THE HONORABLE RICARDO S. MARTINEZ

IN THE UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

WORD TO INFO, INC.,

Plaintiff,

v.

MICROSOFT CORPORATION,

Defendant.

Civil Action No. 2:17-cv-00596

JURY TRIAL DEMANDED

CORRECTED FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Word to Info, Inc. ("Plaintiff" or "Word to Info"), by way of its First Amended Complaint for Patent Infringement ("Complaint") against the above-named Defendant Microsoft Corporation ("Microsoft" or "Defendant"), alleges the following:

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the Patent Laws of the United States, Title 35 of the United States Code.

THE PARTIES

2. Plaintiff Word to Info, Inc. is a corporation organized under the laws of the State of Texas with a place of business at 1106 Edgewood Dr., Richardson, Texas 75081.

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3. Upon information and belief, Defendant Microsoft Corporation ("Microsoft") is a corporation organized under the laws of the State of Washington with its principal place of business at 1 Microsoft Way, Redmond, Washington 98052.

JURISDICTION AND VENUE

4. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338.

5. On information and belief, Defendant Microsoft is subject to the jurisdiction of this Court by virtue of the facts that Defendant conducts substantial business in this District, Defendant has committed acts of infringement within this District, a substantial part of the events giving rise to the claims in this Complaint occurred and continue to occur in this District, and Defendant has its principal place of business in this District.

6. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(c) and 1400(b).

STATEMENT OF FACTS

7. This is an action for patent infringement of one or more claims of United States U.S. Patent No. 5,715,468 entitled "Memory System for Storing and Retrieving Experience and Knowledge with Natural Language" (the '468 Patent); U.S. Patent No. 6,138,087 entitled "Memory System for Storing and Retrieving Experience and Knowledge with Natural Language Utilizing State Representation Data, Word Sense Numbers, Function Codes and/or Directed Graphs" (the '087 Patent); U.S. Patent No. 6,609,091 entitled "Memory System for Storing and Retrieving Experience and Knowledge with Natural Language Utilizing State Representation Data, Word Sense Numbers, Function Codes and/or Directed Graphs" (the '091 Patent); U.S. Patent No. 7,349,840 entitled "Memory System for Storing and Retrieving Experience and Knowledge with Natural Language Utilizing State Representation Data, Word Sense Numbers, Function Codes, Directed Graphs and/or Context Memory" (the '840 Patent); U.S. Patent No. 7,873,509 entitled "Memory System for Storing and Retrieving Experience and Knowledge with Natural Language Utilizing State Representation Data, Word Sense Numbers, Function Codes, Directed Graphs, Context Memory, and/or Purpose Relations" (the '509 Patent); U.S. Patent No. 8,326,603 entitled "Memory System for Storing and Retrieving Experience and Knowledge with

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Natural Language Queries" (the '603 Patent); U.S. Patent No. 8,688,436 entitled "Memory System for Storing and Retrieving Experience and Knowledge by Utilizing Natural Language Responses" (the '436 Patent) (collectively, the "Patents-in-Suit").

8. Word to Info is the assignee and owner of the right, title and interest in and to, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them. The Patents-in-Suit were previously owned by their sole inventor, Robert L. Budzinski, who is the owner of Word to Info.

9. At least one of the Patents-in-Suit has been cited during prosecution of numerous issued United States Patents relating to natural language processing. In particular, one of the patents-in-suit has been cited during prosecution of patents listing Defendant Microsoft as assignee, such patents including but not limited to U.S. Patent Nos. 7,113,905; 7,398,210; 7,421,386; 7,447,627; 7,490,034; 7,716,158; 7,822,992; 7,890,744; 7,894,677; 7,228,268; 7,228,269; 7,254,527; 7,315,809; 8,249,871; 7,376,551; 7,624,018; and 7,668,791.

10. On February 3, 1998, the '468 Patent, was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '468 Patent is attached as Exhibit A to this Complaint.

11. On October 24, 2000, the '087 Patent was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '087 Patent is attached as Exhibit B to this Complaint.

12. On August 19, 2003, the '091 Patent was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '091 Patent is attached as Exhibit C to this Complaint.

13. On March 25, 2008, the '840 Patent was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '840 Patent is attached as Exhibit D to this Complaint.

14. On January 18, 2011, the '509 Patent was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '509 Patent is attached as

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Exhibit E to this Complaint.

15. On December 4, 2012, the ’603 Patent was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’603 Patent is attached as Exhibit F to this Complaint.

16. On April 1, 2014, the ’436 Patent was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’436 Patent is attached as Exhibit G to this Complaint.

FIRST CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 5,715,468

17. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 16 as though fully set forth herein.

18. Defendant Microsoft has been directly infringing and continues to directly infringe one or more claims of the ’468 Patent, including but not limited to Claims 1, 8, 21, 29, and 33, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft’s Cortana personal assistant software.

19. For example, on information and belief, Microsoft Cortana provides electronically encoded data which is representative of natural language by encoding natural language inputs into audio files and/or text files which represent the natural language input. For example, Microsoft Cortana encodes natural language speech using one or more audio codecs. *See* “Welcome to Cortana Workshop” (available at https://sec.ch9.ms/slides/winHEC/CortanaAudioSystem DesignGuide.pdf) at slides 6, 14.

20. On information and belief, Microsoft Cortana provides a dictionary database containing entries having syntax usage data. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is “powered by Bing”). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/

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understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/A16sept/A16SEP-CD.pdf). The entities in Satori includes addresses. *See* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *Id.*; "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

21. On information and belief, Microsoft Cortana provides a dictionary database containing entries having associated word sense numbers. "Word sense number" has been construed in the Northern District of California as "[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2) organized into relations to other word sense numbers." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing utilizes Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research

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Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

22. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated adjective word sense numbers. "Adjective word sense number" has been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.*.

23. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated concrete noun word sense numbers. "Concrete noun word

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sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34.

Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id.* Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88.

24. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated verb word sense numbers. "Verb word sense number" has been construed in the Northern District of California as follows: " A verb word sense number contains an identification number which defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at

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https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5.

25. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having syntax usage data. "Syntax usage data" has been construed in the Northern District of California as "data comprised of sets of words which can syntactically be used interchangeably in a natural language construction." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. For example, Microsoft Cortana provides data comprised of synonyms that can syntactically be used interchangeably. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/ A16sept/A16SEP-CD.pdf).

26. On information and belief, Microsoft Cortana lexically processes the electronically encoded data to access the dictionary database. *See* above; *see also* https://arstechnica.com/information-technology/2015/05/cortana-for-all-microsofts-plan-to-put-voice-recognition-behind-anything/ (stating, "As the speech is processed, the Bing speech APIs use entity discovery to try to assemble the semantic meaning of the recognized text and correct the results, streaming back changes to previous text until the speech recognition is complete" and

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"The final product of the speech recognition service is a JSON data structure that can include the text in several forms: the 'lexical' form, which is the raw, unadulterated speech recognition result in text; or various flavors of 'display text' with a best guess at capitalization, punctuation, conversion of number words to numerals, and application of common abbreviations such as 'Mr.' for 'mister' and 'St.' for 'street.'").

27. On information and belief, Microsoft Cortana provides a grammar specification. *See* https://msdn.microsoft.com/library/windows/apps/xaml/dn630426.aspx (stating that speech recognition "includes support for pre-defined grammars for free-text dictation and web search, and support for custom grammars").

28. On information and belief, Microsoft Cortana utilizes syntax usage data from the database, with reference to the grammar specification to produce output data representing a grammatical parse of the natural language. In particular, Microsoft Cortana utilizes a syntactic parser which performs syntactic parsing of the speech. *See* https://www.microsoft.com/cognitive-services/en-us/Linguistic-Analysis-API/documentation/Constituency-Parsing. Parsing includes specification of a Speech Recognition Gramma Specification (SRGS) and a grammar specification for a language (such as English) for the speech. *See* https://msdn.microsoft.com/library/windows/apps/xaml/dn630426.aspx and https://www.microsoft.com/cognitive-services/en-us/Linguistic-Analysis-API/documentation/AnalyzeMethod.

29. Because of Microsoft's infringement of the '468 Patent, Plaintiff has suffered damages and will continue to suffer damages in the future. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable royalty, the precise amount to be determined at trial.

SECOND CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 6,138,087

30. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 29 as though fully set forth herein.

31. Defendant Microsoft has been directly infringing and continues to directly

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infringe one or more claims of the '087 Patent, including but not limited to Claims 17 and 18, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software.

32. For example, on information and belief, Microsoft Cortana provides electronically encoded data which is representative of natural language by encoding natural language inputs into audio files and/or text files which represent the natural language input. For example, Microsoft Cortana encodes natural language speech using one or more audio codecs. *See* "Welcome to Cortana Workshop" (available at https://sec.ch9.ms/slides/winHEC/CortanaAudioSystem DesignGuide.pdf) at slides 6, 14.

33. On information and belief, Microsoft Cortana provides a dictionary database containing entries having associated word sense numbers. "Word sense number" has been construed in the Northern District of California as "[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2) organized into relations to other word sense numbers." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing utilizes Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of

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40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

34. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated adjective word sense numbers. "Adjective word sense number" has been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.*.

35. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated concrete noun word sense numbers. "Concrete noun word sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position

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regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34. Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id*. Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88.

36. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated verb word sense numbers. "Verb word sense number" has been construed in the Northern District of California as follows: " A verb word sense number contains an identification number which defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5.

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37. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having syntax usage data. "Syntax usage data" has been construed in the Northern District of California as "data comprised of sets of words which can syntactically be used interchangeably in a natural language construction." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. For example, Microsoft Cortana provides data comprised of synonyms that can syntactically be used interchangeably. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/ A16sept/A16SEP-CD.pdf).

38. On information and belief, Microsoft Cortana lexically processes the electronically encoded data to access the dictionary database. *See* above; *see also* https://arstechnica.com/information-technology/2015/05/cortana-for-all-microsofts-plan-to-put-voice-recognition-behind-anything/ (stating, "As the speech is processed, the Bing speech APIs use entity discovery to try to assemble the semantic meaning of the recognized text and correct the results, streaming back changes to previous text until the speech recognition is complete." and "The final product of the speech recognition service is a JSON data structure that can include the text in several forms: the 'lexical' form, which is the raw, unadulterated speech recognition result in text; or various flavors of 'display text' with a best guess at capitalization, punctuation, conversion of number words to numerals, and application of common abbreviations such as

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'Mr.' for 'mister' and 'St.' for 'street.'").

39. On information and belief, Microsoft Cortana utilizes syntax usage data and word sense numbers which are from entries of the dictionary database and which are associated with words of the natural language with reference to associated state representation data to select and access word sense numbers for words of the natural language. For example, Microsoft Cortana utilizes an algorithm based on relationships between database entries and synonyms to select and access database entries. *See* https://blogs.bing.com/search/2013/03/21/understand-your-world-with-bing/ (presenting information on Mt. Everest when asked "what is the tallest mountain in the world"); *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 3 (providing an algorithm and example for selecting word sense numbers with reference to associated state representation data).

40. Because of Microsoft's infringement of the '087 Patent, Plaintiff has suffered damages. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable royalty, the precise amount to be determined at trial.

THIRD CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 6,609,091

41. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 40 as though fully set forth herein.

42. Defendant Microsoft has been directly infringing and continues to directly infringe one or more claims of the '091 Patent, including but not limited to Claims 1 and 12, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software.

43. For example, on information and belief, Microsoft Cortana provides electronically

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encoded data which is representative of natural language by encoding natural language inputs into audio files and/or text files which represent the natural language input. For example, Microsoft Cortana encodes natural language speech using one or more audio codecs. *See* "Welcome to Cortana Workshop" (available at https://sec.ch9.ms/slides/winHEC/CortanaAudioSystemDesignGuide.pdf) at slides 6, 14.

44. On information and belief, Microsoft Cortana provides a dictionary database containing entries having syntax usage data. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/A16sept/A16SEP-CD.pdf). The entities in Satori includes addresses. *See* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *Id.*; "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

45. On information and belief, Microsoft Cortana provides a dictionary database containing entries having associated word sense numbers. "Word sense number" has been construed in the Northern District of California as "[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2)

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organized into relations to other word sense numbers." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing utilizes Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

46. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated adjective word sense numbers. "Adjective word sense number" has been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at

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https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.*.

47. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated concrete noun word sense numbers. "Concrete noun word sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34.

Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id*. Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88.

48. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated verb word sense numbers. "Verb word sense number" has been construed in the Northern District of California as follows: " A verb word sense number

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contains an identification number which defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5.

49. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having syntax usage data. "Syntax usage data" has been construed in the Northern District of California as "data comprised of sets of words which can syntactically be used interchangeably in a natural language construction." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. For example, Microsoft Cortana provides data comprised of synonyms that can syntactically be used interchangeably. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by

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Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/ A16sept/A16SEP-CD.pdf).

50. On information and belief, Microsoft Cortana lexically processes the electronically encoded data to access the dictionary database. *See* above; *see also* https://arstechnica.com/information-technology/2015/05/cortana-for-all-microsofts-plan-to-put-voice-recognition-behind-anything/ (stating, "As the speech is processed, the Bing speech APIs use entity discovery to try to assemble the semantic meaning of the recognized text and correct the results, streaming back changes to previous text until the speech recognition is complete" and "The final product of the speech recognition service is a JSON data structure that can include the text in several forms: the 'lexical' form, which is the raw, unadulterated speech recognition result in text; or various flavors of 'display text' with a best guess at capitalization, punctuation, conversion of number words to numerals, and application of common abbreviations such as 'Mr.' for 'mister' and 'St.' for 'street.'").

51. On information and belief, Microsoft Cortana provides a grammar specification. *See* https://msdn.microsoft.com/library/windows/apps/xaml/dn630426.aspx (stating that speech recognition "includes support for pre-defined grammars for free-text dictation and web search, and support for custom grammars").

52. On information and belief, Microsoft Cortana provides a database of requirements such that the requirements must be met by the associated state representation data of the word sense numbers for the word sense numbers to be selected. For example, for entities to be selected, they must meet certain relationship and user requirements. *See also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, at 3-4, (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) (providing an algorithm and example for selecting word sense numbers with reference to associated state representation data). Furthermore, word sense numbers are selected according to

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an analysis of syntactic structure and application of syntactic rules. *See* "Linguistic Analysis API" available at https://www.microsoft.com/cognitive-services/en-us/linguistic-analysis-api (stating that "The Linguistic API uses advanced linguistic analysis tools for natural language processing, giving you access to part-of-speech tagging and parsing").

53. On information and belief, Microsoft Cortana utilizes syntax usage data which includes entries of the dictionary database and which are associated with words of the natural language with reference to the grammar specification to produce output data representative of a grammatical parse of the natural language, the output data including selected syntax usage. For example, an exemplary workflow comprises sentence separation, tokenization, parts-of-speech tokens and syntactic parsing is performed against grammar, in order to create natural language output such as speech. *See* "Linguistic Analysis API" available at https://www.microsoft.com/cognitive-services/en-us/linguistic-analysis-api. *See also* https://blogs.bing.com/search/2013/03/21/understand-your-world-with-bing/ (presenting information on Mt. Everest when asked "what is the tallest mountain in the world").

54. Because of Microsoft's infringement of the '091 Patent, Plaintiff has suffered damages. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable royalty, the precise amount to be determined at trial.

FOURTH CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 7,349,840

55. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 54 as though fully set forth herein.

56. Defendant Microsoft has been directly infringing and continues to directly infringe one or more claims of the '840 Patent, including but not limited to Claims 1, 2, 3, and 5, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software.

57. For example, on information and belief, Microsoft Cortana provides electronically

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encoded data which is representative of natural language by encoding natural language inputs into audio files and/or text files which represent the natural language input. For example, Microsoft Cortana encodes natural language speech using one or more audio codecs. *See* "Welcome to Cortana Workshop" (available at https://sec.ch9.ms/slides/winHEC/CortanaAudio SystemDesignGuide.pdf) at slides 6, 14.

58. On information and belief, Microsoft Cortana provides a dictionary database containing entries having syntax usage data. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/ debull/A16sept/A16SEP-CD.pdf). The entities in Satori includes addresses. *See* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *Id.*; "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/ 2015/04/Template.pdf) at 1.

59. On information and belief, Microsoft Cortana provides a dictionary database containing entries having associated word sense numbers. "Word sense number" has been construed in the Northern District of California as "[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2)

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organized into relations to other word sense numbers." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing utilizes Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

60. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated adjective word sense numbers. "Adjective word sense number" has been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at

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https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.*.

61. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated concrete noun word sense numbers. "Concrete noun word sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34.

Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id*. Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88.

62. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated verb word sense numbers. "Verb word sense number" has been construed in the Northern District of California as follows: " A verb word sense number

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contains an identification number which defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5.

63. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having syntax usage data. "Syntax usage data" has been construed in the Northern District of California as "data comprised of sets of words which can syntactically be used interchangeably in a natural language construction." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. For example, Microsoft Cortana provides data comprised of synonyms that can syntactically be used interchangeably. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by

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64. On information and belief, Microsoft Cortana lexically processes the electronically encoded data to access the dictionary database. *See* above; *see also* https://arstechnica.com/information-technology/2015/05/cortana-for-all-microsofts-plan-to-put-voice-recognition-behind-anything/ (stating, "As the speech is processed, the Bing speech APIs use entity discovery to try to assemble the semantic meaning of the recognized text and correct the results, streaming back changes to previous text until the speech recognition is complete" and "The final product of the speech recognition service is a JSON data structure that can include the text in several forms: the 'lexical' form, which is the raw, unadulterated speech recognition result in text; or various flavors of 'display text' with a best guess at capitalization, punctuation, conversion of number words to numerals, and application of common abbreviations such as 'Mr.' for 'mister' and 'St.' for 'street.'").

65. On information and belief, Microsoft Cortana provides a grammar specification. *See* https://msdn.microsoft.com/library/windows/apps/xaml/dn630426.aspx (stating that speech recognition "includes support for pre-defined grammars for free-text dictation and web search, and support for custom grammars").

66. On information and belief, Microsoft Cortana provides a context data base containing entries having word sense numbers. For example, Microsoft Cortana provides data base entities that are associated with query contexts, to present data to a user in a specific context. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/A16sept/A16SEP-CD.pdf). *See also* "Question Answering at Bing" by Yan Ke, Principal Software Engineering Manager Entity Understanding

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Group, Microsoft Research Faculty Summit 2015, July 8-9, 2015, at 5 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/03/Ke-Yan_ QnAAtBing.pdf) (providing an example of Microsoft Cortana presenting data to a user based upon the context of the user's location and time).

67. On information and belief, Microsoft Cortana utilizes syntax usage data and word sense numbers which are from entries of the dictionary database and which are associated with words of the natural language with reference to the grammar specification and the context database to select word sense numbers associated with the natural language words. For example, Microsoft Cortana utilizes an algorithm based on relationships between database entries and synonyms with reference to the grammar specification and the context database to select and access database entries. *See* https://blogs.bing.com/search/2013/03/21/understand-your-world-with-bing/ (presenting information on Mt. Everest when asked "what is the tallest mountain in the world"); *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3 (providing an algorithm and example for selecting word sense numbers with reference to associated state representation data). *See also* "Question Answering at Bing" by Yan Ke, Principal Software Engineering Manager Entity Understanding Group, Microsoft Research Faculty Summit 2015, July 8-9, 2015, at 5 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/03/Ke-Yan_QnAAtBing.pdf) (providing an example of Microsoft Cortana presenting data to a user based upon the context of the user's location and time). *See also* https://msdn.microsoft.com/library/windows/apps/xaml/dn630426.aspx (stating that speech recognition "includes support for pre-defined grammars for free-text dictation and web search, and support for custom grammars").

68. Because of Microsoft's infringement of the '840 Patent, Plaintiff has suffered damages. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable

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royalty, the precise amount to be determined at trial.

FIFTH CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 7,873,509

69. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 68 as though fully set forth herein.

70. Defendant Microsoft has been directly infringing and continues to directly infringe one or more claims of the '509 Patent, including but not limited to Claims 9, 10, and 16, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software.

71. On information and belief, Microsoft Cortana provides an experience and knowledge database comprising directed graphs that are associated with word sense numbers. Microsoft Cortana utilizes directed graphs associated with Resource Description Framework (RDF) triples having paths and conditions for accessing each path. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. *See also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1. "Word sense number" has been construed in the Northern District of California as "[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2) organized into relations to other word sense numbers." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing utilizes

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Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

72. On information and belief, the experience and knowledge database provided by Microsoft Cortana comprises directed graphs that are associated with adjective word sense numbers. "Adjective word sense number" has been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft

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Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.*. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

73. On information and belief, the experience and knowledge database provided by Microsoft Cortana comprises directed graphs that are associated with concrete noun word sense numbers. "Concrete noun word sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34. Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id.* Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

74. On information and belief, the experience and knowledge database provided by Microsoft Cortana comprises directed graphs with nodes that are associated with verb word sense numbers. "Verb word sense number" has been construed in the Northern District of California as follows: " A verb word sense number contains an identification number which

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defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

75. On information and belief, the experience and knowledge database provided by Microsoft Cortana comprises entries having syntax usage data. "Syntax usage data" has been construed in the Northern District of California as "data comprised of sets of words which can syntactically be used interchangeably in a natural language construction." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. For example, Microsoft Cortana provides data comprised of synonyms that can syntactically be used interchangeably. Microsoft Cortana utilizes Microsoft Bing technology. See http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. See https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of synonyms for entities in the database. See "Data services leveraging Bing's data assets" by

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Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/ A16sept/A16SEP-CD.pdf). Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

76. For example, on information and belief, Microsoft Cortana provides an experience and knowledge database having directed graphs with nodes with associated clause implying word sense numbers organized into paths of the nodes such that the nodes have access conditions which determine zero or more next nodes on zero or more paths that are accessible. Microsoft Cortana utilizes directed graphs associated with Resource Description Framework (RDF) triples having paths and conditions for accessing each path. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. *See also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. Microsoft Cortana software is configured to run on a computer having memory for providing the forgoing described functionality.

77. On information and belief, Microsoft Cortana performs relation path identification processing to find zero or more paths from nodes associated with a clause implying word sense numbers associated with natural language using the experience and knowledge database such that access conditions of the nodes on the found paths are met. *See* "Path-Tree: An Efficient

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Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. Microsoft Cortana software is configured to run on a computer having memory for providing the forgoing described functionality.

78. On information and belief, Microsoft Cortana provides criteria for selecting an experience and knowledge path using the previously identified directed graph. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. Microsoft Cortana software is configured to run on a computer having memory for providing the forgoing described functionality.

79. On information and belief, Microsoft Cortana utilizes criteria to select one or more found paths using the previously identified directed graph. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. Microsoft Cortana software is configured to run on a computer having memory for providing the forgoing described functionality.

80. Because of Microsofts' infringement of the '509 Patent, Plaintiff has suffered damages. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable royalty, the precise amount to be determined at trial.

SIXTH CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 8,326,603

81. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 80 as though fully set forth herein.

82. Defendant Microsoft has been directly infringing and continues to directly

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infringe one or more claims of the ’603 Patent, including but not limited to Claims 14 and 16, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software.

83. For example, on information and belief, Microsoft Cortana provides natural language with associated clause implying word sense numbers. “Word sense number” has been construed in the Northern District of California as “[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2) organized into relations to other word sense numbers.” Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is “powered by Bing”). Bing utilizes Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* “Trinity: A Distributed Graph Engine on a Memory Cloud” by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* “Knowledge Graph Inference for Spoke Dialog Systems” by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

84. On information and belief, Microsoft Cortana provides natural language with associated clause implying adjective word sense numbers. “Adjective word sense number” has

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been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.* Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

85. On information and belief, Microsoft Cortana provides natural language with associated clause implying concrete noun word sense numbers. "Concrete noun word sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with

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concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34. Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id*. Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

86. On information and belief, Microsoft Cortana provides natural language with associated clause implying verb word sense numbers. "Verb word sense number" has been construed in the Northern District of California as follows: " A verb word sense number contains an identification number which defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

87. On information and belief, Microsoft Cortana provides an experience and knowledge database comprising directed graphs that are associated with word sense numbers.

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Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/ 2013/03/21/understand-your-world-with-bing/. The entities in Satori include addresses. *See* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/ Trinity.pdf) at 33. Microsoft Cortana utilizes directed graphs associated with Resource Description Framework (RDF) triples having paths and conditions for accessing each path. The Satori database contains over 4 trillion knowledge entries of various types: raw Resource Description Framework (RDF) data, entities, relationships between entities, and multi-lingual and synonymous terms that represent the entities. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. *See also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/ 2015/04/Template.pdf) at 1. Microsoft Cortana further includes accessing associated word sense numbers having associated state representation data and which are utilized in traversing directed graphs. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/ TODSFinal.pdf), at 9-10. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

88. On information and belief, Microsoft Cortana identifies zero or more paths from nodes associated with a clause implying word sense numbers associated with natural language

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with reference to the experience and knowledge database such that the access conditions of the nodes on the found paths are met. *See* "Path-Tree: An Efficient Reachability Indexing Scheme for Large Directed Graphs" by Ruoming Jin, et al., ACM Transactions on Database Systems, Vol. 1, No. 1, Article 1, (January 2011), (available at http://research.microsoft.com/pubs/144985/TODSFinal.pdf), at 9-10. Microsoft Cortana is configured to run on a computer having memory for providing the forgoing described functionality.

89. Because of Microsoft's infringement of the '603 Patent, Plaintiff has suffered damages. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable royalty, the precise amount to be determined at trial.

SEVENTH CLAIM FOR RELIEF

INFRINGEMENT OF U.S. PATENT NO. 8,688,436

90. Plaintiff repeats and re-alleges the allegations of paragraphs 1 through 89 as though fully set forth herein.

91. Defendant Microsoft has been directly infringing and continues to directly infringe one or more claims of the '468 Patent, including but not limited to Claims 1, 2, and 7, in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software.

92. For example, on information and belief, Microsoft Cortana provides electronically encoded data which is representative of natural language by encoding natural language inputs into audio files and/or text files which represent the natural language input. For example, Microsoft Cortana encodes natural language speech using one or more audio codecs. *See* "Welcome to Cortana Workshop" (available at https://sec.ch9.ms/slides/winHEC/CortanaAudioSystemDesignGuide.pdf) at slides 6, 14.

93. On information and belief, Microsoft Cortana provides a dictionary database containing entries having associated word sense numbers. "Word sense number" has been

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construed in the Northern District of California as "[a]n address to the meaning of a word, which has meaning data that is (1) utilized to determine the intended meaning of a word usage, and (2) organized into relations to other word sense numbers." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing utilizes Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. The entities in Satori are associated with entries of a knowledge repository database. Database entries are associated with start addresses. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88. *See also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33. The entities in Satori are organized in relation to other entities. *See id.*; *see also* "Knowledge Graph Inference for Spoke Dialog Systems" by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 1.

94. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated adjective word sense numbers. "Adjective word sense number" has been construed in the Northern District of California as follows: "An adjective word sense number is composed of an identification number, a state value or value range, and an owner word sense number". Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with adjectives comprise an associated identification number. *See* "Knowledge Graph Inference for Spoke Dialog Systems"

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by Ma, et al., Microsoft Corporation, published in Proceedings of 40th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2015 (available at https://www.microsoft.com/en-us/research/wp-content/uploads/2015/04/Template.pdf) at 2-3; *see also* "Trinity: A Distributed Graph Engine on a Memory Cloud" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at www.graphengine.io/downloads/slides/Trinity.pdf) at 33; *see also* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34; Satori entities associated with adjectives comprise a data value representing a state. *See id.* Satori entities associated with adjectives comprise an owner word sense number. *See id.*.

95. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated concrete noun word sense numbers. "Concrete noun word sense number" has been construed in the Northern District of California as follows: "The word sense number of a concrete noun contains a word sense identification number, a type number, a specificity number, and an experience number." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with concrete nouns comprise an associated identification number. *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 34. Satori entities associated with concrete nouns comprise a type number. *See id; see also id.* at 30. Satori entities associated with concrete nouns comprise a specificity number. *See id.* Satori entities associated with concrete nouns comprise an experience number. *See* B. Stroustroup, The C++ Programming Language (3rd ed.) at Section 5.1 pp.87-88.

96. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having associated verb word sense numbers. "Verb word sense number" has

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been construed in the Northern District of California as follows: " A verb word sense number contains an identification number which defines the verb word sense number, and includes partial to complete word sense identification numbers of main sentence roles." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. Microsoft Cortana utilizes Microsoft Bing technology which utilizes Satori technology. *See above.* Satori entities associated with verbs comprise an associated identification number. Satori entities associated with verbs comprise identification numbers identifying the source entity (e.g. the subject role of a sentence) and the destination entity (e.g. the object role of a sentence). *See* "Distributed Real-time Knowledge Graph Serving" by Bin Shao, Yatao Li, and Wei-Ying Ma, Microsoft Research Asia (n.d.) (available at https://www.graphengine.io/downloads/slides/Trinity.KnowledgeServing.pdf) at 63; see also "A Distributed Graph Engine for Web Scale RDF Data" by Kai Zen et al., Proceedings of the VLDB Endowment, Vol. 6, No. 4 (2013), (available at research.microsoft.com/pubs/183717/Trinity.RDF.pdf) at 4-5.

97. On information and belief, the dictionary database provided by Microsoft Cortana comprises entries having syntax usage data. "Syntax usage data" has been construed in the Northern District of California as "data comprised of sets of words which can syntactically be used interchangeably in a natural language construction." Although Plaintiff does not take a position regarding whether or not this construction is correct, the extent the Court chooses to adopt this construction, Microsoft Cortana meets this construction. For example, Microsoft Cortana provides data comprised of synonyms that can syntactically be used interchangeably. Microsoft Cortana utilizes Microsoft Bing technology. *See* http://www.bing.com/explore/personal (stating that Cortana is "powered by Bing"). Bing provides syntax usage data based on Satori technology which provides a plurality of entities and relationships between entities. *See* https://blogs.bing.com/search/2013/03/21/ understand-your-world-with-bing/. In particular, Bing utilizes a "synonym service" that includes a plurality of

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synonyms for entities in the database. *See* "Data services leveraging Bing's data assets" by Kaushik Chakrabarti, Surajit Chaudhuri, Zhimin Chen, Kris Ganjam, Yeye He, Microsoft Research, IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering, Vol. 39, No. 3, September 2016 (available at http://sites.computer.org/debull/ A16sept/A16SEP-CD.pdf).

98. On information and belief, Microsoft Cortana as installed in a computer system lexically processes the electronically encoded data to access the dictionary database. *See* above; *see also* https://arstechnica.com/information-technology/2015/05/cortana-for-all-microsofts-plan-to-put-voice-recognition-behind-anything/ (stating, "As the speech is processed, the Bing speech APIs use entity discovery to try to assemble the semantic meaning of the recognized text and correct the results, streaming back changes to previous text until the speech recognition is complete" and "The final product of the speech recognition service is a JSON data structure that can include the text in several forms: the 'lexical' form, which is the raw, unadulterated speech recognition result in text; or various flavors of 'display text' with a best guess at capitalization, punctuation, conversion of number words to numerals, and application of common abbreviations such as 'Mr.' for 'mister' and 'St.' for 'street.'").

99. On information and belief, Microsoft Cortana as installed in a computer system provides a natural language plausibility and expectedness processor. For example, Microsoft Cortana provides alternate choices via the autocomplete functionality (*see* https://blogs.bing.com/search-quality-insights/September-2016/more-intelligent-autocomplete) or the autosuggest functionality (https://www.microsoft.com/cognitive-services/en-us/bing-autosuggest-api/documentation).

100. On information and belief, Microsoft Cortana utilizes the natural language plausibility and expectedness processor to initiate accessing entries of the dictionary database which are associated with words of the natural language. For example, the query autocomplete service performs analysis for relationships that exist between a search term and terms found in the surrounding context using available domain knowledge. (*See* https://blogs.bing.com/

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search-quality-insights/September-2016/more-intelligent-autocomplete. *See also* https://www.microsoft.com/cognitive-services/en-us/bing-autosuggest-api/documentation).

101. Because of Microsoft's infringement of the '436 Patent, Plaintiff has suffered damages. Plaintiff is entitled to an award of such damages, but in no event less than a reasonable royalty, the precise amount to be determined at trial.

JURY DEMAND

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, Plaintiff demands a trial by jury on all issues triable as such.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Word to Info, Inc. respectfully demands entry of judgment against Microsoft as follows:

A. finding that Microsoft in the United States in violation of 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, through at least its development, testing, support, and operation of Microsoft's Cortana personal assistant software has infringed one or more claims of the Patents-in-Suit;

B. finding Microsoft's infringement of at least one of the Patents-in-Suit to be willful;

C. awarding Plaintiff damages to be paid by Microsoft adequate to compensate Plaintiff for Microsoft's past infringement of the Patents-in-Suit and any continuing or future infringement of the Patents-in-Suit through the date such judgment is entered, together with pre-judgment and post-judgment interest, costs, expenses and an accounting of all infringing acts including, but not limited to, those acts not presented at trial as justified under 35 U.S.C. § 284;

D. a declaration that this case is exceptional under 35 U.S.C. § 285, and an award of Plaintiff's reasonable attorneys' fees;

E. ordering an accounting of all infringing acts including, but not limited to, those acts not presented at trial and an award of damages to Plaintiff for any such acts; and

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F. awarding such other and further relief at law or in equity as the Court deems just and proper.

DATED this 7th day of July, 2017.

Respectfully submitted,

By: */s/ Bryan D. Atkinson*
Steven R. Daniels (*Pro Hac Vice*)
Bryan D. Atkinson (*Pro Hac Vice*)
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Attorneys for Plaintiff Word to Info, Inc.

CERTIFICATE OF SERVICE

I hereby declare that on July 7, 2017, I caused to be electronically filed the foregoing Corrected First Amended Complaint with the Clerk of the Court using the CM/ECF system which will send notification of such filing to the registered users of the CM/ECF system in this case.

Dated: July 7, 2017

/s/Bryan D. Atkinson
Bryan D. Atkinson