC.,	)	
Petitioners,	)	
v.	)	Case IPR2023-00923
	)	U.S. Patent 7,266,682
VL COLLECTIVE IP LLC,	)	
Patent Owner.	)	

DEPOSITION OF HENRY HOUH, PH.D.

July 19, 2024

9:00 a.m. Eastern Standard Time

Reported by: Lori J. Goodin, RPR, CRR, RSA,
California CSR #13959

DIGITAL EVIDENCE GROUP
1730 M Street, NW, Suite 812
Washington, D.C. 20036
(202) 232-0646

1 REMOTE APPEARANCES:

2 FOR PETITIONER:

3 KIRKLAND & ELLIS LLP

4 BY: JONATHAN D. BRIT, ESQUIRE

5 601 Lexington Avenue

6 New York, New York 10022

7 212-446-4800

8 jonathan.brit@kirkland.com

9 AND

10 KIRKLAND & ELLIS LLP

11 BY: ETHAN PERBOHNER, ESQUIRE

300 North LaSalle

12 Chicago, Illinois 60654

312-862-2000

13 ethan.perbohner@kirkland.com

14

15 FOR PATENT OWNER:

16 REICHMAN JORGENSEN LEHMAN & FELDBERG LLP

BY: PHILIP EKLEM, ESQUIRE

17 1909 K Street, Northwest

Suite 800

18 Washington, D.C. 20006

202-894-7310

19 peklem@reichmanjorgensen.com

20

21

22

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1 FRIDAY, JULY 19, 2024, 9:00 a.m. EST

2 PROCEEDINGS

3 * * *

4 Whereupon,

5 HENRY HOUH, PH.D.,

6 a witness called for examination, having been
7 first duly sworn, was examined and testified as
8 follows:

9 * * *

10 EXAMINATION

11 BY MR. EKLEM:

12 Q. Good morning, Dr. Houh.

13 A. Good morning.

14 MR. EKLEM: I will just state for
15 the record, this is Philip Eklem with
16 Reichman Jorgensen Lehman & Feldberg, on
17 behalf of the patent owner, VL Collective IP,
18 LLC.

19 Jon, do you want to make an
20 appearance?

21 MR. BRIT: Yes, Jonathan Brit,
22 Kirkland & Ellis on behalf of the

1 petitioners, Meta Platform, Inc., Instagram
2 Inc., Whatsapp LLC, Meta Platforms Technologies,
3 LLC and Giphy, Inc., on behalf of the witness.

4 And with me today is my colleague,
5 Ethan Perbohner, also of Kirkland & Ellis.

6 BY MR. EKLEM:

7 Q. Okay. Dr. Houh, you were previously
8 deposed in this matter, correct?

9 A. Yes.

10 Q. And that was in relation to your
11 first declaration, Exhibit 1003, right?

12 A. Yes.

13 Q. And do you understand why you are
14 being deposed again?

15 A. Yes, I think so.

16 Q. What is your understanding?

17 A. I submitted additional declarations
18 in this matter.

19 Q. Okay. And those additional
20 declarations, are you referring to Exhibits 1033
21 and 1035?

22 A. Yes, at least.

1 Q. Do you have -- did you bring any
2 paper copies or anything with you to your
3 deposition today?

4 A. I think there are some in the room,
5 yes.

6 Q. Okay. Do you plan --

7 MR. BRIT: I had printed out paper
8 copies that are clean copies in case it is
9 helpful to have a hard copy.

10 But, I understand you have a Box
11 linkup.

12 So, if you have any objections to
13 the paper copy, just let me know. I will
14 represent that they are clean printed copies
15 of some of the exhibits. I don't think we
16 have all of them. But if he wants a paper
17 copy of passages, I am happy to provide it.

18 BY MR. EKLEM:

19 Q. Yes, Dr. Houh, if you prefer to look
20 at paper copies of anything that we discuss
21 today, that is completely fine.

22 I just ask that you don't pick up

1 anything that we haven't, that I haven't asked
2 you to look at, or that we haven't agreed that
3 you can go ahead and pick up otherwise.

4 Is that okay?

5 A. Okay, sure.

6 Q. And --

7 MR. BRIT: I have all of the paper
8 copies with me, they are not with the witness
9 right now, so.

10 BY MR. EKLEM:

11 Q. Okay, all right. Well, Dr. Houh,
12 would you prefer to have any paper copies with
13 you instead of looking at them electronically?

14 A. Sometimes it is nice to have both.

15 MR. EKLEM: Jon, if you want to have
16 somebody bring them over to Dr. Houh, feel
17 free.

18 MR. BRIT: Okay, great, thanks.

19 BY MR. EKLEM:

20 Q. So, you are obviously looking at a
21 computer right now.

22 Do you have anything open on your

1 computer other than the Zoom and the Box that was
2 provided?

3 A. There is a Word document open with
4 links to the exhibits and the Zoom meeting.

5 But that is the only other thing
6 that I have open.

7 Q. Okay. If you would agree not to
8 open any other windows or programs on your
9 computer, other than what is available in the Box
10 or unless we otherwise agree, can you agree to
11 that for the duration of the deposition?

12 A. Am I allowed to download the PDFs
13 and bring up a browser, a viewer for the PDF
14 files?

15 Q. Yes. Whatever is required for
16 purposes of accessing the Box information.

17 A. Okay.

18 Q. Yes.

19 A. Okay, sure, yes, I would agree to
20 that.

21 Q. Okay. Because you have multiple
22 declarations in this case, I will do my best to

1 identify them by exhibit number.

2 And it should also be clear from the
3 context of my question which one we are talking
4 about.

5 But, if at any time you have any
6 questions about which declaration I am referring
7 to, just stop me and ask and I will clarify.

8 Okay?

9 A. Sure, thank you.

10 Q. Sure. Did you do anything to
11 prepare for your deposition today?

12 A. I did.

13 Q. What did you do?

14 A. I met with attorneys -- the
15 attorneys and reviewed some documents.

16 Q. Did you meet with anybody besides
17 attorneys?

18 A. No.

19 Q. How many times did you meet with
20 them?

21 A. At least twice. It could have been
22 more. I don't remember.

1 Q. Okay. And how long were each of
2 those meetings?

3 MR. BRIT: I will caution the
4 witness not to disclose the substance of any
5 of those meetings or the substance of what
6 was disclosed during those meetings. But you
7 can answer the question.

8 THE WITNESS: Actually, I think it
9 was three times. A couple of times over
10 Zoom, and I think were each at least a few
11 hours or around there.

12 And then in person, with one of the
13 attorneys in person, and one online, that
14 probably was about 5, 5 and a half hours.

15 BY MR. EKLEM:

16 Q. In preparing your declarations,
17 Exhibits 1033 and 1035, did you consult with
18 anybody other than attorneys during the
19 preparation of those declarations?

20 MR. BRIT: Objection to form. I
21 will caution the witness not to disclose the
22 substance of any communications with counsel.

1 But you can answer the question.

2 THE WITNESS: No, I don't think so.

3 BY MR. EKLEM:

4 Q. Okay. So, all the documents that we
5 are going to be referring to today, they are
6 already exhibits to the proceedings, to the IPR
7 proceeding.

8 So, to avoid any confusion, I'm
9 going to refer to them by their IPR exhibit
10 number. And we are not going to separately mark
11 them as exhibits to the -- to the deposition.

12 Is that okay? Do you understand?

13 A. Yes, that works for me.

14 Q. Okay. All right. Could you please
15 pull up Exhibit 1035, which is one of your
16 supplemental declarations?

17 (Whereupon, previously marked
18 Exhibit 1035,
19 first referral.)

20 THE WITNESS: Oh, by the way, I do
21 notice that the petition -- excuse me the
22 original petition is in the Box. And that

1 doesn't have an exhibit number.

2 BY MR. EKLEM:

3 Q. Correct. If we refer to that, we
4 may give it an exhibit number. But that would be
5 Paper Number 3 to the proceedings, we could also
6 identify it that way. Or just refer to it as the
7 petition.

8 A. Sorry, so, this was -- you want --
9 which declaration did you want me to look at
10 again, please?

11 MR. EKLEM: Exhibit 1035.

12 MR. BRIT: Counsel, I think there
13 might be a question on this one because it
14 was served and not filed.

15 So, just take it from 1035 is the
16 Supplemental Declaration of Dr. Henry H.
17 Houh, Ph.D. in Response to Patent Owner's
18 Objections to Petitioner's Reply Evidence.

19 MR. EKLEM: That's correct. Right.

20 MR. BRIT: Okay.

21 BY MR. EKLEM:

22 Q. Yes, I see that the unserved

1 document does not have the exhibit numbers that
2 petitioners gave it marked on the pages
3 themselves.

4 So, this can be Exhibit 1 to the
5 deposition. It was provided with a document file
6 name that starts with EX 1035.

7 Is that -- do you have that in front
8 of you, Dr. Houh?

9 A. Yes, I have it open now.

10 Q. Okay. And you can confirm that on
11 the first page, it is titled Supplemental
12 Declaration of Dr. Henry H. Houh Ph.D. In
13 Response to Patent Owner's Objections to
14 Petitioner's Reply Evidence.

15 A. Yes, I see that.

16 Q. Okay. And that is your signature at
17 the end on Page 14, correct?

18 A. Yes.

19 Q. Okay. And the date, next to your
20 signature, is July 1st, 2024, correct?

21 A. Yes.

22 Q. Okay. Could you go to Paragraph 16,

1 please. And just read that paragraph to yourself
2 and let me know when you've finished.

3 A. Okay, I have read it.

4 Q. Okay. In the third sentence of
5 Paragraph 16 you state, "The text of Exhibit 1032
6 is complete, no pages are missing. The text on
7 each page appears to flow seamlessly from one
8 page to the next. Further, there are no visible
9 alterations to the document."

10 Do you see that?

11 A. Yes.

12 Q. Why did you include that statement?

13 A. I think it is simply to show that
14 the 1032 was complete and it was a true and
15 accurate copy as found on the IETF website.

16 Q. Okay. Do you know who Dr. Sylvia
17 Hall-Ellis is?

18 A. Yes.

19 Q. Who is she?

20 A. I think she is a librarian that is
21 serving as an expert in this case. Or a former
22 librarian and professor.

1 Q. Okay. So you are aware that she has
2 submitted declarations in this case?

3 A. Yes.

4 Q. Have you read any of those
5 declarations?

6 A. Yes. In fact, I think -- I think
7 they are with -- yes, I cite to them. I list
8 Exhibit 1010, Exhibit 1018, Exhibit 1019.

9 Those can be found in the first
10 pages of the report that's Exhibit 1 to this
11 deposition.

12 Q. Okay.

13 A. Did I say 1018, yes, 1018, 1019, at
14 least, and 1010. Yeah, I hope I didn't miss
15 anything. But I did cite to and review those
16 with respect -- in preparing my different
17 declarations.

18 Q. Okay. Did you copy the language in
19 your declaration, Exhibit 1035, from any of
20 Dr. Hall-Ellis's declarations?

21 MR. BRIT: Objection as to form.

22 Lacks foundation. Lack of relevance.

1 THE WITNESS: I mean, if you are
2 asking if I had a physical copy of her report
3 in front of me and copied from there, that
4 is -- I don't think that is what happened.

5 BY MR. EKLEM:

6 Q. Okay. So, if any of the phrases or
7 sentences in your declaration, Exhibit 1035, were
8 identical to phrases or sentences in
9 Dr. Hall-Ellis's declaration, that would be just
10 a coincidence?

11 MR. BRIT: Same objections to form.
12 Relevance. And lacks foundation.

13 THE WITNESS: No. I don't think
14 that is accurate to say exactly.

15 BY MR. EKLEM:

16 Q. What is not accurate?

17 A. How you characterized it as a
18 coincidence.

19 Q. So, if they were identical or
20 extremely similar, if it is not a coincidence,
21 how would that have happened?

22 A. Well, as I said, I didn't copy them

1 directly, but I think, this was an effort with
2 the attorneys, and I reviewed them all carefully,
3 all these statements are my opinions and I stand
4 by them.

5 But this kind of thing often happens
6 in my reports where there are passages that are
7 similar to other people's reports.

8 And, it is -- I wouldn't
9 characterize that as a coincidence.

10 Q. Okay. In the fourth sentence of
11 Paragraph 16 you state, "Exhibit 1032 was found
12 within the custody of IETF, namely on the IETF's
13 website where it is freely downloadable. A place
14 where an authentic copy of this document would
15 likely be."

16 Do you see that?

17 A. Yes.

18 Q. You say that Exhibit 1032 was found.
19 Who was it found by?

20 A. I think I found that.

21 Q. So, when you were referring to
22 Exhibit 1032 in forming your opinions, you became

1 aware of that exhibit because you first found it?

2 A. I first found it, yes.

3 Q. Okay.

4 A. Well, I mean I may have been aware
5 of it before I found it for the purposes of this
6 case.

7 But, I -- I included it for the
8 purposes of this case because I, you know, I
9 found that -- the reference, again. And I had
10 downloaded it through the IETF website, an entire
11 archive at some point in the past -- I don't
12 remember how many years ago -- of that document
13 because I have downloaded the entire archives of
14 RFCs at some point in the past, maybe in the past
15 few years or so.

16 But then I refound it. When I
17 wanted to use it for the purposes of this case, I
18 did do a fresh download and do a comparison of my
19 archived copy to the copy that I freshly
20 downloaded from the site, the IETF site, and they
21 were the same.

22 So, that is what I provided to the

1 attorneys for the purposes of my relying on this
2 document in direct response of Dr. Stubblebine's
3 statements in his previous declaration.

4 And that is -- that is why I found
5 this document. That is why I went to search for
6 this document.

7 Q. Okay. Could you go to Paragraph 18
8 of your declaration, Exhibit 1035, which is
9 Exhibit 1 to your deposition.

10 A. Okay.

11 Q. And just read that paragraph to
12 yourself. And when you've finished, let me know.

13 A. Yes, I have read it.

14 Q. Okay. In the second sentence you
15 state, "Should any of my first declaration,
16 second declaration, and/or third declaration omit
17 a statement declaring under penalty of perjury
18 that all of the statements included therein are
19 or were true and correct, such omission was an
20 oversight."

21 Do you see that?

22 A. Yes.

1 Q. You begin that sentence with the
2 word "should."

3 Do you know if your second
4 declaration, Exhibit 1033, did, in fact, omit
5 such a statement?

6 MR. BRIT: Objection. Exhibit 1033
7 is -- is that a second declaration? I'm just
8 confused. I'm sorry.

9 So, objection to form.

10 THE WITNESS: Sorry, which document
11 are you referring to?

12 BY MR. EKLEM:

13 Q. Exhibit 1033 is the Supplemental
14 Declaration of Dr. Henry Houh, Ph.D. in Support
15 of Petitioner's Reply.

16 Is that correct?

17 A. I think that would be the third
18 declaration that I am referring to here in this
19 sentence.

20 Did you say it was the second
21 declaration, or the third declaration? What were
22 you asking about?

1 Q. Well, okay. So, I will just clarify
2 here.

3 Let's start with your statement.
4 So, in your -- in Paragraph 18, you refer to them
5 as first declaration, second declaration, and/or
6 third declaration.

7 Your first declaration is
8 Exhibit 1003 to these proceedings. Correct?

9 A. Yes.

10 Q. Your second declaration is
11 Exhibit 1017 to these proceedings. Correct?

12 A. Yes.

13 Q. And your third declaration is
14 Exhibit 1033 to these proceedings. Correct?

15 A. Yes.

16 Q. Okay. So, I may have -- I may have
17 mentioned the wrong one.

18 So, my question is, do you know if
19 your third declaration, Exhibit 1033, it, in
20 fact, omits such a statement?

21 MR. BRIT: Objection to form. Lacks
22 foundation.

1 THE WITNESS: Well, I mean, in my
2 third declaration at Paragraph 22, I state
3 that, "I declare that all statements made
4 herein of my knowledge are true, and that all
5 statements made on information and belief are
6 believed to be true. And that these
7 statements were made with the knowledge that
8 willful false statements and the like so made
9 are punishable by fine or imprisonment or
10 both under Section 1001 of Title 18 of the
11 U.S. Code."

12 So, I mean, it doesn't refer
13 directly to penalties of perjury.

14 But, I think I understand that fines
15 or imprisonment may be a result of being, you
16 know, of perjury, of being found guilty of
17 perjury.

18 So, I am not making a direct
19 reference to perjury, or penalty of perjury.

20 But I have said that these
21 statements were made with the knowledge that
22 willful false statements and the like, so

1 made, are punishable by fine or imprisonment
2 or both under some portion of the U.S. Code.

3 And that is my understanding. I
4 don't -- I'm not a lawyer, so I could look up
5 that. But I -- I don't know what that -- I
6 don't know what exactly -- that is my
7 understanding.

8 So, if that section refers to
9 perjury, then -- then perhaps without
10 referring to perjury, certainly I acknowledge
11 that willful false statements can be
12 punishable by fine or imprisonment.

13 BY MR. EKLEM:

14 Q. Okay. Do you have an understanding
15 of what perjury is?

16 A. Again, I am not a lawyer, but I
17 think I kind of do.

18 Q. Okay. What is your understanding?

19 MR. BRIT: Objection to form. Calls
20 for speculation. Calls for a legal
21 conclusion.

22 THE WITNESS: Again, I'm not a

1 lawyer. But, I understand, if I knowingly
2 lie under oath that might be considered
3 perjury. That is kind of, in my mind, what I
4 have as a layperson.

5 BY MR. EKLEM:

6 Q. Okay. So, let's switch over to
7 Exhibit 1033, which is your third declaration.

8 If you could get that and put it in
9 front of you, please.

10 (Whereupon, previously marked
11 Exhibit 1033,
12 first referral.)

13 THE WITNESS: Okay, I have that open
14 now.

15 BY MR. EKLEM:

16 Q. Okay. Could you go to Paragraph 10,
17 please. And read that to yourself and let me
18 know when you've finished.

19 A. Okay.

20 Q. Okay. In the first sentence you
21 state that "Dr. Stubblebine sets forth a claim
22 construction for two terms, 'application layer'

1 and 'application protocol'."

2 Do you see that?

3 A. Yes.

4 Q. You don't dispute Dr. Stubblebine's
5 constructions in your declaration, correct?

6 MR. BRIT: Objection, form.

7 Leading.

8 THE WITNESS: Well, in Paragraph 10
9 I am not saying that I disagree in that
10 paragraph.

11 What I'm saying is that even under
12 those proposed claim constructions, it
13 doesn't render any of the asserted references
14 inapplicable, nor does it change that those
15 references either disclose and/or render
16 obvious all the challenged claims.

17 BY MR. EKLEM:

18 Q. Okay. So you did not offer any
19 constructions of your own for application layer
20 or application protocol, right?

21 MR. BRIT: Objection to form. Asked
22 and answered.

1 THE WITNESS: That is not what I am
2 saying in Paragraph 10, no.

3 BY MR. EKLEM:

4 Q. So, you think you did offer
5 constructions of application layer and
6 application protocol?

7 A. Well, I mean, I am not looking at
8 the rest of it. But I don't think I did.

9 I'm just saying that in Paragraph 10
10 it certainly doesn't.

11 Q. Okay. So then I will just ask you
12 in general, anywhere in your declaration, did you
13 provide a construction of application layer or
14 application protocol?

15 MR. BRIT: Objection to form. Asked
16 and answered.

17 THE WITNESS: I don't think I set
18 forth a construction for those terms.

19 But my point here is that even under
20 those terms, it doesn't render any asserted
21 reference inapplicable, nor does it change my
22 opinions that those references either

1 disclose and/or render obvious all of the
2 challenged claims.

3 BY MR. EKLEM:

4 Q. Okay. Could we go on down to
5 Paragraph 12, please. And if you want to just
6 read that to yourself and let me know when you've
7 finished.

8 A. Okay.

9 Q. All right. So, at about the fifth
10 sentence -- are you with me?

11 A. Yes. Fifth sentence.

12 Q. Yes, about the fifth sentence in, it
13 is the one that starts with "A POSITA would have
14 understood."

15 A. Okay, I see that.

16 Q. Okay. You say, "A POSITA would have
17 understood Basturk's statement as a shorthand for
18 two separate statements."

19 Do you see that? That is the
20 sentence I am talking about. You see where it is
21 at?

22 A. I do, but, I don't see the word

1 shorthand in that statement.

2 Q. Shorthand is 1, 2, 3, 4, 5, 6, 7, 8,
3 9 -- nine lines down?

4 A. Oh, okay.

5 Q. Three words in from the right.

6 A. Sorry, I'm not looking at the right
7 sentence. I was looking at the last sentence
8 which also starts "A POSITA would -- "

9 Q. Yes, that is what I wanted to
10 clarify.

11 A. All right. So, I can see that I
12 used the word "shorthand" in that sentence,
13 which, I don't know -- I -- it is in the middle
14 of the paragraph.

15 Q. Well, I haven't asked my question
16 yet. I'm just trying to make sure we are looking
17 at the same. I want to ask you a question about
18 that sentence. I want to make sure we are
19 looking at the correct sentence.

20 A. Okay. I wasn't before but I think I
21 am now.

22 Q. Okay, all right. So, in that

1 sentence, you say, "A POSITA would have
2 understood Basturk's statement as a shorthand for
3 two separate statements," and then you provide
4 those statements, numbering them 1 and 2, and
5 each statement is in quotation marks, correct?

6 MR. BRIT: Objection,
7 mischaracterizes the document. And to form.

8 THE WITNESS: In that sentence, I do
9 have items listed 1 and 2, and I have
10 quotation marks around the text after the
11 Numbers 1 and 2.

12 BY MR. EKLEM:

13 Q. Okay. So, the text after Numbers 1
14 and 2 are in quotation marks, but those are not
15 exact quotations from the Basturk document,
16 right?

17 MR. BRIT: Objection to form. The
18 document speaks for itself.

19 THE WITNESS: What I'm saying is
20 that there is one statement in Basturk which
21 I do cite and have the complete text of in
22 the prior sentence.

1 And I'm saying that unrolls into --
2 because it is going to two, at least two
3 different ideas with respect to data
4 transmission, and in parens, exceptions.

5 And so what I'm saying is that this
6 is how a person of skill would have
7 understood. And I used some of the same
8 words.

9 But the first statement is simply a
10 restatement of the cited sentence, exactly
11 except for the parentheses, the parenthesized
12 words, I think.

13 So, if you look there, I think that
14 is the same. Number 1 is actually exactly
15 the sentence, but leaving out the
16 parenthesized words in the original citation.

17 Let me just double-check that. Yes.
18 Now, the number two is replacing the word
19 before the parentheses, parenthesized word,
20 with the word in parentheses.

21 So, those words are actually
22 literally part of the original citation.

1 But, my point is that the short form
2 of the -- that is used in the original
3 citation has these parenthesized words, which
4 would be understood by a POSITA to be -- to
5 be used in the second case, which I have
6 enumerated as Number 2, which actually are
7 literally the same words, just replacing one
8 of the words before the parentheses with the
9 word in parentheses.

10 Let me just double-check that. And
11 I think that is the case. And that is why I
12 said that that is how a POSITA would have
13 understood that original sentence that is --
14 is verbatim from Basturk. Yeah.

15 Yes, and so, it uses all the same
16 words. But I have broken it into the two
17 different forms which the first sentence was
18 effectively shorthand for.

19 BY MR. EKLEM:

20 Q. All right, so, have you been looking
21 at the Basturk reference to compare what is in
22 your report to Basturk?

1 A. No. But I probably should just to
2 make sure I've got the original citation correct.

3 Q. I'm just -- I'm just asking the
4 question. Because if you don't have it in front
5 of you, why don't you go ahead and get the
6 Basturk reference now.

7 (Whereupon, previously marked
8 Exhibit 1006,
9 first referral.)

10 THE WITNESS: Sure. Could I get a
11 copy, please?

12 BY MR. EKLEM:

13 Q. And once you have it in front of you
14 let me know. And I will have a question for you.

15 Actually, once you get Basturk in
16 front of you, could you just go to Page 7.

17 A. Okay. I am on Page 7.

18 Q. Okay. So, a little more than
19 halfway down the page there is a heading and line
20 that says "Increased Processing."

21 Do you see that?

22 A. Yes.

1 Q. Okay. If you could just read the --
2 that paragraph and the one below it, and then let
3 me know when you've finished. I will have a
4 question for you.

5 A. Okay. I just want to say, I did
6 compare the statement in my Paragraph 12 to the
7 original statement on Page 12 of Basturk. They
8 are the same.

9 So, I did recite the original text
10 correctly.

11 And I have looked at the increased
12 processing section, though.

13 Q. So, in the first sentence after the
14 heading Increased Processing, Basturk says, "The
15 other aspect of security that has the potential
16 to degrade performance is the additional
17 processing required by security functions."

18 Do you see that?

19 A. Yes.

20 Q. Okay. So, the security functions
21 that require additional processing include MAC
22 generation and verification, right?

1 MR. BRIT: Objection to form. Lacks
2 foundation.

3 THE WITNESS: Well, if you look two
4 paragraphs down from there, and actually also
5 on the previous page, it says -- the second
6 paragraph down says, "When applied to
7 security functions such as signature
8 generation and verification, or
9 encryption/decryption," and it goes on.

10 But then also there is a similar or
11 identical statement at the bottom of Page 6.
12 It says, "Increased processing is the result
13 of computational requirements of security
14 functions such as signature generation and
15 verification and encryption/decryption."

16 And so, I think those are examples
17 the paper gives of security functions.

18 BY MR. EKLEM:

19 Q. Okay. And so, the Basturk teaches,
20 with respect to the signature generation and
21 verification, Basturk teaches a signature in the
22 form of a MAC, correct?

1 MR. BRIT: Objection, asked and
2 answered. Form. The document speaks for
3 itself.

4 THE WITNESS: If you look at the
5 bottom of Page 9 in the section, it is
6 labeled Number 2, although that is not the
7 section heading, that is just a number that
8 is under Section 2.3.

9 It says, "If the integrity option is
10 selected then data is signed by MA under the
11 session Key Alpha (a signature is also called
12 a MAC, or message authentication code)."

13 So, that is what the Basturk says
14 about that.

15 BY MR. EKLEM:

16 Q. Okay, so, the additional processing
17 required for signature generation and
18 verification that we were discussing on Page 7,
19 includes additional processing required for MAC
20 generation and verification, right?

21 MR. BRIT: Objection to form.
22 Mischaracterizes the witness' testimony.

1 THE WITNESS: Well, I mean this
2 section is talking about, and if you look at
3 the last paragraph of this section that
4 starts with the heading Increased Processing,
5 it talks about "requirement for timely and
6 on-the-fly security computations translates
7 into three specific design rules."

8 Number 1, "Signature computation
9 starts before the retrieval of connection
10 context."

11 Number 2, "Packets are independently
12 encrypted."

13 Number 3, "Hardware utilization is
14 facilitated wherever possible."

15 So -- and, actually I think each of
16 those are described a little more in more
17 detail in the preceding discussion under that
18 heading of increased computation -- increased
19 processing, sorry.

20 And that is just summarizing these
21 specific design rules.

22 BY MR. EKLEM:

1 Q. Right. So, I think my question is
2 different.

3 In the first sentence after the
4 heading Increased Processing, when Basturk is
5 referring to additional processing required by
6 security functions, that additional processing
7 required by security functions includes
8 processing for MAC generation and verification,
9 right?

10 MR. BRIT: Objection to form. Asked
11 and answered.

12 THE WITNESS: Well, the -- Basturk
13 gives several examples of security functions
14 such as signature generation and verification
15 or encryption/decryption. Made that
16 statement several times as we have discussed.

17 And then I think it did talk about,
18 we just discussed this, too, that
19 signature -- what was the exact language --
20 that a MAC was -- a signature is also called
21 a MAC, or Message Authentication Code.

22 So, that is what Basturk says.

1 BY MR. EKLEM:

2 Q. So, the answer to my question is
3 yes?

4 MR. BRIT: Same objections.

5 THE WITNESS: Well, I am telling you
6 what Basturk says here. So, Basturk does
7 give examples of security functions, which
8 include signature generation.

9 And it does refer to an example
10 of -- where is that? That a signature is
11 also known as a MAC or something, whatever it
12 said, is what it said.

13 So, Basturk is giving several
14 examples.

15 And, but it is also saying, these --
16 he is giving these design rules. At the top
17 of Page 8, it is giving three specific design
18 rules which are -- which are the three listed
19 there.

20 And they can, you know, you can use
21 hardware utilization, which would speed up
22 the process over similar functions in

1 software.

2 It -- packets are independently
3 encrypted and an example it gives why is
4 that, you know, if you -- if packet
5 encryption is dependent on prior packets, and
6 if those packets are received out of order,
7 that would -- that could delay it. I'm just
8 paraphrasing. But that is -- if you just
9 look a couple of paragraphs above, that is
10 what it says.

11 And that signature computation can
12 start before the retrieval of connection
13 context.

14 So, you can actually start the
15 process of computing the signature even
16 before you -- on receipt, even before the
17 connection context is retrieved.

18 So, that is giving some ways to
19 shorten the, or, being -- it is giving some
20 rules in order to reduce the impact of the
21 increased processing.

22 BY MR. EKLEM:

1 Q. Have you finished your answer?

2 A. Yes.

3 Q. Okay. So, going -- I want to direct
4 you to -- so, let's -- do you see the heading
5 Increased Processing there on Basturk?

6 Let's call that Paragraph 1 under
7 Increased Processing. I want to direct you to
8 the paragraph below that. Let's just call that
9 Paragraph 2 under Increased Processing.

10 It starts with, "The main one is
11 that" -- do you see that paragraph?

12 A. Yes.

13 Q. So, in the second sentence under
14 that paragraph, Basturk says, "In other words,
15 while an increase in the amount of computation is
16 unavoidable, it is important to ensure that
17 nothing slows down or delays this additional
18 processing."

19 Do you see that?

20 A. Yes.

21 Q. So, this additional processing
22 refers to the processing of the security

1 functions like signature generation and
2 verification, right?

3 MR. BRIT: Objection to form.
4 Mischaracterizes the document.

5 THE WITNESS: It is -- it does say
6 that, you know, the first sentence does say,
7 "an increase in the amount of computation is
8 unavoidable."

9 But then it goes on to say that "it
10 is important to ensure that nothing slows
11 down or delays this additional processing."
12 And that "In all instances, we would like all
13 computations to be carried out 'on-the-fly'
14 as data is being transmitted or received.
15 This minimizes latency."

16 So, that is what it is saying there.

17 BY MR. EKLEM:

18 Q. Right. And my question is about the
19 words "this additional processing" there, trying
20 to ask you what your understanding of this
21 additional processing is referring to.

22 And so my question is, is it

1 referring to the additional processing of
2 signature generation and verification?

3 MR. BRIT: Objection, asked and
4 answered.

5 The document speaks for itself.

6 THE WITNESS: If you look at the
7 first sentence, in Paragraph 1 as you are
8 labelling it, it does say that "The other
9 aspect of security that has the potential to
10 degrade performance is the additional
11 processing required by security functions."

12 And, we already pointed out to you
13 examples of security functions. And we had
14 that discussion.

15 So, it is talking about the
16 additional processing required by security
17 functions.

18 But here it is giving reasons and
19 ways to minimize the impact which is, do
20 things on-the-fly as data is being
21 transmitted or received.

22 And I know that -- and I just note

1 that Dr. Stubblebine seems to be taking an
2 interpretation of on-the-fly, that is --
3 appears to be contrary to what Basturk is
4 saying right here.

5 BY MR. EKLEM:

6 Q. Okay. We will get there. I will
7 ask you about that later.

8 But let's focus on my questions for
9 the time being.

10 So --

11 MR. BRIT: Counsel, the witness is
12 answering the question in his own words,
13 so --

14 MR. EKLEM: Jon, please don't
15 interrupt.

16 MR. BRIT: I wasn't interrupting; it
17 was dead air. So I will renew my objection
18 that the witness was answering your questions
19 in his testimony and he shouldn't be cut off
20 because you don't think he is answering your
21 question.

22 MR. EKLEM: Dr. Houh, did you

1 complete your answer?

2 THE WITNESS: I gave you my answer.

3 BY MR. EKLEM:

4 Q. Okay. So, when Basturk is saying
5 "to ensure that nothing slows down or delays this
6 additional processing," Basturk is talking about
7 not slowing down MAC generation and MAC
8 verification, right?

9 MR. BRIT: Objection to form. Asked
10 and answered. And the document speaks for
11 itself.

12 THE WITNESS: In Paragraph 1 the
13 first sentence says that "The other aspect of
14 security that has the potential to degrade
15 performance is the additional processing
16 required by security functions."

17 And this goes on to say how, it
18 gives some design rules for minimizing or
19 really, you know, even -- even mitigating the
20 degradation performance.

21 And, as I say in, I think, my third
22 supplemental declaration, if you are doing

1 the MAC computation on-the-fly as the data is
2 being transmitted, then actually the -- that
3 computation has no impact on the overall
4 latency. And that is part of the design
5 rules that are right here.

6 It is part of the design rules and
7 it is part of the -- what this paragraph is
8 talking about of doing on-the-fly.

9 And similarly on reception, I
10 discuss in my supplemental -- third
11 supplemental declaration, I lay out in more
12 detail, it is really a continuation of what I
13 laid out in previous declarations, that
14 the -- the on-the-fly processing for
15 transmission and reception, you can actually
16 compute the MAC in parallel with the
17 reception or transmission of the packet,
18 which has to be done anyway.

19 So, in that case, as Basturk is
20 teaching, you have actually mitigated and not
21 degraded performance in it.

22 Basturk is only saying it has the

1 potential to degrade performance.

2 Especially, and I'm going to say this kind of
3 paraphrasing, if you do it the wrong way.

4 If you do it the right way, you
5 might be able to not degrade performance of
6 the system at all, such as when you do things
7 on-the-fly during transmission, which has to
8 occur anyway, because you have to transmit
9 the packet.

10 But if you do all the MAC
11 computation, as one of the examples of
12 generating the signature, while you are doing
13 the transmission and while you are -- and
14 verify it while you are doing the reception,
15 then actually for that particular example of
16 a security function, it can be designed in a
17 way that there is no impact on the ultimate
18 performance by -- by doing things on-the-fly
19 and maybe even have hardware as well. And
20 that is part of what the design rules lay
21 out.

22 BY MR. EKLEM:

1 Q. So, in the last two sentences of
2 what we are calling the second paragraph under
3 Increased Processing, it says, "In all instances
4 we would like all computations to be carried out
5 'on-the-fly' as data is being transmitted or
6 received. This minimizes latency."

7 Do you see that?

8 A. Yes.

9 Q. So, here the phrase "as data is
10 being transmitted" refers to when the transmitter
11 is doing the computations, right?

12 MR. BRIT: Objection to form. Asked
13 and answered. And mischaracterizes the
14 document.

15 THE WITNESS: It doesn't say the
16 transmitter. It doesn't say exactly what you
17 asked.

18 But it is saying that if you do
19 computations on-the-fly as data is being
20 transmitted, and it is part of -- it can be
21 done in parallel to the transmission, and I
22 lay this out in my third supplemental

1 declaration with a number of figures that I
2 created to illustrate this process.

3 And the overall impact on the
4 latency is minimized. It is minimized to the
5 actual latency of the computation of the
6 transmission of the packet or the reception
7 of the packet which is unavoidable anyway.

8 But if you can do the MAC
9 computation and the MAC verification in
10 parallel as the data is being transmitted, as
11 Basturk is actually teaching right here, then
12 it does minimize the latency, and the overall
13 impact of the additional processing doesn't
14 add any latency.

15 It does require additional
16 processing compared to when you are not
17 generating a signature, as one of the
18 examples of the security functions listed in
19 Basturk.

20 But, but the -- while there is
21 increased computation and increased
22 processing, it doesn't have an impact on the

1 overall latency, and it minimizes the latency
2 to the latency it takes to transmit the
3 packet to start with, which is unavoidable
4 anyway.

5 And then by inserting the MAC at the
6 end, which I lay out reasons in a number of
7 my declarations as to why that is -- a person
8 of ordinary skill would have put it at the
9 end. It allows for this parallel processing
10 on-the-fly that minimizes the latency, as
11 Basturk is teaching here.

12 BY MR. EKLEM:

13 Q. So, in those two sentences that we
14 are talking about where Basturk is talking about
15 on-the-fly and then, and I will just read it
16 back, "In all instances we would like all
17 computations to be carried out 'on-the-fly' as
18 data is being transmitted or received. This
19 minimizes latency."

20 So, what minimizes latency here is
21 on-the-fly, correct?

22 MR. BRIT: Objection to form. Asked

1 and answered. And mischaracterizes the
2 document.

3 THE WITNESS: What it says is, "In
4 all instances we would like all computations
5 to be carried out 'on-the-fly' as data is
6 being transmitted or received. This
7 minimizes latency."

8 So, it is referring to computations
9 being carried out on-the-fly as data is being
10 transmitted or received.

11 And I give examples of that for
12 transmission in, I think, my third
13 supplemental declaration, and I draw some
14 charts to show why what Basturk is teaching
15 does minimize latency; it minimizes the
16 latency to simply the latency of the time it
17 takes to transmit the packet because you are
18 doing the computation of the MAC in parallel
19 to the transmission itself.

20 And that is why Dr. Stubblebine's
21 interpretation is incorrect, because I show
22 how what Basturk teaching does minimize

1 latency and why Dr. Stubblebine's proposed
2 interpretation of on-the-fly does not
3 minimize latency, which is contrary to what
4 Basturk is teaching.

5 BY MR. EKLEM:

6 Q. Okay. Have you finished your
7 answer?

8 A. For now.

9 Q. Okay. Can you go to Page 8 of
10 Basturk, please. The first paragraph. Read it
11 to yourself and let me know when you are ready.

12 A. Okay.

13 Q. So, the beginning of the paragraph
14 says, "Both signature computation and
15 encryption/decryption rely on the use of secret
16 information (key) shared by the two communicating
17 parties. Retrieval of this information is,
18 therefore, necessary for such processing. While
19 one can assume its immediate availability when
20 transmitting data, it must typically be retrieved
21 upon receipt of a packet and this context
22 retrieval step can introduce latency."

1 Do you see that?

2 A. Yes.

3 Q. So, the latency that Basturk is
4 talking about here is context retrieval latency,
5 right?

6 MR. BRIT: Objection to form.
7 Misquotes the document. Mischaracterizes the
8 document.

9 THE WITNESS: In this one sentence,
10 latency, in -- refers to a number of things.

11 But in this one sentence, Basturk is
12 specifically referring to the latency
13 introduced by context retrieval.

14 But if you look down at the next
15 paragraph, one of the design rules is that a
16 signature computation starts before the
17 retrieval of connection context.

18 So, while it may introduce latency,
19 it can, you know, Basturk says it can
20 introduce latency. One of the design rules
21 that if you start the signature computation
22 before the retrieval of connection context

1 and do it on-the-fly as you are receiving the
2 data, the latency -- the work, the work of
3 the -- of retrieving the context is done in
4 parallel to the reception of the packet
5 on-the-fly.

6 And that it would minimize the
7 impact of the context retrieval, because you
8 are doing it in parallel with another
9 process, that is, the data reception, and
10 Basturk is teaching that signature
11 computation starts before the retrieval of
12 context content.

13 And so that, you do these things in
14 parallel and you actually minimize latency.

15 And, and it is teaching how you can
16 really kind of eliminate additional latency
17 required for the context retrieval in the
18 overall system by doing it in parallel with
19 another operation, which has to be done
20 anyway.

21 You have to receive the packet. So,
22 if you start the computation of the signature

1 for verification purposes, while you -- while
2 the packet is being received and then look up
3 the context after you start the signature
4 computation, then it -- it is not introducing
5 latency if you do it that way.

6 It is not introducing any additional
7 latency over the latency that is already in
8 the system, which is the time it takes to
9 receive the actual packet.

10 So, what it is saying is that, yeah,
11 it can do it. If you do it the wrong way it
12 can introduce additional latency.

13 But, under our design rules, it is
14 not going to introduce any additional latency
15 with the system. Because you can do it in
16 parallel with the reception of the packet.
17 And that is what it is teaching and that is
18 what it says in the previous paragraph about
19 doing computation on-the-fly as data is being
20 transmitted or received.

21 And that is a way to not introduce
22 any additional latency due to context

1 retrieval upon reception because you can
2 start the signature computation on-the-fly as
3 you receive the data and then look up the
4 context in parallel to the reception of the
5 data.

6 BY MR. EKLEM:

7 Q. Have you finished your answer?

8 A. Yes, for now.

9 Q. You mentioned --

10 MR. BRIT: We have been going for
11 over an hour. Is it okay if we take a quick
12 break?

13 MR. EKLEM: Let me finish this line
14 and then we can take a break.

15 BY MR. EKLEM:

16 Q. You mentioned the design rules. Are
17 you referring to the three design rules shown at
18 the top third of Page 8 on Basturk?

19 A. That is what I was referring to.

20 Q. Okay. And, so Basturk includes at
21 the top of Page 8 -- excuse me, one moment.

22 Three -- well, Basturk says, "To

1 summarize our requirement for timely and
2 on-the-fly security computations translates into
3 three specific design rules."

4 And then it lists three rules,
5 one -- numbered 1, 2, and 3.

6 Do you see that?

7 A. Yes.

8 Q. Okay. So, here Basturk does not say
9 that one of the three design rules required for
10 on-the-fly security computations is putting a MAC
11 in a trailer, right?

12 MR. BRIT: Objection to form.
13 Mischaracterizes the document.

14 THE WITNESS: It is not explicitly
15 included with those three rules.

16 But if you look at Page 16, the
17 third full paragraph, the last sentence it
18 says, "Following data a trailer has been
19 added that contains the packet signature."

20 And that is consistent with the
21 on-the-fly processing as I have interpreted
22 it, but not the way Dr. Stubblebine has

1 interpreted it, that is if you allow the MAC
2 computation, the generation to occur in
3 parallel with the data transmission, which is
4 what that section Increased Processing
5 explicitly says, then -- and place it at the
6 end of the packet, as it explicitly says
7 where the signature is in the trailer on
8 Page 16, then that is consistent with
9 on-the-fly generation of the MAC, which is in
10 parallel with the actual transmission of the
11 packet, of the data in the packet.

12 And so, Dr. Stubblebine seems to
13 have ignored this sentence when he proposes
14 other locations for the MAC, such as in the
15 header of the RTP, the header or in the
16 middle of -- or, I don't know if he proposes
17 in the middle, but there are reasons that I
18 say that a person of ordinary skill would not
19 have put the MAC in the middle of the data
20 portion of a packet.

21 And that it would have been placed
22 at the end. And it would not have been

1 placed in the header for reasons I outline in
2 my rebuttal to Dr. Stubblebine's statements.

3 BY MR. EKLEM:

4 Q. Okay. Have you finished your
5 answer?

6 A. I think so for now.

7 MR. EKLEM: All right. We can take
8 a break. Jon, is five minutes good?

9 MR. BRIT: Yes, thanks.

10 MR. EKLEM: All right.

11 (Recess taken -- 10:04 a.m.)

12 (After recess -- 10:10 a.m.)

13 BY MR. EKLEM:

14 Q. Dr. Houh, could you go to Page 12 of
15 Basturk, please. And the last paragraph on
16 Page 12 which spills into Page 13, could you just
17 read that to yourself and let me know when you
18 are ready.

19 A. Okay.

20 Q. In the sentence that spans Page 12
21 and 13, or that crosses over from 12 into 13,
22 Basturk says, "The ability to achieve such

1 on-the-fly processing depends on two major
2 components. The first is the latency in
3 retrieving the information needed to perform the
4 necessary computations. The second is the nature
5 of the computations themselves."

6 Do you see that?

7 A. Yes.

8 Q. Here Basturk does not say that one
9 of the two major components of achieving
10 on-the-fly processing is putting the MAC in a
11 trailer, right?

12 MR. BRIT: Objection to form.

13 Mischaracterizes the document.

14 THE WITNESS: I mean, this paragraph
15 doesn't say that. But as I pointed out
16 earlier, it does -- Basturk does say that the
17 MAC is in the trailer or what is in the
18 trailer.

19 But, we have looked at that
20 paragraph earlier and paragraph -- the third
21 full paragraph on Page 16, the last sentence
22 says, "Following data, a trailer has been

1 added that contains the packet signature."

2 So, it might not be saying it here
3 on Page 12 to 13. But Basturk does teach
4 that that is where the packet signature is
5 placed.

6 And that is consistent with the
7 ability to do these things on-the-fly as
8 Basturk is teaching to generate the -- the --
9 to generate the MAC, which is in the sentence
10 in the beginning of this paragraph, starting
11 at the bottom of Page 12.

12 And then, to be able to generate the
13 signature on-the-fly as data is being
14 transmitted and then just before you have to
15 transmit the MAC, it is then computed and put
16 in the packet as the packet is -- as the
17 train is leaving the station, so to speak.

18 All right, you hop on the very last
19 car and that is where the signature goes, in
20 the -- at the end of the packet, the trailer,
21 as Basturk teaches on Page 16.

22 So, that is all consistent with what

1 I have laid out in my supplemental
2 declarations. The second and third.

3 And again, it is inconsistent with
4 what Dr. Stubblebine appears to interpret or
5 misinterpret on-the-fly.

6 BY MR. EKLEM:

7 Q. Okay. When you said just now "as
8 the train is leaving the station," can you
9 explain what you mean by that?

10 A. Yes. So, I'm referring to the
11 packet being in the process of being transmitted.
12 In doing all of this computation on-the-fly to
13 generate the signature, as Basturk is teaching,
14 and then, as the -- and then you are able to do
15 it up to the last byte of actual data over which
16 the signature is computed.

17 And then, you have the -- you can
18 have the value of the signature ready to be
19 placed in the next set of bytes, after the last
20 bit of data, as that data is being transmitted.

21 So then you can then fill in the
22 last four bytes of data, that -- I think I am,

1 you know, if the signature is four bytes of data,
2 then you fill in the signature and finish
3 computing it as the last byte of the actual data
4 is being transmitted.

5 Then transmit the next four bytes of
6 data, for a four-byte signature, in the trailer
7 where it is consistent with on-the-fly, and
8 inconsistent with the way Dr. Stubblebine is
9 interpreting on-the-fly.

10 And that allows you to minimize the
11 latency of the MAC generation to simply the
12 actual transmission time of the packet, of the
13 overall packet including the trailer by doing it
14 on-the-fly, and having the value ready as the
15 last byte of the data is being transmitted.

16 And why I say that is as the train
17 is leaving the station.

18 Imagine the doors were open on the
19 train on the last car, and you get there just as
20 the last car is leaving the station, but the
21 train is, you know, ten cars long, and the first
22 car has already left the station.

1 Well, I mean the whole train moves
2 together.

3 But the point is that you hop on the
4 last car at the last minute.

5 And that is the MAC generation with
6 a trailer at the end that, as you finish
7 generating the MAC, you are able to just get it
8 in in time as the last byte of data has left and
9 then you are the next four bytes or however many
10 bytes the signature is of data in the trailer.

11 And that is what Basturk is
12 referring to by having the MAC, the signature in
13 the trailer of the packet. And doing these
14 computations and generation of the MAC
15 on-the-fly.

16 And similarly it is saying you can
17 start the computation of a MAC for verification
18 purposes as you are receiving the first byte of
19 data or as you are seeing the first part of the
20 data that -- that is signed.

21 And then after you receive the last
22 byte of data, the signature is right there, so it

1 is ready to be read in and compared to the value
2 that you have just computed in parallel to the
3 reception of the packet.

4 And that -- that is what Basturk is
5 teaching with respect to on-the-fly.

6 And it minimizes the latency of all
7 of these things that Basturk is talking about
8 because that latency and the extra computation is
9 done in parallel to the reception and
10 transmission of the data packet.

11 And so, Basturk is teaching a way to
12 not introduce any additional latency over the
13 latency that is already there.

14 It may introduce additional
15 computation, and it may allow the use of hardware
16 acceleration, as Basturk is teaching, to be able
17 to do that.

18 But the on-the-fly aspect does
19 minimize the latency of the -- of the extra
20 computation and extra processing introduced by
21 having the signature, by putting the trailer at
22 the end so you can do on-the-fly data

1 transmission and MAC and signature generation.

2 And so, that is what Basturk is
3 teaching about this issue. And that is how it
4 says you can, like, retrieval of context can
5 introduce latency.

6 But it -- by following these design
7 rules, it doesn't introduce any additional
8 latency over what is already there in a system,
9 because it can be done in parallel to the -- an
10 on-the-fly, which I have shown in my third
11 supplemental declaration with some charts, how
12 that can be done in parallel to the actual
13 transmission of a packet.

14 And, therefore, not introduce
15 latency. It may -- it may involve an additional
16 processing because you are generating a
17 signature. If you didn't have to generate it,
18 you wouldn't have that processing.

19 But, by doing it on-the-fly, it
20 actually eliminates the impact of the additional
21 processing with respect to introducing additional
22 latency in this system.

1 And, and that is what
2 Dr. Stubblebine's misinterpretation of on-the-fly
3 and the strict OSI layering is doing. It is
4 introducing unnecessary latency because if you
5 have to compute the signature at a higher level
6 before passing it down, then you have to do it
7 where you could have done it on-the-fly. And as
8 Basturk is teaching, you are doing it on-the-fly
9 in parallel with the transmission of a packet.

10 And, therefore, you are effectively
11 doing it in a serial fashion but with a
12 separation between the generation of the
13 completely -- of completing the generation of the
14 MAC and starting to transmit the packet.

15 But, imagine you eliminate the
16 latency involved with the generation of the
17 signature before you pass it down, and you allow,
18 as Basturk is teaching, that generation to happen
19 on-the-fly in parallel with the transmission,
20 that you wouldn't have that additional latency.

21 And so, Dr. Stubblebine's
22 interpretation is ignoring what these design

1 rules are saying. And, his interpretation of
2 on-the-fly does add the latency.

3 But, Basturk is teaching that you
4 can do it in a way that you minimize the latency
5 and, in fact, just make the latency of the
6 additional computation of MAC generation or MAC
7 computation for verification following the design
8 rules and doing it on-the-fly and using hardware
9 acceleration so that you can do it in the time it
10 takes to transmit or receive the packet, then you
11 are actually minimizing the latency to the
12 latency that is already in the system and you are
13 not adding any additional latency.

14 Q. So, looking at Page 13 of Basturk,
15 once you go to the second indented paragraph,
16 where it says, "These different requirements,"
17 you see that?

18 A. Yes.

19 Q. Okay. It says, "These different
20 requirements have been incorporated into our" --
21 excuse me, it says, "These different requirements
22 have been incorporated in our design for the goal

1 of minimal latency as reflected in the following
2 two rules."

3 Do you see that?

4 A. Yes.

5 Q. Okay. And at the very bottom of the
6 page, the last indented paragraph, it says, "The
7 authentication protocols and packet formats of
8 our implementation guarantee minimal latency by
9 following the above two rules."

10 Do you see that?

11 A. Yes.

12 Q. Here Basturk does not say that one
13 of the two rules for minimal latency is putting
14 the MAC in a trailer, right?

15 MR. BRIT: Objection to form. Asked
16 and answered. The document speaks for
17 itself.

18 THE WITNESS: So, if you look at the
19 first rule, it talks about the data needed to
20 transmit, to generate the packet, to generate
21 the signature is present in the packet. And
22 that is -- that is what the first paragraph

1 after the two rules paragraph says.

2 And that is the, "a signed packet
3 will be the form 'D, Sigma' where Sigma is a
4 signature of the Packet D under Key Alpha."

5 So, that is saying that the signed
6 packet is -- the signature is over the data
7 of the Packet D itself under Alpha, not over
8 any other data, in another packet like a
9 previous packet which it discussed earlier
10 that if you -- if the signature is dependent
11 on the previous packet or an encryption, then
12 if you receive them out of order, you are
13 kind of forced to wait.

14 But, so, this says that the
15 signature is generated over the packet itself
16 and only the packet itself, made under Key A.

17 But if you are generating the packet
18 consistent with the trailer being at the end,
19 you can do that in parallel and reduce
20 latency of the overall system by doing the
21 MAC generation in parallel to the actual
22 transmission of the packet. And that is

1 discussed elsewhere in, you know, we've
2 looked at -- we've looked at portions of
3 Basturk before this paragraph and after, that
4 are consistent with this interpretation.

5 It is like the train example.

6 If you had to jump on the first car
7 of the train and it takes, say, 20 seconds
8 for the train to kind of pull out of the
9 station, and you have to get on the train
10 20 seconds earlier than if you were able to
11 jump on the last car of the train, assuming
12 you can jump on a moving train.

13 And that means you have to arrive at
14 the station 20 seconds before, earlier in the
15 case of if you are getting on the front of
16 the train versus the last car of the train.

17 And it is the same issue here.

18 If you have to put the MAC in the
19 header, as Dr. Stubblebine opines where it
20 should go, then you have to generate the MAC
21 as the header is being transmitted before the
22 data is being transmitted.

1 So, you have to generate the MAC,
2 and assuming the MAC generation takes longer
3 than the time necessary to transmit the
4 header -- actually in any case, right, if you
5 have to put the MAC in the header, then you
6 can't have computed the signature over the
7 entire packet on-the-fly. You had to have
8 done -- started the process if it takes
9 longer than the data transmission.

10 You have to have started that
11 process before you started to transmit the
12 header.

13 And I lay that out in my third
14 supplemental declaration as well -- I think
15 that is Exhibit 1033 -- with some diagrams
16 that illustrate that.

17 If you put the MAC in the header
18 when you had to start the MAC signature
19 generation, you may actually be before you
20 start to transmit the packet.

21 And in that case, that is adding
22 additional latency to the system.

1 Whereas if you do it fully
2 on-the-fly as Basturk is actually teaching,
3 then if you can start the MAC generation, the
4 signature computation and hash computation
5 and the signature computation, as you are
6 starting to transmit the packet and complete
7 the process prior to the last -- the trailer
8 being transmitted, you can actually stuff
9 that value in the trailer and minimize the
10 latency of the MAC generation to just that of
11 transmitting the packet to start with, which
12 is already in the system.

13 And you can't -- you can't minimize
14 it below there unless you move to a faster
15 network so you can transmit these things
16 faster.

17 But given the same network speed of
18 transmission, then Basturk is teaching a way
19 to eliminate the latency due to the increased
20 processing of generating the MAC on the
21 transmission side as well as eliminate
22 additional latency.

1 If you calculate on the reception
2 side, if you do the things that it is
3 teaching, which is on the reception side
4 start the computation of the hash before you
5 look up the context.

6 And this rule here, the second rule,
7 shown on Page 13 in the paragraph, the second
8 to the last full paragraph on 13, says that
9 if -- you can know the hash so that you can
10 start the hash.

11 But, you may not know the
12 cryptographic function required to compute
13 the signature over the hash before you
14 retrieve the context.

15 But, if you retrieve the context in
16 parallel after you start computing the hash
17 as you are receiving the packet, and you can
18 look up that context before the packet is
19 fully received, then you can compute the
20 signature over that hash function, as you are
21 then receiving and before you are -- as you
22 are receiving the last byte of data over

1 which the hash is computed for the signature
2 generation and then just do the comparison
3 right there.

4 So, that second rule is definitely
5 teaching a way whereby all of those
6 operations are computed on-the-fly in
7 parallel with the reception of a packet.

8 And the first rule is talking about
9 generating the signature only over the data
10 of the packet itself.

11 And that -- and then, because you
12 put the trailer, the MAC, the signature in
13 the trailer as suggested -- as taught,
14 actually, explicitly taught on Page 16, then
15 you can stuff that generated signature at the
16 end of the packet just as the last bytes of
17 the trailer need to be transmitted.

18 That is what Basturk is referring to
19 when it refers to on-the-fly. And that is --
20 that is -- that is how I have written up all
21 of my supplemental declarations.

22 And even the original one is really

1 based on that on-the-fly teaching interpreted
2 correctly in that as Dr. Stubblebine
3 misinterprets.

4 BY MR. EKLEM:

5 Q. During your answer you mentioned,
6 you referred to the Key A, and I think maybe, did
7 you happen to mean Key Alpha in this case?

8 A. I thought I did say Alpha. Maybe I
9 didn't say it everywhere.

10 But, the Key Alpha, within the
11 second, the paragraph starting second, there is
12 a, by the time we need to compute F sub-Alpha,
13 the Key Alpha in cryptographic function will have
14 an issue.

15 If I said A, it was a misstatement.
16 There is a challenge A, but the key is Alpha.

17 So, I guess, I don't recall exactly,
18 I didn't think I said Key A. But, maybe I did.
19 But, I certainly intended to use the terminology
20 of the -- of Basturk for Key Alpha, if I
21 misstated that earlier.

22 Q. Okay. So, in -- on Page 13 when

1 Basturk is describing the two rules for minimal
2 latency, the word "trailer" doesn't appear
3 anywhere on Page 13, right?

4 MR. BRIT: Objection to form. Asked
5 and answered. And the document speaks for
6 itself.

7 THE WITNESS: I don't see the word
8 "trailer" at least in the turn up in my
9 search. But, I don't even see it just
10 look -- quickly looking at Page 13.

11 But it definitely talks about
12 following data, a trailer has been added that
13 contains the packet signature on Page 16.

14 But on Page 13, it doesn't say it.
15 But, Basturk is a reference that has a
16 teaching overall. You can't ignore other
17 parts of Basturk in the teachings.

18 It is teaching what it is teaching.
19 But it is a whole reference.

20 And I would say Dr. Stubblebine is
21 ignoring explicit teachings within Basturk.

22 BY MR. EKLEM:

1 Q. Okay. So, let's go to -- let's get
2 your declaration Exhibit 1033 back up. And go to
3 Paragraph 14, please.

4 Just let me know when you are there.

5 A. Okay.

6 Q. In the second sentence you say, "For
7 example, and with respect to data transmission,
8 Basturk is clear that 'computed on-the-fly' means
9 that the generation of the MAC occurs as data
10 transmission proceeds and that 'these operations'
11 refer to the operations for data transmission,
12 not the process of retrieving context data as
13 Dr. Stubblebine asserts."

14 Do you see that?

15 A. Yes.

16 MR. BRIT: Objection to form.

17 Misquotes the document.

18 BY MR. EKLEM:

19 Q. Is the process of retrieving context
20 data part of the operations for data
21 transmission?

22 MR. BRIT: Objection to form.

1 THE WITNESS: So, with respect to
2 data transmission, Basturk actually says that
3 one can assume it is, and referring to
4 context information, which is "The use of
5 secret information (key) shared by the two
6 communicating parties... is necessary for
7 such processing. But that it says, "While
8 one can assume its immediate availability
9 when transmitting data, it must typically be
10 retrieved upon receipt of a packet and this
11 context retrieval step can introduce
12 latency."

13 Basturk has a way of, teaching a way
14 to actually not add any additional latency by
15 having that operation performed in parallel
16 to the actual reception of a packet.

17 And it is teaching that it is
18 already immediately available on the
19 transmission side.

20 So, and I think even Dr. Stubblebine
21 confirmed both of those. Actually he even
22 said that the context retrieval step doesn't

1 cost anything, in his deposition, I believe,
2 if I am remembering correctly.

3 And so, there is basically no
4 additional latency that needs to be
5 introduced by context retrieval.

6 And certainly when you do it in
7 parallel to the -- to the reception of a
8 packet, of a data of a packet, it would also
9 have, you know, if it already has zero impact
10 on latency, certainly doing it in parallel
11 with another required operation also leads to
12 zero impact on overall latency.

13 And so, that is what Basturk is
14 saying, is that there is -- it is immediately
15 available on -- when transmitting data.

16 So, there is -- but, that context
17 information that is -- what the key is to be
18 used for encrypting the hash to generate the
19 signature or to verify the hash on receiving,
20 it can have -- you can do it in such a way
21 that it has basically zero impact on creating
22 additional latency in the system, over

1 latency that is already in the system.

2 It can have it, if you do it the
3 wrong way, you know, if you do it after you
4 receive the full packet and then look up the
5 context. If it did take time, which I think
6 Dr. Stubblebine has stated in his deposition,
7 it doesn't take any time anyway.

8 But, even if it did take time there,
9 well, I think Dr. Stubblebine is saying it
10 doesn't matter when you do it because it
11 doesn't take any time.

12 I may be paraphrasing him. But if
13 he is saying it is already immediately
14 available also on reception, but -- but, even
15 if it -- if it had latency, you could
16 eliminate the additional latency required by
17 doing in parallel with another existing step
18 that is already required to be done, like
19 receiving the data.

20 BY MR. EKLEM:

21 Q. So, you are saying that even if
22 there was context retrieval latency, it wouldn't

1 matter at all because it is already being done in
2 parallel with transmission or reception?

3 MR. BRIT: Objection to form.
4 Mischaracterizes the witness' prior
5 testimony.

6 THE WITNESS: What I am saying is
7 that, you know, Dr. Stubblebine, I think, has
8 said at his deposition that even context
9 retrieval on reception, you know, it is
10 already available and he -- if I am
11 remembering correctly of what he said at his
12 deposition, he basically said there isn't any
13 latency introduced by context retrieval on
14 reception.

15 But even if there were, I'm saying
16 that Basturk was teaching doing that in
17 parallel after you start computing the hash.

18 And that was a design rule, by the
19 way, that you can have a hash independent of
20 the crypto algorithm or key.

21 So, if you know the hash, you can
22 start computing the hash upon reception.

1 Look up the context which tells you the key
2 and the algorithm to use to, to compute the
3 signature, which is an encrypted version of
4 the hash.

5 But if you know the hash, you can
6 start computing the hash as soon as you start
7 receiving the packet.

8 And then you can generate the
9 signature to compare against the existing
10 signature at the end of a packet in a
11 trailer. That is where Basturk teaches where
12 the signature is placed.

13 And, then, you can just -- you can
14 be -- you can be done with that comparison as
15 soon as you receive the last byte.

16 Because you can generate the
17 signature using the context that was
18 retrieved in parallel with the reception of a
19 packet while you are also computing the hash
20 over the data of the packet.

21 Then, you are done as soon as you
22 receive the last byte of the data and perform

1 the comparison to the signature that you are
2 able to compute on-the-fly.

3 And similarly, with transmission,
4 Basturk is already teaching that the context
5 is already -- is immediately available.

6 And so, as you compute the hash, you
7 already know -- and even if it weren't, you
8 could retrieve it while you are sending the
9 data anyway.

10 But, it is already -- Basturk is
11 already teaching that it is immediately
12 available. So that after you compute the
13 hash you can generate the signature as the
14 signature is needed to be placed in the
15 outgoing packet at the end, and the trailer
16 that Basturk is also explicitly teaching
17 where the signature is placed.

18 BY MR. EKLEM:

19 Q. So, even if you assume that the
20 context information is immediately available when
21 transmitting the data, it still has to be
22 retrieved from memory somewhere, right?

1 MR. BRIT: Objection to form.

2 Improper hypothetical. Incomplete
3 hypothetical. And calls for speculation.

4 THE WITNESS: Basturk is already
5 teaching that it is immediately available
6 upon data transmission.

7 So, my point is that even if you had
8 to do the retrieval, you could also still do
9 it in parallel with the data transmission, as
10 it is being taught for data reception.

11 So, if there were any latency,
12 already immediately having the context on
13 transmission, you could actually reduce that
14 further by performing the context retrieval
15 in parallel with the data transmission while
16 you are computing the hash because that is
17 how it is -- because you -- if the hash is
18 independent of the context, right, and if it
19 is fixed, then that is what Basturk is
20 teaching, that you know the hash algorithm.
21 So you can start computing the hash before
22 you need the key to encrypt the hash to

1 generate the signature.

2 BY MR. EKLEM:

3 Q. So, when the context information is
4 immediately available, where is it -- where is
5 it? Like, where -- is it stored in memory?

6 MR. BRIT: Objection to form.

7 THE WITNESS: Well, that is where
8 most things on a computer would be stored.
9 It may already be cached is the point, if it
10 were needed earlier.

11 And even if it weren't, my point is,
12 Basturk is teaching that it is immediately
13 available. But, you know, even if it
14 weren't, you could still do the context
15 retrieval in parallel with the transmission,
16 because you can generate the hash independent
17 of the key which is -- which is what I think
18 the second rule that we looked at was
19 teaching.

20 And that then once you knew the key
21 and the algorithm to use, then you could --
22 you could encrypt the hash after you have

1 finished computing the hash to generate the
2 signature which can be placed in the packet
3 in the trailer as the trailer is being
4 transmitted.

5 In other words, it is done just in
6 time to the last part of the packet that is
7 the trailer being transmitted.

8 And -- and that allows no impact to
9 the overall latency of the system, even
10 though there is increased computation,
11 because you can do this increased computation
12 on-the-fly in parallel with data transmission
13 and reception.

14 And -- and have all of these
15 operations, even though they include an
16 additional processing, increased processing,
17 to do, that you can do it in a way that has
18 no overall impact on adding additional
19 latency to the system over what is already
20 there as part of the data transmission and
21 reception process.

22 BY MR. EKLEM:

1 Q. So, whether the context information
2 is immediately available or not, whether you are
3 getting it from cache or from the context
4 retrieval from somewhere else, the -- the step of
5 getting that context information in order to use
6 it is part of the operation for data
7 transmission, right?

8 MR. BRIT: Objection to form.

9 THE WITNESS: Well, it is teaching
10 that context retrieval can occur on the
11 reception side.

12 My point is that on the transmission
13 side, Basturk is already teaching that it is
14 immediately available. And that is what I
15 pointed to in my declarations.

16 BY MR. EKLEM:

17 Q. Okay. And so my question is about
18 that.

19 So, assuming it is immediately
20 available, like what you are saying Basturk
21 teaches, when it is immediately available, the
22 computer has to go get it from somewhere to use

1 it, even when it is immediately available, right?

2 MR. BRIT: Objection to form.

3 Incomplete hypothetical.

4 THE WITNESS: I mean, every system,
5 even the challenge patent, if it is doing
6 this, it has to retrieve, you know. The
7 patent is not teaching a way to magically
8 retrieve data that you need without any
9 latency. That is not what the patent is
10 about.

11 And so, you know, it is the same as
12 in the -- in the system of the challenged
13 patent which, whatever information you need,
14 you know, if you have to get it, you have to
15 get it. It is -- it is not -- it is not, you
16 know, if you have to access this data in a
17 register or in a cache or in a memory, you
18 are doing that in every system. There is no
19 way to get around that.

20 But Basturk is teaching a way to
21 have no additional latency introduced by this
22 increased processing through its various

1 rules and design principles or whatever
2 Basturk is teaching.

3 But, primarily, the teaching of
4 on-the-fly leads to the minimization of
5 latency over to effectively the latency that
6 is already in the system anyway, which is,
7 you know, you have to receive a packet, you
8 have to transmit a packet.

9 If you can do everything in
10 parallel, you know, these operations in
11 parallel, that is generating the MAC,
12 computing the hash, generating the, you know,
13 encrypting the hash which generates a
14 signature or, you know, generating the hash,
15 calculating the signature to compare it on
16 the reception side or to put in the packet on
17 the transmission side, Basturk is teaching a
18 way for that to have basically by following
19 its rules and what it is laying out, no
20 impact on the latency of the system.

21 Yes, it is additional processing
22 over if you didn't do any of that work. But

1 you can -- because you can do the processing
2 in parallel on-the-fly with data transmission
3 and reception, it doesn't actually have an
4 impact on the overall latency. It doesn't
5 increase the latency. And it can be done in
6 a way that doesn't increase the latency over
7 the latency that is already in the existing
8 system.

9 And, you know, yes, if you have to
10 retrieve it, it is a -- it is a memory access
11 operation. If computers didn't do that fast,
12 weren't able to do that in, you know, a clock
13 cycle or, a small number of, you know, clock
14 cycles of a processor, then all the computing
15 would be much, much, much slower.

16 BY MR. EKLEM:

17 Q. Could you go to Paragraph 15 of your
18 declaration, Exhibit 1033, please.

19 Let me know when you are there.

20 A. Paragraph 15 did you say?

21 Q. Yes.

22 A. Okay.

1 Q. So, about seven lines down from the
2 beginning of the paragraph you say, "A POSITA
3 would have understood that when the MAC is
4 computed on-the-fly over the data payload and
5 transport header as data transmission of the
6 packet proceeds, this can only be done if the MAC
7 is placed at the end of the packet."

8 Do you see that?

9 A. Yes.

10 Q. So, you are saying that it is
11 impossible for the MAC to be computed over the
12 header and the payload as data transmission
13 proceeds and to be placed anywhere other than the
14 end of the packet. Right?

15 MR. BRIT: Objection to form.

16 THE WITNESS: Certainly if the -- if
17 the -- if you don't oversize one of the
18 operations, overpower one of the operations
19 and you make them the approximate length,
20 then you can do that.

21 You know, if you make MAC
22 generation, you know, 100 times faster, but,

1 you know, you can always throw more
2 processing power at something to make it
3 faster, except for data transmission, right?

4 Because, if you have a network, that
5 is the network speed.

6 But my point here is that if you are
7 going to be computing on-the-fly while you
8 are transmitting it, that is, you are looking
9 at the values as they are being transmitted
10 or being, you know, transmitted through the
11 device interface, and that reading from other
12 portions of memory.

13 But, if you are doing it in parallel
14 for the process of data transmission, and you
15 are using the data as it is being transmitted
16 through the final part of the system, so you
17 don't actually have to do additional look-up
18 operations ahead of what data is being
19 transmitted, then it can only be placed at
20 the end of a packet.

21 And so, that is -- that is my point
22 here, which is that if you are doing these

1 operations on the data as it is being
2 transmitted, then the only place to put the
3 data after you compute it is after all that
4 data.

5 Could a system be -- yeah, so, that
6 is what I am saying right here.

7 BY MR. EKLEM:

8 Q. So, by data transmission, you mean
9 the transmission over the network?

10 A. Well, it is transmission through the
11 transmitter device, which has some sort of --
12 yeah, I mean, as the, as the data is leaving or
13 is being, you know, read to be transmitted, if
14 you do that computation over that transmitted
15 data, then the only place to put the packet, the
16 MAC, is at the end because if the you are not --
17 if you are not reading ahead and performing
18 additional data lookup operations, then you can
19 only place the MAC that you compute over the data
20 that is in the process of being transmitted,
21 after you have seen the last bit of data in the
22 packet that is being transmitted.

1 Q. So, when you said transmission
2 speed, were you talking about transmission speed
3 through the transmitter device or over the
4 network?

5 MR. BRIT: Objection to form.

6 THE WITNESS: Well, the -- the
7 transmission speed of the network can't be
8 increased unless you upgrade the network,
9 right?

10 I'm not saying you can't do that.
11 But, if you know that your device is going to
12 be attached on that 100 megabit network or a
13 gigabit network, you know that and you can
14 actually scale the hardware required to do
15 operations in parallel to the transmission of
16 a packet according to the speed of the
17 network that you need to operate on to do
18 things on-the-fly.

19 BY MR. EKLEM:

20 Q. Okay. So, let's go to Paragraph 19,
21 please, of your declaration.

22 A. Okay.

1 Q. So, at the beginning of Paragraph 19
2 you say, "However, when the MAC is computed
3 'on-the-fly,' and placed at the end of a packet,
4 the packet transmission can begin at the same
5 time the MAC is computed, as shown in Houh
6 Figure 2 below, the MAC is computed in parallel
7 with the packet transmission and is completed
8 just-in-time to be placed at the end of the
9 packet."

10 Do you see that?

11 A. Yes.

12 Q. So, you say that the MAC is computed
13 in parallel with the packet transmission. So are
14 MAC computation and packet transmission two
15 different things?

16 MR. BRIT: Objection to form.

17 Mischaracterizes the document.

18 THE WITNESS: So, in these figures
19 what I'm trying to show is, it is kind of a
20 time sequence.

21 And, if you look at the yellow and
22 green boxes, time is moving from the left to

1 the right.

2 So, initially as you are
3 transmitting data, say for the header, that
4 is what you send first, you send the header
5 first.

6 So, as time moves to the right, the
7 time increases. You have first fully sent
8 the header and then you've fully sent the
9 data.

10 But, once you have fully sent the
11 data, computing the MAC in parallel as I'm
12 showing in Figure 2, and then you are, you
13 are able to finish the computation of the MAC
14 as the last bit of the data is being
15 transmitted so that you can then insert the
16 computed MAC at the end of the data.

17 And that is what I am trying to show
18 here.

19 They are parallel operations. The
20 bottom is showing the transmission, and that
21 is what I am trying to illustrate.

22 And it is a separate process to

1 compute the MAC as from transmitting the
2 actual data, except you transmit the MAC at
3 the end, right?

4 But what this is showing is that if
5 you can start the computation of the MAC when
6 you start to transmit the header, because you
7 can use the data that is being sent to the
8 device as it is being sent and calculate the
9 MAC over that data being sent to the device
10 to be transmitted over the network.

11 And then as you -- as you see the
12 last byte going by, while doing this
13 on-the-fly, then you can finish the
14 computation and then -- and then put the
15 signature, send the next four bytes for the
16 completion of the packet by having the MAC,
17 the signature at the end of the packet. That
18 is what I am saying here.

19 BY MR. EKLEM:

20 Q. So, when you said fully sent the
21 header or fully sent the data, you mean
22 transmitted over the network?

1 MR. BRIT: Objection to form.

2 THE WITNESS: Yes. So, the lower,
3 the lower green and yellow bar in Figure 2 is
4 intended to represent the actual transmission
5 of the data on the network. Right?

6 So you are transmitting the header,
7 you are transmitting the data.

8 Now that you are at the end of the
9 data where the signature goes in the trailer,
10 which is right at the end, at the end of the
11 data, and the MAC is ready, because you have
12 computed it in parallel and then finished the
13 final computation after you have seen the
14 last byte, then you can then insert the four
15 bytes into the packet as it is being
16 transmitted.

17 It is like jumping on the train, the
18 last car in the train as it is leaving the
19 station.

20 That -- I don't know if that analogy
21 works exactly right. But that is kind of the
22 thought which is, you are getting the four

1 bytes at the very end because you have
2 computed it just in time to when it needs to
3 be transmitted.

4 And, and that benefit, you know, to
5 have it ready just in time is what Basturk is
6 teaching where the signature is to start
7 with, which is at the end of a packet. And
8 that allows you to do this just-in-time
9 processing while the packet is being
10 transmitted and insert the value of the
11 signature right after the data when it is --
12 while those bytes need to be in a part of the
13 packet as the final part to the packets are
14 leaving the device.

15 BY MR. EKLEM:

16 Q. So, in your train leaves the station
17 analogy, anything that left the station is
18 analogous to anything that has already been
19 transmitted over the network; is that right?

20 MR. BRIT: Objection to form.

21 Mischaracterizes the prior testimony. And
22 incomplete hypothetical.

1 THE WITNESS: Yes, I mean, I'm
2 assuming you can't run instantly, you know,
3 from the back of the train forward, you know,
4 down the tube of the tracks or wherever. Or
5 down the tracks to get on the first car,
6 right, that actually takes some time and I'm
7 assuming you -- it has already been
8 transmitted.

9 So, you can't actually go to
10 whatever the, you know, the optical fiber,
11 you know, and twiddle the bits in the header
12 because it has already been transmitted.

13 And so, that is why -- and, Basturk
14 is teaching already that the signature is the
15 end of a packet. So you can, because the end
16 of the packet, you are just -- you are just
17 calculated the value over the last byte of
18 the data. And now you -- you have the
19 signature ready, you can have it ready, and
20 then send it as the next -- if the signature
21 is four bytes you can send the final four
22 bytes of the packet as the packet is, you

1 know, that part of the packet is ready to
2 leave and be transmitted.

3 BY MR. EKLEM:

4 Q. So, when you said that you can't
5 twiddle the bits of the packet on the fiber, you
6 mean that -- you are talking about the bits that
7 are already in the network connecting the
8 transmitter and the receiver, right?

9 MR. BRIT: Objection to form.

10 THE WITNESS: Yes, if you had to put
11 it in the header as Dr. Stubblebine argues,
12 then you had to have put it in the header as
13 the header is leaving.

14 You know, if it is at the end of the
15 header. And I have a figure on this,
16 actually, Figure 1, right? You have to
17 compute the MAC before you need to place it
18 in the header for transmission.

19 And I'm still showing transmission
20 in Figure 1, the bottom is transmission. So,
21 the header is being transmitted. If you
22 haven't computed the signature by the time,

1 the end of the header where Dr. Stubblebine
2 argues that this -- that the signature would
3 go, despite Basturk's teaching that it goes
4 at the end, if you had to put it in the
5 packet header, then, then what you see here
6 is that if A is greater than B1 in Figure 1,
7 then you had to have started that computation
8 of the MAC before you actually start sending
9 the header, by at least A minus B1 seconds
10 before.

11 So that it will be ready at the time
12 the end of the header is being transmitted.

13 And I think the way actually
14 Dr. Stubblebine is teaching is if you look at
15 I think Figure 4, right, Dr. Stubblebine is
16 arguing that, no, no, no, you actually have
17 to compute the MAC before you pass it down
18 from an upper layer to a lower layer.

19 So, that is akin to Figure 4 except
20 there is -- I would say in that case there is
21 additional processing in between computing a
22 MAC and starting to send the header, because

1 you have to process it through all the other
2 layers in the stack.

3 But, effectively, Dr. Stubblebine is
4 arguing that, you know, if the signature has
5 to go in the header, he is -- and that you
6 have to compute the MAC before you pass it
7 down to a lower layer in the stack, and I
8 disagree that that is how a person of
9 ordinary skill would have seen it, the
10 Basturk teaching or done it based on
11 Basturk's teachings, that effectively what
12 you've got is Figure 4, which is requiring
13 you to do all the MAC computation before you
14 start any of the transmission of the packet.
15 Then you can put it wherever you want. You
16 can put it in the header at the very front of
17 the packet because you have already computed
18 it.

19 But, what that doesn't allow is this
20 on-the-fly processing that Basturk is
21 actually teaching, which is you don't have
22 to -- you don't have to suffer the latency of

1 computing the MAC at all if you -- compared
2 to doing it in the serial fashion in
3 Figure 4, which is effectively what
4 Dr. Stubblebine is arguing.

5 That you can do it on-the-fly and in
6 parallel and reduce and minimize the latency
7 of the system, which is what Basturk is
8 actually teaching, by doing the computation
9 of a MAC in parallel as shown in Figure 2.

10 BY MR. EKLEM:

11 Q. So, in Paragraph 19 in the figure
12 that you call Houh Figure 2, you have a black
13 arrow that points downward to the green portion
14 called Data, do you see that?

15 A. Yes.

16 Q. So, if -- so, in the -- so, the
17 black arrow that points downward in the bottom
18 part where you have B1, B2 above the header and
19 data, everything to the left of the black arrow
20 is already transmitted over the network in Houh
21 Figure 2, right?

22 A. Yes, the bottom bar, the green and

1 yellow bar isn't -- yes, it is already

2 transmitted up to the end of the data.

3 But, now it is ready -- I suppose I

4 could have put the trailer in here which shows

5 that the value that you computed in the top bar,

6 now it is ready to be transmitted. That is why I

7 have the bar, the arrow going down. And that is

8 consistent with Figure 1 which is, you know, you

9 have computed the MAC in Figure 1 now it is ready

10 to be transmitted. In the case where it is at

11 the end of the header -- this is Stubblebine's,

12 Dr. Stubblebine's interpretation of putting,

13 putting it in the header.

14 And then, so, the black arrow

15 signifies that the signature has now been

16 complete and generated. And now it is ready to

17 be transmitted.

18 And now the black arrow going down

19 is showing, okay, send the data, it is going to

20 be transmitted. And yes, the front part of the

21 packet, the header and the data portion have

22 already been transmitted on-the-fly.

1 That is -- that is how you do stuff
2 in parallel with data transmission, in parallel
3 with data reception.

4 I didn't draw figures for reception,
5 but it is working. It's about the same. If you
6 are receiving the header, you can compute the MAC
7 in the same fashion.

8 Instead of inserting it, you have a
9 value that you compare with what you receive at
10 the very end of the packet on reception.

11 Q. Okay. In Houh Figure 2 under
12 Paragraph 19, you indicate that the time
13 represented by A you have the words "spread out"
14 in parentheses. Why -- why would you spread out
15 the time duration of the MAC computation rather
16 than just computing it as fast as you can?

17 MR. BRIT: Objection to form.

18 THE WITNESS: Well, because here the
19 data as it is being transmitted through the
20 device that you are actually computing on as
21 opposed to reading ahead in memory elsewhere.

22 So, on-the-fly is while you are

1 transmitting the data.

2 So, you -- although the data may be
3 in memory and you could look in memory, you
4 could do this on-the-fly, which is as the
5 data is flowing through the system for
6 transmission.

7 And that is -- that is why I have
8 spread it out here because you are doing it
9 on-the-fly using the data that is flowing
10 through the system for transmission and
11 that's why it is spread out a little bit
12 there. Because the data isn't going through
13 the system for transmission until it is being
14 transmitted.

15 And so -- so you can do it
16 on-the-fly with this data as opposed to
17 looking ahead in memory and reading elsewhere
18 in memory, which could be done.

19 But that requires additional memory
20 lookups that you can leverage the memory
21 lookups for the actual data transmission
22 process, right? Because you need to get that

1 data out of memory to transmit it, you might
2 as well leverage that lookup, doing it
3 on-the-fly. That is kind of what on-the-fly
4 is referring to.

5 BY MR. EKLEM:

6 Q. Okay.

7 A. As far as operating on the data as
8 it is flowing through for the process of
9 transmission.

10 Q. Okay. So, when you are doing
11 on-the-fly, you are not reading ahead in memory
12 to compute the MAC, you are only doing it
13 literally as it is being transmitted?

14 MR. BRIT: Objection, compound
15 question. And to form.

16 THE WITNESS: Well, I mean that is a
17 very efficient method of doing on-the-fly,
18 which is you don't have to do additional
19 memory lookups.

20 I mean, clearly the serial method
21 that Dr. Stubblebine is proposing is less
22 efficient because it does add additional

1 latency. It does force you to do all of the
2 MAC computation before you even transmit the
3 packet.

4 And, therefore, under
5 Dr. Stubblebine's interpretation of the very
6 strict boundaries between the OSI layers
7 where you are forced to do the Mac
8 computation before you move the whole packet
9 down to the lower layers for processing, you
10 are forced to suffer the latency of the -- of
11 a MAC generation.

12 So, I am saying that the most
13 efficient way to do this, minimizing
14 additional memory lookups, is to do the --
15 what Basturk is teaching on-the-fly, it's
16 teaching a very efficient way of doing it,
17 which is, as the data is being flown through
18 the system for transmission, you can actually
19 operate on the data right there with those
20 data that is already being looked up and
21 transmitted.

22 So, instead of doing an additional

1 lookup, on-the-fly, it is talking about
2 leveraging the data as it is passing through
3 the device for transmission.

4 And that is -- and that is, you
5 know -- and that is why I have spread this
6 out; that is why I have spread this out over
7 the -- over the whole packet, because it is
8 done as the data is flowing through the
9 system for transmission.

10 BY MR. EKLEM:

11 Q. So --

12 A. On the data that is flowing through
13 the system for transmission.

14 And that is a very efficient way of
15 doing it.

16 MR. BRIT: I see Ms. Goodin has put
17 a message in the Chat about the realtime. It
18 has been a little over an hour, is it okay if
19 we take a break?

20 MR. EKLEM: Yes, we can take a break
21 now. Five minutes good?

22 MR. BRIT: Yes.

1 MR. EKLEM: All right.

2 (Recess taken -- 11:10 a.m.)

3 (After recess -- 11:16 a.m.)

4 BY MR. EKLEM:

5 Q. All right. Dr. Houh, could you go
6 to Paragraph 22 of your declaration, please. Let
7 me know when you are there.

8 A. Okay.

9 Q. So, in Paragraph 22 you say that
10 strict boundary requirements between layers do
11 not exist.

12 And you cite to and you quote from a
13 portion of the '682 patent that discusses
14 combining Layers 5 through 7.

15 Do you see that?

16 MR. BRIT: Objection to form. It
17 mischaracterizes the document and the
18 witness' testimony.

19 THE WITNESS: I do say that these
20 strict boundary requirements between layers
21 do not exist. And then I cite to what the
22 '682 patent itself states.

1 BY MR. EKLEM:

2 Q. Okay. And the part you cite is
3 Column 1, Line 37 through 45 of the '682 patent.
4 Correct?

5 A. Yes.

6 Q. Okay. So, in that portion, the '682
7 patent is referring to boundary specifically
8 between the upper layer protocol layers
9 particularly Layers 5 to 7, right?

10 A. Well, it says, "In practice many
11 applications do not always permit exact
12 nomination of strict boundaries, specifically
13 between the upper protocol layers, particularly
14 Layers 5 through 7 -- 5 to 7." That is what it
15 says in the '682 patent.

16 Q. Okay. So, the '682 patent is
17 specifically talking about nominations between
18 Layers 5 through 7, correct?

19 MR. BRIT: Objection to form. The
20 '682 patent isn't an exhibit to this
21 deposition.

22 BY MR. EKLEM:

1 Q. And you can look at the quoted text
2 in Paragraph 22 of your declaration.

3 A. I have it in the Box. Can I also
4 download it?

5 Q. Yeah, you can pull down the patent
6 and take a look. That is fine.

7 (Whereupon, previously marked
8 Exhibit 1001,
9 first referral.)

10 BY MR. EKLEM:

11 Q. And we will refer to that as
12 Exhibit 1001 or the '682 patent. Okay?

13 A. Yes. Sounds good.

14 I mean, it does say specifically
15 between the upper protocol layers, particularly
16 Layers 5 through 7 in the '682 patent.

17 Q. And so, in that same portion,
18 Column 1, Line 37 to 45, it describes that the
19 three layers above the Transport Layer 4 combine
20 to form an application layer.

21 Do you see that?

22 A. Yes.

1 Q. So, the patent here is still talking
2 about a difference between the application layer
3 and the transport layer, Layer 4. Correct?

4 A. I wouldn't agree with that the way
5 you have written the question. This is just --
6 it is talking about the Application Layers 5
7 through 7 and the Transport Layer 4. But it is
8 in no way contrasting it to anything else. It is
9 just saying what it is saying.

10 Which is that there is really no
11 boundaries between Layers 5 through 7, and in
12 fact, they are just combined above Layer 4 in
13 this example.

14 Q. Okay. Let's go down to Paragraph 26
15 of your declaration, please. Let me know when
16 you are there.

17 A. Okay.

18 Q. So, in Paragraph 26 you discuss
19 hardware protocol accelerators, right?

20 A. I start out 26 with the phrase
21 hardware protocol accelerators.

22 Q. Okay. And you say that "With

1 hardware protocol accelerators, incomplete
2 packets are passed down to network interfaced
3 hardware and missing values are computed and
4 filled in at a lower layer in the protocol
5 stack." Right?

6 MR. BRIT: Objection to form.
7 Misquotes the document.

8 THE WITNESS: Yeah, I mean what I
9 say is that "Hardware protocol accelerators
10 allow incomplete packets such as those
11 including uncomputed header checksum values
12 to be passed from upper layers down to the
13 network interface hardware that compute and
14 fill in these values at a lower layer in the
15 protocol stack."

16 By the way, I might have said "yeah"
17 at the beginning, that wasn't -- I'm not --
18 your question wasn't exactly phrased the way
19 my -- my paragraph actually reads.

20 So, that was just a -- a -- I wasn't
21 intending to say "yes" to your question. It
22 was just -- I mean, my -- my report here or

1 declaration says what it says. And it wasn't
2 exactly saying what you were asking about.

3 BY MR. EKLEM:

4 Q. Okay. And just so you know, I'm not
5 trying to trick you and I'm not trying to
6 mischaracterize what you said in your
7 declaration.

8 I'm just trying to give us a
9 foundation for asking a question so we are
10 talking about the same thing, okay?

11 So, I just -- I want you to be aware
12 that we don't -- just so we are not missing the
13 point of my questions here.

14 But, when -- in Paragraph 26 what
15 you are describing here, you said you are talking
16 about values that are filled in at a lower layer
17 in the protocol stack.

18 So, by "lower layer," do you mean a
19 layer lower than where the packet is being
20 generated?

21 MR. BRIT: Objection to form.

22 Incomplete hypothetical.

1 THE WITNESS: I mean, so what I'm
2 saying here is that that is what Basturk is
3 teaching; it is teaching this idea of using
4 dedicated hardware.

5 And especially, you know, doing
6 things in parallel with the transmission,
7 specifically computing the signature while in
8 parallel with transmission.

9 And that is clearly at a lower
10 layer.

11 I think Dr. Stubblebine has agreed
12 that it is signed at the application layer
13 for one of these references. I'm not --

14 So, but, you know, if you have to
15 sign things at the application layer and you
16 are not actually computing them until you are
17 doing it on the fly in parallel with
18 transmission, then that is clearly a lower
19 layer.

20 And that is what Basturk is
21 teaching. It is teaching the ability to use
22 hardware acceleration to do things, you know,

1 for example, on the fly, and offloading
2 operations of the hardware.

3 And so, that -- that is what Basturk
4 is teaching with respect to, that you don't
5 have to include these uncomputed header
6 checksum values or even the MAC signature
7 value.

8 And that is the kind of thing that
9 hardware protocol accelerators teach. And I
10 think you might have asked about this other
11 internet RFC. I think I talk about that in a
12 previous paragraph which talks about having a
13 lower layer compute the checksums, in a
14 checksum, as support in direct rebuttal to
15 statements that Dr. Stubblebine made in his
16 declaration that I am responding to.

17 BY MR. EKLEM:

18 Q. And the checksum that you were
19 talking about were header checksums, right?

20 A. Well, and I am talking about that as
21 an example of these uncomputed header checksums
22 which are what the previous paragraph is talking

1 about. But, clearly Basturk is teaching about
2 the generation of the signature on the fly as the
3 transmission is occurring.

4 And then, it is -- it is -- it is
5 a -- another example of a value that you can
6 compute on the fly at a lower layer such as the
7 internet checksum that I cited to in the previous
8 paragraph.

9 That was the internet checksum
10 value. But, clearly Basturk is teaching the
11 ability to do the generation of a signature on
12 the fly as transmission is occurring.

13 And that occurs at the lower layer
14 in contrast to what Dr. Stubblebine is saying it
15 has required to be computed at the higher layer
16 before being passed down to the lower layer.

17 Q. Okay. Let's go down to Paragraph 28
18 of your declaration, please. And just let me
19 know when you are there.

20 A. Okay.

21 Q. About ten lines down from the top of
22 the paragraph, there is a sentence that reads,

1 "For example, an application cannot sign the data
2 without the session key."

3 Do you see that?

4 A. Yes.

5 Q. In Basturk, data is signed under a
6 session key denoted as Alpha, correct?

7 A. Well, on Page 14, the first
8 paragraph, the end of the first line it does say
9 that "The secure transport protocol will encrypt
10 user data under the session key, and use the
11 cipher text as the actual payload."

12 And then I just want to also on
13 Page 11, the second full paragraph before the 2.5
14 second section header says that, "Note that data
15 packets in the authentication flows are assigned
16 using the session key."

17 So --

18 Q. Sorry, where were you just reading
19 from?

20 A. That was Page 11, two paragraphs
21 before the 2.5 heading.

22 MR. BRIT: I think the witness

1 wasn't done with his answer. So, Henry,
2 please feel welcome to continue.

3 THE WITNESS: Yeah, I don't remember
4 if I -- I can't remember now.

5 But, I was on Page 11, just before
6 the section heading 2.5, the second paragraph
7 before.

8 So, it is saying -- oh, yeah, I
9 know.

10 So, it is saying that the authentic
11 flows are signed using the session key and
12 that also user data is encrypted under the
13 session key.

14 And that, it is the ciphertexts that
15 are, that are used to generate the signature,
16 not the decrypted data. If there is
17 encryption here, under the -- yeah.

18 So, signatures are generated over
19 the encrypted ciphertexts and they are
20 generated over the ciphertext and they are
21 computed over the ciphertext if the
22 packets -- if an encrypted packet is received

1 as opposed to over the decrypted data.

2 BY MR. EKLEM:

3 Q. Okay. Basturk teaches that the
4 applications never see the session key, right?

5 MR. BRIT: Objection to form.

6 BY MR. EKLEM:

7 Q. I can refer you to Page 10 of
8 Basturk, second paragraph under Section 2.4.

9 Are you still reviewing Basturk,
10 Dr. Houh?

11 A. I am still looking at Basturk.

12 Q. Okay.

13 A. So, on Page 10, I think that is
14 where you said that, and I do see that. And it
15 does say that "Notice that only the transport
16 machines MA and MB know about the session key. A
17 and B never see it."

18 I do want to point out that on
19 Page 8, it talks about how the potential user
20 application A of the secure transport protocol,
21 that is how it starts out just under 2.2.

22 But then if you look at -- there is

1 a software that creates an entity for the
2 application, we call her secure transport machine
3 and denote by M_A , that is kind of in the middle,
4 like the fourth line down.

5 And so that is if A wishes to
6 initiate a connection with B.

7 And so, it does say that the -- it
8 is the M_A and M_B that -- that note the session
9 key.

10 And, is it 12 -- sorry -- yes, oh,
11 sorry, ten, that A and B never see it.

12 But, A, M_A and M_B are
13 created for the user application A and B
14 respectively.

15 And, I think even Dr. Stubblebine
16 has said that the -- that these things are
17 signed, the packets are signed at the application
18 level.

19 Q. Okay. Can we go to Paragraph 30 of
20 your declaration?

21 A. Okay.

22 Q. About six lines down there is two

1 sentences, they say, "In full, Basturk states
2 that secure delivery, roughly speaking, is a
3 guarantee to the sender A, that his message was
4 received by B and not intercepted and destroyed
5 by the adversary. It is essentially an extension
6 of the standard transport level reliability
7 feature to the more adversarial setting we are
8 discussing."

9 Do you see that?

10 A. Yes.

11 Q. So, Basturk's extension of the
12 standard transport level reliability feature is
13 its addition of security features that other
14 protocols don't have, right?

15 MR. BRIT: Objection to form.

16 THE WITNESS: Well, I mean, TCP
17 doesn't have the ability to detect forged
18 acknowledgments from real acknowledgments so
19 that the TCP is vulnerable to bad actors
20 hijacking the data and connection. And in
21 that scenario, in regular TCP, if there is an
22 adversary like that in a network that can

1 actually have access to the communications
2 and destroy some packets and forge reply
3 packets, TCP will not -- and forge them
4 correctly as if the acknowledgments were
5 being sent from the ultimate receiver of the
6 data of the other endpoint in a TCP
7 connection -- the adversary can actually fool
8 TCP into thinking that the receiver received
9 the data when it actually didn't, and it can
10 intercept all the data in the connection.

11 So, TCP doesn't have native to it
12 the ability to guarantee to the sender that
13 A, that his message was actually received by
14 B and not intercepted and destroyed by the
15 adversary.

16 And so, Basturk is teaching these
17 features that can be extend -- it can extend
18 standard other protocols to, to address this
19 other orthogonal issue to the features
20 already provided by TCP or potentially other
21 protocols as well.

22 BY MR. EKLEM:

1 Q. So, the extension then is the
2 addition of security features described in
3 Basturk, right?

4 MR. BRIT: Objection to form. Asked
5 and answered.

6 THE WITNESS: I mean, so what
7 Basturk is saying is that it is essentially
8 an extension of the standard transport level
9 reliability feature to the more adversarial
10 setting we are discussing.

11 And that is one way messages that A
12 sends to B can be intercepted or destroyed by
13 an adversary in the network.

14 BY MR. EKLEM:

15 Q. So, when Basturk calls secure
16 delivery an extension of the standard transport
17 level reliability feature, by extension Basturk
18 means adding security, right?

19 MR. BRIT: Objection to form.

20 THE WITNESS: Well, it can extend
21 existing protocols to mitigate or eliminate
22 the threat posed by adversaries in the

1 network that may, you know, intercept or
2 destroy packets and fool the sender into
3 thinking that the data has actually been
4 received.

5 So, it is simply an extension to
6 existing protocols. And the features in
7 Basturk are, I would say, orthogonal to the
8 features provided by a protocol such as TCP.

9 That is, they can be used in
10 conjunction with each other, and the
11 extensions discussed in Basturk are, are --
12 can provide additional security functions
13 or -- well, sorry. I'm not sure I -- I don't
14 use that word the same way as --

15 But, it can provide the ability to
16 detect such malicious activity by adversaries
17 in the network.

18 And so, that is how it can extend
19 other existing protocols such as TCP.

20 BY MR. EKLEM:

21 Q. Okay. Let's go down to Paragraph 35
22 of your declaration, please. Let me know when

1 you are there.

2 A. By the way, this paragraph contains
3 a typo that I noticed when I was reviewing my
4 declaration.

5 And I just point out that at the
6 bottom of Page 21 in Paragraph 35, it says,
7 "Compare the serialized computation in Houh
8 Figure 3 to the parallel computation of the MAC
9 as shown below in Houh Figure 5 (on the fly
10 used:)"

11 And the Figure 3 should actually be
12 Figure 4 because it is referring to the figure I
13 am just showing.

14 And it should read, "Compare the
15 serialized computation in Houh Figure 4 to the
16 parallel computation of the MAC as shown below in
17 Houh Figure 5 (on the fly used:)"

18 So, it only changes the number 3
19 to 4 in that. That was just a typo that I
20 noticed.

21 But, here -- I am here on
22 Paragraph 35 now.

1 Q. Okay. That paragraph spans Pages 21
2 and 22.

3 Near the end of Page 22, you have a
4 Footnote 1, do you see that?

5 A. Yes. It actually goes all of the
6 way to Page 23. But I do see the footnote.

7 Q. Okay. The footnote part is on
8 Page 22. In Footnote 1 you say that "In this
9 example, the assumption is that the system is
10 limited by the transmission speed rather than the
11 compute cycles available."

12 Do you see that?

13 A. Yes.

14 Q. What is the transmission speed here?

15 A. The transmission speed that I am
16 referring to is the network to which this device
17 was attached that has a rate at which the data
18 can be transmitted onto the network.

19 So, if you are attached to a
20 100-megabit Ethernet, then you can transmit onto
21 that 100-megabit Ethernet at about 100 megabits.

22 So, that is -- when the data is

1 being transmitted, it would go out at a certain
2 rate and that is whatever the rate of the network
3 to which the device attached is running.

4 Q. Okay.

5 A. That it is the speed that it is
6 running at.

7 Q. So, that is the rate of the physical
8 network, correct?

9 MR. BRIT: Objection to form.

10 Mischaracterizes the witness' prior
11 testimony.

12 THE WITNESS: Yeah, it is the -- it
13 is the -- it is the --

14 There is a physical interface to
15 connect to the network. And the network is
16 running at a certain speed.

17 You know, so, if you are dialed in
18 by a 288 modem, then that is the speed at
19 which the transmission is occurring when you
20 send data on the modem.

21 But if you are connected with a, you
22 know, 100 megabit Ethernet interface to a

1 network, the rate that you transmit onto the
2 local network to which your device is
3 directly attached would be that 100 megabits.

4 And so, what I am assuming here is
5 that the system is limited by this
6 transmission speed rather than the compute
7 cycles available.

8 So that you can, you know, do things
9 like compute the MAC and that the system is
10 bound by the transmission and you can, you
11 know, for example, that you can compute the
12 MAC faster in about the same time or faster
13 slightly than the -- than the time it takes
14 for the data to be transmitted on the
15 network.

16 That is what I am working under
17 here.

18 And I go on to say that even if it
19 is not true, that it may take longer to
20 compute the MAC than to transmit the packet.

21 It still will always be faster to
22 transmit the packet using the on-the-fly

1 approach, which is at least part of the
2 computation that is done in parallel, right,
3 that is kind of the on-the-fly approach that
4 you can start -- you can start the
5 computation and then finish the computation
6 up at the end of the packet, in that case.
7 It is still faster to transmit the packet
8 using the on-the-fly approach or at least
9 doing it in part of the operations in
10 parallel than the serial approach.

11 So, that is what I am saying here.

12 BY MR. EKLEM:

13 Q. Okay. Can we go to Paragraph 41 of
14 your declaration, please. And let me know when
15 you are ready.

16 A. Okay.

17 Q. So, Paragraph 41 starts on Page 26
18 and breaks over into Page 27.

19 On Page 27, about six lines down
20 there is a sentence that reads, "Because Handley
21 discloses encryption at the application layer,
22 for example, using encryption schemes such as

1 DES, Handley discloses authentication at the
2 application layer."

3 Do you see that?

4 A. Yes.

5 Q. Okay. Handley does not disclose the
6 use of a MAC for authentication, right?

7 A. Can I open up the Handley reference
8 since we are talking about it now?

9 Q. Yes. And that is -- Handley is
10 Exhibit 1006?

11 (Whereupon, previously marked
12 Exhibit 1005,
13 first referral.)

14 THE WITNESS: Yes -- no, 1005.

15 BY MR. EKLEM:

16 Q. Correct, thank you.

17 A. If you look at Handley on the bottom
18 of Page 13 it talks about secure broadcasts that
19 is in the Section 8.3 named Secure Broadcasts.

20 And it says how "Such secure
21 broadcasts can be performed by encrypting a hash
22 (digitally signing) of each packet with the

1 sender's private key of a public-private key
2 pair."

3 And that is functionally equivalent
4 to a MAC which is, you create -- generate a hash
5 and then you sign it with your private key, that
6 way -- which is decrypted, can be decrypted using
7 a public key.

8 And that way whoever decrypts it has
9 access to the public key because that is why it
10 is called a public key.

11 And that then, if it -- if the
12 hashes match -- if what the -- if the user
13 successfully decrypts the signature into a hash
14 that it can compute on its own, then it knows
15 that only the sender using its private key could
16 have sent the data. That is how public-private
17 key -- private-public key encryption works, which
18 is -- these are different than the symmetric
19 keys.

20 They are known as asymmetric keys
21 because you use a different key to decrypt data
22 than you use to encrypt data.

1 And if the user keeps their
2 encryption key or private key safe and doesn't
3 give it to anyone, then they are the only entity
4 that can sign a packet, or encrypt data. And so
5 if I encrypt the hash using a private key, the
6 receiver can decrypt the hash using the public
7 key. And if the hashes match, then it was
8 authentically -- authentically sent from the
9 sender. That is how --

10 So, it is not -- Handley is not --
11 does not use the word MAC, but this signature of
12 a hash, encryption of a hash using the sender's
13 private key is the same, is functionally the same
14 as the MAC.

15 Q. Okay. Can we go to Paragraph 39 of
16 your declaration, please. Let me know when you
17 are there.

18 A. Okay.

19 Q. The second to the last sentence of
20 that paragraph which is on Page 26, you say, "But
21 the combination I set forth does not duplicate
22 functions because Handley does not disclose the

1 use of a MAC. Any checksums and different
2 protocol layers used in Handley are not for the
3 purpose of authentication."

4 Do you see that?

5 A. Yes.

6 Q. So, you are saying here that in your
7 combination of Handley and Basturk, there is no
8 duplication because you say that Handley does not
9 disclose a MAC.

10 But now you are telling me that
11 Handley discloses a MAC.

12 So, are you changing your testimony?

13 A. I mean, the point here is that you
14 are not saying generate a MAC and then generate a
15 second MAC. That would be duplicating
16 functionality.

17 There is no teaching in Handley and
18 the combination where you do it twice.

19 I think that is part of the point
20 here. That there are other teachings in Handley
21 that are -- so, the combination isn't generating
22 two MACs. The combination -- Basturk is teaching

1 on-the-fly computation of the MAC or the
2 signature. Basturk teaches to put it at the end.

3 And so Handley is talking about this
4 hash and signing the hash, which is functionally
5 equivalent.

6 But I am not saying that in the
7 combination you are doing it twice. That is not
8 what I am saying.

9 So, it is not duplicative
10 functionality that Handley is teaching it in one
11 layer and you are going to redo it at a second
12 place. That is not what the combination I am
13 talking about is.

14 So, the combination isn't -- I am
15 not saying it is duplicating functionality by
16 doing it twice.

17 Q. But what you said was Handley does
18 not disclose the use of a MAC.

19 And so that is the part I'm focusing
20 on.

21 So, in your declaration you say,
22 "Handley does not disclose the use of a MAC,

1 period." And now you are saying it does.

2 So, are you changing your testimony?

3 MR. BRIT: Objection to form.

4 Mischaracterizes the document. Misquotes the
5 document. And asked and answered.

6 THE WITNESS: I am not. Because I
7 said Handley doesn't use the word MAC, right,
8 so it is not disclosing using the MAC.

9 But Handley is talking about the
10 signature and we are not going to do it twice
11 in the combination. That is not what I am
12 saying.

13 But what I am saying is Handley is
14 not using -- does not disclose using a MAC
15 and making the combination it is not, I'm not
16 saying that oh, you've got this other thing,
17 this signature, it is not called a MAC. But
18 I'm going to do a MAC in addition to that.
19 Handley does not use the word MAC in this
20 description. But what it has is, as I said,
21 functionally equivalent. And that the
22 combination, I'm still not doing it twice.

1 So, there is no performance impact
2 by doing it twice. It is just now being
3 called a MAC, it is functionally equivalent,
4 you can do it the way Basturk is teaching
5 on-the-fly.

6 I'm not sure about -- give me one
7 second here, please.

8 So, I mean, Basturk is teaching what
9 it is teaching. And I said they are
10 functionally equivalent and that you wouldn't
11 replicate the, you know, you wouldn't say,
12 well, I'm going to sign in with a private key
13 in Handley and I'm going to resign it again
14 with a, whatever keys that, you know, the
15 session key in Basturk.

16 It is functionally equivalent. But
17 it is not the same MAC as taught in Basturk,
18 but the combination wouldn't do both.

19 So, you are not duplicating
20 functions. And I stand by what I said, which
21 is Handley doesn't use the word MAC but it
22 teaches the signature using a private key.

1 But the combination is not going to
2 do, you know, Handley's functionally
3 equivalent signature and Basturk's
4 functionally equivalent signature, it is just
5 doing it once. It is not duplicating
6 functions.

7 Dr. Stubblebine is arguing that
8 there is a lot of duplication, as I say in my
9 declaration. He is taking the statements out
10 of context and he is not -- you know, I am
11 not saying that you are going to do two
12 signatures.

13 You know, they are functionally
14 equivalent, but you still only need to sign a
15 packet once to have this authentication
16 functionality.

17 BY MR. EKLEM:

18 Q. So, where in your declaration do you
19 say that what Handley does is functionally
20 equivalent to a MAC?

21 MR. BRIT: Objection to form.

22 THE WITNESS: I just say that

1 Handley doesn't disclose the use of a MAC.

2 And it doesn't. It doesn't use the word MAC.

3 So, I'm just saying what I'm saying
4 in my declaration.

5 But see, it is Handley -- sorry, it
6 is Dr. Stubblebine taking certain statements
7 out of context to adversely, you know --
8 Basturk indicates that it would be a poor
9 design, belies a -- this is what he says,
10 "belies the layered communication structure,
11 would adversely affect performance, would
12 make implementation significantly harder,
13 duplicate functionality and degrade
14 performance, and modify an application to
15 implement its transport protocol."

16 Now, what I am saying is that
17 Dr. Stubblebine is taking these out of
18 context. It is actually Dr. Stubblebine's
19 misinterpretation of how to compute the MAC
20 that leads to degraded performance, that --
21 that is adversely affecting performance.

22 And I am not saying I am duplicating

1 the functionality in the combination. But,
2 that is not what I'm saying.

3 Handley is teaching this signature,
4 but it is not the same as the MAC taught
5 in -- it is functionally equivalent but it
6 doesn't use the word "MAC."

7 BY MR. EKLEM:

8 Q. Okay. So, let's go to Paragraph 60
9 of your declaration, please.

10 MR. BRIT: Sorry. Did you say 16?

11 MR. EKLEM: 6, 0. 60.

12 MR. BRIT: All right, thanks.

13 THE WITNESS: Okay.

14 BY MR. EKLEM:

15 Q. Okay. In the sentence that starts
16 on the second line from the bottom of Page 36
17 that crosses over into Page 37, you state, "I
18 discuss in my First Declaration that there are
19 only a finite number of places where the MAC
20 could be placed to start, and why it would be
21 obvious to a POSITA that the MAC would be placed
22 at the end of a packet."

1 Do you see that?

2 A. Yes.

3 Q. So, you acknowledge that there are
4 multiple places where the MAC could be placed,
5 right?

6 MR. BRIT: Objection to the form.
7 Mischaracterizes the document.

8 THE WITNESS: What I am saying is
9 that there are only a finite number of places
10 where the MAC could be placed to start.

11 And, and I discuss in my opening
12 first declaration, Exhibit 1003, why it would
13 be obvious that the MAC would be placed at
14 the end of a packet -- of the packet.

15 So, there are reasons I give why
16 that would be obvious.

17 And there are a finite number of
18 other locations. I -- I do say that, where
19 the MAC could be placed.

20 BY MR. EKLEM:

21 Q. Okay. Let's go to Paragraph 62 of
22 your declaration. 6, 2.

1 A. Yes, okay.

2 Q. In about six -- about six lines down
3 from the top of Paragraph 62, there is a sentence
4 where you state, "The authentication data in the
5 middle of the packet" -- sorry, it says, "The
6 authentication data in the middle of the packet
7 data causes the data to be separated into two
8 segments - the data segment before the
9 authentication data and the data segment after
10 the authentication data."

11 Do you see that?

12 A. Yes.

13 Q. The two segments that you are
14 talking about are in the same packet, right?

15 MR. BRIT: Objection to form. Lacks
16 foundation.

17 THE WITNESS: Yeah, what I am
18 talking about here is when, if the -- this is
19 part of the finite number of places it could
20 be placed.

21 So, one place to put it is somewhere
22 in the middle of the data.

1 And I'm counting that as one of a
2 general class of them. I mean, if the data
3 were 1,000 bytes long, this argument applies
4 equally whether you put the first 100 bytes
5 or the first 800 bytes and you inserted the
6 MAC.

7 So, what I'm saying here is,
8 generally, if you put the MAC in the middle
9 of the data, a user wouldn't do that because
10 it fragments that data chunk into two blocks,
11 the one before where I put the MAC and the
12 one after, within a single packet.

13 And, there are lots of reasons why
14 one wouldn't do that because fragmentation in
15 this sense, and it is different than what I
16 understand that Dr. Stubblebine seems to mean
17 by fragmentation.

18 He is talking about some different
19 issue. I address that elsewhere in my
20 declaration.

21 But, in this case what I am talking
22 about is that if one were to put the MAC in

1 the middle of the data portion of a single
2 packet, that there is -- it would become two
3 portions.

4 And there are reasons that that is
5 not good.

6 For example, a lot of network
7 drivers, you know, you have to process a
8 packet. You have to strip off the header.

9 And in this case, if you put the MAC
10 in the middle, you have to tell -- you have
11 to tell the processor on the subset where in
12 the middle of the data you put it.

13 So, there is an additional field
14 that is required. And that means that the --
15 then the -- you have to go access the MAC,
16 you have to first have that field in the
17 packet which adds data to the packet. It is
18 inefficient. It -- you have to look up the
19 MAC, and furthermore when you copy the data
20 packet to user memory to create a consecutive
21 stream of data, you actually have to make two
22 copy operations, one for the block, the first

1 block separated by the MAC, and one for the
2 second block separated by the MAC.

3 That causes an additional
4 inefficiency.

5 Otherwise, you know, if it was a
6 single block not separated, you know, without
7 the MAC in the middle, you could just make
8 the one copy operation.

9 But now you have to break it up into
10 two copy operations, for two smaller blocks,
11 to get the data to become contiguous
12 eventually in the user data stream.

13 And, you know, there is other
14 reasons, you know, I say what I say in my
15 declaration.

16 But these are reasons why a POSITA
17 would not want to locate the data in the
18 middle of the data portion of a single
19 packet. They would not locate the MAC or
20 signature there.

21 BY MR. EKLEM:

22 Q. Okay. Let's go to Paragraph 67 of

1 your declaration, please. 6, 7.

2 A. Okay.

3 Q. Okay. In the first sentence you
4 say, "Dr. Stubblebine further states that 'RTP
5 does not define a trailer and instead defines a
6 mechanism for placing additional information in
7 the header as explained above'."

8 Do you see that?

9 A. Yes.

10 Q. So, you don't dispute in your
11 supplemental declaration that RTP does not define
12 a trailer, correct?

13 MR. BRIT: Objection to form. Lacks
14 foundation.

15 THE WITNESS: What I am rebutting
16 with respect to Dr. Stubblebine's statements
17 is why this header field extension is also
18 not -- I am rebutting his statements about
19 placing the additional information in the
20 header, at least I think in this paragraph.

21 BY MR. EKLEM:

22 Q. Okay. Let's go to Paragraph 68 of

1 your declaration, please. It is a little bit
2 longer. So, I guess go ahead and read it and let
3 me know when you are ready.

4 A. Okay.

5 Q. All right. On Page 43 in
6 Paragraph 68 on Page 43 which is about -- which
7 is four lines from the top of Page 43, there is a
8 sentence that states plainly, "Dr. Stubblebine
9 proposes that using the RTP header extension for
10 the MAC avoids dealing with variable size PDUs by
11 proposing using the RTP header extension, which
12 itself is variably sized and part of the PDU."

13 Do you see that?

14 A. Yes.

15 Q. Okay. So, when you say, "Variably
16 sized and part of the PDU," the PDU you are
17 talking about here is the RTP packet, right?

18 A. I mean, it could be -- it could be
19 the IP packet as well.

20 My point here is that
21 Dr. Stubblebine is criticizing the placement of
22 the MAC at the end of the packet which may be,

1 you know, RTP within a UDP within IP.

2 He is criticizing that because it
3 creates this -- it's variable length.

4 But, my point here is that IP
5 packets and RTP packets, they are already
6 variable length, you are already dealing, every
7 system is already dealing with the variable
8 length nature of it.

9 And by putting the MAC at the end,
10 after the variable length field, it actually does
11 not create additional work as Dr. Stubblebine is
12 arguing here.

13 He is saying, well, you shouldn't
14 put it at the end because you have to deal with
15 the variable length nature of the packet. I am
16 paraphrasing. I will refer you to exactly what
17 he says but I am rebutting.

18 But my point is, that all the
19 protocol sets are already dealing with this
20 variable nature of the length of an IP or RTP,
21 the variable length nature of these packets.

22 So, putting at the end actually

1 doesn't add work. But what does add work is
2 Dr. Stubblebine's use of the header extension,
3 which if it were not used, you wouldn't have an
4 additional variable length field which you would
5 have to deal with by putting -- by using that
6 field.

7 So, the contradiction is that
8 Dr. Stubblebine is arguing that putting it at the
9 end requires the additional overhead of dealing
10 with a variable length PDU and getting to the
11 MAC.

12 But that is already effectively free
13 because you are already -- you are already -- the
14 system already has to track where the end of the
15 data in a packet is anyway.

16 And so you simply just read the next
17 four bytes to get -- and there is not actual
18 additional work in dealing with the variable
19 nature of the packet, to start with.

20 But his proposal or his assertion is
21 that you would use this header extension to place
22 the signature in the header of an RTP packet.

1 And the irony there is that that
2 does introduce additional processing due to
3 having to deal with the variable length field.
4 The variable length field is the data of the
5 header extension as defined itself. That is how
6 it is defined. The header extension is the
7 variable length field.

8 So, there is a bit in the RTP header
9 that tells you whether there is an extension, so
10 you have to check the bit one way or the other.
11 The stacks are checking the bits.

12 The bit is set to show that there is
13 a variable size extension. You actually then
14 have to deal with this variable size extension
15 that you wouldn't have had to deal with if you
16 didn't have the header extension.

17 So, it is ironic that the very
18 reason Dr. Stubblebine criticizes that you would
19 not put the -- that why you wouldn't put the MAC
20 at the end, that is free.

21 But his alternative actually
22 introduces the very problem that he criticizes.

1 So, that is kind of the point of
2 what I am laying out here.

3 Q. Okay. So, you know what a PDU is,
4 right?

5 MR. BRIT: Objection to form.
6 Argumentative.

7 THE WITNESS: Yes, that is -- that
8 stands for Protocol Data Unit.

9 BY MR. EKLEM:

10 Q. Okay. And what is a protocol data
11 unit?

12 A. Well, if the protocol is IP, it is
13 the IP, it is the size of the IP, you know, data
14 unit carried by IP.

15 It depends on various parts, which
16 protocol you are talking about. It is the data
17 unit of the protocol you are talking about.

18 But RTP packets are encapsulated
19 inside UDP packets typically. They are
20 encapsulated inside IP packets, that may be also
21 encapsulated inside Ethernet frames or layer
22 frames. But the point here is that it doesn't

1 matter what PDU he is talking about, one PDU or
2 the other.

3 He is criticizing the variable
4 length nature of PDUs as why a user -- a POSITA
5 would not put the data at the end of the -- of
6 the PDU or packet. And which -- what the stacks
7 already have to deal with.

8 They already have to deal with the
9 variable length nature of an IP packet of the UDP
10 packet.

11 And, therefore, it is effectively,
12 you are not actually having to additionally deal
13 with more a variable length data than you already
14 have to deal with to access the MAC at the end.

15 And instead, Dr. Stubblebine's, you
16 know, argument about -- about the header
17 introduces the requirement to process an
18 additional variable length field over the
19 existing method of putting it at the end, which
20 is exactly the reason Dr. Stubblebine argues you
21 wouldn't place it at the end.

22 So, that is the irony there, which

1 is his proposal is to deal with a new variable
2 length field in the header and have to suffer the
3 overhead consequences of that.

4 When the overhead consequences of
5 dealing with the MAC at the end are already
6 required by the system, to get to the -- to know
7 how long the IP and UDT data units are, which if
8 it encapsulates RTP, you know that whatever is
9 after or at the end would be the MAC.

10 So, you already have to deal with
11 that variable length nature of a protocol data
12 unit, for example, for an IP or UDP which carry
13 RTP typically.

14 It is Dr. Stubblebine's proposal to
15 put it in the header extension that introduces
16 additional overhead to deal with a new variable
17 length field which wasn't present prior when the
18 MAC is simply at the end.

19 Q. The RTP header extension includes a
20 length field, right?

21 MR. BRIT: Objection to form. Lacks
22 foundation.

1 THE WITNESS: Well, I am not sure
2 where I say it, but it does because it is a
3 variable length field, and I can just verify
4 that by looking at the RTP. I think it is
5 part of the exhibits.

6 But my point is that the RTP's
7 header extension field is variable length.

8 So, you need that data to tell how
9 long it is.

10 And there is, furthermore, another
11 four bytes as part of the header for the
12 extension as well.

13 And so not only does
14 Dr. Stubblebine's proposal or argument that
15 the field be put in the header, by doing so
16 there is actually additional data that has to
17 be part of a packet and transmitted when
18 doing so, over simply putting the MAC at the
19 end of the whole packet. Like Basturk is --
20 explicitly teaches to put the data in the
21 signature and the trailer.

22 And so, I'm, not only does it

1 introduce the variable length processing that
2 Dr. Stubblebine criticizes against as a
3 reason why it would not be at the end, when
4 in fact you already have to do that variable
5 length processing for the whole PDU, either
6 IP UDP which RTP is contained within.

7 But it also introduces more data, it
8 makes the packets longer, and I forget by how
9 many, I thought I talked about how many
10 bytes, but it uses more data to both capture
11 the length and there is another field in the
12 header.

13 So, now all the packets are slightly
14 longer. They all take slightly, you know,
15 incrementally longer to transmit, which adds
16 up if you send millions of packets or, you
17 know, a large number of packets.

18 So, this is why I disagree and I
19 think Dr. Stubblebine is incorrect about the
20 use of the header.

21 And I lay it out here in this, in
22 the paragraphs around this section.

1 MR. BRIT: I will note for the
2 record that Exhibit 1008 in this proceeding
3 is the RTP spec, RFC 1889.

4 So I will advise the witness if he
5 would like to see that, that he should
6 request it.

7 THE WITNESS: Yes, actually that is
8 in the Box, too, so can I just download it
9 now?

10 MR. EKLEM: Of course.

11 THE WITNESS: I can point to the --

12 MR. EKLEM: Yes, check out Page 15.

13 THE WITNESS: Okay. So, it starts
14 on Page 14 and it goes over to Page 15. And
15 so there are -- there is a two-byte field
16 that is defined by a profile, and there is a
17 two-byte field that is the length. And then
18 there is a header extension. So there are
19 four additional bytes on top of, if you just
20 put the MAC at the end and by convention know
21 that that is at the end.

22 Now, you have to deal with the

1 variable length nature of processing the
2 header extension because you have a, you
3 know, use the length to determine how many
4 bytes are actually contained within the
5 extension.

6 And there is these four extra bytes,
7 the field that is defined by the profile and
8 the length that have to be included as part
9 of every RTP packet sent in order to capture
10 the MAC in the header.

11 So, that is, again, additional
12 transmission time, incrementally.

13 I mean, it might be 4 out of
14 1,000 bytes, but, it is still, you know, a
15 half a percentage more processing time and
16 that transmission time.

17 And if you send a lot of RTP
18 packets, that adds up. And that is a slight
19 degradation to the performance because it
20 takes that much longer to receive a packet
21 that has more data in it than if you didn't
22 need that data to start with, which you don't

1 simply by placing the MAC at the end.

2 You know it is at the end. By
3 convention, you know what size it is. And
4 then, you simply deal with it as you deal
5 with all of the variable length IP and UDP
6 PDUs.

7 You know that whatever is at the end
8 or after that would be the trailer, that is
9 where the MAC or signature would be.

10 And so -- so as opposed to inserting
11 it in the header, where now you have to deal
12 with the variable length field, because the
13 header extension requires it.

14 I mean, it may always be the same
15 because you know what it is going to be ahead
16 of time based on what you use, you know, what
17 the signature is going to be.

18 But you are forced to have a length
19 field anyway because that is what the
20 protocol specification requires you to have
21 as part of the header extension when it is
22 present.

1 And you are forced to have this
2 defined by a profile which is an additional
3 two bytes in the RTP header.

4 BY MR. EKLEM:

5 Q. And so an RTP header and payload
6 make up a PDU, right?

7 MR. BRIT: Objection to form.

8 THE WITNESS: Um, that might make up
9 the UDP, if it's encapsulated in UDP. That
10 would be the UDP protocols, protocol data
11 unit. And UDP, I think I discuss this in my
12 declaration, it has a length field to tell
13 you how long the UDP data, the data portion
14 of the UDP packet, how long that data portion
15 is.

16 And similarly, that is contained
17 within an IP packet or can be, typically
18 would be.

19 That the IP header, I also believe
20 has a data length field.

21 BY MR. EKLEM:

22 Q. Okay. So I just want to clarify.

1 I'm not sure I understood your answer.

2 So, the RTP header and payload, my
3 question is, does that make up a PDU?

4 But I think your answer suggested
5 that that is the UDP PDU.

6 So, did you mean that the RTP header
7 and payload, just those things is the UDP PDU?

8 MR. BRIT: Objection to form.

9 Compound question. Mischaracterizes the
10 witness' prior testimony.

11 THE WITNESS: So, whatever protocol
12 your data unit is carrying, so, if it is the
13 RTP protocol, it is the data -- you know, one
14 way to look at PDU is it is the data that the
15 RTP protocol carries. That is the PDU.

16 But an RTP packet as a whole, the
17 header and the data would be carried inside a
18 UDP packet.

19 So, at a different layer, there is
20 the whole RTP packet including the header is
21 a PDU in a higher layer protocol like UDP
22 which encapsulates RTP.

1 BY MR. EKLEM:

2 Q. Okay.

3 A. And similarly the UDP, whole UDP
4 portion of the packet is encapsulated within an
5 IP packet.

6 So, just the data portion of an IP
7 packet exclusive of the header would -- would be
8 one example of what a POSITA would think of as
9 the protocol's data unit, which is that the data
10 that is carried within the protocol.

11 Another way to look at it is that,
12 you know, people -- people may consider the whole
13 protocol, the whole including the header.

14 But, there are multiple -- it
15 depends -- it is the -- it is just one layer
16 separated. But it, you know, one way to look at
17 it is what data does the, like IP carry.

18 And that is the data portion. And
19 how long is that data portion? Well, the header
20 defines how long that data portion is. And you
21 already have to deal with the variable length
22 nature of an IP packet overall because, you know,

1 the header can be variable length in IP as well.

2 But so can the data. And there are
3 similarly like there are flags in the RTP header
4 that tell you if there are extensions. There are
5 flags for IP that tell you if there are
6 extensions.

7 We can look at the protocol specs.
8 But, there is variability in both the headers and
9 the data carried by the protocol.

10 Q. Okay. Have you finished your
11 answer?

12 A. Yes, for now, I think I have.

13 Q. All right.

14 MR. EKLEM: All right, I have no
15 further questions.

16 MR. BRIT: Okay, why don't we take a
17 break for lunch.

18 MR. EKLEM: Do you think you are
19 going to do a redirect?

20 MR. BRITT: We need time to figure
21 that out.

22 MR. EKLEM: Do you need a lunch

1 break to do that? Can we just do like a
2 ten-minute break?

3 MR. BRIT: Let's go off the record.
4 (Whereupon, a discussion off the
5 record took place.)

6 EXAMINATION

7 BY MR. BRIT:

8 Q. Hi, Dr. Houh, thank you again for
9 your time today at this deposition.

10 I just have a few items for you on,
11 I have a few items to question you on.

12 So, I would like you to open your
13 supplemental declaration, that is Exhibit 1033 to
14 this proceeding. That is the one we have been
15 talking about most of today.

16 A. Okay.

17 Q. And also I note today that you made
18 a few corrections when counsel was going through
19 this declaration.

20 Do you remember doing that?

21 A. Yes, at least one.

22 Q. Are there any other corrections you

1 would like to make with respect to this exhibit?

2 A. Yes. Actually there is one more.

3 If you -- because I noticed when reviewing.

4 If you look at Paragraph 68 on

5 Page 43, the last part of it, it is the last full

6 sentence. It says, "But, adding an additional

7 variable-length field in the RTP does add a new

8 variable-length field, i.e., the RTP header

9 extension field adds more processing compared to

10 only dealing with the variable-length IP and UDP

11 data fields."

12 And that first instance of RTP

13 should actually read RTP header, it is just an

14 omission of the word header.

15 So, it should read, "But, adding an

16 additional variable-length field in the RTP

17 header does add a new variable-length field,

18 i.e., the RTP header extension field adds more

19 processing compared to only dealing with the

20 variable length IP and UDP data fields."

21 Q. Okay, thank you.

22 A. Yes, that was it.

1 Q. Okay. Any other corrections or
2 clarifications you want to make with respect to
3 this declaration?

4 A. I think those are the two that I
5 noticed when I was reviewing. So, no, not at
6 this moment.

7 Q. Okay. And in putting together this
8 declaration, are there any documents that you
9 reviewed or analyzed that you want to make note
10 of as included or incorporated herein?

11 A. I did. So, the table at the front I
12 list Exhibits 1016 through 1028. And I did
13 incorporate and analyze those.

14 And furthermore, I think I also
15 referred in the third declaration, Exhibit 1033,
16 to the PTAB's paper 28, which also incorporated
17 those references, 1016 to 1028.

18 So, I think I have analyzed and
19 cited to those for the purposes of my declaration
20 here.

21 MR. EKLEM: I'm going to object to
22 that question and answer as leading and

1 outside the scope.

2 BY MR. BRIT:

3 Q. And Dr. Houh, you mentioned
4 references 1016 through 1028.

5 I just want to clarify, did you mean
6 Exhibits 1016 through 1028?

7 A. Yes.

8 MR. EKLEM: Excuse me. Objection,
9 leading and outside the scope.

10 THE WITNESS: Yeah, I mean, they are
11 listed as exhibits in the table that I
12 referred to.

13 BY MR. BRIT:

14 Q. Great, thanks. And Dr. Houh, if you
15 could turn back to Page 35 of your supplemental
16 declaration, Exhibit 1033 to this proceeding.

17 Let me know when you are there.

18 A. Okay.

19 Q. Do you see at the, about five lines
20 down on Page 35 it says Roman Numeral V,
21 Ground II?

22 A. Yes.

1 Q. Do you recall if counsel asked you
2 today about various paragraphs within this
3 section entitled Ground II?

4 A. Yes, I believe he did. I think
5 Paragraph 60 at least.

6 Q. Okay. And do you know what Ground
7 II in the petition is?

8 A. Yes. Ground II is the combination
9 of PacketCable and Basturk renders the challenged
10 claims obvious.

11 Q. And do you cite either of those
12 references PacketCable or Basturk in this section
13 for Ground II? I will represent to you that
14 PacketCable was 1007 and Basturk was
15 Exhibit 1006.

16 (Whereupon, previously marked
17 Exhibit 1007,
18 first referral.)

19 THE WITNESS: I see numerous
20 citations to 1007, and I think I refer back
21 to my original report where I believe I do
22 make citations directly to 1006. So --

1 sorry, did I say that right.

2 I see references to 1007 in this
3 section. But I think I also see references
4 citing back to arguments I made in my
5 original report, and I can take a look. But
6 I believe there are citations to 1006 there.

7 Q. Okay. And 1006 we talked about
8 earlier, I believe; is that correct?

9 A. Yes, that is Basturk.

10 Q. Okay. And do you agree or would you
11 agree that you are familiar with the PacketCable
12 reference that is --

13 MR. EKLEM: Objection, leading and
14 scope.

15 THE WITNESS: Yes. I would agree.

16 BY MR. BRIT:

17 Q. And when citing to the PacketCable
18 reference, Exhibit 1007 to this proceeding, did
19 you analyze this reference to determine its
20 public availability?

21 MR. EKLEM: Objection, scope. And
22 leading.

1 THE WITNESS: Yes, I did.

2 BY MR. BRIT:

3 Q. I'm going to hand you a document
4 that is Exhibit 1007 to this proceeding. It is
5 the PacketCable reference.

6 A. Okay. And that is --

7 MR. EKLEM: Jon, this is clearly
8 outside the scope. We didn't even open
9 PacketCable.

10 MR. BRIT: Right, but Counsel, it is
11 in Ground II which you fully explored when
12 discussing Paragraphs 60, 62, 67, 68, in
13 which this reference is cited as part of this
14 ground. So you opened the door and it is
15 part of this --

16 MR. EKLEM: We didn't open the
17 door -- we did not open the door to public
18 accessibility, not in this deposition and not
19 in Dr. Houh's Supplemental Declaration 1033
20 which is what this deposition is about. So,
21 it is clearly outside the scope.

22 MR. BRIT: Okay. Your objection is

1 noted, thank you.

2 BY MR. BRIT:

3 Q. I will repeat the question,

4 Dr. Houh.

5 When citing the PacketCable
6 reference throughout this declaration, did you
7 analyze this reference to determine its public
8 availability?

9 MR. EKLEM: Objection, leading and
10 scope.

11 THE WITNESS: Yes, I did.

12 BY MR. BRIT:

13 Q. And what is your opinion as to the
14 public availability with respect to this
15 reference?

16 MR. EKLEM: Objection, scope.

17 THE WITNESS: So, I was satisfied
18 that in my review it was publicly available
19 and I will -- it talks about a copyright date
20 of 1999.

21 In the notice on the front page it
22 says how the -- that the -- that this

1 technical report is a cooperative effort
2 undertaken at the direction of Cable
3 Television Labs, Inc. or CableLabs for the
4 benefit of the cable industry.

5 And that is the entire -- it is
6 saying the entire industry.

7 And that if you look at the date on
8 the bottom of every page it is December 1st,
9 '99, and that is also consistent with a note
10 on Page 3 as indicated by the lower right
11 page numbering which is also Romanette iii of
12 the document itself, which indicates a date
13 of December 1st, which is also embedded in
14 their revision history which talks about a
15 release, that it is released. If you look on
16 that page it says D01991201:release.

17 And, that indicates that this was a
18 release document.

19 BY MR. BRIT:

20 Q. And does it indicate what date it
21 was released on?

22 MR. EKLEM: Objection, leading and

1 scope.

2 THE WITNESS: Yes, as I mention it
3 has the date December 1st, 1999, at that
4 table and at the bottom of every page. And
5 that that date is further embedded in the
6 revision history that indicates what is
7 followed by a colon dash release on that
8 table on Page 3 and Romanette iii.

9 BY MR. BRIT:

10 Q. In what forms, in your opinion, was
11 it likely available in the 1999 time frame at the
12 time of its release?

13 MR. EKLEM: Objection, scope.

14 THE WITNESS: So, based on my
15 experience, these documents or types of
16 documents from these types of groups are
17 released both electronically and in paper
18 form.

19 BY MR. BRIT:

20 Q. Are you familiar with CableLabs as
21 an organization?

22 A. Yes.

1 MR. EKLEM: Objection, leading and
2 scope.

3 THE WITNESS: Yes.

4 MR. BRIT: Counsel, can you explain
5 how that is a leading question?

6 MR. EKLEM: Because it has nothing
7 to do with what we have been -- what -- it
8 has nothing to do with the scope of direct.
9 And so the only purpose for you to be asking
10 him about this is to lead him into an answer
11 affirming whatever it is that is coming next.

12 MR. BRIT: Sounds like that is a
13 scope objection rather than a leading
14 objection.

15 MR. EKLEM: Both.

16 MR. BRIT: I will note for the
17 record that you said this deposition was
18 about Exhibit 1033 and Dr. Houh discusses the
19 public availability in that -- in that
20 document, so, that is why it is relevant.

21 MR. EKLEM: Where in 1033 does he
22 discuss the public availability of

1 PacketCable?

2 MR. BRIT: We can discuss this off
3 line.

4 MR. EKLEM: No, let's get it on the
5 record, because this is the objection.

6 MR. BRIT: Dr. Houh, are you
7 familiar with CableLabs as an organization?

8 THE WITNESS: Yes, I am.

9 MR. EKLEM: Objection, scope.

10 BY MR. BRIT:

11 Q. And how are you familiar with them
12 as an organization?

13 MR. EKLEM: Objection, scope.

14 THE WITNESS: So, I was at a company
15 called NBX which got acquired by 3Com. And
16 the group that we worked -- I worked closely
17 with after the acquisition was a group that
18 made all sorts of cable head end equipment,
19 including DOCSIS compliant equipment in which
20 DOCSIS is also a part of what CableLabs has
21 supplied as standards and technical reports
22 for DOCSIS.

1 And I actually attended a trade show
2 that this CableLabs compliant equipment was
3 part of the show, and I actually showed the
4 NBX system working over a DOCSIS-compliant
5 cable system to show that we can make phone
6 calls through the cable plant system, which
7 was DOCSIS compatible, to make telephone
8 calls over 3Com's equipment, which we showed
9 at a trade show.

10 I -- with a number of other vendors
11 showing cable plant infrastructure that
12 supported data access.

13 And so that was the trade show I
14 went. I don't remember the exact name of it.
15 But that was a show I actually went to and
16 worked with the 3Com engineers on the cable
17 plant side of the house to ensure ahead of
18 time that we could actually do a successful
19 integration. And I -- I did the integration
20 for demonstration on a trade show floor.
21 That was probably sometime in 1999. Before I
22 left 3Com which is, I think, sometime in 1999

1 as my CV indicates. I just don't remember
2 what month.

3 BY MR. BRIT:

4 Q. Okay. Do you have any opinion as to
5 the reputation of CableLabs?

6 MR. EKLEM: Objection, scope.

7 THE WITNESS: I do. It is a
8 reputable industry association. As I said, I
9 was familiar with the DOCSIS protocols
10 that -- that I was able to get our system, we
11 developed at NBX to run over.

12 BY MR. BRIT:

13 Q. And what is DOCSIS? I'm sorry, if
14 you could just explain what DOCSIS is?

15 MR. EKLEM: Objection -- sorry,
16 objection, scope.

17 THE WITNESS: DOCSIS is a standard
18 published by CableLabs that I think
19 standardizes how data is transmitted over
20 cable plant infrastructure.

21 BY MR. BRIT:

22 Q. And how does PacketCable, the

1 reference at Exhibit 1007, relate to CableLabs?

2 MR. EKLEM: Objection, scope.

3 THE WITNESS: The PacketCable

4 reference is a technical report published by
5 CableLabs.

6 If you look at the front page, it
7 says it "is a cooperative effort undertaken
8 at the direction of Cable Television Labs,
9 Inc." which is CableLabs, "for the benefit of
10 the cable industry."

11 BY MR. BRIT:

12 Q. And are you familiar with any other
13 specifications that CableLabs has produced in the
14 past?

15 MR. EKLEM: Objection, scope.
16 Foundation.

17 THE WITNESS: Yes, the DOCSIS series
18 as I mentioned earlier.

19 BY MR. BRIT:

20 Q. You also mentioned attending a
21 CableLabs trade show in the 1999 time frame; is
22 that correct?

1 MR. EKLEM: Objection, scope. And
2 foundation.

3 THE WITNESS: That is the trade show
4 where a lot of CableLabs-compatible equipment
5 was being shown by numerous vendors and at
6 which I was able to show the integration of
7 our telephone system running over a
8 DOCSIS-compliant cable infrastructure that
9 3Com sold.

10 BY MR. BRIT:

11 Q. And did your experience at that
12 trade show teach you anything relevant to the
13 distribution of CableLabs's technical reports?

14 MR. EKLEM: Objection, leading and
15 scope.

16 THE WITNESS: Yes, that is, you
17 know, the various standards were accessible
18 by numerous vendors who produced compliant
19 equipment.

20 I don't think they would have been
21 able to do so without, you know, the
22 availability of the standards and technical

1 report documents provided by CableLabs.

2 BY MR. BRIT:

3 Q. And can you explain how those
4 vendors were able to develop CableLabs-compliant
5 hardware?

6 MR. EKLEM: Objection, form. Scope.
7 And leading.

8 THE WITNESS: Well, typically to
9 develop around a standard, engineers often
10 have printed copies of those standards, you
11 know, that they may have acquired from the
12 respective organizations.

13 And, they may -- they also may have
14 had, you know, electronic copies. But,
15 typically in my experience, they are -- both
16 were often available by engineers working to
17 a standards body, a set of standards.

18 BY MR. BRIT:

19 Q. And around the time or at the time
20 of this trade show, do you ever recall seeing any
21 CableLabs technical reports in hard printed form?

22 MR. EKLEM: Objection, scope.

1 Foundation. Form. Leading.

2 THE WITNESS: I don't recall
3 specifically. I think it is likely that I
4 had seen some of the DOCSIS documents because
5 I was responsible for integrating with 3Com's
6 DOCSIS system.

7 BY MR. BRIT:

8 Q. Do you have direct experience and
9 knowledge with both electronic and hard printed
10 formats of technical specifications like
11 Exhibit 1007 in the 1999 time frame?

12 MR. EKLEM: Objection, form and
13 scope, foundation, leading.

14 THE WITNESS: Yes, I do.

15 BY MR. BRIT:

16 Q. Dr. Houh, in your experience as a
17 person of ordinary skill in the art, are you
18 familiar with something called the Internet
19 Archive?

20 MR. EKLEM: Objection, scope.

21 THE WITNESS: Yes, I am.

22 BY MR. BRIT:

1 Q. What is the Internet Archive --

2 MR. EKLEM: Objection, scope.

3 MR. BRIT: If I could finish my
4 question before you object, counsel, I would
5 appreciate it.

6 BY MR. BRIT:

7 Q. Doctor, what is the Internet
8 Archive?

9 MR. EKLEM: Objection, scope.

10 THE WITNESS: The Internet Archive
11 is an organization that is seeking to
12 preserve documents that were on the web. And
13 so they crawl around the web on a regular
14 basis archiving versions of pages and other
15 documents accessible through web pages and
16 present a search interface to those
17 documents, as well as the ability to look up
18 old archive versions of certain web pages and
19 urls, and they provide that service to the
20 internet community.

21 BY MR. BRIT:

22 Q. Have you ever personally used the

1 Internet Archive?

2 MR. EKLEM: Objection, scope,
3 leading.

4 THE WITNESS: Yes, I use it all the
5 time.

6 BY MR. BRIT:

7 Q. Have you ever used the Internet
8 Archive to search for any of the references that
9 we have discussed today?

10 MR. EKLEM: Objection, scope, form.

11 THE WITNESS: Yes. I think I used
12 it to find pages for -- related to the three
13 main references, but in particular, I did
14 find an old CableLabs web page from
15 February 2000 that had a direct pointer on it
16 to the -- an electronic copy of the file.

17 And I was able to access that file
18 from the Internet Archive, albeit one that
19 came from a little later in the year, I think
20 in August of 2000. Even -- but the page that
21 pointed to it was on February.

22 And my experience with the Internet

1 Archive is that the archive doesn't always,
2 usually doesn't archive every single page
3 within a website every time it goes, so that,
4 you know, a page that has links on it, they
5 point to links and it will produce a version
6 where it has archived it that may be a
7 different date. But that the -- that if you
8 click on a link, you sometimes, you have to
9 look at the link sometimes and see what the
10 resulting pages and what date it was
11 archived.

12 MR. BRIT: Dr. Houh, just to clarify
13 your last answer, you mentioned that you had
14 searched for the reference.

15 Can you clarify what reference you
16 were discussing?

17 MR. EKLEM: Objection, form, scope.

18 THE WITNESS: I was discussing
19 Exhibit 7, 1007, the PacketCable reference.
20 And I did find a link to that reference on a
21 web page from the Internet Archive of
22 CableLabs that was dated from February 2000.

1 MR. BRIT: Thank you, Dr. Houh, I
2 have no further questions for you at this
3 time.

4 REDIRECT EXAMINATION

5 BY MR. EKLEM:

6 Q. Dr. Houh, the testimony that you
7 just provided about your work with DOCSIS, your
8 experience at the trade show and your opinions
9 about the Internet Archive and the February 2000
10 version of Exhibit 1007, are any of those
11 opinions in your first declaration, Exhibit 1003,
12 or your third declaration, Exhibit 1033?

13 MR. BRIT: Objection to the extent
14 the question calls for speculation. Those
15 documents are available. The witness should
16 be able to see them and look through them.

17 THE WITNESS: So, Exhibit 1003 is in
18 the Box, also, so I'm going to download that
19 now.

20 MR. EKLEM: Uh-huh.

21 THE WITNESS: Because that has -- I
22 refer to that throughout Exhibit 1033.

1 BY MR. EKLEM:

2 Q. Actually, Dr. Houh, let me narrow my
3 question.

4 MR. BRIT: Just to clarify, is 1003
5 an exhibit to this deposition or not since
6 the witness already downloaded it?

7 MR. EKLEM: Sure.

8 MR. BRIT: Okay.

9 MR. EKLEM: Actually, no, it is not,
10 because I haven't -- I am withdrawing any
11 questions about it, so, no, it is not.

12 BY MR. EKLEM:

13 Q. But I am going to re-ask my question
14 specifically within the scope of Exhibit 1033.

15 So, the opinions that you just gave
16 with respect to your work with DOCSIS, your
17 experience at the trade show, and your testimony
18 about the Internet Archives and the
19 February 20th -- the February 2000 version of
20 Exhibit 1007, none of those opinions are in your
21 declaration, Exhibit 1033, correct?

22 MR. BRIT: Objection to the form.

1 The witness's declaration also includes
2 citation to a CV and other deposition -- the
3 other exhibits cited therein on the cover
4 pages.

5 MR. EKLEM: Jon, that is an improper
6 objection and it is leading; it is
7 inappropriate. It is coaching.

8 THE WITNESS: Well, in Paragraph 5
9 of Exhibit 1033, I talk about, I say, "In
10 forming my opinions expressed in this
11 supplemental declaration, I relied upon my
12 education and experience which I describe in
13 Section 2 of my first declaration and in my
14 curriculum vitae, Exhibit 1004."

15 And the first declaration is 1003.
16 So, I am making a reference there. Just to
17 not repeat the whole section here. But, I
18 have referred to both my CV and my -- and my
19 first -- and in the first declaration, which
20 is Exhibit 1003, for my background and
21 qualifications.

22 And, I am pretty sure that in my CV

1 I do state that I have worked for 3Com. I
2 don't recall offhand what I said about the
3 Internet Archive.

4 MR. EKLEM: Okay. No further
5 questions.

6 FURTHER EXAMINATION

7 BY MR. BRIT:

8 Q. Dr. Houh, can you turn to
9 Paragraph 5 of Exhibit 1033?

10 A. Okay.

11 Q. Can you read that to yourself,
12 briefly?

13 A. Okay.

14 Q. Dr. Houh, do you consider yourself a
15 person of ordinary skill in the art relevant to
16 this proceeding?

17 MR. EKLEM: Objection, scope.

18 THE WITNESS: Yes, because that is
19 the viewpoint from which I perform my
20 analysis, with respect to my opinions laid
21 out here.

22 MR. BRIT: Great. Thank you,

1 Dr. Houh, I appreciate your time today and I
2 hope you have a great weekend.

3 THE WITNESS: Thank you, you, too,
4 and everyone here as well.

5 (Whereupon, signature not having
6 been waived, the deposition ended at 1:42
7 p.m. EST)

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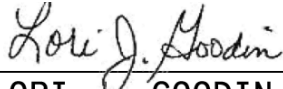
22

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2 I, LORI J. GOODIN, RPR, CRR,

3 CA CSR # 13959, the reporter before whom the
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10 deposition is a true record of the testimony11 given by said witness; that I am neither counsel
12 for, related to, nor employed by any of the13 parties to the action in which this deposition was taken;
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23

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25 Notary Commission Number: GG987804

26 My Commission expires: May 12, 2028

27 STATE OF CALIFORNIA, CA CSR# 13959

28 My Commission expires: February 22, 2025

29 STATE OF MARYLAND, COUNTY OF ANNE ARUNDEL

30 My Commission expires: August 2, 2025

31 DISTRICT OF COLUMBIA, WASHINGTON DC

32 My Commission expires: May 31, 2026

33 STATE OF DELAWARE: COUNTY OF KENT

34 My Commission expires: September 9, 2025

35 STATE OF PENNSYLVANIA, COUNTY OF LEHIGH

36 My Commission expires: April 5, 2025

1 Henry Houh, Ph.D., c/o
2 KIRKLAND & ELLIS LLP
3 601 Lexington Avenue
4 New York, New York 10022

5
6 Case: Meta Platforms, Inc. et al. v. VL Collective IP LLC
7 Date of deposition: July 19, 2024
8 Deponent: Henry Houh, Ph.D.

9
10 Please be advised that the transcript in the above
11 referenced matter is now complete and ready for signature.
12 The deponent may come to this office to sign the transcript,
13 a copy may be purchased for the witness to review and sign,
14 or the deponent and/or counsel may waive the option of
signing. Please advise us of the option selected.
15 Please forward the errata sheet and the original signed
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8 Witness Name: Henry Houh, Ph.D.

9 Deposition Date: July 19, 2024

10

I do hereby acknowledge that I have read
11 and examined the foregoing pages
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12

(Check appropriate box):

13

() The same is a true, correct and
complete transcription of the answers given by
14 me to the questions therein recorded.

() Except for the changes noted in the
15 attached Errata Sheet, the same is a true,
correct and complete transcription of the
16 answers given by me to the questions therein
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17

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ERRATA SHEET

7

8 Case: Meta Platforms, Inc. et al. v. VL Collective IP LLC

9 Witness Name: Henry Houh, Ph.D.

10 Deposition Date: July 19, 2024

11 Page No. Line No. Change

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22

Signature_____
Date

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