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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

-----X

APPLE INC.,
Petitioner,

IPR2025-00700
U.S. Patent 6,182,128

-against-

ZIKLAG IP LLC
Patent Owner.

-----X

DEPOSITION OF
IAN MCCULLOH, PH.D.
REMOTE LOCATION
MARCH 10, 2026

REPORTED BY: KIARA MILLER
FILE NO.: 622182

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3 -----X
4 APPLE INC.,
5 Petitioner,
6 IPR2025-00700
7 U.S. Patent 6,182,128
8 -against-
9
10 ZIKLAG IP LLC
11 Patent Owner.
12 -----X
13
14
15 Deposition of IAN MCCULLOH, PH.D., taken on
16 behalf of PETITIONER, at REMOTE LOCATION
17 commencing at 2:06 PM, MARCH 10, 2026, before
18 Kiara Miller.
19
20
21
22

1 A P P E A R A N C E S:

2
3 ON BEHALF OF PETITIONER:

4 HAYNES AND BOONE, LLP
5 6000 HEADQUARTERS DRIVE, SUITE 200
6 PLANO, TX 75024

7 EMAIL: ADAM.FOWLES@HAYNESBOONE.COM
8 KALYANI.JOSHI@HAYNESBOONE.COM

9 BY: ADAM C. FOWLES, ESQ.
10 KALYANI JOSHI, ESQ. (D.C.)

11 ON BEHALF OF PATENT OWNER:

12 DOWELL COMMERCIAL LITIGATION
13 101 Foundry drive, suite 1200
14 West Lafayette indiana 47906

15 EMAIL: AEDOWELL@DOWELLCOMLIT.COM

16 BY: ANTHONY DOWELL, ESQ.

17 KLARQUIST SPARKMAN, LLP
18 121 SOUTHWEST SALMON STREET, SUITE 1600
19 PORTLAND, OR 97204

20 EMAIL: FRANK.MORTON-PARK@KLARQUIST.COM

21 BY: FRANK MORTON-PARK, ESQ.

22 A P P E A R A N C E S (continued):

1

2 ALSO PRESENT:

3 LOREN JOHNSON

4 ZOOM TECH, PARKER SIMPSON

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1 TECH SIMPSON: Thank you to everyone for
2 attending this proceeding remotely,
3 which we anticipate will run smoothly.
4 Please remember to speak slowly and do
5 your best not to talk over one another.
6 Please be aware that we're recording the
7 proceeding for backup purposes.
8 Any off-the-record discussion should be
9 had away from the computer. Please
10 remember to the mute your mic for those
11 conversations. Please have your video
12 enabled to help the reporter identify
13 who is speaking.
14 If you're unable to connect with video
15 and are connecting via phone, please
16 identify yourself each time before
17 speaking.
18 I apologize in advance for any
19 technical-related interruptions.
20 I A N M C C U L L O H , P H . D ., after having
21 first been duly sworn by a Notary Public of the
22 State of New York, was examined and testified as

1 follows:

2 COURT REPORTER: Please state your name
3 and address for the record.

4 THE WITNESS: My name is Ian McCulloh.
5 My address is 1332 Jewel Avenue,
6 Franklin, Tennessee 37064.

7 EXAMINATION BY

8 MR. FOWLES:

9 Q Dr. McCulloh, it's nice to meet you.

10 A It's nice to meet you too.

11 Q So you're aware that today you are
12 testifying in connection with the
13 declaration you filed in IPR2025-00700
14 for Patent No. 61821828?

15 A Yes, I am.

16 Q Perfect. And if I refer to that as the
17 '128 patent throughout the day, will you
18 know what I'm talking about?

19 A I will.

20 Q Okay. Have you ever been deposed
21 before?

22 A Say that again. Have I ever been to a

1 post?

2 Q Have you ever been deposed before?

3 A I have not.

4 Q So throughout the course of today it's
5 important to remember that when you
6 respond to a question that you answer
7 verbally so the reporter can make an
8 accurate transcript, okay?

9 A Okay.

10 Q Can you hear me clearly now?

11 A Can I hear you now, yes I can.

12 Q Okay. At any point, if you don't
13 understand my question will you agree to
14 ask me to clarify that question?

15 A I will.

16 Q And if your counsel objects to a
17 question that I ask, do you understand
18 that you must still provide an answer to
19 that question unless you are instructed
20 otherwise?

21 A I guess I do now.

22 Q Perfect. We'll try to take breaks every

1 hour, but if you need a break sooner
2 will you just let me know?

3 A I will.

4 Q Is there any reason that you would not
5 be able to provide full and accurate
6 testimony today?

7 A There is no reason. The only thing that
8 might interfere is some of the work that
9 I did in the military has security
10 classification that I will not be able
11 to speak to. But I don't think that
12 should bear on the testimony today.

13 Q And if there ever comes a point where I
14 ask about something that does have a
15 security classification, you'll let me
16 know?

17 A I will.

18 Q Do you have copies of the relevant
19 documents for this case with you?

20 A I might. Let me just -- I believe they
21 were sent to me again.

22 I have several documents, I have PO

1 in response to the IPR, and I have
2 another document that's an exhibit. I
3 have four documents. I don't know if
4 those are all of them, or which ones
5 you're referring to. I have my
6 deposition, right, I have my statement.

7 Q You have Exhibit 2009, your declaration?

8 A I have my declaration, yeah, it's not
9 labeled as 2009, it's just labeled as my
10 declaration.

11 Q I'll try to refer to it as that, but it
12 might slip. I might call
13 it Exhibit 2009 throughout the course of
14 today.

15 A Okay.

16 Q Exhibit 2010 is what I have marked as
17 your CV. Do you have your CV available
18 as well?

19 A I can pull up my CV. I do not have it,
20 It wasn't recently sent to me, but I can
21 go and find it on my computer real
22 quick. I keep updating it as I do

1 various proposals and work and such, so
2 it may be a slightly, you know, there
3 might be a few more recent things added
4 on there, but it should be good. Let me
5 just pull it up. Of course, when I want
6 to find it quickly, it hides from me.

7 Here we go. Okay. I have that up
8 and I've got it minimized on my machine.

9 Q Okay. All right. Go back to your
10 declaration if you will. And go to the
11 last page of the declaration. I have it
12 as Page 13 of 13.

13 A Yes.

14 Q Can you let me know the date that is
15 given for the signature?

16 A January 4, 2025.

17 Q And you signed on January 4, 2025?

18 A Yes.

19 Q Okay. As we're going throughout the
20 course of today, just another level
21 setting, if I mention a POSITA,
22 P-O-S-I-T-A, that is referring to a

1 person having ordinary skill in the art
2 of March 1998; is that understood?

3 A Understood, yes.

4 Q Now, you had mentioned there might be
5 some differences from your CV, which is
6 Exhibit 2010 for us, since it was filed
7 in January of 2025. Do you have any
8 sense of what might have changed between
9 then and now?

10 A Just any recent things. Like if I've
11 had a recent publication, or new classes
12 taught or anything like that.

13 Q Off the top your head, are there any new
14 publications listed there?

15 A Let me look.

16 Q Since January 2025 I suppose?

17 A I typically update my CV around the time
18 of beginning of semester. I think the
19 newest publications probably de la Pena
20 et al., Public Sentiment Towards
21 Analysis in the Department of Education,
22 there's another one, Mislabeling

1 Misinformation, Annotations Consistency,
2 Cross-Subreddit Behavior as Open Source
3 Indicators of Coordinated Influence. I
4 don't know if those are on there or not.
5 And those would be the publications, I
6 suppose.

7 Q Let's sift through a little bit of your
8 CV. In the background you detailed in
9 the declaration. Your declaration. If
10 I'm looking at this correctly, you
11 earned your bachelor's degree in
12 industrial engineering from the
13 University of Washington in 1994; is
14 that right?

15 A Yes, it is.

16 Q What was the focus of an industrial
17 engineering degree at that time?

18 A Robotics. So when I first went to the
19 University of Washington in 1990, I
20 worked in the robotics labs, so I was
21 doing things like facial expression --
22 facial recognition, speech processing in

1 autonomous robots. University of
2 Washington had a robotics proving ground
3 in the, what used to be a daylight
4 nuclear reactor and so we would do
5 robotics. I then decided to switch more
6 towards industrial engineering, which
7 would involve like processing, queuing
8 and those kind of queuing process models
9 and dealing with like interactions and I
10 did more of that. So my focus was a
11 blend of, you know, computer science and
12 artificial intelligence with figuring
13 out how to put those into processes,
14 mostly logistics applications, right.
15 So we did work for like Boeing, CAD
16 models. I did work for GM name plate, I
17 did work for cold storage company.
18 These are some of the things I did in
19 college.

20 Q That robotics, was that part of the
21 industrial engineering program or did
22 you say start in mechanical engineering

1 and switch majors during the course of
2 it?

3 A That's a complicated question. Just for
4 context, I went to college at 14, and so
5 I initially was going to a community
6 college, got my associate's degree and
7 then I probably spent a total of like
8 seven years from like age 14 to 21 in
9 college. So I took a lot of different
10 classes and a lot of different things
11 that interested me before I finally
12 ended up graduating with a degree in
13 industrial engineering. I mean, I guess
14 you could say I switched majors. I think
15 it was probably more I was pursuing what
16 I was interested in at that time. If
17 that make sense. I had an ROTC
18 scholarship at some point, you know,
19 they basically tell you you've got to
20 get a degree and that seemed to be the
21 fastest point to get a degree, if that
22 makes sense.

1 Q That does, thank you. So moving on to
2 your master degrees, so that looks like
3 those were both from Florida State
4 University, one in applied statistics
5 and one in industrial engineering and
6 those were both in 2004?

7 A That's right. So you know, in the Army
8 I was selected to go be an instructor at
9 West Point, so they send you to get a --
10 two years to get a master's degree. So
11 I did industrial engineering in a year
12 and I thought I was being slick and I
13 could then get assigned to West Point,
14 and they're like no, you've got to do
15 another year, so I got a second's master
16 degree. And I also was all but
17 dissertation in Ph.D. in industrial
18 engineering. I decided to, I don't
19 know -- don't tell Florida State, but I
20 decided to upgrade to Carnegie Mellon
21 for the Ph.D.

22 Q We'll keep that secret between us and

1 the record that gets filed.

2 So that Ph.D from Carnegie Mellon
3 that was awarded in 2009?

4 A Yes.

5 Q The thesis was entitled Social Network
6 Change Detection?

7 A Yes.

8 Q So was that about detecting changes in
9 social networks?

10 A It was -- yes. It was about really
11 detecting changes and anomalies in
12 network traffic. So at the time without
13 trudging into too much, right, you can
14 imagine that America during that time
15 had a significant amount of large
16 network data that was uncommon, so the
17 real focus was on detecting changes.

18 So when I was at, when I was
19 teaching at West Point, my research, I
20 established the Network Science Center
21 there and I established a line of
22 research for basically taking forensic

1 data and illuminating various networks,
2 either elicit supply chains to
3 communication networks to adversaries.
4 And that was credited with significant
5 impact. And so at special operations
6 command and -- a little point in history
7 is, after 9/11 there was no central body
8 that was commanding and controlling
9 operations across Iraq to Afghanistan.
10 So a special operations command was
11 appointed that role in 2004, and by 2005
12 they had a large research effort called
13 the Research Development Engineering, it
14 was RDEC, I forgot what the C was for.
15 And this is what brought like Carnegie
16 Mellon, MIT, Stanford, Johns Hopkins,
17 conspicuously not Berkley, to study what
18 they would do with networks and how they
19 would kind of handle -- this is the
20 birth of network based targeting, if you
21 will. So my Ph.D. was sponsored out of
22 that work and then of course none of the

1 classified applications appear in the
2 dissertation. That's where you see
3 that.

4 We were able to use some datasets
5 from -- like Yahoo kind of emerged at
6 that time to kind of have more, you
7 know, unclassified examples to kind of
8 demonstrate it on.

9 But the biggest criticisms of my
10 dissertation at the time is, when would
11 you have so much data? Which I could
12 easily explain at the time now, now
13 people think it's kind of funny.

14 Q So you mentioned a couple of different
15 kinds of networks as part of research,
16 correct? Because for me, when I hear
17 the word "social network," I think about
18 human relationship networks.

19 Are you saying there were physical
20 networks involved as well?

21 A So a network, right, is typically
22 defined as a set of nodes and a set of

1 relationships or set of links between
2 them. So a social network is where that
3 set of nodes is specifically people.
4 Now, those people could be -- the
5 relationships could be friendship, it
6 could be communication, it could be
7 transactions, it could be any number of
8 things.

9 And the mathematics across that is
10 fairly consistent. You know, stems from
11 graph theory, but I would argue that
12 there's certain additional theories or
13 phenomena that gets realized in what we
14 would call network or social network
15 analysis.

16 Q Okay. Thank you.

17 So let's look a little bit more at
18 your military experience, if we can.

19 In if 1994, you were commissioned
20 as an army officer; is that right?

21 A That's correct.

22 Q Okay. And you were an officer --

1 A Well, actually, let me just correct
2 that. My actual commission date was
3 January 10 of 1995.

4 Q Got it. And you were an officer in the
5 army with the Tenth Mountain Division
6 until 1999?

7 A Yes.

8 Q Okay. In what month did you transition
9 to that detachment commander position in
10 the First Special Forces Group?

11 A So that would have been, I think, May of
12 '99.

13 Q Okay. Going back to 1995, for a moment,
14 you state in your declaration, at
15 Paragraph 7, that you were commissioned
16 as an officer and served as the officer
17 in charge of the advanced War Fighter
18 Experiment in 1995; is that correct?

19 A It is. My official position was I was a
20 chemical officer assigned to 317
21 Cavalry. And 317 Cavalry was the test
22 cite for the first tactical deployment

1 of computers, from army CECOM,
2 Communication Electronics Command.

3 So on my first actual day at the
4 Tenth Mountain Division, is the day they
5 were rolling out to the field and they
6 dropped off the battle-hardened
7 computers; they were 286 processors.
8 Most people don't know what that is.
9 And they pretty much had no the
10 operating system, except from the Unix
11 prompt.

12 Q Understood. And for what it's worth, I
13 remember 686 being a powerful processor.

14 So with that, you described in the
15 declaration that that was the first
16 tactical deployment specifically of
17 distributed computing within the US
18 Army; is that right?

19 A I don't know if that was the initial
20 envision, like, initial plan for it, but
21 we had -- it was called the Aviation
22 Mission Planing System. And so we had

1 computers set up at the battalion level,
2 brigade level, at companies, right --
3 which I can give you more detail, if you
4 want to know -- troops and squadron in
5 the cavalry terms.

6 And so then what I did is I hooked
7 them up through FM secure. So FM, we
8 call it SINCGARS, which is a frequency
9 hopping FM network. You know, so we
10 would, basically, be distributing
11 content via FM signal as opposed to
12 normal coax cable-type thing.

13 Eventually, we were able to tap
14 into something the military called
15 mobile scriber equipment network, which
16 is basically going from the FM into, you
17 know, secure telecoms network. And we
18 were able to transfer information from
19 the Joint Readiness Training Center, in
20 Fort Polk, Louisiana, all the way up to
21 the commission commander's desk in Tenth
22 Mountain Division in Upstate New York,

1 and General Magruder ended up going to
2 Lead Force XXI, which was the army's
3 large-scale division deployment of
4 distributed computing.

5 And then what that allowed the army
6 to do, is it allowed them to figure out
7 how they could effectively downsize
8 while still having situational
9 awareness, so that they can match fires
10 upon objective, but having a much
11 smaller footprint. And, of course, that
12 technology paved the way for our success
13 in Afghanistan and Iraq, to that point.

14 And what's really funny is I
15 remember when I was working as a
16 lieutenant, and you can imagine, I'm a
17 fairly junior officer at that time. And
18 the senior leadership was like this is
19 so stupid. The army will never have
20 computers. How would we ever power the
21 batteries for these things. And of
22 course, you know, a lot of these

1 concerns seem silly but they were fairly
2 significant at the time.

3 Q That is funny.

4 There was something you mentioned
5 there that I don't recall you mentioning
6 in your declaration with respect to that
7 mobile subscriber equipment network.

8 Around when did that happen, that
9 transition to that type of network?

10 A That would have been in '97, so that was
11 a couple of years in. So, you know, in
12 that summer, of '95, it was literally
13 figuring out what was on the computer.
14 Nobody could really do anything with it,
15 that sort of thing. I think the plan in
16 the summer of '95 was they had a
17 removable hard drive that would go in
18 into a Kiowa warrior helicopter, which
19 was fielded, I want to say '94/'95. And
20 then you could take -- so Kiowa warrior
21 helicopters had -- they were the ones
22 that had the big ball on the top of

1 them, that's how you would recognize
2 them.

3 But, basically, they had advanced
4 imaging systems, so they could do
5 thermals in the night, you know,
6 variation imaging equipment.

7 And so helicopters would go out in
8 a reconnaissance mission, take live
9 video or images and then those would get
10 stored on a hard drive. And then when
11 the helicopter would return to the
12 operating base, the forward operating
13 base, then the pilots could take the
14 hard drive out of the helicopter and put
15 into a computer that then that could be
16 transmitted in some way. Initially,
17 they were moving hard drives around.

18 And so it seemed natural that we
19 could perhaps improve that by using
20 secure FM radio signals to be able to
21 transmit that in a distributed way, as
22 opposed to having to move hard drives

1 around. And that was a significant
2 Innovation that came up in '95, that
3 people hadn't thought of before. So we
4 were able to continue working on that.
5 And then by '97, that is when we where
6 able to have distributive COMS from Fort
7 Polk, Louisiana, up to 10th Mountain
8 Division, near Watertown, New York.

9 It had significant abilities. I
10 mean, there was a lot of work dealing
11 with, like, how do you compress images,
12 how do you handle the network traffic,
13 and all those sorts of things.

14 Q So is that work with the Aviation
15 Mission Planning System the primary
16 basis for your claim to experience with
17 distributed systems in that relevant
18 time period leading up to 1998?

19 A You know, I had done some work in
20 undergrad before I had aspirations of,
21 you know, doing online commerce, you
22 know. That was the time of that sort of

1 stuff. My army deployment did not allow
2 me to do that, you know what I mean, so
3 in college I also had a fair amount of
4 work with some of the e-commerce side of
5 things. I mean, this is going to sound
6 really embarrassing, but I set up an
7 online business to sell Star Trek
8 paraphernalia because I was that kind of
9 nerd, I guess, and I didn't really
10 succeed very well. So I did have a
11 little bit of exposure there.

12 And just kind of hobby work as well
13 around that, but that would be my basis
14 in the '90s. Now, that's not to say
15 that, you know, as I progressed in the
16 Army, I became increasingly --
17 increasingly worked with distributed
18 systems and with networks.

19 So I did a lot with
20 telecommunications networks. I did a
21 lot with attacks and threats to signal
22 networks. I did a lot with distributed

1 computing from the perspective of
2 performance. So when you start to deal
3 with very large networks -- so now this
4 is in the 2000s, right. But when you
5 start dealing with very large networks,
6 processing power in the 2000s were not
7 quite sufficient to deal with that.

8 So when you start dealing with
9 distributed computing, instead of
10 bringing the data to the algorithm, you
11 kind of break the algorithm up and send
12 the algorithms to the data, if that
13 makes sense, right, so I did do some
14 work there as well.

15 So I don't know if that answered
16 your question clearly, but, you know, I
17 mean, there's a difference between --
18 probably with everybody what we all knew
19 in the '90s and what we knew in
20 the 2000s and what we know today, you
21 know what I mean.

22 Q Yeah, that makes sense.

1 So that Aviation Mission Planning
2 System, did you ever call it AMPS, or is
3 that the too close to the AMPS?

4 A No, no. We called it AMPS. That's
5 exactly what we call it, yeah. Yeah, I
6 actually got this -- this is the coin I
7 got from the -- I might as well show it
8 to you. That was the coin I got from
9 the chief of staff of the Army, General
10 Gordon at the time, for the work there.
11 And they offered me an exception to
12 switch over to aviation branch, which I
13 considered, but then I thought I would
14 get out of the Army instead, and that
15 didn't quite happen so, you know.

16 Q Yeah, so that Aviation Mission Planning
17 System, AMPS, that involved distributing
18 mission planning data? situation
19 awareness data? Did it involve any
20 other types of data?

21 A Yeah, I mean, we had -- I called it Sit
22 Stat. People would probably now know it

1 as Blue Force Tracker. But we would
2 send location data for equipment so that
3 would allow us to track helicopters, and
4 then we eventually had an application
5 that would do it for ground vehicles as
6 well. We had distributed imaging,
7 mostly distributing data.

8 But part of that too was making
9 sure that we would track, you know, a
10 time stamp of which rotary helicopter
11 craft is sending what image to what
12 system. We had maps. We had algorithms
13 for threat data for looking at where air
14 defense artillery would be so the pilots
15 could essentially from their computer
16 terminal, you know, do pre-mission
17 flights, these sorts of things. So
18 there was a ton of different things that
19 were in there.

20 And then eventually this was
21 integrated with the AllSource -- I think
22 we called it ACAS or something like

1 that. It was, like, an AllSource intel
2 system. So you would be able to pull
3 intel threat data at the secret level
4 onto the system. That would be part of
5 the templating of threats. We would be
6 able to feed intel -- you know, like,
7 reconnaissance data collected directly
8 into the intel systems.

9 And so this was largely -- you
10 know, these was kind of the precursors,
11 which of course grew into the cloud
12 computing that we had in the 2000s as
13 the Department of Defense started
14 recognizing the need for more of that
15 after Force XXI.

16 Q Got it.

17 Did that involve any consumer audio
18 or video distribution?

19 A When you say "consumer," like, from a
20 retail perspective or a --

21 Q Yes.

22 A At that time I -- well, I'm not sure --

1 I don't recall exactly when the
2 transition happened. But like, I know
3 that, you know, we eventually were at
4 the point where we -- like, in the mid-
5 to late 2000s, we would be pulling in --
6 various vendors would provide everything
7 from social media to news media to --
8 you know, like, there's -- all that sort
9 of stuff was available, right.

10 So intelligence community -- I
11 don't think that's a secret -- would
12 parse news content, that sort of thing.
13 There was certain entertainment content,
14 all of that sort of stuff was being
15 distributed, mainly for missions ranging
16 from, like, intelligence, social
17 listening, understanding what's
18 happening on the ground, you know, as
19 far as in the culture, to -- you know,
20 you can imagine psychological operations
21 products and production and those sorts
22 of things as well.

1 Q Got it.

2 Did AMPS, was it classified in
3 1995?

4 A The AMPS program was not classified.
5 I -- but, like, aspects of it were. So
6 the fact that there was an Aviation
7 Mission Planning System was not
8 classified. The capabilities were not
9 really understood outside out of 10th
10 Mountain Division and CECOM, and those
11 weren't scaled until the end of
12 Force XXI, which would have probably
13 been in -- I'm going to guess
14 '99ish, 2000 when those findings start
15 rolling out.

16 Q Okay. You'd also mentioned that AMPS
17 operated over FM, right?

18 A It did. Well, that data was transferred
19 over secure FM, yeah.

20 Q Okay. Does that mean that no data was
21 operated over satellite TV
22 infrastructure?

1 A No. It doesn't. It doesn't mean that.
2 I just -- my work was focused at
3 developing that component of it, and I'm
4 not an expert on the mobile subscriber
5 equipment at that time of '95, right. I
6 used the infrastructure that was there,
7 but I don't know. I could probably look
8 into if you would like me to.

9 Q When you say the mobile subscriber
10 equipment, are you referring that the
11 military used just general --

12 A Yeah, the military used mobile
13 subscriber equipment. So like, every
14 Humvee had, like, basically an early
15 cell phone that -- you know, I'm not
16 really familiar with what backbone or
17 structure that that particular system
18 used at that time.

19 Q And that aspect was still considered
20 part of AMPS?

21 A No. The AMPS -- AMPS was we had
22 physical computers located at company

1 battalion- or brigade-level
2 organizations, and we had secure FM
3 radio that we would hook up to the back
4 end of that system, and we would be able
5 to kind of set up a network to pass
6 data, to share analytics, and that sort
7 of thing -- and to be able to track, you
8 know, various things. And then when you
9 want to expand beyond where you have FM
10 range, I would tap into the mobile
11 subscriber equipment, which then had
12 larger range, you know, from, like, the
13 telecoms. But I mean, it's basically
14 just tapping into a telecom network at
15 that point.

16 Q Got it.

17 So it sounds like AMPS, because it
18 focused on FM, also did not operate over
19 cable TV infrastructure?

20 A I don't know. I -- my use of AMPS did
21 not operate over cable TV.

22 Q Okay. But your use of AMPS focused

1 specifically on FM only for
2 interconnections?

3 A We had some that would be hardwired,
4 like the land -- you know, like a LAN
5 cable. That's, like, a local area
6 network cable, not a -- I don't know
7 that it had coax. I don't believe so.

8 Q Okay. And was AMPS solely designed for
9 military use?

10 A Yes, yeah.

11 Q Okay. Would you agree that military use
12 for AMPS is different than a consumer
13 entertainment use of that system?

14 A Well, there's dual-use technology, but
15 yes. I -- I mean, I -- it's kind of a
16 weird question. So I guess you asked me
17 to be -- make sure I'm clear on what
18 question you're asking. Like, are you
19 saying there's nothing that AMPS is
20 doing that could be used in commercial
21 entertainment or vice versa or like --
22 what are -- I don't understand the

1 question.

2 Q Yes, that is the question. So first --
3 (Cross-talk.)

4 A -- that's not true. I would say that,
5 like, pretty much everything you do in
6 military technology innovation can find
7 an application or a use that is
8 nonmilitary, you know, for the most
9 part, right. And I think a lot of
10 innovations have been driven by that.
11 And like, I mean, if we look at the
12 entertainment industry today -- or cloud
13 computing, right. Like, cloud -- the
14 cloud, right, hugely used, right, for
15 entertainment, right.

16 You know, look at any -- well,
17 you're talking about streaming service.
18 Look at any streaming provider. Look at
19 any site where you look at movies or
20 music or anything, right. The cloud,
21 like, was primarily developed under a
22 lot of defense contracts for sharing of

1 data and moving data around for
2 information and situational awareness
3 that found, then, dual use probably in
4 the entertainment industry, you know, a
5 decade after they were conceived of in
6 the military for a different purpose.

7 And we still see that today, right,
8 with -- we could argue the internet, we
9 could argue email, we could argue --
10 like, a lot of different things they'll
11 find application in the military and
12 then other dual use.

13 Q Got it. It sounds like then that the
14 technologies at issue with respect to
15 AMPS could have and perhaps would have
16 found applicability in a different
17 domain like consumer use; is that fair
18 to say?

19 A I think so, yes, that is fair to say.

20 Q Would that also be transferable to
21 enterprise distributed system use, there
22 could be some transferability there?

1 A Yes.

2 Q Okay. So I'm looking a little bit
3 further down in your declaration now,
4 Paragraph 10, and there you mention that
5 your experience includes hands-on
6 deployment, and academic research and
7 distributed systems, operated under real
8 world constraints.

9 What distributed systems are you
10 referring to there?

11 A That would be referring to aviation
12 mission planing system. And then there
13 are a number of distributed systems that
14 I did in, well, so there's stuff that I
15 did for classified deployment that I can
16 not discuss, but what I can is, I also
17 managed about a large portion of the
18 internet bandwidth in Iraq in my job in
19 the -- I was chief of counter IED, so I
20 was a deputy for the JIDO network. And
21 so part of that mission was taking
22 satellite communications networks and

1 basically using that to take intel that
2 would be done in the 43 different IC
3 agencies in, you know, organizations,
4 you know, in the continental United
5 States and bringing that forward into
6 Iraq so we could distribute it for intel
7 planing.

8 And then, you know, one of the
9 things that I did in that was
10 renegotiated some of satellite contracts
11 to kind of lower cost for the U.S. I
12 was hoping that I could redistribute
13 that for expanded licenses for -- I was
14 one of the first consumers of Palantir,
15 if you're familiar with that company, in
16 2010, when it was deployed in Iraq.
17 That was not successful. So we kind of
18 had to use other networks. So that
19 concept, you know, distributed networks
20 we had systems that would use satellite
21 coms that would kind of go from sharing
22 information for intel, streaming video

1 imagery, et cetera. There's probably
2 some more tactical stuff that I can't go
3 into a lot of detail with.

4 Q That stuff you can't go into detail
5 with, if I'm understanding you
6 correctly, that would have been
7 post 2001 after the invasion of Iraq or
8 some other time?

9 A Yes. That would be post 2001, um-hmm.
10 Pre 2001, just to be clear, would
11 be AMPS and the associated systems
12 there, primarily over FM or LAN cable.
13 Post 2001, probably post 2005, right,
14 around that 2005 time, is where I
15 started doing more network-based
16 research and all the other stuff that
17 kind of came from there.

18 Q Thank you for that clarification. So
19 that research you mentioned included
20 academic research would have been
21 after 2001?

22 A Yes.

1 Q Okay. You had mentioned that there were
2 some LAN connections that you worked
3 with, with respect to AMPS. But you
4 also mention that maybe cable wasn't the
5 type of connection used; is that right?

6 A Yeah, I do not recall, I mean, I -- you
7 know, I don't know, I can't imagine
8 setting up a coax cable at that time for
9 it. I just don't remember what the back
10 end of the system was. Every cord that
11 you had in the military was battle
12 hardened, so it was thicker than it
13 should be, so it's kind of hard for me
14 to remember what the exact connection
15 looked like. I don't recall.

16 Q And to be clear, when you talk about
17 coax cables, are you using that
18 synonymously with the more general idea
19 of cable structure?

20 A I was, yeah.

21 Q Would it be fair to say that you were
22 familiar with coax cables or cable

1 infrastructure generally before 1998?

2 A Yes.

3 Q Was cable infrastructure a mature
4 infrastructure by 1998?

5 A I do not know. I can't speak to who
6 else knew about it or that sort of
7 thing.

8 Q Do you by chance know around when coax
9 was initially used in interconnections
10 between different computing systems?

11 A Oh, between computing systems, I do not
12 recall. I know we set up networks, you
13 know, when I was in my undergrad in labs
14 and that sort of thing, we would
15 interface with the robots. I don't know
16 what kind of cable we used in
17 particular.

18 Q Are you aware of coax being used with
19 respect to the cable TV systems prior to
20 1998?

21 A Yes. I had a TV, I had a VCR, I did,
22 like, stupid movies as a kid. I copied

1 VHS tapes of stupid movies that I made,
2 yeah.

3 Q I was not so lucky, probably for the
4 best.

5 In terms of that cable
6 infrastructure for TV and whatnot, do
7 you have any sense of when that first
8 started getting built out?

9 A I don't. I know from my perspective,
10 you know, I was probably very much a
11 consumer in college, you know, so I know
12 that we had TV. I know we hooked it up
13 to the cable. I don't know how that --
14 I was not familiar with how those worked
15 or how those ran and you know.

16 Q Okay. But it sounds like just in terms
17 of cable TV consumption that the
18 infrastructure for that would have been
19 relatively mature by the late '90s or
20 whenever you had your own subscription;
21 would that be fair?

22 A Yeah, I would imagine in the '90s, you

1 know, I'm not -- I don't know for sure,
2 but I'm going guess here that there were
3 like cable companies as I recall and you
4 can buy cable -- is that what you're
5 asking, like?

6 Q Yes.

7 A Yes. I don't know, like -- I mean, yes,
8 I would imagine so.

9 Q Okay. And to your recollection, would
10 you agree that cable infrastructure back
11 in the 1998 time frame, offered a
12 relatively high bandwidth capability?

13 A I can't speak to what the cable
14 infrastructure looked like in the 1990s,
15 I can probably do some research and
16 figure out what that information is, if
17 you need it, but I, you know, I can't
18 testify to what the cable infrastructure
19 was or was not in the mid-'90s before I
20 started getting into professional life.

21 Q Fair enough. Would you have any sense
22 of how high a bandwidth cable

1 connections were able to provide
2 relative to the FM work you were engaged
3 in the '90s?

4 A I would imagine that cable would have
5 higher bandwidth than FM at that time.

6 Q What leads you to that conclusion?

7 A We had to do a lot of more image
8 compression to transmit over FM. Also,
9 with signal frequency hopping there were
10 a lot of challenges with doing that.
11 And of course, later the -- so we were
12 compressing digital content to be able
13 to transmit it thru FM, but of course
14 the ability to compress digital content,
15 meant that that then when you had a
16 regular connection, you could transmit
17 much more digital content through those
18 networks.

19 But at the time, I would say
20 through the '90s, the focus was very
21 much on -- the motivating purpose for
22 compressing images is so that we could

1 send large images -- large data files
2 through narrow bandwidth pipes, if you
3 will.

4 It was probably -- you know,
5 probably in the 2000s when I was at
6 West Point that I heard people talking
7 about the opposite problem of trying to
8 send more data. And that was, of
9 course, the era of software defined
10 networking and all of that sort of
11 stuff, which was a focus area in, you
12 know, a number of my colleagues at the
13 science center at West Point were doing
14 that, and the electrical engineering
15 computer science program as you can
16 imagine.

17 Q I can. So with respect to that, you had
18 mentioned that you were working on using
19 compression to send this data through
20 the -- how did you phrase this, through
21 the narrow band data pipes of FM; is
22 that right?

1 A Yes.

2 Q Would you -- does that mean that
3 relative to cable, would -- if FM is a
4 narrow band technology at that time,
5 would you say the cable was a relatively
6 broad band technology?

7 A It was larger than FM, is what I would
8 say. I've heard of broadband cable, I
9 don't remember when I heard that. But
10 yeah, cable was -- had bigger bandwidth
11 than FM if that's the question.

12 Q What would have constituted a broadband
13 connection back in the late '90s?

14 A I do not know. I can speculate, but I
15 don't have any specific knowledge. I
16 could probably find that for you if you
17 needed me to.

18 Q Thank you. Based on the experience
19 we've talked about and that you
20 identified in your declaration, would
21 you agree that a POSITA back in 1998
22 time frame would have known how much

1 data a cable connection could carry
2 downstream to an endpoint?

3 A Say again what a POSITA was?

4 Q A person having ordinary skill in the
5 art.

6 A A person having ordinary skill in the
7 art, and you're asking and about what
8 would they -- repeat the question,
9 please then.

10 Q Sure. Based on your experience, would a
11 person having ordinary skill in the art
12 back in the March 1998 time frame, have
13 known how much data a cable channel
14 could carry downstream to an endpoint?

15 A I can't speculate. I don't know. I
16 would imagine that they would know that
17 they could do more with cable than they
18 could with FM. I don't know that they
19 would necessarily think that was better
20 than -- you know, I mean, we've seen the
21 growth of LAN cables and fiber optics
22 and, I mean, that problem of trying to

1 figure out how to do better transfer of
2 data and information was certainly
3 probably to the theme from the late '90s
4 into the 2000s, and I think people tried
5 many, many different things. And I
6 think there were many brilliant
7 inventors and patents that came up with
8 a lot of technology that, you know, has
9 enabled us to get to the state that
10 we're in today.

11 Q Understood.

12 Another related question, so you
13 know that the '128 Patent is related to
14 content like audio and back in the 1998
15 time frame.

16 Based on your experience, how much
17 bandwidth do you think that a CD-quality
18 audio file would have required for
19 transmission?

20 A I would have to research that. I don't
21 have those -- I don't have accurate
22 numbers off the top of my head, I'm

1 sorry.

2 Q Okay. Do you have any sense of whether
3 it would have required compression, as
4 with the other types of data we talked
5 about before?

6 A I would imagine there was a need for
7 compression.

8 Q So basically, if an audio file was
9 compressed, I believe you had said
10 before that would enable more data to be
11 transmitted over an existing bandwidth,
12 correct?

13 A Yes. That's correct.

14 Q Okay. Let's go down to Paragraph 20 of
15 your declaration. Let me know when
16 you're there.

17 A Yes.

18 Q Okay. So there, you state that from
19 your own work in the '90s, both inside
20 government and academic research -- and
21 I'm quoting you here:

22 "I can say with confidence that

1 realtime content routing across regional
2 networks for consumer media delivery was
3 not something engineers were thinking
4 about, let alone building."

5 Do you see that?

6 A I do.

7 Q So when you say there from your own work
8 in the 1990s, is that with reference to
9 government and military applications
10 specifically?

11 A No. I would say in my applications in
12 my undergraduate, where I did a lot of
13 the internships for -- well, I think I
14 enumerated them. The -- so there was
15 what we were learning about in school;
16 there was what I saw in kind of
17 commercial, you know, work, and then
18 there is -- I worked with AMPS and the
19 Aviation Mission Planning System, right.
20 People were not doing that with a mind
21 of consumer media delivery.

22 In fact, I don't think the idea of

1 consumer media delivery really, like,
2 caught anybody's interest until Napster
3 came out, and I think I said that
4 somewhere in that declaration as well
5 too. And I think once Napster came out,
6 everybody's, like, "Oh my gosh, is this
7 even legal? Is this piracy? Is this --
8 like, how are we, like" -- and so these
9 were the thoughts that everybody was
10 talking about, both at CECOM, you know,
11 when I'm talking to engineers there who,
12 you know, I would argue would be state
13 of art in their fields, right, in the
14 '90s to -- you know, at that point I
15 probably wasn't talking to people in --
16 you know, back in my undergrad when I --
17 in '98.

18 But you know, the idea of using it
19 for the consumer media was kind of,
20 like, the mind blow. You know, like,
21 oh, why didn't I think of this, right?
22 And it's -- you know, that's kind of

1 the -- you know, that was kind of the
2 general feeling. You know, and I would
3 say that probably Napster probably
4 changed our thinking about what could be
5 done in Department of Defense because
6 it's -- you know, it was, like, you
7 know, pretty big.

8 And so I kind of feel like, you
9 know, there was a -- like, at least --
10 you know, there's many paths through
11 history. My view point is that, you
12 know, a lot of our cloud computing and a
13 lot of our distributed computing was
14 really about sharing enterprise data,
15 right, and being able to kind of move
16 information quicker so that we could
17 gain information advantage over
18 adversaries in the military context.

19 And then when -- you know, when
20 we -- when that tech -- same kind of
21 technology was in a dual-use way
22 discovered and people were using it for

1 kind of consumer media application, and
2 that kind of was, like, oh, well, here's
3 another area for military growth, right.
4 And so there's that kind of dual use --
5 you know, dual-use aspect of it. Does
6 that make sense?

7 So there, that's what I was
8 referring to in that statement.

9 Q Yeah, I think it makes sense, but it
10 sounds like you're saying that, pursuant
11 to this dual-use concept, that the
12 consumer media domain wasn't
13 fundamentally different than the
14 military domain; rather, it was just an
15 issue of lag between when it was
16 introduced in the military and when it
17 reached --

18 A No, I wouldn't say it's a matter of lag.
19 I would say that you -- you know,
20 innovation is where you take something
21 from one domain or idea or use over
22 here, and you think about how you can

1 repurpose it over here. And you get
2 this kind of innovation back and forth.
3 So I don't -- I would disagree with your
4 characterization that the consumer media
5 space would just develop the way it did
6 without military, you know, innovation
7 and, you know, interventions and even
8 the war on -- you know, even post 9/11
9 investments in the war on terror, I
10 don't know that we would have seen that
11 level of growth.

12 Q Okay. So it sounds like then the
13 military domain isn't fundamentally
14 different from the consumer
15 entertainment distribution domain in
16 terms of being able to apply technology
17 from the former to the latter; is that
18 fair?

19 A I guess I disagree with your
20 characterization that there is no
21 difference. I think there's a critical
22 difference, right. I think there is

1 differences in what your application,
2 your use case and what you're doing. I
3 wouldn't say that they are synonymous,
4 but I would say, you know, when you have
5 one, you do another.

6 You know, I'll give you an example
7 maybe that's a little more tangible,
8 right. I'm proposing a project right
9 now to take social network, like social
10 science social network theories about,
11 like, how people make friends and how,
12 like, social conformity and normal
13 conformity and all that stuff works, and
14 applying it to modeling the T cells to
15 see if we can innovate new breakthroughs
16 in cancer treatment at Johns Hopkins.

17 Now, I don't think anybody would
18 agree that a T cell is fundamentally the
19 same as a human being and that the way a
20 T cell metastasizes and grows cancer is
21 at all the same as the way people make
22 friends in a coffee shop. But that

1 doesn't mean that some of the network
2 models and math and theories that you
3 find in social networks cannot inform
4 cancer treatment, and there are funded
5 works in doing that.

6 Moreover, I would tell you that,
7 you know, at the -- you know, I don't
8 know what it is since this current
9 administration, but, like, as of a few
10 years ago, something like 65 percent of
11 academic research was funded by the
12 Department of Defense alone. So when
13 the Department of Defense has missions
14 that inform research priorities, those
15 research priorities then fund graduate
16 education in the United States. And
17 then certainly, people get ideas as they
18 are pursuing what is fundamentally
19 defense innovations. They get ideas for
20 maybe how they would spin that out into
21 commercial enterprises, and that is how
22 we grow, right.

1 But I don't think that means that
2 military applications and consumer media
3 networks are the same or that without
4 military innovation, you would have this
5 inevitable commercial pipeline. Like,
6 they feed off each other. I don't think
7 you'd have the defense posture today
8 without commercial innovation; I don't
9 think you have commercial innovation
10 without the defense base, right. I
11 think they go hand in hand, and that's
12 why the US has, like, pretty much
13 technical superiority, right, in the
14 world today, and I think we'd all agree.

15 Q Okay. So it sounds like, then, they are
16 different domains. Say, military versus
17 consumer versus enterprise are different
18 domains, but that engineers familiar
19 with the relevant technology would know
20 how to change whatever's necessary to
21 make it applicable to a different
22 domain; is that fair to say?

1 A Yeah, maybe, right. Like, I don't think
2 that's, like, a given, right. But given
3 the right kind of creativity and, you
4 know -- I mean, you know -- like, yes,
5 right, like, obviously that's how it
6 works, right, I mean.

7 Q Okay.

8 A I mean, there's a lot you can say there,
9 right. Like, you know, sure, yeah, is a
10 guy going to -- you know, what they do
11 with that information, how they innovate
12 it, I mean, like, yeah, that's how,
13 like, kind of innovation and invention
14 works, right. They come up with an
15 idea, and then they patent it. Then
16 they build it, and then everybody looks
17 at it, and they say, okay, well, how am
18 I going to take it to the next level.
19 And they build from that. Then they
20 publish it and share it with people.
21 And people say, okay, how am I going to
22 build from that. Like, that's how

1 innovation works.

2 And so I think you're -- I think
3 what you're saying is are there
4 innovations that occur in the defense
5 space that then get repurposed and drive
6 innovation in the commercial space and
7 then those get documented and then drive
8 innovation in the defense space, like,
9 yes, right.

10 Q Okay. That's fair.

11 You had mentioned just briefly
12 about people you interacted with in your
13 undergraduate studies. I don't recall
14 if you had said that that was also or
15 instead with respect to the internships.
16 But those kinds of peoples that you lost
17 contact with by the late '90s, do you
18 think it's possible that they -- any of
19 them were thinking about realtime
20 content routing and you -- because you
21 were out of contact with them, you were
22 simply not exposed to that work?

1 A I can't speculate on that. I know
2 the -- of the friends that I got later
3 reconnected with, right, like, probably
4 my best friend in that day and age now
5 works for Salesforce. But you know, he
6 did his first, you know, Army
7 enlistment, and I kind of bumped into
8 him when I was living in Orlando, kind
9 of surprised, right. But I don't think
10 he was thinking about that at the time.
11 I think he -- you know, I think there's
12 people in the technical space that
13 gravitate back to that, right. You
14 know, it's like I'm -- you know, I've
15 got a background -- you know, I've been
16 doing AI probably since the late '80s,
17 right, and so it's, like, you know, I'm
18 going to kind of gravitate toward back
19 to that industry now because that's
20 popular and that sort of thing, but I
21 don't know.
22 Q Okay. So I guess expanding that circle,

1 you know, looking beyond your
2 acquaintances, do you think it's
3 possible that engineers or researchers
4 back in the late '90s would have been
5 thinking about realtime content routing
6 for consumer media delivery, and perhaps
7 you just weren't exposed to their work?

8 A Well, I mean, I've looked -- done -- you
9 know, I've done extensive lit review in
10 my research, right, in the 2000s, right,
11 when I was looking at, like, you know,
12 signal network and how all of the -- you
13 know, like, without getting classified,
14 you can imagine that, you know, America
15 probably monitors and attempts to defend
16 and exploit communications networks
17 so -- right, like, that involves going
18 back to '60s, right, on some of these
19 sorts of things, right. You know, I
20 mean, even if you look at data
21 integration, you can go back to, you
22 know, early work in the '60s.

1 So I don't know that I'm unfamiliar
2 with -- it's not fair to say I was
3 unfamiliar with published works over the
4 past, you know, 50 to 100 years, right.
5 Like, I mean, I teach AI, so, like, I
6 mean, I go back to probably the 1920s
7 with Claude Shannon with that work. So
8 I would like to think that I'm pretty
9 familiar with the literature. If
10 there's something specific, I can
11 certainly go and do a deep dive if you
12 want me to, you know, do more research
13 on what was going on. I don't know that
14 that's what you're asking me, though.

15 Q Not necessarily. More just about what
16 you recall just sitting here right now.
17 So for example, do you recall any
18 literature in your reviews related to
19 realtime content routing, such as audio
20 or video?

21 A I mean, I have looked at that content.
22 I don't recall off the top of my head

1 what the publication dates are. Again,
2 I can go and try and put those together
3 if you want me to kind of try and
4 construct a timeline, although I imagine
5 others have already done this, but.

6 Q Okay. I mean, do you think that it may
7 have been before 1998 or after 1998, to
8 your recollection?

9 A I know in my graduate work in Florida
10 State between 2002 and 2004 we were
11 doing singular value decomposition,
12 which is used in compression, but, you
13 know, I mean, that was, you know, let's
14 just say unimpressive by modern
15 standards today, you know. So like, at
16 what point did it become a commercially
17 viable thing? I don't know, right.

18 And certainly, eigenvectors were
19 not invented in the '90s. I don't think
20 they were invented in -- I mean, they're
21 probably -- you know, they're probably
22 hundreds of years old, right. Like, a

1 lot of times people come up with the
2 math for something well before there is
3 a practical use case or application,
4 sometimes hundreds of years in advance.
5 And you know, that doesn't mean the
6 commercial use case is inevitable,
7 right. It just means that the math has
8 kind of been developed and proven out
9 for it. And then people study that, and
10 then they find new applications for it.
11 MR. FOWLES: Got it. Well, we are just
12 about an hour since we started. If it's
13 all right with you, let's go ahead and
14 take a ten-minute break and reconvene at
15 2:14 Central Time.

16 (Whereupon, a recess was taken
17 from 3:04 PM until 3:16 PM.)

18 MR. FOWLES: Let's go back on.

19 BY MR. FOWLES:

20 Q So Dr. McCulloh, you had been talking
21 previously about the literature reviews
22 you did back in the 2000s as part of

1 your Ph.D. program.

2 Do you recall that?

3 A Yeah, yes.

4 Q And I know that you've said that you
5 don't recall particular publications
6 that you came across; is that fair to
7 say?

8 A Yeah, I mean, I don't know, I mean -- so
9 I mean, obviously, I know some; others I
10 don't, right. It depends on the
11 publication. But like, you do a lot
12 more reading than you remember
13 everything, you know.

14 Q Sure. So if there were prior art
15 publications that described a consumer
16 entertainment distribution system prior
17 to 1998 and it described having a
18 central controller that searched
19 multiple geographically separated
20 content libraries that orchestrated
21 transfers across regions, initiated
22 realtime delivery to users over networks

1 like cable and logged user-specific
2 requests for billing and advertising,
3 would that change any of your opinions
4 in your declaration?

5 A So that's a long question. So you're
6 saying if I were to see that there was a
7 publication about content delivery
8 networks in the -- you know, in the '90s
9 or earlier, right, would that change
10 some of my assertions? I mean, I would
11 have to see the papers you're talking
12 about and review them. You know, I
13 don't know that I can speculate in the
14 abstract.

15 Q Okay.

16 A I mean, if you want to send me some
17 paper that was done, you know, I can do
18 a technical review and say, hey, is that
19 the same thing or not? Certainly. But
20 I mean, so, like -- I mean, if you're
21 asking me, like, if I was given new
22 information that kind of somehow

1 contradicted something I said, would
2 that change things? Like, well, I mean,
3 that's true for anybody. So if you have
4 something, I can certainly review it.

5 Q In terms of documents that were
6 reviewed, looking at what you listed in
7 your declaration, it looks like you
8 reviewed the '128 Patent, correct?

9 A I did, yes.

10 Q And Dr. Lippman's declaration?

11 A I did.

12 Q Did you review that in total or just
13 portions of it?

14 A I believe -- I -- actually I don't
15 recall. I believe that I -- I mean, I
16 have what I thought was his declaration,
17 and then I did go -- and he made
18 references to a number of other -- to
19 several other studies and I think I went
20 and did do a review of those, so I
21 pulled those papers. And I think my
22 general impression was that those were

1 not exactly the same thing, right. Like
2 that there was some differences and I
3 think I probably I must've, like,
4 specified what those were in my
5 statement.

6 Q Possibly. So it sounds like there was
7 no step claim-by-claim analysis in the
8 portions of the Lippman declaration that
9 you reviewed?

10 A Say that again, I'm sorry, I didn't
11 understand that.

12 Q Would it be fair to say that there were
13 not claim-by-claim limitations that were
14 stepped through in the portions of the
15 Lippman declaration that you looked at?

16 A Are you saying did I go claim-by-claim
17 and refute or confirm what Dr. Lippman
18 said.

19 Q No, I'm asking if the portions of the
20 Lippman declaration you looked at
21 included specific claim limitations of
22 the '128 Patent and analysis thereof?

1 A I don't recall. I don't recall. I
2 mean, that was -- I would have read his
3 statement like what, December, a few
4 months ago.

5 Q Okay. The last document I see listed
6 here is something by Paxson, it's a very
7 long title, so I'm not going to read it,
8 do you know what I'm referring to?

9 A I think it was one of the papers that I
10 looked at when I was doing my technical
11 review.

12 Q Yeah, it has to do the contemporaneous
13 measurement research on internet
14 behavior?

15 A Um-hmm.

16 Q I see now that it includes work by
17 Paxson, but also public documentation
18 reflecting where major institutional
19 engineering efforts and funding were
20 constituted in the '90s?

21 A Um-hmm.

22 Q Is that a complete list of documents

1 that you reviewed?

2 A No. What I just put in were documents
3 that I felt were relevant to whatever
4 the point is just so that it wasn't, you
5 know, just can give further strength to
6 my statements.

7 Q What other documents did you review that
8 weren't mentioned here?

9 A Well, I did a lit review, so I did a
10 search through Google Scholar and I
11 looked at some of the papers that
12 Dr. Lippman had said, I looked at some
13 other papers that I had come up. I did
14 some, you know, a variety of things and
15 I don't think I -- I probably have notes
16 if you want me to try and figure out
17 what the specific search terms were for
18 how I did it, if I still have those.
19 But I basically just did a systematic
20 review of literature that would be
21 pertaining to networks, distributed
22 systems, you know, commercial media and

1 with an emphasis on what would have been
2 published in probably the '90s and
3 earl 2000s just to see what was the
4 standard feel.

5 Q Understood. And in that review, did you
6 come across any publications that were
7 at odds with your conclusions in your
8 declaration?

9 A I did not, and what I -- no, I did not
10 come across any papers that would be at
11 odds with what I stated. I think -- I
12 think the overwhelming kind of consensus
13 is that the people were using networks
14 for distributed, like, information
15 sharing. Right. I think it's still the
16 day today probably the largest IT costs
17 than any enterprise invests in is in
18 data integration and like enterprise
19 data discovery, right, you see data mesh
20 you see all these solutions that are
21 coming up. That still remains probably
22 about 80 percent of IT focus and budget,

1 not on the commercial media or content
2 delivery.

3 In fact, even in -- so Johns
4 Hopkins, our AI program is depending on
5 your ranking, ranked No. one or two.
6 Depending on where various news or world
7 report places it for online masters.
8 And even in that program recommender
9 systems, which would be kind of central
10 to content delivery systems has dropped
11 off the curriculum, and we're trying to
12 figure out, hey, where do we put it back
13 in. Even today a lot of the commercial
14 media delivery systems takes a back seat
15 to enterprise data and that's just a
16 reality, that's just surprising to me
17 actually, but...

18 Q Got it. Now, you mentioned you did a
19 search on Google Scholar, correct?

20 A I did.

21 Q Did you do any other searching in any
22 other tools or platforms?

1 A No. I pretty much kept it to Google
2 Scholar. Google Scholar will search
3 across various IEEE, ACM sources, which
4 would probably be the more definitive
5 authoritative sources on that.

6 Q So you didn't do any searching of prior
7 patent publications or patents, things
8 like that?

9 A I did not search prior patents.

10 Q Okay. Is it part of your standard
11 procedure to not include searching
12 patent type literature when you do a
13 literature review?

14 A I typically do not search patents.

15 Q Okay. Why is that?

16 A It's not the normal academic process. I
17 mean, I have searched patents, sometimes
18 patents will pop up. But I think that's
19 the part of Google Scholar. Let me.

20 I can check fairly quickly.

21 Q That's okay. Let's just keep it limited
22 to the documents of the proceeding.

1 A Okay. You know, Google is, I mean, I
2 just sense that you're saying this,
3 right, like, so Google patents is the
4 search engine for the US Patent and
5 Trade Office. I don't know if you're
6 aware of that. But one of the projects
7 I did when I was at Accenture was to
8 develop and deploy the search tool that
9 patent examiners use when they're
10 searching patents. So that was a
11 multi-cloud system where we had Amazon
12 as the standard cloud system that they
13 use, but we used the Google search
14 engine and the arrangement of the Google
15 Patents in there to try and make patent
16 searches more obvious to people so they
17 don't file frivolous patents.

18 Q And that work with Accenture, can you
19 remind what time frame that was?

20 A I retired from Accenture in 2023, that
21 probably would have been in the '22 to
22 '23 time frame.

1 Q Okay.

2 A And I have a couple of papers that were,
3 may not be obviously related to that
4 patent search, but I don't know if it's
5 relevant to these proceedings.

6 Q As part of that literature review that
7 you said you performed, would it be fair
8 to say that you didn't come across any
9 publications that described a single
10 central controller that was able to
11 search multiple different content
12 libraries in different geographical
13 regions, things like that?

14 A I don't believe so. I think that the
15 thing that probably stuck out to me as
16 part of the uniqueness of the Patent
17 '128 is the ability to actually tie
18 billing data to that. And I don't
19 recall prior to -- I didn't see anything
20 prior to, like, when I first looked at
21 it, my immediate thought was Napster.
22 And then when I started looking at the

1 Patent '128, in my review my impression
2 was that until Napster went public and
3 everybody looked at it, nobody really
4 thought of using it to tie streaming
5 data to an actual payment capability.

6 As far as the central routing and
7 content delivery, you know, I think the
8 part that was interesting there is when
9 you have copies of data on different
10 distributed platforms, it's one thing to
11 be able to integrate and assemble that
12 data together and be able to retrieve it
13 or retrieve copies of it in different
14 ways for a purpose and I'm not sure
15 exactly off the top of my head, I could
16 probably research and find out, when
17 that was done. But that's different
18 than when you're assigning billing or
19 payment to it. Right. Because how do I
20 know that you didn't get a copy of it
21 from this server A versus server B, how
22 I do actually know what you've

1 downloaded and how do I actually tie
2 that together. And I think that aspect
3 of it is kind of where the '128 patent
4 was novel in the way that they handled
5 that.

6 Q Got it. If I hear you correctly, you're
7 saying that it was combination of a
8 central controller that can perform the
9 searching and get it -- content between
10 regions as well as facilitating that
11 transfer and tying it to billing that
12 you thought you hadn't seen before; is
13 that correct?

14 A Yeah, that's correct.

15 Q Okay. What about the concept of
16 initiating realtime delivery to users
17 over high bandwidth networks like cable
18 or satellite?

19 A I think there was also innovations in
20 reducing latency. Which remains -- I
21 mean, the problem with latency remains a
22 problem today, right. People are still

1 trying to figure out solutions to
2 latency, and you know, I mean, like, I'm
3 sure all of us wish we had better ways
4 of doing that.

5 That's like where that's typically
6 addressed in the most people's minds is
7 trying out different architectures.

8 But in my experience working in the
9 Fortune 500 industry with large scale,
10 you know, network deployments, cloud
11 deployments, what's really kind of
12 surprising is the reality is people
13 don't truly look at the design and
14 innovate. What they do is take their
15 last appointment and they move it over,
16 right. So you might imagine, hey, I'm
17 going to do a project where we were
18 developing integrating seven legacy
19 systems to create the system that the US
20 Marshal's uses for delivery which is an
21 Amazon back end and the data lake and a
22 Pega front end and so that project team

1 basically brought out people from the
2 company that had delivered under similar
3 technology happened to be a Bank of
4 America engagement and you can imagine
5 that, well, there's maybe 70,000
6 prisoners at most in the US Marshal
7 database, right, where there's like how
8 many millions of transactions does Bank
9 of America use everyday, right. Why
10 would you think that the architecture
11 would be the same.

12 But like, that's the expeditary
13 part of what actually happens in
14 technology. They just lift what worked
15 in one area, move it to another. And if
16 the latency is good and they've
17 overkilled, that's great. But that
18 doesn't necessarily lead to innovation
19 unless there's problems and then people
20 try and come up with quick solutions to
21 those problems, and that's how, like,
22 the innovation often occurs, you know.

1 But most of what it is, is they look to
2 see where has this worked before, where
3 have I experienced this working before,
4 and then they repurpose it.

5 And oftentimes, they're even
6 unaware that that's where they got the
7 idea for the solution because they just
8 think that that's state of art when the
9 reality is, no, it was somebody else's
10 fit-for-use purpose, which may or may
11 not be optimal for what you're doing
12 right now in your deployment.

13 Q So based on that experience, would you
14 say that the particular deployment
15 examples of the '128 Patent were a
16 different deployment of preexisting
17 technology?

18 A No. I think they came up with fairly
19 unique solutions to engineering
20 problems, many of which we still have
21 today. And I would say that if you
22 would probably go into, you know,

1 enterprise cloud production class, I
2 mean, I think they probably would still
3 not necessarily implement -- you know, I
4 wonder how many graduates of computer
5 science, you know, leading school you
6 could reach out to, and they would
7 understand how the billing system works
8 for any streaming platform today, right,
9 unless they were specifically taught
10 that.

11 And then of course, once they're
12 experiencing it in one system, that's
13 going to be their natural go-to when
14 they try and implement it in whatever
15 target deployment they do. And
16 they're -- you know, I would call it --
17 you know, not to create a bad term, but
18 I call it -- when I talk in class, I
19 call it accidental plagiarism, right,
20 where you've seen something that worked,
21 and that's just what you know works,
22 right. So then you use it, and you're

1 not even aware that you have, like, you
2 know, impinged on somebody else's IP
3 unless it's brought to your attention.
4 And then once it's brought to your
5 attention, then, you know, that's where
6 it kind of becomes wrong.

7 Q Got it.

8 So you had mentioned that there was
9 a unique solution to enterprise problems
10 put forward in the '128 Patent.

11 What solution in particular are
12 you -- do you see that it provided?

13 A Well, what I see is the ability to tie
14 a -- you know, in this case, a
15 particular piece of content, right, a
16 particular piece of media content to a
17 particular user that downloaded it. So
18 it's not just the routing of that to get
19 that content to the user in realtime,
20 like, that's cool. But it's also being
21 able to tie that this person played that
22 one time or two times or how many times

1 so that you can actually arrange the
2 billing so you can have an accurate
3 billing recovery for it.

4 To me, that is the -- you know,
5 there are different ways in which you
6 can route media content, right. And so
7 I would say that, hey, let's say there's
8 a really great way that lowers latency,
9 but, you know, like in my experience in
10 Fortune 500, right, if we had a solution
11 that was going to reduce the latency,
12 right, but drives up the fixed costs
13 that we have to pay, we may choose not
14 to do that, right. So that could be a
15 cost in terms of software licensing
16 because, you know, the algorithms or the
17 technology belongs to, like, Amazon or
18 Google or something like that. Or it
19 could be that the energy costs, right,
20 the compute costs are high. It could be
21 any number of reasons, right. We'll
22 find a solution. It's not always the

1 best solution, but it's the most
2 cost-effective solution.

3 But I think the one piece of the
4 '128 Patent that's really hard to get
5 around is how you actually handle the
6 billing data. And like, you know, so
7 that's not to say that there aren't
8 other ways to route content, sure. Are
9 they better than the '128 Patent? I
10 mean, you would have to test that out
11 and see, right, if they're better or
12 not. I would imagine that if there were
13 better solutions, right, we wouldn't be
14 having this proceeding.

15 But I would argue that probably the
16 one thing that I don't know a better way
17 to get around is the billing issue,
18 right, which, I mean, that's kind of
19 what drives the revenue model that works
20 for the streaming industry, which, I
21 mean, to be honest with you -- and I
22 know you're not asking this question --

1 before I read the '128 Patent, I thought
2 that that was actually Napster's. I did
3 not even realize that it was the
4 '128 Patent. And I think probably most
5 people would probably -- you know, most
6 people -- what is it, what's the word
7 you use, the Latin word of people of
8 normal art and skill or whatever?

9 Q POSITA?

10 A Yeah.

11 Probably would think back to
12 Napster, not to '128, so.

13 Q That's fair.

14 So based on that, if the -- how to
15 handle the billing data was a key
16 improvement, would you say then that
17 routing to get content in realtime to
18 where it's requested was already known?

19 A I mean, in realtime, no. So realtime is
20 always an interesting one because
21 whenever you do a project, even today
22 with distributed computing in 2026, you

1 have to say, "What do you mean by
2 realtime?" Right. Because realtime is
3 not instantaneous, right, like, it's the
4 calculus idea. There's, like, a million
5 points around right now.

6 So it's what is realtime? You
7 know, and realtime for people -- you
8 know, I mean, I'll just go back to the
9 US Marshals' case. They had certain
10 requirements that were realtime, meaning
11 when a judge says you're a free man on a
12 Thursday, that means you get populated
13 in the system on Thursday so you don't
14 accidentally incarcerate somebody over a
15 four-day weekend. They get really upset
16 about that, probably more than I do,
17 but, like, that's -- they're better
18 people than me.

19 And so like, what is realtime?
20 Does it mean, like, instantaneous? No,
21 that's not feasible, right. What we
22 mean by realtime is within 15 minutes.

1 So within 15 minutes for, you know,
2 whether someone's a free man or
3 incarcerated, right, that kind of works,
4 right, because it's going to take them
5 all to process, let them out of -- do
6 whatever they've got to do, right. When
7 you're talking about streaming music and
8 you have a consumer that if they don't
9 get the download, like, instantly,
10 right, like, how long before they get
11 frustrated at the download, right?
12 We've all seen buffering on our content
13 and get irritated. Then we jump to
14 another piece of content, right.
15 So again, that's where handling
16 that -- you know, what is realtime. You
17 know, we don't really think about
18 realtime as a yes/no. We think about it
19 in terms of the latency and what's the
20 service level agreement of what level of
21 latency is acceptable or not. And so
22 when you -- you know, you want to get

1 that as small as possible, and people
2 are constantly trying to come up with
3 new and better and cleverer ways of
4 doing that.

5 Q So that example you gave with respect to
6 Marshals suggests that realtime does
7 mean something different in different
8 industries perhaps; is that fair?

9 A No. I don't know anybody is going to
10 tell you realtime means, like, instant
11 right. Like, that is absurd, right.
12 Like, that violates the fundamental
13 theorem of calculus, right. Like, if I
14 have a distance between my hands, right,
15 and go halfway, right. And then I go
16 halfway again and I go halfway again and
17 I go halfway again, am I ever going to
18 touch my hand? No. And that's where I
19 will never be exactly at the time.

20 So we can measure latency in
21 milliseconds. We can measure latency in
22 minutes. But what you -- what is common

1 across industries is SLA. What is the
2 service-level agreement that you are
3 going to set for how you're going to
4 transfer data?

5 Q Right. So I said "industries" not
6 "instantaneous." So it sounds like
7 you're saying that the SLA might be
8 different in different industries or
9 technologies.

10 A I wouldn't say "industries." I would
11 say different applications, different
12 projects, right. So you know, the SLA
13 on, I don't know, buffering videos
14 different than music, I would imagine.
15 I would say that the SLA on getting your
16 social media content updated is probably
17 different than, you know, phone call.

18 Q Okay. Now, in terms of meeting an SLA,
19 we've been using this term "buffering."
20 What do you mean by "buffering"?

21 A Oh, I was just talking about, like, when
22 you get content and it takes a while to

1 load into your system, your end so that
2 you can actually look at the video.
3 That's what I was referring to.

4 Q Okay.

5 A It could be video. It could be sound.
6 It could be image rendering. It could
7 be whatever.

8 Q So are you saying that for something to
9 qualify as realtime -- let's just stick
10 with audio as an example -- that the
11 entire audio file would have to be
12 downloaded first and fast enough to then
13 be consumed to be considered realtime?

14 A I don't know what the current state of
15 art -- like, if you're asking me what
16 the music industry considers realtime, I
17 don't know that.

18 Q Well, going back to your example of
19 streaming music, you had said something
20 about if a user doesn't have the
21 download instantly, how long do they
22 get -- until they get frustrated by the

1 download.

2 So in that example at what point
3 does it cease to become realtime, in
4 your opinion?

5 A I don't know, I guess I don't think of
6 it as realtime or not realtime. It
7 depends upon the application. What I
8 would say is more -- what I would do in
9 a use case like that is I would probably
10 look at data on consumer behavior and
11 look at balking, right, look at how many
12 times -- like, what percentage of users
13 under different, you know, latency
14 choose or hop or switch, right. So
15 that's generally what I do is I'm kind
16 of more -- just in practice, more
17 empirically driven.

18 Q Did you say look at blocking or balking?

19 A Balking, B-A-L-K, where you step out of
20 line, right, where you don't -- that's
21 what I call it.

22 But yeah, like, if I'm doing, you

1 know, consulting for a credit union,
2 right, one of the issues they have is in
3 loan approval, right. So when you have
4 JPMorgan Chase, being an AI bank, they
5 can do fairly instantaneous, meaning,
6 like -- you know, in the case of credit
7 approval, if I can be getting my credit
8 approved while I'm waiting in line at
9 Walmart, like, that's probably -- to
10 give you a realtime definition, that's
11 probably good enough, right. It's
12 before I do point of sale. But if it
13 takes me ten days to approve a loan,
14 which is fairly common, right, then how
15 many consumers are going to choose to
16 not avail themselves of that product or
17 choose a bank like Bank of America or
18 JPMorgan Chase, right.

19 So in that industry, getting the
20 time, the latency for a loan approval to
21 a realistic period, right, you know, how
22 do I take them from ten days to

1 ten seconds, right, and that might
2 involve things like, you know, an AI
3 module to better score the risk of a
4 loan. But it could also just as easily
5 be how do we auto-populate the loan
6 application, or how did I verify income
7 and debts, right. Is there a way to do
8 that?

9 And so like, there are many
10 different places in the process where
11 you can improve latency, and this is the
12 mixture of creativity and engineering
13 where you kind of come up with where are
14 the different ideas from a deep
15 understanding of that particular
16 industry. Not my understanding of the
17 industry, but, like, the people that
18 have been doing that for a long time,
19 their understanding. And then where I'm
20 coming to play is can we figure out how
21 to measure that, can we model that.
22 This is where the industrial engineering

1 comes in. We model that process. We
2 figure out where are there opportunities
3 for improvement, automation, or do we
4 rethink the entire process, something
5 different. And in doing so, this is
6 where you come up with a better
7 best-in-breed process.

8 Now, once you come up with that,
9 you can go and swap it from, you know,
10 credit union to credit union to bank to
11 bank to bank in that -- to follow that
12 analogy, right. Or maybe you go to
13 another institution, and you find out a
14 completely better way to do it because
15 there's something that they have an
16 insight or they know something, and
17 that's kind of how creative process
18 works.

19 So I think when you're talking
20 about media, right, we know that people
21 get increasingly impatient as technology
22 gets better because the standard moves.

1 And so you become more and more inclined
2 to come up with something new. And if
3 somebody has something that they've come
4 up with a solution to that problem, that
5 process, I think it's totally
6 disrespectful to the people that
7 innovate and create to call that
8 inevitable. You know, it's -- there are
9 some creative people that have come up
10 with great solutions to a wide range of
11 problems, and that's kind of how these
12 things get repurposed today.

13 Q So in the media industry, say in sharing
14 audio files, what would be considered
15 realtime from an industry perspective?

16 A I don't know. I'm not -- you know, I've
17 only entered doing some stuff in the
18 music industry fairly recently, so I
19 don't know. I don't have empirical
20 data. I would imagine it would be
21 fairly -- if they're not published, I
22 would imagine that it would be fairly

1 straightforward to ask any streaming
2 music or video provider to -- I'm sure
3 they have -- I would hope that they have
4 data on what -- like, hey, if they have
5 an X millisecond or second delay in
6 delivering content, what's the
7 likelihood a consumer bounces to
8 something else and what's the value of
9 that? Like, that's -- I would hope that
10 would be a standard thing in the
11 commercial media technology.

12 Q Do you think that realtime in the music
13 industry or content delivery industry
14 would have some component of what the
15 user is experiencing in terms of how
16 they measure realtime?

17 A Yes. Yeah, I think that's what I was
18 trying to say, right. It's -- does the
19 user feel like they're getting their
20 content, their media content in a fast
21 enough time to prevent them from going
22 to something else. And that changes,

1 right. So when everything is slow and
2 internet bandwidth is narrow, and like
3 we wait longer than something else,
4 right.

5 If you ever go to a crowded stadium
6 it takes long to download a social media
7 feed or whatever you put up with it
8 because what alternative do you have,
9 and you're sitting around you're waiting
10 and you know that everybody else is
11 doing the same thing.

12 If I'm sitting at home in a quiet
13 hour, and I can't download my content
14 then I'm looking for another provider
15 that can do it better. That's a
16 relative time and space context
17 situation as far as what is -- what
18 latency is acceptable or not acceptable.

19 Q Do you think that a user who is
20 consuming an audio or video file as it's
21 being transmitted and to them there's no
22 pause, but on the back end the system is

1 still downloading the later parts of it
2 that they haven't reached yet, would
3 that still be considered realtime in
4 your opinion?

5 A Well, again, I don't like to put a
6 definition to realtime, but I would say
7 that if it doesn't have a buffering or
8 any delay in the music content, right,
9 then I would say that is probably
10 meeting the user's expectation.

11 Q That term "buffering," do you use that
12 as --

13 A No pause or delay in content delivery.
14 Right. If there's no pause or delay in
15 content delivery. But the reason why I
16 hesitate to call it realtime or not
17 realtime is that's going to depend. In
18 a current situation where you have
19 normal, say bandwidth delivery, you
20 know, delivery pipelines, right. This
21 system might work, right. You might
22 have two systems, let's say, one is like

1 super fast, it's downloaded right there.
2 It's all on your machine. The other
3 ones it takes a while and it downloads
4 over the duration of the content. So
5 you can imagine that in times of high
6 demand of those networks, right, the
7 fast immediate one is going to have
8 greater robustness and reliability than
9 the one that takes longer time to
10 download. And so it's not always like
11 is it either good enough or not good
12 enough, those conditions vary. And so
13 the reliability of that is going to
14 vary. Now, is that enough of a
15 reliability to lose customers to a
16 competitor or not, I mean, that's what
17 you have to empirically test. There's a
18 view that the faster you do it the
19 better. There's always a trade off
20 between what is the cost of using a fast
21 reliable system versus a slow
22 non-reliable system. And it is quite

1 common in industry that people take
2 inferior technical solutions that have
3 lower license costs that they can
4 commercialize better. Like that is like
5 I would says that is standard practice,
6 right. When you are an end user and you
7 have a systems integrator delivering
8 cloud services to you or whatever. They
9 are not going -- like I have rarely seen
10 anybody go and deliver you the best
11 highest performing system. They are
12 going to typically deliver you the
13 system that is going to maximize their
14 ability to realize revenue. I can give
15 you some modern examples of that if you
16 wish. But...

17 Q That's okay for now. Maybe we'll
18 revisit that.

19 You had mentioned something about
20 those two different examples of
21 delivering content where one is really
22 fast and the other one is not as fast in

1 times of higher demand that slower
2 one -- are you saying then that realtime
3 is all or nothing, if a system is most
4 of the time in regular demand delivering
5 from the user's perspective in realtime,
6 does that qualify as realtime system or
7 only in 100 percent of the cases?

8 A Well, what I would say is we live in an
9 age of liquid expectation and if I can
10 go on Amazon before we start this
11 deposition and order something and it's
12 delivered at my doorstep, you know,
13 halfway through, right. I expect that
14 level of service everywhere I go.
15 Right. When I go to the DMV, I don't
16 want to wait an hour to get my driver's
17 license, right. When I go to the
18 grocery store I don't want to have to
19 wait in line. When I order a credit
20 card, when I get a credit -- there's no
21 aspect in my life where I want to wait,
22 that's the idea of liquid expectations.

1 And that is hyper the case in media
2 content and delivery. Right. For me,
3 if takes a little while for, you know,
4 Netflix to come up on my Samsung, I'm
5 switching to Prime. Right. Nobody
6 waits for anything. So with that
7 context in mind, which I call liquid
8 expectations, what that means is every
9 second, millisecond of delay in
10 delivering services to a consumer there
11 is a cost associated with it. Right.
12 Might be a small cost or a larger cost,
13 that depends upon the context, but this
14 is what we deliver to. This is what we
15 deliver to with the promise of
16 artificial intelligence today, right, is
17 you're either using it to make better
18 decisions, decisions around routing
19 things, or around what you're going to
20 purchase, the recommended system of
21 offering what you want to watch or buy,
22 to an automation, to how do we reduce

1 latency, reduce bottlenecks, reduce
2 inefficiencies to hyper personalization
3 to say, what do you want to watch, what
4 you do need to consume, right.

5 This is what we ultimately deliver.
6 And when you look at this and I know I'm
7 expanding it to the modern concept of
8 artificial intelligence, but when we
9 look at why 80 percent of AI initiatives
10 fail, it still comes down to the three
11 common and preventable reasons. It
12 becomes the industry defining the use
13 cases in the scenarios, it becomes do
14 businesses actually understand the
15 process, and where the bottlenecks and
16 the pain points are, and it comes to the
17 fit for use purposes for the data. So
18 there are data considerations, which I
19 think were relevant in the IP '128, more
20 so though, it's in that automation piece
21 of like how do we store, how do we
22 route, how do we understand where the

1 pain points are in content delivery.
2 And how do we remove that pain point or
3 that latency, right, and like this is
4 the No. 1 issue facing artificial
5 intelligence today, right. I mean, this
6 is what I teach, I taught five and a
7 half thousand students last year, I
8 going on pace to teach 12,000 this year,
9 in executive and professional ed. And
10 this is still the No. 1 case. I always
11 like to say the coolest problems were
12 solved in '80s, right. It's not that
13 different than total quality management,
14 right. We're still trying to come up
15 with solutions to get that issue of
16 latency and identifying where those pain
17 points are and how to relieve them.

18 When a solution comes out, in
19 practice, you're looking and saying, am
20 I going to use something that exists, am
21 I going to come up with something new or
22 am I not going to care about it. Today,

1 if you don't care about it, you do not
2 maintain market share. Right. So when
3 people talk about AI, is AI automation
4 going to disrupt the market and put a
5 lot of people out of jobs? Yes,
6 absolutely. And then people are like,
7 should we do it. Well, if you're in a
8 flat declining market and nothing is
9 going to change then you need to squeeze
10 every dollar out of it until you go out
11 of business, then that's probably
12 exactly what you should.

13 But if you recognize that there's
14 innovation and growth, what you want to
15 be able to do is you want to be able to
16 define what works and decide whether you
17 want to buy or whether you want to
18 invent you're own. And the decision
19 between whether you buy it and whether
20 you invent you're own, is really it
21 comes down to how much is it going to
22 cost me to buy it, how good is it.

1 Obviously, if you can make something of
2 your own that is materially better,
3 you're not even entertaining the idea of
4 buying something you don't need. Right.

5 But then the question becomes,
6 okay, how novel or how different does
7 this thing I create or buy have to be
8 from the thing that already exists, so
9 it's more lucrative for me to use my own
10 instead of buying something that's over
11 there. That's why large companies go
12 and buy smaller companies to get their
13 IP or in many cases they will try and
14 just use the IP that exists, and I
15 guess, you know, again for whatever
16 reason. I don't mean to ascribe intent
17 to that.

18 The third piece of the decision
19 support is how do we make better
20 decisions? How do we make better
21 decisions in the case of the IP -- the
22 '128 Patent context some of those

1 decisions are around, like, the
2 decisions about who do we bill, how long
3 do we bill, how do we know that we
4 billed them, how do we defend that, how
5 do we audit that, these are all kind of
6 like decision support things. So
7 hopefully that gives a broader context
8 of this issue about latency, innovation,
9 problems why industries are dealing with
10 this. I don't think it's nearly as
11 black and white or noncomplex as we're
12 characterizing it.

13 Q Why is it not very complex? You
14 mentioned Netflix, just as an example --

15 A I use Netflix all the time.

16 Q That's fair. When you're trying to
17 watch something on Netflix, do you know
18 if it downloads the entire movie before
19 you can start watching?

20 A I don't care. I think that's the point
21 you're getting at is whether it
22 downloads the entire thing before you

1 start watching or it downloads it in a
2 fit for use basis, that's what you care
3 about. How I watched the Netflix movie
4 and had the thing pause and hang up in
5 the middle of it. Yeah, what do you do,
6 right. If it's a second or two I get
7 annoyed. If it happens repeated times
8 through there I might watch the whole
9 show, and I'll be like, you know,
10 thinking my wife was really annoyed at
11 that and she's going to be even more
12 annoyed if I try and play episode two.
13 So we'll find a different series. If it
14 hangs up too much in the middle of it,
15 we turn it off and we go to the
16 competitor.

17 Now, how likely is that, right.
18 That could be one out of a million
19 cases, right. There's still a loss,
20 revenue/loss value to that attitude and
21 that consumer. So again, this is going
22 back to what it really matters about is

1 that every time the consumer is
2 inconvenienced or threatened in a liquid
3 expectation, there is a change cost,
4 there's an opportunity that they're
5 going to bounce and you're going to lose
6 that customer, that market share.
7 Assuming that there is a better, faster
8 competing technology. And so what this
9 does is, it does two things, right.
10 Hey, you could be good enough 99 percent
11 of the time. There's still value in
12 that 1 percent. Right. That's still
13 going to shape latent attitudes of the
14 consumer to want to go with whatever is,
15 you know, there's a mixture, right.
16 When you're making a choice, just to
17 follow the Netflix example, not to be
18 tasteless here, but like if you're going
19 to say am I going to go with Netflix or
20 am I going to look at Amazon or Hulu, or
21 you know pick your streaming service,
22 right, well, there's a weighted set of

1 content that I'm sure the content media
2 delivery companies know about, but you
3 know, it's going to be a little bit
4 about the title of the film, probably a
5 little bit about how reliable is the
6 series, it's going to be priced, it's
7 going to be what are my friends
8 watching, you know, and what am I going
9 to be talking about, what's the rage out
10 there, it's going to be probably user
11 experience and are they giving me
12 content that I want to see or are they
13 giving me generic content that doesn't
14 fit for me. All of these things fit
15 into that and there's like a different
16 value in terms of what that contributes.

17 Latency is one of those factors,
18 and I think probably more so than the
19 recommender system they use to tell me
20 what shows I want to watch or what's
21 mostly tied up for me.

22 Q So if it's good enough on the latency

1 side for 99 percent of time, do you
2 think that company could advertise that
3 they're providing realtime content?

4 A Well, a person can advertise realtime
5 content with whatever definition they
6 want to operationally define, but I
7 think the issue is -- like, are you just
8 talking about whether an organization
9 can say or not say something, or are you
10 saying like --

11 Q Well, let me rephrase --

12 (Cross-talk.)

13 A -- there's an issue of, like, are you
14 competing against, like, my competitor.
15 And there is, like, is this a fair
16 legitimate statement.

17 Q Yeah, let me rephrase then. That wasn't
18 a good question. Fair point.

19 So if the user experience receives
20 content as expected 99 percent of the
21 time and the company calls that realtime
22 media provision, would an engineer

1 knowledgeable in the space agree with
2 that characterization?

3 A That's an opinion, so I -- some would;
4 some wouldn't.

5 Q Okay.

6 A I mean, I would say that if -- you know,
7 if my experience with a system is that
8 they're delivering it and I don't have a
9 disruption in my content, I would
10 consider that, for most people's
11 definitions, realtime, right. And I
12 think --

13 Q And would that be your definition?

14 A Yeah, that's -- that would be my
15 definition for a streaming service. I
16 would call it realtime if I had no delay
17 or disruption in playing the content.

18 Q And that would be the case whether or
19 not it was downloaded all fast upfront
20 or over time, just faster than the
21 playback is?

22 A Yes. And at the point where I have a

1 disruption or delay, then I would say
2 that's not realtime. So I think what
3 we're talking about is I would agree
4 that if you can download it and there's
5 no disruption in the content, the music,
6 the song, the show, whatever, I would
7 call that realtime from a consumer's
8 perspective.

9 And I think what I'm saying is how
10 much -- you know, there's two
11 architectures that both meet realtime.
12 One meets realtime 99 percent of the
13 time; one meets realtime 99.9 percent of
14 the time, right. That's -- there's a
15 material difference, and what I'm saying
16 is the platform provider has a cost
17 associated in lost market share when
18 they have the 99 as opposed to the 99.9.
19 I'm not saying it's a big cost. I don't
20 know what that cost is, right. I don't
21 have that data, right. There is a cost.
22 And so if the 99 percent, right,

1 was more expensive than the 99.9,
2 obviously, I would go the 99.9 all day
3 long. It's when the 99.9 solution is
4 more expensive than the 99 solution,
5 right, whether it's because a license
6 cost or they have to, you know, do
7 whatever, then they have to make a
8 business decision on which one they're
9 going to use, which one they're going to
10 adopt. That's, I think, the point I was
11 trying to make.

12 Q Yeah, that business case makes sense, I
13 understand what you're saying.

14 Now, you know, obviously, we're
15 talking about the '128 Patent today, and
16 we just talked about what someone today
17 would understand as realtime in this
18 context.

19 Does that -- does your
20 understanding change when you look back
21 at someone in the 1998 time frame?

22 A Well, I think the -- well, so I would

1 say in the 1998 time frame, I don't
2 think that people thought, that -- like,
3 I don't think that people thought
4 latency of today was realistically
5 possible in the 1990s, right.

6 Like, I even think about when we
7 were having -- like, part of the whole
8 motivation of having autonomous robots
9 was because you couldn't have a central
10 controller that could distribute
11 commands in -- with sufficient latency
12 to prevent a robot from running into
13 somebody or doing harm or doing damage,
14 right. So like, that -- I think the
15 levels of latency and bandwidth that we
16 have today were not realistic in the
17 1990s.

18 I think that the technology -- you
19 know, this is my opinion, right, is that
20 the technology that is kind of embedded
21 in the '128 Patent in terms of the way
22 they do content routing and delivery and

1 the way they do billing, right, I think
2 is still a -- probably the best-in-class
3 solution to get you from 99 to 99.9, to
4 use our analogy there, which is why
5 probably there's a case here at all,
6 right. Because if the streaming
7 platforms could produce a better
8 solution that was more cost effective,
9 right, we wouldn't be here talking about
10 this.

11 I think it's just because the --
12 that the '128 Patent still has the
13 best-in-class solution for this that,
14 hey, if we can use it and we don't have
15 to pay a license fee for it, why not use
16 it? If there was a better solution, we
17 wouldn't be talking, right.

18 Q And that solution you're talking about
19 in terms of being best in class, it
20 sounds like you're referring to, at
21 least in part, how the '128 Patent is
22 based on a cable or satellite

1 backbone --

2 (Cross-talk.)

3 A -- you know, what you're talking about
4 is, you know, hey, do we have a -- you
5 know, a 1969 Mustang is a lot different
6 than a 2026 Mustang, right. But if you
7 have a driver's license, you still know
8 how to drive the car, right. Like, I
9 don't think the type of car, whether
10 you're talking about coax cable or LAN
11 or, you know, modern cloud networks or
12 fiber networks or whatever, right, all
13 of these have different properties, just
14 like a 2026 engine probably is better
15 than a, you know, 1969 engine, I would
16 imagine, or at least the emissions
17 standards are better in 2026 than they
18 were in 1969, right.

19 So yeah, there's improvements to
20 the car, but what we're really talking
21 about is how you drive the car, right.
22 We're really talking about how are you

1 dealing with, you know, content delivery
2 and how you're dealing with, like, the
3 algorithm that matches, you know, source
4 content to whoever's consuming it or
5 using it, right. Like, those are really
6 the key things that are still relevant
7 today.

8 Q That's fair.

9 In your research of the
10 '128 Patent, though, would you say that
11 the network by which the content was
12 delivered was an important aspect of it?

13 A No.

14 Q No?

15 A No. I mean, like, it was novel at the
16 time, right. And it was, like -- you
17 know, it was, you know, highly relevant
18 at the time, right. Because I don't
19 think -- I think while people were
20 thinking about cable networks as content
21 delivery, I don't think they were
22 thinking about it in billing, I don't

1 think they were thinking about -- you
2 know, there was no concept of
3 distributed storage and, like, these
4 concepts, which are kind of, you know,
5 common in cloud computing today.

6 But as I kind of made the point in
7 the testimony, right, is I believe that
8 there were advances -- you know, even
9 some of the Napster stuff, right, I
10 think these ideas in the popular domain
11 inform military innovation following
12 9/11 that were driving investments
13 either from DOD into the
14 research/academic world or direct DOD
15 investments or investments in driving
16 cloud computing solution, right. And
17 then as these have emerged, you know,
18 hearing about things like Napster and
19 getting exposed to some of these things
20 in commercial, then I think, you know,
21 these things have evolved, right.

22 But you know, this is -- you know,

1 the fact they're, you know, coax, you
2 know, networks, cable networks, right, I
3 think these are higher level ideas of
4 how do we handle moving data, storage,
5 these sorts of things.

6 I'm just going to move off camera
7 to open the door for my dog to get in
8 here so he doesn't whine. I'm sorry.
9 Sorry about that.

10 Q Fine. Are you good?

11 A Yeah, I am.

12 Q So you said something about latency that
13 people in the '90s didn't think that
14 latency like we expect today was
15 possible back then. So does that mean
16 that if someone was wanting something
17 consumed in realtime in the media
18 consumption space back in the '90s, that
19 those standards would have been relaxed
20 relative to what we already talked about
21 today?

22 A Well, I think the term "realtime"

1 becomes, like, a marketing slogan, and
2 then people operationally define what
3 that means, right. You know, same thing
4 with -- like, as we discussed earlier,
5 right, like, realtime, you know, is not
6 realtime, right. It's good enough for a
7 certain standard, so.

8 Q Okay. And that realtime consumption, if
9 we're talking about, again, media
10 consumption, "good enough" would include
11 either downloading it all at once or
12 downloading enough that the consumption
13 doesn't stop, even if the rest of the
14 download is still ongoing further down
15 the line?

16 A Yeah, I mean, I think -- I'm going to
17 say the same definitions. I don't
18 know -- yeah, I guess what I would say
19 is in the '90s the idea of what we
20 thought was possible to stream realtime,
21 right, if we could is probably
22 different. Does that make sense?

1 So like, I wasn't even thinking
2 about -- like, when I was dealing with
3 the AMPS, for example, right, I had no
4 expectation that -- you know, that
5 the -- from the time a pilot would key
6 the mic that I would get, like, instant
7 GPS location, right. Like, it wouldn't
8 be five seconds, right, but it would be,
9 you know, some set of milliseconds
10 before it would pop it up, and that
11 would be kind of good enough. When
12 they're transmitting an image that they
13 had just taken on a screen line
14 somewhere, no expectation that that's
15 going to be instant, right, or realtime,
16 right.

17 Q Well, so your example of AMPS, I believe
18 your CV talks about your experience in
19 the '90s as a lieutenant in that 10th
20 Mountain Division. The -- I'm looking
21 now at your CV, at least the copy I have
22 of it, on Page 5, it mentions the

1 division level and higher commanders
2 being able to view near realtime imagery
3 of deployed units.

4 So what does that mean relative to
5 what we were just talking about?

6 A Well, that's a definition that I put in
7 today's vernacular of that, right. So
8 that's not exactly how we would have it
9 there, but there was a -- I don't know
10 why I remember this number, but it was,
11 like, a 32-second delay between actions
12 that would happen on the screen line and
13 between when the division commander of
14 the 10th Mountain Division could see the
15 content.

16 Q And I mean -- so back then they wouldn't
17 have called that realtime?

18 A I don't think that was a term of art
19 that we were using. I think he was just
20 amazed that he could see within
21 30 seconds what was happening, you know,
22 halfway, like, across the country. And

1 it was actually -- it actually created a
2 unique situation where now the division
3 commander wanted to call down and tell
4 the brigade commander what was going on.
5 And then we had generals trying to tell
6 pilots and aircraft where they should
7 fly the screen line to get a better
8 view.

9 And it -- actually, that was one of
10 the major findings with that initial
11 advanced war fighter experiment is how
12 does this affect and change command and
13 control. And it was so alarming at that
14 time, people were thinking about it,
15 that the Department of Defense ended up
16 with a whole set of -- you know, there's
17 the whole concept called network-centric
18 warfare that came out of this, all
19 focused on command and control.

20 And this of course then became
21 relevant very much in the 2000s -- I
22 forget the guy's name that was the

1 undersecretary that was driving it, but
2 we did a lot of research on how does
3 faster networks enable differences in
4 command and control. Because what you
5 want to do is you still want to be able
6 to delegate and empower people at the
7 edge to be able to do their job, but you
8 want to be able to give greater
9 situational awareness and, like, how do
10 you draw the balance, right. And so
11 there's a whole new field of research
12 that emerged out of that finding that
13 started in -- you know, I think that was
14 1997 that we realized that.

15 Q Interesting. Now, in this discussion
16 you've mentioned the concept of latency
17 several times, and I recall that in your
18 declaration you cited to Paxson's
19 measurement studies, and one of the
20 issues there was latency.

21 Is that an accurate recall?

22 A I believe so. I can refer to the thing

1 here.

2 Q Sure.

3 A Yeah, Paxson's work was showing that --
4 I mean, this is -- I mean, this is some
5 of the concept I'm talking about, right,
6 so hopefully I haven't done accidental
7 plagiarism here. But you know,
8 Paxson's, I think, work was showing
9 instability of some of these connections
10 and, you know, metrics, that they were
11 not fully reliable.

12 Q Now, those connections he studied, were
13 they public internet connections; is
14 that right?

15 A I don't recall. I'd have to go back and
16 look at the work. You know, I
17 referenced them and studied them for the
18 purpose of this case.

19 Q Okay. Well, why don't you go to
20 Paragraph 24 then of your declaration.
21 I think that's where you mentioned
22 Paxson again.

1 A Yes, it is. I'm there.

2 Q So at the start of that paragraph, you
3 talk about the public internet not
4 behaving in a stable way, and then it
5 talks about Paxson's measurement
6 studies.

7 Do you see that?

8 A Yep, I do.

9 Q So would you say that Paxson's studies
10 related to the public internet?

11 A I -- actually, I don't recall. I must
12 be getting old. I would have to go back
13 and double-check if I'm on the record
14 for verifying that, but I can check if
15 you like. I'm sure we can look up his
16 papers and find them. I don't know if
17 they were talking about just measurement
18 studies on networks or, you know, if it
19 was, like, the internet particularly,
20 or...

21 Q Okay. Why else would you have mentioned
22 the public internet specifically in that

1 paragraph?

2 A Well, I would imagine that's the case.
3 If you want me to verify that, I can go
4 back and look at the paper and just make
5 sure that that's true. You know, I
6 wrote that statement, like, three --
7 like, what, now three months ago so --
8 or whatever, three, four months ago. So
9 I just -- before I make a statement on
10 the record, I would just like to go and
11 pull the papers and make sure that
12 that's true. Which I can do right now
13 if you'd like, or I can do in follow-up.

14 Q Not just yet. I'll ask you if we think
15 that's necessary.

16 I am curious, though, in terms of
17 the public internet mentioned in
18 Paragraph 24 of your declaration, are
19 you aware of any cable TV networks that
20 relied upon the public network for the
21 distribution of the content in the '98
22 time frame?

1 A I couldn't name a network. I can go and
2 look into that in a little bit more
3 detail, if you need to, but...

4 Q So you're not aware just off the top of
5 your head?

6 A No.

7 Q Okay. What about satellite TV networks,
8 are you aware of any satellite networks
9 that relied upon the public internet for
10 distribution of satellite content in the
11 '98 time frame?

12 A Not off the top of my head. My -- I
13 can't even tell you what satellite
14 networks provided me service in Iraq
15 when I was responsible for those
16 networks. I -- let alone when the
17 networks emerged and how they were used
18 in media. I'm sure that is a matter of
19 public record and we can figure that out
20 pretty quick, if you need it.

21 Q Probably, yeah. Basically it sounds
22 like you're saying that in your

1 observation, cable networks and
2 satellite networks were not necessarily
3 the same as the public internet; is that
4 fair to say?

5 A I would have to go back and look at
6 them. I think there's probably
7 parallels in terms of how we would
8 measure the stability of networks. I
9 think that for any of us that lived in
10 the 1990s, we knew that networks were
11 not particularly reliable. And I don't
12 think -- heck, I was using FM frequency
13 hopping radio in the 1990s, right. And
14 that certainly wasn't reliable. So I
15 think that people were trying to figure
16 out solutions for how do we actually get
17 the speed of transmission, bandwidth,
18 accuracy and people were trying to do a
19 mixture of improving the networks and
20 doing data compression.

21 Q Well, based on that, would you say that
22 dedicated cable infrastructure back in

1 the 1998 time frame would have different
2 performance characteristics than the
3 public internet or similar?

4 A Say that again, I was just distracted.
5 I'm sorry.

6 Q Sorry about that. It's fine.

7 In your opinion, would dedicated
8 cable infrastructure back in the 1998
9 time frame, have had different
10 performance characteristics than public
11 internet or similar?

12 A I don't know. I'd have to figure out
13 what the public internet was run on. I
14 think I recall at some point that I got
15 my internet through my cable company and
16 I don't know if they ran that separately
17 or they ran that through the cable or if
18 they were the same or not. I don't know
19 that would be universal for all.

20 Q Okay. And in terms of cable network
21 systems back in the 1998 time frame, to
22 your recollection, would dedicated cable

1 systems have had a higher bandwidth
2 allocation than the public internet or
3 similar?

4 A Again, I don't know. It depends on how
5 the public internet was run, right.
6 There's different phrases when it was
7 run on the LAN, telephone, you know,
8 wires and we had dial up too, cable to
9 fiber optic to -- you know what I mean.
10 There have been significant innovations
11 and I don't know when each of those were
12 done and where they were done.

13 Q Okay. And a similar question for
14 satellite networks, in your observation
15 or recollection, would satellite
16 networks have had similar or higher
17 bandwidth than public networks?

18 A I don't know.

19 MR. FOWLES: It's been about another
20 hour, take another 10-minute break if
21 that's okay with you.

22 THE WITNESS: Okay.

1 MR. FOWLES: Reconvene at 3:27 central
2 time.

3 (Whereupon, a recess was taken
4 from 4:17 PM until 4:27 PM.)

5 MR. FOWLES: Back on the record.

6 Q So Dr. McCulloh, why don't we go to a
7 couple of paragraphs earlier in your
8 declaration now. Let's go to
9 Paragraph 12.

10 A Okay.

11 Q So you state there "The '128 Patent
12 discloses and teaches a novel
13 architectural system committed to active
14 distributed orchestration, not passive
15 distribution."

16 Do you see that?

17 A I do.

18 Q Where did that phrase "active
19 distributed organization" originate?

20 A Like where did that term come from?

21 Q Yeah, why did you decide to use that
22 term?

1 A Active instead of passive, like passive
2 is where you pull, active is where you
3 kind of push. I don't know that people
4 were thinking about pushing data as much
5 as pulling data at that time. If that
6 makes sense.

7 Q So when you say active, which is push
8 and which is pull?

9 A Active is push.

10 Q Okay.

11 A Passive is pull. Passive you're waiting
12 for somebody to ask you for the data,
13 active is where you're pushing the data
14 to the consumer or pushing the data to
15 the edge.

16 Q So active orchestration would involve
17 pushing the data before it's asked for?

18 A Well, yes. I think in this case
19 thinking about how you are distributing
20 the storage to make more easily
21 retrievable or more responsive is
22 probably the point here. I mean, if

1 you'd like to me kind of -- if you want
2 me to revise that and go into more
3 detail, I'd probably like to just review
4 the patent again, and then just make
5 sure that I could be more expressive and
6 expansive and clear if that would be
7 helpful.

8 Q I appreciate that. I'm just trying to
9 make sure I'm understanding what you're
10 saying right now and then we can talk
11 about any clarifications down the road.

12 A Okay.

13 Q Sounds like you're saying that active
14 orchestration doesn't require the
15 content being orchestrated to be
16 requested first; is that right?

17 A No. I think active could even be
18 positioning it so that it is closer to
19 the user that's requesting it, right.
20 So it's doing something active,
21 something in advance to make this
22 faster. I don't think you wouldn't give

1 a user music before they ask to play a
2 song, right. But there's a difference
3 between having the music in one central
4 location, which might have greater
5 latency to get to that consumer versus
6 putting it in a node that is closer to
7 where the consumer would be drawing
8 content.

9 Now of course, the problem you have
10 is when you start to put content in
11 different nodes, right, how do you
12 track, like, how many times they played
13 this song, or where they've pulled it
14 from. does that make sense? I guess in
15 this case, the idea of active is --
16 active orchestration is you're thinking
17 about how am I reducing the latency so
18 that I'm not just waiting for somebody
19 to say they need the song before I've
20 done something to deliver it to them.
21 Do you see what I'm saying? It's not
22 the same thing as me pushing a song to

1 your phone, right, that you haven't
2 requested and it just starts playing on
3 your phone to be active. But maybe I've
4 moved it from a central server in
5 freaking China somewhere to putting it
6 in a node stored closer to you, so the
7 latency is better, right. I thought
8 about where that's going to be and where
9 we need to store this content.

10 Q Right. And I don't think I was
11 understanding it to be pushed to the end
12 user's phone or computer, but it sounds
13 like what you're saying the '128 Patent
14 is described in ways to push that closer
15 to the edge so that it's more quickly
16 accessible even if it's not requested
17 first; is that right?

18 A That's right.

19 Q So passive distribution you're saying
20 that would be distribution responsive to
21 a request?

22 A Passive distribution which was probably

1 more common in the '90s where you would
2 have a single server or location where
3 you would store everything. People
4 would go to that single central server
5 to get whatever it is they need. Part
6 of distributed computing is you figure
7 out what data you can put on different
8 servers and then you have a network that
9 allows people to access that faster and
10 more reliably than having it in one
11 central place where everybody's
12 requesting demand on the central server.

13 Q That would be active distribution,
14 right, based on what you talked about
15 before because it's distributed in
16 multiple places to speed up?

17 A Yeah, that would be active. Passive is
18 when you just have it in like one spot
19 and everybody goes to that one spot to
20 get it. That would be more passive.
21 And again, these are gradients, right,
22 like you can be more active or more

1 passive. Right. I don't think it's
2 like -- just like realtime, right. It's
3 not like now it's active, now it's
4 passive. It's kind of like these are
5 kind of like archetypal concepts that we
6 use to distribute computing to kind of
7 like describe these concepts.

8 Q So on that gradient, if I have that
9 system where there is content in
10 multiple locations to reduce on central
11 server, but that is only pulled from
12 that location in response to a request,
13 would that be more passive or more
14 active?

15 A Well, the fact that it's distributed
16 closer to the user is more active. The
17 fact that you're -- depending on how you
18 actually have the user retrieve the
19 content would be more passive. So you
20 could imagine like when somebody -- like
21 if a user -- like a play lists are an
22 example, right, is more active than what

1 you just described, right. I still
2 might request a play list, but then what
3 it's doing is it might download or push
4 a collection of songs that tend to be
5 played together as way to be more
6 active, right, in terms of that sort of
7 thing.

8 Q Now, does the '128 Patent use that
9 terminology of the active distribution
10 or passive distribution?

11 A I do not recall.

12 Q Okay. So is that -- that's terminology
13 that you used just as a shorthand for
14 what you wanted to describe?

15 A It is. I don't know if it was cited in
16 there and I -- like, that's what was in
17 my mind four months ago or three months
18 ago or whenever it is that I wrote that
19 and put it down or if it -- you know,
20 I'm not sure.

21 Q Got it.

22 So I mean, just, again, looking at

1 that gradient. So like, if a request
2 comes in for some content and it's not
3 at the regional node that's closest to
4 the requesting user and so that gets
5 escalated to a central controller to
6 then provide it, would that be more of a
7 passive distribution per what we talked
8 about?

9 A Well, if it -- yeah, well, these are
10 weird questions, ways to phrase it. But
11 like, if you're saying you're going --
12 like, passive is if you're kind of
13 having to go to central controller to do
14 it, yes. But I think the fact that
15 there is a central controller and it's
16 pushed the content out to, you know,
17 distributed nodes is more active.

18 So I'm not sure that I've answered
19 that question very well, but.

20 Q Yeah, I mean, maybe we can't answer it
21 because you said it's a gradient or
22 maybe you would call it a spectrum. I'm

1 trying to kind of just tell, where is
2 the line between when it's passive and
3 when it's active.

4 A Well, what I was referring to in the
5 statement is that there was a concept of
6 saying, hey, how do we address the
7 latency issue -- in this case of
8 streaming content, how do we address the
9 latency issue by pushing it to edge so
10 that it is closer to the user to reduce
11 latency. That is a concept that I don't
12 think was standard practice in the '90s.
13 I think that is, nowadays, standard
14 practice in distributed computing,
15 right. I think that's very common in
16 distributed computing today.

17 But you know, like, knowing that
18 was something -- like, I mean, you might
19 as well have bought stock in Apple or
20 Microsoft in the '80s as well, you know
21 what I mean. You can't kind of say that
22 just because everybody does it today and

1 knows about these concepts, that it was
2 novel in the mid- to late '90s.

3 Q Got it.

4 And in terms of experience with
5 active orchestration in the late '90s,
6 what in your background would you say
7 gave you that experience with active
8 orchestration?

9 A Well, with active orchestration, I would
10 say my -- probably the closest would be
11 my work with, you know, setting up
12 networks for AMPS and dealing with
13 integrating that into the larger, you
14 know, AllSource intelligence system that
15 the Army was deploying through CECOM. I
16 had some degree of that as we were
17 trying to figure out how to orchestrate
18 control networks for robotics in the
19 early '90s, you know, when I was an
20 undergrad. That would be my background
21 and experience.

22 And of course, you know, like, I've

1 done that at more scale, more -- you
2 know, later in -- you know, in my
3 professional career, my post-Ph.D.,
4 which doesn't necessarily mean I knew
5 everything that I know now in the '90s
6 that I know now, you know what I mean.
7 Like, but I think all of us can say
8 that, so.

9 Q So you mentioned AMPS as part of that
10 experience. What --

11 A Yeah, AMPS, I would say, is distributed
12 computing, right. We, you know, stored
13 data at different places, different
14 nodes, pushed it in different ways,
15 everywhere from, like, the actual
16 helicopter at the edge to the -- there's
17 a, you know, troop company computer, and
18 then there was a battalion squadron
19 computer, and then there was a brigade
20 computer.

21 So like, you know, do they -- you
22 know, some of that data is being pushed

1 directly to the squadron level. Some of
2 that's being physically moved and
3 downloaded at the troop level and then,
4 you know, transmitted. So I mean,
5 there's, like, a whole lot of
6 different -- I mean, it was network
7 distributed for data collection --

8 Q And it sounds like that would have been
9 pushed to the battalion without them
10 having to request it first, right?

11 A Well, what was pushed? There were
12 certain procedures set up where they
13 would say in advance that, hey, we're
14 going to send certain, like, operations
15 orders or information. Like, if it's a
16 control, like, you're going to tell
17 people what to do or missions, that
18 would be pushed. The intel data would
19 be, you know, sent up.

20 But I don't think -- well, at least
21 at that time, not that I know, there
22 wasn't a concept of where we store the

1 data, where we set up rules for
2 accessing the data and sharing the data
3 would improve latency. Like, those
4 kinds of concepts and ideas were not
5 common or prevalent at that time.
6 That's not how people were thinking.

7 Now, granted, one could argue
8 now -- and I think we do argue now --
9 that latency is important for intel
10 sharing because we want to get -- you
11 know, need to know right away. That
12 just wasn't -- I mean, I think we were
13 so amazed in the '90s that we could
14 actually move data without having to
15 physically carry a hard drive across,
16 you know, an operating base. I think we
17 were pretty -- everybody was just amazed
18 that we could send it through FM radio
19 signals, right. Like, I don't think
20 people were thinking about how we use
21 network technology to do things, like,
22 efficiently at that time.

1 Q Got it.

2 Similar question but with passive
3 orchestration, what in your background
4 as of that 1998 time frame would you say
5 gave you experience with passive
6 orchestration?

7 A Well, everybody stored data in hard
8 drives and, you know, pulled from it and
9 did all of that. In fact, I think there
10 was a robot -- software for a robot that
11 I was working on in my undergrad. This
12 would have been about '91. And there
13 was a flaw in the code, and every time
14 it would save, it would replicate. So
15 it basically effectively was, like, a
16 virus that killed the AI robot, right.
17 So it was running around doing whatever.

18 Now, had I had this distributed, I
19 might have had an earlier copy, or I
20 might have had a backup or whatever.
21 But like, you know, back in the early
22 '90s, I don't even think we realized the

1 presence of viruses, the presence of
2 backups, a lot of the safety mechanisms
3 we take for granted, we learned through
4 a series of mistakes and cyber attacks
5 and best practices and stuff that kind
6 of emerged. You know, I mean, I'm sure
7 it was going on since the '60s, but, you
8 know, my time frame was in the '90s,
9 where we were learning about all these
10 sorts of things. And then you learn a
11 hard lesson, and then you adapt, and you
12 overcome.

13 Q Fair enough.

14 There's another term that was used
15 in your declaration I was curious about.
16 You mentioned a couple times the idea of
17 a control plane.

18 Do you recall using that phrase?

19 A Not off the top of my head. I probably
20 should have reviewed -- read this before
21 the deposition. But let me just see
22 here. Oh.

1 Q Yeah, it's on Paragraph 13.

2 A Yeah. Oh, okay, yeah.

3 Q Something about a realtime control plan.

4 A Give me just a second to read what I
5 wrote, and I'll remember. Let's see.

6 Oh, yeah, yeah. So the control
7 plane, I'm talking about the central
8 controller that kind of, you know, makes
9 kind of intelligent decisions as far as
10 where it is going to store content to
11 improve the latency.

12 So you know, I think the statement
13 you're referring to is "Passive
14 approaches, such as indexing content,
15 staging it in advance or replicating it
16 based on popularity can operate without
17 a realtime control plane." And then I
18 think I say that "True multi-region
19 orchestration, by contrast, reliably
20 executes per request decisions across
21 independent regions while managing
22 failure, consistency, user-visible

1 latency" -- and that's actually a better
2 term that I used, "user-visible latency
3 than realtime in distributed practice."

4 So the idea of, you know, you are
5 going to not just stick out content in
6 different nodes in hopes that somebody
7 likes that song, right. That would be,
8 like, equivalent to saying, you know,
9 what's the Top 40 list and letting
10 people get it. But what you're doing is
11 you're doing something a little more
12 clever, which is you're saying, like,
13 how am I going to control where I put
14 it, how I bill it, you know, how I
15 manage that with a little more
16 intelligence in it.

17 And I think that's what really
18 helps with reducing the latency. And,
19 you know, the other piece that I think
20 is really kind of complex is how do you
21 actually tie the billing of the user
22 that requests the content to the actual

1 content so that you can actually have a
2 billing model, right. And I know you
3 haven't really talked about billing very
4 much, and I don't know if you're going
5 to get into that or not, but it just
6 seems like, you know, that's possibly,
7 probably the more relevant today thing
8 that's, like, harder to get around, you
9 know what I mean.

10 Q Oh, he's got to monetize it. That's for
11 sure.

12 So that "control plane"
13 terminology, do you think you used that
14 because that's a networking term of art?

15 A I think I probably just used the terms
16 that came into my head. So you know, I
17 guess I probably should have written and
18 could have written it to be a little bit
19 more laymen's speak, I guess, but you
20 know.

21 Q And that's okay. I mean, isn't "control
22 plane" a term that's used in networking?

1 Are there other types of planes that are
2 described as well in networking that
3 you're aware of?

4 A Yeah, I mean, we could call it a
5 realtime control, control logic or
6 control engine or control node or -- you
7 know, there's different terms that
8 people might use, right.

9 Q Um-hmm. And in -- does data flow
10 through this control plane, as in, like,
11 the data we care about, like an audio
12 file?

13 A Does data flow through it? Like, not
14 necessarily. Like, are you talking in
15 the abstract or in the '128 Patent?

16 Q First, in the abstract. I'm, you know,
17 just trying to contextualize this
18 "control plane" term.

19 A No, I think the term I'm talking about
20 is just the logic by which you kind of
21 manage where you're storing data for the
22 purpose of reducing the latency.

1 So as I mentioned before, the state
2 of, like, practice in the '90s was
3 people had, like, a central server, and
4 they weren't thinking about the problem
5 of distributed computing. They weren't
6 thinking about how they can improve some
7 of the latency and access to data by
8 placing it in a distributed
9 architecture. That was just not what
10 people were talking about.

11 So the idea that you can actually
12 have distributed locations from this
13 idea and then you can actually have some
14 sort of logic or centralized logic to
15 direct that or control that or optimize
16 over that is kind of what I think was
17 the innovation in the '128 Patent.

18 Q Got it.

19 And so that centralized control
20 logic that you're talking about, it
21 sounds like it -- the '128 Patent didn't
22 necessarily require data transfer to

1 follow the same paths as, you know,
2 maybe those commands from the
3 centralized logic.

4 A I did not understand what you just said.
5 I'm sorry. Can you say that again?

6 Q Sure. Yeah, let me say it a different
7 way.

8 You're saying that this centralized
9 control logic is what's -- something
10 interesting about the '128 Patent,
11 right?

12 A Um-hmm.

13 Q And I know that the '128 Patent also
14 talks about moving this data closer to
15 the edge, like you talked about before,
16 right?

17 A Um-hmm.

18 Q Does that data, as it moves, have to go
19 through the centralized control logic as
20 it moves from one node to maybe a node
21 closer to the end user?

22 A I don't think the data has to move

1 through the central logic to do that.

2 Q Okay.

3 A Like, I mean, there's -- I mean, you can
4 route requests to the node that is most
5 accessible or where it has, right.

6 Like, I mean, there's a number of
7 different architectures for it, you know
8 what I mean. Like, you don't
9 necessarily have to have the data go
10 through the central node.

11 Q Got it.

12 So the '128 Patent wouldn't have
13 been limited to having to go through a
14 central node for data as it's going to a
15 node that is closer to where it's
16 needed?

17 A Well, I guess I kind of feel -- I feel
18 like I'm not really exactly
19 understanding the distinction here. I
20 mean, I think you have central logic,
21 and you can direct, you know, a user's
22 request to go anywhere in that network

1 that you want. So it doesn't have to,
2 like, go through a central node for
3 doing that. You can embed that logic --
4 you know, versions of that logic at all
5 the different nodes so that that's
6 distributed.

7 But the idea here of a central
8 plane is that there is a central set of
9 rules for how you're going to handle the
10 routing of requests to content and be
11 able to track billing.

12 Q Okay. Now, would those central set of
13 rules also include anything for how to
14 route the content back to the requesting
15 user?

16 A It could. I mean, I don't recall. I
17 would have to go back and review the
18 patent. I don't recall if that was
19 something that the '128 Patent had or
20 not.

21 Q Okay.

22 A Sorry.

1 In principle, like, I don't think
2 it has to do that to be novel, right. I
3 think we're talking about a distributed
4 network architecture at a time when that
5 was novel and that was not what people
6 were thinking, right. And then I think
7 we're talking about how we are being
8 able to -- like, in the '90s, late
9 '90s -- I don't even think it was late
10 '90s. In my experience, it was more in
11 the 2000s -- people were trying to
12 figure out how do we store data across
13 an enterprise and how do we retrieve and
14 access that data in a way that is faster
15 and improves latency and all of that
16 sort of stuff.

17 Now, I mean, there are different
18 innovations that occur probably from the
19 '60s, when database theory was being
20 emerged, right, for different ways of
21 doing that, and some of it's used, and
22 some of it's not used. And you know, so

1 I mean, I'm sure there's all sorts of a
2 mess of that, you know, that are -- you
3 know, that we're -- you know, we're
4 looking at in terms of how you access
5 data, how you retrieve data, how you --
6 you know, all that sort of stuff, but.

7 Q Yeah, I mean, maybe we're just using
8 different terms.

9 How about we make up just this -- a
10 very simple hypothetical distributed
11 system with central logic and two nodes,
12 A and B.

13 So if this central logic sends a
14 control instruction via a path to Node B
15 and says, hey, Node B, send this
16 requested audio file to Node A and if
17 that Node A -- I'm sorry, that Node B
18 sends the file to Node A and it doesn't
19 go through the centralized control
20 logic, would you say that central logic
21 is responsible for the routing of that
22 file still?

1 A I -- yes, I would. I thought you were
2 going to say that, like, if we have a
3 central -- you know, central node and we
4 have A and B and a user requests an
5 audio file from Node B and B doesn't
6 have the audio file and sends a request
7 to A to either get it or route the user
8 to Node A, I would say that's still the
9 central logic, right. That's still the
10 central control plane across that
11 network, right, as far as directing --
12 you're distributing the content. You're
13 directing the user to where to get the
14 content in the most expeditious way.
15 And then you're tracking that audit so
16 that you can effectively bill it.

17 Q And that would be a centralized control
18 plane in that example you gave, even if
19 Node B forwarded that request to Node A
20 and that request doesn't go through the
21 central logic?

22 A Right. Because it's still -- like, it's

1 still the logic, right. Like, I still
2 think -- it's probably what I was
3 getting at with the idea of a plane,
4 right, is it's still, like, a central
5 logic that exists across that network.

6 Q Got it.

7 So it's -- this control plane,
8 because that logic is defined by that
9 central control node and everything
10 operates based on that afterwards,
11 right?

12 A Right. And then you can update that and
13 distribute that logic across the network
14 in a variety of different ways.

15 Q Okay. In that example that you're
16 talking about with this Node A and
17 Node B and that Node B is forwarding
18 something to Node A, are those two nodes
19 interconnected with each other?

20 A Well, yeah, they would be interconnected
21 in some way.

22 Now, you can have -- like, if

1 there's a third node, C, and you don't
2 have a pathway established between A and
3 B, then they might route that request
4 through Node C, right, to get there,
5 right. So I mean, these become, you
6 know, the graph architecture, right, and
7 then it can get a lot more complicated
8 from there, right.

9 So in distributed data, you know,
10 my criticism of the way we do most
11 enterprise data management is people
12 build these pathways very manually and
13 ad hoc, right, so it's very procedural.
14 But if you adopt formal logic, right,
15 which, you know, when database theory
16 was being established, right, in the
17 '60s, there was relational algebra which
18 referred to how you are going to
19 procedural map A to B to C to D to all
20 these different things, and we're going
21 to merge and join -- this is what SQL is
22 based on, S-Q-L, to do, a lot of data

1 movement, data migration, data
2 engineering efforts, right.

3 There was also relational calculus,
4 which is where you create logical axioms
5 about what must be true about the data.
6 And then you can logically derive
7 optimally efficient pathways. Well, in
8 the '60s, right, data was small enough
9 where people just did it in a very
10 relational algebra ad hoc way, right,
11 and that's what's kind of evolved now.

12 So even when you have now, you
13 know, algorithms that are going to use
14 first order predicate logic to use data
15 integration it's not widely adopted at
16 the enterprise. We can speculate as to
17 why. But the point is that with
18 relational calculus based methods or
19 mathematical category theory, what
20 you're able to do is say I know the
21 mapping between A and B and I know the
22 mapping between A and C, I can derive

1 the mapping between B and C. And then I
2 can create optimal virtual data
3 warehouses or exchanges that are far
4 more efficient, that take up less
5 compute, less space, they can do better
6 routing.

7 And to be perfectly honest, those
8 aren't widely used at enterprise because
9 the SQL approaches are good enough,
10 right. And as long as everybody does a
11 good enough method, right, that's
12 totally fine. I believe that once
13 somebody actually goes back to the
14 drawing board and starts with maybe the
15 first order of logic and has a more
16 central view of that, huge.

17 I'll give you an example, this is
18 data integration, so this is data across
19 networks not -- so this is dealing with
20 like oil and gas industry, pressure,
21 these sorts of things, right. But a
22 Fortune 500, 20 person engagement, that

1 took 18 months using a first order
2 predicate logic approach allowed two
3 people to do the same thing in 18 days
4 and find error in the other system. You
5 can have huge deficiencies when it
6 becomes competitive and when it matters.

7 So when you start having multiple,
8 you know, bringing this back to media
9 content delivery, when you have multiple
10 content delivery companies having -- in
11 competition with each other and needing
12 to be faster with lower latency, right.
13 Having good logic and having good, you
14 know, good centrally controlled
15 mechanism. Not even centrally
16 controlled, but just like that central
17 logic of how you're going to route data
18 and bill effectively and efficiently,
19 right, becomes the competitive edge. So
20 people are going to go for the best
21 solution, right, or they're going to say
22 I don't want to pay for the best

1 solution, so I'll take the hit in the
2 marketplace because my revenue loss
3 using an inferior solution is not worth
4 the higher cost or central solution.
5 Obviously just business. Hopefully
6 that's not too much of a tangent.

7 Q No, I was thinking about your Napster
8 example before, do you think that
9 Napster, the reason it succeeded, is
10 because it has some of that kind of
11 logic to make it a little faster?

12 A No. I think the reason why Napster hit
13 is the idea you could bill by song
14 instead of bill by album. I feel like
15 it introduced this idea that you can
16 democratize access to media content and
17 I think that was its real innovation.
18 It kind of promised to break up the
19 monopoly, monopolies in the music
20 industry, right. It would be equivalent
21 if somebody came out with something
22 today that was a platform that said you

1 do not have to pay a subscription fee to
2 Netflix, Amazon, Apple et cetera, et
3 cetera and you can get access to
4 whatever content you want to get and you
5 pay the artist directly. And that would
6 be kind of the equivalent to what
7 Napster did. Now, from -- I don't know
8 the details of Napster's architecture,
9 right. I don't know those details. But
10 what I understand is that there is some
11 similarity between the '128 Patent in
12 terms of it provided an architecture an
13 infrastructure to do something. I
14 understand it, it was able to do it
15 better because it was able to track the
16 billing better because it actually was
17 something that would have been or could
18 be or is a solution for streaming
19 services to actually monetize better
20 than what the Napster approach did.

21 And of course, when I first
22 reviewed the patent I thought this is

1 pretty much what Napster was trying to
2 do and I realized the patent was filed
3 before Napster, like became famous,
4 right. But I think had Napster not hit
5 the scene and not captured the public's
6 attention, I don't know that we would
7 have had the same inevitable push
8 towards streaming content services that
9 we see today.

10 Q You'd also mentioned TiVo in your
11 declaration, is that similar in your
12 opinion that if TiVo didn't happen we
13 wouldn't be having this conversation
14 today either?

15 A Well, certainly that was part of it, you
16 know. Like being able to like, like,
17 this whole idea of on-demand services,
18 right, like I don't have to be pushed
19 content over the radio, that I have some
20 choice, right. It becomes very
21 difficult to put a pin in the road and
22 say what was the innovation that like,

1 you know, made it big, right. I mean, I
2 think it's a mixture of things, right,
3 so it's a mixture of who did it first.
4 We can speculate whether anybody
5 reviewed those patents or not reviewed
6 those patents as you can point it out to
7 me that I didn't do a patent search at
8 the beginning of the deposition. You
9 can say that or you can say who had the
10 media attention to make it go big, go
11 viral. That too, right.

12 Q Got it. Now, to my recollection, it was
13 your opinion that Dr. Lippman was biased
14 by TiVo and Napster and other types of
15 products that came out after the
16 '128 Patent; is that right?

17 A That's right. I think when you see all
18 these popular things that occur in the
19 late '90s, right, it can make you think
20 that this is just an inevitable thing.
21 But I think none of those solutions
22 really had a way to handle the

1 centralized billing. Right. And I
2 think that is what is really -- I think
3 that is why we're having this
4 conversation today, because I don't know
5 that there is a better way right now to
6 be able to handle the centralized
7 billing efficiently. So you're dealing
8 with not just low latency, but you're
9 also dealing with being able to bill
10 content so you have the billing model.

11 Q To your recollection, did Dr. Lippman
12 mention Napster in his declaration.

13 A I do not recall.

14 Q Do you know if he mentioned TiVo in his
15 declaration?

16 A I do not know. I'm sorry. I have not
17 read Dr. Lippman's statements since
18 December.

19 Q That is fair.

20 A I'm trying to remember like -- I would
21 say -- I would feel like two things, if
22 he did mention it, that would be great.

1 If he did not mention it, I think what
2 the broader point here is, there are a
3 lot of technologies that kind of like
4 hit the public mainstream in late '90s,
5 early 2000s that just changed the way we
6 think about things and it's really,
7 really hard for us to kind of go back
8 and remember what the technology space
9 was like in the '90s.

10 Q I see what you're saying. Why don't we
11 move on to a slightly different topic.
12 I was curious if we can talk more or
13 again, about your background a little
14 bit. And I was curious what in your
15 background as of the 1998 time frame,
16 would have qualified you as having
17 experience with cable and satellite
18 delivery architectures?

19 A No. The late '90s, I don't know that I
20 would have any unique expertise in that.
21 My knowledge of cable or satellite
22 probably 2000s post, I don't know -- I

1 probably started getting into that
2 around 2005, 2006.

3 Q And around 2005, 2006, what kind of
4 things did you research or do that would
5 have given you experience of cable and
6 satellite delivery architectures?

7 A So between 2004 to 2005, I was in my
8 first year teaching at West Point and I
9 stumbled upon a method of basically
10 taking open source videos and
11 identifying forensic clues that would
12 allow us to eliminate terrorist
13 networks. So when we started having
14 success and being able to provide
15 actionable intel there, then that took
16 me on a different path through the
17 combating terrorism center at West Point
18 where I started doing work into signals
19 intelligence and at that point, I can't
20 really talk much about that work, right.
21 Short of it to say it involved network
22 based target for offensive and defensive

1 purposes for a variety of different
2 signals networks.

3 Now, I'm not trying to be cute when
4 I say I can't talk about it. I don't
5 know where the line is between what I'm
6 allowed to talk about and what I'm not
7 allowed to talk about. Do you know what
8 I mean? Certainly things that were
9 classified in 2005 or '06 maybe are not
10 now. I'm sure the internet is full of
11 sorts of things that the US government
12 would consider classified. So I don't
13 know where that line is. So I prefer
14 not to talk about things that might put
15 me into an issue there. So I guess all
16 I can say is I did a lot with signals
17 data, if that --

18 Q And honestly, I don't have much
19 experience with classified things. So
20 I'm going to have to lean on your
21 experience with that.

22 In terms of what you did research

1 and experience either up to 1998 or in
2 this 2005, 2006 time frame. Based on
3 that experience, would you understand
4 the bandwidth capabilities of cable
5 systems?

6 A I certainly knew the bandwidth of cable
7 systems in Iraq, so I think it's my
8 Officer evaluation report from that time
9 I was optimizing bandwidth and satellite
10 coms cost. I can probably try and find
11 an old valuation report if you are
12 trying to substantiate that. But I was
13 optimizing bandwidth for moving data
14 across satellite communications
15 networks.

16 Q So satellite, cable or both?

17 A Satellite.

18 Q What was the typical bandwidth
19 capability of a satellite channel at the
20 time?

21 A I don't have that number of data and I
22 don't know if I can share it. I'm

1 sorry.

2 Q Okay.

3 A Certainly, satellite bandwidths and
4 design that certainly was classified in
5 Iraq. Whether or not it's declassified
6 now or not, but I can't share. And I
7 don't know to what extent the knowledge
8 that I had at the time, not that I would
9 remember, I mean, I'm not trying to be
10 cute, I wouldn't remember the number off
11 the top of my head and if I did remember
12 off the top of my head, I would not be
13 clear as to whether it would be a
14 classified number or not for military
15 networks or commercial.

16 Q Okay. Yeah, well, let's just leave that
17 then.

18 Would you say that in the 1998 time
19 frame that you didn't have any
20 experience with distributed media
21 delivery systems?

22 A Outside of -- well, no, media systems,

1 like songs and that sort of thing, I did
2 not, no.

3 Q Okay. What about as of the, you know,
4 1990 --

5 (Cross-talk.)

6 A -- I wonder how many people actually
7 would in the late '90s, right. Like,
8 Pre-Napster, there was not a whole lot
9 of -- I mean, like, that's kind of the
10 point here, right, is that content media
11 delivery systems over networks were
12 novel, not common in the '90s, right.

13 Q Okay. What about as of that time frame,
14 what experience did you have that would
15 be applicable with respect to
16 multi-region orchestration or routing?
17 Would it be the AMPS we were talking
18 about before?

19 A Well, AMPS and then I think at a more
20 local level, when we would be looking
21 at, like, robot proving grounds and,
22 like, you know, routing, you know,

1 information, you know, what logic are
2 you keeping central, what logic are you
3 pushing to the, you know, distributor
4 robots for operating around that. That
5 would probably be the work in the '90s
6 yeah.

7 Q Okay. And based on that level of
8 experience, would someone similar to you
9 with that level of experience have
10 understood how to use a centralized
11 database or control logic to keep track
12 of available content in different
13 regional locations?

14 A Well, I certainly wish I had thought of
15 that when I was working on the Aviation
16 Mission Planning System because I think
17 that would have made things a lot better
18 for routing, you know, intel data. But
19 like, no, that did not occur to me, nor
20 did it occur to the best engineers at
21 CECOM working for the US Army. In fact,
22 I don't know that that even was an

1 outcome for Force XXI, which was the
2 larger scale effort at the end of the
3 '90s, right. I think these ideas and
4 concepts didn't really emerge until
5 cloud computing in the 2000s.

6 Q Okay.

7 A In fact, even in 2010 when Palantir
8 first was launching its content, you
9 know, one of the challenges was -- you
10 know, I mean, it's a tool, right. It
11 can't do everything. So it basically
12 restricted a lot of the analytic tools
13 that we had to one system that had all
14 the data, and its promise or its value
15 that -- you know, like, however many
16 billion dollar company it is, was based
17 on the idea of distributed computing
18 from the idea that they could have
19 analysts in Virginia working on the same
20 analytic problems with people in Baghdad
21 or in wherever, and that was in 2010.
22 And that was, like, totally novel and

1 the result of a lot of R&D across the
2 2000s to get to that point.

3 So I mean, I think if this was,
4 like, inevitable -- you know, I mean,
5 certainly was inspired by stories of
6 Napster and, you know, certainly
7 people -- I mean, you've got to keep in
8 mind, remember, the original iPods were,
9 like, little squares that people --
10 like, I mean, they thought that was
11 amazing, right, that they could select
12 their own songs and make their own
13 playlists, right, and put it on a little
14 device that they could, like -- that was
15 small and they run around with.

16 Like, I don't think that this idea
17 of -- you know, if content streaming
18 were so inevitable and so obvious,
19 right, I don't think we would have -- it
20 would have taken as long to get cloud
21 computing for, like, mission-critical
22 stuff in Iraq. I don't think it would

1 have taken us so long to get -- you
2 know, I mean, like, just look at the
3 evolution of streaming content, right.
4 I don't think that inevitability is a
5 fair characterization.

6 MR. FOWLES: Okay. Well, I don't know
7 that we need much more time, but I do
8 need to take a quick break personally.
9 So if we could break for another
10 ten minutes, I would appreciate it.

11 THE WITNESS: Okay.

12 MR. FOWLES: Okay. Let's reconvene at
13 4:19 Central.

14 (Whereupon, a recess was taken
15 from 5:09 PM until 5:20 PM.)

16 MR. FOWLES: Back on the record.

17 BY MR. FOWLES:

18 Q Okay. So Dr. McCulloh, we talked a bit
19 about billing and how this was a
20 potentially unique aspect of the
21 '128 Patent.

22 Do you remember that discussion?

1 A I do.

2 Q Great. So I wanted to just better
3 understand what you're talking about
4 with respect to that.

5 Specifically, in your opinion, did
6 enterprise systems back in the 1998 time
7 frame have any reason to track
8 user-level consumption for billing or
9 marketing purposes?

10 A No, they did not. No, I don't believe
11 they did. I think that the use cases
12 were more moving data and doing that. I
13 don't even think data integrity
14 realizations were really were talked
15 about much until the 2000s.

16 You know, like, the idea of how do
17 you take data from A and data from B and
18 you put them together and maybe some of
19 the data from B was modified in some
20 way, right. Now, how do you put it
21 together and ensure you have correctness
22 of data, right? Like, that is still a

1 problem where -- you know, it's one of
2 these interesting technical areas where,
3 while I would argue there were solutions
4 for that as early as the 1960s, people
5 are still using data match to try and
6 practically solve that at enterprise
7 scale today and largely unsuccessfully.

8 Q Wouldn't auditing have been something of
9 interest back in the '90s as well with
10 respect to enterprise systems?

11 A I think auditing would be, yeah. I
12 think auditing has been of interest
13 since the 1960s.

14 Q In your opinion, wouldn't enterprise
15 systems in the '90s have had auditing
16 systems to be able to routinely track
17 user-level activity?

18 A Yeah, but we're talking about how do you
19 actually handle that in a way that you
20 can actually bill or invoice. So I
21 would say, like, for example -- I don't
22 know, this may be a silly example. But

1 when you have, like, a data enterprise
2 today and there is -- like, you know,
3 like Uber. Uber creates a different
4 model, data model for San Francisco than
5 they do New York, right. They weren't
6 made together and -- or let's say
7 San Francisco and Tampa, to make it
8 politically different, right. And so
9 there's different regulations and rules
10 and required fields that they have. And
11 now Uber wants to look at data for
12 auditing purposes, right, and for
13 decision support across both of those.
14 They're not consistent. Those data
15 models aren't consistent.

16 So you can create maps, but, like,
17 you know, when you're dealing with,
18 like, Uber auditing requirements, you
19 know, states are going to have different
20 levels of privacy around the driver,
21 right, W-2s and tax IDs and the rider,
22 the tax levels, different levels of

1 privacy, different levels of the rules,
2 how they're going to handle the data
3 that was an unsolved problem for Uber a
4 few years ago that they could not even
5 keen keep compliance with the different
6 emerging laws in different countries and
7 different regions on privacy. So you
8 know, that was solved with a formal
9 methods approach, right, that they used.

10 But my point is, just because there
11 is a requirement for auditing going back
12 to the '60s doesn't mean that even in
13 the '20s today that the auditing is done
14 correctly, well or provably accurate.
15 There are errors in that auditing, and
16 there are different ways in which you
17 can do the auditing, right. Like, I can
18 do auditing by asking a bunch of people
19 to just, you know, hey, submit me your
20 invoices of what you think made and
21 earned last year. And I can bring those
22 together, and I can try and manually do

1 it. I can ask them to submit it in a
2 spreadsheet. I can ask them to track it
3 as they go and upload a document as they
4 go, right. This is just a simple
5 example, but there are different ways of
6 doing auditing. Some are better; some
7 are worse.

8 So my assertion with the
9 '128 Patent is they introduced -- I
10 guess to use your word -- an auditing
11 method that allows them to actually tie
12 the song played to the account. So this
13 person gets billed whatever cents for
14 the song that goes to this artist or
15 company or whoever owns the IP on it,
16 right. That was kind of -- that billing
17 model, I would assert, was not common or
18 thought of in the '90s.

19 Q If it wasn't common, are you saying that
20 it was in existence in the '90s?

21 A Well, I'm not -- I've not been able to
22 find any evidence of anybody doing that

1 in the '90s, right.

2 Q Got it. Okay.

3 And also, you had mentioned this
4 concept of accuracy in the auditing.
5 Does the -- do any of the claims of the
6 '128 Patent require any kind of accuracy
7 or lack of error?

8 A Well, there is an approach that I think
9 reduces error. Do I think it could be
10 improved on? Yes. You know, do I think
11 30 years later we can do better?
12 Probably. I'm not really going to
13 expose my thoughts on how that happens
14 here, you know, I might -- you know.

15 Q Okay. That's fair.

16 Have you ever heard of a concept
17 called chargeback billing in IT,
18 information technology?

19 A Um-hmm.

20 Q What is that?

21 A I don't feel comfortable enough on the
22 concept to tell you on the record,

1 explanation of that. I could probably
2 look that up and get back to you on
3 that. I've heard the term. I don't
4 know that I know it well enough to go
5 and, you know, on the record right now
6 in this deposition and have a discussion
7 about it. But I can certainly research
8 it and follow up.

9 Q Got it.

10 So in terms of just terminologies,
11 that's not something as -- you're not as
12 familiar with that as perhaps other
13 things we've spoken about today?

14 A Like, that was one of the billing
15 models -- like, so, you know, as you
16 know from my CV, I was an executive at
17 Accenture, which is a top five
18 consulting firm for IT. You know, I ran
19 the AI practice for Federal there, so
20 that was one of our charging models for
21 that. I don't feel like I am read up on
22 it and comfortable enough to have a

1 discussion. You know, I mean, if you
2 want to define it, you know, we can
3 certainly discuss something, but.

4 Q Okay.

5 A I mean, if we're going to -- like, I
6 feel in this context you're -- you know,
7 you're saying, hey, is chargeback
8 billing the same as what '128 Patent is
9 asserting, or is there parallels or
10 differences, I think I would want to go
11 back and understand what chargeback
12 billing, when did it emerge, what was
13 the predecessor for it, which would take
14 more research to kind of look at how
15 that model is or is not different to
16 that, and I'm not prepared to have that
17 conversation right now. I just haven't
18 read up on it enough to have that level
19 of detail.

20 Q Fair enough. I appreciate that --
21 (Cross-talk.)

22 A -- model for, like, IT services, right,

1 where you use it and then you charge it,
2 right. Like, but, like, beyond that, I
3 don't know -- I'm just not read up on
4 the specifics, are there different
5 models of chargeback billing, you know
6 what I mean, like.

7 Q Well, just out of curiosity, in your
8 experience at Accenture with chargeback
9 billing, are you aware of whether that
10 ever was per user or per department or
11 both?

12 A I don't know. You know, I know we would
13 largely resell services, so we would
14 track that, but, you know, I don't
15 remember off the top of my head, you
16 know, what some of those different
17 models are.

18 Q Got it. Okay.

19 Well, I -- you know, if you don't
20 have recollection at the point, we won't
21 push on that.

22 But I was curious, in general,

1 during the course of our deposition
2 today, have you had any discussions with
3 your counsel about your testimony after
4 the deposition started?

5 A No, I have not.

6 Q Have there been --

7 A There's been texts on my phone, but I
8 have not looked at them.

9 Q Okay. Good. Have you looked at any
10 other notes or anything other than the
11 documents we talked about in the
12 exhibits during your testimony today?

13 A No. I have not. I have gone for coffee
14 or a bio break or talked to my dog.

15 Q That's dangerous, talking to a dog.

16 A I did have -- just to be full
17 transparent, I did have a couple texts
18 back and forth with work colleagues
19 'cause, as I mentioned earlier, I had
20 meetings scheduled this afternoon. I
21 did not anticipate the deposition taking
22 as long as it did.

1 MR. FOWLES: Understand.

2 All right. Thank you, Dr. McCulloh. I
3 have no further questions.

4 THE WITNESS: Okay. So am I free to go,
5 or is there anything else?

6 MR. DOWELL: I have nothing on my end,
7 so I think, Dr. McCulloh and Adam, I
8 have nothing here.

9 COURT REPORTER: Are you ordering a copy
10 of the transcript?

11 MR. DOWELL: Yes.

12 (Whereupon, this examination
13 was concluded at 5:31 PM.)

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IAN MCCULLOH, PH.D.

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Subscribed and sworn to
before me on this ____ day
7 of _____, _____.

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Notary Public

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I N D E X

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WITNESS: IAN MCCULLOH, PH.D.	
MR. FOWLES	6

C E R T I F I C A T E

I, KIARA MILLER,
A Shorthand Reporter and Notary Public of the
State of New York, do hereby certify:

That the witness whose examination is
hereinbefore set forth, was duly sworn or
affirmed by me, and the foregoing transcript
is a true record of the testimony given by
such witness.

I further certify that I am not related to
any of the parties to this action by blood or
marriage, and that I am in no way interested
in the outcome of this matter.

Kiara Miller

KIARA MILLER

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