1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 _____

3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4 _____

5 CISCO SYSTEMS, INC.,

6 Petitioner,

7 v.

8 LIONRA TECHNOLOGIES LTD.,

9 Patent Owner.

10 _____

11 Case Number IPR2023-00673

12 Patent 7,685,436

13 _____

14 -and-

15 _____

16 Case Number IPR2023-00703

17 Patent 8,566,612

18 _____

19 REMOTE DEPOSITION OF MARK EDWARD CROVELLA, PH.D.

20 Wednesday, January 10, 2024; 10:11 a.m. EST

21 Reported by: Cindy L. Sebo, RMR, CRR, CLR, RPR, CCR,
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2 Remote Deposition of MARK EDWARD CROVELLA, PH.D.,
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15 Reporter, LiveLitigation Authorized Reporter and
16 Notary Public, beginning at approximately 10:11 a.m.
17 EST, when were present on behalf of the respective
18 parties:
19
20
21
22
23
24
25

1 A P P E A R A N C E S:
2 (All via Zoom Video Communications)
3
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1

2 --oOo--

3 INDEX OF EXAMINATION

4 MARK EDWARD CROVELLA, PH.D.

5 Cisco Systems, Inc. v. Lionra Technologies Limited

6 Wednesday, January 10, 2024

7 --oOo--

8

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1 S T I P U L A T I O N S

2

3 IT IS HEREBY STIPULATED AND AGREED
4 by and between counsel no party to the litigation will
5 object to the remote deposition on the grounds that
6 the certified stenographer may not have the legal
7 authority to swear in the witness.

8

9 FURTHER STIPULATED AND AGREED
10 that in lieu of the oath administered in person, the
11 witness declares the testimony in this matter under
12 the penalty of perjury.

13

14 FURTHER STIPULATED AND AGREED
15 that the certified stenographer is not physically
16 present in the deposition room and will be reporting
17 this deposition remotely.

18

19 FURTHER STIPULATED AND AGREED
20 all parties and their counsel consent to this
21 arrangement and waive any objections to this manner of
22 reporting.

23

24

25

1 M. Crovella
2 --oOo--
3 P R O C E E D I N G S
4 --oOo--
5 --oOo--
6 Remote Deposition
7 Wednesday, January 10, 2024; 10:11 a.m. EST
8 --oOo--
9 --oOo--
10 MARK E. CROVELLA, PH.D.,
11 having first been duly sworn remotely by the
12 certified stenographer, under penalty of perjury,
13 to tell the truth, the whole truth, and nothing
14 but the truth, was examined and testified remotely
15 as follows:
16 --oOo--
17 CERTIFIED STENOGRAPHER: Thank
18 you.
19 The witness is sworn, and I'll go
20 on mute now, Counsel.
21 MR. AUCHTER: Thank you.
22 ///
23 ///
24 ///
25 ///

1 M. Crovella
2 --oOo--
3 EXAMINATION BY COUNSEL FOR PATENT OWNER
4 --oOo--
5 BY MR. AUCHTER:
6 Q. Good morning, Dr. Crovella.
7 A. Good morning.
8 Q. Is there any reason you can't
9 testify fully and accurately today?
10 A. No.
11 Q. Great.
12 Do you understand you are here
13 for two notices of deposition: one being
14 Paper Number 12, which is the Notice of
15 Deposition in the 703 IPR for the '612 patent,
16 and the second one being Paper 13 of the 673 IPR
17 for the '436 patent?
18 A. I do.
19 Q. And that's because you've submitted
20 a single declaration and combined declaration for
21 both IPRs?
22 A. That's right.
23 Q. Did you write your Declaration?
24 A. The Declaration was prepared jointly
25 between myself and counsel. We agreed on the

1 M. Crovella

2 arguments and then exchanged drafts.

3 In the end, every word in the

4 Declaration is my opinion, and I stand behind

5 everything in the Declaration.

6 Q. In preparing for your Declaration,

7 did you consider the prosecution history of the

8 '436 patent?

9 A. I did review the prosecution

10 history.

11 Q. And by review of the prosecution

12 history, what do you mean?

13 A. I read through it and, you know,

14 understood it.

15 Q. Okay. How long did that take?

16 A. It's been quite a while since I did

17 that. I -- I can't remember.

18 Q. Did you look at the references that

19 were cited in the prosecution history?

20 A. I don't recall that I looked at

21 references cited. It's been quite a while since I

22 did that.

23 Q. Okay. So, for example, when you

24 looked at the prosecution history, which was

25 Exhibit 1002, did you, on your own, look at

1 M. Crovella

2 any patents that were cited there, or did you just

3 look at what's in Exhibit 1002 as part of your

4 review of the prosecution history?

5 A. Is there a specific patent that

6 you're asking me about with respect to the

7 prosecution history?

8 Q. Sure.

9 Krishna -- what's known as

10 Krishna '627, U.S. Publication 2003/0014627.

11 A. I reviewed the Krishna reference,

12 Patent '670. I don't recall reviewing a Krishna

13 reference with the identifier that you're listing.

14 Q. Did you also review the '612 patent

15 prosecution history?

16 A. I don't recall reviewing the '612

17 patent prosecution history.

18 Q. Would it be correct to say that you

19 wouldn't have looked at any of the references

20 cited in that either, presumably?

21 A. I don't know that that's true.

22 Q. I understand; you might have.

23 Of the information that's

24 identified as information you reviewed in

25 Appendix A of your Declaration, was that provided

1 M. Crovella

2 to you by counsel?

3 A. I believe that counsel was the

4 source of identifying the items that are in

5 Appendix A.

6 Q. Okay. Did you conduct any prior art

7 researches on your own in the context of this

8 Declaration?

9 A. As I recall, at the time, I thought

10 about my knowledge of the art from having worked

11 in the field during the time that the -- of the

12 priority date of the patent. I thought back about

13 the various technologies that I was aware of at

14 the time, including intrusion detection systems

15 and security processing systems.

16 I did do research looking for

17 references to technology at the time. To the

18 best of my recollection, that wasn't something

19 that I shared with counsel, but it was something

20 that I did as part of refreshing my memory about

21 the technology from the time.

22 Q. Is it accurate to say that none of

23 that information is reflected in Appendix A in

24 your Declaration?

25 A. Again, Appendix A lists the

1 M. Crovella

2 materials that I'm relying on in my report. Of
3 course, I'm also using my own knowledge from, as I
4 say, the time that I was working in computer
5 networking, which far predates the date of
6 the patent, throughout the time that the patent
7 was prosecuted and issued.
8 So I certainly relied on quite a
9 bit of personal knowledge and understanding of
10 the technology at the time, but the materials
11 that are specifically relied on in this report
12 are what are listed in Appendix A.
13 Q. Can you identify where in your
14 report you were relying on your personal
15 knowledge, as opposed to the materials that are
16 identified in Appendix A?
17 A. Well, the report covers quite a bit
18 of technology, including the technology
19 background, the state of the art. Knowledge of a
20 person of ordinary skill in the art comes into the
21 analysis at many places in the report.
22 Those are just some examples of
23 places where my own knowledge was important for
24 the report.
25 I would add that the technology

M. Crovella

references that I rely on in this report were recognized by me at the time as examples of the broader technology that I was already familiar with. There wasn't anything particularly new in these references that went beyond what I already understood to be present in the state of the art at the time.

Q. Now, were you aware of the '436 patent before you were retained in this matter?

A. No. I didn't have any reason to be aware of the patent before I was retained.

Q. What about Exhibit 1004, the Pham-published patent application, P-H-A-M?

A. The Pham reference wasn't known to me before working on this case, but as I say, it's an example of the technology that was very familiar to me at the time. And the details of Pham are very similar to lots of other technology that was relevant at the time.

Q. What about the Wu, W-U, reference, the '744 Wu reference?

Were you aware of that before you were retained?

M. Crovella

A. The Wu reference specifically I wasn't aware of before I was retained. But Wu also is an example of very familiar technology. And the components of Wu are very similar to well-known technology from the time of the patent.

Q. Did you know Mr. Wu -- or Dr. Wu?

A. I haven't asked myself that question. It's -- his name is not ringing a bell for me at this moment.

Q. And what about Mr. Pham?

A. Again, I haven't thought about whether I knew Mr. Pham as part of my analysis. His name is, again, not ringing a bell right now.

Q. They're both in California, so I guess it's unlikely.

Going down to the next reference that you relied on, the Krishna reference, the '670 patent, had you seen that before you were retained for this matter?

A. I hadn't seen the Krishna reference before I was retained. Again, the Krishna reference is another example of technology that was very familiar at the time. And there's nothing in the Krishna reference that I found to

M. Crovella

be unusual or surprising given my knowledge of the technology at the time.

Q. Continuing then, the Vaidya, V-A-I-D-Y-A, reference, the '113 patent -- had you seen that before you were retained for this matter?

A. Again, I hadn't seen the Vaidya reference before I was retained, but the Vaidya reference is another example of technology that was very familiar to me from the time of the patent.

Q. And what about the Collins patent publication, which is Exhibit 1008?

A. I had not seen the Collins publication before this case, but Collins also is an example of technology that was very familiar to me from my years of working in the -- in the field.

Q. And what about the Nagel, Elbe and Bruton references -- that's E-L-B-E and B-R-U-T-O-N references -- Exhibits 1009, 1010 and 1015?

A. I had not seen those references before this case.

1 M. Crovella
2 As I look at them now, again,
3 they're examples of technology that was very
4 familiar to me from my time working in the field.
5 Q. Is there a description of your time
6 working in the field with respect to intrusion
7 detection systems in your Declaration?
8 A. So the section in the -- the
9 relevant section in my report, the Qualifications
10 section, is quite short, and it doesn't go into
11 great detail about my experience working in
12 security technology. But I'm happy to do that
13 now. I'd be happy to give you details on that.
14 Q. I'm just asking what was in your
15 Declaration at this point, sir. Thank you,
16 though.
17 Is there a description of your
18 experience or a discussion of your experience --
19 personal experience with packet engines in your
20 Declaration?
21 A. I'm sorry. I didn't hear you quite
22 clearly.
23 Q. I apologize. I probably muttered in
24 my water glass, which is not good form. So my
25 apologies, sir.

1 M. Crovella
2 Is there a description of your
3 experience with packet engines in your
4 Declaration?
5 A. So is there a particular kind of
6 packet engine that you'd like me to talk about?
7 Q. I'm just actually asking if there's
8 a discussion of your personal experience with
9 packet engines of the type that are being
10 referenced in the Declaration -- within the
11 Declaration.
12 A. I've done quite a bit of work in the
13 area of systems for processing packets that could
14 be described as packet engines.
15 I would, again, point out that
16 although the section of Qualifications is short,
17 it makes reference to the almost 30 years that
18 I've been working as a professor doing research
19 in computer networking. It mentions patents that
20 I have -- that I hold that involve design of
21 systems that process packets and could be
22 described as packet engines.
23 And in general, I've also done a
24 fair amount of work in industry, designing
25 systems that process packets and could be

1 M. Crovella
2 described as packet engines.
3 Q. Have any of your patents been
4 subject to litigation?
5 A. I don't believe so, no.
6 I would point out as well that
7 although the section in my report is short, my
8 curriculum vitae is part of the report, and it
9 lists my work in industry; it lists the citations
10 I've received for my research in computer
11 networking; the activities that I performed in
12 researching computer activity; the book that I've
13 written that covers Internet technology.
14 So those are additional examples
15 that are in the appendix.
16 Q. Okay. In your report, there's a
17 heading on Page 26 immediately before Paragraph 55
18 that talks about intrusion and detection systems.
19 Is that a term that's normally
20 used in the art?
21 A. Thanks for pointing that out.
22 That's a typo. It should be the use of intrusion
23 detection systems.
24 Q. Moving on to the Grounds, which is
25 starting on Page 32 -- and in the Pham reference,

1 M. Crovella

2 it's Paragraph 62, Page 32 in Exhibit 1003 of your

3 Declaration --

4 A. Okay.

5 Q. -- are the opinions you express

6 based on the preferred embodiment disclosed in the

7 Pham reference?

8 A. Well, the opinions that I'm

9 expressing are based on the totality of the

10 teaching in the Pham reference.

11 Q. I was asking a -- are you familiar

12 with the term "preferred embodiment"?

13 A. I understand the term, yes.

14 Q. What is your understanding of that

15 term?

16 A. It would be an embodiment that the

17 patent drafters referred to as a preferred

18 embodiment.

19 Q. And have you heard the term

20 "alternative embodiment"?

21 A. I have.

22 Q. And what's your understanding of

23 that term?

24 A. That would be another embodiment

25 besides the preferred.

1 M. Crovella

2 Q. And what makes an alternative

3 embodiment or an alternate embodiment altered or

4 alternative, in your understanding?

5 A. The fact that it's referred to as

6 such by the patentee.

7 Q. In the case of the Pham reference,

8 do you have an understanding as to why there are

9 alternative embodiments disclosed?

10 CERTIFIED STENOGRAPHER: I'm

11 sorry, Counsel. I couldn't hear you.

12 MR. MCPHERSON: Objection to the

13 form of the question.

14 CERTIFIED STENOGRAPHER: Thank

15 you.

16 THE WITNESS: So which preferred

17 and alternate embodiment are you referring

18 to in Pham?

19 BY MR. AUCHTER:

20 Q. Well, let's start with the first one

21 you identify, which is Figure 6 of -- on Page 34.

22 Do you have an understanding of

23 what portion of the device -- or devices shown in

24 Figure 6 are an alternate embodiment, as opposed

25 to a preferred embodiment?

1 M. Crovella
2 MR. MCPHERSON: Object to the
3 form of the question.
4 THE WITNESS: It's not an
5 analysis I performed for my report. I can
6 read through Pham now, if you'd like, for
7 me to try to answer your question, but my
8 analysis is based on the totality of what
9 Pham teaches. And the distinction between
10 different embodiments wasn't relevant to
11 me.
12 BY MR. AUCHTER:
13 Q. So is it correct to say that you
14 don't know why the route/SA table would be in the
15 cryptoprocessor, as opposed to the ingress or
16 egress processor in Pham?
17 A. No.
18 Q. Okay. Well, why would they?
19 A. Well, this is a design decision.
20 Q. And what do you mean by "design
21 decision"?
22 A. It's a decision that is made based
23 on different ways of achieving a result.
24 Q. What -- what criteria go into a
25 design decision, in your experience?

M. Crovella

A. This is -- as I say, this is different ways of achieving a result, not defining a design decision in my report. I'm simply saying that the table is taught by Pham as being in the memory associated with a network processor. That was what was relevant for me in my analysis.

And whether it could be in other locations is something that I would have to think about in order to answer.

Q. All right. Is it accurate to say that that was not part of your analysis when you were drafting this Declaration?

A. I'd have to think about that.

I think that -- in my analysis, I also considered the fact that the functions, as I say, in Paragraph 126 --

Q. One second, please.

A. -- the functions of the ingress processor can be offloaded to the network processor. And so those functions could also exist in the ingress processor, meaning that this route/SA table could exist there as well.

Q. Why would a person of ordinary skill in the art put the routing/SA table in the network

1 M. Crovella

2 processor?

3 A. Again, the functions of Pham can be

4 realized in multiple ways. And placing the

5 route/SA table in the network processor allows the

6 network processor to perform the functions that

7 use the route/SA table, for example, the -- look

8 up security association information, the tagging

9 of packets, and so forth.

10 Q. Is there a reason to have the

11 route/SA table in the cryptoprocessor, as opposed

12 to the ingress processor and/or the egress

13 processor?

14 A. As I say, Pham discloses that these

15 functions can be performed in either location.

16 For my purposes, it was sufficient that they're

17 performed by the network processor.

18 I haven't considered whether it

19 could be performed in an egress processor, but

20 logically, for packets that are going to be

21 encrypted by the encryption -- encryption engine,

22 they're going to need the information from that

23 SA table to be associated with the packet before

24 it enters that engine.

25 Q. Does Pham disclose the SA --

1 M. Crovella
2 route/SA table as in the ingress and egress
3 processors in the preferred embodiment?
4 MR. MCPHERSON: I'll object to
5 the form of the question.
6 THE WITNESS: Again, I didn't
7 do -- again, I didn't consider which
8 embodiments were preferred or alternative.
9 In my analysis, that wasn't relevant to the
10 question that concerned me, which was
11 whether Pham discloses the functions we're
12 talking about. And, indeed, it does. And
13 for that reason, it -- it reads on both
14 patents.
15 BY MR. AUCHTER:
16 Q. Okay. What does Pham disclose in a
17 broad sense?
18 A. So as I say in Paragraph 62, Pham is
19 directed to a network data processor system in the
20 form of a virtual private network gateway that
21 includes a plurality of data packet processors in
22 the form of cryptoprocessors, coupled through a
23 data switch fabric between network connection
24 processors.
25 Q. Does a virtual private network

1 M. Crovella

2 gateway provide access to websites and other data

3 that's available on the Internet, typically?

4 A. I'm sorry. The question --

5 Q. Poorly crafted?

6 A. -- doesn't make sense for me.

7 Q. In your experience, can a user

8 access websites on the Internet through a virtual

9 private network gateway?

10 A. So a virtual private network gateway

11 is an element that's included in the key

12 indication path under certain circumstances in

13 which data's flowing over a virtual private

14 network. It's not directly related to whether or

15 not websites are accessible.

16 Q. So, for example, in Figure 1 of

17 Pham, does that suggest that the communication

18 between the two virtual private network gateways

19 are essentially a VPN going through the Internet

20 between them?

21 A. In the specific scenario that's

22 being designed in Figure 1, which I understand is

23 exemplary, the communication that's shown going

24 over the Internet is encrypted and is passing

25 between the two VPN gateways.

1 M. Crovella

2 Q. What in Pham corresponds to the

3 claimed security processor?

4 A. So as I say on Page 45 --

5 Q. One second while I scroll there,

6 please.

7 A. Yep.

8 (Pause.)

9 BY MR. AUCHTER:

10 Q. Thank you, Dr. Crovella.

11 A. The security processor is outlined

12 in brown in the figure in my report. It includes

13 the control processor 84, the crossbar switch

14 fabric 78 and the plurality of cryptoprocessors

15 86.

16 Q. Why doesn't it include an ingress

17 processor?

18 A. The functions of the security

19 processor, as described in the patent, are met by

20 the elements that I'm identifying in this figure.

21 Q. Does the ingress processor receive

22 incoming packets in the VPN gateway in Pham?

23 A. The ingress processor in Pham is one

24 of many elements that receive ingress -- incoming

25 packets in Pham.

1 M. Crovella

2 Q. Why isn't the egress processor part

3 of the security processor you've identified in

4 your Declaration?

5 MR. MCPHERSON: Object to the

6 form of the question.

7 THE WITNESS: Again, the security

8 processor that I identify in the figure in

9 my report fulfills the elements of the

10 claim, as described in Claim 1.

11 BY MR. AUCHTER:

12 Q. Does the egress processor send

13 outgoing packets?

14 A. The egress processor is one of many

15 elements that send outgoing packets in Pham.

16 Q. Could packets be sent out in Pham

17 without the egress processor?

18 A. Again, the sending in or out of

19 packets occurs in many places in Pham. All the

20 packets that leave the device of Pham eventually

21 pass through the egress processor.

22 Q. Could the devices in Pham receive

23 incoming packets without going through the ingress

24 processor?

25 A. Again, there are many devices within

1 M. Crovella

2 the system of Pham that receive incoming packets.
3 All the packets that enter the device of Pham pass
4 through the ingress processor, among other
5 elements.
6 Q. What other element do they go
7 through before they pass through the ingress
8 processor?
9 A. I'm sorry. That wasn't my --
10 Q. Okay. I'm sorry. I misunderstood
11 your answer. I apologize.
12 A. Okay.
13 Q. Okay. Do outgoing packets go
14 through the ingress processor in Pham?
15 A. The patents make reference to
16 incoming and outgoing packets. And every incoming
17 and outgoing packet will initially enter through
18 the ingress processor and eventually exit through
19 the egress processor.
20 Q. And is it correct to say that the
21 ingress processor could be part of the claimed
22 security processor?
23 A. I haven't considered that. I'd have
24 to think about it. It wasn't necessary for my
25 analysis to consider that.

1 M. Crovella

2 Q. Would it be incorrect to say that

3 the egress processor is part of the claimed

4 security processor?

5 A. I haven't considered that. It

6 wasn't necessary for my analysis. I'd have to

7 think about it.

8 Q. Directing your attention to

9 Paragraph 83, which is on Page 48 of your report.

10 Okay. In the -- is the SA table

11 that's shown there part of the preferred

12 embodiment in Pham?

13 A. Again, I didn't consider which

14 embodiments were preferred or alternative in Pham.

15 It wasn't necessary because Pham clearly teaches

16 the technology we're talking about here.

17 Q. What is patent -- I'm sorry. I

18 misspoke.

19 What is "packet classification,"

20 as that term is used in your report, specifically

21 at Page -- Paragraph 85, for example?

22 A. As I say in Paragraph 85, and as

23 the patents disclose, packet classification

24 generally involves matching information from an

25 incoming packet to a table of connection entries

1 M. Crovella

2 (which may include state and context elements and

3 relations to encryption associations) stored in,

4 for example, memory.

5 Q. And you were citing the '436 and the

6 '612 patents for that.

7 Does packet classification also

8 involve filtering?

9 A. It's going to depend on the context.

10 "Packet classification" is a term that could be

11 applied to a variety of different activities. It

12 may or may not include filtering.

13 Q. What about in Figure 12 of Pham,

14 which I believe is on Page 56 of your report --

15 A. Okay.

16 Q. -- so does packet classification

17 include filtering in that context?

18 MR. MCPHERSON: I object to the

19 form of the question.

20 MR. AUCHTER: I'm certain that

21 one made it on the record clearly.

22 (Laughter.)

23 THE WITNESS: I'm sorry. I

24 wanted to refresh my memory.

25 If you could just give me the

1 M. Crovella
2 question again.
3 BY MR. AUCHTER:
4 Q. Is filtering, as shown in Figure 12,
5 part of packet classification?
6 A. It may or may not be. It is clear
7 that the system of Pham processes packets needing
8 network address translation processing, firewall
9 table processing. And this is consistent with the
10 patents' disclosure.
11 Q. Why wouldn't packet filtering be
12 part of packet classification in Figure 12?
13 A. Again, it may or may not be. I
14 haven't considered that.
15 It's clear that the system of Pham
16 discloses classification processing, as described
17 by the patent.
18 Q. Where is it shown in your
19 Declaration where the intrusion detection system
20 of Wu would be located in the Pham system?
21 A. I describe this in Paragraphs 106
22 and 107 --
23 Q. Just give me a second, please --
24 (Pause.)
25 THE WITNESS: -- among other

1 M. Crovella
2 places in the report.
3 BY MR. AUCHTER:
4 Q. And does it say -- I mean, is there
5 an indication as to where the intrusion detection
6 system of Wu would actually be physically located
7 in the context of the block diagrams of Pham or
8 the architecture of Pham in these paragraphs or
9 any other paragraphs in your declaration?
10 A. I wasn't concerned with the physical
11 location. I was concerned with the functional
12 relationship. And as I describe in Paragraph 107,
13 it would have been obvious to modify the teachings
14 of Pham with the teachings of Wu, to add an
15 intrusion detection system, signature database to
16 the network data processor system and to
17 functionally locate the IDS between the network
18 processor and the encryption/decryption engine, as
19 I discussed above.
20 I make reference back to Section 7,
21 where I describe the motivation to combine Wu and
22 Pham, and I describe it in detail there as well,
23 the reason why functionally the system of Wu
24 would be located between the packet engine and
25 the cryptographic core or the network processor

1 M. Crovella

2 of the encryption and decryption engine.

3 Q. So in your opinion, where would the

4 signature database reside?

5 A. Are you referring to the signature

6 database of Wu?

7 Q. Yes.

8 A. So the signature database of Wu is

9 used to look up signatures in the system of Wu,

10 and in applying the teachings of Wu to Pham, it's

11 -- it would be expected that the signature

12 database would be accessible to the processor

13 that's performing the matching. So functionally,

14 it would need to have -- it would need to be

15 accessible to the processing system.

16 Q. And where is that set out in your

17 Declaration?

18 A. Again, the teachings of Wu are

19 clearly laid out in my declaration. I describe it

20 both in Paragraphs 104 through 107 but also in

21 Paragraphs 70 through 74. And in both of those

22 cases, it's clear from the figures that I provide

23 that the database is accessible to the IDS.

24 Q. And those figures are from Wu; is

25 that correct?

1 M. Crovella
2 A. That's right.
3 Q. What is a "cryptographic boundary"?
4 A. As I say in Paragraph 130 -- and I
5 think this is consistent with the patent as
6 well -- a person of ordinary skill in the art
7 understands a cryptographic boundary to mean an
8 explicitly defined continuous perimeter that
9 establishes the physical bounds of a cryptographic
10 module and contains all hardware, software and/or
11 firmware components of a cryptographic module.
12 Q. And in your illustration on Page 76,
13 the cryptographic boundary includes the ingress
14 processor and the egress processor; is that
15 correct?
16 A. That's correct.
17 Actually, if there's a good
18 breaking point in the next few minutes, that
19 would be great.
20 MR. AUCHTER: We can do it now,
21 if you'd like.
22 THE WITNESS: Okay.
23 --oOo--
24 (Whereupon, a recess was taken from
25 11:07 a.m. EST to 11:18 a.m. EST.)

1 M. Crovella
2 --oOo--
3 BY MR. AUCHTER:
4 Q. Dr. Crovella, did you speak with
5 counsel during the break?
6 A. We didn't discuss anything related
7 to the case.
8 Q. Directing your attention to Figure 1
9 of the Pham reference, Exhibit 1004 --
10 A. Okay.
11 Q. -- do you see that there are two
12 LANs going into the VPN gateway, as shown in
13 Figure 1?
14 A. I do.
15 Q. Okay. If packets are being moved
16 between, for example, LAN 3 and LAN 4, as shown in
17 Figure 1, would those packets go through the
18 cryptoprocessors of the VPN gateway?
19 A. My understanding of how Pham could
20 and would be used in practice is that in general,
21 packets could be processed by the cryptoprocessor.
22 But in Figure 1 specifically, the figure is
23 describing a specific scenario, not necessarily
24 the only way in which Pham would be used, and in
25 this specific scenario, the figure indicates that

M. Crovella

data traffic on both LAN 3 and LAN 4 is clear text.

So, generally, we would say that in this specific scenario, those packets would not be going through the cryptoprocessor.

Q. Is there -- strike that.

Directing your attention to Page 66 of your declaration, which would be Paragraph 17 -- well, Section IX -- IX, I guess --

A. Okay.

Q. -- am I correct that you're identifying 122 as being the local data bus?

A. That's correct.

Q. And how is that local data bus coupled to the switching system, as shown in Figure 6?

A. As I describe in Paragraphs 118 through 120, the direct data transfer bus 122 is coupled to the switch fabric, the switching system, via the network processor, and this is consistent with the patent's use of the word "coupling," in that it includes direct coupling as well as coupling through an intermediate element.

1 M. Crovella
2 I also point out to the extent that
3 the patent owner argues that the local data bus
4 must be directly coupled to the switching system,
5 it would have been obvious to a POSITA to do so.
6 Q. Is coupling through the network
7 processor consistent with direct data transfer, as
8 disclosed in Pham?
9 A. Where in Pham would you like me to
10 look?
11 Q. Paragraph 52. I believe that's the
12 only time they actually discuss direct data
13 transfer in Pham.
14 A. So in Paragraph 52, Pham is
15 describing the data transfer bus as a direct data
16 transfer bus. That's exactly what I say in my
17 Paragraph 117 in my report.
18 Q. And what is your understanding of a
19 "direct data transfer bus"?
20 A. This is a phrase that appears in
21 Pham apparently in this one location, and it's
22 describing the data transfer bus that moves data
23 between the network processor and the
24 encryption/decryption engine.
25 Q. And do you have an understanding as

1 M. Crovella
2 to what was meant by "direct data transfer bus,"
3 as opposed to any other kind of bus?
4 A. I don't see Pham as making a
5 distinction between a direct data transfer bus and
6 any other kind of bus.
7 Q. In your experience, is a local data
8 bus a direct data transfer bus?
9 A. Reading the patents and the
10 reference that they make to a local data bus, when
11 I read Pham, it's clear to me that Pham's direct
12 data transfer bus satisfies the limitation of a
13 local data bus in the patents.
14 Q. In your experience, at the time of
15 the invention, would a local data bus have been a
16 direct data transfer bus?
17 A. If you're asking me about those
18 terms as I would have understood them at the time,
19 I would say that it may or may not be the same
20 thing, depending entirely on the context.
21 Here, the context is the patents as
22 well as the disclosure of Pham, and in this
23 context, it's quite clear that what Pham is
24 disclosing as a direct data transfer bus meets
25 the limitation of a local data bus in

1 M. Crovella

2 the patents.

3 Q. Does Pham disclose a direct data

4 transfer bus to the memory in, for example,

5 Figure 6?

6 A. As I said, Pham discloses a coupling

7 between the local data bus, which is the direct

8 data bus of Pham, and the switching system; and

9 that coupling is through the network processor.

10 Q. Is it accurate to say that the

11 memory is coupled to the network processor?

12 A. In the system of Pham, the memory is

13 connected to the network processor, and so that

14 would be an example of coupling.

15 As I say, in my report, it's also

16 the case that the memory would be coupled to the

17 local data bus in the -- consistent with

18 the patent's use of the word "coupling."

19 Q. The Pham patent or the patents --

20 '436 and '612 patents?

21 A. Pham's publication, correct?

22 Q. Pham's publication. My apologies.

23 Directing your attention to the

24 Krishna reference in -- I guess that's at Page 82

25 of your declaration. Does the Krishna reference

1 M. Crovella
2 disclose having the ingress and egress engine on
3 a single chip along with the other elements?
4 A. Can you tell me what you mean by
5 "the ingress and egress engine"?
6 Q. I'm sorry. I meant the ingress
7 processor and the egress processor. I misspoke.
8 A. So you're asking about the ingress
9 and egress processor? Is this the processor in
10 Pham -- the ingress and egress processor in Pham?
11 Q. Along with that.
12 Would the FIFO input unit be the
13 equivalent of the ingress processor?
14 MR. MCPHERSON: Object to the
15 form of the question.
16 BY MR. AUCHTER:
17 Q. The FIFO input unit is Element 202,
18 Figure 2 of Krishna Exhibit 1006; the ingress
19 processor is the ingress processor of Pham that
20 we've discussed.
21 A. So what Krishna teaches is the
22 integration of multiple components on a single
23 chip. Krishna specifically includes a packet
24 engine, a cryptographic core and communication
25 components.

1 M. Crovella

2 The combination, including Krishna,
3 teaches the application of the ideas of Krishna
4 in the system of Pham and Collins and, therefore,
5 teaches that the components of Pham and Collins
6 could be integrated on a single chip.
7 Q. Would that include the switching
8 system?
9 A. Again, what Krishna teaches is the
10 integration of multiple components on a single
11 chip, including the network processor, the
12 encryption/decryption engine and the arithmetic
13 unit. It may or may not include the network
14 processor, but it teaches a system that combines
15 those components with or without the network
16 processor.
17 Q. What is it in Pham that corresponds
18 to the tag that determines an egress path in the
19 context of -- I think it was Claim 1 on Page 50 --
20 starting on Page 53 of your declaration?
21 A. As I say in Paragraph 92, Pham
22 discloses the incoming and outgoing packets are
23 provided with SA header information and an IP
24 tunneling header on ingress to one of the
25 plurality of network processors, and so the SA

1 M. Crovella
2 header information and IP tunneling header
3 constitute the tag.
4 Q. What are the elements of the SA
5 header information?
6 A. Generally, the SA header includes
7 security association parameters. These are,
8 typically, the choice of cryptographic algorithms
9 and keys necessary for performing cryptographic
10 functions.
11 Q. Would that include, for example, the
12 ESP header, if I understand that term correctly?
13 Not "extrasensory perception,"
14 but rather "encapsulating security payload," I
15 believe is the acronym.
16 A. The ESP header is used when the
17 packet is transmitted over the network. The SA
18 header here is simply a term for whatever security
19 parameters are needed for processing by the crypto
20 engine.
21 Q. Would that be part of the IPsec
22 encryption that's referred to in Figure 1?
23 MR. MCPHERSON: Object to the
24 form of the question.
25 THE WITNESS: Can you be more

1 M. Crovella
2 specific?
3 BY MR. AUCHTER:
4 Q. Sure.
5 Would the ESP header be part of
6 IPsec encryption, as shown in Figure 1 of the
7 Pham reference?
8 A. In Figure 1 of the Pham reference,
9 the data that's flown over the WAN is encrypted.
10 Is IPsec encrypted? That's a
11 general term. It could refer to either of --
12 well, in the case of a VPN, it's going to refer
13 to encryption using the ESP protocol, which would
14 involve ESP headers.
15 Q. In the embodiment shown in Figure 1
16 of Pham, what percentage of the traffic would be
17 going over the Internet WAN?
18 A. In the embodiment shown, there's the
19 -- there's no imitation; it could be anything
20 between none or all of the traffic.
21 Q. Does the Wu reference teach a
22 preferred location from the IDS?
23 A. I didn't determine whether Wu
24 identifies a single preferred location, but Wu is
25 very clear that the network intrusion detection

1 M. Crovella
2 may be placed at key points throughout the
3 network.
4 It's also the case that a person of
5 ordinary skill in the art would understand that
6 IDS systems require inspection of unencrypted
7 traffic, and so placement on a link passing
8 unencrypted data would be needed.
9 Q. At the time of the invention in the
10 '436 and '612 patents, were intrusion detection
11 systems in commercial systems typically located
12 near the encryption/decryption?
13 A. My recollection is that, in fact,
14 systems that used encryption would typically
15 locate a network intrusion detection system near
16 the encryption component so that unencrypted
17 traffic could be examined. That was common but,
18 certainly, by no means the only way that network
19 intrusion detection systems were deployed.
20 MR. AUCHTER: Give me about
21 five minutes, if you would, and I think
22 we're close to wrapping up.
23 THE WITNESS: Okay.
24 CERTIFIED STENOGRAPHER: Okay.
25 I'm off the record.

1 M. Crovella
2 --oOo--
3 (Whereupon, a recess was taken from
4 11:50 a.m. EST to 11:58 a.m. EST.)
5 --oOo--
6 MR. AUCHTER: I have no further
7 questions at this point.
8 MR. MCPHERSON: I'm going to
9 follow up with one quick section -- or
10 several questions.
11 Can the court reporter hear me
12 okay?
13 CERTIFIED STENOGRAPHER: If you
14 can speak a little bit more into the input,
15 that'd be great.
16 MR. MCPHERSON: Yes, I will try.
17 CERTIFIED STENOGRAPHER: Thank
18 you.
19 --oOo--
20 EXAMINATION BY COUNSEL FOR PETITIONER
21 --oOo--
22 BY MR. MCPHERSON:
23 Q. Dr. Crovella, you were asked certain
24 questions about what you reviewed in preparing
25 your declaration.

1 M. Crovella
2 Do you recall that?
3 A. I do.
4 Q. Can you turn to Page 2 of your
5 declaration and, specifically, to Paragraph 7?
6 A. Okay.
7 Q. I think you were asked specifically
8 whether you reviewed the file history of the '612
9 patent.
10 Do you recall that question?
11 A. Yes.
12 Q. I'm not sure I heard what your
13 answer was.
14 In preparation, did you, in
15 fact, review the '612 patent prosecution history?
16 A. I did.
17 Q. Okay. And is that identified in
18 Paragraph 7?
19 A. It is.
20 Q. And is the '612 prosecution history
21 identified as part of the materials you reviewed
22 in Appendix A?
23 A. It is.
24 MR. MCPHERSON: I have no further
25 questions.

1 M. Crovella
2 MR. AUCHTER: No further
3 questions.
4 Thank you very much,
5 Dr. Crovella.
6 THE WITNESS: Okay.
7 MR. MCPHERSON: Cindy, thank you.
8 Everybody, have a good day.
9 Thank you, Robert.
10 MR. AUCHTER: Thank you, Pat.
11 Thank you, Cindy.
12
13 (Witness excused.)
14
15 (Deposition concluded at approximately 11:59 a.m.
16 EST.)
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1 C E R T I F I C A T E

2 I, Cindy L. Sebo, Nationally Certified Court
3 Reporter herein, do hereby certify that the foregoing
4 remote deposition of **MARK E. CROVELLA, PH.D.** was
5 taken before me pursuant to notice at the time and
6 place indicated remotely; that said witness remotely
7 duly swore to tell the truth, the whole truth, and
8 nothing but the truth under penalties of perjury; that
9 said testimony of the witness was correctly recorded
10 to the best of my abilities in machine shorthand,
11 thereafter transcribed under my supervision with
12 computer-aided transcription; that the remote
13 deposition is a true and accurate record of the
14 testimony given by the witness; that I am neither
15 counsel, nor kin to any party in said action, nor
16 interested in the outcome; and that a copy of this
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18 court reporting firm, including an adversary or
19 co-counsel in the matter, is uncertified and may not
20 be used at trial.
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22 CINDY L. SEBO, RMR, CRR, CLR, RPR, CCR, CSR,
23 RSA, CA CSR 14409, NJ Certified CR 30XI0024460,
NJ Certified RT 30XR00019500, NM CSR 589, NY
24 Realtime Court Reporter, NY Association Certified
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25 12778, WA CSR 23005926, Notary Public

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2 Please read your deposition over
3 carefully and make any necessary corrections. You
4 should state the reason in the appropriate space on
5 the errata sheet for any corrections that are made.
6 After doing so, please sign the
7 errata sheet and date it.
8 You are signing same subject to the
9 changes you have noted on the errata sheet, which
10 will be attached to your deposition.
11 It is imperative that you return the
12 original errata sheet to the deposing attorney
13 within thirty (30) days of receipt of the
14 deposition transcript by you. If you fail to do
15 so, the deposition transcript may be deemed to be
16 accurate and may be used in court.
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1 E R R A T A
2 WITNESS: MARK E. CROVELLA, PH.D.
3 DATE: January 11, 2024
4 CAPTION: Cisco Systems, Inc. v. Lionra Technologies Limited
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1 E R R A T A

2 WITNESS: MARK E. CROVELLA, PH.D.

3 DATE: January 11, 2024

4 CAPTION: Cisco Systems, Inc. v. Lionra Technologies Limited

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24 _____ _____

25 DATE MARK E. CROVELLA, PH.D.

1 ACKNOWLEDGMENT OF WITNESS

2

3 I, MARK E. CROVELLA, PH.D., do hereby
4 certify that I have read the foregoing pages herein,
5 and that the same is a correct transcription of the
6 answers given by me of the proceedings taken
7 remotely to the questions therein propounded under
8 penalty of perjury, except for the corrections or
9 changes in form or substance, if any, noted in the
10 attached errata sheet.

11

12 _____ _____
13 DATE SIGNATURE

14

15

16 Subscribed and sworn to before me
17 this _____ day of_____, 20____.

18

19

20 My Commission expires:

21

22 _____

23

24 _____
25 Notary Public