

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3

4
5 CISCO SYSTEMS, INC.,

6 Petitioner

7 v.

8 ORCKIT CORPORATION,

9 Patent Owner.

10
11 Case IPR2023-00714

12 U.S. Patent No. 6,680,904
13

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16 DEPOSITION OF DR. HENRY H. HOUH, Ph.D.

17 TAKEN REMOTELY BY VIDEOCONFERENCE

18 February 6, 2023
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24 Reported by: Mary Ann Payonk

25 Job No. 1291

February 6, 2024

9:30 a.m.

DEPOSITION OF HENRY H. HOUH, Ph.D., taken
remotely by videoconference pursuant to Notice and
agreement of counsel, stenographically reported by Mary
Ann Payonk, Shorthand Reporter and Notary Public, CA CSR
No. 13431.

All attorneys participating in this deposition
acknowledge that the reporter is not physically present
in the deposition room and there is no objection to the
oath being administered remotely.

1 APPEARANCES:

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18
19 ALSO PRESENT:

20 Deric Shults, Videographer

1 THE VIDEOGRAPHER: We are now on the record.
2 The time now is 9:30 AM Eastern Standard Time. Today's
3 date is February 6, 2024.

4 This begins the remote video-recorded
5 deposition of Dr. Henry Houh in the matter of Cisco
6 Systems versus Orckit Corporation. I will be recording
7 this deposition remotely, and the reporter will swear in
8 the witness remotely pursuant to Federal Rules of Civil
9 Procedure and the stipulated deposition protocol in this
10 case.

11 My name is Deric Shults, and I'm with BlueBear
12 Solutions. Our court reporter is Mary Ann Payonk.

13 Counsel, please identify yourselves and state
14 whom you represent.

15 ATTORNEY STAMATOPOULOS: Should we start with
16 the petitioner or patent owner?

17 THE REPORTER: Doesn't matter.

18 ATTORNEY STAMATOPOULOS: For the patent owner,
19 George Stamatopoulos with Kobre & Kim.

20 ATTORNEY KONSTANTAKOPOULOS: Theodoros
21 Konstantakopoulos on behalf of petitioner Cisco Systems.

22 THE VIDEOGRAPHER: Any stipulations or
23 announcements from either party?

24 ATTORNEY STAMATOPOULOS: No.

25 ATTORNEY KONSTANTAKOPOULOS: None from

1 petitioner either.

2 THE VIDEOGRAPHER: The reporter may swear in
3 the witness.

4 THE REPORTER: Yes, and I'll give you my
5 California license number, which is 13431. And now I'll
6 swear the witness.

7 HENRY H. HOUH, Ph.D.,

8 called as a witness, having been duly
9 sworn, was examined and testified as
10 follows:

11 EXAMINATION

12 BY ATTORNEY STAMATOPOULOS:

13 Q. Good morning, Dr. Houh. How are you?

14 A. Good morning. I'm well, thank you. How are
15 you?

16 Q. Doing well.

17 Dr. Houh, have you ever been deposed before?

18 A. Yes, I have.

19 Q. Approximately how many times, sir?

20 A. I don't know. Maybe 120 times or more.

21 Q. And have you ever testified at trial?

22 A. Yes, I have.

23 Q. And approximately how many times have you
24 testified at trial?

25 A. Maybe around 15 times.

1 Q. And with respect to your depositions, were all
2 these depositions in patent cases?

3 A. Might have been.

4 Q. They may not have been?

5 A. That's right. They -- they -- they may not
6 have all been in patent cases.

7 Q. Roughly how many times have you been deposed
8 in patent cases?

9 A. Well, the same number minus maybe a handful, a
10 couple. Two, three, four maybe that -- that -- that
11 work may be not -- not patent cases.

12 Q. So you've been deposed over 100 times in
13 patent cases.

14 Fair?

15 A. Yes.

16 Q. And of the times you've testified at trial,
17 roughly how many times were they in connection with
18 patent cases?

19 A. All but one.

20 Q. All but one?

21 A. Yes.

22 Q. Now, you understand that your testimony here
23 today is under oath just like in court.

24 Is that correct?

25 A. Yes.

1 Q. Is there any reason why you can't give
2 accurate and complete testimony here today?

3 A. No.

4 Q. I'll ask that in answering my questions you
5 try to provide verbal answers as opposed to gestures or
6 nonwords so that the court reporter can capture your
7 answers.

8 Is that okay with you, sir?

9 A. Yes. I'll do my best.

10 Q. Okay. If you find a question I've asked to be
11 unclear, please let me know and I'll try to ask a better
12 question.

13 Fair?

14 A. Yes.

15 Q. If you do understand my question, however,
16 you'll answer my question?

17 A. I'll do my best.

18 Q. And if -- your lawyer may -- may at times
19 object. Even if your lawyer objects, you should still
20 answer my question unless your lawyer instructs you not
21 to do so.

22 Do you understand that?

23 A. Yes.

24 Q. And if you think of something that's relevant
25 to a question that I've asked after we've proceeded to a

1 different question, you'll let me know?

2 A. Yes.

3 Q. Great.

4 Now, sir, you've been retained in this case as
5 an expert witness on Cisco's behalf, right?

6 A. Yes.

7 Q. Do you recall who reached out to you in
8 connection with serving as an expert in this case?

9 A. I don't recall exactly.

10 Q. Was it one of Cisco's lawyers?

11 A. Yes.

12 Q. Was it Mr. Konstantakopoulos?

13 A. I think that's the most likely, but I'm not
14 totally sure. I just don't remember.

15 Q. Have you worked with Mr. Konstantakopoulos
16 before?

17 A. Yes, I have.

18 Q. How many times?

19 A. I don't remember exactly. Maybe six times.
20 Half a dozen times or so.

21 Q. And in each of those instances did you serve
22 as an expert on Cisco's behalf, or was it some other
23 party?

24 A. It may have been some other parties. I -- I
25 just don't remember all the cases exactly.

1 Q. Were they all in the context of inter partes
2 review proceedings?

3 A. I'd have to look at my files. I don't -- I
4 don't know for sure.

5 Q. Okay. Each of those times you were paid for
6 your services?

7 A. I mean, to the extent there aren't any
8 outstanding invoices still, but generally, I do get paid
9 for my services.

10 Q. The arrangement was that you would serve as an
11 expert and be paid for your services. Correct?

12 A. Generally, yes.

13 Q. Okay. And in total, how much would you say
14 you have invoiced Cisco in connection with providing
15 services as an expert witness?

16 A. I don't usually send my invoices to Cisco.

17 Q. Okay. You send your invoices to the law firm
18 representing Cisco.

19 Is that fair?

20 A. Usually, yes.

21 Q. All right. And how much would you say you've
22 invoiced in connection with matters in which you've
23 served as an expert witness for Cisco?

24 A. Yeah, I -- I wouldn't have an -- I wouldn't
25 have an exact -- I -- I don't know. I don't even know

1 how to estimate a rough number here. I just don't track
2 things like that.

3 Q. You don't have a rough approximation?

4 A. It's hard to come up with even a rough
5 approximation because I don't know how far off I'd be.

6 Q. Okay. Now, are you expecting to have to
7 testify in connection with any other matter relating to
8 Cisco other than the matter that you're testifying on
9 here today?

10 ATTORNEY KONSTANTAKOPOULOS: Objection to the
11 extent it requires privileged information.

12 ATTORNEY STAMATOPOULOS: It does not. It's
13 just a yes or no question.

14 BY ATTORNEY STAMATOPOULOS:

15 Q. You can answer yes or no, or I don't know.

16 A. At the moment, I -- I don't think I am, but
17 that could change.

18 Q. Do you know, yes or no, if you are expected to
19 provide expert testimony or testify at trial in any
20 matter involving these patents?

21 Let me rephrase the question.

22 Are you expecting to provide an expert report
23 or testify in a district court case involving the '904
24 patent?

25 ATTORNEY KONSTANTAKOPOULOS: Objection. Same

1 objection.

2 THE WITNESS: What was the objection?

3 ATTORNEY KONSTANTAKOPOULOS: Same objection,
4 to the extent it asks for privileged information.

5 A. I mean, I have nothing on my calendar right
6 now.

7 BY ATTORNEY STAMATOPOULOS:

8 Q. Okay. And when I say the '904 patent, you
9 understand that to be the US Patent Number 6,680,904?

10 A. Yes.

11 Q. I'll refer to that as the '904 patent for
12 short.

13 Is that fair?

14 A. Sure.

15 Q. Do you have the '904 patent with you today?

16 A. Yes.

17 Q. Do you have it in front of you?

18 A. Yes.

19 Q. And in addition to the '904 patent, do you
20 have a declaration that you submitted in this matter in
21 front of you?

22 A. Yes.

23 Q. Okay. So do you also have a prior art
24 reference called Patrick that is -- on which you've
25 provided opinions in your declaration in front of you?

1 A. Yes.

2 Q. And similarly, do you have a prior art
3 reference referred to as Vink in your declaration in
4 front of you?

5 A. Yes.

6 Q. Okay. Now, Dr. Houh, have you ever worked for
7 Cisco as an employee?

8 A. No.

9 Q. Have you ever received any grants from Cisco?

10 A. No, not directly.

11 Q. What about indirectly?

12 A. Well, I don't think so. I -- I once worked at
13 a company that had some sort of partnership with -- with
14 Cisco, but I -- I don't know all the legalities of that
15 or what was involved.

16 Q. Roughly how long ago was that?

17 A. Oh, that was around 1998, '99 time frame.

18 Q. And, Dr. Houh, let me switch gears a little
19 bit. Did you do anything to prepare for your testimony
20 here today, sir?

21 A. Yes, I did.

22 Q. What did you do to prepare, at a high level?

23 A. I -- I met with attorneys and I -- I reviewed
24 some documents.

25 Q. And when did you meet with your attorneys?

1 A. Yesterday.

2 Q. Was it just yesterday that you met with your
3 attorneys?

4 A. Yes.

5 Q. For how long did you meet?

6 A. I don't remember exactly. Probably over four
7 hours.

8 Q. Okay. And it was -- you met with
9 Mr. Konstantakopoulos.

10 Did you meet with anybody else?

11 A. Yes.

12 Q. With whom did you meet?

13 A. Also with Sam -- I -- I don't -- I don't know
14 his -- I think it's -- I think it's a Korean name, but
15 Sam Ha, I think, and also Emily Weber. I think those
16 are right. I'm not 100 percent sure.

17 Q. Okay. Was it just those three folks?

18 A. Yes.

19 Q. Okay. And you said you reviewed some
20 documents.

21 You reviewed your declaration?

22 A. Yes.

23 Q. Did you review the Vink reference?

24 A. Yes.

25 Q. Did you review the Patrick reference?

1 A. Yes.

2 Q. Did you review the '904 patent?

3 A. Yes.

4 Q. And you reviewed these patents with your
5 attorneys? Or let me rephrase that.

6 You reviewed those documents with your
7 attorneys. Correct?

8 A. Some of them. Some of them.

9 Q. Some of them? What do you mean by that?
10 (Reporter clarification.)

11 A. I don't think I reviewed all of those
12 documents with the attorneys in terms of looking at the
13 documents, but I reviewed some of them.

14 BY ATTORNEY STAMATOPOULOS:

15 Q. Okay. And that was during the -- the course
16 of a four -- approximately four-hour meeting you had
17 with your attorneys?

18 A. Yes.

19 Q. Did you review any other documents beyond the
20 declaration, the Vink reference, the Patrick reference,
21 and the '904 patent?

22 A. I --

23 ATTORNEY KONSTANTAKOPOULOS: Objection. I
24 just want to caution the witness not to reveal any
25 privileged communications.

1 BY ATTORNEY STAMATOPOULOS:

2 Q. You can answer yes or no, assuming that's okay
3 with your attorney.

4 ATTORNEY KONSTANTAKOPOULOS: You can answer
5 yes or no.

6 A. Yes.

7 BY ATTORNEY STAMATOPOULOS:

8 Q. What other documents did you review?
9 Do you recall?

10 A. I reviewed the institution decision and the
11 patent owner preliminary response.

12 Q. Okay. And you reviewed all of these documents
13 yesterday?

14 A. No.

15 Q. When did you review these documents?

16 A. I reviewed some of them the day before.

17 Q. How much time would you say you spent
18 reviewing these documents the day before?

19 A. Couple hours.

20 Q. Okay. And outside of the couple of hours that
21 you spent on your own reviewing the documents, as well
22 as the four or five hours you said you spent with your
23 attorneys yesterday, did you spend any other time
24 reviewing any documents related to this case?

25 A. I mean, I spent some time outside of meeting

1 with attorneys yesterday reviewing some documents as
2 well.

3 Q. Okay. So outside of those occasions yesterday
4 and the day before yesterday, how much time would you
5 say you spent preparing for your testimony here today?

6 A. So outside of yesterday and the day before,
7 how much -- how much time did I spend reviewing?

8 Q. Correct.

9 A. I -- there was no other time, really.

10 Q. Your meetings with your attorneys, were they
11 in person or via Zoom?

12 How were they conducted?

13 A. They were on Zoom.

14 Q. Now, Dr. Houh, you submitted a declaration in
15 connection with your deposition. Correct?

16 Is that right?

17 A. I mean, I submitted a declaration. I don't
18 think it was specifically in -- in connection with
19 this -- I mean, it -- it -- the deposition was with
20 respect to that, but -- but I submitted it before the
21 deposition ever occurred or even if I knew there would
22 be a deposition.

23 Q. I -- I misspoke, sir. I misspoke. You
24 submitted a declaration in this case. Yes?

25 A. Yes.

1 Q. How much time would you say you spent
2 preparing your declaration?

3 A. Sorry, I -- I didn't hear the whole question.

4 Q. How much time did you spend in connection with
5 preparing your declaration?

6 A. Yeah, I don't know offhand.

7 Q. Well, did you spend more or less than 10
8 hours?

9 A. It was probably more, but I don't recall
10 offhand.

11 Q. You don't know for sure if it was more than 10
12 hours?

13 A. I mean, it seems likely that to me it was
14 more, but I don't know. I'd have to go back and review
15 my records.

16 Q. Okay. Do you think you spent more or less
17 than 20 hours?

18 A. Again, I'm not sure how to answer that one way
19 or the other because I -- I just don't recall the
20 details of how much time I worked on this case.

21 Q. So what's your best estimate of how much time
22 you spent in connection with preparing your declaration
23 for the '904 patent?

24 A. I mean, any estimate I have is going to be
25 rough because I don't really have an idea or -- or

1 remember any specifics about the time when I prepared
2 this declaration.

3 Q. Well, give me your best rough estimate.

4 A. Probably, you know, two or three days' worth
5 of time.

6 Q. And what did you do to prepare your
7 declaration?

8 A. Just to be clear, it's -- it's spread out, not
9 just necessarily limited to two or three days. But I
10 mean, reviewed various documents related to the case,
11 the patent prosecution history, various pieces of prior
12 art.

13 I -- I -- I had some meetings with the
14 attorneys. That's the kind of thing I generally do.
15 And I do -- I have vague memories of -- of meetings but,
16 you know, I don't remember specific meetings.

17 Q. Okay. You -- you said at the top of your
18 response that it wasn't necessarily limited to two to
19 three days. Did I catch that correctly?

20 A. What I meant was it wasn't over a period of --
21 the total time was about two or three work days of
22 hours, not that it happened only on two or three days is
23 what -- is what I meant.

24 Q. Okay. And in this -- in this time span of two
25 to three days in total, you reviewed the patent. Yes?

1 A. Well, that's a rough estimate. It could have
2 been more than that. It could have been around -- I --
3 you know, again, that was a very rough -- rough
4 estimate. But I do review the patent, yes. I did
5 review the patent.

6 Q. Okay. Your best recollection is two to three
7 days, right?

8 A. Of -- of total time spread out over some
9 period of time, which I don't remember how long it would
10 have been. But -- but that's a rough estimate. It
11 could very well have been more. It probably wasn't
12 likely that much less.

13 Q. Okay. But your best recollection as you sit
14 here today is two to three days.

15 Is that fair?

16 A. It -- it's not a recollection, it's a -- just
17 a rough estimate, but I -- I -- because I don't recall
18 like exactly those hours. It's just a rough estimate
19 that you asked me for.

20 Q. Let me rephrase it just to be clear for the
21 record.

22 So your best rough estimate as you sit here
23 today is two to three days?

24 A. Of total work time, yes.

25 Q. Okay. And during that total work time, you

1 reviewed the '904 patent. Correct?

2 A. Yes.

3 Q. And you reviewed the Vink reference, right?

4 A. Yes.

5 Q. And you reviewed the Patrick patent. Correct?

6 A. Yes.

7 Q. And you analyzed these documents carefully.
8 Correct?

9 A. I mean, I -- I reviewed them. I mean, I -- I
10 do -- and for my analysis with respect to my
11 declaration, I reviewed all the analysis. I spent time
12 on the analysis in reviewing the references in light
13 of -- of -- of the analysis that I'm doing, or did.

14 Q. So my question was whether you reviewed these
15 documents carefully.

16 Do you agree that you reviewed them carefully?

17 ATTORNEY KONSTANTAKOPOULOS: Objection.

18 A. Sure. Some portions more carefully, but sure.

19 BY ATTORNEY STAMATOPOULOS:

20 Q. Some portions less carefully?

21 A. Well, I reviewed the whole references. But,
22 like, I spent -- sometimes I spent a lot more time
23 reviewing selected portions. So I wouldn't characterize
24 it the way you did.

25 I would say that there's some questions I

1 spent a lot of time reviewing and analyzing the context
2 of the whole patent.

3 Q. You said selected portions. Fair?

4 A. I did say that, I think.

5 Q. Who selected these portions?

6 Did you?

7 ATTORNEY KONSTANTAKOPOULOS: Objection.

8 A. I -- I mean, I don't have specific memories,
9 but I very well could have selected, and I often do when
10 writing declarations select portions of the patents to
11 cite.

12 BY ATTORNEY STAMATOPOULOS:

13 Q. Okay. So how did you choose which portions
14 not to review as carefully?

15 ATTORNEY KONSTANTAKOPOULOS: Objection.

16 A. Well, I think that's a mischaracterization. I
17 reviewed the whole patent, you -- you know, in context
18 and all the -- the patents. And there are some -- some
19 portions that are -- that I recognize as standard
20 boilerplate and some portions that are more relevant to
21 my analysis.

22 So the -- the portions I -- I -- and are more
23 relevant to certain parts of the analysis I often
24 review, you know, over and over again and look -- look
25 at the context with respect to those passages and, you

1 know, with respect to the whole reference.

2 BY ATTORNEY STAMATOPOULOS:

3 Q. And these portions that are more relevant to
4 your analysis, do you recall which portions those are?

5 A. Oftentimes, I'll cite those portions in my
6 declaration. So if you look at the declaration, most of
7 what's cited are portions that I focus in on.

8 Q. Okay. And so the portions that are most
9 relevant to your analysis from the prior art references
10 in the patent, those should be in your declaration.

11 Correct?

12 A. Maybe they should have been, but sometimes or
13 oftentimes there are duplicative or other passages that
14 say similar or the same things in the patent and I don't
15 always cite to all of the -- all of them.

16 Q. Fair to say that if something -- withdrawn.

17 Fair to say that if you considered something
18 relevant to your opinions, you cited it in your
19 declaration?

20 A. I mean, I think that's generally what I try to
21 do, so I think that's generally a fair statement.

22 Q. And if something isn't relevant to your
23 analysis, then it's not in your declaration. Fair?

24 A. Well, I mean, again there may be passages that
25 were similar or say the same thing that I didn't

1 necessarily cite to. I -- I might have cited something
2 that said the same or something very similar.

3 Q. How would you describe your level of
4 familiarity with Vink?

5 A. I think I'm familiar with it enough to write
6 this declaration and submit it.

7 Q. And would you give the same answer if I asked
8 you about the '904 patent? Same question?

9 A. Well, I mean, I suppose.

10 Q. Well, I'm not asking you to suppose.

11 Are you familiar with the '904 patent?

12 A. I'm not -- I'm -- I mean, I'm saying I suppose
13 my answer would be similar, which is, you know, I'm
14 familiar with it enough at least to write this
15 declaration and submit it, and these are my opinions.

16 Q. Same with Patrick?

17 Oh, sorry. Your -- your answer -- sir, your
18 answer cut off, or at least I missed it, the last part
19 of it.

20 A. I think the -- the last part was of the '904
21 patent.

22 Q. So you're familiar enough with the '904 patent
23 to submit a declaration. Is that -- did I capture that
24 correctly?

25 A. I suppose that's -- generally goes to the gist

1 of what I said.

2 Q. Okay. And what about Patrick?

3 Are you familiar with the Patrick reference?

4 A. Generally, yes.

5 Q. How would you describe your level of
6 familiarity with respect to the Patrick reference?

7 A. I mean, familiar with it enough to submit
8 opinions with respect to the patentability of the '904
9 patent with respect to the various references I -- I
10 cited to therein.

11 Q. Okay. And how much time would you say you
12 spent actually writing your declaration?

13 A. I mean, whatever time I spent on this case was
14 reviewing documents and writing and reviewing the
15 declaration. I don't -- I don't know what else I would
16 have spent time on that's not related to this
17 declaration.

18 Q. Well, you testified earlier that in total you
19 spent between two and three days preparing the
20 declaration, right?

21 A. I -- I'm not sure it was characterized exactly
22 as -- as -- yeah, but generally, that's, I mean, a rough
23 estimate of the time that I've spent on this case up --
24 up to the point where the declaration was submitted.

25 Q. Okay. So what I'd like to do is -- is dig

1 into a little bit how that time was spent.

2 So you spent that time reviewing the various
3 documents that you cite in your declaration. Correct?

4 A. I spent that time, sure.

5 Q. Okay. And then you spent some time writing
6 your declaration. Fair?

7 A. Some of that time, sure.

8 Q. Okay. How much was that time, approximately?

9 A. I mean, I -- I can't recall exactly. And it
10 varies over my different cases, so I -- I don't -- I --
11 I don't know how specific of an answer I could -- could
12 give here.

13 Q. Well, I'm not asking you about your other
14 cases. I'm asking you about this case.

15 How much time would you say, approximately,
16 you spent writing your declaration in this case?

17 A. I mean, I mention them because I work on a
18 number of cases so I don't have specific memories of --
19 of how much time I spent writing.

20 And as I said, I can only give you a rough
21 estimate how much time I actually spent on this case.
22 And it's -- you know, it -- it could be -- it could
23 be -- sometimes cases I know I work on I spend much more
24 time than -- than just, you know, three days' worth of
25 time.

1 So it's -- it's a rough estimate, but it's not
2 built from recalling specific tasks I did for this case.
3 It's -- it's a rough estimate because I -- I don't have
4 specific memories of -- of working on this case in
5 particular, so I -- it's hard for me to answer these
6 types of questions.

7 Q. You submitted your declaration in March of
8 2023. Yes?

9 A. That's correct.

10 Q. How many cases were you working on in parallel
11 as of March 2023?

12 A. Probably dozens of cases.

13 Q. Sorry?

14 A. Probably dozens of cases.

15 Q. Dozens of cases?

16 A. Yes.

17 Q. And you have -- correct me if I'm
18 mischaracterizing your testimony. You -- you said you
19 have a vague recollection of preparing your declaration
20 on this case.

21 Is that fair?

22 A. I have vague recollections of -- of meetings
23 with Theodoros and Emily and -- and Sam, but I -- I -- I
24 don't recall, like, which particular cases they're
25 related to.

1 And it could have been this case, but I just
2 have these vague memories. I mean, it was a -- it was
3 quite some time ago now, and I just don't remember
4 everything I did from day to day of things that happened
5 about a year ago.

6 Q. Okay. And when you met with your attorneys to
7 prepare for your deposition, was your recollection about
8 the various issues in this case refreshed?

9 A. Sure, to some extent.

10 Q. Some extent?

11 A. Yes.

12 Q. Do you feel prepared to testify here today
13 about those issues?

14 A. I'm prepared here to -- to answer questions
15 related to my declaration.

16 Q. Okay. Now, can you walk me through, Dr. Houh,
17 your academic background after college?

18 Or actually, let me withdraw that.

19 Can you walk me through your academic
20 background including college?

21 A. I don't have my CV here, but --

22 Q. Yeah, I don't need you to read me your entire
23 CV. You have a background in electrical engineering?

24 A. Yes. I got a bachelor's degree in electrical
25 engineering and computer science from MIT. I think that

1 was in 1989. And I got a bachelor's degree in physics
2 from MIT in 1990, I think. I think I'm remembering
3 those two years properly. They could be swapped. I
4 just don't remember.

5 Then in 1991, I got a master's degree in
6 electrical engineering and computer science, also from
7 MIT. And then in February 1998 I got my Ph.D. in
8 electrical engineering and computer science.

9 Q. Did you at any point in time teach any courses
10 on networking technologies?

11 A. I mean, I think I -- I've given lectures
12 and -- and -- and what -- and talks about -- about
13 topics in -- in networking, and -- and I wrote some I
14 guess I would say magazine articles that discussed the
15 kind of network that we were building. And I've given
16 talks about my papers, which are in networking.

17 Q. You said "the network that we were building."
18 What were you referring to?

19 A. I mean, in -- in my graduate work, I was part
20 of a research group called the Telemedia Network Systems
21 Group, and we built a high-speed network. So we worked
22 from it as part of what was known as the AURORA gigabit
23 testbed. And those were efforts funded by DARPA. They
24 funded a number of different test beds across the
25 country that were experimenting in high-speed networking

1 technologies at the time. And I believe it was well
2 beyond, you know, what as available at the time. This
3 was in the early to mid '90s that -- that I started.

4 The -- the technology was, you know, 10 to 100
5 megabits local area network was -- was the standard. I
6 think it was probably 10 when I started and -- and --
7 and changed to 100 megabit later -- later on in my
8 graduate career. And that was kind of what was
9 installed in -- in our -- our office in -- in the lab.

10 But we built a -- a gigabit speed network
11 and -- and then experimented -- that was distributed
12 between MIT, I think, Bellcore and UPenn, and -- and all
13 interconnected at high-speed rate.

14 And we explored the kind of applications that
15 could be built, what networks had this capability. And
16 what we focused on in particular was video, video
17 applications, streaming video, things like that.

18 ATTORNEY STAMATOPOULOS: Dr. Houh, can we
19 go -- actually, counsel, can we go off the record for
20 just a second?

21 ATTORNEY KONSTANTAKOPOULOS: Sure.

22 THE VIDEOGRAPHER: Time is 10:02 AM. We are
23 off the record.

24 (Discussion held off the record.)

25 THE VIDEOGRAPHER: We are back on the record.

1 The time is 10:05 AM.

2 BY ATTORNEY STAMATOPOULOS:

3 Q. So, Dr. Houh, before we went on break you were
4 talking about your experience building a high-speed
5 network. Fair?

6 A. Yes.

7 Q. And this high-speed network, it was a local
8 area network?

9 A. Well, not entirely. It was designed to be
10 a -- a -- what we called a desk area network, which was
11 around -- you know, components were near your desk or in
12 your office.

13 But we interconnected various offices, and
14 we -- we interconnected to equipment that we shipped out
15 to I think it was UPenn and Bellcore so that they had
16 some workstations and we could communicate over a
17 high-speed link that we had. I can't remember --

18 Q. And this was -- oh, sorry. I didn't mean to
19 cut you off.

20 A. Yeah, I don't remember if it was 622 megabit
21 link or a -- a 2.4 gigabit link that we had, but it was
22 some SONET link we had between those three sites, so --

23 Q. So --

24 A. -- it was kind of wide area in terms of where
25 we could communicate.

1 Q. I see.

2 So the distinction you're drawing is between a
3 local area network that is confined to a small area
4 versus a wide area network which may encompass a broader
5 area? Is that -- is that a fair understanding of what
6 you just said?

7 A. Yeah. I mean, we did ship our equipment that
8 we built down to I -- I -- I think it was Bellcore and
9 UPenn. We -- we had some specific collaborators at --
10 at those locations, and they were also part of the
11 Aurora gigabit testbed project.

12 And -- and the other thing we did, actually,
13 we interconnected to -- to the internet so we could
14 provide our video demos through a website that I helped
15 set up.

16 Q. How was connection to the internet
17 established?

18 A. We had a -- a web server that was both on the
19 internet and on our -- our -- our network, the -- our
20 high-speed network, so it had interfaces to both. And
21 that -- that -- those -- actually, a number of different
22 computers had that configuration.

23 And those were the -- the servers that
24 provided the video demonstrations over the internet. So
25 you could come to our website, I -- which I -- which I

1 set up, and then other people started helping put our
2 demos on the website.

3 You could -- you could pick a -- a camera to
4 turn on, and the camera was connected directly to our --
5 our equipment. It was our -- a home-built camera that
6 my officemate designed and built, plugged into --
7 directly into the network, and then -- the high-speed
8 network components.

9 And then through these computers, we could
10 provide the video from those cameras to people on the
11 internet who requested our -- to -- to watch the
12 demonstrations. And you could actually go to a web
13 page, pick my office, and turn on my office camera and
14 just watch me sit there and work.

15 Q. You said this was a high-speed network?

16 A. In terms -- yes, it was a high-speed network,
17 a gigabit speed network.

18 Q. What made -- by the way, this was, you said,
19 in the mid '90s, or early to mid '90s.

20 Is that fair?

21 A. Yeah, I think we got started around 1993. I
22 think -- I think Al -- Al Gore -- I don't remember what
23 year he was running for election, but he came and
24 visited us. Could have been 1994. And I don't remember
25 the exact year.

1 But -- but yes, you know, I mean, it was -- we
2 started back then, and -- and by the time he visited us,
3 it was -- everything was working. Well, not -- not
4 everything, but like the -- the fundamentals of the
5 network were there.

6 I think we already had the video
7 demonstrations up. I think those were put up around
8 late 1993 or early 1994.

9 Q. And that was --

10 A. That was '94 or '96 that he visited us, but I
11 think it might have -- I -- I don't remember for sure
12 now.

13 Q. How many people were working on getting the
14 fundamentals of the network ready?

15 A. Well, there were a number of people that
16 worked on hardware, some people that worked on hardware
17 and software, and some people that worked mostly in
18 software. So in terms of the hardware design, maybe
19 there were four of us, including me. And then in terms
20 of the software, there were probably five or six, seven
21 people, including me too.

22 Q. How did you decide how to staff your teams?

23 A. Well, I -- I don't think I made those
24 decisions. We were a research group. There was a
25 professor. He kind of guided the research and -- and --

1 and had gotten the -- the grants from -- from DARPA
2 to -- to -- to be part of this gigabit testbed, and so
3 he kind of guided things.

4 But, I mean, sometimes there were students
5 that would come talk to us about like wanting to join
6 the group, and he would -- he would have the grad
7 students talk to these people. And then we'd -- we'd
8 say, oh, yeah, you know, kind of like -- I won't say
9 it's really a hiring decision, I suppose, but like he
10 would solicit our input as to what we -- we thought,
11 whether, you know -- and -- and -- and I think he
12 probably decided in the end -- our professor, that is --
13 who to bring on, into the group.

14 Q. And you had some input into his
15 decision-making process. Fair?

16 A. I think in some cases, but probably not in all
17 cases.

18 Q. So what types of things were you looking at in
19 terms of the various candidates when you were providing
20 input to your professor?

21 A. I mean, I don't -- I don't remember exactly
22 now. That's probably like what they'd done -- what --
23 whether I thought they -- they'd mesh personality-wise
24 with various members of the group. But I -- I don't
25 really -- I mean, sometimes people would just show up.

1 You know, we didn't really have any input. Maybe a
2 visiting scientist or -- or -- or two.

3 And I remember two in particular, or three.
4 Three, actually, that I don't think I was asked to, you
5 know, and -- and at least two of them, maybe all three
6 were -- were -- you know, we shared an office at some
7 point.

8 Q. You said visiting scientists. What do you
9 mean by visiting scientists?

10 A. Well, sometimes a visiting scientist would
11 be -- scientist would be like an academic from
12 another -- another institution that -- that came to MIT
13 for six months, a year, two years, and would kind of do
14 some research in our group.

15 And so I -- I remember -- I remember a couple
16 of people in particular, two or three that -- that --
17 that I might have put in that category along -- I'm --
18 some, I -- I know were actually that category. The
19 others, I -- I'm not really sure what their exact
20 position was.

21 Q. You called this network a high-speed network.
22 What -- what would constitute a high-speed network in
23 the time frame that you set up this network?

24 A. Well, you know, it was the gigabit speed. So
25 the -- DARPA had funded, I don't remember how many, five

1 to seven maybe, maybe more than that, gigabit testbeds.
2 And -- and they're all -- I mean, gigabit was chosen
3 because it was at the time probably over an order of
4 magnitude larger than the standard, you know, networking
5 technology speeds. Maybe, you know, up to two orders of
6 magnitude.

7 So it was kind of DARPA who had this vision to
8 kind of fund some research that would push the state of
9 the art in networking forward, not only in just the
10 speed but also in, you know, what can you do when you
11 have a gigabit network.

12 So other testbeds were investigating medical
13 applications, you know. You're transmitting now huge
14 x-ray files, and can -- how does, you know, that impact
15 the medical field. And we were researching kind of real
16 time applications like video, how to -- you know, what
17 can you do with video.

18 And -- and you, know, at the time, we actually
19 did quite a bit of things that actually have somewhat
20 come to fruition now that networking speeds, computation
21 speeds, have -- have become much faster.

22 But back then, you know, we had, you know,
23 live green screening, or as fast as the computer could
24 go. We had, you know, things like that that -- that you
25 actually see now in video and video apps.

1 And -- and so those were the kinds of things
2 we -- we did research in once we had the high-speed
3 network, which we had to build, to explore what you
4 could do with -- with video.

5 I mean, we had streaming demos. They weren't
6 very good over the internet because the internet speeds
7 were a -- a mismatch to our -- our high-speed network,
8 but you could get an idea of -- of the -- and we built
9 applications that -- that clipped, searched video,
10 indexed video, and things like that.

11 Q. How were internet speeds a mismatch to your
12 own network?

13 A. Well, back then, if people wanted to kind of
14 pull down our video demos, they could do so really
15 pretty much a low resolution. Like, you know, where --
16 where -- you know, it -- our -- we could do full -- full
17 resolution standard definition TV, which is about 640 by
18 480 within -- within our group, you know, at -- at about
19 30 frames a second, 20 to 30 frames a second, and
20 display that on our internal computers.

21 And -- and I remember it required a lot of
22 bandwidth out of our -- well, I mean, maybe not a lot --
23 lot compared to the fraction of bandwidth we had
24 available, but at the time, I -- I don't remember the
25 exact numbers. It's in some of our groups, you know,

1 report somewhere. But certainly at least tens of
2 megabits into -- getting it into the computer and
3 displayed on the screen.

4 And, you know, at the time, you know, people
5 would be lucky to pull down like a -- a -- a video that
6 was maybe a fourth resolution each, so basically a 16th
7 vid -- the number of pixels and do it at a -- a rate
8 that was maybe five, six frames a second.

9 So, you know, 1/16 the pixels at, you know,
10 1/5, 1/6 the rate of full video, you know. So
11 they're -- they're, you know, 80 times less bandwidth
12 needed to view the video than we could do in our --
13 our -- within our network.

14 Q. What did you call your network?

15 A. It was called the VuNET, V-U then capital NET.

16 Q. How did you -- withdrawn.

17 What were the factors that affected VuNET's
18 speeds?

19 A. I think we were limited really by the
20 computation power of our desktop computers. And we had
21 pretty high end DEC workstations. DEC was the old
22 company DEC, D-E-C.

23 And, you know, we could bring up a couple,
24 three, four different videos from different cameras and
25 run them at maybe a half resolution each direction or

1 about one -- one, you know, full resolution 640 by 480
2 screen. And I think the limiting factor at that point
3 was the -- how fast the computers -- computers ran.

4 Q. How were the different computers connected to
5 one another?

6 A. So I built a network interface to the -- our
7 high-speed network that plugged into the computer using
8 whatever bus, you know, was -- it was plugged into
9 the -- the bus on our DEC workstation and then also
10 plugged into the -- the -- a port on our switch.

11 And I helped design the switch but I designed
12 the interface and wrote all the software for the
13 interface my own -- on my own. That was kind of the
14 beginning of my thesis work.

15 And so it was through this card, this
16 interface I built, and that's how our workstation was
17 interconnected with the high-speed network.

18 And as I mentioned before, on my -- well, I'm
19 not sure how much I said, but my officemate, he designed
20 a camera that plugged directly into the port of the
21 switch. Sorry, a -- a camera capture board. You -- you
22 plug a camera into it. We had commercial, you know,
23 video cameras of how you could plug the video output
24 into his board, and his board would capture the --
25 and -- and digitize the video from the analog signal and

1 generate a stream of data that we could feed into our
2 computers.

3 Q. And so each user using a computer was
4 connected to a switch.

5 Is that fair?

6 A. Yeah. So most of the workstations in the
7 group -- you know, I think each of our -- the -- the
8 grad student offices had a switch in it. This was a
9 high-speed switch that we designed and built.

10 And then the -- the -- the switches may have
11 one or two cameras plugged in, or one or two
12 workstations plugged into it within the office. And --
13 and the grad students, at least, we -- we each had our
14 own, you know, DEC workstation that was -- had an
15 interface card that I -- I designed and built that was
16 plugged into the switch.

17 Q. What did the switch connect to?

18 A. The switch connected to these interface cards,
19 the cameras, and also links. So I -- I also designed
20 the hardware for the links that interconnected the
21 switches. So it was an optical link and, you know, we
22 pulled fibers between the offices, plugged them into our
23 links, and -- and so the switches interconnected with
24 the -- with links that interconnected switches in
25 different offices.

1 And then we had this wide area network SONET
2 thing that we eventually got. And I don't remember how
3 we interconnected with the SONET device, but we could
4 use that as -- as -- as a transport between I think us
5 and UPenn and Bellcore.

6 Q. And when you say "us," you mean MIT. Yes?

7 A. Yeah, that's what I meant.

8 Q. And so the --

9 A. Our -- our local area network, as -- as you --
10 you might say, of -- of these high-speed switches, we
11 could interconnect directly down to. And we shipped the
12 same switch and interface card. I don't remember if we
13 had links, but I think we just sent one switch to each
14 location, Bellcore and UPenn. And -- and they
15 interconnected with the SONET equipment.

16 Again, I don't recall -- I don't -- I was
17 trying to figure out how we did that. I don't -- I
18 don't actually remember how -- how we did that, but --
19 so we could actually communicate between the -- the
20 computers on the switches in these remote locations, and
21 the cameras.

22 Q. When you say "remote locations," you're
23 referring to Bellcore and Penn?

24 A. Yes. And -- and that's remote from MIT.

25 They -- if you're there, they think of us as the remote

1 location, I suppose.

2 Q. Right. It's all relative to one another.

3 A. Yes.

4 Q. And so let's focus on the MIT network a little
5 bit. Was this -- would you characterize this as a local
6 area network?

7 A. Well, I mean, we called it a desk area
8 network, but -- but once we interconnected to offices,
9 then I -- I -- it formed, you know, it -- it was similar
10 to local area network.

11 I mean, we had ethernet LAN technology, you
12 know, running through all our offices as well, and all
13 these computers were also connected to the LAN, the --
14 the ethernet LAN. And I -- I think initially was 10
15 megabit shared internet. Might have upgraded to 10
16 megabit switched. And then eventually at some point to
17 100 megabits. I don't remember if they were hubs or
18 switched or how that all went, but -- and that was kind
19 of the technology that we had available or, you know,
20 and -- and I'd like to think we were probably on the
21 cutting edge, you know, in -- even in terms of adoption
22 of -- of commercial networking technology. But I don't
23 remember when all that occurred.

24 But -- and -- and then some of the machines
25 were also connected to our own switch and so that if you

1 were connected to a switch, you could communicate at
2 much higher rates than you could over our -- our -- our
3 standard ethernet office local area network.

4 Ethernet-based local area network.

5 Q. So the local area network had devices that
6 were connected via ethernet connections. Fair?

7 A. Yes. And, you know, at the very beginning, we
8 had, you know, coaxial thin -- Thinnet, I think it was
9 called. Or actually, I'm not really -- it -- it was
10 coax-based ethernet that's shared.

11 And then at some point we upgraded to kind of
12 the -- I don't think it was CAT 5 back then, but the
13 kind of, you know, ethernet-type cables that you -- are
14 more commonplace now that may probably support a lower
15 speed than today's ethernet wires do.

16 Q. What do you mean, it supported lower speed?

17 A. Well, there are different levels of rating for
18 these ethernet cables. You know, CAT 3, 4, 5. And I
19 think the higher ones are designed to -- to support
20 higher speeds. Or, you know, some of them are designed
21 to support higher speeds.

22 So what I'm saying is that it's -- it's like
23 today's ethernet cable, but back then, they weren't
24 rated as highly to support as high -- as high speeds.

25 I mean, today I have gigabit ethernet in my

1 home. But, you know, that's -- that's -- that's
2 commercially available, like I bought off the shelf.
3 But, you know, 30 years ago, you know, that -- that
4 wasn't available. The speeds were more like 10 megabits
5 30 years ago, and that was shared. And then it evolved
6 into 10 megabit switched maybe, and then, you know, 100
7 megabit shared and maybe -- and 100 megabit switched.
8 So that took some time.

9 Q. And did Penn have a similar type of LAN as
10 unit?

11 A. Well, I mean, they had one of our switches,
12 so -- but they only had one device, so I wouldn't say
13 they were -- really had a LAN of our -- our devices,
14 right? They -- they just had one switch.

15 So it was just at the other end of the -- a
16 high-speed link, you know, plugged in the same way as
17 however we plugged into our -- our -- our side. And
18 then they had a -- I think they also had a DEC
19 workstation and my interface card and, you know,
20 running -- running our software.

21 Q. And was Penn's switch connected to a switch on
22 your end, on the MIT end?

23 A. Well, I mean, we had this -- this connection,
24 this high-speed connection, but it wasn't -- you know, I
25 think programmed it to be wired in so any -- any

1 device -- you know, I -- we generally set up a full mesh
2 of -- of virtual circuits.

3 Our -- our network was based on ATM so we set
4 up a full mesh of -- of virtual circuits between all the
5 machines that were -- that were plugged into our
6 high-speed switches, and so I think they -- they were
7 part of us -- they were part of that full mesh.

8 And so there wasn't like a point-to-point
9 connection, but there were virtual connections between
10 the machines that were, you know, at UPenn and IBM, I
11 think, and -- and -- and our computers, any -- any of
12 our computers.

13 Q. What is ATM?

14 A. ATM stands for asynchronous transfer mode, and
15 it was common back then in the early to mid '90s as a --
16 as a -- it was just a -- a networking technology that
17 was available at the time.

18 Q. And what types of networks was ATM used in?

19 A. Well, I mean, at the time, I think it was
20 mostly a -- a -- a core, a kind of a core network
21 technology.

22 But, you know, later on in the -- in the '90s
23 towards the end, I -- I do remember going to trade shows
24 when I was working and seeing, you know, people with ATM
25 LAN technology in cards, just like you'd buy an ethernet

1 card, except you'd buy an ATM card for your -- your PC.
2 You know, ethernet kind of won out in the end, but --
3 but people were trying in the -- in the '90s to -- to
4 make ATM available in -- in a local area network as a
5 local area network technology as -- as well as, I think,
6 a wide area network technology.

7 And there were companies out there that
8 were -- were trying to commercialize local area network
9 technology based on -- on -- on ATM.

10 Q. And at a high level, how does ATM work?

11 A. Well, at a high level, ATM is based on -- on
12 things known as cells, and those are akin to packets in
13 a -- in an ethernet.

14 But in contrast, ATM cells are fixed size.
15 They contain -- contain a 48-byte payload and a -- a
16 5-byte header. So the ethernet cells are 53 bytes, and
17 there's a virtual circuit identifier and a virtual path
18 identifier.

19 Things have changed since then. They've kind
20 of munged different fields together. But back then,
21 there was a separate VCI and a separate VPI for virtual
22 circuit identifier, virtual path identifier, and those
23 identifiers would help guide the routing of ATM cells
24 throughout the network.

25 But ATM kind of requires circuits -- virtual

1 circuits to be set up that are end-to-end, and our
2 switching equipment supported the remapping of virtual
3 circuit and -- or -- and/or virtual path labels on a
4 hop-by-hop basis so that we'd have to set up the tables
5 and the switches.

6 And -- and I kind of wrote the software to --
7 to send out these control frames to -- to the switches
8 and work on the design of -- of the switch ports to be
9 able to understand these control frames so that you
10 could then, you know, set up all the appropriate
11 routing -- routing tables so that when I sent a -- a --
12 people a ATM cell using a, say -- I'm just going to give
13 an example here -- a VCI of zero, that would take it all
14 the way to the computer two offices down on switch port
15 3.

16 So -- so we -- our -- our system was based
17 on -- on effectively full mesh connectivity between all
18 the different devices on our networks plugged into our
19 high-speed switches.

20 Q. Were there differences in the manner in which
21 ATM was implemented in wide-area networks versus local
22 area networks?

23 A. I -- yeah, probably were. You know, ATM,
24 it -- our -- can be used to set up virtual circuits
25 between different locations to support a wide -- like

1 a -- a point-to-point link that's actually not a -- a
2 direct, you know, fiber between the locations, but it
3 goes through switching equipment. And you can set up
4 kind of circuits or -- or -- or connections between
5 locations using ATM technology.

6 Q. You mentioned something earlier, identifiers
7 helping guide routing.

8 What did you mean by that?

9 A. So we did -- we did a -- a -- a lookup of the
10 virtual -- of part of the virtual circuit or virtual
11 path identifiers in our switch, which -- which then,
12 you -- you could look up part of that and -- and
13 retrieve the output port to which the -- a cell with
14 that incoming VCI, VPI on a particular port should be
15 remapped to. And -- and you could also remap the label,
16 the virtual circuit and/or virtual path, or parts of it.
17 I don't remember exactly how much of it or what portion
18 on -- on the output side.

19 So -- so a virtual circuit, if -- if I sent a
20 cell with a particular VCI, it would go into a switch.
21 The switch would look up for that VCI which output port
22 should this cell be forwarded and what -- what label,
23 what new label should be replaced, you know, should
24 replace the VCI.

25 And when I say VCI, I kind of mean VCI, VPI or

1 some combination or parts of that because I'm not sure
2 we -- we had -- we used the full address space. But
3 anyway, so you could then -- it would then be forwarded
4 based on the incoming VCI and -- and port using a quick
5 lookup as opposed to internet routing, which is based on
6 looking up the destination address, which is kind of
7 like looking up the VCI.

8 But in internet routing, you have -- routers
9 do what's known as the longest prefix match, so it's not
10 an exact match because routing tables and routers in the
11 internet don't have the capacity to -- to create a
12 router -- it's just inefficient, anyway -- for every
13 possible computer on the internet.

14 So they -- they bunch them up into groups
15 based on the leading bits of the internet, of the IP
16 address, and -- and -- and create a -- routing table
17 entries based on some number of leading bits of the IP
18 address.

19 So, for example, MIT at the time had
20 18.star.star.star as its IP address space so you could
21 just route 18 dot anything and that would be -- I don't
22 remember how many bits. I mean, it -- it could have
23 been 8 bits, but it could have been fewer than 8 bits.
24 You'd -- the -- MIT would have an -- a -- a routing
25 entry for its network that -- that, you know, just was

1 18 dot anything and would be forwarded towards MIT by
2 the routers.

3 And -- and but -- but sometimes you'd have
4 three blocks -- three digits of an IP address, and then
5 they could be -- those networks could be anywhere,
6 really, over -- so -- so you might not have like an
7 8-bit entry. You might have a 24-bit entry. Or, sorry,
8 a -- yeah, 24-bit entry in a routing table to dictate
9 where -- the -- the output port on a router.

10 So it -- it -- it's -- it's -- it was very
11 different than ATM, which we just did a lookup of the
12 circuit. We didn't have to do a longest prefix match.
13 And so that's how it differed than standard IP routing.

14 Q. It sounds like the issue you were trying to
15 solve for was that the address system was a little bit
16 ambiguous.

17 Is that fair?

18 A. I wouldn't say it was ambiguous. You know,
19 there's -- there's -- there's 32 bits in an IP address.
20 But at the time, and actually even today, it's probably
21 impractical to store -- and -- and highly inefficient to
22 store one routing table entry for every possible IP
23 address, right?

24 So if you route things in blocks, assuming,
25 you know -- you know, A.B.C. from zero to 255 is the

1 last bit are all co-located, then you really only need
2 to store the routing table entry for A.B.C. Once you
3 get it to that place, the -- the right place that has
4 all those 256 possible addresses, you don't need an
5 entry for all 256 because they're all generally
6 co-located. They're on -- on the same network, they
7 have the same range of I -- or they're within the same
8 range of IP addresses, and so I don't think it was
9 necessary to -- to store one.

10 But -- but because the way IP addresses were
11 created and allocated, they're -- at the time -- and
12 this has changed since then -- there were Class A
13 networks, Class B networks, Class C networks. And those
14 dictated how many leading bits, how many -- how many --
15 how many computers were in a block of IP addresses.

16 So a Class A network had up to 200 -- 2 to the
17 24th computers, I think, something like that. A Class B
18 network had up to 2 to the 16th computers, and a Class C
19 network had 2 to the 8th computers.

20 And -- and MIT, companies like I think Xerox
21 had a Class A address, IBM I think had a Class A
22 address. A number of institutions and -- and entities
23 had Class A addresses.

24 The company that I used to work for, BBN, even
25 though it was a company of at the time when I was there,

1 you know, no more than 1,000 people, probably like 800
2 maybe, I -- I don't remember exactly. Back in the -- in
3 those early days had a -- a -- a Class A address space,
4 which 2 to the 24th was -- was a huge number. They were
5 never going to have that many computers.

6 But nevertheless, they were an early pioneer
7 in the internet so they got a Class A address space,
8 which is highly inefficient in terms of address block
9 allocation. And that's why you hear -- or I don't know
10 if you've heard, but like that the internet is about to
11 run out of IP addresses, you know, for IPv4 because they
12 were highly inefficiently allocated.

13 And now, things -- it's -- it's not so much of
14 an issue now, and IPv6, you know, alleviated that --
15 that bottleneck as well.

16 Q. But at the time, this was an issue. When I
17 say "at the time," I'm talking about the mid '90s.

18 A. Yeah. I mean, at the time, there -- I think
19 there was still this -- this -- these -- these network
20 classes, which -- which was alleviated when they went to
21 what they -- what -- what's known as classless
22 interdomain routing, or CIDR, which -- which now allowed
23 entries and -- and networks to have any number of
24 leading bits as -- as a block as opposed to 8, 16, or
25 24, which is what the class system kind of limited

1 network blocks to be.

2 Q. Is the class system that you described related
3 at all to a hierarchical address system?

4 A. Yeah, I -- I suppose there is some relation,
5 yes.

6 Q. What's the relation?

7 A. Well, so -- so, you know, you'd have the
8 top-level space, so your Class A space, right? And
9 then -- and then underneath that space, MIT could --
10 could allocate different blocks of different groups
11 within the -- within -- within its own block.

12 And, you know, the -- once you properly
13 configure the routers and -- and devices, you know,
14 the -- the -- within MIT, you could then route -- route
15 the IP packets to the appropriate -- towards the
16 appropriate correct building or lab use -- using the,
17 you know, address space within the Class A address
18 space. And so I think in some sense, that's -- that's a
19 hierarchy.

20 There's also a hierarchy in the domain name
21 space, which is kind of separate. It can be managed
22 kind of separately. You know, you have a top-level
23 domain like mit.edu. We -- we had tns.mit.edu, and then
24 we had computers within that -- that space which we were
25 able to control.

1 So my computer was named dil.tns.mit.edu, and
2 that's -- that's hierarchical as well in -- in the name
3 space, but the routing could also be hierarchical.

4 I think our -- our subnet number was 18.31.0
5 and then anything else, you know, 0 to 255 is the last
6 digit, would get routed to our -- our group's router and
7 then, you know, then to the appropriate computer.

8 Q. Is the opposite of hierarchical -- withdrawn.

9 Is it fair to say that the opposite of a
10 hierarchical address system is a flat address system?

11 A. I mean, I have to consider what that means.
12 But, I mean, are you asking if, you know --

13 Q. Well, let me ask you this. So we talked about
14 a hierarchical address system.

15 Is there such a thing as a nonhierarchical
16 address system?

17 A. I -- I mean, sure, I suppose, because lots of
18 things are possible.

19 Q. Have you encountered such a nonhierarchical
20 address system in your experience with networking?

21 A. Well, I -- I mean, I suppose there are other
22 ways of -- of addressing items. I -- I think like, for
23 example, Vink talks about addressing in some sort of
24 order, all right? So -- so I -- I think in -- in that
25 case, the -- the ordering is -- is not necessarily

1 hierarchical there because it's based on ordering of the
2 devices.

3 Q. Okay. Well, my understanding of a
4 hierarchical system based on what you've described is
5 that basically, you have different tiers of addresses
6 such that once you identify the address of a particular
7 tier, then other tiers are grouped underneath that tier.

8 Is that -- is that a fair understanding?

9 A. Yeah. I -- I mean, I'm not trying to give a
10 comprehensive, you know, all-encompassing definition
11 here, but that generally seems to work under what I
12 understand, you know, these types of -- of address
13 schemes are.

14 Q. And -- and you could also have a system where
15 you don't have any tiers but devices communicate with
16 one another by having a precise address that corresponds
17 only to a particular device. Correct?

18 A. I -- I mean, there may be some local systems
19 that -- that work that way, you -- you know. But -- but
20 in terms of broader interconnectivity to other devices,
21 they -- they typically, because there's so many other
22 devices to -- to -- that you could possibly communicate
23 with. And then systems with large numbers of
24 addressable computers are typically arranged in a more
25 hierarchical fashion.

1 Q. Why?

2 A. It's just -- I suppose it's -- well, I mean,
3 some of the -- I can't tell you every reason why. But,
4 you know, it -- it -- it -- you -- you -- you don't have
5 to know details about the other end and you can still
6 get to them, you know. So I don't need to know exactly
7 where this computer is. I haven't -- and -- and neither
8 does the network know where an exact computer is. It
9 can route based on -- on the -- on the -- on the address
10 prefix, which kind of can get it closer and closer to
11 the ultimate destination.

12 You know, I -- I suppose local area
13 technologies may -- may have some -- like, you know,
14 if -- if you're not going outside your -- your -- your
15 own space, your own network or subnetwork, then -- then
16 it may look nonhierarchical at that point. But -- but,
17 you know, in order to interact with the -- the rest of
18 the network, you -- you know, it -- it helps to -- to
19 have these hierarchies.

20 Q. At MIT locally, each device on your local
21 network knew the exact address of every other device.
22 Correct?

23 A. Well, there -- there is a protocol for that.
24 So there's -- there's, you know, an IP address. Like, I
25 can try to send something using my -- the -- a

1 destination computer's IP address, but then within the
2 local area network, let's say an ethernet, there's a
3 address resolution process, a protocol, that resolves IP
4 addresses to ethernet layer addresses or MAC layer
5 addresses. And that's known as the ARP protocol.

6 And, you know, within the network, because you
7 kind of broadcast within your own network, you can
8 actually broadcast these queries and get replies and
9 then -- and then ultimately use your destination's MAC
10 address to address the ethernet frame in which you
11 encapsulate an IP packet. And that's how IP packets get
12 to the destination on a -- on a local area network on a
13 subnet.

14 Q. Are MAC addresses local area -- well,
15 withdrawn.

16 What is a MAC address?

17 A. Well, MAC stands for media access control, but
18 it's -- it's -- so, for example, on the -- on the
19 ethernet, that's kind of what people think of as a
20 physical layer kind of access technology, that -- that
21 you still have a -- the equivalent of a packet and a
22 header. It's typically known as an ethernet frame, and
23 there's a header with a -- a source address and
24 destination address that -- that -- that are media --
25 that are MAC layer addresses.

1 And there's a few other things in the header
2 as well, and that's the -- that's actually the address
3 of a -- of an actual interface card. And so ethernet --
4 ethernet cards are -- are made so typically, that every
5 ethernet card that's ever been manufactured is supposed
6 to have a different MAC address and -- and so they --
7 they should be unique. And I know people can spoof
8 them. You can program a -- a chip to have a different
9 MAC address. But as they typically get made, they
10 will -- will -- will be unique.

11 And so IP addresses, especially if you're
12 using private IP address space, are -- are not
13 necessarily unique. But on your local area network, you
14 should have a unique IP address.

15 And whatever device is -- has that IP address
16 has its own globally unique MAC address, assuming
17 there -- it's like an ethernet card they have. And
18 the -- the -- the MAC address is actually used within
19 the local area network to address ethernet frames,
20 typically.

21 Q. Is there a distinction between the MAC layer
22 and the ethernet layer, or are those two the same thing,
23 essentially?

24 A. Yeah, it's -- it's -- it's like a -- you know,
25 ethernet's a specific type of MAC technology, media

1 access control technology. But it's -- it's probably by
2 far one of the most common -- common today.

3 Q. Okay. It sounds like every device on -- that
4 is connectable to a network has a unique MAC address.

5 Is that fair?

6 A. That's supposed to be how it works.

7 Q. So I guess if every device on a local network
8 has a unique MAC address, why did you need to have a
9 nonhierarchical address system in the VuNET network?

10 A. I'm not really sure what you mean. I -- I
11 don't remember describing the VuNET address base as
12 nonhierarchical, but --

13 Q. Oh, sorry. I -- I may have misspoken.

14 So did the VuNET network have a hierarchical
15 address system?

16 A. Well, I mean, I -- I don't really know how to
17 answer that. The way we did it was we set up virtual
18 circuits and we had some system of being -- of -- of
19 mapping the virtual circuits to -- to -- to the
20 different computers.

21 So if I -- if I looked at a virtual circuit, I
22 could tell you what the source computer was and what the
23 destination computer was intended to be by using a
24 particular virtual circuit.

25 What was it? I mean, I guess I haven't really

1 thought much about whether that -- that was strictly
2 hierarchical or not. I mean --

3 Q. Well, was there a need to use IP addresses in
4 connection with implementing the unit?

5 A. We actually did -- I mean, I -- we did
6 integrate the -- the virtual circuits with IP addresses.
7 So there was a separate IP address space which mapped to
8 our network that was different than the IP addresses
9 that our computers used to communicate with the
10 internet, right?

11 And so, you know, we could -- we could address
12 other computers using their IP address on the VuNET.
13 And I think that in -- in some cases, that's what we
14 did. I don't know that we did it all the time, because
15 we could address them just with -- with a -- we could
16 just send -- send traffic over a particular virtual
17 circuit, and that we knew -- we knew how it would get to
18 that machine.

19 But we did overlay an IP address space onto
20 our VuNET devices in such a way that -- that -- and --
21 and set up the -- the -- the routing tables in such a
22 way that -- that some of those IP addresses got mapped
23 to VuNET devices.

24 Again, I don't remember if -- how we did it
25 for Bellcore and IBM, at least from my -- from the best

1 of my recollection. So I don't remember if we assigned
2 them a different IP routing domain or, you know, or not.
3 I -- I just don't remember.

4 Q. Did assigning an IP name or domain require you
5 to program the devices in any particular way?

6 A. I -- yeah, I think so. I mean, we had to set
7 up the right entry in the routing table to use a
8 particular interface instead of the standard ethernet
9 interface, right? So I -- I -- I don't think that's
10 special pro -- I mean, I -- it -- I would call that more
11 configuration than programming.

12 Q. Why would you say that?

13 A. Because we weren't writing a program to do
14 that. We were editing a -- a configuration file or
15 routing table file, and it's more about configuring than
16 reprogram -- reprogramming, I think.

17 Q. So once you have the routing tables, it's just
18 a matter of configuring the routing tables.

19 Is that fair?

20 A. Yeah, I think that's fair. I mean, people
21 might call that programming the routing tables, but if
22 you mean we wrote a -- like a program that we ran,
23 that -- that -- that isn't a good description of --
24 of -- of how we set that up.

25 Q. Were there off-the-shelf protocols or programs

1 that allowed you to load routing tables onto the
2 different devices that ran the network?

3 A. Well, on the workstations I think there's a --
4 standard commands in -- in UNIX to add entries to -- to
5 routing tables and -- and reference a particular device
6 to which the drivers, network drivers should interface
7 with when -- when -- when the particular addresses so
8 indicate.

9 Q. You said "a particular device." Do you mean a
10 device that was already known to you?

11 A. Well, no. I mean I wrote a driver to -- so
12 to -- to interface with our interface cards. And --
13 and, you know, in -- in a UNIX system, we'd create a --
14 a device in there so that when you reference this
15 particular device, it -- it knew to interface with
16 our -- our -- the driver that I wrote.

17 Q. So let's say you wanted to send a message from
18 a unit device to a device at the University of
19 California Berkeley, which was not part of the Penn
20 system. How would you address your message to that
21 device?

22 A. Well, I -- I -- I mean, typically if, you
23 know, if it's -- if it's -- if it's like a web server
24 there, you might have the address of the -- the
25 domain -- the domain name of a web server at the --

1 at -- did you say Berkeley?

2 Q. Yes.

3 A. WWW dot some group acronym dot Berkeley dot
4 EDU, or something like that. And then there would a
5 domain name lookup to look -- to map -- to look up the
6 IP address associated with the name, and then you have
7 an IP address.

8 And then when you have an IP address, you
9 consult -- the -- the computer would consult its routing
10 table to see which interface to use to contact this IP
11 address. And it would look in the routing table. And
12 seeing that that wasn't an address of our VuNET device,
13 any of our VuNET devices or the subnet, the -- it would
14 route to the standard ethernet interface.

15 Now, if we use the -- the name of a -- of a --
16 of a VuNET device, it could get mapped to -- you -- you
17 can actually create a file in -- in a UNIX system to --
18 to -- to do these mappings that -- you don't need a
19 domain name server for. And if it looked it up and the
20 IP address was in this space that -- that by default
21 should have routed out to our interface, it would -- it
22 would route out our interface.

23 But because the Berkeley computer wouldn't
24 have been in that -- that space, that address space, it
25 would route out the standard ethernet interface and --

1 and go to our -- through our lab's gateway, through
2 MIT's gateway, over through a bunch of hops on the
3 internet to the Berkeley computer.

4 Q. Did the protocols exist as of the time that
5 you were developing VuNET to communicate with devices
6 outside of your network?

7 A. I mean, yeah, we interconnected with the
8 internet and there were all the standard internet
9 protocols that -- that allowed for communication outside
10 our local -- our local area network.

11 Q. And did you use the same protocols in order to
12 run your local area network, or were they different
13 protocols?

14 A. Well, we had a -- a -- different protocols in
15 some cases. I mean, we could -- like, if we did a file
16 transfer between the computer -- two computers in our
17 lab over our network, we'd use effectively the same
18 protocols at the higher layer.

19 But down, you know, at the -- at the interface
20 card level, we actually -- you know, we could use IP,
21 but we'd break IP packets into cells. My driver would
22 do this. And then send them as ATM cells over the right
23 virtual circuit to the other computer on the other end,
24 which would reassemble the -- the ATM cell data into the
25 packets again and pass them up to the network layer,

1 to -- to the standard UNIX thing that -- that processes
2 packets.

3 And -- and so some of the protocols could --
4 could be used over our network. But at the -- at the
5 low level, because we built our own ATM network, there
6 were additional protocols used.

7 I mean, if you send the packet over the -- the
8 internet and there might be an ATM link in the way,
9 there might be something happening. You don't really
10 know, because it's just all an obstruction to you, that
11 it might get broke -- an ATM packet might get broken up
12 to ATM cells at some point, but it's -- it's all
13 transparent because they'll get assemble -- reassembled
14 and the -- the end point gets the right data, and that's
15 kind of what happened in our system, you know.

16 You know, we had this ATM network that did
17 break down the cells, packets into cells, and reassemble
18 on their side. But if you're using IP communications
19 over our network, you wouldn't really know what's --
20 what's happening except, you know, you are using
21 internet protocols. You don't necessarily know what's
22 going on below, underneath that.

23 Q. You said "my driver would do this." What did
24 you mean by that?

25 A. So I wrote the software to -- to -- to drive

1 the hardware card, the network interface. And, you
2 know, I -- we -- we could -- we could -- the driver
3 could handle, I think, interfacing to the -- to the IP
4 layer of the computer. And -- and -- and, you know, in
5 order to do so, we'd have to receive IP packets and --
6 and -- and send up IP packets.

7 But at the -- at the -- at the layer of the
8 switch, our own devices, it was ATM. So we had to --
9 you know, ATM only has, you know, 48-byte payloads with
10 5-byte headers so I had to convert the IP packet and
11 chop it up, put it into a bunch of ATM cells, figure out
12 where the right destination is and the right virtual
13 circuit identifier to use to -- to get to that IP
14 address.

15 And an IP packet could get chopped up into 20,
16 30 different ATM cells. Or, I mean, fewer. Could, you
17 know -- maybe it was just one or two in some cases for
18 small packets, but -- and then I'd have to track that,
19 reassemble the -- the cells back into IP packets on the
20 other side, and then pass them up to the network layer.

21 So the software to do that, it was custom
22 written, and that's part of what I did as -- as work
23 that underlied my thesis research.

24 Q. And this software just -- withdrawn.

25 Fair to call this software that you just

1 described just as your driver?

2 A. Sure.

3 Q. How long did it take you to write your driver?

4 A. Well, I -- I don't really remember. It's
5 probably something like months. I -- but again, I don't
6 have a specific recollection. And I -- I was tweaking
7 it, you know. And, you know, we'd add a new feature or
8 something and I'd have to go and work on it again.

9 Q. Was this part of -- this wasn't part of the
10 DARPA-funded research, though, this driver. Correct?

11 A. Well, I mean, I think it was all part of the
12 research project. But this was just like one of the
13 things you would -- we had to do to get to that point
14 where we could do the research that was really written
15 up in the grant that we got, you know.

16 Q. So you're telling me that, if I understand it
17 correctly, that writing this driver was an essential
18 part of facilitating what you have described as cutting
19 edge networking research?

20 A. Well, I don't remember how I described our --
21 our group's work. But, you know, yeah, I mean, in order
22 to -- to do the -- get the -- the high-speed video
23 and -- and, you know, like, all the data had to go
24 through the -- the interface card and through the -- and
25 the -- through my -- the driver software that I wrote,

1 because it was all custom built.

2 So any interaction with -- with our -- our
3 own -- our group's high-speed network hardware was
4 through the -- the device driver, my device driver,
5 and -- and the hardware device itself.

6 THE REPORTER: Counsel, this is the court
7 reporter. Is it time for a break?

8 ATTORNEY STAMATOPOULOS: I'm going to ask I
9 think one more question and then we're -- I was going to
10 suggest going on a break.

11 THE REPORTER: Excellent.

12 BY ATTORNEY STAMATOPOULOS:

13 Q. So, Dr. Houh, earlier in your testimony I
14 believe you said that this high-speed network, VuNET,
15 was oriented to supporting specific types of
16 applications. And I think you mentioned video as one
17 potential application.

18 My question is, how was video different in
19 terms of its demands of a network than other
20 applications?

21 A. Well, I mean, videos typically requires a --
22 a -- ongoing bandwidth demands over, you know, over time
23 or throughout the course of a video.

24 Video is somewhat tolerant to loss depending
25 on how you encode the -- the data. But if you lose a

1 little bit of -- of packets here and there, sometimes it
2 may not drastically impact the quality of the -- of the
3 video and might only be a momentary glitch that -- that
4 you may or may not even notice.

5 I mean, there's -- there -- I mean -- I mean,
6 back then, you know, in the '90s there really wasn't
7 much or any video.

8 You know, I think -- I think our video demos
9 on the -- on the web quite possibly could have been the
10 first videos of, you know, live videos that you could
11 pull down and watch, you know, by -- by going to a
12 website first.

13 And -- and you could watch it on an ongoing
14 basis so it was -- it was kind of like early streaming.
15 I mean, there were files that you could go download at
16 the time and then watch on your computer, but that's
17 different.

18 And the demands of -- on the network are --
19 are different in downloading a video to watch than to --
20 to -- you know, now what we call streaming a video.

21 I mean, you could -- you could start our demo
22 and leave it up indefinitely for however long you
23 wanted. I -- I don't know why, but -- and, you know,
24 so -- so -- so that's what you could have done back then
25 with -- with some of the live camera feeds we had

1 available.

2 We had recorded demos which would stop, you
3 know, when the -- when the recording stopped or ended,
4 but -- or the, you know, the file was over. But we also
5 had these live cameras you could watch.

6 So -- so the nature in which people interacted
7 with -- with the video and -- and what they do with it
8 kind of, you know, are -- are different, like -- and if
9 you went to a web page back then, you would download all
10 the web page components and they'd be downloaded until
11 you went to the next web page, assuming your browser
12 didn't do other, you know, predictive things.

13 But -- but you might have a burst of network
14 activity followed by, you know, your reading some
15 article for five minutes and then you go to the next web
16 page.

17 But with video, the demands are typically kind
18 of ongoing. You know, there might be a burst of data
19 to -- to support what -- a frame or a portion of the
20 video you're watching right now, but you're -- you're
21 continuing to watch the video so it's -- it's on --
22 ongoing demand on the network.

23 And that's at least one of the differences.
24 I -- I think there would probably be a lot more if --
25 if, you know, if I had the time to sit down and really

1 think about it.

2 Q. Do you need faster processing at the device
3 level in order to accommodate a video application on a
4 high-speed network?

5 A. Well, I -- I mean, you know, our work -- well,
6 at -- at the time, I think as I mentioned earlier, we
7 were kind of CPU bound on our -- our video speed.

8 I mean, I think today, things are -- are a lot
9 different, you know. But this was, wow, 30 years ago.
10 So, you know, we talked about back then, you know, once
11 you can get video in at kind of human speeds, you know,
12 I -- you don't really need to go a lot faster than that.

13 And for now we're up at 4K, but back then, we
14 were at standard definition. And going to 4K is
15 probably like, you know, 10, 16 times more data. But
16 the compression methods are better and -- and -- and the
17 computers are much, much faster too.

18 So I think back in the time we started,
19 there -- there was a -- you know, we were more CPU
20 bound, you know, and -- and that was more of a
21 bottleneck back then than today.

22 I mean, network speeds were also bottleneck.
23 That -- that's kind of why we -- we jumped up to gigabit
24 speeds and that DARPA funded these gigabit testbeds.
25 Once you increase the network speed by orders of

1 magnitude, now what can you do?

2 But our philosophy was once you can get
3 full-rate video in, you know -- and I know gamers might
4 disagree, but like if you're at 30 frames a second, you
5 don't need to be at 120 frames a second, right? Because
6 the human visual system is only so fast. And, you know,
7 I -- I -- I suppose you could go up in resolution, which
8 now, of course, we're at much higher resolution.

9 But -- but, you know, once you can get that
10 kind of data for full-motion video into the computer and
11 there's more CPU overhead, then you can do these
12 interesting things.

13 And our research was about, well, what can you
14 do? So can you do the green -- like, you know, green
15 screening, like someone's walking into an office. Can
16 you kind of cut them out against the background and --
17 and -- and make it green screen? And we could do that.
18 We might not have been able to do that at full rate,
19 full resolution, but we could -- we could set up a
20 system in which then you'd take a -- an image or another
21 camera view and merge those two together and overlay the
22 person walking into an office with the background after
23 you've done the green screen.

24 And so we -- we had all sorts of applications
25 like that that we explored. And -- and there were

1 limits on -- on the CPU speed, but we could -- we could
2 show what could be done by using lower resolution video
3 than -- than full standard def and change the frame
4 rate. You know, we could use lower frame rate. Or
5 actually, our system was kind of built that the
6 processing needs dictated the -- the frame rate.

7 So, you know, naturally as you threw more
8 processing into the -- the -- the frames, the video on
9 the computer like they're doing green screening,
10 merging, we had a -- a thing called the puzzle, which
11 would scramble the video into the like 4-by-4 blocks
12 that you could move around like those old kid's toy with
13 the -- with the blocks you moved around to kind of get
14 the picture to come back to original, but with an empty
15 block, right?

16 And so we could do all this in real time. And
17 the more we did in real time, the slower the frame rate
18 would be for a given resolution. And so -- so I think
19 back then, we did experience issues of being bound by
20 the CPU. But today, you know, a -- a phone can take a
21 live video and like overlay a -- a cat image, you know.
22 So we're less bound by that today, and -- and I'm --
23 it's quite likely that today's phones have more compute
24 power than our -- our workstations did back then.

25 ATTORNEY STAMATOPOULOS: All right. Thank

1 you, Dr. Houh. I think we can go off the record.

2 THE VIDEOGRAPHER: Time is 11:09 AM. We are
3 off the record.

4 (Recess taken.)

5 THE VIDEOGRAPHER: We are back on the record.
6 The time is 11:28 AM.

7 BY ATTORNEY STAMATOPOULOS:

8 Q. Welcome back, Dr. Houh. So you submitted a
9 declaration in this case. Yes?

10 A. Yes.

11 Q. And as part of your declaration, you -- or,
12 rather, the subject of your declaration is the validity
13 of the '904 patent?

14 A. It's really directed to the unpatentability of
15 the claims of the '904 patent.

16 Q. Okay. And the '904 patent is titled
17 Bidirectional Chaining of Network Access Ports. Yes?

18 A. Yes.

19 Q. Tell me at a high level what's your
20 understanding of the purpose of the technologies
21 described in the '904 patent.

22 A. Well, if you look at the '904 patent itself in
23 the specification, what it says, it's a -- that it is an
24 object of some aspects of the present invention to
25 provide an improved multi-shelf access architecture. It

1 is a further object of some aspects of the present
2 invention to provide apparatus and methods for efficient
3 high-speed transfer of data packets within an access
4 multiplexer system, and that it is a still further
5 object of some aspects of the present invention to
6 improve the robustness and reliability of multi-shelf
7 access systems.

8 So I think that's what the spec is saying the
9 object of the invention are.

10 Q. What is a multi-shelf access architecture?

11 A. It talks about -- it gives an example in
12 Figure 1 that schematically illustrates a -- a -- a
13 DSLAM system implementing a multi-shelf architecture,
14 so -- so that's one of the examples that the -- the '904
15 patent is giving.

16 Q. Right.

17 But what's your understanding of a multi-shelf
18 access architecture?

19 A. Well, what the patent says about it, if -- if
20 you look around -- in column 1 around line 27, it
21 says -- it says: Because of the high cost of network
22 bandwidth, a single DSLAM must typically be designed to
23 serve between 10 and 1,000 subscribers and to
24 concentrate their traffic through one or a few network
25 trunks. The need to serve such a large and potentially

1 variable number of subscribers in one DSLAM has led to
2 the development of multi -- quote, multi-shelf access
3 architectures.

4 And I -- I think that typically, multi-shelf
5 typically refers to a shelf in a rack, you know, like
6 an -- I don't remember what the standard is, 19- or
7 21-inch racks, or something like that, and that a shelf
8 is kind of one position in the rack, and that -- that
9 I've heard multi-shelf referred to, you know, you've got
10 a number of different -- a number of different items in
11 a rack stacked above each other.

12 Q. And each of the shelves is intended to provide
13 access to between 100 and 1,000 subscribers?

14 A. Sorry, could you repeat your question, please?

15 Q. Each of the shelves is intended to provide
16 access to between 100 and 1,000 subscribers?

17 A. I think what it's saying here is that the
18 whole DSLAM itself must typically be designed to serve
19 between 100 and 1,000 subscribers. So I don't think
20 that means there's 1,000 subscriber that can be
21 supported by one -- one position in the rack or -- or
22 shelf, as I've heard it referred to. That makes that
23 the whole DSLAM needs to support that, and that's why I
24 think they're talking about multi-shelf, because it
25 takes up a number of positions in a rack to support this

1 high number of subscribers.

2 Q. So you need several different shelves in order
3 to accommodate this high number of subscribers. Fair?

4 A. I think what the patent says is that the need
5 to serve such a large and potentially variable number of
6 subscribers in the one DSLAM has led to the development
7 of multi-shelf access architectures.

8 Q. Okay. So there is a need for a multi-shelf
9 architecture as a result of the high number of
10 subscribers. Fair?

11 A. I -- I mean, that's -- that's what the '904
12 patent is describing.

13 Q. Do you agree with that?

14 A. I -- I -- you know, I -- I don't think I have
15 any specific reason that I can think of now to disagree.
16 But, I mean, supporting large subscribers takes physical
17 space in a system, and so I think that's part of what
18 this is describe -- describing in the '904 patent.

19 Q. Okay. And what is a subscriber?

20 A. Well, in the case of what it's talking about
21 for a DSLAM, a DSLAM stands for digital subscriber line
22 access multiplexer. And so what -- what the patent
23 describes here is that there are DSL subscribers.

24 That's -- that's column 1 around line 25. And -- and --
25 and that's known as a -- a DSL subscriber would be

1 someone that's -- that's getting some sort of access to
2 communications over this type of line called a -- known
3 as a DSL line, or a digital subscriber line.

4 Q. And what type of network would a DSL
5 subscriber gain access to?

6 ATTORNEY KONSTANTAKOPOULOS: Objection.

7 A. I mean, what it says in line -- column 1, line
8 10, it says: Digital subscriber line (DSL) is a modem
9 technology that enables broadband digital data to be
10 transmitted over twisted-pair wire, which is the type of
11 infrastructure that links most home and small business
12 subscribers to their telephone service providers.

13 So it would be the kind of service offered by
14 what it's saying -- describing as telephone service
15 providers, that they --

16 Q. And that would include connectivity beyond
17 just a local area network. Correct?

18 A. Well, I mean, I think that's -- that's fair.
19 I mean, the fact that they're -- they're going over
20 this -- this line, it's -- it's kind of saying that it's
21 leaving the site of -- of their business or home.

22 Q. Does the patent, the '904 patent anywhere
23 limit the type of subscriber to which it is applicable?

24 A. Well, Claim 1, for example, just talks
25 about -- about respective subscriber lines. I -- I

1 don't have this memorized, but I don't -- I don't -- I
2 don't recall offhand any express -- express, you know,
3 discussion in -- in the -- in the spec about limiting
4 that.

5 I mean, it gives an example of DSL, at -- at
6 least, but the claim doesn't appear to have words that
7 are -- are -- that -- that limit the -- the -- it just
8 says subscriber line.

9 Q. Is any type of end user on a network
10 considered a subscriber?

11 ATTORNEY KONSTANTAKOPOULOS: Objection.

12 A. Well, in the prior art that I looked at, I
13 think a POSITA would have recognized that the -- the
14 types of -- that -- that Patrick teaches these secondary
15 stations are subscriber access units and -- and even
16 uses the phrase "subscriber access unit."

17 So I think a POSITA would have understood that
18 at least these types of stations in -- in the -- that
19 Patrick discloses are -- are subscriber access units.

20 BY ATTORNEY STAMATOPOULOS:

21 Q. Is -- so you -- let me repeat my question.

22 Does the term "subscriber" encompass all types
23 of network users?

24 ATTORNEY KONSTANTAKOPOULOS: Objection.

25 A. I mean, so I think a POSITA would have

1 recognized that it at least encompasses some users and
2 their devices, such as disclosed in Patrick.

3 And, you know, they -- they specifically use
4 the term "subscriber access units." So it's pretty
5 clear that's -- that the Patrick subscriber -- that
6 Patrick has and is disclosing subscribers.

7 BY ATTORNEY STAMATOPOULOS:

8 Q. Other than Patrick, can you think of any other
9 types of users that would be included in the meaning of
10 the term "subscriber"?

11 ATTORNEY KONSTANTAKOPOULOS: Objection.

12 A. Well, I mean, as I'm sitting here now, I mean,
13 I have an account with an internet service provider, so
14 I subscribe to their services. And so I think I'm the
15 type of user who subscribe to network access, for
16 example. But certainly, we recognize that the user and
17 the equipment -- you know, if you look at paragraph 107,
18 I'll refer you there, but -- and -- and 108 through the
19 end of the section, it -- my analysis in my declaration
20 was specific to the -- the prior art references.

21 So in the prior art references, I think a
22 POSITA would recognize that there is a -- a subscriber
23 that's disclosed.

24 BY ATTORNEY STAMATOPOULOS:

25 Q. In what prior art references?

1 A. Well, Patrick is the one that uses the phrase
2 "subscriber access units." And I talk about the, you
3 know, that -- that -- that the challenged claims are --
4 are unpatentable over -- over the combination of Vink
5 and Patrick, and also Vink and Patrick and the -- the
6 applicant admitted prior art.

7 Q. So just to summarize, so you're a subscriber.
8 Correct?

9 A. Well, in my home here, I consider, you know,
10 I'm subscribing to a service and -- a -- a networking
11 service. And -- and certainly Patrick is disclosing
12 that there are subscriber access units, and -- and it's
13 described -- it's disclosing, you know, and the
14 combination renders obvious the -- the challenged
15 claims. I think --

16 Q. Right. We'll get -- we'll get to the
17 combination. I just want to get step by step a little
18 bit. My question is very specific.

19 Other than you, Patrick, and the applicant
20 admitted prior art, do you have any other examples as
21 you sit here today of network users that could properly,
22 in your opinion, be referred to as subscribers?

23 ATTORNEY KONSTANTAKOPOULOS: Objection.

24 A. Well, I mean, I gave you the example, but --
25 but specifically with the analysis I did with respect to

1 the -- the -- the patentability of the challenged
2 claims, that's disclosed in -- at least by Patrick.

3 It's also disclosed I think by the applicant
4 admitted prior art, as I -- as I show kind of -- as I
5 talk about in -- in that section I -- I just referred
6 you to earlier.

7 But -- but that's for the purposes of --
8 that's my analysis. So, I mean, yeah, I mean, I -- I
9 gave you the example. I -- I -- I'm -- I consider --
10 you know, I subscribe to network services at home.

11 BY ATTORNEY STAMATOPOULOS:

12 Q. And so your reason for including yourself as a
13 subscriber in your response is because you subscribe to
14 a particular type of service. Yes?

15 A. Yeah, I mean, this is outside of my analysis.
16 You asked me if any -- if I knew -- could think of any
17 other subscribers. But the -- but with respect to the
18 analysis I did for the declaration, analysis was focused
19 on the prior art that I analyzed.

20 And in the prior art, Patrick does disclose
21 subscribers and subscriber lines, and -- and so
22 that's -- that's -- that's the analysis I did with
23 respect to the patentability of -- of the challenged
24 claims.

25 Q. So of the prior art that you analyzed, the

1 ones that disclose subscribers are Patrick and the
2 applicant admitted prior art.

3 Is that fair?

4 ATTORNEY KONSTANTAKOPOULOS: Objection.

5 A. Yeah, I mean, if you look at my analysis
6 starting around paragraph 107 to the end of that
7 section, that's -- that's where I'm discussing how
8 Patrick and AAPA -- that's the acronym I use for -- for
9 applicant admitted prior art -- teach these limitations,
10 and that Patrick teaches that -- that the secondary
11 stations are subscriber access units where the
12 subscriber access units can be connected to a personal
13 computer, workstation, or other data terminal equipment,
14 for example, in households having new or preexisting
15 cable television capacity.

16 And then I talk about in 109 about how AAPA
17 teaches that each slave unit typically comprises a
18 switching core 29 coupled to a plurality of ports
19 serving respective subscriber premises via suitable DSL
20 modems. And that's in -- in the Background section of
21 the -- of the patent specification. And that applicant
22 conceded that limitations 1B, 4B, 9B, and 11B were well
23 known during prosecution.

24 Q. Would it be okay if I asked you to focus your
25 answers on the questions I'm asking as opposed to

1 reading different parts of your declaration?

2 And to the extent you feel that you need to
3 read a part of your declaration, I ask you to explain a
4 part of your declaration, then you can do that.

5 Is that -- is that fair?

6 A. Well, I'm telling you the actual analysis I
7 did, so in -- in -- with respect to your question.

8 Q. What I'm asking is that if you will -- if --
9 so that we can get through this deposition, you know,
10 expeditiously, if it's possible to refrain from reading
11 the entire portions of your declaration. Your
12 declaration's in the record.

13 Is that okay, sir?

14 A. Sure. But that's -- that's where I -- you
15 know, that's the -- I -- I -- I've spent a lot of time,
16 you know -- you know, on the declaration in terms of
17 preparing it, and that's where the best analysis has
18 gone into producing.

19 And so, you know, I can paraphrase if you
20 want, but the -- the -- my declaration is what it is.
21 And really, those are my written opinions in this -- in
22 this matter.

23 Q. Understood.

24 Now, without necessarily reading me from your
25 declaration unless you think it's relevant, in your

1 declaration, you do not opine that Vink discloses
2 subscribers. Correct?

3 ATTORNEY KONSTANTAKOPOULOS: Objection.

4 A. I mean, I do talk about how a POSITA would
5 recognize that their connections disclosed in Vink lead
6 to subscriber lines, and I do discuss that in paragraph
7 107, at least.

8 BY ATTORNEY STAMATOPOULOS:

9 Q. Does Vink anywhere mention subscribers?

10 A. I mean, not to my recollection.

11 Q. And you have Vink in front of you. Yes?

12 A. I do.

13 Q. And you have a search functionality on your --
14 or do you have it in electronic form?

15 A. Yes.

16 Q. Do you have a search functionality?

17 A. Yes.

18 Q. Does it mention the word "subscriber"
19 anywhere?

20 A. So I did not find the word "subscribe" or --
21 or anything containing "subscribe" when I did the
22 search.

23 Q. Now, Vink is -- Vink is directed to a local
24 area network. Yes?

25 A. I do see the phrase "local area network" used

1 in -- in the specification of -- of Vink. But if you
2 look at the claims, they talk about generic I/O modules
3 which -- and -- and they're not limited by the claims
4 to -- to only be used in -- in -- in a local area
5 network. In fact, there's no discussion of local area
6 network in the -- in the claims that I saw.

7 Q. Do the claims describe a connection to an
8 external network in Vink?

9 A. So first of all, I don't -- I don't think
10 there's the use of the phrase "external network" in any
11 of the -- any of the challenged claims.

12 But in my analysis, I do talk about the
13 combination of Vink and Patrick and -- and why the -- in
14 the combination there would be, you know, that --
15 that -- reasons that a person of ordinary skill would
16 have sought to make the combination and that there is
17 the required network in the claims, you know, that, for
18 example, the first mass unit transmits over the -- over
19 the network, or -- or receives, you know, what --
20 whatever the -- the -- the requirements of the claims
21 are, I do the proper analysis with respect to the -- the
22 phrase "network" in some of the -- the claims.

23 And that's laid out in my declaration. But
24 it's the combination of Vink and Patrick and the -- the
25 reasons why a POSITA would have put them together that I

1 set forth in my analysis.

2 Q. So the term "external network" does not appear
3 in the claims. Fair? Of the '904 patent.

4 A. Yeah, I -- I didn't see it just now looking --
5 looking through the claims.

6 Q. The term "network" does appear, however.
7 Correct?

8 A. Yes.

9 Q. And so to satisfy that particular limitation
10 of a network, you've relied on the Vink and Patrick
11 combination.

12 Is that correct?

13 A. Well, that's ground 1, but then there -- I
14 also have discussion about ground 2 about Vink and
15 Patrick and AAPA. And I discuss the motivations to
16 combine with that and how the patent -- and what the
17 patent says about that in -- in -- starting around
18 paragraph 83 of my declaration.

19 So it's not just Vink and Patrick. That --
20 that's one ground. But there's also Vink and Patrick
21 and AAPA ground.

22 Q. Okay. So turning to paragraph 87 of your
23 declaration, you state: Combining Vink communication
24 system with an external network such as taught by both
25 Patrick and AAPA would have been obvious to a person of

1 ordinary skill in the art at the time.

2 Do you see that?

3 A. Yes.

4 Q. What did you mean by "external network" when
5 you wrote that? Just the phrase "external network."

6 A. Well, I think that would include examples that
7 are disclosed in the AAPA, such as ATM or -- or an IP
8 network.

9 Q. Okay. Does Vink itself provide any examples
10 of an external network?

11 A. If you look at paragraph 229, I do discuss
12 this issue in that and the next paragraph, which is that
13 Vink does disclose that public networks are available
14 for long distance connections and that Vink does not
15 explicitly disclose that the network comprises an ATM
16 network. But ATM networks, which can be public
17 networks, were well known.

18 And, you know, for example, AAPA discloses
19 that an ATM network could be connected to two masters.
20 And it goes on to say what -- what -- what that says.
21 And I'll just refer you to that section of my
22 declaration.

23 Q. What section was that?

24 A. Paragraph 229.

25 Q. Any other sections of your declaration that

1 discuss Vink's disclosure or purported disclosure of a
2 external network?

3 A. I think I only cited to two lines in Vink, but
4 the paragraph in which those two lines are are generally
5 discussing public networks and -- and -- and how they
6 can provide point-to-point connections between two
7 stations.

8 Q. Are public networks external networks?

9 A. Well, I think examples of -- of public
10 networks are like the -- the -- the -- the one that many
11 people think of. Like, the internet is generally
12 considered a public network.

13 Q. Okay. And Vink -- withdrawn.

14 Vink does not disclose the manner in which an
15 interface is provided between the network described in
16 Vink and such a public network. Correct?

17 A. I mean, Vink does talk about -- and this is in
18 the same paragraph I cited to. But this is page 1 of
19 Vink around line 18.

20 It says: For long distance connections,
21 public networks equipped with cables or radio links are
22 inter alia available.

23 And so I think it's saying if there's cables,
24 radio links, and more available for long distance
25 connections, and that public networks are equipped

1 with -- with these types of -- of cables and radio links
2 and other types of -- of links.

3 Q. Does Vink describe which specific devices
4 provide an interface to such networks?

5 A. Well, in the Motivation to Combine section, I
6 do discuss how Vink does not expressly show its
7 communications system being connected to an external
8 network. But it -- it's not restricted to this
9 particular embodiment, but that -- in that it -- it
10 was -- an obvious modification to a POSITA is to open up
11 Vink's communication system to an external network, such
12 as taught by Patrick. And I give the reasons why a
13 POSITA would have done that in -- in -- in that section.

14 Q. What are those reasons?

15 I mean, what -- let me -- let me actually
16 withdraw that question.

17 What sections of your declaration do you
18 provide those reasons in?

19 A. Well, there's the section, section -- section
20 8A1, for example.

21 Q. Sorry, could you repeat that?

22 A. Section 8A1, or 8.A.1.

23 Q. Let me withdraw the previous question.

24 What specific paragraphs of your declaration
25 do you provide the motivations of the person of ordinary

1 skill in the art to combine Vink with Patrick in order
2 to satisfy the limitation of providing an interface to
3 an external network?

4 A. I mean, which claim limitation are you asking
5 about? Because "external network" is not a -- a phrase
6 used in any of the claims that I -- that I understand.

7 Q. Let's turn to Claim 1 of the '904 patent. You
8 have referred to the phrase "external network" in your
9 declaration. Correct?

10 A. Yes, I -- I have used the phrase "external
11 network" in my declaration, but it's not a phrase
12 that -- that I think is used in any of the asserted --

13 Q. You used -- you used the phrase "external
14 network" in your declaration in connection with the
15 limitation in Claim 1, which reads: First and second
16 master units each comprising a physical interface to a
17 packet switched network. Correct?

18 ATTORNEY KONSTANTAKOPOULOS: Objection. The
19 text says "internal." I believe you asked for external,
20 just to clarify for the record.

21 ATTORNEY STAMATOPOULOS: So I asked -- so I
22 asked Dr. Houh if he's used the term "external network,"
23 and I believe the answer --

24 ATTORNEY KONSTANTAKOPOULOS: Correct.

25 ATTORNEY STAMATOPOULOS: Yeah.

1 ATTORNEY KONSTANTAKOPOULOS: I'm looking at
2 the realtime. Sorry, I just wanted to clarify the
3 record.

4 ATTORNEY STAMATOPOULOS: Oh, yeah. I said
5 external, not internal. Thank you. Appreciate it.

6 A. If you are asking about that claim element in
7 particular, I think I have that labeled as 1A in my
8 report. And if you look at paragraph 93, I do mention
9 external networks there, but the -- the -- it's -- it's
10 mentioned, but -- but it's mentioned in paragraph where
11 I'm talking about how Vick -- Vink is disclosing a
12 method and communication system for serially exchanging
13 data such as a local -- such as local area networks, and
14 that LANs are known to rely on packet switching. And
15 then I do mention, you know, in the rest of that
16 paragraph the -- the phrase "external packet switched
17 network."

18 But the, I mean, the analysis in my
19 declaration is -- is -- is what's written there. And I
20 do mention "external packet network" in paragraph 93.

21 But primarily, I discuss that with respect to
22 the motivations to combine, which I reference in the
23 preamble, which recites network access apparatus
24 comprising.

25 And -- and I refer back to my, in -- in that

1 section, which is paragraph 89 through 91, I refer back
2 to the Motivation to Combine sections, which was 8.A.1,
3 and I was going to add that it's also 8.A.2 for the
4 Vink, Patrick, and AAPA challenged ground. And I -- I
5 do talk about external networks a lot more in those
6 sections.

7 BY ATTORNEY STAMATOPOULOS:

8 Q. And the reason you talk about external
9 networks is because you understand the limitation in the
10 '904 patent Claim 1 reciting first and second master
11 units each comprising a physical interface to a packet
12 switched network to be referring to an interface between
13 slave units and an external network. Correct?

14 ATTORNEY KONSTANTAKOPOULOS: Objection.

15 A. Well, in my analysis I don't think I'm
16 limiting it, the -- this physical interface to a packet
17 switched network in the manner you so describe because
18 I -- I discuss that there's the various physical
19 interface lines and things like that with -- with
20 respect to the analysis in later parts of -- of -- of
21 the Claim 1 analysis.

22 BY ATTORNEY STAMATOPOULOS:

23 Q. Earlier, you described subscribers as users
24 and their devices accessing an external network.
25 Correct?

1 A. I don't remember the exact words I used, but
2 if you say -- say I did.

3 Q. Well, does that sound right to you?

4 A. I -- I mean, I recall we had a discussion --
5 discussion about subscribers, but I -- I don't recall
6 the details about that.

7 Q. Well, would you agree that a subscriber is a
8 user and a user's device accessing an external network?

9 ATTORNEY KONSTANTAKOPOULOS: Objection.

10 A. I -- I mean, certainly when I'm a subscriber
11 to -- you know, at home here, for example, in that
12 example, I -- I -- I -- you know, I am subscribing to
13 general internet access services.

14 And -- and I think the subscribers that --
15 that are disclosed in -- in -- in Patrick do have access
16 to -- and I don't remember what word I used to describe
17 it, but I -- I know there's a figure in Patrick that
18 shows --

19 BY ATTORNEY STAMATOPOULOS:

20 Q. I'm not asking you about Patrick. I'm asking
21 you about your understanding of the term "subscriber."

22 Is a subscriber a user and a user's device
23 accessing a network?

24 ATTORNEY KONSTANTAKOPOULOS: Same objection.

25 BY ATTORNEY STAMATOPOULOS:

1 Q. Dr. Houh, with all due respect, sir, I've
2 tried to be very, very patient as you go through your
3 materials to answer what I consider to be very simple
4 questions.

5 So I'm not asking you about what's in Patrick.
6 Not asking you about what's in Vink. I'm asking you,
7 sir, about your understanding. You're the expert that
8 Cisco has retained in this case.

9 I'm asking you what your understanding is of a
10 term that appears in the patent. That term is
11 "subscriber." So I'll go ahead and ask my question one
12 more time and then you can respond as you see fit.

13 But I will tell you that what has been going
14 on thus far, in my opinion, is not an appropriate way to
15 conduct a deposition or to answer questions in a
16 deposition. Your counsel may disagree, but I'm putting
17 it on the record.

18 So my question to you, sir, is: In your
19 opinion, what type of user satisfies the definition of
20 the term "subscriber" as that term appears in Claim 1 of
21 the '904 patent?

22 ATTORNEY KONSTANTAKOPOULOS: Objection. And I
23 do disagree, and I'd like to put it on record.

24 Dr. Houh, you can -- you can answer.

25 A. In my opinion, a person of ordinary skill do

1 recognize that the type of subscriber as claimed in --
2 in Claim 1 or the use of subscriber is disclosed within
3 the combination of -- of Vink and Patrick, and by
4 Patrick, which talks about subscriber access devices.

5 And so a person of ordinary skill recognize
6 that -- that that scope at least includes what's
7 disclosed within Patrick. And -- and, you know, and
8 that's -- that's the analysis I did with respect to my
9 declaration.

10 BY ATTORNEY STAMATOPOULOS:

11 Q. Why would a person of ordinary skill in the
12 art recognize that the term "subscriber" includes what
13 is disclosed in Patrick?

14 A. So Patrick is directed towards data
15 communications and data communication systems and
16 devices. And more specifically, to an apparatus,
17 method, and system for distributed routing in a
18 multipoint communication system.

19 And a POSITA would have recognized that's the
20 same field as -- as the '904 patent and that -- that
21 they're discussing very similar methods to access a
22 network, such as in Figure 1 -- 105. And it's the same
23 context, and it uses the word "subscriber."

24 I mean, there are many reasons why a POSITA
25 would have -- would have understood that -- that

1 that's -- that's a subscriber that has a subscriber
2 access unit.

3 Q. And what's a subscriber access unit?

4 A. So the context of the -- of the Patrick patent
5 talks about -- you know, this is column 1 of Patrick,
6 line like around 24. It's discussing a -- a particular
7 Motorola system. And the patent is assigned to
8 Motorola, or at least on its face I believe it says
9 that.

10 And it talks about subscriber units connected
11 to a personal computer, workstation, or other data
12 terminal equipment, for example, in households having
13 new or preexisting cable television capability. And I
14 think I talk about how it's obvious that these are
15 subscribers. They -- they have cable TV, and -- and --
16 and now they're accessing this other service over this
17 subscriber access equipment.

18 And it also talks about subscriber access
19 equipment further down around line 34: With the
20 CableCom system, digital data may be transmitted both in
21 the downstream direction from the primary station or
22 controller connected to a network to the secondary
23 station of an individual user subscriber access unit and
24 in the upstream direction from the secondary station to
25 the primary station and to a network.

1 And it's talking about this really in the same
2 context as the '904 patent, which is -- talks about
3 upstream and downstream data as well. And there's
4 other -- there's another reference I saw, but I'm -- I
5 don't -- you probably don't want me to read that.

6 Q. So what are the reasons that a person of
7 ordinary skill in the art would have been motivated to
8 combine Vink and Patrick?

9 A. One motivation would be that it -- that
10 modification permits Vink's system to have contact with
11 an external network. And a POSITA would have recognized
12 that without contact with an external network, Vink
13 would only have operated internally, functioning purely
14 as a local system. But by connecting the communication
15 system described by Vink to an external network, it
16 would have benefited by gaining access to more
17 information and being able to connect to more computers
18 and servers to exchange information than what would have
19 been available on an internally only network. And so
20 that's one reason I -- I -- I give. And I kind of
21 paraphrased that from paragraph 81.

22 Q. So external networks were known in the art
23 prior to Patrick. Correct?

24 A. Well, I mean, networks like the internet
25 predated, you know, the '904 patent.

1 Q. Why is it that Patrick -- sorry, withdrawn.
2 Why is it that Vink itself does not disclose
3 connection to an external network?

4 ATTORNEY KONSTANTAKOPOULOS: Objection.

5 A. Well, I mean, the specification as written
6 is -- is -- is -- it maybe doesn't -- doesn't explicitly
7 say those words. But Vink does suggest that there are
8 ways to connect to other devices on the network. We
9 reviewed that -- that section. I think it was from a
10 paragraph in page 1 of -- of Vink.

11 Q. But Vink itself discloses a network that's not
12 connected to an external network. Correct?

13 A. I don't think Vink says you can't connect to
14 an external network. I -- I think it's just focused on
15 the different aspect of networking for -- for what
16 it's -- what it's teaching. But I don't --

17 Q. It's focused on a local area network.
18 Correct?

19 A. But it -- it's not precluding any further
20 connectivity which, you know, it -- it's -- it's not
21 saying you can't connect to an external network.

22 Q. I'm not asking you whether it's precluding.

23 To be very clear, I'm asking you whether Vink
24 discloses a specific way of connecting a local area
25 network to an external network.

1 Does it do that?

2 ATTORNEY KONSTANTAKOPOULOS: Objection.

3 A. As I said, Vink does not explicitly show its
4 communication system being connected to an external
5 network. But it does talk about other -- going point to
6 point over long distances, and so it's suggesting that
7 that -- that is indeed possible. But it's just focused
8 on the things it's focused on.

9 BY ATTORNEY STAMATOPOULOS:

10 Q. If it's beneficial for the Vink network to be
11 connected to an external network, and external networks
12 were known prior to Vink, why is it, do you think, that
13 Vink does not disclose connecting its network to an
14 external network?

15 ATTORNEY KONSTANTAKOPOULOS: Objection. Calls
16 for speculation.

17 A. I don't know what was in the inventors' minds,
18 but the patent specifications don't have to cover every
19 possible thing in the world because -- so I don't --
20 you'd have to ask, you know, why -- why the patentees
21 didn't -- didn't add that. I -- I don't know one way or
22 the other, but --

23 Q. So the answer --

24 A. -- the --

25 Q. The answer is --

(Simultaneous speaking. Reporter admonition.)

A. -- to include all these things that can be directed towards something. But, as I said, Vink doesn't -- does not explicitly show its communication system being connected to an external network.

It doesn't mean that's precluding it, and it doesn't mean it wouldn't have been obvious to combine it with Patrick for very good reasons as one I -- I just mentioned.

BY ATTORNEY STAMATOPOULOS:

Q. So the answer --

A. -- to -- for users --

Q. -- to my question --

(Simultaneous speaking. Reporter admonition.)

THE WITNESS: If I could be permitted to finish.

ATTORNEY STAMATOPOULOS: Yeah, yeah. I didn't mean to talk over you.

A. You know, for the reasons I gave, that there's a lot of information out -- I'm going to paraphrase, but I'll refer you to my declaration.

There's a lot of information on -- on the -- on the network, and it allows Vink users to access that when -- when you put Patrick in, and when a -- and -- and that's a reason that a -- a -- a POSITA would have

1 combined Vink and Patrick as well as Vink and Patrick
2 and -- and using the -- the AAPA.

3 And so there's lots of reasons why it would
4 have been beneficial to add access to a network, and --
5 and -- and that's -- that's the -- challenged ground is
6 the combination. It's not just Vink on its own.

7 BY ATTORNEY STAMATOPOULOS:

8 Q. So all of the reasons that it would be
9 desirable to combine Vink and Patrick, in your view,
10 those are given in your declaration. Correct?

11 A. Yeah. I mean, the ones I laid out in my
12 declaration are -- are what's -- what my written
13 opinions are.

14 Q. Does Vink anywhere suggest that it would be
15 desirable to connect the local area network disclosed in
16 Vink to an external network for the reasons that you
17 have provided in your declaration?

18 ATTORNEY KONSTANTAKOPOULOS: Objection.

19 A. I mean, Vink, as we -- as I said earlier, does
20 talk about long distance connections. It talks about
21 public networks. It talks about radio links. It talks
22 about other types of cables and links.

23 But I -- I don't -- I don't think it uses the
24 words or the -- the motivation with respect to all that
25 information available. But that's -- that's still a

1 reason, as I lay out in my declaration, why a POSITA
2 would have recognized that it would have been beneficial
3 to combine Vink with -- with Patrick.

4 BY ATTORNEY STAMATOPOULOS:

5 Q. And that's the part of Vink that you pointed
6 me to earlier. Correct?

7 A. Yes.

8 Q. Is there any support in your declaration based
9 on either Patrick or Vink or any other piece of
10 literature suggesting that it would be desirable to
11 connect to an external network, a local area network,
12 with Vink's specific topology?

13 ATTORNEY KONSTANTAKOPOULOS: Objection.

14 A. Well, I address the reasons why it would have
15 been obvious to make that combination. I don't think
16 I -- I've cited to anything about Vink's specific
17 topology, mostly because I think the -- the motivations
18 are present with respect to really any type of network
19 system where it's talking about point-to-point, you
20 know, access within its system, that it would still be
21 obvious to interconnect that with a broader public
22 network to access more information so you could charge
23 users or subscribers for -- you know, get revenue for
24 providing such services.

25 There's lots of reasons, and I've -- I've gone

1 over them. And -- and -- and, you know, there -- there
2 are further reasons that we didn't get to discuss that
3 are in my declaration that we haven't explicitly
4 discussed.

5 But there are motivations to add access to
6 this information, and -- and that's -- that's -- it
7 would have been -- it -- I mean, that -- that would have
8 been obvious to a POSITA to make that combination. But
9 I don't think I specifically cite to any third-party
10 reference that says wouldn't it be great to combine Vink
11 with external network access. But I don't think I need
12 to, because I think that's just obvious to a POSITA for
13 the reasons that I've given.

14 BY ATTORNEY STAMATOPOULOS:

15 Q. Did I catch it correctly that you think that
16 the reasons to combine Vink and Patrick apply to all
17 point-to-point network connections?

18 ATTORNEY KONSTANTAKOPOULOS: Objection.

19 A. What I said is if you -- if you had a -- a --
20 a, you know, a -- a system directed to kind of internal
21 communications and all you could do was communicate, the
22 same reasons a -- a person would want to connect that
23 network to a -- a -- an external network are -- are
24 equally applicable.

25 I mean, you might say maybe this is a military

1 network patent and -- and it says we don't want to
2 connect to the external network because of this reason
3 or that reason, and don't. Well, maybe that wouldn't be
4 applicable, all right?

5 But -- but -- but I think it -- it -- it'd be
6 obvious to a POSITA that -- that, like, local area
7 networking technologies can be interconnected to broader
8 networks so that you can access more information if
9 you're a service provider so you can charge for that
10 access.

11 There -- there are lots of beneficial reasons
12 why a POSITA would have made such combinations. And I
13 lay them out, and some could be applicable to other
14 network systems. Maybe "all" wasn't the right word
15 because I -- you know, there may be situations where
16 someone's talking about a very precise internal
17 networking technology, and that -- that doesn't or
18 shouldn't have access to an external network.

19 BY ATTORNEY STAMATOPOULOS:

20 Q. So you agree that there are at least some
21 networks where it's not desirable to have connectivity
22 to an external network. Correct?

23 ATTORNEY KONSTANTAKOPOULOS: Objection.

24 A. Well, I don't think there's any teaching away
25 from having an external network in Vink, so I think it

1 is applicable to -- these reasons are applicable to the
2 combination of Vink and Patrick for the reasons that
3 I've given in my declaration.

4 I, you know, I -- I shouldn't be doing any
5 analysis on the fly here about other systems, but at
6 least the same motivation could apply to at least some
7 other systems.

8 BY ATTORNEY STAMATOPOULOS:

9 Q. So you haven't analyzed to see if there are
10 any types of networks to which -- for which it would not
11 be desirable to connect to the -- to an external
12 network. Correct?

13 ATTORNEY KONSTANTAKOPOULOS: Objection.

14 A. There's certainly nothing in my declaration
15 that I have written about it.

16 BY ATTORNEY STAMATOPOULOS:

17 Q. Don't you think it would have been relevant to
18 see whether it is not desirable to connect certain types
19 of local area networks to an external network?

20 ATTORNEY KONSTANTAKOPOULOS: Objection.

21 A. Vink doesn't have any explicit teaching away
22 that I can recall about doing so, so I'm just concerned
23 with the combination of Vink. And I don't think Patrick
24 is teaching away from any sort of combination as I made
25 it either. So my concern was with respect to the -- the

1 prior art that I'm analyzing with respect to the
2 declaration, and that's -- that's what I've written up
3 in the declaration.

4 BY ATTORNEY STAMATOPOULOS:

5 Q. You mentioned in your declaration that a
6 person of ordinary skill in the art would modify Vink in
7 light of Patrick. Correct?

8 I'll refer you to paragraph 79.

9 A. Yeah. I mean, here I say specifically a
10 POSITA would have been motivated to modify Vink's system
11 in view of Patrick's teachings -- teachings to provide
12 the option in Vink's system for the master units to be
13 connected to an external packet switched network. More
14 specifically, that's -- that's what I said in 79.

15 Q. Okay. What are the specific steps that a
16 person of ordinary skill in the art would have had to
17 undertake in order to modify Vink's system in view of
18 Patrick's teachings to provide the option in Vink's
19 system for the master units to be connected to an
20 external packet switched network?

21 ATTORNEY KONSTANTAKOPOULOS: Objection.

22 A. I don't think I get to that -- that exact
23 level of detail about the steps, but it's -- it's
24 generally just adding an external network reachable from
25 the master units of -- of Vink, which would involve, you

1 know, having interface and having appropriate software
2 to -- to route packets accordingly.

3 BY ATTORNEY STAMATOPOULOS:

4 Q. What's the appropriate --

5 A. Hold -- hold on.

6 Q. Oh, sorry. I didn't mean to speak over you.
7 I thought you were done. Please finish.

8 A. And, you know, these were well-known things at
9 the time. People could -- did that to have an interface
10 to a ATM or IP network or other types of -- of -- of
11 networks.

12 And so that's just within the -- the skill set
13 of a person of ordinary skill. And I -- I give reasons
14 why -- why the combination would have been success --
15 successful. And I think I talk about that in this --
16 this section as well.

17 Q. Okay. You said, for example, that you would
18 need certain types of software in order to add an
19 external network to Vink. Correct?

20 A. Yeah, I think I did say that. But this was
21 all well known already because there was plenty of
22 software and systems that -- that -- that allowed, you
23 know --

24 Q. We'll get to that.

25 As of the time of the filing date of the '904

1 patent application, what were the types of software that
2 would have been available to a person of ordinary skill
3 in the art in order to facilitate modifying Vink's
4 system in view of Patrick's teaching to provide the
5 option in Vink's system for the master units to be
6 connected to an external packet switched network, as you
7 opine on paragraph 79 of your declaration?

8 A. I mean, there's plenty of software available.
9 There were versions of open source software available
10 for routing, for all sorts of networking functions, and
11 these -- these were all available to be used and as a --
12 even as a model to create software. And this was all
13 within the capability of a person of ordinary skill, so
14 they would have been successful in making the
15 combination, and that's what I lay out in my
16 declaration.

17 This technology was -- this kind of software
18 for -- for routing was -- was well known, and someone
19 could have interfaced that software and incorporated it
20 and had been successful in doing so.

21 Q. You mentioned there were a number of different
22 functionalities that the software that a person of
23 ordinary skill in the art would need to use to modify
24 Vink's system in view of Patrick to facilitate.
25 Correct?

1 A. I don't remember the exact words I used, but
2 sure. I mean, that's -- you asked about what potential
3 steps there would be. That -- that could be one step.

4 Q. What were the functionalities that a person of
5 ordinary skill in the art would have to program in
6 software in order to modify Vink's system in view of
7 Patrick's teachings to provide the option in Vink's
8 system for the master units to be connected to an
9 external packet switched network?

10 A. I mean, persons of ordinary skill had a
11 particular skill level. They had -- you know, that I --
12 I've laid out. They can make and use this invention.
13 That's -- that's -- that's -- and -- and they would have
14 been aware of a number of different -- you know, I mean,
15 there were plenty of existing software packages that
16 could be integrated.

17 So I think what would need to be written
18 would -- would be some specific integrations into the
19 specific system. But because the person of ordinary
20 skill can make and use Vink, they -- they can also --
21 they have the skill to also inter -- interface with
22 existing software for -- for networking. And they would
23 have had a reasonable expectation of success in doing
24 so.

25 So I think that's all within the purview of a

1 person of ordinary skill, as has been laid out in this
2 declaration.

3 Q. My question was a little bit different.

4 ATTORNEY STAMATOPOULOS: Would the court
5 reporter please reread my last question?

6 (The reporter read from the record.)

7 ATTORNEY STAMATOPOULOS: One correction on the
8 read-back of my question. It's "the option," not
9 "optimization."

10 THE REPORTER: Thank you, sir.

11 BY ATTORNEY STAMATOPOULOS:

12 Q. Did you understand the question, Dr. Houh?

13 A. Yeah, I -- I think so.

14 Q. Okay.

15 A. So, you know, to the extent that a POSITA may
16 have actually started with a -- an available operating
17 system already, it may have already included all the
18 code necessary.

19 So really, you know, the steps might have just
20 included integrating the very specific software
21 integrate -- that -- that drove the -- the network
22 capability of disclosing Vink with the existing software
23 that may have probably already been available in an
24 operating system that -- that a POSITA may have used
25 to -- to -- to build Vink to start with, and in which

1 case it might be some -- some straightforward
2 integration software and some configuration of the -- of
3 the operating system to -- to interact and to -- to
4 forward packets to an external network.

5 Q. So what were the functionalities again that --
6 do you -- that I -- that I asked about in my previous
7 question? Could you list those out for us?

8 A. Well, you asked about the option of --
9 ATTORNEY KONSTANTAKOPOULOS: Objection.

10 A. I think you asked about the option of
11 connecting to an external network, and some of that --
12 some of that's already built in and enabled to the
13 extent -- you know, if -- you know, if the system
14 already had an external interface that you could just
15 plug an external cable to, you may not have even needed
16 to -- to do that, because there's plenty of systems you
17 could -- you could -- you could buy off the shelf to
18 program the functionality of the master controller into,
19 or -- or just buy a computer and load open source
20 software.

21 So to the extent that that's how Vink's system
22 was created to start with, there might not be a lot of
23 additional software needed to be loaded or -- or
24 written, aside from some integration software.

25 And to the extent that Vink may already be

1 implemented in a way that uses IP packets internally, it
2 might just be a few -- one -- a very simple modification
3 to a configuration file.

4 BY ATTORNEY STAMATOPOULOS:

5 Q. Okay. What are the existing software packages
6 that you were referring to in your answer as of the 1999
7 time frame and prior to the filing date of the '904
8 patent application?

9 A. So prior to the -- the -- the -- I don't know
10 if I have an exact opinion about the priority date, but
11 prior to the filing date of the -- of the '904 patent
12 there were open source operating systems available like
13 LINUX, Red Hat, a number of operating systems like that.

14 There were generic computer platforms you
15 could buy to implement that. Those -- to load and run
16 those on. You could -- some vendors, I believe,
17 would -- would sell you a -- a platform with a operating
18 system preinstalled.

19 And there are lots of operating systems and
20 computer systems on which users could easily implement
21 and create systems like that disclosed in Vink and --
22 and other systems for the software that's required.
23 You -- you don't have -- a -- a -- a POSITA doesn't have
24 to, like, write their own operating system from scratch.

25 Q. You understand that I'm not just asking you

1 about an operating system, right?

2 A. Well, for -- I mean, you -- you asked about
3 the option to connect with an external network. And
4 many operating systems already have a lot of that built
5 in is -- is -- is my point.

6 Q. Well --

7 A. By the way, it's -- it's past 1 now, so if we
8 could find a convenient stopping point for lunch.

9 Q. In -- in a couple minutes, yes. I just need
10 to ask you a couple more questions. So because I'm in
11 the middle of a line, I hope you'll -- you'll indulge
12 me.

13 A. No, I understand. Sure.

14 Q. So you haven't included any of these operating
15 systems in your report. Correct?

16 A. Because this is -- these are all the reasons,
17 additional reasons that a -- a POSITA would succeed in
18 the combination, and -- and -- because I -- it -- but
19 yeah, I think it's correct. I don't think I mentioned
20 Red Hat, LINUX, or LINUX in my declaration.

21 Q. Not just Red Hat and LINUX. You, in fact,
22 have not included any software packages that could have
23 been used by a person of ordinary skill in the art to
24 enable Vink's system to be connected to an external
25 packet switched network. Correct?

1 A. Yeah, I don't think it's necessary. I think
2 these are the kinds of things that, in my opinion, a
3 POSITA knows about at this skill level. And I don't
4 need -- I don't think there's a need to list every --
5 every possible software package a POSITA knows in --
6 in -- in any declaration that I've ever really had to
7 submit.

8 Q. And what's your basis for opining today that
9 all of this software functionality would be within a
10 POSITA's skill set as of the relevant time frame?

11 A. Well, because the POSITA isn't -- isn't a
12 particular -- it's a hypothetical person that has the
13 knowledge and skill at that level and -- and -- and
14 knows about -- you know, I'm not a lawyer so I don't
15 know if I can get this right, but it's like how would
16 they know about Vink? Well, it's not that a POSITA
17 knows about every patent in the world. Or maybe they
18 do, hypothetically. Or every -- every piece of prior
19 art in -- in, you know, in history is -- is supposed to
20 be accessible to, to my understanding -- again, I'm not
21 a lawyer -- to a POSITA.

22 And so the things that are already out there.
23 And certainly, things like LINUX and Red Hat were well
24 known as of the priority date of -- of the patent
25 filing, or at least the filing date of the patent, and

1 had been around for -- for years. And operating systems
2 and all this software, I mean, people had been doing
3 networking, you know, probably for -- for decades before
4 the -- the filing date of this patent.

5 And the ARPANET goes back to the late '60s,
6 and a lot of the protocols were developed in the -- in
7 the '70s. And so these are just part of -- of the body
8 of prior art that POSITAs, the hypothetical person of
9 ordinary skill in the art, is -- is supposed to, in my
10 understanding, have access to and knowledge of.

11 ATTORNEY STAMATOPOULOS: Okay, I think we can
12 go off the record.

13 THE VIDEOGRAPHER: Time is 1:08 PM. We are
14 off the record.

15 (Recess taken.)

16 THE VIDEOGRAPHER: We are back on the record.
17 The time is 2:01 PM.

18 BY ATTORNEY STAMATOPOULOS:

19 Q. Welcome back, Dr. Houh. I'd like to invite
20 your attention to the Vink reference. And specifically,
21 the abstract of Vink.

22 A. Okay.

23 Q. In the abstract as well as in other parts,
24 Vink discloses input and output modules.

25 Do you see that?

1 A. Yes.

2 Q. Can you tell me briefly what a person of
3 ordinary skill in the art would understand these
4 input/output modules to be?

5 A. One example of the input and output module as
6 given in the Vink specification talks about how the
7 input can -- and output can either be digital data or
8 analog data.

9 And if you look at page 19 of Vink, it -- it
10 talks about that starting around line 10, going down
11 through around line 23.

12 Q. Can I ask you to speak a little bit more
13 loudly? It's -- I have -- I'm on max volume, by the
14 way.

15 A. Sure. I'll do my best. Should I repeat the
16 answer, or is it --

17 Q. Thank you, thank you.

18 So this is an example of the input and output
19 that would go in and out of a module.

20 Is that fair?

21 A. That's one example embodiment that Vink
22 discloses in -- in that -- that the input and output can
23 be either or both digital and -- and -- or analog data.

24 Q. And what would the module itself be, according
25 to Vink?

1 A. I mean, Vink calls it an I/O module, or
2 input/output module. I -- I'm not sure if I
3 understand -- if -- if I understand your question
4 correctly.

5 Q. So a person of ordinary skill in the art
6 reading Vink would try to implement Vink's teachings in
7 a particular type of device.

8 Is that fair?

9 A. I -- I'm -- I'm not sure exactly what you
10 mean.

11 Q. I guess I'm trying to -- what I'm trying to
12 understand is what is your opinion as to the types of
13 devices that would constitute a -- an input/output
14 module according to Vink?

15 A. Well, I do discuss the -- the combination of
16 Vink and -- and -- and Patrick. And if you look at, for
17 example -- for example, paragraph 86 or in this section
18 about -- about why and what a combination would be,
19 would be -- it would allow the I/O units -- it would
20 have been obvious to a POSITA to connect the I/O units
21 of Vink to DSL access units to allow the system of Vink
22 and Patrick in order to provide -- or to provide
23 broadband internet access to telephone subscribers.

24 So I'm -- I think that, you know, that's
25 another way that -- that, you know, that that

1 connection, you know, has inputs and outputs, and so I
2 think that that's one of the things I discussed in --
3 about the combination.

4 Q. So do you have any opinions as to what Vink
5 means when Vink discloses input and output modules?

6 A. Vink is disclosing that the input and output
7 can be either digital or -- or -- and has got a separate
8 section for analog inputs and outputs. And I think
9 it -- it's -- that -- that that can serve a wide variety
10 of different functions having both analog and digital
11 inputs and outputs.

12 Q. What is the meaning of a digital -- withdrawn.
13 What is the meaning of an input/output module?

14 A. Well, it would be a module that can -- can
15 provide some outputs and receive some inputs.

16 Q. And would a -- would a switch be an example of
17 an input/output module?

18 A. I mean, there -- there are lots of different
19 kinds of switches. Can you be more specific about
20 what -- what specifically kind of switch you're asking
21 about?

22 Q. I'm asking you to tell me what types of
23 switches would constitute input and output modules, if
24 any.

25 A. Well, I mean, switches typically have inputs

1 and outputs. But with respect to Vink, Vink is teaching
2 these generally input/output modules that are capable
3 of -- of digital inputs and outputs and analog inputs
4 and outputs.

5 Q. So is a switch an example of an input/output
6 module according to Vink's disclosure?

7 ATTORNEY KONSTANTAKOPOULOS: Objection.

8 A. I mean, this is one example of an input/output
9 module in Vink. It -- this doesn't say anything beyond
10 what the spec of Vink says, so I -- I -- is there
11 something you're looking at in Vink that's talking about
12 switches?

13 I -- I mean, I do discuss generally there is a
14 switch fabric disclosed in Vink, and we can -- we can
15 look at that section if -- if that's what you're trying
16 to get to.

17 BY ATTORNEY STAMATOPOULOS:

18 Q. I'm not trying to get to anything. I'm just
19 asking you if you understand what input/output module
20 would signify to a POSITA reading Vink.

21 A. It'd signify just what it -- it says in the --
22 in that it -- it -- it -- Vink gives a very -- one
23 example of an input/output module that's it's teaching,
24 illustrates in Figure 4, and it's describing that figure
25 in -- at least part in -- in part in the section that I

1 referred you to.

2 Q. Would a -- an end user device like a computer
3 constitute an input/output module?

4 ATTORNEY KONSTANTAKOPOULOS: Objection.

5 A. Again, you -- you're asking -- I -- I'm not
6 sure the context you're asking with respect to switch,
7 which can be -- can be discussed in a number of
8 different contexts.

9 But in my declaration, I do talk about -- in
10 my analysis of some claim terms that -- that use the --
11 the phrase "switch fabric," I do discuss how there are
12 various elements in Vink that a -- a person of ordinary
13 skill would -- would -- would understand are disclosing
14 switch fabric in the way I've discussed in my
15 declaration.

16 BY ATTORNEY STAMATOPOULOS:

17 Q. Is it your opinion that the input/output
18 module in Vink satisfies the construction of "slave" as
19 that term is used in the '904 patent?

20 ATTORNEY KONSTANTAKOPOULOS: Objection.

21 A. I'm not sure where you're looking, if
22 you're -- you're -- you're seeing that -- that I'm
23 saying something like that in my declaration.

24 But if you look at paragraph 96 in my
25 declaration, for example, what I'm calling the slave

1 units are these plurality of substations that are
2 disclosed in Vink where it's the whole thing in green
3 where I believe an I/O module might be part of that, but
4 it's not the entirety. And -- and that's not -- I'm not
5 making that direct mapping as you asked in your
6 question.

7 But it -- my -- my declaration discloses this
8 mapping as -- as the -- as the -- I talk about the
9 plurality of substations in -- in -- in at least
10 paragraph 96. It's -- it's throughout. Also in the
11 background section of Vink I think I discuss this
12 mapping.

13 BY ATTORNEY STAMATOPOULOS:

14 Q. What's the function of the I/O module in the
15 context of Vink?

16 A. Well, I think there's some -- some description
17 of at least some of the functions if you look in Vink at
18 page 5, line 28. And -- and the I/O modules present in
19 a mutually synchronized manner at their output site the
20 databits supplied by the at least one of -- at least one
21 master and record and mutually synchronize and/or at
22 their input side databits for supply to the at least one
23 master.

24 So Vink is describing those two things as --
25 as -- as functions, example of functions at -- at least

1 of -- of the I/O module.

2 Q. Where did you point me?

3 A. That was page 5, line -- around line --
4 starting around line 28.

5 Q. Of Vink. Correct?

6 A. Yes.

7 Q. What is -- withdrawn.

8 What would a person of ordinary skill in the
9 art understand the following phrase to mean? "To
10 present in a mutually synchronized manner."

11 A. Well, I think it's describing, you know,
12 receiving a data from the master and then -- and then
13 presenting some bits. And if you look elsewhere, I
14 believe there's a -- a shift register that is able to
15 present bits in -- in parallel fashion.

16 And then -- and -- and -- and it -- it's --
17 it's talking of presenting series of -- of, you know,
18 output data at the output.

19 Q. Where does that output data go?

20 A. I think -- so it would have been obvious to a
21 POSITA to connect the I/O units, or now might just be
22 talking about the output of Vink to, for example, DSL
23 access units to allow the system of Vink and Patrick to
24 provide broadband internet access to telephone
25 subscribers. So that's -- that's one place it would

1 have been obvious for that output to go.

2 Q. That's your opinion, right, that it would have
3 been obvious?

4 A. Well, at least in -- in paragraph 86, I'm
5 saying that -- that it would have been obvious to a
6 POSITA.

7 Q. Right.

8 But where does Vink say that that data goes?

9 A. So Vink describes a -- one practical
10 embodiment of an I/O module that can be achieved with
11 digital shift registers, and it gives two type of part
12 numbers. They look like discrete digital chip part
13 numbers to me.

14 And so anywhere you can take digital data and
15 route them is where that -- that can go. And anything
16 you can design into a -- a digital circuit using outputs
17 from these example types of chip is one example of -- of
18 output that Vink is talking about.

19 Q. And Vink describes a topology, correct, in,
20 for example, this very first page in the figure, right?

21 A. You're referring to the figure that's on the
22 cover of -- of Vink?

23 Q. Yes.

24 A. So I think that's Figure 2, and it describes
25 Figure 2 that it shows diagram -- diagrammatically the

1 architecture of a more extensive communication system
2 according to the invention.

3 And it goes on, but at a high level, that's --
4 that's what Vink says Figure 2 is.

5 Q. Would you agree with me that that's a topology
6 of a network?

7 A. I -- I think maybe in a -- in a broad sense
8 it's showing some portions of the system and some
9 interconnections.

10 Q. You understand the meaning of the term
11 "topology"?

12 A. Well, I think it -- it -- it depends on the --
13 the context. But, you know, I've heard that used in the
14 context of -- of a network, for example.

15 Q. Okay. You've used that word in the context of
16 your analysis. Correct?

17 Are you looking through your declaration?

18 A. Yes. Yes, I -- I do use that word with both
19 respect to Patrick and Vink. That's a --

20 Q. Okay.

21 A. They are describing -- yeah, in -- in
22 paragraph 80, for example.

23 Q. And what did you mean when you used the word
24 "topology" in paragraph 80 of your declaration?

25 A. Well, what I meant was that -- that the -- a

1 POSITA would recognize that the topology of the system
2 disclosed in -- in Patrick closely mirrors the topology
3 of the system described in Vink in that they both have
4 primary station -- primary stations, or masters,
5 secondary nodes, or slaves, and terminals, or ports, and
6 that -- that there are similarities in -- in the -- the
7 interconnections between at least some of those
8 components.

9 Q. So is it fair to say that a topology is the
10 manner in which different parts of a system are arranged
11 and connected?

12 A. I mean, I don't think that's an
13 all-encompassing definition but, I mean, in -- in -- in
14 the sense that I -- that's how I'm referring to at least
15 some of these similarities in Patrick and Vink, I think
16 it would include that as I'm using it.

17 Q. And the topology -- sorry?

18 A. I'm sorry, I was just going to say that I'm
19 not sure that's the exact precise definition that I
20 would use, but I -- you know, it doesn't seem to go --
21 but that -- but that certainly isn't every topology
22 that -- that I can think of that wouldn't -- wouldn't
23 fit with -- with that.

24 Q. Well, in the context of paragraph 80, going
25 back to my initial question, what did you mean when you

1 used the word "topology"?

2 What did you use -- what definition would you
3 apply to the word "topology" as used in paragraph 80 of
4 the declaration that you submitted in this case?

5 A. In that kind of a -- the -- the layouts of
6 some -- of many of the components are -- are -- have --
7 have similarities, and that there are certain elements
8 present in -- in -- in both that I -- I point out, so --

9 Q. So --

10 A. -- it -- it's partly in that sense that I used
11 the word. But, I don't know, are -- are you confused by
12 what I'm trying to say here?

13 Q. I'm --

14 A. It seems pretty clear to me.

15 Q. Are you -- are you asking me if I'm confused
16 by your answer?

17 A. No, by what I -- what I --

18 Q. I am. I guess my question to you is I
19 understand that your view is that there are similarities
20 between Vink and Patrick. Let's put that to the side
21 for just a minute, if you'll bear with me.

22 My question for you is: What did you mean by
23 using specifically the word "topology" in the context of
24 paragraph 80 of your declaration, setting aside that it
25 is your view that the topology of Patrick closely

1 mirrors the topology of Vink?

2 A. I'm not sure how to set aside what I'm saying
3 in the context of what I'm saying. I -- I don't really
4 understand the question.

5 Q. I'm just asking you the meaning that you've
6 applied to the word "topology."

7 Is it the arrangement of specific elements?

8 Is it the way in which certain elements are
9 connected?

10 Is it the presence or absence of certain
11 elements from a network?

12 I'm just asking you about what you mean when
13 you say the word "topology." That's -- that's all I'm
14 asking. So let me just put a question on the record.

15 What do you mean through your use of the word
16 "topology" in the context of paragraph 80 of your
17 declaration?

18 A. Okay, so I -- so I understand that's your
19 question. But I don't think it necessarily includes all
20 those types of things that you listed.

21 But what I'm saying is that -- is that
22 there -- there are similarities in -- if you look at,
23 well, figure -- Figure 1 of -- of Patrick and -- and
24 Figure 2 of -- of Vink as -- as examples.

25 I mean, I -- I'm not specifically referring to

1 those figures in that statement, but generally, there
2 are -- and -- and -- and I also recognize that the --
3 those figures don't necessarily include all the things
4 that -- like Patrick discusses in its specification.
5 I'm just -- I -- but I do cite to that figure and
6 excerpt it in my declaration, as well as Figure 2 from
7 Vink.

8 And there are -- you know, they both have
9 these, well, daisy chains, and especially when you
10 consider that the -- the -- the links or the 116, 115 in
11 Figure 1 of Patrick can be optical links, that they
12 would then have to go through each of the secondary
13 stations.

14 And that's -- that's similar in that there are
15 links in Figure 2 of Vink that -- that go through these
16 sub -- I -- I -- they call it substations, or something
17 like that, of -- of -- of Vink.

18 And so there's that, and they have some of the
19 same and similar elements. But I wouldn't say topology
20 necessarily relates to what's in the topology as --
21 as -- as some -- some of the ways things are -- are
22 interconnected.

23 But there are similarities in -- in the
24 connections to -- now, there's a primary station in --
25 in Patrick that's connected to a -- to several of -- of

1 these -- these -- these daisy chained items. Maybe
2 that -- I think I used that in my declaration.

3 And in -- in Vink, Vink -- although Figure 2
4 doesn't necessarily illustrate it, I -- I -- I show a --
5 a modified Figure 2 from -- from the teachings of Vink
6 that -- that there also could be several different
7 chained substations, for example.

8 So in -- in that sense, I'm just saying what
9 I'm saying. I -- I don't think I'm using topology in
10 any weird sense that -- and -- and I don't -- I don't
11 know what's necessarily confusing about -- about the
12 statement that I'm just saying the two topologies,
13 they -- they somewhat -- they mirror each other in
14 including, you know, primary stations, secondary nodes,
15 terminals.

16 Q. So you're saying the two topologies are
17 similar. Correct?

18 A. Yeah, I mean, they have -- they have
19 similarities. And in some -- some cases, they have
20 corresponding elements that -- that mirror each other
21 and are even interconnected in -- in the same ways in
22 the two -- in the two -- well, in the two descriptions
23 of what's in Patrick and Vink.

24 Q. The two -- the similarities are
25 interconnected? You said the similarities are

1 interconnected. What did you mean by that?

2 A. I mean, some of the components are
3 interconnected -- interconnected in similar ways in --
4 in the descriptions of Patrick and -- and Vink.

5 Q. And in your view, that is a topological
6 similarity?

7 A. In -- in my view, that's part of what I'm
8 trying to say here, and I'm trying to explain it to you.
9 So I -- I'm -- again, I -- I think -- I thought
10 paragraph 80 was pretty straightforward, and it says
11 what it says, and it --

12 Q. Well, I'm asking -- I'm asking you -- I'm not
13 just asking you about paragraph 80, I'm asking you about
14 the specific word "topology."

15 What is the meaning, in your view, of the word
16 "topology" as relevant to your report?

17 A. I think I've just been explaining it to you.
18 So I'm not using it, I don't think, in any highly
19 unusual manner that -- that I -- again, I -- I'm not
20 sure what is so confusing about this statement.

21 Q. Let's try something different. Let's try
22 something different.

23 So Vink has a topology. Yes?

24 A. Well, I mean, portions of Vink do describe
25 things that -- that would relate to the topology of it.

1 But I -- I don't -- I don't know what you mean by it has
2 one.

3 Q. Well --

4 A. I mean --

5 Q. -- Vink discloses a system that has a
6 particular topology. Yes?

7 A. I think some of the examples that it discusses
8 would -- I think you could draw a -- a network -- you
9 could draw components and how they interrelate in a
10 topological manner.

11 Q. What do you mean by "topological manner"?

12 A. I would say that that describes, you know,
13 relations between different components and -- and their
14 connectivity. And that includes -- I'm not -- I'm not
15 saying that's an all-encompassing, you know, definition.
16 I'm just saying that in -- in one sense that that is
17 part of what -- what I'm saying.

18 Q. Okay. Thank you for that.

19 In Vink, what trajectory -- withdrawn.

20 In Vink, how do data bits travel from the I/O
21 modules to the masters? And specifically -- let me
22 withdraw that question.

23 In Vink, you'll see that there are two masters
24 at the very top of Figure 2, and in that same figure
25 there are four figures at the bottom.

1 Do you see that?

2 A. Well, I see two things at the top and four
3 rectangles at the bottom.

4 Q. And the four rectangles at the bottom each
5 contain different I/O modules. Correct?

6 A. I believe there's a description like that
7 in -- in Vink.

8 Q. Well, do you have an understanding as to
9 whether the four figures at the bottom contain I/O
10 modules?

11 A. I mean, I -- I would say those are the things
12 that -- that are described with the label 10, for
13 example, on page -- page 8 of Vink. If you look at
14 line -- lines 30, 31, it's describing the I/O modules.
15 And that's consistent with the label 10 that appears in
16 Figure 2. So those -- those things labeled 10 are --
17 are -- are described as I/O modules.

18 Q. And the same things labeled with the label 10
19 are also shown in the very first page of Vink under the
20 abstract. Correct?

21 A. Yes. In the abstract it's labeled 10 as well.

22 Q. And so just to make our conversation easier,
23 because there's language in the abstract and there's a
24 figure right next to it on the very first page, let's
25 focus on that first page.

1 When output data comes out of the I/O modules,
2 how does it travel, if at all, to the masters?

3 A. Well, I mean, at least this description in --
4 in column -- on page 5 around line 27, it's the data
5 from the -- from the master, supplied by the master that
6 are presented at the output. So I wouldn't say that --
7 that at least here it's describing that the output from
8 the I/O module goes to the master.

9 Q. Does -- so, by the way, the four rectangles at
10 the bottom of the figure that we were just looking at in
11 the first page of Vink, those are described as slaves.
12 Correct?

13 A. You mean the four large rectangles at the --
14 at the bottom?

15 Q. I mean the four large rectangles at the bottom
16 labeled 2, 3, 4 and 5.

17 A. So I am discussing those, and I think they're
18 described as substations in -- in Vink. But I am
19 describing and -- and mapping those substations to
20 the -- the -- the slaves.

21 Q. If you go to the abstract, do you see where it
22 says: The I/O modules 10 can be connected in groups to
23 the at least one master via one or more substations, in
24 parens, slaves 2, 3, 4, 5?

25 Do you see that?

1 A. Yes, I see that.

2 Q. Okay. So fair to say that the four large
3 rectangles at the bottom are slaves, according to Vink?

4 A. Sure.

5 Q. So is data ever sent from one of the slaves to
6 one of the masters according to Vink?

7 A. Well, one example in figure -- in page 5 of
8 Vink at line 31 is that there are data bits recorded at
9 their input side that are supplied to the master.

10 Q. When those data bits are supplied to the
11 master from the slave, what transmission line do they
12 follow in Vink?

13 A. So if you look at paragraph 98, around there,
14 of my declaration, I do have an example in using the
15 figure in Vink.

16 In this particular example, which is, you
17 know, Vink explains that there are two masters and that
18 they communicate with the plurality of sub --
19 substations via the physical transmission lines 7 and 8.
20 So those are the transmission lines -- they're
21 throughout Figure 2 -- over which, like, a slave unit --
22 I -- I've highlighted in the blue dot like a
23 receiving -- the -- where -- where data originates from
24 externally.

25 And then there's an upstream data packet that

1 can go either one of two ways in the -- in Figure 2, as
2 indicated by the blue arrows. So they could either go
3 from -- from the substation labeled 3, sub -- yeah,
4 labeled 3 to the left, and they could also go to the
5 right.

6 And they're -- I discuss various circumstances
7 and -- and whatnot. And -- and -- and those are really
8 the only two ways they can go up to the masters in -- in
9 Figure 2.

10 Q. In normal operations, that is not -- in the
11 event of a fault, how does data travel from substation 3
12 to master -- to the master on the left-hand side of your
13 annotated figure?

14 A. So if you look at paragraph 123 of my
15 declaration, it's expressing the claim element 4D, which
16 starts out wherein, in normal operation, and it goes on.
17 But I'm listing that claim element here.

18 And I -- I talk about how in the modified
19 system with Vink's communication system when it's
20 connected to an external network, a POSITA would have
21 understood that downstream data packets received from
22 the external network would have passed from the first
23 master into the communication network via the first
24 slave 2.

25 And then I'll -- I'll skip down a little. And

1 that upstream data packets to be sent to the external
2 network would have -- would have been passed from the
3 first slave unit 2 to the first master shown in Figure 2
4 because Vink teaches a serial bit transfer of a data
5 through the transmission lines that forms a daisy chain
6 of slaves 2, 3, 4, and 5.

7 So upstream -- upstream packets going from the
8 input of an I/O unit up to the master for the external
9 network would -- would pass through the slave for slave
10 2, and that would be I guess in the diagram of Figure 2
11 going counterclockwise.

12 Q. But your opinion --

13 A. That's what -- (transmission garbled) here --

14 Q. Sorry?

15 A. And that's what I'm describing here in this
16 paragraph.

17 Q. And -- but your opinion, I thought you stated
18 earlier, was that Vink discloses data traveling upstream
19 in both a clockwise and a counterclockwise direction.

20 A. And -- and --

21 Q. Is that right?

22 A. Yes. I mean, that can occur. But -- but in
23 terms of an analysis for the normal operation, claim
24 element 4D, this is what I'm discussing in -- in this
25 particular combination with -- with Vink and Patrick,

1 that -- that the -- this is what a POSITA would
2 understood, that the upstream data packets sent to the
3 external network would have been passed from the first
4 slave unit 2 to the first master.

5 And it -- it would have been obvious that you
6 could go the other way, but I'm saying that this is --
7 in the combination, this is the analysis for -- with
8 respect to element 4D, that this is part of the
9 analysis.

10 Q. In what circumstances does Vink disclose that
11 it is appropriate to go in a counterclockwise versus a
12 clockwise direction?

13 A. So Vink talks about on page 14 around line 31,
14 master and/or slaves constructed in this way are capable
15 of functioning as a switching center so that, for
16 example, the master is able to reach as many connected
17 slaves as possible in a fault situation.

18 And then in my declaration I describe fault --
19 some fault scenarios where there's a trans -- a break in
20 one of the transmission lines and from, for example,
21 a -- a break between -- in the -- in the line between
22 the units 3 -- labeled 3 and 4 in Figure 2.

23 And in that case, to the right of the break in
24 the fault situation, then -- then a packet can travel
25 towards the right, or counterclockwise.

1 Sorry. When I -- when I said to the left from
2 the bottom before, I'm not sure if I used
3 counterclockwise or clockwise, but I think that would be
4 the clockwise direction. From the -- from the -- from
5 the ones at the bottom towards the left is -- is
6 clockwise. It's the ones from the bottom towards the
7 right, that's counterclockwise. So I may have misspoke
8 earlier if I used counterclockwise when I should have
9 used clockwise.

10 I don't remember exactly what I said, but if
11 you just look at the -- the description of what -- what
12 I said, if it's going to the left from the -- from the
13 bottom, that would be in Figure 2 in a clockwise
14 direction.

15 So -- so to the right of the break, then
16 they -- the upstream packets would -- would -- because
17 you want to reach as many slaves as possible, the
18 direction of some of the transmission when there's a
19 fault situation to -- to reach some of the slaves is --
20 is -- is reversed.

21 And I discuss that somewhere in my declaration
22 as well. But -- but -- but there's a figure on page 105
23 that indicates a fault, and I just don't recall if this
24 is specifically where I'm discussing that particular
25 fault or -- but -- but the figure illustrating the

1 fault, break in transmission lines between 3 and 4, is
2 on page 105.

3 Q. In Vink's abstract close to the bottom, it
4 says: The present method and communication system
5 provide unambiguosness in the communication of
6 cause-and-effect relationships at the I/O level in
7 particular for measurement, control applications,
8 monitoring purposes, and data acquisition.

9 Do you see that?

10 A. Yes.

11 Q. What's your -- what's your understanding of
12 the phrase "provide unambiguosness" in this sentence?

13 A. So the patent describes a situation I think
14 referring to the prior art where it can be ambiguous
15 whether what -- the cause-and-effect relationships of --
16 of a command versus its effects, measured effects.

17 For example, if you look at page 2, that is
18 saying that -- that some systems generally have the
19 disadvantage for use in, for example, industrial
20 measurement and control environments having a large
21 number of I/O points, for example, 1,000 or -- or over.
22 They are too slow to be able to fulfill the required
23 cause-and -- and-effect ambiguous -- unambiguosness
24 owing, among other things, to the communication
25 protocols needed.

1 And it -- it gives a -- a further description
2 here, yeah, on page 3, line 21: Suppose that the
3 modules are designed to transfer the values of a number
4 of measured variables to the central compute -- control
5 unit. Because there is a certain type period between
6 the sampling of, for example, the last and first module
7 in the cascade, as a consequence of the sequential
8 sampling, there's no guarantee that a change in the
9 measured variable of the relevant modules is the result
10 of the same cause. After all, a further cause may have
11 arisen between the sampling of the modules as a result
12 of which the measured variable of the last module to be
13 sampled has changed. It is therefore unclear to the
14 central control unit whether the values of the measured
15 variables received all refer to one and the same cause.
16 In other words, cause-and-effect relationships cannot be
17 unambiguously -- unambiguously transferred at I/O level
18 with this communication system.

19 So it's referring to a system where it's
20 unclear about the -- about measured variables with
21 respect to what caused it because of this long delays
22 introduced in sampling the module.

23 So that -- that's one example where it's
24 ambiguous, and what it's describing is -- is that
25 this -- this present system and communication -- method

1 and communication system provides unambiguousness in the
2 communication of cause-and-effect relationships at the
3 I/O level, in particular for measurement and control
4 applications, monitoring purposes, and data acquisition,
5 unlike what was described therein, looks like around
6 page 3.

7 Q. And what are the communications -- withdrawn.

8 What are the communication protocols needed
9 referred to on page 2, lines 10 through 11 in Vink?

10 A. Well, I mean, it further describes that as a
11 consequence of sequential sampling, so it appears that
12 one thing that is -- it -- it's saying is part of the --
13 the protocol is -- is sequential sampling of what's
14 wrong in the -- in the -- or the -- the -- the problems
15 in the prior art.

16 Q. Say that again. Sorry.

17 A. I think one of the disadvantages of -- of, you
18 know, if you -- is if you -- if you sequentially sample
19 these, you know, thousand modules or -- or -- or items
20 sequentially, then -- then that -- that can be -- that
21 protocol can result in this ambiguousness of cause and
22 effect.

23 Q. Is it your understanding that the sampling of
24 these I/O points constitutes a communication protocol?

25 A. Well, I mean the protocol is -- is -- is how

1 you design the -- the communication. So if the protocol
2 is go sample module 1, then go sample module 2, then go
3 sample module 3, and that's -- that's what it -- it's
4 talking about on page 3, then -- then the protocol for
5 doing the sampling is saying can -- that's one of the
6 things that can contribute to this ambiguous
7 cause-and-effect relationship.

8 Q. And what is the relevance of this protocol to
9 Vink's disclosed system?

10 A. Well, at the top of page 5, Vink talks about
11 how none of the known communication systems fulfills the
12 required unambiguousness in communicating
13 cause-and-effect relationships.

14 And it goes on to say that to achieve this, a
15 communication system having a so-called deterministic
16 nature is required. That is to say, a defined time
17 relationship must exist both during the input and the
18 output phase between the response of the separate I/O
19 modules and within the module itself regardless of the
20 configuration or topology of the communication system.
21 And that the object of the invention is therefore to
22 provide a method and a communication system for serial
23 bit transfer suitable for exchanging data with the
24 desired large number of information points with which a
25 relatively rapid response which is unambiguous in terms

1 of cause-and-effect relationships is possible and which
2 has a low cost structure which is flexibly adaptable.

3 So I'm not sure it addresses the -- it doesn't
4 specifically mention the communication protocol, but it
5 is addressing the cause-and-effect relationship and how
6 it -- it intends to achieve the unambiguousness issue
7 that it mentions.

8 Q. And is this unambiguousness a problem
9 identified in the '904 patent?

10 ATTORNEY KONSTANTAKOPOULOS: Objection.

11 A. Yeah, I mean, I searched the '904 patent, and
12 to the extent my search index is built correctly --
13 and -- and I don't remember reading this either -- I
14 didn't see a -- a use of the word "ambiguous" or
15 "unambiguous" or any -- any word with the root AMBIG.

16 BY ATTORNEY STAMATOPOULOS:

17 Q. Right. I mean, setting aside what's in the --
18 what the -- what the express words of the '904 patent
19 are, in reading the '904 patent, did you form an
20 understanding one way or the other as to whether
21 cause-and-effect ambiguousness as described by Vink is a
22 problem to which the '904 patent is addressed?

23 ATTORNEY KONSTANTAKOPOULOS: Objection.

24 A. Well, I think the way that Vink addressed it
25 with its communications architecture is -- is similar,

1 and it's in a similar field of -- of -- of -- and -- and
2 discloses similar layouts of various components.

3 And so I think they are in similar fields
4 regardless of -- I mean, there's a lot of problems to
5 address in networking, networking communications
6 protocols, and I don't think -- I don't think patents
7 have to -- to explicitly state they're addressing the
8 same problem in order to be considered in the same field
9 or in similar fields.

10 BY ATTORNEY STAMATOPOULOS:

11 Q. That's not my question, though. My question
12 is whether they are addressed to the same problem.

13 Yes or no. Are they?

14 A. I don't recall that -- that the '904 patent
15 talked anything about this cause-and-effect ambiguity
16 issue.

17 But nevertheless, the Vink patent has -- has a
18 network layout and -- and -- and addresses things --
19 does address things like the -- you know, a relatively
20 rapid response and, you know, and exchanging data with
21 a -- a large number of information points.

22 Again, the -- the layouts and the
23 communications, they -- you know, a POSITA would
24 recognize there that this is in the same area of
25 endeavor as -- as the '904 patent.

1 And again, I don't think it has to be stated
2 that they are addressing the exact same problem for a
3 POSITA to recognize that the -- the solutions and the --
4 the layouts are -- and the -- the systems are in the
5 same area.

6 Q. So let's look again at the statement at the
7 bottom of the abstract of Vink: The present method and
8 communication system provide unambiguosness in the
9 communication of cause-and-effect relationships at the
10 I/O level in particular, for measurement and control
11 applications, monitoring purposes, and data acquisition.

12 Do you see that?

13 A. Yes.

14 Q. Based on your reading of Vink, do you agree
15 with this statement in Vink or not?

16 A. I mean, it's a statement that's there. I'm
17 not denying that that's what it says, but the -- but
18 the -- I think a POSITA would recognize that the -- the
19 layout has -- has similarities to the layout of the
20 components in the '904 and they are in the same area
21 regardless of -- of what the abstract would say about
22 the -- one particular issue which the invention of
23 the -- or that Vink is addressing.

24 Q. Okay. Now, what's your understanding of the
25 phrase "for measurement and control applications,

1 monitoring purposes, and data acquisition" as stated in
2 Vink's abstract?

3 A. I mean, I didn't see it further elaborated in
4 Vink, but I think generally, you know, an example of --
5 of such measurement or control would be things like, you
6 know, I -- I have these apps today. Like, I can connect
7 to the network and see what my thermostat is set at and
8 measure -- and see what the temperature is. So I think
9 that's -- that's a form of -- and then I can -- I can
10 change the temperature from my phone app. So I think
11 that's an example of an app that is for, you know,
12 measurement and control, for example.

13 Now, I -- I will note that the claims of the
14 Vink as -- as this is filed don't say anything about
15 restricting any application to measurement.

16 In -- in fact, I didn't find the word
17 "measurement" in the claims when I searched. So, you
18 know, I -- I -- so -- so I think it would be recognized
19 that the -- the claims themselves aren't being expressly
20 limited to measurement capacity.

21 And it's that the overall network that --
22 that -- and the network layout and method of
23 interconnection and operation with these masters and the
24 substations and how they interoperate that it's -- it's
25 a communication system and it's very much -- be

1 recognized by a POSITA that it's in the same area of
2 endeavor as the '904 patent.

3 Q. So the claims, you said, are not limited just
4 to measurement and control applications, monitoring
5 purposes, and data acquisition. Correct?

6 A. Yeah, I -- I didn't -- I mean, the word
7 "control" I think was used in the claims but not in the
8 sense of a control application, but just con -- control,
9 because it's a very broad term.

10 But -- but the -- the -- the claims of Vink
11 don't -- don't restrict its invention to only
12 measurement apps, for example.

13 Q. And one example you gave was changing the
14 temperature at your home on the thermostat through your
15 phone.

16 You haven't included that example in your
17 declaration, have you?

18 A. No, I'm -- I'm pretty sure that that example's
19 not there. And that's an example from today.

20 Q. What are some other examples you can think of
21 as you sit here today?

22 By the way, let me withdraw that question.

23 You haven't included any examples of this sort
24 in your declaration. Correct?

25 A. Well, I don't have my declaration memorized

1 word for word, but I don't -- it doesn't -- I don't
2 recall, you know, providing example apps like this, no.

3 Q. As you sit here today, can you think of any
4 other examples other than the one you mentioned?

5 A. Well, I understand a lot of things are now
6 on -- today are on the network. So I know that there's
7 like remote smokers that you can measure the
8 temperature, set timing, you know, I think, and -- and
9 control things remotely.

10 My -- my garage doors are on the network. And
11 they have video cameras so I can actually sense the
12 state of the door, whether it's open or closed. And I
13 can turn on the video, and I can open and close the door
14 from my -- an app on my phone, for example.

15 Q. What other examples can you think of as you
16 sit here today?

17 A. Well, yeah, I mean, I -- I mean, I think
18 that -- I understand that there are, you know, sensor
19 networks, for example, like ad hoc networks of sensors
20 that can be deployed throughout, for example, a factory
21 that can measure various, you know, operational aspects
22 of -- of machines and whatnot. And they can report it
23 back to a central console and -- and -- and after which
24 operators can actually control various aspects of the
25 machinery.

1 I think network operation centers have a lot
2 of command and measurement and control features to
3 control various aspects remotely over -- over a network
4 of -- of various things in -- in the network, for
5 example.

6 I think there's -- there's -- I -- I could
7 probably go on and on and on because I think there's a
8 lot of examples of this. But these types of apps that
9 work over a network that are for measurement and control
10 of various component -- components that are -- are --
11 certainly today, a lot more things are on the network
12 than -- than -- you know, more things are being added to
13 the network and more people are adding these features to
14 their -- their devices.

15 Q. And you mentioned network operation centers.
16 Did I get that correctly?

17 A. Yes.

18 Q. What are network operation centers?

19 A. I mean, they're locations where operators can
20 monitor the overall state of a network and respond to
21 events that they -- may be detected in -- in the
22 network.

23 Q. Is that a context that is contemplated in
24 Vink?

25 A. I can't recall specifically that it was. And

1 I -- you know, I don't recall that it was. I -- I mean,
2 I don't have every word of Vink memorized, but I
3 don't -- I don't recall an example like that.

4 Q. Now, previously when I've asked you questions,
5 you've searched through Vink and through your
6 declaration. Correct?

7 A. I have in some cases, yes.

8 Q. Can you take a look at Vink and tell me if you
9 see any reference, be it direct or indirect, to network
10 operation centers?

11 And once you've given me your response, I
12 think we can go on another brief break.

13 A. I mean, I searched for a number of phrases
14 or -- NOC is often used, N-O-C, short for network
15 operations center.

16 The other words are kind of used throughout,
17 but I -- I didn't see a context that it was discussing a
18 network operations center in particular.

19 Q. You've described a number of applications that
20 could be referred to broadly as the internet of things.
21 Is that fair?

22 A. Well, today, sure. That's -- that's a phrase
23 today.

24 Q. And then you've mentioned network operation
25 centers. Correct?

1 A. I -- I did mention that. You asked me to
2 think of what kind of applications are -- I don't
3 remember the question exactly, but measurement and
4 control applications.

5 Q. Right. So you gave internet of things
6 applications as well as network operation centers as
7 examples of measurement and control applications used
8 for monitoring purposes in data acquisition, right?

9 A. Yeah, I did give those examples, yes.

10 Q. Any other examples you can think of beyond
11 those two?

12 A. Well, if you gave me time I could probably
13 come up with tons more, but -- because it doesn't really
14 stop there. It's not like that's -- that's it. There's
15 lots of networking control applications.

16 Q. But those are the ones that you could think of
17 in response to my previous questions, right?

18 A. Yeah. So I'll -- I'll go on if you want me
19 to. I have a firewall that I can monitor over the
20 network, and I can control it. My routers, Wi-Fi
21 routers, they have the same thing. My internet gateway
22 has a similar feature where I can monitor, you know, log
23 in over the web and -- and monitor and control --
24 control a device.

25 There -- there are plenty of servers that can

1 be monitored in the same way, as a subset of a whole
2 network operations center. But, you know, servers often
3 have ways to monitor them remotely.

4 Most devices connected to the network now have
5 that -- have that kind of capability. A router can be
6 logged in to monitor and control over the network.
7 Most -- most server-based devices have -- have that
8 capability, I mean, so this like could go on for a while
9 if you gave me enough time.

10 Q. Well, I mean, we have limited time. If you
11 feel that there's anything else that's material or
12 relevant that you want to add to your response, I don't
13 want to cut you short. At the same time, you know, I
14 can't tell you how long to make your response. It's
15 your -- it's your response.

16 So if you feel comfortable, we can end it
17 here. If you want to go on, I'm not going to cut you
18 off.

19 A. Well, I mean, if you gave me more time I could
20 certainly come up with more, but I think for -- for --

21 Q. I have not taken away your time. You have all
22 the time that you want to take to formulate your
23 response, Dr. Houh. And when you feel comfortable, we
24 can go on a break.

25 A. I have an internet-enabled phone.

1 Q. I can't -- I can't hear you, though. I'm
2 sorry, sir.

3 A. I have a cloud-based phone system at home
4 which I can go on line and -- and control, set controls
5 for and -- and -- and check the status of things like
6 how many voice mails I have and whatnot like -- and
7 things like that.

8 I have -- I have a -- I have -- I have smart
9 lights in my home so I can go online and check the
10 status of my lights and control various lights in my
11 home. And I think that's a -- I have a smart doorbell.
12 I have some remote cameras that I can go online and --
13 and check and -- and control like the status of -- you
14 know, maybe they snap a picture or send me alert,
15 depending on what kind of motion and how much, or limit
16 the motion to a box I draw on the screen.

17 I mean, there are so many things that now
18 are -- are for measurement and control remote that
19 again, I could go on and on. I think I can probably,
20 you know, just say that if you -- if -- if you -- if --
21 if I could take more time, I would probably be able to
22 still come up with examples that could go on quite some
23 time. But I'm comfortable saying just that but, you
24 know, saying that we can continue with a different line
25 of questioning if you'd like.

1 ATTORNEY STAMATOPOULOS: Okay. Well, thank
2 you for your response. I think we can go on break.
3 Let's go off the record.

4 THE VIDEOGRAPHER: Time is 3:36 PM. We are
5 off the record.

6 (Recess taken.)

7 THE VIDEOGRAPHER: We are back on the record.
8 The time is 4 o'clock PM.

9 BY ATTORNEY STAMATOPOULOS:

10 Q. Dr. Houh, Patrick teaches that routing of
11 packets of information in a multipoint communication
12 system having secondary stations that are geographically
13 distributed from each other present special
14 difficulties, right?

15 A. In Patrick, that starts out that way, but it
16 goes on to explain some of these specific issues.

17 Q. I'm sorry, sir, your -- your answer cut out in
18 the beginning and you're coming in a little bit low
19 volume.

20 A. What I said was Patrick did -- does have a
21 paragraph that starts out that way, but it goes on to
22 list some -- some of the specific issues.

23 Q. Okay. And -- and what is your understanding
24 of the specific issues?

25 A. In Patrick, it -- it talks about -- this is

1 column 2 of Patrick, line 11. In the prior art, routing
2 is typically performed with -- within a
3 nongeographically distributed area, such as within a
4 local area network. In addition, in the prior art,
5 routing between various locations has required the
6 assignment of an internet work address to every device
7 within the system, resulting in excessive use of a
8 limited resource as there are an inherently limited
9 number of such 4-byte internet addresses. In the prior
10 art, moreover, the implementation of routing functions
11 at a secondary node has tended to require complicated
12 and expensive equipment, severely limiting the expansion
13 of such systems to -- to consumers. Accordingly, a need
14 has remained to provide such routing of information
15 between -- well, it goes on, but I think it's -- it's
16 saying what it's saying there in Patrick. And as of the
17 filing date of -- of 1996, April 1 is what Patrick says.

18 Q. So what's your understanding of the
19 difficulties presented with routing packets of
20 information in a multipoint communication system?

21 A. Well, I mean, I think in the prior art,
22 routing can be performed in a -- in a wide geographic
23 area. And some of the -- the class and classless
24 interdomain routing is -- was -- was set up to address
25 some of these difficulties in -- in -- in routing to

1 basically the entire global address space of the
2 internet.

3 You know, and I -- I don't recall when the --
4 in particular, the classes entered domain routing. RFC
5 was published, I -- I don't have that memorized.
6 There's -- there's a -- I think there's a internet RFC,
7 IETF RFC about it.

8 But as that was implemented in routers, that
9 helped alleviate some of the issues with respect to the
10 inefficient allocation of internet addresses.

11 And also, the -- the -- the widespread use of
12 NAT devices, network address translation devices, also
13 helped alleviate some of the pressure on the internet
14 address space.

15 So, I -- I mean, I wouldn't dispute some of
16 the things that Patrick is saying here at the time, but
17 I think people are creative and they -- they can come up
18 with solutions. In some cases, did come up with
19 alternative methods of addressing some of these
20 limitations. And -- and as you know, computers got
21 faster over time as well, so -- so, you know, some --
22 some limitations such as, you know, it's expensive to do
23 certain routing functions also became cheaper and more
24 available over time as well.

25 So at the time, I -- I don't know that I'd

1 particularly dispute what Patrick was saying here,
2 but -- but sure. Patrick is saying what it's saying.

3 Q. Have you addressed what Patrick is saying here
4 in your declaration?

5 A. I don't recall specifically addressing this
6 portion of Patrick, but I don't remember every word of
7 my declaration.

8 Q. Is what Patrick is saying here relevant at all
9 to your opinions?

10 A. I mean, I considered all of what's in Patrick
11 in -- in forming my opinions. I -- I'm not sure if --
12 what -- if there's a specific item you're asking about,
13 a specific claim element. But again, I don't think I --
14 I -- I don't think I would have cited to this portion
15 of -- of Patrick, but I did review the whole of Patrick.

16 Q. Does Patrick teach a topology in which a
17 primary and a secondary master are deployed in a
18 network?

19 A. I don't think I rely on anything from Patrick
20 specifically when I'm analyzing the claims that require
21 the second master unit. I've mapped those to
22 disclosures in Vink for the second master unit.

23 Q. Does Patrick teach that it is generally
24 desirable to provide an option to connect a local area
25 network to an external network?

1 A. Patrick does talk about, you know, how
2 networks or other information sources can -- can be --
3 can, you know, reachable through prime -- this equipment
4 and such as online services, telephone networks, video
5 movie subscriber services.

6 And so I don't know if it gave reasons why it
7 would be desirable to do that, but I think a POSITA
8 would have recognized that, that going from a closed
9 network to a -- and reaching the public (transmission
10 garbled) like the internet, it would provide some --

11 (Reporter clarification.)

12 A. Public networks like the internet would be
13 beneficial because there's a wealth of information
14 available even at the time of the invention that was
15 available on the -- on the internet. And -- and that
16 would be beneficial to offer access to that material and
17 to be able to, you know, charge subscription fees for --
18 for offering that -- that kind of access. And I -- and
19 I lay out those motivations in my declaration in the
20 Motivation to Combine sections at least.

21 But -- but -- but Patrick does talk about
22 various types of online services that are available from
23 the internet or otherwise.

24 Q. Right. But does Patrick specifically teach
25 that in every instance, it is desirable to connect a

1 local area network to the internet?

2 ATTORNEY KONSTANTAKOPOULOS: Objection.

3 A. I mean, I did find one use of the word
4 "desired" in it, but it wasn't about how it's desired to
5 connect to the internet.

6 But I think a person of ordinary skill would
7 recognize that there's a disclosure in -- in Patrick.
8 It discloses connecting to the internet. And a person
9 of ordinary skill in the art would have recognized that
10 it was desirable and been motivated to make the
11 combination of the network connecting to the network or
12 external network in Patrick and -- and -- and bring that
13 into the system disclosed by Vink, because it -- there
14 are reasons that it would be desirable, that there's a
15 lot of information on the internet that you otherwise
16 couldn't reach if you couldn't reach the internet, and
17 that -- I -- I discuss these reasons in my declaration,
18 that a -- a service provider could charge -- not only
19 could charge for providing access to the internet.

20 And -- and for those reasons and other reasons
21 I lay out in my report as -- as we went over some of
22 them earlier, I think a person of ordinary skill would
23 have recognized that.

24 BY ATTORNEY STAMATOPOULOS:

25 Q. Does Patrick teach that it would be desirable

1 to connect a local area network with the topology
2 disclosed in Vink to the internet?

3 ATTORNEY KONSTANTAKOPOULOS: Objection.

4 A. I didn't find an explicit reference in Patrick
5 to either the name Vink or to -- to the -- anything
6 ending with a number 324 in it, which is -- which is the
7 last three digits of the publication number of Vink.

8 So no, I mean, I don't think -- I don't think
9 it's necessary for -- for Patrick to explicitly talk
10 about combining itself with Vink for a person of
11 ordinary skill to recognize that there would be benefits
12 to doing so.

13 BY ATTORNEY STAMATOPOULOS:

14 Q. Okay. Is there any piece of literature --
15 first of all, I'm not asking you just about Vink. You
16 understand that, right?

17 A. Well, I mean, your last question did mention
18 Vink.

19 Q. I mentioned Vink because I was asking you
20 about networks with a topology disclosed in Vink, not
21 Vink specifically.

22 Do you understand that?

23 A. Well, sure. But aside from similarities in
24 the topology in -- in Patrick to -- to topology in Vink,
25 which we already discussed, I haven't done an analysis

1 for the purpose of this declaration aside from looking
2 at the '904 patent with respect to any other topologies
3 laid out in any other, you know, patents or systems.

4 Q. Okay.

5 A. The declaration is just about Patrick and Vink
6 was one ground, and -- and adding AAPA as a -- a second
7 ground.

8 Q. Do you know if the specific topology in
9 Vink -- withdrawn.

10 Do you have any reference or other material to
11 which you can point cited in your declaration that
12 suggests that the topology specifically described in
13 Vink would benefit from connection to the internet other
14 than the reasons that you gave me about the wealth of
15 information found on the internet?

16 A. I didn't see any citations in my declaration
17 to, for example, the Exhibits 1001 to 1009 that support
18 that point, so I -- but I still think it's obvious to a
19 POSITA for the reasons that I gave. I don't know --
20 I -- I -- I guess I didn't see the need to cite to a --
21 a third-party document that -- that -- that said that
22 also.

23 Q. Can you give me a list of all the
24 modifications that a person of ordinary skill in the art
25 would need to perform on Vink in order to connect it to

1 the internet by providing an interface through the two
2 masters shown in the Vink system?

3 ATTORNEY KONSTANTAKOPOULOS: Objection.

4 BY ATTORNEY STAMATOPOULOS:

5 Q. -- shown in the Vink system.

6 A. I mean, I think it's straightforward to add
7 access to an external network to the system of Vink. I
8 think I've already -- we already discussed some of the
9 steps to the extent they -- they were -- you know,
10 there -- there -- there could be even -- even for a
11 person of ordinary creativity, I think they could come
12 up with a number of ways. And -- and depending -- you
13 know, if the starting point of Vink was -- it was
14 implemented using, you know, an operating system,
15 another computer already as -- as the master, then I
16 think it would have been pretty straightforward to add
17 an external network connection.

18 If -- if that computer already had an ethernet
19 interface, if -- if that already had all the software,
20 for example, any standard version of LINUX or Red Hat
21 available at the time of -- of the invention of -- of
22 the -- the '904, then it would have been some, you know,
23 additional integration software to integrate the
24 specific method that -- that the masters taught to
25 the -- the I/O modules and what -- the items connected

1 to them in Vink --

2 Q. Sorry.

3 A. -- with -- with the -- the IP stack of the --
4 of the existing operating system, and then they could
5 leverage all the existing well-known software that was
6 available for routing and -- and providing a gateway to
7 the internet.

8 And so that -- that's one set of steps that
9 could have been taken. And, you know, to the extent the
10 starting point of Vink as implemented was already done
11 with -- with a standard computer and operating system
12 such as -- such as what I describe.

13 Q. Does Vink disclose such a starting point?

14 A. So if you look at Vink on pages 20 and 21, it
15 does disclose that the -- the software -- this is
16 starting at line 30 on page 20. The software for
17 controlling the communication system according to the
18 invention is essentially concentrated in the master 1,
19 which comprises in an exemplary body of the invention as
20 shown in Figure 5 a control unit 36 for controlling the
21 data flow via the transmission system 78 with an
22 associated memory 37 for storing and exchanging
23 information with a control computer 38, which contains
24 the calculations and background information necessary
25 for the process to be controlled via the I/O modules.

1 And then it goes on to give an example of -- I
2 mean, that's what it says about the master, which is --
3 is it's -- it's -- it's saying comprises software. And
4 let's look at Figure 5, that the master -- Figure 5 is
5 next to Figure 1. There's a control computer 38, for
6 example. And this is all part of the master, as well as
7 control unit 36.

8 And I think, you know, it -- I think a POSITA
9 would have understood that control computers were --
10 were often used in conjunction with an operating system,
11 existing one, because it -- it -- those are all kind of
12 pieces you need to operate or interact with a wide range
13 of -- of -- of available devices, especially -- and --
14 and it does mention a number of bus interfaces, I think.
15 Let me see, on -- this is on page 2 where it talks
16 about -- well, I mean, yeah, let's leave it at that, the
17 reference in what -- whatever pages, 20 and 21 that we
18 were just discussing that specifically mention that
19 there's software running on a computer as part of the
20 master 1.

21 Q. And that software running on that computer a
22 POSITA would understand inherently allows connectivity
23 to a wide -- to an -- sorry. Let me withdraw that
24 question.

25 Is it your opinion as you sit here today that

1 a POSITA would understand on the basis of this
2 disclosure that Vink's masters would contain software
3 that enables connection to an external network?

4 A. No, I don't think that's exactly what I'm
5 saying. I -- what I'm saying is that a person of
6 ordinary skill would have combined Vink with -- with
7 Patrick, and Patrick teaches connecting to a -- a
8 network.

9 And you asked me, well, how would someone go
10 about doing it? And I said, well, to the extent that
11 the software in -- that you started with in Vink already
12 has it, you could just reuse it. I'm not saying there's
13 any inherency involved here. I'm not saying that Vink
14 is -- is explicitly teaching that there -- all this
15 software about connecting to an external network already
16 exists.

17 I'm saying that the combination that I
18 analyzed with respect to the unpatentability of the
19 claims of the '904 patent are the combination of Vink
20 and Patrick, and it would have been obvious for a POSITA
21 to -- to take the -- the -- the disclosures, the -- of
22 the external network in Patrick and add that kind --
23 that same network to be available to be accessed through
24 the system of -- of Vink through the master and the
25 master nodes because of the benefits and the reasons

1 that I laid out in my declaration.

2 That's what I'm saying. You asked me about
3 these details. I'm saying that, well, this is what was
4 known, this was what's available. I'm not saying that
5 Vink is teaching all this. It -- I don't see explicit
6 disclosures about the computer software other than what
7 I showed you. But it's well known to a POSITA that if
8 you have an -- an existing operating system that you
9 started with to implement the software which, by the
10 way, the -- the operating systems typically come with
11 compilers and C -- you know, C compilers and you can
12 compile the application to run on that computer -- on
13 that computer in that operating system. That's kind of
14 the existing tool set that's -- that's available.

15 And there are some other specialized platforms
16 that have, you know, development tools to -- to write
17 code for processors. But an operating system already
18 gives you a wealth of functions that are already
19 implemented, and you can -- you can integrate with a lot
20 of already -- the -- the preexisting devices, so you
21 don't have to write it all from scratch. That's all I'm
22 saying.

23 And a POSITA would have known about these
24 types of -- of preexisting operating systems, as I
25 mentioned earlier. And they could have started

1 implementation of Vink, as Vink describes, as the master
2 running computer software because that's one way to --
3 one way to do it.

4 I'm not saying it's the only way to do it.
5 That -- that wouldn't be -- that's not what I'm saying.
6 But to the extent that that's how a user would begin to
7 implement the master of -- of Vink, then they may
8 already have a lot of the software that's necessary.
9 They just have to configure it in the right integration
10 and -- and integrate with it.

11 So -- so if you are asking me about the steps
12 that a POSITA would have to take to -- to make that
13 combination, those are among some of the steps they
14 could take if they started with a preexisting
15 implementation using a standard operating system.

16 Q. What's your basis for opining that a POSITA
17 would possess the toolkit that you just described?

18 A. So the basis is in -- in -- in considering,
19 you know, and determining the level of ordinary skill in
20 the art, you know, I considered the types of problems
21 encountered in the field, the prior art solutions to the
22 problems encountered in the art, the rapidity of
23 innovation, the sophistication of the technology and
24 education level of active workers in the field. And
25 then, you know, what I -- and -- and -- and in my

1 opinion, the -- the -- the level of that person of
2 ordinary skill.

3 And this is someone who -- who is -- is -- is
4 going to look at -- is going to be looking at the --
5 this is the point of view that I took in the level of
6 skill of a person analyzing the -- the -- the
7 preferences that I've disclosed herein in my declaration
8 as to their obviousness. It was based on that level of
9 skill and what that person would have found obvious.

10 And -- and that level of a person of ordinary
11 skill in the art would have been in the field of the
12 '904 patent as of December 27, 1999. They would have
13 had a bachelor's degree in electrical engineering,
14 computer science, or equivalent training, and
15 approximately two years of work experience in
16 information technology and networking.

17 And -- and those are the kind of people with
18 the -- the right tools to address the problems in the
19 field and to be able to, you know, make and use the '904
20 invention, or alleged invention.

21 And -- and those are the kind of things that
22 they have in their toolkit. And that's based on -- on
23 the consideration of these types of things, the -- the
24 level of education of workers in the field, you know, at
25 the time, and all those other factors that I listed.

1 Q. All those other factors that you listed?

2 A. Well, I mean, I -- if you look at
3 paragraph 32, those are factors that I considered in
4 determining the level of ordinary skill. And then the
5 level of ordinary skill I laid out in paragraph 59, I
6 mean.

7 So all of those things might not actually be
8 applicable to the -- the fact that they are -- were
9 aware of -- of, you know, operating systems they could
10 use as a starting point for writing software, right?
11 But that was part of that person of ordinary skill's
12 toolkit at the time based on their level of experience
13 and education.

14 Q. Dr. Houh, what is a daisy chain in the context
15 of the '904 patent?

16 A. I think the abstract is a good overview and --
17 of -- of what a daisy chain would include, which is --
18 it says in the abstract -- it talks about a plurality of
19 physical interface lines in one or more daisy chains in
20 which the slave units are mutually connected in series
21 by the physical interface lines therebetween. Each
22 daisy chain includes at least a first slave unit
23 connected by one of the physical interface lines to the
24 first master unit. And the last slave -- well, that's
25 not so important about.

1 But -- but I think that's -- that's what it's
2 discussing, and it's -- it's -- it's a -- a chain, so to
3 speak, in which units are, you know -- and giving one
4 example of -- of a daisy chain where these units are
5 mutually connected in series by physical interface lines
6 therebetween.

7 Q. And this chain, does it form a closed loop?

8 ATTORNEY KONSTANTAKOPOULOS: Objection.

9 ATTORNEY STAMATOPOULOS: Well, let me ask you
10 a different -- let me -- let me withdraw that question.

11 BY ATTORNEY STAMATOPOULOS:

12 Q. To constitute a daisy chain, do the devices
13 connected in a daisy chain need to be connected in such
14 fashion that the first device in the chain is also
15 connected to the -- the last device in the chain?

16 ATTORNEY KONSTANTAKOPOULOS: Objection.

17 A. I mean, I don't see that requirement in, for
18 example, Claim 1, and I don't -- I looked at a
19 smattering of daisy chain references. I don't see that
20 described in the -- in the spec at the -- in the handful
21 of daisy chain references that I looked at.

22 BY ATTORNEY STAMATOPOULOS:

23 Q. So a daisy chain is simply a series of
24 device -- withdrawn.

25 So is it fair to say that a daisy chain is

1 simply a series of devices connected in series?

2 A. I mean, I think that's close enough to what it
3 says in the abstract -- abstract. That certainly would
4 be understood by a person of ordinary skill to be an
5 example of a way to create a daisy chain.

6 And -- and I think daisy chain is used in
7 the -- in the claims, and so I think that would -- the
8 examples in the spec of how to create a daisy chain and
9 the specific examples I think would be understood by a
10 POSITA to be examples of the claim -- a claim -- a
11 claimed daisy chain.

12 Q. In Vink, what does the second master do in
13 normal operation?

14 A. Vink itself -- and I just want to be clear.
15 I'm not relying on Vink alone for any challenge grounds
16 in this declaration.

17 But -- but Vink discloses that, if you look at
18 page 16 around line 20 -- 24 or 20 -- 24, 26. So all
19 the masters are so designed that they can assume the
20 function of the active master, for example, in the event
21 of faults.

22 So one function of a passive master is to
23 assume the -- the function of a -- the active master in
24 the -- in the event of faults, for example. And it goes
25 on to say that the passive masters are easily able to

1 detect errors of the active master because as a
2 consequence of their cascade arrangement and the serial
3 transfer of data bits in the communication system
4 according to the invention, they receive all the
5 information which is intended for the active master.
6 Consequently, no separate communication path is required
7 between the various masters to keep the passive masters
8 abreast of their operations, instruction, etc., carried
9 out by the active master. Such a hot standby mode is of
10 importance in particular in industrial process
11 measurement and control in which failure or delay in the
12 production process -- well, it goes on.

13 But -- so that kind of outlines a number of
14 different functions. One function is to take over for
15 the active master in case of a -- of a fault. Another
16 function is to receive all the information which is
17 intended for the active master. And -- and so that
18 section says what it says, and some functions of the
19 passive master are described in that section.

20 Q. Do you have an opinion as to whether the
21 standby master operates in any fashion when the Vink
22 system is not experiencing -- experiencing a fault?

23 ATTORNEY KONSTANTAKOPOULOS: Objection.

24 A. I -- I mean, I don't have an opinion about
25 Vink in isolation with respect to the patentability

1 of -- of the challenged claims. That's -- Vink alone is
2 not a -- a ground.

3 But I do have opinions about the combination
4 of Vink and Patrick, and Vink, Patrick, and AAPA. And
5 in there I do talk about some -- some -- some of the
6 functions that it would have been obvious based on AAPA,
7 for example, that -- that the passive master also would
8 be performing.

9 And I lay those out. I think that's toward
10 the end of my declaration.

11 BY ATTORNEY STAMATOPOULOS:

12 Q. Well, I'm asking you just about Vink, though.
13 And maybe your answer is that you don't have an opinion.

14 But my question is: Does the passive master
15 in Vink perform any function in the absence of a fault
16 in the Vink system?

17 A. Yeah, I mean, I would describe things here in
18 just that section I read -- I read that our actions
19 taken by the passive master, even when there's no fault.
20 For example, it says that --

21 Q. I'm sorry, what section are you pointing to?
22 I apologize.

23 A. Page 16 starting around line 23 or so, that --
24 that paragraph.

25 Q. Of -- of Vink? I apologize, there's --

1 there's static coming through, so --

2 A. Yes, page 16 of Vink.

3 Q. Okay.

4 A. And if you look around line 30, it says: They
5 receive all the information which is intended for the
6 active master. And that's referring to the passive
7 master that -- if you go back to about line 26, that's
8 the sentence it's in.

9 And so it's -- that's one function it's doing
10 so that it can take over in the event of a -- of a
11 fault. So it is doing things when there's no fault.
12 It's receiving all the data and -- or all the
13 information which is intended for the active master even
14 when there's no fault in the active master, and that's
15 what Vink is describing.

16 Q. Is it receiving this data from a slave or is
17 it receiving this data from the active master?

18 A. Well, it's doing that because if you go back
19 to line 26, it says: The passive masters are easily
20 able to detect errors of the active master because as a
21 consequence of their cascade arrangement and the serial
22 transfer of data bits in the communication system
23 according to the invention, they receive all the
24 information which is intended for the active master.

25 So Vink is saying that that's a consequence of

1 this serial transfer of data bits according to the --
2 and the cascade arrangement according to the invention.

3 Q. Right.

4 So my question was is it -- is the passive
5 master receiving this data that you just referred to
6 from one of the slaves, or is it receiving this data
7 from the active master?

8 A. Well, that sentence wasn't directed from --
9 to -- from which, but it does say that it's a
10 consequence of the cascade arrangement and the serial
11 transfer of data bits in the communication system
12 according to the invention.

13 So, I mean, that's -- that's what it's saying
14 there. It's -- it's not -- it's not as specific about
15 the question you asked, but that's -- that's what it's
16 saying.

17 Q. So do you know from that portion that you just
18 read to me from Vink or from elsewhere from which device
19 the passive master is receiving data in normal
20 operations?

21 A. I mean, I cited to this portion, but I -- but
22 I'm not sure I considered exactly the question you're
23 asking because I -- I don't think there's a requirement
24 in the claims going to that issue, that I recall. If
25 there is, you can point me to my analysis. I -- I -- I

1 don't recall something like that.

2 But I -- I recite -- I did cite to this
3 section a number of times. But with respect to the fact
4 that showing that the passive master has all the
5 information which is intended for the active master, you
6 know, so that it can take over in case of a fault and it
7 has all the information needed on standby, that's --
8 that's why I said it to it.

9 To -- to consider this additional question of,
10 you know, how this is arranged according to the mention
11 of where, I'd need to spend through some time looking
12 through Vink and considering that exact question.

13 Q. Now, in Claim -- withdrawn.

14 You'll agree with me that Claim 4 of the '904
15 patent recites a limitation that is directed to the
16 direction in which upstream data travels from the slaves
17 to the network. Correct?

18 A. I -- I -- I mean, it -- it does talk about
19 that the -- there -- Claim 4, element D I think is what
20 I call this in my declaration. There's a requirement in
21 part of 4D says: Upstream data packets received by the
22 slaves in each chain from the subscriber lines are
23 passed via the first slave unit in the chain to the
24 first master unit for transmission over the network.

25 So I think that that does claim where these

1 up -- upstream data packets received by any slave, how
2 the data has to be passed. It has to be passed via the
3 first slave, which is the -- the -- the slave that's, I
4 think, connected to the master in the description of the
5 '904.

6 Yeah, that's -- that's the previous element.
7 That -- that requires at least a first slave unit
8 connected by one of the physical interface lines to the
9 first master unit.

10 And so what it's saying is that Claim 4 is
11 requiring that the upstream data packets received by the
12 slaves do have to be passed via the first slave unit.
13 And that first slave unit is one that's -- that's
14 connected by one of the physical interface lines to the
15 first master unit.

16 Q. I want to turn your attention to paragraph 133
17 of your declaration.

18 A. Okay.

19 Q. Is it your testimony in this paragraph that
20 there is a daisy chain and control computer 38 selects
21 one slave in that daisy chain to which you refer in this
22 paragraph as the correct slave unit?

23 A. Could you repeat that question, please?

24 ATTORNEY STAMATOPOULOS: Could the court
25 reporter please repeat the question?

1 (The reporter read from the record.)

2 A. Well, I am saying that there is a control
3 computer 38, and that determines the routing of data
4 packets to the correct slave unit based on where the I/O
5 modules are located in the daisy chain.

6 And there's some other discussion that I have
7 elsewhere in my declaration. Well, I -- and the rest of
8 it says that Vink teaches that the control computer 38
9 provides for and monitors the correct sequence of data
10 bits for a relevant slave related to the sequence in
11 which the I/O modules are arranged.

12 And so it's the sequence of this -- of the I/O
13 module arrangement that -- that -- that -- and -- and
14 the right sequence of data bits for that -- a particular
15 slave.

16 And I think I discuss elsewhere the -- the
17 addressing is based on the -- the position in the chain
18 and that it can be different based on whether you're
19 coming in from the -- the left or right side of a --
20 of -- of a sub -- a substation, or whatever. I think --
21 I forget what they -- I forgot the exact word, but the
22 2, 3, 4, 5 slave units as -- as labeled in Figure 2.

23 And so -- so I -- I am saying that the control
24 computer is what determines the routing of data packets
25 to the right slave, and that would be the intended slave

1 unit to receive the data packet based on where the I/O
2 modules are located in the daisy chain.

3 So if the I -- if the intended I/O module was
4 in number 2, that's different than if the intended I/O
5 module were in number 4, for example.

6 And -- and -- and the -- it's the control
7 computer that is determining the routing of the -- of
8 the packets so that it does go to the appropriate I/O
9 unit based on which -- which slave unit that -- that's
10 within.

11 ATTORNEY STAMATOPOULOS: Let's go off the
12 record briefly.

13 THE VIDEOGRAPHER: Time is 5 o'clock PM. We
14 are off the record.

15 (Discussion held off the record.)

16 THE VIDEOGRAPHER: We're back on the record.
17 The time is 5:05 PM.

18 ATTORNEY STAMATOPOULOS: So, Dr. Houh, I don't
19 have any further questions. Thank you very much for
20 your time today.

21 THE WITNESS: Thank you.

22 ATTORNEY KONSTANTAKOPOULOS: I have just a
23 follow-up.
24
25

EXAMINATION

BY ATTORNEY KONSTANTAKOPOULOS:

Q. Dr. Houh, do you remember when counsel asked you from which device the passive master is receiving data in normal operations?

A. Yes.

Q. Can I direct you to your declaration starting on paragraph 97 and the next few paragraphs. And can you just review these paragraphs and let me know if those paragraphs refresh your recollection regarding the question.

A. Did you say paragraph 97?

Q. 97, correct.

A. Yeah, I didn't remember this section when he asked me, because I don't remember every word here, but -- but I do say here that -- well, he asked me about Vink alone. But here, it's the combination of Vink and Patrick for ground 1 and further with AAPA suggests that the passive master 1 is a standby master that receives upstream packets from the first master unit during normal operations, so -- and certainly, that's with respect to Vink, Patrick, and -- and AAPA for ground 2.

ATTORNEY KONSTANTAKOPOULOS: I have no further questions.

THE VIDEOGRAPHER: Anymore follow-up?

ATTORNEY STAMATOPOULOS: Bear with me for one second. Dr. Houh, I do have a follow-up question or two.

EXAMINATION

BY ATTORNEY STAMATOPOULOS:

Q. Where do you cite in Vink in support of paragraph 97?

A. Well, it's -- it's -- again, this is the combination of Vink, Patrick, and AAPA. And I do cite to that section in -- and in Figure 2 where I've kind of illustrated the flow -- the -- of -- of -- of data received by the -- at the -- at the -- at the I/O unit indicated by the blue dot and that it could flow one of two ways, but to the master and then further to the blue arrow that's -- that's an annotation.

That flows from the -- the left red one to the -- to the right pink master, which is the passive master. And that -- and that's how Vink describes that all the information -- that the passive master is receiving all the information which is intended for the active master. And that -- that gets to that section we -- we -- we were looking at in Vink on page 16 towards the end of your question -- your first round of questioning.

And then I go on to talk about how the -- the

1 admitted -- applicant admitted prior art talks about
2 sending upstream data from the active master to passive
3 master across transmission lines, because that -- that's
4 a means employed to enable fault protection.

5 And I go on and I discuss that AAPA after I
6 discuss Vink.

7 Q. To be clear, paragraph 97 of your declaration
8 doesn't contain any citations. Correct?

9 A. No, but the follow-on paragraphs are
10 discussing this point. And I provide diagrams and
11 citations to Vink in the next couple of paragraphs.

12 Q. And Vink doesn't contain an explicit
13 disclosure of how the standby master receives its data.
14 Correct?

15 ATTORNEY KONSTANTAKOPOULOS: Objection.

16 A. What I said was that I would have to analyze
17 where -- where that came from based on only looking at,
18 you know, one or part of one paragraph, that I'd need
19 more time.

20 But certainly, in this -- this combination of
21 Vink and Patrick and applicant admitted prior art it --
22 it discusses these things and it would be obvious that,
23 like, the data flow could be as I've outlined in -- in
24 Figure 2. And that's an example of transmission where
25 data originates from slave 3.

1 But what I was saying when you were asking me
2 just about Vink alone was about that section that you --
3 that I was looking at wasn't clear about where, so I
4 would need to do further analysis.

5 Now here, this is saying -- I -- I've drawn
6 these circles to indicate that small set of paths from
7 which the -- the data could flow from the -- the I/O
8 unit to either of the masters.

9 And then, you know, to the extent the passive
10 master was receiving all information, it would still
11 have to flow further. But then the -- and -- and so it
12 is flowing around in this blue chain. And it does
13 suggest that passive master 1 is the standby master that
14 receives upstream packets from the first master unit.
15 And that's -- that's what it's suggesting.

16 And I said I'd have to -- I wanted to do
17 further analysis outside of that one little section I
18 was looking at earlier.

19 Q. Dr. Houh, the figure, just to be clear, under
20 paragraph 98 of your declaration, to which you just
21 referred, that's a figure that you yourself annotated.
22 Correct?

23 A. Yeah, that was -- that's the annotated figure
24 in my report. And -- and all the colored, you know,
25 the -- the nonblack-and-white items are -- are

1 annotations.

2 Q. You've referred a number of times during the
3 course of this deposition to AAPA.

4 Do you recall that?

5 A. Yes.

6 Q. And what specific prior art references fall
7 into the -- by the way, AAPA -- let me withdraw that
8 question.

9 AAPA is short for applicant admitted prior
10 art. Correct?

11 ATTORNEY KONSTANTAKOPOULOS: Objection. Scope
12 of redirect.

13 BY ATTORNEY STAMATOPOULOS:

14 Q. I'm just asking how you're referring to it in
15 your declaration. Is that what you're -- what that
16 means?

17 A. I -- I'm not a lawyer, but that's what I
18 understand it means. And I think I said that several
19 times during my deposition.

20 Q. Right. And I'm just making sure we're on the
21 same page at this portion of your deposition.

22 What specific prior art references did you
23 review as part of the applicant admitted prior art?

24 ATTORNEY KONSTANTAKOPOULOS: Again, objection,
25 scope for recross.

1 A. Well, what I'm referring to is -- is cite --
2 cited to the specification of the '904 itself, which it
3 admits itself. For example, in column 8, line 50-ish,
4 which is what I cited -- what I'm citing to in paragraph
5 101, it says that the -- this redundancy in transmission
6 is in accordance with fault protection mechanisms used
7 in high-speed networks known in the art, such as the
8 standard 1+1 APS, automatic protection switching
9 techniques used in SONET.

10 So what -- what -- my point here is that that
11 statement admits that -- that this 1+1 protection
12 switching is -- is -- is known in the art, that that's a
13 fault protection mechanism. And it's a standard, 1+1.
14 It calls it the standard 1+1, which indicates that even
15 the applicant admits that this technique, the 1+1
16 protection switching, or automatic protection switching,
17 is -- is known in the art.

18 So that -- that's what I'm citing to here,
19 not -- not an external document in -- in 101 other than
20 the statements that the applicant made in the
21 specification themselves as to what was well known in
22 the art.

23 BY ATTORNEY STAMATOPOULOS:

24 Q. And what teaching of Vink and what teaching of
25 Patrick are you relying on specifically in support of

1 the opinions set forth in paragraph 97 of your
2 declaration?

3 A. Well, part of what I'm relying on in Vink I --
4 I talk about in 100, which is sending it -- I mean the
5 packet -- in either direction would have been an obvious
6 variant that could have been readily carried out by a
7 POSITA with a reasonable expectation of success because
8 Vink explicitly teaches it is possible to send data
9 packets in any direction. Specifically, Vink teaches
10 that a very flexible system is obtained in an embodiment
11 of the invention and that the at least one master and
12 slaves are designed to transmit or receive packets of
13 data bits by a transmission system running in one and/or
14 the other direction.

15 So that's -- that's what I'm citing to that --
16 that supports that the -- the -- the annotations
17 example, at least that, that I've shown in Figure 2 that
18 packets from the blue dot highlighted I/O unit or I/O
19 module in Vink, the packets from that can be transmitted
20 either to the left or to the right from that unit 3.

21 ATTORNEY STAMATOPOULOS: Okay. I don't have
22 any further questions. Thank you.

23 THE VIDEOGRAPHER: The time is 5:19 PM. We
24 are off the record.

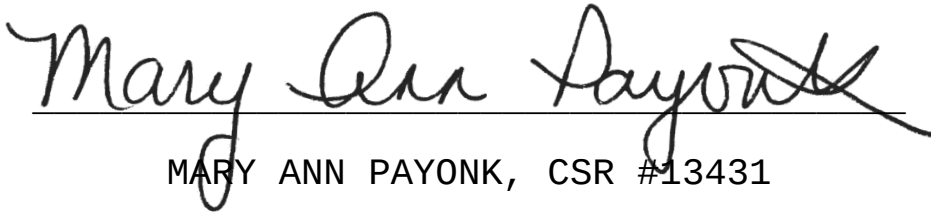
25 (Deposition adjourned at 5:19 p.m.)

REPORTER'S CERTIFICATE

I, MARY ANN PAYONK, shorthand reporter and Notary Public, CA CSR No. 13431, do hereby certify that the witness whose deposition is hereinbefore set forth was sworn by agreement of all parties, that the proceedings were reported stenographically by me, and that this transcript is a true, correct, and full record of the testimony given.

I further certify that I am not related to any of the parties to this action by blood or by marriage, and that I am in no way interested in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 7th day of February, 2024.


MARY ANN PAYONK, CSR #13431

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(None.)

ERRATA SHEET FOR TRANSCRIPT OF: HENRY H. HOUH, Ph.D.
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DEPOSITION DATE: February 6, 2024

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1 I,

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3 state that I have read the foregoing deposition and
4 declare under penalty of perjury:

5 That the foregoing is my deposition under
6 oath;

7 That I have read same and have made the
8 necessary corrections, additions or changes to my
9 answers that I deem necessary;

10 That my answers as indicated are true and
11 correct.

12
13 Executed at _____
14 this _____ day of _____, 2024.

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