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10:08:26 1 known to a person of ordinary skill at the relevant time that
10:08:30 2 that person would have understood would allow you to store
10:08:34 3 compressed video on a hard drive?
10:08:43 4 A. You mean the whole video? When you say "store
10:08:47 5 compressed video," you're referring to the entire file?
10:08:49 6 Q. Well, let's say a full-motion video work, as
10:08:54 7 construed by the Court.
10:08:55 8 A. Well, again, we have a bunch of variables here that
10:08:59 9 are -- come into play and are unknown, how long is the work,
10:09:0410 what is the compression algorithm and how big is the disk.
10:09:0811 Q. Okay. And I'm asking you to make whatever reasonable
10:09:1112 assumptions you need there to answer the question.
10:09:1313 A. We also have this issue of quality in the back of our
10:09:1714 mind, right? Clearly we don't want to represent every frame
10:09:2115 by a single number. So, compression algorithms existed; and
10:09:2816 certainly one could take video -- let's go with my
10:09:4017 three-minute length -- or two-minute, whatever I did in the
10:09:4418 tutorial -- and compress it. And providing that the
10:09:4919 compressed -- combination of the compression algorithm in the
10:09:5320 hard disk size gave us a file that there was sufficient room
10:09:5621 to put it on the hard disk, then certainly it could be stored
10:10:0022 on the hard disk.
10:10:0023 Q. Okay. And a person of ordinary skill would have
10:10:0224 understood that before Mr. Lang came up with his invention,
10:10:0725 right?

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10:10:07 1 A. Well, I don't think that storing a file is part of
10:10:10 2 the -- I mean, storing is certainly one of the -- the steps in
10:10:13 3 the claims, but --
10:10:14 4 Q. I -- I'm not ask --
10:10:15 5 A. -- any file can be stored on a disk, right? I mean,
10:10:17 6 this is -- you know, this happens to be a file where the bits
10:10:22 7 represent compressed video. But, you know, this is simply
10:10:25 8 storing a file on a disk. I mean, this was known starting
10:10:28 9 whenever the first disks came out in the Fifties or Sixties.
10:10:3310 Q. Well, and -- and the ability to store compressed
10:10:3411 video on a disk was known as soon as algorithms became
10:10:3812 available that allowed you to compress it to a reasonable size
10:10:4213 that would fit on then-available disks, right?
10:10:4614 A. Well, the ability to store anything on a disk goes
10:10:4915 along with how big is the disk and how big is your thing. So,
10:10:5316 this is just one particular example of data.
10:10:5617 Q. Okay. So, as long as it will fit on a disk, you can
10:10:5918 store any kind of digital information on a disk, right?
10:11:0219 A. That's a bit broad, and I'm not sure I want to agree
10:11:0420 to that. But, you know, bits are bits, right? And what do
10:11:0821 disks do? They store bits so --
10:11:1022 Q. Okay. So, I'd like to talk a little bit now about
10:11:1323 what computers are and what a person of ordinary skill in the
10:11:1824 art would have understood about computers in the mid Eighties.
10:11:1925 A person of ordinary skill in the mid Eighties would have

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10:11:23 1 understood that typical, let's say, workstations had both disk
10:11:33 2 drives -- well, had disk drives, right?
10:11:39 3 A. What is a typical workstation? Can you be a little
10:11:41 4 bit more specific? Previously you mentioned a PC. So, I'm --
10:11:44 5 I just want to make sure we're talking about the --
10:11:47 6 Q. Well, you said that a PC might not be what a person
10:11:49 7 of ordinary skill in the art would use to develop algorithms,
10:11:52 8 for example.
10:11:53 9 A. Right.
10:11:5410 Q. So, I'm talking about the kind of computer that a --
10:11:5611 A. Okay.
10:11:5612 Q. -- person of ordinary skill --
10:11:5813 A. Okay.
10:11:5814 Q. -- would use to develop algorithms. That would
10:12:0015 normally have had a disk drive, right?
10:12:0216 A. You know, I don't actually know that it would have
10:12:0317 normally had a disk drive.
10:12:0418 Q. If it didn't have a disk drive, how would it store
10:12:0719 files?
10:12:0720 A. Oh, I'm sorry. You're referring to hard disk drive.
10:12:1021 Q. Yes.
10:12:1122 A. Yes, I believe it would have had a -- a hard disk
10:12:1323 drive.
10:12:1324 Q. Or it might have had a -- a Ethernet card and used a
10:12:1725 file server, right?

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10:12:20 1 A. Then, I guess, we wouldn't call that a -- a -- more
10:12:24 2 likely, that workstation would be a little bit more akin to a
10:12:28 3 dumb terminal that's running off of some large compute server.
10:12:31 4 Q. Well, certainly was commonplace to -- to use Ethernet
10:12:34 5 to network Unix workstations in the mid Eighties, right?
10:12:39 6 A. Yes. But given the type of development that -- that
10:12:41 7 these folks would be doing on -- even audio, still relatively
10:12:45 8 large file sizes, I don't know that they would want to be
10:12:52 9 constantly shuffling those files back and forth over the
10:12:5510 network as they processed them. I suspect that it would be
10:12:5811 slow for them, and it would be maddening for anybody else on
10:13:0112 the same network.
10:13:0213 Q. Well, whether you do it when you're processing them
10:13:0514 or just to offload the disk space on to a file server
10:13:0815 somewhere, certainly it was something that people of ordinary
10:13:1116 skill in the art at the time would have understood as within
10:13:1417 the range of solutions available to them for working on
10:13:1918 compressed audio or video, right?
10:13:2219 MR. PAYNE: Objection, form.
10:13:2220 A. I sort of lost what the "it" was in that question.
10:13:2621 Q. (By Mr. Stephens) Meaning transferring a file over a
10:13:2822 network to a disk drive on another machine.
10:13:3023 A. There certainly were remote compute servers, yes.
10:13:3424 Q. I'm not asking about a compute server. I'm asking
10:13:3725 about a remote disk drive.

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A. I don't know what the common configuration for those systems were.
Q. It certainly would have been known to one of ordinary skill in the art that you could transfer a file, an audio file, let's say, on one Unix workstation hard disk to a hard disk residing on another machine on the same network, right?
MR. PAYNE: Objection, form.
A. I believe that was possible.
Q. (By Mr. Stephens) And with Ethernet, that transfer would have happened faster than real-time, correct?
A. Now, the Ethernet data rates were 1 to 10 megabit per second; but Ethernet is a shared resource. So, I think it depends on how much other traffic there is on the network as to whether that's a faster-than-real-time transfer or not.
Q. Okay. So, let's assume there's no one else using the network at the time.
A. I think it would be reasonable to expect that the transmission time for the audio file would be less than the playback time of the original file.
Q. And a person of ordinary skill in the art would have understood that if they were using a workstation to develop digital audio compression methods in the mid Eighties, right?
MR. PAYNE: Objection, form.
A. I'm not sure that's something that occurred to them. I think if -- if a genie showed up and asked them to, "Hey,

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what is the bit rate of your audio and what is the bit rate of your Ethernet connection," they might say, "Gee, you're right."
Q. (By Mr. Stephens) Well, let me ask it a little differently. So, if I have a file on my disk inside my Unix workstation and I want to copy that to another disk, whether that's on the -- my same machine or across the network to another machine, there's no connection between that copying time and the amount of time required to play that file back, is there?
A. The data transfer time is solely a function of the available bandwidth and the file size, as we have discussed. So, the transfer is ignorant of whatever the bits represent.
Q. So, the --
A. Now, let's -- let me -- I mean, there is a little bit of a connection. Clearly, if we have a four-hour Wagner opera, that is going to have a larger file than a three-minute Beetles tune.
Q. Well, bigger files take somewhat longer to --
A. Yes.
Q. -- transmit?
A. Yes. So, I mean, I don't think we can completely decouple the two.
Q. Well, it's decoupled in the sense that there's -- you can't predict the amount of time required to make the file

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copy based on the length in minutes that it would take to listen to the performance, right, particularly for compressed?
A. You could, you could. As an engineer, you could certainly upper-bound it.
Q. I'm not asking about an upper bound. I'm asking --
A. No, no, no. Yeah, but this is how engineers think, right? You said you could not; and actually, the -- the -- I think the engineer would say, "Well, first off, I know what the audio is. I mean, I know it's four hours or three minutes. And if it's compressed, then I have a range of what I expect it to be." So, you know, back-of-the-envelope calculations, one can actually -- and -- and similar back-of-the-envelope calculations for available bandwidth, if it's a shared resource or not.
Q. Okay. Now, if you're -- if you're copying a file from one disk to another, you generally want that to happen quickly, right?
MR. PAYNE: Objection, form.
A. I -- I'm not sure that we really want anything to happen when we copy -- I mean, I -- I just --
Q. (By Mr. Stephens) Well, would you agree that the history of computer technology development has been one of ever-increasing speeds?
A. That is certainly true.
Q. And that applies both to I/O, to disk drives and to

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transfers between the simple processing unit in RAM?
A. I think that internal bus speeds as well as transistor switching speeds -- really, it's the transistor -- let me just put in a little blurb here. This is all electrical engineers, nothing to do with computer scientists, in terms of increasing speed of computers. Certainly the -- the Moore's Law and faster and faster transistors have driven all of -- all of the speed increases that you've discussed.
Q. Well, and it's also generally been desirable by users of computers to make them compute faster, right?
A. Well, users of computers and just about everything else that we deal with in daily life. Yeah, I think that's the case.
Q. And it's also been desirable to make the disk drives transfer data faster during that period of computer development, right?
A. Again, I don't know what desirable is. This is all natural evolution of the equipment.
Q. So, the natural evolution of computer systems has led to ever-faster disk drives, right?
A. To this point, yes.
Q. And that's partly because what you can do with a computer is limited by how fast you can move data around, right?
A. It depends on what you're trying to do.

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10:19:05 1 Q. As a -- as a very general principle, that's true,
10:19:08 2 right?
10:19:08 3 A. Well, in some applications, yes. It's the data
10:19:11 4 movement, which is the bottleneck. In other applications, it
10:19:15 5 may well be the -- the computing.
10:19:17 6 Q. Okay. But in many applications and particularly in
10:19:19 7 many multimedia applications, it's how fast you can move data,
10:19:23 8 right?
10:19:24 9 A. I think that multimedia has been also -- "hampered"
10:19:2910 is the wrong word. Multimedia has a lot of computational
10:19:3211 requirements, and I think that it's -- it's not fair to say
10:19:3612 it's solely data transfer speeds within the machine that
10:19:4013 that -- that have -- that are the issue for multimedia.
10:19:4614 Q. Okay. But it's "an" issue for multimedia, right?
10:19:4715 A. It is "an" issue for multimedia. But, again, as I
10:19:5116 mentioned, the driving data rate for MPEG was getting video
10:19:5517 off a CD.
10:19:5618 Q. Okay. And, so, once I have a multimedia file on my
10:20:0019 hard drive and I want to copy it to another hard drive, what
10:20:0420 determines how fast that copy occurs?
10:20:1021 A. Well, we have the -- the computer itself has to --
10:20:1622 operating system has to deal with issuing commands and causing
10:20:2323 the copy to occur at a higher level. The disk drives have I/O
10:20:3224 speeds, as you mentioned, which are caused by both the
10:20:3725 fundamental physical read/write data rate off the disk as well

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10:20:41 1 as the level of error correction and any other signal
10:20:43 2 conditioning or pre- or post-processing they have to do on the
10:20:48 3 data to get it off.
10:20:48 4 Q. Okay.
10:20:49 5 A. And, of course, you know, they are connected by some
10:20:50 6 type of bus. So, we have the fundamental speed of the bus as
10:20:55 7 well.
10:20:56 8 Q. But there's nothing in that process of copying a file
10:21:00 9 from one disk to another that restricts the transfer speed to
10:21:0610 the time required or the speed required for playback; is that
10:21:1111 right?
10:21:1312 MR. PAYNE: Objection, form.
10:21:1413 A. Well, the -- speed required? Speed required for
10:21:1914 playback?
10:21:2015 Q. (By Mr. Stephens) In other words, the -- the time it
10:21:2216 takes to transfer a multimedia file from one disk to another
10:21:2717 on a computer in the mid Eighties was not restricted to the
10:21:3018 amount of time required to play that file back, right?
10:21:3719 MR. PAYNE: Objection, form, assumes facts.
10:21:3920 A. I guess I don't know that. I mean, you could
10:21:4121 certainly imagine building a system where you did put some
10:21:4522 type of constraint on what was going on.
10:21:4923 Q. (By Mr. Stephens) I'm not -- I'm not asking about an
10:21:4924 imaginary system. I'm asking about a typical multimedia -- a
10:21:5225 typical Unix workstation used by a person of ordinary skill in

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10:21:56 1 the art.
10:21:57 2 MR. PAYNE: Objection, form.
10:21:57 3 A. Well, first off, I don't know that the term
10:21:59 4 "multimedia file" even existed --
10:22:02 5 Q. (By Mr. Stephens) Well, let's say audio file.
10:22:05 6 A. -- in the 1988 time frame. So, however the audio was
10:22:08 7 represented, it was simply bits. And as far as the file
10:22:14 8 system is concerned, bits are bits and the bits will be moved
10:22:17 9 from Point A to Point B and there's no reason to expect that
10:22:2010 the bits that happen to belong to an audio file would be
10:22:2311 treated any better or any worse than the bits that belong to,
10:22:2712 say, a -- a user's dissertation file.
10:22:3113 Q. So, the computer doesn't know how long it would take
10:22:3414 to play that audio file back when it's moving it from one disk
10:22:3815 to another, right?
10:22:4016 A. A generic, ignorant computer without prior
10:22:4517 programming or special features, certainly it has no way to
10:22:4918 know anything. The -- what the computer knows about the data
10:22:5119 is really just the file system structure and how big it is and
10:22:5520 where it is.
10:22:5521 Q. So, the transfer time would not be limited to or
10:23:0122 restricted to the amount of time required to play that file
10:23:0423 back, right?
10:23:0624 MR. PAYNE: Objection, form, incomplete
10:23:0825 hypothetical.

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10:23:15 1 A. Sorry, I lost my train of thought. Can you repeat
10:23:17 2 the question?
10:23:17 3 Q. (By Mr. Stephens) Sure. So, when you're copying an
10:23:20 4 audio file from one disk to another disk in a Unix workstation
10:23:24 5 in the mid Eighties, the time required to make that copy isn't
10:23:28 6 restricted to the amount of time required to play that file
10:23:31 7 back, right?
10:23:32 8 MR. PAYNE: Objection, form. Where -- what are
10:23:33 9 you talking about, Unix-based workstations? That's not a
10:23:3610 declaration --
10:23:3711 MR. STEPHENS: Make your objection. Stop --
10:23:3812 MR. PAYNE: I'm going to instruct her not to
10:23:4013 answer the question.
10:23:4114 MR. STEPHENS: You're going to -- okay.
10:23:4115 MR. PAYNE: It's beyond the declaration.
10:23:4116 MR. STEPHENS: All right. You're going to
10:23:4117 instruct her not to answer?
10:23:4318 MR. PAYNE: If you've got a specific prior
10:23:4519 art --
10:23:4520 THE WITNESS: I'm sorry, could I take a break
10:23:4521 and --
10:23:4722 MR. STEPHENS: No. There's a question pending.
10:23:4823 MR. PAYNE: -- you've got specific prior art in
10:23:5124 the declaration. You're suggesting hypotheticals that assume
10:23:5425 facts not in evidence. And, so, I have no choice but to

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10:23:59 1 instruct her not to answer.
10:24:00 2 Q. (By Mr. Stephens) Are you going to follow your
10:24:01 3 counsel's advice?
10:24:02 4 A. Yes.
10:24:01 5 Q. Okay.
10:24:02 6 THE WITNESS: Is it okay if we take a little
10:24:04 7 break?
10:24:05 8 MR. STEPHENS: Then we can take a break.
10:24:07 9 All right. I'll be asking for another day of
10:24:0910 deposition with this witness after we move to compel on this
10:24:1011 point.
10:24:1512 THE VIDEOGRAPHER: Off the record at 10:24.
10:24:1713 MR. PAYNE: And the objection stands.
14 (Recess taken)
10:35:2615 THE VIDEOGRAPHER: Beginning of Tape 3 to the
10:35:2816 deposition of Dr. Hemami. The time is 10:35. We're back on
10:35:3317 the record.
10:35:3318 Q. (By Mr. Stephens) Okay. Dr. Hemami, let's see, we
10:35:3719 were still talking about a person of ordinary skill in the art
10:35:4020 in the mid Eighties. Now, it would have been known to such a
10:35:4421 person that analog-to-digital and digital-to-analog convertors
10:35:5122 were things that were available to them, right?
10:35:5623 A. Yes. The existence of A to D and D to A would have
10:35:5924 been known.
10:36:0125 Q. And that's true both for audio and for video; is that

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10:36:03 1 right?
10:36:07 2 A. Yes. Although, the A-to-D conversion video were
10:36:13 3 substantially more specialized and difficult to get; but they
10:36:16 4 would be aware that it was possible to do that.
10:36:19 5 Q. Okay. And I think we've already talked about the use
10:36:29 6 of disk drives being well known at the time to store digital
10:36:35 7 data; is that right?
10:36:36 8 A. Yes.
10:36:40 9 Q. Now, was it known to use external storage devices
10:36:4310 like disk drives on a SCSI interface?
10:36:5411 A. Storage external to a computer that contained the CPU
10:37:0412 unit was known, yes.
10:37:1213 Q. And the Small Computer Systems Interface or SCSI
10:37:1414 interface, that was also known, right?
10:37:1815 A. I don't know what the time was on the SCSI interface.
10:37:2016 Q. Would you agree that, at least with respect to
10:37:2317 personal computers, the primary types of personal computers in
10:37:2718 the marketplace at the time were PCs and Apple Macintoshes?
10:37:3219 A. I think we called them IBMs at the time.
10:37:3420 Q. Okay.
10:37:3621 A. Certainly the -- well, there were actually quite a
10:37:3822 lot of computers. I had several Commodore computers. I think
10:37:4423 that Radio Shack's Tandy brand had a fair chunk of the market.
10:37:4924 And I think we -- we referred to IBMs and IBM clones.
10:37:5325 Q. Okay. And Apple Macintoshes were available?

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10:37:58 1 A. They were available; but they certainly did not have,
10:38:01 2 I think, really very much market base.
10:38:03 3 Q. Okay.
10:38:04 4 A. They were expensive. I -- they were also, I think,
10:38:08 5 really marketed very much to academic institutions and perhaps
10:38:13 6 not so much to the general public.
10:38:15 7 Q. So, a person who had recently graduated with a
10:38:20 8 electrical engineering degree might well have owned an Apple
10:38:25 9 Macintosh, right?
10:38:2610 A. No, I don't think I would say they might well have
10:38:2711 owned. They may have used one, depending on what institution
10:38:3312 they went to.
10:38:3313 Q. Okay. Well, they were commonly known at least,
10:38:3614 right?
10:38:3615 A. Certainly after the commercial during the Super Bowl,
10:38:3916 I think they were commonly known.
10:38:4117 Q. And that was the Big Brother commercial you're
10:38:4418 referring to?
10:38:4519 A. Yes.
10:38:4620 Q. And Apple Macintoshes had SCSI ports so that you
10:38:5021 could use an external disk drive; is that right?
10:38:5322 A. I do not know if that's right or not. I do not
10:38:5523 remember what was on the back of those units.
10:38:5724 Q. Okay. Well, certainly SCSI interfaces for external
10:39:0125 computer drives were available on many platforms, right?

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10:39:04 1 A. I don't know that. I don't actually know what -- I
10:39:06 2 don't remember what was sitting off the back of those units.
10:39:09 3 Q. Okay. Fair enough. Amigas were another type of
10:39:13 4 computer that was available at the time; is that right?
10:39:15 5 A. Amigas did exist, yes.
10:39:29 6 Q. Now, for any given file representing audio, there is
10:39:36 7 some rate at which it will be transferred faster than
10:39:39 8 real-time, right?
10:39:44 9 A. I -- this question is a little bit vague. Perhaps
10:39:4810 you could be more specific for the -- what's going on.
10:39:5011 Q. Okay. Fair enough. Sure. In your -- your tutorial,
10:39:5212 you talked about faster-than-real-time transmission being
10:39:5713 determined by simply taking the amount of time it takes to
10:40:0014 transmit a file and comparing that to the amount of time it
10:40:0215 takes to play back that file and if it's -- if the time
10:40:0816 required to transfer is less than the time required to play
10:40:1117 back, then you've transmitted faster than real-time. Do you
10:40:1318 remember that?
10:40:1419 A. Yes. That's -- that's an accurate representation of
10:40:1620 what I said in my tutorial.
10:40:1821 Q. Okay. So, for any given file, there's some
10:40:2022 transmission rate at which it will be transmitted faster than
10:40:2423 real-time, correct?
10:40:2524 A. According to how I explained it, yes, that's correct.
10:40:3225 Q. And there's generally going to be at least an average

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10:40:35 1 bit rate associated with playback for a given file. I think
10:40:38 2 that was also something else you explained; is that right?
10:40:41 3 A. Well, we can compute an average bit rate for any
10:40:46 4 digital file that is played back by simply taking the number
10:40:49 5 of bits in a file and dividing it by the length. Now, that
10:40:53 6 may or may not be representative of any particular instant bit
10:40:55 7 rate.
10:40:55 8 Q. Okay. But you can take that average bit rate and so
10:40:59 9 long as the average transmission rate over the whole
10:41:0210 transmission period is higher than that average bit rate for
10:41:0511 playback, then, again, the transmission will be faster than
10:41:0912 real-time, right?
10:41:1113 A. Well, this goes back to the same equation that we
10:41:1414 dealt with before. If we take the average rate of the audio
10:41:1715 file and simply multiply it by the length of the file, we then
10:41:2016 have our bits and we can, again, then do a computation.
10:41:2417 Q. So, these are just simple mathematical manipulations
10:41:2518 of the same underlying numbers, right?
10:41:2919 A. Yes.
10:41:3920 Q. So, you would agree that you can take a given file
10:41:4421 and readily determine whether a given transmission channel, if
10:41:4822 you know the bit rate for that transmission channel, will be
10:41:5323 transmitted over that transmission channel faster than
10:41:5624 real-time, right?
10:41:5725 A. Well, here you -- you've referred to a file. So, if

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10:42:01 1 that file represents some type of information with a temporal
10:42:07 2 duration, then we can certainly compare what we know about
10:42:13 3 that file with the transmission bandwidth.
10:42:16 4 Q. So, for example, if you know the average bit rate for
10:42:20 5 a DVI compressed file is less than 150 kilobytes per second
10:42:27 6 because it can be played back from a CD-ROM, then you would
10:42:30 7 know that if you store it to a hard disk over a -- a I/O
10:42:37 8 channel that will allow you to write to that hard disk, say,
10:42:41 9 at a megabyte per second, that it will be transferred to that
10:42:4510 hard disk faster than real-time, right?
10:42:4811 A. Well, these are numerical comparisons; but, you know,
10:42:5112 the DVI system was not a system to install data on a hard
10:43:0013 drive. It was a system that was designed to produce
10:43:0414 multimedia products in the CD-ROMs. It was very explicit
10:43:0915 about being for training, teaching or sales. And that was a
10:43:1316 CD-ROM product.
10:43:1417 Q. Let me just stop you for a moment. DVI was designed
10:43:1918 to output compressed digital video, correct?
10:43:2419 A. No --
10:43:2520 MR. PAYNE: Objection, form.
10:43:2621 A. -- I don't think that's what DVI was designed to do
10:43:2922 at all. DVI was a system that was envisioned to allow -- to
10:43:3323 put -- for example, an example that is given in a tutorial
10:43:4024 textbook on DVI is to put that book on a CD-ROM. So, to
10:43:5025 today -- what we might call a multimedia presentation of the

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10:43:53 1 book. So, it would contain the text. It might contain some
10:43:59 2 images. It might contain some audio. That was the goal of
10:44:03 3 DVI, was to produce these multimedia products. The goal of
10:44:07 4 DVI was not to produce compressed video.
10:44:10 5 Q. (By Mr. Stephens) Are you confusing DVI with CDI?
10:44:13 6 A. No, I'm not.
10:44:14 7 Q. Okay. So, you're not aware that DVI was done at
10:44:19 8 Sarnoff Laboratories specifically in order to compress motion
10:44:22 9 video so that it could be played back from a CD-ROM? You're
10:44:2610 not aware of that?
10:44:2611 A. Well, I think, perhaps, here, then, what I should ask
10:44:2912 is: When you say "DVI," if you could clarify what you mean by
10:44:3313 "DVI." Now, what I'm referring to is the DVI system that was
10:44:3814 marketed by Intel and seen as a hardware and software solution
10:44:4715 to putting multimedia on personal computers.
10:44:5016 Q. Have you read about the demonstration that -- that
10:44:5417 was done by the people who developed DVI at Sarnoff to play
10:44:5918 back motion video from a CD-ROM in 1987?
10:45:0219 A. I may have, but I do not recall.
10:45:0420 Q. Okay. Are you aware of whether or not DVI was
10:45:1021 capable of outputting compressed digital video that could be
10:45:1622 played back from a CD-ROM?
10:45:1823 A. The video compression in DVI that was part of -- let
10:45:2224 me say, the video compression that was performed off site --
10:45:2625 this is not something that a home computer user could do -- if

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10:45:31 1 a content creator sent the content to a central location,
10:45:40 2 which I believe was Intel, they would get it back on CD in a
10:45:47 3 form that they could then incorporate into their product which
10:45:51 4 was designed to be played back off the CD. So, just to back
10:45:54 5 up just to how we got on the CD thing in the first place, this
10:45:58 6 idea of copying these files from the CD to a hard drive was
10:46:02 7 not something that was envisioned in the scope of DVI. It was
10:46:06 8 not something that DVI, as the entire system with the software
10:46:10 9 and the hardware, taught or even suggested that would be done.
10:46:13 10 Q. I'm not -- I'm not asking about that for the moment.
10:46:16 11 I'm simply asking about whether or not what you got back from
10:46:18 12 Intel when you sent them a video and they sent you back a
10:46:24 13 CD-ROM with compressed video on it was capable of being played
10:46:28 14 back from a CD-ROM?
10:46:29 15 A. My understanding is that it was.
10:46:30 16 Q. Okay. So, it had a bit rate for playback of 150
10:46:38 17 kilobytes per second or less, correct?
10:46:39 18 A. Yes.
10:46:40 19 Q. And, so, if you were able to copy that digital video
10:46:45 20 content from the CD-ROM to a hard drive at a speed of
10:46:48 21 1 megabyte per second, that transfer would happen faster than
10:46:53 22 real-time, correct?
10:46:53 23 A. Well, I could also put the CD in my car and drive a
10:46:59 24 city block and as long as me driving the city block was less
10:47:03 25 time than playing back the video, this transfer also occurred

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faster than real-time. But this is not something that was envisioned or taught or even considered in the DVI system. It simply was outside of the scope of what was appropriate in terms of operation.
Q. I'm not asking -- I'm not asking about whether it was taught or suggested or anything like that. I'm just asking about what would happen. If you were able to copy the video from the CD-ROM to a hard drive at a speed of 1 megabyte per second, would that copy happen faster than real-time?
A. 1 megabyte per second is 8 megabits per second. So, from a file transfer perspective, the time for the file to move, simply crunching the numbers would be less time than that file took to play back. But, again, this is not within the scope or what was envisioned at all for DVI.
Q. Do you know what format the CD-ROMs that Intel sent back to its customers used?
A. I'm not sure what you mean by "format."
Q. For example, ISO 9600 or something like that?
A. No, I don't know.
Q. Okay. So, you don't know whether or not what you got back as a CD-ROM was formatted as a file system that could be mounted and the contents copied to a hard drive; is that right?
A. I do not know.
Q. Okay. If it was, if it was a mountable CD-ROM that

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could be mounted like a normal file system, then you could copy the video content like any other file, correct?
A. That's just not something that is even in the realm of DVI so --
Q. I'm not asking about whether it was taught. I'm asking about whether it -- that is something that would have been possible. If you could mount the CD-ROM as an ordinary file system like a normal CD-ROM, then one of ordinary skill would be able to copy it to a hard drive, right?
A. I don't -- I don't know what the format was. So, I -- I don't know if that was possible or not.
Q. Okay.
A. Now, again, you know, they were very uptight about their proprietary compression algorithm. The point of that -- the point of the off-site compression, they even built something into the PC system, which was essentially crummy compression for developers, so they could develop their multimedia product without having to constantly send stuff off and pay for it getting compressed and getting it back such that sort of at the end when they were satisfied with exactly how their system was going to work, they would ship the -- the video that they wanted in their final product off to Intel or whoever the compression house was, if I'm incorrect about Intel, get the compressed stuff back. Now, that was for the final product, which would then be manufactured. So, in fact,

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I -- I don't know that it would come back in -- in a normal file system format. I mean, this was for the final production. These CDs would be burned or stamped or whatever the term is and then distributed or sold.
Q. You just don't know one way or another, though, what the format was, right?
A. I don't.
Q. In a normal CD-ROM format, a typical CD-ROM format would be mountable as a typical file system, right?
A. Again, what's a normal CD-ROM format?
Q. For example, ISO 9600.
A. So, when I stick a CD in a computer, it can be mounted as a file system. Whether that was the case at that time, with respect to ordinary file system activities, I don't know.
Q. A typical CD, in your experience -- excuse me, a typical CD-ROM as opposed to an audio CD, when you put it into your computer, it's automatically mounted as a file system, right?
A. Not my computers but maybe an ordinary computer, yes.
Q. Do you use a Unix machine?
A. I do.
Q. And it's --
A. Actually, I use three Unix machines that look just like yours.

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Q. Okay. And you can type "mount" and maybe dash "T ISO 9600" and mount it --
A. And mount the system.
Q. -- as an ordinary file system, right?
A. Yes.
Q. Okay. Oh, incidentally, do you know what UUCP stands for?
A. Yes. It's Unix to Unix copy protocol.
Q. Okay. What did Mr. Lang invent?
A. What did Mr. Lang invent?
Q. Yeah, what's his invention?
A. Well, Mr. Lang -- I think this is probably best described and certainly more eloquently than what I'm going to say here in the -- what I think is the very last section of my claim construction report prior to the -- very close to the end of the -- prior to the -- the arguments about the constructions, in that based on an understanding that compression technology and communication technology -- let me just state something here. Let's remove "the based on" effect. Compression technology and communication technology to that point for audio and video information had been used to essentially provide digital broadcasting. And when I say "digital broadcasting," I'm using "broadcasting" in the sense of real-time delivery. What Mr. Lang understood that was unique was that the combination of having digital information

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and high-speed communication actually allowed one to move beyond the realm of simple real-time delivery to actually what I think we would call today a fast download, that it was possible to decouple, to some extent, as we've been discussing, the transfer time of the information from the playback time of the information.

So, then, Mr. Lang invented -- I hate using legal terms -- an apparatus and a method to -- that essentially provided the capability to do this. Now, of course, there's also a lot of other stuff in there. Editing of this information is one thing that comes to mind, other things which are facilitated, the -- the retransmission of the compressed information.

Q. Okay. But putting the other things to one side for the moment, you would say his invention was -- the recognition that the combination of digital compression and fast transmission allowed you to decouple the transfer playback -- transfer and playback time of an audio or video media file by sending it faster than real-time; is that right?

MR. PAYNE: Objection, form.

Q. (By Mr. Stephens) Did I miss something?

A. Yes. And let me add to that that while -- all of this is being done in the context of units to whom this information is meaningful. Now, what I mean by that is the VCR-ET that is described in the specification has -- in the

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'995, has the hardware in it in order to not simply receive those bits and transmit them away faster than real-time but also to decompress and make available for, at the very least, viewing or -- viewing in a broad sense, viewing or listening -- by a user and, of course, also -- also editing. But as this -- this device -- these bits have meaning to the device. It's not simply a -- let's contrast it with a satellite relay which can certainly receive the compressed -- if -- if one is transmitting through a satellite, can certainly receive the bits faster than real-time and transmit them away and store them for some amount of time possibly, if we had a special satellite, and then transmit them away; but that satellite has no capability -- those bits are meaningless to that satellite. The bits may as well be, you know, some T1 line that is being routed through the -- through the satellite system or, you know, some large corporation that is leasing -- leasing their own satellite link for high-speed data transmission between two points. Satellite doesn't care what the bits are. Mr. Lang's invention, the bits are meaningful. They're not simply files which may or may not represent any particular type of information.

Q. Let me just -- I just want to make sure I've got your understanding correctly. So, what Mr. Lang invented was the combination of digital compression and fast transmission that allowed you to decouple the transfer and playback time so that

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you could send an audio or video file faster than real-time; is that right?

MR. PAYNE: Objection, form.

A. I think that's accurate. The realization that one was no longer stuck with real-time delivery.

Q. (By Mr. Stephens) Okay.

A. And I think that was really the -- you know, that -- that was something that, I think, the community really did not foresee, audio and video information had been broadcast, "broadcast" meaning we got it over our television sets or over our radios and, you know, 6:00 news was at 6:00 and that's the way it was and it was this concept that -- that just because you went to digital, you actually could move away from this real-time transmission that I think is -- is an important feature.

Q. Okay. Now, you said something interesting a moment ago. You said you can also transfer a video in your car faster than real-time, right?

A. Ah, yes.

Q. So, you can take the tangible copy of a movie and walk out the door of a video store and get home in less than two hours, typically, right?

A. Not given my experience with Houston traffic but certainly in Ithaca, yes, that is a possibility. Yeah, so, if we go by -- again, going back to my tutorial with the little

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stopwatch, if you clock the time it takes you to walk or drive home from the video store and that comes in under the time that is printed on the disk in terms of the viewing time, then certainly you have moved that disk in less time than it takes to watch it.

Q. Okay. Otherwise, it would always take you 90 minutes to get home with a 90-minute movie, right?

A. Some people are like that anyway, yes.

Q. What I'm getting at is that the very fact of making a tangible copy of a temporal media product decouples the time required to transfer it from the amount of time required to view it, correct?

A. I -- I think I -- with all the Ts at the beginning, I didn't quite follow you there.

Q. Okay. Would you agree that the simple fact of making a tangible embodiment of a -- of a video --

A. Having a physical copy of it.

Q. -- having a physical copy of that, decouples the time it takes to transfer it from the time it takes to watch it?

A. Well, in a hypothetical situation, yes. With respect to what we're speaking about here in these patents, I don't think that physical transfer -- I would include as anything that -- that falls into faster than real-time.

Q. I understand you're not saying that its transmission is required by this patent. I'm just simply asking, not --

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not as a hypothetical matter but as a very practical, real matter, having a physical copy of a video on a tape decouples the amount of time required to transfer it from one place to another place from the amount of time required to watch it, right?

A. Well, you know, I -- I have to say that this -- this concept is -- is actually in a textbook that I had referred to earlier which starts off by saying: "You should never underestimate the bandwidth of a station wagon driving down the freeway that's filled with magnetic tapes in the back." And, you know, I think that this, again, this simply goes back to this concept of the communication link as an abstract entity. Again, I want to make completely clear I do not think that physical transfer has any relationship whatsoever with this particular group of -- of patents. But a communication link is bits per second and to get from -- from Point A to Point B.

Q. What's the name of that textbook?

A. That's the Sklar -- I can't tell you what the name is, but the author is S-k-l-a-r.

Q. And that's cited in one of your reports?

A. It's in the claim construction report, yeah.

Q. Okay. So, that was something that people of skill in the art understood, actually, that physical transfer of tapes is one way to have a high bandwidth transmission, correct?

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A. Oh, I don't think that they would consider it a high bandwidth transmission. I think it's a matter of engineering efficiency. It's -- you know, what -- what is simply the appropriate solution for what needs to happen? If somebody has, you know, in the magnetic -- in the magnetic tape example, you know, if you have to get all the information from Point A to Point B, never mind the communication link. Somebody has to physically insert all those tapes and take them out. So, whereas you may have no issues with the actual physical propagation media, be it -- be it the RF or physical, you may have plenty of bandwidth. You just don't have somebody who's willing to sit there all day and exchange the tapes. So, you know, there are many factors which go into how do we try to get information from Point A to Point B.

Q. Okay. But you'd also agree that the simple fact of having a physical copy of a video on your hard drive decouples the amount of time required to transfer that video to another hard drive, electronically, from the time required to view it, right?

A. I'm not sure there's anything that has to be decoupled. I mean, you know, files are files; and whatever you do with them is a function of the application and the file and what you happen to be doing with your -- your computer at the time. So, you know, I'm not even sure there's a relationship here that was coupled that was then decoupled.

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Q. Okay. So, when you're making a copy as opposed to broadcasting for somebody to view it, there really is no coupling of the amount of time required to make a copy to the amount of time required to view, right?

A. Well, make a copy how?

Q. Digitally from one hard drive to another.

A. Well, again, we have discussed transfer rates of drives and that these are independent of what is stored on the drive. So, from that perspective, moving a file from Point A to Point B is -- is irrelevant as to what the file is. Now, again, you know, let me go back to emphasize with respect to this invention that, you know, I think an important feature is that these units that are receiving and transmitting away in the -- the Lang patents, the data has meaning to them and, in other words, these -- these units, the data could be played on them. A simple -- were -- were a compressed audio file randomly sitting on some hard drive moved to some other random hard drive, those bits have no special meaning to the hard drive. Maybe this goes back to the decoupling. They're just bits.

Q. Okay. But that's not in the claims anywhere, right?

A. What's not in the claims?

Q. There's nothing in the claims that say that -- that bits have to have meaning to the devices; is that right?

A. That statement does not appear in the claims, but I

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read the specification as a whole and I interpret the claims in light of what I read in the specification. I mean, this is a packaged deal.

Q. Okay. So, what is it? What specific language in the claims do you have in mind that means that bits have to have meaning to the device?

A. I don't have any specific language in mind. Although, I have to say I could go back and look at them. But in terms of reading the specification, the claims go with the specification, I'm considering this as a whole.

Q. All right. Well, considering it as a whole, is it your opinion that the claims require that the device that practices the claims has to be capable of playing back the audio/video source information?

A. I think that that is certainly a feature that is implied. Now, whether it becomes a rigid requirement or not, I don't know. I mean, I have a sense that moving data between two hard drives that just happen to be sitting somewhere is not in the spirit of the claims.

Q. Well, if -- if we talk about the workstation that we were talking about before that you mentioned that a person of ordinary skill in the art might use to debug an algorithm or verify that it worked, that would be able, typically, to decode the audio file we're talking about, right?

A. So -- no, actually, I don't know that any arbitrary

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workstation would be able to decode an audio file.
Q. My question is not about an arbitrary work station. My question is about the work station that the person of ordinary skill in the art is using to verify a particular algorithm.
A. I don't know what that workstation is, though. I don't know what's on it. I don't know what they're using. I -- I don't know.
Q. Okay. Now, the decoupling that we were talking about with respect to making copies -- actually, let me ask a different question. Have you ever listened to music on cassettes?
A. Yes.
Q. Do you know how cassettes are manufactured, prerecorded cassettes?
A. No.
Q. Would it surprise you to learn that they are made by high-speed tape duplicators?
A. No.
Q. So, that's another example of where -- if what you're doing is copying a medium or copying an audio representation from one medium to another, that you can decouple it from the amount of time required to listen to it, right?
MR. PAYNE: Objection, form.
A. Again, I'm not sure what the decoupling is.

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Q. (By Mr. Stephens) Well, it's the decoupling --
A. Certainly, if you do a high-speed recording, meaning were one to listen to what was being played as the tape spun about, it would come out sounding like the Chipmunks.
Q. That's not what I'm asking about.
A. But that's certainly not the speed at which the recording is intended to be listened to.
Q. Okay. So, here --
A. So, those two things are certainly unequal. Again, decouple is -- is -- I'm not quite sure what that means.
Q. Well, it was a phrase you used just a few minutes ago.
A. Yes. But in this context, you know, obviously a longer tape is still going to take longer to copy than a shorter tape. I mean, there is still going to be some relationship there.
Q. That's the same as a longer file taking longer to copy than a shorter file, right?
A. Yes.
Q. That has nothing to do with what's in the file, just how big it is, right?
A. Yes.
Q. Okay. So, I guess what I'm getting at is that as long as you're making a copy and you're not listening to it as you're making the copy, there's really no necessary connection

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between how long it would take to make the copy and the time required to listen, right?
A. That's very much a function of the copying -- the recording technology and the copying technology. So, I mean, I think it's a blanket statement. I don't think that's necessarily true. Certainly in several of the examples we've discussed, it is.
Q. Okay. Well, and as a general matter, if your goal is to make a lot of copies, you want to do it faster, wouldn't you agree with that?
A. I don't know. I've not actually been in a position where I've had to make a lot of copies of -- of many things. And actually, I could see a situation where the most important thing might be the -- the fidelity of the copies, the quality of what was done so that speed may be one factor; but it certainly would not necessarily, I think, be the only one.
Q. Okay. There's always trade-offs in engineering, right, almost always?
A. Yes.
Q. Okay.
A. If -- if they're not tradeoffs, then we have a bad design.
Q. But in mass production, it's typical to want to produce things quickly, right?
A. I think a good capitalist would agree with you, yes.

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Q. Okay. So, if your goal is to make a lot of cassettes to distribute music, chances are you want to be able to copy tapes faster than real-time to do that, right?
A. You know, I --
MR. PAYNE: Objection, form.
A. -- I'm not a recording house. So, I -- I -- I really don't want to speculate on what they're trying to do or what they're not trying to do when they're trying to make lots of copies or not. You know, we -- we certainly see a plethora of copies and all kinds of things that come out of China and -- and I have no idea how these things are put together, but they certainly keep coming and are apparently being purchased.
Q. (By Mr. Stephens) Well, would a person of skill in the art have understood that you could make copies faster than real-time of audio?
A. What is "make copies" now? First we were talking about -- I mean, we just talked about, I guess, mass production. So, what -- what do you mean by making a copy, now?
Q. Take one audio recording of any kind and then produce an identical or nearly identical copy of it.
A. I guess I -- I don't even know -- you know, the person of ordinary skill that I've described is not a manufacturing engineer. This person is a -- a technical person who can develop and understand algorithms.

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Q. What --
A. So, you know, to just -- "copy" is a -- is a term that is very broad at the very least.
Q. Okay. Well, let me ask you a different question, then. Would a person of skill in the art have understood tape duplication?
A. "Tape duplication" meaning mass production or what --
Q. Meaning take a copy -- take a tape and make a copy of it.
A. Well, I -- I think that we certainly had dual-deck tape drives at the time. So, I don't even think one of skill in the art would -- I mean, this was something that was known, I think, in general, consumer electronics, in 1988.
Q. And, in fact, high-speed cassette duplicators were known in the art at the time, right?
A. I don't know that.
Q. Okay. You just don't know one way or the other?
A. I'm not familiar with high-speed cassette duplicators.
Q. Okay. In fact, the problem Mr. Lang was trying to solve, as set out in the '995 patent, was how to duplicate video cassettes, right --
A. Yes.
Q. -- one of the problems?
A. Yes.

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Q. So, presumably, a person of ordinary skill in the art directing themselves to the same problem that Mr. Lang was attempting to solve would have had some familiarity with the process of making copies of tapes, correct?
A. A person of skill in the art who was directed to making copies of tapes certainly would be aware that this was a problem.
Q. Okay. Do you think that a person of skill in the art who was attempting to solve the same problem that Mr. Lang was trying to solve would have known about how cassettes were duplicated at the time for mass markets?
A. Well, okay. Again, let's clarify what we mean by "skill in the art" here. I looked at this from the standpoint of designing a system that was put in place. Now, one problem that was in there was this cassette duplication. Certainly people who were looking into cassette duplication, I think, yeah, are going to be aware that this was a -- this is a problem that they want to solve.
Q. So, a person looking into tape duplication would likely have been aware that you could duplicate tapes faster than real-time, right?
MR. PAYNE: Objection, form.
A. I just -- I don't know any such person. So, I just don't know what the world of -- of tape duplication involved at the time. It's something I'm just not familiar with.

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Q. (By Mr. Stephens) Okay. Have you looked at any of the tape duplication art in this case?
A. I have looked at everything that was in the file histories. Now, I may not have a memory of looking at it; but I looked at it. So, if there was tape duplication material in those file histories, then I read that.
Q. Okay. But you don't know what the state of the art was with respect to tape duplication at the time that invention of the '995 patent was conceived; is that right?
A. That's right. Beyond what is actually in the '995 patent and whatever I read in the -- if there is anything in the -- in the file histories, I don't know.
Q. Okay. So, you just can't say whether a person of ordinary skill in the art would have known that making copies faster than real-time was normal in the tape duplication art, right?
A. That's correct. I don't. I don't know.
Q. Okay. Now, you said earlier that Mr. Lang's invention was a combination of digital compression and fast transmission that allowed you to move an audio or video file faster than real-time.
A. I said maybe the realization that that combination allowed you to do that.
Q. Okay. Mr. Lang was not the first person to have that realization, right?

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A. No, I think he was.
Q. Now, Walter -- you're familiar with the Walter patent, right?
A. Yes.
Q. You've expressed opinions about it in connection with the summary judgment proceedings, right?
A. Yes.
Q. Walter explicitly describes using digital compression and fast transmission to send a compressed digital video file faster than real-time, correct?
A. Walter does send the file -- a file that has been compressed faster than real-time. Walter is missing key elements that we see in the -- the Burst claims.
Q. Okay.
A. But I do agree, Walter certainly talks about sending a two-hour movie in 31 seconds.
Q. So, with respect to the realization that you could use compression and fast transmission to send an audio/video work faster than real-time, that is spelled out very clearly in Walter, correct?
A. No, I -- I disagree with that. And I disagree with that because the Lang patents specifically describe how the compression might be done and provide for actually doing it. We have the compressor, decompressor. We have a system diagram that is given that actually performs this. Walter

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11:16:27 1 tells us that his video files are compressed, but he -- I
11:16:39 2 should say his system does not actually perform that
11:16:44 3 compression.
11:16:44 4 Q. Okay. But his -- his patent tells you how to do it,
11:16:50 5 right?
11:16:51 6 A. Tells you how to do it? Can you be more specific?
11:16:53 7 To do --
11:16:53 8 Q. Well, it describes to compress video. It describes
11:16:57 9 inter-frame differential, pulse code, compression, correct?
11:17:0310 A. Walter does mention that, yes.
11:17:0411 Q. Now, is that description enough to enable a person of
11:17:0812 ordinary skill to figure out how to do the kind of compression
11:17:1313 that's described?
11:17:1414 A. I think that that is certainly a sufficient
11:17:1715 description of the algorithm, but Walter teaches us that he or
11:17:2316 his system is not actually performing the compression.
11:17:2717 Q. Well, that's not true, is it? In fact, it uses files
11:17:3018 that he specifically says are compressed in that form. So,
11:17:3319 therefore, he teaches you that you need to compress them in
11:17:3620 that form, correct?
11:17:4021 MR. PAYNE: Objection, form.
11:17:4222 A. Actually, could I see the Walter patent?
11:17:4423 Q. (By Mr. Stephens) Yeah.
11:17:4524 A. And, also, if I could just have my second
11:17:4725 declaration, too --

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11:17:49 1 Q. Sure.
11:17:49 2 A. -- so I don't waste time flipping around.
11:17:52 3 Q. All right. Let's mark your second declaration first.
11:17:55 4 This will be Exhibit 248.
5 (Exh.248 marked)
11:18:00 6 MR. STEPHENS: Do you need that, Les; or do you
11:18:01 7 have one of those?
11:18:03 8 MR. PAYNE: I've got it. Thanks.
11:18:05 9 MR. STEPHENS: Sure. Let me just write on my
11:18:0710 copy so I don't lose track of the number. Sorry. Bear with
11:18:2311 me just a second here. These are labeled in a way that's very
11:19:0412 hard to understand.
11:19:0613 MR. PAYNE: Can we just take a one-minute break?
11:19:0914 MR. STEPHENS: Yeah, sure.
11:19:0915 THE VIDEOGRAPHER: Off the record at 11:19.
16 (Exh.249 marked)
17 (Recess taken)
11:23:2718 THE VIDEOGRAPHER: Tape 4 to the deposition of
11:23:2819 Dr. Hemami. The time is 11:23. We're back on the record.
11:23:3420 Q. (By Mr. Stephens) Okay. Dr. Hemami, I think before
11:23:3821 the break, we were talking about Walter; and I asked you
11:23:4122 whether or not Walter specifically teaches that the files that
11:23:4423 are being transmitted faster than real-time are compressed.
11:23:5124 A. Yes.
11:23:5425 Q. And he tells you how to do that, right?

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11:23:55 1 A. He does tell us that -- he mentions an inter-frame
11:24:03 2 differential post-code modulation technique.
11:24:05 3 Q. Okay. And I think you mentioned that that
11:24:08 4 description is enough that one of ordinary skill in the art
11:24:11 5 would be able to figure out how to actually make that work,
11:24:14 6 right?
11:24:14 7 A. Yes.
11:24:15 8 Q. So, then, the Walter patent, then, tells one of
11:24:19 9 ordinary skill in the art back in 1985 that you could take
11:24:2810 video, compress it using inter-frame differential pulse-code
11:24:3311 modulation, store it in memory and transmit it faster than
11:24:3912 real-time, right?
11:24:4113 MR. PAYNE: Objection, form.
11:24:4214 A. So, I -- I think I would disagree slightly with how
11:24:4615 you phrased that. Walter does not perform the compression.
11:24:5416 What Walter tells us is that you can take stored, compressed
11:25:0017 video and transmit that from effectively a cable system head
11:25:0718 end faster than real-time to what he calls -- what did he call
11:25:1319 it -- data receiving station, which is essentially a set-top
11:25:1720 box.
11:25:1821 Q. (By Mr. Stephens) Okay. But you can't store
11:25:2022 compressed information unless you compress it, right?
11:25:2423 A. Well, I disagree with the statement as you have
11:25:2824 phrased it --
11:25:3025 Q. Well, someone has to --

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11:25:30 1 A. -- with the use of "you" --
11:25:32 2 Q. -- compress it. Fair enough.
11:25:34 3 A. Yes. The data must be compressed in order to have it
11:25:37 4 stored in compressed form.
11:25:39 5 Q. Okay. So, a person of ordinary skill reading Walter
11:25:41 6 would understand that in order to perform the methods that are
11:25:44 7 described in the patent, you would have to -- someone would
11:25:49 8 have to compress digital video, right?
11:25:52 9 A. I -- I think it's -- we can be a little bit stronger
11:25:5610 than that. I think one of ordinary skill reading the Walter
11:25:5911 patent would understand that that someone is not the cable
11:26:0512 that the -- get the name right here -- the central data
11:26:0913 station, that that compression occurs outside of the central
11:26:1414 data station, which is described in detail in the Walter
11:26:1915 specification.
11:26:2016 Q. But it does have to be performed somewhere, right?
11:26:2517 A. It does have to be performed somewhere by someone,
11:26:2718 which is -- that someone is -- is not -- now, it's someone --
11:26:3019 something. That something is not the central data station in
11:26:3620 the Walter specification.
11:26:3821 Q. Okay. But Walter doesn't say you can't perform the
11:26:4022 compression at the same central data station where you perform
11:26:4523 other parts of the method, does it?
11:26:4924 A. I would argue that Walter is very strong in teaching
11:26:5325 that the central data station does not perform the

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compression, and --
Q. Where does --
A. -- I think I've outlined that.
Q. Okay. Where does he say that?
A. Sorry. I just want to use the -- so, I think probably the best -- we have extensive use of the term "preprogrammed" throughout the Walter specification. Now, I've made mention of that in my declaration, and we also have -- Walter gives us a very nice description of the invention, as I mentioned, in Item 40 in Column 2, lines 9 through 46. And in the combination of this continued use of "preprogrammed" in the memory modules and the -- the description of the unit in Column 2 and, for that matter, throughout the rest of the document makes it clear to me that the -- the compression is not performed in the central data station.
Q. Okay. But he never says that anywhere, does he? He never says: "Do not perform the compression in the central data station" or "you can't perform it in the central data station." There's not -- there's no language to that effect anywhere in the specification, is there?
MR. PAYNE: Objection, form.
A. Those two sentences that you just gave do not appear in the specification --
Q. (By Mr. Stephens) And there's no language

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specifically to that effect, even using different words, correct?
MR. PAYNE: I don't -- I don't know if she was finished with her answer.
MR. STEPHENS: I'm sure she's capable of telling me if she wasn't.
Q. (By Mr. Stephens) It was not my intention to cut you off.
A. So, what did I say? I said --
THE WITNESS: Can you read my answer, please?
(The record was read as requested.)
A. Okay. So, let me continue to the end of that sentence. But "preprogrammed" throughout this and the very clear absence of description of any type of hardware to perform that compression does indicate that it's not in the central data station.
Q. (By Mr. Stephens) Again, though, there's no language anywhere that expressly says that it's not in the central data station; isn't that right?
MR. PAYNE: Objection, form.
Q. (By Mr. Stephens) Other than the fact that it's pre -- that the modules are preprogrammed and that it doesn't, in your view, expressly describe hardware for performing compression, is there anything else you would point to as showing that it cannot be done or would not be done in the

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central data station?
A. So, my arguments for why I feel very strongly that there is no teaching and, in fact, a teaching away of the compression being performed in the central data station are as I have outlined in Item 40, the extensive use of "preprogrammed," the descriptions of the unit which completely omit any reference to compression apparatus or a compressor, decompressor and --
Q. Okay. Now --
A. Sorry, go --
Q. Are you finished? I didn't mean to cut you off.
A. Yeah.
Q. Now, you mentioned that one of ordinary skill would be able to implement the compression that Walter discloses. How would one of ordinary skill go about doing that?
A. Now, you're asking this question with respect to Walter or in a vacuum?
Q. No, with somebody reading Walter in 1985. How would a person of ordinary skill reading Walter in 1985 have gone about implementing the compression that's described in Walter?
A. That depends on essentially their system design constraints. I mean, we need some constraints in order to put a system together.
Q. Okay. Assuming no other constraints besides what one of ordinary skill in the art would have known about and what's

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described in Walter, what's your view of how such a person would go about implementing that compression?
A. Well, I -- I can't -- I can't really answer that question without having some kind of design constraints. I mean, there are many, many ways in which that compression inter-frame differential pulse-code modulation could be implemented; and the particular application is going to -- and the desires of the -- the customer, for lack of a better word, whoever the system is being designed for, are -- are really going to dictate how that would be done.
Q. Okay. Could it have been done with a general purpose computer?
A. I'm a little -- again, are we talking about inserting something into the data station or somebody just walks down the street and reads the Walter patent and goes back to their home and says, "Gee, I think I'll do inter-frame differential post-code modulation"?
Q. No. What I'm talking about is somebody at a -- let's say a large sophisticated cable television organization and read Walter and said, "Hey, this looks pretty cool. Let's build it. Let's take a license from Walter, and let's build it. And let's also say that the boss who made that decision told his team of engineers: "Use a general purpose computer to do the compression that's described there." Is that possible?

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MR. PAYNE: Objection, form.
A. Again, nearly -- nearly anything would be possible. Whether it would be considered a even feasible solution at the time would be another -- another matter. And Walter has given us inter-frame differential post-code modulation and also suggested a compressed data rate. So, with those two things, what an engineer is missing is design constraints that are essentially put in place by, again, the customer, how big does this equipment -- how big should it be, how big can it be, maybe, is a better word, how small would you like it to be, how much power would you like it to consume and how long would you -- what -- what is your upper bound on how long it should take in order to perform the desired operation? Probably in the -- you know, a corollary would be how long are the programs which you intend to run through the compression system, sort of consistent with how long do you want it to take. So, without really having design constraints, it's difficult to say that any particular solution would be a valid solution.
Q. (By Mr. Stephens) Okay. Well, let's say that your design constraints are that you only want to use it for 3 minute music videos and that you want to be able to compress one or two of those a day to put -- add to your library so that in the course of a few months, you can have a few dozen to be able to load into memory modules so that they could be

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transmitted over the system described in Walter. Would -- could you do that on a general purpose computer in 1985?
A. So, I would need to actually get some specifications for general purpose computer in 1985 and do some computation. I don't want to answer that just off the top of my head.
Q. Okay. Fair enough. So, you can't say that it wouldn't, and you can't say that it would right now; is that right?
A. Yes. I -- I just -- you know, I -- I don't want to speculate on what particular rates were that I might be correct or incorrect. I'd rather do the correct calculation.
Q. Okay. Now, I just want to be clear. Now, you've said that Walter teaches away from actually putting the compressor into the central data station; but you haven't -- I think you've admitted that it does teach compression, though, right?
A. Walter certainly mentions that the digital data is compressed, yes.
Q. Okay. And then it also teaches storing that compressed digital video in memory, right?
A. The compressed digital video is in the memory modules, yes.
Q. Okay. And then it also discloses transmitting that compressed digital video that was stored in memory faster than real-time, right?

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A. Walter doesn't use those words; but certainly 31 seconds for a 2 hour movie, we would call faster than real-time.
Q. Okay. And it also discloses receiving that compressed digital video transmission faster than real-time, correct?
A. The data receiving station receives the data, yes.
Q. Okay. And it discloses storing that compressed digital representation in memory after receiving it, correct?
A. Yes.
Q. Okay. So, all of those elements are present, right?
A. The elements that you have -- using the term "elements" sort of to refer to -- again, I'm thinking back through the -- the claim terms. Walter, we have drawn on two separate locations or entities in order to go through those elements.
Q. Okay.
A. So --
Q. But -- hold on, before you -- I don't mean to cut you off, but -- but we've only drawn on one document; that's right?
A. We have only drawn on the Walter patent; but Walter teaches us a central data station, which I -- I describe as a cable head end, and a data receiving station, which is the -- what we would call today, I think, the user set-top box. And

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the receiving and storing and, for that matter, playback as well occurs at the data receiving station, which is a separate location than the -- the central data station. I think I -- I explained how these -- one of ordinary skill understands that these are two separate locations and would not be considered to be a single entity.
Q. Okay. Now, building out a system like this, at least if it covered more than a -- a hotel, let's say, if it covered several neighborhoods, would be very expensive, right?
A. I don't know.
Q. Well, running optical fibers to homes in several neighborhoods would be expensive, right?
A. So, I think that generally I can agree that this would not be a -- it would incur some cost. You know, what the cost is clearly depends on who you hire to run the wire and -- and where you got the wire from and so on.
Q. Okay. So, if you were an engineer in 1985 tasked by your cable system customer to develop an actual working version of what's described in Walter, you would first build that in a prototype system, right? You wouldn't go out and pull the -- pull the fiber to dozens of houses before you'd made sure you had it working, correct?
A. I actually don't know that that's necessarily the case. You know, I'm not a marketing person; but I've seen plenty of examples where the job is sort of moved to the point

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where it's beyond return: "Oh, we've invested so much" --
Q. I'm not asking about one --
A. -- "we can't possibly go back here." So, no, I don't know that. I don't know that. I could see a scenario where somebody says: "You know, we really need to go practice running these optical fibers first and make sure that we can really do this because, after all, what a shame it would be spend all those engineering manhours on building a prototype when it turns out we can't actually get the optical fiber somewhere."
Q. I'm not following you. You -- you're saying you should go ahead and build out the system before you do a prototype because you're not sure you can get the fiber? I'm not following your example.
A. I'm -- I'm not saying you should. I'm saying that it -- it is not implausible that -- that somebody might do that.
Q. Okay. But certainly it's common engineering practice when building something you've never built before to build a prototype or a breadboard or a brass board, as they're sometimes referred to, to see if you can make it work before you build out a large investment?
A. Generally, I think we do have to prototype things before going into production of any sort.
Q. Okay.

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A. Now, sometimes the prototype becomes the lone product.
Q. Okay. Now, if you're building a prototype, it's typical to do that in a laboratory, right?
A. I would say, no, it's not typical. Look at Hewlitt Packard and Apple, I mean, the famous garages, right, so --
Q. Well, but if you're a large company, you're normally going to have a place, a building where you do that kind of development work, maybe more than one, right?
A. I would agree that large companies may have development -- development facilities.
Q. Okay.
A. A lot of them farmed it out as well.
Q. Okay. Now, if you're going to prototype the system that's described in Walter, you have to have all the elements we talked about, right? You have to have compression of video. You have to have storage in memory. You have to transmission faster than real-time. You have to have receiving and storage in memory. You have to have all those things to make the system described in Walter work, right, somewhere?
A. You -- well, you know, the question you asked sort of started off one way and ended up in an inconsistent way. So, first off, let me say, I don't know if anybody ever prototyped this. I have absolutely no idea. But secondly, so -- so,

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having said that, I haven't the foggiest idea what -- what was done, if anything at all, in prototyping the Walter system.
Q. I'm not asking about your knowledge of what was actually done.
A. But let me also say that -- that, in fact -- you implied that in order to -- your question started off saying: If you were going to prototype this, you'd have to build absolutely everything. And, in fact, no, actually, prototypes -- a prototype is a flexible term. We -- prototypes can have all of the components of a system. They can have three components. There might be fake things put in. In particular, let me just mention, that with respect to this system and the fact that the compression is off site, it is certainly -- would certainly be feasible to prototype substantial portions of this system. And depending on what the designers thought were the most difficult parts to design, they may well be exercising, really, hitting on what they think is the toughest thing with random data in the memory modules.
Q. Okay. You could do that. But if you wanted to prototype the system as described here, you'd have to have compressed digital video, right?
A. So, "prototype the system as described here" means --
Q. Means having all the elements that we see in Figure 1.

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A. If one wanted to play back video on one's prototype data receiving station that actually -- no, actually -- having a working -- this system and any system, for that -- maybe I shouldn't say "any." Many systems can be completely exercised in prototype without actually ending up with a complete replica of exactly the system doing exactly what it wanted.
Q. I understand all kinds of things are possible. But I'm saying, if you want a prototype of what's shown in Figure 1, you'd need to put all those elements together, right, including the compression that we talked about, which is not shown in Figure 1?
A. No, no. It depends what does "prototype" mean, you know. Is -- it depends what we're prototyping. If -- if an engineer's concern is Communications Controller 64 and he or she thinks that, you know, everything else here, I've either already designed or I know of XYZ that I can go buy and put together, then maybe that's what -- that's what's done. I mean, prototype is a -- you know --
Q. Okay. Well, let me ask a different question. Are you aware of any practical reason that would prevent you from building everything that's described in Figure 1 in a single, large room?
MR. PAYNE: Objection, form.
A. This is -- other than the fact that this is just something that from a practical standpoint one typically would

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not do. Certainly if a room were big enough, one could keep inserting things in it until everything was there.
Q. (By Mr. Stephens) And that's also true for a cabinet, right?
A. While true, one would have no motivation whatsoever to put a data receiving station and a central data station in the same cabinet or in the same room.
Q. Okay. Unless you were trying to mock up the entire system and make -- see if you could make it work from end to end. That would be a motivation to do it, wouldn't it?
A. Again, I -- I even disagree that -- that mocking up the system, you would end up with exactly the whole thing put together. That's just -- you know --
Q. Can you point to a specific reason why --
A. Yes.
Q. -- or a specific thing that would be missing, in your view?
A. Well, there may be absolutely no reason to implement some of -- if -- if one is prototyping -- presumably there's for a reason that -- you know, as opposed to just recreational, let's get a patent and build something. And, you know, these are -- people cost money. Equipment costs money. Time is valuable. Designs are put together in prototype so that people can either work out foreseen or unforeseen bugs or optimize options, parameters, be they

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hardware or software, control units, whatever, to get the -- the system to work. Now, that could require building a full-blown system. It could also require complete emulation or simulation of substantial components of the system and zeroing in on only what's there.
Q. Okay. Is there any engineering problem with building the system described in Figure 1 and a device to -- to compress the video all together in one room? I mean, putting aside whether you'd be motivated to do it, is there anything that would prevent you from doing it?
A. This is such an abstract question, I just don't -- I just don't even feel I can answer this. I mean, who is "you" and how much money does one have and what is the room and why is one doing this and when is this and where am I doing this?
Q. I'm not asking about motivations. I'm not asking about how much it costs. I'm asking about any engineering problems you can identify that would make it difficult or impossible -- or more difficult or impossible to build what's described in Figure 1 together in a single room?
A. So, I think -- I would have to think about that before answering. I mean, I -- I -- I don't want to give you a knee-jerk reaction. Let me just say, I don't think I'm prepared to answer that at this -- this point.
Q. Okay.
A. I've certainly outlined why I don't feel that anybody

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has any motivation to do that. I understand that your question is --
Q. Not that.
A. -- not addressing that. At the same time, that is something I just haven't thought about.
Q. Okay. Now, the system that's described in the Walter patent, at least as shown in Figure 1, is for transmitting video in one direction only, right?
A. That's right. The video goes from the central data station to the data receiving station.
Q. Okay. Sort of like an FM radio station, only sends audio in one direction, right, you can't send it back to the station over --
A. Actually, FM sends it in all directions, right, even down into the ground. I think we would say it's a -- it's a one-way transfer.
Q. Okay. Now, taking two one-way systems and putting them together and pointing in opposite directions is something that's been done in electrical engineering in the past, right?
A. Can you give me an example?
Q. Yeah. Radio, I picked that specifically with this in mind. So, you can take radios and put a transmitter in one place and a receiver in another; and that's a one-way system, right?
A. Yes.

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Q. Okay. And you can add a transmitter to the place where you have a receiver and a receiver to the place where you have a transmitter and make it a two-way system, right?
A. Well, with some design and engineering.
Q. Or -- or none at all, right? You can take the -- a duplicate of the system that you created in the first place and simply put the ends in the opposite places and you end up with a two-way system, right?
A. No. If you're both transmitting on the same frequency, that's not really going to work very well.
Q. Fair enough. You might have to change the crystal to modify the frequency?
A. So, we have a little bit of design and -- and various other -- you know, there's also, maybe, a -- a power issue on swapping out signals so --
Q. Okay.
A. There -- you know, I disagree, that you can't just turn something around and say: "Presto. Let's go."
Q. Well, with a physical media, you might be able to, right? You just pull another wire, and suddenly it's two ways?
A. Well, I think we discussed that just pulling another wire sounds good in theory, but in practice --
Q. Unless you're in a single room.
A. Well, or unless you're dealing with a cable that is

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a -- I mean, there are various examples but --
Q. Okay. But certainly taking a one-way transmitter/receiver pair and building a two-way system from those is something that was stock and trade for electrical engineers for a century, right?
MR. PAYNE: Objection, form.
A. I really don't -- can you give me another example besides FM and pulling another wire?
Q. (By Mr. Stephens) Sure. Ethernet.
A. How?
Q. You have the ability to put a moduled signal on to the medium, the -- the wire; and you have an ability to listen to that -- listen for that on the other end.
A. But it was designed that way from day one.
Q. Okay.
A. It wasn't a one-way system where somebody just said, "Woo hoo, let's now" -- whatever.
Q. Okay. Well, certainly the same principles, though, apply, right? I mean, you can --
A. No. I disagree. I disagree. I think that if a system is being inherently designed for two-way communication or -- let's say multi because you brought up Ethernet -- multiple use --
Q. So, okay, you think --
A. There are -- there are very different issues. I

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mean, the whole -- you know, an issue with Ethernet is -- is: How do all of these users share the carrier? That is a substantial portion of Ethernet and -- and for that matter, many, many other multiple -- any system that -- that has multiple users, you need -- the system must be designed to deal with that. I mean, I can think back to the radio from the start, Aloha Radio, where the algorithm was -- everybody just talks at once and, well, if you collide, you keep trying again. And believe it or not, this --
Q. That's the way Ethernet works today?
A. -- this works. Yes, yes, exactly, it works. It's not particularly efficient, but there are better -- there are better techniques for -- I mean, this carrier sends multi-access, which is what we have in Ethernet. So, I think that -- that, you know, two-way communication is -- is different from one way. I don't think it's fair to say, well, you can just reverse something and all of a sudden you get two-way.
Q. Well, I guess the Aloha network is a pretty good example for that, right? I mean, they use conventional transmitter pairs on radio. You can, anyway, and add to that a little bit of logic to figure out if the channel is already in use.
A. Right, add to that a little bit of logic. I mean, that's not, oh, let's take these things and run. I mean,

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these are all situations where -- you know, I wouldn't not say it's trivial just to grab a bunch of one-way systems and stick it together and have it -- have it function.
Q. But it was something that was frequently done, right. Taking one-way systems and building two-way systems from them is something that's frequently been done in the course of electrical engineering history, right?
MR. PAYNE: Objection, form.
A. I honestly don't know that, and I would not agree to that. I mean, certainly --
Q. (By Mr. Stephens) Okay. Fair enough.
A. -- if you would like to prepare a document and I can read it, you could convince me, perhaps; but I just don't have enough --
Q. Okay.
A. I don't think I believe that.
Q. Fair enough. But you would agree that electrical engineers, as a matter of their normal practice, take existing solutions and combine those in different ways to solve problems, right, that's what electrical engineers do?
MR. PAYNE: Objection, form.
A. I think the nature of engineering is -- is -- considering what's available, how it can be used creatively and what additional stuff, material, as a result of a creative process, either -- and the creative process could be a

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combination as well.
Q. (By Mr. Stephens) Okay. Is there anything that would prevent you from taking the transmitter from the top half of Figure 1 in the Walter patent and combining it with the receiver on the bottom half, putting motivation to one side? If you -- if you were already motivated to do that and someone said, "Put them together," is there anything that would present a difficulty that would make it impossible for you to do that?
A. So, I don't know how big these units are. I don't know how large the modulators are. I don't know what protocols are running over those fibers. Maybe, you know, I -- I -- there are various aspects that have to be addressed, and it's not clear to me that necessarily it's just a straightforward sliding it in.
Q. Okay. You just don't know one way or another; is that right?
A. I don't know.
Q. Okay.
MR. PAYNE: Do you want to take a quick lunch break or --
MR. STEPHENS: If you guys are hungry. I know that Dr. Hemami is on Eastern time. We can take a quick lunch break now. That's fine. Why don't we try to keep it as short as we can.

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11:54:47 1 THE VIDEOGRAPHER: We're off the record at
11:54:47 2 11:54.
3 (Luncheon recess)
12:27:29 4 THE VIDEOGRAPHER: Tape 5 of the deposition of
12:27:30 5 Dr. Hemami. The time is 12:27. We're back on the record.
12:27:38 6 Q. (By Mr. Stephens) Dr. Hemami, did computers in 1985
12:27:40 7 generally have RAM?
12:27:47 8 MR. PAYNE: Objection, form.
12:27:48 9 A. I feel like I'm speculating answering this question,
12:27:5110 but I believe the answer is yes.
12:27:5211 Q. (By Mr. Stephens) Okay. And what does "RAM" stand
12:27:5612 for?
12:27:5713 A. Random access memory.
12:27:5814 Q. What does the "random access" part of that mean?
12:28:0415 A. Now, let me clarify. My interpretation of your
12:28:0816 question, you've asked me if computers have RAM. And in
12:28:1217 particular, computers in 1985 had RAM. My answer I'm thinking
12:28:1718 of, I'm answering with respect to semiconductor random access
12:28:2119 memory, might be called DRAM, dynamic RAM; or SRAM, static
12:28:2320 RAM. These semiconductor random access memories provided
12:28:2921 storage locations where a location might be a byte or two
12:28:3522 bytes in a word where each individual memory location, the
12:28:4223 5th byte, the 8th byte, the 19th byte, could be addressed,
12:28:4724 meaning one could ask the memory to deliver on its output
12:28:5225 lines precisely the data word, whatever the size of the word

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12:28:56 1 was, that was stored at the particular location that was
12:29:00 2 requested.
12:29:02 3 Q. And it also meant that that memory location -- the
12:29:08 4 data stored in that memory location would be presented in a
12:29:12 5 very predictable amount of time, right?
12:29:16 6 A. I'm not sure what you mean by "predictable."
12:29:18 7 Q. Well, so, for example, a tape would not be random
12:29:21 8 access memory, right?
12:29:25 9 A. A tape is serial access.
12:29:2710 Q. Okay. And, yet, you can, using many different
12:29:3011 utilities, request a specific tape block from a tape and
12:29:3412 retrieve that information, right?
12:29:3813 A. If we're talking about digital magnetic tapes which
12:29:4114 were used as backup devices, particular blocks could be
12:29:4515 accessed.
12:29:4616 Q. Okay. So, it's not just a matter of being able to
12:29:4817 present an address and get back a particular set of
12:29:5218 addressable data?
12:29:5319 A. Oh, I'm sorry. I understand what you're saying.
12:29:5720 Yes, not only could you access each independent location but
12:30:0221 these chips typically came with criteria for the maximum read
12:30:0522 time or write time which applied equally to all locations.
12:30:1023 Q. Okay. And -- and generally the systems were clocked
12:30:1624 so that the data would actually be read out of the memory in
12:30:1825 the same amount of time, regardless of which address was being

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12:30:22 1 presented, right?
12:30:23 2 A. I'm not aware of any asynchronous memories, but that
12:30:28 3 didn't mean that they existed. A clocked memory, we would
12:30:30 4 have a read -- some number of cycles for read and some number
12:30:34 5 of cycles for write.
12:30:36 6 Q. And that's generally fixed, right?
12:30:38 7 A. I don't know what generally -- I -- I don't know. I
12:30:40 8 haven't reviewed data sheets from RAM in 1985.
12:30:44 9 Q. Well, regardless of -- of what the data sheet says,
12:30:4610 the system that it's put into usually would have a fixed
12:30:5011 amount of time that it would expect the data to become
12:30:5212 available after, from the time you presented the address,
12:30:5513 right?
12:30:5514 A. I -- I -- I'm not sure I understand the question.
12:30:5915 Q. All I'm getting at is that part of the -- part of
12:31:0216 what it means to be random access is that you get the contents
12:31:0717 back in the same amount of time regardless of which address
12:31:1118 you present.
12:31:1219 A. Colloquially, yeah. I think, uh, sure, we can say
12:31:1620 the same amount of time. We would -- we would certainly
12:31:1721 expect the device to behave. But whether I accessed the first
12:31:2222 or the 80th location, that that data would appear in the same
12:31:2723 number of clock cycles on the output lines.
12:31:2924 Q. Okay. Now, general purpose computers are capable of
12:31:3325 performing any algorithm subject only to constraints on

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12:31:39 1 storage space, right, and time?
12:31:45 2 A. So, this is a very broad question; but I would not
12:31:46 3 agree with that. So, let's start off with what is a general
12:31:50 4 purpose computer and in what time frame.
12:31:52 5 Q. 1985. Why would you not agree with that?
12:31:58 6 A. So, you said any -- any algorithm -- let me make sure
12:32:02 7 I get all the pieces right -- any algorithm -- and there were
12:32:08 8 some more things there, independent of time, something along
12:32:11 9 those lines.
12:32:1110 Q. Allow -- if you don't have time constraints or space
12:32:1611 constraints.
12:32:1612 A. Okay.
12:32:1613 Q. Right? So, it's just a matter of adding more memory
12:32:1814 and waiting long enough for the output to become available.
12:32:2215 Part of what it means to be a general purpose computer is that
12:32:2416 it can perform any algorithm, right?
12:32:2817 A. I don't think -- for one, there -- there's certainly
12:32:3018 analog computers. There are a lot of turbulent style airflow,
12:32:3719 water flow simulations that are better solved using analog
12:32:4320 techniques. The Air Force maintained analog computers for
12:32:4621 many times in designing aerodynamics and wings and so on.
12:32:4822 And, so, I think any --
12:32:4923 Q. Let's restrict ourselves to digital algorithms.
12:32:5224 A. You know, that's such a broad statement. I -- I --
12:32:5625 I'm not sure that that's actually correct. Certainly I -- it

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12:33:02 1 is easy to envision scenarios where the data that you're
12:33:08 2 processing might have a dynamic range that exceeds the
12:33:13 3 capacity of the computer or the computer simply cannot perform
12:33:17 4 calculations on the data that you're doing without
12:33:21 5 substantially causing problems. Actually, there's an entire
12:33:25 6 field of computer science algorithm design that has to do with
12:33:30 7 solving problems that -- of algorithms that can be written
12:33:34 8 down on paper, but when one goes -- and even here, I'm talking
12:33:39 9 about numerical algorithms -- when one goes to implement them
12:33:4310 on a computer, the finite precision arithmetic really -- they
12:33:4811 can't be done. It's a -- it's a -- you know, you can run the
12:33:5112 algorithm; but the output is meaningless and -- and -- and
12:33:5213 doesn't -- doesn't mean anything.
12:33:5514 Q. Okay. Now, I asked you before about whether or not
12:34:0915 the algorithm described in Walter could be performed on a
12:34:1316 general purpose computer and you asked for constraints and
12:34:1617 then I gave you some and you said you wouldn't be able to
12:34:1918 answer without doing the calculations and the like, right?
12:34:2119 A. So, here, you're referring to -- to the compression
12:34:2420 algorithm that was mentioned?
12:34:2521 Q. That's right.
12:34:2722 A. Yes.
12:34:2823 Q. Now, if you had enough memory and enough disk space
12:34:3024 and you weren't concerned about how quickly you were able to
12:34:3325 perform that algorithm, you would be able to perform that

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12:34:35 1 algorithm on general purpose computers that were widely
12:34:39 2 available in 1985, right? In other words, you weren't trying
12:34:41 3 to do it in real-time?
12:34:43 4 A. So, let me say -- I'm not sure that the disk space
12:34:48 5 constraint would necessarily come into play. Certainly
12:34:57 6 subtracting two frames is merely a matter of executing some
12:35:03 7 number of -- of subtractions, the number being generally equal
12:35:08 8 to the number of pixels you have in the -- in the frame, which
12:35:11 9 maybe a reasonable number might be 512 by 512, so half a
12:35:1510 million per frame. Half a million subtractions, integer
12:35:1811 subtractions, typically, is something that, given enough time,
12:35:2512 a general purpose computer could do. Now, I don't know that
12:35:3013 the disk space would come into play in 1985.
12:35:3414 Q. When you say you don't know whether it would come
12:35:3515 into play, you mean you don't know whether you'd have enough
12:35:3816 disk space to store video?
12:35:4117 A. I'm not even sure in 1985 if one would involve a hard
12:35:4418 disk with respect to actually trying to do that type of
12:35:4919 computation.
12:35:5020 Q. Okay. So, you might put the video on to a magnetic
12:35:5421 tape and process it one frame at a time by advancing the
12:35:5722 magnetic tape, like an IBM, whatever it was, 9 track digital
12:36:0223 tape?
12:36:0224 A. So, that might be one option. Additionally, the
12:36:0725 digitization equipment could feed directly into the computer.

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12:36:13 1 You know, I -- I just don't -- I just don't know.
12:36:15 2 Q. Okay. So, is it fair to say that it's -- it may be
12:36:19 3 possible, you're just not sure, whether the host computer,
12:36:23 4 what's shown as 20 in Figure 1 on Walter, was capable of
12:36:27 5 performing the inter-frame differential post-code modulation
12:36:31 6 compression algorithm described in the Walter patent?
12:36:36 7 A. So, I don't believe that Walter really gives us any
12:36:39 8 description whatsoever as to what that host computer is. If
12:36:43 9 you have a -- to save time, do -- do you have a particular
12:36:4710 point --
12:36:4811 Q. No, I don't.
12:36:4912 A. Okay. Okay. So, actually, let's see -- so, see,
12:36:5013 just in Column 4, already, we have two paragraphs that refer
12:36:5514 to host computer. Now, Column 3, preferred embodiment, starts
12:37:0215 off and mentions host computer; but it doesn't tell us
12:37:0816 anything about it. So, starting around line 27, we see host
12:37:1617 computer. Well, host computer is certainly connected to a lot
12:37:3418 of things, isn't it? We see that a lot.
12:37:3719 I'll tell you what I'm looking for. I'm looking
12:37:4020 for to get an understanding of what host computer did besides
12:37:4321 being connected to all these lines.
12:37:4522 Q. Well, I don't -- I'm not aware -- well, go ahead.
12:37:4823 I'm sorry.
12:37:4924 A. Well, I -- I thought that host computer involved
12:37:5425 directing the instructions as to what the -- a data receiving

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12:38:00 1 station has requested, but I -- I would prefer to find that
12:38:08 2 than rely on my memory.
12:38:09 3 Q. Oh, no. I think you're right, that there are places
12:38:12 4 where it's described as, for example, directing the memory
12:38:15 5 to -- and the switching system to connect the memory to the
12:38:21 6 optic fibers -- well, to connect the memory to the laser
12:38:26 7 diodes and then transfer the data over the optical fibers.
12:38:30 8 So, it does describe that sort of thing. I'm just wondering
12:38:33 9 whether you --
12:38:3510 A. Well, so, that's -- that's all we're told about host
12:38:3811 computer, if, indeed, that is all -- I think, hopefully, we
12:38:4112 agree on that; but I'm not really missing some -- so, if all
12:38:4513 we're told that that host computer does is -- following a
12:38:4814 command from host computer. I'm sorry. I see now, line 30 of
12:38:5315 Column 4, "Communications controller assumes control of fiber
12:38:5716 optic lines." So -- so, in reading -- finding this and in
12:39:0217 reading the specification, you know, my understanding of host
12:39:0618 computer is that host computer is simply a controller for the
12:39:1319 overall operation of the system. And as such, it may or may
12:39:2220 not be able to perform the functions that one would expect to
12:39:3121 be required to run a inter-frame differential pulse-code
12:39:3822 modulation. So, just to give you an example, it could be a
12:39:4223 very, very simple microprocessor or even something that we
12:39:4824 might call a microcontroller, which is a simpler-type unit
12:39:5225 which is somewhat programmable and can execute various tasks;