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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

MATTHEW CAMPBELL and MICHAEL HURLEY, on behalf of themselves and all others similarly situated,

Plaintiffs,

v.

FACEBOOK, INC.,

Defendant.

Case No. C 13-05996 PJH (SK)

DECLARATION OF DR. JENNIFER GOLBECK IN SUPPORT OF PLAINTIFFS' MOTION TO COMPEL CONFIGURATION TABLES

I. QUALIFICATIONS AND BACKGROUND

1. As indicated in my *curriculum vitae*, I have been a professor in the College of Information Studies ("The iSchool") at the University of Maryland since 2007 (assistant professor from 2007-2013, associate professor with tenure to present), where I have focused my research and teaching efforts on aspects of social media and the web.

2. I have previously submitted two expert reports in this case, both in support of Plaintiffs' motion for class certification. My qualifications are described in detail at paragraphs 1-10 of my opening report and in my *curriculum vitae*, attached thereto as Exhibit A.

3. In forming my opinions below, I have reviewed source code which I understand was provided by Facebook's counsel and which was represented as containing the relevant source code between some time in 2009 and December 2012. Additionally I have reviewed numerous internal Facebook documents produced in this litigation, as well as certain public materials. These materials are listed in Exhibit B to my opening report.

II. SUMMARY OF ASSIGNMENT

4. I have been asked by the Plaintiffs through their counsel to provide the following, which I understand to be in support of Plaintiffs' request to the court to compel certain types of discovery:

a. An explanation of the term "configuration table" as it relates to this case;

b. A description of why, in my opinion, I need to review certain of Facebook's configuration tables in order to fully opine on the issues that I understand are relevant to this case; and

c. A description of the particular relevant configuration tables I have identified thus far, along with the information that I understand to be contained in them.

III. CONFIGURATION TABLES

5. Databases, in the most general sense, are systems that store data. That data is often divided into tables. A database table is analogous to one sheet in a spreadsheet. A table is a collection of related data in a database, and it contains rows and columns. Rows typically store the data about a particular entity, and the columns each represent a different attribute.

6. For example, an e-commerce website might have a table for products that had a row for each item and columns for attributes like name, price, SKU, description, etc. The website might also have a separate table for customers, with each row representing a customer and columns for user ID, password, name, street address, etc.

7. "Configuration tables" are a specific type of database table. They store data that configures functionality of the system. Storing data in a configuration table rather than putting it directly in the system's code has the benefit of allowing easy changes to the system's functionality without requiring any code changes. Configuration tables essentially allow the system to be more flexible and adaptable, since changes can be made once in the configuration table, and then every place in the system that uses that information can easily access the change.

8. Continuing the simple example above, the e-commerce company may want to offer a discount to customers when they visit the site. They could offer a particular discount, say 10% off, and a coupon code that the customer has to enter when they checkout, say "SUMMER2016." A message with the discount and code can appear in many places. For this example, say it will be on the homepage and the Shopping Cart page. The data representing the coupon code can be stored in a configuration table. Then, the website code simply requests the discount value and the coupon code from the database, and uses them. On the home page, it may be in a banner message that says "New Customers: Receive <discount> off your order with the coupon code <coupon code>", replacing the values in brackets with the data retrieved from the configuration table. The values can also appear on the Shopping Cart page in the message "Remember to use code <coupon code> for <discount> off!" If the company decides to change tactics, and offer 15% off with the coupon code "SUNSHINE1", they simply update the configuration table. Both messages would be updated and no one needs to change the actual code that runs the website.

9. Configuration tables can also be used to dictate what code is executed in a system. For example, say the e-commerce company wants to test a new site design. They may send some of their customers to the original version of the site (call this option A) and others to the new version (option B). The code for these site designs may change over time as the e-commerce

company makes updates. While all of the code for every option could be embedded in the home page, it is much more efficient to keep the homepage code simple and consistent. It can simply choose if the viewer will see option A or B. Then, it can refer to a configuration table to find exactly which code to execute for each option. If either option changes, the homepage code can remain the same, and the configuration tables can simply be updated to point to the newest code. In cases like this, a code reviewer cannot know what code will be executed by the system unless they have access to the configuration tables. Without those tables, she would only know that there are two versions of the system, but it would be impossible to know what code corresponds to each version.

10. The use of configuration tables reduces errors because a programmer does not have to find every place in the code where a value appears (e.g. they don't have to search for every place a coupon code is used and update it).

11. Configuration tables hold information that is critical for the system to function. It is essentially part of the source code, since it stores values and instructions that make the source code run. The instructions they contain can be much more complicated than the simple example given here. Configuration tables may list where data should be stored, which attributes to store, what is displayed, etc.

12. While "configuration table" is not a formal database term, the concept is well known, widely used, and quite common.[1]

[1] *See, e.g.*, Knight's Microsoft SQL Server 2012 Integration Services 24-Hour Trainer, By Brian Knight, Devin Knight, Mike Davis, Wayne Snyder. Chapter 44 "Easing Deployment with Configuration Tables"; The Programmers' Guide to OsCommerce: the Nuts and Bolts of OsCommerce, By Myles O'Reilly. Chapter 2; Modern Industrial Automation Software Design, By Lingfeng Wang, Kay CHen Tan, Chapter 13; Wingerd, Laura, and Christopher Seiwald. "Constructing a large product with Jam." *International Workshop on Software Configuration Management*. Springer Berlin Heidelberg, 1997; "Dynamic adaptive display design based on wireless sensor networks", Zheng Wei Wang , Xiao Shi Zheng , Lin Wang , Ping Tang , Ru Liang Zhang , Guang He Cheng , Qing Long Meng , Rang Yong Zhang , and Yang Wan. *Proceedings of the 2015 International Conference on Computer, Intelligent Computing and Education Technology (CICET 2015)*, April 11-12, 2015, Guilin, P.R. China; Hallin, Peter F., and David W. Ussery. "CBS Genome Atlas Database: a dynamic storage for bioinformatic results and sequence data." *Bioinformatics* 20.18 (2004) 3682-3686; Souyris, Jean, et al. "Computing the worst case execution time of an avionics program by abstract interpretation." *OASIcs-OpenAccess Series in Informatics*. Vol. 1. Schloss Dagstuhl-Leibniz-Zentrum für Informatik, 2007; Watkins, Christopher B., and Randy Walter. "Transitioning from federated avionics architectures to

IV. FACEBOOK'S USE OF CONFIGURATION TABLES

13. I have reviewed source code which I understand was provided by Facebook's counsel and which was represented as containing the relevant source code between some time in 2009 and December 2012. I have provided my opinions, based on my review of the code thus far, on the functioning of Facebook's source code with respect to Facebook's redirection and interception of Private Message content in my opening and rebuttal reports in support of Plaintiffs' motion for class certification.

14. Facebook's source code makes extensive use of configuration tables. These were not produced as part of the source code, but I have found evidence of their existence throughout the source code, as I describe in more detail in the following section of this declaration. They describe and control what data is stored, how certain systems function, and connections between different parts of the code.

15. At a general level, within Facebook's source code, when a person shares a URL in a private message, data is created about that action (e.g. the URL preview information, the EntShare, the data that is in the EntShare, etc.). This data is stored. In order to understand where it is stored and any subsequent use, I require a list of all the places it is stored (e.g. database tables, objects, etc.) and the metadata and schemas for every place. This information would include field names and descriptive information for the database tables, attributes for any objects, etc. This information is contained in the configuration tables.

16. The web-facing source code that Facebook produced has a number of places where, in the execution of the process of a user sharing a URL in a private message, the code relies on databases or other external information for configuration. This includes values for variables and other configuration data. These variables and configuration tables are contained in Facebook's configuration tables.

integrated modular avionics." *2007 IEEE/AIAA 26th Digital Avionics Systems Conference*. IEEE, 2007.

V. SPECIFIC RELEVANT CONFIGURATION TABLES

17. Because I have not been given access to these tables, it is impossible for me to say exactly how they function. Similarly, I cannot know all the relevant configuration tables that exist just like I could not know all the Facebook php files (i.e., source code) that existed before I could see them. However, there are some specific tables that I have seen evidence of that I know are relevant to this case. I describe some of these below, but this is in no way a complete list of the relevant tables. There are likely many more configuration tables that are important but I simply cannot know what they are until I am given access and allowed to inspect them.

A. [redacted] and [redacted] tables (in the [redacted] database)

18. The [redacted], and [redacted] tables (in the [redacted] database) appear to [redacted]. Logging is a major sub-system involved in, among other things, storing information for later processing. Based on review of the code, [redacted]. That particular log call has the [redacted]. This log call gets transformed at some point into the [redacted]. The configuration tables may have the link between that log call and the [redacted]. As described in by rebuttal report, I have also identified a log call, [redacted] that appears to perform the same logging as the [redacted] log call, and which appears to have been ongoing as of the final version of the code I reviewed from December 2012.

B. [redacted] and [redacted] tables (in the [redacted] database)

19. "Associations" are one of the two fundamental database-based features of the Facebook system. Associations are used to associate one object to another object. They link people to other people, people to URLs, etc. Based on review of the code, it appears the [redacted] and [redacted] tables (in the [redacted] database) determine [redacted]

[redacted].

20. One of the issues in this case is how Facebook connects users to the URLs they share in Private Messages. That data could be stored as an association, and these tables may contain information showing how the association is created. These configuration tables may also show other code that is executed as part of the association process.

C. [redacted], [redacted], and [redacted] tables (in the [redacted] database)

21. All of the data within Facebook is stored in databases, in other tables besides the configuration tables this declaration discusses. These tables include all the data generated during the process of sending a private message with a URL attachment and the generation of the URL preview.

22. I am not requesting access to this data, but rather to the configuration tables that *describe the structure* of those databases. Based on review of the [redacted].

23. [redacted]. This information is necessary for me to know what data is being stored – for example, if user IDs and URLs sent in private messages are being stored together and where.

D. [redacted] table (in the [redacted] database)

24. [redacted].

25. One particularly significant and directly relevant use is in the use of the [redacted]. Access to this configuration table is critical to know what code is executed as part of the [redacted]. I know that [redacted]. What the system does with that data is

hidden in the configuration tables. I cannot know how it is being used or stored without the configuration tables that [redacted].

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct.

Executed this 1st day of August, 2016, in Silver Springs, Maryland.

Jennifer Golbeck