

EXHIBIT 12

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
OAKLAND DIVISION

MATTHEW CAMPBELL, MICHAEL HURLEY,)
and DAVID SHADPOUR,)
Plaintiffs,)
Case No.)
vs.) C 13-05996 PJH
FACEBOOK, INC.,)
Defendant.)
_____)

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VIDEOTAPED DEPOSITION OF BENJAMIN GOLDBERG, PH.D.
Palo Alto, California
February 2, 2016

Reported by:
KELLI COMBS, CSR No. 7705
Job No. 2224913
Pages 1 - 201

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1 "There was substantial, 11:56:44AM
2 inherent variability based on the
3 evolution of features and the
4 software over time."

5 What do you mean by "substantial" there? 11:56:56AM

6 A Meaning that it's simply not possible to
7 conclude that all messages in the Facebook system
8 were handled the same and resulted in the same
9 processes being performed and provided the same
10 experience to the users, and -- and that the users 11:57:22AM
11 interacted the same way with the Messaging system.

12 Q Well, you say:

13 "It's simply not possible to
14 conclude that all messages in the
15 Facebook system were handled the 11:57:51AM
16 same."

17 But what do you mean by "substantial" in
18 the context of this paragraph?

19 MR. JESSEN: Objection; asked and
20 answered. 11:58:05AM

21 THE WITNESS: I don't know how to quantify
22 that for you other than "substantial" meaning not
23 "insubstantial"; that it is the case that there was
24 sufficient variability that one cannot conclude that
25 the system worked the same way for -- for everybody, 11:58:33AM

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1 and that there would be lots of people for whom the 11:58:36AM
2 Messaging operated in a way other than what
3 Dr. Goldbeck has claimed to be in violation of the
4 statutes.

5 BY MR. RUDOLPH: 11:58:59AM

6 Q Other than defining "substantial" as
7 meaning not "insubstantial," can you quantify it?

8 A I don't have numbers to give you for that.

9 Q Okay. Why not?

10 A Because I don't -- I don't have access to 11:59:22AM
11 statistics regarding, for example, database
12 failures, race conditions. I'm not sure anybody --

13 (Reporter clarification.)

14 THE WITNESS: Race, R-A-C-E, conditions,
15 corruption of data, and it's not true that -- I'm 11:59:40AM
16 not -- sorry. It's not clear to me that anybody has
17 statistics on -- on that in the system, the size and
18 complexity of Facebook's.

19 My understanding is that no statistics
20 were kept on, for example, the number of users who 11:59:57AM
21 typed a URL and then deleted the preview or typed
22 the URL without hitting a space so that no preview
23 was generated. There's -- there's going to be
24 tremendous variation among the way that users use
25 the system and the way the system behaved for which 12:00:23PM

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1 no statistics are gathered. 12:00:27PM

2 Q You say you didn't have access to
3 statistics regarding, for example, database
4 failures, race conditions, corruption of data.

5 Did you ask for access to those 12:00:45PM
6 statistics?

7 A The -- the declarations actually talk
8 about that these kinds of grounds for variability
9 are not, in fact, tracked within Facebook and that
10 there's no way to -- to generate the statistics. 12:01:06PM

11 Q Are you saying that in the declarations,
12 one of the declarants states that there are no
13 statistics on database failures?

14 MR. JESSEN: Objection; documents speak
15 for themselves. 12:01:33PM

16 THE WITNESS: No. What I said was that
17 the -- one of the Facebook's declarants talked about
18 at least one source of variability for which
19 Facebook had no way of gathering statistics or did
20 not gather statistics. 12:01:50PM

21 BY MR. RUDOLPH:

22 Q And I'm asking specifically about database
23 failures.

24 A I don't recall.

25 Q Okay. 12:01:58PM

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1 What about race conditions? 12:01:58PM

2 MR. JESSEN: What's your question?

3 BY MR. RUDOLPH:

4 Q Do any of the declarants discuss whether

5 or not Facebook has any statistics on things like 12:02:08PM

6 race conditions?

7 A I don't recall. I know one of the

8 declarants discusses race conditions. I don't

9 recall exactly what he says.

10 Q Do any of the declarants discuss whether 12:02:23PM

11 or not Facebook has statistics on database

12 corruption?

13 A I don't recall.

14 Q Did you look at any internal studies or

15 statistics related to race conditions? 12:02:55PM

16 A I did not.

17 Q Did you ask for those?

18 A No.

19 Q And for data corruption?

20 A I did not. 12:03:07PM

21 Q And for database failures?

22 A I did not.

23 Q And did you speak to anyone at Facebook to

24 determine the rate of these problems?

25 A No. 12:03:25PM

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1 Q Did you do anything at all to ascertain 12:03:28PM
2 the rate of these implementation issues?

3 MR. JESSEN: Object to the form. Asked
4 and answered.

5 THE WITNESS: No. My experience in 12:03:38PM
6 teaching and doing research in the area of
7 distributed and parallel computing is con- -- a
8 substantial rate of variability, and these kinds of
9 failures is consistent with my experience.

10 BY MR. RUDOLPH: 12:04:02PM

11 Q Okay.
12 You can't quantify what you mean by
13 "substantial"? 1 percent of the time, 5 percent of
14 the time, 10 percent of the time?

15 MR. JESSEN: Object to the form. 12:04:13PM

16 THE WITNESS: Correct. I do not have a
17 number for you.

18 BY MR. RUDOLPH:

19 Q Is there a number below which you would
20 say the variability is not substantial? 12:04:22PM

21 MR. JESSEN: Objection.

22 Are you just talking about the
23 parenthetical or the other parts of that sentence?

24 MR. RUDOLPH: No.

25 MR. JESSEN: It's unclear, because you've 12:04:35PM

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1 been talking about race conditions, data corruption, 12:04:36PM
2 but that's not the whole sentence, so...

3 MR. RUDOLPH: Well, fair enough. Right --
4 right now, I'm -- I'm -- I'm asking about
5 variability related to race conditions, data 12:04:44PM
6 corruption or database failures.

7 THE WITNESS: And just restate the
8 question.

9 BY MR. RUDOLPH:

10 Q Is there a number below which you would 12:04:57PM
11 say these issues: Race conditions, database
12 corruption, database failures, leads to variability
13 that is not substantial?

14 MR. JESSEN: Object to the form.

15 THE WITNESS: I can't give you a -- a 12:05:15PM
16 number that delineates when it is and when it is not
17 substantial.

18 BY MR. RUDOLPH:

19 Q And -- and by "number," I'm -- I'm asking
20 for a -- a percentage of -- of the time. 12:05:28PM

21 A I understood that.

22 Q Right. Okay.

23 So with respect to variability related to
24 race conditions, data corruption or database
25 failure, you really don't have any basis to say that 12:05:50PM

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1 variability related to those issues is substantial, 12:05:54PM
2 then; is that correct?
3 MR. JESSEN: Objection; misstates the
4 testimony.
5 THE WITNESS: Well, let me -- the basis 12:06:00PM
6 includes the sworn statements of the declarants and
7 an understanding of the complexities and the
8 difficulties in maintaining a system the size of
9 Facebook's. And so my experience, my knowledge of
10 the technology and the sworn statements of the 12:06:19PM
11 people who built the system are the bases for my
12 conclusions.
13 BY MR. RUDOLPH:
14 Q But you didn't do anything to investigate
15 the actual rate of things like race conditions, data 12:06:38PM
16 corruption or database failures, correct?
17 A That's correct.
18 Q In paragraph 15, you are discussing what
19 you characterize as Dr. Goldbeck's distinction
20 between memory and storage. 12:07:15PM
21 Did you do anything to investigate whether
22 or not such a distinction exists within the field of
23 computer science?
24 A Well, I -- I cited that the Microsoft
25 dictionary definition of "memory," which makes clear 12:07:52PM

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1 [REDACTED] table in the Hive database and any data 2:35:03PM
2 that it -- it contained.
3 BY MR. RUDOLPH:
4 Q Do you have any understanding of what the
5 structure of the [REDACTED] table was? 2:35:15PM
6 A I think there was some -- something that
7 was produced and attached to Dr. Goldbeck's report
8 that gave information about the [REDACTED] table.
9 I don't remember the specifics.
10 Q And what is your basis for your 2:36:00PM
11 understanding that in 2011 the [REDACTED] table and
12 its data were deleted?
13 A Two things: One is the sworn statement
14 from Mr. Himel. And I did a search in the code, the
15 2012 code, looking for use of this table, and I did 2:36:25PM
16 not find it.
17 Q What do you mean by "use of the table"?
18 A Adding data to the table, retrieving the
19 table, retrieving data from the table.
20 Q Retrieving data from the table or adding 2:36:45PM
21 data to it?
22 A Both.
23 Q And what sort of search did you perform to
24 determine that?
25 A I looked for code that accessed the 2:37:02PM

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1 [REDACTED] table, specifically database code for 2:37:04PM
2 accessing the [REDACTED] table.
3 Q And describe specifically how you looked
4 for code that accesses the [REDACTED] table.
5 A Doing a search on the -- on the source 2:37:27PM
6 code computer using standard tools for searching
7 code such as Grep, G-R-E-P.
8 Q What is Grep?
9 A It's a program in which you can specify
10 text to be searched for in files and directories. 2:37:56PM
11 It includes the ability to specify what -- specify
12 wildcards which match lots of different possible
13 strings of characters.
14 Q You say:
15 "I looked for code that 2:38:28PM
16 accessed the [REDACTED] table,
17 specifically database code for
18 accessing the [REDACTED] table."
19 What -- what is database code?
20 A Code in files that, for example, in this 2:38:40PM
21 case, have an HQL or a similar file extensions as
22 well as PHP code that would invoke database queries.
23 Q Are you confident that if such code
24 existed, it would have been on the source code
25 computer that you were provided? 2:39:26PM

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1 A There was lots of database code for 2:39:38PM
2 accessing other database tables. There was a huge
3 amount of code on the source code computer, so I
4 feel -- I feel confident that if it was part of the
5 code base and in use, that it would have been on 2:39:55PM
6 that source code computer.

7 Q When did you perform the search of the --
8 for code that uses the ██████████ table?

9 A I believe that was on my second trip to
10 Cooley, so mid-January. 2:40:23PM

11 Q Okay.
12 Why is the fact that you performed that
13 search not mentioned in your report?

14 A No particular reason. If I thought of it
15 while I was drafting the text -- sitting here, I 2:40:56PM
16 probably would have mentioned it. But it really
17 just confirmed what Mr. Himel had stated.

18 Q I believe you said you searched in code
19 from 2012. What -- what time period in 2012 were
20 you searching? 2:41:18PM

21 A It was the -- the last version of the code
22 on the source code computer, which was
23 December 2012.

24 Q Okay.
25 It's possible that the code that used 2:41:33PM

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1 [REDACTED] would have shown up in a search for 2:41:36PM
2 previous iterations of the code from previous time
3 periods, correct?
4 MR. JESSEN: Objection.
5 BY MR. RUDOLPH: 2:41:51PM
6 Q You did a search for all of the class
7 period?
8 MR. JESSEN: Objection; calls for
9 speculation.
10 THE WITNESS: I did not search, but, of 2:41:56PM
11 course, Mr. Himel has stated under oath that that
12 table did not exist during the class period.
13 BY MR. RUDOLPH:
14 Q So I want to go back to, you were saying
15 you used tools like you call it Grep? 2:42:18PM
16 A Grep (pronounced differently).
17 Q Grep. What exactly did you search for
18 using Grep?
19 A I searched for the string [REDACTED]
20 Q Okay. 2:42:39PM
21 And that would have returned what?
22 A It would have returned the list of all
23 files containing that -- that string, along with the
24 line where that string appeared in each file.
25 Q And so, in other words, you searched for 2:43:16PM

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1 the word [REDACTED] the name of the table, and 2:43:21PM
2 that didn't return any results?
3 A To the best of my recollection, that's
4 right. I don't recall exactly what happened. But
5 if I had found it, I would have noted it, and I did 2:43:35PM
6 not.
7 Q And why does the fact that that search
8 returned no results demonstrate that no code within
9 Facebook was using [REDACTED]
10 A It was using that table because in the 2:43:55PM
11 code you specify the table you want to access by the
12 name of the table.
13 Q Where would the [REDACTED] table itself
14 have been stored within Facebook's system?
15 MR. JESSEN: Objection; calls for 2:44:28PM
16 speculation, lacks foundation.
17 THE WITNESS: My understanding is it's in
18 their Hive database, which is a particular, very
19 large database that they maintained.
20 BY MR. RUDOLPH: 2:44:48PM
21 Q Was -- were any of Facebook's databases
22 made available to you as part of your analysis?
23 A The data itself, no, I don't believe so.
24 Q You say in paragraph 45 of Nectar:
25 "I understand that it is one 2:45:38PM

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1 Messaging software is itself a device as one of 3:33:53PM
2 skill would understand it, as computer scientists
3 would understand it. And that's -- and I believe
4 that's erroneous.

5 Q You're not offering a legal opinion on 3:34:11PM
6 whether or not software can constitute a device?

7 A Within a statute, for example?

8 Q Uh-huh.

9 A Yes, I am not offering that opinion.

10 Q Are you aware of allegations against 3:35:05PM
11 Volkswagen that they, let's say, doctored their
12 software to get around environmental regulations?

13 MR. JESSEN: Objection; outside the scope,
14 outside the case.

15 THE WITNESS: From what I hear from the 3:35:29PM
16 popular press, right, they customize their software
17 so that it could detect when a test is being
18 performed and change the pollution emissions for the
19 purpose of that test.

20 MR. RUDOLPH: Can you mark this as the 3:35:49PM
21 next exhibit.

22 (Deposition Exhibit 6 marked for
23 identification.)

24 BY MR. RUDOLPH:

25 Q Dr. Goldberg, can you read what the title 3:36:18PM

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1 of this article is? 3:36:20PM

2 A "Volkswagen's Software Was 'Illegal Defeat
3 Device' German Regulator Says."

4 Q This is an example of software being
5 referred to as a "device"; is that correct? 3:36:41PM

6 MR. JESSEN: Objection; lacks foundation.

7 THE WITNESS: Let me just take the time to
8 read the article so I can get the context.

9 BY MR. RUDOLPH:

10 Q Sure. 3:36:54PM

11 A Okay. So what was your -- your question?

12 Q This is an example of software being
13 referred to as a "device"; is that correct?

14 A Well, it's software that was running on a
15 computer within the car, and in conjunction with 3:38:42PM
16 the -- with the piece of the car that -- that
17 determines the emissions -- it was in here
18 somewhere -- activating the special Eco friendly
19 mode of lower emissions.

20 And so the software running on the 3:39:06PM
21 computer in the car, together with the ability to
22 change the emissions, is what I believe is being
23 referred to as a "illegal defeat device."

24 Of course, it's in German, so it's hard to
25 know -- it's a German law, so it's hard to know what 3:39:23PM

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1 the words actually mean. 3:39:27PM

2 Q Would it surprise you if a governmental
3 organization defined a certain type of software as a
4 "device"?

5 MR. JESSEN: Objection; lacks foundation, 3:39:52PM
6 incomplete hypothetical, calls for speculation.

7 THE WITNESS: It would surprise me if the
8 government characterized software on its own without
9 actually being -- without running on something as a
10 device, but... 3:40:12PM

11 BY MR. RUDOLPH:

12 Q All software has to run on something to
13 function, correct?

14 A Correct.

15 MR. RUDOLPH: Okay. Next exhibit. 3:40:19PM
16 (Deposition Exhibit 7 marked for
17 identification.)

18 BY MR. RUDOLPH:

19 Q So can you read the -- what the title of
20 this document is, Dr. Goldberg? 3:40:55PM

21 A (Reading):
22 "EPA, California Notify
23 Volkswagen of Clean Air Act
24 violations. Carmaker allegedly
25 used software that circumvents 3:41:11PM

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1 emissions testing for certain air 3:41:13PM
2 pollutants."
3 Q Can you read the first line of the article
4 after the word "Washington"?
5 A (Reading): 3:41:28PM
6 "Today, EPA is issuing a
7 notice of violation of the Clean
8 Air Act to Volkswagen AG, Audi AG,
9 and Volkswagen Group of America,
10 Inc., collectively referred to as 3:41:43PM
11 Volkswagen."
12 Q Okay.
13 And then can you read the first sentence
14 of the fourth paragraph. It starts with "as
15 described in the NOV"? 3:41:54PM
16 A (Reading):
17 "As described in the NOV, a
18 sophisticated software algorithm on
19 certain Volkswagen vehicles detects
20 when the car is undergoing official 3:42:05PM
21 emissions testing and turns full
22 emissions controls on only during
23 the test."
24 Q Okay.
25 And then can you read the last sentence of 3:42:16PM

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1 that paragraph. 3:42:18PM

2 A (Reading):

3 "The software produced by

4 Volkswagen is a 'defeat device' as

5 defined by the Clean Air Act." 3:42:33PM

6 Q So would you agree that the EPA is

7 defining software produced by Volkswagen as a type

8 of device --

9 MR. JESSEN: Objection.

10 BY MR. RUDOLPH: 3:42:49PM

11 Q -- within the meaning of a statute?

12 MR. JESSEN: Objection; lacks foundation,

13 calls for speculation, document speaks for itself,

14 also irrelevant. But you can certainly read this,

15 if you want. 3:43:01PM

16 THE WITNESS: I -- I read this as them

17 saying that the software running on the Volkswagen

18 computer is a defeat device. I think they're

19 being -- perhaps being imprecise, but the software

20 on its own can't defeat anything. 3:43:20PM

21 BY MR. RUDOLPH:

22 Q Imprecise by whose lights?

23 A Meaning who would consider this imprecise,

24 this press release?

25 Q Uh-huh. 3:43:36PM

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1 A Someone in computer science would 3:43:38PM
2 consider -- might consider this imprecise. It's
3 clear from the context they're talking about the
4 software running on the Volkswagen computer.

5 Q So the statement: 3:44:03PM

6 "In my 33 years as a computer
7 scientist, I have never heard the
8 term 'device' used to refer to
9 software."

10 Is that statement still true? 3:44:11PM

11 MR. JESSEN: Object to the form.

12 THE WITNESS: Well, it's certainly true
13 when I -- I wrote it. To the extent that this does
14 refer to software as a device, it's -- it's an odd
15 characterization, but the way I read it is as 3:44:30PM

16 software running on the Volkswagen computer was a
17 device, which I don't disagree with. But this --
18 this language is not language you would see in
19 computer science itself.

20 BY MR. RUDOLPH: 3:44:47PM

21 Q So you say:
22 "But the way I read it is as
23 software running on the Volkswagen
24 computer was a device, which I
25 don't disagree with." 3:44:55PM

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1 Why does the fact that the software was 3:45:00PM
2 running on the device lead you to not disagree with
3 the statement that "The software produced by
4 Volkswagen is a defeat device"?

5 MR. JESSEN: Objection. I'll just object 3:45:17PM
6 to this entire line as lacking foundation, calling
7 for speculation.

8 BY MR. RUDOLPH:

9 Q I'm sorry. Yeah. Thanks.

10 Why does the fact that the software was 3:46:08PM
11 running on a computer lead you to not disagree with
12 the statement that "the software produced by
13 Volkswagen is a defeat device"?

14 MR. JESSEN: Object to the form.

15 THE WITNESS: Because lots of devices run 3:46:25PM
16 software, and so if you read that as I do, that what
17 they're saying is that the software, when it runs on
18 the -- on the computer, constitutes a device because
19 there's something physical there, then that would be
20 a normal use of the term "device" because you have 3:46:47PM
21 an actual, physical device.

22 MR. RUDOLPH: How long have we been going?
23 Let's take a break.

24 THE VIDEOGRAPHER: This marks the end of
25 Disk 3 to the deposition of Dr. Benjamin Goldberg, 3:47:11PM

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1 I, the undersigned, a Certified Shorthand
2 Reporter of the State of California, do hereby certify:

3 That the foregoing proceedings were taken
4 before me at the time and place herein set forth; that
5 any witnesses in the foregoing proceedings, prior to
6 testifying, were administered an oath; that a record of
7 the proceedings was made by me using machine shorthand
8 which was thereafter transcribed under my direction;
9 that the foregoing transcript is a true record of the
10 testimony given.

11 Further, that the foregoing pertains to the
12 original transcript of a deposition in a Federal Case,
13 before completion of the proceedings, a review of the
14 transcript [] was [X] was not requested.

15 I further certify I am neither financially
16 interested in the action nor a relative or employee of
17 any attorney or any party to this action.

18 IN WITNESS WHEREOF, I have this date
19 subscribed my name.

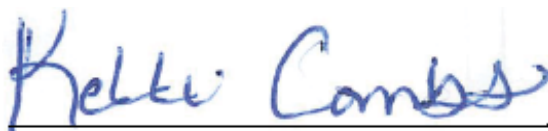
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21 Dated: 2/3/16

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